Military COTS 28V_{IN} Filter

M-FIAM5B

Example Model Number **M-FIAM5BM21**

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

CE

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 power up to 560W
- Output current up to 20A
- 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 Maxi, Mini, Micro Series 24V 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 – 36V_{DC} and delivers output current up to 20A.

M-FIAM5B 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 24V Input DC-DC converters
- 24V Input VIPAC Arrays™

Absolute Maximum Rating

Parameter	Rating	Unit	Notes
+IN to –IN	36	V_{DC}	Continuous
	50	V_{DC}	12.5ms, See Figure 3
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-FIAM5BM21)

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

Part Numbering

M-FIAM5B | **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. As such, external components in addition to those listed herein may be required in specific instances to gain full compliance to the standards specified.
[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	14	28	36	V_{DC}	Continuous
Inrush limiting			0.007	A/µF	
Transient immunity			50	V_{DC}	12.5ms per MIL-STD-704E/F, continuous operation 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	V_{DC}	@ 20A, 100°C baseplate
External capacitance					See Figure 6 on page 5
	330		1000	µF	50V

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.

General Specifications

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

Specifications (Cont.)

Typical at T_{BP} = 25°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 –65 to +100°C	12 cycles –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.

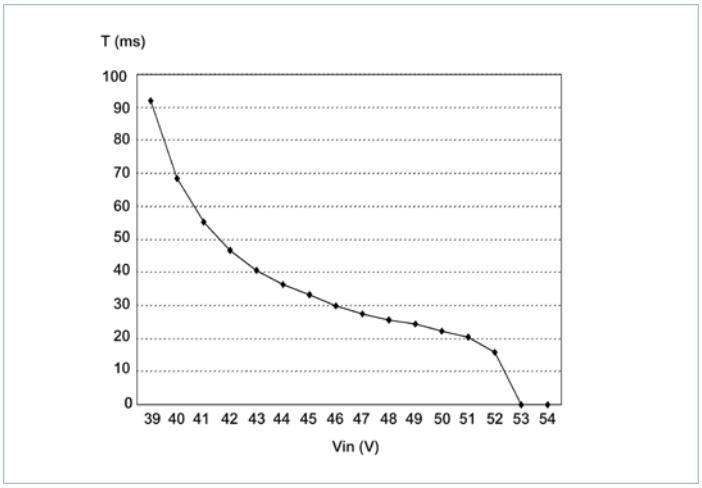


Figure 1 — *Shut-down time of M-FIAM5B vs. overvoltage*

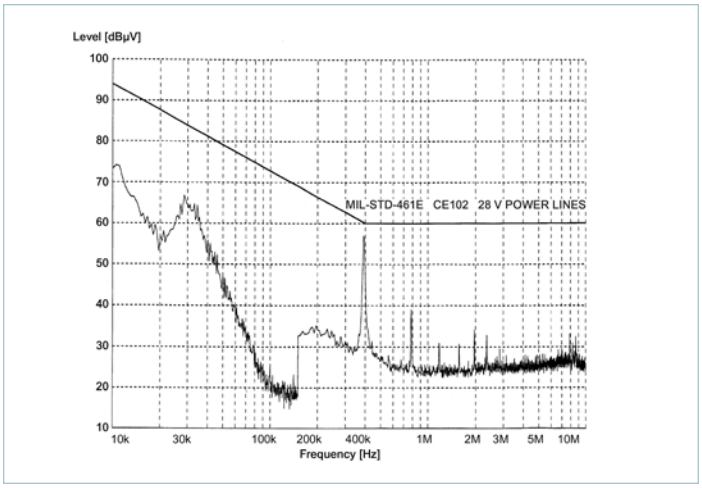


Figure 2 — *Conducted noise; M-FIAM5B and Model V24A12M400B DC-DC converter operating at 28V_{DC}, 400W*

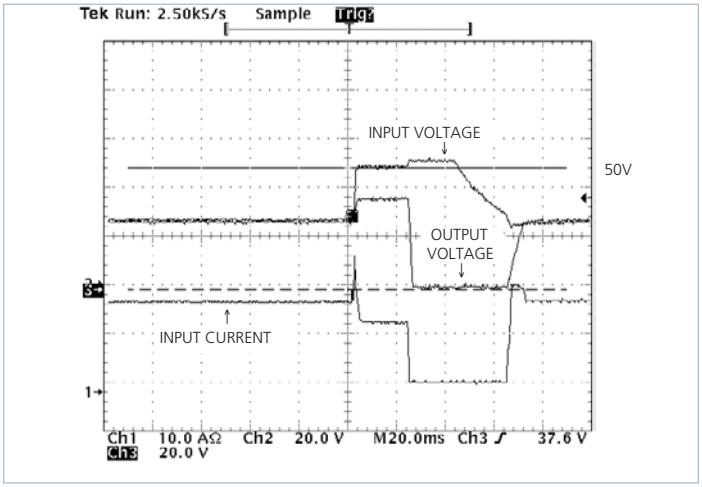


Figure 3 — *Transient immunity: M-FIAM5B output response to an input transient*

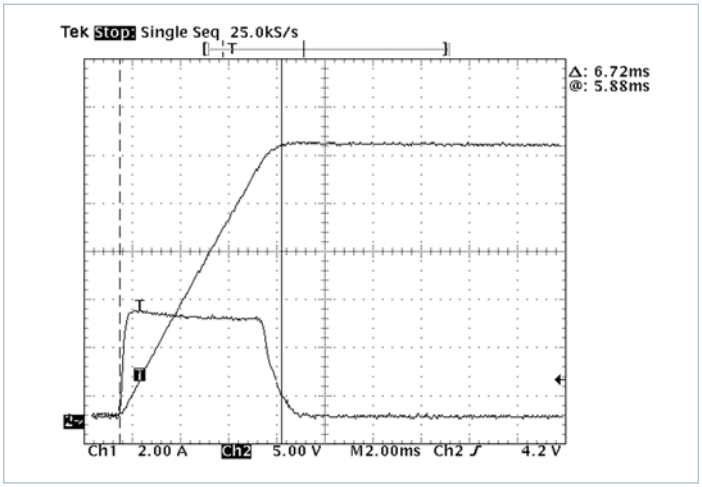


Figure 4 — *Inrush limiting: inrush current with 1000µF external capacitance, (C1 in Figure 6)*

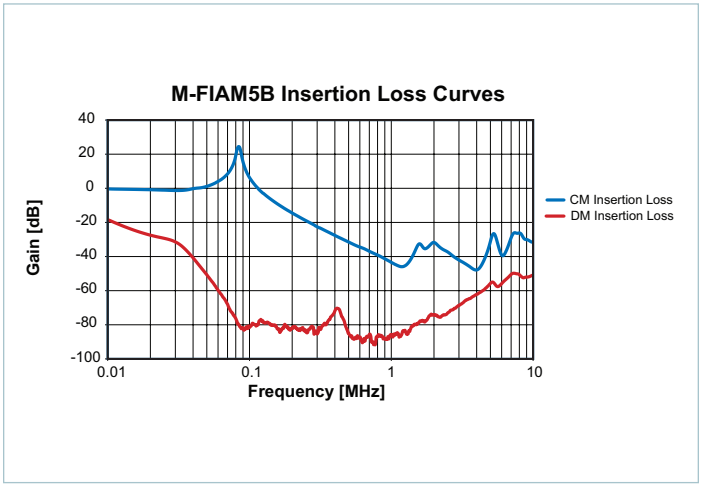
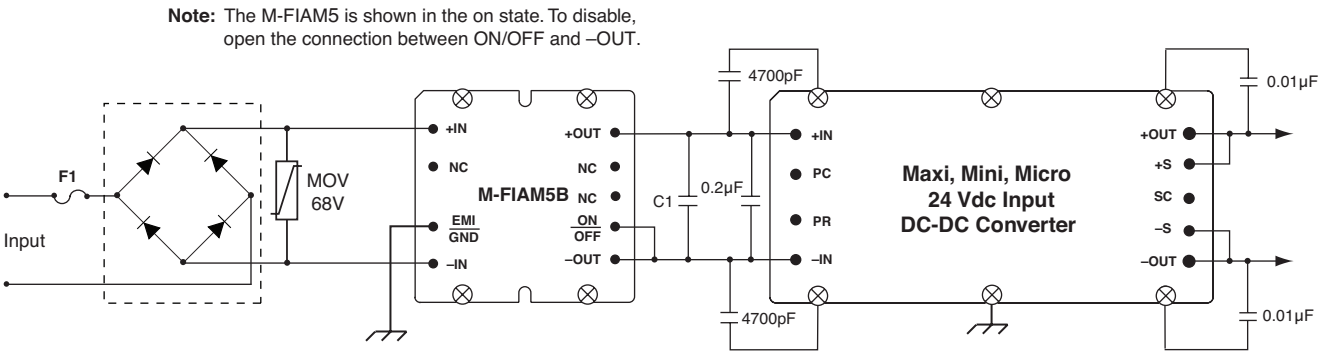


Figure 5 — *Insertion loss*

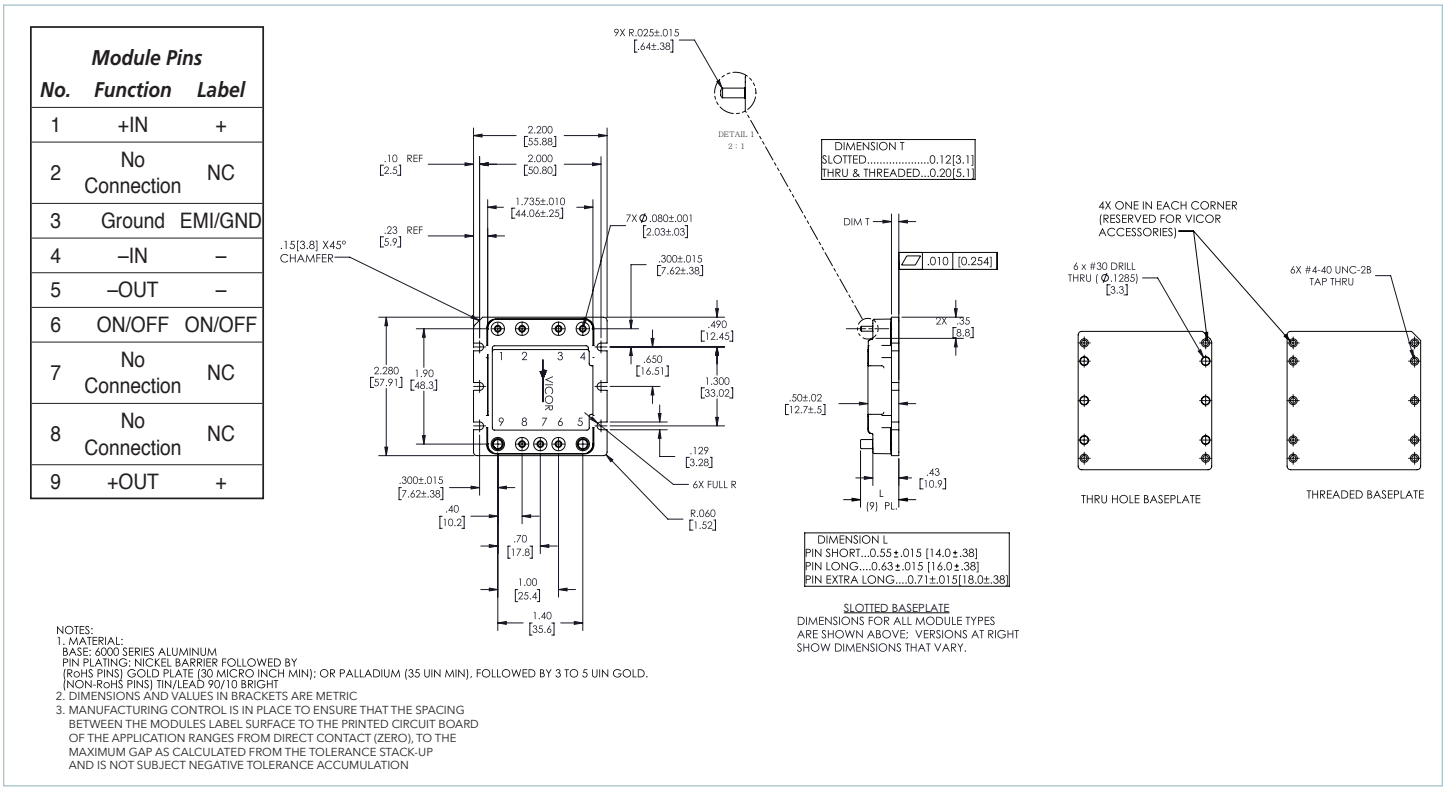


Component Suggestions
Recommended Fuse: (F1) 20A (max), Bussmann ABC style
Capacitance: (C1) 330µF (min), 1000µF (max)
MOV: Panasonic ERZV10D680 or equivalent

Figure 6 — *Basic connection diagram with suggested 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 7 — *Mechanical diagram*

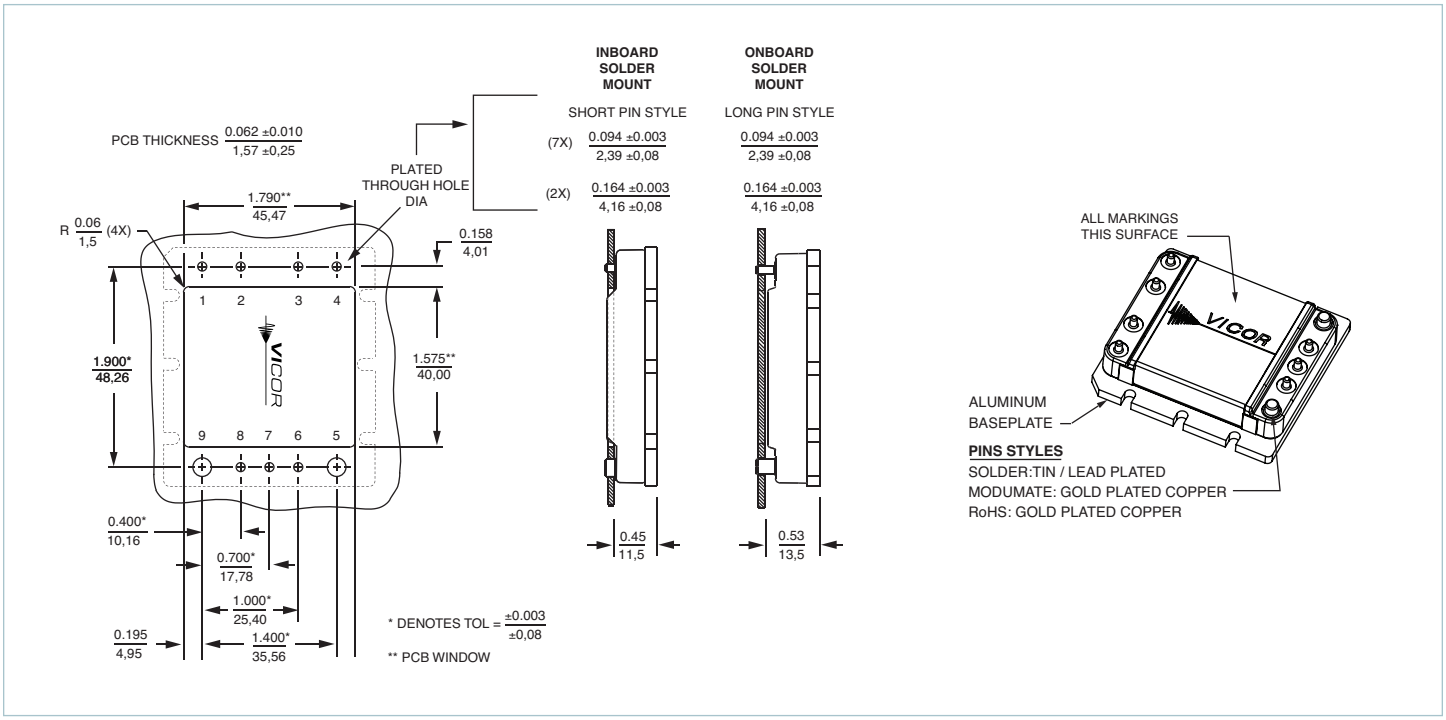


Figure 8 — *PCB mounting specifications.*

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