



# Data Sheet

## MI-IAM™

### Input Attenuator Modules



#### Features

- Inputs: 28 Vdc and 270 Vdc
- MIL-STD-461C/D/E EMI compliance
- MIL-STD-810 environments
- MIL-STD-704A-F, MIL-STD-1275A/B/D and DO-160E transients and spikes
- Reverse polarity protection
- Output power: Up to 200 W from any combination of MI-200 or MI-J00 modules
- Expansion port for additional power
- Short circuit protected
- Size: 2.28" x 2.4" x 0.5" (57,9 x 61,0 x 12,7 mm)

#### Product Highlights

The MI-IAM is an accessory product to Vicor's MI-Series of DC-DC converters that provides EMI filtering and transient protection. Designed for use with all 28 V and 270 V input MI-200 or MI-J00 converters, the MI-IAM can drive any number of modules with output loads to 200 W.

The MI-IAM meets the conducted emissions specifications of MIL-STD-461C/D/E and offers complete input transient, surge, and spike protection to the most severe levels of MIL-STD-1275, MIL-STD-704 and DO-160. Reverse polarity protection and overvoltage lockout provide additional safeguards against potentially damaging line conditions. High power arrays can be configured using the expansion port capability of the MI-IAM.

#### Compatible Products

- MI-200, MI-J00 (Inputs: 2 and 6)
- Mega Modules (Inputs: 2 and 6)

#### Packaging Options

**Standard:** Slotted baseplate

**SlimMod:** Flangeless baseplate, option suffix: - S  
Example: MI - AXX - XX - S

**FinMod:** Finned heat sink, option suffix:  
- F1, - F2, -F3 or -F4

Examples:

- MI - AXX - XX -F1, 0.25" fins, longitudinal
- MI - AXX - XX -F2, 0.50" fins, longitudinal
- MI - AXX - XX -F3, 0.25" fins, transverse
- MI - AXX - XX -F4, 0.50" fins, transverse

#### MI-IAM Specifications

(Typical at TBP = 25°C, nominal line, 75% load, unless otherwise specified)

##### Input Characteristics

| Parameter                            | Min  | Typ | Max | Units             | Notes                               |
|--------------------------------------|------|-----|-----|-------------------|-------------------------------------|
| 28 Vdc modules                       |      |     |     |                   |                                     |
| Steady state input                   | 16   | 28  | 50  | Vdc               |                                     |
| Input spike limit                    | -600 |     | 600 | Vdc               | 10 μs, 50 Ω per MIL-STD-704A        |
|                                      | -250 |     | 250 | Vdc               | 70 μs, 15 mJ per MIL-STD-1275A/B/D  |
| Input surge limit                    |      |     | 100 | Vdc               | 50 ms, 0.5 Ω per MIL-STD-1275A/B/D  |
|                                      |      |     | 80  | Vdc               | 100 ms per DO-160E, Sec. 16, Cat. Z |
| Overvoltage shut down <sup>[a]</sup> | 50   |     |     | Vdc               | 100 ms, automatic recovery          |
| Reverse polarity protection          |      |     |     |                   | Shunt diode: input fuse required    |
| Recommended fuse                     |      |     | 20  | Amps              | F03A type                           |
| 270 Vdc modules                      |      |     |     |                   |                                     |
| Steady state input                   | 125  | 270 | 400 | Vdc               |                                     |
| Input spike limit                    |      |     | 800 | Vdc               | 10 μs, 50 Ω                         |
|                                      | -600 |     | 600 | Vdc               | 100 μs, 15 mJ                       |
| Input surge limit                    |      |     | 500 | Vdc               | 100 ms, 0.5 Ω                       |
| Overvoltage shut down <sup>[a]</sup> | 400  |     |     | Vdc               | 100 ms, automatic recovery          |
| Reverse polarity protection          |      |     |     |                   | Shunt diode: input fuse required    |
| Recommended fuse                     |      |     | 4   | Amps              | F03A type                           |
| All models                           |      |     |     |                   |                                     |
| No load power dissipation            |      | 0.5 | 1.5 | Watts             |                                     |
| Inrush current                       |      | 110 | 125 | % I <sub>IN</sub> | Steady state, I <sub>IN</sub> 10 ms |

<sup>[a]</sup> The MI-IAM disables downstream converters and clamps the converter input voltage at a safe level.

##### Output Characteristics

| Parameter             | Min | Typ  | Max | Units | Test Conditions                    |
|-----------------------|-----|------|-----|-------|------------------------------------|
| Clamp voltage         |     |      |     |       |                                    |
| 28 Vdc input          |     |      | 60  | Vdc   |                                    |
| 270 Vdc input         |     |      | 420 | Vdc   |                                    |
| Output power          |     |      | 250 | Watts |                                    |
| Internal voltage drop |     |      |     |       |                                    |
| 28 Vdc                |     | 0.6  |     | Vdc   |                                    |
| 270 Vdc               |     | 0.85 |     | Vdc   |                                    |
| Overload protection   |     |      |     |       |                                    |
| 28 Vdc input          |     |      | 20  | Amps  | Foldback threshold; auto recovery  |
| 270 Vdc input         |     |      | 4   | Amps  | with latched shut down after 10 ms |

##### Isolation Characteristics

| Parameter      | Min | Typ   | Max | Units | Notes    |
|----------------|-----|-------|-----|-------|----------|
| Input to base  |     | 1,500 |     | Vrms  | 1 minute |
| Output to base |     | 1,500 |     | Vrms  | 1 minute |

##### EMI Characteristics MIL-STD-461

| Parameter                | Notes                      |
|--------------------------|----------------------------|
| Input power leads        |                            |
| Conducted emissions      | CE01, CE03, CE07           |
|                          | CE101, CE102               |
| Conducted susceptibility | CS01, CS02, CS06,          |
|                          | CS101, CS114, CS115, CS116 |

##### Model Selection Chart

| Model Number | Nominal Input Voltage | Input Range   | Compatible MI-Series    | Converter |
|--------------|-----------------------|---------------|-------------------------|-----------|
| MI-A22-MU    | 28 Vdc                | 16 – 50 Vdc   | MI-22x-Mx and MI-J2x-Mx | M-grade   |
| MI-A66-MU    | 270 Vdc               | 125 – 400 Vdc | MI-26x-Mx and MI-J6x-Mx | M-grade   |
| MI-A22-IU    | 28 Vdc                | 16 – 50 Vdc   | MI-22x-Ix and MI-J2x-Ix | I-grade   |
| MI-A66-IU    | 270 Vdc               | 125 – 400 Vdc | MI-26x-Ix and MI-J6x-Ix | I-grade   |

## SPECIFICATIONS

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

### ■ ENVIRONMENTAL – MIL-STD-810D

| Parameter                   | Min    | Typ | Max | Units   | Test Conditions         |
|-----------------------------|--------|-----|-----|---------|-------------------------|
| Altitude - method 500.2     | 70,000 |     |     | feet    | Procedure II            |
| Humidity - method 507.2     | 88/240 |     |     | %/hours | Procedure I, cycle 1    |
| Acceleration - method 513.3 | 9      |     |     | g       | Procedure II            |
| Vibration - method 514.3    | 20     |     |     | g       | Procedure I, category 6 |
| Shock - method 516.3        | 40     |     |     | g       | Procedure I             |

### ■ RELIABILITY – MIL-HDBK-217F (MI-A22-MU)

| Parameter                                | Min | Typ   | Max | Units       | Test Conditions |
|--|-----|-------|-----|-------------|-----------------|
| 25°C Ground Benign: G.B.                 |     | 5,637 |     | 1,000 hours |                 |
| 50°C Naval Sheltered: N.S.               |     | 1,014 |     | 1,000 hours |                 |
| 65°C Airborne Inhabited<br>Cargo: A.I.C. |     | 795   |     | 1,000 hours |                 |

### ■ THERMAL CHARACTERISTICS

| Parameter                           | Min | Typ  | Max | Units   | Test Conditions                  |
|-------------------------------------|-----|------|-----|---------|----------------------------------|
| Efficiency                          |     | 97   |     | %       |                                  |
| Baseplate to sink                   |     | 0.14 |     | °C/Watt |                                  |
| Operating temperature,<br>baseplate |     |      | 100 | °C      | See product grade specifications |
| Storage temperature                 |     |      | 125 | °C      | See product grade specifications |

### ■ MECHANICAL SPECIFICATIONS

| Parameter | Min | Typ      | Max | Units          | Test Conditions |
|-----------|-----|----------|-----|----------------|-----------------|
| Weight    |     | 3.0 (85) |     | ounces (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<br>17°C per minute rate of change | 12 cycles<br>-65°C to +100°C | 12 cycles<br>-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             |

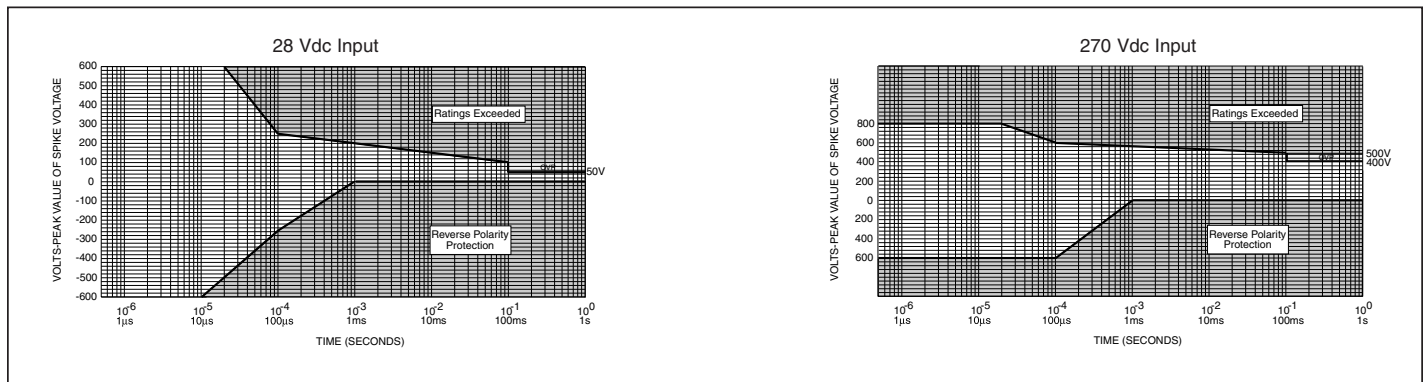
<sup>[a]</sup> Test data available for review or download from vicorpower.com

# SPECIFICATIONS (CONT.)

## ENVIRONMENTAL QUALIFICATIONS

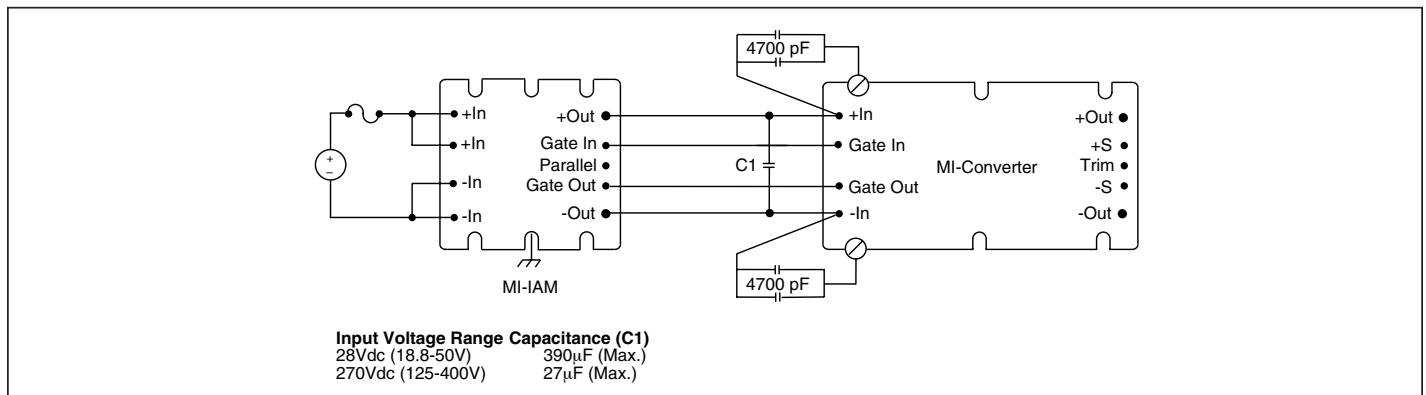
| Parameter            | Qualification  |
|----------------------|--|
| Altitude             | MIL-STD-810D, Method 500.2, Procedure III, explosive decompression (40 K ft.).   |
|                      | MIL-STD-810D, Method 500.2, Procedure II, 40,000 ft., 1000 – 1500 ft./min. to 70,000 ft., unit functioning   |
| Explosive Atmosphere | MIL-STD-810C, Method 511.1, Procedure I  |
| Vibration            | MIL-STD-810D, Method 514.3, Procedure I, category 6, helicopter, 20 g  |
|                      | MIL-STD-810D, Method 514.3 random: 10 – 300 Hz @ 0.02 g <sup>2</sup> /Hz, 2000 Hz @ 0.002 g <sup>2</sup> /Hz, 3.9 total G rms<br>3 hrs/axis. Sine: 30 Hz @ 20 g, 60 Hz @ 10 g, 90 Hz @ 6.6 g, 120 Hz @ 5.0 g, 16.0 total G rms, 3 axes |
|                      | MIL-STD-810E, Method 514.4, Table 514.4-VII, ±6 db/octave, 7.7 G rms, 1hr/axis   |
| Shock                | MIL-STD-810D, Method 516.3, Procedure I, functional shock, 40 g  |
|                      | MIL-STD-202F, Method 213B, 18 pulses, 60 g, 9 msec   |
|                      | MIL-STD-202F, Method 213B, 75 g, 11 ms 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, 9 g 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, 8 hr. aging   |
| Fungus               | MIL-STD-810C, Method 508.1   |
| Salt-Fog             | MIL-STD-810C, Method 509.1   |

## SAFE OPERATING AREA <sup>[a]</sup>

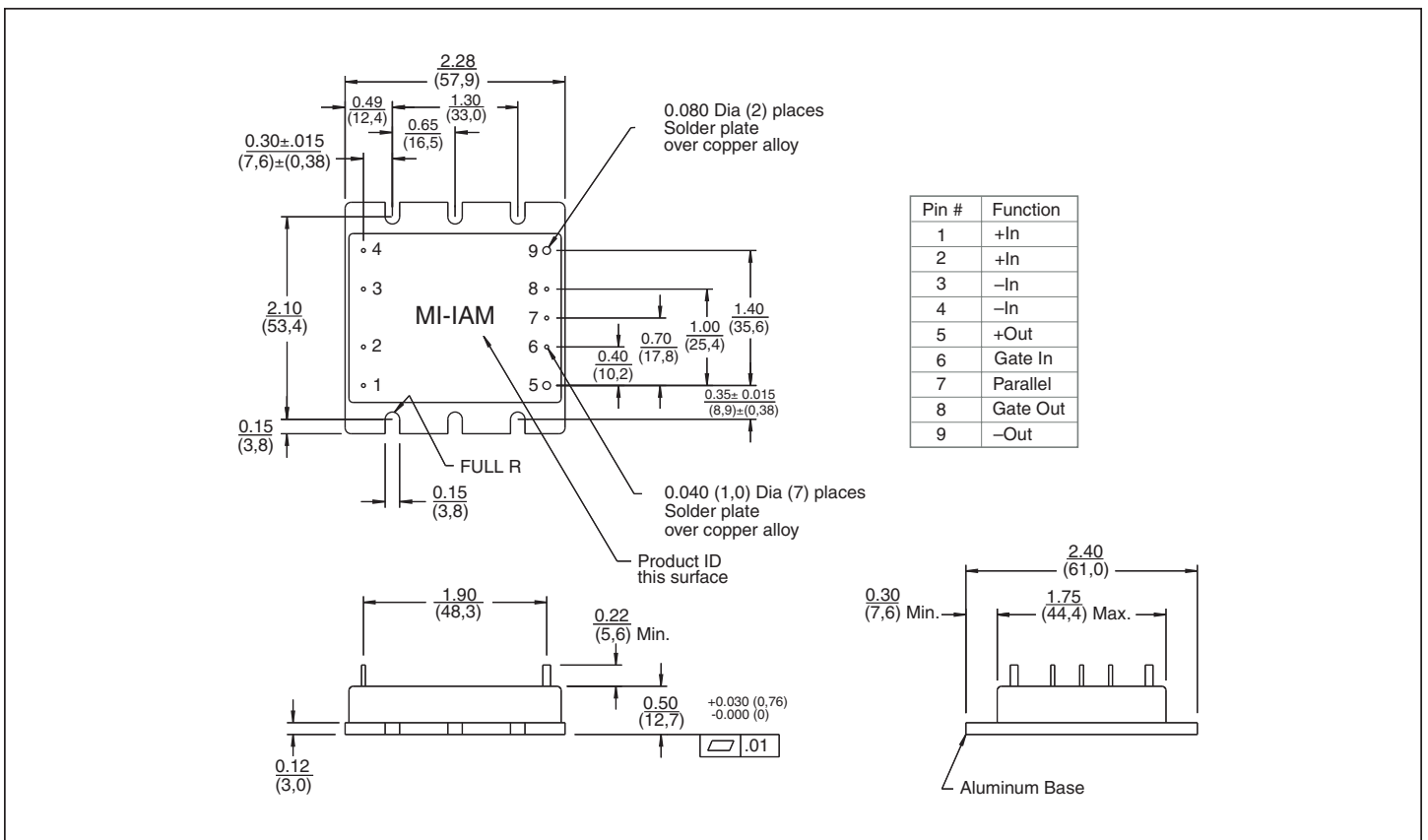


<sup>[a]</sup> Refer to Input Characteristics

## TYPICAL CONNECTION DIAGRAM



# MECHANICAL DRAWING



Note: For alternate packaging options refer to the mechanical drawing page of vicorpower.com

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