



# Military COTS 28 Vin Filter

**M-FIAM5B**

Model Number **M-FIAM5BM21\***



## Input Attenuator Module

### Features

- EMI filtering-MIL-STD-461E<sup>[1]</sup>
- Transient protection-MIL-STD-704E/F
- Environments-MIL-STD-810, MIL-STD-202
- Environmental stress screening
- Low profile mounting options
- Output power up to 560 W
- Output current up to 20 A
- Mini sized package
- Inrush current limiting

### Product Highlights

The M-FIAM5B is a DC front-end module that provides EMI filtering and transient protection. The M-FIAM5B enables designers using Vicor's Maxi, Mini, Micro Series 24 V DC-DC converters to meet conducted emission / conducted susceptibility per MIL-STD-461E; and input transients per MIL-STD-704E/F. The M-FIAM5B accepts an input voltage of 14 – 36 Vdc and delivers output current up to 20 A.

M-FIAM5B is housed in an industry standard "half brick" module measuring 2.28" x 2.2" x 0.5" and depending upon model selected, may be mounted onboard or inboard for height critical applications.

### Compatible Products

- Maxi, Mini, Micro Series 24 V Input DC-DC converters
- 24 V Input VIPAC Arrays

<sup>[1]</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.



Actual Size:  
2.28 x 2.2 x 0.5 in  
57,9 x 55,9 x 12,7 mm

### Absolute Maximum Rating

| Parameter                 | Rating    | Unit   | Notes               |
|---------------------------|-----------|--------|---------------------|
| +In to -In                | 36        | Vdc    | Continuous          |
|                           | 50        | Vdc    | 12.5 ms, See Fig.3  |
| Mounting torque           | 5 (0.57)  | in-lbs | 6 each, #4-40 or M3 |
| Pin soldering temperature | 500 (260) | °F(°C) | <5 sec; wave solder |
|                           | 750 (390) | °F(°C) | <7 sec; 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 |
|                      | 1000 LFM                     |     | 2.2  | °C/Watt |

### MTBF per MIL-HDBK-217F (M-FIAM5BM21)

| Temperature | Environment                      | MTBF  | Unit      |
|-------------|----------------------------------|-------|-----------|
| 25°C        | Ground Benign: G.B.              | 2,533 | 1,000 Hrs |
| 50°C        | Naval Sheltered: N.S.            | 456   | 1,000 Hrs |
| 65°C        | Airborne Inhabited Cargo: A.I.C. | 375   | 1,000 Hrs |

### Part Numbering



<sup>[2]</sup> Compatible with SurfMate and InMate socketing system

<sup>[3]</sup> Not intended for socket or Surfmate mounting

## 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  | 36    | Vdc              | Continuous   |
| Inrush limiting    |     |     | 0.007 | A/ $\mu\text{F}$ |  |
| Transient immunity |     |     | 50    | Vdc              | 12.5 ms per MIL-STD-704E/F, continuous operation<br>Test conditions AA and FF normal overvoltage transients per MIL-HDBK-704 |

### OUTPUT SPECIFICATIONS

| Parameter             | Min | Typ | Max  | Unit          | Notes                          |
|-----------------------|-----|-----|------|---------------|--------------------------------|
| Output current        |     |     | 20   | A             |                                |
| Output power          |     |     | 560  | W             |                                |
| Efficiency            | 96  | 98  |      | %             |                                |
| Internal voltage drop |     | 0.5 | 0.7  | Vdc           | @20 A, 100°C baseplate         |
| External capacitance  | 330 |     | 1000 | $\mu\text{F}$ | See Figure 6 on page 5<br>50 V |

### CONTROL PIN SPECIFICATIONS

| Parameter      | Min | Typ | Max | Unit | Notes                                    |
|----------------|-----|-----|-----|------|--|
| ON/OFF control |     |     |     |      |  |
| Enable (ON)    | 0.0 |     | 1.0 | Vdc  | Referenced to – Vout                     |
| Disable (OFF)  | 3.5 |     | 5.0 | Vdc  | 100 k $\Omega$ internal pull up resistor |

### SAFETY SPECIFICATIONS

| Parameter            | Min | Typ | Max   | Unit | Notes                  |
|----------------------|-----|-----|-------|------|------------------------|
| Dielectric withstand |     |     | 1,500 | Vrms | Input / Output to Base |
|                      |     |     | 2,121 | Vdc  | 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.

### GENERAL SPECIFICATIONS

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

## SPECIFICATIONS (CONT.)

### ■ ENVIRONMENTAL QUALIFICATION

|                             |   |
|-----------------------------|---|
| <b>Altitude</b>             | MIL-STD-810F, Method 500.4, Procedure I & II, 40,000 ft. and 70,000 ft. Operational.  |
| <b>Explosive Atmosphere</b> | MIL-STD-810F, Method 511.4, Procedure I, Operational.   |
| <b>Vibration</b>            | 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 5.6 G rms for 4 hours per axis. MIL-STD-810F, Method 514.5C, General Minimum Integrity Curve per Figure 514.5C-17 with overall level of 7.7 G rms for 1 hour per axis. |
| <b>Shock</b>                | MIL-STD-810F, Method 516.5, Procedure I, Functional Shock, 40 g. MIL-S-901D, Lightweight Hammer Shock, 3 impacts/axis, 1,3,5 ft. MIL-STD-202F, Method 213B, 60 g, 9 ms half sine. MIL-STD-202F, Method 213B, 75 g, 11 ms Saw Tooth Shock.   |
| <b>Acceleration</b>         | MIL-STD-810F, Method 513.5, Procedure II, table 513.5-II, Operational, 2-7 g, 6 directions.   |
| <b>Humidity</b>             | MIL-STD-810F, Method 507.4.   |
| <b>Solder Test</b>          | MIL-STD-202G, Method 208H, 8 hour aging.  |

### ■ ENVIRONMENTAL STRESS SCREENING

| Parameter                           | H-Grade  | M-Grade  |
|-------------------------------------|--|--|
| Operating temperature               | -40°C to +100°C                                    | -55°C to +100°C                                    |
| Storage temperature                 | -55°C to +125°C                                    | -65°C to +125°C                                    |
| Temperature cycling*                | 12 cycles<br>-65°C to +100°C                       | 12 cycles<br>-65°C 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°C and +100°C                                   | -55°C 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 — Shut Down Time of M-FIAM5B vs. Overvoltage



Figure 2 — Conducted Noise; M-FIAM5B and Model V24A12M400B DC-DC converter operating at 28 Vdc, 400 W.



Figure 3 — Transient Immunity: M-FIAM5B output response to an input transient.



Figure 4— Inrush Limiting: Inrush current with 1000  $\mu$ F external capacitance, (C1 in Figure 6)

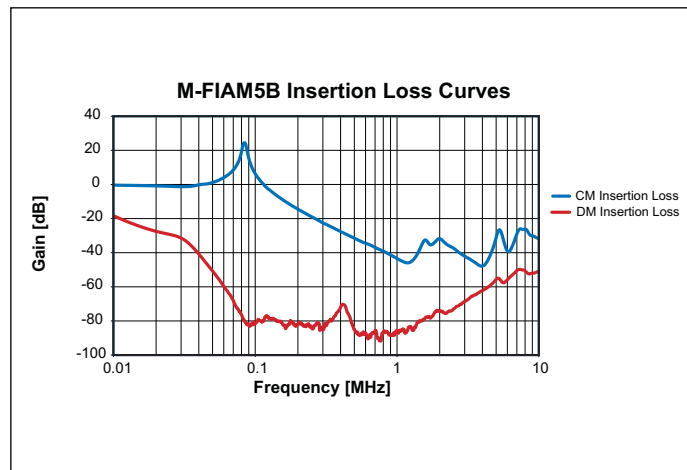


Figure 5 — Insertion Loss



**Figure 6**—Basic connection diagram with suggested Transient, Surge Protection and Recommended Reverse Polarity Protection.

MECHANICAL DRAWINGS



Figure 7 — Mechanical diagram



Figure 8 — PCB Mounting Specifications.

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