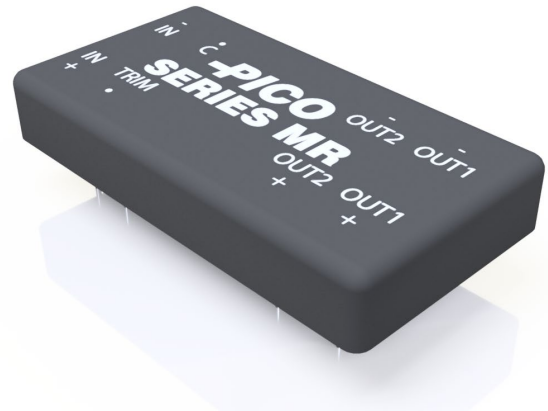


Series MR

2.5W Isolated Regulated Low Profile DC-DC Converter

PRODUCT OVERVIEW

The MR series are regulated DC-DC converters with upgraded MIL screened / qualified components and expanded operating temperature range. The 6-sided epoxy insulated shielded case is in a low profile package – 1.900" x 1.000" x 0.300". Over 40 models are available in both single and dual isolated outputs. They can operate over the wide temperature range of -55°C to +85°C without derating, a heat sink or active cooling.



FEATURES

- JANTX Diodes
- MIL screened transformers, capacitors and resistors
- Hermetically sealed transistors
- Up to 2.5W output at +85°C ambient
- Low profile – 0.300" height
- Up to 3.33:1 input voltage range
- 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:

- Select screening per MIL-STD-883:
Stabilization Bake
Temperature Cycle
Burn-In
- Special Input Voltage, Output Voltage, Isolation Voltage or Output Power

MR	A	28	S
SERIES NAME	INPUT VOLTAGE RANGE	NOM. OUTPUT VOLTAGE	NUMBER OF OUTPUTS
MR	E = 5 to 15V F = 8 to 24V A = 18 to 36V	3.3 = 3.3V 5 = 5V 5.2 = 5.2V 9 = 9V 12 = 12V 15 = 15V 24 = 24V 28 = 28V	S = SINGLE D = DUAL

MODEL LIST**SINGLE OUTPUT**

Pico Part Number	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]							
MRE3.3S	3.3	37.9	379	1.25	67	186	2.0	2.00	200	1.00
MRE5S	5	30	300	1.5	70	214	1.75	1.75	200	0.75
MRE5.2S	5.2	28.8	288	1.5	70	214	1.75	1.75	200	0.75
MRE9S	9	16.7	167	1.5	75	200	1.50	1.25	150	0.50
MRE12S	12	12.5	125	1.5	75	200	1.25	1.00	150	0.50
MRE15S	15	10	100	1.5	76	197	1.25	1.00	150	0.50
MRE24S	24	6.3	63	1.5	77	195	1.00	0.75	150	0.50
MRE28S	28	5.4	54	1.5	78	192	0.75	0.75	200	0.50
MRF3.3S	3.3	53	530	1.75	67	163	1.75	2.00	200	1.00
MRF5S	5	40	400	2.0	70	179	1.50	1.75	200	0.75
MRF5.2S	5.2	38.4	384	2.0	70	179	1.50	1.75	200	0.75
MRF9S	9	22.2	222	2.0	75	167	1.25	1.25	150	0.50
MRF12S	12	16.7	167	2.0	75	167	1.00	1.00	150	0.50
MRF15S	15	13.3	133	2.0	76	164	1.00	1.00	150	0.50
MRF24S	24	8.3	83	2.0	77	162	1.00	0.75	150	0.50
MRF28S	28	7.1	71	2.0	78	160	0.75	0.75	200	0.50
MRA3.3S	3.3	53	530	1.75	67	97	1.25	2.00	200	1.00
MRA5S	5	40	400	2.0	70	106	1.00	1.75	200	0.75
MRA5.2S	5.2	38.4	384	2.0	70	106	1.00	1.75	200	0.75
MRA9S	9	27.8	278	2.5	75	123	0.75	1.25	150	0.50
MRA12S	12	20.8	208	2.5	75	123	0.75	1.00	150	0.50
MRA15S	15	16.7	167	2.5	76	122	0.75	1.00	150	0.50
MRA24S	24	10.4	104	2.5	77	120	0.75	0.75	150	0.50
MRA28S	28	8.9	89	2.5	78	119	0.50	0.75	200	0.50

MODEL LIST**DUAL OUTPUT**

Pico Part Number	Output Voltage Per Output [VDC]	Output Current Per Output		Output Power [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]							
MRE5D	5	15	150	0.75	70	214	1.75	1.75	200	0.75
MRE9D	9	8.4	84	0.75	75	200	1.50	1.25	150	0.50
MRE12D	12	6.3	63	0.75	75	200	1.25	1.00	150	0.50
MRE15D	15	5	50	0.75	76	197	1.25	1.00	150	0.50
MRE24D	24	3.2	32	0.75	77	195	1.00	0.75	150	0.50
MRE28D	28	2.7	27	0.75	78	192	0.75	0.75	200	0.50
MRF5D	5	20	200	1.00	70	179	1.50	1.75	200	0.75
MRF9D	9	11.1	111	1.00	75	167	1.25	1.25	150	0.50
MRF12D	12	8.4	84	1.00	75	167	1.00	1.00	150	0.50
MRF15D	15	6.7	67	1.00	76	164	1.00	1.00	150	0.50
MRF24D	24	4.2	42	1.00	77	162	1.00	0.75	150	0.50
MRF28D	28	3.6	36	1.00	78	160	0.75	0.75	200	0.50
MRA5D	5	20	200	1.00	70	106	1.00	1.75	200	0.75
MRA9D	9	13.9	139	1.25	75	123	0.75	1.25	150	0.50
MRA12D	12	10.4	104	1.25	75	123	0.75	1.00	150	0.50
MRA15D	15	8.4	84	1.25	76	122	0.75	1.00	150	0.50
MRA24D	24	5.2	52	1.25	77	120	0.75	0.75	150	0.50
MRA28D	28	4.5	45	1.25	78	119	0.50	0.75	200	0.50

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

Note 1: Dual outputs 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	MRE models	5	10	15	VDC
	MRF models	8	16	24	
	MRA models	18	27	36	

ENVIRONMENTAL

Parameter	Condition	Min.	Typ.	Max.	Units
Operating Temperature Range	Ambient without derating	-55	-	85	°C
Storage Temperature Range	Ambient	-55	-	125	°C
Temperature Coefficient				0.02	%/°C
Cooling	Free Air Convection				

SPECIFICATIONS (Nominal V_{IN} , Full Load, $T_A = +25^\circ\text{C}$, 1 hour warm up unless otherwise specified)**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)		1.9 x 1 x 0.3 (48.26 x 25.4 x 7.62)			inches (mm)
Weight			26		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	%

UPGRADED MILITARY QUALIFIED COMPONENTS

Component	Standard
Diodes	JANTX
Transformers	MIL-PRF-27, Class S, Grade 5
Capacitors	MIL-C 55365/4, MIL-C 39003/03, MIL-C 20/27E, MIL-C 39014/05
Resistors	MIL-R-39017, MIL-R-22097
Integrated Circuit (IC)	Hermetically Sealed

DESIGNED TO MEET

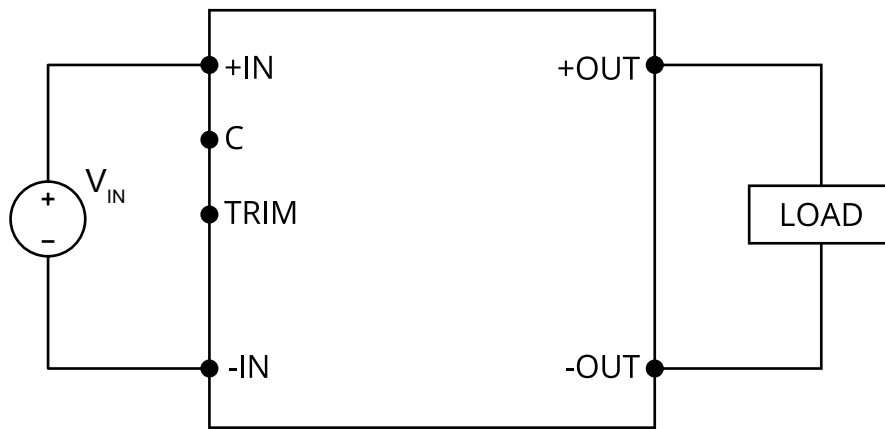
Test	Referenced Standard	Description
Vibration	MIL-STD-202	Method 204, Vibration, High Frequency, Condition D
Shock	MIL-STD-202	Method 213, Shock (Specified Pulse), Condition I
Humidity	MIL-STD-202	Method 106, Moisture Resistance
Altitude	MIL-STD-202	Method 105, Barometric Pressure (Reduced), Condition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

OPTIONS AVAILABLE - CONTACT PICO FOR PART NUMBER

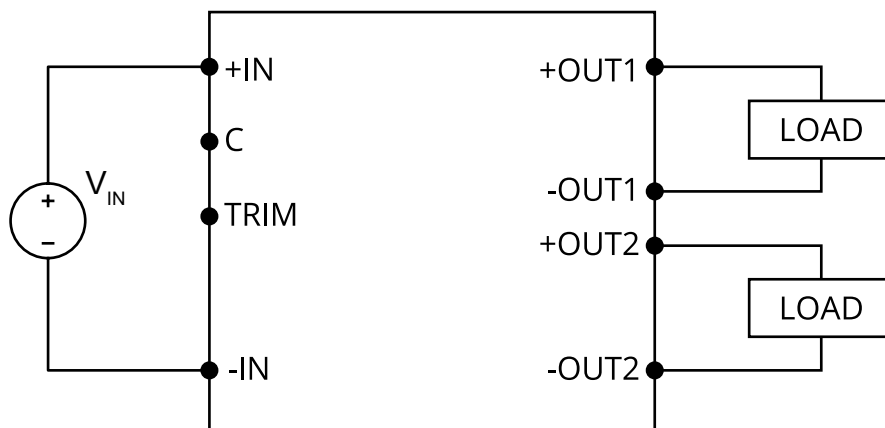
Parameter	Referenced Standard	Description
Stabilization Bake	MIL-STD-883	Referenced Method 1008 Non-operating maximum storage temperature for 24 hours
Temperature Cycle	MIL-STD-883	Referenced Method 1010 Non-operating at temperature extremes, 15 mins/temp, 10 cycles
Burn-In	MIL-STD-883	Referenced Method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

TYPICAL CONNECTION CIRCUIT

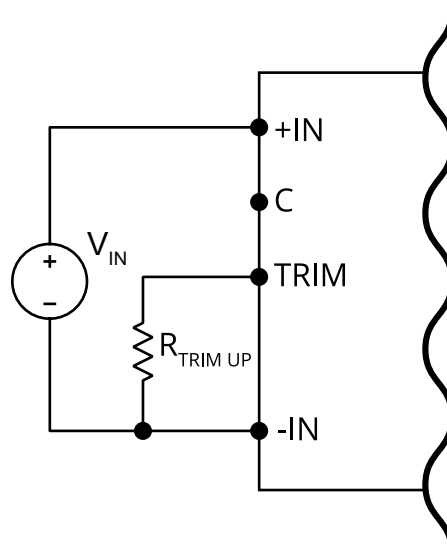
SINGLE OUTPUT



DUAL OUTPUT



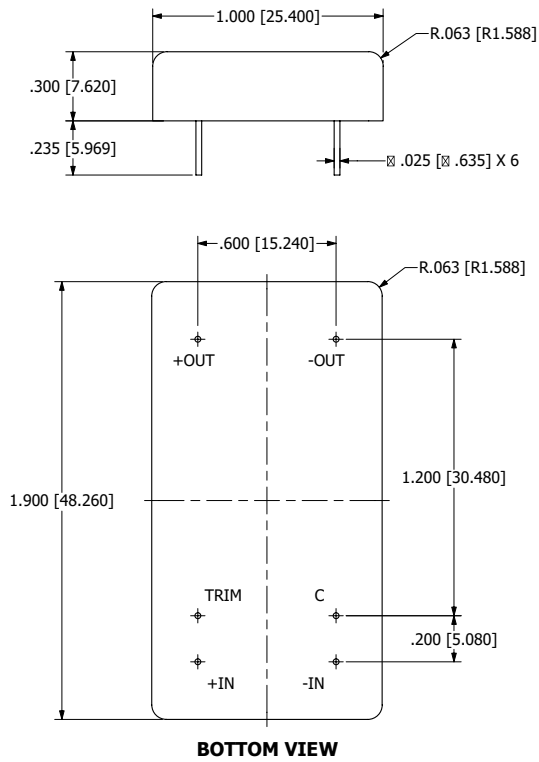
TRIM



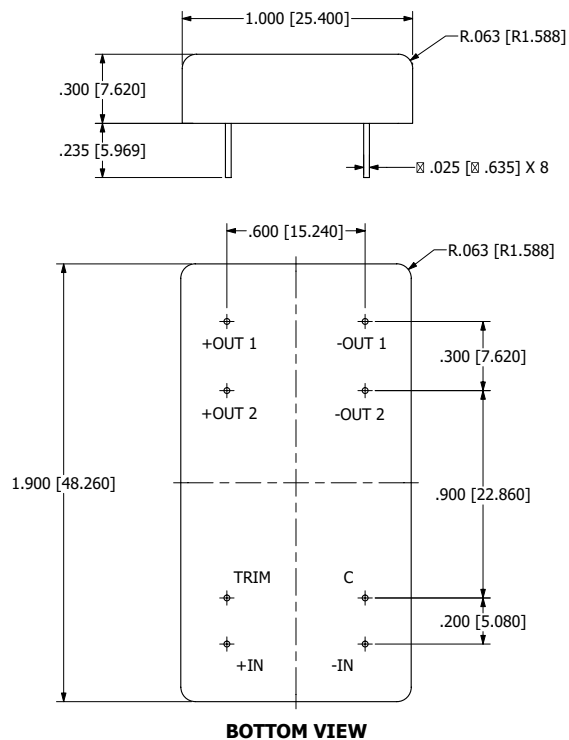
Note: Use 50kΩ, 1/4W trim pot between TRIM and -IN. Reduce resistance to raise output voltage to 5% maximum. Raising the output voltage beyond 5% could cause damage to the module.

MECHANICAL DRAWINGS

SINGLE OUTPUT

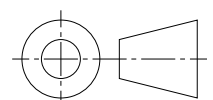


DUAL OUTPUT

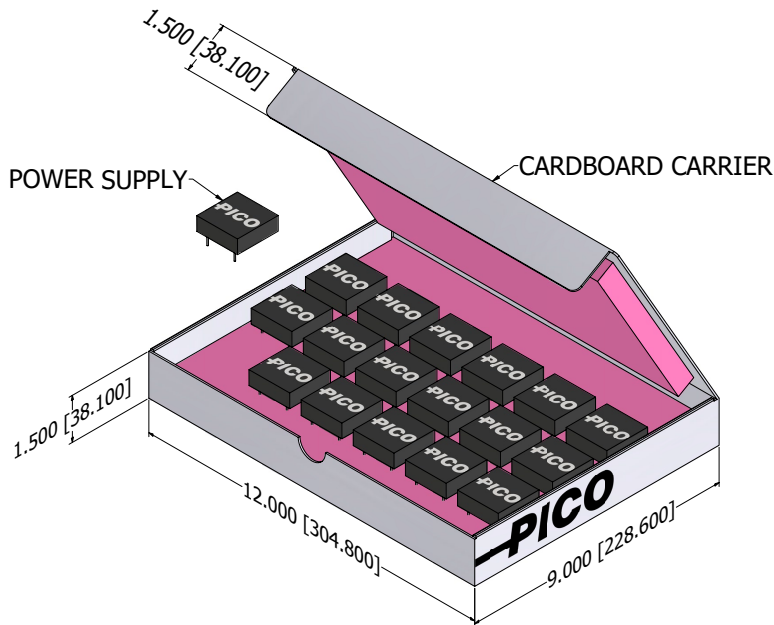
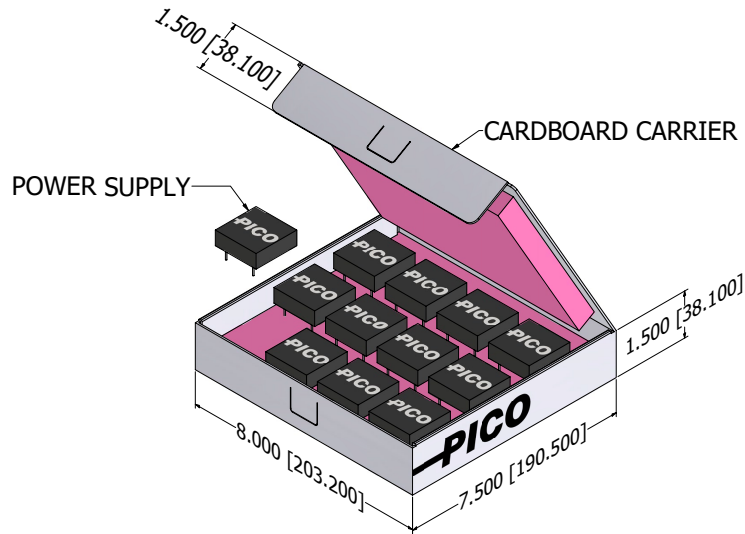


NOTES

- a. ALL DIMENSIONS ARE IN INCHES, [] = MM
- b. C IS CONTROL PIN



BOX PACKAGING - BULK



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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