

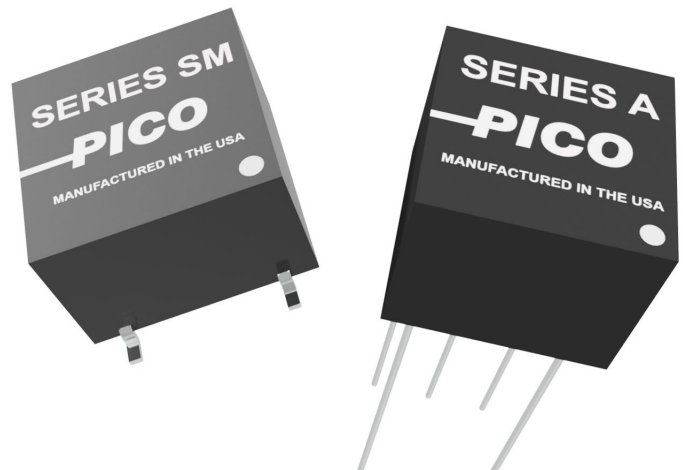
Series A & SM

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

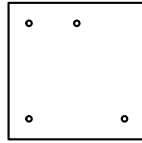
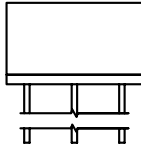
Contact Pico for part number of available options:

- 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

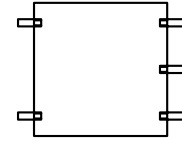
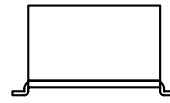
5	A	5	S
NOM. INPUT VOLTAGE	MOUNTING TYPE	NOM. OUTPUT VOLTAGE	NUMBER OF OUTPUTS
5 = 5V 12 = 12V 15 = 15V 24 = 24V 28 = 28V 48 = 48V	A = THROUGH HOLE SM = SURFACE MOUNT	3.3 = 3.3V 5 = 5V 5.2 = 5.2V 9 = 9V 12 = 12V 15 = 15V 24 = 24V 28 = 28V 48 = 48V 100 = 100V 150 = 150V 200 = 200V 250 = 250V	S = SINGLE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

MODEL LIST - SINGLE OUTPUT

SERIES A - THROUGH HOLE



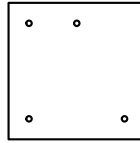
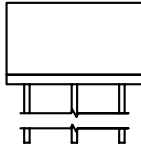
SERIES SM - SURFACE MOUNT



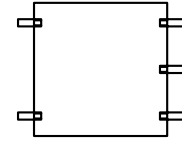
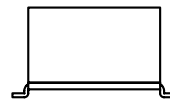
Through Hole	Surface Mount	Input Voltage [VDC]	Output Voltage [VDC]	Output Current Min. [mA]	Output Current Max. [mA]	Efficiency ⁽³⁾ [%] typ.	Input Current No Load [mA] typ.	Input Current Full Load [mA] typ.	Output Ripple ⁽²⁾ [Vp-p max]	Output Voltage Tolerance ⁽³⁾ [±VDC]
5A3.3S	5SM3.3S	5	3.3	0	303	60	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

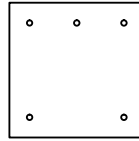
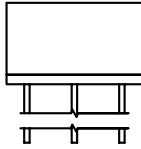
Note 1: Maintain minimum 10% of rated load to prevent a voltage surge.

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.

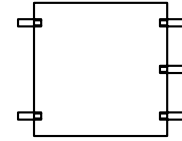
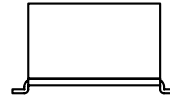
Note 3: Tested at nominal input voltage and full output load.

MODEL LIST - DUAL OUTPUT

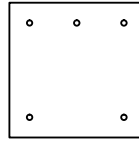
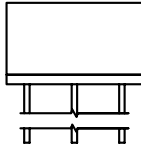
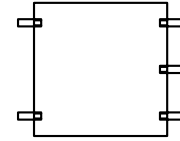
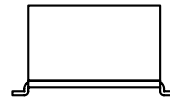
SERIES A - THROUGH HOLE



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			

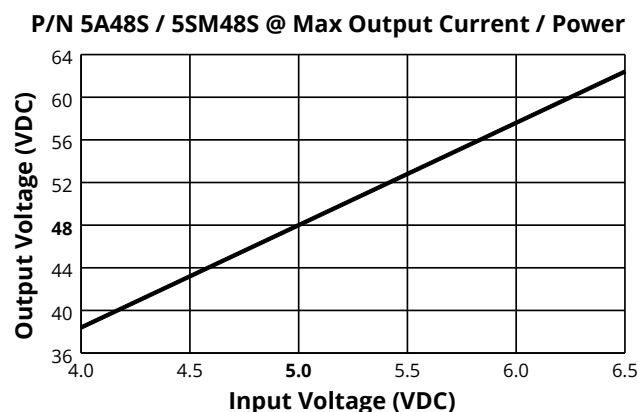
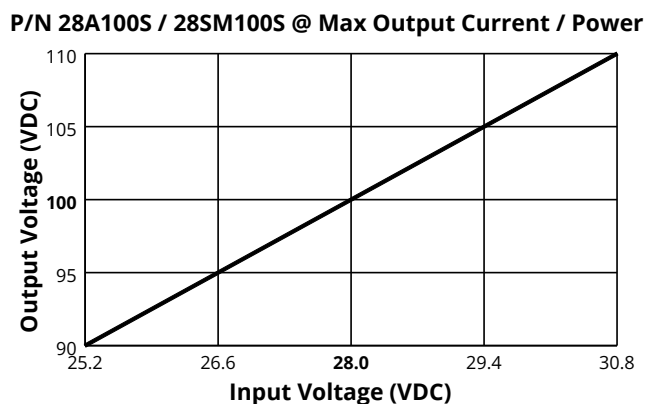
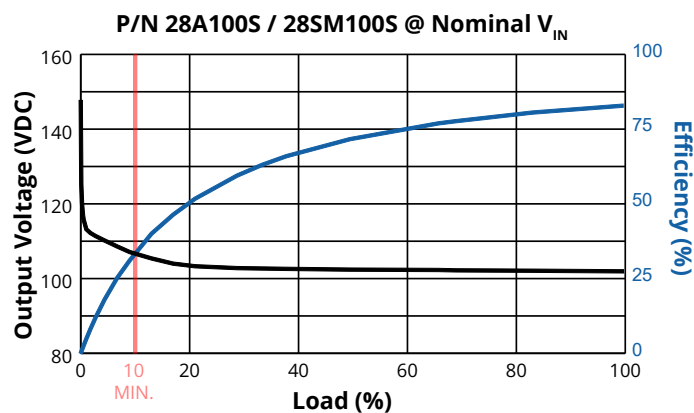
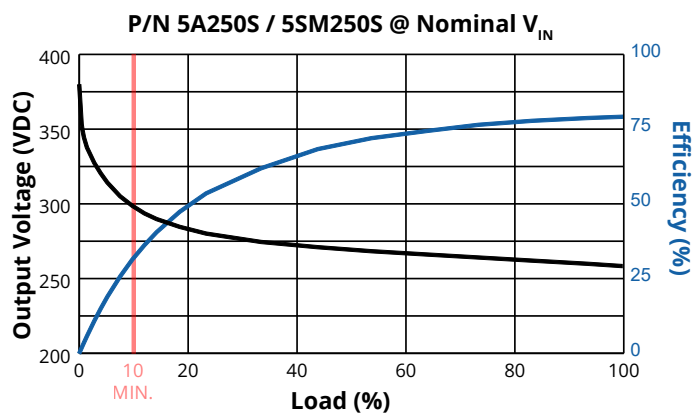
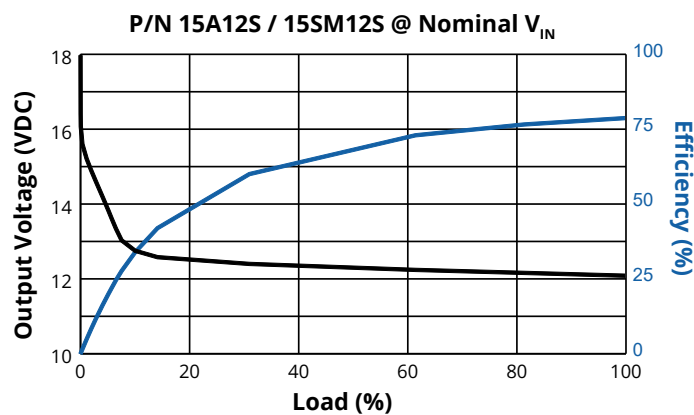
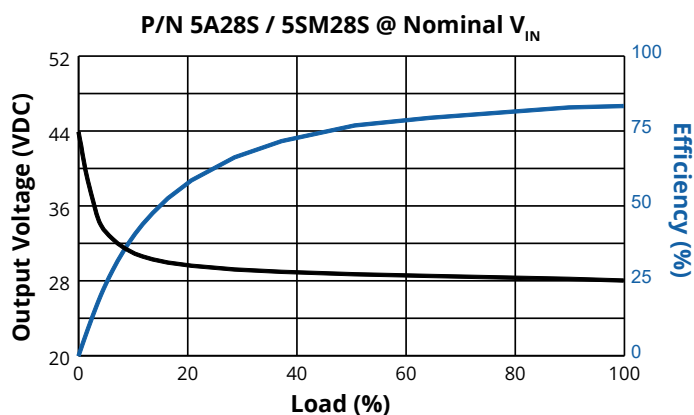
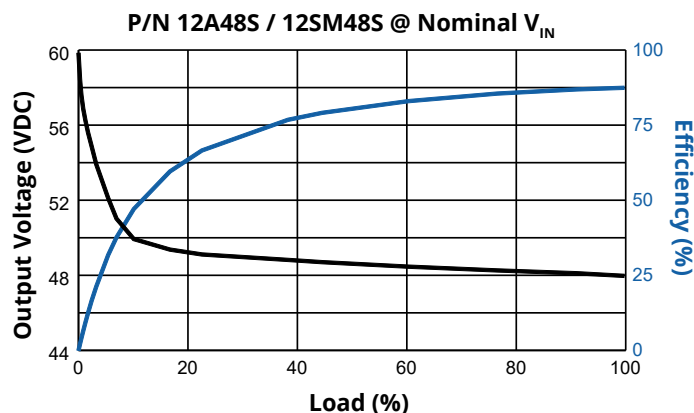
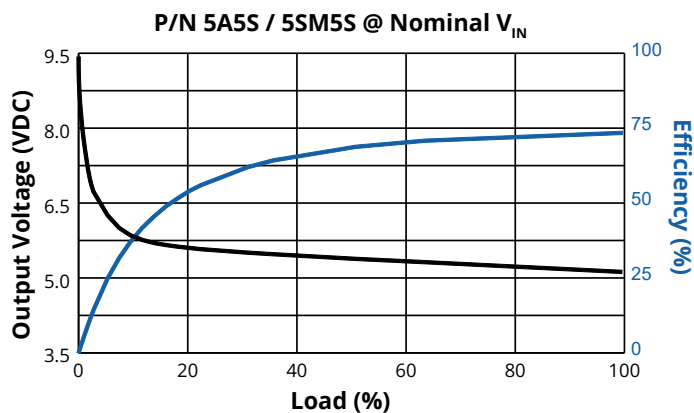
DESIGNED TO MEET

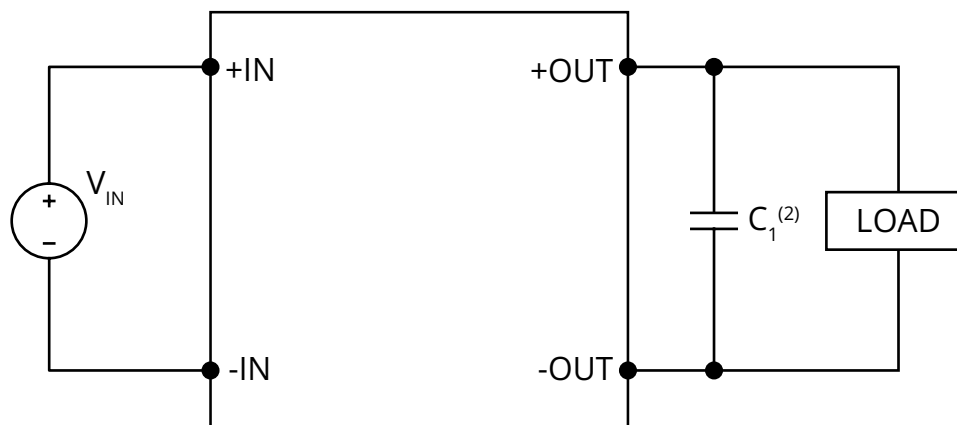
Test	Referenced Standard	Description
Vibration	MIL-STD-202	Method 204, Vibration, High Frequency, Condition D
Shock	MIL-STD-202	Method 213, Shock (Specified Pulse), Condition I
Humidity	MIL-STD-202	Method 106, Moisture Resistance
Altitude	MIL-STD-202	Method 105, Barometric Pressure (Reduced), Condition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

OPTIONS AVAILABLE – CONTACT PICO FOR PART NUMBER

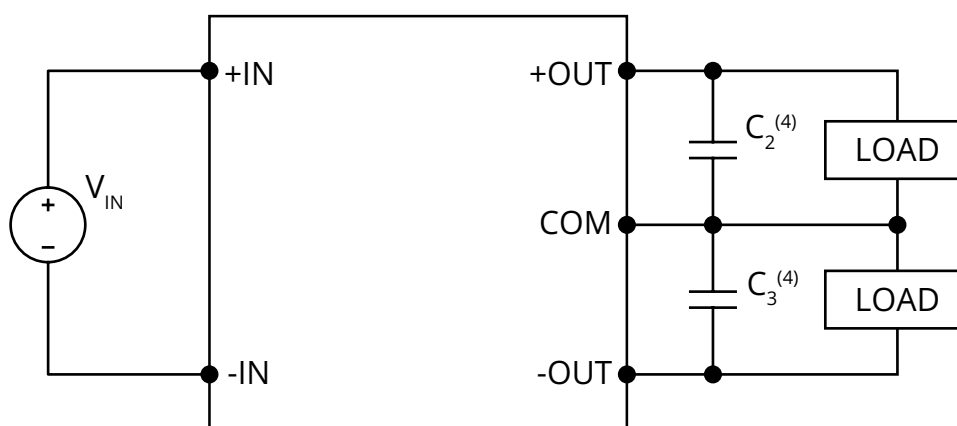
Parameter	Referenced Standard	Description
Stabilization Bake	MIL-STD-883	Referenced Method 1008 Non-operating maximum storage temperature for 24 hours
Temperature Cycle	MIL-STD-883	Referenced Method 1010 Non-operating at temperature extremes, 15 mins/temp, 10 cycles
Burn-In	MIL-STD-883	Referenced Method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

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.

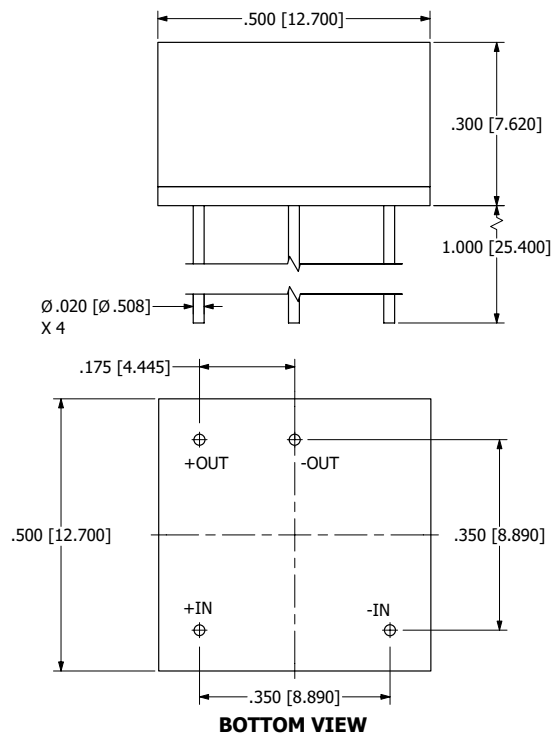
DUAL OUTPUTS

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

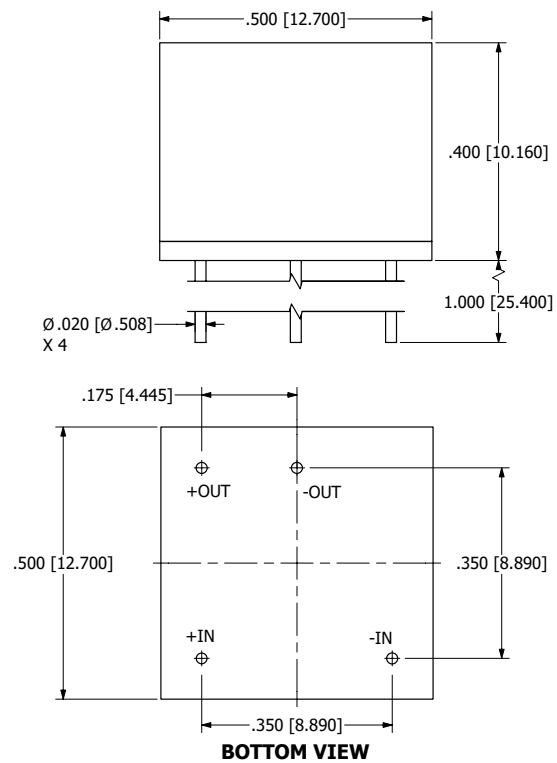
MECHANICAL DRAWINGS

SERIES A - THROUGH HOLE

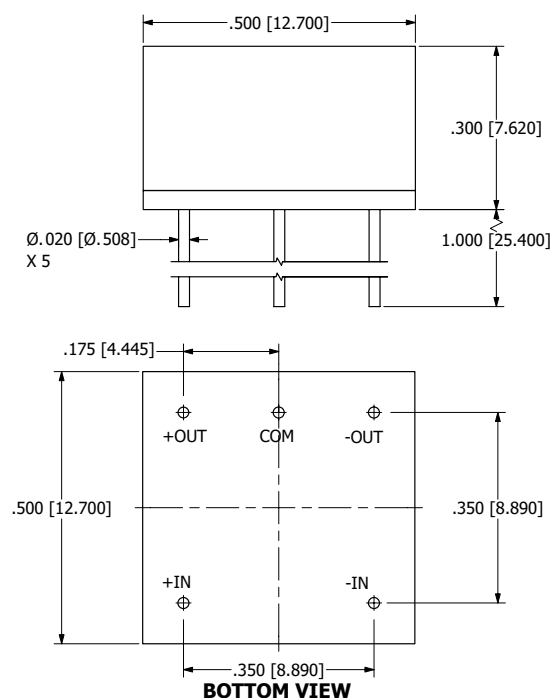
SINGLE $\leq 48V$ OUTPUTS



SINGLE $\geq 100V$ OUTPUTS

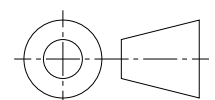


DUAL OUTPUTS



NOTES

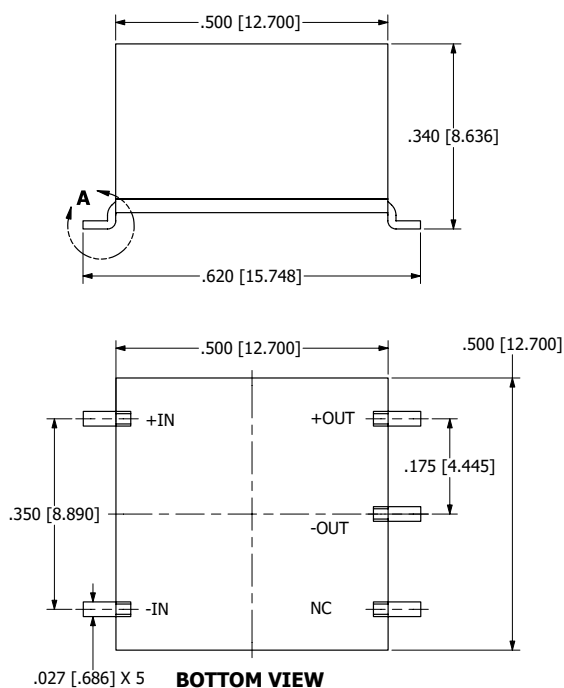
- ALL DIMENSIONS ARE IN INCHES, [] = MM
- WHITE DOT ON TOP SIDE INDICATES +IN LOCATION



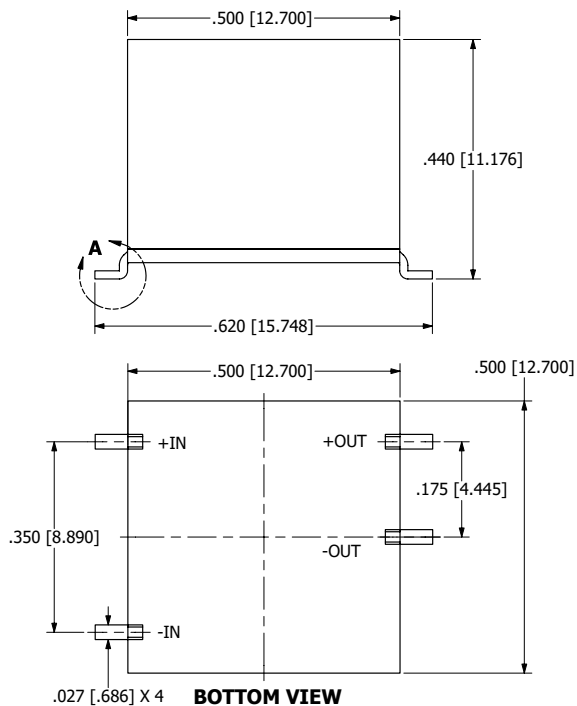
MECHANICAL DRAWINGS

SERIES SM - SURFACE MOUNT

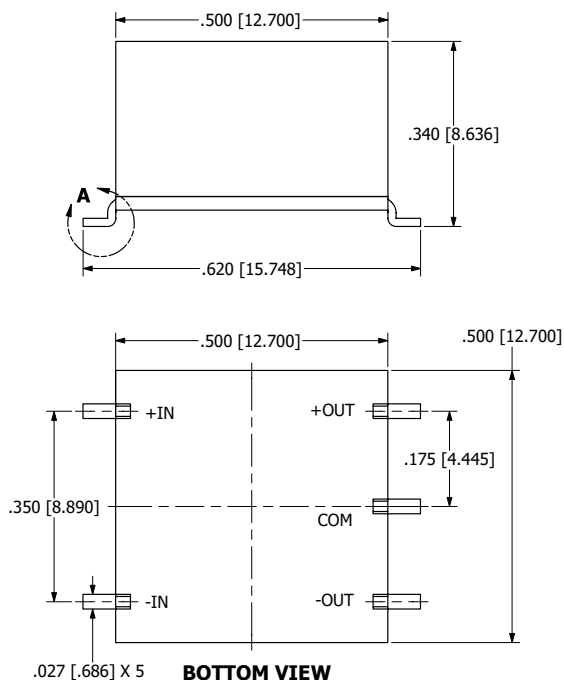
SINGLE $\leq 48V$ OUTPUTS



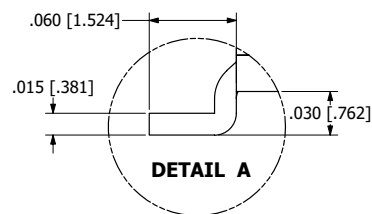
SINGLE $\geq 100V$ OUTPUTS



DUAL OUTPUTS

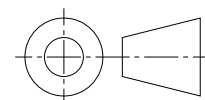


LEAD DETAILS



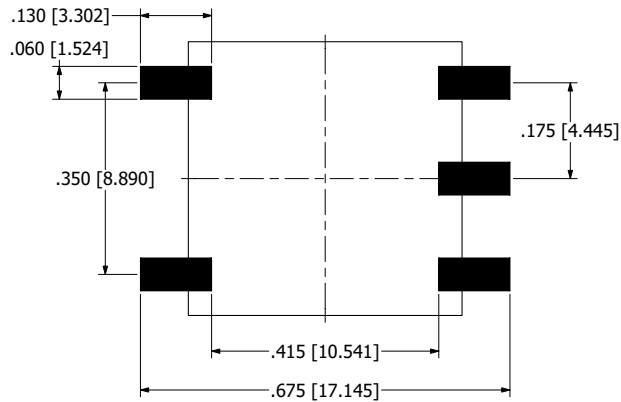
NOTES

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

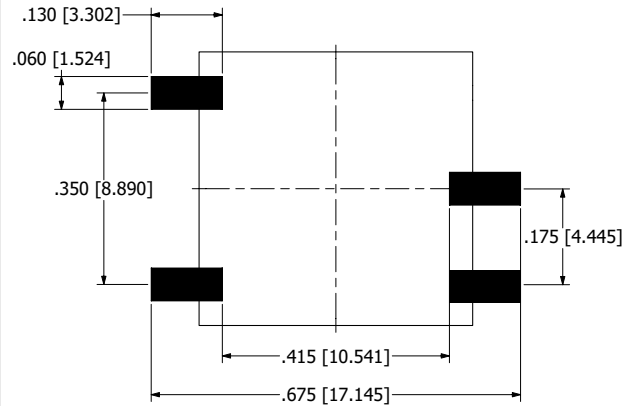


RECOMMENDED LAND PATTERN DIMENSIONS - SERIES SM

SINGLE $\leq 48V$ AND DUAL OUTPUTS

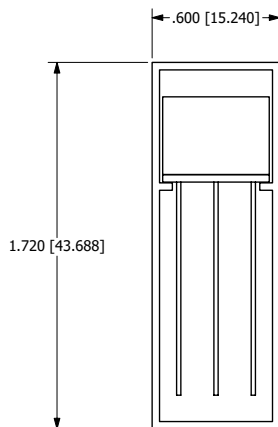


SINGLE $\geq 100V$ OUTPUTS

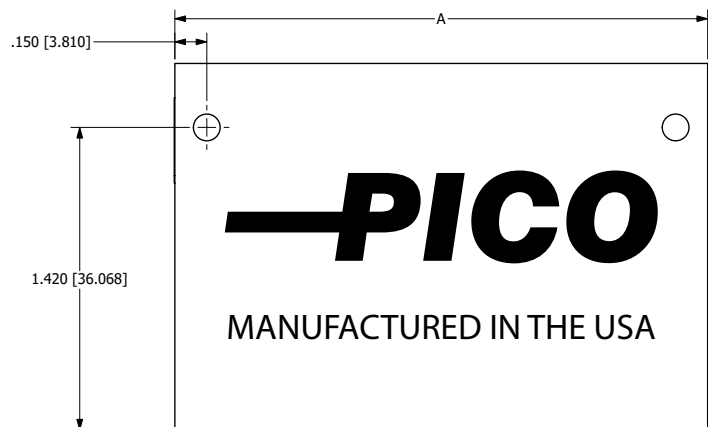


TUBE PACKAGING

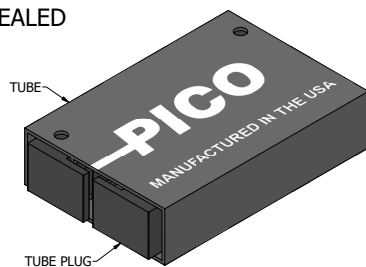
SERIES A - THROUGH HOLE



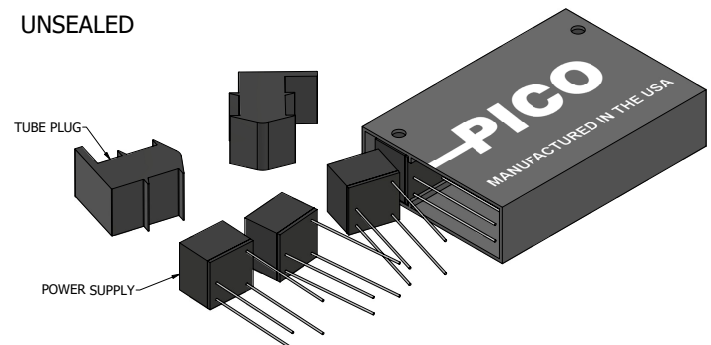
DIMENSION A
4.00 [101.60]
6.50 [165.10]
10.50 [266.70]



SEALED

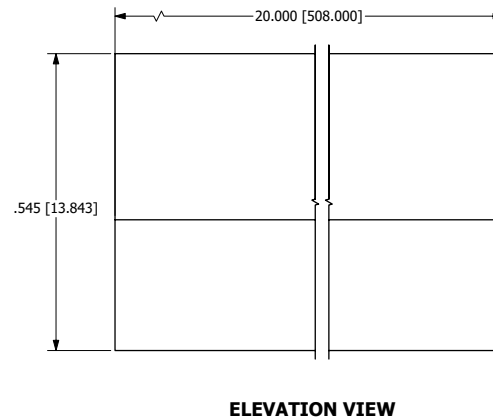
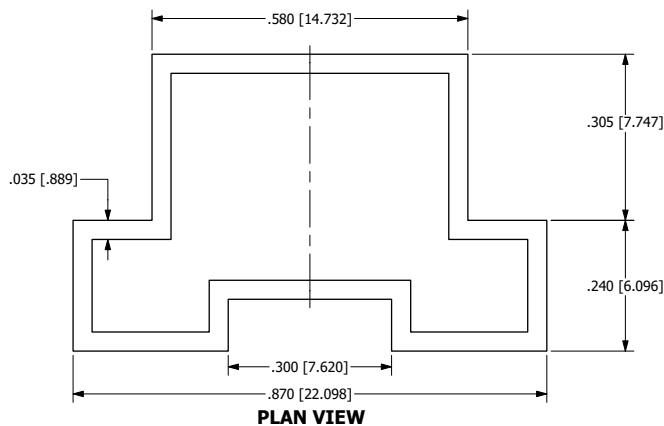


UNSEALED

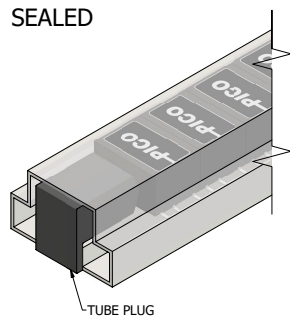


TUBE PACKAGING

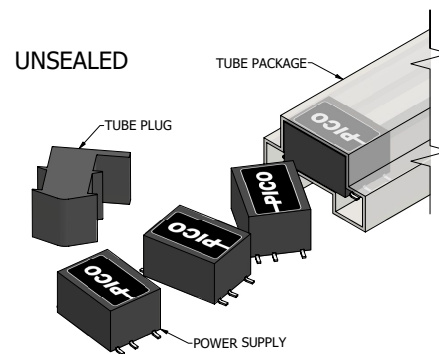
SERIES SM - SURFACE MOUNT



SEALED



UNSEALED



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