

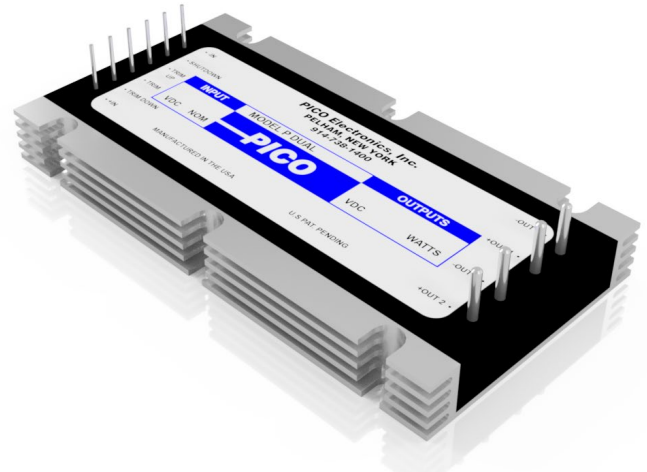
Series P

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	Output Voltage [VDC]	Output Current		Output Power [W]	Efficiency ⁽²⁾ [%] typ.	Line Regulation [±%] max	Load Regulation [±%] max	Output Voltage Tolerance ⁽²⁾ [±%]
			Min. ⁽¹⁾ [A]	Max. [A]					
PA3.3S	18-36	3.3	1.52	15.15	50	74	1.5	2	2
PA5S		5	1.50	15.00	75	76	1.5	2	2
PA5.2S		5.2	1.44	14.42	75	76	1.5	2	2
PA9S		9	1.11	11.11	100	81	1.25	1.5	1.5
PA12S		12	0.83	8.33	100	83	1	1.25	1
PA15S		15	0.67	6.67	100	84	0.75	1	1
PA24S		24	0.42	4.17	100	86	0.5	0.75	1
PA28S		28	0.36	3.57	100	86	0.5	0.5	0.5
PA48S		48	0.21	2.08	100	86	0.5	0.5	0.5
PA100S		100	0.10	1.00	100	85	0.5	0.5	0.5
PA125S		125	0.08	0.80	100	82	0.3	0.5	0.5
PA150S		150	0.07	0.67	100	82	0.3	0.5	0.5
PA175S		175	0.06	0.57	100	82	0.3	0.5	0.5
PA200S		200	0.05	0.50	100	82	0.3	0.5	0.5
PA225S		225	0.04	0.44	100	82	0.3	0.5	0.5
PA250S	250	0.04	0.40	100	82	0.3	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 [±%] max	Load Regulation [±%] max	Output Voltage Tolerance ⁽²⁾ [±%]
			Min. ⁽¹⁾ [A]	Max. [A]					
PA5D	18-36	5	0.75	7.50	37.5	76	1.5	2	2
PA9D		9	0.56	5.56	50	81	1.25	1.5	1.5
PA12D		12	0.42	4.17	50	83	1	1.25	1
PA15D		15	0.33	3.33	50	84	0.75	1	1
PA24D		24	0.21	2.08	50	85	0.5	0.75	1
PA28D		28	0.18	1.79	50	86	0.5	0.5	0.5
PA48D		48	0.10	1.04	50	86	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: For ≤100V output models, load regulation is specified for 10-100% load. For ≥125V output models, load regulation is specified for 20-100% load.

Note 4: Dual output loads must be balanced.

MODEL LIST - PB (36-72V INPUT RANGE)
SINGLE OUTPUT

Pico Part Number	Input Voltage Range	Output Voltage [VDC]	Output Current		Output Power [W]	Efficiency ⁽²⁾ [%] typ.	Line Regulation [±%] max	Load Regulation [±%] max	Output Voltage Tolerance ⁽²⁾ [±%]
			Min. ⁽¹⁾ [A]	Max. [A]					
PB3.3S	36-72	3.3	1.52	15.15	50	76	0.75	1.5	2
PB5S		5	1.50	15.00	75	78	0.75	1	1.5
PB5.2S		5.2	1.44	14.42	75	78	0.75	1	1.5
PB9S		9	1.11	11.11	100	82	0.75	1	1
PB12S		12	0.83	8.33	100	84	0.5	0.75	1
PB15S		15	0.67	6.67	100	85	0.5	0.75	1
PB24S		24	0.42	4.17	100	87	0.5	0.5	0.5
PB28S		28	0.36	3.57	100	87	0.5	0.5	0.5
PB48S		48	0.21	2.08	100	88	0.5	0.5	0.5
PB100S		100	0.10	1.00	100	87	0.5	0.5	0.5
PB125S		125	0.12	1.20	150	84	0.3	0.5	0.5
PB150S		150	0.10	1.00	150	84	0.3	0.5	0.5
PB175S		175	0.09	0.86	150	84	0.3	0.5	0.5
PB200S		200	0.08	0.75	150	84	0.3	0.5	0.5
PB225S		225	0.06	0.56	125	84	0.3	0.5	0.5
PB250S		250	0.05	0.50	125	84	0.3	0.5	0.5
PB275S		275	0.04	0.36	100	84	0.3	0.5	0.5
PB300S	300	0.03	0.33	100	84	0.3	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 [±%] max	Load Regulation [±%] max	Output Voltage Tolerance ⁽²⁾ [±%]
			Min. ⁽¹⁾ [A]	Max. [A]					
PB5D	36-72	5	0.75	7.50	37.5	78	0.75	1	1.5
PB9D		9	0.56	5.56	50	82	0.75	1	1
PB12D		12	0.42	4.17	50	84	0.5	0.75	1
PB15D		15	0.33	3.33	50	85	0.5	0.75	1
PB24D		24	0.21	2.08	50	87	0.5	0.5	0.5
PB28D		28	0.18	1.79	50	87	0.5	0.5	0.5
PB48D		48	0.10	1.04	50	88	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: For ≤100V output models, load regulation is specified for 10-100% load. For ≥125V output models, load regulation is specified for 20-100% load.

Note 4: Dual output loads must be balanced.

MODEL LIST - PC (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 [±%] max	Load Regulation [±%] max	Output Voltage Tolerance ⁽²⁾ [±%]
			Min. ⁽¹⁾ [A]	Max. [A]					
PC3.3S	100-180	3.3	1.52	15.15	50	76	0.75	1	2
PC5S		5	1.50	15.00	75	78	0.75	1	1.5
PC5.2S		5.2	1.44	14.42	75	78	0.75	1	1.5
PC9S		9	1.11	11.11	100	84	0.5	0.75	1
PC12S		12	0.83	8.33	100	86	0.5	0.75	1
PC15S		15	0.67	6.67	100	87	0.5	0.75	1
PC24S		24	0.42	4.17	100	88	0.3	0.5	0.5
PC28S		28	0.36	3.57	100	88	0.2	0.5	0.5
PC48S		48	0.21	2.08	100	88	0.2	0.5	0.5
PC100S		100	0.10	1.00	100	87	0.3	0.5	0.5
PC125S		125	0.12	1.20	150	85	0.3	0.5	0.5
PC150S		150	0.10	1.00	150	85	0.3	0.5	0.5
PC175S		175	0.09	0.86	150	85	0.3	0.5	0.5
PC200S		200	0.08	0.75	150	85	0.3	0.5	0.5
PC225S		225	0.06	0.56	125	85	0.3	0.5	0.5
PC250S		250	0.05	0.50	125	85	0.3	0.5	0.5
PC275S		275	0.04	0.36	100	85	0.3	0.5	0.5
PC300S	300	0.03	0.33	100	85	0.3	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 [±%] max	Load Regulation [±%] max	Output Voltage Tolerance ⁽²⁾ [±%]
			Min. ⁽¹⁾ [A]	Max. [A]					
PC5D	100-180	5	0.75	7.50	37.5	78	0.75	1	1.5
PC9D		9	0.56	5.56	50	84	0.5	0.75	1
PC12D		12	0.42	4.17	50	86	0.5	0.75	1
PC15D		15	0.33	3.33	50	87	0.5	0.75	1
PC24D		24	0.21	2.08	50	88	0.3	0.5	0.5
PC28D		28	0.18	1.79	50	88	0.2	0.5	0.5
PC48D		48	0.10	1.04	50	88	0.2	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: For ≤100V output models, load regulation is specified for 10-100% load. For ≥125V output models, load regulation is specified for 20-100% load.

Note 4: Dual output loads must be balanced.

MODEL LIST - PD (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 [±%] max	Load Regulation [±%] max	Output Voltage Tolerance ⁽²⁾ [±%]
			Min. ⁽¹⁾ [A]	Max. [A]					
PD3.3S	200-380	3.3	1.52	15.15	50	76	1.25	1.5	2
PD5S		5	1.50	15.00	75	78	1	1.25	1.5
PD5.2S		5.2	1.44	14.42	75	78	1	1.25	1.5
PD9S		9	1.11	11.11	100	84	1	1.25	1
PD12S		12	0.83	8.33	100	85	0.75	1	1
PD15S		15	0.67	6.67	100	86	0.75	1	1
PD24S		24	0.42	4.17	100	87	0.5	0.75	0.5
PD28S		28	0.36	3.57	100	87	0.5	0.5	0.5
PD48S		48	0.21	2.08	100	88	0.2	0.5	0.5
PD100S		100	0.10	1.00	100	88	0.2	0.5	0.5
PD125S		125	0.12	1.20	150	85	0.3	0.5	0.5
PD150S		150	0.10	1.00	150	85	0.3	0.5	0.5
PD175S		175	0.09	0.86	150	85	0.3	0.5	0.5
PD200S		200	0.08	0.75	150	85	0.3	0.5	0.5
PD225S		225	0.06	0.56	125	85	0.3	0.5	0.5
PD250S		250	0.05	0.50	125	85	0.3	0.5	0.5
PD275S		275	0.04	0.36	100	85	0.3	0.5	0.5
PD300S		300	0.03	0.33	100	85	0.3	0.5	0.5
PD325S	325	0.03	0.31	100	85	0.3	0.5	0.5	
PD350S	350	0.03	0.29	100	85	0.3	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 [±%] max	Load Regulation ⁽³⁾ [±%] max	Output Voltage Tolerance ⁽²⁾ [±%]
			Min. ⁽¹⁾ [A]	Max. [A]					
PD5D	200-380	5	0.75	7.50	37.5	78	1	1.25	1.5
PD9D		9	0.56	5.56	50	84	1	1.25	1
PD12D		12	0.42	4.17	50	85	0.75	1	1
PD15D		15	0.33	3.33	50	86	0.75	1	1
PD24D		24	0.21	2.08	50	87	0.5	0.75	0.5
PD28D		28	0.18	1.79	50	87	0.5	0.5	0.5
PD48D		48	0.10	1.04	50	88	0.2	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: For ≤100V output models, load regulation is specified for 10-100% load. For ≥125V output models, load regulation is specified for 20-100% 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.	Typ.	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	≤100V output models	-	-	50	mVp-p
		≥125V 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				

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	-	°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 ⁽³⁾	P option models	Connect as shown in connection diagram.				

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.

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

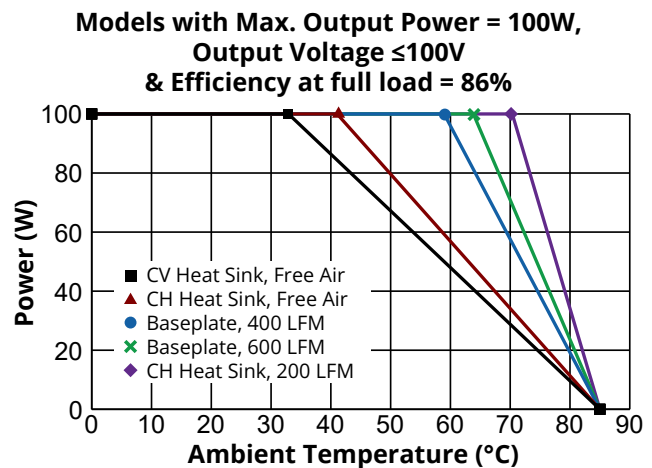
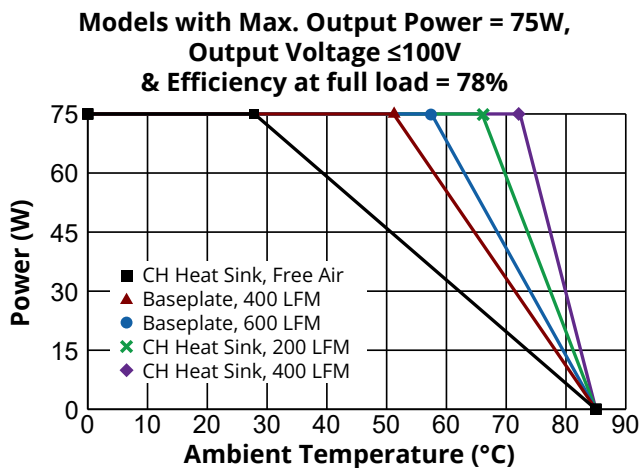
T_A = Ambient temperature in °C

T_{RCA} = Thermal resistance of case to air in °C / W

Thermal resistance of case (T_{RCA})

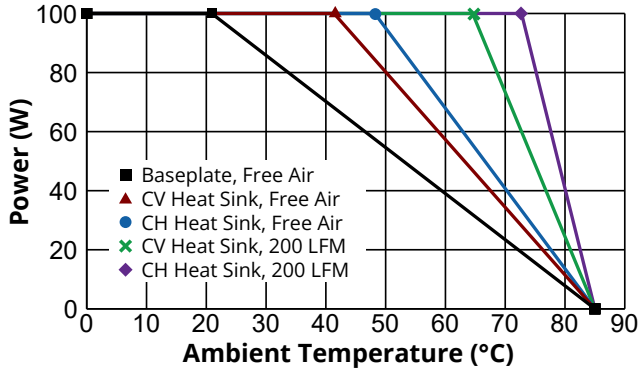
Airflow	≤100V output models			≥125V output models			Units
	Baseplate only	CV Heat Sink	CH Heat Sink	Baseplate only	CV Heat Sink	CH Heat Sink	
Free Air	4.7	3.2	2.7	5.1	3.5	3	°C / W
200 LFM	2.5	1.5	0.9	2.8	1.8	1	
400 LFM	1.6	1	0.6	1.8	1.1	0.7	
600 LFM	1.3	0.7	0.5	1.4	0.8	0.55	
800 LFM	1.1	0.6	0.4	1.2	0.65	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)

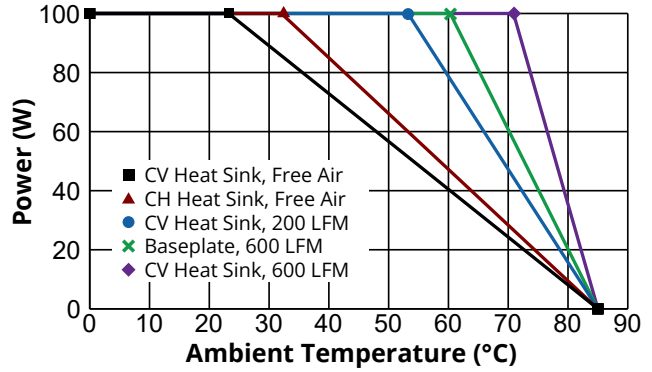


DERATING GRAPHS (Nominal V_{IN} Full Load, Efficiency @ Full Load)

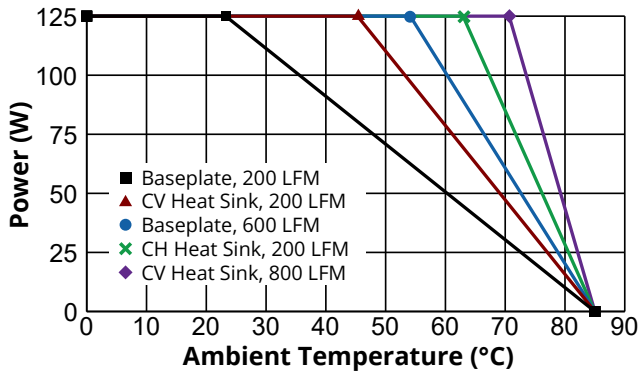
Models with Max. Output Power = 100W,
Output Voltage $\leq 100V$
& Efficiency at full load = 88%



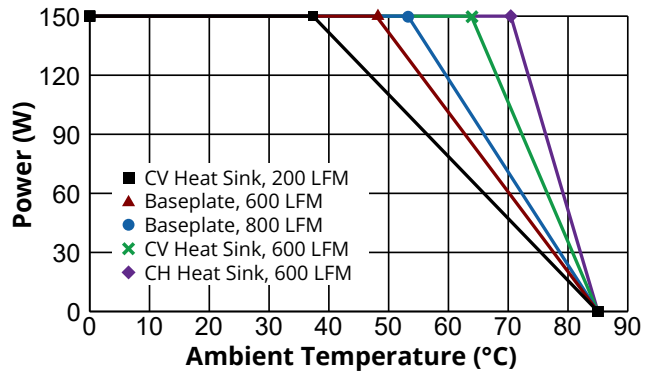
Models with Max. Output Power = 100W,
Output Voltage $\geq 125V$
& Efficiency at full load = 85%



Models with Max. Output Power = 125W,
Output Voltage $\geq 125V$
& Efficiency at full load = 85%

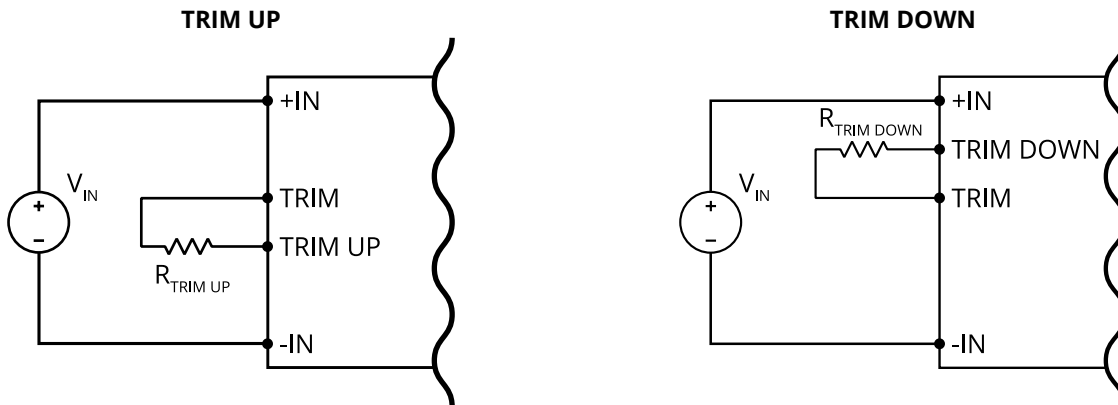


Models with Max. Output Power = 150W,
Output Voltage $\geq 125V$
& Efficiency at full load = 85%



TYPICAL CONNECTION CIRCUIT

TRIM

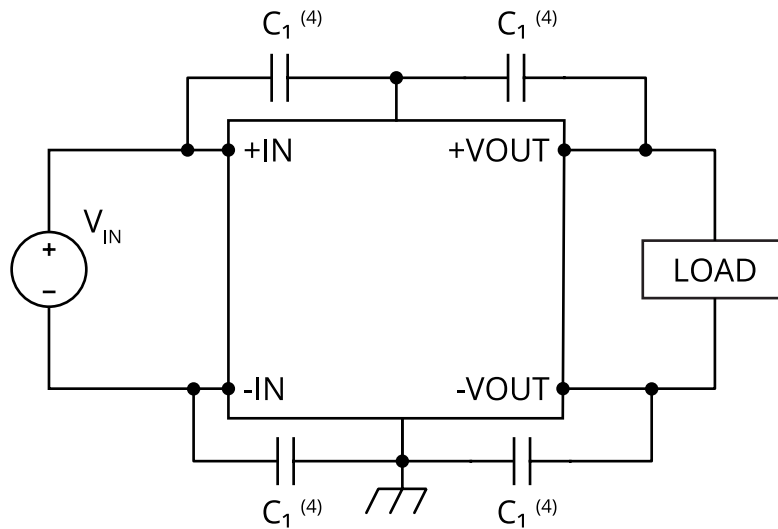


ΔV_{OUT}	0	1	2	3	5	% typ.
Trim Up Resistance	Open	300	150	50	20	k Ω typ.
Trim Down Resistance	Open	1000	500	250	100	

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.

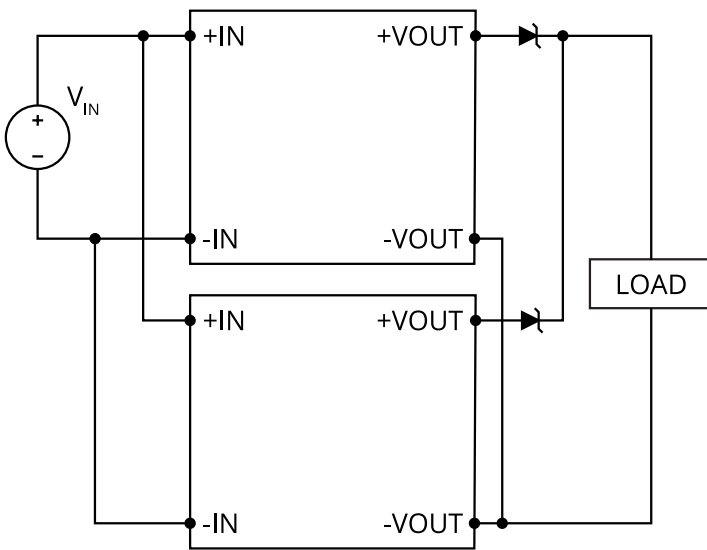
TYPICAL CONNECTION CIRCUIT

NOISE REDUCTION



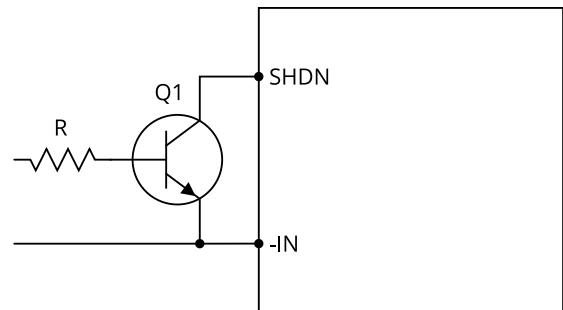
Note 4: C1 filter capacitors may reduce noise further. Please contact Pico for more details.

PARALLEL

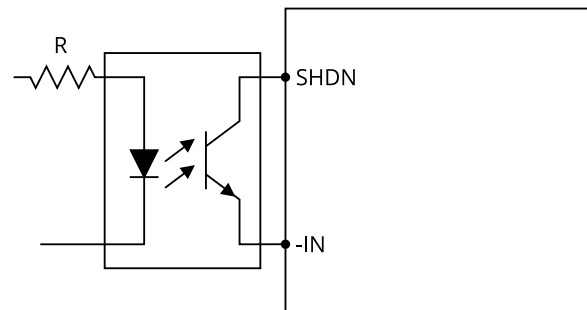


SHUTDOWN

NON-ISOLATED

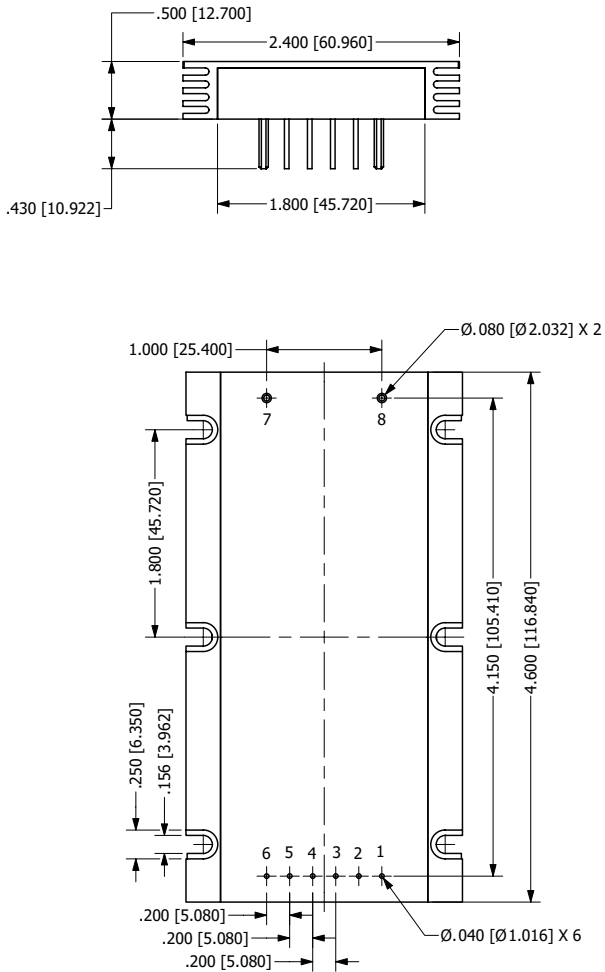


ISOLATED



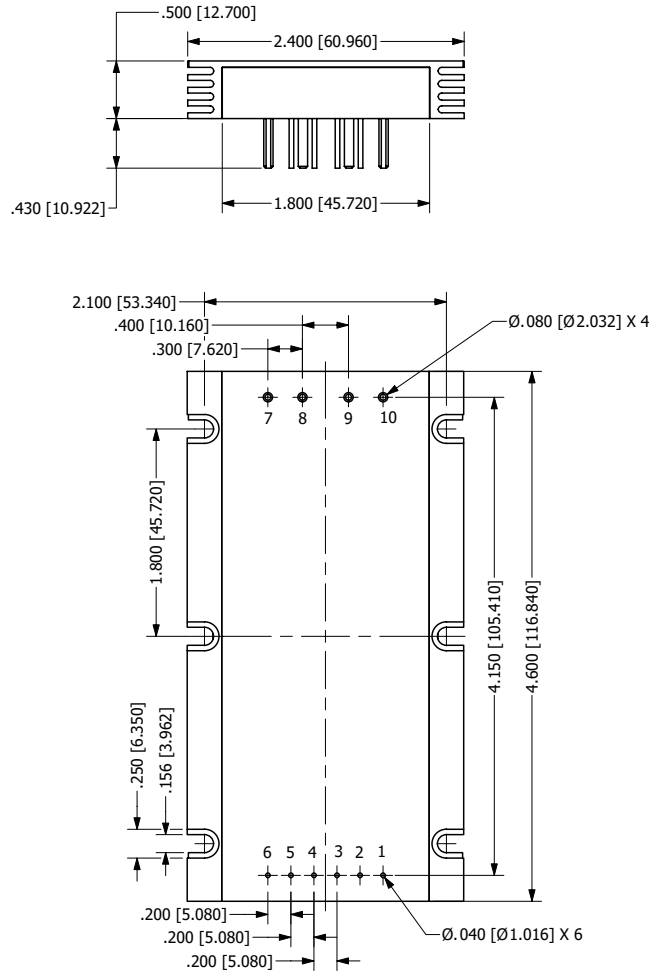
MECHANICAL DRAWINGS

≤100V SINGLE OUTPUTS



BOTTOM VIEW

DUAL OUTPUTS

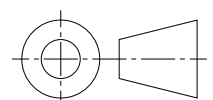


BOTTOM VIEW

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]

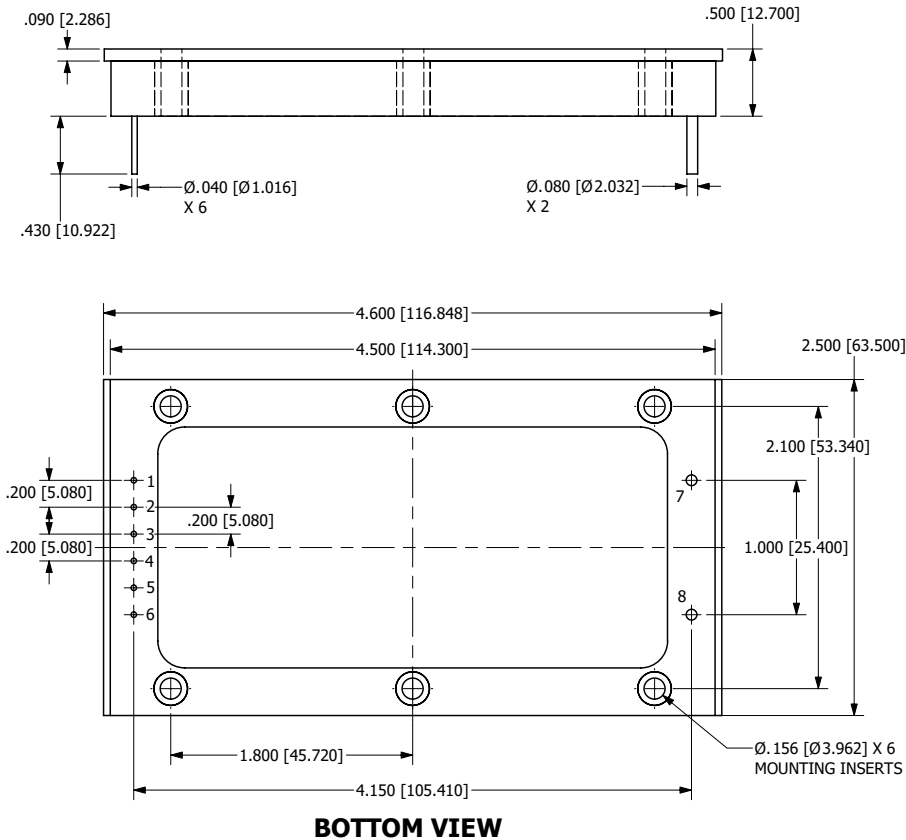
NOTES

- a. ALL DIMENSIONS ARE IN INCHES, [] = MM
- b. RECOMMENDED TORQUE FOR MOUNTING SCREWS: 6-9 INCH-LBS



MECHANICAL DRAWINGS

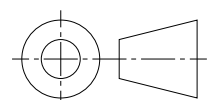
≥125V SINGLE OUTPUTS



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]

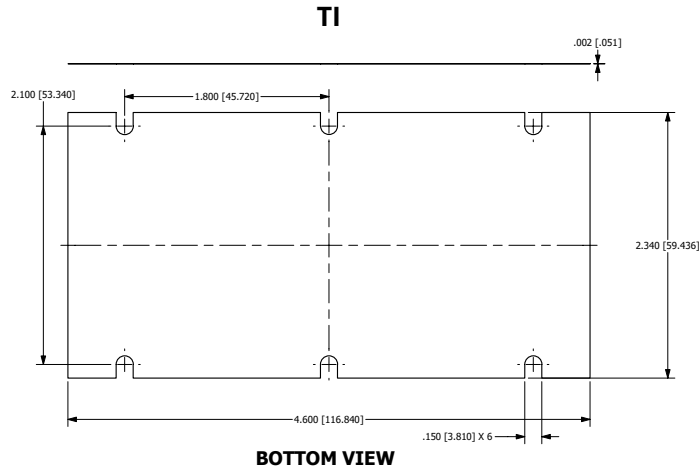
NOTES

- a. ALL DIMENSIONS ARE IN INCHES, [] = MM
- b. RECOMMENDED TORQUE FOR MOUNTING SCREWS: 6-9 INCH-LBS



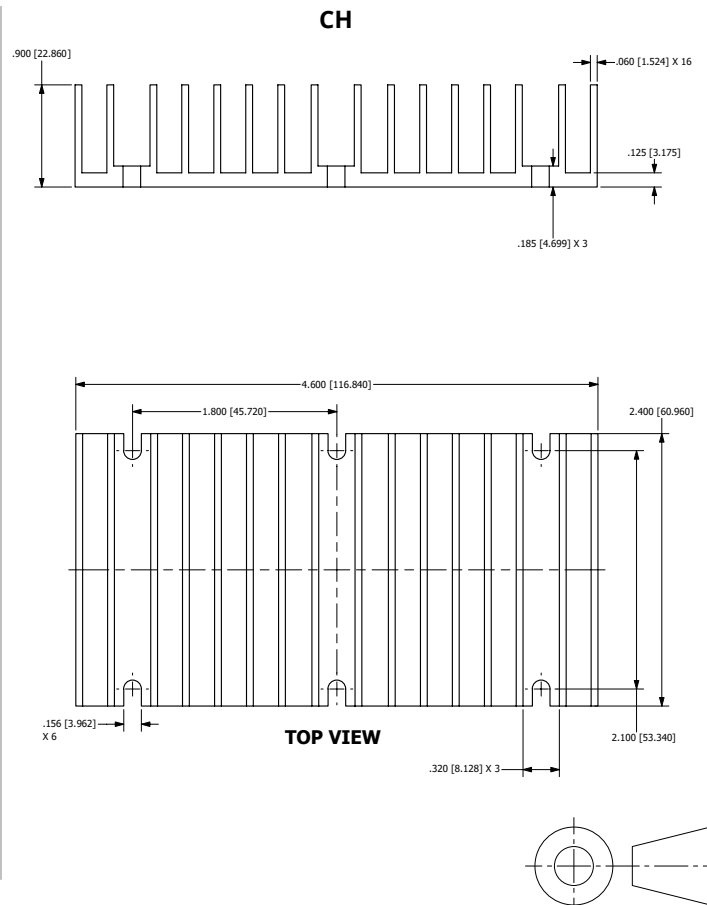
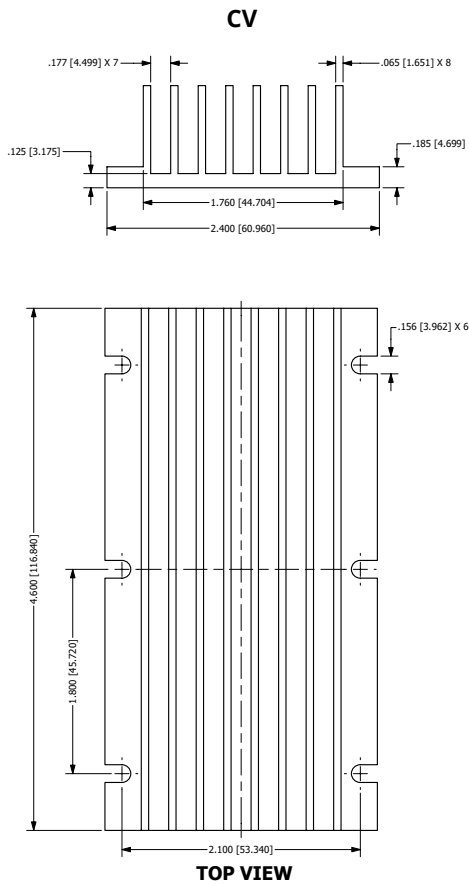
MECHANICAL DRAWINGS

THERMAL INTERFACE

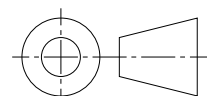


Material	Alloy Aluminum Substrate
Thermal Conductivity	1530 BTU-in/hr sq.ft °F
Coefficient of Thermal Expansion, (25-100°C)	13.1 10 ⁻⁶ in-in/°F
Brinell Hardness	23 HB
Endurance Limit	5000 PSI
Standard Thickness	0.002 inches

HEAT SINKS

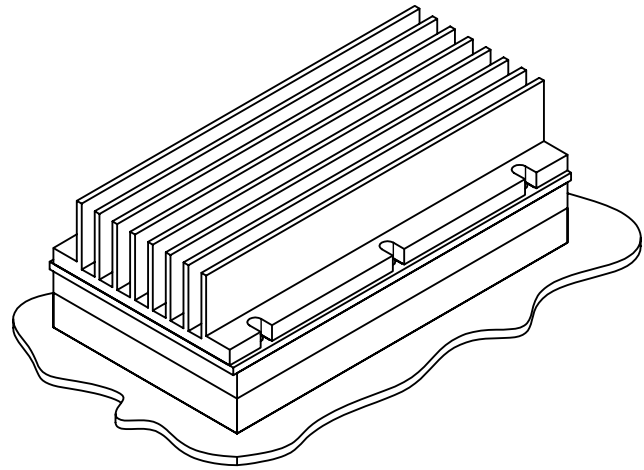
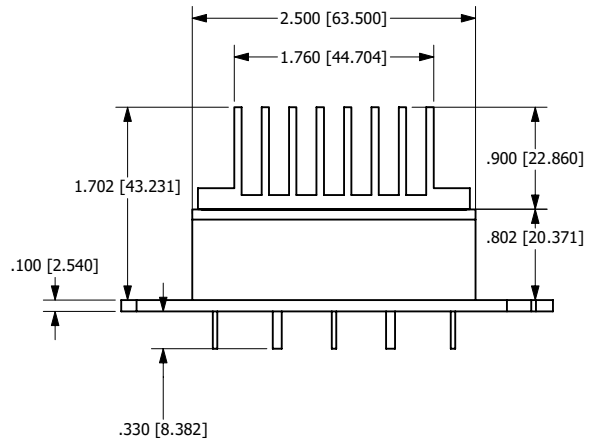
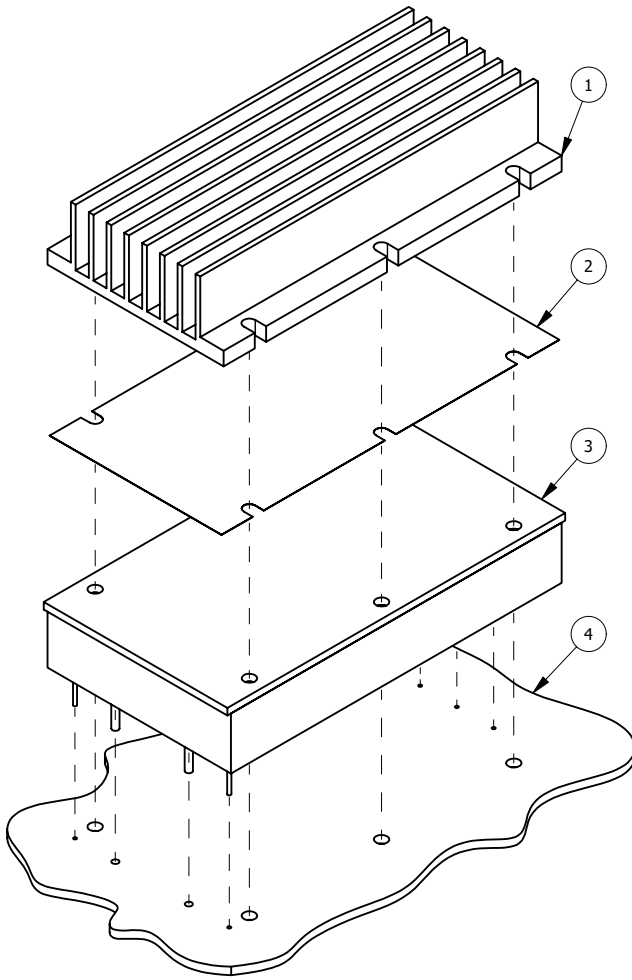


Weight: 145 grams typical



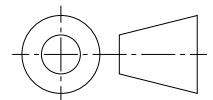
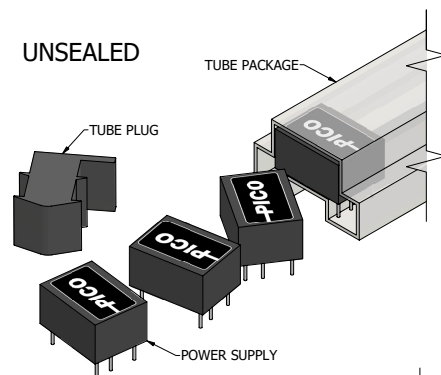
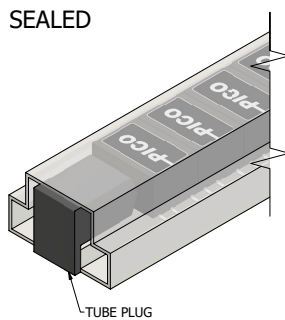
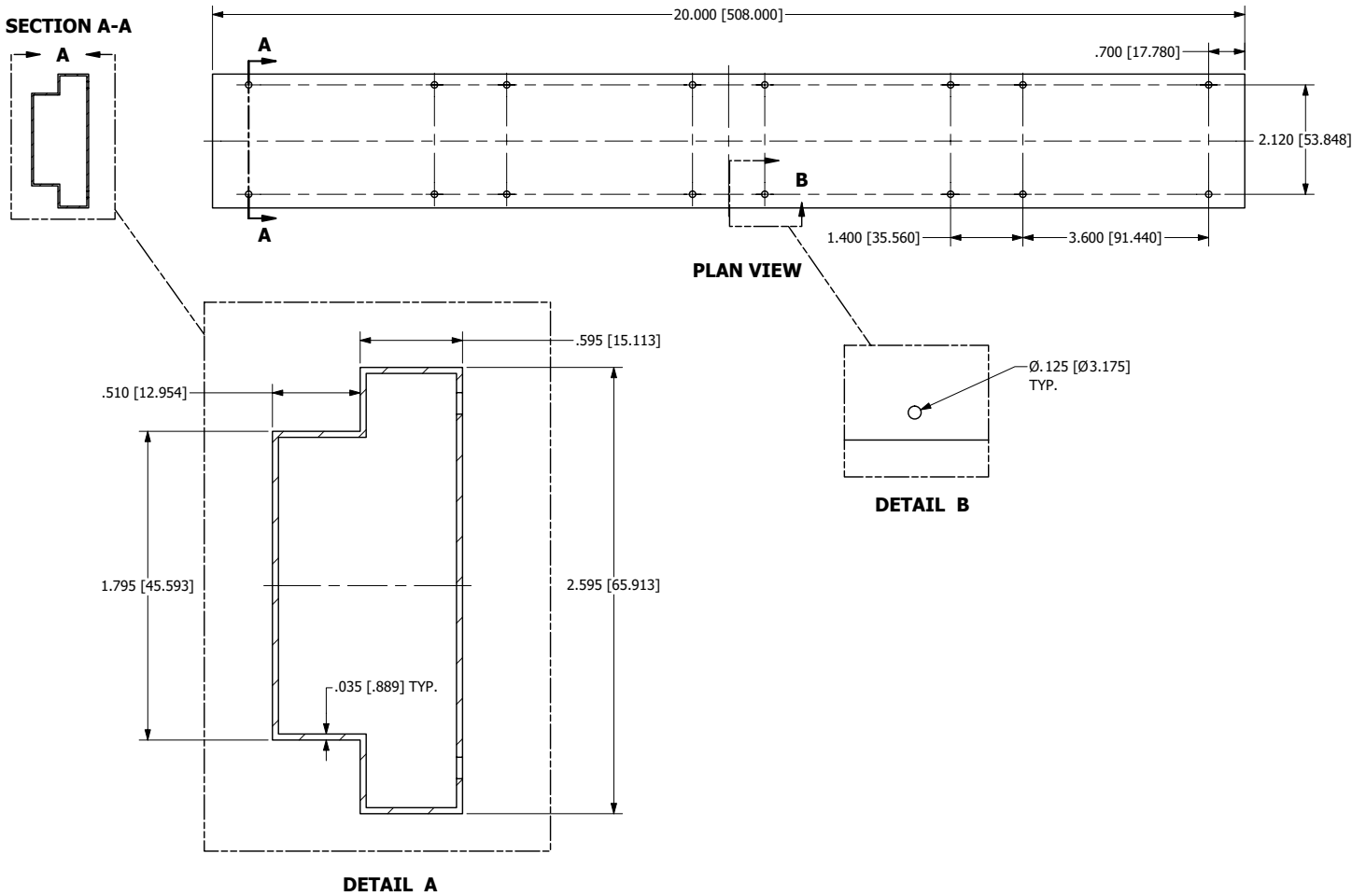
MECHANICAL DRAWINGS

HEAT SINK ASSEMBLY



ITEM	QTY	DESCRIPTION
1	1	CH OR CV HEAT SINK
2	1	TI THERMAL INTERFACE
3	1	P MODULE
4	1	PCB

TUBE PACKAGING



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