

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
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12AV5000	5000	25	250	80	130	125
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15AV2000	2000	62.5	625	79	105	75
15AV2500	2500	50	500	79	105	75
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		Min. ⁽²⁾ [μA]	Max. [μA]			
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24AV2000	2000	62.5	625	79	66	75
24AV2500	2500	50	500	79	66	75
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24AV5000	5000	25	250	80	65	125
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28AV4000	4000	31.3	313	80	56	100
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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
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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
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15AVP7K	+7000	17.9	179	75	111	150
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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]			
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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
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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

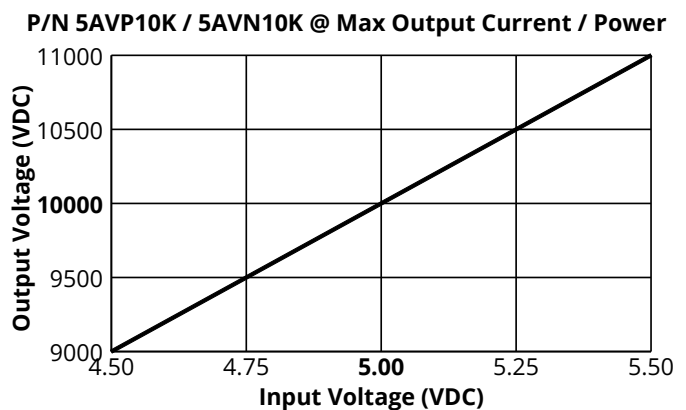
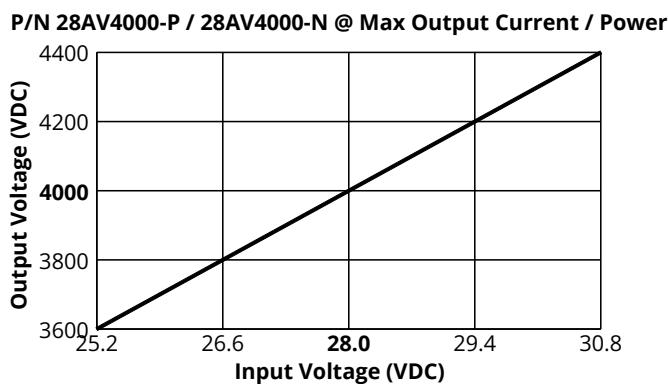
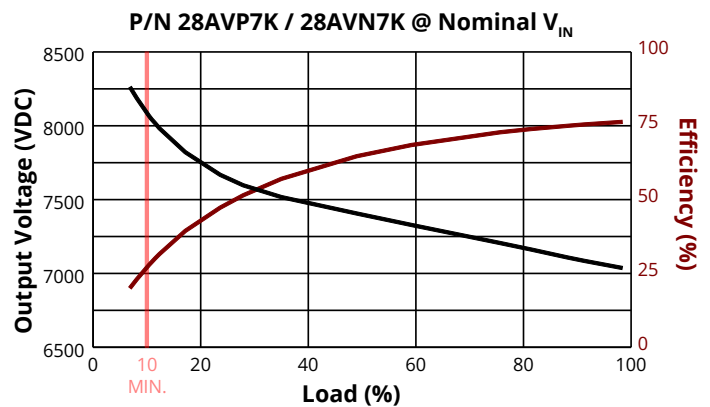
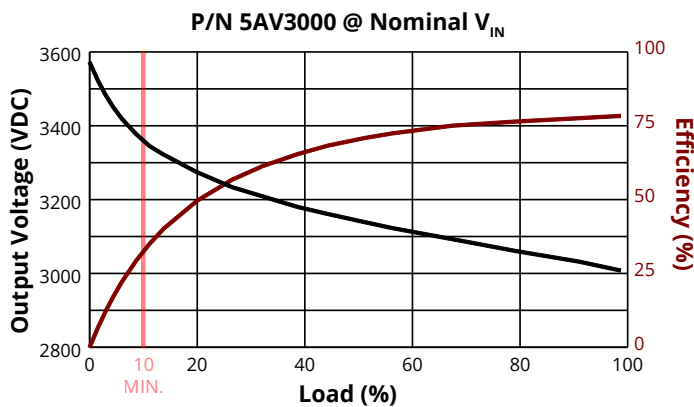
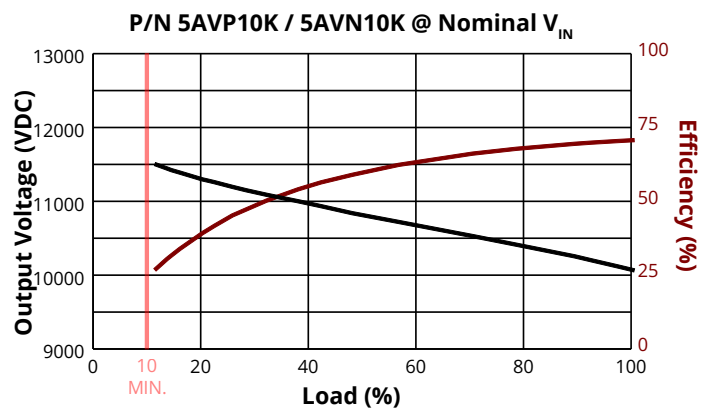
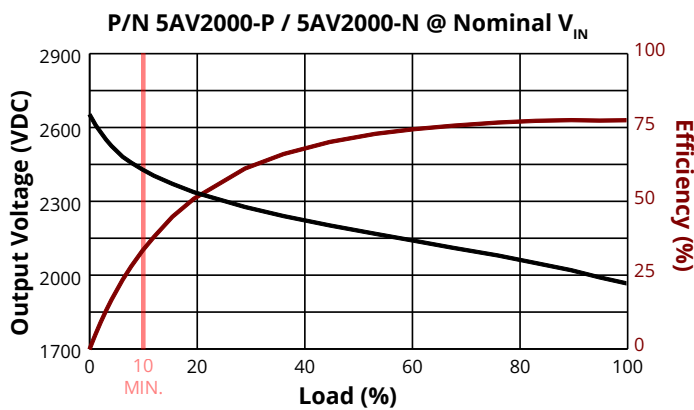
Test	Referenced Standard	Description
Vibration	MIL-STD-202	Method 204, Vibration, High Frequency, Condition D
Shock	MIL-STD-202	Method 213, Shock (Specified Pulse), Condition I
Humidity	MIL-STD-202	Method 106, Moisture Resistance
Altitude	MIL-STD-202	Method 105, Barometric Pressure (Reduced), Condition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

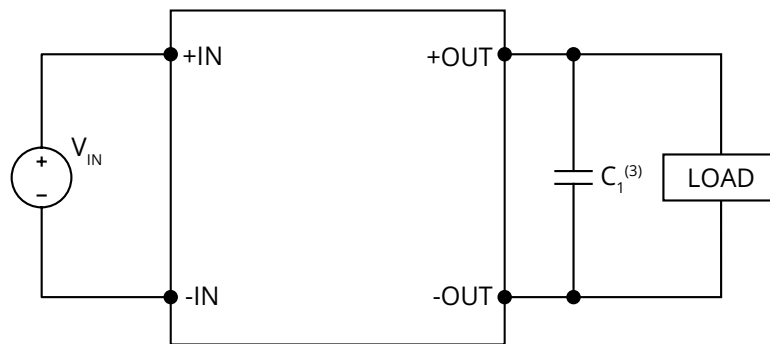
Parameter	Referenced Standard	Description
Stabilization Bake	MIL-STD-883	Referenced Method 1008 Non-operating maximum storage temperature for 24 hours
Temperature Cycle	MIL-STD-883	Referenced Method 1010 Non-operating at temperature extremes, 15 mins/temp, 10 cycles
Burn-In	MIL-STD-883	Referenced Method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

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

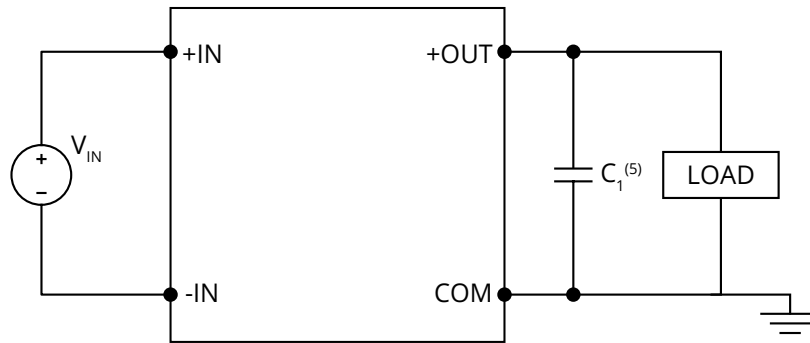


TYPICAL CONNECTION CIRCUIT

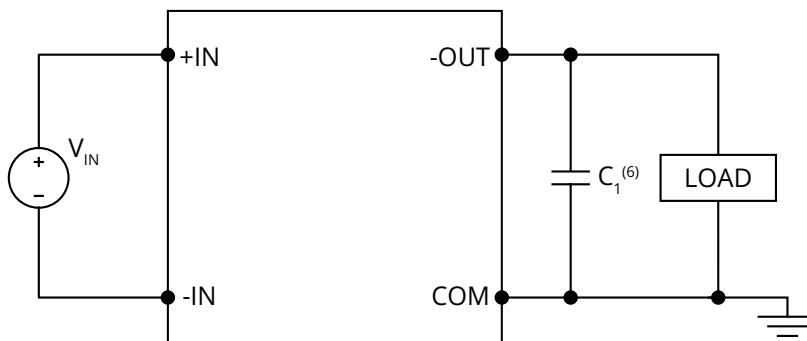
ISOLATED MODELS



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.

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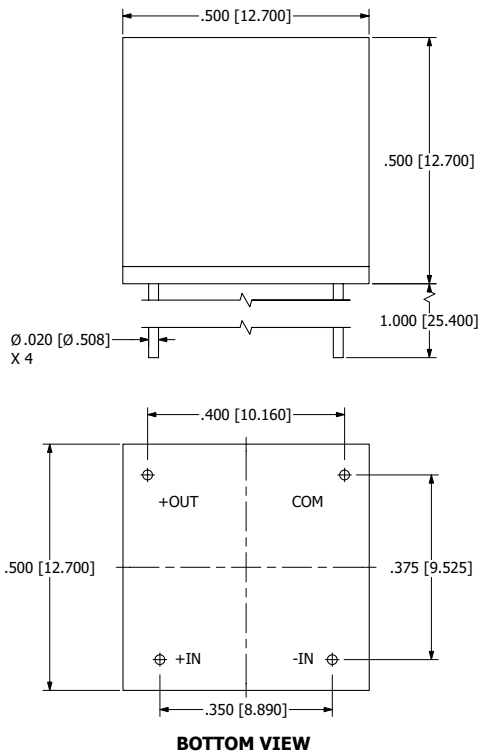
Note 5: For non-isolated positive models, output COM terminal must be connected to input positive or input negative externally. Output will be positive voltage and non-isolated from input. Module is internally transformer isolated.

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.

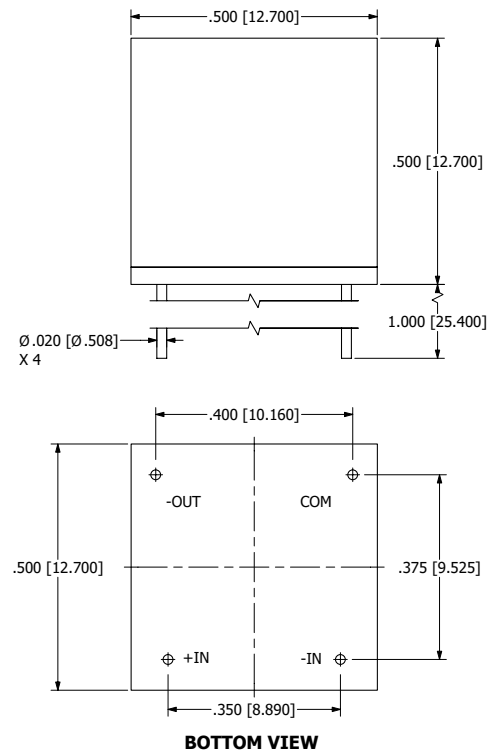
MECHANICAL DRAWINGS

≤5000V OUTPUT MODELS

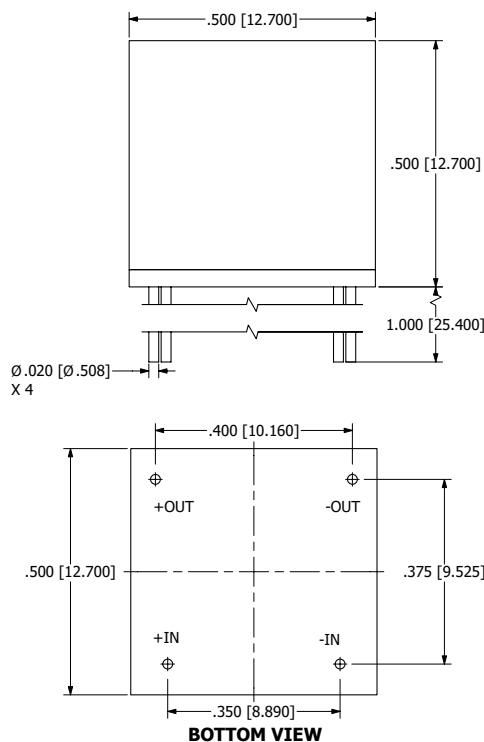
NON-ISOLATED POSITIVE OUTPUT



NON-ISOLATED NEGATIVE OUTPUT

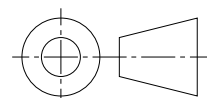


ISOLATED OUTPUT



NOTES

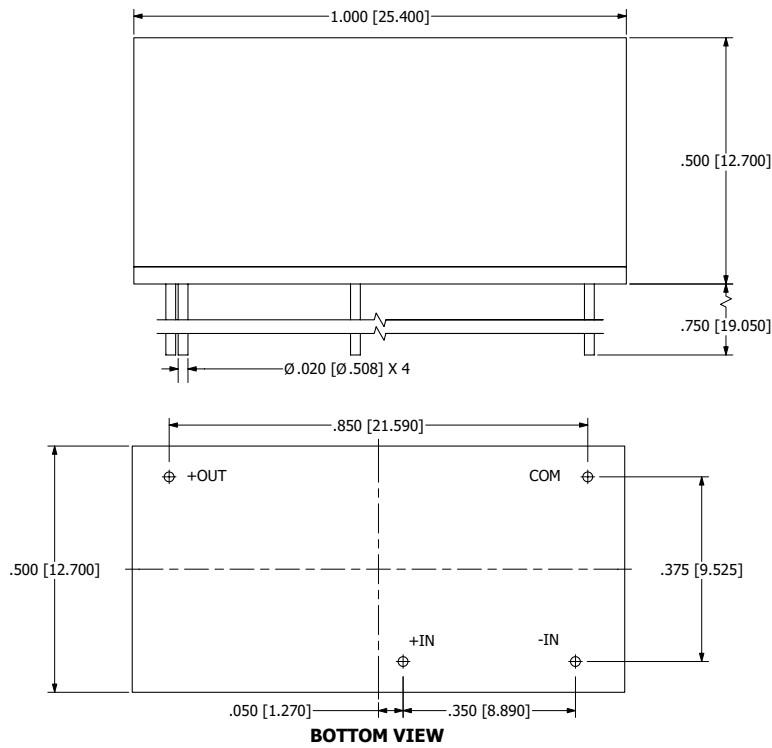
- a. ALL DIMENSIONS ARE IN INCHES, [] = MM
- b. COMMON OUTPUT MUST BE CONNECTED TO +IN OR -IN INPUT



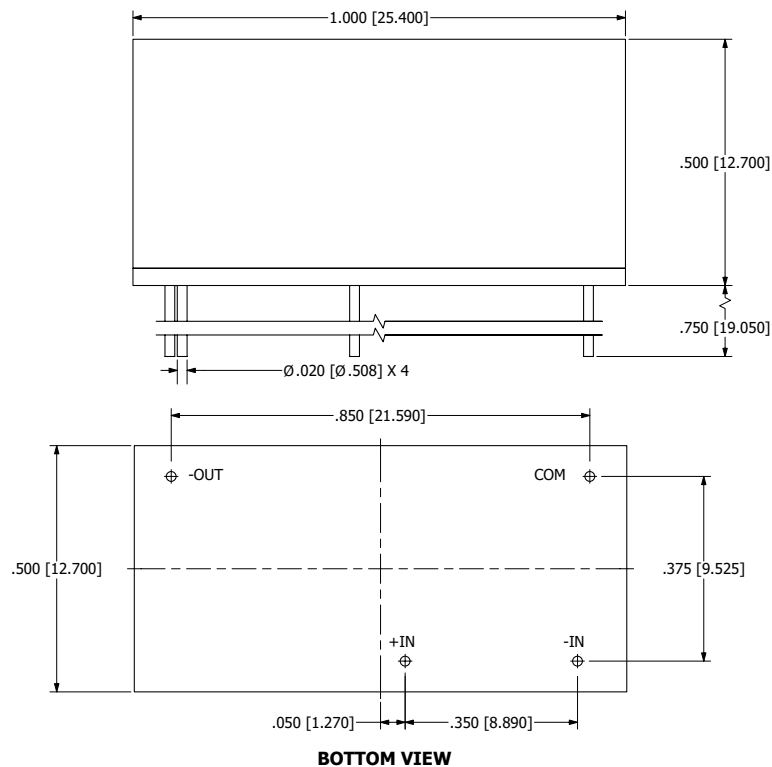
MECHANICAL DRAWINGS

≥6000V OUTPUT MODELS

ISOLATED POSITIVE OUTPUT

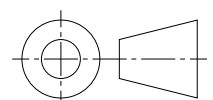


ISOLATED NEGATIVE OUTPUT

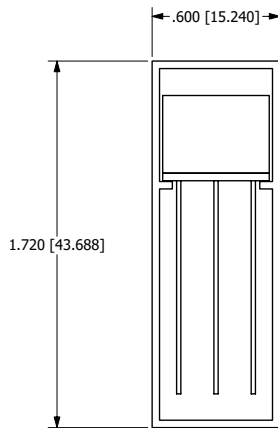


NOTES

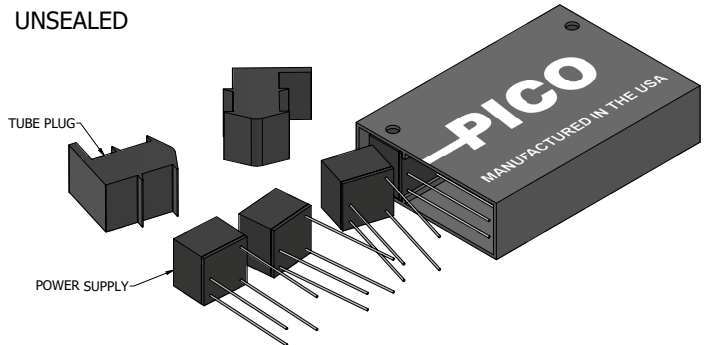
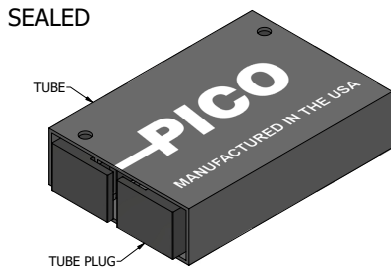
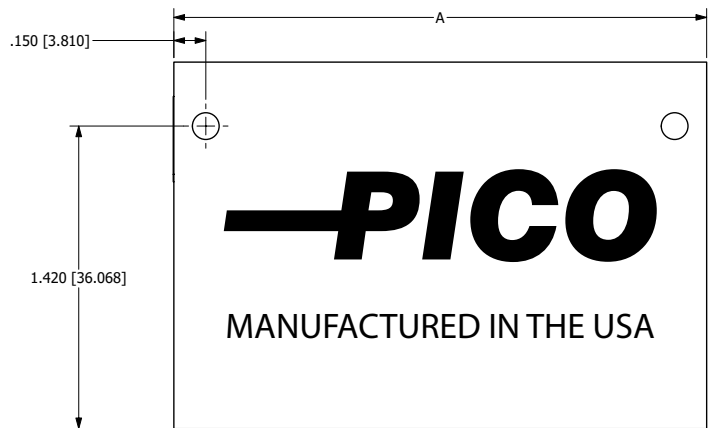
- a. ALL DIMENSIONS ARE IN INCHES, [] = MM
- b. COMMON OUTPUT MUST BE CONNECTED TO +IN OR -IN INPUT



TUBE PACKAGING



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



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