# Military COTS 270$V_{IN}$ Filter

## M-FIAM3

Example Model Number **M-FIAM3M21**

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 [b]
- Transient protection: MIL-STD-704E/F
- Environments: MIL-STD-810, MIL-STD-202
- Environmental stress screening
- Low-profile mounting options
- Output current up to 3A
- Mini-sized package
- Inrush current limiting

### Product Highlights

The M-FIAM3 is a DC front-end module that provides EMI filtering and transient protection. The M-FIAM3 enables designers using Vicor Maxi, Mini, Micro Series 300V DC-DC converters to meet conducted emission/ conducted susceptibility per MIL-STD-461E; and input transients per MIL-STD-704E/F. The M-FIAM3 accepts an input voltage of 180 – 375$V_{DC}$ and delivers output current up to 3A.

M-FIAM3 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

- Maxi, Mini, Micro Series 300V Input DC-DC converters

### Absolute Maximum Rating

| Parameter | Rating | Unit | Notes |
|---|---|---|---|
| +IN to –IN | 375 | $V_{DC}$ | Continuous |
| | 400 | $V_{DC}$ | 100ms |
| 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 | | | | |
| flat, greased surface | | 0.16 | | °C/Watt |
| with thermal pad (P/N 20264) | | 0.1 | | °C/Watt |
| Baseplate to ambient | | | | |
| Free convection | | 7.9 | | °C/Watt |
| 1000LFM | | 2.2 | | °C/Watt |

### MTBF per MIL-HDBK-217F (M-FIAM3M21)

| Temperature | Environment | MTBF | Unit |
|---|---|---|---|
| 25°C | Ground Benign: G.B. | 13,291 | 1,000Hrs |
| 50°C | Naval Sheltered: N.S. | 2,392 | 1,000Hrs |
| 65°C | Airborne Inhabited Cargo: A.I.C. | 1,874 | 1,000Hrs |

### Part Numbering

**M-FIAM3** **M** **2** **1**

***Product***

***Product Grade Temperatures (°C)***

| Grade | Operating | Storage |
|---|---|---|
| ***H*** = | –40 to +100 | –55 to +125 |
| ***M*** = | –55 to +100 | –65 to +125 |

***Pin Style***

***1*** = *Short Pin*
***2*** = *Long Pin*
***S*** = *Short ModuMate* [a]
***N*** = *Long ModuMate* [a]
***F*** = *Short RoHS*
***G*** = *Long RoHS*
***K*** = *Extra Long RoHS* [c]

***Baseplate***

***1*** = *Slotted*
***2*** = *Threaded*
***3*** = *Thru hole*

[a] Compatible with SurfMate and InMate socketing system
[b] EMI performance is subject to a wide variety of external influences such as PCB construction, circuit layout etc. External components in addition to those listed herein may be required in specific instances to gain full compliance to the standards specified at various line and load conditions.
[c] Not intended for socket or Surfmate mounting

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

## Specifications

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

### Input Specifications

| Parameter | Min | Typ | Max | Unit | Notes |
|---|---|---|---|---|---|
| Input voltage | 180 | 270 | 375 | $V_{DC}$ | Continuous |
| Inrush limiting | | | 0.018 | A/µF | |
| Transient immunity | | | | | Exceeds limits of MIL-STD-704E/F |

### Output Specifications

| Parameter | Min | Typ | Max | Unit | Notes |
|---|---|---|---|---|---|
| Output current | | | 3 | A | |
| Efficiency | 96 | 98 | | % | |
| Internal voltage drop | | 3.0 | 5.0 | V | @ 3A, 100°C baseplate |
| External capacitance | | | | | See Figure 5 on page 4. |
| | 10 | | 22 | µF | 400V |

### 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) | 3.5 | | 5.0 | $V_{DC}$ | 100kΩ internal pull-up resistor |

### 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, CS114, CS115, CS116 | |

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.

## Specifications (Cont.)

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

### General Specifications

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

### 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, 1,3,5 ft.
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 | vicorpower.com | vicorpower.com |

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

## 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.

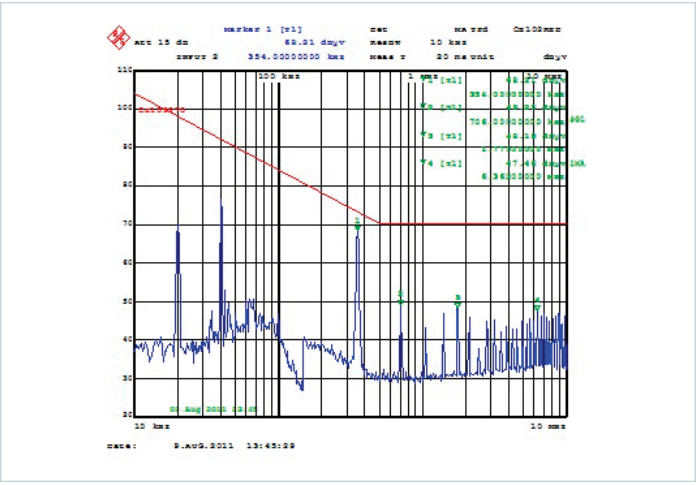


***Figure 1 —*** *Conducted noise; M-FIAM3 and V300A48C500BG DC-DC converter operating at 270$V_{DC}$ input at 450W*

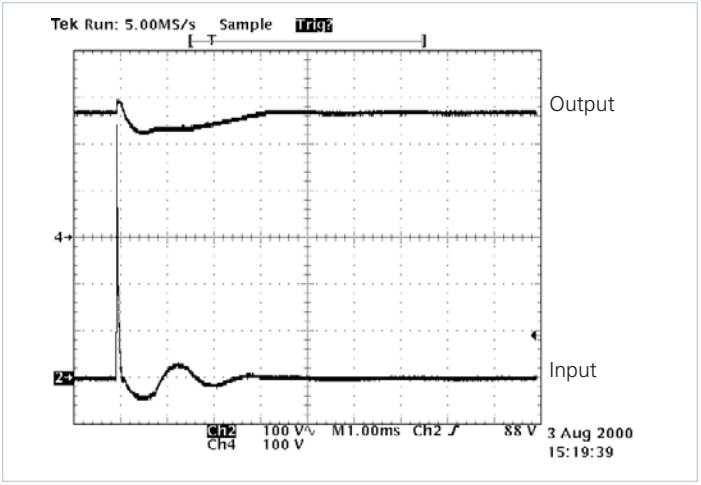



***Figure 2 —*** *Transient immunity; M-FIAM3 output response to an input transient*

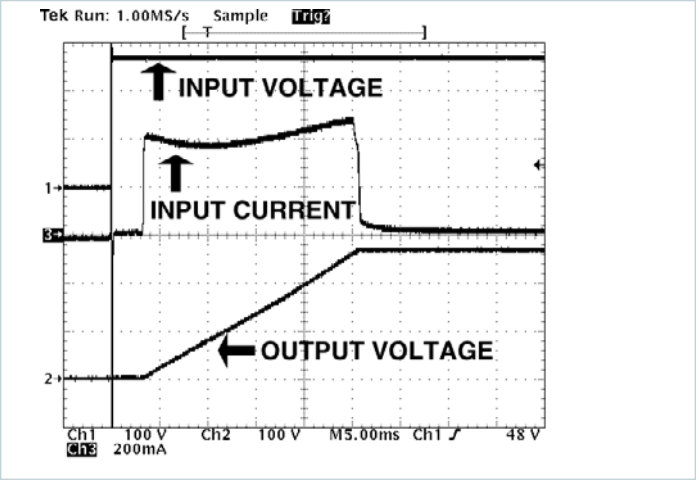



***Figure 3 —*** *Inrush limiting; inrush current with 22µF external capacitance, (C1 in Figure 5)*

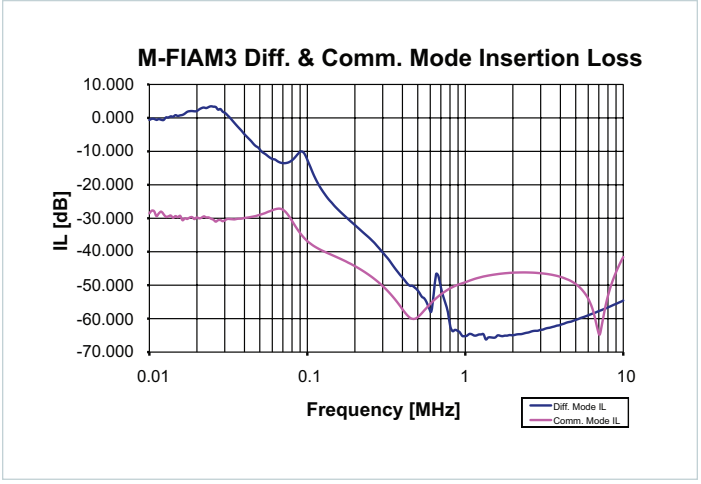



***Figure 4 —*** *Insertion loss curve*

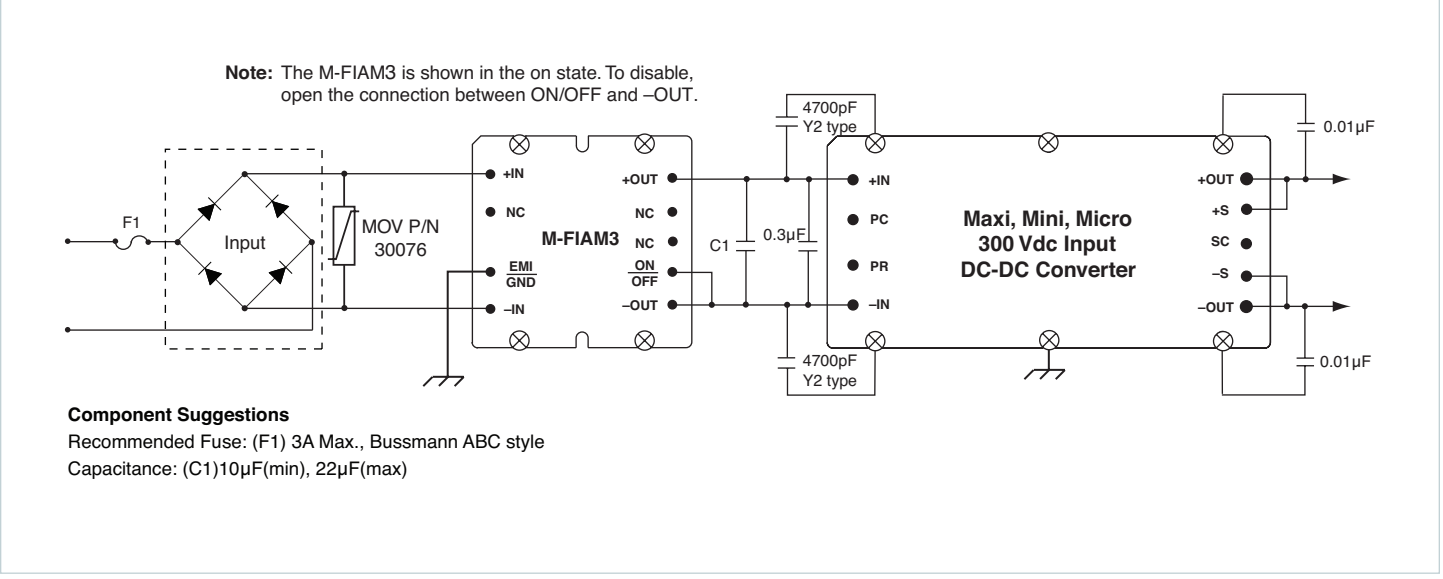
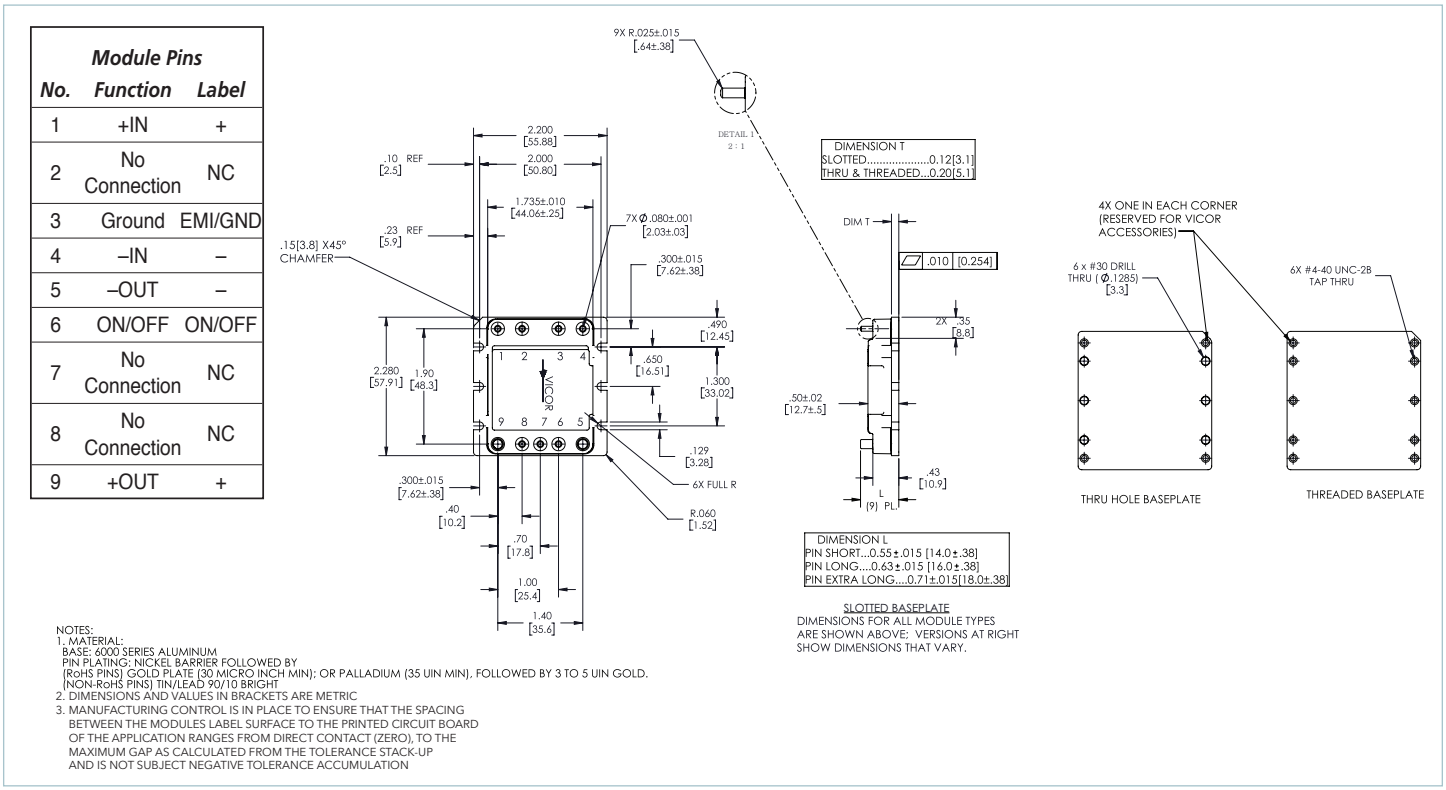



***Figure 5 —*** *Basic connection diagram with transient, surge protection and recommended reverse-polarity protection*

## Mechanical Drawings

| Module Pins | | |
|---|---|---|
| *No.* | *Function* | *Label* |
| 1 | +IN | + |
| 2 | No Connection | NC |
| 3 | Ground | EMI/GND |
| 4 | –IN | – |
| 5 | –OUT | – |
| 6 | ON/OFF | ON/OFF |
| 7 | No Connection | NC |
| 8 | No Connection | NC |
| 9 | +OUT | + |




NOTES:
1. MATERIAL:
BASE: 6000 SERIES ALUMINUM
PIN PLATING: NICKEL BARRIER FOLLOWED BY
(RoHS PINS) GOLD PLATE (30 MICRO INCH MIN); OR PALLADIUM (35 UIN MIN), FOLLOWED BY 3 TO 5 UIN GOLD.
(NON-RoHS PINS) TIN/LEAD 90/10 BRIGHT
2. DIMENSIONS AND VALUES IN BRACKETS ARE METRIC
3. MANUFACTURING CONTROL IS IN PLACE TO ENSURE THAT THE SPACING BETWEEN THE MODULES LABEL SURFACE TO THE PRINTED CIRCUIT BOARD OF THE APPLICATION RANGES FROM DIRECT CONTACT (ZERO), TO THE MAXIMUM GAP AS CALCULATED FROM THE TOLERANCE STACK-UP AND IS NOT SUBJECT NEGATIVE TOLERANCE ACCUMULATION

***Figure 6 —*** *Mechanical diagram*

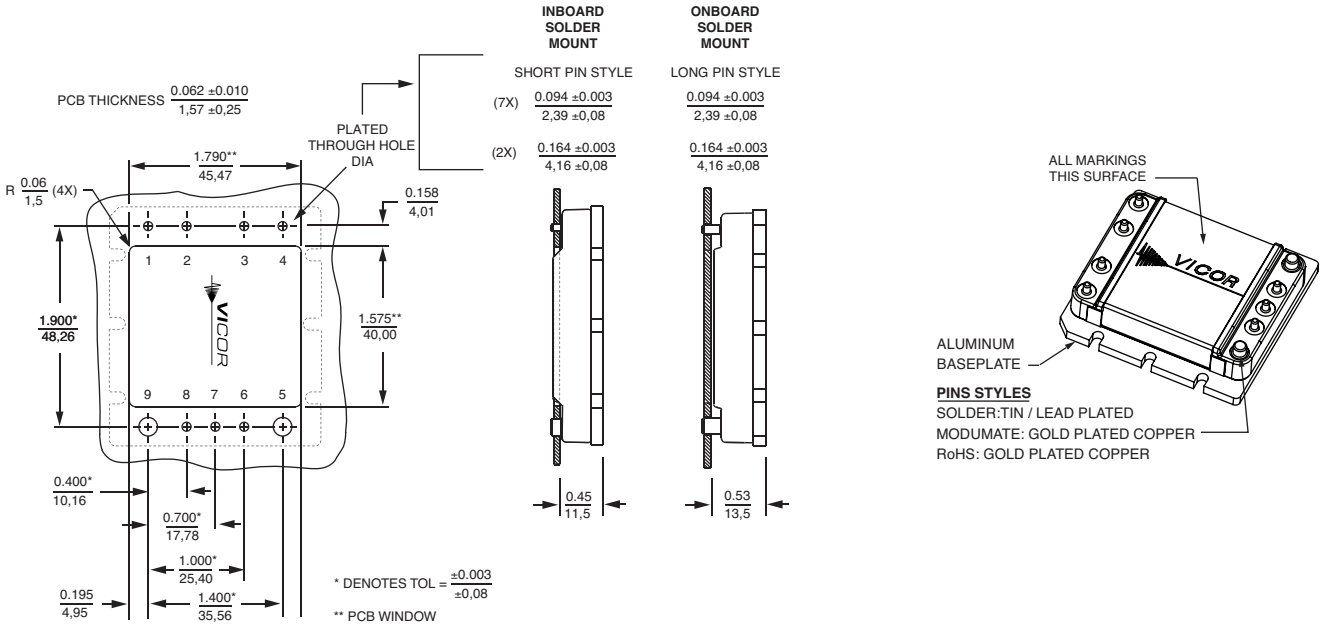



***Figure 7 —*** *PCB mounting specifications*

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**Vicor Corporation**
25 Frontage Road
Andover, MA, USA 01810
Tel: 800-735-6200
Fax: 978-475-6715
www.vicorpower.com

**email**
Customer Service: custserv@vicorpower.com
Technical Support: apps@vicorpower.com

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