



# Military COTS 28V<sub>IN</sub> Filter

## M-FIAM7B

Example Model Number **M-FIAM7BM21**

Actual size:  
2.28 x 2.2 x 0.5in  
[57,9 x 55,9 x 12,7mm]

## Input Attenuator Module

### Features & Benefits

- EMI filtering-MIL-STD-461E <sup>[b]</sup>
- Transient protection:  
MIL-STD-1275A/B/D,  
MIL-STD-704A-F and  
DO-160E
- Environments: MIL-STD-810,  
MIL-STD-202
- Environmental stress screening
- Low-profile mounting options
- Output power up to 400W
- Mini-sized package
- Inrush current limiting

### Product Highlights

The M-FIAM7B is a DC front-end module that provides EMI filtering and transient protection. The M-FIAM7B enables designers using Vicor 28V DC-DC VI Chip and VI Brick® modules to meet conducted emission/ conducted susceptibility per MIL-STD-461E; and input transients per MIL-STD-1275A/B/D, MIL-STD-704A-F and DO-160E. The M-FIAM7B accepts an input voltage of 14 – 50V<sub>DC</sub> and delivers output power up to 400W.

M-FIAM7B is housed in an industry-standard “half-brick” module measuring 2.28 x 2.2 x 0.5in and depending upon model selected, may be mounted onboard or inboard for height-critical applications.

### Compatible Products

- 28V Input DC-DC VI Chip® or VI Brick modules

**Note:** This product is not compatible with Maxi, Mini, Micro DC-DC converters.

### Absolute Maximum Rating

| Parameter                 | Rating    | Unit            | Notes               |
|---------------------------|-----------|-----------------|---------------------|
| +IN to -IN                | 50        | V <sub>DC</sub> | Continuous          |
| Mounting torque           | 5 [0.57]  | in-lbs [N-m]    | 6 each, #4-40 or M3 |
| Pin soldering temperature | 500 [260] | °F [°C]         | <5sec; wave solder  |
|                           | 750 [390] | °F [°C]         | <7sec; hand solder  |

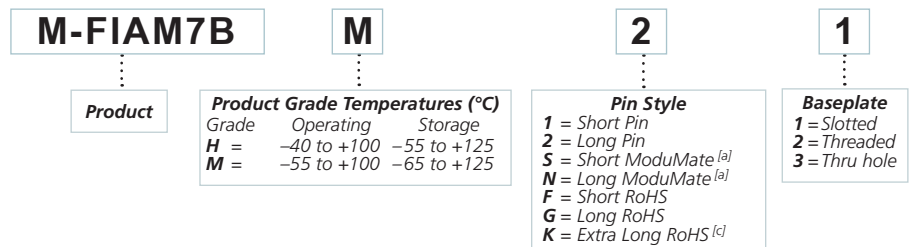
### Thermal Resistance and Capacity

| Parameter  | Min | Typ  | Max | Unit    |
|--|-----|------|-----|---------|
| Baseplate to sink<br>flat, greased surface<br>with thermal pad (P/N 20264) |     | 0.16 |     | °C/Watt |
|  |     | 0.1  |     | °C/Watt |
| Baseplate to ambient<br>Free convection<br>1000LFM                         |     | 7.9  |     | °C/Watt |
|  |     | 2.2  |     | °C/Watt |

### MTBF per MIL-HDBK-217F (M-FIAM7BM21)

| Temperature | Environment                      | MTBF  | Unit     |
|-------------|----------------------------------|-------|----------|
| 25°C        | Ground Benign: G.B.              | 4,041 | 1,000Hrs |
| 50°C        | Naval Sheltered: N.S.            | 727   | 1,000Hrs |
| 65°C        | Airborne Inhabited Cargo: A.I.C. | 570   | 1,000Hrs |

### Part Numbering



<sup>[a]</sup> Compatible with SurfMate and InMate socketing system

<sup>[b]</sup> EMI performance is subject to a wide variety of external influences such as PCB construction, circuit layout etc. As such, external components in addition to those listed herein may be required in specific instances to gain full compliance to the standards specified.

<sup>[c]</sup> Not intended for socket or Surfmate mounting

**Note:** Product images may not highlight current product markings.

## Specifications

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

### Input Specifications

| Parameter          | Min | Typ | Max      | Unit  | Notes   |
|--------------------|-----|-----|----------|---|---|
| Input voltage      | 14  | 28  | 50       | $V_{DC}$  | Continuous  |
| Inrush limiting    |     |     | 0.007    | A/ $\mu\text{F}$  | See Figure 4  |
| Transient immunity |     |     | 100      | $V_{DC}$  | 50ms per MIL-STD-1275A/B/D, continuous operation (see Figure 3) |
|                    |     |     | 250      | $V_{DC}$  | 70 $\mu\text{s}$ per MIL-STD-1275B, continuous operation        |
|                    |     |     | 70       | $V_{DC}$  | 20ms per MIL-STD-704A, continuous operation                     |
|                    |     | 80  | $V_{DC}$ | 100ms per DO-160E, Section 16, Power Input, Category Z<br>50ms per MIL-STD-704A, continuous operation |   |

### Output Specifications

| Parameter             | Min | Typ | Max  | Unit          | Notes  |
|-----------------------|-----|-----|------|---------------|--|
| Output current        |     |     | 25   | A             | Over continuous input and temp. range                |
| Output power          |     |     | 400  | W             | Transient compliance over temp. range (see Figure 7) |
| Efficiency            | 96  | 98  |      | %             | @ 25A, 100 $^{\circ}\text{C}$ baseplate              |
| Internal voltage drop |     | 0.5 | 0.7  | V             |  |
| External capacitance  |     |     |      |               | See Figure 8   |
|                       | 330 |     | 3300 | $\mu\text{F}$ | 63V  |

### Control Pin Specifications

| Parameter      | Min | Typ   | Max  | Unit     | Notes                                   |
|----------------|-----|-------|------|----------|---|
| ON/OFF control |     |       |      |          |   |
| Enable (ON)    | 0.0 |       | 1.0  | $V_{DC}$ | Referenced to $-V_{OUT}$                |
| Disable (OFF)  | 4.0 |       | 5.50 | $V_{DC}$ | 100k $\Omega$ internal pull-up resistor |
| EMI GRD        |     | earth |      |          | Not electrically connected to baseplate |

### Safety Specifications

| Parameter            | Min   | Typ | Max | Unit      | Notes                |
|----------------------|-------|-----|-----|-----------|----------------------|
| Dielectric withstand | 1,500 |     |     | $V_{RMS}$ | Input/Output to Base |
|                      | 2,121 |     |     | $V_{DC}$  | Input/Output to Base |

### EMI

| Standard                  | Test Procedure                        | Notes                                      |
|---------------------------|---------------------------------------|--|
| MIL-STD-461E              |                                       |  |
| Conducted emissions:      | CE101, CE102                          |  |
| Conducted susceptibility: | CS101 (see note), CS114, CS115, CS116 | With suggested Reverse Polarity Protection |

EMI performance is subject to a wide variety of external influences such as PCB construction, circuit layout etc. As such, external components in addition to those listed herein may be required in specific instances to gain full compliance to the standards specified.

### General Specifications

| Parameter | Min | Typ | Max      | Unit           | Notes |
|-----------|-----|-----|----------|----------------|-------|
| Weight    |     |     | 3.3 [94] | Ounces [grams] |       |
| Warranty  |     |     | 2        | Years          |       |

## Specifications (Cont.)

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

### Environmental Qualification

#### Altitude

MIL-STD-810F, Method 500.4, Procedure I & II, 40,000ft. and 70,000ft. Operational.

#### Explosive Atmosphere

MIL-STD-810F, Method 511.4, Procedure I, Operational.

#### Vibration

MIL-STD-810F, Method 514.5, Procedure I, Category 14, Sine and Random vibration per Table 514.5C for Helicopter AH-6J Main Rotor with overall level of 5.6Grms for 4 hours per axis. MIL-STD-810F, Method 514.5C, General Minimum Integrity Curve per Figure 514.5C-17 with overall level of 7.7Grms for 1 hour per axis.

#### Shock

MIL-STD-810F, Method 516.5, Procedure I, Functional Shock, 40g. MIL-S-901D, Lightweight Hammer Shock, 3 impacts/axis, 1,3,5ft. MIL-STD-202F, Method 213B, 60g, 9ms half sine. MIL-STD-202F, Method 213B, 75g, 11ms Saw Tooth Shock.

#### Acceleration

MIL-STD-810F, Method 513.5, Procedure II, table 513.5-II, Operational, 2-7g, 6 directions.

#### Humidity

MIL-STD-810F, Method 507.4.

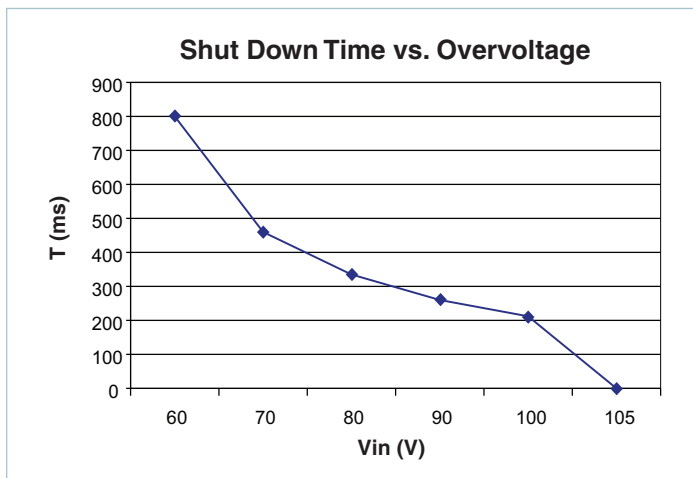
#### Solder Test

MIL-STD-202G, Method 208H, 8 hour aging.

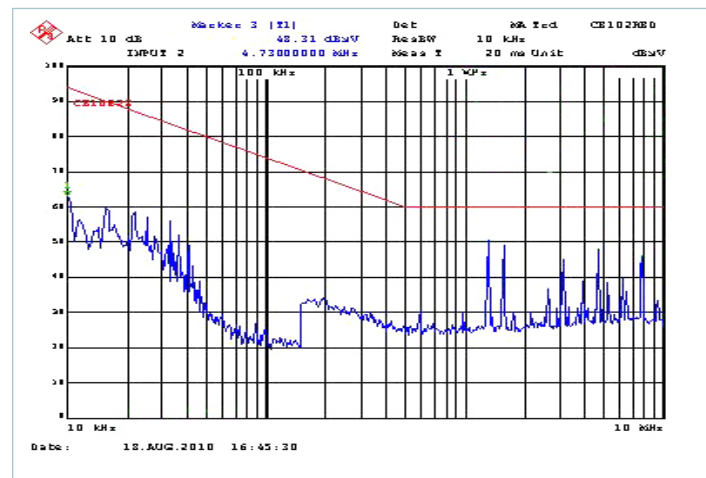
### Environmental Stress Screening

| Parameter                           | H-Grade  | M-Grade  |
|-------------------------------------|--|--|
| Operating temperature               | -40 to +100°C                                      | -55 to +100°C                                      |
| Storage temperature                 | -55 to +125°C                                      | -65 to +125°C                                      |
| Temperature cycling*                | 12 cycles<br>-65 to +100°C                         | 12 cycles<br>-65 to +100°C                         |
| Ambient test @ 25°C                 | Yes  | Yes  |
| Power cycling burn-in               | 12 hours, 29 cycles                                | 24 hours, 58 cycles                                |
| Functional and parametric ATE tests | -40 and +100°C                                     | -55 and +100°C                                     |
| Hi-Pot test                         | Yes  | Yes  |
| Visual inspection                   | Yes  | Yes  |
| Test data                           | <a href="http://vicorpower.com">vicorpower.com</a> | <a href="http://vicorpower.com">vicorpower.com</a> |

\*Temperature cycled with power off, 17°C per minute rate of change.



**Figure 1** —  $T$  = time period before overvoltage protection.  
 $V_{IN}$  = input voltage (switching up from 28V<sub>DC</sub>)



**Figure 2** — MIL-STD-461F, CE102; M-FIAM7B and three MIL-COTS PRMs and three MIL-COTS VTMs, 350W

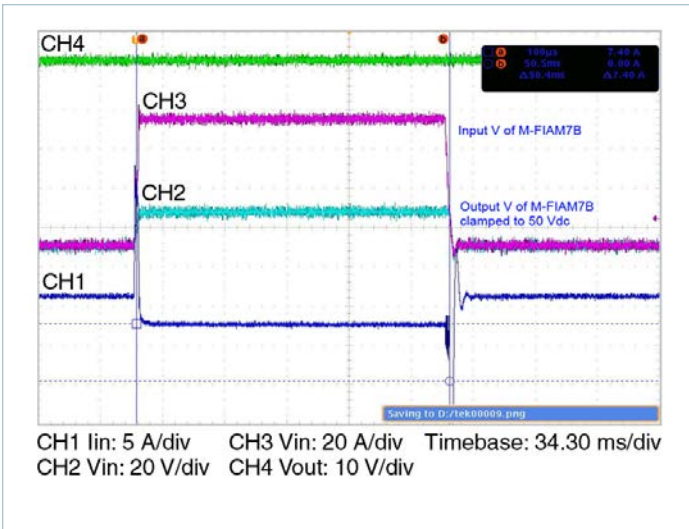


Figure 3 — Transient immunity; M-FIAM7B output response to an input transient

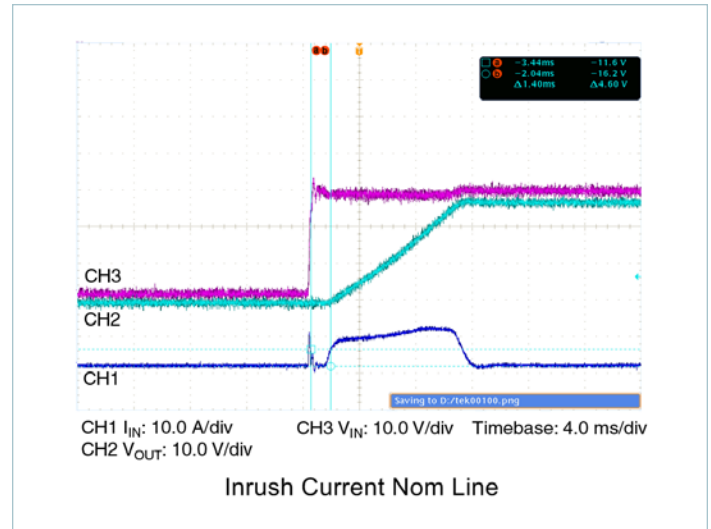


Figure 4 — Inrush limiting; inrush current with 3300μF external capacitance

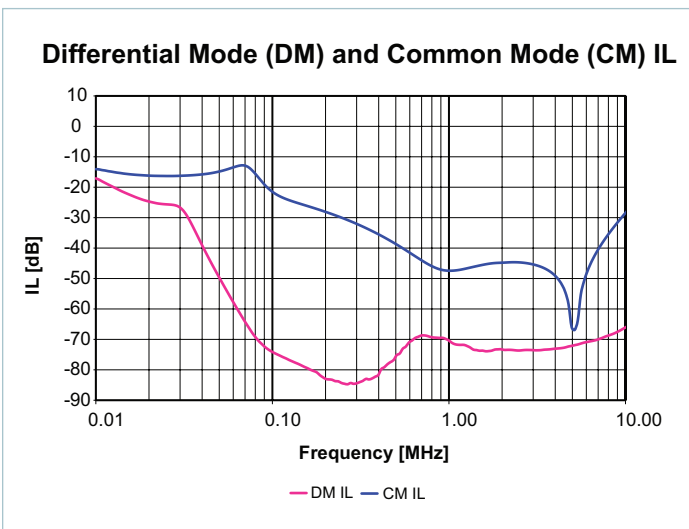


Figure 5 — Insertion loss curve

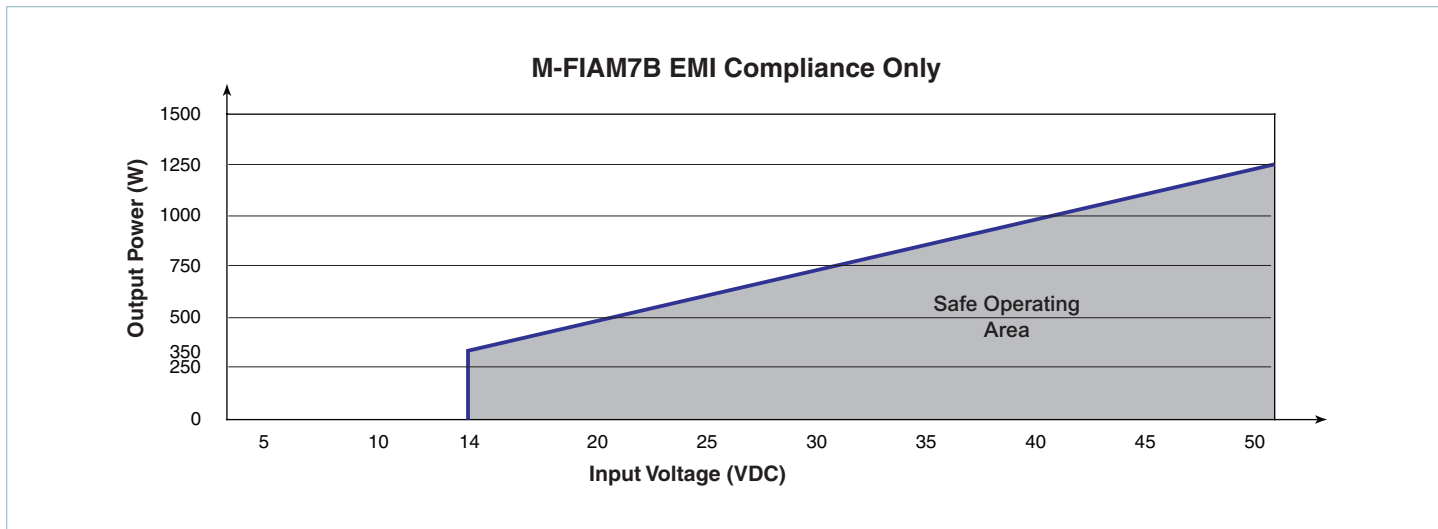


Figure 6 — M-FIAM7B EMI compliance only

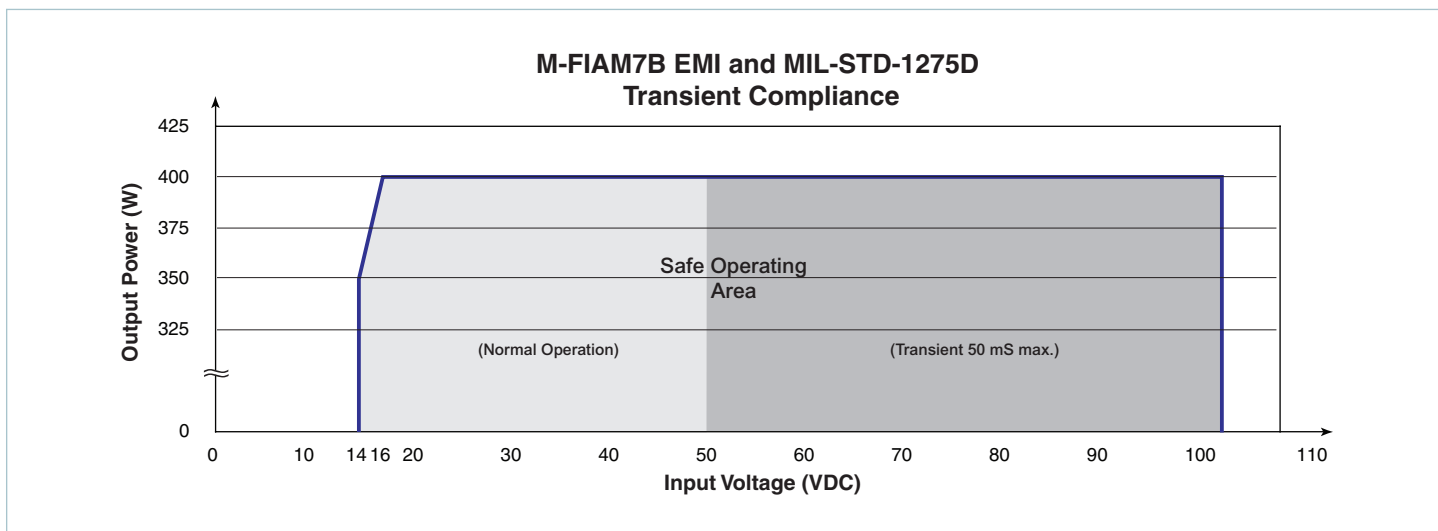


Figure 7 — M-FIAM7B EMI and MIL-STD-1275D transient compliance

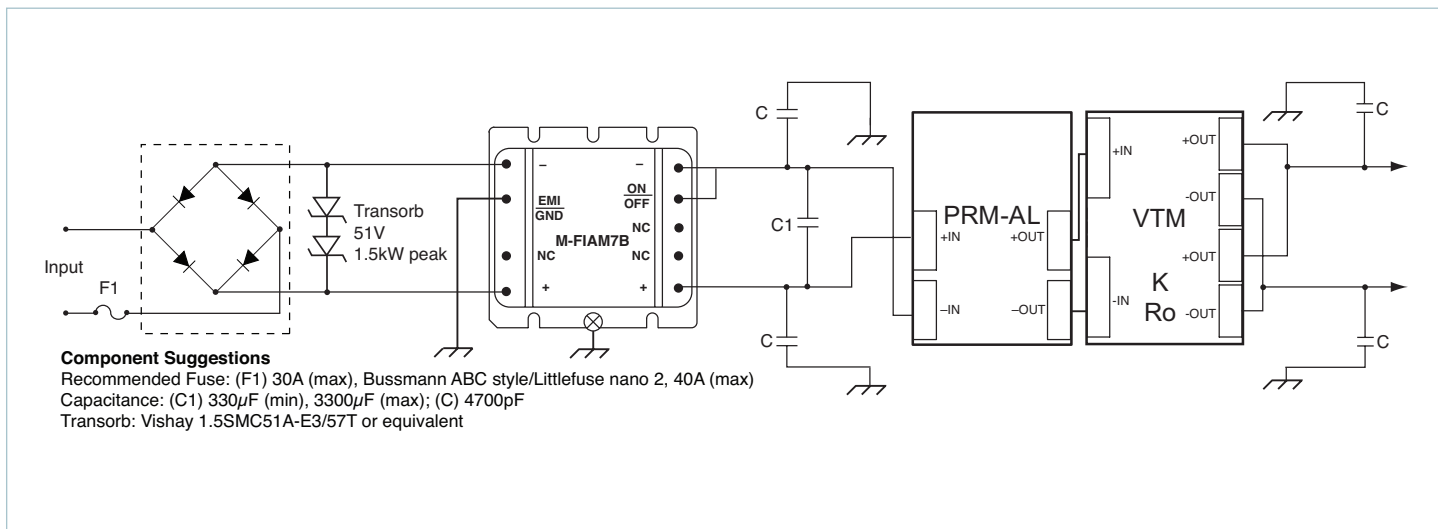


Figure 8 — Basic connection diagram with suggested transient, surge protection and reverse-polarity protection (R.P.P)

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 Drawings

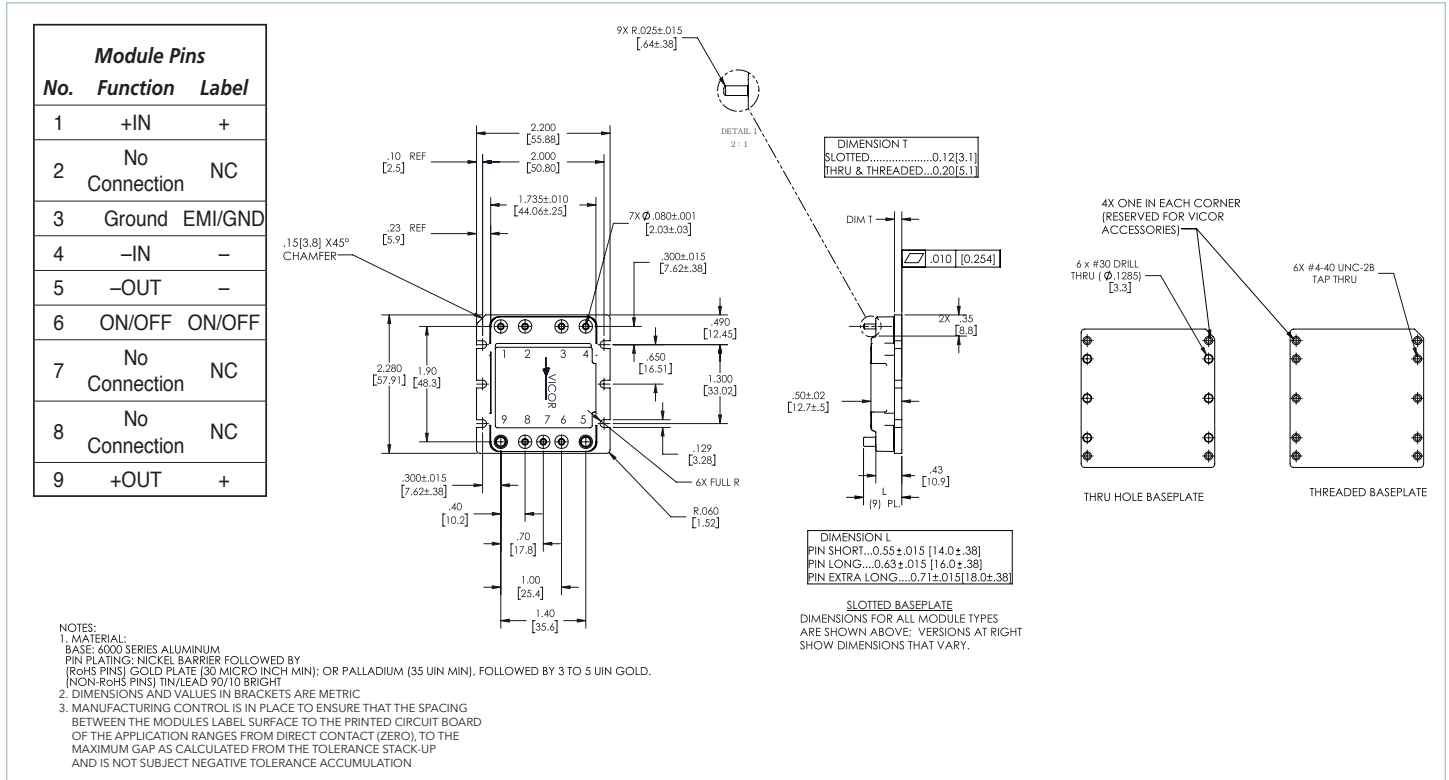


Figure 9 — Mechanical diagram

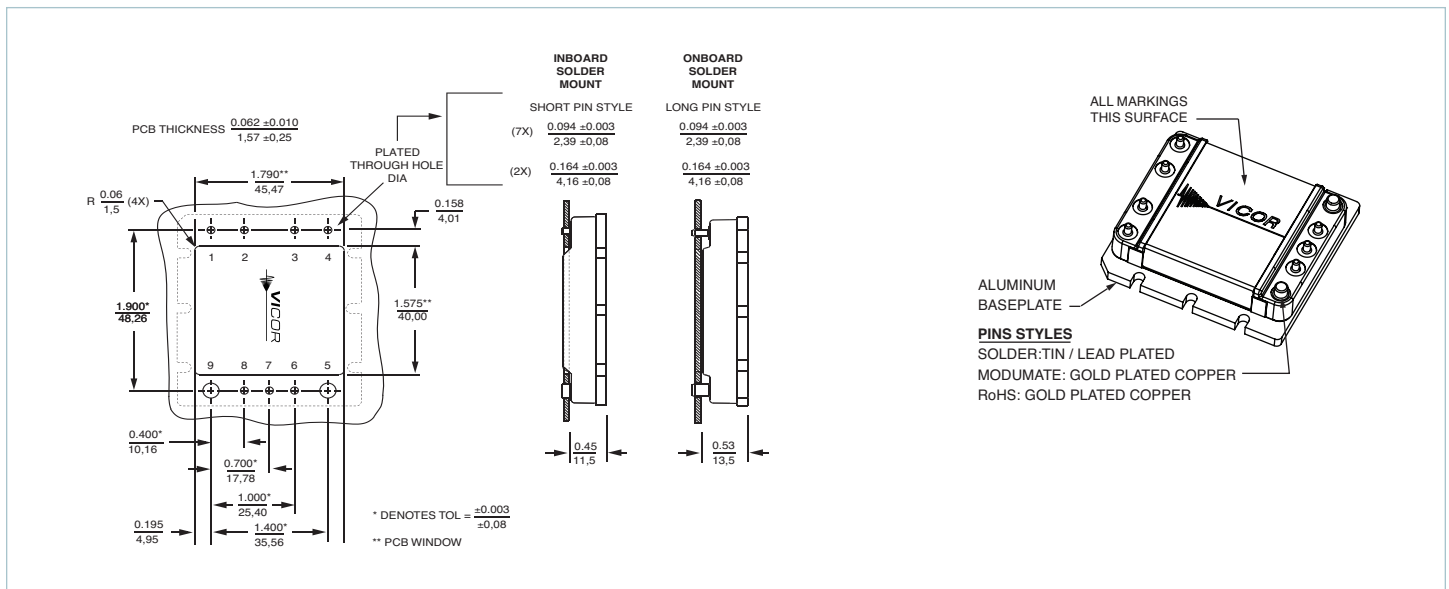


Figure 10 — PCB mounting specifications

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