

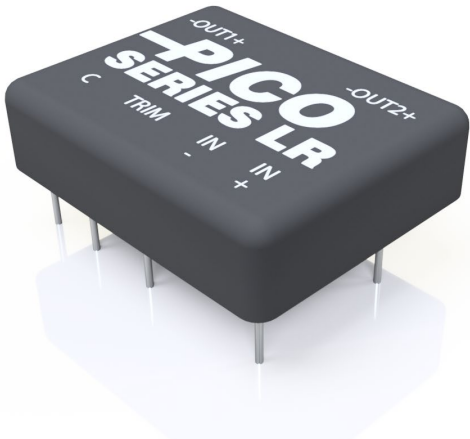
Series LR

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**

Through Hole	Output Voltage [VDC]	Output Current		Output Power	Efficiency ⁽¹⁾	Input Current ⁽¹⁾	Line Regulation	Load Regulation 25-100%	Output Ripple @ 1MHz BW	Output Voltage Tolerance ⁽¹⁾
		Min. [mA]	Max. [mA]	[W]	[%] typ.	[%] typ.	[±%]	[±%]	[mVp-p]	[±%]
LRE2S	2	100	1000	2	68	294	3.50	3.50	150	1.50
LRE3.3S	3.3	91	910	3	75	400	2.75	3.00	200	1.00
LRE5S	5	60	600	3	78	385	2.00	1.50	150	0.75
LRE5.2S	5.2	57.6	576	3	78	385	2.00	1.50	150	0.75
LRE9S	9	44.4	444	4	78	515	1.50	1.25	125	0.50
LRE12S	12	33.3	333	4	79	505	1.25	1.25	125	0.50
LRE15S	15	26.7	267	4	79	505	1.25	1.25	125	0.50
LRE24S	24	16.7	167	4	80	500	1.25	1.00	125	0.50
LRE28S	28	14.3	143	4	80	500	1.00	1.00	125	0.50
LRE48S	48	8.3	83	4	80	500	1.00	1.00	175	0.50
LRE100S	100	4	40	4	80	500	1.00	1.00	200	0.50
LRF2S	2	150	1500	3	69	272	3.00	3.50	150	1.50
LRF3.3S	3.3	121.2	1212	4	75	333	2.75	3.00	200	1.00
LRF5S	5	100	1000	5	78	400	2.00	1.50	150	0.75
LRF5.2S	5.2	96.1	961	5	78	400	2.00	1.50	150	0.75
LRF9S	9	55.6	556	5	78	400	1.50	1.25	125	0.50
LRF12S	12	41.7	417	5	79	395	1.25	1.25	125	0.50
LRF15S	15	33.3	333	5	79	395	1.25	1.25	125	0.50
LRF24S	24	20.8	208	5	80	390	1.25	1.00	125	0.50
LRF28S	28	17.9	179	5	80	390	1.00	1.00	125	0.50
LRF48S	48	10.4	104	5	80	390	1.00	1.00	175	0.50
LRF100S	100	5	50	5	80	390	1.00	1.00	200	0.50
LRA2S	2	150	1500	3	69	161	2.00	4.00	150	1.50
LRA3.3S	3.3	121.2	1212	4	76	195	1.50	3.00	150	1.00
LRA5S	5	100	1000	5	76	245	0.75	2.00	100	0.75
LRA5.2S	5.2	96.1	961	5	76	245	0.75	2.00	100	0.75
LRA9S	9	55.6	556	5	76	245	0.50	2.00	100	0.50
LRA12S	12	41.7	417	5	77	240	0.50	2.00	100	0.50
LRA15S	15	33.3	333	5	79	235	0.50	1.50	100	0.50
LRA24S	24	20.8	208	5	80	230	0.25	1.50	100	0.50
LRA28S	28	17.9	179	5	80	230	0.25	1.50	100	0.50
LRA48S	48	10.4	104	5	80	230	0.25	1.00	150	0.50
LRA100S	100	5	50	5	80	230	0.50	1.00	200	0.50

MODEL LIST**SINGLE OUTPUT**

Through Hole	Output Voltage [VDC]	Output Current		Output Power [W]	Efficiency ⁽¹⁾ [%] typ.	Input Current ⁽¹⁾ [%] typ.	Line Regulation [±%]	Load Regulation 25-100% [±%]	Output Ripple @ 1MHz BW [mVp-p]	Output Voltage Tolerance ⁽¹⁾ [±%]
		Min. [mA]	Max. [mA]							
LRB2S	2	150	1500	3	67	93	2.00	4.00	150	1.50
LRB3.3S	3.3	121.2	1212	4	74	113	1.50	3.00	150	1.00
LRB5S	5	100	1000	5	74	140	0.50	1.25	100	0.75
LRB5.2S	5.2	96.1	961	5	74	140	0.50	1.25	100	0.75
LRB9S	9	55.6	556	5	74	140	0.25	1.00	100	0.50
LRB12S	12	41.7	417	5	74	140	0.25	1.00	100	0.50
LRB15S	15	33.3	333	5	76	135	0.25	1.00	100	0.50
LRB24S	24	20.8	208	5	76	135	0.25	0.75	100	0.50
LRB28S	28	17.9	179	5	76	135	0.25	0.75	100	0.50
LRB48S	48	10.4	104	5	76	135	0.25	0.75	150	0.50
LRB100S	100	5	50	5	78	135	0.50	1.00	200	0.50
LRC2S	2	150	1500	3	67	115	2.50	4.00	150	1.50
LRC3.3S	3.3	121.2	1212	4	74	139	1.75	3.00	150	1.00
LRC5S	5	100	1000	5	76	170	1.25	2.00	100	0.75
LRC5.2S	5.2	96.1	961	5	76	170	1.25	2.00	100	0.75
LRC9S	9	55.6	556	5	76	170	0.75	1.00	100	0.50
LRC12S	12	41.7	417	5	76	170	0.75	1.00	100	0.50
LRC15S	15	33.3	333	5	77	165	0.75	1.00	100	0.50
LRC24S	24	20.8	208	5	78	165	0.50	0.75	100	0.50
LRC28S	28	17.9	179	5	78	165	0.50	0.75	100	0.50
LRC48S	48	10.4	104	5	78	165	0.50	0.75	150	0.50
LRC100S	100	5	50	5	78	165	0.50	1.00	200	0.50

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

DUAL OUTPUT

Through Hole	Output Voltage Per Output [VDC]	Output Current Per Output		Output Power Per Output [W]	Efficiency ⁽¹⁾ [%] typ.	Input Current ⁽¹⁾ [%] typ.	Line Regulation [±%]	Load Regulation 25-100% [±%]	Output Ripple Per Output @ 1MHz BW [mVp-p]	Output Voltage Tolerance ⁽¹⁾ [±%]
		Min. [mA]	Max. [mA]							
LRE5D	5	30	300	1.5	78	385	2.00	1.50	150	0.75
LRE9D	9	22.2	222	2.0	78	515	1.50	1.25	125	0.50
LRE12D	12	16.7	167	2.0	79	505	1.25	1.25	125	0.50
LRE15D	15	13.4	134	2.0	79	505	1.25	1.25	125	0.50
LRE24D	24	8.4	84	2.0	80	500	1.25	1.00	125	0.50
LRE28D	28	7.2	72	2.0	80	500	1.00	1.00	125	0.50
LRE48D	48	4.2	42	2.0	80	500	1.00	1.00	175	0.50

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

Note 2: Dual output loads must be balanced.

MODEL LIST**DUAL OUTPUT**

Through Hole	Output Voltage Per Output [VDC]	Output Current Per Output		Output Power Per Output [W]	Efficiency ⁽¹⁾ [%] typ.	Input Current ⁽¹⁾ [%] typ.	Line Regulation [±%]	Load Regulation 25-100% [±%]	Output Ripple Per Output @ 1MHz BW [mVp-p]	Output Voltage Tolerance ⁽¹⁾ [±%]
		Min. [mA]	Max. [mA]							
LRF5D	5	50	500	2.5	78	400	2.00	1.50	150	0.75
LRF9D	9	27.8	278	2.5	78	400	1.50	1.25	125	0.50
LRF12D	12	20.8	208	2.5	79	395	1.25	1.25	125	0.50
LRF15D	15	16.7	167	2.5	79	395	1.25	1.25	125	0.50
LRF24D	24	10.4	104	2.5	80	390	1.25	1.00	125	0.50
LRF28D	28	8.9	89	2.5	80	390	1.00	1.00	125	0.50
LRF48D	48	5.2	52	2.5	80	390	1.00	1.00	175	0.50
LRA5D	5	50	500	2.5	76	245	0.75	2.00	100	0.75
LRA9D	9	27.8	278	2.5	76	245	0.50	2.00	100	0.50
LRA12D	12	20.8	208	2.5	77	240	0.50	2.00	100	0.50
LRA15D	15	16.7	167	2.5	79	235	0.50	1.50	100	0.50
LRA24D	24	10.4	104	2.5	80	230	0.25	1.50	100	0.50
LRA28D	28	8.9	89	2.5	80	230	0.25	1.50	100	0.50
LRA48D	48	5.2	52	2.5	80	230	0.25	1.00	150	0.50
LRB5D	5	50	500	2.5	74	140	0.50	1.25	100	0.75
LRB9D	9	27.8	278	2.5	74	140	0.25	1.00	100	0.50
LRB12D	12	20.8	208	2.5	74	140	0.25	1.00	100	0.50
LRB15D	15	16.7	167	2.5	76	135	0.25	1.00	100	0.50
LRB24D	24	10.4	104	2.5	76	135	0.25	0.75	100	0.50
LRB28D	28	8.9	89	2.5	76	135	0.25	0.75	100	0.50
LRB48D	48	5.2	52	2.5	76	135	0.25	0.75	150	0.50
LRC5D	5	50	500	2.5	75	170	1.25	2.00	100	0.75
LRC9D	9	27.8	278	2.5	75	170	0.75	1.00	100	0.50
LRC12D	12	20.8	208	2.5	75	170	0.75	1.00	100	0.50
LRC15D	15	16.7	167	2.5	77	165	0.75	1.00	100	0.50
LRC24D	24	10.4	104	2.5	78	165	0.50	0.75	100	0.50
LRC28D	28	8.9	89	2.5	78	165	0.50	0.75	100	0.50
LRC48D	48	5.2	52	2.5	78	165	0.50	0.75	150	0.50

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	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

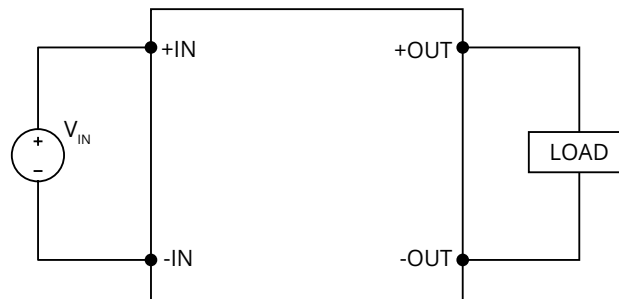
Test	Referenced Standard	Description
Vibration	MIL-STD-202	Method 204, Vibration, High Frequency, Condition D
Shock	MIL-STD-202	Method 213, Shock (Specified Pulse), Condition I
Humidity	MIL-STD-202	Method 106, Moisture Resistance
Altitude	MIL-STD-202	Method 105, Barometric Pressure (Reduced), Condition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

OPTIONS AVAILABLE – CONTACT PICO FOR PART NUMBER

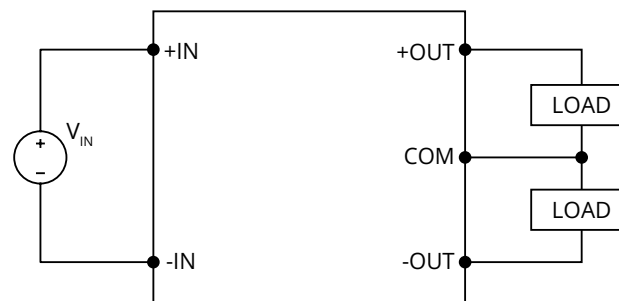
Parameter	Referenced Standard	Description
Stabilization Bake	MIL-STD-883	Referenced Method 1008 Non-operating maximum storage temperature for 24 hours
Temperature Cycle	MIL-STD-883	Referenced Method 1010 Non-operating at temperature extremes, 15 mins/temp, 10 cycles
Burn-In	MIL-STD-883	Referenced Method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

TYPICAL CONNECTION CIRCUIT

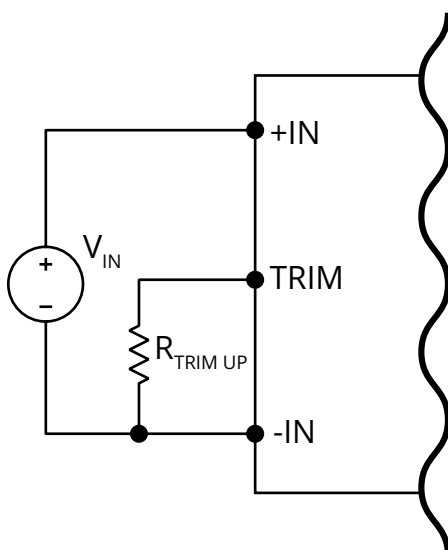
SINGLE OUTPUT



DUAL OUTPUT



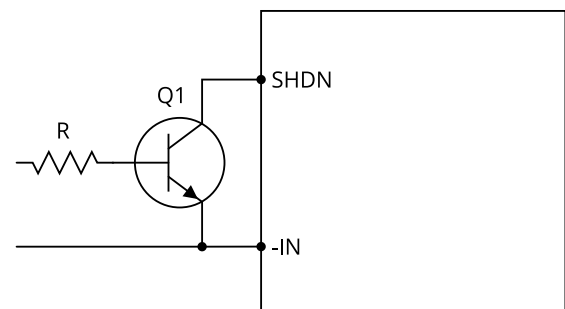
TRIM



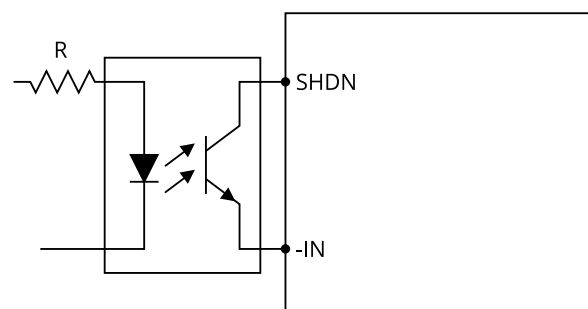
Note: Use 50k Ω , 1/4W trim pot between TRIM and -IN. Reduce resistance to raise output voltage to 5% maximum. Raising the output voltage beyond 5% could cause damage to the module.

SHUTDOWN

NON-ISOLATED

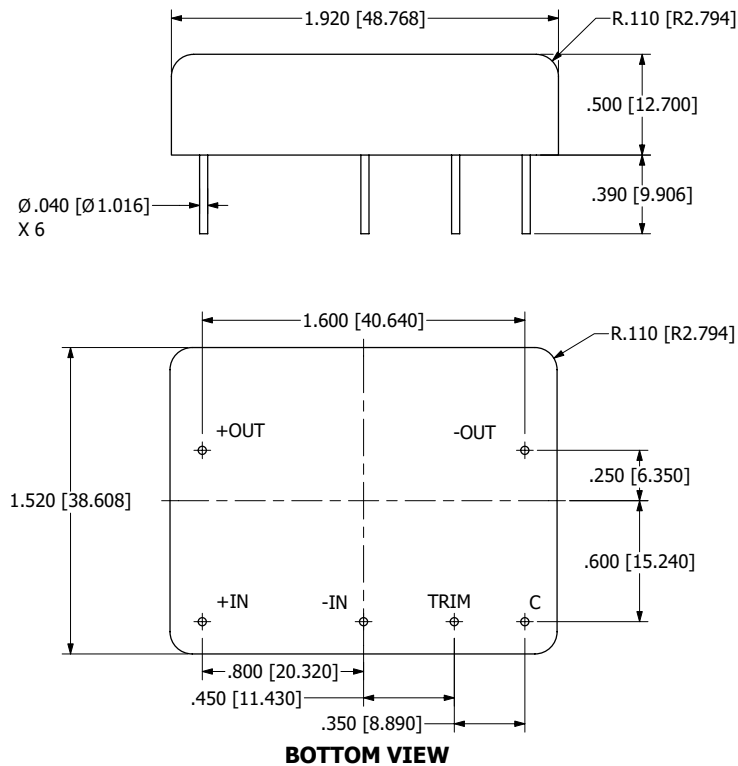


ISOLATED

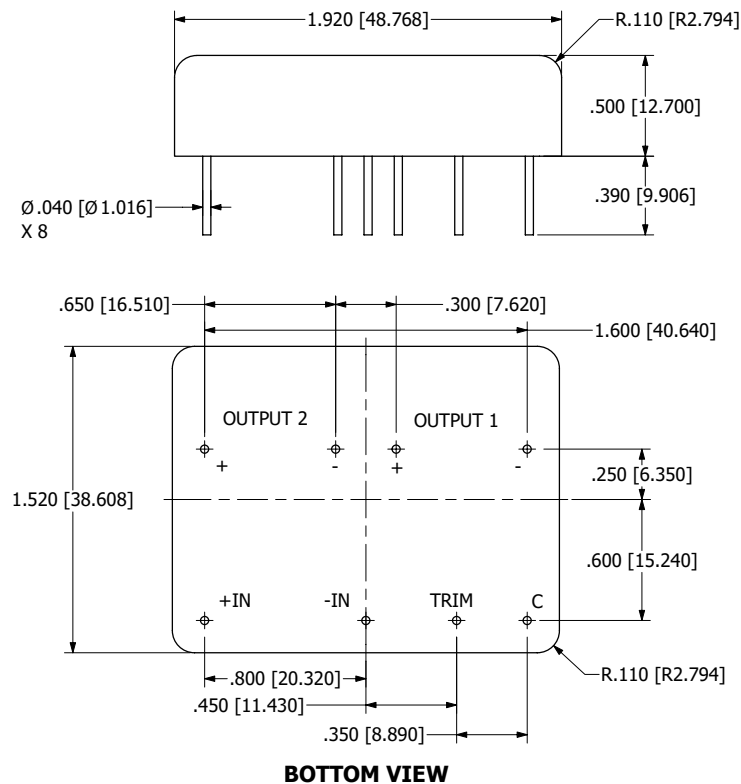


MECHANICAL DRAWINGS

SINGLE OUTPUT

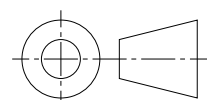


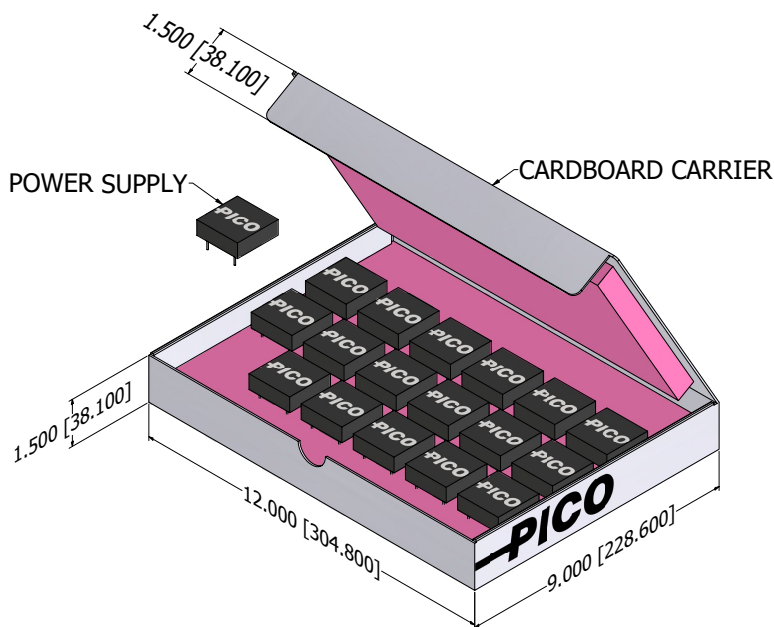
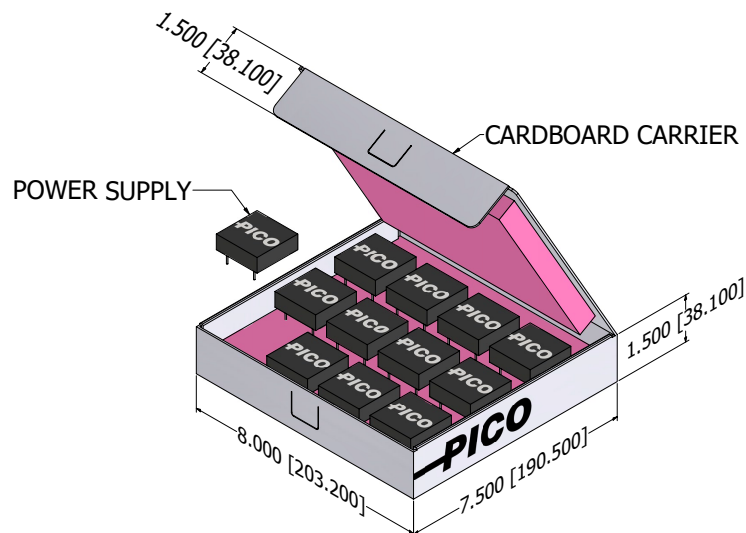
DUAL OUTPUT



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.

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