

# 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

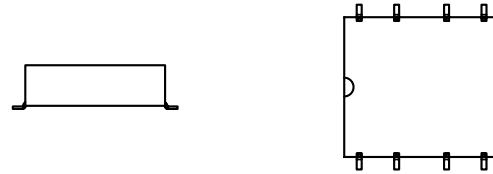
5	E	5	S
NOM. INPUT VOLTAGE	MOUNTING TYPE	NOM. OUTPUT VOLTAGE	NUMBER OF OUTPUTS
5 = 5V	<b>B</b> = THROUGH HOLE	<b>3.3</b> = 3.3V	<b>S</b> = SINGLE
<b>12</b> = 12V	<b>SE</b> = SURFACE MOUNT	<b>5</b> = 5V	<b>D</b> = DUAL
<b>15</b> = 15V		<b>5.2</b> = 5.2V	
<b>24</b> = 24V		<b>9</b> = 9V	
<b>28</b> = 28V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

**MODEL LIST - SINGLE OUTPUT**

**SERIES E - THROUGH HOLE**



**SERIES SE - SURFACE MOUNT**



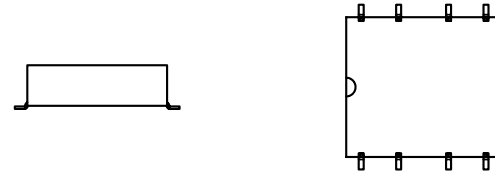
Through Hole	Surface Mount	Output Voltage [VDC]	Output Current		Output Power [W]	Efficiency <sup>(1)</sup> [%] typ.	Input Current		Output Ripple [Vp-p max]	Output Voltage Tolerance <sup>(1)</sup> [±VDC]
			Min. [mA]	Max. [mA]			No Load [mA] typ.	Full Load [mA] typ.		
5E3.3S	5SE3.3S	3.3	0	1061	3.5	60	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 <sup>(1)</sup> [%] typ.	Input Current		Output Ripple [Vp-p] max	Output Voltage Tolerance <sup>(1)</sup> [±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	

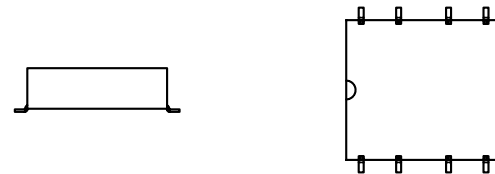
Note 1: Tested at nominal input voltage and full output load.

**MODEL LIST - DUAL OUTPUT**

**SERIES E - THROUGH HOLE**



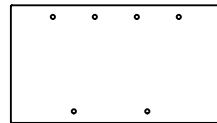
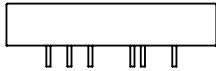
**SERIES SE - SURFACE MOUNT**



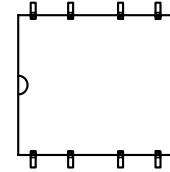
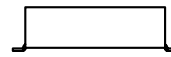
Through Hole	Surface Mount	Output Voltage Per Output [VDC]	Output Current Per Output		Output Power Per Output [W]	Efficiency <sup>(1)</sup> [%] typ.	Input Current		Output Ripple Per Output [Vp-p] max	Output Voltage Tolerance Per Output <sup>(1)</sup> [±VDC]
			Min. [mA]	Max. [mA]			No Load [mA] typ.	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 <sup>(1)</sup> [%] typ.	Input Current		Output Ripple Per Output [Vp-p max]	Output Voltage Tolerance Per Output <sup>(1)</sup> [±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	-	-	$\text{M}\Omega$
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**

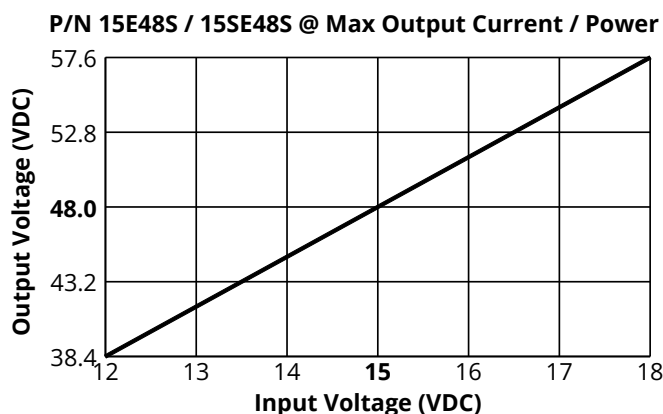
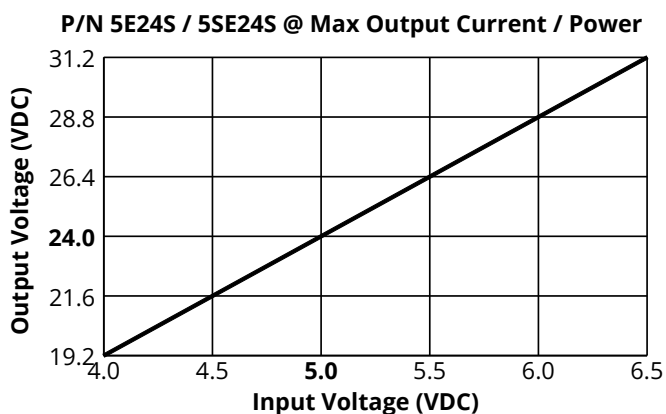
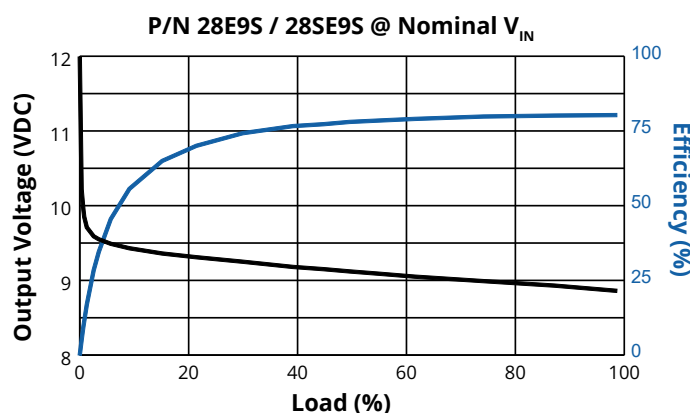
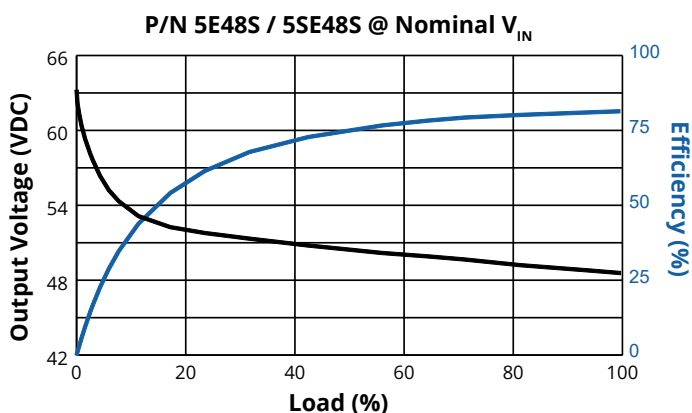
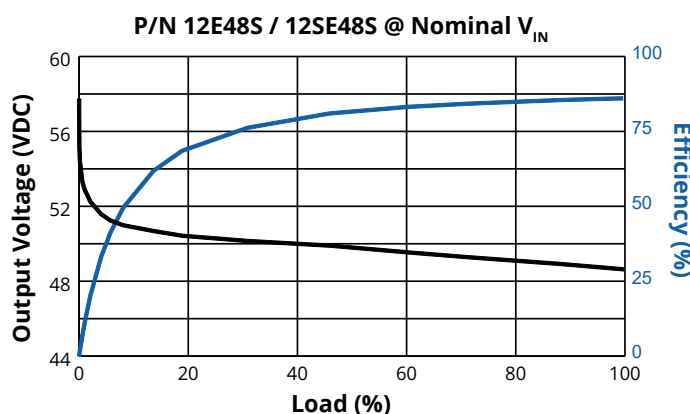
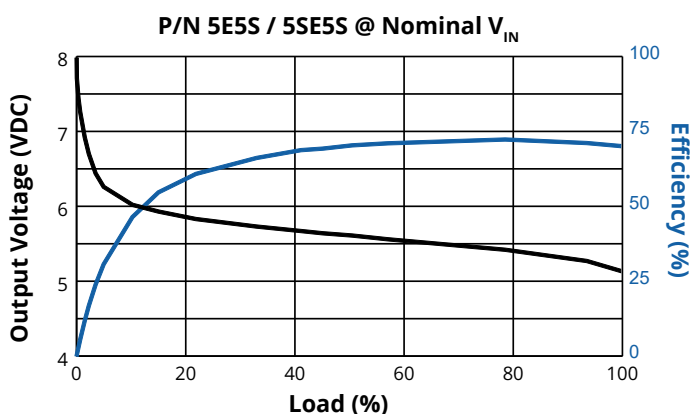
Test	Referenced Standard	Description
Vibration	MIL-STD-202	Method 204, Vibration, High Frequency, Condition D
Shock	MIL-STD-202	Method 213, Shock (Specified Pulse), Condition I
Humidity	MIL-STD-202	Method 106, Moisture Resistance
Altitude	MIL-STD-202	Method 105, Barometric Pressure (Reduced), Condition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

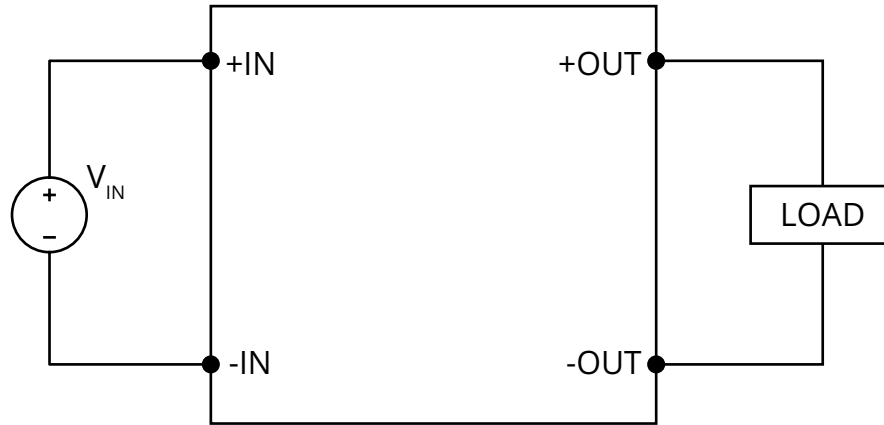
Parameter	Referenced Standard	Description
Stabilization Bake	MIL-STD-883	Referenced Method 1008 Non-operating maximum storage temperature for 24 hours
Temperature Cycle	MIL-STD-883	Referenced Method 1010 Non-operating at temperature extremes, 15 mins/temp, 10 cycles
Burn-In	MIL-STD-883	Referenced Method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

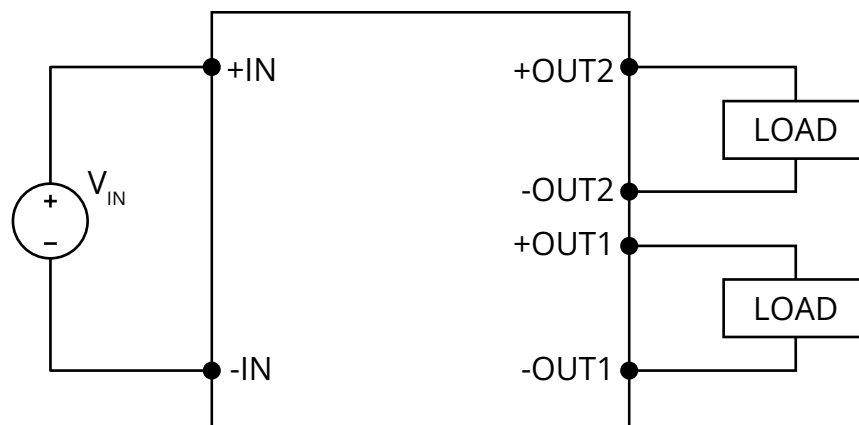


TYPICAL CONNECTION CIRCUIT

SINGLE OUTPUTS



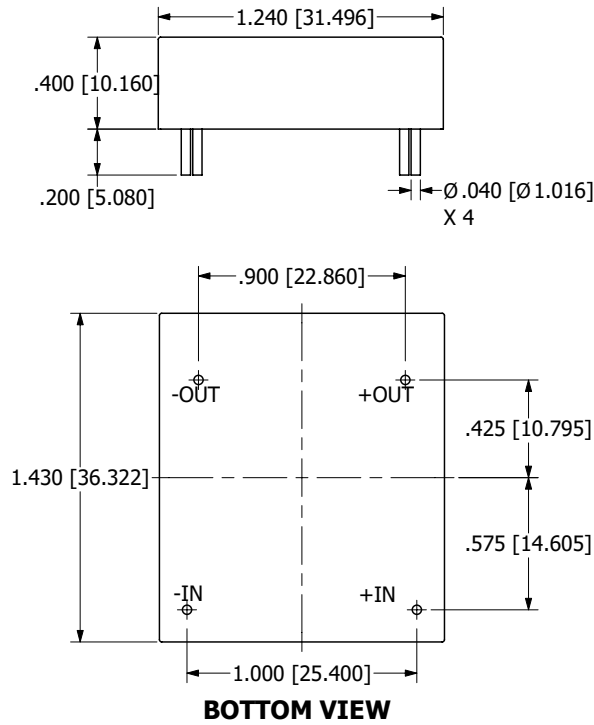
DUAL OUTPUTS



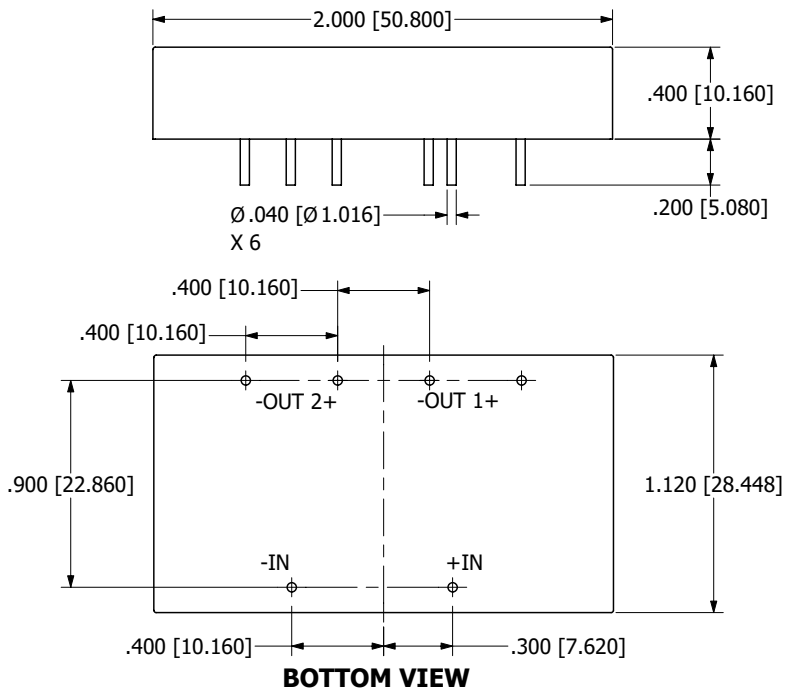
**MECHANICAL DRAWINGS**

**SERIES E - THROUGH HOLE**

**SINGLE OUTPUTS**

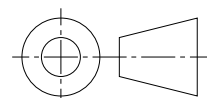


**DUAL OUTPUTS**



**NOTES**

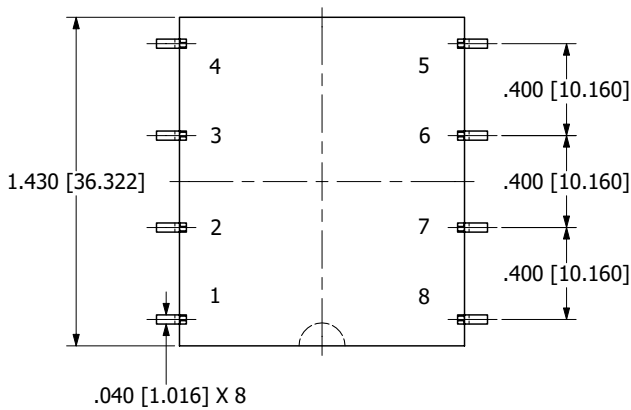
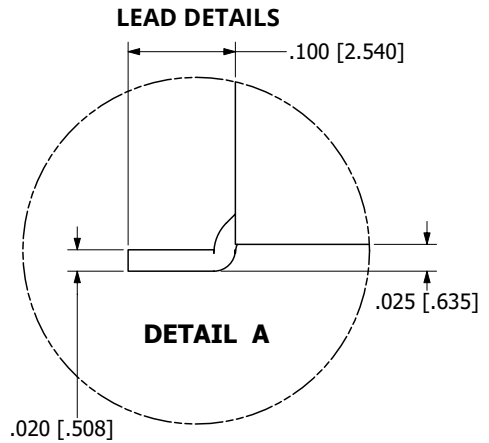
a. ALL DIMENSIONS ARE IN INCHES, [ ] = MM





**MECHANICAL DRAWINGS**

**SERIES SE - SURFACE MOUNT**

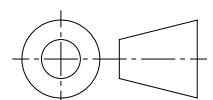
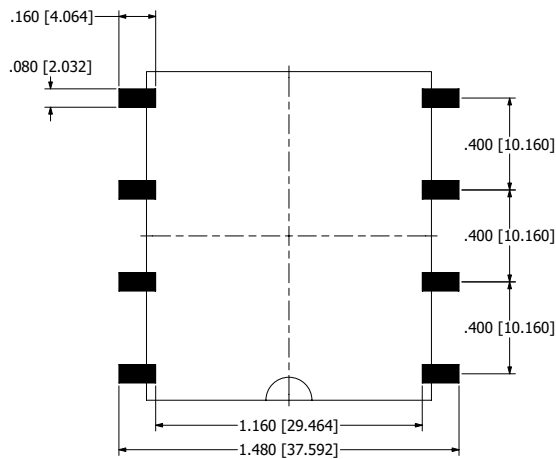


PIN	FUNCTION	
	SINGLE	DUAL
1	-IN	
2	N/C	
3	N/C	
4	+IN	
5	+OUT	+OUT1
6	-OUT	-OUT1
7	N/C	+OUT2
8	N/C	-OUT2

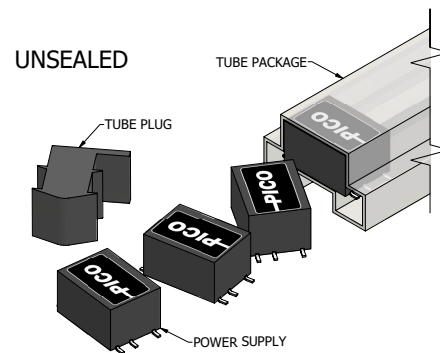
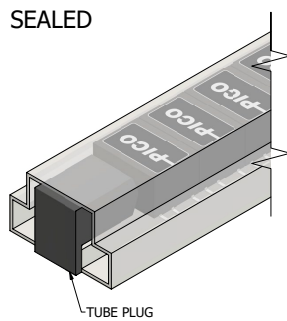
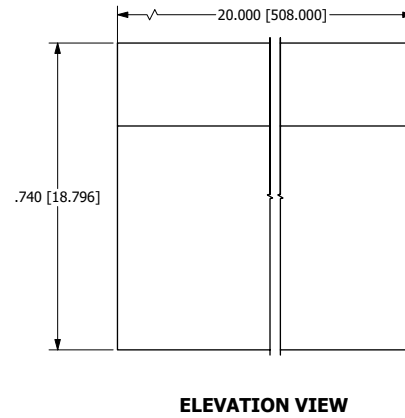
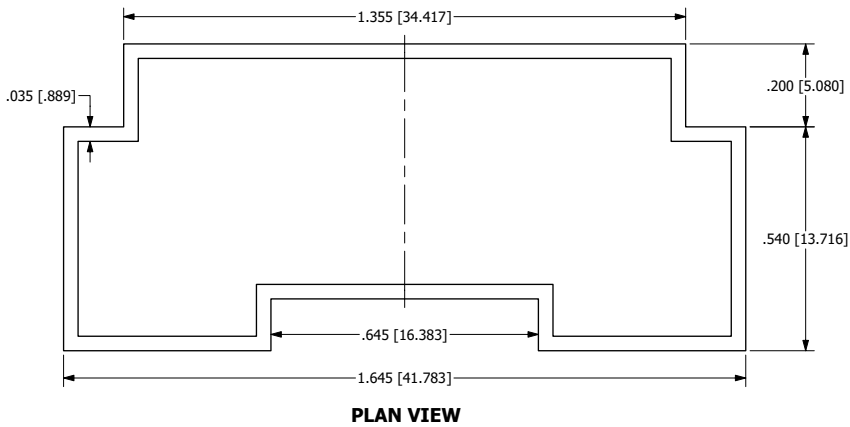
**NOTES**

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

**RECOMMENDED LAND PATTERN DIMENSIONS - SERIES SE**



**TUBE PACKAGING**



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