

TRANSFORMERS

INDUCTORS

DC-DC CONVERTERS

AC-DC POWER SUPPLIES



**Your *Trusted* Aerospace and Military
Magnetics & Power Supply Manufacturer**

About Pico

Our Story



Founded in 1967 by Mr. Joseph Sweeney and Mr. Henry Spoldi, Pico Electronics was established to improve and reduce the size of transformers and converters – which at the time were quite large. They began developing **miniature and ultra-miniature** units of high quality and reliability for **military specifications** and commercial air flight applications. With the new technologies that allow for surface mounting and other installation venues, The transformers were developed in accordance with MIL-T (now **MIL-PRF**) military specifications. As the technology advanced, so too did Pico Electronics by progressing from **flying lead** transformers, to through-hole configurations and axial leads, to gull lead and “J” lead surface mount models.

Pico Electronics has come to be known as “the” resource for ‘anything that flies’ using a miniature inductor or transformer. Additionally, Pico Electronics became the experts in miniature DC to DC power converters and miniature AC to DC power supplies. Over the years Pico established itself as a **leader in high voltage** DC to DC output (the high voltage outputs that meet today’s modern requirements of up to 10,000 volts DC).

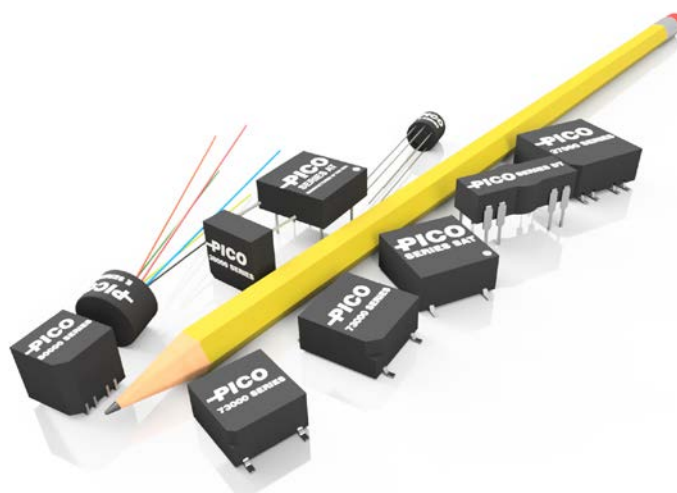
Today, Pico Electronics is constantly improving the **efficiency** of the power source and power factor correction, and is extending their high voltage product line.

PICO. The Big Name in Small Components

At Pico, we craft the industry’s **most compact** and **reliable** electronic components.

As experts in **miniature products** – transformers, inductors, DC to DC and AC to DC power supplies, we’re the top choice for power conversion.

From **cutting-edge** power systems to advanced aerospace applications, we deliver ultra-miniature inductors and transformers with **unmatched reliability**.



Product Portfolio



Transformers >

Discover Pico's innovative solution in transformer technology. Reliability and performance at miniature size for compact spaces. Product line in audio, power, DC-DC conversion, data-bus and current sensing.



Inductors >

Unchallenged in high current capability, diverse inductance values, wide frequency range & ultra-miniature in size — Pico inductor lines are offered in common mode chokes or power inductors.



DC-DC Converters >

Pico's DC-DC converter lineup features High Voltage, Extended Temperature, High Power, and Low Profile options.



AC-DC Power Supplies >

Our AC-DC Power Supplies offer versatile input and output options that ensure reliable power conversion for a wide range of applications including power factor correction, 400Hz or single / three phase inputs.



QPL Mil Spec >

Pico manufacture magnetic components that guarantee certified performance, from military to aerospace environments. These parts deliver outstanding serviceability to flight or mission critical applications.



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QPL MIL SPEC

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Audio Transformers	

Bold series have surface mount package options

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500 to 2000W Non-Isolated Regulated Power Factor Corrected Modules	

Bold series denotes surface mount package

Transformers



Audio Transformers >

- 20Hz to 250KHz (± 3 dB response) operating frequency range
- 15mW to 2W device power rating
- Wide range of impedance matching and turns ratio options
- Round package SMT, square package SMT, through hole plug-ins, and flexible insulated leads mounting types
- Size as small as 0.25" x 0.25"



Low Profile Audio Transformers >

- 300Hz to 200KHz (± 3 dB response) operating frequency range
- 50mW to 400mW device power rating
- Low profile height at 0.24"
- Square package SMT - gull wing leads
- Size as small as 0.55" x 0.55"



DC-DC Converters Transformers >

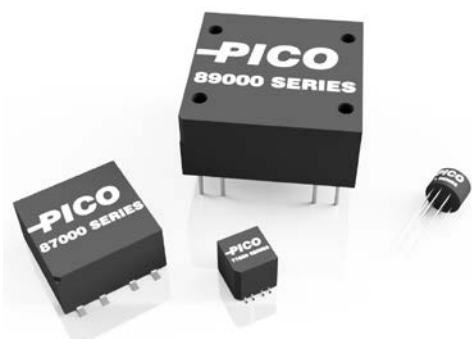
- Designed for switching power supplies with circuit topologies in bridge, dual bridge, and full wave rectification process
- Square wave switching frequency from 10kHz to 60kHz
- Up to 40W output power
- Input/output voltages from 5V to 300V
- Surface mount or plug-in mounting types
- Size as small as 0.41" x 0.41"



MIL-STD-1553 Data Bus Transformer >

- Ultra-low leakage inductance down to 2.7 μ H
- Common mode rejection ≥ 45 dB over 3K Ω impedance across 75KHz to 1MHz freq band
- Minimum rise and fall time as low as 50nS
- Droop % is down to 4.5%
- Surface mount and plug-in mounting types
- Multi-output windings with custom turns ratio change available
- Size as small as 0.4" x 0.4"

Transformers



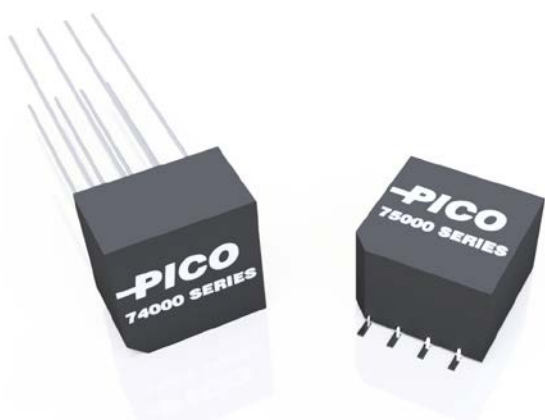
Power Transformers >

- 0.37W to 150W device power rating
- Input voltages at 115V or 26V
- Output voltages up to 300V
- Surface mount and through hole mounting types with optional mechanical inserts
- Custom modifications include voltage/power change, wider frequency, or low profile design
- Size as small as 0.55" x 0.55"



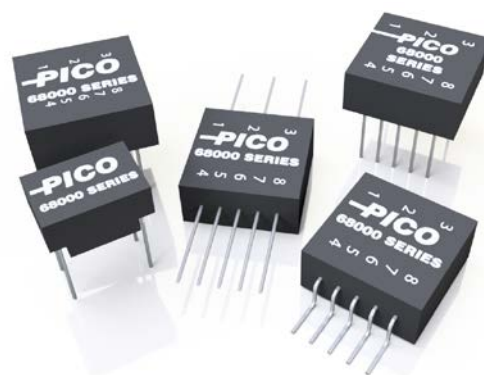
Current Sense Transformers >

- 5 to 20 Amps current rating
- Turns ratio $\leq 1:100$
- Designed for metering and load management
- Available in surface mount only
- Size as small as 0.38" x 0.38"



Pulse Transformers >

- ET Constant from 10 to 150V- μ s
- Minimum leakage inductance at 0.1 μ H
- Available in plug-in or surface mount
- Split secondary or output windings
- Turns ratio from 1:1:1 to 4:2:1
- Size as small as 0.45" x 0.45"



QPL MIL-PRF-21038/27 >

- Common mode rejection ≥ 45 dB over 3K Ω
- impedance across 75KHz to 1MHz freq band
- Maximum rise and fall time up to 250nS
- Maximum droop % is 20%
- Surface mount and plug-in mounting types
- Multi-output windings with custom turns ratio change available
- Size as small as 0.35" x 0.5"

R · 82000 & CSR Series

2-135kΩ, 75-30kHz, 1.5W Max. @ 1kHz+ Audio Transformer

PICO
Electronics, Inc.

PRODUCT OVERVIEW

The R and 82000 & CSR series are ultra-miniature transformers in an encapsulated package with design layouts as through-hole or surface mount types. They can operate over a wide temperature range of -55°C to +130°C. Our proprietary materials and methods allow extreme temperatures of vapor phase, IR or other reflow procedures without degrading the high reliability of their physical form and electrical performance.

Typical applications:

- Sensors
- Radars
- Avionic flight controls
- Airborne systems
- Naval electronics
- Military, aerospace, or commercial aircraft

FEATURES

- Extreme resistance to impact, shock, and vibration
- Manufactured to MIL-PRF-27, Class S, Grade 5
- High reliability for space and mission critical applications
- Ultra miniature in size and minimalistic design
- Design layouts in through-hole or surface mount types
- Available with magnetic shielding and/or electrostatic shielding

Contact Pico for part number of available options:

- Screening and qualification criteria to flight standard
- Capability to thermal shock up to 300 cycles
- Extra layers of magnetic shielding
- Fully RoHS compliant or with exemption 7(a)
- Modifications to mechanical design and electrical characteristics
- Custom new design and parameters

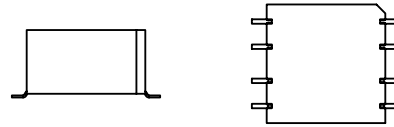


SPECIFICATIONS

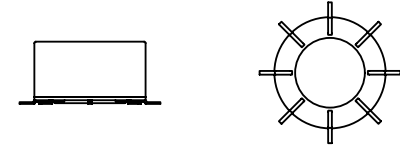
R SERIES - THROUGH HOLE



82000 SERIES - SQUARE SURFACE MOUNT



CSR SERIES - ROUND SURFACE MOUNT



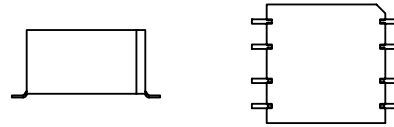
Through Hole ⁽²⁾	Surface Mount ⁽³⁾		Primary Impedance [Ω]	Secondary Impedance with Split Windings		Power			Primary Unbalanced DC Current [mA]	Primary DCR [Ω]	Secondary DCR		Turns Ratio PRI:SEC	
	Square	Round		Series [Ω]	Parallel [Ω]	1kHz+ [W]	300Hz+ [W]	75Hz+ [W]			Series [Ω]	Parallel [Ω]	Series	Parallel
R-20003	82003	CSR003	20 CT	8 CT	2	1.5	.9	.03	22	1.6	.76	.19	1.58:1	3.16:1
R-20005	82005	CSR005	20 CT	20 CT	5	1.5	.9	.03	22	1.6	1.9	.48	1:1	2:1
R-20010	82010	CSR010	32 CT	32 CT	8	1.5	.9	.03	17.5	2.56	3	.75	1:1	2:1
R-20015	82015	CSR015	40 CT	40 CT	10	1.5	.9	.03	16	3.2	3.8	.95	1:1	2:1
R-20018	82018	CSR018	48 CT	16 CT	4	1.5	.9	.03	14.5	3.84	1.52	.38	1.73:1	3.46:1
R-20020	82020	CSR020	50 CT	50 CT	12.5	1.5	.9	.03	14	4	4.75	1.19	1:1	2:1
R-20025	82025	CSR025	80 CT	32 CT	8	1.5	.9	.03	11	6.4	3	.75	1.58:1	3.16:1
R-20028	82028	CSR028	100 CT	40 CT	10	1.5	.9	.03	10	8	3.8	.95	1.58:1	3.16:1
R-20030	82030	CSR030	100 CT	100 CT	25	1.5	.9	.03	10	8	9.5	2.38	1:1	2:1
R-20035	82035	CSR035	120 CT	12.8 CT	3.2	1.5	.9	.03	9	9.6	1.22	.3	3.06:1	6.12:1
R-20040	82040	CSR040	120 CT	60 CT	15	1.5	.9	.03	9	9.6	5.7	1.4	1.14:1	2.83:1
R-20045	82045	CSR045	120 CT	120 CT	30	1.5	.9	.03	9	9.6	11.4	2.85	1:1	2:1
R-20050	82050	CSR050	150 CT	12 CT	3	1.5	.9	.03	8	12	1.14	.29	3.54:1	7.08:1
R-20055	82055	CSR055	150 CT	50 CT	12.5	1.5	.9	.03	8	12	4.75	1.19	1.73:1	3.46:1
R-20060	82060	CSR060	150 CT	100 CT	25	1.5	.9	.03	8	12	9.5	2.38	1.22:1	2.44:1
R-20065	82065	CSR065	150 CT	150 CT	37.5	1.5	.9	.03	8	12	14.3	3.56	1:1	2:1
R-20070	82070	CSR070	150 CT	600 CT	150	1.5	.9	.03	8	12	57	14.3	1:2	1:1
R-20075	82075	CSR075	200 CT	200 CT	50	1.5	.9	.03	7	16	19	4.75	1:1	2:1
R-20080	82080	CSR080	300 CT	12 CT	3	1.5	.9	.03	5.5	24	1.14	.29	5:1	10:1
R-20085	82085	CSR085	300 CT	50 CT	12.5	1.5	.9	.03	5.5	24	4.75	1.19	2.45:1	4.9:1
R-20090	82090	CSR090	300 CT	150 CT	37.5	1.5	.9	.03	5.5	24	14.25	3.56	1.41:1	2.83:1
R-20095	82095	CSR095	300 CT	300 CT	75	1.5	.9	.03	5.5	24	28.5	7.13	1:1	2:1
R-20100	82100	CSR100	300 CT	600 CT	150	1.5	.9	.03	5.5	24	57	14.25	1:1.41	1.41:1
R-20105	82105	CSR105	320 CT	12.8 CT	3.2	1.5	.9	.03	5.5	25.6	1.22	.3	5:1	10:1
R-20110	82110	CSR110	400 CT	40 CT	10	1.5	.9	.03	5	32	3.8	.95	3.16:1	6.32:1

SPECIFICATIONS

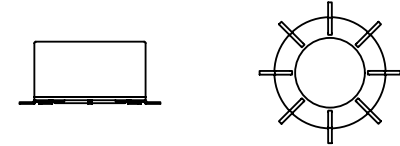
R SERIES - THROUGH HOLE



82000 SERIES - SQUARE SURFACE MOUNT



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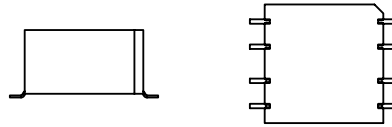
Through Hole ⁽²⁾	Surface Mount ⁽³⁾		Primary Impedance [Ω]	Secondary Impedance with Split Windings		Power			Primary Unbalanced DC Current [mA]	Primary DCR [Ω]	Secondary DCR		Turns Ratio PRI:SEC	
	Square	Round		Series [Ω]	Parallel [Ω]	1kHz+ [W]	300Hz+ [W]	75Hz+ [W]			Series [Ω]	Parallel [Ω]	Series	Parallel
R-20115	82115	CSR115	400 CT	120 CT	30	1.5	.9	.03	5	32	11.4	2.85	1.83:1	3.65:1
R-20120	82120	CSR120	400 CT	200 CT	50	1.5	.9	.03	5	32	19	4.75	1.41:1	2.83:1
R-20125	82125	CSR125	400 CT	400 CT	100	1.5	.9	.03	5	32	38	9.5	1:1	2:1
R-20130	82130	CSR130	400 CT	1000 CT	250	1.5	.9	.03	5	32	95	23.8	1:1.58	1.26:1
R-20135	82135	CSR135	400 CT	2000 CT	500	1.5	.9	.03	5	32	190	47.5	1:2.24	1:1.12
R-20140	82140	CSR140	400 CT	4000 CT	1000	1.5	.9	.03	5	32	380	95	1:3.16	1:1.58
R-20142	82142	CSR142	500 CT	12.8 CT	3.2	1.5	.9	.03	4.5	40	1.22	.3	6.25:1	12.5:1
R-20144	82144	CSR144	500 CT	16 CT	4	1.5	.9	.03	4.5	40	1.52	.38	5.6:1	11.2:1
R-20145	82145	CSR145	500 CT	50 CT	12.5	1.5	.9	.03	4.5	40	4.75	1.19	3.16:1	6.32:1
R-20147	82147	CSR147	500 CT	150 CT	37.5	1.5	.9	.03	4.5	40	14.25	3.56	1.83:1	3.65:1
R-20150	82150	CSR150	500 CT	500 CT	125	1.5	.9	.03	4.5	40	47.5	11.88	1:1	2:1
(1) R-20155	82155	CSR155	500 CT	500 CT	-	1.5	.9	.03	4.5	40	47.5	-	1:1	-
R-20160	82160	CSR160	500 CT	600 CT	150	1.5	.9	.03	4.5	40	57	14.25	1:1.1	1.83:1
R-20165	82165	CSR165	600 CT	12.8 CT	3.2	1.5	.9	.03	4	48	1.22	.3	6.85:1	13.7:1
R-20167	82167	CSR167	600 CT	30 CT	7.5	1.5	.9	.03	4	48	2.85	.71	4.47:1	8.94:1
R-20170	82170	CSR170	600 CT	48 CT	12	1.5	.9	.03	4	48	4.56	1.14	3.54:1	7.07:1
R-20175	82175	CSR175	600 CT	200 CT	50	1.5	.9	.03	4	48	19	4.75	1.73:1	3.46:1
R-20180	82180	CSR180	600 CT	600 CT	150	1.5	.9	.03	4	48	57	14.25	1:1	2:1
(1) R-20185	82185	CSR185	600 CT	600 CT	-	1.5	.9	.03	4	48	57	-	1:1	-
(1) R-20186	82186	CSR186	600 CT	900 CT	-	1.5	.9	.03	4	48	85.5	-	1:1.22	-
R-20187	82187	CSR187	600 CT	1200 CT	300	1.5	.9	.03	4	48	114	28.5	1:1.41	1.41:1
R-20190	82190	CSR190	640 CT	12.8 CT	3.2	1.5	.9	.03	4	51.2	1.22	.3	7.07:1	14.14:1
R-20195	82195	CSR195	700 CT	100 CT	25	1.5	.9	.03	3.5	56	9.5	2.38	2.65:1	5.29:1
R-20200	82200	CSR200	800 CT	12.8 CT	3.2	1.5	.9	.03	3.5	64	1.22	.3	7.91:1	15.8:1
R-20205	82205	CSR205	800 CT	48 CT	12	1.5	.9	.03	3.5	64	4.56	1.14	4.08:1	8.16:1

SPECIFICATIONS

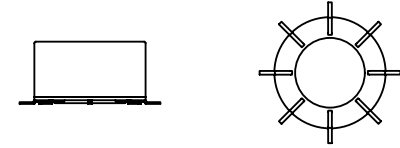
R SERIES - THROUGH HOLE



82000 SERIES - SQUARE SURFACE MOUNT



CSR SERIES - ROUND SURFACE MOUNT



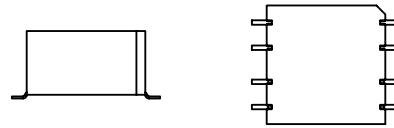
	Through Hole ⁽²⁾	Surface Mount ⁽³⁾		Primary Impedance [Ω]	Secondary Impedance with Split Windings		Power			Primary Unbalanced DC Current [mA]	Primary DCR [Ω]	Secondary DCR		Turns Ratio PRI:SEC	
		Square	Round		Series [Ω]	Parallel [Ω]	1kHz+ [W]	300Hz+ [W]	75Hz+ [W]			Series [Ω]	Parallel [Ω]	Series	Parallel
	R-20210	82210	CSR210	800 CT	800 CT	200	1.5	.9	.03	3.5	64	76	19	1:1	2:1
	R-20215	82215	CSR215	900 CT	600 CT	150	1.5	.9	.03	3	72	57	14.3	1.23:1	2.45:1
(1)	R-20217	82217	CSR217	900 CT	900 CT	-	1.5	.9	.03	3	72	85.5	-	1:1	-
	R-20220	82220	CSR220	1000 CT	12 CT	3	1.5	.9	.03	3	80	1.14	.29	9.13:1	18.26:1
	R-20225	82225	CSR225	1000 CT	50 CT	12.5	1.5	.9	.03	3	80	4.75	1.19	4.47:1	8.94:1
	R-20230	82230	CSR230	1000 CT	1000 CT	250	1.5	.9	.03	3	80	95	23.8	1:1	2:1
	R-20235	82235	CSR235	1060 CT	12.8 CT	3.2	1.5	.9	.03	3	85	1.22	.3	9.1:1	18.2:1
	R-20250	82240	CSR240	1200 CT	12.8 CT	3.2	1.5	.9	.03	3	96	1.22	.3	9.68:1	19.4:1
	R-20255	82245	CSR245	1200 CT	500 CT	125	1.5	.9	.03	3	96	47.5	11.88	1.55:1	3.1:1
	R-20250	82250	CSR250	1200 CT	1200 CT	300	1.5	.9	.03	3	96	114	28.5	1:1	2:1
(1)	R-20255	82255	CSR255	1200 CT	1200 CT	-	1.5	.9	.03	3	96	114	-	1:1	-
	R-20260	82260	CSR260	1500 CT	12 CT	3	1.5	.9	.03	2.5	120	1.14	.29	11.18:1	22.36:1
	R-20265	82265	CSR265	1500 CT	500 CT	125	1.5	.9	.03	2.5	120	47.5	11.88	1.73:1	3.46:1
(1)	R-20270	82270	CSR270	1500 CT	600 CT	-	1.5	.9	.03	2.5	120	57	-	1.58:1	-
(1)	R-20275	82275	CSR275	1500 CT	1500 CT	-	1.5	.9	.03	2.5	120	142	-	1:1	-
	R-20280	82280	CSR280	1600 CT	12.8 CT	3.2	1.5	.9	.03	2.5	128	1.22	3	11.18:1	22.36:1
	R-20283	82283	CSR283	2000 CT	8 CT	2	1.5	.9	.03	2.2	160	.76	.19	15.8:1	31.6:1
	R-20285	82285	CSR285	2000 CT	2000 CT	500	1.5	.9	.03	2.2	160	190	47.5	1:1	2:1
(1)	R-20290	82290	CSR290	2000 CT	2000 CT	-	1.5	.9	.03	2.2	160	190	-	1:1	-
	R-20295	82295	CSR295	2000 CT	8000 CT	2000	1.5	.9	.03	2.2	160	760	190	1:2	1:1
	R-20297	82297	CSR297	2500 CT	2500 CT	625	1.5	.9	.03	2	200	238	59.5	1:1	2:1
	R-20300	82300	CSR300	3000 CT	3000 CT	750	1.5	.9	.03	1.8	240	285	71.3	1:1	2:1
(1)	R-20305	82305	CSR305	3000 CT	3000 CT	-	1.5	.9	.03	1.8	240	285	-	1:1	-
	R-20310	82310	CSR310	3600 CT	3600 CT	900	1.5	.9	.03	1.7	288	342	86	1:1	2:1
	R-20312	82312	CSR312	4000 CT	16 CT	4	1.5	.9	.03	1.6	320	1.52	.38	15.8:1	31.6:1

SPECIFICATIONS

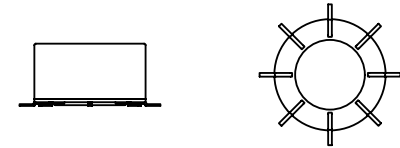
R SERIES - THROUGH HOLE



82000 SERIES - SQUARE SURFACE MOUNT



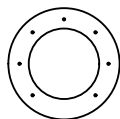
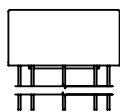
CSR SERIES - ROUND SURFACE MOUNT



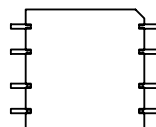
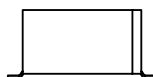
	Through Hole ⁽²⁾	Surface Mount ⁽³⁾		Primary Impedance [Ω]	Secondary Impedance with Split Windings		Power			Primary Unbalanced DC Current [mA]	Primary DCR [Ω]	Secondary DCR		Turns Ratio PRI:SEC	
		Square	Round		Series [Ω]	Parallel [Ω]	1kHz+ [W]	300Hz+ [W]	75Hz+ [W]			Series [Ω]	Parallel [Ω]	Series	Parallel
	R-20314	82314	CSR314	4000 CT	600 CT	150	1.5	.9	.03	1.6	320	57	14.3	2.58:1	5.16:1
	R-20315	82315	CSR315	4000 CT	1000 CT	250	1.5	.9	.03	1.6	320	95	23.8	2:1	4:1
(1)	R-20320	82320	CSR320	4000 CT	8000 CT	-	1.5	.9	.03	1.6	320	760	-	1:1.41	-
	R-20325	82325	CSR325	5000 CT	500 CT	125	1.5	.9	.03	1.4	400	47.5	11.88	3.16:1	6.32:1
	R-20330	82330	CSR330	5000 CT	5000 CT	1250	1.5	.9	.03	1.4	400	475	119	1:1	2:1
	R-20335	82335	CSR335	7500 CT	50 CT	12.5	1.3	.9	.03	1.2	600	4.75	1.19	12.25:1	24.5:1
	R-20340	82340	CSR340	7500 CT	100 CT	25	1.3	.9	.03	1.2	600	9.5	2.38	8.66:1	17.32:1
	R-20345	82345	CSR345	7500 CT	600 CT	150	1.3	.9	.03	1.2	600	57	14.3	3.54:1	7.07:1
	R-20350	82350	CSR350	7500 CT	2500 CT	625	1.3	.9	.03	1.2	600	238	59.5	1.73:1	3.46:1
(1)	R-20355	82355	CSR355	7500 CT	7500 CT	-	1.3	.9	.03	1.2	600	713	-	1:1	-
	R-20360	82360	CSR360	8000 CT	12.8 CT	3.2	1.2	.9	.03	1.1	640	1.22	.3	25:1	50:1
	R-20365	82365	CSR365	8000 CT	1000 CT	250	1.2	.9	.03	1.1	640	95	23.8	2.83:1	5.66:1
(1)	R-20370	82370	CSR370	8000 CT	1200 CT	-	1.2	.9	.03	1.1	640	114	-	2.58:1	-
(1)	R-20375	82375	CSR375	9000 CT	9000 CT	-	1.1	.9	.03	1.1	720	855	-	1:1	-
	R-20380	82380	CSR380	10,000 CT	12.8 CT	3.2	1.0	.9	.03	1	800	1.22	.3	28:1	56:1
	R-20385	82385	CSR385	10,000 CT	16 CT	4	1.0	.9	.03	1	800	1.52	.38	25:1	50:1
	R-20390	82390	CSR390	10,000 CT	100 CT	25	1.0	.9	.03	1	800	9.5	2.38	10:1	20:1
	R-20395	82395	CSR395	10,000 CT	200 CT	50	1.0	.9	.03	1	800	19	4.75	7.07:1	14.14:1
	R-20400	82400	CSR400	10,000 CT	500 CT	125	1.0	.9	.03	1	800	47.5	11.88	4.47:1	8.94:1
	R-20405	82405	CSR405	10,000 CT	600 CT	150	1.0	.9	.03	1	800	57	14.25	4.08:1	8.16:1
	R-20410	82410	CSR410	10,000 CT	1000 CT	250	1.0	.9	.03	1	800	95	23.8	3.16:1	6.32:1
	R-20415	82415	CSR415	10,000 CT	1200 CT	300	1.0	.9	.03	1	800	114	28.5	2.89:1	5.77:1
	R-20420	82420	CSR420	10,000 CT	1500 CT	375	1.0	.9	.03	1	800	143	35.8	2.58:1	5.16:1
	R-20425	82425	CSR425	10,000 CT	2000 CT	500	1.0	.9	.03	1	800	190	47.5	2.24:1	4.47:1
	R-20430	82430	CSR430	10,000 CT	5000 CT	1250	1.0	.9	.03	1	800	475	119	1.41:1	2.83:1

SPECIFICATIONS

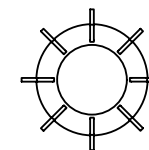
R SERIES - THROUGH HOLE



82000 SERIES - SQUARE SURFACE MOUNT



CSR SERIES - ROUND SURFACE MOUNT



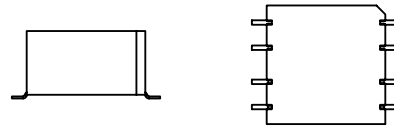
	Through Hole ⁽²⁾	Surface Mount ⁽³⁾		Primary Impedance [Ω]	Secondary Impedance with Split Windings		Power			Primary Unbalanced DC Current [mA]	Primary DCR [Ω]	Secondary DCR		Turns Ratio PRI:SEC	
		Square	Round		Series [Ω]	Parallel [Ω]	1kHz+ [W]	300Hz+ [W]	75Hz+ [W]			Series [Ω]	Parallel [Ω]	Series	Parallel
	R-20435	82435	CSR435	10,000 CT	7500 CT	1875	1.0	.9	.03	1	800	713	178	1.16:1	2.31:1
	R-20440	82440	CSR440	10,000 CT	10,000 CT	2500	1.0	.9	.03	1	800	950	238	1:1	2:1
(1)	R-20445	82445	CSR445	10,000 CT	10,000 CT	-	1.0	.9	.03	1	800	950	-	1:1	-
	R-20450	82450	CSR450	15,000 CT	400 CT	100	.66	.66	.03	.8	1200	38	9.5	6.12:1	12.25:1
	R-20452	82452	CSR452	15,000 CT	500 CT	125	.66	.66	.03	.8	1200	48	12	5.48:1	10.95:1
	R-20455	82455	CSR455	15,000 CT	600 CT	150	.66	.66	.03	.8	1200	57	14.3	5:1	10:1
	R-20460	82460	CSR460	15,000 CT	10,000 CT	2500	.66	.66	.03	.8	1200	950	238	1.22:1	2.45:1
(1)	R-20465	82465	CSR465	15,000 CT	15,000 CT	-	.66	.66	.03	.8	1200	1430	-	1:1	-
	R-20470	82470	CSR470	15,000 CT	15,000 CT	3750	.66	.66	.03	.8	1200	1430	357	1:1	2:1
	R-20475	82475	CSR475	16,000 CT	1000 CT	250	.62	.62	.03	.8	1280	95	23.8	4:1	8:1
	R-20480	82480	CSR480	20,000 CT	500 CT	125	.5	.5	.03	.7	1600	47.5	11.88	6.32:1	12.65:1
	R-20485	82485	CSR485	20,000 CT	600 CT	150	.5	.5	.03	.7	1600	57	14.25	5.77:1	11.55:1
	R-20490	82490	CSR490	20,000 CT	800 CT	200	.5	.5	.03	.7	1600	76	19	5:1	10:1
	R-20495	82495	CSR495	20,000 CT	1000 CT	250	.5	.5	.03	.7	1600	95	23.8	4.47:1	8.94:1
	R-20500	82500	CSR500	20,000 CT	5000 CT	1250	.5	.5	.03	.7	1600	475	119	2:1	4:1
	R-20505	82505	CSR505	20,000 CT	10,000 CT	2500	.5	.5	.03	.7	1600	950	238	1.41:1	2.83:1
(1)	R-20510	82510	CSR510	20,000 CT	20,000 CT	-	.5	.5	.03	.7	1600	1900	-	1:1	-
	R-20515	82515	CSR515	25,000 CT	500 CT	125	.4	.4	.03	.6	2000	47.5	11.88	7.07:1	14.14:1
	R-20520	82520	CSR520	25,000 CT	1000 CT	250	.4	.4	.03	.6	2000	95	23.8	5:1	10:1
	R-20525	82525	CSR525	30,000 CT	50 CT	12.5	.33	.33	.03	.6	2400	4.75	1.19	24.5:1	49:1
	R-20530	82530	CSR530	30,000 CT	1200 CT	300	.33	.33	.03	.6	2400	114	28.5	5:1	10:1
	R-20532	82532	CSR532	30,000 CT	500 CT	125	.33	.33	.03	.6	2400	47.5	11.88	7.7:1	15.5:1
	R-20534	82534	CSR534	30,000 CT	200 CT	50	.33	.33	.03	.6	2400	19	4.75	12.2:1	24.5:1
	R-20535	82535	CSR535	30,000 CT	5000 CT	1250	.33	.33	.03	.6	2400	475	119	2.45:1	4.9:1
	R-20540	82540	CSR540	30,000 CT	10,000 CT	2500	.33	.33	.03	.6	2400	950	238	1.73:1	3.46:1

SPECIFICATIONS

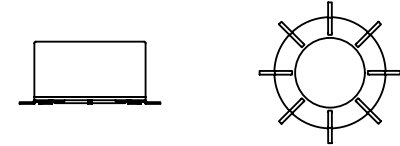
R SERIES - THROUGH HOLE



82000 SERIES - SQUARE SURFACE MOUNT



CSR SERIES - ROUND SURFACE MOUNT



	Through Hole ⁽²⁾	Surface Mount ⁽³⁾		Primary Impedance [Ω]	Secondary Impedance with Split Windings		Power			Primary Unbalanced DC Current [mA]	Primary DCR [Ω]	Secondary DCR		Turns Ratio PRI:SEC	
		Square	Round		Series [Ω]	Parallel [Ω]	1kHz+ [W]	300Hz+ [W]	75Hz+ [W]			Series [Ω]	Parallel [Ω]	Series	Parallel
(1)	R-20545	82545	CSR545	30,000 CT	30,000 CT	-	.33	.33	.03	.6	2400	2850	-	1:1	-
	R-20550	82550	CSR550	40,000 CT	400 CT	100	.25	.25	.03	.5	3200	38	9.5	10:1	20:1
	R-20555	82555	CSR555	40,000 CT	2000 CT	500	.25	.25	.03	.5	3200	190	47.5	4.47:1	8.94:1
	R-20560	82560	CSR560	40,000 CT	4000 CT	1000	.25	.25	.03	.5	3200	380	95	3.16:1	6.32:1
	R-20565	82565	CSR565	40,000 CT	20,000 CT	5000	.25	.25	.03	.5	3200	1900	475	1.41:1	2.83:1
(1)	R-20570	82570	CSR570	40,000 CT	40,000 CT	-	.25	.25	.03	.5	3200	3800	-	1:1	-
	R-20575	82575	CSR575	50,000 CT	200 CT	50	.2	.2	.03	.4	4000	19	4.75	15.8:1	31.6:1
	R-20577	82577	CSR577	50,000 CT	500 CT	125	.2	.2	.03	.4	4000	47.5	11.88	10:1	20:1
	R-20578	82578	CSR578	50,000 CT	600 CT	150	.2	.2	.03	.4	4000	57	14.3	9.13:1	18.26:1
	R-20579	82579	CSR579	50,000 CT	50,000 CT	12,500	.2	.2	.03	.4	4000	4750	1190	1:1	2:1
	R-20580	82580	CSR580	60,000 CT	15,000 CT	3750	.16	.16	.03	.4	4800	1430	358	2:1	4:1
	R-20585	82585	CSR585	62,500 CT	50 CT	12.5	.16	.16	.03	.4	5000	4.75	1.19	35.4:1	70.7:1
	R-20587	82587	CSR587	80,000 CT	15,000 CT	3750	.12	.12	.03	.3	6400	1430	358	2.3:1	4.6:1
	R-20590	82590	CSR590	90,000 CT	10,000 CT	2500	.11	.11	.03	.3	7200	950	238	3:1	6:1
	R-20595	82595	CSR595	95,000 CT	15,000 CT	3750	.1	.1	.03	.3	7600	1430	358	2.5:1	5:1
	R-20600	82600	CSR600	100,000 CT	60 CT	15	.1	.1	.03	.3	8000	5.7	1.43	40.8:1	81.6:1
	R-20605	82605	CSR605	100,000 CT	100 CT	25	.1	.1	.03	.3	8000	9.5	2.38	31.6:1	63.2:1
	R-20610	82610	CSR610	100,000 CT	500 CT	125	.1	.1	.03	.3	8000	47.5	11.88	14.1:1	28.3:1
	R-20613	82613	CSR613	100,000 CT	1000 CT	250	.1	.1	.03	.3	8000	95	23.8	10:1	20:1
	R-20614	82614	CSR614	100,000 CT	2000 CT	500	.1	.1	.03	.3	8000	190	47.5	7.07:1	14.14:1
	R-20615	82615	CSR615	100,000 CT	10,000 CT	2500	.1	.1	.03	.3	8000	950	238	3.16:1	6.32:1
	R-20620	82620	CSR620	135,000 CT	82 CT	20.5	.07	.07	.03	.2	10,800	7.8	1.9	40.6:1	81.2:1

Note 1: Includes electrostatic shield.

Note 2: For RoHS compliance on a through-hole component, please consult with Pico's engineer and provide the part number.

Note 3: All SMDs are available with Pb-free dipped terminals that is compliant to RoHS exemption 7 by requesting part number + 'RoHS-7'

SPECIFICATIONS

GENERAL

Parameter	Condition	Min.	Typ.	Max.	Units
Dielectric Strength	60Hz	-	200	-	V _{RMS}
Insulation Resistance	300VDC	10	-	-	GΩ
Distortion	75Hz, 300Hz & 1kHz @ Rated Power	-	-	5	%
Frequency Response	75 - 30kHz @ 1mW	-3	-	3	dB
Operating Temperature Range	Ambient with temperature rise	-55	-	+130	°C
Storage Temperature Range	Ambient	-55	-	+105	°C
Size	R Series - Diameter x Height	0.75 x 0.375 (19.05 x 9.525)			inches (mm)
	CSR Series - Diameter x Height	0.75 x 0.42 (19.05 x 10.668)			
	82000 Series - Length x Width x Height	0.8 x 0.8 x 0.455 (20.32 x 20.32 x 11.557)			
Weight	R, CSR, & 82000 Series	-	12	-	grams
Case	R & CSR Series	Epoxy Insulated Metal			
	82000 Series	Glass Reinforced Polymer			
Potting	Vacuum Impregnated Epoxy				
Box Packaging (L x W x H)	R Series	9.45 x 2.35 x 1.29 (240.03 x 59.69 x 32.766)			inches (mm)
Tube Packaging (W x H x L)	CSR & 82000 Series	1.24 x 0.61 x 20.0 (31.496 x 15.494 x 508)			
Tape & Reel Packaging	Upon request				
Moisture Sensitivity Level	Surface Mount only	Level 3			

OPTIONAL DESIGN CRITERIA

Test	Standard	Description
Vibration	MIL-STD-202	Method 204, Vibration, High Frequency
Shock	MIL-STD-202	Method 213, Shock (Specified Pulse)
Immersion	MIL-STD-202	Method 104, Immersion
Moisture Resistance	MIL-STD-202	Method 106, Moisture Resistance
Flammability	MIL-STD-202	Method 111, Flammability (External Flame)
Thermal Shock	MIL-STD-202	Method 107, Thermal Shock

OPTIONAL SCREENING AND QUALIFICATION

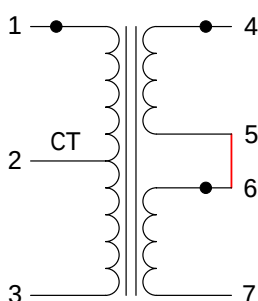
Standard	Screening & Qualification	Test ⁽⁴⁾
MIL-PRF-27	a.) Group A inspection Level-T - Table VII b.) Qualification inspection, Grade 5 - Table V	I. Thermal Shock II. Vibration III. Burn-in IV. Induced Voltage V. Shock VI. Dielectric Withstanding Voltage (at reduced pressure) VII. Insulation Resistance VIII. Electrical Characteristics IX. Visual and Mechanical Examination (External) X. Life XI. Radiographic Inspection
MIL-STD-981	a.) Group A screening tests - Table VI b.) Group B tests - Table XII, Class S	
EEE-INST-002, Section M1	a.) Magnetism Screening Req. - Table 2 b.) Magnetism Part Qual. - Table 3	

Note 4: Screening and qualification tests are not limited to the options in the chart above. Each standard may also be stringent or exclude certain tests from one another. Please contact Pico for specific application needs and for Pico part number.

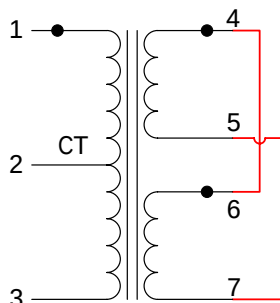
ELECTRICAL SCHEMATIC

R SERIES - THROUGH HOLE

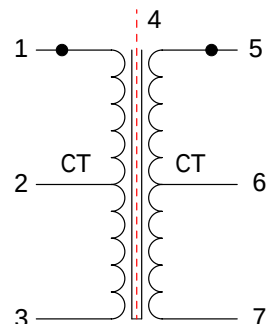
**SPLIT SECONDARIES
SERIES CONNECTION**



**SPLIT SECONDARIES
PARALLEL CONNECTION**

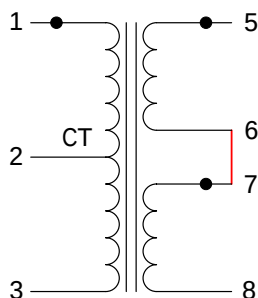


ELECTROSTATIC SHIELD

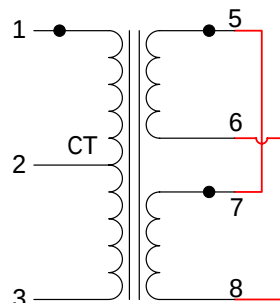


82000 & CSR SERIES - SURFACE MOUNT

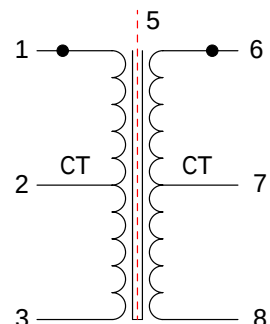
**SPLIT SECONDARIES
SERIES CONNECTION**



**SPLIT SECONDARIES
PARALLEL CONNECTION**



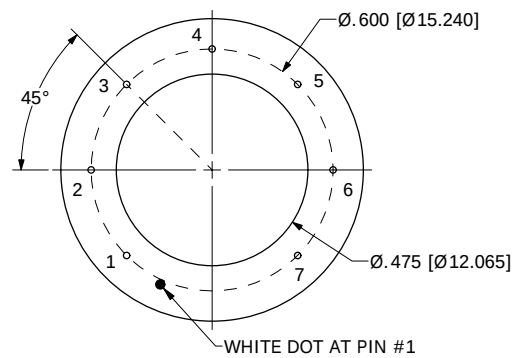
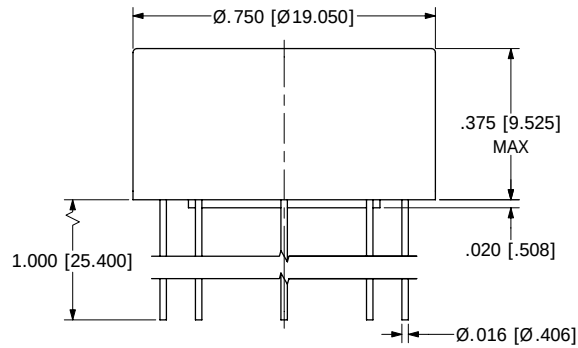
ELECTROSTATIC SHIELD



NOTES

- ANY TERMINALS NOT SHOWN HERE MAY BE USED FOR MECHANICAL STABILITY ON THE PCB ONLY, AS THEY DO NOT HAVE ANY ELECTRICAL CONNECTION.
- CT STANDS FOR "CENTER-TAP", WHERE THE TOTAL NUMBER OF TURNS IS EVENLY SPLIT BETWEEN THE TOP HALF AND BOTTOM HALF OF A COMPLETE WINDING.

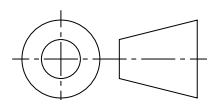
R SERIES - THROUGH HOLE

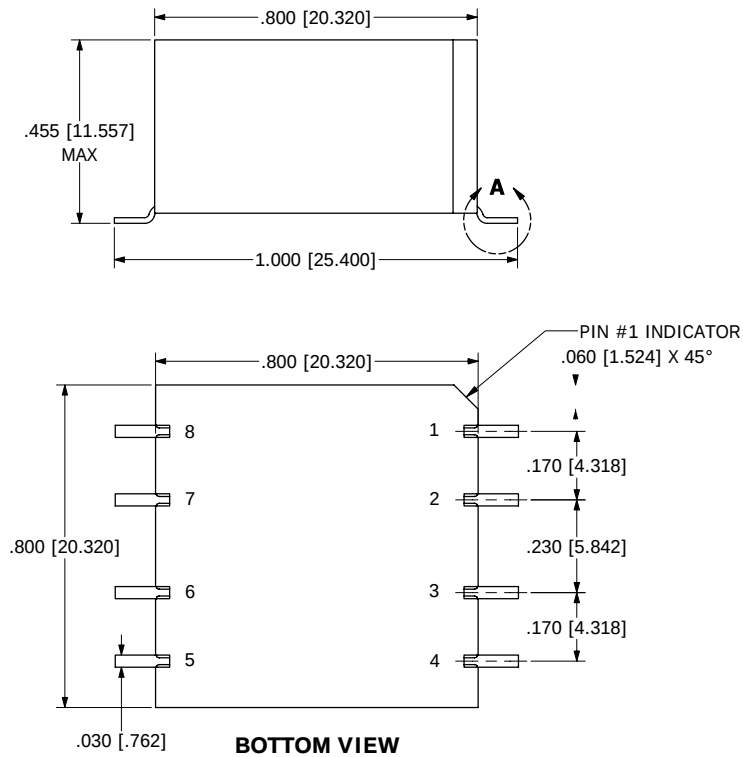
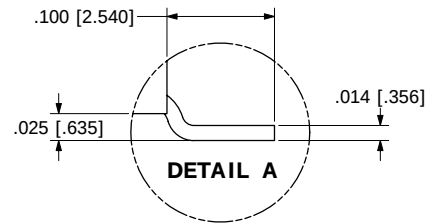


BOTTOM VIEW

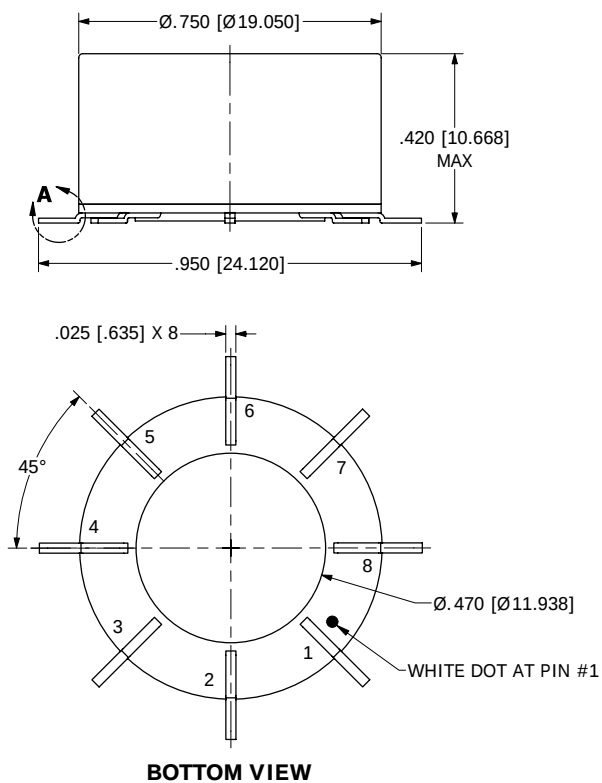
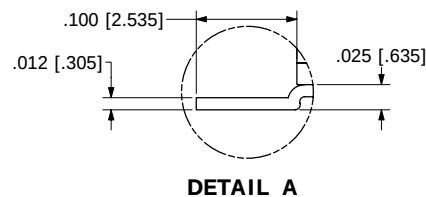
NOTES

- a. ALL DIMENSIONS ARE IN INCHES, [] = MM
- b. TERMINALS ARE CLOCKWISE FROM PIN #1

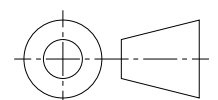


MECHANICAL DRAWINGS
82000 SERIES - SQUARE SURFACE MOUNT

LEAD DETAILS

NOTES

- ALL DIMENSIONS ARE IN INCHES, [] = MM
- TERMINALS ARE CLOCKWISE FROM PIN #1
- PIN #4 HAS NO CONNECTION

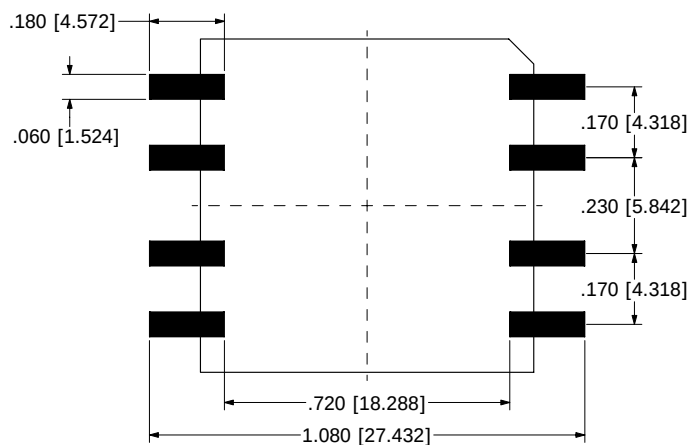
CSR SERIES - ROUND SURFACE MOUNT

LEAD DETAILS

NOTES

- ALL DIMENSIONS ARE IN INCHES, [] = MM
- TERMINALS ARE CLOCKWISE FROM PIN #1
- PIN #4 HAS NO CONNECTION

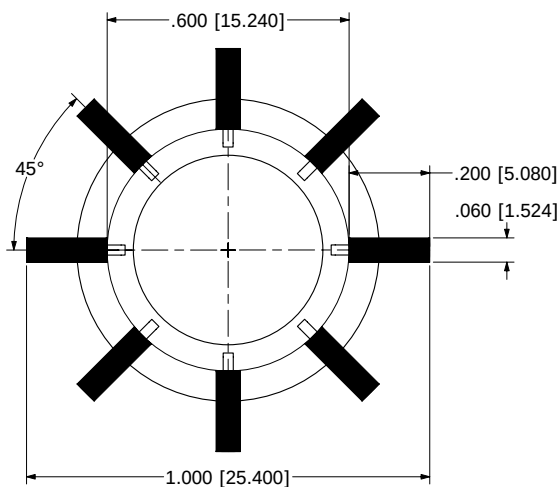


RECOMMENDED LAND PATTERN DIMENSIONS

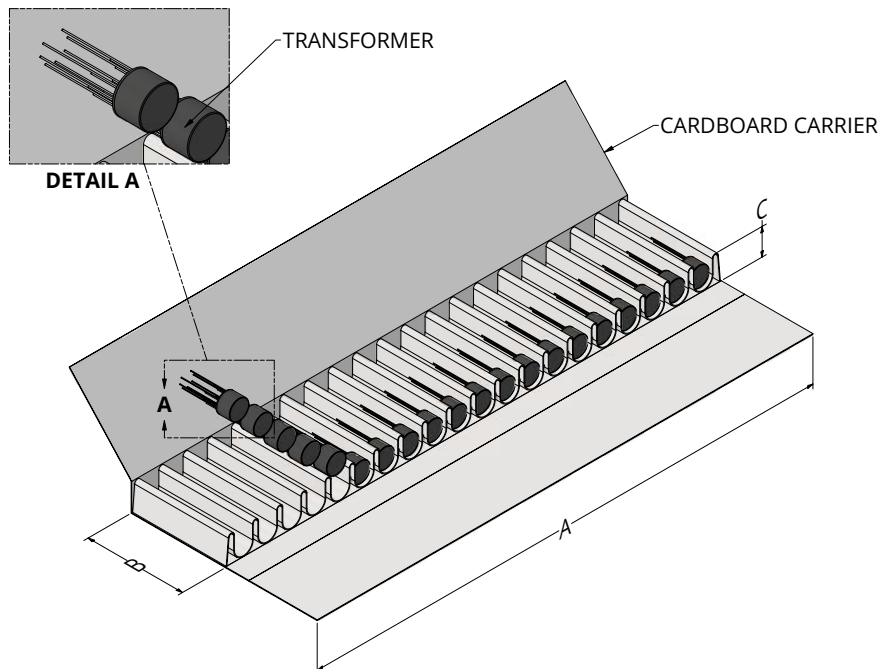
82000 SERIES - SQUARE SURFACE MOUNT



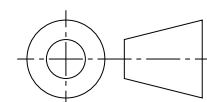
CSR SERIES - ROUND SURFACE MOUNT



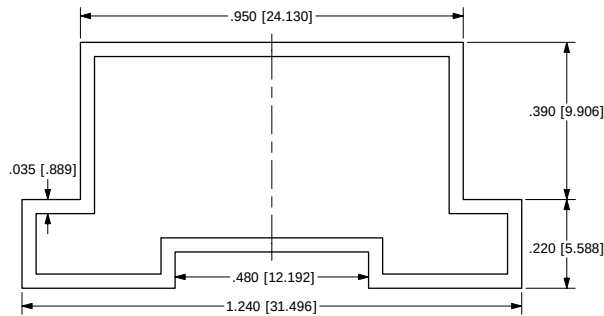
BOX PACKAGING - R SERIES



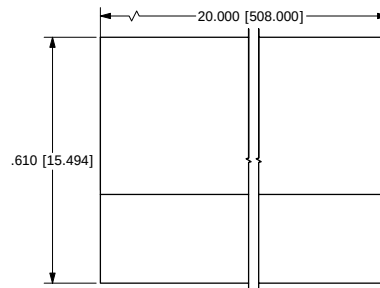
Dimension		
A	B	C
9.45 [240.03]	2.35 [59.69]	1.29 [32.766]



TUBE PACKAGING - 82000 & CSR SERIES

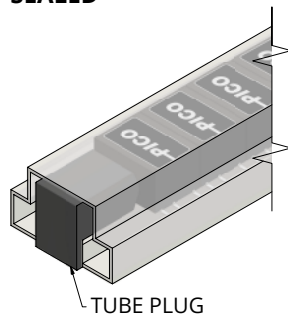


PLAN VIEW

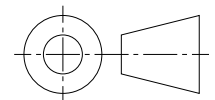
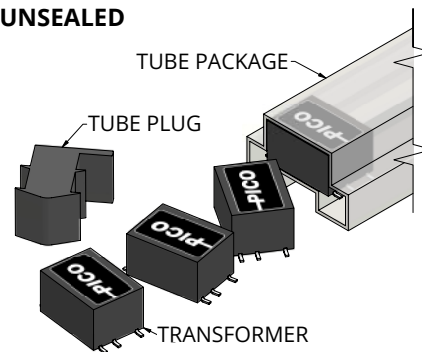


ELEVATION VIEW

SEALED



UNSEALED



Pico warrants each product manufactured by us and sold by us or an authorized representative, to be free from defects in material and workmanship. If properly used, it will perform within its applicable specifications for a period of one year after original shipment. Pico's obligation under this guarantee is limited to repairing or replacing our product to the original purchaser. This warranty is in lieu of all other warranties, express or implied and constitutes fulfillment of our obligations to the purchaser. We do not guarantee that the products can be used for a particular purpose other than those solely covered by the product's specifications. Pico must be notified if the product must meet particular certifications and/or standards. We assume no liability, in any event, for consequential damages, for anticipated or lost profits, incidental damages or loss of time or other losses incurred by the purchaser or any third party in connection with products covered by this warranty or otherwise. The purchaser will indemnify and hold Pico harmless for any damages, losses, costs, etc. from usage not within the product's specifications. Pico must be consulted before usage of its products in a nuclear, radioactive or space environment.

We reserve the right to discontinue products without notice, We reserve the right to make modifications to any existing catalog products without notice, at any time, without the obligation to modify units previously sold.

F & G · 70000 & 80000 Series

2-20kΩ, 400-250kHz, 125mW Max. @ 1kHz+ Audio Transformer

PICO
Electronics, Inc.

PRODUCT OVERVIEW

The F & G and 70000 & 80000 series are ultra-miniature transformers in an encapsulated package with design layouts as through-hole with insulated leads option, or surface mount types. They can operate over a wide temperature range of -55°C to +130°C. Our proprietary materials and methods allow extreme temperatures of vapor phase, IR or other reflow procedures without degrading the high reliability of their physical form and electrical performance.

Typical applications:

- Sensors
- Radars
- Avionic flight controls
- Airborne systems
- Naval electronics
- Military, aerospace, or commercial aircraft

FEATURES

- Extreme resistance to impact, shock, and vibration
- Manufactured to MIL-PRF-27, Class S, Grade 5
- High reliability for space and mission critical applications
- Ultra miniature in size and minimalistic design
- Design layouts in through-hole with insulated leads option or surface mount types
- Available with magnetic shielding and/or electrostatic shielding

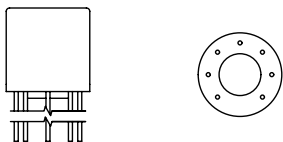
Contact Pico for part number of available options:

- Screening and qualification criteria to flight standard
- Capability to thermal shock up to 300 cycles
- Extra layers of magnetic shielding
- Fully RoHS compliant or with exemption 7(a)
- Modifications to mechanical design and electrical characteristics
- Custom new design and parameters

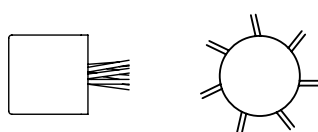


SPECIFICATIONS

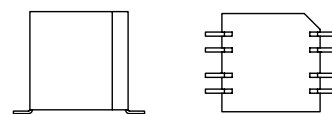
F SERIES (STRAIGHT LEADS)



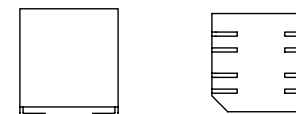
G SERIES (INSULATED LEADS)



70000 SERIES (GULL WING LEADS SURFACE MOUNT)



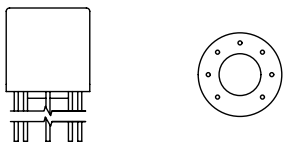
80000 SERIES (J LEADS SURFACE MOUNT)



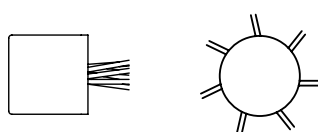
Through Hole ⁽²⁾		Surface Mount ⁽³⁾		Primary Impedance [Ω]	Secondary Impedance with Split Windings		Power		Primary Unbalanced DC Current [mA]	Primary DCR [Ω]	Secondary DCR		Turns Ratio PRI:SEC	
Straight	Insulated	Gull Wing Leads	J Leads		Series [Ω]	Parallel [Ω]	1kHz+ [mW]	400Hz+ [mW]			Series [Ω]	Parallel [Ω]	Series	Parallel
F-28003	G-29003	70003	80003	10 CT	10 CT	2.5	125	20	11.5	1.1	1.35	.34	1:1	2:1
F-28005	G-29005	70005	80005	20 CT	8 CT	2	125	20	8	2.1	1.28	.32	1.58:1	3.16:1
F-28010	G-29010	70010	80010	20 CT	20 CT	5	125	20	8	2.1	2.56	.64	1:1	2:1
F-28015	G-29015	70015	80015	32 CT	32 CT	8	125	20	6.5	3.52	4.32	1.08	1:1	2:1
F-28020	G-29020	70020	80020	40 CT	40 CT	10	125	20	5.6	4	4.77	1.19	1:1	2:1
F-28025	G-29025	70025	80025	48 CT	16 CT	4	125	20	5.2	4.3	2.3	.58	1.73:1	3.46:1
F-28030	G-29030	70030	80030	50 CT	50 CT	12.5	125	20	5	5.5	6.6	1.65	1:1	2:1
F-28035	G-29035	70035	80035	80 CT	32 CT	8	125	20	4	8.5	4.25	1.06	1.58:1	3.16:1
F-28040	G-29040	70040	80040	100 CT	40 CT	10	125	20	3.6	12.1	4.85	1.21	1.58:1	3.16:1
F-28045	G-29045	70045	80045	100 CT	100 CT	25	125	20	3.6	12.1	12	3	1:1	2:1
F-28050	G-29050	70050	80050	120 CT	12.8 CT	3.2	125	20	3.3	13.2	1.6	.4	3.06:1	6.12:1
F-28055	G-29055	70055	80055	120 CT	60 CT	15	125	20	3.3	13.2	7.3	1.83	1.41:1	2.83:1
F-28060	G-29060	70060	80060	120 CT	120 CT	30	125	20	3.3	13.2	16	4	1:1	2:1
F-28065	G-29065	70065	80065	150 CT	12 CT	3	125	20	3	15	1.56	.39	3.54:1	7.07:1
F-28070	G-29070	70070	80070	150 CT	50 CT	12.5	125	20	3	15	6.6	1.65	1.73:1	3.46:1
F-28075	G-29075	70075	80075	150 CT	100 CT	25	125	20	3	15	14.5	3.63	1.22:1	2.45:1
F-28080	G-29080	70080	80080	150 CT	150 CT	37.5	125	20	3	15	18.3	4.58	1:1	2:1
F-28085	G-29085	70085	80085	150 CT	600 CT	150	125	20	3	15	72	18	1:2	1:1
F-28090	G-29090	70090	80090	200 CT	200 CT	50	125	20	2.5	22	26.8	6.7	1:1	2:1
F-28095	G-29095	70095	80095	300 CT	12 CT	3	125	20	2	33	1.56	.39	5:1	10:1
F-28100	G-29100	70100	80100	300 CT	50 CT	12.5	125	20	2	33	6.6	1.65	2.45:1	4.9:1
F-28105	G-29105	70105	80105	300 CT	150 CT	37.5	125	20	2	33	18.3	4.58	1.41:1	2.83:1
F-28110	G-29110	70110	80110	300 CT	300 CT	75	125	20	2	33	40.3	10.08	1:1	2:1
F-28115	G-29115	70115	80115	300 CT	600 CT	150	125	20	2	33	72	18	1:1.41	1.41:1

SPECIFICATIONS

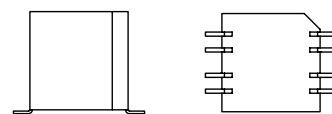
F SERIES (STRAIGHT LEADS)



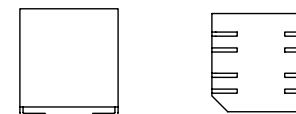
G SERIES (INSULATED LEADS)



70000 SERIES (GULL WING LEADS SURFACE MOUNT)



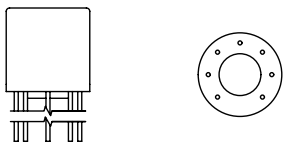
80000 SERIES (J LEADS SURFACE MOUNT)



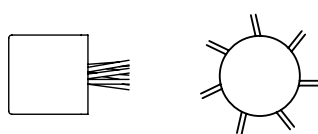
Through Hole ⁽²⁾		Surface Mount ⁽³⁾		Primary Impedance [Ω]	Secondary Impedance with Split Windings		Power		Primary Unbalanced DC Current [mA]	Primary DCR [Ω]	Secondary DCR		Turns Ratio PRI:SEC	
Straight	Insulated	Gull Wing Leads	J Leads		Series [Ω]	Parallel [Ω]	1kHz+ [mW]	400Hz+ [mW]			Series [Ω]	Parallel [Ω]	Series	Parallel
F-28120	G-29120	70120	80120	320 CT	12.8 CT	3.2	125	20	2	34	1.6	0.4	5:1	10:1
F-28125	G-29125	70125	80125	400 CT	40 CT	10	125	20	1.8	49	4.7	1.18	3.16:1	6.32:1
F-28130	G-29130	70130	80130	400 CT	120 CT	30	125	20	1.8	49	16.3	4.08	1.83:1	3.65:1
F-28135	G-29135	70135	80135	400 CT	200 CT	50	125	20	1.8	49	27.3	6.83	1.41:1	2.83:1
F-28140	G-29140	70140	80140	400 CT	400 CT	100	125	20	1.8	49	49	12.25	1:1	2:1
F-28145	G-29145	70145	80145	400 CT	1000 CT	250	125	20	1.8	49	120	30	1:1.58	1.26:1
F-28150	G-29150	70150	80150	400 CT	2000 CT	500	125	20	1.8	49	270	67.5	1:2.24	1:1.12
F-28155	G-29155	70155	80155	400 CT	4000 CT	1000	125	20	1.8	49	476	119	1:3.16	1:1.58
F-28160	G-29160	70160	80160	500 CT	12.8 CT	3.2	125	20	1.6	54	1.6	0.4	6.25:1	12.5:1
F-28165	G-29165	70165	80165	500 CT	16 CT	4	125	20	1.6	54	2.3	0.58	5.6:1	11.2:1
F-28170	G-29170	70170	80170	500 CT	50 CT	12.5	125	20	1.6	54	6.6	1.65	3.16:1	6.32:1
F-28175	G-29175	70175	80175	500 CT	150 CT	37.5	125	20	1.6	54	18.3	4.58	1.83:1	3.65:1
F-28180	G-29180	70180	80180	500 CT	500 CT	125	125	20	1.6	54	65	16.3	1:1	2:1
(1) F-28185	G-29185	70185	80185	500 CT	500 CT	-	125	20	1.6	54	65	-	1:1	-
F-28190	G-29190	70190	80190	500 CT	600 CT	150	125	20	1.6	54	72	18	1:1.1	1.83:1
F-28195	G-29195	70195	80195	600 CT	12.8 CT	3.2	125	20	1.5	59	1.6	0.4	6.85:1	13.7:1
F-28200	G-29200	70200	80200	600 CT	30 CT	7.5	125	20	1.5	59	4.1	1.03	4.47:1	8.94:1
F-28205	G-29205	70205	80205	600 CT	48 CT	12	125	20	1.5	59	5.2	1.3	3.54:1	7.07:1
F-28210	G-29210	70210	80210	600 CT	200 CT	50	125	20	1.5	59	26.5	6.63	1.73:1	3.46:1
F-28215	G-29215	70215	80215	600 CT	600 CT	150	125	20	1.5	59	72	18	1:1	2:1
(1) F-28220	G-29220	70220	80220	600 CT	600 CT	-	125	20	1.5	59	72	-	1:1	-
F-28225	G-29225	70225	80225	600 CT	1200 CT	300	125	20	1.5	59	160	40	1:1.41	1.41:1
F-28230	G-29230	70230	80230	640 CT	12.8 CT	3.2	125	20	1.5	62	1.6	0.4	7.07:1	14.14:1
F-28235	G-29235	70235	80235	700 CT	100 CT	25	125	20	1.35	65	12	3	2.65:1	5.29:1

SPECIFICATIONS

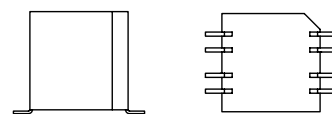
F SERIES (STRAIGHT LEADS)



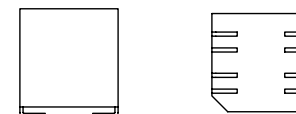
G SERIES (INSULATED LEADS)



70000 SERIES (GULL WING LEADS SURFACE MOUNT)



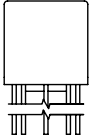
80000 SERIES (J LEADS SURFACE MOUNT)



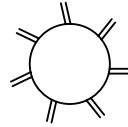
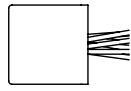
Through Hole ⁽²⁾		Surface Mount ⁽³⁾		Primary Impedance [Ω]	Secondary Impedance with Split Windings		Power		Primary Unbalanced DC Current [mA]	Primary DCR [Ω]	Secondary DCR		Turns Ratio PRI:SEC	
Straight	Insulated	Gull Wing Leads	J Leads		Series [Ω]	Parallel [Ω]	1kHz+ [mW]	400Hz+ [mW]			Series [Ω]	Parallel [Ω]	Series	Parallel
F-28240	G-29240	70240	80240	800 CT	12.8 CT	3.2	125	20	1.3	88	16	4	7.9:1	15.8:1
F-28245	G-29245	70245	80245	800 CT	48 CT	12	125	20	1.3	88	6.7	1.68	4.08:1	8.16:1
F-28250	G-29250	70250	80250	800 CT	800 CT	200	125	20	1.3	88	106	26.5	1:1	2:1
F-28255	G-29255	70255	80255	900 CT	600 CT	150	125	20	1.2	93	74	18.5	1.22:1	2.45:1
F-28260	G-29260	70260	80260	1000 CT	12 CT	3	125	20	1.2	120	1.55	0.39	9.13:1	18.3:1
F-28265	G-29265	70265	80265	1000 CT	50 CT	12.5	125	20	1.2	120	6.6	1.65	4.47:1	8.94:1
F-28270	G-29270	70270	80270	1000 CT	1000 CT	250	125	20	1.2	120	120	30	1:1	2:1
F-28275	G-29275	70275	80275	1060 CT	12.8 CT	3.2	125	20	1.2	125	1.6	0.4	9.1:1	18.2:1
F-28280	G-29280	70280	80280	1200 CT	12.8 CT	3.2	125	20	1	133	1.6	0.4	9.68:1	19.4:1
F-28285	G-29285	70285	80285	1200 CT	500 CT	125	125	20	1	133	65	16.25	1.55:1	3.1:1
F-28290	G-29290	70290	80290	1200 CT	1200 CT	300	125	20	1	133	160	40	1:1	2:1
(1) F-28295	G-29295	70295	80295	1200 CT	1200 CT	-	125	20	1	133	160	-	1:1	-
F-28300	G-29300	70300	80300	1500 CT	12 CT	3	125	20	1	180	1.55	0.39	11.2:1	22.4:1
F-28305	G-29305	70305	80305	1500 CT	500 CT	125	125	20	1	180	65	16.31	1.73:1	3.46:1
(1) F-28310	G-29310	70310	80310	1500 CT	600 CT	-	125	20	1	180	73	-	1.58:1	-
(1) F-28315	G-29315	70315	80315	1500 CT	1500 CT	-	125	20	1	180	215	-	1:1	-
F-28320	G-29320	70320	80320	1600 CT	12.8 CT	3.2	125	20	1	190	1.6	0.4	11.2:1	22.4:1
F-28325	G-29325	70325	80325	2000 CT	8 CT	2	125	20	0.8	218	1	0.25	15.8:1	31.6:1
F-28330	G-29330	70330	80330	2000 CT	2000 CT	500	125	20	0.8	218	260	65	1:1	2:1
(1) F-28335	G-29335	70335	80335	2000 CT	2000 CT	-	125	20	0.8	218	260	-	1:1	-
F-28340	G-29340	70340	80340	2000 CT	8000 CT	2000	125	20	0.8	218	830	207.5	1:2	1:1
F-28345	G-29345	70345	80345	2500 CT	2500 CT	625	125	20	0.75	280	280	70	1:1	2:1
F-28350	G-29350	70350	80350	3000 CT	3000 CT	725	125	20	0.65	330	330	82.5	1:1	2:1
(1) F-28355	G-29355	70355	80355	3000 CT	3000 CT	-	125	20	0.65	330	330	-	1:1	-

SPECIFICATIONS

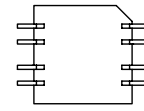
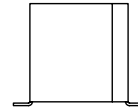
F SERIES (STRAIGHT LEADS)



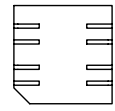
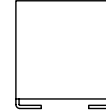
G SERIES (INSULATED LEADS)



70000 SERIES (GULL WING LEADS SURFACE MOUNT)



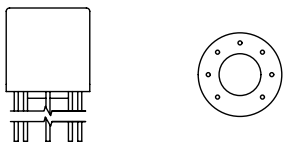
80000 SERIES (J LEADS SURFACE MOUNT)



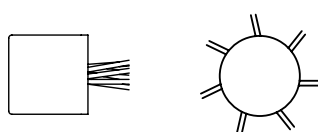
	Through Hole ⁽²⁾		Surface Mount ⁽³⁾		Primary Impedance [Ω]	Secondary Impedance with Split Windings		Power		Primary Unbalanced DC Current [mA]	Primary DCR [Ω]	Secondary DCR		Turns Ratio PRI:SEC	
	Straight	Insulated	Gull Wing Leads	J Leads		Series [Ω]	Parallel [Ω]	1kHz+ [mW]	400Hz+ [mW]			Series [Ω]	Parallel [Ω]	Series	Parallel
	F-28360	G-29360	70360	80360	3600 CT	3600 CT	900	125	20	0.6	370	450	112.5	1:1	2:1
	F-28365	G-29365	70365	80365	4000 CT	16 CT	4	125	20	0.57	400	2.3	0.58	15.8:1	31.6:1
	F-28370	G-29370	70370	80370	4000 CT	600 CT	150	125	20	0.57	400	73	18.25	2.58:1	5.16:1
	F-28375	G-29375	70375	80375	4000 CT	1000 CT	250	125	20	0.57	400	120	30	2:1	4:1
(1)	F-28380	G-29380	70380	80380	4000 CT	8000 CT	-	125	20	0.57	400	1070	-	1:1.41	-
	F-28385	G-29385	70385	80385	5000 CT	500 CT	125	125	20	0.5	540	65	16.25	3.16:1	6.32:1
	F-28390	G-29390	70390	80390	5000 CT	5000 CT	1250	125	20	0.5	540	650	162.5	1:1	2:1
	F-28395	G-29395	70395	80395	7500 CT	50 CT	12.5	125	20	0.5	835	6.6	1.65	12.2:1	24.5:1
	F-28400	G-29400	70400	80400	7500 CT	100 CT	25	125	20	0.4	835	12	3	8.66:1	17.3:1
	F-28405	G-29405	70405	80405	7500 CT	600 CT	150	125	20	0.4	835	72	18	3.54:1	7.07:1
	F-28410	G-29410	70410	80410	7500 CT	2500 CT	625	125	20	0.4	835	280	70	1.73:1	3.46:1
(1)	F-28415	G-29415	70415	80415	7500 CT	7500 CT	-	125	20	0.4	835	1020	-	1:1	-
	F-28420	G-29420	70420	80420	8000 CT	12.8 CT	3.2	125	20	0.4	865	1.6	0.4	25:1	50:1
	F-28425	G-29425	70425	80425	8000 CT	1000 CT	250	125	20	0.4	865	120	30	2.83:1	5.66:1
(1)	F-28430	G-29430	70430	80430	8000 CT	1200 CT	-	125	20	0.4	865	160	-	2.58:1	-
(1)	F-28435	G-29435	70435	80435	9000 CT	9000 CT	-	125	20	0.4	1160	1160	-	1:1	-
	F-28440	G-29440	70440	80440	10,000 CT	12.8 CT	3.2	125	20	0.36	1200	1.6	0.4	28:1	56:1
	F-28445	G-29445	70445	80445	10,000 CT	16 CT	4	125	20	0.36	1200	1.77	0.44	25:1	50:1
	F-28450	G-29450	70450	80450	10,000 CT	100 CT	25	125	20	0.36	1200	12	3	10:1	20:1
	F-28455	G-29455	70455	80455	10,000 CT	200 CT	50	125	20	0.36	1200	27	6.75	7.07:1	14.14:1
	F-28460	G-29460	70460	80460	10,000 CT	500 CT	125	125	20	0.36	1200	65	16.25	4.47:1	8.94:1
	F-28465	G-29465	70465	80465	10,000 CT	600 CT	150	125	20	0.36	1200	72	18	4.08:1	8.16:1
	F-28470	G-29470	70470	80470	10,000 CT	1000 CT	250	125	20	0.36	1200	120	30	3.16:1	6.32:1
	F-28475	G-29475	70475	80475	10,000 CT	1200 CT	300	125	20	0.36	1200	160	40	2.88:1	5.77:1

SPECIFICATIONS

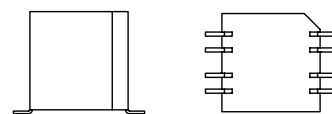
F SERIES (STRAIGHT LEADS)



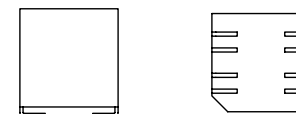
G SERIES (INSULATED LEADS)



70000 SERIES (GULL WING LEADS SURFACE MOUNT)



80000 SERIES (J LEADS SURFACE MOUNT)



Through Hole ⁽²⁾		Surface Mount ⁽³⁾		Primary Impedance [Ω]	Secondary Impedance with Split Windings		Power		Primary Unbalanced DC Current [mA]	Primary DCR [Ω]	Secondary DCR		Turns Ratio PRI:SEC	
Straight	Insulated	Gull Wing Leads	J Leads		Series [Ω]	Parallel [Ω]	1kHz+ [mW]	400Hz+ [mW]			Series [Ω]	Parallel [Ω]	Series	Parallel
F-28480	G-29480	70480	80480	10,000 CT	1500 CT	375	125	20	0.36	1200	215	53.8	2.58:1	5.16:1
F-28485	G-29485	70485	80485	10,000 CT	2000 CT	500	125	20	0.36	1200	260	65	2.24:1	4.47:1
F-28490	G-29490	70490	80490	10,000 CT	5000 CT	1250	125	20	0.36	1200	650	162.5	1.41:1	2.83:1
F-28495	G-29495	70495	80495	10,000 CT	7500 CT	1875	125	20	0.36	1200	1020	255	1.15:1	2.3:1
F-28500	G-29500	70500	80500	10,000 CT	10,000 CT	2500	125	20	0.36	1200	1200	300	1:1	2:1
(1) F-28505	G-29505	70505	80505	10,000 CT	10,000 CT	-	125	20	0.36	1200	1440	-	1:1	-
F-28510	G-29510	70510	80510	15,000 CT	400 CT	100	100	15	0.35	1420	43	10.75	6.12:1	12.24:1
F-28515	G-29515	70515	80515	15,000 CT	500 CT	125	100	15	0.35	1420	49	12.25	5.48:1	10.95:1
F-28520	G-29520	70520	80520	15,000 CT	600 CT	150	100	15	0.35	1420	68	17	5:1	10:1
F-28525	G-29525	70525	80525	15,000 CT	10,000 CT	2500	100	15	0.35	1420	1100	275	1.22:1	2.45:1
(1) F-28530	G-29530	70530	80530	15,000 CT	15,000 CT	-	100	15	0.35	1420	1730	-	1:1	-
F-28535	G-29535	70535	80535	15,000 CT	15,000 CT	3750	100	15	0.35	1420	1730	433	1:1	2:1
F-28540	G-29540	70540	80540	16,000 CT	1000 CT	250	100	15	0.35	1500	115	28.75	4:1	8:1
F-28545	G-29545	70545	80545	20,000 CT	500 CT	125	100	15	0.3	1600	60	15	6.33:1	12.65:1
F-28550	G-29550	70550	80550	20,000 CT	600 CT	150	100	15	0.3	1600	66	16.5	5.77:1	11.55:1
F-28555	G-29555	70555	80555	20,000 CT	800 CT	200	100	15	0.3	1600	94	23.5	5:1	10:1
F-28560	G-29560	70560	80560	20,000 CT	1000 CT	250	100	15	0.3	1600	106	26.5	4.47:1	8.94:1
F-28565	G-29565	70565	80565	20,000 CT	5000 CT	1250	100	15	0.3	1600	600	150	2:1	4:1
F-28570	G-29570	70570	80570	20,000 CT	10,000 CT	2500	100	15	0.3	1600	1100	275	1.41:1	2.83:1

Note 1: Includes electrostatic shield

Note 2: For RoHS compliance on a through-hole component, please consult with Pico's engineer and provide the part number.

Note 3: All SMDs are available with Pb-free dipped terminals that is compliant to RoHS exemption 7 by requesting part number + 'RoHS-7'

SPECIFICATIONS

GENERAL

Parameter	Condition	Min.	Typ.	Max.	Units
Dielectric Strength	60Hz	-	200	-	V _{RMS}
Insulation Resistance	300VDC	10	-	-	GΩ
Distortion	400Hz & 1kHz @ Rated Power	-	-	5	%
Frequency Response	400 - 250kHz @ 1mW	-3	-	3	dB
Size	F & G Series - Diameter x Height	0.25 x 0.25 (6.35 x 6.35)			inches (mm)
	70000 Series - Length x Width x Height	0.31 x 0.31 x 0.322 (7.874 x 7.874 x 8.179)			
	80000 Series - Length x Width x Height	0.31 x 0.31 x 0.34 (7.874 x 7.874 x 8.636)			
Operating Temperature Range	Ambient with temperature rise	-55	-	+130	°C
Storage Temperature Range	Ambient	-55	-	+105	°C
Weight	F, G, 70000, & 80000 Series	-	1.5	-	grams
Case	F & G Series	Epoxy Insulated Metal			
	70000 & 80000 Series	Glass Reinforced Polymer			
Potting	Vacuum Impregnated Epoxy				
Box Packaging (W x H x L)	F & G Series	10.6 x 2.28 x 0.39 (269.24 x 57.91 x 9.91)			inches (mm)
Tube Packaging (W x H x L)	70000 Series	0.68 x 0.49 x 20 (17.374 x 12.446 x 508)			inches (mm)
	80000 Series	0.42 x 0.49 x 12 (10.673 x 12.446 x 304.8)			
Tape & Reel Packaging	Upon request				
Moisture Sensitivity Level	Surface Mount only	Level 3			

OPTIONAL DESIGN CRITERIA

Test	Standard	Description
Vibration	MIL-STD-202	Method 204, Vibration, High Frequency
Shock	MIL-STD-202	Method 213, Shock (Specified Pulse)
Immersion	MIL-STD-202	Method 104, Immersion
Moisture Resistance	MIL-STD-202	Method 106, Moisture Resistance
Flammability	MIL-STD-202	Method 111, Flammability (External Flame)
Thermal Shock	MIL-STD-202	Method 107, Thermal Shock

OPTIONAL SCREENING AND QUALIFICATION

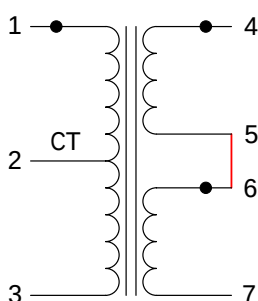
Standard	Screening & Qualification	Test ⁽⁴⁾
MIL-PRF-27	a.) Group A inspection Level-T - Table VII b.) Qualification inspection, Grade 5 - Table V	I. Thermal Shock II. Vibration III. Burn-in IV. Induced Voltage V. Shock VI. Dielectric Withstanding Voltage (at reduced pressure) VII. Insulation Resistance VIII. Electrical Characteristics IX. Visual and Mechanical Examination (External) X. Life XI. Radiographic Inspection
MIL-STD-981	a.) Group A screening tests - Table VI b.) Group B tests - Table XII, Class S	
EEE-INST-002, Section M1	a.) Magnetics Screening Req. - Table 2 b.) Magnetics Part Qual. - Table 3	

Note 4: Screening and qualification tests are not limited to the options in the chart above. Each standard may also be stringent or exclude certain tests from one another. Please contact Pico for specific application needs and for Pico part number.

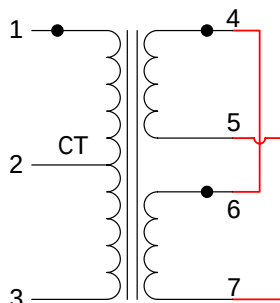
ELECTRICAL SCHEMATIC

F SERIES - THROUGH HOLE

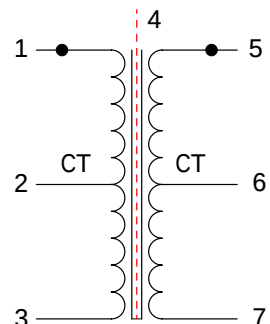
**SPLIT SECONDARIES
SERIES CONNECTION**



**SPLIT SECONDARIES
PARALLEL CONNECTION**

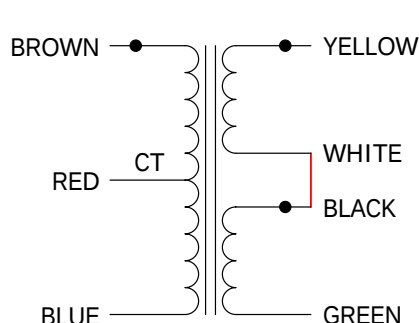


ELECTROSTATIC SHIELD

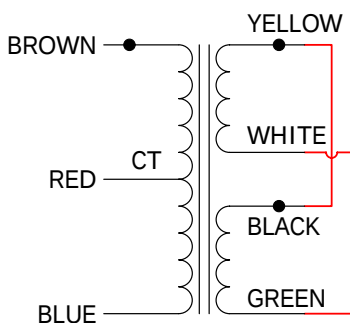


G SERIES - INSULATED LEADS

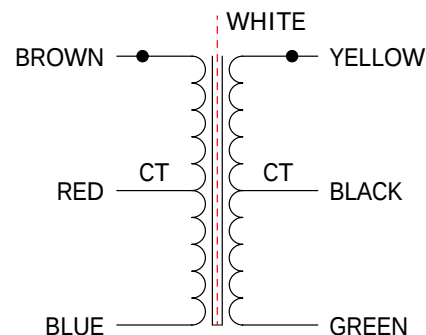
**SPLIT SECONDARIES
SERIES CONNECTION**



**SPLIT SECONDARIES
PARALLEL CONNECTION**

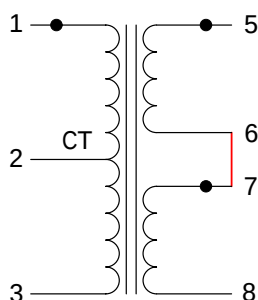


ELECTROSTATIC SHIELD

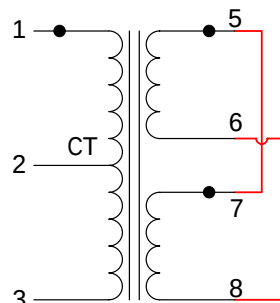


70000 & 80000 SERIES - SURFACE MOUNT

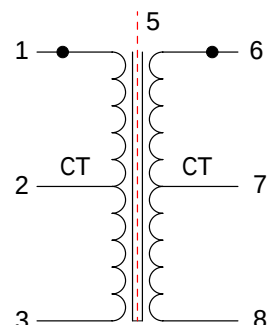
**SPLIT SECONDARIES
SERIES CONNECTION**



**SPLIT SECONDARIES
PARALLEL CONNECTION**



ELECTROSTATIC SHIELD

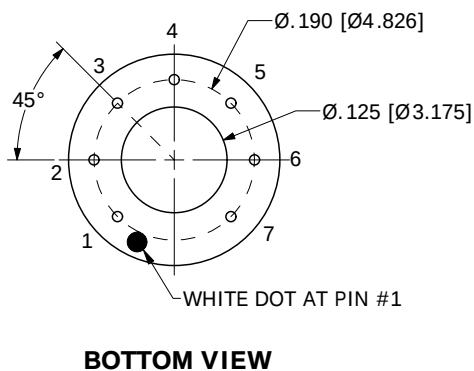
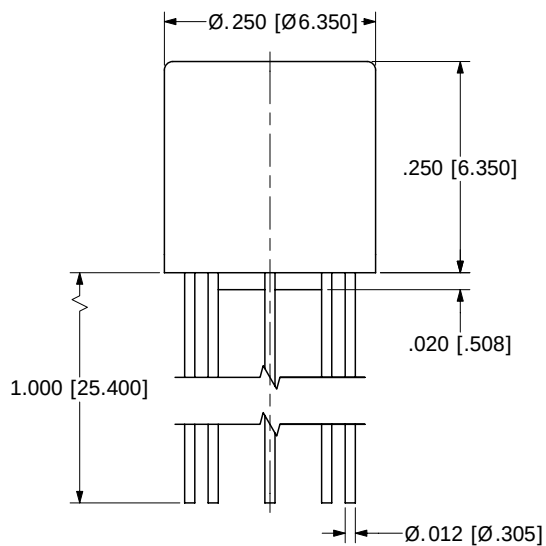


NOTES

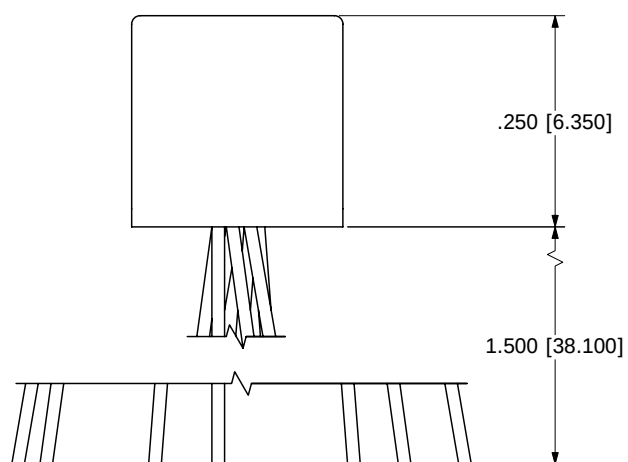
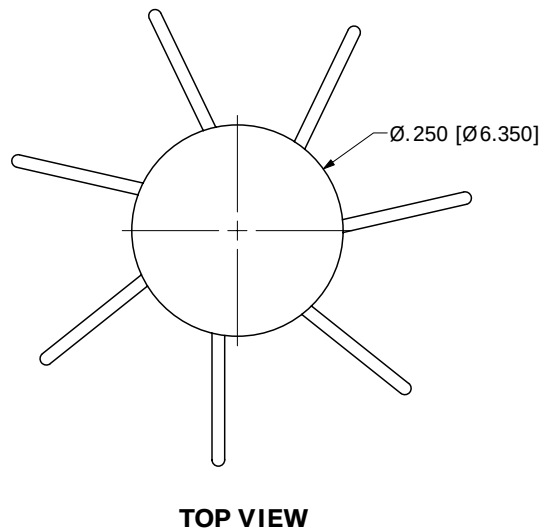
- ANY TERMINALS NOT SHOWN HERE MAY BE USED FOR MECHANICAL STABILITY ON THE PCB ONLY, AS THEY DO NOT HAVE ANY ELECTRICAL CONNECTION.
- CT STANDS FOR "CENTER-TAP", WHERE THE TOTAL NUMBER OF TURNS IS EVENLY SPLIT BETWEEN THE TOP HALF AND BOTTOM HALF OF A COMPLETE WINDING.

MECHANICAL DRAWINGS

SERIES F - THROUGH HOLE

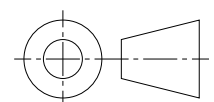


SERIES G - INSULATED LEADS



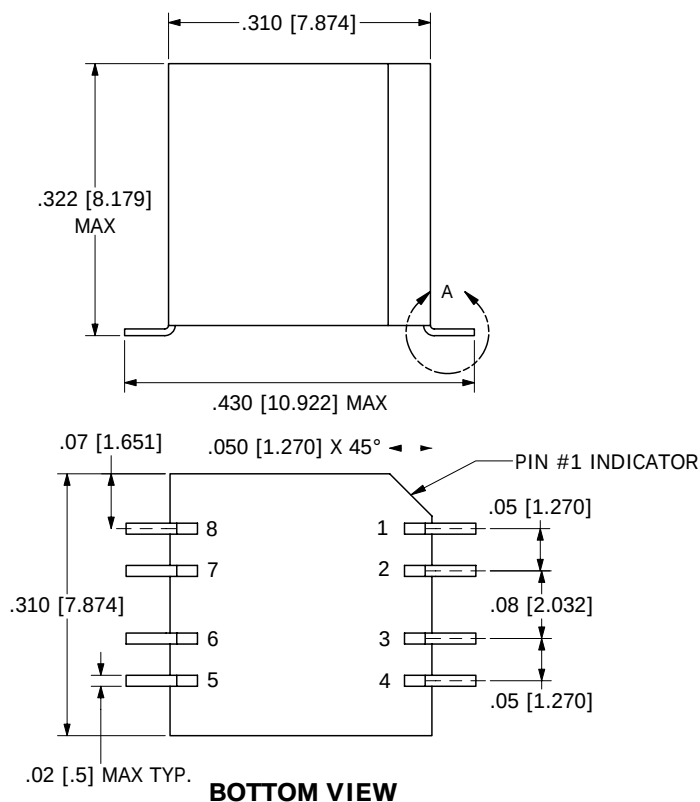
NOTES

- a. ALL DIMENSIONS ARE IN INCHES, [] = MM
- b. TERMINALS ARE CLOCKWISE FROM PIN #1

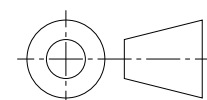
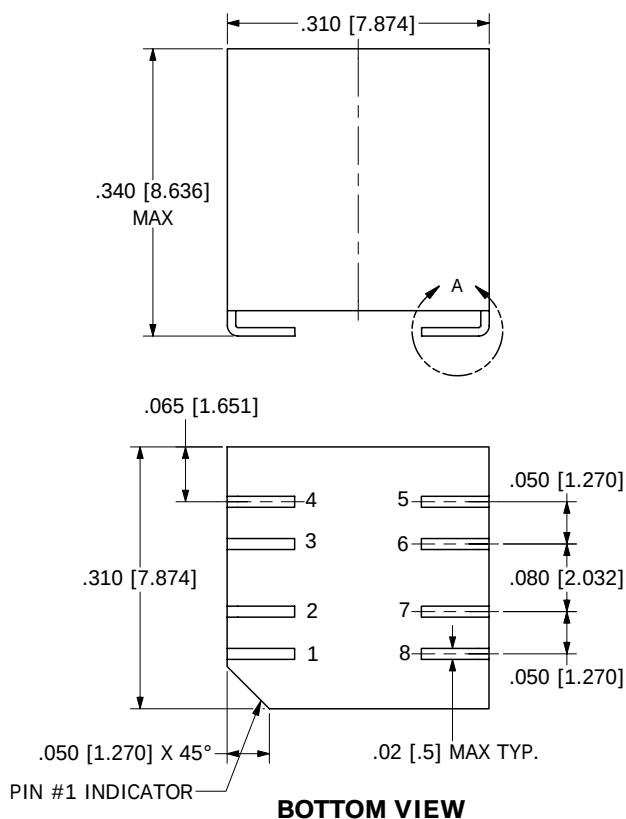


MECHANICAL DRAWINGS

70000 SERIES - GULL WING LEADS SURFACE MOUNT

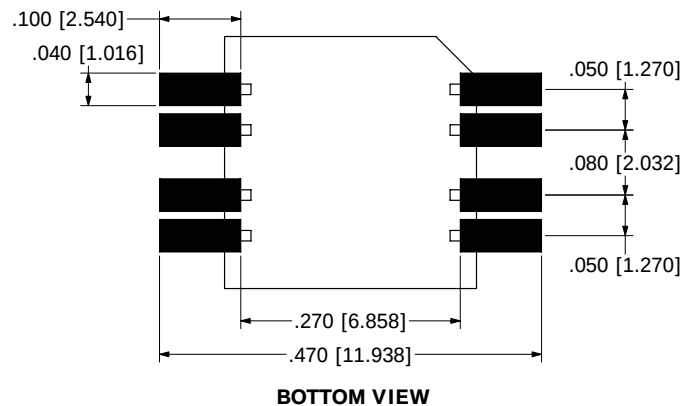


80000 SERIES - J LEADS SURFACE MOUNT

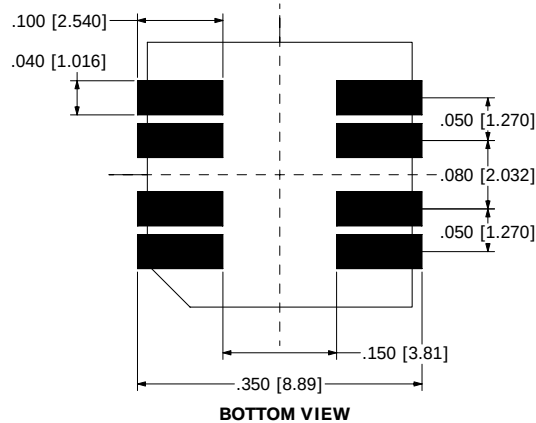


RECOMMENDED LAND PATTERN DIMENSIONS

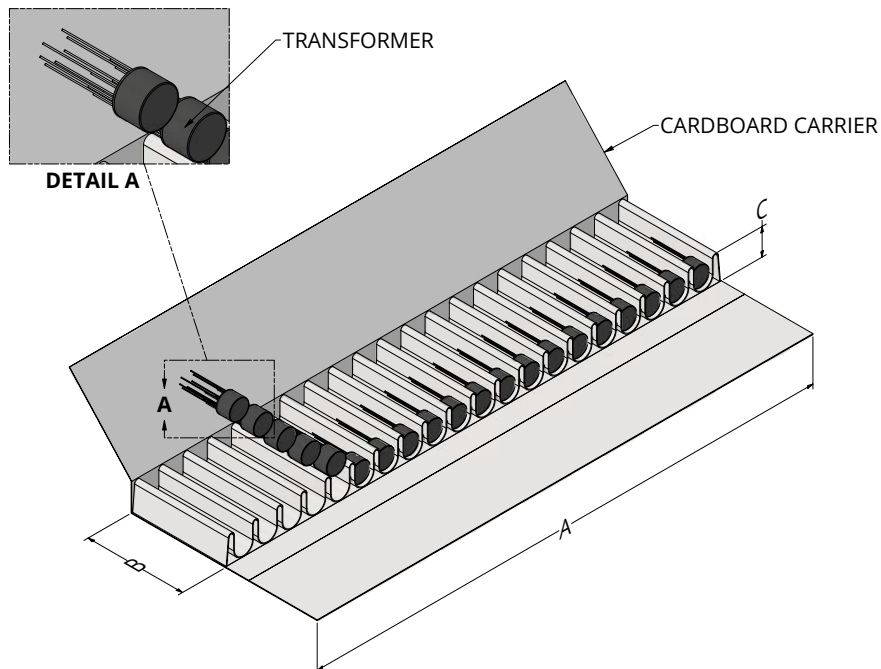
70000 SERIES - GULL WING LEADS SURFACE MOUNT



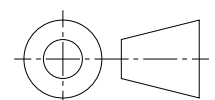
80000 SERIES - J LEADS SURFACE MOUNT



BOX PACKAGING - F & G SERIES

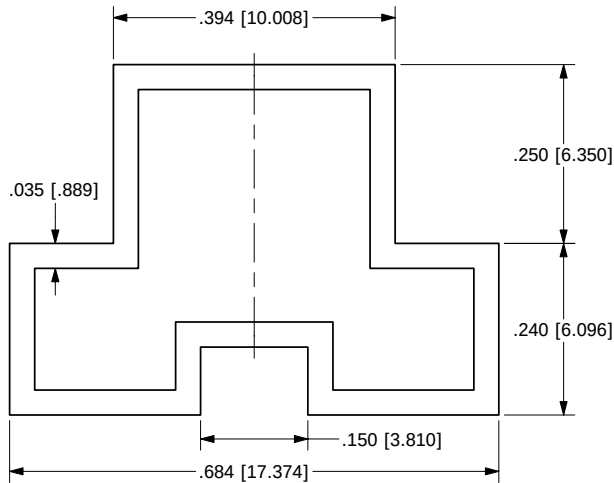


Dimension		
A	B	C
10.60 [269.24]	2.28 [57.91]	0.39 [9.91]

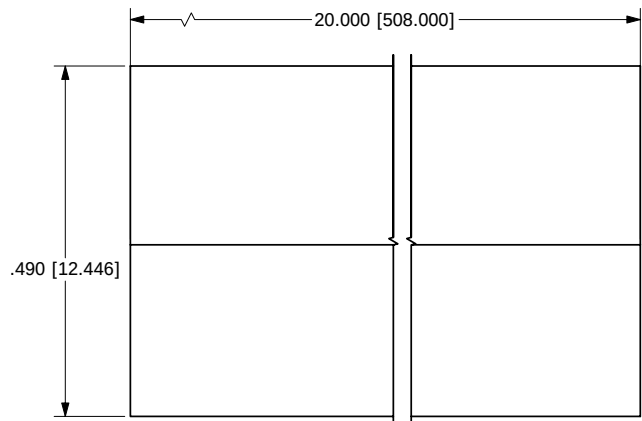


TUBE PACKAGING - 70000 & 80000 SERIES

70000 SERIES

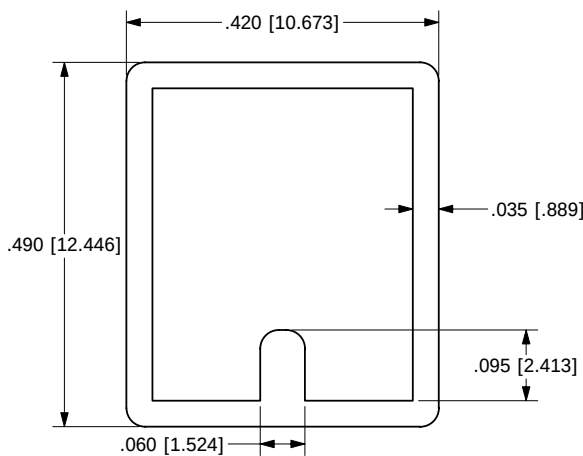


PLAN VIEW

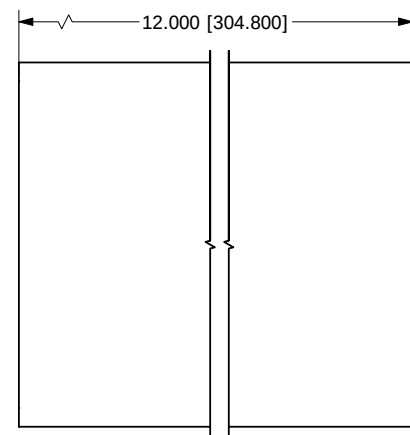


ELEVATION VIEW

80000 SERIES

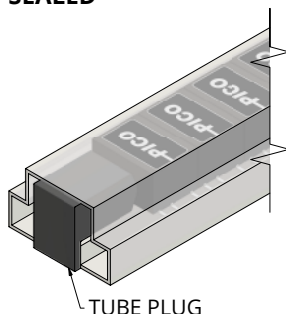


PLAN VIEW

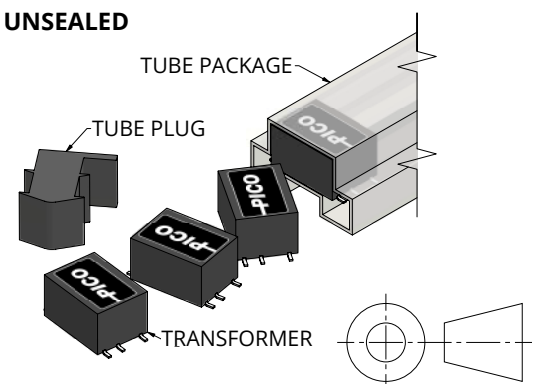


ELEVATION VIEW

SEALED



UNSEALED



Pico warrants each product manufactured by us and sold by us or an authorized representative, to be free from defects in material and workmanship. If properly used, it will perform within its applicable specifications for a period of one year after original shipment. Pico's obligation under this guarantee is limited to repairing or replacing our product to the original purchaser. This warranty is in lieu of all other warranties, express or implied and constitutes fulfillment of our obligations to the purchaser. We do not guarantee that the products can be used for a particular purpose other than those solely covered by the product's specifications. Pico must be notified if the product must meet particular certifications and/or standards. We assume no liability, in any event, for consequential damages, for anticipated or lost profits, incidental damages or loss of time or other losses incurred by the purchaser or any third party in connection with products covered by this warranty or otherwise. The purchaser will indemnify and hold Pico harmless for any damages, losses, costs, etc. from usage not within the product's specifications. Pico must be consulted before usage of its products in a nuclear, radioactive or space environment.

We reserve the right to discontinue products without notice, We reserve the right to make modifications to any existing catalog products without notice, at any time, without the obligation to modify units previously sold.

N & K · 77000 & CSN Series

2-250kΩ, 150-75kHz, 1W Max. @ 1kHz+ Audio Transformer

PICO
Electronics, Inc.

PRODUCT OVERVIEW

The N & K and 77000 & CSN series are ultra-miniature transformers in an encapsulated package with design layouts as through-hole or surface mount types. They can operate over a wide temperature range of -55°C to +130°C. Our proprietary materials and methods allow extreme temperatures of vapor phase, IR or other reflow procedures without degrading the high reliability of their physical form and electrical performance.

Typical applications:

- Sensors
- Radars
- Avionic flight controls
- Airborne systems
- Naval electronics
- Military, aerospace, or commercial aircraft

FEATURES

- Extreme resistance to impact, shock, and vibration
- Manufactured to MIL-PRF-27, Class S, Grade 5
- High reliability for space and mission critical applications
- Ultra miniature in size and minimalistic design
- Design layouts in straight plug-in, insulated leads, square SMT, or round SMT
- Available with magnetic shielding and/or electrostatic shielding
- Certain parts are QPL approved

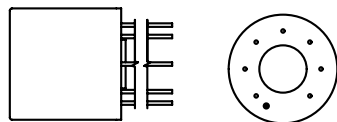
Contact Pico for part number of available options:

- Screening and qualification criteria to flight standard
- Capability to thermal shock up to 300 cycles
- Extra layers of magnetic shielding
- Fully RoHS compliant or with exemption 7(a)
- Modifications to mechanical design and electrical characteristics
- Custom new design and parameters

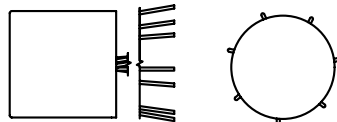


SPECIFICATIONS

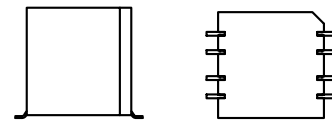
N SERIES (STRAIGHT LEADS)



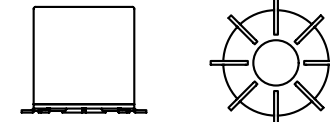
K SERIES (INSULATED LEADS)



77000 SERIES (SQUARE SURFACE MOUNT)



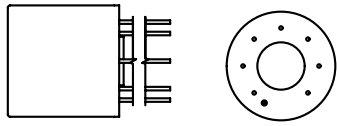
CSN SERIES (ROUND SURFACE MOUNT)



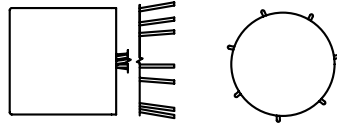
Through Hole ⁽²⁾		Surface Mount ⁽³⁾		Primary Impedance [Ω]	Secondary Impedance with Split Windings		Power			Primary Unbalanced DC Current [mA]	Primary DCR [Ω]	Secondary DCR		Turns Ratio PRI:SEC	
Straight	Insulated	Square	Round		Series [Ω]	Parallel [Ω]	1kHz+ [W]	400Hz+ [W]	150Hz+ [W]			Series [Ω]	Parallel [Ω]	Series	Parallel
N-6203	K-7203	77203	CSN203	20 CT	8 CT	2	1	0.75	0.11	22	1.75	1	0.25	1.58:1	3.16:1
N-6205	K-7205	77205	CSN205	20 CT	20 CT	5	1	0.75	0.11	22	1.75	2.5	0.63	1:1	2:1
N-6210	K-7210	77210	CSN210	32 CT	32 CT	8	1	0.75	0.11	18	2.7	3.7	0.93	1:1	2:1
N-6215	K-7215	77215	CSN215	40 CT	40 CT	10	1	0.75	0.11	16	3	5.2	1.3	1:1	2:1
N-6218	K-7218	77218	CSN218	48 CT	16 CT	4	1	0.75	0.11	13	4.5	2.4	0.6	1.73:1	3.46:1
N-6220	K-7220	77220	CSN220	50 CT	50 CT	12.5	1	0.75	0.11	13	4.5	6.2	1.6	1:1	2:1
N-6225	K-7225	77225	CSN225	80 CT	32 CT	8	1	0.75	0.11	11	6.6	3.7	0.93	1.58:1	3.16:1
N-6228	K-7228	77228	CSN228	100 CT	40 CT	10	1	0.75	0.11	10	9.7	5.6	1.4	1.58:1	3.16:1
N-6230	K-7230	77230	CSN230	100 CT	100 CT	25	1	0.75	0.11	10	9.7	11	2.8	1:1	2:1
N-6235	K-7235	77235	CSN235	120 CT	12.8 CT	3.2	1	0.75	0.11	9	10.8	1.6	0.4	3.06:1	6.12:1
N-6240	K-7240	77240	CSN240	120 CT	60 CT	15	1	0.75	0.11	9	10.8	8.5	2.2	1.41:1	2.83:1
N-6245	K-7245	77245	CSN245	120 CT	120 CT	30	1	0.75	0.11	9	10.8	15	3.8	1:1	2:1
N-6250	K-7250	77250	CSN250	150 CT	12 CT	3	1	0.75	0.11	8	13.5	1.75	0.44	3.54:1	7.08:1
N-6255	K-7255	77255	CSN255	150 CT	50 CT	12.5	1	0.75	0.11	8	12	5.8	1.5	1.73:1	3.46:1
N-6260	K-7260	77260	CSN260	150 CT	100 CT	25	1	0.75	0.11	8	12	13	3.3	1.22:1	2.44:1
N-6265	K-7265	77265	CSN265	150 CT	150 CT	37.5	1	0.75	0.11	8	12	20	5	1:1	2:1
N-6270	K-7270	77270	CSN270	150 CT	600 CT	150	1	0.75	0.11	8	12	82	20.5	1:2	1:1
N-6275	K-7275	77275	CSN275	200 CT	200 CT	50	1	0.75	0.11	7	17	24	6	1:1	2:1
N-6280	K-7280	77280	CSN280	300 CT	12 CT	3	1	0.75	0.11	5	30	1.75	0.44	5:1	10:1
N-6285	K-7285	77285	CSN285	300 CT	50 CT	12.5	1	0.75	0.11	5	27	6.2	1.6	2.45:1	4.9:1
N-6290	K-7290	77290	CSN290	300 CT	150 CT	37.5	1	0.75	0.11	5	26	21	5.3	1.41:1	2.83:1
N-6295	K-7295	77295	CSN295	300 CT	300 CT	75	1	0.75	0.11	5	27	38	9.5	1:1	2:1
N-6300	K-7300	77300	CSN300	300 CT	600 CT	150	1	0.75	0.11	5	27	66	17	1.41:1	1.41:1
N-6305	K-7305	77305	CSN305	320 CT	12.8 CT	3.2	1	0.75	0.11	5	30	1.75	0.44	5:1	10:1
N-6310	K-7310	77310	CSN310	400 CT	40 CT	10	1	0.75	0.11	5	39	4.3	1.1	3.16:1	6.32:1
N-6315	K-7315	77315	CSN315	400 CT	120 CT	30	1	0.75	0.11	5	30	14	3.5	1.83:1	3.65:1

SPECIFICATIONS

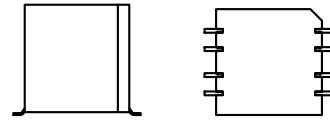
N SERIES (STRAIGHT LEADS)



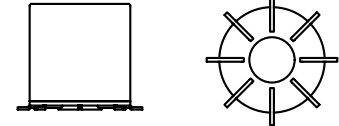
K SERIES (INSULATED LEADS)



77000 SERIES (SQUARE SURFACE MOUNT)



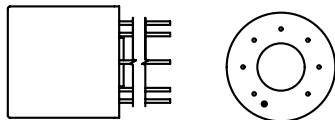
CSN SERIES (ROUND SURFACE MOUNT)



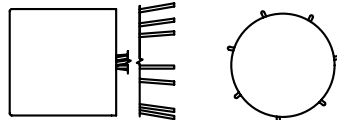
Through Hole ⁽²⁾		Surface Mount ⁽³⁾		Primary Impedance [Ω]	Secondary Impedance with Split Windings		Power			Primary Unbalanced DC Current [mA]	Primary DCR [Ω]	Secondary DCR		Turns Ratio PRI:SEC	
Straight	Insulated	Square	Round		Series [Ω]	Parallel [Ω]	1kHz+ [W]	400Hz+ [W]	150Hz+ [W]			Series [Ω]	Parallel [Ω]	Series	Parallel
N-6320	K-7320	77320	CSN320	400 CT	200 CT	50	1	0.75	0.11	5	39	24	6	1.41:1	2.83:1
N-6325	K-7325	77325	CSN325	400 CT	400 CT	100	1	0.75	0.11	5	39	42	10.5	1:1	2:1
N-6330	K-7330	77330	CSN330	400 CT	1000 CT	250	1	0.75	0.11	5	39	109	28	1:1.58	1.26:1
N-6335	K-7335	77335	CSN335	400 CT	2000 CT	500	1	0.75	0.11	5	39	198	49	1:2.24	1:1.12
N-6340	K-7340	77340	CSN340	400 CT	4000 CT	1000	1	0.75	0.11	5	39	436	109	1:3.16	1:1.58
N-6342	K-7342	77342	CSN342	500 CT	12.8 CT	3.2	1	0.75	0.11	4.5	43	1.6	0.4	6.25:1	12.5:1
N-6344	K-7344	77344	CSN344	500 CT	16 CT	4	1	0.75	0.11	4.5	43	2.3	0.56	5.6:1	11.2:1
N-6345	K-7345	77345	CSN345	500 CT	50 CT	12.5	1	0.75	0.11	4.5	43	5.8	1.5	3.16:1	6.32:1
N-6347	K-7347	77347	CSN347	500 CT	150 CT	37.5	1	0.75	0.11	4.5	43	19.8	5	1.83:1	3.65:1
N-6350	K-7350	77350	CSN350	500 CT	500 CT	125	1	0.75	0.11	4.5	43	60	15	1:1	2:1
(1) N-6355	K-7355	77355	CSN355	500 CT	500 CT	-	1	0.75	0.11	4.5	43	60	-	1:1	-
N-6360	K-7360	77360	CSN360	500 CT	600 CT	150	1	0.75	0.11	4.5	43	66	17	1:1.1	1.83:1
N-6365	K-7365	77365	CSN365	600 CT	12.8 CT	3.2	1	0.75	0.11	4	68	1.75	0.44	6.85:1	13.7:1
N-6367	K-7367	77367	CSN367	600 CT	30 CT	7.5	1	0.75	0.11	4	60	3.7	0.93	4.47:1	8.94:1
N-6370	K-7370	77370	CSN370	600 CT	48 CT	12	1	0.75	0.11	4	60	5.9	1.5	3.54:1	7.07:1
N-6375	K-7375	77375	CSN375	600 CT	200 CT	50	1	0.75	0.11	4	60	25	6.3	1.73:1	3.46:1
N-6380	K-7380	77380	CSN380	600 CT	600 CT	150	1	0.75	0.11	4	60	66	17	1:1	2:1
(1) N-6385	K-7385	77385	CSN385	600 CT	600 CT	-	1	0.75	0.11	4	60	68	-	1:1	-
(1) N-6386	K-7386	77386	CSN386	600 CT	900 CT	-	1	0.75	0.11	4	60	104	-	1:1.22	-
N-6387	K-7387	77387	CSN387	600 CT	1200 CT	300	1	0.75	0.11	4	60	116	29	1:1.41	1.41:1
N-6390	K-7390	77390	CSN390	640 CT	12.8 CT	3.2	1	0.75	0.11	4	69	1.75	0.44	7.07:1	14.14:1
N-6395	K-7395	77395	CSN395	700 CT	100 CT	25	1	0.75	0.11	4	62	10.6	2.7	2.65:1	5.29:1
N-6400	K-7400	77400	CSN400	800 CT	12.8 CT	3.2	1	0.75	0.11	3.5	78	1.75	0.44	7.91:1	15.8:1
N-6405	K-7405	77405	CSN405	800 CT	48 CT	12	1	0.75	0.11	3.5	74	6	1.5	4.08:1	8.16:1
N-6410	K-7410	77410	CSN410	800 CT	800 CT	200	1	0.75	0.11	3.5	74	102	26	1:1	2:1
N-6415	K-7415	77415	CSN415	900 CT	600 CT	150	1	0.75	0.11	3	90	66	17	1.23:1	2.45:1

SPECIFICATIONS

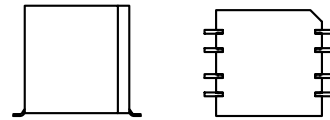
N SERIES (STRAIGHT LEADS)



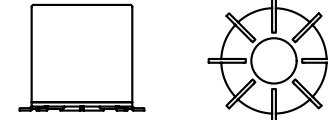
K SERIES (INSULATED LEADS)



77000 SERIES (SQUARE SURFACE MOUNT)



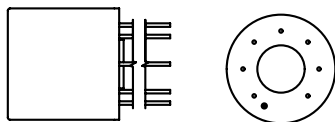
CSN SERIES (ROUND SURFACE MOUNT)



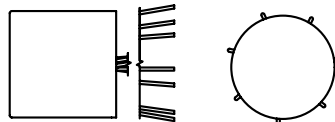
	Through Hole ⁽²⁾		Surface Mount ⁽³⁾		Primary Impedance [Ω]	Secondary Impedance with Split Windings		Power			Primary Unbalanced DC Current [mA]	Primary DCR [Ω]	Secondary DCR		Turns Ratio PRI:SEC	
	Straight	Insulated	Square	Round		Series [Ω]	Parallel [Ω]	1kHz+ [W]	400Hz+ [W]	150Hz+ [W]			Series [Ω]	Parallel [Ω]	Series	Parallel
(1)	N-6417	K-7417	77417	CSN417	900 CT	900 CT	-	1	0.75	0.11	3	90	102	-	1:1	-
	N-6420	K-7420	77420	CSN420	1000 CT	12 CT	3	1	0.75	0.11	3	115	1.75	0.44	9.13:1	18.26:1
	N-6425	K-7425	77425	CSN425	1000 CT	50 CT	12.5	1	0.75	0.11	3	100	5.8	1.5	4.47:1	8.94:1
	N-6430	K-7430	77430	CSN430	1000 CT	1000 CT	250	1	0.75	0.11	3	75	103	26	1:1	2:1
	N-6435	K-7435	77435	CSN435	1060 CT	12.8 CT	3.2	1	0.75	0.11	3	115	1.75	0.44	9.1:1	18.2:1
	N-6440	K-7440	77440	CSN440	1200 CT	12.8 CT	3.2	1	0.75	0.11	3	122	1.75	0.44	9.68:1	19.4:1
	N-6445	K-7445	77445	CSN445	1200 CT	500 CT	125	1	0.75	0.11	3	113	63	16	1.55:1	3.1:1
	N-6450	K-7450	77450	CSN450	1200 CT	1200 CT	300	1	0.75	0.11	3	113	155	39	1:1	2:1
(1)	N-6455	K-7455	77455	CSN455	1200 CT	1200 CT	-	1	0.75	0.11	3	109	150	-	1:1	-
	N-6460	K-7460	77460	CSN460	1500 CT	12 CT	3	1	0.75	0.11	2.5	140	1.75	0.44	11.18:1	22.36:1
	N-6465	K-7465	77465	CSN465	1500 CT	500 CT	125	1	0.75	0.11	2.5	150	60	15	1.73:1	3.46:1
(1)	N-6470	K-7470	77470	CSN470	1500 CT	600 CT	-	1	0.75	0.11	2.5	150	66	-	1.58:1	-
(1)	N-6475	K-7475	77475	CSN475	1500 CT	1500 CT	-	1	0.75	0.11	2.5	150	168	-	1:1	-
	N-6480	K-7480	77480	CSN480	1600 CT	12.8 CT	3.2	1	0.75	0.11	2.5	140	1.75	0.44	11.18:1	22.36:1
	N-6483	K-7483	77483	CSN483	2000 CT	8 CT	2	1	0.75	0.11	2	250	1	0.25	15.8:1	31.6:1
	N-6485	K-7485	77485	CSN485	2000 CT	2000 CT	500	1	0.75	0.11	2	185	255	64	1:1	2:1
(1)	N-6490	K-7490	77490	CSN490	2000 CT	2000 CT	-	1	0.75	0.11	2	175	240	-	1:1	-
	N-6495	K-7495	77495	CSN495	2000 CT	8000 CT	2000	1	0.75	0.11	2	185	1015	254	1:2	1:1
	N-6597	K-7497	77497	CSN497	2500 CT	2500 CT	625	1	0.75	0.11	2	245	268	68	1:1	2:1
	N-6500	K-7500	77500	CSN500	3000 CT	3000 CT	750	1	0.75	0.11	1.8	267	295	74	1:1	2:1
(1)	N-6505	K-7505	77505	CSN505	3000 CT	3000 CT	-	1	0.75	0.11	1.8	267	368	-	1:1	-
	N-6510	K-7510	77510	CSN510	3600 CT	3600 CT	900	1	0.75	0.11	1.5	300	413	103	1:1	2:1
	N-6512	K-7512	77512	CSN512	4000 CT	16 CT	4	1	0.75	0.11	1.5	395	2.5	0.65	15.8:1	31.6:1
	N-6514	K-7514	77514	CSN514	4000 CT	600 CT	150	1	0.75	0.11	1.5	395	66	17	2.58:1	5.16:1
	N-6515	K-7515	77515	CSN515	4000 CT	1000 CT	250	1	0.75	0.11	1.5	395	108	27	2:1	4:1
(1)	N-6520	K-7520	77520	CSN520	4000 CT	8000 CT	-	1	0.75	0.11	1.5	390	955	-	1:1.41	-

SPECIFICATIONS

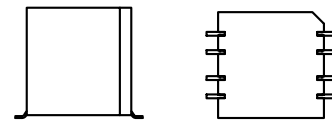
N SERIES (STRAIGHT LEADS)



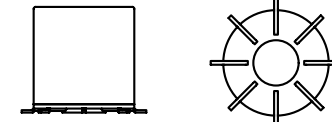
K SERIES (INSULATED LEADS)



77000 SERIES (SQUARE SURFACE MOUNT)



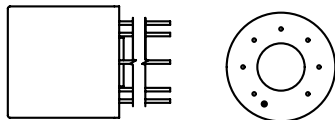
CSN SERIES (ROUND SURFACE MOUNT)



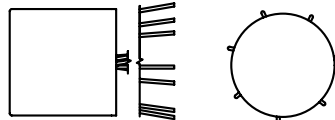
	Through Hole ⁽²⁾		Surface Mount ⁽³⁾		Primary Impedance [Ω]	Secondary Impedance with Split Windings		Power			Primary Unbalanced DC Current [mA]	Primary DCR [Ω]	Secondary DCR		Turns Ratio PRI:SEC	
	Straight	Insulated	Square	Round		Series [Ω]	Parallel [Ω]	1kHz+ [W]	400Hz+ [W]	150Hz+ [W]			Series [Ω]	Parallel [Ω]	Series	Parallel
	N-6525	K-7525	77525	CSN525	5000 CT	500 CT	125	1	0.75	0.11	1.3	450	62	16	3.16:1	6.32:1
	N-6530	K-7530	77530	CSN530	5000 CT	5000 CT	1250	1	0.75	0.11	1.3	450	620	155	1:1	2:1
	N-6535	K-7535	77535	CSN535	7500 CT	50 CT	12.5	1	0.75	0.11	1	670	6	1.5	12.25:1	24.5:1
	N-6540	K-7540	77540	CSN540	7500 CT	100 CT	25	1	0.75	0.11	1	670	11	2.8	8.66:1	17.32:1
	N-6545	K-7545	77545	CSN545	7500 CT	600 CT	150	1	0.75	0.11	1	670	66	16.5	3.54:1	7.07:1
	N-6550	K-7550	77550	CSN550	7500 CT	2500 CT	625	1	0.75	0.11	1	670	268	67	1.73:1	3.46:1
(1)	N-6555	K-7555	77555	CSN555	7500 CT	7500 CT	-	1	0.75	0.11	1	670	925	-	1:1	-
	N-6560	K-7560	77560	CSN560	8000 CT	12.8 CT	3.2	1	0.75	0.11	1	765	1.75	0.44	25:1	50:1
	N-6565	K-7565	77565	CSN565	8000 CT	1000 CT	250	1	0.75	0.11	1	695	106	26.5	2.83:1	5.66:1
(1)	N-6570	K-7570	77570	CSN570	8000 CT	1200 CT	-	1	0.75	0.11	1	715	153	-	2.58:1	-
(1)	N-6575	K-7575	77575	CSN575	9000 CT	9000 CT	-	1	0.75	0.11	1	925	1020	-	1:1	-
	N-6580	K-7580	77580	CSN580	10,000 CT	12.8 CT	3.2	1	0.75	0.11	1	768	1.6	0.4	28:1	56:1
	N-6585	K-7585	77585	CSN585	10,000 CT	16 CT	4	1	0.75	0.11	1	756	1.7	0.43	25:1	50:1
	N-6590	K-7590	77590	CSN590	10,000 CT	100 CT	25	1	0.75	0.11	1	780	10	2.5	10:1	20:1
	N-6595	K-7595	77595	CSN595	10,000 CT	200 CT	50	1	0.75	0.11	1	780	24	6	7.07:1	14.14:1
	N-6600	K-7600	77600	CSN600	10,000 CT	500 CT	125	1	0.75	0.11	1	780	60	15	4.47:1	8.94:1
	N-6605	K-7605	77605	CSN605	10,000 CT	600 CT	150	1	0.75	0.11	1	780	83	21	4.08:1	8.16:1
	N-6610	K-7610	77610	CSN610	10,000 CT	1000 CT	250	1	0.75	0.11	1	780	106	27	3.16:1	6.32:1
	N-6615	K-7615	77615	CSN615	10,000 CT	1200 CT	300	1	0.75	0.11	1	780	145	36	2.89:1	5.77:1
	N-6620	K-7620	77620	CSN620	10,000 CT	1500 CT	375	1	0.75	0.11	1	780	160	40	2.58:1	5.16:1
	N-6625	K-7625	77625	CSN625	10,000 CT	2000 CT	500	1	0.75	0.11	1	780	300	75	2.24:1	4.47:1
	N-6630	K-7630	77630	CSN630	10,000 CT	5000 CT	1250	1	0.75	0.11	1	780	610	153	1.41:1	2.83:1
	N-6635	K-7635	77635	CSN635	10,000 CT	7500 CT	1875	1	0.75	0.11	1	780	932	233	1.16:1	2.31:1
	N-6640	K-7640	77640	CSN640	10,000 CT	10,000 CT	2500	1	0.75	0.11	1	780	1075	269	1:1	2:1
(1)	N-6645	K-7645	77645	CSN645	10,000 CT	10,000 CT	-	1	0.75	0.11	1	715	985	-	1:1	-
	N-6650	K-7650	77650	CSN650	15,000 CT	400 CT	100	0.66	0.66	0.11	0.8	1165	52	13	6.12:1	12.25:1

SPECIFICATIONS

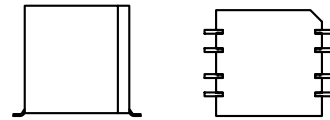
N SERIES
(STRAIGHT LEADS)



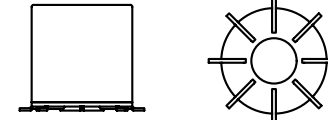
K SERIES
(INSULATED LEADS)



77000 SERIES
(SQUARE SURFACE MOUNT)



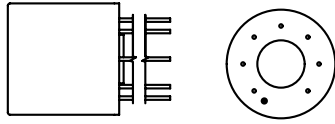
CSN SERIES
(ROUND SURFACE MOUNT)



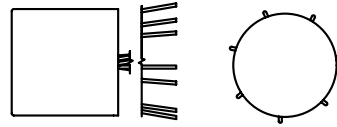
	Through Hole ⁽²⁾		Surface Mount ⁽³⁾		Primary Impedance [Ω]	Secondary Impedance with Split Windings		Power			Primary Unbalanced DC Current [mA]	Primary DCR [Ω]	Secondary DCR		Turns Ratio PRI:SEC	
	Straight	Insulated	Square	Round		Series [Ω]	Parallel [Ω]	1kHz+ [W]	400Hz+ [W]	150Hz+ [W]			Series [Ω]	Parallel [Ω]	Series	Parallel
	N-6652	K-7652	77652	CSN652	15,000 CT	500 CT	125	0.66	0.66	0.11	0.8	1165	60	15	5.48:1	10.95:1
	N-6655	K-7655	77655	CSN655	15,000 CT	600 CT	150	0.66	0.66	0.11	0.8	1165	80	20	5:1	10:1
	N-6660	K-7660	77660	CSN660	15,000 CT	10,000 CT	2500	0.66	0.66	0.11	0.8	1165	1050	263	1.22:1	2.45:1
(1)	N-6665	K-7665	77665	CSN665	15,000 CT	15,000 CT	-	0.66	0.66	0.11	0.8	1165	1600	-	1:1	-
	N-6670	K-7670	77670	CSN670	15,000 CT	15,000 CT	3750	0.66	0.66	0.11	0.8	1165	1600	400	1:1	2:1
	N-6675	K-7675	77675	CSN675	16,000 CT	1000 CT	250	0.62	0.62	0.11	0.8	1560	108	27	4:1	8:1
	N-6680	K-7680	77680	CSN680	20,000 CT	500 CT	125	0.5	0.5	0.11	0.7	1750	60	15	6.32:1	12.65:1
	N-6685	K-7685	77685	CSN685	20,000 CT	600 CT	150	0.5	0.5	0.11	0.7	1750	82	20.5	5.77:1	11.55:1
	N-6690	K-7690	77690	CSN690	20,000 CT	800 CT	200	0.5	0.5	0.11	0.7	1750	98	24.5	5:1	10:1
	N-6695	K-7695	77695	CSN695	20,000 CT	1000 CT	250	0.5	0.5	0.11	0.7	1750	135	34	4.47:1	8.94:1
	N-6700	K-7700	77700	CSN700	20,000 CT	5000 CT	1250	0.5	0.5	0.11	0.7	1750	610	153	2:1	4:1
	N-6705	K-7705	77705	CSN705	20,000 CT	10,000 CT	2500	0.5	0.5	0.11	0.7	1750	1075	269	1.41:1	2.83:1
(1)	N-6710	K-7710	77710	CSN710	20,000 CT	20,000 CT	-	0.5	0.5	0.11	0.7	1715	2370	-	1:1	-
	N-6715	K-7715	77715	CSN715	25,000 CT	500 CT	125	0.4	0.4	0.11	0.6	2470	60	15	7.07:1	14.14:1
	N-6720	K-7720	77720	CSN720	25,000 CT	1000 CT	250	0.4	0.4	0.11	0.6	2470	106	27	5:1	10:1
	N-6725	K-7725	77725	CSN725	30,000 CT	50 CT	12.5	0.33	0.33	0.11	0.5	2730	6.2	1.6	24.5:1	49:1
	N-6730	K-7730	77730	CSN730	30,000 CT	1200 CT	300	0.33	0.33	0.11	0.5	2815	156	39	5:1	10:1
	N-6732	K-7732	77732	CSN732	30,000 CT	500 CT	125	0.33	0.33	0.11	0.5	2730	61	15.3	7.7:1	15.5:1
	N-6734	K-7734	77734	CSN734	30,000 CT	200 CT	50	0.33	0.33	0.11	0.5	2730	24	6	12.2:1	24.5:1
	N-6735	K-7735	77735	CSN735	30,000 CT	5000 CT	1250	0.33	0.33	0.11	0.5	2730	620	155	2.45:1	4.9:1
	N-6740	K-7740	77740	CSN740	30,000 CT	10,000 CT	2500	0.33	0.33	0.11	0.5	2730	1090	272	1.73:1	3.46:1
(1)	N-6745	K-7745	77745	CSN745	30,000 CT	30,000 CT	-	0.33	0.33	0.11	0.5	2730	3740	-	1:1	-
	N-6750	K-7750	77750	CSN750	40,000 CT	400 CT	100	0.25	0.25	0.11	0.5	3150	53	13	10:1	20:1
	N-6755	K-7755	77755	CSN755	40,000 CT	2000 CT	500	0.25	0.25	0.11	0.5	3150	300	75	4.47:1	8.94:1
	N-6760	K-7760	77760	CSN760	40,000 CT	4000 CT	1000	0.25	0.25	0.11	0.5	3150	548	137	3.16:1	6.32:1
	N-6765	K-7765	77765	CSN765	40,000 CT	20,000 CT	5000	0.25	0.25	0.11	0.5	3150	3075	769	1.41:1	2.83:1

SPECIFICATIONS

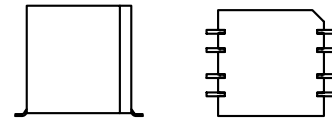
N SERIES (STRAIGHT LEADS)



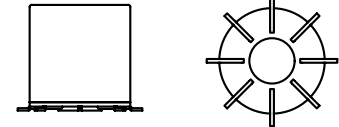
K SERIES (INSULATED LEADS)



77000 SERIES (SQUARE SURFACE MOUNT)



CSN SERIES (ROUND SURFACE MOUNT)



	Through Hole ⁽²⁾		Surface Mount ⁽³⁾		Primary Impedance	Secondary Impedance with Split Windings		Power			Primary Unbalanced DC Current	Primary DCR	Secondary DCR		Turns Ratio PRI:SEC	
	Straight	Insulated	Square	Round		Series [Ω]	Parallel [Ω]	1kHz+ [W]	400Hz+ [W]	150Hz+ [W]			Series [Ω]	Parallel [Ω]	Series	Parallel
(1)	N-6770	K-7770	77770	CSN770	40,000 CT	40,000 CT	-	0.25	0.25	0.11	0.5	3940	4350	-	1:1	-
	N-6775	K-7775	77775	CSN775	50,000 CT	200 CT	50	0.2	0.2	0.11	0.4	4275	24	6	15.8:1	31.6:1
	N-6777	K-7777	77777	CSN777	50,000 CT	500 CT	125	0.2	0.2	0.11	0.4	4275	60	15	0:1	20:1
	N-6778	K-7778	77778	CSN778	50,000 CT	600 CT	150	0.2	0.2	0.11	0.4	4275	82	21	9.13:1	18.26:1
	N-6779	K-7779	77779	CSN779	50,000 CT	50,000 CT	12,500	0.2	0.2	0.11	0.4	4500	6270	1568	1:1	2:1
	N-6780	K-7780	77780	CSN780	60,000 CT	15,000 CT	3750	0.16	0.16	0.11	0.4	5960	1650	412	2:1	4:1
	N-6785	K-7785	77785	CSN785	62,500 CT	50 CT	12.5	0.16	0.16	0.11	0.4	5960	6	1.5	35.4:1	70.7:1
	N-6787	K-7787	77787	CSN787	80,000 CT	15,000 CT	3750	0.12	0.12	0.11	0.3	7200	1690	423	2.3:1	4.6:1
	N-6789	K-7789	77789	CSN789	80,000 CT	80,000 CT	20,000	0.12	0.12	0.11	0.3	7200	9920	2480	1:1	2:1
	N-6790	K-7790	77790	CSN790	90,000 CT	10,000 CT	2500	0.11	0.11	0.11	0.3	7500	1350	338	3:1	6:1
	N-6795	K-7795	77795	CSN795	95,000 CT	15,000 CT	3750	0.1	0.1	0.1	0.3	9550	1635	410	2.5:1	5:1
	N-6800	K-7800	77800	CSN800	100,000 CT	60 CT	15	0.1	0.1	0.1	0.3	10,000	8.5	2.2	40.8:1	81.6:1
	N-6805	K-7805	77805	CSN805	100,000 CT	100 CT	25	0.1	0.1	0.1	0.3	10,000	14	3.5	31.6:1	63.2:1
	N-6810	K-7810	77810	CSN810	100,000 CT	500 CT	125	0.1	0.1	0.1	0.3	10,000	62	15.5	14.1:1	28.3:1
	N-6813	K-7813	77813	CSN813	100,000 CT	1000 CT	250	0.1	0.1	0.1	0.3	10,000	140	35	10:1	20:1
	N-6814	K-7814	77814	CSN814	100,000 CT	2000 CT	500	0.1	0.1	0.1	0.3	10,000	248	62	7.07:1	14.14:1
	N-6815	K-7815	77815	CSN815	100,000 CT	10,000 CT	2500	0.1	0.1	0.1	0.3	10,000	1075	270	3.16:1	6.32:1
	N-6820	K-7820	77820	CSN820	135,000 CT	82 CT	20.5	0.074	0.074	0.074	0.25	13,700	9.5	2.4	40.6:1	81.2:1
	N-6823	K-7823	77823	CSN823	200,000 CT	500 CT	125	0.05	0.05	0.05	0.2	17,340	75	19	20:1	40:1
	N-6825	K-7825	77825	CSN825	200,000 CT	1000 CT	250	0.05	0.05	0.05	0.2	17,340	133	33	14.1:1	28.3:1
	N-6830	K-7830	77830	CSN830	200,000 CT	10,000 CT	2500	0.05	0.05	0.05	0.2	17,340	1350	336	4.47:1	8.94:1
	N-6835	K-7835	77835	CSN835	200,000 CT	20,000 CT	5000	0.05	0.05	0.05	0.2	17,340	3000	750	3.16:1	6.32:1
	N-6837	K-7837	77837	CSN837	250,000 CT	200 CT	50	0.04	0.04	0.04	0.2	17,340	28	7	35.4:1	70.7:1
	N-6840	K-7840	77840	CSN840	250,000 CT	1000 CT	250	0.04	0.04	0.04	0.2	17,340	118	30	15.8:1	31.6:1

Note 1: Includes electrostatic shield

Note 2: For RoHS compliance on a through-hole component, please consult with Pico's engineer and provide the part number.

Note 3: All SMDs are available with Pb-free dipped terminals that is compliant to RoHS exemption 7 by requesting part number + 'RoHS-7'

SPECIFICATIONS

GENERAL

Parameter	Condition	Min.	Typ.	Max.	Units
Dielectric Strength	60Hz	-	200	-	V _{RMS}
Insulation Resistance	300VDC	10	-	-	GΩ
Distortion	150, 400, 1kHz @ Rated Power	-	-	5	%
Frequency Response	150 - 75 kHz @ 1mW, Primary Impedance < 50kΩ	-3	-	3	dB
	150 - 20 kHz @ 1mW, Primary Impedance ≥ 50kΩ				
Operating Temperature Range	Ambient with temperature rise	-55	-	+130	°C
Storage Temperature Range	Ambient	-55	-	+105	°C
Size	K Series - Diameter x Height	0.5 x 0.5 (12.7 x 12.7)			inches (mm)
	N Series - Diameter x Height	0.5 x 0.5 (12.7 x 12.7)			
	CSN Series - Diameter x Height	0.5 x 0.525 (12.7 x 13.335)			
	77000 Series - Length x Width x Height	0.55 x 0.55 x 0.565 (13.97 x 13.97 x 14.351)			
Weight	K, N, CSN & 77000 Series	-	7.5	-	grams
Case	N, K & CSN Series	Epoxy Insulated Metal			
	77000 Series	Glass Reinforced Polymer			
Potting	Vacuum Impregnated Epoxy				
Box Packaging (L x W x H)	N & K Series	10.5 x 6.42 x 0.79 (266.7 x 163.068 x 20.066)			inches (mm)
Tube Packaging (W x H x L)	77000 & CSN Series	0.93 x 0.73 x 20.0 (23.724 x 18.542 x 508)			
Tape & Reel Packaging	Upon request				
Moisture Sensitivity Level	Surface Mount only	Level 3			

OPTIONAL DESIGN CRITERIA

Test	Standard	Description
Vibration	MIL-STD-202	Method 204, Vibration, High Frequency
Shock	MIL-STD-202	Method 213, Shock (Specified Pulse)
Immersion	MIL-STD-202	Method 104, Immersion
Moisture Resistance	MIL-STD-202	Method 106, Moisture Resistance
Flammability	MIL-STD-202	Method 111, Flammability (External Flame)
Thermal Shock	MIL-STD-202	Method 107, Thermal Shock

OPTIONAL SCREENING AND QUALIFICATION

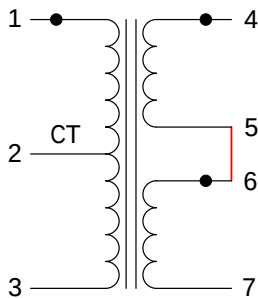
Standard	Screening & Qualification	Test ⁽⁴⁾
MIL-PRF-27	a.) Group A inspection Level-T - Table VII b.) Qualification inspection, Grade 5 - Table V	I. Thermal Shock II. Vibration III. Burn-in IV. Induced Voltage V. Shock VI. Dielectric Withstanding Voltage (at reduced pressure) VII. Insulation Resistance VIII. Electrical Characteristics IX. Visual and Mechanical Examination (External) X. Life XI. Radiographic Inspection
MIL-STD-981	a.) Group A screening tests - Table VI b.) Group B tests - Table XII, Class S	
EEE-INST-002, Section M1	a.) Magnetics Screening Req. - Table 2 b.) Magnetics Part Qual. - Table 3	

Note 4: Screening and qualification tests are not limited to the options in the chart above. Each standard may also be stringent or exclude certain tests from one another. Please contact Pico for specific application needs and for Pico part number.

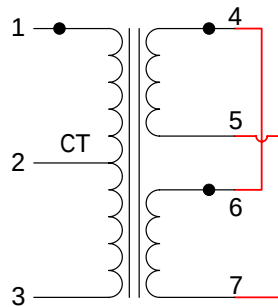
ELECTRICAL SCHEMATIC

N SERIES - THROUGH HOLE

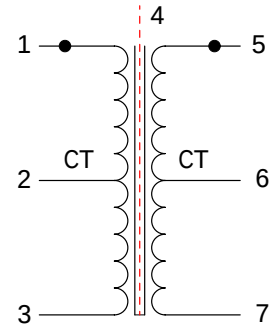
**SPLIT SECONDARIES
SERIES CONNECTION**



**SPLIT SECONDARIES
PARALLEL CONNECTION**

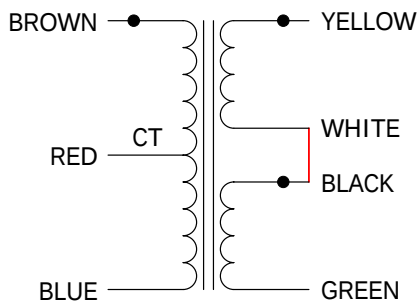


ELECTROSTATIC SHIELD

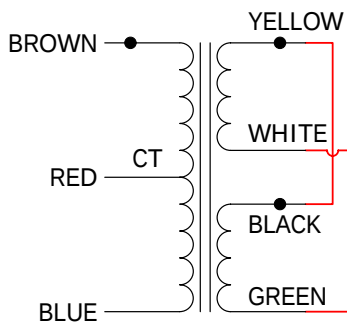


K SERIES - INSULATED LEADS

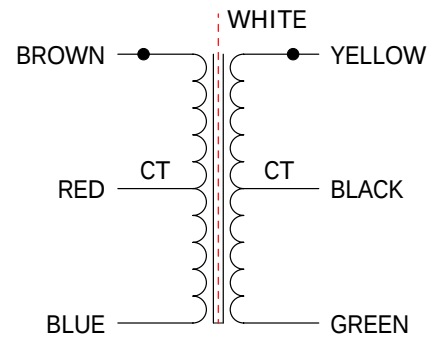
**SPLIT SECONDARIES
SERIES CONNECTION**



**SPLIT SECONDARIES
PARALLEL CONNECTION**

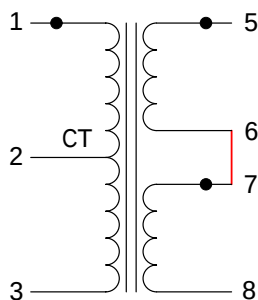


ELECTROSTATIC SHIELD

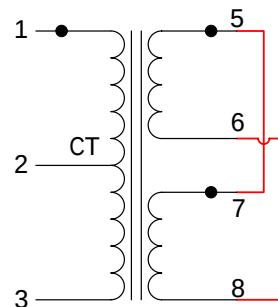


77000 & CSN SERIES - SURFACE MOUNT

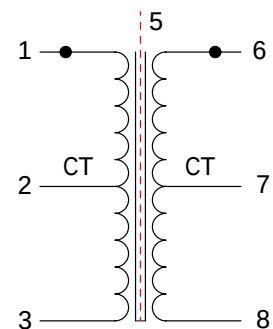
**SPLIT SECONDARIES
SERIES CONNECTION**



**SPLIT SECONDARIES
PARALLEL CONNECTION**



ELECTROSTATIC SHIELD

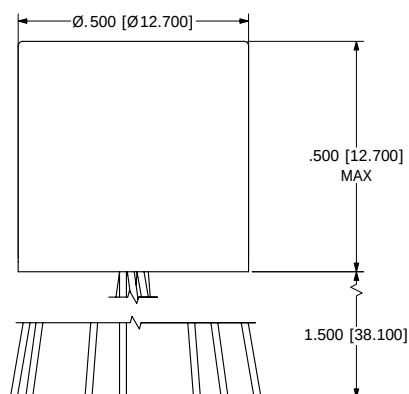
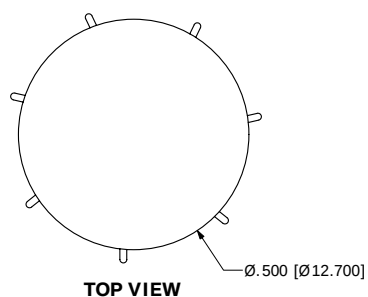


NOTES

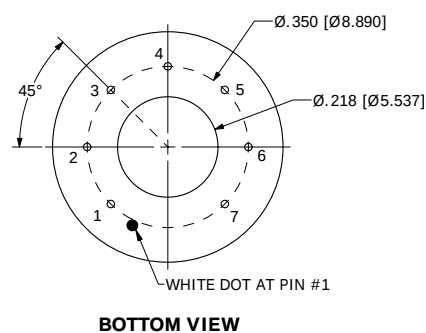
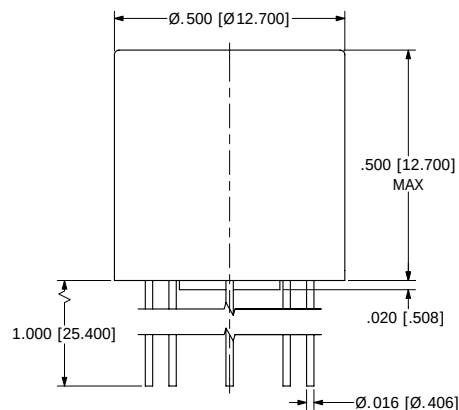
- ANY TERMINALS NOT SHOWN HERE MAY BE USED FOR MECHANICAL STABILITY ON THE PCB ONLY, AS THEY DO NOT HAVE ANY ELECTRICAL CONNECTION.
- CT STANDS FOR "CENTER-TAP", WHERE THE TOTAL NUMBER OF TURNS IS EVENLY SPLIT BETWEEN THE TOP HALF AND BOTTOM HALF OF A COMPLETE WINDING.

MECHANICAL DRAWINGS

K SERIES - INSULATED LEADS



N SERIES - THROUGH HOLE

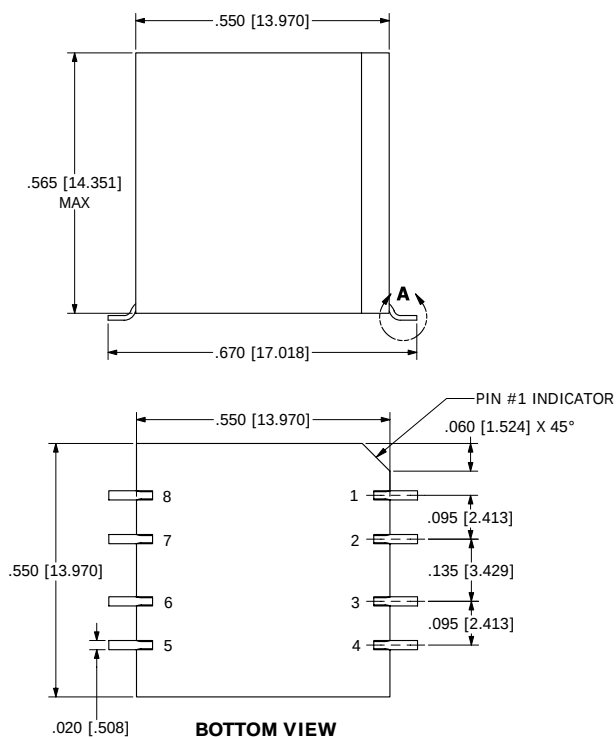


NOTES

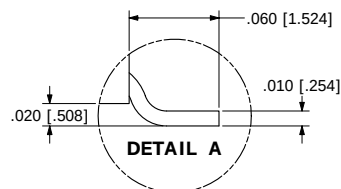
- a. ALL DIMENSIONS ARE IN INCHES, [] = MM
- b. TERMINALS ARE CLOCKWISE FROM PIN #1

MECHANICAL DRAWINGS

77000 SERIES - SQUARE SURFACE MOUNT



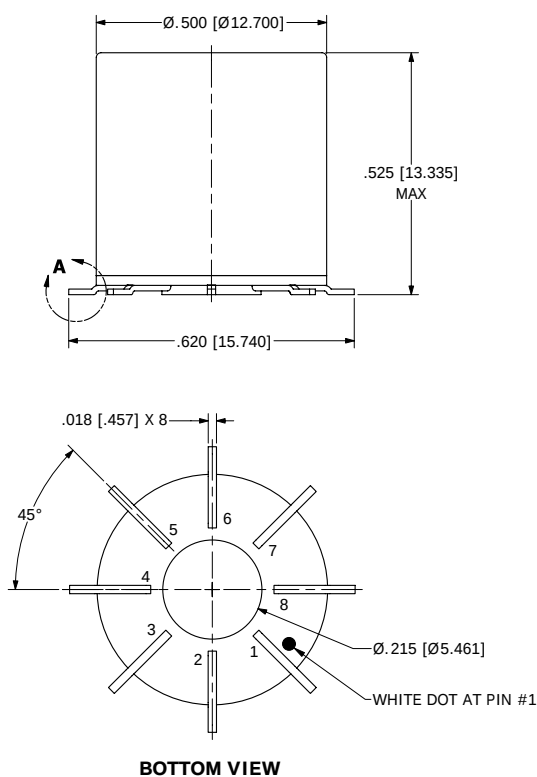
LEAD DETAILS



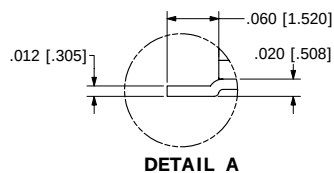
NOTES

- a. ALL DIMENSIONS ARE IN INCHES, [] = MM
- b. TERMINALS ARE CLOCKWISE FROM PIN #1
- c. PIN #4 HAS NO CONNECTION

CSN SERIES - ROUND SURFACE MOUNT

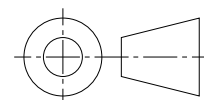


LEAD DETAILS



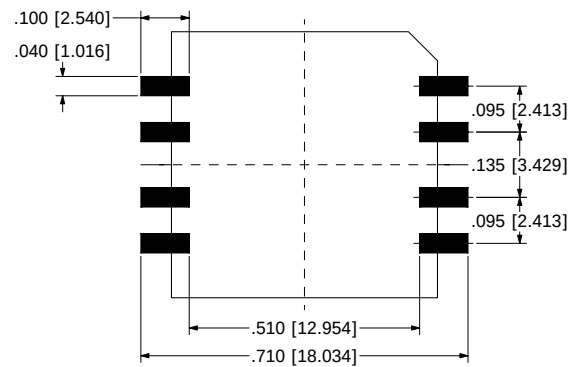
NOTES

- a. ALL DIMENSIONS ARE IN INCHES, [] = MM
- b. TERMINALS ARE CLOCKWISE FROM PIN #1
- c. PIN #4 HAS NO CONNECTION

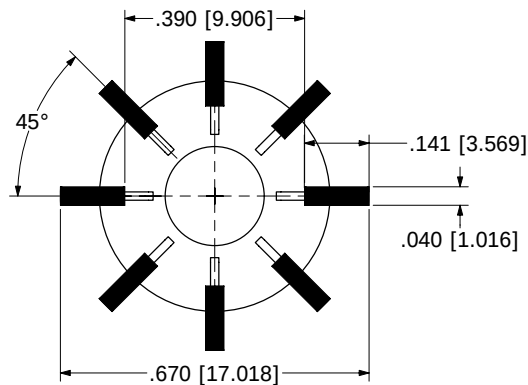


RECOMMENDED LAND PATTERN DIMENSIONS

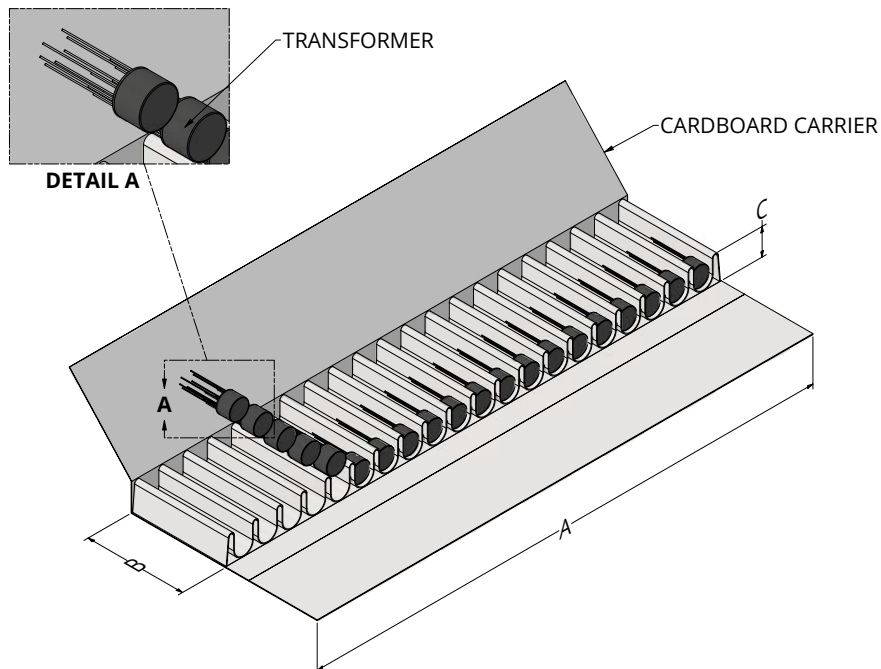
SERIES 77000 - SQUARE SURFACE MOUNT



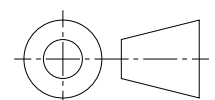
SERIES CSN - ROUND SURFACE MOUNT



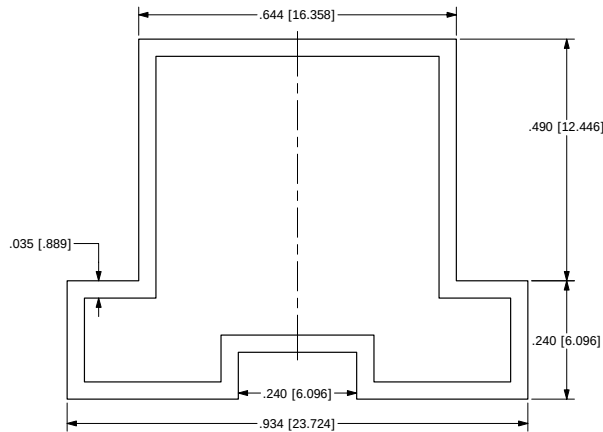
BOX PACKAGING - N & K SERIES



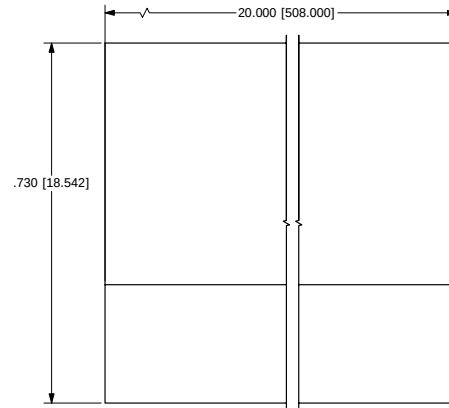
Dimension		
A	B	C
10.5 [266.7]	6.42 [163.068]	0.79 [20.066]



TUBE PACKAGING - 77000 & CSN SERIES

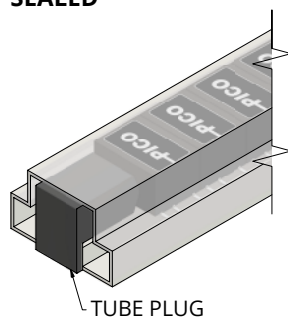


PLAN VIEW

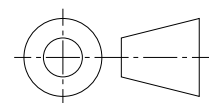
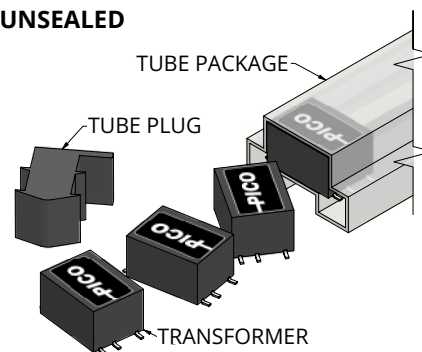


ELEVATION VIEW

SEALED



UNSEALED



Pico warrants each product manufactured by us and sold by us or an authorized representative, to be free from defects in material and workmanship. If properly used, it will perform within its applicable specifications for a period of one year after original shipment. Pico's obligation under this guarantee is limited to repairing or replacing our product to the original purchaser. This warranty is in lieu of all other warranties, express or implied and constitutes fulfillment of our obligations to the purchaser. We do not guarantee that the products can be used for a particular purpose other than those solely covered by the product's specifications. Pico must be notified if the product must meet particular certifications and/or standards. We assume no liability, in any event, for consequential damages, for anticipated or lost profits, incidental damages or loss of time or other losses incurred by the purchaser or any third party in connection with products covered by this warranty or otherwise. The purchaser will indemnify and hold Pico harmless for any damages, losses, costs, etc. from usage not within the product's specifications. Pico must be consulted before usage of its products in a nuclear, radioactive or space environment.

We reserve the right to discontinue products without notice, We reserve the right to make modifications to any existing catalog products without notice, at any time, without the obligation to modify units previously sold.

S · 83000 & CSS Series

2-135k Ω , 50-30kHz, 2W Max. @ 1kHz+ Audio Transformer

PICO
Electronics, Inc.

PRODUCT OVERVIEW

The S , 83000 & CSS series are ultra-miniature transformers in an encapsulated package with design layouts as through-hole or surface mount types. They can operate over a wide temperature range of -55°C to +130°C. Our proprietary materials and methods allow extreme temperatures of vapor phase, IR or other reflow procedures without degrading the high reliability of their physical form and electrical performance.

Typical applications:

- Sensors
- Radars
- Avionic flight controls
- Airborne systems
- Naval electronics
- Military, aerospace, or commercial aircraft

FEATURES

- Extreme resistance to impact, shock, and vibration
- Manufactured to MIL-PRF-27, Class S, Grade 5
- High reliability for space and mission critical applications
- Ultra miniature in size and minimalistic design
- Design layouts in through-hole or surface mount types
- Available with magnetic shielding and/or electrostatic shielding
- Certain parts are QPL approved

Contact Pico for part number of available options:

- Screening and qualification criteria to flight standard
- Capability to thermal shock up to 300 cycles
- Extra layers of magnetic shielding
- Fully RoHS compliant or with exemption 7(a)
- Modifications to mechanical design and electrical characteristics
- Custom new design and parameters

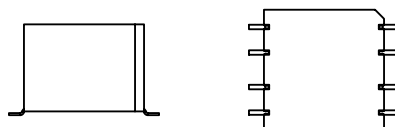


SPECIFICATIONS

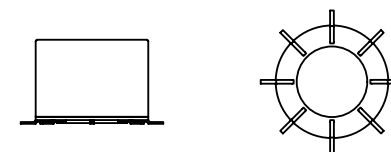
S SERIES - THROUGH HOLE



83000 SERIES - SQUARE SURFACE MOUNT



CSS SERIES - ROUND SURFACE MOUNT



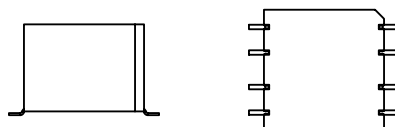
Through Hole ⁽²⁾	Surface Mount ⁽³⁾		Primary Impedance [Ω]	Secondary Impedance with Split Windings		Power			Primary Unbalanced DC Current [mA]	Primary DCR [Ω]	Secondary DCR		Turns Ratio PRI:SEC	
	Square	Round		Series [Ω]	Parallel [Ω]	1kHz+ [W]	300Hz+ [W]	75Hz+ [W]			Series [Ω]	Parallel [Ω]	Series	Parallel
S-21003	83003	CSS003	20 CT	8 CT	2	2.0	1.5	.03	22	1.6	.88	.22	1.58:1	3.16:1
S-21005	83005	CSS005	20 CT	20 CT	5	2.0	1.5	.03	22	1.6	2.2	.55	1:1	2:1
S-21010	83010	CSS010	32 CT	32 CT	8	2.0	1.5	.03	17.5	2.56	3.52	.88	1:1	2:1
S-21015	83015	CSS015	40 CT	40 CT	10	2.0	1.5	.03	16	3.2	4.4	1.1	1:1	2:1
S-21018	83018	CSS018	48 CT	16 CT	4	2.0	1.5	.03	14.5	3.84	1.76	.44	1.73:1	3.46:1
S-21020	83020	CSS020	50 CT	50 CT	12.5	2.0	1.5	.03	14	4	5.5	1.38	1:1	2:1
S-21025	83025	CSS025	80 CT	32 CT	8	2.0	1.5	.03	11	6.4	3.52	.88	1.58:1	3.16:1
S-21028	83028	CSS028	100 CT	40 CT	10	2.0	1.5	.03	10	8	4.4	1.1	1.58:1	3.16:1
S-21030	83030	CSS030	100 CT	100 CT	25	2.0	1.5	.03	10	8	11	2.75	1:1	2:1
S-21035	83035	CSS035	120 CT	12.8 CT	3.2	2.0	1.5	.03	9	9.6	1.41	.35	3.06:1	6.12:1
S-21040	83040	CSS040	120 CT	60 CT	15	2.0	1.5	.03	9	9.6	6.6	1.65	1.41:1	2.83:1
S-21045	83045	CSS045	120 CT	120 CT	30	2.0	1.5	.03	9	9.6	13.2	3.3	1:1	2:1
S-21050	83050	CSS050	150 CT	12 CT	3	2.0	1.5	.03	8	12	1.32	.33	3.54:1	7.08:1
S-21055	83055	CSS055	150 CT	50 CT	12.5	2.0	1.5	.03	8	12	5.5	1.38	1.73:1	3.46:1
S-21060	83060	CSS060	150 CT	100 CT	25	2.0	1.5	.03	8	12	11	2.75	1.22:1	2.44:1
S-21065	83065	CSS065	150 CT	150 CT	37.5	2.0	1.5	.03	8	12	16.5	4.13	1:1	2:1
S-21070	83070	CSS070	150 CT	600 CT	150	2.0	1.5	.03	8	12	66	16.5	1:2	1:1
S-21075	83075	CSS075	200 CT	200 CT	50	2.0	1.5	.03	7	16	22	5.5	1:1	2:1
S-21080	83080	CSS080	300 CT	12 CT	3	2.0	1.5	.03	5.5	24	1.32	.33	5:1	10:1
S-21085	83085	CSS085	300 CT	50 CT	12.5	2.0	1.5	.03	5.5	24	5.5	1.38	2.45:1	4.9:1
S-21090	83090	CSS090	300 CT	150 CT	37.5	2.0	1.5	.03	5.5	24	16.5	4.13	1.41:1	2.83:1
S-21095	83095	CSS095	300 CT	300 CT	75	2.0	1.5	.03	5.5	24	33	8.25	1:1	2:1
S-21100	83100	CSS100	300 CT	600 CT	150	2.0	1.5	.03	5.5	24	66	16.5	1:1.41	1.41:1
S-21105	83105	CSS105	320 CT	12.8 CT	3.2	2.0	1.5	.03	5.5	25.6	1.41	.35	5:1	10:1
S-21110	83110	CSS110	400 CT	40 CT	10	2.0	1.5	.03	5	32	4.4	1.1	3.16:1	6.32:1

SPECIFICATIONS

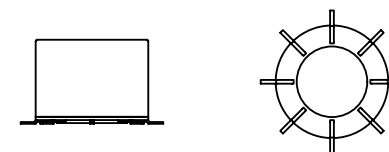
S SERIES - THROUGH HOLE



83000 SERIES - SQUARE SURFACE MOUNT



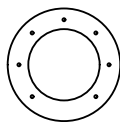
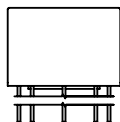
CSS SERIES - ROUND SURFACE MOUNT



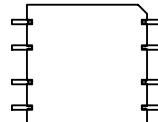
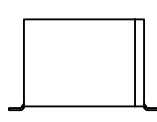
	Through Hole ⁽²⁾	Surface Mount ⁽³⁾		Primary Impedance [Ω]	Secondary Impedance with Split Windings		Power			Primary Unbalanced DC Current [mA]	Primary DCR [Ω]	Secondary DCR		Turns Ratio PRI:SEC	
		Square	Round		Series [Ω]	Parallel [Ω]	1kHz+ [W]	300Hz+ [W]	75Hz+ [W]			Series [Ω]	Parallel [Ω]	Series	Parallel
(1)	S-21115	83115	CSS115	400 CT	120 CT	30	2.0	1.5	.03	5	32	13.2	3.3	1.83:1	3.65:1
	S-21120	83120	CSS120	400 CT	200 CT	50	2.0	1.5	.03	5	32	22	5.5	1.41:1	2.83:1
	S-21125	83125	CSS125	400 CT	400 CT	100	2.0	1.5	.03	5	32	44	11	1:1	2:1
	S-21130	83130	CSS130	400 CT	1000 CT	250	2.0	1.5	.03	5	32	110	27.5	1:1.58	1.26:1
	S-21135	83135	CSS135	400 CT	2000 CT	500	2.0	1.5	.03	5	32	220	55	1:2.24	1:1.12
	S-21140	83140	CSS140	400 CT	4000 CT	1000	2.0	1.5	.03	5	32	440	110	1:3.16	1:1.58
	S-21142	83142	CSS142	500 CT	12.8 CT	3.2	2.0	1.5	.03	4.5	40	1.41	.35	6.25:1	12.5:1
	S-21144	83144	CSS144	500 CT	16 CT	4	2.0	1.5	.03	4.5	40	1.76	.44	5.6:1	11.2:1
	S-21145	83145	CSS145	500 CT	50 CT	12.5	2.0	1.5	.03	4.5	40	5.5	1.38	3.16:1	6.32:1
	S-21147	83147	CSS147	500 CT	150 CT	37.5	2.0	1.5	.03	4.5	40	16.5	4.13	1.83:1	3.65:1
	S-21150	83150	CSS150	500 CT	500 CT	125	2.0	1.5	.03	4.5	40	55	13.75	1:1	2:1
	S-21155	83155	CSS155	500 CT	500 CT	-	2.0	1.5	.03	4.5	40	55	-	1:1	-
	S-21160	83160	CSS160	500 CT	600 CT	150	2.0	1.5	.03	4.5	40	66	16.5	1:1.1	1.83:1
	S-21165	83165	CSS165	600 CT	12.8 CT	3.2	2.0	1.5	.03	4	48	1.41	.35	6.85:1	13.7:1
	S-21167	83167	CSS167	600 CT	30 CT	7.5	2.0	1.5	.03	4	48	3.3	.83	4.47:1	8.94:1
(1)	S-21170	83170	CSS170	600 CT	48 CT	12	2.0	1.5	.03	4	48	5.28	1.37	3.54:1	7.07:1
	S-21175	83175	CSS175	600 CT	200 CT	50	2.0	1.5	.03	4	48	22	5.5	1.73:1	3.46:1
	S-21180	83180	CSS180	600 CT	600 CT	150	2.0	1.5	.03	4	48	66	16.5	1:1	2:1
(1)	S-21185	83185	CSS185	600 CT	600 CT	-	2.0	1.5	.03	4	48	66	-	1:1	-
(1)	S-21186	83186	CSS186	600 CT	900 CT	-	2.0	1.5	.03	4	48	99	-	1:1.22	-
	S-21187	83187	CSS187	600 CT	1200 CT	300	2.0	1.5	.03	4	48	132	33	1:1.41	1.41:1
	S-21190	83190	CSS190	640 CT	12.8 CT	3.2	2.0	1.5	.03	4	51	1.41	.35	7.07:1	14.14:1
	S-21195	83195	CSS195	700 CT	100 CT	25	2.0	1.5	.03	3.5	56	11	2.75	2.65:1	5.29:1
	S-21200	83200	CSS200	800 CT	12.8 CT	3.2	2.0	1.5	.03	3.5	64	1.41	.35	7.91:1	15.8:1
	S-21205	83205	CSS205	800 CT	48 CT	12	2.0	1.5	.03	3.5	64	5.28	1.32	4.08:1	8.16:1

SPECIFICATIONS

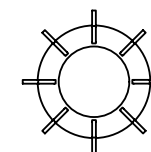
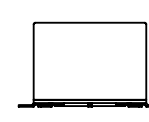
S SERIES - THROUGH HOLE



83000 SERIES - SQUARE SURFACE MOUNT



CSS SERIES - ROUND SURFACE MOUNT



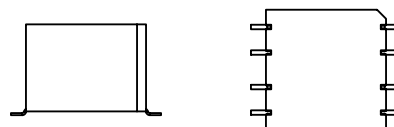
	Through Hole ⁽²⁾	Surface Mount ⁽³⁾		Primary Impedance [Ω]	Secondary Impedance with Split Windings		Power			Primary Unbalanced DC Current [mA]	Primary DCR [Ω]	Secondary DCR		Turns Ratio PRI:SEC	
		Square	Round		Series [Ω]	Parallel [Ω]	1kHz+ [W]	300Hz+ [W]	75Hz+ [W]			Series [Ω]	Parallel [Ω]	Series	Parallel
	S-21210	83210	CSS210	800 CT	800 CT	200	2.0	1.5	.03	3.5	64	88	22	1:1	2:1
	S-21215	83215	CSS215	900 CT	600 CT	150	2.0	1.5	.03	3	72	66	16.5	1.23:1	2.45:1
(1)	S-21217	83217	CSS217	900 CT	900 CT	-	2.0	1.5	.03	3	72	99	-	1:1	-
	S-21220	83220	CSS220	1000 CT	12 CT	3	2.0	1.5	.03	3	80	1.32	.33	9.13:1	18.26:1
	S-21225	83225	CSS225	1000 CT	50 CT	12.5	2.0	1.5	.03	3	80	5.5	1.38	4.47:1	8.94:1
	S-21230	83230	CSS230	1000 CT	1000 CT	250	2.0	1.5	.03	3	80	110	27.5	1:1	2:1
	S-21235	83235	CSS235	1060 CT	12.8 CT	3.2	2.0	1.5	.03	3	85	1.41	.35	9.1:1	18.2:1
	S-21240	83240	CSS240	1200 CT	12.8 CT	3.2	2.0	1.5	.03	3	96	1.41	.35	9.68:1	19.4:1
	S-21245	83245	CSS245	1200 CT	500 CT	125	2.0	1.5	.03	3	96	55	13.75	1.55:1	3.1:1
	S-21250	83250	CSS250	1200 CT	1200 CT	300	2.0	1.5	.03	3	96	132	33	1:1	2:1
(1)	S-21255	83255	CSS255	1200 CT	1200 CT	-	2.0	1.5	.03	3	96	132	-	1:1	-
	S-21260	83260	CSS260	1500 CT	12 CT	3	2.0	1.5	.03	2.5	120	1.32	.33	11.18:1	22.36:1
	S-21265	83265	CSS265	1500 CT	500 CT	125	2.0	1.5	.03	2.5	120	55	13.75	1.73:1	3.46:1
(1)	S-21270	83270	CSS270	1500 CT	600 CT	-	2.0	1.5	.03	2.5	120	66	-	1.58:1	-
(1)	S-21275	83275	CSS275	1500 CT	1500 CT	-	2.0	1.5	.03	2.5	120	165	-	1:1	-
	S-21280	83280	CSS280	1600 CT	12.8 CT	3.2	2.0	1.5	.03	2.5	128	1.41	.35	11.18:1	22.36:1
	S-21283	83283	CSS283	2000 CT	8 CT	2	2.0	1.5	.03	2.2	160	.88	.22	15.8:1	31.6:1
	S-21285	83285	CSS285	2000 CT	2000 CT	500	2.0	1.5	.03	2.2	160	220	55	1:1	2:1
(1)	S-21290	83290	CSS290	2000 CT	2000 CT	-	2.0	1.5	.03	2.2	160	220	-	1:1	-
	S-21295	83295	CSS295	2000 CT	8000 CT	2000	2.0	1.5	.03	2.2	160	880	220	1:2	1:1
	S-21297	83297	CSS297	2500 CT	2500 CT	625	2.0	1.5	.03	2	200	275	69	1:1	2:1
	S-21300	83300	CSS300	3000 CT	3000 CT	750	2.0	1.5	.03	1.8	240	330	83	1:1	2:1
(1)	S-21305	83305	CSS305	3000 CT	3000 CT	-	2.0	1.5	.03	1.8	240	330	-	1:1	-
	S-21310	83310	CSS310	3600 CT	3600 CT	900	2.0	1.5	.03	1.7	288	396	99	1:1	2:1
	S-21312	83312	CSS312	4000 CT	16 CT	4	2.0	1.5	.03	1.6	320	1.76	.44	15.8:1	31.6:1

SPECIFICATIONS

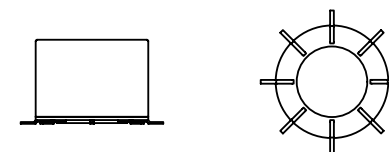
S SERIES - THROUGH HOLE



83000 SERIES - SQUARE SURFACE MOUNT



CSS SERIES - ROUND SURFACE MOUNT



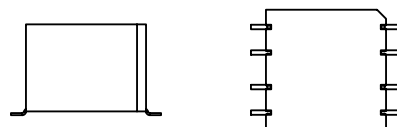
	Through Hole ⁽²⁾	Surface Mount ⁽³⁾		Primary Impedance [Ω]	Secondary Impedance with Split Windings		Power			Primary Unbalanced DC Current [mA]	Primary DCR [Ω]	Secondary DCR		Turns Ratio PRI:SEC	
		Square	Round		Series [Ω]	Parallel [Ω]	1kHz+ [W]	300Hz+ [W]	75Hz+ [W]			Series [Ω]	Parallel [Ω]	Series	Parallel
	S-21314	83314	CSS314	4000 CT	600 CT	150	2.0	1.5	.03	1.6	320	66	16.5	2.58:1	5.16:1
	S-21315	83315	CSS315	4000 CT	1000 CT	250	2.0	1.5	.03	1.6	320	110	27.5	2:1	4:1
(1)	S-21320	83320	CSS320	4000 CT	8000 CT	-	2.0	1.5	.03	1.6	320	880	-	1:1.41	-
	S-21325	83325	CSS325	5000 CT	500 CT	125	2.0	1.5	.03	1.4	400	55	13.8	3.16:1	6.32:1
	S-21330	83330	CSS330	5000 CT	5000 CT	1250	2.0	1.5	.03	1.4	400	550	138	1:1	2:1
	S-21335	83335	CSS335	7500 CT	50 CT	12.5	1.3	1.3	.03	1.2	600	5.5	1.38	12.25:1	24.5:1
	S-21340	83340	CSS340	7500 CT	100 CT	25	1.3	1.3	.03	1.2	600	11	2.75	8.66:1	17.32:1
	S-21345	83345	CSS345	7500 CT	600 CT	150	1.3	1.3	.03	1.2	600	66	16.5	3.54:1	7.07:1
	S-21350	83350	CSS350	7500 CT	2500 CT	625	1.3	1.3	.03	1.2	600	275	69	1.73:1	3.46:1
(1)	S-21355	83355	CSS355	7500 CT	7500 CT	-	1.3	1.3	.03	1.2	600	825	-	1:1	-
	S-21360	83360	CSS360	8000 CT	12.8 CT	3.2	1.2	1.2	.03	1.1	640	1.4	.35	25:1	50:1
	S-21365	83365	CSS365	8000 CT	1000 CT	250	1.2	1.2	.03	1.1	640	110	27.5	2.83:1	5.66:1
(1)	S-21370	83370	CSS370	8000 CT	1200 CT	-	1.2	1.2	.03	1.1	640	132	-	2.58:1	-
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	S-21390	83390	CSS390	10,000 CT	100 CT	25	1.0	1.0	.03	1	800	11	2.75	10:1	20:1
	S-21395	83395	CSS395	10,000 CT	200 CT	50	1.0	1.0	.03	1	800	22	5.5	7.07:1	14.14:1
	S-21400	83400	CSS400	10,000 CT	500 CT	125	1.0	1.0	.03	1	800	55	13.75	4.47:1	8.94:1
	S-21405	83405	CSS405	10,000 CT	600 CT	150	1.0	1.0	.03	1	800	66	16.5	4.08:1	8.16:1
	S-21410	83410	CSS410	10,000 CT	1000 CT	250	1.0	1.0	.03	1	800	110	27.5	3.16:1	6.32:1
	S-21415	83415	CSS415	10,000 CT	1200 CT	300	1.0	1.0	.03	1	800	132	33	2.89:1	5.77:1
	S-21420	83420	CSS420	10,000 CT	1500 CT	375	1.0	1.0	.03	1	800	165	41.3	2.58:1	5.16:1
	S-21425	83425	CSS425	10,000 CT	2000 CT	500	1.0	1.0	.03	1	800	220	55	2.24:1	4.47:1
	S-21430	83430	CSS430	10,000 CT	5000 CT	1250	1.0	1.0	.03	1	800	550	138	1.41:1	1.83:1

SPECIFICATIONS

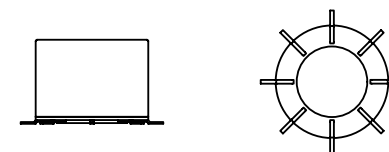
S SERIES - THROUGH HOLE



83000 SERIES - SQUARE SURFACE MOUNT



CSS SERIES - ROUND SURFACE MOUNT



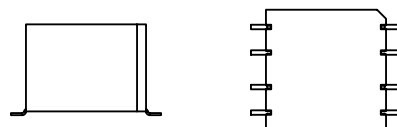
	Through Hole ⁽²⁾	Surface Mount ⁽³⁾		Primary Impedance [Ω]	Secondary Impedance with Split Windings		Power			Primary Unbalanced DC Current [mA]	Primary DCR [Ω]	Secondary DCR		Turns Ratio PRI:SEC	
		Square	Round		Series [Ω]	Parallel [Ω]	1kHz+ [W]	300Hz+ [W]	75Hz+ [W]			Series [Ω]	Parallel [Ω]	Series	Parallel
	S-21435	83435	CSS435	10,000 CT	7500 CT	1875	1.0	1.0	.03	1	800	825	206	1.16:1	2.31:1
	S-21440	83440	CSS440	10,000 CT	10,000 CT	2500	1.0	1.0	.03	1	800	1100	275	1:1	2:1
(1)	S-21445	83445	CSS445	10,000 CT	10,000 CT	-	1.0	1.0	.03	1	800	1100	-	1:1	-
	S-21450	83450	CSS450	15,000 CT	400 CT	100	.65	.65	.03	.8	1200	44	11	6.12:1	12.25:1
	S-21452	83452	CSS452	15,000 CT	500 CT	125	.65	.65	.03	.8	1200	55	13.8	5.48:1	10.95:1
	S-21455	83455	CSS455	15,000 CT	600 CT	150	.65	.65	.03	.8	1200	66	16.5	5:1	10:1
	S-21460	83460	CSS460	15,000 CT	10,000 CT	2500	.65	.65	.03	.8	1200	1100	275	1.22:1	2.45:1
(1)	S-21465	83465	CSS465	15,000 CT	15,000 CT	-	.65	.65	.03	.8	1200	1650	-	1:1	-
	S-21470	83470	CSS470	15,000 CT	15,000 CT	3750	.65	.65	.03	.8	1200	1650	413	1:1	2:1
	S-21475	83475	CSS475	16,000 CT	1000 CT	250	.62	.62	.03	.8	1280	110	27.5	4:1	8:1
	S-21480	83480	CSS480	20,000 CT	500 CT	125	.5	.5	.03	.7	1600	55	13.8	6.32:1	12.65:1
	S-21485	83485	CSS485	20,000 CT	600 CT	150	.5	.5	.03	.7	1600	66	16.5	5.77:1	11.55:1
	S-21490	83490	CSS490	20,000 CT	800 CT	200	.5	.5	.03	.7	1600	88	22	5:1	10:1
	S-21495	83495	CSS495	20,000 CT	1000 CT	250	.5	.5	.03	.7	1600	110	27.5	4.47:1	8.94:1
	S-21500	83500	CSS500	20,000 CT	5000 CT	1250	.5	.5	.03	.7	1600	550	138	2:1	4:1
	S-21505	83505	CSS505	20,000 CT	10,000 CT	2500	.5	.5	.03	.7	1600	1100	275	1.41:1	2.83:1
(1)	S-21510	83510	CSS510	20,000 CT	20,000 CT	-	.5	.5	.03	.7	1600	2200	-	1:1	-
	S-21515	83515	CSS515	25,000 CT	500 CT	125	.4	.4	.03	.6	2000	55	13.8	7.07:1	14.14:1
	S-21520	83520	CSS520	25,000 CT	1000 CT	250	.4	.4	.03	.6	2000	110	27.5	5:1	10:1
	S-21525	83525	CSS525	30,000 CT	50 CT	12.5	.33	.33	.03	.6	2400	5.5	1.38	24.5:1	49:1
	S-21530	83530	CSS530	30,000 CT	1200 CT	300	.33	.33	.03	.6	2400	132	33	5:1	10:1
	S-21532	83532	CSS532	30,000 CT	500 CT	125	.33	.33	.03	.6	2400	55	13.8	7.7:1	15.5:1
	S-21534	83534	CSS534	30,000 CT	200 CT	50	.33	.33	.03	.6	2400	22	5.5	12.2:1	24.5:1
	S-21535	83535	CSS535	30,000 CT	5000 CT	1250	.33	.33	.03	.6	2400	550	137.5	2.45:1	4.9:1
	S-21540	83540	CSS540	30,000 CT	10,000 CT	2500	.33	.33	.03	.6	2400	1100	275	1.73:1	3.46:1

SPECIFICATIONS

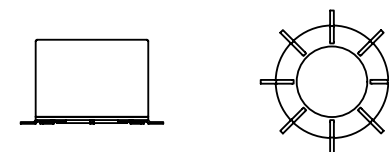
S SERIES - THROUGH HOLE



83000 SERIES - SQUARE SURFACE MOUNT



CSS SERIES - ROUND SURFACE MOUNT



	Through Hole ⁽²⁾	Surface Mount ⁽³⁾		Primary Impedance [Ω]	Secondary Impedance with Split Windings		Power			Primary Unbalanced DC Current [mA]	Primary DCR [Ω]	Secondary DCR		Turns Ratio PRI:SEC	
		Square	Round		Series [Ω]	Parallel [Ω]	1kHz+ [W]	300Hz+ [W]	75Hz+ [W]			Series [Ω]	Parallel [Ω]	Series	Parallel
(1)	S-21545	83545	CSS545	30,000 CT	30,000 CT	-	.33	.33	.03	.6	2400	3300	-	1:1	-
	S-21550	83550	CSS550	40,000 CT	400 CT	100	.25	.25	.03	.5	3200	44	11	10:1	20:1
	S-21555	83555	CSS555	40,000 CT	2000 CT	500	.25	.25	.03	.5	3200	220	55	4.47:1	8.94:1
	S-21560	83560	CSS560	40,000 CT	4000 CT	1000	.25	.25	.03	.5	3200	440	110	3.16:1	6.32:1
	S-21565	83565	CSS565	40,000 CT	20,000 CT	5000	.25	.25	.03	.5	3200	2200	550	1.41:1	2.83:1
(1)	S-21570	83570	CSS570	40,000 CT	40,000 CT	-	.25	.25	.03	.5	3200	4400	-	1:1	-
	S-21575	83575	CSS575	50,000 CT	200 CT	50	.2	.2	.03	.4	4000	22	5.5	15.8:1	31.6:1
	S-21577	83577	CSS577	50,000 CT	500 CT	125	.2	.2	.03	.4	4000	55	13.8	10:1	20:1
	S-21578	83578	CSS578	50,000 CT	600 CT	150	.2	.2	.03	.4	4000	66	16.5	9.13:1	18.26:1
	S-21579	83579	CSS579	50,000 CT	50,000 CT	12,500	.2	.2	.03	.4	4000	5500	1380	1:1	2:1
	S-21580	83580	CSS580	60,000 CT	15,000 CT	3750	.16	.16	.03	.4	4800	1650	413	2:1	4:1
	S-21585	83585	CSS585	62,500 CT	50 CT	12.5	.16	.16	.03	.4	5000	5.5	1.38	35.4:1	70.7:1
	S-21587	83587	CSS587	80,000 CT	15,000 CT	3750	.12	.12	.03	.3	6400	1650	413	2.3:1	4.6:1
	S-21590	83590	CSS590	90,000 CT	10,000 CT	2500	.11	.11	.03	.3	7200	1100	275	3:1	6:1
	S-21595	83595	CSS595	95,000 CT	15,000 CT	3750	.1	.1	.03	.3	7600	1650	413	2.5:1	5:1
	S-21600	83600	CSS600	100,000 CT	60 CT	15	.1	.1	.03	.3	8000	6.6	1.65	40.8:1	81.6:1
	S-21605	83605	CSS605	100,000 CT	100 CT	25	.1	.1	.03	.3	8000	11	2.75	31.6:1	63.2:1
	S-21610	83610	CSS610	100,000 CT	500 CT	125	.1	.1	.03	.3	8000	55	13.8	14.1:1	28.3:1
	S-21613	83613	CSS613	100,000 CT	1000 CT	250	.1	.1	.03	.3	8000	110	27.5	10:1	20:1
	S-21614	83614	CSS614	100,000 CT	2000 CT	500	.1	.1	.03	.3	8000	220	55	7.07:1	14.14:1
	S-21615	83615	CSS615	100,000 CT	10,000 CT	2500	.1	.1	.03	.3	8000	1100	275	3.16:1	6.32:1
	S-21620	83620	CSS620	135,000 CT	82 CT	20.5	.07	.07	.03	.2	10,800	9	2.25	40.6:1	81.2:1

Note 1: Includes electrostatic shield.

Note 2: For RoHS compliance on a through-hole component, please consult with Pico's engineer and provide the part number.

Note 3: All SMDs are available with Pb-free dipped terminals that is compliant to RoHS exemption 7 by requesting part number + 'RoHS-7'

SPECIFICATIONS

GENERAL

Parameter	Condition	Min.	Typ.	Max.	Units
Dielectric Strength	60Hz	-	200	-	V _{RMS}
Insulation Resistance	300VDC	10	-	-	GΩ
Distortion	50Hz, 300Hz & 1kHz @ Rated Power	-	-	5	%
Frequency Response	50Hz - 30kHz @ 1mW	-3	-	3	dB
Operating Temperature Range	Ambient with temperature rise	-55	-	+130	°C
Storage Temperature Range	Ambient	-55	-	+105	°C
Size	S Series - Diameter x Height	0.75 x 0.52 (19.05 x 13.208)			inches (mm)
	CSS Series - Diameter x Height	0.75 x 0.56 (19.05 x 14.224)			
	83000 Series - Length x Width x Height	0.8 x 0.8 x 0.605 (20.32 x 20.32 x 15.367)			
Weight	S, 83000, & CSS Series	-	17	-	grams
Case	S Series & CSS Series	Epoxy Insulated Metal			
	83000 Series	Glass Reinforced Polymer			
Potting	Vacuum Impregnated Epoxy				
Box Packaging (L x W x H)	S Series	9.45 x 2.35 x 1.29 (240.03 x 59.69 x 32.766)			inches (mm)
Tube Packaging (W x H x L)	83000 & CSS Series	1.17 x 0.75 x 20.0 (29.718 x 18.923 x 508)			
Tape & Reel Packaging	Upon Request				
Moisture Sensitivity Level	Surface Mount only	Level 3			

OPTIONAL DESIGN CRITERIA

Test	Standard	Description
Vibration	MIL-STD-202	Method 204, Vibration, High Frequency
Shock	MIL-STD-202	Method 213, Shock (Specified Pulse)
Immersion	MIL-STD-202	Method 104, Immersion
Moisture Resistance	MIL-STD-202	Method 106, Moisture Resistance
Flammability	MIL-STD-202	Method 111, Flammability (External Flame)
Thermal Shock	MIL-STD-202	Method 107, Thermal Shock

OPTIONAL SCREENING AND QUALIFICATION

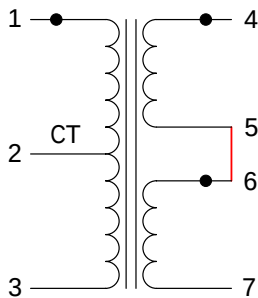
Standard	Screening & Qualification	Test ⁽⁴⁾
MIL-PRF-27	a.) Group A inspection Level-T - Table VII b.) Qualification inspection, Grade 5 - Table V	I. Thermal Shock II. Vibration III. Burn-in IV. Induced Voltage V. Shock VI. Dielectric Withstanding Voltage (at reduced pressure) VII. Insulation Resistance VIII. Electrical Characteristics IX. Visual and Mechanical Examination (External) X. Life XI. Radiographic Inspection
MIL-STD-981	a.) Group A screening tests - Table VI b.) Group B tests - Table XII, Class S	
EEE-INST-002, Section M1	a.) Magnetics Screening Req. - Table 2 b.) Magnetics Part Qual. - Table 3	

Note 4: Screening and qualification tests are not limited to the options in the chart above. Each standard may also be stringent or exclude certain tests from one another. Please contact Pico for specific application needs and for Pico part number.

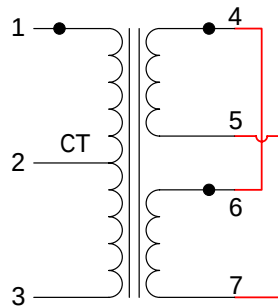
ELECTRICAL SCHEMATIC

S SERIES - THROUGH HOLE

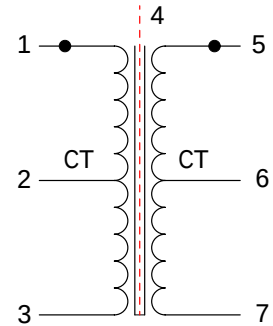
**SPLIT SECONDARIES
SERIES CONNECTION**



**SPLIT SECONDARIES
PARALLEL CONNECTION**

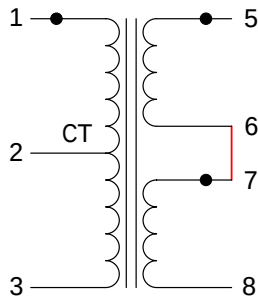


ELECTROSTATIC SHIELD

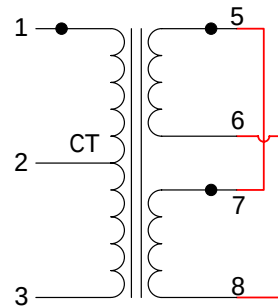


83000 & CSS SERIES - SURFACE MOUNT

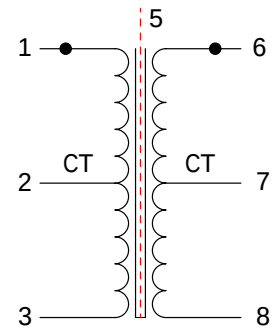
**SPLIT SECONDARIES
SERIES CONNECTION**



**SPLIT SECONDARIES
PARALLEL CONNECTION**



ELECTROSTATIC SHIELD

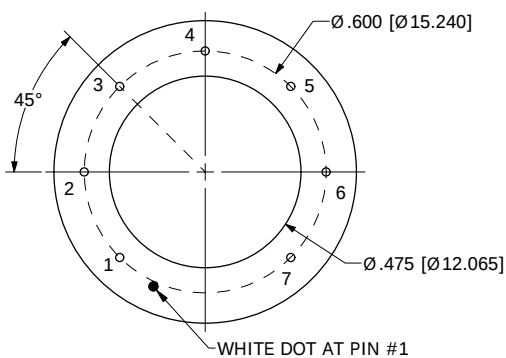
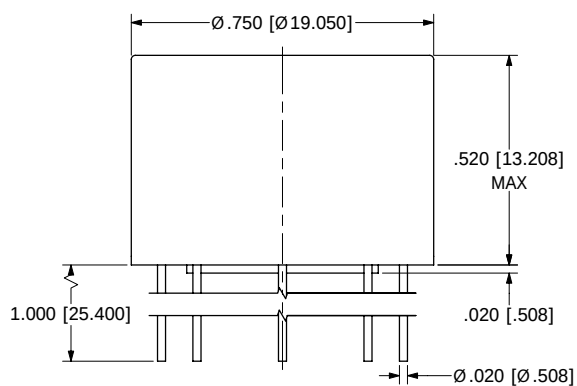


NOTES

a. ANY TERMINALS NOT SHOWN HERE MAY BE USED FOR MECHANICAL STABILITY ON THE PCB ONLY, AS THEY DO NOT HAVE ANY ELECTRICAL CONNECTION.

b. CT STANDS FOR "CENTER-TAP", WHERE THE TOTAL NUMBER OF TURNS IS EVENLY SPLIT BETWEEN THE TOP HALF AND BOTTOM HALF OF A COMPLETE WINDING.

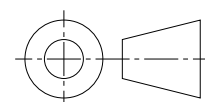
S SERIES - THROUGH HOLE



BOTTOM VIEW

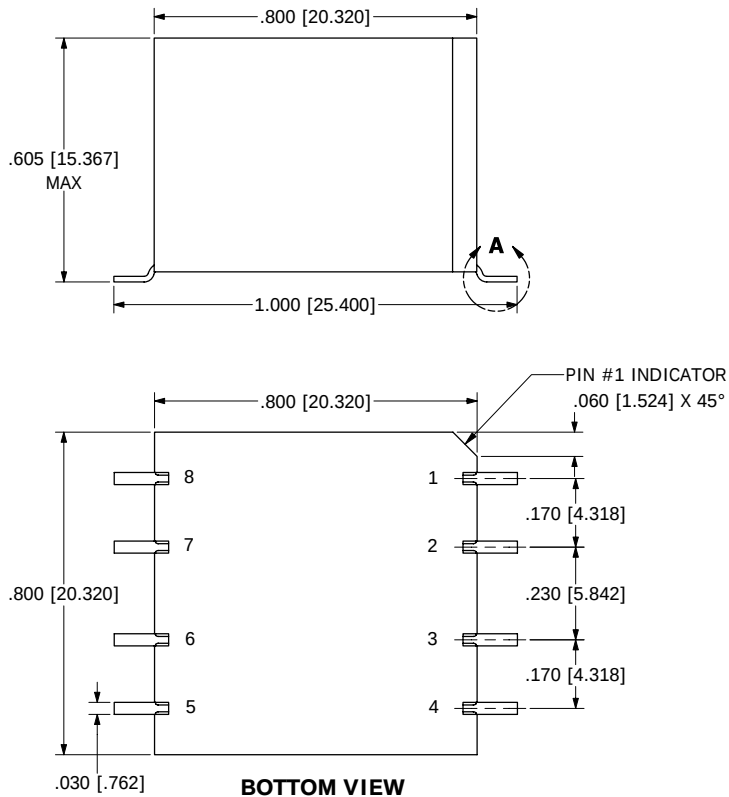
NOTES

- a. ALL DIMENSIONS ARE IN INCHES, [] = MM
- b. TERMINALS ARE CLOCKWISE FROM PIN #1

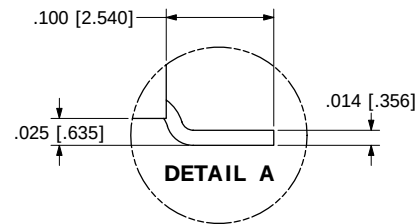


MECHANICAL DRAWINGS

83000 SERIES - SQUARE SURFACE MOUNT



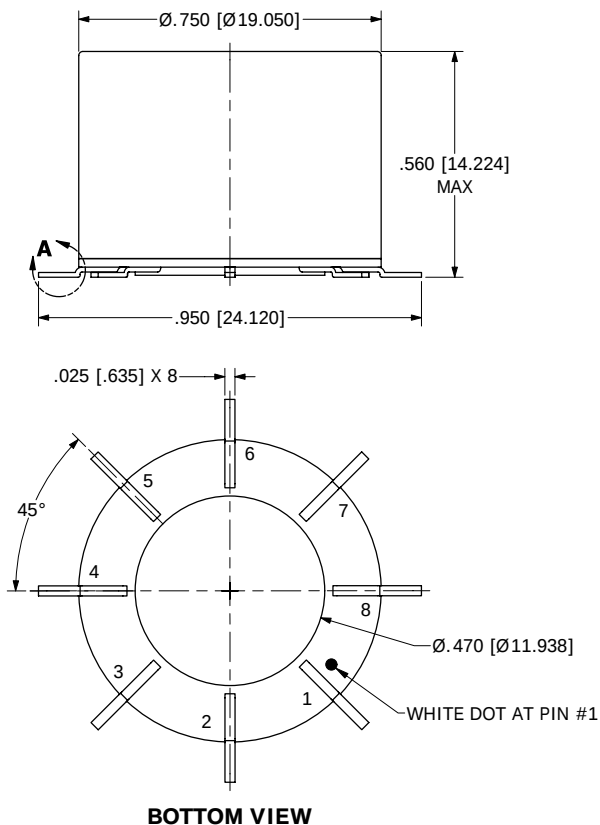
LEAD DETAILS



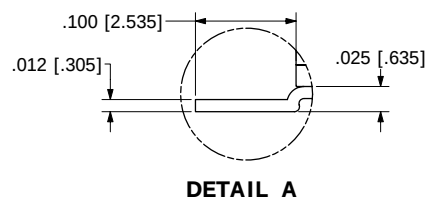
NOTES

- a. ALL DIMENSIONS ARE IN INCHES, [] = MM
- b. TERMINALS ARE CLOCKWISE FROM PIN #1
- c. PIN #4 HAS NO CONNECTION

CSS SERIES - ROUND SURFACE MOUNT

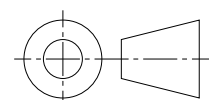


LEAD DETAILS



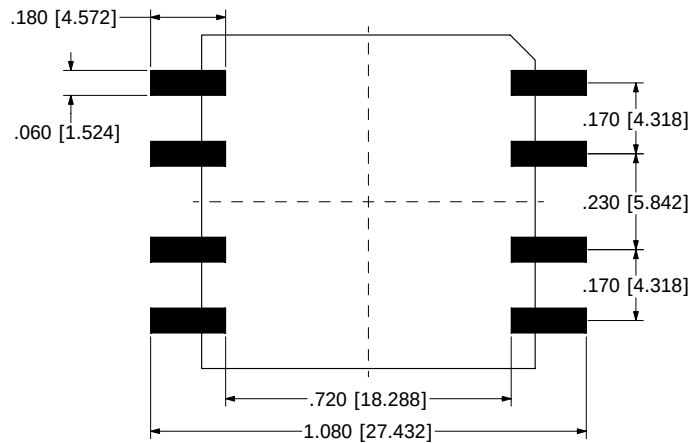
NOTES

- a. ALL DIMENSIONS ARE IN INCHES, [] = MM
- b. TERMINALS ARE CLOCKWISE FROM PIN #1
- c. PIN #4 HAS NO CONNECTION

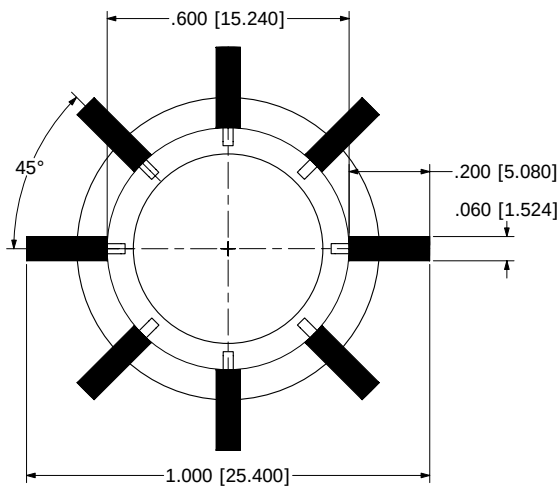


RECOMMENDED LAND PATTERN DIMENSIONS

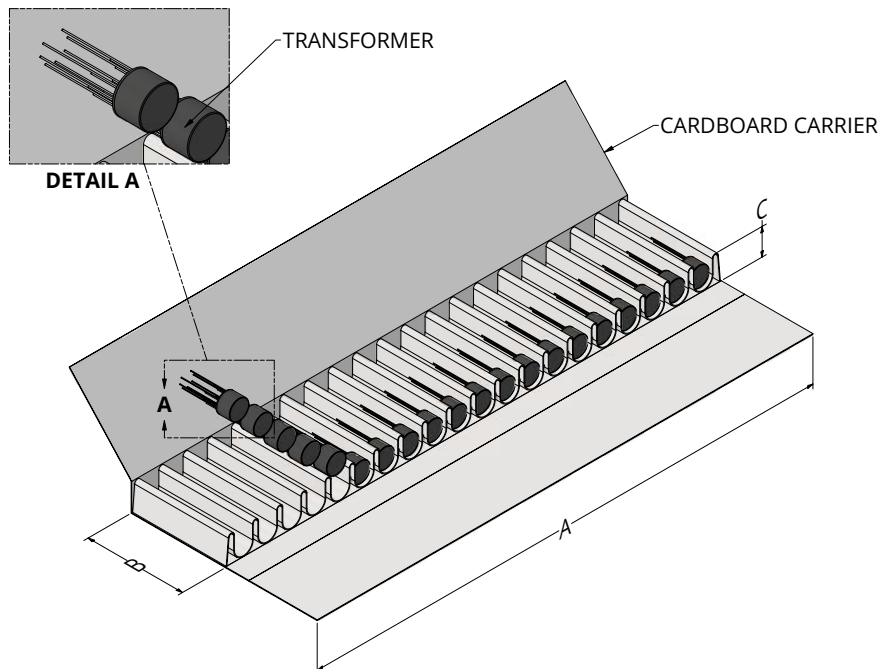
83000 SERIES - SQUARE SURFACE MOUNT



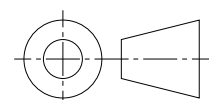
CSS SERIES - ROUND SURFACE MOUNT

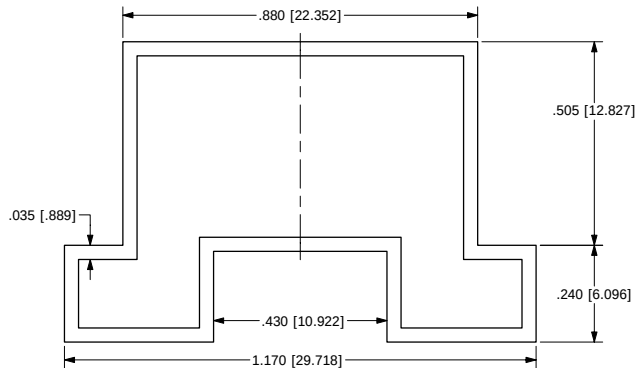


BOX PACKAGING - S SERIES

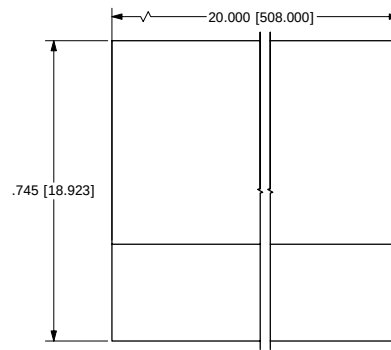


Dimension		
A	B	C
9.45 [240.03]	2.35 [59.69]	1.29 [32.766]



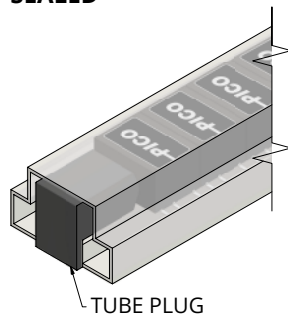


PLAN VIEW

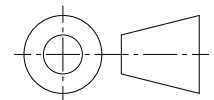
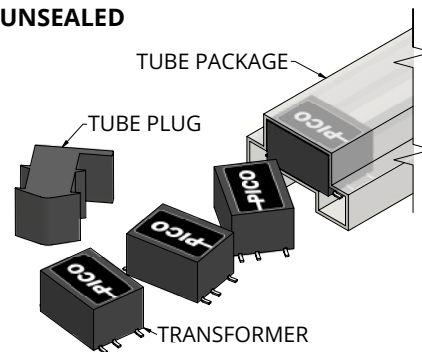


ELEVATION VIEW

SEALED



UNSEALED



Pico warrants each product manufactured by us and sold by us or an authorized representative, to be free from defects in material and workmanship. If properly used, it will perform within its applicable specifications for a period of one year after original shipment. Pico's obligation under this guarantee is limited to repairing or replacing our product to the original purchaser. This warranty is in lieu of all other warranties, express or implied and constitutes fulfillment of our obligations to the purchaser. We do not guarantee that the products can be used for a particular purpose other than those solely covered by the product's specifications. Pico must be notified if the product must meet particular certifications and/or standards. We assume no liability, in any event, for consequential damages, for anticipated or lost profits, incidental damages or loss of time or other losses incurred by the purchaser or any third party in connection with products covered by this warranty or otherwise. The purchaser will indemnify and hold Pico harmless for any damages, losses, costs, etc. from usage not within the product's specifications. Pico must be consulted before usage of its products in a nuclear, radioactive or space environment.

We reserve the right to discontinue products without notice, We reserve the right to make modifications to any existing catalog products without notice, at any time, without the obligation to modify units previously sold.

T & 84000 Series

2-80k Ω , 20-25kHz, 3W Max. @ 1kHz+ Audio Transformer

PICO
Electronics, Inc.

PRODUCT OVERVIEW

The T and 84000 series are ultra-miniature transformers in an encapsulated package with design layouts as plug-in or surface mount. They can operate over a wide temperature range of -55°C to +130°C. Our materials and methods allow extreme temperatures of vapor phase, IR or other reflow procedures without degrading the high reliability of their physical form and electrical performance.

Typical applications:

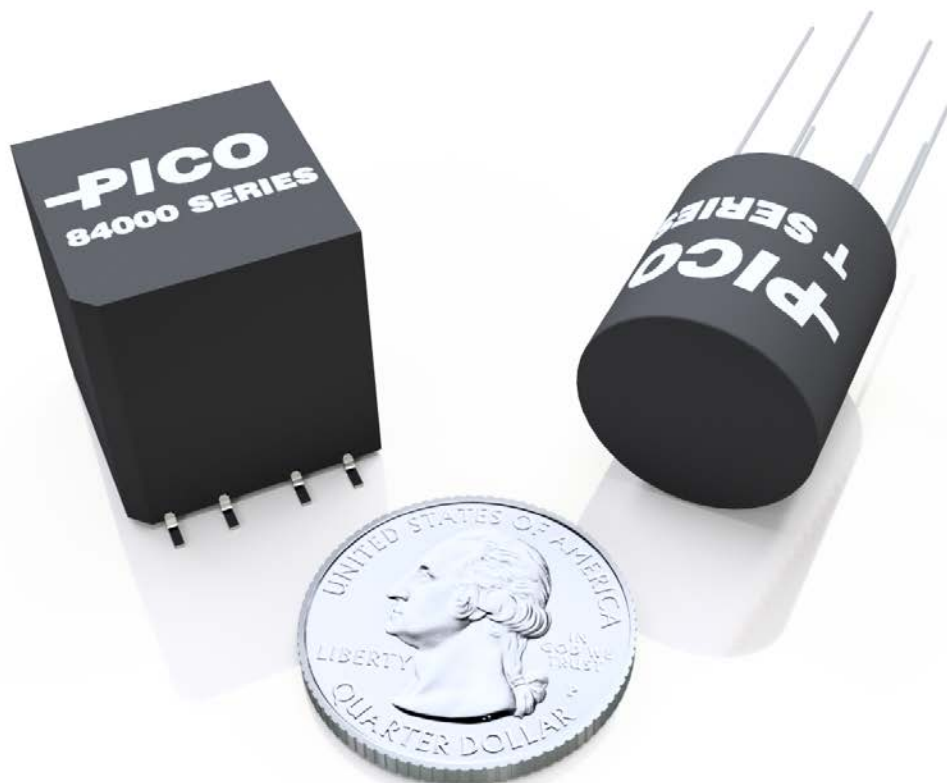
- Sensors
- Radars
- Avionic flight controls
- Airborne systems
- Naval electronics
- Military, aerospace, or commercial aircraft

FEATURES

- Extreme resistance to impact, shock, and vibration
- Manufactured to MIL-PRF-27, Class S, Grade 5
- High reliability for space and mission critical applications
- Ultra miniature in size and minimalistic design
- Design layouts in through-hole or surface mount
- Available with magnetic shielding and/or electrostatic shielding

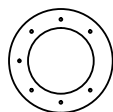
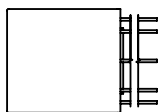
Contact Pico for part number of available options:

- Screening and qualification criteria to flight standard
- Capability to thermal shock up to 300 cycles
- Extra layers of magnetic shielding
- Fully RoHS compliant or with exemption 7(a)
- Modifications to mechanical design and electrical characteristics
- Custom new design and parameters

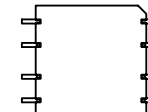
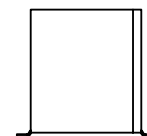


SPECIFICATIONS

T SERIES - THROUGH HOLE



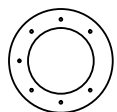
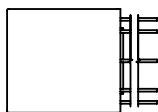
84000 SERIES - SURFACE MOUNT



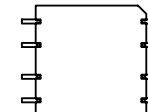
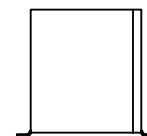
Through Hole ⁽²⁾	Surface Mount ⁽³⁾	Primary Impedance [Ω]	Secondary Impedance with Split Windings		Power			Primary Unbalanced DC Current [mA]	Primary DCR [Ω]	Secondary DCR		Turns Ratio PRI:SEC	
			Series [Ω]	Parallel [Ω]	1kHz+ [W]	300Hz+ [W]	20Hz+ [W]			Series [Ω]	Parallel [Ω]	Series	Parallel
T-22003	84003	20 CT	8 CT	2	3.0	2.0	.006	22	1.6	.8	.2	1.58:1	3.16:1
T-22005	84005	20 CT	20 CT	5	3.0	2.0	.006	22	1.6	2	.5	1:1	2:1
T-22010	84010	32 CT	32 CT	8	3.0	2.0	.006	17.5	2.56	3.2	.8	1:1	2:1
T-22015	84015	40 CT	40 CT	10	3.0	2.0	.006	16	3.2	4	1	1:1	2:1
T-22018	84018	48 CT	16 CT	4	3.0	2.0	.006	14.5	3.84	1.6	.4	1.73:1	3.46:1
T-22020	84020	50 CT	50 CT	12.5	3.0	2.0	.006	14	4	5	1.25	1:1	2:1
T-22025	84025	80 CT	32 CT	8	3.0	2.0	.006	11	6.4	3.2	.8	1.58:1	3.16:1
T-22028	84028	100 CT	40 CT	10	3.0	2.0	.006	10	8	4	1	1.58:1	3.16:1
T-22030	84030	100 CT	100 CT	25	3.0	2.0	.006	10	8	10	2.5	1:1	2:1
T-22035	84035	120 CT	12.8 CT	3.2	3.0	2.0	.006	9	9.6	1.3	.32	3.06:1	26.12:1
T-22040	84040	120 CT	60 CT	15	3.0	2.0	.006	9	9.6	6	1.5	1.41:1	2.83:1
T-22045	84045	120 CT	120 CT	30	3.0	2.0	.006	9	9.6	12	3	1:1	2:1
T-22050	84050	150 CT	12 CT	3	3.0	2.0	.006	8	12	1.2	.3	3.54:1	7.08:1
T-22055	84055	150 CT	50 CT	12.5	3.0	2.0	.006	8	12	5	1.25	1.73:1	3.46:1
T-22060	84060	150 CT	100 CT	25	3.0	2.0	.006	8	12	10	2.5	1.22:1	2.44:1
T-22065	84065	150 CT	150 CT	37.5	3.0	2.0	.006	8	12	15	3.75	1:1	2:1
T-22070	84070	150 CT	600 CT	150	3.0	2.0	.006	8	12	60	15	1:2	1:1
T-22075	84075	200 CT	200 CT	50	3.0	2.0	.006	7	16	20	5	1:1	2:1
T-22080	84080	300 CT	12 CT	3	3.0	2.0	.006	5.5	24	1.2	.3	5:1	10:1
T-22085	84085	300 CT	50 CT	12.5	3.0	2.0	.006	5.5	24	5	1.25	2.45:1	4.9:1
T-22090	84090	300 CT	150 CT	37.5	3.0	2.0	.006	5.5	24	15	3.75	1.41:1	2.83:1
T-22095	84095	300 CT	300 CT	75	3.0	2.0	.006	5.5	24	30	7.5	1:1	2:1
T-22100	84100	300 CT	600 CT	150	3.0	2.0	.006	5.5	24	60	15	1:1.41	1.41:1
T-22105	84105	320 CT	12.8 CT	3.2	3.0	2.0	.006	5.5	25.6	1.3	.32	5:1	10:1

SPECIFICATIONS

T SERIES - THROUGH HOLE



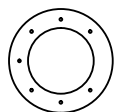
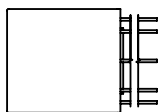
84000 SERIES - SURFACE MOUNT



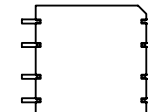
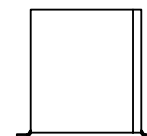
Through Hole ⁽²⁾	Surface Mount ⁽³⁾	Primary Impedance [Ω]	Secondary Impedance with Split Windings		Power			Primary Unbalanced DC Current [mA]	Primary DCR [Ω]	Secondary DCR		Turns Ratio PRI:SEC	
			Series [Ω]	Parallel [Ω]	1kHz+ [W]	300Hz+ [W]	20Hz+ [W]			Series [Ω]	Parallel [Ω]	Series	Parallel
T-22110	84110	400 CT	40 CT	10	3.0	2.0	.006	5	32	4	1	3.16:1	6.32:1
T-22115	84115	400 CT	120 CT	30	3.0	2.0	.006	5	32	12	3	1.83:1	3.65:1
T-22120	84120	400 CT	200 CT	50	3.0	2.0	.006	5	32	20	5	1.41:1	2.83:1
T-22125	84125	400 CT	400 CT	100	3.0	2.0	.006	5	32	40	10	1:1	2:1
T-22130	84130	400 CT	1000 CT	250	3.0	2.0	.006	5	32	100	25	1:1.58	1.26:1
T-22135	84135	400 CT	2000 CT	500	3.0	2.0	.006	5	32	200	50	1:2.24	1:1.12
T-22140	84140	400 CT	4000 CT	1000	3.0	2.0	.006	5	32	400	100	1:3.16	1:1.58
T-22142	84142	500 CT	12.8 CT	3.2	3.0	2.0	.006	4.5	40	1.3	.32	6.25:1	12.5:1
T-22144	84144	500 CT	16 CT	4	3.0	2.0	.006	4.5	40	1.6	.4	5.6:1	11.2:1
T-22145	84145	500 CT	50 CT	12.5	3.0	2.0	.006	4.5	40	5	1.25	3.16:1	6.32:1
T-22147	84147	500 CT	150 CT	37.5	3.0	2.0	.006	4.5	40	15	3.75	1.83:1	3.65:1
T-22150	84150	500 CT	500 CT	125	3.0	2.0	.006	4.5	40	50	12.5	1:1	2:1
(1) T-22155	84155	500 CT	500 CT	-	3.0	2.0	.006	4.5	40	50	-	1:1	-
T-22160	84160	500 CT	600 CT	150	3.0	2.0	.006	4.5	40	60	15	1:1.1	1.83:1
T-22165	84165	600 CT	12.8 CT	3.2	3.0	2.0	.006	4	48	1.3	.32	6.85:1	13.7:1
T-22167	84167	600 CT	30 CT	7.5	3.0	2.0	.006	4	48	3	.75	4.47:1	8.94:1
T-22170	84170	600 CT	48 CT	12	3.0	2.0	.006	4	48	4.8	1.2	3.54:1	7.07:1
T-22175	84175	600 CT	200 CT	50	3.0	2.0	.006	4	48	20	5	1.73:1	3.46:1
T-22180	84180	600 CT	600 CT	150	3.0	2.0	.006	4	48	60	15	1:1	2:1
(1) T-22185	84185	600 CT	600 CT	-	3.0	2.0	.006	4	48	60	-	1:1	-
(1) T-22186	84186	600 CT	900 CT	-	3.0	2.0	.006	4	48	90	-	1:1.22	-
T-22187	84187	600 CT	1200 CT	300	3.0	2.0	.006	4	48	120	30	1:1.41	1.41:1
T-22190	84190	640 CT	12.8 CT	3.2	3.0	2.0	.006	4	51	1.3	.32	7.07:1	14.14:1
T-22195	84195	700 CT	100 CT	25	3.0	2.0	.006	3.5	56	10	2.5	2.65:1	5.29:1

SPECIFICATIONS

T SERIES - THROUGH HOLE



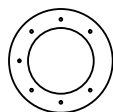
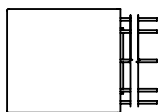
84000 SERIES - SURFACE MOUNT



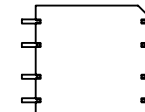
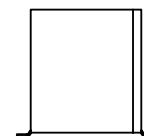
	Through Hole ⁽²⁾	Surface Mount ⁽³⁾	Primary Impedance [Ω]	Secondary Impedance with Split Windings		Power			Primary Unbalanced DC Current [mA]	Primary DCR [Ω]	Secondary DCR		Turns Ratio PRI:SEC	
				Series [Ω]	Parallel [Ω]	1kHz+ [W]	300Hz+ [W]	20Hz+ [W]			Series [Ω]	Parallel [Ω]	Series	Parallel
	T-22200	84200	800 CT	12.8 CT	3.2	3.0	2.0	.006	3.5	64	1.3	.32	7.91:1	15.8:1
	T-22205	84205	800 CT	48 CT	12	3.0	2.0	.006	3.5	64	4.8	1.2	4.08:1	8.16:1
	T-22210	84210	800 CT	800 CT	200	3.0	2.0	.006	3.5	64	80	20	1:1	2:1
	T-22215	84215	900 CT	600 CT	150	3.0	2.0	.006	3	72	60	15	1.22:1	2.45:1
(1)	T-22217	84217	900 CT	900 CT	-	3.0	2.0	.006	3	72	90	-	1:1	-
	T-22220	84220	1000 CT	12 CT	3	3.0	2.0	.006	3	80	1.2	.3	9.13:1	18.26:1
	T-22225	84225	1000 CT	50 CT	12.5	3.0	2.0	.006	3	80	5	1.25	4.47:1	8.94:1
	T-22230	84230	1000 CT	1000 CT	250	3.0	2.0	.006	3	80	100	25	1:1	2:1
	T-22235	84235	1060 CT	12.8 CT	3.2	3.0	2.0	.006	3	85	1.3	.32	9.1:1	18.2:1
	T-22240	84240	1200 CT	12.8 CT	3.2	3.0	2.0	.006	3	96	1.3	.32	9.68:1	19.4:1
	T-22245	84245	1200 CT	500 CT	125	3.0	2.0	.006	3	96	50	12.5	1.55:1	3.1:1
	T-22250	84250	1200 CT	1200 CT	300	3.0	2.0	.006	3	96	120	30	1:1	2:1
(1)	T-22255	84255	1200 CT	1200 CT	-	3.0	2.0	.006	3	96	120	-	1:1	-
	T-22260	84260	1500 CT	12 CT	3	3.0	2.0	.006	2.5	120	1.2	.3	11.18:1	22.36:1
	T-22265	84265	1500 CT	500 CT	125	3.0	2.0	.006	2.5	120	50	12.5	1.73:1	3.46:1
(1)	T-22270	84270	1500 CT	600 CT	-	3.0	2.0	.006	2.5	120	60	-	1.58:1	-
(1)	T-22275	84275	1500 CT	1500 CT	-	3.0	2.0	.006	2.5	120	150	-	1:1	-
	T-22280	84280	1600 CT	12.8 CT	3.2	3.0	2.0	.006	2.5	128	1.3	.32	11.18:1	22.36:1
	T-22283	84283	2000 CT	8 CT	2	3.0	2.0	.006	2.2	160	.8	.2	15.8:1	31.6:1
	T-22285	84285	2000 CT	2000 CT	500	3.0	2.0	.006	2.2	160	200	50	1:1	2:1
(1)	T-22290	84290	2000 CT	2000 CT	-	3.0	2.0	.006	2.2	160	200	-	1:1	-
	T-22295	84295	2000 CT	8000 CT	2000	3.0	2.0	.006	2.2	160	800	200	1:2	1:1
	T-22297	84297	2500 CT	2500 CT	625	3.0	2.0	.006	2	200	250	63	1:1	2:1
	T-22300	84300	3000 CT	3000 CT	750	3.0	2.0	.006	1.8	240	300	75	1:1	2:1

SPECIFICATIONS

T SERIES - THROUGH HOLE



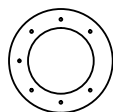
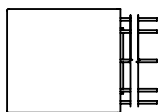
84000 SERIES - SURFACE MOUNT



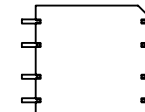
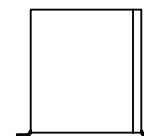
	Through Hole ⁽²⁾	Surface Mount ⁽³⁾	Primary Impedance [Ω]	Secondary Impedance with Split Windings		Power			Primary Unbalanced DC Current [mA]	Primary DCR [Ω]	Secondary DCR		Turns Ratio PRI:SEC	
				Series [Ω]	Parallel [Ω]	1kHz+ [W]	300Hz+ [W]	20Hz+ [W]			Series [Ω]	Parallel [Ω]	Series	Parallel
(1)	T-22305	84305	3000 CT	3000 CT	-	3.0	2.0	.006	1.8	240	300	-	1:1	-
	T-22310	84310	3600 CT	3600 CT	900	2.7	2.0	.006	1.7	288	360	90	1:1	2:1
	T-22312	84312	4000 CT	16 CT	4	2.5	2.0	.006	1.6	320	1.6	.4	15.8:1	31.6:1
	T-22314	84314	4000 CT	600 CT	150	2.5	2.0	.006	1.6	320	60	15	2.58:1	5.16:1
	T-22315	84315	4000 CT	1000 CT	250	2.5	2.0	.006	1.6	320	100	25	2:1	4:1
(1)	T-22320	84320	4000 CT	8000 CT	-	2.5	2.0	.006	1.6	320	800	-	1:1.41	-
	T-22325	84325	5000 CT	500 CT	125	2.0	2.0	.006	1.4	400	50	12.5	3.16:1	6.32:1
	T-22330	84330	5000 CT	5000 CT	1250	2.0	2.0	.006	1.4	400	500	125	1:1	2:1
	T-22335	84335	7500 CT	50 CT	12.5	1.3	1.3	.006	1.2	600	5	1.25	12.25:1	24.5:1
	T-22340	84340	7500 CT	100 CT	25	1.3	1.3	.006	1.2	600	10	2.5	8.66:1	17.32:1
	T-22345	84345	7500 CT	600 CT	150	1.3	1.3	.006	1.2	600	60	15	3.54:1	7.07:1
	T-22350	84350	7500 CT	2500 CT	625	1.3	1.3	.006	1.2	600	250	63	1.73:1	3.46:1
(1)	T-22355	84355	7500 CT	7500 CT	-	1.3	1.3	.006	1.2	600	750	-	1:1	-
	T-22360	84360	8000 CT	12.8 CT	3.2	1.2	1.2	.006	1.1	640	1.3	.32	25:1	50:1
	T-22365	84365	8000 CT	1000 CT	250	1.2	1.2	.006	1.1	640	100	25	2.83:1	5.66:1
(1)	T-22370	84370	8000 CT	1200 CT	-	1.2	1.2	.006	1.1	640	120	-	2.58:1	-
(1)	T-22375	84375	9000 CT	9000 CT	-	1.1	1.1	.006	1.1	720	900	-	1:1	-
	T-22380	84380	10,000 CT	12.8 CT	3.2	1.0	1.0	.006	1	800	1.3	.32	28:1	56:1
	T-22385	84385	10,000 CT	16 CT	4	1.0	1.0	.006	1	800	1.6	.4	25:1	50:1
	T-22390	84390	10,000 CT	100 CT	25	1.0	1.0	.006	1	800	10	2.5	10:1	20:1
	T-22395	84395	10,000 CT	200 CT	50	1.0	1.0	.006	1	800	20	5	7.07:1	14.14:1
	T-22400	84400	10,000 CT	500 CT	125	1.0	1.0	.006	1	800	50	12.5	4.47:1	8.94:1
	T-22405	84405	10,000 CT	600 CT	150	1.0	1.0	.006	1	800	60	15	4.08:1	8.16:1
	T-22410	84410	10,000 CT	1000 CT	250	1.0	1.0	.006	1	800	100	25	3.16:1	6.32:1

SPECIFICATIONS

T SERIES - THROUGH HOLE



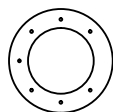
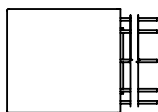
84000 SERIES - SURFACE MOUNT



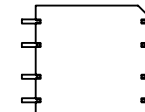
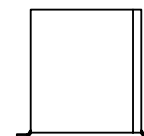
	Through Hole ⁽²⁾	Surface Mount ⁽³⁾	Primary Impedance [Ω]	Secondary Impedance with Split Windings		Power			Primary Unbalanced DC Current [mA]	Primary DCR [Ω]	Secondary DCR		Turns Ratio PRI:SEC	
				Series [Ω]	Parallel [Ω]	1kHz+ [W]	300Hz+ [W]	20Hz+ [W]			Series [Ω]	Parallel [Ω]	Series	Parallel
	T-22415	84415	10,000 CT	1200 CT	300	1.0	1.0	.006	1	800	120	30	2.89:1	5.77:1
	T-22420	84420	10,000 CT	1500 CT	375	1.0	1.0	.006	1	800	150	38	2.58:1	5.16:1
	T-22425	84425	10,000 CT	2000 CT	500	1.0	1.0	.006	1	800	200	50	2.24:1	4.47:1
	T-22430	84430	10,000 CT	5000 CT	1250	1.0	1.0	.006	1	800	500	125	1.41:1	2.83:1
	T-22435	84435	10,000 CT	7500 CT	1875	1.0	1.0	.006	1	800	750	188	1.16:1	2.31:1
	T-22440	84440	10,000 CT	10,000 CT	2500	1.0	1.0	.006	1	800	1000	250	1:1	2:1
(1)	T-22445	84445	10,000 CT	10,000 CT	-	1.0	1.0	.006	1	800	1000	-	1:1	-
	T-22450	84450	15,000 CT	400 CT	100	.66	.66	.006	.8	1200	40	10	6.12:1	12.25:1
	T-22452	84452	15,000 CT	500 CT	125	.66	.66	.006	.8	1200	50	12.5	5.48:1	10.95:1
	T-22455	84455	15,000 CT	600 CT	150	.66	.66	.006	.8	1200	60	15	5:1	10:1
	T-22460	84460	15,000 CT	10,000 CT	2500	.66	.66	.006	.8	1200	1000	250	1.22:1	2.45:1
(1)	T-22465	84465	15,000 CT	15,000 CT	-	.66	.66	.006	.8	1200	1500	-	1:1	-
	T-22470	84470	15,000 CT	15,000 CT	3750	.66	.66	.006	.8	1200	1500	375	1:1	2:1
	T-22475	84475	16,000 CT	1000 CT	250	.62	.62	.006	.8	1280	100	25	4:1	8:1
	T-22480	84480	20,000 CT	500 CT	125	.5	.5	.006	.7	1600	50	12.5	6.32:1	12.6:1
	T-22485	84485	20,000 CT	600 CT	150	.5	.5	.006	.7	1600	60	15	5.77:1	11.55:1
	T-22490	84490	20,000 CT	800 CT	200	.5	.5	.006	.7	1600	80	20	5:1	10:1
	T-22495	84495	20,000 CT	1000 CT	250	.5	.5	.006	.7	1600	100	25	4.47:1	8.94:1
	T-22500	84500	20,000 CT	5000 CT	1250	.5	.5	.006	.7	1600	500	125	2:1	4:1
	T-22505	84505	20,000 CT	10,000 CT	2500	.5	.5	.006	.7	1600	1000	250	1.41:1	2.83:1
(1)	T-22510	84510	20,000 CT	20,000 CT	-	.5	.5	.006	.7	1600	2000	-	1:1	-
	T-22515	84515	25,000 CT	500 CT	125	.4	.4	.006	.6	2000	50	12.5	7.07:1	14.14:1
	T-22520	84520	25,000 CT	1000 CT	250	.4	.4	.006	.6	2000	100	25	5:1	10:1
	T-22525	84525	30,000 CT	50 CT	12.5	.33	.33	.006	.6	2400	5	1.25	24.5:1	49:1

SPECIFICATIONS

T SERIES - THROUGH HOLE



83000 SERIES - SURFACE MOUNT



	Through Hole ⁽²⁾	Surface Mount ⁽³⁾	Primary Impedance [Ω]	Secondary Impedance with Split Windings		Power			Primary Unbalanced DC Current [mA]	Primary DCR [Ω]	Secondary DCR		Turns Ratio PRI:SEC	
				Series [Ω]	Parallel [Ω]	1kHz+ [W]	300Hz+ [W]	20Hz+ [W]			Series [Ω]	Parallel [Ω]	Series	Parallel
	T-22530	84530	30,000 CT	1200 CT	300	.33	.33	.006	.6	2400	120	30	5:1	10:1
	T-22532	84532	30,000 CT	500 CT	125	.33	.33	.006	.6	2400	50	12.5	7.7:1	15.5:1
	T-22534	84534	30,000 CT	200 CT	50	.33	.33	.006	.6	2400	20	5	12.2:1	24.5:1
	T-22535	84535	30,000 CT	5000 CT	1250	.33	.33	.006	.6	2400	500	125	2.45:1	4.9:1
	T-22540	84540	30,000 CT	10,000 CT	2500	.33	.33	.006	.6	2400	1000	250	1.73:1	3.46:1
(1)	T-22545	84545	30,000 CT	30,000 CT	-	.33	.33	.006	.6	2400	3000	-	1:1	-
	T-22550	84550	40,000 CT	400 CT	100	.25	.25	.006	.5	3200	40	10	10:1	20:1
	T-22555	84555	40,000 CT	2000 CT	500	.25	.25	.006	.5	3200	200	50	4.47:1	8.94:1
	T-22560	84560	40,000 CT	4000 CT	1000	.25	.25	.006	.5	3200	400	100	3.16:1	6.32:1
	T-22565	84565	40,000 CT	20,000 CT	5000	.25	.25	.006	.5	3200	2000	500	1.41:1	2.83:1
(1)	T-22570	84570	40,000 CT	40,000 CT	-	.25	.25	.006	.5	3200	4000	-	1:1	-
	T-22575	84575	50,000 CT	200 CT	50	.2	.2	.006	.4	4000	20	5	15.8:1	31.6:1
	T-22577	84577	50,000 CT	500 CT	125	.2	.2	.006	.4	4000	50	12.5	10:1	20:1
	T-22578	84578	50,000 CT	600 CT	150	.2	.2	.006	.4	4000	60	15	9.13:1	18.26:1
	T-22579	84579	50,000 CT	50,000 CT	12,500	.2	.2	.006	.4	4000	5000	1250	1:1	2:1
	T-22580	84580	60,000 CT	15,000 CT	3750	.16	.16	.006	.4	4800	1500	375	2:1	4:1
	T-22585	84585	62,500 CT	50 CT	12.5	.16	.16	.006	.4	5000	5	1.25	35.4:1	70.7:1
	T-22587	84587	80,000 CT	15,000 CT	3750	.12	.12	.006	.3	6400	1500	375	2.3:1	4.6:1

Note 1: Includes electrostatic shield

Note 2: For RoHS compliance on a through-hole component, please consult with Pico's engineer and provide the part number.

Note 3: All SMDs are available with Pb-free dipped terminals that is compliant to RoHS exemption 7 by requesting part number + 'RoHS-7'

SPECIFICATIONS

GENERAL

Parameter	Condition	Min.	Typ.	Max.	Units
Dielectric Strength	60Hz	-	200	-	V _{RMS}
Insulation Resistance	300VDC	10	-	-	GΩ
Distortion	300Hz & 1kHz @ Rated Power	-	-	5	%
	20Hz @ Rated Power	-	-	10	
Frequency Response	20 - 25kHz @ 1mW	-3	-	3	dB
Operating Temperature Range	Ambient with temperature rise	-55	-	+130	°C
Storage Temperature Range	Ambient	-55	-	+105	°C
Size	T Series - Diameter x Height	0.75 x 0.82 (19.05 x 20.828)			inches (mm)
	84000 Series - Length x Width x Height	0.8 x 0.8 x 0.915 (20.32 x 20.32 x 23.241)			
Weight	T & 84000 Series	-	28	-	grams
Case	T Series	Epoxy Insulated Metal			
	84000 Series	Glass Reinforced Polymer			
Potting	Vacuum Impregnated Epoxy				
Box Packaging (W x H x L)	T Series	2.417 x 0.679 x 12.7 (61.392 x 17.247 x 322.58)			inches (mm)
Tube Packaging (W x H x L)	84000 Series	1.17 x 1.14 x 20.0 (29.718 x 28.956 x 508)			
Tape & Reel Packaging	Upon request				
Moisture Sensitivity Level	Surface Mount only	Level 3			

OPTIONAL DESIGN CRITERIA

Test	Standard	Description
Vibration	MIL-STD-202	Method 204, Vibration, High Frequency
Shock	MIL-STD-202	Method 213, Shock (Specified Pulse)
Immersion	MIL-STD-202	Method 104, Immersion
Moisture Resistance	MIL-STD-202	Method 106, Moisture Resistance
Flammability	MIL-STD-202	Method 111, Flammability (External Flame)
Thermal Shock	MIL-STD-202	Method 107, Thermal Shock

OPTIONAL SCREENING AND QUALIFICATION

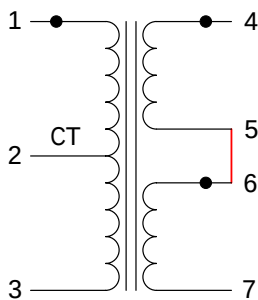
Standard	Screening & Qualification	Test ⁽⁴⁾
MIL-PRF-27	a.) Group A inspection Level-T - Table VII b.) Qualification inspection, Grade 5 - Table V	I. Thermal Shock II. Vibration III. Burn-in IV. Induced Voltage V. Shock VI. Dielectric Withstanding Voltage (at reduced pressure) VII. Insulation Resistance VIII. Electrical Characteristics IX. Visual and Mechanical Examination (External) X. Life XI. Radiographic Inspection
MIL-STD-981	a.) Group A screening tests - Table VI b.) Group B tests - Table XII, Class S	
EEE-INST-002, Section M1	a.) Magnetics Screening Req. - Table 2 b.) Magnetics Part Qual. - Table 3	

Note 4: Screening and qualification tests are not limited to the options in the chart above. Each standard may also be stringent or exclude certain tests from one another. Please contact Pico for specific application needs and for Pico part number.

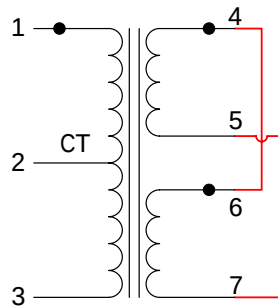
ELECTRICAL SCHEMATIC

T SERIES - THROUGH HOLE

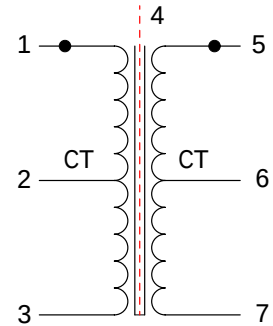
**SPLIT SECONDARIES
SERIES CONNECTION**



**SPLIT SECONDARIES
PARALLEL CONNECTION**

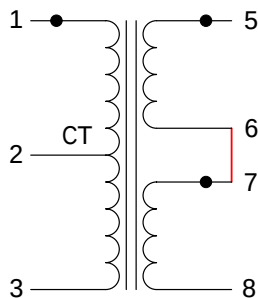


ELECTROSTATIC SHIELD

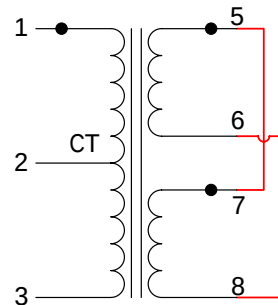


84000 SERIES - SURFACE MOUNT

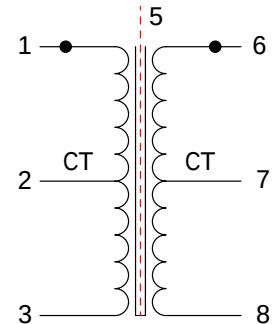
**SPLIT SECONDARIES
SERIES CONNECTION**



**SPLIT SECONDARIES
PARALLEL CONNECTION**



ELECTROSTATIC SHIELD



NOTES

- ANY TERMINALS NOT SHOWN HERE MAY BE USED FOR MECHANICAL STABILITY ON THE PCB ONLY, AS THEY DO NOT HAVE ANY ELECTRICAL CONNECTION.
- CT STANDS FOR "CENTER-TAP", WHERE THE TOTAL NUMBER OF TURNS IS EVENLY SPLIT BETWEEN THE TOP HALF AND BOTTOM HALF OF A COMPLETE WINDING.

T SERIES - THROUGH HOLE



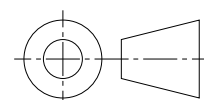
a. ALL DIMENSIONS ARE IN INCHES, [] = MM
b. TERMINALS ARE CLOCKWISE FROM PIN #1

BOTTOM VIEW

DETAIL A

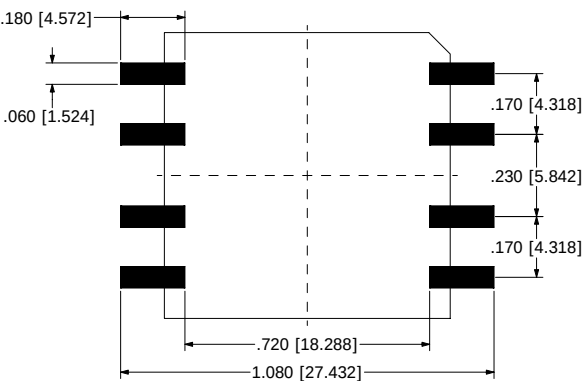
NOTES

- a. ALL DIMENSIONS ARE IN INCHES, [] = MM
- b. TERMINALS ARE CLOCKWISE FROM PIN #1
- c. PIN #4 HAS NO CONNECTION

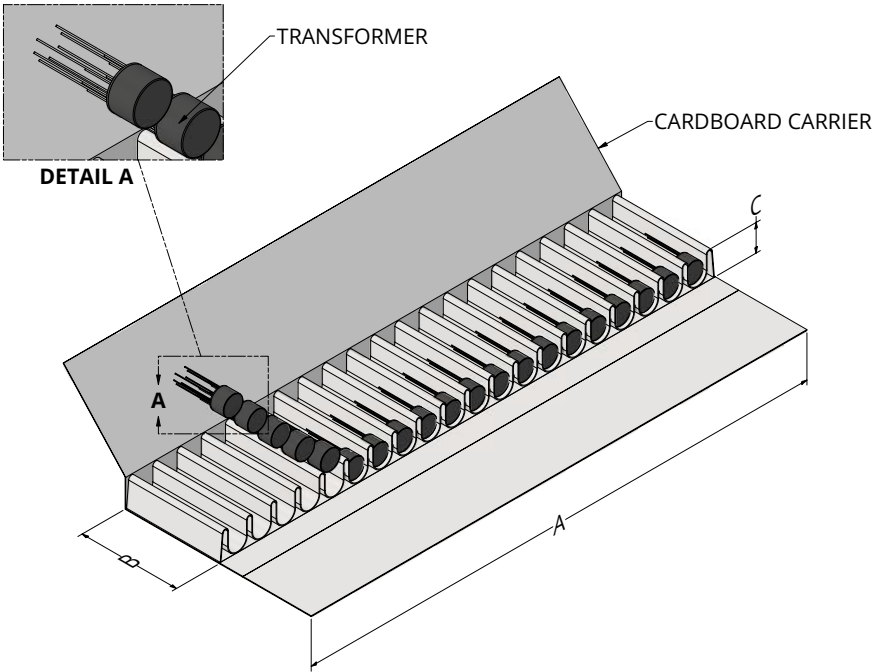


RECOMMENDED LAND PATTERN DIMENSIONS

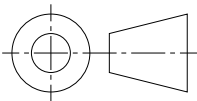
84000 SERIES - SQUARE SURFACE MOUNT



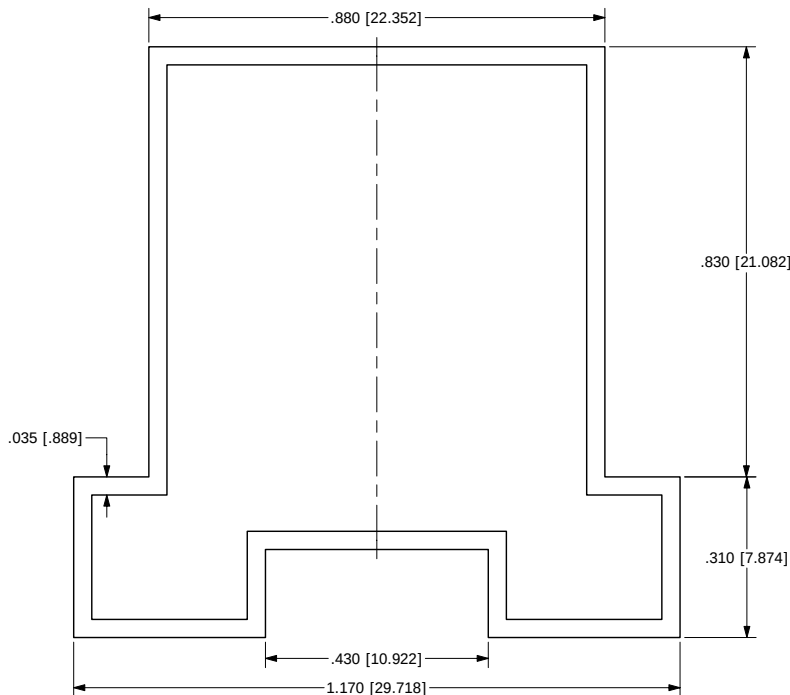
BOX PACKAGING - S SERIES



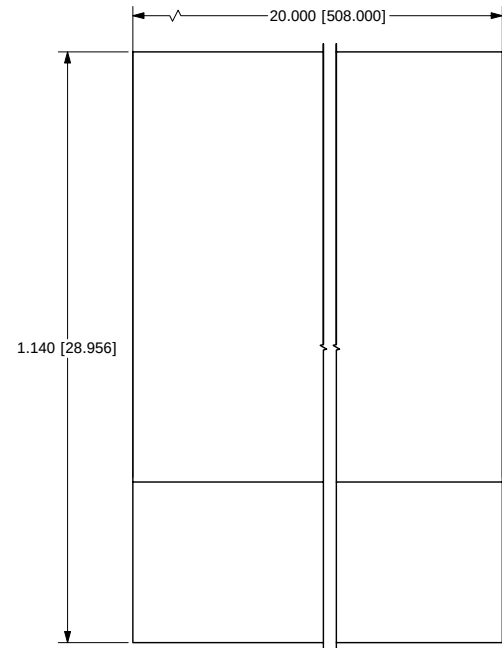
Dimension		
A	B	C
9.45 [240.03]	2.35 [59.69]	1.29 [32.766]



TUBE PACKAGING - 84000 SERIES

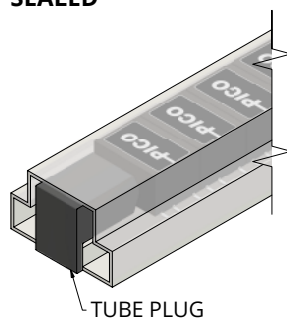


PLAN VIEW

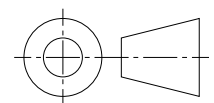
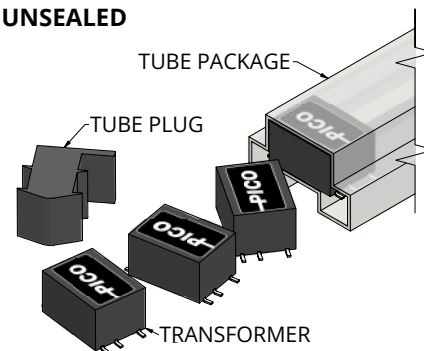


ELEVATION VIEW

SEALED



UNSEALED



Pico warrants each product manufactured by us and sold by us or an authorized representative, to be free from defects in material and workmanship. If properly used, it will perform within its applicable specifications for a period of one year after original shipment. Pico's obligation under this guarantee is limited to repairing or replacing our product to the original purchaser. This warranty is in lieu of all other warranties, express or implied and constitutes fulfillment of our obligations to the purchaser. We do not guarantee that the products can be used for a particular purpose other than those solely covered by the product's specifications. Pico must be notified if the product must meet particular certifications and/or standards. We assume no liability, in any event, for consequential damages, for anticipated or lost profits, incidental damages or loss of time or other losses incurred by the purchaser or any third party in connection with products covered by this warranty or otherwise. The purchaser will indemnify and hold Pico harmless for any damages, losses, costs, etc. from usage not within the product's specifications. Pico must be consulted before usage of its products in a nuclear, radioactive or space environment.

We reserve the right to discontinue products without notice, We reserve the right to make modifications to any existing catalog products without notice, at any time, without the obligation to modify units previously sold.

W · 71000 & 81000 Series

2-40k Ω , 400-100kHz, 400mW Max. @ 1kHz+ Audio Transformer

PICO
Electronics, Inc.

PRODUCT OVERVIEW

The W and 71000 & 81000 series are ultra-miniature transformers in an encapsulated package with design layouts as plug-in or surface mount types. They can operate over a wide temperature range of -55°C to +130°C. Our materials and methods allow extreme temperatures of vapor phase, IR or other reflow procedures without degrading the high reliability of their physical form and electrical performance.

Typical applications:

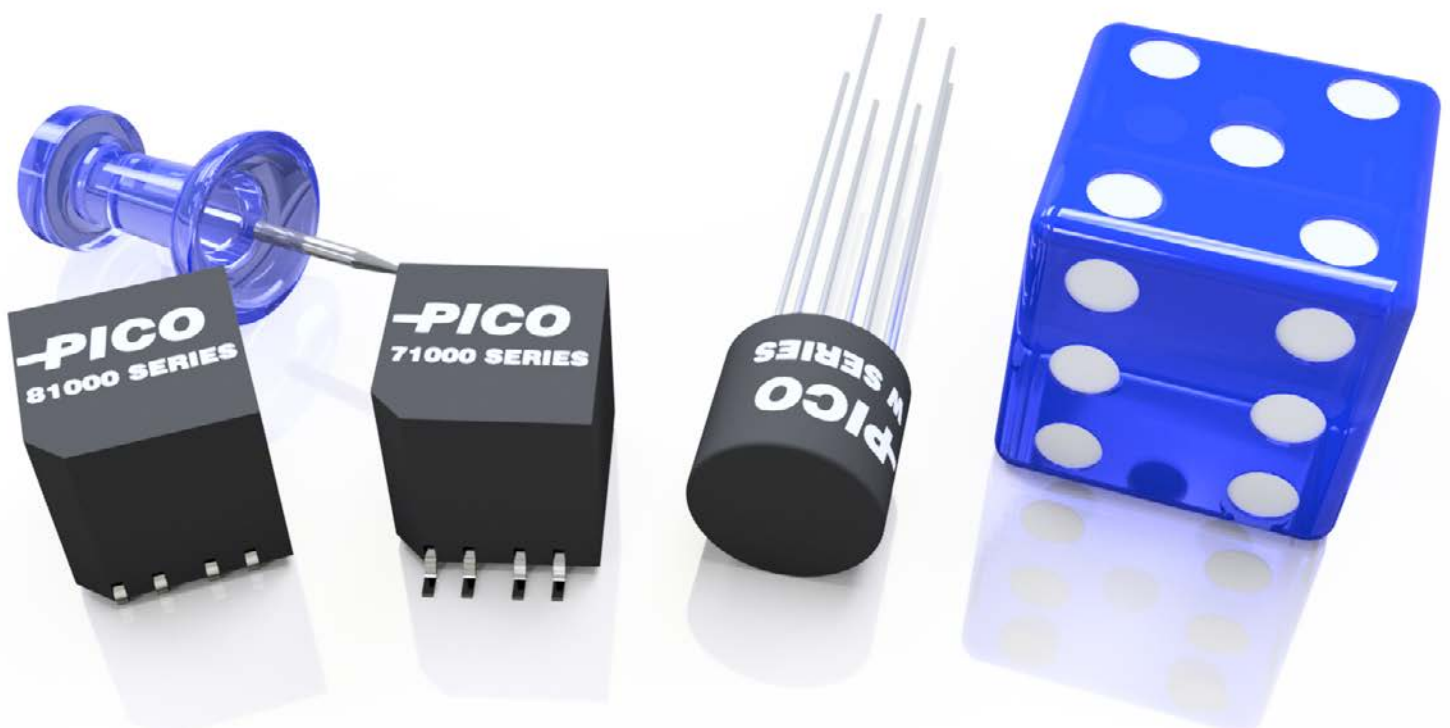
- Sensors
- Radars
- Avionic flight controls
- Airborne systems
- Naval electronics
- Military, aerospace, or commercial aircraft

FEATURES

- Extreme resistance to impact, shock, and vibration
- Manufactured to MIL-PRF-27, Class S, Grade 5
- High reliability for space and mission critical applications
- Ultra miniature in size and minimalistic design
- Design layouts in through-hole or surface mount types
- Available with magnetic shielding and/or electrostatic shielding

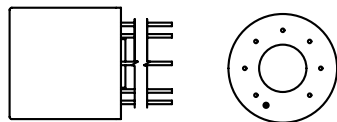
Contact Pico for part number of available options:

- Screening and qualification criteria to flight standard
- Capability to thermal shock up to 300 cycles
- Extra layers of magnetic shielding
- Fully RoHS compliant or with exemption 7(a)
- Modifications to mechanical design and electrical characteristics
- Custom new design and parameters

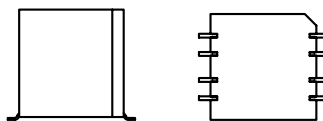


SPECIFICATIONS

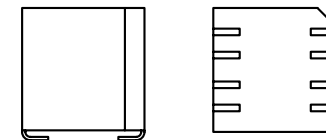
**W SERIES
(THROUGH HOLE)**



**71000 SERIES
(GULL WING LEADS SURFACE MOUNT)**



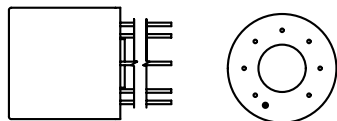
**81000 SERIES
(J LEADS SURFACE MOUNT)**



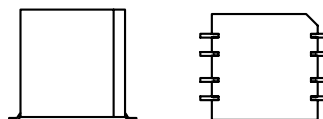
Through Hole ⁽²⁾	Surface Mount ⁽³⁾		Primary Impedance [Ω]	Secondary Impedance with Split Windings		Power		Primary Unbalanced DC Current [mA]	Primary DCR [Ω]	Secondary DCR		Turns Ratio PRI:SEC	
	Gull Wing Leads	J Leads		Series [Ω]	Parallel [Ω]	1kHz+ [W]	400Hz+ [W]			Series [Ω]	Parallel [Ω]	Series	Parallel
W-26003	71003	81003	10 CT	10 CT	2.5	.4	.075	31.6	1.1	1.3	.33	1:1	2:1
W-26005	71005	81005	20 CT	8 CT	2	.4	.075	22.3	2.2	1	.25	1.58:1	3.16:1
W-26010	71010	81010	20 CT	20 CT	5	.4	.075	22.3	2.2	2.6	.65	1:1	2:1
W-26015	71015	81015	32 CT	32 CT	8	.4	.075	17.6	3.5	4.2	1.05	1:1	2:1
W-26020	71020	81020	40 CT	40 CT	10	.4	.075	15.8	4	4.5	1.2	1:1	2:1
W-26025	71025	81025	48 CT	16 CT	4	.4	.075	14.4	5.3	1.9	.48	1.73:1	3.46:1
W-26030	71030	81030	50 CT	50 CT	12.5	.4	.075	14.1	5.6	6.5	1.6	1:1	2:1
W-26035	71035	81035	80 CT	32 CT	8	.4	.075	11.1	8	4	1	1.58:1	3.16:1
W-26040	71040	81040	100 CT	40 CT	10	.4	.075	10	10	4.5	1.2	1.58:1	3.16:1
W-26045	71045	81045	100 CT	100 CT	25	.4	.075	10	10	12	3	1:1	2:1
W-26050	71050	81050	120 CT	12.8 CT	3.2	.4	.075	9.1	12	1.5	.38	3.06:1	6.12:1
W-26055	71055	81055	120 CT	60 CT	15	.4	.075	9.1	12	7.2	1.8	1.41:1	2.83:1
W-26060	71060	81060	120 CT	120 CT	30	.4	.075	9.1	12	14.5	3.6	1:1	2:1
W-26065	71065	81065	150 CT	12 CT	3	.4	.075	8.2	15	1.5	.38	3.54:1	7.08:1
W-26070	71070	81070	150 CT	50 CT	12.5	.4	.075	8.2	15	6	1.5	1.73:1	3.46:1
W-26075	71075	81075	150 CT	100 CT	25	.4	.075	8.2	15	12	3	1.22:1	2.45:1
W-26080	71080	81080	150 CT	150 CT	37.5	.4	.075	8.2	15	16.8	4.2	1:1	2:1
W-26085	71085	81085	150 CT	600 CT	150	.4	.075	8.2	15	70	17.5	1:2	1:1
W-26090	71090	81090	200 CT	200 CT	50	.4	.075	7	20	24	6	1:1	2:1
W-26095	71095	81095	300 CT	12 CT	3	.4	.075	5.8	30	1.5	.38	5:1	10:1
W-26100	71100	81100	300 CT	50 CT	12.5	.4	.075	5.8	30	6	1.5	2.45:1	4.9:1
W-26105	71105	81105	300 CT	150 CT	37.5	.4	.075	5.8	30	18	4.5	1.41:1	2.83:1
W-26110	71110	81110	300 CT	300 CT	75	.4	.075	5.8	30	36	9	1:1	2:1
W-26115	71115	81115	300 CT	600 CT	150	.4	.075	5.8	30	72	18	1:1.41	1.41:1
W-26120	71120	81120	320 CT	12.8 CT	3.2	.4	.075	5.6	32	1.5	.38	5:1	10:1
W-26125	71125	81125	400 CT	40 CT	10	.4	.075	5	40	4.5	1.1	3.16:1	6.32:1

SPECIFICATIONS

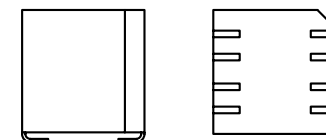
**W SERIES
(THROUGH HOLE)**



**71000 SERIES
(GULL WING LEADS SURFACE MOUNT)**



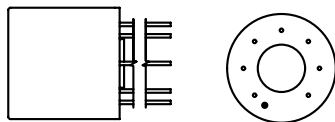
**81000 SERIES
(J LEADS SURFACE MOUNT)**



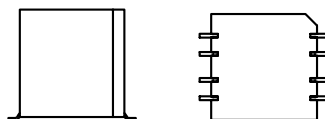
Through Hole ⁽²⁾	Surface Mount ⁽³⁾		Primary Impedance [Ω]	Secondary Impedance with Split Windings		Power		Primary Unbalanced DC Current [mA]	Primary DCR [Ω]	Secondary DCR		Turns Ratio PRI:SEC	
	Gull Wing Leads	J Leads		Series [Ω]	Parallel [Ω]	1kHz+ [W]	400Hz+ [W]			Series [Ω]	Parallel [Ω]	Series	Parallel
W-26130	71130	81130	400 CT	120 CT	30	.4	.075	5	40	14	3.5	1.83:1	3.65:1
W-26135	71135	81135	400 CT	200 CT	50	.4	.075	5	40	24	6	1.41:1	2.83:1
W-26140	71140	81140	400 CT	400 CT	100	.4	.075	5	40	48	12	1:1	2:1
W-26145	71145	81145	400 CT	1000 CT	250	.4	.075	5	40	120	30	1:1.58	1.26:1
W-26150	71150	81150	400 CT	2000 CT	500	.4	.075	5	40	240	60	1:2.24	1:1.12
W-26155	71155	81155	400 CT	4000 CT	1000	.4	.075	5	40	480	120	1:3.16	1:1.58
W-26160	71160	81160	500 CT	12.8 CT	3.2	.4	.075	4.5	50	1.5	.38	6.25:1	12.5:1
W-26165	71165	81165	500 CT	16 CT	4	.4	.075	4.5	50	2	.5	5.6:1	11.2:1
W-26170	71170	81170	500 CT	50 CT	12.5	.4	.075	4.5	50	6	1.5	3.16:1	6.32:1
W-26175	71175	81175	500 CT	150 CT	37.5	.4	.075	4.5	50	18	4.5	1.83:1	3.65:1
W-26180	71180	81180	500 CT	500 CT	125	.4	.075	4.5	50	60	15	1:1	2:1
(1) W-26185	71185	81185	500 CT	500 CT	-	.4	.075	4.5	50	60	-	1:1	-
W-26190	71190	81190	500 CT	600 CT	150	.4	.075	4.5	50	72	18	1:1.1	1.83:1
W-26195	71195	81195	600 CT	12.8 CT	3.2	.4	.075	4.1	60	1.5	.38	6.85:1	13.7:1
W-26200	71200	81200	600 CT	30 CT	7.5	.4	.075	4.1	60	3.6	.9	4.47:1	8.94:1
W-26205	71205	81205	600 CT	48 CT	12	.4	.075	4.1	60	5.8	1.45	3.54:1	7.07:1
W-26210	71210	81210	600 CT	200 CT	50	.4	.075	4.1	60	24	6	1.73:1	3.46:1
W-26215	71215	81215	600 CT	600 CT	150	.4	.075	4.1	60	72	18	1:1	2:1
(1) W-26220	71220	81220	600 CT	600 CT	-	.4	.075	4.1	60	72	-	1:1	-
W-26225	71225	81225	600 CT	1200 CT	300	.4	.075	4.1	60	144	36	1:1.41	1.41:1
W-26230	71230	81230	640 CT	12.8 CT	3.2	.4	.075	3.9	64	1.5	.38	7.07:1	14.14:1
W-26235	71235	81235	700 CT	100 CT	25	.4	.075	3.8	70	12	3	2.65:1	5.29:1
W-26240	71240	81240	800 CT	12.8 CT	3.2	.4	.075	3.5	80	1.5	.38	7.9:1	15.8:1
W-26245	71245	81245	800 CT	48 CT	12	.4	.075	3.5	80	5.8	1.45	4.08:1	8.16:1
W-26250	71250	81250	800 CT	800 CT	200	.4	.075	3.5	80	96	24	1:1	2:1
W-26255	71255	81255	900 CT	600 CT	150	.4	.075	3.3	90	72	18	1.22:1	2.45:1

SPECIFICATIONS

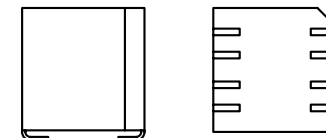
**W SERIES
(THROUGH HOLE)**



**71000 SERIES
(GULL WING LEADS SURFACE MOUNT)**



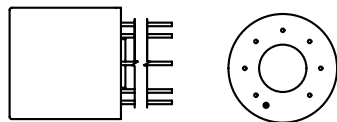
**81000 SERIES
(J LEADS SURFACE MOUNT)**



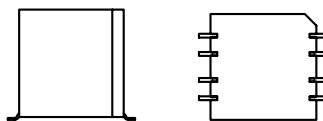
	Through Hole ⁽²⁾	Surface Mount ⁽³⁾		Primary Impedance [Ω]	Secondary Impedance with Split Windings		Power		Primary Unbalanced DC Current [mA]	Primary DCR [Ω]	Secondary DCR		Turns Ratio PRI:SEC	
		Gull Wing Leads	J Leads		Series [Ω]	Parallel [Ω]	1kHz+ [W]	400Hz+ [W]			Series [Ω]	Parallel [Ω]	Series	Parallel
	W-26260	71260	81260	1000 CT	12 CT	3	.4	.075	3.2	100	1.5	.38	9.13:1	18.3:1
	W-26265	71265	81265	1000 CT	50 CT	12.5	.4	.075	3.2	100	6	1.5	4.47:1	8.94:1
	W-26270	71270	81270	1000 CT	1000 CT	250	.4	.075	3.2	100	120	30	1:1	2:1
	W-26275	71275	81275	1060 CT	12.8 CT	3.2	.4	.075	3.1	106	1.5	.38	9.1:1	18.2:1
	W-26280	71280	81280	1200 CT	12.8 CT	3.2	.4	.075	2.9	120	1.5	.38	9.68:1	19.4:1
	W-26285	71285	81285	1200 CT	500 CT	125	.4	.075	2.9	120	60	15	1.55:1	3.1:1
	W-26290	71290	81290	1200 CT	1200 CT	300	.4	.075	2.9	120	140	35	1:1	2:1
(1)	W-26295	71295	81295	1200 CT	1200 CT	-	.4	.075	2.9	120	140	-	1:1	-
	W-26300	71300	81300	1500 CT	12 CT	3	.4	.075	2.6	150	1.5	.38	11.2:1	22.4:1
	W-26305	71305	81305	1500 CT	500 CT	125	.4	.075	2.6	150	60	15	1.73:1	3.46:1
(1)	W-26310	71310	81310	1500 CT	600 CT	-	.4	.075	2.6	150	72	-	1.58:1	-
(1)	W-26315	71315	81315	1500 CT	1500 CT	-	.4	.075	2.6	150	180	-	1:1	-
	W-26320	71320	81320	1600 CT	12.8 CT	3.2	.4	.075	2.5	160	1.5	.38	11.2:1	22.4:1
	W-26325	71325	81325	2000 CT	8 CT	2	.4	.075	2.2	200	1	.25	15.8:1	31.6:1
	W-26330	71330	81330	2000 CT	2000 CT	500	.4	.075	2.2	200	240	60	1:1	2:1
(1)	W-26335	71335	81335	2000 CT	2000 CT	-	.4	.075	2.2	200	240	-	1:1	-
	W-26340	71340	81340	2000 CT	8000 CT	2000	.4	.075	2.2	200	960	240	1:2	1:1
	W-26345	71345	81345	2500 CT	2500 CT	625	.4	.075	2	250	300	75	1:1	2:1
	W-26350	71350	81350	3000 CT	3000 CT	725	.4	.075	1.8	300	360	90	1:1	2:1
(1)	W-26355	71355	81355	3000 CT	3000 CT	-	.4	.075	1.8	300	360	-	1:1	-
	W-26360	71360	81360	3600 CT	3600 CT	900	.4	.075	1.7	360	432	108	1:1	2:1
	W-26365	71365	81365	4000 CT	16 CT	4	.4	.075	1.6	400	1.9	.47	15.8:1	31.6:1
	W-26370	71370	81370	4000 CT	600 CT	150	.4	.075	1.6	400	72	18	2.58:1	5.16:1
	W-26375	71375	81375	4000 CT	1000 CT	250	.4	.075	1.6	400	120	30	2:1	4:1
(1)	W-26380	71380	81380	4000 CT	8000 CT	-	.4	.075	1.6	400	960	-	1:1.41	-
	W-26385	71385	81385	5000 CT	500 CT	125	.4	.075	1.4	500	60	15	3.16:1	6.32:1

SPECIFICATIONS

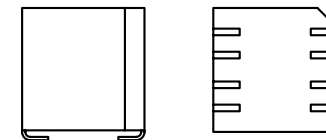
**W SERIES
(THROUGH HOLE)**



**71000 SERIES
(GULL WING LEADS SURFACE MOUNT)**



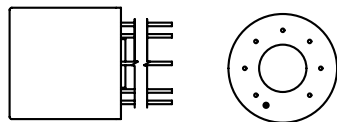
**81000 SERIES
(J LEADS SURFACE MOUNT)**



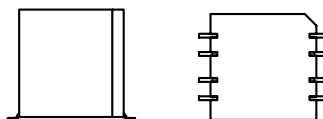
	Through Hole ⁽²⁾	Surface Mount ⁽³⁾		Primary Impedance [Ω]	Secondary Impedance with Split Windings		Power		Primary Unbalanced DC Current [mA]	Primary DCR [Ω]	Secondary DCR		Turns Ratio PRI:SEC	
		Gull Wing Leads	J Leads		Series [Ω]	Parallel [Ω]	1kHz+ [W]	400Hz+ [W]			Series [Ω]	Parallel [Ω]	Series	Parallel
	W-26390	71390	81390	5000 CT	5000 CT	1250	.4	.075	1.4	500	600	150	1:1	2:1
	W-26395	71395	81395	7500 CT	50 CT	12.5	.33	.075	1.2	750	6	1.5	12.2:1	24.5:1
	W-26400	71400	81400	7500 CT	100 CT	25	.33	.075	1.2	750	12	3	8.66:1	17.3:1
	W-26405	71405	81405	7500 CT	600 CT	150	.33	.075	1.2	750	72	18	3.54:1	7.07:1
	W-26410	71410	81410	7500 CT	2500 CT	625	.33	.075	1.2	750	300	75	1.73:1	3.46:1
(1)	W-26415	71415	81415	7500 CT	7500 CT	-	.33	.075	1.2	750	900	-	1:1	-
	W-26420	71420	81420	8000 CT	12.8 CT	3.2	.3	.075	1.1	800	1.5	.38	25:1	50:1
	W-26425	71425	81425	8000 CT	1000 CT	250	.3	.075	1.1	800	120	30	2.83:1	5.66:1
(1)	W-26430	71430	81430	8000 CT	1200 CT	-	.3	.075	1.1	800	144	-	2.58:1	-
(1)	W-26435	71435	81435	9000 CT	9000 CT	-	.27	.075	1.1	900	1080	-	1:1	-
	W-26440	71440	81440	10,000 CT	12.8 CT	3.2	.25	.075	1.0	1000	1.5	.38	28:1	56:1
	W-26445	71445	81445	10,000 CT	16 CT	4	.25	.075	1.0	1000	1.92	.48	25:1	50:1
	W-26450	71450	81450	10,000 CT	100 CT	25	.25	.075	1.0	1000	12	3	10:1	20:1
	W-26455	71455	81455	10,000 CT	200 CT	50	.25	.075	1.0	1000	24	6	7.07:1	14.14:1
	W-26460	71460	81460	10,000 CT	500 CT	125	.25	.075	1.0	1000	60	15	4.47:1	8.94:1
	W-26465	71465	81465	10,000 CT	600 CT	150	.25	.075	1.0	1000	72	18	4.08:1	8.16:1
	W-26470	71470	81470	10,000 CT	1000 CT	250	.25	.075	1.0	1000	120	30	3.16:1	6.32:1
	W-26475	71475	81475	10,000 CT	1200 CT	300	.25	.075	1.0	1000	144	36	2.89:1	5.77:1
	W-26480	71480	81480	10,000 CT	1500 CT	375	.25	.075	1.0	1000	180	45	2.58:1	5.16:1
	W-26485	71485	81485	10,000 CT	2000 CT	500	.25	.075	1.0	1000	240	60	2.24:1	4.47:1
	W-26490	71490	81490	10,000 CT	5000 CT	1250	.25	.075	1.0	1000	600	150	1.41:1	2.83:1
	W-26495	71495	81495	10,000 CT	7500 CT	1875	.25	.075	1.0	1000	900	225	1.15:1	2.3:1
	W-26500	71500	81500	10,000 CT	10,000 CT	2500	.25	.075	1.0	1000	1200	300	1:1	2:1
(1)	W-26505	71505	81505	10,000 CT	10,000 CT	-	.25	.075	1.0	1000	1200	-	1:1	-
	W-26510	71510	81510	15,000 CT	400 CT	100	.16	.075	.82	1500	48	12	6.12:1	12.24:1
	W-26515	71515	81515	15,000 CT	500 CT	125	.16	.075	.82	1500	60	15	5.48:1	10.95:1

SPECIFICATIONS

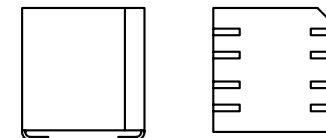
**W SERIES
(THROUGH HOLE)**



**71000 SERIES
(GULL WING LEADS SURFACE MOUNT)**



**81000 SERIES
(J LEADS SURFACE MOUNT)**



	Through Hole ⁽²⁾	Surface Mount ⁽³⁾		Primary Impedance [Ω]	Secondary Impedance with Split Windings		Power		Primary Unbalanced DC Current [mA]	Primary DCR [Ω]	Secondary DCR		Turns Ratio PRI:SEC	
		Gull Wing Leads	J Leads		Series [Ω]	Parallel [Ω]	1kHz+ [W]	400Hz+ [W]			Series [Ω]	Parallel [Ω]	Series	Parallel
(1)	W-26520	71520	81520	15,000 CT	600 CT	150	.16	.075	.82	1500	72	18	5:1	10:1
	W-26525	71525	81525	15,000 CT	10,000 CT	2500	.16	.075	.82	1500	1200	300	1.22:1	2.45:1
	W-26530	71530	81530	15,000 CT	15,000 CT	-	.16	.075	.82	1500	1800	-	1:1	-
	W-26535	71535	81535	15,000 CT	15,000 CT	3750	.16	.075	.82	1500	1800	450	1:1	2:1
	W-26540	71540	81540	16,000 CT	1000 CT	250	.15	.075	.8	1600	120	30	4:1	8:1
	W-26545	71545	81545	20,000 CT	500 CT	125	.125	.075	.7	2000	60	15	6.33:1	12.65:1
	W-26550	71550	81550	20,000 CT	600 CT	150	.125	.075	.7	2000	72	18	5.77:1	11.55:1
	W-26555	71555	81555	20,000 CT	800 CT	200	.125	.075	.7	2000	96	24	5:1	10:1
(1)	W-26560	71560	81560	20,000 CT	1000 CT	250	.125	.075	.7	2000	120	30	4.47:1	8.94:1
	W-26565	71565	81565	20,000 CT	5000 CT	1250	.125	.075	.7	2000	600	150	2:1	4:1
	W-26570	71570	81570	20,000 CT	10,000 CT	2500	.125	.075	.7	2000	1200	300	1.41:1	2.83:1
	W-26575	71575	81575	20,000 CT	20,000 CT	-	.125	.075	.7	2000	2400	-	1:1	-
	W-26580	71580	81580	25,000 CT	500 CT	125	.1	.075	.63	2500	60	15	7.07:1	14.14:1
	W-26585	71585	81585	25,000 CT	1000 CT	250	.1	.075	.63	2500	120	30	5:1	10:1
	W-26590	71590	81590	30,000 CT	50 CT	12.5	.083	.075	.58	3000	6	1.5	24.5:1	49:1
	W-26595	71595	81595	30,000 CT	1200 CT	300	.083	.075	.58	3000	144	36	5:1	10:1
(1)	W-26600	71600	81600	30,000 CT	500 CT	125	.083	.075	.58	3000	60	15	7.75:1	15.5:1
	W-26605	71605	81605	30,000 CT	200 CT	50	.083	.075	.58	3000	24	6	12.25:1	24.5:1
	W-26610	71610	81610	30,000 CT	5000 CT	1250	.083	.075	.58	3000	600	150	2.45:1	4.9:1
	W-26615	71615	81615	30,000 CT	10,000 CT	2500	.083	.075	.58	3000	1200	300	1.73:1	3.46:1
	W-26620	71620	81620	30,000 CT	30,000 CT	-	.083	.075	.58	3000	3600	-	1:1	-
	W-26625	71625	81625	40,000 CT	400 CT	100	.062	.062	.5	4000	48	12	10:1	20:1

Note 1: Includes electrostatic shield.

Note 2: For RoHS compliance on a through-hole component, please consult with Pico's engineer and provide the part number.

Note 3: All SMDs are available with Pb-free dipped terminals that is compliant to RoHS exemption 7 by requesting part number + 'RoHS-7'

SPECIFICATIONS**GENERAL**

Parameter	Condition	Min.	Typ.	Max.	Units
Dielectric Strength	60Hz	-	200	-	V _{RMS}
Insulation Resistance	300VDC	10	-	-	GΩ
Distortion	400Hz & 1kHz @ Rated Power	-	-	5	%
Frequency Response	400 - 100kHz @ 1mW	-3	-	3	dB
Operating Temperature Range	Ambient with temperature rise	-55	-	+130	°C
Storage Temperature Range	Ambient	-55	-	+105	°C
Size	W Series - Diameter x Height	0.35 x 0.32 (8.89 x 8.128)			inches (mm)
	71000 Series - Length x Width x Height	0.375 x 0.375 x 0.4 (9.525 x 9.525 x 10.16)			
	81000 Series - Length x Width x Height	0.375 x 0.375 x 0.405 (9.525 x 9.525 x 10.287)			
Weight	W, 71000, & 81000 Series	-	3	-	grams
Case	W Series	Epoxy Insulated Metal			
	71000 & 81000 Series	Glass Reinforced Polymer			
Potting	Vacuum Impregnated Epoxy				
Box Packaging (L x W x H)	W Series	10.79 x 2.48 x 0.39 (274.066 x 62.992 x 9.906)			inches (mm)
Tube Packaging (W x H x L)	71000 & 81000 Series	0.76 x 0.57 x 20.0 (19.304 x 14.351 x 508)			
Tape & Reel Packaging	Upon request				
Moisture Sensitivity Level	Surface Mount only	Level 3			

OPTIONAL DESIGN CRITERIA

Test	Standard	Description
Vibration	MIL-STD-202	Method 204, Vibration, High Frequency
Shock	MIL-STD-202	Method 213, Shock (Specified Pulse)
Immersion	MIL-STD-202	Method 104, Immersion
Moisture Resistance	MIL-STD-202	Method 106, Moisture Resistance
Flammability	MIL-STD-202	Method 111, Flammability (External Flame)
Thermal Shock	MIL-STD-202	Method 107, Thermal Shock

OPTIONAL SCREENING AND QUALIFICATION

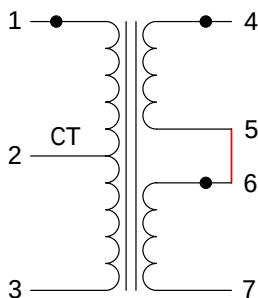
Standard	Screening & Qualification	Test ⁽⁴⁾
MIL-PRF-27	a.) Group A inspection Level-T - Table VII b.) Qualification inspection, Grade 5 - Table V	I. Thermal Shock II. Vibration III. Burn-in IV. Induced Voltage V. Shock VI. Dielectric Withstanding Voltage (at reduced pressure) VII. Insulation Resistance VIII. Electrical Characteristics IX. Visual and Mechanical Examination (External) X. Life XI. Radiographic Inspection
MIL-STD-981	a.) Group A screening tests - Table VI b.) Group B tests - Table XII, Class S	
EEE-INST-002, Section M1	a.) Magnetics Screening Req. - Table 2 b.) Magnetics Part Qual. - Table 3	

Note 4: Screening and qualification tests are not limited to the options in the chart above. Each standard may also be stringent or exclude certain tests from one another. Please contact Pico for specific application needs and for Pico part number.

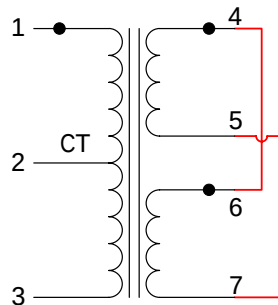
ELECTRICAL SCHEMATIC

W SERIES - THROUGH HOLE

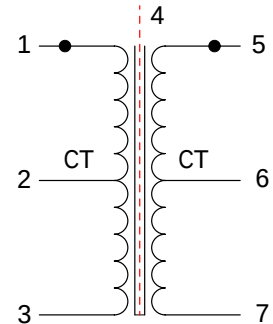
**SPLIT SECONDARIES
SERIES CONNECTION**



**SPLIT SECONDARIES
PARALLEL CONNECTION**

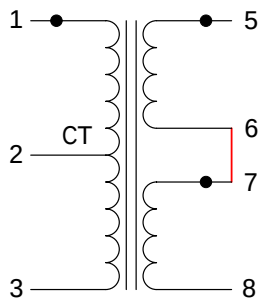


ELECTROSTATIC SHIELD

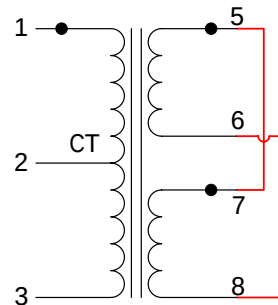


71000 & 81000 SERIES - SURFACE MOUNT

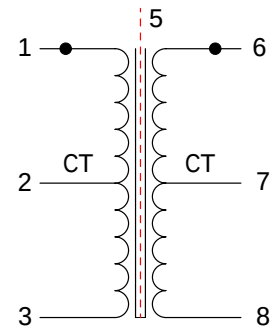
**SPLIT SECONDARIES
SERIES CONNECTION**



**SPLIT SECONDARIES
PARALLEL CONNECTION**



ELECTROSTATIC SHIELD



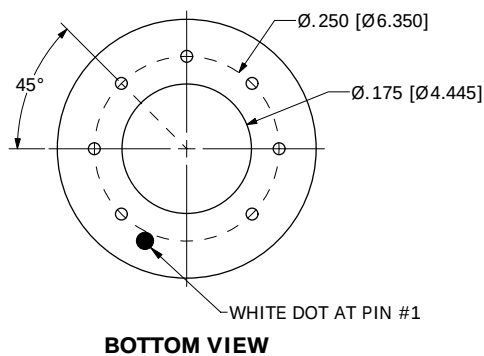
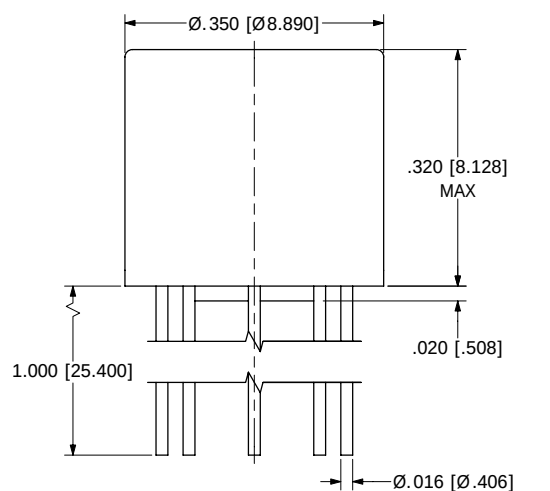
NOTES

a. ANY TERMINALS NOT SHOWN HERE MAY BE USED FOR MECHANICAL STABILITY ON THE PCB ONLY, AS THEY DO NOT HAVE ANY ELECTRICAL CONNECTION.

b. CT STANDS FOR "CENTER-TAP", WHERE THE TOTAL NUMBER OF TURNS IS EVENLY SPLIT BETWEEN THE TOP HALF AND BOTTOM HALF OF A COMPLETE WINDING.

MECHANICAL DRAWINGS

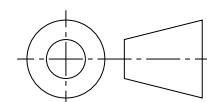
W SERIES - THROUGH HOLE



BOTTOM VIEW

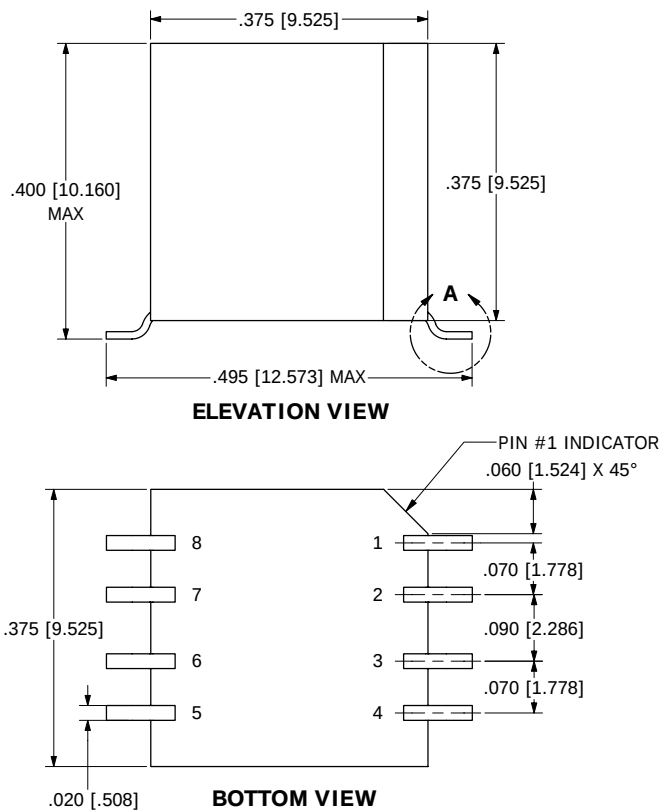
NOTES

- ALL DIMENSIONS ARE IN INCHES, [] = MM
- TERMINALS ARE CLOCKWISE FROM PIN #1

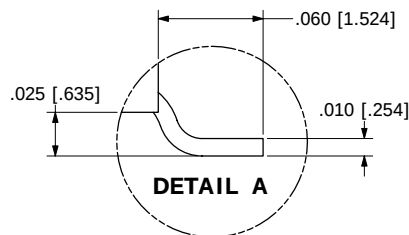


MECHANICAL DRAWINGS

71000 SERIES - GULL WING LEADS SURFACE MOUNT



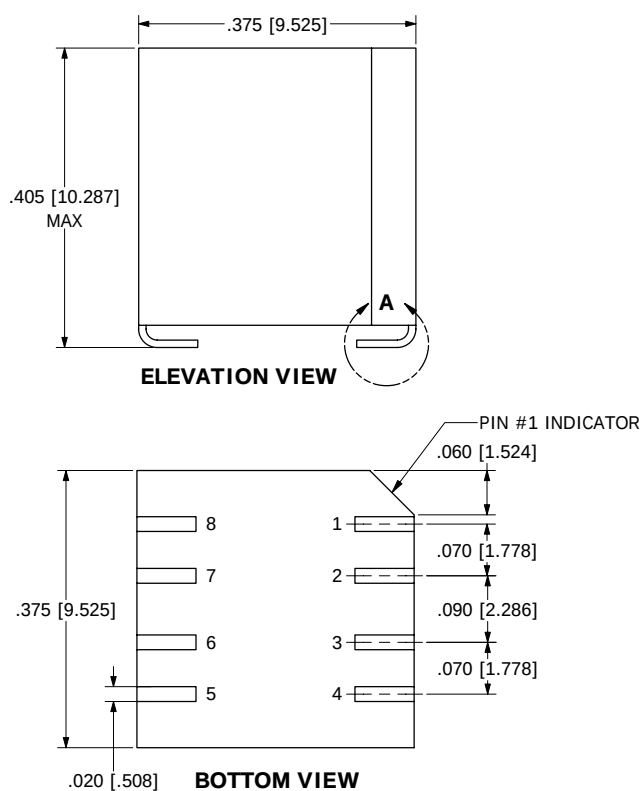
LEAD DETAILS



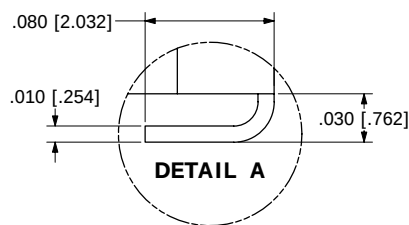
NOTES

- a. ALL DIMENSIONS ARE IN INCHES, [] = MM
- b. TERMINALS ARE CLOCKWISE FROM PIN #1
- c. PIN #4 HAS NO CONNECTION

81000 SERIES - J LEADS SURFACE MOUNT

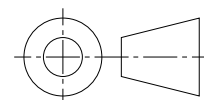


LEAD DETAILS



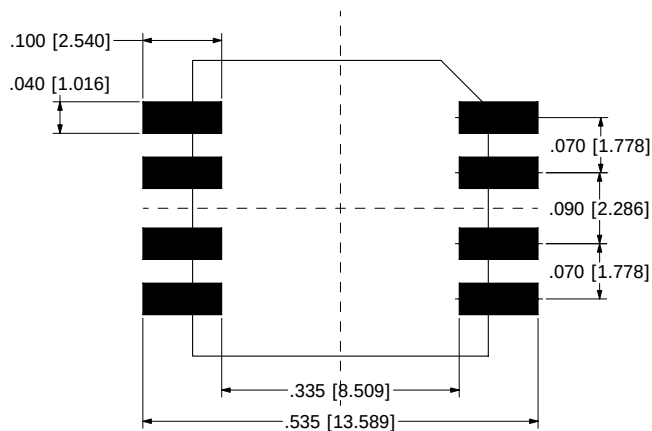
NOTES

- a. ALL DIMENSIONS ARE IN INCHES, [] = MM
- b. TERMINALS ARE CLOCKWISE FROM PIN #1
- c. PIN #4 HAS NO CONNECTION

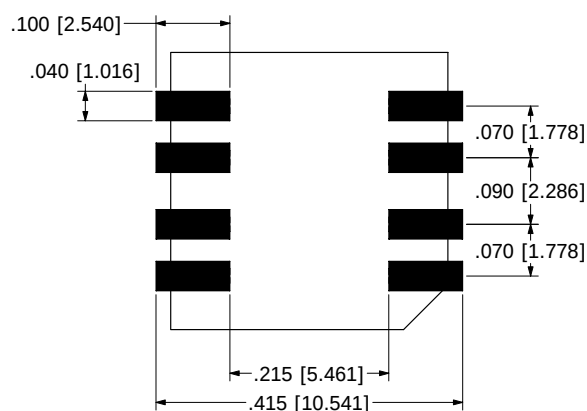


RECOMMENDED LAND PATTERN DIMENSIONS

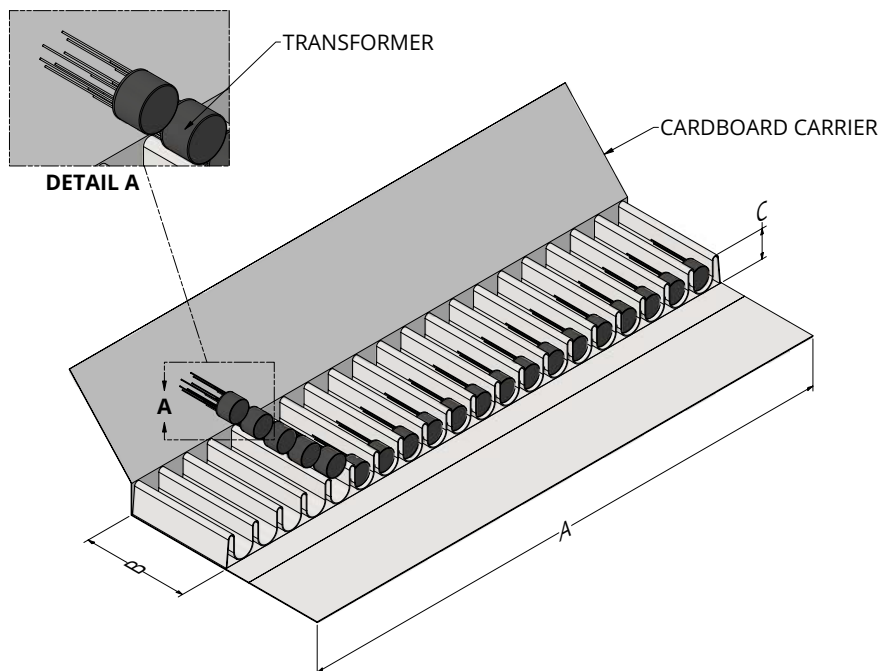
71000 SERIES - GULL WING LEADS SURFACE MOUNT



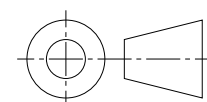
81000 SERIES - J LEADS SURFACE MOUNT



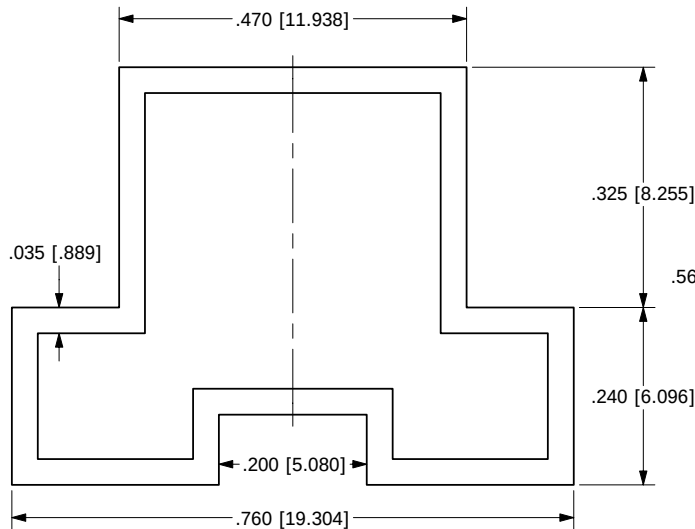
BOX PACKAGING - W SERIES



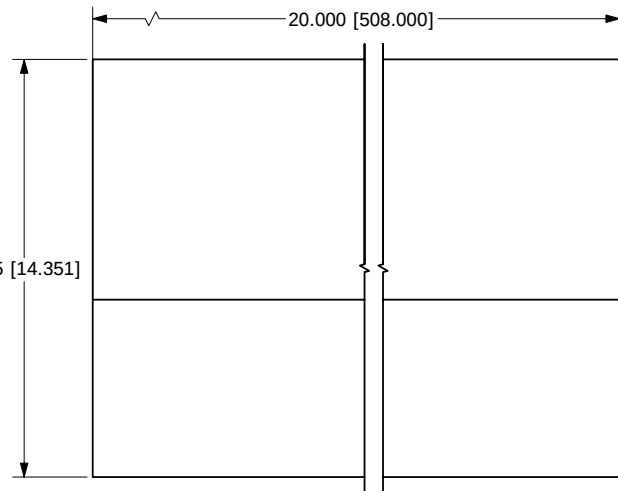
Dimension		
A	B	C
10.79 [274.07]	2.48 [62.99]	0.39 [9.91]



TUBE PACKAGING - 71000 & 81000 SERIES

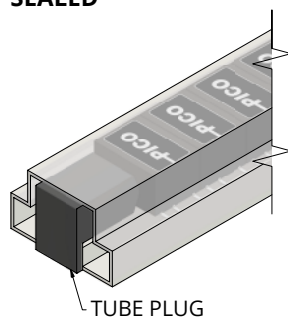


PLAN VIEW

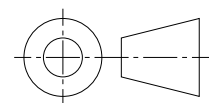
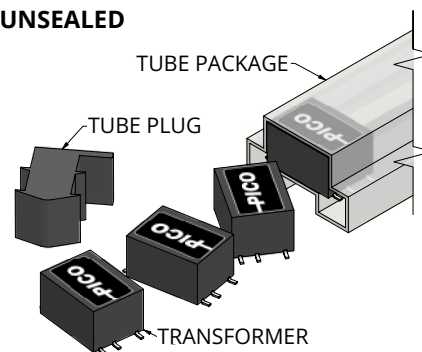


ELEVATION VIEW

SEALED



UNSEALED



Pico warrants each product manufactured by us and sold by us or an authorized representative, to be free from defects in material and workmanship. If properly used, it will perform within its applicable specifications for a period of one year after original shipment. Pico's obligation under this guarantee is limited to repairing or replacing our product to the original purchaser. This warranty is in lieu of all other warranties, express or implied and constitutes fulfillment of our obligations to the purchaser. We do not guarantee that the products can be used for a particular purpose other than those solely covered by the product's specifications. Pico must be notified if the product must meet particular certifications and/or standards. We assume no liability, in any event, for consequential damages, for anticipated or lost profits, incidental damages or loss of time or other losses incurred by the purchaser or any third party in connection with products covered by this warranty or otherwise. The purchaser will indemnify and hold Pico harmless for any damages, losses, costs, etc. from usage not within the product's specifications. Pico must be consulted before usage of its products in a nuclear, radioactive or space environment.

We reserve the right to discontinue products without notice, We reserve the right to make modifications to any existing catalog products without notice, at any time, without the obligation to modify units previously sold.

Y Series

2-100k Ω , 300-100kHz, 600mW Max. @ 1kHz+ Audio Transformer

PICO
Electronics, Inc.

PRODUCT OVERVIEW

The Y series are ultra-miniature transformers in an encapsulated package with through hole design. They can operate over a wide temperature range of -55°C to +130°C. Our materials and methods allow extreme temperatures of vapor phase, IR or other reflow procedures without degrading the high reliability of their physical form and electrical performance.

Typical applications:

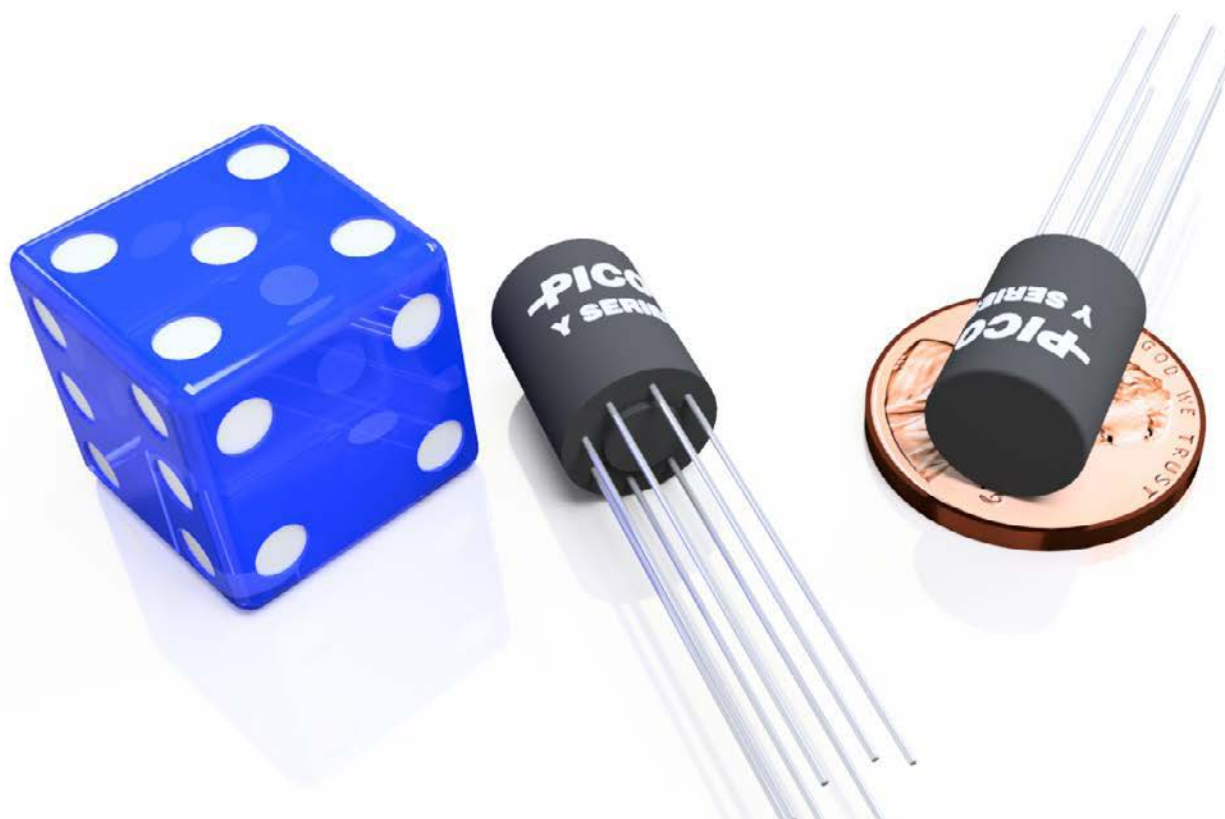
- Sensors
- Radars
- Avionic flight controls
- Airborne systems
- Naval electronics
- Military, aerospace, or commercial aircraft

FEATURES

- Extreme resistance to impact, shock, and vibration
- Manufactured to MIL-PRF-27, Class S, Grade 5
- High reliability for space and mission critical applications
- Ultra miniature in size and minimalistic design
- Design layout in through-hole type
- Available with magnetic shielding and/or electrostatic shielding

Contact Pico for part number of available options:

- Screening and qualification criteria to flight standard
- Capability to thermal shock up to 300 cycles
- Extra layers of magnetic shielding
- Fully RoHS compliant or with exemption 7(a)
- Modifications to mechanical design and electrical characteristics
- Custom new design and parameters



SPECIFICATIONS

Part Number ⁽²⁾	Primary Impedance [Ω]	Secondary Impedance with Split Windings		Power			Primary Unbalanced DC Current [mA]	Primary DCR [Ω]	Secondary DCR		Turns Ratio PRI:SEC	
		Series [Ω]	Parallel [Ω]	1kHz+ [W]	400Hz+ [W]	300Hz+ [W]			Series [Ω]	Parallel [Ω]	Series	Parallel
Y-27003	10 CT	10 CT	2.5	.6	.2	.1	31.6	1	1.25	.32	1:1	2:1
Y-27005	20 CT	8 CT	2	.6	.2	.1	22.3	2	.9	.23	1.58:1	3.16:1
Y-27010	20 CT	20 CT	5	.6	.2	.1	22.3	2.7	2.25	.56	1:1	2:1
Y-27015	32 CT	32 CT	8	.6	.2	.1	17.6	3.4	4	1	1:1	2:1
Y-27020	40 CT	40 CT	10	.6	.2	.1	15.8	4.2	4.5	1.13	1:1	2:1
Y-27025	48 CT	16 CT	4	.6	.2	.1	14.4	5	1.8	.45	1.73:1	3.46:1
Y-27030	50 CT	50 CT	12.5	.6	.2	.1	14.1	5.25	5.6	1.4	1:1	2:1
Y-27035	80 CT	32 CT	8	.6	.2	.1	11.1	8.4	4	1	1.58:1	3.16:1
Y-27040	100 CT	40 CT	10	.6	.2	.1	10	10	4.5	1.13	1.58:1	3.16:1
Y-27045	100 CT	100 CT	25	.6	.2	.1	10	11	11.25	2.8	1:1	2:1
Y-27050	120 CT	12.8 CT	3.2	.6	.2	.1	9.1	14.4	1.8	.45	3.06:1	6.12:1
Y-27055	120 CT	60 CT	15	.6	.2	.1	9.1	14.4	8.4	2.1	1.41:1	2.83:1
Y-27060	120 CT	120 CT	30	.6	.2	.1	9.1	14.4	16.8	4.2	1:1	2:1
Y-27065	150 CT	12 CT	3	.6	.2	.1	8.2	15	1.5	.38	3.54:1	7.08:1
Y-27070	150 CT	50 CT	12.5	.6	.2	.1	8.2	15	6	1.5	1.73:1	3.46:1
Y-27075	150 CT	100 CT	25	.6	.2	.1	8.2	15	12	3	1.22:1	2.45:1
Y-27080	150 CT	150 CT	37.5	.6	.2	.1	8.2	15	18	4.5	1:1	2:1
Y-27085	150 CT	600 CT	150	.6	.2	.1	8.2	15	72	18	1:2	1:1
Y-27090	200 CT	200 CT	50	.6	.2	.1	7	22	24	6	1:1	2:1
Y-27095	300 CT	12 CT	3	.6	.2	.1	5.8	30	1.4	.35	5:1	10:1
Y-27100	300 CT	50 CT	12.5	.6	.2	.1	5.8	30	6	1.5	2.45:1	4.9:1
Y-27105	300 CT	150 CT	37.5	.6	.2	.1	5.8	30	18	4.5	1.41:1	2.83:1
Y-27110	300 CT	300 CT	75	.6	.2	.1	5.8	30	36	9	1:1	2:1
Y-27115	300 CT	600 CT	150	.6	.2	.1	5.8	30	72	18	1:1.41	1.41:1
Y-27120	320 CT	12.8 CT	3.2	.6	.2	.1	5.6	36	1.8	.45	5:1	10:1
Y-27125	400 CT	40 CT	10	.6	.2	.1	5	40	4.8	1.2	3.16:1	6.32:1
Y-27130	400 CT	120 CT	30	.6	.2	.1	5	40	14.5	3.6	1.83:1	3.65:1
Y-27135	400 CT	200 CT	50	.6	.2	.1	5	40	24	6	1.41:1	2.83:1
Y-27140	400 CT	400 CT	100	.6	.2	.1	5	40	48	12	1:1	2:1
Y-27145	400 CT	1000 CT	250	.6	.2	.1	5	40	125	31	1:1.58	1.26:1
Y-27150	400 CT	2000 CT	500	.6	.2	.1	5	40	240	60	1:2.24	1:1.12
Y-27155	400 CT	4000 CT	1000	.6	.2	.1	5	40	480	120	1:3.16	1:1.58
Y-27160	500 CT	12.8 CT	3.2	.6	.2	.1	4.5	50	1.5	.38	6.25:1	12.5:1
Y-27165	500 CT	16 CT	4	.6	.2	.1	4.5	50	1.9	.48	5.6:1	11.2:1
Y-27170	500 CT	50 CT	12.5	.6	.2	.1	4.5	50	6	1.5	3.16:1	6.32:1
Y-27175	500 CT	150 CT	37.5	.6	.2	.1	4.5	50	18	4.5	1.83:1	3.65:1

SPECIFICATIONS

	Part Number ⁽²⁾	Primary Impedance [Ω]	Secondary Impedance with Split Windings		Power			Primary Unbalanced DC Current [mA]	Primary DCR [Ω]	Secondary DCR		Turns Ratio PRI:SEC	
			Series [Ω]	Parallel [Ω]	1kHz+ [W]	400Hz+ [W]	300Hz+ [W]			Series [Ω]	Parallel [Ω]	Series	Parallel
(1)	Y-27180	500 CT	500 CT	125	.6	.2	.1	4.5	50	60	15	1:1	2:1
	Y-27185	500 CT	500 CT	-	.6	.2	.1	4.5	50	60	-	1:1	-
	Y-27190	500 CT	600 CT	150	.6	.2	.1	4.5	50	72	18	1:1.1	1.83:1
	Y-27195	600 CT	12.8 CT	3.2	.6	.2	.1	4.1	60	1.5	.38	6.85:1	13.7:1
	Y-27200	600 CT	30 CT	7.5	.6	.2	.1	4.1	60	3.6	.9	4.47:1	8.94:1
(1)	Y-27205	600 CT	48 CT	12	.6	.2	.1	4.1	60	5.8	1.45	3.54:1	7.07:1
	Y-27210	600 CT	200 CT	50	.6	.2	.1	4.1	60	24	6	1.73:1	3.46:1
	Y-27215	600 CT	600 CT	150	.6	.2	.1	4.1	60	72	18	1:1	2:1
	Y-27220	600 CT	600 CT	-	.6	.2	.1	4.1	60	72	-	1:1	-
	Y-27225	600 CT	1200 CT	300	.6	.2	.1	4.1	60	144	36	1:1.41	1.41:1
(1)	Y-27230	640 CT	12.8 CT	3.2	.6	.2	.1	3.9	64	1.5	.38	7.07:1	14.14:1
	Y-27235	700 CT	100 CT	25	.6	.2	.1	3.8	70	12	3	2.65:1	5.29:1
	Y-27240	800 CT	12.8 CT	3.2	.6	.2	.1	3.5	80	1.5	.38	7.9:1	15.8:1
	Y-27245	800 CT	48 CT	12	.6	.2	.1	3.5	80	5.8	1.45	4.08:1	8.16:1
	Y-27250	800 CT	800 CT	200	.6	.2	.1	3.5	80	96	24	1:1	2:1
(1)	Y-27255	900 CT	600 CT	150	.6	.2	.1	3.3	90	72	18	1.22:1	2.45:1
	Y-27260	1000 CT	12 CT	3	.6	.2	.1	3.2	100	1.4	.35	9.13:1	18.3:1
	Y-27265	1000 CT	50 CT	12.5	.6	.2	.1	3.2	100	6	1.5	4.47:1	8.94:1
	Y-27270	1000 CT	1000 CT	250	.6	.2	.1	3.2	100	120	30	1:1	2:1
	Y-27275	1060 CT	12.8 CT	3.2	.6	.2	.1	3.1	106	1.5	.38	9.1:1	18.2:1
(1)	Y-27280	1200 CT	12.8 CT	3.2	.6	.2	.1	2.9	120	1.5	.38	9.68:1	19.4:1
	Y-27285	1200 CT	500 CT	125	.6	.2	.1	2.9	120	60	15	1.55:1	3.1:1
	Y-27290	1200 CT	1200 CT	300	.6	.2	.1	2.9	120	144	36	1:1	2:1
	Y-27295	1200 CT	1200 CT	-	.6	.2	.1	2.9	120	144	-	1:1	-
	Y-27300	1500 CT	12 CT	3	.6	.2	.1	2.6	150	1.44	.36	11.2:1	22.4:1
(1)	Y-27305	1500 CT	500 CT	125	.6	.2	.1	2.6	150	60	15	1.73:1	3.46:1
	Y-27310	1500 CT	600 CT	-	.6	.2	.1	2.6	150	72	-	1.58:1	-
	Y-27315	1500 CT	1500 CT	-	.6	.2	.1	2.6	150	180	-	1:1	-
	Y-27320	1600 CT	12.8 CT	3.2	.6	.2	.1	2.5	160	1.5	.38	11.2:1	22.4:1
	Y-27325	2000 CT	8 CT	2	.6	.2	.1	2.2	200	.96	.24	15.8:1	31.6:1
(1)	Y-27330	2000 CT	2000 CT	500	.6	.2	.1	2.2	200	240	60	1:1	2:1
	Y-27335	2000 CT	2000 CT	-	.6	.2	.1	2.2	200	240	-	1:1	-
	Y-27340	2000 CT	8000 CT	2000	.6	.2	.1	2.2	200	960	240	1:2	1:1
	Y-27345	2500 CT	2500 CT	625	.6	.2	.1	2	250	300	75	1:1	2:1
	Y-27350	3000 CT	3000 CT	725	.6	.2	.1	1.8	300	360	90	1:1	2:1
(1)	Y-27355	3000 CT	3000 CT	-	.6	.2	.1	1.8	300	360	-	1:1	-

SPECIFICATIONS

	Part Number ⁽²⁾	Primary Impedance [Ω]	Secondary Impedance with Split Windings		Power			Primary Unbalanced DC Current [mA]	Primary DCR [Ω]	Secondary DCR		Turns Ratio PRI:SEC	
			Series [Ω]	Parallel [Ω]	1kHz+ [W]	400Hz+ [W]	300Hz+ [W]			Series [Ω]	Parallel [Ω]	Series	Parallel
	Y-27360	3600 CT	3600 CT	900	.6	.2	.1	1.7	360	432	108	1:1	2:1
	Y-27365	4000 CT	16 CT	4	.6	.2	.1	1.6	400	1.92	.48	15.8:1	31.6:1
	Y-27370	4000 CT	600 CT	150	.6	.2	.1	1.6	400	72	18	2.58:1	5.16:1
	Y-27375	4000 CT	1000 CT	250	.6	.2	.1	1.6	400	120	30	2:1	4:1
(1)	Y-27380	4000 CT	8000 CT	-	.6	.2	.1	1.6	400	960	-	1:1.41	-
	Y-27385	5000 CT	500 CT	125	.5	.2	.1	1.4	500	60	15	3.16:1	6.32:1
	Y-27390	5000 CT	5000 CT	1250	.5	.2	.1	1.4	500	600	150	1:1	2:1
	Y-27395	7500 CT	50 CT	12.5	.33	.2	.1	1.2	750	6	1.5	12.2:1	24.5:1
	Y-27400	7500 CT	100 CT	25	.33	.2	.1	1.2	750	12	3	8.66:1	17.3:1
	Y-27405	7500 CT	600 CT	150	.33	.2	.1	1.2	750	72	18	3.54:1	7.07:1
	Y-27410	7500 CT	2500 CT	625	.33	.2	.1	1.2	750	300	75	1.73:1	3.46:1
(1)	Y-27415	7500 CT	7500 CT	-	.33	.2	.1	1.2	750	900	-	1:1	-
	Y-27420	8000 CT	12.8 CT	3.2	.3	.2	.1	1.1	800	1.5	.38	25:1	50:1
	Y-27425	8000 CT	1000 CT	250	.3	.2	.1	1.1	800	120	30	2.83:1	5.66:1
(1)	Y-27430	8000 CT	1200 CT	-	.3	.2	.1	1.1	800	144	-	2.58:1	-
(1)	Y-27435	9000 CT	9000 CT	-	.27	.2	.1	1.1	900	1080	-	1:1	-
	Y-27440	10,000 CT	12.8 CT	3.2	.25	.2	.1	1.0	1000	1.5	.38	28:1	56:1
	Y-27445	10,000 CT	16 CT	4	.25	.2	.1	1.0	1000	1.92	.48	25:1	50:1
	Y-27450	10,000 CT	100 CT	25	.25	.2	.1	1.0	1000	12	3	10:1	20:1
	Y-27455	10,000 CT	200 CT	50	.25	.2	.1	1.0	1000	24	6	7.07:1	14.14:1
	Y-27460	10,000 CT	500 CT	125	.25	.2	.1	1.0	1000	60	15	4.47:1	8.94:1
	Y-27465	10,000 CT	600 CT	150	.25	.2	.1	1.0	1000	72	18	4.08:1	8.16:1
	Y-27470	10,000 CT	1000 CT	250	.25	.2	.1	1.0	1000	120	30	3.16:1	6.32:1
	Y-27475	10,000 CT	1200 CT	300	.25	.2	.1	1.0	1000	144	36	2.89:1	5.77:1
	Y-27480	10,000 CT	1500 CT	375	.25	.2	.1	1.0	1000	180	45	2.58:1	5.16:1
	Y-27485	10,000 CT	2000 CT	500	.25	.2	.1	1.0	1000	240	60	2.24:1	4.47:1
	Y-27490	10,000 CT	5000 CT	1250	.25	.2	.1	1.0	1000	600	150	1.41:1	2.83:1
	Y-27495	10,000 CT	7500 CT	1875	.25	.2	.1	1.0	1000	900	225	1.15:1	2.3:1
	Y-27500	10,000 CT	10,000 CT	2500	.25	.2	.1	1.0	1000	1200	300	1:1	2:1
(1)	Y-27505	10,000 CT	10,000 CT	-	.25	.2	.1	1.0	1000	1200	-	1:1	-
	Y-27510	15,000 CT	400 CT	100	.16	.16	.1	.82	1500	48	12	6.12:1	12.24:1
	Y-27515	15,000 CT	500 CT	125	.16	.16	.1	.82	1500	60	15	5.48:1	10.95:1
	Y-27520	15,000 CT	600 CT	150	.16	.16	.1	.82	1500	72	18	5:1	10:1
	Y-27525	15,000 CT	10,000 CT	2500	.16	.16	.1	.82	1500	1200	300	1.22:1	2.45:1
(1)	Y-27530	15,000 CT	15,000 CT	-	.16	.16	.1	.82	1500	1800	-	1:1	-
	Y-27535	15,000 CT	15,000 CT	3750	.16	.16	.1	.82	1500	1800	450	1:1	2:1

SPECIFICATIONS

Part Number ⁽²⁾	Primary Impedance [Ω]	Secondary Impedance with Split Windings		Power			Primary Unbalanced DC Current [mA]	Primary DCR [Ω]	Secondary DCR		Turns Ratio PRI:SEC	
		Series [Ω]	Parallel [Ω]	1kHz+ [W]	400Hz+ [W]	300Hz+ [W]			Series [Ω]	Parallel [Ω]	Series	Parallel
Y-27540	16,000 CT	1000 CT	250	.15	.15	.1	.8	1600	120	30	4:1	8:1
Y-27545	20,000 CT	500 CT	125	.125	.125	.1	.7	2000	60	15	6.33:1	12.65:1
Y-27550	20,000 CT	600 CT	150	.125	.125	.1	.7	2000	72	18	5.77:1	11.55:1
Y-27555	20,000 CT	800 CT	200	.125	.125	.1	.7	2000	96	24	5:1	10:1
Y-27560	20,000 CT	1000 CT	250	.125	.125	.1	.7	2000	120	30	4.47:1	8.94:1
Y-27565	20,000 CT	5000 CT	1250	.125	.125	.1	.7	2000	600	150	2:1	4:1
Y-27570	20,000 CT	10,000 CT	2500	.125	.125	.1	.7	2000	1200	300	1.41:1	2.83:1
(1) Y-27575	20,000 CT	20,000 CT	-	.125	.125	.1	.7	2000	2400	-	1:1	-
Y-27580	25,000 CT	500 CT	125	.1	.1	.1	.63	2500	60	15	7.07:1	14.14:1
Y-27585	25,000 CT	1000 CT	250	.1	.1	.1	.63	2500	120	30	5:1	10:1
Y-27590	30,000 CT	50 CT	12.5	.08	.08	.08	.58	3000	6	1.5	24.5:1	49:1
Y-27595	30,000 CT	1200 CT	300	.08	.08	.08	.58	3000	144	36	5:1	10:1
Y-27600	30,000 CT	500 CT	125	.08	.08	.08	.58	3000	60	15	7.75:1	15.5:1
Y-27605	30,000 CT	200 CT	50	.08	.08	.08	.58	3000	24	6	12.25:1	24.5:1
Y-27610	30,000 CT	5000 CT	1250	.08	.08	.08	.58	3000	600	150	2.45:1	4.9:1
Y-27615	30,000 CT	10,000 CT	2500	.08	.08	.08	.58	3000	1200	300	1.73:1	3.46:1
(1) Y-27620	30,000 CT	30,000 CT	-	.08	.08	.08	.58	3000	3600	-	1:1	-
Y-27625	40,000 CT	400 CT	100	.06	.06	.06	.5	4000	48	12	10:1	20:1
Y-27630	40,000 CT	2000 CT	500	.06	.06	.06	.5	4000	240	60	4.47:1	8.94:1
Y-27635	40,000 CT	4000 CT	1000	.06	.06	.06	.5	4000	480	120	3.16:1	6.32:1
Y-27640	40,000 CT	20,000 CT	5000	.06	.06	.06	.5	4000	2400	600	1.41:1	2.83:1
(1) Y-27645	40,000 CT	40,000 CT	-	.06	.06	.06	.5	4000	4800	-	1:1	-
Y-27650	50,000 CT	200 CT	50	.05	.05	.05	.45	5000	24	6	15.8:1	31.6:1
Y-27655	50,000 CT	500 CT	125	.05	.05	.05	.45	5000	60	15	10:1	20:1
Y-27660	50,000 CT	600 CT	150	.05	.05	.05	.45	5000	72	18	9.13:1	18.26:1
Y-27665	60,000 CT	15,000 CT	3750	.04	.04	.04	.41	6000	1800	450	2:1	4:1
Y-27670	62,500 CT	50 CT	12.5	.04	.04	.04	.4	6250	6	1.5	35.4:1	70.7:1
Y-27675	80,000 CT	15,000 CT	3750	.03	.03	.03	.35	8000	1800	450	2.3:1	4.6:1
Y-27680	90,000 CT	10,000 CT	2500	.028	.028	.028	.33	9000	1200	300	3:1	6:1
Y-27685	95,000 CT	15,000 CT	3750	.026	.026	.026	.32	9500	1800	450	2.52:1	5.03:1
Y-27690	100,000 CT	60 CT	15	.025	.025	.025	.31	10,000	7.2	1.8	40.8:1	81.6:1
Y-27695	100,000 CT	100 CT	25	.025	.025	.025	.31	10,000	12	3	31.6:1	63.2:1
Y-27700	100,000 CT	500 CT	125	.025	.025	.025	.31	10,000	60	15	14.1:1	28.3:1
Y-27705	100,000 CT	10,000 CT	2500	.025	.025	.025	.31	10,000	1200	300	3.16:1	6.32:1

Note 1: Includes electrostatic shield

Note 2: For RoHS compliance, please consult with Pico's engineer and provide the part number.

SPECIFICATIONS

GENERAL

Parameter	Condition	Min.	Typ.	Max.	Units
Dielectric Strength	60Hz	-	200	-	V _{RMS}
Insulation Resistance	300VDC	10	-	-	GΩ
Distortion	300Hz, 400Hz & 1kHz @ Rated Power	-	-	5	%
Frequency Response	300 - 100kHz @ 1mW	-3	-	3	dB
Operating Temperature Range	Ambient with temperature rise	-55	-	+130	°C
Storage Temperature Range	Ambient	-55	-	+105	°C
Size	Diameter x Height	0.35 x 0.46 (8.89 x 11.684)			inches (mm)
Weight		-	3	-	grams
Case	Epoxy Insulated Metal				
Potting	Vacuum Impregnated Epoxy				
Box Packaging (L x W x H)		10.79 x 2.48 x 0.39 (274.066 x 62.992 x 9.906)			inches (mm)

OPTIONAL DESIGN CRITERIA

Test	Standard	Description
Vibration	MIL-STD-202	Method 204, Vibration, High Frequency
Shock	MIL-STD-202	Method 213, Shock (Specified Pulse)
Immersion	MIL-STD-202	Method 104, Immersion
Moisture Resistance	MIL-STD-202	Method 106, Moisture Resistance
Flammability	MIL-STD-202	Method 111, Flammability (External Flame)
Thermal Shock	MIL-STD-202	Method 107, Thermal Shock

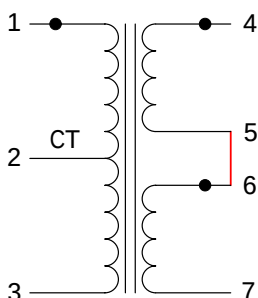
OPTIONAL SCREENING AND QUALIFICATION

Standard	Screening & Qualification	Test ⁽³⁾
MIL-PRF-27	a.) Group A inspection Level-T - Table VII b.) Qualification inspection, Grade 5 - Table V	I. Thermal Shock II. Vibration III. Burn-in IV. Induced Voltage V. Shock VI. Dielectric Withstanding Voltage (at reduced pressure) VII. Insulation Resistance VIII. Electrical Characteristics IX. Visual and Mechanical Examination (External) X. Life XI. Radiographic Inspection
MIL-STD-981	a.) Group A screening tests - Table VI b.) Group B tests - Table XII, Class S	
EEE-INST-002, Section M1	a.) Magnetics Screening Req. - Table 2 b.) Magnetics Part Qual. - Table 3	

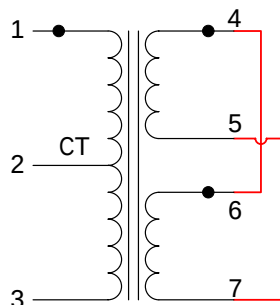
Note 3: Screening and qualification tests are not limited to the options in the chart above. Each standard may also be stringent or exclude certain tests from one another. Please contact Pico for specific application needs and for Pico part number.

ELECTRICAL SCHEMATIC

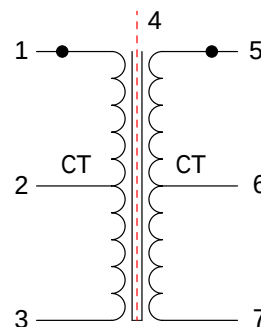
**SPLIT SECONDARIES
SERIES CONNECTION**



**SPLIT SECONDARIES
PARALLEL CONNECTION**

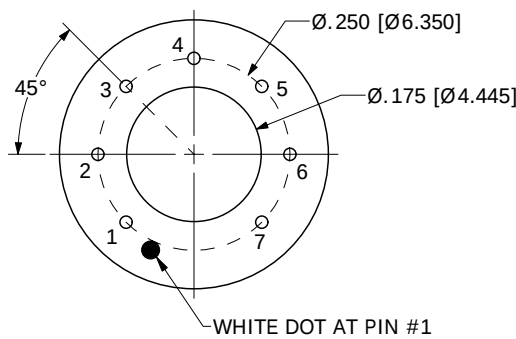
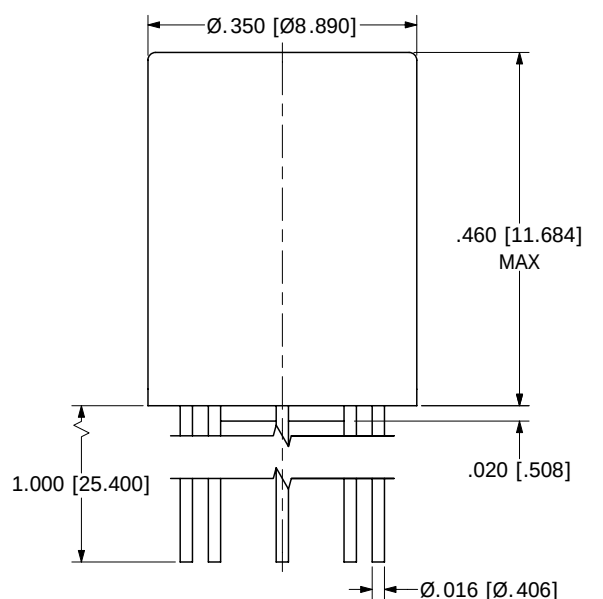


ELECTROSTATIC SHIELD



NOTE: CT STANDS FOR "CENTER-TAP", WHERE THE TOTAL NUMBER OF TURNS IS EVENLY SPLIT BETWEEN THE TOP HALF AND BOTTOM HALF OF A COMPLETE WINDING.

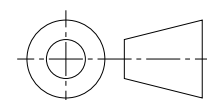
MECHANICAL DRAWINGS



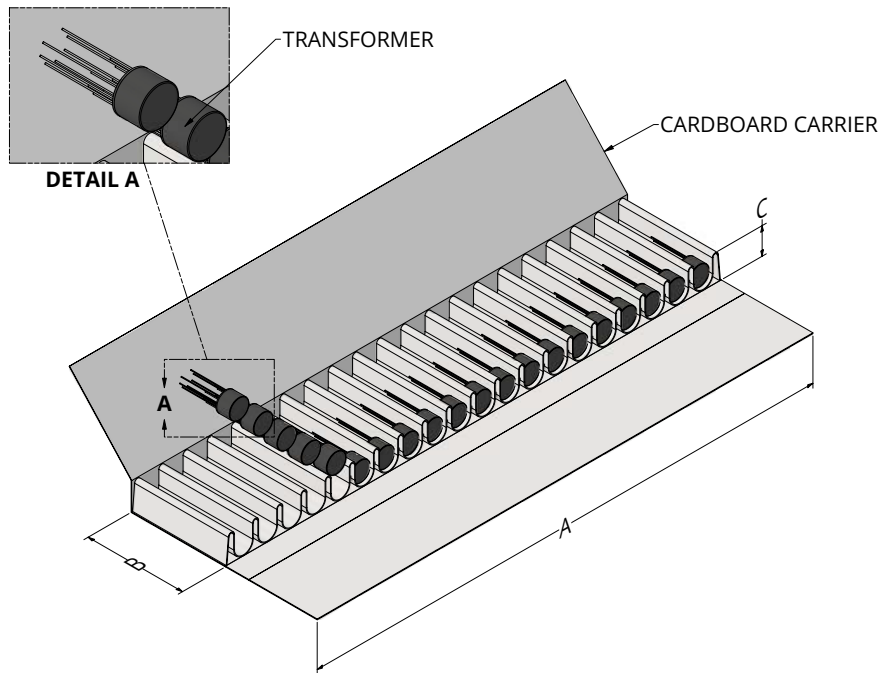
BOTTOM VIEW

NOTES

- ALL DIMENSIONS ARE IN INCHES, [] = MM
- TERMINALS ARE CLOCKWISE FROM PIN #1



BOX PACKAGING



Dimension		
A	B	C
10.79 [274.066]	2.48 [62.992]	0.39 [9.906]

Pico warrants each product manufactured by us and sold by us or an authorized representative, to be free from defects in material and workmanship. If properly used, it will perform within its applicable specifications for a period of one year after original shipment. Pico's obligation under this guarantee is limited to repairing or replacing our product to the original purchaser. This warranty is in lieu of all other warranties, express or implied and constitutes fulfillment of our obligations to the purchaser. We do not guarantee that the products can be used for a particular purpose other than those solely covered by the product's specifications. Pico must be notified if the product must meet particular certifications and/or standards. We assume no liability, in any event, for consequential damages, for anticipated or lost profits, incidental damages or loss of time or other losses incurred by the purchaser or any third party in connection with products covered by this warranty or otherwise. The purchaser will indemnify and hold Pico harmless for any damages, losses, costs, etc. from usage not within the product's specifications. Pico must be consulted before usage of its products in a nuclear, radioactive or space environment.

We reserve the right to discontinue products without notice, We reserve the right to make modifications to any existing catalog products without notice, at any time, without the obligation to modify units previously sold.

L & P · 76000 & CSL Series

2-100kΩ, 300-75kHz, 600mW Max. @ 1kHz+ Audio Transformer

PICO
Electronics, Inc.

PRODUCT OVERVIEW

The L & P and 76000 & CSL series are ultra-miniature transformers in an encapsulated package with design layouts as through-hole, insulated leads, or surface mount types. They can operate over a wide temperature range of -55°C to +130°C. Our proprietary materials and methods allow extreme temperatures of vapor phase, IR or other reflow procedures without degrading the high reliability of their physical form and electrical performance.

Typical applications:

- Sensors
- Radars
- Avionic flight controls
- Airborne systems
- Naval electronics
- Military, aerospace, or commercial aircraft

FEATURES

- Extreme resistance to impact, shock, and vibration
- Manufactured to MIL-PRF-27, Class S, Grade 5
- High reliability for space and mission critical applications
- Ultra miniature in size and minimalistic design
- Design layouts in through-hole with insulated leads option or surface mount types in round/square packages
- Available with magnetic shielding and/or electrostatic shielding
- Certain parts are QPL approved

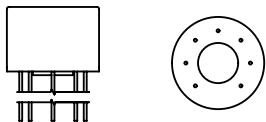
Contact Pico for part number of available options:

- Screening and qualification criteria to flight standard
- Capability to thermal shock up to 300 cycles
- Extra layers of magnetic shielding
- Fully RoHS compliant or with exemption 7(a)
- Modifications to mechanical design and electrical characteristics
- Custom new design and parameters

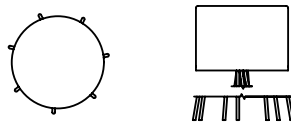


SPECIFICATIONS

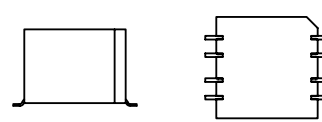
L SERIES (STRAIGHT LEADS)



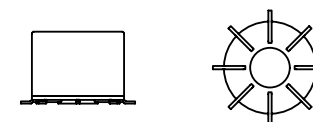
P SERIES (INSULATED LEADS)



76000 SERIES (SQUARE SURFACE MOUNT)



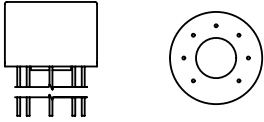
CSL SERIES (ROUND SURFACE MOUNT)



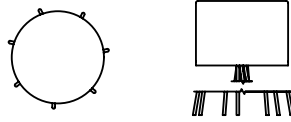
Through Hole ⁽²⁾		Surface Mount ⁽³⁾		Primary Impedance [Ω]	Secondary Impedance with Split Windings		Power			Primary Unbalanced DC Current [mA]	Primary DCR [Ω]	Secondary DCR		Turns Ratio PRI:SEC	
Straight	Insulated	Square	Round		Series [Ω]	Parallel [Ω]	1kHz+ [W]	400Hz+ [W]	300Hz+ [W]			Series [Ω]	Parallel [Ω]	Series	Parallel
L-8203	P-9203	76203	CSL203	20 CT	8 CT	2	.6	.4	.3	30.0	2	1.2	.3	1.58:1	3.16:1
L-8205	P-9205	76205	CSL205	20 CT	20 CT	5	.6	.4	.3	30.0	2	2.8	.7	1:1	2:1
L-8210	P-9210	76210	CSL210	32 CT	32 CT	8	.6	.4	.3	23.0	3.3	4.5	1.13	1:1	2:1
L-8215	P-9215	76215	CSL215	40 CT	40 CT	10	.6	.4	.3	21.0	3.7	5	1.25	1:1	2:1
L-8218	P-9218	76218	CSL218	48 CT	16 CT	4	.6	.4	.3	19.0	3.75	3	.75	1.73:1	3.46:1
L-8220	P-9220	76220	CSL220	50 CT	50 CT	12.5	.6	.4	.3	19.0	5	7	1.75	1:1	2:1
L-8225	P-9225	76225	CSL225	80 CT	32 CT	8	.6	.4	.3	15.0	7.5	4.3	1.13	1.58:1	3.16:1
L-8228	P-9228	76228	CSL228	100 CT	40 CT	10	.6	.4	.3	13.0	10.8	5	1.25	1.58:1	3.16:1
L-8230	P-9230	76230	CSL230	100 CT	100 CT	25	.6	.4	.3	13.0	10.8	12	3	1:1	2:1
L-8235	P-9235	76235	CSL235	120 CT	12.8 CT	3.2	.6	.4	.3	12.0	9.3	2.2	.55	3.06:1	6.12:1
L-8240	P-9240	76240	CSL240	120 CT	60 CT	15	.6	.4	.3	12.0	9	7.2	1.8	1.41:1	2.83:1
L-8245	P-9245	76245	CSL245	120 CT	120 CT	30	.6	.4	.3	12.0	11.6	13	3.3	1:1	2:1
L-8250	P-9250	76250	CSL250	150 CT	12 CT	3	.6	.4	.3	11.0	11.2	2.2	.55	3.54:1	7.08:1
L-8255	P-9255	76255	CSL255	150 CT	50 CT	12.5	.6	.4	.3	11.0	13	6.8	1.7	1.73:1	3.46:1
L-8260	P-9260	76260	CSL260	150 CT	100 CT	25	.6	.4	.3	11.0	13	11.8	3	1.22:1	2.45:1
L-8265	P-9265	76265	CSL265	150 CT	150 CT	37.5	.6	.4	.3	11.0	12	18.3	4.6	1:1	2:1
L-8270	P-9270	76270	CSL270	150 CT	600 CT	150	.6	.4	.3	11.0	13	75	19	1:2	1:1
L-8275	P-9275	76275	CSL275	200 CT	200 CT	50	.6	.4	.3	10.0	19	21.3	5.4	1:1	2:1
L-8280	P-9280	76280	CSL280	300 CT	12 CT	3	.6	.4	.3	8.0	24	1.7	.43	5:1	10:1
L-8285	P-9285	76285	CSL285	300 CT	50 CT	12.5	.6	.4	.3	8.0	30	6.8	1.7	2.45:1	4.9:1
L-8290	P-9290	76290	CSL290	300 CT	150 CT	37.5	.6	.4	.3	8.0	30	18	4.6	1.41:1	2.83:1
L-8295	P-9295	76295	CSL295	300 CT	300 CT	75	.6	.4	.3	8.0	30	34	8.5	1:1	2:1
L-8300	P-9300	76300	CSL300	300 CT	600 CT	150	.6	.4	.3	8.0	30	60	15	1:1.41	1.41:1
L-8305	P-9305	76305	CSL305	320 CT	12.8 CT	3.2	.6	.4	.3	7.5	31	1.7	.43	5:1	10:1

SPECIFICATIONS

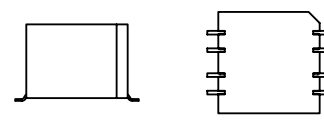
L SERIES (STRAIGHT LEADS)



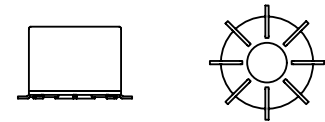
P SERIES (INSULATED LEADS)



76000 SERIES (SQUARE SURFACE MOUNT)



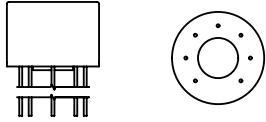
CSL SERIES (ROUND SURFACE MOUNT)



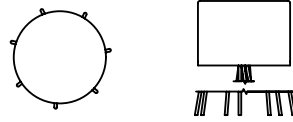
Through Hole ⁽²⁾		Surface Mount ⁽³⁾		Primary Impedance [Ω]	Secondary Impedance with Split Windings		Power			Primary Unbalanced DC Current [mA]	Primary DCR [Ω]	Secondary DCR		Turns Ratio PRI:SEC	
Straight	Insulated	Square	Round		Series [Ω]	Parallel [Ω]	1kHz+ [W]	400Hz+ [W]	300Hz+ [W]			Series [Ω]	Parallel [Ω]	Series	Parallel
L-8310	P-9203	76310	CSL310	400 CT	40 CT	10	.6	.4	.3	7.0	41	4.5	1.13	3.16:1	6.32:1
L-8315	P-9205	76315	CSL315	400 CT	120 CT	30	.6	.4	.3	7.0	41	12	3	1.83:1	3.65:1
L-8320	P-9210	76320	CSL320	400 CT	200 CT	50	.6	.4	.3	7.0	41	21.3	5.4	1.41:1	2.83:1
L-8325	P-9215	76325	CSL325	400 CT	400 CT	100	.6	.4	.3	7.0	41	37.5	9.4	1:1	2:1
L-8330	P-9218	76330	CSL330	400 CT	1000 CT	250	.6	.4	.3	7.0	41	96	24	1:1.58	1.26:1
L-8335	P-9220	76335	CSL335	400 CT	2000 CT	500	.6	.4	.3	7.0	41	212	53	1:2.24	1:1.12
L-8340	P-9225	76340	CSL340	400 CT	4000 CT	1000	.6	.4	.3	7.0	41	375	94	1:3.16	1:1.58
L-8342	P-9228	76342	CSL342	500 CT	12.8 CT	3.2	.6	.4	.3	6.0	48	1.7	.43	6.25:1	12.5:1
L-8344	P-9230	76344	CSL344	500 CT	16 CT	4	.6	.4	.3	6.0	48	1.9	.5	5.6:1	11.2:1
L-8345	P-9235	76345	CSL345	500 CT	50 CT	12.5	.6	.4	.3	6.0	39	6.8	1.7	3.16:1	6.32:1
L-8347	P-9240	76347	CSL347	500 CT	150 CT	37.5	.6	.4	.3	6.0	48	18	4.6	1.83:1	3.65:1
L-8350	P-9245	76350	CSL350	500 CT	500 CT	125	.6	.4	.3	6.0	48	54	13.5	1:1	2:1
(1) L-8355	P-9250	76355	CSL355	500 CT	500 CT	-	.6	.4	.3	6.0	48	68	-	1:1	-
L-8360	P-9255	76360	CSL360	500 CT	600 CT	150	.6	.4	.3	6.0	48	59	15	1:1.1	1.83:1
L-8365	P-9260	76365	CSL365	600 CT	12.8 CT	3.2	.6	.4	.3	5.5	53	1.7	.43	6.85:1	13.7:1
L-8367	P-9265	76367	CSL367	600 CT	30 CT	7.5	.6	.4	.3	5.5	53	4.2	1.1	4.47:1	8.94:1
L-8370	P-9270	76370	CSL370	600 CT	48 CT	12	.6	.4	.3	5.5	53	6.8	1.7	3.54:1	7.07:1
L-8375	P-9275	76375	CSL375	600 CT	200 CT	50	.6	.4	.3	5.5	53	21.3	5.3	1.73:1	3.46:1
L-8380	P-9280	76380	CSL380	600 CT	600 CT	150	.6	.4	.3	5.5	57	79	20	1:1	2:1
(1) L-8385	P-9285	76385	CSL385	600 CT	600 CT	-	.6	.4	.3	5.5	53	75	-	1:1	-
L-8387	P-9290	76387	CSL387	600 CT	1200 CT	300	.6	.4	.3	5.5	53	105	26	1:1.41	1.41:1
L-8390	P-9295	76390	CSL390	640 CT	12.8 CT	3.2	.6	.4	.3	5.5	66	1.7	.43	7.07:1	14.14:1
L-8395	P-9300	76395	CSL395	700 CT	100 CT	25	.6	.4	.3	5.0	69	12	3	2.65:1	5.29:1
L-8400	P-9305	76400	CSL400	800 CT	12.8 CT	3.2	.6	.4	.3	5.0	75	1.7	.43	7.9:1	15.8:1

SPECIFICATIONS

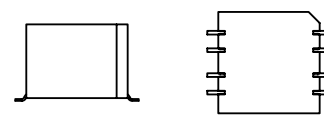
L SERIES (STRAIGHT LEADS)



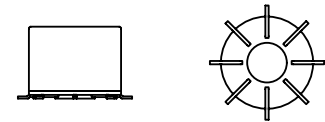
P SERIES (INSULATED LEADS)



76000 SERIES (SQUARE SURFACE MOUNT)



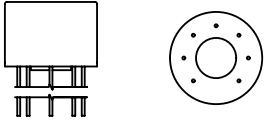
CSL SERIES (ROUND SURFACE MOUNT)



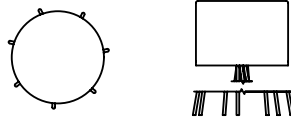
	Through Hole ⁽²⁾		Surface Mount ⁽³⁾		Primary Impedance [Ω]	Secondary Impedance with Split Windings		Power			Primary Unbalanced DC Current [mA]	Primary DCR [Ω]	Secondary DCR		Turns Ratio PRI:SEC	
	Straight	Insulated	Square	Round		Series [Ω]	Parallel [Ω]	1kHz+ [W]	400Hz+ [W]	300Hz+ [W]			Series [Ω]	Parallel [Ω]	Series	Parallel
	L-8405	P-9405	76405	CSL405	800 CT	48 CT	12	.6	.4	.3	5.0	75	6.8	1.7	4.08:1	8.16:1
	L-8410	P-9410	76410	CSL410	800 CT	800 CT	200	.6	.4	.3	5.0	75	105	26	1:1	2:1
	L-8415	P-9415	76415	CSL415	900 CT	600 CT	150	.6	.4	.3	4.5	79	75	19	1.22:1	2.45:1
	L-8420	P-9420	76420	CSL420	1000 CT	12 CT	3	.6	.4	.3	4.5	103	1.6	.4	9.13:1	18.3:1
	L-8425	P-9425	76425	CSL425	1000 CT	50 CT	12.5	.6	.4	.3	4.5	103	6.4	1.6	4.47:1	8.94:1
	L-8430	P-9430	76430	CSL430	1000 CT	1000 CT	250	.6	.4	.3	4.5	103	115	28	1:1	2:1
	L-8435	P-9435	76435	CSL435	1060 CT	12.8 CT	3.2	.6	.4	.3	4.0	108	1.7	.43	9.1:1	18.2:1
	L-8440	P-9440	76440	CSL440	1200 CT	12.8 CT	3.2	.6	.4	.3	4.0	113	1.7	.43	9.68:1	19.4:1
	L-8445	P-9445	76445	CSL445	1200 CT	500 CT	125	.6	.4	.3	4.0	113	54	13.5	1.55:1	3.1:1
	L-8450	P-9450	76450	CSL450	1200 CT	1200 CT	300	.6	.4	.3	4.0	113	126	31.6	1:1	2:1
(1)	L-8455	P-9455	76455	CSL455	1200 CT	1200 CT	-	.6	.4	.3	4.0	111	125	-	1:1	-
	L-8460	P-9460	76460	CSL460	1500 CT	12 CT	3	.6	.4	.3	3.5	126	1.6	.4	11.2:1	22.4:1
	L-8465	P-9465	76465	CSL465	1500 CT	500 CT	125	.6	.4	.3	3.5	126	68	17	1.73:1	3.46:1
(1)	L-8470	P-9470	76470	CSL470	1500 CT	600 CT	-	.6	.4	.3	3.5	126	94	-	1.58:1	-
(1)	L-8475	P-9475	76475	CSL475	1500 CT	1500 CT	-	.6	.4	.3	3.5	126	176	-	1:1	-
	L-8480	P-9480	76480	CSL480	1600 CT	12.8 CT	3.2	.6	.4	.3	3.5	130	1.7	.43	11.2:1	22.4:1
	L-8483	P-9483	76483	CSL483	2000 CT	8 CT	2	.6	.4	.3	3.0	210	1.2	.3	15.8:1	31.6:1
	L-8485	P-9485	76485	CSL485	2000 CT	2000 CT	500	.6	.4	.3	3.0	198	218	55	1:1	2:1
(1)	L-8490	P-9490	76490	CSL490	2000 CT	2000 CT	-	.6	.4	.3	3.0	198	218	-	1:1	-
	L-8495	P-9495	76495	CSL495	2000 CT	8000 CT	2000	.6	.4	.3	3.0	198	850	213	1:2	1:1
	L-8497	P-9497	76497	CSL497	2500 CT	2500 CT	625	.6	.4	.3	2.5	220	305	76	1:1	2:1
	L-8500	P-9500	76500	CSL500	3000 CT	3000 CT	750	.6	.4	.3	2.5	243	335	84	1:1	2:1
(1)	L-8505	P-9505	76505	CSL505	3000 CT	3000 CT	-	.6	.4	.3	2.5	304	335	-	1:1	-
	L-8510	P-9510	76510	CSL510	3600 CT	3600 CT	900	.6	.4	.3	2.5	330	366	92	1:1	2:1

SPECIFICATIONS

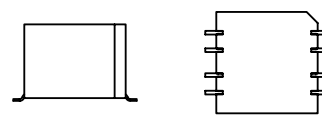
L SERIES (STRAIGHT LEADS)



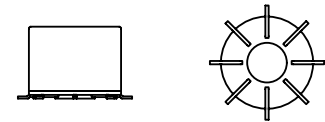
P SERIES (INSULATED LEADS)



76000 SERIES (SQUARE SURFACE MOUNT)



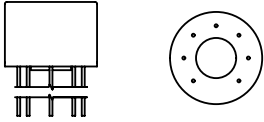
CSL SERIES (ROUND SURFACE MOUNT)



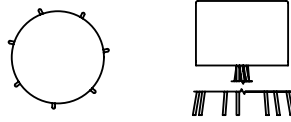
	Through Hole ⁽²⁾		Surface Mount ⁽³⁾		Primary Impedance [Ω]	Secondary Impedance with Split Windings		Power			Primary Unbalanced DC Current [mA]	Primary DCR [Ω]	Secondary DCR		Turns Ratio PRI:SEC	
	Straight	Insulated	Square	Round		Series [Ω]	Parallel [Ω]	1kHz+ [W]	400Hz+ [W]	300Hz+ [W]			Series [Ω]	Parallel [Ω]	Series	Parallel
	L-8512	P-9512	76512	CSL512	4000 CT	16 CT	4	.6	.4	.3	2.0	350	3	.75	15.8:1	31.6:1
	L-8514	P-9514	76514	CSL514	4000 CT	600 CT	150	.6	.4	.3	2.0	350	76	19	2.58:1	5.16:1
	L-8515	P-9515	76515	CSL515	4000 CT	1000 CT	250	.6	.4	.3	2.0	350	115	29	2:1	4:1
(1)	L-8520	P-9520	76520	CSL520	4000 CT	8000 CT	-	.6	.4	.3	2.0	350	1062	-	1:1.41	-
	L-8525	P-9525	76525	CSL525	5000 CT	500 CT	125	.6	.4	.3	2.0	350	67	17	3.16:1	6.32:1
	L-8530	P-9530	76530	CSL530	5000 CT	5000 CT	1250	.6	.4	.3	2.0	390	538	135	1:1	2:1
	L-8535	P-9535	76535	CSL535	7500 CT	50 CT	12.5	.6	.4	.3	1.5	600	7	1.75	12.2:1	24.5:1
	L-8540	P-9540	76540	CSL540	7500 CT	100 CT	25	.6	.4	.3	1.5	600	12	3	8.66:1	17.3:1
	L-8545	P-9545	76545	CSL545	7500 CT	600 CT	150	.6	.4	.3	1.5	600	78	19.5	3.54:1	7.07:1
	L-8550	P-9550	76550	CSL550	7500 CT	2500 CT	625	.6	.4	.3	1.5	600	305	77	1.73:1	3.46:1
(1)	L-8555	P-9555	76555	CSL555	7500 CT	7500 CT	-	.6	.4	.3	1.5	750	828	-	1:1	-
	L-8560	P-9560	76560	CSL560	8000 CT	12.8 CT	3.2	.6	.4	.3	1.5	750	1.7	.43	25:1	50:1
	L-8565	P-9565	76565	CSL565	8000 CT	1000 CT	250	.6	.4	.3	1.5	750	115	29	2.83:1	5.66:1
(1)	L-8570	P-9570	76570	CSL570	8000 CT	1200 CT	-	.6	.4	.3	1.5	750	158	-	2.58:1	-
(1)	L-8575	P-9575	76575	CSL575	9000 CT	9000 CT	-	.6	.4	.3	1.4	796	1100	-	1:1	-
	L-8580	P-9580	76580	CSL580	10,000 CT	12.8 CT	3.2	.6	.4	.3	1.4	1048	1.7	.43	28:1	56:1
	L-8585	P-9585	76585	CSL585	10,000 CT	16 CT	4	.6	.4	.3	1.4	1048	3	.75	25:1	50:1
	L-8590	P-9590	76590	CSL590	10,000 CT	100 CT	25	.6	.4	.3	1.4	839	12	3	10:1	20:1
	L-8595	P-9595	76595	CSL595	10,000 CT	200 CT	50	.6	.4	.3	1.4	839	27	6.7	7.07:1	14.14:1
	L-8600	P-9600	76600	CSL600	10,000 CT	500 CT	125	.6	.4	.3	1.4	850	67	17	4.47:1	8.94:1
	L-8605	P-9605	76605	CSL605	10,000 CT	600 CT	150	.6	.4	.3	1.4	850	74	18.5	4.08:1	8.16:1
	L-8610	P-9610	76610	CSL610	10,000 CT	1000 CT	250	.6	.4	.3	1.4	850	115	29	3.16:1	6.32:1
	L-8615	P-9615	76615	CSL615	10,000 CT	1200 CT	300	.6	.4	.3	1.4	850	158	39.5	2.89:1	5.77:1
	L-8620	P-9620	76620	CSL620	10,000 CT	1500 CT	375	.6	.4	.3	1.4	850	177	44	2.58:1	5.16:1

SPECIFICATIONS

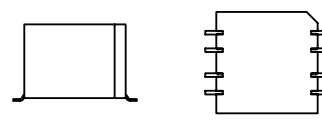
L SERIES (STRAIGHT LEADS)



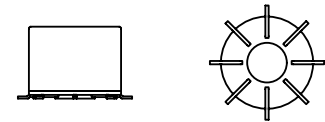
P SERIES (INSULATED LEADS)



76000 SERIES (SQUARE SURFACE MOUNT)



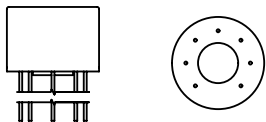
CSL SERIES (ROUND SURFACE MOUNT)



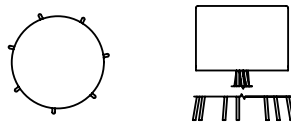
	Through Hole ⁽²⁾		Surface Mount ⁽³⁾		Primary Impedance [Ω]	Secondary Impedance with Split Windings		Power			Primary Unbalanced DC Current [mA]	Primary DCR [Ω]	Secondary DCR		Turns Ratio PRI:SEC	
	Straight	Insulated	Square	Round		Series [Ω]	Parallel [Ω]	1kHz+ [W]	400Hz+ [W]	300Hz+ [W]			Series [Ω]	Parallel [Ω]	Series	Parallel
	L-8625	P-9625	76625	CSL625	10,000 CT	2000 CT	500	.6	.4	.3	1.4	850	255	64	2.24:1	4.47:1
	L-8630	P-9630	76630	CSL630	10,000 CT	5000 CT	1250	.6	.4	.3	1.4	850	630	158	1.41:1	2.83:1
	L-8635	P-9635	76635	CSL635	10,000 CT	7500 CT	1875	.6	.4	.3	1.4	850	772	193	1.15:1	2.3:1
	L-8640	P-9640	76640	CSL640	10,000 CT	10,000 CT	2500	.6	.4	.3	1.4	866	1215	304	1:1	2:1
(1)	L-8645	P-9645	76645	CSL645	10,000 CT	10,000 CT	-	.6	.4	.3	1.4	1060	1215	-	1:1	-
	L-8650	P-9650	76650	CSL650	15,000 CT	400 CT	100	.6	.4	.3	1.0	1305	47	12	6.12:1	12.24:1
	L-8652	P-9652	76652	CSL652	15,000 CT	500 CT	125	.6	.4	.3	1.0	1305	53	13	5.48:1	10.95:1
	L-8655	P-9655	76655	CSL655	15,000 CT	600 CT	150	.6	.4	.3	1.0	1305	72.5	18	5:1	10:1
	L-8660	P-9660	76660	CSL660	15,000 CT	10,000 CT	2500	.6	.4	.3	1.0	1305	1215	304	1.22:1	2.45:1
(1)	L-8665	P-9665	76665	CSL665	15,000 CT	15,000 CT	-	.6	.4	.3	1.0	1305	1800	-	1:1	-
	L-8670	P-9670	76670	CSL670	15,000 CT	15,000 CT	3750	.6	.4	.3	1.0	1305	1800	450	1:1	2:1
	L-8675	P-9675	76675	CSL675	16,000 CT	1000 CT	250	.6	.4	.3	1.0	1343	115	29	4:1	8:1
	L-8680	P-9680	76680	CSL680	20,000 CT	500 CT	125	.5	.4	.3	1.0	1560	68	17	6.33:1	12.65:1
	L-8685	P-9685	76685	CSL685	20,000 CT	600 CT	150	.5	.4	.3	1.0	1560	75	19	5.77:1	11.55:1
	L-8690	P-9690	76690	CSL690	20,000 CT	800 CT	200	.5	.4	.3	1.0	1560	108	27	5:1	10:1
	L-8695	P-9695	76695	CSL695	20,000 CT	1000 CT	250	.5	.4	.3	1.0	1560	121	30.5	4.47:1	8.94:1
	L-8700	P-9700	76700	CSL700	20,000 CT	5000 CT	1250	.5	.4	.3	1.0	1560	672	168	2:1	4:1
	L-8705	P-9705	76705	CSL705	20,000 CT	10,000 CT	2500	.5	.4	.3	1.0	1560	1520	380	1.41:1	2.83:1
(1)	L-8710	P-9710	76710	CSL710	20,000 CT	20,000 CT	-	.5	.4	.3	1.0	1560	2727	682	1:1	-
	L-8715	P-9715	76715	CSL715	25,000 CT	500 CT	125	.4	.4	.3	0.8	2170	68	17	7.07:1	14.14:1
	L-8720	P-9720	76720	CSL720	25,000 CT	1000 CT	250	.4	.4	.3	0.8	2170	120	30	5:1	10:1
	L-8725	P-9725	76725	CSL725	30,000 CT	50 CT	12.5	.33	.33	.3	0.8	2400	7	1.75	24.5:1	49:1
	L-8730	P-9730	76730	CSL730	30,000 CT	1200 CT	300	.33	.33	.3	0.8	2400	156	39	5:1	10:1
	L-8732	P-9732	76732	CSL732	30,000 CT	500 CT	125	.33	.33	.3	0.8	2400	68	17	7.75:1	15.5:1

SPECIFICATIONS

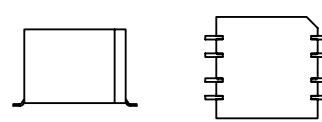
L SERIES (STRAIGHT LEADS)



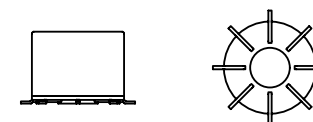
P SERIES (INSULATED LEADS)



76000 SERIES (SQUARE SURFACE MOUNT)



CSL SERIES (ROUND SURFACE MOUNT)



	Through Hole ⁽²⁾		Surface Mount ⁽³⁾		Primary Impedance [Ω]	Secondary Impedance with Split Windings		Power			Primary Unbalanced DC Current [mA]	Primary DCR [Ω]	Secondary DCR		Turns Ratio PRI:SEC	
	Straight	Insulated	Square	Round		Series [Ω]	Parallel [Ω]	1kHz+ [W]	400Hz+ [W]	300Hz+ [W]			Series [Ω]	Parallel [Ω]	Series	Parallel
	L-8734	P-9734	76734	CSL734	30,000 CT	200 CT	50	.33	.33	.3	0.8	2400	29	7.2	12.25:1	24.5:1
	L-8735	P-9735	76735	CSL735	30,000 CT	5000 CT	1250	.33	.33	.3	0.8	2400	673	169	2.45:1	4.9:1
	L-8740	P-9740	76740	CSL740	30,000 CT	10,000 CT	2500	.33	.33	.3	0.8	2400	1520	380	1.73:1	3.46:1
(1)	L-8745	P-9745	76745	CSL745	30,000 CT	30,000 CT	-	.33	.33	.3	0.8	3000	3310	-	1:1	-
	L-8750	P-9750	76750	CSL750	40,000 CT	400 CT	100	.25	.25	.25	0.7	3400	57	14.3	10:1	20:1
	L-8755	P-9755	76755	CSL755	40,000 CT	2000 CT	500	.25	.25	.25	0.7	3400	268	67	4.47:1	8.94:1
	L-8760	P-9760	76760	CSL760	40,000 CT	4000 CT	1000	.25	.25	.25	0.7	3400	476	119	3.16:1	6.32:1
	L-8765	P-9765	76765	CSL765	40,000 CT	20,000 CT	5000	.25	.25	.25	0.7	3400	2700	675	1.41:1	2.83:1
(1)	L-8770	P-9770	76770	CSL770	40,000 CT	40,000 CT	-	.25	.25	.25	0.7	3400	4750	-	1:1	-
	L-8775	P-9775	76775	CSL775	50,000 CT	200 CT	50	.2	.2	.2	0.6	4850	27	6.7	15.8:1	31.6:1
	L-8777	P-9777	76777	CSL777	50,000 CT	500 CT	125	.2	.2	.2	0.6	4850	68	17	10:1	20:1
	L-8779	P-9779	76779	CSL779	50,000 CT	600 CT	150	.2	.2	.2	0.6	4850	75	18.5	9.13:1	18.26:1
	L-8780	P-9780	76780	CSL780	60,000 CT	15,000 CT	3750	.16	.16	.16	0.5	5275	2250	563	2:1	4:1
	L-8785	P-9785	76785	CSL785	62,500 CT	50 CT	12.5	.16	.16	.16	0.5	5445	8.7	2.2	35.4:1	70.7:1
	L-8787	P-9787	76787	CSL787	80,000 CT	15,000 CT	3750	.12	.12	.12	0.4	6130	2250	563	2.3:1	4.6:1
	L-8790	P-9790	76790	CSL790	90,000 CT	10,000 CT	2500	.1	.1	.1	0.4	8140	1520	380	3:1	6:1
	L-8795	P-9795	76795	CSL795	95,000 CT	15,000 CT	3750	.1	.1	.1	0.4	8400	2250	563	2.52:1	5.03:1
	L-8800	P-9800	76800	CSL800	100,000 CT	60 CT	15	.1	.1	.1	0.4	8750	9.2	2.3	40.8:1	81.6:1
	L-8805	P-9805	76805	CSL805	100,000 CT	100 CT	25	.1	.1	.1	0.4	8750	15	3.8	31.6:1	63.2:1
	L-8810	P-9810	76810	CSL810	100,000 CT	500 CT	125	.1	.1	.1	0.4	8750	68	17	14.1:1	28.3:1
	L-8815	P-9815	76815	CSL815	100,000 CT	10,000 CT	2500	.1	.1	.1	0.4	8750	1535	385	3.16:1	6.32:1

Note 1: Includes electrostatic shield.

Note 2: For RoHS compliance on a through-hole component, please consult with Pico's engineer and provide the part number.

Note 3: All SMDs are available with Pb-free dipped terminals that is compliant to RoHS exemption 7 by requesting part number + 'RoHS-7'

SPECIFICATIONS

GENERAL

Parameter	Condition	Min.	Typ.	Max.	Units
Dielectric Strength	60Hz	-	200	-	V _{RMS}
Insulation Resistance	300VDC	10	-	-	GΩ
Distortion	400, 1kHz @ Rated Power	-	-	5	%
Frequency Response	300 - 75 kHz @ 1mW	-3	-	3	dB
Operating Temperature Range	Ambient with temperature rise	-55	-	+130	°C
Storage Temperature Range	Ambient	-55	-	+105	°C
Size	P Series - Diameter x Height	0.5 x 0.35 (12.7 x 8.89)			inches (mm)
	L Series - Diameter x Height	0.5 x 0.35 (12.7 x 8.89)			
	CSL Series - Diameter x Height	0.5 x 0.39 (12.7 x 9.906)			
	76000 Series - Length x Width x Height	0.55 x 0.55 x 0.415 (13.97 x 13.97 x 10.541)			
Weight	P, L, CSL & 76000 Series	-	5	-	grams
Case	L, P & CSL Series	Epoxy Insulated Metal			
	76000 Series	Glass Reinforced Polymer			
Potting	Vacuum Impregnated Epoxy				
Box Packaging (L x W x H)	L & P Series	10.5 x 6.42 x 0.79 (266.7 x 163.068 x 20.066)			inches (mm)
Tube Packaging (W x H x L)	76000 & CSL Series	0.93 x 0.58 x 20.0 (23.724 x 14.732 x 508)			
Tape & Reel Packaging	Upon request				
Moisture Sensitivity Level	Surface Mount only		Level 3		

OPTIONAL DESIGN CRITERIA

Test	Standard	Description
Vibration	MIL-STD-202	Method 204, Vibration, High Frequency
Shock	MIL-STD-202	Method 213, Shock (Specified Pulse)
Immersion	MIL-STD-202	Method 104, Immersion
Moisture Resistance	MIL-STD-202	Method 106, Moisture Resistance
Flammability	MIL-STD-202	Method 111, Flammability (External Flame)
Thermal Shock	MIL-STD-202	Method 107, Thermal Shock

OPTIONAL SCREENING AND QUALIFICATION

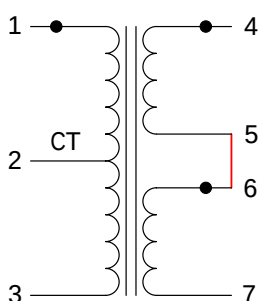
Standard	Screening & Qualification	Test ⁽⁴⁾
MIL-PRF-27	a.) Group A inspection Level-T - Table VII b.) Qualification inspection, Grade 5 - Table V	I. Thermal Shock II. Vibration III. Burn-in IV. Induced Voltage V. Shock VI. Dielectric Withstanding Voltage (at reduced pressure) VII. Insulation Resistance VIII. Electrical Characteristics IX. Visual and Mechanical Examination (External) X. Life XI. Radiographic Inspection
MIL-STD-981	a.) Group A screening tests - Table VI b.) Group B tests - Table XII, Class S	
EEE-INST-002, Section M1	a.) Magnetics Screening Req. - Table 2 b.) Magnetics Part Qual. - Table 3	

Note 4: Screening and qualification tests are not limited to the options in the chart above. Each standard may also be stringent or exclude certain tests from one another. Please contact Pico for specific application needs and for Pico part number.

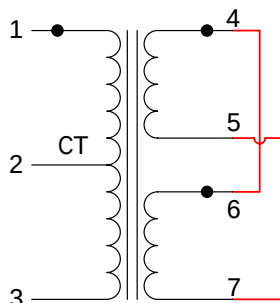
ELECTRICAL SCHEMATIC

L SERIES - THROUGH HOLE

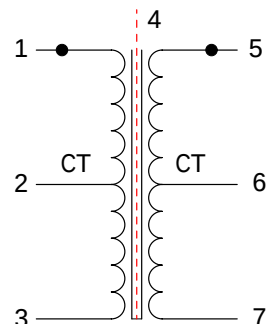
**SPLIT SECONDARIES
SERIES CONNECTION**



**SPLIT SECONDARIES
PARALLEL CONNECTION**

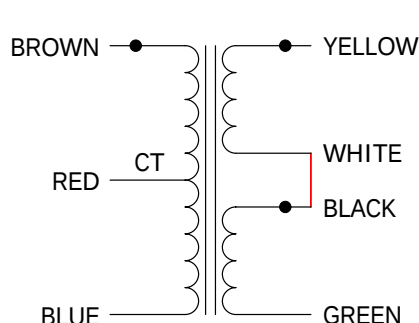


ELECTROSTATIC SHIELD

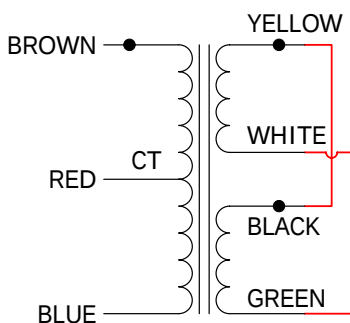


P SERIES - INSULATED LEADS

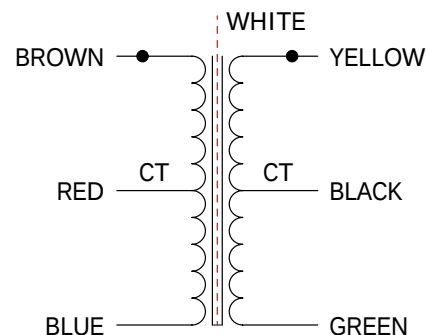
**SPLIT SECONDARIES
SERIES CONNECTION**



**SPLIT SECONDARIES
PARALLEL CONNECTION**

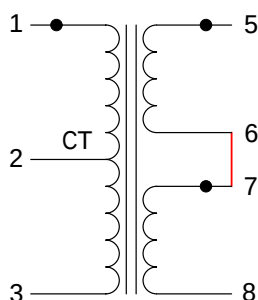


ELECTROSTATIC SHIELD

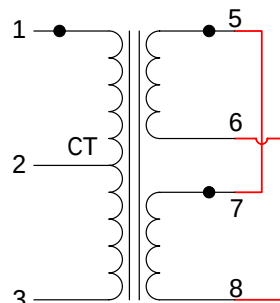


76000 & CSL SERIES - SURFACE MOUNT

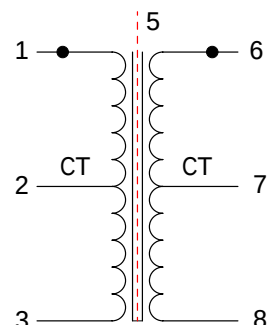
**SPLIT SECONDARIES
SERIES CONNECTION**



**SPLIT SECONDARIES
PARALLEL CONNECTION**



ELECTROSTATIC SHIELD

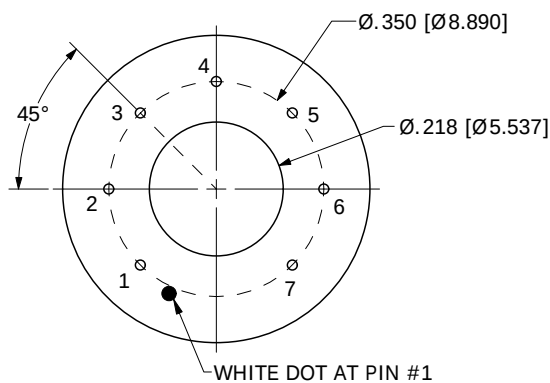
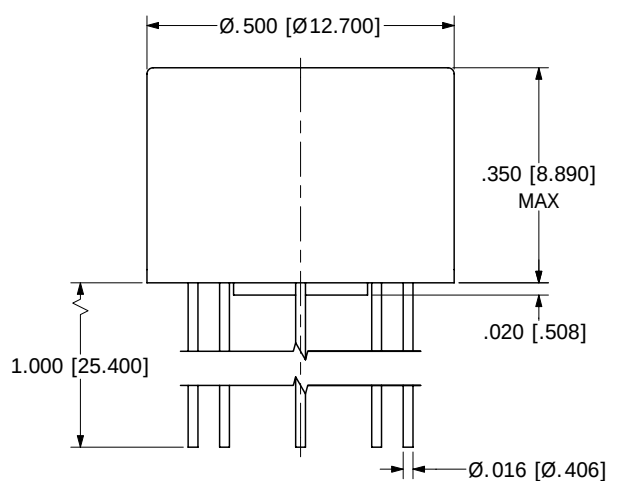


NOTES

- ANY TERMINALS NOT SHOWN HERE MAY BE USED FOR MECHANICAL STABILITY ON THE PCB ONLY, AS THEY DO NOT HAVE ANY ELECTRICAL CONNECTION.
- CT STANDS FOR "CENTER-TAP", WHERE THE TOTAL NUMBER OF TURNS IS EVENLY SPLIT BETWEEN THE TOP HALF AND BOTTOM HALF OF A COMPLETE WINDING.

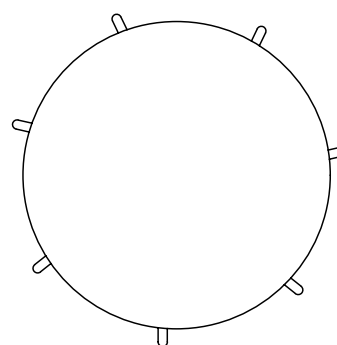
MECHANICAL DRAWINGS

L SERIES - THROUGH HOLE

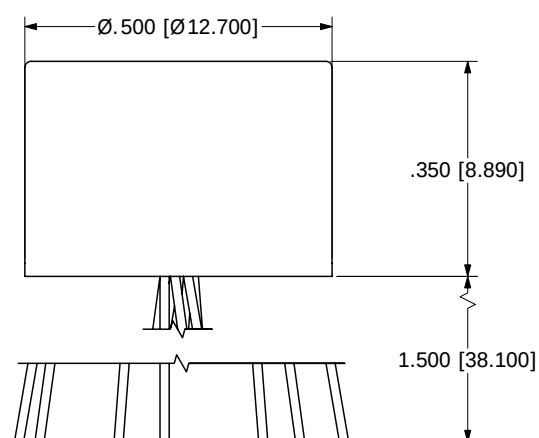


BOTTOM VIEW

P SERIES - INSULATED LEADS

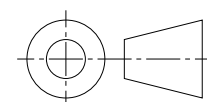


TOP VIEW



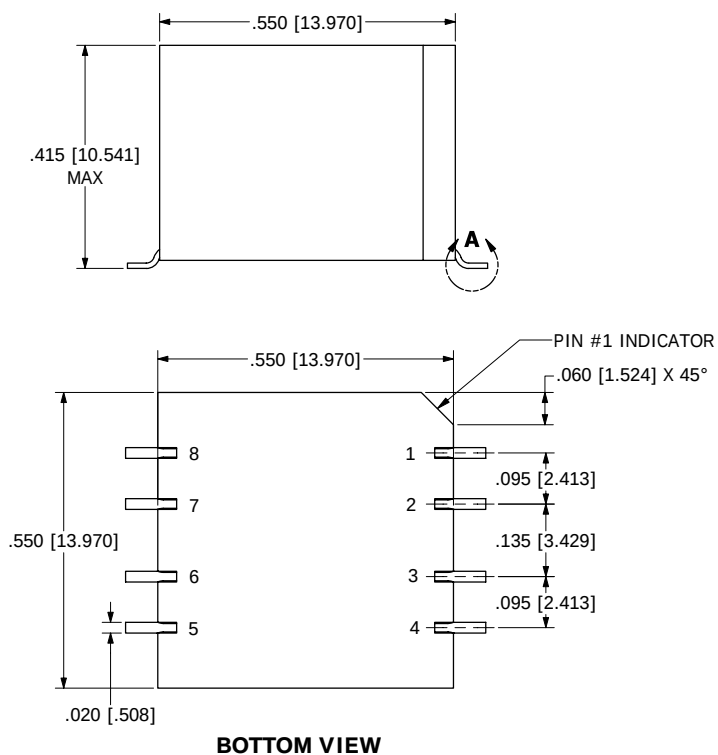
NOTES

- ALL DIMENSIONS ARE IN INCHES, [] = MM
- TERMINALS ARE CLOCKWISE FROM PIN #1

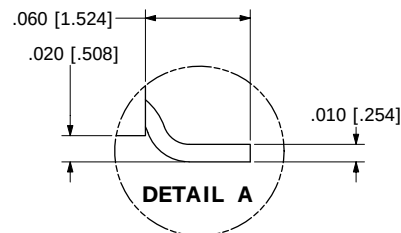


MECHANICAL DRAWINGS

76000 SERIES - SQUARE SURFACE MOUNT



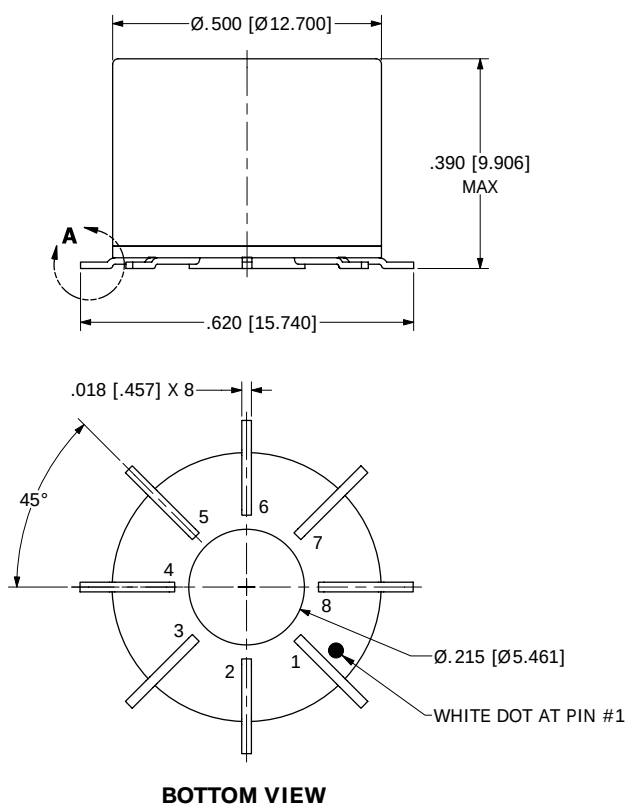
LEAD DETAILS



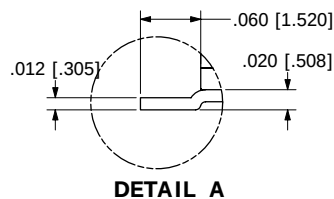
NOTES

- a. ALL DIMENSIONS ARE IN INCHES, [] = MM
- b. TERMINALS ARE CLOCKWISE FROM PIN #1
- c. PIN #4 HAS NO CONNECTION

CSL SERIES - ROUND SURFACE MOUNT

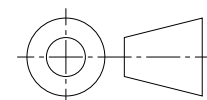


LEAD DETAILS



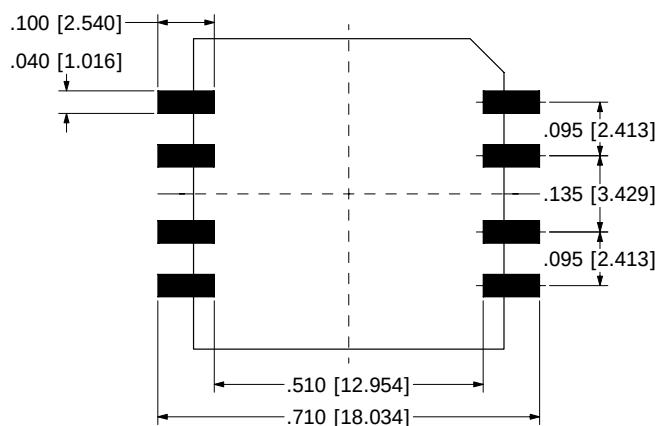
NOTES

- a. ALL DIMENSIONS ARE IN INCHES, [] = MM
- b. TERMINALS ARE CLOCKWISE FROM PIN #1
- c. PIN #4 HAS NO CONNECTION

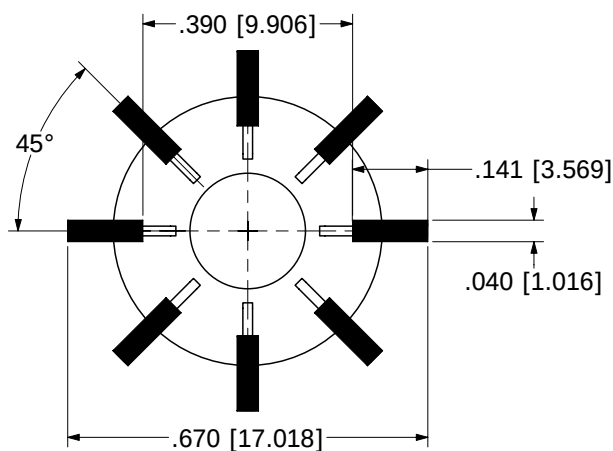


RECOMMENDED LAND PATTERN DIMENSIONS

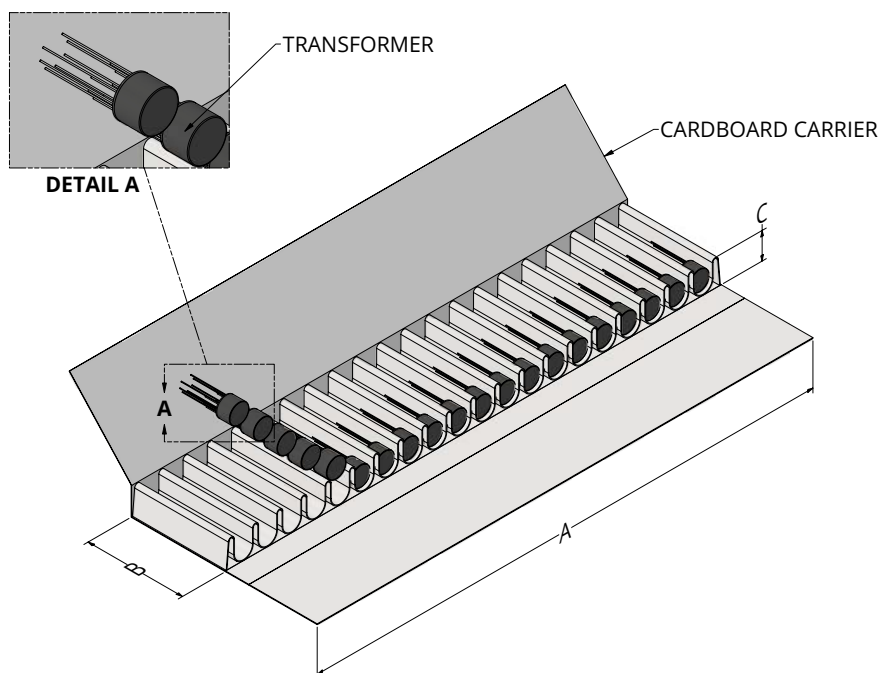
SERIES 76000 - SQUARE SURFACE MOUNT



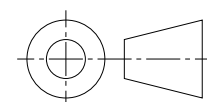
SERIES CSL - ROUND SURFACE MOUNT



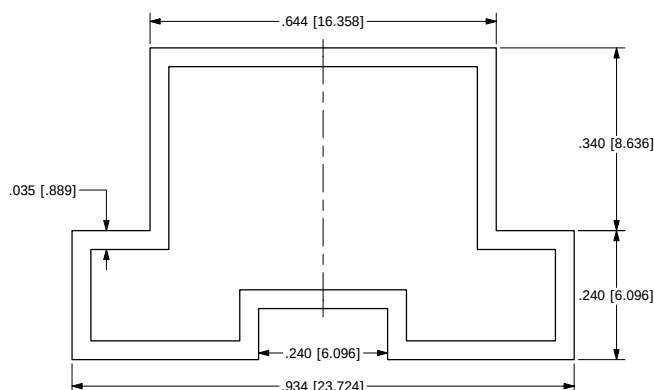
BOX PACKAGING - L & P SERIES



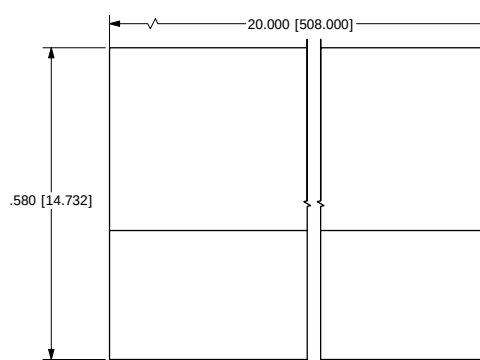
Dimension		
A	B	C
10.5 [266.7]	6.42 [163.068]	0.79 [20.066]



TUBE PACKAGING - 76000 & CSL SERIES

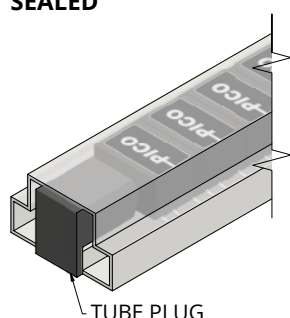


PLAN VIEW

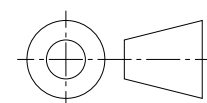
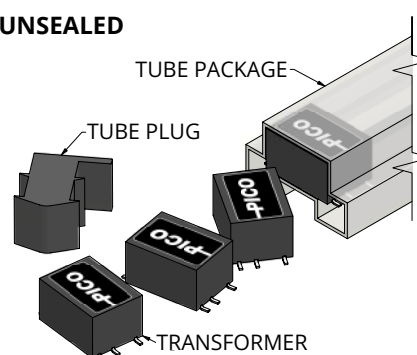


ELEVATION VIEW

SEALED



UNSEALED



Pico warrants each product manufactured by us and sold by us or an authorized representative, to be free from defects in material and workmanship. If properly used, it will perform within its applicable specifications for a period of one year after original shipment. Pico's obligation under this guarantee is limited to repairing or replacing our product to the original purchaser. This warranty is in lieu of all other warranties, express or implied and constitutes fulfillment of our obligations to the purchaser. We do not guarantee that the products can be used for a particular purpose other than those solely covered by the product's specifications. Pico must be notified if the product must meet particular certifications and/or standards. We assume no liability, in any event, for consequential damages, for anticipated or lost profits, incidental damages or loss of time or other losses incurred by the purchaser or any third party in connection with products covered by this warranty or otherwise. The purchaser will indemnify and hold Pico harmless for any damages, losses, costs, etc. from usage not within the product's specifications. Pico must be consulted before usage of its products in a nuclear, radioactive or space environment.

We reserve the right to discontinue products without notice, We reserve the right to make modifications to any existing catalog products without notice, at any time, without the obligation to modify units previously sold.

78000 Series

2-10k Ω , 300-200kHz, 400mW Max. @ 1kHz+ Low Profile Audio Transformer

PICO
Electronics, Inc.

PRODUCT OVERVIEW

The 78000 series are ultra-miniature transformers in an encapsulated package with design layout as surface mount gull-wing leads. They can operate over a wide temperature range of -55°C to +130°C. Our proprietary materials and methods allow extreme temperatures of vapor phase, IR or other reflow procedures without degrading the high reliability of their physical form and electrical performance.

Typical applications:

- Sensors
- Radars
- Avionic flight controls
- Airborne systems
- Naval electronics
- Military, aerospace, or commercial aircraft

FEATURES

- Extreme resistance to impact, shock, and vibration
- Manufactured to MIL-PRF-27, Class S, Grade 5
- High reliability for space and mission critical applications
- Ultra miniature in size and minimalistic design
- Design layout in surface mount
- Available with magnetic shielding and/or electrostatic shielding

Contact Pico for part number of available options:

- Screening and qualification criteria to flight standard
- Capability to thermal shock up to 300 cycles
- Extra layers of magnetic shielding
- Fully RoHS compliant or with exemption 7(a)
- Modifications to mechanical design and electrical characteristics
- Custom new design and parameters



SPECIFICATIONS

Part Number ⁽²⁾	Primary Impedance [Ω]	Secondary Impedance with Split Windings		Power		Primary Unbalanced DC Current [mA]	Primary DCR [Ω]	Secondary DCR		Turns Ratio PRI:SEC	
		Series [Ω]	Parallel [Ω]	1kHz+ [W]	300Hz+ [W]			Series [Ω]	Parallel [Ω]	Series	Parallel
78003	10 CT	10 CT	2.5	.4	.050	31.6	.83	1.16	.29	1:1	2:1
78005	20 CT	8 CT	2	.4	.050	22.3	1.66	.93	.23	1.58:1	3.16:1
78010	20 CT	20 CT	5	.4	.050	22.3	1.66	2.33	.58	1:1	2:1
78015	32 CT	32 CT	8	.4	.050	17.6	2.66	3.73	.93	1:1	2:1
78020	40 CT	40 CT	10	.4	.050	15.8	3.33	4.66	1.16	1:1	2:1
78025	48 CT	16 CT	4	.4	.050	14.4	4	1.86	.46	1.73:1	3.46:1
78030	50 CT	50 CT	12.5	.4	.050	14.1	4.16	5.8	1.45	1:1	2:1
78035	80 CT	32 CT	8	.4	.050	11.1	6.66	3.73	.93	1.58:1	3.16:1
78040	100 CT	40 CT	10	.4	.050	10	8.33	4.66	1.16	1.58:1	3.16:1
78045	100 CT	100 CT	25	.4	.050	10	8.33	11.6	2.91	1:1	2:1
78050	120 CT	12.8 CT	3.2	.4	.050	9.1	10	1.49	.37	3.06:1	6.12:1
78055	120 CT	60 CT	15	.4	.050	9.1	10	7	1.75	1.41:1	2.83:1
78060	120 CT	120 CT	30	.4	.050	9.1	10	14	3.5	1:1	2:1
78065	150 CT	12 CT	3	.4	.050	8.2	12.5	1.4	.35	3.54:1	7.08:1
78070	150 CT	50 CT	12.5	.4	.050	8.2	12.5	5.8	1.45	1.73:1	3.46:1
78075	150 CT	100 CT	25	.4	.050	8.2	12.5	11.6	2.91	1.22:1	2.45:1
78080	150 CT	150 CT	37.5	.4	.050	8.2	12.5	17.5	4.37	1:1	2:1
78085	150 CT	600 CT	150	.4	.050	8.2	12.5	70	17.5	1:2	1:1
78090	200 CT	200 CT	50	.4	.050	7	16.6	23.3	5.83	1:1	2:1
78095	300 CT	12 CT	3	.4	.050	5.8	25	1.4	.35	5:1	10:1
78100	300 CT	50 CT	12.5	.4	.050	5.8	25	5.8	1.45	2.45:1	4.9:1
78105	300 CT	150 CT	37.5	.4	.050	5.8	25	17.5	4.37	1.41:1	2.83:1
78110	300 CT	300 CT	75	.4	.050	5.8	25	35	8.75	1:1	2:1
78115	300 CT	600 CT	150	.4	.050	5.8	25	70	17.5	1:1.41	1.41:1
78120	320 CT	12.8 CT	3.2	.4	.050	5.6	26.6	1.49	.37	5:1	10:1
78125	400 CT	40 CT	10	.4	.050	5	33.3	4.66	1.16	3.16:1	6.32:1
78130	400 CT	120 CT	30	.4	.050	5	33.3	14	3.5	1.83:1	3.65:1
78135	400 CT	200 CT	50	.4	.050	5	33.3	23.3	5.83	1.41:1	2.83:1
78140	400 CT	400 CT	100	.4	.050	5	33.3	46.6	11.66	1:1	2:1
78145	400 CT	1000 CT	250	.4	.050	5	33.3	116.6	29.16	1:1.58	1.26:1
78150	400 CT	2000 CT	500	.4	.050	5	33.3	233.3	58.3	1:2.24	1:1.12
78155	400 CT	4000 CT	1000	.4	.050	5	33.3	466.6	116.6	1:3.16	1:1.58
78160	500 CT	12.8 CT	3.2	.4	.050	4.5	41.6	1.49	.37	6.25:1	12.5:1
78165	500 CT	16 CT	4	.4	.050	4.5	41.6	1.86	.46	5.6:1	11.2:1
78170	500 CT	50 CT	12.5	.4	.050	4.5	41.6	5.83	1.45	3.16:1	6.32:1

SPECIFICATIONS

Part Number ⁽²⁾	Primary Impedance [Ω]	Secondary Impedance with Split Windings		Power		Primary Unbalanced DC Current [mA]	Primary DCR [Ω]	Secondary DCR		Turns Ratio PRI:SEC	
		Series [Ω]	Parallel [Ω]	1kHz+ [W]	300Hz+ [W]			Series [Ω]	Parallel [Ω]	Series	Parallel
78175	500 CT	150 CT	37.5	.4	.050	4.5	41.6	17.5	4.37	1.83:1	3.65:1
78180	500 CT	500 CT	125	.4	.050	4.5	41.6	58.3	14.58	1:1	2:1
(1) 78185	500 CT	500 CT	-	.4	.050	4.5	41.6	58.3	14.58	1:1	-
78190	500 CT	600 CT	150	.4	.050	4.5	41.6	70	17.5	1:1.1	1.83:1
78195	600 CT	12.8 CT	3.2	.4	.050	4.1	50	1.49	.37	6.85:1	13.7:1
78200	600 CT	30 CT	7.5	.4	.050	4.1	50	3.5	.875	4.47:1	8.94:1
78205	600 CT	48 CT	12	.4	.050	4.1	50	5.6	1.4	3.54:1	7.07:1
78210	600 CT	200 CT	50	.4	.050	4.1	50	23.3	5.83	1.73:1	3.46:1
78215	600 CT	600 CT	150	.4	.050	4.1	50	70	17.5	1:1	2:1
(1) 78220	600 CT	600 CT	-	.4	.050	4.1	50	70	17.5	1:1	-
78225	600 CT	1200 CT	300	.4	.050	4.1	50	140	35	1:1.41	1.41:1
78230	640 CT	12.8 CT	3.2	.4	.050	3.9	53.3	1.49	.37	7.07:1	14.4:1
78235	700 CT	100 CT	25	.4	.050	3.8	58.3	11.6	2.91	2.65:1	5.29:1
78240	800 CT	12.8 CT	3.2	.4	.050	3.5	66.6	1.49	.37	7.9:1	15.8:1
78245	800 CT	48 CT	12	.4	.050	3.5	66.6	5.6	1.4	4.08:1	8.16:1
78250	800 CT	800 CT	200	.4	.050	3.5	66.6	93.3	23.3	1:1	2:1
78255	900 CT	600 CT	150	.4	.050	3.3	75	70	17.5	1.22:1	2.45:1
78260	1000 CT	12 CT	3	.4	.050	3.2	83.3	1.4	.35	9.13:1	18.3:1
78265	1000 CT	50 CT	12.5	.4	.050	3.2	83.3	5.83	1.45	4.47:1	8.94:1
78270	1000 CT	1000 CT	250	.4	.050	3.2	83.3	116.6	29.15	1:1	2:1
78275	1060 CT	12.8 CT	3.2	.4	.050	3.1	88.3	1.49	.37	9.1:1	18.2:1
78280	1200 CT	12.8 CT	3.2	.4	.050	2.9	100	1.49	.37	9.68:1	19.4:1
78285	1200 CT	500 CT	125	.4	.050	2.9	100	58.3	14.58	1.55:1	3.1:1
78290	1200 CT	1200 CT	300	.4	.050	2.9	100	140	35	1:1	2:1
(1) 78295	1200 CT	1200 CT	-	.4	.050	2.9	100	140	35	1:1	-
78300	1500 CT	12 CT	3	.4	.050	2.6	125	1.4	.35	11.2:1	22.4:1
78305	1500 CT	500 CT	125	.4	.050	2.6	125	58.3	14.58	1.73:1	3.46:1
(1) 78310	1500 CT	600 CT	-	.4	.050	2.6	125	70	17.5	1.58:1	-
(1) 78315	1500 CT	1500 CT	-	.4	.050	2.6	125	175	43.75	1:1	-
78320	1600 CT	12.8 CT	3.2	.4	.050	2.5	133.3	1.49	.37	11.2:1	22.4:1
78325	2000 CT	8 CT	2	.4	.050	2.2	166.6	.93	.23	15.8:1	31.6:1
78330	2000 CT	2000 CT	500	.4	.050	2.2	166.6	233.3	58.33	1:1	2:1
(1) 78335	2000 CT	2000 CT	-	.4	.050	2.2	166.6	233.3	58.33	1:1	-
78340	2000 CT	8000 CT	2000	.4	.050	2.0	166.6	933.3	233.3	1:2	1:1
78345	2000 CT	2500 CT	625	.4	.050	1.8	166.6	291.6	72.4	1:1	2:1

SPECIFICATIONS

	Part Number ⁽²⁾	Primary Impedance [Ω]	Secondary Impedance with Split Windings		Power		Primary Unbalanced DC Current [mA]	Primary DCR [Ω]	Secondary DCR		Turns Ratio PRI:SEC	
			Series [Ω]	Parallel [Ω]	1kHz+ [W]	300Hz+ [W]			Series [Ω]	Parallel [Ω]	Series	Parallel
(1)	78350	3000 CT	3000 CT	725	.4	.050	1.8	250	350	87.5	1:1	2:1
	78355	3000 CT	3000 CT	-	.4	.050	1.7	250	350	87.5	1:1	-
	78360	3600 CT	3600 CT	900	.4	.050	1.6	300	420	105	1:1	2:1
	78365	4000 CT	16 CT	4	.4	.050	1.6	333.3	1.86	.46	15.8:1	31.6:1
(1)	78370	4000 CT	600 CT	150	.4	.050	1.6	333.3	70	17.5	2.58:1	5.16:1
	78375	4000 CT	1000 CT	250	.4	.050	1.6	333.3	116.6	29.16	2:1	4:1
	78380	4000 CT	8000 CT	-	.4	.050	1.4	333.3	933.3	233.3	1:1.41	-
	78385	5000 CT	500 CT	125	.4	.050	1.4	416.6	58.3	14.58	3.16:1	6.32:1
(1)	78390	5000 CT	5000 CT	1250	.4	.050	1.2	416.6	583.3	145.8	1:1	2:1
	78395	7500 CT	50 CT	12.5	.4	.050	1.2	625	5.83	1.45	12.2:1	24.5:1
	78400	7500 CT	100 CT	25	.4	.050	1.2	625	11.66	2.91	8.66:1	17.3:1
	78405	7500 CT	600 CT	150	.4	.050	1.2	625	70	17.5	3.54:1	7.07:1
(1)	78410	7500 CT	2500 CT	625	.4	.050	1.2	625	291.6	72.9	1.73:1	3.46:1
	78415	7500 CT	7500 CT	-	.4	.050	1.1	625	875	218.75	1:1	-
	78420	8000 CT	12.8 CT	3.2	.4	.050	1.1	666.6	1.49	.37	25:1	50:1
	78425	8000 CT	1000 CT	250	.4	.050	1.1	666.6	116.6	29.16	2.83:1	5.66:1
(1)	78430	8000 CT	1200 CT	-	.4	.050	1.1	666.6	140	35	2.58:1	-
(1)	78435	9000 CT	9000 CT	-	.4	.050	1.0	750	1.050	262.5	1:1	-
(1)	78440	10,000 CT	12.8 CT	3.2	.4	.050	1.0	833	1.49	.37	28:1	56:1
	78445	10,000 CT	16 CT	4	.4	.050	1.0	833	1.86	.46	25:1	50:1
	78450	10,000 CT	100 CT	25	.4	.050	1.0	833	11.66	2.91	10:1	20:1
	78455	10,000 CT	200 CT	50	.4	.050	1.0	833	23.3	5.83	7.07:1	14.14:1
(1)	78460	10,000 CT	500 CT	125	.4	.050	1.0	833	58.3	14.58	4.47:1	8.94:1
	78465	10,000 CT	600 CT	150	.4	.050	1.0	833	70	17.5	4.08:1	8.16:1
	78470	10,000 CT	1000 CT	250	.4	.050	1.0	833	116.6	29.16	3.16:1	6.32:1
	78475	10,000 CT	1200 CT	300	.4	.050	1.0	833	140	35	2.89:1	5.77:1
(1)	78480	10,000 CT	1500 CT	375	.4	.050	1.0	833	175	43.75	2.58:1	5.16:1
	78485	10,000 CT	2000 CT	500	.4	.050	1.0	833	233.33	58.33	2.24:1	4.47:1
	78490	10,000 CT	5000 CT	1250	.4	.050	1.0	833	583.3	145.83	1.41:1	2.83:1
	78495	10,000 CT	7500 CT	1875	.4	.050	1.0	833	875	218.75	1.15:1	2.3:1
(1)	78500	10,000 CT	10,000 CT	2500	.4	.050	1.0	833	1166.6	291.6	1:1	2:1
	78505	10,000 CT	10,000 CT	-	.4	.050	1.0	833	1166.6	291.6	1:1	-

Note 1: Includes electrostatic shield.

Note 2: Parts are available with Pb-free dipped terminals that is compliant to RoHS exemption 7 by requesting part number + '-RoHS-7'

SPECIFICATIONS**GENERAL**

Parameter	Condition	Min.	Typ.	Max.	Units
Dielectric Strength	60Hz	-	200	-	V _{RMS}
Insulation Resistance	300VDC	10	-	-	GΩ
Distortion	1kHz @ Rated Power	-	-	5	%
Frequency Response	300 - 200kHz @ 1mW	-3	-	3	dB
Operating Temperature Range	Ambient with temperature rise	-55	-	+130	°C
Storage Temperature Range	Ambient	-55	-	+105	°C
Size	Width x Length x Height	0.55 x 0.55 x 0.24 (13.97 x 13.97 x 6.096)			inches (mm)
Weight		-	3	-	grams
Case	Glass Reinforced Polymer				
Potting	Vacuum Impregnated Epoxy				
Tube Packaging	Width x Height x Length	0.93 x 0.40 x 20.0 (23.734 x 10.16 x 508)			inches (mm)
Tape & Reel Packaging	Upon request				
Moisture Sensitivity Level	Surface mount only	Level 3			

OPTIONAL DESIGN CRITERIA

Test	Standard	Description
Vibration	MIL-STD-202	Method 204, Vibration, High Frequency
Shock	MIL-STD-202	Method 213, Shock (Specified Pulse)
Immersion	MIL-STD-202	Method 104, Immersion
Moisture Resistance	MIL-STD-202	Method 106, Moisture Resistance
Flammability	MIL-STD-202	Method 111, Flammability (External Flame)
Thermal Shock	MIL-STD-202	Method 107, Thermal Shock

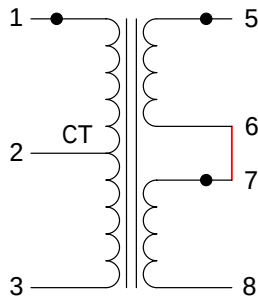
OPTIONAL SCREENING AND QUALIFICATION

Standard	Screening & Qualification	Test ⁽³⁾
MIL-PRF-27	a.) Group A inspection Level-T - Table VII b.) Qualification inspection, Grade 5 - Table V	I. Thermal Shock II. Vibration III. Burn-in IV. Induced Voltage V. Shock VI. Dielectric Withstanding Voltage (at reduced pressure) VII. Insulation Resistance VIII. Electrical Characteristics IX. Visual and Mechanical Examination (External) X. Life XI. Radiographic Inspection
MIL-STD-981	a.) Group A screening tests - Table VI b.) Group B tests - Table XII, Class S	
EEE-INST-002, Section M1	a.) Magnetism Screening Req. - Table 2 b.) Magnetism Part Qual. - Table 3	

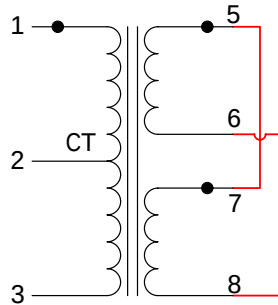
Note 3: Screening and qualification tests are not limited to the options in the chart above. Each standard may also be stringent or exclude certain tests from one another. Please contact Pico for specific application needs and for Pico part number.

ELECTRICAL SCHEMATIC

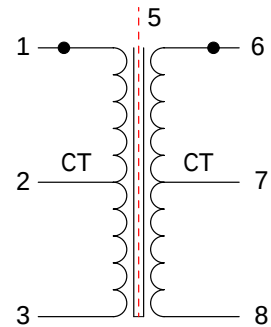
SPLIT SECONDARIES SERIES CONNECTION



SPLIT SECONDARIES PARALLEL CONNECTION



ELECTROSTATIC SHIELD

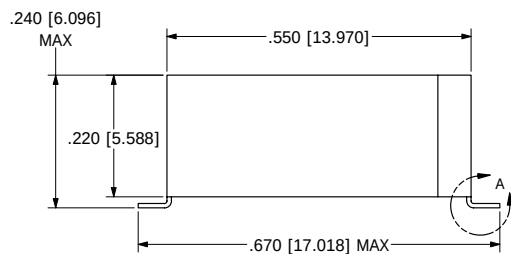


NOTES

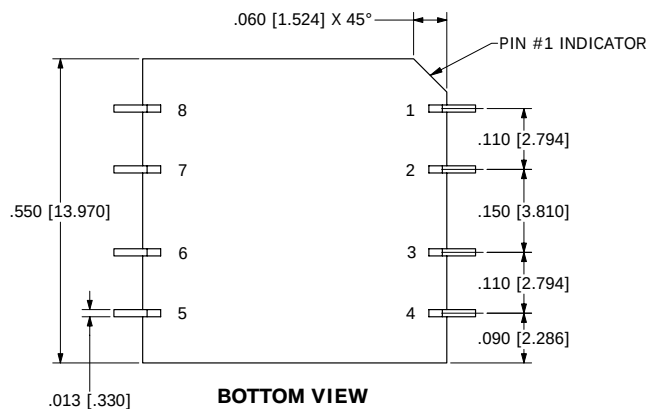
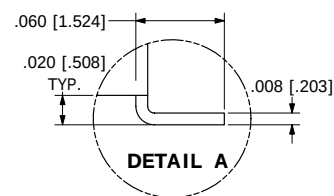
a. TERMINAL 4 HAS NO CONNECTION. MECHANICAL STABILITY ONLY.

b. CT STANDS FOR "CENTER-TAP", WHERE THE TOTAL NUMBER OF TURNS IS EVENLY SPLIT BETWEEN THE TOP HALF AND BOTTOM HALF OF A COMPLETE WINDING.

MECHANICAL DRAWINGS



LEAD DETAILS

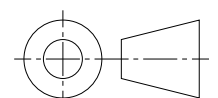


NOTES

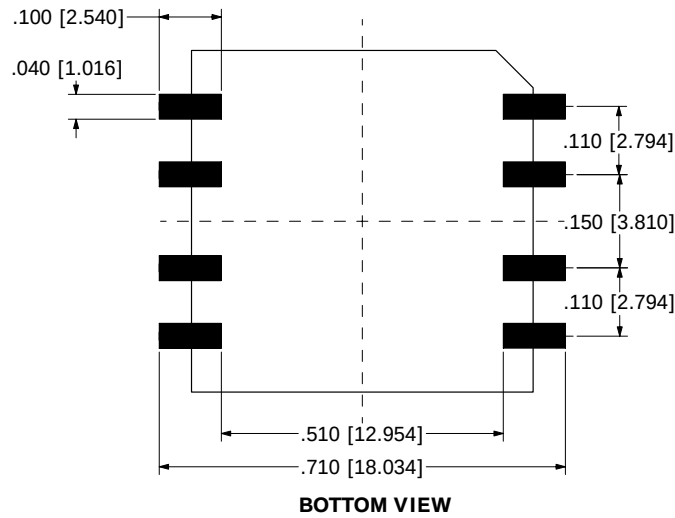
a. ALL DIMENSIONS ARE IN INCHES, [] = MM

b. TERMINALS ARE CLOCKWISE FROM PIN #1

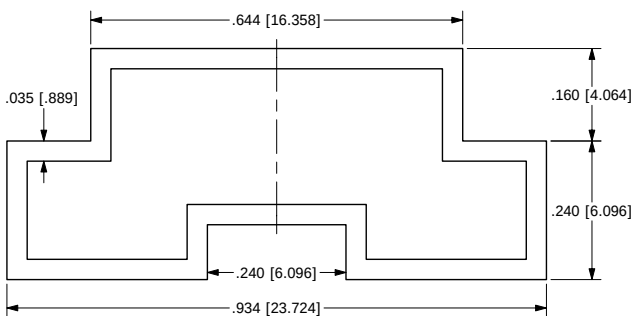
c. PIN #4 HAS NO CONNECTION



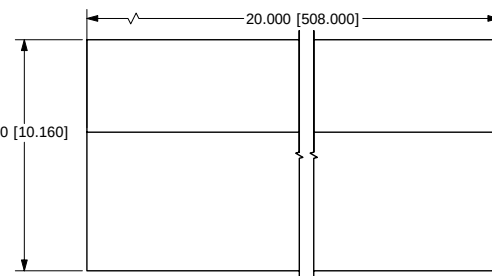
RECOMMENDED LAND PATTERN DIMENSIONS



TUBE PACKAGING

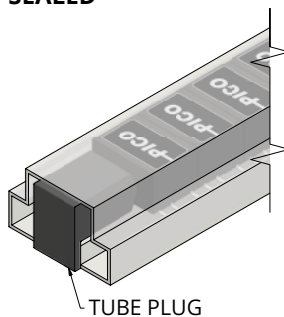


PLAN VIEW

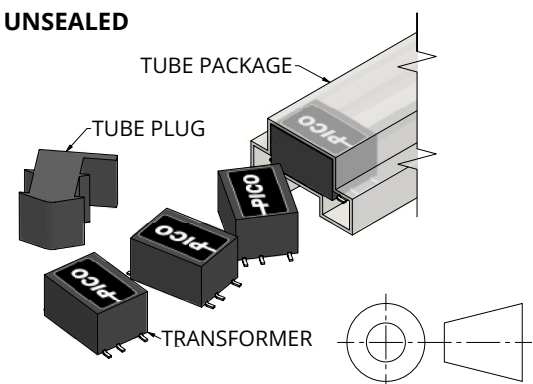


ELEVATION VIEW

SEALED



UNSEALED



Pico warrants each product manufactured by us and sold by us or an authorized representative, to be free from defects in material and workmanship. If properly used, it will perform within its applicable specifications for a period of one year after original shipment. Pico's obligation under this guarantee is limited to repairing or replacing our product to the original purchaser. This warranty is in lieu of all other warranties, express or implied and constitutes fulfillment of our obligations to the purchaser. We do not guarantee that the products can be used for a particular purpose other than those solely covered by the product's specifications. Pico must be notified if the product must meet particular certifications and/or standards. We assume no liability, in any event, for consequential damages, for anticipated or lost profits, incidental damages or loss of time or other losses incurred by the purchaser or any third party in connection with products covered by this warranty or otherwise. The purchaser will indemnify and hold Pico harmless for any damages, losses, costs, etc. from usage not within the product's specifications. Pico must be consulted before usage of its products in a nuclear, radioactive or space environment.

We reserve the right to discontinue products without notice. We reserve the right to make modifications to any existing catalog products without notice, at any time, without the obligation to modify units previously sold.

DC-DC Converter Transformers Series

PICO

5-48V Input, Up to 300V Output, Up to 40W, DC-DC Converter Transformer

Electronics, Inc.

PRODUCT OVERVIEW

Pico DC-DC converter transformers are ultra-miniature in size as the energy driver to the switch-mode power supplies. They are power efficient in reducing core losses and able to be used in a wide variety of energy conversion applications. These are designed to maximum performance at low switching operating frequency and minimal losses. The electrical rectification process of these components are designed for bridge, dual-bridge, and full wave circuit configurations. Though, they are certainly not limited to these topologies.

Typical applications:

- Servers & Data Processing
- Telecommunication
- Switches
- Aviation Power Systems
- Automation
- EVs
- Medical Equipment

FEATURES

- Extreme resistance to impact, shock, and vibration
- Manufactured to MIL-PRF-27, Class S, Grade 5
- High reliability for space and mission critical applications
- Ultra miniature in size and minimalistic design
- Design layouts in through-hole or surface mount types

Contact Pico for part number of available options:

- Screening and qualification criteria to flight standard
- Fully RoHS compliant or with exemption 7(a)
- Modifications to mechanical design and electrical characteristics
- Custom new design and parameters



SPECIFICATIONS - 5V INPUT

Part Number		Output Voltage			Max. Output Power		Typical Switching Frequency		
Through Hole ⁽¹⁾	Surface Mount ⁽²⁾	Bridge [VDC]	Full Wave [VDC]	Dual Bridge [VDC]	-55°C to +105°C [W]	-55°C to +70°C [W]	Self Saturated [kHz]	Square Wave Driven ⁽³⁾ Min. [kHz]	Max [kHz]
31021	31420	10	5	±5	1.5	3	15	30	60
31041	31440	12	6	±6	1.5	3	15	30	60
31061	31460	28	14	±14	1.5	3	15	30	60
31081	31480	48	24	±24	1.5	3	20	40	60
31101	31500	100	50	±50	1.5	3	20	40	60
32106	32505	10	5	±5	3	4.5	15	30	60
32126	32525	12	6	±6	3	4.5	15	30	60
32146	32545	28	14	±14	3	4.5	15	30	60
32166	32565	48	24	±24	3	4.5	20	40	60
32186	32585	100	50	±50	3	4.5	20	40	60
32189	32588	150	75	±75	3	-	10	30	60
32192	32591	200	100	±100	3	-	10	30	60
32195	32594	300	150	±150	3	-	10	30	60
33104	33503	10	5	±5	5	7.5	10	20	50
33124	33523	12	6	±6	5	7.5	10	20	50
33144	33543	28	14	±14	5	7.5	10	20	50
33164	33563	48	24	±24	5	7.5	10	20	50
33184	33583	100	50	±50	5	7.5	10	20	50
33187	33586	150	75	±75	5	-	10	30	60
33190	33589	200	100	±100	5	-	10	30	60
33193	33592	300	150	±150	5	-	10	30	60
34501	-	10	5	±5	10	14	10	20	40
34521	-	28	14	±14	10	14	10	20	40
34541	-	48	24	±24	10	14	10	20	40

Note 1: For RoHS compliance on a through-hole component, please consult with Pico's engineer and provide the part number.

Note 2: All SMDs are available with Pb-free dipped terminals that is compliant to RoHS exemption 7 by requesting part number + 'RoHS-7'

Note 3: Lower Switching Frequency may be used at lower output power.

SPECIFICATIONS - 12V INPUT

Part Number		Output Voltage			Max. Output Power		Typical Switching Frequency		
Through Hole ⁽¹⁾	Surface Mount ⁽²⁾	Bridge [VDC]	Full Wave [VDC]	Dual Bridge [VDC]	-55°C to +105°C [W]	-55°C to +70°C [W]	Self Saturated [kHz]	Square Wave Driven ⁽³⁾ Min. [kHz]	Max [kHz]
31121	31520	12	6	±6	1.5	3	15	30	60
31141	31540	24	12	±12	1.5	3	15	30	60
31161	31560	28	14	±14	1.5	3	15	30	60
31181	31580	48	24	±24	1.5	3	20	40	60
31201	31600	100	50	±50	1.5	3	20	40	60
32206	32605	12	6	±6	3	4.5	15	30	60
32226	32625	24	12	±12	3	4.5	15	30	60
32246	32645	28	14	±14	3	4.5	15	30	60
32266	32665	48	24	±24	3	4.5	20	40	60
32286	32685	100	50	±50	3	4.5	20	40	60
32289	32688	150	75	±75	3	-	10	30	60
32292	32691	200	100	±100	3	-	10	30	60
32295	32694	300	150	±150	3	-	10	30	60
33204	33603	12	6	±6	5	7.5	10	30	60
33224	33623	28	14	±14	5	7.5	10	30	60
33244	33643	48	24	±24	5	7.5	10	40	60
33264	33663	100	50	±50	5	7.5	10	40	60
33267	33666	150	75	±75	5	-	10	30	60
33270	33669	200	100	±100	5	-	10	30	60
33273	33672	300	150	±150	5	-	10	30	60
34561	-	24	12	±12	10	14	15	30	50
34581	-	28	14	±14	10	14	15	30	50
34601	-	48	24	±24	10	14	15	30	50
34604	-	100	50	±50	7.5	-	10	30	60
34607	-	150	75	±75	7.5	-	10	30	60
34610	-	200	100	±100	7.5	-	10	30	60
34613	-	300	150	±150	7.5	-	10	30	60
35110	-	24	12	±12	17	25	-	30	60
35130	-	28	14	±14	17	25	-	30	60
35150	-	48	24	±24	17	25	-	30	60

Note 1: For RoHS compliance on a through-hole component, please consult with Pico's engineer and provide the part number.

Note 2: All SMDs are available with Pb-free dipped terminals that is compliant to RoHS exemption 7 by requesting part number + '-RoHS-7'

Note 3: Lower Switching Frequency may be used at lower output power.

SPECIFICATIONS - 24V INPUT

Part Number		Output Voltage			Max. Output Power		Typical Switching Frequency		
Through Hole ⁽¹⁾	Surface Mount ⁽²⁾	Bridge [VDC]	Full Wave [VDC]	Dual Bridge [VDC]	-55°C to +105°C [W]	-55°C to +70°C [W]	Self Saturated [kHz]	Square Wave Driven ⁽³⁾ Min. [kHz]	Max [kHz]
31221	31620	10	5	±5	1.5	3	15	30	60
31241	31640	28	14	±14	1.5	3	15	30	60
31261	31660	48	24	±24	1.5	3	20	40	60
31281	31680	100	50	±50	1.5	3	20	40	60
32306	32705	10	5	±5	3	4.5	15	30	60
32326	32725	28	14	±14	3	4.5	15	30	60
32346	32745	48	24	±24	3	4.5	20	40	60
32366	32765	100	50	±50	3	4.5	20	40	60
32369	32768	150	75	±75	3	-	10	30	60
32372	32771	200	100	±100	3	-	10	30	60
32375	32774	300	150	±150	3	-	10	30	60
33284	33683	10	5	±5	5	7.5	15	30	60
33304	33703	28	14	±14	5	7.5	15	30	60
33324	33723	48	24	±24	5	7.5	20	40	60
33344	33743	100	50	±50	5	7.5	20	40	60
33347	33746	150	75	±75	5	-	10	30	60
33350	33749	200	100	±100	5	-	10	30	60
33353	33752	300	150	±150	5	-	10	30	60
34621	-	28	14	±14	10	14	15	30	50
34641	-	48	24	±24	10	14	15	30	50
34644	-	100	50	±50	7.5	-	10	30	60
34647	-	150	75	±75	7.5	-	10	30	60
34650	-	200	100	±100	7.5	-	10	30	60
34653	-	300	150	±150	7.5	-	10	30	60
35170	-	24	12	±12	17	25	-	30	60
35190	-	28	14	±14	17	25	-	30	60
35210	-	48	24	±24	17	25	-	30	60
36710	-	48	24	±24	25	40	-	30	60
36730	-	56	28	±28	25	40	-	30	60

Note 1: For RoHS compliance on a through-hole component, please consult with Pico's engineer and provide the part number.

Note 2: All SMDs are available with Pb-free dipped terminals that is compliant to RoHS exemption 7 by requesting part number + 'RoHS-7'

Note 3: Lower Switching Frequency may be used at lower output power.

SPECIFICATIONS - 48V INPUT

Part Number		Output Voltage			Max. Output Power		Typical Switching Frequency		
Through Hole ⁽¹⁾	Surface Mount ⁽²⁾	Bridge [VDC]	Full Wave [VDC]	Dual Bridge [VDC]	-55°C to +105°C [W]	-55°C to +70°C [W]	Self Saturated [kHz]	Square Wave Driven ⁽³⁾ Min. [kHz]	Max [kHz]
31301	31700	24	12	±12	1.5	3	15	30	60
31321	31720	48	24	±24	1.5	3	15	40	60
31341	31740	100	50	±50	1.5	3	20	40	60
31361	31760	150	75	±75	1.5	3	20	40	60
32386	32785	24	12	±12	3	4.5	15	30	60
32406	32805	48	24	±24	3	4.5	20	40	60
32426	32825	100	50	±50	3	4.5	20	40	60
32446	32845	150	75	±75	3	4.5	20	40	60
32449	32848	200	100	±100	3	4.5	10	30	60
32452	32851	300	150	±150	3	4.5	10	30	60
33364	33763	24	12	±12	5	7.5	15	30	60
33384	33783	48	24	±24	5	7.5	20	40	60
33404	33803	100	50	±50	5	7.5	20	40	60
33424	33823	150	75	±75	5	7.5	20	40	60
33427	33826	200	100	±100	5	-	10	30	60
33430	33829	300	150	±150	5	-	10	30	60
34661	-	24	12	±12	10	14	15	30	50
34681	-	48	24	±24	10	14	15	30	50
34701	-	56	28	±28	10	14	15	30	50
34704	-	100	50	±50	7.5	-	10	30	60
34707	-	150	75	±75	7.5	-	10	30	60
34710	-	200	100	±100	7.5	-	10	30	60
34713	-	300	150	±150	7.5	-	10	30	60
35230	-	24	12	±12	17	25	-	30	60
35250	-	48	24	±24	17	25	-	30	60
35270	-	56	28	±28	17	25	-	30	60
36750	-	48	24	±24	25	40	-	30	60
36770	-	56	28	±28	25	40	-	30	60
36790	-	100	50	±50	25	40	-	30	60

Note 1: For RoHS compliance on a through-hole component, please consult with Pico's engineer and provide the part number.

Note 2: All SMDs are available with Pb-free dipped terminals that is compliant to RoHS exemption 7 by requesting part number + '-RoHS-7'

Note 3: Lower Switching Frequency may be used at lower output power.

SPECIFICATIONS

GENERAL

Parameter	Condition		Min.	Typ.	Max.	Units	
Primary Voltage	5V models		-	5	-	VDC	
	12V models		-	12	-		
	24V models		-	24	-		
	48V models		-	48	-		
Switching Frequency	Square wave driven		20	45	60	kHz	
Output Voltage	Bridge		10	-	300	VDC	
	Full wave		5	-	150		
	Dual bridge		±5	-	±150		
Dielectric Withstanding Voltage	60Hz		200	-	900	V _{RMS}	
Insulation Resistance	300VDC		10	-	-	GΩ	
Size	See mechanical drawings						
Operating Temperature Range	Ambient with temperature rise		-55	-	+130	°C	
Storage Temperature Range	Ambient		-55	-	+105	°C	
Weight	See mechanical drawings						
Case	Through hole models		Epoxy Insulated Metal				
	Surface mount models		Glass Reinforced Polymer				
Potting	Vacuum Impregnated Epoxy						
Box Packaging (W x H x L)	Through hole models		2.35 x 1.29 x 9.45 (59.69 x 32.766 x 240.03)				inches (mm)
Tube Packaging (W x H x L)	Surface mount models	31000 Series	0.77 x 0.49 x 20.0 (19.660 x 12.446 x 508)				
		32000 Series	0.87 x 0.55 x 20.0 (22.098 x 13.97 x 508)				
		33000 Series	0.99 x 0.64 x 20.0 (25.146 x 16.256 x 508)				
Tape & Reel Packaging	Upon request						
Moisture Sensitivity Level	Surface Mount only		Level 3				

OPTIONAL DESIGN CRITERIA

Test	Standard	Description
Vibration	MIL-STD-202	Method 204, Vibration, High Frequency
Shock	MIL-STD-202	Method 213, Shock (Specified Pulse)
Immersion	MIL-STD-202	Method 104, Immersion
Moisture Resistance	MIL-STD-202	Method 106, Moisture Resistance
Flammability	MIL-STD-202	Method 111, Flammability (External Flame)
Thermal Shock	MIL-STD-202	Method 107, Thermal Shock

OPTIONAL SCREENING AND QUALIFICATION

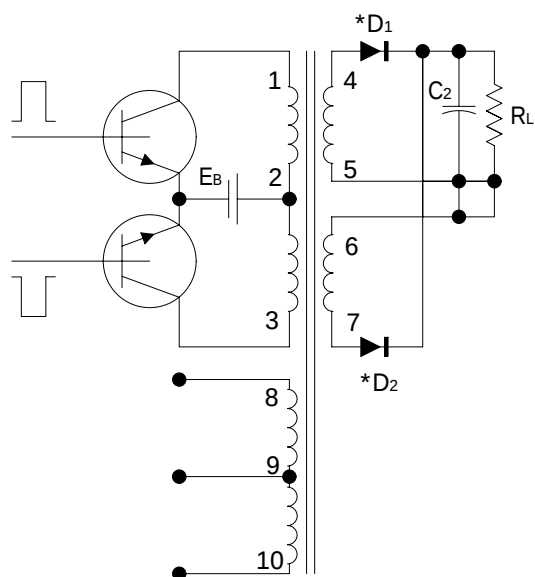
Standard	Screening & Qualification	Test ⁽⁴⁾
MIL-PRF-27	a.) Group A inspection Level-T - Table VII b.) Qualification inspection, Grade 5 - Table V	I. Thermal Shock II. Vibration III. Burn-in IV. Induced Voltage V. Shock VI. Dielectric Withstanding Voltage (at reduced pressure) VII. Insulation Resistance VIII. Electrical Characteristics IX. Visual and Mechanical Examination (External) X. Life XI. Radiographic Inspection
MIL-STD-981	a.) Group A screening tests – Table VI b.) Group B tests – Table XII, Class S	
EEE-INST-002, Section M1	a.) Magnetics Screening Req. – Table 2 b.) Magnetics Part Qual. – Table 3	

Note 4: Screening and qualification tests are not limited to the options in the chart above. Each standard may also be stringent or exclude certain tests from one another. Please contact Pico for specific application needs and for Pico part number.

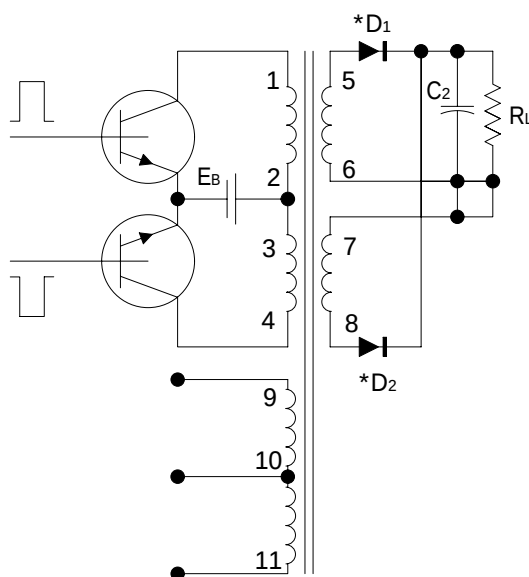
ELECTRICAL SCHEMATIC

LINEAR SWITCHING REFERENCE DESIGN

31000, 32000, & 33000 SERIES



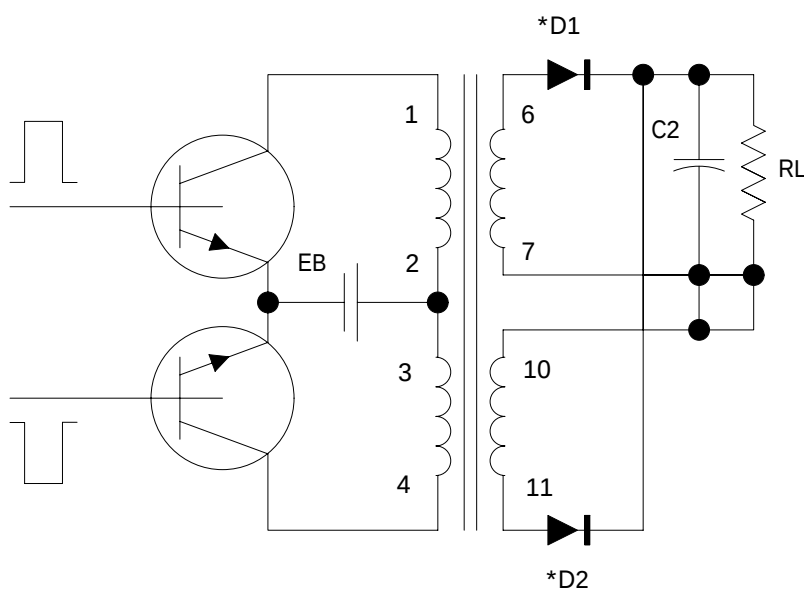
34000 SERIES



NOTES

a. SCHOTTKY OR FAST-SWITCHING DIODES USED

36000 SERIES



NOTES

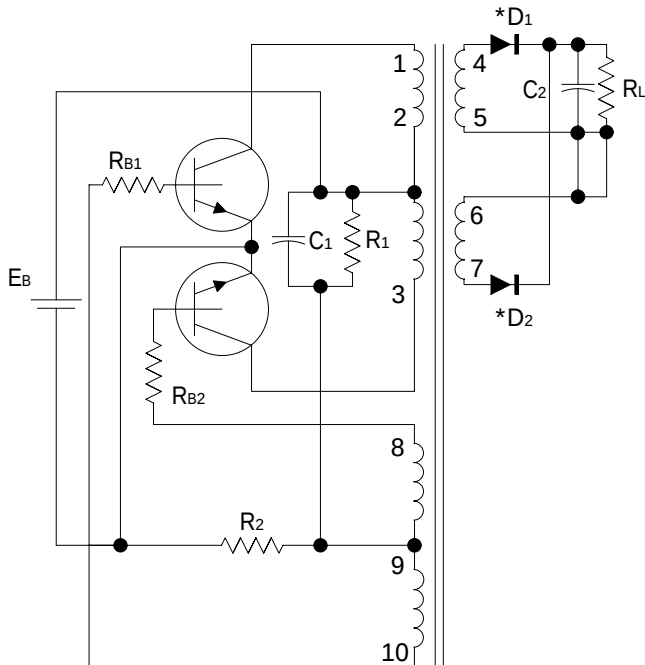
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b. PINS 5, 8 AND 9 HAVE BEEN OMITTED

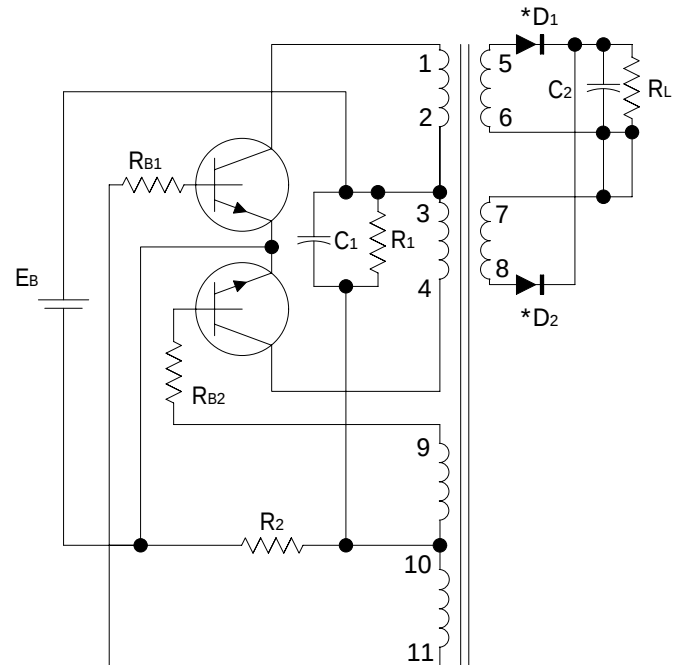
ELECTRICAL SCHEMATIC

SELF-SATURATING REFERENCE DESIGN

31000, 32000, & 33000 SERIES



34000 SERIES

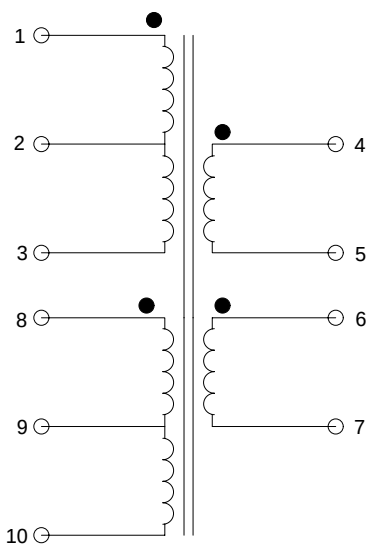


NOTES

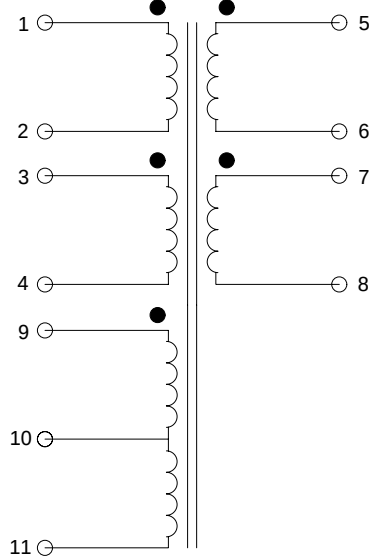
* SCHOTTKY OR FAST-SWITCHING DIODES USED

WIRING DIAGRAM

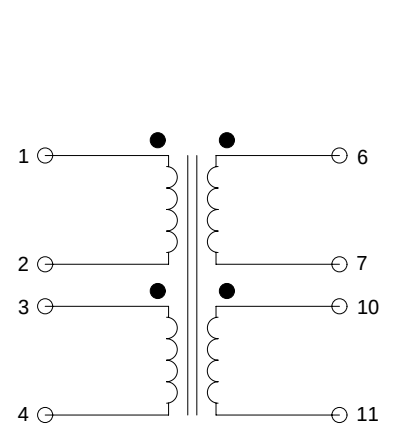
31000, 32000, & 33000 SERIES



34000 SERIES



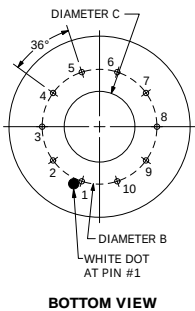
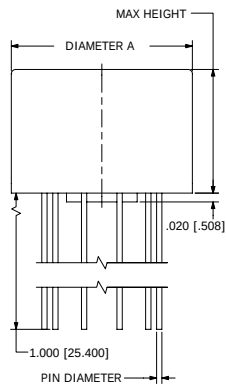
35000 & 36000 SERIES



MECHANICAL DRAWINGS

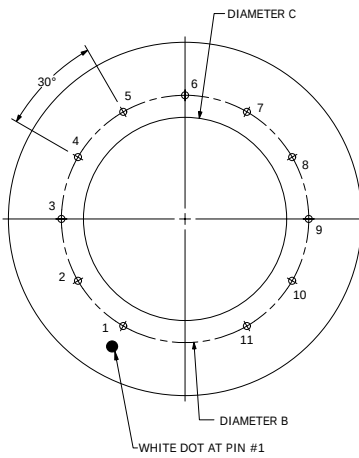
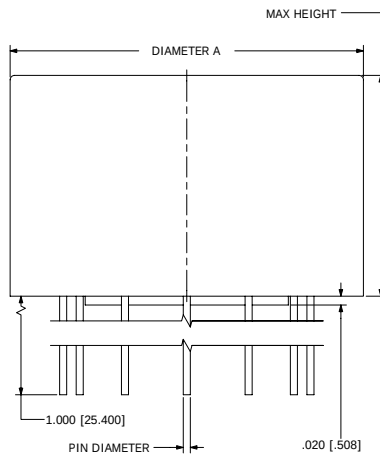
THROUGH HOLE MODELS

FIGURE 1



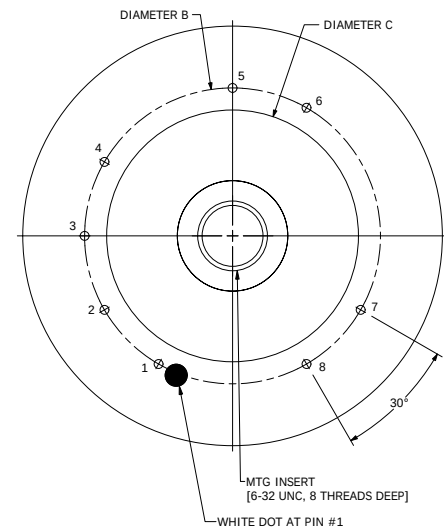
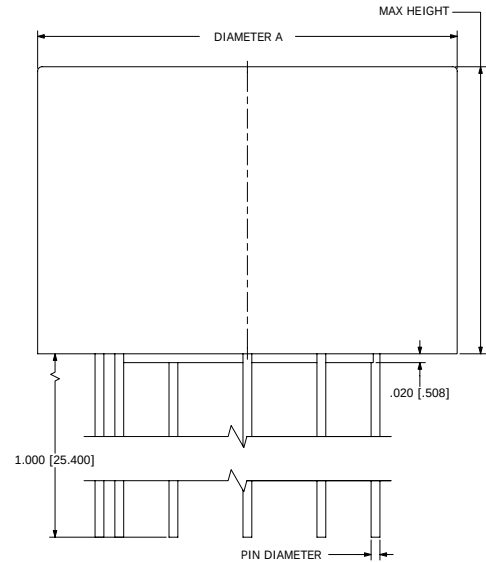
BOTTOM VIEW

FIGURE 2



BOTTOM VIEW

FIGURE 3

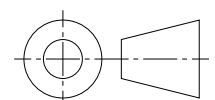


BOTTOM VIEW

Series	Max Height	Dimension				Insert	Typ. Weight (grams)	Figure
		A	B	C	Pin Diameter			
31000	.280 (7.112)	.410 (10.414)	.260 (6.604)	.160 (4.064)	.012 (.305)	-	2.1	1
32000	.340 (8.636)	.500 (12.700)	.350 (8.890)	.250 (6.350)	.012 (.305)	-	3.5	
33000	.415 (10.541)	.630 (16.002)	.440 (11.176)	.340 (8.636)	.016 (.406)	-	7.1	
34000	.500 (12.700)	.800 (20.320)	.560 (14.224)	.460 (11.684)	.016 (.406)	-	15.1	2
35000	.650 (16.510)	.950 (24.130)	.670 (17.018)	.570 (14.478)	.020 (.508)	6 - 32 UNC	15.9	3
36000	.745 (18.923)	1.125 (28.575)	.800 (20.320)	.700 (17.780)	.020 (.508)	6 - 32 UNC	15.9	

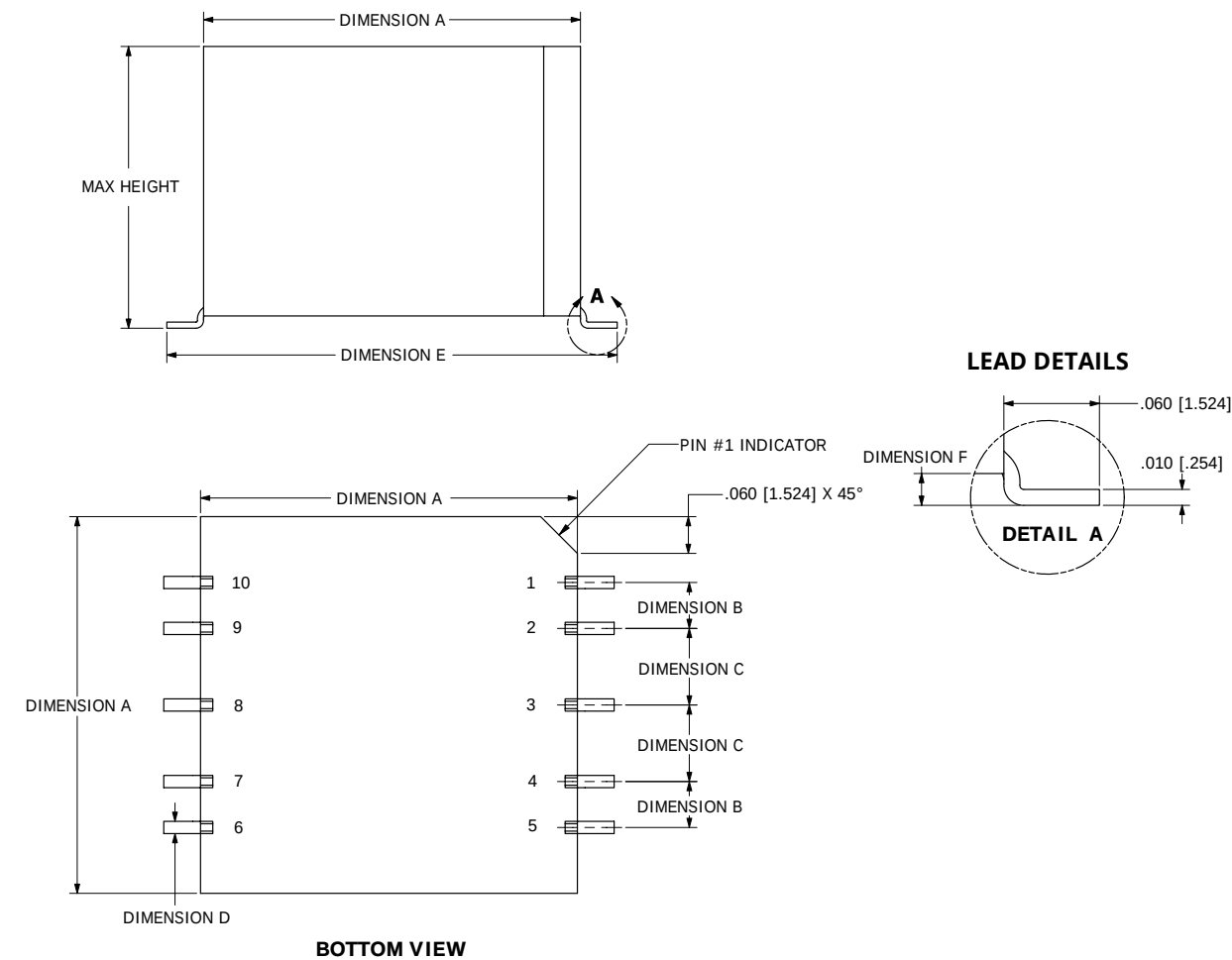
NOTES

- ALL DIMENSIONS ARE IN INCHES, [] = MM
- TERMINALS ARE CLOCKWISE FROM PIN #1



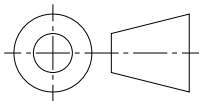
MECHANICAL DRAWINGS

SURFACE MOUNT MODELS



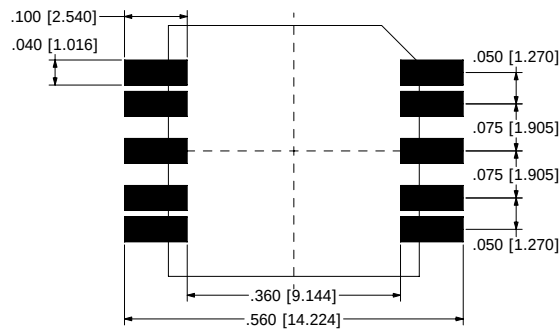
Series	Max Height	Dimension						Weight (grams)
		A	B	C	D	E	F	
31000	.310 (7.87)	.400 (10.16)	.050 (1.27)	.075 (1.91)	.020 (.51)	.520 (13.21)	.012 (.30)	2.0
32000	.365 (9.27)	.495 (12.57)	.055 (1.40)	.095 (2.41)	.020 (.51)	.615 (15.62)	.012 (.30)	3.8
33000	.460 (11.68)	.615 (15.62)	.075 (1.90)	.125 (3.18)	.027 (.69)	.735 (18.67)	.020 (.51)	6.9

NOTES
a. ALL DIMENSIONS ARE IN INCHES, [] = MM
b. TERMINALS ARE CLOCKWISE FROM PIN #1

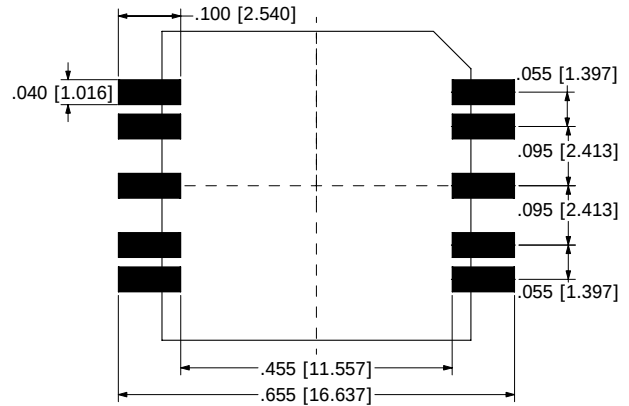


RECOMMENDED LAND PATTERN DIMENSIONS

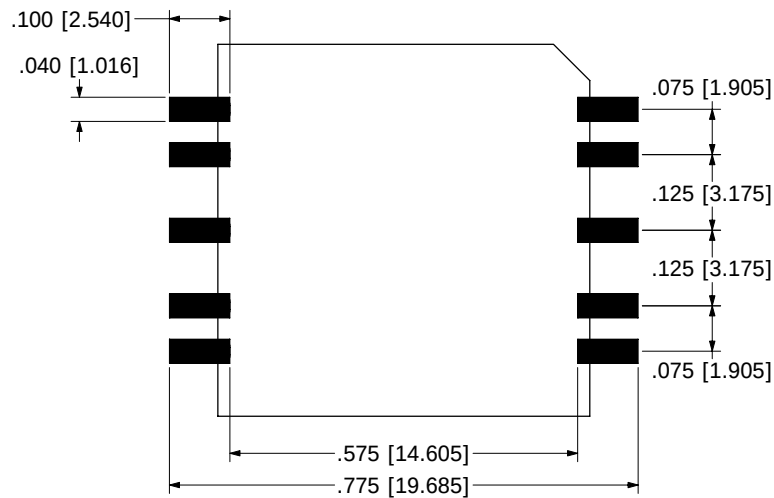
31000 SERIES



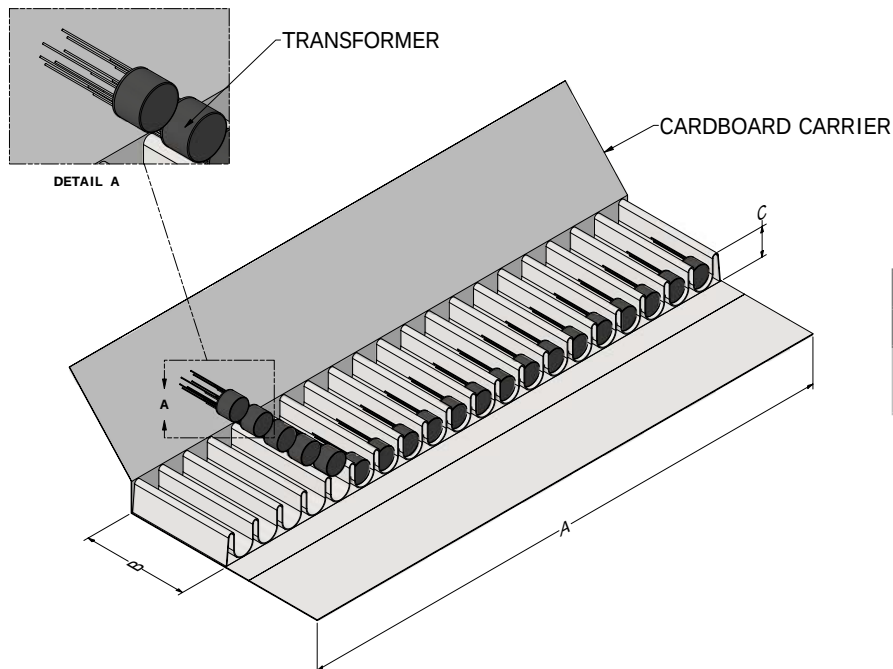
32000 SERIES



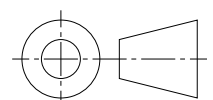
33000 SERIES



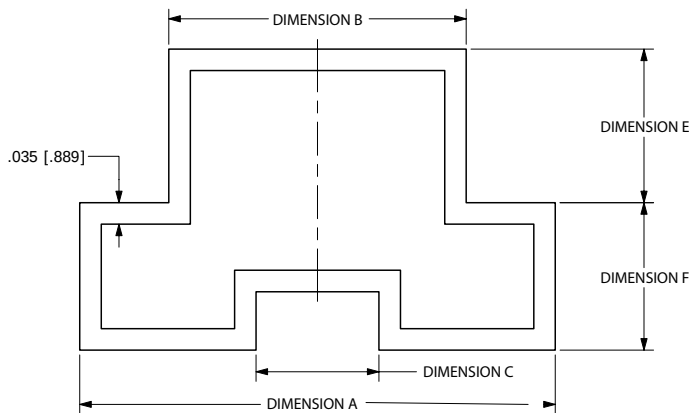
BOX PACKAGING - THROUGH HOLE MODELS



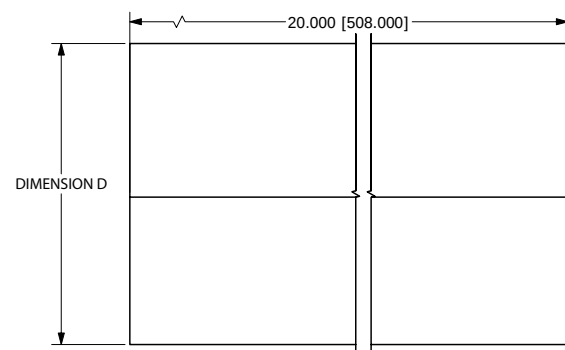
Dimension		
A	B	C
9.45 [240.03]	2.35 [59.69]	1.29 [32.766]



TUBE PACKAGING - SURFACE MOUNT MODELS



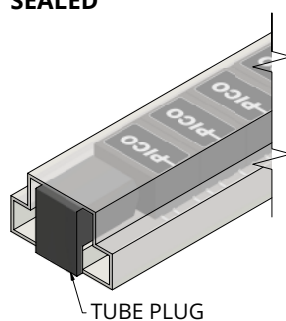
PLAN VIEW



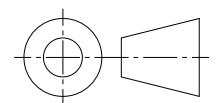
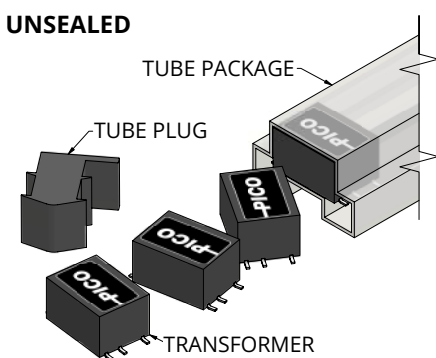
ELEVATION VIEW

Series	Dimension					
	A	B	C	D	E	F
31000	.774 [19.660]	.484 [12.294]	.200 [5.080]	.490 [12.446]	.250 [6.350]	.240 [6.096]
32000	.870 [22.098]	.580 [14.732]	.300 [7.620]	.545 [13.843]	.305 [7.747]	.240 [6.096]
33000	.990 [25.146]	.700 [17.780]	.400 [10.160]	.640 [16.256]	.400 [10.160]	.240 [6.096]

SEALED



UNSEALED



Pico warrants each product manufactured by us and sold by us or an authorized representative, to be free from defects in material and workmanship. If properly used, it will perform within its applicable specifications for a period of one year after original shipment. Pico's obligation under this guarantee is limited to repairing or replacing our product to the original purchaser. This warranty is in lieu of all other warranties, express or implied and constitutes fulfillment of our obligations to the purchaser. We do not guarantee that the products can be used for a particular purpose other than those solely covered by the product's specifications. Pico must be notified if the product must meet particular certifications and/or standards. We assume no liability, in any event, for consequential damages, for anticipated or lost profits, incidental damages or loss of time or other losses incurred by the purchaser or any third party in connection with products covered by this warranty or otherwise. The purchaser will indemnify and hold Pico harmless for any damages, losses, costs, etc. from usage not within the product's specifications. Pico must be consulted before usage of its products in a nuclear, radioactive or space environment.

We reserve the right to discontinue products without notice, We reserve the right to make modifications to any existing catalog products without notice, at any time, without the obligation to modify units previously sold.

68500 Series

Electrical Surface Mount Equivalent of QPL MIL-PRF-21038/27

PICO
Electronics, Inc.

PRODUCT OVERVIEW

Pico's 65000 series is the surface mount version but electrical equivalent to the QPL of data-bus transformers in MIL-PRF-21038/27. This design with gull wing terminals is convenient than the through-hole versions of the MIL-PRF-21038/27 for pick and place manufacturing process on the PCB. These parts are reliable for enabling data transmission and electrical isolation in MIL-STD-1553 compliant systems.

Typical applications:

- Propulsion Control
- Precision Guiding Systems
- Air Traffic Control
- Communication
- Sensors
- Data Management
- MIL-STD-1553 Interfaces

FEATURES

- Extreme resistance to impact, shock, and vibration
- Manufactured to MIL-PRF-21038 and MIL-STD-1553
- High reliability for space and mission critical applications
- Miniature in size and minimalistic design

Contact Pico for part number of available options:

- Screening and qualification criteria to flight standard
- Fully RoHS compliant or with exemption 7(a)
- Modifications to mechanical design and electrical characteristics
- Custom new design and parameters



SPECIFICATIONS

Pico Part Number ⁽²⁾	Turns Ratio	Primary Pins	Secondary Pins	DC Resistance		Impedance		Config. Reference
				Pins	[Ω] min.	Pins	[MΩ] min.	
68500	1:1 1:0.707	1-3 1-3	4-8 5-7	1-3 4-8	2.90 1.42	1-3	4	A
68505	1.4:1 2:1	1-3 1-3	4-8 5-7	1-3 4-8	2.90 1.08	1-3	7.2	A
68510	1.25:1 1.66:1	1-3 1-3	4-8 5-7	1-3 4-8	2.90 1.20	1-3	4	A
68515	2.3:1 3.2:1	4-8 5-7	1-3 1-3	1-3 4-8	1.20 3.00	5-7	3	A ⁽¹⁾
68520	1:1.41	1-3	4-6	1-3 4-6	0.82 1.95	4-6	3	C
68525	1:1	1-3	4-6	1-3 4-6	2.05 2.14	1-3	3	B
68530	1:1.41	1-3	4-6	1-3 4-6	0.80 2.05	4-6	3	B
68535	1:1.66	1-3	4-6	1-3 4-6	0.72 2.05	4-6	3	B
68540	1:2	1-3	4-6	1-3 4-6	0.52 2.05	4-6	3	B
68545	2.12:1 1.5:1	4-8 5-7	1-3 1-3	1-3 4-8	0.82 2.12	4-8	4	A
68550	1:2.5 1:1.79	1-3 1-3	4-8 5-7	1-3 4-8	0.87 2.52	4-8	4	A
68555	1:1.5	1-3	4-6	1-3 4-6	0.75 2.05	4-6	3	B
68560	1:1.79	1-3	4-6	1-3 4-6	0.71 2.05	4-6	3	B
68565	1:2.5	1-3	4-6	1-3 4-6	0.50 2.10	4-6	3	B

Note 1: P/N 68515 electrical schematic differs from other Configuration A electrical schematic. Please see Electrical Schematic section.

Note 2: Parts are available with Pb-free dipped terminals that's compliant to RoHS exemption 7 by requesting part number + '-RoHS-7'

SPECIFICATIONS

GENERAL

Parameter	Condition	Min.	Typ.	Max.	Units
Impedance	75 kHz to 1 MHz	3	-	-	kΩ
Dielectric Strength	60Hz	-	100	-	V _{RMS}
Droop		-	-	20	%
Overshoot	Peak	-1		1	V
Common Mode Rejection		45	-	-	dB
Insulation Resistance	250VDC	1	-	-	GΩ
Operating Temperature Range	Ambient with temperature rise	-55	-	+130	°C
Storage Temperature Range	Ambient	-55	-	+130	°C
Size (L x W x H)	Config. A	0.625 x 0.625 x 0.315 (15.875 x 15.875 x 8.001)			inches (mm)
	Config. B & C	0.4 x 0.4 x 0.25 (10.16 x 10.16 x 6.35)			
Weight		-	-	5	grams
Case	Glass Reinforced Polymer				
Potting	Vacuum Impregnated Epoxy				
Tube Packaging (W x H x L)	Config. A	0.93 x 0.52 x 20.0 (23.724 x 13.081 x 508)			inches (mm)
	Config. B & C	0.77 x 0.49 x 20.0 (19.660 x 12.446 x 508)			
Tape & Reel Packaging	Upon request				
Moisture Sensitivity Level	Surface Mount only	Level 3			

OPTIONAL DESIGN CRITERIA

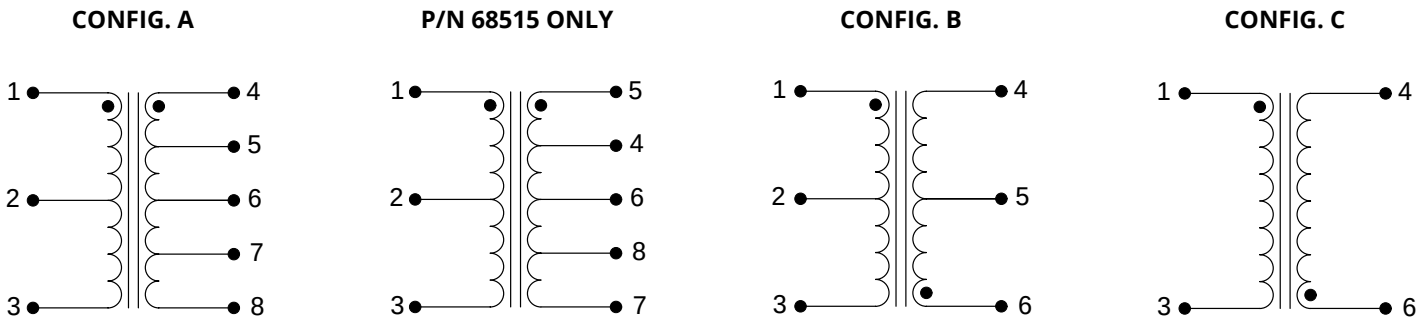
Test	Standard	Description
Vibration	MIL-STD-202	Method 204, Vibration, High Frequency
Shock	MIL-STD-202	Method 213, Shock (Specified Pulse)
Immersion	MIL-STD-202	Method 104, Immersion
Moisture Resistance	MIL-STD-202	Method 106, Moisture Resistance
Flammability	MIL-STD-202	Method 111, Flammability (External Flame)
Thermal Shock	MIL-STD-202	Method 107, Thermal Shock

OPTIONAL SCREENING AND QUALIFICATION

Standard	Screening & Qualification	Test ⁽³⁾
MIL-PRF-27	a.) Group A inspection Level-T - Table VII b.) Qualification inspection, Grade 5 - Table V	I. Thermal Shock II. Vibration III. Burn-in IV. Induced Voltage V. Shock VI. Dielectric Withstanding Voltage (at reduced pressure) VII. Insulation Resistance VIII. Electrical Characteristics IX. Visual and Mechanical Examination (External) X. Life XI. Radiographic Inspection
MIL-STD-981	a.) Group A screening tests - Table VI b.) Group B tests - Table XII, Class S	
EEE-INST-002, Section M1	a.) Magnetics Screening Req. - Table 2 b.) Magnetics Part Qual. - Table 3	

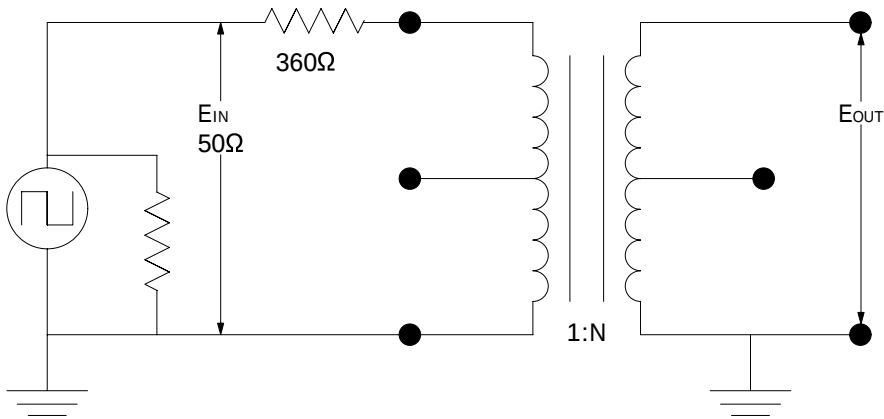
Note 3: Screening and qualification tests are not limited to the options in the chart above. Each standard may also be stringent or exclude certain tests from one another. Please contact Pico for specific application needs and for Pico part number.

ELECTRICAL SCHEMATIC

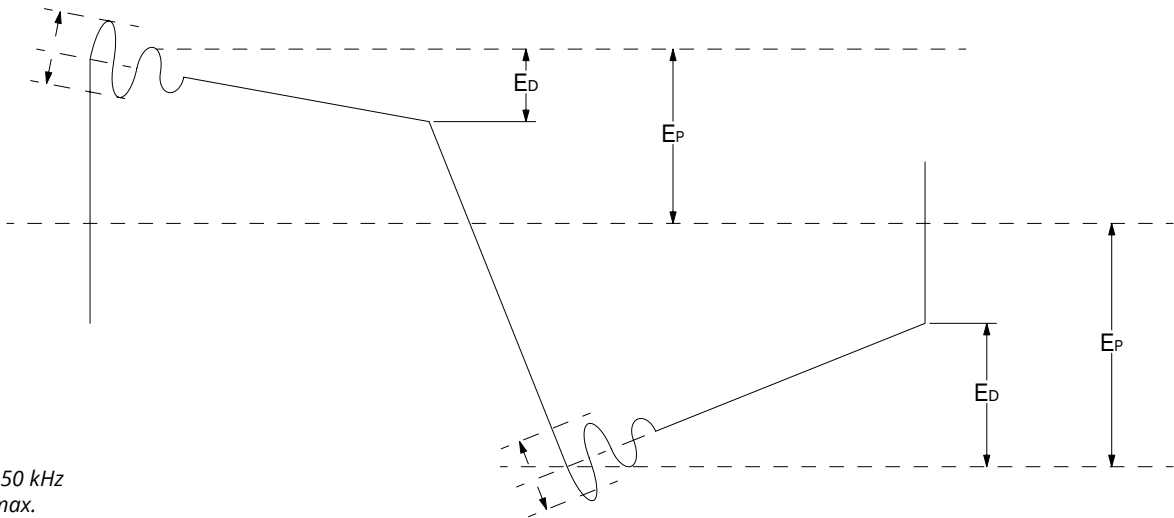


MEASUREMENT SCHEMATICS

DROOP



DROOP GRAPH



Notes

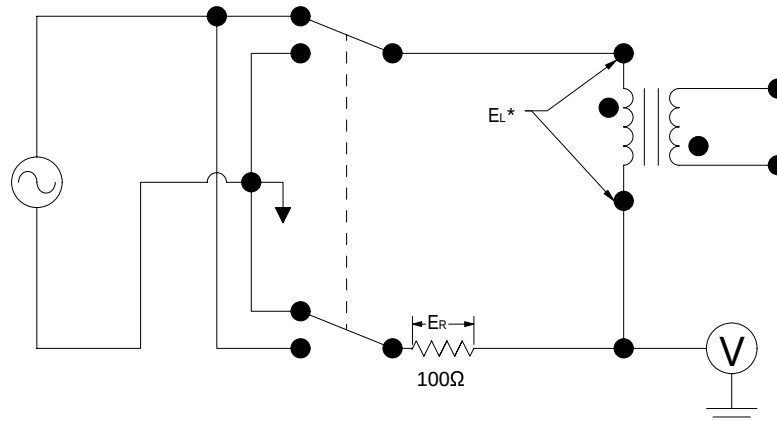
$E_{IN} = 27\text{ V}_{P-P}$

Frequency = 250 kHz

$T_{AIN} = 100\text{ ns max.}$

MEASUREMENT SCHEMATICS

IMPEDANCE

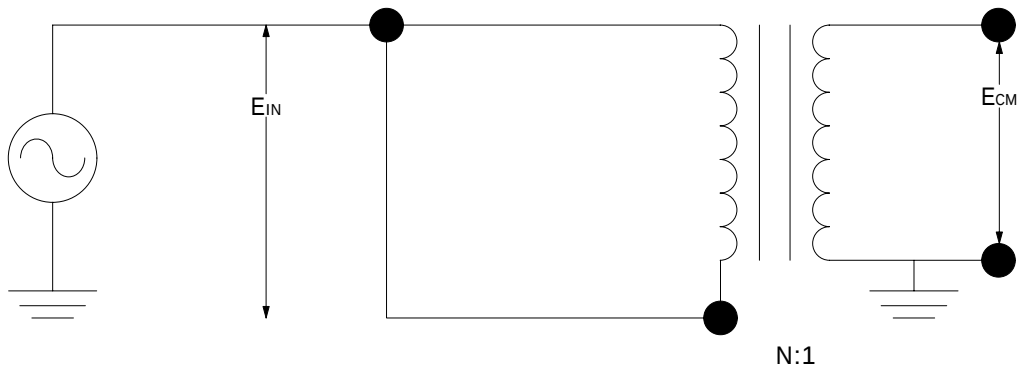


* ACROSS HIGH TURN SIDE

Notes

$$Z = \frac{E_L \times 100\Omega}{E_R}$$

COMMON MODE REJECTION

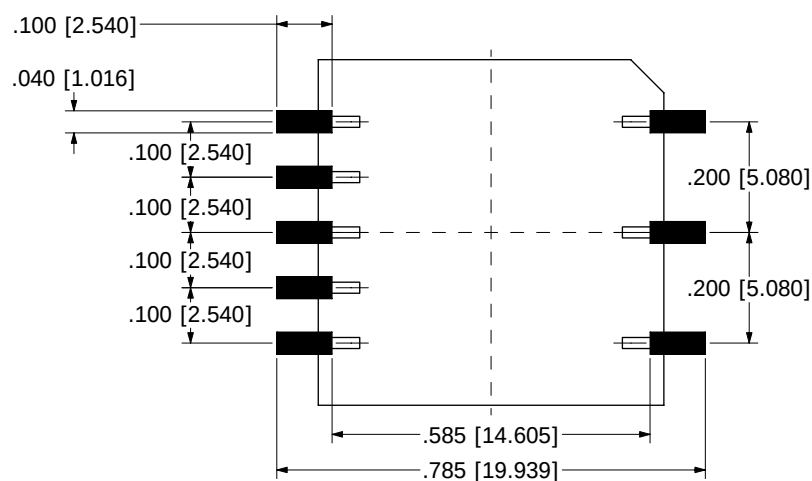


Notes

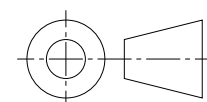
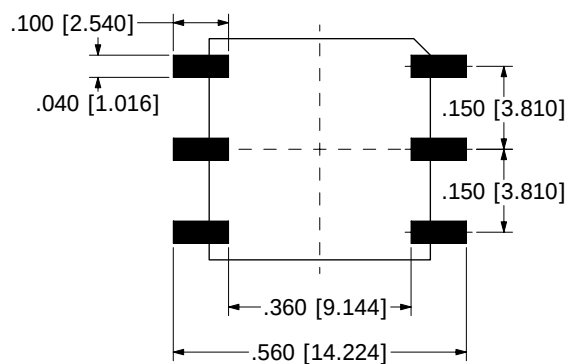
$E_{IN} = 10 V_{RMS}$
Frequency = 1 MHz
 $CMR = 20 \log_{10} (E_{LIN} / E_{CM})$

RECOMMENDED LAND PATTERN DIMENSIONS

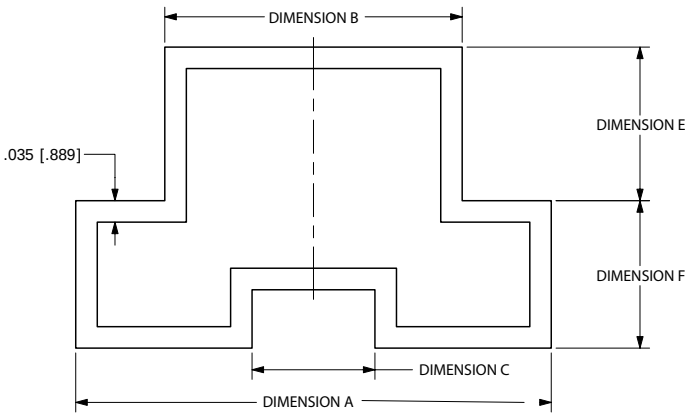
CONFIG. A



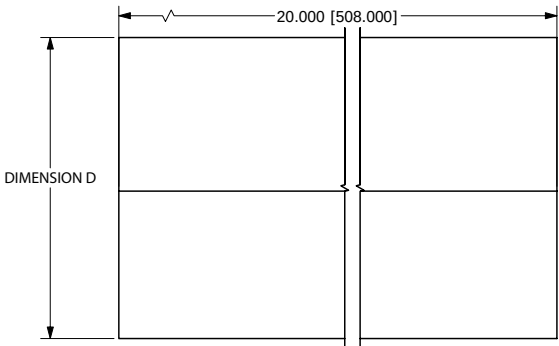
CONFIG. B & C



TAPE & REEL PACKAGING



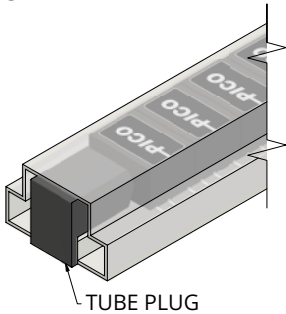
PLAN VIEW



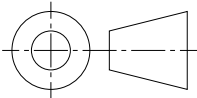
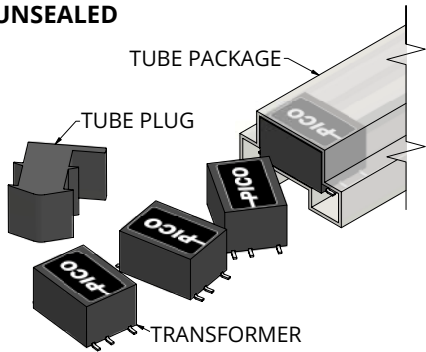
ELEVATION VIEW

Configuration Reference	Dimension					
	A	B	C	D	E	F
A	.934 [23.724]	.644 [16.358]	.240 [6.096]	.515 [13.081]	.275 [6.985]	.240 [6.096]
B & C	.774 [19.660]	.484 [12.294]	.200 [5.080]	.490 [12.446]	.250 [6.350]	.240 [6.096]

SEALED



UNSEALED



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We reserve the right to discontinue products without notice, We reserve the right to make modifications to any existing catalog products without notice, at any time, without the obligation to modify units previously sold.

LL-68500-TH & LL-68500-SM Series

Low Leakage MIL-STD-1553 Multiplex Data Bus Transformer

PICO
Electronics, Inc.

PRODUCT OVERVIEW

The LL-68500-TH & LL-68500-SM series are Low Leakage MIL-STD-1553 Interface / Multiplex Data Bus Pulse transformers in an encapsulated package with design layouts as through-hole or surface mount types. These transformers are designed for the lowest possible leakage inductance and DC resistance. The transparent signal processing for data transfer with minimal distortion making them ideal for aerospace and military applications.

Typical applications:

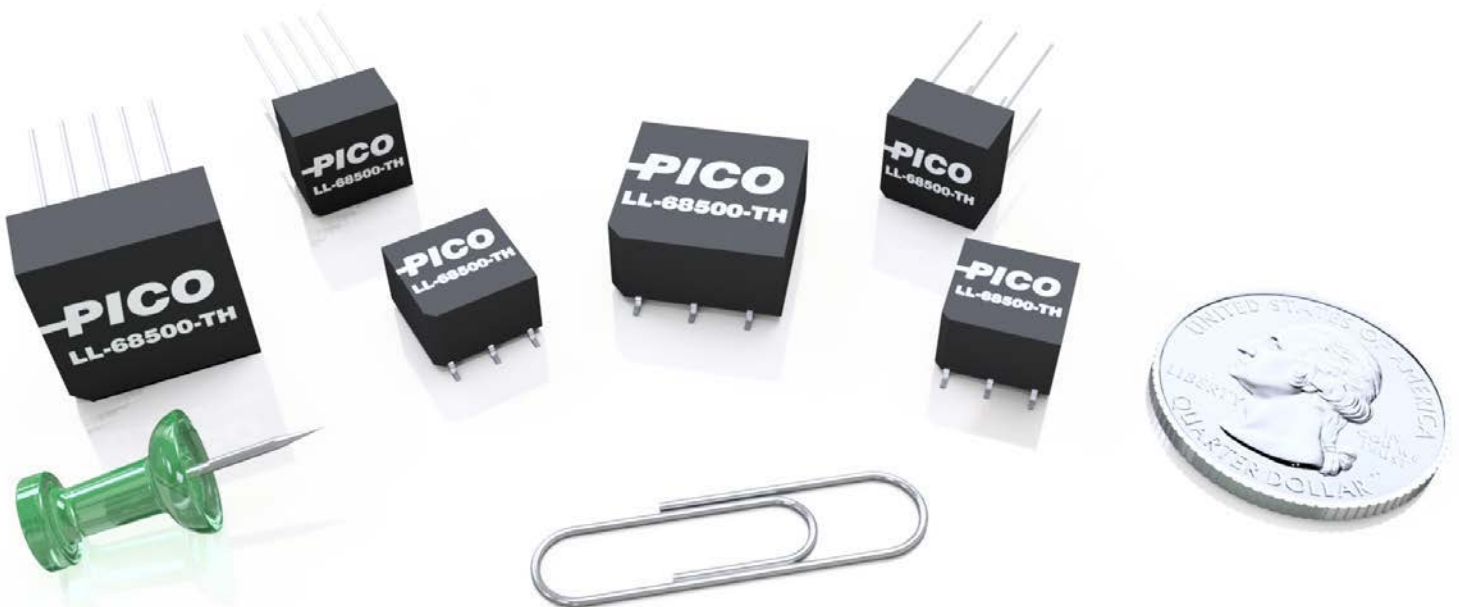
- Propulsion Control
- Precision Guiding Systems
- Air Traffic Control
- Communication
- Sensors
- Data Management
- MIL-STD-1553 Interfaces

FEATURES

- Extreme resistance to impact, shock, and vibration
- Manufactured to MIL-PRF-21038 and MIL-STD-1553
- High reliability for space and mission critical applications
- Ultra miniature in size and minimalistic design
- Design layouts in through-hole or surface mount types

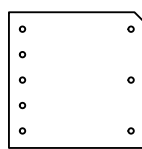
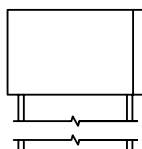
Contact Pico for part number of available options:

- Screening and qualification criteria to flight standard
- Fully RoHS compliant or with exemption 7(a)
- Modifications to mechanical design and electrical characteristics
- Custom new design and parameters

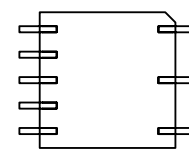
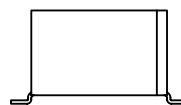


SPECIFICATIONS

LL-68500-TH SERIES - THROUGH HOLE



LL-68500-SM SERIES - SURFACE MOUNT



Through Hole ⁽¹⁾	Surface Mount ⁽²⁾	Turns Ratio	Primary Pins	Secondary Pins	DC Resistance		Impedance		Leakage Inductance		Schematic Reference	Size Reference
					Pins	[Ω] min.	Pins	[MΩ] min.	Pins	μH		
LL-68500-TH	LL-68500-SM	1:1 1:0.707	1-3 1-3	4-8 5-7	1-3 4-8	2.90 1.42	1-3	4	1-3	4.7	1	A
LL-68505-TH	LL-68505-SM	1.41:1 2:1	1-3 1-3	4-8 5-7	1-3 4-8	2.90 1.08	1-3	7.2	1-3	4.7	1	A
LL-68510-TH	LL-68510-SM	1.25:1 1.66:1	1-3 1-3	4-8 5-7	1-3 4-8	2.90 1.20	1-3	4	1-3	4.7	1	A
LL-68520-TH	LL-68520-SM	1:1.41	1-3	4-6	1-3 4-6	0.82 1.95	4-6	3	4-6	2.73	3	C
LL-68525-TH	LL-68525-SM	1:1	1-3	4-6	1-3 4-6	2.05 2.14	1-3	3	1-3	2.73	2	C
LL-68530-TH	LL-68530-SM	1:1.41	1-3	4-6	1-3 4-6	0.80 2.05	4-6	3	4-6	2.73	2	C
LL-68535-TH	LL-68535-SM	1:1.66	1-3	4-6	1-3 4-6	0.72 2.05	4-6	3	4-6	2.73	2	C
LL-68540-TH	LL-68540-SM	1:2	1-3	4-6	1-3 4-6	0.52 2.05	4-6	3	4-6	4.5	1	C
LL-68545-TH	LL-68545-SM	2.12:1 1.5:1	4-8 5-7	1-3 1-3	1-3 4-8	0.82 2.12	4-8	4	4-8	8	1	A
LL-68550-TH	LL-68550-SM	1:2.5 1:1.79	1-3 1-3	4-8 5-7	1-3 4-8	0.87 2.52	4-8	4	4-8	7.1	1	A
LL-68555-TH	LL-68555-SM	1:1.5	1-3	4-6	1-3 4-6	0.75 2.05	4-6	3	4-6	5.2	2	C
LL-68560-TH	LL-68560-SM	1:1.79	1-3	4-6	1-3 4-6	0.71 2.05	4-6	3	4-6	5.2	2	C
LL-68565-TH	LL-68565-SM	1:2.5	1-3	4-6	1-3 4-6	0.50 2.10	4-6	3	4-6	5.2	2	C
LL-68570-TH	LL-68570-SM	1:1 1:0.707	1-3 1-3	4-8 5-7	1-3 4-8	2.07 1.32	4-8	3	4-8	4.2	1	B
LL-68575-TH	LL-68575-SM	1:2.5 1:1.79	1-3 1-3	4-8 5-7	1-3 4-8	0.72 2.75	4-8	3	4-8	4.2	1	B
LL-68580-TH	LL-68580-SM	2.12:1 1.5:1	4-8 5-7	1-3 1-3	1-3 4-8	0.81 2.82	4-8	3	4-8	10.2	1	B
LL-68585-TH	LL-68585-SM	1.41:1 2:1	1-3 1-3	4-8 5-7	1-3 4-8	2.07 0.98	1-3	3	1-3	4.5	1	B

Note 1: For RoHS compliance on a through-hole component, please consult with Pico's engineer and provide the part number.

Note 2: All SMDs are available with Pb-free dipped terminals that's compliant to RoHS exemption 7 by requesting part number + 'RoHS-7'

SPECIFICATIONS

GENERAL

Parameter	Condition		Min.	Typ.	Max.	Units
Impedance	75 kHz to 1 MHz		3	-	-	kΩ
Dielectric Withstanding Voltage	60Hz		-	100	-	V _{RMS}
Droop			-	10	20	%
Overshoot	Peak		-1	-	1	V
Common Mode Rejection			45	-	-	dB
Insulation Resistance	200VDC		10	-	-	GΩ
Operating Temperature Range	Ambient with temperature rise		-55	-	+130	°C
Storage Temperature Range	Ambient		-55	-	+105	°C
Size (L x W x H)	LL-68500-TH Series	Size A	0.625 x 0.625 x 0.29 (15.875 x 15.875 x 7.366)			inches (mm)
		Size B & C	0.4 x 0.4 x 0.25 (10.16 x 10.16 x 6.35)			
	LL-68500-SM Series	Size A	0.625 x 0.625 x 0.315 (15.875 x 15.875 x 8.001)			inches (mm)
		Size B & C	0.4 x 0.4 x 0.275 (10.16 x 10.16 x 6.985)			
Weight	Size A		-	4.2	-	grams
	Size B		-	1.8	-	
	Size C		-	1.6	-	
Case	LL-68500-SM & TH		Glass Reinforced Polymer			
Potting	Vacuum Impregnated Epoxy					
Box Packaging (L x W x H)	LL-68500-TH Series		10.65 x 2.49 x 0.95 (270.51 x 63.246 x 24.13)			inches (mm)
Tube Packaging (W x H x L)	LL-68500-SM Series	Size A	0.93 x 0.52 x 20.0 (23.724 x 13.081 x 508)			
		Size B & C	0.77 x 0.49 x 20.0 (19.660 x 12.446 x 508)			
Tape & Reel Packaging	Upon request					
Moisture Sensitivity Level	Surface mount only		Level 3			
Tape & Reel Packaging (Upon request)	70000 & 80000 Series	Tape Width	-	1.26 (32)	-	inches (mm)
		Tape Pitch	-	0.157 (4)	-	
		Reel Diameter	-	13 (330.2)	-	
Moisture Sensitivity Level	Surface Mount only		Level 3			

OPTIONAL DESIGN CRITERIA

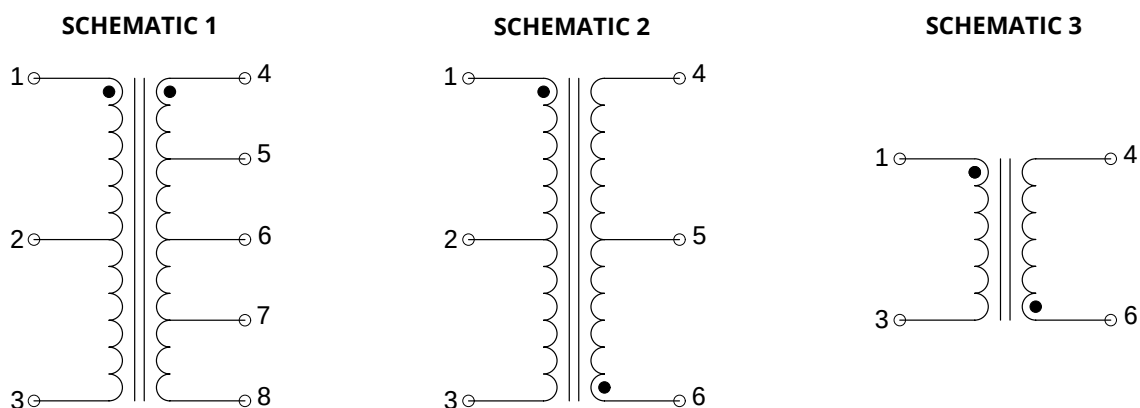
Test	Standard	Description
Vibration	MIL-STD-202	Method 204, Vibration, High Frequency
Shock	MIL-STD-202	Method 213, Shock (Specified Pulse)
Immersion	MIL-STD-202	Method 104, Immersion
Moisture Resistance	MIL-STD-202	Method 106, Moisture Resistance
Flammability	MIL-STD-202	Method 111, Flammability (External Flame)
Thermal Shock	MIL-STD-202	Method 107, Thermal Shock

OPTIONAL SCREENING AND QUALIFICATION

Standard	Screening & Qualification	Test ⁽³⁾
MIL-PRF-27	a.) Group A inspection Level-T - Table VII b.) Qualification inspection, Grade 5 - Table V	I. Thermal Shock II. Vibration III. Burn-in IV. Induced Voltage V. Shock
MIL-STD-981	a.) Group A screening tests - Table VI b.) Group B tests - Table XII, Class S	VI. Dielectric Withstanding Voltage (at reduced pressure) VII. Insulation Resistance VIII. Electrical Characteristics
EEE-INST-002, Section M1	a.) Magnetics Screening Req. - Table 2 b.) Magnetics Part Qual. - Table 3	IX. Visual and Mechanical Examination (External) X. Life XI. Radiographic Inspection

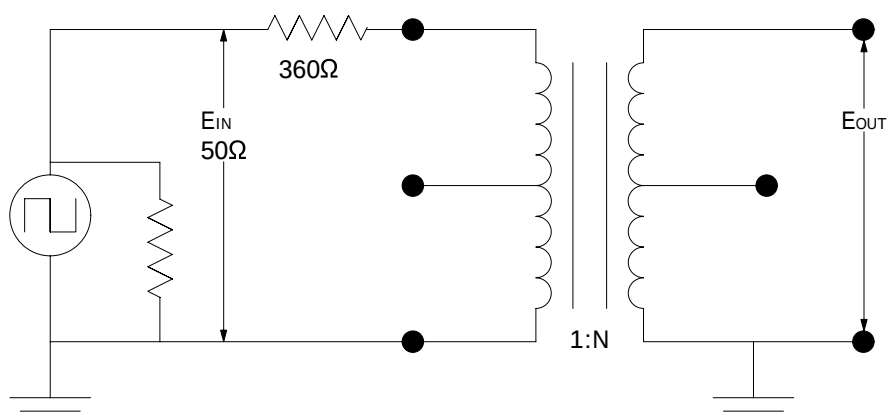
Note 3: Screening and qualification tests are not limited to the options in the chart above. Each standard may also be stringent or exclude certain tests from one another. Please contact Pico for specific application needs and for Pico part number.

ELECTRICAL SCHEMATIC

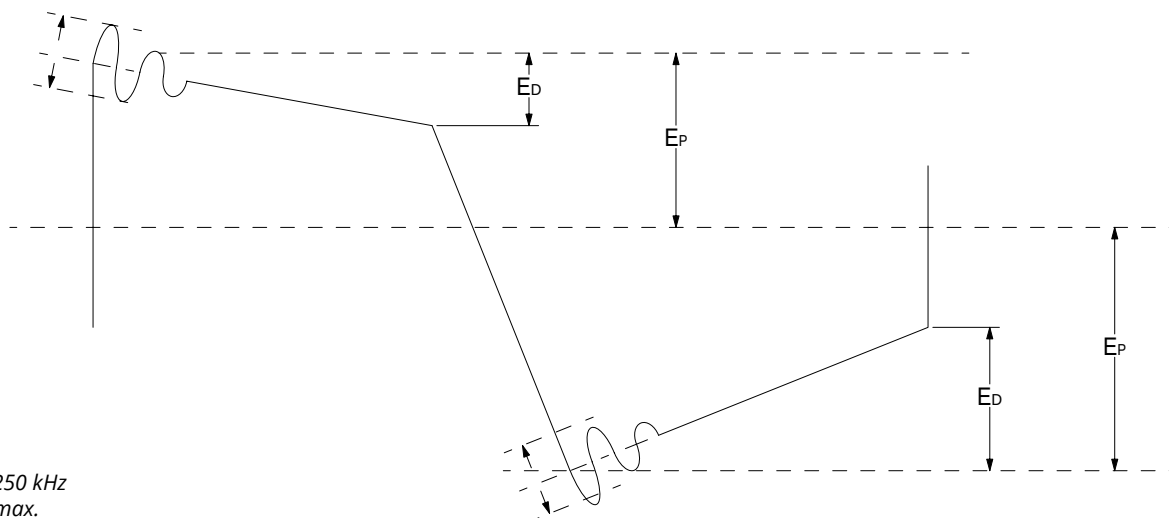


MEASUREMENT SCHEMATICS

DROOP



DROOP GRAPH

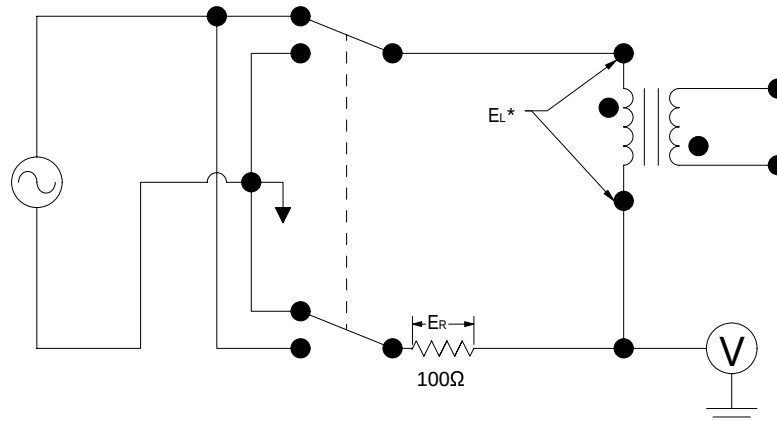


Notes

$E_{IN} = 27 V_{P-P}$
 Frequency = 250 kHz
 $T_{AIN} = 100 ns \text{ max.}$

MEASUREMENT SCHEMATICS

IMPEDANCE

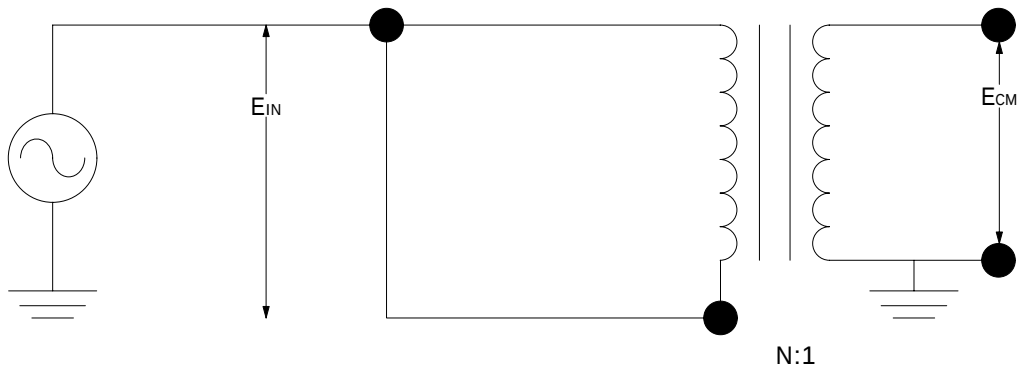


* ACROSS HIGH TURN SIDE

Notes

$$Z = \frac{E_L \times 100\Omega}{E_R}$$

COMMON MODE REJECTION



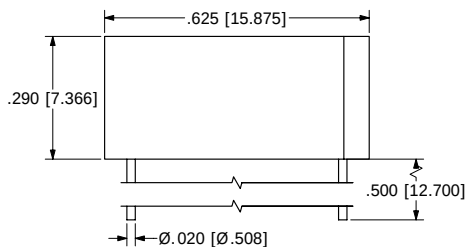
Notes

$E_{IN} = 10 V_{RMS}$
Frequency = 1 MHz
 $CMR = 20 \log_{10} (E_{LIN} / E_{CM})$

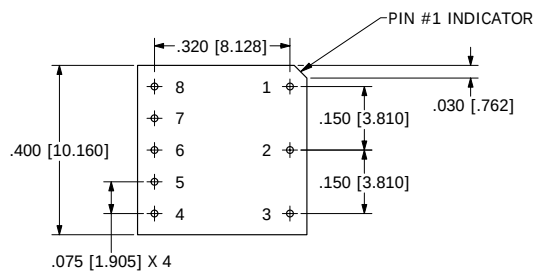
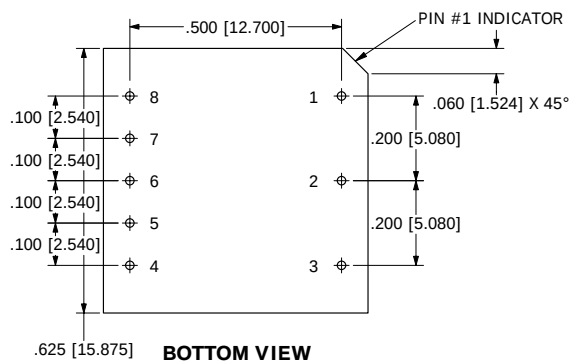
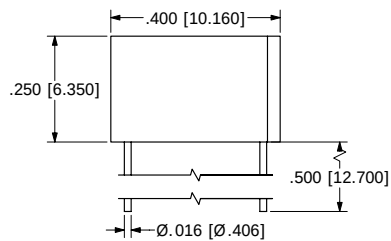
MECHANICAL DRAWINGS

LL-68500-TH SERIES - THROUGH HOLE

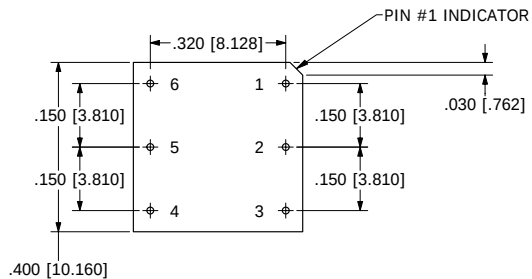
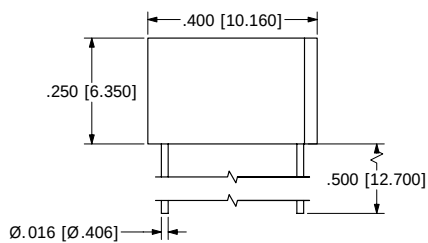
SIZE A



SIZE B

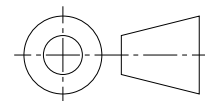


SIZE C



NOTES

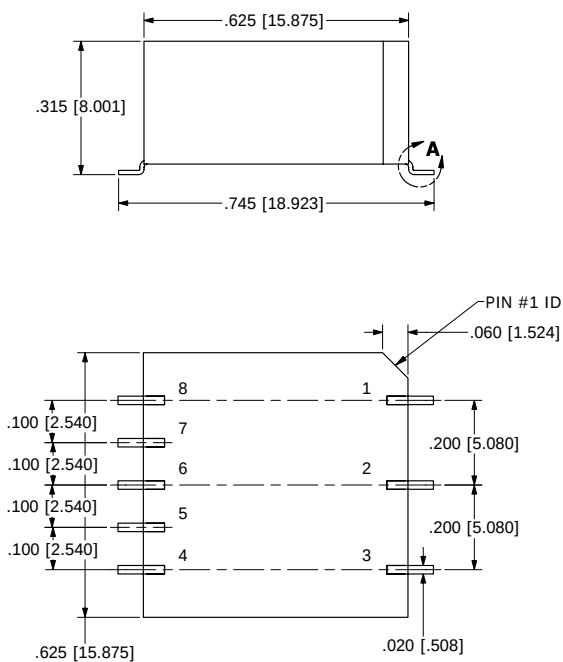
- a. ALL DIMENSIONS ARE IN INCHES, [] = MM
b. TERMINALS ARE CLOCKWISE FROM PIN #1



MECHANICAL DRAWINGS

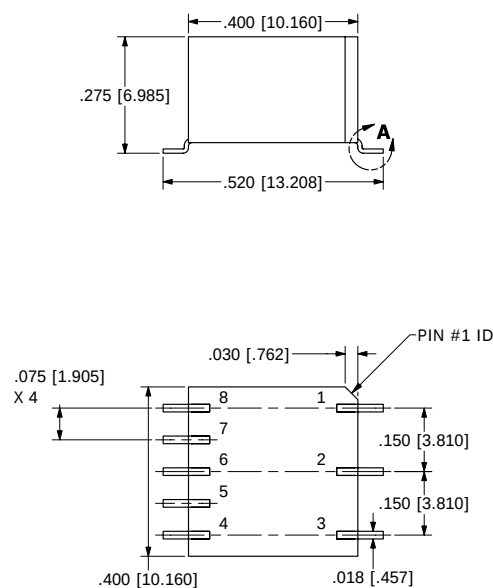
LL-68500-SM - SURFACE MOUNT

SIZE A



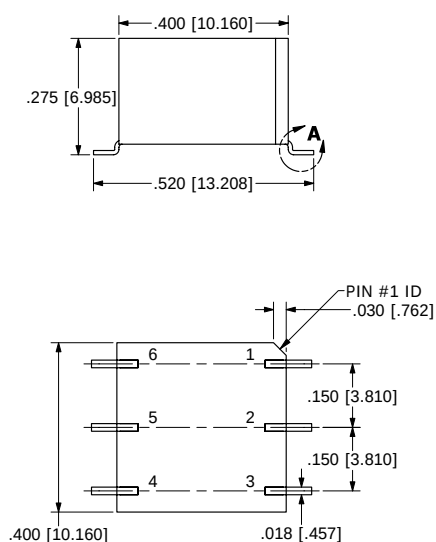
BOTTOM VIEW

SIZE B



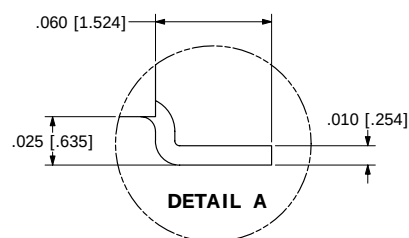
BOTTOM VIEW

SIZE C



BOTTOM VIEW

LEAD DETAILS

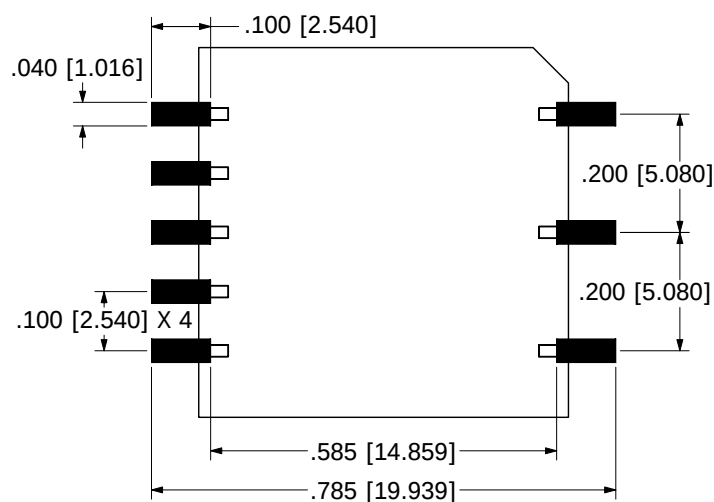


NOTES

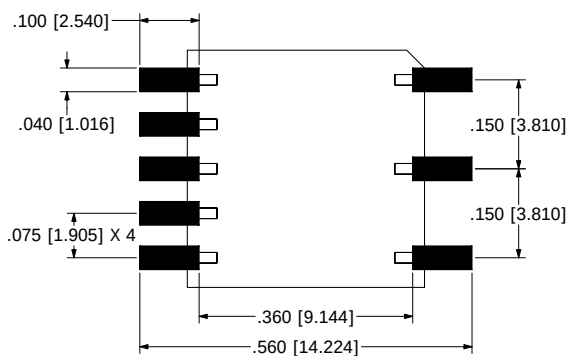
- ALL DIMENSIONS ARE IN INCHES, [] = MM
- TERMINALS ARE CLOCKWISE FROM PIN #1

RECOMMENDED LAND PATTERN DIMENSIONS

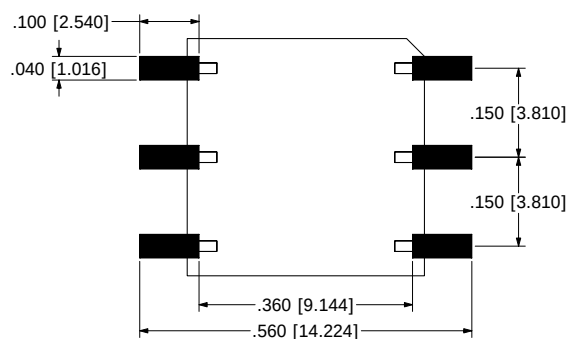
LL-68500-SM - SURFACE MOUNT SIZE A



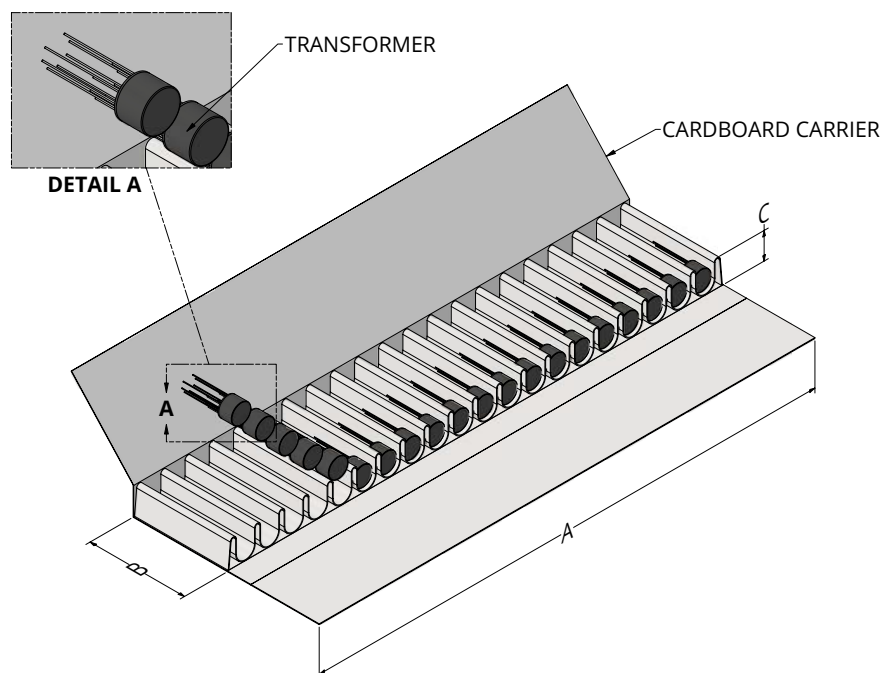
LL-68500-SM - SURFACE MOUNT SIZE B



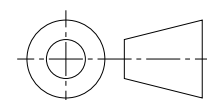
LL-68500-SM - SURFACE MOUNT SIZE C



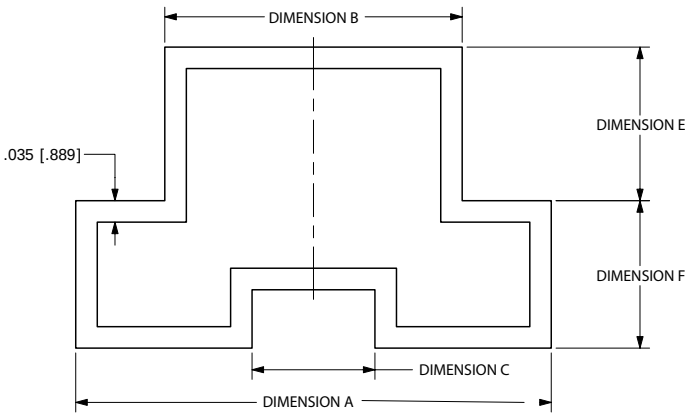
BOX PACKAGING - LL-68500-TH SERIES - THROUGH HOLE



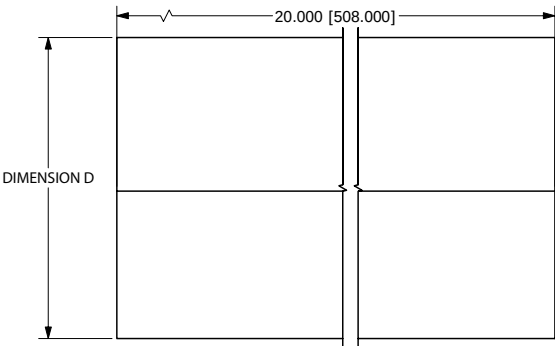
Dimension		
A	B	C
10.65 [270.51]	2.49 [63.246]	0.95 [24.13]



TUBE PACKAGING - LL-68500-SM - SURFACE MOUNT

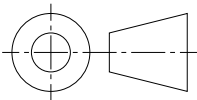
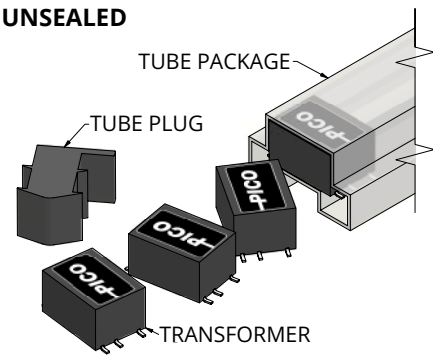
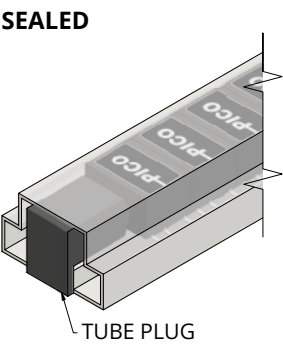


PLAN VIEW



ELEVATION VIEW

LL-68500-SM Size	Dimension					
	A	B	C	D	E	F
A	.934 [23.724]	.644 [16.358]	.240 [6.096]	.515 [13.081]	.275 [6.985]	.240 [6.096]
B & C	.774 [19.660]	.484 [12.294]	.200 [5.080]	.490 [12.446]	.250 [6.350]	.240 [6.096]



Pico warrants each product manufactured by us and sold by us or an authorized representative, to be free from defects in material and workmanship. If properly used, it will perform within its applicable specifications for a period of one year after original shipment. Pico's obligation under this guarantee is limited to repairing or replacing our product to the original purchaser. This warranty is in lieu of all other warranties, express or implied and constitutes fulfillment of our obligations to the purchaser. We do not guarantee that the products can be used for a particular purpose other than those solely covered by the product's specifications. Pico must be notified if the product must meet particular certifications and/or standards. We assume no liability, in any event, for consequential damages, for anticipated or lost profits, incidental damages or loss of time or other losses incurred by the purchaser or any third party in connection with products covered by this warranty or otherwise. The purchaser will indemnify and hold Pico harmless for any damages, losses, costs, etc. from usage not within the product's specifications. Pico must be consulted before usage of its products in a nuclear, radioactive or space environment.

We reserve the right to discontinue products without notice, We reserve the right to make modifications to any existing catalog products without notice, at any time, without the obligation to modify units previously sold.

Miniature 400Hz Power Transformers Series

115VAC/26VAC Input, 0.38VA to 2.4VA

PICO
Electronics, Inc.

PRODUCT OVERVIEW

400Hz power transformers are used in various energy conversion power supplies. They are crucial to aerospace and military industry for aircraft systems as the lightweight solution to the traditional 50/60Hz heavy electronics. The application is not limited to flight systems, but also in stationary controls, airport equipment, and vehicle mobility systems. This miniature class of 400Hz power transformers has an operating temperature range from -55°C to +130°C, with 90°C maximum ambient temperature.

Typical applications:

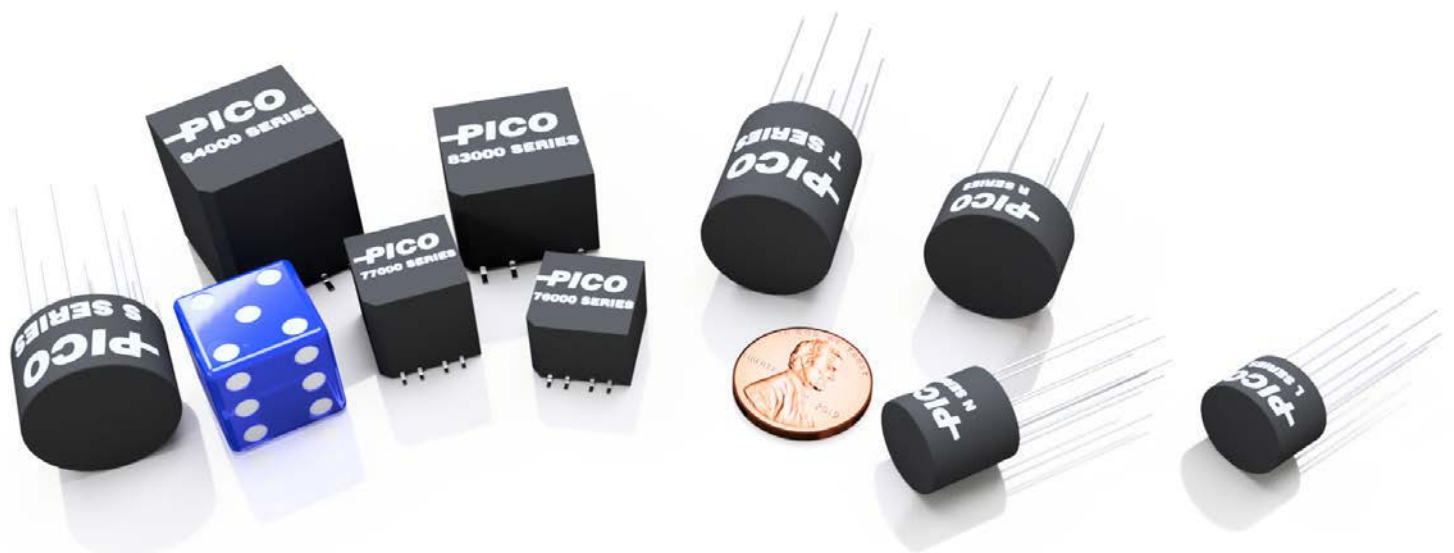
- Lighting
- Defense systems
- Air conditioning
- Avionic flight controls
- Naval electronics
- Power conversion systems
- Vehicle and aircraft navigation

FEATURES

- Extreme resistance to impact, shock, and vibration
- Manufactured to MIL-PRF-27, Class S, Grade 5
- High reliability for space and mission critical applications
- Ultra miniature in size and minimalistic design
- Design layouts in through-hole or surface mount types
- 115VAC or 26VAC primary

Contact Pico for part number of available options:

- Screening and qualification criteria to flight standard
- Fully RoHS compliant or with exemption 7(a)
- Modifications to mechanical design and electrical characteristics
- Custom new design and parameters



Miniature 400Hz Power Transformers Series

SPECIFICATIONS

Primary				Secondary ⁽³⁾	
Through Hole ⁽¹⁾		Surface Mount ⁽²⁾		Voltage [V]	Current [mA]
115V	26V	115V	26V		
L-8948	L-8951	76900	76902	5 CT	75
N-6948	N-6951	77900	77902		150
R-20650	R-20815	82650	82815		204
S-21650	S-21815	83650	83815		338
T-22650	T-22815	84650	84815		480
L-8947	L-8952	76899	76903	6.3 CT	59.5
N-6947	N-6952	77899	77903		119
R-20655	R-20820	82655	82820		162
S-21655	S-21820	83655	83820		268
T-22655	T-22820	84655	84820		381
L-8946	L-8953	76898	76904	8 CT	47
N-6946	N-6953	77898	77904		94
R-20660	R-20825	82660	82825		128
S-21660	S-21825	83660	83825		211
T-22660	T-22825	84660	84825		300
L-8945	L-8954	76897	76905	10 CT	37.5
N-6945	N-6954	77897	77905		75
R-20665	R-20830	82665	82830		102
S-21665	S-21830	83665	83830		169
T-22665	T-22830	84665	84830		240
L-8940	L-8956	76892	76906	12.8 CT	29
N-6940	N-6956	77892	77906		58.6
R-20670	R-20835	82670	82835		79.7
S-21670	S-21835	83670	83835		132
T-22670	T-22835	84670	84835		188
L-8937	L-8957	76889	76907	14 CT	26.8
N-6937	N-6957	77889	77907		53.6
R-20675	R-20840	82675	82840		72.9
S-21675	S-21840	83675	83840		121
T-22675	T-22840	84675	84840		171
L-8935	L-8958	76887	76908	16 CT	23
N-6935	N-6958	77887	77908		47
R-20680	R-20845	82680	82845		63.8
S-21680	S-21845	83680	83845		106
T-22680	T-22845	84680	84845		150

Primary				Secondary ⁽³⁾	
Through Hole ⁽¹⁾		Surface Mount ⁽²⁾		Voltage [V]	Current [mA]
115V	26V	115V	26V		
L-8934	L-8959	76886	76909	18 CT	20.8
N-6934	N-6959	77886	77909		41.7
R-20685	R-20850	82685	82850		56.7
S-21685	S-21850	83685	83850		93.9
T-22685	T-22850	84685	84850		133
L-8933	L-8961	76885	76911	20 CT	18.8
N-6933	N-6961	77885	77911		37.5
R-20690	R-20855	82690	82855		51
S-21690	S-21855	83690	83855		84.5
T-22690	T-22855	84690	84855		120
L-8932	L-8962	76884	76912	22 CT	17
N-6932	N-6962	77884	77912		34
R-20695	R-20860	82695	82860		46.4
S-21695	S-21860	83695	83860		76.8
T-22695	T-22860	84695	84860		109
L-8930	L-8963	76882	76913	24 CT	15.5
N-6930	N-6963	77882	77913		31
R-20700	R-20865	82700	82865		42.5
S-21700	S-21865	83700	83865		70.4
T-22700	T-22865	84700	84865		100
L-8929	L-8964	76881	76914	28 CT	13.4
N-6929	N-6964	77881	77914		26.8
R-20705	R-20870	82705	82870		36.4
S-21705	S-21870	83705	83870		60.4
T-22705	T-22870	84705	84870		85.7
L-8927	L-8966	76879	76916	31 CT	12
N-6927	N-6966	77879	77916		24
R-20710	R-20875	82710	82875		32.9
S-21710	S-21875	83710	83875		54.5
T-22710	T-22875	84710	84875		77.4
L-8925	L-8967	76877	76917	36 CT	10.4
N-6925	N-6967	77877	77917		20.8
R-20715	R-20880	82715	82880		28.3
S-21715	S-21880	83715	83880		46.9
T-22715	T-22880	84715	84880		66.7

Note 1: For RoHS compliance on a through-hole component, please consult with Pico's engineer and provide the part number.

Note 2: All SMDs are available with Pb-free dipped terminals that is compliant to RoHS exemption 7 by requesting part number + 'RoHS-7'

Note 3: Series connection rating. For parallel connection, the voltage rating would be half and current rating would be double.

Miniature 400Hz Power Transformers Series

SPECIFICATIONS

Primary				Secondary ⁽³⁾	
Through Hole ⁽¹⁾		Surface Mount ⁽²⁾		Voltage [V]	Current [mA]
115V	26V	115V	26V		
L-8924	L-8968	76876	76918	39 CT	9.6
N-6924	N-6968	77876	77918		19.2
R-20720	R-20885	82720	82885		26.2
S-21720	S-21885	83720	83885		43.3
T-22720	T-22885	84720	84885		61.5
L-8923	L-8969	76875	76919	43 CT	8.7
N-6923	N-6969	77875	77919		17.4
R-20725	R-20890	82725	82890		23.7
S-21725	S-21890	83725	83890		39.3
T-22725	T-22890	84725	84890		55.8
L-8922	L-8971	76874	76920	48 CT	7.8
N-6922	N-6971	77874	77920		15.6
R-20730	R-20895	82730	82895		21.1
S-21730	S-21895	83730	83895		35.2
T-22730	T-22895	84730	84895		50
L-8920	L-8972	76872	76921	56 CT	6.6
N-6920	N-6972	77872	77921		13.2
R-20735	R-20900	82735	82900		18.2
S-21735	S-21900	83735	83900		30.2
T-22735	T-22900	84735	84900		42.9
L-8917	L-8973	76869	76922	63 CT	6
N-6917	N-6973	77869	77922		11.9
R-20740	R-20905	82740	82905		16.2
S-21740	S-21905	83740	83905		26.9
T-22740	T-22905	84740	84905		38.2
L-8915	L-8974	76867	76923	68 CT	5.5
N-6915	N-6974	77867	77923		11
R-20745	R-20910	82745	82910		15
S-21745	S-21910	83745	83910		24.9
T-22745	T-22910	84745	84910		35.3
L-8910	L-8976	76862	76925	80 CT	4.6
N-6910	N-6976	77862	77925		9.4
R-20750	R-20915	82750	82915		12.1
S-21750	S-21915	83750	83915		21.1
T-22750	T-22915	84750	84915		30

Primary				Secondary ⁽³⁾	
Through Hole ⁽¹⁾		Surface Mount ⁽²⁾		Voltage [V]	Current [mA]
115V	26V	115V	26V		
L-8905	L-8977	76857	76926	88 CT	4.2
N-6905	N-6977	77857	77926		8.5
R-20755	R-20920	82755	82920		11.6
S-21755	S-21920	83755	83920		19.2
T-22755	T-22920	84755	84920		27.3
L-8902	L-8978	76854	76927	100 CT	3.7
N-6902	N-6978	77854	77927		8.5
R-20760	R-20925	82760	82925		10.2
S-21760	S-21925	83760	83925		16.9
T-22760	T-22925	84760	84925		24
L-8900	L-8979	76852	76928	115 CT	3.2
N-6900	N-6979	77852	77928		6.5
R-20765	R-20930	82765	82930		8.9
S-21765	S-21930	83765	83930		14.7
T-22765	T-22930	84765	84930		20.9
R-20770	R-20935	82770	82935	123 CT	8.3
S-21770	S-21935	83770	83935		13.7
T-22770	T-22935	84770	84935	138 CT	19.5
R-20775	R-20940	82775	82940		7.4
S-21775	S-21940	83775	83940		12.2
T-22775	T-22940	84775	84940	157 CT	17.4
R-20780	R-20945	82780	82945		6.5
S-21780	S-21945	83780	83945		10.8
T-22780	T-22945	84780	84945	175 CT	15.3
R-20785	R-20950	82785	82950		5.8
S-21785	S-21950	83785	83950		9.6
T-22785	T-22950	84785	84950	200 CT	13.7
R-20790	R-20955	82790	82955		5.1
S-21790	S-21955	83790	83955		8.4
T-22790	T-22955	84790	84955	220 CT	12
S-21795	S-21960	83795	83960		7.7
T-22795	T-22960	84795	84960		10.9
S-21800	S-21965	83800	83965	250 CT	6.8
T-22800	T-22965	84800	84965		9.6
S-21805	S-21970	83805	83970	275 CT	6.1
T-22805	T-22970	84805	84970		8.7
S-21810	S-21975	83810	83975	310 CT	5.4
T-22810	T-22975	84810	84975		7.7

Note 1: For RoHS compliance on a through-hole component, please consult with Pico's engineer and provide the part number.

Note 2: All SMDs are available with Pb-free dipped terminals that is compliant to RoHS exemption 7 by requesting part number + 'RoHS-7'

Note 3: Series connection rating. For parallel connection, the voltage rating would be half and current rating would be double.

SPECIFICATIONS

GENERAL

Parameter	Condition	Min.	Typ.	Max.	Units
Operating Frequency		380	400	420	Hz
Load Regulation	Output voltage adjusted to nominal value at half load	17	-	24	%
Dielectric Strength	60Hz	200	-	868	V _{RMS}
Insulation Resistance	300VDC to 500VDC	10	-	-	GΩ
Operating Temperature Range	Ambient with temperature rise	-55	-	+130	°C
Storage Temperature Range	Ambient	-55	-	+90	°C
Size	See mechanical drawings				
Weight	L & 76000 Series	-	5	-	grams
	N & 77000 Series	-	7.5	-	
	R & 82000 Series	-	12	-	
	S & 83000 Series	-	17	-	
	T & 84000 Series	-	28	-	
Case	Through hole models	Epoxy Insulated Metal			
	Surface mount models	Glass Reinforced Polymer			
Potting	Vacuum Impregnated Epoxy				
Box Package (W x H x L)	L & N Series	6.42 (163.07) x 0.79 (20.07) x 10.50 (266.70)			inches (mm)
	R, S, & T Series	2.35 (59.69) x 1.29 (32.77) x 9.45 (240.03)			
Tube Packaging (W x H x L)	Surface mount models	See drawing			inches (mm)
Tape & Reel Packaging	Upon request				
Moisture Sensitivity Level	SMT only	Level 3			

OPTIONAL DESIGN CRITERIA

Test	Standard	Description
Vibration	MIL-STD-202	Method 204, Vibration, High Frequency
Shock	MIL-STD-202	Method 213, Shock (Specified Pulse)
Immersion	MIL-STD-202	Method 104, Immersion
Moisture Resistance	MIL-STD-202	Method 106, Moisture Resistance
Flammability	MIL-STD-202	Method 111, Flammability (External Flame)
Thermal Shock	MIL-STD-202	Method 107, Thermal Shock

OPTIONAL SCREENING AND QUALIFICATION

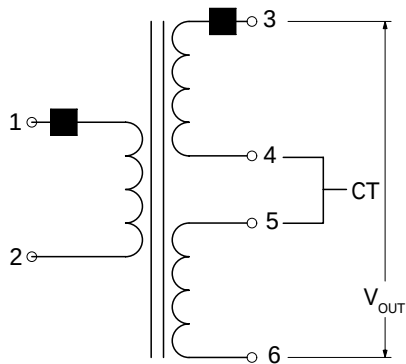
Standard	Screening & Qualification	Test ⁽⁴⁾
MIL-PRF-27	a.) Group A inspection Level-T - Table VII b.) Qualification inspection, Grade 5 - Table V	I. Thermal Shock II. Vibration III. Burn-in IV. Induced Voltage V. Shock VI. Dielectric Withstanding Voltage (at reduced pressure) VII. Insulation Resistance VIII. Electrical Characteristics IX. Visual and Mechanical Examination (External) X. Life XI. Radiographic Inspection
MIL-STD-981	a.) Group A screening tests - Table VI b.) Group B tests - Table XII, Class S	
EEE-INST-002, Section M1	a.) Magnetics Screening Req. - Table 2 b.) Magnetics Part Qual. - Table 3	

Note 4: Screening and qualification tests are not limited to the options in the chart above. Each standard may also be stringent or exclude certain tests from one another. Please contact Pico for specific application needs and for Pico part number.

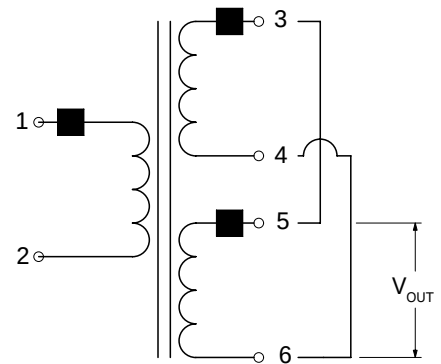
ELECTRICAL SCHEMATIC

THROUGH HOLE MODELS

SERIES CONNECTION

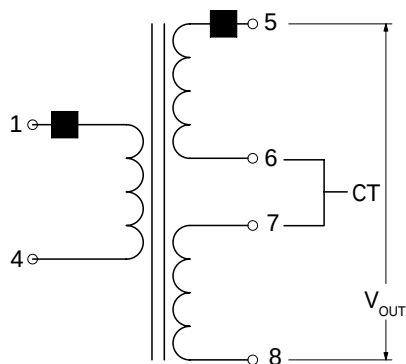


PARALLEL CONNECTION

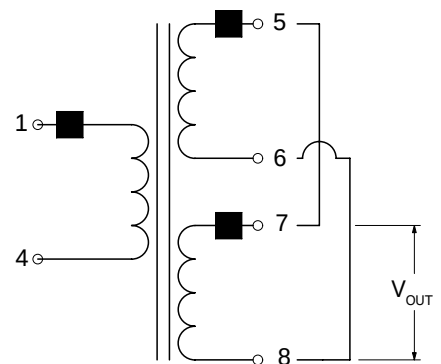


SURFACE MOUNT MODELS

SERIES CONNECTION

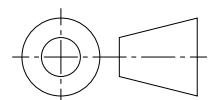


PARALLEL CONNECTION



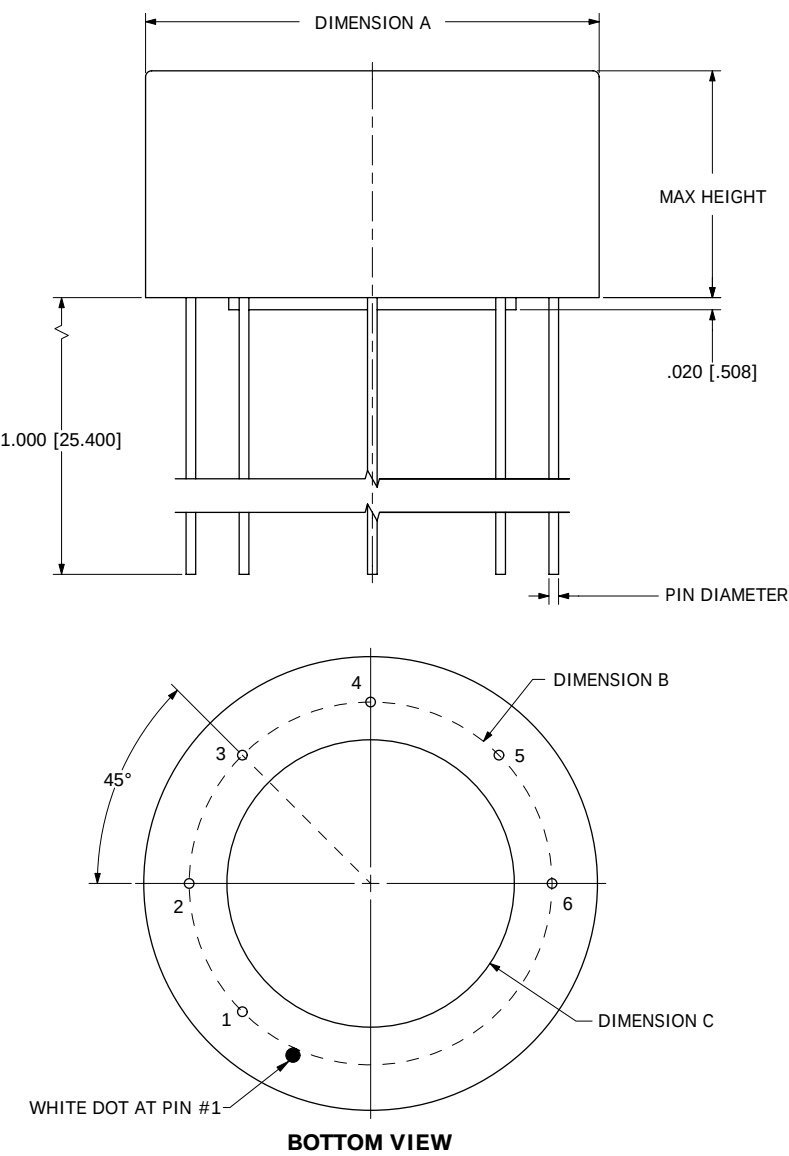
NOTES

- Please note that for through hole plug-ins 400Hz transformers, there are 6 pins which are not the same as the typical 7 pins design for series L, N, R, S, & T.
- Pins that are not shown here, but are physically there on the component, are only for mechanical stability on the PCB.
- CT stands for "center-tap", where the total number of turns is evenly split between the top half and bottom half of a complete winding.



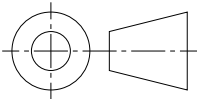
MECHANICAL DRAWINGS

THROUGH HOLE MODELS



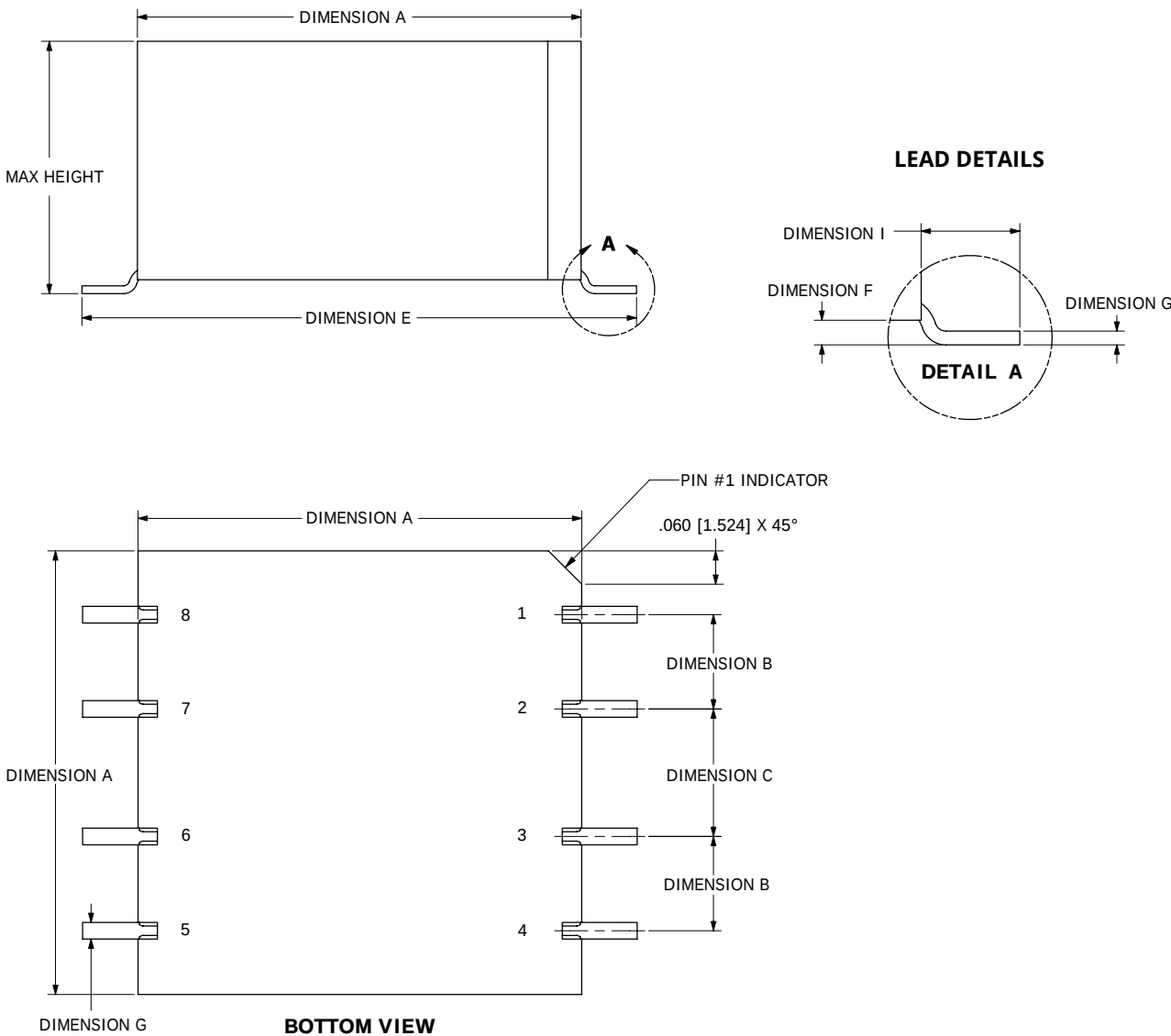
Series	Max Height	Diameter Dimension			
		A	B	C	Pin
L	.350 (8.89)	.510 (12.95)	.350 (8.89)	.218 (5.54)	.016 (0.41)
N	.500 (12.70)				.016 (0.41)
R	.375 (9.53)	.750 (19.05)	.600 (15.24)	.475 (12.07)	.016 (0.41)
S	.520 (13.21)				.020 (0.51)
T	.820 (20.83)				.020 (0.51)

NOTES
a. ALL DIMENSIONS ARE IN INCHES, [] = MM
b. TERMINALS ARE CLOCKWISE FROM PIN #1



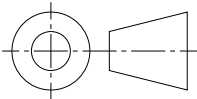
MECHANICAL DRAWINGS

SURFACE MOUNT MODELS



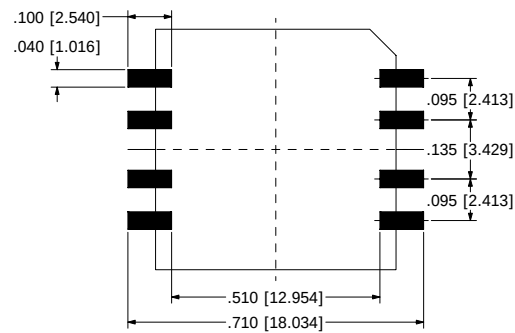
Series	Max Height	Dimension							
		A	B	C	D	E	F	G	I
76000	.415 (10.54)	.550 (13.97)	.095 (2.41)	.135 (3.43)	.010 (.25)	.670 (17.02)	.015 (.38)	.020 (.51)	.060 (1.52)
77000	.565 (14.35)								
82000	.455 (11.56)	.800 (20.32)	.170 (4.32)	.230 (5.84)	.014 (.35)	1.00 (25.40)	.025 (.63)	.030 (.76)	.100 (2.54)
83000	.605 (15.37)								
84000	.915 (23.24)								

NOTES
a. ALL DIMENSIONS ARE IN INCHES, [] = MM
b. TERMINALS ARE CLOCKWISE FROM PIN #1
c. PIN #4 HAS NO CONNECTION

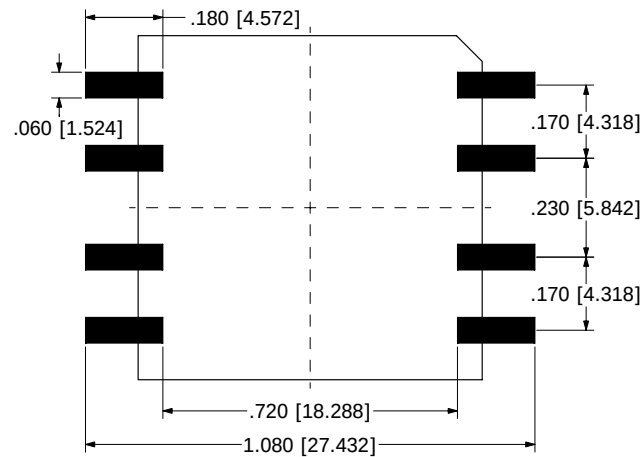


RECOMMENDED LAND PATTERN DIMENSIONS

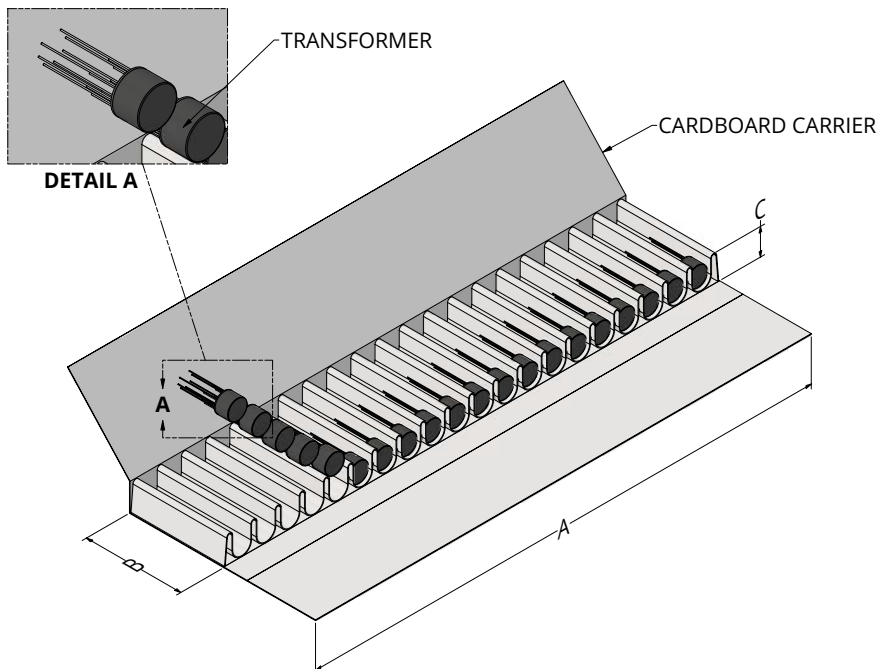
76000 & 77000 SERIES



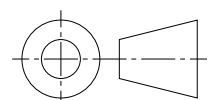
82000, 83000 & 84000 SERIES



BOX PACKAGING - L, N, R, S & T SERIES



Series	Dimension		
	A	B	C
L & N	10.5 [266.7]	6.42 [163.068]	0.79 [20.066]
R, S & T	9.45 [240.03]	2.35 [59.69]	1.29 [32.766]

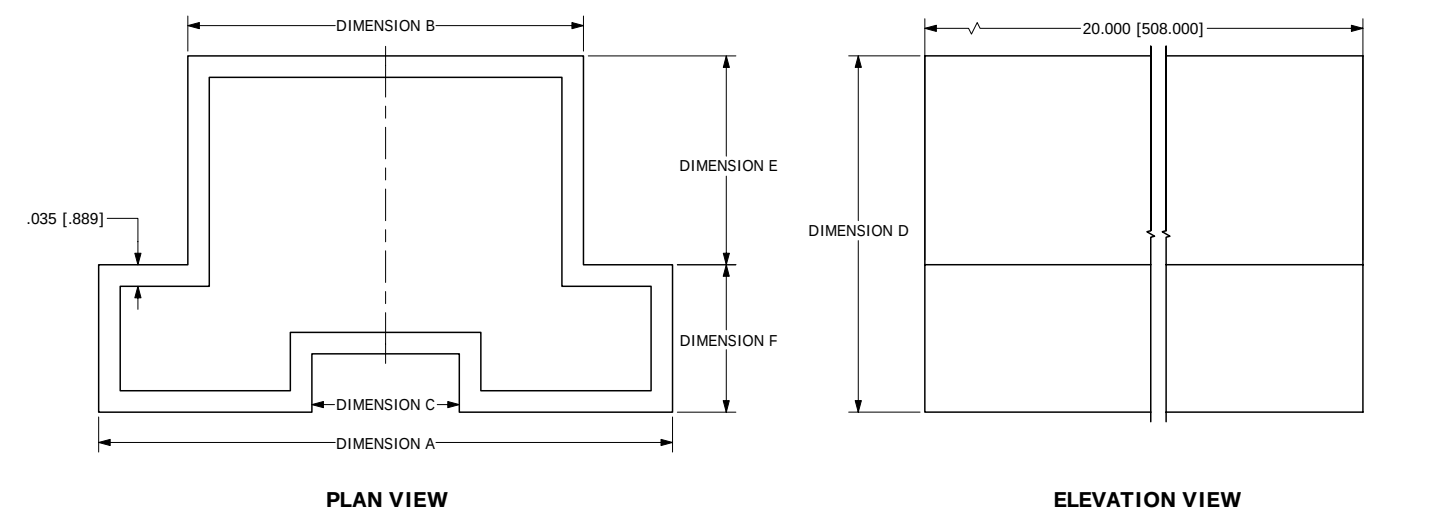


Miniature 400Hz Power Transformers Series

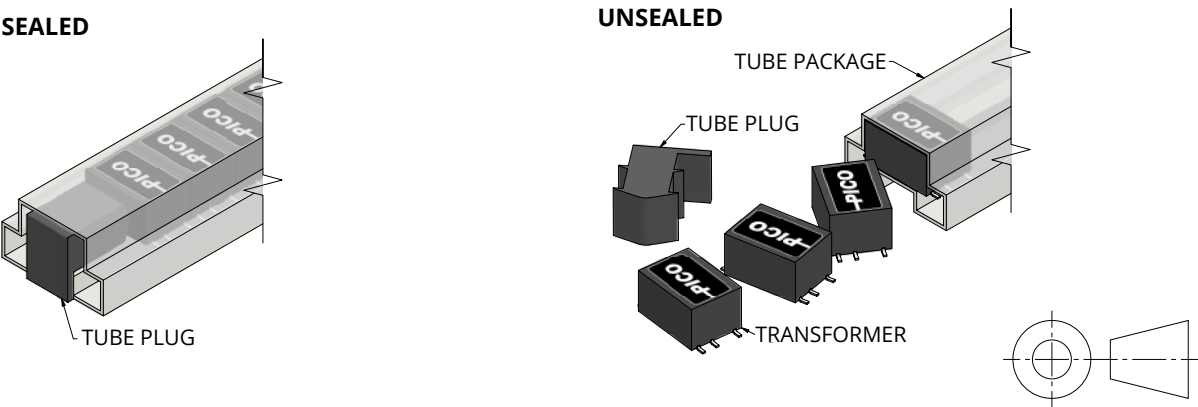
Power Transformer

PICO

TUBE PACKAGING - 76000, 77000, 82000, 83000 & 84000 SERIES



Series	Dimension					
	A	B	C	D	E	F
76000	.934 [23.724]	.644 [16.358]	.240 [6.096]	.580 [14.732]	.340 [8.636]	.240 [6.096]
77000	.934 [23.724]	.644 [16.358]	.240 [6.096]	.730 [18.542]	.490 [12.446]	.240 [6.096]
82000	1.240 [31.496]	.950 [24.130]	.480 [12.192]	.610 [15.494]	.390 [9.906]	.220 [2.558]
83000	1.170 [29.718]	.880 [22.352]	.430 [10.922]	.745 [18.923]	.505 [12.827]	.240 [6.096]
84000	1.170 [29.718]	.880 [22.352]	.430 [10.922]	1.140 [28.956]	.830 [21.082]	.310 [7.874]



Pico warrants each product manufactured by us and sold by us or an authorized representative, to be free from defects in material and workmanship. If properly used, it will perform within its applicable specifications for a period of one year after original shipment. Pico's obligation under this guarantee is limited to repairing or replacing our product to the original purchaser. This warranty is in lieu of all other warranties, express or implied and constitutes fulfillment of our obligations to the purchaser. We do not guarantee that the products can be used for a particular purpose other than those solely covered by the product's specifications. Pico must be notified if the product must meet particular certifications and/or standards. We assume no liability, in any event, for consequential damages, for anticipated or lost profits, incidental damages or loss of time or other losses incurred by the purchaser or any third party in connection with products covered by this warranty or otherwise. The purchaser will indemnify and hold Pico harmless for any damages, losses, costs, etc. from usage not within the product's specifications. Pico must be consulted before usage of its products in a nuclear, radioactive or space environment.

We reserve the right to discontinue products without notice, We reserve the right to make modifications to any existing catalog products without notice, at any time, without the obligation to modify units previously sold.

400Hz Power Transformers Series **PICO**

115VAC/26VAC Input, 5VA to 150VA

Electronics, Inc.

PRODUCT OVERVIEW

400Hz power transformers are used in various energy conversion power supplies. They are crucial to aerospace and military industry for aircraft systems as the lightweight solution to the traditional 50/60Hz heavy electronics. The application is not limited to flight systems, but also in stationary controls, airport equipment, and vehicle mobility systems. This larger class of 400Hz power transformers has an operating temperature range from -55°C to +130°C.

Typical applications:

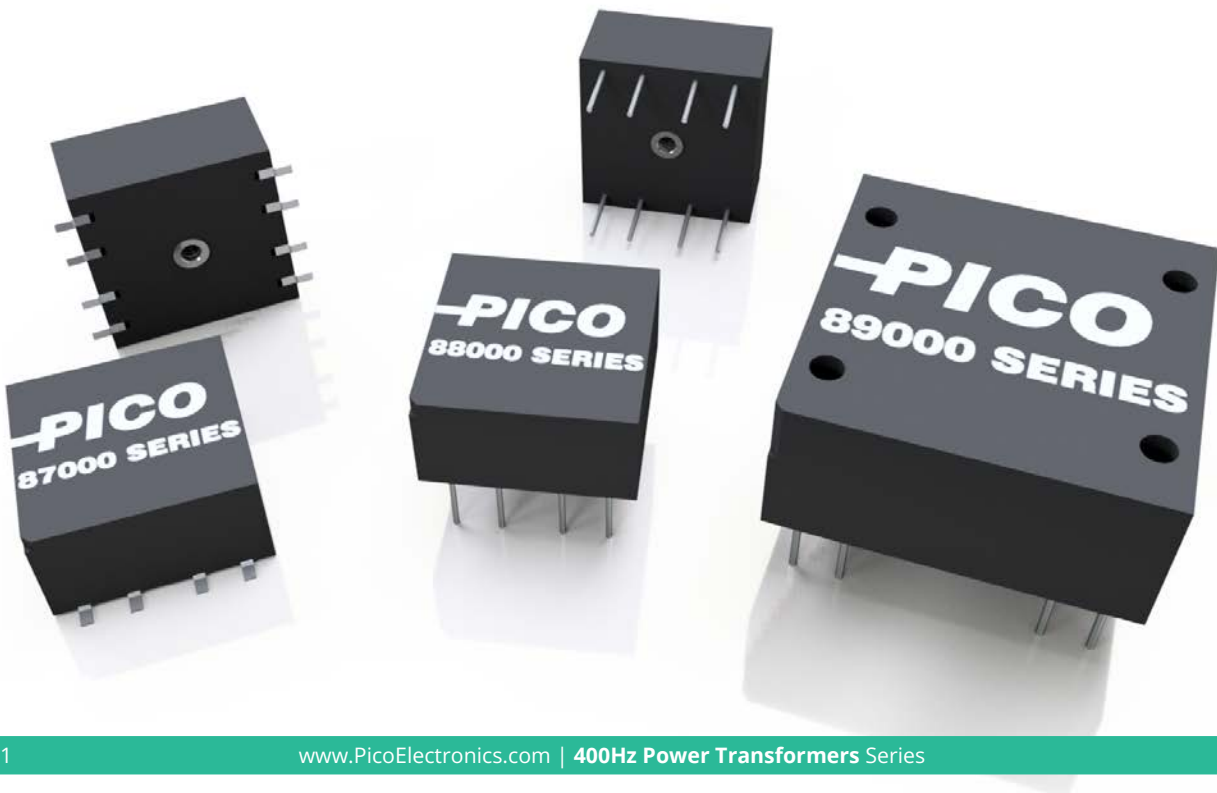
- Lighting
- Defense systems
- Air conditioning
- Avionic flight controls
- Naval electronics
- Power conversion systems
- Vehicle and aircraft navigation

FEATURES

- Extreme resistance to impact, shock, and vibration
- Manufactured to MIL-PRF-27, Class S, Grade 5
- High reliability for space and mission critical applications
- Ultra miniature in size and minimalistic design
- Design layouts in through-hole or surface mount types
- 115VAC or 26VAC primary

Contact Pico for part number of available options:

- Screening and qualification criteria to flight standard
- Fully RoHS compliant or with exemption 7(a)
- Modifications to mechanical design and electrical characteristics
- Custom new design and parameters



SPECIFICATIONS

Primary				Secondary ⁽³⁾		Primary				Secondary ⁽³⁾	
Through Hole ⁽¹⁾		Surface Mount ⁽²⁾		Voltage [V]	Current [mA]	Through Hole ⁽¹⁾		Surface Mount ⁽²⁾		Voltage [V]	Current [mA]
115VAC	26VAC	115VAC	26VAC			115VAC	26VAC	115VAC	26VAC		
88515	88015	87515	87015	5 CT	1000	88535	88035	87535	87035	14 CT	357
88615	88115	87615	87115		3000	88635	88135	87635	87135		1071
88715	88215	87715	87215		5000	88735	88235	87735	87235		1786
88815	88315	87815	87315		7000	88835	88335	87835	87335		2500
88915	88415	87915	87415		10,000	88935	88435	87935	87435		3571
89515	89015	-	-		15,000	89535	89035	-	-		5350
89715	89215	-	-		30,000	89735	89235	-	-		10,714
88520	88020	87520	87020	6 CT	833	88540	88040	87540	87040	15 CT	333
88620	88120	87620	87120		2500	88640	88140	87640	87140		1000
88720	88220	87720	87220		4166	88740	88240	87740	87240		1667
88820	88320	87820	87320		5833	88840	88340	87840	87340		2333
88920	88420	87920	87420		8333	88940	88440	87940	87440		3333
89520	89020	-	-		12,500	89540	89040	-	-		5000
89720	89220	-	-		25,000	89740	89240	-	-		10,000
88525	88025	87525	87025	9 CT	555	88545	88045	87545	87045	22 CT	227
88625	88125	87625	87125		1666	88645	88145	87645	87145		681
88725	88225	87725	87225		2777	88745	88245	87745	87245		1136
88825	88325	87825	87325		3888	88845	88345	87845	87345		1591
88925	88425	87925	87425		5555	88945	88445	87945	87445		2272
89525	89025	-	-		8330	89545	89045	-	-		3400
89725	89225	-	-		16,666	89745	89245	-	-		6818
88530	88030	87530	87030	12 CT	417	88550	88050	87550	87050	24 CT	208
88630	88130	87630	87130		1250	88650	88150	87650	87150		625
88730	88230	87730	87230		2083	88750	88250	87750	87250		1041
88830	88330	87830	87330		2917	88850	88350	87850	87350		1450
88930	88430	87930	87430		4166	88950	88450	87950	87450		2083
89530	89030	-	-		6250	89550	89050	-	-		3125
89730	89230	-	-		12,500	89750	89250	-	-		6250

Note 1: For RoHS compliance on a through-hole component, please consult with Pico's engineer and provide the part number.

Note 2: All SMDs are available with Pb-free dipped terminals that is compliant to RoHS exemption 7 by requesting part number + 'RoHS-7'

Note 3: Series connection rating. For parallel connection, the voltage rating would be half and current rating would be double.

SPECIFICATIONS

Primary				Secondary ⁽³⁾	
Through Hole ⁽¹⁾		Surface Mount ⁽²⁾		Voltage	Current
115VAC	26VAC	115VAC	26VAC	[V]	[mA]
88555	88055	87555	87055	28 CT	178
88655	88155	87655	87155		535
88755	88255	87755	87255		892
88855	88355	87855	87355		1250
88955	88455	87955	87455		1786
89555	89055	-	-		2678
89755	89255	-	-		5357
88560	88060	87560	87060	36 CT	138
88660	88160	87660	87160		416
88760	88260	87760	87260		694
88860	88360	87860	87360		972
88960	88460	87960	87460		1389
89560	89060	-	-		2083
89760	89260	-	-		4166
88565	88065	87565	87065	48 CT	104
88665	88165	87665	87165		312
88765	88265	87765	87265		521
88865	88365	87865	87365		729
88965	88465	87965	87465		1043
89565	89065	-	-		1562
89765	89265	-	-		3125
88570	88070	87570	87070	75 CT	67
88670	88170	87670	87170		200
88770	88270	87770	87270		333
88870	88370	87870	87370		467
88970	88470	87970	87470		676
89570	89070	-	-		1000
89770	89270	-	-		2000

Primary				Secondary ⁽³⁾	
Through Hole ⁽¹⁾		Surface Mount ⁽²⁾		Voltage	Current
115VAC	26VAC	115VAC	26VAC	[V]	[mA]
88575	88075	87575	87075	100 CT	50
88675	88175	87675	87175		150
88775	88275	87775	87275		250
88875	88375	87875	87375		350
88975	88475	87975	87475		500
89575	89075	-	-		750
89775	89275	-	-		1500
88580	88080	87580	87080	110 CT	145
88680	88180	87680	87180		1136
88780	88280	87780	87280		227
88880	88380	87880	87380		318
88980	88480	87980	87480		454
89580	89080	-	-		682
89780	89280	-	-		1364
88585	88085	87585	87085	115 CT	43
88685	88185	87685	87185		130
88785	88285	87785	87285		217
88885	88385	87885	87385		304
88985	88485	87985	87485		434
89585	89085	-	-		652
89785	89285	-	-		1304

Note 1: For RoHS compliance on a through-hole component, please consult with Pico's engineer and provide the part number.

Note 2: All SMDs are available with Pb-free dipped terminals that is compliant to RoHS exemption 7 by requesting part number + 'RoHS-7'

Note 3: Series connection rating. For parallel connection, the voltage rating would be half and current rating would be double.

SPECIFICATIONS

GENERAL

Parameter	Condition	Min.	Typ.	Max.	Units
Operating Frequency		380	400	420	Hz
Load Regulation		-	-	8	%
Dielectric Withstanding Voltage	60Hz	200	-	868	V _{RMS}
Insulation Resistance	300VDC to 500VDC	10	-	-	GΩ
Operating Temperature Range	Ambient with temperature rise	-55	-	+130	°C
Storage Temperature Range	Ambient	-55	-	+90	°C
Size	See mechanical drawings				
Weight	See mechanical drawings				
Case	Glass Reinforced Polymer				
Potting	Vacuum Impregnated Epoxy				
Box Packaging (L x W x H)		11.56 x 8.92 x 1.4 (293.624 x 226.568 x 35.56)			inches (mm)
Moisture Sensitivity Level	SMT only	Level 3			

OPTIONAL DESIGN CRITERIA

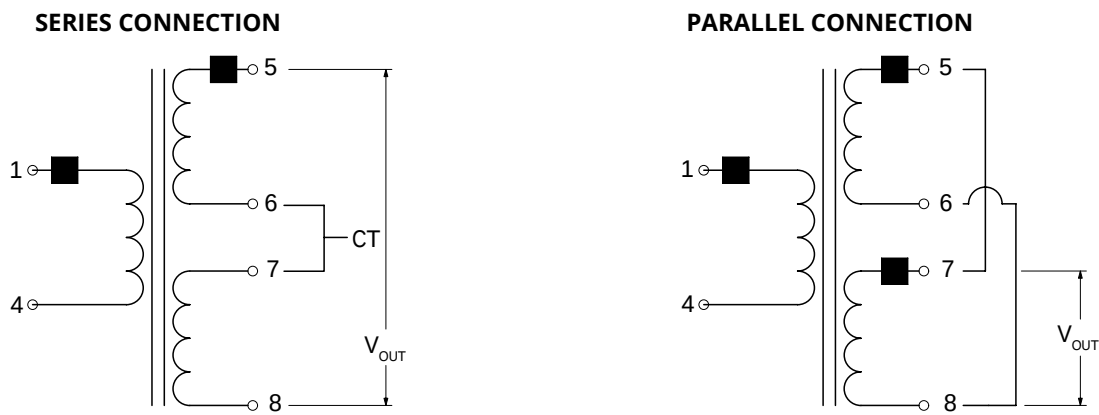
Test	Standard	Description
Vibration	MIL-STD-202	Method 204, Vibration, High Frequency
Shock	MIL-STD-202	Method 213, Shock (Specified Pulse)
Immersion	MIL-STD-202	Method 104, Immersion
Moisture Resistance	MIL-STD-202	Method 106, Moisture Resistance
Flammability	MIL-STD-202	Method 111, Flammability (External Flame)
Thermal Shock	MIL-STD-202	Method 107, Thermal Shock

OPTIONAL SCREENING AND QUALIFICATION

Standard	Screening & Qualification	Test ⁽⁴⁾
MIL-PRF-27	a.) Group A inspection Level-T - Table VII b.) Qualification inspection, Grade 5 - Table V	I. Thermal Shock II. Vibration III. Burn-in IV. Induced Voltage V. Shock VI. Dielectric Withstanding Voltage (at reduced pressure) VII. Insulation Resistance VIII. Electrical Characteristics IX. Visual and Mechanical Examination (External) X. Life XI. Radiographic Inspection
MIL-STD-981	a.) Group A screening tests - Table VI b.) Group B tests - Table XII, Class S	
EEE-INST-002, Section M1	a.) Magnetics Screening Req. - Table 2 b.) Magnetics Part Qual. - Table 3	

Note 4: Screening and qualification tests are not limited to the options in the chart above. Each standard may also be stringent or exclude certain tests from one another. Please contact Pico for specific application needs and for Pico part number.

ELECTRICAL SCHEMATIC



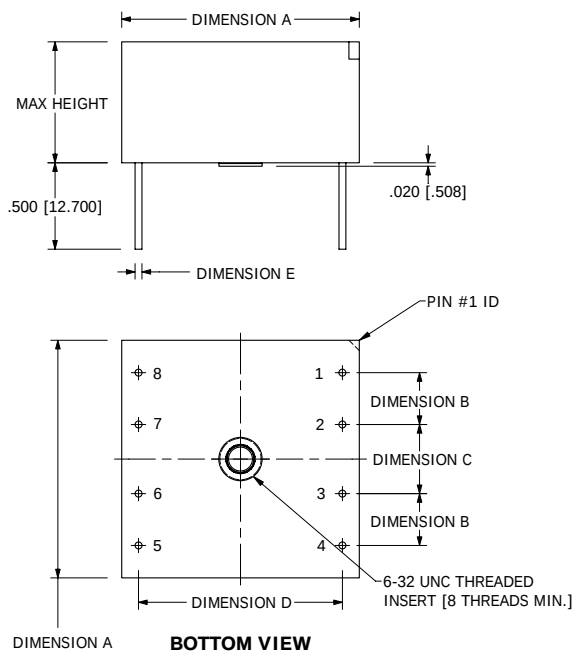
NOTES

a. TERMINAL 2 & 3 HAVE NO CONNECTION. MECHANICAL STABILITY ONLY.

b. CT STANDS FOR "CENTER-TAP", WHERE THE TOTAL NUMBER OF TURNS IS EVENLY SPLIT BETWEEN THE TOP HALF AND BOTTOM HALF OF A COMPLETE WINDING.

MECHANICAL DRAWINGS

THROUGH HOLE MODELS

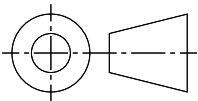


Series	Max Height	Dimension					Weight (grams)
		A	B	C	D	E	
88000 & 88500	.700 (17.78)	1.375 (34.93)	.300 (7.62)	.400 (10.16)	1.180 (29.97)	.040 (1.01)	52
88100 & 88600	.825 (20.95)	1.500 (38.10)	.300 (7.62)	.500 (12.70)	1.330 (33.75)	.040 (1.01)	65
88200 & 88700	.825 (20.95)	1.625 (41.28)	.300 (7.62)	.700 (17.78)	1.400 (35.56)	.040 (1.01)	100
88300 & 88800	.925 (23.49)	1.750 (44.45)	.300 (7.62)	.800 (20.32)	1.570 (39.88)	.040 (1.01)	145
88400 & 88900	1.025 (26.03)	2.000 (50.80)	.300 (7.62)	.900 (22.86)	1.800 (45.72)	.052 (1.32)	195

NOTES

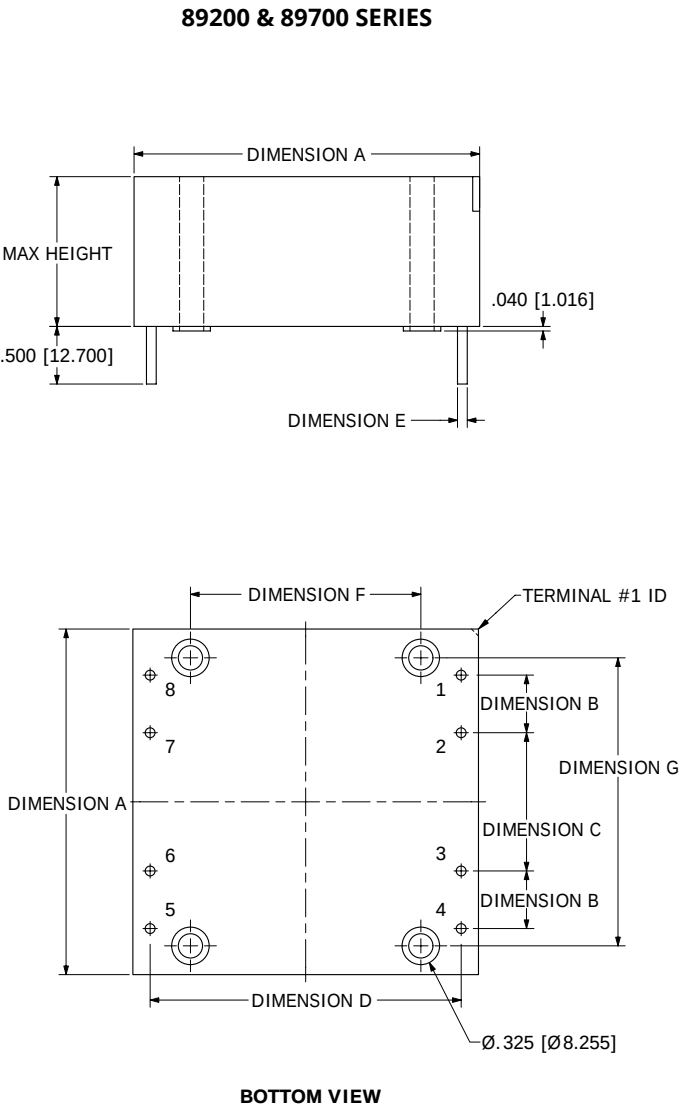
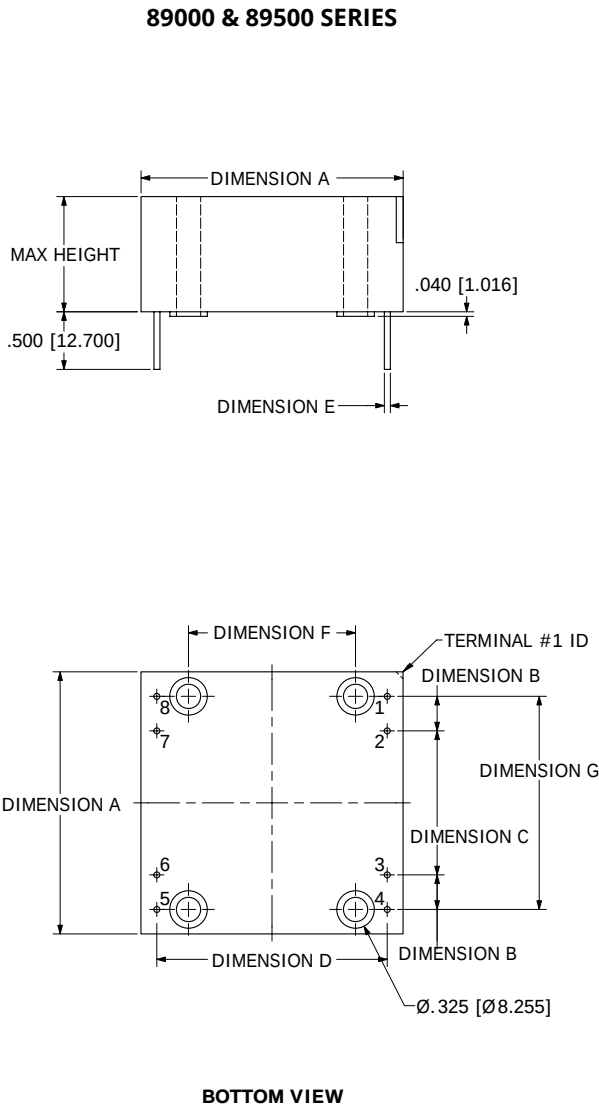
a. ALL DIMENSIONS ARE IN INCHES, [] = MM

b. TERMINALS ARE CLOCKWISE FROM PIN #1



MECHANICAL DRAWINGS

THROUGH HOLE MODELS

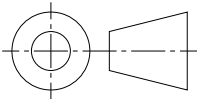


Series	Max Height	Dimension							Weight (grams)
		A	B	C	D	E	F	G	
89000 & 89500	1.000 (25.40)	2.275 (57.78)	.300 (7.62)	1.250 (31.75)	2.000 (50.60)	.052 (1.32)	1.450 (36.83)	1.850 (47.00)	252
89200 & 89700	1.300 (33.02)	3.000 (76.20)	.500 (12.70)	1.200 (30.48)	2.700 (68.58)	.085 (2.16)	2.000 (50.80)	2.500 (63.50)	525

NOTES

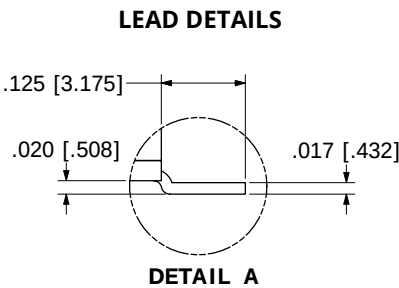
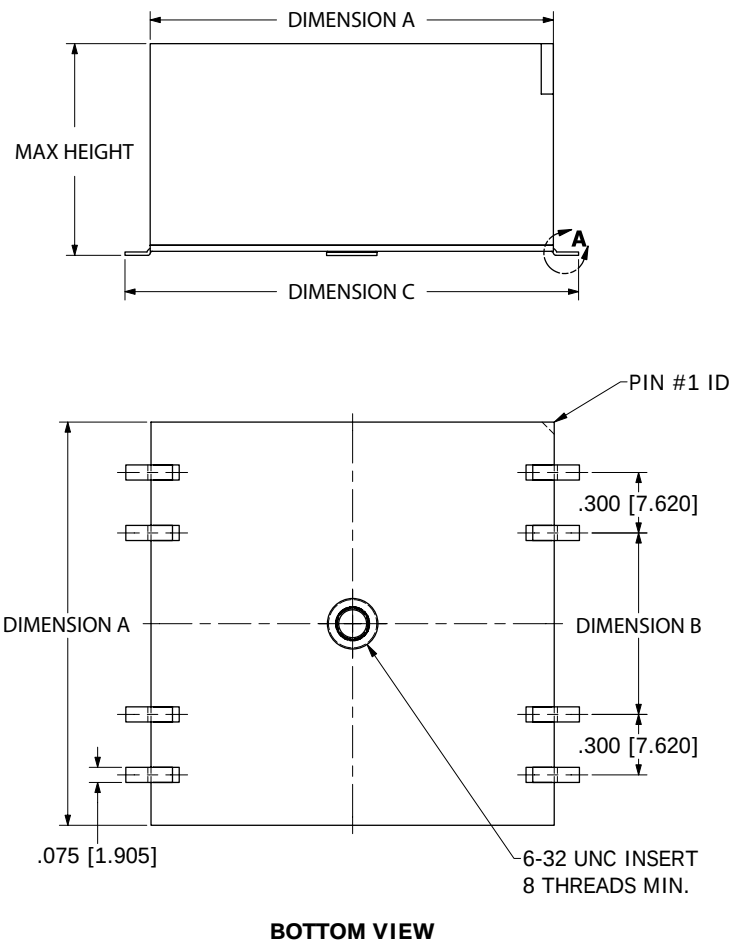
a. ALL DIMENSIONS ARE IN INCHES, [] = MM

b. TERMINALS ARE CLOCKWISE FROM PIN #1



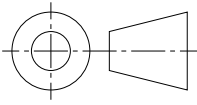
MECHANICAL DRAWINGS

SURFACE MOUNT MODELS



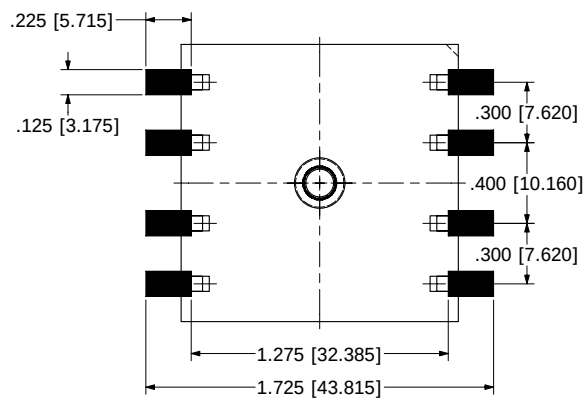
Series	Max Height	A	Dimension B	C	Insert	Weight (grams)
87000 & 87500	.725 (18.42)	1.375 (34.93)	.400 (10.16)	1.625 (41.27)	6 - 32 UNC	52
87100 & 87600	.850 (20.32)	1.500 (38.10)	.500 (12.70)	1.750 (44.45)		65
87200 & 87700	.850 (21.59)	1.625 (41.28)	.700 (17.78)	1.875 (47.63)		100
87300 & 87800	.950 (24.13)	1.750 (44.45)	.800 (20.32)	2.000 (50.80)		145
87400 & 87900	1.050 (26.67)	2.000 (50.80)	.900 (22.86)	2.250 (57.15)		195

NOTES
a. ALL DIMENSIONS ARE IN INCHES, [] = MM
b. TERMINALS ARE CLOCKWISE FROM PIN #1
c. PIN #3 HAS NO CONNECTION

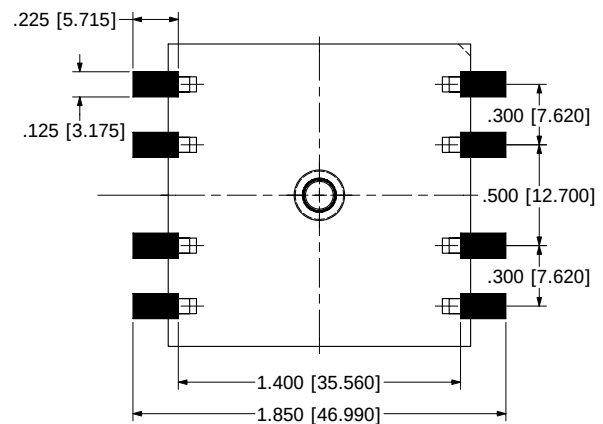


RECOMMENDED LAND PATTERN DIMENSIONS

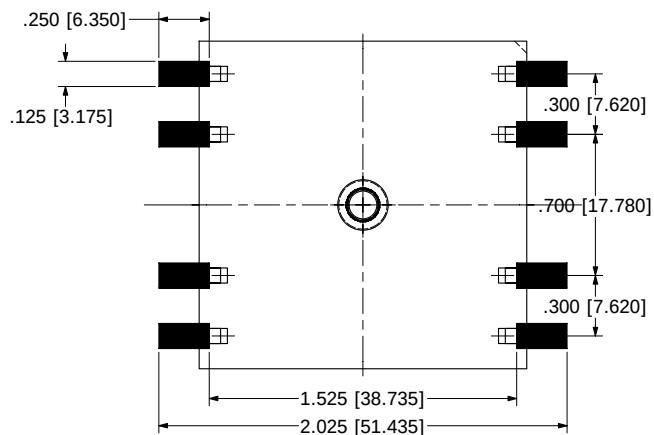
87000 & 87500 SERIES



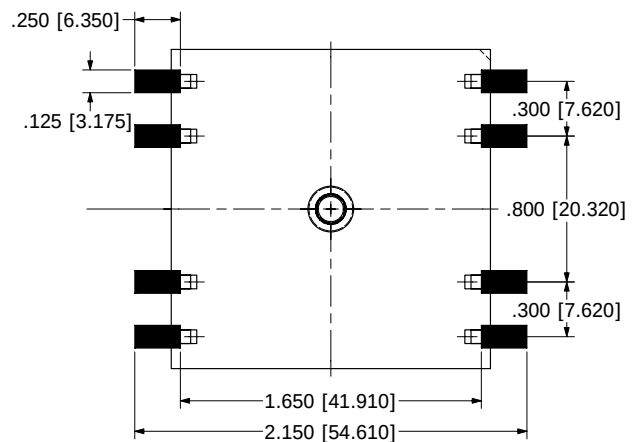
87100 & 87600 SERIES



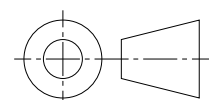
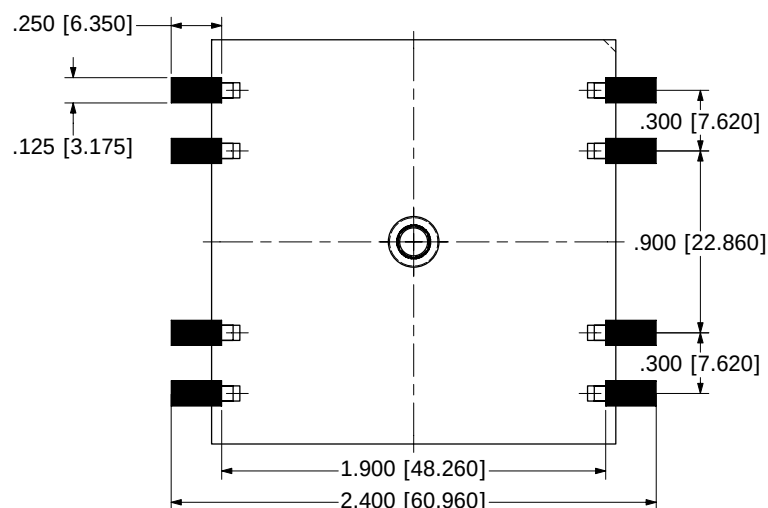
87200 & 87700 SERIES



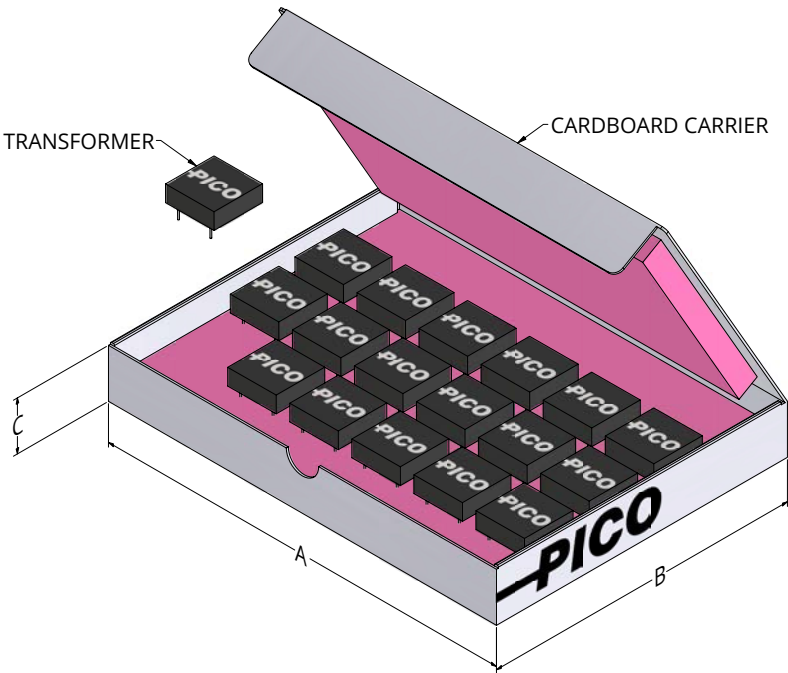
87300 & 87800 SERIES



87400 & 87900 SERIES



BOX PACKAGING



Dimension		
A	B	C
11.56	8.92	1.4
[293.624]	[226.568]	[35.56]

Pico warrants each product manufactured by us and sold by us or an authorized representative, to be free from defects in material and workmanship. If properly used, it will perform within its applicable specifications for a period of one year after original shipment. Pico's obligation under this guarantee is limited to repairing or replacing our product to the original purchaser. This warranty is in lieu of all other warranties, express or implied and constitutes fulfillment of our obligations to the purchaser. We do not guarantee that the products can be used for a particular purpose other than those solely covered by the product's specifications. Pico must be notified if the product must meet particular certifications and/or standards. We assume no liability, in any event, for consequential damages, for anticipated or lost profits, incidental damages or loss of time or other losses incurred by the purchaser or any third party in connection with products covered by this warranty or otherwise. The purchaser will indemnify and hold Pico harmless for any damages, losses, costs, etc. from usage not within the product's specifications. Pico must be consulted before usage of its products in a nuclear, radioactive or space environment.

We reserve the right to discontinue products without notice, We reserve the right to make modifications to any existing catalog products without notice, at any time, without the obligation to modify units previously sold.

38000 Series

5-20A, 1:100 Ratio Current Sense Transformer

PICO
Electronics, Inc.

PRODUCT OVERVIEW

Pico's Current Sense Transformers are designed for load management and power circuit protection. They provide the safest step-up current monitoring by allowing measurement of the current on the low side. This ensures proper load profiling in energy industry for system distribution and effective in cost allocation by metering the data output. At the same time, these devices maintain electrical isolation in power supplies and uphold minimal sensitivity to temperature change. The current rating extends from 5A to 20A.

Typical applications:

- Power Controls
- System Monitoring
- Circuit Protection
- Load Balance
- Renewable Energy Systems
- Energy Distribution

FEATURES

- Extreme resistance to impact, shock, and vibration
- Manufactured to MIL-PRF-27 Grade 5, Class S
- High reliability for space and mission critical applications
- Ultra miniature in size and minimalistic design
- Design layouts in through-hole, or surface mount
- Terminal solderability per MIL-STD-202, Method 208

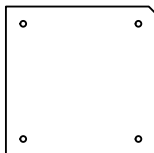
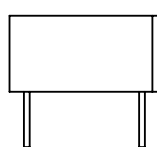
Contact Pico for part number of available options:

- Screening and qualification criteria to flight standard
- Fully RoHS compliant or with exemption 7(a)
- Modifications to mechanical design and electrical characteristics
- Custom new design and parameters

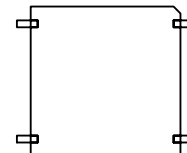
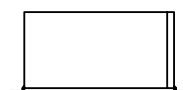


SPECIFICATIONS

38000 - THROUGH HOLE



38000SM - SURFACE MOUNT



Part Number		Secondary Inductance [mH] min.	Primary Current [A]	Turns Ratio	Secondary DC Resistance [Ω]	Size Reference
Through Hole ⁽¹⁾	Surface Mount ⁽²⁾					
38100	38100SM	0.49	5	1:30	0.137	1
38105	38105SM	0.87		1:40	0.280	
38110	38110SM	1.36		1:50	0.440	
38115	38115SM	1.95		1:60	0.670	
38120	38120SM	2.66		1:70	1.230	
38125	38125SM	5.40		1:100	3.550	
38200	38200SM	1.62	15	1:30	0.027	2
38205	38205SM	2.90		1:40	0.150	
38210	38210SM	4.50		1:50	0.300	
38215	38215SM	6.50		1:60	0.440	
38220	38220SM	8.82		1:70	0.830	
38225	38225SM	18.00		1:100	2.150	
38300	38300SM	2.40	20	1:30	0.055	3
38305	38305SM	4.27		1:40	0.082	
38310	38310SM	6.67		1:50	0.160	
38315	38315SM	9.60		1:60	0.300	
38320	38320SM	13.07		1:70	0.440	
38325	38325SM	26.66		1:100	1.230	

Note 1: For RoHS compliance on a through-hole component, please consult with Pico's engineer and provide the part number.

Note 2: All SMDs are available with Pb-free dipped terminals that is compliant to RoHS exemption 7 by requesting part number + '-RoHS-7'

SPECIFICATIONS

GENERAL

Parameter	Condition		Min.	Typ.	Max.	Units
Dielectric Strength	60Hz		-	500	-	V _{RMS}
Insulation Resistance	500VDC		10	-	-	GΩ
Operating Temperature Range	Ambient with temperature rise		-55	-	+130	°C
Storage Temperature Range	Ambient		-55	-	+130	°C
Size	See mechanical drawings					
Weight	Size 1		-	-	1.5	grams
	Size 2		-	-	4	
	Size 3		-	-	7.7	
Case	Glass Reinforced Polymer					
Potting	Vacuum Impregnated Epoxy					
Box Packaging (L x W x H)	Through hole models		10.65 x 2.49 x 0.95 (270.51 x 63.246 x 24.13)			inches (mm)
Tube Packaging (W x H x L)	Surface mount models	Size 1	0.77 x 0.49 x 20.0 (19.660 x 12.446 x 508)			inches (mm)
		Size 2	0.93 x 0.52 x 20.0 (23.724 x 13.081 x 508)			
		Size 3	1.03 x 0.52 x 20.0 (26.264 x 13.081 x 508)			
Tape & Reel Packaging	Upon request					
Moisture Sensitivity Level	Surface mount only		Level 3			

OPTIONAL DESIGN CRITERIA

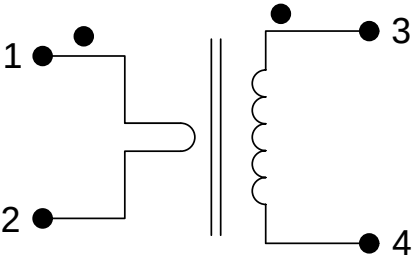
Test	Standard	Description
Vibration	MIL-STD-202	Method 204, Vibration, High Frequency
Shock	MIL-STD-202	Method 213, Shock (Specified Pulse)
Immersion	MIL-STD-202	Method 104, Immersion
Moisture Resistance	MIL-STD-202	Method 106, Moisture Resistance
Flammability	MIL-STD-202	Method 111, Flammability (External Flame)
Thermal Shock	MIL-STD-202	Method 107, Thermal Shock

OPTIONAL SCREENING AND QUALIFICATION

Standard	Screening & Qualification	Test ⁽³⁾
MIL-PRF-27	a.) Group A inspection Level-T - Table VII b.) Qualification inspection, Grade 5 - Table V	I. Thermal Shock II. Vibration III. Burn-in IV. Induced Voltage V. Shock VI. Dielectric Withstanding Voltage (at reduced pressure) VII. Insulation Resistance VIII. Electrical Characteristics IX. Visual and Mechanical Examination (External) X. Life XI. Radiographic Inspection
MIL-STD-981	a.) Group A screening tests - Table VI b.) Group B tests - Table XII, Class S	
EEE-INST-002, Section M1	a.) Magnetics Screening Req. - Table 2 b.) Magnetics Part Qual. - Table 3	

Note 3: Screening and qualification tests are not limited to the options in the chart above. Each standard may also be stringent or exclude certain tests from one another. Please contact Pico for specific application needs and for Pico part number.

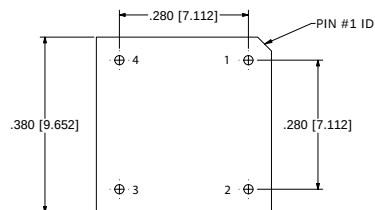
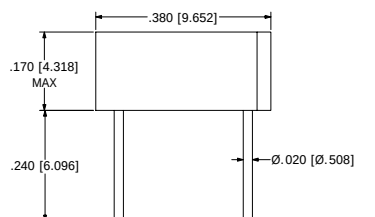
ELECTRICAL SCHEMATIC



MECHANICAL DRAWINGS

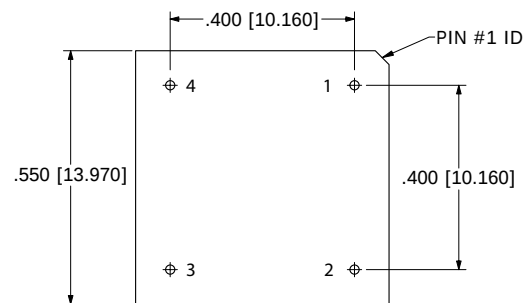
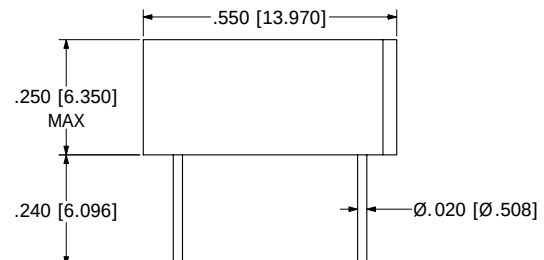
38000 SERIES - THROUGH HOLE

SIZE 1



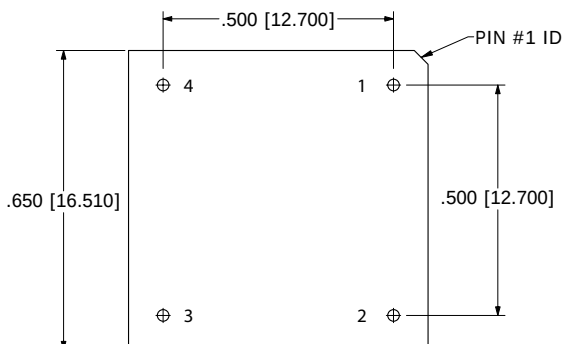
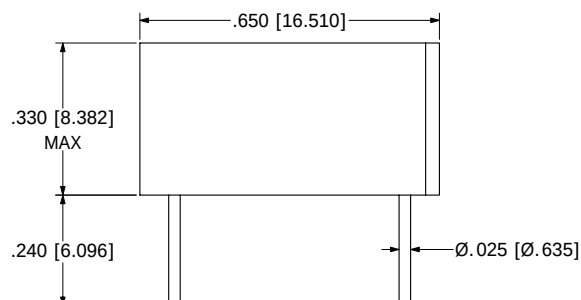
BOTTOM VIEW

SIZE 2



BOTTOM VIEW

SIZE 3



BOTTOM VIEW

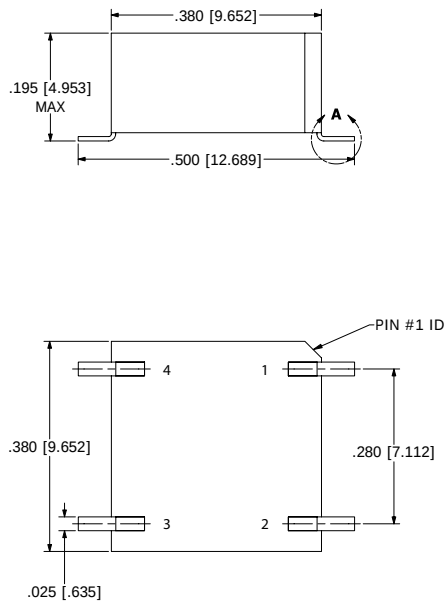
NOTES

- ALL DIMENSIONS ARE IN INCHES, [] = MM
- TERMINALS ARE CLOCKWISE FROM PIN #1

MECHANICAL DRAWINGS

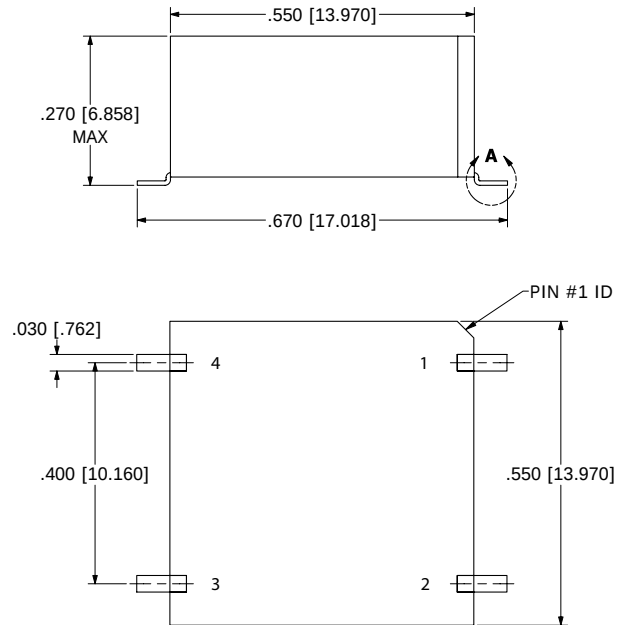
38000 SERIES - SURFACE MOUNT

SIZE 1



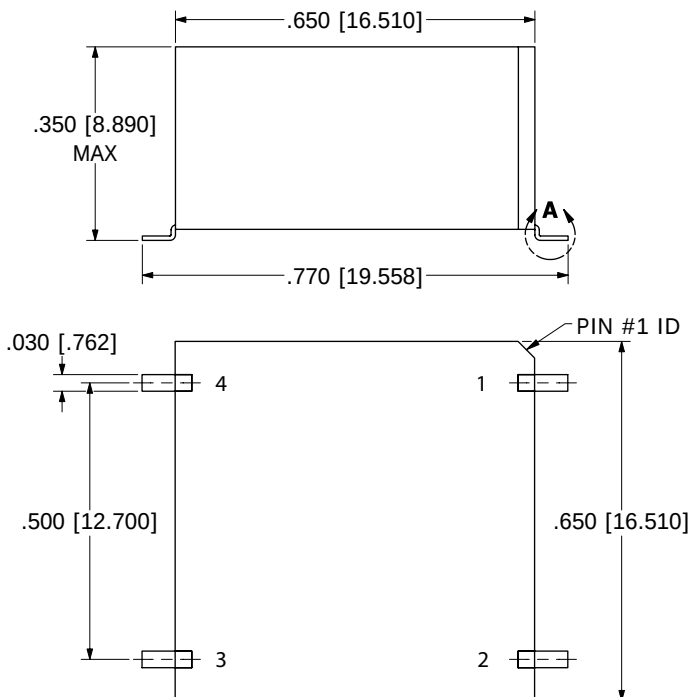
BOTTOM VIEW

SIZE 2



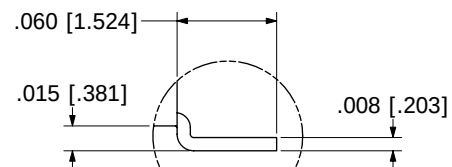
BOTTOM VIEW

SIZE 3



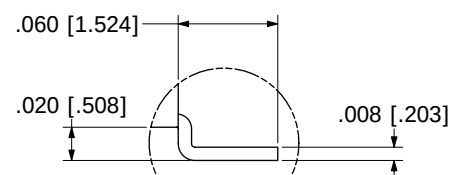
BOTTOM VIEW

LEAD DETAILS - SIZE 1 & 2



DETAIL A

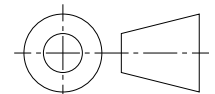
LEAD DETAILS - SIZE 3



DETAIL A

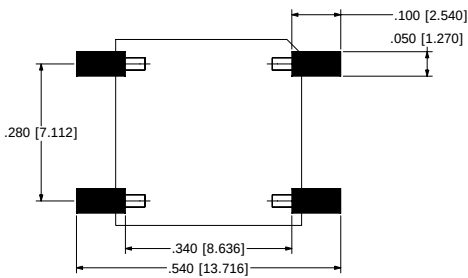
NOTES

- a. ALL DIMENSIONS ARE IN INCHES, [] = MM
- b. TERMINALS ARE CLOCKWISE FROM PIN #1

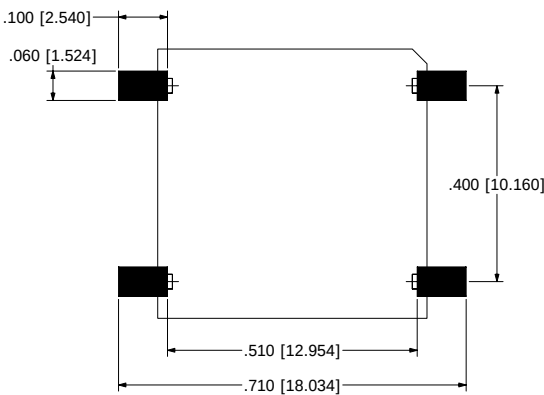


RECOMMENDED LAND PATTERN DIMENSIONS

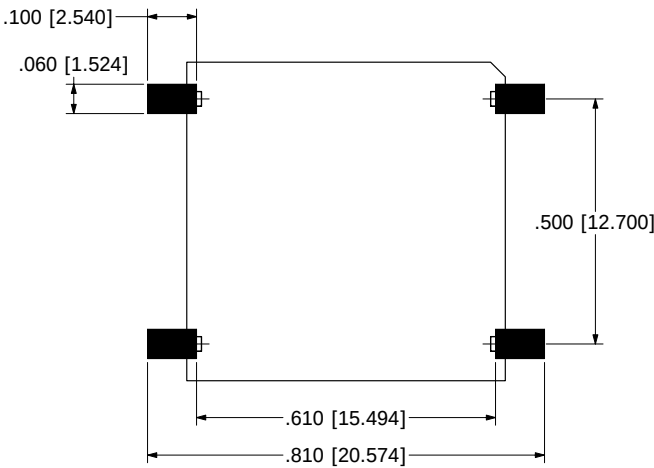
38000 SERIES - SIZE 1



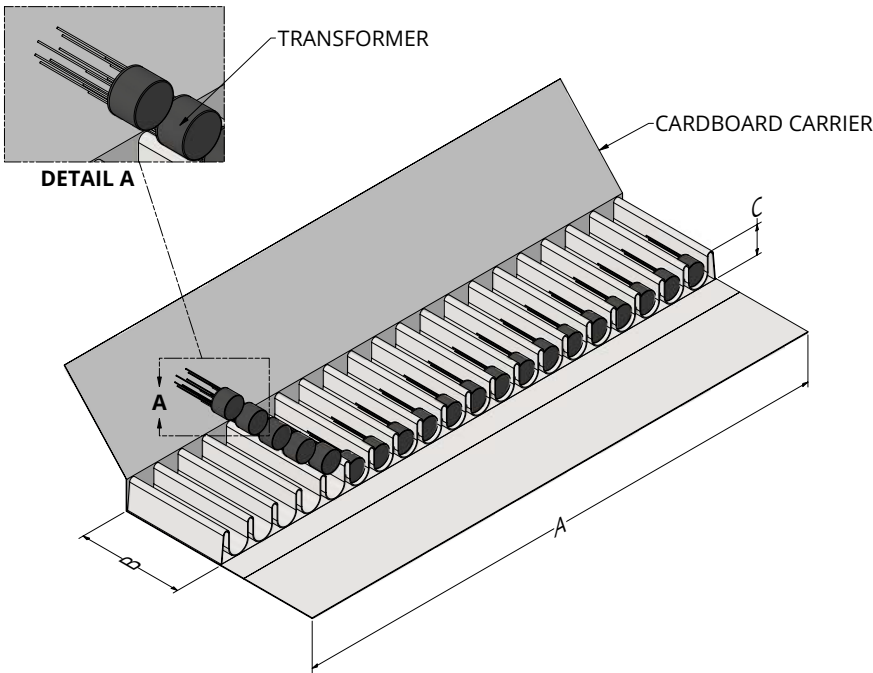
38000 SERIES - SIZE 2



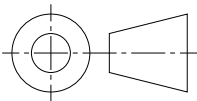
38000 SERIES - SIZE 3



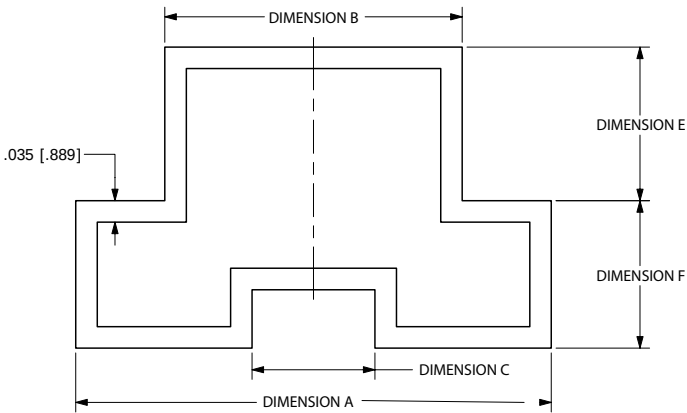
BOX PACKAGING - 38000 SERIES - THROUGH HOLE



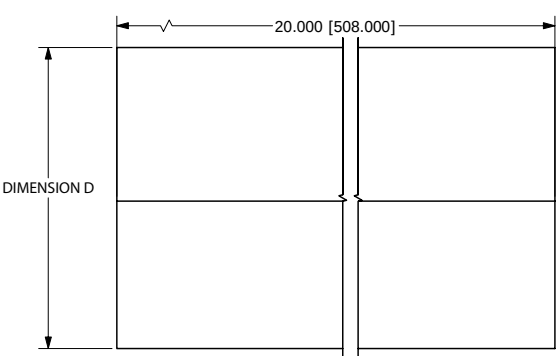
Dimension		
A	B	C
10.65 [270.51]	2.49 [63.246]	0.95 [24.13]



TUBE PACKAGING - 38000 SERIES - SURFACE MOUNT

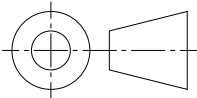
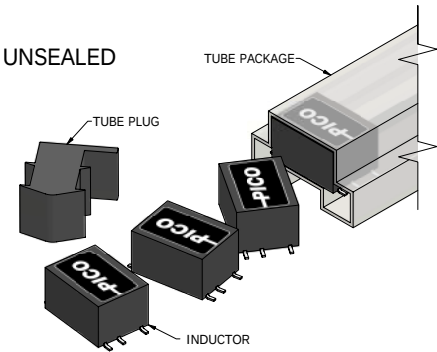
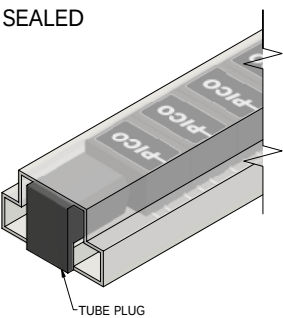


PLAN VIEW



ELEVATION VIEW

Size	Dimension					
	A	B	C	D	E	F
1	.774 [19.660]	.484 [12.294]	.200 [5.080]	.490 [12.446]	.250 [6.350]	.240 [6.096]
2	.934 [23.724]	.644 [16.358]	.240 [6.096]	.515 [13.081]	.275 [6.985]	.240 [6.096]
3	1.034 [26.264]	.744 [18.898]	.340 [8.636]	.515 [13.081]	.275 [6.985]	.240 [6.096]



Pico warrants each product manufactured by us and sold by us or an authorized representative, to be free from defects in material and workmanship. If properly used, it will perform within its applicable specifications for a period of one year after original shipment. Pico's obligation under this guarantee is limited to repairing or replacing our product to the original purchaser. This warranty is in lieu of all other warranties, express or implied and constitutes fulfillment of our obligations to the purchaser. We do not guarantee that the products can be used for a particular purpose other than those solely covered by the product's specifications. Pico must be notified if the product must meet particular certifications and/or standards. We assume no liability, in any event, for consequential damages, for anticipated or lost profits, incidental damages or loss of time or other losses incurred by the purchaser or any third party in connection with products covered by this warranty or otherwise. The purchaser will indemnify and hold Pico harmless for any damages, losses, costs, etc. from usage not within the product's specifications. Pico must be consulted before usage of its products in a nuclear, radioactive or space environment.

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74000 & 75000 Series

10-150 V- μ s ET Constant Pulse Transformer

PICO
Electronics, Inc.

PRODUCT OVERVIEW

The 74000 & 75000 series are pulse transformers in an encapsulated package with design layouts as through-hole and surface mount types. They can operate over a wide temperature range of -55°C to +130°C. Our proprietary materials and methods allow extreme temperatures of vapor phase, IR or other reflow procedures without degrading the high reliability of their physical form and electrical performance.

Typical applications:

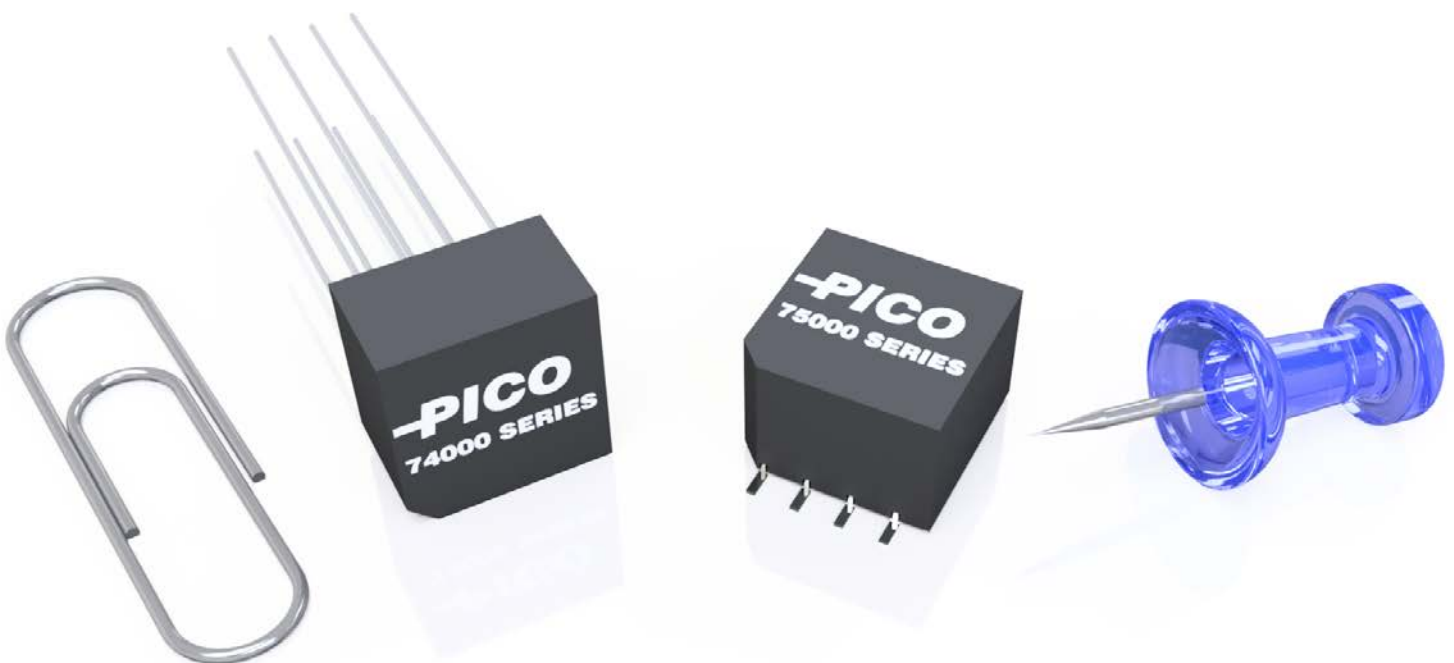
- Sensors
- Radars
- Avionic flight controls
- Airborne systems
- Naval electronics
- Military, aerospace, or commercial aircraft

FEATURES

- Extreme resistance to impact, shock, and vibration
- Manufactured to MIL-PRF-21038
- High reliability for space and mission critical applications
- Ultra miniature in size and minimalistic design
- Design layouts in through-hole or surface mount types

Contact Pico for part number of available options:

- Screening and qualification criteria to flight standard
- Fully RoHS compliant or with exemption 7(a)
- Modifications to mechanical design and electrical characteristics
- Custom new design and parameters

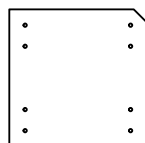
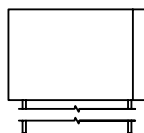


74000 & 75000 Series | Pulse Transformer

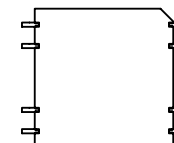
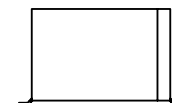


SPECIFICATIONS - SIZE 1

74000 SERIES - THROUGH HOLE



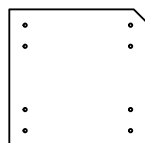
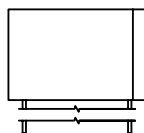
75000 SERIES - SURFACE MOUNT



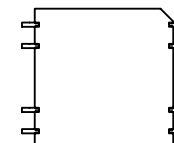
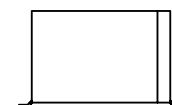
Through Hole ⁽¹⁾	Surface Mount ⁽²⁾	Turns Ratio PRI/SEC 5% tolerance	Inductance [μH] typ.	Leakage Inductance		Winding Resistance			Interwinding Capacitance		Primary ET Rating V-μs max.
				LL (N1-N2) [μH] typ.	LL (N1-N3) [μH] typ.	R (N1) [Ω] ±25%	R (N2) [Ω] ±25%	R (N3) [Ω] ±25%	C1 (N1-N2) [pF] typ.	C2 (N1-N3) [pF] typ.	
74005	75005	1:1:1	150	.100	.250	.070	.080	.085	25	12	10
74010	75010	1:1:1	600	.400	1.1	.15	.18	.21	25	12	20
74015	75015	1:1:1	1300	.900	2.5	.45	.51	.58	25	12	30
74020	75020	1:1:1	2400	1.6	4.2	1.14	1.27	1.39	25	12	40
74025	75025	1:1:1	3700	3.0	6.5	2.0	2.3	2.5	25	12	50
74030	75030	2:1:1	150	.250	.450	.062	.014	.014	25	12	10
74035	75035	2:1:1	600	1.0	1.5	.15	.074	.087	25	12	20
74040	75040	2:1:1	1300	1.5	3.5	.45	.10	.13	25	12	30
74045	75045	2:1:1	2400	2.2	6.0	1.14	.17	.20	25	12	40
74050	75050	2:1:1	3700	3.4	9.0	2.07	.29	.32	25	12	50
74055	75055	3:1:1	200	.617	1.0	.081	.018	.018	25	12	12
74060	75060	3:1:1	800	1.2	1.5	.18	.035	.040	25	12	24
74065	75065	3:1:1	1800	2.5	5.0	.37	.15	.16	25	12	36
74070	75070	3:1:1	3200	4.5	10.0	.62	.25	.28	25	12	48
74075	75075	3:1:1	5300	7.0	15.0	1.28	.25	.28	25	12	60
74080	75080	3:3:1	200	200	1.0	.082	.096	.025	25	12	12
74085	75085	3:3:1	800	1.0	1.5	.18	.22	.042	25	12	24
74090	75090	3:3:1	1800	2.5	5.0	.58	.73	.28	25	12	36
74095	75095	3:3:1	3200	4.5	10.0	.95	1.18	.55	25	12	48
74100	75100	3:3:1	5300	7.0	15.0	1.56	1.78	.69	25	12	60
74105	75105	4:2:1	200	.506	2.0	.047	.024	.019	25	12	12
74110	75110	4:2:1	800	1.5	3.0	.18	.071	.041	25	12	24
74115	75115	4:2:1	1800	3.0	5.5	.46	.28	.16	25	12	36
74120	75120	4:2:1	3200	5.5	10.0	.77	.46	.25	25	12	48
74125	75125	4:2:1	5300	8.0	15.0	1.25	.72	.40	25	12	60

SPECIFICATIONS - SIZE 2

74000 SERIES - THROUGH HOLE



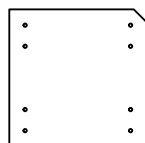
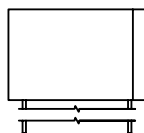
75000 SERIES - SURFACE MOUNT



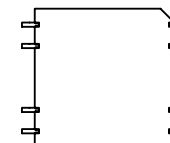
Through Hole ⁽¹⁾	Surface Mount ⁽²⁾	Turns Ratio PRI/SEC 5% tolerance	Inductance [μH] typ.	Leakage Inductance		Winding Resistance			Interwinding Capacitance		Primary ET Rating V-μs max.
				LL (N1-N2) [μH] typ.	LL (N1-N3) [μH] typ.	R (N1) [Ω] ±25%	R (N2) [Ω] ±25%	R (N3) [Ω] ±25%	C1 (N1-N2) [pF] typ.	C2 (N1-N3) [pF] typ.	
74210	75210	1:1:1	250	.350	.712	.038	.046	.048	35	18	16
74215	75215	1:1:1	1000	.650	1.2	.12	.15	.17	35	18	32
74220	75220	1:1:1	2250	1.5	3.0	.28	.32	.37	35	18	48
74225	75225	1:1:1	4000	2.5	5.0	.59	.66	.74	35	18	65
74230	75230	1:1:1	6200	4.0	8.0	1.27	1.48	1.56	35	18	80
74235	75235	2:1:1	250	.400	.815	.038	.014	.015	35	18	16
74240	75240	2:1:1	1000	.800	1.6	.12	.044	.049	35	18	32
74245	75245	2:1:1	2250	1.8	3.6	.28	.11	.13	35	18	48
74250	75250	2:1:1	4000	3.2	6.4	.59	.17	.20	35	18	65
74255	75255	2:1:1	6200	5.0	10.0	1.26	.29	.31	35	18	80
74260	75260	3:1:1	350	.400	.900	.036	.017	.023	35	18	19
74265	75265	3:1:1	1400	1.1	2.2	.15	.035	.039	35	18	38
74270	75270	3:1:1	3000	2.4	5.0	.42	.062	.068	35	18	57
74275	75275	3:1:1	5500	4.2	8.0	.75	.23	.24	35	18	76
74280	75280	3:1:1	9000	6.5	10.0	1.02	.39	.41	35	18	95
74285	75285	3:3:1	350	.450	1.0	.063	.068	.049	35	18	19
74290	75290	3:3:1	1400	1.2	2.6	.15	.17	.065	35	18	38
74295	75295	3:3:1	3000	2.5	5.0	.42	.48	.089	35	18	57
74300	75300	3:3:1	5500	4.5	9.0	.94	1.14	.43	35	18	76
74305	75305	3:3:1	9000	7.0	14.0	1.54	1.74	.64	35	18	95
74310	75310	4:2:1	350	.700	1.64	.040	.023	.014	35	18	19
74315	75315	4:2:1	1400	1.3	2.7	.12	.067	.035	35	18	38
74320	75320	4:2:1	3000	2.7	5.5	.42	.12	.070	35	18	57
74325	75325	4:2:1	5500	4.8	9.0	.94	.27	.15	35	18	76
74330	75330	4:2:1	9000	7.5	15.0	1.53	.35	.19	35	18	95

SPECIFICATIONS - SIZE 3

74000 SERIES - THROUGH HOLE



75000 SERIES - SURFACE MOUNT



Through Hole ⁽¹⁾	Surface Mount ⁽²⁾	Turns Ratio PRI/SEC 5% tolerance	Inductance [μH] typ.	Leakage Inductance		Winding Resistance			Interwinding Capacitance		Primary ET Rating V-μs max.
				LL (N1-N2) [μH] typ.	LL (N1-N3) [μH] typ.	R (N1) [Ω] ±25%	R (N2) [Ω] ±25%	R (N3) [Ω] ±25%	C1 (N1-N2) [pF] typ.	C2 (N1-N3) [pF] typ.	
74515	75515	1:1:1	300	.300	.400	.035	.040	.045	45	25	25
74520	75520	1:1:1	1200	1.25	1.9	.095	.11	.13	45	25	50
74525	75525	1:1:1	2700	1.75	4.2	.22	.26	.29	45	25	75
74530	75530	1:1:1	4800	3.0	7.3	.46	.53	.60	45	25	100
74535	75535	1:1:1	7500	4.6	11.4	.78	.96	1.15	45	25	125
74540	75540	2:1:1	300	.514	.630	.035	.013	.014	45	25	25
74545	75545	2:1:1	1200	.900	1.7	.095	.043	.047	45	25	50
74550	75550	2:1:1	2700	2.0	3.7	.22	.10	.12	45	25	75
74555	75555	2:1:1	4800	3.0	6.5	.46	.17	.19	45	25	100
74560	75560	2:1:1	7500	4.88	10.0	.80	.28	.34	45	25	125
74565	75565	3:1:1	400	.686	.800	.042	.010	.012	45	25	30
74570	75570	3:1:1	1600	1.25	3.0	.12	.035	.038	45	25	60
74575	75575	3:1:1	3600	2.75	6.5	.33	.062	.068	45	25	90
74580	75580	3:1:1	6400	4.6	1.20	.58	.14	.15	45	25	120
74585	75585	3:1:1	10,000	7.2	18.0	1.16	.12	.14	45	25	150
74590	75590	3:3:1	400	.400	1.02	.054	.060	.011	45	25	30
74595	75595	3:3:1	1600	1.25	1.5	.12	.14	.040	45	25	60
74600	75600	3:3:1	3600	3.0	2.9	.33	.38	.070	45	25	90
74605	75605	3:3:1	6400	5.3	5.0	.58	.73	.18	45	25	120
74610	75610	3:3:1	10,000	8.2	7.8	1.16	1.43	.14	45	25	150
74615	75615	4:2:1	400	.580	1.12	.042	.015	.009	45	25	30
74620	75620	4:2:1	1600	1.2	3.0	.12	.052	.028	45	25	60
74625	75625	4:2:1	3600	2.75	7.0	.33	.15	.084	45	25	90
74630	75630	4:2:1	6400	4.6	12.0	.59	.15	.082	45	25	120
74635	75635	4:2:1	10,000	7.1	19.6	1.16	.27	.15	45	25	150

Note 1: For RoHS compliance on a through-hole component, please consult with Pico's engineer and provide the part number.

Note 2: All SMDs are available with Pb-free dipped terminals that is compliant to RoHS exemption 7 by requesting part number + '-RoHS-7'

SPECIFICATIONS

GENERAL

Parameter	Condition	Min.	Typ.	Max.	Units
Dielectric Strength	60Hz	-	500	-	V _{RMS}
Insulation Resistance	700VDC	10	-	-	GΩ
Operating Temperature Range	Ambient with temperature rise	-55	-	+130	°C
Storage Temperature Range	Ambient	-55	-	+105	°C
Size	Size 1 - Length x Width x Height	0.45 x 0.45 x 0.30 (11.43 x 11.43 x 7.493)			inches (mm)
	Size 2 - Length x Width x Height	0.55 x 0.55 x 0.35 (13.97 x 13.97 x 8.763)			
	Size 3 - Length x Width x Height	0.65 x 0.65 x 0.45 (16.51 x 16.51 x 11.43)			
Weight	Size 1	-	2.5	-	grams
	Size 2	-	4.5	-	
	Size 3	-	8	-	
Case	74000 & 75000 Series	Glass Reinforced Polymer			
Potting	Vacuum Impregnated Epoxy				
Box Packaging (W x H x L)	74000 Series	10.65 x 2.49 x 0.95 (270.51 x 63.246 x 24.13)			inches (mm)
Tube Packaging (W x H x L)	75000 Series - Size 1	0.83 x 0.46 x 20.0 (21.184 x 11.684 x 508)			
	75000 Series - Size 2	0.93 x 0.52 x 20.0 (23.724 x 13.081 x 508)			
	75000 Series - Size 3	1.03 x 0.60 x 20.0 (26.264 x 15.113 x 508)			
Tape & Reel Packaging	Upon request				
Moisture Sensitivity Level	Surface Mount only	Level 3			

OPTIONAL DESIGN CRITERIA

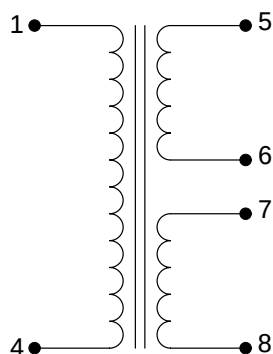
Test	Standard	Description
Vibration	MIL-STD-202	Method 204, Vibration, High Frequency
Shock	MIL-STD-202	Method 213, Shock (Specified Pulse)
Immersion	MIL-STD-202	Method 104, Immersion
Moisture Resistance	MIL-STD-202	Method 106, Moisture Resistance
Flammability	MIL-STD-202	Method 111, Flammability (External Flame)
Thermal Shock	MIL-STD-202	Method 107, Thermal Shock

OPTIONAL SCREENING AND QUALIFICATION

Standard	Screening & Qualification	Test ⁽³⁾
MIL-PRF-27	a.) Group A inspection Level-T - Table VII b.) Qualification inspection, Grade 5 - Table V	I. Thermal Shock II. Vibration III. Burn-in IV. Induced Voltage V. Shock VI. Dielectric Withstanding Voltage (at reduced pressure) VII. Insulation Resistance VIII. Electrical Characteristics IX. Visual and Mechanical Examination (External) X. Life XI. Radiographic Inspection
MIL-STD-981	a.) Group A screening tests - Table VI b.) Group B tests - Table XII, Class S	
EEE-INST-002, Section M1	a.) Magnetics Screening Req. - Table 2 b.) Magnetics Part Qual. - Table 3	

Note 3: Screening and qualification tests are not limited to the options in the chart above. Each standard may also be stringent or exclude certain tests from one another. Please contact Pico for specific application needs and for Pico part number.

ELECTRICAL SCHEMATIC



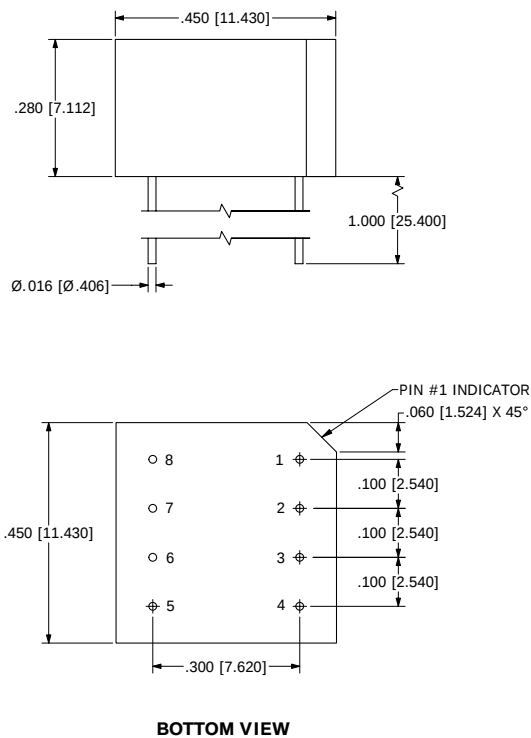
NOTES

a. TERMINALS 2 & 3 HAVE NO CONNECTION. MECHANICAL STABILITY ONLY.

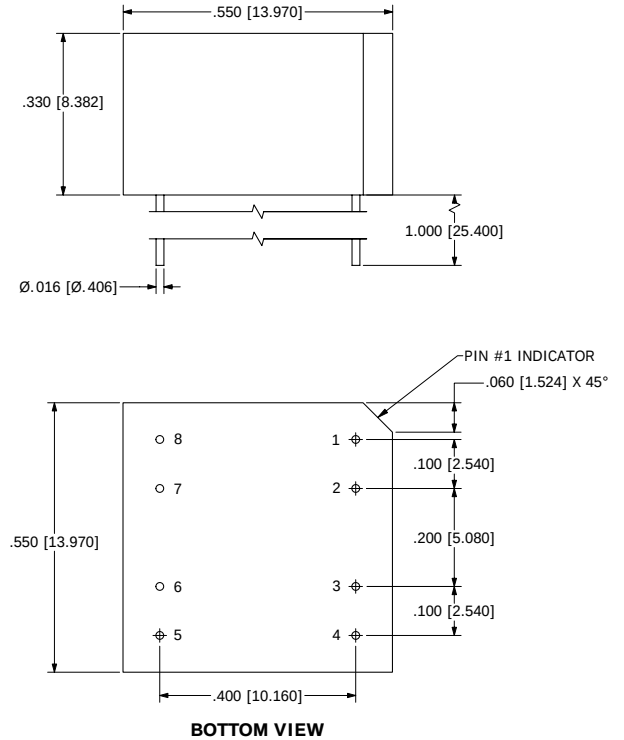
MECHANICAL DRAWINGS

74000 SERIES - THROUGH HOLE

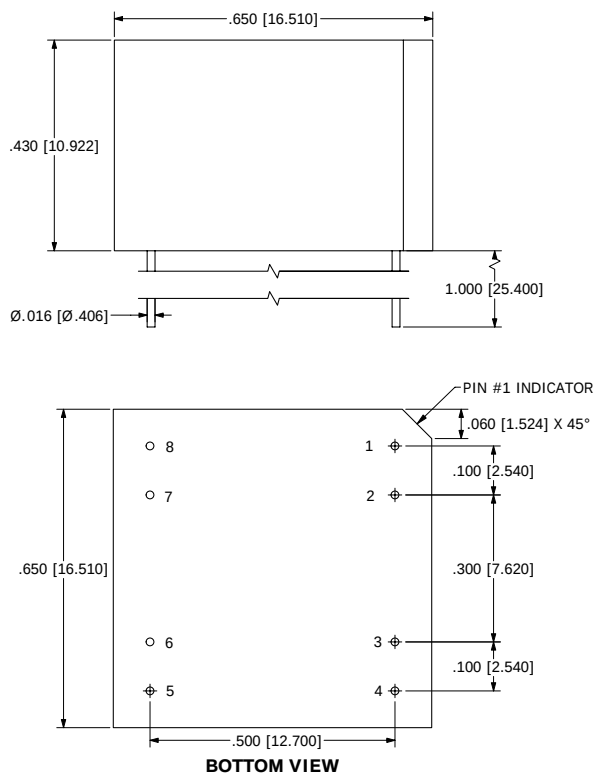
SIZE 1



SIZE 2

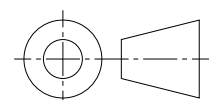


SIZE 3



NOTES

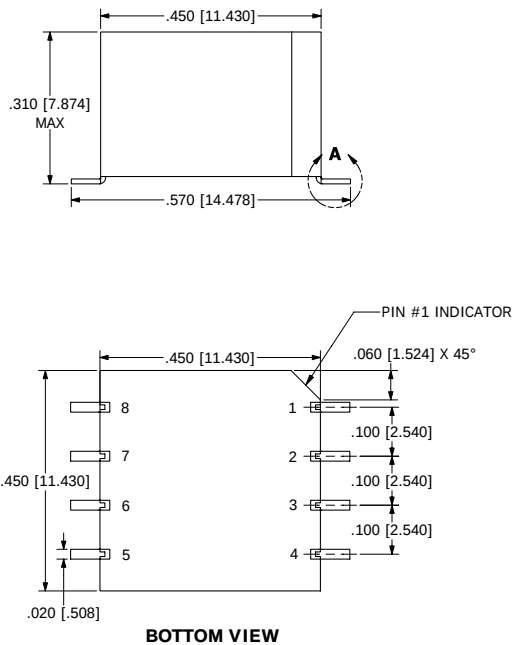
- ALL DIMENSIONS ARE IN INCHES, [] = MM
- TERMINALS ARE CLOCKWISE FROM PIN #1
- PIN #2 & #3 HAVE NO CONNECTION



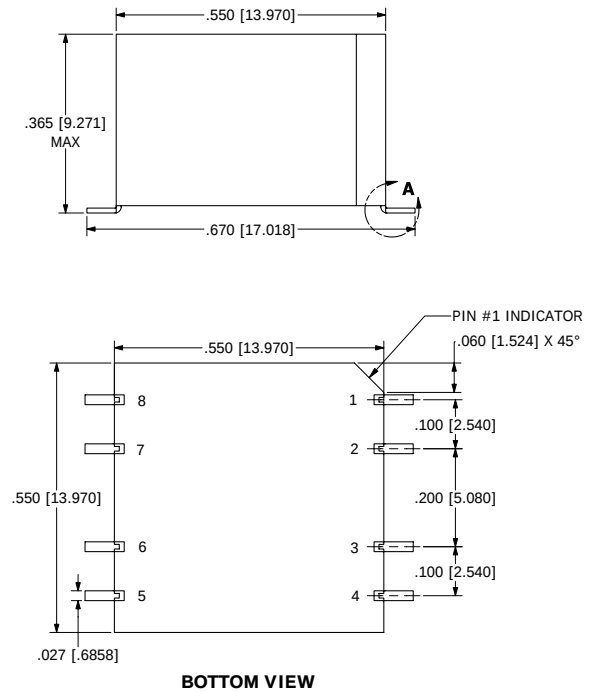
MECHANICAL DRAWINGS

75000 SERIES - SURFACE MOUNT

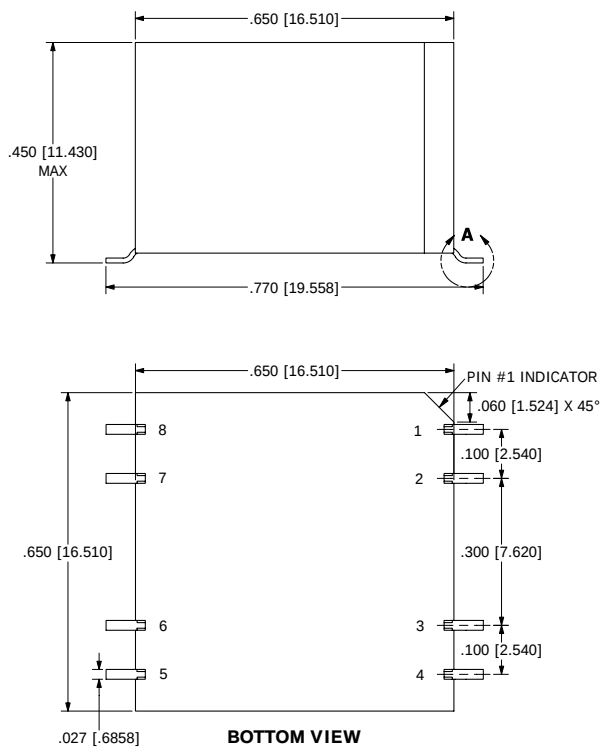
SIZE 1



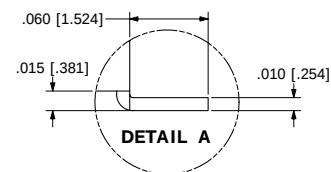
SIZE 2



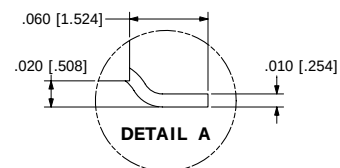
SIZE 3



LEAD DETAILS - SIZE 1 & 2

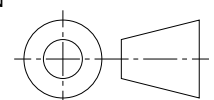


LEAD DETAILS - SIZE 3



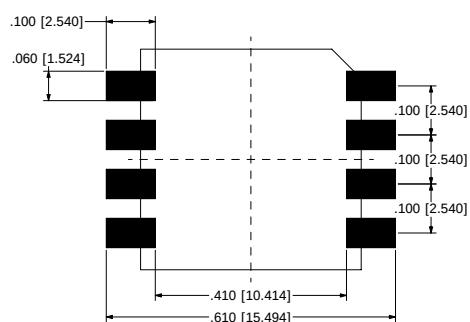
NOTES

- ALL DIMENSIONS ARE IN INCHES, [] = MM
- TERMINALS ARE CLOCKWISE FROM PIN #1
- PIN #2 & #3 HAVE NO CONNECTION

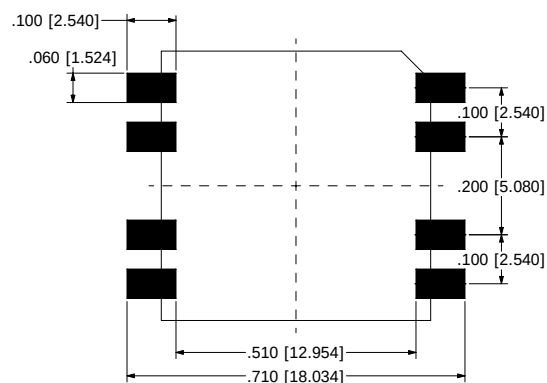


RECOMMENDED LAND PATTERN DIMENSIONS

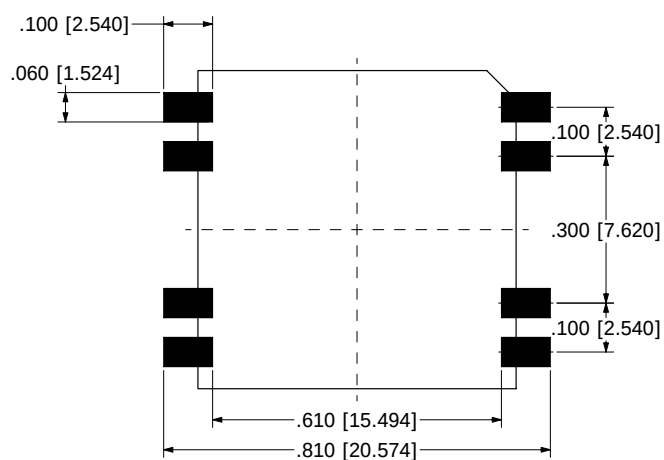
75000 SERIES - SIZE 1



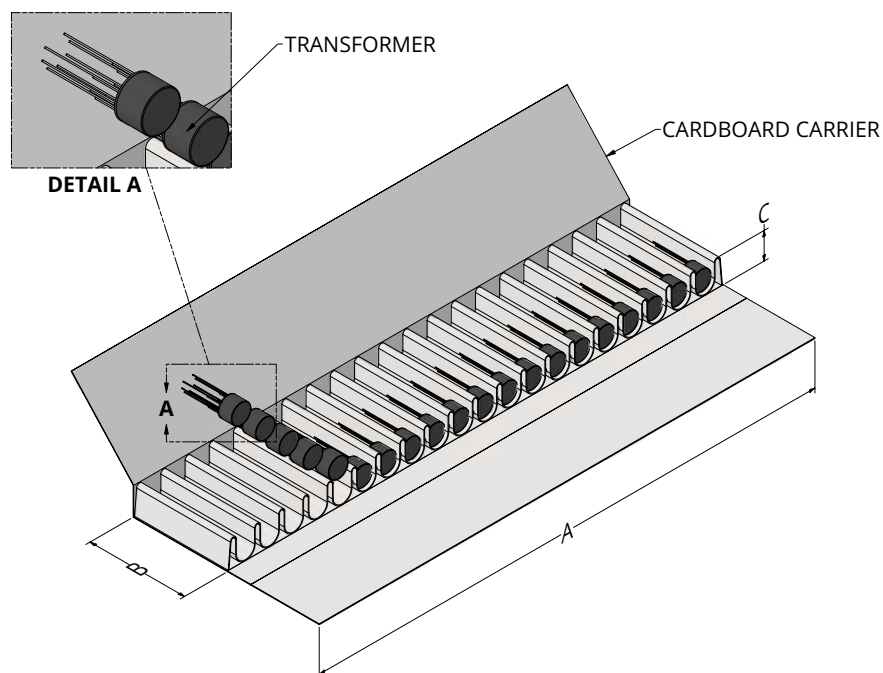
75000 SERIES - SIZE 2



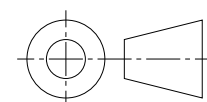
75000 SERIES - SIZE 3



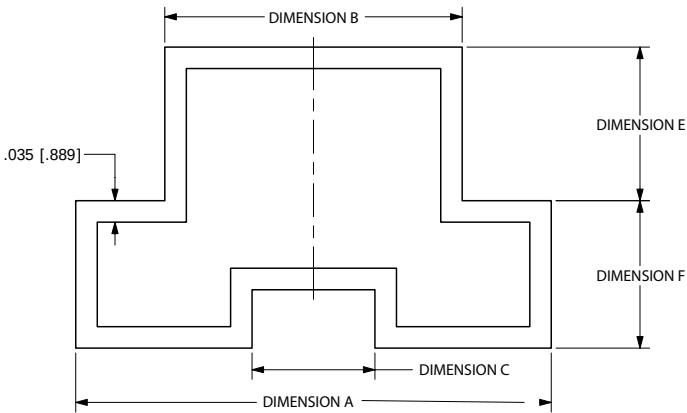
BOX PACKAGING - 74000 SERIES (THROUGH HOLE)



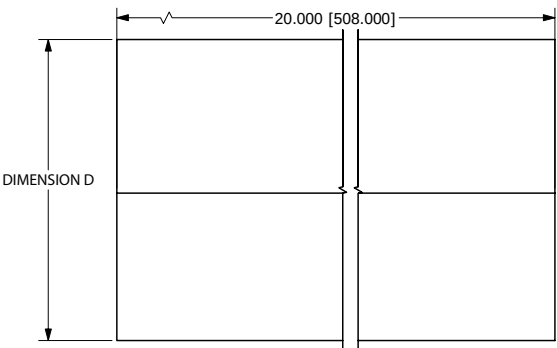
Dimension		
A	B	C
10.65 [270.51]	2.49 [63.246]	0.95 [24.13]



TUBE PACKAGING - 75000 SERIES (SURFACE MOUNT)



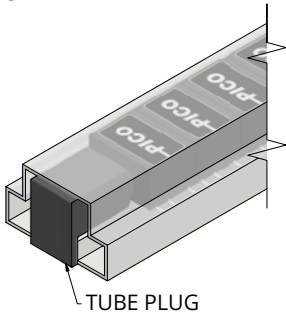
PLAN VIEW



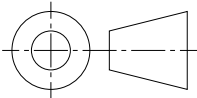
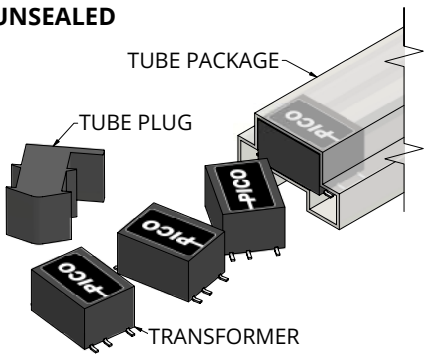
ELEVATION VIEW

Size	Dimension					
	A	B	C	D	E	F
1	.834 [21.184]	.544 [13.818]	.160 [4.064]	.460 [11.684]	.220 [5.588]	.240 [6.096]
2	.934 [23.724]	.644 [16.358]	.240 [6.096]	.515 [13.081]	.275 [6.985]	.240 [6.096]
3	1.034 [26.264]	.744 [18.898]	.340 [8.636]	.595 [15.113]	.355 [9.017]	.240 [6.096]

SEALED



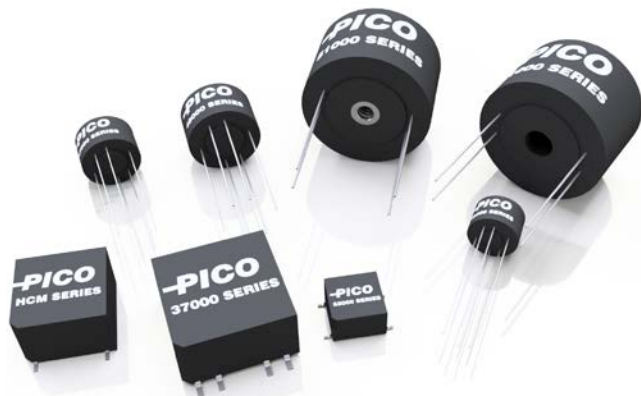
UNSEALED



Pico warrants each product manufactured by us and sold by us or an authorized representative, to be free from defects in material and workmanship. If properly used, it will perform within its applicable specifications for a period of one year after original shipment. Pico's obligation under this guarantee is limited to repairing or replacing our product to the original purchaser. This warranty is in lieu of all other warranties, express or implied and constitutes fulfillment of our obligations to the purchaser. We do not guarantee that the products can be used for a particular purpose other than those solely covered by the product's specifications. Pico must be notified if the product must meet particular certifications and/or standards. We assume no liability, in any event, for consequential damages, for anticipated or lost profits, incidental damages or loss of time or other losses incurred by the purchaser or any third party in connection with products covered by this warranty or otherwise. The purchaser will indemnify and hold Pico harmless for any damages, losses, costs, etc. from usage not within the product's specifications. Pico must be consulted before usage of its products in a nuclear, radioactive or space environment.

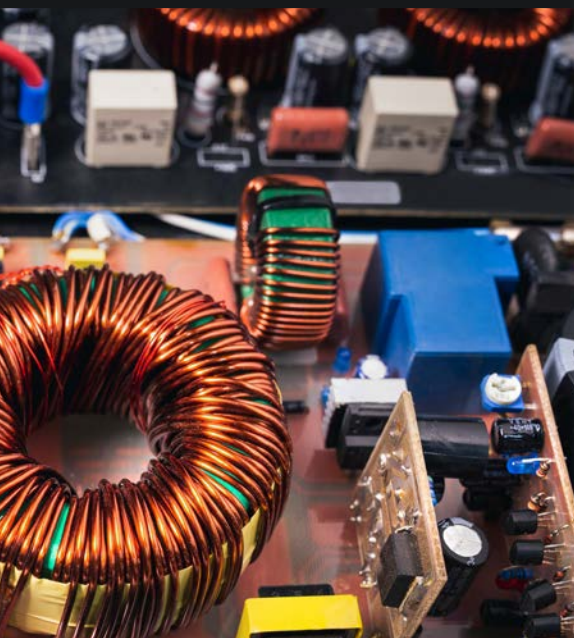
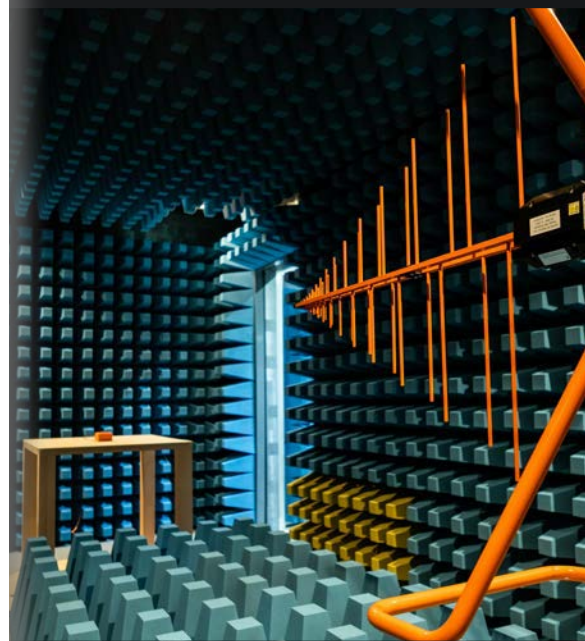
We reserve the right to discontinue products without notice, We reserve the right to make modifications to any existing catalog products without notice, at any time, without the obligation to modify units previously sold.

Inductors



Common Mode Chokes >

- Capable of eliminating electromagnetic and noise interference generated by switching operations of power supplies through semiconductors (rectifiers, MOSFETs, etc.)
- Device RMS current rating: 0.01A to 30A
- Winding options are dual, or 3-phase windings
- Inductance per winding: 25 μ H to 20 mH
- Mounting in surface mount, or through-hole
- Size as small as 0.4" x 0.4" (L x W) to largest 1.13" x 1.13" SMTs



Power Inductors >

- Mounting in surface mount & through hole options—axial leads or plug-ins
- Device direct current rating: 0.01A to 28.4A
- Maximum inductance for single, or dual windings in series connection is 2 μ H to 20 mH
- Self-resonant frequency up to 24.7 MHz
- Size as small as 0.4" x 0.4" (L x W) to largest 2.15" plug-in diameter

37000 Series

100 μ H to 1.5mH, Up to 8A_{RMS} 3 Phase Winding Common Mode Choke

PICO
Electronics, Inc.

PRODUCT OVERVIEW

Pico 3 Phase Winding Common Mode Chokes are constructed to be highly effective in suppressing electromagnetic interference and radio frequency interference, where high-frequency noises are blocked to allow DC and low-frequency AC signals to pass through. These noise suppression devices offer overall stability of a system for balanced load handling, reduced harmonics, and distributed thermal output. They are extremely reliable in the performance of electronic systems where security of data and information are crucial, as well as mechanically durable to the integrity of mission systems.

Typical applications:

- DC-DC Converters
- Switching Power Supplies
- Communication Interfaces
- Aviation Power Systems
- Automotive & EVs
- Medical Equipment
- Lighting Systems

FEATURES

- Extreme resistance to impact, shock, and vibration
- Manufactured to MIL-PRF-27 Grade 5, Class S (Class V - 155°C available)
- High reliability for space and mission critical applications
- Ultra miniature in size and minimalistic design
- Terminal solderability per MIL-STD-202, Method 208

Contact Pico for part number of available options:

- Screening and qualification criteria to flight standard
- Fully RoHS compliant or with exemption 7(a)
- Modifications to mechanical design and electrical characteristics
- Custom new design and parameters



SPECIFICATIONS

Part Number ⁽¹⁾	Inductance Per Winding ⁽⁴⁾ [μH]	RMS Current [A]	DC Resistance Per Winding [mΩ]	Leakage Inductance [μH] typ.	Size Reference
37100	100	1.2	11	0.68	1
37200		3.25	6.4	1.1	2
37300		6.5	3.4	1.2	3
37400		8.2	3.4	1.52	4
37110	150	1	18	1.1	1
37210		2.04	12.6	1.38	2
37310		4.1	6	1.6	3
37410		6.5	4.8	2.06	4
37120	200	0.8	25	1.4	1
37220		1.61	16.5	2.1	2
37320		3.25	10	2.35	3
37420		5.2	6.8	2.5	4
37130	300	0.63	38	2.15	1
37230		1.28	23	2.9	2
37330		2.56	13.5	2.9	3
37430		4.1	10.1	3.1	4
37140	400	0.5	55	2.75	1
37240		1	34	3	2
37340		2.04	20	3.9	3
37440		3.24	13.4	4.52	4
37150	500	0.4	79	3.62	1
37250		0.8	45	3.52	2
37350		1.62	27.6	4.3	3
37450		2.56	20	5.7	4
37160	1000	0.26	160	5.79	1
37260		0.63	76	6.2	2
37360		0.8	94.2	5.3	3
37460		2.04	27.2	8.5	4
37170	1500	0.16	305	6.5	1
37270		0.4	145	7.1	2
37370		0.51	146	6.7	3
37470		1.61	54	9.3	4

Note 1: Parts are available with Pb-free dipped terminals that is compliant to RoHS exemption 7 by requesting part number + 'RoHS-7'

Note 2: Inductance measured at 0.1VRMS and 10kHz.

Note 3: Maximum ambient plus temperature rise is limited 130°C.

Note 4: Minimum inductance is 80% of listed value with no maximum value.

Note 5: Winding balance at ±1%.

SPECIFICATIONS

GENERAL

Parameter	Condition	Min.	Typ.	Max.	Units
Dielectric Withstanding Voltage	60Hz	-	1500	-	V _{RMS}
Insulation Resistance	300VDC	10	-	-	GΩ
Operating Temperature Range	Class S, Ambient with temperature rise	-55	-	+130	°C
Storage Temperature Range	Ambient	-55	-	+130	°C
Size	See mechanical drawings				
Weight	See mechanical drawings				
Case	Glass Reinforced Polymer				
Potting	Vacuum Impregnated Epoxy				
Tube Packaging (W x H x L)	Size 1	1.03 x 0.52 x 20.0 (26.264 x 13.081 x 508)			inches (mm)
	Size 2	1.24 x 0.61 x 20.0 (31.496 x 15.494 x 508)			
	Size 3	1.24 x 0.61 x 20.0 (31.496 x 15.494 x 508)			
	Size 4	1.65 x 0.74 x 20.0 (41.783 x 18.796 x 508)			
Tape & Reel Packaging	Upon request				
Moisture Sensitivity Level	Surface Mount only	Level 3			

OPTIONAL DESIGN CRITERIA

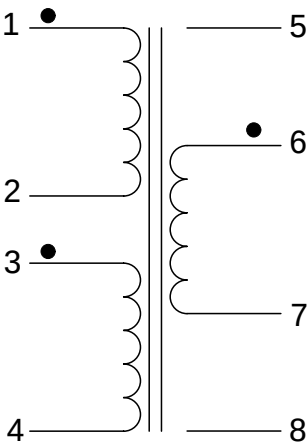
Test	Standard	Description
Vibration	MIL-STD-202	Method 204, Vibration, High Frequency
Shock	MIL-STD-202	Method 213, Shock (Specified Pulse)
Immersion	MIL-STD-202	Method 104, Immersion
Moisture Resistance	MIL-STD-202	Method 106, Moisture Resistance
Flammability	MIL-STD-202	Method 111, Flammability (External Flame)
Thermal Shock	MIL-STD-202	Method 107, Thermal Shock

OPTIONAL SCREENING AND QUALIFICATION

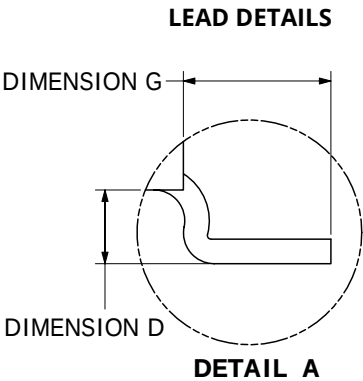
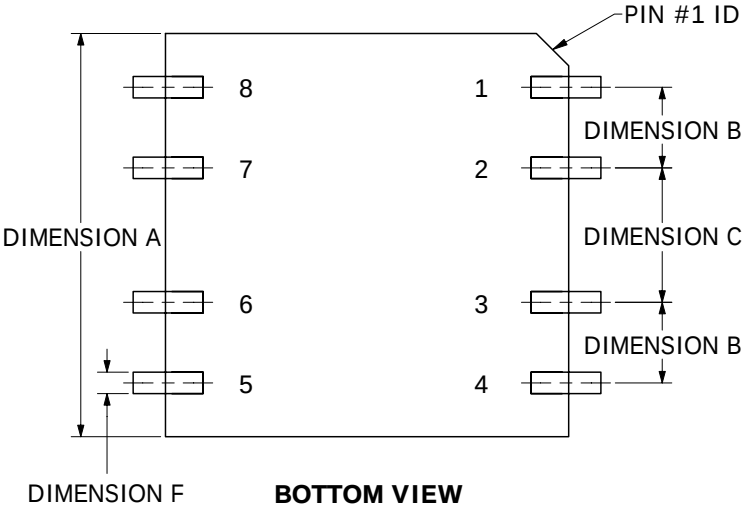
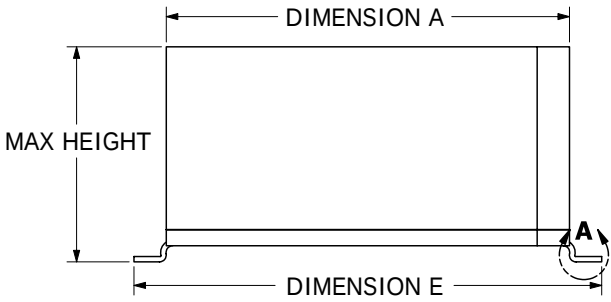
Standard	Screening & Qualification	Test ⁽⁶⁾
MIL-PRF-27	a.) Group A inspection Level-T - Table VII b.) Qualification inspection, Grade 5 - Table V	I. Thermal Shock II. Vibration III. Burn-in IV. Induced Voltage V. Shock VI. Dielectric Withstanding Voltage (at reduced pressure) VII. Insulation Resistance VIII. Electrical Characteristics IX. Visual and Mechanical Examination (External) X. Life XI. Radiographic Inspection
MIL-STD-981	a.) Group A screening tests - Table VI b.) Group B tests - Table XII, Class S	
EEE-INST-002, Section M1	a.) Magnetism Screening Req. - Table 2 b.) Magnetism Part Qual. - Table 3	

Note 6: Screening and qualification tests are not limited to the options in the chart above. Each standard may also be stringent or exclude certain tests from one another. Please contact Pico for specific application needs and for Pico part number.

ELECTRICAL SCHEMATIC

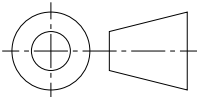


MECHANICAL DRAWINGS



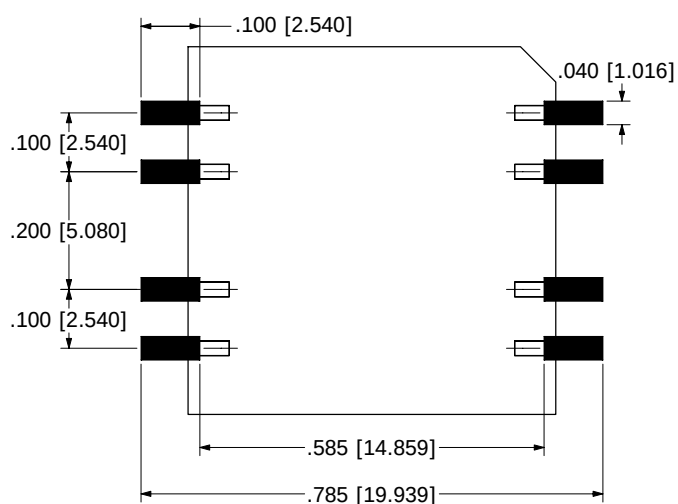
Size	Max Height	Dimension								Typ. Weight (grams)
		A	B	C	D	E	F	G		
1	.280 (7.11)	.625 (15.87)	.100 (2.54)	.200 (5.08)	.030 (0.76)	.745 (18.92)	.025 (0.64)	.060 (1.52)		3.5
2	.400 (10.16)	.750 (19.05)	.150 (3.81)	.250 (6.35)	.030 (0.76)	.870 (22.10)	.040 (1.02)	.060 (1.52)		7.7
3	.475 (12.06)	.850 (21.59)	.150 (3.81)	.350 (8.89)	.030 (0.76)	1.050 (26.67)	.040 (1.02)	.100 (2.54)		11.3
4	.550 (13.97)	1.125 (28.57)	.200 (5.08)	.525 (13.33)	.030 (0.76)	1.425 (36.20)	.055 (1.40)	.150 (3.81)		24.2

NOTES
a. ALL DIMENSIONS ARE IN INCHES, [] = MM
b. TERMINALS ARE CLOCKWISE FROM PIN #1
c. PINS # 5 & #8 HAVE NO CONNECTION

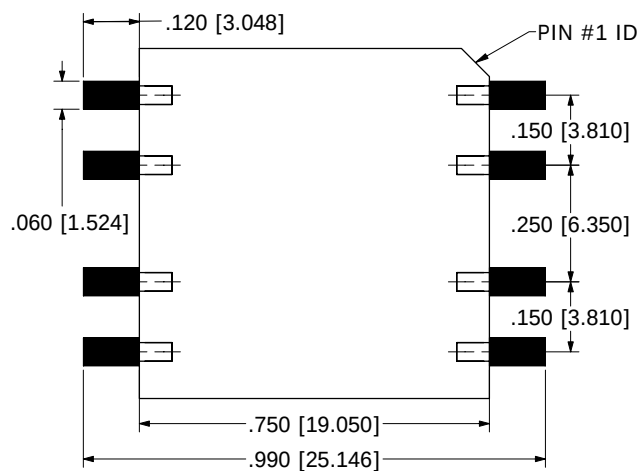


RECOMMENDED LAND PATTERN DIMENSIONS

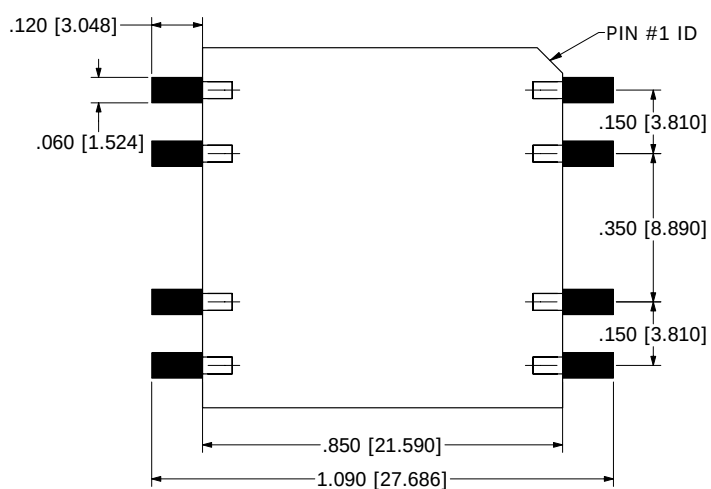
SIZE 1



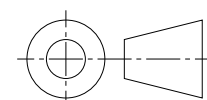
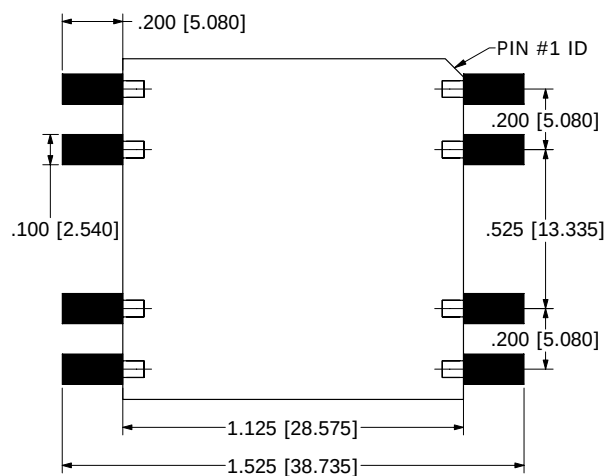
SIZE 2



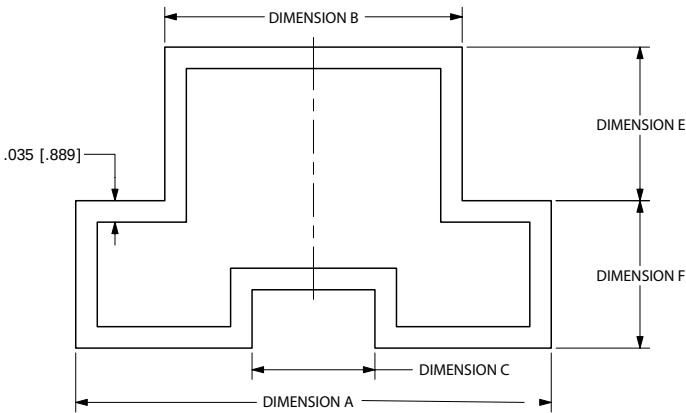
SIZE 3



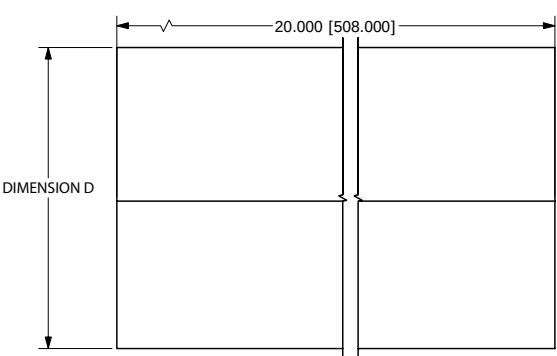
SIZE 4



TUBE PACKAGING



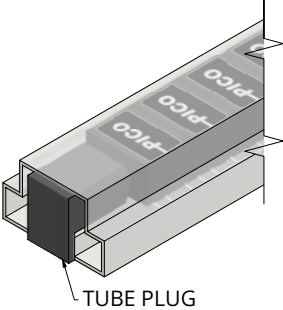
PLAN VIEW



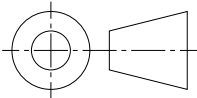
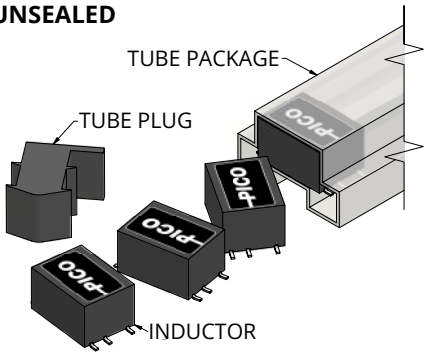
ELEVATION VIEW

Size	Dimension					
	A	B	C	D	E	F
1	1.034 [26.264]	.744 [18.898]	.340 [8.636]	.515 [13.081]	.275 [6.985]	.240 [6.096]
2 & 3	1.240 [31.496]	.950 [24.130]	.480 [12.192]	.610 [15.494]	.390 [9.906]	.220 [2.558]
4	1.645 [41.783]	1.355 [34.417]	.645 [13.383]	.740 [18.796]	.200 [5.080]	.540 [13.716]

SEALED



UNSEALED



Pico warrants each product manufactured by us and sold by us or an authorized representative, to be free from defects in material and workmanship. If properly used, it will perform within its applicable specifications for a period of one year after original shipment. Pico's obligation under this guarantee is limited to repairing or replacing our product to the original purchaser. This warranty is in lieu of all other warranties, express or implied and constitutes fulfillment of our obligations to the purchaser. We do not guarantee that the products can be used for a particular purpose other than those solely covered by the product's specifications. Pico must be notified if the product must meet particular certifications and/or standards. We assume no liability, in any event, for consequential damages, for anticipated or lost profits, incidental damages or loss of time or other losses incurred by the purchaser or any third party in connection with products covered by this warranty or otherwise. The purchaser will indemnify and hold Pico harmless for any damages, losses, costs, etc. from usage not within the product's specifications. Pico must be consulted before usage of its products in a nuclear, radioactive or space environment.

We reserve the right to discontinue products without notice, We reserve the right to make modifications to any existing catalog products without notice, at any time, without the obligation to modify units previously sold.

Common Mode EMI Choke Series

PICO
Electronics, Inc.

50 μ H to 20mH, Up to 9.9A_{RMS} Common Mode Choke

PRODUCT OVERVIEW

Pico's Common Mode EMI Chokes are highly effective in suppressing electromagnetic interference and radio frequency interference, where high-frequency noises are blocked to allow DC and low-frequency AC signals to pass through. These noise suppression devices can be offered in common mode or differential mode operations. They are extremely reliable in the performance of electronic systems where security of data and information are crucial, as well as mechanically durable to the integrity of mission systems.

Typical applications:

- DC-DC Converters
- Switching Power Supplies
- Communication Interfaces
- Aviation Power Systems
- Automotive & EVs
- Medical Equipment
- Lighting Systems

FEATURES

- Extreme resistance to impact, shock, and vibration
- Manufactured to MIL-PRF-27 Grade 5, Class S (Except Size 0 which is Class V)
- High reliability for space and mission critical applications
- Ultra miniature in size and minimalistic design
- Design layouts in through-hole, or surface mount
- Magnetically shielded (through-hole only)
- Terminal solderability per MIL-STD-202, Method 208

Contact Pico for part number of available options:

- Screening and qualification criteria to flight standard
- Fully RoHS compliant or with exemption 7(a)
- Modifications to mechanical design and electrical characteristics
- Custom new design and parameters



SPECIFICATIONS - THROUGH HOLE MODELS

Part Number ⁽¹⁾	Inductance Per Winding ⁽⁵⁾ [mH]	+60°C temp rise [A]	RMS Current +40°C temp rise [A]	+25°C temp rise [A]	DC Resistance Per Winding [Ω]	Leakage Inductance [μH] typ.	Figure Reference
46283	0.075	1.95	1.57	1.29	0.051	3.5	A1
47291		2.57	2.2	1.9	0.033	3.5	A2
48381		4.43	3.79	3.23	0.015	4	A3
46263	0.185	1.25	1	0.959	0.125	5	A1
47271		1.61	1.39	1.19	0.083	5	A2
48361		2.8	2.39	2.04	0.038	4.5	A3
49461		4.58	3.83	3.06	0.019	4.5	A4
46243	0.375	0.862	0.691	0.572	0.263	9	A1
47251		1.14	0.986	0.851	0.163	8	A2
48341		1.98	1.7	1.44	0.075	8	A3
49441		3.23	2.7	2.16	0.037	7.5	A4
50241		4.7	4.18	3.04	0.021	6.5	A5
46223	0.55	0.711	0.568	0.472	0.31	10.3	A1
47231		0.924	0.792	0.686	0.2	8.9	A2
48321		1.62	1.38	1.18	0.09	8.4	A3
49421		2.64	2.2	1.77	0.045	7.7	A4
50221		3.8	3.39	2.46	0.026	7.5	A5
46203	0.75	0.619	0.495	0.41	0.41	13.8	A1
47211		0.814	0.694	0.601	0.26	11.9	A2
48301		1.4	1.2	1.02	0.12	11.3	A3
49401		2.29	1.91	1.53	0.06	10.3	A4
50201		3.33	2.96	2.15	0.034	10	A5
51303		5.1	4.23	3.77	0.022	9.4	A6

Note 1: For RoHS compliance on a through-hole component, please consult with Pico's engineer and provide the part number.

Note 3: Inductance measured at 0.1VRMS and 10kHz.

Note 4: Maximum ambient plus temperature rise is limited 130°C.

Note 5: Minimum inductance is 80% of listed value with no maximum value.

Note 6: Winding balance at ±1%.

SPECIFICATIONS - THROUGH HOLE MODELS

Part Number ⁽¹⁾	Inductance Per Winding ⁽⁵⁾ [mH]	+60°C temp rise [A]	RMS Current +40°C temp rise [A]	+25°C temp rise [A]	DC Resistance Per Winding [Ω]	Leakage Inductance [μH] typ.	Size Reference
46183	1.5	0.437	0.349	0.29	0.82	27.5	A1
47191		0.575	0.491	0.425	0.52	23.8	A2
48281		0.986	0.847	0.722	0.24	22.5	A3
49381		1.61	1.36	1.08	0.12	20.6	A4
50181		2.31	2.06	1.5	0.07	20	A5
51283		3.78	3.14	2.8	0.04	18.8	A6
46163	3	0.308	0.246	0.204	1.65	55	A1
47171		0.405	0.345	0.299	1.05	47.5	A2
48261		0.708	0.605	0.516	0.47	45	A3
49361		1.14	0.959	0.766	0.24	41.3	A4
50161		1.64	1.45	1.06	0.14	40	A5
51263		2.53	2.09	1.86	0.09	37.5	A6
46143	6.75	0.205	0.165	0.136	3.71	123.8	A1
47151		0.27	0.231	0.2	2.36	106.9	A2
48241		0.468	0.401	0.342	1.07	101.3	A3
49341		0.769	0.643	0.516	0.53	92.8	A4
50141		1.1	0.977	0.711	0.31	90	A5
51243		1.69	1.41	1.25	0.2	84.4	A6
46123	12	0.154	0.123	0.101	6.6	220	A1
47131		0.202	0.172	0.15	4.2	190	A2
48221		0.352	0.299	0.255	1.9	180	A3
49321		0.572	0.48	0.378	0.95	165	A4
50121		0.827	0.73	0.528	0.55	160	A5
51223		1.28	1.06	0.942	0.35	150	A6

Note 1: For RoHS compliance on a through-hole component, please consult with Pico's engineer and provide the part number.

Note 3: Inductance measured at 0.1VRMS and 10kHz.

Note 4: Maximum ambient plus temperature rise is limited 130°C.

Note 5: Minimum inductance is 80% of listed value with no maximum value.

Note 6: Winding balance at ±1%.

SPECIFICATIONS - SURFACE MOUNT MODELS

Part Number ⁽²⁾	Inductance Per Winding ⁽⁵⁾ [mH]	+60°C temp rise [A]	RMS Current +40°C temp rise [A]	+25°C temp rise [A]	DC Resistance Per Winding [Ω]	Leakage Inductance [μH] typ.	Size Reference
52070	0.05	1.02	0.82	0.72	0.009	0.35	B0
46470		3.4	2.8	2.6	0.0125	0.4	B1
47570		6	5.2	4.4	0.0063	0.34	B2
48670		9.9	8.2	7.2	0.0033	0.29	B3
52065	0.75	0.78	0.62	0.54	0.15	0.52	B0
46465		2.6	2.1	1.9	0.0212	0.6	B1
47565		4.8	4.2	3.6	0.0094	0.54	B2
48665		8	6.7	5.9	0.0085	0.43	B3
52060	0.1	0.69	0.55	0.49	0.02	0.7	B0
46460		2.3	1.8	1.7	0.0288	0.8	B1
47560		4.2	3.7	3.1	0.0125	0.68	B2
48660		6.9	5.7	5	0.0066	0.58	B3
52055	0.25	0.42	0.34	0.3	0.056	1.8	B0
46455		1.4	1.1	1.1	0.07	2	B1
47555		2.6	2.3	1.9	0.0313	1.7	B2
48655		4.4	3.7	3.3	0.0163	1.4	B3
52050	0.5	0.33	0.27	0.24	0.13	3.5	B0
46450		1.1	0.9	0.8	0.125	4	B1
47550		1.8	1.7	1.4	0.0625	3.4	B2
48650		3.1	2.6	2.3	0.0325	2.9	B3
52045	0.75	0.24	0.19	0.17	0.17	5.25	B0
46445		0.8	0.7	0.6	0.2125	6	B1
47545		1.5	1.3	1.1	0.0938	5.1	B2
48645		2.6	1.1	1.8	0.0488	4.3	B3

Note 2: All SMDs are available with Pb-free dipped terminals that is compliant to RoHS exemption 7 by requesting part number + '-RoHS-7'

Note 3: Inductance measured at 0.1VRMS and 10kHz.

Note 4: Maximum ambient plus temperature rise is limited 130°C.

Note 5: Minimum inductance is 80% of listed value with no maximum value.

Note 6: Winding balance at ±1%.

SPECIFICATIONS - SURFACE MOUNT MODELS

Part Number ⁽²⁾	Inductance Per Winding ⁽⁵⁾ [mH]	+60°C temp rise [A]	RMS Current +40°C temp rise [A]	+25°C temp rise [A]	DC Resistance Per Winding [Ω]	Leakage Inductance [μH] typ.	Size Reference
52040	1	0.16	0.13	0.11	0.55	0.75	B0
46440		0.81	0.66	0.61	0.23	8	B1
47540		1.5	1.3	1.1	0.1	6.8	B2
48640		2.5	2.1	1.8	0.053	5.75	B3
52035	2.5	0.18	0.07	0.06	0.88	17.5	B0
46435		0.52	0.42	0.39	0.56	20	B1
47535		0.96	0.84	0.71	0.25	17	B2
48635		1.6	1.3	1.2	0.131	14.4	B3
52030	5	0.06	0.48	0.03	1.62	37	B0
46430		0.37	0.3	0.28	1.1	40	B1
47530		0.68	0.59	0.5	0.5	34	B2
48630		1.1	0.9	0.82	0.263	28.8	B3
46425	7.5	0.3	0.24	0.22	1.7	60	B1
47525		0.55	0.48	0.41	0.75	51	B2
48625		0.9	0.8	0.67	0.394	43.1	B3
46420	10	0.26	0.21	0.19	2.3	80	B1
47520		0.48	0.42	0.35	1	68	B2
48620		0.8	0.7	0.57	0.53	57.5	B3
46415	15	0.21	0.17	0.16	3.4	120	B1
47515		0.39	0.34	0.29	1.5	102	B2
48615		0.64	0.53	0.47	0.79	86	B3
46410	17.5	0.2	0.16	0.15	3.94	140	B1
47510		0.36	0.32	0.27	1.75	119	B2
48610		0.59	0.49	0.44	0.919	101	B3
46405	20	0.18	0.15	0.14	4.5	160	B1
47505		0.34	0.3	0.25	2	136	B2
48605		0.56	0.46	0.41	1.05	115	B3

Note 2: All SMDs are available with Pb-free dipped terminals that is compliant to RoHS exemption 7 by requesting part number + '-RoHS-7'

Note 3: Inductance measured at 0.1VRMS and 10kHz.

Note 4: Maximum ambient plus temperature rise is limited 130°C.

Note 5: Minimum inductance is 80% of listed value with no maximum value.

Note 6: Winding balance at ±1%.

SPECIFICATIONS

GENERAL

Parameter	Condition		Min.	Typ.	Max.	Units
Dielectric Withstanding Voltage	60Hz		-	1500	-	V _{RMS}
Operating Temperature Range	Ambient with temperature rise		-55	-	+130	°C
Storage Temperature Range	Ambient		-55	-	+130	°C
Size	See mechanical drawings					
Weight	See mechanical drawings					
Case	Through hole models		Epoxy Insulated Metal			
	Surface mount models		Glass Reinforced Polymer			
Potting	Vacuum Impregnated Epoxy					
Box Packaging (L x W x H)	Through hole models		10.5 x 6.42 x 0.79 (266.7 x 163.068 x 20.066)			inches (mm)
Tube Packaging (W x H x L)	Surface Mount	52000 Series	0.77 x 0.49 x 20.0 (19.660 x 12.446 x 508)			inches (mm)
		46000 Series	0.83 x 0.46 x 20.0 (21.184 x 11.684 x 508)			
		47000 Series	0.93 x 0.52 x 20.0 (23.724 x 13.081 x 508)			
		48000 Series	1.03 x 0.60 x 20.0 (26.264 x 15.113 x 508)			
Tape & Reel Packaging	Upon request					
Moisture Sensitivity Level	Surface Mount only		Level 3			

OPTIONAL DESIGN CRITERIA

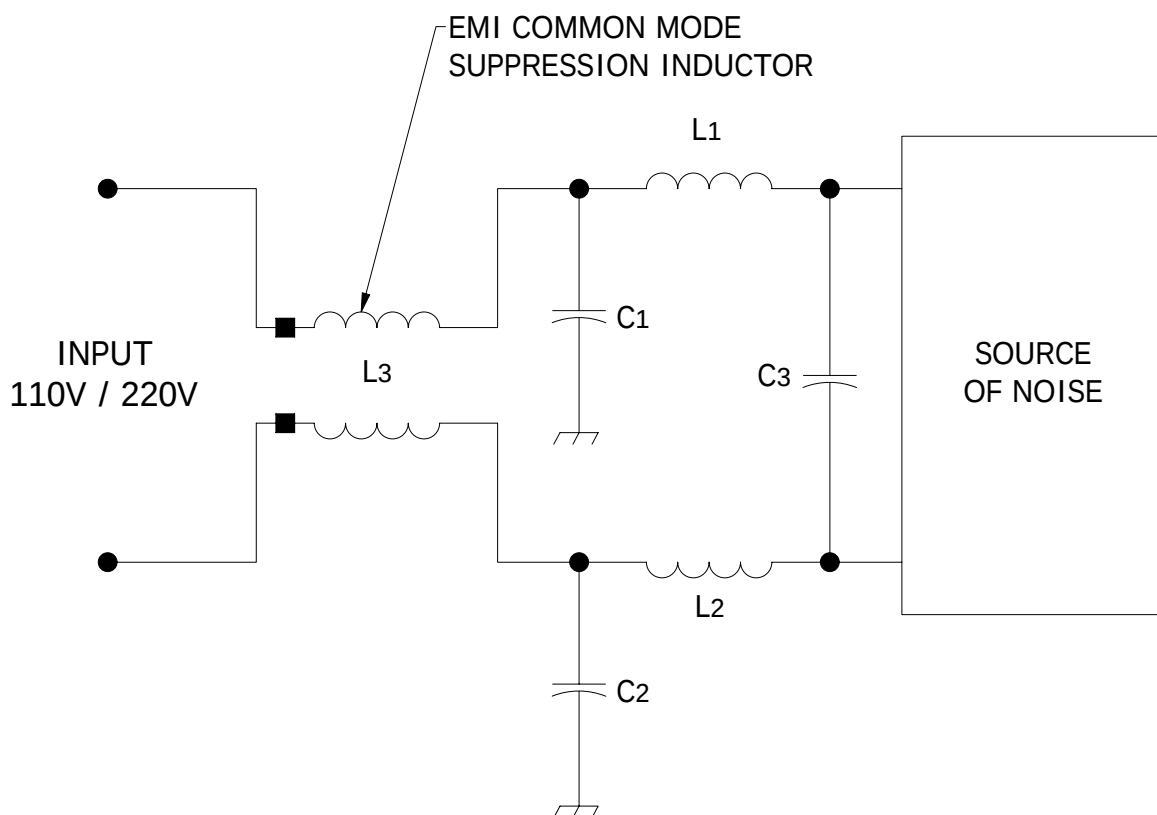
Test	Standard	Description
Vibration	MIL-STD-202	Method 204, Vibration, High Frequency
Shock	MIL-STD-202	Method 213, Shock (Specified Pulse)
Immersion	MIL-STD-202	Method 104, Immersion
Moisture Resistance	MIL-STD-202	Method 106, Moisture Resistance
Flammability	MIL-STD-202	Method 111, Flammability (External Flame)
Thermal Shock	MIL-STD-202	Method 107, Thermal Shock

OPTIONAL SCREENING AND QUALIFICATION

Standard	Screening & Qualification	Test ⁽⁷⁾
MIL-PRF-27	a.) Group A inspection Level-T - Table VII b.) Qualification inspection, Grade 5 - Table V	I. Thermal Shock II. Vibration III. Burn-in IV. Induced Voltage V. Shock
MIL-STD-981	a.) Group A screening tests - Table VI b.) Group B tests - Table XII, Class S	VI. Dielectric Withstanding Voltage (at reduced pressure) VII. Insulation Resistance VIII. Electrical Characteristics
EEE-INST-002, Section M1	a.) Magnetics Screening Req. - Table 2 b.) Magnetics Part Qual. - Table 3	IX. Visual and Mechanical Examination (External) X. Life XI. Radiographic Inspection

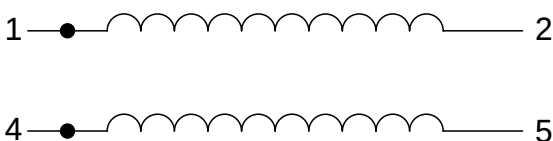
Note 7: Screening and qualification tests are not limited to the options in the chart above. Each standard may also be stringent or exclude certain tests from one another. Please contact Pico for specific application needs and for Pico part number.

TYPICAL APPLICATION CIRCUITS

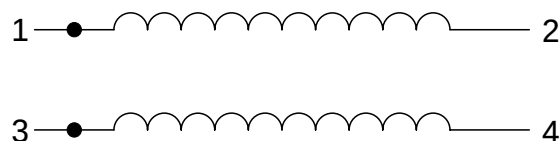


ELECTRICAL SCHEMATIC

SIZE A1, A2, A3

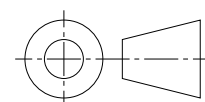


SIZE A4, A5, A6, B0, B1, B2, B3



NOTES

a. FOR SIZES A1, A2, AND A3, TERMINALS 3 & 6 HAVE NO CONNECTION. MECHANICAL STABILITY ONLY.



MECHANICAL DRAWINGS

THROUGH HOLE MODELS

FIGURE 1

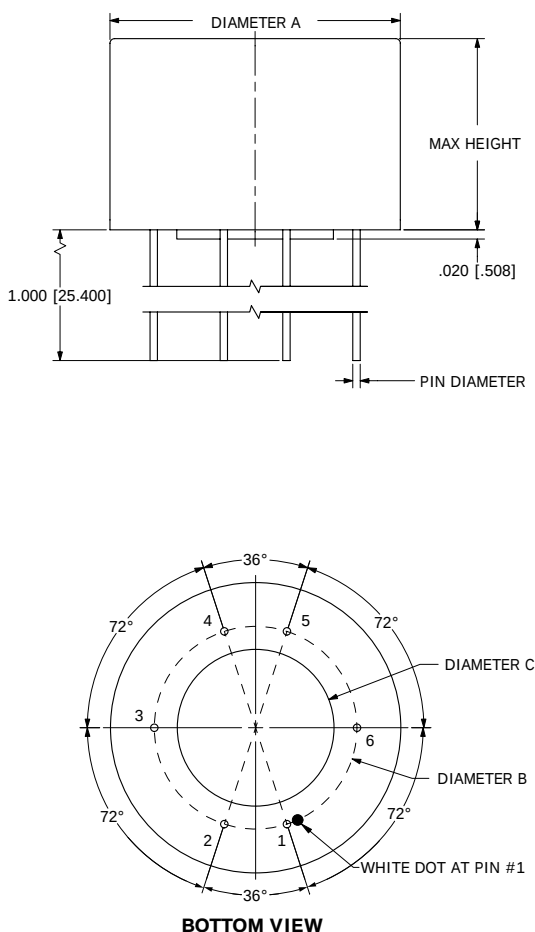
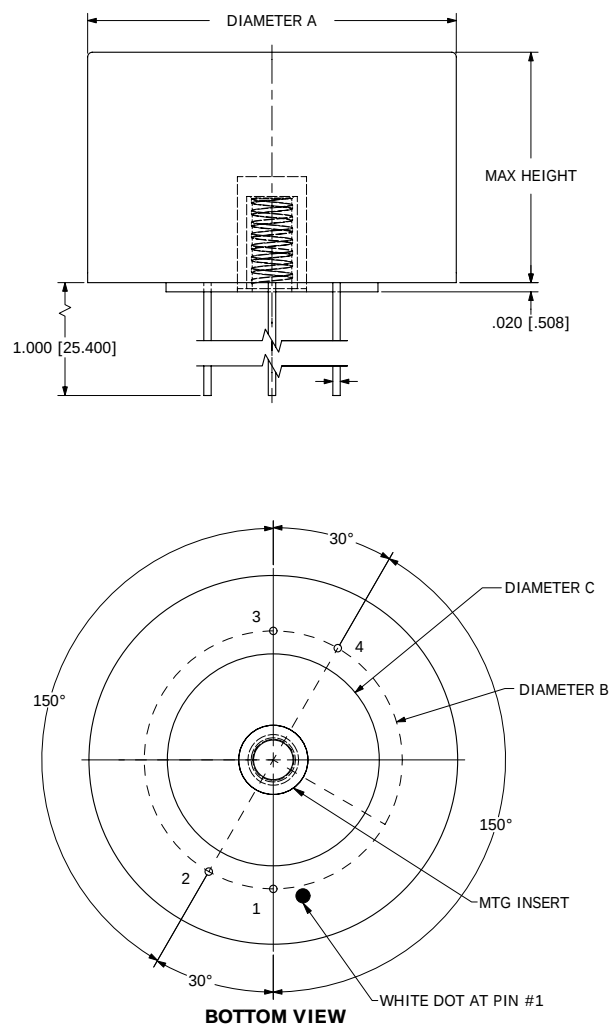


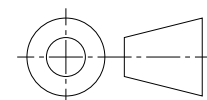
FIGURE 2



Series	Max Height	Diameter Dimension			PIN	Insert	Typ. Weight (grams)	Size	Figure
		A	B	C					
46000	.280 (7.110)	.410 (10.410)	.260 (6.600)	.160 (4.060)	.012 (.310)	-	2.0	A1	1
47000	.340 (8.640)	.500 (12.700)	.350 (8.890)	.250 (6.350)	.012 (.310)	-	3.5	A2	
48000	.415 (10.540)	.630 (16.000)	.440 (11.170)	.340 (8.640)	.016 (.410)	-	6.8	A3	
49000	.500 (12.700)	.800 (20.320)	.560 (14.220)	.460 (11.680)	.016 (.410)	2 - 56 UNC 6 threads min	15.5	A4	2
50000	.650 (16.510)	.950 (24.130)	.670 (17.000)	.570 (14.480)	.020 (.510)	6 - 32 UNC 6 threads min	26.3	A5	
51000	.745 (18.920)	1.125 (28.570)	.800 (20.320)	.700 (17.780)	.020 (.510)	6 - 32 UNC 6 threads min	42.9	A6	

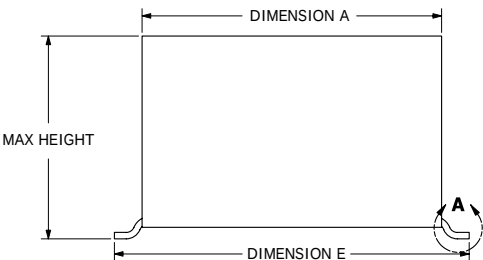
NOTES

- ALL DIMENSIONS ARE IN INCHES, [] = MM
- TERMINALS ARE CLOCKWISE FROM PIN #1
- FOR FIGURE 1, PINS # 3 AND #6 HAVE NO CONNECTION

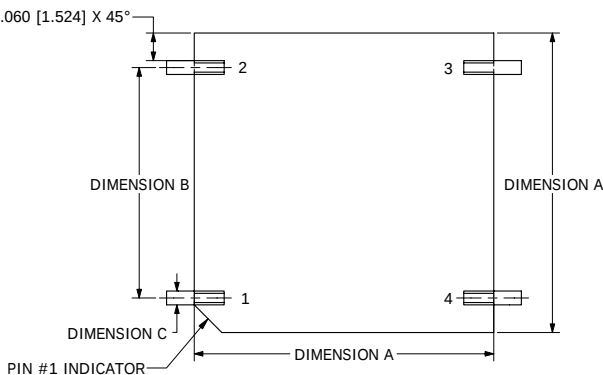
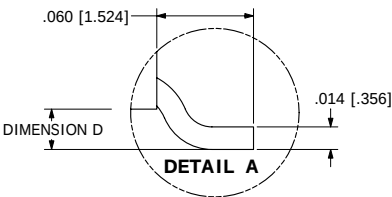


MECHANICAL DRAWINGS

SURFACE MOUNT MODELS



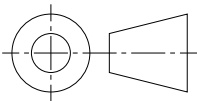
LEAD DETAILS



BOTTOM VIEW

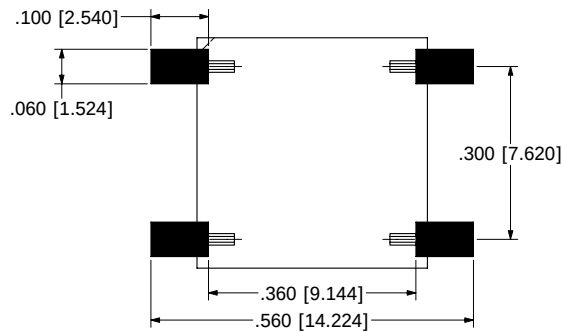
Series	Max Height	Dimension					Typ. Weight (grams)	Size
		A	B	C	D	E		
52000	.260 (6.600)	.400 (10.160)	.300 (7.620)	.020 (.508)	.015 (.381)	.520 (13.208)	1.4	B0
46000	.305 (7.747)	.450 (11.430)	.300 (7.620)	.027 (.686)	.020 (.508)	.570 (14.478)	2.2	B1
47000	.360 (9.144)	.550 (13.970)	.400 (10.160)	.030 (.762)	.025 (.635)	.670 (17.018)	4.1	B2
48000	.440 (11.176)	.650 (16.510)	.500 (12.700)	.030 (.762)	.025 (.635)	.770 (19.558)	7.7	B3

NOTES
a. ALL DIMENSIONS ARE IN INCHES, [] = MM
b. TERMINALS ARE CLOCKWISE FROM PIN #1

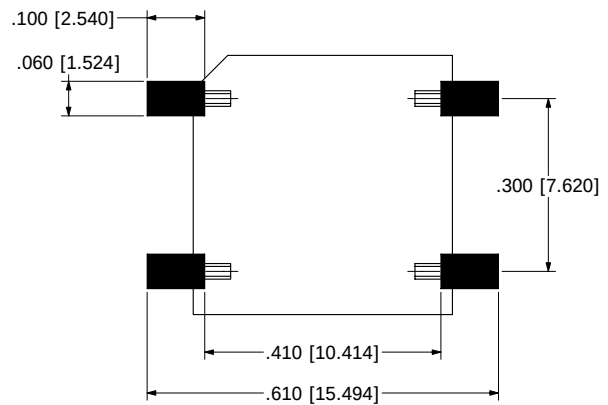


RECOMMENDED LAND PATTERN DIMENSIONS

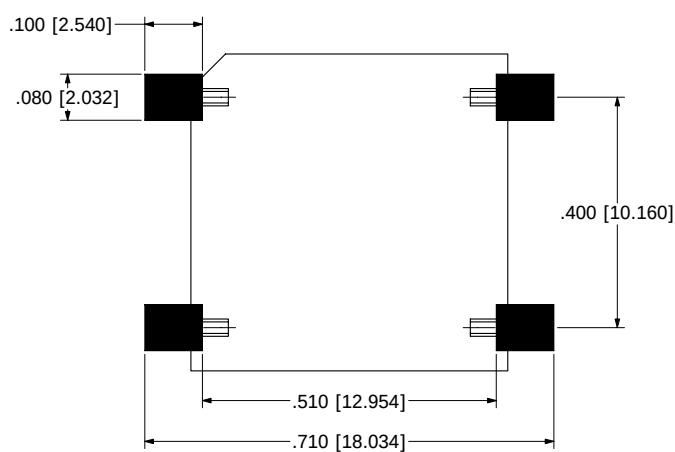
52000 SERIES (SIZE B0)



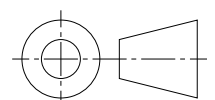
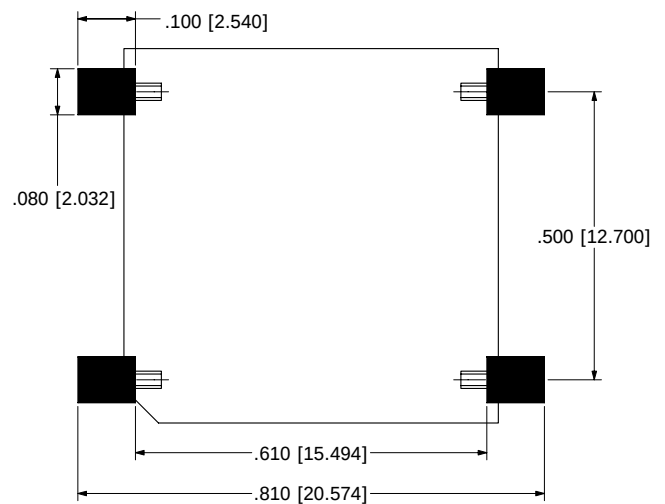
46000 SERIES (SIZE B1)



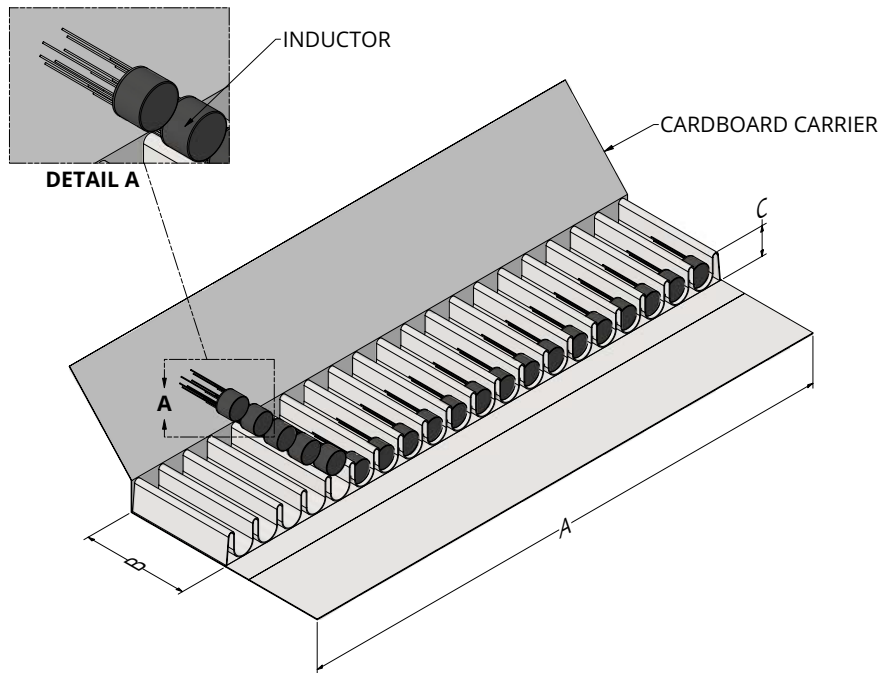
47000 SERIES (SIZE B2)



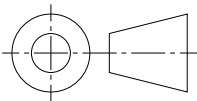
48000 SERIES (SIZE B3)



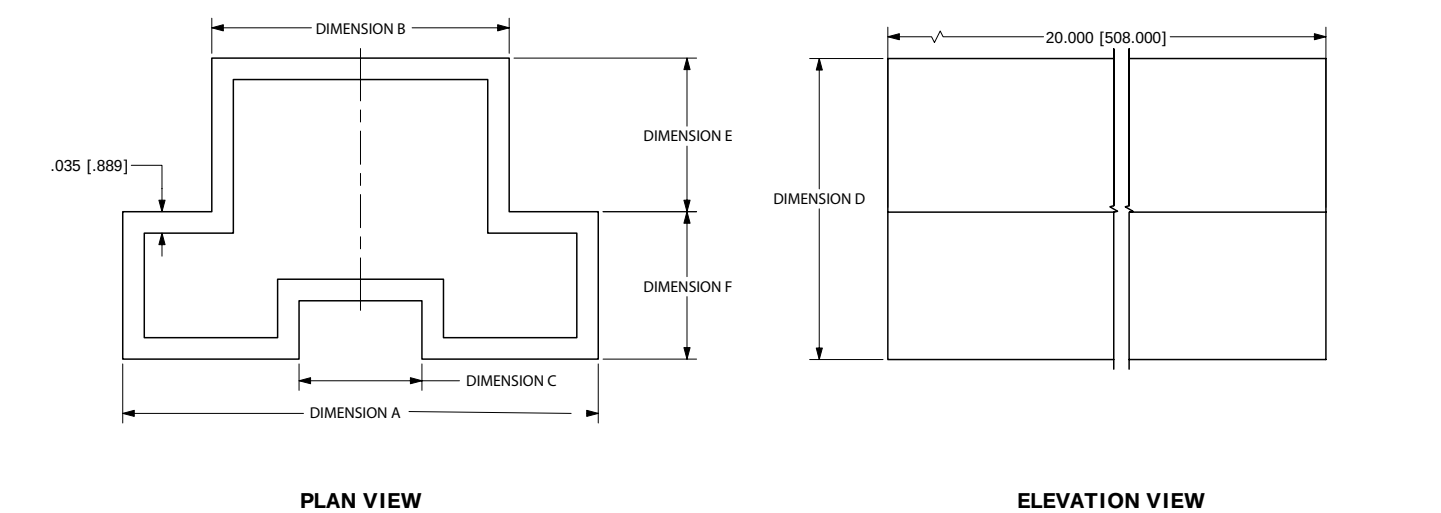
BOX PACKAGING - THROUGH HOLE MODELS



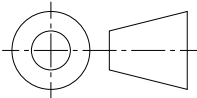
Dimension		
A	B	C
10.5 [266.7]	6.42 [163.068]	0.79 [20.066]



TUBE PACKAGING - SURFACE MOUNT MODELS



Series	Dimension					
	A	B	C	D	E	F
52000	.774 [19.660]	.484 [12.294]	.200 [5.080]	.490 [12.446]	.250 [6.350]	.240 [6.096]
46000	.834 [21.184]	.544 [13.818]	.160 [4.064]	.460 [11.684]	.220 [5.588]	.240 [6.096]
47000	.934 [23.724]	.644 [16.358]	.240 [6.096]	.515 [13.081]	.275 [6.985]	.240 [6.096]
48000	1.034 [26.264]	.744 [18.898]	.340 [8.636]	.595 [15.113]	.355 [9.017]	.240 [6.096]



Pico warrants each product manufactured by us and sold by us or an authorized representative, to be free from defects in material and workmanship. If properly used, it will perform within its applicable specifications for a period of one year after original shipment. Pico's obligation under this guarantee is limited to repairing or replacing our product to the original purchaser. This warranty is in lieu of all other warranties, express or implied and constitutes fulfillment of our obligations to the purchaser. We do not guarantee that the products can be used for a particular purpose other than those solely covered by the product's specifications. Pico must be notified if the product must meet particular certifications and/or standards. We assume no liability, in any event, for consequential damages, for anticipated or lost profits, incidental damages or loss of time or other losses incurred by the purchaser or any third party in connection with products covered by this warranty or otherwise. The purchaser will indemnify and hold Pico harmless for any damages, losses, costs, etc. from usage not within the product's specifications. Pico must be consulted before usage of its products in a nuclear, radioactive or space environment.

We reserve the right to discontinue products without notice, We reserve the right to make modifications to any existing catalog products without notice, at any time, without the obligation to modify units previously sold.

HCM Series

25 μ H to 400 μ H, Up to 30A_{RMS} Common Mode Choke

PICO
Electronics, Inc.

PRODUCT OVERVIEW

HCM series is a newer line of Pico capable common mode chokes at highest current capability to the expense of minimal saturation density loss. They are the smallest size for any industry; meeting harsh environmental conditions than the typical commercial and non-sealed designs. These noise suppression devices can be offered in common mode or differential mode operations. They are extremely reliable in the performance of power systems, where space could be a limitation, as well as mechanically durable to any setting.

Typical applications:

- DC-DC Converters
- Switching Power Supplies
- Communication Interfaces
- Aviation Power Systems
- Automotive & EVs
- Medical Equipment
- Lighting Systems

FEATURES

- Extreme resistance to impact, shock, and vibration
- Manufactured to MIL-PRF-27 Grade 5, Class S
- High reliability for space and mission critical applications
- Ultra miniature in size and minimalistic design
- Terminal solderability per MIL-STD-202, Method 208

Contact Pico for part number of available options:

- Screening and qualification criteria to flight standard
- Fully RoHS compliant or with exemption 7(a)
- Modifications to mechanical design and electrical characteristics
- Custom new design and parameters



SPECIFICATIONS

Part Number ⁽¹⁾	Inductance Per Winding ⁽⁴⁾ [μH]	+60°C temp rise [A]	RMS Current +40°C temp rise [A]	+25°C temp rise [A]	DC Resistance Per Winding [mΩ]	Leakage Inductance [μH] max.	Size Reference
HCM1250	25	12.86	10.08	7.60	2	5	1
HCM2250		18.68	14.64	11.04	1.38		2
HCM3250		27.35	21.44	16.17	0.0921		3
HCM1500	50	9.09	7.13	5.37	4	5	1
HCM2500		15.25	11.96	9.02	2.07		2
HCM3500		25.62	20.08	15.15	1.05		3
HCM1101	100	9.09	7.13	5.37	4	5	1
HCM2101		18.68	14.64	11.04	1.38		2
HCM3101		30.31	23.76	17.92	0.75		3
HCM1151	150	10.33	8.10	6.11	3.1	5	1
HCM2151		9.40	8.81	5.56	5.45		2
HCM3151		12.12	13.72	10.35	2.25		3
HCM1201	200	9.09	7.13	5.37	4	5	1
HCM2201		15.25	11.96	9.02	2.07		2
HCM3301		13.55	10.63	8.01	3.75		3
HCM1401	400	7.42	5.82	4.39	6	5	1
HCM2401		18.68	14.64	11.04	1.38		2
HCM3401		19.56	15.34	11.57	1.8		3

Note 1: Parts are available with Pb-free dipped terminals that is compliant to RoHS exemption 7 by requesting part number + 'RoHS-7'

Note 2: Inductance measured at 0.1VRMS and 10kHz.

Note 3: Maximum ambient plus temperature rise is limited 130°C.

Note 4: Minimum inductance is 80% of listed value with no maximum value.

Note 5: Winding balance at ±1%.

SPECIFICATIONS

GENERAL

Parameter	Condition	Min.	Typ.	Max.	Units
Dielectric Withstanding Voltage	60Hz	-	1500	-	V _{RMS}
Operating Temperature Range	Ambient with temperature rise	-55	-	+130	°C
Storage Temperature Range	Ambient	-55	-	+130	°C
Size	See mechanical drawings				
Weight	See mechanical drawings				
Case	Glass Reinforced Polymer				
Potting	Vacuum Impregnated Epoxy				
Box Packaging					
Tube Packaging (W x H x L)	Size 1	0.83 x 0.46 x 20.0 (21.184 x 11.684 x 508)			Inches (mm)
	Size 2	0.93 x 0.52 x 20.0 (23.724 x 13.081 x 508)			
	Size 3	1.03 x 0.60 x 20.0 (26.264 x 15.113 x 508)			
Tape & Reel Packaging	Upon request				
Moisture Sensitivity Level	Surface Mount only	Level 3			

OPTIONAL DESIGN CRITERIA

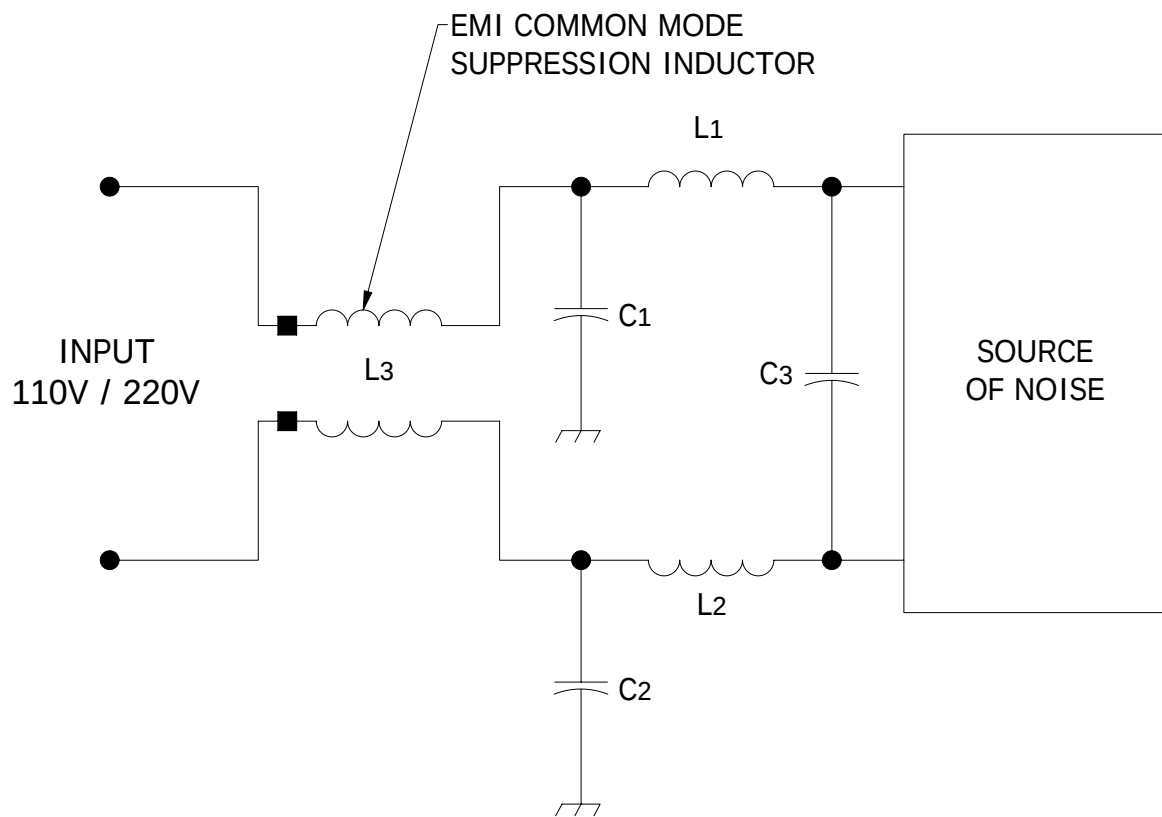
Test	Standard	Description
Vibration	MIL-STD-202	Method 204, Vibration, High Frequency
Shock	MIL-STD-202	Method 213, Shock (Specified Pulse)
Immersion	MIL-STD-202	Method 104, Immersion
Moisture Resistance	MIL-STD-202	Method 106, Moisture Resistance
Flammability	MIL-STD-202	Method 111, Flammability (External Flame)
Thermal Shock	MIL-STD-202	Method 107, Thermal Shock

OPTIONAL SCREENING AND QUALIFICATION

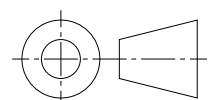
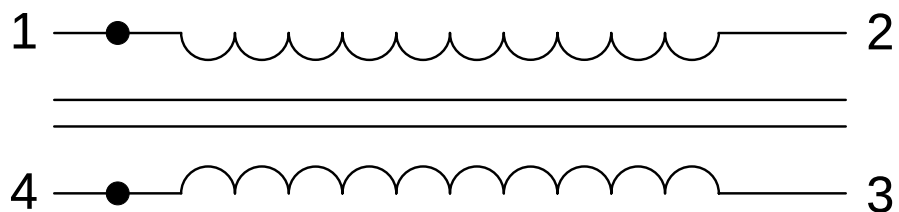
Standard	Screening & Qualification	Test ⁽⁶⁾
MIL-PRF-27	a.) Group A inspection Level-T - Table VII b.) Qualification inspection, Grade 5 - Table V	I. Thermal Shock II. Vibration III. Burn-in IV. Induced Voltage V. Shock VI. Dielectric Withstanding Voltage (at reduced pressure) VII. Insulation Resistance VIII. Electrical Characteristics IX. Visual and Mechanical Examination (External) X. Life XI. Radiographic Inspection
MIL-STD-981	a.) Group A screening tests - Table VI b.) Group B tests - Table XII, Class S	
EEE-INST-002, Section M1	a.) Magnetics Screening Req. - Table 2 b.) Magnetics Part Qual. - Table 3	

Note 6: Screening and qualification tests are not limited to the options in the chart above. Each standard may also be stringent or exclude certain tests from one another. Please contact Pico for specific application needs and for Pico part number.

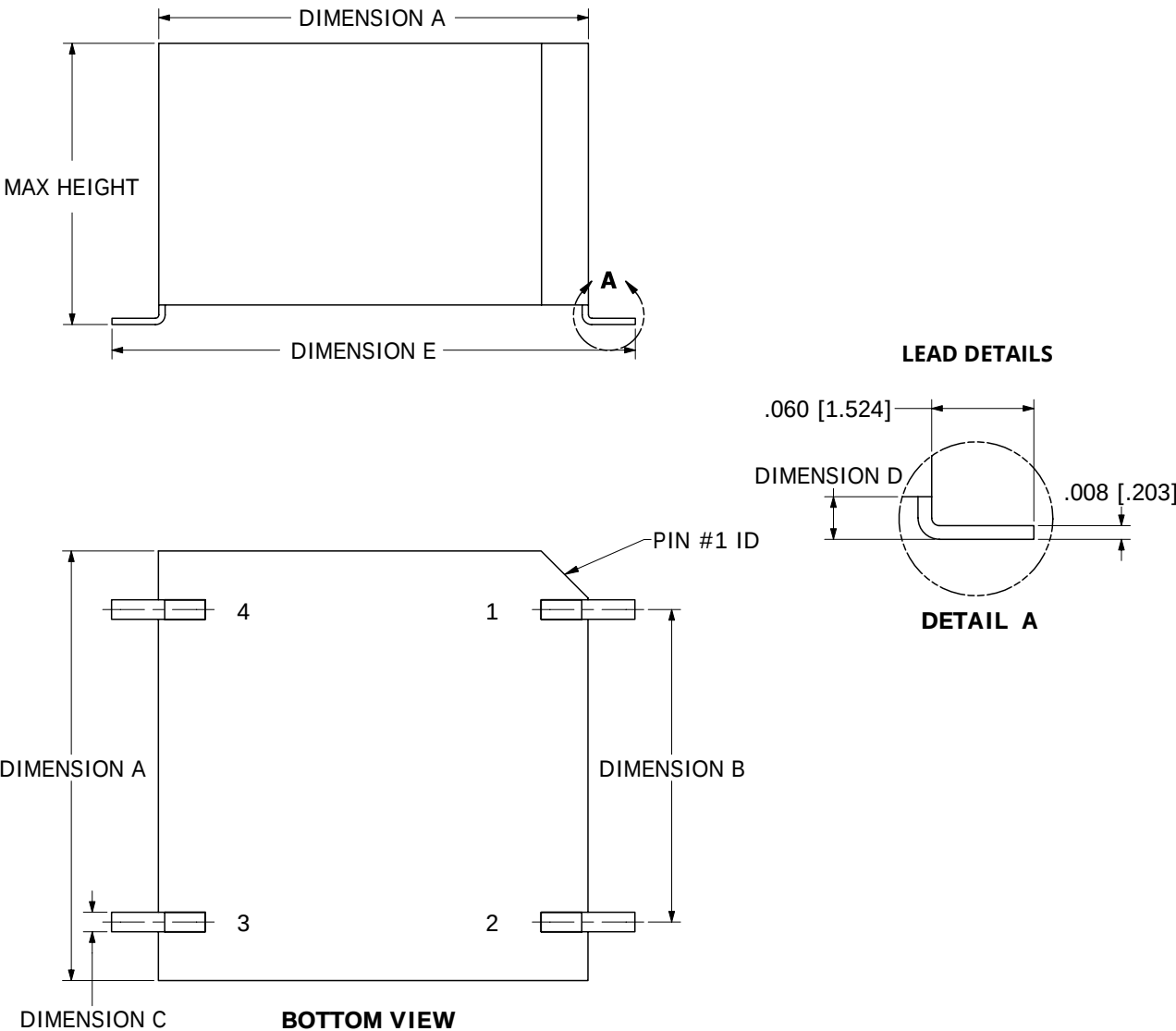
TYPICAL APPLICATION CIRCUITS



ELECTRICAL SCHEMATIC

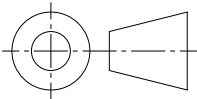


MECHANICAL DRAWINGS



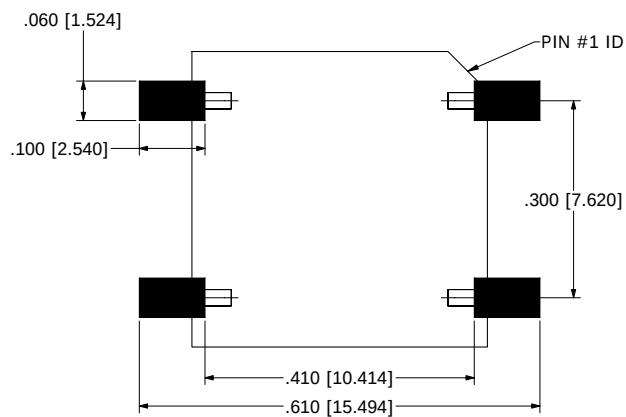
Series	Max Height	Dimension					Typ. Weight (grams)	Size
		A	B	C	D	E		
HCM1000	.305 (7.75)	.450 (11.43)	.300 (7.62)	.025 (0.64)	.020 (0.51)	.570 (14.48)	2.2	1
HCM2000	.360 (9.14)	.550 (13.97)	.400 (10.16)	.025 (0.64)	.025 (0.64)	.670 (17.02)	3.6	2
HCM3000	.440 (11.18)	.650 (16.51)	.500 (12.70)	.030 (0.70)	.025 (0.64)	.770 (19.56)	5.2	3

NOTES
a. ALL DIMENSIONS ARE IN INCHES, [] = MM
b. TERMINALS ARE CLOCKWISE FROM PIN #1

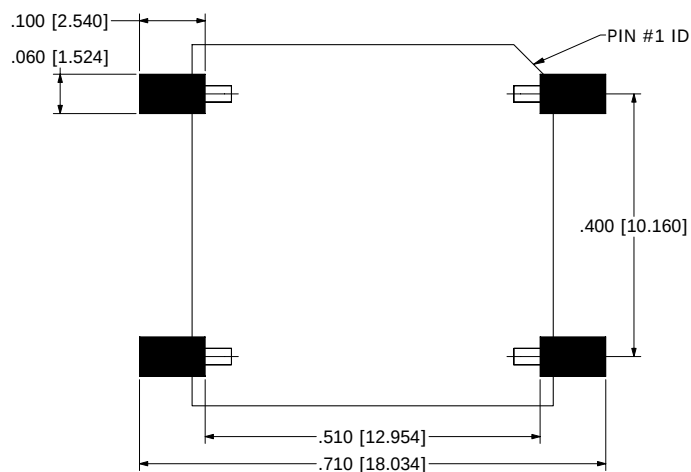


RECOMMENDED LAND PATTERN DIMENSIONS

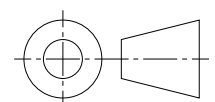
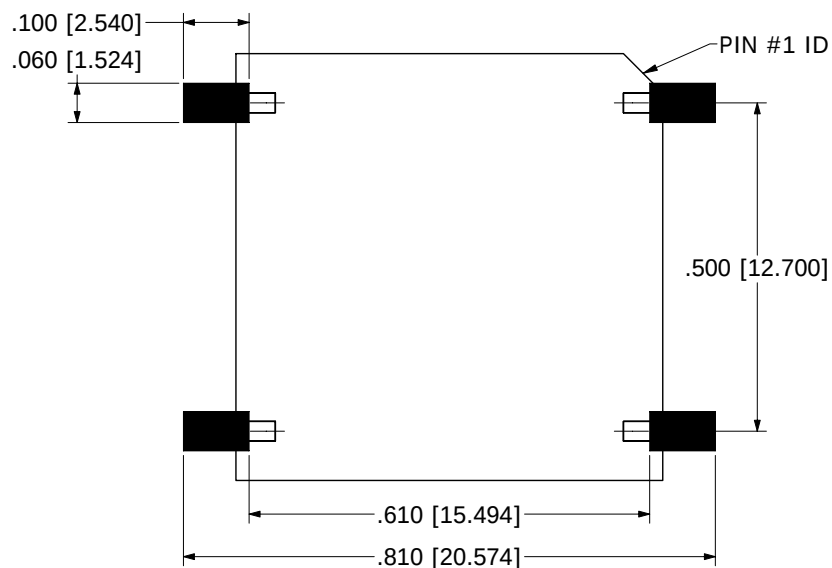
HCM1000s - SIZE 1



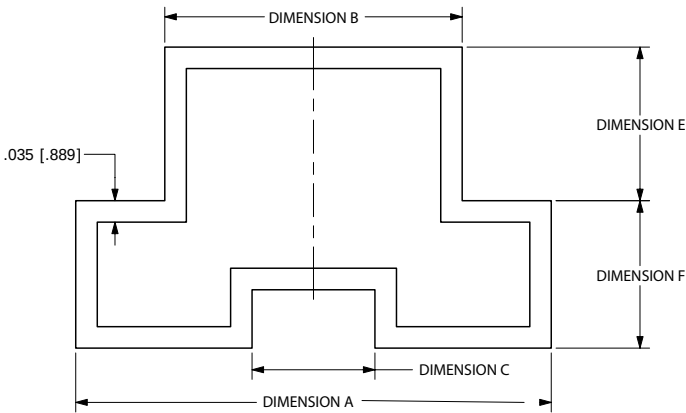
HCM2000s - SIZE 2



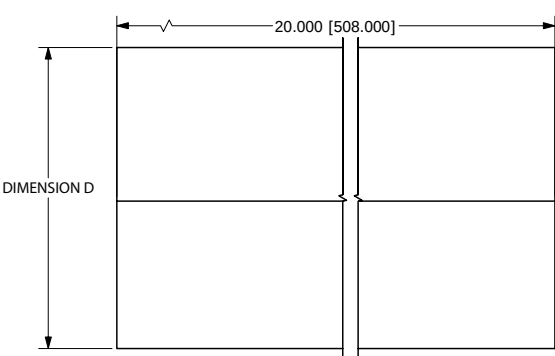
HCM3000s - SIZE 3



TUBE PACKAGING



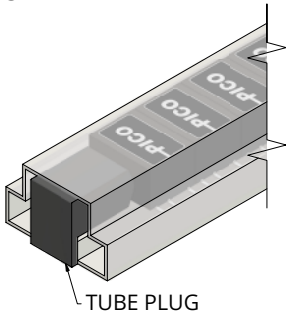
PLAN VIEW



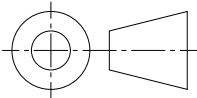
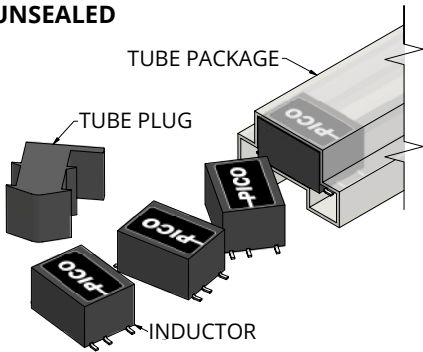
ELEVATION VIEW

Size	Dimension					
	A	B	C	D	E	F
1	.834 [21.184]	.544 [13.818]	.160 [4.064]	.460 [11.684]	.220 [5.588]	.240 [6.096]
2	.934 [23.724]	.644 [16.358]	.240 [6.096]	.515 [13.081]	.275 [6.985]	.240 [6.096]
3	1.034 [26.264]	.744 [18.898]	.340 [8.636]	.595 [15.113]	.355 [9.017]	.240 [6.096]

SEALED



UNSEALED



Pico warrants each product manufactured by us and sold by us or an authorized representative, to be free from defects in material and workmanship. If properly used, it will perform within its applicable specifications for a period of one year after original shipment. Pico's obligation under this guarantee is limited to repairing or replacing our product to the original purchaser. This warranty is in lieu of all other warranties, express or implied and constitutes fulfillment of our obligations to the purchaser. We do not guarantee that the products can be used for a particular purpose other than those solely covered by the product's specifications. Pico must be notified if the product must meet particular certifications and/or standards. We assume no liability, in any event, for consequential damages, for anticipated or lost profits, incidental damages or loss of time or other losses incurred by the purchaser or any third party in connection with products covered by this warranty or otherwise. The purchaser will indemnify and hold Pico harmless for any damages, losses, costs, etc. from usage not within the product's specifications. Pico must be consulted before usage of its products in a nuclear, radioactive or space environment.

We reserve the right to discontinue products without notice, We reserve the right to make modifications to any existing catalog products without notice, at any time, without the obligation to modify units previously sold.

Miniature Power Inductor Series

0.04-20mH, 0.060-3.88A, Power Inductor

PICO
Electronics, Inc.

PRODUCT OVERVIEW

Pico power inductors are built to smoothly transmit direct current across various DC-DC converters and switching regulators. They can provide low core losses and are used to store energy, which the electromotive force can filter out frequency noise and reduce signal loss. Energy storage can also allow higher power consumption in system designs. These power inductors are ideal for filtering out noise and ripple spikes in many applications. Pico has a diverse portfolio of power inductors ranging in mechanical size, mounting options, current rating, and inductance rating.

Typical applications:

- DC-DC Converters
- Switching Regulators
- Radar & Communication Systems
- Step-up or Step-down Transformers
- Aviation Power Systems
- Automotive & EVs
- Medical Equipment

FEATURES

- Extreme resistance to impact, shock, and vibration
- Manufactured to MIL-PRF-27 Grade 5, Class S (Except Size 0 which is Class V)
- High reliability for space and mission critical applications
- Ultra miniature in size and minimalistic design
- Design layouts in through-hole, or surface mount
- Magnetically shielded (through-hole only)
- Terminal solderability per MIL-STD-202, Method 208

Contact Pico for part number of available options:

- Screening and qualification criteria to flight standard
- Fully RoHS compliant or with exemption 7(a)
- Modifications to mechanical design and electrical characteristics
- Custom new design and parameters



Miniature Power Inductor Series | Power Inductor **PICO**

SPECIFICATIONS

Through Hole	Surface Mount	Inductance		DC Current		DC Resistance		Self Resonant Frequency [MHz]	Size Reference
		Parallel [mH] typ.	Series [mH] typ.	Parallel [A]	Series [A]	Parallel [Ω]	Series [Ω]		
41020	41320	5	20	0.12	0.06	13.5	54	0.275	1
42105	42405			0.2	0.1	7.25	29	0.207	2
43103	43403			0.28	0.14	5	20	0.23	3
44500	-			0.44	0.22	3.1	12.4	0.21	4
45107	-			0.58	0.29	2.55	10.2	0.18	5
41040	41340	3.75	15	0.14	0.07	10.125	40.5	0.32	1
42125	42425			0.24	0.12	5.5	22	0.24	2
43123	43423			0.32	0.16	3.75	15	0.235	3
44520	-			0.46	0.23	2.325	9.3	0.28	4
45127	-			0.66	0.33	1.925	7.7	0.245	5
40050	40350	2.5	10	0.1	0.05	18.75	75	0.4	0
41060	41360			0.16	0.08	6.75	27	0.38	1
42145	42445			0.28	0.14	3.65	14.6	0.39	2
43143	43443			0.4	0.2	2.5	10	0.34	3
44560	-			0.62	0.31	1.55	6.2	0.29	4
45147	-			0.8	0.4	1.275	5.1	0.3	5
40070	40370	1.875	7.5	0.116	0.058	14	56	0.5	0
41080	41380			0.2	0.1	5.075	20.3	0.45	1
42165	42465			0.34	0.17	2.75	11	0.43	2
43163	43463			0.48	0.24	1.875	7.5	0.39	3
44580	-			0.76	0.38	1.175	4.7	0.35	4
45167	-			0.98	0.49	0.95	3.8	0.34	5
40090	40390	1.25	5	0.142	0.071	9.5	38	0.65	0
41100	41400			0.24	0.12	3.375	13.5	0.6	1
42185	42485			0.42	0.21	1.825	7.3	0.49	2
43183	43483			0.6	0.3	1.25	5	0.55	3
44600	-			0.94	0.47	0.775	3.1	0.46	4
45187	-			1.2	0.6	0.65	2.6	0.41	5
40110	40410	0.75	3	0.182	0.091	5.5	22	0.8	0
41120	41420			0.32	0.16	2.025	8.1	0.71	1
42205	42505			0.54	0.27	1.1	4.4	0.65	2
43203	43503			0.76	0.38	0.75	3	0.57	3
44620	-			1.2	0.6	0.475	1.9	0.6	4
45207	-			1.56	0.78	0.375	1.5	0.55	5
40130	40430	0.5	2	0.224	0.112	4.5	18	1	0
41140	41440			0.38	0.19	1.35	5.4	0.95	1
42225	42525			0.66	0.33	0.725	2.9	0.85	2
43223	43523			0.94	0.47	0.5	2	0.8	3
44640	-			1.48	0.74	0.325	1.3	0.7	4
45227	-			1.9	0.95	0.25	1	0.65	5

Miniature Power Inductor Series | Power Inductor **PICO**

SPECIFICATIONS

Through Hole ⁽¹⁾	Surface Mount ⁽²⁾	Inductance ⁽³⁾		DC Current		DC Resistance		Self Resonant Frequency [MHz]	Size Reference
		Parallel [mH] typ.	Series [mH] typ.	Parallel [A]	Series [A]	Parallel [Ω]	Series [Ω]		
40150	40450	0.25	1	0.316	0.158	2	8	1.65	0
41160	41460			0.54	0.27	0.675	2.7	1.5	1
42245	42545			0.94	0.47	0.375	1.5	1.2	2
43243	43543			1.32	0.66	0.25	1	1.1	3
44660	-			2	1	0.155	0.62	1.05	4
45247	-			2.6	1.3	0.125	0.5	1	5
40170	40470	0.1875	0.750	0.364	0.182	1.5	6	1.7	0
41180	41480			0.62	0.31	0.5	2	1.55	1
42265	42565			1.08	0.54	0.25	1	1.4	2
43263	43563			1.52	0.76	0.188	0.75	1.4	3
44680	-			2.4	1.2	0.118	0.47	1.2	4
45267	-			3.2	1.6	0.095	0.38	1.15	5
40190	40490	0.125	0.5	0.448	0.224	1.25	5	2.3	0
41200	41500			0.76	0.38	0.325	1.3	2.1	1
42285	42585			1.32	0.66	0.165	0.66	1.9	2
43283	43583			1.86	0.93	0.125	0.5	1.6	3
44700	-			2.94	1.47	0.078	0.31	1.5	4
45287	-			3.8	1.9	0.063	0.25	1.45	5
40210	40510	0.0625	0.25	0.632	0.316	0.475	1.9	3.3	0
41220	41520			1.06	0.53	0.165	0.66	3	1
42305	42605			1.86	0.93	0.083	0.33	2.5	2
43303	43603			2.6	1.3	0.063	0.25	2.4	3
44720	-			4.16	2.08	0.04	0.16	2.1	4
45307	-			5.4	2.7	0.033	0.13	2.01	5
40230	40530	0.025	0.1	1	0.5	0.188	0.75	4.5	0
41240	41540			1.56	0.78	0.075	0.3	4	1
42325	42625			2.7	1.35	0.043	0.17	3.9	2
43323	43623			3.9	1.95	0.028	0.11	3.5	3
44740	-			6.16	3.08	0.018	0.07	3.3	4
45327	-			7.76	3.88	0.015	0.06	3.2	5
40250	40550	0.01	0.04	1.58	0.79	0.1	0.4	5.5	0
41260	41560			2.36	1.18	0.035	0.141	5	1
42345	42645			4.06	2.03	0.018	0.07	4.5	2
43343	43643			5.36	2.68	0.015	0.06	4.5	3

Note 1: For RoHS compliance on a through-hole component, please consult with Pico's engineer and provide the part number.

Note 2: All SMDs are available with Pb-free dipped terminals that is compliant to RoHS exemption 7 by requesting part number + '-RoHS-7'

Note 3: Inductance measured at 0.1V_{RMS}, 10kHz and zero DC current. Tolerance is -5% to +10%.

Note 4: Temperature rise at rated D.C. current is <30°C. Size 0 is <50°C.

Note 5: Maximum ambient is 100°C.

Miniature Power Inductor Series | Power Inductor **PICO**

SPECIFICATIONS

GENERAL

Parameter	Condition		Min.	Typ.	Max.	Units
Dielectric Withstanding Voltage	60Hz		-	200	-	V _{RMS}
Insulation Resistance	300VDC		10	-	-	GΩ
Operating Temperature Range	Ambient with temperature rise	Class S	-55	-	+130	°C
		Class V	-55	-	+155	°C
Storage Temperature Range	Ambient		-55	-	+90	°C
Size	See mechanical drawings					
Weight	See mechanical drawings					
Case	Through hole models		Epoxy Insulated Metal			
	Surface mount models		Glass Reinforced Polymer			
Potting	Vacuum Impregnated Epoxy					
Box Packaging (L x W x H)	Through hole models		10.5 x 6.42 x 0.79 (266.7 x 163.068 x 20.066)			inches (mm)
Tube Packaging (W x H x L)	Surface mount models	40000 Series	0.70 x 0.46 x 20.0 (17.780 x 11.684 x 508)			inches (mm)
		41000 Series	0.77 x 0.49 x 20.0 (19.660 x 12.446 x 508)			
		42000 Series	0.87 x 0.55 x 20.0 (22.098 x 13.843 x 508)			
		43000 Series	0.99 x 0.64 x 20.0 (25.146 x 16.256 x 508)			
Tape & Reel Packaging	Upon request					
Moisture Sensitivity Level	Surface mount models		Level 3			

OPTIONAL DESIGN CRITERIA

Test	Standard	Description
Vibration	MIL-STD-202	Method 204, Vibration, High Frequency
Shock	MIL-STD-202	Method 213, Shock (Specified Pulse)
Immersion	MIL-STD-202	Method 104, Immersion
Moisture Resistance	MIL-STD-202	Method 106, Moisture Resistance
Flammability	MIL-STD-202	Method 111, Flammability (External Flame)
Thermal Shock	MIL-STD-202	Method 107, Thermal Shock

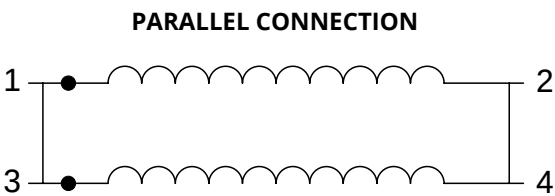
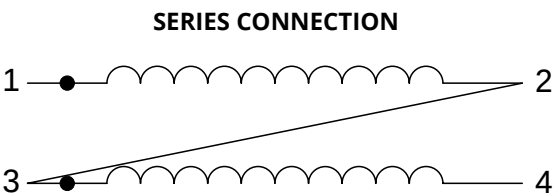
OPTIONAL SCREENING AND QUALIFICATION

Standard	Screening & Qualification	Test ⁽⁶⁾
MIL-PRF-27	a.) Group A inspection Level-T - Table VII b.) Qualification inspection, Grade 5 - Table V	I. Thermal Shock II. Vibration III. Burn-in IV. Induced Voltage V. Shock VI. Dielectric Withstanding Voltage (at reduced pressure) VII. Insulation Resistance VIII. Electrical Characteristics IX. Visual and Mechanical Examination (External) X. Life XI. Radiographic Inspection
MIL-STD-981	a.) Group A screening tests - Table VI b.) Group B tests - Table XII, Class S	
EEE-INST-002, Section M1	a.) Magnetics Screening Req. - Table 2 b.) Magnetics Part Qual. - Table 3	

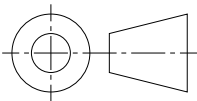
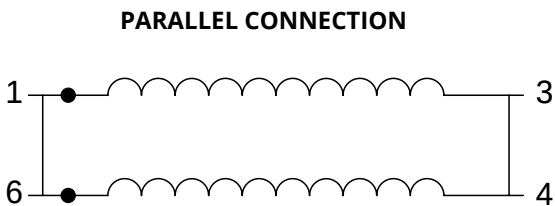
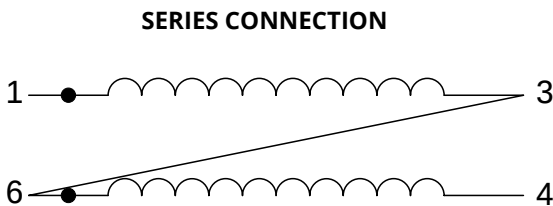
Note 6: Screening and qualification tests are not limited to the options in the chart above. Each standard may also be stringent or exclude certain tests from one another. Please contact Pico for specific application needs and for Pico part number.

ELECTRICAL SCHEMATIC

THROUGH HOLE MODELS



SURFACE MOUNT MODELS



MECHANICAL DRAWINGS

THROUGH HOLE MODELS

FIGURE 1

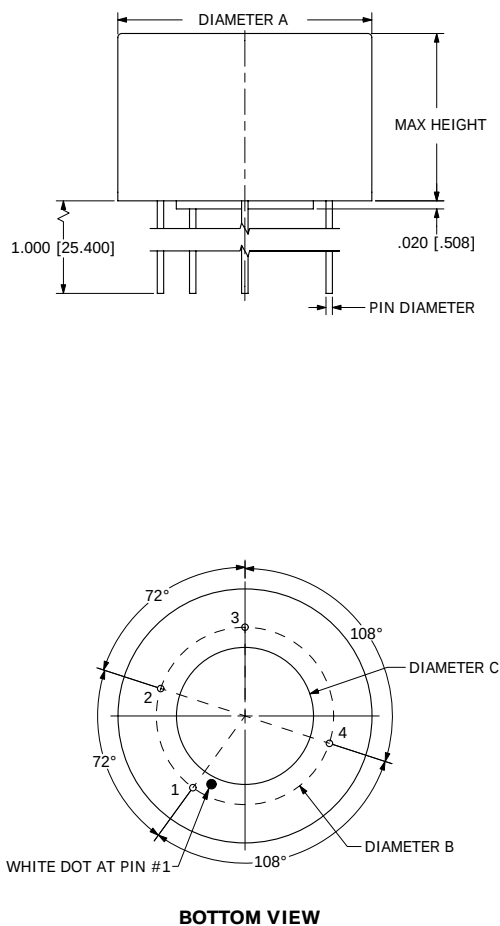
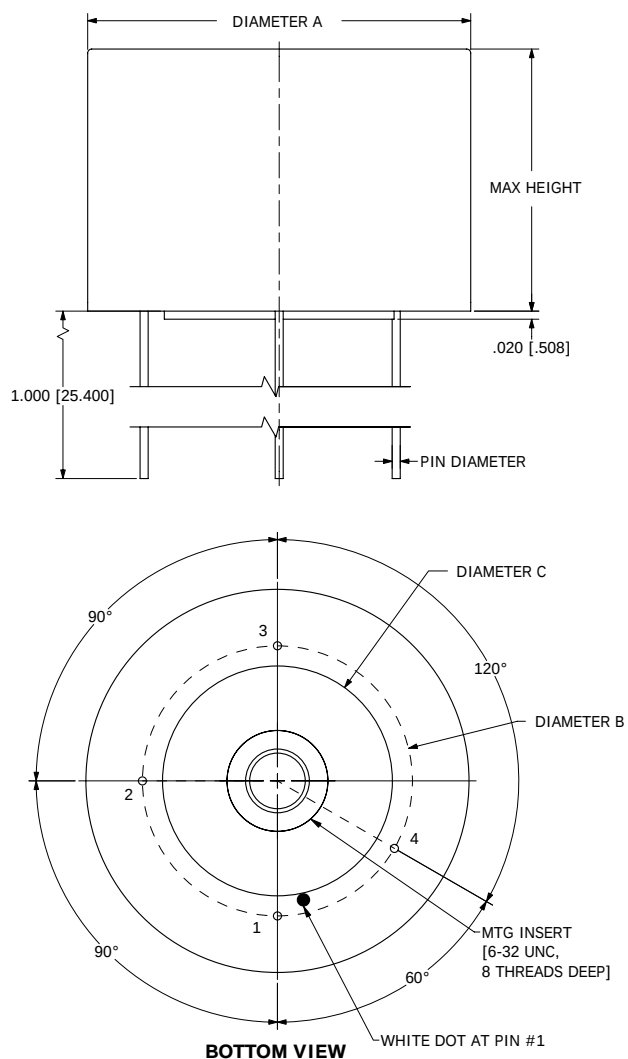


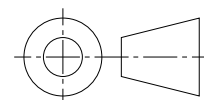
FIGURE 2



Series	Max Height	Diameter Dimension				Insert	Typ. Weight (grams)	Size	Figure
		A	B	C	PIN				
40000	.250 (6.350)	.320 (8.128)	.210 (5.334)	.13 (3.302)	.012 (.305)	-	1.1	0	1
41000	.280 (7.112)	.410 (10.414)	.260 (6.604)	.160 (4.064)	.012 (.305)	-	2.0	1	
42000	.340 (8.636)	.500 (12.700)	.350 (8.890)	.250 (6.350)	.012 (.305)	-	3.6	2	
43000	.415 (10.541)	.630 (16.002)	.440 (11.176)	.340 (8.636)	.016 (.406)	-	7.2	3	
44000	.500 (12.700)	.800 (20.320)	.560 (14.224)	.460 (11.684)	.016 (.406)	-	15.9	4	2
45000	.650 (16.510)	.950 (24.130)	.670 (17.018)	.570 (14.478)	.020 (.508)	6 - 32 UNC 8 Threads Deep	28.1	5	

NOTES

- a. ALL DIMENSIONS ARE IN INCHES, [] = MM
b. TERMINALS ARE CLOCKWISE FROM PIN #1

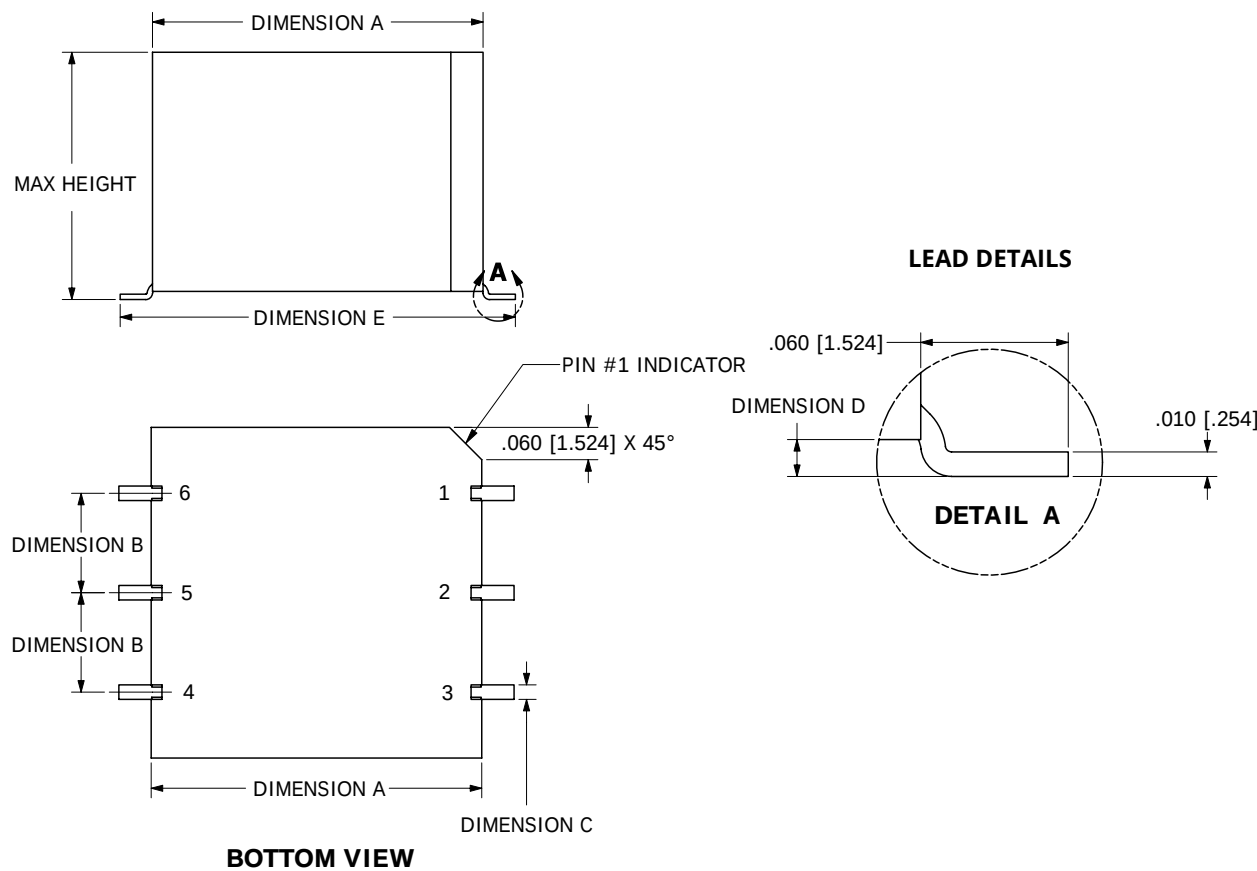


Miniature Power Inductor Series | Power Inductor

PICO

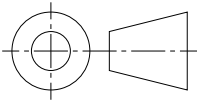
MECHANICAL DRAWINGS

SURFACE MOUNT MODELS



Series	Max Height	Dimension					Typ. Weight (grams)	Size
		A	B	C	D	E		
40000	.280 (7.11)	.325 (8.26)	.085 (2.16)	.020 (0.51)	.012 (0.30)	.445 (11.30)	1.0	0
41000	.310 (7.87)	.400 (10.16)	.115 (2.92)	.020 (0.51)	.012 (0.30)	.520 (13.21)	2.0	1
42000	.365 (9.27)	.495 (12.57)	.140 (3.56)	.027 (0.69)	.015 (0.38)	.615 (15.62)	3.7	2
43000	.460 (11.68)	.615 (15.62)	.185 (4.70)	.027 (0.69)	.015 (0.38)	.735 (18.66)	7.1	3

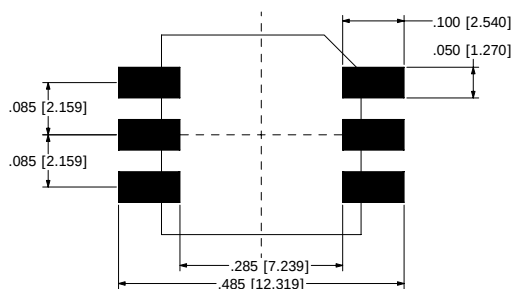
NOTES
a. ALL DIMENSIONS ARE IN INCHES, [] = MM
b. TERMINALS ARE CLOCKWISE FROM PIN #1
c. PIN #2 & #5 HAVE NO CONNECTION



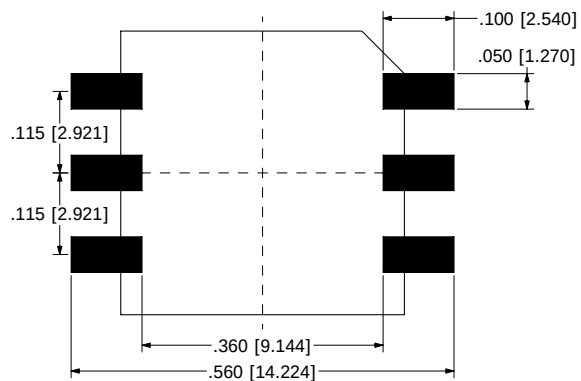
Miniature Power Inductor Series | Power Inductor **PICO**

RECOMMENDED LAND PATTERN DIMENSIONS

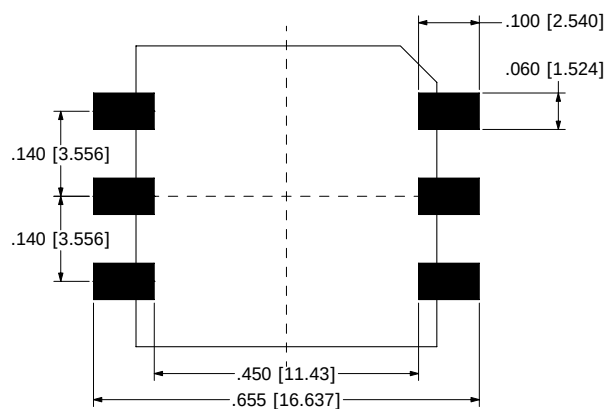
40000 SERIES (SIZE 0)



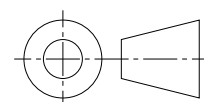
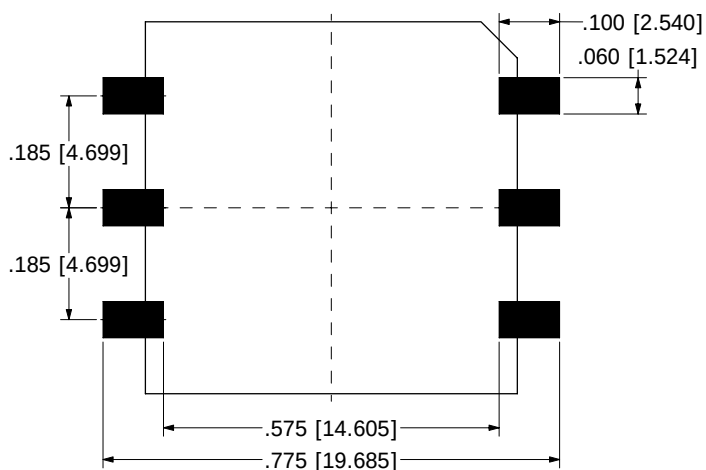
41000 SERIES (SIZE 1)



42000 SERIES (SIZE 2)



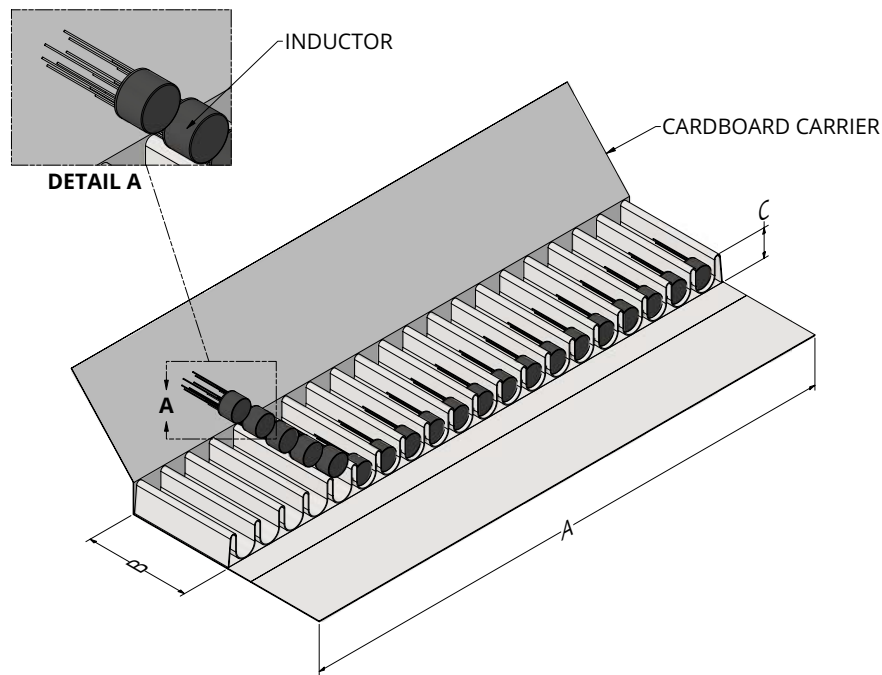
43000 SERIES (SIZE 3)



Miniature Power Inductor Series | Power Inductor

PICO

BOX PACKAGING - THROUGH HOLE MODELS

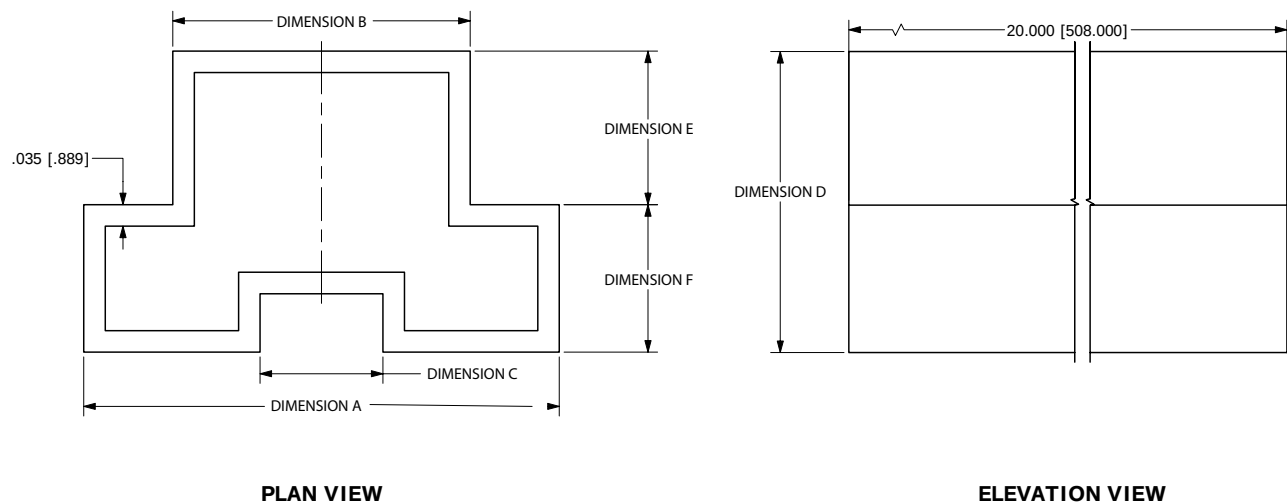


Dimension		
A	B	C
10.5 [266.7]	6.42 [163.068]	0.79 [20.066]

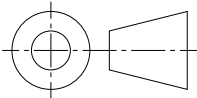
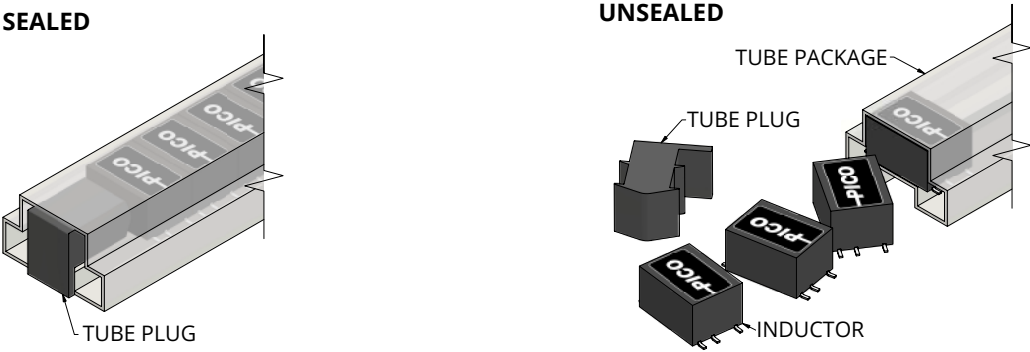
Miniature Power Inductor Series | Power Inductor

PICO

TUBE PACKAGING



Series (Size)	Dimension					
	A	B	C	D	E	F
40000 (Size 0)	.700 [17.780]	.410 [10.414]	.150 [3.810]	.460 [11.684]	.220 [5.588]	.240 [6.096]
41000 (Size 1)	.774 [19.660]	.484 [12.294]	.200 [5.080]	.490 [12.446]	.250 [6.350]	.240 [6.096]
42000 (Size 2)	.870 [22.098]	.580 [14.732]	.300 [7.620]	.545 [13.843]	.305 [7.747]	.240 [6.096]
43000 (Size 3)	.990 [25.146]	.700 [17.780]	.400 [10.160]	.640 [16.256]	.400 [10.160]	.240 [6.096]



Pico warrants each product manufactured by us and sold by us or an authorized representative, to be free from defects in material and workmanship. If properly used, it will perform within its applicable specifications for a period of one year after original shipment. Pico's obligation under this guarantee is limited to repairing or replacing our product to the original purchaser. This warranty is in lieu of all other warranties, express or implied and constitutes fulfillment of our obligations to the purchaser. We do not guarantee that the products can be used for a particular purpose other than those solely covered by the product's specifications. Pico must be notified if the product must meet particular certifications and/or standards. We assume no liability, in any event, for consequential damages, for anticipated or lost profits, incidental damages or loss of time or other losses incurred by the purchaser or any third party in connection with products covered by this warranty or otherwise. The purchaser will indemnify and hold Pico harmless for any damages, losses, costs, etc. from usage not within the product's specifications. Pico must be consulted before usage of its products in a nuclear, radioactive or space environment.

We reserve the right to discontinue products without notice, We reserve the right to make modifications to any existing catalog products without notice, at any time, without the obligation to modify units previously sold.

72000 Series

15 μ H - 1000 μ H, Up to 10A, Axial Power Inductor

PICO
Electronics, Inc.

PRODUCT OVERVIEW

Pico power inductors are built to smoothly transmit direct current across various DC-DC converters and switching regulators. They can provide low core losses and are used to store energy, which the electromotive force can filter out frequency noise and reduce signal loss. Energy storage can also allow higher power consumption in system designs. These power inductors are ideal for filtering out noise and ripple spikes in many applications. Pico has a diverse portfolio of power inductors ranging in mechanical size, mounting options, current rating, and inductance rating.

Typical applications:

- DC-DC Converters
- Switching Regulators
- Radar & Communication Systems
- Step-up or Step-down Transformers
- Aviation Power Systems
- Automotive & EVs
- Medical Equipment

FEATURES

- Extreme resistance to impact, shock, and vibration
- Manufactured to MIL-PRF-27 Grade 5, Class S
- High reliability for space and mission critical applications
- Miniature in size and minimalistic design
- Mountable to PCB or to posts
- Capable for reel-mounting assembly

Contact Pico for part number of available options:

- Screening and qualification criteria to flight standard
- Fully RoHS compliant or with exemption 7(a)
- Modifications to mechanical design and electrical characteristics
- Custom new design and parameters



SPECIFICATIONS

SIZE A

Part Number ⁽¹⁾	Inductance [μH]	10% drop in L [A]	DC Current 20% drop in L [A]	30% drop in L [A]	DC Resistance [Ω]	Self Resonant Frequency [MHz]	Q @ 100kHz
72205	500	0.425	0.64	0.848	0.74	1.4	25
72215	375	0.49	0.74	0.98	0.55	1.6	25
72225	250	0.6	0.906	1.2	0.36	2	25
72235	150	0.775	1.17	1.55	0.22	2.5	25
72245	100	0.95	1.43	1.9	0.15	3	25
72255	75	1.01	1.65	2.2	0.11	3.6	25
72265	50	1.34	2.02	2.7	0.075	4.4	25

SIZE B

Part Number ⁽¹⁾	Inductance [μH]	10% drop in L [A]	DC Current 20% drop in L [A]	30% drop in L [A]	DC Resistance [Ω]	Self Resonant Frequency [MHz]	Q @ 100kHz
72310	1000	0.45	0.6	0.75	0.85	0.9	25
72320	750	0.52	0.693	0.866	0.64	1.04	25
72330	500	0.63	0.848	1.06	0.43	1.3	25
72340	375	0.73	0.98	1.22	0.32	1.5	25
72350	250	0.9	1.2	1.5	0.22	1.8	25
72360	150	1.16	1.55	1.93	0.13	2.3	25
72370	100	1.42	1.9	2.37	0.11	2.8	25
72380	75	1.64	2.2	2.73	0.064	3.3	25
72390	50	2	2.7	3.35	0.043	4	25

SPECIFICATIONS

SIZE C

Part Number ⁽¹⁾	Inductance [μH]	10% drop in L [A]	DC Current 20% drop in L [A]	30% drop in L [A]	DC Resistance [Ω]	Self Resonant Frequency [MHz]	Q @ 100kHz
72405	1000	0.5	0.75	1	0.7	0.85	25
72415	750	0.58	0.866	1.15	0.52	1	25
72425	500	0.707	1.06	1.41	0.35	1.2	25
72435	375	0.816	1.22	1.63	0.26	1.4	25
72445	250	1	1.5	2	0.175	1.7	25
72455	150	1.29	1.93	2.58	0.105	2.2	25
72465	100	1.58	2.37	3.16	0.07	2.7	25
72475	75	1.82	2.73	3.65	0.053	3.1	25
72485	50	2.25	3.35	4.5	0.035	4	25

SIZE D

Part Number ⁽¹⁾	Inductance [μH]	10% drop in L [A]	DC Current 20% drop in L [A]	30% drop in L [A]	DC Resistance [Ω]	Self Resonant Frequency [MHz]	Q @ 100kHz
72500	200	1.4	2.14	2.76	0.107	1.7	35
72510	175	1.5	2.29	2.95	0.093	2	35
72520	150	1.6	2.47	3.18	0.08	2.2	35
72530	125	1.78	2.7	3.49	0.066	2.5	35
72540	100	1.99	3.03	3.9	0.053	2.7	35
72550	75	2.3	3.5	4.5	0.04	3.1	35
72560	50	2.8	4.3	5.5	0.027	4	35
72570	25	3.98	6.06	7.79	0.014	4.5	35
72580	15	5.14	7.82	10	0.007	5.1	35

Note 1: For RoHS compliance, please consult with Pico's engineer and provide the part number.

Note 2: Inductance measured at 0.1V_{RMS}, 100kHz and zero DC current.

Note 3: Maximum ambient plus temperature rise is limited to 130°C. (i.e. The temperature rise for Pico # 72205 at 0.425A is +12°C from the curve data, and therefore, the ambient should be limited to 118°C. At 0.64A, the temperature rise is +30°C, so ambient should be limited to 100°C.

SPECIFICATIONS

GENERAL

Parameter	Condition	Min.	Typ.	Max.	Units
Size	See mechanical drawings				
Operating Temperature Range	Ambient with temperature rise	-55	-	+130	°C
Storage Temperature Range	Ambient	-55	-	+130	°C
Weight	Size A	-	3	-	grams
	Size B	-	3.5	-	
	Size C	-	6.6	-	
	Size D	-	10.4	-	
Case	Molded Epoxy				
Box Packaging	Length x Width x Height	12 x 6.4 x 0.4 (304.8 x 162.56 x 10.16)			inches (mm)

OPTIONAL DESIGN CRITERIA

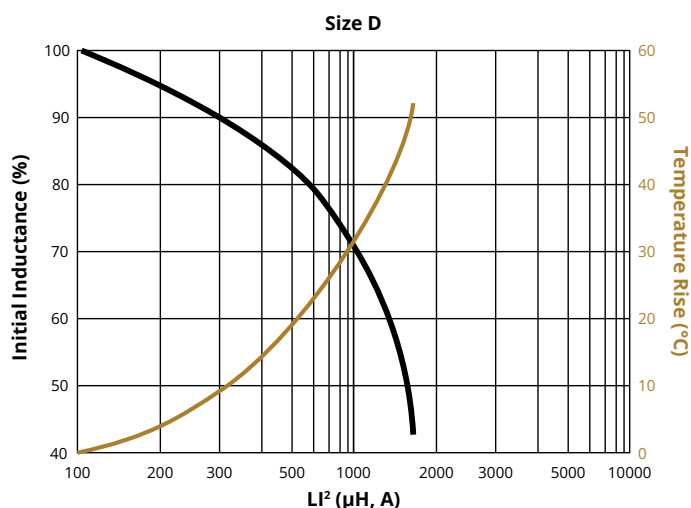
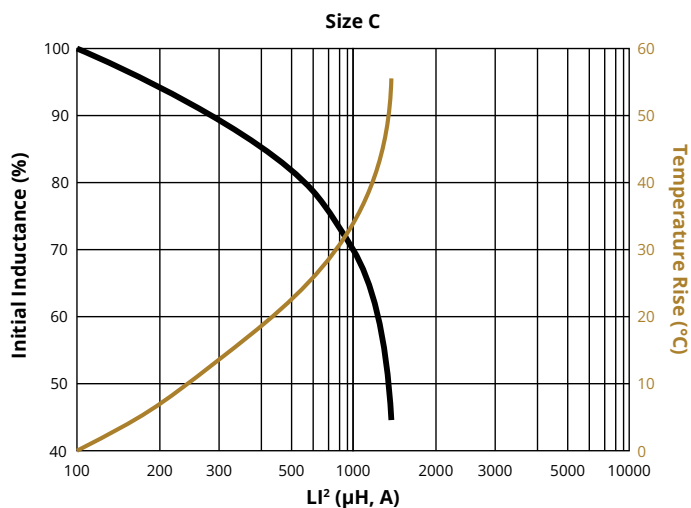
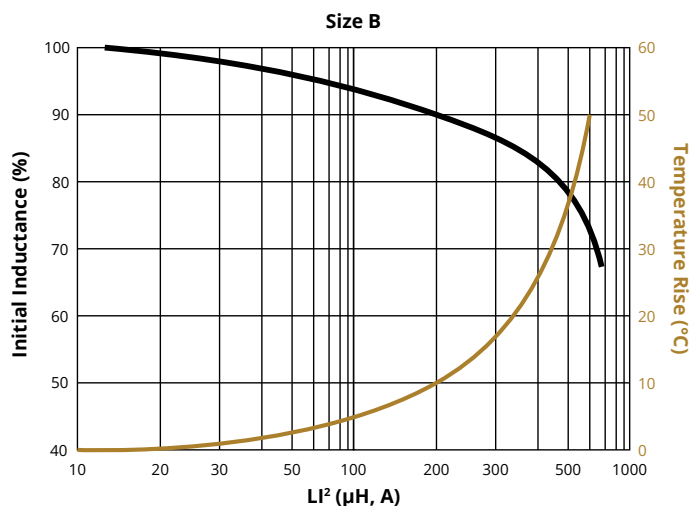
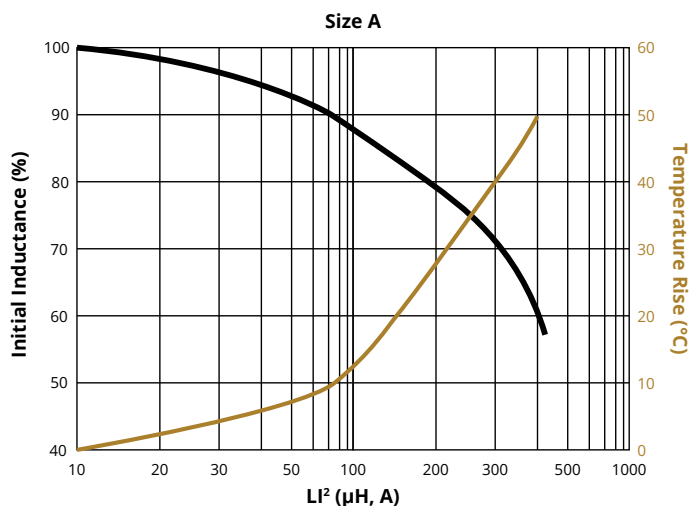
Test	Standard	Description
Vibration	MIL-STD-202	Method 204, Vibration, High Frequency
Shock	MIL-STD-202	Method 213, Shock (Specified Pulse)
Immersion	MIL-STD-202	Method 104, Immersion
Moisture Resistance	MIL-STD-202	Method 106, Moisture Resistance
Flammability	MIL-STD-202	Method 111, Flammability (External Flame)
Thermal Shock	MIL-STD-202	Method 107, Thermal Shock

OPTIONAL SCREENING AND QUALIFICATION

Standard	Screening & Qualification	Test ⁽⁴⁾
MIL-PRF-27	a.) Group A inspection Level-T - Table VII b.) Qualification inspection, Grade 5 - Table V	I. Thermal Shock II. Vibration III. Burn-in IV. Induced Voltage V. Shock VI. Dielectric Withstanding Voltage (at reduced pressure) VII. Insulation Resistance VIII. Electrical Characteristics IX. Visual and Mechanical Examination (External) X. Life XI. Radiographic Inspection
MIL-STD-981	a.) Group A screening tests - Table VI b.) Group B tests - Table XII, Class S	
EEE-INST-002, Section M1	a.) Magnetics Screening Req. - Table 2 b.) Magnetics Part Qual. - Table 3	

Note 4: Screening and qualification tests are not limited to the options in the chart above. Each standard may also be stringent or exclude certain tests from one another. Please contact Pico for specific application needs and for Pico part number.

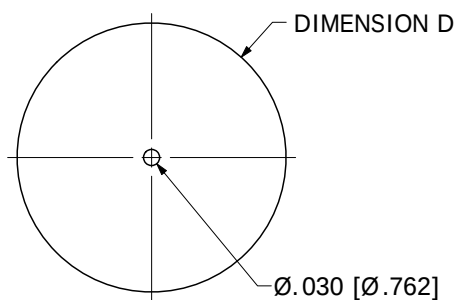
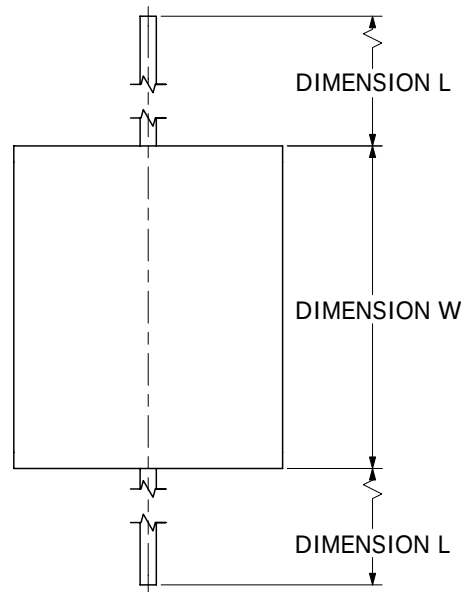
DATA CURVES



ELECTRICAL SCHEMATIC



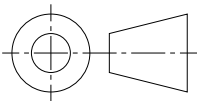
MECHANICAL DRAWINGS



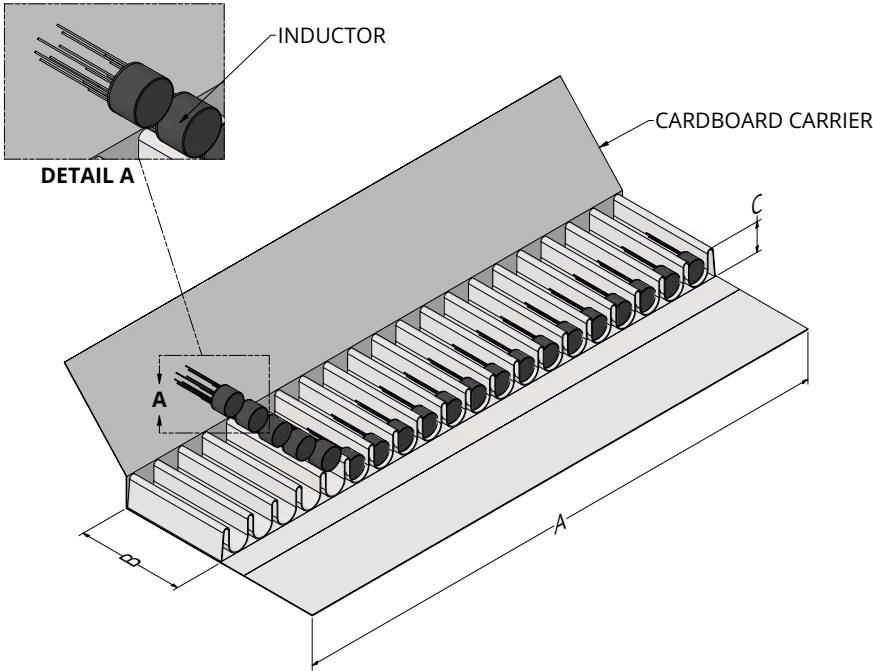
BOTTOM VIEW

Size	Diameter Dimension			Typ. Weight (grams)
	L	W	D	
A	1.25 (31.70)	.45 (11.40)	.35 (8.90)	3
B	1.25 (31.70)	.50 (12.70)	.38 (9.65)	3.5
C	1.25 (31.70)	.60 (15.20)	.50 (12.70)	6.6
D	1.25 (31.70)	.82 (20.80)	.56 (14.20)	10.4

NOTES
a. ALL DIMENSIONS ARE IN INCHES, [] = MM



BOX PACKAGING



Dimension		
A	B	C
12 [304.8]	6.4 [162.56]	0.4 [10.16]

Pico warrants each product manufactured by us and sold by us or an authorized representative, to be free from defects in material and workmanship. If properly used, it will perform within its applicable specifications for a period of one year after original shipment. Pico's obligation under this guarantee is limited to repairing or replacing our product to the original purchaser. This warranty is in lieu of all other warranties, express or implied and constitutes fulfillment of our obligations to the purchaser. We do not guarantee that the products can be used for a particular purpose other than those solely covered by the product's specifications. Pico must be notified if the product must meet particular certifications and/or standards. We assume no liability, in any event, for consequential damages, for anticipated or lost profits, incidental damages or loss of time or other losses incurred by the purchaser or any third party in connection with products covered by this warranty or otherwise. The purchaser will indemnify and hold Pico harmless for any damages, losses, costs, etc. from usage not within the product's specifications. Pico must be consulted before usage of its products in a nuclear, radioactive or space environment.

We reserve the right to discontinue products without notice, We reserve the right to make modifications to any existing catalog products without notice, at any time, without the obligation to modify units previously sold.

69000 Series

25-10000 μ H, 0.25-11.5A, Shielded Power Inductor

PICO
Electronics, Inc.

PRODUCT OVERVIEW

Pico power inductors are built to smoothly transmit direct current across various DC-DC converters and switching regulators. They can provide low core losses and are used to store energy, which the electromotive force can filter out frequency noise and reduce signal loss. Energy storage can also allow higher power consumption in system designs. These power inductors are ideal for filtering out noise and ripple spikes in many applications. Pico has a diverse portfolio of power inductors ranging in mechanical size, mounting options, current rating, and inductance rating.

Typical applications:

- DC-DC Converters
- Switching Regulators
- Radar & Communication Systems
- Step-up or Step-down Transformers
- Aviation Power Systems
- Automotive & EVs
- Medical Equipment

FEATURES

- Extreme resistance to impact, shock, and vibration
- Manufactured to MIL-PRF-27 Grade 5, Class S
- High reliability for space and mission critical applications
- Miniature in size and minimalistic design
- Handle large transient direct currents
- Magnetically shielded

Contact Pico for part number of available options:

- Screening and qualification criteria to flight standard
- Fully RoHS compliant or with exemption 7(a)
- Modifications to mechanical design and electrical characteristics
- Custom new design and parameters



SPECIFICATIONS

SIZE AA

Part Number ⁽¹⁾	Inductance [μH]	10% drop in L [A]	DC Current 20% drop in L [A]	30% drop in L [A]	DC Resistance [Ω]	Self Resonant Frequency [MHz]
69410	25	3.53	4.8	5.94	0.012	4
69420	50	2.5	3.4	4.2	0.024	3
69430	75	2.04	2.78	3.43	0.036	2.4
69440	100	1.77	2.4	2.99	0.048	2
69450	250	1.12	1.52	1.88	0.12	1.3
69460	750	0.65	0.88	1.08	0.36	0.75
69470	1000	0.56	0.76	0.94	0.48	0.65
69480	1500	0.46	0.62	0.77	0.72	0.55
69490	2500	0.35	0.48	0.59	1.2	0.4
69500	5000	0.25	0.34	0.42	2.4	0.3

SIZE A

Part Number ⁽¹⁾	Inductance [μH]	10% drop in L [A]	DC Current 20% drop in L [A]	30% drop in L [A]	DC Resistance [Ω]	Self Resonant Frequency [MHz]
69010	130	3	4.5	5.5	0.06	1.7
69020	210	2.5	3.5	4.5	0.11	1.4
69030	260	2.2	3.2	3.9	0.14	1.25
69040	315	2	2.9	3.5	0.17	1.14
69050	525	1.6	2.2	2.7	0.28	0.9
69060	790	1.2	1.8	2.2	0.42	0.7
69070	1050	1	1.6	1.9	0.56	0.6
69080	1300	0.95	1.4	1.7	0.7	0.4

SIZE B

Part Number ⁽¹⁾	Inductance [μH]	10% drop in L [A]	DC Current 20% drop in L [A]	30% drop in L [A]	DC Resistance [Ω]	Self Resonant Frequency [MHz]
69105	228	3.5	5.2	6.8	0.07	1.1
69115	323	2.7	4	5	0.105	0.9
69125	460	2.5	3.7	4.8	0.15	0.8
69135	787	1.9	2.8	3.7	0.26	0.6
69145	1050	1.6	2.4	3.2	0.34	0.5
69155	1310	1.5	2.2	2.8	0.43	0.45
69165	1600	1.3	2	2.6	0.52	0.4
69175	1840	1.2	1.8	2.4	0.6	0.38
69185	2100	1.1	1.7	2.2	0.7	0.33

SPECIFICATIONS

SIZE C

Part Number ⁽¹⁾	Inductance	DC Current			DC Resistance	Self Resonant Frequency
	[μH]	10% drop in L [A]	20% drop in L [A]	30% drop in L [A]		
69205	165	5	7	9.5	0.04	1.4
69215	191	4.7	7	8.8	0.05	1.3
69225	262	4	5.6	7.5	0.07	1.1
69235	390	3.3	4.6	6.2	0.1	0.9
69245	525	2.8	4	5.3	0.14	0.8
69255	790	2.3	3.2	4.3	0.2	0.6
69265	1050	2	2.8	3.8	0.27	0.55
69275	1310	1.8	2.5	3.4	0.34	0.5
69285	1580	1.6	2.3	3	0.41	0.45
69295	1838	1.5	2.1	2.8	0.48	0.4

SIZE D

Part Number ⁽¹⁾	Inductance	DC Current			DC Resistance	Self Resonant Frequency
	[μH]	10% drop in L [A]	20% drop in L [A]	30% drop in L [A]		
69310	150	6.35	9.23	11.5	0.027	1.4
69320	250	4.9	7.15	9	0.045	1.2
69330	500	3.5	5	6.32	0.09	0.8
69340	750	2.8	4.13	5.16	0.135	0.65
69350	1000	2.5	3.6	4.5	0.18	0.55
69360	2500	1.55	2.26	2.8	0.45	0.35
69370	5000	1.1	1.6	2	0.9	0.25

SIZE E

Part Number ⁽¹⁾	Inductance	DC Current			DC Resistance	Self Resonant Frequency
	[μH]	10% drop in L [A]	20% drop in L [A]	30% drop in L [A]		
69605	1500	2.6	4.5	6	0.13	0.4
69615	2000	2.25	3.9	5.2	0.17	0.35
69625	3000	1.85	3.2	4.25	0.26	0.3
69635	4000	1.6	2.8	3.7	0.35	0.25
69645	5000	1.45	2.5	3.3	0.45	0.2
69655	7500	1.15	2	2.7	0.65	0.18
69665	10,000	1	1.75	2.35	0.85	0.15

Note 1: For RoHS compliance, please consult with Pico's engineer and provide the part number.

Note 2: All Inductors have split windings (except size AA). Ratings shown in table are for series connection. Parallel connection will have 1/4 inductance at twice the DC current and 1/4 the DC resistance.

ie. Parallel connection of PICO # 69010 will have 32.5 μH, 15mΩ DC resistance, 6A DC current at 10% drop in L.

SPECIFICATIONS

GENERAL

Parameter	Condition	Min.	Typ.	Max.	Units
Dielectric Withstanding Voltage	60Hz	-	200	-	V _{RMS}
Insulation Resistance	200VDC	10	-	-	GΩ
Size	See mechanical drawings				
Operating Temperature Range	Ambient with temperature rise	-55	-	+130	°C
Storage Temperature Range	Ambient	-55	-	+130	°C
Weight					grams
Case	Epoxy Insulated Metal				
Potting	Vacuum Impregnated Epoxy				
Box Packaging	Length x Width x Height	11.56 x 8.92 x 1.4 (293.624 x 226.568 x 35.56)			inches (mm)

OPTIONAL DESIGN CRITERIA

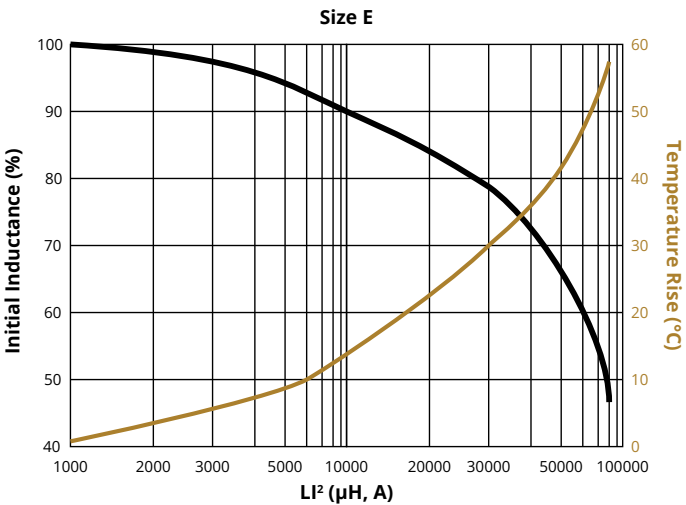
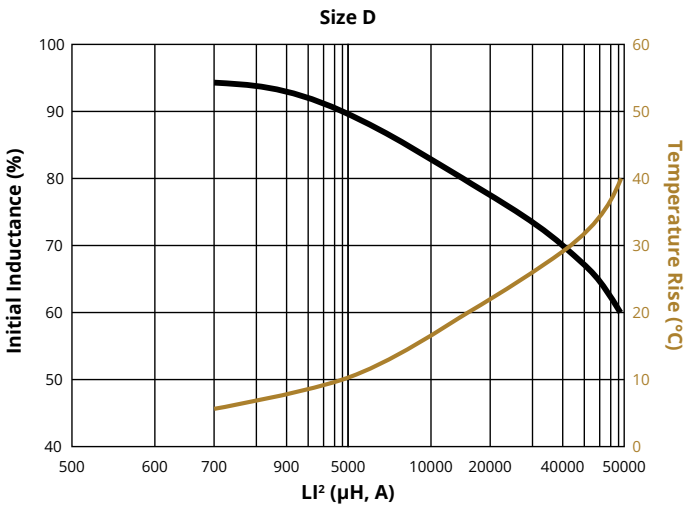
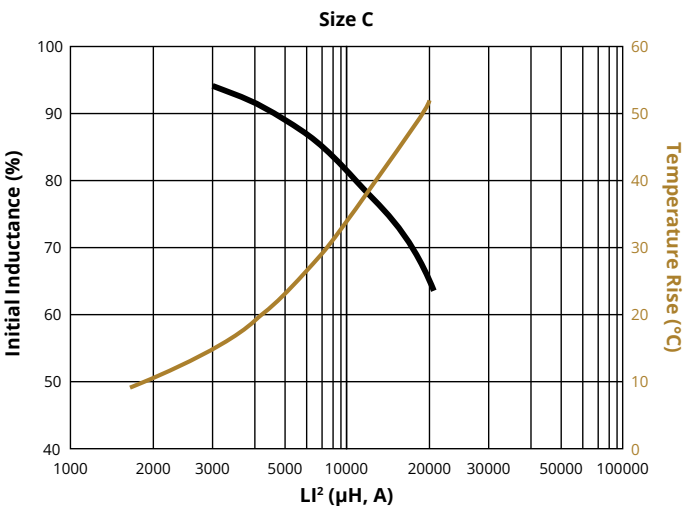
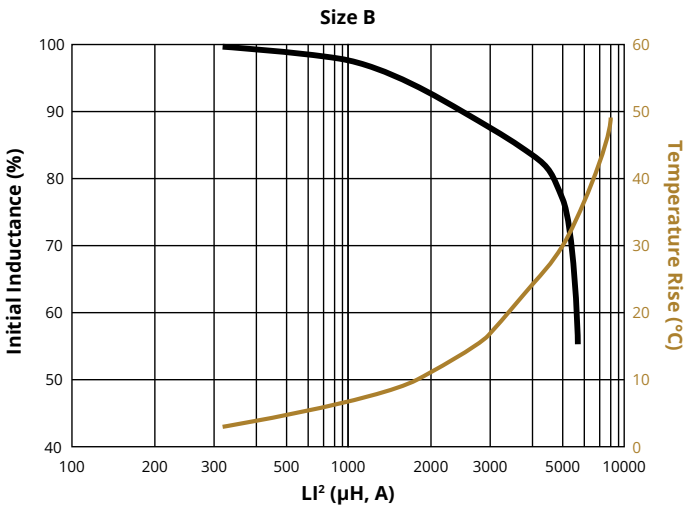
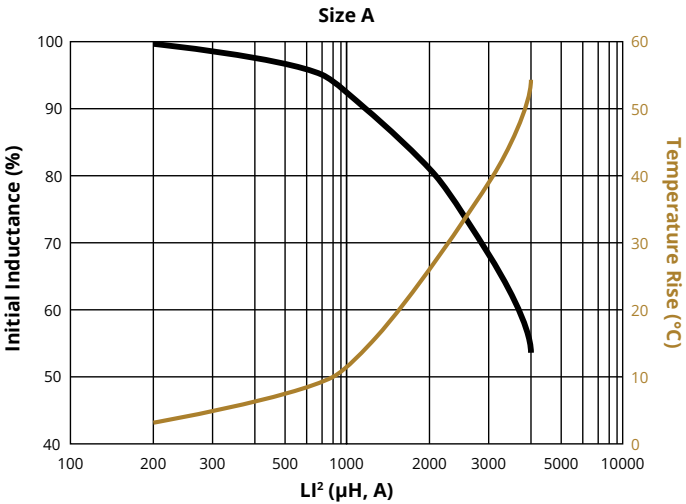
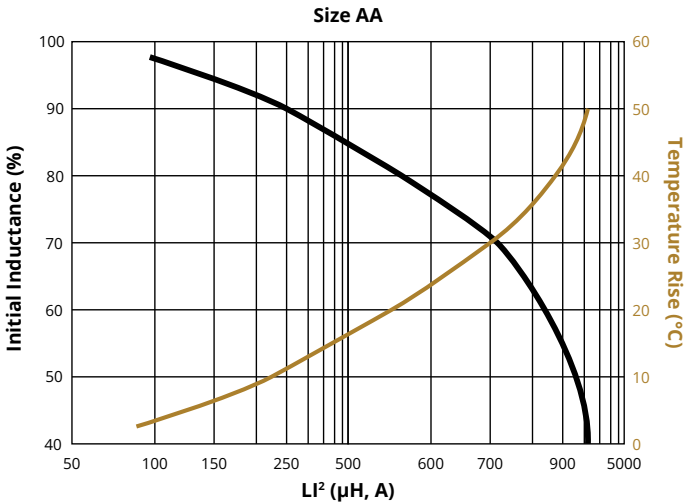
Test	Standard	Description
Vibration	MIL-STD-202	Method 204, Vibration, High Frequency
Shock	MIL-STD-202	Method 213, Shock (Specified Pulse)
Immersion	MIL-STD-202	Method 104, Immersion
Moisture Resistance	MIL-STD-202	Method 106, Moisture Resistance
Flammability	MIL-STD-202	Method 111, Flammability (External Flame)
Thermal Shock	MIL-STD-202	Method 107, Thermal Shock

OPTIONAL SCREENING AND QUALIFICATION

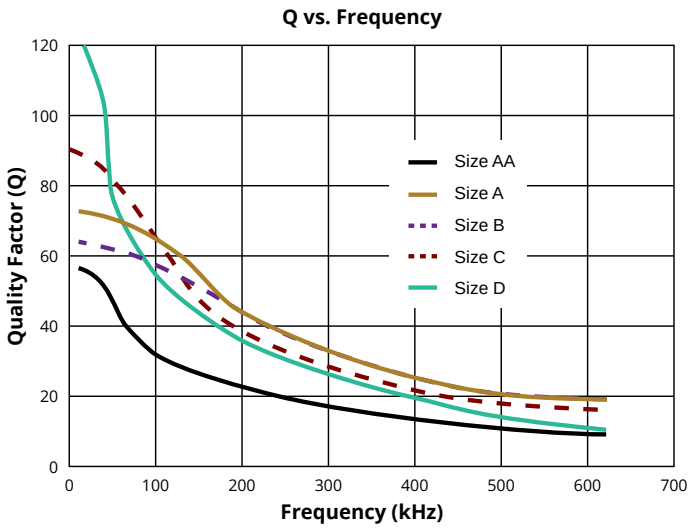
Standard	Screening & Qualification	Test ⁽³⁾
MIL-PRF-27	a.) Group A inspection Level-T - Table VII b.) Qualification inspection, Grade 5 - Table V	I. Thermal Shock II. Vibration III. Burn-in IV. Induced Voltage V. Shock VI. Dielectric Withstanding Voltage (at reduced pressure) VII. Insulation Resistance VIII. Electrical Characteristics IX. Visual and Mechanical Examination (External) X. Life XI. Radiographic Inspection
MIL-STD-981	a.) Group A screening tests - Table VI b.) Group B tests - Table XII, Class S	
EEE-INST-002, Section M1	a.) Magnetics Screening Req. - Table 2 b.) Magnetics Part Qual. - Table 3	

Note 3: Screening and qualification tests are not limited to the options in the chart above. Each standard may also be stringent or exclude certain tests from one another. Please contact Pico for specific application needs and for Pico part number.

DATA CURVES



DATA CURVES



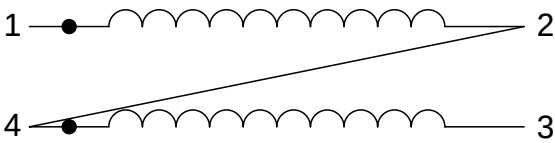
ELECTRICAL SCHEMATIC

SIZE AA

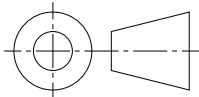
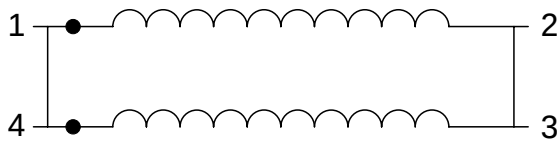


SIZE A, B, C, D & E

SERIES CONNECTION

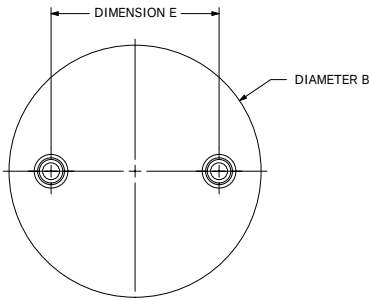
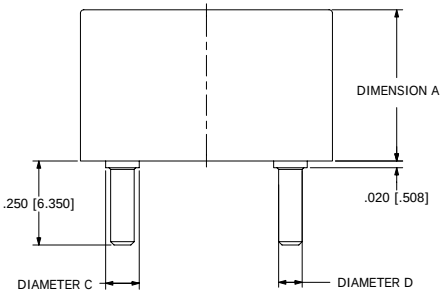


PARALLEL CONNECTION



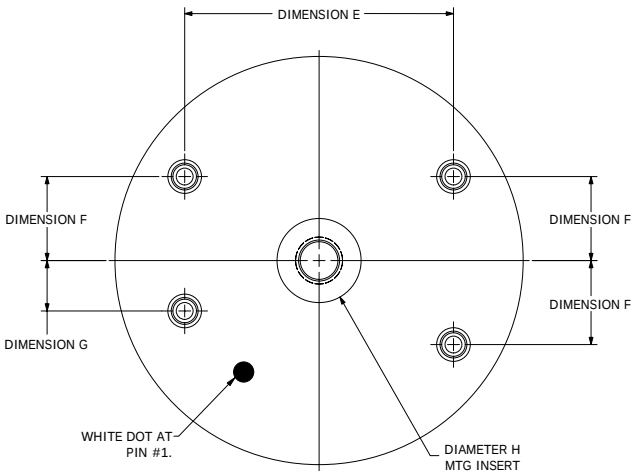
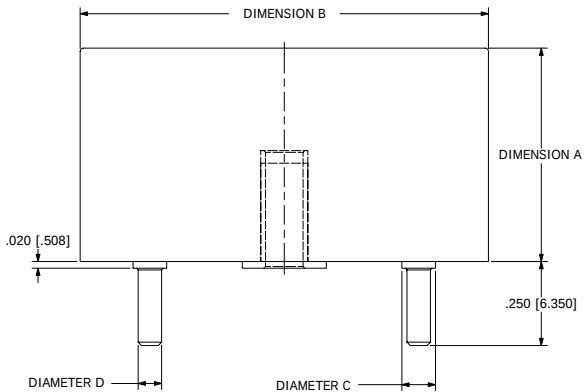
MECHANICAL DRAWINGS

SIZE AA



BOTTOM VIEW

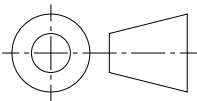
SIZE A TO E



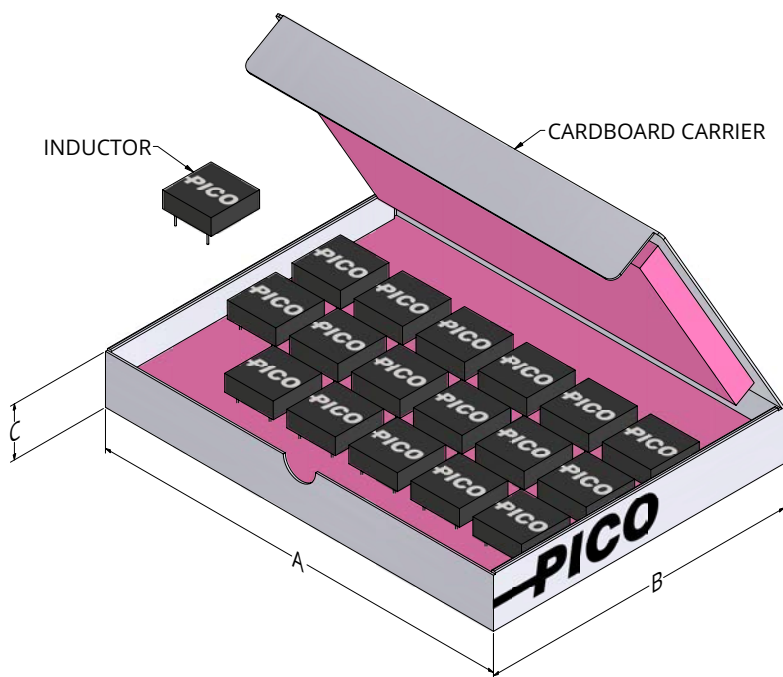
BOTTOM VIEW

Size	Dimension / Diameter								Insert	Typ. Weight (grams)
	A	B	C	D	E	F	G	H		
AA	.450 (11.400)	.750 (19.100)	.100 (2.540)	.070 (1.780)	.500 (12.700)	-	-	-	-	7
A	.560 (14.200)	.960 (24.00)	.100 (2.540)	.070 (1.780)	.600 (15.200)	.200 (5.100)	.100 (2.500)	.250 (6.350)	4 - 40 UNC 5 Threads min.	23
B	.635 (16.100)	1.215 (30.900)	.100 (1.780)	.070 (1.780)	.800 (20.300)	.250 (6.400)	.150 (3.800)	.250 (6.350)	4 - 40 UNC 5 Threads min.	44
C	.720 (18.300)	1.330 (33.800)	.125 (3.200)	.094 (2.400)	.900 (22.900)	.250 (6.400)	.150 (3.800)	.312 (7.920)	6 - 32 UNC 6 Threads min.	60
D	.760 (19.300)	1.500 (38.100)	.125 (3.200)	.094 (2.400)	1.100 (27.900)	.300 (7.600)	.200 (5.100)	.312 (7.920)	6 - 32 UNC 6 Threads min.	80
E	1.100 (27.900)	2.150 (54.600)	.150 (3.800)	.125 (3.200)	1.700 (43.200)	.400 (10.200)	.300 (7.600)	.312 (7.920)	6 - 32 UNC 6 Threads min.	170

NOTES
a. ALL DIMENSIONS ARE IN INCHES, [] = MM
b. TERMINALS ARE CLOCKWISE FROM PIN #1



BOX PACKAGING



Dimension		
A	B	C
11.56	8.92	1.4
[293.624]	[226.568]	[35.56]

Pico warrants each product manufactured by us and sold by us or an authorized representative, to be free from defects in material and workmanship. If properly used, it will perform within its applicable specifications for a period of one year after original shipment. Pico's obligation under this guarantee is limited to repairing or replacing our product to the original purchaser. This warranty is in lieu of all other warranties, express or implied and constitutes fulfillment of our obligations to the purchaser. We do not guarantee that the products can be used for a particular purpose other than those solely covered by the product's specifications. Pico must be notified if the product must meet particular certifications and/or standards. We assume no liability, in any event, for consequential damages, for anticipated or lost profits, incidental damages or loss of time or other losses incurred by the purchaser or any third party in connection with products covered by this warranty or otherwise. The purchaser will indemnify and hold Pico harmless for any damages, losses, costs, etc. from usage not within the product's specifications. Pico must be consulted before usage of its products in a nuclear, radioactive or space environment.

We reserve the right to discontinue products without notice, We reserve the right to make modifications to any existing catalog products without notice, at any time, without the obligation to modify units previously sold.

73000 Series

0.05-5mH, Up to 28.4A, High DC & Low Profile Power Inductors

PICO
Electronics, Inc.

PRODUCT OVERVIEW

Pico power inductors are built to smoothly transmit direct current across various DC-DC converters and switching regulators. They can provide low core losses and are used to store energy, which the electromotive force can filter out frequency noise and reduce signal loss. Energy storage can also allow higher power consumption in system designs. These power inductors are ideal for filtering out noise and ripple spikes in many applications. Pico has a diverse portfolio of power inductors ranging in mechanical size, mounting options, current rating, and inductance rating.

Typical applications:

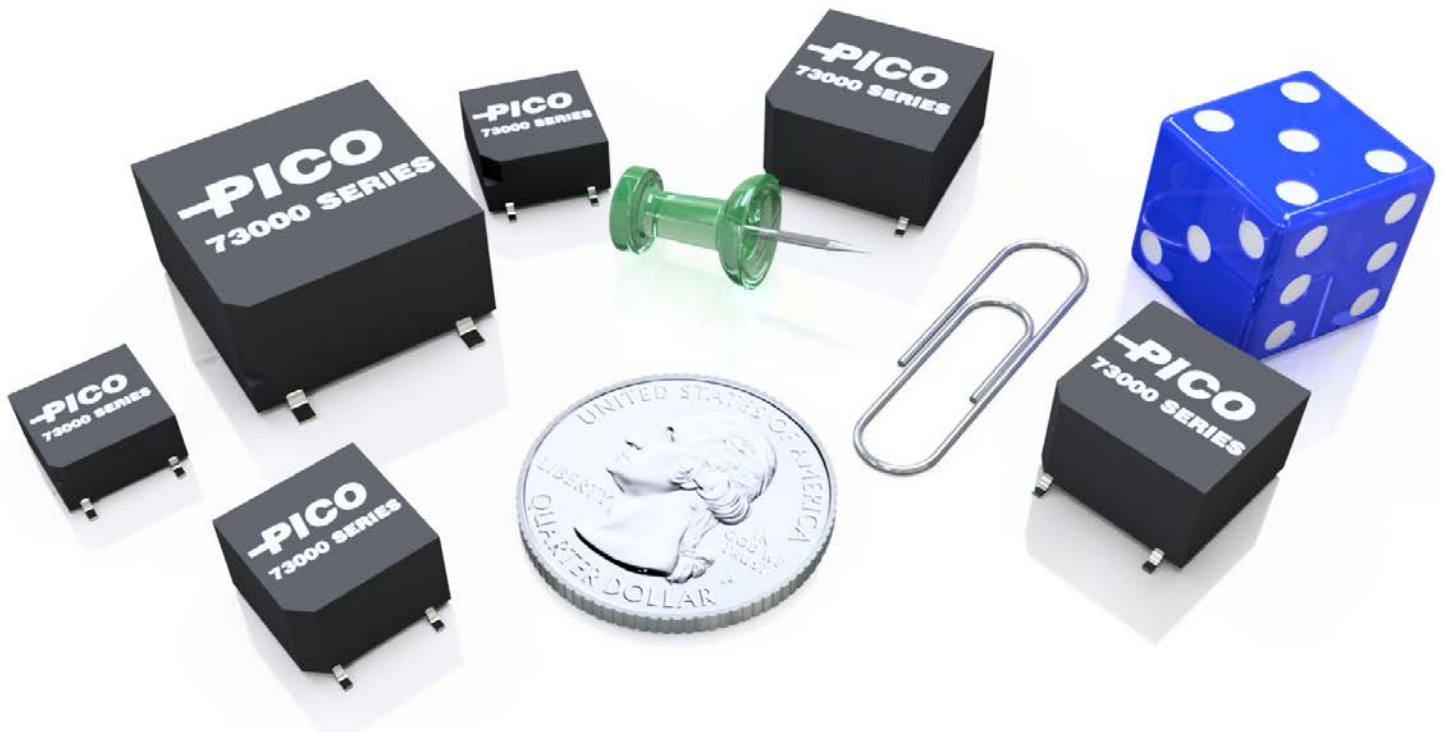
- DC-DC Converters
- Switching Regulators
- Radar & Communication Systems
- Step-up or Step-down Transformers
- Aviation Power Systems
- Automotive & EVs
- Medical Equipment

FEATURES

- Extreme resistance to impact, shock, and vibration
- Manufactured to MIL-PRF-27 Grade 5, Class S
- High reliability for space and mission critical applications
- Miniature in size and minimalistic design
- Handle large transient direct currents

Contact Pico for part number of available options:

- Screening and qualification criteria to flight standard
- Fully RoHS compliant or with exemption 7(a)
- Modifications to mechanical design and electrical characteristics
- Custom new design and parameters



SPECIFICATIONS

SIZE 00

Part Number	Inductance	DC Current			DC Resistance	Self Resonant Frequency
	[μH]	10% drop in L [A]	20% drop in L [A]	30% drop in L [A]		
73905	2	3.84	5.56	7	0.005	24.7
73910	3.5	2.9	4.2	5.3	0.009	18.7
73915	5	2.43	3.5	4.43	0.013	15.7
73920	8	1.92	2.78	3.5	0.021	12.4
73925	10	1.72	2.49	3.13	0.026	11.1
73930	15	1.4	2.03	2.56	0.039	9.04
73935	20	1.22	1.76	2.21	0.051	7.83
73940	25	1.09	1.57	1.98	0.064	7
73945	30	0.99	1.44	1.81	0.077	6.4
73950	35	0.92	1.33	1.67	0.09	5.92
73955	40	0.86	1.24	1.57	0.103	5.53
73960	45	0.81	1.17	1.48	0.116	5.22
73965	50	0.77	1.11	1.4	0.129	4.95

SIZE 0

Part Number	Inductance	DC Current			DC Resistance	Self Resonant Frequency
	[μH]	10% drop in L [A]	20% drop in L [A]	30% drop in L [A]		
73796	5	3.35	4.47	5.59	0.012	10
73797	10	2.37	3.16	3.95	0.024	7.07
73798	15	1.93	2.58	3.23	0.036	5.77
73799	20	1.68	2.24	2.8	0.048	5
73800	25	1.5	2	2.5	0.06	4.5
73805	50	1.06	1.4	1.7	0.12	3.3
73810	75	0.85	1.1	1.4	0.18	2.7
73815	100	0.75	1	1.2	0.24	2.3
73820	150	0.61	0.81	0.97	0.36	2
73825	200	0.53	0.7	0.84	0.48	1.7
73830	250	0.47	0.6	0.79	0.6	1.5
73832	500	0.33	0.42	0.55	1.2	1
73835	750	0.27	0.36	0.45	1.8	0.8
73840	1000	0.23	0.31	0.39	2.4	0.7
73845	1500	0.19	0.25	0.32	3.6	0.6
73850	2000	0.16	0.22	0.26	4.8	0.55
73855	2500	0.15	0.2	0.25	6	0.5
73860	5000	0.1	0.14	0.17	12	0.3

SPECIFICATIONS

SIZE 1

Part Number ⁽¹⁾	Inductance	DC Current			DC Resistance	Self Resonant Frequency
	[μH]	10% drop in L [A]	20% drop in L [A]	30% drop in L [A]		
73001	5	4.25	5.8	7.38	0.006	10
73002	10	3	4.1	5.22	0.013	7.07
73003	15	2.45	3.35	4.26	0.019	5.77
73004	20	2.13	2.9	3.69	0.026	5
73005	25	1.9	2.6	3.3	0.032	4.5
73010	50	1.34	1.84	2.33	0.064	3.3
73015	75	1.1	1.5	1.91	0.098	2.7
73020	100	0.95	1.3	1.65	0.128	2.25
73022	150	0.77	1	1.3	0.192	1.9
73023	200	0.67	0.91	1.1	0.256	1.3
73025	250	0.6	0.82	1.04	0.32	1.5
73027	500	0.42	0.57	0.73	0.64	1
73030	750	0.35	0.47	0.6	0.96	0.85
73035	1000	0.3	0.41	0.52	1.28	0.73
73040	1500	0.25	0.34	0.43	1.92	0.6
73042	2000	0.21	0.29	0.36	2.56	0.52
73045	2500	0.19	0.26	0.33	3.2	0.45
73050	5000	0.13	0.18	0.23	6.4	0.33

SIZE 2

Part Number ⁽¹⁾	Inductance	DC Current			DC Resistance	Self Resonant Frequency
	[μH]	10% drop in L [A]	20% drop in L [A]	30% drop in L [A]		
73111	5	5.6	8.27	10.5	0.004	10
73112	10	3.96	5.86	7.42	0.008	7.07
73113	15	3.23	4.77	6.06	0.012	5.77
73114	20	2.8	4.14	5.25	0.016	5
73115	25	2.5	3.7	4.7	0.02	4.5
73120	50	1.77	2.61	3.3	0.04	3.3
73125	75	1.44	2.14	2.71	0.06	2.7
73130	100	1.25	1.85	2.35	0.08	2.25
73132	150	1	1.5	1.9	0.12	1.9
73133	200	0.88	1.3	1.6	0.16	1.3
73135	250	0.79	1.17	1.49	0.2	1.5
73137	500	0.55	0.82	1	0.4	1
73140	750	0.46	0.68	0.86	0.6	0.85
73145	1000	0.4	0.59	0.74	0.8	0.73
73150	1500	0.32	0.48	0.61	1.2	0.6
73152	2000	0.28	0.41	0.5	1.6	0.52
73155	2500	0.25	0.37	0.47	2	0.45
73160	5000	0.18	0.26	0.33	4	0.33

SPECIFICATIONS

SIZE 3

Part Number ⁽¹⁾	Inductance	DC Current			DC Resistance	Self Resonant Frequency
	[μH]	10% drop in L [A]	20% drop in L [A]	30% drop in L [A]		
73201	5	6.7	9.84	12.5	0.003	8.9
73202	10	4.74	6.96	8.84	0.006	6.29
73203	15	3.87	5.68	7.22	0.009	5.14
73204	20	3.35	4.92	6.25	0.012	4.45
73205	25	3	4.4	5.6	0.015	4
73210	50	2.12	3.11	4	0.03	3
73215	75	1.73	2.54	3.23	0.05	2.4
73220	100	1.5	2.2	2.8	0.06	2
73222	150	1.2	1.7	2.2	0.09	1.5
73223	200	1	1.5	1.9	0.12	1
73225	250	0.95	1.39	1.77	0.15	1.3
73227	500	0.67	0.98	1.25	0.3	1
73230	750	0.55	0.8	1.02	0.45	0.75
73235	1000	0.47	0.7	0.89	0.6	0.65
73240	1500	0.39	0.57	0.72	0.9	0.55
73242	2000	0.33	0.49	0.62	1.2	0.46
73245	2500	0.3	0.44	0.56	1.5	0.4
73250	5000	0.21	0.31	0.4	3	0.3

SIZE 4

Part Number ⁽¹⁾	Inductance	DC Current			DC Resistance	Self Resonant Frequency
	[μH]	10% drop in L [A]	20% drop in L [A]	30% drop in L [A]		
73301	5	14	22	28.4	0.006	8.9
73302	10	9.9	15.56	20	0.005	6.29
73303	15	8.1	12.7	16.4	0.016	5.14
73304	20	7	11	14.2	0.011	4.45
73305	25	6.3	9.8	12.7	0.015	4
73310	50	4.5	7	9	0.046	3
73315	75	3.6	5.7	7.3	0.04	2.4
73320	100	3.1	4.9	6.3	0.055	2
73325	150	2.5	4	5.1	0.082	1.7
73330	200	2.2	3.4	4.5	0.114	1.5
73335	250	2	3.1	4	0.16	1.3
73337	500	1.4	2.2	2.8	0.29	1
73340	750	1.15	1.79	2.3	0.43	0.75
73345	1000	1	1.55	2	0.48	0.65
73350	1500	0.81	1.27	1.64	0.67	0.55
73355	2000	0.7	1.1	1.42	0.94	0.47
73360	2500	0.63	0.98	1.27	1.2	0.4
73365	5000	0.45	0.69	0.9	2.93	0.3

Note 1: Parts are available with Pb-free dipped terminals that is compliant to RoHS exemption 7 by requesting part number + '-RoHS-7'

SPECIFICATIONS

GENERAL

Parameter	Condition	Min.	Typ.	Max.	Units
Dielectric Withstanding Voltage	60Hz	-	200	-	V _{RMS}
Insulation Resistance	200VDC	10	-	-	GΩ
Operating Temperature Range	Ambient with temperature rise	-55	-	+130	°C
Storage Temperature Range	Ambient	-55	-	+130	°C
Size	See mechanical drawings				
Weight	See mechanical drawings				
Case	Glass Reinforced Polymer				
Potting	Vacuum Impregnated Epoxy				
Tube Packaging (W x H x L)	739XX - Size 00	0.77 x 0.49 x 20.0 (19.66 x 12.446 x 508)			inches (mm)
	737XX & 738XX - Size 0	0.83 x 0.46 x 20.0 (21.184 x 11.684 x 508)			
	730XX - Size 1	0.83 x 0.46 x 20.0 (21.184 x 11.684 x 508)			
	731XX - Size 2	0.93 x 0.52 x 20.0 (23.724 x 13.081 x 508)			
	732XX - Size 3	1.03 x 0.52 x 20.0 (26.264 x 13.081 x 508)			
	733XX - Size 4	1.24 x 0.61 x 20.0 (31.496 x 15.494 x 508)			
Tape & Reel Packaging	Upon request				
Moisture Sensitivity Level	Level 3				

OPTIONAL DESIGN CRITERIA

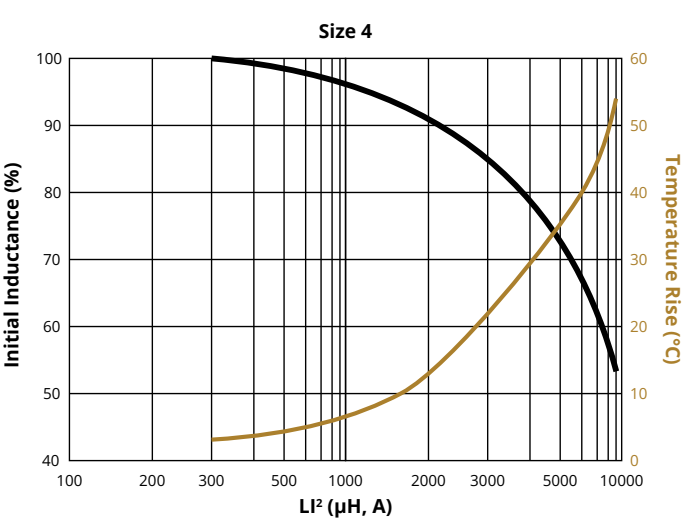
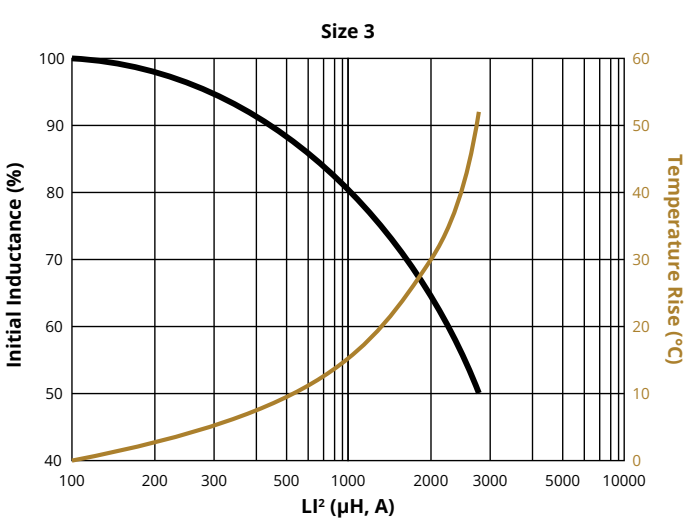
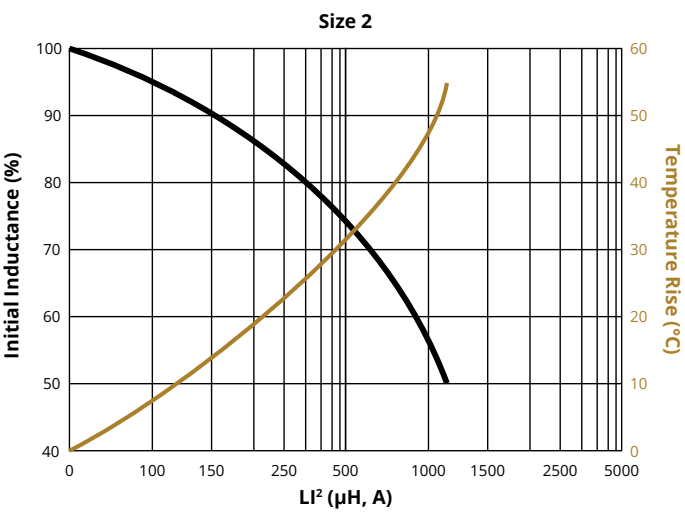
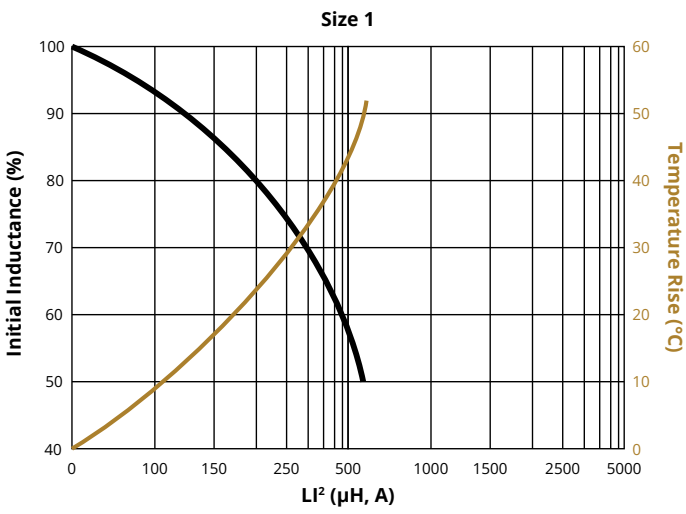
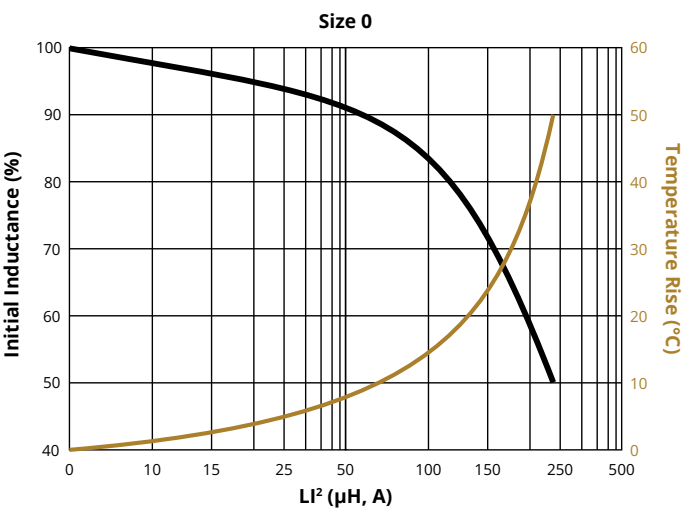
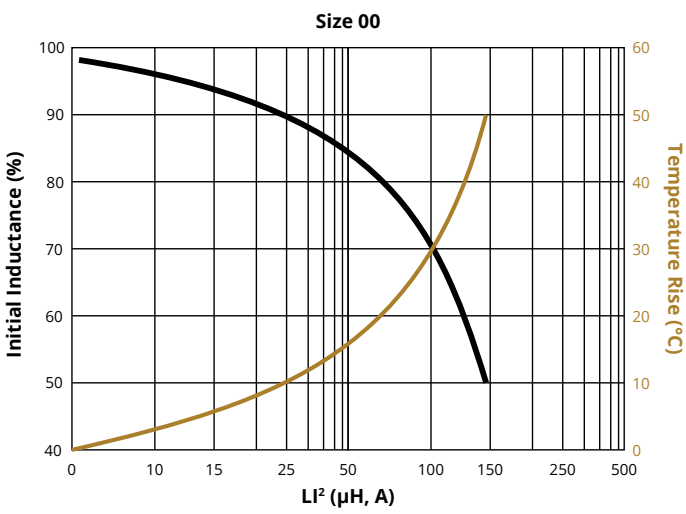
Test	Standard	Description
Vibration	MIL-STD-202	Method 204, Vibration, High Frequency
Shock	MIL-STD-202	Method 213, Shock (Specified Pulse)
Immersion	MIL-STD-202	Method 104, Immersion
Moisture Resistance	MIL-STD-202	Method 106, Moisture Resistance
Flammability	MIL-STD-202	Method 111, Flammability (External Flame)
Thermal Shock	MIL-STD-202	Method 107, Thermal Shock

OPTIONAL SCREENING AND QUALIFICATION

Standard	Screening & Qualification	Test ⁽²⁾
MIL-PRF-27	a.) Group A inspection Level-T - Table VII b.) Qualification inspection, Grade 5 - Table V	I. Thermal Shock II. Vibration III. Burn-in IV. Induced Voltage V. Shock VI. Dielectric Withstanding Voltage (at reduced pressure) VII. Insulation Resistance VIII. Electrical Characteristics IX. Visual and Mechanical Examination (External) X. Life XI. Radiographic Inspection
MIL-STD-981	a.) Group A screening tests - Table VI b.) Group B tests - Table XII, Class S	
EEE-INST-002, Section M1	a.) Magnetics Screening Req. - Table 2 b.) Magnetics Part Qual. - Table 3	

Note 2: Screening and qualification tests are not limited to the options in the chart above. Each standard may also be stringent or exclude certain tests from one another. Please contact Pico for specific application needs and for Pico part number.

DATA CURVES

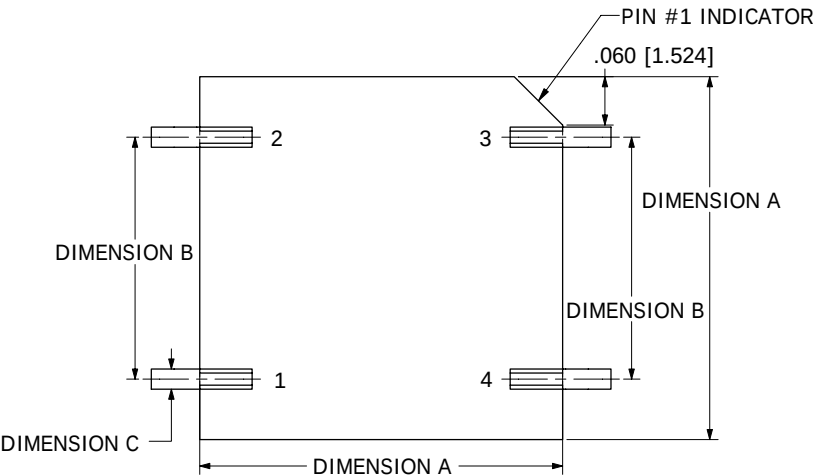
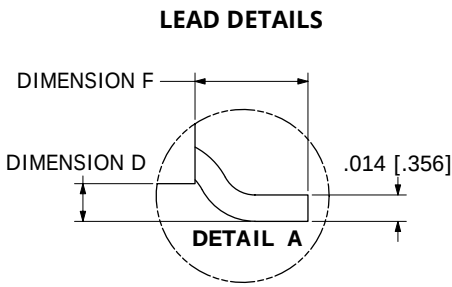
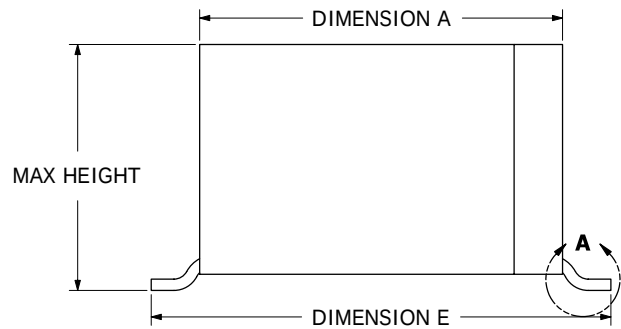


ELECTRICAL SCHEMATIC



NOTES
a. TERMINALS 3 & 4 HAVE NO CONNECTION. MECHANICAL STABILITY ONLY.

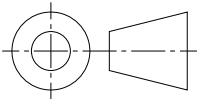
MECHANICAL DRAWINGS



BOTTOM VIEW

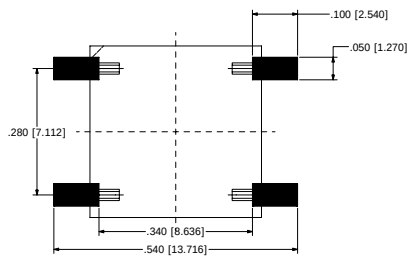
Size	Max Height	Dimension						Typ. Weight (grams)
		A	B	C	D	E	F	
00	.220 (5.080)	.380 (9.650)	.280 (7.110)	.025 (.640)	.015 (.380)	.500 (12.700)	.060 (1.520)	1.1
0	.235 (5.969)	.450 (11.430)	.300 (7.620)	.025 (.640)	.020 (.510)	.570 (14.480)	.060 (1.520)	1.6
1	.305 (7.750)	.450 (11.430)	.300 (7.620)	.025 (.640)	.020 (.510)	.570 (14.480)	.060 (1.520)	2.5
2	.360 (9.140)	.550 (14.000)	.400 (10.160)	.025 (.640)	.025 (.640)	.670 (17.020)	.060 (1.520)	4.5
3	.360 (9.140)	.650 (16.510)	.500 (12.700)	.030 (.760)	.025 (.640)	.770 (19.560)	.060 (1.520)	6.9
4	.455 (11.560)	.850 (21.590)	.600 (15.240)	.055 (1.400)	.025 (.640)	1.05 0(26.670)	.100 (2.540)	15.5

NOTES
a. ALL DIMENSIONS ARE IN INCHES, [] = MM
b. TERMINALS ARE CLOCKWISE FROM PIN #1
c. PIN #3 & #4 HAVE NO CONNECTION

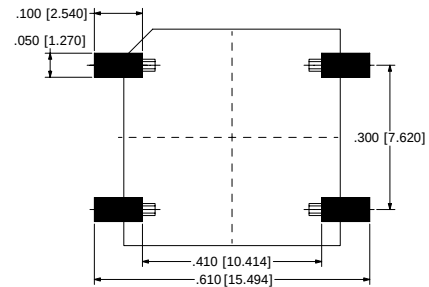


RECOMMENDED LAND PATTERN DIMENSIONS

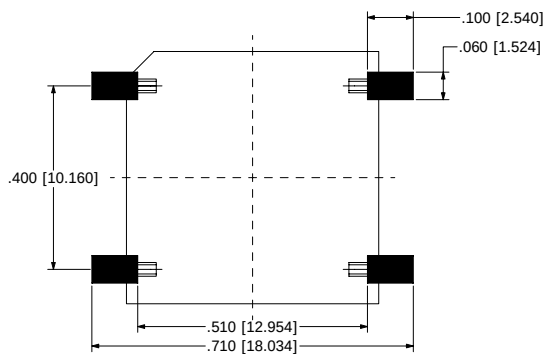
SIZE 00



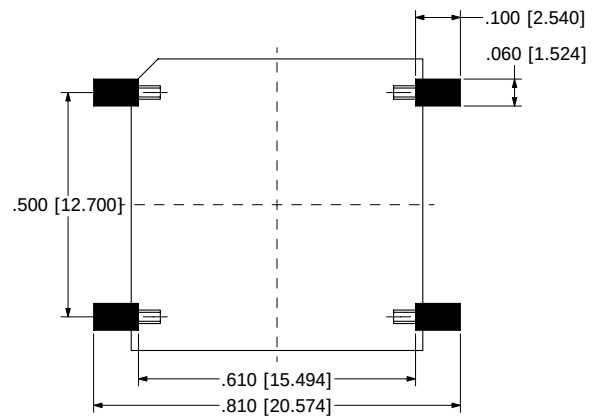
SIZE 0 & SIZE 1



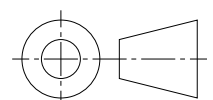
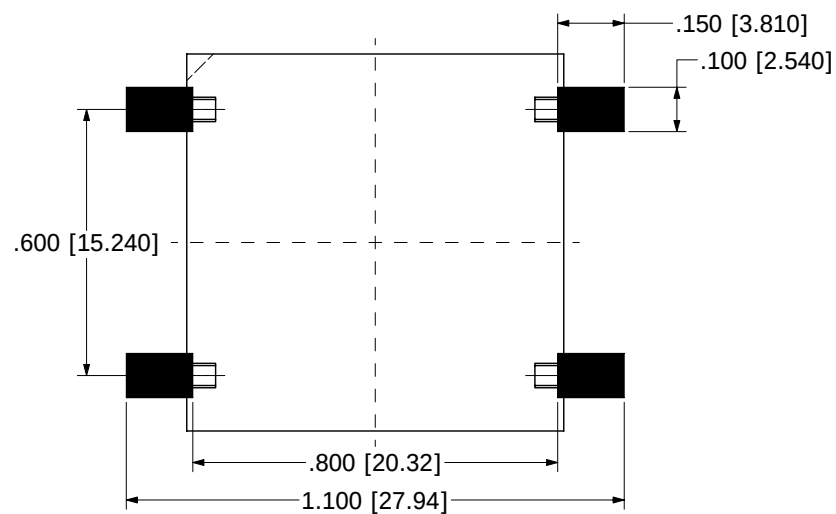
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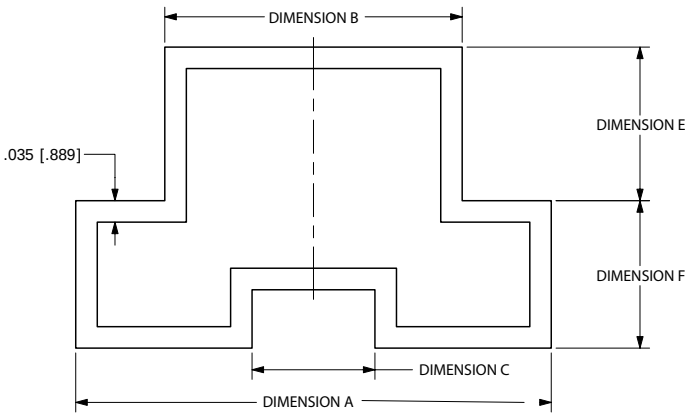
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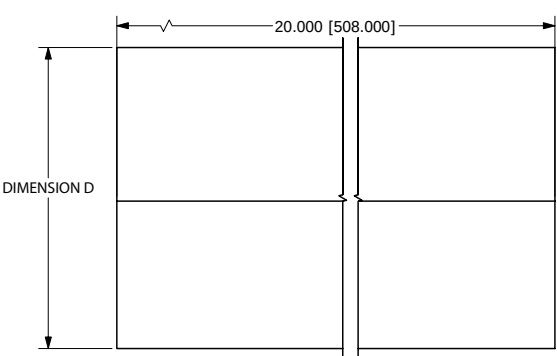
SIZE 4



TUBE PACKAGING



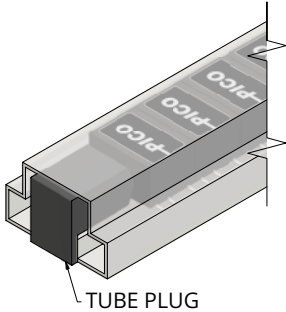
PLAN VIEW



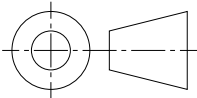
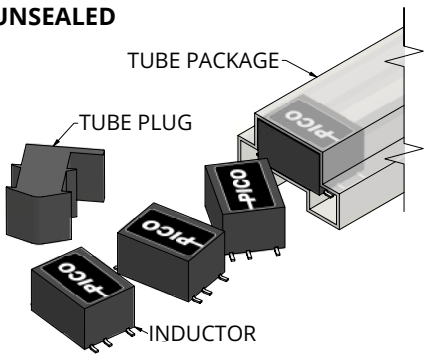
ELEVATION VIEW

Size	Dimension					
	A	B	C	D	E	F
00	.774 [19.660]	.484 [12.294]	.200 [5.080]	.490 [12.446]	.250 [6.350]	.240 [6.096]
0 & 1	.834 [21.184]	.544 [13.818]	.160 [4.064]	.460 [11.684]	.220 [5.588]	.240 [6.096]
2	.934 [23.724]	.644 [16.358]	.240 [6.096]	.515 [13.081]	.275 [6.985]	.240 [6.096]
3	1.034 [26.264]	.744 [18.898]	.340 [8.636]	.595 [15.113]	.355 [9.017]	.240 [6.096]
4	1.240 [31.496]	.950 [24.130]	.480 [12.192]	.610 [15.494]	.390 [9.906]	.220 [5.588]

SEALED



UNSEALED



Pico warrants each product manufactured by us and sold by us or an authorized representative, to be free from defects in material and workmanship. If properly used, it will perform within its applicable specifications for a period of one year after original shipment. Pico's obligation under this guarantee is limited to repairing or replacing our product to the original purchaser. This warranty is in lieu of all other warranties, express or implied and constitutes fulfillment of our obligations to the purchaser. We do not guarantee that the products can be used for a particular purpose other than those solely covered by the product's specifications. Pico must be notified if the product must meet particular certifications and/or standards. We assume no liability, in any event, for consequential damages, for anticipated or lost profits, incidental damages or loss of time or other losses incurred by the purchaser or any third party in connection with products covered by this warranty or otherwise. The purchaser will indemnify and hold Pico harmless for any damages, losses, costs, etc. from usage not within the product's specifications. Pico must be consulted before usage of its products in a nuclear, radioactive or space environment.

We reserve the right to discontinue products without notice, We reserve the right to make modifications to any existing catalog products without notice, at any time, without the obligation to modify units previously sold.

Qualified Products List Military Specification



Pico products are listed on the [Qualified Products List \(QPL\)](#) and have met all applicable standards and qualification requirements established by the certifying organization. As a QPL approved manufacturer, we have undergone [rigorous testing](#), inspections, and audits to ensure our products adhere to specified requirements for quality, reliability, and performance. Our QPL status provides assurance that our products have demonstrated the necessary characteristics demanded by diverse applications and can be used without further documentation or testing. Pico caters to industries such as telecommunications, defense, and aerospace.

M21038/27 >

Data Bus Transformers

M27/76 >

Audio Transformers

M27/103 >

Audio Transformers

M27/103 >

Audio Transformers

M27/286 >

Axial Power Inductors

M27/287 >

Power Inductors

M27/288 >

Power Inductors

M27/289 >

Power Inductors

M27/356 >

Power Inductors

M27/357 >

Audio Transformers

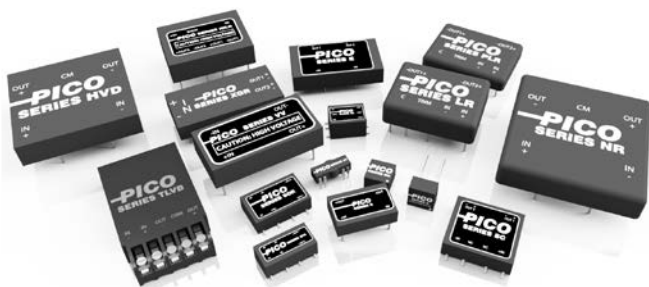
M27/358 >

Audio Transformers

M27/359 >

Audio Transformers

DC-DC Converters



Low Profile DC-DC Converters >

- 0.200" to 0.500" heights
- Output voltages 3.3V to 10kV
- 0.625W to 30W power
- Input/output isolation
- Regulated, programmable & adjustable outputs
- Surface mount, through hole or terminal strip packages



High Power DC-DC Converters >

- Output power up to 300W
- input voltage up to 1200V
- Up to 350V output models
- Industry standard brick sizes
- Conduction cooling with compatible heat sinks and thermal interfaces



Extended Temperature Industrial / Military DC-DC Converters >

- Temperature ranges as wide as -55°C to +95°C
- MIL screened/qualified components models
- For industrial or military applications



High Voltage DC-DC Converters >

- Output voltages up to 10,000V
- Power levels up to 300W
- Programmable & adjustable outputs
- Surface mount, through hole or terminal strip packages.

Series AT · SAT · DT · SDT

0.75W Isolated Proportional Low Profile DC-DC Converter

PICO
Electronics, Inc.

PRODUCT OVERVIEW

The AT/SAT and DT/SDT series are unregulated DC-DC converters in an ultra-miniature low profile encapsulated package – 0.200" height. Single and dual output models and through hole and surface mount packages are standard. Traditional IC through hole or surface mount leads are available for more compatibility. They can operate up to 0.75W over the temperature range of -25°C to +70°C without derating, a heat sink or active cooling.



FEATURES

- Up to 0.75W output at +70°C ambient
- Encapsulated semiconductors, conservatively rated for maximum reliability
- Ultra-miniature size – down to 0.200" height
- 3 to 12V input models
- 3.3 to 15V output models
- Input/output isolation
- Single and dual output
- No external components required
- No heat sink or derating required

Contact Pico for part number of available options:

- Expanded operating temp: -55°C to +85°C
- Select screening per MIL-STD-883:
 - Stabilization Bake
 - Temperature Cycle
 - Burn-In
- Available RoHS Compliant module
- Special Input Voltage, Output Voltage, Isolation Voltage or Output Power

12

NOM. INPUT VOLTAGE

3 = 3V
5 = 5V
9 = 9V
12 = 12V

AT

MOUNTING TYPE

AT = THROUGH HOLE
SAT = SURFACE MOUNT
DT = IC THROUGH HOLE
SDT = IC SURFACE MOUNT

5

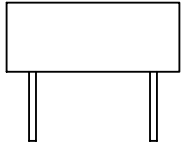
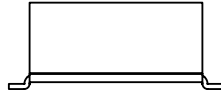
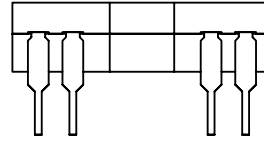
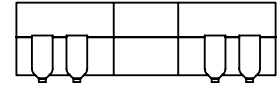
NOM. OUTPUT VOLTAGE

3.3 = 3.3V
5 = 5V
5.2 = 5.2V
9 = 9V
12 = 12V
15 = 15V

S

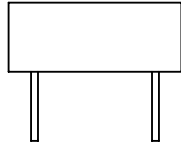
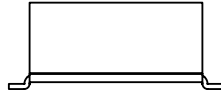
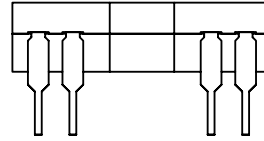
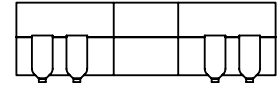
NUMBER OF OUTPUTS

S = SINGLE
D = DUAL

MODEL LIST**SERIES AT
(THROUGH HOLE)****SERIES SAT
(SURFACE MOUNT)****SERIES DT
(IC THROUGH HOLE)****SERIES SDT
(IC SURFACE MOUNT)****SINGLE OUTPUT**

Through Hole	Surface Mount	IC Through Hole	IC Surface Mount	Output Voltage [VDC]	Output Current		Output Power [W]	Efficiency ⁽¹⁾ [%] typ.	Input Current		Output Voltage Tolerance ⁽¹⁾ [±VDC]
					Min. [mA]	Max. [mA]			No Load [mA] typ.	Full Load [mA] typ.	
3AT3.3S	3SAT3.3S	3DT3.3S	3SDT3.3S	3.3	0	197	0.65	61	35	355	0.2
3AT5S	3SAT5S	3DT5S	3SDT5S	5		130	0.65	66		328	0.25
3AT5.2S	3SAT5.2S	3DT5.2S	3SDT5.2S	5.2		125	0.65	66		328	0.25
3AT9S	3SAT9S	3DT9S	3SDT9S	9		83	0.75	70		357	0.3
3AT12S	3SAT12S	3DT12S	3SDT12S	12		63	0.75	72		347	0.4
3AT15S	3SAT15S	3DT15S	3SDT15S	15		50	0.75	73		342	0.4
5AT3.3S	5SAT3.3S	5DT3.3S	5SDT3.3S	3.3		227	0.75	64	25	234	0.2
5AT5S	5SAT5S	5DT5S	5SDT5S	5		150	0.75	69		217	0.25
5AT5.2S	5SAT5.2S	5DT5.2S	5SDT5.2S	5.2		144	0.75	69		217	0.25
5AT9S	5SAT9S	5DT9S	5SDT9S	9		83	0.75	72		208	0.3
5AT12S	5SAT12S	5DT12S	5SDT12S	12		63	0.75	75		200	0.4
5AT15S	5SAT15S	5DT15S	5SDT15S	15		50	0.75	76		197	0.4
9AT3.3S	9SAT3.3S	9DT3.3S	9SDT3.3S	3.3		227	0.75	65	15	128	0.2
9AT5S	9SAT5S	9DT5S	9SDT5S	5		150	0.75	70		119	0.25
9AT5.2S	9SAT5.2S	9DT5.2S	9SDT5.2	5.2		144	0.75	70		119	0.25
9AT9S	9SAT9S	9DT9S	9SDT9S	9		83	0.75	72		116	0.3
9AT12S	9SAT12S	9DT12S	9SDT12S	12		63	0.75	78		107	0.4
9AT15S	9SAT15S	9DT15S	9SDT15S	15		50	0.75	80		104	0.4
12AT3.3S	12SAT3.3S	12DT3.3S	12SDT3.3S	3.3		227	0.75	66	8	95	0.2
12AT5S	12SAT5S	12DT5S	12SDT5S	5		150	0.75	71		88	0.25
12AT5.2S	12SAT5.2S	12DT5.2S	12SDT5.2	5.2		144	0.75	71		88	0.25
12AT9S	12SAT9S	12DT9S	12SDT9S	9		83	0.75	73		86	0.3
12AT12S	12SAT12S	12DT12S	12SDT12S	12		63	0.75	78		80	0.4
12AT15S	12SAT15S	12DT15S	12SDT15S	15		50	0.75	80		78	0.4

Note 1: Tested at nominal input voltage and full output load.

MODEL LIST
**SERIES AT
(THROUGH HOLE)**

**SERIES SAT
(SURFACE MOUNT)**

**SERIES DT
(IC THROUGH HOLE)**

**SERIES SDT
(IC SURFACE MOUNT)**

DUAL OUTPUT

Through Hole	Surface Mount	IC Through Hole	IC Surface Mount	Output Voltage [±VDC]	Output Current		Output Power [±W]	Efficiency ⁽¹⁾ [%] typ.	Input Current		Output Voltage Tolerance ⁽¹⁾ [±VDC]
					Min. [±mA]	Max. [±mA]			No Load [mA] typ.	Full Load [mA] typ.	
3AT5D	3SAT5D	3DT5D	3SDT5D	5	0	65	0.325	66	35	328	0.25
3AT9D	3SAT9D	3DT9D	3SDT9D	9		41	0.375	70		357	0.30
3AT12D	3SAT12D	3DT12D	3SDT12D	12		31	0.375	72		347	0.40
3AT15D	3SAT15D	3DT15D	3SDT15D	15		25	0.375	73		342	0.40
5AT5D	5SAT5D	5DT5D	5SDT5D	5		75	0.375	69	25	217	0.25
5AT9D	5SAT9D	5DT9D	5SDT9D	9		41	0.375	72		208	0.30
5AT12D	5SAT12D	5DT12D	5SDT12D	12		31	0.375	75		200	0.40
5AT15D	5SAT15D	5DT15D	5SDT15D	15		25	0.375	76		197	0.40
9AT5D	9SAT5D	9DT5D	9SDT5D	5		75	0.375	70	15	119	0.25
9AT9D	9SAT9D	9DT9D	9SDT9D	9		41	0.375	72		116	0.30
9AT12D	9SAT12D	9DT12D	9SDT12D	12		31	0.375	78		107	0.40
9AT15D	9SAT15D	9DT15D	9SDT15D	15		25	0.375	80		104	0.40
12AT5D	12SAT5D	12DT5D	12SDT5D	5		75	0.375	71	8	88	0.25
12AT9D	12SAT9D	12DT9D	12SDT9D	9		41	0.375	78		86	0.30
12AT12D	12SAT12D	12DT12D	12SDT12D	12		31	0.375	78		80	0.40
12AT15D	12SAT15D	12DT15D	12SDT15D	15		25	0.375	80		78	0.40

Note 1: Tested at nominal input voltage and full output load.

SPECIFICATIONS (Nominal V_{IN} , Full Load, $T_A = +25^{\circ}\text{C}$, 1 hour warm up unless otherwise specified)**INPUT**

Parameter	Condition	Min.	Typ.	Max.	Units
Input Voltage Range	3SAT/SAT/DT/SDT models	2.5	3	3.5	VDC
	5SAT/SAT/DT/SDT models	4	5	6	
	9SAT/SAT/DT/SDT models	7	9	11	
	12SAT/SAT/DT/SDT models	9	12	14	

OUTPUT

Parameter	Condition	Min.	Typ.	Max.	Units
Line Regulation	Output voltage is directly proportional to input voltage				
Output Ripple		-	-	200	mVp-p

ENVIRONMENTAL

Parameter	Condition	Min.	Typ.	Max.	Units
Operating Temperature Range	Ambient without derating	-25	-	+70	$^{\circ}\text{C}$
Storage Temperature Range	Ambient	-55	-	+125	$^{\circ}\text{C}$
Temperature Coefficient		-	0.05	-	$\%/^{\circ}\text{C}$
Cooling	Free Air Convection				

GENERAL

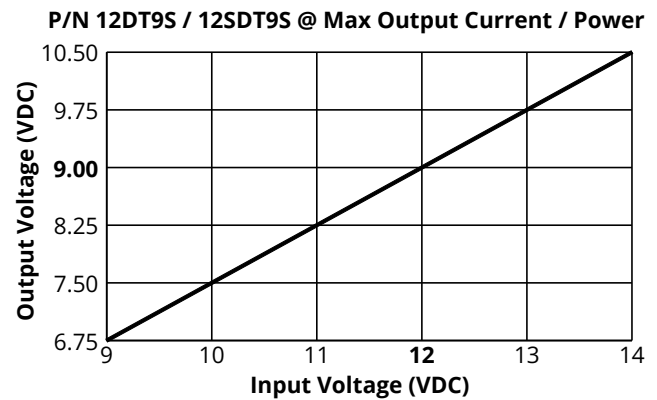
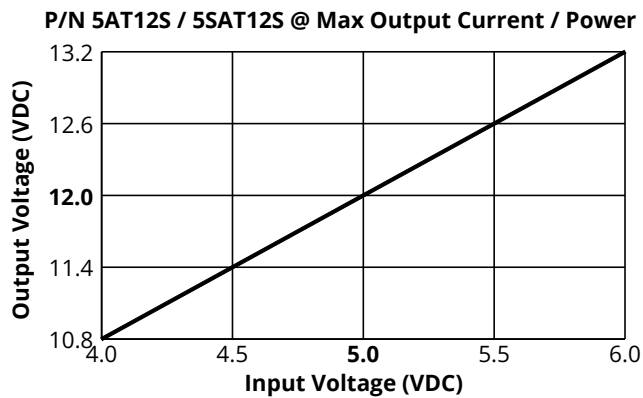
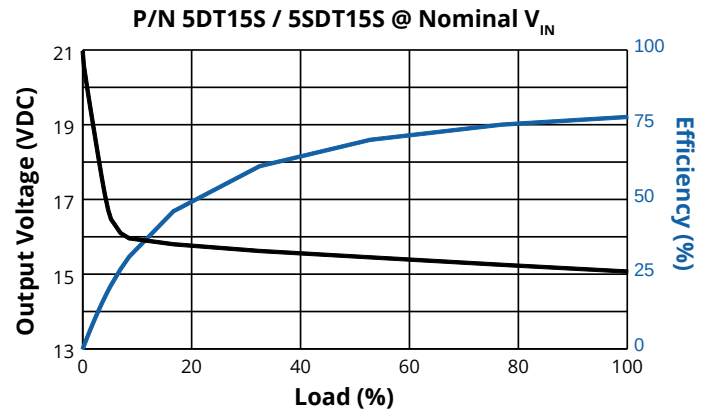
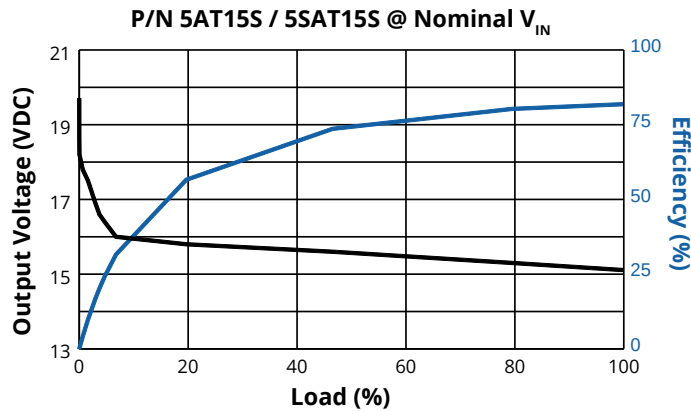
Parameter	Condition	Min.	Typ.	Max.	Units
Isolation Voltage		500	-	-	VDC
Insulation Resistance		100	-	-	MΩ
Switching Frequency		40	-	60	kHz
Size (L x W x H)	Series AT	0.5 x 0.5 x 0.2 (12.7 x 12.7 x 5.08)			inches (mm)
	Series SAT	0.5 x 0.5 x 0.25 (12.7 x 12.7 x 6.35)			
	Series DT	0.75 x 0.312 x 0.262 (19.05 x 7.925 x 6.655)			
	Series SDT	0.75 x 0.312 x 0.23 (19.05 x 7.925 x 5.837)			
Weight		-	3	-	grams
Potting	Molded Epoxy				
Tube Packaging (W x H x L)	Series AT, SAT & SDT	0.87 x 0.545 x 20 (22.098 x 13.843 x 101.6)			inches (mm)
	Series DT	0.6 x 0.55 x 20 (15.24 x 13.97 x 101.6)			
Moisture Sensitivity Level	Series SAT & SDT	IPC / JEDEC J-STD-020, Level 3			

DESIGNED TO MEET

Test	Referenced Standard	Description
Vibration	MIL-STD-202	Method 204, Vibration, High Frequency, Condition D
Shock	MIL-STD-202	Method 213, Shock (Specified Pulse), Condition I
Humidity	MIL-STD-202	Method 106, Moisture Resistance
Altitude	MIL-STD-202	Method 105, Barometric Pressure (Reduced), Condition D

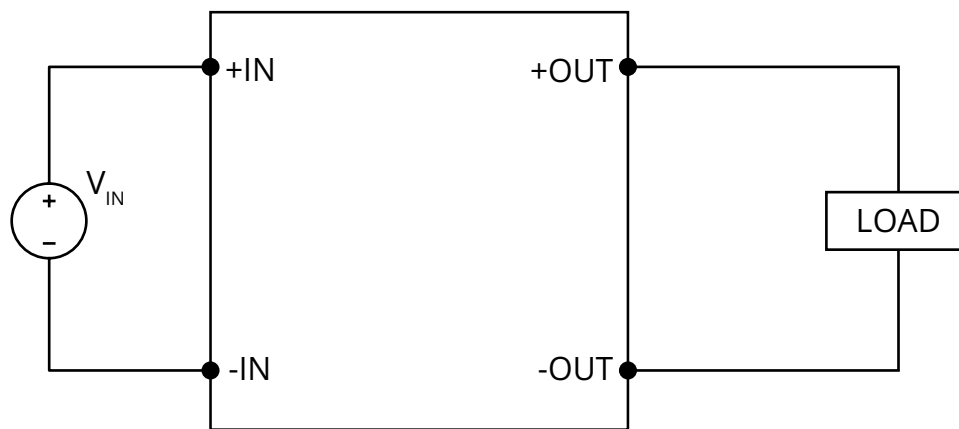
OPTIONS AVAILABLE – CONTACT PICO FOR PART NUMBER

Parameter	Referenced Standard	Description
Stabilization Bake	MIL-STD-883	Referenced Method 1008 Non-operating maximum storage temperature for 24 hours
Temperature Cycle	MIL-STD-883	Referenced Method 1010 Non-operating at temperature extremes, 15 mins/temp, 10 cycles
Burn-In	MIL-STD-883	Referenced Method 1015 Max operating temperature for 160 hours
Expanded Ambient Operating Temperature	-55 $^{\circ}\text{C}$ to +85 $^{\circ}\text{C}$	
RoHS Compliance	-	

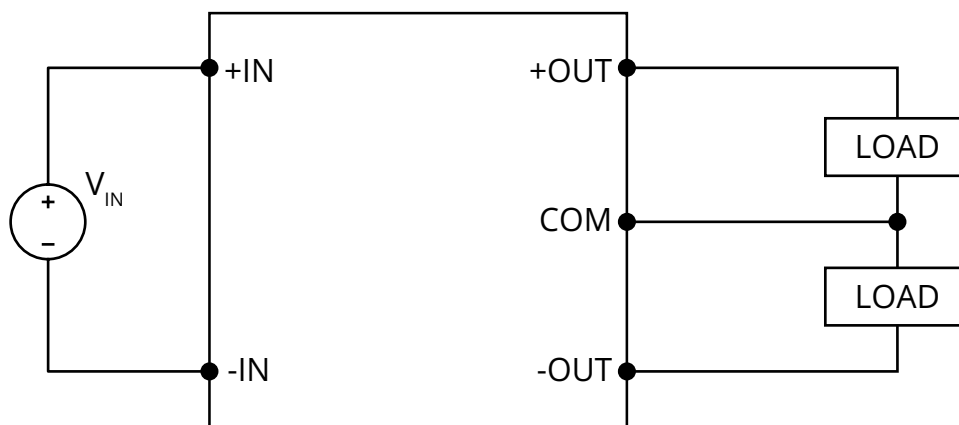
DATA CURVES (Nominal V_{IN} , $T_A = +25^\circ\text{C}$, 1 hour warm up unless otherwise specified)

TYPICAL CONNECTION CIRCUIT

SINGLE OUTPUTS



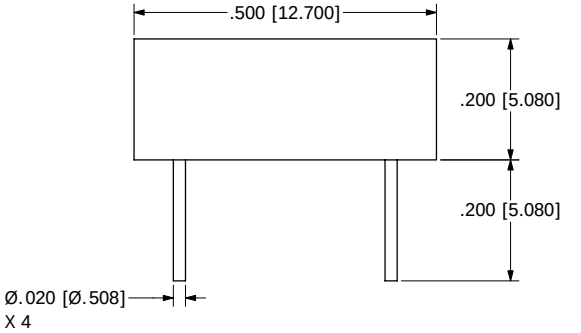
DUAL OUTPUTS



MECHANICAL DRAWINGS

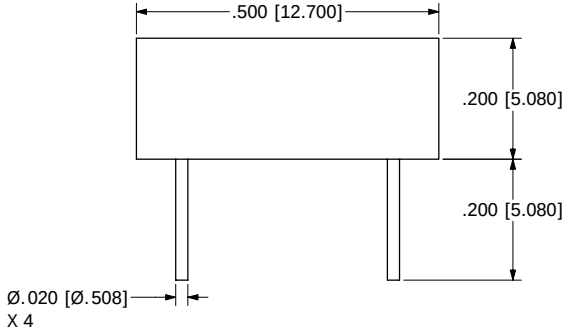
SERIES AT - THROUGH HOLE

SINGLE OUTPUTS

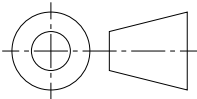


BOTTOM VIEW

DUAL OUTPUTS

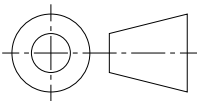
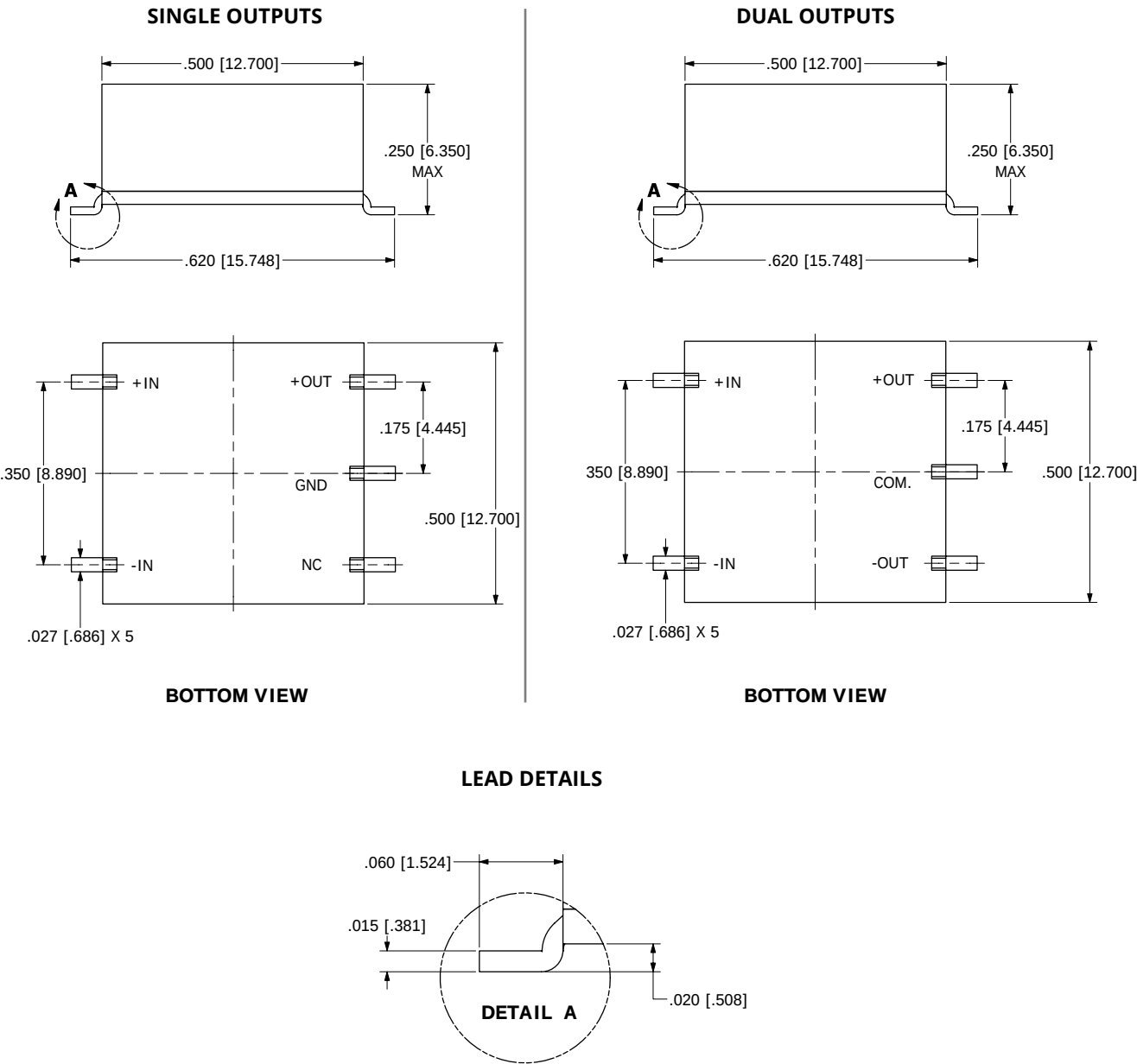


BOTTOM VIEW



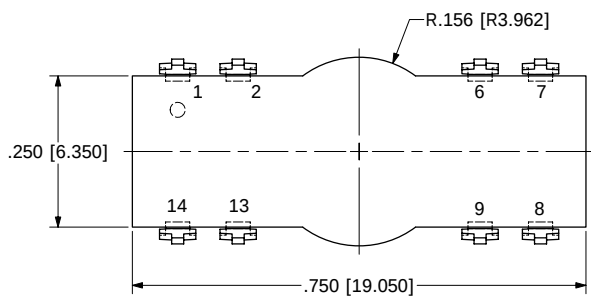
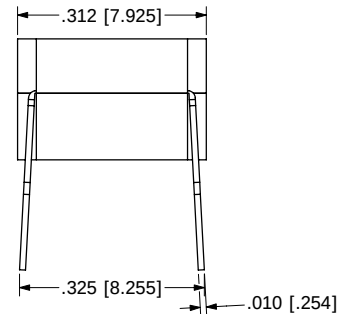
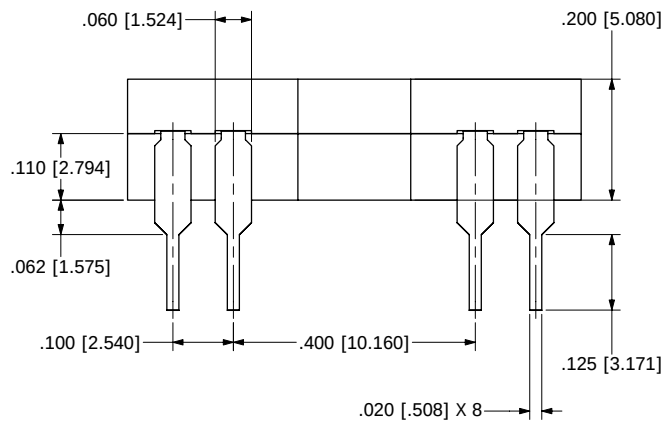
MECHANICAL DRAWINGS

SERIES SAT - SURFACE MOUNT



MECHANICAL DRAWINGS

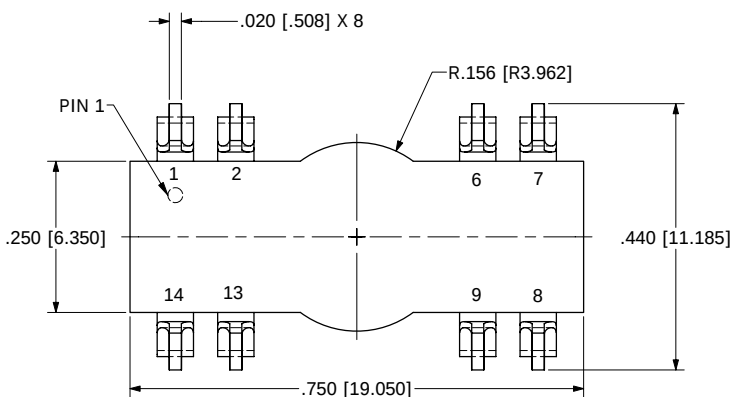
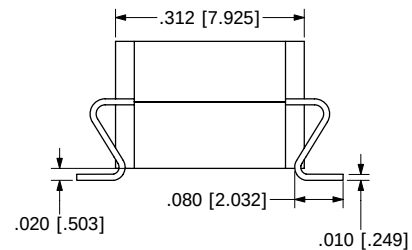
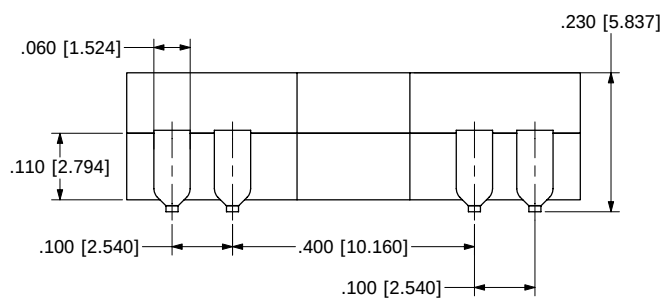
SERIES DT - IC THROUGH HOLE



BOTTOM VIEW

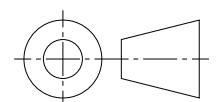
PIN	FUNCTION	
	SINGLE	DUAL
1	-IN	
2	-IN	
6	+OUT	
7	-OUT	COM
8	-OUT	COM
9	N/C	-OUT
13	+IN	
14	-IN	

SERIES SDT - IC SURFACE MOUNT



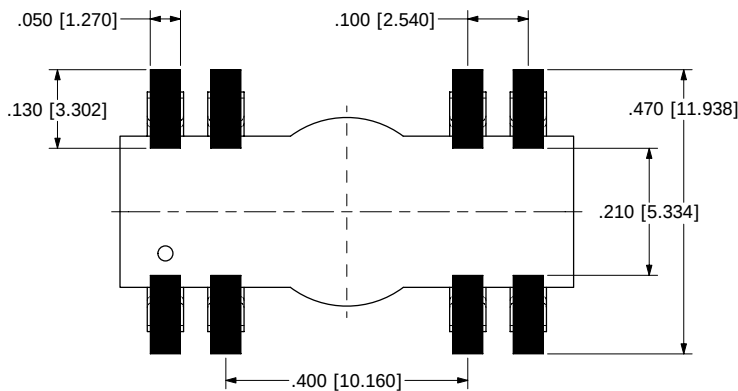
BOTTOM VIEW

PIN	FUNCTION	
	SINGLE	DUAL
1	-IN	
2	-IN	
6	+OUT	
7	-OUT	COM
8	-OUT	COM
9	N/C	-OUT
13	+IN	
14	-IN	

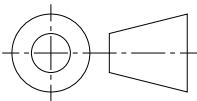
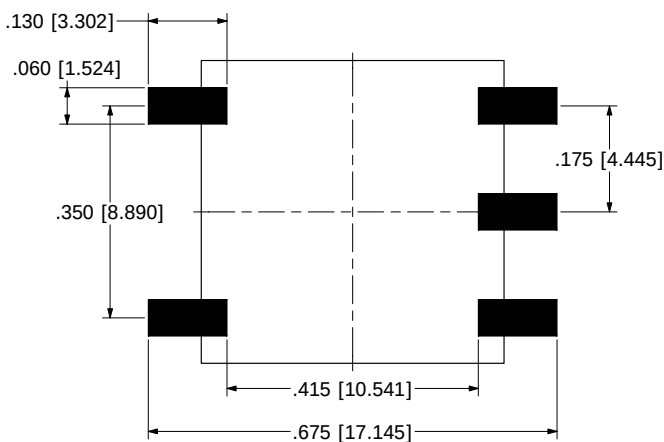


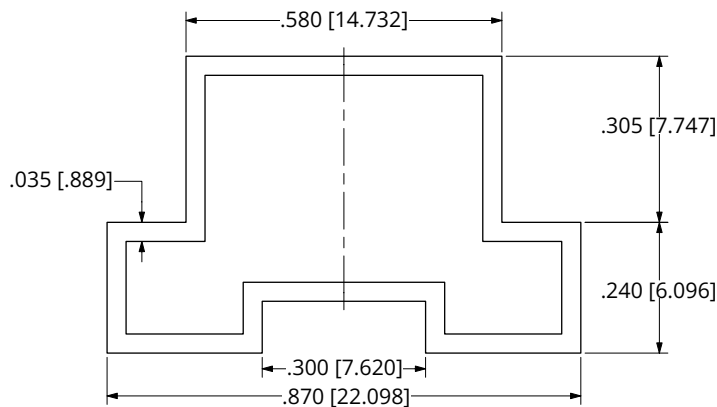
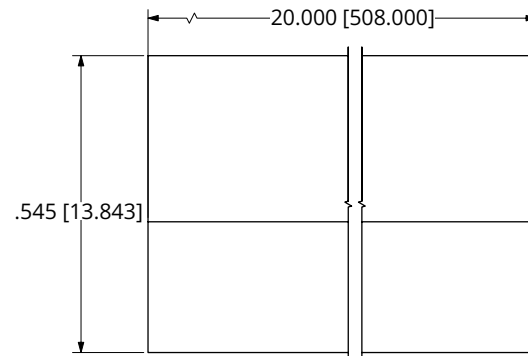
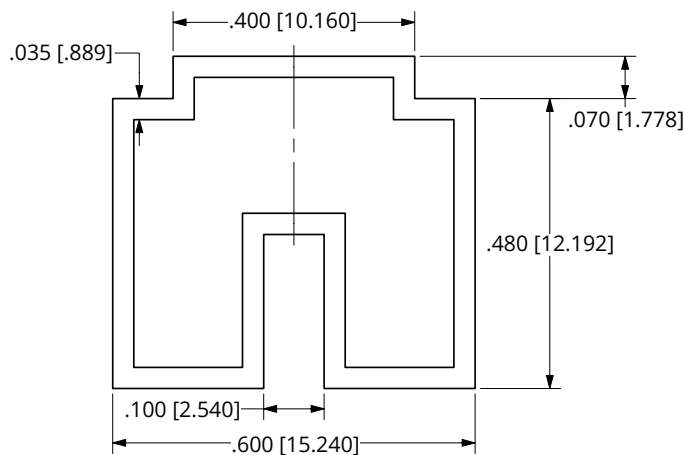
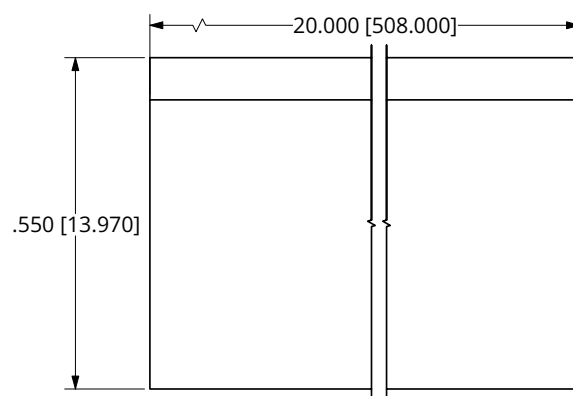
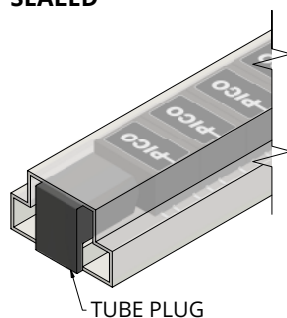
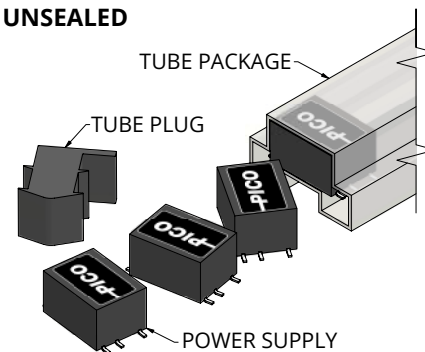
RECOMMENDED LAND PATTERN DIMENSIONS

SERIES SDT - IC SURFACE MOUNT



SERIES SAT - SURFACE MOUNT



TUBE PACKAGING
SERIES AT, SAT & SDT

PLAN VIEW

ELEVATION VIEW
SERIES DT

PLAN VIEW

ELEVATION VIEW
SEALED

UNSEALED


Pico warrants each product manufactured by us and sold by us or an authorized representative, to be free from defects in material and workmanship. If properly used, it will perform within its applicable specifications for a period of one year after original shipment. Pico's obligation under this guarantee is limited to repairing or replacing our product to the original purchaser. This warranty is in lieu of all other warranties, express or implied and constitutes fulfillment of our obligations to the purchaser. We do not guarantee that the products can be used for a particular purpose other than those solely covered by the product's specifications. Pico must be notified if the product must meet particular certifications and/or standards. We assume no liability, in any event, for consequential damages, for anticipated or lost profits, incidental damages or loss of time or other losses incurred by the purchaser or any third party in connection with products covered by this warranty or otherwise. The purchaser will indemnify and hold Pico harmless for any damages, losses, costs, etc. from usage not within the product's specifications. Pico must be consulted before usage of its products in a nuclear, radioactive or space environment.

We reserve the right to discontinue products without notice, We reserve the right to make modifications to any existing catalog products without notice, at any time, without the obligation to modify units previously sold.

Series M & MV

1.25W Isolated Proportional Low Profile DC-DC Converter



PRODUCT OVERVIEW

The M & MV series are unregulated DC-DC converters with upgraded MIL screened / qualified components and expanded operating temperature range. The epoxy insulated shielded case is in an ultra-miniature encapsulated package – as small as 1.250" x 0.500" x 0.300". Over 100 models are available in both single and dual isolated outputs as well as high output voltages - up to 500V. They can operate over the wide temperature range of -55°C to +85°C without derating, a heat sink or active cooling.



FEATURES

- JANTX Diodes
- MIL screened transformers, capacitors and resistors
- Hermetically sealed transistors
- Up to 1.25W output at +85°C ambient
- Encapsulated semiconductors, conservatively rated for maximum reliability
- Ultra-miniature size – down to 0.300" height
- 5 to 48V input models
- Up to 500V output models
- Up to 1000VDC isolation at 100MΩ
- Five-sided or six-sided shielded case
- Single and dual isolated output
- No heat sink or derating required

Contact Pico for part number of available options:

- Select screening per MIL-STD-883:
 - Stabilization Bake
 - Temperature Cycle
 - Burn-In
- Special Input Voltage, Output Voltage, Isolation Voltage or Output Power
- Tighter output voltage tolerances

5	M	5	S
NOM. INPUT VOLTAGE	Series Name	NOM. OUTPUT VOLTAGE	NUMBER OF OUTPUTS
5 = 5V 12 = 12V 15 = 15V 24 = 24V 28 = 28V	M	3.3 = 3.3V 5 = 5V 5.2 = 5.2V 9 = 9V 12 = 12V 15 = 15V 24 = 24V 28 = 28V 48 = 48V	S = SINGLE D = DUAL
5 = 5V 12 = 12V 15 = 15V 24 = 24V 28 = 28V	MV	100 = 100V 150 = 150V 200 = 200V 250 = 250V 300 = 300V 350 = 350V 400 = 400V 450 = 450V 500 = 500V	S = SINGLE

MODEL LIST

SERIES M, SINGLE OUTPUT

Through Hole	Input Voltage [VDC]	Output Voltage [VDC]	Output Current		Efficiency ⁽¹⁾	Input Current		Output Ripple ⁽²⁾	Output Voltage Tolerance ⁽¹⁾
			Min. [mA]	Max. [mA]	[%] typ.	No Load [mA] typ.	Full Load [mA] typ.	[Vp-p max]	[±VDC]
5M3.3S	5	3.3	0	303	60	80	333	0.2	0.2
5M5S		5		200	65	65	308	0.2	0.25
5M5.2S		5.2		192	65	65	308	0.2	0.25
5M9S		9		139	71	80	352	0.15	0.3
5M12S		12		104	74	80	338	0.15	0.4
5M15S		15		83	74	90	338	0.12	0.4
5M24S		24		52	77	90	325	0.1	0.5
5M28S		28		45	76	90	329	0.1	0.5
5M48S		48		26	77	90	325	0.1	1
12M3.3S	12	3.3		303	60	40	139	0.2	0.2
12M5S		5		200	67	40	124	0.15	0.25
12M5.2S		5.2		192	67	40	124	0.15	0.25
12M9S		9		139	74	40	141	0.15	0.3
12M12S		12		104	76	40	137	0.12	0.4
12M15S		15		83	76	40	137	0.12	0.4
12M24S		24		52	78	40	134	0.08	0.5
12M28S		28		45	80	40	130	0.08	0.5
12M48S		48		26	80	40	130	0.08	1
15M3.3S	15	3.3		303	60	35	111	0.2	0.2
15M5S		5		200	67	35	100	0.15	0.25
15M5.2S		5.2		192	67	35	100	0.15	0.25
15M9S		9		139	74	35	113	0.15	0.3
15M12S		12		104	76	35	110	0.12	0.4
15M15S		15		83	76	35	110	0.12	0.4
15M24S		24		52	78	35	107	0.08	0.5
15M28S		28		45	80	35	104	0.08	0.5
15M48S		48		26	80	35	104	0.08	1
24M3.3S	24	3.3		303	60	16	69	0.2	0.2
24M5S		5		200	67	13	62	0.15	0.25
24M5.2S		5.2		192	67	13	62	0.15	0.25
24M9S		9		139	74	15	70	0.15	0.3
24M12S		12		104	75	15	69	0.1	0.4
24M15S		15		83	78	15	67	0.1	0.4
24M24S		24		52	82	15	64	0.1	0.5
24M28S		28		45	79	15	66	0.1	0.5
24M48S		48		26	80	16	65	0.07	1

Note 1: Tested at nominal input voltage and full output load.

Note 2: 10µF, 75V high quality low ESR capacitor is required across the output.

MODEL LIST

SERIES M, SINGLE OUTPUT

Through Hole	Input Voltage [VDC]	Output Voltage [VDC]	Output Current		Efficiency ⁽¹⁾ [%] typ.	Input Current		Output Ripple ⁽²⁾ [Vp-p max]	Output Voltage Tolerance ⁽¹⁾ [±VDC]
			Min. [mA]	Max. [mA]		No Load [mA] typ.	Full Load [mA] typ.		
28M3.3S	28	3.3	0	303	60	15	59	0.2	0.2
28M5S		5		200	68	12	53	0.15	0.25
28M5.2S		5.2		192	68	12	53	0.15	0.25
28M9S		9		139	76	14	59	0.15	0.3
28M12S		12		104	78	14	57	0.12	0.4
28M15S		15		83	79	14	57	0.1	0.4
28M24S		24		52	81	14	55	0.09	0.5
28M28S		28		45	81	14	55	0.09	0.5
28M48S		48		26	80	15	56	0.09	1

Note 1: Tested at nominal input voltage and full output load.

Note 2: 10µF, 75V high quality low ESR capacitor is required across the output.

SERIES M, DUAL OUTPUT

Through Hole	Input Voltage [VDC]	Output Voltage Per Output [VDC]	Output Current Per Output		Efficiency ⁽¹⁾ [%] typ.	Input Current		Output Ripple Per Output ⁽³⁾ [Vp-p max]	Output Voltage Tolerance Per Output ⁽¹⁾ [±VDC]
			Min. [mA]	Max. [mA]		No Load [mA] typ.	Full Load [mA] typ.		
5M5D	5	5	0	100	65	65	308	0.2	0.25
5M9D		9		69	71	80	352	0.15	0.3
5M12D		12		52	74	80	338	0.15	0.4
5M15D		15		42	74	90	338	0.12	0.4
5M24D		24		26	77	90	325	0.1	0.5
5M28D		28		22	76	90	329	0.1	0.5
5M48D		48		13	77	90	325	0.1	1
12M5D	12	5	0	100	67	40	124	0.15	0.25
12M9D		9		69	74	40	141	0.15	0.3
12M12D		12		52	76	40	137	0.12	0.4
12M15D		15		42	76	40	137	0.12	0.4
12M24D		24		26	78	40	134	0.08	0.5
12M28D		28		22	80	40	130	0.08	0.5
12M48D		48		13	80	40	130	0.05	1
15M5D	15	5	0	100	67	35	100	0.15	0.25
15M9D		9		69	74	35	113	0.15	0.3
15M12D		12		52	76	35	110	0.12	0.4
15M15D		15		42	76	35	110	0.12	0.4
15M24D		24		26	78	35	107	0.08	0.5
15M28D		28		22	80	35	104	0.08	0.5
15M48D		48		13	80	35	104	0.05	1

Note 1: Tested at nominal input voltage and full output load.

Note 3: 10µF, 75V high quality low ESR capacitor is required across each output.

MODEL LIST

SERIES M, DUAL OUTPUT

Through Hole	Input Voltage [VDC]	Output Voltage Per Output [VDC]	Output Current Per Output		Efficiency ⁽¹⁾ [%] typ.	Input Current		Output Ripple Per Output ⁽³⁾ [Vp-p max]	Output Voltage Tolerance Per Output ⁽¹⁾ [±VDC]
			Min. [mA]	Max. [mA]		No Load [mA] typ.	Full Load [mA] typ.		
24M5D	24	5	0	100	67	13	62	0.15	0.25
24M9D		9		69	74	15	70	0.15	0.3
24M12D		12		52	75	15	69	0.1	0.4
24M15D		15		42	78	15	67	0.1	0.4
24M24D		24		26	82	15	64	0.1	0.5
24M28D		28		22	79	15	66	0.1	0.5
24M48D		48		13	80	16	65	0.07	1
28M5D	28	5		100	68	12	53	0.15	0.25
28M9D		9		69	76	14	59	0.15	0.3
28M12D		12		52	78	14	57	0.12	0.4
28M15D		15		42	79	14	57	0.1	0.4
28M24D		24		26	81	14	55	0.09	0.5
28M28D		28		22	81	14	55	0.09	0.5
28M48D		48		13	80	15	56	0.09	1

Note 1: Tested at nominal input voltage and full output load.

Note 3: 10µF, 75V high quality low ESR capacitor is required across each output.

SERIES MV

Through Hole	Input Voltage [VDC]	Output Voltage [VDC]	Output Current		Efficiency ⁽¹⁾ [%] typ.	Input Current ⁽¹⁾ [mA] typ.	Output Ripple ⁽⁴⁾ [Vp-p max]	Output Voltage Tolerance ⁽¹⁾ [±VDC]
			Min. ⁽⁵⁾ [mA]	Max. [mA]				
5MV100	5	100	1.25	12.5	78	321	0.9	3
5MV150		150	0.83	8.3	76	329	0.9	4.5
5MV200		200	0.625	6.25	75	333	0.9	6
5MV250		250	0.5	5	75	333	0.9	7.5
5MV300		300	0.416	4.16	70	357	1.2	9
5MV350		350	0.357	3.57	70	357	1.2	10.5
5MV400		400	0.312	3.12	70	357	1.2	12
5MV450		450	0.277	2.77	70	357	1.5	13.5
5MV500		500	0.25	2.5	70	357	1.5	15
12MV100	12	100	1.25	12.5	80	130	0.9	3
12MV150		150	0.83	8.3	79	132	0.9	4.5
12MV200		200	0.625	6.25	78	134	0.9	6
12MV250		250	0.5	5	75	139	0.9	7.5
12MV300		300	0.416	4.16	75	139	1.2	9
12MV350		350	0.357	3.57	75	139	1.2	10.5
12MV400		400	0.312	3.12	75	139	1.2	12
12MV450		450	0.277	2.77	75	139	1.5	13.5
12MV500		500	0.25	2.5	75	139	1.5	15

MODEL LIST

SERIES MV

Through Hole	Input Voltage [VDC]	Output Voltage [VDC]	Output Current		Efficiency ⁽¹⁾ [%] typ.	Input Current ⁽¹⁾ [mA] typ.	Output Ripple ⁽⁴⁾ [Vp-p max]	Output Voltage Tolerance ⁽¹⁾ [±VDC]
			Min. ⁽⁵⁾ [mA]	Max. [mA]				
15MV100	15	100	1.25	12.5	80	104	0.9	3
15MV150		150	0.83	8.3	79	105	0.9	4.5
15MV200		200	0.625	6.25	78	107	0.9	6
15MV250		250	0.5	5	75	111	0.9	7.5
15MV300		300	0.416	4.16	75	111	1.2	9
15MV350		350	0.357	3.57	75	111	1.2	10.5
15MV400		400	0.312	3.12	75	111	1.2	12
15MV450		450	0.277	2.77	75	111	1.5	13.5
15MV500		500	0.25	2.5	75	111	1.5	15
24MV100	24	100	1.25	12.5	76	69	0.9	3
24MV150		150	0.83	8.3	73	71	0.9	4.5
24MV200		200	0.625	6.25	73	71	0.9	6
24MV250		250	0.5	5	70	74	0.9	7.5
24MV300		300	0.416	4.16	73	71	1.2	9
24MV350		350	0.357	3.57	73	71	1.2	10.5
24MV400		400	0.312	3.12	73	71	1.2	12
24MV450		450	0.277	2.77	73	71	1.5	13.5
24MV500		500	0.25	2.5	73	71	1.5	15
28MV100	28	100	1.25	12.5	75	60	0.9	3
28MV150		150	0.83	8.3	76	59	0.9	4.5
28MV200		200	0.625	6.25	75	60	0.9	6
28MV250		250	0.5	5	70	64	0.9	7.5
28MV300		300	0.416	4.16	73	61	1.2	9
28MV350		350	0.357	3.57	73	61	1.2	10.5
28MV400		400	0.312	3.12	73	61	1.2	12
28MV450		450	0.277	2.77	73	61	1.5	13.5
28MV500		500	0.25	2.5	73	61	1.5	15

Note 1: Tested at nominal input voltage and full output load.

Note 4: 0.1μF, 1kV capacitor is required across the output.

Note 5: Maintain minimum 10% of rated load to prevent a voltage surge.

SPECIFICATIONS (Nominal V_{IN} , Full Load, $T_A = +25^\circ\text{C}$, 1 hour warm up unless otherwise specified)**INPUT**

Parameter	Condition		Min.	Typ.	Max.	Units
Input Voltage Range	5V input models	Series M	4	5	6.5	VDC
		Series MV	4.5	5	5.5	
	9V input models	Series M	9	12	15	
		Series MV	10.8	12	13.2	
	15V input models	Series M	12	15	18	
		Series MV	13.5	15	16.5	
	24V input models	Series M	17	24	28	VDC
		Series MV	21.6	24	26.4	
	28V input models	Series M	21	28	32	
		Series MV	25.2	28	30.8	
	48V input models	Series M	25	48	50	
		Series MV	43.2	48	52.8	

OUTPUT

Parameter	Condition		Min.	Typ.	Max.	Units
Line Regulation	Output voltage is directly proportional to input voltage					
Output Power	Series M	$\leq 5.2\text{V}$ output models	-	-	1	W
		All other output models	-	-	1.25	
	Series MV		0.125	-	1.25	

ENVIRONMENTAL

Parameter	Condition	Min.	Typ.	Max.	Units
Operating Temperature Range	Ambient without derating	-55	-	+85	°C
Storage Temperature Range	Ambient	-55	-	+125	°C
Temperature Coefficient	≤9V output models	-	0.05	-	%°C
	All other output models	-	0.02	-	
Cooling	Free Air Convection				

GENERAL

Parameter	Condition	Min.	Typ.	Max.	Units
Isolation Voltage	Series M	500	-	-	VDC
	Series MV	1000	-	-	
Insulation Resistance		100	-	-	MΩ
Switching Frequency		20	-	40	kHz
Size (L x W x H)	Series M	1.25 x 0.5 x 0.3 (31.75 x 12.7 x 7.62)			inches (mm)
	Series MV	1.25 x 0.55 x 0.4 (31.75 x 13.97 x 10.16)			
Weight	Series M	-	9	-	grams
	Series MV	-	10.5	-	
Case	Series M	5-Sided Epoxy Insulated Metal			
	Series MV	6-Sided Epoxy Insulated Metal			
Potting	Vacuum Impregnated Epoxy				
Box Packaging (W x L x H)	4.8 x 3.25 x 1.15 (121.92 x 82.55 x 29.21)				inches (mm)

SPECIFICATIONS (Nominal V_{IN} , Full Load, $T_A = +25^\circ\text{C}$, 1 hour warm up unless otherwise specified)**UPGRADED MILITARY QUALIFIED COMPONENTS**

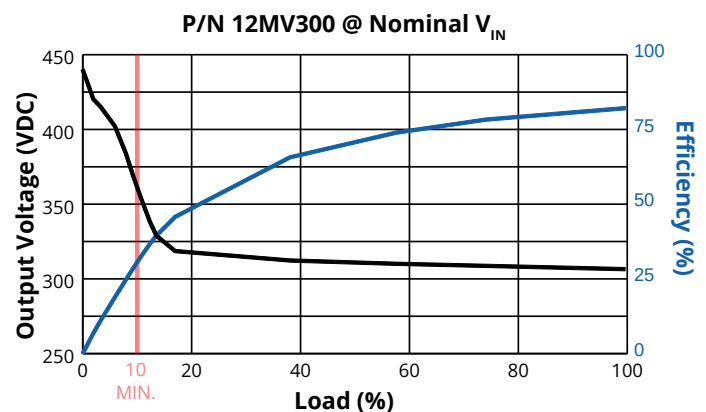
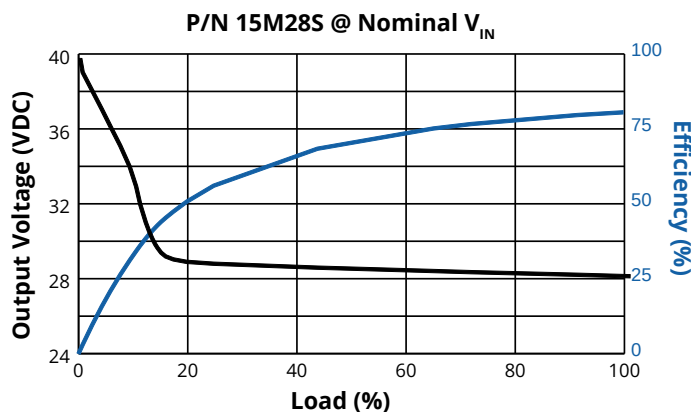
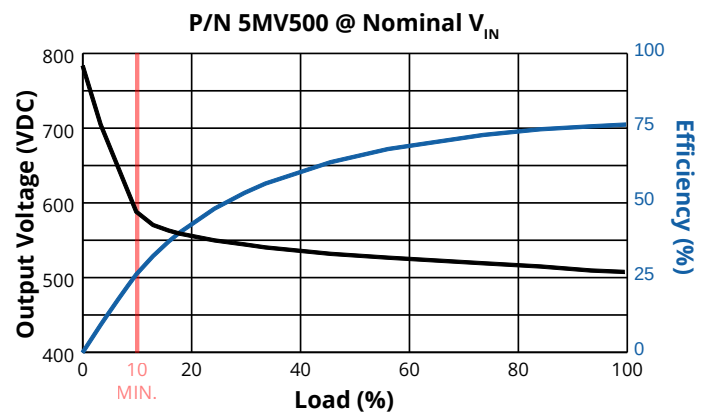
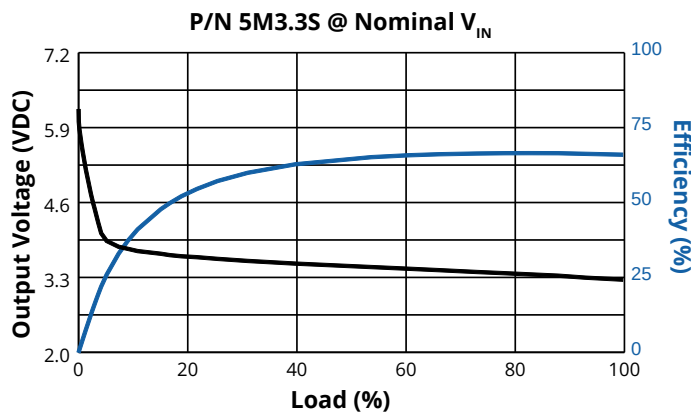
Component	Standard
Diodes	JANTX
Transformers	MIL-PRF-27, Class S, Grade 5
Capacitors	MIL-C-39003, S Level, MIL-C-55681, S Level
Resistors	MIL-R-39008, S Level, MIL-PRF-39017, S Level
Transistors	Hermetically Sealed, Screened per MIL-S-19500, Table II, JAN TX

DESIGNED TO MEET

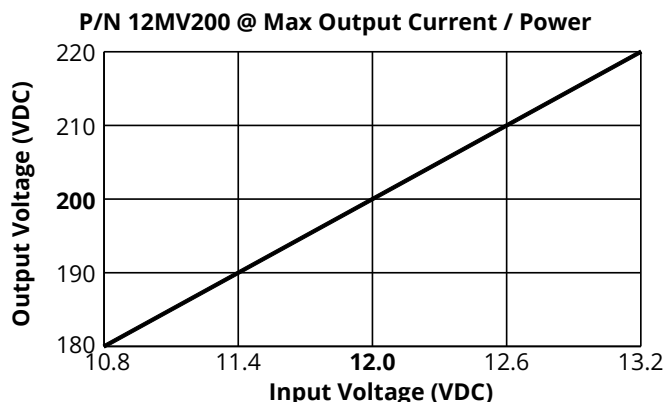
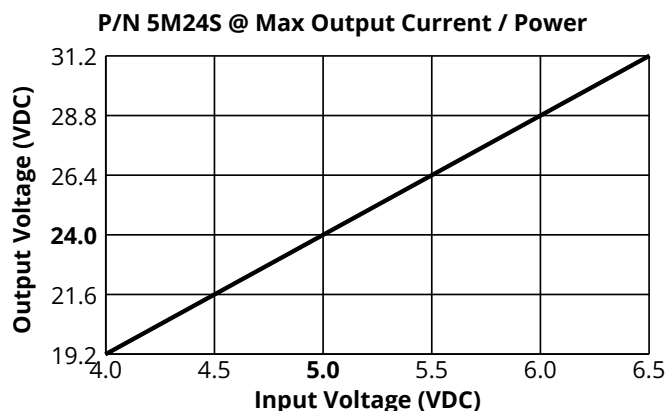
Test	Referenced Standard	Description
Vibration	MIL-STD-202	Method 204, Vibration, High Frequency, Condition D
Shock	MIL-STD-202	Method 213, Shock (Specified Pulse), Condition I
Humidity	MIL-STD-202	Method 106, Moisture Resistance
Altitude	MIL-STD-202	Method 105, Barometric Pressure (Reduced), Condition D

OPTIONS AVAILABLE – CONTACT PICO FOR PART NUMBER

Parameter	Referenced Standard	Description
Stabilization Bake	MIL-STD-883	Referenced Method 1008 Non-operating maximum storage temperature for 24 hours
Temperature Cycle	MIL-STD-883	Referenced Method 1010 Non-operating at temperature extremes, 15 mins/temp, 10 cycles
Burn-In	MIL-STD-883	Referenced Method 1015 Max operating temperature for 160 hours

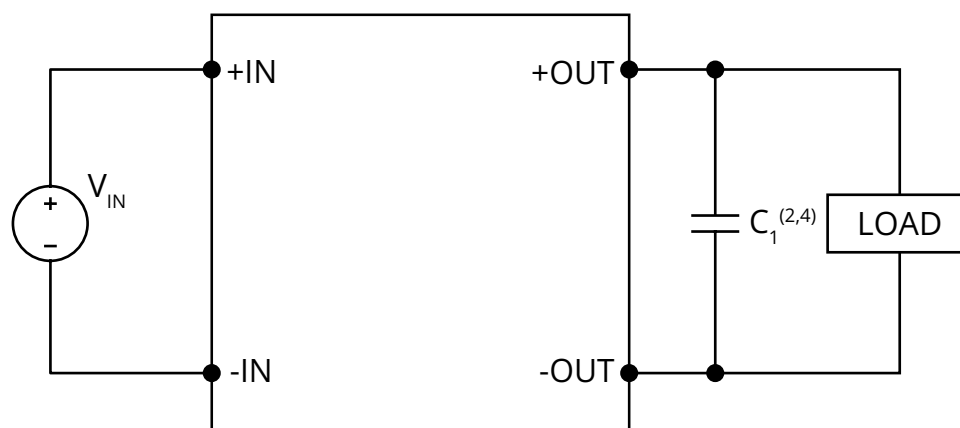
DATA CURVES (Nominal V_{IN} , $T_A = +25^\circ\text{C}$, 1 hour warm up unless otherwise specified)

DATA CURVES (Nominal V_{IN} , $T_A = +25^\circ\text{C}$, 1 hour warm up unless otherwise specified)



TYPICAL CONNECTION CIRCUIT

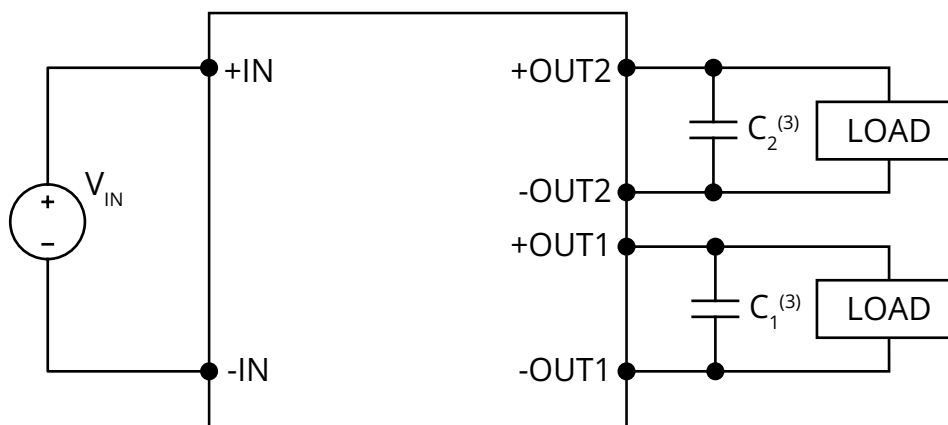
SINGLE OUTPUTS



Note 2: For Series M, a 10 μF , 75V high quality low ESR capacitor is required across the output.

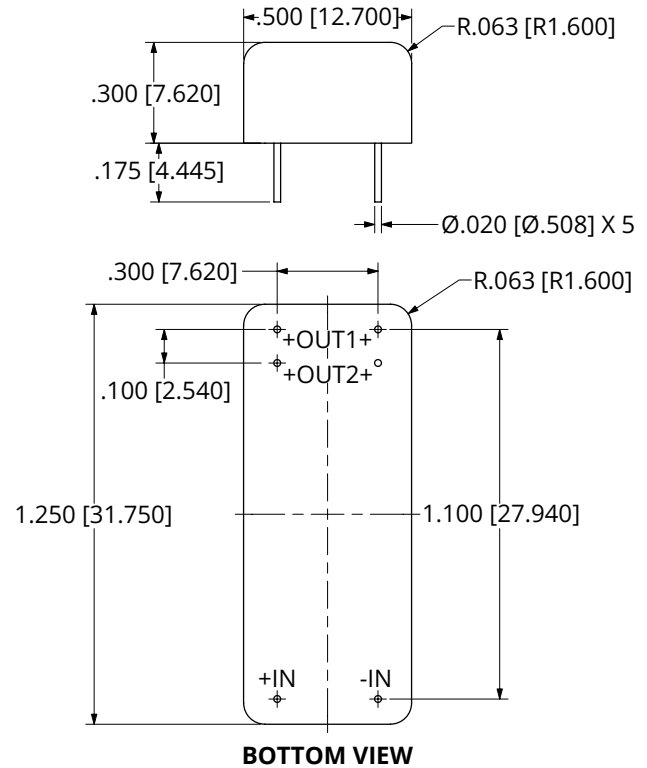
Note 4: For Series MV, a 0.1 μF , 1kV capacitor is required across the output.

DUAL OUTPUTS

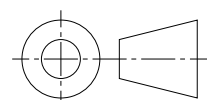
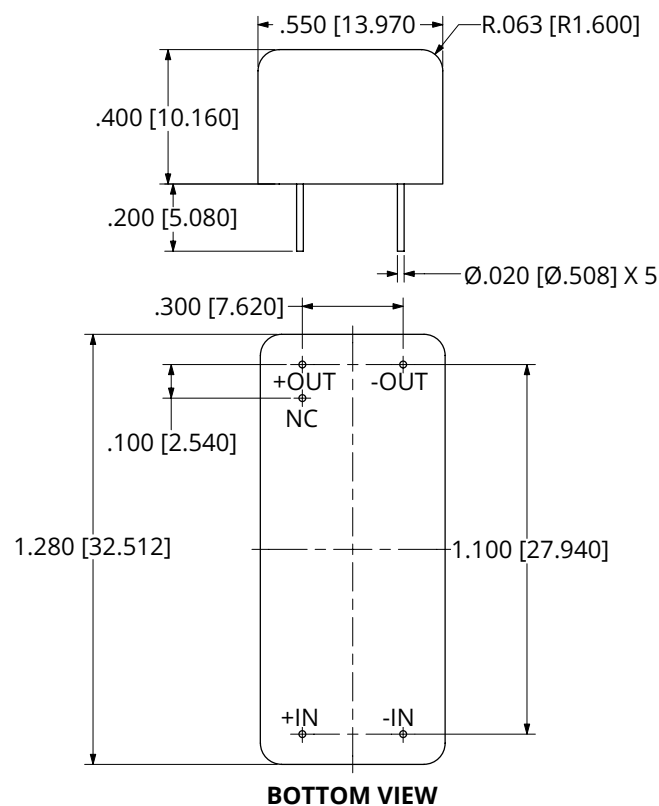


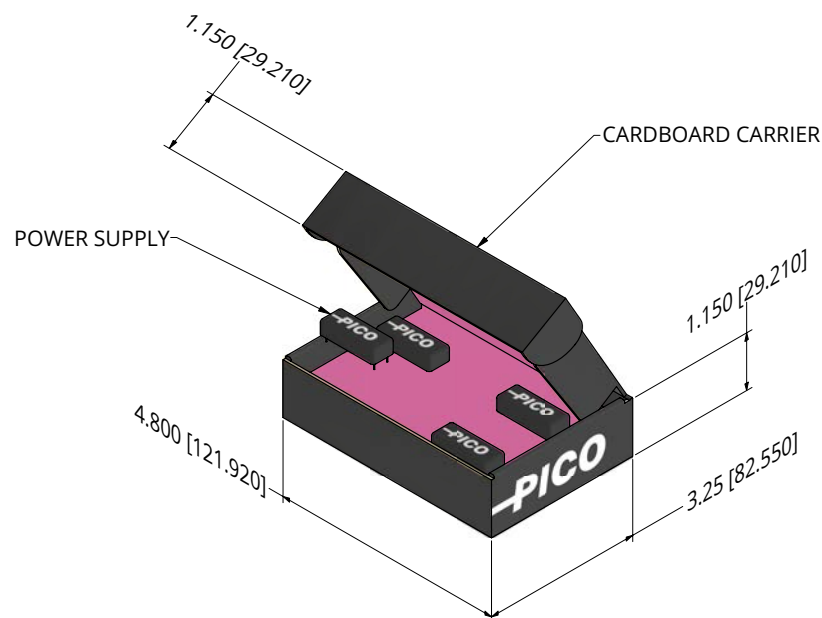
Note 3: For Series M, a 10 μF , 75V high quality low ESR capacitor is required across each output.

DUAL OUTPUTS



SERIES MV





Pico warrants each product manufactured by us and sold by us or an authorized representative, to be free from defects in material and workmanship. If properly used, it will perform within its applicable specifications for a period of one year after original shipment. Pico's obligation under this guarantee is limited to repairing or replacing our product to the original purchaser. This warranty is in lieu of all other warranties, express or implied and constitutes fulfillment of our obligations to the purchaser. We do not guarantee that the products can be used for a particular purpose other than those solely covered by the product's specifications. Pico must be notified if the product must meet particular certifications and/or standards. We assume no liability, in any event, for consequential damages, for anticipated or lost profits, incidental damages or loss of time or other losses incurred by the purchaser or any third party in connection with products covered by this warranty or otherwise. The purchaser will indemnify and hold Pico harmless for any damages, losses, costs, etc. from usage not within the product's specifications. Pico must be consulted before usage of its products in a nuclear, radioactive or space environment.

We reserve the right to discontinue products without notice, We reserve the right to make modifications to any existing catalog products without notice, at any time, without the obligation to modify units previously sold.

Series A & SM

1.25W Isolated Proportional Low Profile DC-DC Converter

PICO
Electronics, Inc.

PRODUCT OVERVIEW

The A & SM series are unregulated DC-DC converters in an ultra-miniature encapsulated package – 0.500" x 0.500" footprint. Over 200 models are available in both single and dual outputs. They can operate over the temperature range of -25°C to +70°C without derating, a heat sink or active cooling.



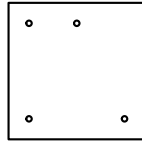
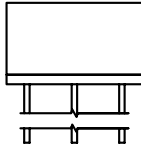
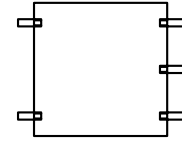
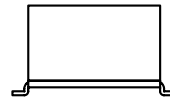
FEATURES

- Up to 1.25W output at +70°C ambient
- Encapsulated semiconductors, conservatively rated for maximum reliability
- Ultra-miniature size – down to 0.300" height
- 5 to 48V input models
- Up to 250V output models
- Up to 1000VDC isolation at 100MΩ
- Input/output isolation
- Single and dual output
- No heat sink or derating required

Contact Pico for part number of available options:

- Expanded operating temp: -55°C to +85°C
- Select screening per MIL-STD-883:
 - Stabilization Bake
 - Temperature Cycle
 - Burn-In
- Available RoHS Compliant module
- Special Input Voltage, Output Voltage, Isolation Voltage or Output Power

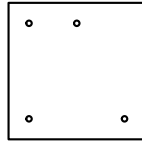
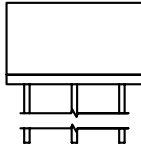
5	A	5	S
NOM. INPUT VOLTAGE	MOUNTING TYPE	NOM. OUTPUT VOLTAGE	NUMBER OF OUTPUTS
5 = 5V 12 = 12V 15 = 15V 24 = 24V 28 = 28V 48 = 48V	A = THROUGH HOLE SM = SURFACE MOUNT	3.3 = 3.3V 5 = 5V 5.2 = 5.2V 9 = 9V 12 = 12V 15 = 15V 24 = 24V 28 = 28V 48 = 48V 100 = 100V 150 = 150V 200 = 200V 250 = 250V	S = SINGLE D = DUAL

MODEL LIST - SINGLE OUTPUT**SERIES A - THROUGH HOLE****SERIES SM - SURFACE MOUNT**

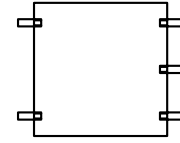
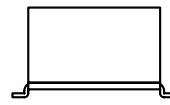
Through Hole	Surface Mount	Input Voltage [VDC]	Output Voltage [VDC]	Output Current		Efficiency ⁽³⁾ [%] typ.	Input Current		Output Ripple ⁽²⁾ [Vp-p max]	Output Voltage Tolerance ⁽³⁾ [±VDC]
				Min. [mA]	Max. [mA]		No Load [mA] typ.	Full Load [mA] typ.		
5A3.3S	5SM3.3S	5	3.3	0	303	60	80	333	0.2	0.20
5A5S	5SM5S		5		200	66	65	303	0.2	0.25
5A5.2S	5SM5.2S		5.2		192	66	65	303	0.2	0.25
5A9S	5SM9S		9		139	73	80	342	0.15	0.3
5A12S	5SM12S		12		104	73	80	342	0.15	0.4
5A15S	5SM15S		15		83	75	90	333	0.12	0.4
5A24S	5SM24S		24		52	75	90	333	0.1	0.5
5A28S	5SM28S		28		45	74	90	338	0.1	0.5
5A48S	5SM48S		48		26	77	90	325	0.1	1
5A100S	5SM100S		100	1.25	12.5	78	- ⁽¹⁾	321	0.9	3
5A150S	5SM150S		150	0.83	8.3	76		329	0.9	4.5
5A200S	5SM200S		200	0.63	6.25	75		333	0.9	6
5A250S	5SM250S		250	0.5	5	75		333	0.9	7.5
12A3.3S	12SM3.3S	12	3.3	0	303	60	26	139	0.2	0.2
12A5S	12SM5S		5		200	66	24	126	0.2	0.25
12A5.2S	12SM5.2S		5.2		192	66	24	126	0.2	0.25
12A9S	12SM9S		9		139	74	26	141	0.15	0.3
12A12S	12SM12S		12		104	76	26	137	0.15	0.4
12A15S	12SM15S		15		83	78	26	134	0.15	0.4
12A24S	12SM24S		24		52	78	26	134	0.15	0.5
12A28S	12SM28S		28		45	77	26	135	0.15	0.5
12A48S	12SM48S		48		26	80	26	130	0.2	1
12A100S	12SM100S		100	1.25	12.5	80	- ⁽¹⁾	130	0.9	3
12A150S	12SM150S		150	0.83	8.3	79		132	0.9	4.5
12A200S	12SM200S		200	0.63	6.25	78		134	0.9	6
12A250S	12SM250S		250	0.5	5	75		139	0.9	7.5
15A3.3S	15SM3.3S	15	3.3	0	303	60	22	111	0.2	0.2
15A5S	15SM5S		5		200	66	20	101	0.2	0.25
15A5.2S	15SM5.2S		5.2		192	66	20	101	0.2	0.25
15A9S	15SM9S		9		139	74	20	113	0.15	0.3
15A12S	15SM12S		12		104	76	20	110	0.15	0.4
15A15S	15SM15S		15		83	78	20	107	0.15	0.4
15A24S	15SM24S		24		52	78	20	107	0.15	0.5
15A28S	15SM28S		28		45	77	20	108	0.15	0.5
15A48S	15SM48S		48		26	80	20	104	0.2	1
15A100S	15SM100S		100	1.25	12.5	80	- ⁽¹⁾	104	0.9	3
15A150S	15SM150S		150	0.83	8.3	79		105	0.9	4.5
15A200S	15SM200S		200	0.63	6.25	78		107	0.9	6
15A250S	15SM250S		250	0.5	5	75		111	0.9	7.5

MODEL LIST - SINGLE OUTPUT

SERIES A - THROUGH HOLE



SERIES SM - SURFACE MOUNT



Through Hole	Surface Mount	Input Voltage [VDC]	Output Voltage [VDC]	Output Current Min. [mA]	Output Current Max. [mA]	Efficiency ⁽³⁾ [%] typ.	Input Current No Load [mA] typ.	Input Current Full Load [mA] typ.	Output Ripple ⁽²⁾ [Vp-p] max	Output Voltage Tolerance ⁽³⁾ [±VDC]
24A3.3S	24SM3.3S	24	3.3	0	303	60	16	69	0.2	0.2
24A5S	24SM5S		5		200	66	13	43	0.2	0.25
24A5.2S	24SM5.2S		5.2		192	66	13	43	0.2	0.25
24A9S	24SM9S		9		139	72	15	72	0.2	0.3
24A12S	24SM12S		12		104	75	15	69	0.2	0.4
24A15S	24SM15S		15		83	75	15	69	0.2	0.4
24A24S	24SM24S		24		52	78	15	67	0.2	0.5
24A28S	24SM28S		28		45	77	15	68	0.2	0.5
24A48S	24SM48S		48		26	78	16	67	0.25	1
24A100S	24SM100S		100	1.25	12.5	76	- ⁽¹⁾	69	0.9	3
24A150S	24SM150S		150	0.83	8.3	73		71	0.9	4.5
24A200S	24SM200S		200	0.63	6.25	73		71	0.9	6
24A250S	24SM250S		250	0.5	5	70		74	0.9	7.5
28A3.3S	28SM3.3S	28	3.3	0	303	60	15	59	0.2	0.2
28A5S	28SM5S		5		200	66	12	54	0.2	0.25
28A5.2S	28SM5.2S		5.2		192	66	12	54	0.2	0.25
28A9S	28SM9S		9		139	72	14	62	0.2	0.3
28A12S	28SM12S		12		104	72	14	62	0.2	0.4
28A15S	28SM15S		15		83	73	14	61	0.2	0.4
28A24S	28SM24S		24		52	76	14	59	0.2	0.5
28A28S	28SM28S		28		45	76	14	59	0.2	0.5
28A48S	28SM48S		48		26	77	15	58	0.25	1
28A100S	28SM100S		100	1.25	12.5	75	- ⁽¹⁾	60	0.9	3
28A150S	28SM150S		150	0.83	8.3	76		59	0.9	4.5
28A200S	28SM200S		200	0.63	6.25	75		60	0.9	6
28A250S	28SM250S		250	0.5	5	70		64	0.9	7.5
48A3.3S	48SM3.3S	48	3.3	0	303	60	5	35	0.2	0.2
48A5S	48SM5S		5		200	66	6	32	0.25	0.25
48A5.2S	48SM5.2S		5.2		192	66	6	32	0.25	0.25
48A9S	48SM9S		9		139	72	8	36	0.25	0.3
48A12S	48SM12S		12		104	73	8	36	0.25	0.4
48A15S	48SM15S		15		83	72	8	36	0.25	0.4
48A24S	48SM24S		24		52	76	9	34	0.25	0.5
48A28S	48SM28S		28		45	76	9	34	0.25	0.5

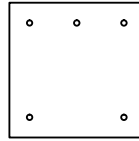
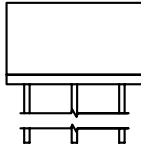
Note 1: Maintain minimum 10% of rated load to prevent a voltage surge.

Note 2: For ≤48V output models, a 10µF, 75V high quality low ESR capacitor is required across the output. For ≥100V output models, a 0.1µF, 500V high quality low ESR capacitor is required across output.

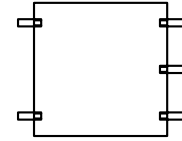
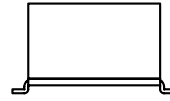
Note 3: Tested at nominal input voltage and full output load.

MODEL LIST - DUAL OUTPUT

SERIES A - THROUGH HOLE



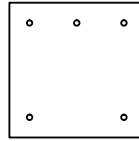
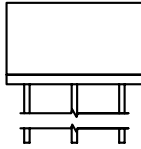
SERIES SM - SURFACE MOUNT



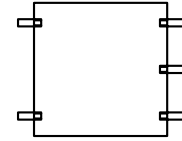
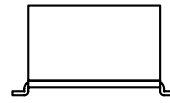
Through Hole	Surface Mount	Input Voltage [VDC]	Output Voltage [VDC]	Output Current		Efficiency ⁽³⁾ [%] typ.	Input Current		Output Ripple ⁽⁴⁾ [Vp-p max]	Output Voltage Tolerance Per Output ⁽³⁾ [±VDC]
				Min. [mA]	Max. [mA]		No Load [mA] typ.	Full Load [mA] typ.		
5A5D	5SM5D	5	±5	0	±100	66	65	303	0.2	0.25
5A9D	5SM9D		±9		±69	73	80	342	0.15	0.3
5A12D	5SM12D		±12		±52	73	80	342	0.15	0.4
5A15D	5SM15D		±15		±42	75	90	333	0.12	0.4
5A24D	5SM24D		±24		±26	75	90	333	0.1	0.5
5A28D	5SM28D		±28		±22	74	90	338	0.1	0.5
5A48D	5SM48D		±48		±13	77	90	325	0.1	1
12A5D	12SM5D	12	±5		±100	66	24	126	0.2	0.25
12A9D	12SM9D		±9		±69	74	26	141	0.15	0.3
12A12D	12SM12D		±12		±52	76	26	137	0.15	0.4
12A15D	12SM15D		±15		±42	78	26	134	0.15	0.4
12A24D	12SM24D		±24		±26	78	26	134	0.15	0.5
12A28D	12SM28D		±28		±22	77	26	135	0.15	0.5
12A48D	12SM48D		±48		±13	80	26	130	0.2	1
15A5D	15SM5D	15	±5		±100	66	20	101	0.2	0.25
15A9D	15SM9D		±9		±69	74	20	113	0.15	0.3
15A12D	15SM12D		±12		±52	76	20	110	0.15	0.4
15A15D	15SM15D		±15		±42	78	20	107	0.15	0.4
15A24D	15SM24D		±24		±26	78	20	107	0.15	0.5
15A28D	15SM28D		±28		±22	77	20	108	0.15	0.5
15A48D	15SM48D		±48		±13	80	20	104	0.2	1
24A5D	24SM5D	24	±5		±100	66	13	63	0.2	0.25
24A9D	24SM9D		±9		±69	72	15	72	0.2	0.3
24A12D	24SM12D		±12		±52	75	15	69	0.2	0.4
24A15D	24SM15D		±15		±42	75	15	69	0.2	0.4
24A24D	24SM24D		±24		±26	78	15	67	0.2	0.5
24A28D	24SM28D		±28		±22	77	15	68	0.2	0.5
24A48D	24SM48D		±48		±13	78	16	67	0.25	1
28A5D	28SM5D	28	±5		±100	66	12	54	0.2	0.25
28A9D	28SM9D		±9		±69	72	14	62	0.2	0.3
28A12D	28SM12D		±12		±52	72	14	62	0.2	0.4
28A15D	28SM15D		±15		±42	73	14	61	0.2	0.4
28A24D	28SM24D		±24		±26	76	14	59	0.2	0.5
28A28D	28SM28D		±28		±22	76	14	59	0.2	0.5
28A48D	28SM48D		±48		±13	77	15	58	0.25	1

MODEL LIST - DUAL OUTPUT

SERIES A - THROUGH HOLE



SERIES SM - SURFACE MOUNT



Through Hole	Surface Mount	Input Voltage [VDC]	Output Voltage [VDC]	Output Current Per Output		Efficiency ⁽³⁾ [%] typ.	Input Current		Output Ripple ⁽⁴⁾ [Vp-p max]	Output Voltage Tolerance Per Output ⁽³⁾ [±VDC]
				Min. [mA]	Max. [mA]		No Load [mA] typ.	Full Load [mA] typ.		
48A5D	48SM5D	48	±5	0	±100	66	6	32	0.25	0.3
48A9D	48SM9D		±9		±69	72	8	36	0.25	0.4
48A12D	48SM12D		±12		±52	73	8	36	0.25	0.4
48A15D	48SM15D		±15		±42	72	8	36	0.25	0.5
48A24D	48SM24D		±24		±26	76	9	34	0.25	0.5
48A28D	48SM28D		±28		±22	76	9	34	0.25	0.25

Note 3: Tested at nominal input voltage and full output load.

Note 4: 10µF, 75V high quality low ESR capacitor is required across each output.

SPECIFICATIONS (Nominal V_{IN} , Full Load, $T_A = +25^\circ\text{C}$, 1 hour warm up unless otherwise specified)

INPUT

Parameter	Condition		Min.	Typ.	Max.	Units
Input Voltage Range	5V input models	≤48V output models	4	5	6.5	VDC
		≥100V output models	4.5	5	5.5	
	12V input models	≤48V output models	9	12	15	
		≥100V output models	10.8	12	13.2	
	15V input models	≤48V output models	12	15	18	
		≥100V output models	13.5	15	16.5	
	24V input models	≤48V output models	17	24	28	
		≥100V output models	21.6	24	26.4	
	28V input models	≤48V output models	21	28	32	
		≥100V output models	25.2	28	30.8	
	48V input models	≤48V output models	25	48	50	
		≥100V output models	43.2	48	52.8	

OUTPUT

Parameter	Condition		Min.	Typ.	Max.	Units
Line Regulation	Output voltage is directly proportional to input voltage					
Output Power	Single output models	≤5.2V Output models	0	-	1	W
		≥100V output models	0.125	-	1.25	
		All other models	0	-	1.25	
	Dual output models	≤5.2V Output models	0	-	±0.5	
		All other models	0	-	±0.625	

SPECIFICATIONS (Nominal V_{IN} , Full Load, $T_A = +25^{\circ}\text{C}$, 1 hour warm up unless otherwise specified)**ENVIRONMENTAL**

Parameter	Condition	Min.	Typ.	Max.	Units
Operating Temperature Range	Ambient without derating	-25	-	+70	°C
Storage Temperature Range	Ambient	-55	-	+125	°C
Temperature Coefficient	≤5.2V Output models	-	0.05	-	% / °C
	9V, 12V & 15V Output models	-	0.04	-	
	All other models	-	0.02	-	
Cooling	Free Air Convection				

GENERAL

Parameter	Condition	Min.	Typ.	Max.	Units
Isolation Voltage	≤48V Output Models	500	-	-	VDC
	≥100V Output Models	1000	-	-	
Insulation Resistance		100	-	-	MΩ
Switching Frequency		20	-	40	kHz
Size (L x W x H)	Series A - ≤48V Output Models	0.5 x 0.5 x 0.3 (12.7 x 12.7 x 7.62)			inches (mm)
	Series A - ≥100V Output Models	0.5 x 0.5 x 0.4 (12.7 x 12.7 x 10.16)			
	Series SM - ≤48V Output Models	0.5 x 0.5 x 0.34 (12.7 x 12.7 x 8.636)			
	Series SM - ≥100V Output Models	0.5 x 0.5 x 0.44 (12.7 x 12.7 x 11.176)			
Weight	≤48V Output Models	-	3.5	-	Grams
	≥100V Output Models	-	4	-	
Case	Glass Reinforced Polymer				
Potting	Vacuum Impregnated Epoxy				
Tube Packaging (W x H x L)	Series A (See drawing)	0.6 x 1.72 x DIM A (15.24 x 43.688 x DIM A)			inches (mm)
	Series SM	0.87 x 0.545 x 20 (22.098 x 13.843 x 101.6)			
Tape & Reel Packaging	Upon Request				
Moisture Sensitivity Level	Series SM	IPC / JEDEC J-STD-020, Level 3			

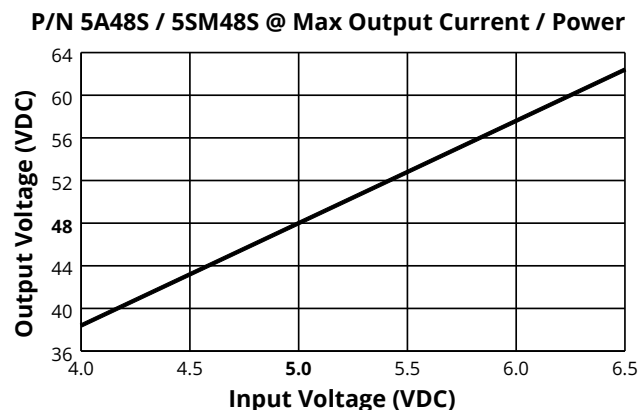
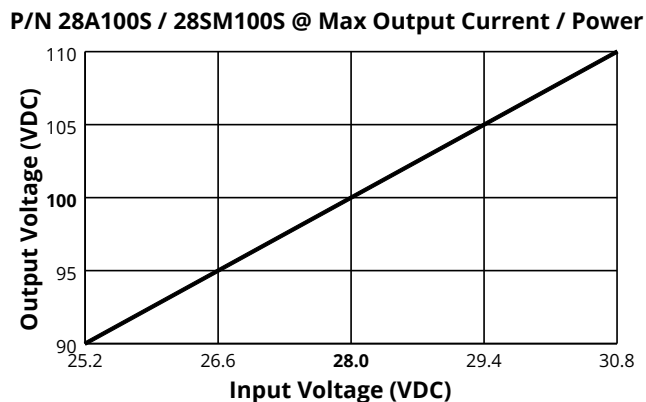
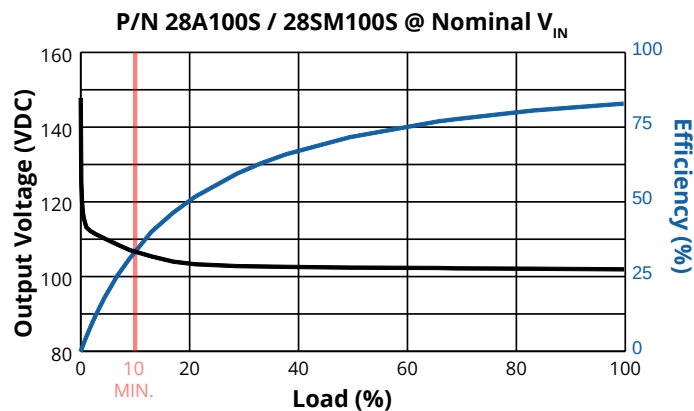
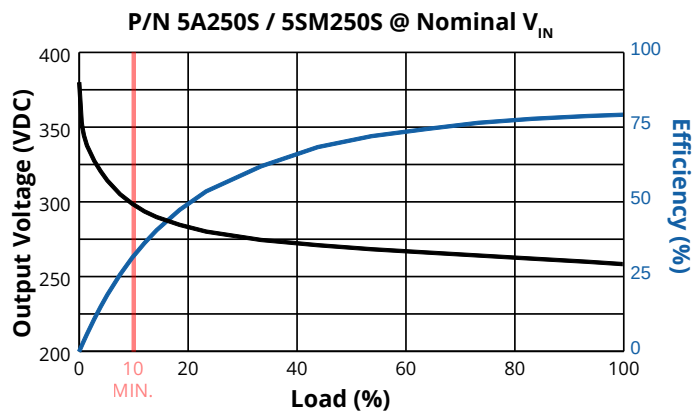
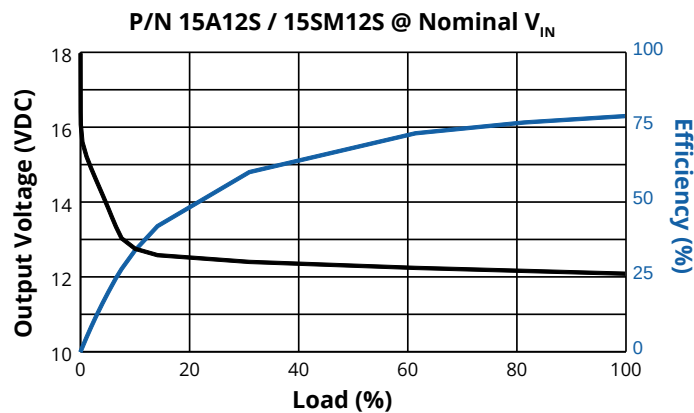
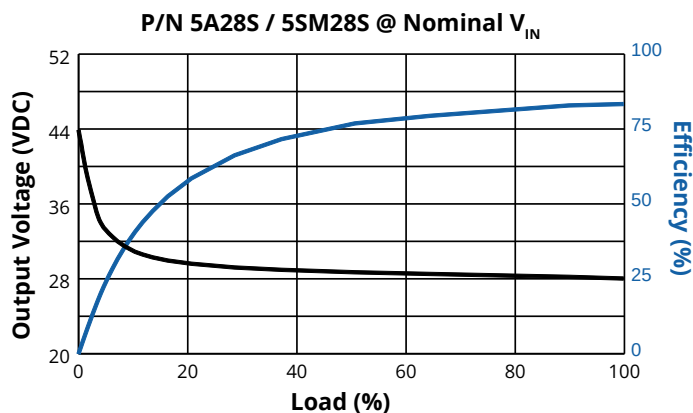
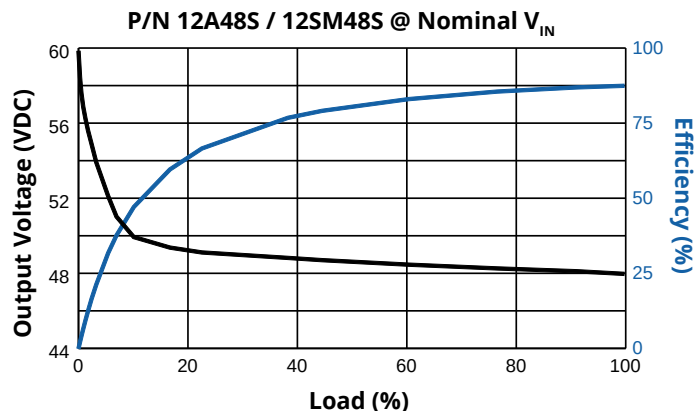
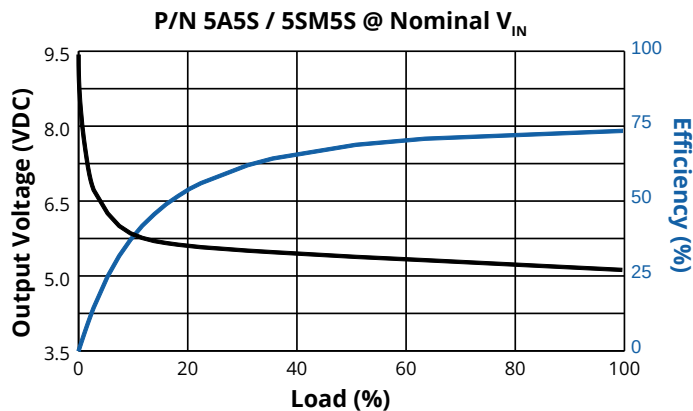
DESIGNED TO MEET

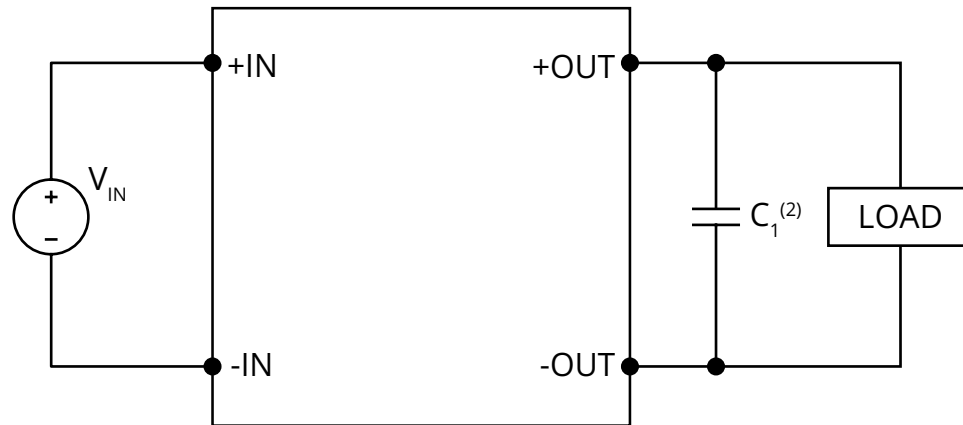
Test	Referenced Standard	Description
Vibration	MIL-STD-202	Method 204, Vibration, High Frequency, Condition D
Shock	MIL-STD-202	Method 213, Shock (Specified Pulse), Condition I
Humidity	MIL-STD-202	Method 106, Moisture Resistance
Altitude	MIL-STD-202	Method 105, Barometric Pressure (Reduced), Condition D

OPTIONS AVAILABLE – CONTACT PICO FOR PART NUMBER

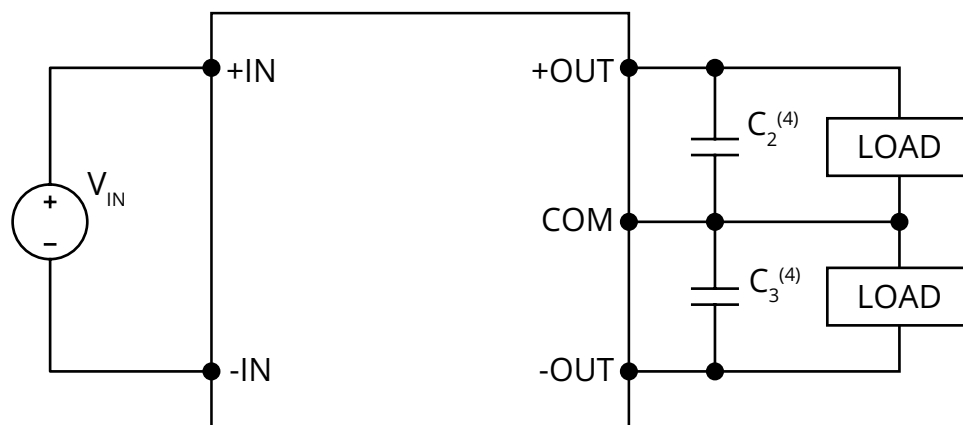
Parameter	Referenced Standard	Description
Stabilization Bake	MIL-STD-883	Referenced Method 1008 Non-operating maximum storage temperature for 24 hours
Temperature Cycle	MIL-STD-883	Referenced Method 1010 Non-operating at temperature extremes, 15 mins/temp, 10 cycles
Burn-In	MIL-STD-883	Referenced Method 1015 Max operating temperature for 160 hours
Expanded Ambient Operating Temperature	-55°C to $+85^{\circ}\text{C}$	
RoHS Compliance	-	

DATA CURVES (Nominal V_{IN} , $T_A = +25^\circ\text{C}$, 1 hour warm up unless otherwise specified)



TYPICAL CONNECTION CIRCUIT**SINGLE OUTPUTS**

Note 2: For $\leq 48V$ output models, a $10\mu F$, 75V high quality low ESR capacitor is required across the output. For $\geq 100V$ output models, a $0.1\mu F$, 500V high quality low ESR capacitor is required across output.

DUAL OUTPUTS

Note 4: $10\mu F$, 75V high quality low ESR capacitor is required across each output.

SERIES A - THROUGH HOLE

The drawing shows a 4-pin connector with the following dimensions:

- Top View:**
 - Overall width: .500 [12.700]
 - Overall height: .300 [7.620]
 - Pin pitch (center-to-center): .175 [4.445]
 - Pin diameter: $\varnothing .020$ [$\varnothing .508$]
 - Pin length: 1.000 [25.400]
- Bottom View:**
 - Overall width: .500 [12.700]
 - Overall height: .350 [8.890]
 - Pin pitch (center-to-center): .350 [8.890]
 - Pin locations: +OUT, -OUT, +IN, -IN

Ø.020 [Ø.508]
X 4

.175 [4.445]

.500 [12.700]

+OUT

-OUT

.350 [8.890]

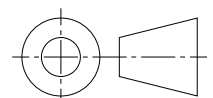
+IN

-IN

.350 [8.890]

BOTTOM VIEW

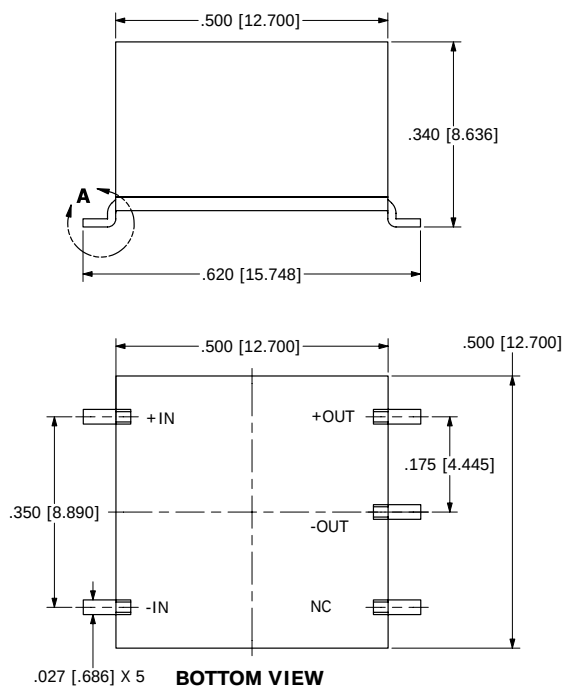
2025 REV 0



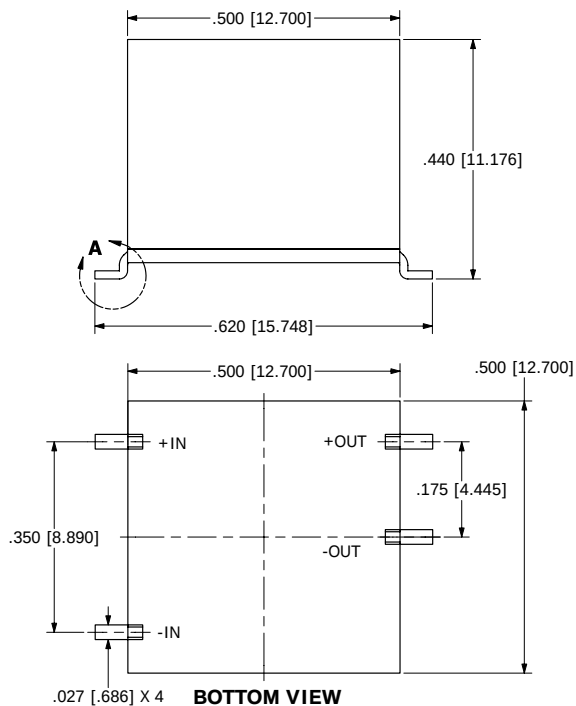
MECHANICAL DRAWINGS

SERIES SM - SURFACE MOUNT

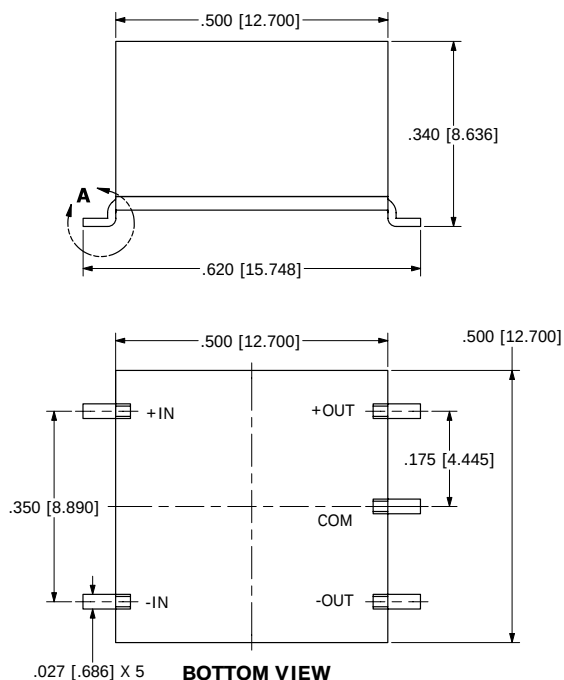
SINGLE $\leq 48V$ OUTPUTS



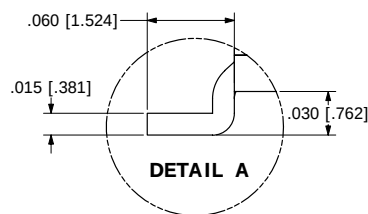
SINGLE $\geq 100V$ OUTPUTS



DUAL OUTPUTS

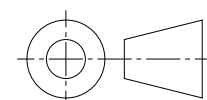


LEAD DETAILS



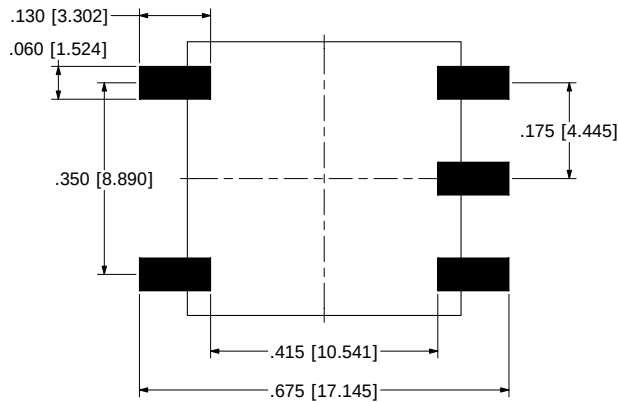
NOTES

- ALL DIMENSIONS ARE IN INCHES, [] = MM
- WHITE DOT ON TOP SIDE INDICATES +IN LOCATION

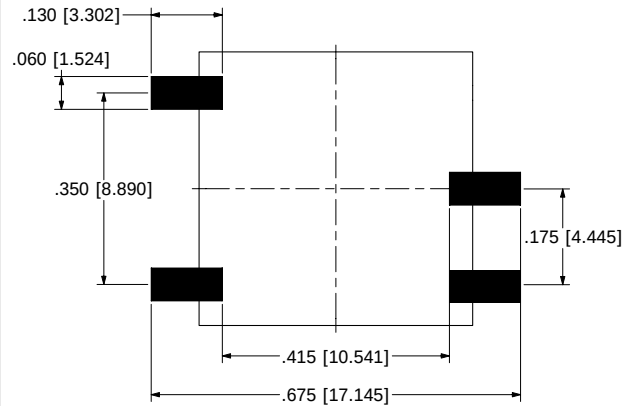


RECOMMENDED LAND PATTERN DIMENSIONS - SERIES SM

SINGLE $\leq 48V$ AND DUAL OUTPUTS

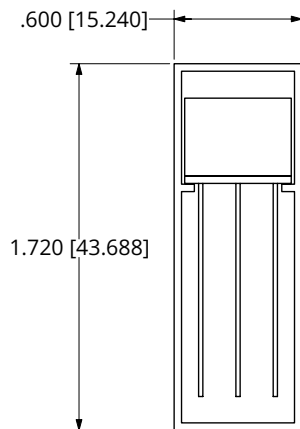


SINGLE $\geq 100V$ OUTPUTS

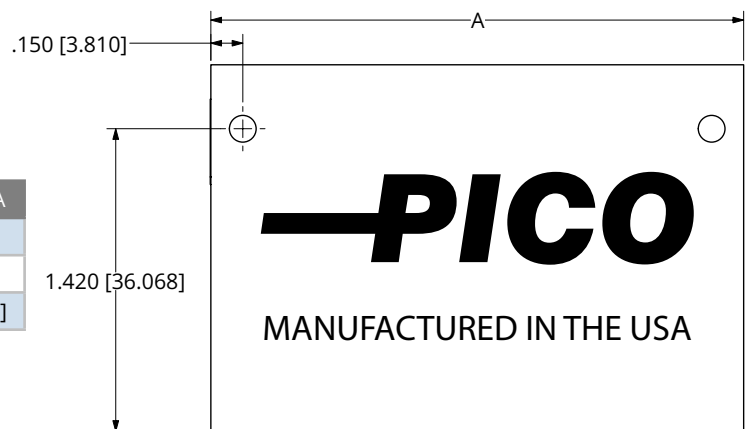


TUBE PACKAGING

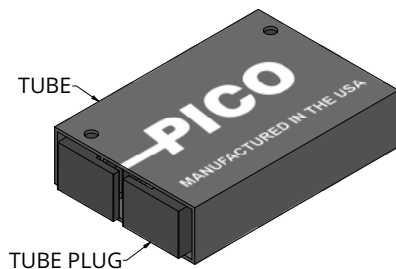
SERIES A - THROUGH HOLE



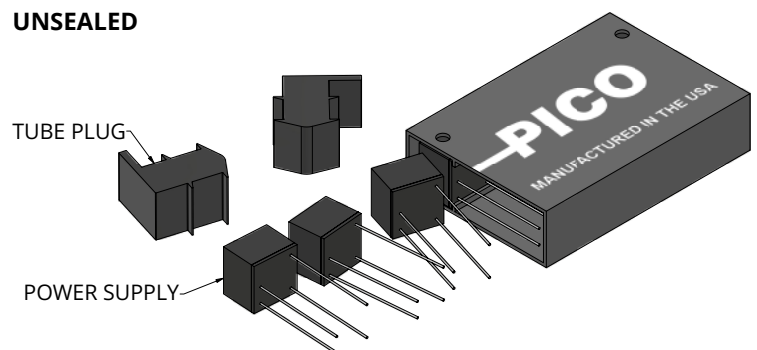
DIMENSION A
4.00 [101.60]
6.50 [165.10]
10.50 [266.70]



SEALED

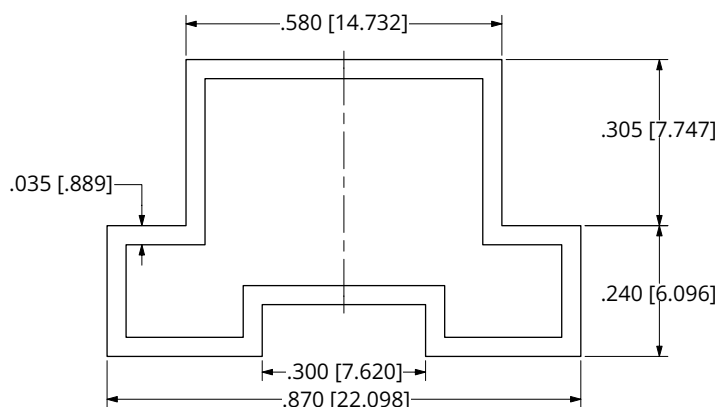


UNSEALED

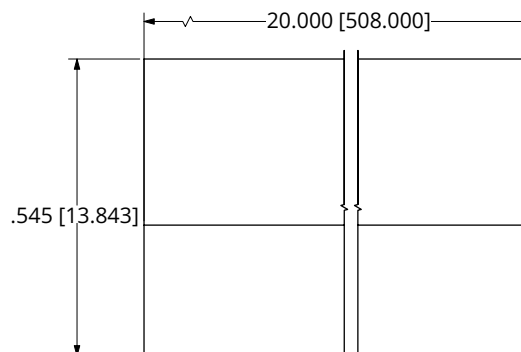


TUBE PACKAGING

SERIES SM - SURFACE MOUNT, $\leq 48V$ OUTPUTS

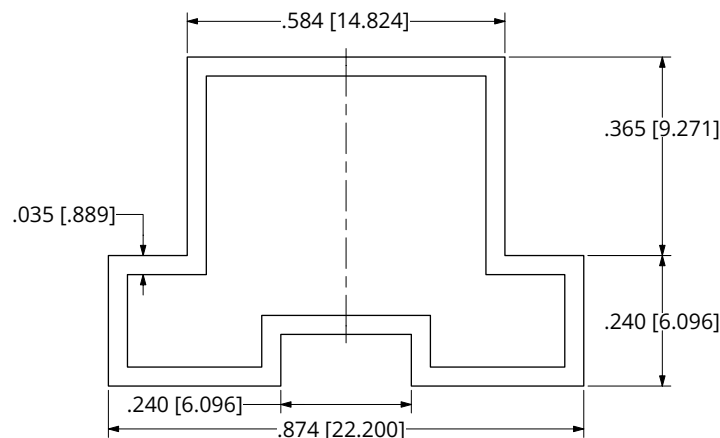


PLAN VIEW

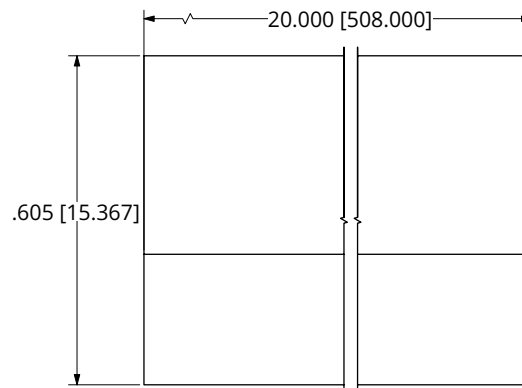


ELEVATION VIEW

SERIES SM - SURFACE MOUNT, $\geq 100V$ OUTPUTS

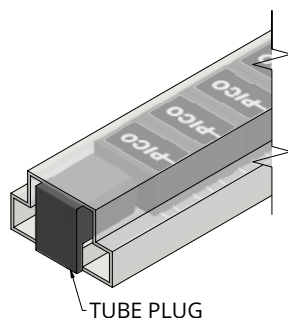


PLAN VIEW

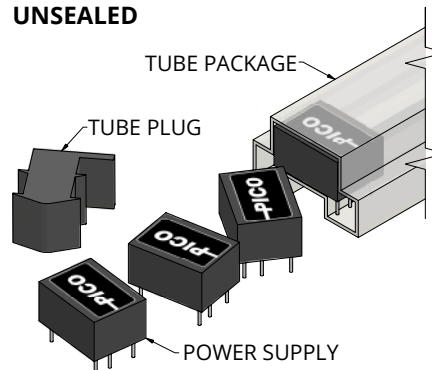


ELEVATION VIEW

SEALED



UNSEALED



Pico warrants each product manufactured by us and sold by us or an authorized representative, to be free from defects in material and workmanship. If properly used, it will perform within its applicable specifications for a period of one year after original shipment. Pico's obligation under this guarantee is limited to repairing or replacing our product to the original purchaser. This warranty is in lieu of all other warranties, express or implied and constitutes fulfillment of our obligations to the purchaser. We do not guarantee that the products can be used for a particular purpose other than those solely covered by the product's specifications. Pico must be notified if the product must meet particular certifications and/or standards. We assume no liability, in any event, for consequential damages, for anticipated or lost profits, incidental damages or loss of time or other losses incurred by the purchaser or any third party in connection with products covered by this warranty or otherwise. The purchaser will indemnify and hold Pico harmless for any damages, losses, costs, etc. from usage not within the product's specifications. Pico must be consulted before usage of its products in a nuclear, radioactive or space environment.

We reserve the right to discontinue products without notice, We reserve the right to make modifications to any existing catalog products without notice, at any time, without the obligation to modify units previously sold.

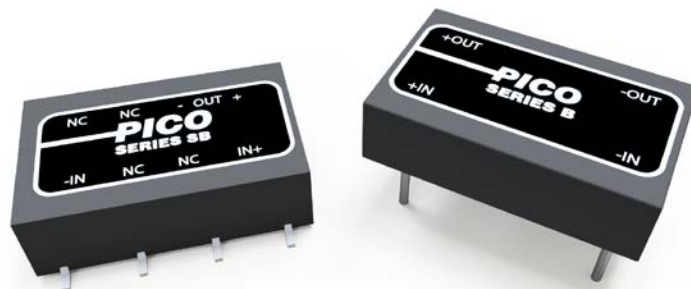
Series B & SB

2.5W Isolated Proportional Low Profile DC-DC Converter

PICO
Electronics, Inc.

PRODUCT OVERVIEW

The B & SB series are unregulated DC-DC converters in an ultra-miniature encapsulated package – 1.12" x 0.7" footprint and low profile – 0.3". Over 180 models are available in both single and dual outputs. They can operate over the temperature range of -25°C to +70°C without derating, a heat sink or active cooling.



FEATURES

- Up to 2.5W output at +70°C ambient
- Encapsulated semiconductors, conservatively rated for maximum reliability
- Ultra-miniature size – down to 0.300" height
- 5 to 48V input models
- Up to 48V output models
- 500VDC isolation at 100MΩ
- Input/output isolation
- Single and isolated dual output
- No heat sink or derating required

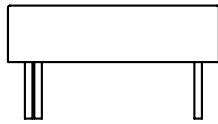
Contact Pico for part number of available options:

- Expanded operating temp: -55°C to +85°C
- Select screening per MIL-STD-883:
 - Stabilization Bake
 - Temperature Cycle
 - Burn-In
- Available RoHS Compliant module
- Special Input Voltage, Output Voltage, Isolation Voltage or Output Power

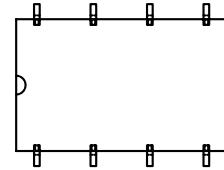
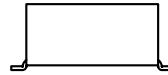
5	B	5	S
NOM. INPUT VOLTAGE	MOUNTING TYPE	NOM. OUTPUT VOLTAGE	NUMBER OF OUTPUTS
5 = 5V 12 = 12V 15 = 15V 24 = 24V 28 = 28V 48 = 48V	B = THROUGH HOLE SB = SURFACE MOUNT	3.3 = 3.3V 5 = 5V 5.2 = 5.2V 9 = 9V 12 = 12V 15 = 15V 24 = 24V 28 = 28V 48 = 48V	S = SINGLE D = DUAL

MODEL LIST - SINGLE OUTPUT

SERIES B - THROUGH HOLE



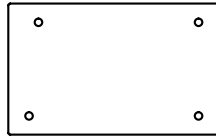
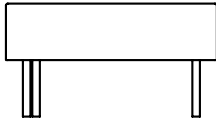
SERIES SB - SURFACE MOUNT



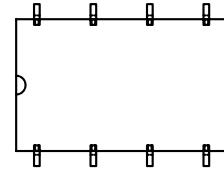
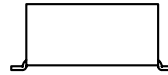
Through Hole	Surface Mount	Output Voltage [VDC]	Output Current		Output Power [W]	Efficiency ⁽¹⁾ [%] typ.	Input Current		Output Ripple ⁽²⁾ [Vp-p max]	Output Voltage Tolerance [±VDC]
			Min. [mA]	Max. [mA]			No Load [mA] typ.	Full Load [mA] typ.		
5B3.3S	5SB3.3S	3.3	0	454	1.5	60	90	500	0.15	0.2
5B5S	5SB5S	5		300	1.5	67	90	447		0.25
5B5.2S	5SB5.2S	5.2		288	1.5	67	90	447		0.25
5B9S	5SB9S	9		167	1.5	73	90	411		0.3
5B12S	5SB12S	12		125	1.5	75	90	400		0.4
5B15S	5SB15S	15		100	1.5	75	90	400		0.4
5B24S	5SB24S	24		63	1.5	78	90	385		0.5
5B28S	5SB28S	28		54	1.5	78	90	385		0.5
5B48S	5SB48S	48		31	1.5	79	90	380		1
12B3.3S	12SB3.3S	3.3		454	1.5	60	40	208	0.15	0.2
12B5S	12SB5S	5		300	1.5	69	40	182		0.25
12B5.2S	12SB5.2S	5.2		288	1.5	69	40	182		0.25
12B9S	12SB9S	9		222	2	76	40	219		0.3
12B12S	12SB12S	12		167	2	78	40	214		0.4
12B15S	12SB15S	15		133	2	78	40	214		0.4
12B24S	12SB24S	24		83	2	80	40	208		0.5
12B28S	12SB28S	28		71	2	80	40	208		0.5
12B48S	12SB48S	48		42	2	80	40	208		1
15B3.3S	15SB3.3S	3.3		454	1.5	60	34	167	0.15	0.2
15B5S	15SB5S	5		300	1.5	69	34	145		0.25
15B5.2S	15SB5.2S	5.2		288	1.5	69	34	145		0.25
15B9S	15SB9S	9		222	2	76	34	175		0.3
15B12S	15SB12S	12		167	2	78	34	171		0.4
15B15S	15SB15S	15		133	2	78	34	171		0.4
15B24S	15SB24S	24		83	2	80	34	167		0.5
15B28S	15SB28S	28		71	2	80	34	167		0.5
15B48S	15SB48S	48		42	2	80	34	167		1
24B3.3S	24SB3.3S	3.3		454	1.5	60	10	104	0.15	0.2
24B5S	24SB5S	5		300	1.5	69	10	91		0.25
24B5.2S	24SB5.2S	5.2		288	1.5	69	10	91		0.25
24B9S	24SB9S	9		222	2	76	15	110		0.3
24B12S	24SB12S	12		167	2	78	15	107		0.4
24B15S	24SB15S	15		133	2	78	15	107		0.4
24B24S	24SB24S	24		104	2.5	82	15	127		0.5
24B28S	24SB28S	28		89	2.5	81	15	129		0.5
24B48S	24SB48S	48		52	2.5	82	15	127		1

MODEL LIST - SINGLE OUTPUT

SERIES B - THROUGH HOLE



SERIES SB - SURFACE MOUNT



Through Hole	Surface Mount	Output Voltage [VDC]	Output Current		Output Power [W]	Efficiency ⁽¹⁾ [%] typ.	Input Current		Output Ripple ⁽²⁾ [Vp-p] max	Output Voltage Tolerance ⁽¹⁾ [±VDC]
			Min. [mA]	Max. [mA]			No Load [mA] typ.	Full Load [mA] typ.		
28B3.3S	28SB3.3S	3.3	0	454	1.5	60	15	89	0.15	0.2
28B5S	28SB5S	5		300	1.5	67	15	80		0.25
28B5.2S	28SB5.2S	5.2		288	1.5	67	15	80		0.25
28B9S	28SB9S	9		222	2	75	15	95		0.3
28B12S	28SB12S	12		167	2	77	15	93		0.4
28B15S	28SB15S	15		133	2	77	15	93		0.4
28B24S	28SB24S	24		104	2.5	81	15	110		0.5
28B28S	28SB28S	28		89	2.5	81	15	110		0.5
28B48S	28SB48S	48		52	2.5	82	15	109		1
48B3.3S	48SB3.3S	3.3		454	1.5	60	3	52	0.2	0.2
48B5S	48SB5S	5		300	1.5	71	3	44		0.25
48B5.2S	48SB5.2S	5.2		288	1.5	71	3	44		0.25
48B9S	48SB9S	9		222	2	76	3	55		0.3
48B12S	48SB12S	12		167	2	82	3	51		0.4
48B15S	48SB15S	15		133	2	82	3	51		0.4
48B24S	48SB24S	24		104	2.5	84	3	62		0.5
48B28S	48SB28S	28		89	2.5	83	3	63		0.5

Note 1: Tested at nominal input voltage and full output load.

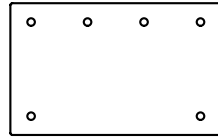
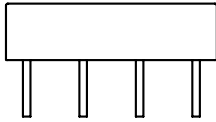
Note 2: A 22µF, 75V high quality tantalum capacitor is required across the output.

MODEL LIST - DUAL OUTPUT

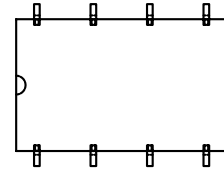
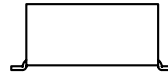
Through Hole	Surface Mount	Output Voltage Per Output [VDC]	Output Current Per Output		Output Power Per Output [W]	Efficiency ⁽¹⁾ [%] typ.	Input Current		Output Ripple Per Output ⁽³⁾ [Vp-p max]	Output Voltage Tolerance Per Output ⁽¹⁾ [±VDC]
			Min. [mA]	Max. [mA]			No Load [mA] typ.	Full Load [mA] typ.		
5B5D	5SB5D	5	0	150	0.75	68	90	441	0.15	0.25
5B9D	5SB9D	9		83	0.75	73	90	411		0.3
5B12D	5SB12D	12		62	0.75	76	90	394		0.4
5B15D	5SB15D	15		50	0.75	78	90	384		0.4
5B24D	5SB24D	24		31	0.75	80	90	375		0.5
5B28D	5SB28D	28		27	0.75	78	90	385		0.5
5B48D	5SB48D	48		15	0.75	79	90	380		1

MODEL LIST - DUAL OUTPUT

SERIES B - THROUGH HOLE



SERIES SB - SURFACE MOUNT



Through Hole	Surface Mount	Output Voltage Per Output [VDC]	Output Current Per Output		Output Power Per Output [W]	Efficiency ⁽¹⁾ [%] typ.	Input Current		Output Ripple Per Output ⁽³⁾ [Vp-p max]	Output Voltage Tolerance Per Output ⁽¹⁾ [±VDC]
			Min. [mA]	Max. [mA]			No Load [mA] typ.	Full Load [mA] typ.		
12B5D	12SB5D	5	0	150	0.75	71	40	176	0.15	0.25
12B9D	12SB9D	9		111	1	76	40	219		0.3
12B12D	12SB12D	12		83	1	81	40	205		0.4
12B15D	12SB15D	15		66	1	81	40	205		0.4
12B24D	12SB24D	24		41	1	83	40	200		0.5
12B28D	12SB28D	28		35	1	80	40	208		0.5
12B48D	12SB48D	48		21	1	80	40	208		1
15B5D	15SB5D	5		150	0.75	71	34	141	0.15	0.25
15B9D	15SB9D	9		111	1	76	34	175		0.3
15B12D	15SB12D	12		83	1	81	34	165		0.4
15B15D	15SB15D	15		66	1	81	34	165		0.4
15B24D	15SB24D	24		41	1	83	34	161		0.5
15B28D	15SB28D	28		35	1	80	34	167		0.5
15B48D	15SB48D	48		21	1	80	34	167		1
24B5D	24SB5D	5		150	0.75	71	10	88	0.15	0.25
24B9D	24SB9D	9		111	1	76	15	110		0.3
24B12D	24SB12D	12		83	1	80	15	104		0.4
24B15D	24SB15D	15		66	1	81	15	102		0.4
24B24D	24SB24D	24		52	1.25	82	15	127		0.5
24B28D	24SB28D	28		45	1.25	81	15	129		0.5
24B48D	24SB48D	48		26	1.25	82	15	127		1
28B5D	28SB5D	5		150	0.75	67	15	80	0.15	0.25
28B9D	28SB9D	9		111	1	75	15	95		0.3
28B12D	28SB12D	12		83	1	77	15	93		0.4
28B15D	28SB15D	15		66	1	77	15	93		0.4
28B24D	28SB24D	24		52	1.25	81	15	110		0.5
28B28D	28SB28D	28		45	1.25	81	15	110		0.5
28B48D	28SB48D	48		26	1.25	82	15	109		1
48B5D	48SB5D	5		150	0.75	71	3	44	0.2	0.25
48B9D	48SB9D	9		111	1	76	3	55		0.3
48B12D	48SB12D	12		83	1	82	3	51		0.4
48B15D	48SB15D	15		67	1	82	3	51		0.4
48B24D	48SB24D	24		52	1.25	84	3	62		0.5
48B28D	48SB28D	28		45	1.25	83	3	63		0.5

Note 1: Tested at nominal input voltage and full output load.

Note 3: A 22µF, 75V high quality tantalum capacitor is required across each output.

SPECIFICATIONS (Nominal V_{IN} , Full Load, $T_A = +25^{\circ}\text{C}$, 1 hour warm up unless otherwise specified)**INPUT**

Parameter	Condition	Min.	Typ.	Max.	Units
Input Voltage Range	5V input models	4	5	6.5	VDC
	12V input models	9	12	15	
	15V input models	12	15	18	
	24V input models	17	24	28	
	28V input models	21	28	32	
	48V input models	25	48	50	

OUTPUT

Parameter	Condition	Min.	Typ.	Max.	Units
Line Regulation	Output voltage is directly proportional to input voltage				

ENVIRONMENTAL

Parameter	Condition	Min.	Typ.	Max.	Units
Operating Temperature Range	Ambient without derating	-25	-	+70	$^{\circ}\text{C}$
Storage Temperature Range	Ambient	-55	-	+125	$^{\circ}\text{C}$
Temperature Coefficient		-	0.02	-	$\%/^{\circ}\text{C}$
Cooling	Free Air Convection				

GENERAL

Parameter	Condition	Min.	Typ.	Max.	Units
Isolation Voltage	Input to output	500	-	-	VDC
	OUT1 to OUT2	500	-	-	
Insulation Resistance		100	-	-	MΩ
Switching Frequency		20	-	40	kHz
Size (L x W x H)	Series B	1.12 x 0.7 x 0.3 (28.448 x 17.78 x 7.62)			inches (mm)
	Series SB	1.12 x 0.7 x 0.35 (28.448 x 17.78 x 8.89)			
Weight		-	8.5	-	grams
Case	Glass Reinforced Polymer				
Potting	Vacuum Impregnated Epoxy				
Tube Packaging (W x H x L)	1.03 x 0.74 x 20 (26.162 x 18.796 x 508)				inches (mm)
Moisture Sensitivity Level	Series SB	IPC / JEDEC J-STD-020, Level 3			

PROTECTIONS & FEATURES

Parameter	Condition	Min.	Typ.	Max.	Units
Short circuit	Temporary				

DESIGNED TO MEET

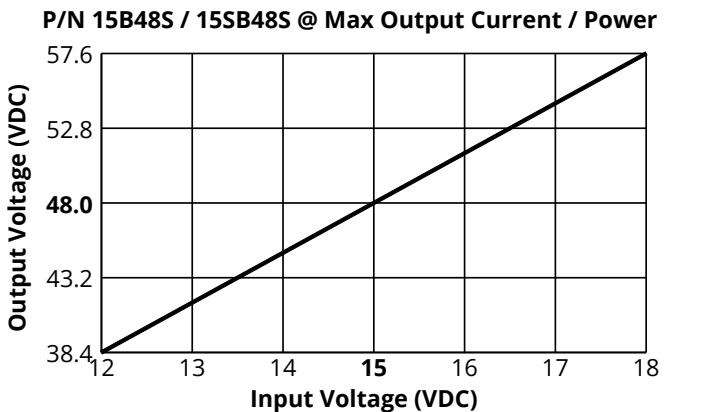
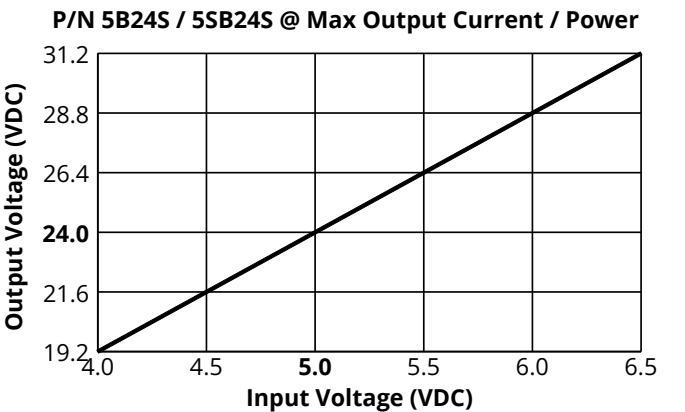
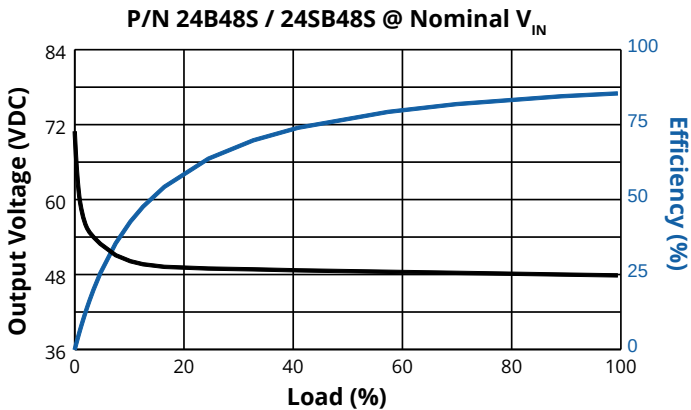
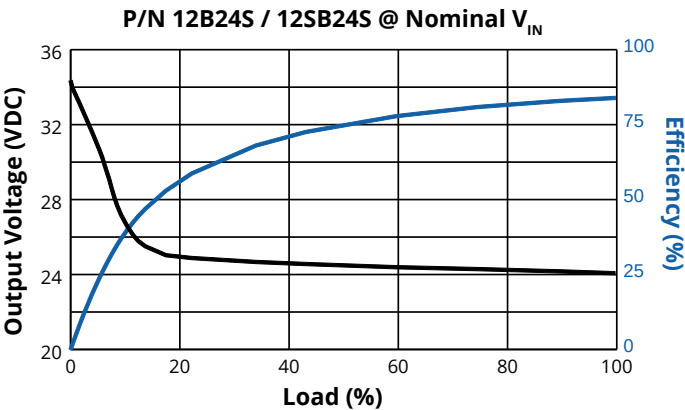
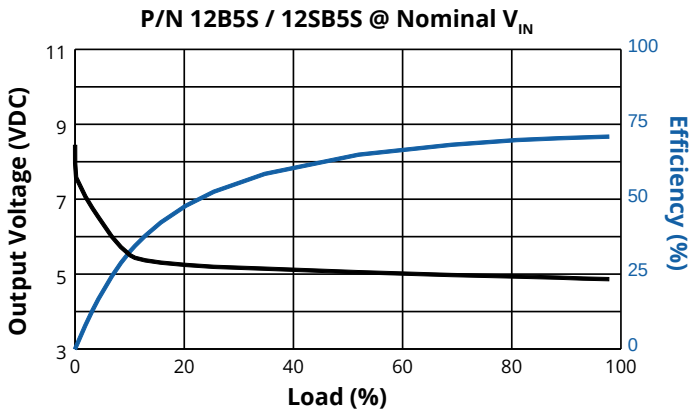
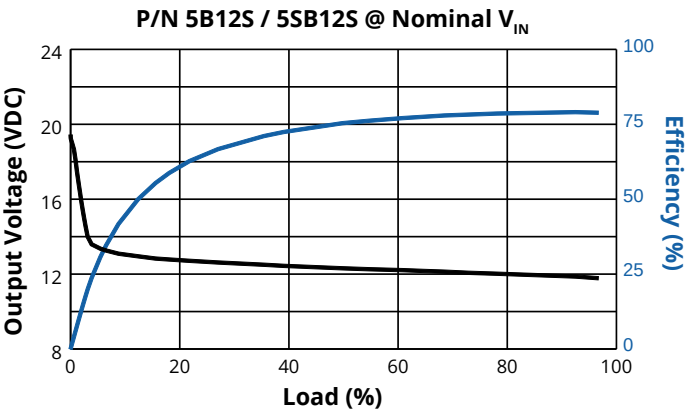
Test	Referenced Standard	Description
Vibration	MIL-STD-202	Method 204, Vibration, High Frequency, Condition D
Shock	MIL-STD-202	Method 213, Shock (Specified Pulse), Condition I
Humidity	MIL-STD-202	Method 106, Moisture Resistance
Altitude	MIL-STD-202	Method 105, Barometric Pressure (Reduced), Condition D

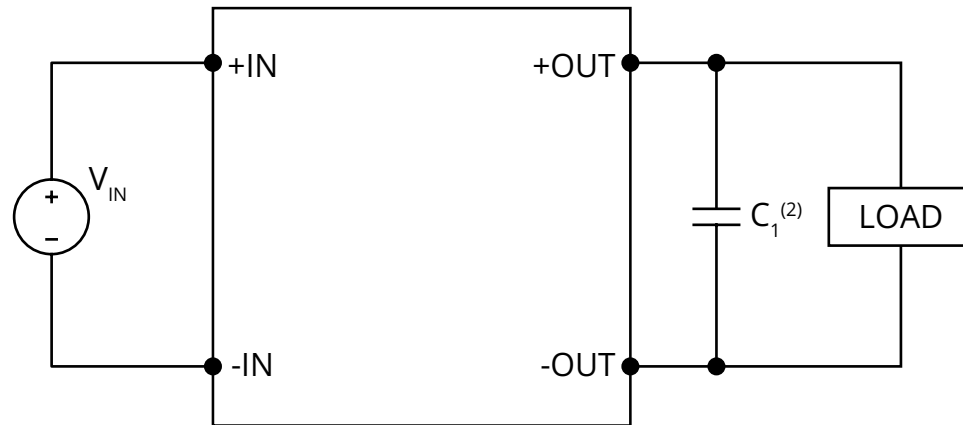
SPECIFICATIONS (Nominal V_{IN} , Full Load, $T_A = +25^{\circ}\text{C}$, 1 hour warm up unless otherwise specified)

OPTIONS AVAILABLE – CONTACT PICO FOR PART NUMBER

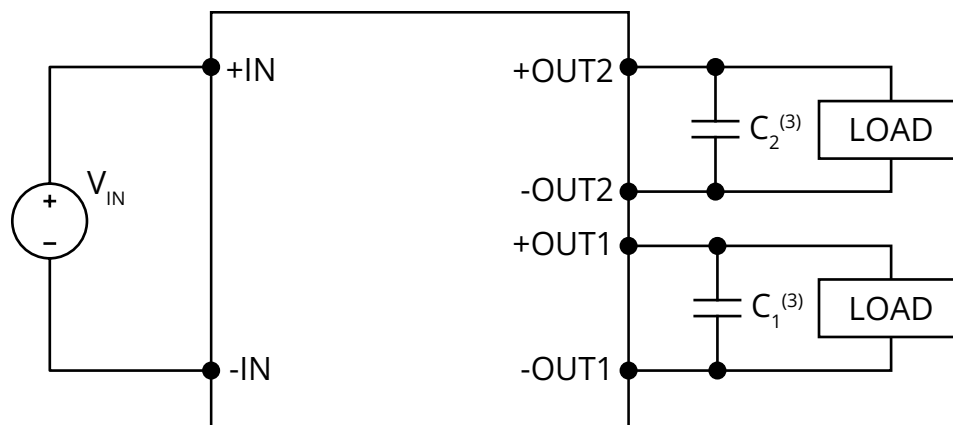
Parameter	Referenced Standard	Description
Stabilization Bake	MIL-STD-883	Referenced Method 1008 Non-operating maximum storage temperature for 24 hours
Temperature Cycle	MIL-STD-883	Referenced Method 1010 Non-operating at temperature extremes, 15 mins/temp, 10 cycles
Burn-In	MIL-STD-883	Referenced Method 1015 Max operating temperature for 160 hours
Expanded Ambient Operating Temperature		-55°C to $+85^{\circ}\text{C}$
RoHS Compliance		-

DATA CURVES (Nominal V_{IN} , $T_A = +25^{\circ}\text{C}$, 1 hour warm up unless otherwise specified)



TYPICAL CONNECTION CIRCUIT**SINGLE OUTPUTS**

Note 2: A 22 μ F, 75V high quality tantalum capacitor is required across the output.

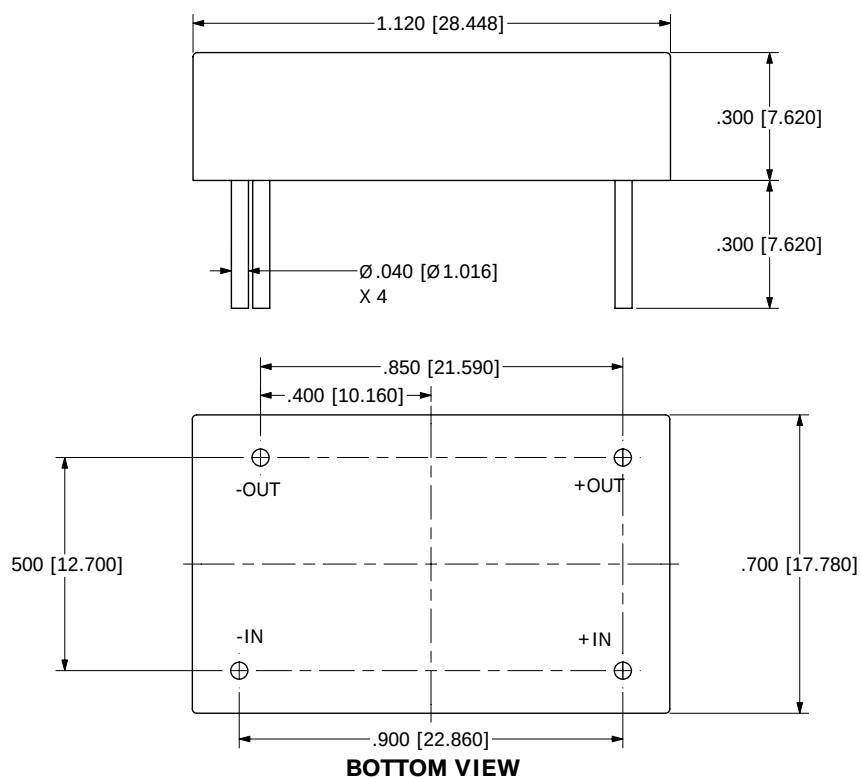
DUAL OUTPUTS

Note 3: 22 μ F, 75V high quality tantalum capacitor is required across each output.

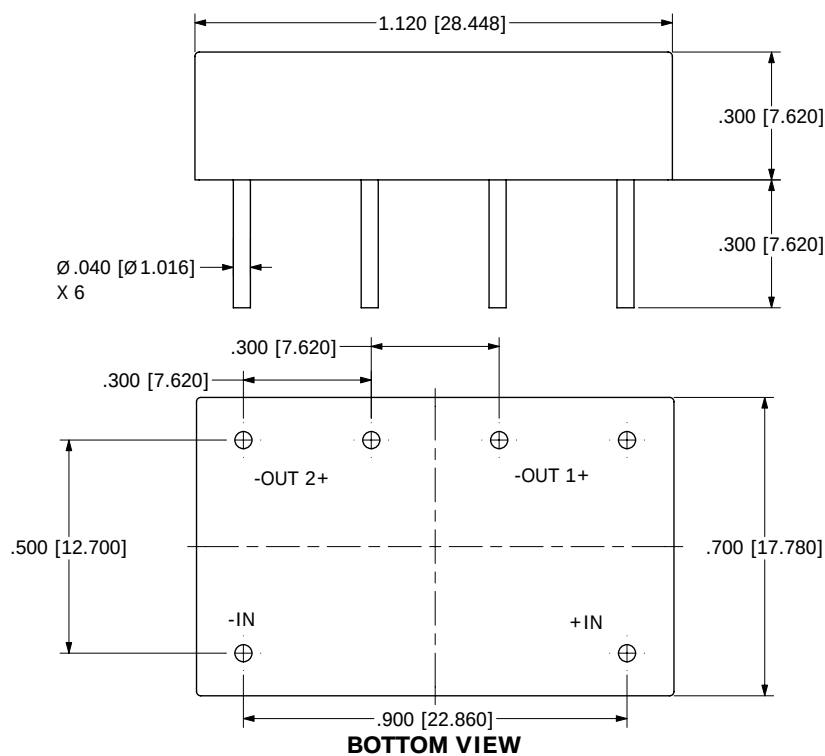
MECHANICAL DRAWINGS

SERIES B - THROUGH HOLE

SINGLE OUTPUTS



DUAL OUTPUTS



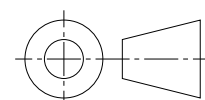
NOTES

a. ALL DIMENSIONS ARE IN INCHES, [] = MM

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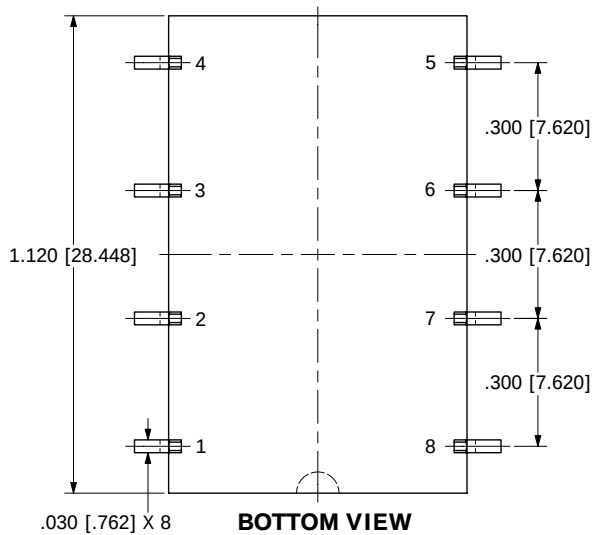
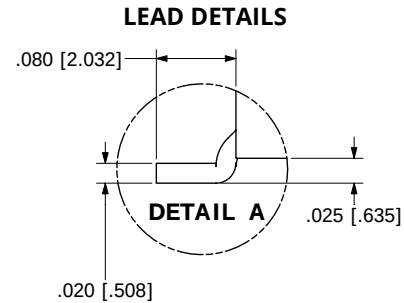
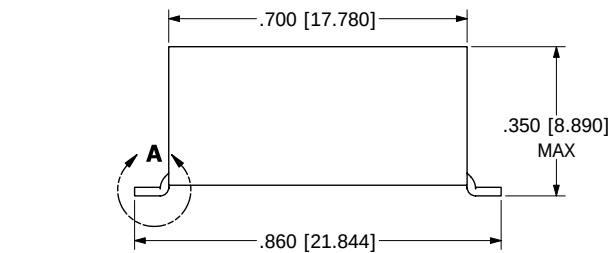
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MECHANICAL DRAWINGS

SERIES SB - SURFACE MOUNT

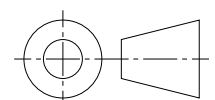
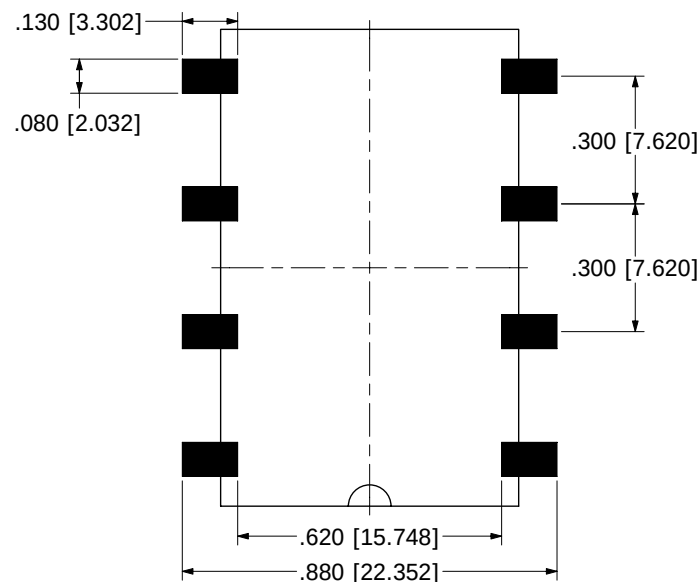


PIN	FUNCTION	
	SINGLE	DUAL
1	-IN	
2	N/C	
3	N/C	
4	+IN	
5	+OUT	+OUT1
6	-OUT	-OUT1
7	N/C	+OUT2
8	N/C	-OUT2

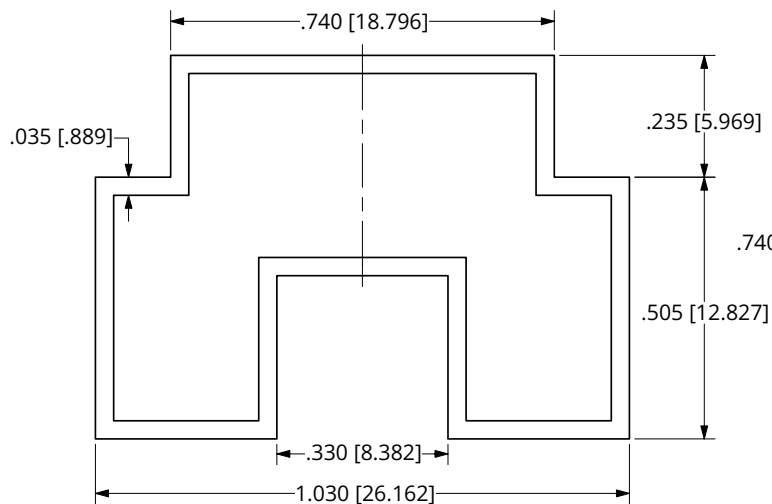
NOTES

a. ALL DIMENSIONS ARE IN INCHES, [] = MM

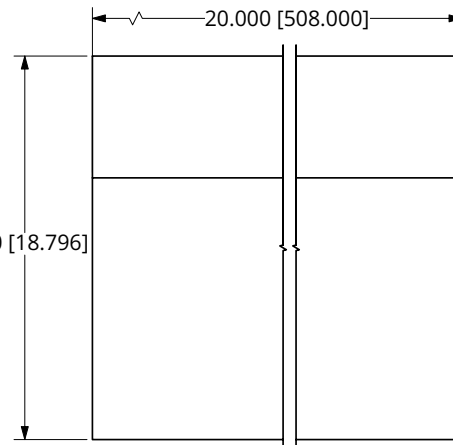
RECOMMENDED LAND PATTERN DIMENSIONS - SERIES SB



TUBE PACKAGING

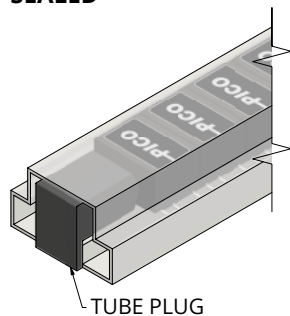


PLAN VIEW

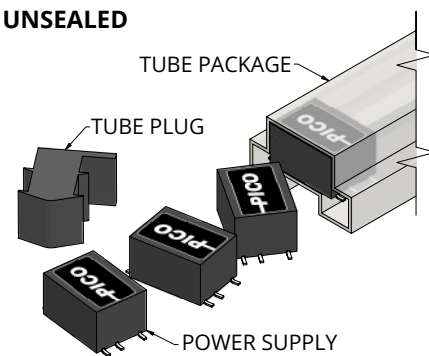


ELEVATION VIEW

SEALED



UNSEALED



Pico warrants each product manufactured by us and sold by us or an authorized representative, to be free from defects in material and workmanship. If properly used, it will perform within its applicable specifications for a period of one year after original shipment. Pico's obligation under this guarantee is limited to repairing or replacing our product to the original purchaser. This warranty is in lieu of all other warranties, express or implied and constitutes fulfillment of our obligations to the purchaser. We do not guarantee that the products can be used for a particular purpose other than those solely covered by the product's specifications. Pico must be notified if the product must meet particular certifications and/or standards. We assume no liability, in any event, for consequential damages, for anticipated or lost profits, incidental damages or loss of time or other losses incurred by the purchaser or any third party in connection with products covered by this warranty or otherwise. The purchaser will indemnify and hold Pico harmless for any damages, losses, costs, etc. from usage not within the product's specifications. Pico must be consulted before usage of its products in a nuclear, radioactive or space environment.

We reserve the right to discontinue products without notice, We reserve the right to make modifications to any existing catalog products without notice, at any time, without the obligation to modify units previously sold.

Series C & SC

4W Isolated Proportional Low Profile DC-DC Converter



PRODUCT OVERVIEW

The C & SC series are unregulated DC-DC converters in an ultra-miniature encapsulated package – 1.24" x 1.12" footprint and low profile - 0.3". Over 180 models are available in both single and dual outputs. They can operate over the temperature range of -25°C to +70°C without derating, a heat sink or active cooling.



FEATURES

- Up to 4W output at +70°C ambient
- Encapsulated semiconductors, conservatively rated for maximum reliability
- Ultra-miniature size – down to 0.300" height
- 5 to 48V input models
- Up to 48V output models
- 500VDC isolation at 100MΩ
- Input/output isolation
- Single and isolated dual output
- No heat sink or derating required

Contact Pico for part number of available options:

- Expanded operating temp: -55°C to +85°C
- Select screening per MIL-STD-883:
 - Stabilization Bake
 - Temperature Cycle
 - Burn-In
- Available RoHS Compliant module
- Special Input Voltage, Output Voltage, Isolation Voltage or Output Power

5	C	5	S
NOM. INPUT VOLTAGE	MOUNTING TYPE	NOM. OUTPUT VOLTAGE	NUMBER OF OUTPUTS
5 = 5V	B = THROUGH HOLE	3.3 = 3.3V	S = SINGLE
12 = 12V	SC = SURFACE MOUNT	5 = 5V	D = DUAL
15 = 15V		5.2 = 5.2V	
24 = 24V		9 = 9V	
28 = 28V		12 = 12V	
48 = 48V		15 = 15V	
		24 = 24V	
		28 = 28V	
		48 = 48V	

MODEL LIST - SINGLE OUTPUT

SERIES C - THROUGH HOLE



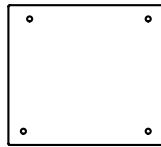
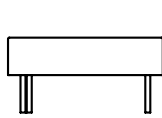
SERIES SC - SURFACE MOUNT



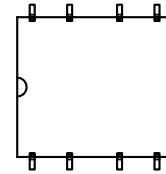
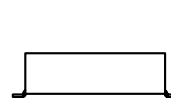
Through Hole	Surface Mount	Output Voltage [VDC]	Output Current		Output Power [W]	Efficiency ⁽¹⁾ [%] typ.	Input Current		Output Ripple ⁽²⁾ [Vp-p max]	Output Voltage Tolerance ⁽¹⁾ [±VDC]
			Min. [mA]	Max. [mA]			No Load [mA] typ.	Full Load [mA] typ.		
5C3.3S	5SC3.3S	3.3	0	758	2.5	60	90	833	0.2	0.2
5C5S	5SC5S	5		500	2.5	68		735		0.25
5C5.2S	5SC5.2S	5.2		481	2.5	68		735		0.25
5C9S	5SC9S	9		333	3	72	100	833	0.2	0.3
5C12S	5SC12S	12		250	3	75		800		0.4
5C15S	5SC15S	15		200	3	77		779		0.4
5C24S	5SC24S	24		125	3	76	120	789	0.15	0.5
5C28S	5SC28S	28		107	3	76		789		0.5
5C48S	5SC48S	48		63	3	76		789		1.0
12C3.3S	12SC3.3S	3.3		758	2.5	60	45	347	0.2	0.2
12C5S	12SC5S	5		500	2.5	67		311		0.25
12C5.2S	12SC5.2S	5.2		481	2.5	67		311		0.25
12C9S	12SC9S	9		333	3	75	40	333	0.2	0.3
12C12S	12SC12S	12		290	3.5	77		379		0.4
12C15S	12SC15S	15		266	4	84		396		0.4
12C24S	12SC24S	24		166	4	81	45	411	0.15	0.5
12C28S	12SC28S	28		143	4	82		407		0.5
12C48S	12SC48S	48		83	4	81		412		1.0
15C3.3S	15SC3.3S	3.3		758	2.5	60	38	278	0.2	0.2
15C5S	15SC5S	5		500	2.5	67		249		0.25
15C5.2S	15SC5.2S	5.2		481	2.5	67		249		0.25
15C9S	15SC9S	9		333	3	75	35	267	0.2	0.3
15C12S	15SC12S	12		290	3.5	77		303		0.4
15C15S	15SC15S	15		266	4	84		317		0.4
15C24S	15SC24S	24		166	4	81	38	329	0.15	0.5
15C28S	15SC28S	28		143	4	82		325		0.5
15C48S	15SC48S	48		83	4	81		329		1.0
24C3.3S	24SC3.3S	3.3		758	2.5	60	25	174	0.2	0.20
24C5S	24SC5S	5		500	2.5	67		155		0.25
24C5.2S	24SC5.2S	5.2		481	2.5	67		155		0.25
24C9S	24SC9S	9		333	3	73		171		0.3
24C12S	24SC12S	12		290	3.5	75		194		0.4
24C15S	24SC15S	15		235	3.5	79		184		0.4
24C24S	24SC24S	24		166	4	83		200		0.5
24C28S	24SC28S	28		143	4	83		201		0.5
24C48S	24SC48S	48		83	4	83		201		1.0

MODEL LIST - SINGLE OUTPUT

SERIES C - THROUGH HOLE



SERIES SC - SURFACE MOUNT



Through Hole	Surface Mount	Output Voltage [VDC]	Output Current		Output Power [W]	Efficiency ⁽¹⁾ [%] typ.	Input Current		Output Ripple ⁽²⁾ [Vp-p max]	Output Voltage Tolerance ⁽¹⁾ [±VDC]
			Min. [mA]	Max. [mA]			No Load [mA] typ.	Full Load [mA] typ.		
28C3.3S	28SC3.3S	3.3	0	758	2.5	60	25	149	0.2	0.20
28C5S	28SC5S	5		500	2.5	67		133		0.25
28C5.2S	28SC5.2S	5.2		481	2.5	67		133		0.25
28C9S	28SC9S	9		333	3	73		147		0.3
28C12S	28SC12S	12		290	3.5	75		167		0.4
28C15S	28SC15S	15		235	3.5	78		160		0.4
28C24S	28SC24S	24		166	4	82		174		0.5
28C28S	28SC28S	28		143	4	83		172		0.5
28C48S	28SC48S	48		83	4	83		172		1.0
48C3.3S	48SC3.3S	3.3		758	2.5	65	3	80	0.25	0.20
48C5S	48SC5S	5		500	2.5	75		69		0.25
48C5.2S	48SC5.2S	5.2		481	2.5	75		69		0.25
48C9S	48SC9S	9		333	3	76		82		0.3
48C12S	48SC12S	12		290	3.5	81		90		0.4
48C15S	48SC15S	15		235	3.5	81		90		0.4
48C24S	48SC24S	24		166	4	85		98		0.5
48C28S	48SC28S	28		143	4	83		100		0.5

Note 1: Tested at nominal input voltage and full output load.

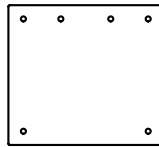
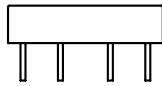
Note 2: A 22µF, 75V high quality tantalum capacitor is required across the output.

MODEL LIST - DUAL OUTPUT

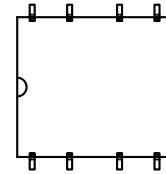
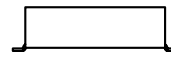
Through Hole	Surface Mount	Output Voltage Per Output [VDC]	Output Current Per Output		Output Power Per Output [W]	Efficiency ⁽¹⁾ [%] typ.	Input Current		Output Ripple Per Output ⁽³⁾ [Vp-p max]	Output Voltage Tolerance Per Output ⁽¹⁾ [±VDC]
			Min. [mA]	Max. [mA]			No Load [mA] typ.	Full Load [mA] typ.		
5C5D	5SC5D	5	0	250	1.25	71	90	704	0.2	0.25
5C9D	5SC9D	9		166	1.5	72	100	833	0.2	0.3
5C12D	5SC12D	12		125	1.5	75	100	800	0.2	0.4
5C15D	5SC15D	15		100	1.5	77	110	779	0.15	0.4
5C24D	5SC24D	24		62	1.5	78	120	769	0.15	0.5
5C28D	5SC28D	28		53	1.5	76	120	789	0.15	0.5
5C48D	5SC48D	48		31	1.5	76	120	789	0.15	1

MODEL LIST - DUAL OUTPUT

SERIES C - THROUGH HOLE



SERIES SC - SURFACE MOUNT



Through Hole	Surface Mount	Output Voltage Per Output [VDC]	Output Current Per Output		Output Power Per Output [W]	Efficiency ⁽¹⁾ [%] typ.	Input Current		Output Ripple Per Output ⁽³⁾ [Vp-p max]	Output Voltage Tolerance Per Output ⁽¹⁾ [±VDC]
			Min. [mA]	Max. [mA]			No Load [mA] typ.	Full Load [mA] typ.		
12C5D	12SC5D	5	0	250	1.25	69	45	302	0.2	0.25
12C9D	12SC9D	9		166	1.5	75		333		0.3
12C12D	12SC12D	12		145	1.75	80	40	364		0.4
12C15D	12SC15D	15		133	2	82		406	0.15	0.4
12C24D	12SC24D	24		83	2	83	45	401		0.5
12C28D	12SC28D	28		71	2	82		407		0.5
12C48D	12SC48D	48		41	2	81		412		1
15C5D	15SC5D	5		250	1.25	69	38	242	0.2	0.25
15C9D	15SC9D	9		166	1.5	75		267		0.3
15C12D	15SC12D	12		145	1.75	80	35	292	0.15	0.4
15C15D	15SC15D	15		133	2	82		325		0.4
15C24D	15SC24D	24		83	2	83	38	321		0.5
15C28D	15SC28D	28		71	2	82		325		0.5
15C48D	15SC48D	48		41	2	81		329		1
24C5D	24SC5D	5		250	1.25	67	30	155	0.2	0.25
24C9D	24SC9D	9		166	1.5	73		171		0.3
24C12D	24SC12D	12		145	1.75	78		186		0.4
24C15D	24SC15D	15		117	1.75	79	25	184		0.4
24C24D	24SC24D	24		83	2	82		203		0.5
24C28D	24SC28D	28		71	2	83		201		0.5
24C48D	24SC48D	48		41	2	83		201		1
28C5D	28SC5D	5		250	1.25	67	30	133	0.2	0.25
28C9D	28SC9D	9		166	1.5	73		147		0.3
28C12D	28SC12D	12		145	1.75	75		167		0.4
28C15D	28SC15D	15		117	1.75	78	25	160		0.4
28C24D	28SC24D	24		83	2	82		174		0.5
28C28D	28SC28D	28		71	2	83		172		0.5
28C48D	28SC48D	48		41	2	83		172		1
48C5D	48SC5D	5		250	1.25	74	3	70	0.25	0.25
48C9D	48SC9D	9		166	1.5	76		82		0.3
48C12D	48SC12D	12		145	1.75	82		89		0.4
48C15D	48SC15D	15		117	1.75	82		89		0.4
48C24D	48SC24D	24		83	2	85		98		0.5
48C28D	48SC28D	28		71	2	83		100		0.5

Note 1: Tested at nominal input voltage and full output load.

Note 3: A 22µF, 75V high quality tantalum capacitor is required across each output.

SPECIFICATIONS (Nominal V_{IN} , Full Load, $T_A = +25^{\circ}\text{C}$, 1 hour warm up unless otherwise specified)**INPUT**

Parameter	Condition	Min.	Typ.	Max.	Units
Input Voltage Range	5V input models	4	5	6.5	VDC
	12V input models	9	12	15	
	15V input models	12	15	18	
	24V input models	17	24	28	
	28V input models	21	28	32	
	48V input models	25	48	50	

OUTPUT

Parameter	Condition	Min.	Typ.	Max.	Units
Line Regulation	Output voltage is directly proportional to input voltage				

ENVIRONMENTAL

Parameter	Condition	Min.	Typ.	Max.	Units
Operating Temperature Range	Ambient without derating	-25	-	+70	$^{\circ}\text{C}$
Storage Temperature Range	Ambient	-55	-	+125	$^{\circ}\text{C}$
Temperature Coefficient		-	0.02	-	$\%/^{\circ}\text{C}$
Cooling	Free Air Convection				

GENERAL

Parameter	Condition	Min.	Typ.	Max.	Units
Isolation Voltage	Input to output	500	-	-	VDC
	OUT1 to OUT2	500	-	-	
Insulation Resistance		100	-	-	MΩ
Switching Frequency		20	-	40	kHz
Size (L x W x H)	Series C	1.24 x 1.12 x 0.3 (31.496 x 28.448 x 7.62)			inches (mm)
	Series SC	1.24 x 1.12 x 0.35 (31.496 x 28.448 x 8.89)			
Weight		-	14.5	-	grams
Case	Glass Reinforced Polymer				
Potting	Vacuum Impregnated Epoxy				
Tube Packaging (W x H x L)	1.545 x 0.65 x 20 (39.243 x 16.51x 508)				inches (mm)
Moisture Sensitivity Level	Series SC	IPC / JEDEC J-STD-020, Level 3			

PROTECTIONS & FEATURES

Parameter	Condition	Min.	Typ.	Max.	Units
Short circuit	Temporary				

DESIGNED TO MEET

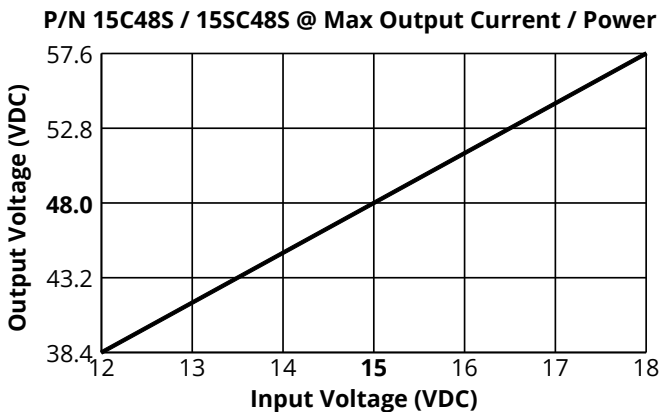
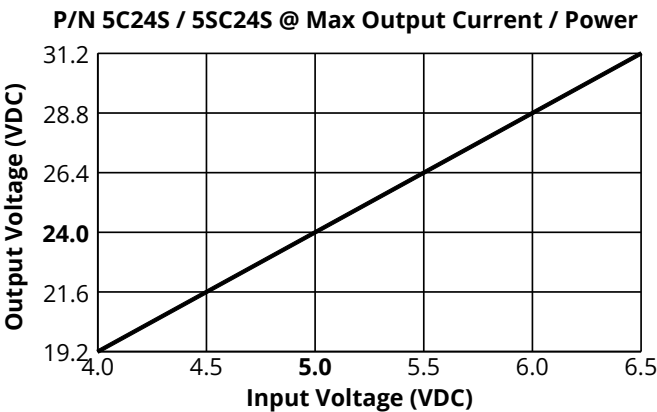
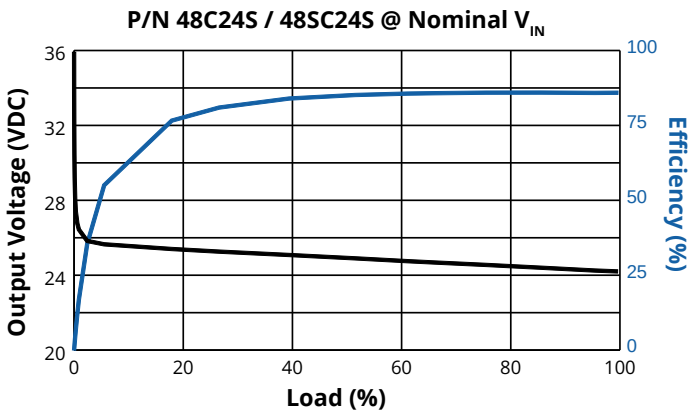
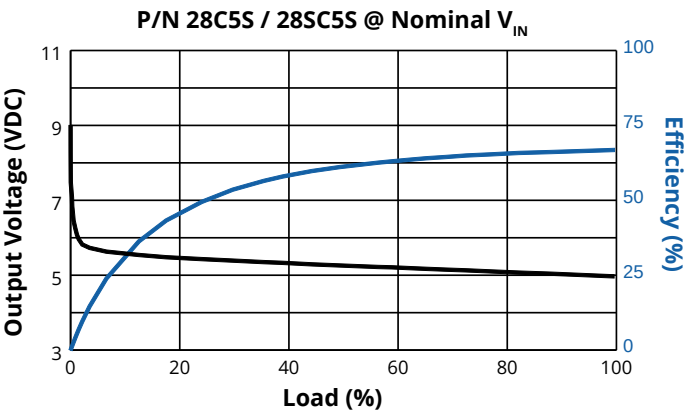
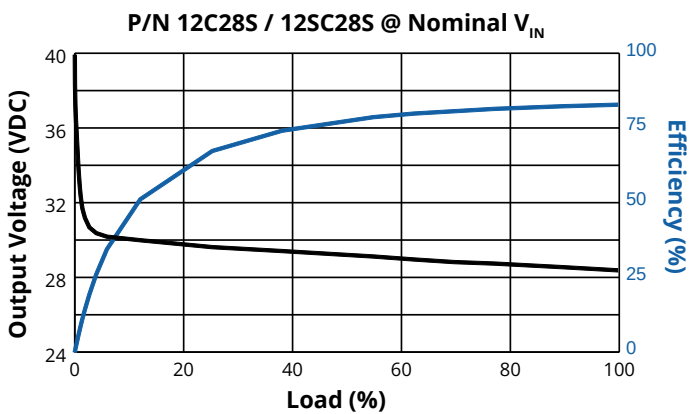
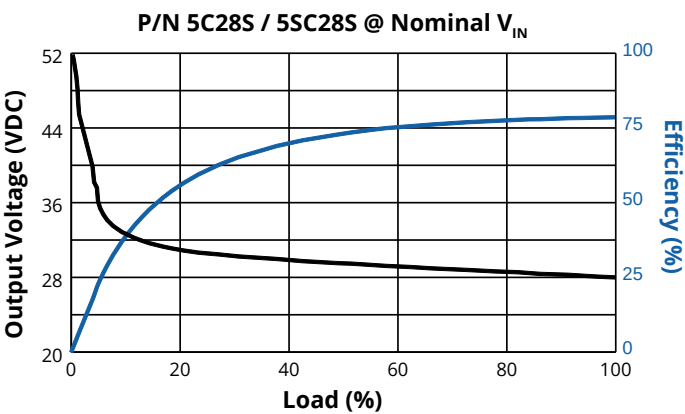
Test	Referenced Standard	Description
Vibration	MIL-STD-202	Method 204, Vibration, High Frequency, Condition D
Shock	MIL-STD-202	Method 213, Shock (Specified Pulse), Condition I
Humidity	MIL-STD-202	Method 106, Moisture Resistance
Altitude	MIL-STD-202	Method 105, Barometric Pressure (Reduced), Condition D

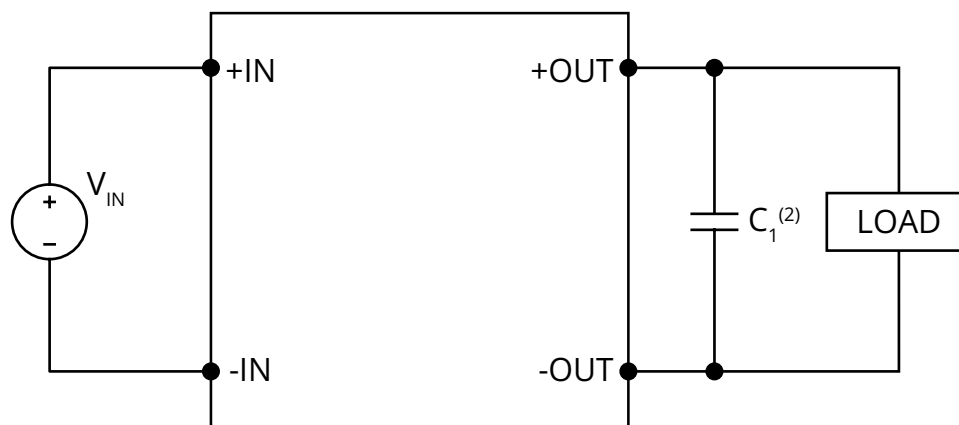
SPECIFICATIONS (Nominal V_{IN} , Full Load, $T_A = +25^{\circ}\text{C}$, 1 hour warm up unless otherwise specified)

OPTIONS AVAILABLE – CONTACT PICO FOR PART NUMBER

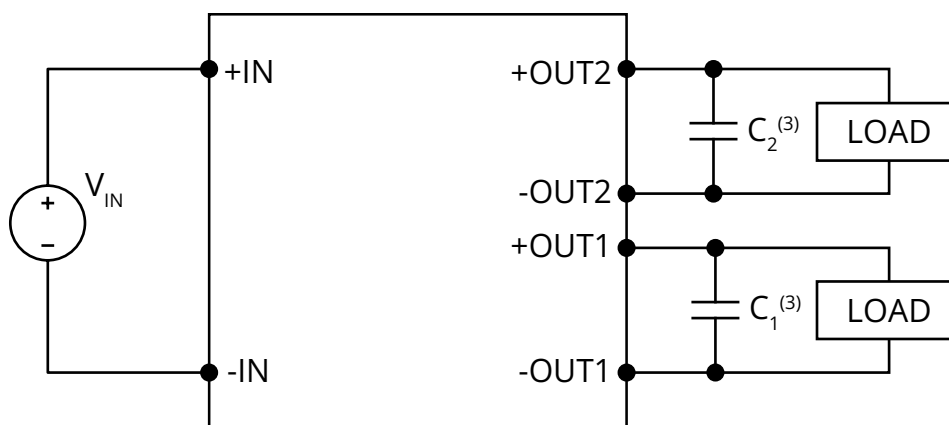
Parameter	Referenced Standard	Description
Stabilization Bake	MIL-STD-883	Referenced Method 1008 Non-operating maximum storage temperature for 24 hours
Temperature Cycle	MIL-STD-883	Referenced Method 1010 Non-operating at temperature extremes, 15 mins/temp, 10 cycles
Burn-In	MIL-STD-883	Referenced Method 1015 Max operating temperature for 160 hours
Expanded Ambient Operating Temperature		-55°C to $+85^{\circ}\text{C}$
RoHS Compliance		-

DATA CURVES (Nominal V_{IN} , $T_A = +25^{\circ}\text{C}$, 1 hour warm up unless otherwise specified)



TYPICAL CONNECTION CIRCUIT**SINGLE OUTPUTS**

Note 2: A 22 μ F, 75V high quality tantalum capacitor is required across the output.

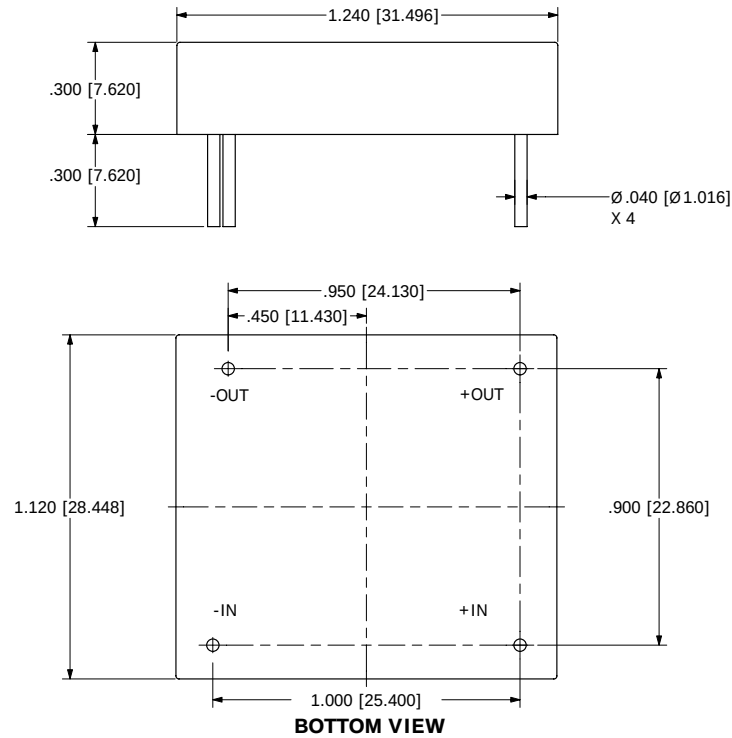
DUAL OUTPUTS

Note 3: 22 μ F, 75V high quality tantalum capacitor is required across each output.

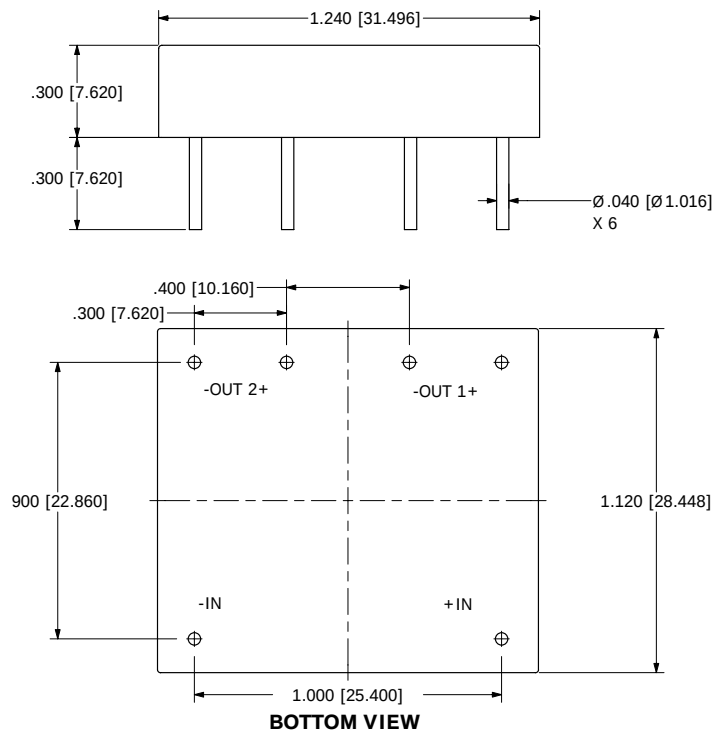
MECHANICAL DRAWINGS

SERIES C - THROUGH HOLE

SINGLE OUTPUTS



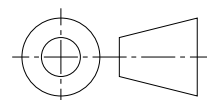
DUAL OUTPUTS



NOTES

a. ALL DIMENSIONS ARE IN INCHES, [] = MM

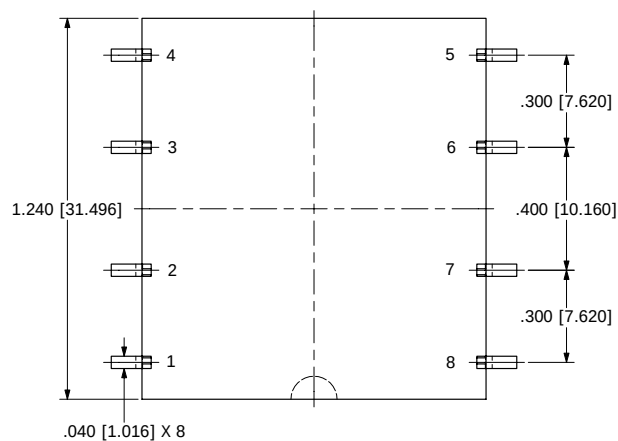
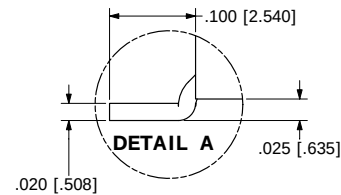
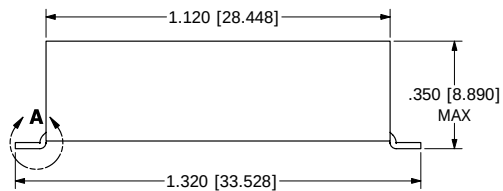
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MECHANICAL DRAWINGS

SERIES SC - SURFACE MOUNT

LEAD DETAILS



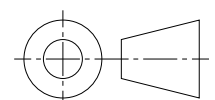
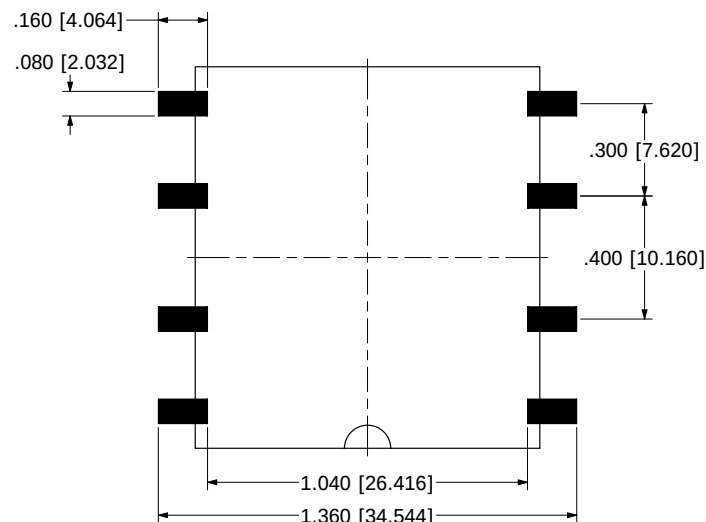
PIN	FUNCTION	
	SINGLE	DUAL
1	-IN	
2	N/C	
3	N/C	
4	+IN	
5	+OUT	+OUT1
6	-OUT	-OUT1
7	N/C	+OUT2
8	N/C	-OUT2

BOTTOM VIEW

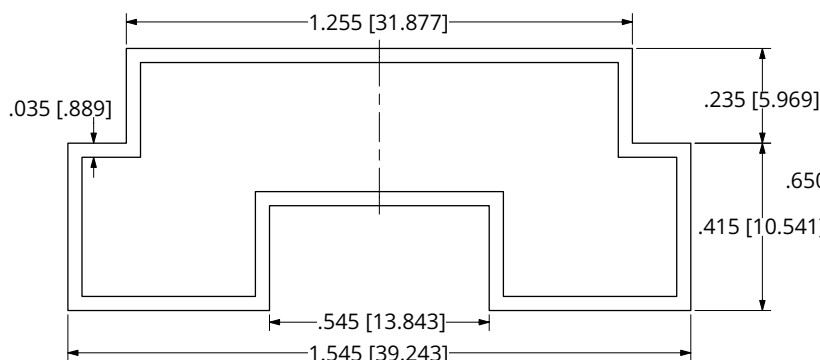
NOTES

a. ALL DIMENSIONS ARE IN INCHES, [] = MM

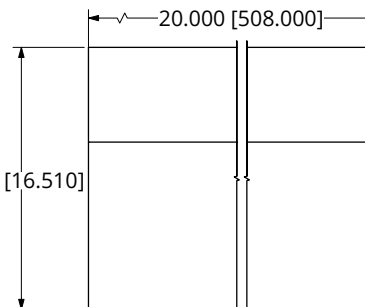
RECOMMENDED LAND PATTERN DIMENSIONS - SERIES SC



TUBE PACKAGING

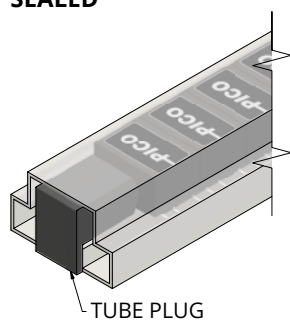


PLAN VIEW

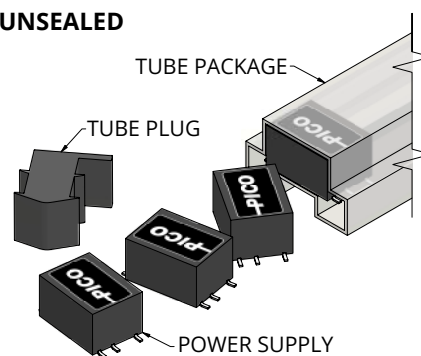


ELEVATION VIEW

SEALED



UNSEALED



Pico warrants each product manufactured by us and sold by us or an authorized representative, to be free from defects in material and workmanship. If properly used, it will perform within its applicable specifications for a period of one year after original shipment. Pico's obligation under this guarantee is limited to repairing or replacing our product to the original purchaser. This warranty is in lieu of all other warranties, express or implied and constitutes fulfillment of our obligations to the purchaser. We do not guarantee that the products can be used for a particular purpose other than those solely covered by the product's specifications. Pico must be notified if the product must meet particular certifications and/or standards. We assume no liability, in any event, for consequential damages, for anticipated or lost profits, incidental damages or loss of time or other losses incurred by the purchaser or any third party in connection with products covered by this warranty or otherwise. The purchaser will indemnify and hold Pico harmless for any damages, losses, costs, etc. from usage not within the product's specifications. Pico must be consulted before usage of its products in a nuclear, radioactive or space environment.

We reserve the right to discontinue products without notice, We reserve the right to make modifications to any existing catalog products without notice, at any time, without the obligation to modify units previously sold.

Series E & SE

7W Isolated Proportional Low Profile DC-DC Converter



PRODUCT OVERVIEW

The E & SE series are unregulated DC-DC converters in an ultra-miniature encapsulated package – 1.43" x 1.24" (single) or 2" x 1.12" (dual) footprint and low profile - 0.4". Over 180 models are available in both single and dual outputs. They can operate over the temperature range of -25°C to +70°C without derating, a heat sink or active cooling.



FEATURES

- Up to 7W output at +70°C ambient
- Encapsulated semiconductors, conservatively rated for maximum reliability
- Ultra-miniature size – down to 0.400" height
- 5 to 48V input models
- Up to 48V output models
- 500VDC isolation at 100MΩ
- Input/output isolation
- Single and isolated dual output
- No heat sink or derating required

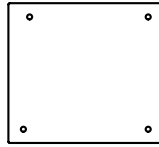
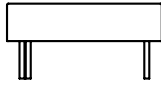
Contact Pico for part number of available options:

- Expanded operating temp: -55°C to +85°C
- Select screening per MIL-STD-883:
 - Stabilization Bake
 - Temperature Cycle
 - Burn-In
- Available RoHS Compliant module
- Special Input Voltage, Output Voltage, Isolation Voltage or Output Power

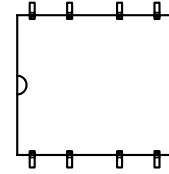
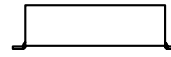
5	E	5	S
NOM. INPUT VOLTAGE	MOUNTING TYPE	NOM. OUTPUT VOLTAGE	NUMBER OF OUTPUTS
5 = 5V	B = THROUGH HOLE	3.3 = 3.3V	S = SINGLE
12 = 12V	SE = SURFACE MOUNT	5 = 5V	D = DUAL
15 = 15V		5.2 = 5.2V	
24 = 24V		9 = 9V	
28 = 28V		12 = 12V	
48 = 48V		15 = 15V	
		24 = 24V	
		28 = 28V	
		48 = 48V	

MODEL LIST - SINGLE OUTPUT

SERIES E - THROUGH HOLE



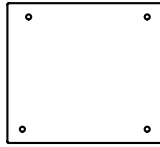
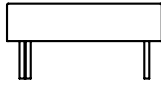
SERIES SE - SURFACE MOUNT



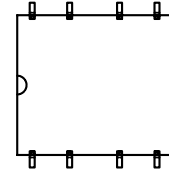
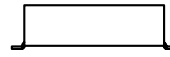
Through Hole	Surface Mount	Output Voltage [VDC]	Output Current		Output Power [W]	Efficiency ⁽¹⁾ [%] typ.	Input Current		Output Ripple [Vp-p max]	Output Voltage Tolerance ⁽¹⁾ [±VDC]
			Min. [mA]	Max. [mA]			No Load [mA] typ.	Full Load [mA] typ.		
5E3.3S	5SE3.3S	3.3	0	1061	3.5	60	150	1167	0.3	0.2
5E5S	5SE5S	5		800	4	68	140	1176	0.3	0.25
5E5.2S	5SE5.2S	5.2		769	4	68	140	1176	0.3	0.25
5E9S	5SE9S	9		500	4.5	73	200	1233	0.3	0.3
5E12S	5SE12S	12		375	4.5	75	200	1200	0.25	0.4
5E15S	5SE15S	15		300	4.5	78	190	1154	0.25	0.4
5E24S	5SE24S	24		187	4.5	80	190	1125	0.25	0.5
5E28S	5SE28S	28		161	4.5	79	190	1139	0.25	0.5
5E48S	5SE48S	48		93	4.5	80	190	1125	0.25	1.0
12E3.3S	12SE3.3S	3.3		1061	3.5	65	40	449	0.3	0.2
12E5S	12SE5S	5		800	4	73	40	456	0.3	0.25
12E5.2S	12SE5.2S	5.2		769	4	73	40	456	0.3	0.25
12E9S	12SE9S	9		666	6	80	45	625	0.3	0.3
12E12S	12SE12S	12		541	6.5	82	45	660	0.25	0.4
12E15S	12SE15S	15		433	6.5	83	40	652	0.25	0.4
12E24S	12SE24S	24		281	6.75	86	40	654	0.25	0.5
12E28S	12SE28S	28		241	6.75	86	40	654	0.25	0.5
12E48S	12SE48S	48		141	6.75	86	40	654	0.25	1.0
15E3.3S	15SE3.3S	3.3		1061	3.5	65	35	359	0.3	0.2
15E5S	15SE5S	5		800	4	73	35	365	0.3	0.25
15E5.2S	15SE5.2S	5.2		769	4	73	35	365	0.3	0.25
15E9S	15SE9S	9		666	6	80	38	500	0.3	0.3
15E12S	15SE12S	12		541	6.5	82	38	528	0.25	0.4
15E15S	15SE15S	15		433	6.5	83	35	522	0.25	0.4
15E24S	15SE24S	24		281	6.75	86	35	523	0.25	0.5
15E28S	15SE28S	28		241	6.75	86	35	523	0.25	0.5
15E48S	15SE48S	48		141	6.75	86	35	523	0.25	1.0
24E3.3S	24SE3.3S	3.3		1061	3.5	61	22	239	0.3	0.2
24E5S	24SE5S	5		800	4	69	22	241	0.3	0.25
24E5.2S	24SE5.2S	5.2		769	4	69	22	214	0.3	0.25
24E9S	24SE9S	9		666	6	79	22	316	0.3	0.3
24E12S	24SE12S	12		541	6.5	81	22	334	0.25	0.4
24E15S	24SE15S	15		433	6.5	82	22	330	0.25	0.4
24E24S	24SE24S	24		291	7	88	17	331	0.25	0.5
24E28S	24SE28S	28		250	7	88	17	331	0.25	0.5
24E48S	24SE48S	48		146	7	88	17	331	0.25	1.0

MODEL LIST - SINGLE OUTPUT

SERIES E - THROUGH HOLE



SERIES SE - SURFACE MOUNT

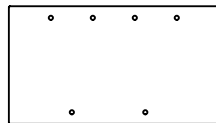
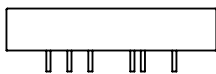


Through Hole	Surface Mount	Output Voltage [VDC]	Output Current		Output Power [W]	Efficiency ⁽¹⁾ [%] typ.	Input Current		Output Ripple [Vp-p] max	Output Voltage Tolerance ⁽¹⁾ [±VDC]
			Min. [mA]	Max. [mA]			No Load [mA] typ.	Full Load [mA] typ.		
28E3.3S	28SE3.3S	3.3	0	1061	3.5	61	22	205	0.3	0.2
28E5S	28SE5S	5		800	4	69	22	207	0.3	0.25
28E5.2S	28SE5.2S	5.2		769	4	69	22	207	0.3	0.25
28E9S	28SE9S	9		666	6	80	22	268	0.3	0.3
28E12S	28SE12S	12		541	6.5	80	22	290	0.25	0.4
28E15S	28SE15S	15		433	6.5	82	22	283	0.25	0.4
28E24S	28SE24S	24		291	7	88	22	284	0.25	0.5
28E28S	28SE28S	28		250	7	88	20	284	0.25	0.5
28E48S	28SE48S	48		146	7	88	20	284	0.25	1.0
48E3.3S	48SE3.3S	3.3		1061	3.5	67	6	109	0.3	0.2
48E5S	48SE5S	5		800	4	75	6	111	0.3	0.25
48E5.2S	48SE5.2S	5.2		769	4	75	6	111	0.3	0.25
48E9S	48SE9S	9		666	6	80	6	156	0.3	0.3
48E12S	48SE12S	12		541	6.5	84	6	161	0.3	0.4
48E15S	48SE15S	15		433	6.5	84	6	161	0.3	0.4
48E24S	48SE24S	24		291	7	89	6	164	0.3	0.5
48E28S	48SE28S	28		250	7	89	6	164	0.3	0.5

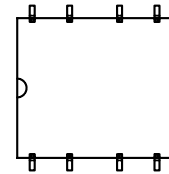
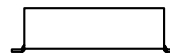
Note 1: Tested at nominal input voltage and full output load.

MODEL LIST - DUAL OUTPUT

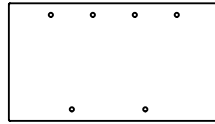
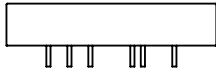
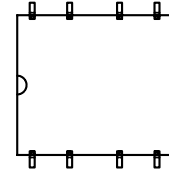
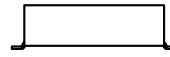
SERIES E - THROUGH HOLE



SERIES SE - SURFACE MOUNT



Through Hole	Surface Mount	Output Voltage Per Output [VDC]	Output Current Per Output		Output Power Per Output [W]	Efficiency ⁽¹⁾ [%] typ.	Input Current		Output Ripple Per Output [Vp-p] max	Output Voltage Tolerance Per Output ⁽¹⁾ [±VDC]
			Min. [mA]	Max. [mA]			No Load [mA] typ.	Full Load [mA] typ.		
5E5D	5SE5D	5	0	400	2	68	200	1176	0.3	0.25
5E9D	5SE9D	9		250	2.25	74	200	1216	0.3	0.3
5E12D	5SE12D	12		187	2.25	77	220	1168	0.25	0.4
5E15D	5SE15D	15		150	2.25	79	200	1139	0.25	0.4
5E24D	5SE24D	24		93	2.25	80	200	1125	0.25	0.5
5E28D	5SE28D	28		80	2.25	80	200	1139	0.25	0.5
5E48D	5SE48D	48		46	2.25	80	200	1125	0.25	1

MODEL LIST - DUAL OUTPUT**SERIES E - THROUGH HOLE****SERIES SE - SURFACE MOUNT**

Through Hole	Surface Mount	Output Voltage Per Output [VDC]	Output Current Per Output		Output Power Per Output [W]	Efficiency ⁽¹⁾ [%] typ.	Input Current		Output Ripple Per Output [Vp-p max]	Output Voltage Tolerance Per Output ⁽¹⁾ [±VDC]
			Min. [mA]	Max. [mA]			No Load [mA] typ.	Full Load [mA] typ.		
12E5D	12SE5D	5	0	400	2	75	40	444	0.3	0.25
12E9D	12SE9D	9		333	3	80	40	625	0.3	0.3
12E12D	12SE12D	12		270	3.25	83	40	652	0.25	0.4
12E15D	12SE15D	15		217	3.25	85	40	637	0.25	0.4
12E24D	12SE24D	24		140	3.375	86	40	654	0.25	0.5
12E28D	12SE28D	28		121	3.375	86	40	654	0.25	0.5
12E48D	12SE48D	48		70	3.375	88	40	654	0.25	1
15E5D	15SE5D	5		400	2	75	35	356	0.3	0.25
15E9D	15SE9D	9		333	3	80	35	500	0.3	0.3
15E12D	15SE12D	12		270	3.25	83	35	528	0.25	0.4
15E15D	15SE15D	15		217	3.25	85	35	522	0.25	0.4
15E24D	15SE24D	24		140	3.375	86	35	523	0.25	0.5
15E28D	15SE28D	28		121	3.375	86	35	523	0.25	0.5
15E48D	15SE48D	48		70	3.375	86	35	523	0.25	1
24E5D	24SE5D	5		400	2	72	22	231	0.3	0.25
24E9D	24SE9D	9		333	3	79	22	316	0.3	0.3
24E12D	24SE12D	12		270	3.25	82	22	330	0.25	0.4
24E15D	24SE15D	15		217	3.25	85	22	318	0.25	0.4
24E24D	24SE24D	24		145	3.5	88	18	331	0.25	0.5
24E28D	24SE28D	28		125	3.5	88	18	331	0.25	0.5
24E48D	24SE48D	48		73	3.5	88	18	331	0.25	1
28E5D	28SE5D	5		400	2	69	25	207	0.3	0.25
28E9D	28SE9D	9		333	3	80	25	268	0.3	0.3
28E12D	28SE12D	12		270	3.25	80	22	290	0.25	0.4
28E15D	28SE15D	15		217	3.25	82	22	283	0.25	0.4
28E24D	28SE24D	24		145	3.5	88	20	284	0.25	0.5
28E28D	28SE28D	28		125	3.5	88	20	284	0.25	0.5
28E48D	28SE48D	48		73	3.5	88	20	284	0.25	1
48E5D	48SE5D	5		400	2	74	6	113	0.3	0.25
48E9D	48SE9D	9		333	3	80	6	156	0.3	0.3
48E12D	48SE12D	12		270	3.25	85	6	160	0.3	0.4
48E15D	48SE15D	15		217	3.25	85	6	160	0.3	0.4
48E24D	48SE24D	24		145	3.5	88	6	166	0.3	0.5
48E28D	48SE28D	28		125	3.5	89	6	164	0.3	0.5

Note 1: Tested at nominal input voltage and full output load.

SPECIFICATIONS (Nominal V_{IN} , Full Load, $T_A = +25^{\circ}\text{C}$, 1 hour warm up unless otherwise specified)**INPUT**

Parameter	Condition	Min.	Typ.	Max.	Units
Input Voltage Range	5V input models	4	5	6.5	VDC
	12V input models	9	12	15	
	15V input models	12	15	18	
	24V input models	17	24	28	
	28V input models	21	28	32	
	48V input models	25	48	50	

OUTPUT

Parameter	Condition	Min.	Typ.	Max.	Units
Line Regulation	Output voltage is directly proportional to input voltage				

ENVIRONMENTAL

Parameter	Condition	Min.	Typ.	Max.	Units
Operating Temperature Range	Ambient without derating	-25	-	+70	$^{\circ}\text{C}$
Storage Temperature Range	Ambient	-55	-	+125	$^{\circ}\text{C}$
Temperature Coefficient		-	0.02	-	$\%/^{\circ}\text{C}$
Cooling	Free Air Convection				

GENERAL

Parameter	Condition	Min.	Typ.	Max.	Units
Isolation Voltage	Input to output	500	-	-	VDC
	OUT1 to OUT2	500	-	-	
Insulation Resistance		100	-	-	MΩ
Switching Frequency		20	-	40	kHz
Size (L x W x H)	Series E - single output models	1.43 x 1.24 x 0.4 (36.322 x 31.496 x 10.16)			inches (mm)
	Series E - dual output models	2 x 1.12 x 0.4 (50.8 x 28.448 x 10.16)			
	Series SE	1.43 x 1.24 x 0.43 (31.496 x 31.496 x 10.922)			
Weight	All other models	-	25	-	grams
	Series E - dual output models	-	33	-	
Case	Glass Reinforced Polymer				
Potting	Vacuum Impregnated Epoxy				
Tube Packaging (W x H x L)	1.645 x 0.74 x 20 (41.783 x 18.796 x 508)				inches (mm)
Moisture Sensitivity Level	Series SE	IPC / JEDEC J-STD-020, Level 3			

PROTECTIONS & FEATURES

Parameter	Condition	Min.	Typ.	Max.	Units
Short circuit	Temporary				

DESIGNED TO MEET

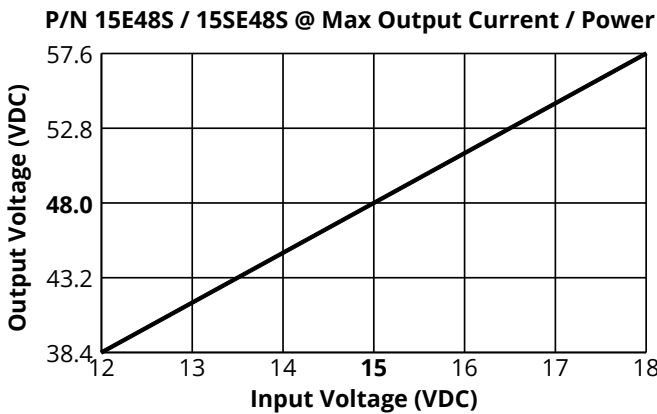
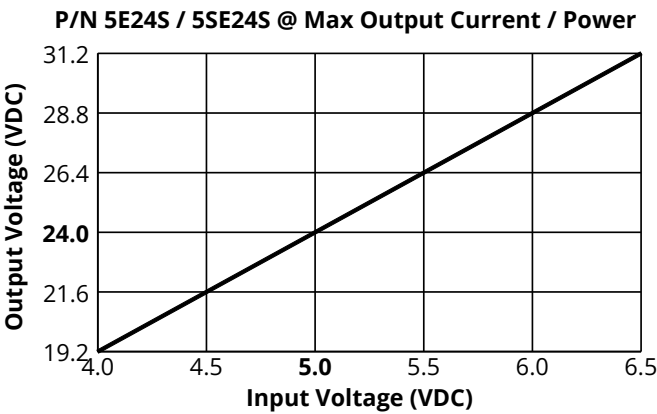
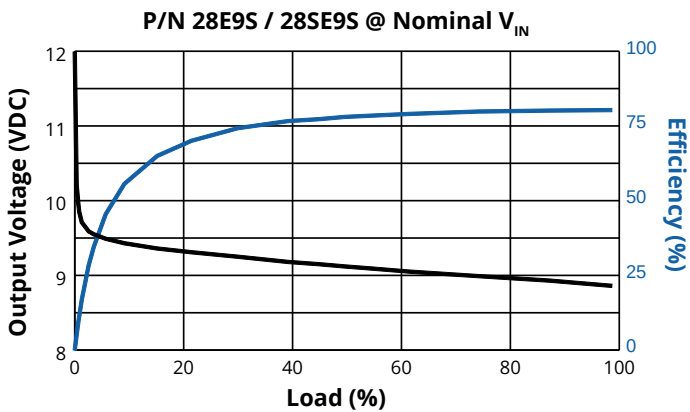
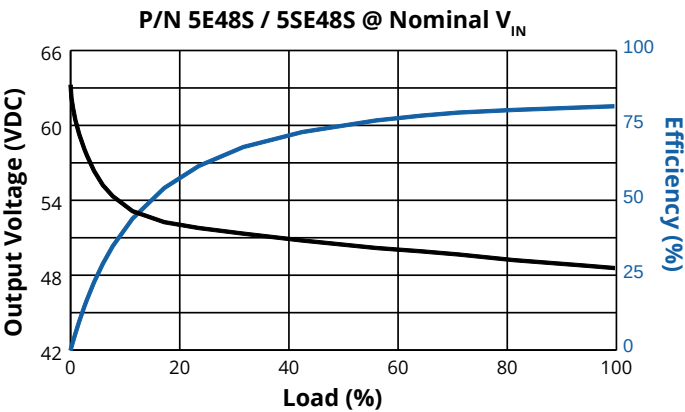
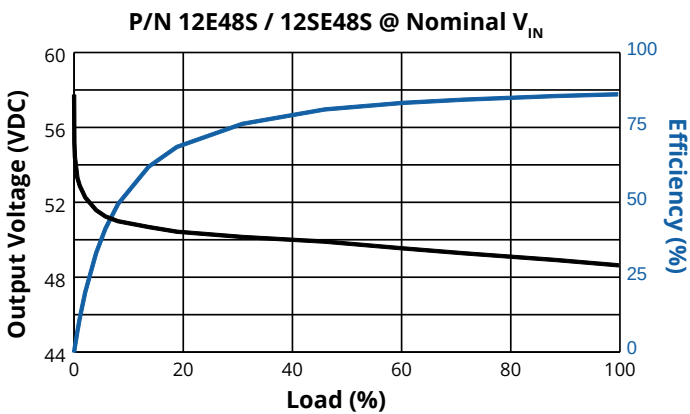
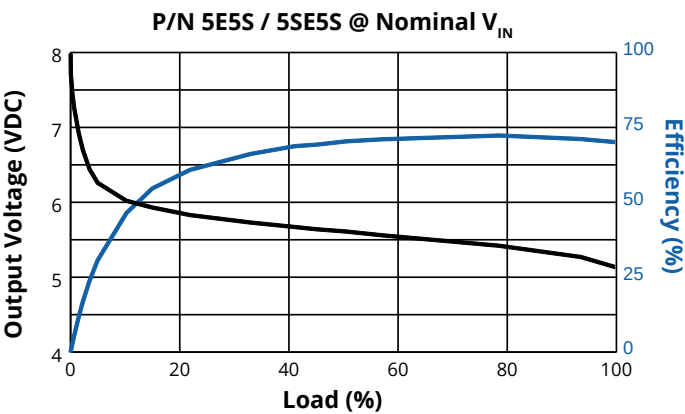
Test	Referenced Standard	Description
Vibration	MIL-STD-202	Method 204, Vibration, High Frequency, Condition D
Shock	MIL-STD-202	Method 213, Shock (Specified Pulse), Condition I
Humidity	MIL-STD-202	Method 106, Moisture Resistance
Altitude	MIL-STD-202	Method 105, Barometric Pressure (Reduced), Condition D

SPECIFICATIONS (Nominal V_{IN} , Full Load, $T_A = +25^{\circ}\text{C}$, 1 hour warm up unless otherwise specified)

OPTIONS AVAILABLE – CONTACT PICO FOR PART NUMBER

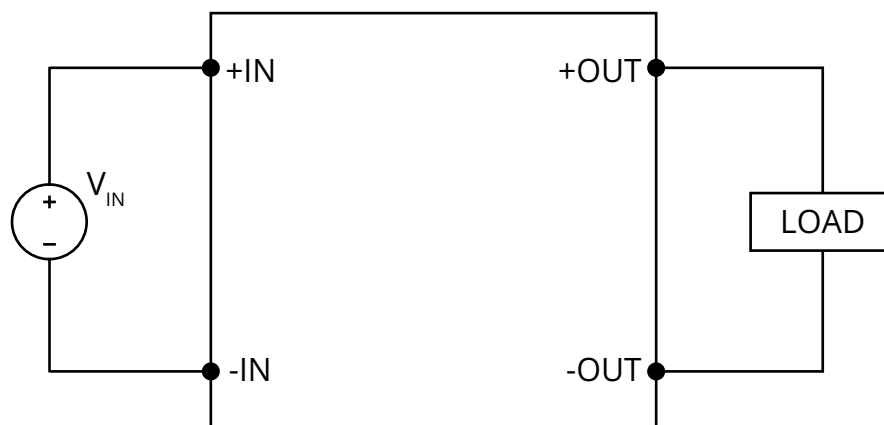
Parameter	Referenced Standard	Description
Stabilization Bake	MIL-STD-883	Referenced Method 1008 Non-operating maximum storage temperature for 24 hours
Temperature Cycle	MIL-STD-883	Referenced Method 1010 Non-operating at temperature extremes, 15 mins/temp, 10 cycles
Burn-In	MIL-STD-883	Referenced Method 1015 Max operating temperature for 160 hours
Expanded Ambient Operating Temperature		-55°C to $+85^{\circ}\text{C}$
RoHS Compliance		-

DATA CURVES (Nominal V_{IN} , $T_A = +25^{\circ}\text{C}$, 1 hour warm up unless otherwise specified)

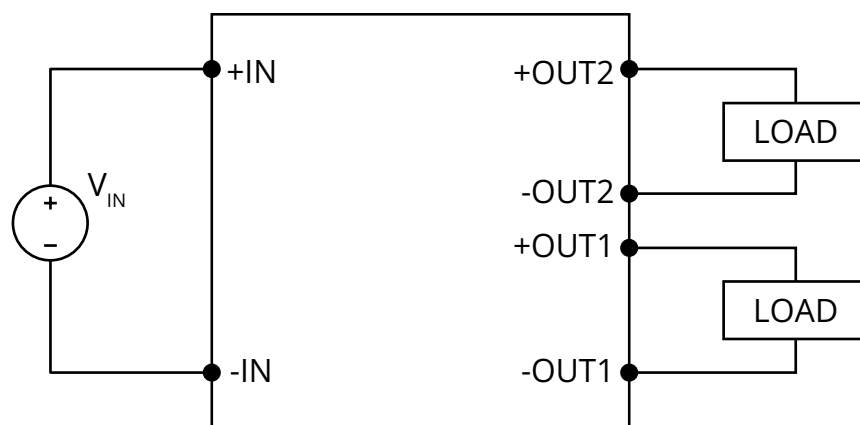


TYPICAL CONNECTION CIRCUIT

SINGLE OUTPUTS



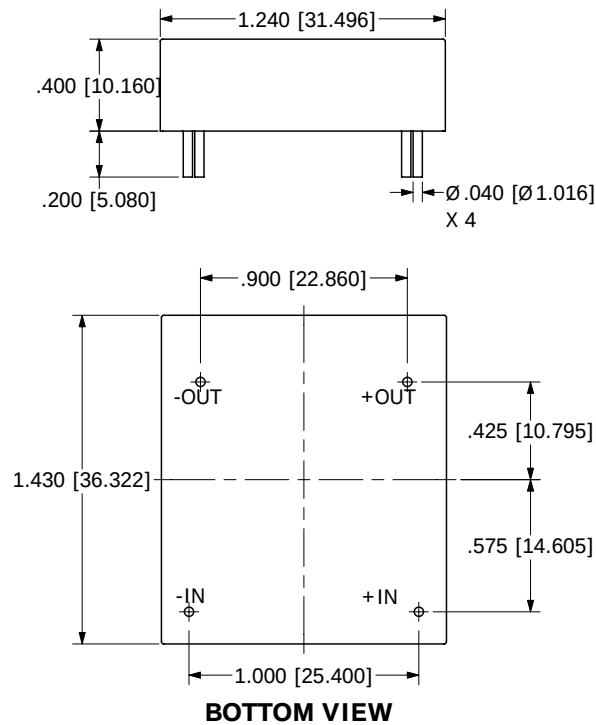
DUAL OUTPUTS



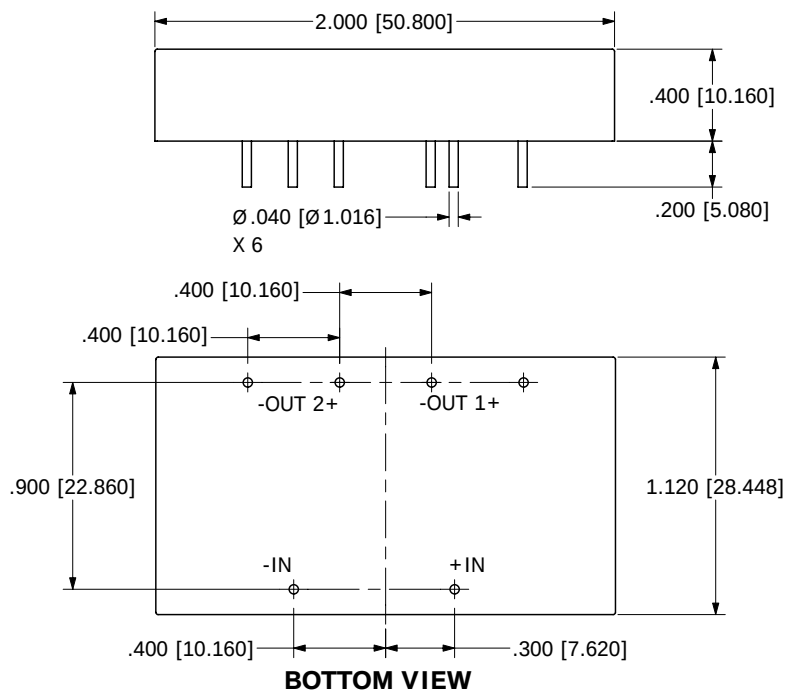
MECHANICAL DRAWINGS

SERIES E - THROUGH HOLE

SINGLE OUTPUTS



DUAL OUTPUTS



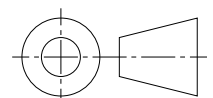
NOTES

a. ALL DIMENSIONS ARE IN INCHES, [] = MM

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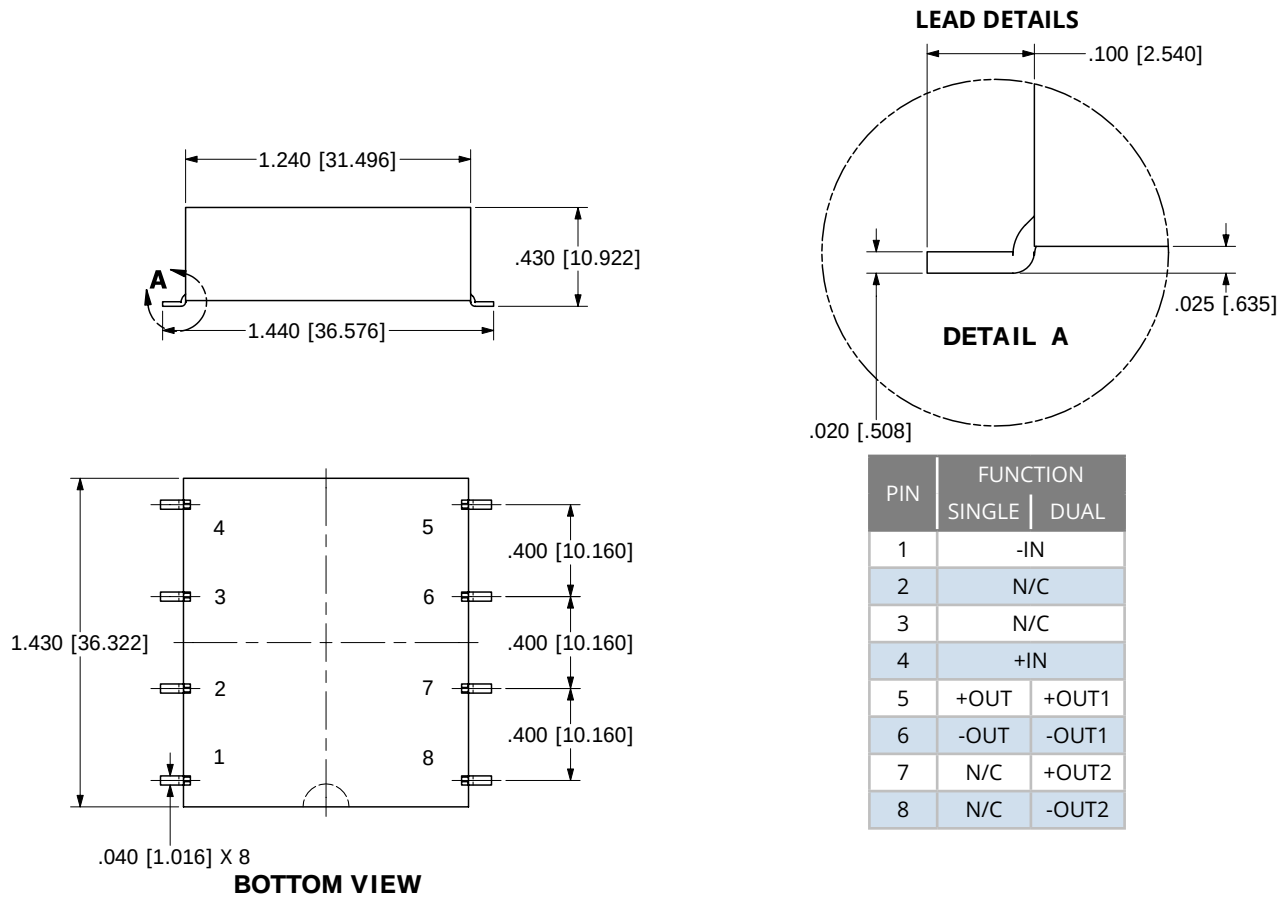
www.PicoElectronics.com | Series **E & SE**

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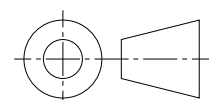
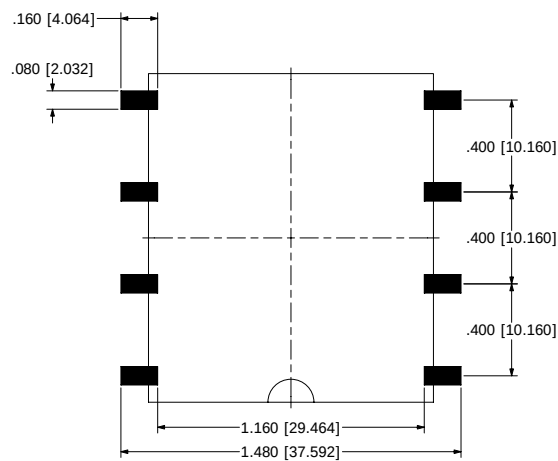


MECHANICAL DRAWINGS

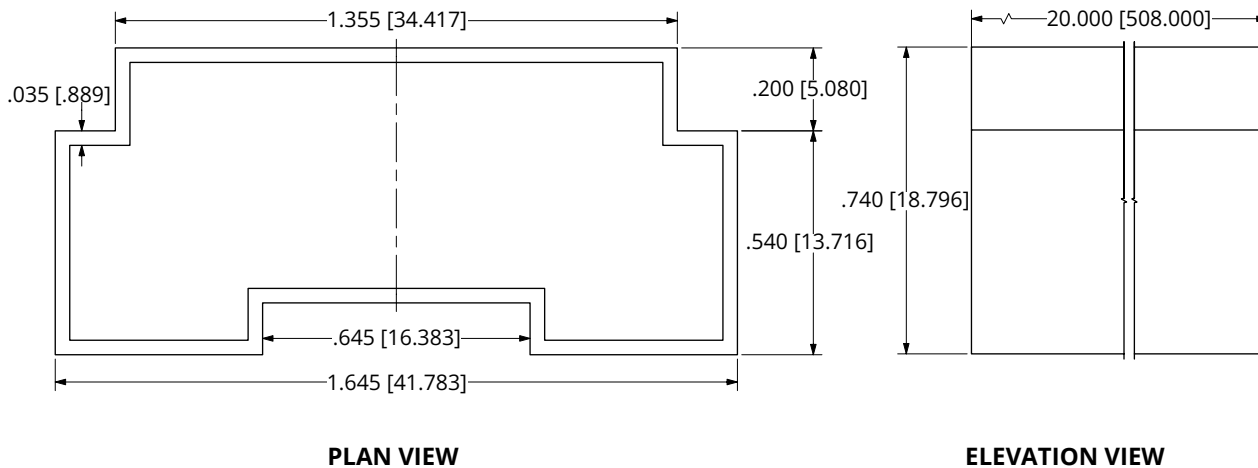
SERIES SE - SURFACE MOUNT



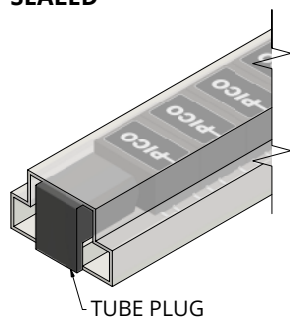
RECOMMENDED LAND PATTERN DIMENSIONS - SERIES SE



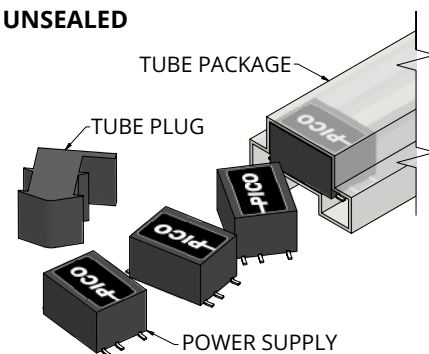
TUBE PACKAGING



SEALED



UNSEALED



Pico warrants each product manufactured by us and sold by us or an authorized representative, to be free from defects in material and workmanship. If properly used, it will perform within its applicable specifications for a period of one year after original shipment. Pico's obligation under this guarantee is limited to repairing or replacing our product to the original purchaser. This warranty is in lieu of all other warranties, express or implied and constitutes fulfillment of our obligations to the purchaser. We do not guarantee that the products can be used for a particular purpose other than those solely covered by the product's specifications. Pico must be notified if the product must meet particular certifications and/or standards. We assume no liability, in any event, for consequential damages, for anticipated or lost profits, incidental damages or loss of time or other losses incurred by the purchaser or any third party in connection with products covered by this warranty or otherwise. The purchaser will indemnify and hold Pico harmless for any damages, losses, costs, etc. from usage not within the product's specifications. Pico must be consulted before usage of its products in a nuclear, radioactive or space environment.

We reserve the right to discontinue products without notice, We reserve the right to make modifications to any existing catalog products without notice, at any time, without the obligation to modify units previously sold.

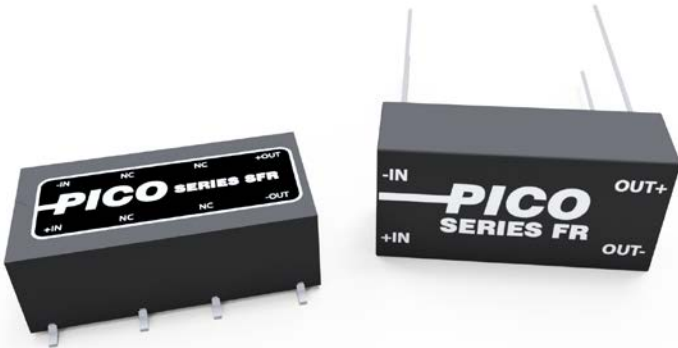
Series FR & SFR

1W Isolated Regulated Low Profile DC-DC Converter



PRODUCT OVERVIEW

The FR & SFR series are isolated DC-DC converter with tight regulation, low ripple and low profile - 0.300" height. These modules are excellent for applications where the input voltage is constant and the load regulation must be tightly regulated. Single and dual isolated output models are standard. They can operate up to 1W over the temperature range of -25°C to +70°C without derating, a heat sink or active cooling.



FEATURES

- 5 to 28V input models
 - Up to 1W output at +70°C ambient
 - Low profile – 0.300" height
 - 5 to 15V output models
 - Down to 0.4% load regulation
 - Input/output isolation
 - Single and dual isolated output
 - No external components required
 - No heat sink or derating required
- Contact Pico for part number of available options:
- Expanded operating temp: -55°C to +85°C
 - Select screening per MIL-STD-883:
 - Stabilization Bake
 - Temperature Cycle
 - Burn-In
 - Available RoHS Compliant module
 - Special Input Voltage, Output Voltage, Isolation Voltage or Output Power

28	FR	5	S
NOM. INPUT VOLTAGE	MOUNTING TYPE	NOM. OUTPUT VOLTAGE	NUMBER OF OUTPUTS
5 = 5V	FR = THROUGH HOLE	5 = 5V	S = SINGLE
12 = 12V	SFR = SURFACE MOUNT	12 = 12V	D = DUAL
15 = 15V		15 = 15V	
24 = 24V			
28 = 28V			

SPECIFICATIONS (Nominal V_{IN} , Full Load, $T_A = +25^\circ\text{C}$, 1 hour warm up unless otherwise specified)**SINGLE OUTPUTS**

Input Voltage [VDC]	Output Voltage [VDC]	Output Current		Output Power [W]	Efficiency ⁽¹⁾			Input Current		Output Ripple [mVp-p] max
		Min. [A]	Max. [A]		Min. V_{IN} [%] typ.	Typ. V_{IN} [%] typ.	Max. V_{IN} [%] typ.	No Load [mA] typ.	Full Load [mA] typ.	
5	5	0	150	0.75	34	37	42	88	405	75
	12		83	1	45	50	56	88	400	50
	15		67	1	45	51	57	86	392	50
12	5		150	0.75	38	42	48	27	149	75
	12		83	1	47	53	60	32	157	50
	15		67	1	49	55	62	34	152	50
15	5		150	0.75	38	42	48	22	119	75
	12		83	1	47	53	60	26	126	50
	15		67	1	49	55	62	27	121	50
24	5		150	0.75	37	41	47	16	76	75
	12		83	1	45	51	58	19	82	50
	15		67	1	47	54	61	19	77	50
28	5		150	0.75	32	41	40	16	65	75
	12		83	1	40	51	50	19	70	50
	15		67	1	41	54	52	19	66	50

DUAL OUTPUTS

Input Voltage [VDC]	Output Voltage Per Output [VDC]	Output Current Per Output		Output Power Per Output [W]	Efficiency ⁽¹⁾			Input Current		Output Ripple Per Output [mVp-p] max
		Min. [A]	Max. [A]		Min. V_{IN} [%] typ.	Typ. V_{IN} [%] typ.	Max. V_{IN} [%] typ.	No Load [mA] typ.	Full Load [mA] typ.	
5	5	0	50	0.25	34	37	42	100	270	50
	12		29	0.35	38	42	48	100	333	50
	15		23	0.35	41	45	52	120	311	50
12	5		50	0.25	36	40	45	32	104	50
	12		29	0.35	44	49	55	39	119	50
	15		23	0.35	44	49	55	35	119	50
15	5		50	0.25	36	40	45	26	83	50
	12		29	0.35	44	49	55	33	95	50
	15		23	0.35	44	49	55	30	95	50
24	5		50	0.25	35	39	44	18	53	50
	12		29	0.35	41	46	52	22	63	50
	15		23	0.35	42	47	53	22	62	50
28	5		50	0.25	31	40	39	18	45	50
	12		29	0.35	36	46	45	22	54	50
	15		23	0.35	36	47	45	22	53	50

Note 1: Tested at nominal input voltage and full output load.

Note 2: Dual output loads must be balanced.

SPECIFICATIONS (Nominal V_{IN} , Full Load, $T_A = +25^{\circ}\text{C}$, 1 hour warm up unless otherwise specified)**INPUT**

Parameter	Condition	Min.	Typ.	Max.	Units
Input Voltage Range	5V input models	4.5	5	6.5	VDC
	12V input models	10.8	12	13.2	
	15V input models	13.5	15	16.5	
	24V input models	21.6	24	26.4	
	28V input models	25.2	28	30.8	

OUTPUT

Parameter	Condition		Min.	Typ.	Max.	Units
Line Regulation	Single output models		-	-	0.1	±%
	Dual output models		-	-	0.2	
Load Regulation	Single output models		-	-	0.2	%
	Dual output models		-	-	0.4	
Output Voltage Tolerance	Nominal V _{IN} , Full Load	Single output models	-	-	1	±%
		Dual output models	-	-	2	

ENVIRONMENTAL

Parameter	Condition	Min.	Typ.	Max.	Units
Operating Temperature Range	Ambient without derating	-25	-	+70	°C
Storage Temperature Range	Ambient	-55	-	+125	°C
Temperature Coefficient		-	0.01	-	%/°C
Cooling	Free Air Convection				

GENERAL

Parameter	Condition	Min.	Typ.	Max.	Units
Isolation Voltage	Input to output	500	-	-	VDC
	OUT1 to OUT2	500	-	-	
Insulation Resistance		100	-	-	MΩ
Switching Frequency		20	-	40	kHz
Size (L x W x H)	Series FR	1 x 0.5 x 0.3 (25.4 x 12.7 x 7.62)			inches (mm)
	Series SFR	1 x 0.5 x 0.35 (25.4 x 12.7 x 8.89)			
Weight		-	10	-	grams
Case	Glass Reinforced Polymer				
Potting	Vacuum Impregnated Epoxy				
Tube Packaging (W x H x L)	Series FR (See drawing)	0.6 x 1.72 x DIM A (15.24 x 43.688 x DIM A)			inches (mm)
	Series SFR	0.87 x 0.545 x 20 (22.098 x 13.843 x 101.6)			
Tape & Reel Packaging	Upon request				
Moisture Sensitivity Level	Series SFR	IPC / JEDEC J-STD-020, Level 3			

PROTECTION & FEATURES

Parameter	Condition	Min.	Typ.	Max.	Units
Shortcircuit	Temporary				

SPECIFICATIONS (Nominal V_{IN} , Full Load, $T_A = +25^{\circ}\text{C}$, 1 hour warm up unless otherwise specified)

DESIGNED TO MEET

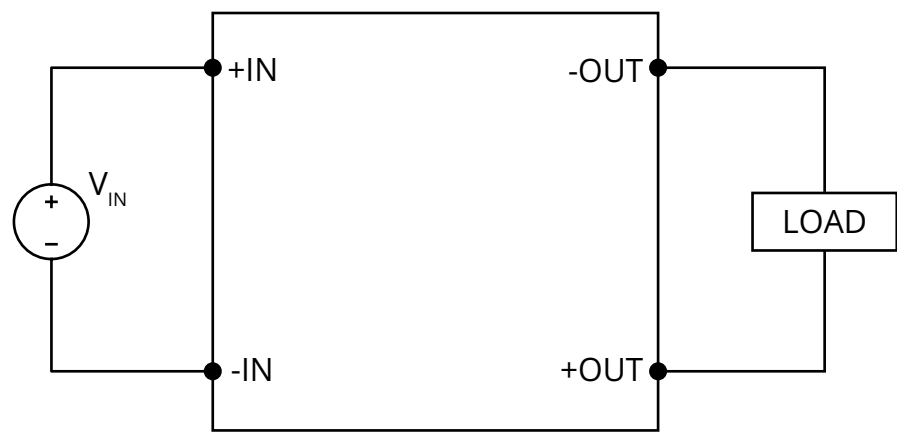
Test	Referenced Standard	Description
Vibration	MIL-STD-202	Method 204, Vibration, High Frequency, Condition D
Shock	MIL-STD-202	Method 213, Shock (Specified Pulse), Condition I
Humidity	MIL-STD-202	Method 106, Moisture Resistance
Altitude	MIL-STD-202	Method 105, Barometric Pressure (Reduced), Condition D

OPTIONS AVAILABLE – CONTACT PICO FOR PART NUMBER

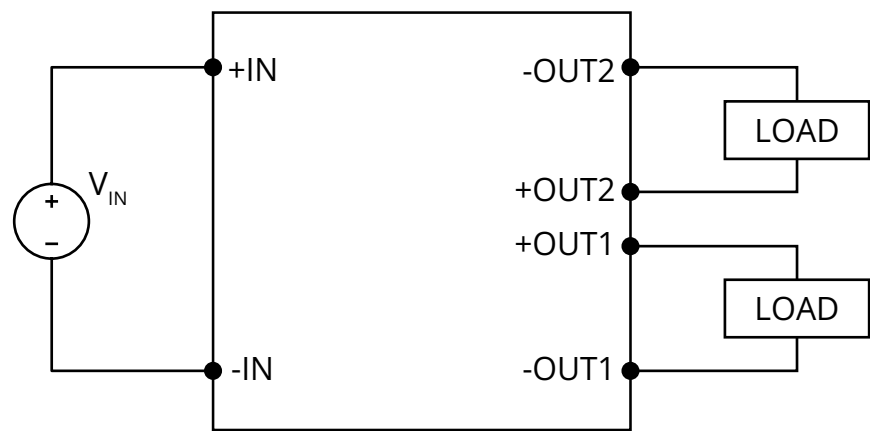
Parameter	Standard	Description
Stabilization Bake	MIL-STD-883	Method 1008 as a guide, Condition B Non-operating maximum storage temperature for 24 hours
Temperature Cycle	MIL-STD-883	Method 1010 as a guide, Condition B Non-operating at temperature extremes, 15 mins/temp, 10 cycles
Burn-In	MIL-STD-883	Method 1015 as a guide Max operating temperature for 160 hours
Expanded Ambient Operating Temperature	-55°C to +85°C	
RoHS Compliance	-	

TYPICAL CONNECTION CIRCUIT

SINGLE OUTPUT



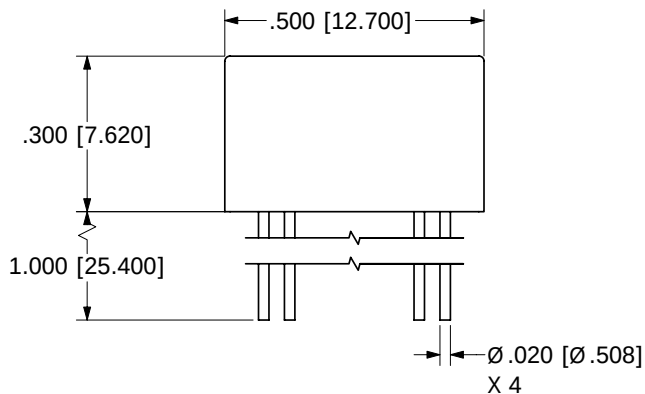
DUAL OUTPUT



MECHANICAL DRAWINGS

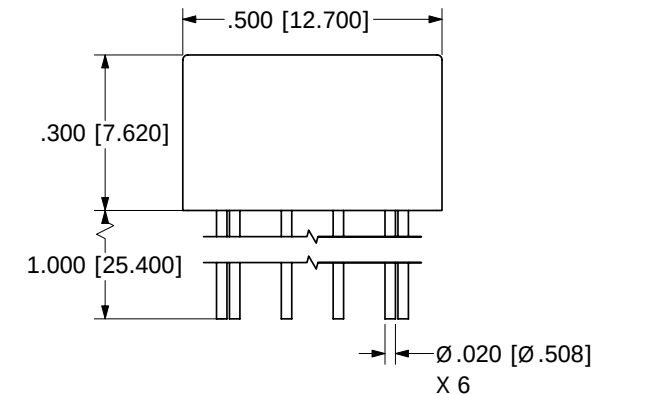
SERIES FR - THROUGH HOLE

SINGLE OUTPUT



BOTTOM VIEW

DUAL OUTPUT



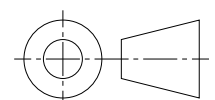
BOTTOM VIEW

NOTES

a. ALL DIMENSIONS ARE IN INCHES, [] = MM

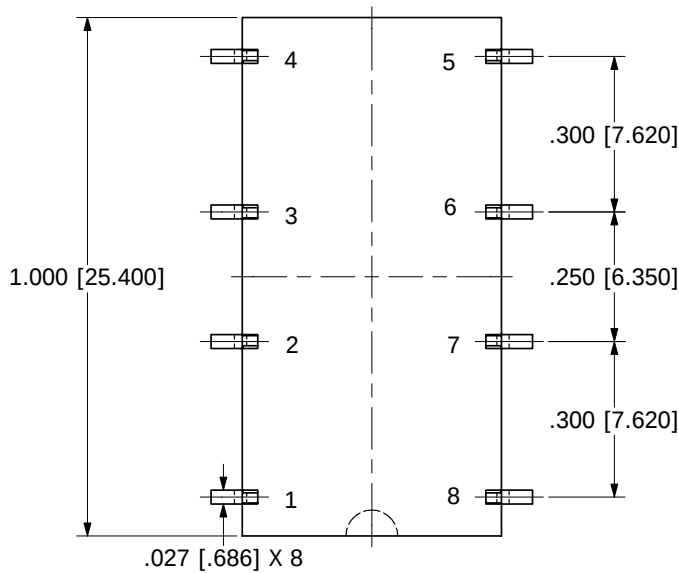
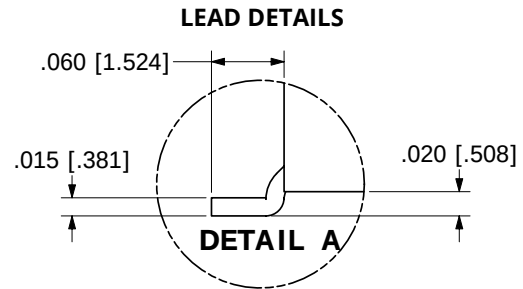
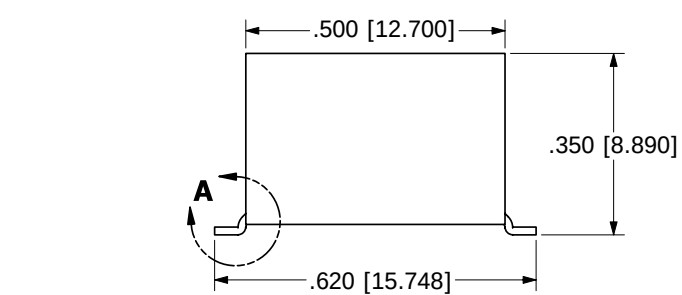
2025 REV 0

www.PicoElectronics.com | Series **FR & SFR**



MECHANICAL DRAWINGS

SERIES SFR - SUFACE MOUNT



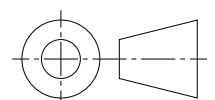
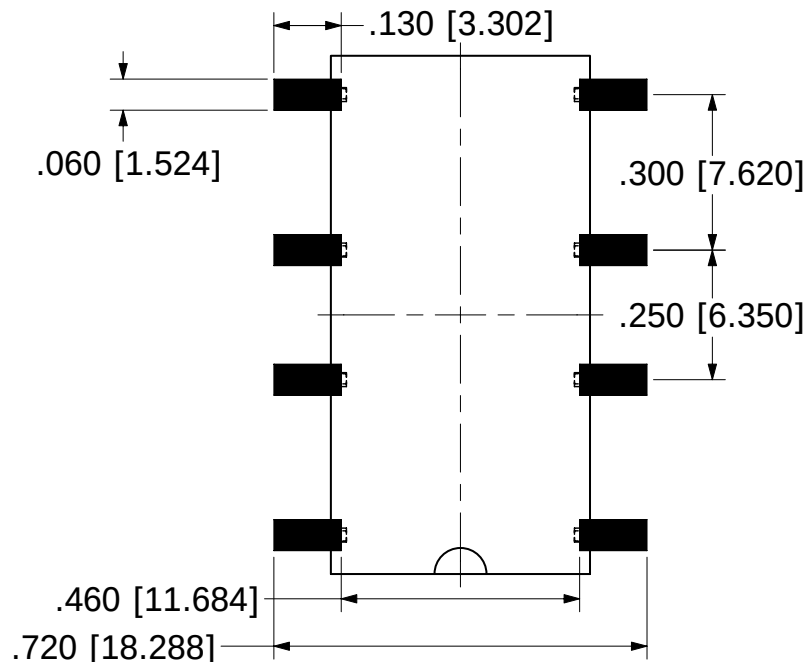
BOTTOM VIEW

NOTES

a. ALL DIMENSIONS ARE IN INCHES, [] = MM

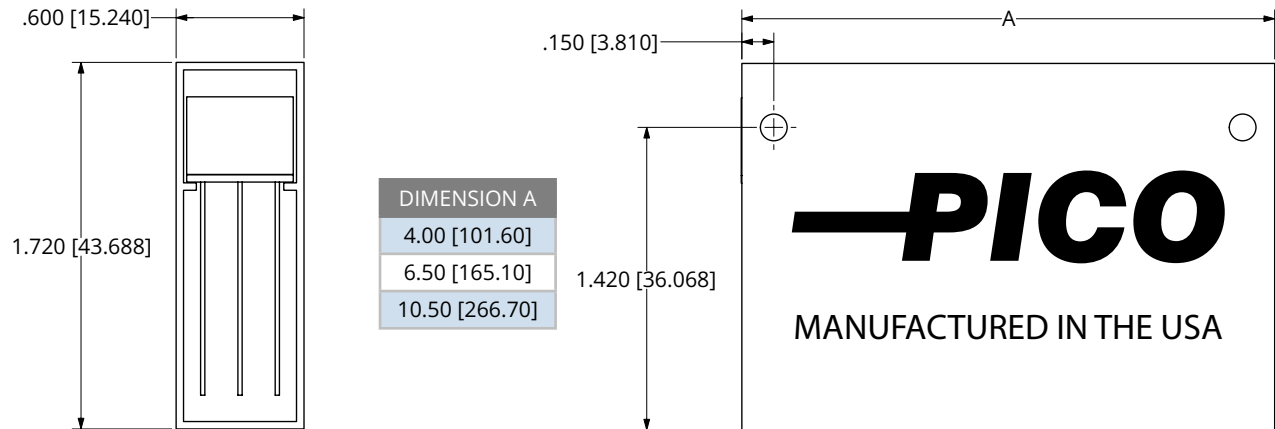
PIN	FUNCTION	
	SINGLE	DUAL
1	+IN	
2	N/C	
3	N/C	+OUT2
4	-OUT	-OUT2
5	+OUT	-OUT1
6	N/C	+OUT1
7	N/C	
8	-IN	

RECOMMENDED LAND PATTERN DIMENSIONS - SERIES SFR

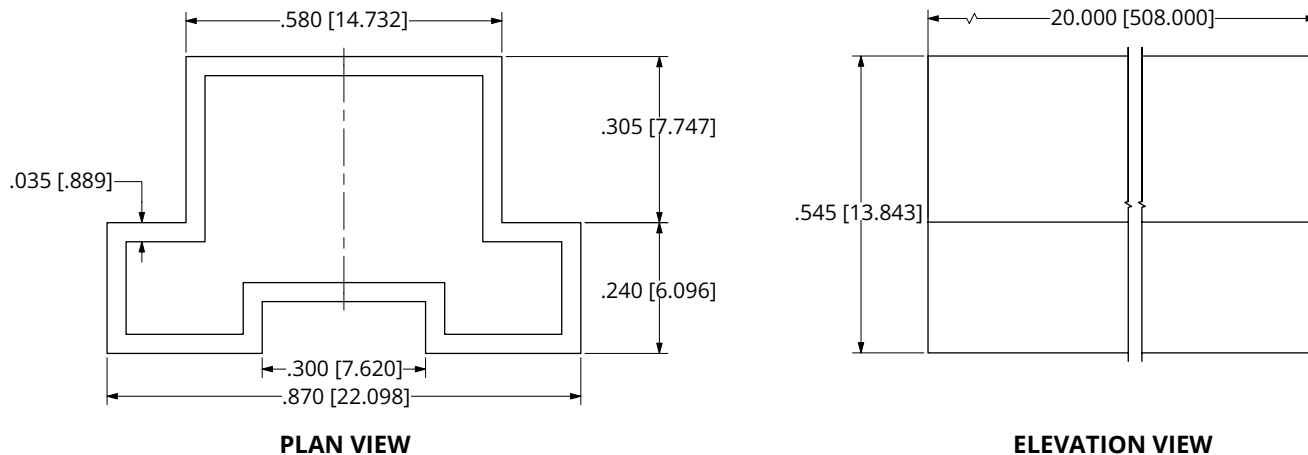


TUBE PACKAGING

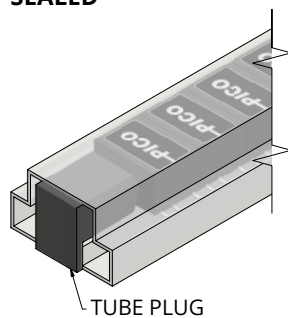
SERIES FR - THROUGH HOLE



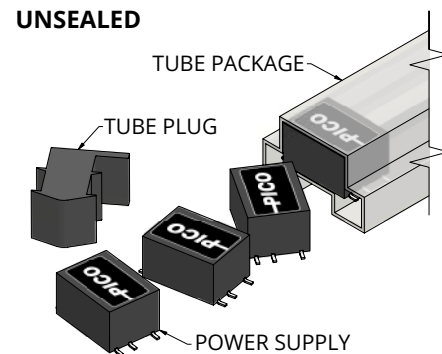
SERIES SFR - SURFACE MOUNT



SEALED



UNSEALED



Pico warrants each product manufactured by us and sold by us or an authorized representative, to be free from defects in material and workmanship. If properly used, it will perform within its applicable specifications for a period of one year after original shipment. Pico's obligation under this guarantee is limited to repairing or replacing our product to the original purchaser. This warranty is in lieu of all other warranties, express or implied and constitutes fulfillment of our obligations to the purchaser. We do not guarantee that the products can be used for a particular purpose other than those solely covered by the product's specifications. Pico must be notified if the product must meet particular certifications and/or standards. We assume no liability, in any event, for consequential damages, for anticipated or lost profits, incidental damages or loss of time or other losses incurred by the purchaser or any third party in connection with products covered by this warranty or otherwise. The purchaser will indemnify and hold Pico harmless for any damages, losses, costs, etc. from usage not within the product's specifications. Pico must be consulted before usage of its products in a nuclear, radioactive or space environment.

We reserve the right to discontinue products without notice, We reserve the right to make modifications to any existing catalog products without notice, at any time, without the obligation to modify units previously sold.

Series MR

2.5W Isolated Regulated Low Profile DC-DC Converter

PICO
Electronics, Inc.

PRODUCT OVERVIEW

The MR series are regulated DC-DC converters with upgraded MIL screened / qualified components and expanded operating temperature range. The 6-sided epoxy insulated shielded case is in a low profile package – 1.900" x 1.000" x 0.300". Over 40 models are available in both single and dual isolated outputs. They can operate over the wide temperature range of -55°C to +85°C without derating, a heat sink or active cooling.



FEATURES

- JANTX Diodes
- MIL screened transformers, capacitors and resistors
- Hermetically sealed transistors
- Up to 2.5W output at +85°C ambient
- Low profile – 0.300" height
- Up to 3.33:1 input voltage range
- Six-sided shielded case
- Control feature
- Trimmable output
- Input/output isolation
- Single and dual isolated output
- No external components required
- No heat sink or derating required

Contact Pico for part number of available options:

- Select screening per MIL-STD-883:
 - Stabilization Bake
 - Temperature Cycle
 - Burn-In
- Special Input Voltage, Output Voltage, Isolation Voltage or Output Power

MR	A	28	S
SERIES NAME	INPUT VOLTAGE RANGE	NOM. OUTPUT VOLTAGE	NUMBER OF OUTPUTS
MR	E = 5 to 15V F = 8 to 24V A = 18 to 36V	3.3 = 3.3V 5 = 5V 5.2 = 5.2V 9 = 9V 12 = 12V 15 = 15V 24 = 24V 28 = 28V	S = SINGLE D = DUAL

MODEL LIST**SINGLE OUTPUT**

Pico Part Number	Output Voltage [VDC]	Output Current		Output Power [W]	Efficiency ⁽¹⁾ [%] typ.	Input Current ⁽¹⁾ [%] typ.	Line Regulation ⁽²⁾		Load Regulation ⁽³⁾		Output Ripple @ 1MHz BW [mVp-p]	Output Voltage Tolerance ⁽¹⁾ [±%]
		Min. [mA]	Max. [mA]				Nom.-Min. [-%]	Nom.-Max. [%]	60%-25% [%]	60%-100% [%]		
MRE3.3S	3.3	37.9	379	1.25	67	186	2.00	2.00	2.00	2.00	200	1.00
MRE5S	5	30	300	1.5	70	214	1.75	1.75	1.75	1.75	200	0.75
MRE5.2S	5.2	28.8	288	1.5	70	214	1.75	1.75	1.75	1.75	200	0.75
MRE9S	9	16.7	167	1.5	75	200	1.50	1.50	1.25	1.25	150	0.50
MRE12S	12	12.5	125	1.5	75	200	1.25	1.25	1.00	1.00	150	0.50
MRE15S	15	10	100	1.5	76	197	1.25	1.25	1.00	1.00	150	0.50
MRE24S	24	6.3	63	1.5	77	195	1.00	1.00	0.75	0.75	150	0.50
MRE28S	28	5.4	54	1.5	78	192	0.75	0.75	0.75	0.75	200	0.50
MRF3.3S	3.3	53	530	1.75	67	163	1.75	1.75	2.00	2.00	200	1.00
MRF5S	5	40	400	2.0	70	179	1.50	1.50	1.75	1.75	200	0.75
MRF5.2S	5.2	38.4	384	2.0	70	179	1.50	1.50	1.75	1.75	200	0.75
MRF9S	9	22.2	222	2.0	75	167	1.25	1.25	1.25	1.25	150	0.50
MRF12S	12	16.7	167	2.0	75	167	1.00	1.00	1.00	1.00	150	0.50
MRF15S	15	13.3	133	2.0	76	164	1.00	1.00	1.00	1.00	150	0.50
MRF24S	24	8.3	83	2.0	77	162	1.00	1.00	0.75	0.75	150	0.50
MRF28S	28	7.1	71	2.0	78	160	0.75	0.75	0.75	0.75	200	0.50
MRA3.3S	3.3	53	530	1.75	67	97	1.25	1.25	2.00	2.00	200	1.00
MRA5S	5	40	400	2.0	70	106	1.00	1.00	1.75	1.75	200	0.75
MRA5.2S	5.2	38.4	384	2.0	70	106	1.00	1.00	1.75	1.75	200	0.75
MRA9S	9	27.8	278	2.5	75	123	0.75	0.75	1.25	1.25	150	0.50
MRA12S	12	20.8	208	2.5	75	123	0.75	0.75	1.00	1.00	150	0.50
MRA15S	15	16.7	167	2.5	76	122	0.75	0.75	1.00	1.00	150	0.50
MRA24S	24	10.4	104	2.5	77	120	0.75	0.75	0.75	0.75	150	0.50
MRA28S	28	8.9	89	2.5	78	119	0.50	0.50	0.75	0.75	200	0.50

Note 1: Tested at nominal input voltage and full output load.

Note 2: Line regulation is specified at full output load, nominal to minimum input voltage (-%) and nominal to maximum input voltage (+%).

Note 3: Load regulation is specified at nominal input voltage, 60% to 25% load (+%) and 60% to 100% load (-%).

MODEL LIST**DUAL OUTPUT**

Pico Part Number	Output Voltage Per Output [VDC]	Output Current Per Output		Output Power [W]	Efficiency ⁽¹⁾ [%] typ.	Input Current ⁽¹⁾ [%] typ.	Line Regulation ⁽²⁾		Load Regulation ⁽³⁾		Output Ripple Per Output @ 1MHz BW [mVp-p]	Output Voltage Tolerance ⁽¹⁾ [±%]
		Min. [mA]	Max. [mA]				Nom.-Min. [-%]	Nom.-Max. [%]	60%-25% [%]	60%-100% [-%]		
MRE5D	5	15	150	0.75	70	214	1.75	1.75	1.75	1.75	200	0.75
MRE9D	9	8.4	84	0.75	75	200	1.50	1.50	1.25	1.25	150	0.50
MRE12D	12	6.3	63	0.75	75	200	1.25	1.25	1.00	1.00	150	0.50
MRE15D	15	5	50	0.75	76	197	1.25	1.25	1.00	1.00	150	0.50
MRE24D	24	3.2	32	0.75	77	195	1.00	1.00	0.75	0.75	150	0.50
MRE28D	28	2.7	27	0.75	78	192	0.75	0.75	0.75	0.75	200	0.50
MRF5D	5	20	200	1.00	70	179	1.50	1.50	1.75	1.75	200	0.75
MRF9D	9	11.1	111	1.00	75	167	1.25	1.25	1.25	1.25	150	0.50
MRF12D	12	8.4	84	1.00	75	167	1.00	1.00	1.00	1.00	150	0.50
MRF15D	15	6.7	67	1.00	76	164	1.00	1.00	1.00	1.00	150	0.50
MRF24D	24	4.2	42	1.00	77	162	1.00	1.00	0.75	0.75	150	0.50
MRF28D	28	3.6	36	1.00	78	160	0.75	0.75	0.75	0.75	200	0.50
MRA5D	5	20	200	1.00	70	106	1.00	1.00	1.75	1.75	200	0.75
MRA9D	9	13.9	139	1.25	75	123	0.75	0.75	1.25	1.25	150	0.50
MRA12D	12	10.4	104	1.25	75	123	0.75	0.75	1.00	1.00	150	0.50
MRA15D	15	8.4	84	1.25	76	122	0.75	0.75	1.00	1.00	150	0.50
MRA24D	24	5.2	52	1.25	77	120	0.75	0.75	0.75	0.75	150	0.50
MRA28D	28	4.5	45	1.25	78	119	0.50	0.50	0.75	0.75	200	0.50

Note 1: Tested at nominal input voltage and full output load.

Note 2: Line regulation is specified at full output load, nominal to minimum input voltage (-%) and nominal to maximum input voltage (+%).

Note 3: Load regulation is specified at nominal input voltage, 60% to 25% load (+%) and 60% to 100% load (-%).

Note 4: Dual outputs must be balanced.

SPECIFICATIONS (Nominal V_{IN} , Full Load, $T_A = +25^\circ\text{C}$, 1 hour warm up unless otherwise specified)**INPUT**

Parameter	Condition	Min.	Nom.	Max.	Units
Input Voltage Range	MRE models	5	10	15	VDC
	MRF models	8	16	24	
	MRA models	18	27	36	

ENVIRONMENTAL

Parameter	Condition	Min.	Typ.	Max.	Units
Operating Temperature Range	Ambient without derating	-55	-	85	°C
Storage Temperature Range	Ambient	-55	-	125	°C
Temperature Coefficient		-	-	0.02	%/°C
Cooling	Free Air Convection				

SPECIFICATIONS (Nominal V_{IN} , Full Load, $T_A = +25^\circ\text{C}$, 1 hour warm up unless otherwise specified)**GENERAL**

Parameter	Condition	Min.	Typ.	Max.	Units
Isolation Voltage	Input to output	500	-	-	VDC
	OUT1 to OUT2	500	-	-	
Switching Frequency		-	40	-	kHz
Size (L x W x H)		1.9 x 1 x 0.3 (48.26 x 25.4 x 7.62)			inches (mm)
Weight		-	26	-	grams
Case	6-Sided Epoxy Insulated Metal				
Potting	Vacuum Impregnated Epoxy				
Box Packaging (W x L x H)	8 x 7.5 x 1.5 (203.2 x 190.5 x 38.1) or 12 x 9 x 1.5 (304.8 x 228.6 x 38.1)				inches (mm)

PROTECTION & FEATURES

Parameter	Condition	Min.	Typ.	Max.	Units
Shortcircuit	Temporary				
Shutdown (C)	Non-latched shutdown, Self-recovery	Shutdown	Connect to -IN		
		Restart	OPEN		
Output Voltage Trim (TRIM)	Trim up only	0	-	5	%

UPGRADED MILITARY QUALIFIED COMPONENTS

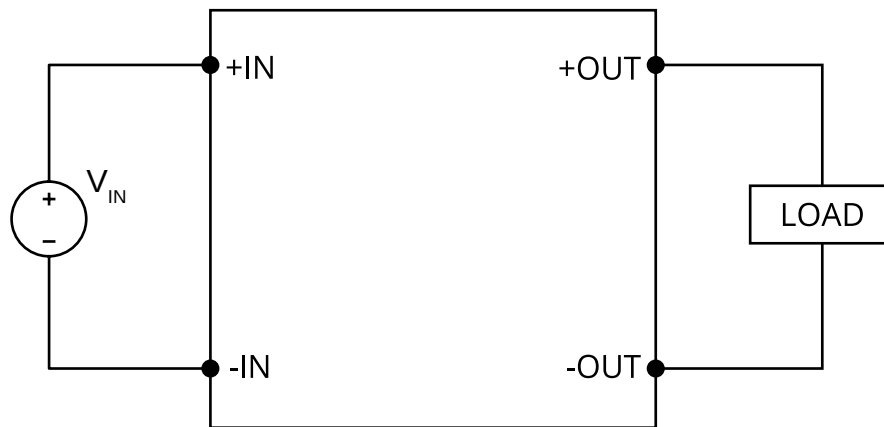
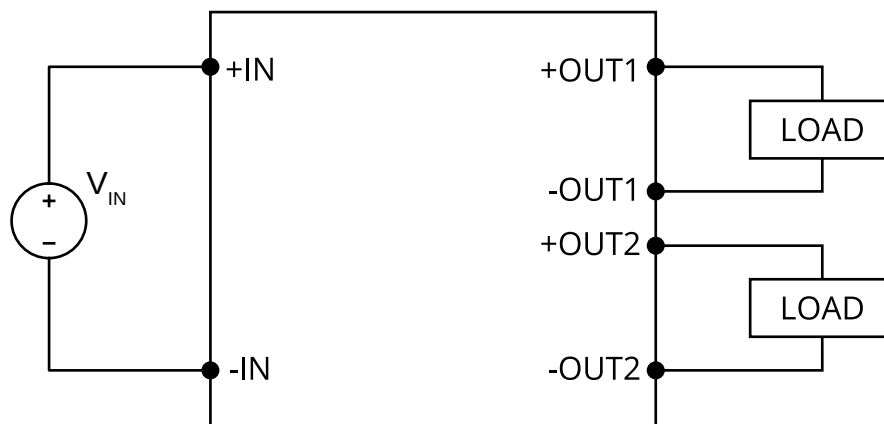
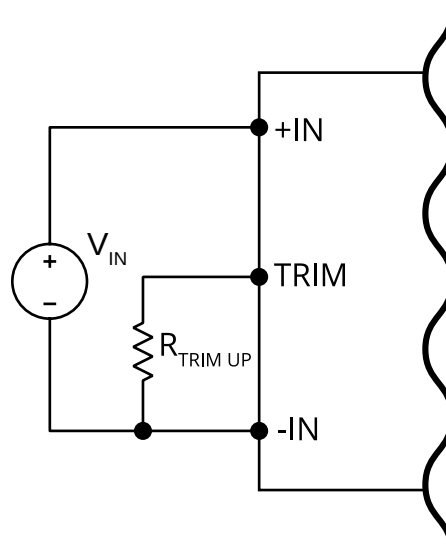
Component	Standard
Diodes	JANTX
Transformers	MIL-PRF-27, Class S, Grade 5
Capacitors	MIL-C 55365/4, MIL-C 39003/03, MIL-C 20/27E, MIL-C 39014/05
Resistors	MIL-R-39017, MIL-R-22097
Integrated Circuit (IC)	Hermetically Sealed

DESIGNED TO MEET

Test	Referenced Standard	Description
Vibration	MIL-STD-202	Method 204, Vibration, High Frequency, Condition D
Shock	MIL-STD-202	Method 213, Shock (Specified Pulse), Condition I
Humidity	MIL-STD-202	Method 106, Moisture Resistance
Altitude	MIL-STD-202	Method 105, Barometric Pressure (Reduced), Condition D

OPTIONS AVAILABLE – CONTACT PICO FOR PART NUMBER

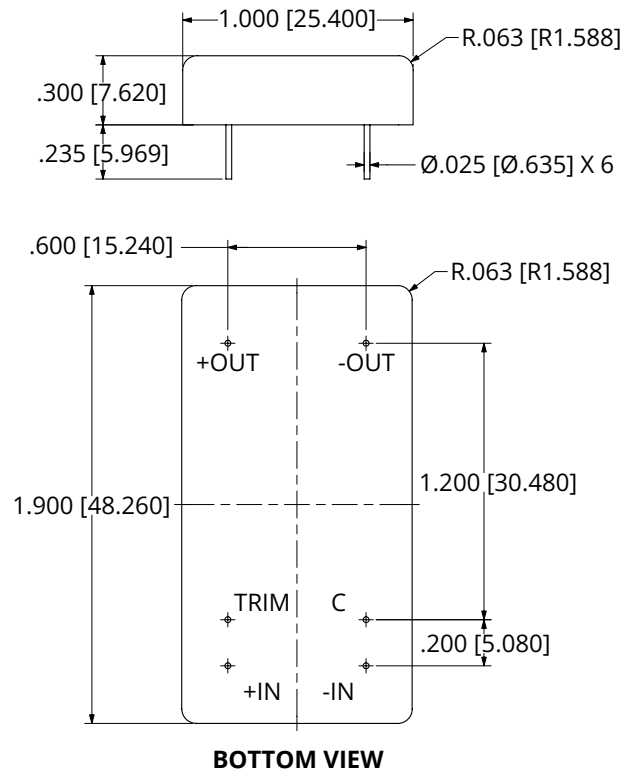
Parameter	Referenced Standard	Description
Stabilization Bake	MIL-STD-883	Referenced Method 1008 Non-operating maximum storage temperature for 24 hours
Temperature Cycle	MIL-STD-883	Referenced Method 1010 Non-operating at temperature extremes, 15 mins/temp, 10 cycles
Burn-In	MIL-STD-883	Referenced Method 1015 Max operating temperature for 160 hours

TYPICAL CONNECTION CIRCUIT**SINGLE OUTPUT****DUAL OUTPUT****TRIM**

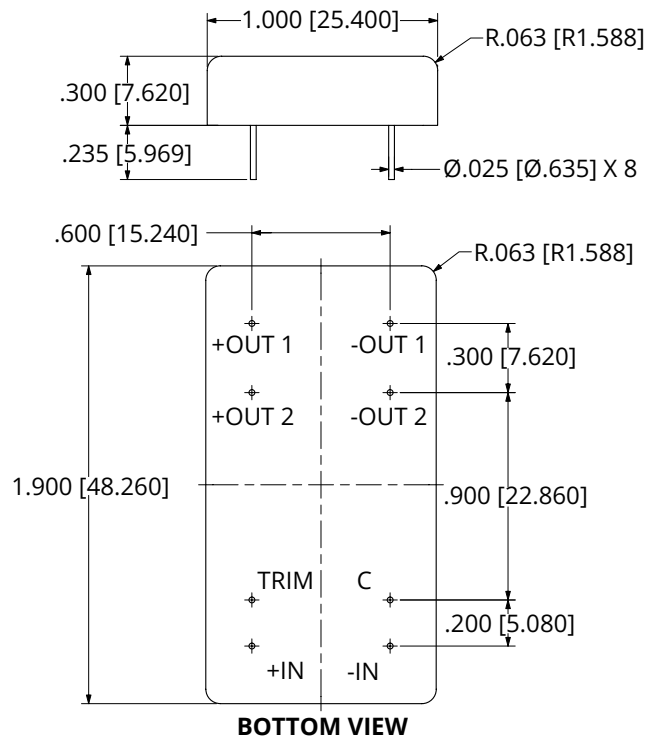
Note: Use 50k Ω , 1/4W trim pot between TRIM and -IN. Reduce resistance to raise output voltage to 5% maximum. Raising the output voltage beyond 5% could cause damage to the module.

MECHANICAL DRAWINGS

SINGLE OUTPUT

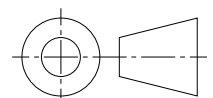


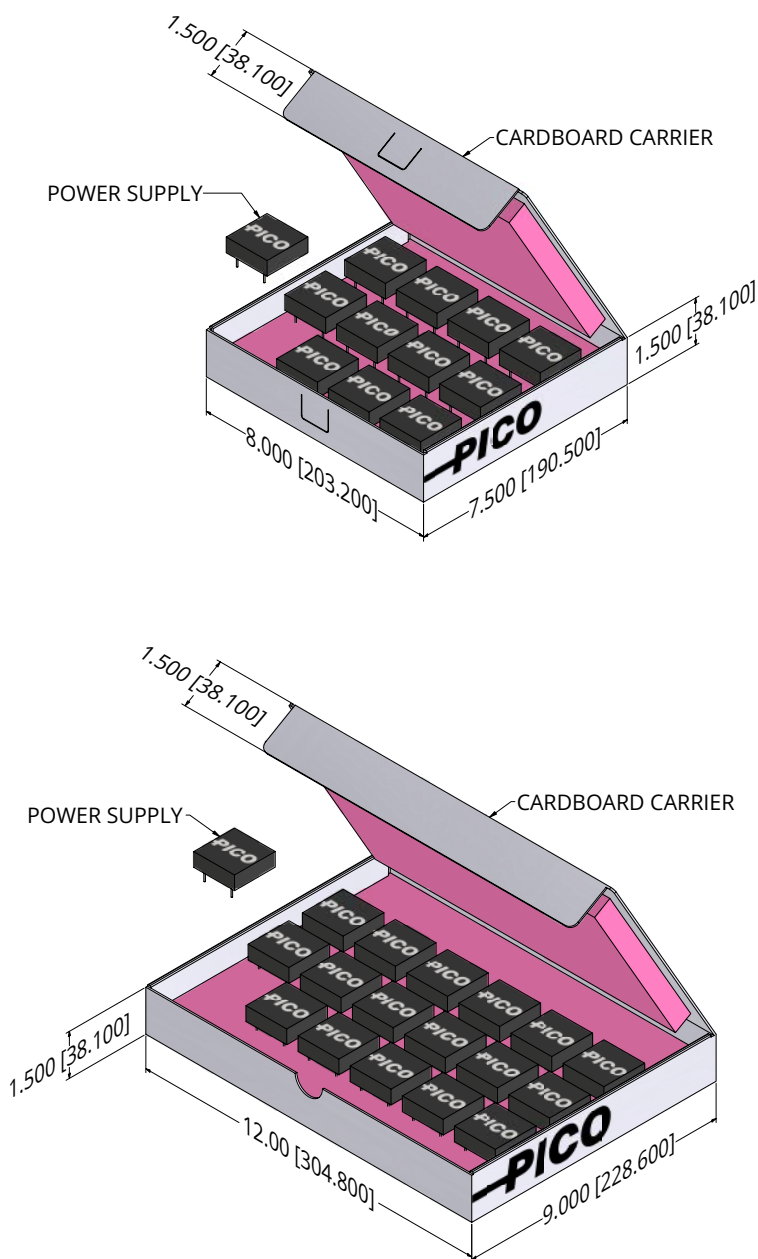
DUAL OUTPUT



NOTES

- a. ALL DIMENSIONS ARE IN INCHES, [] = MM
- b. C IS CONTROL PIN



BOX PACKAGING - BULK

Pico warrants each product manufactured by us and sold by us or an authorized representative, to be free from defects in material and workmanship. If properly used, it will perform within its applicable specifications for a period of one year after original shipment. Pico's obligation under this guarantee is limited to repairing or replacing our product to the original purchaser. This warranty is in lieu of all other warranties, express or implied and constitutes fulfillment of our obligations to the purchaser. We do not guarantee that the products can be used for a particular purpose other than those solely covered by the product's specifications. Pico must be notified if the product must meet particular certifications and/or standards. We assume no liability, in any event, for consequential damages, for anticipated or lost profits, incidental damages or loss of time or other losses incurred by the purchaser or any third party in connection with products covered by this warranty or otherwise. The purchaser will indemnify and hold Pico harmless for any damages, losses, costs, etc. from usage not within the product's specifications. Pico must be consulted before usage of its products in a nuclear, radioactive or space environment.

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Series OR & SOR

2.5W Isolated Regulated Low Profile DC-DC Converter

PICO
Electronics, Inc.

PRODUCT OVERVIEW

The OR & SOR series are isolated DC-DC converter with wide input range, tight regulation in a low profile package and feature shutdown control. Single and dual isolated output models are standard. They can operate up to 2.5W over the temperature range of -25°C to +70°C without derating, a heat sink or active cooling.



FEATURES

- Up to 2.5W output at +70°C ambient
- Low profile – 0.300" height
- Up to 3:1 input voltage range
- 3.3 to 28V output models
- Control feature
- 1500V Input/output isolation
- Single and dual isolated output
- No heat sink or derating required

Contact Pico for part number of available options:

- Expanded operating temp: -55°C to +85°C
- Select screening per MIL-STD-883:
 - Stabilization Bake
 - Temperature Cycle
 - Burn-In
- Special Input Voltage, Output Voltage, Isolation Voltage or Output Power

OR

MOUNTING TYPE

OR = THROUGH HOLE
SOR = SURFACE MOUNT

E

INPUT VOLTAGE RANGE

E = 5 to 15V
F = 8 to 24V
A = 18 to 36V

28

NOM. OUTPUT VOLTAGE

3.3 = 3.3V
5 = 5V
5.2 = 5.2V
9 = 9V
12 = 12V
15 = 15V
24 = 24V
28 = 28V

S

NUMBER OF OUTPUTS

S = SINGLE
D = DUAL

MODEL LIST**SINGLE OUTPUTS**

Pico Part Number		Output Voltage [VDC]	Output Current		Output Power [W]	Efficiency ⁽¹⁾ [%] typ.	Input Current ⁽¹⁾ [%] typ.	Line Regulation ⁽²⁾		Load Regulation ⁽³⁾		Output Voltage Tolerance ⁽¹⁾ [±%]
Through Hole	Surface Mount		Min. [mA]	Max. [mA]				Nom.-Min. [-%]	Nom.-Max. [+%]	60%-25% [+%]	60%-100% [-%]	
ORE3.3S	SORE3.3S	3.3	36.4	364	1.2	69	174	2.00	2.00	2.50	2.50	1.50
ORE5S	SORE5S	5	30	300	1.5	70	215	1.75	1.75	1.75	1.75	0.75
ORE5.2S	SORE5.2S	5.2	28.8	288	1.5	70	215	1.75	1.75	1.75	1.75	0.75
ORE9S	SORE9S	9	16.7	167	1.5	75	200	1.50	1.50	1.25	1.25	0.50
ORE12S	SORE12S	12	12.5	125	1.5	77	195	1.25	1.25	1.00	1.00	0.50
ORE15S	SORE15S	15	10	100	1.5	77	195	1.25	1.25	1.00	1.00	0.50
ORE24S	SORE24S	24	6.3	63	1.5	77	195	1.00	1.00	0.75	0.75	0.50
ORE28S	SORE28S	28	5.4	54	1.5	78	190	0.75	0.75	0.75	0.75	0.50
ORF3.3S	SORF3.3S	3.3	45.5	455	1.5	72	130	3.00	3.00	3.00	3.00	2.00
ORF5S	SORF5S	5	40	400	2.0	74	170	1.50	1.50	1.75	1.75	0.75
ORF5.2S	SORF5.2S	5.2	38.4	384	2.0	74	170	1.50	1.50	1.75	1.75	0.75
ORF9S	SORF9S	9	22.2	222	2.0	76	165	1.25	1.25	1.25	1.25	0.50
ORF12S	SORF12S	12	16.7	167	2.0	77	160	1.00	1.00	1.00	1.00	0.50
ORF15S	SORF15S	15	13.3	133	2.0	78	160	1.00	1.00	1.00	1.00	0.50
ORF24S	SORF24S	24	8.3	83	2.0	78	160	1.00	1.00	0.75	0.75	0.50
ORF28S	SORF28S	28	7.1	71	2.0	79	155	0.75	0.75	0.75	0.75	0.50
ORA3.3S	SORA3.3S	3.3	45.5	455	1.5	72	77	2.00	2.00	3.00	3.00	2.00
ORA5S	SORA5S	5	40	400	2.0	76	98	1.00	1.00	1.75	1.75	0.75
ORA5.2S	SORA5.2S	5.2	38.4	384	2.0	76	98	1.00	1.00	1.75	1.75	0.75
ORA9S	SORA9S	9	27.8	278	2.5	78	120	0.75	0.75	1.25	1.25	0.50
ORA12S	SORA12S	12	20.8	208	2.5	78	120	0.75	0.75	1.00	1.00	0.50
ORA15S	SORA15S	15	16.7	167	2.5	79	115	0.75	0.75	1.00	1.00	0.50
ORA24S	SORA24S	24	10.4	104	2.5	80	115	0.75	0.75	0.75	0.75	0.50
ORA28S	SORA28S	28	8.9	89	2.5	80	115	0.50	0.50	0.75	0.75	0.50

Note 1: Tested at nominal input voltage and full output load.

Note 2: Line regulation is specified at full output load, nominal to minimum input voltage (-%) and nominal to maximum input voltage (+%).

Note 3: Load regulation is specified at nominal input voltage, 60% to 25% load (+%) and 60% to 100% load (-%).

MODEL LIST**DUAL OUTPUT**

Pico Part Number		Output Voltage Per Output [VDC]	Output Current Per Output		Output Power Per Output [W]	Efficiency ⁽¹⁾ [%] typ.	Input Current ⁽¹⁾ [%] typ.	Line Regulation ⁽²⁾		Load Regulation ⁽³⁾		Output Voltage Tolerance ⁽¹⁾ [±%]
Through Hole	Surface Mount		Min. [mA]	Max. [mA]				Nom.-Min. [-%]	Nom.-Max. [+%]	60%-25% [+%]	60%-100% [-%]	
ORE5D	SORE5D	5	15	150	0.75	70	215	1.75	1.75	1.75	1.75	0.75
ORE9D	SORE9D	9	8.4	84	0.75	75	200	1.50	1.50	1.25	1.25	0.50
ORE12D	SORE12D	12	6.3	63	0.75	77	195	1.25	1.25	1.00	1.00	0.50
ORE15D	SORE15D	15	5	50	0.75	77	195	1.25	1.25	1.00	1.00	0.50
ORE24D	SORE24D	24	3.2	32	0.75	77	195	1.00	1.00	0.75	0.75	0.50
ORE28D	SORE28D	28	2.7	27	0.75	78	190	0.75	0.75	0.75	0.75	0.50
ORF5D	SORF5D	5	20	200	1.00	74	170	1.50	1.50	1.75	1.75	0.75
ORF9D	SORF9D	9	11.1	111	1.00	76	165	1.25	1.25	1.25	1.25	0.50
ORF12D	SORF12D	12	8.4	84	1.00	77	160	1.00	1.00	1.00	1.00	0.50
ORF15D	SORF15D	15	6.7	67	1.00	78	160	1.00	1.00	1.00	1.00	0.50
ORF24D	SORF24D	24	4.2	42	1.00	78	160	1.00	1.00	0.75	0.75	0.50
ORF28D	SORF28D	28	3.6	36	1.00	79	155	0.75	0.75	0.75	0.75	0.50
ORA5D	SORA5D	5	20	200	1.00	76	98	1.00	1.00	1.75	1.75	0.75
ORA9D	SORA9D	9	13.9	139	1.25	78	120	0.75	0.75	1.25	1.25	0.50
ORA12D	SORA12D	12	10.4	104	1.25	78	120	0.75	0.75	1.00	1.00	0.50
ORA15D	SORA15D	15	8.4	84	1.25	79	115	0.75	0.75	1.00	1.00	0.50
ORA24D	SORA24D	24	5.2	52	1.25	80	115	0.75	0.75	0.75	0.75	0.50
ORA28D	SORA28D	28	4.5	45	1.25	80	115	0.50	0.50	0.75	0.75	0.50

Note 1: Tested at nominal input voltage and full output load.

Note 2: Line regulation is specified at full output load, nominal to minimum input voltage (-%) and nominal to maximum input voltage (+%).

Note 3: Load regulation is specified at nominal input voltage, 60% to 25% load (+%) and 60% to 100% load (-%).

Note 4: Dual output loads must be balanced.

SPECIFICATIONS (Nominal V_{IN} , Full Load, $T_A = +25^{\circ}\text{C}$, 1 hour warm up unless otherwise specified)**INPUT**

Parameter	Condition	Min.	Nom.	Max.	Units
Input Voltage Range	ORE/SORE models	5	10	15	VDC
	ORF/SORF models	8	16	24	
	ORA/SORA models	18	27	36	

OUTPUT

Parameter	Condition		Min.	Typ.	Max.	Units
Output Ripple	1MHz bandwidth, with 0.1μF ceramic capacitor	9V to 24V output models	-	-	150	mVp-p
		All other output models	-	-	200	

ENVIRONMENTAL

Parameter	Condition	Min.	Typ.	Max.	Units
Operating Temperature Range	Ambient without derating	-25	-	+70	$^{\circ}\text{C}$
Storage Temperature Range	Ambient	-55	-	+125	$^{\circ}\text{C}$
Temperature Coefficient		-	-	0.02	$\%/^{\circ}\text{C}$
Cooling	Free Air Convection				

GENERAL

Parameter	Condition	Min.	Typ.	Max.	Units
Isolation Voltage	Input to output	500	-	-	VDC
	OUT1 to OUT2	500	-	-	
Switching Frequency		-	100	-	kHz
Size (L x W x H)	Series OR	1.12 x 0.7 x 0.3 (28.448 x 17.78 x 7.62)			inches (mm)
	Series SOR	1.12 x 0.7 x 0.35 (28.448 x 17.78 x 8.89)			
Weight	Series OR	-	8.5	-	grams
	Series SOR	-	10	-	
Case	Glass Reinforced Polymer				
Potting	Vacuum Impregnated Epoxy				
Tube Packaging (W x H x L)	1.03 x 0.74 x 20 (26.162 x 18.796 x 508)				inches (mm)
Moisture Sensitivity Level	Series SOR	IPC / JEDEC J-STD-020, Level 3			

PROTECTION & FEATURES

Parameter	Condition	Min.	Typ.	Max.	Units
Short Circuit	Temporary				
Shutdown (C)	Non-latched shutdown, Self-recovery	Shutdown	Connect to -IN		
		Restart	OPEN		

SPECIFICATIONS (Nominal V_{IN} , Full Load, $T_A = +25^{\circ}\text{C}$, 1 hour warm up unless otherwise specified)**DESIGNED TO MEET**

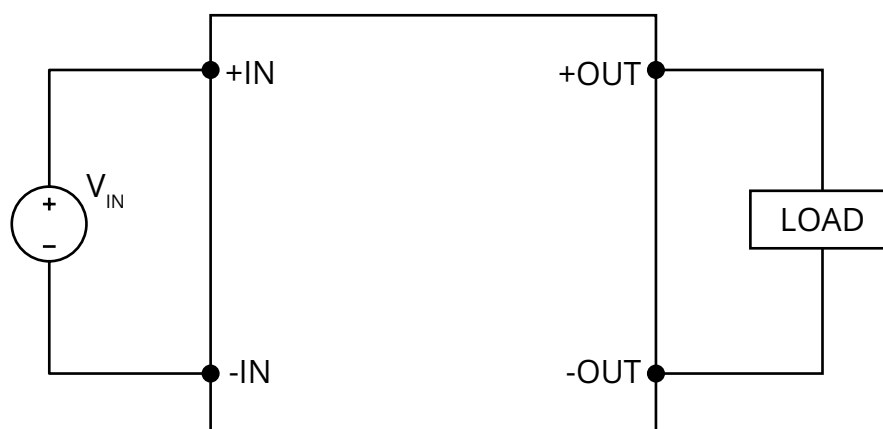
Test	Referenced Standard	Description
Vibration	MIL-STD-202	Method 204, Vibration, High Frequency, Condition D
Shock	MIL-STD-202	Method 213, Shock (Specified Pulse), Condition I
Humidity	MIL-STD-202	Method 106, Moisture Resistance
Altitude	MIL-STD-202	Method 105, Barometric Pressure (Reduced), Condition D

OPTIONS AVAILABLE – CONTACT PICO FOR PART NUMBER

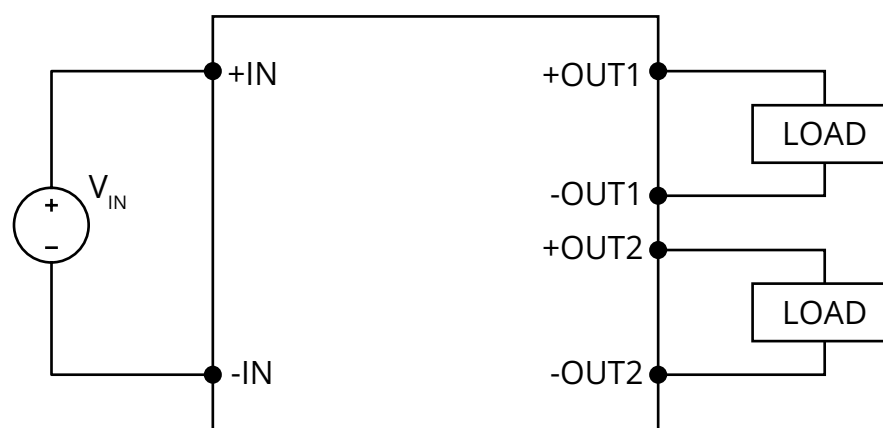
Parameter	Referenced Standard	Description
Stabilization Bake	MIL-STD-883	Referenced Method 1008 Non-operating maximum storage temperature for 24 hours
Temperature Cycle	MIL-STD-883	Referenced Method 1010 Non-operating at temperature extremes, 15 mins/temp, 10 cycles
Burn-In	MIL-STD-883	Referenced Method 1015 Max operating temperature for 160 hours
Expanded Ambient Operating Temperature		-55°C to +85°C

TYPICAL CONNECTION CIRCUIT

SINGLE OUTPUT



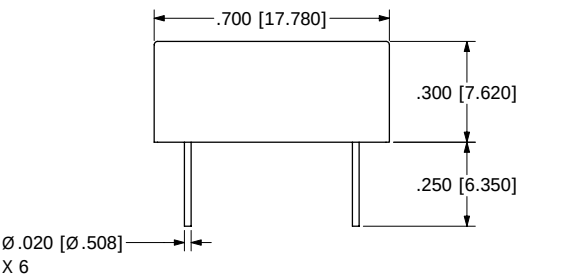
DUAL OUTPUT



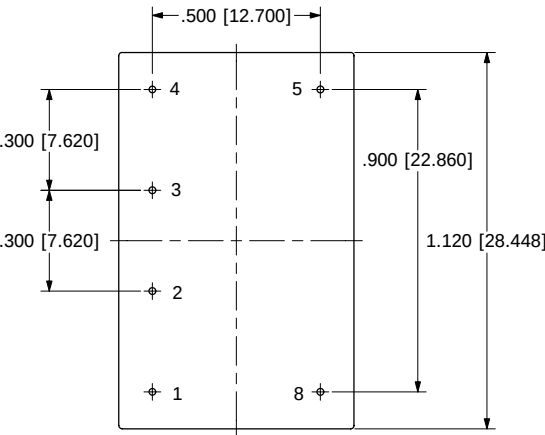
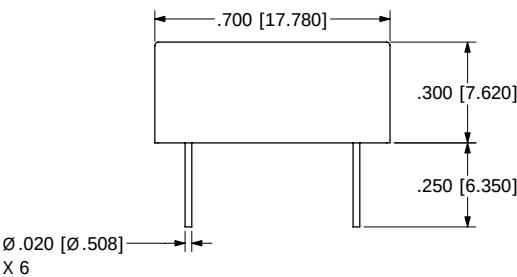
MECHANICAL DRAWINGS

SERIES OR - THROUGH HOLE

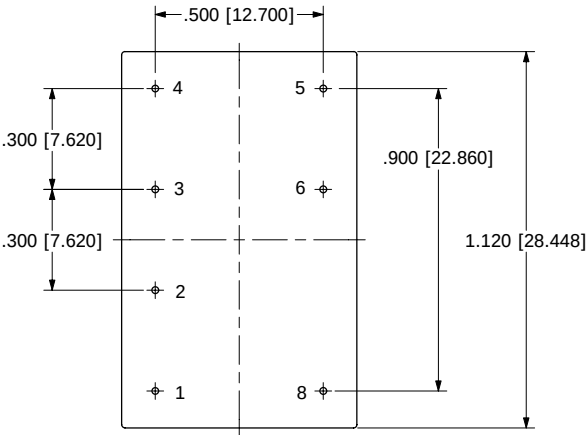
SINGLE OUTPUT



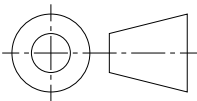
DUAL OUTPUT



BOTTOM VIEW

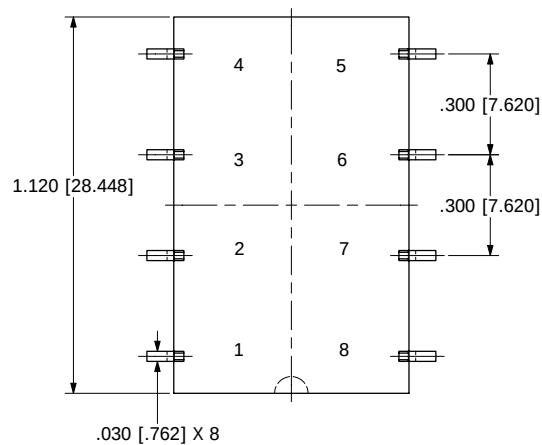
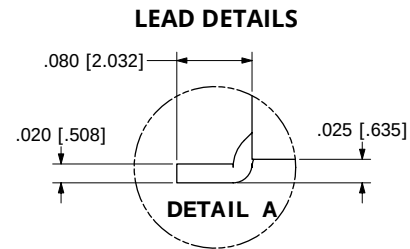
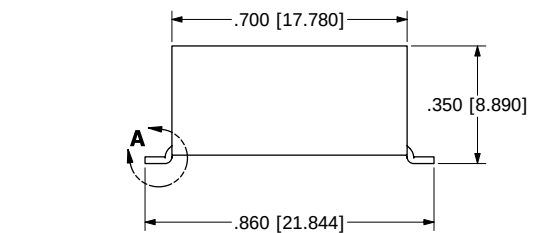


BOTTOM VIEW



MECHANICAL DRAWINGS

SERIES SOR - SUFRACE MOUNT



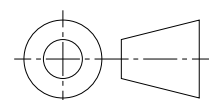
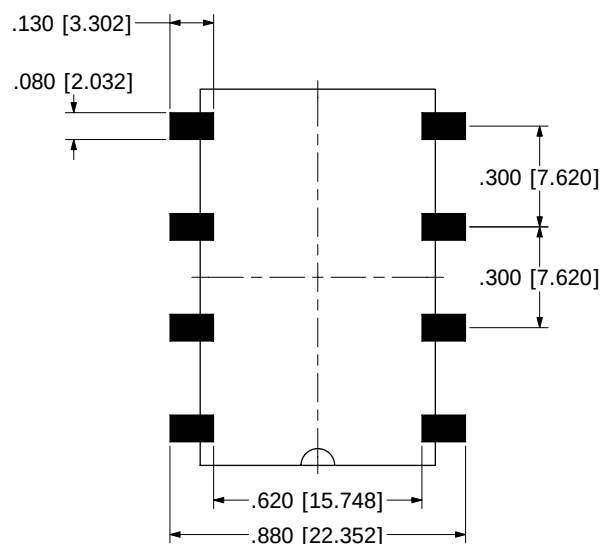
BOTTOM VIEW

PIN	FUNCTION	
	SINGLE	DUAL
1	-IN	
2	CTRL	
3	+OUT	+OUT1
4	-OUT	-OUT1
5	-OUT	-OUT2
6	N/C	+OUT2
7	N/C	
8	+IN	

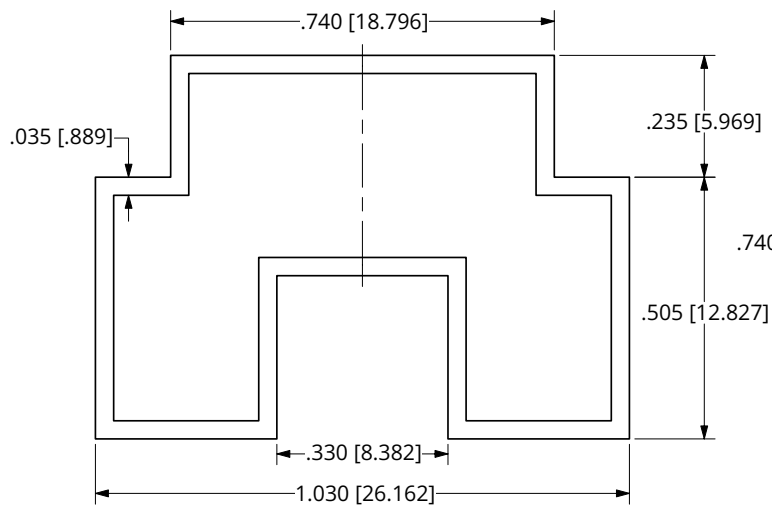
NOTES

a. ALL DIMENSIONS ARE IN INCHES, [] = MM

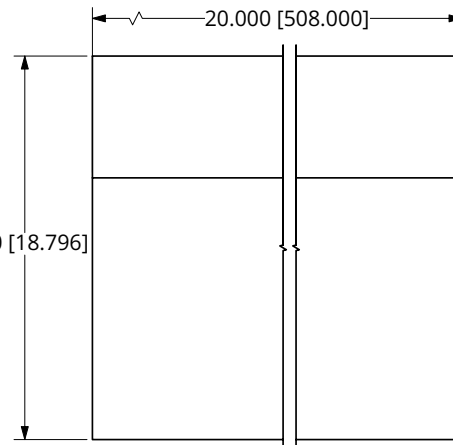
RECOMMENDED LAND PATTERN DIMENSIONS - SERIES SOR



TUBE PACKAGING

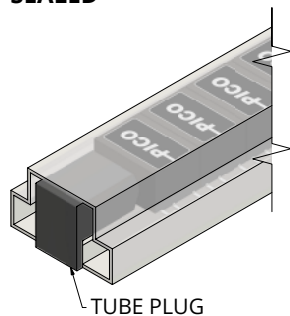


PLAN VIEW

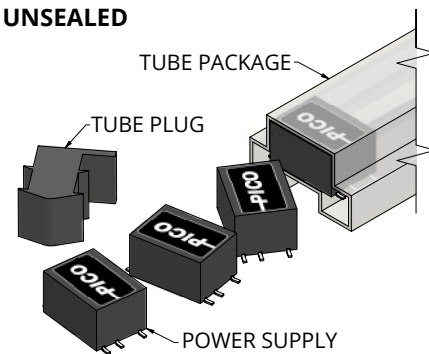


ELEVATION VIEW

SEALED



UNSEALED



Pico warrants each product manufactured by us and sold by us or an authorized representative, to be free from defects in material and workmanship. If properly used, it will perform within its applicable specifications for a period of one year after original shipment. Pico's obligation under this guarantee is limited to repairing or replacing our product to the original purchaser. This warranty is in lieu of all other warranties, express or implied and constitutes fulfillment of our obligations to the purchaser. We do not guarantee that the products can be used for a particular purpose other than those solely covered by the product's specifications. Pico must be notified if the product must meet particular certifications and/or standards. We assume no liability, in any event, for consequential damages, for anticipated or lost profits, incidental damages or loss of time or other losses incurred by the purchaser or any third party in connection with products covered by this warranty or otherwise. The purchaser will indemnify and hold Pico harmless for any damages, losses, costs, etc. from usage not within the product's specifications. Pico must be consulted before usage of its products in a nuclear, radioactive or space environment.

We reserve the right to discontinue products without notice, We reserve the right to make modifications to any existing catalog products without notice, at any time, without the obligation to modify units previously sold.

Series XGR & XSGR

4.5W Isolated Regulated Low Profile DC-DC Converter

PICO
Electronics, Inc.

PRODUCT OVERVIEW

The XGR & XSGR series are isolated DC-DC converter with tight regulation, low ripple and low profile - 0.350" height. These modules are excellent for applications where the input voltage has some variation and the output voltage must be tightly regulated throughout output loading variations. Single and dual isolated output models are standard. They can operate up to 4.5W over the temperature range of -25°C to +70°C without derating, a heat sink or active cooling.



FEATURES

- 5 to 28V input models
- Up to 4.5W output at +70°C ambient
- Low profile – 0.350" height
- 2 to 15V output models
- Down to 0.5% load regulation
- No minimum load
- Input/output isolation
- Single and dual isolated output
- No external components required
- No heat sink or derating required

Contact Pico for part number of available options:

- Expanded operating temp: -55°C to +85°C
- Select screening per MIL-STD-883:
 - Stabilization Bake
 - Temperature Cycle
 - Burn-In
- Available RoHS Compliant module
- Special Input Voltage, Output Voltage, Isolation Voltage or Output Power

28

NOM. INPUT VOLTAGE

5 = 5V
12 = 12V
15 = 15V
24 = 24V
28 = 28V

XGR

MOUNTING TYPE

XGR = THROUGH HOLE
XSGR = SURFACE MOUNT

5

NOM. OUTPUT VOLTAGE

2 = 2V
3.3 = 3.3V
5 = 5V
9 = 9V
12 = 12V
15 = 15V

S

NUMBER OF OUTPUTS

S = SINGLE
D = DUAL

MODEL LIST**SINGLE OUTPUTS**

Pico Part Number		Input Voltage $\pm 10\%$ [VDC]	Output Voltage [VDC]	Output Current		Output Power [W]	Efficiency @ Full Load			Input Current	
Through Hole	Surface Mount			Min. [mA]	Max. [mA]		Min. V_{IN} [%] typ.	Typ. V_{IN} [%] typ.	Max. V_{IN} [%] typ.	No Load [mA] typ.	Full Load ⁽¹⁾ [mA] typ.
5XGR2S	5XSGR2S	5	2	0	625	1.25	50	45	40	90	556
5XGR3.3S	5XSGR3.3S		3.3		530	1.75	55	50	45	90	700
5XGR5S	5XSGR5S		5		400	2	60	55	50	90	727
5XGR9S	5XSGR9S		9		278	2.5	58	54	51	90	926
5XGR12S	5XSGR12S		12		250	3	67	60	53	90	1000
5XGR15S	5XSGR15S		15		200	3	68	61	55	100	984
12XGR2S	12XSGR2S	12	2		750	1.5	50	45	40	25	278
12XGR3.3S	12XSGR3.3S		3.3		606	2	55	50	45	25	333
12XGR5S	12XSGR5S		5		400	2	60	54	50	25	309
12XGR9S	12XSGR9S		9		334	3	57	52	47	30	481
12XGR12S	12XSGR12S		12		333	4	70	64	58	30	521
12XGR15S	12XSGR15S		15		266	4	73	66	61	30	505
15XGR2S	15XSGR2S	15	2		750	1.5	50	45	40	30	222
15XGR3.3S	15XSGR3.3S		3.3		606	2	55	50	45	30	267
15XGR5S	15XSGR5S		5		400	2	60	54	50	30	247
15XGR9S	15XSGR9S		9		334	3	57	52	47	30	481
15XGR12S	15XSGR12S		12		333	4	70	64	58	30	417
15XGR15S	15XSGR15S		15		266	4	73	66	61	30	404
24XGR2S	24XSGR2S	24	2		750	1.5	56	50	45	25	125
24XGR3.3S	24XSGR3.3S		3.3		606	2	55	50	45	25	154
24XGR5S	24XSGR5S		5		500	2.5	61	54	47	25	193
24XGR9S	24XSGR9S		9		334	3	52	56	51	25	223
24XGR12S	24XSGR12S		12		333	4	71	63	56	25	265
24XGR15S	24XSGR15S		15		266	4	73	66	58	30	253
28XGR2S	28XSGR2S	28	2		750	1.5	56	50	45	25	107
28XGR3.3S	28XSGR3.3S		3.3		606	2	59	54	49	25	132
28XGR5S	28XSGR5S		5		600	3	65	56	52	25	191
28XGR9S	28XSGR9S		9		388	3.5	52	55	51	25	227
28XGR12S	28XSGR12S		12		375	4.5	74	65	58	25	247
28XGR15S	28XSGR15S		15		300	4.5	75	67	60	30	240

Note 1: Tested at nominal input voltage.

MODEL LIST**DUAL OUTPUTS**

Pico Part Number		Input Voltage ±10% [VDC]	Output Voltage Per Output [VDC]	Output Current Per Output		Output Power Per Output [W]	Efficiency @ Full Load			Input Current	
Through Hole	Surface Mount			Min. [mA]	Max. [mA]		Min. V _{IN} [%] typ.	Typ. V _{IN} [%] typ.	Max. V _{IN} [%] typ.	No Load [mA] typ.	Full Load ⁽¹⁾ [mA] typ.
5XGR5D	5XSGR5D	5	5	0	200	1	60	55	50	90	727
5XGR9D	5XSGR9D		9		139	1.25	58	54	51	90	926
5XGR12D	5SGR12D		12		125	1.5	67	60	53	90	1000
5XGR15D	5SGR15D		15		100	1.5	68	61	55	100	984
12XGR5D	12XSGR5D	12	5		200	1	60	54	50	30	309
12XGR9D	12XSGR9D		9		167	1.5	57	52	47	30	481
12XGR12D	12XSGR12D		12		166	2	70	64	58	30	521
12XGR15D	12XSGR15D		15		133	2	73	66	61	30	505
15XGR5D	15XSGR5D	15	5		200	1	60	54	50	30	247
15XGR9D	15XSGR9D		9		167	1.5	57	52	47	30	385
15XGR12D	15XSGR12D		12		166	2	70	64	58	30	417
15XGR15D	15XSGR15D		15		133	2	73	66	61	30	404
24XGR5D	24XSGR5D	24	5		250	1.25	61	54	47	25	193
24XGR9D	24XSGR9D		9		167	1.5	62	56	51	25	223
24XGR12D	24XSGR12D		12		166	2	71	63	56	25	265
24XGR15D	24XSGR15D		15		133	2	73	66	58	30	253
28XGR5D	28XSGR5D	28	5		300	1.5	65	56	52	25	191
28XGR9D	28XSGR9D		9		194	1.75	62	55	51	25	227
28XGR12D	28XSGR12D		12		188	2.25	74	65	58	25	247
28XGR15D	28XSGR15D		15		150	2.25	75	67	60	30	240

Note 1: Tested at nominal input voltage.

Note 2: Dual output loads must be balanced.

SPECIFICATIONS (Nominal V_{IN} , Full Load, $T_A = +25^\circ\text{C}$, 1 hour warm up unless otherwise specified)**INPUT**

Parameter	Condition	Min.	Typ.	Max.	Units
Input Voltage Range	5V input models	4.5	5	5.5	VDC
	12V input models	10.8	12	13.2	
	15V input models	13.5	15	16.5	
	24V input models	21.6	24	26.4	
	28V input models	25.2	28	30.8	

OUTPUT

Parameter	Condition	Min.	Typ.	Max.	Units
Line Regulation		-	0.2	-	±%
Load Regulation	0-100% load	-	0.5	-	%
Output Ripple	2 to 3.3V output models	-	30	-	mVp-p
	All other models	-	50	-	
Output Voltage Tolerance	Nominal V_{IN} Full Load	2 to 3.3V single output models	-	3	±%
		All other single output models	-	1	
		Dual output models	-	2	

ENVIRONMENTAL

Parameter	Condition	Min.	Typ.	Max.	Units
Operating Temperature Range	Ambient without derating	-25	-	+70	°C
Storage Temperature Range	Ambient	-55	-	+125	°C
Temperature Coefficient				0.005	%/°C
Cooling	Free Air Convection				

GENERAL

Parameter	Condition	Min.	Typ.	Max.	Units
Isolation Voltage	Input to output	500	-	-	VDC
	OUT1 to OUT2	500	-	-	
Switching Frequency		20	-	40	kHz
Size (L x W x H)	Series XGR	2.25 x 1.125 x 0.35 (57.15 x 28.575 x 8.89)			inches (mm)
	Series XSGR	2.25 x 1.125 x 0.35 (57.15 x 28.575 x 8.89)			
Weight		-	30	-	grams
Case	Glass Reinforced Polymer				
Potting	Vacuum Impregnated Epoxy				
Tube Packaging (W x H x L)	Series XGR	1.545 x 0.65 x 20 (39.243 x 16.51x 508)			inches (mm)
Box Packaging (W x L x H)	Series XSGR	8 x 7.5 x 1.5 (203.2 x 190.5 x 38.1) or 12 x 9 x 1.5 (304.8 x 228.6 x 38.1)			inches (mm)
Moisture Sensitivity Level	Series XSGR	IPC / JEDEC J-STD-020, Level 3			

PROTECTION & FEATURES

Parameter	Condition	Min.	Typ.	Max.	Units
Shortcircuit	Continuous, self-recovery				

SPECIFICATIONS (Nominal V_{IN} , Full Load, $T_A = +25^{\circ}\text{C}$, 1 hour warm up unless otherwise specified)

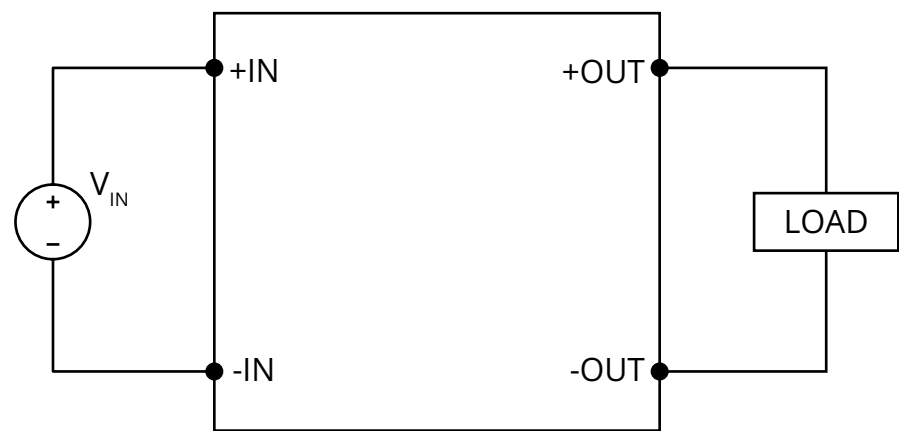
DESIGNED TO MEET		
Test	Referenced Standard	Description
Vibration	MIL-STD-202	Method 204, Vibration, High Frequency, Condition D
Shock	MIL-STD-202	Method 213, Shock (Specified Pulse), Condition I
Humidity	MIL-STD-202	Method 106, Moisture Resistance
Altitude	MIL-STD-202	Method 105, Barometric Pressure (Reduced), Condition D

OPTIONS AVAILABLE – CONTACT PICO FOR PART NUMBER

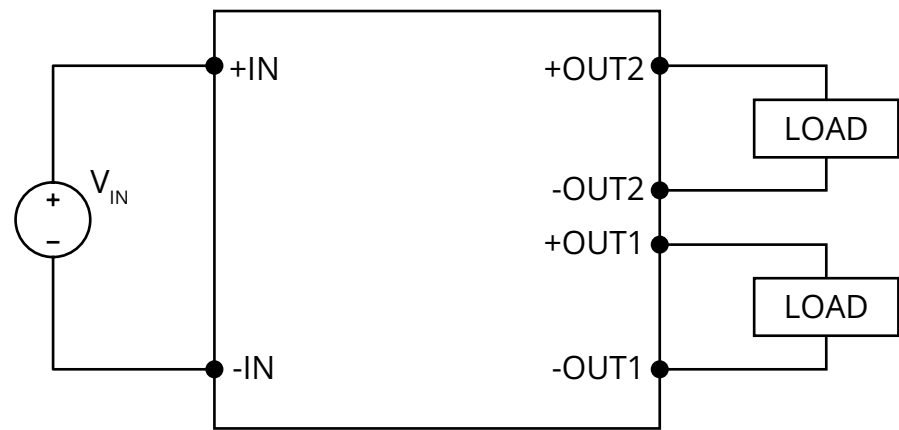
Parameter	Referenced Standard	Description
Stabilization Bake	MIL-STD-883	Referenced Method 1008 Non-operating maximum storage temperature for 24 hours
Temperature Cycle	MIL-STD-883	Referenced Method 1010 Non-operating at temperature extremes, 15 mins/temp, 10 cycles
Burn-In	MIL-STD-883	Referenced Method 1015 Max operating temperature for 160 hours
Expanded Ambient Operating Temperature		-55°C to +85°C
RoHS Compliance		-

TYPICAL CONNECTION CIRCUIT

SINGLE OUTPUT



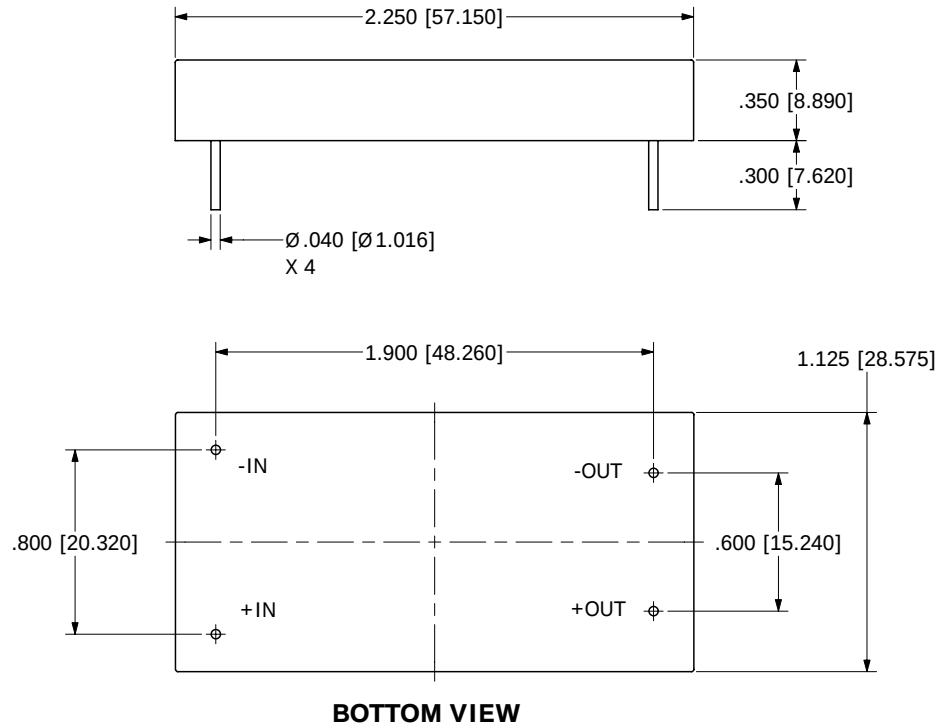
DUAL OUTPUT



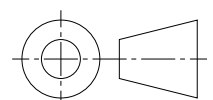
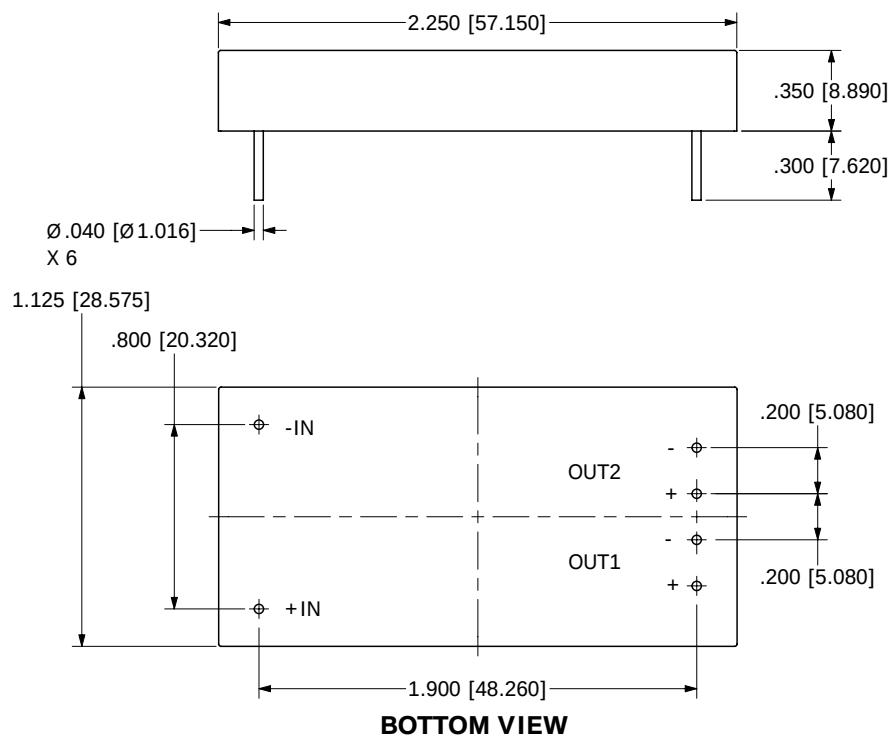
MECHANICAL DRAWINGS

SERIES XGR - THROUGH HOLE

SINGLE OUTPUT



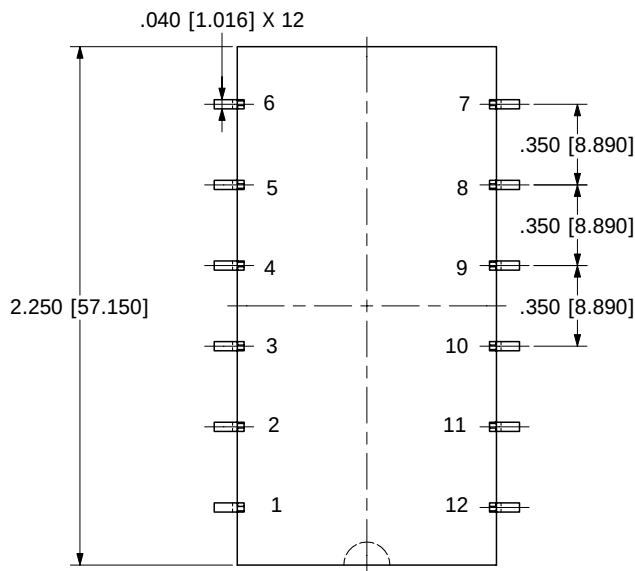
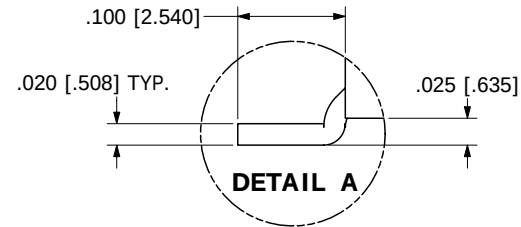
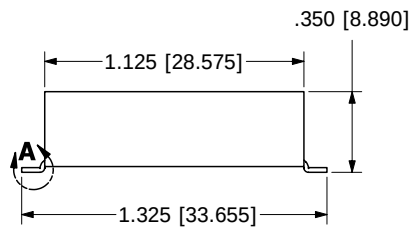
DUAL OUTPUT



MECHANICAL DRAWINGS

SERIES XSGR - SUFRACE MOUNT

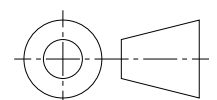
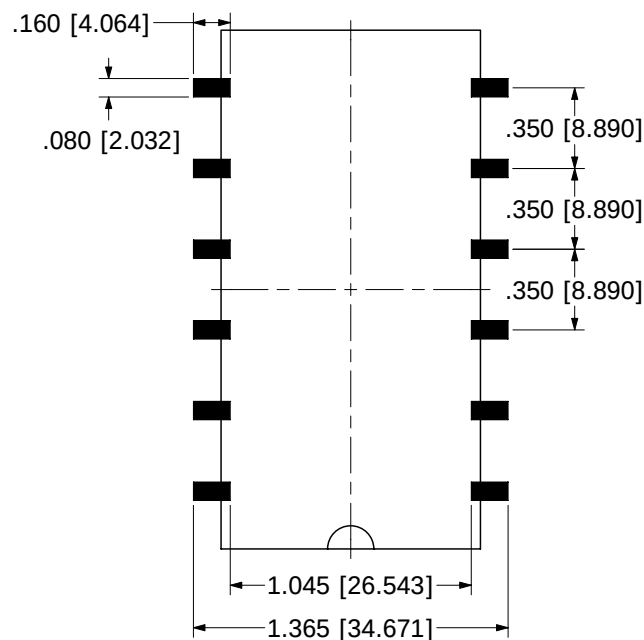
LEAD DETAILS



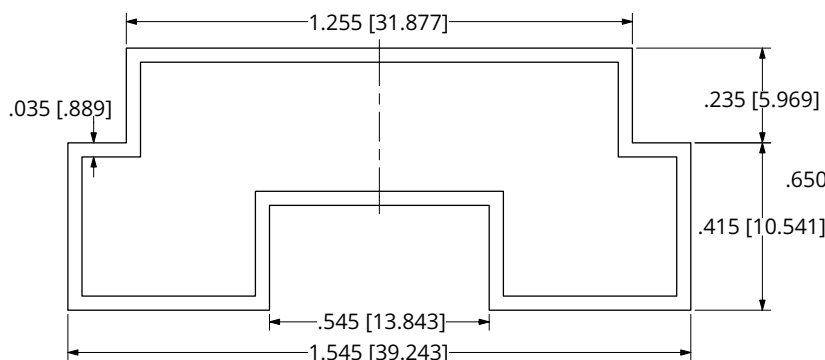
BOTTOM VIEW

PIN	FUNCTION	
	SINGLE	DUAL
1	-IN	
2	-IN	
3	N/C	
4	N/C	
5	+IN	
6	+IN	
7	+OUT	+OUT1
8	-OUT	-OUT1
9	N/C	
10	N/C	
11	N/C	+OUT2
12	N/C	-OUT2

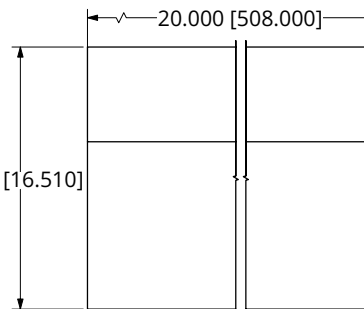
RECOMMENDED LAND PATTERN DIMENSIONS - SERIES XSGR



TUBE PACKAGING - SERIES XSGR

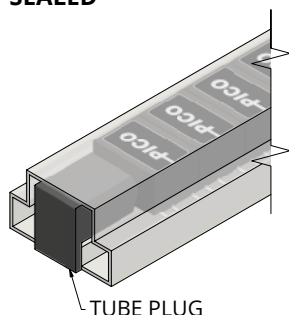


PLAN VIEW

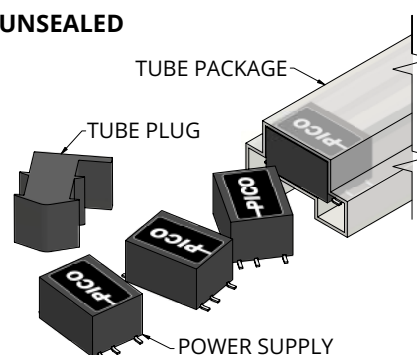


ELEVATION VIEW

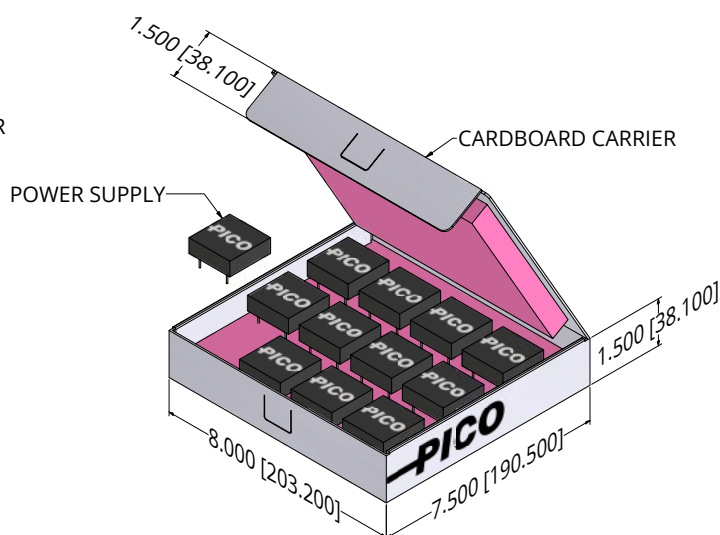
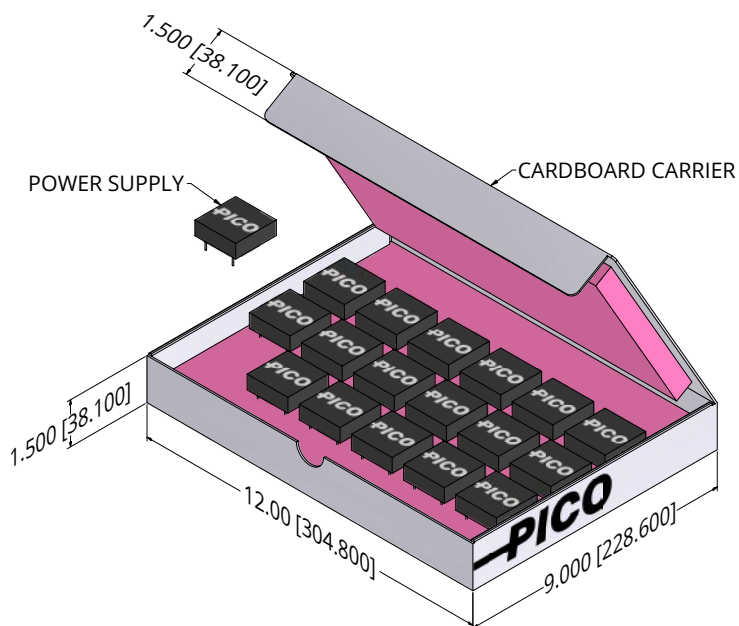
SEALED



UNSEALED



BOX PACKAGING - BULK - SERIES XGR



Pico warrants each product manufactured by us and sold by us or an authorized representative, to be free from defects in material and workmanship. If properly used, it will perform within its applicable specifications for a period of one year after original shipment. Pico's obligation under this guarantee is limited to repairing or replacing our product to the original purchaser. This warranty is in lieu of all other warranties, express or implied and constitutes fulfillment of our obligations to the purchaser. We do not guarantee that the products can be used for a particular purpose other than those solely covered by the product's specifications. Pico must be notified if the product must meet particular certifications and/or standards. We assume no liability, in any event, for consequential damages, for anticipated or lost profits, incidental damages or loss of time or other losses incurred by the purchaser or any third party in connection with products covered by this warranty or otherwise. The purchaser will indemnify and hold Pico harmless for any damages, losses, costs, etc. from usage not within the product's specifications. Pico must be consulted before usage of its products in a nuclear, radioactive or space environment.

We reserve the right to discontinue products without notice, We reserve the right to make modifications to any existing catalog products without notice, at any time, without the obligation to modify units previously sold.

Series HILR

5W Isolated Regulated Low Profile DC-DC Converter

PRODUCT OVERVIEW

The HILR series is an isolated DC-DC converter with wide and high input voltage range, tight regulation, low ripple and low profile - 0.500" height. These modules are fully protected from input over/undervoltage, output overcurrent, and over temperature. Shutdown feature, single and dual isolated output models are standard. They can operate over the temperature range of -25°C to +70°C without derating, a heat sink or active cooling.



FEATURES

- Wide input voltage range - 125 to 475V
 - Up to 5W output at +70°C ambient
 - Low profile – 0.500" height
 - 3.3 to 100V output models
 - Down to 0.5% line regulation
 - 1500V Input/output isolation
 - Single and dual isolated output
 - Protected against input over/undervoltage, output overcurrent, and over temperature
 - No heat sink or derating required
- Contact Pico for part number of available options:

 - Expanded operating temp: -55°C to +85°C
 - Select screening per MIL-STD-883:
 - Stabilization Bake
 - Temperature Cycle
 - Burn-In
 - Special Input Voltage, Output Voltage, Isolation Voltage or Output Power

HILR	28	S
SERIES NAME	NOM. OUTPUT VOLTAGE	NUMBER OF OUTPUTS
HILR	3.3 = 3.3V 5 = 5V 9 = 9V 12 = 12V 15 = 15V 24 = 24V 28 = 28V 48 = 48V 100 = 100V	S = SINGLE D = DUAL

MODEL LIST

SINGLE OUTPUTS

Pico Part Number	Output Voltage [VDC]	Output Current		Efficiency ⁽¹⁾ [%] typ.	Line Regulation [±%] max	Load Regulation 0-100% [±%] max	Output Ripple @ 1MHz BW [mVp-p] max	Output Voltage Tolerance ⁽¹⁾ [±%]
		Min. [A]	Max. [A]					
HILR3.3S	3.3	0	1212.12	73	1	1	50	1.5
HILR5S	5		1000	78	1	1	50	1
HILR12S	12		416.67	84	0.75	1	50	1
HILR15S	15		333.33	84	0.75	1	50	1
HILR24S	24		208.33	85	0.75	0.75	75	0.75
HILR28S	28		178.57	85	0.75	0.75	75	0.75
HILR48S	48		104.17	86	0.5	1	125	0.75
HILR100S	100		50	85	1	1.5	250	0.75

DUAL OUTPUTS

Pico Part Number	Output Voltage Per Output [VDC]	Output Current Per Output		Efficiency ⁽¹⁾ [%] typ.	Line Regulation [±%] max	Load Regulation 0-100% [±%] max	Output Ripple @ 1MHz BW [mVp-p] max	Output Voltage Tolerance ⁽¹⁾ [±%]
		Min. [A]	Max. [A]					
HILR3.3D	3.3	0	606.06	73	1	1	50	1.5
HILR5D	5		500.00	78	1	1	50	1
HILR12D	12		208.33	84	0.75	1	50	1
HILR15D	15		166.67	84	0.75	1	50	1
HILR24D	24		104.17	85	0.75	0.75	75	0.75
HILR28D	28		89.29	85	0.75	0.75	75	0.75
HILR48D	48		52.08	86	0.5	1	125	0.75

Note 1: Tested at nominal input voltage and full output load.

Note 2: Dual output loads must be balanced.

SPECIFICATIONS (Nominal V_{IN} , Full Load, $T_A = +25^\circ\text{C}$, 1 hour warm up unless otherwise specified)

INPUT

Parameter	Condition	Min.	Typ.	Max.	Units
Input Voltage Range		125	300	475	VDC
Input Current	Shutdown enabled	-	1	-	mA
	0% load	-	0.3	-	
Startup Overshoot		-	5	-	%

OUTPUT

Parameter	Condition	Min.	Typ.	Max.	Units
Output Power	≤3.3V Output models	-	-	4	W
	All other models	-	-	5	

SPECIFICATIONS (Nominal V_{IN} , Full Load, $T_A = +25^{\circ}\text{C}$, 1 hour warm up unless otherwise specified)**ENVIRONMENTAL**

Parameter	Condition	Min.	Typ.	Max.	Units
Operating Temperature Range	Ambient without derating	-25	-	+70	$^{\circ}\text{C}$
Storage Temperature Range	Ambient	-55	-	+125	$^{\circ}\text{C}$
Cooling	Free Air Convection				

GENERAL

Parameter	Condition	Min.	Typ.	Max.	Units
Isolation Voltage	Input/outputs	1500	-	-	VDC
	OUT1 to OUT2	500	-	-	
Switching Frequency		-	-	80	kHz
Size	L x W x H	1.875 x 1.475 x 0.5 (47.625 x 37.465 x 12.7)			inches (mm)
Weight		-	45	-	grams
Case	Glass Reinforced Polymer				
Potting	Vacuum Impregnated Epoxy				

PROTECTION & FEATURES

Parameter	Condition		Min.	Typ.	Max.	Units
Shortcircuit or Overload	Hiccup mode, self-recovery		-	125	-	%
Overtemperature	Baseplate, self-recovery	Shutdown	90	95	100	VDC
		Restart	-	50	-	
Input Over Voltage	Non-latched shutdown, Self-recovery	Shutdown	-	505	-	VDC
		Restart	-	495	-	
Input Under Voltage	Non-latched shutdown, Self-recovery	Shutdown	-	98	-	VDC
		Restart	-	103	-	
Shutdown (SHDN)	Non-latched shutdown, Self-recovery	Shutdown	-	1	-	VDC
		Restart	OPEN			
	Open connection		-	-	22	VDC

DESIGNED TO MEET

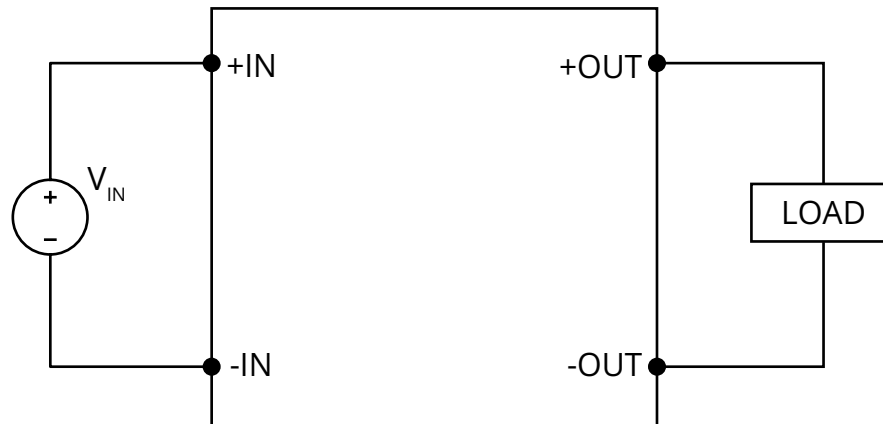
Test	Referenced Standard	Description
Vibration	MIL-STD-202	Method 204, Vibration, High Frequency, Condition D
Shock	MIL-STD-202	Method 213, Shock (Specified Pulse), Condition I
Humidity	MIL-STD-202	Method 106, Moisture Resistance
Altitude	MIL-STD-202	Method 105, Barometric Pressure (Reduced), Condition D

OPTIONS AVAILABLE – CONTACT PICO FOR PART NUMBER

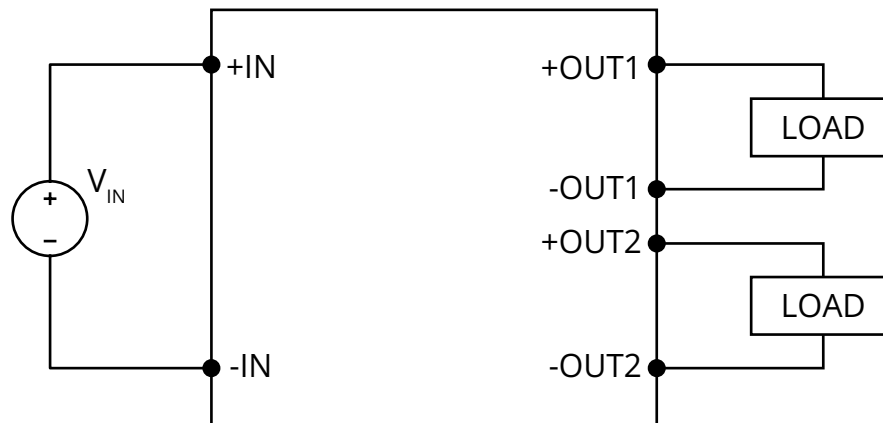
Parameter	Referenced Standard	Description
Stabilization Bake	MIL-STD-883	Referenced Method 1008 Non-operating maximum storage temperature for 24 hours
Temperature Cycle	MIL-STD-883	Referenced Method 1010 Non-operating at temperature extremes, 15 mins/temp, 10 cycles
Burn-In	MIL-STD-883	Referenced Method 1015 Max operating temperature for 160 hours

TYPICAL CONNECTION CIRCUIT

SINGLE OUTPUT

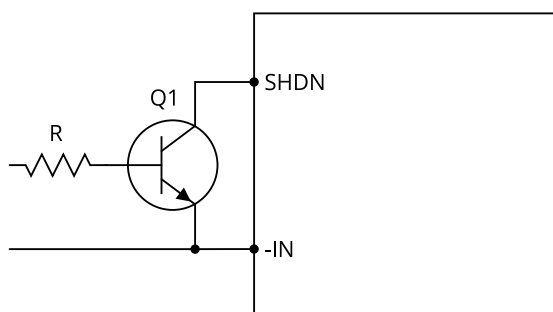


DUAL OUTPUT

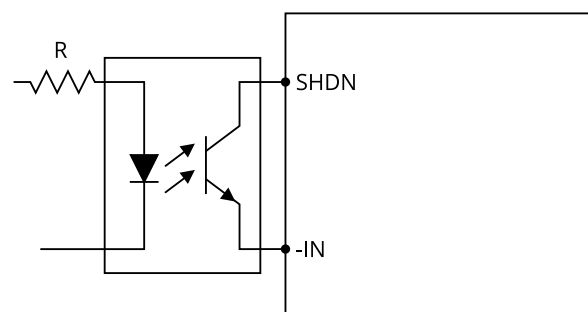


SHUTDOWN

NON-ISOLATED



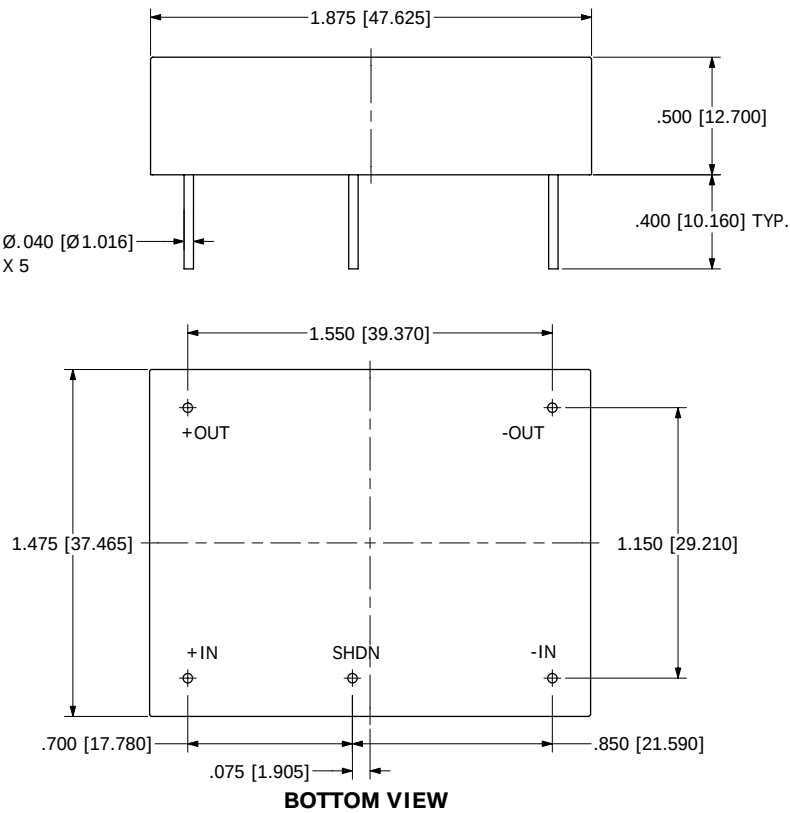
ISOLATED



Please note: During shutdown mode, 475V input and no load condition, the output voltage may increase up to 5% of nominal output voltage. Shutdown is enabled when SHDN pin is pulled low ($<1V$) relative to $-IN$. OPEN will automatically restart the module. When floating, the maximum voltage of SHDN is limited to 22VDC.

MECHANICAL DRAWINGS

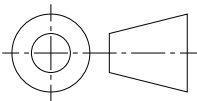
SINGLE OUTPUT

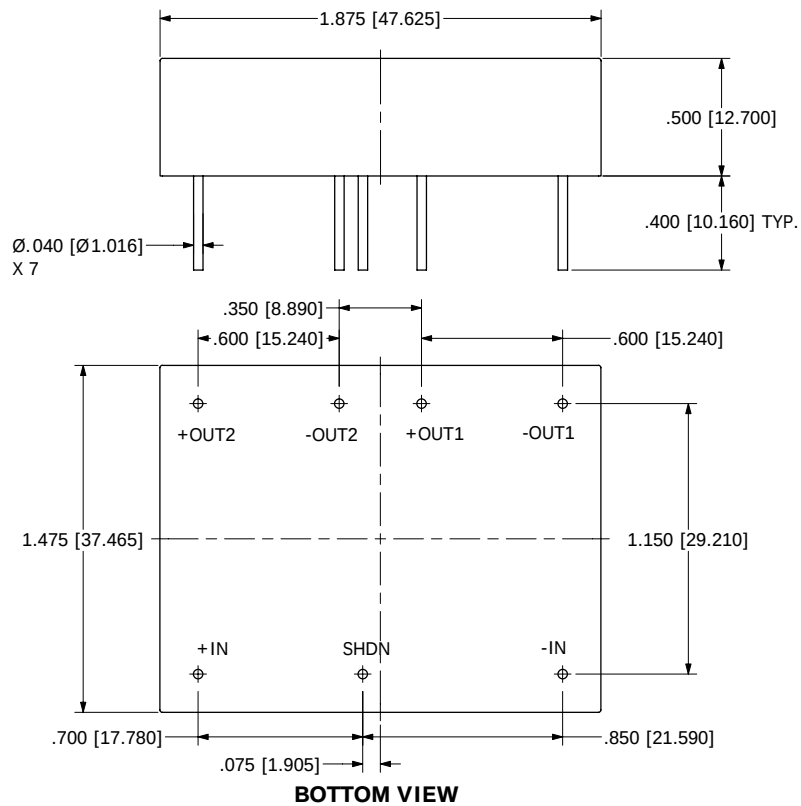


NOTES

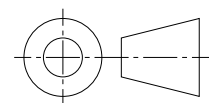
a. ALL DIMENSIONS ARE IN INCHES, [] = MM

2025 REV 0



MECHANICAL DRAWINGS**DUAL OUTPUT****NOTES**

a. ALL DIMENSIONS ARE IN INCHES, [] = MM



Pico warrants each product manufactured by us and sold by us or an authorized representative, to be free from defects in material and workmanship. If properly used, it will perform within its applicable specifications for a period of one year after original shipment. Pico's obligation under this guarantee is limited to repairing or replacing our product to the original purchaser. This warranty is in lieu of all other warranties, express or implied and constitutes fulfillment of our obligations to the purchaser. We do not guarantee that the products can be used for a particular purpose other than those solely covered by the product's specifications. Pico must be notified if the product must meet particular certifications and/or standards. We assume no liability, in any event, for consequential damages, for anticipated or lost profits, incidental damages or loss of time or other losses incurred by the purchaser or any third party in connection with products covered by this warranty or otherwise. The purchaser will indemnify and hold Pico harmless for any damages, losses, costs, etc. from usage not within the product's specifications. Pico must be consulted before usage of its products in a nuclear, radioactive or space environment.

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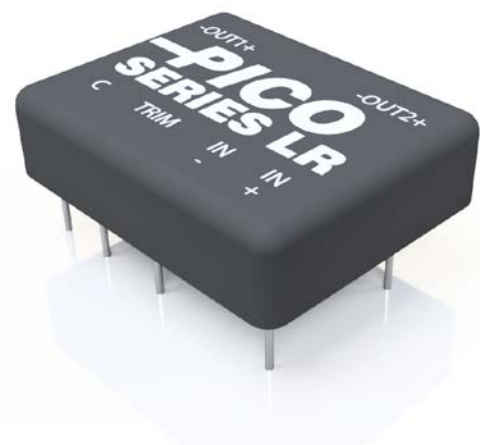
Series LR

5W Isolated Regulated Low Profile DC-DC Converter



PRODUCT OVERVIEW

The LR series is an isolated DC-DC converter with wide input range, tight regulation and six-sided shielded case. These modules have trim and control features. Single and dual isolated output models are standard. They can operate up to 5W over the temperature range of -25°C to +70°C without derating, a heat sink or active cooling.



FEATURES

- Up to 5W output at +70°C ambient
- Low profile – 0.500" height
- Up to 3.33:1 input voltage range
- 2 to 100V output models
- Six-sided shielded case
- Control feature
- Trimmable output
- Input/output isolation
- Single and dual isolated output
- No external components required
- No heat sink or derating required

Contact Pico for part number of available options:

- Expanded operating temp: -55°C to +85°C
- Select screening per MIL-STD-883:
 - Stabilization Bake
 - Temperature Cycle
 - Burn-In
- Special Input Voltage, Output Voltage, Isolation Voltage or Output Power

LR	F	28	S
SERIES NAME	INPUT VOLTAGE RANGE	NOM. OUTPUT VOLTAGE	NUMBER OF OUTPUTS
LR	E = 5 to 15V F = 8 to 24V A = 18 to 36V B = 36 to 60V C = 18 to 60V	2 = 2V 3.3 = 3.3V 5 = 5V 5.2 = 5.2V 9 = 9V 12 = 12V 15 = 15V 24 = 24V 28 = 28V 48 = 48V 100 = 100V	S = SINGLE D = DUAL

MODEL LIST**SINGLE OUTPUT**

Pico Part Number	Output Voltage [VDC]	Output Current		Output Power [W]	Efficiency ⁽¹⁾ [%] typ.	Input Current ⁽¹⁾ [%] typ.	Line Regulation ⁽²⁾		Load Regulation ⁽³⁾		Output Ripple @ 1MHz BW [mVp-p]	Output Voltage Tolerance ⁽¹⁾ [±%]
		Min. [mA]	Max. [mA]				Nom.-Min. [-%]	Nom.-Max. [%]	60%-25% [%]	60%-100% [%]		
LRE2S	2	100	1000	2	68	294	3.50	3.50	3.50	3.50	150	1.50
LRE3.3S	3.3	91	910	3	75	400	2.75	2.75	3.00	3.00	200	1.00
LRE5S	5	60	600	3	78	385	2.00	2.00	1.50	1.50	150	0.75
LRE5.2S	5.2	57.6	576	3	78	385	2.00	2.00	1.50	1.50	150	0.75
LRE9S	9	44.4	444	4	78	515	1.50	1.50	1.25	1.25	125	0.50
LRE12S	12	33.3	333	4	79	505	1.25	1.25	1.25	1.25	125	0.50
LRE15S	15	26.7	267	4	79	505	1.25	1.25	1.25	1.25	125	0.50
LRE24S	24	16.7	167	4	80	500	1.25	1.25	1.00	1.00	125	0.50
LRE28S	28	14.3	143	4	80	500	1.00	1.00	1.00	1.00	125	0.50
LRE48S	48	8.3	83	4	80	500	1.00	1.00	1.00	1.00	175	0.50
LRE100S	100	4	40	4	80	500	1.00	1.00	1.00	1.00	200	0.50
LRF2S	2	150	1500	3	69	272	3.00	3.00	3.50	3.50	150	1.50
LRF3.3S	3.3	121.2	1212	4	75	333	2.75	2.75	3.00	3.00	200	1.00
LRF5S	5	100	1000	5	78	400	2.00	2.00	1.50	1.50	150	0.75
LRF5.2S	5.2	96.1	961	5	78	400	2.00	2.00	1.50	1.50	150	0.75
LRF9S	9	55.6	556	5	78	400	1.50	1.50	1.25	1.25	125	0.50
LRF12S	12	41.7	417	5	79	395	1.25	1.25	1.25	1.25	125	0.50
LRF15S	15	33.3	333	5	79	395	1.25	1.25	1.25	1.25	125	0.50
LRF24S	24	20.8	208	5	80	390	1.25	1.25	1.00	1.00	125	0.50
LRF28S	28	17.9	179	5	80	390	1.00	1.00	1.00	1.00	125	0.50
LRF48S	48	10.4	104	5	80	390	1.00	1.00	1.00	1.00	175	0.50
LRF100S	100	5	50	5	80	390	1.00	1.00	1.00	1.00	200	0.50
LRA2S	2	150	1500	3	69	161	2.00	2.00	4.00	4.00	150	1.50
LRA3.3S	3.3	121.2	1212	4	76	195	1.50	1.50	3.00	3.00	150	1.00
LRA5S	5	100	1000	5	76	245	0.75	0.75	2.00	2.00	100	0.75
LRA5.2S	5.2	96.1	961	5	76	245	0.75	0.75	2.00	2.00	100	0.75
LRA9S	9	55.6	556	5	76	245	0.50	0.50	2.00	2.00	100	0.50
LRA12S	12	41.7	417	5	77	240	0.50	0.50	2.00	2.00	100	0.50
LRA15S	15	33.3	333	5	79	235	0.50	0.50	1.50	1.50	100	0.50
LRA24S	24	20.8	208	5	80	230	0.25	0.25	1.50	1.50	100	0.50
LRA28S	28	17.9	179	5	80	230	0.25	0.25	1.50	1.50	100	0.50
LRA48S	48	10.4	104	5	80	230	0.25	0.25	1.00	1.00	150	0.50
LRA100S	100	5	50	5	80	230	0.50	0.50	1.00	1.00	200	0.50

Note 1: Tested at nominal input voltage and full output load.

Note 2: Line regulation is specified at full output load, nominal to minimum input voltage (-%) and nominal to maximum input voltage (+%).

Note 3: Load regulation is specified at nominal input voltage, 60% to 25% load (+%) and 60% to 100% load (-%).

MODEL LIST**SINGLE OUTPUT**

Pico Part Number	Output Voltage [VDC]	Output Current		Output Power [W]	Efficiency ⁽¹⁾ [%] typ.	Input Current ⁽¹⁾ [%] typ.	Line Regulation ⁽²⁾		Load Regulation ⁽³⁾		Output Ripple @ 1MHz BW [mVp-p]	Output Voltage Tolerance ⁽¹⁾ [±%]
		Min. [mA]	Max. [mA]				Nom.-Min. [-%]	Nom.-Max. [+%]	60%-25% [+%]	60%-100% [-%]		
LRB2S	2	150	1500	3	67	93	2.00	2.00	4.00	4.00	150	1.50
LRB3.3S	3.3	121.2	1212	4	74	113	1.50	1.50	3.00	3.00	150	1.00
LRB5S	5	100	1000	5	74	140	0.50	0.50	1.25	1.25	100	0.75
LRB5.2S	5.2	96.1	961	5	74	140	0.50	0.50	1.25	1.25	100	0.75
LRB9S	9	55.6	556	5	74	140	0.25	0.25	1.00	1.00	100	0.50
LRB12S	12	41.7	417	5	74	140	0.25	0.25	1.00	1.00	100	0.50
LRB15S	15	33.3	333	5	76	135	0.25	0.25	1.00	1.00	100	0.50
LRB24S	24	20.8	208	5	76	135	0.25	0.25	0.75	0.75	100	0.50
LRB28S	28	17.9	179	5	76	135	0.25	0.25	0.75	0.75	100	0.50
LRB48S	48	10.4	104	5	76	135	0.25	0.25	0.75	0.75	150	0.50
LRB100S	100	5	50	5	78	135	0.50	0.50	1.00	1.00	200	0.50
LRC2S	2	150	1500	3	67	115	2.50	2.50	4.00	4.00	150	1.50
LRC3.3S	3.3	121.2	1212	4	74	139	1.75	1.75	3.00	3.00	150	1.00
LRC5S	5	100	1000	5	76	170	1.25	1.25	2.00	2.00	100	0.75
LRC5.2S	5.2	96.1	961	5	76	170	1.25	1.25	2.00	2.00	100	0.75
LRC9S	9	55.6	556	5	76	170	0.75	0.75	1.00	1.00	100	0.50
LRC12S	12	41.7	417	5	76	170	0.75	0.75	1.00	1.00	100	0.50
LRC15S	15	33.3	333	5	77	165	0.75	0.75	1.00	1.00	100	0.50
LRC24S	24	20.8	208	5	78	165	0.50	0.50	0.75	0.75	100	0.50
LRC28S	28	17.9	179	5	78	165	0.50	0.50	0.75	0.75	100	0.50
LRC48S	48	10.4	104	5	78	165	0.50	0.50	0.75	0.75	150	0.50
LRC100S	100	5	50	5	78	165	0.50	0.50	1.00	1.00	200	0.50

Note 1: Tested at nominal input voltage and full output load.

Note 2: Line regulation is specified at full output load, nominal to minimum input voltage (-%) and nominal to maximum input voltage (+%).

Note 3: Load regulation is specified at nominal input voltage, 60% to 25% load (+%) and 60% to 100% load (-%).

DUAL OUTPUT

Pico Part Number	Output Voltage Per Output [VDC]	Output Current Per Output		Output Power [W]	Efficiency ⁽¹⁾ [%] typ.	Input Current ⁽¹⁾ [%] typ.	Line Regulation ⁽²⁾		Load Regulation ⁽³⁾		Output Ripple Per Output @ 1MHz BW [mVp-p]	Output Voltage Tolerance ⁽¹⁾ [±%]
		Min. [mA]	Max. [mA]				Nom.-Min. [-%]	Nom.-Max. [+%]	60%-25% [+%]	60%-100% [-%]		
LRE5D	5	30	300	1.5	78	385	2.00	2.00	1.50	1.50	150	0.75
LRE9D	9	22.2	222	2.0	78	515	1.50	1.50	1.25	1.25	125	0.50
LRE12D	12	16.7	167	2.0	79	505	1.25	1.25	1.25	1.25	125	0.50
LRE15D	15	13.4	134	2.0	79	505	1.25	1.25	1.25	1.25	125	0.50
LRE24D	24	8.4	84	2.0	80	500	1.25	1.25	1.00	1.00	125	0.50
LRE28D	28	7.2	72	2.0	80	500	1.00	1.00	1.00	1.00	125	0.50
LRE48D	48	4.2	42	2.0	80	500	1.00	1.00	1.00	1.00	175	0.50

Note 1: Tested at nominal input voltage and full output load.

Note 2: Line regulation is specified at full output load, nominal to minimum input voltage (-%) and nominal to maximum input voltage (+%).

Note 3: Load regulation is specified at nominal input voltage, 60% to 25% load (+%) and 60% to 100% load (-%).

Note 4: Dual outputs must be balanced.

MODEL LIST**DUAL OUTPUT**

Pico Part Number	Output Voltage Per Output [VDC]	Output Current Per Output		Output Power [W]	Efficiency ⁽¹⁾ [%] typ.	Input Current ⁽¹⁾ [%] typ.	Line Regulation ⁽²⁾		Load Regulation ⁽³⁾		Output Ripple Per Output @ 1MHz BW [mVp-p]	Output Voltage Tolerance ⁽¹⁾ [±%]
		Min. [mA]	Max. [mA]				Nom.-Min. [-%]	Nom.-Max. [%]	60%-25% [%]	60%-100% [-%]		
LRF5D	5	50	500	2.5	78	400	2.00	2.00	1.50	1.50	150	0.75
LRF9D	9	27.8	278	2.5	78	400	1.50	1.50	1.25	1.25	125	0.50
LRF12D	12	20.8	208	2.5	79	395	1.25	1.25	1.25	1.25	125	0.50
LRF15D	15	16.7	167	2.5	79	395	1.25	1.25	1.25	1.25	125	0.50
LRF24D	24	10.4	104	2.5	80	390	1.25	1.25	1.00	1.00	125	0.50
LRF28D	28	8.9	89	2.5	80	390	1.00	1.00	1.00	1.00	125	0.50
LRF48D	48	5.2	52	2.5	80	390	1.00	1.00	1.00	1.00	175	0.50
LRA5D	5	50	500	2.5	76	245	0.75	0.75	2.00	2.00	100	0.75
LRA9D	9	27.8	278	2.5	76	245	0.50	0.50	2.00	2.00	100	0.50
LRA12D	12	20.8	208	2.5	77	240	0.50	0.50	2.00	2.00	100	0.50
LRA15D	15	16.7	167	2.5	79	235	0.50	0.50	1.50	1.50	100	0.50
LRA24D	24	10.4	104	2.5	80	230	0.25	0.25	1.50	1.50	100	0.50
LRA28D	28	8.9	89	2.5	80	230	0.25	0.25	1.50	1.50	100	0.50
LRA48D	48	5.2	52	2.5	80	230	0.25	0.25	1.00	1.00	150	0.50
LRB5D	5	50	500	2.5	74	140	0.50	0.50	1.25	1.25	100	0.75
LRB9D	9	27.8	278	2.5	74	140	0.25	0.25	1.00	1.00	100	0.50
LRB12D	12	20.8	208	2.5	74	140	0.25	0.25	1.00	1.00	100	0.50
LRB15D	15	16.7	167	2.5	76	135	0.25	0.25	1.00	1.00	100	0.50
LRB24D	24	10.4	104	2.5	76	135	0.25	0.25	0.75	0.75	100	0.50
LRB28D	28	8.9	89	2.5	76	135	0.25	0.25	0.75	0.75	100	0.50
LRB48D	48	5.2	52	2.5	76	135	0.25	0.25	0.75	0.75	150	0.50
LRC5D	5	50	500	2.5	75	170	1.25	1.25	2.00	2.00	100	0.75
LRC9D	9	27.8	278	2.5	75	170	0.75	0.75	1.00	1.00	100	0.50
LRC12D	12	20.8	208	2.5	75	170	0.75	0.75	1.00	1.00	100	0.50
LRC15D	15	16.7	167	2.5	77	165	0.75	0.75	1.00	1.00	100	0.50
LRC24D	24	10.4	104	2.5	78	165	0.50	0.50	0.75	0.75	100	0.50
LRC28D	28	8.9	89	2.5	78	165	0.50	0.50	0.75	0.75	100	0.50
LRC48D	48	5.2	52	2.5	78	165	0.50	0.50	0.75	0.75	150	0.50

Note 1: Tested at nominal input voltage and full output load.

Note 2: Line regulation is specified at full output load, nominal to minimum input voltage (-%) and nominal to maximum input voltage (+%).

Note 3: Load regulation is specified at nominal input voltage, 60% to 25% load (+%) and 60% to 100% load (-%).

Note 4: Dual outputs must be balanced.

SPECIFICATIONS (Nominal V_{IN} , Full Load, $T_A = +25^{\circ}\text{C}$, 1 hour warm up unless otherwise specified)**INPUT**

Parameter	Condition	Min.	Nom.	Max.	Units
Input Voltage Range	LRE models	5	10	15	VDC
	LRF models	8	16	24	
	LRA models	18	27	36	
	LRB models	36	48	60	
	LRC models	18	39	60	

ENVIRONMENTAL

Parameter	Condition	Min.	Typ.	Max.	Units
Operating Temperature Range	Ambient without derating	-25	-	+70	$^{\circ}\text{C}$
Storage Temperature Range	Ambient	-55	-	+105	$^{\circ}\text{C}$
Temperature Coefficient		-	-	0.02	$\%/^{\circ}\text{C}$
Cooling	Free Air Convection				

GENERAL

Parameter	Condition	Min.	Typ.	Max.	Units
Isolation Voltage	Input to output	500	-	-	VDC
	OUT1 to OUT2	500	-	-	
Switching Frequency		-	40	-	kHz
Size (L x W x H)		1.92 x 1.52 x 0.5 (48.768 x 38.608 x 12.7)			inches (mm)
Weight		-	65	-	grams
Case	6-Sided Epoxy Insulated Metal				
Potting	Vacuum Impregnated Epoxy				
Box Packaging (W x L x H)	8 x 7.5 x 1.5 (203.2 x 190.5 x 38.1) or 12 x 9 x 1.5 (304.8 x 228.6 x 38.1)				inches (mm)

PROTECTION & FEATURES

Parameter	Condition	Min.	Typ.	Max.	Units
Shortcircuit	Temporary				
Shutdown (C)	Non-latched shutdown, Self-recovery	Shutdown	Connect to -IN		
		Restart	OPEN		
Output Voltage Trim (TRIM)	Trim up only	0	-	5	%

DESIGNED TO MEET

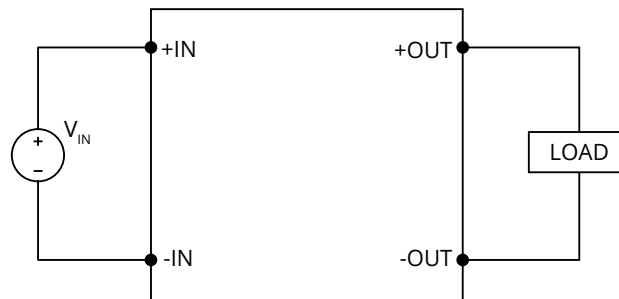
Test	Referenced Standard	Description
Vibration	MIL-STD-202	Method 204, Vibration, High Frequency, Condition D
Shock	MIL-STD-202	Method 213, Shock (Specified Pulse), Condition I
Humidity	MIL-STD-202	Method 106, Moisture Resistance
Altitude	MIL-STD-202	Method 105, Barometric Pressure (Reduced), Condition D

OPTIONS AVAILABLE – CONTACT PICO FOR PART NUMBER

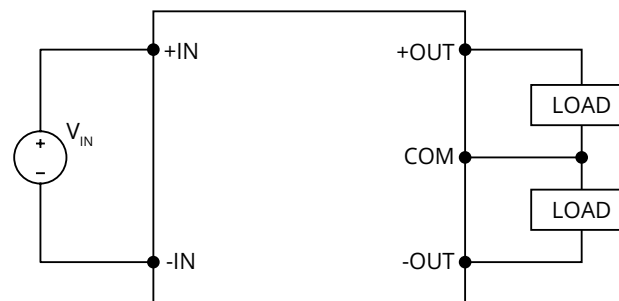
Parameter	Referenced Standard	Description
Stabilization Bake	MIL-STD-883	Referenced Method 1008 Non-operating maximum storage temperature for 24 hours
Temperature Cycle	MIL-STD-883	Referenced Method 1010 Non-operating at temperature extremes, 15 mins/temp, 10 cycles
Burn-In	MIL-STD-883	Referenced Method 1015 Max operating temperature for 160 hours
Expanded Ambient Operating Temperature		-55 $^{\circ}\text{C}$ to +85 $^{\circ}\text{C}$

TYPICAL CONNECTION CIRCUIT

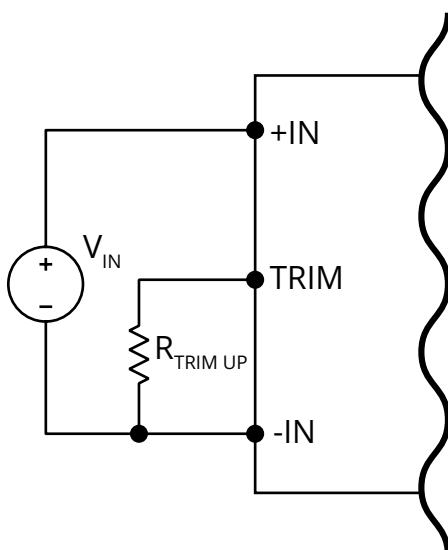
SINGLE OUTPUT



DUAL OUTPUT



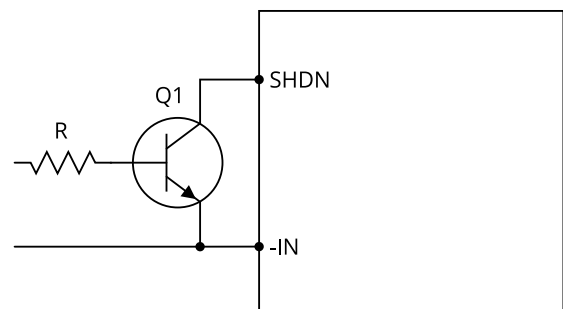
TRIM



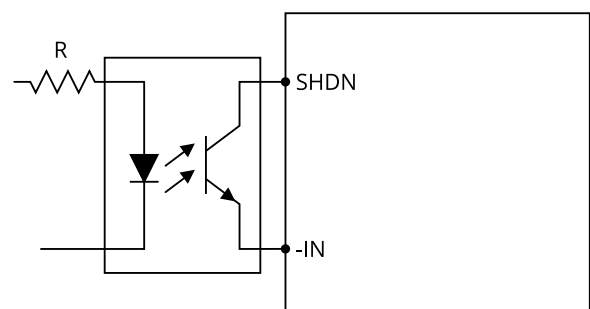
Note: Use 50k Ω , 1/4W trim pot between TRIM and -IN. Reduce resistance to raise output voltage to 5% maximum. Raising the output voltage beyond 5% could cause damage to the module.

SHUTDOWN

NON-ISOLATED

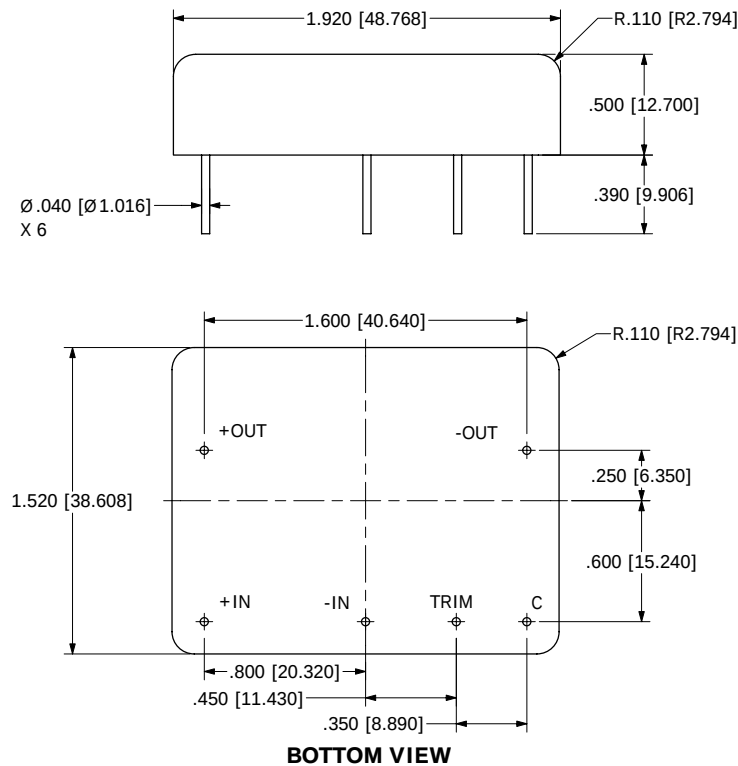


ISOLATED

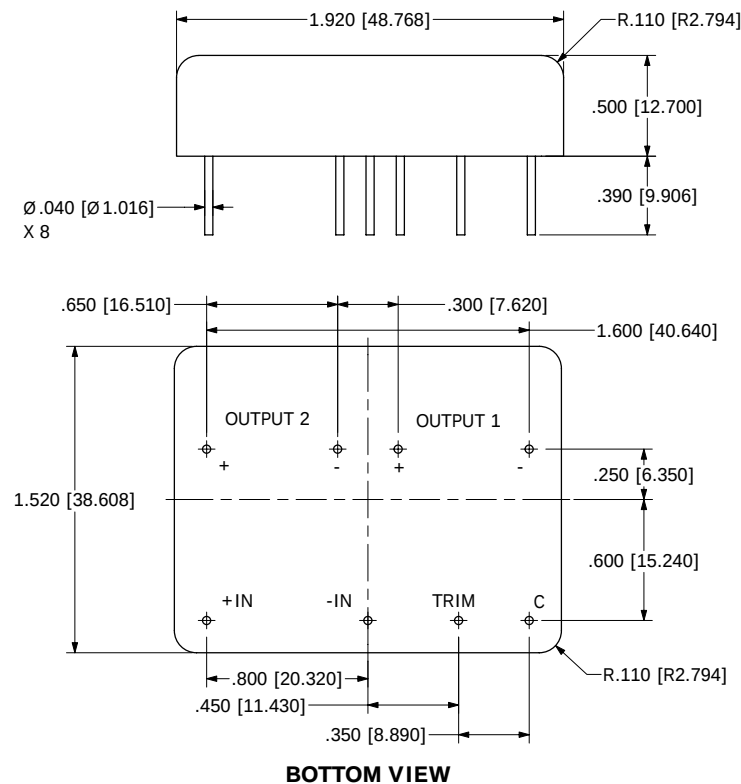


MECHANICAL DRAWINGS

SINGLE OUTPUT

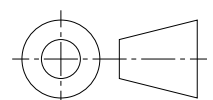


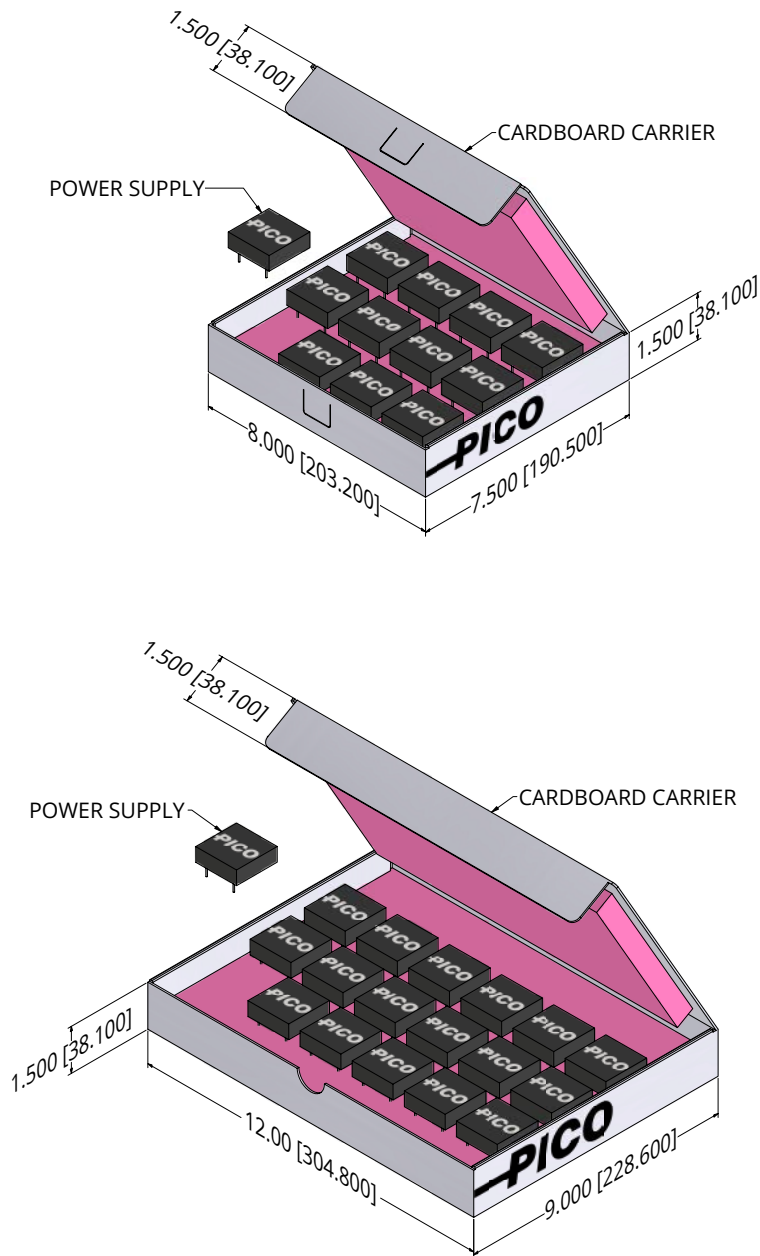
DUAL OUTPUT



NOTES

- ALL DIMENSIONS ARE IN INCHES, [] = MM
- C IS CONTROL PIN





Pico warrants each product manufactured by us and sold by us or an authorized representative, to be free from defects in material and workmanship. If properly used, it will perform within its applicable specifications for a period of one year after original shipment. Pico's obligation under this guarantee is limited to repairing or replacing our product to the original purchaser. This warranty is in lieu of all other warranties, express or implied and constitutes fulfillment of our obligations to the purchaser. We do not guarantee that the products can be used for a particular purpose other than those solely covered by the product's specifications. Pico must be notified if the product must meet particular certifications and/or standards. We assume no liability, in any event, for consequential damages, for anticipated or lost profits, incidental damages or loss of time or other losses incurred by the purchaser or any third party in connection with products covered by this warranty or otherwise. The purchaser will indemnify and hold Pico harmless for any damages, losses, costs, etc. from usage not within the product's specifications. Pico must be consulted before usage of its products in a nuclear, radioactive or space environment.

We reserve the right to discontinue products without notice, We reserve the right to make modifications to any existing catalog products without notice, at any time, without the obligation to modify units previously sold.

Series PLR

5W Isolated Regulated Low Profile DC-DC Converter



PRODUCT OVERVIEW

The PLR series is an isolated DC-DC converter with wide input range, tight regulation and six-sided shielded case. These modules have trim and control features. Single and dual isolated output models are standard. They can operate up to 5W over the temperature range of -25°C to +70°C without derating, a heat sink or active cooling.



FEATURES

- Up to 5W output at +70°C ambient
- Low profile – 0.300" height
- Up to 3.33:1 input voltage range
- 3.3 to 100V output models
- Six-sided shielded case
- Control feature
- Trimmable output
- Input/output isolation
- Single and dual isolated output
- No external components required
- No heat sink or derating required

Contact Pico for part number of available options:

- Expanded operating temp: -55°C to +85°C
- Select screening per MIL-STD-883:
 - Stabilization Bake
 - Temperature Cycle
 - Burn-In
- Special Input Voltage, Output Voltage, Isolation Voltage or Output Power

PLR	F	28	S
SERIES NAME	INPUT VOLTAGE RANGE	NOM. OUTPUT VOLTAGE	NUMBER OF OUTPUTS
PLR	E = 5 to 15V F = 8 to 24V A = 18 to 36V B = 36 to 60V C = 18 to 60V	3.3 = 3.3V 5 = 5V 5.2 = 5.2V 9 = 9V 12 = 12V 15 = 15V 24 = 24V 28 = 28V 48 = 48V 100 = 100V	S = SINGLE D = DUAL

MODEL LIST

SINGLE OUTPUT

Pico Part Number	Output Voltage [VDC]	Output Current		Output Power [W]	Efficiency ⁽¹⁾ [%] typ.	Input Current ⁽¹⁾ [%] typ.	Line Regulation ⁽²⁾		Load Regulation ⁽³⁾		Output Ripple @ 1MHz BW [mVp-p]	Output Voltage Tolerance ⁽¹⁾ [±%]
		Min. [mA]	Max. [mA]				Nom.-Min. [-%]	Nom.-Max. [+%]	60%-25% [+%]	60%-100% [-%]		
PLRE3.3S	3.3	90.9	909	3	75	400	2.75	2.75	3	3	200	1
PLRE5S	5	60	600	3	78	385	2	2	1.75	1.75	175	0.75
PLR5.2S	5.2	57.7	577	3	78	385	2	2	1.75	1.75	175	0.75
PLRE9S	9	44.4	444	4	78	515	1.5	1.5	1.5	1.5	125	0.5
PLRE12S	12	33.3	333	4	79	505	1.25	1.25	1.25	1.25	125	0.5
PLRE15S	15	26.7	267	4	79	505	1.25	1.25	1.25	1.25	125	0.5
PLRE24S	24	16.7	167	4	80	500	1.25	1.25	1	1	125	0.5
PLRE28S	28	14.3	143	4	80	500	1	1	1	1	125	0.5
PLRE48S	48	8.3	83	4	80	500	1	1	1	1	300	0.5
PLRE100S	100	4	40	4	80	500	1	1	1	1	300	0.5
PLRF3.3S	3.3	121.2	1212	4	75	333	2.75	2.75	3	3	200	1
PLRF5S	5	100	1000	5	78	400	2	2	1.75	1.75	150	0.75
PLRF5.2S	5.2	96.1	961	5	78	400	2	2	1.75	1.75	150	0.75
PLRF9S	9	55.6	556	5	78	400	1.5	1.5	1.5	1.5	125	0.5
PLRF12S	12	41.7	417	5	79	395	1.25	1.25	1.25	1.25	125	0.5
PLRF15S	15	33.3	333	5	79	395	1.25	1.25	1.25	1.25	125	0.5
PLRF24S	24	20.8	208	5	80	390	1.25	1.25	1	1	125	0.5
PLRF28S	28	17.9	179	5	80	390	1	1	1	1	125	0.5
PLRF48S	48	10.4	104	5	80	390	1	1	1	1	250	0.5
PLRF100S	100	5	50	5	80	390	1	1	1	1	300	0.5
PLRA3.3S	3.3	121.2	1212	4	76	195	1.5	1.5	3	3	150	1
PLRA5S	5	100	1000	5	76	245	1	1	2	2	100	0.75
PLRA5.2S	5.2	96.1	961	5	76	245	1	1	2	2	100	0.75
PLRA9S	9	55.6	556	5	76	245	0.5	0.5	2	2	100	0.5
PLRA12S	12	41.7	417	5	77	240	0.5	0.5	2	2	100	0.5
PLRA15S	15	33.3	333	5	79	235	0.5	0.5	1.5	1.5	100	0.5
PLRA24S	24	20.8	208	5	80	230	0.5	0.5	1.5	1.5	100	0.5
PLRA28S	28	17.9	179	5	80	230	0.5	0.5	1.5	1.5	100	0.5
PLRA48S	48	10.4	104	5	80	230	0.5	0.5	1	1	250	0.5
PLRA100S	100	5	50	5	80	230	1	1	1	1	300	0.5

Note 1: Tested at nominal input voltage and full output load.

Note 2: Line regulation is specified at full output load, nominal to minimum input voltage (-%) and nominal to maximum input voltage (+%).

Note 3: Load regulation is specified at nominal input voltage, 60% to 25% load (+%) and 60% to 100% load (-%).

MODEL LIST**SINGLE OUTPUT**

Pico Part Number	Output Voltage [VDC]	Output Current		Output Power [W]	Efficiency ⁽¹⁾ [%] typ.	Input Current ⁽¹⁾ [%] typ.	Line Regulation ⁽²⁾		Load Regulation ⁽³⁾		Output Ripple @ 1MHz BW [mVp-p]	Output Voltage Tolerance ⁽¹⁾ [±%]
		Min. [mA]	Max. [mA]				Nom.-Min. [-%]	Nom.-Max. [+%]	60%-25% [+%]	60%-100% [-%]		
PLRB3.3S	3.3	121.2	1212	4	74	113	1.5	1.5	3	3	150	1
PLRB5S	5	100	1000	5	74	140	0.5	0.5	1.75	1.75	100	0.75
PLRB5.2S	5.2	96.1	961	5	74	140	0.5	0.5	1.75	1.75	100	0.75
PLRB9S	9	55.6	556	5	74	140	0.5	0.5	1.5	1.5	100	0.5
PLRB12S	12	41.7	417	5	74	140	0.25	0.25	1	1	100	0.5
PLRB15S	15	33.3	333	5	76	135	0.25	0.25	1	1	100	0.5
PLRB24S	24	20.8	208	5	76	135	0.25	0.25	0.75	0.75	100	0.5
PLRB28S	28	17.9	179	5	76	135	0.25	0.25	0.75	0.75	100	0.5
PLRB48S	48	10.4	104	5	76	135	0.25	0.25	0.75	0.75	200	0.5
PLRB100S	100	5	50	5	76	135	1	1	1	1	300	0.5
PLRC3.3S	3.3	121.2	1212	4	74	139	1.75	1.75	3	3	150	1
PLRC5S	5	100	1000	5	75	170	1.5	1.5	2	2	100	0.75
PLRC5.2S	5.2	96.1	961	5	75	170	1.5	1.5	2	2	100	0.75
PLRC9S	9	55.6	556	5	75	170	1	1	1.5	1.5	100	0.5
PLRC12S	12	41.7	417	5	75	170	0.75	0.75	1	1	100	0.5
PLRC15S	15	33.3	333	5	77	165	0.75	0.75	1	1	100	0.5
PLRC24S	24	20.8	208	5	78	165	0.75	0.75	0.75	0.75	100	0.5
PLRC28S	28	17.9	179	5	78	165	0.75	0.75	0.75	0.75	100	0.5
PLRC48S	48	10.4	104	5	78	165	0.75	0.75	0.75	0.75	225	0.5
PLRC100S	100	5	50	5	78	165	1	1	1	1	300	0.5

Note 1: Tested at nominal input voltage and full output load.

Note 2: Line regulation is specified at full output load, nominal to minimum input voltage (-%) and nominal to maximum input voltage (+%).

Note 3: Load regulation is specified at nominal input voltage, 60% to 25% load (+%) and 60% to 100% load (-%).

DUAL OUTPUT

Pico Part Number	Output Voltage Per Output [VDC]	Output Current Per Output		Output Power [W]	Efficiency ⁽¹⁾ [%] typ.	Input Current ⁽¹⁾ [%] typ.	Line Regulation ⁽²⁾		Load Regulation ⁽³⁾		Output Ripple Per Output @ 1MHz BW [mVp-p]	Output Voltage Tolerance ⁽¹⁾ [±%]
		Min. [mA]	Max. [mA]				Nom.-Min. [-%]	Nom.-Max. [+%]	60%-25% [+%]	60%-100% [-%]		
PLRE5D	5	30	300	1.5	78	385	2	2	1.75	1.75	175	0.75
PLRE9D	9	22.2	222	2	78	515	1.5	1.5	1.5	1.5	125	0.5
PLRE12D	12	16.7	167	2	79	505	1.25	1.25	1.25	1.25	125	0.5
PLRE15D	15	13.4	134	2	79	505	1.25	1.25	1.25	1.25	125	0.5
PLRE24D	24	8.4	84	2	80	500	1.25	1.25	1	1	125	0.5
PLRE28D	28	7.2	72	2	80	500	1	1	1	1	125	0.5
PLRE48D	48	4.2	42	2	80	500	1	1	1	1	300	0.5

Note 1: Tested at nominal input voltage and full output load.

Note 2: Line regulation is specified at full output load, nominal to minimum input voltage (-%) and nominal to maximum input voltage (+%).

Note 3: Load regulation is specified at nominal input voltage, 60% to 25% load (+%) and 60% to 100% load (-%).

Note 4: Dual outputs must be balanced.

MODEL LIST**DUAL OUTPUT**

Pico Part Number	Output Voltage Per Output [VDC]	Output Current Per Output		Output Power [W]	Efficiency ⁽¹⁾ [%] typ.	Input Current ⁽¹⁾ [%] typ.	Line Regulation ⁽²⁾		Load Regulation ⁽³⁾		Output Ripple Per Output @ 1MHz BW [mVp-p]	Output Voltage Tolerance ⁽¹⁾ [±%]
		Min. [mA]	Max. [mA]				Nom.-Min. [-%]	Nom.-Max. [+%]	60%-25% [+%]	60%-100% [-%]		
PLRF5D	5	50	500	2.5	78	400	2	2	1.75	1.75	100	0.75
PLRF9D	9	27.8	278	2.5	78	400	1.5	1.5	1.5	1.5	125	0.5
PLRF12D	12	20.8	208	2.5	79	395	1.25	1.25	1.25	1.25	125	0.5
PLRF15D	15	16.7	167	2.5	79	395	1.25	1.25	1.25	1.25	125	0.5
PLRF24D	24	10.4	104	2.5	80	390	1.25	1.25	1	1	125	0.5
PLRF28D	28	8.9	89	2.5	80	390	1	1	1	1	125	0.5
PLRF48D	48	5.2	52	2.5	80	390	1	1	1	1	250	0.5
PLRA5D	5	50	500	2.5	76	245	1	1	2	2	100	0.75
PLRA9D	9	27.8	278	2.5	76	245	0.5	0.5	2	2	100	0.5
PLRA12D	12	20.8	208	2.5	77	240	0.5	0.5	2	2	100	0.5
PLRA15D	15	16.7	167	2.5	79	235	0.5	0.5	1.5	1.5	100	0.5
PLRA24D	24	10.4	104	2.5	80	230	0.5	0.5	1.5	1.5	100	0.5
PLRA28D	28	8.9	89	2.5	80	230	0.5	0.5	1.5	1.5	100	0.5
PLRA48D	48	5.2	52	2.5	80	230	0.5	0.5	1	1	250	0.5
PLRB5D	5	50	500	2.5	74	140	0.5	0.5	1.75	1.75	100	0.75
PLRB9D	9	27.8	278	2.5	74	140	0.5	0.5	1.5	1.5	100	0.5
PLRB12D	12	20.8	208	2.5	74	140	0.25	0.25	1	1	100	0.5
PLRB15D	15	16.7	167	2.5	76	135	0.25	0.25	1	1	100	0.5
PLRB24D	24	10.4	104	2.5	76	135	0.25	0.25	0.75	0.75	100	0.5
PLRB28D	28	8.9	89	2.5	76	135	0.25	0.25	0.75	0.75	100	0.5
PLRB48D	48	5.2	52	2.5	76	135	0.25	0.25	0.75	0.75	200	0.5
PLRC5D	5	50	500	2.5	75	170	1.5	1.5	2	2	100	0.75
PLRC9D	9	27.8	278	2.5	75	170	1	1	1.5	1.5	100	0.5
PLRC12D	12	20.8	208	2.5	75	170	0.75	0.75	1	1	100	0.5
PLRC15D	15	16.7	167	2.5	77	165	0.75	0.75	1	1	100	0.5
PLRC24D	24	10.4	104	2.5	78	165	0.75	0.75	0.75	0.75	100	0.5
PLRC28D	28	8.9	89	2.5	78	165	0.75	0.75	0.75	0.75	100	0.5
PLRC48D	48	5.2	52	2.5	78	165	0.75	0.75	0.75	0.75	225	0.5

Note 1: Tested at nominal input voltage and full output load.

Note 2: Line regulation is specified at full output load, nominal to minimum input voltage (-%) and nominal to maximum input voltage (+%).

Note 3: Load regulation is specified at nominal input voltage, 60% to 25% load (+%) and 60% to 100% load (-%).

Note 4: Dual outputs must be balanced.

SPECIFICATIONS (Nominal V_{IN} , Full Load, $T_A = +25^{\circ}\text{C}$, 1 hour warm up unless otherwise specified)**INPUT**

Parameter	Condition	Min.	Nom.	Max.	Units
Input Voltage Range	PLRE models	5	10	15	VDC
	PLRF models	8	16	24	
	PLRA models	18	27	36	
	PLRB models	36	48	60	
	PLRC models	18	39	60	

ENVIRONMENTAL

Parameter	Condition	Min.	Typ.	Max.	Units
Operating Temperature Range	Ambient without derating	-25	-	+70	$^{\circ}\text{C}$
Storage Temperature Range	Ambient	-55	-	+125	$^{\circ}\text{C}$
Temperature Coefficient		-	-	0.02	$\%/^{\circ}\text{C}$
Cooling	Free Air Convection				

GENERAL

Parameter	Condition	Min.	Typ.	Max.	Units
Isolation Voltage	Input to output	500	-	-	VDC
	OUT1 to OUT2	500	-	-	
Switching Frequency		-	40	-	kHz
Size (L x W x H)		1.92 x 1.52 x 0.3 (48.768 x 38.608 x 7.62)			inches (mm)
Weight		-	40	-	grams
Case	6-Sided Epoxy Insulated Metal				
Potting	Vacuum Impregnated Epoxy				
Box Packaging	8 x 7.5 x 1.5 (203.2 x 190.5 x 38.1) or 12 x 9 x 1.5 (304.8 x 228.6 x 38.1)				inches (mm)

PROTECTION & FEATURES

Parameter	Condition	Min.	Typ.	Max.	Units
Shortcircuit	Temporary				
Shutdown (C)	Non-latched shutdown, Self-recovery	Shutdown	Connect to -IN		
		Restart	OPEN		
Output Voltage Trim (TRIM)	Trim up only	0	-	5	%

DESIGNED TO MEET

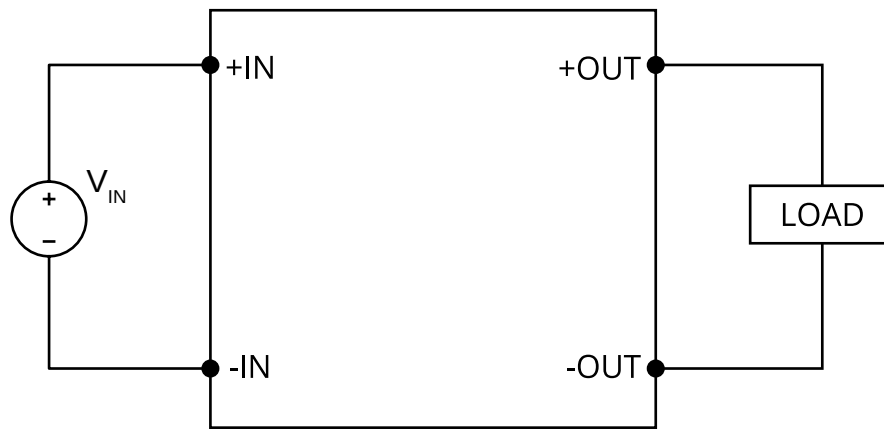
Test	Referenced Standard	Description
Vibration	MIL-STD-202	Method 204, Vibration, High Frequency, Condition D
Shock	MIL-STD-202	Method 213, Shock (Specified Pulse), Condition I
Humidity	MIL-STD-202	Method 106, Moisture Resistance
Altitude	MIL-STD-202	Method 105, Barometric Pressure (Reduced), Condition D

OPTIONS AVAILABLE – CONTACT PICO FOR PART NUMBER

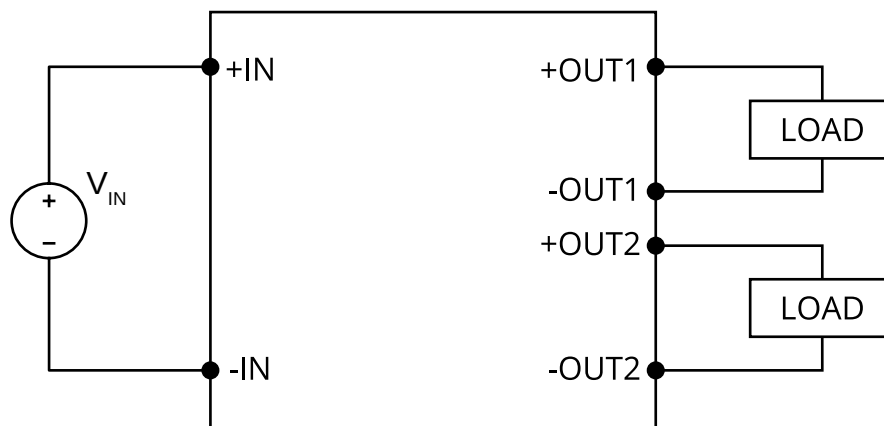
Parameter	Referenced Standard	Description
Stabilization Bake	MIL-STD-883	Referenced Method 1008 Non-operating maximum storage temperature for 24 hours
Temperature Cycle	MIL-STD-883	Referenced Method 1010 Non-operating at temperature extremes, 15 mins/temp, 10 cycles
Burn-In	MIL-STD-883	Referenced Method 1015 Max operating temperature for 160 hours
Expanded Ambient Operating Temperature		-55 $^{\circ}\text{C}$ to +85 $^{\circ}\text{C}$

TYPICAL CONNECTION CIRCUIT

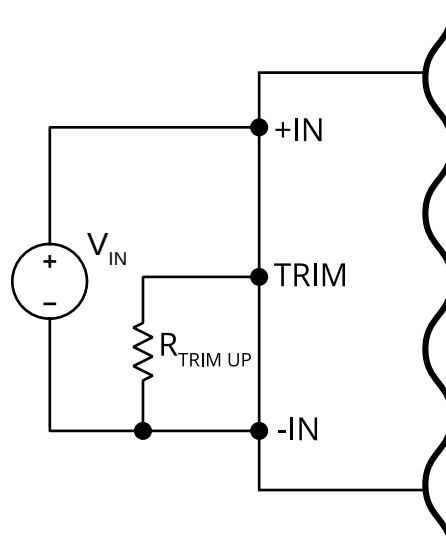
SINGLE OUTPUT



DUAL OUTPUT



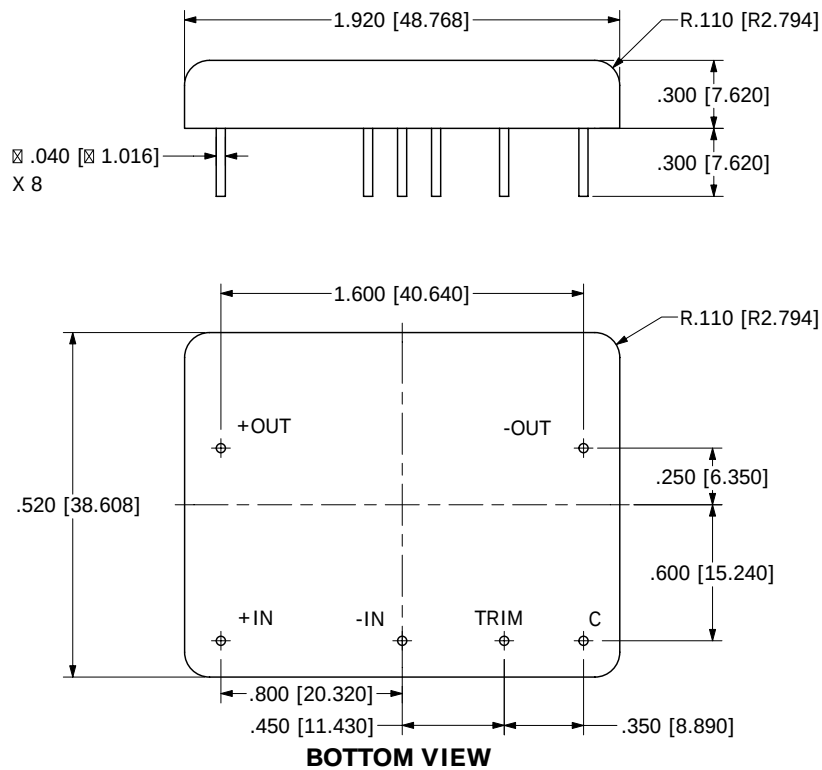
TRIM



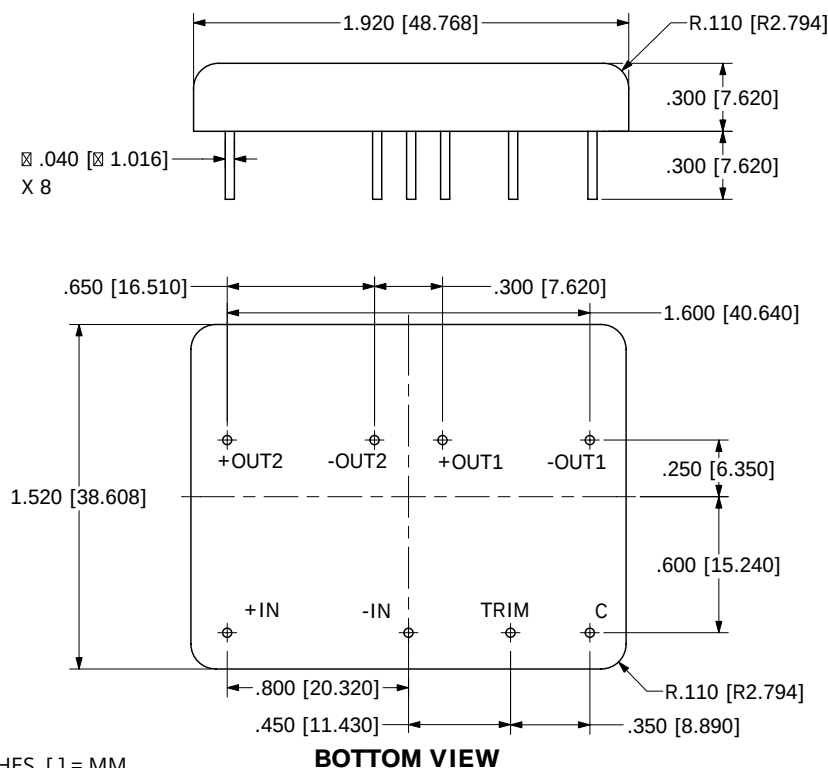
Note: Use 50k Ω , 1/4W trim pot between TRIM and -IN. Reduce resistance to raise output voltage to 5% maximum. Raising the output voltage beyond 5% could cause damage to the module.

MECHANICAL DRAWINGS

SINGLE OUTPUT

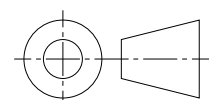


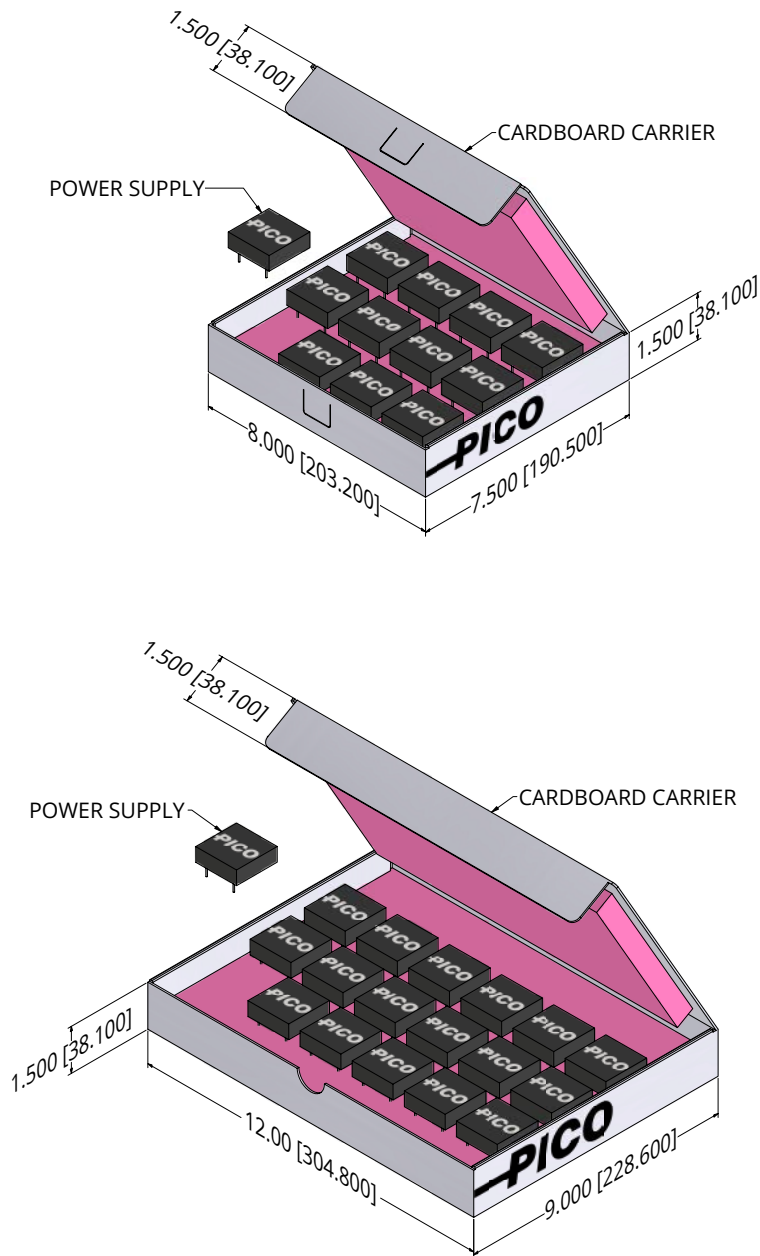
DUAL OUTPUT



NOTES

- a. ALL DIMENSIONS ARE IN INCHES, [] = MM
- b. C IS CONTROL PIN





Pico warrants each product manufactured by us and sold by us or an authorized representative, to be free from defects in material and workmanship. If properly used, it will perform within its applicable specifications for a period of one year after original shipment. Pico's obligation under this guarantee is limited to repairing or replacing our product to the original purchaser. This warranty is in lieu of all other warranties, express or implied and constitutes fulfillment of our obligations to the purchaser. We do not guarantee that the products can be used for a particular purpose other than those solely covered by the product's specifications. Pico must be notified if the product must meet particular certifications and/or standards. We assume no liability, in any event, for consequential damages, for anticipated or lost profits, incidental damages or loss of time or other losses incurred by the purchaser or any third party in connection with products covered by this warranty or otherwise. The purchaser will indemnify and hold Pico harmless for any damages, losses, costs, etc. from usage not within the product's specifications. Pico must be consulted before usage of its products in a nuclear, radioactive or space environment.

We reserve the right to discontinue products without notice, We reserve the right to make modifications to any existing catalog products without notice, at any time, without the obligation to modify units previously sold.

Series IR & SIR

10W Isolated Regulated Low Profile DC-DC Converter

PICO
Electronics, Inc.

PRODUCT OVERVIEW

The IR & SIR series are isolated DC-DC converter with wide input range and tight regulation specifications. These modules have trim and control features. Single and dual isolated output models are standard. They can operate up to 10W over the temperature range of -25°C to +70°C without derating, a heat sink or active cooling.



FEATURES

- Up to 10W output at +70°C ambient
- Low profile – 0.500" height
- Up to 3.33:1 input voltage range
- 2 to 100V output models
- Six-sided shielded case (Series SIR)
- Control feature
- Trimmable output
- Input/output isolation
- Single and dual isolated output
- No external components required
- No heat sink or derating required

Contact Pico for part number of available options:

- Expanded operating temp: -55°C to +85°C
- Select screening per MIL-STD-883:
 - Stabilization Bake
 - Temperature Cycle
 - Burn-In
- Special Input Voltage, Output Voltage, Isolation Voltage or Output Power

IR

MOUNTING TYPE

IR = THROUGH HOLE
SIR = SURFACE MOUNT

E

INPUT VOLTAGE RANGE

E = 5 to 15V
F = 8 to 24V
A = 18 to 36V
B = 36 to 60V
C = 18 to 60V

28

NOM. OUTPUT VOLTAGE

2 = 2V
3.3 = 3.3V
5 = 5V
5.2 = 5.2V
9 = 9V
12 = 12V
15 = 15V
24 = 24V
28 = 28V
48 = 48V
100 = 100V

S

NUMBER OF OUTPUTS

S = SINGLE
D = DUAL

MODEL LIST - SERIES IR - THROUGH HOLE**SINGLE OUTPUT**

Through Hole Part Number	Output Voltage [VDC]	Output Current		Output Power [W]	Efficiency ⁽¹⁾ [%] typ.	Input Current ⁽¹⁾ [%] typ.	Line Regulation ⁽²⁾		Load Regulation ⁽³⁾		Output Ripple @ 1MHz BW [mVp-p]
		Min. [mA]	Max. [mA]				Nom.-Min. [-%]	Nom.-Max. [%]	60%-25% [%]	60%-100% [%]	
IRE2S	2	200	2000	4	68	588	5.5	5.5	5	5	250
IRE3.3S	3.3	151.5	1515	5	76	658	5	5	3.5	3.5	250
IRE5S	5	120	1200	6	80	750	2	2	2	2	175
IRE5.2S	5.2	115.4	1154	6	80	750	2	2	2	2	175
IRE9S	9	88.9	889	8	80	1000	1	1	1.5	1.5	150
IRE12S	12	66.7	667	8	78	1025	1	1	1.5	1.5	150
IRE15S	15	53.3	533	8	78	1025	1	1	1.5	1.5	150
IRE24S	24	33.3	333	8	82	975	1	1	0.75	0.75	150
IRE28S	28	28.6	286	8	83	965	0.5	0.5	0.5	0.5	200
IRE48S	48	16.7	167	8	83	905	0.5	0.5	0.5	0.5	250
IRE100S	100	6	60	6	80	750	0.75	0.75	0.5	0.5	300
IRF2S	2	250	2500	5	70	446	4	4	4	4	250
IRF3.3S	3.3	242.4	2424	8	77	650	2.5	2.5	2.5	2.5	200
IRF5S	5	200	2000	10	80	780	1.75	1.75	1.5	1.5	200
IRF5.2S	5.2	192.3	1923	10	80	780	1.75	1.75	1.5	1.5	200
IRF9S	9	111.1	1111	10	81	770	1.25	1.25	0.75	0.75	150
IRF12S	12	83.3	833	10	78	800	0.75	0.75	0.75	0.75	150
IRF15S	15	68.7	687	10	78	800	0.75	0.75	0.75	0.75	150
IRF24S	24	41.7	417	10	83	755	0.75	0.75	0.75	0.75	150
IRF28S	28	35.7	357	10	83	755	0.5	0.5	0.5	0.5	200
IRF48S	48	20.8	208	10	84	745	0.5	0.5	0.5	0.5	250
IRF100S	100	10	100	10	80	780	0.75	0.75	0.5	0.5	300
IRA2S	2	300	3000	6	71	313	2.5	2.5	4	4	200
IRA3.3S	3.3	272.7	2727	9	78	427	1.5	1.5	2	2	200
IRA5S	5	200	2000	10	81	455	0.75	0.75	1.25	1.25	125
IRA5.2S	5.2	192.3	1923	10	81	455	0.75	0.75	1.25	1.25	125
IRA9S	9	111.1	1111	10	83	445	0.5	0.5	1	1	100
IRA12S	12	83.3	833	10	78	475	0.25	0.25	1	1	75
IRA15S	15	68.7	687	10	78	475	0.25	0.25	0.75	0.75	75
IRA24S	24	41.7	417	10	83	445	0.25	0.25	0.75	0.75	75
IRA28S	28	35.7	357	10	83	445	0.25	0.25	0.75	0.75	100
IRA48S	48	20.8	208	10	84	440	0.25	0.25	0.5	0.5	150
IRA100S	100	10	100	10	81	455	0.5	0.5	0.5	0.5	250

Note 1: Tested at nominal input voltage and full output load.

Note 2: Line regulation is specified at full output load, nominal to minimum input voltage (-%) and nominal to maximum input voltage (+%).

Note 3: Load regulation is specified at nominal input voltage, 60% to 25% load (+%) and 60% to 100% load (-%).

MODEL LIST - SERIES IR - THROUGH HOLE**SINGLE OUTPUT**

Through Hole Part Number	Output Voltage [VDC]	Output Current		Output Power [W]	Efficiency ⁽¹⁾ [%] typ.	Input Current ⁽¹⁾ [%] typ.	Line Regulation ⁽²⁾		Load Regulation ⁽³⁾		Output Ripple @ 1MHz BW [mVp-p]
		Min. [mA]	Max. [mA]				Nom.-Min. [-%]	Nom.-Max. [%]	60%-25% [%]	60%-100% [-%]	
IRB2S	2	300	3000	6	70	179	1.5	1.5	3.5	3.5	200
IRB3.3S	3.3	272.7	2727	9	76	247	1.5	1.5	2	2	200
IRB5S	5	200	2000	10	81	255	0.5	0.5	1.25	1.25	125
IRB5.2S	5.2	192.3	1923	10	81	255	0.5	0.5	1.25	1.25	125
IRB9S	9	111.1	1111	10	83	250	0.5	0.5	0.75	0.75	100
IRB12S	12	83.3	833	10	83	260	0.25	0.25	0.75	0.75	75
IRB15S	15	68.7	687	10	83	250	0.25	0.25	0.75	0.75	75
IRB24S	24	41.7	417	10	83	260	0.25	0.25	0.75	0.75	75
IRB28S	28	35.7	357	10	83	260	0.25	0.25	0.5	0.5	100
IRB48S	48	20.8	208	10	84	250	0.25	0.25	0.5	0.5	150
IRB100S	100	10	100	10	81	255	0.5	0.5	0.5	0.5	250
IRC2S	2	300	3000	6	70	220	3	3	4	4	200
IRC3.3	3.3	272.7	2727	9	76	304	1.5	1.5	2	2	200
IRC5S	5	200	2000	10	81	320	1	1	1.25	1.25	125
IRC5.2S	5.2	192.3	1923	10	81	320	1	1	1.25	1.25	125
IRC9S	9	111.1	1111	10	83	310	0.75	0.75	0.75	0.75	100
IRC12S	12	83.3	833	10	83	310	0.5	0.5	0.75	0.75	75
IRC15S	15	68.7	687	10	83	310	0.5	0.5	0.75	0.75	75
IRC24S	24	41.7	417	10	83	310	0.5	0.5	0.75	0.75	75
IRC28S	28	35.7	357	10	83	310	0.5	0.5	0.5	0.5	100
IRC48S	48	20.8	208	10	84	305	0.5	0.5	0.5	0.5	150
IRC100S	100	10	100	10	81	310	0.75	0.75	0.5	0.5	250

Note 1: Tested at nominal input voltage and full output load.

Note 2: Line regulation is specified at full output load, nominal to minimum input voltage (-%) and nominal to maximum input voltage (+%).

Note 3: Load regulation is specified at nominal input voltage, 60% to 25% load (+%) and 60% to 100% load (-%).

DUAL OUTPUT

Through Hole Part Number	Output Voltage Per Output [VDC]	Output Current Per Output		Output Power Per Output [W]	Efficiency ⁽¹⁾ [%] typ.	Input Current ⁽¹⁾ [%] typ.	Line Regulation ⁽²⁾		Load Regulation ⁽³⁾		Output Ripple Per Output @ 1MHz BW [mVp-p]
		Min. [mA]	Max. [mA]				Nom.-Min. [-%]	Nom.-Max. [%]	60%-25% [%]	60%-100% [-%]	
IRE5D	5	60	600	3	80	750	2	2	2	2	175
IRE9D	9	44.4	444	4	80	1000	1	1	1.5	1.5	150
IRE12D	12	33.3	333	4	78	1025	1	1	1.5	1.5	150
IRE15D	15	26.7	267	4	78	1025	1	1	1.5	1.5	150
IRE24D	24	16.7	167	4	82	975	1	1	0.75	0.75	150
IRE28D	28	14.3	143	4	83	965	0.5	0.5	0.5	0.5	200
IRE48D	48	8.3	83	4	83	965	0.5	0.5	0.5	0.5	250

Note 1: Tested at nominal input voltage and full output load.

Note 2: Line regulation is specified at full output load, nominal to minimum input voltage (-%) and nominal to maximum input voltage (+%).

Note 3: Load regulation is specified at nominal input voltage, 60% to 25% load (+%) and 60% to 100% load (-%).

MODEL LIST - SERIES IR - THROUGH HOLE**DUAL OUTPUT**

Through Hole Part Number	Output Voltage Per Output [VDC]	Output Current Per Output		Output Power Per Output [W]	Efficiency ⁽¹⁾ [%] typ.	Input Current ⁽¹⁾ [%] typ.	Line Regulation ⁽²⁾		Load Regulation ⁽³⁾		Output Ripple Per Output @ 1MHz BW [mVp-p]
		Min. [mA]	Max. [mA]				Nom.-Min. [-%]	Nom.-Max. [%]	60%-25% [%]	60%-100% [%]	
IRF5D	5	100	1000	5	80	780	1.75	1.75	1.5	1.5	200
IRF9D	9	55.6	556	5	81	770	1.25	1.25	0.75	0.75	150
IRF12D	12	41.7	417	5	78	800	0.75	0.75	0.75	0.75	150
IRF15D	15	33.3	333	5	78	800	0.75	0.75	0.75	0.75	150
IRF24D	24	20.8	208	5	83	755	0.75	0.75	0.75	0.75	150
IRF28D	28	17.9	179	5	83	755	0.5	0.5	0.5	0.5	200
IRF48D	48	10.4	104	5	84	745	0.5	0.5	0.5	0.5	250
IRA5D	5	100	1000	5	81	455	0.75	0.75	1.25	1.25	125
IRA9D	9	55.6	556	5	83	445	0.5	0.5	1	1	100
IRA12D	12	41.7	417	5	78	475	0.25	0.25	1	1	75
IRA15D	15	33.3	333	5	78	475	0.25	0.25	0.75	0.75	75
IRA24D	24	20.8	208	5	83	445	0.25	0.25	0.75	0.75	75
IRA28D	28	17.9	179	5	83	445	0.25	0.25	0.75	0.75	100
IRA48D	48	10.4	104	5	84	440	0.25	0.25	0.5	0.5	150
IRB5D	5	100	1000	5	81	255	0.5	0.5	1.25	1.25	125
IRB9D	9	55.6	556	5	83	250	0.5	0.5	0.75	0.75	100
IRB12D	12	41.7	417	5	83	250	0.25	0.25	0.75	0.75	75
IRB15D	15	33.3	333	5	83	250	0.25	0.25	0.75	0.75	75
IRB24D	24	20.8	208	5	83	250	0.25	0.25	0.75	0.75	75
IRB28D	28	17.9	179	5	83	250	0.25	0.25	0.5	0.5	100
IRB48D	48	10.4	104	5	84	250	0.25	0.25	0.5	0.5	150
IRC5D	5	100	1000	5	81	320	1	1	1.25	1.25	125
IRC9D	9	55.6	556	5	83	310	0.75	0.75	0.75	0.75	100
IRC12D	12	41.7	417	5	83	310	0.5	0.5	0.75	0.75	75
IRC15D	15	33.3	333	5	83	310	0.5	0.5	0.75	0.75	75
IRC24D	24	20.8	208	5	83	310	0.5	0.5	0.75	0.75	75
IRC28D	28	17.9	179	5	83	310	0.5	0.5	0.5	0.5	100
IRC48D	48	10.4	104	5	84	305	0.5	0.5	0.5	0.5	150

Note 1: Tested at nominal input voltage and full output load.

Note 2: Line regulation is specified at full output load, nominal to minimum input voltage (-%) and nominal to maximum input voltage (+%).

Note 3: Load regulation is specified at nominal input voltage, 60% to 25% load (+%) and 60% to 100% load (-%).

MODEL LIST - SERIES SIR - SURFACE MOUNT**SINGLE OUTPUT**

Surface Mount Part Number	Output Voltage [VDC]	Output Current		Output Power [W]	Efficiency ⁽¹⁾ [%] typ.	Input Current ⁽¹⁾ [%] typ.	Line Regulation ⁽²⁾		Load Regulation ⁽³⁾		Output Ripple @ 1MHz BW [mVp-p]
		Min. [mA]	Max. [mA]				Nom.-Min. [-%]	Nom.-Max. [%]	60%-25% [%]	60%-100% [%]	
SIRE3.3S	3.3	151.5	1515	5	78	641	2.00	2.00	2.00	2.00	150
SIRE5S	5	100	1000	5	78	640	2.00	2.00	1.50	1.50	150
SIRE5.2S	5.2	96.1	961	5	78	640	2.00	2.00	1.50	1.50	150
SIRE9S	9	66.7	667	6	78	770	1.50	1.50	1.25	1.25	125
SIRE12S	12	50	500	6	78	770	1.25	1.25	1.25	1.25	125
SIRE15S	15	40	400	6	78	770	1.25	1.25	1.25	1.25	125
SIRE24S	24	25	250	6	80	750	1.25	1.25	1.00	1.00	125
SIRE28S	28	21.4	214	6	81	740	1.00	1.00	1.00	1.00	125
SIRE48S	48	12.5	125	6	81	740	1.00	1.00	1.00	1.00	400
SIRE100S	100	6	60	6	81	740	1.00	1.00	1.00	1.00	600
SIRF3.3S	3.3	212.1	2121	7	75	583	2.50	2.50	3.00	3.00	200
SIRF5S	5	160	1600	8	79	635	2.00	2.00	1.50	1.50	150
SIRF5.2S	5.2	153.8	1538	8	79	635	2.00	2.00	1.50	1.50	150
SIRF9S	9	88.9	889	8	79	635	1.50	1.50	1.25	1.25	125
SIRF12S	12	66.7	667	8	79	635	1.25	1.25	1.25	1.25	125
SIRF15S	15	53.3	533	8	79	635	1.25	1.25	1.25	1.25	125
SIRF24S	24	33.3	333	8	80	625	1.25	1.25	1.00	1.00	125
SIRF28S	28	28.6	286	8	81	615	1.00	1.00	1.00	1.00	125
SIRF48S	48	16.7	167	8	82	610	1.00	1.00	1.00	1.00	400
SIRF100S	100	8	80	8	82	610	1.00	1.00	1.00	1.00	600
SIRA3.3S	3.3	242.4	2424	8	78	380	2.00	2.00	2.00	2.00	150
SIRA5S	5	160	1600	8	78	380	0.75	0.75	2.00	2.00	125
SIRA5.2S	5.2	153.8	1538	8	78	380	0.75	0.75	2.00	2.00	125
SIRA9S	9	88.9	889	8	78	380	0.50	0.50	2.00	2.00	100
SIRA12S	12	66.7	667	8	78	380	0.50	0.50	2.00	2.00	100
SIRA15S	15	53.3	533	8	78	380	0.50	0.50	1.50	1.50	100
SIRA24S	24	33.3	333	8	79	375	0.25	0.25	1.50	1.50	100
SIRA28S	28	28.6	286	8	80	370	0.25	0.25	1.50	1.50	100
SIRA48S	48	16.7	167	8	80	370	0.25	0.25	1.00	1.00	400
SIRA100S	100	8	80	8	80	370	0.50	0.50	1.00	1.00	600

Note 1: Tested at nominal input voltage and full output load.

Note 2: Line regulation is specified at full output load, nominal to minimum input voltage (-%) and nominal to maximum input voltage (+%).

Note 3: Load regulation is specified at nominal input voltage, 60% to 25% load (+%) and 60% to 100% load (-%).

MODEL LIST - SERIES SIR - SURFACE MOUNT

SINGLE OUTPUT

Surface Mount Part Number	Output Voltage [VDC]	Output Current		Output Power [W]	Efficiency ⁽¹⁾ [%] typ.	Input Current ⁽¹⁾ [%] typ.	Line Regulation ⁽²⁾		Load Regulation ⁽³⁾		Output Ripple @ 1MHz BW [mVp-p]
		Min. [mA]	Max. [mA]				Nom.-Min. [-%]	Nom.-Max. [%]	60%-25% [%]	60%-100% [%]	
SIRB3.3S	3.3	242.4	2424	8	79	211	2.00	2.00	2.00	2.00	150
SIRB5S	5	160	1600	8	80	210	0.50	0.50	1.25	1.25	100
SIRB5.2S	5.2	153.8	1538	8	80	210	0.50	0.50	1.25	1.25	100
SIRB9S	9	88.9	889	8	81	205	0.25	0.25	1.00	1.00	100
SIRB12S	12	66.7	667	8	81	205	0.25	0.25	1.00	1.00	100
SIRB15S	15	53.3	533	8	81	205	0.25	0.25	1.00	1.00	100
SIRB24S	24	33.3	333	8	82	200	0.25	0.25	0.75	0.75	100
SIRB28S	28	28.6	286	8	82	200	0.25	0.25	0.75	0.75	100
SIRB48S	48	16.7	167	8	82	200	0.25	0.25	0.75	0.75	400
SIRB100S	100	8	80	8	82	200	0.50	0.50	1.00	1.00	600
SIRC3.3S	3.3	242.4	2424	8	78	263	2.00	2.00	2.00	2.00	150
SIRC5S	5	160	1600	8	79	260	1.25	1.25	2.00	2.00	125
SIRC5.2S	5.2	153.8	1538	8	79	260	1.25	1.25	2.00	2.00	125
SIRC9S	9	88.9	889	8	80	255	0.75	0.75	1.00	1.00	100
SIRC12S	12	66.7	667	8	80	255	0.75	0.75	1.00	1.00	100
SIRC15S	15	53.3	533	8	81	255	0.75	0.75	1.00	1.00	100
SIRC24S	24	33.3	333	8	82	250	0.50	0.50	0.75	0.75	100
SIRC28S	28	28.6	286	8	82	250	0.50	0.50	0.75	0.75	100
SIRC48S	48	16.7	167	8	82	250	0.50	0.50	0.75	0.75	400
SIRC100S	100	8	80	8	82	250	0.50	0.50	1.00	1.00	600

Note 1: Tested at nominal input voltage and full output load.

Note 2: Line regulation is specified at full output load, nominal to minimum input voltage (-%) and nominal to maximum input voltage (+%).

Note 3: Load regulation is specified at nominal input voltage, 60% to 25% load (+%) and 60% to 100% load (-%).

DUAL OUTPUT

Surface Mount Part Number	Output Voltage Per Output [VDC]	Output Current Per Output		Output Power Per Output [W]	Efficiency ⁽¹⁾ [%] typ.	Input Current ⁽¹⁾ [%] typ.	Line Regulation ⁽²⁾		Load Regulation ⁽³⁾		Output Ripple Per Output @ 1MHz BW [mVp-p]
		Min. [mA]	Max. [mA]				Nom.-Min. [-%]	Nom.-Max. [%]	60%-25% [%]	60%-100% [%]	
SIRE5D	5	50	500	2.5	78	640	2.00	2.00	1.50	1.50	150
SIRE9D	9	33.3	333	3	78	770	1.50	1.50	1.25	1.25	125
SIRE12D	12	25	250	3	78	770	1.25	1.25	1.25	1.25	125
SIRE15D	15	20	200	3	78	770	1.25	1.25	1.25	1.25	125
SIRE24D	24	12.5	125	3	80	750	1.25	1.25	1.00	1.00	125
SIRE28D	28	10.7	107	3	81	740	1.00	1.00	1.00	1.00	125
SIRE48D	48	6.3	63	3	81	740	1.00	1.00	1.00	1.00	400

Note 1: Tested at nominal input voltage and full output load.

Note 2: Line regulation is specified at full output load, nominal to minimum input voltage (-%) and nominal to maximum input voltage (+%).

Note 3: Load regulation is specified at nominal input voltage, 60% to 25% load (+%) and 60% to 100% load (-%).

MODEL LIST - SERIES SIR - SURFACE MOUNT

DUAL OUTPUT

Surface Mount Part Number	Output Voltage Per Output [VDC]	Output Current Per Output		Output Power Per Output [W]	Efficiency ⁽¹⁾ [%] typ.	Input Current ⁽¹⁾ [%] typ.	Line Regulation ⁽²⁾		Load Regulation ⁽³⁾		Output Ripple Per Output @ 1MHz BW [mVp-p]
		Min. [mA]	Max. [mA]				Nom.-Min. [-%]	Nom.-Max. [%]	60%-25% [%]	60%-100% [%]	
SIRF5D	5	80	800	4	79	635	2.00	2.00	1.50	1.50	150
SIRF9D	9	44.4	444	4	79	635	1.50	1.50	1.25	1.25	125
SIRF12D	12	33.3	333	4	79	635	1.25	1.25	1.25	1.25	125
SIRF15D	15	26.7	267	4	79	635	1.25	1.25	1.25	1.25	125
SIRF24D	24	16.7	167	4	80	625	1.25	1.25	1.00	1.00	125
SIRF28D	28	14.3	143	4	81	615	1.00	1.00	1.00	1.00	125
SIRF48D	48	8.3	83	4	82	610	1.00	1.00	1.00	1.00	400
SIRA5D	5	80	800	4	78	380	0.75	0.75	2.00	2.00	125
SIRA9D	9	44.4	444	4	78	380	0.50	0.50	2.00	2.00	100
SIRA12D	12	33.3	333	4	78	380	0.50	0.50	2.00	2.00	100
SIRA15D	15	26.7	267	4	78	380	0.50	0.50	1.50	1.50	100
SIRA24D	24	16.7	167	4	79	375	0.25	0.25	1.50	1.50	100
SIRA28D	28	14.3	143	4	80	370	0.25	0.25	1.50	1.50	100
SIRA48D	48	8.3	83	4	80	370	0.25	0.25	1.00	1.00	400
SIRB5D	5	80	800	4	80	210	0.50	0.50	1.25	1.25	100
SIRB9D	9	44.4	444	4	81	205	0.25	0.25	1.00	1.00	100
SIRB12D	12	33.3	333	4	81	205	0.25	0.25	1.00	1.00	100
SIRB15D	15	26.7	267	4	81	205	0.25	0.25	1.00	1.00	100
SIRB24D	24	16.7	167	4	82	200	0.25	0.25	0.75	0.75	100
SIRB28D	28	14.3	143	4	82	200	0.25	0.25	0.75	0.75	100
SIRB48D	48	8.3	83	4	82	200	0.25	0.25	0.75	0.75	400
SIRC5D	5	80	800	4	79	260	1.25	1.25	2.00	2.00	125
SIRC9D	9	44.4	444	4	80	255	0.75	0.75	1.00	1.00	100
SIRC12D	12	33.3	333	4	80	255	0.75	0.75	1.00	1.00	100
SIRC15D	15	26.7	267	4	81	255	0.75	0.75	1.00	1.00	100
SIRC24D	24	16.7	167	4	82	250	0.50	0.50	0.75	0.75	100
SIRC28D	28	14.3	143	4	82	250	0.50	0.50	0.75	0.75	100
SIRC48D	48	8.3	83	4	82	250	0.50	0.50	0.75	0.75	400

Note 1: Tested at nominal input voltage and full output load.

Note 2: Line regulation is specified at full output load, nominal to minimum input voltage (-%) and nominal to maximum input voltage (+%).

Note 3: Load regulation is specified at nominal input voltage, 60% to 25% load (+%) and 60% to 100% load (-%).

SPECIFICATIONS (Nominal V_{IN} , Full Load, $T_A = +25^{\circ}\text{C}$, 1 hour warm up unless otherwise specified)**INPUT**

Parameter	Condition	Min.	Nom.	Max.	Units
Input Voltage Range	IRE/SIRE models	5	10	15	VDC
	IRF/SIRF models	8	16	24	
	IRA/SIRA models	18	27	36	
	IRB/SIRB models	36	48	60	
	IRC/SIRC models	18	39	60	

OUTPUT

Parameter	Condition		Min.	Typ.	Max.	Units
Output Voltage Tolerance (Nominal V _{IN} , Full Load)	Series IR	2V output models	-	-	1.5	±%
		3.3V output models	-	-	1	
	Series SIR	3.3V output models	-	-	3	
	5V & 5.2V output models		-	-	0.75	
	All other output models		-	-	0.5	

ENVIRONMENTAL

Parameter	Condition	Min.	Typ.	Max.	Units
Operating Temperature Range	Ambient without derating	-25	-	+70	°C
Storage Temperature Range	Ambient	-55	-	+105	°C
Temperature Coefficient		-	-	0.02	%/°C
Cooling	Free Air Convection				

GENERAL

Parameter	Condition	Min.	Typ.	Max.	Units
Isolation Voltage	Input to output	500	-	-	VDC
	OUT1 to OUT2	500	-	-	
Switching Frequency		-	40	-	kHz
Size (L x W x H)	Series IR	2.2 x 1.8 x 0.5 (55.88 x 45.72 x 12.7)			inches (mm)
	Series SIR	1.82 x 1.5 x 0.53 (46.228 x 38.1 x 13.462)			
Weight	Series IR	-	95	-	grams
	Series SIR	-	48	-	
Case	Series IR	6-Sided Epoxy Insulated Metal			
	Series SIR	Glass Reinforced Polymer			
Potting	Vacuum Impregnated Epoxy				
Tube Packaging	Series SIR	1.96 x 0.975 x 20 (49.784 x 24.765 x 508)			inches (mm)
Box Packaging (W x L x H)	Series IR	8 x 7.5 x 1.5 (203.2 x 190.5 x 38.1) or 12 x 9 x 1.5 (304.8 x 228.6 x 38.1)			inches (mm)
Moisture Sensitivity Level	Series SIR	IPC / JEDEC J-STD-020, Level 3			

PROTECTION & FEATURES

Parameter	Condition	Min.	Typ.	Max.	Units
Shortcircuit	Temporary				
Shutdown (C)	Non-latched shutdown, Self-recovery	Shutdown	Connect to -IN		
		Restart	OPEN		
Output Voltage Trim (TRIM)	Trim up only	0	-	5	%

SPECIFICATIONS (Nominal V_{IN} , Full Load, $T_A = +25^{\circ}\text{C}$, 1 hour warm up unless otherwise specified)**DESIGNED TO MEET**

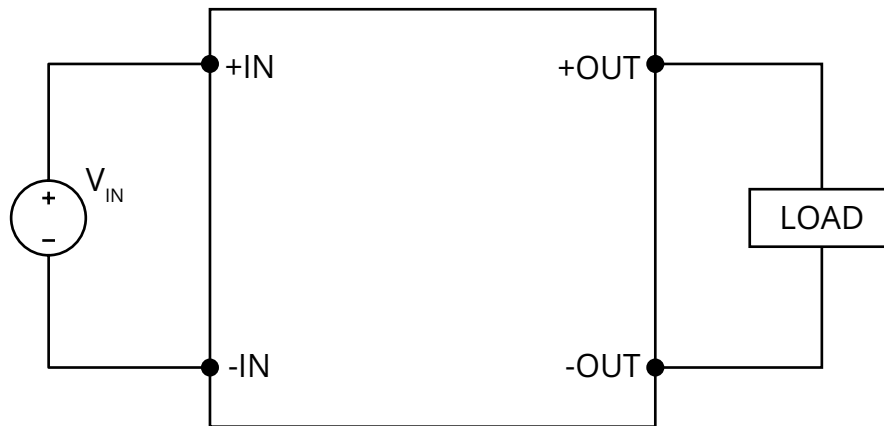
Test	Referenced Standard	Description
Vibration	MIL-STD-202	Method 204, Vibration, High Frequency, Condition D
Shock	MIL-STD-202	Method 213, Shock (Specified Pulse), Condition I
Humidity	MIL-STD-202	Method 106, Moisture Resistance
Altitude	MIL-STD-202	Method 105, Barometric Pressure (Reduced), Condition D

OPTIONS AVAILABLE – CONTACT PICO FOR PART NUMBER

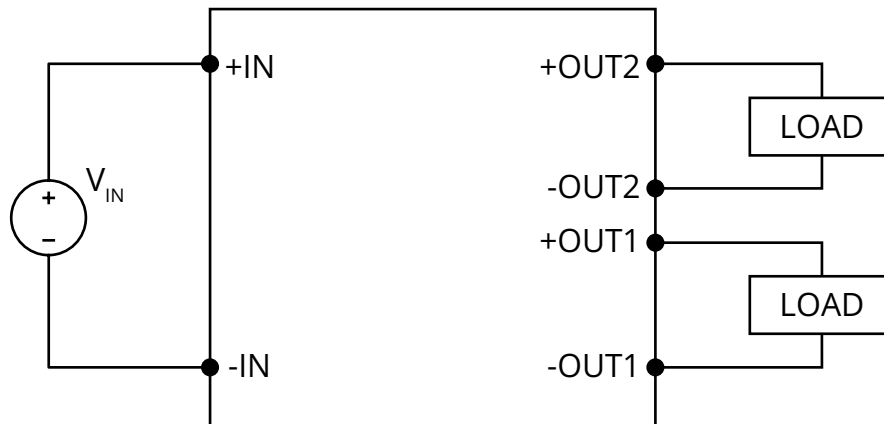
Parameter	Referenced Standard	Description
Stabilization Bake	MIL-STD-883	Referenced Method 1008 Non-operating maximum storage temperature for 24 hours
Temperature Cycle	MIL-STD-883	Referenced Method 1010 Non-operating at temperature extremes, 15 mins/temp, 10 cycles
Burn-In	MIL-STD-883	Referenced Method 1015 Max operating temperature for 160 hours
Expanded Ambient Operating Temperature		-55°C to +85°C

TYPICAL CONNECTION CIRCUIT

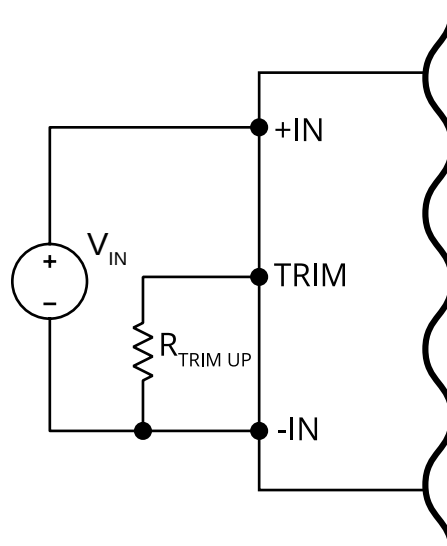
SINGLE OUTPUT



DUAL OUTPUT



TRIM



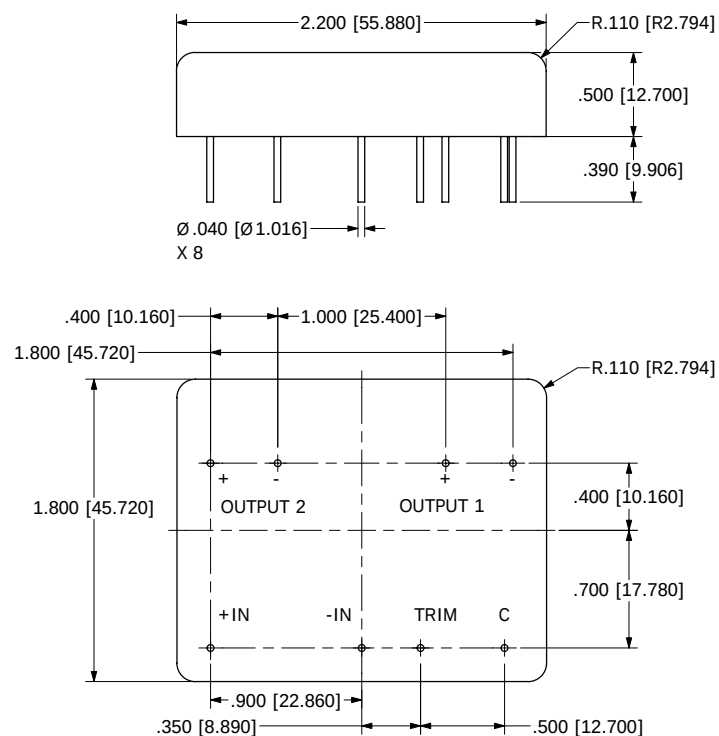
Note: Use 50k Ω , 1/4W trim pot between TRIM and -IN. Reduce resistance to raise output voltage to 5% maximum. Raising the output voltage beyond 5% could cause damage to the module.

SERIES IR - THROUGH HOLE

The drawing shows a rectangular component with the following dimensions and features:

- Overall Width:** 2.200 [55.880]
- Overall Height:** 1.800 [45.720]
- Top Right Corner Radius:** R.110 [R2.794]
- Top Flange Thickness:** .500 [12.700]
- Bottom Flange Thickness:** .390 [9.906]
- Pin Diameter:** Ø.040 [Ø1.016]
- Pin Spacing (Center-to-Center):** 1.800 [45.720]
- Pin Count:** X 6
- Internal Features (from top-left corner):**
 - +OUT:** Located at a vertical distance of .400 [10.160] from the top edge.
 - +IN:** Located at a vertical distance of .700 [17.780] from the bottom edge.
 - IN:** Located at a horizontal distance of .900 [22.860] from the left edge.
 - TRIM:** Located at a horizontal distance of .350 [8.890] from the left edge.
 - C:** Located at a horizontal distance of .500 [12.700] from the right edge.

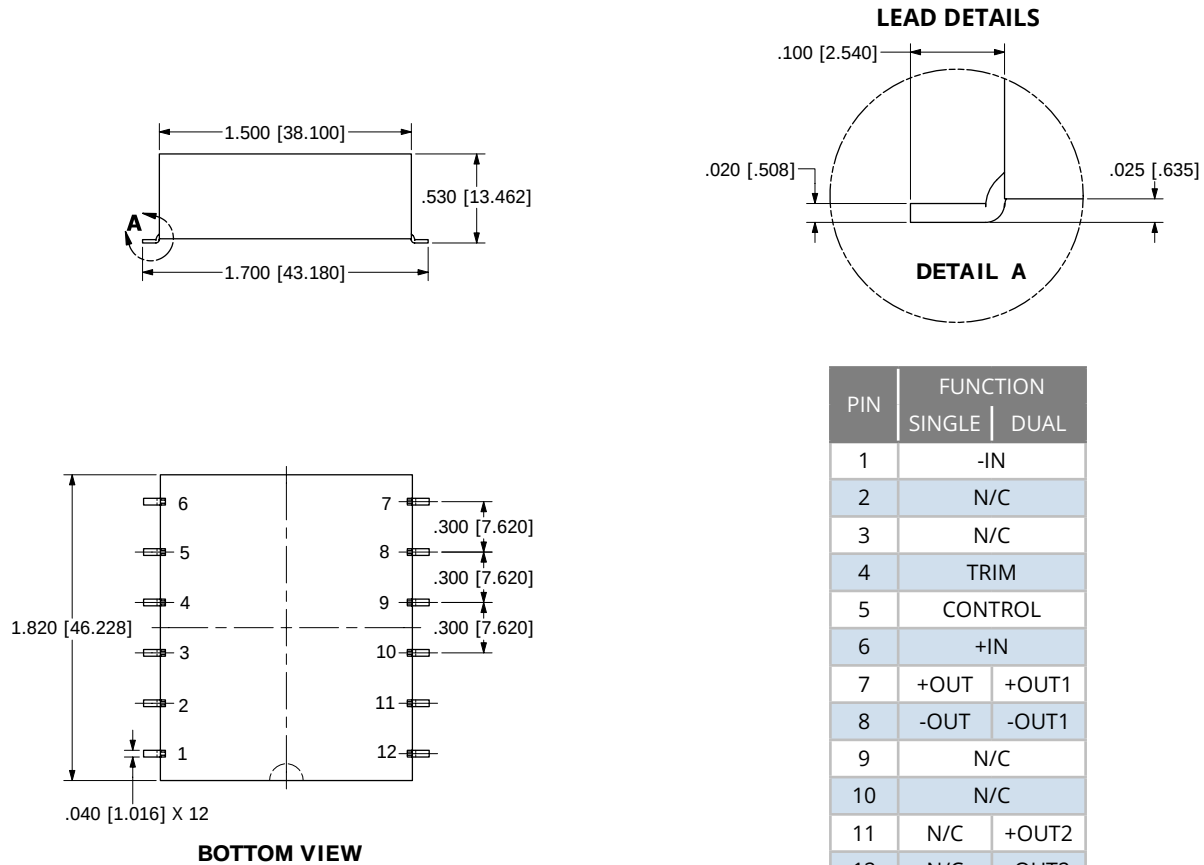
DUAL OUTPUT



The diagram shows the orthographic projection of a truncated cone. On the left is the top view, which consists of two concentric circles. A horizontal centerline and a vertical centerline intersect at the center. To the right of the top view is the front view, which is an isosceles trapezoid. A horizontal centerline extends from the top view through the front view.

MECHANICAL DRAWINGS

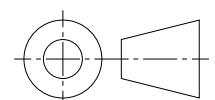
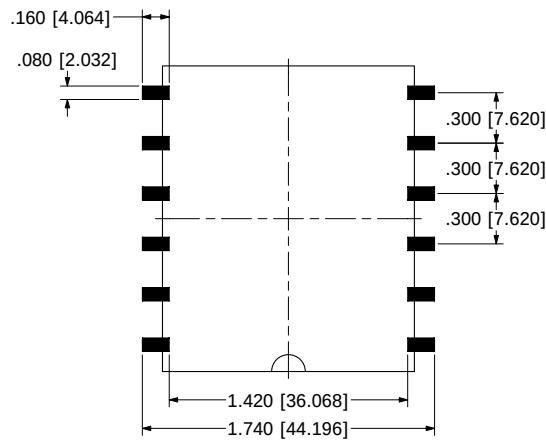
SERIES SIR - SUFRACE MOUNT



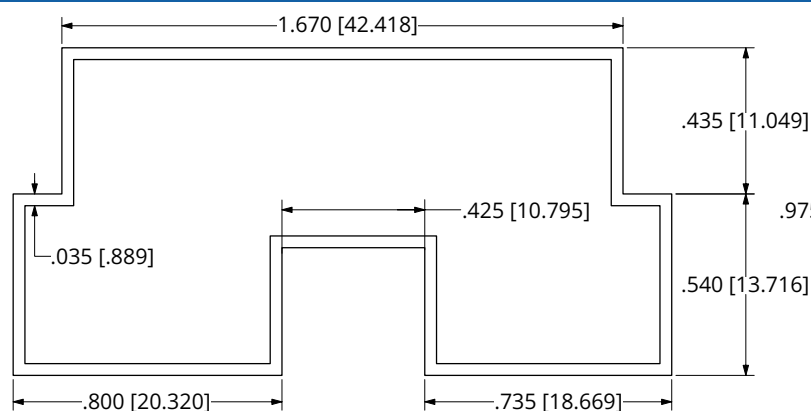
NOTES

a. ALL DIMENSIONS ARE IN INCHES, [] = MM

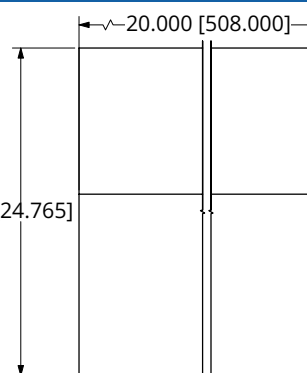
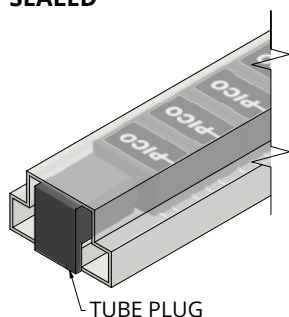
RECOMMENDED LAND PATTERN DIMENSIONS - SERIES SIR



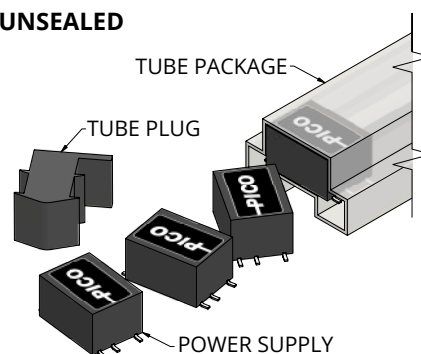
TUBE PACKAGING - SERIES SIR



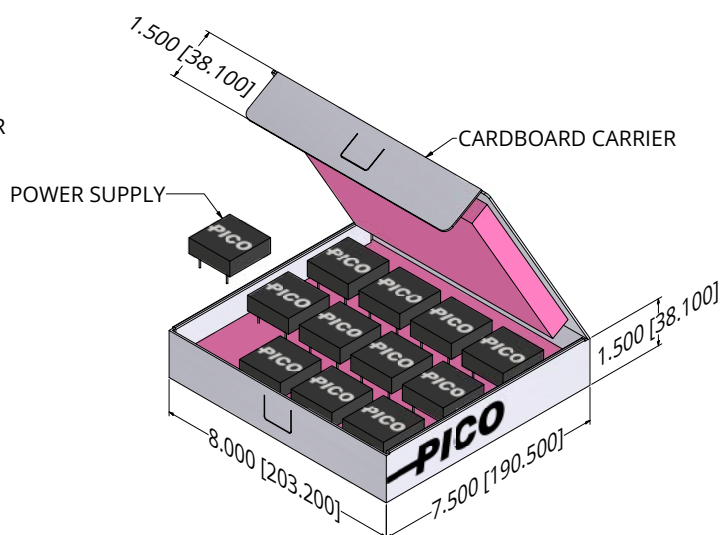
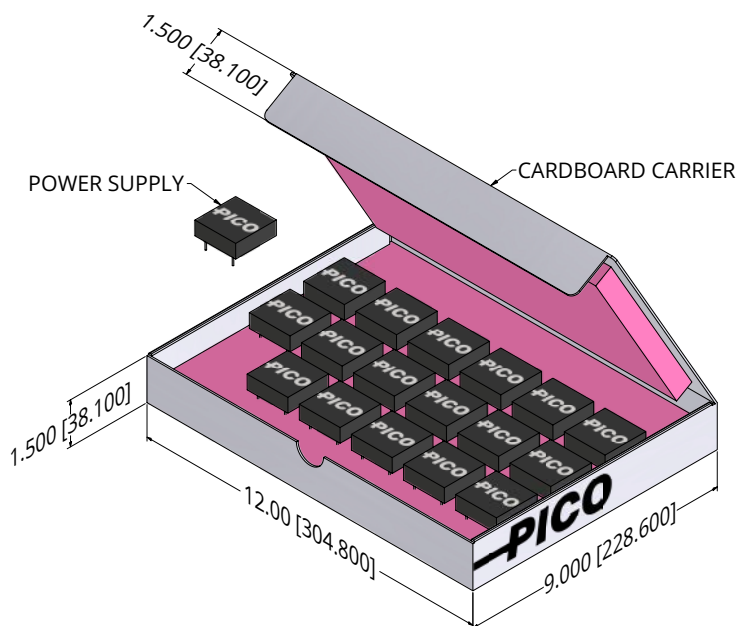
PLAN VIEW
SEALED



ELEVATION VIEW
UNSEALED



BOX PACKAGING - BULK - SERIES IR



Pico warrants each product manufactured by us and sold by us or an authorized representative, to be free from defects in material and workmanship. If properly used, it will perform within its applicable specifications for a period of one year after original shipment. Pico's obligation under this guarantee is limited to repairing or replacing our product to the original purchaser. This warranty is in lieu of all other warranties, express or implied and constitutes fulfillment of our obligations to the purchaser. We do not guarantee that the products can be used for a particular purpose other than those solely covered by the product's specifications. Pico must be notified if the product must meet particular certifications and/or standards. We assume no liability, in any event, for consequential damages, for anticipated or lost profits, incidental damages or loss of time or other losses incurred by the purchaser or any third party in connection with products covered by this warranty or otherwise. The purchaser will indemnify and hold Pico harmless for any damages, losses, costs, etc. from usage not within the product's specifications. Pico must be consulted before usage of its products in a nuclear, radioactive or space environment.

We reserve the right to discontinue products without notice, We reserve the right to make modifications to any existing catalog products without notice, at any time, without the obligation to modify units previously sold.

Series LV & TLV

3-10W Isolated Regulated Low Profile DC-DC Converter

PICO
Electronics, Inc.

PRODUCT OVERVIEW

The LV & TLV series are regulated DC-DC converters with a wide 36 to 80V input range and low profile – 0.500". Over 80 models are available in both single and dual outputs, through hole and terminal strip. They can operate over the temperature range of -25°C to +70°C without derating, a heat sink or active cooling.



FEATURES

- Up to 10W output models
- Encapsulated semiconductors, conservatively rated for maximum reliability
- Low profile – down to 0.500" height
- Wide input voltage range - 36 to 80V
- 3.3 to 48V output models
- Up to 1000VDC isolation at 100MΩ
- Input/output isolation
- Single and dual output
- No heat sink or derating required
- No external components required

Contact Pico for part number of available options:

- Expanded operating temp: -55°C to +85°C
- Select screening per MIL-STD-883:
 - Stabilization Bake
 - Temperature Cycle
 - Burn-In
- Special Input Voltage, Output Voltage, Isolation Voltage or Output Power

LV

MOUNTING

LV = THROUGH HOLE
TLV = TERMINAL STRIP

A

OUTPUT POWER

A = 3W
B = 5W
C = 8W
D = 10W

28

NOM. OUTPUT VOLTAGE

3.3 = 3.3V
5 = 5V
5.2 = 5.2V
12 = 12V
15 = 15V
24 = 24V
28 = 28V
48 = 48V

S

NUMBER OF OUTPUTS

S = SINGLE
D = DUAL



MODEL LIST**SINGLE OUTPUT**

Through Hole	Terminal Strip	Output Voltage [VDC]	Output Current		Output Power [W]	Efficiency ⁽²⁾ [%] typ.	Output Ripple @ 1MHz BW [mVp-p max]
			Min. [mA]	Max. [mA]			
LVA3.3S	-	3.3	60.6	606	2	61	40
LVA5S	-	5	60	600	3	64	20
LVA5.2S	-	5.2	57.7	577	3	64	20
LVA12S	-	12	25	250	3	65	20
LVA15S	-	15	20	200	3	65	15
LVA24S	-	24	12.5	125	3	66	15
LVA28S	-	28	10.7	107	3	66	15
LVA48S	-	48	6.2	62	3	66	15
LVB3.3S	TLVB3.3S	3.3	121.2	1212	4	62	80
LVB5S	TLVB5S	5	100	1000	5	68	50
LVB5.2S	TLVB5.2S	5.2	96.1	961	5	68	50
LVB12S	TLVB12S	12	41.5	415	5	70	25
LVB15S	TLVB15S	15	33	333	5	70	25
LVB24S	TLVB24S	24	21	208	5	72	25
LVB28S	TLVB28S	28	17.5	178	5	72	25
LVB48S	TLVB48S	48	10.5	104	5	74	25
LVC3.3S	TLVC3.3S	3.3	151.5	1515	5	63	80
LVC5S	TLVC5S	5	140	1400	7	68	50
LVC5.2S	TLVC5.2S	5.2	134.6	1346	7	68	50
LVC12S	TLVC12S	12	66.6	666	8	74	25
LVC15S	TLVC15S	15	53.3	533	8	74	25
LVC24S	TLVC24S	24	33.3	333	8	74	25
LVC28S	TLVC28S	28	28.5	285	8	74	25
LVC48S	TLVC48S	48	16.6	166	8	74	25
LVD3.3S	TLVD3.3S	3.3	212.1	2121	7	65	80
LVD5S	TLVD5S	5	180	1800	9	70	50
LVD5.2S	TLVD5.2S	5.2	173	1730	9	70	50
LVD12S	TLVD12S	12	83.3	833	10	74	25
LVD15S	TLVD15S	15	66.6	666	10	74	25
LVD24S	TLVD24S	24	41.6	416	10	74	25
LVD28S	TLVD28S	28	35.7	357	10	74	25
LVD48S	TLVD48S	48	20.8	208	10	74	25

Note 1: Maintain minimum 10% of rated load to prevent a voltage surge.

Note 2: Tested at nominal input voltage and full output load.

MODEL LIST**DUAL OUTPUT**

Through Hole	Terminal Strip	Output Voltage [±VDC]	Output Current		Output Power [±W]	Efficiency ⁽²⁾ [%] typ.	Output Ripple Per Output @ 1MHz BW [mVp-p max]
			Min. [±mA]	Max. [±mA]			
LVA5D	-	5	30	300	1.5	60	25
LVA12D	-	12	12.5	125	1.5	65	25
LVA15D	-	15	10	100	1.5	67	25
LVB5D	TLVB5D	5	50	500	2.5	68	50
LVB12D	TLVB12D	12	20	208	2.5	70	25
LVB15D	TLVB15D	15	16.5	166	2.5	70	25
LVC5D	TLVC5D	5	70	700	3.5	68	50
LVC12D	TLVC12D	12	33.3	333	4	74	25
LVC15D	TLVC15D	15	26.6	266	4	74	25
LVD5D	TLVD5D	5	90	900	4.5	70	50
LVD12D	TLVD12D	12	41.5	416	5	74	25
LVD15D	TLVD15D	15	33.3	333	5	74	25

Note 1: Maintain minimum 10% of rated load to prevent a voltage surge.

Note 2: Tested at nominal input voltage and full output load.

Note 3: Dual output loads must be balanced.

SPECIFICATIONS (Nominal V_{IN} , Full Load, $T_A = +25^{\circ}\text{C}$, 1 hour warm up unless otherwise specified)**INPUT**

Parameter	Condition	Min.	Typ.	Max.	Units
Input Voltage Range		36	48	80	VDC

OUTPUT

Parameter	Condition		Min.	Typ.	Max.	Units
Line Regulation	3.3V Output models		-	-	1.5	±%
	All other models		-	-	1	
Load Regulation	25-100% load	3.3V Output models	-	-	3.5	±%
		All other models	-	-	2	
Output Power	LVC & LVD TLVC & TLVD	48-80V input	See Model List			
		36-48V input	Derate 1.25% power per input voltage			
	All other models		See Model List			
Output Voltage Tolerance	Nominal V _{IN} Full Load	3.3V Output models	-	-	3	±%
		All other models	-	-	2	

ENVIRONMENTAL

Parameter	Condition	Min.	Typ.	Max.	Units
Operating Temperature Range	Ambient without derating	-25	-	+70	°C
Storage Temperature Range	Ambient	-55	-	+105	°C
Temperature Coefficient		-	0.02	-	%/°C
Cooling	Free Air Convection				

SPECIFICATIONS (Nominal V_{IN} , Full Load, $T_A = +25^\circ\text{C}$, 1 hour warm up unless otherwise specified)**GENERAL**

Parameter	Condition	Min.	Typ.	Max.	Units
Isolation Voltage		1000	-	-	VDC
Insulation Resistance		100	-	-	MΩ
Switching Frequency		200	-	1000	kHz
Size (L x W x H)	LVA models	1.5 x 1.5 x 0.5 (38.1 x 38.1 x 12.7)			inches (mm)
	LVB models	2 x 1.5 x 0.5 (50.8 x 38.1 x 12.7)			
	LVC models	2.22 x 1.825 x 0.5 (56.388 x 46.355 x 12.7)			
	LVD models	2.3 x 2.3 x 0.5 (58.42 x 58.42 x 12.7)			
	TLVB models	2.55 x 1.5 x 0.5 (64.77 x 38.1 x 12.7)			
	TLVC models	2.77 x 1.825 x 0.5 (70.358 x 46.355 x 12.7)			
	TLVD models	2.85 x 2.3 x 0.5 (72.39 x 58.42 x 12.7)			
Weight	LVA models	-	34	-	grams
	LVB models	-	43	-	
	LVC models	-	57	-	
	LVD models	-	79	-	
	TLVB models	-	54	-	
	TLVC models	-	71	-	
	TLVD models	-	91	-	
Case	Diallyl Phthalate (DAP)				
Potting	Vacuum Impregnated Epoxy				
Box Packaging (W x L x H)	8 x 7.5 x 1.5 (203.2 x 190.5 x 38.1) or 12 x 9 x 1.5 (304.8 x 228.6 x 38.1)				inches (mm)

PROTECTIONS & FEATURES

Parameter	Condition	Min.	Typ.	Max.	Units
Short circuit	Continuous				

DESIGNED TO MEET

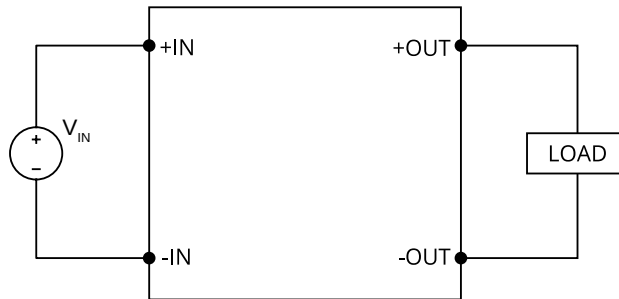
Test	Referenced Standard	Description
Vibration	MIL-STD-202	Method 204, Vibration, High Frequency, Condition D
Shock	MIL-STD-202	Method 213, Shock (Specified Pulse), Condition I
Humidity	MIL-STD-202	Method 106, Moisture Resistance
Altitude	MIL-STD-202	Method 105, Barometric Pressure (Reduced), Condition D

OPTIONS AVAILABLE - CONTACT PICO FOR PART NUMBER

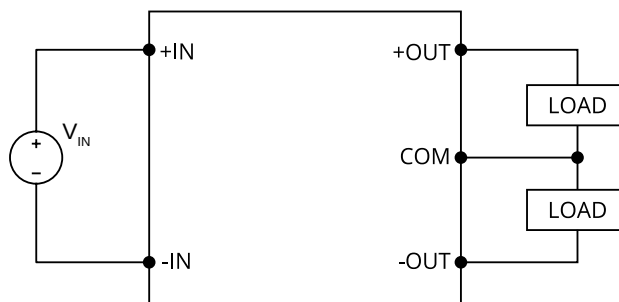
Parameter	Referenced Standard	Description
Stabilization Bake	MIL-STD-883	Referenced Method 1008 Non-operating maximum storage temperature for 24 hours
Temperature Cycle	MIL-STD-883	Referenced Method 1010 Non-operating at temperature extremes, 15 mins/temp, 10 cycles
Burn-In	MIL-STD-883	Referenced Method 1015 Max operating temperature for 160 hours

TYPICAL CONNECTION CIRCUIT

SINGLE OUTPUTS



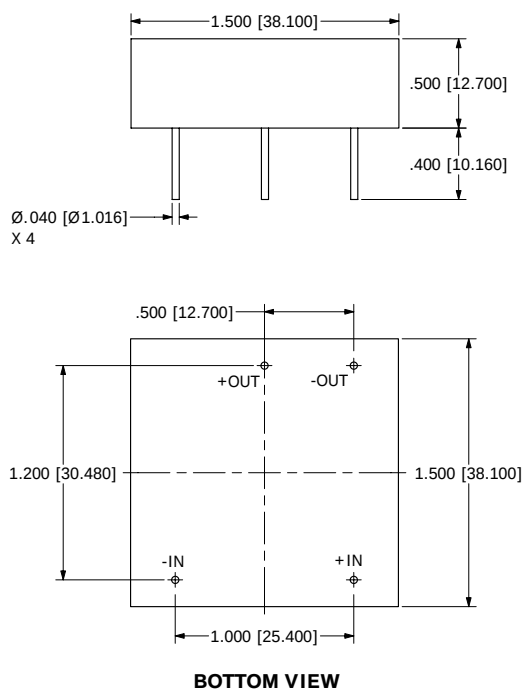
DUAL OUTPUTS



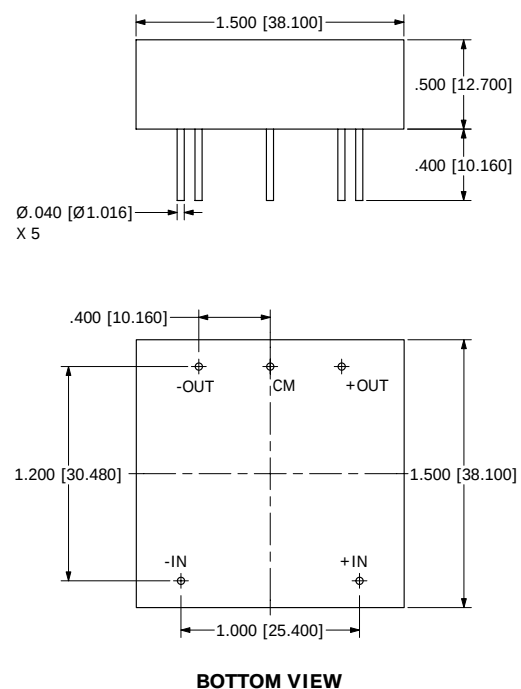
MECHANICAL DRAWINGS

LVA MODELS

SINGLE OUTPUTS



DUAL OUTPUTS



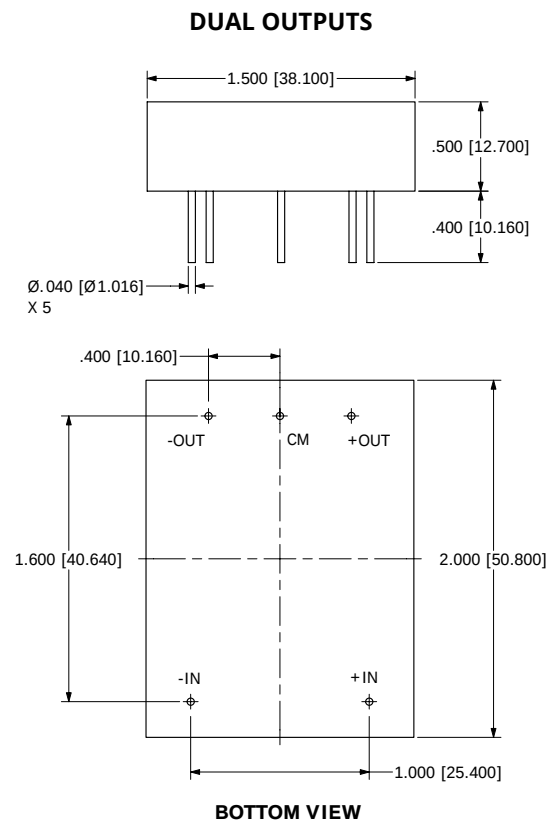
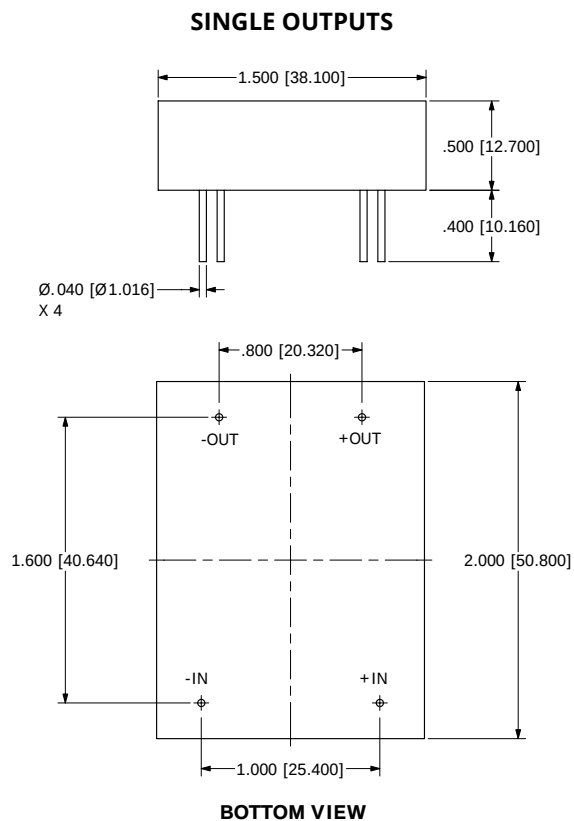
NOTES

a. ALL DIMENSIONS ARE IN INCHES, [] = MM

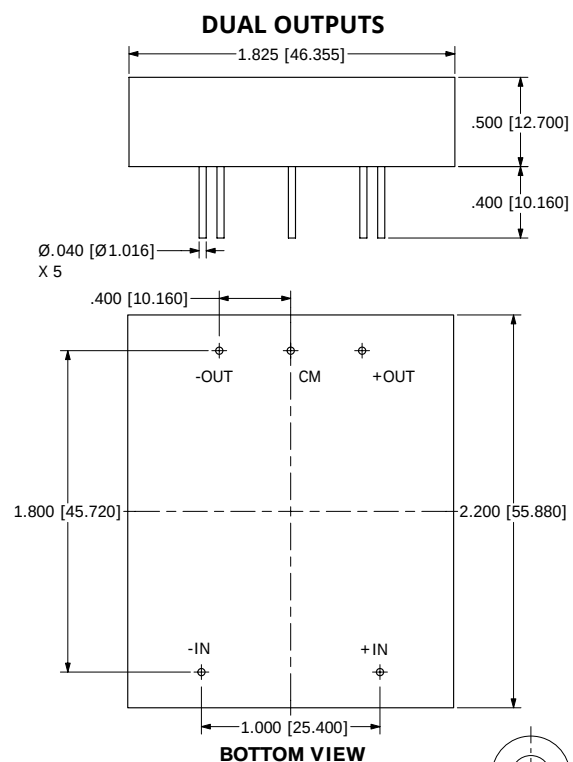
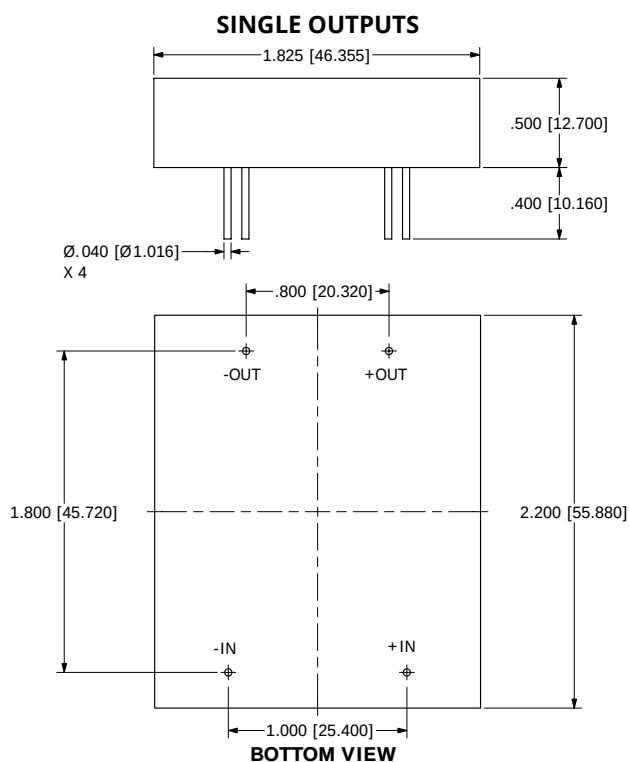
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MECHANICAL DRAWINGS

LVB MODELS



LVC MODELS



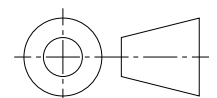
NOTES

a. ALL DIMENSIONS ARE IN INCHES, [] = MM

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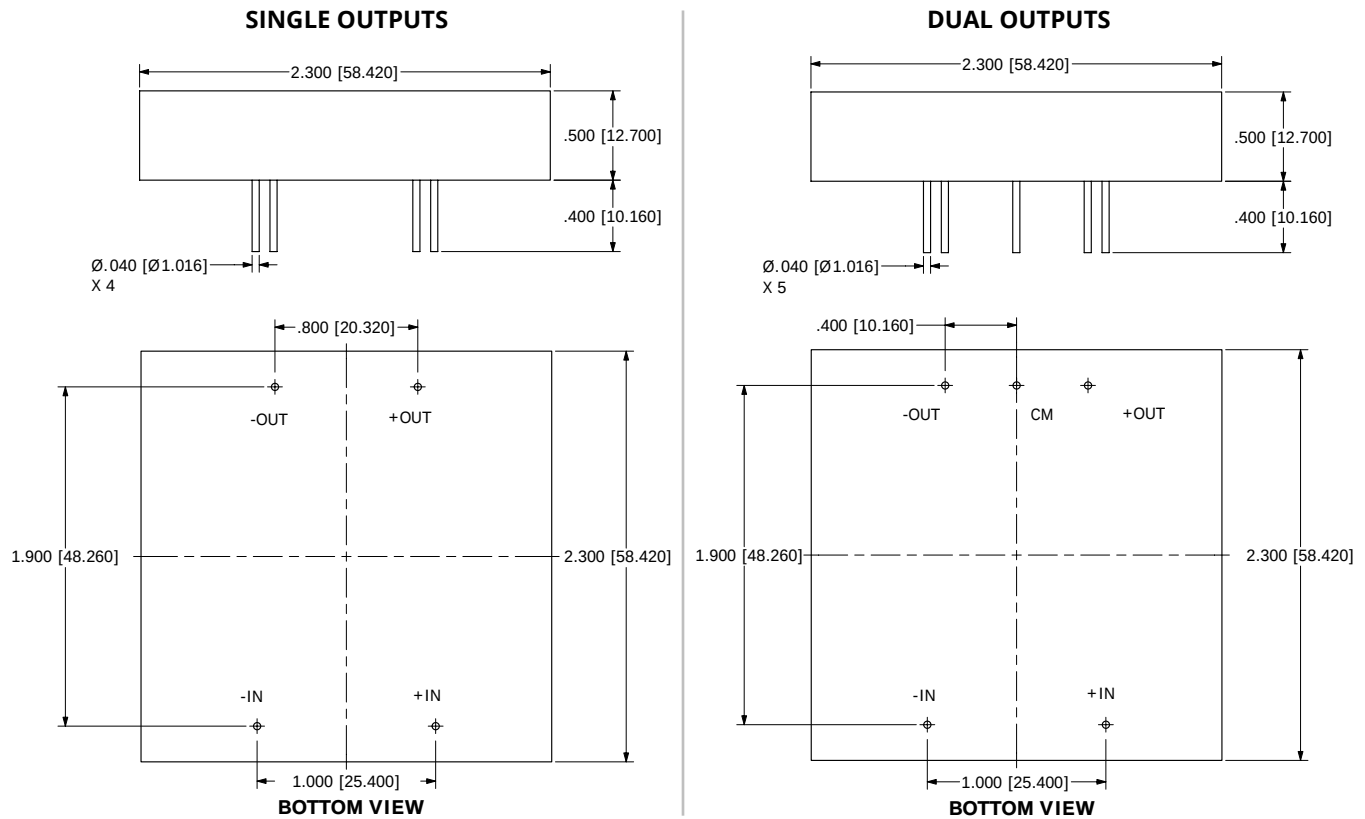
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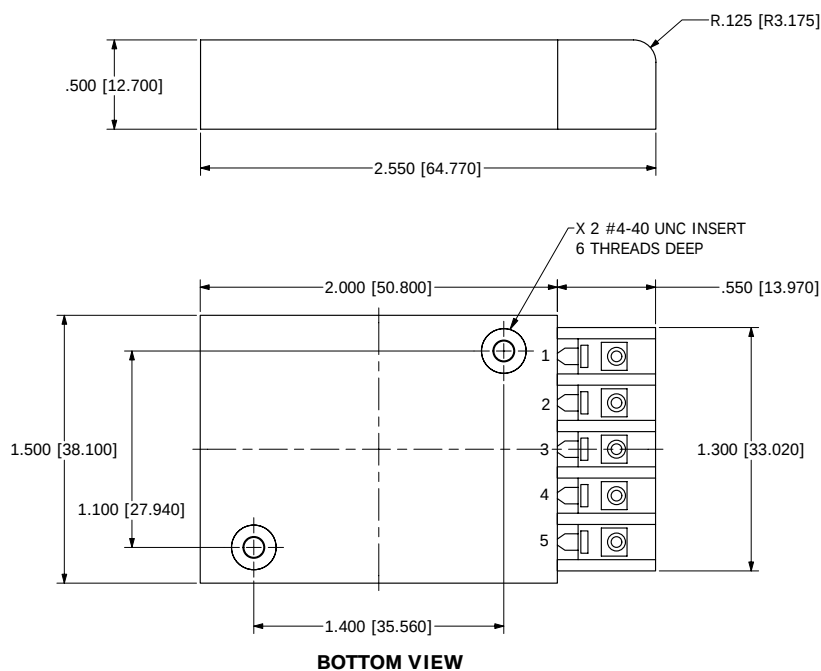


MECHANICAL DRAWINGS

LVD MODELS



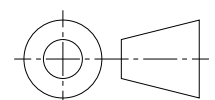
TLVB MODELS



PIN	FUNCTION	
	SINGLE	DUAL
1	-IN	
2	+IN	
3	N/C	-OUT
4	-OUT	COM
5		+OUT

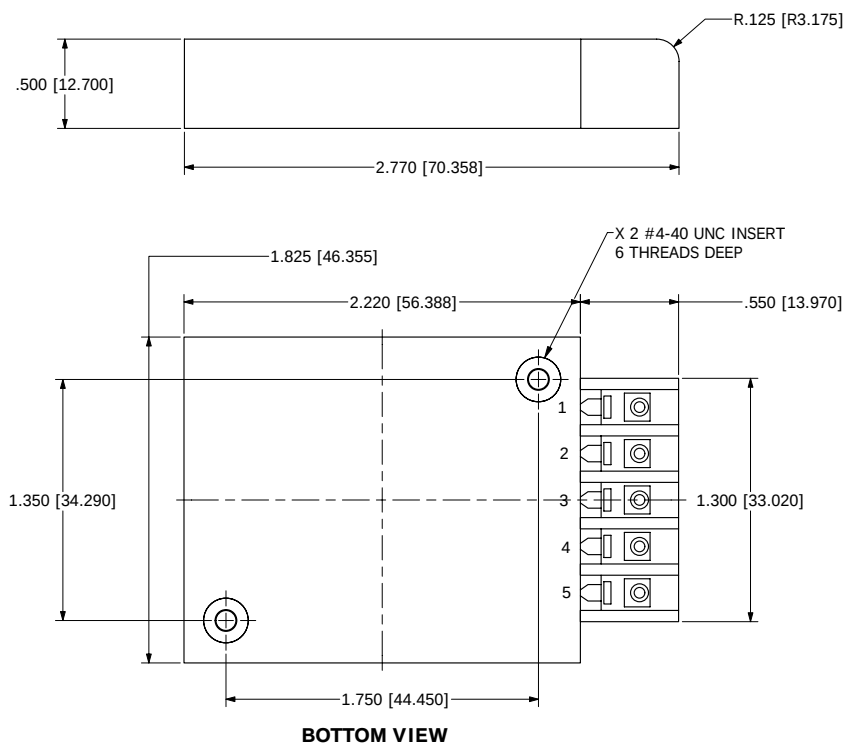
NOTES

- ALL DIMENSIONS ARE IN INCHES, [] = MM
- RECOMMENDED MOUNTING TORQUE: 3-5 IN-LBS



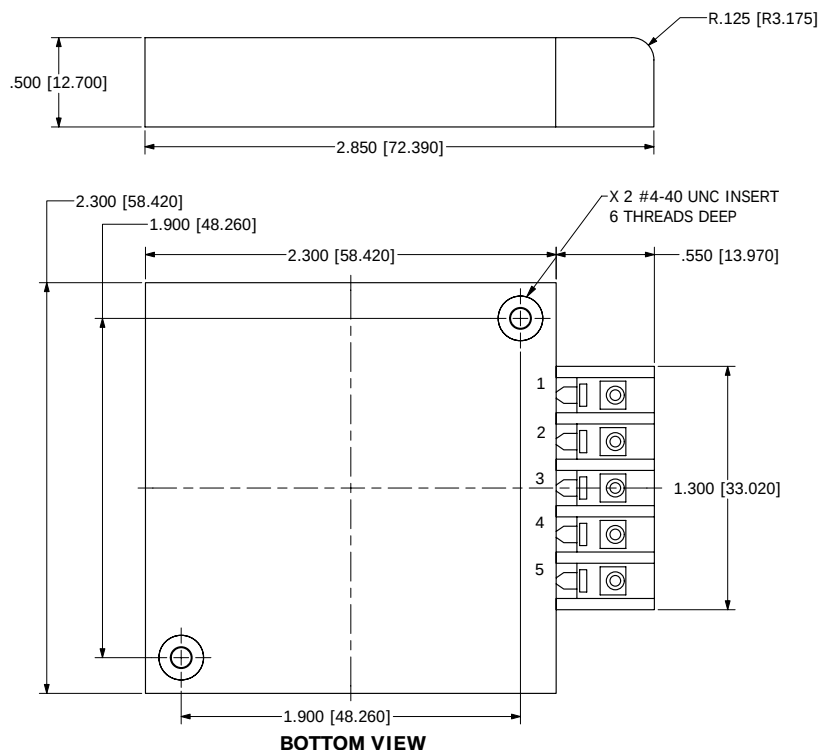
MECHANICAL DRAWINGS

TLVC MODELS



PIN	FUNCTION	
	SINGLE	DUAL
1	-IN	
2	+IN	
3	N/C	-OUT
4	-OUT	COM
5	+OUT	

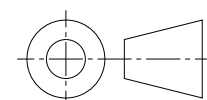
TLVD MODELS

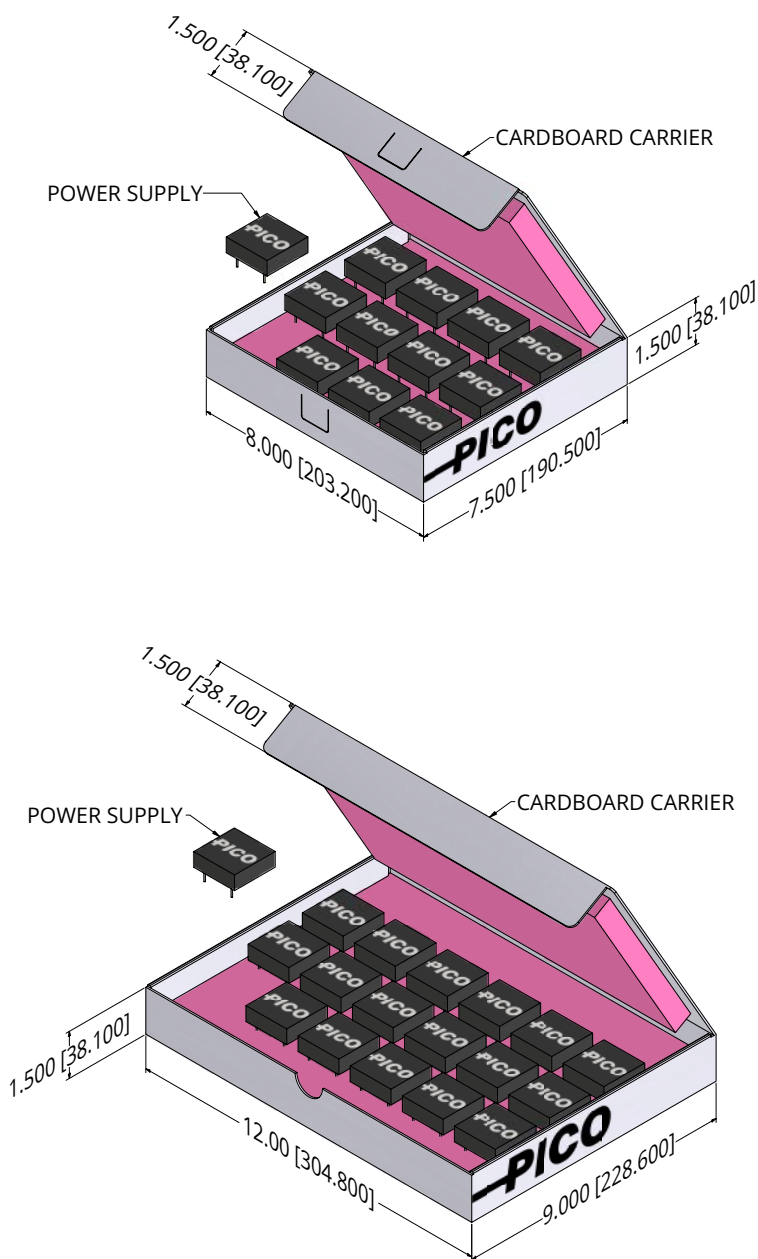


PIN	FUNCTION	
	SINGLE	DUAL
1	-IN	
2	+IN	
3	N/C	-OUT
4	-OUT	COM
5	+OUT	

NOTES

- ALL DIMENSIONS ARE IN INCHES, [] = MM
- RECOMMENDED MOUNTING TORQUE: 3-5 IN-LBS





Pico warrants each product manufactured by us and sold by us or an authorized representative, to be free from defects in material and workmanship. If properly used, it will perform within its applicable specifications for a period of one year after original shipment. Pico's obligation under this guarantee is limited to repairing or replacing our product to the original purchaser. This warranty is in lieu of all other warranties, express or implied and constitutes fulfillment of our obligations to the purchaser. We do not guarantee that the products can be used for a particular purpose other than those solely covered by the product's specifications. Pico must be notified if the product must meet particular certifications and/or standards. We assume no liability, in any event, for consequential damages, for anticipated or lost profits, incidental damages or loss of time or other losses incurred by the purchaser or any third party in connection with products covered by this warranty or otherwise. The purchaser will indemnify and hold Pico harmless for any damages, losses, costs, etc. from usage not within the product's specifications. Pico must be consulted before usage of its products in a nuclear, radioactive or space environment.

We reserve the right to discontinue products without notice, We reserve the right to make modifications to any existing catalog products without notice, at any time, without the obligation to modify units previously sold.

Series HV & THV

3-15W Isolated Regulated Low Profile DC-DC Converter



PRODUCT OVERVIEW

The HV series are regulated DC-DC converters with a wide 17 to 170V input range and low profile – 0.500". Over 30 models are available in both single and dual outputs, through hole and terminal strip. They can operate over the temperature range of -25°C to +70°C without derating, a heat sink or active cooling.



FEATURES

- Up to 15W output models
- Encapsulated semiconductors, conservatively rated for maximum reliability
- Low profile – down to 0.500" height
- Wide input voltage range - 70 to 170V
- 3.3 to 48V output models
- Up to 1000VDC isolation at 100MΩ
- Input/output isolation
- Single and dual output
- No heat sink or derating required
- No external components required

Contact Pico for part number of available options:

- Expanded operating temp: -55°C to +85°C
- Select screening per MIL-STD-883:
 - Stabilization Bake
 - Temperature Cycle
 - Burn-In
- Special Input Voltage, Output Voltage, Isolation Voltage or Output Power

T	HV	A	28	S
MOUNTING	SERIES NAME	OUTPUT POWER	NOMINAL OUTPUT VOLTAGE	# OF OUTPUTS
BLANK = THRU HOLE T = TERMINAL STRIP	HV	A = 3W B = 5W C = 10W D = 15W	3.3 = 3.3V 5 = 5V 5.2 = 5.2V 12 = 12V 15 = 15V 24 = 24V 28 = 28V 48 = 48V	S = SINGLE D = DUAL

MODEL LIST

SINGLE OUTPUT

Through Hole	Terminal Strip	Output Voltage [VDC]	Output Current		Output Power [W]	Efficiency ⁽²⁾ [%] typ.	Output Ripple @ 1MHz BW [mVp-p max]
			Min. ⁽¹⁾ [mA]	Max. [mA]			
HVA3.3S	-	3.3	60.6	606	2	63	50
HVA5S	-	5	60.0	600	3	65	
HVA5.2S	-	5.2	57.7	577	3	65	
HVA12S	-	12	25.0	250	3	67	
HVA15S	-	15	20.0	200	3	67	
HVA24S	-	24	12.5	125	3	68	
HVA28S	-	28	10.7	107	3	68	
HVB3.3S	THVB3.3S	3.3	100.0	1000	3.3	67	50
HVB5S	THVB5S	5	100.0	1000	5	70	
HVB5.2S	THVB5.2S	5.2	96.2	962	5	70	
HVB12S	THVB12S	12	41.7	417	5	73	
HVB15S	THVB15S	15	33.3	333	5	73	
HVB24S	THVB24S	24	20.8	208	5	74	
HVB28S	THVB28S	28	17.9	179	5	74	
HVB48S	THVB48S	48	10.4	104	5	74	150
HVC3.3S	THVC3.3S	3.3	151.5	1515	5	67	50
HVC5S	THVC5S	5	160.0	1600	8	69	
HVC5.2S	THVC5.2S	5.2	153.8	1538	8	69	
HVC12S	THVC12S	12	83.3	833	10	75	
HVC15S	THVC15S	15	66.7	667	10	77	
HVC24S	THVC24S	24	41.7	417	10	77	
HVC28S	THVC28S	28	35.7	357	10	77	
HVC48S	THVC48S	48	20.8	208	10	74	200
HVD3.3S	THVD3.3S	3.3	181.8	1818	6	68	50
HVD5S	THVD5S	5	200.0	2000	10	70	
HVD5.2S	THVD5.2S	5.2	192.3	1923	10	70	
HVD12S	THVD12S	12	125.0	1250	15	75	
HVD15S	THVD15S	15	100.0	1000	15	76	
HVD24S	THVD24S	24	62.5	625	15	76	
HVD28S	THVD28S	28	53.6	536	15	76	
HVD48S	THVD48S	48	31.3	313	15	74	200

Note 1: Maintain minimum 10% of rated load to prevent a voltage surge.

Note 2: Tested at nominal input voltage and full output load.

MODEL LIST

DUAL OUTPUT

Through Hole	Terminal Strip	Output Voltage [±VDC]	Output Current		Output Power [±W]	Efficiency ⁽²⁾ [%] typ.	Output Ripple Per Output @ 1MHz BW [mVp-p max]
			Min. ⁽¹⁾ [±mA]	Max. [±mA]			
HVA5D	-	5	30.0	300	1.5	63	50
HVA12D	-	12	12.5	125	1.5	65	25
HVA15D	-	15	10.0	100	1.5	67	25
HVB5D	THVB5D	5	50.0	500	2.5	70	50
HVB12D	THVB12D	12	20.8	208	2.5	73	25
HVB15D	THVB15D	15	16.7	167	2.5	73	25
HVC5D	THVC5D	5	80.0	800	4	68	50
HVC12D	THVC12D	12	41.7	417	5	75	25
HVC15D	THVC15D	15	33.3	333	5	76	25
HVD5D	THVD5D	5	100.0	1000	5	69	50
HVD12D	THVD12D	12	62.5	625	7.5	75	25
HVD15D	THVD15D	15	50.0	500	7.5	76	25

Note 1: Maintain minimum 10% of rated load to prevent a voltage surge.

Note 2: Tested at nominal input voltage and full output load.

Note 3: Dual output loads must be balanced.

SPECIFICATIONS (Nominal V_{IN} , Full Load, $T_A = +25^{\circ}\text{C}$, 1 hour warm up unless otherwise specified)

INPUT

Parameter	Condition	Min.	Typ.	Max.	Units
Input Voltage Range		70	120	170	VDC

OUTPUT

Parameter	Condition	Min.	Typ.	Max.	Units
Line Regulation	HVA12S, HVA15S, HVA24S & HVA28S	-	-	0.5	±%
	All other models	-	-	1	
Load Regulation	25-100% load	-	-	2	±%
Output Voltage Tolerance	Nominal V_{IN} , Full Load	-	-	2	±%

ENVIRONMENTAL

Parameter	Condition	Min.	Typ.	Max.	Units
Operating Temperature Range	Ambient without derating	-25	-	+70	°C
Storage Temperature Range	Ambient	-55	-	+105	°C
Temperature Coefficient		-	0.02	-	%/°C
Cooling	Free Air Convection				

SPECIFICATIONS (Nominal V_{IN} , Full Load, $T_A = +25^{\circ}\text{C}$, 1 hour warm up unless otherwise specified)**GENERAL**

Parameter	Condition	Min.	Typ.	Max.	Units
Isolation Voltage		1000	-	-	VDC
Insulation Resistance		100	-	-	MΩ
Switching Frequency		-	133	-	kHz
Size (L x W x H)	HVA models	1.5 x 1.5 x 0.5 (38.1 x 38.1 x 12.7)			inches (mm)
	HVB models	2 x 1.5 x 0.5 (50.8 x 38.1 x 12.7)			
	HVC models	2.22 x 1.825 x 0.5 (56.388 x 46.355 x 12.7)			
	HVD models	2.3 x 2.3 x 0.5 (58.42 x 58.42 x 12.7)			
	THVB models	2.55 x 1.5 x 0.5 (64.77 x 38.1 x 12.7)			
	THVC models	2.77 x 1.825 x 0.5 (70.358 x 46.355 x 12.7)			
	THVD models	2.85 x 2.3 x 0.5 (72.39 x 58.42 x 12.7)			
Weight	HVA models	-	34	-	grams
	HVB models	-	45	-	
	HVC models	-	60	-	
	HVD models	-	82	-	
	THVB models	-	54	-	
	THVC models	-	71	-	
	THVD models	-	88	-	
Case	Diallyl Phthalate (DAP)				
Potting	Vacuum Impregnated Epoxy				
Box Packaging (W x L x H)	8 x 7.5 x 1.5 (203.2 x 190.5 x 38.1) or 12 x 9 x 1.5 (304.8 x 228.6 x 38.1)				inches (mm)

PROTECTIONS & FEATURES

Parameter	Condition	Min.	Typ.	Max.	Units
Short circuit	Continuous				

DESIGNED TO MEET

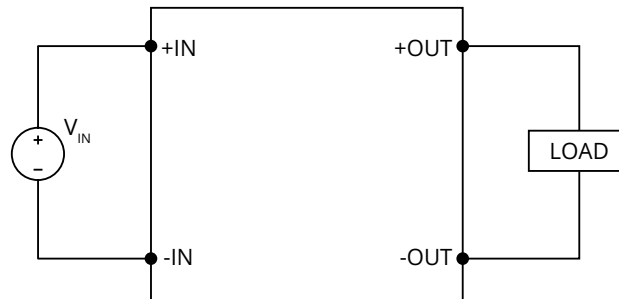
Test	Referenced Standard	Description
Vibration	MIL-STD-202	Method 204, Vibration, High Frequency, Condition D
Shock	MIL-STD-202	Method 213, Shock (Specified Pulse), Condition I
Humidity	MIL-STD-202	Method 106, Moisture Resistance
Altitude	MIL-STD-202	Method 105, Barometric Pressure (Reduced), Condition D

OPTIONS AVAILABLE - CONTACT PICO FOR PART NUMBER

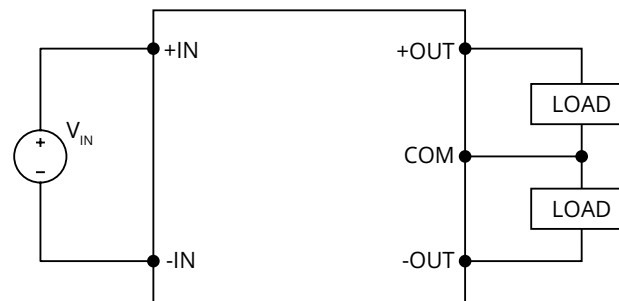
Parameter	Referenced Standard	Description
Stabilization Bake	MIL-STD-883	Referenced Method 1008 Non-operating maximum storage temperature for 24 hours
Temperature Cycle	MIL-STD-883	Referenced Method 1010 Non-operating at temperature extremes, 15 mins/temp, 10 cycles
Burn-In	MIL-STD-883	Referenced Method 1015 Max operating temperature for 160 hours

TYPICAL CONNECTION CIRCUIT

SINGLE OUTPUTS



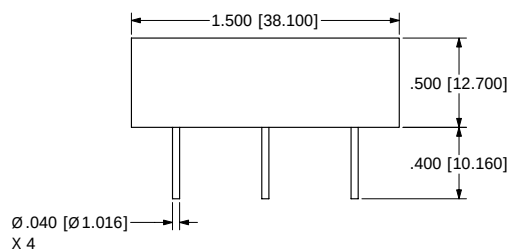
DUAL OUTPUTS



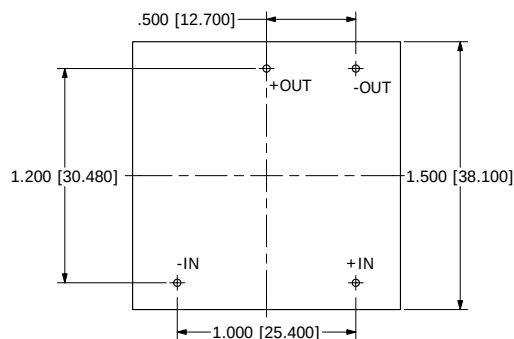
MECHANICAL DRAWINGS

HVA MODELS

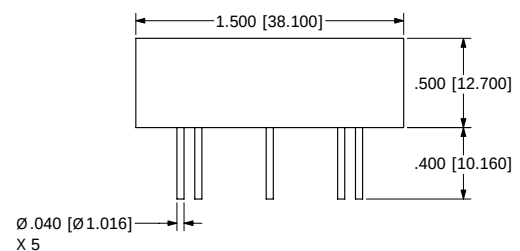
SINGLE OUTPUTS



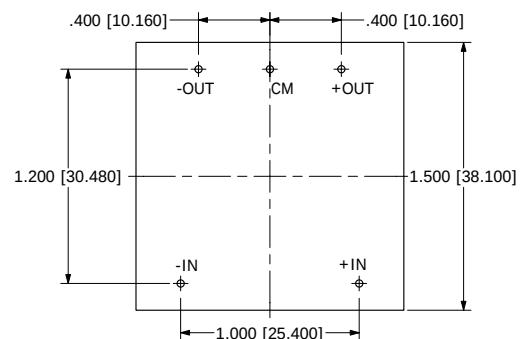
BOTTOM VIEW



DUAL OUTPUTS



BOTTOM VIEW

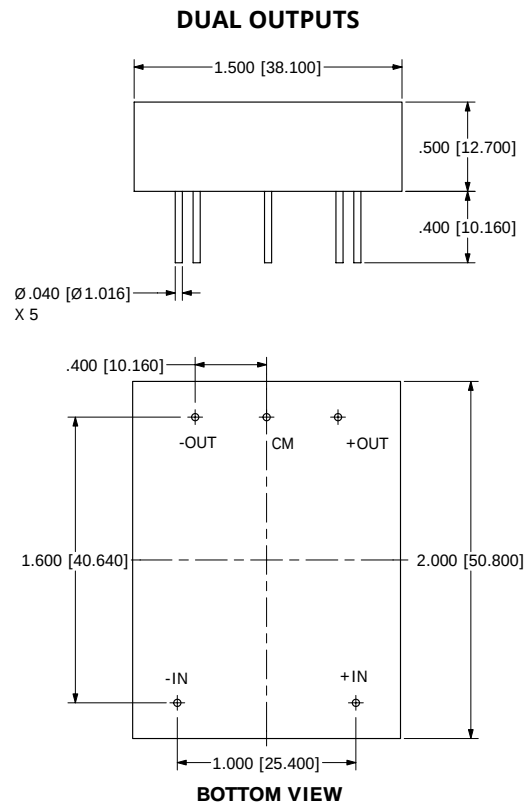
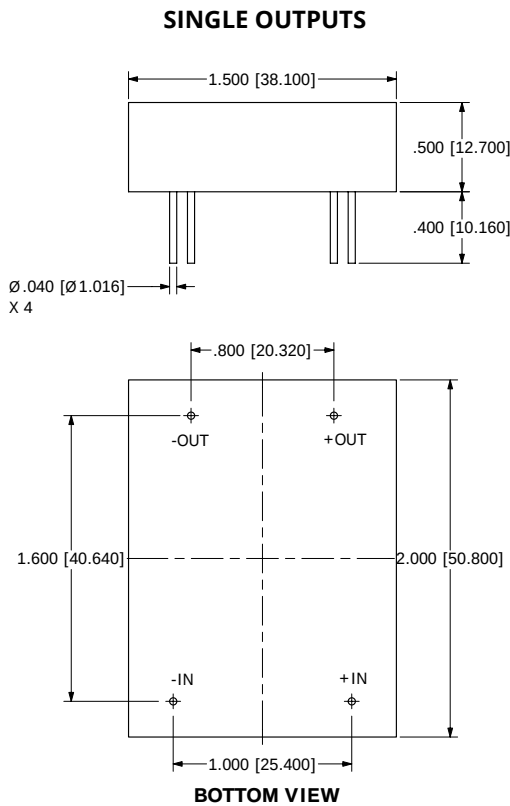


NOTES

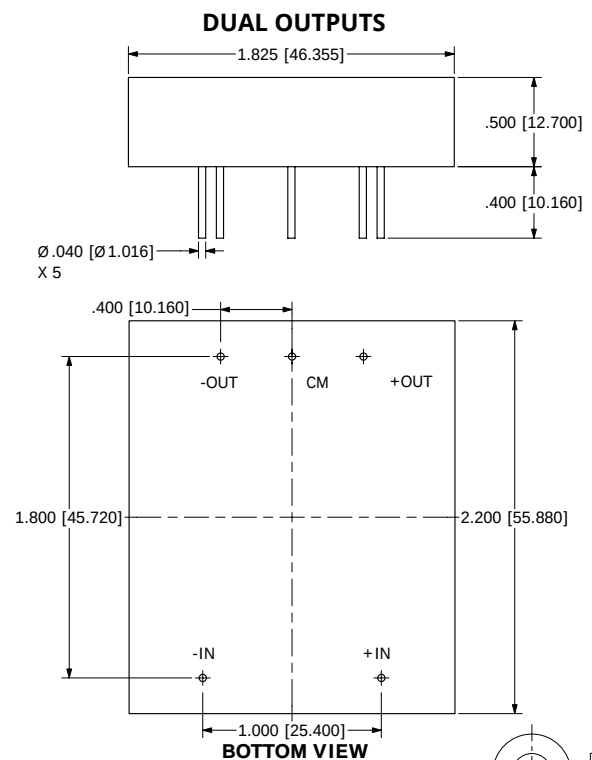
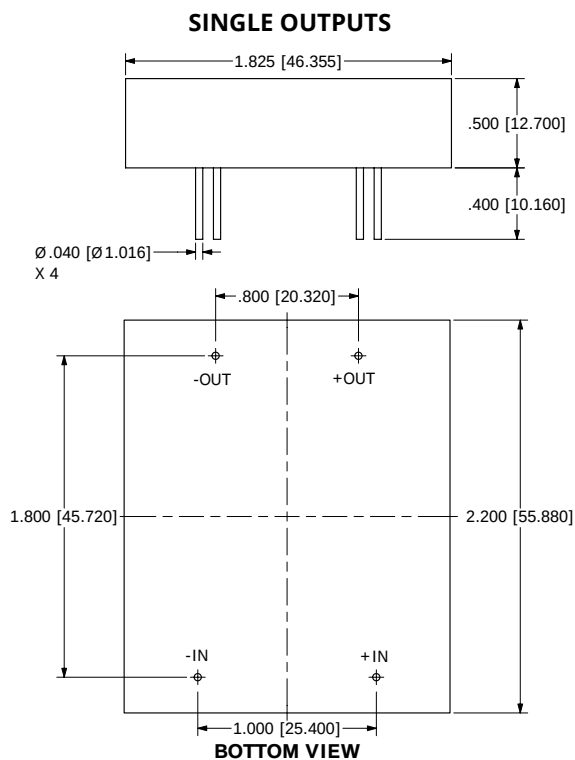
a. ALL DIMENSIONS ARE IN INCHES, [] = MM

MECHANICAL DRAWINGS

HVB MODELS



HVC MODELS



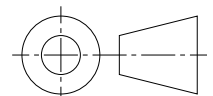
NOTES

a. ALL DIMENSIONS ARE IN INCHES, [] = MM

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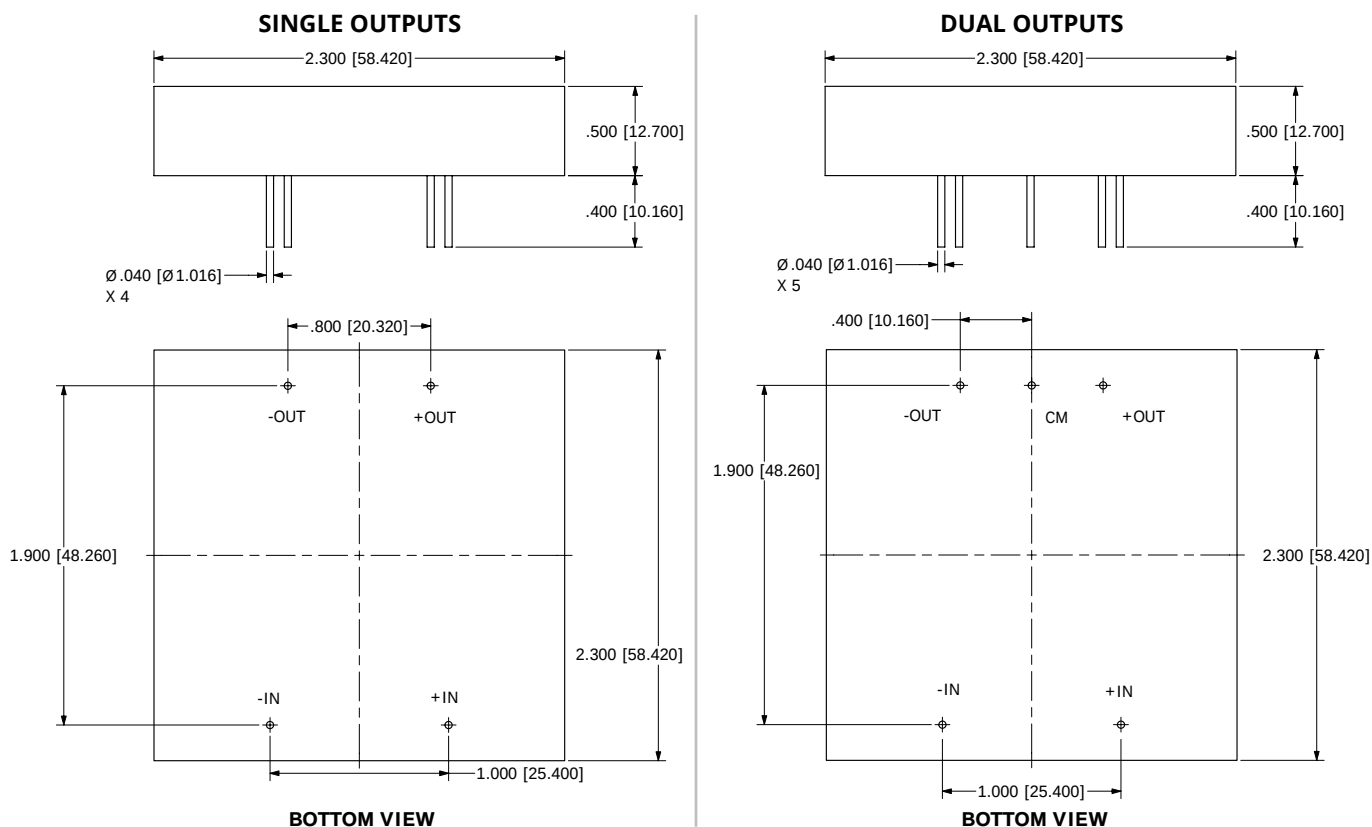
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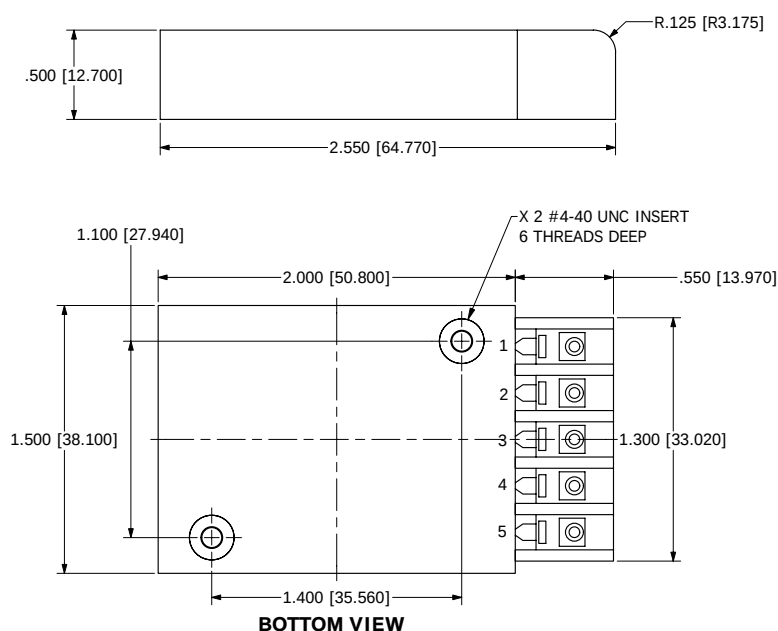


MECHANICAL DRAWINGS

HVD MODELS



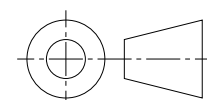
THVA MODELS



PIN	FUNCTION	
	SINGLE	DUAL
1	-IN	
2	+IN	
3	N/C	-OUT
4	-OUT	COM
5		+OUT

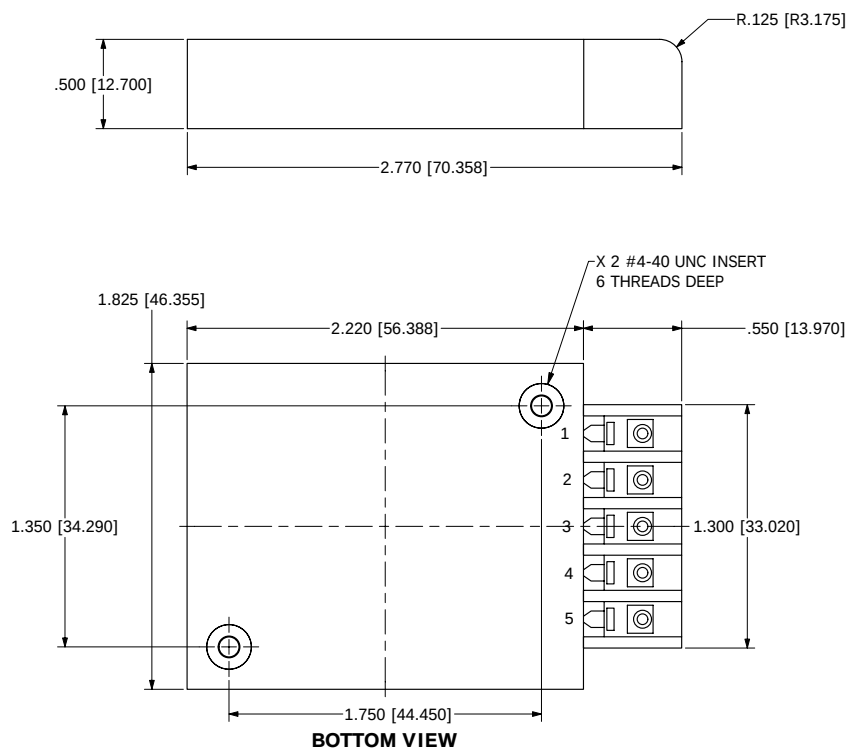
NOTES

- ALL DIMENSIONS ARE IN INCHES, [] = MM
- RECOMMENDED MOUNTING TORQUE: 3-5 IN-LBS



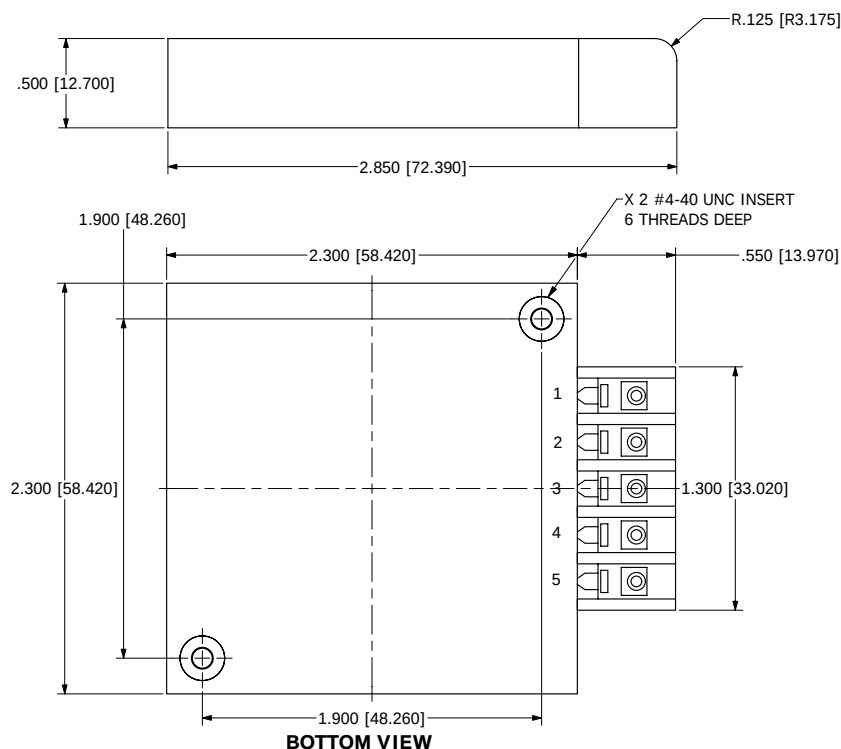
MECHANICAL DRAWINGS

THVC MODELS



PIN	FUNCTION	
	SINGLE	DUAL
1	-IN	
2	+IN	
3	N/C	-OUT
4	-OUT	COM
5		+OUT

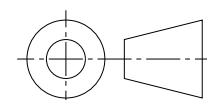
THVD MODELS

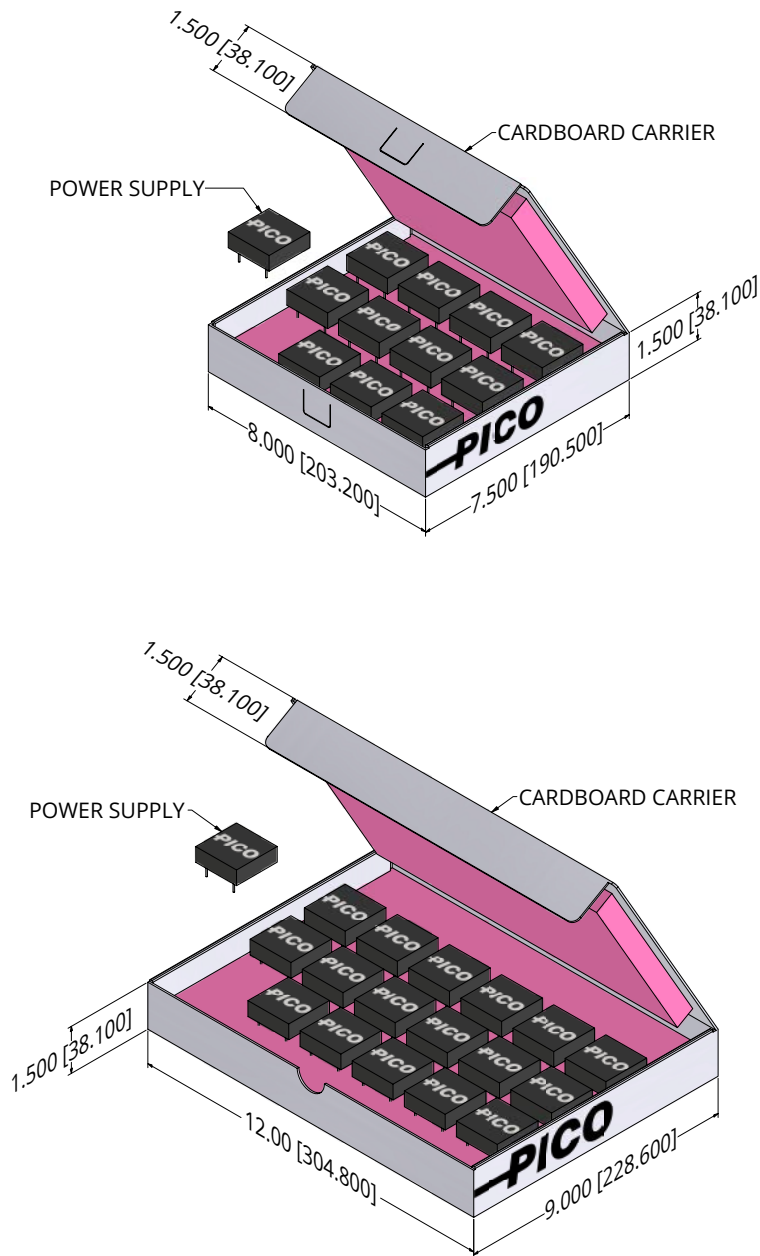


PIN	FUNCTION	
	SINGLE	DUAL
1	-IN	
2	+IN	
3	N/C	-OUT
4	-OUT	COM
5		+OUT

NOTES

- ALL DIMENSIONS ARE IN INCHES, [] = MM
- RECOMMENDED MOUNTING TORQUE: 3-5 IN-LBS





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Series JR

15W Isolated Regulated Low Profile DC-DC Converter

PICO
Electronics, Inc.

PRODUCT OVERVIEW

The JR series is an isolated DC-DC converter with wide input range, tight regulation and six-sided shielded case. These modules have trim and control features. Single and dual isolated output models are standard. They can operate up to 15W over the temperature range of -25°C to +70°C without derating, a heat sink or active cooling.



FEATURES

- Up to 15W output at +70°C ambient
- Low profile – 0.500" height
- Up to 3.33:1 input voltage range
- 3.3 to 100V output models
- Six-sided shielded case
- Control feature
- Trimmable output
- Input/output isolation
- Single and dual isolated output
- No external components required
- No heat sink or derating required

Contact Pico for part number of available options:

- Expanded operating temp: -55°C to +85°C
- Select screening per MIL-STD-883:
 - Stabilization Bake
 - Temperature Cycle
 - Burn-In
- Special Input Voltage, Output Voltage, Isolation Voltage or Output Power

JR	A	28	S
SERIES NAME	INPUT VOLTAGE RANGE	NOM. OUTPUT VOLTAGE	NUMBER OF OUTPUTS
JR	A = 18 to 36V B = 36 to 60V C = 18 to 60V	3.3 = 3.3V 5 = 5V 5.2 = 5.2V 9 = 9V 12 = 12V 15 = 15V 24 = 24V 28 = 28V 48 = 48V 100 = 100V	S = SINGLE D = DUAL

MODEL LIST**SINGLE OUTPUT**

Pico Part Number	Output Voltage [VDC]	Output Current		Efficiency ⁽¹⁾ [%] typ.	Input Current ⁽¹⁾ [%] typ.	Line Regulation ⁽²⁾		Load Regulation ⁽³⁾		Output Ripple @ 1MHz BW [mVp-p]	Output Voltage Tolerance ⁽¹⁾ [±%]
		Min. [mA]	Max. [mA]			Nom.-Min. [-%]	Nom.-Max. [%]	60%-25% [%]	60%-100% [%]		
JRA3.3S	3.3	454.5	4545	78	712	3	3	3	3	100	1
JRA5S	5	300	3000	78	710	1.5	1.5	2	2	50	0.75
JRA5.2S	5.2	288.5	2885	78	710	1.5	1.5	2	2	50	0.75
JRA9S	9	166.7	1667	78	710	0.5	0.5	1.5	1.5	40	0.5
JRA12S	12	125	1250	78	710	0.5	0.5	1	1	40	0.5
JRA15S	15	100	1000	78	710	0.5	0.5	1	1	40	0.5
JRA24S	24	62.5	625	83	670	0.25	0.25	1	1	40	0.5
JRA28S	28	53.6	536	84	660	0.25	0.25	0.5	0.5	40	0.75
JRA48S	48	31.3	313	84	660	0.25	0.25	0.5	0.5	50	0.75
JRA100S	100	15	150	84	660	0.25	0.25	0.75	0.75	75	0.5
JRB3.3S	3.3	454.5	4545	78	401	3	3	3	3	100	1
JRB5S	5	300	3000	78	400	0.75	0.75	2	2	50	0.75
JRB5.2S	5.2	288.5	2885	78	400	0.75	0.75	2	2	50	0.75
JRB9S	9	166.7	1667	78	400	0.5	0.5	1.5	1.5	40	0.5
JRB12S	12	125	1250	80	390	0.5	0.5	1	1	40	0.5
JRB15S	15	100	1000	81	385	0.5	0.5	1	1	40	0.5
JRB24S	24	62.5	625	83	375	0.25	0.25	1	1	40	0.5
JRB28S	28	53.6	536	84	370	0.25	0.25	0.5	0.5	40	0.5
JRB48S	48	31.3	313	84	370	0.25	0.25	0.5	0.5	50	0.5
JRB100S	100	15	150	84	370	0.25	0.25	0.5	0.5	75	0.5
JRC3.3S	3.3	454.5	4545	78	493	3	3	3	3	100	1
JRC5S	5	300	3000	78	495	1.5	1.5	2	2	50	0.75
JRC5.2S	5.2	288.5	2885	78	495	1.5	1.5	2	2	50	0.75
JRC9S	9	166.7	1667	78	495	0.75	0.75	1.5	1.5	40	0.5
JRC12S	12	125	1250	80	480	0.75	0.75	1	1	40	0.5
JRC15S	15	100	1000	81	475	0.75	0.75	1	1	40	0.5
JRC24S	24	62.5	625	83	465	0.5	0.5	1	1	40	0.5
JRC28S	28	53.6	536	84	460	0.5	0.5	0.5	0.5	40	0.5
JRC48S	48	31.3	313	84	460	0.5	0.5	0.5	0.5	50	0.5
JRC100S	100	15	150	84	460	0.5	0.5	0.5	0.5	75	0.5

Note 1: Tested at nominal input voltage and full output load.

Note 2: Line regulation is specified at full output load, nominal to minimum input voltage (-%) and nominal to maximum input voltage (+%).

Note 3: Load regulation is specified at nominal input voltage, 60% to 25% load (+%) and 60% to 100% load (-%).

MODEL LIST**DUAL OUTPUT**

Pico Part Number	Output Voltage Per Output [VDC]	Output Current Per Output		Efficiency ⁽¹⁾ [%] typ.	Input Current ⁽¹⁾ [%] typ.	Line Regulation ⁽²⁾		Load Regulation ⁽³⁾		Output Ripple Per Output @ 1MHz BW [mVp-p]	Output Voltage Tolerance ⁽¹⁾ [±%]
		Min. [mA]	Max. [mA]			Nom.-Min. [-%]	Nom.-Max. [%]	60%-25% [%]	60%-100% [-%]		
JRA5D	5	150	1500	78	710	1.5	1.5	2	2	50	0.75
JRA9D	9	83.3	833	78	710	0.5	0.5	1.5	1.5	40	0.5
JRA12D	12	62.5	625	78	710	0.5	0.5	1	1	40	0.5
JRA15D	15	50	500	78	710	0.5	0.5	1	1	40	0.5
JRA24D	24	31.3	313	83	670	0.25	0.25	1	1	40	0.5
JRA28D	28	26.8	268	84	660	0.25	0.25	0.75	0.75	40	0.75
JRA48D	48	15.6	156	84	660	0.25	0.25	0.75	0.75	50	0.75
JRB5D	5	150	1500	78	400	0.75	0.75	2	2	50	0.75
JRB9D	9	83.3	833	78	400	0.5	0.5	1.5	1.5	40	0.5
JRB12D	12	62.5	625	80	390	0.5	0.5	1	1	40	0.5
JRB15D	15	50	500	81	385	0.5	0.5	1	1	40	0.5
JRB24D	24	31.3	313	83	375	0.25	0.25	1	1	40	0.5
JRB28D	28	26.8	268	84	370	0.25	0.25	0.5	0.5	40	0.5
JRB48D	48	15.6	156	84	370	0.25	0.25	0.5	0.5	50	0.5
JRC5D	5	150	1500	78	495	1.5	1.5	2	2	50	0.75
JRC9D	9	83.3	833	78	495	0.75	0.75	1.5	1.5	40	0.5
JRC12D	12	62.5	625	80	480	0.75	0.75	1	1	40	0.5
JRC15D	15	50	500	81	475	0.75	0.75	1	1	40	0.5
JRC24D	24	31.3	313	83	465	0.5	0.5	1	1	40	0.5
JRC28D	28	26.8	268	84	460	0.5	0.5	0.5	0.5	40	0.5
JRC48D	48	15.6	156	84	460	0.5	0.5	0.5	0.5	50	0.5

Note 1: Tested at nominal input voltage and full output load.

Note 2: Line regulation is specified at full output load, nominal to minimum input voltage (-%) and nominal to maximum input voltage (+%).

Note 3: Load regulation is specified at nominal input voltage, 60% to 25% load (+%) and 60% to 100% load (-%).

Note 4: Dual outputs must be balanced.

SPECIFICATIONS (Nominal V_{IN} , Full Load, $T_A = +25^\circ\text{C}$, 1 hour warm up unless otherwise specified)**INPUT**

Parameter	Condition	Min.	Nom.	Max.	Units
Input Voltage Range	JRA models	18	27	36	VDC
	JRB models	36	48	60	
	JRC models	18	39	60	

SPECIFICATIONS (Nominal V_{IN} , Full Load, $T_A = +25^{\circ}\text{C}$, 1 hour warm up unless otherwise specified)**OUTPUT**

Parameter	Condition	Min.	Typ.	Max.	Units
Output Power	Single output models	1.5	-	15	W
	Dual output models per output	0.75	-	7.5	

ENVIRONMENTAL

Parameter	Condition	Min.	Typ.	Max.	Units
Operating Temperature Range	Ambient without derating	-25	-	+70	$^{\circ}\text{C}$
Storage Temperature Range	Ambient	-55	-	+105	$^{\circ}\text{C}$
Temperature Coefficient		-	-	0.02	$\%/^{\circ}\text{C}$
Cooling	Free Air Convection				

GENERAL

Parameter	Condition	Min.	Typ.	Max.	Units
Isolation Voltage	Input to output	500	-	-	VDC
	OUT1 to OUT2	500	-	-	
Switching Frequency		-	40	-	kHz
Size (L x W x H)		2.3 x 2.2 x 0.5 (58.42 x 55.88 x 12.7)			inches (mm)
Weight		-	115	-	grams
Case	6-Sided Epoxy Insulated Metal				
Potting	Vacuum Impregnated Epoxy				
Box Packaging (W x L x H)	8 x 7.5 x 1.5 (203.2 x 190.5 x 38.1) or 12 x 9 x 1.5 (304.8 x 228.6 x 38.1)				inches (mm)

PROTECTION & FEATURES

Parameter	Condition	Min.	Typ.	Max.	Units
Shortcircuit	Temporary				
Shutdown (C)	Non-latched shutdown, Self-recovery	Shutdown	Connect to -IN		
		Restart	OPEN		
Output Voltage Trim (TRIM)	Trim up only	0	-	5	%

DESIGNED TO MEET

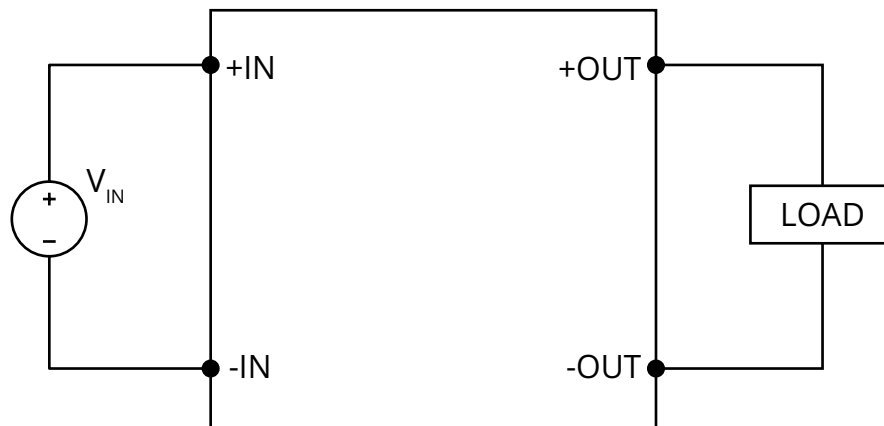
Test	Referenced Standard	Description
Vibration	MIL-STD-202	Method 204, Vibration, High Frequency, Condition D
Shock	MIL-STD-202	Method 213, Shock (Specified Pulse), Condition I
Humidity	MIL-STD-202	Method 106, Moisture Resistance
Altitude	MIL-STD-202	Method 105, Barometric Pressure (Reduced), Condition D

OPTIONS AVAILABLE – CONTACT PICO FOR PART NUMBER

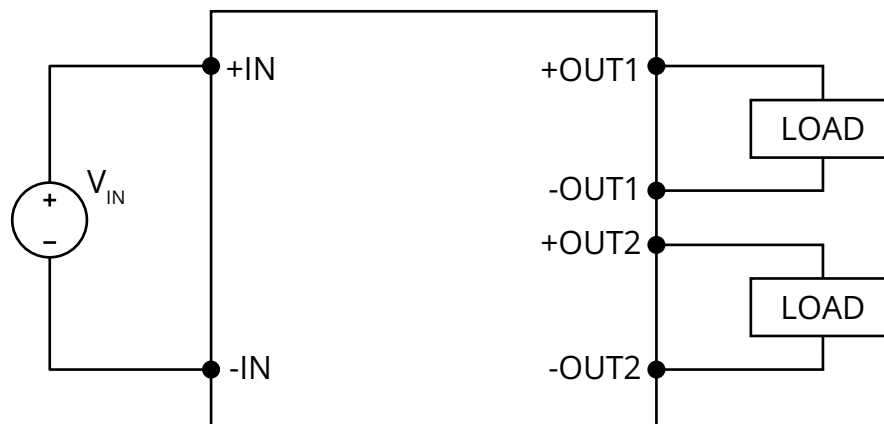
Parameter	Referenced Standard	Description
Stabilization Bake	MIL-STD-883	Referenced Method 1008 Non-operating maximum storage temperature for 24 hours
Temperature Cycle	MIL-STD-883	Referenced Method 1010 Non-operating at temperature extremes, 15 mins/temp, 10 cycles
Burn-In	MIL-STD-883	Referenced Method 1015 Max operating temperature for 160 hours
Expanded Ambient Operating Temperature	-55 $^{\circ}\text{C}$ to +85 $^{\circ}\text{C}$	

TYPICAL CONNECTION CIRCUIT

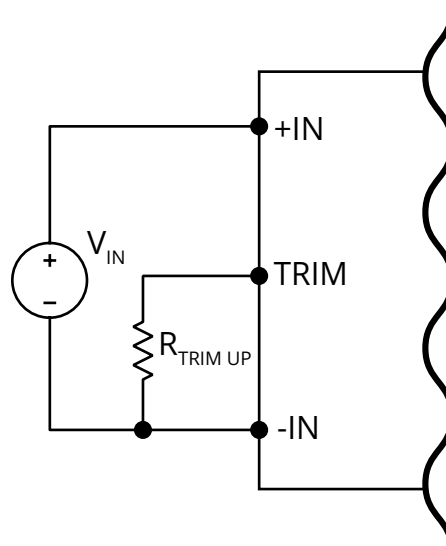
SINGLE OUTPUT



DUAL OUTPUT



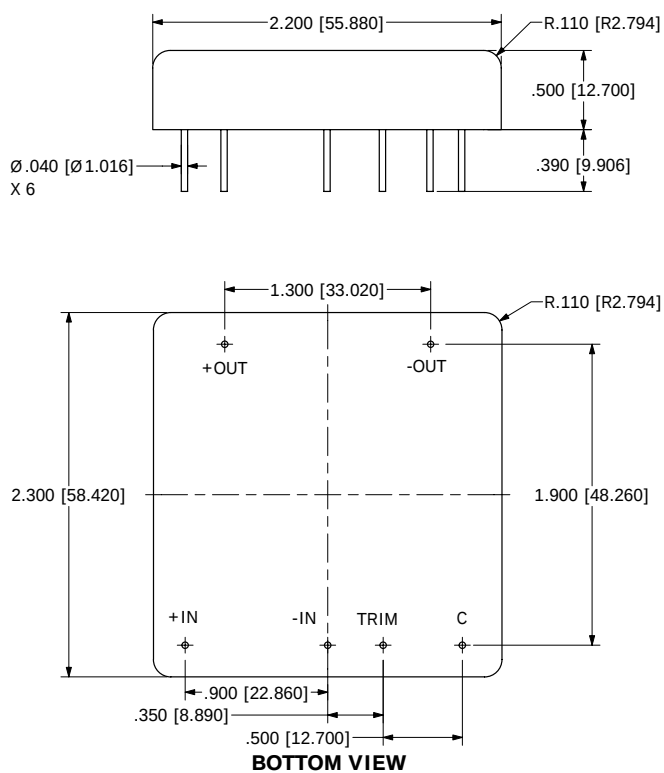
TRIM



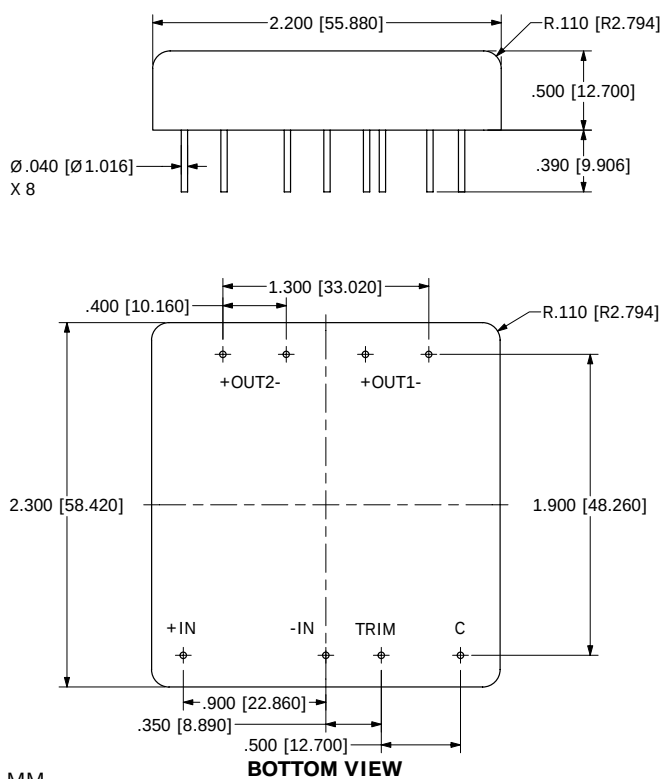
Note: Use 50k Ω , 1/4W trim pot between TRIM and -IN. Reduce resistance to raise output voltage to 5% maximum. Raising the output voltage beyond 5% could cause damage to the module.

MECHANICAL DRAWINGS

SINGLE OUTPUT

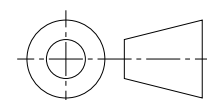


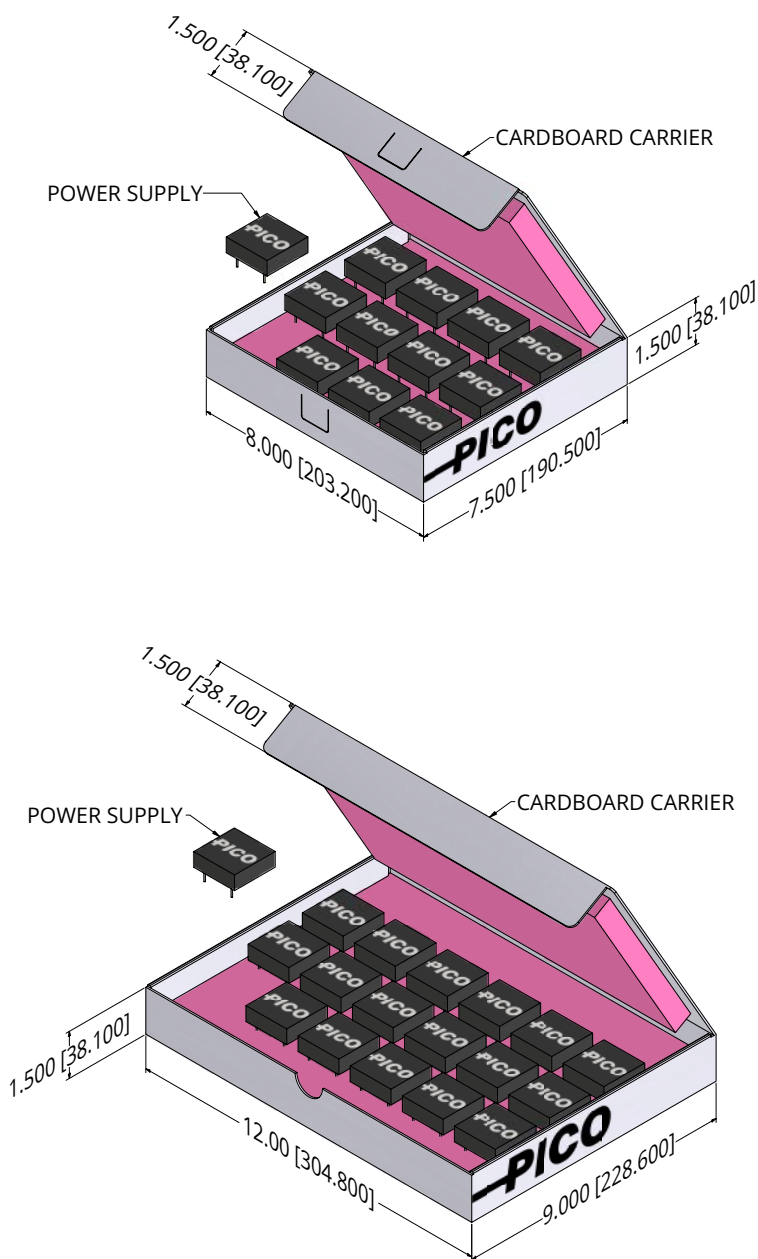
DUAL OUTPUT



NOTES

- a. ALL DIMENSIONS ARE IN INCHES, [] = MM
- b. C IS CONTROL PIN



BOX PACKAGING - BULK

Pico warrants each product manufactured by us and sold by us or an authorized representative, to be free from defects in material and workmanship. If properly used, it will perform within its applicable specifications for a period of one year after original shipment. Pico's obligation under this guarantee is limited to repairing or replacing our product to the original purchaser. This warranty is in lieu of all other warranties, express or implied and constitutes fulfillment of our obligations to the purchaser. We do not guarantee that the products can be used for a particular purpose other than those solely covered by the product's specifications. Pico must be notified if the product must meet particular certifications and/or standards. We assume no liability, in any event, for consequential damages, for anticipated or lost profits, incidental damages or loss of time or other losses incurred by the purchaser or any third party in connection with products covered by this warranty or otherwise. The purchaser will indemnify and hold Pico harmless for any damages, losses, costs, etc. from usage not within the product's specifications. Pico must be consulted before usage of its products in a nuclear, radioactive or space environment.

We reserve the right to discontinue products without notice, We reserve the right to make modifications to any existing catalog products without notice, at any time, without the obligation to modify units previously sold.

Series KR

20W Isolated Regulated Low Profile DC-DC Converter

PICO
Electronics, Inc.

PRODUCT OVERVIEW

The KR series is an isolated DC-DC converter with wide input range, tight regulation and six-sided shielded case. These modules have trim and control features. Single and dual isolated output models are standard. They can operate up to 20W over the temperature range of -25°C to +70°C without derating, a heat sink or active cooling.



FEATURES

- Up to 20W output at +70°C ambient
- Low profile – 0.500" height
- Up to 3.33:1 input voltage range
- 3.3 to 100V output models
- Six-sided shielded case
- Control feature
- Trimmable output
- Input/output isolation
- Single and dual isolated output
- No external components required
- No heat sink or derating required

Contact Pico for part number of available options:

- Expanded operating temp: -55°C to +85°C
- Select screening per MIL-STD-883:
 - Stabilization Bake
 - Temperature Cycle
 - Burn-In
- Special Input Voltage, Output Voltage, Isolation Voltage or Output Power

KR	A	28	S
SERIES NAME	INPUT VOLTAGE RANGE	NOM. OUTPUT VOLTAGE	NUMBER OF OUTPUTS
KR	A = 18 to 36V B = 36 to 60V C = 18 to 60V	3.3 = 3.3V 5 = 5V 5.2 = 5.2V 9 = 9V 12 = 12V 15 = 15V 24 = 24V 28 = 28V 48 = 48V 100 = 100V	S = SINGLE D = DUAL

MODEL LIST**SINGLE OUTPUT**

Pico Part Number	Output Voltage [VDC]	Output Current		Efficiency ⁽¹⁾ [%] typ.	Input Current ⁽¹⁾ [%] typ.	Line Regulation ⁽²⁾		Load Regulation ⁽³⁾		Output Ripple @ 1MHz BW [mVp-p]	Output Voltage Tolerance ⁽¹⁾ [±%]
		Min. [mA]	Max. [mA]			Nom.-Min. [-%]	Nom.-Max. [%]	60%-25% [%]	60%-100% [-%]		
KRA3.3S	3.3	606.1	6061	78	950	2.5	2.5	3	3	60	1
KRA5S	5	400	4000	78	950	1.5	1.5	2.5	2.5	60	0.75
KRA5.2S	5.2	384.6	3846	78	950	1.5	1.5	2.5	2.5	60	0.75
KRA9S	9	222.2	2222	80	925	0.75	0.75	1.25	1.25	60	0.5
KRA12S	12	166.7	1667	78	950	0.5	0.5	1	1	60	0.5
KRA15S	15	133.3	1333	78	950	0.5	0.5	1	1	60	0.5
KRA24S	24	83.3	833	81	915	0.25	0.25	0.5	0.5	60	0.5
KRA28S	28	71.4	714	82	905	0.25	0.25	0.5	0.5	60	0.5
KRA48S	48	41.7	417	83	890	0.25	0.25	0.5	0.5	80	0.5
KRA100S	100	20	200	83	890	0.25	0.25	0.5	0.5	100	0.5
KRB3.3S	3.3	606.1	6061	78	534	2.5	2.5	3	3	60	1
KRB5S	5	400	4000	78	535	1	1	2.5	2.5	60	0.75
KRB5.2AS	5.2	384.6	3846	78	535	1	1	2.5	2.5	60	0.75
KRB9S	9	222.2	2222	80	520	0.5	0.5	1.25	1.25	60	0.5
KRB12S	12	166.7	1667	78	535	0.5	0.5	1	1	60	0.5
KRB15S	15	133.3	1333	78	535	0.5	0.5	1	1	60	0.5
KRB24S	24	83.3	833	81	515	0.25	0.25	0.5	0.5	60	0.5
KRB28S	28	71.4	714	82	510	0.25	0.25	0.5	0.5	60	0.5
KRB48S	48	41.7	417	83	500	0.25	0.25	0.5	0.5	80	0.5
KRB100S	100	20	200	83	500	0.25	0.25	0.5	0.5	100	0.5
KRC3.3S	3.3	606.1	6061	78	657	2.5	2.5	3	3	60	1
KRC5S	5	400	4000	78	660	2	2	2.5	2.5	60	0.75
KRC5.2S	5.2	384.6	3846	78	660	2	2	2.5	2.5	60	0.75
KRC9S	9	222.2	2222	80	640	1	1	1.25	1.25	60	0.5
KRC12S	12	166.7	1667	78	660	0.75	0.75	1	1	60	0.5
KRC15S	15	133.3	1333	78	660	0.75	0.75	1	1	60	0.5
KRC24S	24	83.3	833	81	635	0.5	0.5	0.5	0.5	60	0.5
KRC28S	28	71.4	714	82	625	0.5	0.5	0.5	0.5	60	0.5
KRC48S	48	41.7	417	83	615	0.5	0.5	0.5	0.5	80	0.5
KRC100S	100	20	200	83	615	0.5	0.5	0.5	0.5	100	0.5

Note 1: Tested at nominal input voltage and full output load.

Note 2: Line regulation is specified at full output load, nominal to minimum input voltage (-%) and nominal to maximum input voltage (+%).

Note 3: Load regulation is specified at nominal input voltage, 60% to 25% load (+%) and 60% to 100% load (-%).

MODEL LIST**DUAL OUTPUT**

Pico Part Number	Output Voltage Per Output [VDC]	Output Current Per Output		Efficiency ⁽¹⁾ [%] typ.	Input Current ⁽¹⁾ [%] typ.	Line Regulation ⁽²⁾		Load Regulation ⁽³⁾		Output Ripple Per Output @ 1MHz BW [mVp-p]	Output Voltage Tolerance ⁽¹⁾ [±%]
		Min. [mA]	Max. [mA]			Nom.-Min. [-%]	Nom.-Max. [%]	60%-25% [%]	60%-100% [-%]		
KRA5D	5	200	2000	78	950	1.5	1.5	2.5	2.5	60	0.75
KRA9D	9	111.1	1111	80	925	0.75	0.75	1.25	1.25	60	0.5
KRA12D	12	83.3	833	78	950	0.5	0.5	1	1	60	0.5
KRA15D	15	66.7	667	78	950	0.5	0.5	1	1	60	0.5
KRA24D	24	41.7	417	81	915	0.25	0.25	0.5	0.5	60	0.5
KRA28D	28	35.7	357	82	905	0.25	0.25	0.5	0.5	60	0.5
KRA48D	48	20.8	208	83	890	0.25	0.25	0.5	0.5	80	0.5
KRB5D	5	200	2000	78	535	1	1	2.5	2.5	60	0.75
KRB9D	9	111.1	1111	80	520	0.5	0.5	1.25	1.25	60	0.5
KRB12D	12	83.3	833	78	535	0.5	0.5	1	1	60	0.5
KRB15D	15	66.7	667	78	535	0.5	0.5	1	1	60	0.5
KRB24D	24	41.7	417	81	515	0.25	0.25	0.5	0.5	60	0.5
KRB28D	28	35.7	357	82	510	0.25	0.25	0.5	0.5	60	0.5
KRB48D	48	20.8	208	83	500	0.25	0.25	0.5	0.5	80	0.5
KRC5D	5	200	2000	78	660	2	2	2.5	2.5	60	0.75
KRC9D	9	111.1	1111	80	640	1	1	1.25	1.25	60	0.5
KRC12D	12	83.3	833	78	660	0.75	0.75	1	1	60	0.5
KRC15D	15	66.7	667	78	660	0.75	0.75	1	1	60	0.5
KRC24D	24	41.7	417	81	635	0.5	0.5	0.5	0.5	60	0.5
KRC28D	28	35.7	357	82	625	0.5	0.5	0.5	0.5	60	0.5
KRC48D	48	20.8	208	83	615	0.5	0.5	0.5	0.5	80	0.5

Note 1: Tested at nominal input voltage and full output load.

Note 2: Line regulation is specified at full output load, nominal to minimum input voltage (-%) and nominal to maximum input voltage (+%).

Note 3: Load regulation is specified at nominal input voltage, 60% to 25% load (+%) and 60% to 100% load (-%).

Note 4: Dual outputs must be balanced.

SPECIFICATIONS (Nominal V_{IN} , Full Load, $T_A = +25^\circ\text{C}$, 1 hour warm up unless otherwise specified)**INPUT**

Parameter	Condition	Min.	Nom.	Max.	Units
Input Voltage Range	KRA models	18	27	36	VDC
	KRB models	36	48	60	
	KRC models	18	39	60	

SPECIFICATIONS (Nominal V_{IN} , Full Load, $T_A = +25^{\circ}\text{C}$, 1 hour warm up unless otherwise specified)**OUTPUT**

Parameter	Condition	Min.	Nom.	Max.	Units
Output Power	Single output models	2	-	20	W
	Dual output models per output	1	-	10	

ENVIRONMENTAL

Parameter	Condition	Min.	Typ.	Max.	Units
Operating Temperature Range	Ambient without derating	-25	-	+70	$^{\circ}\text{C}$
Storage Temperature Range	Ambient	-55	-	+105	$^{\circ}\text{C}$
Temperature Coefficient		-	-	0.02	$\%/^{\circ}\text{C}$
Cooling	Free Air Convection				

GENERAL

Parameter	Condition	Min.	Typ.	Max.	Units
Isolation Voltage	Input to output	500	-	-	VDC
	OUT1 to OUT2	500	-	-	
Switching Frequency		-	40	-	kHz
Size (L x W x H)		2.8 x 2.6 x 0.5 (71.12 x 66.04 x 12.7)			inches (mm)
Weight		-	165	-	grams
Case	6-Sided Epoxy Insulated Metal				
Potting	Vacuum Impregnated Epoxy				
Box Packaging (W x L x H)	8 x 7.5 x 1.5 (203.2 x 190.5 x 38.1) or 12 x 9 x 1.5 (304.8 x 228.6 x 38.1)				inches (mm)

PROTECTION & FEATURES

Parameter	Condition	Min.	Typ.	Max.	Units
Shortcircuit	Temporary				
Shutdown (C)	Non-latched shutdown, Self-recovery	Shutdown	Connect to -IN		
		Restart	OPEN		
Output Voltage Trim (TRIM)	Trim up only	0	-	5	%

DESIGNED TO MEET

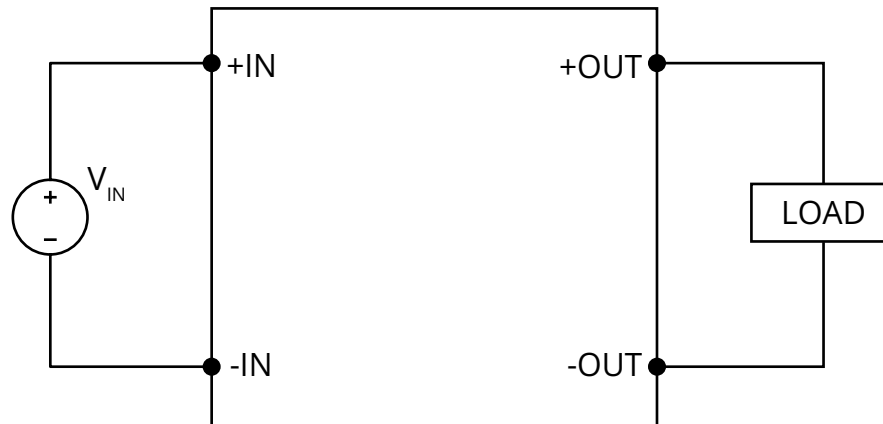
Test	Referenced Standard	Description
Vibration	MIL-STD-202	Method 204, Vibration, High Frequency, Condition D
Shock	MIL-STD-202	Method 213, Shock (Specified Pulse), Condition I
Humidity	MIL-STD-202	Method 106, Moisture Resistance
Altitude	MIL-STD-202	Method 105, Barometric Pressure (Reduced), Condition D

OPTIONS AVAILABLE – CONTACT PICO FOR PART NUMBER

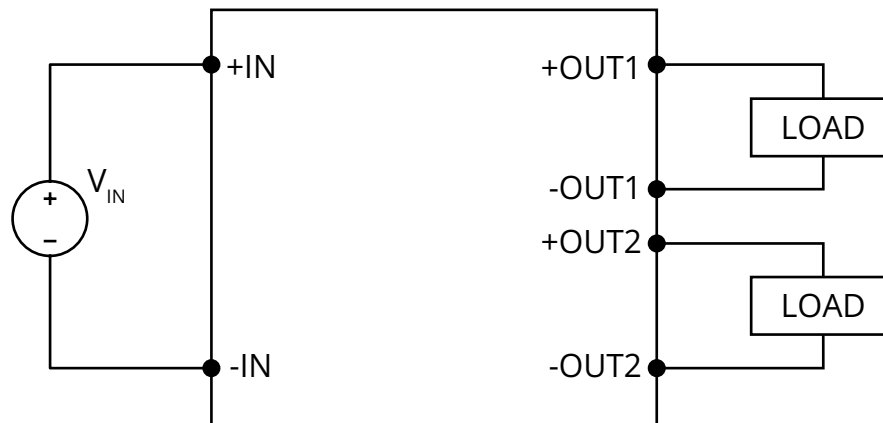
Parameter	Referenced Standard	Description
Stabilization Bake	MIL-STD-883	Referenced Method 1008 Non-operating maximum storage temperature for 24 hours
Temperature Cycle	MIL-STD-883	Referenced Method 1010 Non-operating at temperature extremes, 15 mins/temp, 10 cycles
Burn-In	MIL-STD-883	Referenced Method 1015 Max operating temperature for 160 hours
Expanded Ambient Operating Temperature	-55 $^{\circ}\text{C}$ to +85 $^{\circ}\text{C}$	

TYPICAL CONNECTION CIRCUIT

SINGLE OUTPUT

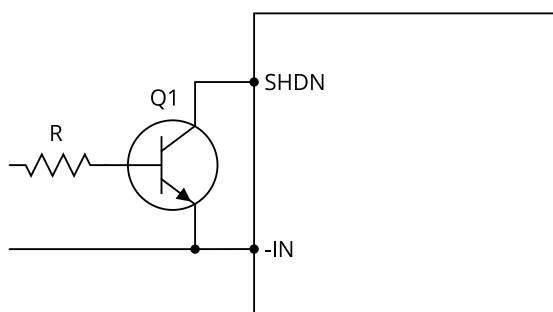


DUAL OUTPUT

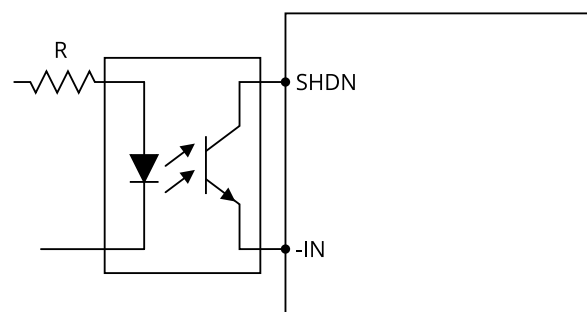


SHUTDOWN

NON-ISOLATED

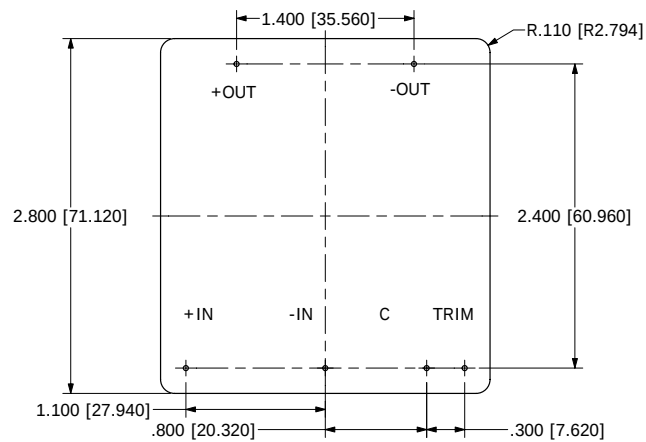
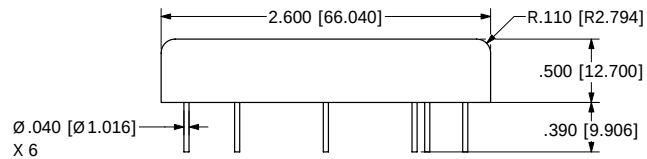


ISOLATED



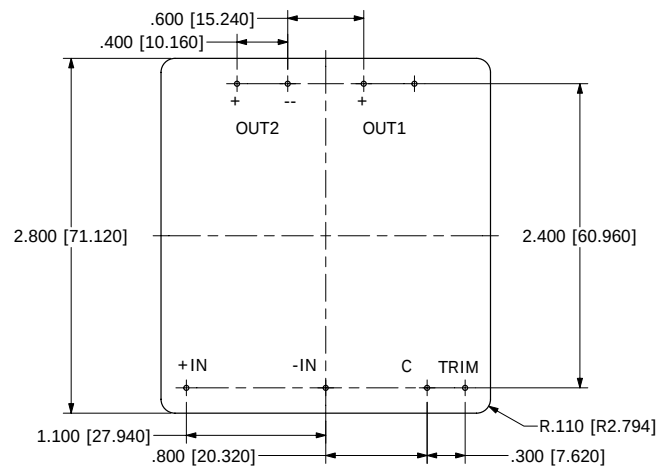
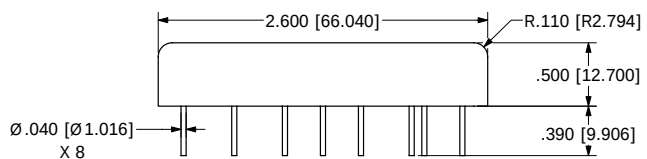
Please note: During shutdown mode, 475V input and no load condition, the output voltage may increase up to 5% of nominal output voltage. Shutdown is enabled when SHDN pin is pulled low ($<1V$) relative to $-IN$. OPEN will automatically restart the module. When floating, the maximum voltage of SHDN is limited to 22VDC.

SINGLE OUTPUT



BOTTOM VIEW

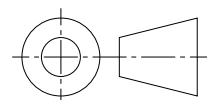
DUAL OUTPUT

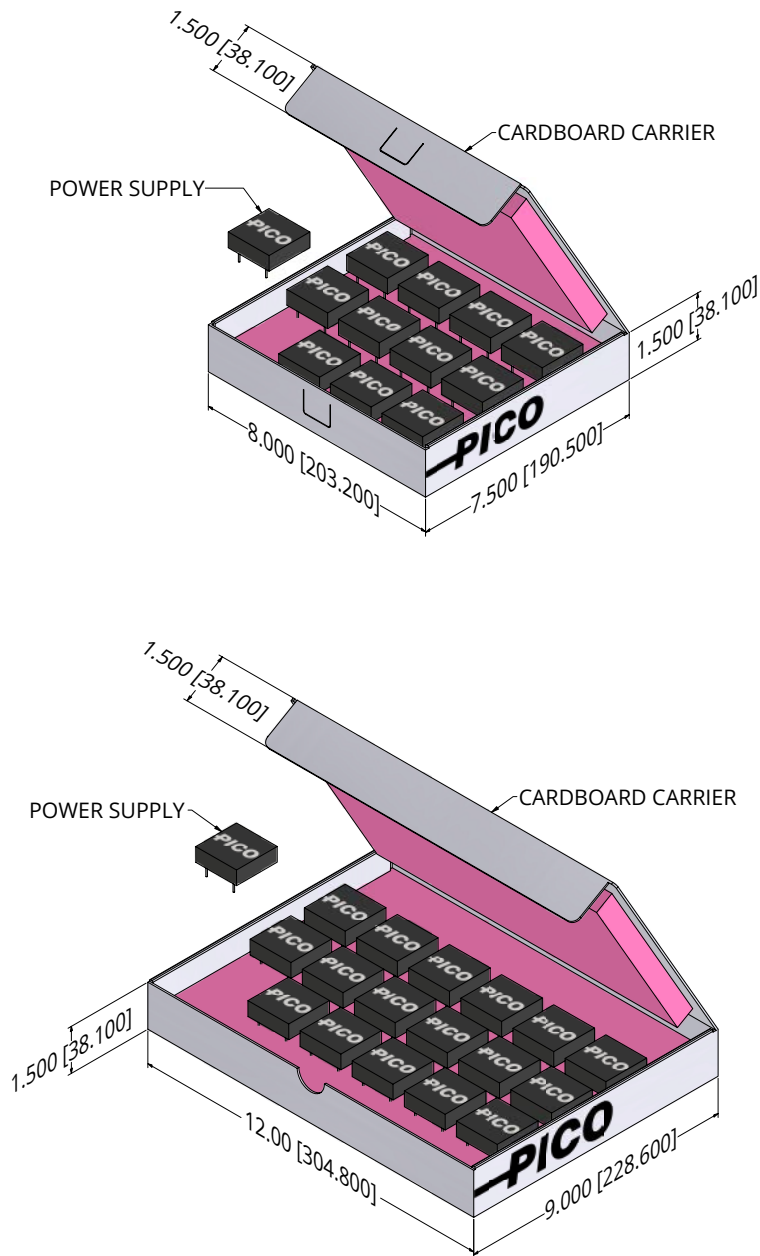


BOTTOM VIEW

a. ALL DIMENSIONS ARE IN INCHES, [] = MM
b. C IS CONTROL PIN

b. C IS CONTROL PIN





Pico warrants each product manufactured by us and sold by us or an authorized representative, to be free from defects in material and workmanship. If properly used, it will perform within its applicable specifications for a period of one year after original shipment. Pico's obligation under this guarantee is limited to repairing or replacing our product to the original purchaser. This warranty is in lieu of all other warranties, express or implied and constitutes fulfillment of our obligations to the purchaser. We do not guarantee that the products can be used for a particular purpose other than those solely covered by the product's specifications. Pico must be notified if the product must meet particular certifications and/or standards. We assume no liability, in any event, for consequential damages, for anticipated or lost profits, incidental damages or loss of time or other losses incurred by the purchaser or any third party in connection with products covered by this warranty or otherwise. The purchaser will indemnify and hold Pico harmless for any damages, losses, costs, etc. from usage not within the product's specifications. Pico must be consulted before usage of its products in a nuclear, radioactive or space environment.

We reserve the right to discontinue products without notice, We reserve the right to make modifications to any existing catalog products without notice, at any time, without the obligation to modify units previously sold.

Series NR

30W Isolated Regulated Low Profile DC-DC Converter



PRODUCT OVERVIEW

The NR series is an isolated DC-DC converter with wide input range, tight regulation and six-sided shielded case. Single, dual and triple output models are standard. They can operate up to 30W over the temperature range of -25°C to +70°C without derating, a heat sink or active cooling.

There are threaded inserts on the bottom to mount securely for high vibration and shock applications.



FEATURES

- Up to 30W output at +70°C ambient
 - Low profile – 0.500" height
 - Up to 3:1 input voltage range
 - 3.3 to 28V output models
 - Six-sided shielded case
 - Input/output isolation
 - Single, dual and triple output
 - No external components required
 - No heat sink or derating required
- Contact Pico for part number of available options:

 - Expanded operating temp: -55°C to +85°C
 - Select screening per MIL-STD-883:
 - Stabilization Bake
 - Temperature Cycle
 - Burn-In
 - Special Input Voltage, Output Voltage, Isolation Voltage or Output Power

NR	A	5	T	12
SERIES NAME	INPUT VOLTAGE RANGE	MAIN OUTPUT VOLTAGE	NUMBER OF OUTPUTS	AUX. OUTPUT VOLTAGE (TRIPLE OUTPUT)
NR	F = 10 to 30V A = 18 to 36V B = 36 to 60V	3.3 = 3.3V 5 = 5V 5.2 = 5.2V 9 = 9V 12 = 12V 15 = 15V 24 = 24V 28 = 28V	S = SINGLE D = DUAL T = TRIPLE	5 = ±5V 12 = ±12V 15 = ±15V

MODEL LIST**SINGLE OUTPUT**

Pico Part Number	Output Voltage [VDC]	Output Current		Output Power [W]	Efficiency ⁽¹⁾ [%] typ.	Input Current ⁽¹⁾ [%] typ.	Line Regulation [±%]	Load Regulation 10-100% [±%]
		Min. [mA]	Max. [mA]					
NRF3.3S	3.3	454.5	4545	15	76	987	0.5	0.5
NRF5S	5	400	4000	20	78	1068	0.2	0.3
NRF5.2S	5.2	384.6	3846	20	78	1068	0.2	0.3
NRF9S	9	277.7	2777	25	80	1302	0.2	0.2
NRF12S	12	208.3	2083	25	81	1286	0.2	0.2
NRF15S	15	166.6	1666	25	83	1255	0.2	0.2
NRF24S	24	104.2	1042	25	84	1240	0.2	0.2
NRF28S	28	89.3	893	25	85	1225	0.2	0.2
NRA3.3S	3.3	454.5	4545	15	76	731	0.5	0.5
NRA5S	5	400	4000	20	78	950	0.2	0.3
NRA5.2S	5.2	384.6	3846	20	78	950	0.2	0.3
NRA9S	9	277.7	2777	25	80	1155	0.2	0.2
NRA12S	12	208.3	2083	25	81	1145	0.2	0.2
NRA15S	15	166.6	1666	25	83	1115	0.2	0.2
NRA24S	24	104.2	1042	25	84	1100	0.2	0.2
NRA28S	28	89.3	893	25	85	1090	0.2	0.2
NRB3.3S	3.3	606.1	6061	20	76	487	0.5	0.5
NRB5S	5	440	4400	22	78	520	0.2	0.3
NRB5.2S	5.2	423	4230	22	78	520	0.2	0.3
NRB9S	9	277.7	2777	25	83	560	0.2	0.2
NRB12S	12	208.3	2083	25	83	560	0.2	0.3
NRB15S	15	200	2000	30	85	655	0.2	0.3
NRB24S	24	125	1250	30	86	645	0.2	0.3
NRB28S	28	107.1	1071	30	87	640	0.2	0.3

DUAL OUTPUT

Pico Part Number	Output Voltage [±VDC]	Output Current		Output Power [±W]	Efficiency ⁽¹⁾ [%] typ.	Input Current ⁽¹⁾ [%] typ.	Line Regulation [±%]	Load Regulation 10-100% [±%]
		Min. [±mA]	Max. [±mA]					
NRF5D	5	200	2000	10	78	1068	0.2	0.3
NRF9D	9	139	1390	12.5	80	1302	0.2	0.2
NRF12D	12	104.2	1042	12.5	81	1286	0.2	0.2
NRF15D	15	83.3	833	12.5	83	1255	0.2	0.2
NRA5D	5	200	2000	10	78	950	0.2	0.3
NRA9D	9	139	1390	12.5	80	1155	0.2	0.2
NRA12D	12	104.2	1042	12.5	81	1145	0.2	0.2
NRA15D	15	83.3	833	12.5	83	1115	0.2	0.2
NRB5D	5	220	2200	11	78	520	0.2	0.2
NRB9D	9	139	1390	12.5	80	580	0.2	0.2
NRB12D	12	104.2	1042	12.5	82	565	0.2	0.2
NRB15D	15	83.3	833	12.5	84	550	0.2	0.2

Note 1: Tested at nominal input voltage and full output load.

Note 2: Dual output loads must be balanced.

MODEL LIST**TRIPLE OUTPUT**

Pico Part Number	Output Voltage [VDC]	Main Output Output Current		Output Power [W]	Output Voltage [±VDC]	Auxiliary Output Output Current		Output Power [±W]	Efficiency ⁽¹⁾ [%] typ.	Input Current ⁽¹⁾ [%] typ.
		Min. [mA]	Max. [mA]			Min. [±mA]	Max. [±mA]			
NRA5T12	5	300	3000	15	12	20.8	208	2.5	78	950
NRA5T15	5	300	3000	15	15	16.7	167	2.5	78	950
NRA9T5	9	222	2220	20	5	50	500	2.5	80	1155
NRA9T12	9	222	2220	20	12	20.8	208	2.5	80	1155
NRA9T15	9	222	2220	20	15	16.7	167	2.5	80	1155
NRA12T5	12	166	1660	20	5	50	500	2.5	81	1145
NRA12T15	12	166	1660	20	15	16.7	167	2.5	81	1145
NRA15T5	15	133	1330	20	5	50	500	2.5	83	1115
NRA15T12	15	133	1330	20	12	20.8	208	2.5	83	1115
NRA24T5	24	83	830	20	5	50	500	2.5	84	1100
NRA24T12	24	83	830	20	12	20.8	208	2.5	84	1100
NRA24T15	24	83	830	20	15	16.7	167	2.5	84	1100
NRA28T5	28	71.4	714	20	5	50	500	2.5	85	1090
NRA28T12	28	71.4	714	20	12	20.8	208	2.5	85	1090
NRA28T15	28	71.4	714	20	15	16.7	167	2.5	85	1090
NRB5T12	5	340	3400	17	12	20.8	208	2.5	78	520
NRB5T15	5	340	3400	17	15	16.7	167	2.5	78	520
NRB9T5	9	222	2220	20	5	50	500	2.5	80	580
NRB9T12	9	222	2220	20	12	20.8	208	2.5	80	580
NRB9T15	9	222	2220	20	15	16.7	167	2.5	80	580
NRB12T5	12	166	1660	20	5	50	500	2.5	84	550
NRB12T15	12	166	1660	20	15	16.7	167	2.5	84	550
NRB15T5	15	166.7	1667	25	5	50	500	2.5	85	655
NRB15T12	15	166.7	1667	25	12	20.8	208	2.5	85	655
NRB24T5	24	104.2	1042	25	5	50	500	2.5	86	645
NRB24T12	24	104.2	1042	25	12	20.8	208	2.5	86	645
NRB24T15	24	104.2	1042	25	15	16.7	167	2.5	86	645
NRB28T5	28	89.3	893	25	5	50	500	2.5	87	640
NRB28T12	28	89.3	893	25	12	20.8	208	2.5	87	640
NRB28T15	28	89.3	893	25	15	16.7	167	2.5	87	640

Note 1: Tested at nominal input voltage and full output load.

Note 2: Auxiliary outputs must be balanced.

SPECIFICATIONS (Nominal V_{IN} , Full Load, $T_A = +25^{\circ}\text{C}$, 1 hour warm up unless otherwise specified)**INPUT**

Parameter	Condition	Min.	Typ.	Max.	Units
Input Voltage Range	NRF models	10	15	30	VDC
	NRA models	18	27	36	
	NRB models	36	48	72	

OUTPUT

Parameter	Condition		Min.	Typ.	Max.	Units
Output Voltage Tolerance	Nominal V _{IN} , Full Load	Triple Main output	-	-	0.5	±%
		Triple Aux output	-	-	4	
		All other models	-	-	0.5	
Load Regulation	Triple output models, 25-100% load	Main output	-	-	0.2	±%
		Aux output	-	-	5	
		All other models		See model list		
Output Ripple	1MHz bandwidth		-	-	50	mVp-p

ENVIRONMENTAL

Parameter	Condition	Min.	Typ.	Max.	Units
Operating Temperature Range	Ambient without derating	-25	-	+70	°C
Storage Temperature Range	Ambient	-55	-	+125	°C
Temperature Coefficient		-	-	0.01	%/°C
Cooling	Free Air Convection				

GENERAL

Parameter	Condition	Min.	Typ.	Max.	Units
Isolation Voltage	All models - Input to output	500	-	-	VDC
	Dual output models - OUT1 to OUT2	500	-	-	
	Triple output models - Main to auxiliary	500	-	-	
Insulation Resistance		100	-	-	MΩ
Switching Frequency		-	30	-	kHz
Size (L x W x H)		2.8 x 2.6 x 0.5 (71.12 x 66.04 x 12.7)			inches (mm)
Weight		-	175	-	grams
Case	6-Sided Epoxy Insulated Metal				
Potting	Vacuum Impregnated Epoxy				
Box Packaging (W x L x H)	8 x 7.5 x 1.5 (203.2 x 190.5 x 38.1) or 12 x 9 x 1.5 (304.8 x 228.6 x 38.1)				inches (mm)

PROTECTION & FEATURES

Parameter	Condition	Min.	Typ.	Max.	Units
Short circuit	Continuous				

SPECIFICATIONS (Nominal V_{IN} , Full Load, $T_A = +25^{\circ}\text{C}$, 1 hour warm up unless otherwise specified)

DESIGNED TO MEET

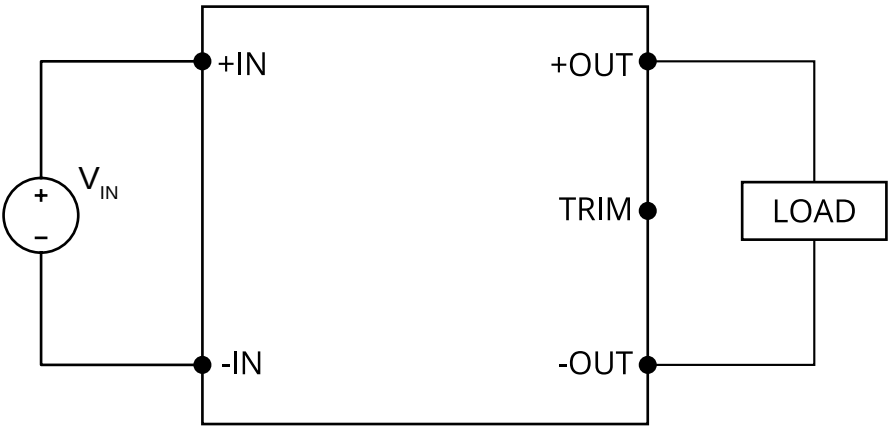
Test	Referenced Standard	Description
Vibration	MIL-STD-202	Method 204, Vibration, High Frequency, Condition D
Shock	MIL-STD-202	Method 213, Shock (Specified Pulse), Condition I
Humidity	MIL-STD-202	Method 106, Moisture Resistance
Altitude	MIL-STD-202	Method 105, Barometric Pressure (Reduced), Condition D

OPTIONS AVAILABLE – CONTACT PICO FOR PART NUMBER

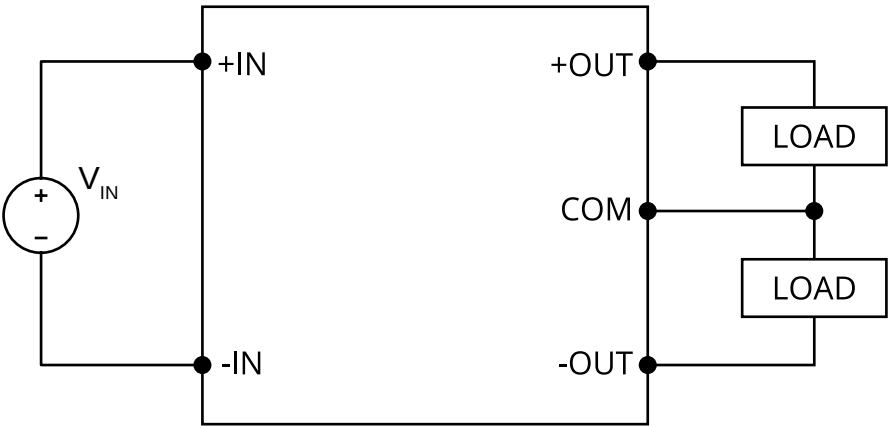
Parameter	Referenced Standard	Description
Stabilization Bake	MIL-STD-883	Referenced Method 1008 Non-operating maximum storage temperature for 24 hours
Temperature Cycle	MIL-STD-883	Referenced Method 1010 Non-operating at temperature extremes, 15 mins/temp, 10 cycles
Burn-In	MIL-STD-883	Referenced Method 1015 Max operating temperature for 160 hours
Expanded Ambient Operating Temperature		-55°C to +85°C

TYPICAL CONNECTION CIRCUIT

SINGLE OUTPUT

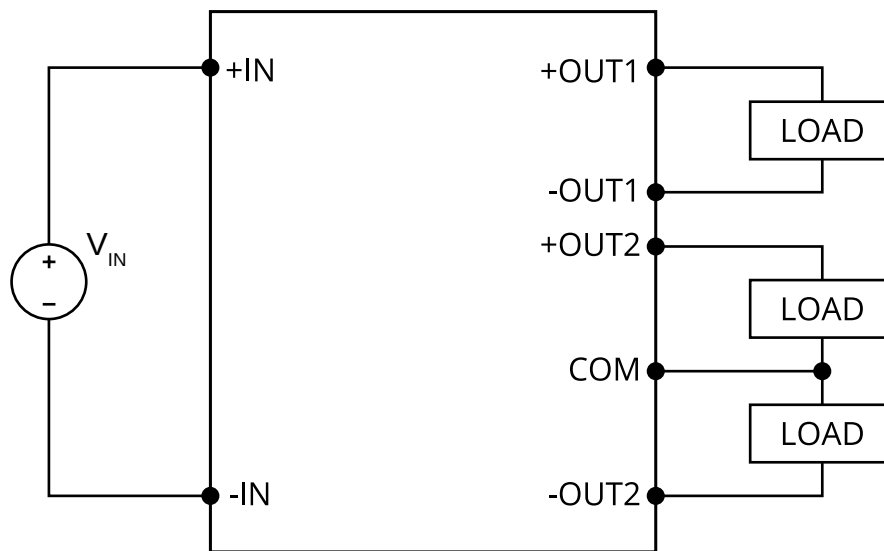


DUAL OUTPUT



TYPICAL CONNECTION CIRCUIT

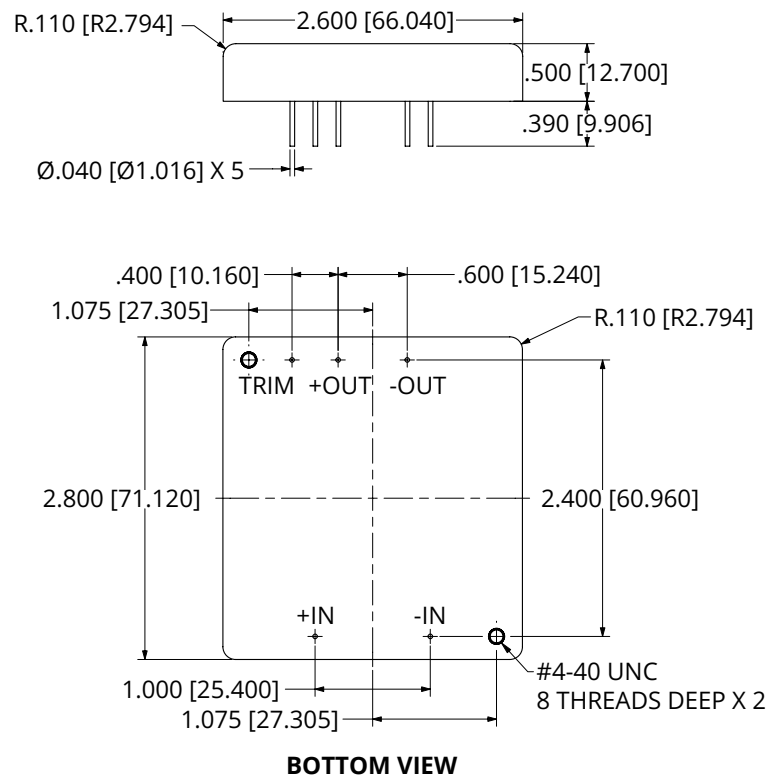
TRIPLE OUTPUT



Note: Main outputs are +OUT1 & -OUT2. Auxiliary outputs are +OUT2, COM & -OUT2.

MECHANICAL DRAWINGS

SINGLE OUTPUT



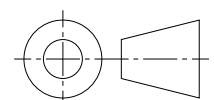
NOTES

a. ALL DIMENSIONS ARE IN INCHES, [] = MM

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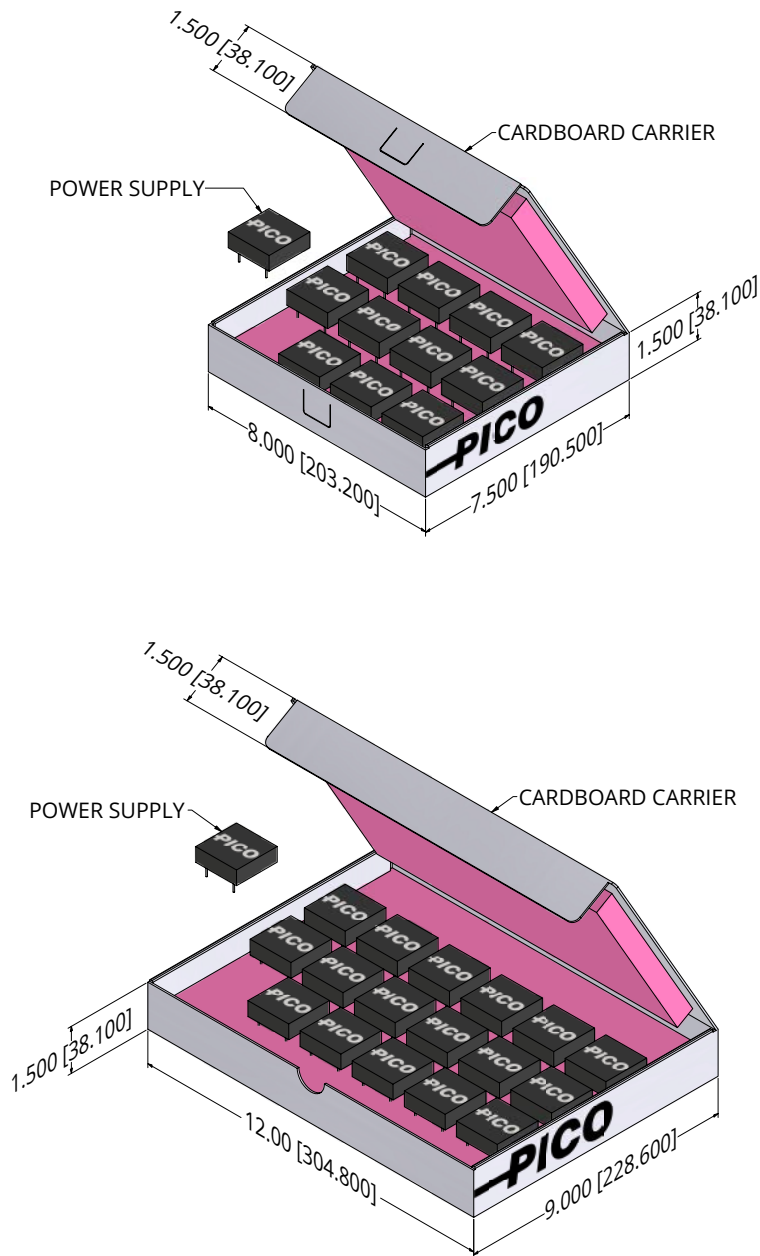
DUAL OUTPUT



TRIPLE OUTPUT



Note: Main outputs are +OUT1 & -OUT2. Auxiliary outputs are +OUT2, COM & -OUT2.



Pico warrants each product manufactured by us and sold by us or an authorized representative, to be free from defects in material and workmanship. If properly used, it will perform within its applicable specifications for a period of one year after original shipment. Pico's obligation under this guarantee is limited to repairing or replacing our product to the original purchaser. This warranty is in lieu of all other warranties, express or implied and constitutes fulfillment of our obligations to the purchaser. We do not guarantee that the products can be used for a particular purpose other than those solely covered by the product's specifications. Pico must be notified if the product must meet particular certifications and/or standards. We assume no liability, in any event, for consequential damages, for anticipated or lost profits, incidental damages or loss of time or other losses incurred by the purchaser or any third party in connection with products covered by this warranty or otherwise. The purchaser will indemnify and hold Pico harmless for any damages, losses, costs, etc. from usage not within the product's specifications. Pico must be consulted before usage of its products in a nuclear, radioactive or space environment.

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Series AVR

1W Isolated Regulated High Voltage DC-DC Converter



PRODUCT OVERVIEW

The AVR series modules are miniature isolated DC-DC converters and are fully regulated from no to full load. These modules have shutdown feature, low ripple and are protected against input overvoltage, output short-circuit, overtemperature and over current. They can operate over the temperature range of -25°C to +70°C without derating, a heat sink or active cooling.

These modules are suitable for applications such as electron beam deflection or focussing, photomultiplier tubes or piezo transducers.



FEATURES

- 1W output power
- At least $\pm 10\%$ input voltage range
- Up to 1000V output models
- Protected against input overvoltage, output short-circuit, overtemperature, and over current
- Input/output isolation
- No minimum load
- Shutdown feature
- Low ripple
- Low profile - 0.500"

Contact Pico for part number of available options:

- Expanded operating temp: -55°C to +85°C
- Select screening per MIL-STD-883:
 - Stabilization Bake
 - Temperature Cycle
 - Burn-In
- Special Input Voltage, Output Voltage, Isolation Voltage or Output Power

24	AVR	500
INPUT VOLTAGE RANGE	SERIES NAME	NOMINAL OUTPUT VOLTAGE
5 = 4.5 - 5.5V	AVR	100 = 100V
12 = 10.5 - 13.5V		200 = 200V
24 = 21 - 27V		300 = 300V
28 = 25 - 32V		400 = 400V
		500 = 500V
		600 = 600V
		700 = 700V
		800 = 800V
		900 = 900V
		1000 = 1000V

MODEL LIST

Pico Part Number	Input Voltage	Output Voltage [VDC]	Output Current		Efficiency		Input Current ⁽¹⁾ [mA] typ.
			Min. [mA]	Max. [mA]	Low Line [%] typ.	High Line [%] typ.	
5AVR100	5	100	0	10	58	46	410
5AVR200		200		5			
5AVR300		300		3.333			
5AVR400		400		2.5			
5AVR500		500		2			
5AVR600		600		1.667			
5AVR700		700		1.429			
5AVR800		800		1.25			
5AVR900		900		1.111			
5AVR1000		1000		1			
12AVR100	12	100	0	10	63	49	165
12AVR200		200		5			
12AVR300		300		3.333			
12AVR400		400		2.5			
12AVR500		500		2			
12AVR600		600		1.667			
12AVR700		700		1.429			
12AVR800		800		1.25			
12AVR900		900		1.111			
12AVR1000		1000		1			
24AVR100	24	100	0	10	65	50	80
24AVR200		200		5			
24AVR300		300		3.333			
24AVR400		400		2.5			
24AVR500		500		2			
24AVR600		600		1.667			
24AVR700		700		1.429			
24AVR800		800		1.25			
24AVR900		900		1.111			
24AVR1000		1000		1			
28AVR100	28	100	0	10	65	50	65
28AVR200		200		5			
28AVR300		300		3.333			
28AVR400		400		2.5			
28AVR500		500		2			
28AVR600		600		1.667			
28AVR700		700		1.429			
28AVR800		800		1.25			
28AVR900		900		1.111			
28AVR1000		1000		1			

Note 1: Tested at full output load.

SPECIFICATIONS (Nominal V_{IN} , Full Load, $T_A = +25^\circ\text{C}$, 1 hour warm up unless otherwise specified)**INPUT**

Parameter	Condition	Min.	Typ.	Max.	Units
Input Voltage Range	5AVR models	4.5	5	5.5	VDC
	12AVR models	10.5	12	13.5	
	24AVR models	21	24	27	
	28AVR models	25	28	32	

OUTPUT

Parameter	Condition	Min.	Typ.	Max.	Units
Line Regulation		-	-	0.1	%
Load Regulation	0-100% load	-	-	0.25	%
Output Power		-	-	1	W
Output Voltage Ripple	1MHz Bandwidth, Peak-to-peak	-	-	0.25	%
Output Voltage Overshoot	50% to 100% load step	-	5	-	%
Output Recovery Time	Within 1% V_{OUT}	-	30	-	ms
Output Voltage Tolerance	Nominal V_{IN} , Full Load	-	-	0.25	±%

ENVIRONMENTAL

Parameter	Condition	Min.	Typ.	Max.	Units
Operating Temperature Range	Ambient without derating	-25	-	+70	°C
Storage Temperature Range	Ambient	-55	-	+125	°C
Temperature Coefficient		-	-	0.025	%/°C
Cooling	Free Air Convection				

GENERAL

Parameter	Condition	Min.	Typ.	Max.	Units
Operating Frequency		25	-	33	kHz
Isolation Voltage	Input to output	1500	-	-	VDC
Insulation Resistance		100	-	-	MΩ
Size	L x W x H	1.25 x 0.7 x 0.5 (31.75 x 17.78 x 12.7)			inches (mm)
Weight		-	14.5	-	grams
Case	Glass Reinforced Polymer				
Potting	Vacuum Impregnated Epoxy				
Box Packaging (W x L x H)	8 x 7.5 x 1.5 (203.2 x 190.5 x 38.1) or 12 x 9 x 1.5 (304.8 x 228.6 x 38.1)				inches (mm)

PROTECTIONS & FEATURES

Parameter	Condition		Min.	Typ.	Max.	Units
Short circuit	Output Current Limit, self-recovery		-	130	-	%
Overtemperature	Internal, Non-latched shutdown, self-recovery		-	95	-	°C
Input Over Voltage	Non-latched shutdown, self-recovery		-	25	-	%
Shutdown (SHDN)	Non-latched shutdown Self-recovery	Shutdown	-	0.28	-	VDC
		Restart	Open or High Z			

SPECIFICATIONS (Nominal V_{IN} , Full Load, $T_A = +25^{\circ}\text{C}$, 1 hour warm up unless otherwise specified)

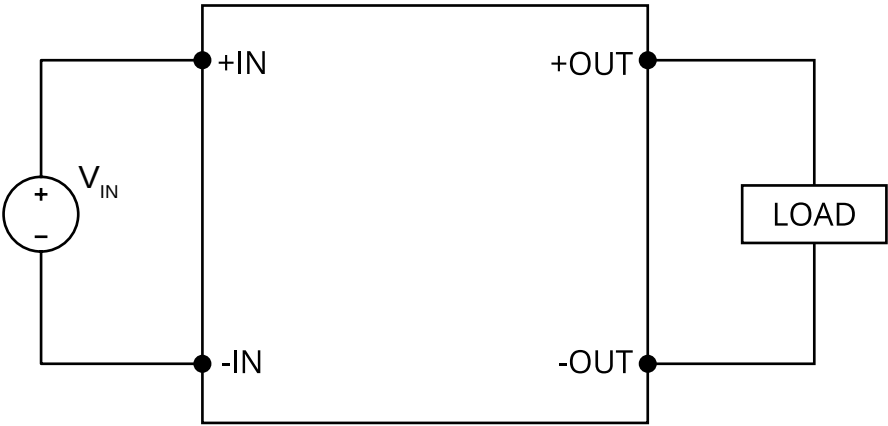
DESIGNED TO MEET

Test	Referenced Standard	Description
Vibration	MIL-STD-202	Method 204, Vibration, High Frequency, Condition D
Shock	MIL-STD-202	Method 213, Shock (Specified Pulse), Condition I
Humidity	MIL-STD-202	Method 106, Moisture Resistance
Altitude	MIL-STD-202	Method 105, Barometric Pressure (Reduced), Condition D

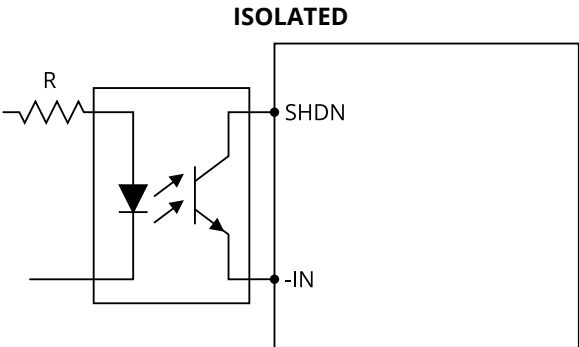
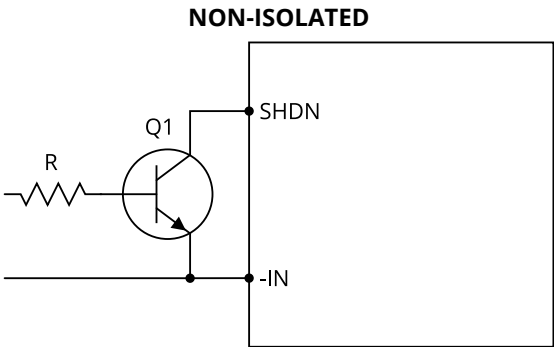
OPTIONS AVAILABLE – CONTACT PICO FOR PART NUMBER

Parameter	Referenced Standard	Description
Stabilization Bake	MIL-STD-883	Referenced Method 1008 Non-operating maximum storage temperature for 24 hours
Temperature Cycle	MIL-STD-883	Referenced Method 1010 Non-operating at temperature extremes, 15 mins/temp, 10 cycles
Burn-In	MIL-STD-883	Referenced Method 1015 Max operating temperature for 160 hours

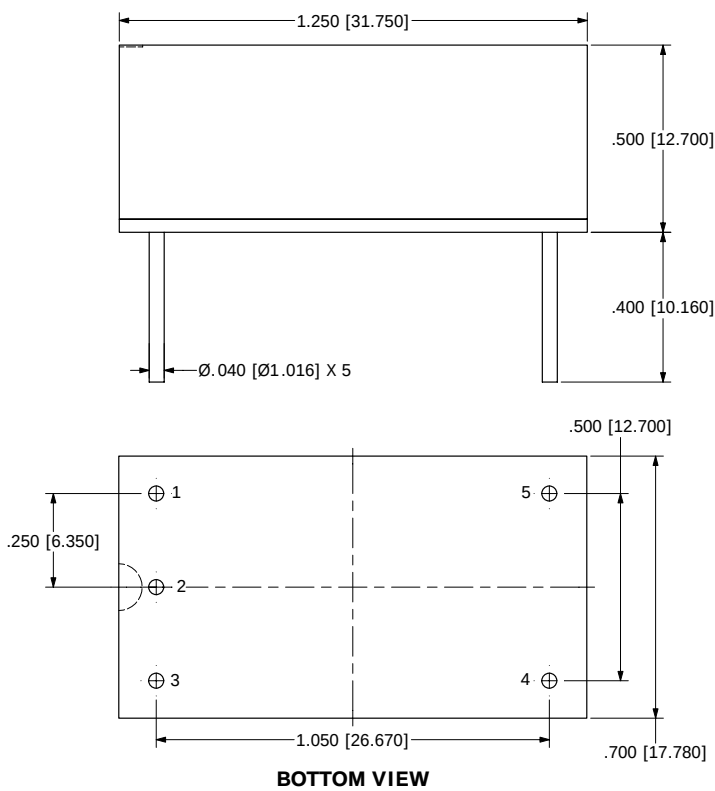
TYPICAL CONNECTION CIRCUIT



SHUTDOWN

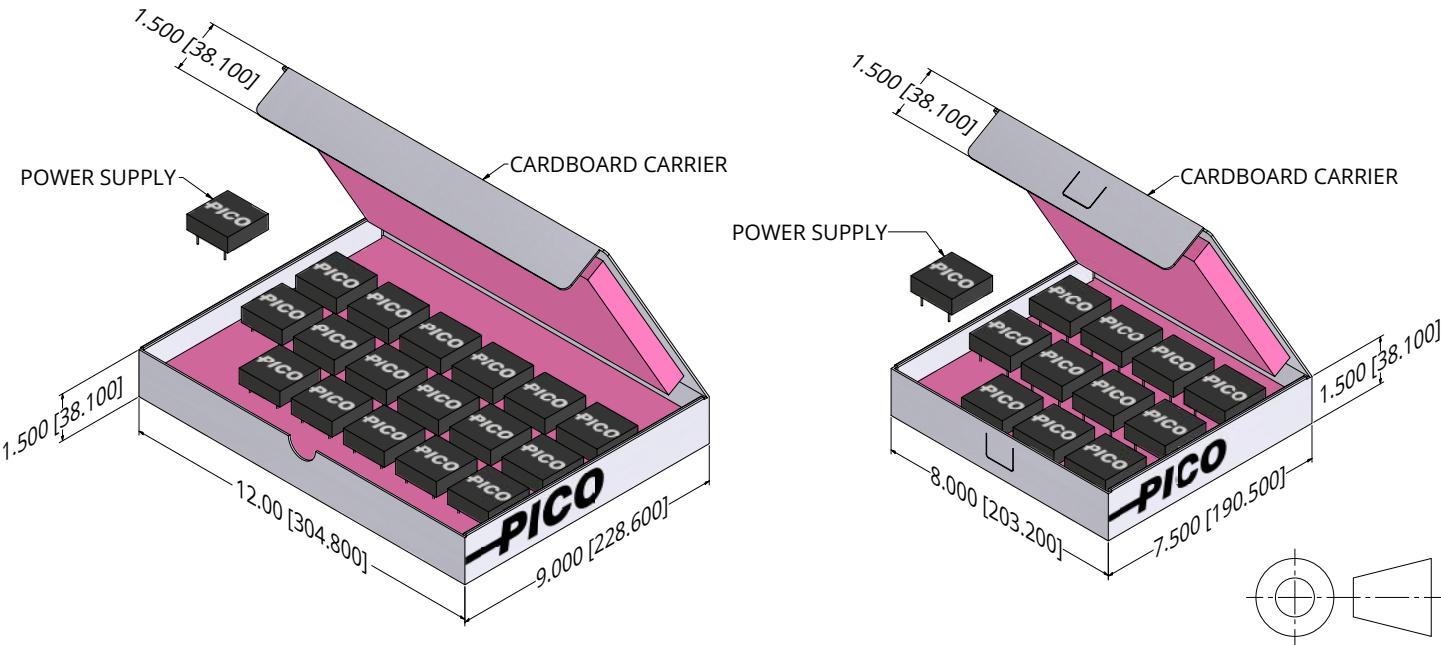


MECHANICAL DRAWINGS



PIN	FUNCTION
1	+IN
2	SHDN
3	-IN
4	-OUT
5	+OUT

BOX PACKAGING - BULK



Pico warrants each product manufactured by us and sold by us or an authorized representative, to be free from defects in material and workmanship. If properly used, it will perform within its applicable specifications for a period of one year after original shipment. Pico's obligation under this guarantee is limited to repairing or replacing our product to the original purchaser. This warranty is in lieu of all other warranties, express or implied and constitutes fulfillment of our obligations to the purchaser. We do not guarantee that the products can be used for a particular purpose other than those solely covered by the product's specifications. Pico must be notified if the product must meet particular certifications and/or standards. We assume no liability, in any event, for consequential damages, for anticipated or lost profits, incidental damages or loss of time or other losses incurred by the purchaser or any third party in connection with products covered by this warranty or otherwise. The purchaser will indemnify and hold Pico harmless for any damages, losses, costs, etc. from usage not within the product's specifications. Pico must be consulted before usage of its products in a nuclear, radioactive or space environment.

We reserve the right to discontinue products without notice, We reserve the right to make modifications to any existing catalog products without notice, at any time, without the obligation to modify units previously sold.

Series AV & SMV (100-1kV)

1.25W Isolated Proportional High Voltage DC-DC Converter



PRODUCT OVERVIEW

The AV & SMV series are unregulated DC-DC converters in a low profile package, down to 0.400", footprint with up to 1000V single or dual output models. They can operate over the temperature range of -25°C to +70°C without derating, a heat sink or active cooling.



FEATURES

- 1.25W output power
- Output voltage is directly proportional to input voltage
- Up to 1000V output models
- 5 to 28V input models
- Down to 0.400" height
- Through hole or surface mount mounting available
- Input/output isolation
- Single and dual output models
- No heat sink or derating required

Contact Pico for part number of available options:

- Expanded operating temp: -55°C to +85°C
- Select screening per MIL-STD-883:
 - Stabilization Bake
 - Temperature Cycle
 - Burn-In
- Available RoHS Compliant module
- Special Input Voltage, Output Voltage, Isolation Voltage or Output Power
- Tighter Output Voltage Tolerance

28	AV	100	D
INPUT VOLTAGE	MOUNTING TYPE	NOM. OUTPUT VOLTAGE	NUMBER OF OUTPUTS
5 = 5V	AV = THROUGH HOLE	100 = 100V	BLANK = SINGLE OUTPUT
12 = 12V	SMV = SURFACE MOUNT	200 = 200V	D = DUAL OUTPUT
15 = 15V		300 = 300V	
24 = 24V		400 = 400V	
28 = 28V		500 = 500V	
		600 = 600V	
		700 = 700V	
		800 = 800V	
		900 = 900V	
		1000 = 1000V	

MODEL LIST - SINGLE OUTPUT

Pico Part Number		Output Voltage [VDC]	Output Current		Efficiency ⁽³⁾ [%] typ.	Input Current ⁽³⁾ [mA]	Output Ripple ⁽²⁾ [Vp-p]
Through Hole	Surface Mount		Min. ⁽¹⁾ [mA]	Max. [mA]			
5AV100	5SMV100	100	1.25	12.5	78	321	0.9
5AV150	5SMV150	150	0.83	8.3	76	329	0.9
5AV200	5SMV200	200	0.625	6.25	75	333	0.9
5AV250	5SMV250	250	0.5	5	75	333	0.9
5AV300	5SMV300	300	0.416	4.16	70	357	1.2
5AV350	5SMV350	350	0.357	3.57			1.2
5AV400	5SMV400	400	0.312	3.12			1.2
5AV450	5SMV450	450	0.277	2.77			1.5
5AV500	5SMV500	500	0.25	2.5			1.5
5AV600	5SMV600	600	0.208	2.08	70	357	3
5AV700	5SMV700	700	0.179	1.79			
5AV800	5SMV800	800	0.156	1.56			
5AV900	5SMV900	900	0.139	1.39			
5AV1000	5SMV1000	1000	0.125	1.25			
12AV100	12SMV100	100	1.25	12.5	80	130	0.9
12AV150	12SMV150	150	0.83	8.3	79	132	0.9
12AV200	12SMV200	200	0.625	6.25	78	134	0.9
12AV250	12SMV250	250	0.5	5	75	139	0.9
12AV300	12SMV300	300	0.416	4.16	75	139	1.2
12AV350	12SMV350	350	0.357	3.57			1.2
12AV400	12SMV400	400	0.312	3.12			1.2
12AV450	12SMV450	450	0.277	2.77			1.5
12AV500	12SMV500	500	0.25	2.5			1.5
12AV600	12SMV600	600	0.208	2.08	70	149	3
12AV700	12SMV700	700	0.179	1.79			
12AV800	12SMV800	800	0.156	1.56			
12AV900	12SMV900	900	0.139	1.39			
12AV1000	12SMV1000	1000	0.125	1.25			
15AV100	15SMV100	100	1.25	12.5	80	104	0.9
15AV150	15SMV150	150	0.83	8.3	79	105	0.9
15AV200	15SMV200	200	0.625	6.25	78	107	0.9
15AV250	15SMV250	250	0.5	5	75	111	0.9
15AV300	15SMV300	300	0.416	4.16	75	111	1.2
15AV350	15SMV350	350	0.357	3.57			1.2
15AV400	15SMV400	400	0.312	3.12			1.2
15AV450	15SMV450	450	0.277	2.77			1.5
15AV500	15SMV500	500	0.25	2.5			1.5
15AV600	15SMV600	600	0.208	2.08	70	120	3
15AV700	15SMV700	700	0.179	1.79			
15AV800	15SMV800	800	0.156	1.56			
15AV900	15SMV900	900	0.139	1.39			
15AV1000	15SMV1000	1000	0.125	1.25			

MODEL LIST - SINGLE OUTPUT

Pico Part Number		Output Voltage [VDC]	Output Current		Efficiency ⁽³⁾ [%] typ.	Input Current ⁽³⁾ [mA]	Output Ripple ⁽²⁾ [Vp-p]
Through Hole	Surface Mount		Min. ⁽¹⁾ [mA]	Max. [mA]			
24AV100	24SMV100	100	1.25	12.5	76	69	0.9
24AV150	24SMV150	150	0.83	8.3	73	71	0.9
24AV200	24SMV200	200	0.625	6.25	73	71	0.9
24AV250	24SMV250	250	0.5	5	70	74	0.9
24AV300	24SMV300	300	0.416	4.16	73	71	1.2
24AV350	24SMV350	350	0.357	3.57			1.2
24AV400	24SMV400	400	0.312	3.12			1.2
24AV450	24SMV450	450	0.277	2.77			1.5
24AV500	24SMV500	500	0.25	2.5			1.5
24AV600	24SMV600	600	0.208	2.08	70	74	3
24AV700	24SMV700	700	0.179	1.79			
24AV800	24SMV800	800	0.156	1.56			
24AV900	24SMV900	900	0.139	1.39			
24AV1000	24SMV1000	1000	0.125	1.25			
28AV100	28SMV100	100	1.25	12.5	75	60	0.9
28AV150	28SMV150	150	0.83	8.3	76	59	0.9
28AV200	28SMV200	200	0.625	6.25	75	60	0.9
28AV250	28SMV250	250	0.5	5	70	64	0.9
28AV300	28SMV300	300	0.416	4.16	73	61	1.2
28AV350	28SMV350	350	0.357	3.57			1.2
28AV400	28SMV400	400	0.312	3.12			1.2
28AV450	28SMV450	450	0.277	2.77			1.5
28AV500	28SMV500	500	0.25	2.5			1.5
28AV600	28SMV600	600	0.208	2.08	70	64	3
28AV700	28SMV700	700	0.179	1.79			
28AV800	28SMV800	800	0.156	1.56			
28AV900	28SMV900	900	0.139	1.39			
28AV1000	28SMV1000	1000	0.125	1.25			

Note 1: Maintain minimum 10% of rated load on each output to prevent a voltage surge.

Note 2: For ≤500V output models, a 0.1μF, 1kV capacitor is required across the output. For ≥600V output models, a 0.01μF, 3kV capacitor is required across output.

Note 3: Tested at nominal input voltage and full output load.

MODEL LIST - DUAL OUTPUT

Pico Part Number		Output Voltage [±VDC]	Output Current		Efficiency ⁽³⁾ [%] typ.	Input Current ⁽³⁾ [mA]	Output Ripple ⁽⁴⁾ [Vp-p]
Through Hole	Surface Mount		Min. ⁽¹⁾ [±mA]	Max. [±mA]			
5AV100D	5SMV100D	100	0.625	6.25	78	320	0.4
5AV150D	5SMV150D	150	0.417	4.17	78	320	
5AV200D	5SMV200D	200	0.313	3.13	78	320	
5AV250D	5SMV250D	250	0.25	2.5	76	329	
12AV100D	12SMV100D	100	0.625	6.25	80	130	0.4
12AV150D	12SMV150D	150	0.417	4.17	80	130	
12AV200D	12SMV200D	200	0.313	3.13	80	130	
12AV250D	12SMV250D	250	0.25	2.5	80	130	
15AV100D	15SMV100D	100	0.625	6.25	81	103	0.4
15AV150D	15SMV150D	150	0.417	4.17	81	103	
15AV200D	15SMV200D	200	0.313	3.13	79	106	
15AV250D	15SMV250D	250	0.25	2.5	78	107	
24AV100D	24SMV100D	100	0.625	6.25	80	66	0.8
24AV150D	24SMV150D	150	0.417	4.17	80	66	
24AV200D	24SMV200D	200	0.313	3.13	79	66	
24AV250D	24SMV250D	250	0.25	2.5	79	66	
28AV100D	28SMV100D	100	0.625	6.25	79	57	0.8
28AV150D	28SMV150D	150	0.417	4.17	79	57	
28AV200D	28SMV200D	200	0.313	3.13	78	58	
28AV250D	28SMV250D	250	0.25	2.5	76	59	

Note 1: Maintain minimum 10% of rated load on each output to prevent a voltage surge.

Note 3: Tested at nominal input voltage and full output load.

Note 4: 0.1µF, 1kV high quality capacitor is required across each output.

SPECIFICATIONS (Nominal V_{IN} , Full Load, $T_A = +25^{\circ}\text{C}$, 1 hour warm up unless otherwise specified)**INPUT**

Parameter	Condition	Min.	Typ.	Max.	Units
Input Voltage Range	5V input models	4.5	5	5.5	VDC
	12V input models	10.8	12	13.2	
	15V input models	13.5	15	16.5	
	24V input models	21.6	24	26.4	
	28V input models	25.2	28	30.8	

OUTPUT

Parameter	Condition	Min.	Typ.	Max.	Units
Line Regulation	Output voltage is directly proportional to input voltage				
Output Power		0.125	-	1.25	W
Output Voltage Tolerance	Nominal V_{IN} , Full Load	-	-	3	±%

ENVIRONMENTAL

Parameter	Condition	Min.	Typ.	Max.	Units
Operating Temperature Range	Ambient without derating	-25	-	+70	°C
Storage Temperature Range	Ambient	-55	-	+125	°C
Temperature Coefficient		-	0.02	-	%/°C
Cooling	Free Air Convection				

GENERAL

Parameter	Condition		Min.	Typ.	Max.	Units
Operating Frequency			20	-	40	kHz
Isolation Voltage	Input to output	≤500V Output models	1000	-	-	VDC
		≥600V output models	1500	-	-	
Insulation Resistance			100	-	-	MΩ
Size (L x W x H)	Through hole	≤500V Output models	0.5 x 0.5 x 0.4 (12.7 x 12.7 x 10.16)			inches (mm)
		≥600V output models	0.5 x 0.5 x 0.5 (12.7 x 12.7 x 12.7)			
	Surface mount	≤500V Output models	0.5 x 0.5 x 0.44 (12.7 x 12.7 x 11.176)			
		≥600V output models	0.5 x 0.5 x 0.54 (12.7 x 12.7 x 13.716)			
Weight	≤500V Output models		-	4	-	grams
	≥600V Output models		-	5	-	
Case	Glass Reinforced Polymer					
Potting	Vacuum Impregnated Epoxy					
Tube Packaging (W x H x L)	Series AV (See drawing)		0.6 x 1.72 x DIM A (15.24 x 43.688 x DIM A)			inches (mm)
	Series SMV	≤500V Output models	0.874 x 0.605 x 20 (22.2 x 15.367 x 508)			
		≥600V Output models	0.874 x 0.715 x 20 (22.2 x 18.161 x 508)			
Tape & Reel Packaging	Upon request					
Moisture Sensitivity Level	IPC / JEDEC J-STD-020, Level 3					

DESIGNED TO MEET

Test	Referenced Standard	Description
Vibration	MIL-STD-202	Method 204, Vibration, High Frequency, Condition D
Shock	MIL-STD-202	Method 213, Shock (Specified Pulse), Condition I
Humidity	MIL-STD-202	Method 106, Moisture Resistance
Altitude	MIL-STD-202	Method 105, Barometric Pressure (Reduced), Condition D

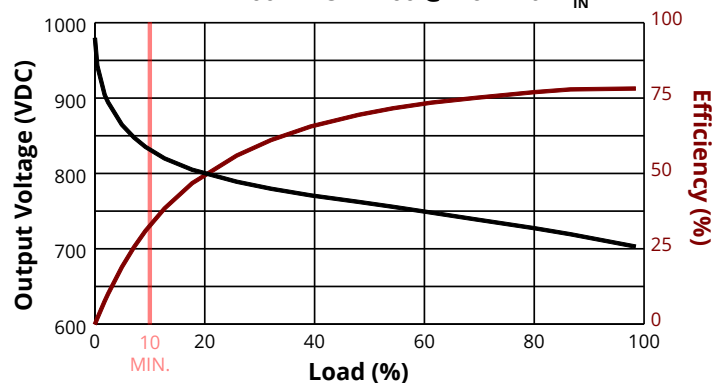
SPECIFICATIONS (Nominal V_{IN} , Full Load, $T_A = +25^\circ\text{C}$, 1 hour warm up unless otherwise specified)

OPTIONS AVAILABLE – CONTACT PICO FOR PART NUMBER

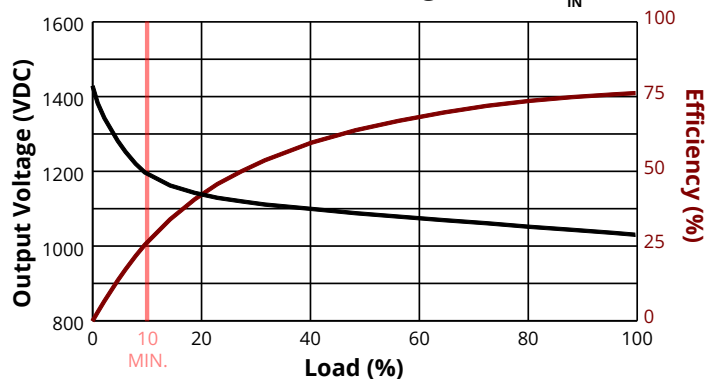
Parameter	Referenced Standard	Description
Stabilization Bake	MIL-STD-883	Referenced Method 1008 Non-operating maximum storage temperature for 24 hours
Temperature Cycle	MIL-STD-883	Referenced Method 1010 Non-operating at temperature extremes, 15 mins/temp, 10 cycles
Burn-In	MIL-STD-883	Referenced Method 1015 Max operating temperature for 160 hours
Expanded Ambient Operating Temperature		-55°C to +85°C
RoHS Compliance		-

DATA CURVES (Nominal V_{IN} , $T_A = +25^\circ\text{C}$, 1 hour warm up unless otherwise specified)

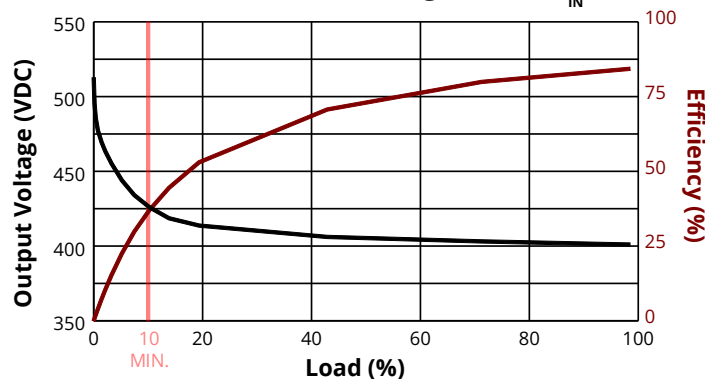
P/N 24AV700 / 24SMV700 @ Nominal V_{IN}



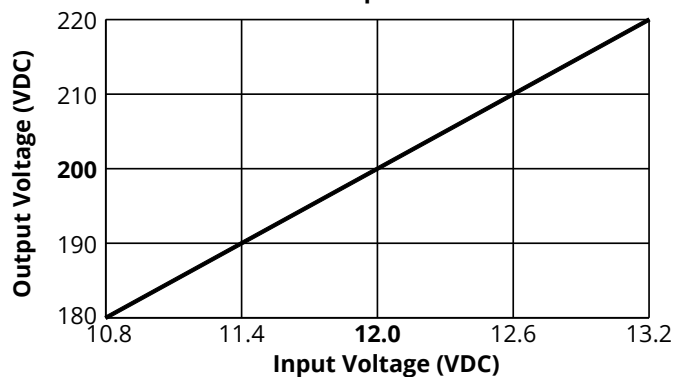
P/N 5AV1000 / 5SMV1000 @ Nominal V_{IN}



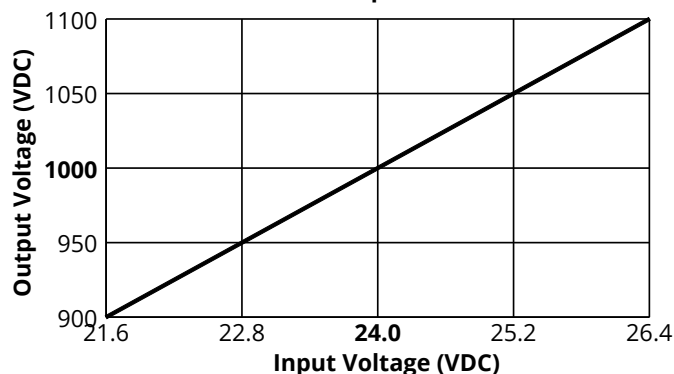
P/N 15AV400 / 15SMV400 @ Nominal V_{IN}



P/N 12AV200 @ Max Output Current / Power

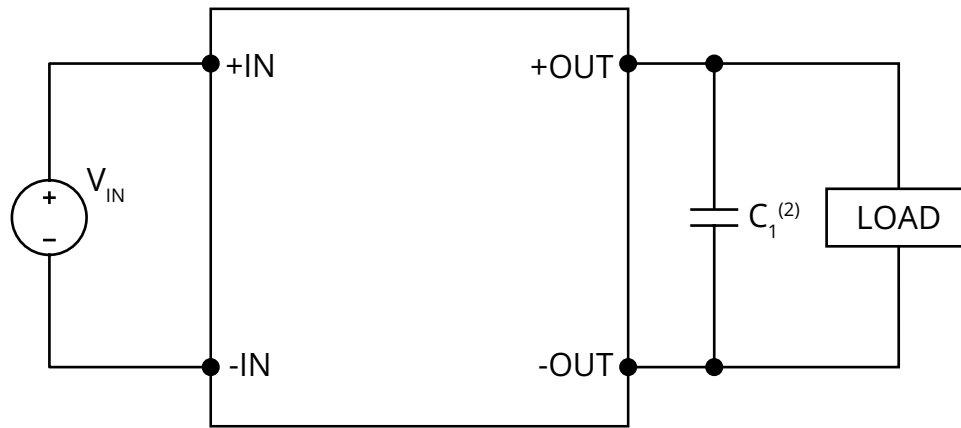


P/N 24AV1000 @ Max Output Current / Power



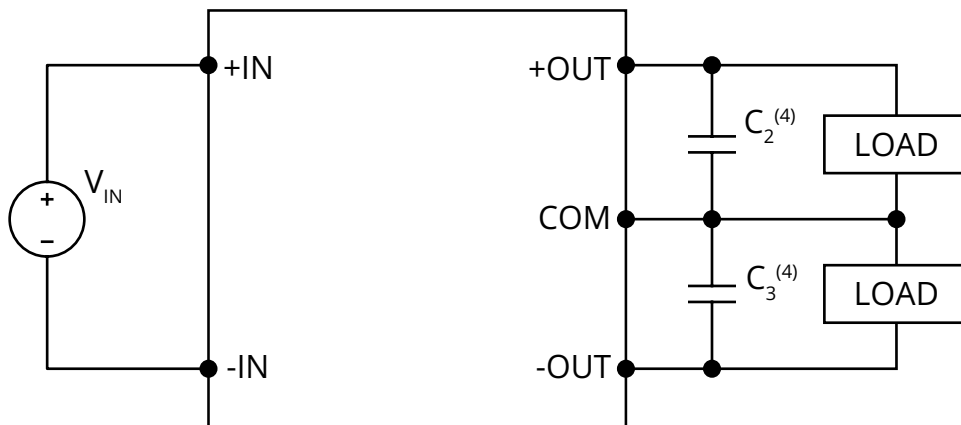
TYPICAL CONNECTION CIRCUIT

SINGLE OUTPUTS



Note 2: For $\leq 500V$ output models, a $0.1\mu F$, 1kV capacitor is required across the output. For $\geq 600V$ output models, a $0.01\mu F$, 3kV capacitor is required across output.

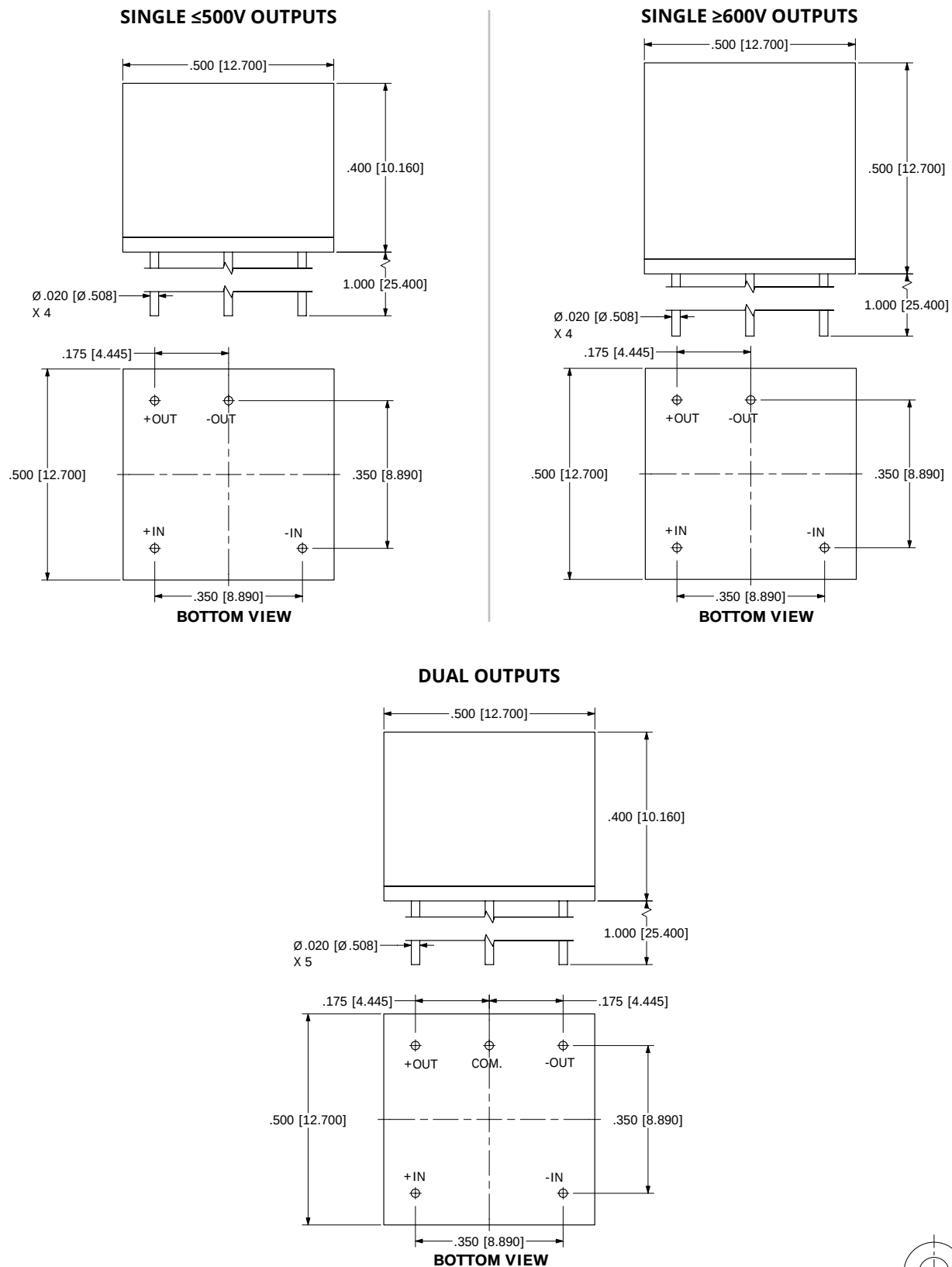
DUAL OUTPUTS



Note 4: $0.1\mu F$, 1kV high quality capacitor is required across each output.

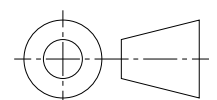
MECHANICAL DRAWINGS

SERIES AV - THROUGH HOLE



NOTES

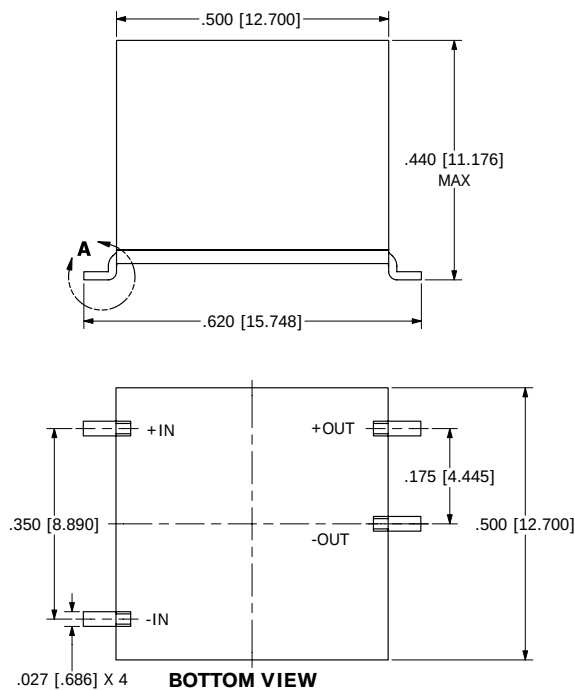
- ALL DIMENSIONS ARE IN INCHES, [] = MM
- WHITE DOT ON TOP SIDE INDICATES +IN LOCATION



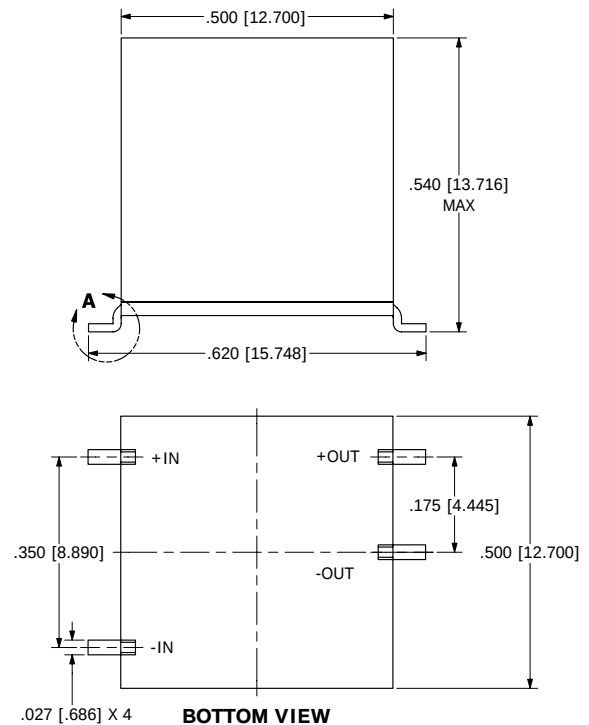
MECHANICAL DRAWINGS

SERIES SM - SURFACE MOUNT

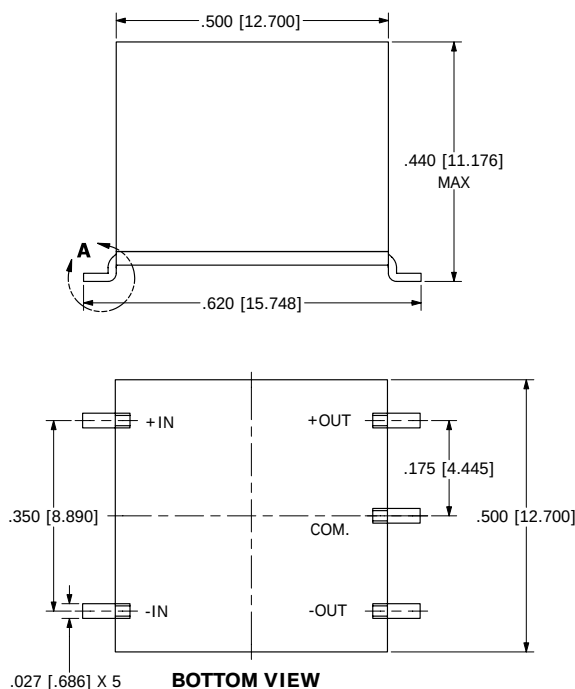
SINGLE $\leq 500V$ OUTPUTS



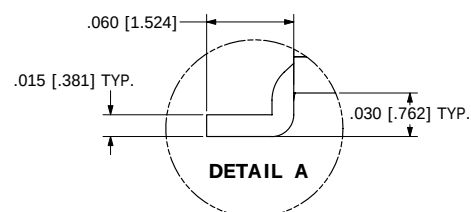
SINGLE $\geq 600V$ OUTPUTS



DUAL OUTPUTS

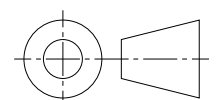


LEAD DETAILS



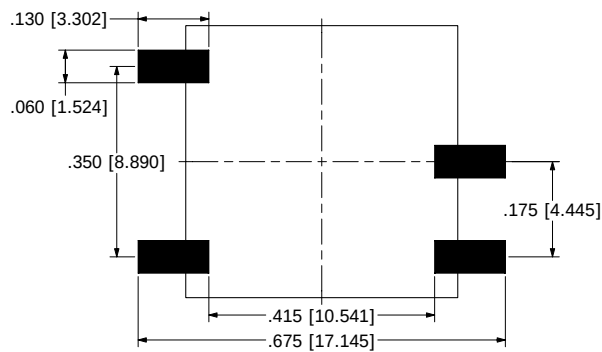
NOTES

- a. ALL DIMENSIONS ARE IN INCHES, [] = MM
- b. WHITE DOT ON TOP SIDE INDICATES +IN LOCATION

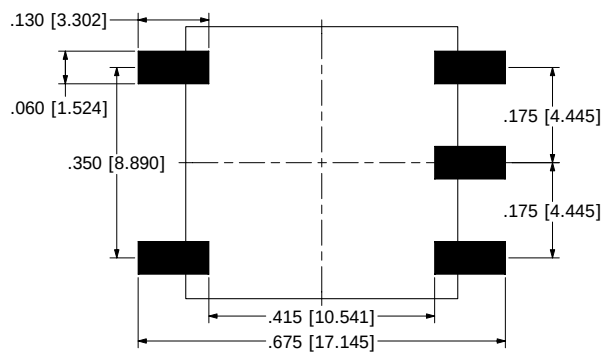


RECOMMENDED LAND PATTERN DIMENSIONS

SERIES SMV - SINGLE OUTPUTS

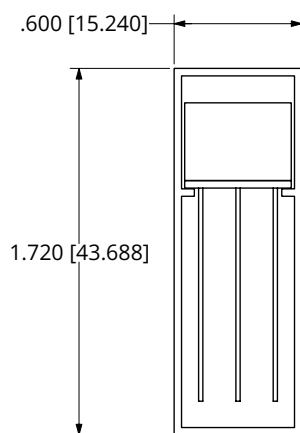


SERIES SMV - DUAL OUTPUTS

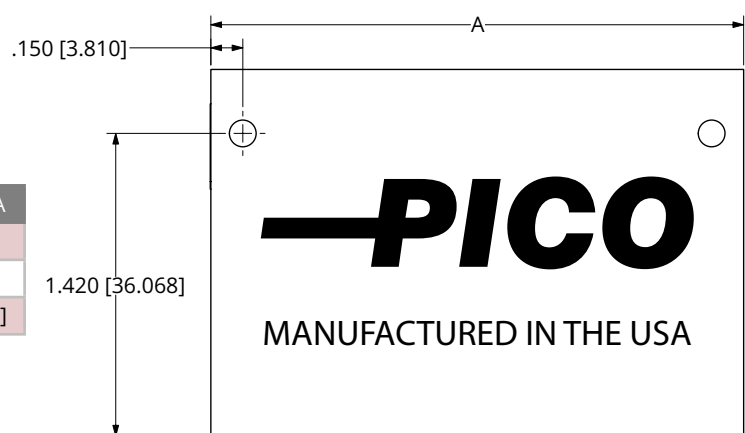


TUBE PACKAGING

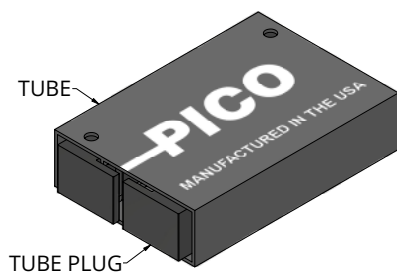
SERIES AV - THROUGH HOLE



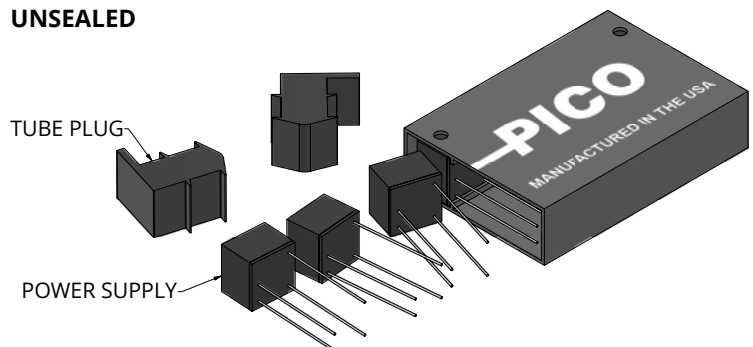
DIMENSION A
4.00 [101.60]
6.50 [165.10]
10.50 [266.70]



SEALED

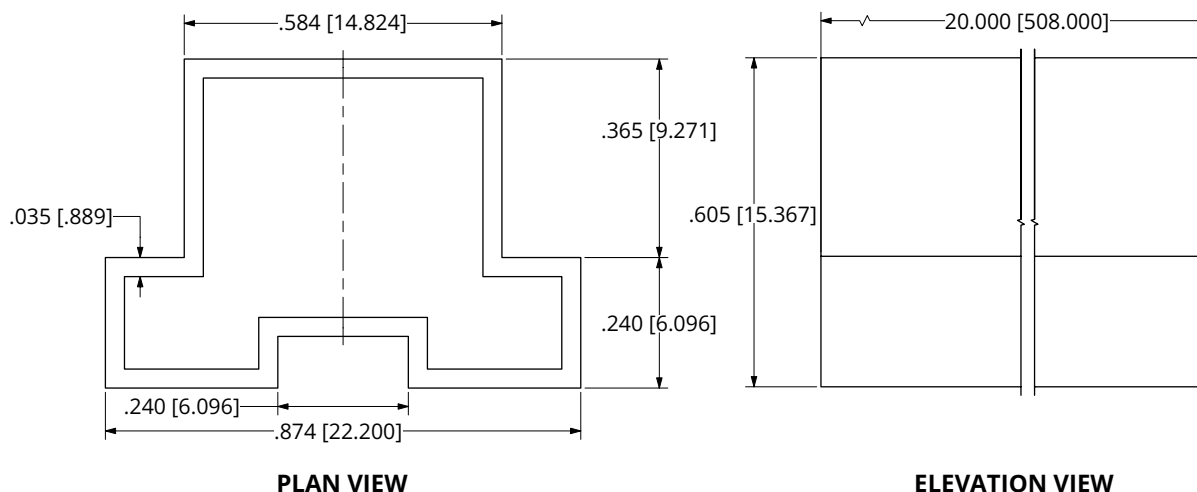


UNSEALED

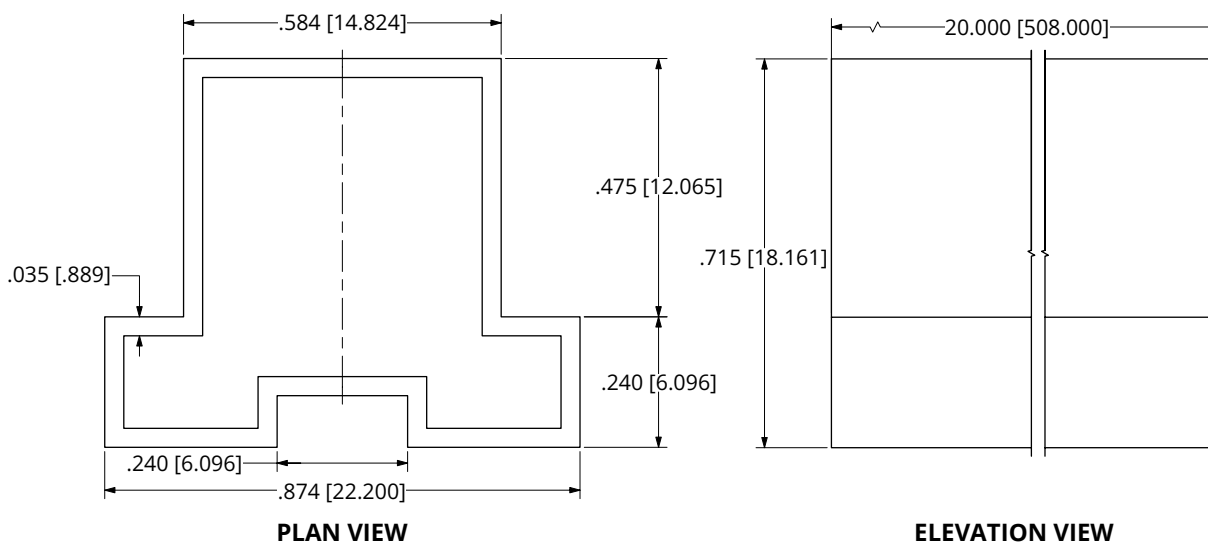


TUBE PACKAGING

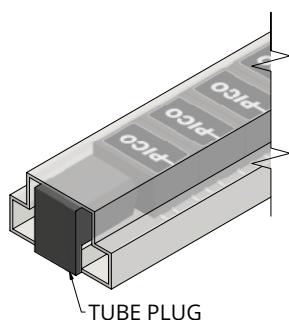
SERIES SMV - SURFACE MOUNT, $\leq 500V$ OUTPUTS



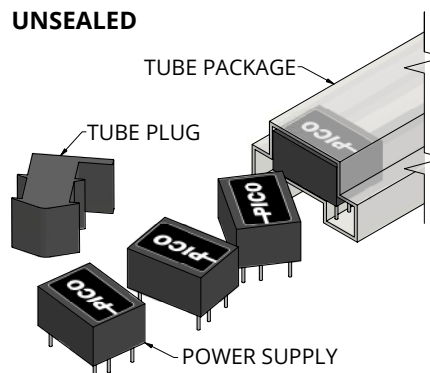
SERIES SMV - SURFACE MOUNT, $\geq 600V$ OUTPUTS



SEALED



UNSEALED



Pico warrants each product manufactured by us and sold by us or an authorized representative, to be free from defects in material and workmanship. If properly used, it will perform within its applicable specifications for a period of one year after original shipment. Pico's obligation under this guarantee is limited to repairing or replacing our product to the original purchaser. This warranty is in lieu of all other warranties, express or implied and constitutes fulfillment of our obligations to the purchaser. We do not guarantee that the products can be used for a particular purpose other than those solely covered by the product's specifications. Pico must be notified if the product must meet particular certifications and/or standards. We assume no liability, in any event, for consequential damages, for anticipated or lost profits, incidental damages or loss of time or other losses incurred by the purchaser or any third party in connection with products covered by this warranty or otherwise. The purchaser will indemnify and hold Pico harmless for any damages, losses, costs, etc. from usage not within the product's specifications. Pico must be consulted before usage of its products in a nuclear, radioactive or space environment.

We reserve the right to discontinue products without notice, We reserve the right to make modifications to any existing catalog products without notice, at any time, without the obligation to modify units previously sold.

Series AV (1500-10kV)

1.25W Isolated/Non-isolated Proportional High Voltage DC-DC Converter

PICO
Electronics, Inc.

PRODUCT OVERVIEW

The AV & SMV series are unregulated DC-DC converters in a low profile 0.5" package footprint with up to 10,000V positive or negative output models. 0.5" x 0.5" footprint packages are available up to 5kV; 1.0" x 0.5" are available up to 10kV. They can operate over the temperature range of -25°C to +70°C without derating, a heat sink or active cooling.



FEATURES

- 1.25W output power
- Output voltage is directly proportional to input voltage
- Up to 10,000V output models
- 5 to 48V input models
- Down to 0.500" height
- Through hole mounting
- Transformer Isolated modules
- Positive or negative output voltage up to 10kV
- Single output models
- No heat sink or derating required

Contact Pico for part number of available options:

- Expanded operating temp: -55°C to +85°C
- Select screening per MIL-STD-883:
 - Stabilization Bake
 - Temperature Cycle
 - Burn-In
- Special Input Voltage, Output Voltage, Isolation Voltage or Output Power

28	AV	5000	-N	
INPUT VOLTAGE RANGE	SERIES NAME	OUTPUT VOLTAGE (≤5000V)	OUTPUT ISOLATION	OUTPUT VOLTAGE (≥6000V)
5 = 5V 12 = 12V 15 = 15V 24 = 24V 28 = 28V 48 = 48V	AV	1500 = 1500V 2000 = 2000V 2500 = 2500V 3000 = 3000V 3500 = 3500V 4000 = 4000V 4500 = 4500V 5000 = 5000V	BLANK = ISOLATED POSITIVE OR NEGATIVE -P = NON-ISOLATED POSITIVE OUTPUT -N = NON-ISOLATED NEGATIVE OUTPUT	
5 = 5V 12 = 12V 15 = 15V 24 = 24V 28 = 28V	AV		P = NON-ISOLATED POSITIVE OUTPUT N = NON-ISOLATED NEGATIVE OUTPUT	6K = 6000V 7K = 7000V 8K = 8000V 9K = 9000V 10K = 10,000V

MODEL LIST - ISOLATED OUTPUT

Pico Part Number	Output Voltage [VDC]	Output Current		Efficiency ⁽¹⁾ [%] typ.	Input Current ⁽¹⁾ [mA]	Output Ripple ⁽¹⁾ [Vp-p]
		Min. ⁽²⁾ [μA]	Max. [μA]			
5AV1500	1500	83.3	833	78	321	75
5AV2000	2000	62.5	625	77	325	75
5AV2500	2500	50	500	77	325	75
5AV3000	3000	41.7	417	76	329	75
5AV3500	3500	35.7	357	75	333	75
5AV4000	4000	31.3	313	73	342	100
5AV4500	4500	27.8	278	71	352	100
5AV5000	5000	25	250	71	352	125
12AV1500	1500	83.3	833	79	132	75
12AV2000	2000	62.5	625	79	132	75
12AV2500	2500	50	500	79	132	75
12AV3000	3000	41.7	417	79	132	75
12AV3500	3500	35.7	357	79	132	75
12AV4000	4000	31.3	313	80	130	100
12AV4500	4500	27.8	278	80	130	100
12AV5000	5000	25	250	80	130	125
15AV1500	1500	83.3	833	79	105	75
15AV2000	2000	62.5	625	79	105	75
15AV2500	2500	50	500	79	105	75
15AV3000	3000	41.7	417	79	105	75
15AV3500	3500	35.7	357	79	105	75
15AV4000	4000	31.3	313	80	104	100
15AV4500	4500	27.8	278	80	104	100
15AV5000	5000	25	250	80	104	125

MODEL LIST - ISOLATED OUTPUT

Pico Part Number	Output Voltage [VDC]	Output Current		Efficiency ⁽¹⁾ [%] typ.	Input Current ⁽¹⁾ [mA]	Output Ripple ⁽¹⁾ [Vp-p]
		Min. ⁽²⁾ [μA]	Max. [μA]			
24AV1500	1500	83.3	833	79	66	75
24AV2000	2000	62.5	625	79	66	75
24AV2500	2500	50	500	79	66	75
24AV3000	3000	41.7	417	79	66	75
24AV3500	3500	35.7	357	79	66	75
24AV4000	4000	31.3	313	80	65	100
24AV4500	4500	27.8	278	80	65	100
24AV5000	5000	25	250	80	65	125
28AV1500	1500	83.3	833	79	57	75
28AV2000	2000	62.5	625	79	57	75
28AV2500	2500	50	500	79	57	75
28AV3000	3000	41.7	417	79	57	75
28AV3500	3500	35.7	357	79	57	75
28AV4000	4000	31.3	313	80	56	100
28AV4500	4500	27.8	278	80	56	100
28AV5000	5000	25	250	80	56	125
48AV1500	1500	83.3	833	79	33	75
48AV2000	2000	62.5	625	79	33	75
48AV2500	2500	50	500	79	33	75
48AV3000	3000	41.7	417	79	33	75
48AV3500	3500	35.7	357	79	33	75
48AV4000	4000	31.3	313	80	33	100
48AV4500	4500	27.8	278	80	33	100
48AV5000	5000	25	250	80	33	125

Note 1: Tested at nominal input voltage and full output load.

Note 2: Maintain minimum 10% of rated load on the output to prevent a voltage surge.

Note 3: For ≤5000V output models, a 470pF, 6kV high quality capacitor is required across the output. For ≥6000V output models, optional capacitors up to 470pF may be placed across the output for further ripple reduction.

Note 4: For isolated models, input ground and output ground is not connected internally. Input ground and output ground cannot be connected externally.

MODEL LIST - NON-ISOLATED POSITIVE OUTPUT

Pico Part Number	Output Voltage [VDC]	Output Current		Efficiency ⁽¹⁾ [%] typ.	Input Current ⁽¹⁾ [mA]	Output Ripple ⁽¹⁾ [Vp-p]
		Min. ⁽²⁾ [μA]	Max. [μA]			
5AV1500-P	+1500	83.3	833	78	321	75
5AV2000-P	+2000	62.5	625	77	325	75
5AV2500-P	+2500	50	500	77	325	75
5AV3000-P	+3000	41.7	417	76	329	75
5AV3500-P	+3500	35.7	357	75	333	75
5AV4000-P	+4000	31.3	313	73	342	100
5AV4500-P	+4500	27.8	278	71	352	100
5AV5000-P	+5000	25	250	71	352	125
5AVP6K	+6000	20.8	208	74	338	150
5AVP7K	+7000	17.9	179	74	338	150
5AVP8K	+8000	15.6	156	73	342	160
5AVP9K	+9000	13.9	139	72	347	180
5AVP10K	+10000	12.5	125	70	357	200
12AV1500-P	+1500	83.3	833	79	132	75
12AV2000-P	+2000	62.5	625	79	132	75
12AV2500-P	+2500	50	500	79	132	75
12AV3000-P	+3000	41.7	417	79	132	75
12AV3500-P	+3500	35.7	357	79	132	75
12AV4000-P	+4000	31.3	313	80	130	100
12AV4500-P	+4500	27.8	278	80	130	100
12AV5000-P	+5000	25	250	80	130	125
12AVP6K	+6000	20.8	208	77	135	150
12AVP7K	+7000	17.9	179	76	137	150
12AVP8K	+8000	15.6	156	76	137	150
12AVP9K	+9000	13.9	139	75	139	180
12AVP10K	+10000	12.5	125	74	141	200
15AV1500-P	+1500	83.3	833	79	105	75
15AV2000-P	+2000	62.5	625	79	105	75
15AV2500-P	+2500	50	500	79	105	75
15AV3000-P	+3000	41.7	417	79	105	75
15AV3500-P	+3500	35.7	357	79	105	75
15AV4000-P	+4000	31.3	313	80	104	100
15AV4500-P	+4500	27.8	278	80	104	100
15AV5000-P	+5000	25	250	80	104	125
15AVP6K	+6000	20.8	208	76	110	150
15AVP7K	+7000	17.9	179	75	111	150
15AVP8K	+8000	15.6	156	74	113	160
15AVP9K	+9000	13.9	139	73	114	180
15AVP10K	+10000	12.5	125	73	114	200

MODEL LIST - NON-ISOLATED POSITIVE OUTPUT

Pico Part Number	Output Voltage [VDC]	Output Current		Efficiency ⁽¹⁾ [%] typ.	Input Current ⁽¹⁾ [mA]	Output Ripple ⁽¹⁾ [Vp-p]
		Min. ⁽²⁾ [μA]	Max. [μA]			
24AV1500-P	+1500	83.3	833	79	66	75
24AV2000-P	+2000	62.5	625	79	66	75
24AV2500-P	+2500	50	500	79	66	75
24AV3000-P	+3000	41.7	417	79	66	75
24AV3500-P	+3500	35.7	357	79	66	75
24AV4000-P	+4000	31.3	313	80	65	100
24AV4500-P	+4500	27.8	278	80	65	100
24AV5000-P	+5000	25	250	80	65	125
24AVP6K	+6000	20.8	208	76	69	150
24AVP7K	+7000	17.9	179	76	69	150
24AVP8K	+8000	15.6	156	76	69	160
24AVP9K	+9000	13.9	139	76	69	180
24AVP10K	+10000	12.5	125	75	70	200
28AV1500-P	+1500	83.3	833	79	57	75
28AV2000-P	+2000	62.5	625	79	57	75
28AV2500-P	+2500	50	500	79	57	75
28AV3000-P	+3000	41.7	417	79	57	75
28AV3500-P	+3500	35.7	357	79	57	75
28AV4000-P	+4000	31.3	313	80	56	100
28AV4500-P	+4500	27.8	278	80	56	100
28AV5000-P	+5000	25	250	80	56	125
28AVP6K	+6000	20.8	208	75	60	150
28AVP7K	+7000	17.9	179	75	60	150
28AVP8K	+8000	15.6	156	75	60	160
28AVP9K	+9000	13.9	139	75	60	180
28AVP10K	+10000	12.5	125	75	60	200
48AV1500-P	+1500	83.3	833	79	33	75
48AV2000-P	+2000	62.5	625	79	33	75
48AV2500-P	+2500	50	500	79	33	75
48AV3000-P	+3000	41.7	417	79	33	75
48AV3500-P	+3500	35.7	357	79	33	75
48AV4000-P	+4000	31.3	313	80	33	100
48AV4500-P	+4500	27.8	278	80	33	100
48AV5000-P	+5000	25	250	80	33	125

Note 1: Tested at nominal input voltage and full output load.

Note 2: Maintain minimum 10% of rated load on the output to prevent a voltage surge.

Note 3: For ≤5000V output models, a 470pF, 6kV high quality capacitor is required across the output. For ≥6000V output models, optional capacitors up to 470pF may be placed across the output for further ripple reduction.

Note 5: For non-isolated positive models, output COM terminal must be connected to input positive or input negative externally. Output will be positive voltage and non-isolated from input. Module is internally transformer isolated.

MODEL LIST - NON-ISOLATED NEGATIVE OUTPUT

Pico Part Number	Output Voltage [VDC]	Output Current		Efficiency ⁽¹⁾ [%] typ.	Input Current ⁽¹⁾ [mA]	Output Ripple ⁽¹⁾ [Vp-p]
		Min. ⁽²⁾ [μA]	Max. [μA]			
5AV1500-N	-1500	83.3	833	78	321	75
5AV2000-N	-2000	62.5	625	77	325	75
5AV2500-N	-2500	50	500	77	325	75
5AV3000-N	-3000	41.7	417	76	329	75
5AV3500-N	-3500	35.7	357	75	333	75
5AV4000-N	-4000	31.3	313	73	342	100
5AV4500-N	-4500	27.8	278	71	352	100
5AV5000-N	-5000	25	250	71	352	125
5AVN6K	-6000	20.8	208	74	338	150
5AVN7K	-7000	17.9	179	74	338	150
5AVN8K	-8000	15.6	156	73	342	160
5AVN9K	-9000	13.9	139	72	347	180
5AVN10K	-10000	12.5	125	70	357	200
12AV1500-N	-1500	83.3	833	79	132	75
12AV2000-N	-2000	62.5	625	79	132	75
12AV2500-N	-2500	50	500	79	132	75
12AV3000-N	-3000	41.7	417	79	132	75
12AV3500-N	-3500	35.7	357	79	132	75
12AV4000-N	-4000	31.3	313	80	130	100
12AV4500-N	-4500	27.8	278	80	130	100
12AV5000-N	-5000	25	250	80	130	125
12AVN6K	-6000	20.8	208	77	135	150
12AVN7K	-7000	17.9	179	76	137	150
12AVN8K	-8000	15.6	156	76	137	150
12AVN9K	-9000	13.9	139	75	139	180
12AVN10K	-10000	12.5	125	74	141	200
15AV1500-N	-1500	83.3	833	79	105	75
15AV2000-N	-2000	62.5	625	79	105	75
15AV2500-N	-2500	50	500	79	105	75
15AV3000-N	-3000	41.7	417	79	105	75
15AV3500-N	-3500	35.7	357	79	105	75
15AV4000-N	-4000	31.3	313	80	104	100
15AV4500-N	-4500	27.8	278	80	104	100
15AV5000-N	-5000	25	250	80	104	125
15AVN6K	-6000	20.8	208	76	110	150
15AVN7K	-7000	17.9	179	75	111	150
15AVN8K	-8000	15.6	156	74	113	160
15AVN9K	-9000	13.9	139	73	114	180
15AVN10K	-10000	12.5	125	73	114	200

MODEL LIST - NON-ISOLATED NEGATIVE OUTPUT

Pico Part Number	Output Voltage [VDC]	Output Current		Efficiency ⁽¹⁾ [%] typ.	Input Current ⁽¹⁾ [mA]	Output Ripple ⁽¹⁾ [Vp-p]
		Min. ⁽²⁾ [μA]	Max. [μA]			
24AV1500-N	-1500	83.3	833	79	66	75
24AV2000-N	-2000	62.5	625	79	66	75
24AV2500-N	-2500	50	500	79	66	75
24AV3000-N	-3000	41.7	417	79	66	75
24AV3500-N	-3500	35.7	357	79	66	75
24AV4000-N	-4000	31.3	313	80	65	100
24AV4500-N	-4500	27.8	278	80	65	100
24AV5000-N	-5000	25	250	80	65	125
24AVN6K	-6000	20.8	208	76	69	150
24AVN7K	-7000	17.9	179	76	69	150
24AVN8K	-8000	15.6	156	76	69	160
24AVN9K	-9000	13.9	139	76	69	180
24AVN10K	-10000	12.5	125	75	70	200
28AV1500-N	-1500	83.3	833	79	57	75
28AV2000-N	-2000	62.5	625	79	57	75
28AV2500-N	-2500	50	500	79	57	75
28AV3000-N	-3000	41.7	417	79	57	75
28AV3500-N	-3500	35.7	357	79	57	75
28AV4000-N	-4000	31.3	313	80	56	100
28AV4500-N	-4500	27.8	278	80	56	100
28AV5000-N	-5000	25	250	80	56	125
28AVN6K	-6000	20.8	208	75	60	150
28AVN7K	-7000	17.9	179	75	60	150
28AVN8K	-8000	15.6	156	75	60	160
28AVN9K	-9000	13.9	139	75	60	180
28AVN10K	-10000	12.5	125	75	60	200
48AV1500-N	-1500	83.3	833	79	33	75
48AV2000-N	-2000	62.5	625	79	33	75
48AV2500-N	-2500	50	500	79	33	75
48AV3000-N	-3000	41.7	417	79	33	75
48AV3500-N	-3500	35.7	357	79	33	75
48AV4000-N	-4000	31.3	313	80	33	100
48AV4500-N	-4500	27.8	278	80	33	100
48AV5000-N	-5000	25	250	80	33	125

Note 1: Tested at nominal input voltage and full output load.

Note 2: Maintain minimum 10% of rated load on the output to prevent a voltage surge.

Note 3: For ≤5000V output models, a 470pF, 6kV high quality capacitor is required across the output. For ≥6000V output models, optional capacitors up to 470pF may be placed across the output for further ripple reduction.

Note 6: For non-isolated negative models, output COM terminal must be connected to input positive or input negative externally. Output will be negative voltage and non-isolated from input. Module is internally transformer isolated.

SPECIFICATIONS (Nominal V_{IN} , Full Load, $T_A = +25^{\circ}\text{C}$, 1 hour warm up unless otherwise specified)**INPUT**

Parameter	Condition	Min.	Typ.	Max.	Units
Input Voltage Range	5AV models	4.5	5	5.5	VDC
	12AV models	10.8	12	13.2	
	15AV models	13.5	15	16.5	
	24AV models	21.6	24	26.4	
	28AV models	25.2	28	30.8	
	48AV models	43.2	48	52.8	

OUTPUT

Parameter	Condition	Min.	Typ.	Max.	Units
Line Regulation	Output voltage is directly proportional to input voltage				
Output Power		0.125	-	1.25	W
Output Voltage Tolerance	Nominal V_{IN} , Full Load	-	-	3	±%

ENVIRONMENTAL

Parameter	Condition	Min.	Typ.	Max.	Units
Operating Temperature Range	Ambient without derating	-25	-	+70	°C
Storage Temperature Range	Ambient	-55	-	+125	°C
Temperature Coefficient		-	0.05	-	%/°C
Cooling	Free Air Convection				

GENERAL

Parameter	Condition	Min.	Typ.	Max.	Units
Operating Frequency		20	-	40	kHz
Isolation Voltage	Input to output, model dependent	1000	-	2200	VDC
Insulation Resistance		100	-	-	MΩ
Size (L x W x H)	≤5000V output models	0.5 x 0.5 x 0.5 (12.7 x 12.7 x 12.7)			inches (mm)
	≥6000V output models	1.0 x 0.5 x 0.5 (25.4 x 12.7 x 12.7)			
Weight	≤5000V output models	-	5	-	grams
	≥6000V output models	-	9.5	-	
Case	≤5000V output models	Glass Reinforced Polymer			
	≥6000V output models	Diallyl Phthalate (DAP)			
Potting	Vacuum Impregnated Epoxy				
Tube Packaging (W x H x L)	See drawing	0.6 x 1.72 x DIM A (15.24 x 43.688 x DIM A)			inches (mm)

DESIGNED TO MEET

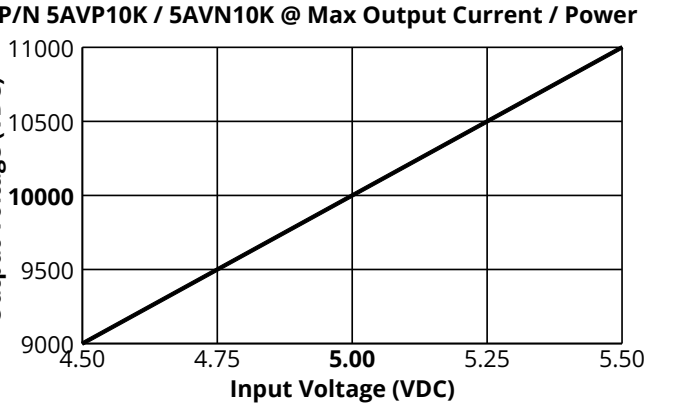
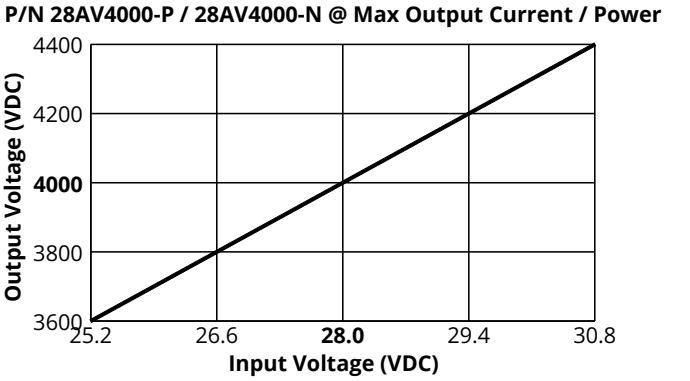
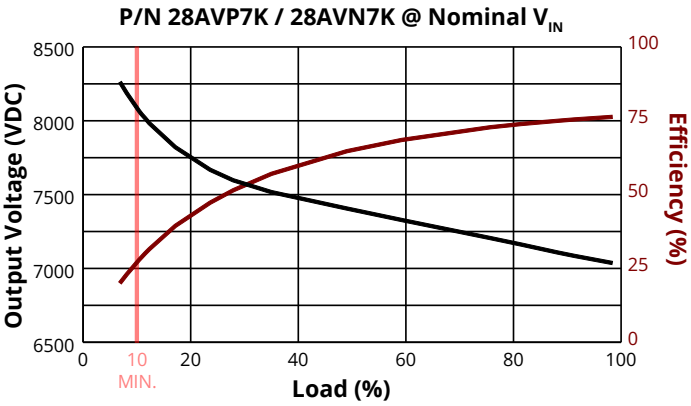
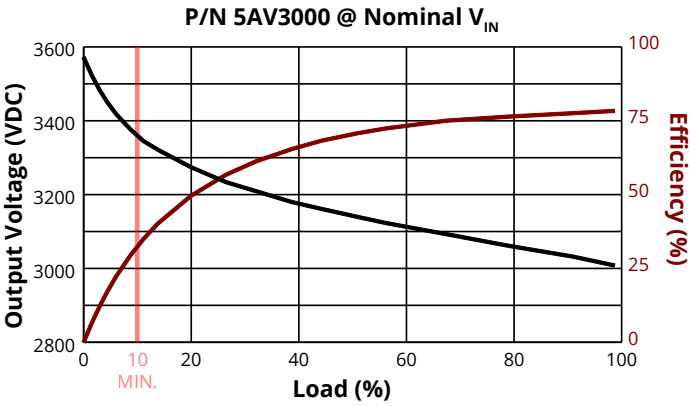
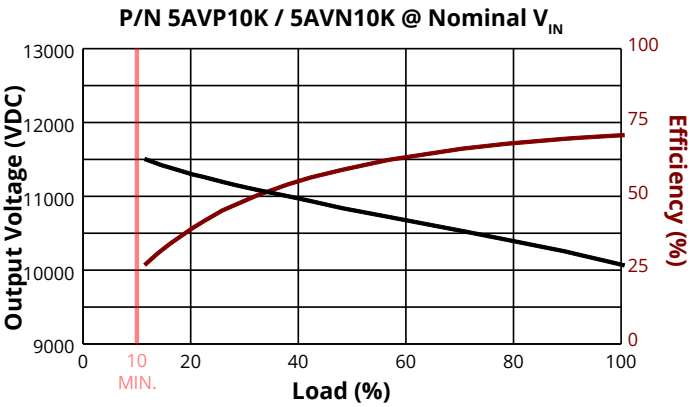
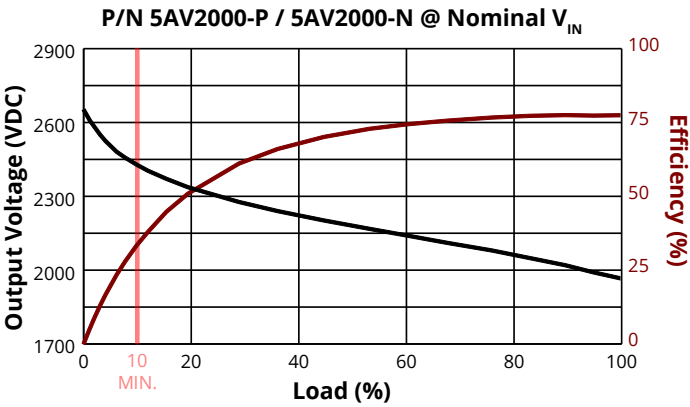
Test	Referenced Standard	Description
Vibration	MIL-STD-202	Method 204, Vibration, High Frequency, Condition D
Shock	MIL-STD-202	Method 213, Shock (Specified Pulse), Condition I
Humidity	MIL-STD-202	Method 106, Moisture Resistance
Altitude	MIL-STD-202	Method 105, Barometric Pressure (Reduced), Condition D

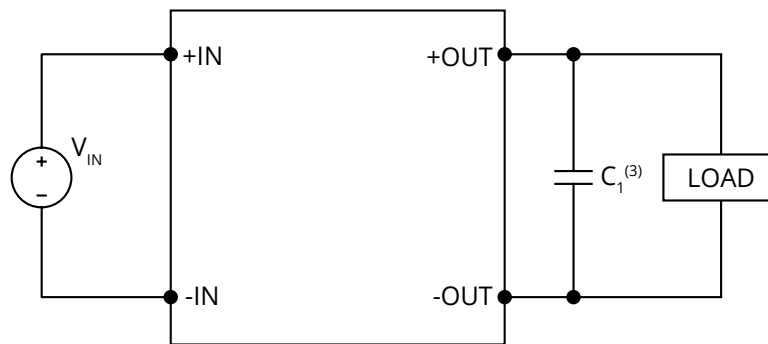
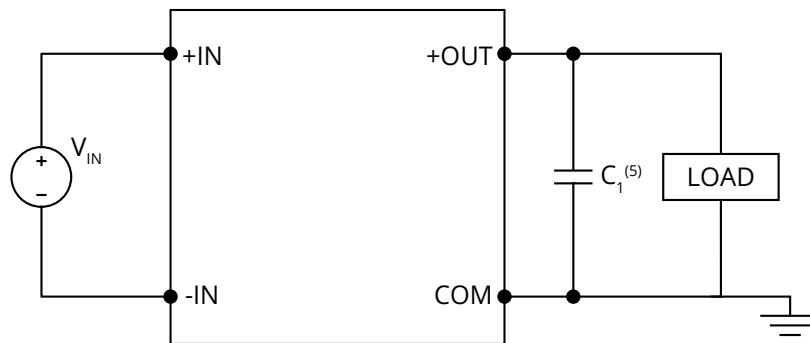
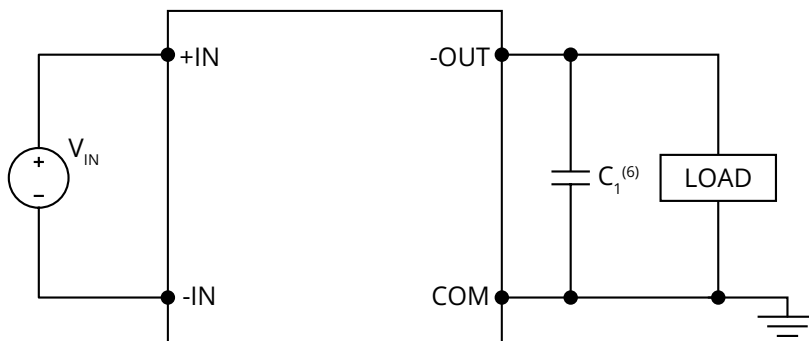
SPECIFICATIONS (Nominal V_{IN} , Full Load, $T_A = +25^{\circ}\text{C}$, 1 hour warm up unless otherwise specified)

OPTIONS AVAILABLE – CONTACT PICO FOR PART NUMBER

Parameter	Referenced Standard	Description
Stabilization Bake	MIL-STD-883	Referenced Method 1008 Non-operating maximum storage temperature for 24 hours
Temperature Cycle	MIL-STD-883	Referenced Method 1010 Non-operating at temperature extremes, 15 mins/temp, 10 cycles
Burn-In	MIL-STD-883	Referenced Method 1015 Max operating temperature for 160 hours
Expanded Ambient Operating Temperature		-55°C to $+85^{\circ}\text{C}$

DATA CURVES (Nominal V_{IN} , $T_A = +25^{\circ}\text{C}$, 1 hour warm up unless otherwise specified)



TYPICAL CONNECTION CIRCUIT**ISOLATED MODELS****NON-ISOLATED POSITIVE MODELS****NON-ISOLATED NEGATIVE MODELS**

Note 3: For $\leq 5000V$ output models, a 470pF, 6kV high quality capacitor is required across the output. For $\geq 6000V$ output models, optional capacitors up to 470pF may be placed across the output for further ripple reduction.

Note 4: For isolated models, input ground and output ground is not connected internally. Input ground and output ground cannot be connected externally.

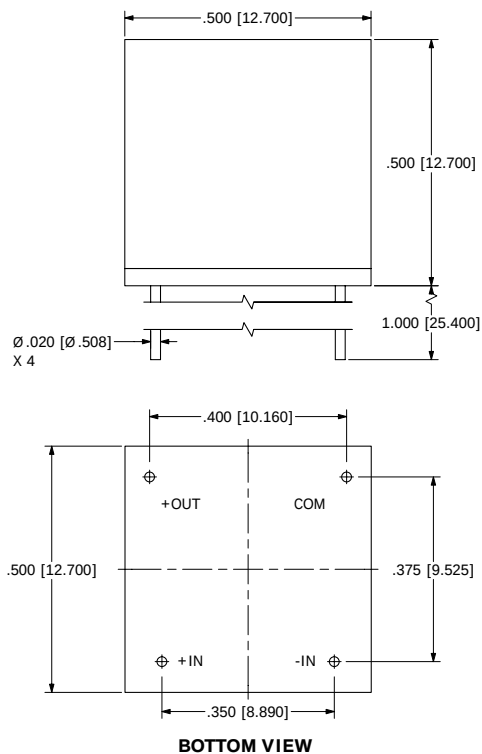
Note 5: For non-isolated positive models, output COM terminal must be connected to input positive or input negative externally. Output will be positive voltage and non-isolated from input. Module is internally transformer isolated.

Note 6: For non-isolated negative models, output COM terminal must be connected to input positive or input negative externally. Output will be negative voltage and non-isolated from input. Module is internally transformer isolated.

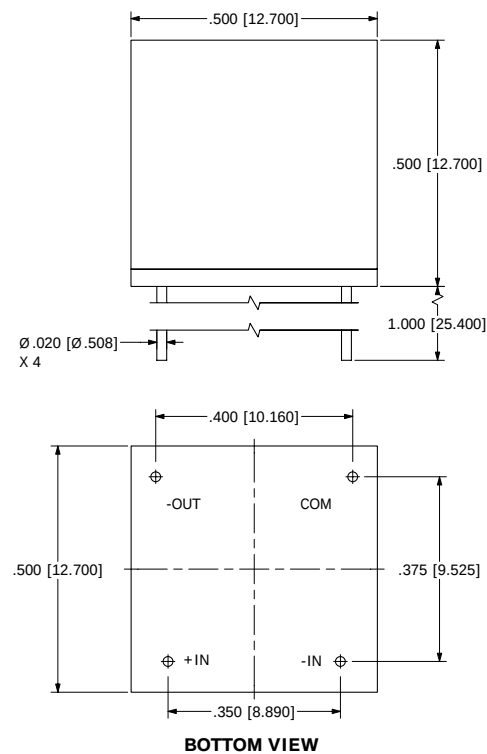
MECHANICAL DRAWINGS

≤5000V OUTPUT MODELS

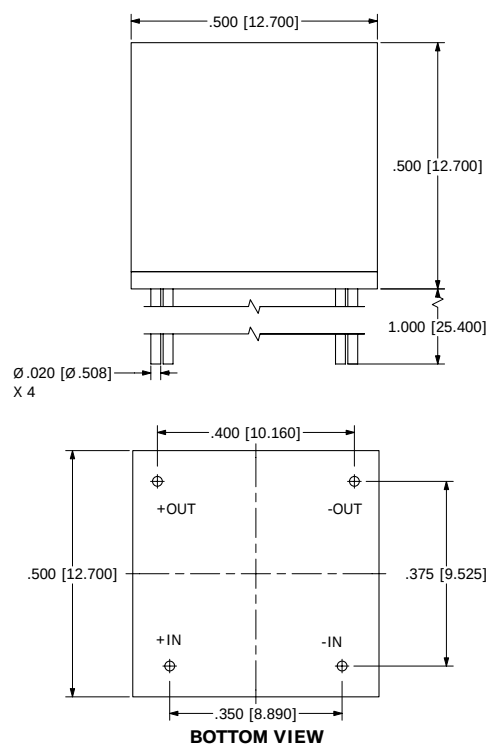
NON-ISOLATED POSITIVE OUTPUT



NON-ISOLATED NEGATIVE OUTPUT

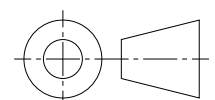


ISOLATED OUTPUT



NOTES

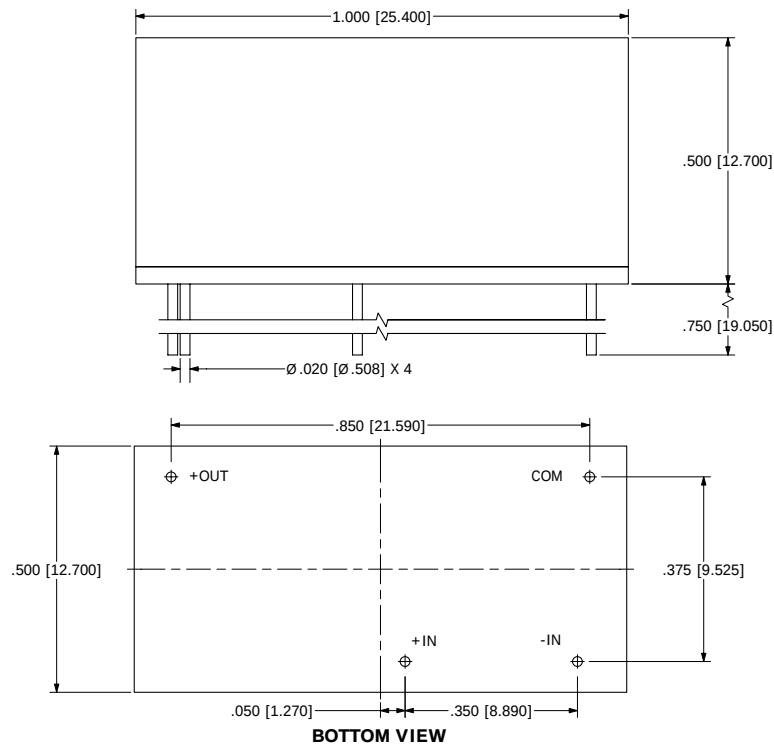
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- COMMON OUTPUT MUST BE CONNECTED TO +IN OR -IN INPUT



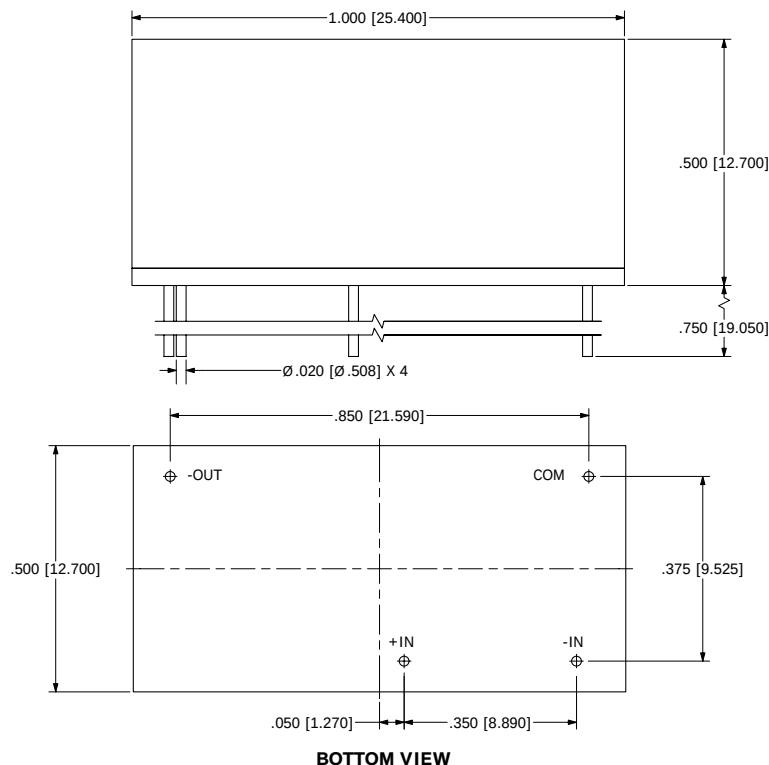
MECHANICAL DRAWINGS

≥6000V OUTPUT MODELS

ISOLATED POSITIVE OUTPUT

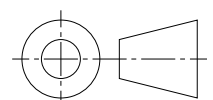


ISOLATED NEGATIVE OUTPUT

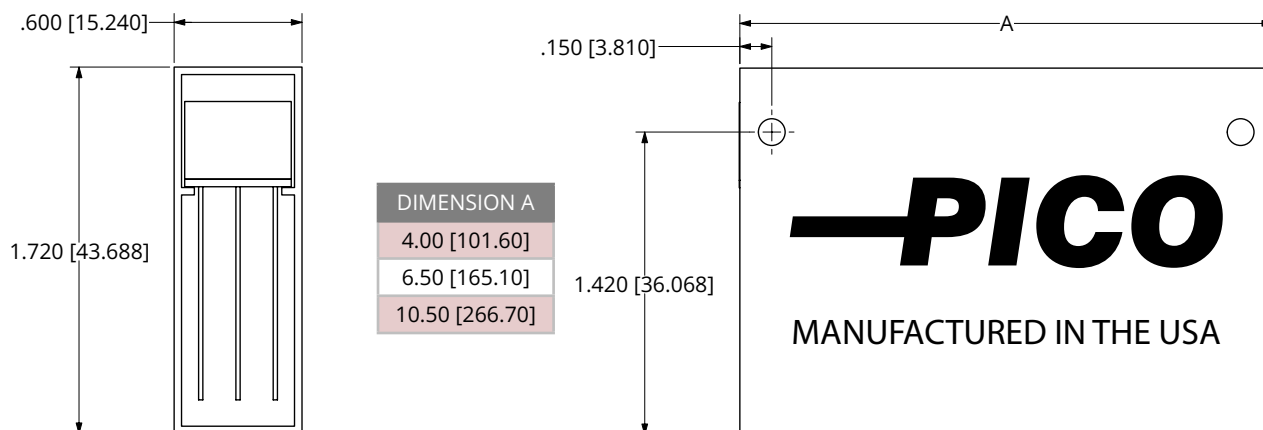


NOTES

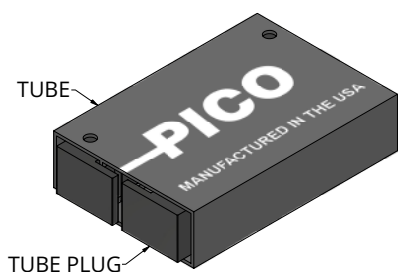
- a. ALL DIMENSIONS ARE IN INCHES, [] = MM
- b. COMMON OUTPUT MUST BE CONNECTED TO +IN OR -IN INPUT



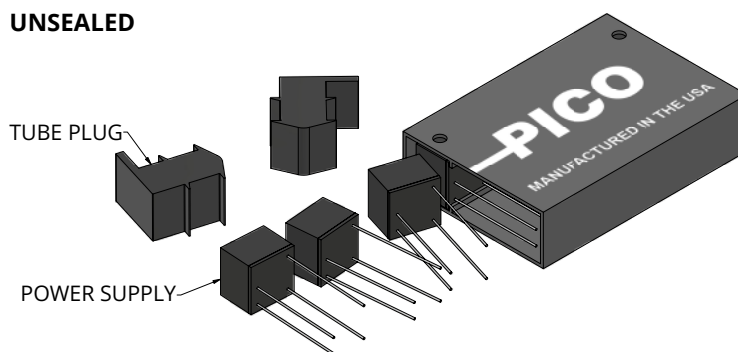
TUBE PACKAGING



SEALED



UNSEALED



Pico warrants each product manufactured by us and sold by us or an authorized representative, to be free from defects in material and workmanship. If properly used, it will perform within its applicable specifications for a period of one year after original shipment. Pico's obligation under this guarantee is limited to repairing or replacing our product to the original purchaser. This warranty is in lieu of all other warranties, express or implied and constitutes fulfillment of our obligations to the purchaser. We do not guarantee that the products can be used for a particular purpose other than those solely covered by the product's specifications. Pico must be notified if the product must meet particular certifications and/or standards. We assume no liability, in any event, for consequential damages, for anticipated or lost profits, incidental damages or loss of time or other losses incurred by the purchaser or any third party in connection with products covered by this warranty or otherwise. The purchaser will indemnify and hold Pico harmless for any damages, losses, costs, etc. from usage not within the product's specifications. Pico must be consulted before usage of its products in a nuclear, radioactive or space environment.

We reserve the right to discontinue products without notice, We reserve the right to make modifications to any existing catalog products without notice, at any time, without the obligation to modify units previously sold.

Series SA & SA-SM

3W Isolated Proportional High Voltage DC-DC Converter

PICO
Electronics, Inc.

PRODUCT OVERVIEW

The SA & SA-SM series modules are isolated DC-DC converters with high efficiency, excellent load regulation, ultra-miniature case and low output ripple. It can operate in a wide temperature range without derating or heatsink. Protections include input overvoltage, and over temperature.

Through hole and surface mount packages are available. Every single output has a center tap for a dual output configuration. Due to a resonant design, it exhibits a very low load effect.



FEATURES

- 3W output power
- At least $\pm 10\%$ input voltage range
- No minimum load
- Protected against input overvoltage, output short-circuit and over temperature
- Shutdown feature
- Single or dual output configuration

Contact Pico for part number of available options:

- Expanded operating temp: -55°C to $+85^{\circ}\text{C}$
- Select screening per MIL-STD-883:
 - Stabilization Bake
 - Temperature Cycle
 - Burn-In
- Available RoHS Compliant module
- Special Input Voltage, Output Voltage, Isolation Voltage or Output Power

24

INPUT VOLTAGE RANGE

5 = 5V
12 = 12V
24 = 24V
28 = 28V

SA

SERIES NAME

SA

100

NOM. OUTPUT VOLTAGE

100 = 100V
150 = 150V
200 = 200V
250 = 250V
300 = 300V
350 = 350V
400 = 400V
450 = 450V
500 = 500V
600 = 600V
700 = 700V
800 = 800V
900 = 900V
1000 = 1000V

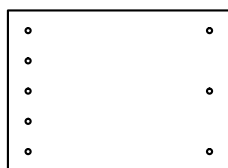
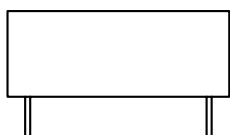
SM

MOUNTING

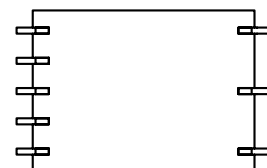
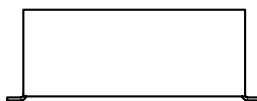
BLANK = THROUGH HOLE
SM = SURFACE MOUNT

MODEL LIST

SERIES SA - THROUGH HOLE



SERIES SA-SM - SURFACE MOUNT



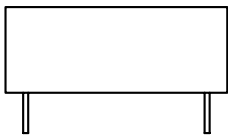
Through Hole	Surface Mount	Output Voltage [VDC]	Output Current		Efficiency ⁽¹⁾ [%] typ.	Input Current ⁽²⁾		Load Regulation 0-100% [%] max	Output Ripple @ 1MHz BW [%]
			Min. [mA]	Max. [mA]		No Load [mA] typ.	Full Load [mA] typ.		
5SA100	5SA100SM	100	0	30	86	65	695	5	0.8
5SA150	5SA150SM	150		20	85	66	705	6	1
5SA200	5SA200SM	200		15	87	65	690	8	1.3
5SA250	5SA250SM	250		12	87	67	690	7	1.6
5SA300	5SA300SM	300		10	85	66	700	6	1.3
5SA350	5SA350SM	350		8.6	85	67	700	6	1.4
5SA400	5SA400SM	400		7.5	84	56	710	5	2
5SA450	5SA450SM	450		6.7	85	57	705	5	2
5SA500	5SA500SM	500		6	85	59	705	2	1
5SA600	5SA600SM	600		5	85	70	700	6	1.5
5SA700	5SA700SM	700		4.3	82	76	725	5	1.4
5SA800	5SA800SM	800		3.8	83	83	720	3	1
5SA900	5SA900SM	900		3.3	81	90	735	5	1
5SA1000	5SA1000SM	1000		3	81	95	740	5	0.5
12SA100	12SA100SM	100		30	86	41	290	3	1
12SA150	12SA150SM	150		20	86	41	290	6	1
12SA200	12SA200SM	200		15	86	44	292	6	1.3
12SA250	12SA250SM	250		12	83	43	302	4.5	1.2
12SA300	12SA300SM	300		10	84	42	298	3.5	0.75
12SA350	12SA350SM	350		8.6	83	42	300	3.5	1.4
12SA400	12SA400SM	400		7.5	85	39	295	5	1.5
12SA450	12SA450SM	450		6.7	85	39	295	6	2
12SA500	12SA500SM	500		6	84	40	298	4	1
12SA600	12SA600SM	600		5	83	40	300	2	1
12SA700	12SA700SM	700		4.3	82	45	305	4	1.4
12SA800	12SA800SM	800		3.8	81	46	308	6	1
12SA900	12SA900SM	900		3.3	81	46	310	7	1
12SA1000	12SA1000SM	1000		3	81	47	310	8	0.75

Note 1: Tested at nominal input voltage and full output load.

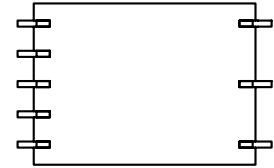
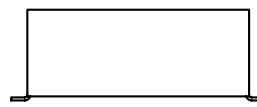
Note 2: Tested at nominal input voltage.

MODEL LIST

SERIES SA - THROUGH HOLE



SERIES SA-SM - SURFACE MOUNT



Through Hole	Surface Mount	Output Voltage [VDC]	Output Current		Efficiency ⁽¹⁾ [%] typ.	Input Current ⁽²⁾		Load Regulation 0-100% [%] max	Output Ripple @ 1MHz BW ⁽³⁾ [%]
			Min. [mA]	Max. [mA]		No Load [mA] typ.	Full Load [mA] typ.		
24SA100	24SA100SM	100	0	30	86	19	145	6	1
24SA150	24SA150SM	150		20	86	20	145	6	1
24SA200	24SA200SM	200		15	83	20	150	6	1.3
24SA250	24SA250SM	250		12	82	21	153	5	1.2
24SA300	24SA300SM	300		10	81	21	155	5	1
24SA350	24SA350SM	350		8.6	80	22	156	4	1.4
24SA400	24SA400SM	400		7.5	85	18	147	5	1.5
24SA450	24SA450SM	450		6.7	84	19	148	6	2
24SA500	24SA500SM	500		6	84	20	148	4	1
24SA600	24SA600SM	600		5	84	20	148	7	1.2
24SA700	24SA700SM	700		4.3	84	23	149	4	1.4
24SA800	24SA800SM	800		3.8	83	23	150	6	1
24SA900	24SA900SM	900		3.3	83	24	150	7	1
24SA1000	24SA1000SM	1000		3	83	24	150	6	0.75
28SA100	28SA100SM	100		30	83	20	129	6	1
28SA150	28SA150SM	150		20	83	20	129	6	1
28SA200	28SA200SM	200		15	81	21	132	6	1.3
28SA250	28SA250SM	250		12	81	21	133	5	1.2
28SA300	28SA300SM	300		10	81	22	133	6	1
28SA350	28SA350SM	350		8.6	80	22	134	4	1.4
28SA400	28SA400SM	400		7.5	84	18	127	5	1.5
28SA450	28SA450SM	450		6.7	84	19	128	6	2
28SA500	28SA500SM	500		6	83	20	129	4	1
28SA600	28SA600SM	600		5	82	20	130	5	1.5
28SA700	28SA700SM	700		4.3	84	23	127	4	1.4
28SA800	28SA800SM	800		3.8	84	23	127	6	1
28SA900	28SA900SM	900		3.3	84	24	128	7	1
28SA1000	28SA1000SM	1000		3	84	24	128	6	1

Note 1: Tested at nominal input voltage and full output load.

Note 2: Tested at nominal input voltage.

SPECIFICATIONS (Nominal V_{IN} , Full Load, $T_A = +25^{\circ}\text{C}$, 1 hour warm up unless otherwise specified)**INPUT**

Parameter	Condition	Min.	Typ.	Max.	Units
Input Voltage Range	5V input models	4.5	5	5.5	VDC
	12V input models	10	12	14	
	24V input models	21	24	27	
	28V input models	25	28	30	

OUTPUT

Parameter	Condition	Min.	Typ.	Max.	Units
Line Regulation	Output voltage is directly proportional to input voltage				
Output Power		0	-	3	W
Output Voltage Tolerance	Nominal V_{IN} , Full Load	-	-	3	±%

ENVIRONMENTAL

Parameter	Condition	Min.	Typ.	Max.	Units
Operating Temperature Range	Ambient without derating	-25	-	+70	°C
Storage Temperature Range	Ambient	-55	-	+125	°C
Temperature Coefficient		-	-	0.05	%/°C
Cooling	Free Air Convection				

GENERAL

Parameter	Condition	Min.	Typ.	Max.	Units
Operating Frequency	Fixed, model dependent	250	-	500	kHz
Isolation Voltage	Input to output	1500	-	-	VDC
Insulation Resistance		100	-	-	MΩ
Size (L x W x H)	Series SA	0.75 x 0.55 x 0.4 (19.05 x 13.97 x 10.16)			inches (mm)
	Series SA-SM	0.75 x 0.55 x 0.45 (19.05 x 13.97 x 11.43)			
Weight		-	6	-	grams
Case	Glass Reinforced Polymer				
Potting	Vacuum Impregnated Epoxy				
Tube Packaging (W x H x L)	1.245 x 0.72 x 20 (31.623 x 18.288 x 508)				inches (mm)
Moisture Sensitivity Level	Series SA-SM	IPC / JEDEC J-STD-020, Level 3			

PROTECTIONS & FEATURES

Parameter	Condition	Min.	Typ.	Max.	Units
Overtemperature	Internal, Non-latched shutdown, self-recovery	-	125	-	°C
Input Over Voltage	Non-latched shutdown, Self-recovery	5V input models	-	6	VDC
		12V input models	-	14.5	
		24V input models	-	28	
		28V input models	-	31	
Shutdown (SHDN)	Non-latched shutdown, self-recovery	-	0.4	-	VDC

DESIGNED TO MEET

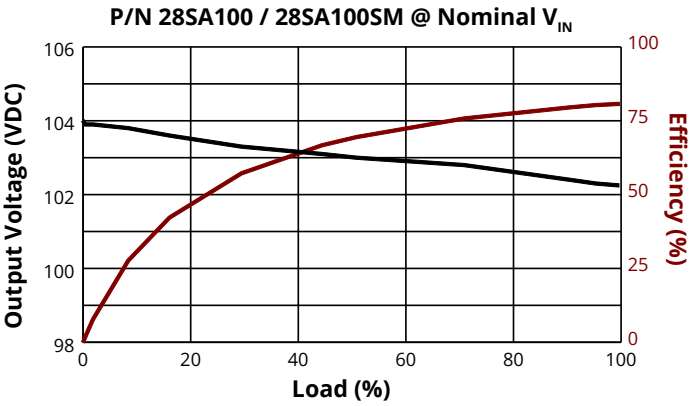
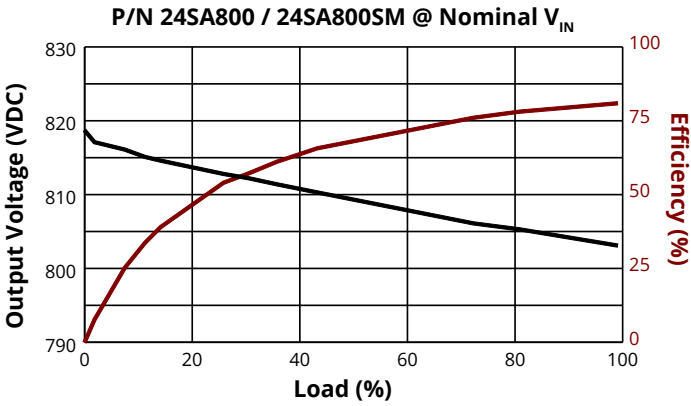
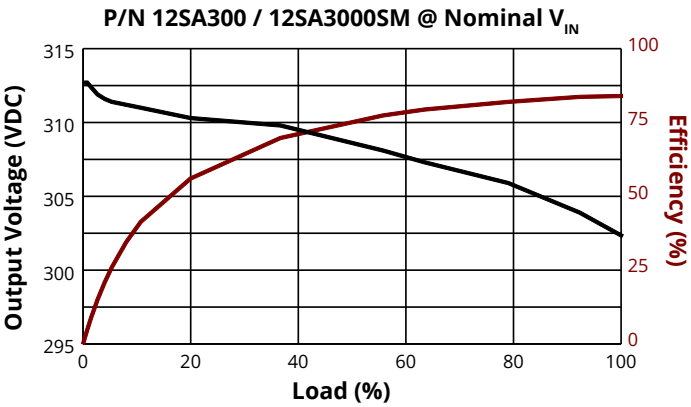
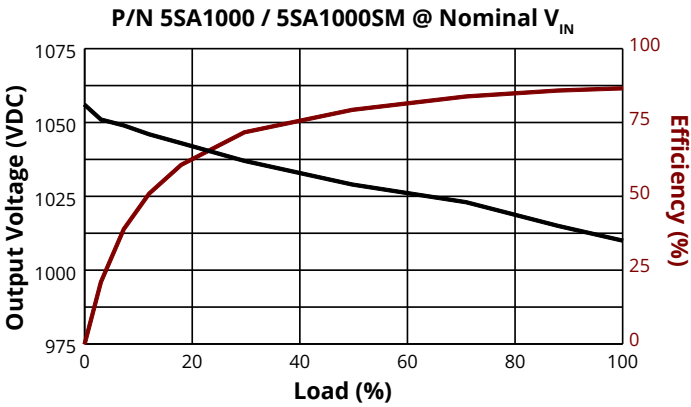
Test	Referenced Standard	Description
Vibration	MIL-STD-202	Method 204, Vibration, High Frequency, Condition D
Shock	MIL-STD-202	Method 213, Shock (Specified Pulse), Condition I
Humidity	MIL-STD-202	Method 106, Moisture Resistance
Altitude	MIL-STD-202	Method 105, Barometric Pressure (Reduced), Condition D

SPECIFICATIONS (Nominal V_{IN} , Full Load, $T_A = +25^{\circ}\text{C}$, 1 hour warm up unless otherwise specified)

OPTIONS AVAILABLE - CONTACT PICO FOR PART NUMBER

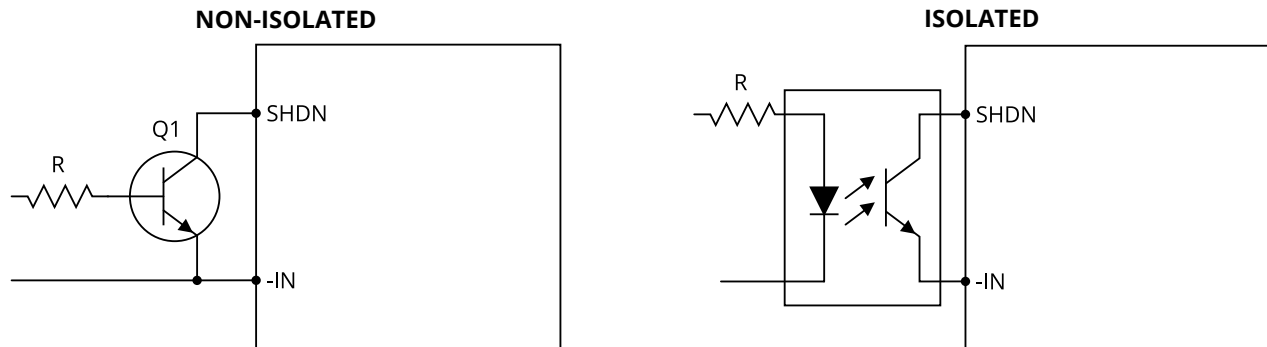
Parameter	Referenced Standard	Description
Stabilization Bake	MIL-STD-883	Referenced Method 1008 Non-operating maximum storage temperature for 24 hours
Temperature Cycle	MIL-STD-883	Referenced Method 1010 Non-operating at temperature extremes, 15 mins/temp, 10 cycles
Burn-In	MIL-STD-883	Referenced Method 1015 Max operating temperature for 160 hours
Expanded Ambient Operating Temperature		-55°C to +85°C
RoHS Compliance		-

DATA CURVES (Nominal V_{IN} , $T_A = +25^{\circ}\text{C}$, 1 hour warm up unless otherwise specified)

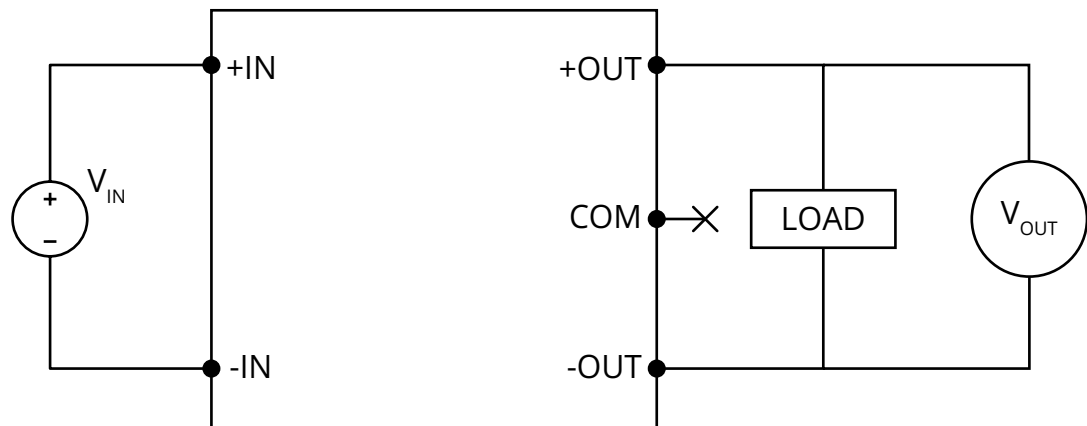


TYPICAL CONNECTION CIRCUIT

SHUTDOWN

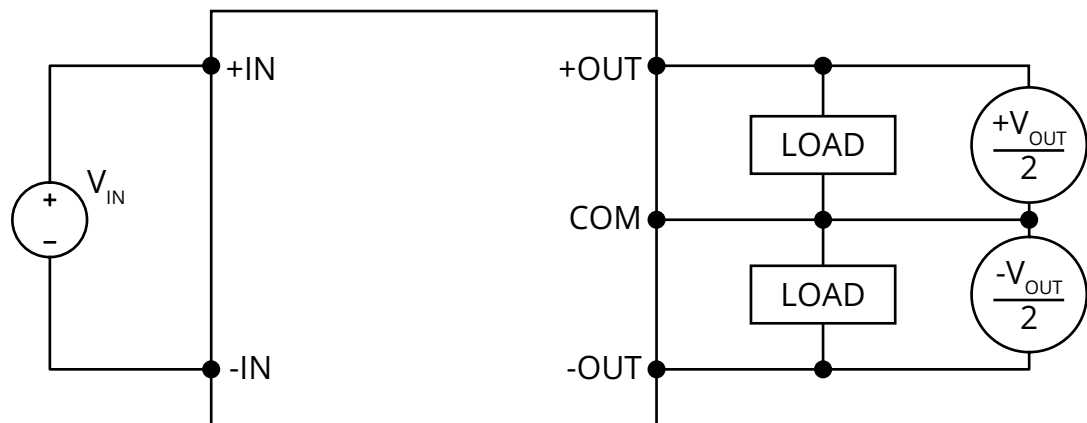


SINGLE OUTPUT OPERATION



Nominal output voltage is measured between $+OUT$ and $-OUT$. For single output, COM should be disconnected.

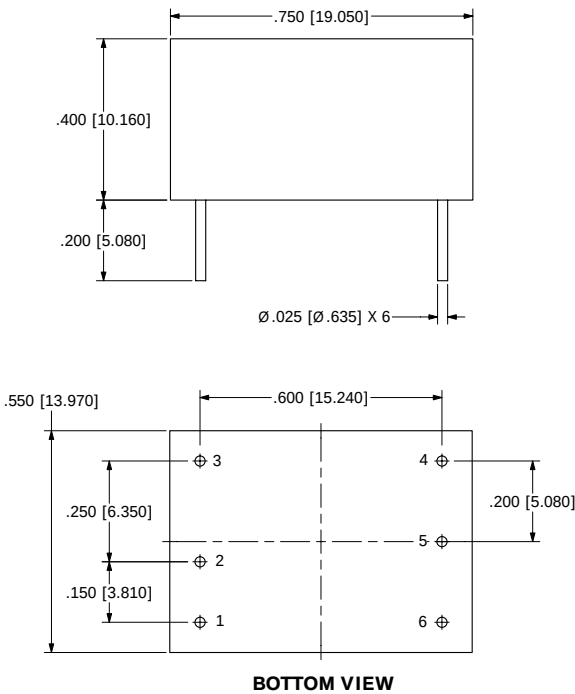
DUAL OUTPUT OPERATION



Nominal output voltage is measured between $+OUT$ and $-OUT$. For dual outputs, COM will be half of the voltage between $+OUT$ and $-OUT$. Both loads must be balanced.

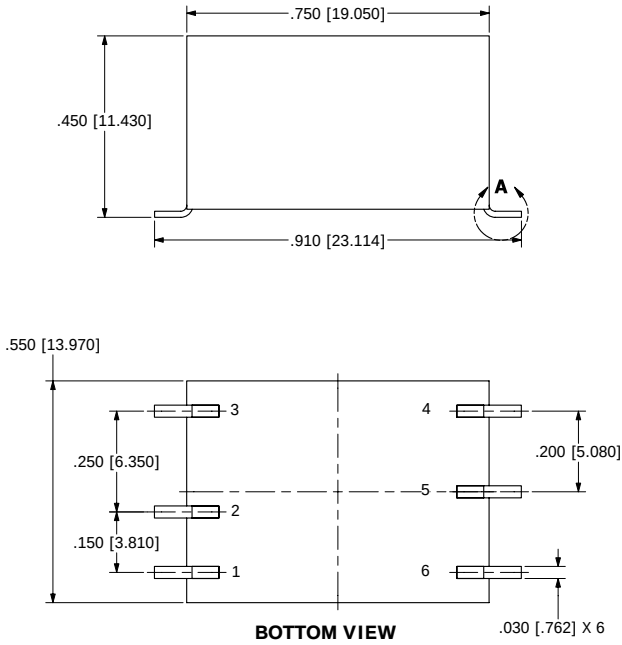
MECHANICAL DRAWINGS

SERIES SA - THROUGH HOLE

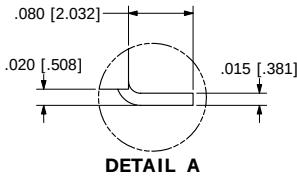


PIN	FUNCTION
1	-IN
2	SHDN
3	+IN
4	+OUT
5	COM
6	-OUT

SERIES SA-SM - SURFACE MOUNT

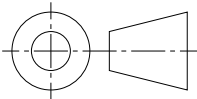


LEAD DETAILS

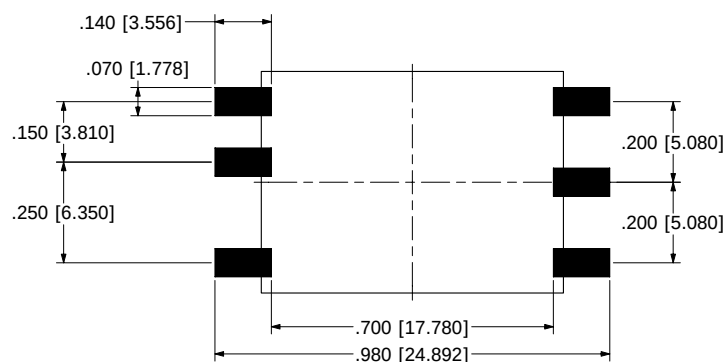


PIN	FUNCTION
1	-IN
2	SHDN
3	+IN
4	+OUT
5	COM
6	-OUT

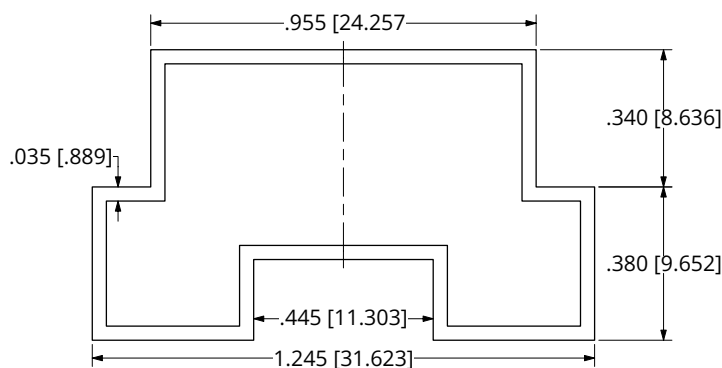
NOTES
a. ALL DIMENSIONS ARE IN INCHES, [] = MM



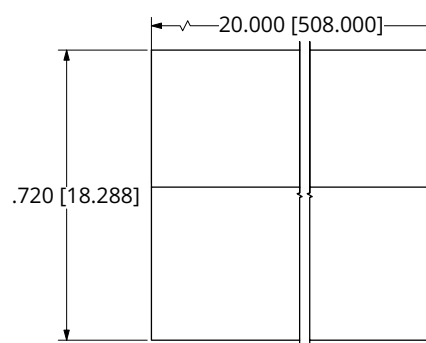
RECOMMENDED LAND PATTERN DIMENSIONS - SERIES SA-SM



TUBE PACKAGING

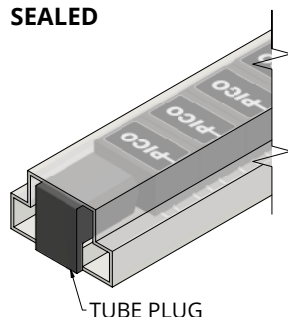


PLAN VIEW

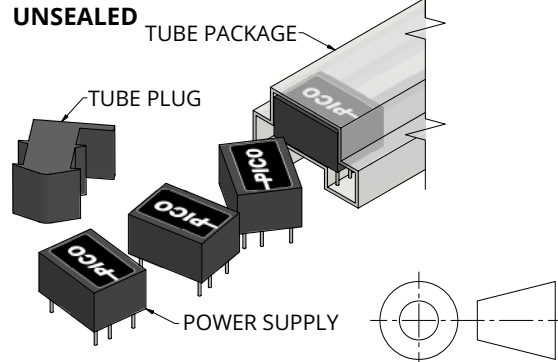


ELEVATION VIEW

SEALED



UNSEALED



Pico warrants each product manufactured by us and sold by us or an authorized representative, to be free from defects in material and workmanship. If properly used, it will perform within its applicable specifications for a period of one year after original shipment. Pico's obligation under this guarantee is limited to repairing or replacing our product to the original purchaser. This warranty is in lieu of all other warranties, express or implied and constitutes fulfillment of our obligations to the purchaser. We do not guarantee that the products can be used for a particular purpose other than those solely covered by the product's specifications. Pico must be notified if the product must meet particular certifications and/or standards. We assume no liability, in any event, for consequential damages, for anticipated or lost profits, incidental damages or loss of time or other losses incurred by the purchaser or any third party in connection with products covered by this warranty or otherwise. The purchaser will indemnify and hold Pico harmless for any damages, losses, costs, etc. from usage not within the product's specifications. Pico must be consulted before usage of its products in a nuclear, radioactive or space environment.

We reserve the right to discontinue products without notice, We reserve the right to make modifications to any existing catalog products without notice, at any time, without the obligation to modify units previously sold.

Series SAR & SAR-SM

3W Isolated Adjustable High Voltage DC-DC Converter

PICO
Electronics, Inc.

PRODUCT OVERVIEW

The SAR series modules are isolated DC-DC converters with 0% to 100% output voltage programmable by internal reference or external voltage. These modules have an internal reference voltage and shutdown. Protections include input over/undervoltage, over temperature and over programming.

Through hole and surface mount packages are available. Every single output has a center tap for a dual output configuration. Due to a resonant design, it exhibits a very low load effect.



FEATURES

- 0-100% programmable output feature
- Up to 3W output power
- 2:1 wide input voltage range with 0.5% line regulation
- Protected against input over/undervoltage, over temperature and over programming
- Internal reference voltage feature
- Shutdown feature
- Single or dual output configuration

Contact Pico for part number of available options:

- Expanded operating temp: -55°C to +85°C
- Select screening per MIL-STD-883:
 - Stabilization Bake
 - Temperature Cycle
 - Burn-In
- Available RoHS Compliant module
- Special Input Voltage, Output Voltage, Isolation Voltage or Output Power

24

INPUT VOLTAGE RANGE

5 = 5 - 10V
12 = 7.5 - 15V
24 = 18 - 36V

SAR

SERIES NAME

SAR

100

NOM. OUTPUT VOLTAGE

100 = 100V
250 = 250V
500 = 500V
1000 = 1000V
1500 = 1500V

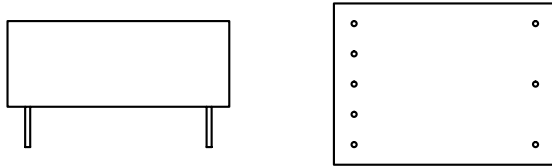
SM

MOUNTING

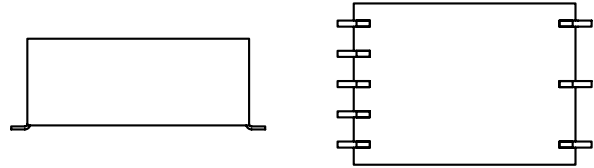
BLANK = THROUGH HOLE
SM = SURFACE MOUNT

MODEL LIST

THROUGH HOLE



SURFACE MOUNT



Through Hole	Surface Mount	Output Voltage [VDC]	Output Current		Efficiency ⁽¹⁾ [%] typ.	Input Current ⁽²⁾		Load Regulation 0-100% [%] typ.	Output Ripple @ 1MHz BW [%]
			Min. [mA]	Max. [mA]		No Load [mA] typ.	Full Load [mA] typ.		
5SAR100	5SAR100SM	100	0	30	78	45	510	8	0.2
5SAR250	5SAR250SM	250		12	78	56	512	5	0.15
5SAR500	5SAR500SM	500		6	77	76	517	4	0.15
5SAR1000	5SAR1000SM	1000		3	75	76	530	5	0.2
5SAR1500	5SAR1500SM	1500		2	74	71	546	5	0.3
12SAR100	12SAR100SM	100		30	80	55	310	5	0.2
12SAR250	12SAR250SM	250		12	81	56	309	3	0.15
12SAR500	12SAR500SM	500		6	79	44	315	4	0.4
12SAR1000	12SAR1000SM	1000		3	79	50	320	4	0.25
12SAR1500	12SAR1500SM	1500		2	78	51	318	4	0.3
24SAR100	24SAR100SM	100		30	75	35	168	5	0.35
24SAR250	24SAR250SM	250		12	75	32	165	3	0.3
24SAR500	24SAR500SM	500		6	77	29	165	4	0.2
24SAR1000	24SAR1000SM	1000		3	76	30	167	4	0.2
24SAR1500	24SAR1500SM	1500		2	73	39	170	4	0.2

Note 1: Tested at nominal input voltage and full output load.

Note 2: Tested at nominal input voltage.

SPECIFICATIONS (Nominal V_{IN} , Full Load, $T_A = +25^{\circ}\text{C}$, 1 hour warm up unless otherwise specified)

INPUT

Parameter	Condition	Min.	Typ.	Max.	Units
Input Voltage Range	5SAR models	5	7.5	10	VDC
	12SAR models	7.5	12	15	
	24SAR models	18	24	36	

OUTPUT

Parameter	Condition		Min.	Typ.	Max.	Units
Line Regulation	24SAR models		-	-	0.5	%
	All other models				0.1	
Output Power	5SAR models	5.5-5V input	Derate 50% power per input voltage from 5.5V input			W
		5.5-10V input	0	-	3	
	All other models		0	-	3	
Output Voltage Tolerance	Nominal V_{IN} , Full Load		-	-	3	±%

ENVIRONMENTAL

Parameter	Condition	Min.	Typ.	Max.	Units
Operating Temperature Range	Ambient without derating	-25	-	+70	°C
Storage Temperature Range	Ambient	-55	-	+125	°C
Temperature Coefficient		-	-	0.02	%/°C
Cooling	Free Air Convection				

SPECIFICATIONS (Nominal V_{IN} , Full Load, $T_A = +25^{\circ}\text{C}$, 1 hour warm up unless otherwise specified)**GENERAL**

Parameter	Condition	Min.	Typ.	Max.	Units
Operating Frequency	Fixed, model dependent	125	-	450	kHz
Isolation Voltage	Input to output	1500	-	-	VDC
Insulation Resistance		100	-	-	MΩ
Size (L x W x H)	Through hole	1.1 x 0.8 x 0.425 (27.94 x 20.32 x 10.795)			inches (mm)
	Surface mount	1.1 x 0.8 x 0.45 (27.94 x 20.32 x 11.43)			
Weight		-	12	-	grams
Case	Glass Reinforced Polymer				
Potting	Vacuum Impregnated Epoxy				
Tube Packaging (W x H x L)		1.645 x 0.74 x 20 (41.783 x 18.796 x 508)			inches (mm)
Moisture Sensitivity Level	Surface mount	IPC / JEDEC J-STD-020, Level 3			

PROTECTIONS & FEATURES

Parameter	Condition	Min.	Typ.	Max.	Units
Overtemperature	Internal, Non-latched shutdown, self-recovery	-	105	-	°C
Input Under Voltage	Non-latched shutdown, Self-recovery	5SAR models	-	4	VDC
		12SAR models	-	7	
		24SAR models	-	16	
Input Over Voltage	Non-latched shutdown, Self-recovery	5SAR models	-	10.5	VDC
		12SAR models	-	16	
		24SAR models	-	38	
Shutdown (SHDN)	Non-latched shutdown, Self-recovery	-	0.4	-	VDC
	Note 1: Shutdown will shut down the unit when the pin is pulled below 0.4V. The unit will restart once the pin reaches operating input voltage.				
Output Voltage Programming (ADJ)	Voltage, Linear 0-100% Vout	0	-	3	VDC
	Note 2: Output Voltage Programming can program the output voltage 0 to 100% Vout using 0 to 3V range. Open connection defaults to 100% Vout.				
Programming Reference (REF)	Voltage	2.85	3	3.15	VDC
	Current	0	-	1	mA
	Note 3: Programming Reference can be used for Output Voltage Programming (ADJ) pin. Voltage is typically 3V and current is <1mA.				

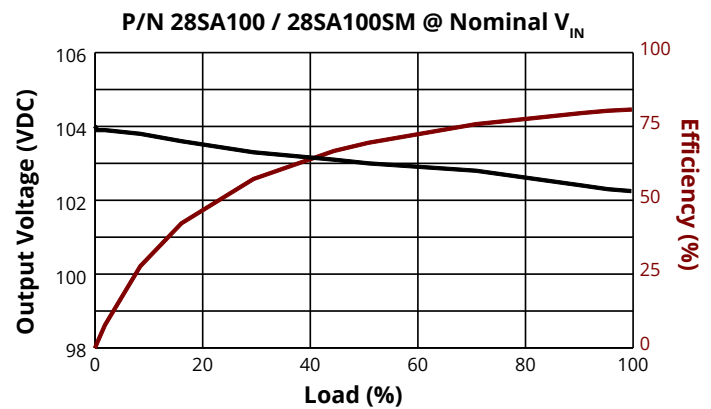
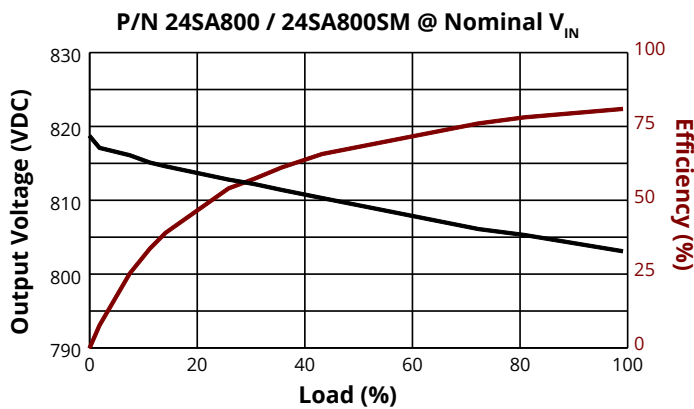
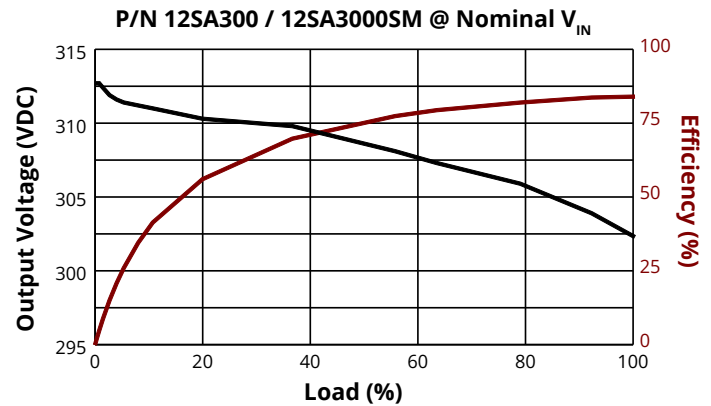
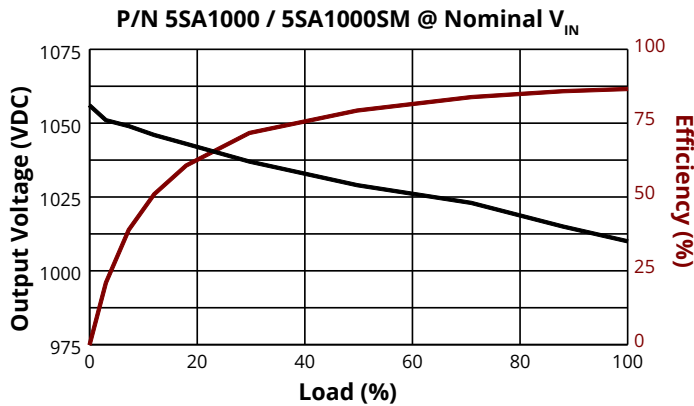
DESIGNED TO MEET

Test	Referenced Standard	Description
Vibration	MIL-STD-202	Method 204, Vibration, High Frequency, Condition D
Shock	MIL-STD-202	Method 213, Shock (Specified Pulse), Condition I
Humidity	MIL-STD-202	Method 106, Moisture Resistance
Altitude	MIL-STD-202	Method 105, Barometric Pressure (Reduced), Condition D

OPTIONS AVAILABLE – CONTACT PICO FOR PART NUMBER

Parameter	Referenced Standard	Description
Stabilization Bake	MIL-STD-883	Referenced Method 1008 Non-operating maximum storage temperature for 24 hours
Temperature Cycle	MIL-STD-883	Referenced Method 1010 Non-operating at temperature extremes, 15 mins/temp, 10 cycles
Burn-In	MIL-STD-883	Referenced Method 1015 Max operating temperature for 160 hours
Expanded Ambient Operating Temperature		-55°C to +85°C
RoHS Compliance		-

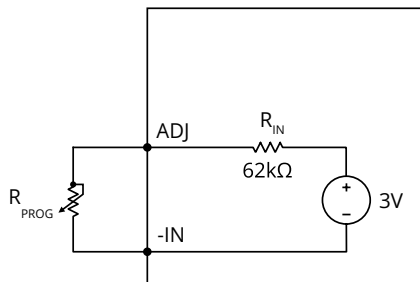
DATA CURVES (Nominal V_{IN} , $T_A = +25^\circ\text{C}$, 1 hour warm up unless otherwise specified)



TYPICAL CONNECTION CIRCUIT

OUTPUT VOLTAGE PROGRAMMING

RESISTOR - 5SAR & 12SAR MODELS ONLY



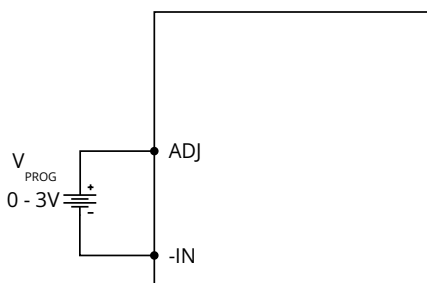
$$\frac{V_{OUT}}{V_{NOM}} = \frac{1.61}{\frac{1}{R_{PROG}} + \frac{1}{62}}$$

V_{OUT} = Programmed Output Voltage

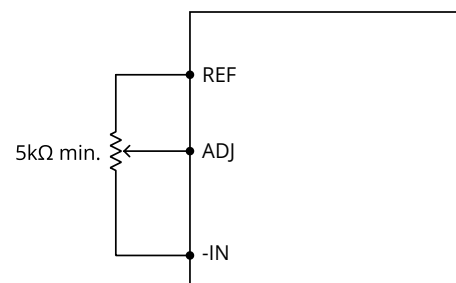
V_{NOM} = Nominal Output Voltage

R_{PROG} = Resistance in kΩ

EXTERNAL VOLTAGE - ALL MODELS



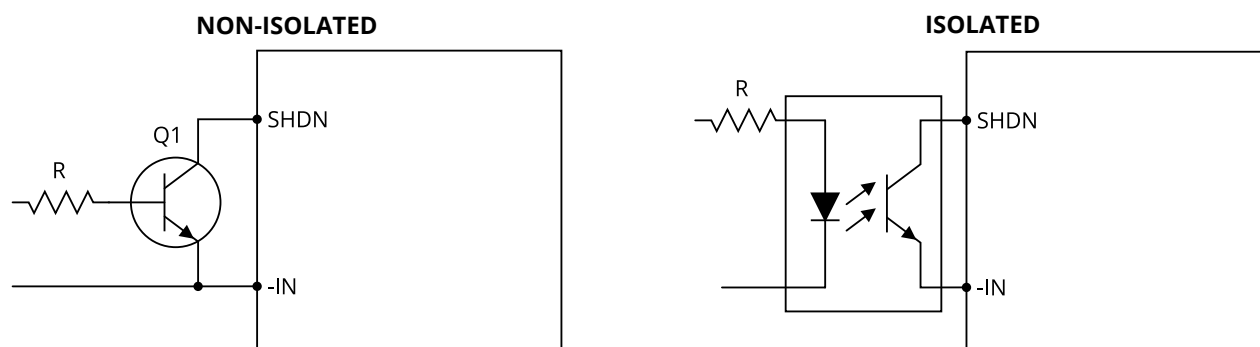
INTERNAL VOLTAGE REFERENCE - ALL MODELS



Note 2: Output Voltage Programming can program the output voltage 0 to 100% V_{out} using 0 to 3V range. Open connection defaults to 100% V_{out} .
 Note 3: Programming Reference can be used for Output Voltage Programming (ADJ) pin. Voltage is typically 3V and current is <1mA.

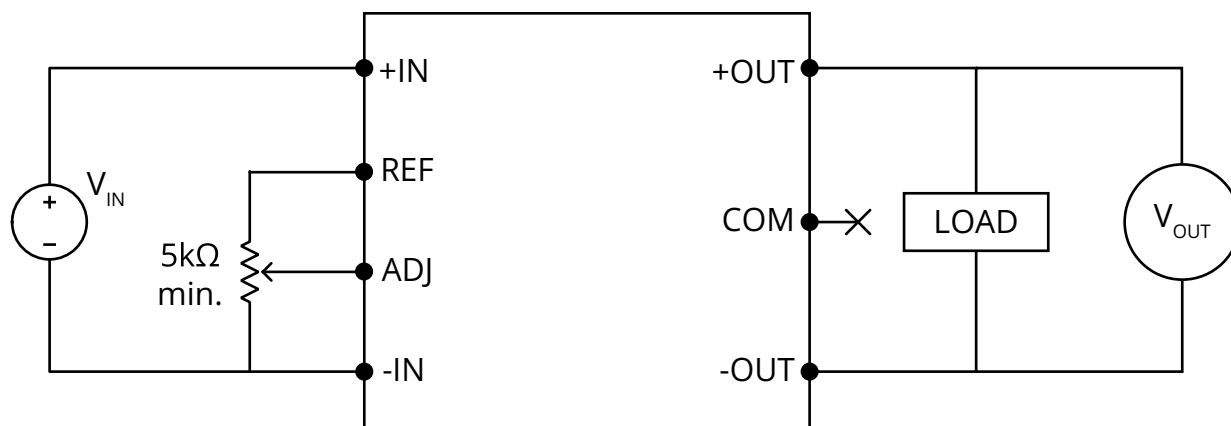
TYPICAL CONNECTION CIRCUIT

SHUTDOWN



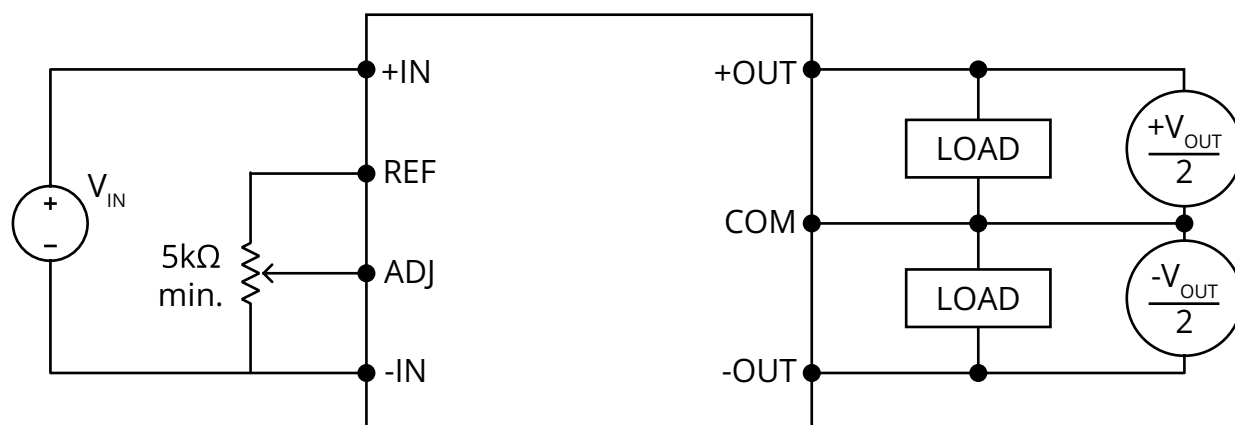
Note 1: Shutdown will shut down the unit when the pin is pulled below 0.4V. The unit will restart once the pin reaches operating input voltage.

SINGLE OUTPUT OPERATION



Note 4: Nominal output voltage is measured between +OUT and -OUT. For single output, COM should be disconnected.

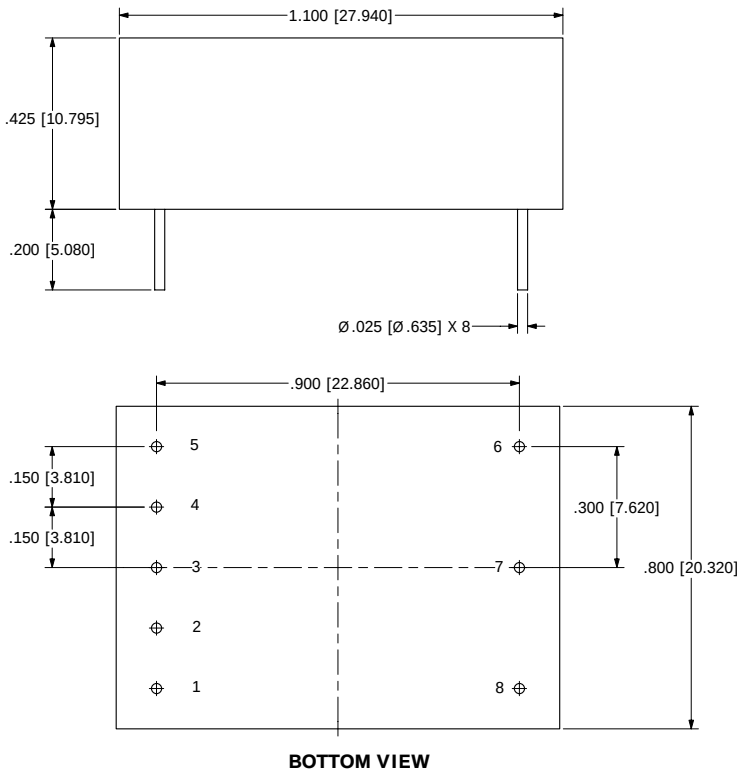
DUAL OUTPUT OPERATION



Note 5: Nominal output voltage is measured between +OUT and -OUT. For dual outputs, COM will be half of the voltage between +OUT and -OUT. Both loads must be balanced.

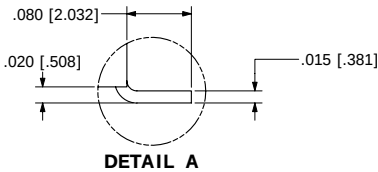
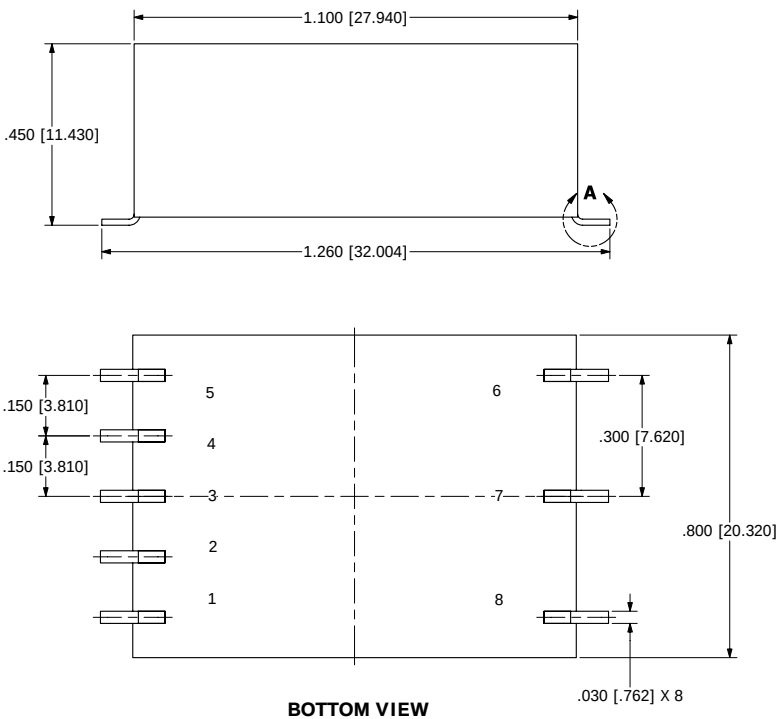
MECHANICAL DRAWINGS

THROUGH HOLE



PIN	FUNCTION
1	-IN
2	ADJ
3	REF
4	SHDN
5	+IN
6	+OUT
7	COM
8	-OUT

SURFACE MOUNT

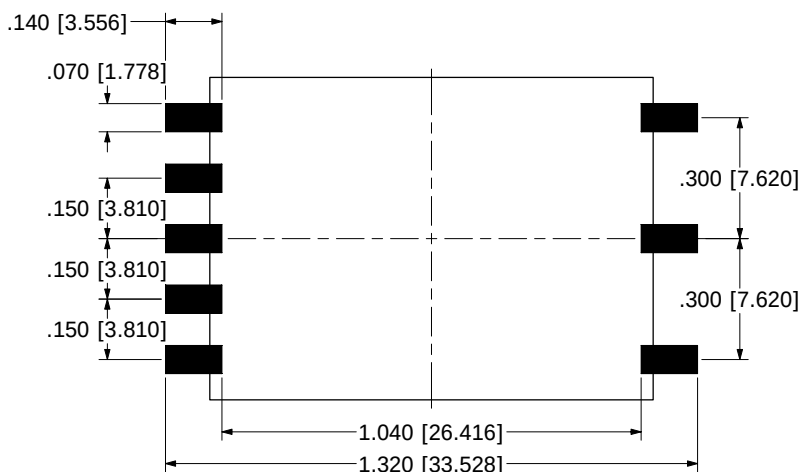


PIN	FUNCTION
1	-IN
2	ADJ
3	REF
4	SHDN
5	+IN
6	+OUT
7	COM
8	-OUT

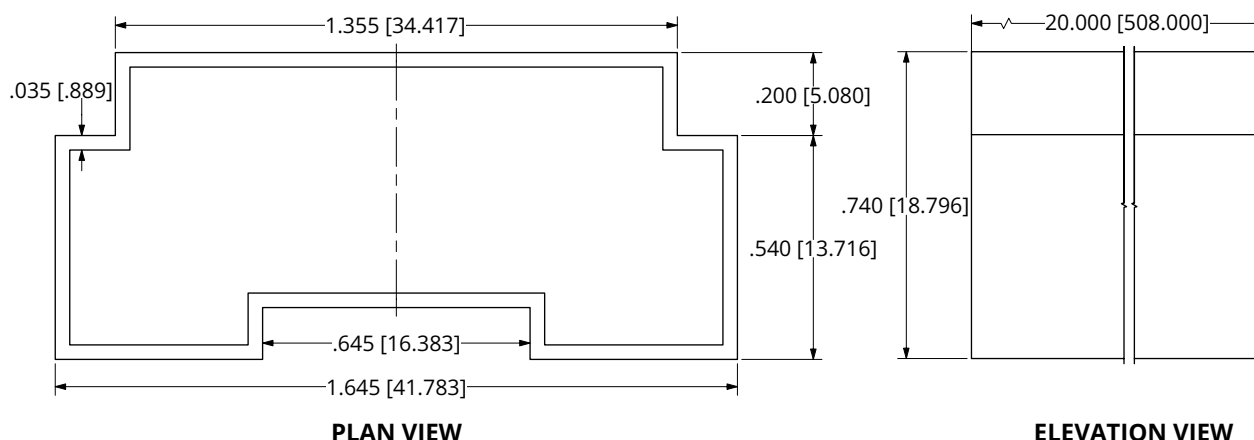
NOTES

a. ALL DIMENSIONS ARE IN INCHES, [] = MM

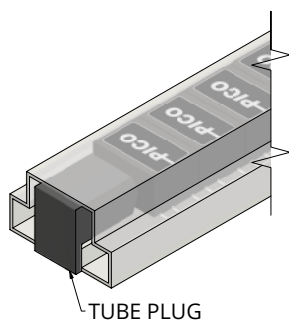
RECOMMENDED LAND PATTERN DIMENSIONS



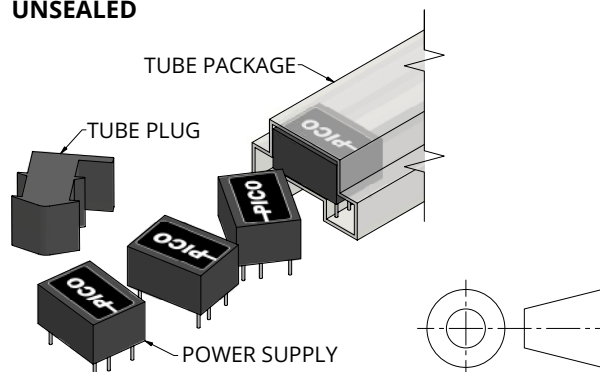
TUBE PACKAGING



SEALED



UNSEALED



Pico warrants each product manufactured by us and sold by us or an authorized representative, to be free from defects in material and workmanship. If properly used, it will perform within its applicable specifications for a period of one year after original shipment. Pico's obligation under this guarantee is limited to repairing or replacing our product to the original purchaser. This warranty is in lieu of all other warranties, express or implied and constitutes fulfillment of our obligations to the purchaser. We do not guarantee that the products can be used for a particular purpose other than those solely covered by the product's specifications. Pico must be notified if the product must meet particular certifications and/or standards. We assume no liability, in any event, for consequential damages, for anticipated or lost profits, incidental damages or loss of time or other losses incurred by the purchaser or any third party in connection with products covered by this warranty or otherwise. The purchaser will indemnify and hold Pico harmless for any damages, losses, costs, etc. from usage not within the product's specifications. Pico must be consulted before usage of its products in a nuclear, radioactive or space environment.

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Series VV & SVV (100-500V)

4W Isolated Proportional High Voltage DC-DC Converter

PICO
Electronics, Inc.

PRODUCT OVERVIEW

The VV series are unregulated DC-DC converters in a low profile package 0.400" (through hole) or 0.430" (surface mount) footprint with up to 500V single output models. They can operate over the temperature range of -25°C to +70°C without derating, a heat sink or active cooling.



FEATURES

- 4W output power
- Output voltage is proportional to input voltage
- Up to 500V output models
- Wide input voltage range
- Through hole or surface mount packages
- Input/output isolation
- Low ripple
- No heat sink or derating required

Contact Pico for part number of available options:

- Expanded operating temp: -55°C to +85°C
- Select screening per MIL-STD-883:
 - Stabilization Bake
 - Temperature Cycle
 - Burn-In
- Available RoHS Compliant module
- Special Input Voltage, Output Voltage, Isolation Voltage or Output Power

28

INPUT VOLTAGE RANGE

5 = 2.5 - 5V
12 = 4 - 12V
24 = 6 - 24V
28 = 7 - 28V
48 = 14 - 48V

VV

MOUNTING TYPE

VV = THROUGH HOLE
SVV = SURFACE MOUNT

500S

NOMINAL OUTPUT VOLTAGE

100S = 100V
200S = 200V
300S = 300V
400S = 400V
500S = 500V

MODEL LIST

Pico Part Number		Output Voltage		Output Current		Efficiency ⁽²⁾	Output Ripple
Through Hole	Surface Mount	Min. [VDC]	Max. [VDC]	Min. ⁽¹⁾ [mA]	Max. [mA]	[%] typ.	[%]
5VV100S	5SVV100S	47	100	2	40	83	0.5
5VV200S	5SVV200S	90	200	1	20	82	0.5
5VV300S	5SVV300S	130	300	0.675	13.5	82	0.3
5VV400S	5SVV400S	175	400	0.5	10	81	0.3
5VV500S	5SVV500S	220	500	0.4	8	81	0.2
12VV100S	12SVV100S	30	100	2	40	87	0.5
12VV200S	12SVV200S	60	200	1	20	85	0.5
12VV300S	12SVV300S	90	300	0.675	13.5	85	0.3
12VV400S	12SVV400S	120	400	0.5	10	84	0.3
12VV500S	12SVV500S	150	500	0.4	8	84	0.2
24VV100S	24SVV100S	23	100	2	40	85	0.4
24VV200S	24SVV200S	48	200	1	20	84	0.4
24VV300S	24SVV300S	70	300	0.675	13.5	84	0.3
24VV400S	24SVV400S	95	400	0.5	10	83	0.3
24VV500S	24SVV500S	120	500	0.4	8	83	0.2
28VV100S	28SVV100S	23	100	2	40	85	0.4
28VV200S	28SVV200S	48	200	1	20	84	0.4
28VV300S	28SVV300S	70	300	0.675	13.5	84	0.3
28VV400S	28SVV400S	95	400	0.5	10	83	0.3
28VV500S	28SVV500S	120	500	0.4	8	83	0.2
48VV100S	48SVV100S	27	100	2	40	89	0.5
48VV200S	48SVV200S	50	200	1	20	89	0.5
48VV300S	48SVV300S	73	300	0.675	13.5	90	0.2
48VV400S	48SVV400S	98	400	0.5	10	89	0.2
48VV500S	48SVV500S	130	500	0.4	8	89	0.2

Note 1: Maintain minimum 5% of rated load to prevent a voltage surge.

Note 2: Tested at maximum input voltage and full output load.

SPECIFICATIONS (Nominal V_{IN} , Full Load, $T_A = +25^{\circ}\text{C}$, 1 hour warm up unless otherwise specified)**INPUT**

Parameter	Condition	Min.	Typ.	Max.	Units
Input Voltage Range	5VV or 5SVV models	2.5	-	5	VDC
	12VV or 12SVV models	4	-	12	
	24VV or 24SVV models	6	-	24	
	28VV or 28SVV models	7	-	28	
	48VV or 48SVV models	14	-	48	

OUTPUT

Parameter	Condition	Min.	Typ.	Max.	Units
Line Regulation	Output voltage is proportional to input voltage				
Output Power		0.2	-	4	W
Output Voltage Tolerance	Nominal V_{IN} , Full Load	5VV models	-	5	±%
		All other models	-	3	±%

ENVIRONMENTAL

Parameter	Condition	Min.	Typ.	Max.	Units
Operating Temperature Range	Ambient without derating	-25	-	+70	°C
Storage Temperature Range	Ambient	-55	-	+125	°C
Temperature Coefficient		-	0.02	-	%/°C
Cooling	Free Air Convection				

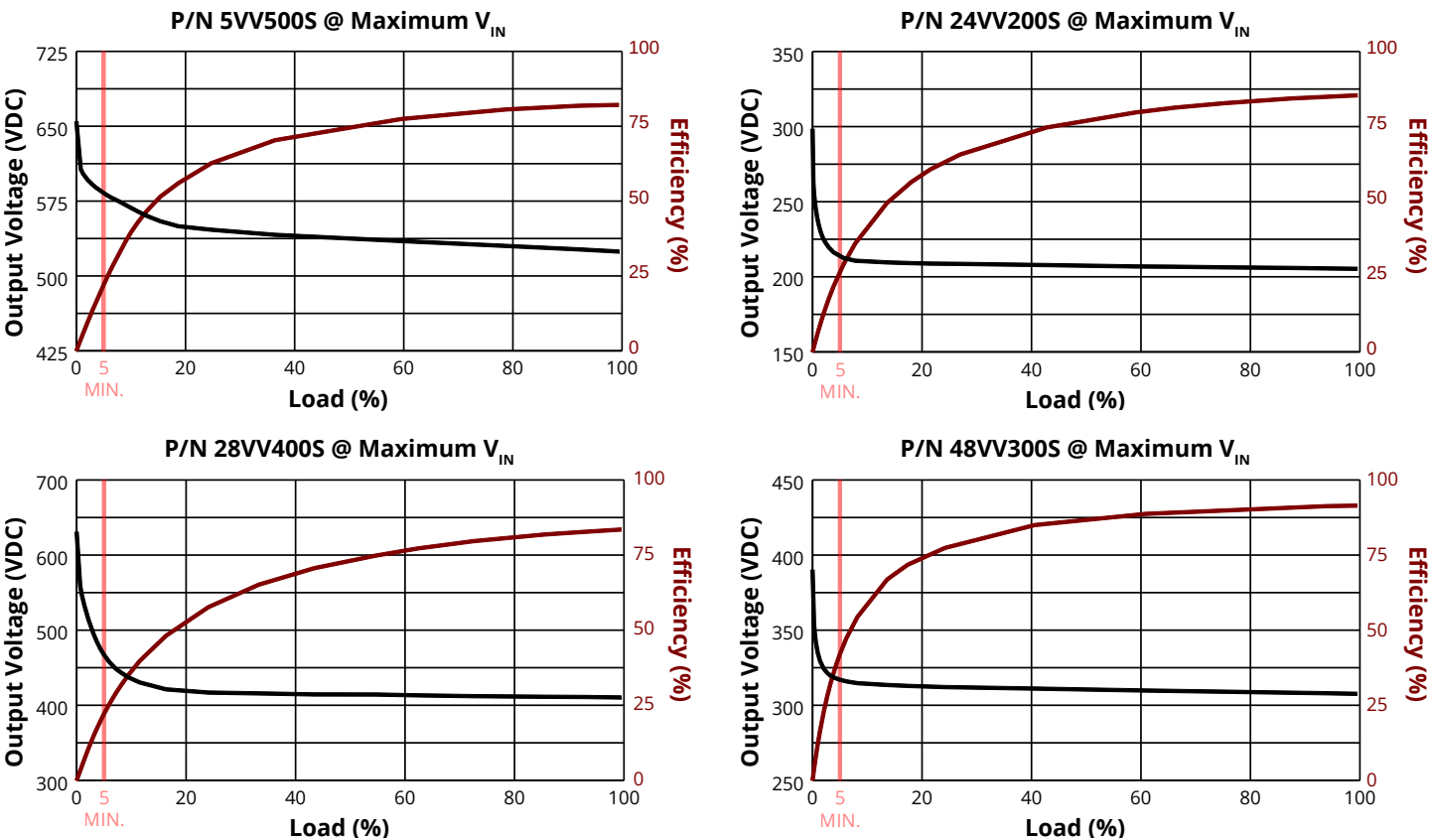
GENERAL

Parameter	Condition	Min.	Typ.	Max.	Units
Operating Frequency	Min V _{IN} to max V _{IN}	8	-	25	kHz
Isolation Voltage	Input to output	1000	-	-	VDC
Insulation Resistance		100	-	-	MΩ
Size (L x W x H)	Through hole	1.43 x 1.24 x 0.4 (36.322 x 31.496 x 10.16)			inches (mm)
	Surface Mount	1.43 x 1.24 x 0.43 (36.322 x 31.496 x 10.922)			
Weight		-	25	-	grams
Case	Glass Reinforced Polymer				
Potting	Vacuum Impregnated Epoxy				
Tube Packaging (W x H x L)	Series SVV	1.645 x 0.74 x 20 (41.783 x 18.796 x 508)			inches (mm)
Box Packaging (W x L x H)	Series VV	8 x 7.5 x 1.5 (203.2 x 190.5 x 38.1) or 12 x 9 x 1.5 (304.8 x 228.6 x 38.1)			inches (mm)
Moisture Sensitivity Level	Series SVV	IPC / JEDEC J-STD-020, Level 3			

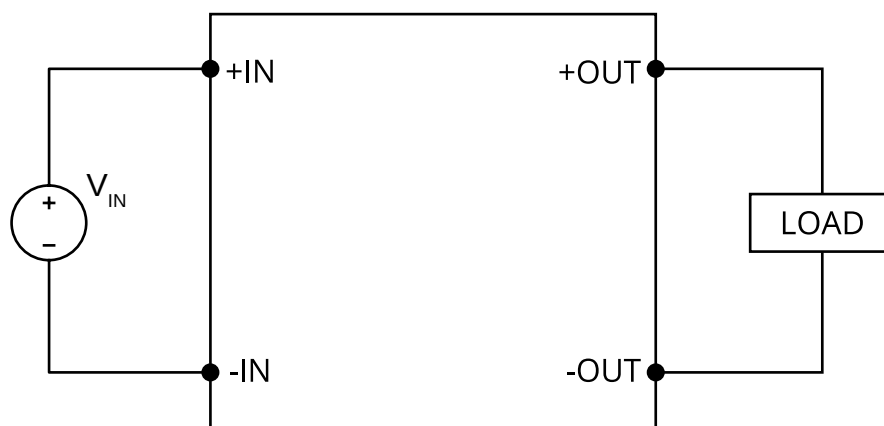
DESIGNED TO MEET

Test	Referenced Standard	Description
Vibration	MIL-STD-202	Method 204, Vibration, High Frequency, Condition D
Shock	MIL-STD-202	Method 213, Shock (Specified Pulse), Condition I
Humidity	MIL-STD-202	Method 106, Moisture Resistance
Altitude	MIL-STD-202	Method 105, Barometric Pressure (Reduced), Condition D

SPECIFICATIONS (Nominal V_{IN} , Full Load, $T_A = +25^{\circ}\text{C}$, 1 hour warm up unless otherwise specified)		
OPTIONAL SCREENING TESTS - CONTACT PICO FOR PART NUMBER		
Parameter	Referenced Standard	Description
Stabilization Bake	MIL-STD-883	Referenced Method 1008 Non-operating maximum storage temperature for 24 hours
Temperature Cycle	MIL-STD-883	Referenced Method 1010 Non-operating at temperature extremes, 15 mins/temp, 10 cycles
Burn-In	MIL-STD-883	Referenced Method 1015 Max operating temperature for 160 hours
Expanded Ambient Operating Temperature		-55°C to $+85^{\circ}\text{C}$
RoHS Compliance		-
DATA CURVES (Nominal V_{IN} , $T_A = +25^{\circ}\text{C}$, 1 hour warm up unless otherwise specified)		

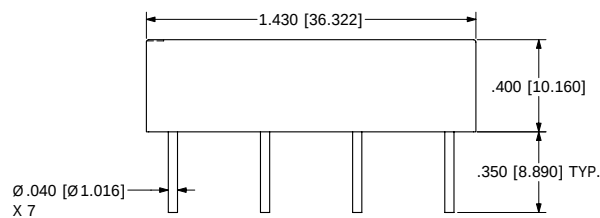


TYPICAL CONNECTION CIRCUIT

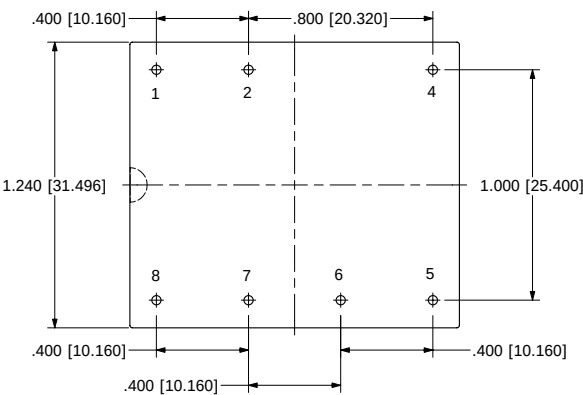


MECHANICAL DRAWINGS

THROUGH HOLE - SERIES VV

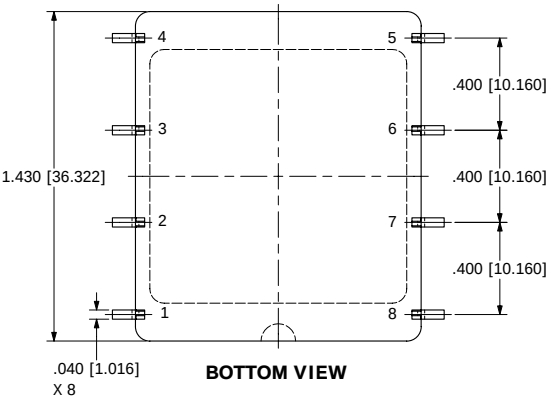
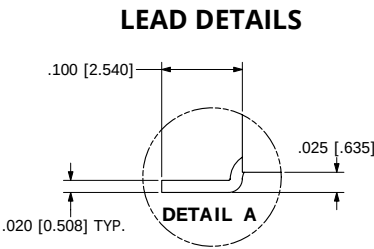
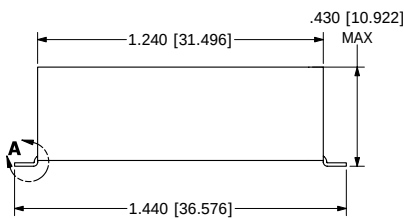


PIN	FUNCTION
1	-IN
2	N/C
3	N/P
4	+IN
5	+OUT
6	-OUT
7	N/C
8	N/C



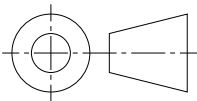
BOTTOM VIEW

SURFACE MOUNT - SERIES SVV

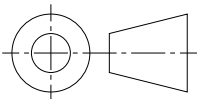
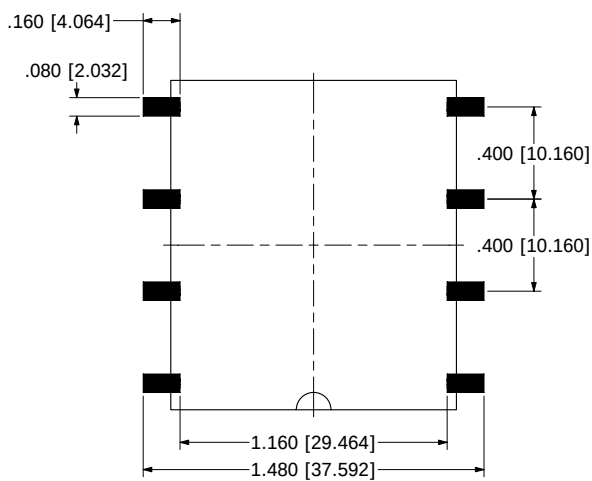


BOTTOM VIEW

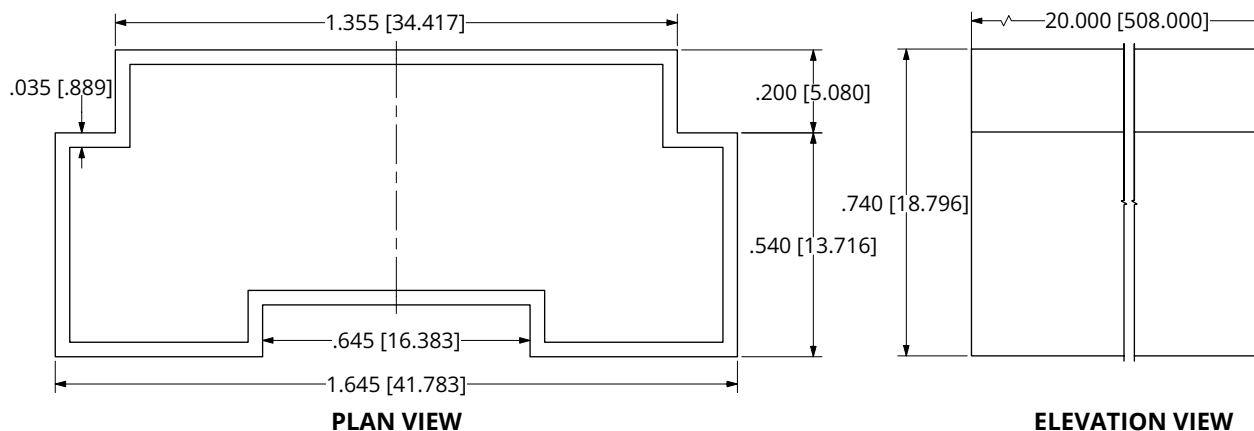
PIN	FUNCTION
1	-IN
2	N/C
3	N/C
4	+IN
5	+OUT
6	-OUT
7	N/C
8	N/C



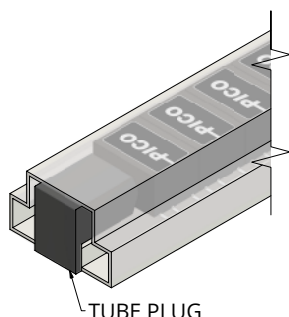
RECOMMENDED LAND PATTERN DIMENSIONS



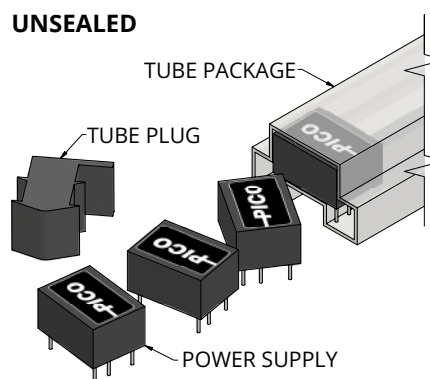
TUBE PACKAGING - SERIES SVV



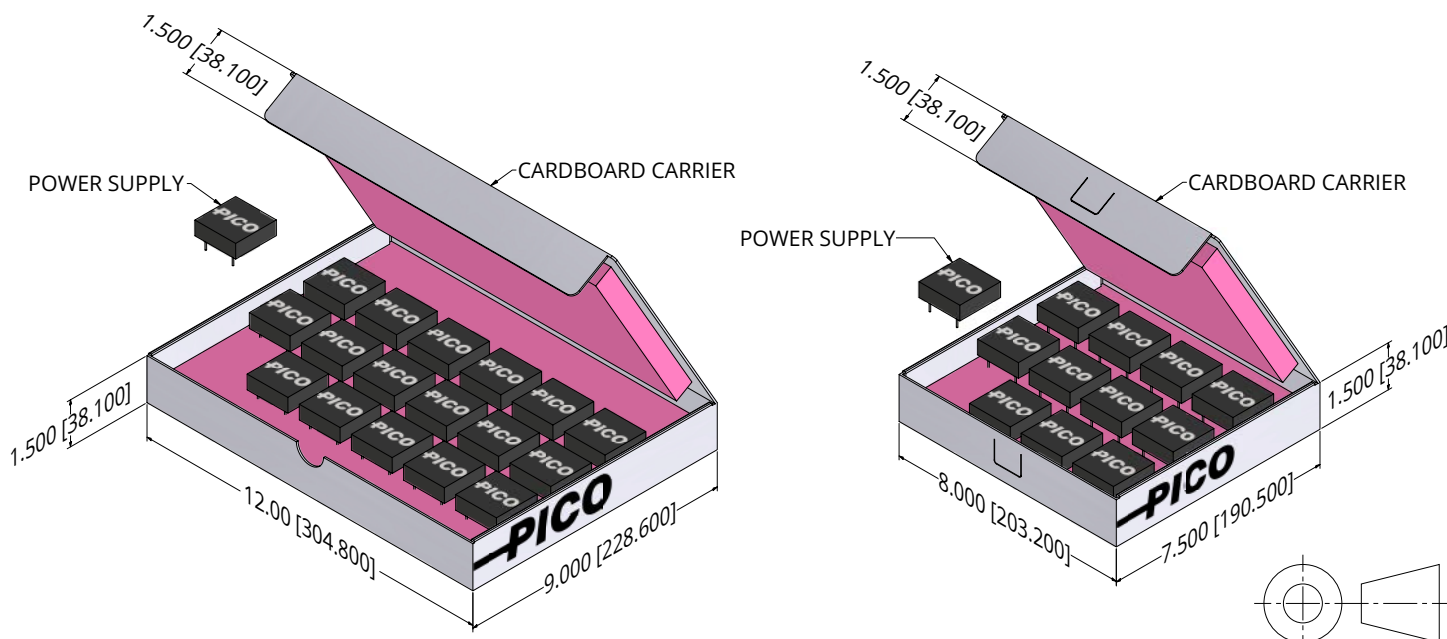
SEALED



UNSEALED



BOX PACKAGING - BULK - SERIES VV



Pico warrants each product manufactured by us and sold by us or an authorized representative, to be free from defects in material and workmanship. If properly used, it will perform within its applicable specifications for a period of one year after original shipment. Pico's obligation under this guarantee is limited to repairing or replacing our product to the original purchaser. This warranty is in lieu of all other warranties, express or implied and constitutes fulfillment of our obligations to the purchaser. We do not guarantee that the products can be used for a particular purpose other than those solely covered by the product's specifications. Pico must be notified if the product must meet particular certifications and/or standards. We assume no liability, in any event, for consequential damages, for anticipated or lost profits, incidental damages or loss of time or other losses incurred by the purchaser or any third party in connection with products covered by this warranty or otherwise. The purchaser will indemnify and hold Pico harmless for any damages, losses, costs, etc. from usage not within the product's specifications. Pico must be consulted before usage of its products in a nuclear, radioactive or space environment.

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Series HVP

5W Non-Isolated Regulated Programmable High Voltage DC-DC Converter



PRODUCT OVERVIEW

The HVP series modules are 0% to 100% output voltage programmable by internal reference or external voltage plus additional 10% fine-tune calibration. These modules have a voltage monitor and shutdown features. Protections include input overvoltage, output short-circuit, output overload, and over temperature. Precise line & load regulation with low ripple down to 0.007% peak to peak.

The 2.55" x 1.3" x 0.5" low profile 6-sided shielded metal case size will mitigate EMI noise and inteference.



FEATURES

- 0-100% programmable output feature
- 11-16 VDC input voltage range
- 5W output power
- 100 to 6kV nominal output voltage models
- Compact 2.55" x 1.3" x 0.5" 6-sided metal case
- Protected against input overvoltage, output short-circuit, output overload and over temperature
- 3 voltage programming methods
- Down to 0.007% peak to peak ripple
- <0.01% load regulation
- Shutdown feature
- Output voltage monitor feature
- 10% fine-tune calibration adjustment screw

Contact Pico for part number of available options:

- Expanded operating temp: -55°C to +85°C
- Select screening per MIL-STD-883:
 - Stabilization Bake
 - Temperature Cycle
 - Burn-In
- Special Input Voltage, Output Voltage, Isolation Voltage or Output Power

HVP	1	P
SERIES NAME	NOMINAL OUTPUT VOLTAGE	OUTPUT POLARITY
HVP	0.1 = 100V 0.25 = 250V 0.5 = 500V 1 = 1000V 2 = 2000V 3 = 3000V 4 = 4000V 5 = 5000V 6 = 6000V	P = POSITIVE OUTPUT N = NEGATIVE OUTPUT

SPECIFICATIONS (Nominal V_{IN} , Full Load, $T_A = +25^\circ\text{C}$, 1 hour warm up unless otherwise specified)**INPUT**

Parameter	Condition	Min.	Typ.	Max.	Units
Input Voltage Range		11	12	16	VDC
Input Current	100% load	-	-	650	mA
	0% load	-	-	150	

OUTPUT

Parameter	Condition	Min.	Typ.	Max.	Units
Load Regulation	0-100% load	-	-	0.01	%
Line Regulation		-	-	0.005	%
Output Current	100V output models	0	-	50	mA
	250V output models		-	20	
	500V output models		-	10	
	1000V output models		-	5	
	2000V output models		-	2.5	
	3000V output models		-	1.67	
	4000V output models		-	1.25	
	5000V output models		-	1	
	6000V output models		-	0.84	
Output Power		-	-	5	W
Output Voltage Ripple (1MHz BW)	100V output models	-	0.15	-	%
	250V to 4000V output models	-	0.007	-	
	5000 to 6000V output models	-	0.15	-	

ENVIRONMENTAL

Parameter	Condition	Min.	Typ.	Max.	Units
Operating Temperature Range	Baseplate	-25	-	+70	$^\circ\text{C}$
Storage Temperature Range	Baseplate	-55	-	+125	$^\circ\text{C}$
Temperature Coefficient		-	-	0.005	%/ $^\circ\text{C}$
Cooling	Free Air Convection				

GENERAL

Parameter	Condition	Min.	Typ.	Max.	Units
Efficiency		-	70	-	%
Operating Frequency		55	-	110	kHz
Isolation Voltage	None				
Stability		-	-	0.005	%/hour
Size	L x W x H	2.55 x 1.3 x 0.5 (64.77 x 33.02 x 12.7)			inches (mm)
Weight		-	70	-	grams
Case	Non-insulated Metal				
Potting	None				
Box Packaging (W x L x H)	8 x 7.5 x 1.5 (203.2 x 190.5 x 38.1) or 12 x 9 x 1.5 (304.8 x 228.6 x 38.1)				inches (mm)

SPECIFICATIONS (Nominal V_{IN} , Full Load, $T_A = +25^{\circ}\text{C}$, 1 hour warm up unless otherwise specified)**PROTECTIONS & FEATURES**

Parameter	Condition	Min.	Typ.	Max.	Units
Short circuit	Output Current Limit, self-recovery	-	130	-	%
Overtemperature	Baseplate, latching	-	95	-	$^{\circ}\text{C}$
Input Over Voltage	Latched shutdown	-	18	-	VDC
Output Voltage Programming (PROG)	Non-latching shutdown	-	0.25	-	VDC
	Voltage	0.25	5	5.5	VDC
	Linearity, 10-100% Vout	-	-	1	%
	Impedance	100	-	-	$\text{k}\Omega$
	Note 1: Output Voltage Programming can program the output voltage from 5 to 100% Vout using 0.25 to 5V range. Linearity is 1% max for 10 to 100% Vout. Linearity will be >1% from 0 to 10% Vout. Unit requires Output Voltage Programming to be >0.25V to turn on and operate normally.				
Programming Reference (REF)	Voltage	4.9	5	5.1	VDC
	Current	0	-	1	mA
	Note 2: Programming Reference can be used for Output Voltage Programming pin. Voltage is typically 5V and current is <1mA.				
Voltage Monitor (MON)	Linear, 0-100% Vout	0	-	5	VDC
	Note 3: Voltage Monitor returns a voltage proportional (0 to 5V) to the output voltage (OUT & COM OUT). This is useful to implement an external output over voltage protection. For negative output models, Voltage Monitor returns a buffered signal of the internal programming voltage.				

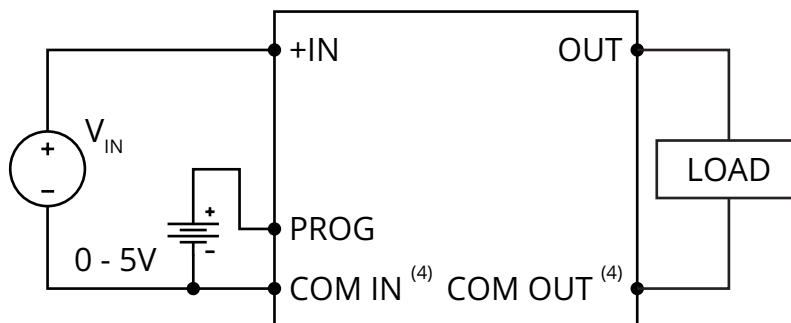
OPTIONS AVAILABLE – CONTACT PICO FOR PART NUMBER

Parameter	Referenced Standard	Description
Stabilization Bake	MIL-STD-883	Referenced Method 1008 Non-operating maximum storage temperature for 24 hours
Temperature Cycle	MIL-STD-883	Referenced Method 1010 Non-operating at temperature extremes, 15 mins/temp, 10 cycles
Burn-In	MIL-STD-883	Referenced Method 1015 Max operating temperature for 160 hours

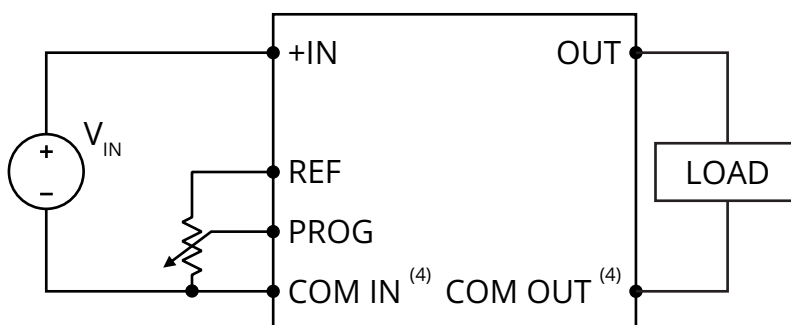
TYPICAL CONNECTION CIRCUIT

OUTPUT VOLTAGE PROGRAMMING

EXTERNAL VOLTAGE & SHUTDOWN



INTERNAL VOLTAGE REFERENCE & RESISTIVE DIVIDER

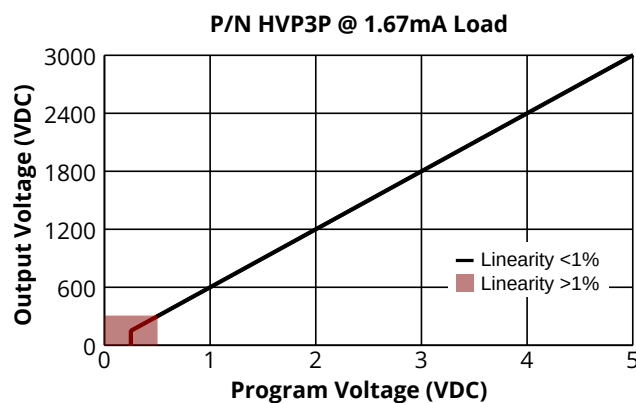
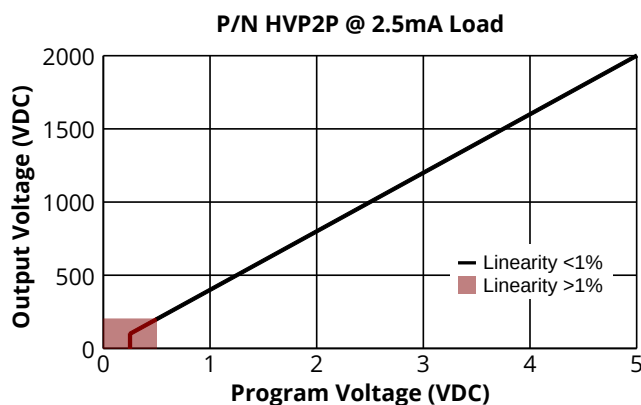


Note 1: Output Voltage Programming can program the output voltage from 5 to 100% V_{out} using 0.25 to 5V range. Linearity is 1% max for 10 to 100% V_{out} . Linearity will be >1% from 0 to 10% V_{out} . **Unit requires Output Voltage Programming to be >0.25V to turn on and operate normally.**

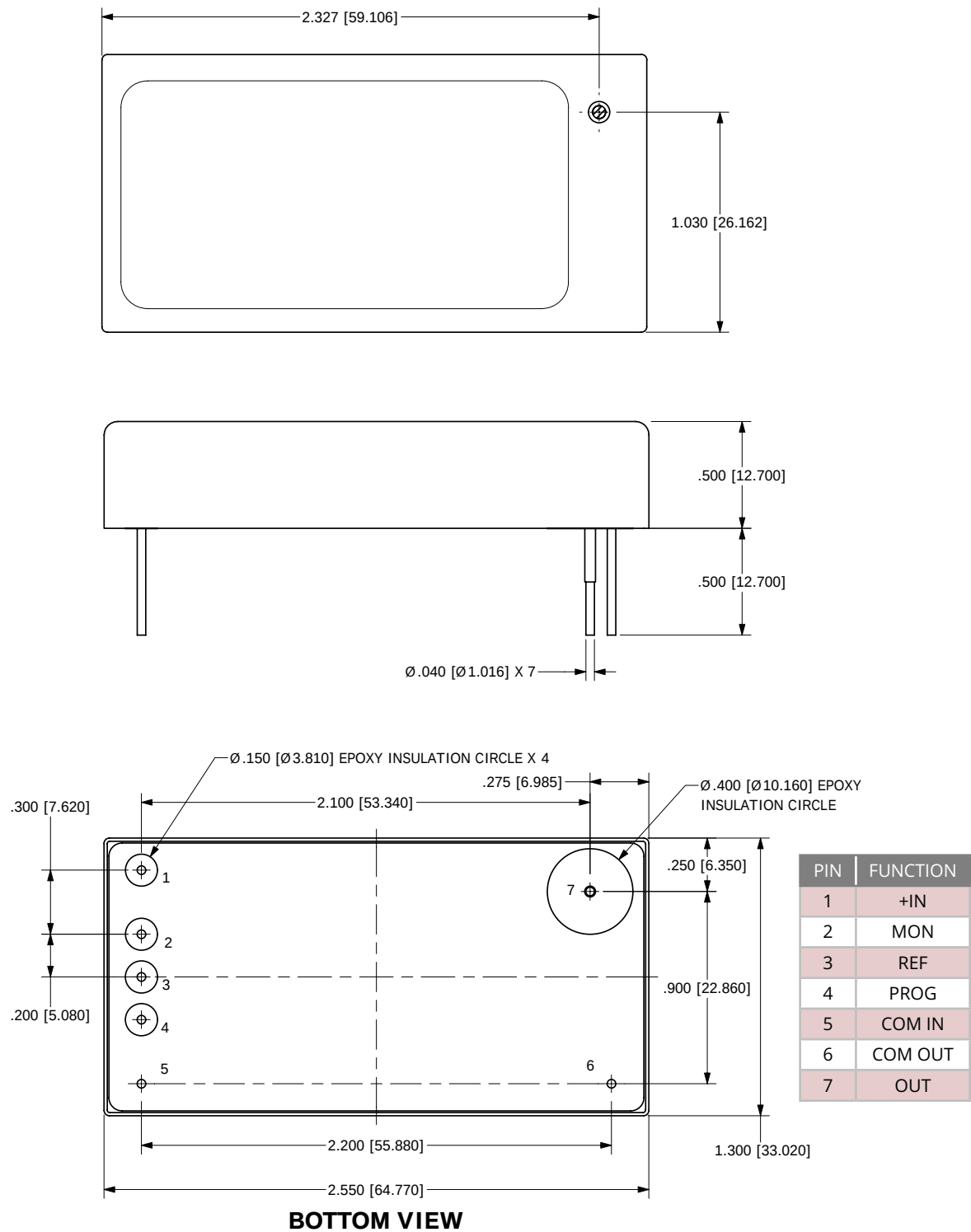
Note 2: Programming Reference can be used for Output Voltage Programming pin. Voltage is typically 5V and current is <1mA.

Note 4: COM IN, COM OUT & case are internally connected.

OUTPUT PROGRAMMING CURVE

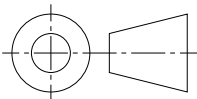


MECHANICAL DRAWINGS

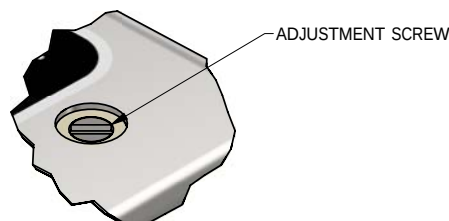
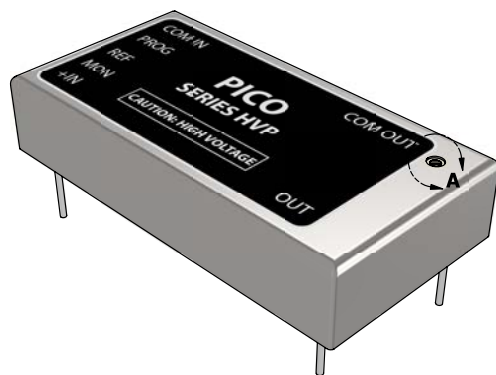


NOTES

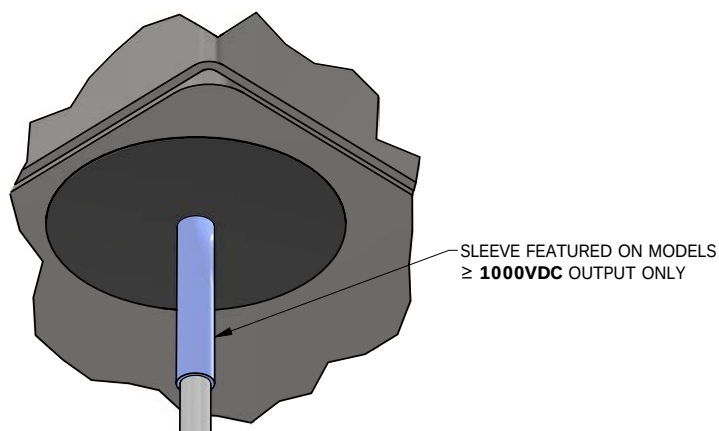
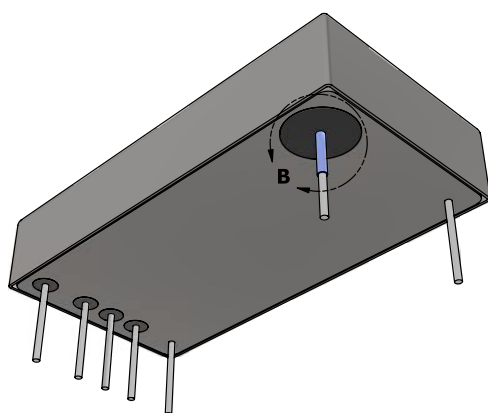
- a. ALL DIMENSIONS ARE IN INCHES, [] = MM
- b. METAL CASE CONNECTED TO PIN NUMBERS #5 & #6
- c. PIN # 7 (OUT) PCB TRACE SHOULD NOT BE ON THE SAME LAYER AS THE NON-INSULATED METAL CASE DUE TO POTENTIAL SHORT. ALTERNATIVELY, STANDOFFS CAN BE USED TO PREVENT ANY SHORTS BETWEEN PIN #7 (OUT) PCB TRACE AND THE NON-INSULATED METAL CASE.



MECHANICAL DRAWINGS

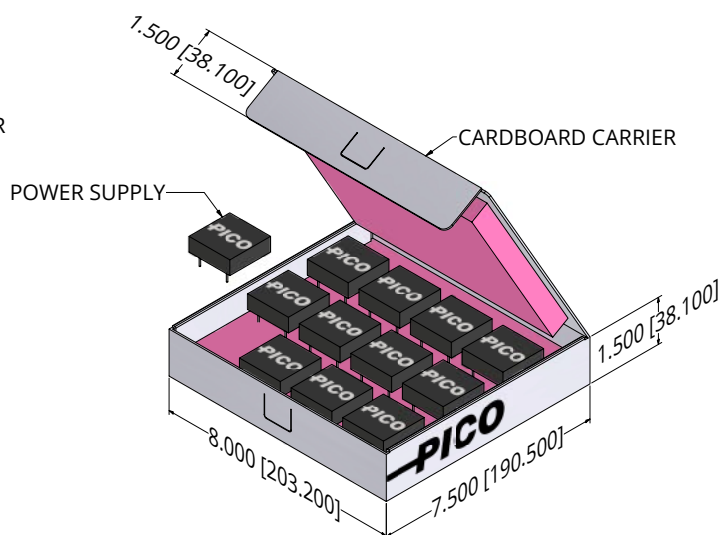
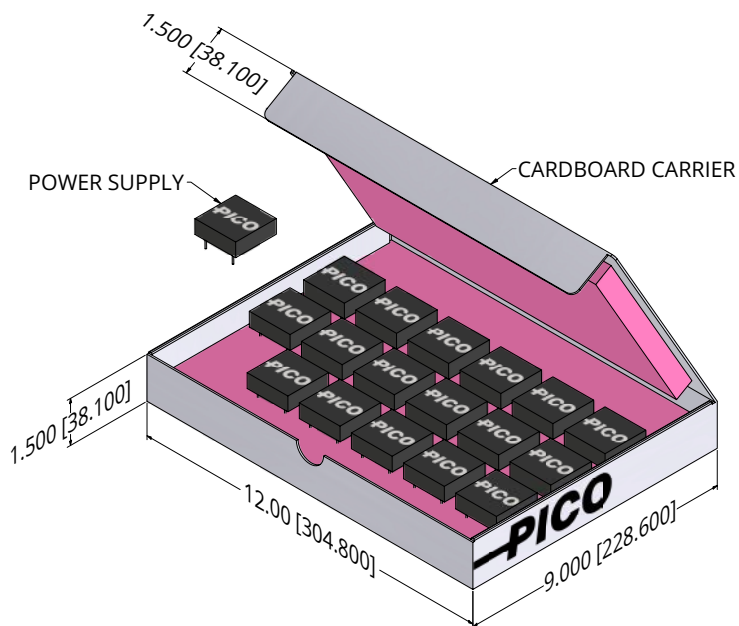


DETAIL A



DETAIL B

BOX PACKAGING - BULK



Pico warrants each product manufactured by us and sold by us or an authorized representative, to be free from defects in material and workmanship. If properly used, it will perform within its applicable specifications for a period of one year after original shipment. Pico's obligation under this guarantee is limited to repairing or replacing our product to the original purchaser. This warranty is in lieu of all other warranties, express or implied and constitutes fulfillment of our obligations to the purchaser. We do not guarantee that the products can be used for a particular purpose other than those solely covered by the product's specifications. Pico must be notified if the product must meet particular certifications and/or standards. We assume no liability, in any event, for consequential damages, for anticipated or lost profits, incidental damages or loss of time or other losses incurred by the purchaser or any third party in connection with products covered by this warranty or otherwise. The purchaser will indemnify and hold Pico harmless for any damages, losses, costs, etc. from usage not within the product's specifications. Pico must be consulted before usage of its products in a nuclear, radioactive or space environment.

We reserve the right to discontinue products without notice, We reserve the right to make modifications to any existing catalog products without notice, at any time, without the obligation to modify units previously sold.

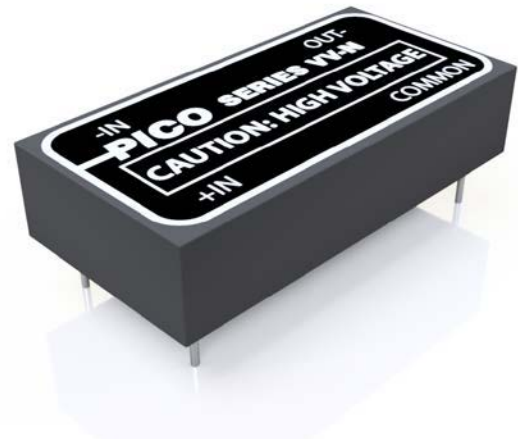
Series VV (100-10kV)

10W Isolated/Non-isolated Proportional High Voltage DC-DC Converter

PICO
Electronics, Inc.

PRODUCT OVERVIEW

The VV series are unregulated DC-DC converters in a low 0.500" profile package footprint with up to 10,000V single output models. They can operate over the temperature range of -25°C to +70°C without derating, a heat sink or active cooling.



FEATURES

- Up to 10W output power
- Output voltage is proportional to input voltage
- Up to 10,000V output models
- Wide input voltage range
- Through hole mounting
- Transformer Isolated modules
- No heat sink or derating required

Contact Pico for part number of available options:

- Expanded operating temp: -55°C to +85°C
- Select screening per MIL-STD-883:
 - Stabilization Bake
 - Temperature Cycle
 - Burn-In
- Special Input Voltage, Output Voltage, Isolation Voltage or Output Power

28

INPUT VOLTAGE RANGE

5 = 2/3.5 - 5V
9 = 3.5/4 - 9V
12 = 4 - 12V
15 = 5 - 15V
24 = 6 - 24V
28 = 7 - 28V
48 = 14 - 48V

VV

SERIES NAME

VV

10

MAX. OUTPUT VOLTAGE

0.1 = 100V
0.2 = 200V
0.3 = 300V
0.4 = 400V
0.5 = 500V
0.6 = 600V
0.7 = 700V
0.8 = 800V
0.9 = 900V
1 = 1000V
2 = 2000V
3 = 3000V
4 = 4000V
5 = 5000V
6 = 6000V
7 = 7000V
8 = 8000V
9 = 9000V
10 = 10,000V

-P

OUTPUT ISOLATION
(≥6000V OUTPUT VOLT.)

BLANK = ISOLATED
-P = NON-ISOLATED
POSITIVE OUTPUT
-N = NON-ISOLATED
NEGATIVE OUTPUT

MODEL LIST - ≤5000V OUTPUT

Pico Part Number	Input Voltage		Output Voltage		Output Current		Output Power [W]	Efficiency ⁽¹⁾ [%] typ.	Output Ripple ⁽³⁾ [%]
	Min. [VDC]	Max. [VDC]	Min. V _{IN} [VDC]	Max. V _{IN} [VDC]	Min. ⁽²⁾ [mA]	Max. ^(3,4) [mA]			
5VV0.1	3.5	5	47	100	3	60	6	74	5
5VV0.2			55	200	1.5	30	6	74	3
5VV0.3			60	300	1	20	6	74	
5VV0.4			65	400	0.75	15	6	74	
5VV0.5			70	500	0.6	12	6	74	
5VV0.6			75	600	0.5	10	6	74	
5VV0.7			78	700	0.43	8.6	6	74	
5VV0.8			80	800	0.38	7.5	6	74	
5VV0.9			85	900	0.33	6.7	6	74	
5VV1	2	5	100	1000	0.3	6	6	76	2
5VV2			250	2000	0.15	3	6	76	
5VV3			300	3000	0.1	2	6	76	
5VV4			550	4000	0.069	1.375	5.5	78	
5VV5			850	5000	0.055	1.1	5.5	78	
9VV0.1	4	9	30	100	3.5	70	7	74	5
9VV0.2			60	200	1.75	35	7	74	3
9VV0.3			90	300	1.17	23.3	7	74	
9VV0.4			120	400	0.88	17.5	7	74	
9VV0.5			150	500	0.7	14	7	74	
9VV0.6			205	600	0.58	11.7	7	74	
9VV0.7			240	700	0.5	10	7	74	
9VV0.8			274	800	0.44	8.8	7	74	
9VV0.9			308	900	0.39	7.8	7	74	
9VV1	3.5	9	75	1000	0.35	7	7	82	2
9VV2			200	2000	0.175	3.5	7	82	
9VV3			400	3000	0.117	2.333	7	78	
9VV4			625	4000	0.088	1.75	7	82	
9VV5			1075	5000	0.06	1.2	6	82	

MODEL LIST - ≤5000V OUTPUT

Pico Part Number	Input Voltage		Output Voltage		Output Current		Output Power [W]	Efficiency ⁽¹⁾ [%] typ.	Output Ripple ⁽³⁾ [%]
	Min. [VDC]	Max. [VDC]	Min. V _{IN} [VDC]	Max. V _{IN} [VDC]	Min. ⁽²⁾ [mA]	Max. ^(3,4) [mA]			
12VV0.1	4	12	30	100	4	80	8	82	5
12VV0.2			60	200	2	40	8	82	3
12VV0.3			90	300	1.33	26.7	8	82	
12VV0.4			120	400	1	20	8	82	
12VV0.5			150	500	0.8	16	8	84	
12VV0.6			176	600	0.67	13.3	8	84	
12VV0.7			205	700	0.57	11.4	8	84	
12VV0.8			235	800	0.5	10	8	84	2
12VV0.9			264	900	0.44	8.9	8	84	
12VV1			100	1000	0.4	8	8	82	
12VV2			175	2000	0.2	4	8	82	
12VV3			350	3000	0.133	2.667	8	82	
12VV4			525	4000	0.088	1.75	7	83	
12VV5			1050	5000	0.06	1.2	6	83	
15VV0.1	5	15	30	100	4.25	85	8.5	82	5
15VV0.2			60	200	2.13	42.5	8.5	82	3
15VV0.3			90	300	1.42	28.3	8.5	82	
15VV0.4			120	400	1.06	21.3	8.5	83	
15VV0.5			150	500	0.85	17	8.5	83	
15VV0.6			176	600	0.71	14.2	8.5	83	
15VV0.7			205	700	0.61	12.1	8.5	83	
15VV0.8			235	800	0.53	10.6	8.5	83	2
15VV0.9			264	900	0.47	9.4	8.5	83	
15VV1			75	1000	0.425	8.5	8.5	83	
15VV2			200	2000	0.213	4.25	8.5	83	
15VV3			400	3000	0.133	2.667	8	83	
15VV4			600	4000	0.088	1.75	7	81	
15VV5			1050	5000	0.06	1.2	6	81	

MODEL LIST - ≤5000V OUTPUT

Pico Part Number	Input Voltage		Output Voltage		Output Current		Output Power [W]	Efficiency ⁽¹⁾ [%] typ.	Output Ripple ⁽³⁾ [%]
	Min. [VDC]	Max. [VDC]	Min. V _{IN} [VDC]	Max. V _{IN} [VDC]	Min. ⁽²⁾ [mA]	Max. ^(3,4) [mA]			
24VV0.1	7	24	23	100	4.5	90	9	83	5
24VV0.2			48	200	2.25	45	9	83	3
24VV0.3			70	300	1.5	30	9	83	
24VV0.4			95	400	1.13	22.5	9	83	
24VV0.5			100	500	0.9	18	9	83	
24VV0.6			132	600	0.75	15	9	83	
24VV0.7			154	700	0.64	12.9	9	83	
24VV0.8			176	800	0.56	11.3	9	83	
24VV0.9			198	900	0.5	10	9	83	
24VV1			75	1000	0.45	9	9	84	2
24VV2	8	28	175	2000	0.225	4.5	9	84	
24VV3			200	3000	0.15	3	9	82	
24VV4			400	4000	0.1	2	8	82	
24VV5			1075	5000	0.06	1.2	6	82	
28VV0.1	8	28	23	100	5	100	10	83	5
28VV0.2			48	200	2.5	50	10	83	3
28VV0.3			70	300	1.67	33.3	10	83	
28VV0.4			95	400	1.25	25	10	83	
28VV0.5			120	500	1	20	10	83	
28VV0.6			132	600	0.83	16.7	10	83	
28VV0.7			154	700	0.71	14.3	10	83	
28VV0.8			176	800	0.63	12.5	10	83	
28VV0.9			198	900	0.56	11.1	10	83	
28VV1	8	28	75	1000	0.5	10	10	83	2
28VV2			175	2000	0.25	5	10	83	
28VV3			250	3000	0.167	3.333	10	83	
28VV4			375	4000	0.1	2	8	82	
28VV5			1100	5000	0.06	1.2	6	82	

MODEL LIST - ≤5000V OUTPUT

Pico Part Number	Input Voltage		Output Voltage		Output Current		Output Power [W]	Efficiency ⁽¹⁾ [%] typ.	Output Ripple ⁽³⁾ [%]
	Min. [VDC]	Max. [VDC]	Min. V _{IN} [VDC]	Max. V _{IN} [VDC]	Min. ⁽²⁾ [mA]	Max. ^(3,4) [mA]			
48VV0.1	15	48	27	100	4	80	8	81	5
48VV0.2			50	200	2	40	8	81	3
48VV0.3			73	300	1.33	26.7	8	81	
48VV0.4			98	400	1	20	8	81	
48VV0.5			140	500	0.8	16	8	84	
48VV0.6			154	600	0.67	13.3	8	84	
48VV0.7			180	700	0.57	11.4	8	84	
48VV0.8			205	800	0.5	10	8	84	
48VV0.9			208	900	0.44	8.9	8	84	
48VV1			75	1000	0.4	8	8	80	2
48VV2	15	48	200	2000	0.2	4	8	80	
48VV3			450	3000	0.133	2.667	8	80	
48VV4			400	4000	0.1	2	8	80	
48VV5			1075	5000	0.06	1.2	6	80	

Note 1: Tested at maximum input voltage and full output load.

Note 2: Maintain minimum 5% of rated load to prevent a voltage surge.

Note 3: For ≤900V output models, a 0.1μF, 2kV high quality ceramic capacitor is required across the output.

Note 4: Unit is capable of sourcing max output current over the entire output voltage range.

Note 5: For ≤5000V output models, input ground and output ground are not connected internally. Input terminals and output terminals may be connected externally.

MODEL LIST - ≥6000V ISOLATED OUTPUT

Pico Part Number	Input Voltage		Output Voltage		Output Current		Output Power [W]	Efficiency ⁽¹⁾ [%] typ.	Output Ripple ⁽³⁾ [%]
	Min. [VDC]	Max. [VDC]	Min. V _{IN} [VDC]	Max. V _{IN} [VDC]	Min. ⁽²⁾ [mA]	Max. ^(3,4) [mA]			
5VV6	2	5	625	6000	0.042	0.833	5	79	2
5VV7			1100	7000	0.036	0.714		77	
5VV8			1750	8000	0.031	0.625		76	
5VV9			1400	9000	0.028	0.556		75	
5VV10			2150	10,000	0.025	0.5		75	
9VV6	3.5	9	2000	6000	0.05	1	6	82	2
9VV7			2250	7000	0.043	0.857		80	
9VV8			2500	8000	0.038	0.75		79	
9VV9			2900	9000	0.033	0.667		77	
9VV10			3100	10,000	0.03	0.6		76	
12VV6	4	12	1700	6000	0.05	1	6	83	2
12VV7			1900	7000	0.043	0.857		81	
12VV8			2100	8000	0.038	0.75		79	
12VV9			2200	9000	0.033	0.667		77	
12VV10			2100	10,000	0.03	0.6		76	
15VV6	5	15	1700	6000	0.05	1	6	80	2
15VV7			1900	7000	0.043	0.857		80	
15VV8			2150	8000	0.038	0.75		79	
15VV9			2300	9000	0.033	0.667		77	
15VV10			2200	10,000	0.03	0.6		76	
24VV6	7	24	1400	6000	0.05	1	6	81	2
24VV7			1600	7000	0.043	0.857		81	
24VV8			1750	8000	0.038	0.75		80	
24VV9			1800	9000	0.033	0.667		78	
24VV10			1500	10,000	0.03	0.6		77	
28VV6	8	28	1350	6000	0.05	1	6	82	2
28VV7			1500	7000	0.043	0.857		80	
28VV8			1600	8000	0.038	0.75		79	
28VV9			1800	9000	0.033	0.667		78	
28VV10			2200	10,000	0.03	0.6		77	
48VV6	15	48	1600	6000	0.05	1	6	80	2
48VV7			1700	7000	0.043	0.857		79	
48VV8			1850	8000	0.038	0.75		79	
48VV9			2000	9000	0.033	0.667		78	
48VV10			2200	10,000	0.03	0.6		77	

Note 1: Tested at maximum input voltage and full output load.

Note 2: Maintain minimum 5% of rated load to prevent a voltage surge.

Note 4: Unit is capable of sourcing max output current over the entire output voltage range.

Note 6: For ≥6000V isolated output models, any input terminals **cannot** be connected to any output terminals.

MODEL LIST - ≥6000V NON-ISOLATED POSITIVE OUTPUT

Pico Part Number	Input Voltage		Output Voltage		Output Current		Output Power [W]	Efficiency ⁽¹⁾ [%] typ.	Output Ripple ⁽³⁾ [%]
	Min. [VDC]	Max. [VDC]	Min. V _{IN} [VDC]	Max. V _{IN} [VDC]	Min. ⁽²⁾ [mA]	Max. ^(3,4) [mA]			
5VV6-P	2	5	+625	+6000	0.042	0.833	5	79	2
5VV7-P			+1100	+7000	0.036	0.714		77	
5VV8-P			+1750	+8000	0.031	0.625		76	
5VV9-P			+1400	+9000	0.028	0.556		75	
5VV10-P			+2150	+10000	0.025	0.5		75	
9VV6-P	3.5	9	+2000	+6000	0.05	1	6	82	2
9VV7-P			+2250	+7000	0.043	0.857		80	
9VV8-P			+2500	+8000	0.038	0.75		79	
9VV9-P			+2900	+9000	0.033	0.667		77	
9VV10-P			+3100	+10000	0.03	0.6		76	
12VV6-P	4	12	+1700	+6000	0.05	1	6	83	2
12VV7-P			+1900	+7000	0.043	0.857		81	
12VV8-P			+2100	+8000	0.038	0.75		79	
12VV9-P			+2200	+9000	0.033	0.667		77	
12VV10-P			+2100	+10000	0.03	0.6		76	
15VV6-P	5	15	+1700	+6000	0.05	1	6	80	2
15VV7-P			+1900	+7000	0.043	0.857		80	
15VV8-P			+2150	+8000	0.038	0.75		79	
15VV9-P			+2300	+9000	0.033	0.667		77	
15VV10-P			+2200	+10000	0.03	0.6		76	
24VV6-P	7	24	+1400	+6000	0.05	1	6	81	2
24VV7-P			+1600	+7000	0.043	0.857		81	
24VV8-P			+1750	+8000	0.038	0.75		80	
24VV9-P			+1800	+9000	0.033	0.667		78	
24VV10-P			+1500	+10000	0.03	0.6		77	
28VV6-P	8	28	+1350	+6000	0.05	1	6	82	2
28VV7-P			+1500	+7000	0.043	0.857		80	
28VV8-P			+1600	+8000	0.038	0.75		79	
28VV9-P			+1800	+9000	0.033	0.667		78	
28VV10-P			+2200	+10000	0.03	0.6		77	
48VV6-P	15	48	+1600	+6000	0.05	1	6	80	2
48VV7-P			+1700	+7000	0.043	0.857		79	
48VV8-P			+1850	+8000	0.038	0.75		79	
48VV9-P			+2000	+9000	0.033	0.667		78	
48VV10-P			+2200	+10000	0.03	0.6		77	

Note 1: Tested at maximum input voltage and full output load.

Note 2: Maintain minimum 5% of rated load to prevent a voltage surge.

Note 4: Unit is capable of sourcing max output current over the entire output voltage range.

Note 7: For ≥6000V non-isolated positive output models, you **must** provide an external connection **only** using the COM output terminal to either +IN or -IN input terminals.

MODEL LIST - ≥6000V NON-ISOLATED NEGATIVE OUTPUT

Pico Part Number	Input Voltage		Output Voltage		Output Current		Output Power [W]	Efficiency ⁽¹⁾ [%] typ.	Output Ripple ⁽³⁾ [%]
	Min. [VDC]	Max. [VDC]	Min. V _{IN} [VDC]	Max. V _{IN} [VDC]	Min. ⁽²⁾ [mA]	Max. ^(3,4) [mA]			
5VV6-N	2	5	-625	-6000	0.042	0.833	5	79	2
5VV7-N			-1100	-7000	0.036	0.714		77	
5VV8-N			-1750	-8000	0.031	0.625		76	
5VV9-N			-1400	-9000	0.028	0.556		75	
5VV10-N			-2150	-10,000	0.025	0.5		75	
9VV6-N	3.5	9	-2000	-6000	0.05	1	6	82	2
9VV7-N			-2250	-7000	0.043	0.857		80	
9VV8-N			-2500	-8000	0.038	0.75		79	
9VV9-N			-2900	-9000	0.033	0.667		77	
9VV10-N			-3100	-10,000	0.03	0.6		76	
12VV6-N	4	12	-1700	-6000	0.05	1	6	83	2
12VV7-N			-1900	-7000	0.043	0.857		81	
12VV8-N			-2100	-8000	0.038	0.75		79	
12VV9-N			-2200	-9000	0.033	0.667		77	
12VV10-N			-2100	-10,000	0.03	0.6		76	
15VV6-N	5	15	-1700	-6000	0.05	1	6	80	2
15VV7-N			-1900	-7000	0.043	0.857		80	
15VV8-N			-2150	-8000	0.038	0.75		79	
15VV9-N			-2300	-9000	0.033	0.667		77	
15VV10-N			-2200	-10,000	0.03	0.6		76	
24VV6-N	7	24	-1400	-6000	0.05	1	6	81	2
24VV7-N			-1600	-7000	0.043	0.857		81	
24VV8-N			-1750	-8000	0.038	0.75		80	
24VV9-N			-1800	-9000	0.033	0.667		78	
24VV10-N			-1500	-10,000	0.03	0.6		77	
28VV6-N	8	28	-1350	-6000	0.05	1	6	82	2
28VV7-N			-1500	-7000	0.043	0.857		80	
28VV8-N			-1600	-8000	0.038	0.75		79	
28VV9-N			-1800	-9000	0.033	0.667		78	
28VV10-N			-2200	-10,000	0.03	0.6		77	
48VV6-N	15	48	-1600	-6000	0.05	1	6	80	2
48VV7-N			-1700	-7000	0.043	0.857		79	
48VV8-N			-1850	-8000	0.038	0.75		79	
48VV9-N			-2000	-9000	0.033	0.667		78	
48VV10-N			-2200	-10,000	0.03	0.6		77	

Note 1: Tested at maximum input voltage and full output load.

Note 2: Maintain minimum 5% of rated load to prevent a voltage surge.

Note 4: Unit is capable of sourcing max output current over the entire output voltage range.

Note 8: For ≥6000V non-isolated negative output models, you **must** provide an external connection **only** using the COM output terminal to either +IN or -IN input terminals.

SPECIFICATIONS (Max. V_{IN} , Full Load, $T_A = +25^{\circ}\text{C}$, 1 hour warm up unless otherwise specified)

INPUT

Parameter	Condition		Min.	Typ.	Max.	Units
Input Voltage Range	5VV input models	≤900V Output models	3.5	5	5	VDC
		≥1kV output models	2			
	9VV input models	≤900V Output models	4	9	9	
		≥1kV output models	3.5			
	12VV input models		4	12	12	
	15VV input models		5	15	15	
	24VV input models		7	24	24	
	28VV input models		8	28	28	
	48VV input models		15	48	48	

OUTPUT

Parameter	Condition	Min.	Typ.	Max.	Units
Line Regulation	Output voltage is proportional to input voltage				
Output Voltage Tolerance	Nominal V_{IN} , Full Load	5VV models	-	5	$\pm\%$
		All other models	-	3	$\pm\%$

ENVIRONMENTAL

Parameter	Condition	Min.	Typ.	Max.	Units
Operating Temperature Range	Ambient without derating	-25	-	+70	$^{\circ}\text{C}$
Storage Temperature Range	Ambient	-55	-	+125	$^{\circ}\text{C}$
Temperature Coefficient		-	0.02	-	$\%/^{\circ}\text{C}$
Cooling	Free Air Convection				

GENERAL

Parameter	Condition	Min.	Typ.	Max.	Units
Operating Frequency	Min V_{IN} to max V_{IN}	$\leq 900\text{V}$ output models	8	-	kHz
		$\geq 1\text{kV}$ output models	15	-	
Isolation Voltage	Input to output, model dependent	1500	-	3600	VDC
Insulation Resistance		100	-	-	$\text{M}\Omega$
Size (L x W x H)		2.25 x 1.125 x 0.5 (57.15 x 28.575 x 12.7)			inches (mm)
Weight		-	45	-	grams
Case	Glass Reinforced Polymer				
Potting	Vacuum Impregnated Epoxy				
Box Packaging (W x L x H)	8 x 7.5 x 1.5 (203.2 x 190.5 x 38.1) or 12 x 9 x 1.5 (304.8 x 228.6 x 38.1)				inches (mm)

DESIGNED TO MEET

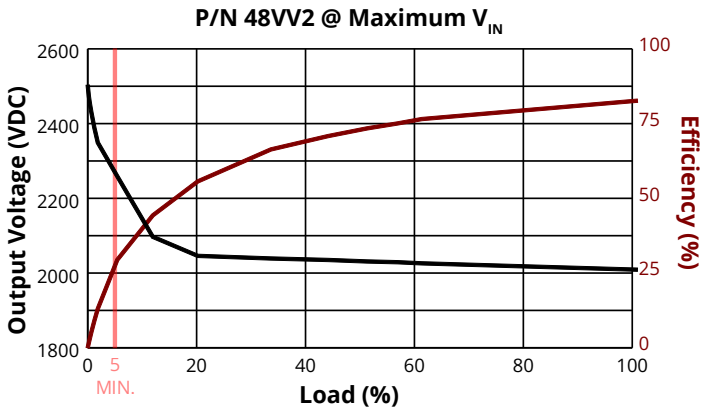
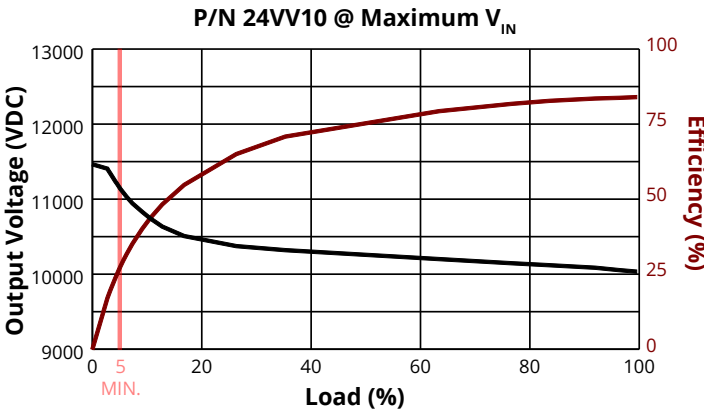
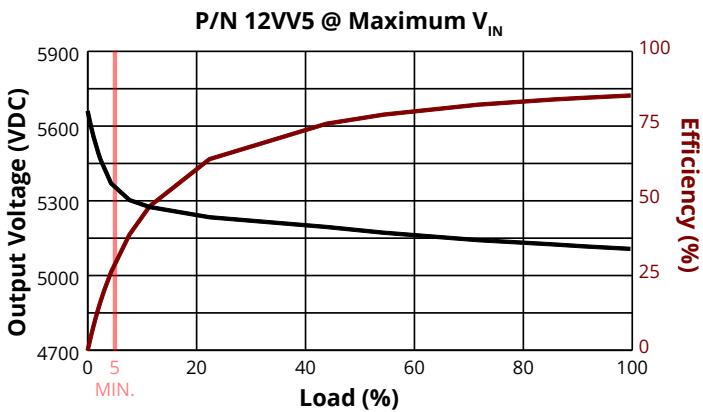
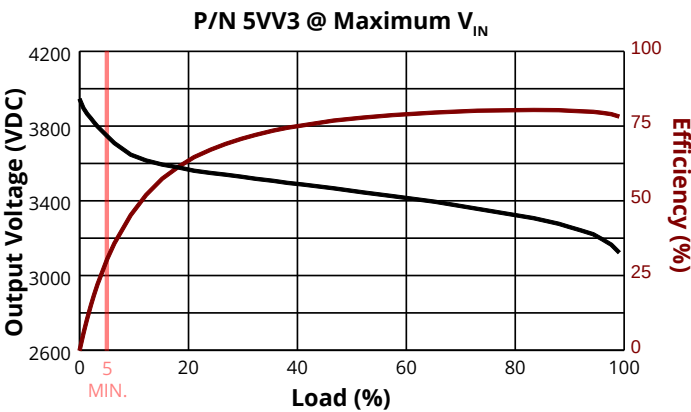
Test	Referenced Standard	Description
Vibration	MIL-STD-202	Method 204, Vibration, High Frequency, Condition D
Shock	MIL-STD-202	Method 213, Shock (Specified Pulse), Condition I
Humidity	MIL-STD-202	Method 106, Moisture Resistance
Altitude	MIL-STD-202	Method 105, Barometric Pressure (Reduced), Condition D

SPECIFICATIONS (Max. V_{IN} , Full Load, $T_A = +25^{\circ}\text{C}$, 1 hour warm up unless otherwise specified)

OPTIONS AVAILABLE – CONTACT PICO FOR PART NUMBER

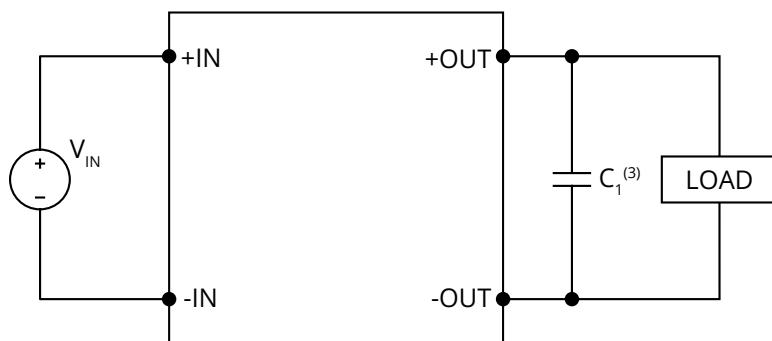
Parameter	Referenced Standard	Description
Stabilization Bake	MIL-STD-883	Referenced Method 1008 Non-operating maximum storage temperature for 24 hours
Temperature Cycle	MIL-STD-883	Referenced Method 1010 Non-operating at temperature extremes, 15 mins/temp, 10 cycles
Burn-In	MIL-STD-883	Referenced Method 1015 Max operating temperature for 160 hours
Expanded Ambient Operating Temperature		-55°C to +85°C

DATA CURVES (Max. V_{IN} , $T_A = +25^{\circ}\text{C}$, 1 hour warm up unless otherwise specified)



TYPICAL CONNECTION DIAGRAM

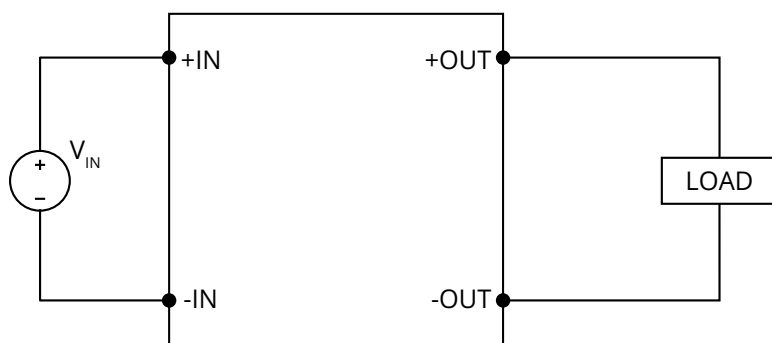
≤5000V MODELS



Note 3: For ≤900V output models, 0.1μF, 2kV high quality ceramic capacitor is required across the output.

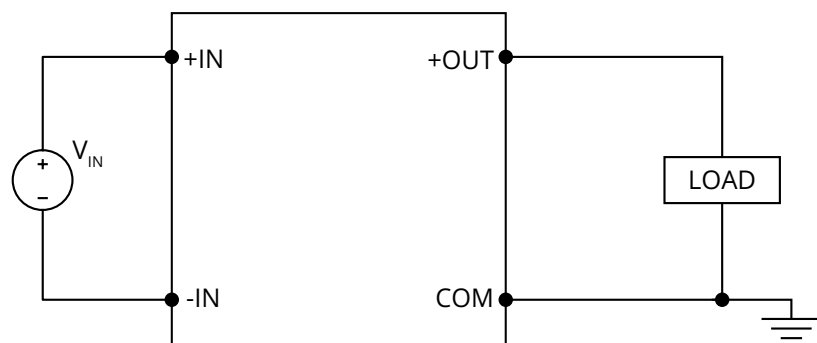
Note 5: For ≤5000V output models, input ground and output ground are not connected internally. Input terminals and output terminals may be connected externally.

≥6000V ISOLATED OUTPUT MODELS



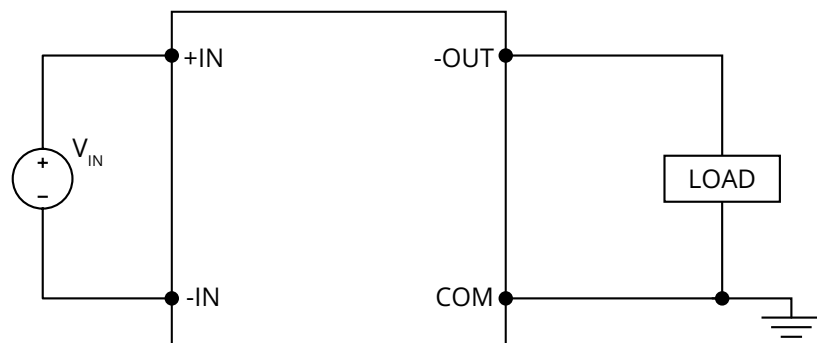
Note 6: For ≥6000V isolated output models, any input terminals **cannot** be connected to any output terminals.

≥6000V NON-ISOLATED POSITIVE MODELS



Note 7: For ≥6000V non-isolated positive output models, you **must** provide an external connection **only** using the COM output terminal to either +IN or -IN input terminals.

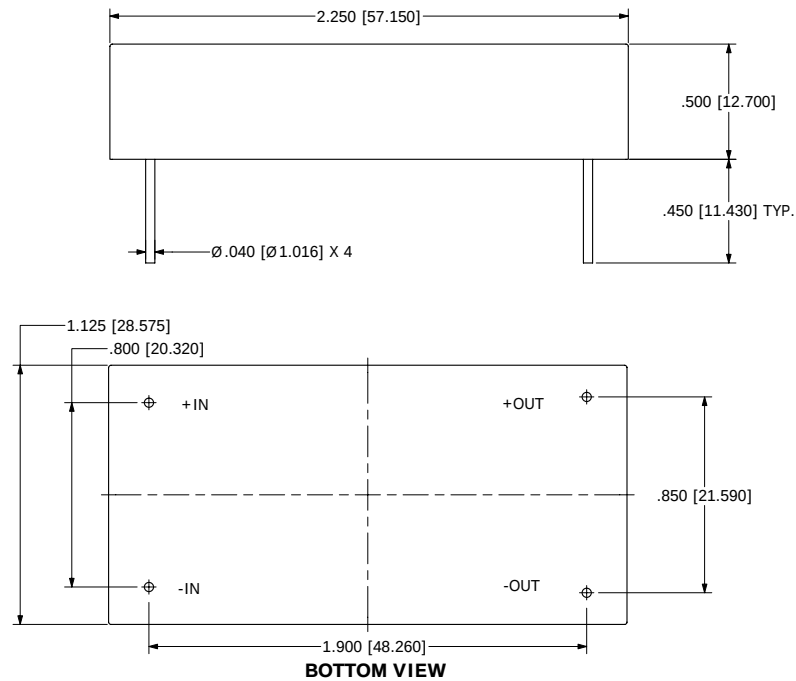
≥6000V NON-ISOLATED NEGATIVE MODELS



Note 8: For ≥6000V non-isolated negative output models, you **must** provide an external connection **only** using the COM output terminal to either +IN or -IN input terminals.

MECHANICAL DRAWINGS

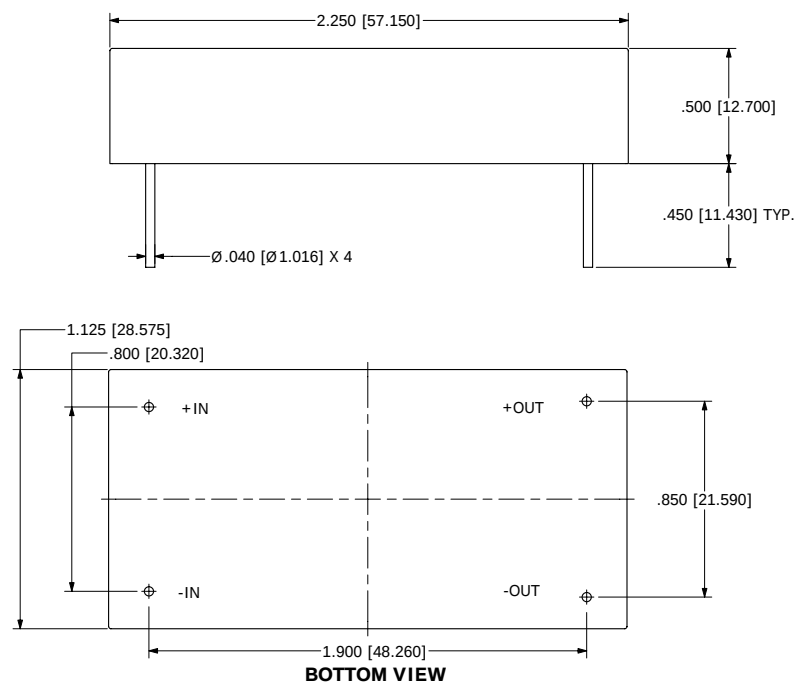
≤5000V OUTPUT MODELS



NOTES

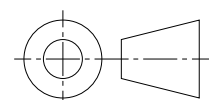
- a. ALL DIMENSIONS ARE IN INCHES, [] = MM
- b. INPUT GROUND AND OUTPUT GROUND MAY BE CONNECTED.

≥6000V ISOLATED OUTPUT MODELS



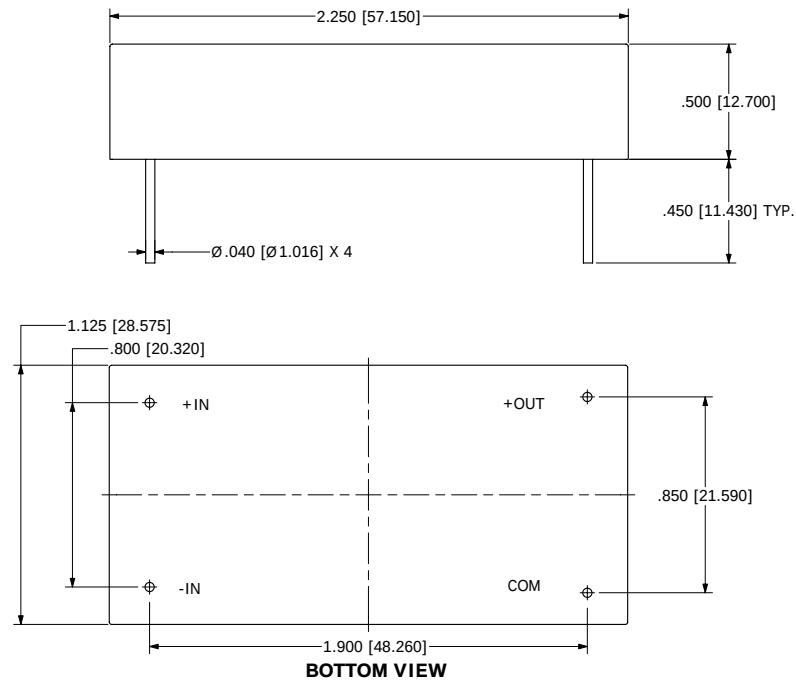
NOTES

- a. ALL DIMENSIONS ARE IN INCHES, [] = MM
- b. INPUT GROUND AND OUTPUT GROUND MUST NOT BE ANYWHERE IN THE CIRCUIT.
- c. FOR ≥6000V OUTPUT MODELS, OUTPUT IS FLOATING.



MECHANICAL DRAWINGS

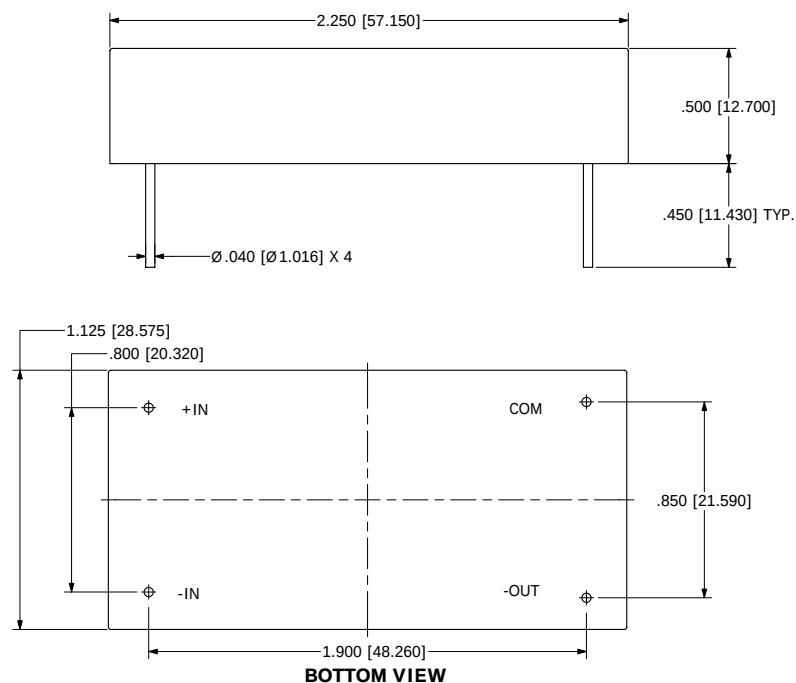
≥6000V NON-ISOLATED POSITIVE OUTPUT MODELS



NOTES

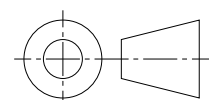
- ALL DIMENSIONS ARE IN INCHES, [] = MM
- COMMON OUTPUT MUST BE CONNECTED TO +IN OR -IN INPUT.
- OUTPUT IS POSITIVE.

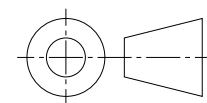
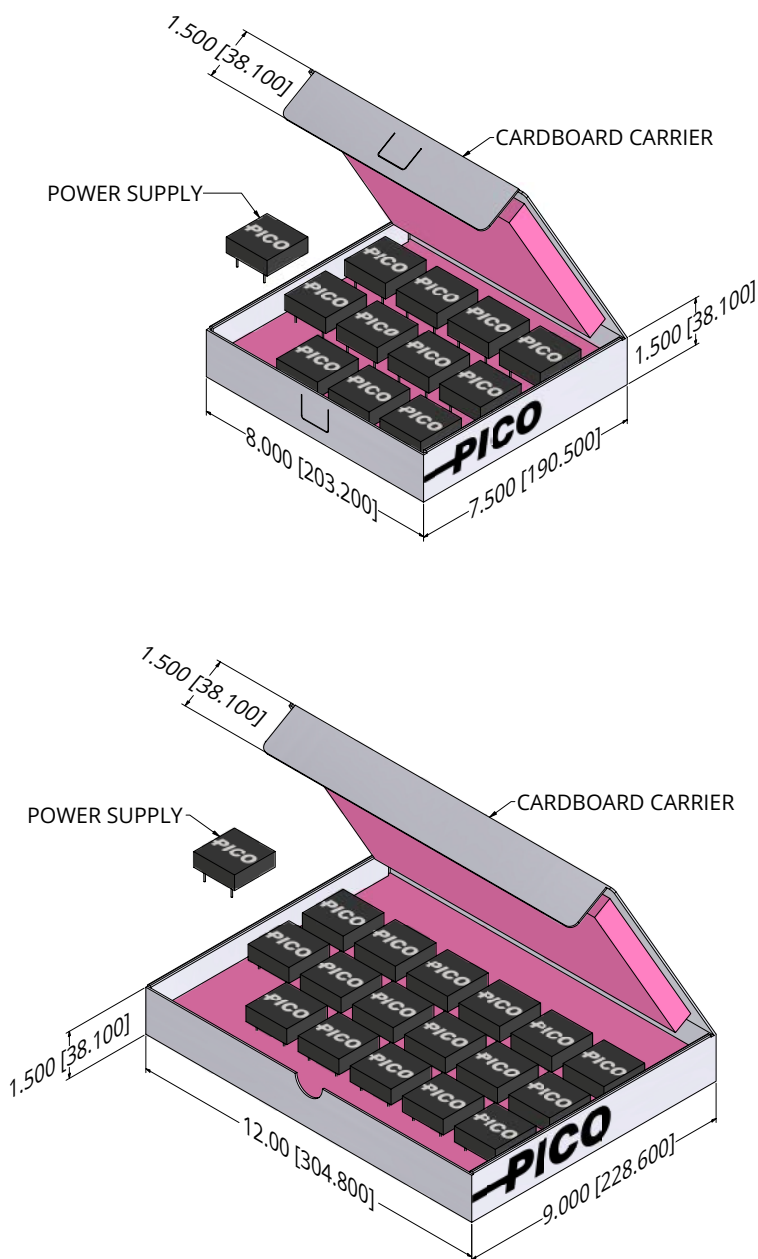
≥6000V NON-ISOLATED NEGATIVE OUTPUT MODELS



NOTES

- ALL DIMENSIONS ARE IN INCHES, [] = MM
- COMMON OUTPUT MUST BE CONNECTED TO +IN OR -IN INPUT.
- OUTPUT IS NEGATIVE.





Pico warrants each product manufactured by us and sold by us or an authorized representative, to be free from defects in material and workmanship. If properly used, it will perform within its applicable specifications for a period of one year after original shipment. Pico's obligation under this guarantee is limited to repairing or replacing our product to the original purchaser. This warranty is in lieu of all other warranties, express or implied and constitutes fulfillment of our obligations to the purchaser. We do not guarantee that the products can be used for a particular purpose other than those solely covered by the product's specifications. Pico must be notified if the product must meet particular certifications and/or standards. We assume no liability, in any event, for consequential damages, for anticipated or lost profits, incidental damages or loss of time or other losses incurred by the purchaser or any third party in connection with products covered by this warranty or otherwise. The purchaser will indemnify and hold Pico harmless for any damages, losses, costs, etc. from usage not within the product's specifications. Pico must be consulted before usage of its products in a nuclear, radioactive or space environment.

We reserve the right to discontinue products without notice, We reserve the right to make modifications to any existing catalog products without notice, at any time, without the obligation to modify units previously sold.

Series HIP

100W Isolated Regulated Programmable High Voltage DC-DC Converter



PRODUCT OVERVIEW

The HIP series modules are 10% to 100% output voltage programmable by internal reference or external voltage. These modules have an adjustable current limit, voltage monitor, shutdown and operating frequency synchronization features. Protections include input over/undervoltage, output short-circuit, and over temperature.

The 3" x 2" x 0.5" case size has threaded inserts to mount securely for high vibration and shock applications. Conduction cooling is available through the baseplate or compatible heat sink.



FEATURES

- 10-100% programmable output feature
- Up to 100W output power
- Compact 3" x 2" x 0.5" case size
- 2:1 input voltage range
- Protected against input over/undervoltage, output short-circuit, and over temperature
- Frequency synchronization feature
- Adjustable output current limit feature
- Shutdown feature
- Output voltage monitor feature

Contact Pico for part number of available options:

- Expanded operating temp: -40°C to +85°C
- Select screening per MIL-STD-883:
 - Stabilization Bake
 - Temperature Cycle
 - Burn-In
- Special Input Voltage, Output Voltage, Isolation Voltage or Output Power

28	HIP	500
INPUT VOLTAGE RANGE	SERIES NAME	NOM. OUTPUT VOLTAGE
15 = 10 to 20V 28 = 18 to 36V	HIP	100 = 100V 200 = 200V 300 = 300V 400 = 400V 500 = 500V

SPECIFICATIONS (Nominal V_{IN} , Full Load, $T_A = +25^\circ\text{C}$, 1 hour warm up unless otherwise specified)

INPUT

Parameter	Condition	Min.	Typ.	Max.	Units
Input Voltage Range	15HIP models	10	15	20	VDC
	28HIP models	18	28	36	

OUTPUT

Parameter	Condition	Min.	Typ.	Max.	Units
Load Regulation	10-100% load	-	-	0.5	%
Line Regulation		-	-	0.2	%
Output Current	15HIP100	50	-	500	mA
	15HIP200	25	-	250	
	15HIP300	16.7	-	167	
	15HIP400	12.5	-	125	
	15HIP500	10	-	100	
	28HIP100, 21-36V input	50	-	1000	
	28HIP100, 21-18V input	50	Derate 3.3% per voltage		
	28HIP200, 21-36V input	25	-	500	mA
	28HIP200, 21-18V input	25	Derate 3.3% per voltage		
	28HIP300, 21-36V input	16.7	-	333	mA
	28HIP300, 21-18V input	16.7	Derate 3.3% per voltage		
	28HIP400	9.4	-	188	mA
	28HIP500	7.5	-	150	
Output Power	15HIP models	-	-	50	W
	28HIP100, 28HIP200 & 28HIP300	-	-	100	
	28HIP400 & 28HIP500	-	-	75	
Output Voltage Tolerance	Nominal V _{IN} , Full Load	-	-	0.5	%
Output Voltage Ripple (1MHz BW)	100V output models	-	-	0.5	Vp-p
	200V output models	-	-	1	
	300V output models	-	-	1.5	
	400V output models	-	-	2	
	500V output models	-	-	2.5	

ENVIRONMENTAL

Parameter	Condition	Min.	Typ.	Max.	Units
Operating Temperature Range	Baseplate	0	-	+85	$^\circ\text{C}$
Storage Temperature Range	Baseplate	-55	-	+125	$^\circ\text{C}$
Temperature Coefficient		-	-	0.005	%/ $^\circ\text{C}$
Cooling	Conduction through baseplate				

GENERAL

Parameter	Condition	Min.	Typ.	Max.	Units
Efficiency	15HIP100, 15HIP200 & 15HIP300	-	87	-	%
	15HIP400 & 15HIP500	-	86	-	
	28HIP models	-	88	-	
Operating Frequency		-	340	-	kHz
Isolation Voltage	Input to output	3000	-	-	VDC
	Input to baseplate	2100	-	-	
	Output to baseplate	2100	-	-	

SPECIFICATIONS (Nominal V_{IN} , Full Load, $T_A = +25^{\circ}\text{C}$, 1 hour warm up unless otherwise specified)**GENERAL**

Parameter	Condition	Min.	Typ.	Max.	Units
Stability		-	-	0.005	%/hour
Size	L x W x H	3 x 2 x 0.5 (76.2 x 50.8 x 12.7)			inches (mm)
Weight		-	110	-	grams
Case	Aluminum baseplate and Glass Reinforced Polymer				
Potting	Vacuum Impregnated Epoxy				
Box Packaging (W x L x H)	8 x 7.5 x 1.5 (203.2 x 190.5 x 38.1) or 12 x 9 x 1.5 (304.8 x 228.6 x 38.1)				inches (mm)

PROTECTIONS & FEATURES

Parameter	Condition			Min.	Typ.	Max.	Units
Short circuit	Output Current Limit, self-recovery			-	130	-	%
Overtemperature	Baseplate, self-recovery			90	95	100	°C
Input Over Voltage	Non-latched shutdown Self-recovery	15HIP models	Shutdown	-	26.2	-	VDC
			Restart	-	25.9	-	
		28HIP models	Shutdown	-	41.1	-	
			Restart	-	40.9	-	
Input Under Voltage	Non-latched shutdown Self-recovery	15HIP models	Shutdown	-	9.28	-	VDC
			Restart	-	9.45	-	
		28HIP models	Shutdown	-	16.3	-	
			Restart	-	16.42	-	
Shutdown (SHDN)	Non-latched shutdown Self-recovery		Shutdown	-	1.14	-	VDC
			Restart	-	1.3	-	
	Note 1: Shutdown will shut down the unit when the pin is pulled below 1.14V. The unit will restart once the pin reaches above 1.3V.						
Output Voltage Programming (VPROG)	Voltage			0.5	5	5.2	VDC
	Linearity, 10-100% Vout			-	-	1	%
	Note 2: Output Voltage Programming can program the output voltage 10 to 100% Vout using 0.5 to 5V range. Linearity is 1% max. for 10 to 100% Vout. Linearity will be >1% from 0 to 10% Vout. Unit requires a voltage ≤ 5VDC at Output Voltage Programming pin to turn on and operate normally.						
Programming Reference (VREF)	Voltage			4.8	5	5.2	VDC
	Current			0	-	7	mA
	Note 3: Programming Reference can be used for Output Voltage Programming (VPROG) pin. Voltage is typically 5V and current is <7mA.						
Voltage Monitor (VMON)	Linear, 0-100% Vout			0	-	5	VDC
	Impedance			10	-		kΩ
	Note 4: Voltage Monitor returns a voltage proportional (0 to 5V) to the output voltage (+OUT & -OUT). This is useful to implement an external output over voltage protection.						
Output Current Limit (ILIM)	Linear, 20-130% Output current			0	-	2	VDC
	Note 5: Output Current Limit can adjust the output current limit 20 to 130% of output current. Leave pin unconnected for 130% output current limit. Pull pin to -IN through a resistor for 20% output current limit.						
Frequency Synchronization (SYNC)	Note 6: Frequency synchronization can synchronize the operating frequency of multiple units to the highest operating frequency. The synchronization threshold is 1.4V.						

DESIGNED TO MEET

Test	Referenced Standard	Description
Vibration	MIL-STD-202	Method 204, Vibration, High Frequency, Condition D
Shock	MIL-STD-202	Method 213, Shock (Specified Pulse), Condition I
Humidity	MIL-STD-202	Method 106, Moisture Resistance
Altitude	MIL-STD-202	Method 105, Barometric Pressure (Reduced), Condition D

SPECIFICATIONS (Nominal V_{IN} , Full Load, $T_A = +25^\circ\text{C}$, 1 hour warm up unless otherwise specified)

OPTIONS AVAILABLE – CONTACT PICO FOR PART NUMBER

Parameter	Referenced Standard	Description
Stabilization Bake	MIL-STD-883	Referenced Method 1008 Non-operating maximum storage temperature for 24 hours
Temperature Cycle	MIL-STD-883	Referenced Method 1010 Non-operating at temperature extremes, 15 mins/temp, 10 cycles
Burn-In	MIL-STD-883	Referenced Method 1015 Max operating temperature for 160 hours
Expanded Ambient Operating Temperature		-40°C to +85°C

THERMAL RESISTANCE

$$P_{OUT} = \frac{T_C - T_A}{T_{RCA} \times (1 / \eta - 1)}$$

P_{OUT} = Output Power in Watts

η = Efficiency

T_C = Case temperature in $^\circ\text{C}$

T_A = Ambient temperature in $^\circ\text{C}$

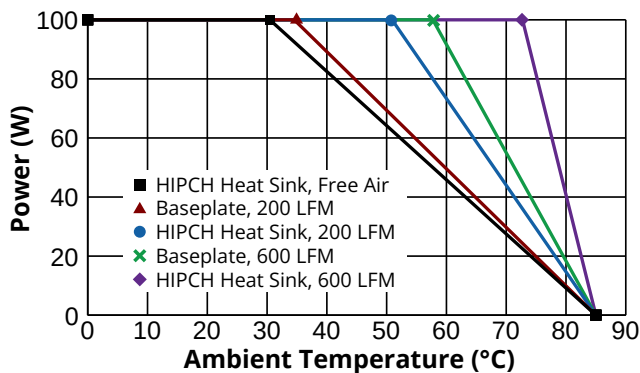
T_{RCA} = Thermal resistance of case to air in $^\circ\text{C}/\text{W}$

Thermal resistance of case (T_{RCA})

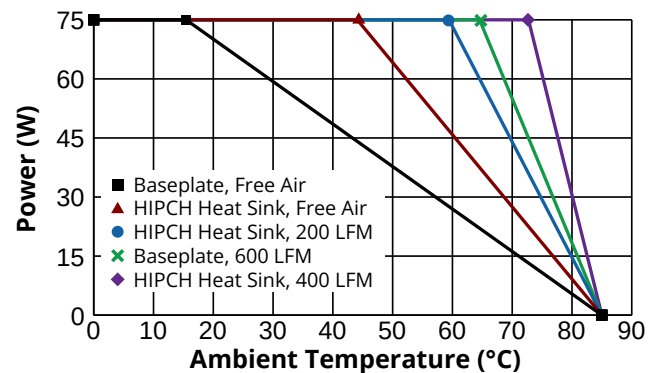
Airflow	Baseplate only	HIPCH Heat Sink	Units
Free Air	6.8	4	$^\circ\text{C} / \text{W}$
200 LFM	3.7	2.5	
400 LFM	2.5	1.2	
600 LFM	2	0.9	

DERATING GRAPHS (Nominal V_{IN} , Full Load, Efficiency @ Full Load)

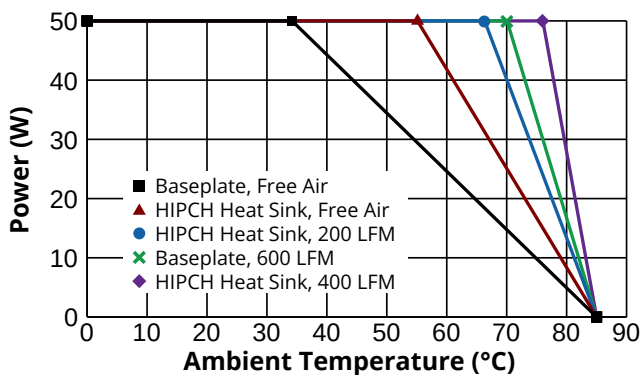
Models with Max. Output Power = 100W
& Efficiency at full load = 88%



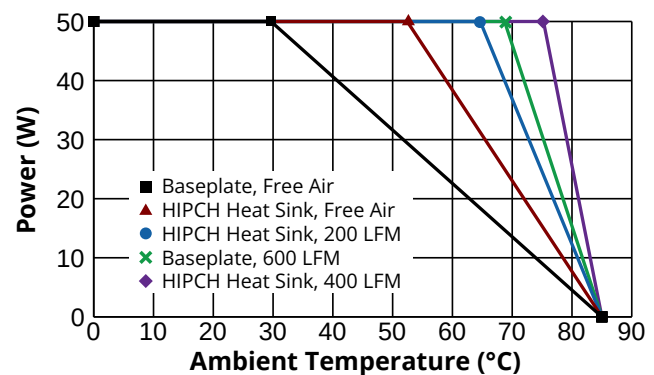
Models with Max. Output Power = 75W
& Efficiency at full load = 88%



Models with Max. Output Power = 50W
& Efficiency at full load = 87%



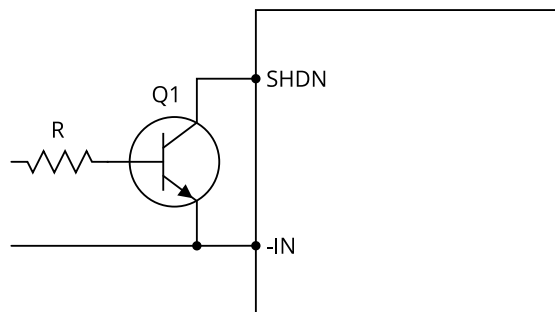
Models with Max. Output Power = 50W
& Efficiency at full load = 86%



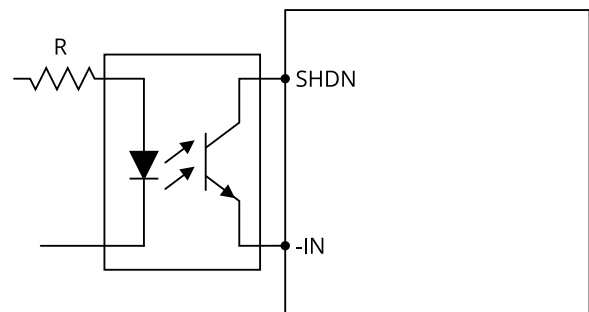
TYPICAL CONNECTION CIRCUIT

SHUTDOWN

NON-ISOLATED



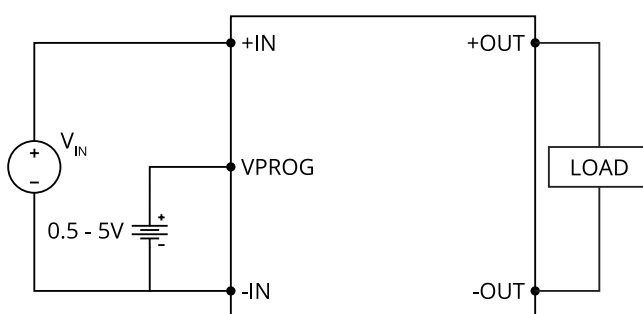
ISOLATED



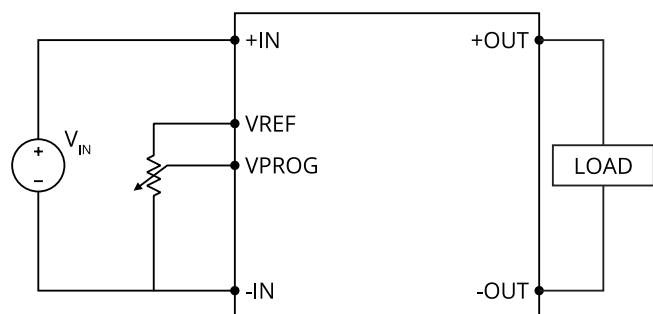
Note 1: Shutdown (SHDN) will shut down the unit when the pin is pulled below 1.14V. The unit will restart once the pin reaches above 1.3V.

OUTPUT VOLTAGE PROGRAMMING

EXTERNAL VOLTAGE



INTERNAL VOLTAGE REFERENCE
& RESISTIVE DIVIDER



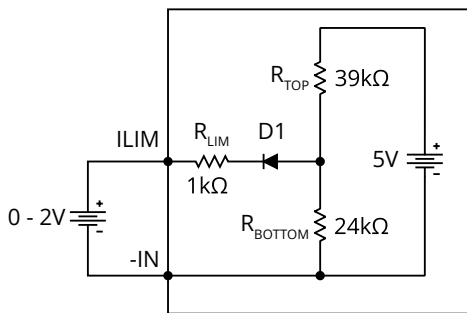
Note 2: Output Voltage Programming (VPROG) can program the output voltage 10 to 100% Vout using 0.5 to 5V range. Linearity is 1% max. for 10 to 100% Vout. Linearity will be >1% from 0 to 10% Vout. **Unit requires a voltage $\leq 5VDC$ at Output Voltage Programming pin to turn on and operate normally.**

Note 3: Programming Reference (VREF) can be used for Output Voltage Programming (VPROG) pin. Voltage is typically 5V and current is <7mA.

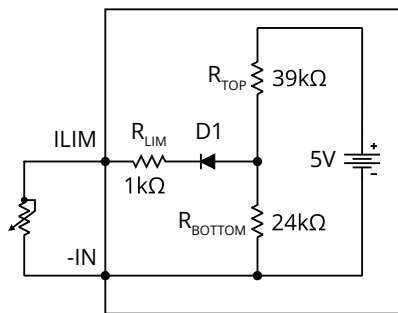
TYPICAL CONNECTION CIRCUIT

OUTPUT CURRENT LIMIT PROGRAMMING

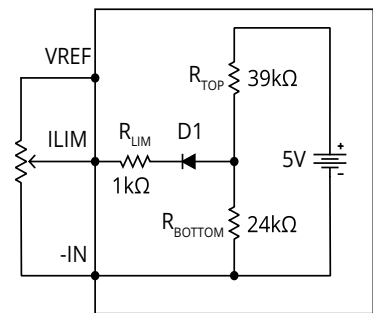
EXTERNAL VOLTAGE



RESISTOR

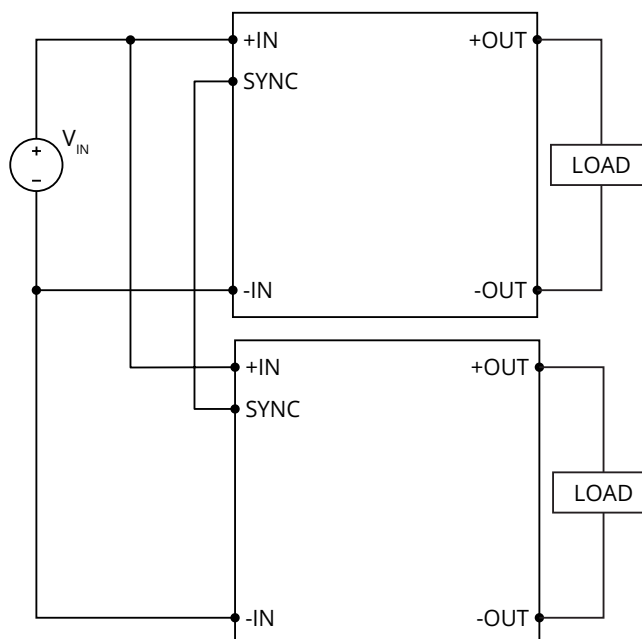


INTERNAL VOLTAGE REFERENCE



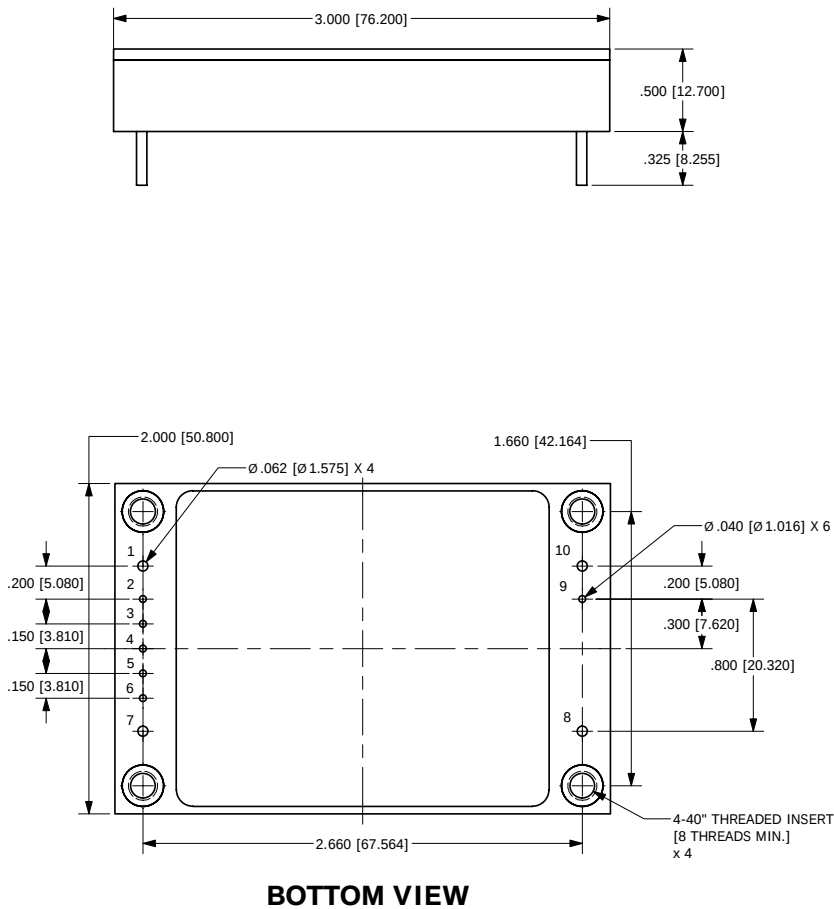
Note 5: Output Current Limit (ILIM) can adjust the output current limit 20 to 130% of output current. Leave pin unconnected for 130% output current limit. Pull pin to -IN through a resistor for 20% output current limit.

FREQUENCY SYNCHRONIZATION



Note 6: Frequency synchronization (SYNC) can synchronize the operating frequency of multiple units to the highest operating frequency. The synchronization threshold is 1.4V.

MECHANICAL DRAWINGS

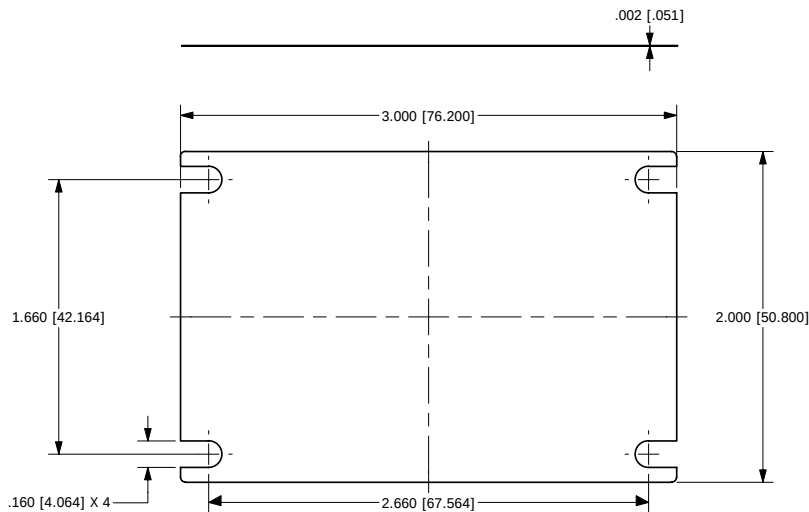


PIN	FUNCTION	PIN DIAMETER
1	-IN	.062 [1.575]
2	SHDN	.040 [1.016]
3	ILIM	.040 [1.016]
4	VPROG	.040 [1.016]
5	VREF	.040 [1.016]
6	SYNC	.040 [1.016]
7	+IN	.062 [1.575]
8	+OUT	.062 [1.575]
9	VMON	.040 [1.016]
10	-OUT	.062 [1.575]

NOTES
a. ALL DIMENSIONS ARE IN INCHES, [] = MM
b. RECOMMENDED TORQUE FOR MOUNTING SCREWS: 3-5 INCH-LBS

MECHANICAL DRAWINGS

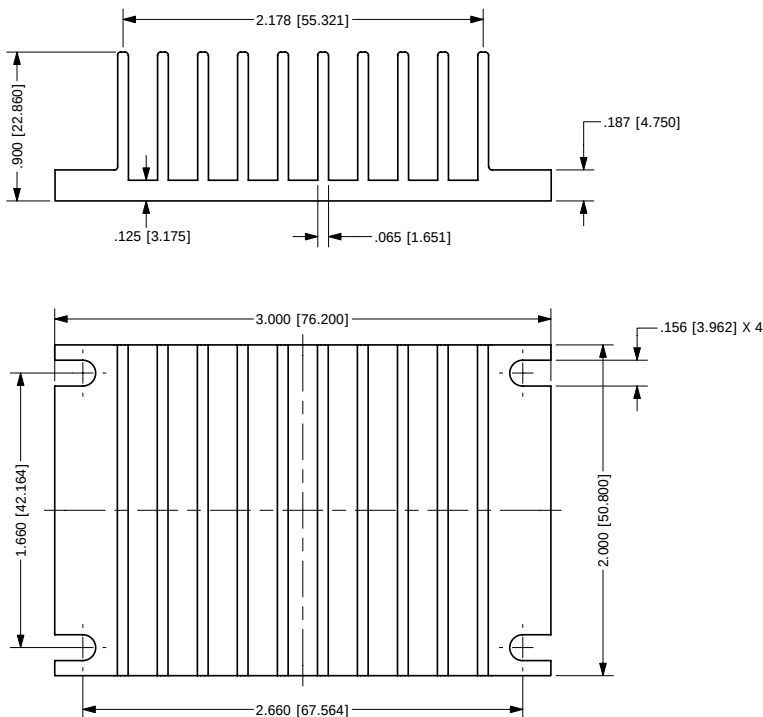
HIPTI - THERMAL INTERFACE



BOTTOM VIEW

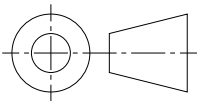
Material	Alloy Aluminum Substrate
Thermal Conductivity	1530 BTU-in/hr sq.ft °F
Coefficient of Thermal Expansion, (25-100°C)	13.1 10 ⁻⁶ in-in/°F
Brinell Hardness	23 HB
Endurance Limit	5000 PSI
Standard Thickness	0.002 inches

HIPCH - HEAT SINK



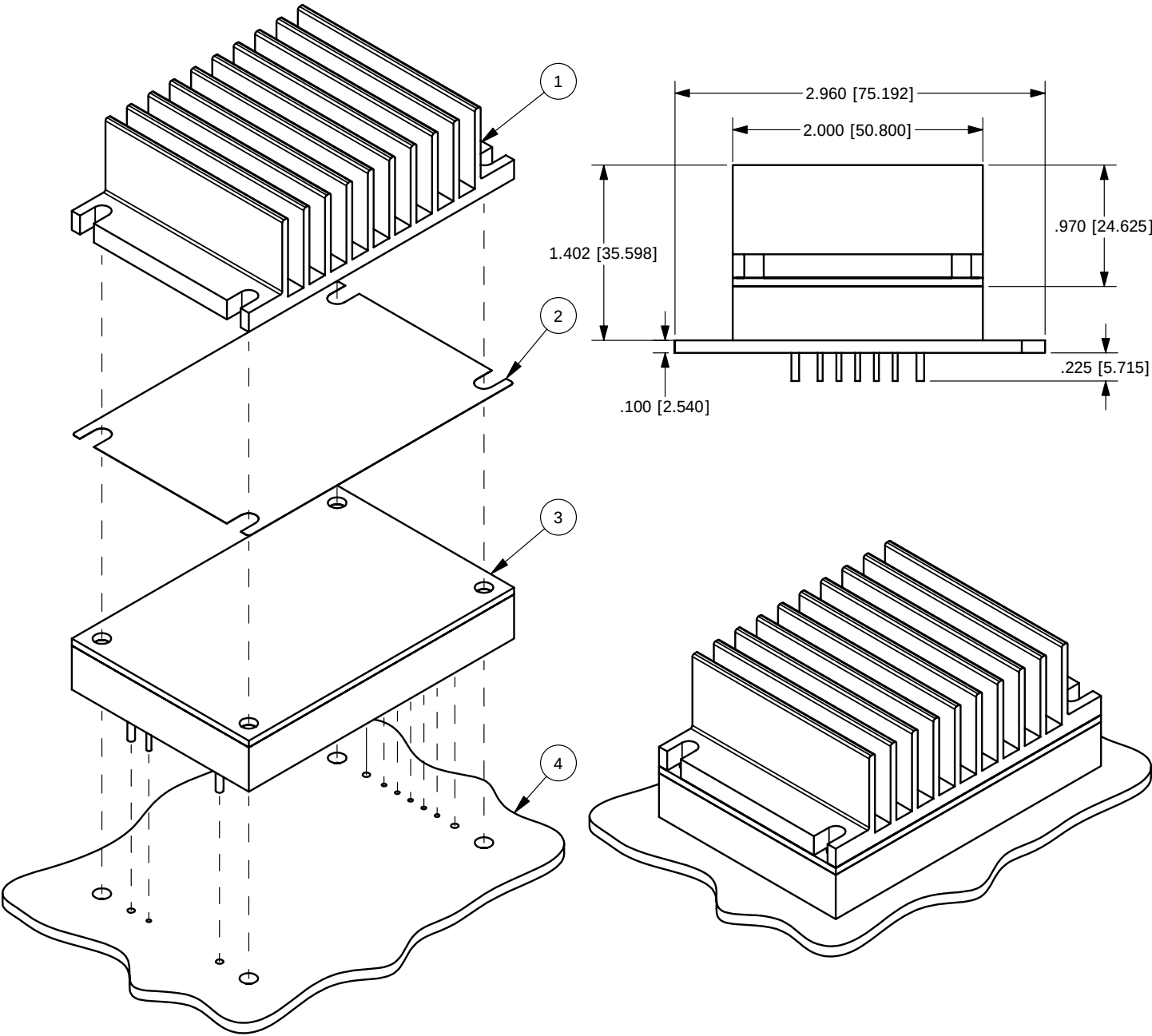
TOP VIEW

Weight: 51.3 grams typical

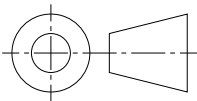


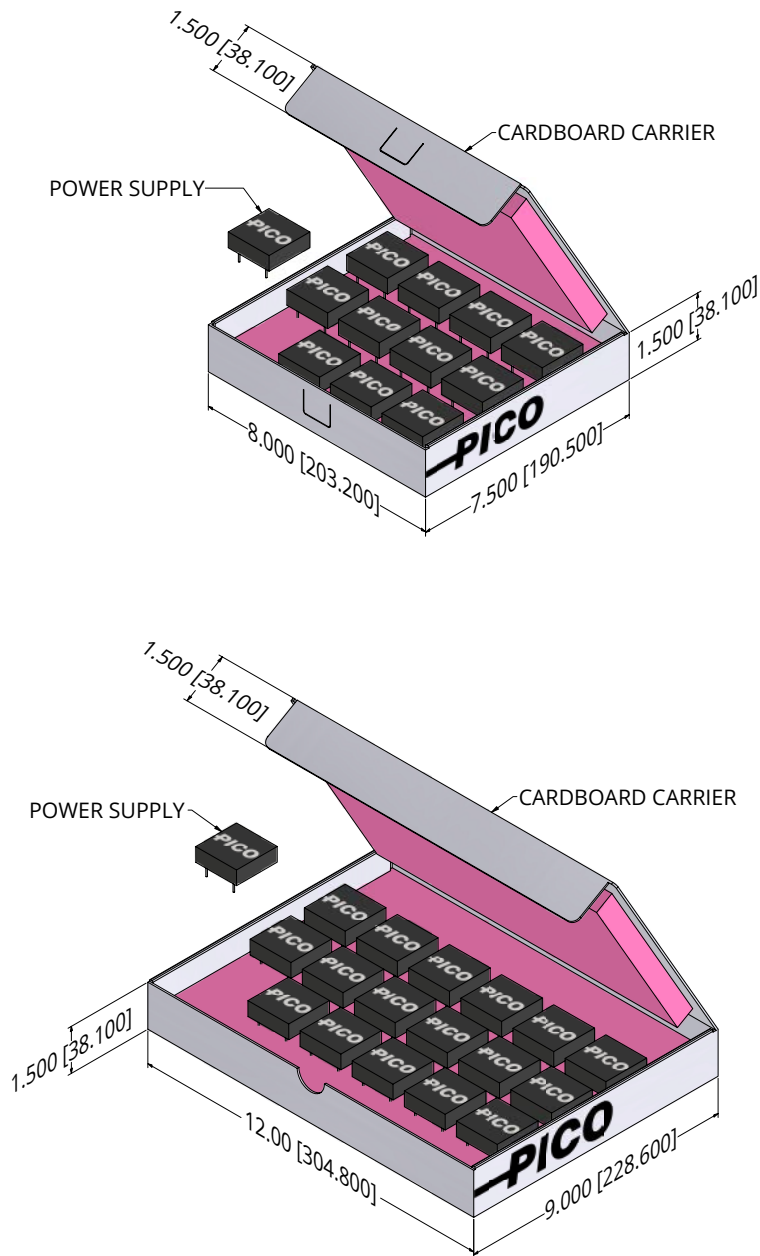
MECHANICAL DRAWINGS

HEAT SINK ASSEMBLY



ITEM	QTY	DESCRIPTION
1	1	HIPCH HEAT SINK
2	1	HIPTI THERMAL INTERFACE
3	1	SERIES HIP MODULE
4	1	PCB





Pico warrants each product manufactured by us and sold by us or an authorized representative, to be free from defects in material and workmanship. If properly used, it will perform within its applicable specifications for a period of one year after original shipment. Pico's obligation under this guarantee is limited to repairing or replacing our product to the original purchaser. This warranty is in lieu of all other warranties, express or implied and constitutes fulfillment of our obligations to the purchaser. We do not guarantee that the products can be used for a particular purpose other than those solely covered by the product's specifications. Pico must be notified if the product must meet particular certifications and/or standards. We assume no liability, in any event, for consequential damages, for anticipated or lost profits, incidental damages or loss of time or other losses incurred by the purchaser or any third party in connection with products covered by this warranty or otherwise. The purchaser will indemnify and hold Pico harmless for any damages, losses, costs, etc. from usage not within the product's specifications. Pico must be consulted before usage of its products in a nuclear, radioactive or space environment.

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Series DC3 & DC3-T

50W Isolated Regulated High Power DC-DC Converter

PICO
Electronics, Inc.

PRODUCT OVERVIEW

The DC3 & DC3-T series are isolated DC-DC converters with a wide 3:1 input voltage range of 300V to 900V and output power up to 50W. These modules have shutdown feature and continuous short-circuit protection.

The compact size has threaded inserts to mount securely for high vibration and shock applications. Conduction cooling is available through the baseplate or compatible heat sink.



FEATURES

- Wide 300V to 900V input range
- 3.3V to 300V output models
- Up to 50W output
- Input/output isolation
- Sense feature
- Shutdown feature
- Short-circuit protection
- Through hole or terminal strip
- Fixed operating frequency
- No external components required

Contact Pico for part number of available options:

- Expanded operating temp: -40°C to +85°C
- Select screening per MIL-STD-883:
 - Stabilization Bake
 - Temperature Cycle
 - Burn-In
- Special Input Voltage, Output Voltage, Isolation Voltage or Output Power

DC3	-28	S	T
SERIES NAME	NOM. OUTPUT VOLTAGE	NUMBER OF OUTPUTS	MOUNTING
DC3	-3.3 = 3.3V -5 = 5V -5.2 = 5.2V -12 = 12V -15 = 15V -24 = 24V -28 = 28V -48 = 48V -100 = 100V -125 = 125V -150 = 150V -175 = 175V -200 = 200V -225 = 225V -250 = 250V -275 = 275V -300 = 300V	S = SINGLE D = DUAL	BLANK = THROUGH HOLE T = TERMINAL STRIP

MODEL LIST

SINGLE OUTPUT

Output Voltage [VDC]	Output Current		Output Power [W]	Efficiency ⁽¹⁾ [%] typ.	Load Regulation 10-100% [±%] max	Output Ripple @ 1MHz BW [mVp-p] max	Output Voltage Tolerance ⁽¹⁾ [±%]
3.3	0.909	9.09	30	68	2	75	2
5	0.8	8	40	74		75	
5.2	0.77	7.7	40	74		75	
12	0.416	4.16	50	80		75	
15	0.333	3.33		80		75	
24	0.208	2.08		84	1	75	1
28	0.179	1.79		85		75	
48	0.104	1.04		85		75	
100	0.05	0.5		82		100	
125	0.04	0.4		82		125	
150	0.033	0.33		82		150	
175	0.029	0.29		81		175	
200	0.025	0.25		81		200	
225	0.022	0.22		81		225	
250	0.02	0.2		81		250	
275	0.018	0.18		80		300	
300	0.017	0.17		80		300	

DUAL OUTPUT

Output Voltage [±VDC]	Output Current		Output Power [±W]	Efficiency ⁽¹⁾ [%] typ.	Load Regulation 10-100% [±%] max	Output Ripple @ 1MHz BW [mVp-p] max	Output Voltage Tolerance ⁽¹⁾ [±%]
5	0.4	4	20	75	2	75	2
12	0.208	2.08	25	80			
15	0.166	1.66		80			
24	0.104	1.04		84			
28	0.089	0.892		84			

Note 1: Tested at nominal input voltage and full output load.

SPECIFICATIONS (Nominal V_{IN} , Full Load, $T_A = +25^{\circ}\text{C}$, 1 hour warm up unless otherwise specified)**INPUT**

Parameter	Condition	Min.	Typ.	Max.	Units
Input Voltage Range		300	600	900	VDC

OUTPUT

Parameter	Condition	Min.	Typ.	Max.	Units
Line Regulation		-	1	-	%

ENVIRONMENTAL

Parameter	Condition	Min.	Typ.	Max.	Units
Operating Temperature Range	Baseplate	0	-	+85	$^{\circ}\text{C}$
Storage Temperature Range		-55	-	+105	$^{\circ}\text{C}$
Temperature Coefficient		-	0.02	-	%/ $^{\circ}\text{C}$
Cooling	Conduction through baseplate				

GENERAL

Parameter	Condition	Min.	Typ.	Max.	Units
Operating Frequency	Fixed	-	66	-	kHz
Isolation Voltage	Input to output	2121	-	-	VDC
	Input/output to baseplate	2121	-	-	
Size (L x W x H)	Through hole	3.225 x 2.27 x 0.725 (81.915 x 57.658 x 18.415)			inches (mm)
	Terminal strip	4.325 x 2.27 x 0.725 (109.855 x 57.658 x 18.415)			
Weight		-	190	-	grams
Case	Aluminum baseplate and Glass Reinforced Polymer				
Potting	Vacuum Impregnated Epoxy				
Box Packaging (W x L x H)	8 x 7.5 x 1.5 (203.2 x 190.5 x 38.1) or 12 x 9 x 1.5 (304.8 x 228.6 x 38.1)				inches (mm)

PROTECTIONS & FEATURES

Parameter	Condition	Min.	Typ.	Max.	Units
Short circuit	Continuous				
Shutdown (SDN)	Non-latched shutdown, Self-recovery	-	4	-	VDC

DESIGNED TO MEET

Test	Referenced Standard	Description
Vibration	MIL-STD-202	Method 204, Vibration, High Frequency, Condition D
Shock	MIL-STD-202	Method 213, Shock (Specified Pulse), Condition I
Humidity	MIL-STD-202	Method 106, Moisture Resistance
Altitude	MIL-STD-202	Method 105, Barometric Pressure (Reduced), Condition D

OPTIONS AVAILABLE – CONTACT PICO FOR PART NUMBER

Parameter	Referenced Standard	Description
Stabilization Bake	MIL-STD-883	Referenced Method 1008 Non-operating maximum storage temperature for 24 hours
Temperature Cycle	MIL-STD-883	Referenced Method 1010 Non-operating at temperature extremes, 15 mins/temp, 10 cycles
Burn-In	MIL-STD-883	Referenced Method 1015 Max operating temperature for 160 hours
Expanded Operating Temperature Range	-40 $^{\circ}\text{C}$ to +85 $^{\circ}\text{C}$	

THERMAL RESISTANCE

$$P_{OUT} = \frac{T_C - T_A}{T_{RCA} \times (1/\eta - 1)}$$

P_{OUT} = Output Power in Watts

η = Efficiency

T_C = Case temperature in °C

T_A = Ambient temperature in °C

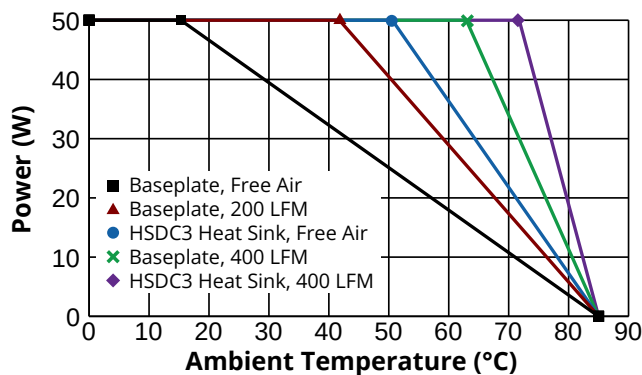
T_{RCA} = Thermal resistance of case to air in °C/w

Thermal resistance of case (T_{RCA})

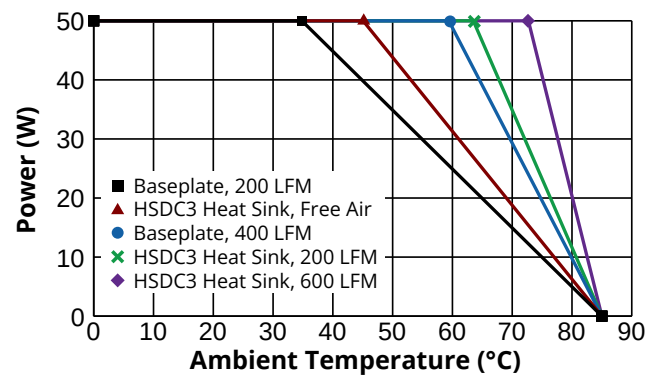
Airflow	Baseplate only	HSDC3 Heat Sink	Units
Free Air	7.9	3.9	°C / W
200 LFM	4.9	2.1	
400 LFM	2.5	1.5	
600 LFM	2.2	1.2	
800 LFM	1.5	1	
1000 LFM	1.2	0.98	

DERATING GRAPHS (Nominal V_{IN} , Full Load, Efficiency @ Full Load)

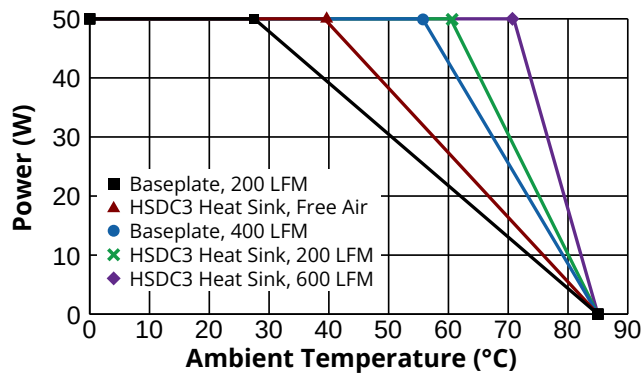
Models with Max. Output Power = 50W
& Efficiency at full load = 85%



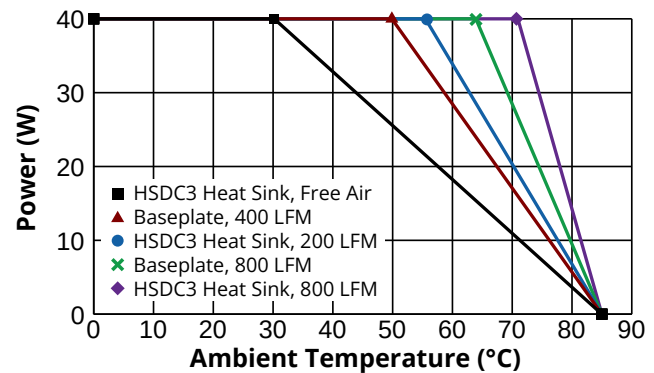
Models with Max. Output Power = 50W
& Efficiency at full load = 83%



Models with Max. Output Power = 50W
& Efficiency at full load = 81%

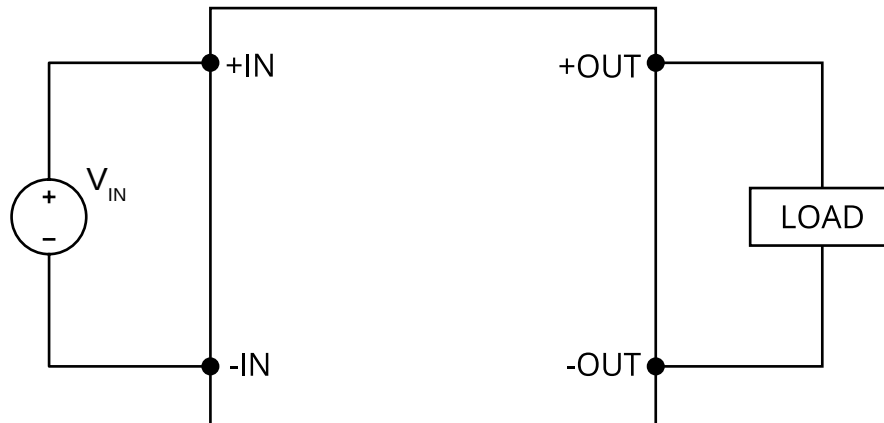


Models with Max. Output Power = 40W
& Efficiency at full load = 74%

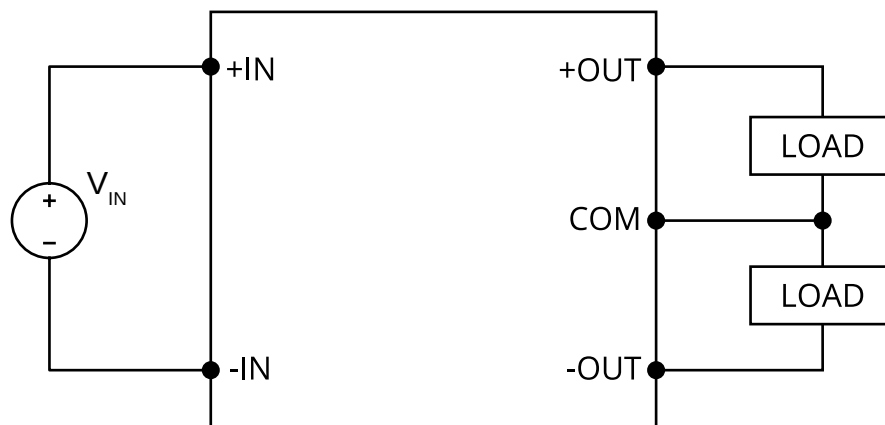


TYPICAL CONNECTION CIRCUIT

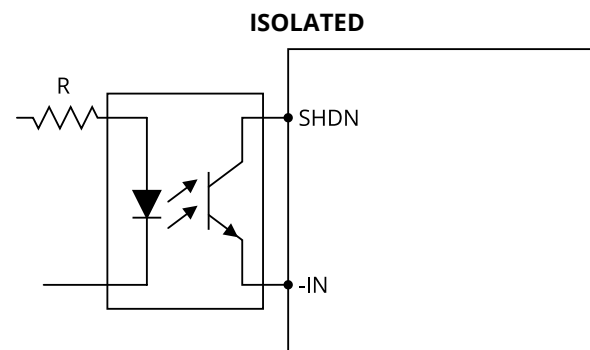
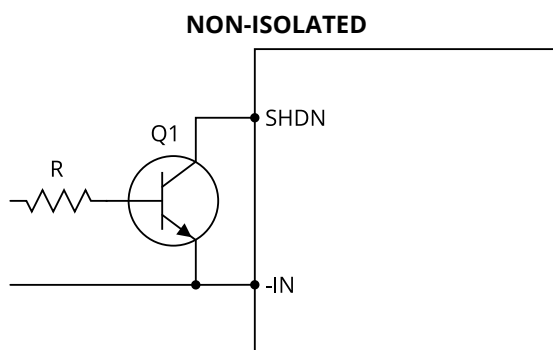
SINGLE OUTPUT



DUAL OUTPUT

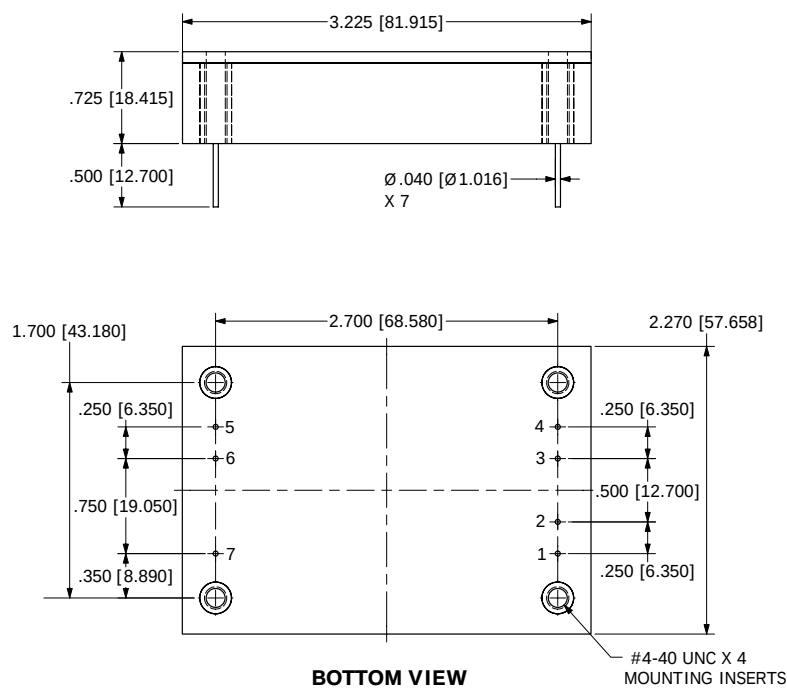


SHUTDOWN



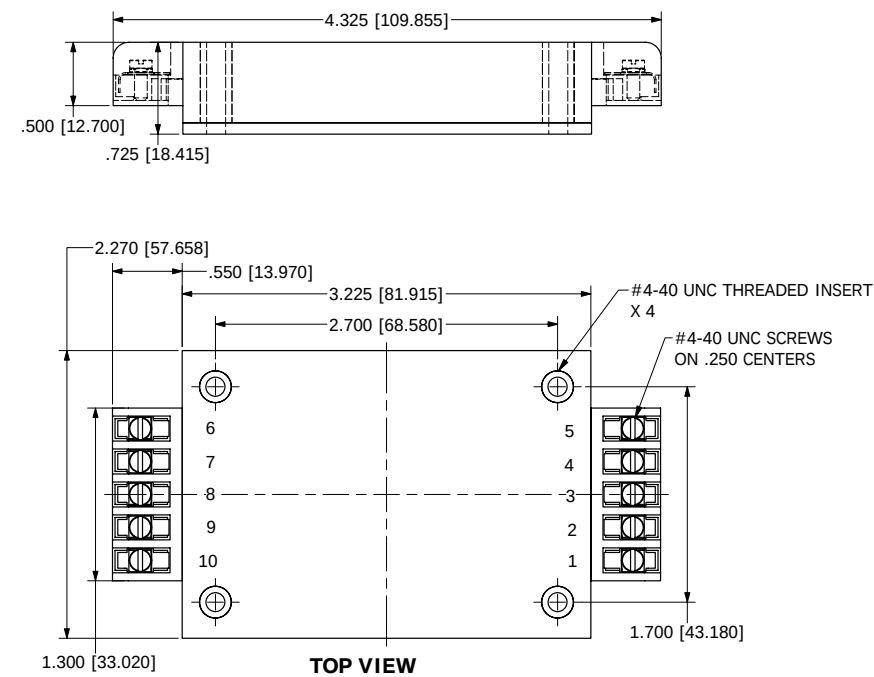
MECHANICAL DRAWINGS

THROUGH HOLE



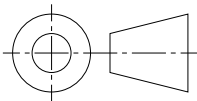
PIN	FUNCTION			PIN DIAMETER
	Single ≤48V	Single ≥100V	Dual	
1	+OUT			.040 [1.016]
2	+OUT	N/C	COM	
3	-OUT	N/C	COM	
4	-OUT			
5	SDN			
6	-IN			
7	+IN			

TERMINAL STRIP



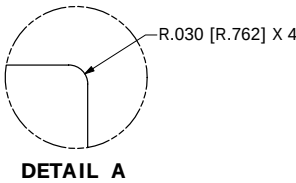
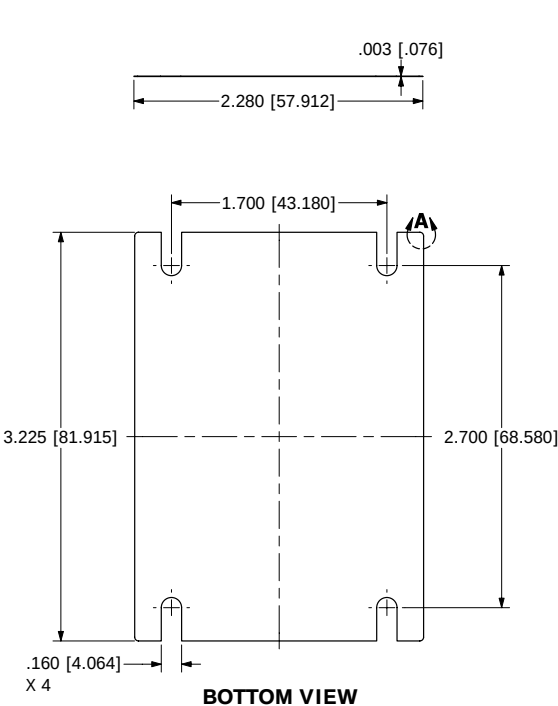
PIN	FUNCTION		
	Single ≤48V	Single ≥100V	Dual
1	+OUT		
2	+OUT	N/C	COM
3	N/C		
4	-OUT	N/C	COM
5	-OUT		
6	SDN		
7	-IN		
8	N/C		
9	N/C		
10	+IN		

NOTES
a. ALL DIMENSIONS ARE IN INCHES, [] = MM
b. RECOMMENDED TORQUE FOR MOUNTING SCREWS: 6-9 INCH-LBS



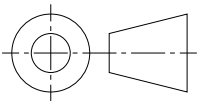
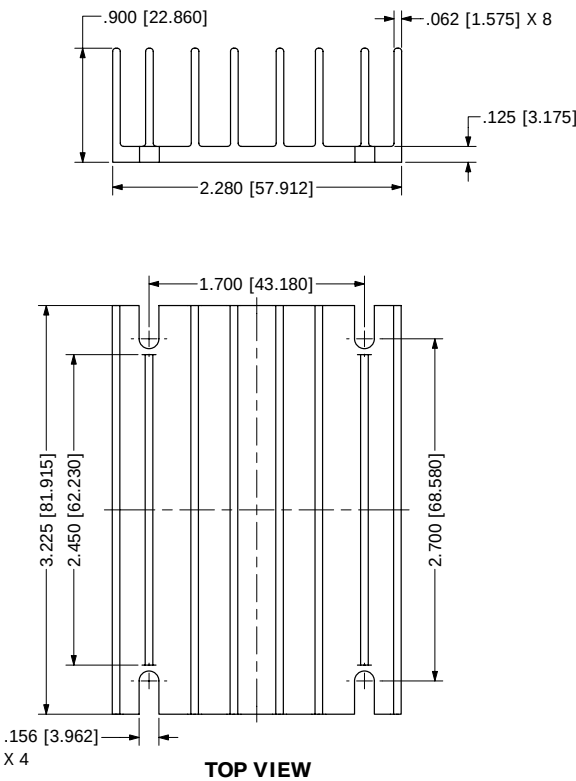
MECHANICAL DRAWINGS

TIDC3 - THERMAL INTERFACE



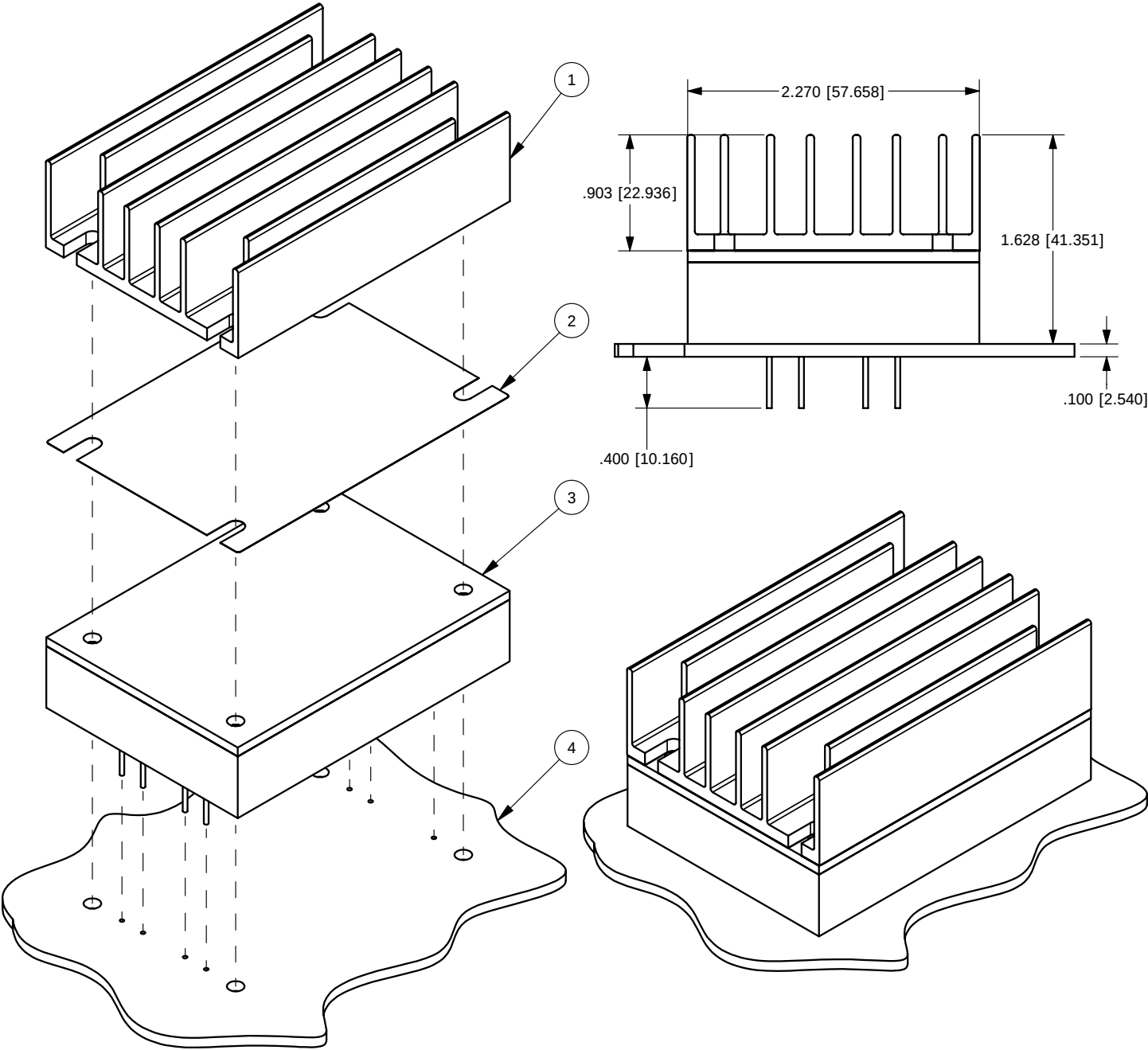
Material	Alloy Aluminum Substrate
Thermal Conductivity	1530 BTU-in/hr sq.ft °F
Coefficient of Thermal Expansion, (25-100°C)	13.1 10 ⁻⁶ in-in/°F
Brinell Hardness	23 HB
Endurance Limit	5000 PSI
Standard Thickness	0.003 inches

HSDC3 - HEAT SINK

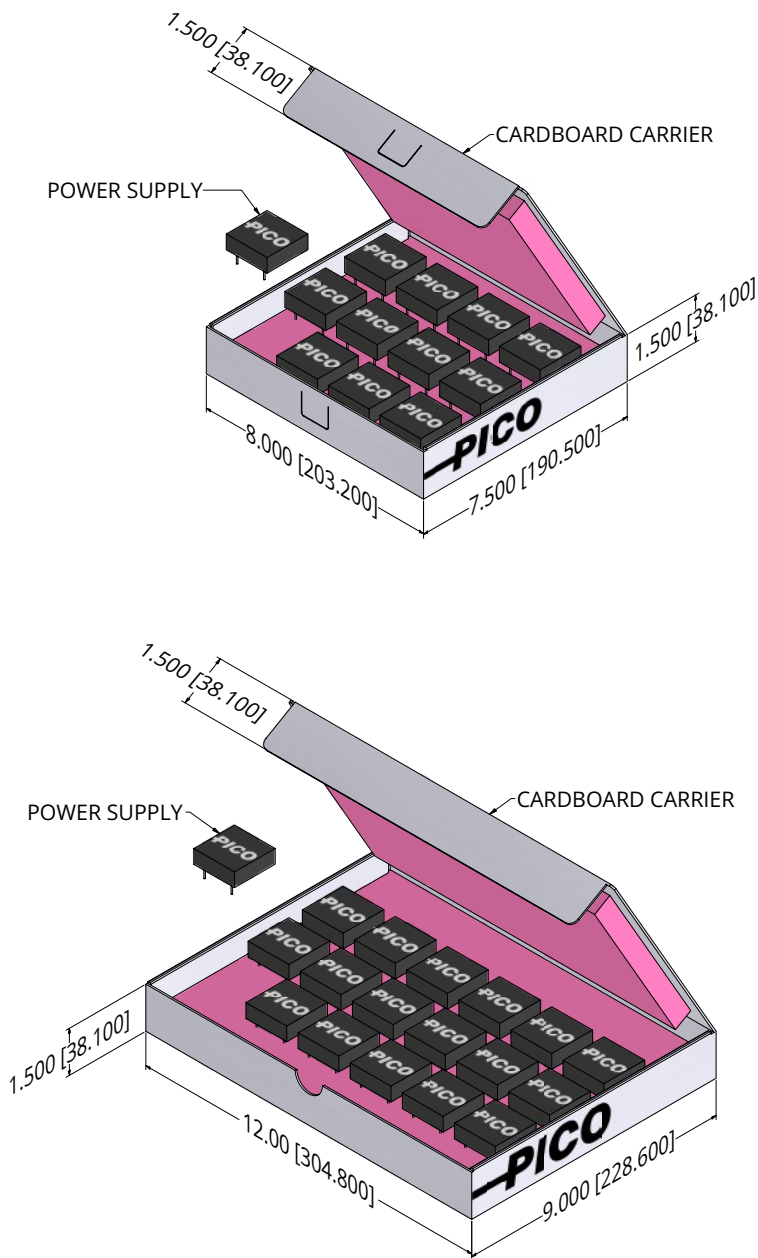


MECHANICAL DRAWINGS

HEAT SINK ASSEMBLY



ITEM	QTY	DESCRIPTION
1	1	HSDC3 HEAT SINK
2	1	TIDC3 THERMAL INTERFACE
3	1	DC3 OR DC3-T MODULE
4	1	PCB



Pico warrants each product manufactured by us and sold by us or an authorized representative, to be free from defects in material and workmanship. If properly used, it will perform within its applicable specifications for a period of one year after original shipment. Pico's obligation under this guarantee is limited to repairing or replacing our product to the original purchaser. This warranty is in lieu of all other warranties, express or implied and constitutes fulfillment of our obligations to the purchaser. We do not guarantee that the products can be used for a particular purpose other than those solely covered by the product's specifications. Pico must be notified if the product must meet particular certifications and/or standards. We assume no liability, in any event, for consequential damages, for anticipated or lost profits, incidental damages or loss of time or other losses incurred by the purchaser or any third party in connection with products covered by this warranty or otherwise. The purchaser will indemnify and hold Pico harmless for any damages, losses, costs, etc. from usage not within the product's specifications. Pico must be consulted before usage of its products in a nuclear, radioactive or space environment.

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Series LF/LM

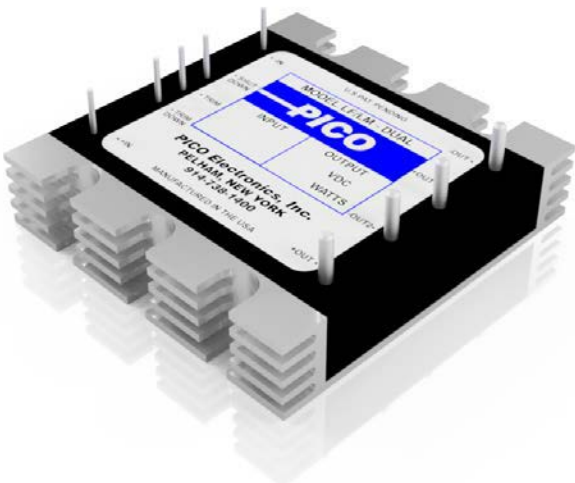
75W Isolated Regulated High Power DC-DC Converter



PRODUCT OVERVIEW

The LF/LM series are isolated DC-DC converters with a wide selection of input voltage ranges from 18V to 380V in a compact half brick size foot print - 2.4" x 2.3". These modules have trim capability and shutdown features. Protections include input overvoltage, output short-circuit, output overvoltage and over temperature.

The unique case has integrated side heat sink for better thermal dissipation but is capable of conduction cooling through the baseplate or additional top mounted heat sink.



FEATURES

- 18V to 380V input range models
- 3.3V to 200V output models
- Up to 75W output
- Input/output isolation
- Integrated side heat sink
- Parallel operation option
- Single and dual isolated outputs
- Industrial temperature option -40°C (LF)
- Military temperature option -55°C (LM)
- Trim capability
- Remote shutdown feature
- Fixed operating frequency
- No external components required

Contact Pico for part number of available options:

- Select screening per MIL-STD-883:
 - Stabilization Bake
 - Temperature Cycle
 - Burn-In
- Special Input Voltage, Output Voltage, Isolation Voltage or Output Power
- Parallel Operation

LM	A	28	S
TEMPERATURE RANGE	INPUT VOLTAGE RANGE	OUTPUT VOLTAGE	NUMBER OF OUTPUTS
LF = -40°C to +85°C LM = -55°C to +85°C	A = 18 - 36V B = 36 - 72V C = 100 - 180V D = 200 - 380V	3.3 = 3.3V 5 = 5V 5.2 = 5.2V 9 = 9V 12 = 12V 15 = 15V 24 = 24V 28 = 28V 48 = 48V 100 = 100V 125 = 125V 150 = 150V 175 = 175V 200 = 200V 225 = 225V 250 = 250V	S = SINGLE D = DUAL

MODEL LIST - LFA/LMA (18-36V INPUT RANGE)

SINGLE OUTPUT

Pico Part Number		Output Voltage [VDC]	Output Current		Output Power [W]	Efficiency ⁽²⁾ [%] typ.	Line Regulation ⁽³⁾		Load Regulation ⁽⁴⁾		Output Voltage Tolerance ⁽²⁾ [±%]
-40°C to +85°C	-55°C to +85°C		Min. ⁽¹⁾ [A]	Max. [A]			Nom.-Min. [-%] max	Nom.-Max. [+%] max	50%-Min. [+%] max	50%-100% [-%] max	
LFA3.3S	LMA3.3S	3.3	0.91	9.09	30	73	1	1	1.5	1.5	2
LFA5S	LMA5S	5	1.00	10.00	50	80	1	1	1.25	1.25	1.5
LFA5.2S	LMA5.2S	5.2	0.96	9.62	50	80	1	1	1.25	1.25	1.5
LFA9S	LMA9S	9	0.67	6.67	60	84	1	1	1.25	1.25	1
LFA12S	LMA12S	12	0.50	5.00	60	85	1	1	1.25	1.25	0.75
LFA15S	LMA15S	15	0.43	4.33	65	85	0.75	0.75	1	1	0.75
LFA24S	LMA24S	24	0.31	3.13	75	87	0.5	0.5	0.75	0.75	0.75
LFA28S	LMA28S	28	0.27	2.68	75	87	0.5	0.5	0.5	0.5	0.5
LFA48S	LMA48S	48	0.16	1.56	75	85	0.5	0.5	0.5	0.5	0.5
LFA100S	LMA100S	100	0.08	0.75	75	85	0.5	0.5	0.5	0.5	0.5
LFA125S	LMA125S	125	0.04	0.40	50	82	0.3	0.3	0.5	0.5	0.5
LFA150S	LMA150S	150	0.03	0.33	50	82	0.3	0.3	0.5	0.5	0.5
LFA175S	LMA175S	175	0.03	0.29	50	82	0.3	0.3	0.5	0.5	0.5
LFA200S	LMA200S	200	0.03	0.25	50	82	0.3	0.3	0.5	0.5	0.5
LFD225S	LMD225S	225	0.02	0.22	50	85	0.3	0.3	0.5	0.5	0.5
LFD250S	LMD250S	250	0.02	0.20	50	85	0.3	0.3	0.5	0.5	0.5

DUAL OUTPUT

Pico Part Number		Output Voltage Per Output [VDC]	Output Current Per Output		Output Power Per Output ⁽⁴⁾ [W]	Efficiency ⁽²⁾ [%] typ.	Line Regulation ⁽³⁾		Load Regulation ⁽⁴⁾		Output Voltage Tolerance ⁽²⁾ [±%]
-40°C to +85°C	-55°C to +85°C		Min. ⁽¹⁾ [A]	Max. [A]			Nom.-Min. [-%] max	Nom.-Max. [+%] max	50%-Min. [+%] max	50%-100% [-%] max	
LFA5D	LMA5D	5	1.00	10.00	25	80	1	1	1.25	1.25	1.5
LFA9D	LMA9D	9	0.67	6.67	30	84	1	1	1.25	1.25	1
LFA12D	LMA12D	12	0.50	5.00	30	85	1	1	1.25	1.25	0.75
LFA15D	LMA15D	15	0.43	4.33	32.5	85	0.75	0.75	1	1	0.75
LFA24D	LMA24D	24	0.31	3.13	37.5	87	0.5	0.5	0.75	0.75	0.5
LFA28D	LMA28D	28	0.27	2.68	37.5	87	0.5	0.5	0.5	0.5	0.5
LFA48D	LMA48D	48	0.16	1.56	37.5	85	0.5	0.5	0.5	0.5	0.5

Note 1: Maintain minimum 10% of rated load to prevent a voltage surge.

Note 2: Tested at nominal input voltage and full output load.

Note 3: Line regulation is specified at full output load, nominal to minimum input voltage (-%) and nominal to maximum input voltage (+%).

Note 4: For ≤100V output models, load regulation is specified at nominal input voltage, 50% to 10% load (+%) and 50% to 100% load (-%). For ≥125V output models, load regulation is specified at nominal input voltage, 50% to 20% load (+%) and 50% to 100% load (-%).

Note 5: Dual output loads must be balanced.

MODEL LIST - LFB/LMB (36-72V INPUT RANGE)**SINGLE OUTPUT**

Pico Part Number		Output Voltage [VDC]	Output Current		Output Power [W]	Efficiency ⁽²⁾ [%] typ.	Line Regulation ⁽³⁾		Load Regulation ⁽⁴⁾		Output Voltage Tolerance ⁽²⁾ [±%]
-40°C to +85°C	-55°C to +85°C		Min. ⁽¹⁾ [A]	Max. [A]			Nom.-Min. [-%] max	Nom.-Max. [%] max	50%-Min. [%] max	50%-100% [-%] max	
LFB3.3S	LMB3.3S	3.3	0.91	9.09	30	74	0.75	0.75	1.5	1.5	2
LFB5S	LMB5S	5	1.00	10.00	50	80	0.75	0.75	1	1	1.5
LFB5.2S	LMB5.2S	5.2	0.96	9.62	50	80	0.75	0.75	1	1	1.5
LFB9S	LMB9S	9	0.72	7.22	65	84	0.75	0.75	1	1	1
LFB12S	LMB12S	12	0.63	6.25	75	84	0.5	0.5	0.75	0.75	1
LFB15S	LMB15S	15	0.50	5.00	75	84	0.5	0.5	0.75	0.75	1
LFB24S	LMB24S	24	0.31	3.13	75	87	0.5	0.5	0.5	0.5	0.5
LFB28S	LMB28S	28	0.27	2.68	75	87	0.5	0.5	0.5	0.5	0.5
LFB48S	LMB48S	48	0.16	1.56	75	85	0.5	0.5	0.5	0.5	0.5
LFB100S	LMB100S	100	0.08	0.75	75	85	0.5	0.5	0.5	0.5	0.5
LFB125S	LMB125S	125	0.04	0.40	50	84	0.3	0.3	0.5	0.5	0.5
LFB150S	LMB150S	150	0.03	0.33	50	84	0.3	0.3	0.5	0.5	0.5
LFB175S	LMB175S	175	0.03	0.29	50	84	0.3	0.3	0.5	0.5	0.5
LFB200S	LMB200S	200	0.03	0.25	50	84	0.3	0.3	0.5	0.5	0.5
LFB225S	LMB225S	225	0.02	0.22	50	84	0.3	0.3	0.5	0.5	0.5
LFB250S	LMB250S	250	0.02	0.20	50	84	0.3	0.3	0.5	0.5	0.5

DUAL OUTPUT

Pico Part Number		Output Voltage Per Output [VDC]	Output Current Per Output		Output Power Per Output ⁽⁴⁾ [W]	Efficiency ⁽²⁾ [%] typ.	Line Regulation ⁽³⁾		Load Regulation ⁽⁴⁾		Output Voltage Tolerance ⁽²⁾ [±%]
-40°C to +85°C	-55°C to +85°C		Min. ⁽¹⁾ [A]	Max. [A]			Nom.-Min. [-%] max	Nom.-Max. [%] max	50%-Min. [%] max	50%-100% [-%] max	
LFB5D	LMB5D	5	1.00	10.00	25	80	0.75	0.75	1	1	1.5
LFB9D	LMB9D	9	0.72	7.22	30	84	0.75	0.75	1	1	1
LFB12D	LMB12D	12	0.63	6.25	30	84	0.5	0.5	0.75	0.75	1
LFB15D	LMB15D	15	0.50	5.00	32.5	85	0.5	0.5	0.75	0.75	1
LFB24D	LMB24D	24	0.31	3.13	37.5	87	0.5	0.5	0.5	0.5	0.5
LFB28D	LMB28D	28	0.27	2.68	37.5	87	0.5	0.5	0.5	0.5	0.5
LFB48D	LMB48D	48	0.16	1.56	37.5	85	0.5	0.5	0.5	0.5	0.5

Note 1: Maintain minimum 10% of rated load to prevent a voltage surge.

Note 2: Tested at nominal input voltage and full output load.

Note 3: Line regulation is specified at full output load, nominal to minimum input voltage (-%) and nominal to maximum input voltage (+%).

Note 4: For ≤100V output models, load regulation is specified at nominal input voltage, 50% to 10% load (+%) and 50% to 100% load (-%). For ≥125V output models, load regulation is specified at nominal input voltage, 50% to 20% load (+%) and 50% to 100% load (-%).

Note 5: Dual output loads must be balanced.

MODEL LIST - LFC/LMC (100-180V INPUT RANGE)**SINGLE OUTPUT**

Pico Part Number		Output Voltage [VDC]	Output Current		Output Power [W]	Efficiency ⁽²⁾ [%] typ.	Line Regulation ⁽³⁾		Load Regulation ⁽⁴⁾		Output Voltage Tolerance ⁽²⁾ [±%]
-40°C to +85°C	-55°C to +85°C		Min. ⁽¹⁾ [A]	Max. [A]			Nom.-Min. [-%] max	Nom.-Max. [%] max	50%-Min. [%] max	50%-100% [-%] max	
LFC3.3S	LMC3.3S	3.3	0.91	9.09	30	74	0.75	0.75	1.25	1.25	2
LFC5S	LMC5S	5	1.00	10.00	50	81	0.75	0.75	1	1	1.5
LFC5.2S	LMC5.2S	5.2	0.96	9.62	50	81	0.75	0.75	1	1	1.5
LFC9S	LMC9S	9	0.72	7.22	65	84	0.5	0.5	0.75	0.75	1
LFC12S	LMC12S	12	0.63	6.25	75	85	0.5	0.5	0.75	0.75	1
LFC15S	LMC15S	15	0.50	5.00	75	86	0.5	0.5	0.75	0.75	1
LFC24S	LMC24S	24	0.31	3.13	75	87	0.5	0.5	0.5	0.5	0.5
LFC28S	LMC28S	28	0.27	2.68	75	87	0.3	0.3	0.5	0.5	0.5
LFC48S	LMC48S	48	0.16	1.56	75	85	0.3	0.3	0.5	0.5	0.5
LFC100S	LMC100S	100	0.08	0.75	75	85	0.3	0.3	0.5	0.5	0.5
LFC125S	LMC125S	125	0.04	0.40	50	85	0.3	0.3	0.5	0.5	0.5
LFC150S	LMC150S	150	0.03	0.33	50	85	0.3	0.3	0.5	0.5	0.5
LFC175S	LMC175S	175	0.03	0.29	50	85	0.3	0.3	0.5	0.5	0.5
LFC200S	LMC200S	200	0.03	0.25	50	85	0.3	0.3	0.5	0.5	0.5
LFC225S	LMC225S	225	0.02	0.22	50	85	0.3	0.3	0.5	0.5	0.5
LFC250S	LMC250S	250	0.02	0.20	50	85	0.3	0.3	0.5	0.5	0.5

DUAL OUTPUT

Pico Part Number		Output Voltage Per Output [VDC]	Output Current Per Output		Output Power Per Output ⁽⁴⁾ [W]	Efficiency ⁽²⁾ [%] typ.	Line Regulation ⁽³⁾		Load Regulation ⁽⁴⁾		Output Voltage Tolerance ⁽²⁾ [±%]
-40°C to +85°C	-55°C to +85°C		Min. ⁽¹⁾ [A]	Max. [A]			Nom.-Min. [-%] max	Nom.-Max. [%] max	50%-Min. [%] max	50%-100% [-%] max	
LFC5D	LMC5D	5	1.00	10.00	25	81	0.75	0.75	1	1	1.5
LFC9D	LMC9D	9	0.72	7.22	30	84	0.75	0.75	1	1	1
LFC12D	LMC12D	12	0.63	6.25	30	85	0.5	0.5	0.75	0.75	1
LFC15D	LMC15D	15	0.50	5.00	32.5	86	0.5	0.5	0.75	0.75	1
LFC24D	LMC24D	24	0.31	3.13	37.5	87	0.5	0.5	0.5	0.5	0.5
LFC28D	LMC28D	28	0.27	2.68	37.5	87	0.5	0.5	0.5	0.5	0.5
LFC48D	LMC48D	48	0.16	1.56	37.5	85	0.5	0.5	0.5	0.5	0.5

Note 1: Maintain minimum 10% of rated load to prevent a voltage surge.

Note 2: Tested at nominal input voltage and full output load.

Note 3: Line regulation is specified at full output load, nominal to minimum input voltage (-%) and nominal to maximum input voltage (+%).

Note 4: For ≤100V output models, load regulation is specified at nominal input voltage, 50% to 10% load (+%) and 50% to 100% load (-%). For ≥125V output models, load regulation is specified at nominal input voltage, 50% to 20% load (+%) and 50% to 100% load (-%).

Note 5: Dual output loads must be balanced.

MODEL LIST - LFD/LMD (200-380V INPUT RANGE)**SINGLE OUTPUT**

Pico Part Number		Output Voltage [VDC]	Output Current		Output Power [W]	Efficiency ⁽²⁾ [%] typ.	Line Regulation ⁽³⁾		Load Regulation ⁽⁴⁾		Output Voltage Tolerance ⁽²⁾ [±%]
-40°C to +85°C	-55°C to +85°C		Min. ⁽¹⁾ [A]	Max. [A]			Nom.-Min. [-%] max	Nom.-Max. [%] max	50%-Min. [%] max	50%-100% [-%] max	
LFD3.3S	LMD3.3S	3.3	0.91	9.09	30	73	1	1	1.5	1.5	2
LFD5S	LMD5S	5	1.00	10.00	50	80	1	1	1.25	1.25	1.5
LFD5.2S	LMD5.2S	5.2	0.96	9.62	50	80	1	1	1.25	1.25	1.5
LFD9S	LMD9S	9	0.72	7.22	65	84	0.75	0.75	1.25	1.25	1
LFD12S	LMD12S	12	0.63	6.25	75	84	0.75	0.75	1	1	1
LFD15S	LMD15S	15	0.50	5.00	75	84	0.75	0.75	1	1	1
LFD24S	LMD24S	24	0.31	3.13	75	85	0.5	0.5	0.75	0.75	0.5
LFD28S	LMD28S	28	0.27	2.68	75	86	0.5	0.5	0.5	0.5	0.5
LFD48S	LMD48S	48	0.16	1.56	75	85	0.5	0.5	0.5	0.5	0.5
LFD100S	LMD100S	100	0.08	0.75	75	85	0.5	0.5	0.5	0.5	0.5
LFD125S	LMD125S	125	0.04	0.40	50	85	0.3	0.3	0.5	0.5	0.5
LFD150S	LMD150S	150	0.03	0.33	50	85	0.3	0.3	0.5	0.5	0.5
LFD175S	LMD175S	175	0.03	0.29	50	85	0.3	0.3	0.5	0.5	0.5
LFD200S	LMD200S	200	0.03	0.25	50	85	0.3	0.3	0.5	0.5	0.5
LFD225S	LMD225S	225	0.02	0.22	50	85	0.3	0.3	0.5	0.5	0.5
LFD250S	LMD250S	250	0.02	0.20	50	85	0.3	0.3	0.5	0.5	0.5

DUAL OUTPUT

Pico Part Number		Output Voltage Per Output [VDC]	Output Current Per Output		Output Power Per Output ⁽⁴⁾ [W]	Efficiency ⁽²⁾ [%] typ.	Line Regulation ⁽³⁾		Load Regulation ⁽⁴⁾		Output Voltage Tolerance ⁽²⁾ [±%]
-40°C to +85°C	-55°C to +85°C		Min. ⁽¹⁾ [A]	Max. [A]			Nom.-Min. [-%] max	Nom.-Max. [%] max	50%-Min. [%] max	50%-100% [-%] max	
LFD5D	LMD5D	5	1.00	10.00	25	80	1	1	1.25	1.25	1.5
LFD9D	LMD9D	9	0.72	7.22	30	84	0.75	0.75	1.25	1.25	1
LFD12D	LMD12D	12	0.63	6.25	30	84	0.75	0.75	1	1	1
LFD15D	LMD15D	15	0.50	5.00	32.5	84	0.5	0.5	1	1	1
LFD24D	LMD24D	24	0.31	3.13	37.5	85	0.5	0.5	0.75	0.75	0.5
LFD28D	LMD28D	28	0.27	2.68	37.5	86	0.5	0.5	0.5	0.5	0.5
LFD48D	LMD48D	48	0.16	1.56	37.5	85	0.5	0.5	0.5	0.5	0.5

Note 1: Maintain minimum 10% of rated load to prevent a voltage surge.

Note 2: Tested at nominal input voltage and full output load.

Note 3: Line regulation is specified at full output load, nominal to minimum input voltage (-%) and nominal to maximum input voltage (+%).

Note 4: For ≤100V output models, load regulation is specified at nominal input voltage, 50% to 10% load (+%) and 50% to 100% load (-%). For ≥125V output models, load regulation is specified at nominal input voltage, 50% to 20% load (+%) and 50% to 100% load (-%).

Note 5: Dual output loads must be balanced.

SPECIFICATIONS (Nominal V_{IN} , Full Load, $T_A = +25^{\circ}\text{C}$, 1 hour warm up unless otherwise specified)**INPUT**

Parameter	Condition	Min.	Nom.	Max.	Units
Input Voltage Range	LFA/LMA models	18	28	36	VDC
	LFB/LMB models	36	48	72	
	LFC/LMC models	100	150	180	
	LFD/LMD models	200	300	380	

OUTPUT

Parameter	Condition	Min.	Typ.	Max.	Units
Output Ripple	1MHz bandwidth	$\leq 48\text{V}$ output models	-	50	mVp-p
		100V output models	-	100	
		$\geq 125\text{V}$ output models	-	1	%

ENVIRONMENTAL

Parameter	Condition	Min.	Typ.	Max.	Units
Operating Temperature Range	Baseplate	LF models	-40	+85	$^{\circ}\text{C}$
		LM models	-55	+85	
Storage Temperature Range		-55	-	+105	$^{\circ}\text{C}$
Cooling	Conduction through baseplate				

GENERAL

Parameter	Condition	Min.	Typ.	Max.	Units
Operating Frequency		-	100	-	kHz
Isolation Voltage	Input to output	4242	-	-	VDC
	Input to baseplate	2121	-	-	
	Output to baseplate	1000	-	-	
Insulation Resistance		100	-	-	MΩ
Size	L x W x H	2.4 x 2.3 x 0.5 (60.96 x 58.42 x 12.7)			inches (mm)
Weight	Single output models	-	110	-	grams
	Dual output models	-	135	-	
Case	Aluminum baseplate and Glass Reinforced Polymer				
Potting	Vacuum Impregnated Epoxy				
Tube Packaging (W x H x L)	2.595 x 1.105 x 20 (65.913 x 28.067 x 101.6)				inches (mm)

PROTECTIONS & FEATURES

Parameter	Condition	Min.	Typ.	Max.	Units
Input Over Voltage	LFA/LMA, LFB/LMB & LFC/LMC models	Yes			
Short circuit or Overload	Hiccup mode, self-recovery	120	-	-	%
Overtemperature	Baseplate, self-recovery	Shutdown	95	-	$^{\circ}\text{C}$
		Restart	50	-	
Output Overvoltage	Zener diode clamp	-	120	-	%
Shutdown (SHUTDOWN)	Non-latched shutdown, Self-recovery	-	-	0.15	VDC
Output Voltage Trim (TRIM & TRIM DOWN)	Trim up or trim down	-5	0	5	%
Parallel ⁽⁶⁾	P option models	Connect as shown in connection diagram.			

Note 6: The parallel option allows units to operate the outputs in parallel to share load, increase total power or allow for N+1 redundancy.

SPECIFICATIONS (Nominal V_{IN} , Full Load, $T_A = +25^\circ\text{C}$, 1 hour warm up unless otherwise specified)

DESIGNED TO MEET

Test	Referenced Standard	Description
Vibration	MIL-STD-202	Method 204, Vibration, High Frequency, Condition D
Shock	MIL-STD-202	Method 213, Shock (Specified Pulse), Condition I
Humidity	MIL-STD-202	Method 106, Moisture Resistance
Altitude	MIL-STD-202	Method 105, Barometric Pressure (Reduced), Condition D
Surge	MIL-STD-704	LFA/LMA & LFD/LMD models

OPTIONS AVAILABLE – CONTACT PICO FOR PART NUMBER

Parameter	Referenced Standard	Description
Stabilization Bake	MIL-STD-883	Referenced Method 1008 Non-operating maximum storage temperature for 24 hours
Temperature Cycle	MIL-STD-883	Referenced Method 1010 Non-operating at temperature extremes, 15 mins/temp, 10 cycles
Burn-In	MIL-STD-883	Referenced Method 1015 Max operating temperature for 160 hours

THERMAL RESISTANCE

$$P_{OUT} = \frac{T_C - T_A}{T_{RCA} \times (1/\eta - 1)}$$

P_{OUT} = Output Power in Watts

η = Efficiency

T_C = Case temperature in $^\circ\text{C}$

T_A = Ambient temperature in $^\circ\text{C}$

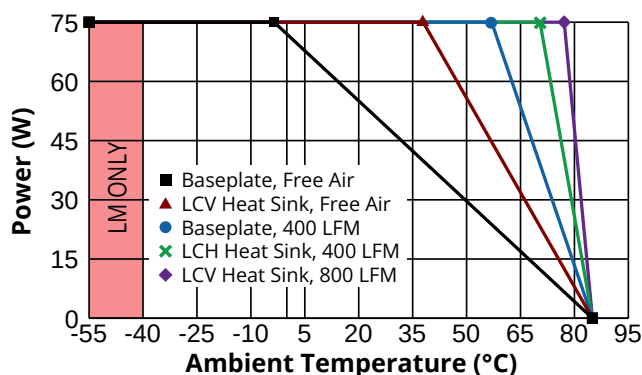
T_{RCA} = Thermal resistance of case to air in $^\circ\text{C} / \text{W}$

Thermal resistance of case (T_{RCA})

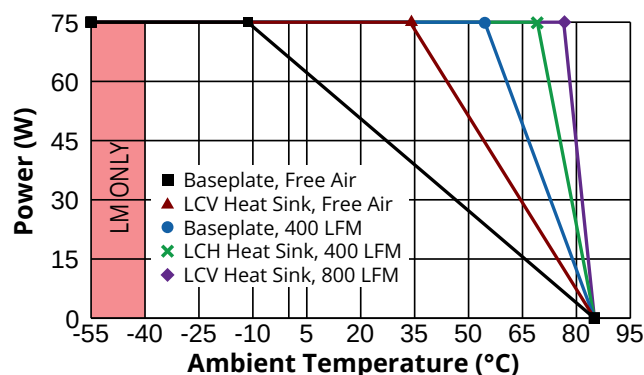
Airflow	Baseplate only	LCV Heat Sink	LCH Heat Sink	Units
Free Air	7.9	4.2	4.0	$^\circ\text{C} / \text{W}$
200 LFM	4.9	1.6	1.6	
400 LFM	2.5	1.6	1.3	
600 LFM	2.2	0.9	0.9	
800 LFM	1.5	0.7	0.7	
1000 LFM	1.2	0.6	0.6	

DERATING GRAPHS (Nominal V_{IN} , Full Load, Efficiency @ Full Load)

Models with Max. Output Power = 75W
& Efficiency at full load = 87%

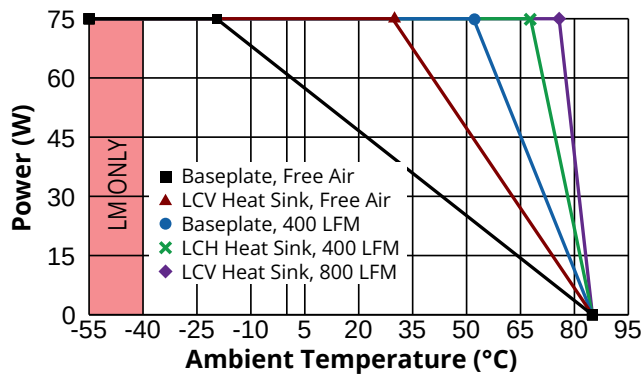


Models with Max. Output Power = 75W
& Efficiency at full load = 86%

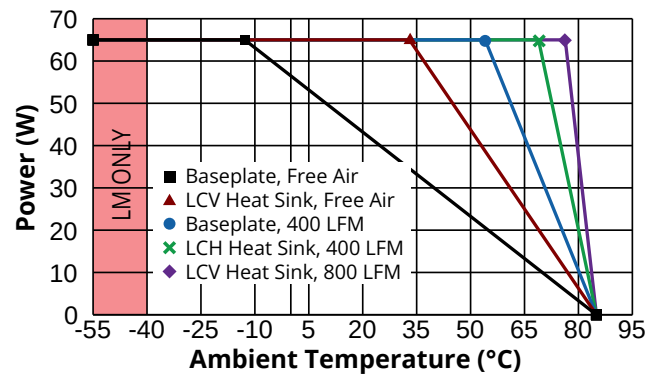


DERATING GRAPHS (Nominal V_{IN} , Full Load, Efficiency @ Full Load)

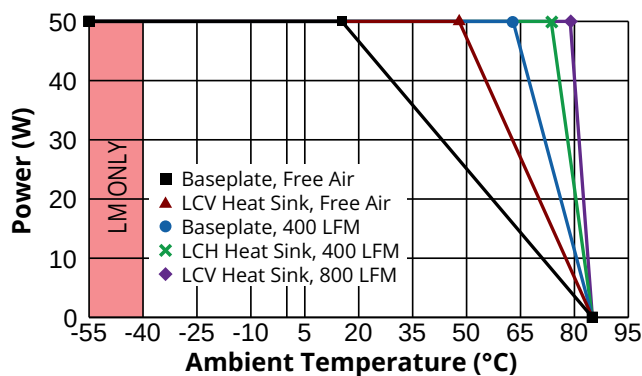
Models with Max. Output Power = 75W
& Efficiency at full load = 85%



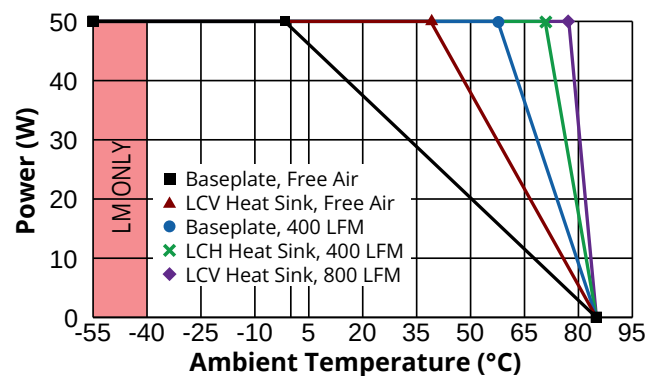
Models with Max. Output Power = 65W
& Efficiency at full load = 84%



Models with Max. Output Power = 50W
& Efficiency at full load = 85%

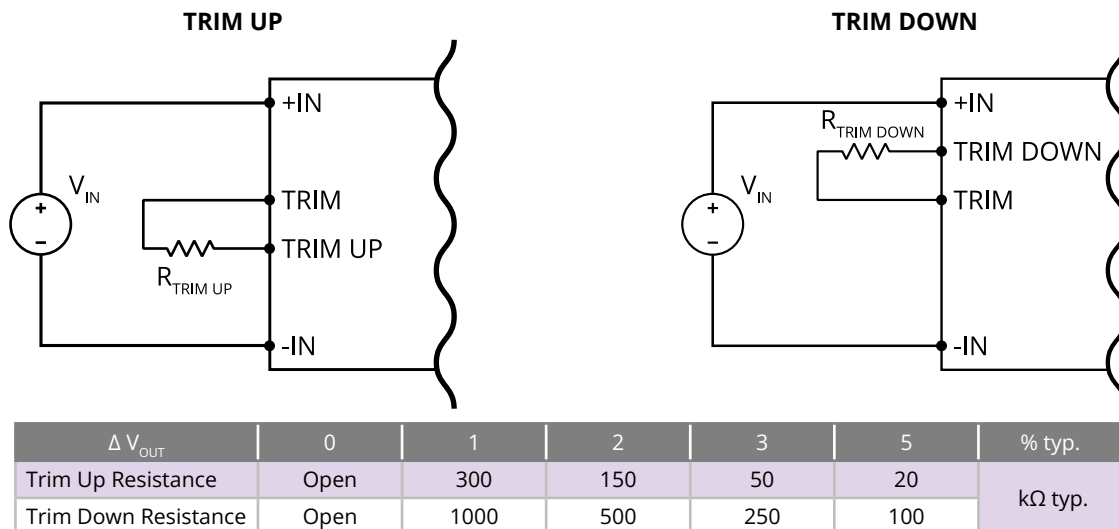


Models with Max. Output Power = 50W
& Efficiency at full load = 82%



TYPICAL CONNECTION CIRCUIT

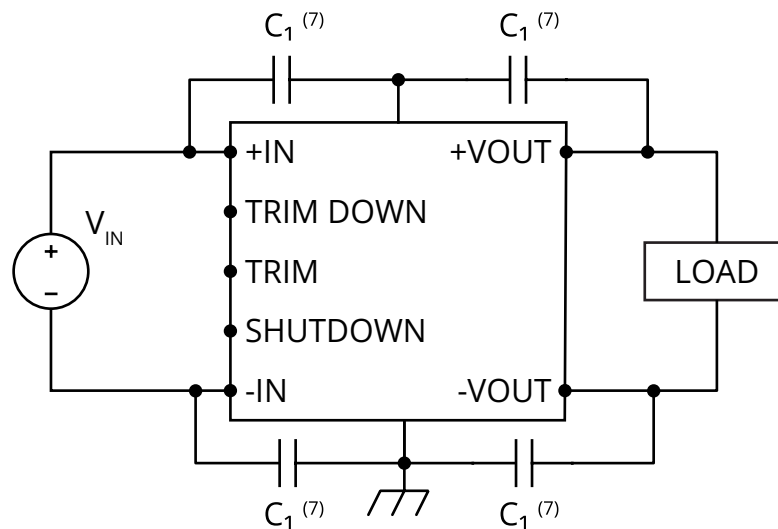
TRIM



Note: Each individual unit will vary slightly. It is recommended to use a 1M Ω multi-turn trimmer potentiometer to determine resistance value and achieve desired adjustment. Use minimum 1/2W power rating resistor. Keep the trim resistor leads as short as possible to eliminate the stray inductance which will effect the trimming results.

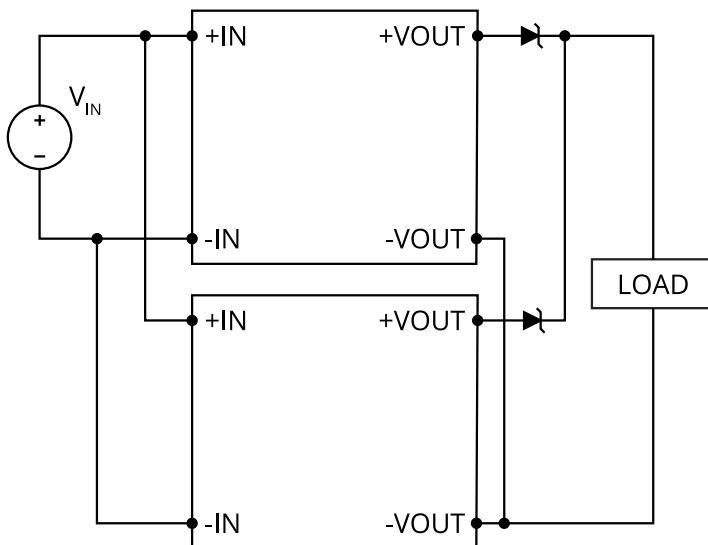
TYPICAL CONNECTION CIRCUIT

NOISE REDUCTION



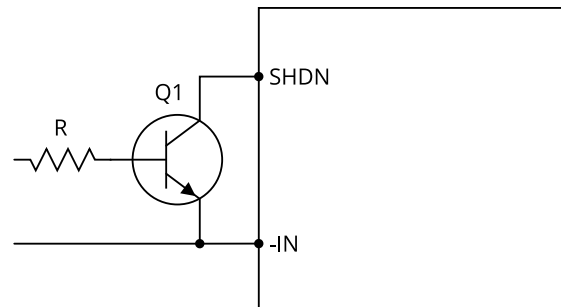
Note 7: C_1 filter capacitors may reduce noise further. Please contact Pico for more details.

PARALLEL

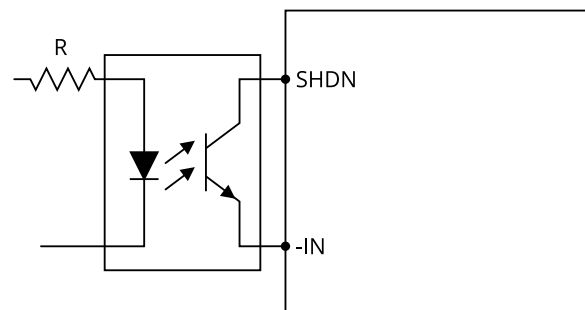


SHUTDOWN

NON-ISOLATED

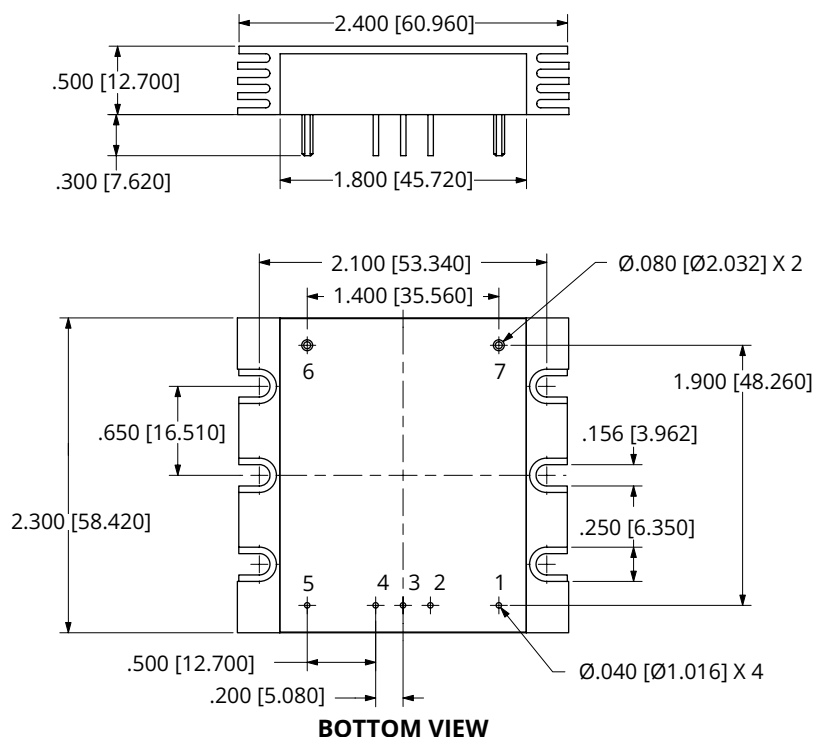


ISOLATED



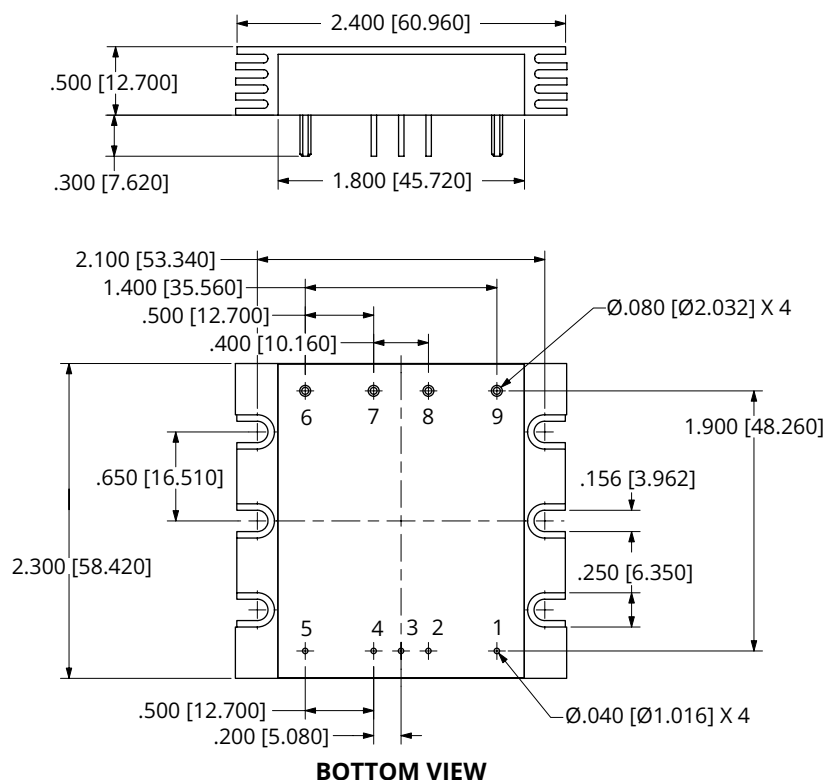
MECHANICAL DRAWINGS

SINGLE OUTPUT



PIN	FUNCTION	PIN DIAMETER
1	+IN	.040 [1.016]
2	TRIM DOWN	.040 [1.016]
3	TRIM	.040 [1.016]
4	SHUT DOWN	.040 [1.016]
5	-IN	.040 [1.016]
6	-OUT	.080 [2.032]
7	+OUT	.080 [2.032]

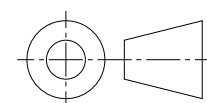
DUAL OUTPUTS



PIN	FUNCTION	PIN DIAMETER
1	+IN	.040 [1.016]
2	TRIM DOWN	.040 [1.016]
3	TRIM	.040 [1.016]
4	SHUT DOWN	.040 [1.016]
5	-IN	.040 [1.016]
6	-OUT1	.080 [2.032]
7	+OUT2	.080 [2.032]
8	-OUT2	.080 [2.032]
9	+OUT2	.080 [2.032]

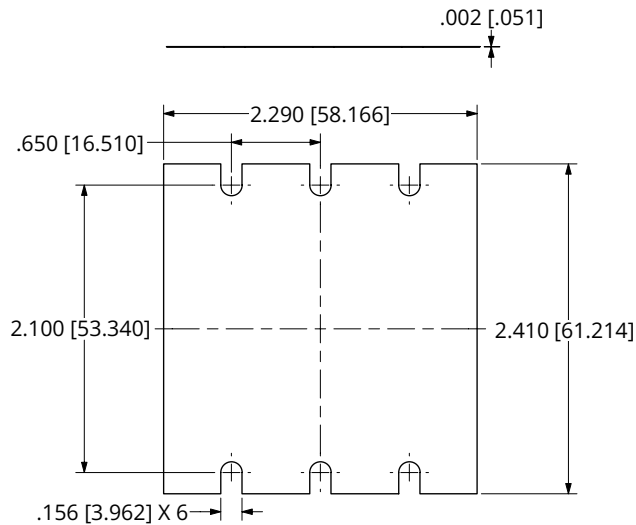
NOTES

- ALL DIMENSIONS ARE IN INCHES, [] = MM
- RECOMMENDED TORQUE FOR MOUNTING SCREWS: 6-9 INCH-LBS



MECHANICAL DRAWINGS

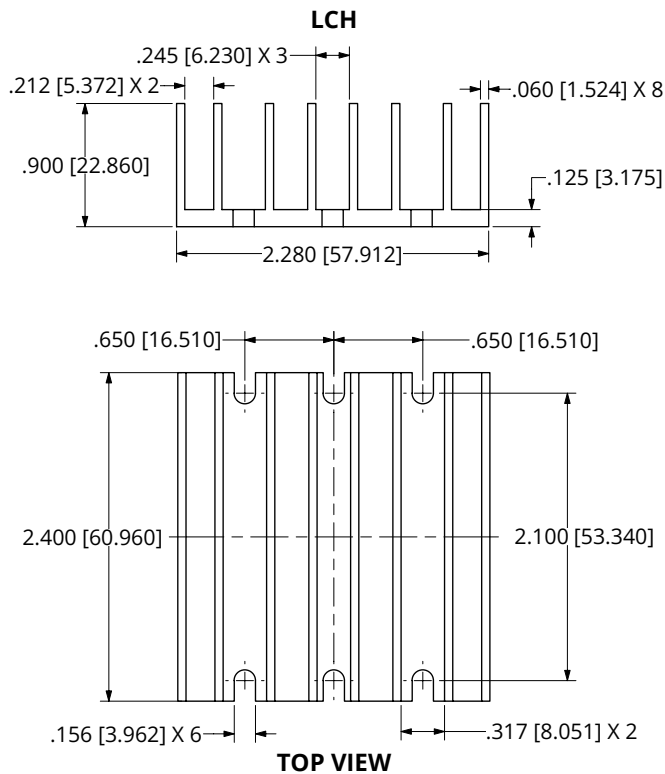
LTI - THERMAL INTERFACE



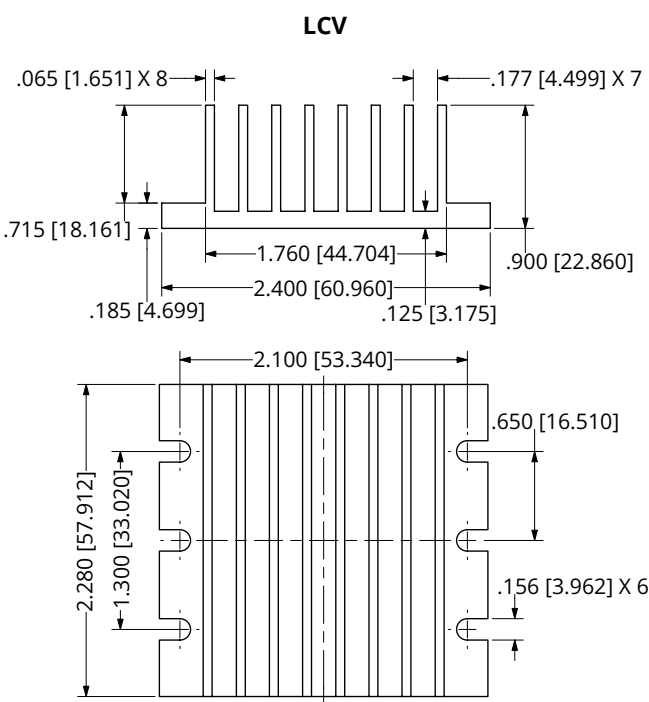
BOTTOM VIEW

Material	Alloy Aluminum Substrate
Thermal Conductivity	1530 BTU-in/hr sq.ft °F
Coefficient of Thermal Expansion, (25-100°C)	13.1 10 ⁻⁶ in-in/°F
Brinell Hardness	23 HB
Endurance Limit	5000 PSI
Standard Thickness	0.002 inches

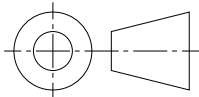
HEAT SINKS



TOP VIEW



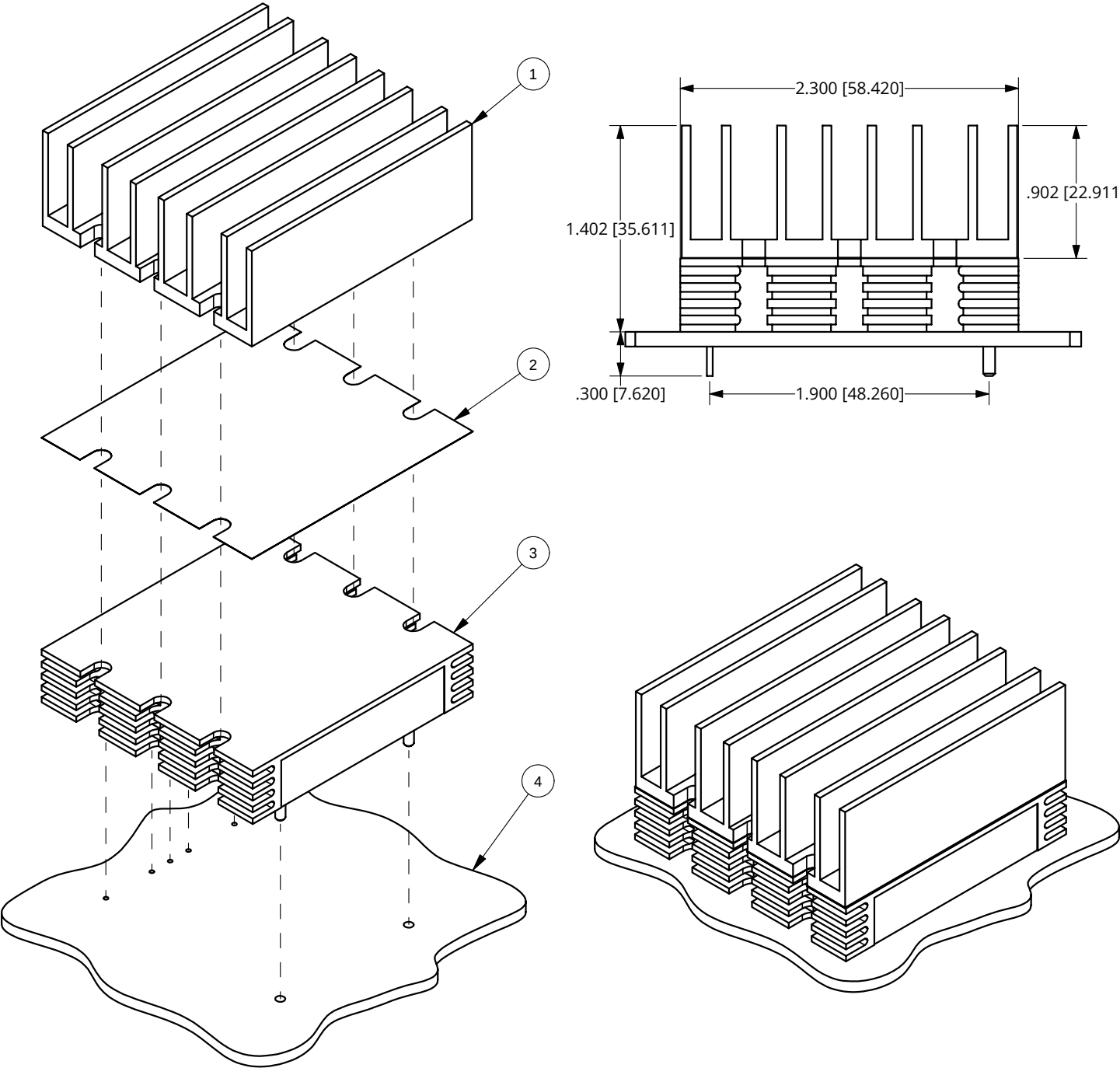
TOP VIEW



Weight: 70 grams typical

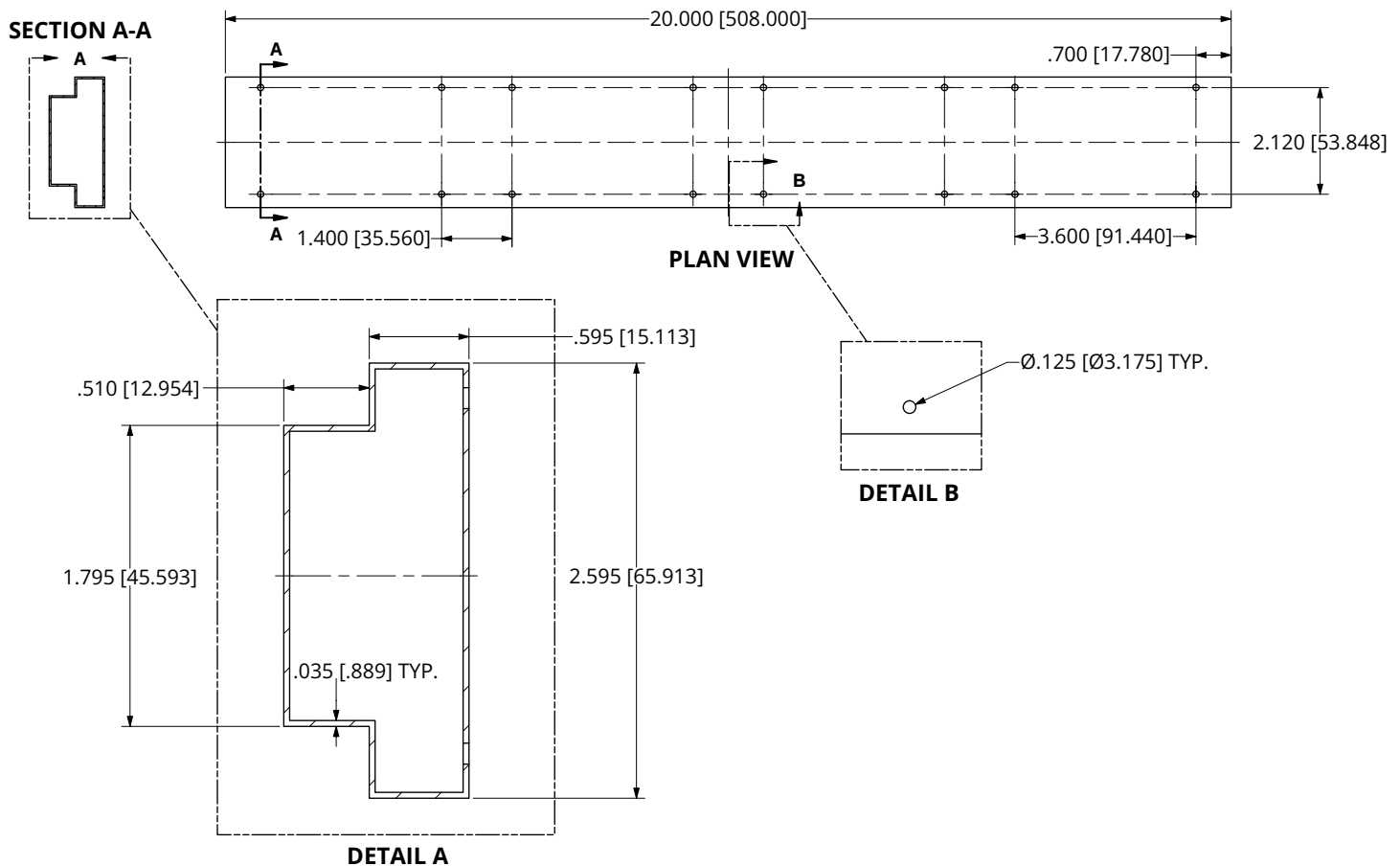
MECHANICAL DRAWINGS

HEAT SINK ASSEMBLY

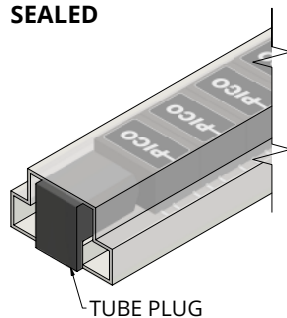


ITEM	QTY	DESCRIPTION
1	1	LCH OR LCV HEAT SINK
2	1	LTI THERMAL INTERFACE
3	1	LF/LM MODULE
4	1	PCB

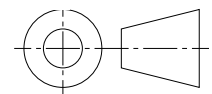
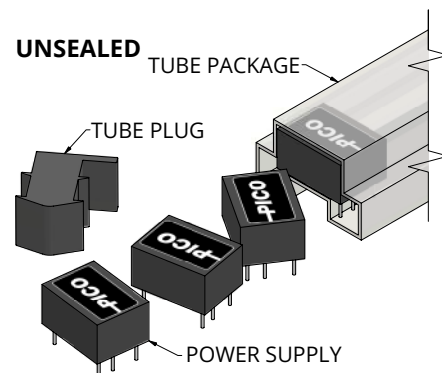
TUBE PACKAGING



SEALED



UNSEALED



Pico warrants each product manufactured by us and sold by us or an authorized representative, to be free from defects in material and workmanship. If properly used, it will perform within its applicable specifications for a period of one year after original shipment. Pico's obligation under this guarantee is limited to repairing or replacing our product to the original purchaser. This warranty is in lieu of all other warranties, express or implied and constitutes fulfillment of our obligations to the purchaser. We do not guarantee that the products can be used for a particular purpose other than those solely covered by the product's specifications. Pico must be notified if the product must meet particular certifications and/or standards. We assume no liability, in any event, for consequential damages, for anticipated or lost profits, incidental damages or loss of time or other losses incurred by the purchaser or any third party in connection with products covered by this warranty or otherwise. The purchaser will indemnify and hold Pico harmless for any damages, losses, costs, etc. from usage not within the product's specifications. Pico must be consulted before usage of its products in a nuclear, radioactive or space environment.

We reserve the right to discontinue products without notice, We reserve the right to make modifications to any existing catalog products without notice, at any time, without the obligation to modify units previously sold.

Series LP

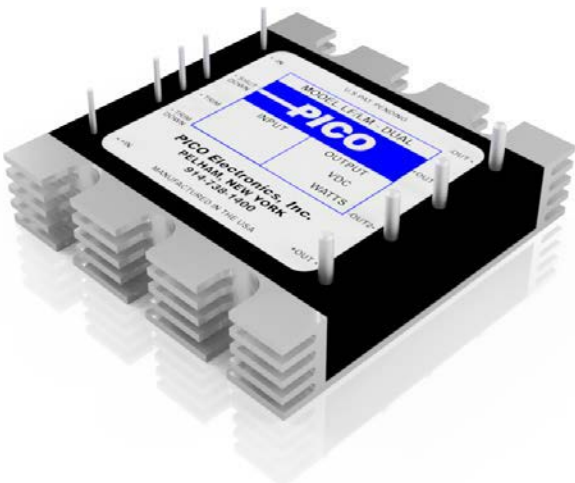
75W Isolated Regulated High Power DC-DC Converter



PRODUCT OVERVIEW

The LP series are isolated DC-DC converters with a wide selection of input voltage ranges from 18V to 380V in a compact half brick size foot print - 2.4" x 2.3". These modules have trim capability and shutdown features. Protections include input overvoltage, output short-circuit, output overvoltage and over temperature.

The unique case has integrated side heat sink for better thermal dissipation but is capable of conduction cooling through the baseplate or additional top mounted heat sink.



FEATURES

- 18V to 380V input range models
- 3.3V to 200V output models
- Up to 75W output
- Input/output isolation
- Integrated side heat sink
- Parallel operation option
- Single and dual isolated outputs
- Trim capability
- Remote shutdown feature
- Fixed operating frequency
- No external components required

Contact Pico for part number of available options:

- Select screening per MIL-STD-883:
 - Stabilization Bake
 - Temperature Cycle
 - Burn-In
- Special Input Voltage, Output Voltage, Isolation Voltage or Output Power
- Parallel Operation

LP	A	28	S
SERIES NAME	INPUT VOLTAGE RANGE	OUTPUT VOLTAGE	NUMBER OF OUTPUTS
LP	A = 18 - 36V B = 36 - 72V C = 100 - 180V D = 200 - 380V	3.3 = 3.3V 5 = 5V 5.2 = 5.2V 9 = 9V 12 = 12V 15 = 15V 24 = 24V 28 = 28V 48 = 48V 100 = 100V 125 = 125V 150 = 150V 175 = 175V 200 = 200V 225 = 225V 250 = 250V	S = SINGLE D = DUAL

MODEL LIST - LPA (18-36V INPUT RANGE)**SINGLE OUTPUT**

Pico Part Number	Output Voltage [VDC]	Output Current		Output Power [W]	Efficiency ⁽²⁾ [%] typ.	Line Regulation ⁽³⁾		Load Regulation ⁽⁴⁾		Output Voltage Tolerance ⁽²⁾ [±%]
		Min. ⁽¹⁾ [A]	Max. [A]			Nom.-Min. [-%] max	Nom.-Max. [%] max	50%-Min. [%] max	50%-100% [-%] max	
LPA3.3S	3.3	0.91	9.09	30	73	1	1	1.5	1.5	2
LPA5S	5	1.00	10.00	50	80	1	1	1.25	1.25	1.5
LPA5.2S	5.2	0.96	9.62	50	80	1	1	1.25	1.25	1.5
LPA9S	9	0.67	6.67	60	84	1	1	1.25	1.25	1
LPA12S	12	0.50	5.00	60	85	1	1	1.25	1.25	0.75
LPA15S	15	0.43	4.33	65	85	0.75	0.75	1	1	0.75
LPA24S	24	0.31	3.13	75	87	0.5	0.5	0.75	0.75	0.75
LPA28S	28	0.27	2.68	75	87	0.5	0.5	0.5	0.5	0.5
LPA48S	48	0.16	1.56	75	85	0.5	0.5	0.5	0.5	0.5
LPA100S	100	0.08	0.75	75	85	0.5	0.5	0.5	0.5	0.5
LPA125S	125	0.04	0.40	50	82	0.3	0.3	0.5	0.5	0.5
LPA150S	150	0.03	0.33	50	82	0.3	0.3	0.5	0.5	0.5
LPA175S	175	0.03	0.29	50	82	0.3	0.3	0.5	0.5	0.5
LPA200S	200	0.03	0.25	50	82	0.3	0.3	0.5	0.5	0.5

DUAL OUTPUT

Pico Part Number	Output Voltage Per Output [VDC]	Output Current Per Output		Output Power Per Output ⁽⁵⁾ [W]	Efficiency ⁽²⁾ [%] typ.	Line Regulation ⁽³⁾		Load Regulation ⁽⁴⁾		Output Voltage Tolerance ⁽²⁾ [±%]
		Min. ⁽¹⁾ [A]	Max. [A]			Nom.-Min. [-%] max	Nom.-Max. [%] max	50%-Min. [%] max	50%-100% [-%] max	
LPA5D	5	1.00	10.00	25	80	1	1	1.25	1.25	1.5
LPA9D	9	0.67	6.67	30	84	1	1	1.25	1.25	1
LPA12D	12	0.50	5.00	30	85	1	1	1.25	1.25	0.75
LPA15D	15	0.43	4.33	32.5	85	0.75	0.75	1	1	0.75
LPA24D	24	0.31	3.13	37.5	87	0.5	0.5	0.75	0.75	0.5
LPA28D	28	0.27	2.68	37.5	87	0.5	0.5	0.5	0.5	0.5
LPA48D	48	0.16	1.56	37.5	85	0.5	0.5	0.5	0.5	0.5

Note 1: Maintain minimum 10% of rated load to prevent a voltage surge.

Note 2: Tested at nominal input voltage and full output load.

Note 3: Line regulation is specified at full output load, nominal to minimum input voltage (-%) and nominal to maximum input voltage (+%).

Note 4: For ≤100V output models, load regulation is specified at nominal input voltage, 50% to 10% load (+%) and 50% to 100% load (-%). For ≥125V output models, load regulation is specified at nominal input voltage, 50% to 20% load (+%) and 50% to 100% load (-%).

Note 5: Dual output loads must be balanced.

MODEL LIST - LPB (36-72V INPUT RANGE)**SINGLE OUTPUT**

Pico Part Number	Output Voltage [VDC]	Output Current		Output Power [W]	Efficiency ⁽²⁾ [%] typ.	Line Regulation ⁽³⁾		Load Regulation ⁽⁴⁾		Output Voltage Tolerance ⁽²⁾ [±%]
		Min. ⁽¹⁾ [A]	Max. [A]			Nom.-Min. [-%] max	Nom.-Max. [%] max	50%-Min. [%] max	50%-100% [-%] max	
LPB3.3S	3.3	0.91	9.09	30	74	0.75	0.75	1.5	1.5	2
LPB5S	5	1.00	10.00	50	80	0.75	0.75	1	1	1.5
LPB5.2S	5.2	0.96	9.62	50	80	0.75	0.75	1	1	1.5
LPB9S	9	0.72	7.22	65	84	0.75	0.75	1	1	1
LPB12S	12	0.63	6.25	75	84	0.5	0.5	0.75	0.75	1
LPB15S	15	0.50	5.00	75	84	0.5	0.5	0.75	0.75	1
LPB24S	24	0.31	3.13	75	87	0.5	0.5	0.5	0.5	0.5
LPB28S	28	0.27	2.68	75	87	0.5	0.5	0.5	0.5	0.5
LPB48S	48	0.16	1.56	75	85	0.5	0.5	0.5	0.5	0.5
LPB100S	100	0.08	0.75	75	85	0.5	0.5	0.5	0.5	0.5
LPB125S	125	0.04	0.40	50	84	0.3	0.3	0.5	0.5	0.5
LPB150S	150	0.03	0.33	50	84	0.3	0.3	0.5	0.5	0.5
LPB175S	175	0.03	0.29	50	84	0.3	0.3	0.5	0.5	0.5
LPB200S	200	0.03	0.25	50	84	0.3	0.3	0.5	0.5	0.5
LPB225S	225	0.02	0.22	50	84	0.3	0.3	0.5	0.5	0.5
LPB250S	250	0.02	0.20	50	84	0.3	0.3	0.5	0.5	0.5

DUAL OUTPUT

Pico Part Number	Output Voltage Per Output [VDC]	Output Current Per Output		Output Power Per Output ⁽⁵⁾ [W]	Efficiency ⁽²⁾ [%] typ.	Line Regulation ⁽³⁾		Load Regulation ⁽⁴⁾		Output Voltage Tolerance ⁽²⁾ [±%]
		Min. ⁽¹⁾ [A]	Max. [A]			Nom.-Min. [-%] max	Nom.-Max. [%] max	50%-Min. [%] max	50%-100% [-%] max	
LPB5D	5	1.00	10.00	25	80	0.75	0.75	1	1	1.5
LPB9D	9	0.72	7.22	30	84	0.75	0.75	1	1	1
LPB12D	12	0.63	6.25	30	84	0.5	0.5	0.75	0.75	1
LPB15D	15	0.50	5.00	32.5	85	0.5	0.5	0.75	0.75	1
LPB24D	24	0.31	3.13	37.5	87	0.5	0.5	0.5	0.5	0.5
LPB28D	28	0.27	2.68	37.5	87	0.5	0.5	0.5	0.5	0.5
LPB48D	48	0.16	1.56	37.5	85	0.5	0.5	0.5	0.5	0.5

Note 1: Maintain minimum 10% of rated load to prevent a voltage surge.

Note 2: Tested at nominal input voltage and full output load.

Note 3: Line regulation is specified at full output load, nominal to minimum input voltage (-%) and nominal to maximum input voltage (+%).

Note 4: For ≤100V output models, load regulation is specified at nominal input voltage, 50% to 10% load (+%) and 50% to 100% load (-%). For ≥125V output models, load regulation is specified at nominal input voltage, 50% to 20% load (+%) and 50% to 100% load (-%).

Note 5: Dual output loads must be balanced.

MODEL LIST - LPC (100-180V INPUT RANGE)**SINGLE OUTPUT**

Pico Part Number	Output Voltage [VDC]	Output Current		Output Power [W]	Efficiency ⁽²⁾ [%] typ.	Line Regulation ⁽³⁾		Load Regulation ⁽⁴⁾		Output Voltage Tolerance ⁽²⁾ [±%]
		Min. ⁽¹⁾ [A]	Max. [A]			Nom.-Min. [-%] max	Nom.-Max. [%] max	50%-Min. [%] max	50%-100% [-%] max	
LPC3.3S	3.3	0.91	9.09	30	74	1.5	1.5	1.5	1.5	2
LPC5S	5	1.00	10.00	50	81	1.5	1.5	1	1	1.5
LPC5.2S	5.2	0.96	9.62	50	81	1.5	1.5	1	1	1.5
LPC9S	9	0.72	7.22	65	84	1	1	1	1	1
LPC12S	12	0.63	6.25	75	85	1	1	0.75	0.75	1
LPC15S	15	0.50	5.00	75	86	1	1	0.75	0.75	1
LPC24S	24	0.31	3.13	75	87	1	1	0.5	0.5	0.5
LPC28S	28	0.27	2.68	75	87	0.6	0.6	0.5	0.5	0.5
LPC48S	48	0.16	1.56	75	85	0.6	0.6	0.5	0.5	0.5
LPC100S	100	0.08	0.75	75	85	0.6	0.6	0.5	0.5	0.5
LPC125S	125	0.04	0.40	50	85	0.6	0.6	0.5	0.5	0.5
LPC150S	150	0.03	0.33	50	85	0.6	0.6	0.5	0.5	0.5
LPC175S	175	0.03	0.29	50	85	0.6	0.6	0.5	0.5	0.5
LPC200S	200	0.03	0.25	50	85	0.6	0.6	0.5	0.5	0.5
LPC225S	225	0.02	0.22	50	85	0.6	0.6	0.5	0.5	0.5
LPC250S	250	0.02	0.20	50	85	0.6	0.6	0.5	0.5	0.5

DUAL OUTPUT

Pico Part Number	Output Voltage Per Output [VDC]	Output Current Per Output		Output Power Per Output ⁽⁵⁾ [W]	Efficiency ⁽²⁾ [%] typ.	Line Regulation ⁽³⁾		Load Regulation ⁽⁴⁾		Output Voltage Tolerance ⁽²⁾ [±%]
		Min. ⁽¹⁾ [A]	Max. [A]			Nom.-Min. [-%] max	Nom.-Max. [%] max	50%-Min. [%] max	50%-100% [-%] max	
LPC5D	5	1.00	10.00	25	81	1.5	1.5	2	2	1.5
LPC9D	9	0.72	7.22	30	84	1.5	1.5	2	2	1
LPC12D	12	0.63	6.25	30	85	1	1	1.5	1.5	1
LPC15D	15	0.50	5.00	32.5	86	1	1	1.5	1.5	1
LPC24D	24	0.31	3.13	37.5	87	1	1	1	1	0.5
LPC28D	28	0.27	2.68	37.5	87	1	1	1	1	0.5
LPC48D	48	0.16	1.56	37.5	85	1	1	1	1	0.5

Note 1: Maintain minimum 10% of rated load to prevent a voltage surge.

Note 2: Tested at nominal input voltage and full output load.

Note 3: Line regulation is specified at full output load, nominal to minimum input voltage (-%) and nominal to maximum input voltage (+%).

Note 4: For ≤100V output models, load regulation is specified at nominal input voltage, 50% to 10% load (+%) and 50% to 100% load (-%). For ≥125V output models, load regulation is specified at nominal input voltage, 50% to 20% load (+%) and 50% to 100% load (-%).

Note 5: Dual output loads must be balanced.

MODEL LIST - LPD (200-380V INPUT RANGE)**SINGLE OUTPUT**

Pico Part Number	Output Voltage [VDC]	Output Current		Output Power [W]	Efficiency ⁽²⁾ [%] typ.	Line Regulation ⁽³⁾		Load Regulation ⁽⁴⁾		Output Voltage Tolerance ⁽²⁾ [±%]
		Min. ⁽¹⁾ [A]	Max. [A]			Nom.-Min. [-%] max	Nom.-Max. [%] max	50%-Min. [%] max	50%-100% [-%] max	
LPD3.3S	3.3	0.91	9.09	30	73	1	1	1.5	1.5	2
LPD5S	5	1.00	10.00	50	80	1	1	1.25	1.25	1.5
LPD5.2S	5.2	0.96	9.62	50	80	1	1	1.25	1.25	1.5
LPD9S	9	0.72	7.22	65	84	0.75	0.75	1.25	1.25	1
LPD12S	12	0.63	6.25	75	84	0.75	0.75	1	1	1
LPD15S	15	0.50	5.00	75	84	0.75	0.75	1	1	1
LPD24S	24	0.31	3.13	75	85	0.5	0.5	0.75	0.75	0.5
LPD28S	28	0.27	2.68	75	86	0.5	0.5	0.5	0.5	0.5
LPD48S	48	0.16	1.56	75	85	0.5	0.5	0.5	0.5	0.5
LPD100S	100	0.08	0.75	75	85	0.5	0.5	0.5	0.5	0.5
LPD125S	125	0.04	0.40	50	85	0.3	0.3	0.5	0.5	0.5
LPD150S	150	0.03	0.33	50	85	0.3	0.3	0.5	0.5	0.5
LPD175S	175	0.03	0.29	50	85	0.3	0.3	0.5	0.5	0.5
LPD200S	200	0.03	0.25	50	85	0.3	0.3	0.5	0.5	0.5
LPD225S	225	0.02	0.22	50	85	0.3	0.3	0.5	0.5	0.5
LPD250S	250	0.02	0.20	50	85	0.3	0.3	0.5	0.5	0.5

DUAL OUTPUT

Pico Part Number	Output Voltage Per Output [VDC]	Output Current Per Output		Output Power Per Output ⁽⁵⁾ [W]	Efficiency ⁽²⁾ [%] typ.	Line Regulation ⁽³⁾		Load Regulation ⁽⁴⁾		Output Voltage Tolerance ⁽²⁾ [±%]
		Min. ⁽¹⁾ [A]	Max. [A]			Nom.-Min. [-%] max	Nom.-Max. [%] max	50%-Min. [%] max	50%-100% [-%] max	
LPD5D	5	1.00	10.00	25	80	1	1	1.25	1.25	1.5
LPD9D	9	0.72	7.22	30	84	0.75	0.75	1.25	1.25	1
LPD12D	12	0.63	6.25	30	84	0.75	0.75	1	1	1
LPD15D	15	0.50	5.00	32.5	84	0.5	0.5	1	1	1
LPD24D	24	0.31	3.13	37.5	85	0.5	0.5	0.75	0.75	0.5
LPD28D	28	0.27	2.68	37.5	86	0.5	0.5	0.5	0.5	0.5
LPD48D	48	0.16	1.56	37.5	85	0.5	0.5	0.5	0.5	0.5

Note 1: Maintain minimum 10% of rated load to prevent a voltage surge.

Note 2: Tested at nominal input voltage and full output load.

Note 3: Line regulation is specified at full output load, nominal to minimum input voltage (-%) and nominal to maximum input voltage (+%).

Note 4: For ≤100V output models, load regulation is specified at nominal input voltage, 50% to 10% load (+%) and 50% to 100% load (-%). For ≥125V output models, load regulation is specified at nominal input voltage, 50% to 20% load (+%) and 50% to 100% load (-%).

Note 5: Dual output loads must be balanced.

SPECIFICATIONS (Nominal V_{IN} , Full Load, $T_A = +25^{\circ}\text{C}$, 1 hour warm up unless otherwise specified)**INPUT**

Parameter	Condition	Min.	Nom.	Max.	Units
Input Voltage Range	LPA models	18	28	36	VDC
	LPB models	36	48	72	
	LPC models	100	150	180	
	LPD models	200	300	380	

OUTPUT

Parameter	Condition	Min.	Typ.	Max.	Units
Output Ripple	1MHz bandwidth	$\leq 48\text{V}$ output models	-	50	mVp-p
		100V output models	-	100	
		$\geq 125\text{V}$ output models	-	1	%

ENVIRONMENTAL

Parameter	Condition	Min.	Typ.	Max.	Units
Operating Temperature Range	Baseplate	0	-	+85	$^{\circ}\text{C}$
Storage Temperature Range		-55	-	+105	$^{\circ}\text{C}$
Cooling	Conduction through baseplate				

GENERAL

Parameter	Condition	Min.	Typ.	Max.	Units
Operating Frequency		-	100	-	kHz
Isolation Voltage	Input to output	4242	-	-	VDC
	Input to baseplate	2121	-	-	
	Output to baseplate	1000	-	-	
Insulation Resistance		100	-	-	MΩ
Size	L x W x H	2.4 x 2.3 x 0.5 (60.96 x 58.42 x 12.7)			inches (mm)
Weight	Single output models	-	110	-	grams
	Dual output models	-	135	-	
Case	Aluminum baseplate and Glass Reinforced Polymer				
Potting	Vacuum Impregnated Epoxy				
Tube Packaging (W x H x L)	2.595 x 1.105 x 20 (65.913 x 28.067 x 101.6)				inches (mm)

PROTECTIONS & FEATURES

Parameter	Condition	Min.	Typ.	Max.	Units
Input Over Voltage	LPA, LPB & LPC models	Yes			
Short circuit or Overload	Hiccup mode, self-recovery	120	-	-	%
Overtemperature	Baseplate, self-recovery	Shutdown	95	-	$^{\circ}\text{C}$
		Restart	50	-	
Output Overvoltage	Zener diode clamp	-	120	-	%
Shutdown (SHUTDOWN)	Non-latched shutdown, Self-recovery	-	-	0.15	VDC
Output Voltage Trim (TRIM & TRIM DOWN)	Trim up or trim down	-5	0	5	%
Parallel ⁽⁶⁾	P option models	Connect as shown in connection diagram.			

Note 6: The parallel option allows units to operate the outputs in parallel to share load, increase total power or allow for N+1 redundancy.

SPECIFICATIONS (Nominal V_{IN} , Full Load, $T_A = +25^\circ\text{C}$, 1 hour warm up unless otherwise specified)

DESIGNED TO MEET

Test	Referenced Standard	Description
Vibration	MIL-STD-202	Method 204, Vibration, High Frequency, Condition D
Shock	MIL-STD-202	Method 213, Shock (Specified Pulse), Condition I
Humidity	MIL-STD-202	Method 106, Moisture Resistance
Altitude	MIL-STD-202	Method 105, Barometric Pressure (Reduced), Condition D
Surge	MIL-STD-704	LPA & LPD models

OPTIONS AVAILABLE – CONTACT PICO FOR PART NUMBER

Parameter	Referenced Standard	Description
Stabilization Bake	MIL-STD-883	Referenced Method 1008 Non-operating maximum storage temperature for 24 hours
Temperature Cycle	MIL-STD-883	Referenced Method 1010 Non-operating at temperature extremes, 15 mins/temp, 10 cycles
Burn-In	MIL-STD-883	Referenced Method 1015 Max operating temperature for 160 hours

THERMAL RESISTANCE

$$P_{OUT} = \frac{T_C - T_A}{T_{RCA} \times (1 / \eta - 1)}$$

P_{OUT} = Output Power in Watts

η = Efficiency

T_C = Case temperature in $^\circ\text{C}$

T_A = Ambient temperature in $^\circ\text{C}$

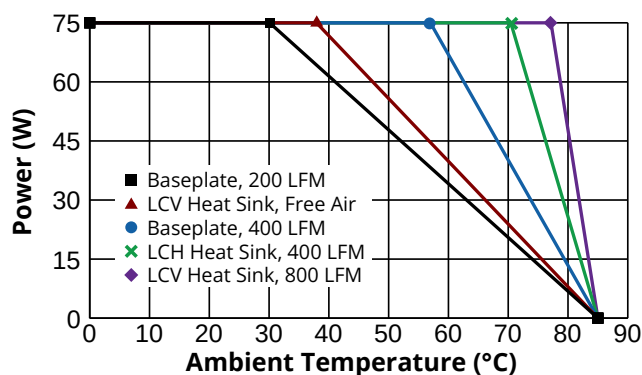
T_{RCA} = Thermal resistance of case to air in $^\circ\text{C} / \text{W}$

Thermal resistance of case (T_{RCA})

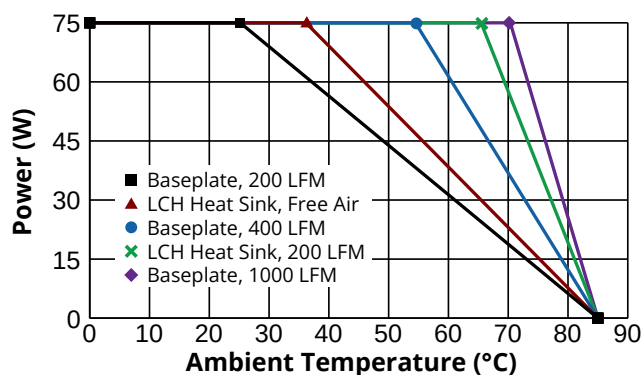
Airflow	Baseplate only	LCV Heat Sink	LCH Heat Sink	Units
Free Air	7.9	4.2	4.0	$^\circ\text{C} / \text{W}$
200 LFM	4.9	1.6	1.6	
400 LFM	2.5	1.6	1.3	
600 LFM	2.2	0.9	0.9	
800 LFM	1.5	0.7	0.7	
1000 LFM	1.2	0.6	0.6	

DERATING GRAPHS (Nominal V_{IN} , Full Load, Efficiency @ Full Load)

Models with Max. Output Power = 75W
& Efficiency at full load = 87%

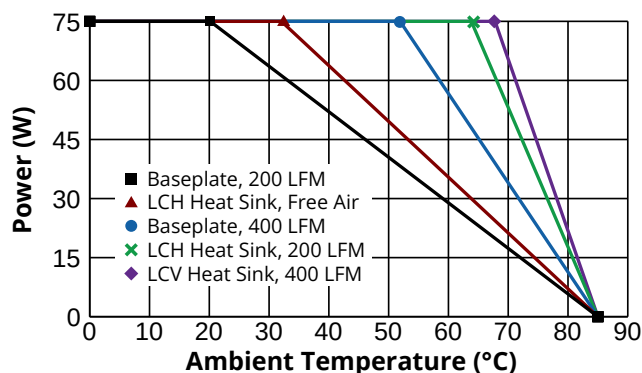


Models with Max. Output Power = 75W
& Efficiency at full load = 86%

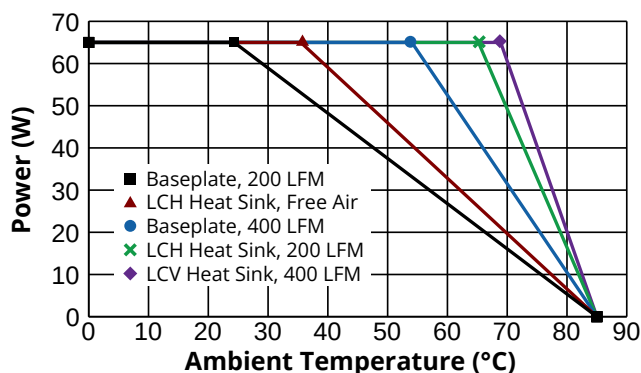


DERATING GRAPHS (Nominal V_{IN} , Full Load, Efficiency @ Full Load)

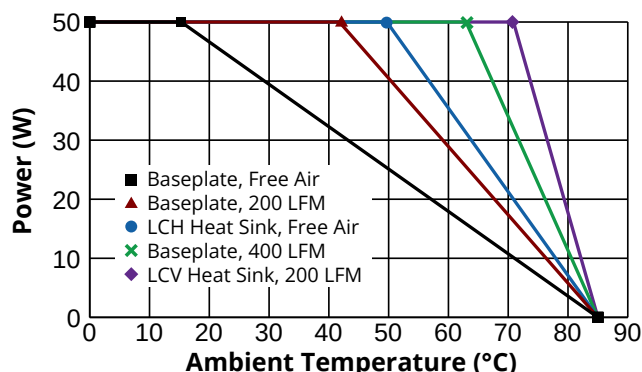
Models with Max. Output Power = 75W
& Efficiency at full load = 85%



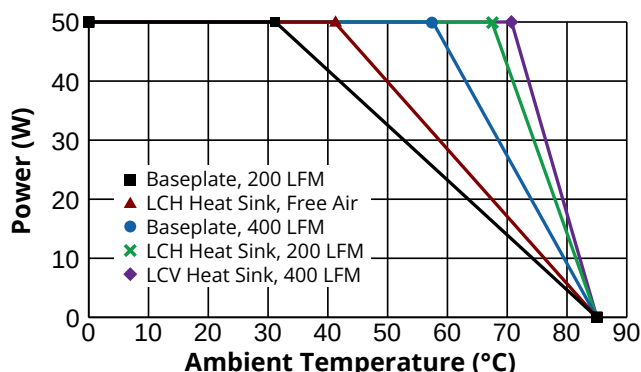
Models with Max. Output Power = 65W
& Efficiency at full load = 84%



Models with Max. Output Power = 50W
& Efficiency at full load = 85%

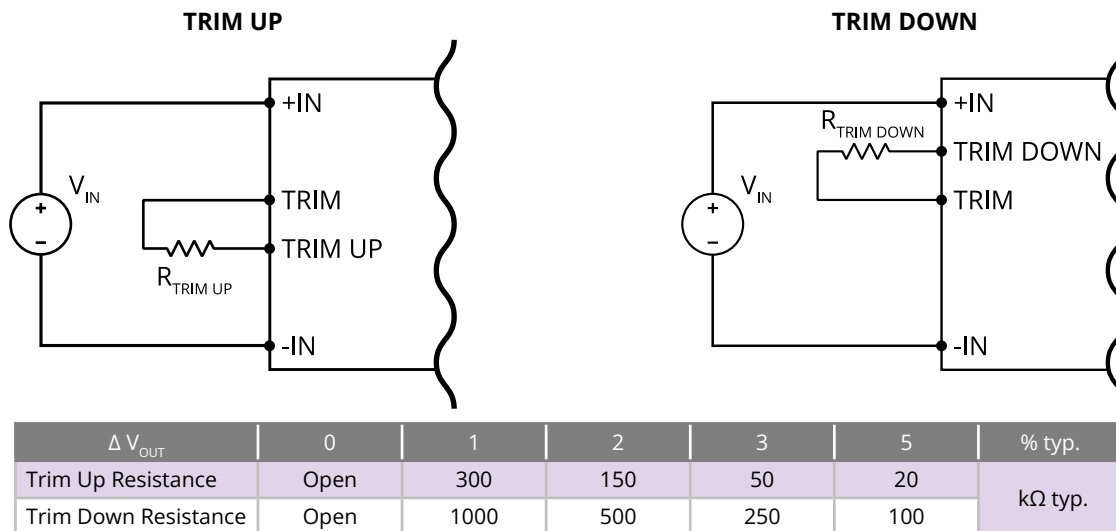


Models with Max. Output Power = 50W
& Efficiency at full load = 82%



TYPICAL CONNECTION CIRCUIT

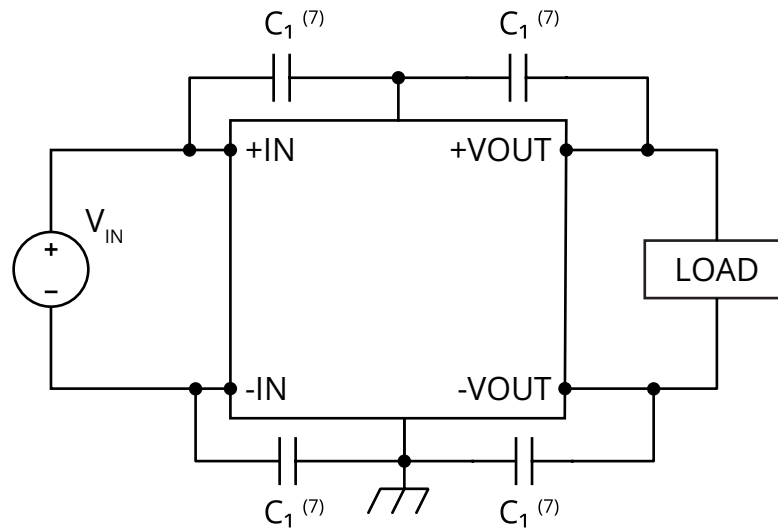
TRIM



Note: Each individual unit will vary slightly. It is recommended to use a 1MΩ multi-turn trimmer potentiometer to determine resistance value and achieve desired adjustment. Use minimum 1/2W power rating resistor. Keep the trim resistor leads as short as possible to eliminate the stray inductance which will effect the trimming results.

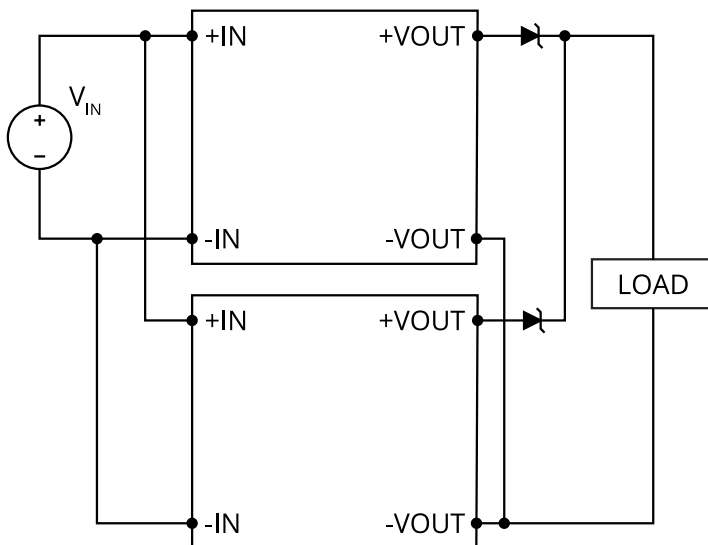
TYPICAL CONNECTION CIRCUIT

NOISE REDUCTION



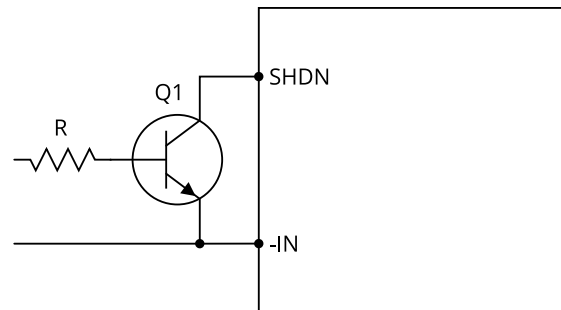
Note 7: C_1 filter capacitors may reduce noise further. Please contact Pico for more details.

PARALLEL

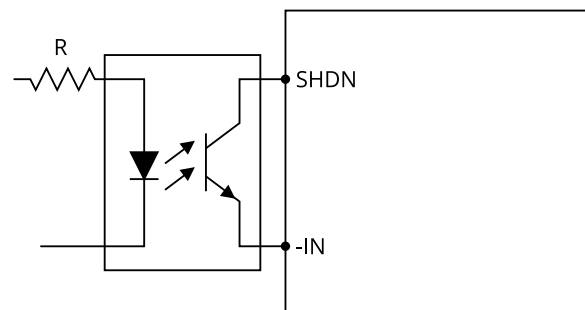


SHUTDOWN

NON-ISOLATED

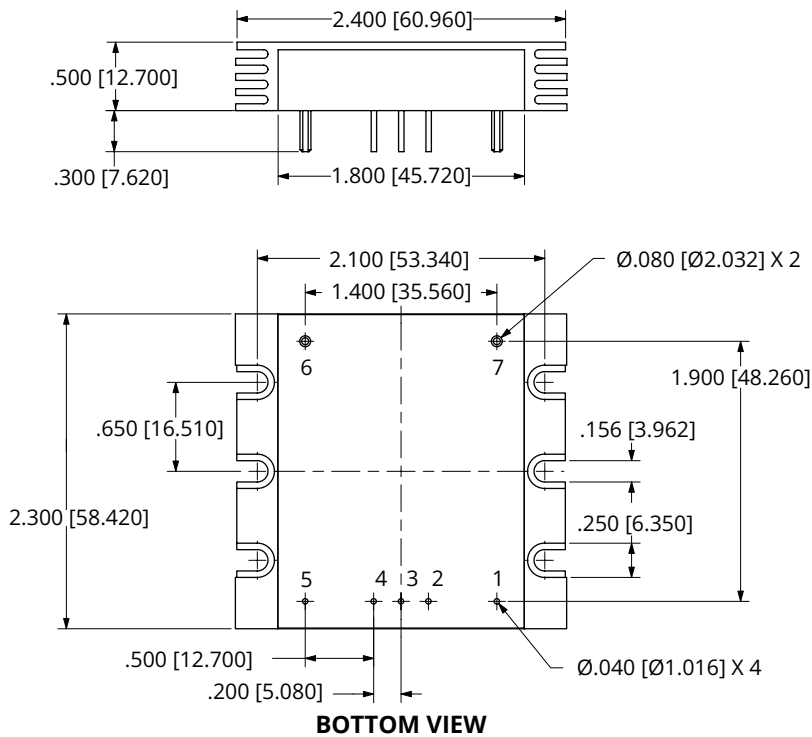


ISOLATED



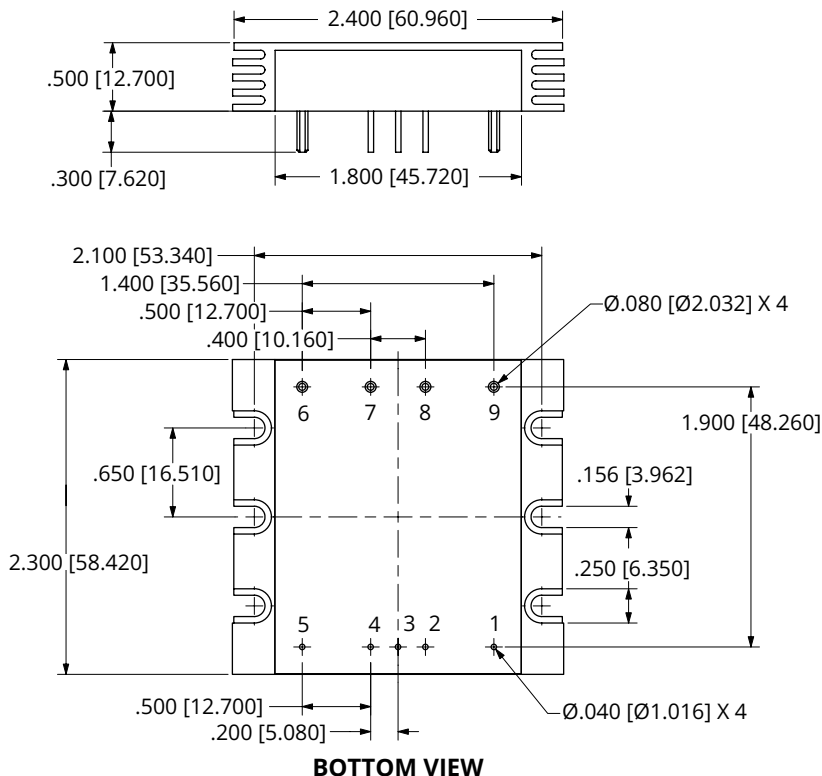
MECHANICAL DRAWINGS

SINGLE OUTPUT



PIN	FUNCTION	PIN DIAMETER
1	+IN	.040 [1.016]
2	TRIM DOWN	.040 [1.016]
3	TRIM	.040 [1.016]
4	SHUT DOWN	.040 [1.016]
5	-IN	.040 [1.016]
6	-OUT	.080 [2.032]
7	+OUT	.080 [2.032]

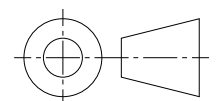
DUAL OUTPUTS



PIN	FUNCTION	PIN DIAMETER
1	+IN	.040 [1.016]
2	TRIM DOWN	.040 [1.016]
3	TRIM	.040 [1.016]
4	SHUT DOWN	.040 [1.016]
5	-IN	.040 [1.016]
6	-OUT1	.080 [2.032]
7	+OUT2	.080 [2.032]
8	-OUT2	.080 [2.032]
9	+OUT2	.080 [2.032]

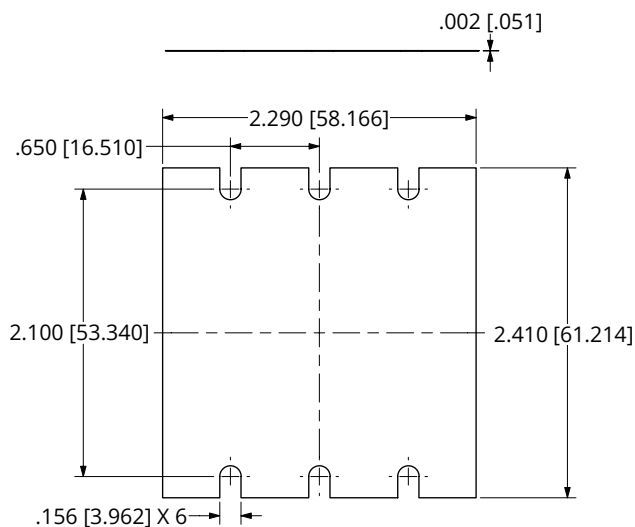
NOTES

- ALL DIMENSIONS ARE IN INCHES, [] = MM
- RECOMMENDED TORQUE FOR MOUNTING SCREWS: 6-9 INCH-LBS



MECHANICAL DRAWINGS

LTI - THERMAL INTERFACE

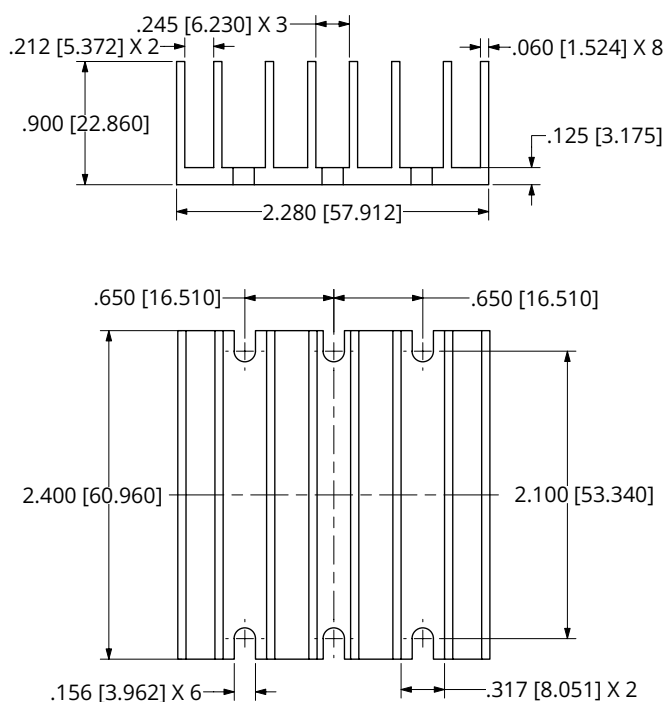


BOTTOM VIEW

Material	Alloy Aluminum Substrate
Thermal Conductivity	1530 BTU-in/hr sq.ft °F
Coefficient of Thermal Expansion, (25-100°C)	13.1 10 ⁻⁶ in-in/°F
Brinell Hardness	23 HB
Endurance Limit	5000 PSI
Standard Thickness	0.002 inches

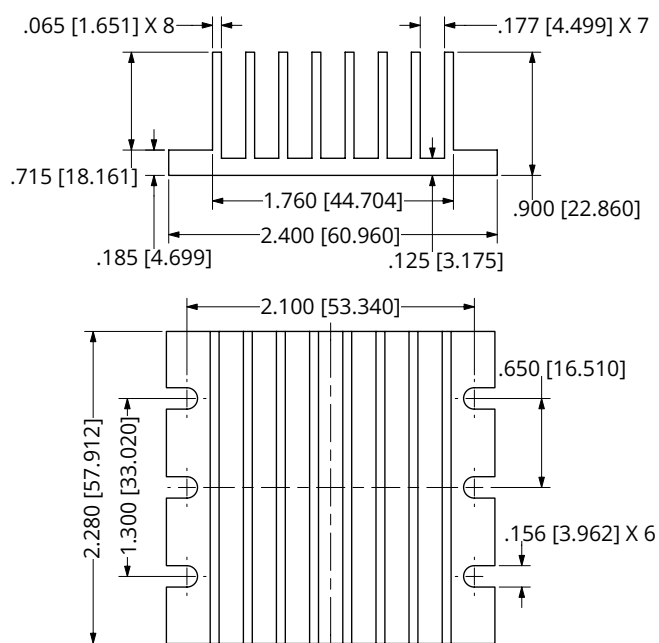
HEAT SINKS

LCH



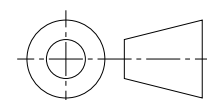
TOP VIEW

LCV



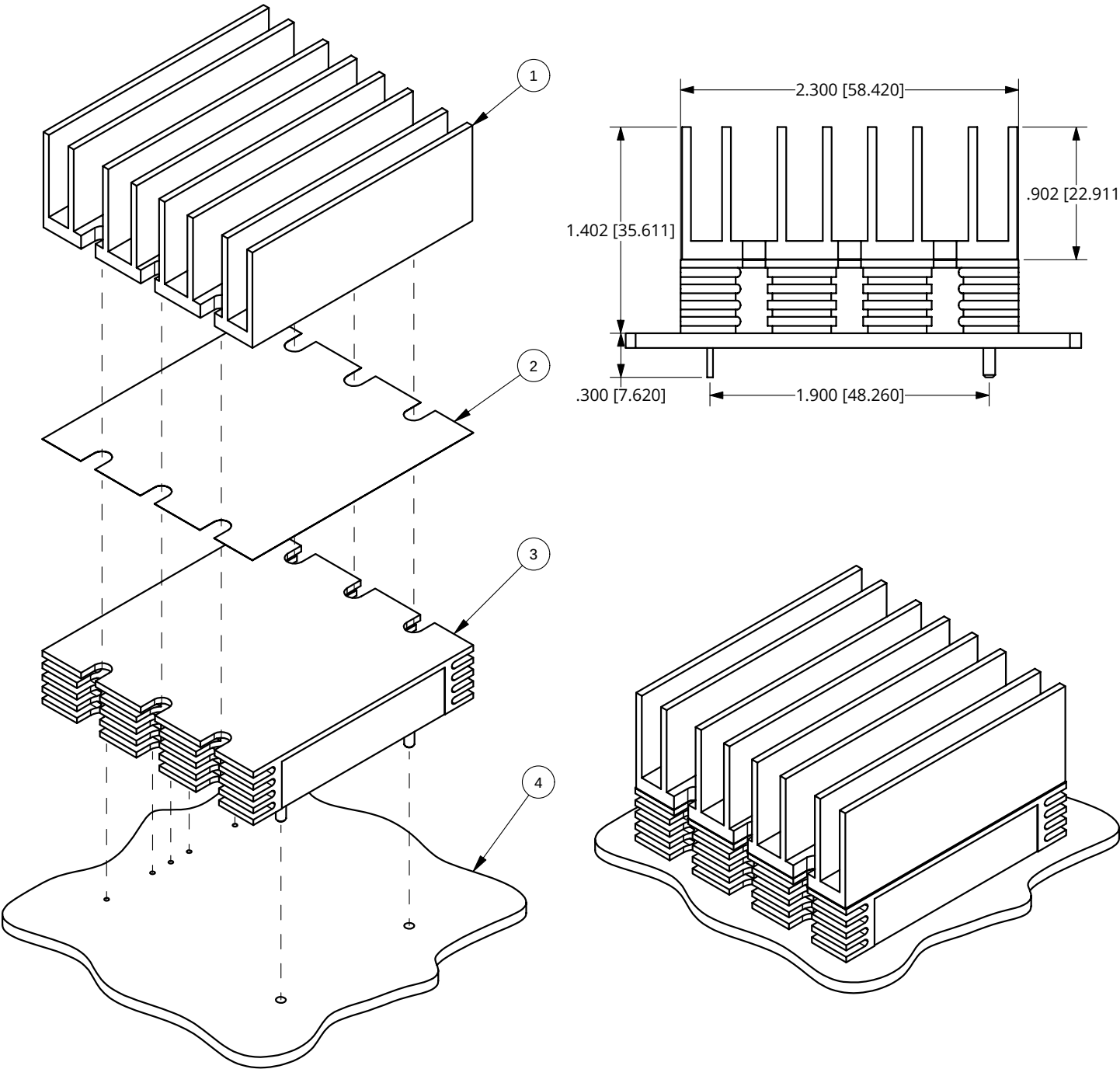
TOP VIEW

Weight: 70 grams typical



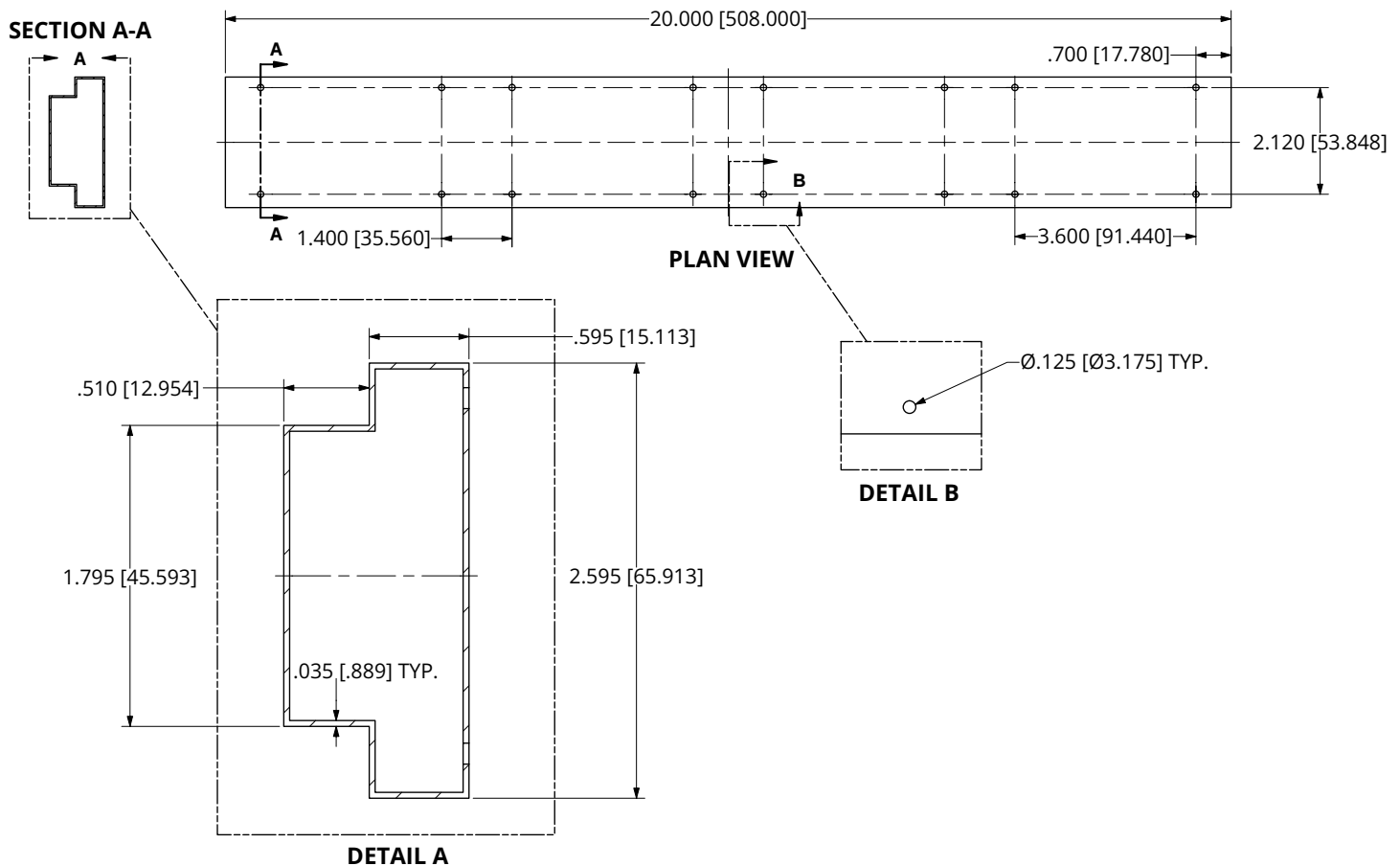
MECHANICAL DRAWINGS

HEAT SINK ASSEMBLY

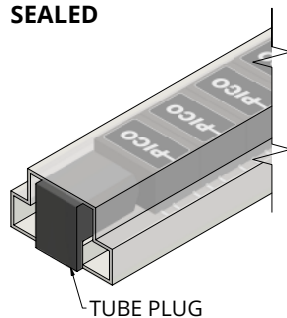


ITEM	QTY	DESCRIPTION
1	1	LCH OR LCV HEAT SINK
2	1	LTI THERMAL INTERFACE
3	1	LF/LM MODULE
4	1	PCB

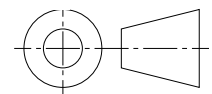
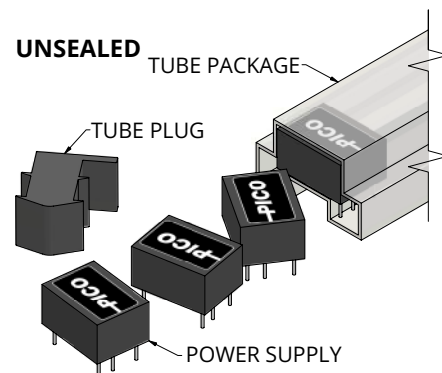
TUBE PACKAGING



SEALED



UNSEALED



Pico warrants each product manufactured by us and sold by us or an authorized representative, to be free from defects in material and workmanship. If properly used, it will perform within its applicable specifications for a period of one year after original shipment. Pico's obligation under this guarantee is limited to repairing or replacing our product to the original purchaser. This warranty is in lieu of all other warranties, express or implied and constitutes fulfillment of our obligations to the purchaser. We do not guarantee that the products can be used for a particular purpose other than those solely covered by the product's specifications. Pico must be notified if the product must meet particular certifications and/or standards. We assume no liability, in any event, for consequential damages, for anticipated or lost profits, incidental damages or loss of time or other losses incurred by the purchaser or any third party in connection with products covered by this warranty or otherwise. The purchaser will indemnify and hold Pico harmless for any damages, losses, costs, etc. from usage not within the product's specifications. Pico must be consulted before usage of its products in a nuclear, radioactive or space environment.

We reserve the right to discontinue products without notice, We reserve the right to make modifications to any existing catalog products without notice, at any time, without the obligation to modify units previously sold.

Series F/M

100W Isolated Regulated High Power DC-DC Converter



PRODUCT OVERVIEW

The F/M series are isolated DC-DC converters with a wide selection of input voltage ranges from 18V to 380V in a low profile full brick size - 4.6" x 2.5" x 0.5". These modules have trim capability and shutdown features. Protections include input overvoltage, output short-circuit, output overvoltage and over temperature.

The unique case has integrated side heat sink for better thermal dissipation but is capable of conduction cooling through the baseplate or additional top mounted heat sink.



FEATURES

- 18V to 380V input range models
 - 3.3V to 350V output models
 - Up to 200W output
 - Input/output isolation
 - Parallel operation option
 - Single and dual isolated outputs
 - Trim capability
 - Remote shutdown feature
 - Fixed operating frequency
 - No external components required
- Contact Pico for part number of available options:

 - Expanded operating temperature: -55°C to +85°C
 - Select screening per MIL-STD-883:
 - Stabilization Bake
 - Temperature Cycle
 - Burn-In
 - Special Input Voltage, Output Voltage, Isolation Voltage or Output Power
 - Parallel Operation

M	B	28	S
TEMPERATURE RANGE	INPUT VOLTAGE RANGE	OUTPUT VOLTAGE	NUMBER OF OUTPUTS
F = -40°C to +85°C M = -55°C to +85°C	A = 18 - 36V B = 36 - 72V C = 100 - 180V D = 200 - 380V	3.3 = 3.3V 5 = 5V 5.2 = 5.2V 9 = 9V 12 = 12V 15 = 15V 24 = 24V 28 = 28V 48 = 48V 100 = 100V 125 = 125V 150 = 150V 175 = 175V 200 = 200V 225 = 225V 250 = 250V 275 = 275V 300 = 300V 325 = 325V 350 = 350V	S = SINGLE D = DUAL

MODEL LIST - FA/MA (18-36V INPUT RANGE)**SINGLE OUTPUT**

Pico Part Number		Output Voltage [VDC]	Output Current		Output Power [W]	Efficiency ⁽²⁾ [%] typ.	Line Regulation ⁽³⁾		Load Regulation ⁽⁴⁾		Output Voltage Tolerance ⁽²⁾ [±%]
-40°C to +85°C	-55°C to +85°C		Min. ⁽¹⁾ [A]	Max. [A]			Nom.-Min. [-%] max	Nom.-Max. [+%] max	50%-Min. [+%] max	50%-100% [-%] max	
FA3.3S	MA3.3S	3.3	1.52	15.15	50	74	1.50	1.50	2.00	2.00	2.0
FA5S	MA5S	5	1.50	15.00	75	76	1.50	1.50	2.00	2.00	2.0
FA5.2S	MA5.2S	5.2	1.44	14.42	75	76	1.50	1.50	2.00	2.00	2.0
FA9S	MA9S	9	1.11	11.11	100	81	1.25	1.25	1.50	1.50	1.5
FA12S	MA12S	12	0.83	8.33	100	83	1.00	1.00	1.25	1.25	1.0
FA15S	MA15S	15	0.67	6.67	100	84	0.75	0.75	1.00	1.00	1.0
FA24S	MA24S	24	0.42	4.17	100	86	0.50	0.50	0.75	0.75	1.0
FA28S	MA28S	28	0.36	3.57	100	86	0.50	0.50	0.50	0.50	0.5
FA48S	MA48S	48	0.21	2.08	100	86	0.50	0.50	0.50	0.50	0.5
FA100S	MA100S	100	0.10	1.00	100	85	0.50	0.50	0.50	0.50	0.5
FA125S	MA125S	125	0.08	0.80	100	85	0.30	0.30	0.50	0.50	0.5
FA150S	MA150S	150	0.07	0.67	100	85	0.30	0.30	0.50	0.50	0.5
FA175S	MA175S	175	0.06	0.57	100	85	0.30	0.30	0.50	0.50	0.5
FA200S	MA200S	200	0.05	0.50	100	85	0.30	0.30	0.50	0.50	0.5
FA225S	MA225S	225	0.04	0.44	100	85	0.30	0.30	0.50	0.50	0.5
FA250S	MA250S	250	0.04	0.40	100	85	0.30	0.30	0.50	0.50	0.5

DUAL OUTPUT

Pico Part Number		Output Voltage Per Output [VDC]	Output Current Per Output		Output Power Per Output ⁽⁴⁾ [W]	Efficiency ⁽²⁾ [%] typ.	Line Regulation ⁽³⁾		Load Regulation ⁽⁴⁾		Output Voltage Tolerance ⁽²⁾ [±%]
-40°C to +85°C	-55°C to +85°C		Min. ⁽¹⁾ [A]	Max. [A]			Nom.-Min. [-%] max	Nom.-Max. [+%] max	50%-Min. [+%] max	50%-100% [-%] max	
FA5D	MA5D	5	0.75	7.50	37.5	76	1.50	1.50	2.00	2.00	2.0
FA9D	MA9D	9	0.56	5.56	50	81	1.25	1.25	1.50	1.50	1.5
FA12D	MA12D	12	0.42	4.17	50	83	1.00	1.00	1.25	1.25	1.0
FA15D	MA15D	15	0.33	3.33	50	84	0.75	0.75	1.00	1.00	1.0
FA24D	MA24D	24	0.21	2.08	50	85	0.50	0.50	0.75	0.75	1.0
FA28D	MA28D	28	0.18	1.79	50	86	0.50	0.50	0.50	0.50	0.5
FA48D	MA48D	48	0.10	1.04	50	86	0.50	0.50	0.50	0.50	0.5

Note 1: Maintain minimum 10% of rated load to prevent a voltage surge.

Note 2: Tested at nominal input voltage and full output load.

Note 3: Line regulation is specified at full output load, nominal to minimum input voltage (-%) and nominal to maximum input voltage (+%).

Note 4: For ≤100V output models, load regulation is specified at nominal input voltage, 50% to 10% load (+%) and 50% to 100% load (-%). For ≥125V output models, load regulation is specified at nominal input voltage, 50% to 20% load (+%) and 50% to 100% load (-%).

Note 5: Dual output loads must be balanced.

MODEL LIST - FB/MB (36-72V INPUT RANGE)**SINGLE OUTPUT**

Pico Part Number		Output Voltage [VDC]	Output Current		Output Power [W]	Efficiency ⁽²⁾ [%] typ.	Line Regulation ⁽³⁾		Load Regulation ⁽⁴⁾		Output Voltage Tolerance ⁽²⁾ [±%]
-40°C to +85°C	-55°C to +85°C		Min. ⁽¹⁾ [A]	Max. [A]			Nom.-Min. [-%] max	Nom.-Max. [%] max	50%-Min. [%] max	50%-100% [-%] max	
FB3.3S	MB3.3S	3.3	1.52	15.15	50	76	0.75	0.75	1.50	1.50	2.0
FB5S	MB5S	5	1.50	15.00	75	78	0.75	0.75	1.25	1.25	1.5
FB5.2S	MB5.2S	5.2	1.44	14.42	75	78	0.75	0.75	1.25	1.25	1.5
FB9S	MB9S	9	1.11	11.11	100	82	0.75	0.75	1.25	1.25	1.0
FB12S	MB12S	12	0.83	8.33	100	84	0.50	0.50	1.00	1.00	1.0
FB15S	MB15S	15	0.67	6.67	100	85	0.50	0.50	1.00	1.00	1.0
FB24S	MB24S	24	0.42	4.17	100	87	0.50	0.50	0.75	0.75	0.5
FB28S	MB28S	28	0.36	3.57	100	87	0.50	0.50	0.50	0.50	0.5
FB48S	MB48S	48	0.21	2.08	100	88	0.50	0.50	0.50	0.50	0.5
FB100S	MB100S	100	0.10	1.00	100	87	0.50	0.50	0.50	0.50	0.5
FB125S	MB125S	125	0.08	0.80	100	85	0.30	0.30	0.50	0.50	0.5
FB150S	MB150S	150	0.07	0.67	100	85	0.30	0.30	0.50	0.50	0.5
FB175S	MB175S	175	0.06	0.57	100	85	0.30	0.30	0.50	0.50	0.5
FB200S	MB200S	200	0.05	0.50	100	85	0.30	0.30	0.50	0.50	0.5
FB225S	MB225S	225	0.04	0.44	100	85	0.30	0.30	0.50	0.50	0.5
FB250S	MB250S	250	0.04	0.40	100	85	0.30	0.30	0.50	0.50	0.5
FB275S	MB275S	275	0.04	0.36	100	85	0.30	0.30	0.50	0.50	0.5
FB300S	MB300S	300	0.03	0.33	100	85	0.30	0.30	0.50	0.50	0.5

DUAL OUTPUT

Pico Part Number		Output Voltage Per Output [VDC]	Output Current Per Output		Output Power Per Output ⁽⁴⁾ [W]	Efficiency ⁽²⁾ [%] typ.	Line Regulation ⁽³⁾		Load Regulation ⁽⁴⁾		Output Voltage Tolerance ⁽²⁾ [±%]
-40°C to +85°C	-55°C to +85°C		Min. ⁽¹⁾ [A]	Max. [A]			Nom.-Min. [-%] max	Nom.-Max. [%] max	50%-Min. [%] max	50%-100% [-%] max	
FB5D	MB5D	5	0.75	7.50	37.5	78	0.75	0.75	1.00	1.00	1.5
FB9D	MB9D	9	0.56	5.56	50	82	0.75	0.75	1.00	1.00	1.0
FB12D	MB12D	12	0.42	4.17	50	84	0.50	0.50	0.75	0.75	1.0
FB15D	MB15D	15	0.33	3.33	50	85	0.50	0.50	0.75	0.75	1.0
FB24D	MB24D	24	0.21	2.08	50	87	0.50	0.50	0.50	0.50	0.5
FB28D	MB28D	28	0.18	1.79	50	87	0.50	0.50	0.50	0.50	0.5
FB48D	MB48D	48	0.10	1.04	50	88	0.50	0.50	0.50	0.50	0.5

Note 1: Maintain minimum 10% of rated load to prevent a voltage surge.

Note 2: Tested at nominal input voltage and full output load.

Note 3: Line regulation is specified at full output load, nominal to minimum input voltage (-%) and nominal to maximum input voltage (+%).

Note 4: For ≤100V output models, load regulation is specified at nominal input voltage, 50% to 10% load (+%) and 50% to 100% load (-%). For ≥125V output models, load regulation is specified at nominal input voltage, 50% to 20% load (+%) and 50% to 100% load (-%).

Note 5: Dual output loads must be balanced.

MODEL LIST - FC/MC (100-180V INPUT RANGE)**SINGLE OUTPUT**

Pico Part Number		Output Voltage [VDC]	Output Current		Output Power [W]	Efficiency ⁽²⁾ [%] typ.	Line Regulation ⁽³⁾		Load Regulation ⁽⁴⁾		Output Voltage Tolerance ⁽²⁾ [±%]
-40°C to +85°C	-55°C to +85°C		Min. ⁽¹⁾ [A]	Max. [A]			Nom.-Min. [-%] max	Nom.-Max. [%] max	50%-Min. [%] max	50%-100% [-%] max	
FC3.3S	MC3.3S	3.3	1.52	15.15	50	76	0.75	0.75	1.00	1.00	2.0
FC5S	MC5S	5	1.50	15.00	75	78	0.75	0.75	1.00	1.00	1.5
FC5.2S	MC5.2S	5.2	1.44	14.42	75	78	0.75	0.75	1.00	1.00	1.5
FC9S	MC9S	9	1.11	11.11	100	84	0.50	0.50	0.75	0.75	1.0
FC12S	MC12S	12	0.83	8.33	100	86	0.50	0.50	0.75	0.75	1.0
FC15S	MC15S	15	0.67	6.67	100	87	0.50	0.50	0.75	0.75	1.0
FC24S	MC24S	24	0.42	4.17	100	88	0.30	0.30	0.50	0.50	0.5
FC28S	MC28S	28	0.36	3.57	100	88	0.20	0.20	0.50	0.50	0.5
FC48S	MC48S	48	0.21	2.08	100	88	0.20	0.20	0.50	0.50	0.5
FC100S	MC100S	100	0.10	1.00	100	87	0.30	0.30	0.50	0.50	0.5
FC125S	MC125S	125	0.08	0.80	100	85	0.30	0.30	0.50	0.50	0.5
FC150S	MC150S	150	0.07	0.67	100	85	0.30	0.30	0.50	0.50	0.5
FC175S	MC175S	175	0.06	0.57	100	85	0.30	0.30	0.50	0.50	0.5
FC200S	MC200S	200	0.05	0.50	100	85	0.30	0.30	0.50	0.50	0.5
FC225S	MC225S	225	0.04	0.44	100	85	0.30	0.30	0.50	0.50	0.5
FC250S	MC250S	250	0.04	0.40	100	85	0.30	0.30	0.50	0.50	0.5
FC275S	MC275S	275	0.04	0.36	100	85	0.30	0.30	0.50	0.50	0.5
FC300S	MC300S	300	0.03	0.33	100	85	0.30	0.30	0.50	0.50	0.5

DUAL OUTPUT

Pico Part Number		Output Voltage Per Output [VDC]	Output Current Per Output		Output Power Per Output ⁽⁴⁾ [W]	Efficiency ⁽²⁾ [%] typ.	Line Regulation ⁽³⁾		Load Regulation ⁽⁴⁾		Output Voltage Tolerance ⁽²⁾ [±%]
-40°C to +85°C	-55°C to +85°C		Min. ⁽¹⁾ [A]	Max. [A]			Nom.-Min. [-%] max	Nom.-Max. [%] max	50%-Min. [%] max	50%-100% [-%] max	
FC5D	MC5D	5	0.75	7.50	37.5	78	0.75	0.75	1.00	1.00	1.5
FC9D	MC9D	9	0.56	5.56	50	84	0.50	0.50	0.75	0.75	1.0
FC12D	MC12D	12	0.42	4.17	50	86	0.50	0.50	0.75	0.75	1.0
FC15D	MC15D	15	0.33	3.33	50	87	0.50	0.50	0.75	0.75	1.0
FC24D	MC24D	24	0.21	2.08	50	88	0.30	0.30	0.50	0.50	0.5
FC28D	MC28D	28	0.18	1.79	50	88	0.20	0.20	0.50	0.50	0.5
FC48D	MC48D	48	0.10	1.04	50	88	0.20	0.20	0.50	0.50	0.5

Note 1: Maintain minimum 10% of rated load to prevent a voltage surge.

Note 2: Tested at nominal input voltage and full output load.

Note 3: Line regulation is specified at full output load, nominal to minimum input voltage (-%) and nominal to maximum input voltage (+%).

Note 4: For ≤100V output models, load regulation is specified at nominal input voltage, 50% to 10% load (+%) and 50% to 100% load (-%). For ≥125V output models, load regulation is specified at nominal input voltage, 50% to 20% load (+%) and 50% to 100% load (-%).

Note 5: Dual output loads must be balanced.

MODEL LIST - FD/MD (200-380V INPUT RANGE)**SINGLE OUTPUT**

Pico Part Number		Output Voltage [VDC]	Output Current		Output Power [W]	Efficiency ⁽²⁾ [%] typ.	Line Regulation ⁽³⁾		Load Regulation ⁽⁴⁾		Output Voltage Tolerance ⁽²⁾ [±%]
-40°C to +85°C	-55°C to +85°C		Min. ⁽¹⁾ [A]	Max. [A]			Nom.-Min. [-%] max	Nom.-Max. [+%] max	50%-Min. [+%] max	50%-100% [-%] max	
FD3.3S	MD3.3S	3.3	1.52	15.15	50	76	1.25	1.25	1.50	1.50	2.0
FD5S	MD5S	5	1.50	15.00	75	78	1.00	1.00	1.25	1.25	1.5
FD5.2S	MD5.2S	5.2	1.44	14.42	75	78	1.00	1.00	1.25	1.25	1.5
FD9S	MD9S	9	1.11	11.11	100	84	1.00	1.00	1.25	1.25	1.0
FD12S	MD12S	12	0.83	8.33	100	85	0.75	0.75	1.00	1.00	1.0
FD15S	MD15S	15	0.67	6.67	100	86	0.75	0.75	1.00	1.00	1.0
FD24S	MD24S	24	0.42	4.17	100	87	0.50	0.50	0.75	0.75	0.5
FD28S	MD28S	28	0.36	3.57	100	87	0.50	0.50	0.50	0.50	0.5
FD48S	MD48S	48	0.21	2.08	100	88	0.20	0.20	0.50	0.50	0.5
FD100S	MD100S	100	0.10	1.00	100	88	0.20	0.20	0.50	0.50	0.5
FD125S	MD125S	125	0.08	0.80	100	85	0.30	0.30	0.50	0.50	0.5
FD150S	MD150S	150	0.07	0.67	100	85	0.30	0.30	0.50	0.50	0.5
FD175S	MD175S	175	0.06	0.57	100	85	0.30	0.30	0.50	0.50	0.5
FD200S	MD200S	200	0.05	0.50	100	85	0.30	0.30	0.50	0.50	0.5
FD225S	MD225S	225	0.04	0.44	100	85	0.30	0.30	0.50	0.50	0.5
FD250S	MD250S	250	0.04	0.40	100	85	0.30	0.30	0.50	0.50	0.5
FD275S	MD275S	275	0.04	0.36	100	85	0.30	0.30	0.50	0.50	0.5
FD300S	MD300S	300	0.03	0.33	100	85	0.30	0.30	0.50	0.50	0.5
FD325S	MD325S	325	0.03	0.31	100	85	0.30	0.30	0.50	0.50	0.5
FD350S	MD350S	350	0.03	0.29	100	85	0.30	0.30	0.50	0.50	0.5

DUAL OUTPUT

Pico Part Number		Output Voltage Per Output [VDC]	Output Current Per Output		Output Power Per Output ⁽⁴⁾ [W]	Efficiency ⁽²⁾ [%] typ.	Line Regulation ⁽³⁾		Load Regulation ⁽⁴⁾		Output Voltage Tolerance ⁽²⁾ [±%]
-40°C to +85°C	-55°C to +85°C		Min. ⁽¹⁾ [A]	Max. [A]			Nom.-Min. [-%] max	Nom.-Max. [+%] max	50%-Min. [+%] max	50%-100% [-%] max	
FD5D	MD5D	5	0.75	7.50	37.5	78	1.00	1.00	1.25	1.25	1.5
FD9D	MD9D	9	0.56	5.56	50	84	1.00	1.00	1.25	1.25	1.0
FD12D	MD12D	12	0.42	4.17	50	85	0.75	0.75	1.00	1.00	1.0
FD15D	MD15D	15	0.33	3.33	50	86	0.75	0.75	1.00	1.00	1.0
FD24D	MD24D	24	0.21	2.08	50	87	0.50	0.50	0.75	0.75	0.5
FD28D	MD28D	28	0.18	1.79	50	87	0.50	0.50	0.50	0.50	0.5
FD48D	MD48D	48	0.10	1.04	50	88	0.50	0.50	0.50	0.50	0.5

Note 1: Maintain minimum 10% of rated load to prevent a voltage surge.

Note 2: Tested at nominal input voltage and full output load.

Note 3: Line regulation is specified at full output load, nominal to minimum input voltage (-%) and nominal to maximum input voltage (+%).

Note 4: For ≤100V output models, load regulation is specified at nominal input voltage, 50% to 10% load (+%) and 50% to 100% load (-%). For ≥125V output models, load regulation is specified at nominal input voltage, 50% to 20% load (+%) and 50% to 100% load (-%).

Note 5: Dual output loads must be balanced.

SPECIFICATIONS (Nominal V_{IN} , Full Load, $T_A = +25^{\circ}\text{C}$, 1 hour warm up unless otherwise specified)**INPUT**

Parameter	Condition	Min.	Nom.	Max.	Units
Input Voltage Range	FA/MA models	18	28	36	VDC
	FB/MB models	36	48	72	
	FC/MC models	100	150	180	
	FD/MD models	200	300	380	

OUTPUT

Parameter	Condition	Min.	Typ.	Max.	Units
Output Ripple	1MHz bandwidth	$\leq 100\text{V}$ output models	-	50	mVp-p
		$\geq 125\text{V}$ output models	-	1	%

ENVIRONMENTAL

Parameter	Condition		Min.	Typ.	Max.	Units
Operating Temperature Range	Baseplate	F models	-40	-	+85	°C
		M models	-55	-	+85	
Storage Temperature Range			-55	-	+105	°C
Cooling	Conduction through baseplate					

GENERAL

Parameter	Condition	Min.	Typ.	Max.	Units
Operating Frequency		-	100	-	kHz
Isolation Voltage	Input to output	4242	-	-	VDC
	Input to baseplate	2121	-	-	
	Output to baseplate	1000	-	-	
Insulation Resistance		100	-	-	MΩ
Size	L x W x H	4.6 x 2.5 x 0.5 (116.84 x 63.5 x 12.7)			inches (mm)
Weight	≤48V single output models	-	210	-	grams
	≥100V single output models	-	220	-	
	Dual output models	-	235	-	
Case	Aluminum baseplate and Glass Reinforced Polymer				
Potting	Vacuum Impregnated Epoxy				
Tube Packaging (W x H x L)	2.595 x 1.105 x 20 (65.913 x 28.067 x 101.6)				inches (mm)

PROTECTIONS & FEATURES

Parameter	Condition	Min.	Typ.	Max.	Units
Input Over Voltage	FA/MA, FB/MB & FC/MC models	Yes			
Short circuit or Overload	Hiccup mode, self-recovery	120	-	-	%
Overtemperature	Baseplate, self-recovery	Shutdown	-	95	$^{\circ}\text{C}$
		Restart	-	50	
Output Overvoltage	Zener diode clamp	-	120	-	%
Shutdown (SHUTDOWN)	Non-latched shutdown, Self-recovery	-	-	0.15	VDC
Output Voltage Trim (TRIM, TRIM UP & TRIM DOWN)	Trim up or trim down	-5	0	5	%
Parallel ⁽⁶⁾	P option models	Connect as shown in connection diagram.			

Note 6: The parallel option allows units to operate the outputs in parallel to share load, increase total power or allow for N+1 redundancy.

SPECIFICATIONS (Nominal V_{IN} , Full Load, $T_A = +25^\circ\text{C}$, 1 hour warm up unless otherwise specified)

DESIGNED TO MEET

Test	Referenced Standard	Description
Vibration	MIL-STD-202	Method 204, Vibration, High Frequency, Condition D
Shock	MIL-STD-202	Method 213, Shock (Specified Pulse), Condition I
Humidity	MIL-STD-202	Method 106, Moisture Resistance
Altitude	MIL-STD-202	Method 105, Barometric Pressure (Reduced), Condition D

OPTIONS AVAILABLE – CONTACT PICO FOR PART NUMBER

Parameter	Referenced Standard	Description
Stabilization Bake	MIL-STD-883	Referenced Method 1008 Non-operating maximum storage temperature for 24 hours
Temperature Cycle	MIL-STD-883	Referenced Method 1010 Non-operating at temperature extremes, 15 mins/temp, 10 cycles
Burn-In	MIL-STD-883	Referenced Method 1015 Max operating temperature for 160 hours
Expanded Operating Temperature Range		-55°C to +85°C

THERMAL RESISTANCE

$$P_{OUT} = \frac{T_C - T_A}{T_{RCA} \times (1 / \eta - 1)}$$

P_{OUT} = Output Power in Watts

η = Efficiency

T_C = Case temperature in $^\circ\text{C}$

T_A = Ambient temperature in $^\circ\text{C}$

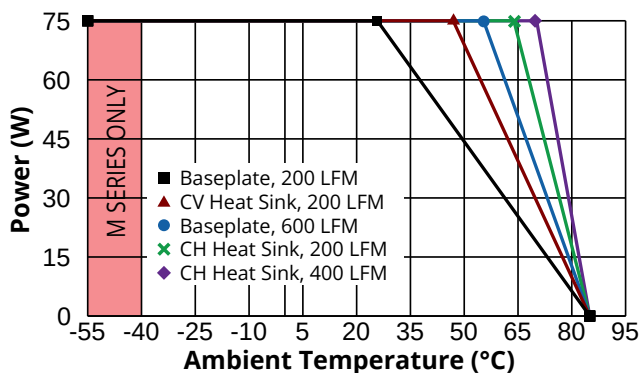
T_{RCA} = Thermal resistance of case to air in $^\circ\text{C} / \text{W}$

Thermal resistance of case (T_{RCA})

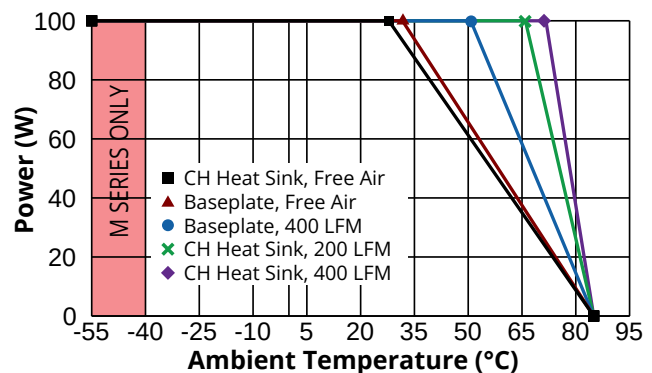
Airflow	Baseplate only	CV Heat Sink	CH Heat Sink	Units
Free Air	5.1	3.5	3.0	$^\circ\text{C} / \text{W}$
200 LFM	2.8	1.8	1	
400 LFM	1.8	1.1	0.7	
600 LFM	1.4	0.8	0.55	
800 LFM	1.2	0.65	0.45	
1000 LFM	1	0.55	0.4	

DERATING GRAPHS (Nominal V_{IN} , Full Load, Efficiency @ Full Load)

Models with Max. Output Power = 75W
& Efficiency at full load = 78%

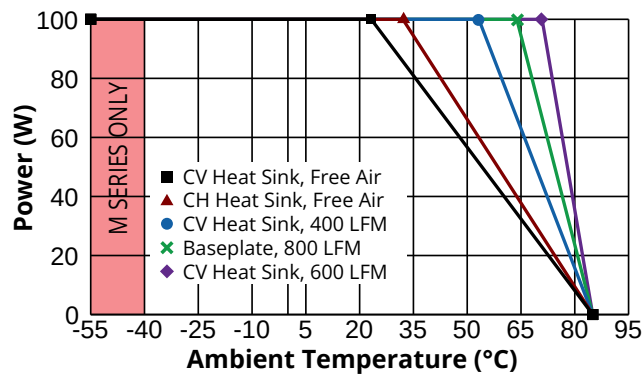


Models with Max. Output Power = 100W
& Efficiency at full load = 84%

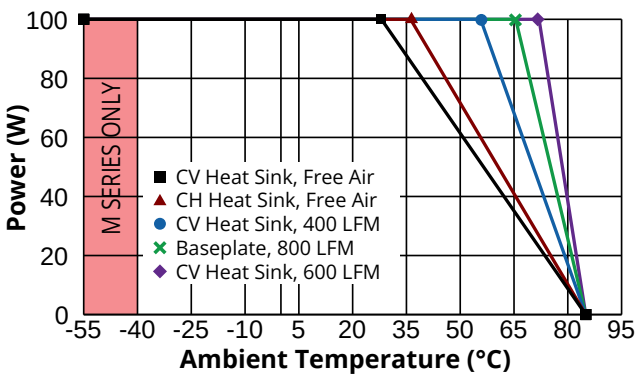


DERATING GRAPHS

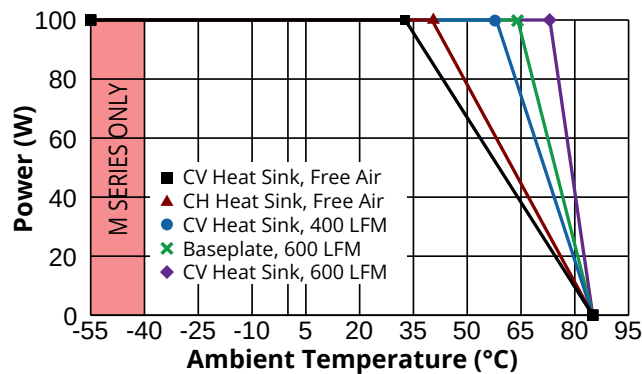
Models with Max. Output Power = 100W
& Efficiency at full load = 85%



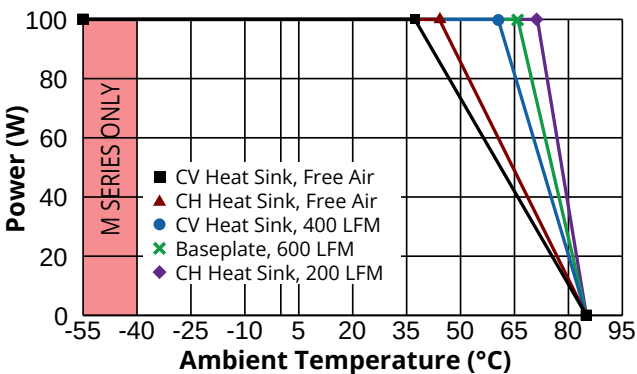
Models with Max. Output Power = 100W
& Efficiency at full load = 86%



Models with Max. Output Power = 100W
& Efficiency at full load = 87%

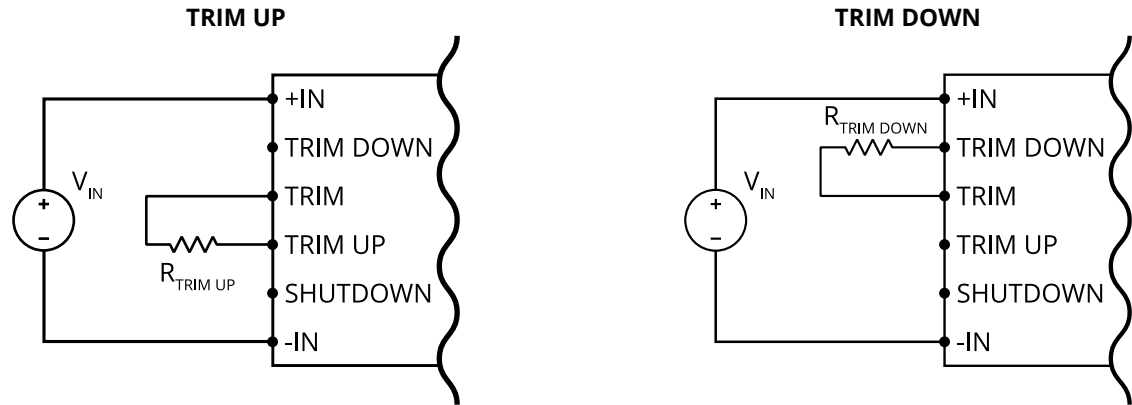


Models with Max. Output Power = 100W
& Efficiency at full load = 88%



TYPICAL CONNECTION CIRCUIT

TRIM

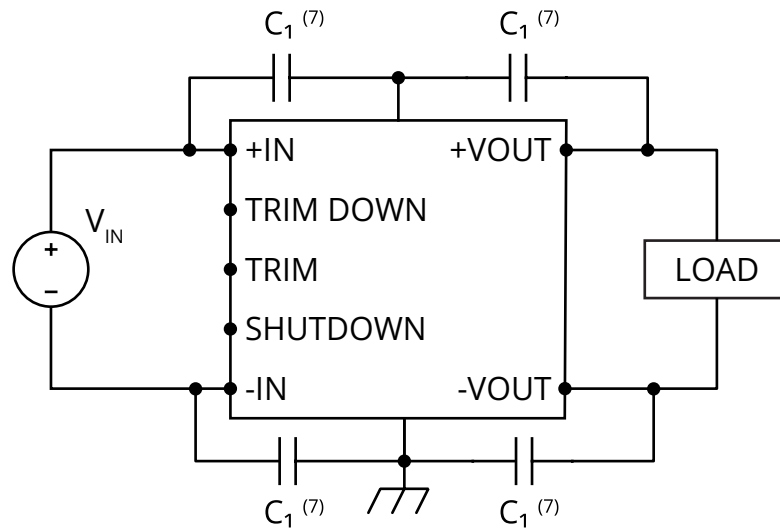


ΔV_{OUT}	0	1	2	3	5	% typ.
Trim Up Resistance	Open	300	150	50	20	k Ω typ.
Trim Down Resistance	Open	1000	500	250	100	

Note: Each individual unit will vary slightly. It is recommended to use a 1M Ω multi-turn trimmer potentiometer to determine resistance value and achieve desired adjustment. Use minimum 1/2W power rating resistor. Keep the trim resistor leads as short as possible to eliminate the stray inductance which will effect the trimming results.

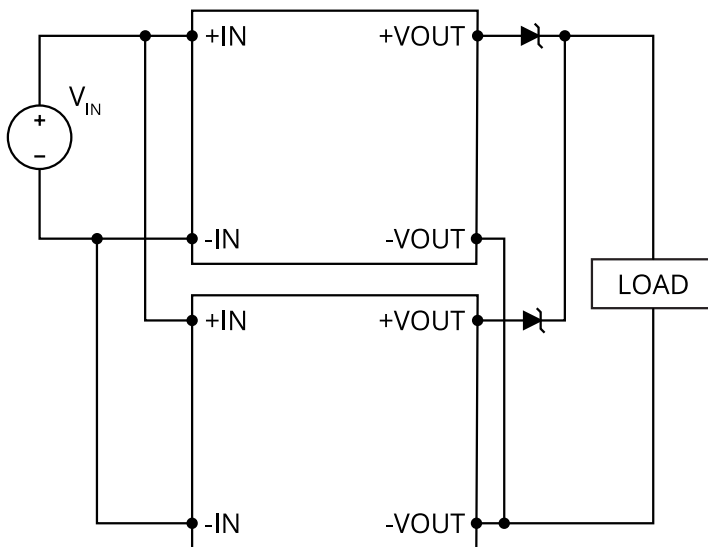
TYPICAL CONNECTION CIRCUIT

NOISE REDUCTION



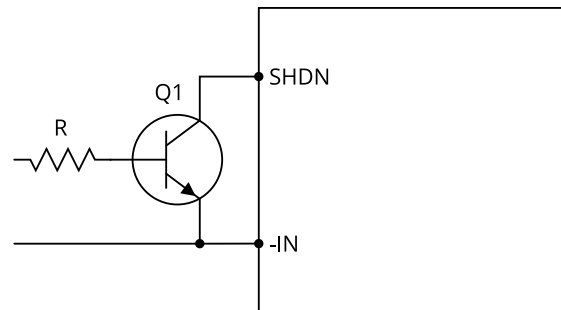
Note 7: C_1 filter capacitors may reduce noise further. Please contact Pico for more details.

PARALLEL

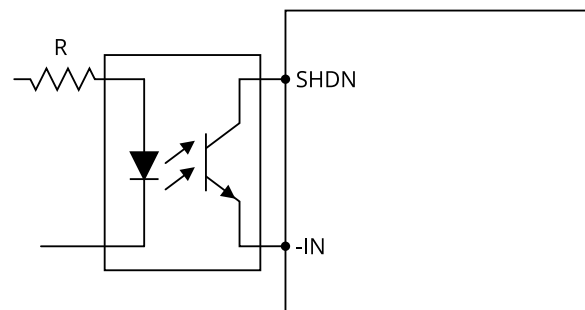


SHUTDOWN

NON-ISOLATED

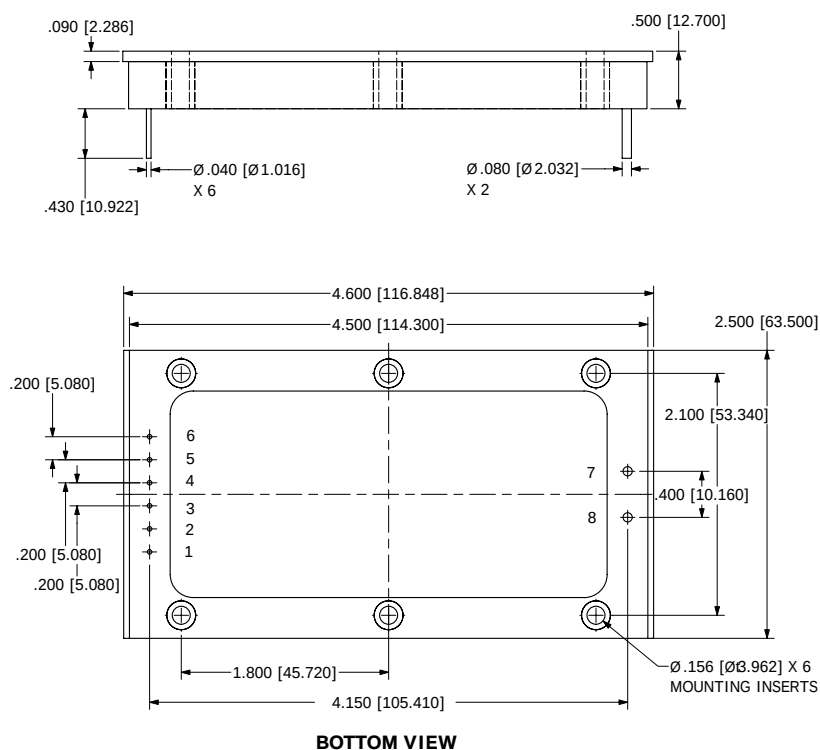


ISOLATED



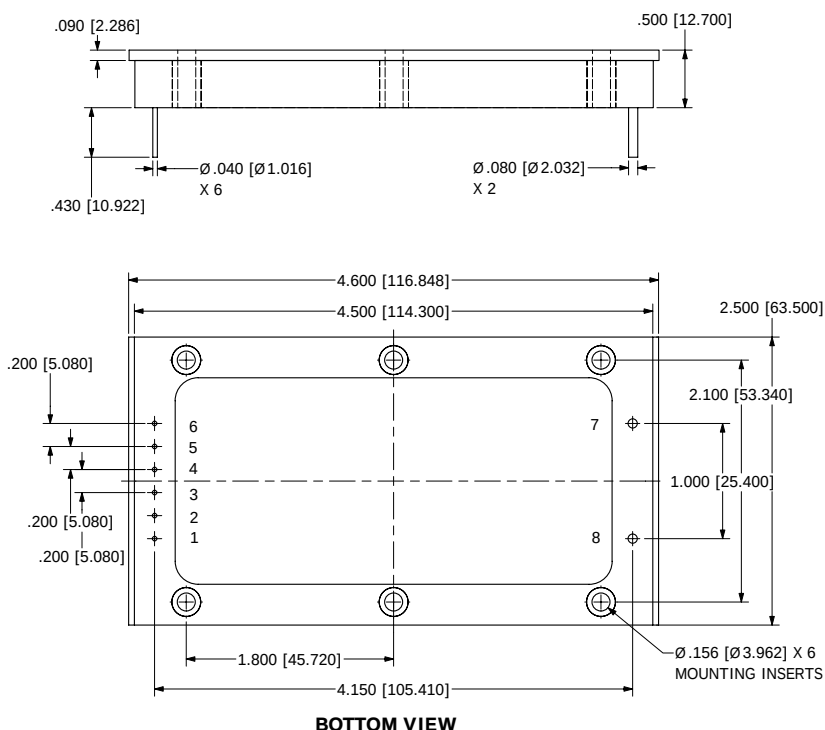
MECHANICAL DRAWINGS

≤48V SINGLE OUTPUT MODELS



PIN	FUNCTION	PIN DIAMETER
1	+IN	.040 [1.016]
2	TRIM DOWN	.040 [1.016]
3	TRIM	.040 [1.016]
4	TRIM UP	.040 [1.016]
5	SHUT DOWN	.040 [1.016]
6	-IN	.040 [1.016]
7	-OUT	.080 [2.032]
8	+OUT	.080 [2.032]

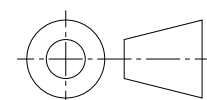
≥100V SINGLE OUTPUT MODELS



PIN	FUNCTION	PIN DIAMETER
1	+IN	.040 [1.016]
2	TRIM DOWN	.040 [1.016]
3	TRIM	.040 [1.016]
4	TRIM UP	.040 [1.016]
5	SHUT DOWN	.040 [1.016]
6	-IN	.040 [1.016]
7	-OUT	.080 [2.032]
8	+OUT	.080 [2.032]

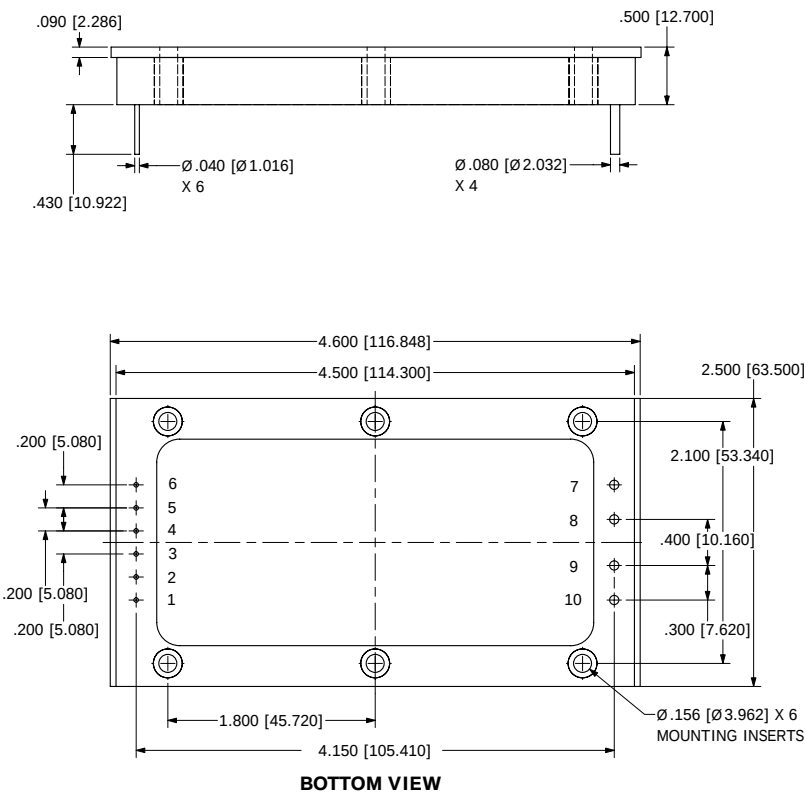
NOTES

- ALL DIMENSIONS ARE IN INCHES, [] = MM
- RECOMMENDED TORQUE FOR MOUNTING SCREWS: 6-9 INCH-LBS



MECHANICAL DRAWINGS

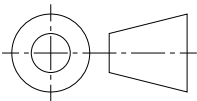
DUAL OUTPUT MODELS



PIN	FUNCTION	PIN DIAMETER
1	+IN	.040 [1.016]
2	TRIM DOWN	.040 [1.016]
3	TRIM	.040 [1.016]
4	TRIM UP	.040 [1.016]
5	SHUT DOWN	.040 [1.016]
6	-IN	.040 [1.016]
7	-OUT1	.080 [2.032]
8	+OUT1	.080 [2.032]
9	-OUT2	.080 [2.032]
10	+OUT2	.080 [2.032]

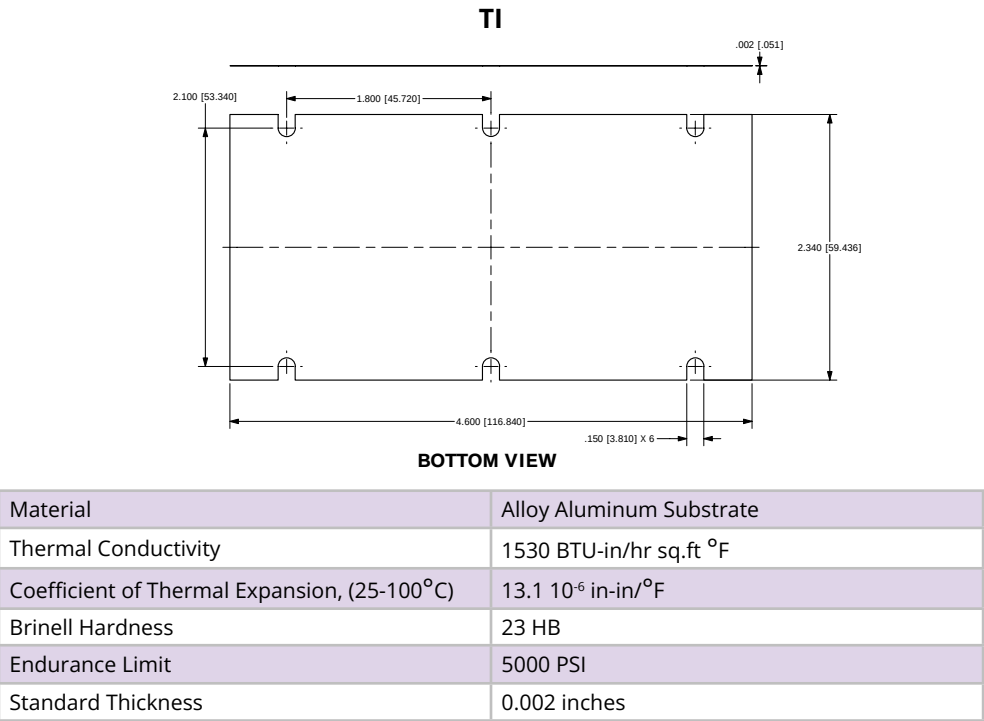
NOTES

- a. ALL DIMENSIONS ARE IN INCHES, [] = MM
- b. RECOMMENDED TORQUE FOR MOUNTING SCREWS: 6-9 INCH-LBS

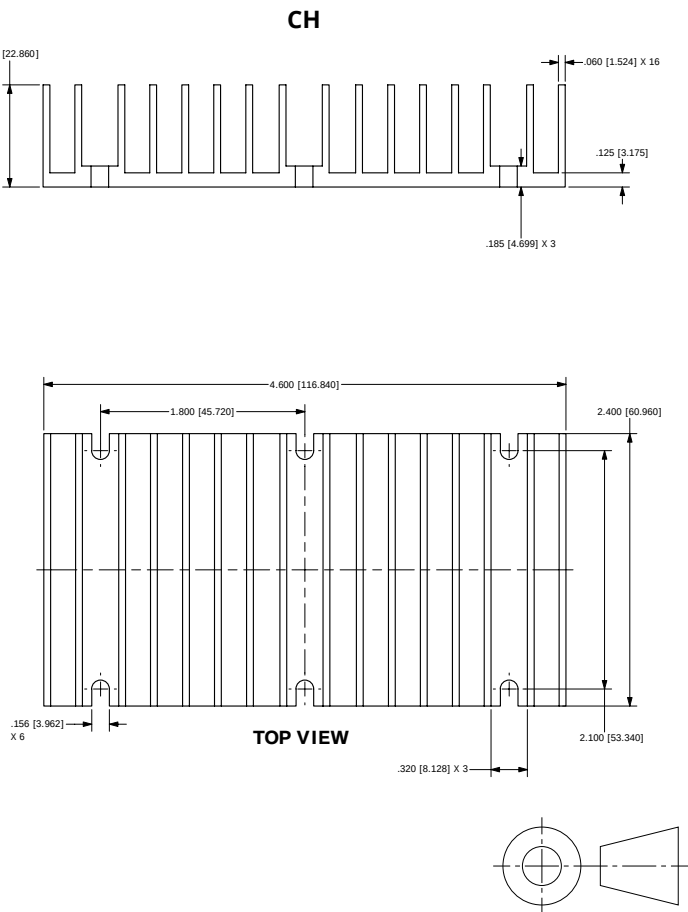
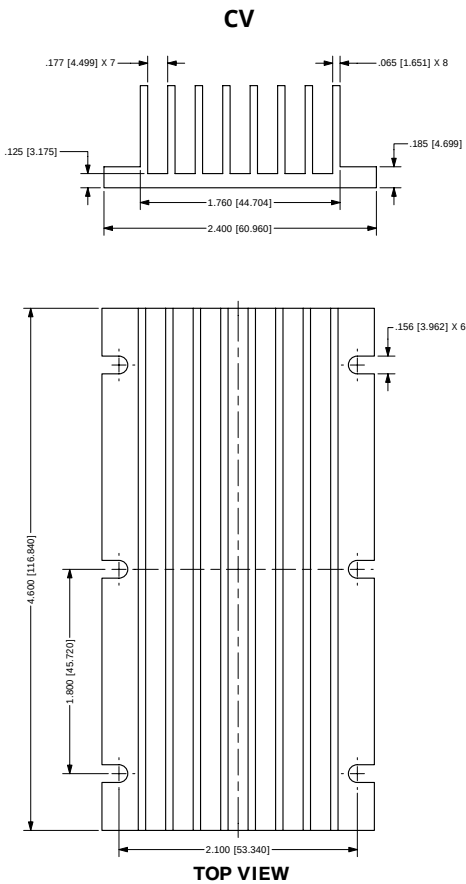


MECHANICAL DRAWINGS

THERMAL INTERFACE



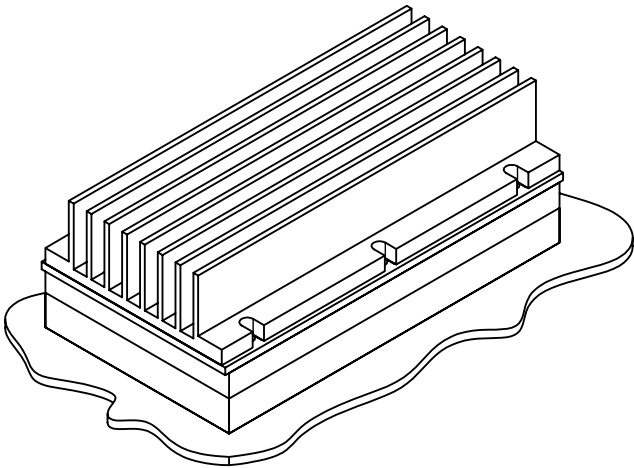
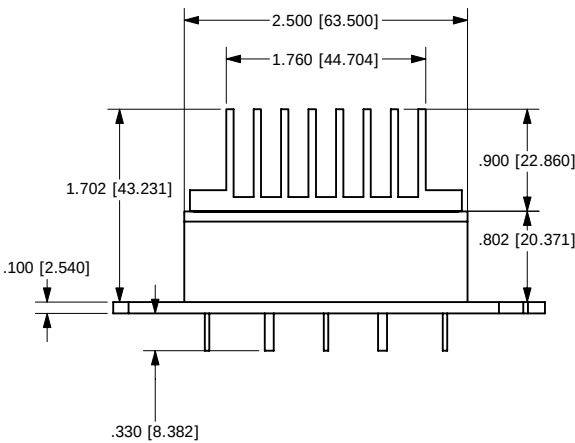
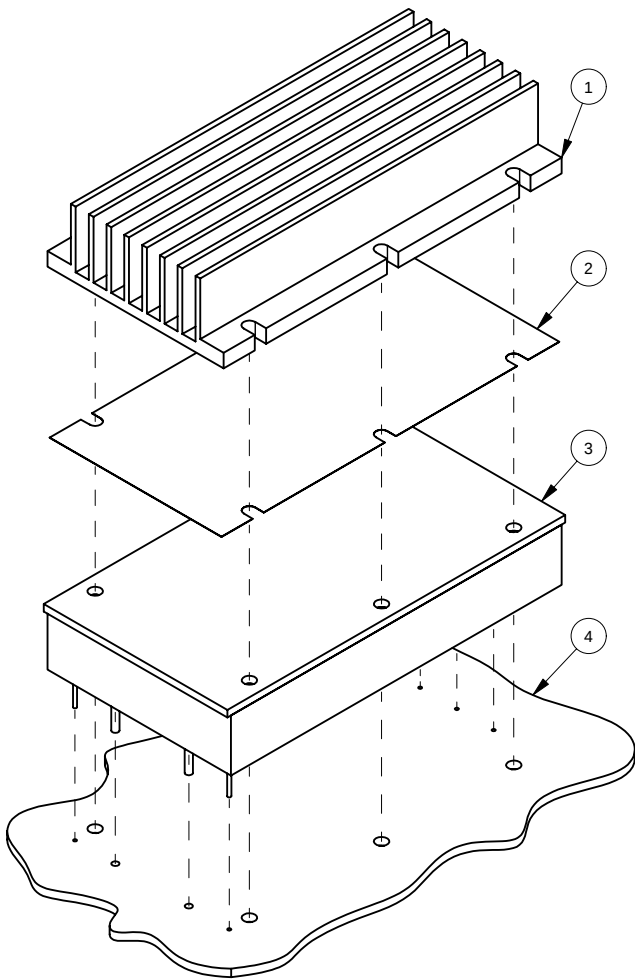
HEAT SINKS



Weight: 145 grams typical

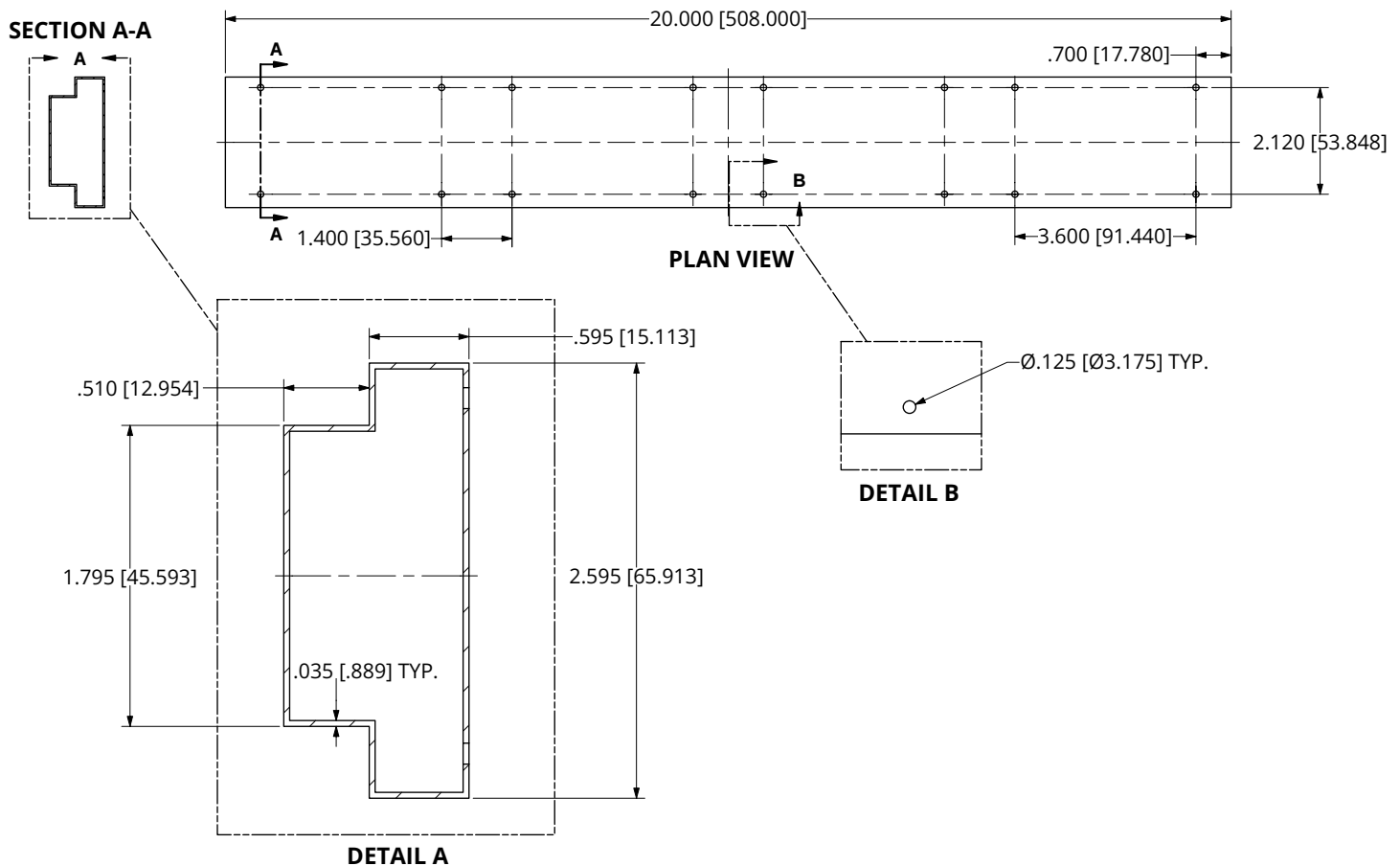
MECHANICAL DRAWINGS

HEAT SINK ASSEMBLY

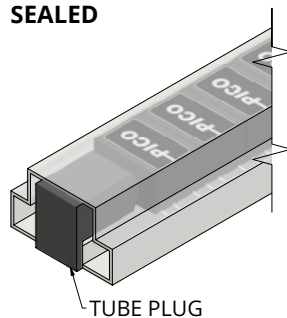


ITEM	QTY	DESCRIPTION
1	1	CH OR CV HEAT SINK
2	1	TI THERMAL INTERFACE
3	1	F/M MODULE
4	1	PCB

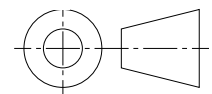
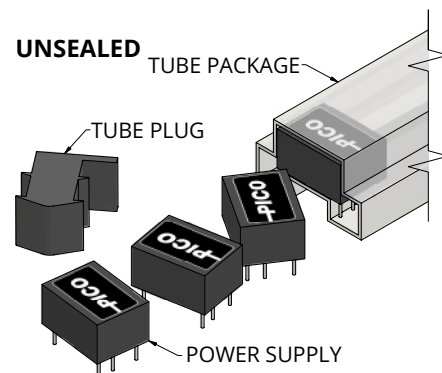
TUBE PACKAGING



SEALED



UNSEALED



Pico warrants each product manufactured by us and sold by us or an authorized representative, to be free from defects in material and workmanship. If properly used, it will perform within its applicable specifications for a period of one year after original shipment. Pico's obligation under this guarantee is limited to repairing or replacing our product to the original purchaser. This warranty is in lieu of all other warranties, express or implied and constitutes fulfillment of our obligations to the purchaser. We do not guarantee that the products can be used for a particular purpose other than those solely covered by the product's specifications. Pico must be notified if the product must meet particular certifications and/or standards. We assume no liability, in any event, for consequential damages, for anticipated or lost profits, incidental damages or loss of time or other losses incurred by the purchaser or any third party in connection with products covered by this warranty or otherwise. The purchaser will indemnify and hold Pico harmless for any damages, losses, costs, etc. from usage not within the product's specifications. Pico must be consulted before usage of its products in a nuclear, radioactive or space environment.

We reserve the right to discontinue products without notice, We reserve the right to make modifications to any existing catalog products without notice, at any time, without the obligation to modify units previously sold.

Series QP

50W Isolated Regulated High Power DC-DC Converter



PRODUCT OVERVIEW

The QP series are isolated DC-DC converters with a wide selection of input voltage ranges from 4.5V to 475V while maintaining tight output regulation, low ripple and noise. These modules have trim capability, shutdown and internal reference voltage. Protections include input over/undervoltage, output short-circuit, output overvoltage and over temperature. For increased reliability, the feedback loop does not use an optocoupler.

The 2.5" x 1.55" x 0.5" case size has threaded inserts to mount securely for high vibration and shock applications. Conduction cooling is available through the baseplate or compatible heat sink.



FEATURES

- 4.75V to 475V input range models
- 5 to 500V output models
- Up to 50W output
- Input/output isolation
- Protected against input over/undervoltage, output short-circuit overcurrent (HiQP) and over temperature
- Does not use optocoupler in feedback loop
- External bias for capacitor charging applications (QP)
- Load Share Parallel operation (HiQP)
- Industrial temperature option -40°C (HiQP)
- Military temperature option -55°C (HiQP)
- Input LC filter for soft start and low reflected current ripple (HiQP)

Contact Pico for part number of available options:

- Expanded operating temp: -55°C to +85°C (QP)
- Select screening per MIL-STD-883:
 - Stabilization Bake
 - Temperature Cycle
 - Burn-In
- Special Input Voltage, Output Voltage, Isolation Voltage or Output Power

Hi	QP	24	-M
INPUT VOLTAGE RANGE	SERIES NAME	NOM. OUTPUT VOLTAGE	TEMPERATURE
6 = 4.75 - 9V 12 = 9 - 18V 24 = 18 - 36V 48 = 36 - 72V	QP	5 = 5V 12 = 12V 15 = 15V 24 = 24V 48 = 48V 100 = 100V 200 = 200V 300 = 300V 400 = 400V 500 = 500V	Blank = 0°C to +85°C
Hi = 125 - 475V	QP	24 = 24V 48 = 48V 100 = 100V 200 = 200V	Blank = 0°C to +70°C -I = -40°C to +95°C -M = -55°C to +95°C

MODEL LIST

Pico Part Number	Output Voltage [VDC]	Output Current		Output Power [W]	Efficiency ⁽²⁾ [%] typ.	Line Regulation [%] max	Load Regulation 10-100% ⁽¹⁾ [%] max	Output Ripple @ 1 MHz BW [mVp-p] max
		Min. [mA]	Max. [mA]					
6QP5.0	5	400	4000	20	73	4	2	50
6QP12	12	167	1667	20	82	2	1.5	40
6QP15	15	167	1667	25	82	2	1.5	40
6QP24	24	104	1042	25	81	1.5	1	20
6QP28	28	89	893	25	81	1.5	1	20
6QP48	48	52	521	25	80	2	1.5	30
6QP100	100	25	250	25	82	3	2	20
6QP200	200	13	125	25	77	3	2	150
6QP300	300	7	67 ⁽³⁾	20 ⁽³⁾	80	2.5	2	100
6QP400	400	5	50 ⁽³⁾	20 ⁽³⁾	79	2.5	2	200
6QP500	500	4	40 ⁽³⁾	20 ⁽³⁾	76	2	1.5	200
12QP5.0	5	800	8000	40	78	3	3	50
12QP12	12	333	3333	40	85	1.5	2	40
12QP15	15	333	3333	50	85	1.5	2	40
12QP24	24	208	2083	50	85	1	1.5	20
12QP28	28	179	1786	50	85	1	1.5	20
12QP48	48	104	1042	50	85	1	1.5	30
12QP100	100	50	500	50	86	1	1.5	20
12QP200	200	25	250	50	85	1.5	2	150
12QP300	300	13	133 ⁽⁴⁾	40 ⁽⁴⁾	87	1	1	100
12QP400	400	10	100 ⁽⁴⁾	40 ⁽⁴⁾	87	1	1	200
12QP500	500	8	80 ⁽⁴⁾	40 ⁽⁴⁾	86	1	1	200
24QP5.0	5	800	8000	40	79	3	2	50
24QP12	12	333	3333	40	88	1	1.5	40
24QP15	15	333	3333	50	88	1	1.5	40
24QP24	24	208	2083	50	87	1	1	20
24QP28	28	179	1786	50	87	1	1	20
24QP48	48	104	1042	50	87	1	1	30
24QP100	100	50	500	50	88	1	1	20
24QP200	200	25	250	50	87	1	1.5	150
24QP300	300	13	133	40	90	0.5	1	100
24QP400	400	10	100	40	89	0.5	0.5	200
24QP500	500	8	80	40	89	1	1	200

Note 1: Maintain minimum 10% of rated load to prevent a voltage surge.

Note 2: Tested at nominal input voltage and full output load.

Note 3: Below 5.5V input, derate linearly 7.5W per input voltage.

Note 4: Below 10.5V input, derate linearly 6.7W per input voltage.

MODEL LIST

Pico Part Number	Output Voltage [VDC]	Output Current		Output Power [W]	Efficiency ⁽²⁾ [%] typ.	Line Regulation [%] max	Load Regulation 10-100% ⁽⁵⁾ [%] max	Output Ripple @ 1MHz BW [mVp-p] max
		Min. [mA]	Max. [mA]					
48QP5.0	5	800	8000	40	81	2	2	30
48QP12	12	417	4167	50	83	1	1	20
48QP15	15	333	3333	50	84	1	1	30
48QP24	24	208	2083	50	88	1	1	20
48QP28	28	179	1786	50	88	1	1	20
48QP48	48	104	1042	50	89	1	1	30
48QP100	100	50	500	50	89	1	1	50
48QP200	200	25	250	50	89	1	1.5	250
48QP300	300	13	133	40	90	0.5	1	200
48QP400	400	10	100	40	87	0.5	1	200
48QP500	500	8	80	40	89	1	1.5	200
HiQP24	24	104	2083	50	86	0.25	1.25	350
HiQP24-I								
HiQP24-M								
HiQP28	28	89	1786		86	0.25	1.25	375
HiQP28-I								
HiQP28-M								
HiQP48	48	52	1042		85	0.25	1.75	400
HiQP48-I								
HiQP48-M								
HiQP100	100	25	500		88	0.3	1.6	600
HiQP100-I								
HiQP100-M								
HiQP200	200	13	250		89	0.1	1.5	750
HiQP200-I								
HiQP200-M								

Note 5: For 6QP, 12QP, 24QP & 48QP models, maintain minimum 10% of rated load to prevent a voltage surge.
For HiQP models, maintain minimum 5% of rated load to prevent >2% voltage overshoot.

SPECIFICATIONS (Nominal V_{IN} , Full Load, $T_A = +25^{\circ}\text{C}$, 1 hour warm up unless otherwise specified)**INPUT**

Parameter	Condition		Min.	Typ.	Max.	Units
Input Voltage Range	6V input models		4.5	6	9	VDC
	12V input models		9	12	18	
	24V input models		18	24	36	
	48V input models		36	48	72	
	HiQP models		125	250	475	
Input Filter	HiQP models		LC filter			
Input Current	HiQP models	Short-circuit condition	-	-	8	mA
		Shutdown mode	-	-	0.5	
Input Reflected Ripple Current	HiQP models	20MHz, Full Load	-	10	-	%

OUTPUT

Parameter	Condition		Min.	Typ.	Max.	Units
Output Voltage Tolerance	Nominal V_{IN} , Full Load	QP models	-	-	0.5	%
		HiQP models	-	-	1	

ENVIRONMENTAL

Parameter	Condition		Min.	Typ.	Max.	Units
Operating Temperature Range	Baseplate	QP models	0	-	+85	$^{\circ}\text{C}$
		HiQP models	0	-	+70	
		HiQP -I models	-40	-	+95	
		HiQP -M models	-55	-	+95	
Storage Temperature Range			-55	-	+125	$^{\circ}\text{C}$
Cooling	Conduction through baseplate					

GENERAL

Parameter	Condition		Min.	Typ.	Max.	Units
Operating Frequency	QP models, Fixed frequency	$\leq 200\text{V}$ output models	-	200	-	kHz
		$\geq 300\text{V}$ output models	-	150	-	
	HiQP models, Variable frequency		80	-	110	
Isolation Voltage	Input to output		4242	-	-	VDC
	Input to baseplate		2121	-	-	
	Output to baseplate		1000	-	-	
Insulation Resistance			100	-	-	M Ω
Size	L x W x H		2.5 x 1.55 x 0.5 (76.2 x 39.37 x 12.7)			inches (mm)
Weight			-	75	-	grams
Case	Aluminum baseplate and Glass Reinforced Polymer					
Potting	Vacuum Impregnated Epoxy					
Tube Packaging (W x H x L)	2.595 x 1.135 x 20 (65.913 x 28.829 x 101.6)					inches (mm)

SPECIFICATIONS (Nominal V_{IN} , Full Load, $T_A = +25^\circ\text{C}$, 1 hour warm up unless otherwise specified)**PROTECTIONS & FEATURES**

Parameter	Condition			Min.	Typ.	Max.	Units
Short circuit or Overload	Hiccup mode, self-recovery			-	130	-	%
Overtemperature	Baseplate, self-recovery	All other models	Shutdown	-	95	-	°C
			Restart	-	50	-	
		HiQP -I & -M models	Shutdown	-	110	-	
			Restart	-	100	-	
Output Overvoltage	Zener diode clamp			-	120	-	%
Input Under Voltage	Non-latched shutdown Self-recovery	6V input models	Shutdown	-	3.6	-	VDC
			Restart	-	4.25	-	
		12V input models	Shutdown	-	7.1	-	
			Restart	-	7.6	-	
		24V input models	Shutdown	-	14.6	-	
			Restart	-	15.6	-	
		48V input models	Shutdown	-	31.2	-	
			Restart	-	31.8	-	
		HiQP models	Shutdown	-	60	-	
			Restart	-	107	-	
Input Over Voltage	Non-latched shutdown Self-recovery	6V input models	Shutdown	-	11	-	VDC
			Restart	-	10.8	-	
		12V input models	Shutdown	-	20	-	
			Restart	-	19.5	-	
		24V input models	Shutdown	-	41	-	
			Restart	-	40	-	
		48V input models	Shutdown	-	82	-	
			Restart	-	81.5	-	
		HiQP models	Shutdown	-	560	-	
			Restart	-	500	-	
Shutdown (SHDN)	Non-latched shutdown, Self-recovery			-	-	0.4	VDC
	Note 1: Shutdown will shut down the unit when the pin is pulled below 0.4V. For 6QP, 12QP, 24QP & 48QP models, the voltage of the open shutdown pin is equal to the input voltage. All external components must be rated to at least the input voltage.						
Output Voltage Trim (TRIM)	QP models			-5	0	-	%
	HiQP models			-15	0	15	
	Note 2: Output Voltage Trim can adjust the output voltage through a resistor to -IN or VREF pins.						
Voltage Reference (VREF)	Voltage	QP models		2.8	3	3.2	VDC
		HiQP models		2.94	3	3.06	
	Current			0	-	10	mA
	Note 3: Voltage Reference can be used for Output Voltage Trim. Voltage is typically 3V and current is <10mA. Units can be trimmed down with a resistor to Output Voltage Trim.						
External Bias (EX. B)	QP models	Voltage		17	-	20	VDC
		Current		-	20	-	mA
		Note 4: External Bias should be used in an application which requires a large start-up current such as capacitor charging. This will disable and prevent the overload or short-circuit protections. After the output has reached 90-95% nominal value, internal bias should be used so normal operations and protections can be restored. External bias should not be connected when not in use.					
Load Share (LDSH)	HiQP models	Note 5: Load Share allows units to operate the outputs in parallel to share load, increase total power or allow for N+1 redundancy. Connect directly to the load share pin of Pico's HiQP converters. -IN terminals must be connected directly.					

SPECIFICATIONS (Nominal V_{IN} , Full Load, $T_A = +25^\circ\text{C}$, 1 hour warm up unless otherwise specified)

DESIGNED TO MEET

Test	Referenced Standard	Description
Vibration	MIL-STD-202	Method 204, Vibration, High Frequency, Condition D
Shock	MIL-STD-202	Method 213, Shock (Specified Pulse), Condition I
Humidity	MIL-STD-202	Method 106, Moisture Resistance
Altitude	MIL-STD-202	Method 105, Barometric Pressure (Reduced), Condition D

OPTIONS AVAILABLE – CONTACT PICO FOR PART NUMBER

Parameter	Referenced Standard	Description
Stabilization Bake	MIL-STD-883	Referenced Method 1008 Non-operating maximum storage temperature for 24 hours
Temperature Cycle	MIL-STD-883	Referenced Method 1010 Non-operating at temperature extremes, 15 mins/temp, 10 cycles
Burn-In	MIL-STD-883	Referenced Method 1015 Max operating temperature for 160 hours
Expanded Operating Temperature Range		-40°C to +85°C (Series QP)

THERMAL RESISTANCE

$$P_{OUT} = \frac{T_C - T_A}{T_{RCA} \times (1 / \eta - 1)}$$

P_{OUT} = Output Power in Watts

η = Efficiency

T_C = Case temperature in °C

T_A = Ambient temperature in °C

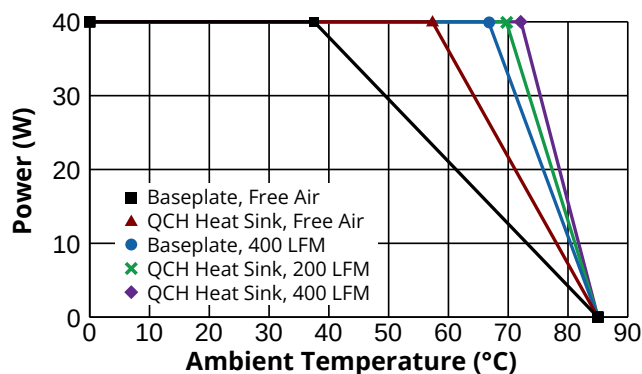
T_{RCA} = Thermal resistance of case to air in °C / W

Thermal resistance of case (T_{RCA})

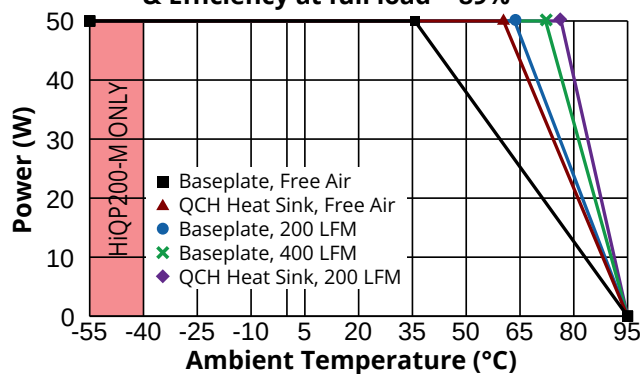
Air Flow	Baseplate only	QCH Heat Sink	Units
Free Air	9.6	5.6	°C / W
200 LFM	5.1	3.0	
400 LFM	3.7	2.2	
600 LFM	3.1	1.8	
800 LFM	2.6	1.5	
1000 LFM	2.2	1.3	

DERATING GRAPHS (Nominal V_{IN} , Full Load, Efficiency @ Full Load)

QP Models with Max. Output Power = 40W
& Efficiency at full load = 89%

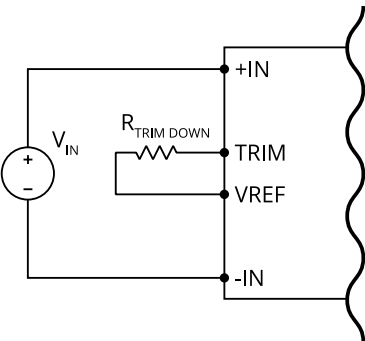


P/N HiQP200-I & HiQP200-M
Max. Output Power = 50W
& Efficiency at full load = 89%



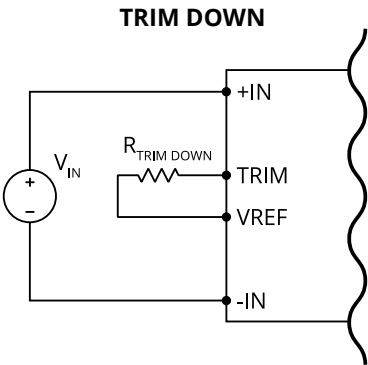
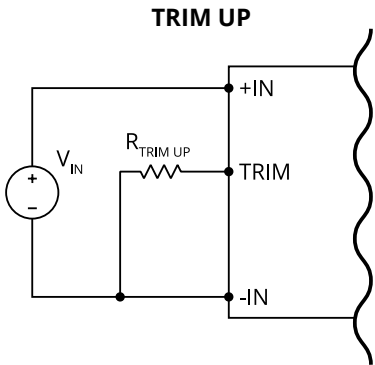
TYPICAL CONNECTION CIRCUIT

TRIM DOWN - 6QP, 12QP, 24QP & 48QP MODELS



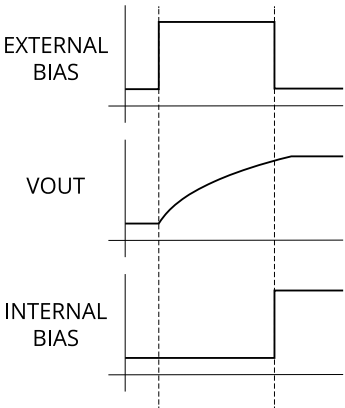
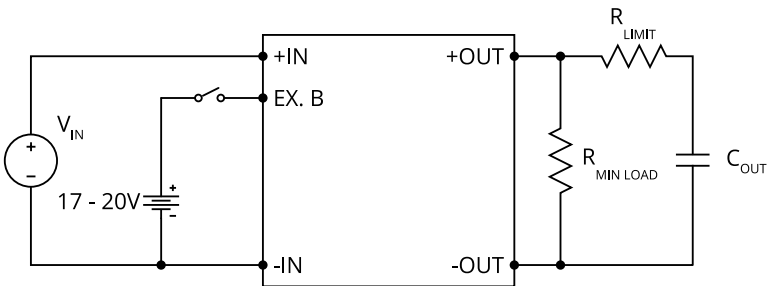
Resistance	Open	374	162	91	33	kΩ typ.
Trim Down	0	-1	-2	-3	-5	V _{OUT} %

TRIM UP & TRIM DOWN - HIQP MODELS



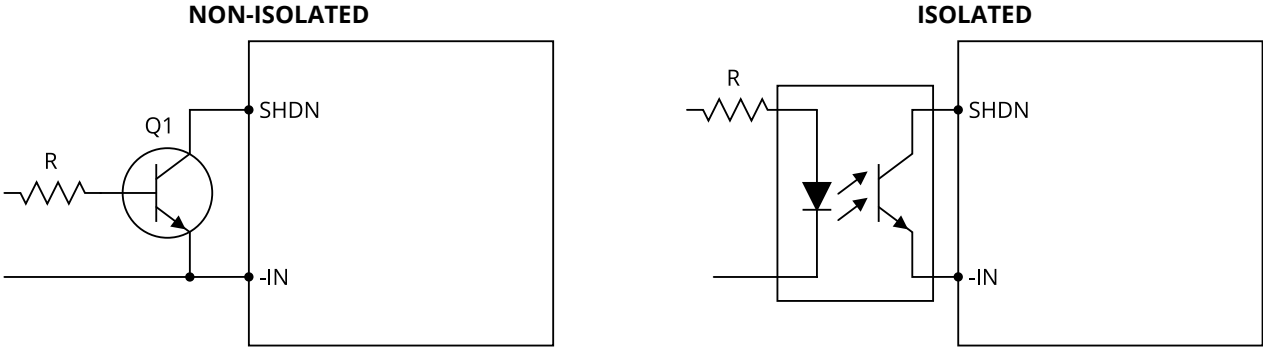
Resistance	Open	1000	470	100	47	10	1	0 (Short)	kΩ typ.
Trim Up	0	0.5	1	4	7	14	16	17	V _{OUT} %
Trim Down	0	-1	-3	-7	-9	-13	-15	-16	

EXTERNAL BIAS - SERIES QP



TYPICAL CONNECTION CIRCUIT

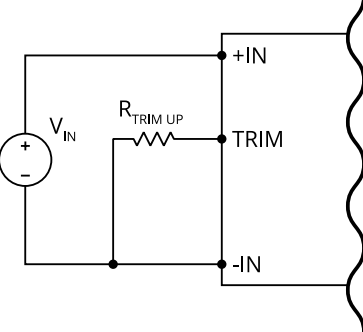
SHUTDOWN



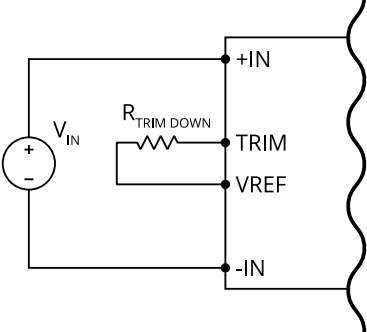
Note 1: Shutdown will shut down the unit when the pin is pulled below 0.4V. For 6QP, 12QP, 24QP & 48QP models, the voltage of the open shutdown pin is equal to the input voltage. All external components must be rated to at least the input voltage.

TRIM

TRIM UP - HiQP MODELS ONLY



TRIM DOWN



6QP, 12QP, 24QP & 48QP MODELS

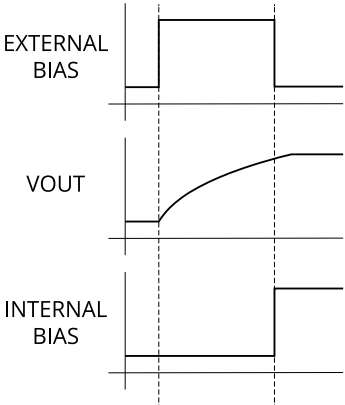
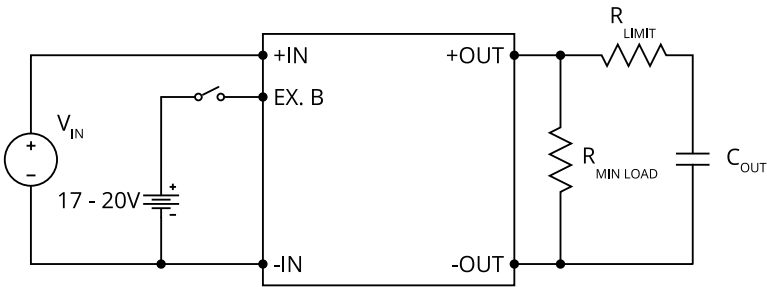
Resistance	Open	374	162	91	33	kΩ typ.
Trim Up	Not available					
Trim Down	0	-1	-2	-3	-5	V _{OUT} %

HiQP MODELS

Resistance	Open	1000	470	100	47	10	1	0 (Short)	kΩ typ.
Trim Up	0	0.5	1	4	7	14	16	17	V _{OUT} %
Trim Down	0	-1	-3	-7	-9	-13	-15	-16	

Note 2: Output Voltage Trim (TRIM) can adjust the output voltage through a resistor to -IN or VREF pins.
Note 3: Voltage Reference (VREF) can be used for Output Voltage Trim. Voltage is typically 3V and current is <10mA. Units can be trimmed down with a resistor to Output Voltage Trim.

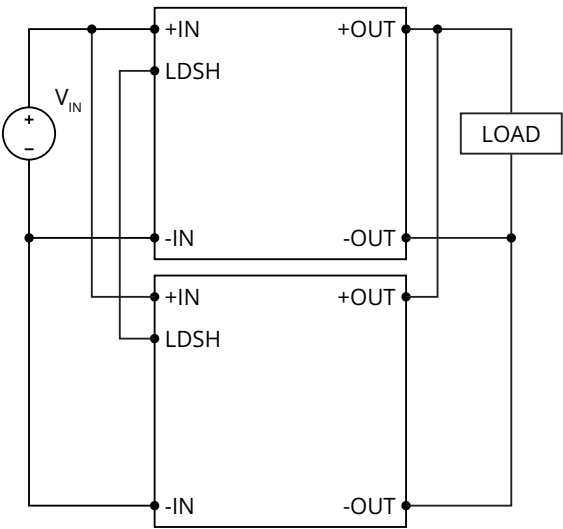
EXTERNAL BIAS - SERIES QP



Note 4: External Bias (EX. B) should be used in an application which requires a large startup current such as capacitor charging. This will disable and prevent the overload or short-circuit protections. After the output has reached 90-95% nominal value, internal bias should be used so normal operations and protections can be restored. External bias should not be connected when not in use.

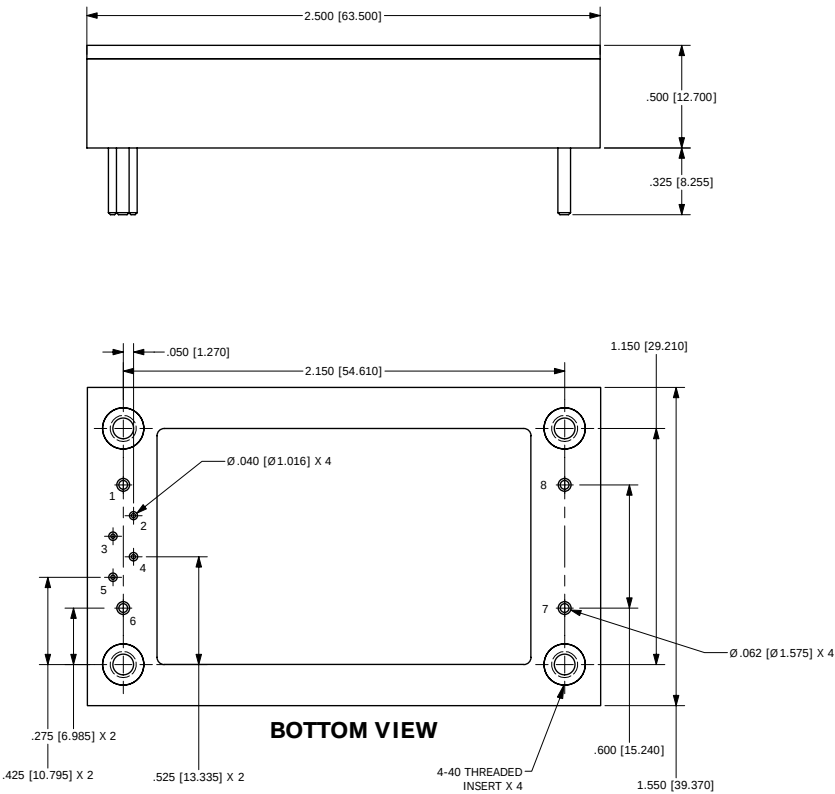
TYPICAL CONNECTION CIRCUIT

LOAD SHARE - HiQP MODELS



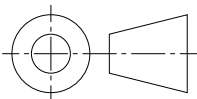
Note 5: Load Share (LDSH) allows units to operate the outputs in parallel to share load, increase total power or allow for N+1 redundancy. Connect directly to the load share pin of Pico's HiQP converters. -IN terminals must be connected directly.

MECHANICAL DRAWINGS



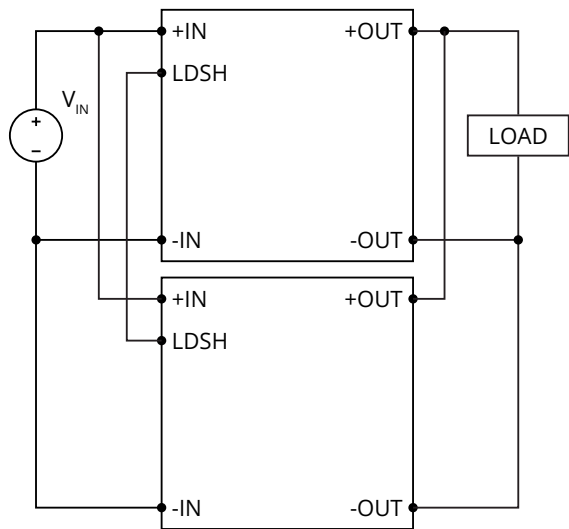
PIN	FUNCTION		PIN DIAMETER
	QP MODELS	HIQP MODELS	
1	-IN		.062 [1.575]
2	SHDN		.040 [1.016]
3	VREF		.040 [1.016]
4	TRIM		.040 [1.016]
5	EX. B	LDSH	.040 [1.016]
6	+IN		.062 [1.575]
7	+OUT		.062 [1.575]
8	-OUT		.062 [1.575]

NOTES
a. ALL DIMENSIONS ARE IN INCHES, [] = MM
b. RECOMMENDED TORQUE FOR MOUNTING SCREWS: 3-5 INCH-LBS



TYPICAL CONNECTION CIRCUIT

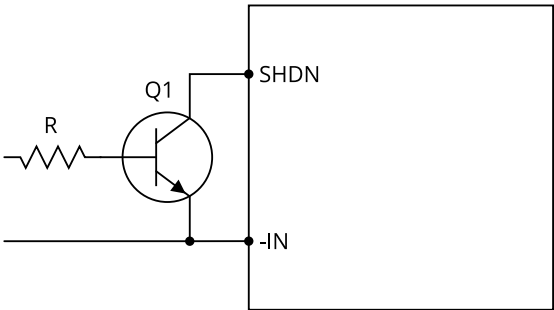
LOAD SHARE - HiQP MODELS



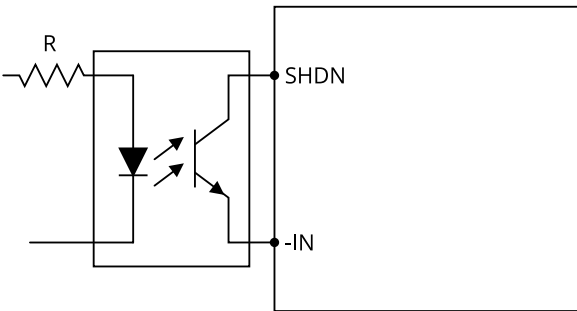
Note 4: When using Load Share function, -IN terminals must be connected directly.

SHUTDOWN

NON-ISOLATED

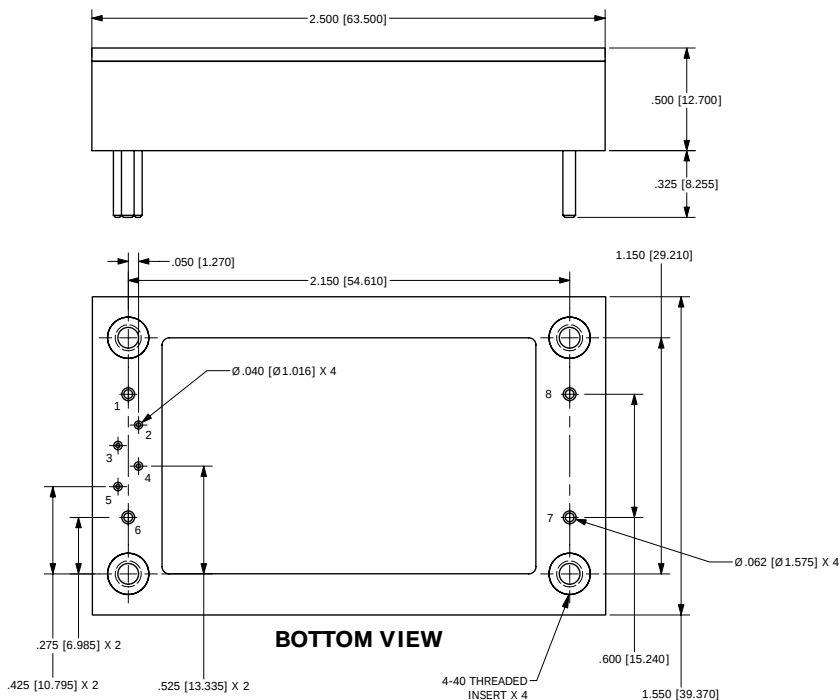


ISOLATED



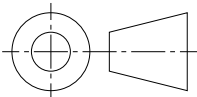
Note 5: The voltage of the open shutdown pin is equal to the input voltage. All external components must be rated to at least the input voltage.

MECHANICAL DRAWINGS



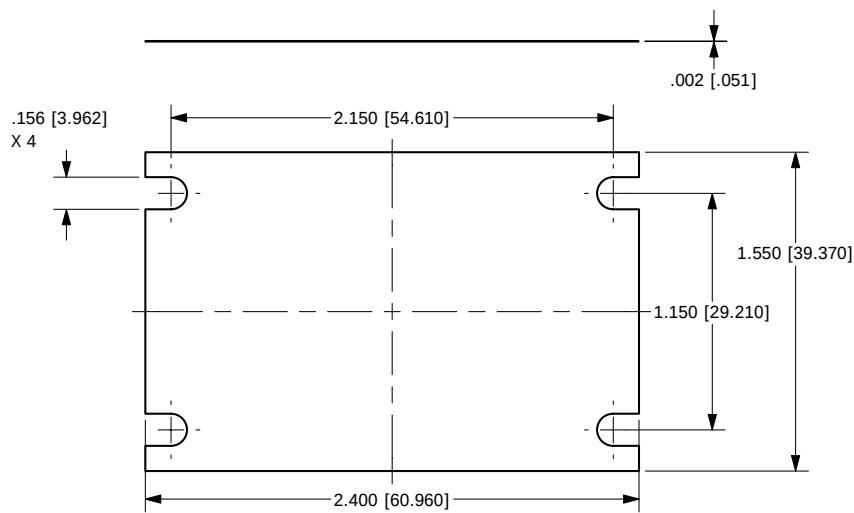
PIN	FUNCTION		PIN DIAMETER
	QP MODELS	HIQP MODELS	
1	-IN		.062 [1.575]
2	SHDN		.040 [1.016]
3	VREF		.040 [1.016]
4	TRIM		.040 [1.016]
5	EX. B	LDSH	.040 [1.016]
6	+IN		.062 [1.575]
7	+OUT		.062 [1.575]
8	-OUT		.062 [1.575]

NOTES
a. ALL DIMENSIONS ARE IN INCHES, [] = MM
b. RECOMMENDED TORQUE FOR MOUNTING SCREWS: 3-5 INCH-LBS



MECHANICAL DRAWINGS

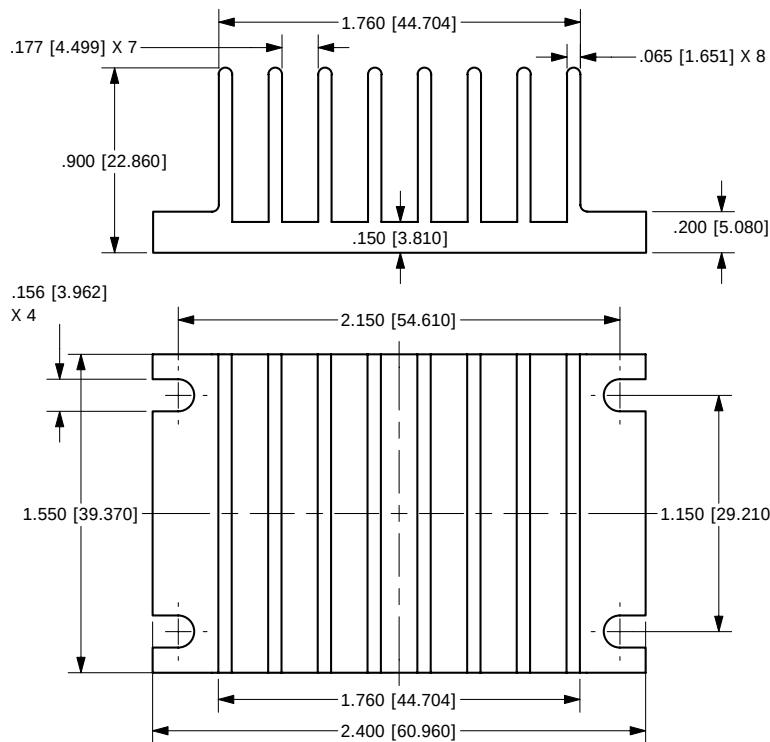
QTI - THERMAL INTERFACE



BOTTOM VIEW

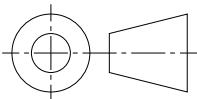
Material	Alloy Aluminum Substrate
Thermal Conductivity	1530 BTU-in/hr sq.ft °F
Coefficient of Thermal Expansion, (25-100°C)	13.1 10 ⁻⁶ in-in/°F
Brinell Hardness	23 HB
Endurance Limit	5000 PSI
Standard Thickness	0.002 inches

QCH - HEAT SINK



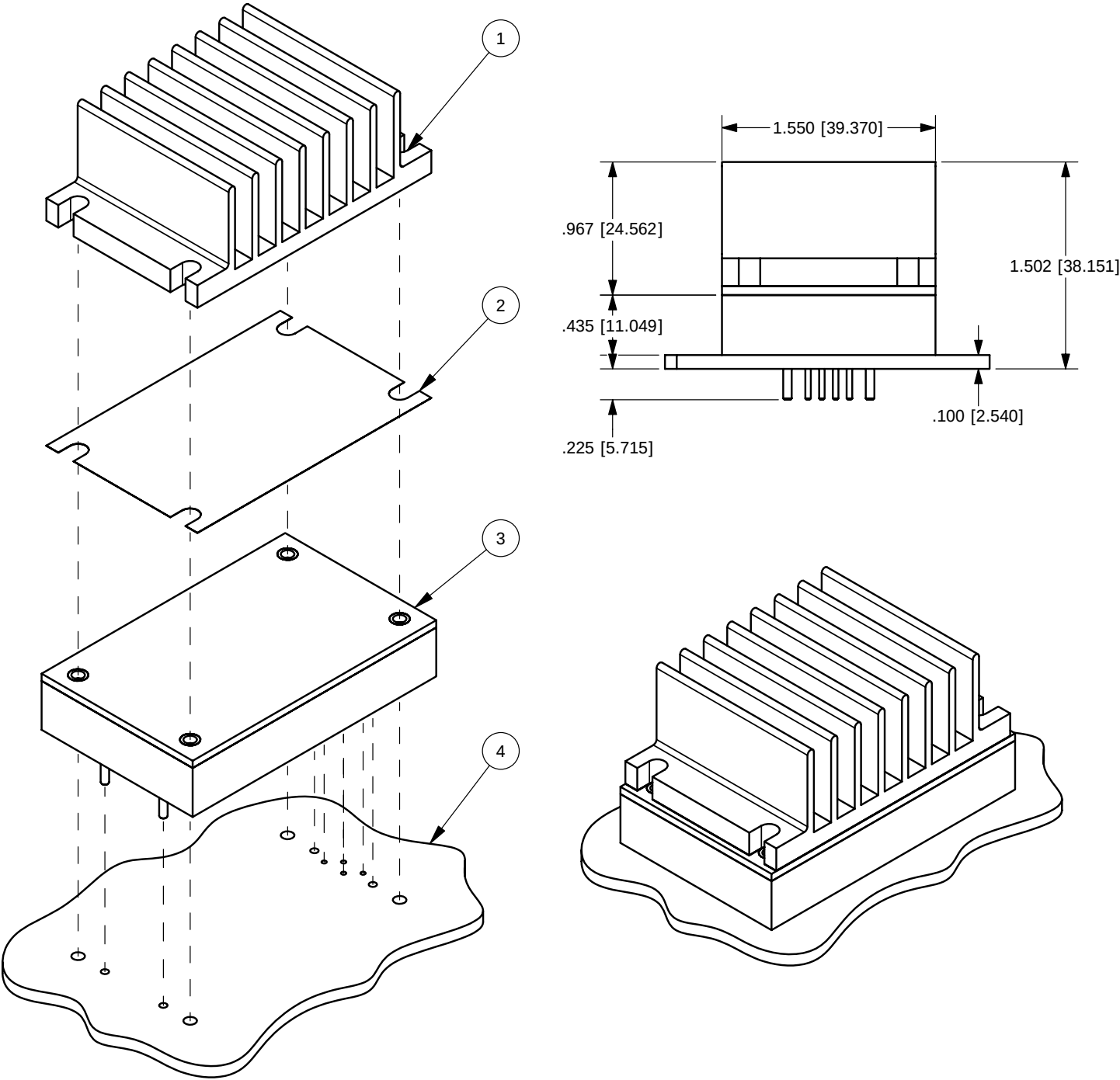
TOP VIEW

Weight: 51.3 grams typical



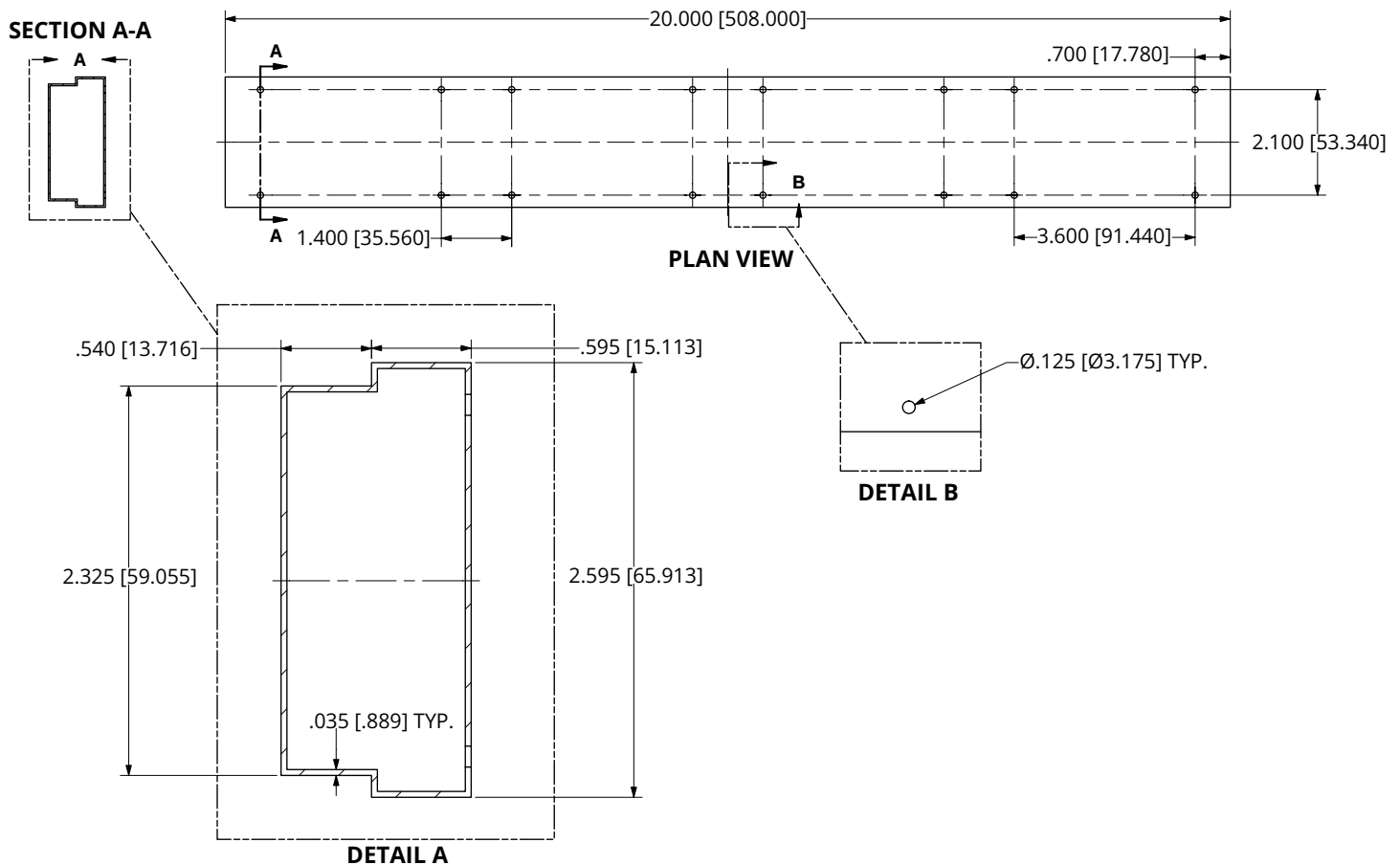
MECHANICAL DRAWINGS

HEAT SINK ASSEMBLY

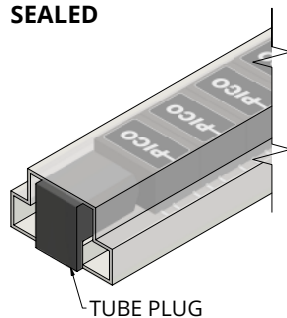


ITEM	QTY	DESCRIPTION
1	1	QCH HEAT SINK
2	1	QTI THERMAL INTERFACE
3	1	QP MODULE
4	1	PCB

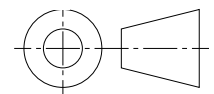
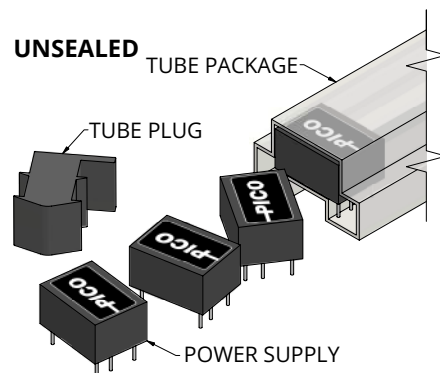
TUBE PACKAGING



SEALED



UNSEALED



Pico warrants each product manufactured by us and sold by us or an authorized representative, to be free from defects in material and workmanship. If properly used, it will perform within its applicable specifications for a period of one year after original shipment. Pico's obligation under this guarantee is limited to repairing or replacing our product to the original purchaser. This warranty is in lieu of all other warranties, express or implied and constitutes fulfillment of our obligations to the purchaser. We do not guarantee that the products can be used for a particular purpose other than those solely covered by the product's specifications. Pico must be notified if the product must meet particular certifications and/or standards. We assume no liability, in any event, for consequential damages, for anticipated or lost profits, incidental damages or loss of time or other losses incurred by the purchaser or any third party in connection with products covered by this warranty or otherwise. The purchaser will indemnify and hold Pico harmless for any damages, losses, costs, etc. from usage not within the product's specifications. Pico must be consulted before usage of its products in a nuclear, radioactive or space environment.

We reserve the right to discontinue products without notice, We reserve the right to make modifications to any existing catalog products without notice, at any time, without the obligation to modify units previously sold.

Series P

100W Isolated Regulated High Power DC-DC Converter



PRODUCT OVERVIEW

The P series are isolated DC-DC converters with a wide selection of input voltage ranges from 18V to 380V in a low profile full brick size - 4.6" x 2.4" x 0.5" ($\leq 100V$ output) or 4.6" x 2.5" x 0.5" ($\geq 125V$ output). These modules have trim capability and shutdown features. Protections include input overvoltage, output short-circuit, output overvoltage and over temperature.



The unique case has integrated side heat sink for better thermal dissipation but is capable of conduction cooling through the baseplate or additional top mounted heat sink.

FEATURES

- 18V to 380V input range models
- 3.3V to 350V output models
- Up to 150W output
- Input/output isolation
- Integrated side heat sink
- Parallel operation option
- Single and dual isolated outputs
- Up to +85°C baseplate operating temperature
- Trim capability
- Remote shutdown feature
- Fixed operating frequency
- No external components required

Contact Pico for part number of available options:

- Expanded operating temp: -55°C to +85°C
- Select screening per MIL-STD-883:
 - Stabilization Bake
 - Temperature Cycle
 - Burn-In
- Special Input Voltage, Output Voltage, Isolation Voltage or Output Power
- Parallel Operation

P	B	175	S
SERIES NAME	INPUT VOLTAGE RANGE	OUTPUT VOLTAGE	NUMBER OF OUTPUTS
P	A = 18 - 36V B = 36 - 72V C = 100 - 180V D = 200 - 380V	3.3 = 3.3V 5 = 5V 5.2 = 5.2V 9 = 9V 12 = 12V 15 = 15V 24 = 24V 28 = 28V 48 = 48V 100 = 100V 125 = 125V 150 = 150V 175 = 175V 200 = 200V 225 = 225V 250 = 250V 275 = 275V 300 = 300V 325 = 325V 350 = 350V	S = SINGLE D = DUAL

MODEL LIST - PA (18-36V INPUT RANGE)

SINGLE OUTPUT

Pico Part Number	Input Voltage Range [VDC]	Output Voltage [VDC]	Output Current		Output Power [W]	Efficiency ⁽²⁾ [%] typ.	Line Regulation ⁽³⁾		Load Regulation ⁽⁴⁾		Output Voltage Tolerance ⁽²⁾ [±%]
			Min. ⁽¹⁾ [A]	Max. [A]			Nom.-Min. [-%] max	Nom.-Max. [%] max	50%-Min. [%] max	50%-100% [-%] max	
PA3.3S	18-36	3.3	1.52	15.15	50	74	1.5	1.5	2	2	2
PA5S		5	1.50	15.00	75	76	1.5	1.5	2	2	2
PA5.2S		5.2	1.44	14.42	75	76	1.5	1.5	2	2	2
PA9S		9	1.11	11.11	100	81	1.25	1.25	1.5	1.5	1.5
PA12S		12	0.83	8.33	100	83	1	1	1.25	1.25	1
PA15S		15	0.67	6.67	100	84	0.75	0.75	1	1	1
PA24S		24	0.42	4.17	100	86	0.5	0.5	0.75	0.75	1
PA28S		28	0.36	3.57	100	86	0.5	0.5	0.5	0.5	0.5
PA48S		48	0.21	2.08	100	86	0.5	0.5	0.5	0.5	0.5
PA100S		100	0.10	1.00	100	85	0.5	0.5	0.5	0.5	0.5
PA125S		125	0.08	0.80	100	82	0.3	0.3	0.5	0.5	0.5
PA150S		150	0.07	0.67	100	82	0.3	0.3	0.5	0.5	0.5
PA175S		175	0.06	0.57	100	82	0.3	0.3	0.5	0.5	0.5
PA200S		200	0.05	0.50	100	82	0.3	0.3	0.5	0.5	0.5
PA225S		225	0.04	0.44	100	82	0.3	0.3	0.5	0.5	0.5
PA250S		250	0.04	0.40	100	82	0.3	0.3	0.5	0.5	0.5

DUAL OUTPUT

Pico Part Number	Input Voltage Range [VDC]	Output Voltage Per Output [VDC]	Output Current Per Output		Output Power Per Output ⁽⁴⁾ [W]	Efficiency ⁽²⁾ [%] typ.	Line Regulation ⁽³⁾		Load Regulation ⁽⁴⁾		Output Voltage Tolerance ⁽²⁾ [±%]
			Min. ⁽¹⁾ [A]	Max. [A]			Nom.-Min. [-%] max	Nom.-Max. [%] max	50%-Min. [%] max	50%-100% [-%] max	
PA5D	18-36	5	0.75	7.50	37.5	76	1.5	1.5	2	2	2
PA9D		9	0.56	5.56	50	81	1.25	1.25	1.5	1.5	1.5
PA12D		12	0.42	4.17	50	83	1	1	1.25	1.25	1
PA15D		15	0.33	3.33	50	84	0.75	0.75	1	1	1
PA24D		24	0.21	2.08	50	85	0.5	0.5	0.75	0.75	1
PA28D		28	0.18	1.79	50	86	0.5	0.5	0.5	0.5	0.5
PA48D		48	0.10	1.04	50	86	0.5	0.5	0.5	0.5	0.5

Note 1: Maintain minimum 10% of rated load to prevent a voltage surge.

Note 2: Tested at nominal input voltage and full output load.

Note 3: Line regulation is specified at full output load, nominal to minimum input voltage (-%) and nominal to maximum input voltage (+%).

Note 4: For ≤100V output models, load regulation is specified at nominal input voltage, 50% to 10% load (+%) and 50% to 100% load (-%). For ≥125V output models, load regulation is specified at nominal input voltage, 50% to 20% load (+%) and 50% to 100% load (-%).

Note 5: Dual output loads must be balanced.

MODEL LIST - PB (36-72V INPUT RANGE)

SINGLE OUTPUT

Pico Part Number	Input Voltage Range [VDC]	Output Voltage [VDC]	Output Current		Output Power [W]	Efficiency ⁽²⁾ [%] typ.	Line Regulation ⁽³⁾		Load Regulation ⁽⁴⁾		Output Voltage Tolerance ⁽²⁾ [±%]
			Min. ⁽¹⁾ [A]	Max. [A]			Nom.-Min. [-%] max	Nom.-Max. [%] max	50%-Min. [%] max	50%-100% [-%] max	
PB3.3S	36-72	3.3	1.52	15.15	50	76	0.75	0.75	1.5	1.5	2
PB5S		5	1.50	15.00	75	78	0.75	0.75	1	1	1.5
PB5.2S		5.2	1.44	14.42	75	78	0.75	0.75	1	1	1.5
PB9S		9	1.11	11.11	100	82	0.75	0.75	1	1	1
PB12S		12	0.83	8.33	100	84	0.5	0.5	0.75	0.75	1
PB15S		15	0.67	6.67	100	85	0.5	0.5	0.75	0.75	1
PB24S		24	0.42	4.17	100	87	0.5	0.5	0.5	0.5	0.5
PB28S		28	0.36	3.57	100	87	0.5	0.5	0.5	0.5	0.5
PB48S		48	0.21	2.08	100	88	0.5	0.5	0.5	0.5	0.5
PB100S		100	0.10	1.00	100	87	0.5	0.5	0.5	0.5	0.5
PB125S		125	0.12	1.20	150	84	0.3	0.3	0.5	0.5	0.5
PB150S		150	0.10	1.00	150	84	0.3	0.3	0.5	0.5	0.5
PB175S		175	0.09	0.86	150	84	0.3	0.3	0.5	0.5	0.5
PB200S		200	0.08	0.75	150	84	0.3	0.3	0.5	0.5	0.5
PB225S		225	0.06	0.56	125	84	0.3	0.3	0.5	0.5	0.5
PB250S		250	0.05	0.50	125	84	0.3	0.3	0.5	0.5	0.5
PB275S		275	0.04	0.36	100	84	0.3	0.3	0.5	0.5	0.5
PB300S		300	0.03	0.33	100	84	0.3	0.3	0.5	0.5	0.5

DUAL OUTPUT

Pico Part Number	Input Voltage Range [VDC]	Output Voltage Per Output [VDC]	Output Current Per Output		Output Power Per Output ⁽⁴⁾ [W]	Efficiency ⁽²⁾ [%] typ.	Line Regulation ⁽³⁾		Load Regulation ⁽⁴⁾		Output Voltage Tolerance ⁽²⁾ [±%]
			Min. ⁽¹⁾ [A]	Max. [A]			Nom.-Min. [-%] max	Nom.-Max. [%] max	50%-Min. [%] max	50%-100% [-%] max	
PB5D	36-72	5	0.75	7.50	37.5	78	0.75	0.75	1	1	1.5
PB9D		9	0.56	5.56	50	82	0.75	0.75	1	1	1
PB12D		12	0.42	4.17	50	84	0.5	0.5	0.75	0.75	1
PB15D		15	0.33	3.33	50	85	0.5	0.5	0.75	0.75	1
PB24D		24	0.21	2.08	50	87	0.5	0.5	0.5	0.5	0.5
PB28D		28	0.18	1.79	50	87	0.5	0.5	0.5	0.5	0.5
PB48D		48	0.10	1.04	50	88	0.5	0.5	0.5	0.5	0.5

Note 1: Maintain minimum 10% of rated load to prevent a voltage surge.

Note 2: Tested at nominal input voltage and full output load.

Note 3: Line regulation is specified at full output load, nominal to minimum input voltage (-%) and nominal to maximum input voltage (+%).

Note 4: For ≤100V output models, load regulation is specified at nominal input voltage, 50% to 10% load (+%) and 50% to 100% load (-%). For ≥125V output models, load regulation is specified at nominal input voltage, 50% to 20% load (+%) and 50% to 100% load (-%).

Note 5: Dual output loads must be balanced.

MODEL LIST - PC (100-180V INPUT RANGE)

SINGLE OUTPUT

Pico Part Number	Input Voltage Range [VDC]	Output Voltage [VDC]	Output Current		Output Power [W]	Efficiency ⁽²⁾ [%] typ.	Line Regulation ⁽³⁾		Load Regulation ⁽⁴⁾		Output Voltage Tolerance ⁽²⁾ [±%]
			Min. ⁽¹⁾ [A]	Max. [A]			Nom.-Min. [-%] max	Nom.-Max. [%] max	50%-Min. [%] max	50%-100% [-%] max	
PC3.3S	100-180	3.3	1.52	15.15	50	76	0.75	0.75	1	1	2
PC5S		5	1.50	15.00	75	78	0.75	0.75	1	1	1.5
PC5.2S		5.2	1.44	14.42	75	78	0.75	0.75	1	1	1.5
PC9S		9	1.11	11.11	100	84	0.5	0.5	0.75	0.75	1
PC12S		12	0.83	8.33	100	86	0.5	0.5	0.75	0.75	1
PC15S		15	0.67	6.67	100	87	0.5	0.5	0.75	0.75	1
PC24S		24	0.42	4.17	100	88	0.3	0.3	0.5	0.5	0.5
PC28S		28	0.36	3.57	100	88	0.2	0.2	0.5	0.5	0.5
PC48S		48	0.21	2.08	100	88	0.2	0.2	0.5	0.5	0.5
PC100S		100	0.10	1.00	100	87	0.3	0.3	0.5	0.5	0.5
PC125S		125	0.12	1.20	150	85	0.3	0.3	0.5	0.5	0.5
PC150S		150	0.10	1.00	150	85	0.3	0.3	0.5	0.5	0.5
PC175S		175	0.09	0.86	150	85	0.3	0.3	0.5	0.5	0.5
PC200S		200	0.08	0.75	150	85	0.3	0.3	0.5	0.5	0.5
PC225S		225	0.06	0.56	125	85	0.3	0.3	0.5	0.5	0.5
PC250S		250	0.05	0.50	125	85	0.3	0.3	0.5	0.5	0.5
PC275S		275	0.04	0.36	100	85	0.3	0.3	0.5	0.5	0.5
PC300S		300	0.03	0.33	100	85	0.3	0.3	0.5	0.5	0.5

DUAL OUTPUT

Pico Part Number	Input Voltage Range [VDC]	Output Voltage Per Output [VDC]	Output Current Per Output		Output Power Per Output ⁽⁴⁾ [W]	Efficiency ⁽²⁾ [%] typ.	Line Regulation ⁽³⁾		Load Regulation ⁽⁴⁾		Output Voltage Tolerance ⁽²⁾ [±%]
			Min. ⁽¹⁾ [A]	Max. [A]			Nom.-Min. [-%] max	Nom.-Max. [%] max	50%-Min. [%] max	50%-100% [-%] max	
PC5D	100-180	5	0.75	7.50	37.5	78	0.75	0.75	1	1	1.5
PC9D		9	0.56	5.56	50	84	0.5	0.5	0.75	0.75	1
PC12D		12	0.42	4.17	50	86	0.5	0.5	0.75	0.75	1
PC15D		15	0.33	3.33	50	87	0.5	0.5	0.75	0.75	1
PC24D		24	0.21	2.08	50	88	0.3	0.3	0.5	0.5	0.5
PC28D		28	0.18	1.79	50	88	0.2	0.2	0.5	0.5	0.5
PC48D		48	0.10	1.04	50	88	0.2	0.2	0.5	0.5	0.5

Note 1: Maintain minimum 10% of rated load to prevent a voltage surge.

Note 2: Tested at nominal input voltage and full output load.

Note 3: Line regulation is specified at full output load, nominal to minimum input voltage (-%) and nominal to maximum input voltage (+%).

Note 4: For ≤100V output models, load regulation is specified at nominal input voltage, 50% to 10% load (+%) and 50% to 100% load (-%). For ≥125V output models, load regulation is specified at nominal input voltage, 50% to 20% load (+%) and 50% to 100% load (-%).

Note 5: Dual output loads must be balanced.

MODEL LIST - PD (200-380V INPUT RANGE)

SINGLE OUTPUT

Pico Part Number	Input Voltage Range [VDC]	Output Voltage [VDC]	Output Current		Output Power [W]	Efficiency ⁽²⁾ [%] typ.	Line Regulation ⁽³⁾		Load Regulation ⁽⁴⁾		Output Voltage Tolerance ⁽²⁾ [±%]
			Min. ⁽¹⁾ [A]	Max. [A]			Nom.-Min. [-%] max	Nom.-Max. [%] max	50%-Min. [%] max	50%-100% [-%] max	
PD3.3S	200-380	3.3	1.52	15.15	50	76	1.25	1.25	1.5	1.5	2
PD5S		5	1.50	15.00	75	78	1	1	1.25	1.25	1.5
PD5.2S		5.2	1.44	14.42	75	78	1	1	1.25	1.25	1.5
PD9S		9	1.11	11.11	100	84	1	1	1.25	1.25	1
PD12S		12	0.83	8.33	100	85	0.75	0.75	1	1	1
PD15S		15	0.67	6.67	100	86	0.75	0.75	1	1	1
PD24S		24	0.42	4.17	100	87	0.5	0.5	0.75	0.75	0.5
PD28S		28	0.36	3.57	100	87	0.5	0.5	0.5	0.5	0.5
PD48S		48	0.21	2.08	100	88	0.2	0.2	0.5	0.5	0.5
PD100S		100	0.10	1.00	100	88	0.2	0.2	0.5	0.5	0.5
PD125S		125	0.12	1.20	150	85	0.3	0.3	0.5	0.5	0.5
PD150S		150	0.10	1.00	150	85	0.3	0.3	0.5	0.5	0.5
PD175S		175	0.09	0.86	150	85	0.3	0.3	0.5	0.5	0.5
PD200S		200	0.08	0.75	150	85	0.3	0.3	0.5	0.5	0.5
PD225S		225	0.06	0.56	125	85	0.3	0.3	0.5	0.5	0.5
PD250S		250	0.05	0.50	125	85	0.3	0.3	0.5	0.5	0.5
PD275S		275	0.04	0.36	100	85	0.3	0.3	0.5	0.5	0.5
PD300S		300	0.03	0.33	100	85	0.3	0.3	0.5	0.5	0.5
PD325S		325	0.03	0.31	100	85	0.3	0.3	0.5	0.5	0.5
PD350S		350	0.03	0.29	100	85	0.3	0.3	0.5	0.5	0.5

DUAL OUTPUT

Pico Part Number	Input Voltage Range [VDC]	Output Voltage Per Output [VDC]	Output Current Per Output		Output Power Per Output ⁽⁴⁾ [W]	Efficiency ⁽²⁾ [%] typ.	Line Regulation ⁽³⁾		Load Regulation ⁽⁴⁾		Output Voltage Tolerance ⁽²⁾ [±%]
			Min. ⁽¹⁾ [A]	Max. [A]			Nom.-Min. [-%] max	Nom.-Max. [%] max	50%-Min. [%] max	50%-100% [-%] max	
PD5D	200-380	5	0.75	7.50	37.5	78	1	1	1.25	1.25	1.5
PD9D		9	0.56	5.56	50	84	1	1	1.25	1.25	1
PD12D		12	0.42	4.17	50	85	0.75	0.75	1	1	1
PD15D		15	0.33	3.33	50	86	0.75	0.75	1	1	1
PD24D		24	0.21	2.08	50	87	0.5	0.5	0.75	0.75	0.5
PD28D		28	0.18	1.79	50	87	0.5	0.5	0.5	0.5	0.5
PD48D		48	0.10	1.04	50	88	0.2	0.2	0.5	0.5	0.5

Note 1: Maintain minimum 10% of rated load to prevent a voltage surge.

Note 2: Tested at nominal input voltage and full output load.

Note 3: Line regulation is specified at full output load, nominal to minimum input voltage (-%) and nominal to maximum input voltage (+%).

Note 4: For ≤100V output models, load regulation is specified at nominal input voltage, 50% to 10% load (+%) and 50% to 100% load (-%). For ≥125V output models, load regulation is specified at nominal input voltage, 50% to 20% load (+%) and 50% to 100% load (-%).

Note 5: Dual output loads must be balanced.

SPECIFICATIONS (Nominal V_{IN} , Full Load, $T_A = +25^\circ\text{C}$, 1 hour warm up unless otherwise specified)**INPUT**

Parameter	Condition	Min.	Nom.	Max.	Units
Input Voltage Range	PA models	18	28	36	VDC
	PB models	36	48	72	
	PC models	100	150	180	
	PD models	200	300	380	

OUTPUT

Parameter	Condition	Min.	Typ.	Max.	Units
Output Ripple	1MHz bandwidth	$\leq 100\text{V}$ output models	-	50	mVp-p
		$\geq 125\text{V}$ output models	-	1	%

ENVIRONMENTAL

Parameter	Condition	Min.	Typ.	Max.	Units
Operating Temperature Range	Baseplate	0	-	+85	$^\circ\text{C}$
Storage Temperature Range		-55	-	+105	$^\circ\text{C}$
Cooling	Conduction through baseplate				

GENERAL

Parameter	Condition	Min.	Typ.	Max.	Units
Operating Frequency		-	100	-	kHz
Isolation Voltage	Input to output	4242	-	-	VDC
	Input to baseplate	2121	-	-	
	Output to baseplate	1000	-	-	
Insulation Resistance		100	-	-	MΩ
Size (L x W x H)	≤100V output models	4.6 x 2.5 x 0.5 (116.84 x 63.5 x 12.7)			inches (mm)
	≥125V output models	4.6 x 2.4 x 0.5 (116.84 x 60.96 x 12.7)			
Weight	Single output models	-	210	-	grams
	Dual output models	-	235	-	
Case	Aluminum baseplate and Glass Reinforced Polymer				
Potting	Vacuum Impregnated Epoxy				
Tube Packaging (W x H x L)	2.595 x 1.105 x 20 (65.913 x 28.067 x 101.6)				inches (mm)

PROTECTIONS & FEATURES

Parameter	Condition	Min.	Typ.	Max.	Units
Input Over Voltage	PA, PB, PC	Yes			
Short circuit or Overload	Hiccup mode, self-recovery	120	-	-	%
Overtemperature	Baseplate, self-recovery	Shutdown	95	-	$^\circ\text{C}$
		Restart	50	-	
Output Overvoltage	Zener diode clamp	-	120	-	%
Shutdown (SHUTDOWN)	Non-latched shutdown, Self-recovery	-	-	0.15	VDC
Output Voltage Trim (TRIM, TRIM UP & TRIM DOWN)		-5	0	5	%
Parallel ⁽⁶⁾	P option models	Connect as shown in connection diagram.			

Note 6: The parallel option allows units to operate the outputs in parallel to share load, increase total power or allow for N+1 redundancy.

SPECIFICATIONS (Nominal V_{IN} , Full Load, $T_A = +25^\circ\text{C}$, 1 hour warm up unless otherwise specified)

DESIGNED TO MEET

Test	Referenced Standard	Description
Vibration	MIL-STD-202	Method 204, Vibration, High Frequency, Condition D
Shock	MIL-STD-202	Method 213, Shock (Specified Pulse), Condition I
Humidity	MIL-STD-202	Method 106, Moisture Resistance
Altitude	MIL-STD-202	Method 105, Barometric Pressure (Reduced), Condition D

OPTIONS AVAILABLE – CONTACT PICO FOR PART NUMBER

Parameter	Referenced Standard	Description
Stabilization Bake	MIL-STD-883	Referenced Method 1008 Non-operating maximum storage temperature for 24 hours
Temperature Cycle	MIL-STD-883	Referenced Method 1010 Non-operating at temperature extremes, 15 mins/temp, 10 cycles
Burn-In	MIL-STD-883	Referenced Method 1015 Max operating temperature for 160 hours
Expanded Operating Temperature Range		-55°C to +85°C

THERMAL RESISTANCE

$$P_{OUT} = \frac{T_C - T_A}{T_{RCA} \times (1 / \eta - 1)}$$

P_{OUT} = Output Power in Watts

η = Efficiency

T_C = Case temperature in °C

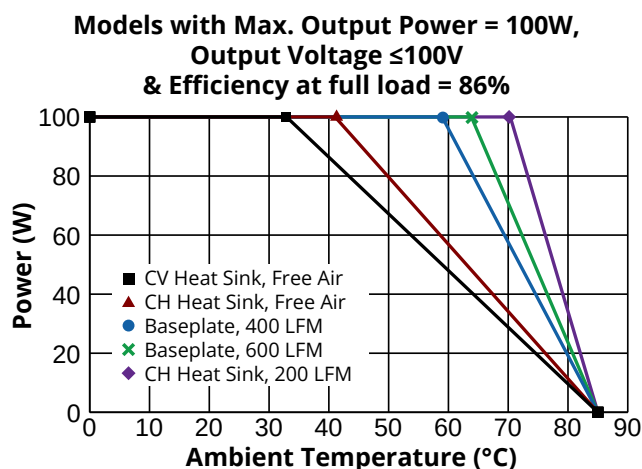
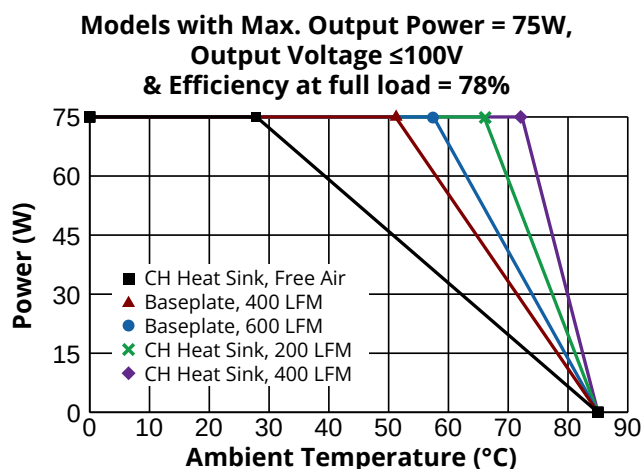
T_A = Ambient temperature in °C

T_{RCA} = Thermal resistance of case to air in °C / W

Thermal resistance of case (T_{RCA})

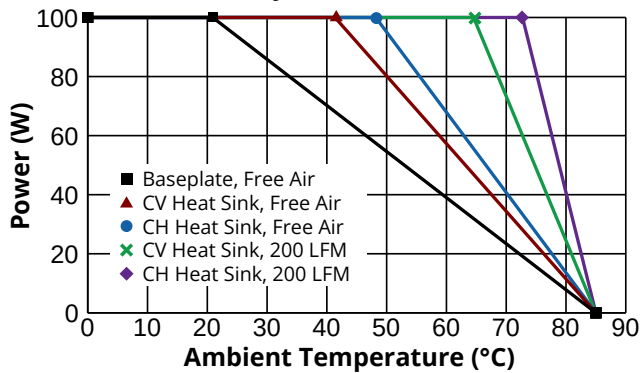
Airflow	≤100V output models			≥125V output models			Units
	Baseplate only	CV Heat Sink	CH Heat Sink	Baseplate only	CV Heat Sink	CH Heat Sink	
Free Air	4.7	3.2	2.7	5.1	3.5	3	°C / W
200 LFM	2.5	1.5	0.9	2.8	1.8	1	
400 LFM	1.6	1	0.6	1.8	1.1	0.7	
600 LFM	1.3	0.7	0.5	1.4	0.8	0.55	
800 LFM	1.1	0.6	0.4	1.2	0.65	0.45	
1000 LFM	0.9	0.5	0.36	1	0.55	0.4	

DERATING GRAPHS (Nominal V_{IN} , Full Load, Efficiency @ Full Load)

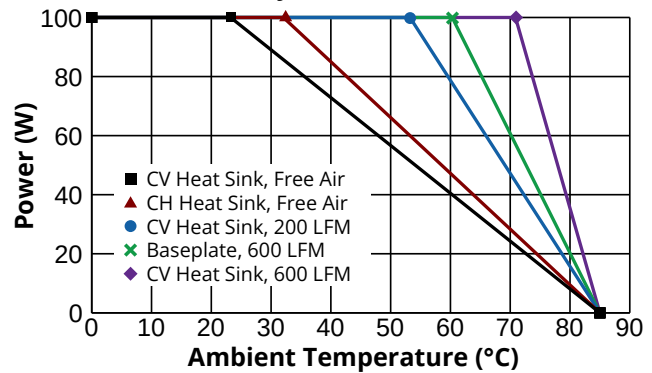


DERATING GRAPHS (Nominal V_{IN} , Full Load, Efficiency @ Full Load)

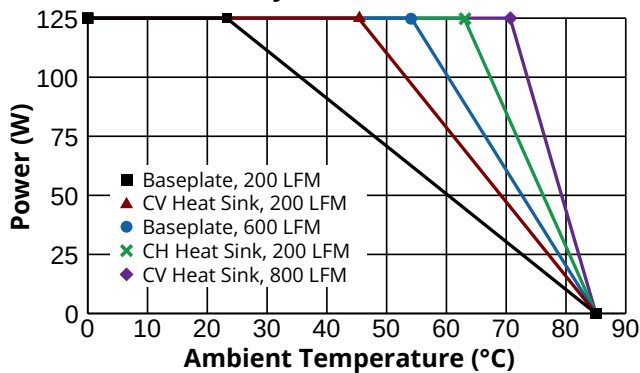
**Models with Max. Output Power = 100W,
Output Voltage $\leq 100V$
& Efficiency at full load = 88%**



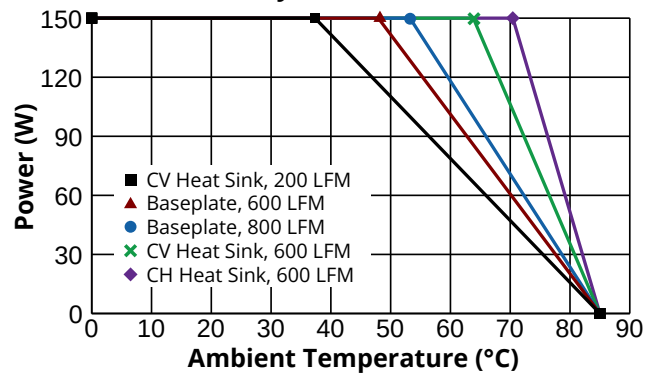
**Models with Max. Output Power = 100W,
Output Voltage $\geq 125V$
& Efficiency at full load = 85%**



**Models with Max. Output Power = 125W,
Output Voltage $\geq 125V$
& Efficiency at full load = 85%**

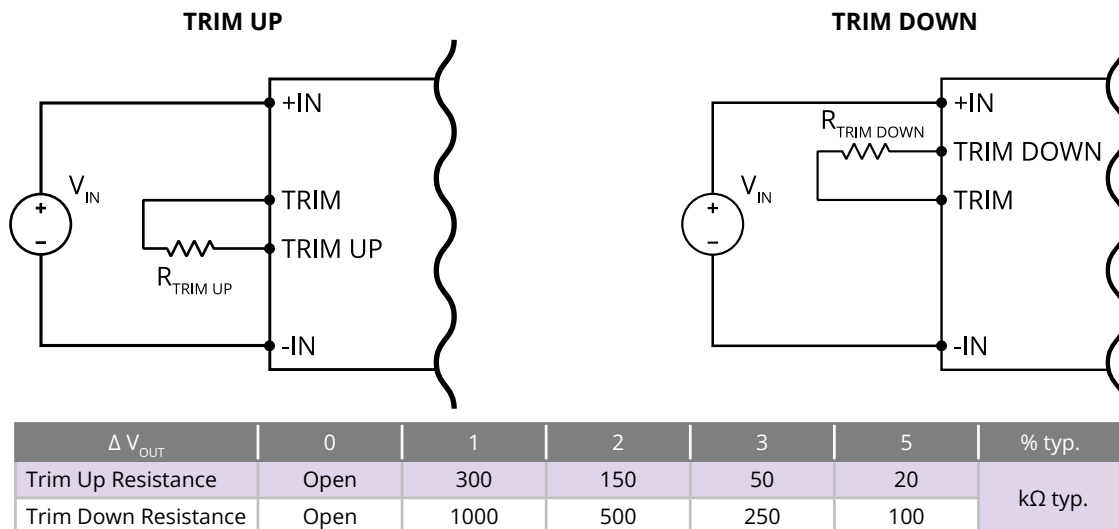


**Models with Max. Output Power = 150W,
Output Voltage $\geq 125V$
& Efficiency at full load = 85%**



TYPICAL CONNECTION CIRCUIT

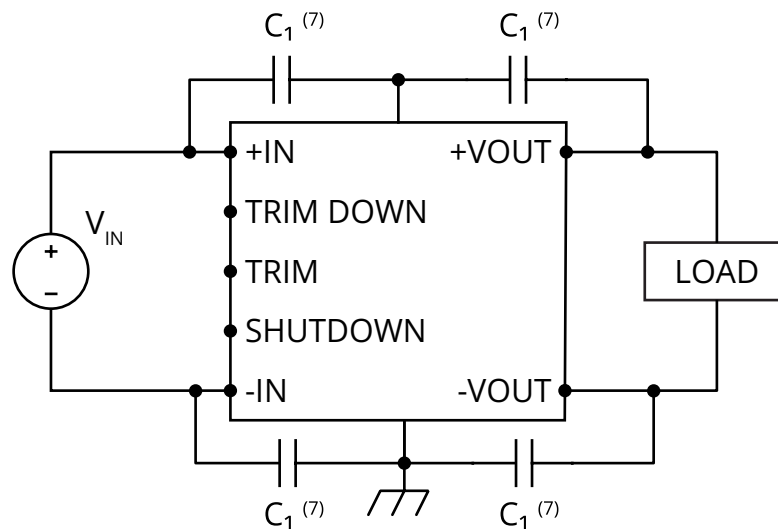
TRIM



Note: Each individual unit will vary slightly. It is recommended to use a 1MOhm multi-turn trimmer potentiometer to determine resistance value and achieve desired adjustment. Use minimum 1/2W power rating resistor. Keep the trim resistor leads as short as possible to eliminate the stray inductance which will effect the trimming results.

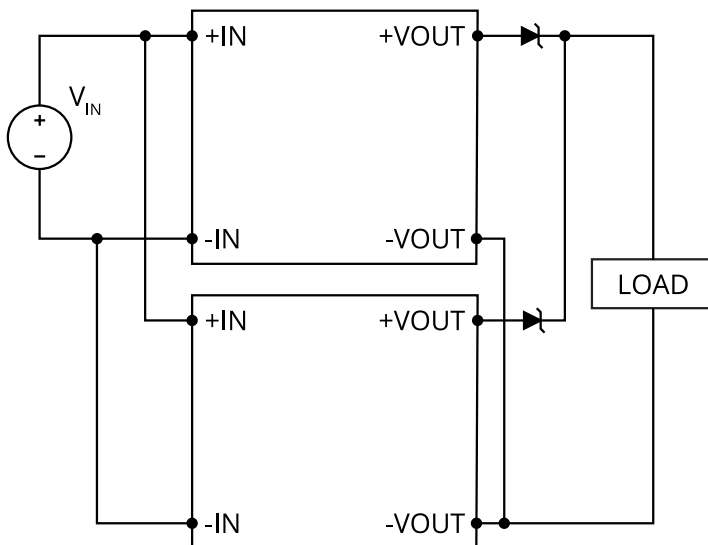
TYPICAL CONNECTION CIRCUIT

NOISE REDUCTION



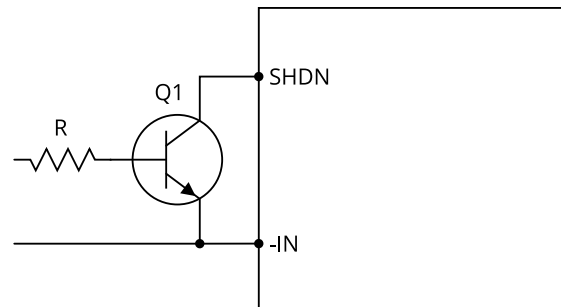
Note 7: C_1 filter capacitors may reduce noise further. Please contact Pico for more details.

PARALLEL

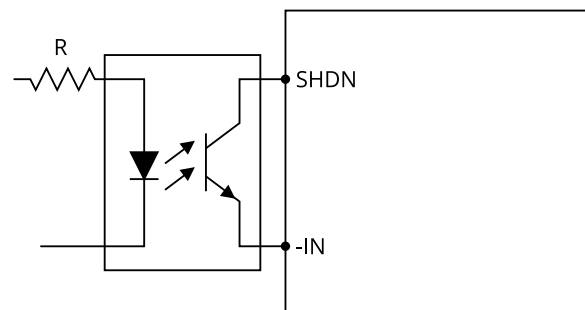


SHUTDOWN

NON-ISOLATED

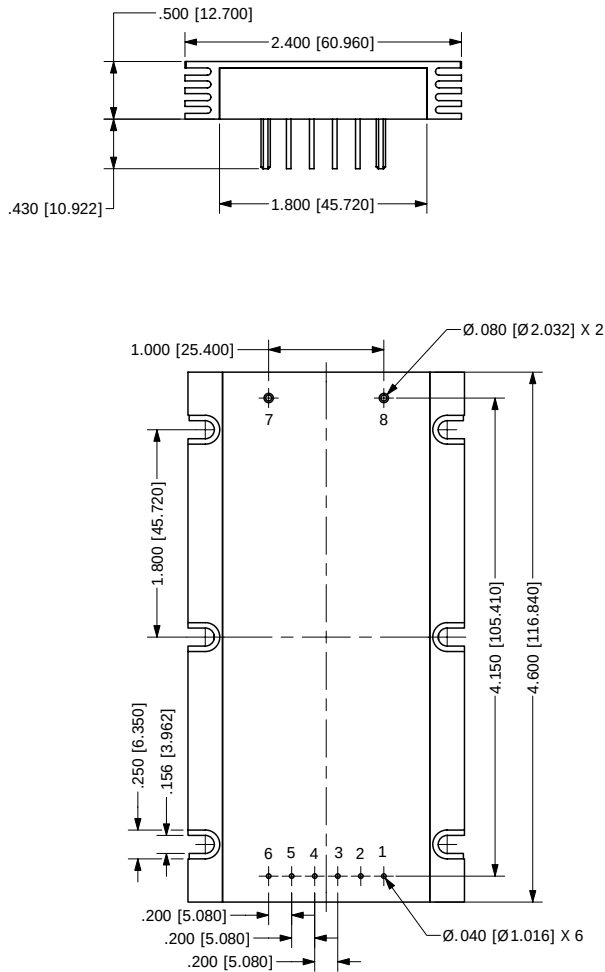


ISOLATED



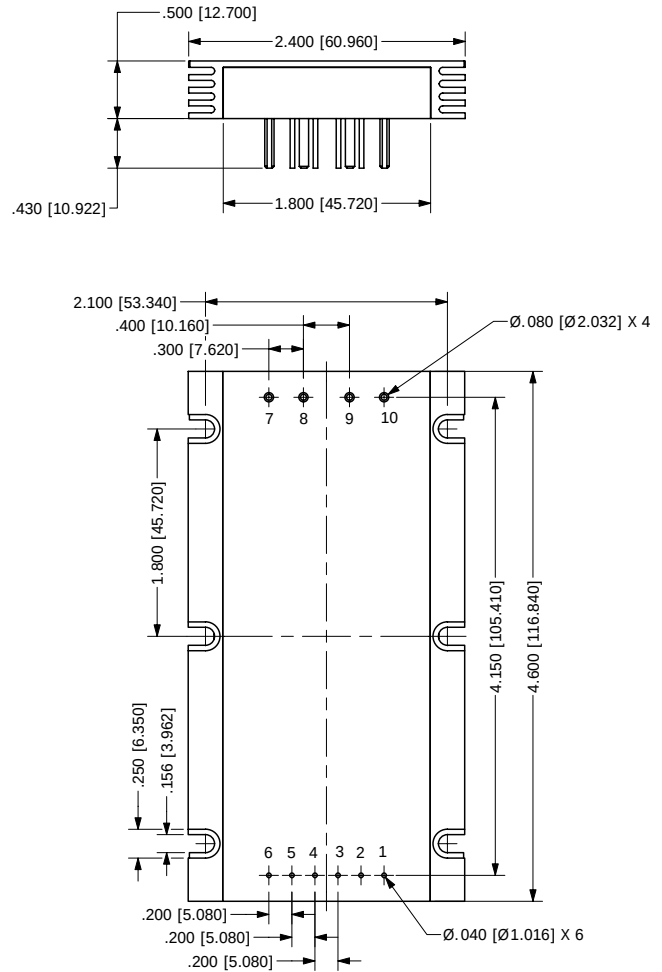
MECHANICAL DRAWINGS

≤100V SINGLE OUTPUTS



BOTTOM VIEW

DUAL OUTPUTS



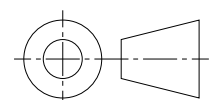
BOTTOM VIEW

PIN	FUNCTION		PIN DIAMETER
	SINGLE	DUAL	
1	+IN		.040 [1.016]
2	TRIM DOWN		.040 [1.016]
3	TRIM		.040 [1.016]
4	TRIM UP		.040 [1.016]
5	SHUT DOWN		.040 [1.016]
6	-IN		.040 [1.016]
7	-OUT	-OUT1	.080 [2.032]
8	+OUT	+OUT1	.080 [2.032]
9	-	-OUT2	.080 [2.032]
10	-	+OUT2	.080 [2.032]

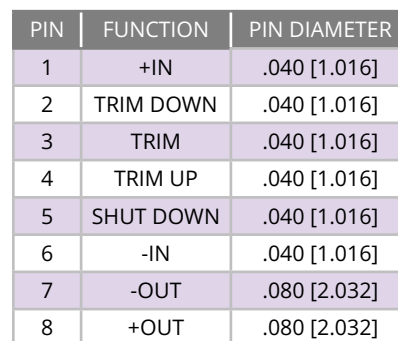
NOTES

a. ALL DIMENSIONS ARE IN INCHES, [] = MM

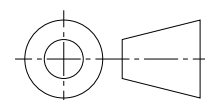
b. RECOMMENDED TORQUE FOR MOUNTING SCREWS: 6-9 INCH-LBS



≥125V SINGLE OUTPUTS



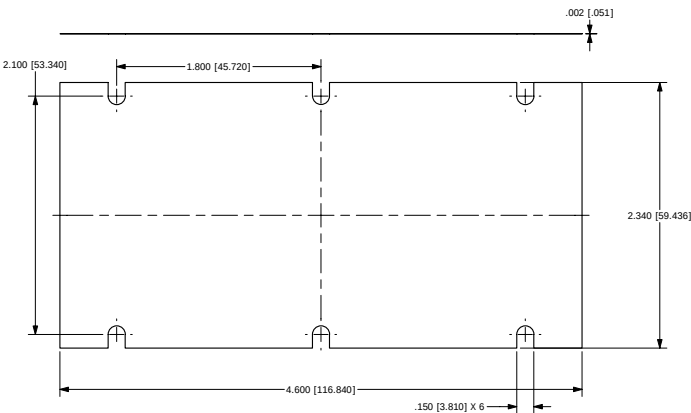
a. ALL DIMENSIONS ARE IN INCHES, [] = MM
b. RECOMMENDED TORQUE FOR MOUNTING SCREWS: 6-9 INCH-LBS



MECHANICAL DRAWINGS

THERMAL INTERFACE

TI

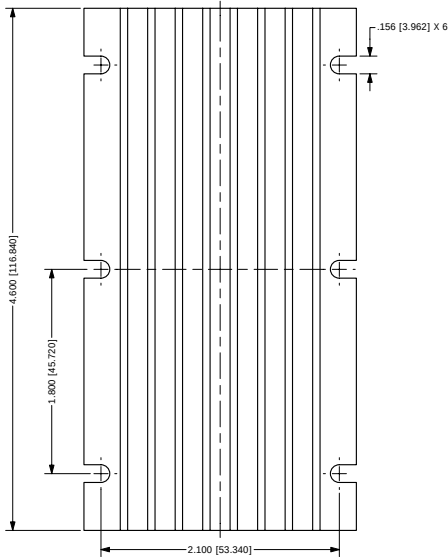
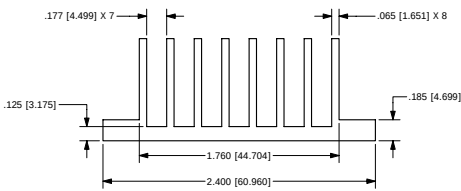


BOTTOM VIEW

Material	Alloy Aluminum Substrate
Thermal Conductivity	1530 BTU-in/hr sq.ft °F
Coefficient of Thermal Expansion, (25-100°C)	13.1 10 ⁻⁶ in-in/°F
Brinell Hardness	23 HB
Endurance Limit	5000 PSI
Standard Thickness	0.002 inches

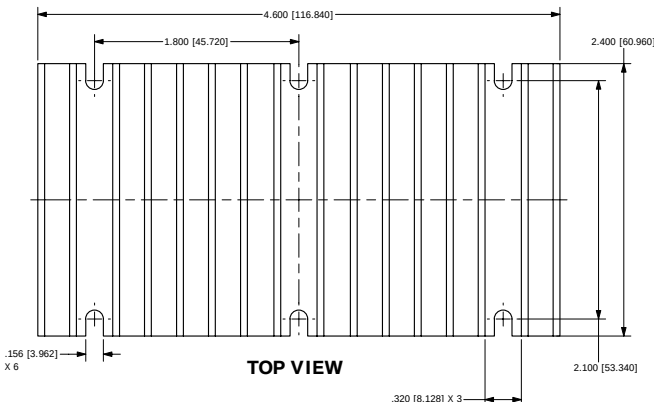
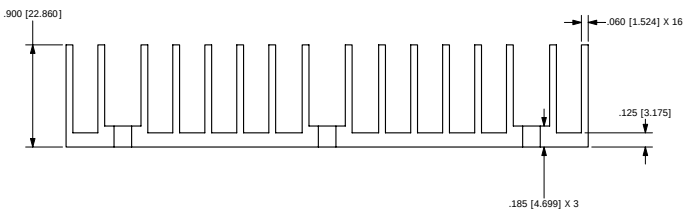
HEAT SINKS

CV

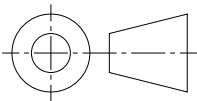


TOP VIEW

CH



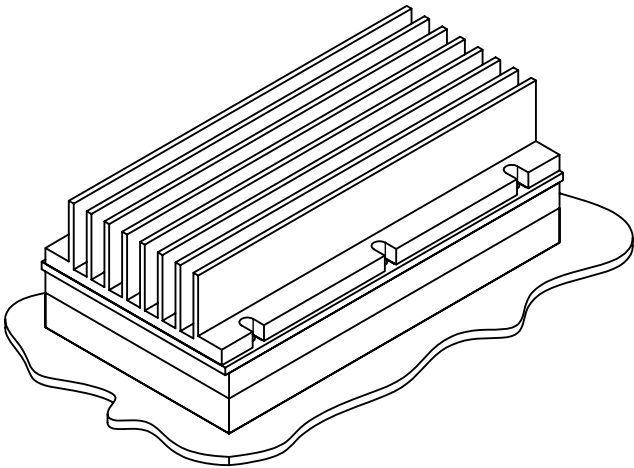
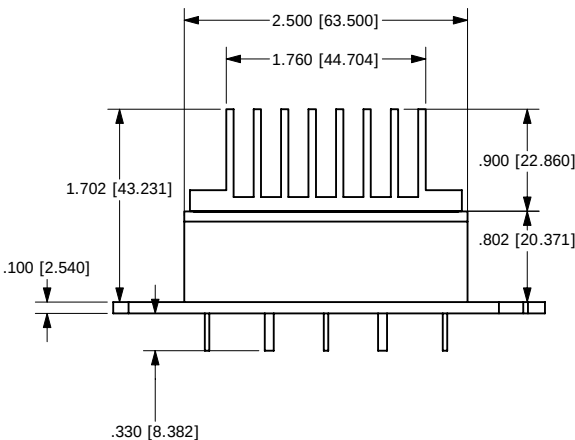
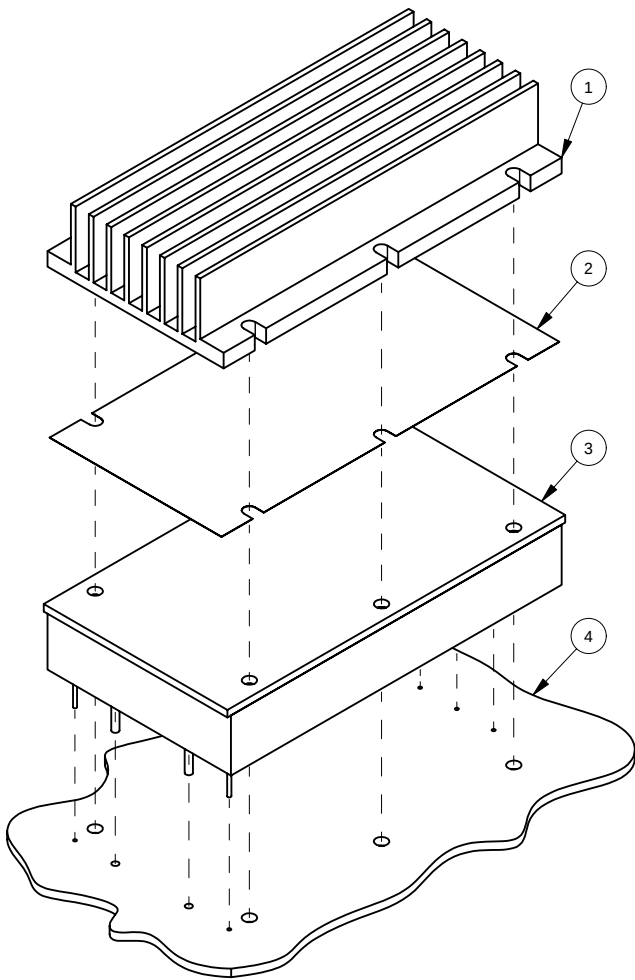
TOP VIEW



Weight: 145 grams typical

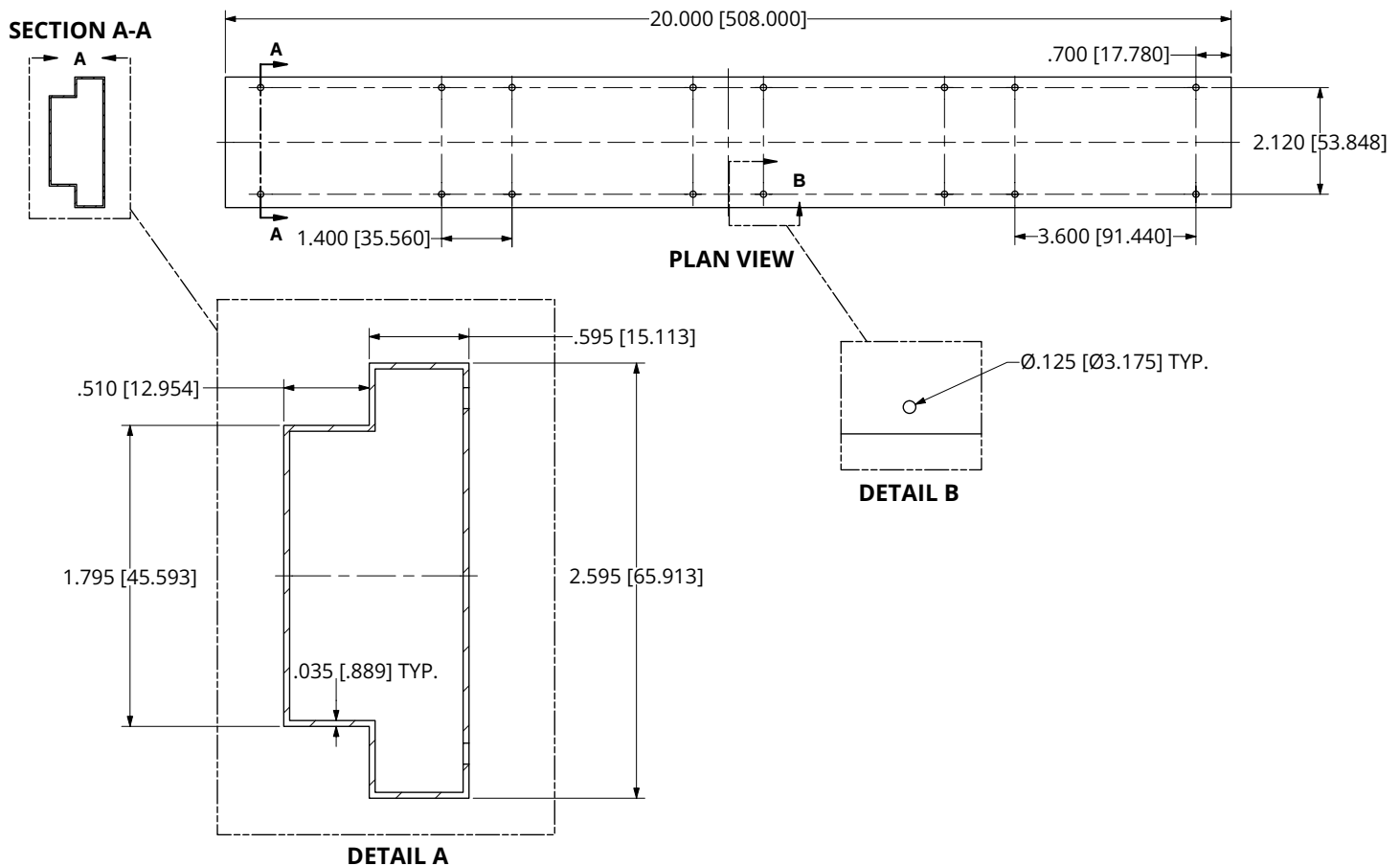
MECHANICAL DRAWINGS

HEAT SINK ASSEMBLY

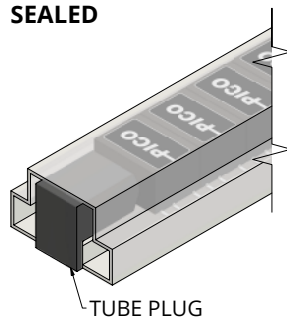


ITEM	QTY	DESCRIPTION
1	1	CH OR CV HEAT SINK
2	1	TI THERMAL INTERFACE
3	1	P MODULE
4	1	PCB

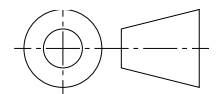
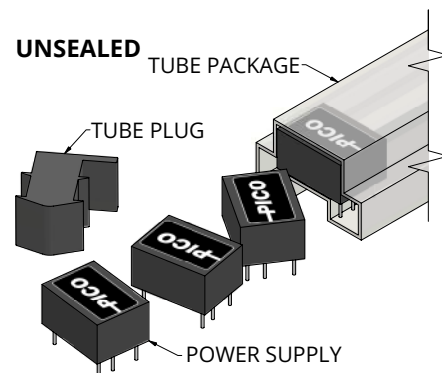
TUBE PACKAGING



SEALED



UNSEALED



Pico warrants each product manufactured by us and sold by us or an authorized representative, to be free from defects in material and workmanship. If properly used, it will perform within its applicable specifications for a period of one year after original shipment. Pico's obligation under this guarantee is limited to repairing or replacing our product to the original purchaser. This warranty is in lieu of all other warranties, express or implied and constitutes fulfillment of our obligations to the purchaser. We do not guarantee that the products can be used for a particular purpose other than those solely covered by the product's specifications. Pico must be notified if the product must meet particular certifications and/or standards. We assume no liability, in any event, for consequential damages, for anticipated or lost profits, incidental damages or loss of time or other losses incurred by the purchaser or any third party in connection with products covered by this warranty or otherwise. The purchaser will indemnify and hold Pico harmless for any damages, losses, costs, etc. from usage not within the product's specifications. Pico must be consulted before usage of its products in a nuclear, radioactive or space environment.

We reserve the right to discontinue products without notice, We reserve the right to make modifications to any existing catalog products without notice, at any time, without the obligation to modify units previously sold.

Series HP

200W Isolated Regulated High Power DC-DC Converter



PRODUCT OVERVIEW

The HP series are isolated DC-DC converters with a wide selection of input voltage ranges from 36V to 380V in a low profile full brick size - 4.6" x 2.5" x 0.5". These modules have trim capability and shutdown features. Protections include input overvoltage, output short-circuit, output overvoltage and over temperature.

The unique case has integrated side heat sink for better thermal dissipation but is capable of conduction cooling through the baseplate or additional top mounted heat sink.



FEATURES

- 36V to 380V input range models
 - 3.3V to 100V output models
 - Up to 200W output
 - Input/output isolation
 - Parallel operation option
 - Single and dual isolated outputs
 - Trim capability
 - Remote shutdown feature
 - Fixed operating frequency
 - No external components required
- Contact Pico for part number of available options:

 - Expanded operating temperature: -55°C to +85°C
 - Select screening per MIL-STD-883:
 - Stabilization Bake
 - Temperature Cycle
 - Burn-In
 - Special Input Voltage, Output Voltage, Isolation Voltage or Output Power
 - Parallel Operation

HP	C	150	D
SERIES NAME	INPUT VOLTAGE RANGE	OUTPUT VOLTAGE	NUMBER OF OUTPUTS
HP	B = 36 - 72V C = 100 - 180V D = 200 - 380V	3.3 = 3.3V 5 = 5V 5.2 = 5.2V 9 = 9V 12 = 12V 15 = 15V 24 = 24V 28 = 28V 48 = 48V 100 = 100V	S = SINGLE D = DUAL

MODEL LIST - HPB (36-72V INPUT RANGE)**SINGLE OUTPUT**

Pico Part Number	Input Voltage Range [VDC]	Output Voltage [VDC]	Output Current		Output Power [W]	Efficiency ⁽²⁾ [%] typ.	Line Regulation ⁽³⁾		Load Regulation ⁽⁴⁾		Output Voltage Tolerance ⁽²⁾ [±%]
			Min. ⁽¹⁾ [A]	Max. [A]			Nom.-Min. [-%] max	Nom.-Max. [%] max	50%-10% [%] max	50%-100% [-%] max	
HPB3.3S	36-72	3.3	1.82	18.18	60	72	1.5	1.5	2	2	1.5
HPB5S		5	2.00	20.00	100	75	1	1	1.5	1.5	1.5
HPB5.2S		5.2	1.92	19.23	100	75	1	1	1.5	1.5	1.5
HPB9S		9	1.67	16.67	150	80	1	1	1.5	1.5	1
HPB12S		12	1.25	12.50	150	82	0.75	0.75	1.25	1.25	1
HPB15S		15	1.00	10.00	150	83	0.75	0.75	1.25	1.25	1
HPB24S		24	0.63	6.25	150	84	0.75	0.75	1	1	1
HPB28S		28	0.54	5.36	150	85	0.5	0.5	0.75	0.75	0.5
HPB48S		48	0.31	3.13	150	84	0.5	0.5	0.75	0.75	0.5
HPB100S		100	0.15	1.50	150	84	0.5	0.5	0.75	0.75	0.5

DUAL OUTPUT

Pico Part Number	Input Voltage Range [VDC]	Output Voltage Per Output [VDC]	Output Current Per Output		Output Power Per Output ⁽⁴⁾ [W]	Efficiency ⁽²⁾ [%] typ.	Line Regulation ⁽³⁾		Load Regulation ⁽⁴⁾		Output Voltage Tolerance ⁽²⁾ [±%]
			Min. ⁽¹⁾ [A]	Max. [A]			Nom.-Min. [-%] max	Nom.-Max. [%] max	50%-10% [%] max	50%-100% [-%] max	
HPB5D	36-72	5	1.00	10.00	50	75	1	1	1.5	1.5	1.5
HPB9D		9	0.83	8.33	75	80	1	1	1.5	1.5	1
HPB12D		12	0.63	6.25	75	82	0.75	0.75	1.25	1.25	1
HPB15D		15	0.50	5.00	75	83	0.75	0.75	1.25	1.25	1
HPB24D		24	0.31	3.13	75	84	0.75	0.75	1	1	1
HPB28D		28	0.27	2.68	75	85	0.75	0.75	0.75	0.75	0.75
HPB48D		48	0.16	1.56	75	84	0.75	0.75	0.75	0.75	0.5

Note 1: Maintain minimum 10% of rated load to prevent a voltage surge.

Note 2: Tested at nominal input voltage and full output load.

Note 3: Line regulation is specified at full output load, nominal to minimum input voltage (-%) and nominal to maximum input voltage (+%).

Note 4: Load regulation is specified at nominal input voltage, 50% to 10% load (+%) and 50% to 100% load (-%).

Note 5: Dual output loads must be balanced.

MODEL LIST - HPC (100-180V INPUT RANGE)**SINGLE OUTPUT**

Pico Part Number	Input Voltage Range	Output Voltage [VDC]	Output Current		Output Power [W]	Efficiency ⁽²⁾ [%] typ.	Line Regulation ⁽³⁾		Load Regulation ⁽⁴⁾		Output Voltage Tolerance ⁽²⁾ [±%]
			Min. ⁽¹⁾ [A]	Max. [A]			Nom.-Min. [-%] max	Nom.-Max. [%] max	50%-10% [%] max	50%-100% [-%] max	
HPC3.3S	100-180	3.3	2.27	22.73	75	71	1.25	1.25	1.5	1.5	1.5
HPC5S		5	2.00	20.00	100	76	1	1	1.25	1.25	1.5
HPC5.2S		5.2	1.92	19.23	100	76	1	1	1.25	1.25	1.5
HPC9S		9	1.67	16.67	150	80	1	1	1.25	1.25	1
HPC12S		12	1.67	16.67	200	83	0.75	0.75	1	1	1
HPC15S		15	1.33	13.33	200	84	0.75	0.75	1	1	1
HPC24S		24	0.83	8.33	200	86	0.5	0.5	0.75	0.75	0.75
HPC28S		28	0.71	7.14	200	86	0.5	0.5	0.75	0.75	0.75
HPC48S		48	0.42	4.17	200	86	0.5	0.5	0.5	0.5	0.5
HPC100S		100	0.15	1.50	150	85	0.5	0.5	0.5	0.5	0.5

DUAL OUTPUT

Pico Part Number	Input Voltage Range	Output Voltage Per Output [VDC]	Output Current Per Output		Output Power Per Output ⁽⁴⁾ [W]	Efficiency ⁽²⁾ [%] typ.	Line Regulation ⁽³⁾		Load Regulation ⁽⁴⁾		Output Voltage Tolerance ⁽²⁾ [±%]
			Min. ⁽¹⁾ [A]	Max. [A]			Nom.-Min. [-%] max	Nom.-Max. [%] max	50%-10% [%] max	50%-100% [-%] max	
HPC5D	100-180	5	1.00	10.00	50	76	1	1	1.25	1.25	1.5
HPC9D		9	0.83	8.33	75	80	1	1	1.25	1.25	1
HPC12D		12	0.63	6.25	75	83	0.75	0.75	1	1	1
HPC15D		15	0.50	5.00	75	84	0.75	0.75	1	1	1
HPC24D		24	0.31	3.13	75	86	0.75	0.75	0.75	0.75	0.75
HPC28D		28	0.27	2.68	75	86	0.5	0.5	0.75	0.75	0.75
HPC48D		48	0.16	1.56	75	85	0.5	0.5	0.5	0.5	0.5

Note 1: Maintain minimum 10% of rated load to prevent a voltage surge.

Note 2: Tested at nominal input voltage and full output load.

Note 3: Line regulation is specified at full output load, nominal to minimum input voltage (-%) and nominal to maximum input voltage (+%).

Note 4: Load regulation is specified at nominal input voltage, 50% to 10% load (+%) and 50% to 100% load (-%).

Note 5: Dual output loads must be balanced.

MODEL LIST - HPD (200-380V INPUT RANGE)

SINGLE OUTPUT

Pico Part Number	Input Voltage Range	Output Voltage [VDC]	Output Current		Output Power [W]	Efficiency ⁽²⁾ [%] typ.	Line Regulation ⁽³⁾		Load Regulation ⁽⁴⁾		Output Voltage Tolerance ⁽²⁾ [±%]
			Min. ⁽¹⁾ [A]	Max. [A]			Nom.-Min. [-%] max	Nom.-Max. [%] max	50%-10% [%] max	50%-100% [-%] max	
HPD3.3S	200-380	3.3	2.27	22.73	75	73	1.25	1.25	1.5	1.5	1.5
HPD5S		5	2.00	20.00	100	77	1	1	1.25	1.25	1.5
HPD5.2S		5.2	1.92	19.23	100	77	1	1	1.25	1.25	1.5
HPD9S		9	1.67	16.67	150	80	1	1	1.25	1.25	1
HPD12S		12	1.67	16.67	200	82	0.75	0.75	1	1	1
HPD15S		15	1.33	13.33	200	83	0.75	0.75	1	1	1
HPD24S		24	0.83	8.33	200	85	0.5	0.5	0.75	0.75	0.75
HPD28S		28	0.71	7.14	200	86	0.5	0.5	0.5	0.5	0.75
HPD48S		48	0.42	4.17	200	86	0.5	0.5	0.5	0.5	0.5
HPD100S		100	0.15	1.50	150	85	0.5	0.5	0.5	0.5	0.5

DUAL OUTPUT

Pico Part Number	Input Voltage Range	Output Voltage Per Output [VDC]	Output Current Per Output		Output Power Per Output ⁽⁴⁾ [W]	Efficiency ⁽²⁾ [%] typ.	Line Regulation ⁽³⁾		Load Regulation ⁽⁴⁾		Output Voltage Tolerance ⁽²⁾ [±%]
			Min. ⁽¹⁾ [A]	Max. [A]			Nom.-Min. [-%] max	Nom.-Max. [%] max	50%-10% [%] max	50%-100% [-%] max	
HPD5D	200-380	5	1.00	10.00	50	77	1	1	1.25	1.25	1.5
HPD9D		9	0.83	8.33	75	80	1	1	1.25	1.25	1
HPD12D		12	0.63	6.25	75	82	0.75	0.75	1	1	1
HPD15D		15	0.50	5.00	75	83	0.75	0.75	1	1	1
HPD24D		24	0.31	3.13	75	85	0.75	0.75	0.75	0.75	0.75
HPD28D		28	0.27	2.68	75	86	0.5	0.5	0.75	0.75	0.75
HPD48D		48	0.16	1.56	75	86	0.5	0.5	0.5	0.5	0.5

Note 1: Maintain minimum 10% of rated load to prevent a voltage surge.

Note 2: Tested at nominal input voltage and full output load.

Note 3: Line regulation is specified at full output load, nominal to minimum input voltage (-%) and nominal to maximum input voltage (+%).

Note 4: Load regulation is specified at nominal input voltage, 50% to 10% load (+%) and 50% to 100% load (-%).

Note 5: Dual output loads must be balanced.

SPECIFICATIONS (Nominal V_{IN} , Full Load, $T_A = +25^{\circ}\text{C}$, 1 hour warm up unless otherwise specified)

INPUT

Parameter	Condition	Min.	Nom.	Max.	Units
Input Voltage Range	HPB models	36	48	72	VDC
	HPC models	100	150	180	
	HPD models	200	300	380	

OUTPUT

Parameter	Condition	Min.	Typ.	Max.	Units
Output Ripple	1MHz bandwidth	-	-	50	mVp-p

ENVIRONMENTAL

Parameter	Condition	Min.	Typ.	Max.	Units
Operating Temperature Range	Baseplate	0	-	+85	$^{\circ}\text{C}$
Storage Temperature Range		-55	-	+105	$^{\circ}\text{C}$
Cooling	Conduction through baseplate				

GENERAL

Parameter	Condition	Min.	Typ.	Max.	Units
Operating Frequency		-	100	-	kHz
Isolation Voltage	Input to output	4242	-	-	VDC
	Input to baseplate	2121	-	-	
	Output to baseplate	1000	-	-	
Insulation Resistance		100	-	-	MΩ
Size	L x W x H	4.6 x 2.5 x 0.5 (116.84 x 63.5 x 12.7)			inches (mm)
Weight	≤48V single output models	-	210	-	grams
	≥100V single output models	-	220	-	
	Dual output models	-	235	-	
Case	Aluminum baseplate and Glass Reinforced Polymer				
Potting	Vacuum Impregnated Epoxy				
Tube Packaging (W x H x L)	2.595 x 1.105 x 20 (65.913 x 28.067 x 101.6)				inches (mm)

PROTECTIONS & FEATURES

Parameter	Condition	Min.	Typ.	Max.	Units
Input Over Voltage		Yes			
Short circuit or Overload	Hiccup mode, self-recovery	120	-	-	%
Overtemperature	Baseplate, self-recovery	Shutdown	95	-	$^{\circ}\text{C}$
		Restart	50	-	
Output Overvoltage	Zener diode clamp	-	120	-	%
Shutdown (SHUTDOWN)	Non-latched shutdown, Self-recovery	-	-	0.15	VDC
Output Voltage Trim (TRIM, TRIM UP & TRIM DOWN)	Trim up or trim down	-5	0	5	%
Parallel ⁽⁶⁾	P option models	Connect as shown in connection diagram.			

Note 6: The parallel option allows units to operate the outputs in parallel to share load, increase total power or allow for N+1 redundancy.

SPECIFICATIONS (Nominal V_{IN} , Full Load, $T_A = +25^\circ\text{C}$, 1 hour warm up unless otherwise specified)

DESIGNED TO MEET

Test	Referenced Standard	Description
Vibration	MIL-STD-202	Method 204, Vibration, High Frequency, Condition D
Shock	MIL-STD-202	Method 213, Shock (Specified Pulse), Condition I
Humidity	MIL-STD-202	Method 106, Moisture Resistance
Altitude	MIL-STD-202	Method 105, Barometric Pressure (Reduced), Condition D

OPTIONS AVAILABLE – CONTACT PICO FOR PART NUMBER

Parameter	Referenced Standard	Description
Stabilization Bake	MIL-STD-883	Referenced Method 1008 Non-operating maximum storage temperature for 24 hours
Temperature Cycle	MIL-STD-883	Referenced Method 1010 Non-operating at temperature extremes, 15 mins/temp, 10 cycles
Burn-In	MIL-STD-883	Referenced Method 1015 Max operating temperature for 160 hours
Expanded Operating Temperature Range		-55°C to +85°C

THERMAL RESISTANCE

$$P_{OUT} = \frac{T_C - T_A}{T_{RCA} \times (1 / \eta - 1)}$$

P_{OUT} = Output Power in Watts

η = Efficiency

T_C = Case temperature in $^\circ\text{C}$

T_A = Ambient temperature in $^\circ\text{C}$

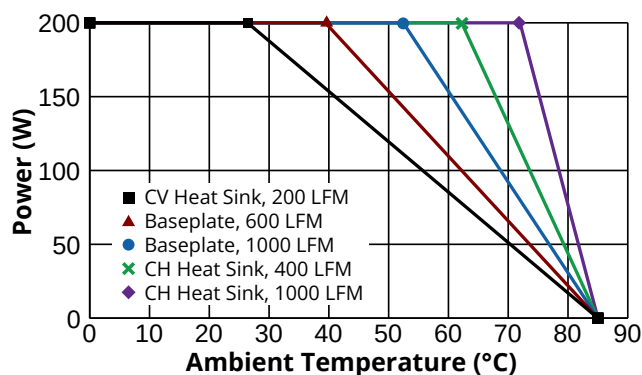
T_{RCA} = Thermal resistance of case to air in $^\circ\text{C} / \text{W}$

Thermal resistance of case (T_{RCA})

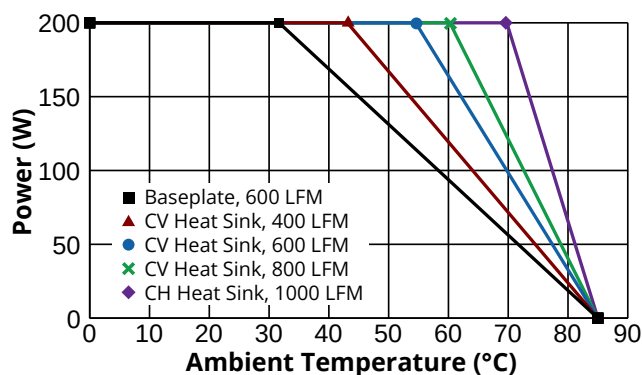
Airflow	Baseplate only	CV Heat Sink	CH Heat Sink	Units
Free Air	5.1	3.5	3.0	$^\circ\text{C} / \text{W}$
200 LFM	2.8	1.8	1	
400 LFM	1.8	1.1	0.7	
600 LFM	1.4	0.8	0.55	
800 LFM	1.2	0.65	0.45	
1000 LFM	1	0.55	0.4	

DERATING GRAPHS (Nominal V_{IN} , Full Load, Efficiency @ Full Load)

Models with Max. Output Power = 200W
& Efficiency at full load = 86%

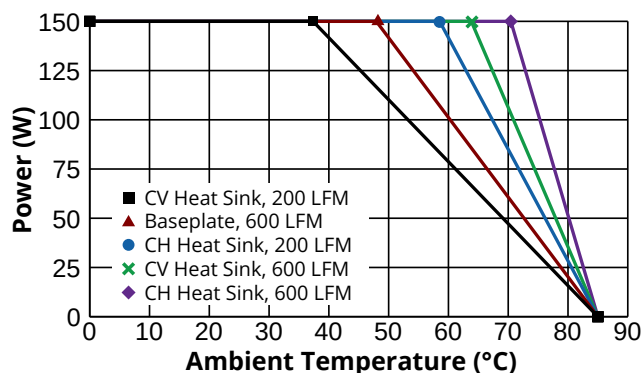


Models with Max. Output Power = 200W
& Efficiency at full load = 84%

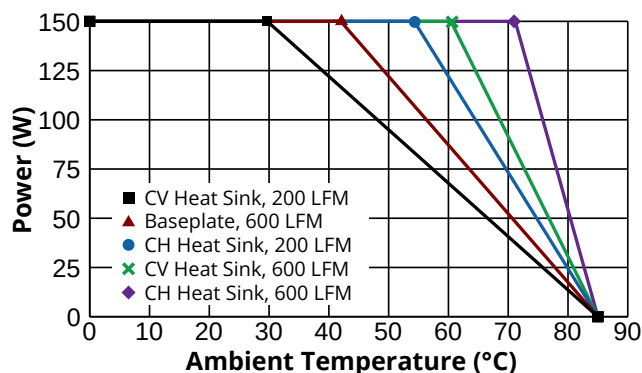


DERATING GRAPHS (Nominal V_{IN} , Full Load, Efficiency @ Full Load)

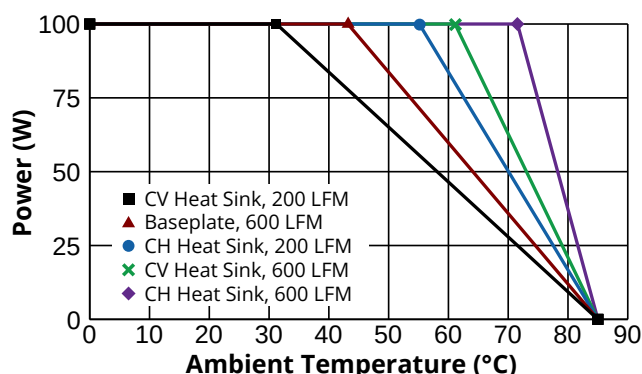
Models with Max. Output Power = 150W
& Efficiency at full load = 85%



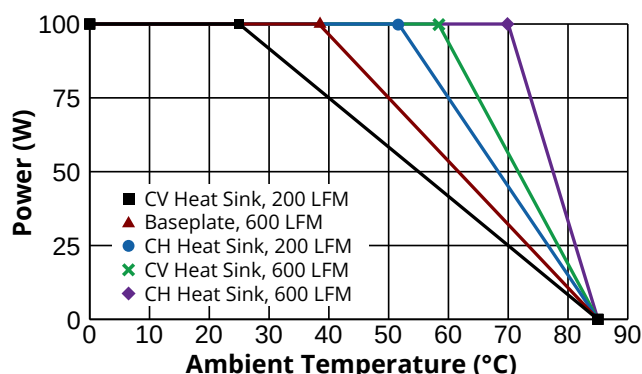
Models with Max. Output Power = 150W
& Efficiency at full load = 83%



Models with Max. Output Power = 100W
& Efficiency at full load = 77%

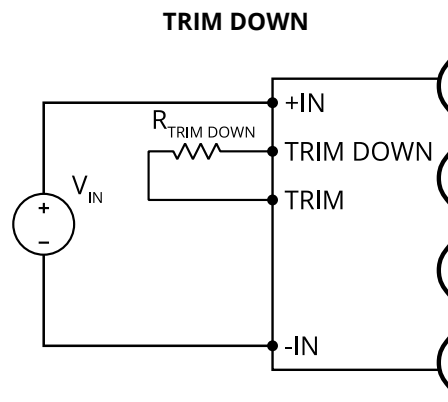
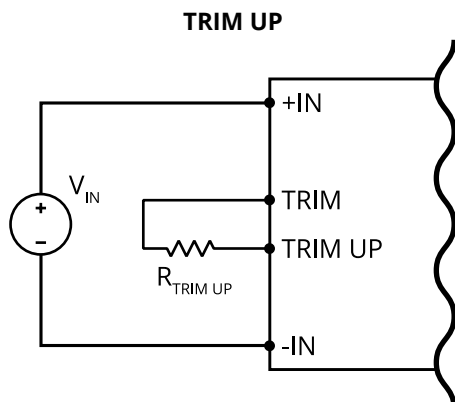


Models with Max. Output Power = 100W
& Efficiency at full load = 75%



TYPICAL CONNECTION CIRCUIT

TRIM

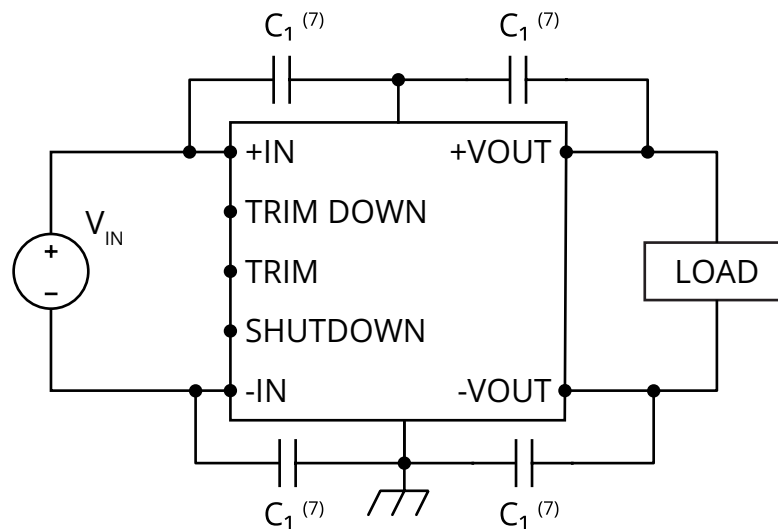


ΔV_{OUT}	0	1	2	3	5	% typ.
Trim Up Resistance	Open	300	150	50	20	kΩ typ.
Trim Down Resistance	Open	1000	500	250	100	

Note: Each individual unit will vary slightly. It is recommended to use a 1MΩ multi-turn trimmer potentiometer to determine resistance value and achieve desired adjustment. Use minimum 1/2W power rating resistor. Keep the trim resistor leads as short as possible to eliminate the stray inductance which will effect the trimming results.

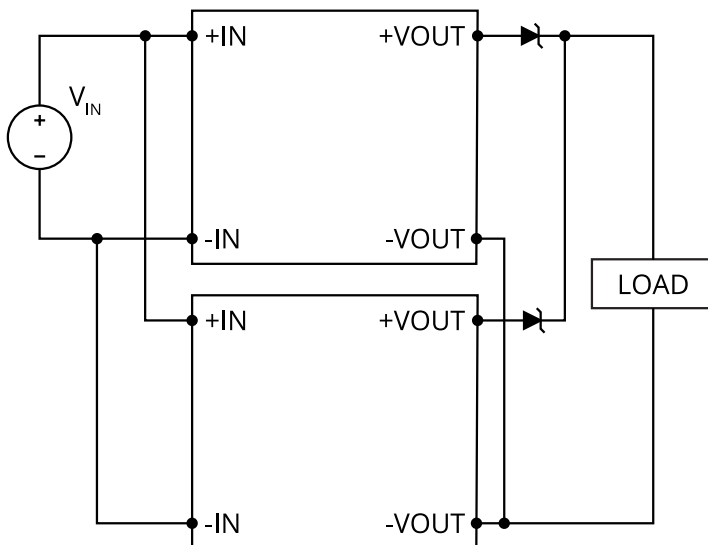
TYPICAL CONNECTION CIRCUIT

NOISE REDUCTION



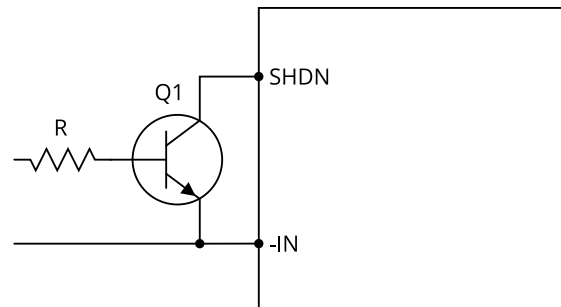
Note 7: C_1 filter capacitors may reduce noise further. Please contact Pico for more details.

PARALLEL

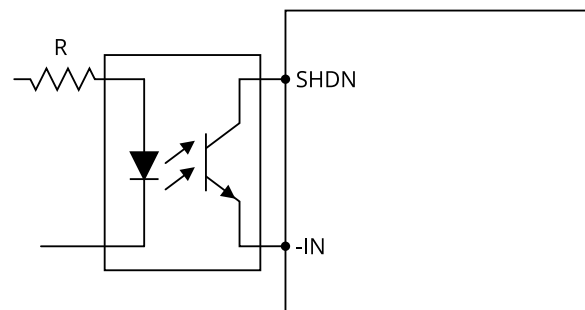


SHUTDOWN

NON-ISOLATED

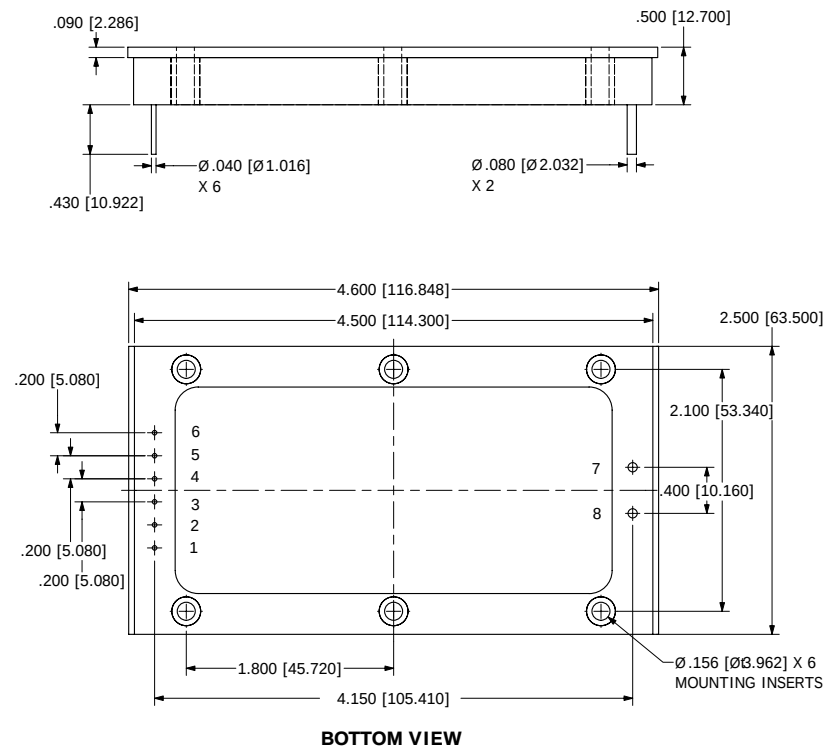


ISOLATED



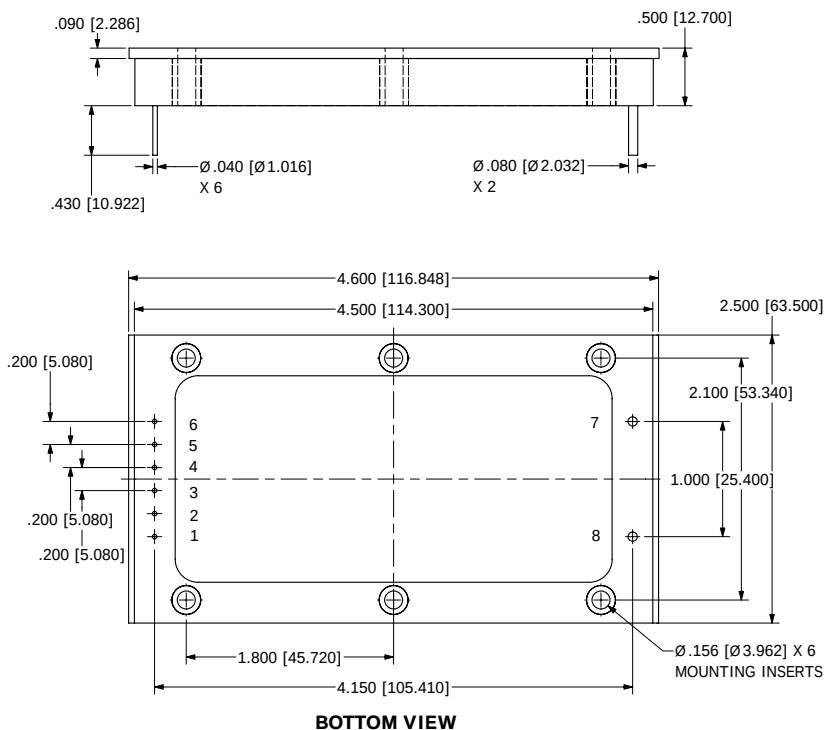
MECHANICAL DRAWINGS

≤48V SINGLE OUTPUT MODELS



PIN	FUNCTION	PIN DIAMETER
1	+IN	.040 [1.016]
2	TRIM DOWN	.040 [1.016]
3	TRIM	.040 [1.016]
4	TRIM UP	.040 [1.016]
5	SHUT DOWN	.040 [1.016]
6	-IN	.040 [1.016]
7	-OUT	.080 [2.032]
8	+OUT	.080 [2.032]

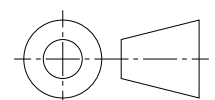
≥100V SINGLE OUTPUT MODELS



PIN	FUNCTION	PIN DIAMETER
1	+IN	.040 [1.016]
2	TRIM DOWN	.040 [1.016]
3	TRIM	.040 [1.016]
4	TRIM UP	.040 [1.016]
5	SHUT DOWN	.040 [1.016]
6	-IN	.040 [1.016]
7	-OUT	.080 [2.032]
8	+OUT	.080 [2.032]

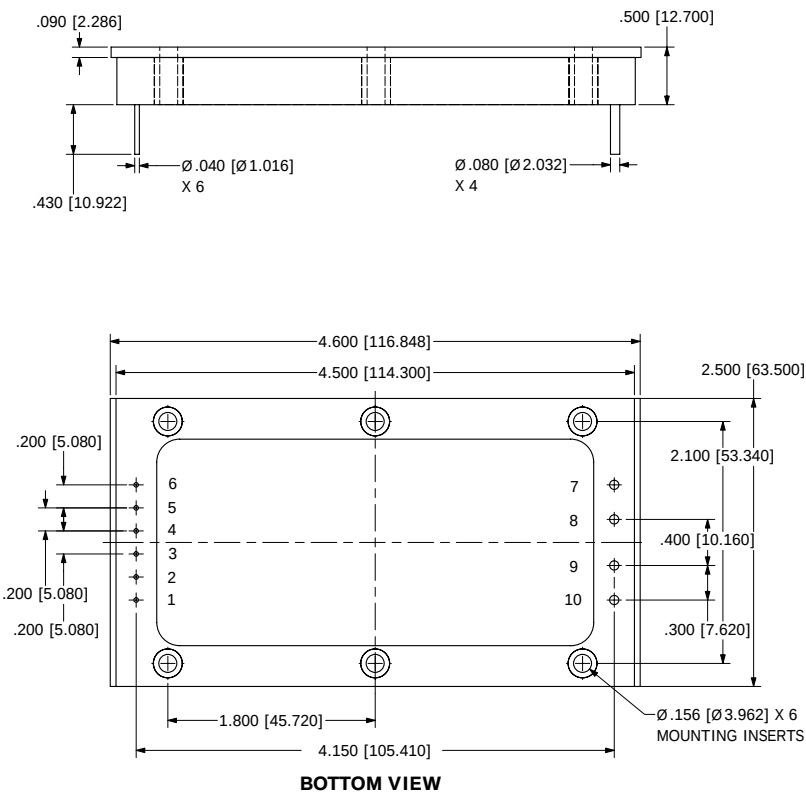
NOTES

- ALL DIMENSIONS ARE IN INCHES, [] = MM
- RECOMMENDED TORQUE FOR MOUNTING SCREWS: 6-9 INCH-LBS



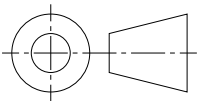
MECHANICAL DRAWINGS

DUAL OUTPUT MODELS



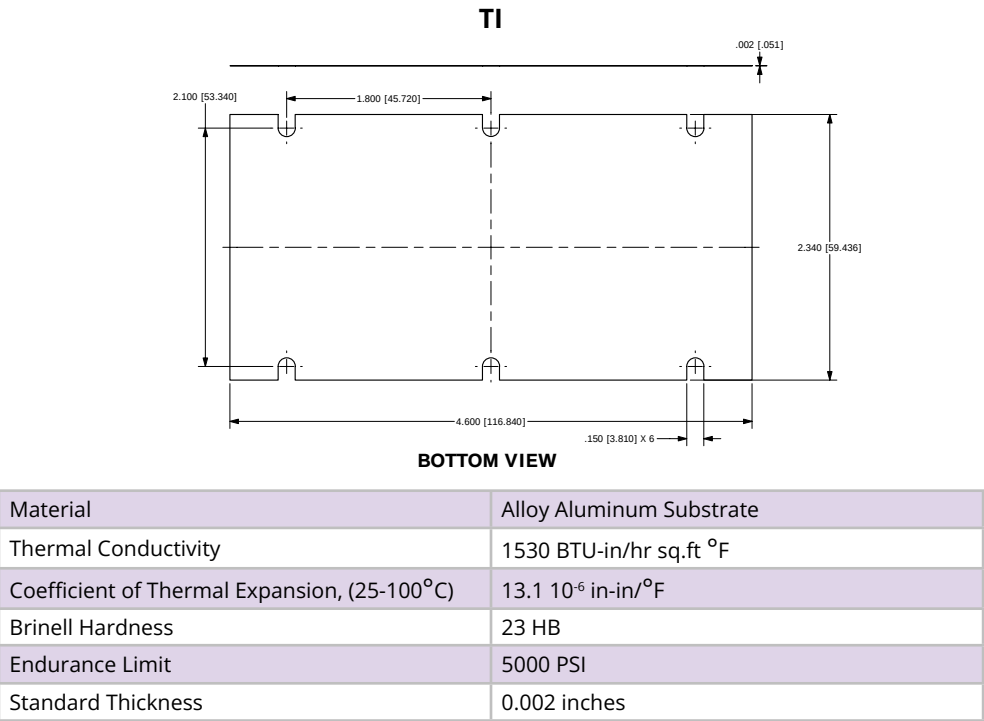
PIN	FUNCTION	PIN DIAMETER
1	+IN	.040 [1.016]
2	TRIM DOWN	.040 [1.016]
3	TRIM	.040 [1.016]
4	TRIM UP	.040 [1.016]
5	SHUT DOWN	.040 [1.016]
6	-IN	.040 [1.016]
7	-OUT1	.080 [2.032]
8	+OUT1	.080 [2.032]
9	-OUT2	.080 [2.032]
10	+OUT2	.080 [2.032]

- NOTES**
- a. ALL DIMENSIONS ARE IN INCHES, [] = MM
 - b. RECOMMENDED TORQUE FOR MOUNTING SCREWS: 6-9 INCH-LBS

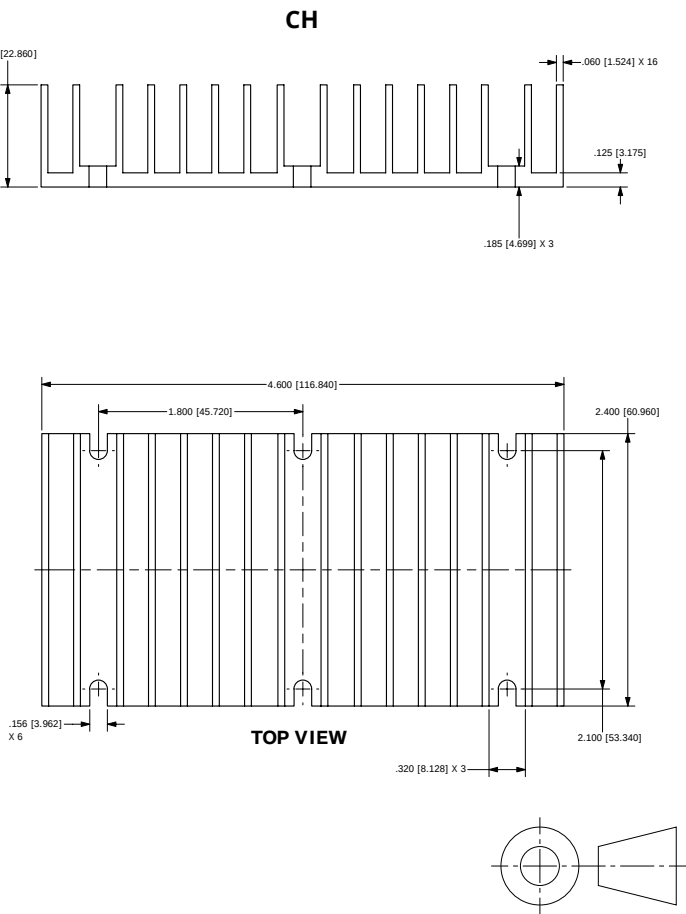
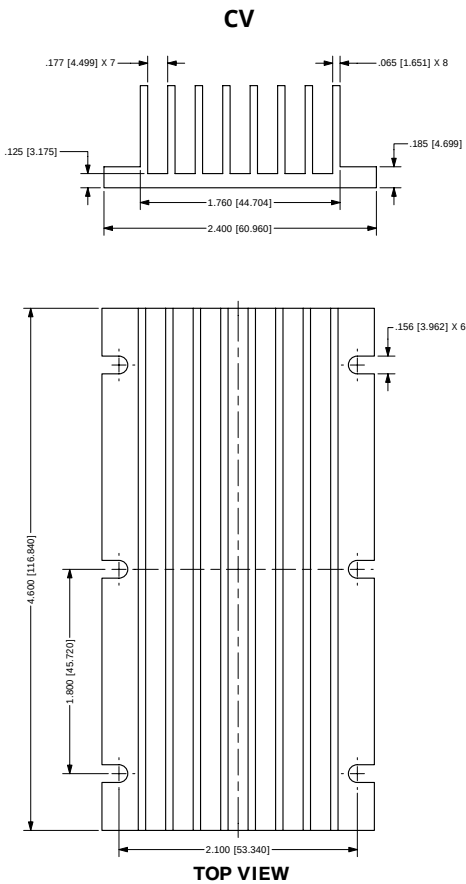


MECHANICAL DRAWINGS

THERMAL INTERFACE



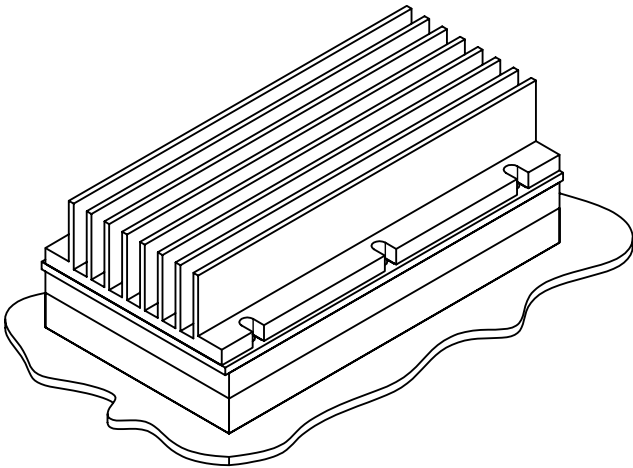
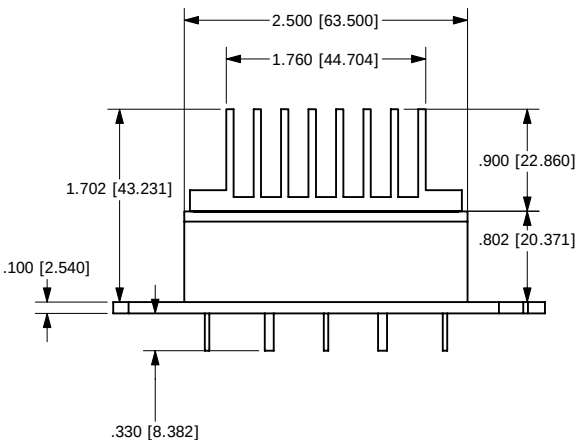
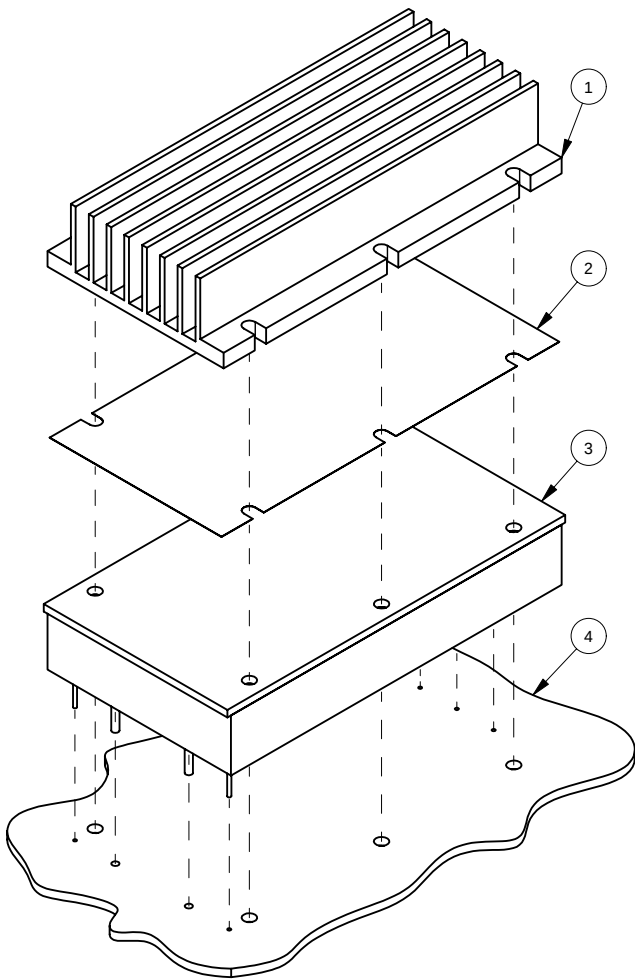
HEAT SINKS



Weight: 145 grams typical

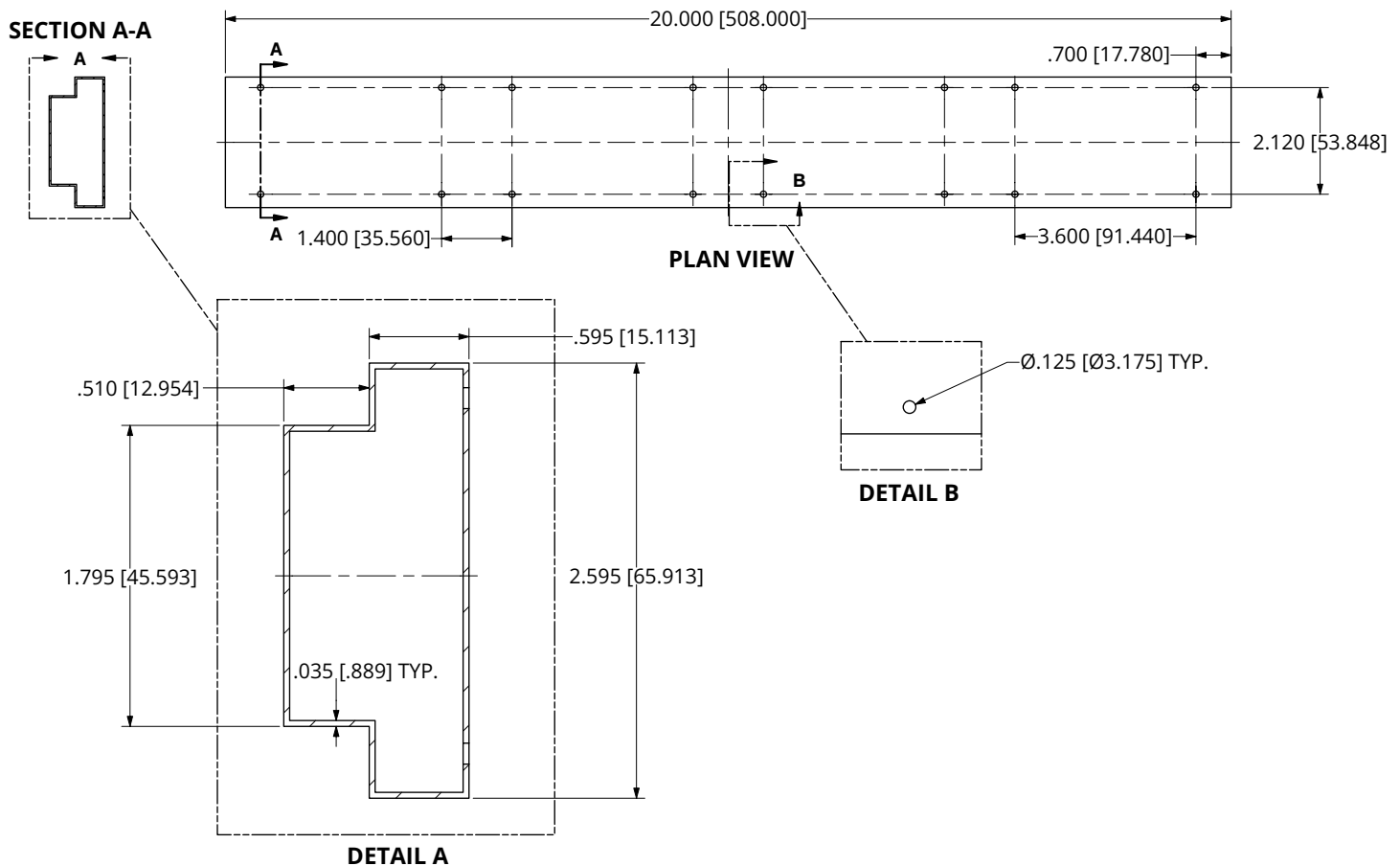
MECHANICAL DRAWINGS

HEAT SINK ASSEMBLY

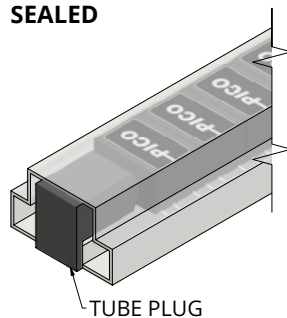


ITEM	QTY	DESCRIPTION
1	1	CH OR CV HEAT SINK
2	1	TI THERMAL INTERFACE
3	1	HP MODULE
4	1	PCB

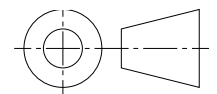
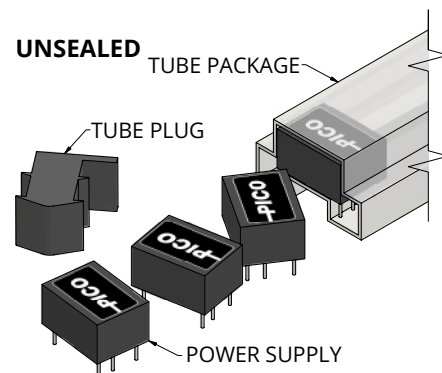
TUBE PACKAGING



SEALED



UNSEALED



Pico warrants each product manufactured by us and sold by us or an authorized representative, to be free from defects in material and workmanship. If properly used, it will perform within its applicable specifications for a period of one year after original shipment. Pico's obligation under this guarantee is limited to repairing or replacing our product to the original purchaser. This warranty is in lieu of all other warranties, express or implied and constitutes fulfillment of our obligations to the purchaser. We do not guarantee that the products can be used for a particular purpose other than those solely covered by the product's specifications. Pico must be notified if the product must meet particular certifications and/or standards. We assume no liability, in any event, for consequential damages, for anticipated or lost profits, incidental damages or loss of time or other losses incurred by the purchaser or any third party in connection with products covered by this warranty or otherwise. The purchaser will indemnify and hold Pico harmless for any damages, losses, costs, etc. from usage not within the product's specifications. Pico must be consulted before usage of its products in a nuclear, radioactive or space environment.

We reserve the right to discontinue products without notice, We reserve the right to make modifications to any existing catalog products without notice, at any time, without the obligation to modify units previously sold.

Series DC1 · DC2A & DC2B

300W Isolated Regulated High Power DC-DC Converter

PICO
Electronics, Inc.

PRODUCT OVERVIEW

The DC1, DC2A & DC2B series are isolated DC-DC converters with a wide selection of input voltage ranges from 120V to 1200V and output power up to 300W. These modules have sense feature to accurately regulate the voltage at a remote load. Input is protected against reverse polarity.

The full brick case size has threaded inserts to mount securely for high vibration and shock applications. Conduction cooling is available through the baseplate or compatible heat sink.



FEATURES

- 120V to 1200V input range models
- 5V to 300V output models
- Up to 300W output
- Input/output isolation
- Parallel operation option
- Remote Sense feature
- Input reverse polarity protection
- Fixed operating frequency
- No external components required

Contact Pico for part number of available options:

- Expanded operating temp: -40°C to +85°C
- Select screening per MIL-STD-883:
 - Stabilization Bake
 - Temperature Cycle
 - Burn-In
- Special Input Voltage, Output Voltage, Isolation Voltage or Output Power

DC1

INPUT VOLTAGE RANGE

DC1 = 120 - 370V

DC2A = 350 - 700V

DC2B = 700 - 1200V

-28S

NOMINAL OUTPUT VOLTAGE

-5S = 5V

-9S = 9V

-12S = 12V

-15S = 15V

-24S = 24V

-28S = 28V

-48S = 48V

-100S = 100V

-125S = 125V

-150S = 150V

-175S = 175V

-200S = 200V

-225S = 225V

-250S = 250V

-275S = 275V

-300S = 300V

MODEL LIST

Pico Part Number			Output Voltage [VDC]	Output Current		Output Power [W]	Efficiency ⁽¹⁾ [%] typ.	Output Ripple @ 1MHz BW [mVp-p] max	Output Voltage Tolerance ⁽¹⁾ [±%]
120-370V Input Range	350-700V Input Range	700-1200V Input Range		Min. [A]	Max. [A]				
DC1-5S	DC2A-5S	DC2B-5S	5	0	30	150	76	100	1
DC1-9S	DC2A-9S	DC2B-9S	9		27.8	250	78	100	1
DC1-12S	DC2A-12S	DC2B-12S	12		25	300	80	150	0.5
DC1-15S	DC2A-15S	DC2B-15S	15		20	300	80	150	0.5
DC1-24S	DC2A-24S	DC2B-24S	24		12.5	300	81	250	0.5
DC1-28S	DC2A-28S	DC2B-28S	28		10.71	300	82	300	0.5
DC1-48S	DC2A-48S	DC2B-48S	48		6.25	300	82	500	0.5
DC1-100S	DC2A-100S	DC2B-100S	100		2.5	250	85	250	1
DC1-125S	DC2A-125S	DC2B-125S	125		2			250	1
DC1-150S	DC2A-150S	DC2B-150S	150		1.67			350	1
DC1-175S	DC2A-175S	DC2B-175S	175		1.43			350	1
DC1-200S	DC2A-200S	DC2B-200S	200		1.25			400	1
DC1-225S	DC2A-225S	DC2B-225S	225		1.11			400	1
DC1-250S	DC2A-250S	DC2B-250S	250		1			500	1
DC1-275S	DC2A-275S	DC2B-275S	275		0.91			500	1
DC1-300S	DC2A-300S	DC2B-300S	300		0.83			500	1

Note 1: Tested at nominal input voltage and full output load.

SPECIFICATIONS (Nominal V_{IN} , Full Load, $T_A = +25^{\circ}\text{C}$, 1 hour warm up unless otherwise specified)**INPUT**

Parameter	Condition	Min.	Typ.	Max.	Units
Input Voltage Range	Series DC1	120	200	370	VDC
	Series DC2A	350	500	700	
	Series DC2B	700	900	1200	

OUTPUT

Parameter	Condition	Min.	Typ.	Max.	Units
Line Regulation	≤48V Output Models	-	0.5	-	±%
	≥100V Output Models	-	1	-	
Load Regulation	10-100% load	≤15V Output Models	-	1.5	±%
		≥24V Output Models	-	1	

ENVIRONMENTAL

Parameter	Condition	Min.	Typ.	Max.	Units
Operating Temperature Range	Baseplate	0	-	+85	°C
Storage Temperature Range		-55	-	+105	°C
Cooling	Conduction through baseplate				

SPECIFICATIONS (Nominal V_{IN} , Full Load, $T_A = +25^{\circ}\text{C}$, 1 hour warm up unless otherwise specified)**GENERAL**

Parameter	Condition	Min.	Typ.	Max.	Units
Operating Frequency		-	100	-	kHz
Isolation Voltage	Input to output	4242	-	-	VDC
	Input/output to baseplate	2121	-	-	
Size	L x W x H	4.6 x 2.5 x 0.8 (116.9 x 63.5 x 20.32)			inches (mm)
Weight		-	340	-	grams
Case	Aluminum baseplate and Glass Reinforced Polymer				
Potting	Vacuum Impregnated Epoxy				
Box Packaging (W x L x H)	8 x 7.5 x 1.5 (203.2 x 190.5 x 38.1) or 12 x 9 x 1.5 (304.8 x 228.6 x 38.1)				inches (mm)

PROTECTIONS & FEATURES

Parameter	Condition		Min.	Typ.	Max.	Units
Output Current Limit	Set Point		-	130	-	%
Short circuit	Continuous, auto-recovery					
Overtemperature	Baseplate, self-recovery	Shutdown	-	95	-	$^{\circ}\text{C}$
		Restart	-	50	-	
Input Under Voltage	Non-latched shutdown Self-recovery	Series DC2A Shutdown	-	314	-	VDC
		Series DC2A Restart	-	320	-	
		Series DC2B Shutdown	-	657	-	
		Series DC2B Restart	-	670	-	
Input Over Voltage	Non-latched shutdown Self-recovery	Series DC2A Shutdown	-	720	-	VDC
		Series DC2A Restart	-	705	-	
		Series DC2B Shutdown	-	1230	-	
		Series DC2B Restart	-	1206	-	
Remote Sense Compensation			-	-	1	VDC

DESIGNED TO MEET

Test	Referenced Standard	Description
Vibration	MIL-STD-202	Method 204, Vibration, High Frequency, Condition D
Shock	MIL-STD-202	Method 213, Shock (Specified Pulse), Condition I
Humidity	MIL-STD-202	Method 106, Moisture Resistance
Altitude	MIL-STD-202	Method 105, Barometric Pressure (Reduced), Condition D

OPTIONS AVAILABLE – CONTACT PICO FOR PART NUMBER

Parameter	Referenced Standard	Description
Stabilization Bake	MIL-STD-883	Referenced Method 1008 Non-operating maximum storage temperature for 24 hours
Temperature Cycle	MIL-STD-883	Referenced Method 1010 Non-operating at temperature extremes, 15 mins/temp, 10 cycles
Burn-In	MIL-STD-883	Referenced Method 1015 Max operating temperature for 160 hours
Expanded Operating Temperature Range	-40°C to +85°C	

THERMAL RESISTANCE

$$P_{OUT} = \frac{T_C - T_A}{T_{RCA} \times (1/\eta - 1)}$$

P_{OUT} = Output Power in Watts

η = Efficiency

T_C = Case temperature in °C

T_A = Ambient temperature in °C

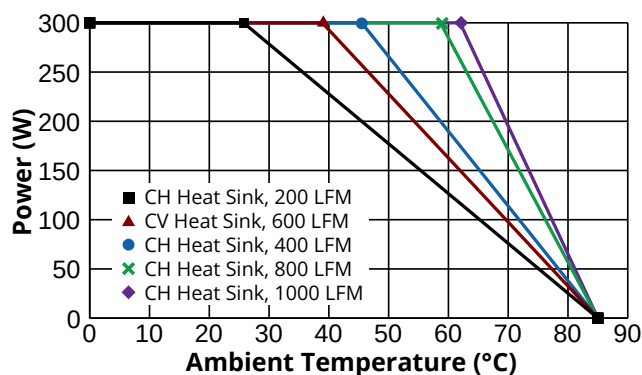
T_{RCA} = Thermal resistance of case to air in °C/W

Thermal resistance of case (T_{RCA})

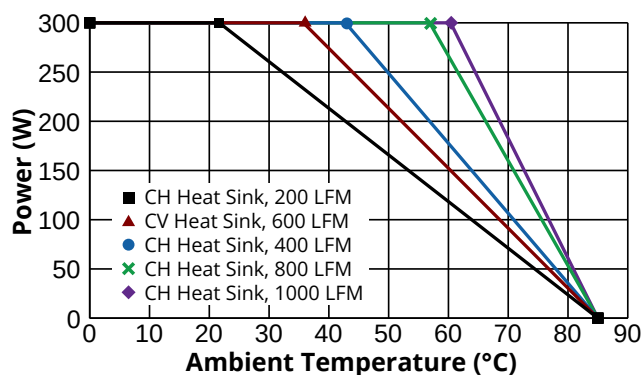
Airflow	Baseplate only	CV Heat Sink	CH Heat Sink	Units
Free Air	4.80	3.30	2.80	°C/W
200 LFM	2.60	1.60	0.90	
400 LFM	1.60	1.00	0.60	
600 LFM	1.30	0.70	0.50	
800 LFM	1.10	0.60	0.40	
1000 LFM	0.90	0.50	0.35	

DERATING GRAPHS (Nominal V_{IN} , Full Load, Efficiency @ Full Load)

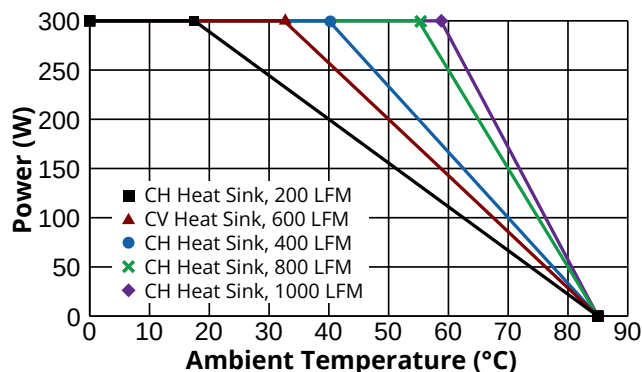
**Models with Max. Output Power = 300W
& Efficiency at full load = 82%**



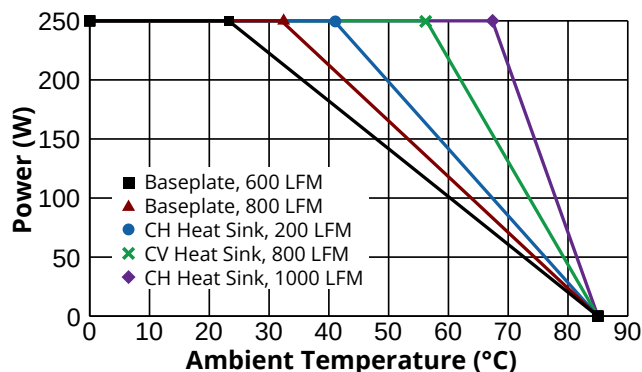
**Models with Max. Output Power = 300W
& Efficiency at full load = 81%**

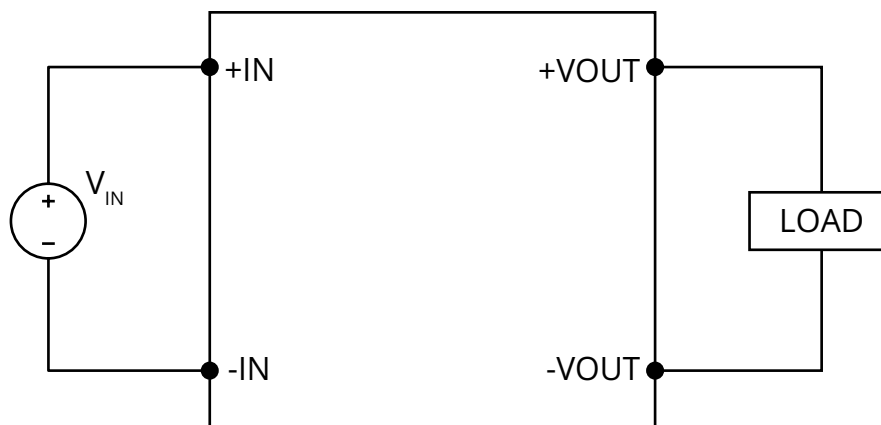
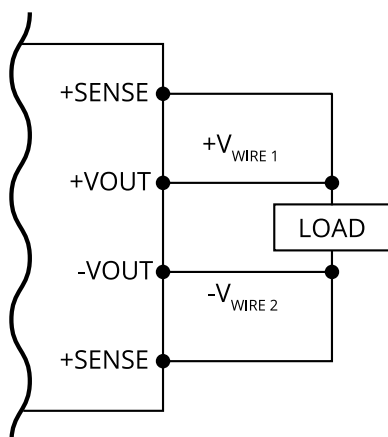


**Models with Max. Output Power = 300W
& Efficiency at full load = 80%**



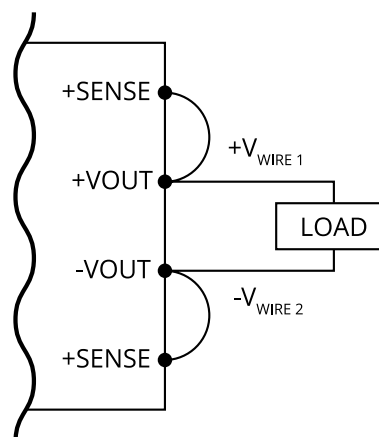
**Models with Max. Output Power = 250W
& Efficiency at full load = 85%**



TYPICAL CONNECTION CIRCUIT**≥ 100V OUTPUT MODELS****SENSE - ≤ 48V OUTPUT MODELS****REMOTE SENSE**

$$V_{OUT} = V_{LOAD} + V_{WIRE1} + V_{WIRE2}$$

The positive remote sense (+SENSE) should be connected to the positive output (+VOUT) at the physical load location. The negative remote sense (-SENSE) should be connected to the negative output (-VOUT) at the physical load location. VOUT may compensate up to 1V of drop in the load wires. Voltage will be regulated at the load.

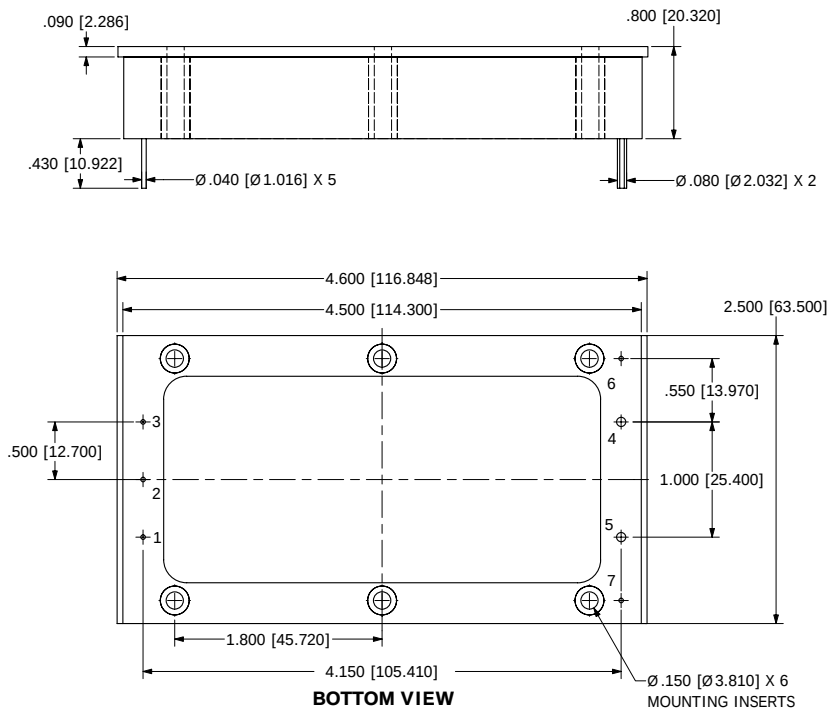
LOCAL SENSE

$$V_{LOAD} = V_{OUT} - V_{WIRE1} - V_{WIRE2}$$

Alternatively, for local sense, +SENSE should be connected to +VOUT and -SENSE should be connected to -VOUT at the output terminals. Voltage will be regulated at the output terminals.

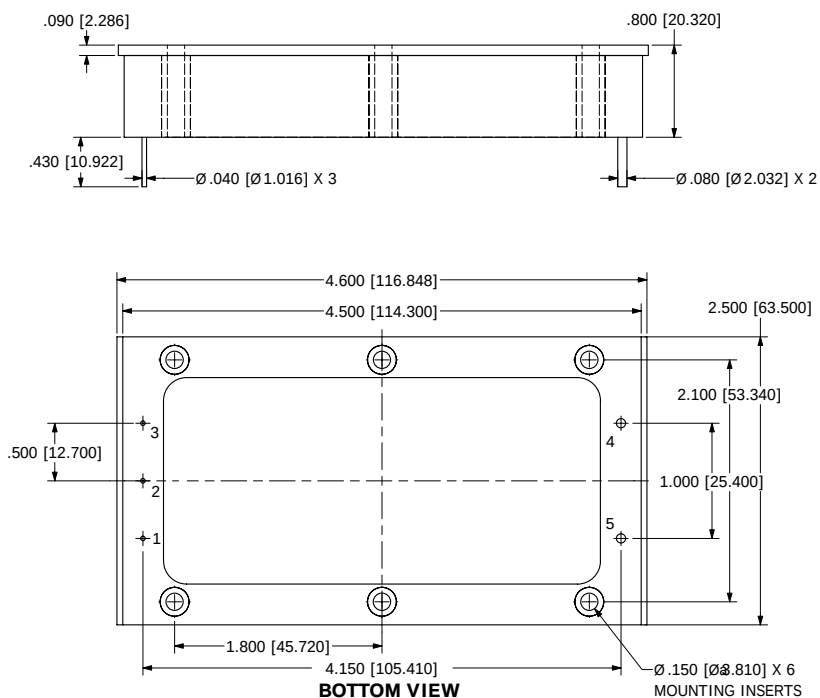
MECHANICAL DRAWINGS

≤48V OUTPUT MODELS



PIN	FUNCTION	PIN DIAMETER
1	+IN	.040 [1.016]
2	-IN	.040 [1.016]
3	N/C	.040 [1.016]
4	-VOUT	.080 [2.032]
5	+VOUT	.080 [2.032]
6	-SENSE	.040 [1.016]
7	+SENSE	.040 [1.016]

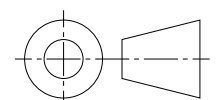
≥100V OUTPUT MODELS

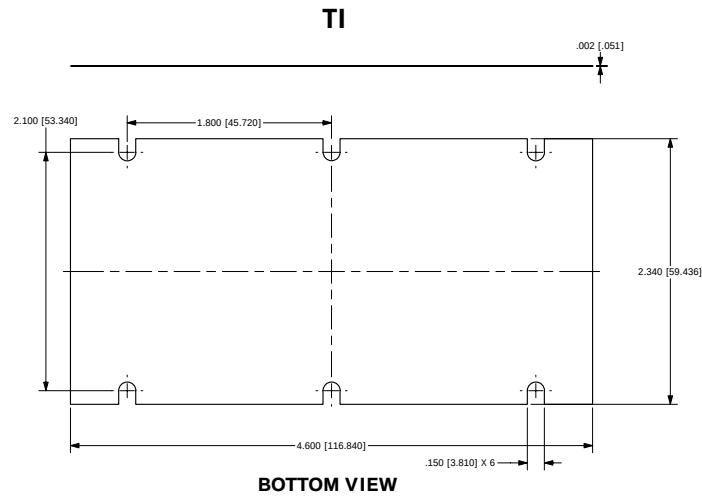


PIN	FUNCTION	PIN DIAMETER
1	+IN	.040 [1.016]
2	-IN	.040 [1.016]
3	N/C	.040 [1.016]
4	-VOUT	.080 [2.032]
5	+VOUT	.080 [2.032]

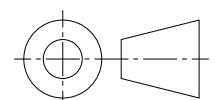
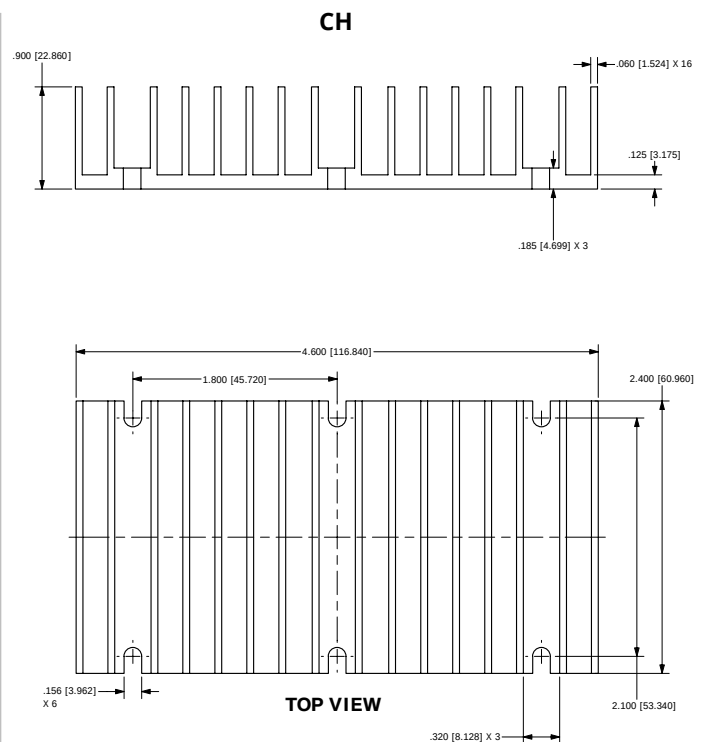
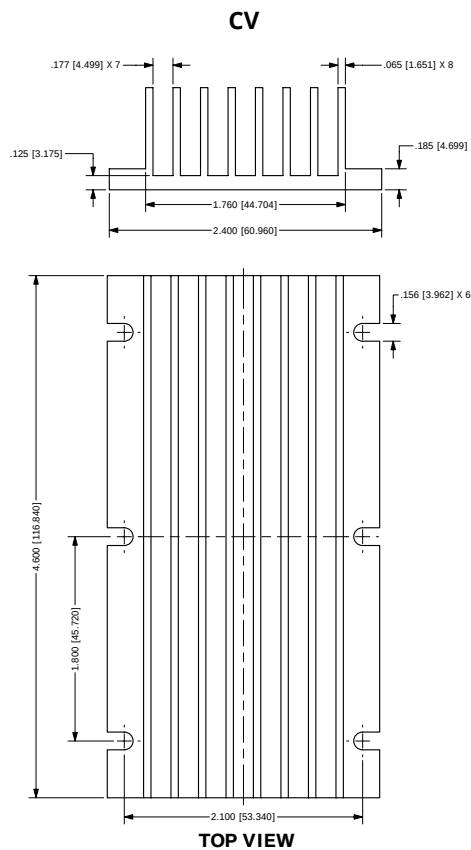
NOTES

- ALL DIMENSIONS ARE IN INCHES, [] = MM
- RECOMMENDED TORQUE FOR MOUNTING SCREWS: 6-9 INCH-LBS



MECHANICAL DRAWINGS**THERMAL INTERFACE**

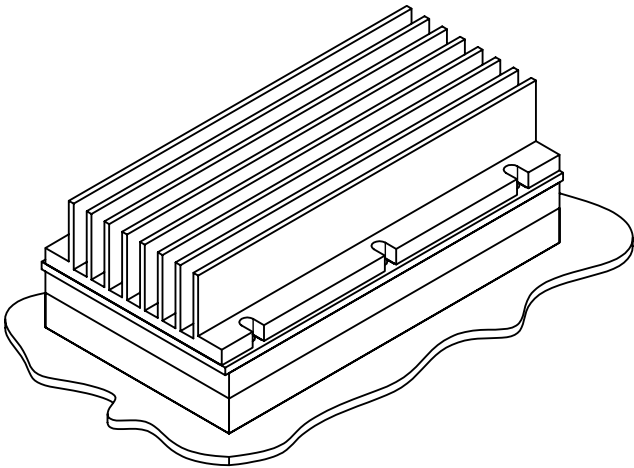
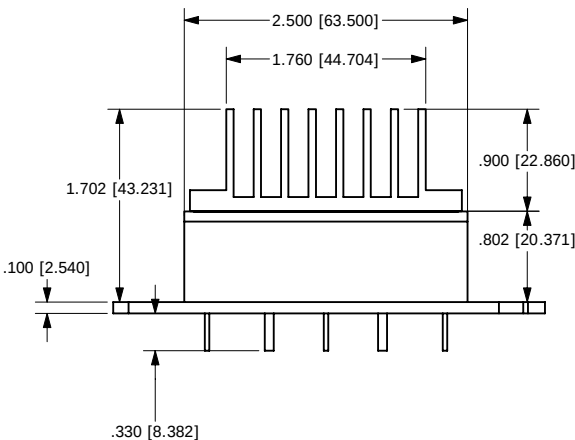
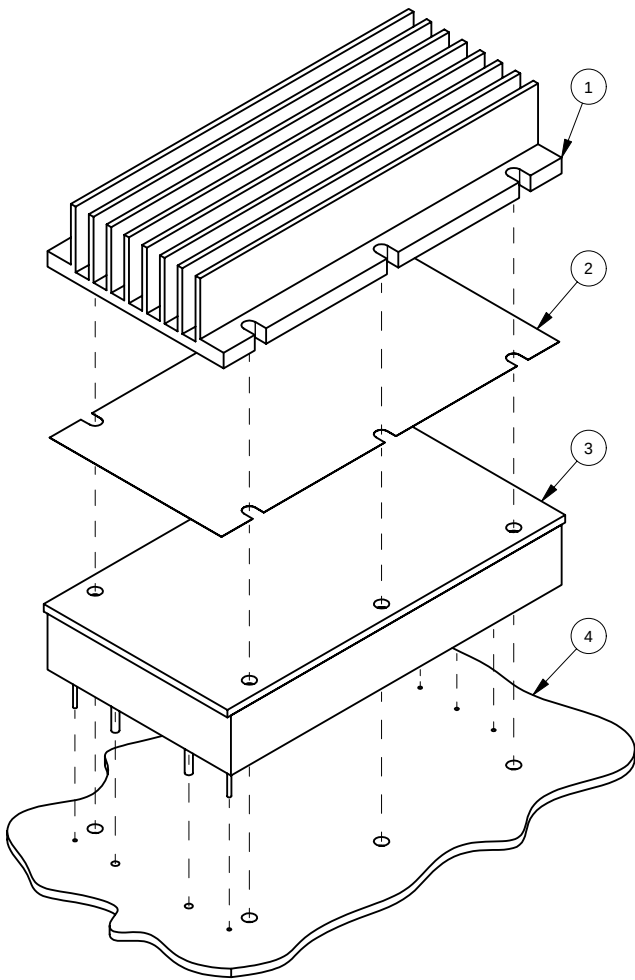
Material	Alloy Aluminum Substrate
Thermal Conductivity	1530 BTU-in/hr sq.ft °F
Coefficient of Thermal Expansion, (25-100°C)	13.1 10 ⁻⁶ in-in/°F
Brinell Hardness	23 HB
Endurance Limit	5000 PSI
Standard Thickness	0.002 inches

HEAT SINKS

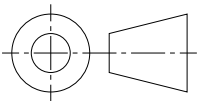
Weight: 145 grams typical

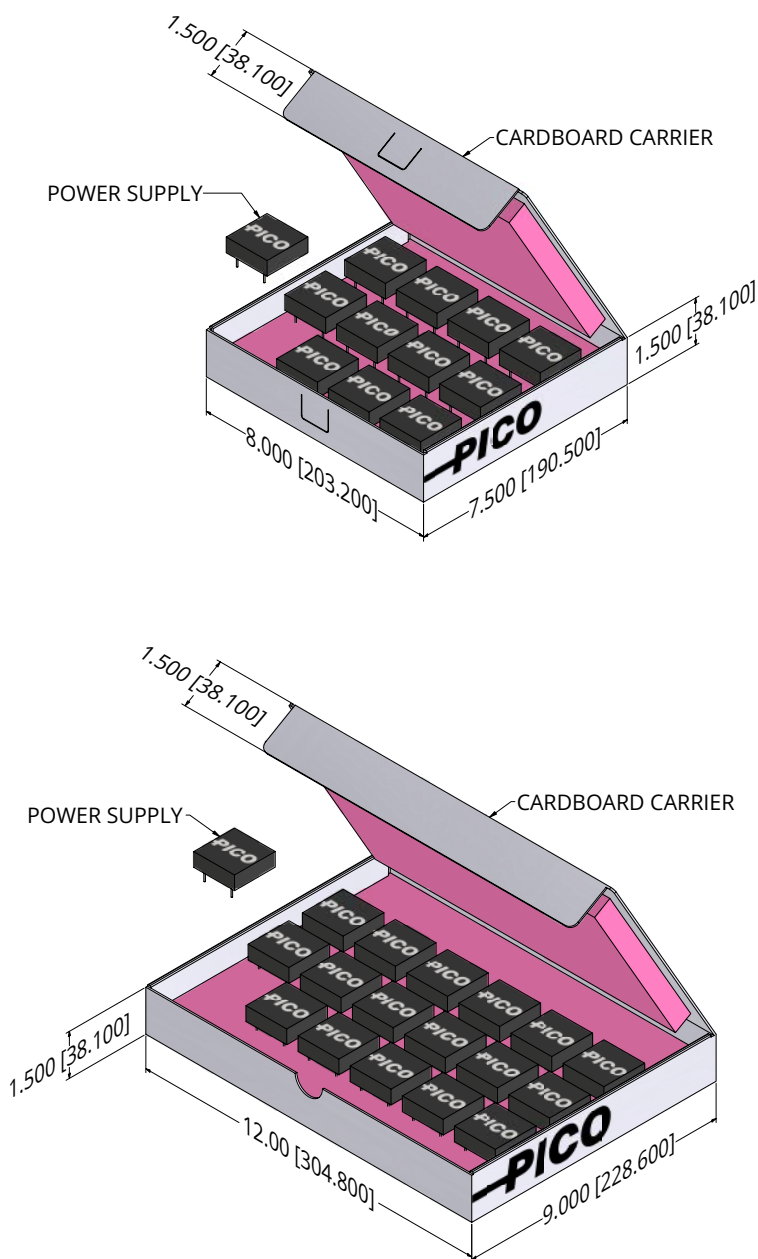
MECHANICAL DRAWINGS

HEAT SINK ASSEMBLY



ITEM	QTY	DESCRIPTION
1	1	CH OR CV HEAT SINK
2	1	TI THERMAL INTERFACE
3	1	DC1, DC2A OR DC2B MODULE
4	1	PCB





Pico warrants each product manufactured by us and sold by us or an authorized representative, to be free from defects in material and workmanship. If properly used, it will perform within its applicable specifications for a period of one year after original shipment. Pico's obligation under this guarantee is limited to repairing or replacing our product to the original purchaser. This warranty is in lieu of all other warranties, express or implied and constitutes fulfillment of our obligations to the purchaser. We do not guarantee that the products can be used for a particular purpose other than those solely covered by the product's specifications. Pico must be notified if the product must meet particular certifications and/or standards. We assume no liability, in any event, for consequential damages, for anticipated or lost profits, incidental damages or loss of time or other losses incurred by the purchaser or any third party in connection with products covered by this warranty or otherwise. The purchaser will indemnify and hold Pico harmless for any damages, losses, costs, etc. from usage not within the product's specifications. Pico must be consulted before usage of its products in a nuclear, radioactive or space environment.

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Series XP

300W Isolated Regulated High Power DC-DC Converter

PRODUCT OVERVIEW

The XP series are isolated DC-DC converters with 2:1 input voltage ranges and high 300W output power in a low profile full brick size - 4.6" x 2.4" x 0.5". These modules have trim capability, shutdown features and frequency sync. Protections include input overvoltage, output short-circuit, output overvoltage and over temperature.

The case has six threaded inserts to mount securely for high vibration and shock applications. Conduction cooling is available through the baseplate or compatible heat sink.



FEATURES

- 2:1 input range models
- 3.3V to 28V output models
- Up to 300W output
- Input/output isolation
- Single outputs
- Up to +85°C baseplate operating temperature
- Trim capability
- Remote shutdown feature
- Operating Frequency sync feature
- Fixed operating frequency
- No external components required

Contact Pico for part number of available options:

- Expanded operating temp: -55°C to +85°C
- Select screening per MIL-STD-883:
 - Stabilization Bake
 - Temperature Cycle
 - Burn-In
- Special Input Voltage, Output Voltage, Isolation Voltage or Output Power

XP	A	-28S
SERIES NAME	INPUT VOLTAGE RANGE	NOMINAL OUTPUT VOLTAGE
XP	A = 18 - 36V B = 36 - 72V	-3.3S = 3.3V -5S = 5V -9S = 9V -12S = 12V -15S = 15V -24S = 24V -28S = 28V

MODEL LIST

Pico Part Number	Output Voltage [VDC]	Output Current		Output Power [W]	Efficiency ⁽¹⁾ [%] typ.	Input Current ⁽¹⁾ [A]	Line Regulation [±%] max	Load Regulation 10-100% ⁽²⁾ [±%] max	Output Ripple @ 1MHz BW [mVp-p] max	Output Voltage Tolerance ⁽¹⁾ [±%]
		Min. [A]	Max. [A]							
XPA3.3S	3.3	2.5	25	82.5	78	3.78	0.5	0.75	50	1
XPA5S	5	2.5	25	125	80	5.58	0.5	0.5	50	0.75
XPA5.2S	5.2	2.4	24	125	80	5.58	0.5	0.5	50	0.75
XPA9S	9	1.94	19.4	175 ⁽³⁾	83	7.53	0.5	0.5	50	0.5
XPA12S	12	1.67	16.7	200 ⁽³⁾	84	8.5	0.5	0.5	50	0.5
XPA15S	15	1.33	13.3	200 ⁽³⁾	85	8.4	0.5	0.5	50	0.5
XPA24S	24	0.938	9.38	225 ⁽³⁾	86	9.34	0.2	0.3	75	0.3
XPA28S	28	0.804	8.04	225 ⁽²⁾	86	9.34	0.2	0.3	75	0.3
XPB3.3S	3.3	3.03	30.3	100	79	3.86	0.5	0.75	50	1
XPB5S	5	3	30	150	81	3.86	0.5	0.5	50	0.75
XPB5.2S	5.2	2.88	28.8	150	81	3.86	0.5	0.5	50	0.75
XPB9S	9	2.78	27.8	250	85	6.13	0.5	0.5	50	0.5
XPB12S	12	2.29	22.9	275	86	6.67	0.5	0.5	50	0.5
XPB15S	15	1.83	18.3	275	86	6.67	0.5	0.5	50	0.5
XPB24S	24	1.25	12.5	300	86	7.27	0.2	0.3	75	0.3
XPB28S	28	1.07	10.7	300	87	7.18	0.2	0.3	75	0.3

Note 1: Tested at nominal input voltage and full output load.

Note 2: Maintain minimum 10% of rated load to prevent a voltage surge.

Note 3: Deate 10% power per input voltage for 18-21V

SPECIFICATIONS (Nominal V_{IN} , Full Load, $T_A = +25^{\circ}\text{C}$, 1 hour warm up unless otherwise specified)**INPUT**

Parameter	Condition	Min.	Typ.	Max.	Units
Input Voltage Range	XPA models	18	28	36	VDC
	XPB models	36	48	72	

ENVIRONMENTAL

Parameter	Condition	Min.	Typ.	Max.	Units
Operating Temperature Range	Baseplate	0	-	+85	$^{\circ}\text{C}$
Storage Temperature Range		-55	-	+105	$^{\circ}\text{C}$
Cooling	Conduction through baseplate				

GENERAL

Parameter	Condition	Min.	Typ.	Max.	Units
Operating Frequency		-	300	-	kHz
Isolation Voltage	Input to output	2000	-	-	VDC
	Input to baseplate	2000	-	-	
	Output to baseplate	1000	-	-	
Insulation Resistance		100	-	-	M Ω
Size	L x W x H	4.6 x 2.5 x 0.5 (116.84 x 63.5 x 12.7)			inches (mm)
Weight		-	210	-	grams
Case	Aluminum baseplate and Glass Reinforced Polymer				
Potting	Vacuum Impregnated Epoxy				
Tube Packaging (W x H x L)	2.595 x 1.105 x 20 (65.913 x 28.067 x 101.6)				inches (mm)

PROTECTIONS & FEATURES

Parameter	Condition	Min.	Typ.	Max.	Units
Short circuit or Overload	Hiccup mode, self-recovery	110	-	120	%
Overtemperature	Baseplate, self-recovery	Shutdown	95	-	$^{\circ}\text{C}$
		Restart	50	-	
Output Overvoltage	Zener diode clamp	-	120	-	%
Shutdown (SHUTDOWN)	Non-latched shutdown, Self-recovery	2.5	-	7	VDC
Output Voltage Trim (TRIM, TRIM UP & TRIM DOWN)		-5	0	5	%
Remote Sense Compensation		-	-	1	VDC

Note 3: The parallel option allows units to operate the outputs in parallel to share load, increase total power or allow for N+1 redundancy.v

SPECIFICATIONS (Nominal V_{IN} , Full Load, $T_A = +25^\circ\text{C}$, 1 hour warm up unless otherwise specified)**DESIGNED TO MEET**

Test	Referenced Standard	Description
Vibration	MIL-STD-202	Method 204, Vibration, High Frequency, Condition D
Shock	MIL-STD-202	Method 213, Shock (Specified Pulse), Condition I
Humidity	MIL-STD-202	Method 106, Moisture Resistance
Altitude	MIL-STD-202	Method 105, Barometric Pressure (Reduced), Condition D

OPTIONS AVAILABLE – CONTACT PICO FOR PART NUMBER

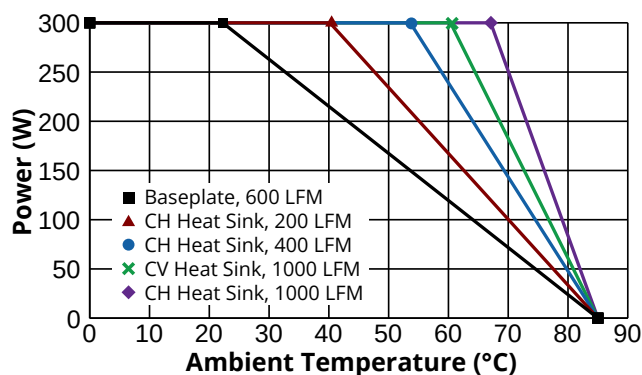
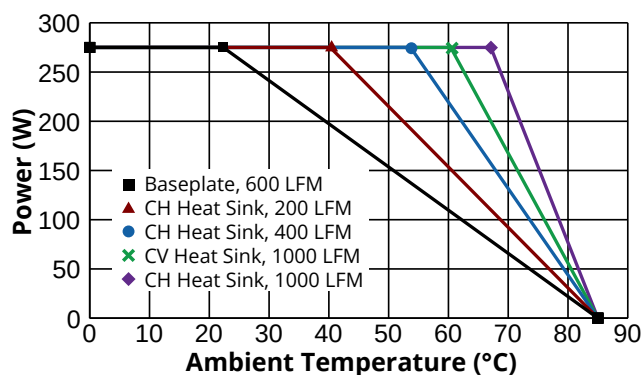
Parameter	Referenced Standard	Description
Stabilization Bake	MIL-STD-883	Referenced Method 1008 Non-operating maximum storage temperature for 24 hours
Temperature Cycle	MIL-STD-883	Referenced Method 1010 Non-operating at temperature extremes, 15 mins/temp, 10 cycles
Burn-In	MIL-STD-883	Referenced Method 1015 Max operating temperature for 160 hours
Expanded Operating Temperature Range		-55°C to +85°C

THERMAL RESISTANCE

$$P_{OUT} = \frac{T_C - T_A}{T_{RCA} \times (1 / \eta - 1)}$$

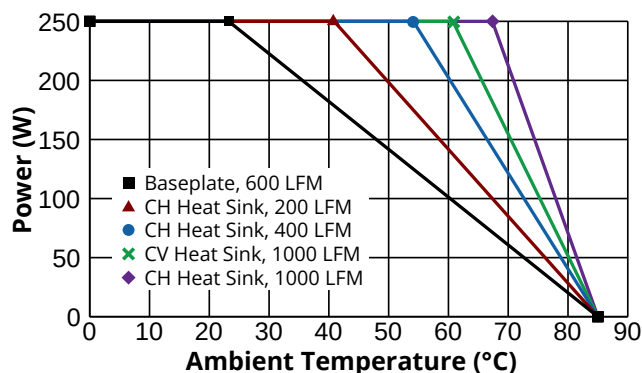
 P_{OUT} = Output Power in Watts η = Efficiency T_C = Case temperature in $^\circ\text{C}$ T_A = Ambient temperature in $^\circ\text{C}$ T_{RCA} = Thermal resistance of case to air in $^\circ\text{C} / \text{W}$ **Thermal resistance of case (T_{RCA})**

Airflow	Baseplate only	CV Heat Sink	CH Heat Sink	Units
Free Air	5.1	3.5	3.0	$^\circ\text{C} / \text{W}$
200 LFM	2.8	1.8	1	
400 LFM	1.8	1.1	0.7	
600 LFM	1.4	0.8	0.55	
800 LFM	1.2	0.65	0.45	
1000 LFM	1	0.55	0.4	

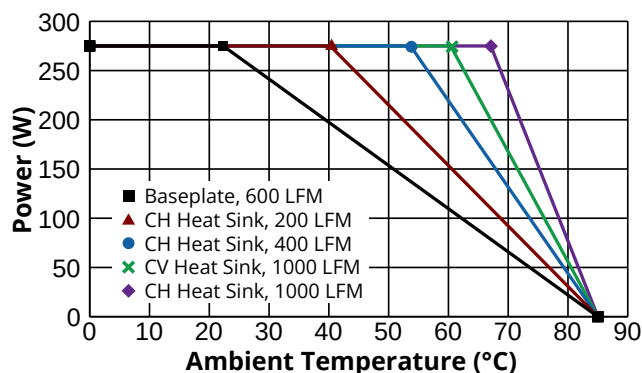
DERATING GRAPHS (Nominal V_{IN} , Full Load, Efficiency @ Full Load)**Models with Max. Output Power = 300W
& Efficiency at full load = 87%****Models with Max. Output Power = 275W
& Efficiency at full load = 86%**

DERATING GRAPHS

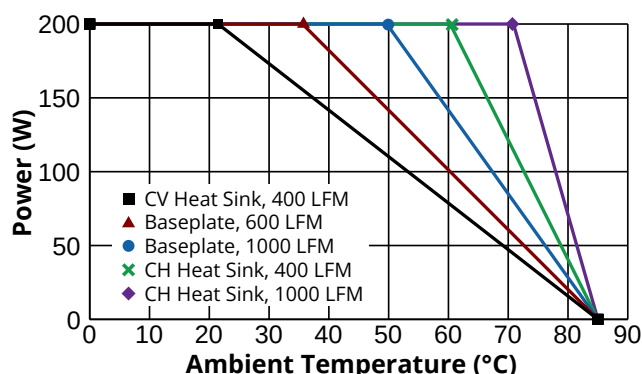
**Models with Max. Output Power = 250W
& Efficiency at full load = 85%**



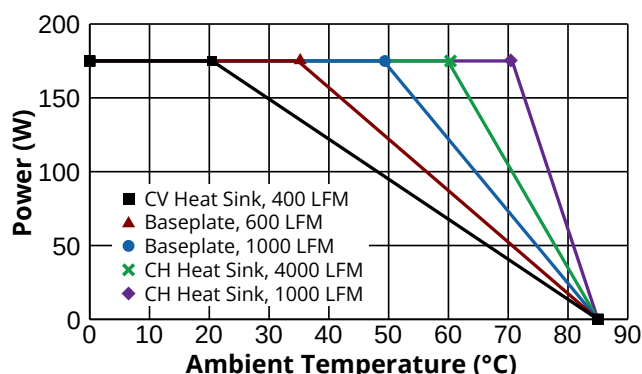
**Models with Max. Output Power = 275W
& Efficiency at full load = 86%**



**Models with Max. Output Power = 200W
& Efficiency at full load = 85%**

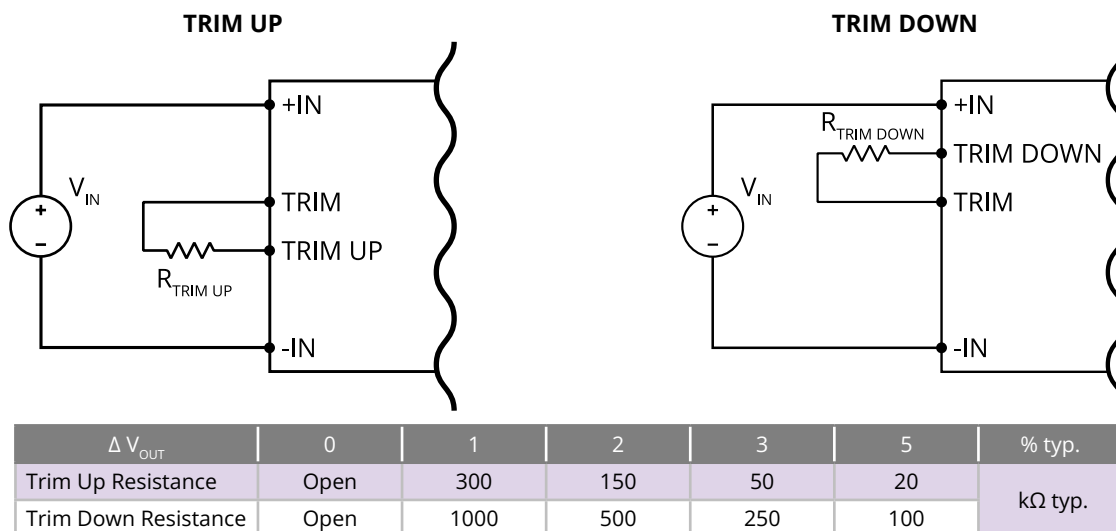


**Models with Max. Output Power = 175W
& Efficiency at full load = 83%**



TYPICAL CONNECTION CIRCUIT

TRIM

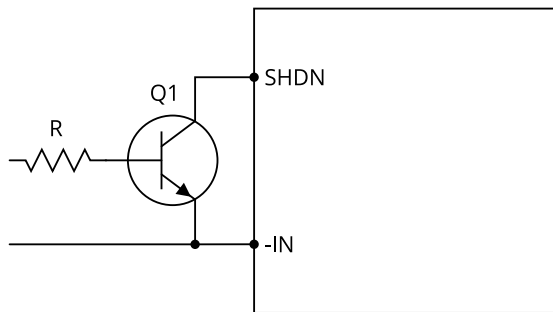


Note: Each individual unit will vary slightly. It is recommended to use a 1MΩ multi-turn trimmer potentiometer to determine resistance value and achieve desired adjustment. Use minimum 1/2W power rating resistor. Keep the trim resistor leads as short as possible to eliminate the stray inductance which will effect the trimming results.

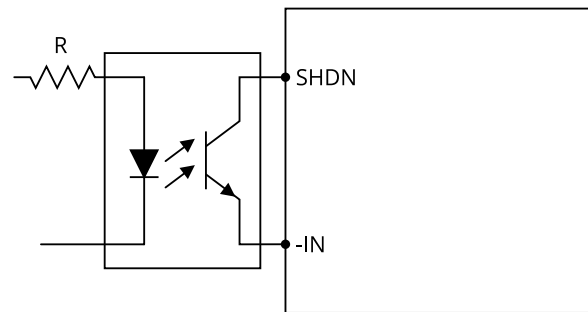
TYPICAL CONNECTION CIRCUIT

SHUTDOWN

NON-ISOLATED

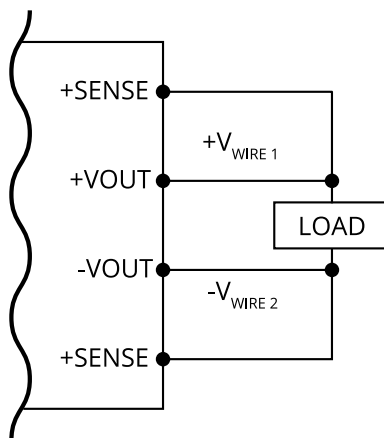


ISOLATED



SENSE

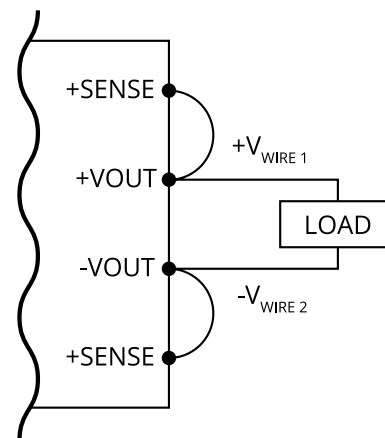
REMOTE SENSE



$$V_{OUT} = V_{LOAD} + V_{WIRE\ 1} + V_{WIRE\ 2}$$

The positive remote sense (+SENSE) should be connected to the positive output (+VOUT) at the physical load location. The negative remote sense (-SENSE) should be connected to the negative output (-VOUT) at the physical load location. VOUT may compensate up to 1V of drop in the load wires. Voltage will be regulated at the load.

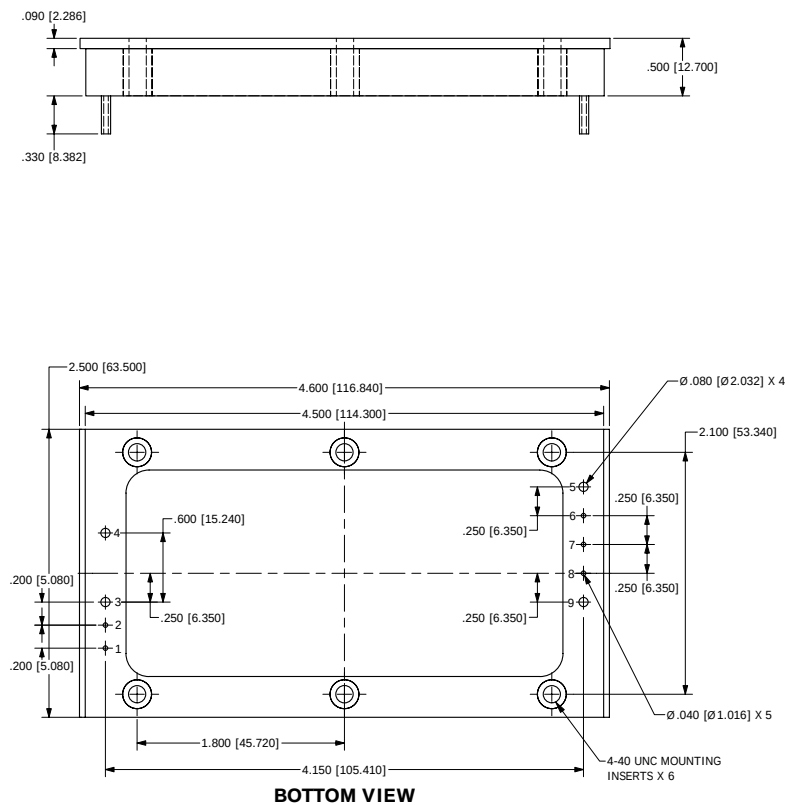
LOCAL SENSE



$$V_{LOAD} = V_{OUT} - V_{WIRE\ 1} - V_{WIRE\ 2}$$

Alternatively, for local sense, +SENSE should be connected to +VOUT and -SENSE should be connected to -VOUT at the output terminals. Voltage will be regulated at the output terminals.

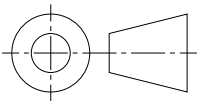
MECHANICAL DRAWINGS



PIN	FUNCTION	PIN DIAMETER
1	SYNC	.040 [1.016]
2	SHUT DOWN	.040 [1.016]
3	-IN	.080 [2.032]
4	+IN	.080 [2.032]
5	+OUT	.080 [2.032]
6	+SENSE	.040 [1.016]
7	TRIM	.040 [1.016]
8	-SENSE	.040 [1.016]
9	-OUT	.080 [2.032]

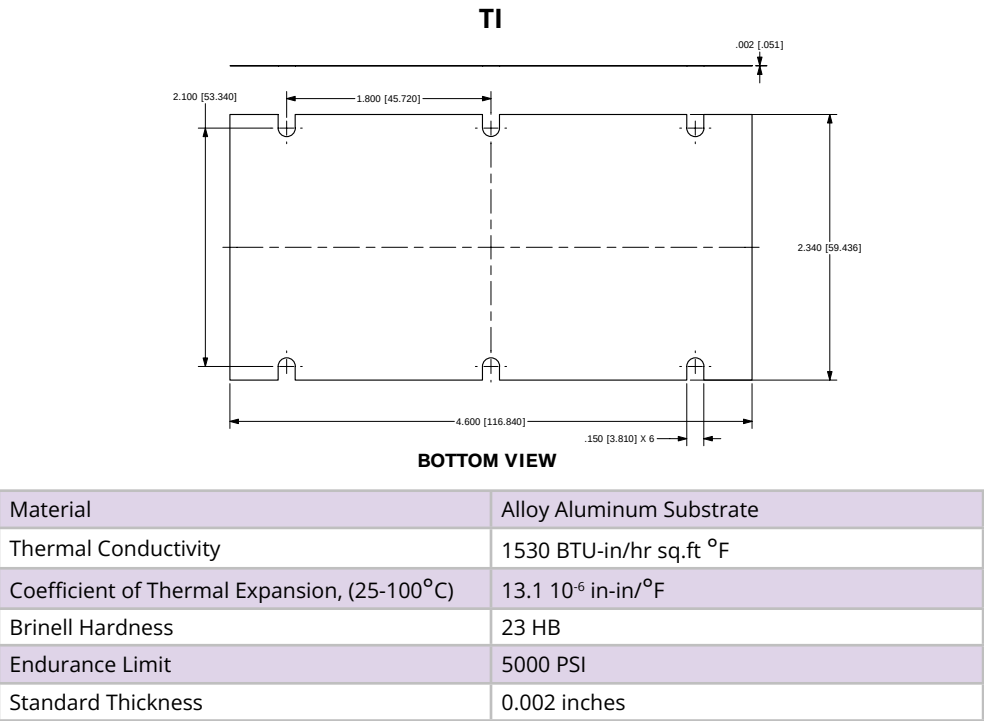
NOTES

- a. ALL DIMENSIONS ARE IN INCHES, [] = MM
- b. RECOMMENDED TORQUE FOR MOUNTING SCREWS: 6-9 INCH-LBS

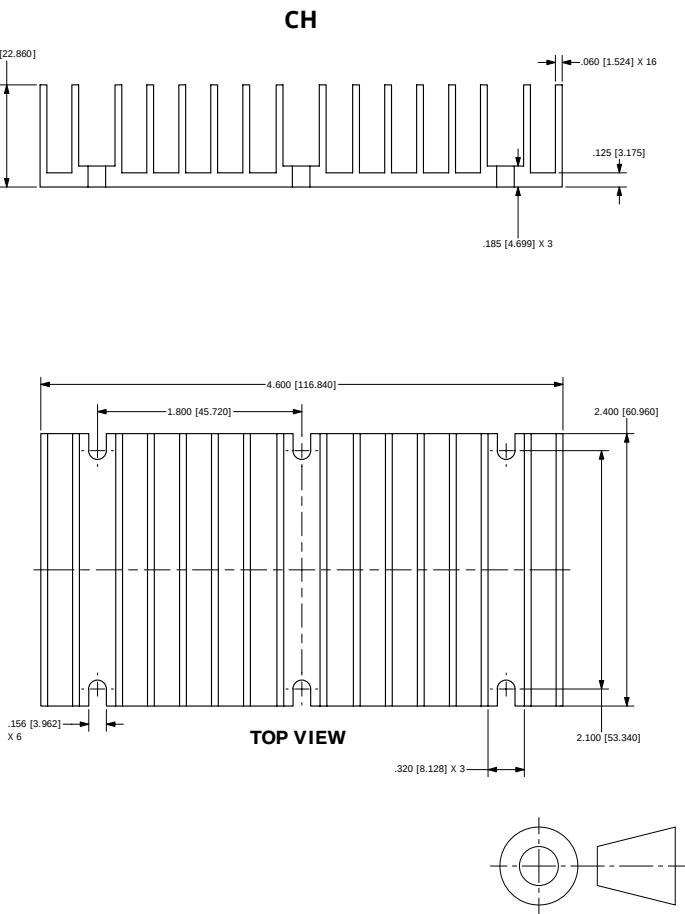
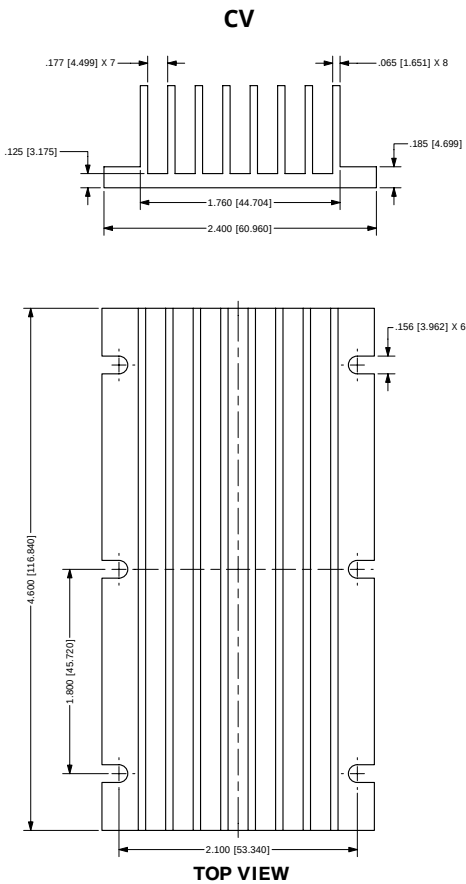


MECHANICAL DRAWINGS

THERMAL INTERFACE



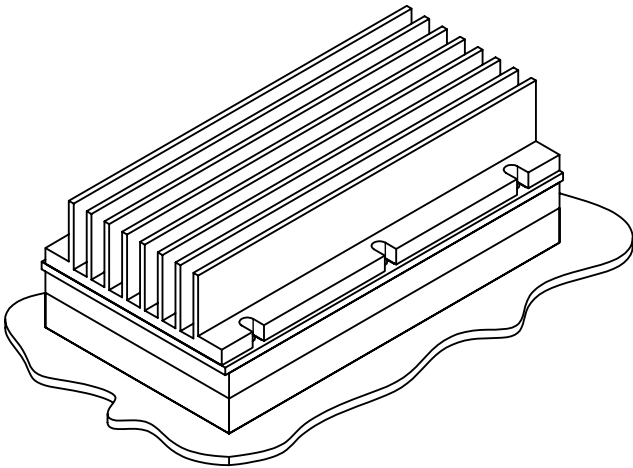
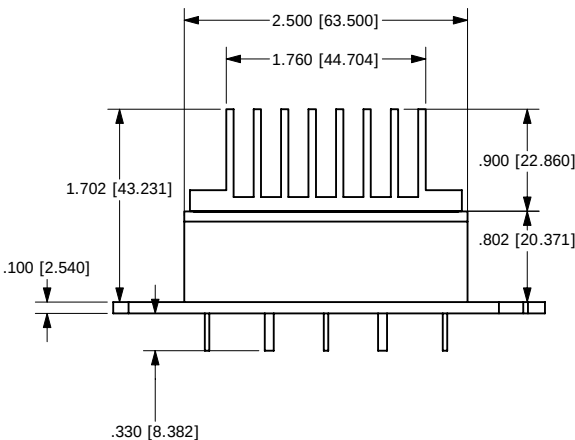
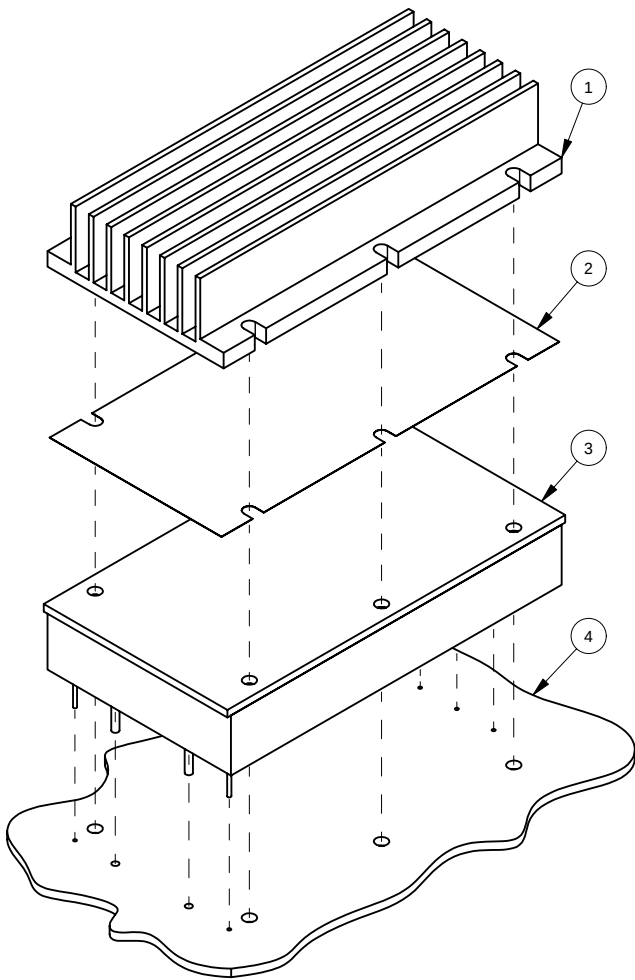
HEAT SINKS



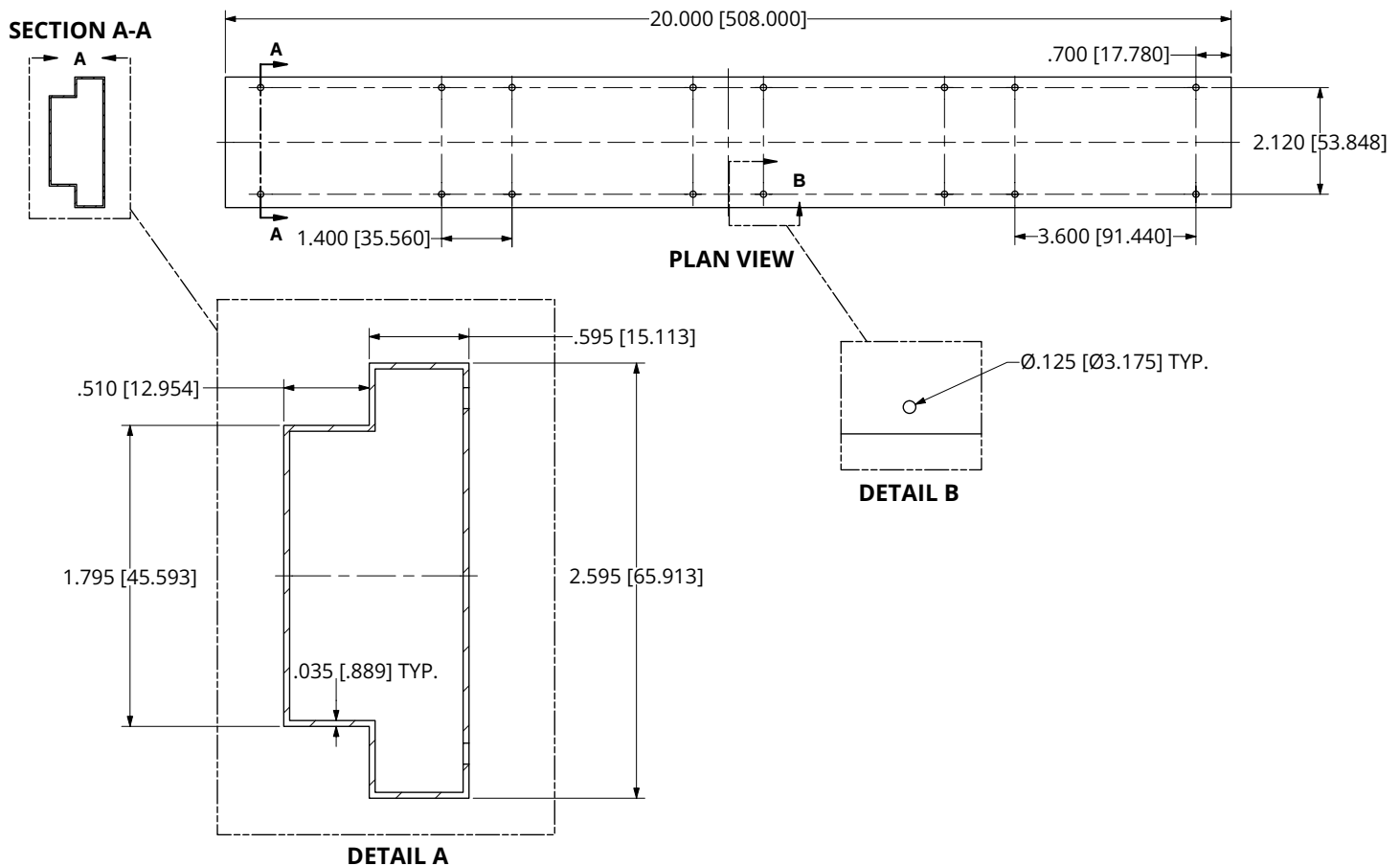
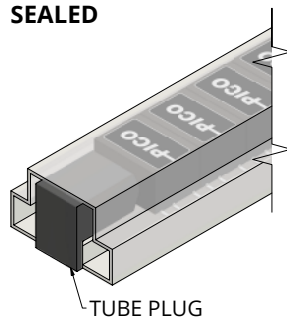
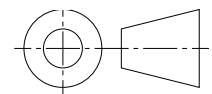
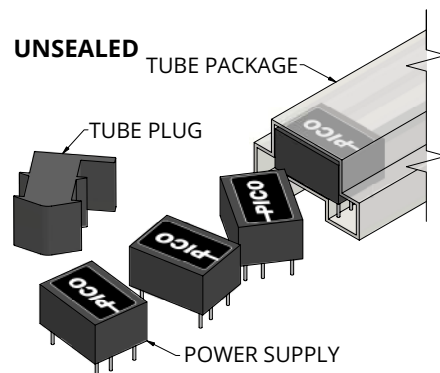
Weight: 145 grams typical

MECHANICAL DRAWINGS

HEAT SINK ASSEMBLY



ITEM	QTY	DESCRIPTION
1	1	CH OR CV HEAT SINK
2	1	TI THERMAL INTERFACE
3	1	XP MODULE
4	1	PCB

TUBE PACKAGING**SEALED****UNSEALED**

Pico warrants each product manufactured by us and sold by us or an authorized representative, to be free from defects in material and workmanship. If properly used, it will perform within its applicable specifications for a period of one year after original shipment. Pico's obligation under this guarantee is limited to repairing or replacing our product to the original purchaser. This warranty is in lieu of all other warranties, express or implied and constitutes fulfillment of our obligations to the purchaser. We do not guarantee that the products can be used for a particular purpose other than those solely covered by the product's specifications. Pico must be notified if the product must meet particular certifications and/or standards. We assume no liability, in any event, for consequential damages, for anticipated or lost profits, incidental damages or loss of time or other losses incurred by the purchaser or any third party in connection with products covered by this warranty or otherwise. The purchaser will indemnify and hold Pico harmless for any damages, losses, costs, etc. from usage not within the product's specifications. Pico must be consulted before usage of its products in a nuclear, radioactive or space environment.

We reserve the right to discontinue products without notice, We reserve the right to make modifications to any existing catalog products without notice, at any time, without the obligation to modify units previously sold.

AC-DC Power Supplies



AC-DC Power Supplies >

- Universal 85 to 265 VAC input range
- 115 VAC or 220VAC nominal inputs
- 47 to 440Hz input frequency
- 3 to 55 Watts output power
- Through hole or terminal strip mounting
- Compatible heatsink to extend temperature range



AC-DC with Power Factor Correction Modules >

- Universal 86 to 265 VAC input range
- Single or three phase inputs
- 47 to 440Hz input frequency
- Up to 0.99 Power Factor
- Isolated outputs up to 300VDC
- Non-isolated 365V regulated output
- 250 to 2000W output power
- Standard full brick packages (4.6" x 2.5") or smaller

Series 5AC

5W Isolated Regulated AC-DC Power Supply



PRODUCT OVERVIEW

The 5AC series is a switching AC-DC power supply available in a low profile 0.500" height and in single and dual outputs. They offer excellent line and load regulation and is continuously protected against short circuits. The highly reliable module is capable of up to 5W power in a wide ambient temperature range -25°C to +70°C. These modules are the perfect design choice for your most stringent industrial applications.



FEATURES

- Up to 5W output power
- Single, dual and triple outputs
- Low profile size - 2.3" x 2.2" x 0.5"
- 1200V input/output isolation
- Through hole mounting
- Continuous short-circuit protection
- Two input voltage ranges
- Fixed operating frequency
- No external components required

Contact Pico for part number of available options:

- Expanded operating temp: -55°C to +85°C
- Select screening per MIL-STD-883:
 - Stabilization Bake
 - Temperature Cycle
 - Burn-In
- Special Input Voltage, Output Voltage, or Output Power
- Low Isolation Capacitance

H	5AC	24	S
INPUT VOLTAGE RANGE	SERIES NAME	NOM. OUTPUT VOLTAGE	NUMBER OF OUTPUTS
BLANK = 90 - 130VAC H = 170 - 240 VAC	5AC	5 = 5V 12 = 12V 15 = 15V 24 = 24V	S = SINGLE D = DUAL

MODEL LIST**SINGLE OUTPUT**

Pico Part Number		Output Voltage [VDC]	Output Current		Output Power [W]	Load Regulation 10-100% ⁽¹⁾ [%] max	Output Voltage Tolerance ⁽²⁾ [±%]	Efficiency ⁽²⁾ [%] typ.
90-130 VAC Input	170-240 VAC Input		Min. ⁽¹⁾ [A]	Max. [A]				
5AC5S	H5AC5S	5	100	1000	5	0.5	0.5	72
5AC12S	H5AC12S	12	41.7	417	5	0.5	0.5	75
5AC15S	H5AC15S	15	33.3	333	5	0.5	0.5	75
5AC24S	H5AC24S	24	20.8	208	5	0.5	0.5	76

Note 1: Maintain minimum 10% of rated load to prevent a voltage surge.

Note 2: Tested at nominal input voltage and full output load.

DUAL OUTPUT

Pico Part Number		Output Voltage [±VDC]	Output Current Per Output		Output Power Per Output [±W]	Load Regulation 10-100% ⁽¹⁾ [%] max	Output Voltage Tolerance ⁽²⁾ [±%]	Efficiency ⁽²⁾ [%] typ.
90-130 VAC Input	170-240 VAC Input		Min. ⁽¹⁾ [±A]	Max. [±A]				
5AC5D	H5AC5D	5	50	500	2.5	0.5	0.5	72
5AC12D	H5AC12D	12	20.9	209	2.5	0.5	0.5	75
5AC15D	H5AC15D	15	16.7	167	2.5	0.5	0.5	75

Note 1: Maintain minimum 10% of rated load to prevent a voltage surge.

Note 2: Tested at nominal input voltage and full output load.

Note 3: Dual output loads must be balanced.

SPECIFICATIONS (V_{IN} , Full Load, $T_A = +25^{\circ}\text{C}$, 1 hour warm up unless otherwise specified)**INPUT**

Parameter	Condition	Min.	Typ.	Max.	Units
Input Voltage Range	5AC models	90	115	130	VAC
	H5AC models	170	220	240	
Input Frequency		47	60	440	Hz
Input Fuse Recommendation	5AC models with external 5Ω inrush thermistor	0.25A, Rated Voltage ≥ Input Voltage			
	H5AC models with external 10Ω inrush thermistor	0.125A, Rated Voltage ≥ Input Voltage			
Input Thermistor Recommendation	5AC models	-	5	-	Ω
	H5AC models	-	10	-	

OUTPUT

Parameter	Condition	Min.	Typ.	Max.	Units
Line Regulation		-	-	0.2	±%
Output Ripple	1MHz bandwidth	-	-	50	mVp-p

ENVIRONMENTAL

Parameter	Condition	Min.	Typ.	Max.	Units
Operating Temperature Range	Ambient without derating	-25	-	+70	°C
Storage Temperature Range	Ambient	-55	-	+125	°C
Temperature Coefficient		-	0.02	-	%/°C
Cooling	Free Air Convection				

SPECIFICATIONS (V_{IN} , Full Load, $T_A = +25^{\circ}\text{C}$, 1 hour warm up unless otherwise specified)**GENERAL**

Parameter	Condition	Min.	Typ.	Max.	Units
Operating Frequency		25	-	35	kHz
Isolation Voltage	Input to output	1200	-	-	V_{RMS}
Size	L x W x H	2.3 x 2.2 x 0.5 (58.42 x 55.88 x 12.7)			inches (mm)
Weight		-	145	-	grams
Case	6-Sided Epoxy Insulated Metal				
Potting	Vacuum Impregnated Epoxy				
Box Packaging	8 x 7.5 x 1.5 (203.2 x 190.5 x 38.1) or 12 x 9 x 1.5 (304.8 x 228.6 x 38.1)				inches (mm)

PROTECTIONS & FEATURES

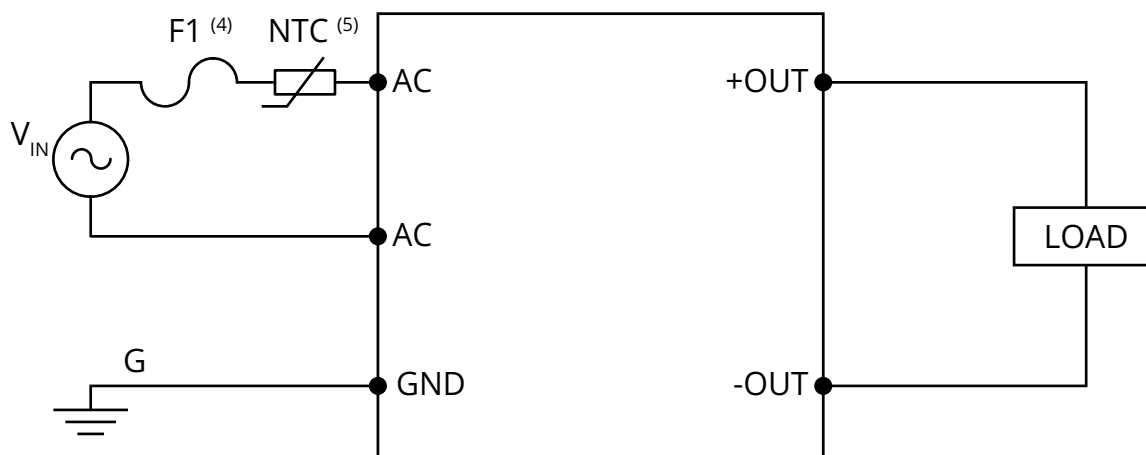
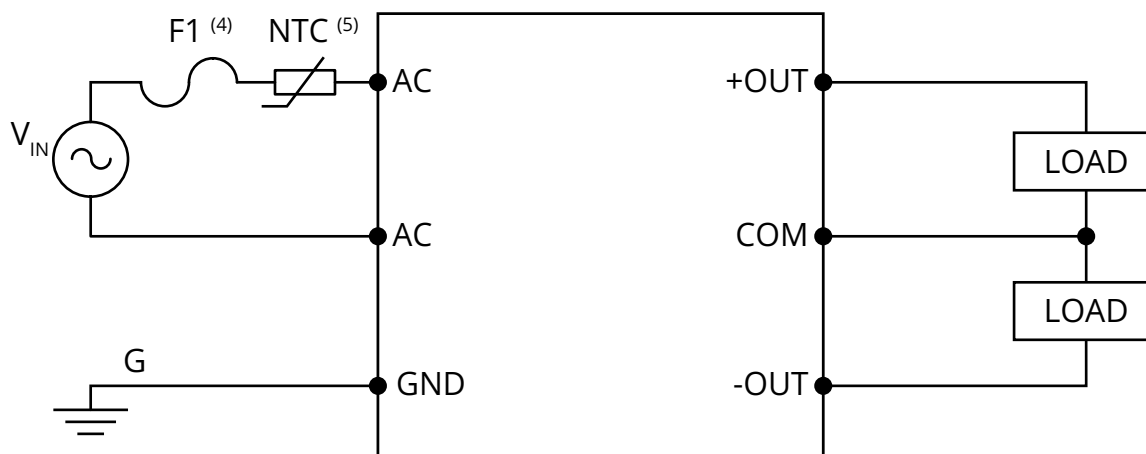
Parameter	Condition	Min.	Typ.	Max.	Units
Short circuit	Continuous, auto-recovery				

DESIGNED TO MEET

Test	Referenced Standard	Description
Vibration	MIL-STD-202	Method 204, Vibration, High Frequency, Condition D
Shock	MIL-STD-202	Method 213, Shock (Specified Pulse), Condition I
Humidity	MIL-STD-202	Method 106, Moisture Resistance
Altitude	MIL-STD-202	Method 105, Barometric Pressure (Reduced), Condition D

OPTIONS AVAILABLE – CONTACT PICO FOR PART NUMBER

Parameter	Referenced Standard	Description
Stabilization Bake	MIL-STD-883	Referenced Method 1008 Non-operating maximum storage temperature for 24 hours
Temperature Cycle	MIL-STD-883	Referenced Method 1010 Non-operating at temperature extremes, 15 mins/temp, 10 cycles
Burn-In	MIL-STD-883	Referenced Method 1015 Max operating temperature for 160 hours
Expanded Operating Temperature Range	-55°C to +85°C	

TYPICAL CONNECTION CIRCUIT**SINGLE OUTPUT****DUAL OUTPUT**

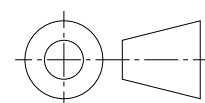
Note 3: Dual output loads must be balanced.

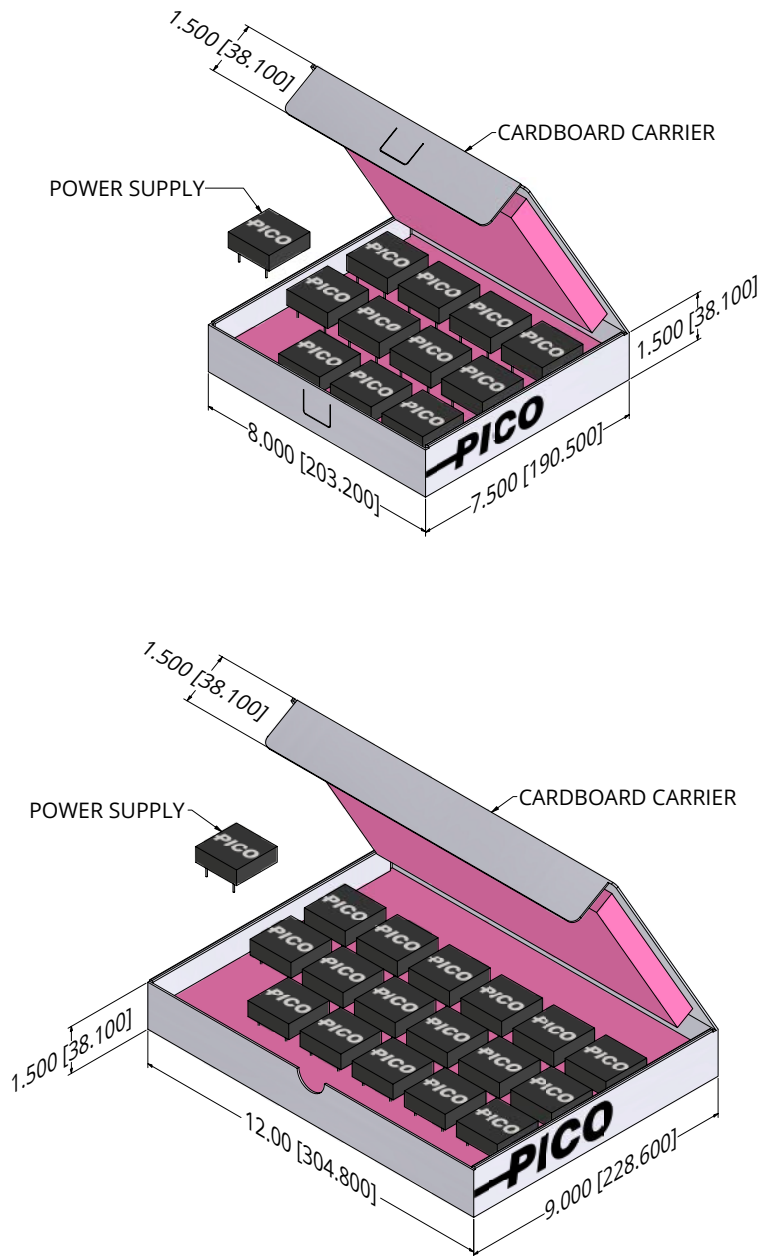
Note 4: For 5AC models, a 0.25A fuse is required on the input. For H5AC models, a 0.125A fuse is required on the input.

Note 5: For 5AC models, a 5Ω inrush thermistor is required on the input. For H5AC models, a 10Ω inrush thermistor is required on the input.



a. ALL DIMENSIONS ARE IN INCHES, [] = MM



BOX PACKAGING - BULK

Pico warrants each product manufactured by us and sold by us or an authorized representative, to be free from defects in material and workmanship. If properly used, it will perform within its applicable specifications for a period of one year after original shipment. Pico's obligation under this guarantee is limited to repairing or replacing our product to the original purchaser. This warranty is in lieu of all other warranties, express or implied and constitutes fulfillment of our obligations to the purchaser. We do not guarantee that the products can be used for a particular purpose other than those solely covered by the product's specifications. Pico must be notified if the product must meet particular certifications and/or standards. We assume no liability, in any event, for consequential damages, for anticipated or lost profits, incidental damages or loss of time or other losses incurred by the purchaser or any third party in connection with products covered by this warranty or otherwise. The purchaser will indemnify and hold Pico harmless for any damages, losses, costs, etc. from usage not within the product's specifications. Pico must be consulted before usage of its products in a nuclear, radioactive or space environment.

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Series 10AC

10W Isolated Regulated AC-DC Power Supply



PRODUCT OVERVIEW

The 10AC series is a switching AC-DC power supply available in a low profile 0.500" height and in single, dual and triple outputs. They offer excellent line and load regulation and is continuously protected against short circuits. The highly reliable module is capable of up to 10W power in a wide ambient temperature range -25°C to +70°C. These modules are the perfect design choice for your most stringent industrial applications.

The case has a low profile height, 0.500", and threaded inserts to mount securely for high vibration and shock applications.



FEATURES

- Up to 10W output power
- Single, dual and triple outputs
- Low profile size - 3.2" x 2.1" x 0.5"
- 1200V input/output isolation
- Through hole mounting
- Continuous short-circuit protection
- Two input voltage ranges
- Fixed operating frequency
- No external components required

Contact Pico for part number of available options:

- Expanded operating temp: -55°C to +85°C
- Select screening per MIL-STD-883:
 - Stabilization Bake
 - Temperature Cycle
 - Burn-In
- Special Input Voltage, Output Voltage, or Output Power
- Low Isolation Capacitance

H	10AC	5	T	12
INPUT VOLTAGE RANGE	SERIES NAME	MAIN OUTPUT VOLTAGE	NUMBER OF OUTPUTS	TRIPLE OUTPUT AUXILIARY
BLANK = 90 - 130VAC H = 170 - 240 VAC	10AC	5 = 5V 12 = 12V 15 = 15V 24 = 24V	S = SINGLE D = DUAL T = TRIPLE	5 = ±5V 12 = ±12V 15 = ±15V

MODEL LIST**SINGLE OUTPUT**

Pico Part Number		Output Voltage [VDC]	Output Current		Output Power [W]	Load Regulation 10-100% ⁽¹⁾ [%] max	Output Voltage Tolerance ⁽²⁾ [±%]	Efficiency ⁽²⁾ [%] typ.
90-130 VAC Input	170-240 VAC Input		Min. ⁽¹⁾ [A]	Max. [A]				
10AC5S	H10AC5S	5	200	2000	10	0.5	0.5	75
10AC12S	H10AC12S	12	83.3	833				77
10AC15	H10AC15	15	66.6	666				79
10AC24S	H10AC24S	24	41.6	416				80

Note 1: Maintain minimum 10% of rated load to prevent a voltage surge.

Note 2: Tested at nominal input voltage and full output load.

DUAL OUTPUT

Pico Part Number		Output Voltage [±VDC]	Output Current Per Output		Output Power Per Output [±W]	Load Regulation 10-100% ⁽¹⁾ [%] max	Output Voltage Tolerance ⁽²⁾ [±%]	Efficiency ⁽²⁾ [%] typ.
90-130 VAC Input	170-240 VAC Input		Min. ⁽¹⁾ [±A]	Max. [±A]				
10AC5D	H10AC5D	5	100	1000	5	0.5	0.5	75
10AC12D	H10AC12D	12	41.7	417				77
10AC15D	H10AC15D	15	33.3	333				80

Note 1: Maintain minimum 10% of rated load to prevent a voltage surge.

Note 2: Tested at nominal input voltage and full output load.

Note 3: Dual output loads must be balanced.

TRIPLE OUTPUT

Pico Part Number		Output Voltage [VDC]	MAIN / AUXILIARY Output Current		Output Power [W]	Load Regulation 25-100% ⁽¹⁾ [%] max	Output Voltage Tolerance ⁽²⁾ [±%]	Efficiency ⁽²⁾ [%] typ.
90-130 VAC Input	170-240 VAC Input		Min. ⁽¹⁾ [mA]	Max. [mA]				
10AC5T12	H10AC5T12	5 / ±12	140 / ±12.5	1400 / ±125	7 / ±1.5	0.5 / 5	0.5 / 5	77
10AC5T15	H10AC5T15	5 / ±15	140 / ±10	1400 / ±100				77
10AC12T5	H10AC12T5	12 / ±5	58.3 / ±30	583 / ±300				77
10AC15T5	H10AC15T5	15 / ±5	46.6 / ±30	466 / ±300				79

Note 1: Maintain minimum 10% of rated load to prevent a voltage surge.

Note 2: Tested at nominal input voltage and full output load.

Note 4: Auxiliary outputs must be balanced.

SPECIFICATIONS (V_{IN} , Full Load, $T_A = +25^\circ\text{C}$, 1 hour warm up unless otherwise specified)**INPUT**

Parameter	Condition	Min.	Typ.	Max.	Units
Input Voltage Range	10AC models	90	115	130	VAC
	H10AC models	170	220	240	
Input Frequency		47	60	440	Hz
Input Fuse Recommendation	10AC models with external 5 Ω inrush thermistor	0.5A, Rated Voltage $\geq$ Input Voltage			
	H10AC models with external 10 Ω inrush thermistor	0.25A, Rated Voltage $\geq$ Input Voltage			
Input Thermistor Recommendation	10AC models	-	5	-	Ω
	H10AC models	-	10	-	

OUTPUT

Parameter	Condition	Min.	Typ.	Max.	Units
Line Regulation		-	-	0.2	$\pm\%$
Output Ripple	1MHz bandwidth	-	-	50	mVp-p

ENVIRONMENTAL

Parameter	Condition	Min.	Typ.	Max.	Units
Operating Temperature Range	Ambient without derating	-25	-	+70	$^\circ\text{C}$
Storage Temperature Range	Ambient	-55	-	+125	$^\circ\text{C}$
Temperature Coefficient		-	0.02	-	$\%/^\circ\text{C}$
Cooling	Free Air Convection				

GENERAL

Parameter	Condition	Min.	Typ.	Max.	Units
Operating Frequency		25	-	35	kHz
Isolation Voltage	Input to output	1200	-	-	V _{RMS}
Size	L x W x H	3.2 x 2.1 x 0.5 (81.28 x 53.34 x 12.7)			inches (mm)
Weight	Single output models	-	130	-	grams
	Dual output models	-	140	-	
	Triple output models	-	145	-	
Case	6-Sided Epoxy Insulated Metal				
Potting	Vacuum Impregnated Epoxy				
Box Packaging	8 x 7.5 x 1.5 (203.2 x 190.5 x 38.1) or 12 x 9 x 1.5 (304.8 x 228.6 x 38.1)				inches (mm)

PROTECTIONS & FEATURES

Parameter	Condition	Min.	Typ.	Max.	Units
Short circuit	Continuous, auto-recovery				

SPECIFICATIONS (V_{IN} , Full Load, $T_A = +25^{\circ}\text{C}$, 1 hour warm up unless otherwise specified)

DESIGNED TO MEET

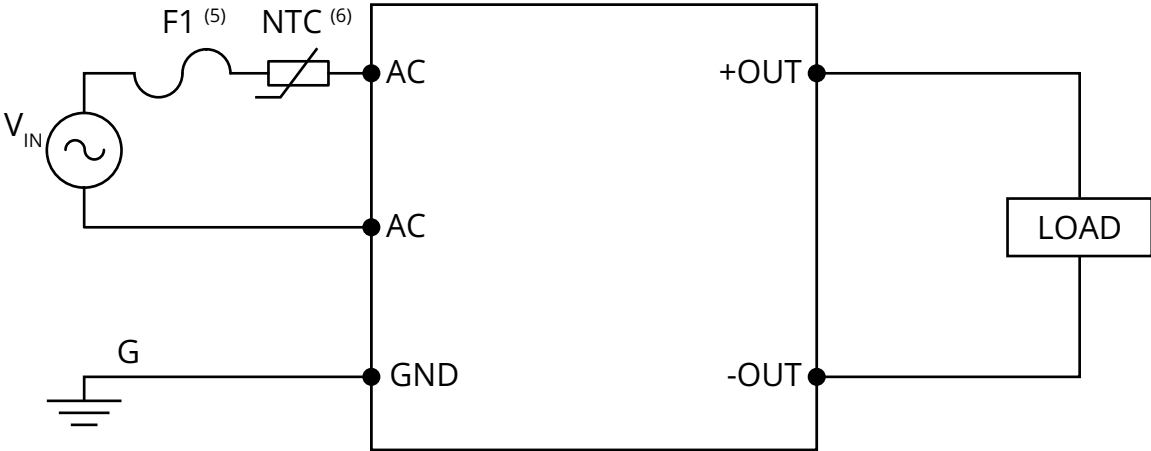
Test	Referenced Standard	Description
Vibration	MIL-STD-202	Method 204, Vibration, High Frequency, Condition D
Shock	MIL-STD-202	Method 213, Shock (Specified Pulse), Condition I
Humidity	MIL-STD-202	Method 106, Moisture Resistance
Altitude	MIL-STD-202	Method 105, Barometric Pressure (Reduced), Condition D

OPTIONS AVAILABLE – CONTACT PICO FOR PART NUMBER

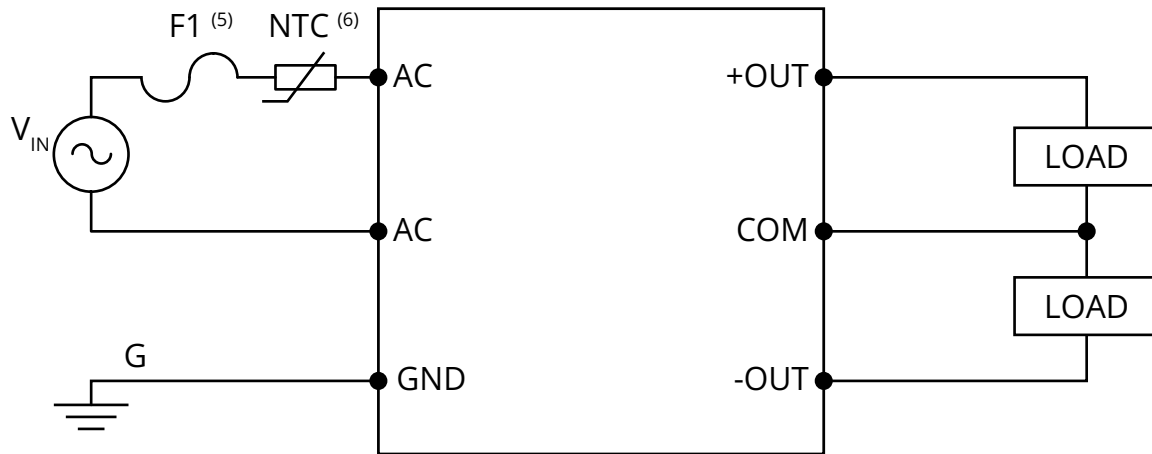
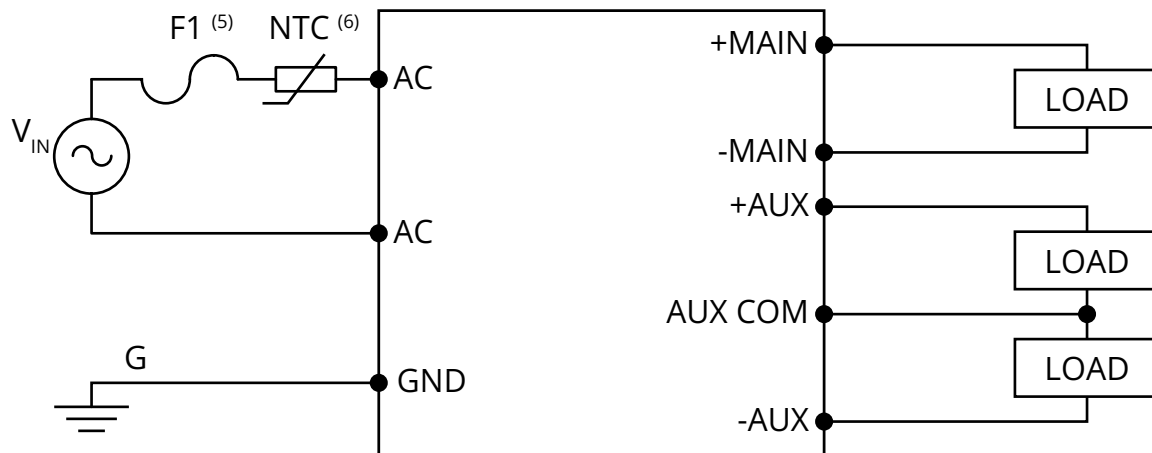
Parameter	Referenced Standard	Description
Stabilization Bake	MIL-STD-883	Referenced Method 1008 Non-operating maximum storage temperature for 24 hours
Temperature Cycle	MIL-STD-883	Referenced Method 1010 Non-operating at temperature extremes, 15 mins/temp, 10 cycles
Burn-In	MIL-STD-883	Referenced Method 1015 Max operating temperature for 160 hours
Expanded Operating Temperature Range		-55°C to +85°C

TYPICAL CONNECTION CIRCUIT

SINGLE OUTPUT



Note 5: For 10AC models, a 0.5A fuse is required on the input. For H10AC models, a 0.25A fuse is required on the input.
Note 6: For 10AC models, a 5Ω inrush thermistor is required on the input. For H10AC models, a 10Ω inrush thermistor is required on the input.

TYPICAL CONNECTION CIRCUIT**DUAL OUTPUT****TRIPLE OUTPUT**

Note 3: Dual output loads must be balanced.

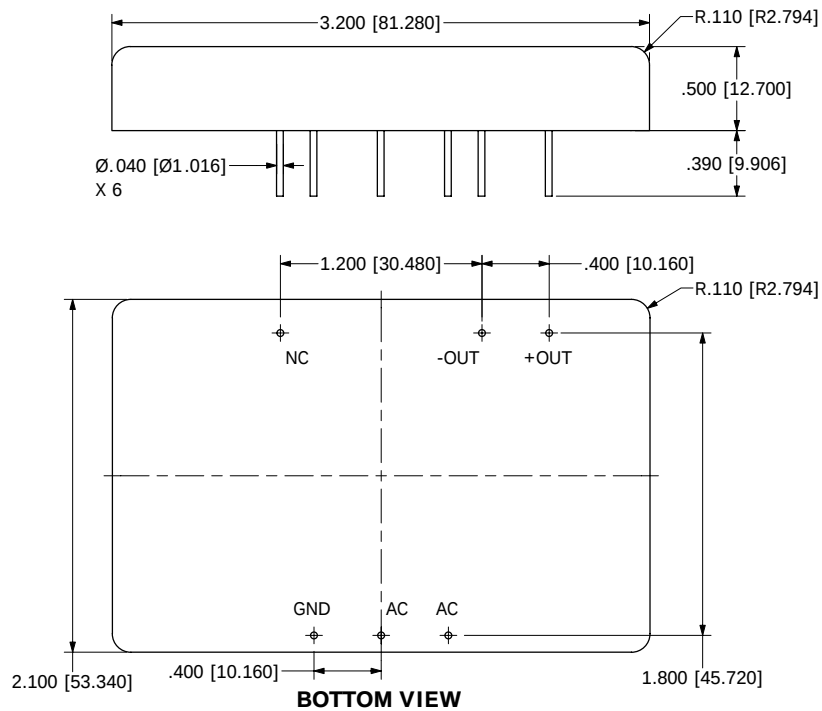
Note 4: Auxiliary outputs must be balanced.

Note 5: For 10AC models, a 0.5A fuse is required on the input. For H10AC models, a 0.25A fuse is required on the input.

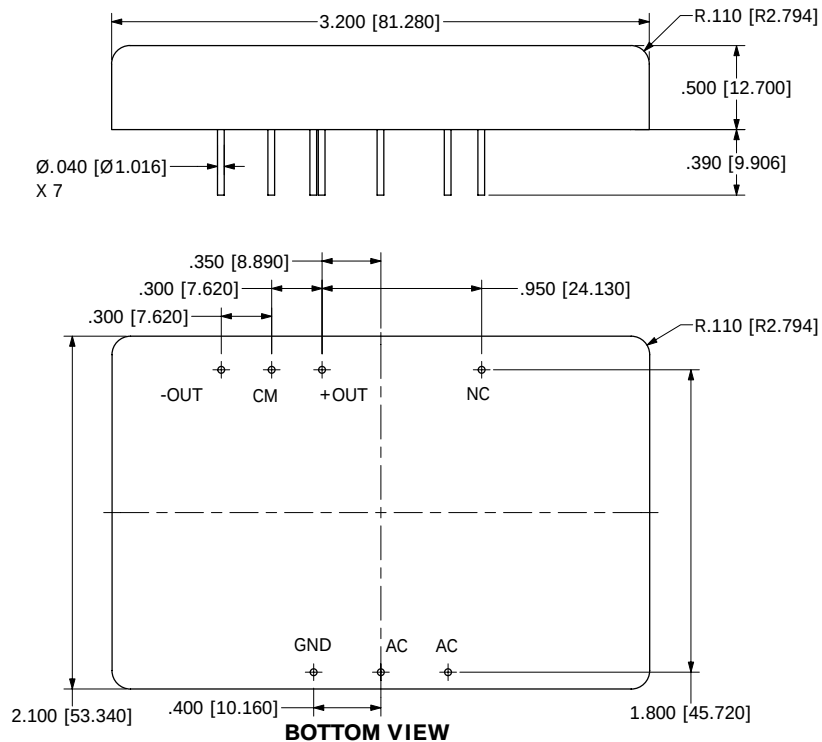
Note 6: For 10AC models, a 5 Ω inrush thermistor is required on the input. For H10AC models, a 10 Ω inrush thermistor is required on the input.

MECHANICAL DRAWINGS

SINGLE OUTPUTS

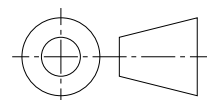


DUAL OUTPUTS



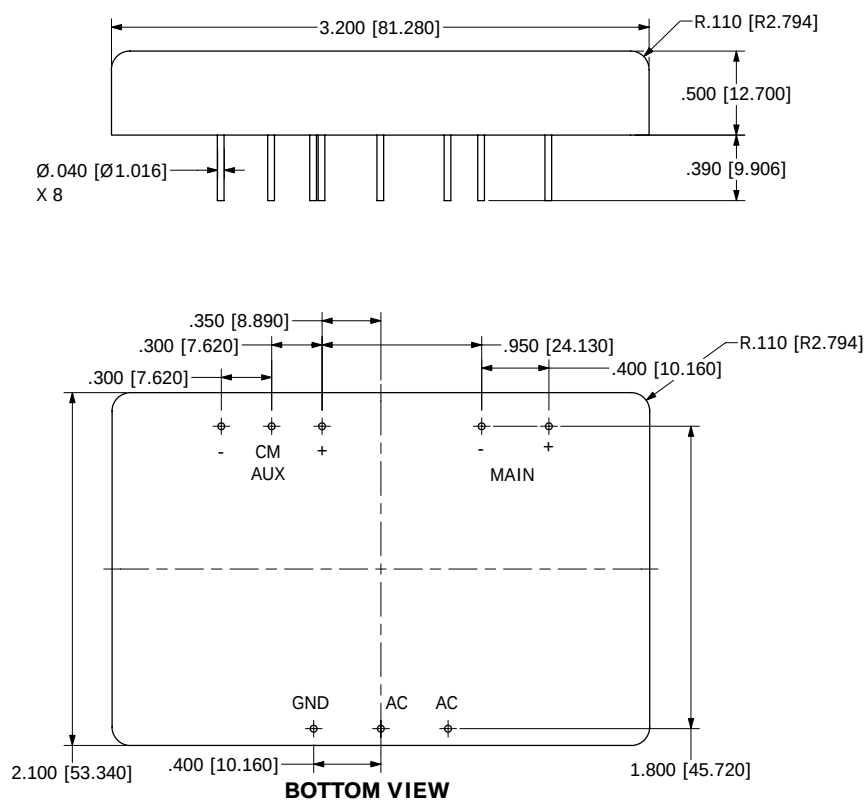
NOTES

a. ALL DIMENSIONS ARE IN inches, [] = MM



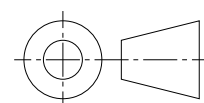
MECHANICAL DRAWINGS

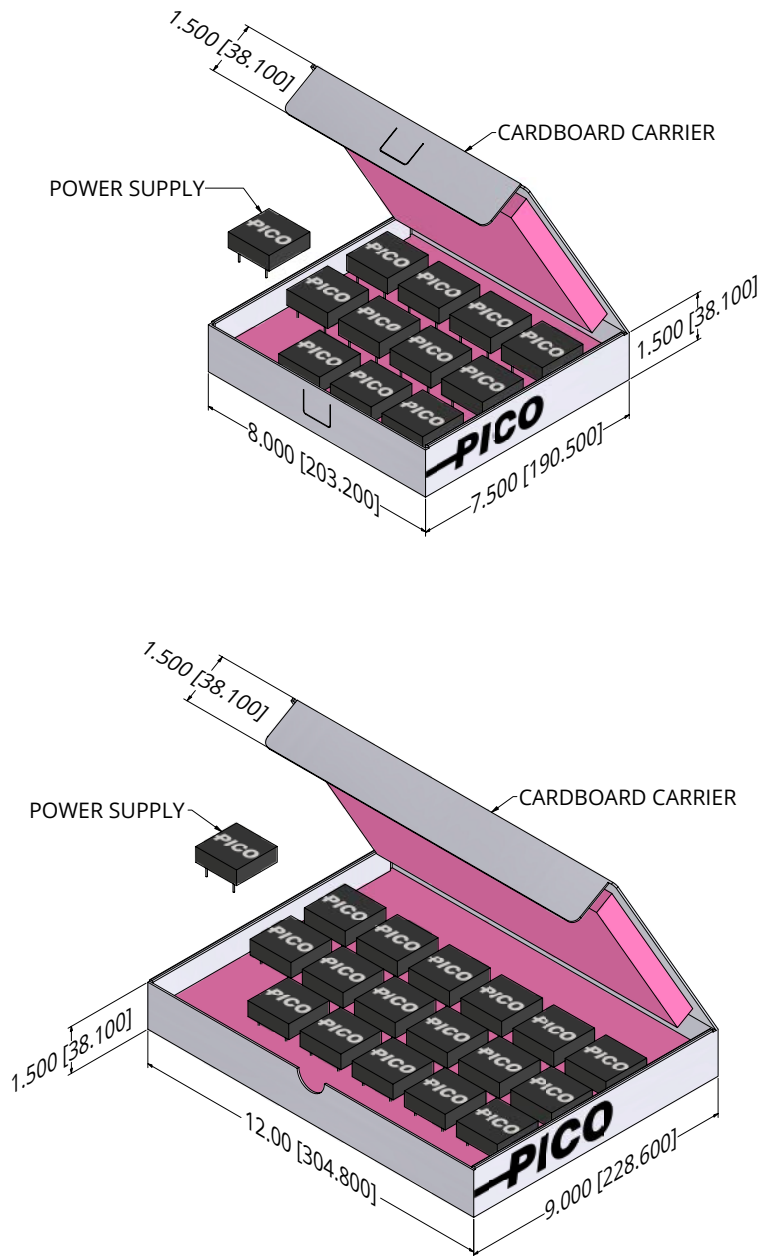
TRIPLE OUTPUTS



NOTES

a. ALL DIMENSIONS ARE IN inches, [] = MM





Pico warrants each product manufactured by us and sold by us or an authorized representative, to be free from defects in material and workmanship. If properly used, it will perform within its applicable specifications for a period of one year after original shipment. Pico's obligation under this guarantee is limited to repairing or replacing our product to the original purchaser. This warranty is in lieu of all other warranties, express or implied and constitutes fulfillment of our obligations to the purchaser. We do not guarantee that the products can be used for a particular purpose other than those solely covered by the product's specifications. Pico must be notified if the product must meet particular certifications and/or standards. We assume no liability, in any event, for consequential damages, for anticipated or lost profits, incidental damages or loss of time or other losses incurred by the purchaser or any third party in connection with products covered by this warranty or otherwise. The purchaser will indemnify and hold Pico harmless for any damages, losses, costs, etc. from usage not within the product's specifications. Pico must be consulted before usage of its products in a nuclear, radioactive or space environment.

We reserve the right to discontinue products without notice, We reserve the right to make modifications to any existing catalog products without notice, at any time, without the obligation to modify units previously sold.

Series LAC & TLAC

10W Isolated Regulated AC-DC Power Supply



PRODUCT OVERVIEW

The LAC series is a linear AC-DC power supply available in single, dual and triple outputs. They offer excellent line and load regulation and very low output ripple - 1mVRMS. The highly reliable module is capable of up to 10W power in a wide ambient temperature range -25°C to +70°C and continuously protected against short circuits. These modules are the perfect design choice for your most stringent industrial applications.

The through hole and terminal strip packages have threaded inserts to mount securely for high vibration and shock applications.



FEATURES

- Up to 10W output power
- Single, dual and triple outputs
- Very low output ripple - 1mVRMS
- Through hole or terminal strip
- Continuous short-circuit protection
- 115VAC input (105-125VAC)
- No external components required



T	LAC	24	/100	S
MOUNTING	SERIES NAME	OUTPUT VOLTAGE	OUTPUT CURRENT (SINGLE OR DUAL)	NUMBER OF OUTPUTS
BLANK = THROUGH HOLE T = TERMINAL STRIP	LAC	5 = 5V 12 = 12V 15 = 15V 24 = 24V 512 = 5V & ±12V 515 = 5V & ±15V	/100 = 100mA /120 = 120mA /200 = 200mA /300 = 300mA /500 = 500mA /1000 = 1000mA /2000 = 2000mA	S = SINGLE OUTPUT D = DUAL OUTPUT A = TRIPLE OUTPUT @ 4.13-4.25W B = TRIPLE OUTPUT @ 5.38-5.50W

MODEL LIST**SINGLE OUTPUT**

Through Hole	Terminal Strip	Output Voltage [VDC]	Output Current		Output Power [W]	Line Regulation [%] max	Load Regulation [%] max	Package Reference		Package Height [in]
			Min. [mA]	Max. [mA]				LAC	TLAC	
LAC5/500S	TLAC5/500S	5	0	500	2.5	0.05	0.2	L1	T1	0.875
LAC5/1000S	TLAC5/1000S	5		1000	5	0.05	0.2	L2	T2	1.25
LAC5/2000S	TLAC5/2000S	5		2000	10	0.05	0.2	L3	T3	1.56
LAC12/120S	TLAC12/120S	12		120	1.44	0.1	0.1	L1	T1	0.875
LAC12/200S	TLAC12/200S	12		200	2.4	0.1	0.1	L2	T2	1.25
LAC12/500S	TLAC12/500S	12		500	6	0.1	0.1	L3	T3	1.56
LAC15/120S	TLAC15/120S	15		120	1.8	0.1	0.1	L1	T1	0.875
LAC15/200S	TLAC15/200S	15		200	3	0.1	0.1	L2	T2	1.25
LAC15/500S	TLAC15/500S	15		500	7.5	0.1	0.1	L3	T3	1.56
LAC24/100S	TLAC24/100S	24		100	2.4	0.1	0.1	L1	T1	0.875
LAC24/300S	TLAC24/300S	24		300	7.2	0.1	0.1	L3	T3	1.56

DUAL OUTPUT

Through Hole	Terminal Strip	Output Voltage [±VDC]	Output Current		Output Power [±W]	Line Regulation [%] max	Load Regulation [%] max	Package Reference		Package Height [in]
			Min. [±mA]	Max. [±mA]				LAC	TLAC	
LAC5/200D	TLAC5/200D	5	0	200	1	0.1	0.05	L2	T2	1.25
LAC5/300D	TLAC5/300D	5		300	1.5	0.1	0.05	L3	T3	1.56
LAC12/100D	TLAC12/100D	12		100	1.2	0.1	0.02	L1	T1	0.875
LAC12/300D	TLAC12/300D	12		300	3.6	0.1	0.02	L3	T3	1.56
LAC15/100D	TLAC15/100D	15		100	1.5	0.1	0.02	L1	T1	0.875
LAC15/300D	TLAC15/300D	15		300	4.5	0.1	0.02	L3	T3	1.56
LAC24/100D	TLAC24/100D	24		100	2.4	0.2	0.01	L2	T2	1.25
LAC24/200D	TLAC24/200D	24		200	4.8	0.2	0.01	L3	T3	1.56

Note 2: Dual output loads must be balanced.

TRIPLE OUTPUT

Through Hole	Terminal Strip	Output Voltage [VDC]	Main / Auxiliary					Package Reference		Package Height [in]
			Output Current Min. [mA]	Output Current Max. [mA]	Output Power [W]	Line Regulation [%] max	Load Regulation [%] max	LAC	TLAC	
LAC512A	TLAC512A	5 / ±12	0 / 0	250 / 120	1.25 / 1.44	0.2 / 0.2	0.2 / 0.1	L3	T3	1.56
LAC512B	TLAC512B	5 / ±12		500 / 120	2.5 / 1.44	0.2 / 0.2	0.2 / 0.1	L3	T3	1.56
LAC515A	TLAC515A	5 / ±15		250 / 100	1.25 / 1.5	0.2 / 0.2	0.2 / 0.1	L3	T3	1.56
LAC515B	TLAC515B	5 / ±15		500 / 100	2.5 / 1.5	0.2 / 0.2	0.2 / 0.1	L3	T3	1.56

Note 3: Auxiliary outputs must be balanced.

SPECIFICATIONS (V_{IN} , Full Load, $T_A = +25^{\circ}\text{C}$, 1 hour warm up unless otherwise specified)**INPUT**

Parameter	Condition	Min.	Typ.	Max.	Units
Input Voltage Range		105	115	125	VAC
Input Frequency		50	60	440	Hz
Input Fuse Recommendation		-	0.5	-	A

OUTPUT

Parameter	Condition	Min.	Typ.	Max.	Units
Line Regulation		-	-	0.2	±%
Output Ripple	1MHz bandwidth	-	-	1	mVRMS
Output Voltage Tolerance	Nominal V_{IN} , Full Load	Triple output models	-	0.5	±%
		All other models	-	1	

ENVIRONMENTAL

Parameter	Condition	Min.	Typ.	Max.	Units
Operating Temperature Range	Ambient without derating	-25	-	+70	°C
Storage Temperature Range	Ambient	-55	-	+85	°C
Temperature Coefficient		-	0.02	-	%/°C
Cooling	Free Air Convection				

GENERAL

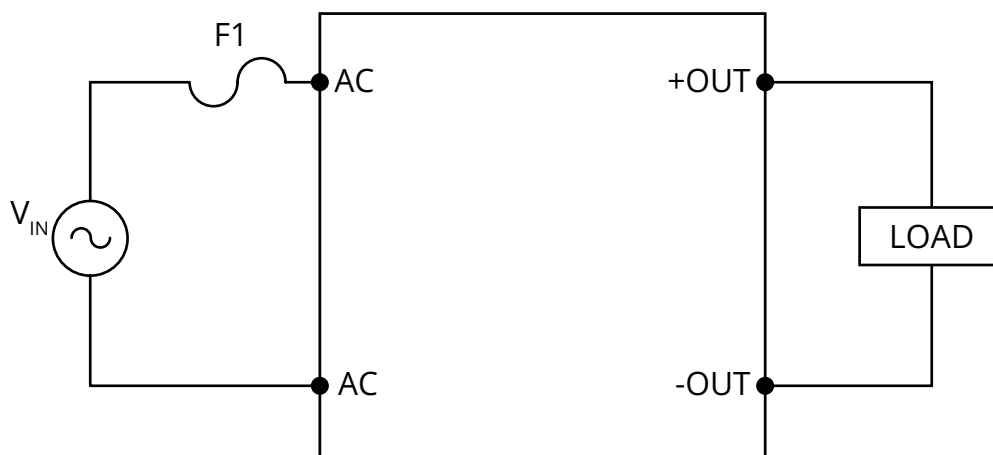
Parameter	Condition	Min.	Typ.	Max.	Units
Operating Frequency		25	-	35	kHz
Insulation Resistance		-	100	-	MΩ
Size (L x W x H)	L1 package	3.5 x 2.5 x 0.875 (88.9 x 63.5 x 22.225)			inches (mm)
	L2 package	3.5 x 2.5 x 1.25 (88.9 x 63.5 x 31.75)			
	L3 package	3.5 x 2.5 x 1.56 (88.9 x 63.5 x 39.624)			
	T1 package	4.1 x 2.5 x 0.875 (104.14 x 63.5 x 22.225)			
	T2 package	4.1 x 2.5 x 1.25 (104.14 x 63.5 x 31.75)			
	T3 package	4.1 x 2.5 x 1.56 (104.14 x 63.5 x 39.624)			
Weight	L1/T1 package	-	340	-	grams
	L2/T2 package	-	490	-	
	L3/T3 package	-	605	-	
Case	Diallyl Phthalate (DAP)				
Potting	Vacuum Impregnated Epoxy				

PROTECTIONS & FEATURES

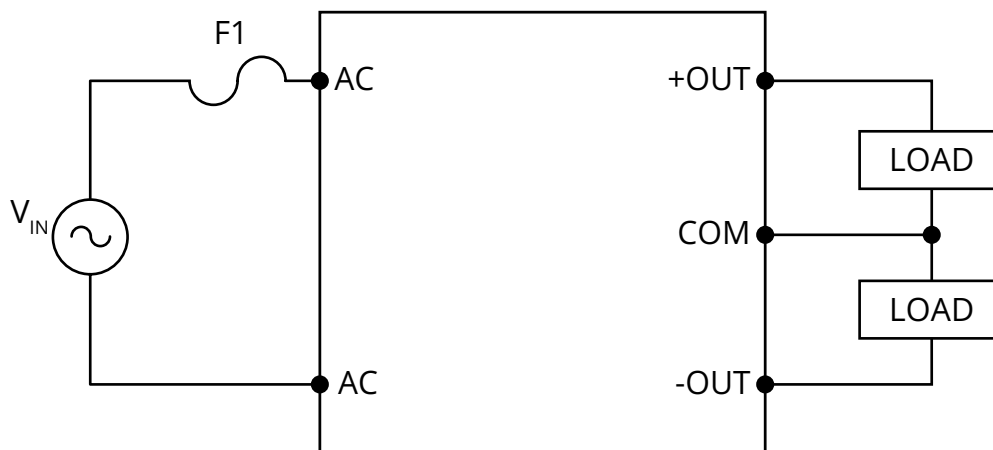
Parameter	Condition	Min.	Typ.	Max.	Units
Short circuit	Continuous, auto-recovery				

TYPICAL CONNECTION CIRCUIT

SINGLE OUTPUT

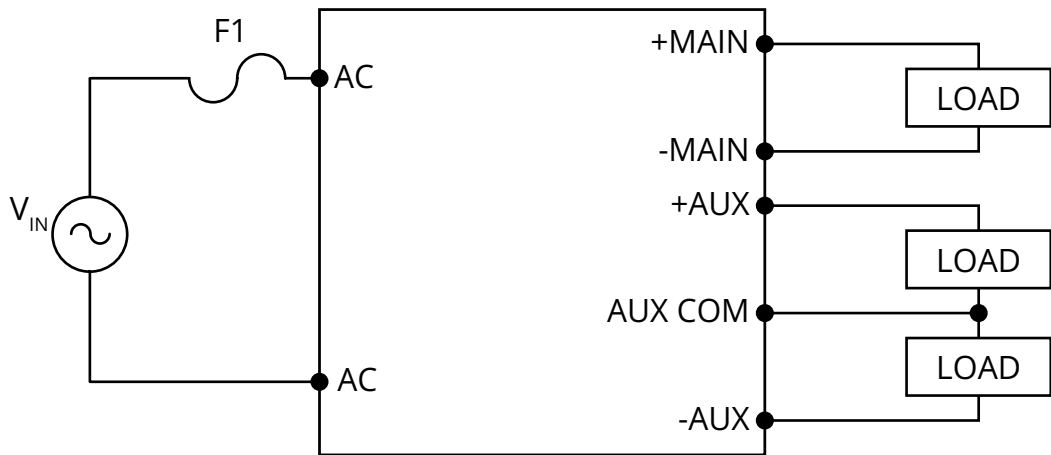


DUAL OUTPUT



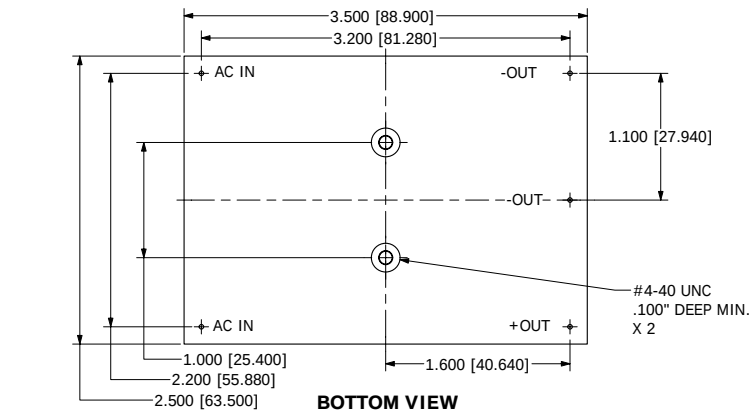
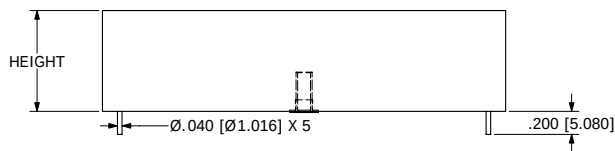
TYPICAL CONNECTION CIRCUIT

TRIPLE OUTPUT



MECHANICAL DRAWINGS

SERIES LAC - SINGLE OUTPUTS



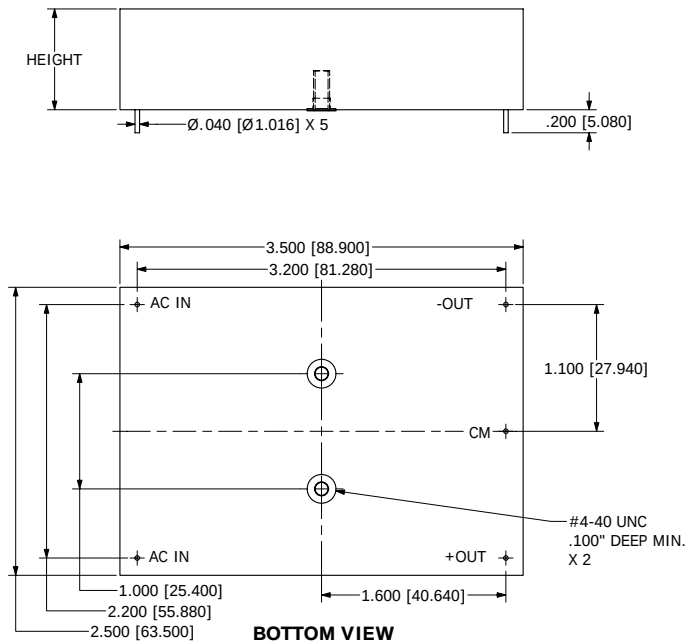
PACKAGE	HEIGHT
L1	.875 [22.225]
L2	1.25 [31.75]
L3	1.56 [39.624]

NOTES

- a. ALL DIMENSIONS ARE IN INCHES, [] = MM
- b. THE RECOMMENDED TORQUE FOR MOUNTING SCREWS IS 3-5 IN-LBS.

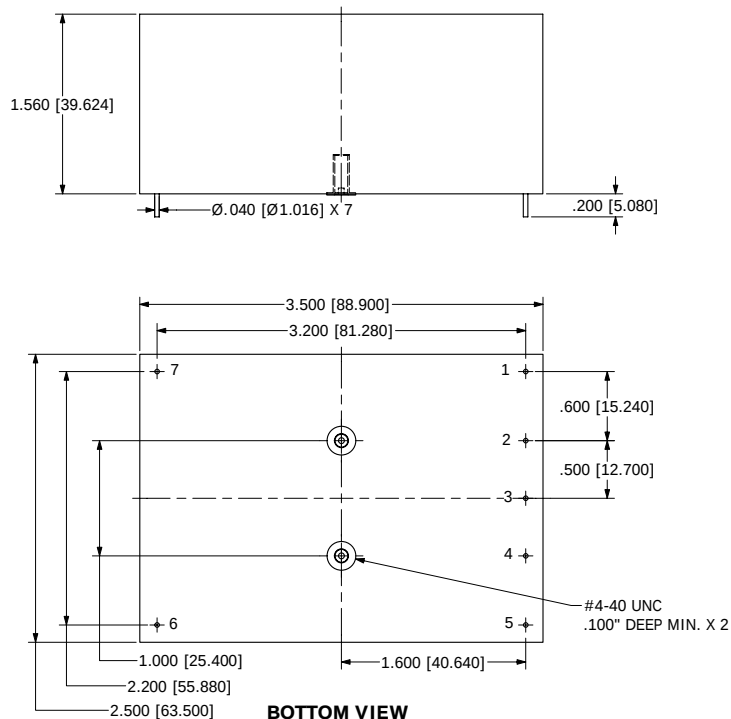
MECHANICAL DRAWINGS

SERIES LAC - DUAL OUTPUTS



PACKAGE	HEIGHT
L1	.875 [22.225]
L2	1.25 [31.75]
L3	1.56 [39.624]

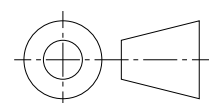
SERIES LAC - TRIPLE OUTPUTS



PIN	FUNCTION	PIN DIAMETER
1	-VOUT [AUX]	.040 [1.016]
2	+VOUT [AUX]	.040 [1.016]
3	COM [AUX]	.040 [1.016]
4	+VOUT [MAIN]	.040 [1.016]
5	-VOUT [MAIN]	.040 [1.016]
6	AC IN	.040 [1.016]
7	AC IN	.040 [1.016]

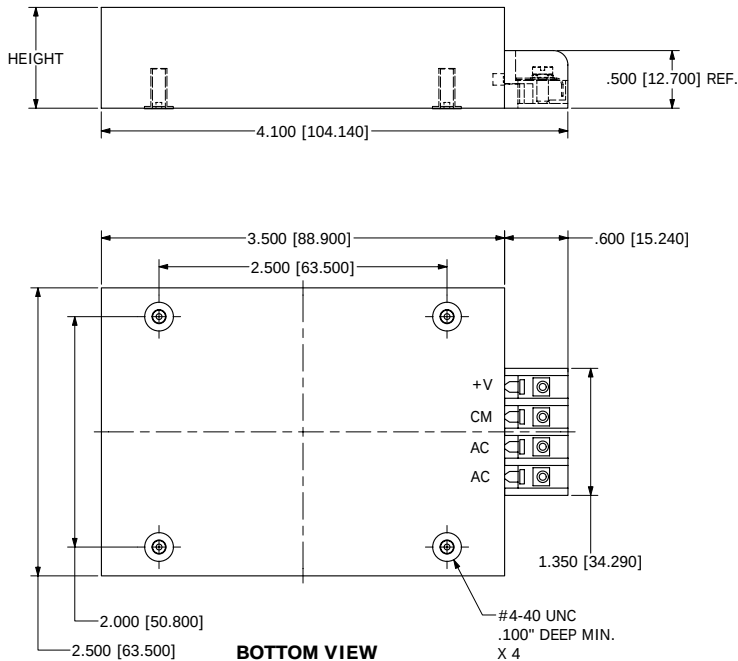
NOTES

- ALL DIMENSIONS ARE IN INCHES, [] = MM
- THE RECOMMENDED TORQUE FOR MOUNTING SCREWS IS 3-5 IN-LBS.



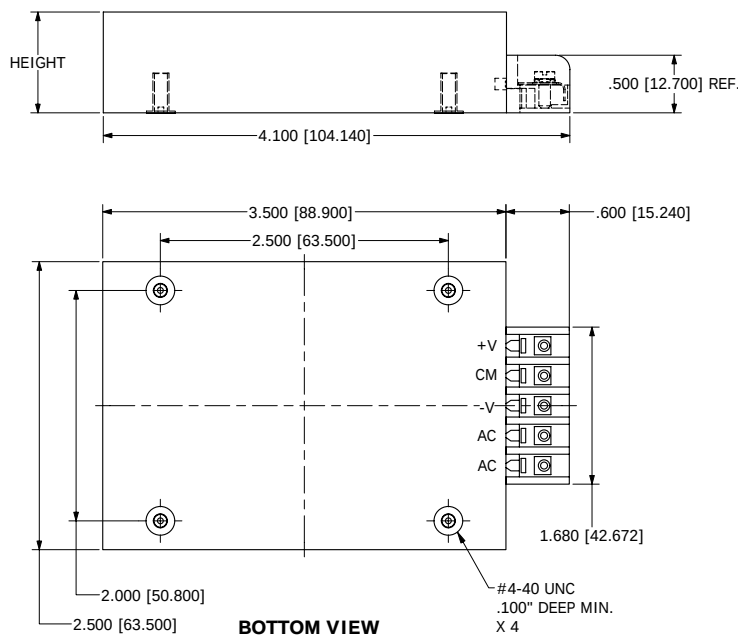
MECHANICAL DRAWINGS

SERIES TLAC - SINGLE OUTPUTS



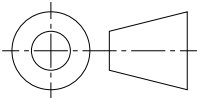
PACKAGE	HEIGHT
L1	.875 [22.225]
L2	1.25 [31.75]
L3	1.56 [39.624]

SERIES TLAC - DUAL OUTPUTS



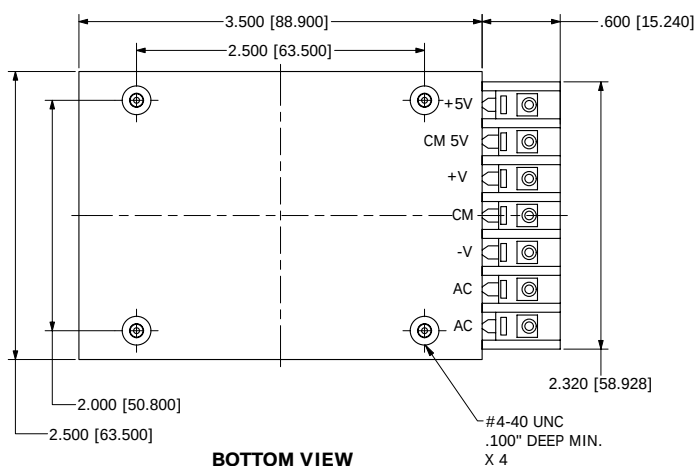
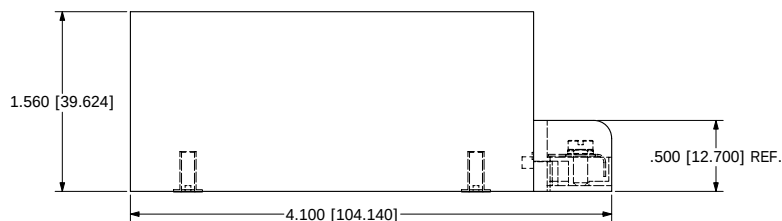
PACKAGE	HEIGHT
L1	.875 [22.225]
L2	1.25 [31.75]
L3	1.56 [39.624]

NOTES
a. ALL DIMENSIONS ARE IN INCHES, [] = MM
b. THE RECOMMENDED TORQUE FOR MOUNTING SCREWS IS 3-5 IN-LBS.



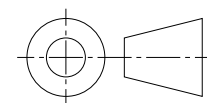
MECHANICAL DRAWINGS

SERIES TLAC - TRIPLE OUTPUTS



NOTES

- ALL DIMENSIONS ARE IN INCHES, [] = MM
- THE RECOMMENDED TORQUE FOR MOUNTING SCREWS IS 3-5 IN-LBS.



Pico warrants each product manufactured by us and sold by us or an authorized representative, to be free from defects in material and workmanship. If properly used, it will perform within its applicable specifications for a period of one year after original shipment. Pico's obligation under this guarantee is limited to repairing or replacing our product to the original purchaser. This warranty is in lieu of all other warranties, express or implied and constitutes fulfillment of our obligations to the purchaser. We do not guarantee that the products can be used for a particular purpose other than those solely covered by the product's specifications. Pico must be notified if the product must meet particular certifications and/or standards. We assume no liability, in any event, for consequential damages, for anticipated or lost profits, incidental damages or loss of time or other losses incurred by the purchaser or any third party in connection with products covered by this warranty or otherwise. The purchaser will indemnify and hold Pico harmless for any damages, losses, costs, etc. from usage not within the product's specifications. Pico must be consulted before usage of its products in a nuclear, radioactive or space environment.

We reserve the right to discontinue products without notice, We reserve the right to make modifications to any existing catalog products without notice, at any time, without the obligation to modify units previously sold.

Series SW & TSW

15W Isolated Regulated AC-DC Power Supply

PICO
Electronics, Inc.

PRODUCT OVERVIEW

The SW series is a switching AC-DC power supply available in single and dual outputs. They offer excellent line and load regulation and is continuously protected against short circuits. The highly reliable module is capable of up to 5W power in a wide ambient temperature range -25°C to +70°C. These modules are the perfect design choice for your most stringent industrial applications.

All packages has a low profile height, 0.500", and terminal strip packages have threaded inserts to mount securely for high vibration and shock applications.



FEATURES

- Up to 15W output models
- Encapsulated semiconductors, conservatively rated for maximum reliability
- Low profile – down to 0.500" height
- Large margin for 115VAC input - 90 to 130VAC
- 3.3 to 48V output models
- Through hole or terminal strip packages
- 1200V Input/output isolation
- Single and dual output
- No heat sink or derating required
- No external components required

Contact Pico for part number of available options:

- Expanded operating temp: -55°C to +85°C
- Select screening per MIL-STD-883:
 - Stabilization Bake
 - Temperature Cycle
 - Burn-In
- Special Input Voltage, Output Voltage, Isolation Voltage or Output Power

T	SW	A	28	S
MOUNTING	SERIES NAME	OUTPUT POWER	NOMINAL OUTPUT VOLTAGE	# OF OUTPUTS
BLANK = THROUGH HOLE T = TERMINAL STRIP	SW	A = 5W B = 10W C = 15W	3.3 = 3.3V 5 = 5V 5.2 = 5.2V 12 = 12V 15 = 15V 24 = 24V 28 = 28V 48 = 48V	S = SINGLE D = DUAL

MODEL LIST**SINGLE OUTPUT**

Through Hole	Terminal Strip	Output Voltage [VDC]	Output Current		Output Power [W]	Efficiency ⁽¹⁾ [%] typ.	Output Ripple @ 1MHz BW [mVp-p max]
			Min. ⁽²⁾ [mA]	Max. [mA]			
SWA3.3S	TSWA3.3S	3.3	90.9	909	3	68	150
SWA5S	TSWA5S	5	100	1000	5	68	150
SWA5.25S	TSWA5.25S	5.2	96.1	961	5	68	150
SWA12S	TSWA12S	12	41.5	415	5	68	100
SWA15S	TSWA15S	15	33	333	5	70	100
SWA24S	TSWA24S	24	20.8	208	5	70	200
SWA28S	TSWA28S	28	17.8	178	5	70	200
SWA48S	TSWA48S	48	10.4	104	5	70	200
SWB3.3S	TSWB3.3S	3.3	151.5	1515	5	67	150
SWB5S	TSWB5S	5	160	1600	8	67	150
SWB5.25S	TSWB5.25S	5.2	153.8	1538	8	67	150
SWB12S	TSWB12S	12	83	833	10	73	100
SWB15S	TSWB15S	15	66	666	10	75	100
SWB24S	TSWB24S	24	41.6	416	10	73	200
SWB28S	TSWB28S	28	35.6	357	10	73	200
SWB48S	TSWB48S	48	20.8	208	10	73	300
SWC3.3S	TSWC3.3S	3.3	181.8	1818	6	67	150
SWC5S	TSWC5S	5	200	2000	10	67	150
SWC5.25S	TSWC5.25S	5	192.3	1923	10	67	150
SWC12S	TSWC12S	12	125	1250	15	73	100
SWC15S	TSWC15S	15	100	1000	15	74	100
SWC24S	TSWC24S	24	62.4	625	15	74	300
SWC28	TSWC28S	28	53.4	536	15	74	300
SWC48S	TSWC48S	48	31.2	312	15	73	350

Note 1: Tested at nominal input voltage and full output load.

Note 2: Maintain minimum 10% of rated load to prevent a voltage surge.

MODEL LIST**DUAL OUTPUT**

Through Hole	Terminal Strip	Output Voltage [±VDC]	Output Current		Output Power [±W]	Efficiency ⁽¹⁾ [%] typ.	Output Ripple Per Output @ 1MHz BW [mVp-p max]
			Min. ⁽²⁾ [±mA]	Max. [±mA]			
SWA5D	TSWA5D	5	50	500	2.5	68	150
SWA12D	TSWA12D	12	20	208	2.5	68	100
SWA15D	TSWA15D	15	16.5	166	2.5	70	100
SWB5D	TSWB5D	5	80	800	4	68	150
SWB12D	TSWB12D	12	41.5	416	5	75	100
SWB15D	TSWB15D	15	33.5	333	5	76	100
SWC5D	TSWC5D	5	100	1000	5	69	150
SWC12D	TSWC12D	12	62.5	625	7.5	75	100
SWC15D	TSWC15D	15	50	500	7.5	76	100

Note 1: Tested at nominal input voltage and full output load.

Note 2: Maintain minimum 10% of rated load to prevent a voltage surge.

Note 3: Dual output loads must be balanced.

SPECIFICATIONS (Nominal V_{IN} , Full Load, $T_A = +25^\circ\text{C}$, 1 hour warm up unless otherwise specified)**INPUT**

Parameter	Condition		Min.	Typ.	Max.	Units
Input Voltage Range			90	115	130	VAC
Input Frequency			47	60	440	Hz
Input Fuse Recommendation	With external 5Ω inrush thermistor	SWA/TSWA models	0.25A, Rated Voltage ≥ Input Voltage			
		SWB/TSWB models	0.5A, Rated Voltage ≥ Input Voltage			
		SWC/TSWC models	0.75A, Rated Voltage ≥ Input Voltage			
Input Thermistor Recommendation			-	5	-	Ω

OUTPUT

Parameter	Condition	Min.	Typ.	Max.	Units
Line Regulation		-	-	1	±%
Load Regulation	25-100% load	-	-	2	±%
Output Voltage Tolerance	Nominal V_{IN} , Full Load	-	-	2	±%

ENVIRONMENTAL

Parameter	Condition	Min.	Typ.	Max.	Units
Operating Temperature Range	Ambient without derating	-25	-	+70	°C
Storage Temperature Range	Ambient	-55	-	+105	°C
Cooling	Free Air Convection				

SPECIFICATIONS (Nominal V_{IN} , Full Load, $T_A = +25^{\circ}\text{C}$, 1 hour warm up unless otherwise specified)**GENERAL**

Parameter	Condition	Min.	Typ.	Max.	Units
Isolation Voltage		1200	-	-	VRMS
Insulation Resistance		100	-	-	MΩ
Switching Frequency		-	100	-	kHz
Size (L x W x H)	SWA models	2.22 x 1.825 x 0.5 (56.388 x 46.355 x 12.7)			inches (mm)
	SWB models	2.3 x 2.3 x 0.5 (58.42 x 58.42 x 12.7)			
	SWC models	3.215 x 2.27 x 0.5 (81.661 x 57.658 x 12.7)			
	TSWA models	2.77 x 1.825 x 0.5 (70.358 x 46.355 x 12.7)			
	TSWB models	2.85 x 2.3 x 0.5 (72.39 x 58.42 x 12.7)			
	TSWC models	3.765 x 2.27 x 0.5 (95.631 x 57.658 x 12.7)			
Weight	SWA models	-	57	-	grams
	SWB models	-	77	-	
	SWC models	-	105	-	
	TSWA models	-	68	-	
	TSWB models	-	88	-	
	TSWC models	-	116	-	
Case	Diallyl Phthalate (DAP)				
Potting	Vacuum Impregnated Epoxy				
Box Packaging	8 x 7.5 x 1.5 (203.2 x 190.5 x 38.1) or 12 x 9 x 1.5 (304.8 x 228.6 x 38.1)				inches (mm)

PROTECTIONS & FEATURES

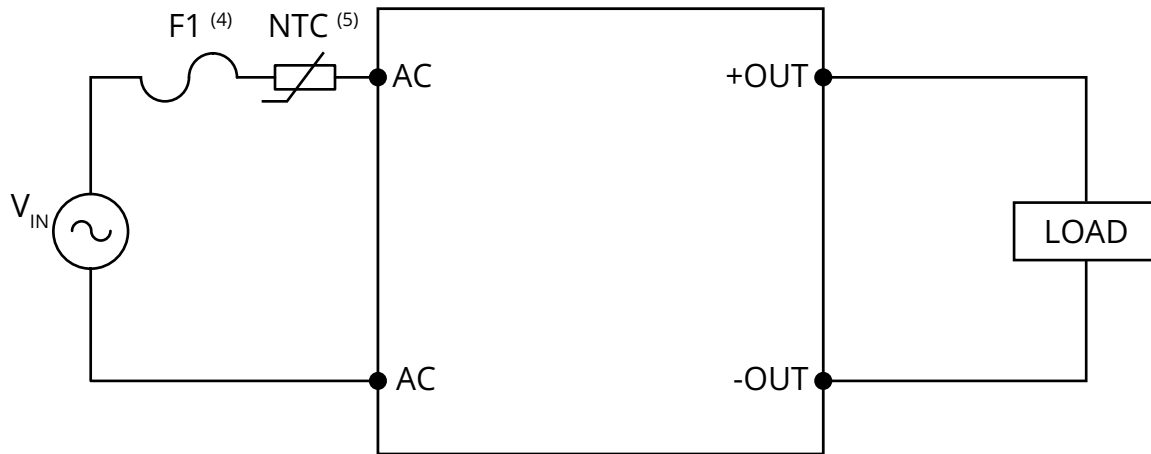
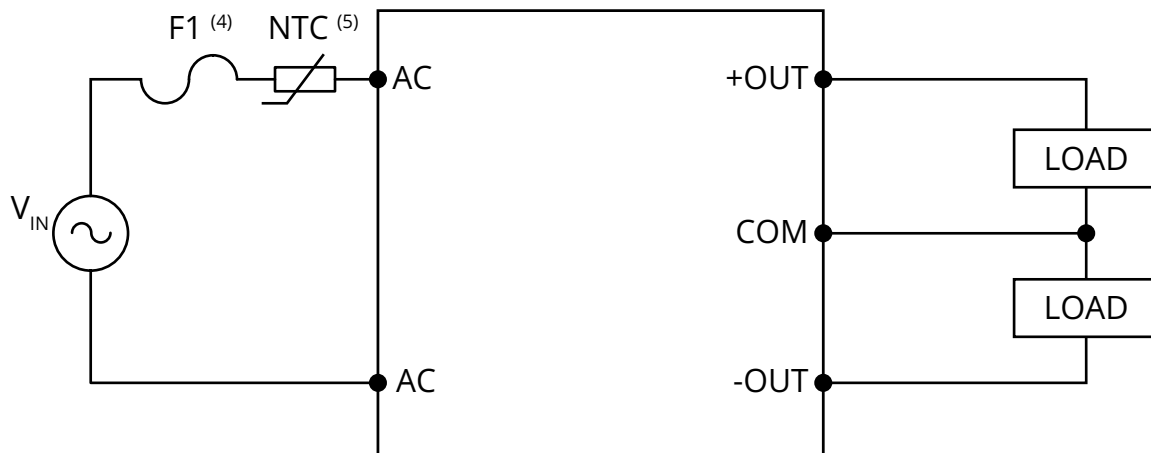
Parameter	Condition	Min.	Typ.	Max.	Units
Short circuit	Continuous				

DESIGNED TO MEET

Test	Referenced Standard	Description
Vibration	MIL-STD-202	Method 204, Vibration, High Frequency, Condition D
Shock	MIL-STD-202	Method 213, Shock (Specified Pulse), Condition I
Humidity	MIL-STD-202	Method 106, Moisture Resistance
Altitude	MIL-STD-202	Method 105, Barometric Pressure (Reduced), Condition D

OPTIONS AVAILABLE - CONTACT PICO FOR PART NUMBER

Parameter	Referenced Standard	Description
Stabilization Bake	MIL-STD-883	Referenced Method 1008 Non-operating maximum storage temperature for 24 hours
Temperature Cycle	MIL-STD-883	Referenced Method 1010 Non-operating at temperature extremes, 15 mins/temp, 10 cycles
Burn-In	MIL-STD-883	Referenced Method 1015 Max operating temperature for 160 hours
Expanded Operating Temperature Range	-55°C to +85°C	

TYPICAL CONNECTION CIRCUIT**SINGLE OUTPUT****DUAL OUTPUT**

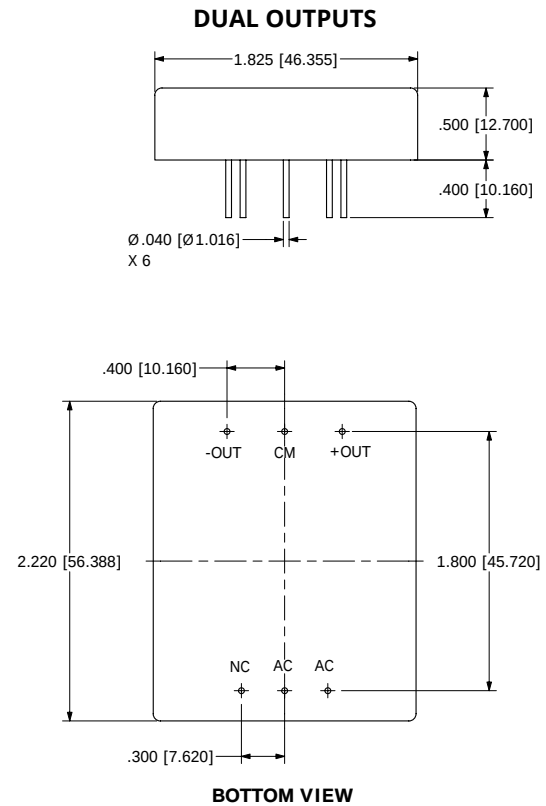
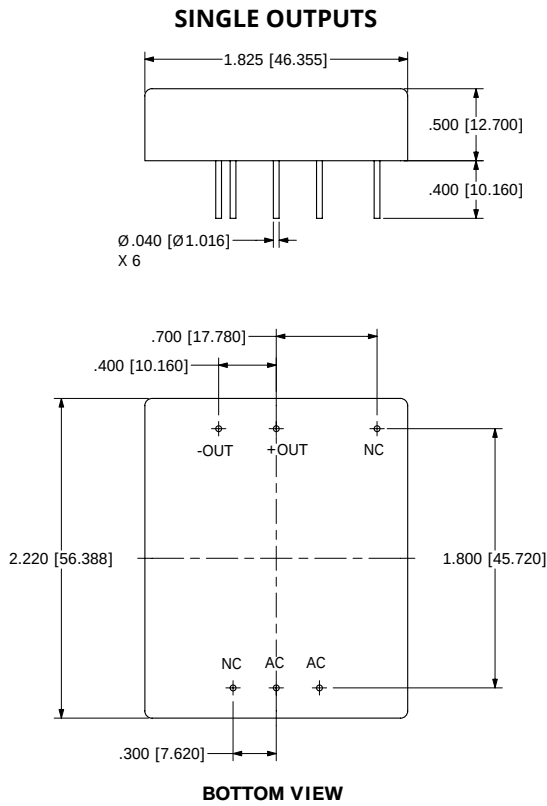
Note 3: Dual output loads must be balanced.

Note 4: For SWA/TSWA models, a 0.25A fuse is required on the input. For SWB/TSWB models, a 0.5A fuse is required on the input. For SWC/TSWC models, a 0.75A fuse is required on the input.

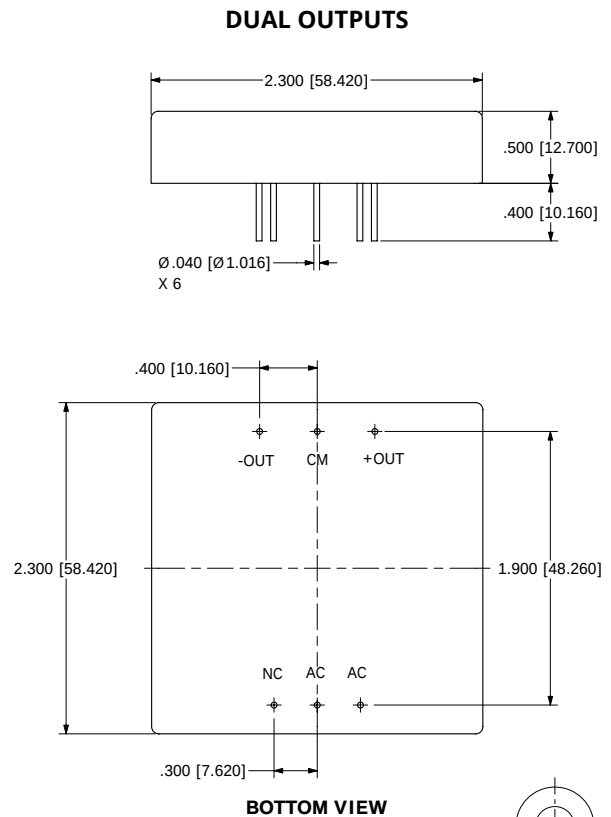
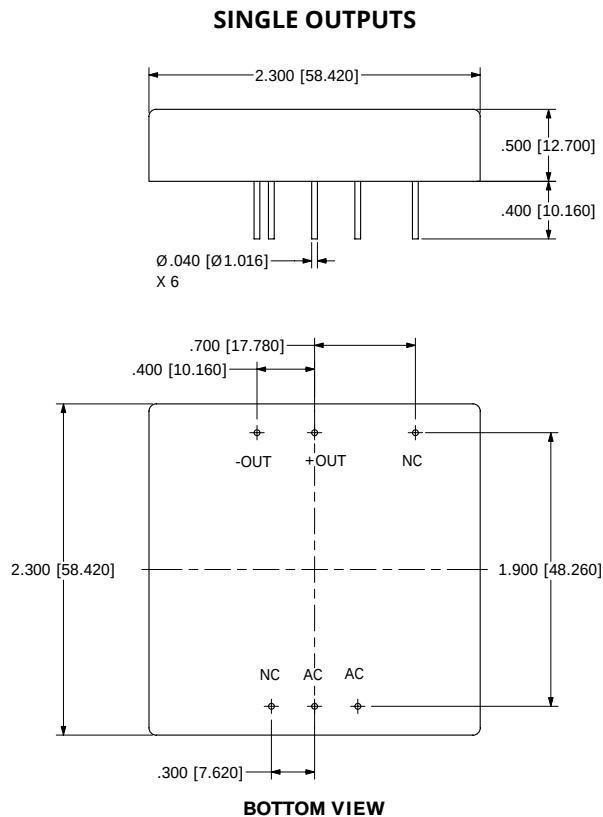
Note 5: A 5Ω inrush thermistor is required on the input.

MECHANICAL DRAWINGS

SWA MODELS

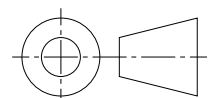


SWB MODELS



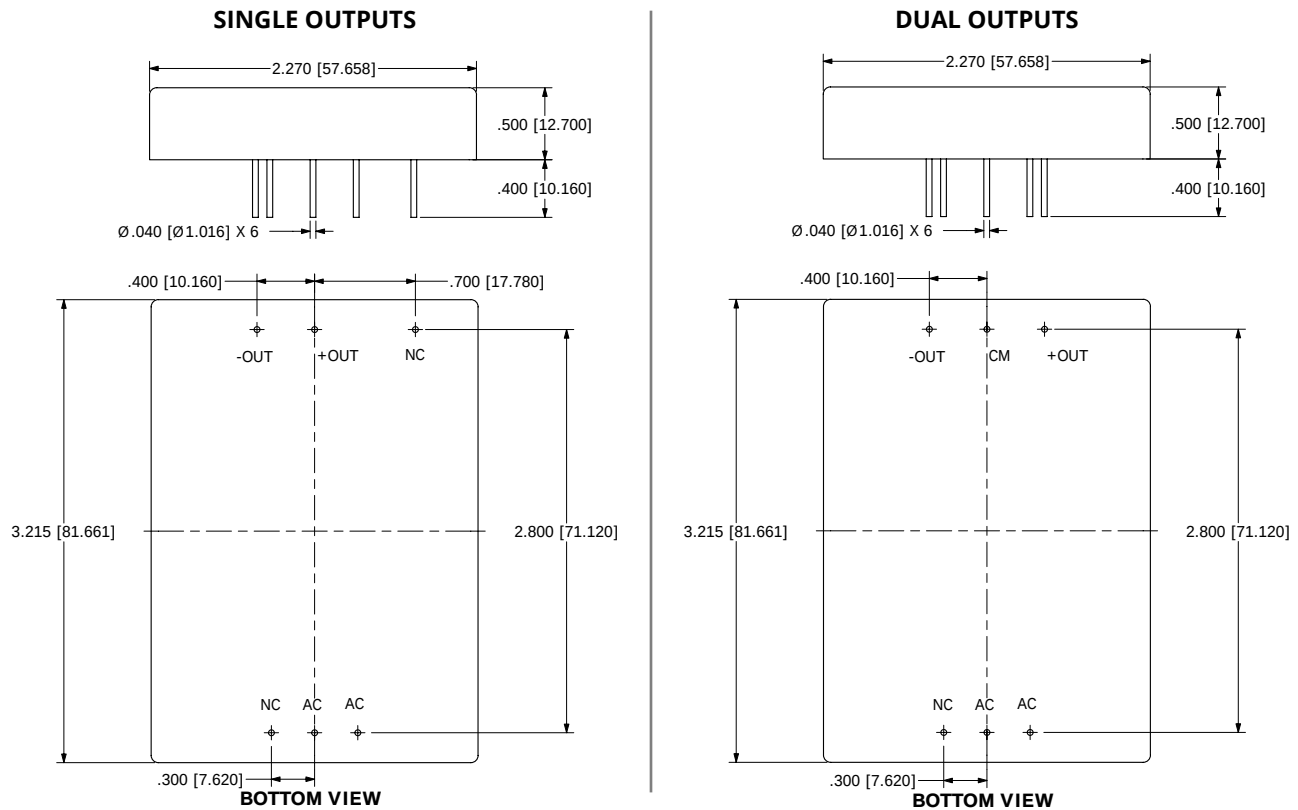
NOTES

a. ALL DIMENSIONS ARE IN INCHES, [] = MM

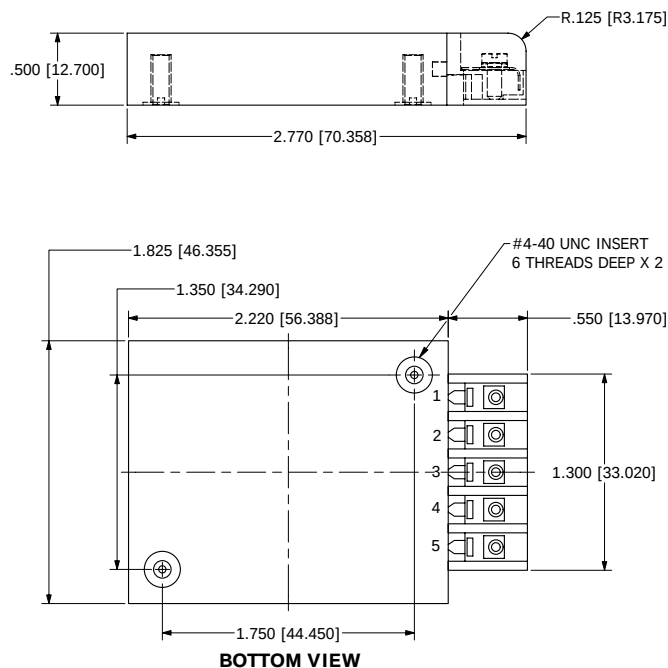


MECHANICAL DRAWINGS

SWC MODELS



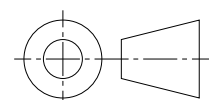
TSWA MODELS



PIN	FUNCTION	
	SINGLE	DUAL
1	AC IN	
2	AC IN	
3	N/C	-OUT
4	-OUT	COM
5		+OUT

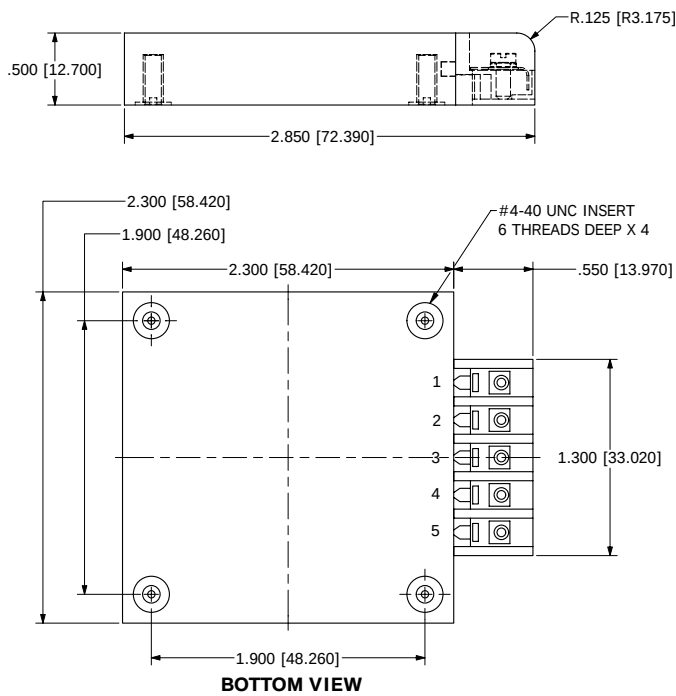
NOTES

- a. ALL DIMENSIONS ARE IN INCHES, [] = MM
- b. RECOMMENDED MOUNTING TORQUE: 3-5 IN-LBS



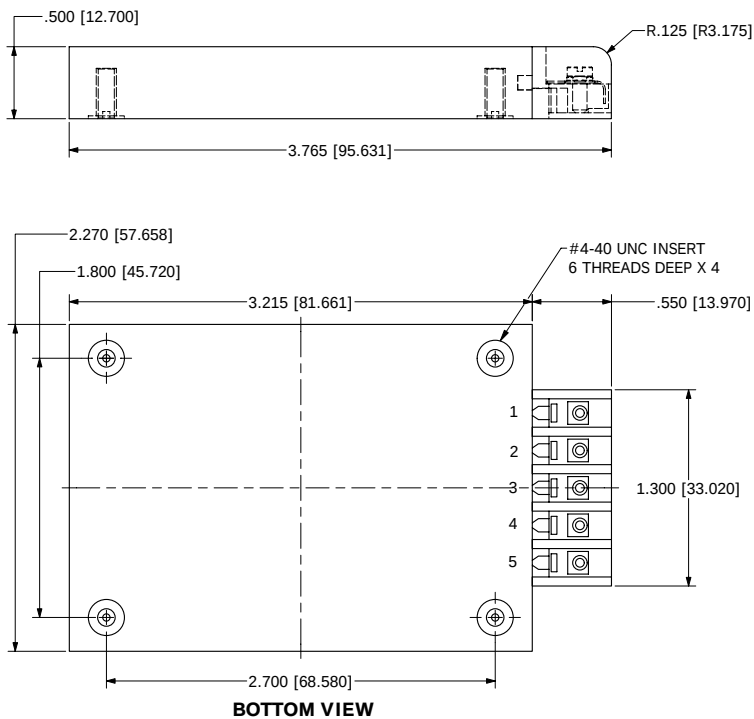
MECHANICAL DRAWINGS

TSWB MODELS



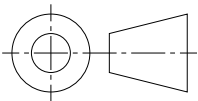
PIN	FUNCTION	
	SINGLE	DUAL
1	AC IN	
2	AC IN	
3	N/C	-OUT
4	-OUT	COM
5	+OUT	

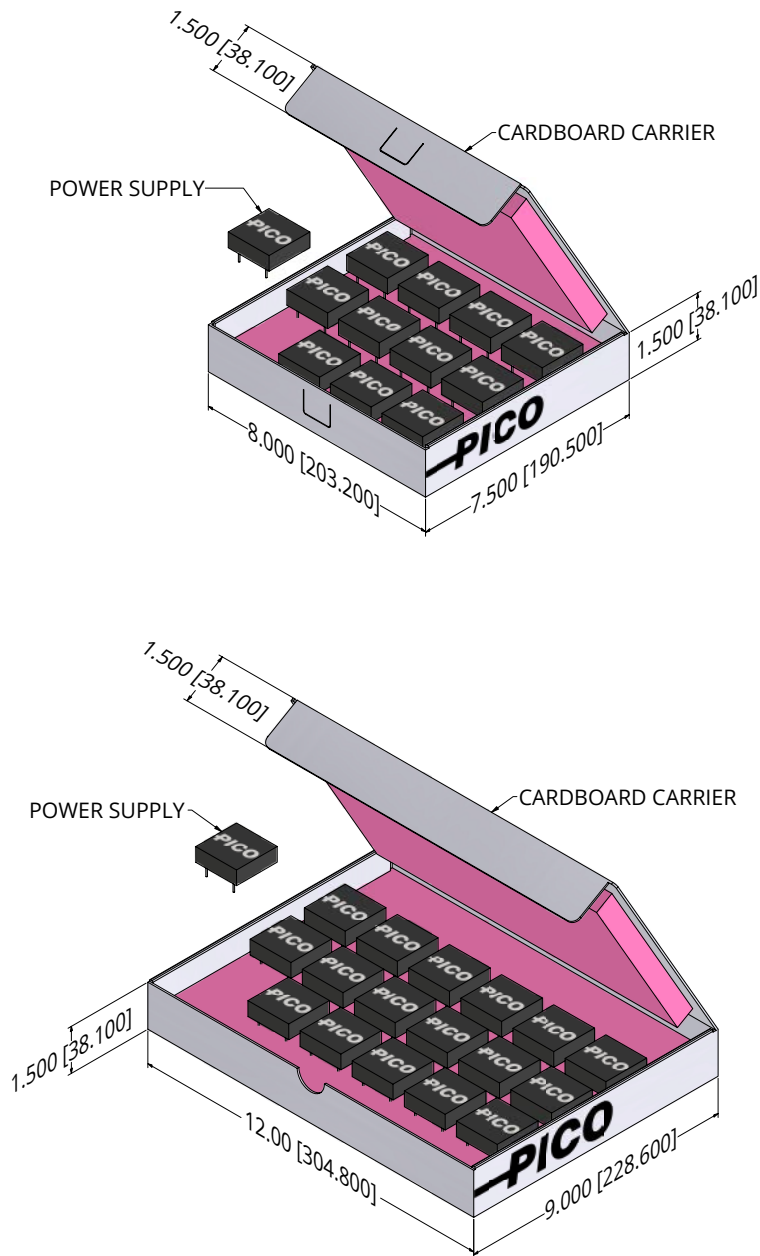
TSWC MODELS



PIN	FUNCTION	
	SINGLE	DUAL
1	AC IN	
2	AC IN	
3	N/C	-OUT
4	-OUT	COM
5	+OUT	

NOTES
a. ALL DIMENSIONS ARE IN INCHES, [] = MM
b. RECOMMENDED MOUNTING TORQUE: 3-5 IN-LBS





Pico warrants each product manufactured by us and sold by us or an authorized representative, to be free from defects in material and workmanship. If properly used, it will perform within its applicable specifications for a period of one year after original shipment. Pico's obligation under this guarantee is limited to repairing or replacing our product to the original purchaser. This warranty is in lieu of all other warranties, express or implied and constitutes fulfillment of our obligations to the purchaser. We do not guarantee that the products can be used for a particular purpose other than those solely covered by the product's specifications. Pico must be notified if the product must meet particular certifications and/or standards. We assume no liability, in any event, for consequential damages, for anticipated or lost profits, incidental damages or loss of time or other losses incurred by the purchaser or any third party in connection with products covered by this warranty or otherwise. The purchaser will indemnify and hold Pico harmless for any damages, losses, costs, etc. from usage not within the product's specifications. Pico must be consulted before usage of its products in a nuclear, radioactive or space environment.

We reserve the right to discontinue products without notice, We reserve the right to make modifications to any existing catalog products without notice, at any time, without the obligation to modify units previously sold.

Series UWC & TUWC

20W Isolated Regulated AC-DC Power Supply



PRODUCT OVERVIEW

The UWC & TUWC series is a switching AC-DC power supply available in single and dual outputs. They offer excellent line and load regulation and is continuously protected against short circuits. The highly reliable module is capable of up to 20W power in a wide ambient temperature range -20°C to +70°C. These modules are the perfect design choice for your most stringent industrial applications.



FEATURES

- Up to 20W output power
- Single and dual outputs
- Compact size - 3.215" x 2.27"
- Through hole or terminal strip
- Continuous short-circuit protection
- Universal input range - 85-265VAC
- Fixed operating frequency

Contact Pico for part number of available options:

- Expanded operating temp: -40°C to +85°C
- Select screening per MIL-STD-883:
 - Stabilization Bake
 - Temperature Cycle
 - Burn-In
- Special Input Voltage, Output Voltage, or Output Power

T	UWC	28	S
MOUNTING	SERIES NAME	NOM. OUTPUT VOLTAGE	NUMBER OF OUTPUTS
BLANK = THRU HOLE T = TERMINAL STRIP	UWC	3.3 = 3.3V 5 = 5V 5.2 = 5.2V 12 = 12V 15 = 15V 24 = 24V 28 = 28V 48 = 48V	S = SINGLE D = DUAL

MODEL LIST**SINGLE OUTPUT**

Through Hole	Terminal Strip	Output Voltage [VDC]	Output Current		Output Power [W]	Efficiency ⁽¹⁾ [%] typ.	Load Regulation 10-100% [%] max	Output Voltage Tolerance ⁽¹⁾ [±VDC]	Output Ripple @ 1MHz BW [mVp-p] max
			Min. ⁽²⁾ [A]	Max. [A]					
UWC3.3S	TUWC3.3S	3.3	303	3030	10	72	2	2	150
UWC5S	TUWC5S	5	300	3000	15	74	2	2	200
UWC5.2S	TUWC5.2S	5.2	288.5	2885	15	74	2	2	200
UWC12S	TUWC12S	12	166	1660	20	80	2	2	200
UWC15S	TUWC15S	15	133	1330	20	80	2	2	200
UWC24S	TUWC24S	24	83.3	833	20	84	1	1	200
UWC28S	TUWC28S	28	71.4	714	20	84	1	1	200
UWC48S	TUWC48S	48	41.6	416	20	84	1	1	400

Note 1: Tested at nominal input voltage and full output load.

Note 2: Maintain minimum 10% of rated load to prevent a voltage surge.

DUAL OUTPUT

Through Hole	Terminal Strip	Output Voltage [VDC]	Output Current Per Output		Output Power Per Output [W]	Efficiency ⁽¹⁾ [%] typ.	Load Regulation 10-100% [%] max	Output Voltage Tolerance ⁽¹⁾ [±VDC]	Output Ripple @ 1MHz BW [mVp-p] max
			Min. ⁽²⁾ [A]	Max. [A]					
UWC5D	TUWC5D	±5	150	1500	7.5	74	2	2	200
UWC12D	TUWC12D	±12	83	830	10	78	2	2	150
UWC15D	TUWC15D	±15	66.5	665	10	78	2	2	150
UWC24D	TUWC24D	±24	41.7	417	10	80	2	2	150
UWC28D	TUWC28D	±28	35.7	357	10	80	2	2	150

Note 1: Tested at nominal input voltage and full output load.

Note 2: Maintain minimum 10% of rated load to prevent a voltage surge.

Note 3: Dual output loads must be balanced.

SPECIFICATIONS (115VAC/60Hz, Full Load, T_A = +25°C, 1 hour warm up unless otherwise specified)**INPUT**

Parameter	Condition	Min.	Typ.	Max.	Units
Input Voltage Range		85	115	265	VAC
Input Frequency		47	60	440	Hz
Input Fuse Recommendation	With external 10Ω inrush thermistor	1A, Rated Voltage ≥ Input Voltage			
Input Thermistor Recommendation		-	10	-	Ω

OUTPUT

Parameter	Condition	Min.	Typ.	Max.	Units
Line Regulation		-	-	1	±%

SPECIFICATIONS (115VAC/60Hz, Full Load, $T_A = +25^{\circ}\text{C}$, 1 hour warm up unless otherwise specified)**ENVIRONMENTAL**

Parameter	Condition	Min.	Typ.	Max.	Units
Operating Temperature Range	Ambient without derating	-25	-	+70	$^{\circ}\text{C}$
Storage Temperature Range	Ambient	-55	-	+105	$^{\circ}\text{C}$
Temperature Coefficient		-	0.02	-	$\%/^{\circ}\text{C}$
Cooling	Free Air Convection				

GENERAL

Parameter	Condition	Min.	Typ.	Max.	Units
Operating Frequency		-	100	-	kHz
Isolation Voltage	Input to output	2121	-	-	VDC
Size	L x W x H	2.5 x 2.3 x 0.5 (63.5 x 58.4 x 12.7)			inches (mm)
Weight		-	130	-	grams
Case	Glass Reinforced Polymer				
Potting	Vacuum Impregnated Epoxy				
Box Packaging	8 x 7.5 x 1.5 (203.2 x 190.5 x 38.1) or 12 x 9 x 1.5 (304.8 x 228.6 x 38.1)				inches (mm)

PROTECTIONS & FEATURES

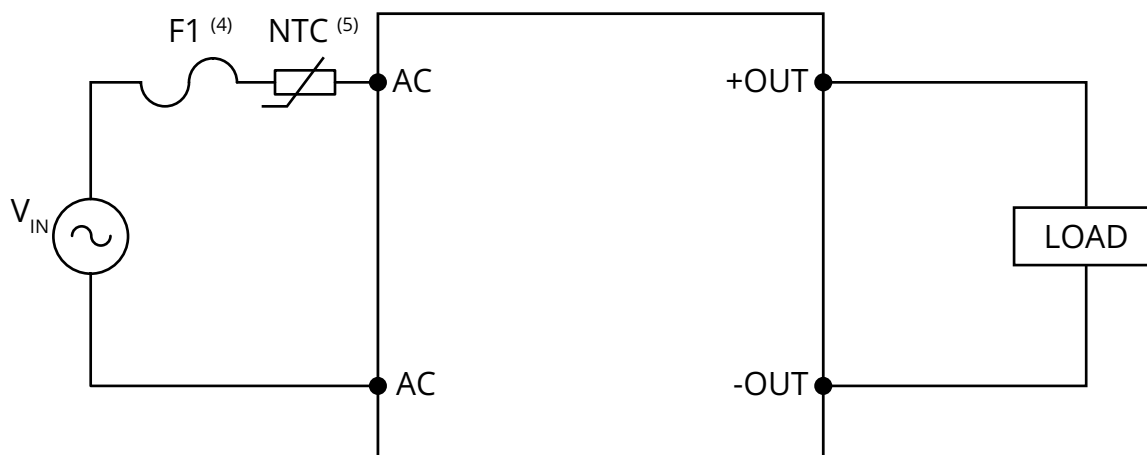
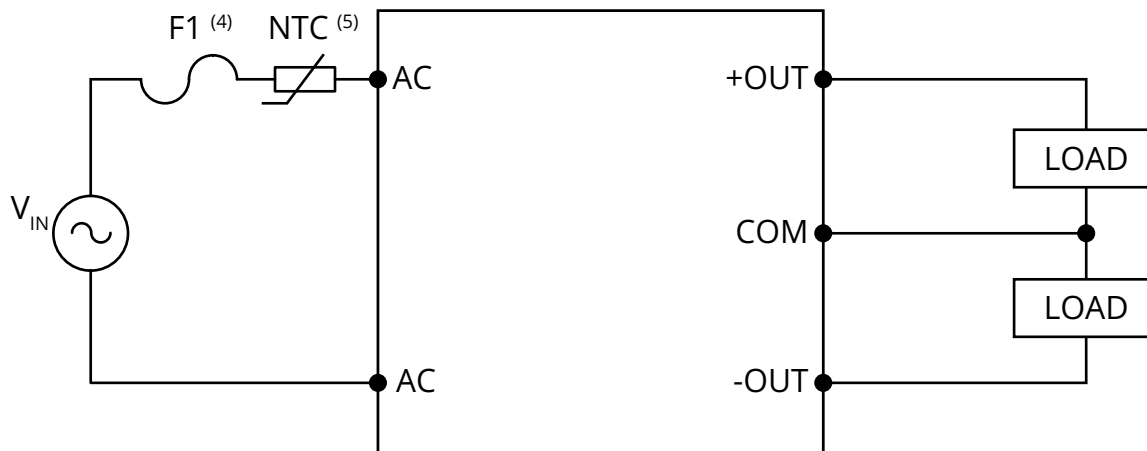
Parameter	Condition	Min.	Typ.	Max.	Units
Short circuit	Continuous, auto-recovery				

DESIGNED TO MEET

Test	Referenced Standard	Description
Vibration	MIL-STD-202	Method 204, Vibration, High Frequency, Condition D
Shock	MIL-STD-202	Method 213, Shock (Specified Pulse), Condition I
Humidity	MIL-STD-202	Method 106, Moisture Resistance
Altitude	MIL-STD-202	Method 105, Barometric Pressure (Reduced), Condition D

OPTIONS AVAILABLE – CONTACT PICO FOR PART NUMBER

Parameter	Referenced Standard	Description
Stabilization Bake	MIL-STD-883	Referenced Method 1008 Non-operating maximum storage temperature for 24 hours
Temperature Cycle	MIL-STD-883	Referenced Method 1010 Non-operating at temperature extremes, 15 mins/temp, 10 cycles
Burn-In	MIL-STD-883	Referenced Method 1015 Max operating temperature for 160 hours
Expanded Operating Temperature Range	-55 $^{\circ}\text{C}$ to +85 $^{\circ}\text{C}$	

TYPICAL CONNECTION CIRCUIT**SINGLE OUTPUT****DUAL OUTPUT**

Note 3: Dual output loads must be balanced.

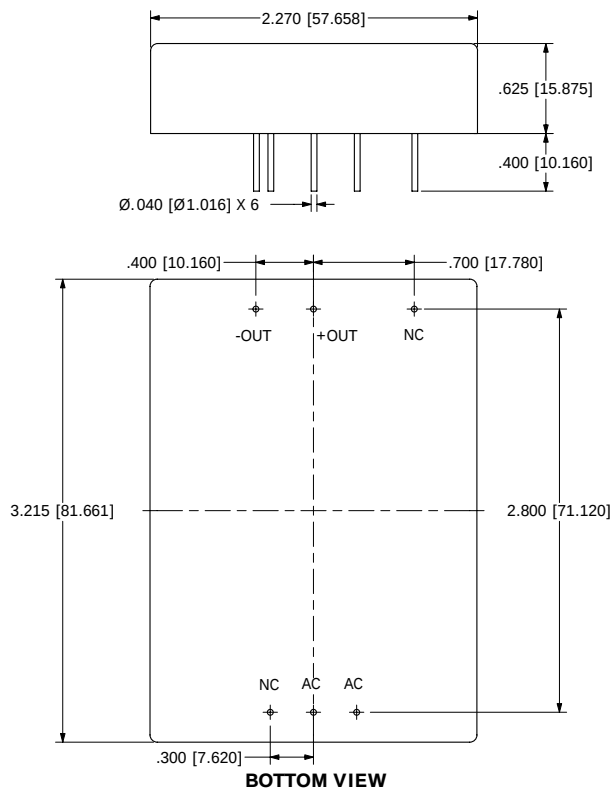
Note 4: A 1A fuse is required on the input.

Note 5: A 10 Ω inrush thermistor is required on the input.

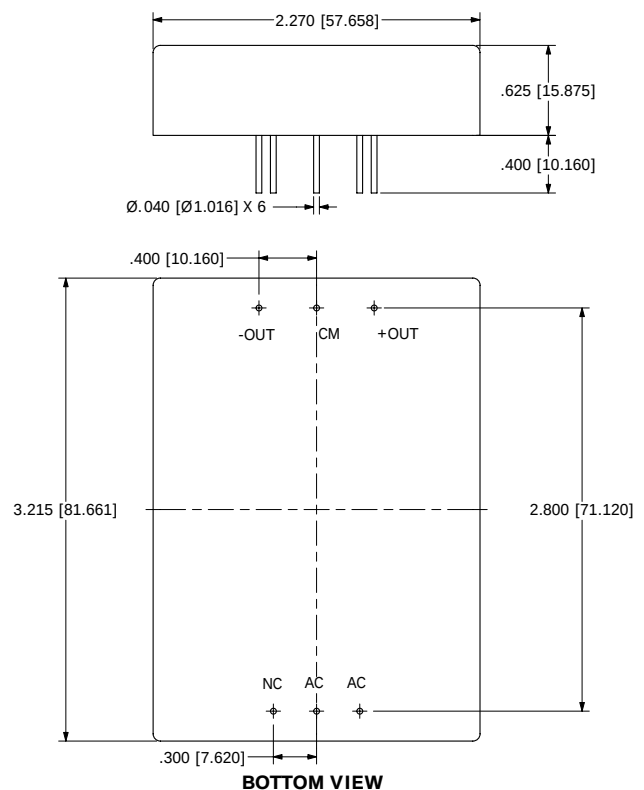
MECHANICAL DRAWINGS

THROUGH HOLE

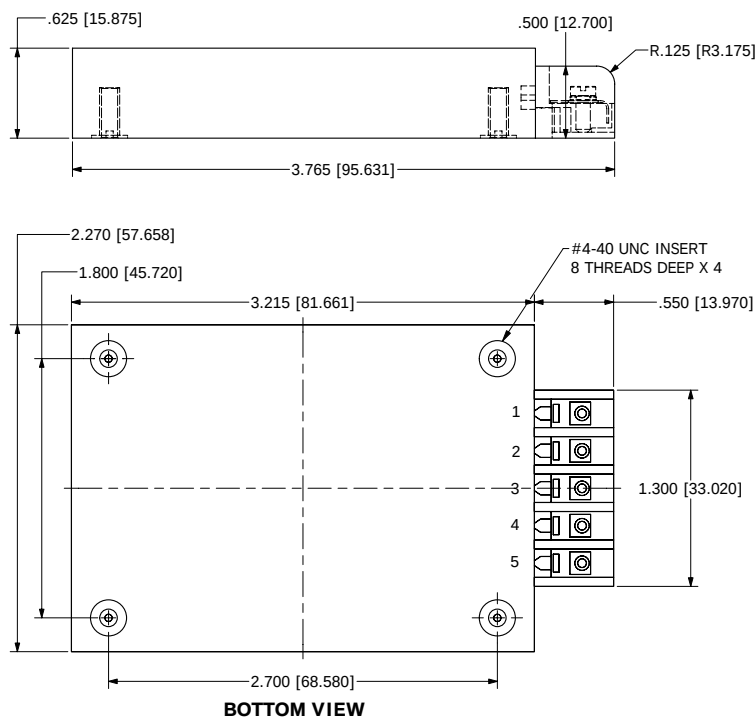
SINGLE OUTPUTS



DUAL OUTPUTS



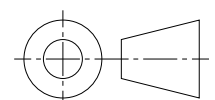
TERMINAL STRIP



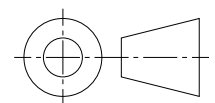
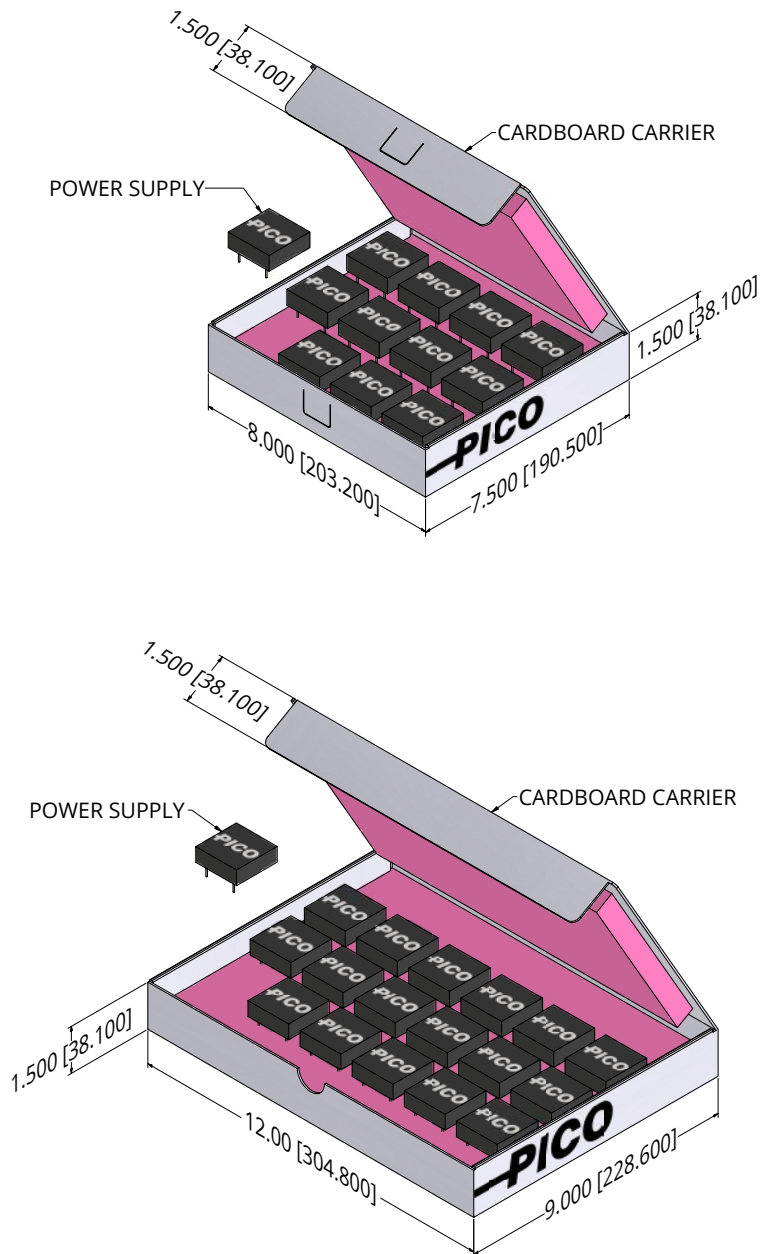
PIN	FUNCTION	
	SINGLE	DUAL
1	AC IN	
2	AC IN	
3	N/C	-OUT
4	-OUT	COM
5		+OUT

NOTES

- ALL DIMENSIONS ARE IN INCHES, [] = MM
- RECOMMENDED MOUNTING TORQUE: 3-5 IN-LBS



BOX PACKAGING - BULK



Pico warrants each product manufactured by us and sold by us or an authorized representative, to be free from defects in material and workmanship. If properly used, it will perform within its applicable specifications for a period of one year after original shipment. Pico's obligation under this guarantee is limited to repairing or replacing our product to the original purchaser. This warranty is in lieu of all other warranties, express or implied and constitutes fulfillment of our obligations to the purchaser. We do not guarantee that the products can be used for a particular purpose other than those solely covered by the product's specifications. Pico must be notified if the product must meet particular certifications and/or standards. We assume no liability, in any event, for consequential damages, for anticipated or lost profits, incidental damages or loss of time or other losses incurred by the purchaser or any third party in connection with products covered by this warranty or otherwise. The purchaser will indemnify and hold Pico harmless for any damages, losses, costs, etc. from usage not within the product's specifications. Pico must be consulted before usage of its products in a nuclear, radioactive or space environment.

We reserve the right to discontinue products without notice, We reserve the right to make modifications to any existing catalog products without notice, at any time, without the obligation to modify units previously sold.

Series 30AC

30W Isolated Regulated AC-DC Power Supply



PRODUCT OVERVIEW

The 30AC series is a switching AC-DC power supply available in single, dual and triple outputs. They offer excellent line and load regulation and is continuously protected against short circuits. The highly reliable module is capable of up to 30W power in a wide ambient temperature range -25°C to +70°C. These modules are the perfect design choice for your most stringent industrial applications.

The case has a low profile height, 0.500", and threaded inserts to mount securely for high vibration and shock applications.



FEATURES

- Up to 30W output power
 - Single, dual and triple outputs
 - Low profile size - 5" x 3.2" x 0.5"
 - 1200V input/output isolation
 - Through hole mounting
 - Continuous short-circuit protection
 - Two input voltage ranges
 - Fixed operating frequency
 - No external components required
- Contact Pico for part number of available options:

 - Expanded operating temp: -55°C to +85°C
 - Select screening per MIL-STD-883:
 - Stabilization Bake
 - Temperature Cycle
 - Burn-In
 - Special Input Voltage, Output Voltage, or Output Power
 - Low Isolation Capacitance

H	30AC	5	T	12
INPUT VOLTAGE RANGE	SERIES NAME	MAIN OUTPUT VOLTAGE	NUMBER OF OUTPUTS	TRIPLE OUTPUT AUXILIARY
BLANK = 90 - 130VAC H = 170 - 240 VAC	30AC	5 = 5V 12 = 12V 15 = 15V 24 = 24V 28 = 28V	S = SINGLE D = DUAL T = TRIPLE	5 = ±5V 12 = ±12V 15 = ±15V

MODEL LIST**SINGLE OUTPUT**

Pico Part Number		Output Voltage [VDC]	Output Current		Output Power [W]	Load Regulation 10-100% ⁽¹⁾ [%] max	Output Voltage Tolerance ⁽²⁾ [±%]	Efficiency ⁽²⁾ [%] typ.
90-130 VAC Input	170-240 VAC Input		Min. [A]	Max. [A]				
30AC5S	H30AC5S	5	500	5000	25	0.5	0.5	75
30AC12S	H30AC12S	12	250	2500	30			81
30AC15S	H30AC15S	15	200	2000	30			82
30AC24S	H30AC24S	24	125	1250	30			83
30AC28S	H30AC28S	28	107	1070	30			83

Note 1: Maintain minimum 10% of rated load to prevent a voltage surge.

Note 2: Tested at nominal input voltage and full output load.

DUAL OUTPUT

Pico Part Number		Output Voltage [±VDC]	Output Current Per Output		Output Power Per Output [±W]	Load Regulation 10-100% ⁽¹⁾ [%] max	Output Voltage Tolerance ⁽²⁾ [±%]	Efficiency ⁽²⁾ [%] typ.
90-130 VAC Input	170-240 VAC Input		Min. [±A]	Max. [±A]				
30AC5D	H30AC5D	5	250	2500	12.5	0.5	0.5	76
30AC12D	H30AC12D	12	125	1250	15			78
30AC15D	H30AC15D	15	100	1000	15			80

Note 1: Maintain minimum 10% of rated load to prevent a voltage surge.

Note 2: Tested at nominal input voltage and full output load.

Note 3: Dual output loads must be balanced.

TRIPLE OUTPUT

Pico Part Number		Output Voltage [VDC]	MAIN / AUXILIARY			Load Regulation 25-100% ⁽¹⁾ [%] max	Output Voltage Tolerance ⁽²⁾ [±%]	Efficiency ⁽²⁾ [%] typ.
90-130 VAC Input	170-240 VAC Input		Output Current		Output Power			
			Min. [mA]	Max. [mA]	[W]			
30AC5T12	H30AC5T12	5 / ±12	400 / ±20.8	4000 / ±208	20 / ±2.5	0.5 / 5	0.5 / 5	78
30AC5T15	H30AC5T15	5 / ±15	400 / ±16.6	4000 / ±166	20 / ±2.5			78
30AC12T5	H30AC12T5	12 / ±5	208 / ±50	2080 / ±500	25 / ±2.5			80
30AC15T5	H30AC15T5	15 / ±5	166 / ±50	1660 / ±500	25 / ±2.5			80

Note 1: Maintain minimum 10% of rated load to prevent a voltage surge.

Note 2: Tested at nominal input voltage and full output load.

Note 4: Auxiliary outputs must be balanced.

SPECIFICATIONS (V_{IN} , Full Load, $T_A = +25^\circ\text{C}$, 1 hour warm up unless otherwise specified)**INPUT**

Parameter	Condition	Min.	Typ.	Max.	Units
Input Voltage Range	30AC models	90	115	130	VAC
	H30AC models	170	220	240	
Input Frequency		47	60	440	Hz
Input Fuse Recommendation	30AC models with external 5Ω inrush thermistor	2A, Rated Voltage $\geq$ Input Voltage			
	H30AC models with external 10Ω inrush thermistor	1A, Rated Voltage $\geq$ Input Voltage			
Input Thermistor Recommendation	30AC models	-	5	-	Ω
	H30AC models	-	10	-	

OUTPUT

Parameter	Condition	Min.	Typ.	Max.	Units
Line Regulation		-	-	0.2	±%
Output Ripple	1MHz bandwidth	-	-	50	mVp-p

ENVIRONMENTAL

Parameter	Condition	Min.	Typ.	Max.	Units
Operating Temperature Range	Ambient without derating	-25	-	+70	°C
Storage Temperature Range	Ambient	-55	-	+125	°C
Temperature Coefficient		-	0.02	-	%/°C
Cooling	Free Air Convection				

GENERAL

Parameter	Condition	Min.	Typ.	Max.	Units
Operating Frequency		25	-	35	kHz
Isolation Voltage	Input to output	1200	-	-	V _{RMS}
Size	L x W x H	5 x 3.2 x 0.5 (127 x 81.28 x 12.7)			inches (mm)
Weight	Single output models	-	325	-	grams
	Dual output models	-	330	-	
	Triple output models	-	340	-	
Case	6-Sided Epoxy Insulated Metal				
Potting	Vacuum Impregnated Epoxy				
Box Packaging	8 x 7.5 x 1.5 (203.2 x 190.5 x 38.1) or 12 x 9 x 1.5 (304.8 x 228.6 x 38.1)				inches (mm)

PROTECTIONS & FEATURES

Parameter	Condition	Min.	Typ.	Max.	Units
Short circuit	Continuous, auto-recovery				

SPECIFICATIONS (V_{IN} , Full Load, $T_A = +25^{\circ}\text{C}$, 1 hour warm up unless otherwise specified)

DESIGNED TO MEET

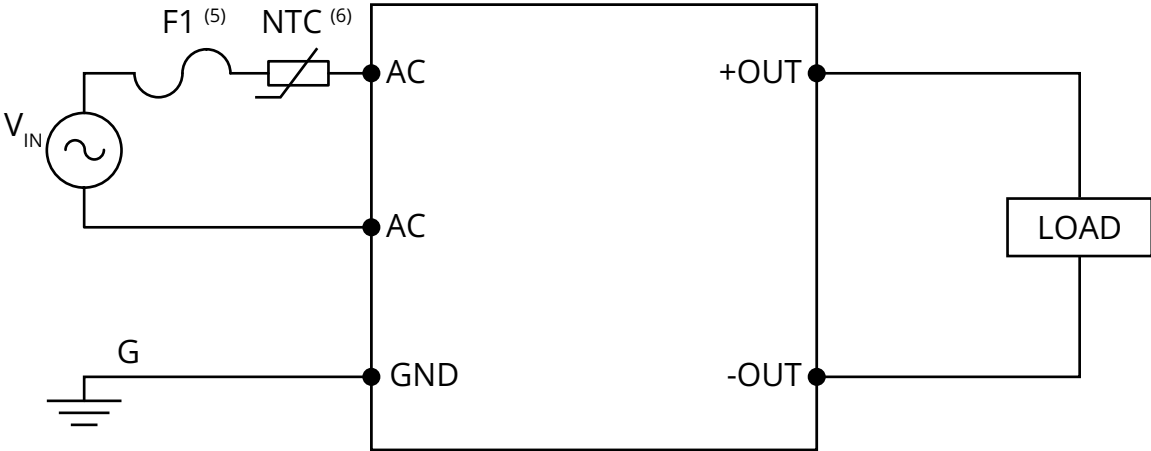
Test	Referenced Standard	Description
Vibration	MIL-STD-202	Method 204, Vibration, High Frequency, Condition D
Shock	MIL-STD-202	Method 213, Shock (Specified Pulse), Condition I
Humidity	MIL-STD-202	Method 106, Moisture Resistance
Altitude	MIL-STD-202	Method 105, Barometric Pressure (Reduced), Condition D

OPTIONS AVAILABLE – CONTACT PICO FOR PART NUMBER

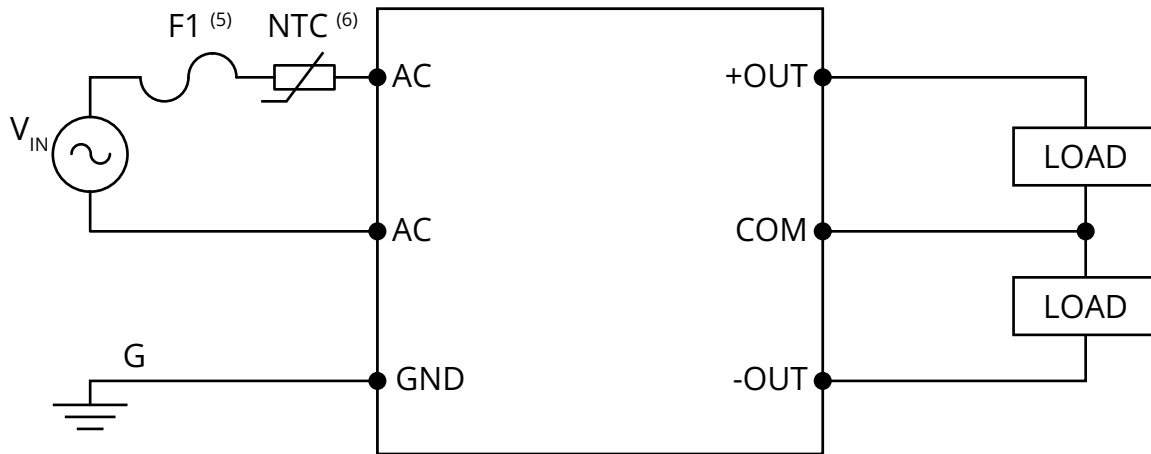
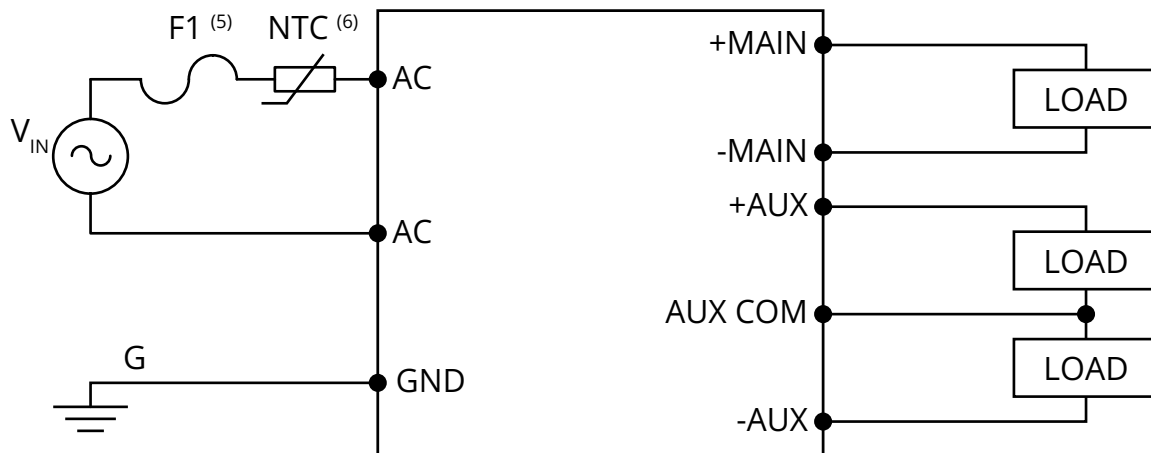
Parameter	Referenced Standard	Description
Stabilization Bake	MIL-STD-883	Referenced Method 1008 Non-operating maximum storage temperature for 24 hours
Temperature Cycle	MIL-STD-883	Referenced Method 1010 Non-operating at temperature extremes, 15 mins/temp, 10 cycles
Burn-In	MIL-STD-883	Referenced Method 1015 Max operating temperature for 160 hours
Expanded Operating Temperature Range		-55°C to +85°C

TYPICAL CONNECTION CIRCUIT

SINGLE OUTPUT



Note 5: For 30AC models, a 2A fuse is required on the input. For H30AC models, a 1A fuse is required on the input.
Note 6: For 30AC models, a 5Ω inrush thermistor is required on the input. For H30AC models, a 10Ω inrush thermistor is required on the input.

TYPICAL CONNECTION CIRCUIT**DUAL OUTPUT****TRIPLE OUTPUT**

Note 3: Dual output loads must be balanced.

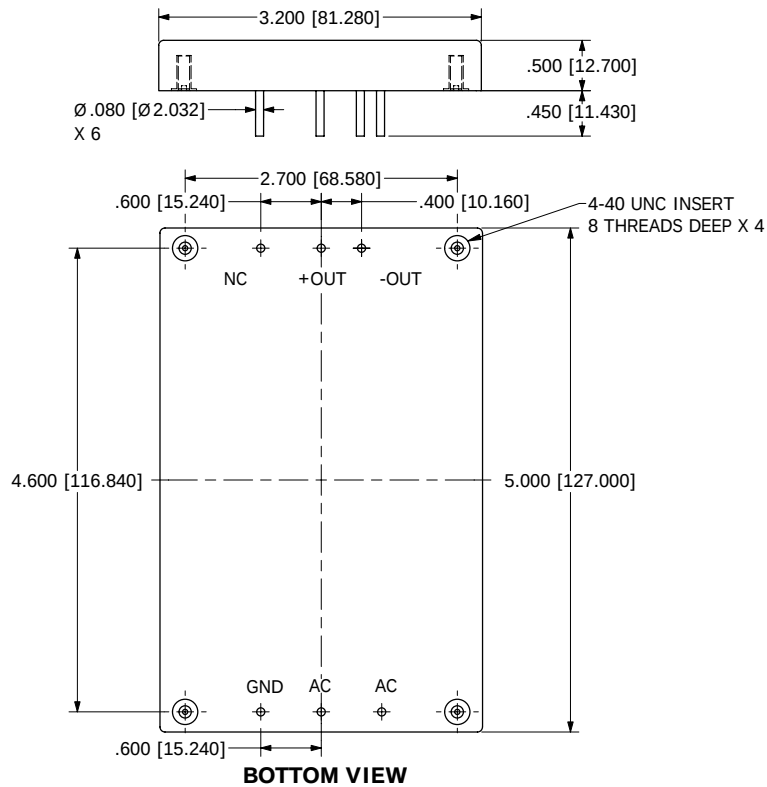
Note 4: Auxiliary outputs must be balanced.

Note 5: For 30AC models, a 1.5A fuse is required on the input. For H30AC models, a 1A fuse is required on the input.

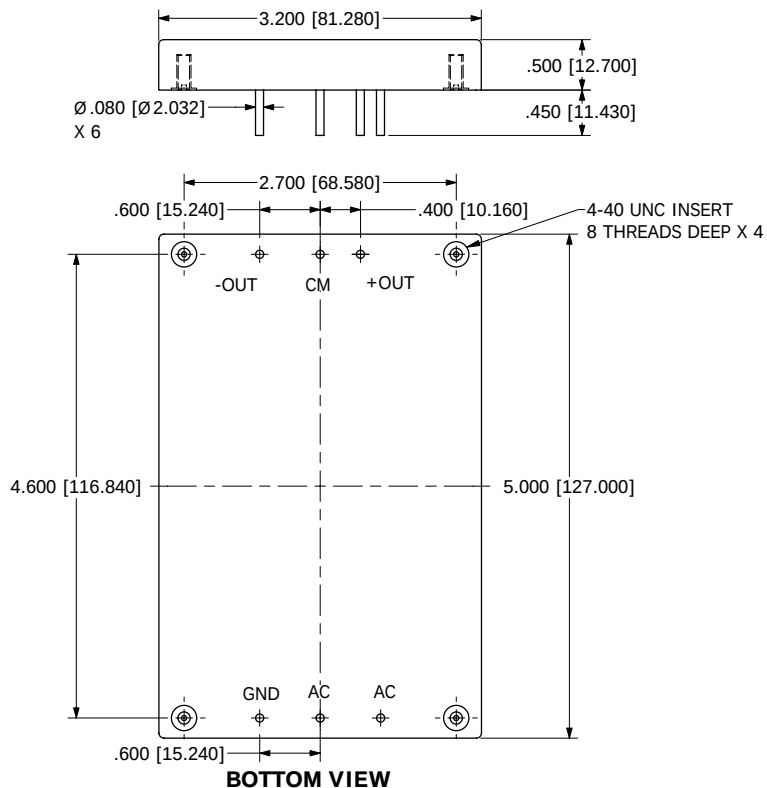
Note 6: For 30AC models, a 5Ω inrush thermistor is required on the input. For H30AC models, a 10Ω inrush thermistor is required on the input.

MECHANICAL DRAWINGS

SINGLE OUTPUTS



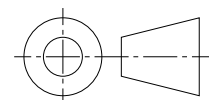
DUAL OUTPUTS



NOTES

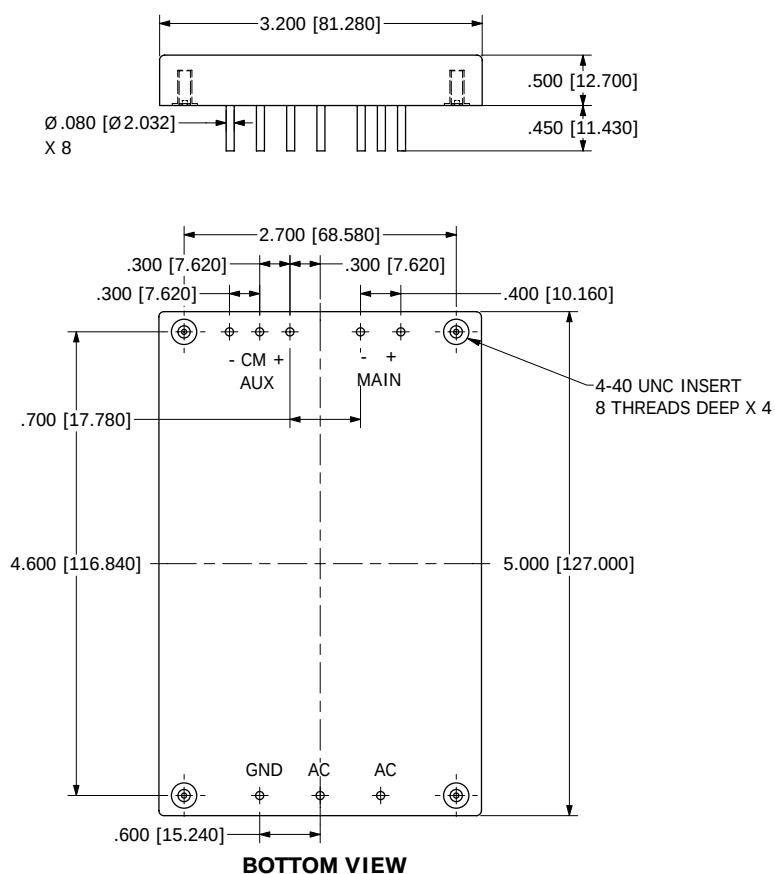
a. ALL DIMENSIONS ARE IN INCHES, [] = MM

b. THE RECOMMENDED TORQUE FOR MOUNTING SCREWS IS 3-5 IN-LBS.



MECHANICAL DRAWINGS

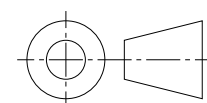
TRIPLE OUTPUTS

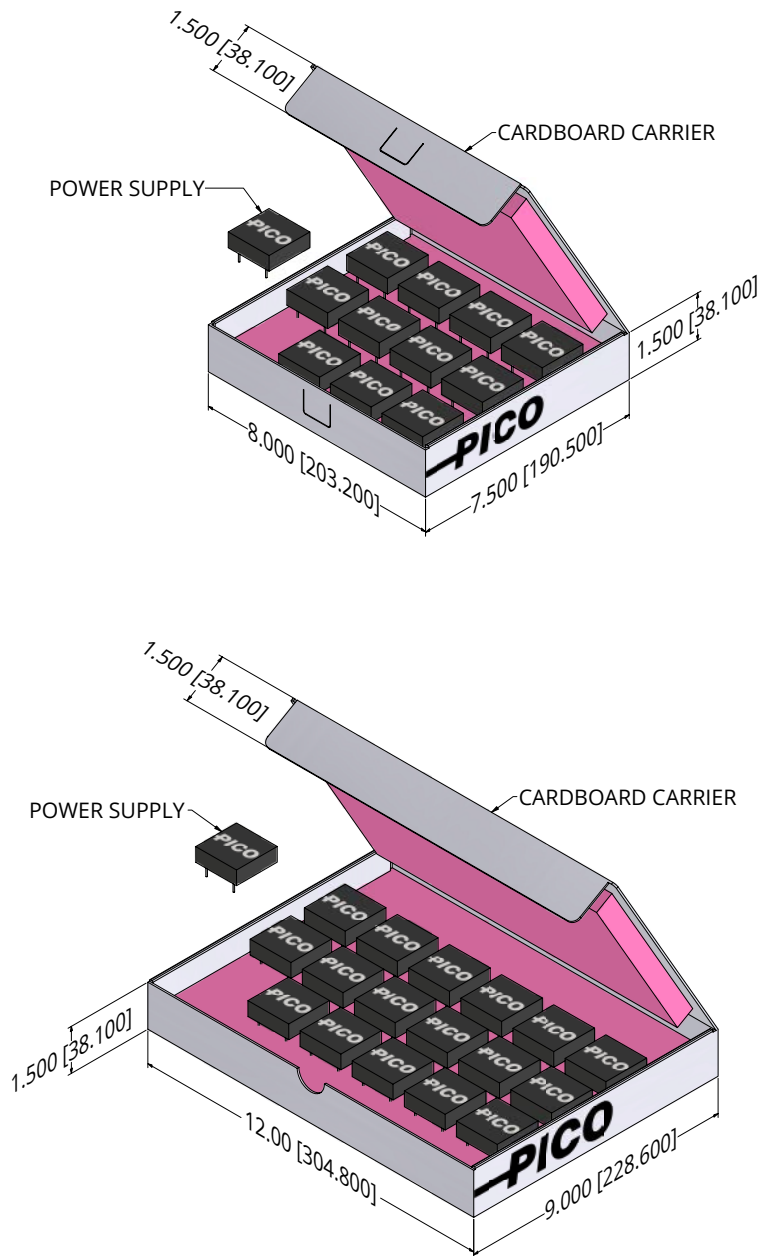


NOTES

a. ALL DIMENSIONS ARE IN INCHES, [] = MM

b. THE RECOMMENDED TORQUE FOR MOUNTING SCREWS IS 3-5 IN-LBS.



BOX PACKAGING - BULK

Pico warrants each product manufactured by us and sold by us or an authorized representative, to be free from defects in material and workmanship. If properly used, it will perform within its applicable specifications for a period of one year after original shipment. Pico's obligation under this guarantee is limited to repairing or replacing our product to the original purchaser. This warranty is in lieu of all other warranties, express or implied and constitutes fulfillment of our obligations to the purchaser. We do not guarantee that the products can be used for a particular purpose other than those solely covered by the product's specifications. Pico must be notified if the product must meet particular certifications and/or standards. We assume no liability, in any event, for consequential damages, for anticipated or lost profits, incidental damages or loss of time or other losses incurred by the purchaser or any third party in connection with products covered by this warranty or otherwise. The purchaser will indemnify and hold Pico harmless for any damages, losses, costs, etc. from usage not within the product's specifications. Pico must be consulted before usage of its products in a nuclear, radioactive or space environment.

We reserve the right to discontinue products without notice, We reserve the right to make modifications to any existing catalog products without notice, at any time, without the obligation to modify units previously sold.

Series 50AC

55W Isolated Regulated AC-DC Power Supply



PRODUCT OVERVIEW

The 50AC series is a switching AC-DC power supply available in single, dual and triple outputs. They offer excellent line and load regulation and continuously protected against short circuits. The highly reliable module is capable of up to 55W power in a wide ambient temperature range -25°C to +70°C. These modules are the perfect design choice for your most stringent industrial applications.

The case has a low profile height, 0.500", and threaded inserts to mount securely for high vibration and shock applications.



FEATURES

- Up to 55W output power
 - Single, dual and triple outputs
 - Low profile size - 5.6" x 4.3" x 0.5"
 - 1200V input/output isolation
 - Through hole mounting
 - Continuous short-circuit protection
 - Two input voltage ranges
 - Fixed operating frequency
 - No external components required
- Contact Pico for part number of available options:

 - Expanded operating temp: -55°C to +85°C
 - Select screening per MIL-STD-883:
 - Stabilization Bake
 - Temperature Cycle
 - Burn-In
 - Special Input Voltage, Output Voltage, or Output Power
 - Low Isolation Capacitance

H	50AC	5	T	12
INPUT VOLTAGE RANGE	SERIES NAME	MAIN OUTPUT VOLTAGE	NUMBER OF OUTPUTS	TRIPLE OUTPUT AUXILIARY
BLANK = 90 - 130VAC H = 170 - 240 VAC	50AC	5 = 5V 12 = 12V 15 = 15V 24 = 24V 28 = 28V	S = SINGLE D = DUAL T = TRIPLE	5 = ±5V 12 = ±12V 15 = ±15V

MODEL LIST**SINGLE OUTPUT**

Pico Part Number		Output Voltage [VDC]	Output Current		Output Power [W]	Load Regulation 10-100% ⁽¹⁾ [%] max	Output Voltage Tolerance ⁽²⁾ [±%]	Efficiency ⁽²⁾ [%] typ.
90-130 VAC Input	170-240 VAC Input		Min. [A]	Max. [A]				
50AC5S	H50AC5S	5	900	9000	45	0.75	1	75
50AC12S	H50AC12S	12	458.3	4583	55	0.3	0.5	80
50AC15S	H50AC15S	15	366.7	3667	55	0.3	0.5	83
50AC24S	H50AC24S	24	229.2	2292	55	0.3	0.5	86
50AC28S	H50AC28S	28	196.4	1964	55	0.3	0.5	86

Note 1: Maintain minimum 10% of rated load to prevent a voltage surge.

Note 2: Tested at nominal input voltage and full output load.

DUAL OUTPUT

Pico Part Number		Output Voltage [±VDC]	Output Current Per Output		Output Power Per Output [±W]	Load Regulation 10-100% ⁽¹⁾ [%] max	Output Voltage Tolerance ⁽²⁾ [±%]	Efficiency ⁽²⁾ [%] typ.
90-130 VAC Input	170-240 VAC Input		Min. [±A]	Max. [±A]				
50AC5D	H50AC5D	5	450	4500	22.5	0.75	1	75
50AC12D	H50AC12D	12	229.1	2291	27.5	0.3	0.5	80
50AC15D	H50AC15D	15	183.3	1833	27.5	0.3	0.5	83

Note 1: Maintain minimum 10% of rated load to prevent a voltage surge.

Note 2: Tested at nominal input voltage and full output load.

Note 3: Dual output loads must be balanced.

TRIPLE OUTPUT

Pico Part Number		Output Voltage [VDC]	MAIN / AUXILIARY Output Current		Output Power [W]	Load Regulation 25-100% ⁽¹⁾ [%] max	Output Voltage Tolerance ⁽²⁾ [±%]	Efficiency ⁽²⁾ [%] typ.
90-130 VAC Input	170-240 VAC Input		Min. [mA]	Max. [mA]				
50AC5T12	H50AC5T12	5 / ±12	800 / ±20.8	8000 / ±208	40 / 2.5	0.75 / 1	0.5 / 5	75
50AC5T15	H50AC5T15	5 / ±15	800 / ±16.7	8000 / ±167	40 / 2.5	0.75 / 1		75
50AC12T5	H50AC12T5	12 / ±5	375 / ±50	3750 / ±500	45 / 2.5	0.25 / 1		77
50AC15T5	H50AC15T5	15 / ±5	300 / ±50	3000 / ±500	45 / 2.5	0.25 / 1		79

Note 1: Maintain minimum 10% of rated load to prevent a voltage surge.

Note 2: Tested at nominal input voltage and full output load.

Note 4: Auxiliary outputs must be balanced.

SPECIFICATIONS (V_{IN} , Full Load, $T_A = +25^\circ\text{C}$, 1 hour warm up unless otherwise specified)**INPUT**

Parameter	Condition		Min.	Typ.	Max.	Units
Input Voltage Range	50AC models		90	115	130	VAC
	H50AC models		170	220	240	
Input Frequency			47	60	440	Hz
Input Fuse Recommendation	With external 2.5 Ω inrush thermistor	50AC models	3A, Rated Voltage $\geq$ Input Voltage			
		H50AC models	2A, Rated Voltage $\geq$ Input Voltage			
Input Thermistor Recommendation			-	2.5	-	Ω

OUTPUT

Parameter	Condition	Min.	Typ.	Max.	Units
Line Regulation		-	-	0.2	$\pm\%$
Output Ripple	1MHz bandwidth	-	-	50	mVp-p

ENVIRONMENTAL

Parameter	Condition	Min.	Typ.	Max.	Units
Operating Temperature Range	Ambient without derating	-25	-	+70	$^\circ\text{C}$
Storage Temperature Range	Ambient	-55	-	+125	$^\circ\text{C}$
Temperature Coefficient		-	0.02	-	$\%/^\circ\text{C}$
Cooling	Free Air Convection				

GENERAL

Parameter	Condition	Min.	Typ.	Max.	Units
Operating Frequency		40	-	60	kHz
Isolation Voltage	Input to output	1200	-	-	V _{RMS}
Size	L x W x H	5.6 x 4.3 x 0.5 (142.24 x 109.22 x 12.7)			inches (mm)
Weight	Single output models	-	475	-	grams
	Dual output models	-	485	-	
	Triple output models	-	495	-	
Case	6-Sided Epoxy Insulated Metal				
Potting	Vacuum Impregnated Epoxy				
Box Packaging	8 x 7.5 x 1.5 (203.2 x 190.5 x 38.1) or 12 x 9 x 1.5 (304.8 x 228.6 x 38.1)				inches (mm)

PROTECTIONS & FEATURES

Parameter	Condition	Min.	Typ.	Max.	Units
Short circuit	Continuous, auto-recovery				

SPECIFICATIONS (V_{IN} , Full Load, $T_A = +25^{\circ}\text{C}$, 1 hour warm up unless otherwise specified)

DESIGNED TO MEET

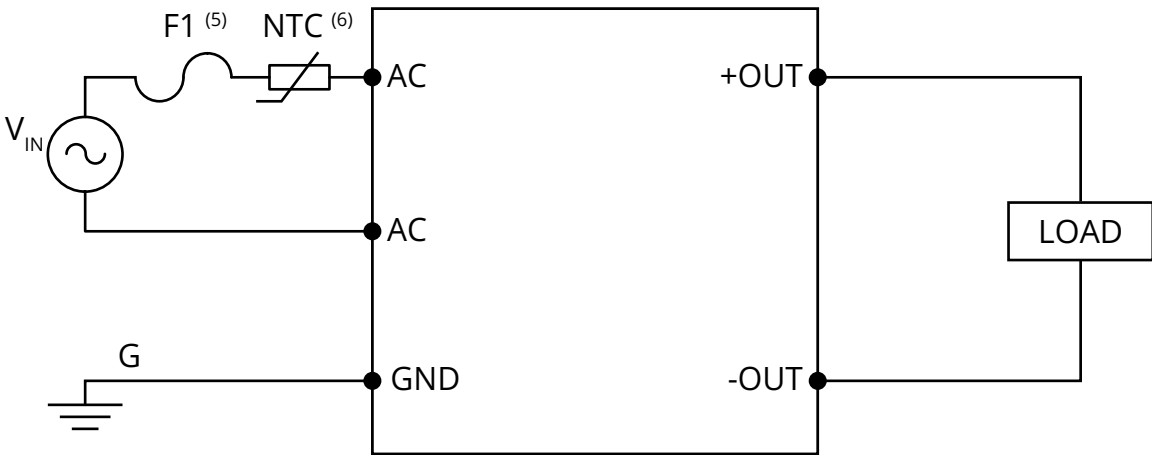
Test	Referenced Standard	Description
Vibration	MIL-STD-202	Method 204, Vibration, High Frequency, Condition D
Shock	MIL-STD-202	Method 213, Shock (Specified Pulse), Condition I
Humidity	MIL-STD-202	Method 106, Moisture Resistance
Altitude	MIL-STD-202	Method 105, Barometric Pressure (Reduced), Condition D

OPTIONS AVAILABLE – CONTACT PICO FOR PART NUMBER

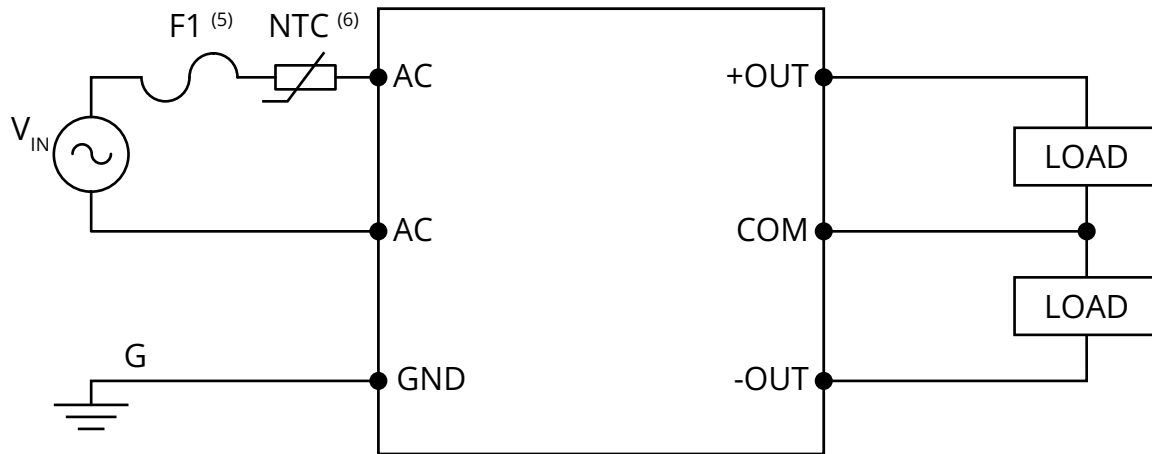
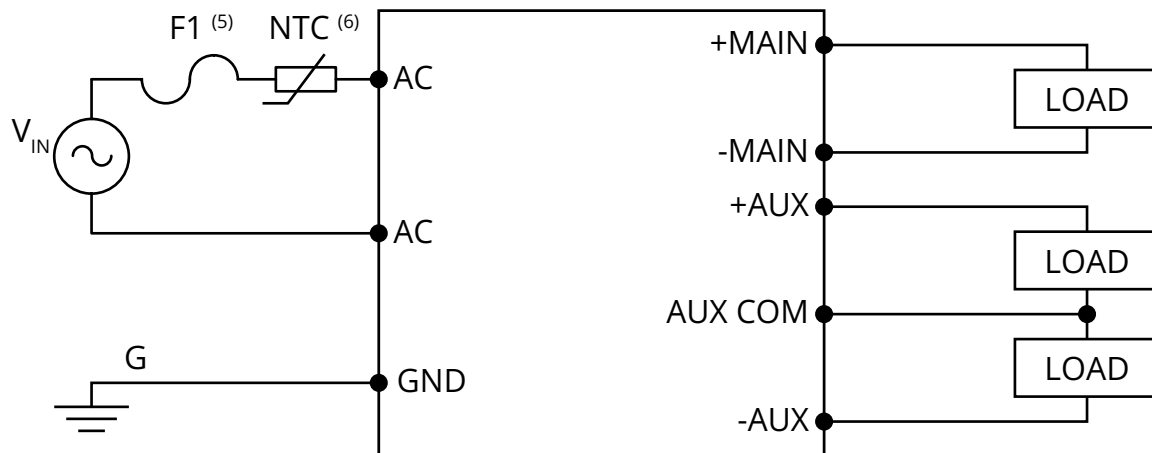
Parameter	Referenced Standard	Description
Stabilization Bake	MIL-STD-883	Referenced Method 1008 Non-operating maximum storage temperature for 24 hours
Temperature Cycle	MIL-STD-883	Referenced Method 1010 Non-operating at temperature extremes, 15 mins/temp, 10 cycles
Burn-In	MIL-STD-883	Referenced Method 1015 Max operating temperature for 160 hours
Expanded Operating Temperature Range		-55°C to +85°C

TYPICAL CONNECTION CIRCUIT

SINGLE OUTPUT



Note 5: For 50AC models, a 3A fuse is required on the input. For H50AC models, a 2A fuse is required on the input.
Note 6: A 2.5Ω inrush thermistor is required on the input.

TYPICAL CONNECTION CIRCUIT**DUAL OUTPUT****TRIPLE OUTPUT**

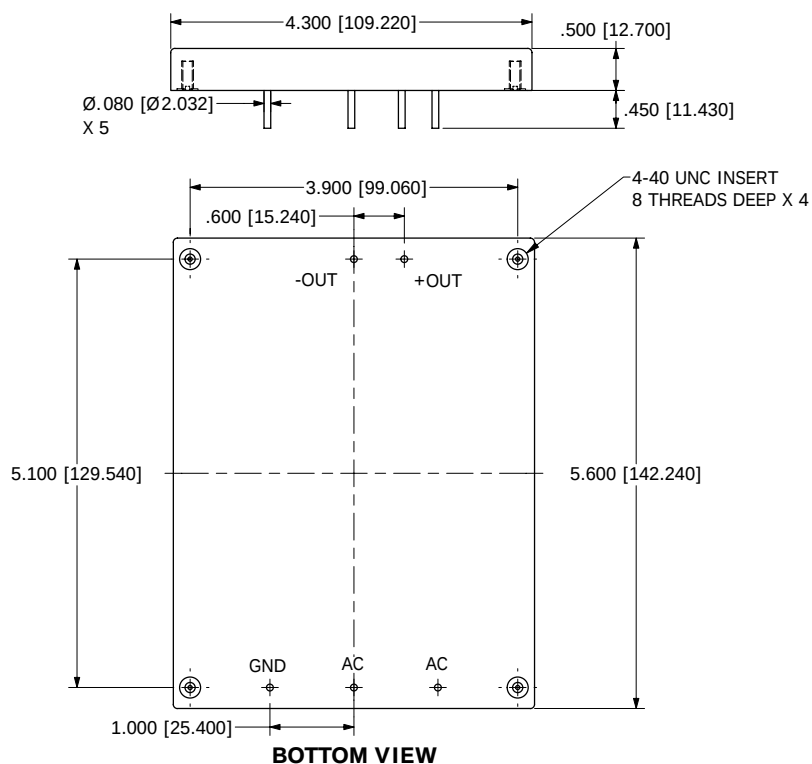
Note 3: Dual output loads must be balanced.

Note 4: Auxiliary outputs must be balanced.

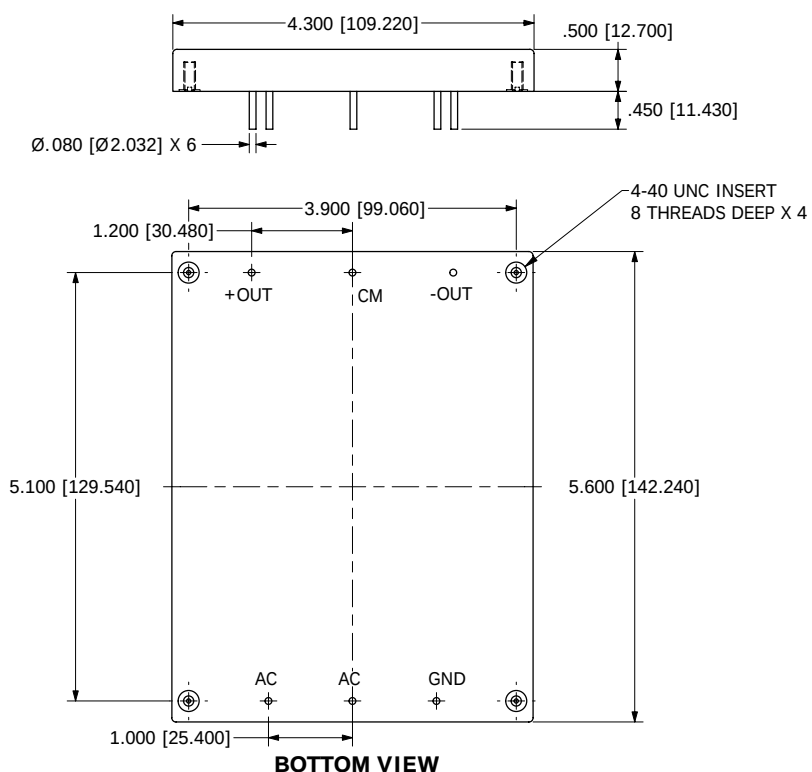
Note 5: For 50AC models, a 2.5A fuse is required on the input. For H50AC models, a 1.5A fuse is required on the input.

Note 6: A 2.5Ω inrush thermistor is required on the input.

SINGLE OUTPUTS

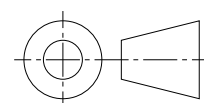


DUAL OUTPUTS



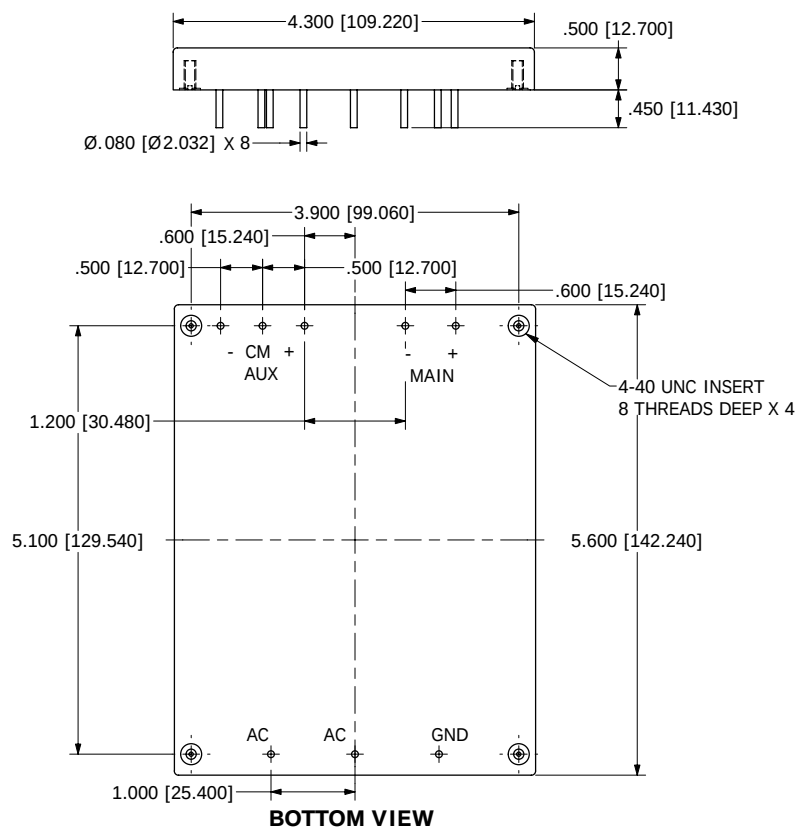
NOTES

- a. ALL DIMENSIONS ARE IN INCHES, [] = MM
b. THE RECOMMENDED TORQUE FOR MOUNTING SCREWS IS 3-5 IN-LBS.



MECHANICAL DRAWINGS

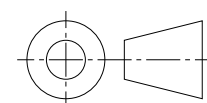
TRIPLE OUTPUTS

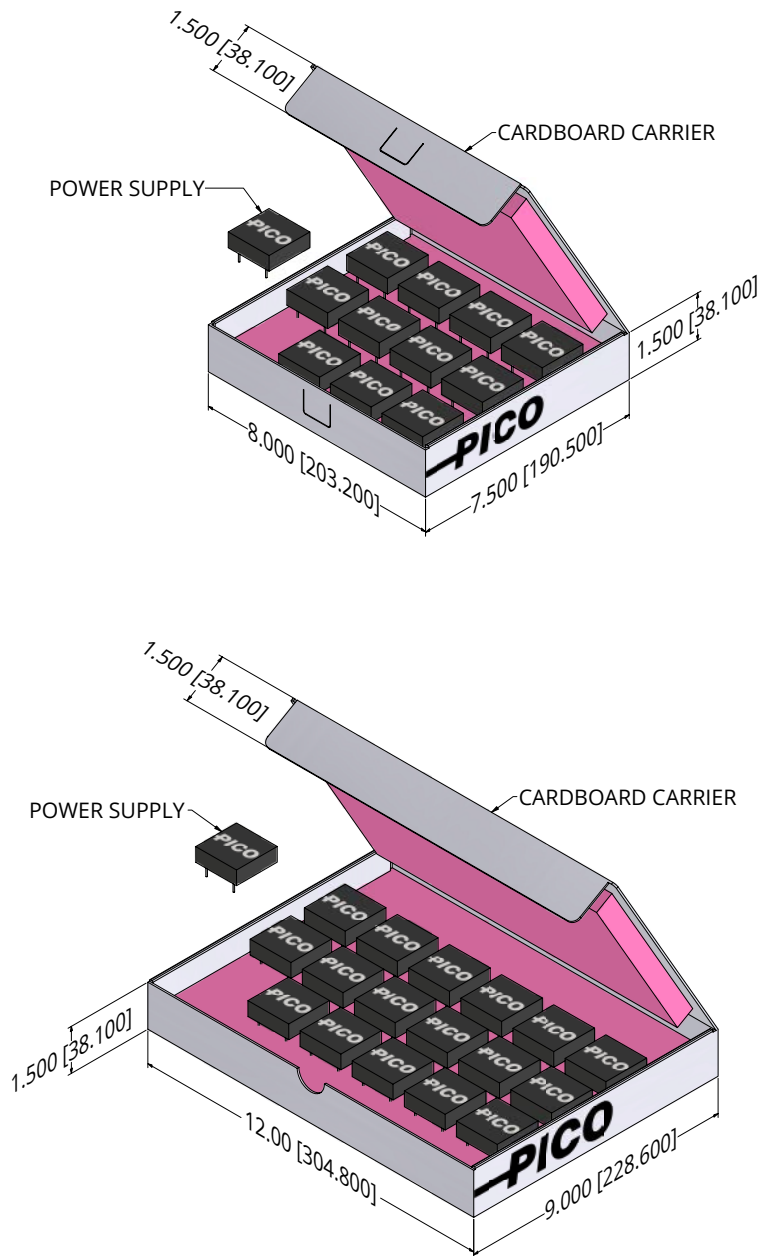


NOTES

a. ALL DIMENSIONS ARE IN INCHES, [] = MM

b. THE RECOMMENDED TORQUE FOR MOUNTING SCREWS IS 3-5 IN-LBS.



BOX PACKAGING - BULK

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We reserve the right to discontinue products without notice, We reserve the right to make modifications to any existing catalog products without notice, at any time, without the obligation to modify units previously sold.

Series UWD

50W Isolated Regulated AC-DC Power Supply



PRODUCT OVERVIEW

The UWD series is a switching AC-DC power supply available in single and dual outputs. They offer excellent line and load regulation and continuously protected against short circuits. The 2.5" x 2.3" x 0.5" half brick footprint is capable of up to 50W power in a wide temperature range 0°C to +85°C. These modules are highly reliable and perfect design choice for your most stringent industrial applications.



FEATURES

- Up to 50W output power
- Single and dual outputs
- Compact half brick size - 2.5" x 2.3"
- Low profile - 0.5" height
- Continuous short-circuit protection
- Universal input range - 85-265VAC
- Fixed operating frequency

Contact Pico for part number of available options:

- Expanded operating temp: -40°C to +85°C
- Select screening per MIL-STD-883:
 - Stabilization Bake
 - Temperature Cycle
 - Burn-In
- Special Input Voltage, Output Voltage, or Output Power

UWD	28	S
SERIES NAME	NOM. OUTPUT VOLTAGE	NUMBER OF OUTPUTS
UWD	3.3 = 3.3V 5 = 5V 5.2 = 5.2V 12 = 12V 15 = 15V 24 = 24V 28 = 28V 48 = 48V	S = SINGLE D = DUAL

MODEL LIST - SINGLE OUTPUT

Pico Part Number	Output Voltage [VDC]	Output Current		Output Power [W]	Efficiency ⁽²⁾ [%] typ.	Load Regulation 10-100% ⁽¹⁾ [%] max	Output Voltage Tolerance ⁽²⁾ [%]	Output Ripple @ 1MHz BW [mVp-p] max
		Min. ⁽¹⁾ [A]	Max. [A]					
UWD3.3S	3.3	0.91	9.09	30	68	2	2	75
UWD5S	5	0.80	8.00	40	74	2	2	75
UWD5.2S	5.2	0.77	7.70	40	74	2	2	75
UWD12S	12	0.42	4.16	50	80	2	2	125
UWD15S	15	0.33	3.33	50	80	2	2	150
UWD24S	24	0.21	2.08	50	84	1	1	250
UWD28S	28	0.18	1.79	50	85	1	1	250
UWD48S	48	0.10	1.04	50	85	1	1	400

Note 1: Maintain minimum 10% of rated load to prevent a voltage surge.

Note 2: Tested at nominal input voltage and full output load.

Note 4: For ≤12V Output models, a minimum 130μF, 400V high quality electrolytic capacitor is required.

For ≥15V Output models, a minimum 280μF, 400V high quality electrolytic capacitor is required.

MODEL LIST - DUAL OUTPUT

Pico Part Number	Output Voltage [VDC]	Output Current Per Output		Output Power Per Output [W]	Efficiency ⁽²⁾ [%] typ.	Load Regulation 10-100% ⁽¹⁾ [%] max	Output Voltage Tolerance ⁽²⁾ [%]	Output Ripple @ 1MHz BW [mVp-p] max
		Min. ⁽¹⁾ [A]	Max. [A]					
UWD5D	±5	0.40	4.00	20	75	2	2	75
UWD12D	±12	0.21	2.08	25	80	2	2	100
UWD15D	±15	0.17	1.66	25	80	2	2	150
UWD24D	±24	0.10	1.04	25	84	2	2	250
UWD28D	±28	0.09	0.89	25	84	2	2	250

Note 1: Maintain minimum 10% of rated load to prevent a voltage surge.

Note 2: Tested at nominal input voltage and full output load.

Note 3: Dual output loads must be balanced.

Note 4: For ≤12V Output models, a minimum 130μF, 400V high quality electrolytic capacitor is required.

For ≥15V Output models, a minimum 280μF, 400V high quality electrolytic capacitor is required.

SPECIFICATIONS (115VAC/60Hz, Full Load, T_A = +25°C, 1 hour warm up unless otherwise specified)**INPUT**

Parameter	Condition		Min.	Typ.	Max.	Units
Input Voltage Range			85	115	265	VAC
Input Frequency			47	60	440	Hz
Peak Inrush Current	With external 2.5Ω inrush thermistor	115VAC Input	-	-	65	A
		230VAC Input	-	-	130	
Input Fuse Recommendation	With external 2.5Ω inrush thermistor		2.5A, Rated Voltage ≥ Input Voltage			
Input Thermistor Recommendation			-	2.5	-	Ω

OUTPUT

Parameter	Condition	Min.	Typ.	Max.	Units
Line Regulation		-	-	1	±%

SPECIFICATIONS (115VAC/60Hz, Full Load, $T_A = +25^{\circ}\text{C}$, 1 hour warm up unless otherwise specified)**ENVIRONMENTAL**

Parameter	Condition	Min.	Typ.	Max.	Units
Operating Temperature Range	Baseplate	0	-	+85	$^{\circ}\text{C}$
Storage Temperature Range	Baseplate	-55	-	+105	$^{\circ}\text{C}$
Temperature Coefficient		-	0.02	-	$\%/^{\circ}\text{C}$
Cooling	Conduction through baseplate				

GENERAL

Parameter	Condition	Min.	Typ.	Max.	Units
Operating Frequency		-	100	-	kHz
Isolation Voltage	Input to output	2121	-	-	VDC
	Input/output to baseplate	2121	-	-	
		Input to external capacitor	None		
Size	L x W x H	2.5 x 2.3 x 0.5 (63.5 x 58.4 x 12.7)			inches (mm)
Weight		-	130	-	grams
Case	Aluminum baseplate and Glass Reinforced Polymer				
Potting	Vacuum Impregnated Epoxy				
Box Packaging (W x L x H)	8 x 7.5 x 1.5 (203.2 x 190.5 x 38.1) or 12 x 9 x 1.5 (304.8 x 228.6 x 38.1)				inches (mm)

PROTECTIONS & FEATURES

Parameter	Condition	Min.	Typ.	Max.	Units
Short circuit	Continuous, auto-recovery				

DESIGNED TO MEET

Test	Referenced Standard	Description
Vibration	MIL-STD-202	Method 204, Vibration, High Frequency, Condition D
Shock	MIL-STD-202	Method 213, Shock (Specified Pulse), Condition I
Humidity	MIL-STD-202	Method 106, Moisture Resistance
Altitude	MIL-STD-202	Method 105, Barometric Pressure (Reduced), Condition D

OPTIONS AVAILABLE – CONTACT PICO FOR PART NUMBER

Parameter	Referenced Standard	Description
Stabilization Bake	MIL-STD-883	Referenced Method 1008 Non-operating maximum storage temperature for 24 hours
Temperature Cycle	MIL-STD-883	Referenced Method 1010 Non-operating at temperature extremes, 15 mins/temp, 10 cycles
Burn-In	MIL-STD-883	Referenced Method 1015 Max operating temperature for 160 hours
Expanded Operating Temperature Range	-55 $^{\circ}\text{C}$ to +85 $^{\circ}\text{C}$	

THERMAL RESISTANCE

$$P_{OUT} = \frac{T_C - T_A}{T_{RCA} \times (1 / \eta - 1)}$$

P_{OUT} = Output Power in Watts

η = Efficiency

T_C = Case temperature in °C

T_A = Ambient temperature in °C

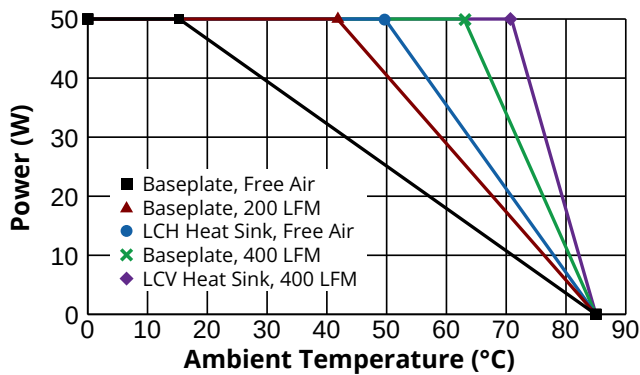
T_{RCA} = Thermal resistance of case to air in °C / W

Thermal resistance of case (T_{RCA})

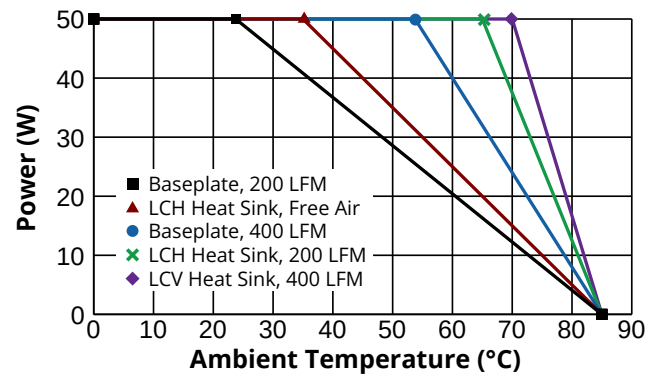
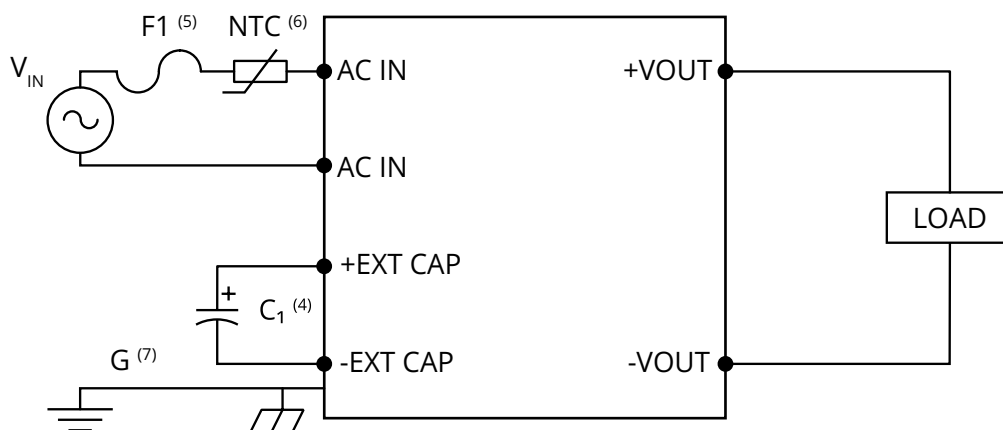
Airflow	Baseplate only	LCV Heat Sink	LCH Heat Sink	Units
Free Air	7.9	4.2	4.0	°C / W
200 LFM	4.9	1.6	1.6	
400 LFM	2.5	1.3	1.3	
600 LFM	2.2	0.9	0.9	
800 LFM	1.5	0.7	0.7	
1000 LFM	1.2	0.6	0.6	

DERATING GRAPHS (Nominal V_{IN} , Full Load, Efficiency @ Full Load)

**Models with Max. Output Power = 50W
& Efficiency at full load = 85%**



**Models with Max. Output Power = 50W
& Efficiency at full load = 80%**

**TYPICAL CONNECTION CIRCUIT**

Note 4: For $\leq 12V$ Output models, a minimum 130 μF , 400V high quality electrolytic capacitor is required.
For $\geq 15V$ Output models, a minimum 280 μF , 400V high quality electrolytic capacitor is required.

Note 5: A 2.5A fuse is required on the input.

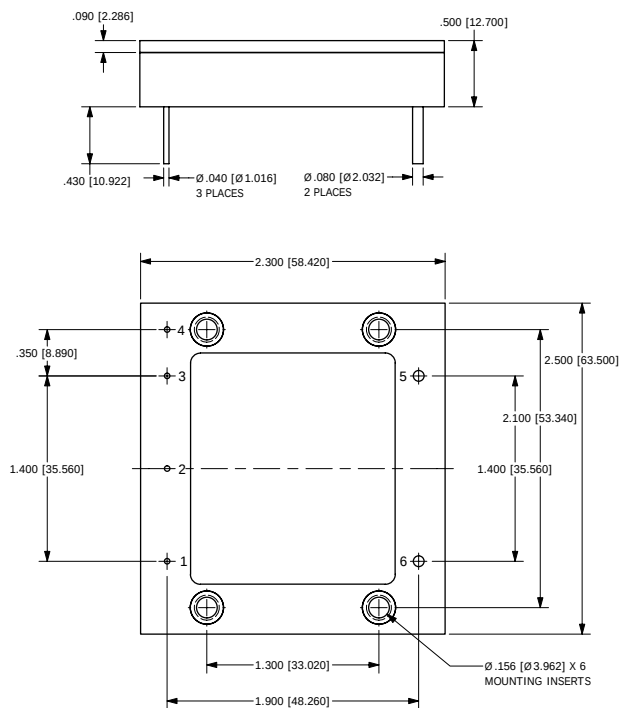
Note 6: A 2.5 Ω inrush thermistor is required on the input.

Note 7: Physical Earth/Ground may be connected to baseplate/chassis or not connected.

Please note: The external hold up capacitor must be installed prior to operation. It cannot be connected to physical earth or ground.

MECHANICAL DRAWINGS

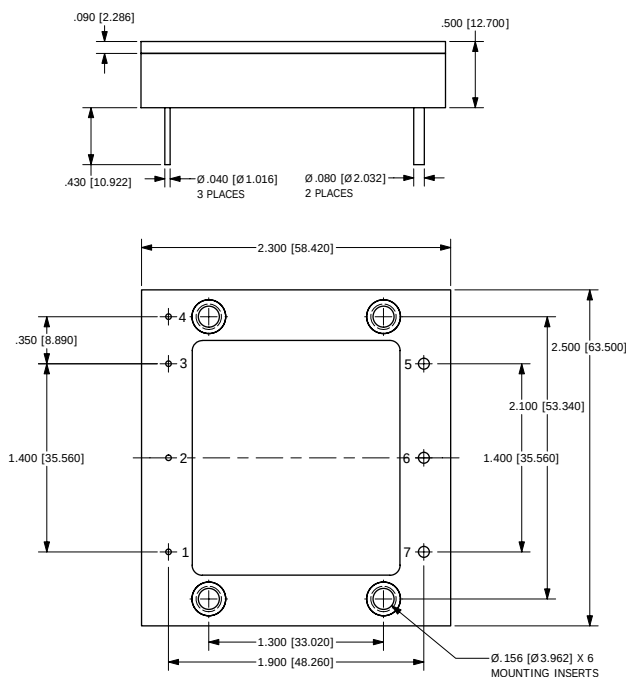
SINGLE OUTPUT



BOTTOM VIEW

PIN	FUNCTION	PIN DIAMETER
1	AC IN	.040 [1.016]
2	AC IN	.040 [1.016]
3	+EXT CAP	.040 [1.016]
4	-EXT CAP	.040 [1.016]
5	-VOUT	.080 [2.032]
6	+VOUT	.080 [2.032]

DUAL OUTPUTS

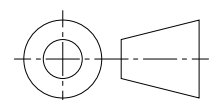


BOTTOM VIEW

PIN	FUNCTION	PIN DIAMETER
1	AC IN	.040 [1.016]
2	AC IN	.040 [1.016]
3	+EXT CAP	.040 [1.016]
4	-EXT CAP	.040 [1.016]
5	-VOUT	.080 [2.032]
6	COM	.080 [2.032]
7	+VOUT	.080 [2.032]

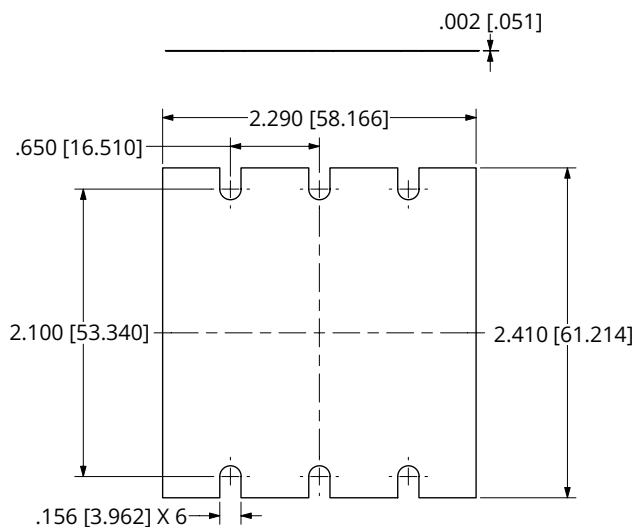
NOTES

- ALL DIMENSIONS ARE IN INCHES, [] = MM
- RECOMMENDED TORQUE FOR MOUNTING SCREWS: 6-9 INCH-LBS
- EXTERNAL CAPACITOR REQUIRED ACROSS TERMINALS 3 AND 4



MECHANICAL DRAWINGS

LTI - THERMAL INTERFACE

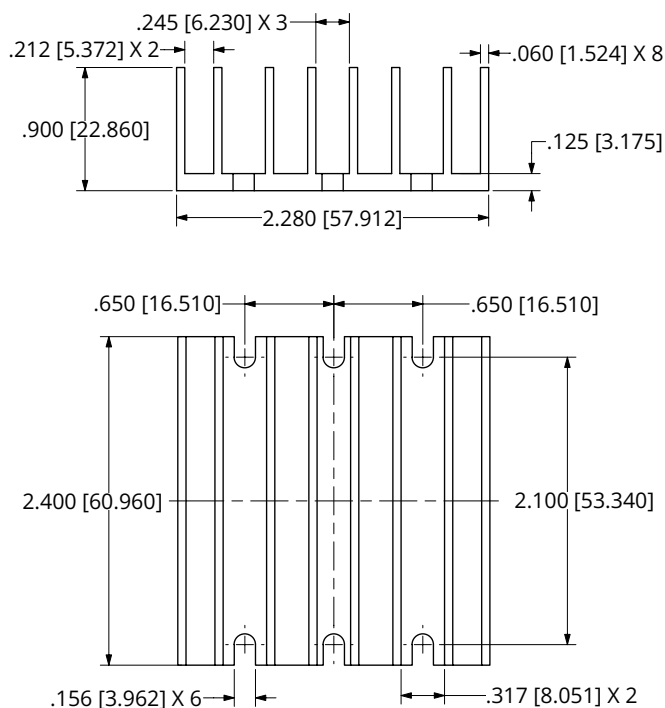


BOTTOM VIEW

Material	Alloy Aluminum Substrate
Thermal Conductivity	1530 BTU-in/hr sq.ft °F
Coefficient of Thermal Expansion, (25-100°C)	13.1 10 ⁻⁶ in-in/°F
Brinell Hardness	23 HB
Endurance Limit	5000 PSI
Standard Thickness	0.002 inches

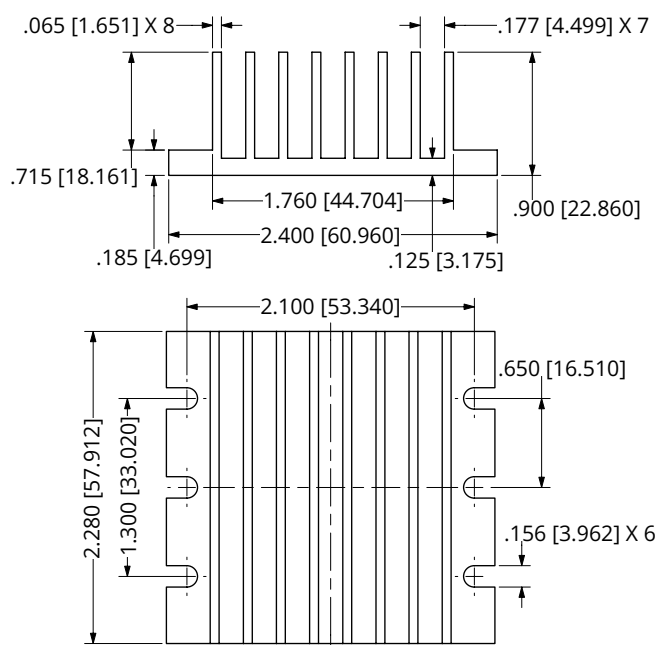
HEAT SINKS

LCH



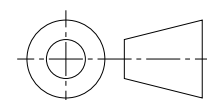
TOP VIEW

LCV



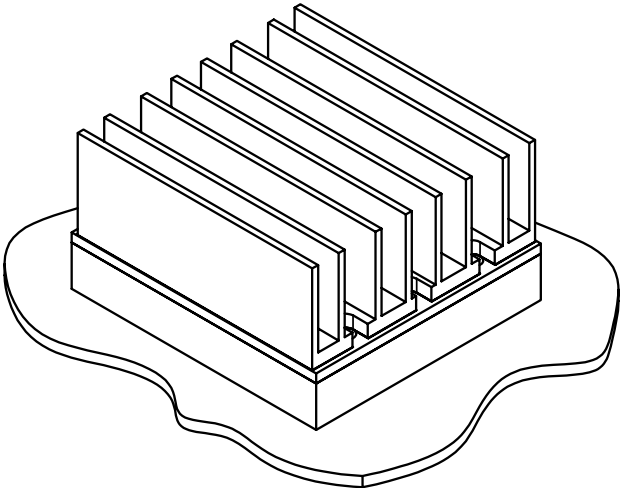
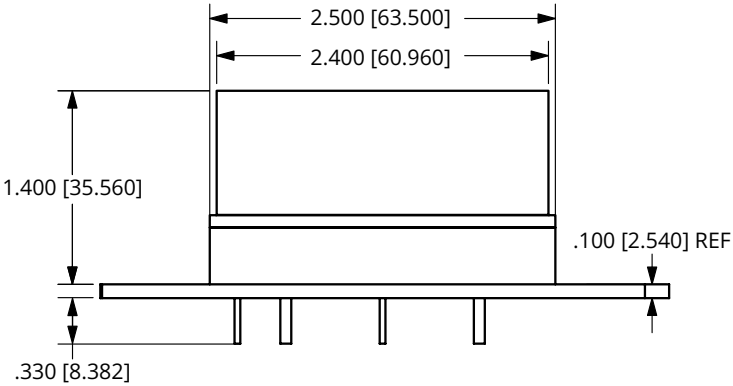
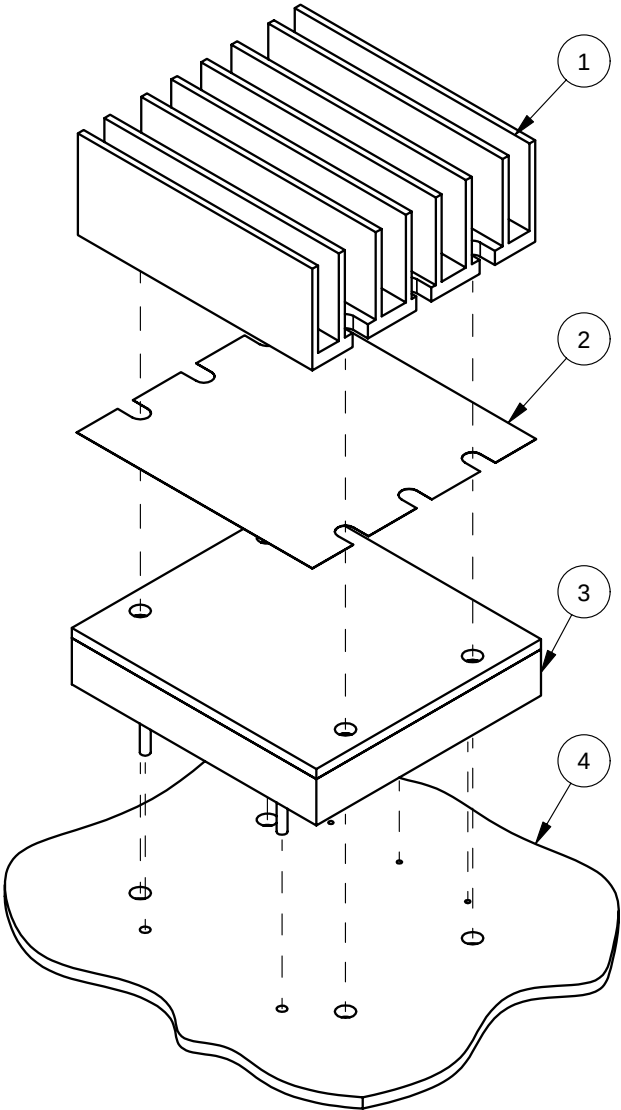
TOP VIEW

Weight: 70 grams typical

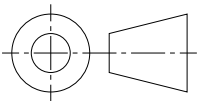


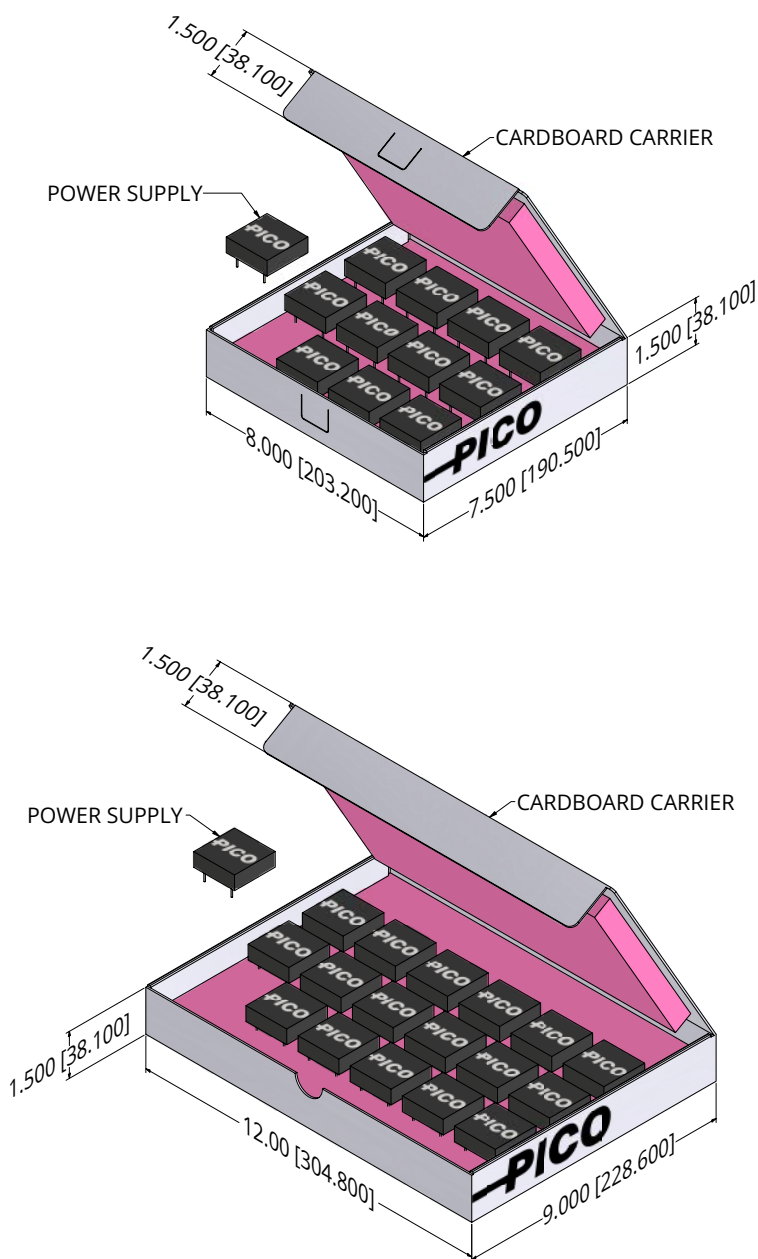
MECHANICAL DRAWINGS

HEAT SINK ASSEMBLY



ITEM	QTY	DESCRIPTION
1	1	LCH OR LCV HEAT SINK
2	1	LTI THERMAL INTERFACE
3	1	UWD MODULE
4	1	PCB





Pico warrants each product manufactured by us and sold by us or an authorized representative, to be free from defects in material and workmanship. If properly used, it will perform within its applicable specifications for a period of one year after original shipment. Pico's obligation under this guarantee is limited to repairing or replacing our product to the original purchaser. This warranty is in lieu of all other warranties, express or implied and constitutes fulfillment of our obligations to the purchaser. We do not guarantee that the products can be used for a particular purpose other than those solely covered by the product's specifications. Pico must be notified if the product must meet particular certifications and/or standards. We assume no liability, in any event, for consequential damages, for anticipated or lost profits, incidental damages or loss of time or other losses incurred by the purchaser or any third party in connection with products covered by this warranty or otherwise. The purchaser will indemnify and hold Pico harmless for any damages, losses, costs, etc. from usage not within the product's specifications. Pico must be consulted before usage of its products in a nuclear, radioactive or space environment.

We reserve the right to discontinue products without notice, We reserve the right to make modifications to any existing catalog products without notice, at any time, without the obligation to modify units previously sold.

Series UAC

250W Isolated Regulated Power Factor Corrected Modules

PICO
Electronics, Inc.

PRODUCT OVERVIEW

The UAC series are isolated AC to DC power supplies with integrated power factor corrections. The low profile 4.6" x 2.5" x 0.5" full brick can power up to 250W. Output voltage models ranges from 5V to 300V. The combination of front end PFC module and isolated low voltage output saves space - one module instead of two modules.



FEATURES

- 0.99 Power Factor
- Wide input voltage range
- Meets EN/IEC 610000-3-2
- Up to 250W output power in a full brick size
- Input/output isolation
- Regulated 5V to 300V output models
- Fixed operating frequency
- Low 0.5" height

Contact Pico for part number of available options:

- Expanded operating temp: -40°C to +85°C
- Select screening per MIL-STD-883:
 - Stabilization Bake
 - Temperature Cycle
 - Burn-In
- Special Input Voltage, Output Voltage, or Output Power
- 360-800Hz input frequency

UAC

SERIES

UAC

28S

NOM. OUTPUT VOLTAGE

5S = 5V
9S = 9V
12S = 12V
15S = 15V
24S = 24V
28S = 28V
48S = 48V
HV100S = 100V
HV125S = 125V
HV150S = 150V
HV175S = 175V
HV200S = 200V
HV225S = 225V
HV250S = 250V
HV275S = 275V
HV300S = 300V

MODEL LIST

Pico Part Number	Output Voltage [VDC]	Output Current		Output Power [W]	Efficiency ⁽²⁾ [%] typ.	Load Regulation 10-100% ⁽¹⁾ [±%] max	Output Ripple @ 1MHz BW [mVp-p] max	Output Voltage Tolerance ⁽²⁾ [±%]
		Min. ^(1,3) [A]	Max. [A]					
UAC5S	5	2	20	100	76	1.5	100	1
UAC9S	9	1.11	11.1	100	78	1.5	75	1
UAC12S	12	1.25	12.5	150	80	1.5	75	0.5
UAC15S	15	1	10	150	80	1.5	75	0.5
UAC24S	24	0.833	8.33	200	81	1	100	0.5
UAC28S	28	0.714	7.14	200	82	1	100	0.5
UAC48S	48	0.417	4.17	200	84	1	200	0.5
UACHV100S	100	0.25	2.5	250	85	1	250	1
UACHV125S	125	0.2	2				250	
UACHV150S	150	0.167	1.67				350	
UACHV175S	175	0.143	1.43				350	
UACHV200S	200	0.125	1.25				400	
UACHV225S	225	0.111	1.11				400	
UACHV250S	250	0.1	1				500	
UACHV275S	275	0.091	0.91				500	
UACHV300S	300	0.083	0.83				500	

Note 1: Maintain minimum 10% of rated load to prevent a voltage surge.

Note 2: Tested at nominal input voltage and full output load.

Note 3: Units can operate <10% load but it may not meet all specifications.

Note 4: A minimum 220μF, 450V high quality aluminum electrolytic capacitor is required.

SPECIFICATIONS (115VAC/60Hz, Full Load, T_A = +25°C, 1 hour warm up unless otherwise specified)**INPUT**

Parameter	Condition	Min.	Typ.	Max.	Units
Input Voltage Range	Refer to Output Power	85	115	265	VAC
Input Frequency		47	60	440	Hz
Input Fuse Recommendation	≤48V output models with 5Ω inrush thermistor	4A, Rated Voltage ≥ Input Voltage			
	≥100V output models	5A, Rated Voltage ≥ Input Voltage			
Input Thermistor Recommendation	≤48V output models	-	5	-	Ω
	≥100V output models	Integrated Thermistor			

OUTPUT

Parameter	Condition		Min.	Typ.	Max.	Units
Line Regulation			-	0.2	-	±%
Output Power	≤48V output models	85-265VAC input	See Model List for Max Output Power			W
	≥100V output models	85-95VAC input	-	-	200	
		95-265VAC input	-	-	250	

ENVIRONMENTAL

Parameter	Condition	Min.	Typ.	Max.	Units
Operating Temperature Range	Baseplate	0	-	+85	°C
Storage Temperature Range	Baseplate	-55	-	+105	°C
Cooling	Conduction through baseplate				

SPECIFICATIONS (115VAC/60Hz, Full Load, $T_A = +25^{\circ}\text{C}$, 1 hour warm up unless otherwise specified)**GENERAL**

Parameter	Condition	Min.	Typ.	Max.	Units
Power Factor	50 to 100% load, 47 to 60Hz Input	0.99	-	-	
Operating Frequency		-	100	-	kHz
Isolation Voltage	Input to output	4242	-	-	VDC
	Input/output to baseplate	2121	-	-	
	Input to 380V BUS	None			
Size (L x W x H)	≤48V output models	4.6 x 2.5 x 0.5 (116.9 x 63.5 x 12.7)			inches (mm)
	≥100V output models	4.6 x 2.5 x 0.8 (116.9 x 63.5 x 20.32)			
Weight	≤48V output models	-	245	-	grams
	≥100V output models	-	340	-	
Case	Aluminum baseplate and Glass Reinforced Polymer				
Potting	Vacuum Impregnated Epoxy				
Box Packaging (W x L x H)	8 x 7.5 x 1.5 (203.2 x 190.5 x 38.1) or 12 x 9 x 1.5 (304.8 x 228.6 x 38.1)				inches (mm)

PROTECTIONS & FEATURES

Parameter	Condition	Min.	Typ.	Max.	Units
Output Current Limit	Set Point	-	130	-	%
Short circuit	Temporary, auto-recovery				
Overtemperature	Baseplate	90	-	100	°C

DESIGNED TO MEET

Test	Referenced Standard	Description
Vibration	MIL-STD-202	Method 204, Vibration, High Frequency, Condition D
Shock	MIL-STD-202	Method 213, Shock (Specified Pulse), Condition I
Humidity	MIL-STD-202	Method 106, Moisture Resistance
Altitude	MIL-STD-202	Method 105, Barometric Pressure (Reduced), Condition D

OPTIONS AVAILABLE – CONTACT PICO FOR PART NUMBER

Parameter	Referenced Standard	Description
Stabilization Bake	MIL-STD-883	Referenced Method 1008 Non-operating maximum storage temperature for 24 hours
Temperature Cycle	MIL-STD-883	Referenced Method 1010 Non-operating at temperature extremes, 15 mins/temp, 10 cycles
Burn-In	MIL-STD-883	Referenced Method 1015 Max operating temperature for 160 hours
Expanded Operating Temperature Range	-40°C to +85°C	

THERMAL RESISTANCE

$$P_{OUT} = \frac{T_C - T_A}{T_{RCA} \times (1 / \eta - 1)}$$

P_{OUT} = Output Power in Watts

η = Efficiency

T_C = Case temperature in °C

T_A = Ambient temperature in °C

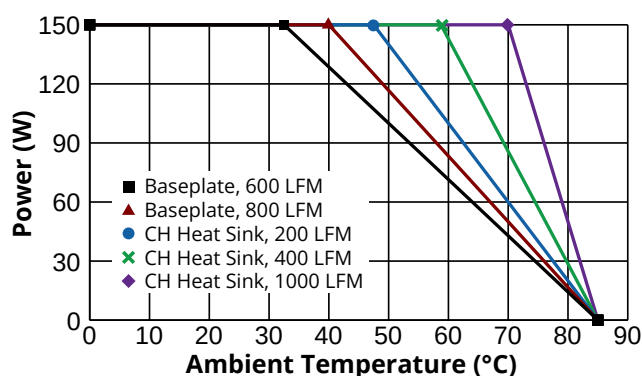
T_{RCA} = Thermal resistance of case to air in °C / W

Thermal resistance of case (T_{RCA})

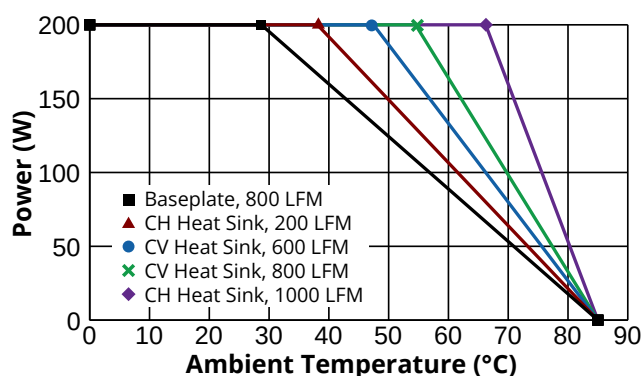
Airflow	≤48V output models			≥100V output models			Units
	Baseplate only	CV Heat Sink	CH Heat Sink	Baseplate only	CV Heat Sink	CH Heat Sink	
Free Air	5.10	3.50	3.00	4.80	3.30	2.80	°C / W
200 LFM	2.80	1.80	1.00	2.60	1.60	0.90	
400 LFM	1.80	1.10	0.70	1.60	1.00	0.60	
600 LFM	1.40	0.80	0.55	1.30	0.70	0.50	
800 LFM	1.20	0.65	0.45	1.10	0.60	0.40	
1000 LFM	1.00	0.55	0.40	0.90	0.50	0.35	

DERATING GRAPHS (Nominal V_{IN} , Full Load, Efficiency @ Full Load)

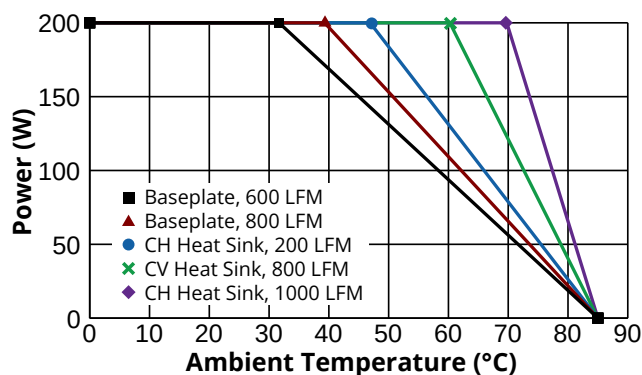
**Models with Max. Output Power = 150W
& Efficiency at full load = 80%**



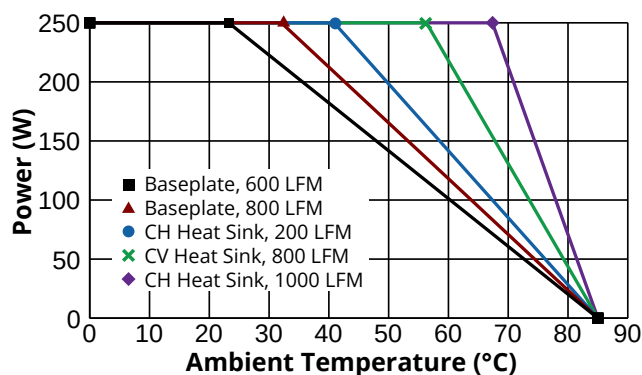
**Models with Max. Output Power = 200W
& Efficiency at full load = 81%**

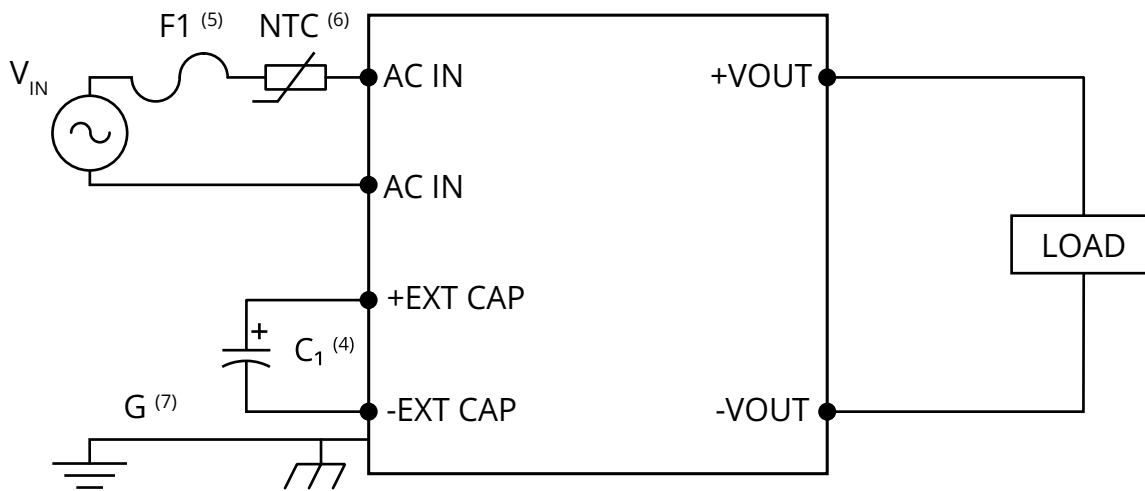


**Models with Max. Output Power = 200W
& Efficiency at full load = 84%**



**Models with Max. Output Power = 250W
& Efficiency at full load = 85%**



TYPICAL CONNECTION CIRCUIT

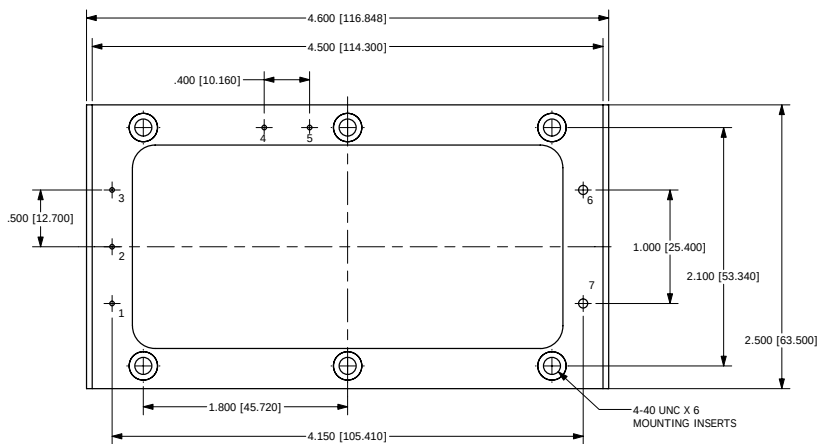
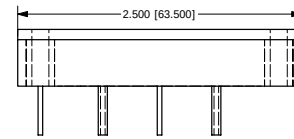
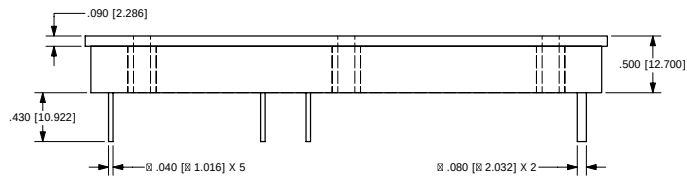
Note 4: A minimum 220 μ F, 450V high quality aluminum electrolytic capacitor is required.

Note 5: For ≤ 48 V output models, a 4A fuse is required on the input. For ≥ 100 V output models, a 5A fuse is required on the input.

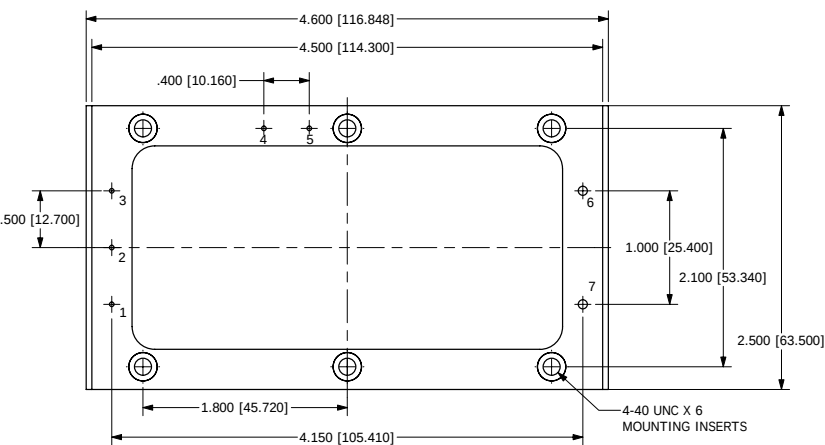
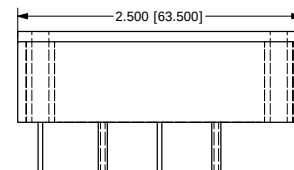
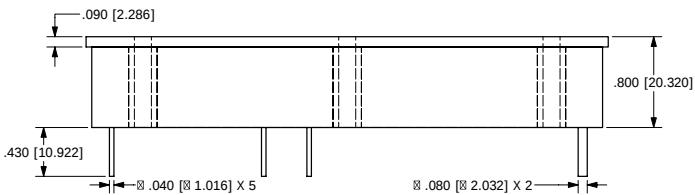
Note 6: For ≤ 48 V output models, a 5 Ω inrush thermistor is required on the input. For ≥ 100 V output models, an external thermistor is not required on the input.

Note 7: Physical Earth/Ground may be connected to baseplate/chassis or not connected.

Please note: The external hold up capacitor must be installed prior to operation. It cannot be connected to physical earth or ground.

MECHANICAL DRAWINGS**≤48V OUTPUT MODELS****BOTTOM VIEW**

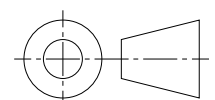
PIN	FUNCTION	PIN DIAMETER
1	AC IN	.040 [1.016]
2	AC IN	.040 [1.016]
3	N.C.	.040 [1.016]
4	+380V BUS	.040 [1.016]
5	-380V BUS	.040 [1.016]
6	-VOUT	.080 [2.032]
7	+VOUT	.080 [2.032]

≥100V OUTPUT MODELS**BOTTOM VIEW**

PIN	FUNCTION	PIN DIAMETER
1	AC IN	.040 [1.016]
2	AC IN	.040 [1.016]
3	N.C.	.040 [1.016]
4	+380V BUS	.040 [1.016]
5	-380V BUS	.040 [1.016]
6	-VOUT	.080 [2.032]
7	+VOUT	.080 [2.032]

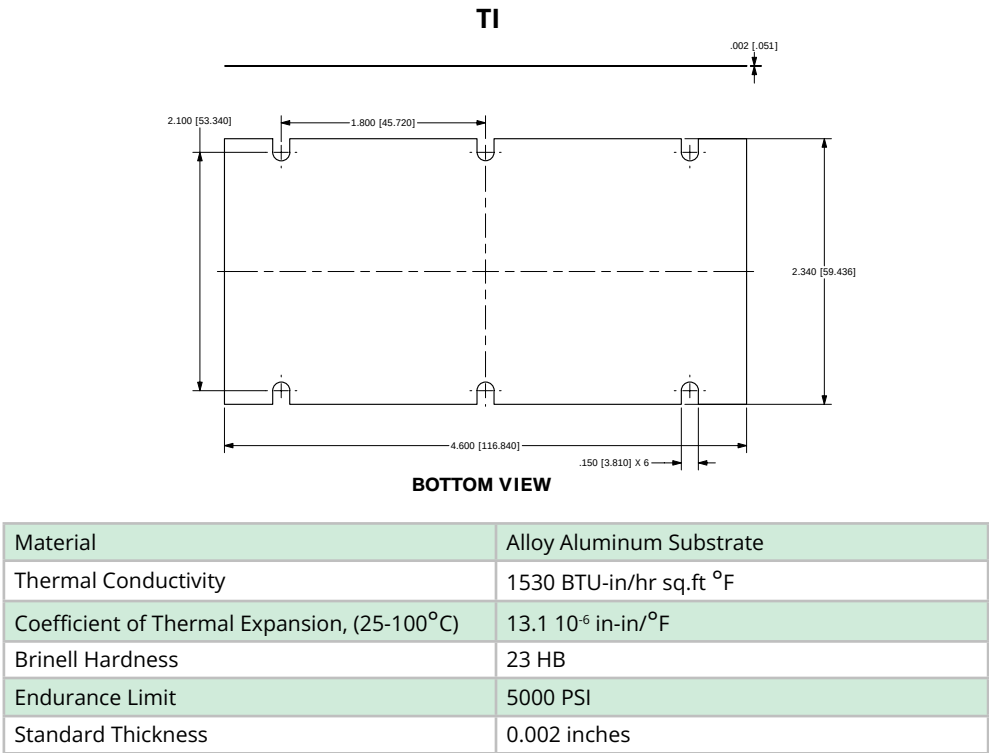
NOTES

- ALL DIMENSIONS ARE IN INCHES, [] = MM
- RECOMMENDED TORQUE FOR MOUNTING SCREWS: 6-9 INCH-LBS
- EXTERNAL CAPACITOR REQUIRED ACROSS TERMINALS 4 AND 5

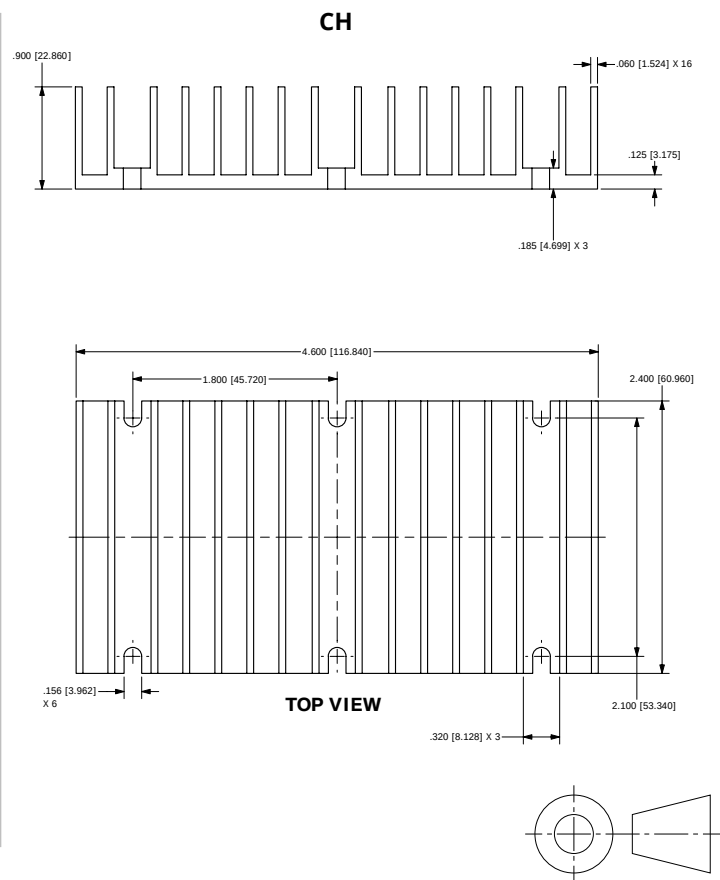
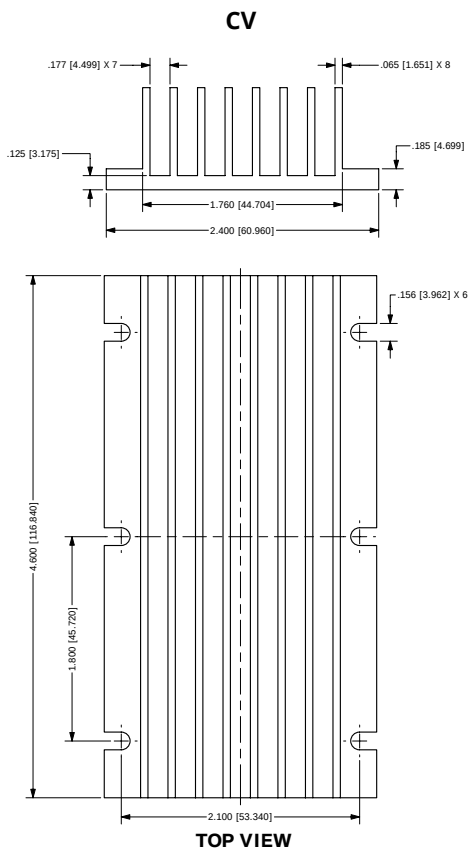


MECHANICAL DRAWINGS

THERMAL INTERFACE

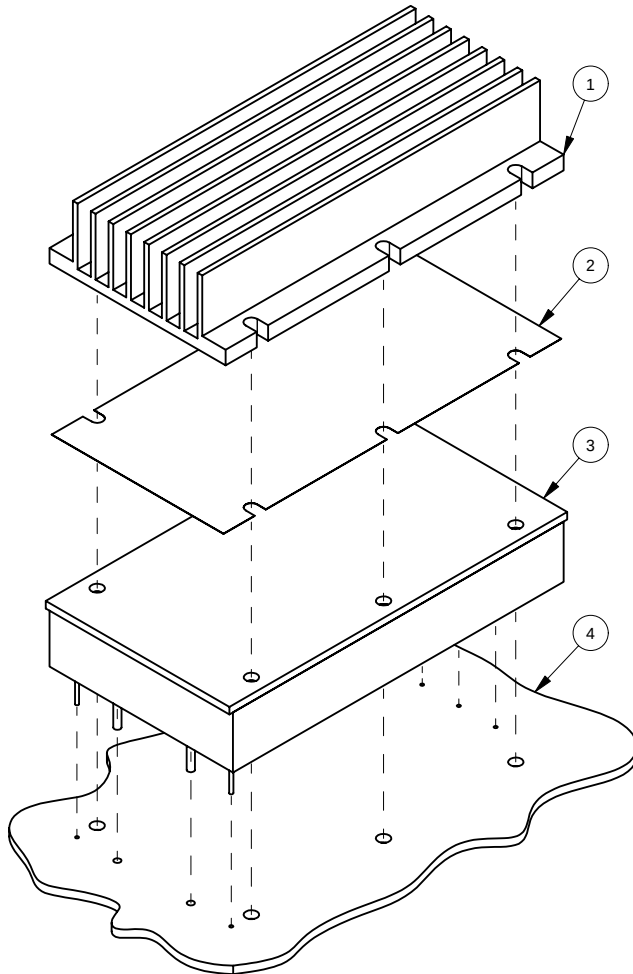


HEAT SINKS



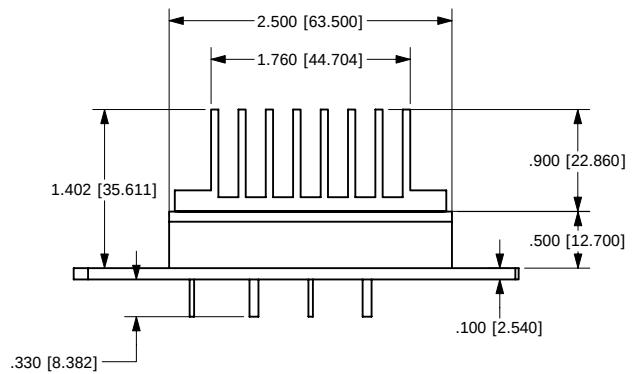
MECHANICAL DRAWINGS

HEAT SINK ASSEMBLY

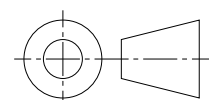
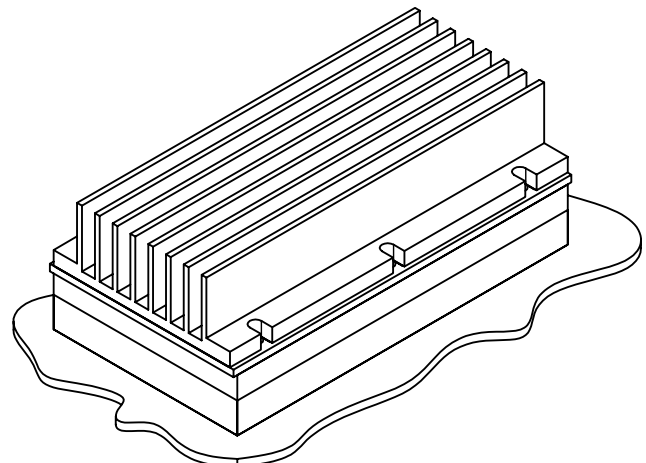
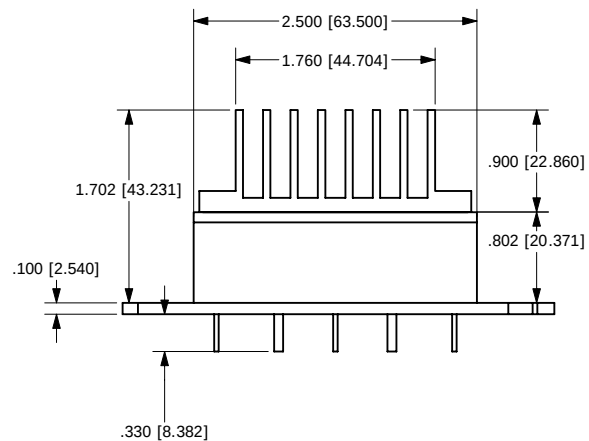


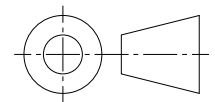
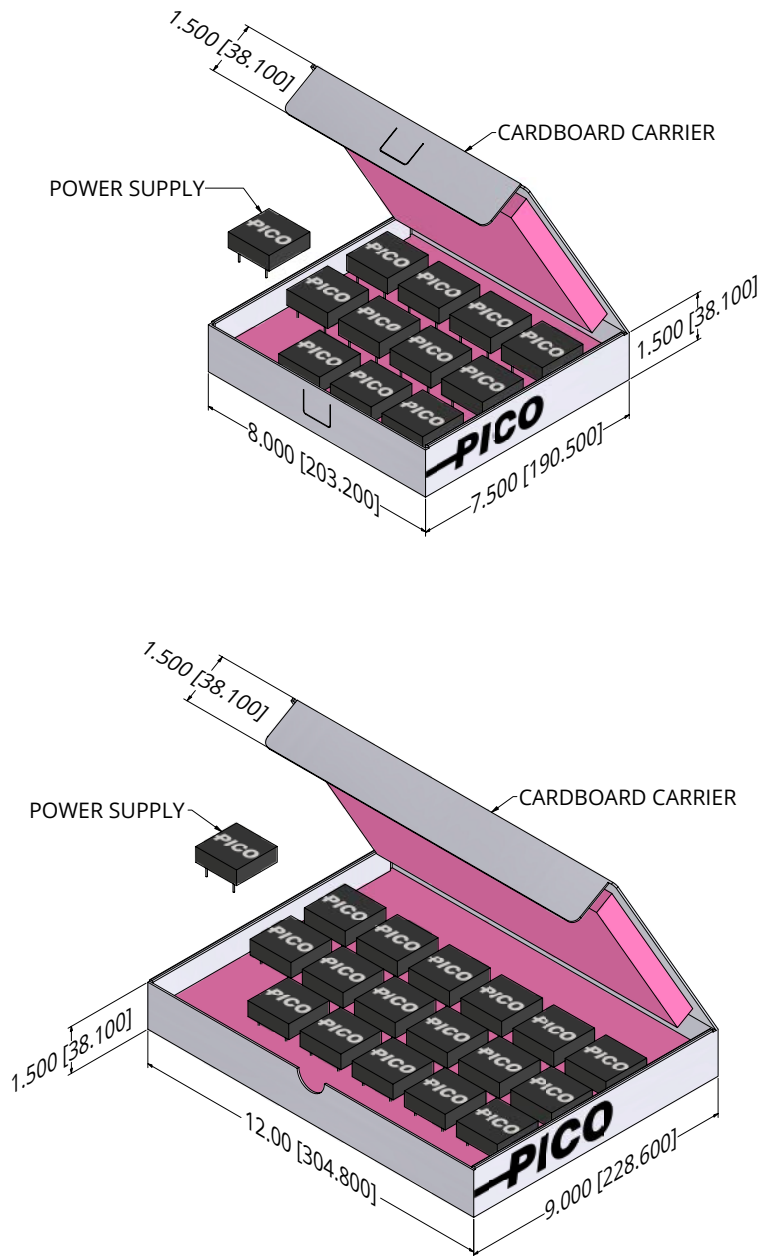
ITEM	QTY	DESCRIPTION
1	1	CH OR CV HEAT SINK
2	1	TI THERMAL INTERFACE
3	1	UAC MODULE
4	1	PCB

≤48V OUTPUT MODELS



≥100V OUTPUT MODELS





Pico warrants each product manufactured by us and sold by us or an authorized representative, to be free from defects in material and workmanship. If properly used, it will perform within its applicable specifications for a period of one year after original shipment. Pico's obligation under this guarantee is limited to repairing or replacing our product to the original purchaser. This warranty is in lieu of all other warranties, express or implied and constitutes fulfillment of our obligations to the purchaser. We do not guarantee that the products can be used for a particular purpose other than those solely covered by the product's specifications. Pico must be notified if the product must meet particular certifications and/or standards. We assume no liability, in any event, for consequential damages, for anticipated or lost profits, incidental damages or loss of time or other losses incurred by the purchaser or any third party in connection with products covered by this warranty or otherwise. The purchaser will indemnify and hold Pico harmless for any damages, losses, costs, etc. from usage not within the product's specifications. Pico must be consulted before usage of its products in a nuclear, radioactive or space environment.

We reserve the right to discontinue products without notice, We reserve the right to make modifications to any existing catalog products without notice, at any time, without the obligation to modify units previously sold.

Series AC

300W Isolated Regulated Power Factor Corrected Modules



PRODUCT OVERVIEW

The AC series are isolated AC to DC power supplies with integrated power factor correction. The space saving 4.6" x 2.5" x 0.8" full brick can power up to 300W. Output voltage models ranges from 5V to 300V. The combination of front end PFC module and isolated low voltage output saves space - one module instead of two modules.



FEATURES

- 0.99 (AC1) or 0.95 (AC3) Power Factor
- Single or three phase input
- Meets EN/IEC 610000-3-2
- 300W output power in a full brick size
- Input/output isolation
- Regulated 5V to 300V output models
- Output sense feature
- Fixed operating frequency

Contact Pico for part number of available options:

- Expanded operating temp: -40°C to +85°C
- Select screening per MIL-STD-883:
 - Stabilization Bake
 - Temperature Cycle
 - Burn-In
- Special Input Voltage, Output Voltage, or Output Power
- 360-800Hz input frequency

AC	3	-150S
SERIES NAME	INPUT VOLTAGE	NOM. OUTPUT VOLTAGE
AC	1 = SINGLE PHASE 3 = THREE PHASE	-5S = 5V -9S = 9V -12S = 12V -15S = 15V -24S = 24V -28S = 28V -48S = 48V -100S = 100V * -125S = 125V * -150S = 150V * -175S = 175V * -200S = 200V * -225S = 225V * -250S = 250V * -275S = 275V * -300S = 300V *

*AC3, Three Phase input only. See Series UAC for Single Phase input and ≥100V output models

MODEL LIST**SINGLE PHASE INPUT MODELS**

Pico Part Number	Output Voltage [VDC]	Output Current		Output Power [W]	Efficiency ⁽¹⁾ [%] typ.	Load Regulation 10-100% [±%] max	Output Ripple @ 1MHz BW [mVp-p] max	Output Voltage Tolerance ⁽¹⁾ [±%]
		Min. [A]	Max. [A]					
AC1-5S	5	0	30	150	76	1.5	100	1
AC1-9S	9		27.8	250	78	1.5	100	1
AC1-12S	12		25	300	80	1.5	150	0.5
AC1-15S	15		20	300	80	1.5	150	0.5
AC1-24S	24		12.5	300	81	1	250	0.5
AC1-28S	28		10.71	300	81	1	300	0.5
AC1-48S	48		6.25	300	82	1	500	0.5

THREE PHASE INPUT MODELS

Pico Part Number	Output Voltage [VDC]	Output Current		Output Power [W]	Efficiency ⁽¹⁾ [%] typ.	Load Regulation 10-100% [±%] max	Output Ripple @ 1MHz BW [mVp-p] max	Output Voltage Tolerance ⁽¹⁾ [±%]
		Min. [A]	Max. [A]					
AC3-5S	5	0	30	150	76	1.5	100	1
AC3-9S	9		27.8	250	78	1.5	100	1
AC3-12S	12		25	300	80	1.5	150	0.5
AC3-15S	15		20	300	80	1.5	150	0.5
AC3-24S	24		12.5	300	81	1	250	0.5
AC3-28S	28		10.71	300	82	1	300	0.5
AC3-48S	48		6.25	300	82	1	500	0.5
AC3-100S	100		2.5	250	85	1	250	1
AC3-125S	125		2				250	
AC3-150S	150		1.67				350	
AC3-175S	175		1.43				350	
AC3-200S	200		1.25				400	
AC3-225S	225		1.11				400	
AC3-250S	250		1				500	
AC3-275S	275		0.91				500	
AC3-300S	300		0.83				500	

Note 1: Tested at nominal input voltage and full output load.

SPECIFICATIONS (Nominal V_{IN} , Full Load, $T_A = +25^{\circ}\text{C}$, 1 hour warm up unless otherwise specified)**INPUT**

Parameter	Condition		Min.	Typ.	Max.	Units
Input Voltage Range	AC1 - Single Phase input, Refer to Output Power		85	115	265	VAC
	AC3 - Three Phase input		166	208	250	VAC
Input Frequency			47	60	440	Hz
Inrush Current	AC1 models	115VAC input	-	33	-	A
		220VAC input	-	63	-	A
	AC3 models	208VAC input	-	59	-	A
Input Fuse Recommendation	AC1 models		5A, Rated Voltage $\geq$ Input Voltage			
	AC3 models		3A on each input line, Rated Voltage $\geq$ Input Voltage			

OUTPUT

Parameter	Condition		Min.	Typ.	Max.	Units
Line Regulation			-	0.2	-	±%
Output Power	AC1, ≤5V Output Models	85-95VAC input	-	-	150	W
	AC1, ≥12V Output Models		-	-	200	
	All other models		See Model List			

ENVIRONMENTAL

Parameter	Condition	Min.	Typ.	Max.	Units
Operating Temperature Range	Baseplate	0	-	+85	$^{\circ}\text{C}$
Storage Temperature Range	Baseplate	-55	-	+105	$^{\circ}\text{C}$
Cooling	Conduction through baseplate				

GENERAL

Parameter	Condition		Min.	Typ.	Max.	Units
Power Factor	50 to 100% load, 47 to 60Hz Input	AC1 models	0.99	-	-	-
		AC3 models	0.95	-	-	
Operating Frequency			-	100	-	kHz
Isolation Voltage	Input to output		4242	-	-	VDC
	Input/output to baseplate		2121	-	-	
	Input to 380V BUS		None			
Size	L x W x H		4.6 x 2.5 x 0.8 (116.9 x 63.5 x 20.32)			inches (mm)
Weight			-	340	-	grams
Case	Aluminum baseplate and Glass Reinforced Polymer					
Potting	Vacuum Impregnated Epoxy					
Box Packaging (W x L x H)	8 x 7.5 x 1.5 (203.2 x 190.5 x 38.1) or 12 x 9 x 1.5 (304.8 x 228.6 x 38.1)					inches (mm)

PROTECTIONS & FEATURES

Parameter	Condition	Min.	Typ.	Max.	Units
Output Current Limit	Set Point	-	130	-	%
Short circuit	Continuous, auto-recovery				
Overtemperature	Baseplate	90	-	100	$^{\circ}\text{C}$
Remote sense compensation		-	-	1	VDC

SPECIFICATIONS (Nominal V_{IN} , Full Load, $T_A = +25^\circ\text{C}$, 1 hour warm up unless otherwise specified)**DESIGNED TO MEET**

Test	Referenced Standard	Description
Vibration	MIL-STD-202	Method 204, Vibration, High Frequency, Condition D
Shock	MIL-STD-202	Method 213, Shock (Specified Pulse), Condition I
Humidity	MIL-STD-202	Method 106, Moisture Resistance
Altitude	MIL-STD-202	Method 105, Barometric Pressure (Reduced), Condition D

OPTIONS AVAILABLE – CONTACT PICO FOR PART NUMBER

Parameter	Referenced Standard	Description
Stabilization Bake	MIL-STD-883	Referenced Method 1008 Non-operating maximum storage temperature for 24 hours
Temperature Cycle	MIL-STD-883	Referenced Method 1010 Non-operating at temperature extremes, 15 mins/temp, 10 cycles
Burn-In	MIL-STD-883	Referenced Method 1015 Max operating temperature for 160 hours
Expanded Operating Temperature Range		-55°C to +85°C

THERMAL RESISTANCE

$$P_{OUT} = \frac{T_C - T_A}{T_{RCA} \times (1 / \eta - 1)}$$

P_{OUT} = Output Power in Watts

η = Efficiency

T_C = Case temperature in $^\circ\text{C}$

T_A = Ambient temperature in $^\circ\text{C}$

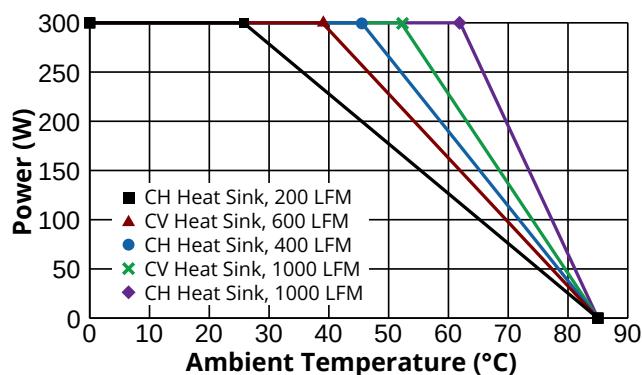
T_{RCA} = Thermal resistance of case to air in $^\circ\text{C} / \text{W}$

Thermal resistance of case (T_{RCA})

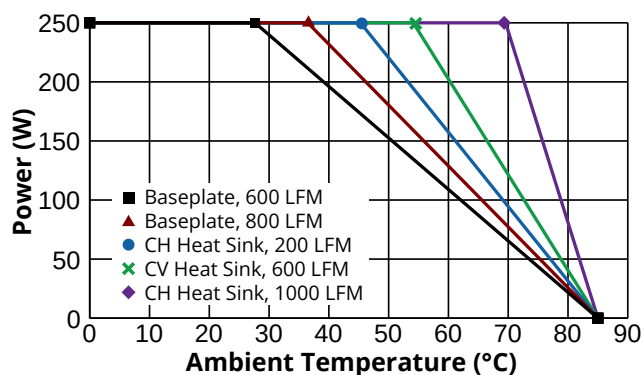
Airflow	Baseplate only	CV Heat Sink	CH Heat Sink	Units
Free Air	4.8	3.3	2.8	$^\circ\text{C} / \text{W}$
200 LFM	2.6	1.6	0.9	
400 LFM	1.6	1	0.6	
600 LFM	1.3	0.7	0.5	
800 LFM	1.1	0.6	0.4	
1000 LFM	0.9	0.5	0.35	

DERATING GRAPHS (Nominal V_{IN} , Full Load, Efficiency @ Full Load)

**Models with Max. Output Power = 300W
& Efficiency at full load = 82%**



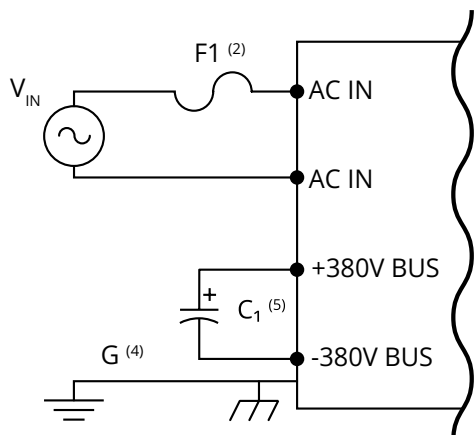
**Models with Max. Output Power = 250W
& Efficiency at full load = 85%**



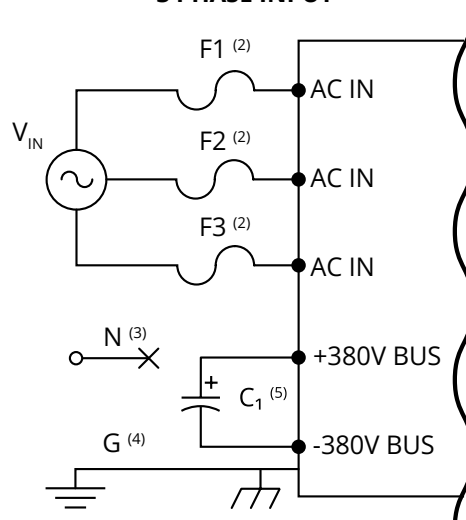
TYPICAL CONNECTION CIRCUIT

INPUT

SINGLE PHASE INPUT



3 PHASE INPUT



Note 2: Required - See Input Fuse Recommendation.

Note 3: Neutral Connection - Not connected.

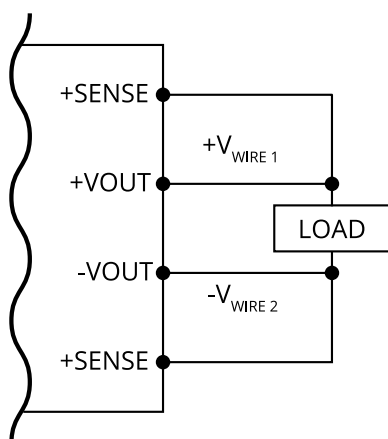
Note 4: Physical Earth/Ground may be connected to baseplate/chassis or not connected.

Note 5: A minimum 220 μ F, 450V high quality aluminum electrolytic capacitor is required.

Please note: The external hold up capacitor must be installed prior to operation. It cannot be connected to physical earth or ground.

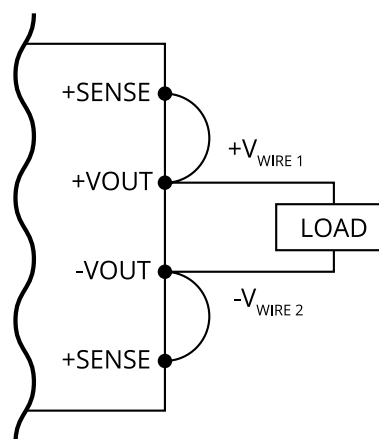
SENSE - AC1 & AC3 $\leq$ 48V OUTPUT MODELS

REMOTE SENSE



$$V_{OUT} = V_{LOAD} + V_{WIRE 1} + V_{WIRE 2}$$

LOCAL SENSE



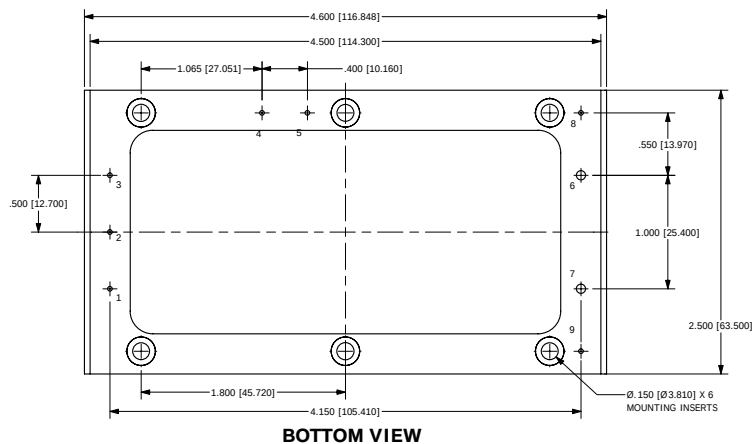
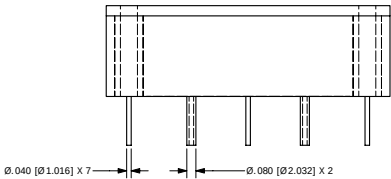
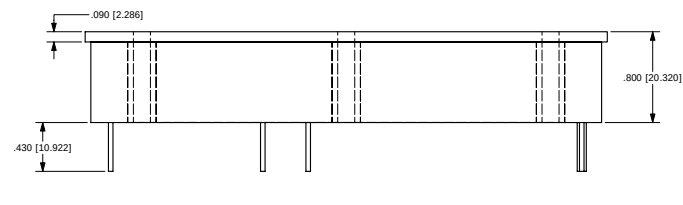
$$V_{LOAD} = V_{OUT} - V_{WIRE 1} - V_{WIRE 2}$$

The positive remote sense (+SENSE) should be connected to the positive output (+VOUT) at the physical load location. The negative remote sense (-SENSE) should be connected to the negative output (-VOUT) at the physical load location. VOUT may compensate up to 1V of drop in the load wires. Voltage will be regulated at the load.

Alternatively, for local sense, +SENSE should be connected to +VOUT and -SENSE should be connected to -VOUT at the output terminals. Voltage will be regulated at the output terminals.

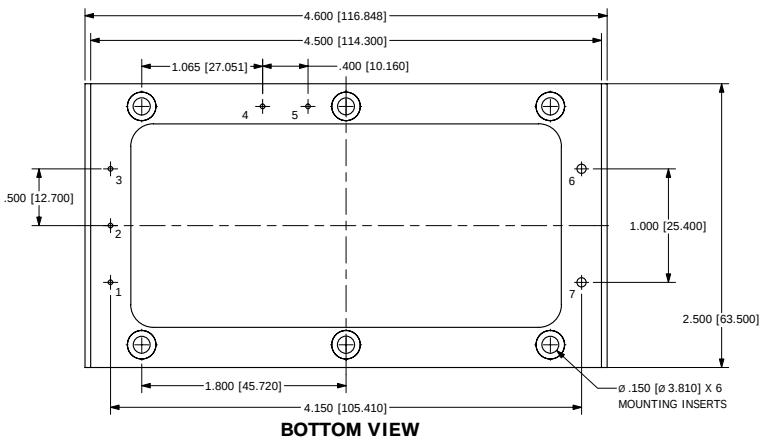
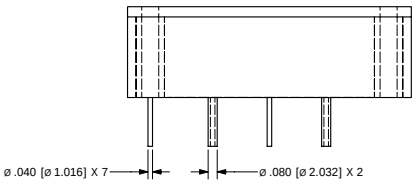
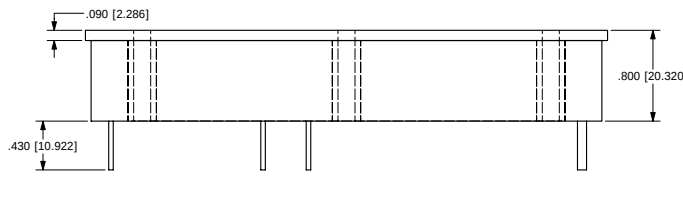
MECHANICAL DRAWINGS

SERIES AC1 & AC3 ≤ 48V OUTPUT MODELS



PIN	FUNCTION	PIN DIAMETER
1	AC IN	.040 [1.016]
2	AC IN	.040 [1.016]
3	AC IN	.040 [1.016]
4	+380V BUS	.040 [1.016]
5	-380V BUS	.040 [1.016]
6	-VOUT	.080 [2.032]
7	+VOUT	.080 [2.032]
8	-SENSE	.040 [1.016]
9	+SENSE	.040 [1.016]

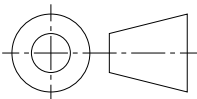
SERIES AC3 ≥ 100V OUTPUT MODELS



PIN	FUNCTION	PIN DIAMETER
1	AC IN	.040 [1.016]
2	AC IN	.040 [1.016]
3	AC IN	.040 [1.016]
4	+380V BUS	.040 [1.016]
5	-380V BUS	.040 [1.016]
6	-VOUT	.080 [2.032]
7	+VOUT	.080 [2.032]

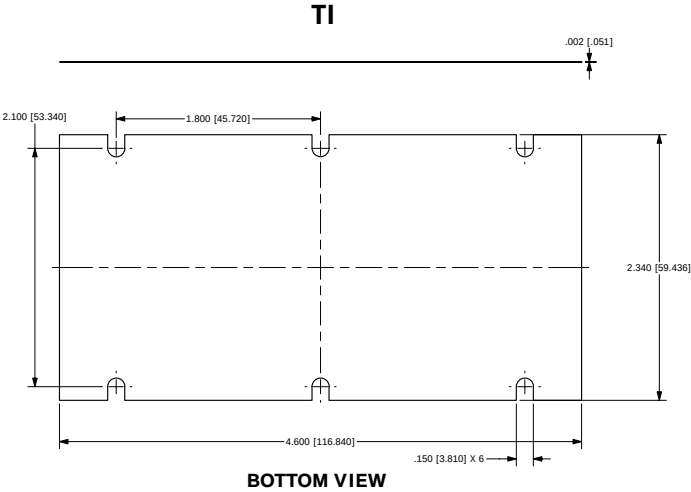
NOTES

- a. ALL DIMENSIONS ARE IN INCHES, [] = MM
- b. RECOMMENDED TORQUE FOR MOUNTING SCREWS: 6-9 INCH-LBS
- c. EXTERNAL CAPACITOR REQUIRED ACROSS TERMINALS 4 AND 5



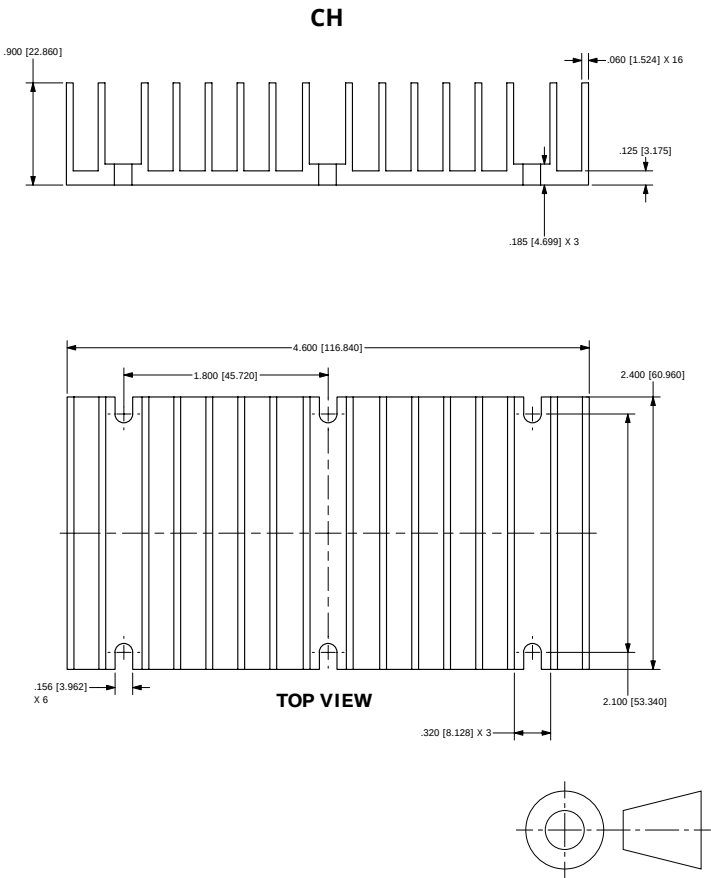
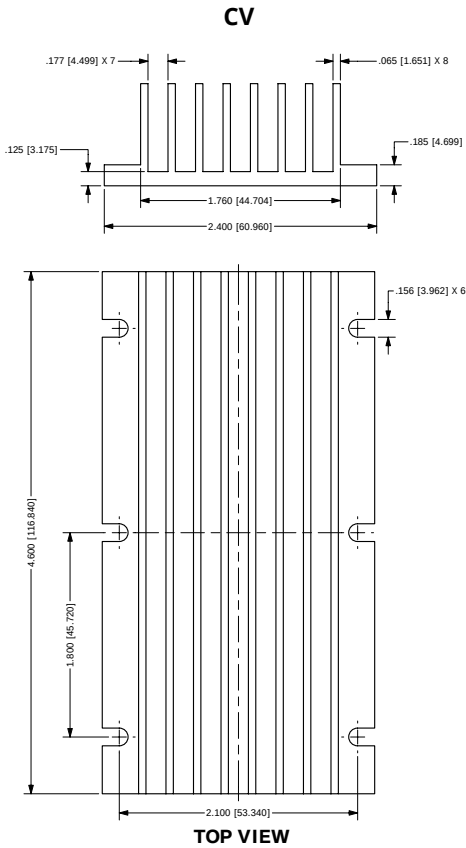
MECHANICAL DRAWINGS

THERMAL INTERFACE



Material	Alloy Aluminum Substrate
Thermal Conductivity	1530 BTU-in/hr sq.ft °F
Coefficient of Thermal Expansion, (25-100°C)	13.1 10 ⁻⁶ in-in/°F
Brinell Hardness	23 HB
Endurance Limit	5000 PSI
Standard Thickness	0.002 inches

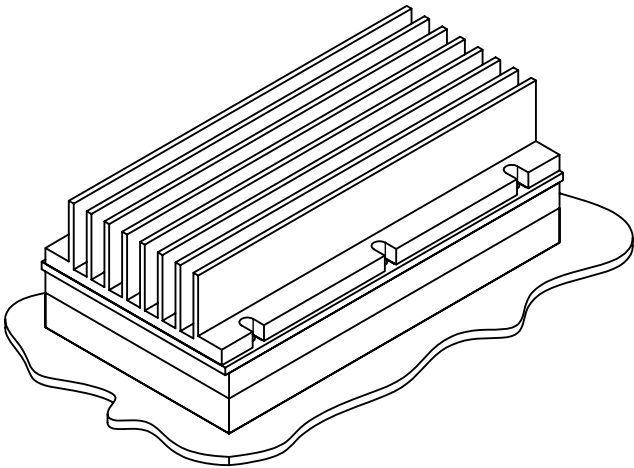
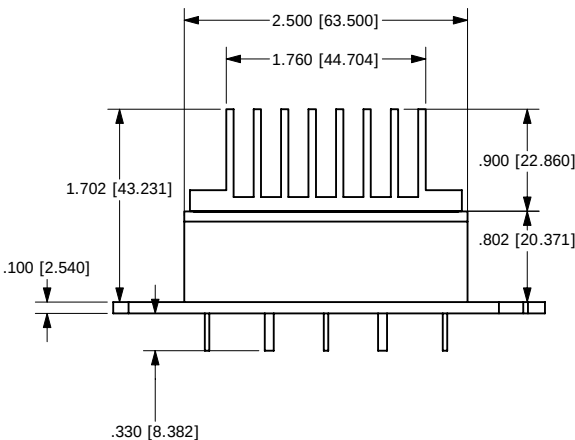
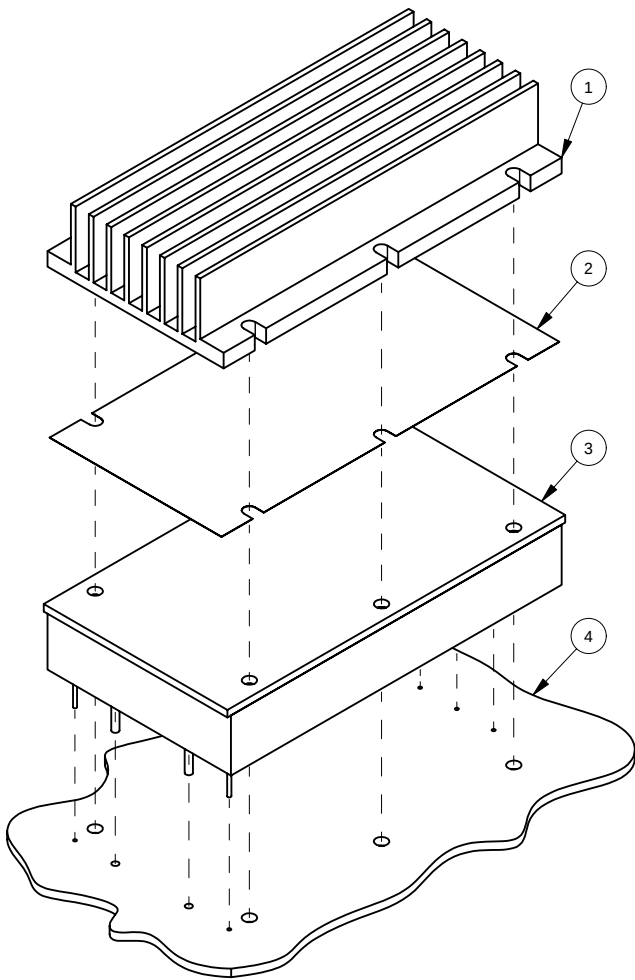
HEAT SINKS



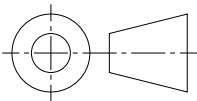
Weight: 145 grams typical

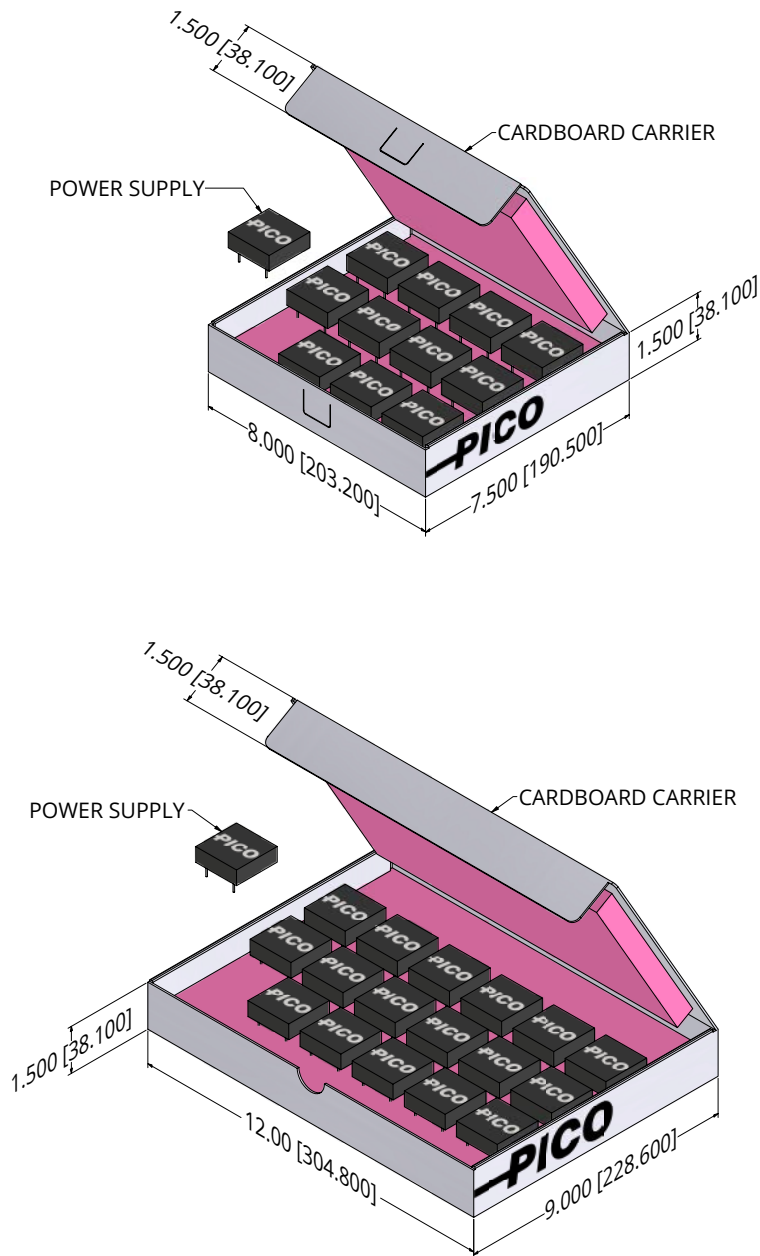
MECHANICAL DRAWINGS

HEAT SINK ASSEMBLY



ITEM	QTY	DESCRIPTION
1	1	CH OR CV HEAT SINK
2	1	TI THERMAL INTERFACE
3	1	AC MODULE
4	1	PCB



BOX PACKAGING - BULK

Pico warrants each product manufactured by us and sold by us or an authorized representative, to be free from defects in material and workmanship. If properly used, it will perform within its applicable specifications for a period of one year after original shipment. Pico's obligation under this guarantee is limited to repairing or replacing our product to the original purchaser. This warranty is in lieu of all other warranties, express or implied and constitutes fulfillment of our obligations to the purchaser. We do not guarantee that the products can be used for a particular purpose other than those solely covered by the product's specifications. Pico must be notified if the product must meet particular certifications and/or standards. We assume no liability, in any event, for consequential damages, for anticipated or lost profits, incidental damages or loss of time or other losses incurred by the purchaser or any third party in connection with products covered by this warranty or otherwise. The purchaser will indemnify and hold Pico harmless for any damages, losses, costs, etc. from usage not within the product's specifications. Pico must be consulted before usage of its products in a nuclear, radioactive or space environment.

We reserve the right to discontinue products without notice, We reserve the right to make modifications to any existing catalog products without notice, at any time, without the obligation to modify units previously sold.

Series PHA

500 to 2000W Non-Isolated Regulated Power Factor Corrected Modules

PICO
Electronics, Inc.

PRODUCT OVERVIEW

The Power Factor Corrected Modules are the perfect front ends for your universal AC single or 3-phase input to DC output applications. The standard 4.6" x 2.5" x 0.5" full brick or 2.5" x 2.3" x 0.5" half brick footprint is one of the smallest on the market today in this power range. Providing a 365V regulated DC output, it can be used as a front end for PICO's FD/MD/LFD/LMD/LPD/ PD/HPD series of DC-DC converters to step down further ranging from 3.3V to 350V. Many laser and motor applications can use the 365V output directly.



FEATURES

- Up to 0.99 Power Factor
- Single or three-phase input (HPHA2)
- Meets EN/IEC 610000-3-2
- Up to 2kW output power in a full brick size
- Non-isolated & Regulated 365V output
- Operating Frequency sync feature (HPHA1/HPHA2)
- Enable DC/DC delay turn on feature (HPHA1/HPHA2)
- Fixed operating frequency
- Compatible with other Pico DC-DC converters providing isolated for 3.3 to 350V outputs

Contact Pico for part number of available options:

- Expanded operating temp: -40°C to +85°C
- Select screening per MIL-STD-883:
 - Stabilization Bake
 - Temperature Cycle
 - Burn-In
- Special Input Voltage, Output Voltage, or Output Power

HPHA1

SERIES NAME

LPHA1 = 250W Output Power

PHA1 = 500W Output Power

HPHA1 = 1000W Output Power

HPHA2 = 2000W Output Power

SPECIFICATIONS (220VAC/60Hz, Full Load, $T_A = +25^{\circ}\text{C}$, 1 hour warm up unless otherwise specified)**INPUT**

Parameter	Condition		Min.	Typ.	Max.	Units
Input Voltage Range	All models	Single-phase input - Refer to Output Power	85	220	250	VAC
	HPHA1 & HPHA2	Three-phase input	166	208	250	VAC
Input Frequency			47	60	440	Hz
Peak Inrush Current ⁽¹⁾	LPHA1 & PHA1 with 2.5Ω inrush thermistor	115VAC Input	-	-	65	A
		230VAC Input	-	-	130	
	HPHA1 & HPHA2	115VAC Input	-	-	102	
		230VAC Input	-	-	203	
Input Fuse Recommendation	LPHA1 with external 2.5Ω inrush thermistor		5A, Rated Voltage ≥ Input Voltage			
	PHA1 with external 2.5Ω inrush thermistor		10A, Rated Voltage ≥ Input Voltage			
	HPHA1 & HPHA2	Single-phase Input	15A, Rated Voltage ≥ Input Voltage			
		Three-phase Input	10A on each input line, Rated Voltage ≥ Input Voltage			
Input Thermistor Recommendation	LPHA1 & PHA1		-	2.5	-	Ω
	HPHA1 & HPHA2		Intergrated Thermistor			

Note 1: For LPHA1 & PHA1, 2.5Ω inrush thermistor is required on the input.

OUTPUT

Parameter	Condition		Min.	Typ.	Max.	Units
Load Regulation	10-100% load		-	-	3	±%
Output Power (Refer to Derating Graph)	HPHA2	166-250VAC three-phase input	-	-	2000	W
		220-250VAC single-phase input	-	-	2000	
		220-170VAC single-phase input	Derate 0.5% power per VAC input			
		170VAC single-phase input	-	-	1500	
		170-110VAC single-phase input	Derate 0.55% power per VAC input			
		110VAC single-phase input	-	-	1000	
	HPHA1	166-250VAC three-phase input or 110-250VAC input	-	-	1000	
	PHA1	110-250VAC input	-	-	500	
	LPHA1	110-250VAC input	-	-	250	
All models	110-85VAC input	Derate 1.2% power per VAC input				
Output Voltage Tolerance	Nominal V_{IN} , Full Load		-	-	2	±%
Ripple	LPHA1 with 450V, ≥250μF output electrolytic capacitor		-	-	10	Vp-p
	PHA1 with 450V, ≥470μF output electrolytic capacitor		-	-	10	
	HPHA1 with 450V, ≥800μF output electrolytic capacitor		-	-	10	
	HPHA2 with 450V, ≥1200μF output electrolytic capacitor		-	-	10	

Note 2: Electrolytic capacitor is required on the output.

ENVIRONMENTAL

Parameter	Condition	Min.	Typ.	Max.	Units
Operating Temperature Range	Baseplate	0	-	+85	°C
Storage Temperature Range	Baseplate	-55	-	+105	°C
Cooling	Conduction through baseplate				

SPECIFICATIONS (220VAC/60Hz, Full Load, $T_A = +25^{\circ}\text{C}$, 1 hour warm up unless otherwise specified)

GENERAL

Parameter	Condition		Min.	Typ.	Max.	Units
Power Factor	50 to 100% load, 47 to 60Hz Input	Single-phase input	0.99	-	-	
		Three-phase input	0.95	-	-	
Efficiency	HPHA1 & HPHA2	110VAC Input	90	-	-	%
		170-250VAC Input or 3-phase Input	95	-	-	
	All other models		90	-	-	
Operating Frequency			-	100	-	kHz
Isolation Voltage	Input/output to baseplate		2121	-	-	VDC
	Input to output		None			
Size (L x W x H)	LPHA1		2.5 x 2.3 x 0.5 (63.5 x 58.4 x 12.7)			inches (mm)
	All other models		4.6 x 2.5 x 0.5 (116.9 x 63.5 x 12.7)			
Weight	LPHA1		-	112	-	grams
	PHA1, HPHA1 & HPHA2		-	231	-	
Case	Aluminum baseplate and Glass Reinforced Polymer					
Potting	Vacuum Impregnated Epoxy					
Tube Packaging (W x H x L)	Series LPHA1, HPHA1 & HPHA2		2.595 x 1.135 x 20 (65.913 x 28.829 x 101.6)			inches
	PHA1		2.595 x 1.105 x 20 (65.913 x 28.067 x 101.6)			(mm)

PROTECTIONS & FEATURES

Parameter	Condition	Min.	Typ.	Max.	Units
Overtemperature	PHA1, HPHA1 & HPHA2	90	-	100	$^{\circ}\text{C}$
Enable Pin ⁽³⁾	HPHA1 & HPHA2	Connect directly to the shutdown pin of Pico's DC-DC converters.			
Synchronization Pin ⁽⁴⁾	HPHA1 & HPHA2	Connect directly to the sync pin of Pico's HPHA1 or HPHA2.			

Note 3: The enable pin connects directly to shutdown pin of Pico's FD/MD/LFD/LMD/LPD/HPD series. It will start up the DC-DC converters after the HPHA1/HPHA2 has reached a safe operating output voltage. See application notes to use an isolated startup circuit.

Note 4: The synchronization pin allows synchronizing the switching frequencies of multiple HPHA1 or HPHA2 to reduce audible noise, ripple or EMI problems. All modules will sync to the highest operating frequency. Units must have a common neutral and cannot be used with 3-phase inputs.

Please note: The holdup capacitor must be installed on a separate wire or PCB trace directly to +VOUT and -VOUT terminals. This will prevent a voltage spike from the inrush current to the electrolytic capacitor into the enable or sync pin and cause issues with these features. All units are not isolated between input and output. It cannot be connected to physical earth or ground, otherwise, unit will be damaged.

DESIGNED TO MEET

Test	Referenced Standard	Description
Vibration	MIL-STD-202	Method 204, Vibration, High Frequency, Condition D
Shock	MIL-STD-202	Method 213, Shock (Specified Pulse), Condition I
Humidity	MIL-STD-202	Method 106, Moisture Resistance
Altitude	MIL-STD-202	Method 105, Barometric Pressure (Reduced), Condition D

OPTIONS AVAILABLE – CONTACT PICO FOR PART NUMBER

Parameter	Referenced Standard	Description
Stabilization Bake	MIL-STD-883	Referenced Method 1008 Non-operating maximum storage temperature for 24 hours
Temperature Cycle	MIL-STD-883	Referenced Method 1010 Non-operating at temperature extremes, 15 mins/temp, 10 cycles
Burn-In	MIL-STD-883	Referenced Method 1015 Max operating temperature for 160 hours
Expanded Operating Temperature Range		-40 $^{\circ}\text{C}$ to +85 $^{\circ}\text{C}$

THERMAL RESISTANCE

$$P_{OUT} = \frac{T_C - T_A}{T_{RCA} \times (1 / \eta - 1)}$$

P_{OUT} = Output Power in Watts

η = Efficiency

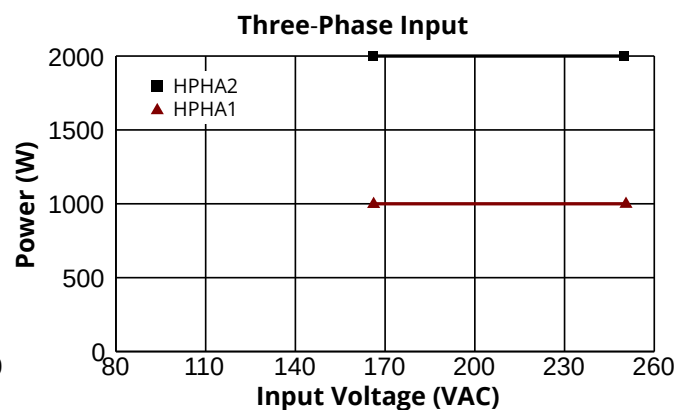
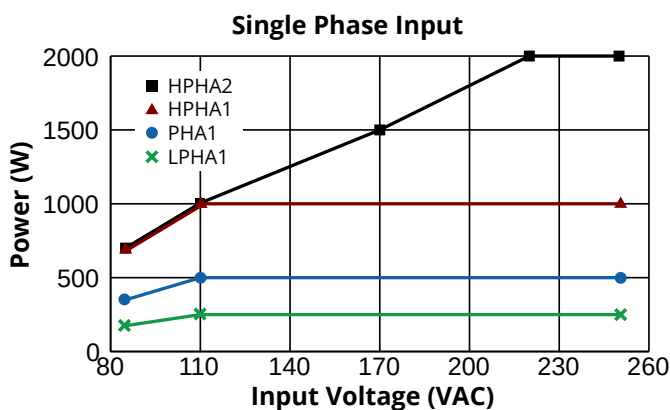
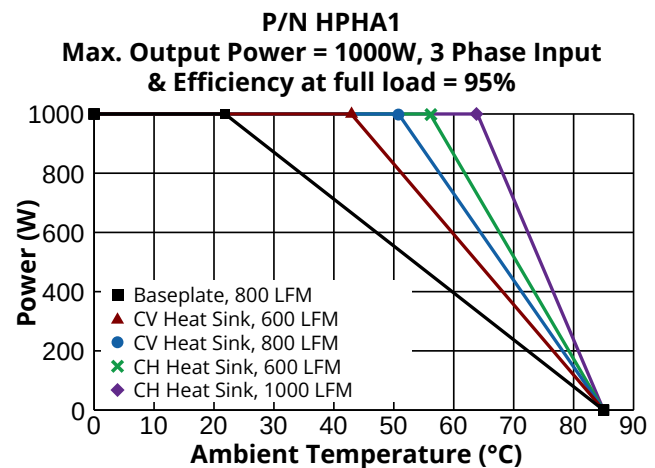
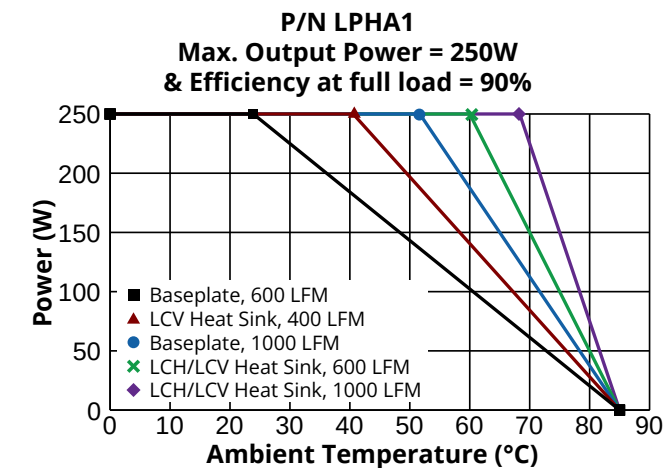
T_C = Case temperature in °C

T_A = Ambient temperature in °C

T_{RCA} = Thermal resistance of case to air in °C / W

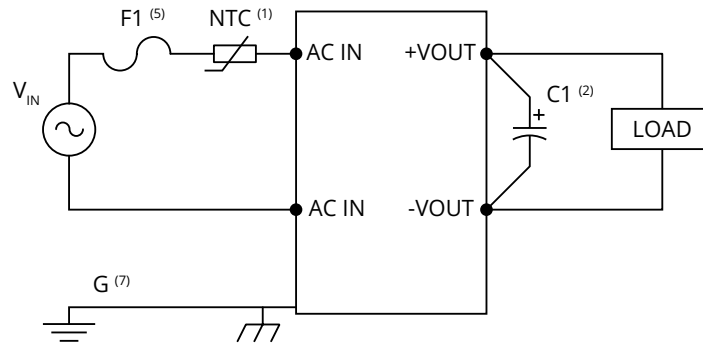
Thermal resistance of case (T_{RCA})

Airflow	PHA1 / HPHA1 / HPHA2			LPHA1			Units
	Baseplate only	CV Heat Sink	CH Heat Sink	Baseplate only	LCV Heat Sink	LCH Heat Sink	
Free Air	5.10	3.50	3.00	7.90	4.20	4.00	°C / W
200 LFM	2.80	1.80	1.00	4.90	1.60	1.60	
400 LFM	1.80	1.10	0.70	2.50	1.30	1.30	
600 LFM	1.40	0.80	0.55	2.20	0.90	0.90	
800 LFM	1.20	0.65	0.45	1.50	0.70	0.70	
1000 LFM	1.00	0.55	0.40	1.20	0.60	0.60	

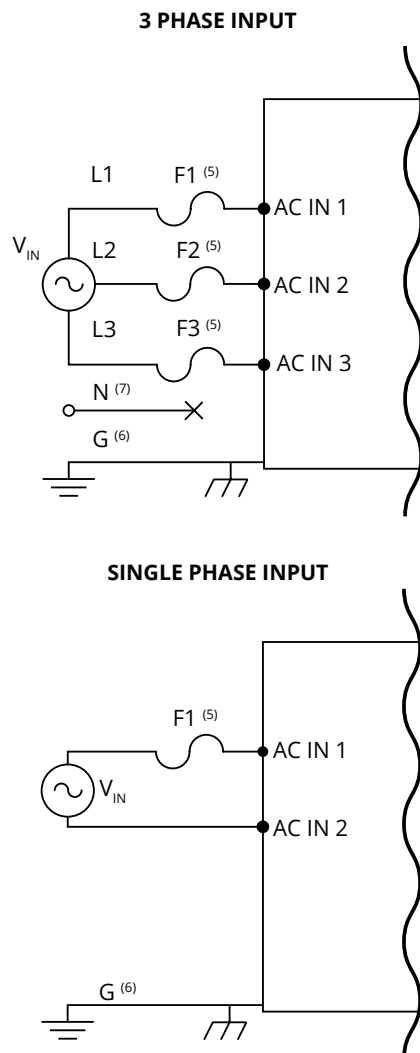
DERATING GRAPHS (Nominal V_{IN} , Full Load, Efficiency @ Full Load)


TYPICAL CONNECTION CIRCUIT

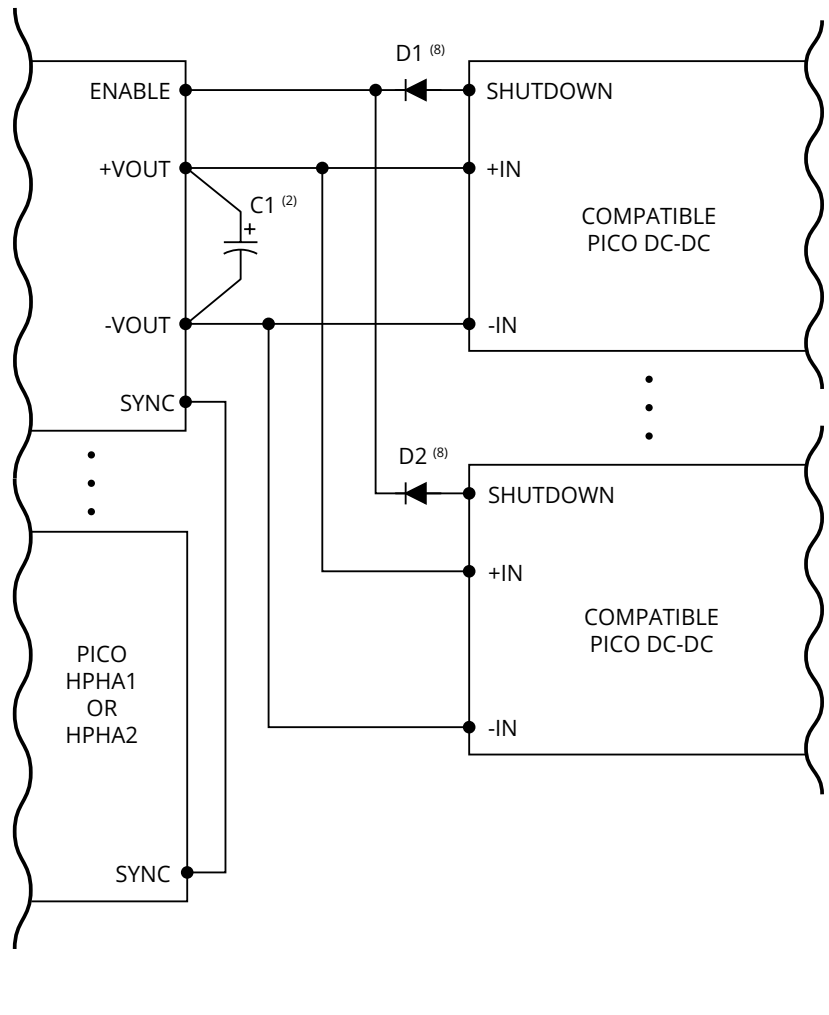
SERIES LPHA1 & PHA1



SERIES HPHA1 & HPHA2 - INPUT



SERIES HPHA1 & HPHA2 - OUTPUT



Note 1: For LPHA1 & PHA1, 2.5Ω inrush thermistor is required on the input.

Note 2: Electrolytic capacitor is required on the output.

Note 5: Input fuse is required - See Input Fuse Recommendation.

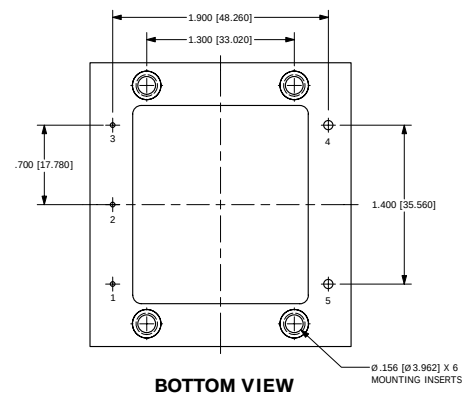
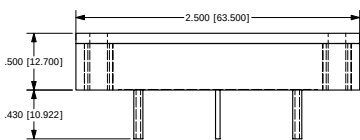
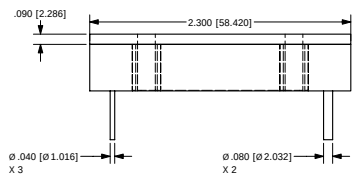
Note 6: Physical Earth/Ground may be connected to baseplate/chassis or not connected.

Note 7: Neutral Connection - Not connected.

Note 8: Diode required for two or more Pico DC-DC modules.

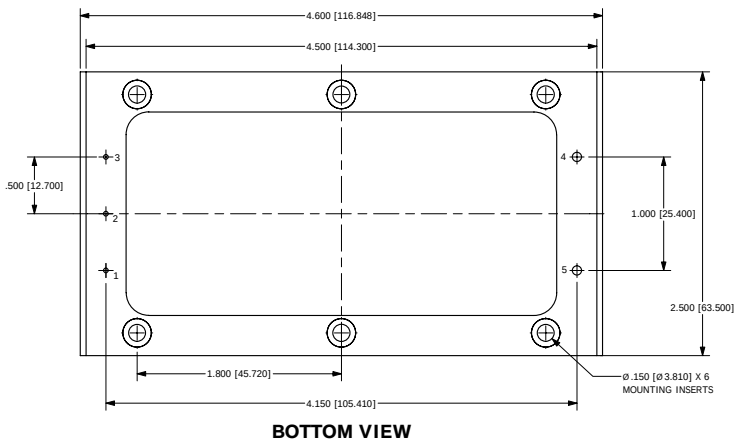
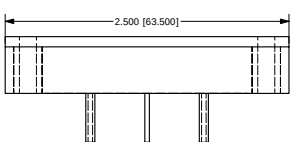
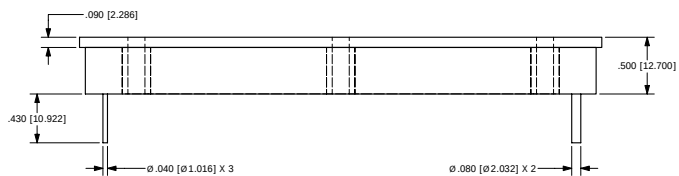
MECHANICAL DRAWINGS

SERIES LPHA1 - 250W



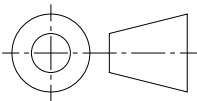
PIN	FUNCTION	PIN DIAMETER
1	AC IN	.040 [1.016]
2	AC IN	.040 [1.016]
3	NC	.040 [1.016]
4	-VOUT	.080 [2.032]
5	+VOUT	.080 [2.032]

SERIES PHA1 - 500W



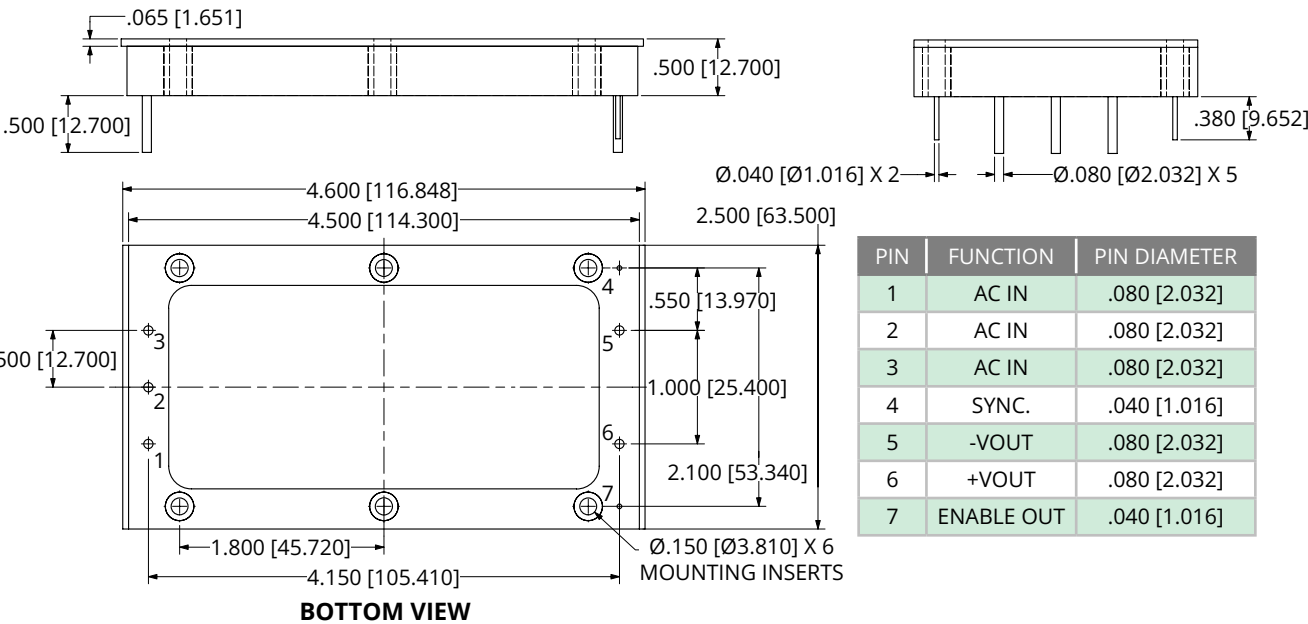
PIN	FUNCTION	PIN DIAMETER
1	AC IN	.040 [1.016]
2	AC IN	.040 [1.016]
3	NC	.040 [1.016]
4	-VOUT	.080 [2.032]
5	+VOUT	.080 [2.032]

- NOTES
- a. ALL DIMENSIONS ARE IN INCHES, [] = MM
 - b. RECOMMENDED TORQUE FOR MOUNTING SCREWS: 6-9 INCH-LBS
 - c. EXTERNAL CAPACITOR REQUIRED ACROSS TERMINALS 4 AND 5



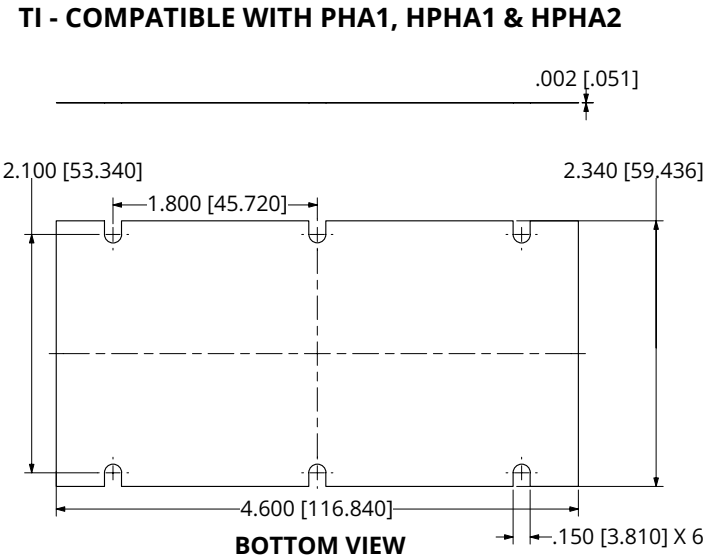
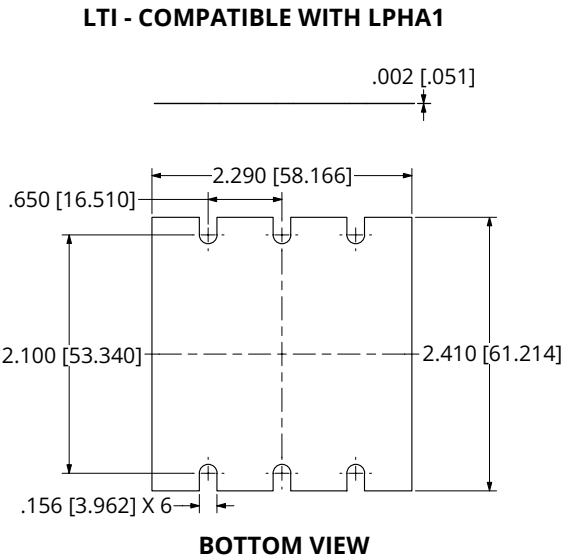
MECHANICAL DRAWINGS

SERIES HPHA1 - 1000W & HPHA2 - 2000W

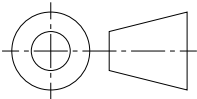


- NOTES**
- a. ALL DIMENSIONS ARE IN INCHES, [] = MM
 - b. RECOMMENDED TORQUE FOR MOUNTING SCREWS: 6-9 INCH-LBS
 - c. EXTERNAL CAPACITOR REQUIRED ACROSS TERMINALS 5 AND 6

THERMAL INTERFACE

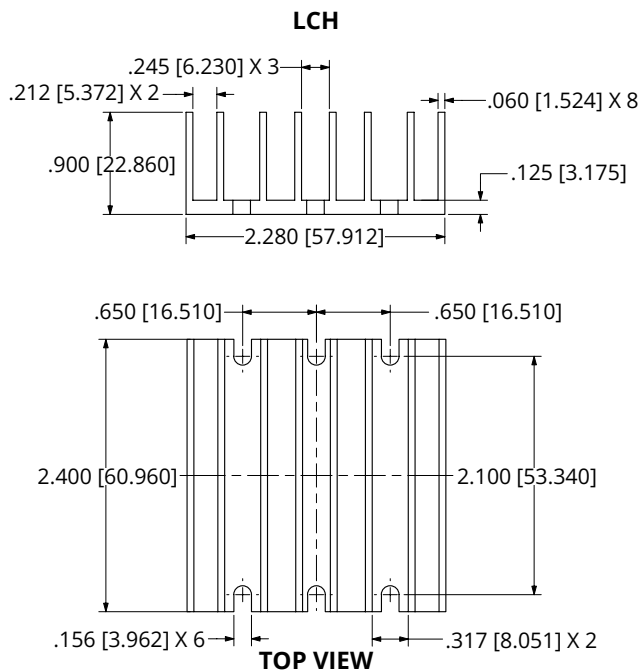


Material	Alloy Aluminum Substrate
Thermal Conductivity	1530 BTU-in/hr sq.ft °F
Coefficient of Thermal Expansion, (25-100°C)	13.1 10 ⁻⁶ in-in/°F
Brinell Hardness	23 HB
Endurance Limit	5000 PSI
Standard Thickness	0.002 inches



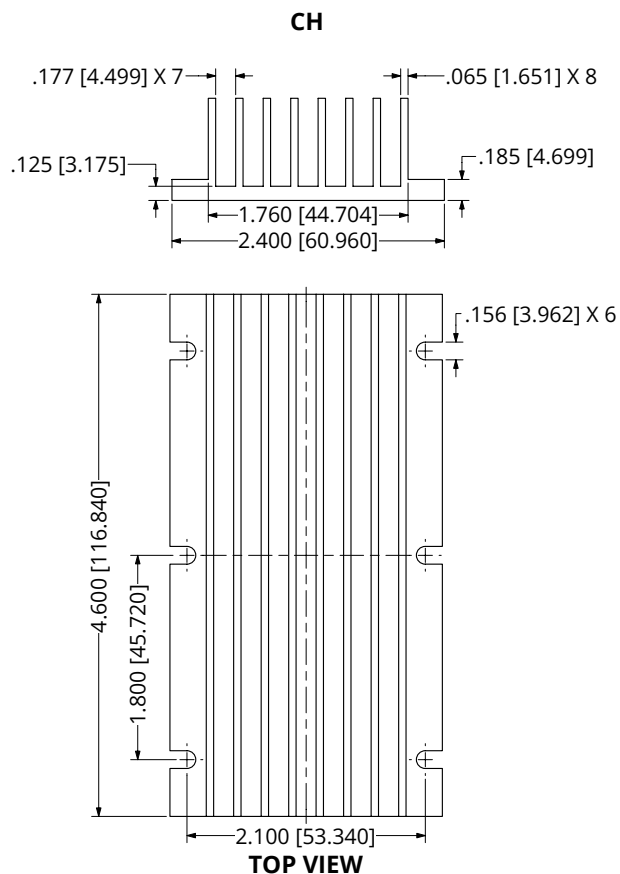
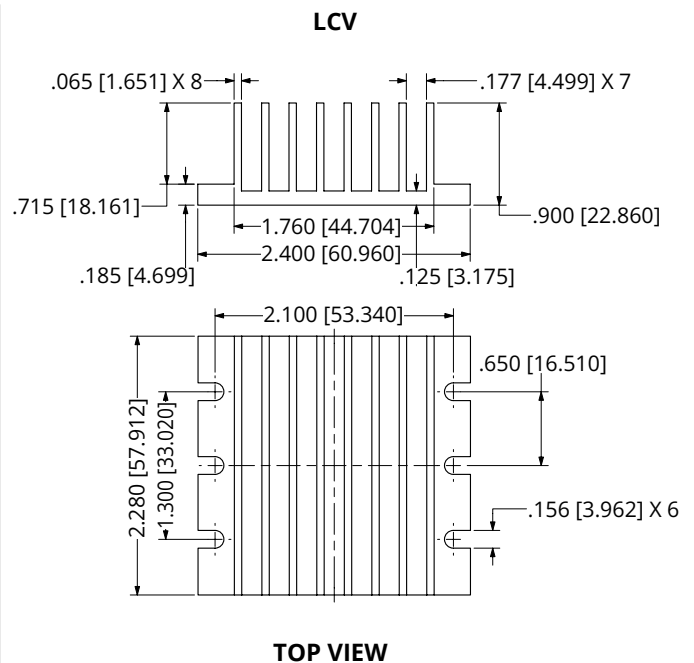
MECHANICAL DRAWINGS

HEAT SINKS COMPATIBLE WITH LPHA1

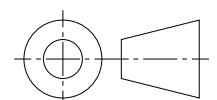
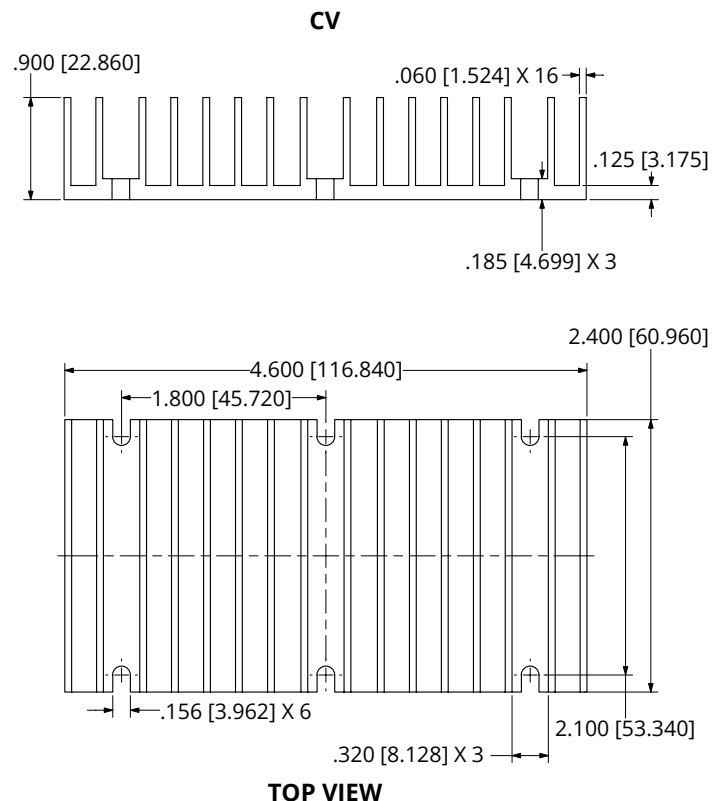


Weight: 70 grams typical

HEAT SINKS COMPATIBLE WITH PHA1, HPHA1 & HPHA2

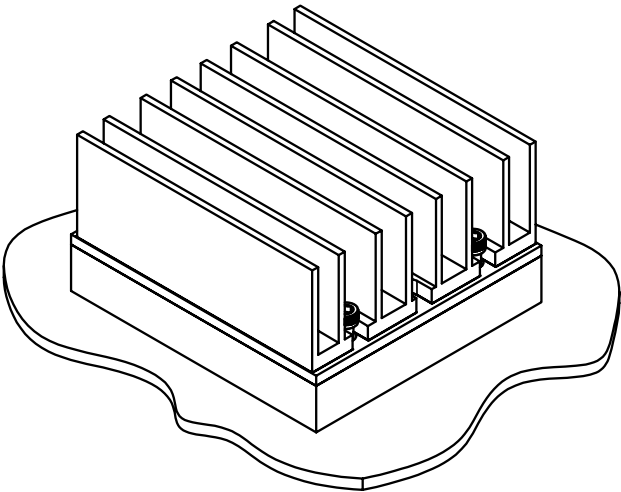
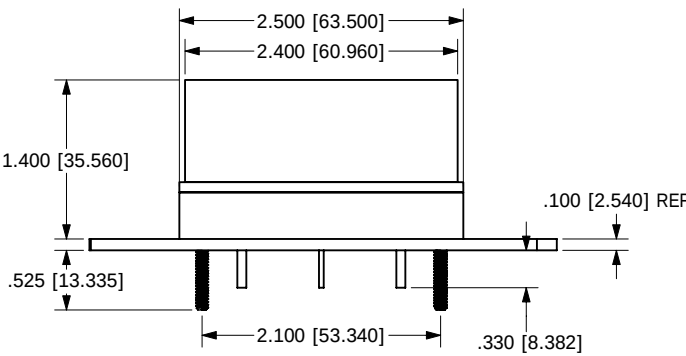
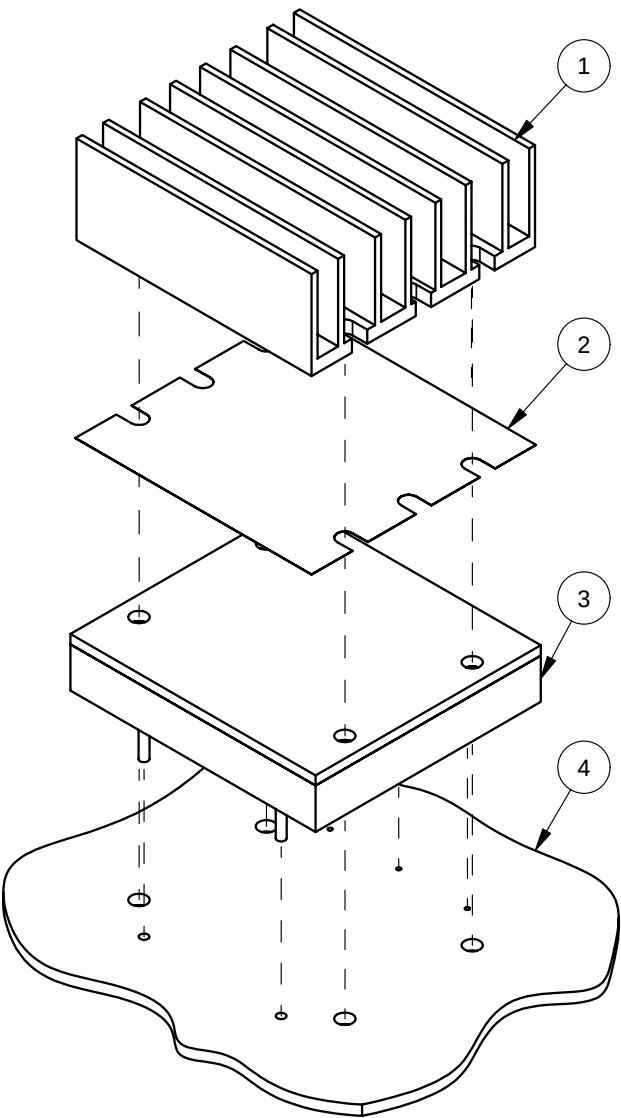


Weight: 145 grams typical



MECHANICAL DRAWINGS

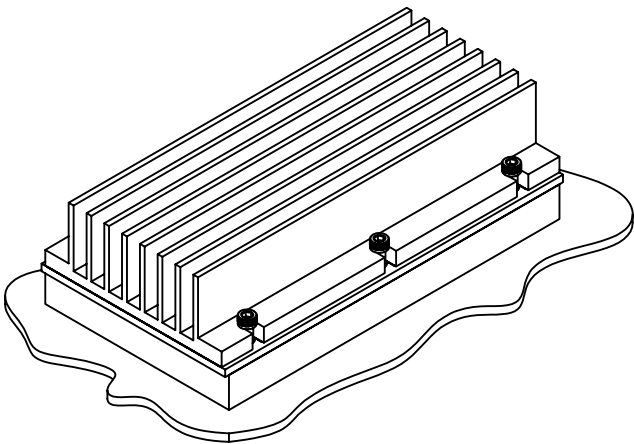
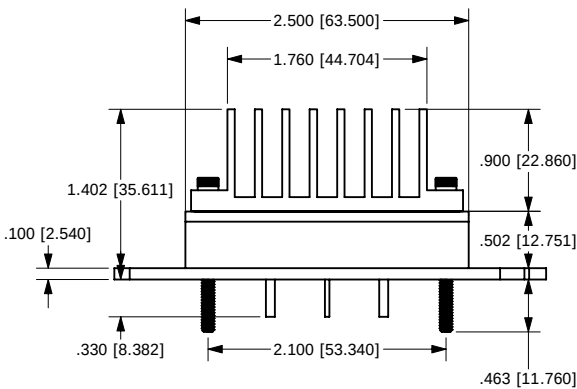
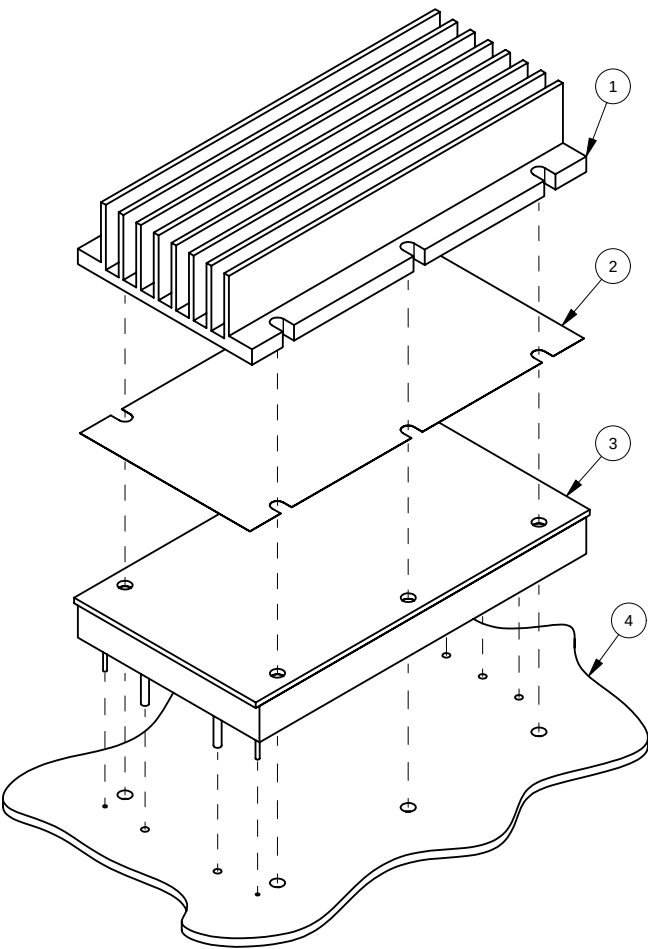
SERIES LPHA1 - HEAT SINK ASSEMBLY



ITEM	QTY	DESCRIPTION
1	1	LCH OR LCV HEAT SINK
2	1	LTI THERMAL INTERFACE
3	1	LPHA1 MODULE
4	1	PCB

MECHANICAL DRAWINGS

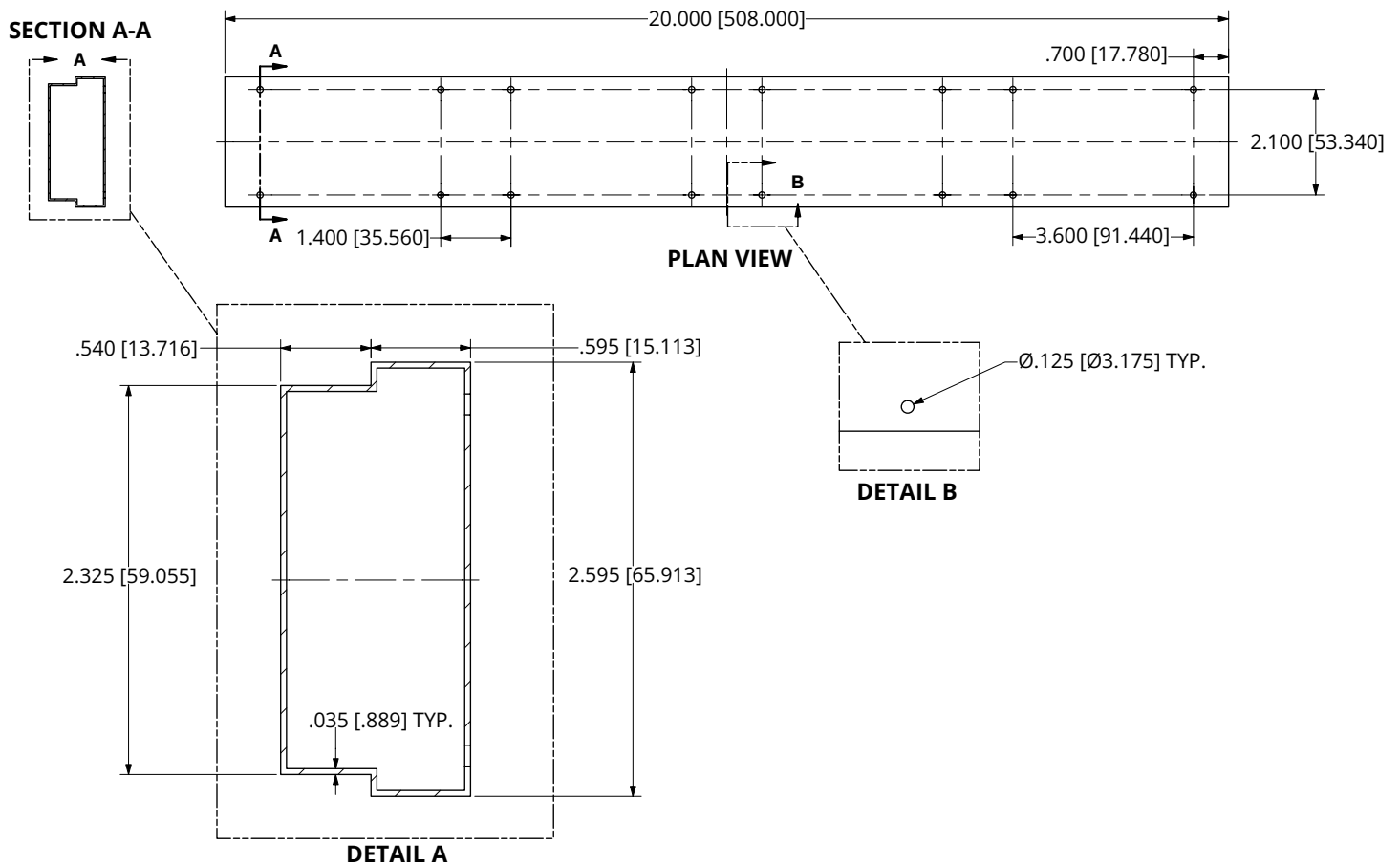
SERIES PHA1, HPHA1 & HPHA2 - HEAT SINK ASSEMBLY



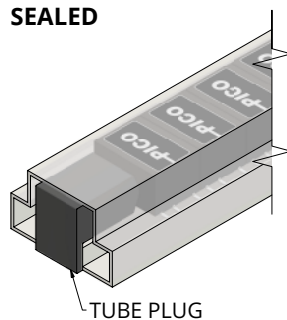
ITEM	QTY	DESCRIPTION
1	1	CH OR CV HEAT SINK
2	1	TI THERMAL INTERFACE
3	1	PHA1, HPHA1 OR HPHA2 MODULE
4	1	PCB

TUBE PACKAGING

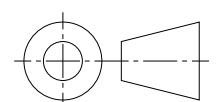
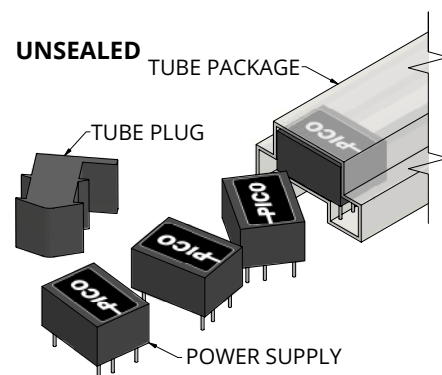
SERIES LPHA1, HPHA1 & HPHA2



SEALED

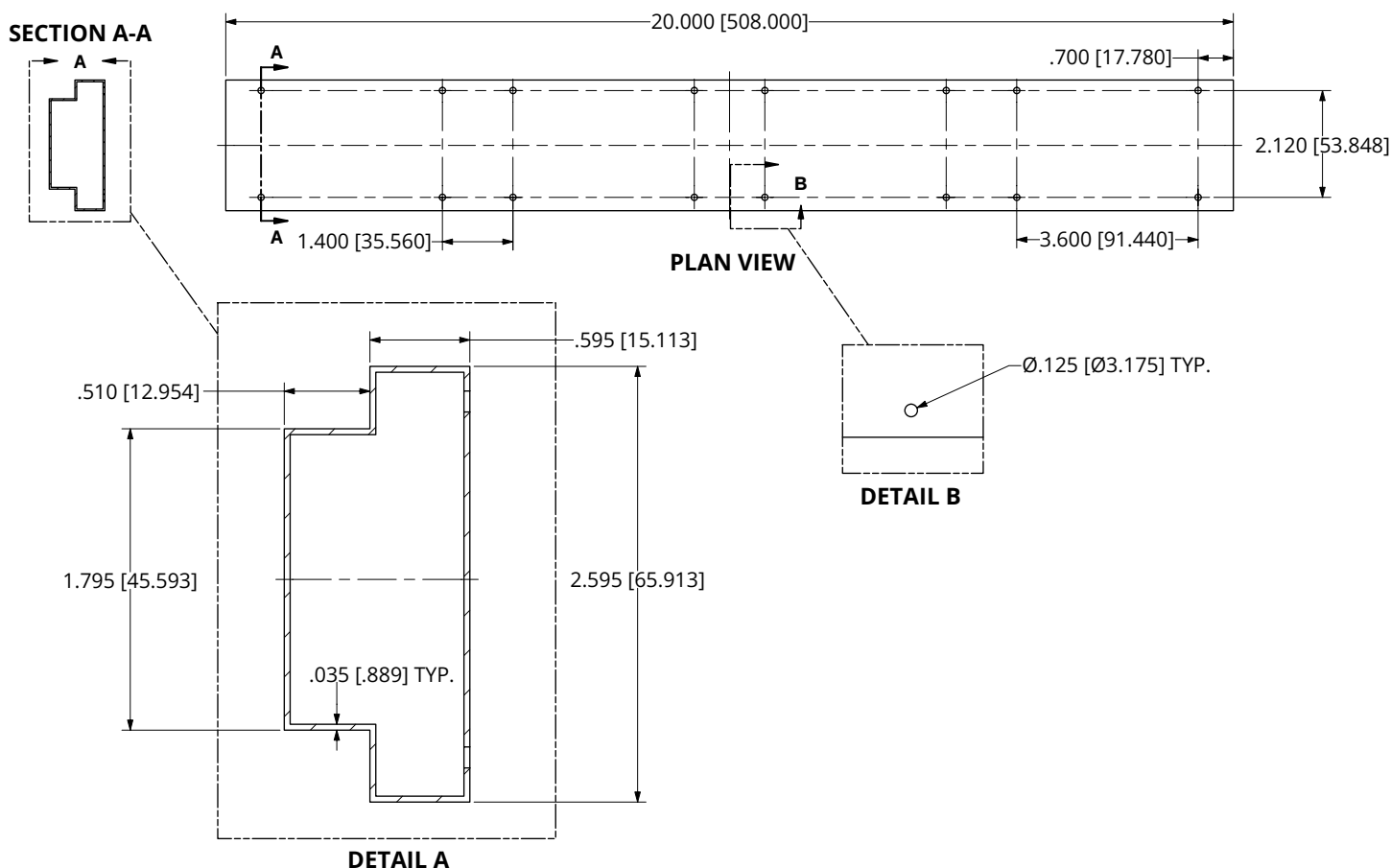


UNSEALED

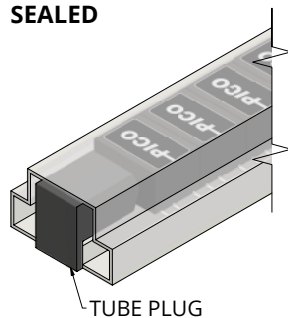


TUBE PACKAGING

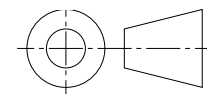
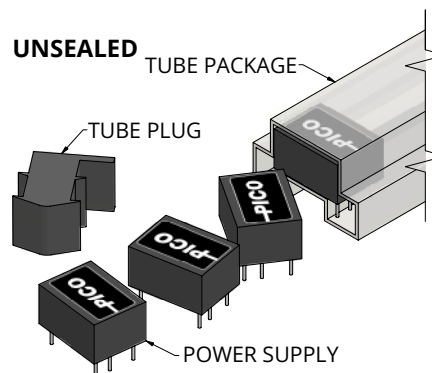
SERIES PHA1



SEALED



UNSEALED



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We reserve the right to discontinue products without notice, We reserve the right to make modifications to any existing catalog products without notice, at any time, without the obligation to modify units previously sold.

Manufacturing Standards

Pico Electronics is a qualified products vendor serving the military and aerospace industries, supporting **mission-critical applications** such as communications systems, aircraft, weapons/defense, naval electronics, and satellites. All products are manufactured to **stringent quality** and **reliability standards**, ensuring performance in **extreme environments**, including high temperature, humidity, and chemical exposure

Military standards include MIL-PRF-27/21038 for Low Power Pulse Transformers, MIL-PRF-27/289 for Power Inductors, MIL-STD-1553 for Data Bus Transformers, QPL for Audio Transformers, and select MIL-STD-883 environmental screening for DC-DC Converters and AC-DC Power Supplies.

DESIGNED TO MEET

Standard	Screening / Test	Description
MIL-STD-202	Vibration	Method 204, Vibration, High Frequency
	Shock	Method 213, Shock (Specified Pulse)
	Immersion	Method 104, Immersion
	Moisture Resistance	Method 106, Moisture Resistance
	Flammability	Method 111, Flammability (External Flame)
	Thermal Shock	Method 107, Thermal Shock
	Humidity	Method 106, Moisture Resistance
	Altitude	Method 105, Barometric Pressure (Reduced)

OPTIONAL SCREENING (TRANSFORMERS & INDUCTORS)

Standard	Screening / Test	Description
MIL-PRF-27	a.) Group A inspection Level-T - Table VII b.) Qualification inspection, Grade 5 - Table V	I. Thermal Shock II. Vibration III. Burn-in IV. Induced Voltage V. Shock VI. Dielectric Withstanding Voltage (at reduced pressure) VII. Insulation Resistance VIII. Electrical Characteristics IX. Visual and Mechanical Examination (External) X. Life XI. Radiographic Inspection
MIL-STD-981	a.) Group A screening tests - Table VI b.) Group B tests - Table XII, Class S	
EEE-INST-002, Section M1	a.) Magnetics Screening Req. - Table 2 b.) Magnetics Part Qual. - Table 3	

OPTIONAL SCREENING (DC-DC CONVERTERS & AC-DC POWER SUPPLIES)

Standard	Screenin / Test	Description
MIL-STD-883	Stabilization Bake	Referenced Method 1008 Non-operating maximum storage temperature for 24 hours
	Temperature Cycle	Referenced Method 1010 Non-operating at temperature extremes, 15 mins/ temp, 10 cycles
	Burn-In	Referenced Method 1015 Max operating temperature for 160 hours

Quality & Compliance Standards

Pico Electronics is committed to the **highest standards of quality** and **compliance**, delivering products that meet rigorous industry certifications such as ISO 9001:2015. Every product undergoes **100% electrical testing** and visual inspection, with Certificates of Conformance provided for complete traceability and assurance. Pico's robust quality management system, strict supplier oversight, and adherence to military and aerospace standards ensure exceptional reliability, safety, and performance for mission-critical applications. Customers can trust Pico Electronics for consistent excellence, proactive risk management, and **responsive, customer-focused service**.



**Certified to
AS9100D
ISO 9001:2015**



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