

Actual size:  
2.28 x 2.4 x 0.5in  
57,9 x 61,0 x 12,7mm



## Ripple Attenuator Module

### Features & Benefits

- Reduces output PARD to  $\leq 10\text{mVp-p}$
- Full attenuation up to 20A load
- No adjustments required
- Compatible with all MI-Family converters from 5 to  $50V_{DC}$  output
- Efficiency: 93% – 99%
- Converter sense, trim, OVP & OCP retained
- MIL-STD-810 environments
- Size: 2.28" x 2.4" x 0.5"  
(57,9 x 61,0 x 12,7mm)

### Product Highlights

The MI-RAM is designed for applications where extremely low noise outputs are required. When used with any Vicor MI-Family DC-DC converter, the MI-RAM reduces both line frequency related ripple and switching noise to less than or equal to  $10\text{mVp-p}$ , DC to 20MHz.

The combination of the MI-RAM with an MI-Family converter provides the output noise performance of a linear supply at a power density in excess of  $15\text{W/in}^3$ .

All of the features of the MI-Family converter remain available while using the MI-RAM, including output voltage trimming, OVP and OTP (MI-200 only), current limiting, remote sense, and output inhibit.

Full encapsulation in a low profile package enables the MI-RAM to meet MIL-STD-810 environmental testing requirements.

### Packaging Options

- Standard:** Slotted baseplate
- SlimMod:** Flangeless baseplate, option suffix: - S  
*Example:* MI - RAM - M1 - S
- FinMod:** Finned heat sink, option suffix:  
- F1, - F2, -F3 or -F4  
*Examples:*  
MI - RAM - M1 -F1, 0.25" fins, longitudinal  
MI - RAM - M1 -F2, 0.50" fins, longitudinal  
MI - RAM - M1 -F3, 0.25" fins, transverse  
MI - RAM - M1 -F4, 0.50" fins, transverse

### Electrical Considerations

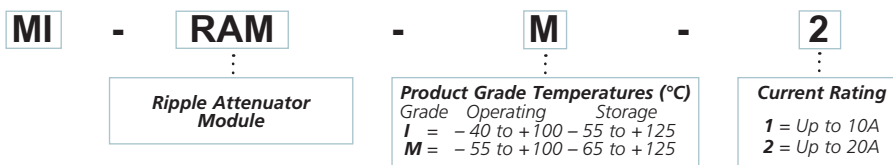
**Transient Response and Dynamic Range:** Full rated noise attenuation will be maintained at the MI-RAM output for step load changes up to 10% of the rated output current of the source converter, with the MI-RAM exhibiting an underdamped output excursion of less than  $10\text{mVp-p}$ . Some degradation in noise attenuation during the transient response period following the step may be exhibited for larger load changes. Adding output capacitance to the MI-RAM will improve the rejection over a larger dynamic range.

**Sense Connection:** Sense-in and sense-out connections are provided on the MI-RAM. Sense-in connections must be connected to the corresponding sense connections on the Vicor converter. Sense-out pins on the MI-RAM must be connected between the MI-RAM power-output pins, and the point of load.

**Output Load Characteristics:** When used in combination with Vicor DC-DC converters, and with sense leads connected, the MI-RAM will be stable for any non-inductive load.

**DC Voltage Drop:** Below full load, the input to output DC Voltage Drop is controlled to be an essentially constant voltage which appears between the -IN and -OUT terminals. In overload the DC voltage drop will rise as current increases. A few tens of millivolts appears between the +IN and +OUT terminals. Care should be taken not to connect IN and OUT terminals (i.e. through scope probe returns, grounds, etc.), as attenuation will be adversely affected.

### Part Numbering



## Specifications

(typical at  $T_{BP} = 25^{\circ}\text{C}$ , nominal line and 75% load, unless otherwise specified)

Parameter	Min.	Typ.	Max.	Units	Notes
Output noise and ripple		2.0	3.0	mVp-p	MI-200; 10% to 100% load
		6.0	10.0	mVp-p	MI-J00; 10% to 100% load
Input voltage range	5.0		50	$V_{DC}$	
Output voltage accuracy	99.5		100.5	%	Of MI source converter
Full load current			10	A	MI-RAM-I1 and MI-RAM-M1
			20	A	MI-RAM-I2 and MI-RAM-M2
DC voltage drop	0.34		0.38		10% to full load
Dissipation = (DC voltage drop x load current) + ( $V_{IN}$ x 15mA)					
Isolation		250		$V_{RMS}$	Input / output to baseplate
Weight	3.6	3.7	3.8	ounces	
	102	105	107	grams	

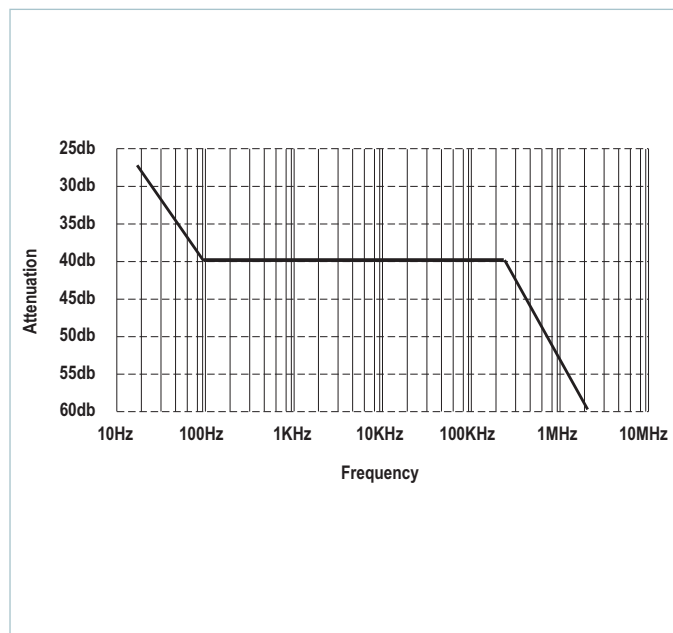
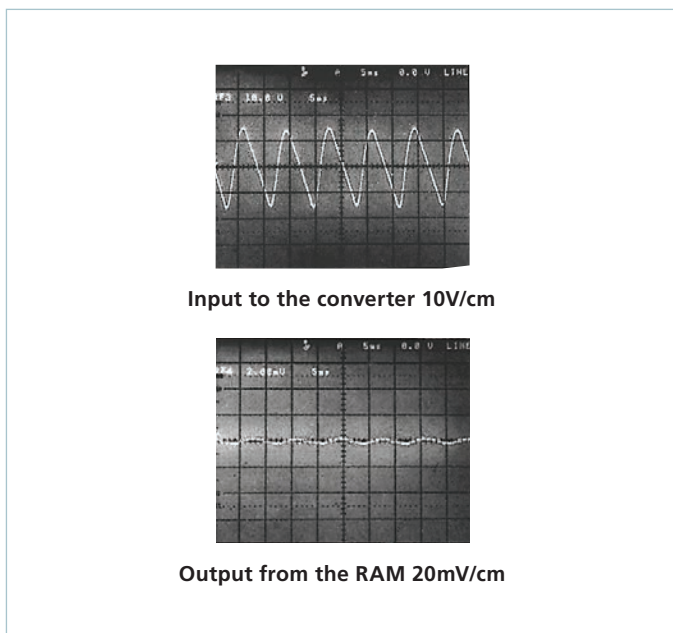
## PRODUCT GRADE SPECIFICATIONS

Parameter	I-Grade	M-Grade
Storage temperature	-55°C to +125°C	-65°C to +125°C
Operating temperature (baseplate)	-40°C to +100°C	-55°C to +100°C
Power cycling burn-in	12 hours, 29 cycles	96 hours, 213 cycles
Temperature cycled with power off	12 cycles	12 cycles
17°C per minute rate of change	-65°C to +100°C	-65°C to +100°C
Test data supplied at these temperatures <sup>[a]</sup>	-40°C, +80°C	-55°C, +80°C
Warranty	2 years	2 years
Environmental compliance	MIL-STD-810	MIL-STD-810
Derating	NAVMAT P-4855-1A	NAVMAT P-4855-1A

<sup>[a]</sup> Test data available for review or download from vicorpower.com

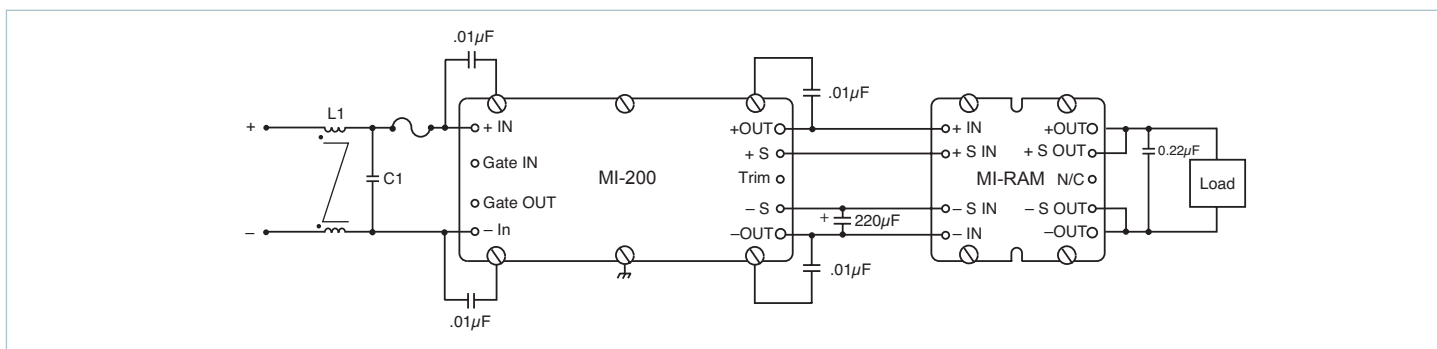
## ENVIRONMENTAL QUALIFICATIONS

Parameter	Qualification
Altitude	MIL-STD-810D, Method 500.2, Procedure III, explosive decompression (40K ft.).
	MIL-STD-810D, Method 500.2, Procedure II, 40,000ft., 1000 – 1500ft./min. to 70,000ft., unit functioning
Explosive Atmosphere	MIL-STD-810C, Method 511.1, Procedure I
Vibration	MIL-STD-810D, Method 514.3, Procedure I, category 6, helicopter, 20g
	MIL-STD-810D, Method 514.3 random: 10 – 300Hz @ 0.02g <sup>2</sup> /Hz, 2000Hz @ 0.002g <sup>2</sup> /Hz, 3.9 total Grms 3hrs/axis. Sine: 30Hz @ 20g, 60Hz @ 10g, 90Hz @ 6.6g, 120Hz @ 5.0g, 16.0 total Grms, 3 axes
	MIL-STD-810E, Method 514.4, Table 514.4-VII, ±6 db/octave, 7.7Grms, 1hr/axis
Shock	MIL-STD-810D, Method 516.3, Procedure I, functional shock, 40g
	MIL-STD-202F, Method 213B, 18 pulses, 60g, 9msec
	MIL-STD-202F, Method 213B, 75g, 11ms saw tooth shock
	MIL-STD-202F, Method 207A, 3 impacts / axis, 1, 3, 5 feet
Acceleration	MIL-STD-810D, Method 513.3, Procedure II Operational test, 9g for 1 minute along 3 mutually perpendicular axes
Humidity	MIL-STD-810D, Method 507.2, Procedure I, cycle I, 240 hrs, 88% relative humidity
Solder Test	MIL-STD-202, Method 208, 8hr. aging
Fungus	MIL-STD-810C, Method 508.1
Salt-Fog	MIL-STD-810C, Method 509.1



**Figure 1** — Comparison of input to output ripple (typical)

**Figure 2** — Attenuation vs. frequency (typical)

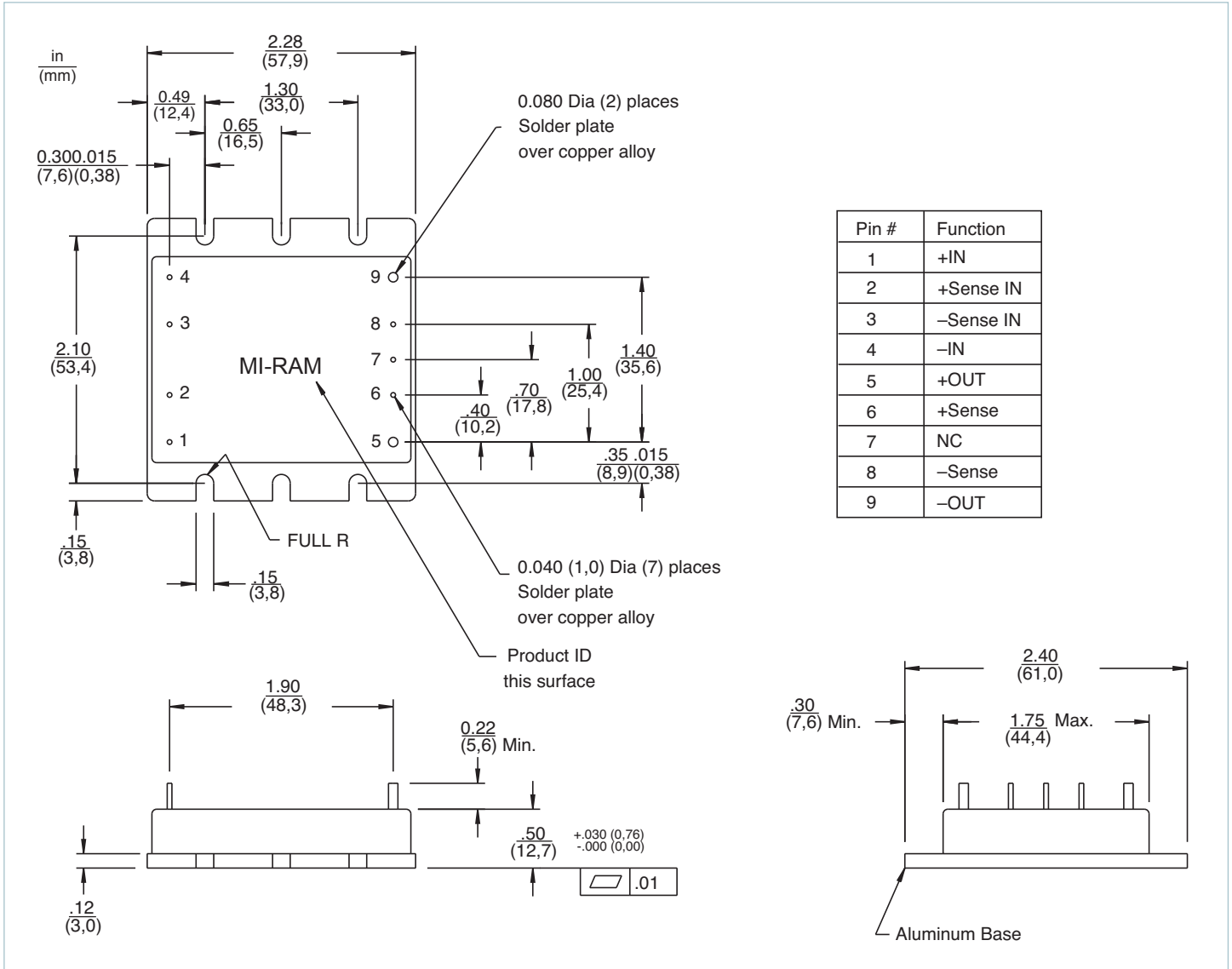


**Figure 3** — Connection diagram

### Storage

Vicor products, when not installed in customer units, should be stored in ESD safe packaging in accordance with ANSI/ESD S20.20, "Protection of Electrical and Electronic Parts, Assemblies and Equipment" and should be maintained in a temperature controlled factory/warehouse environment not exposed to outside elements controlled between the temperature ranges of 15°C and 38°C. Humidity shall not be condensing, no minimum humidity when stored in an ESD compliant package.

Mechanical Drawing



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**Vicor's comprehensive line of power solutions includes high density AC-DC and DC-DC modules and accessory components, fully configurable AC-DC and DC-DC power supplies, and complete custom power systems.**

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Visit [http://www.vicorpower.com/mil-cots\\_dc-dc/mil-cots\\_mi-ram\\_ripple\\_attenuator\\_module](http://www.vicorpower.com/mil-cots_dc-dc/mil-cots_mi-ram_ripple_attenuator_module) for the latest product information.

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