Military COTS 270V_{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 – 375V_{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 –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.

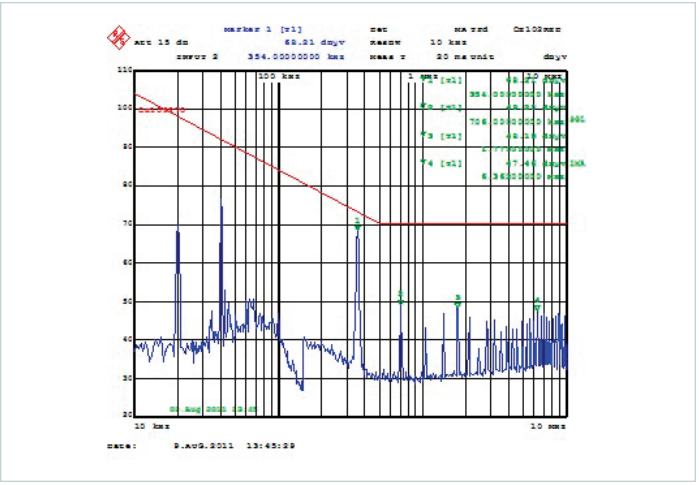


Figure 1 — *Conducted noise; M-FIAM3 and V300A48C500BG DC-DC converter operating at 270V_{DC} input at 450W*

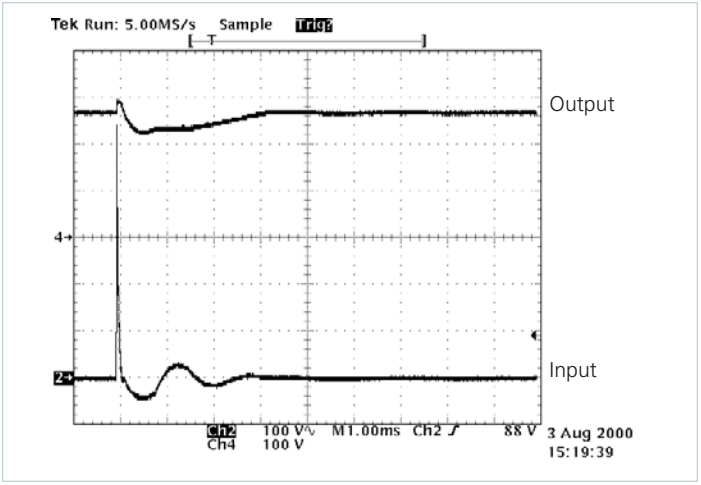


Figure 2 — *Transient immunity; M-FIAM3 output response to an input transient*

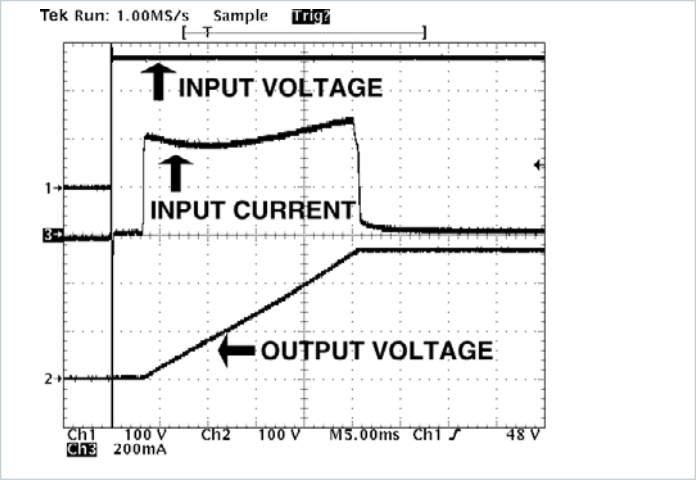


Figure 3 — *Inrush limiting; inrush current with 22µF external capacitance, (C1 in Figure 5)*

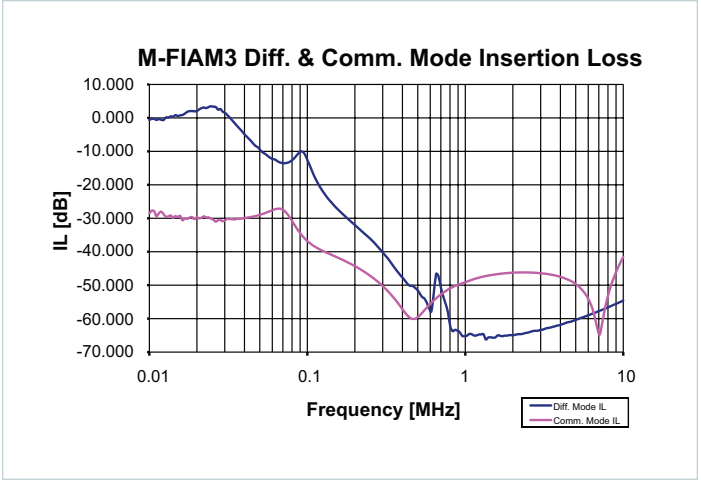


Figure 4 — *Insertion loss curve*

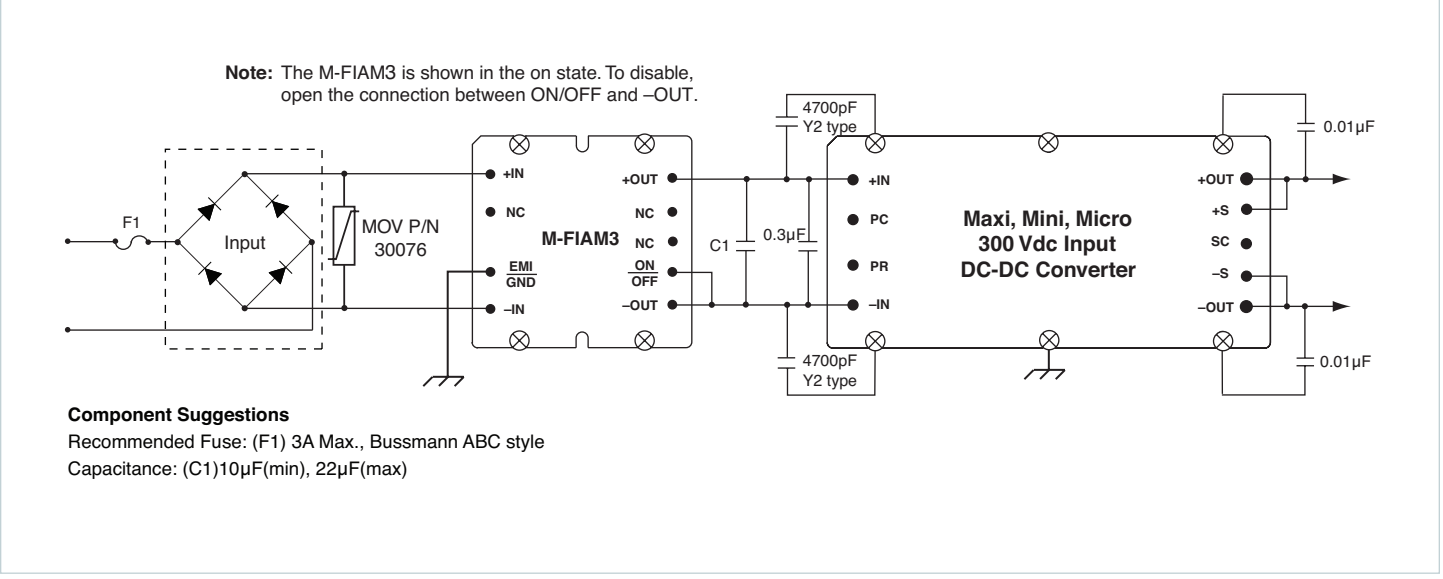
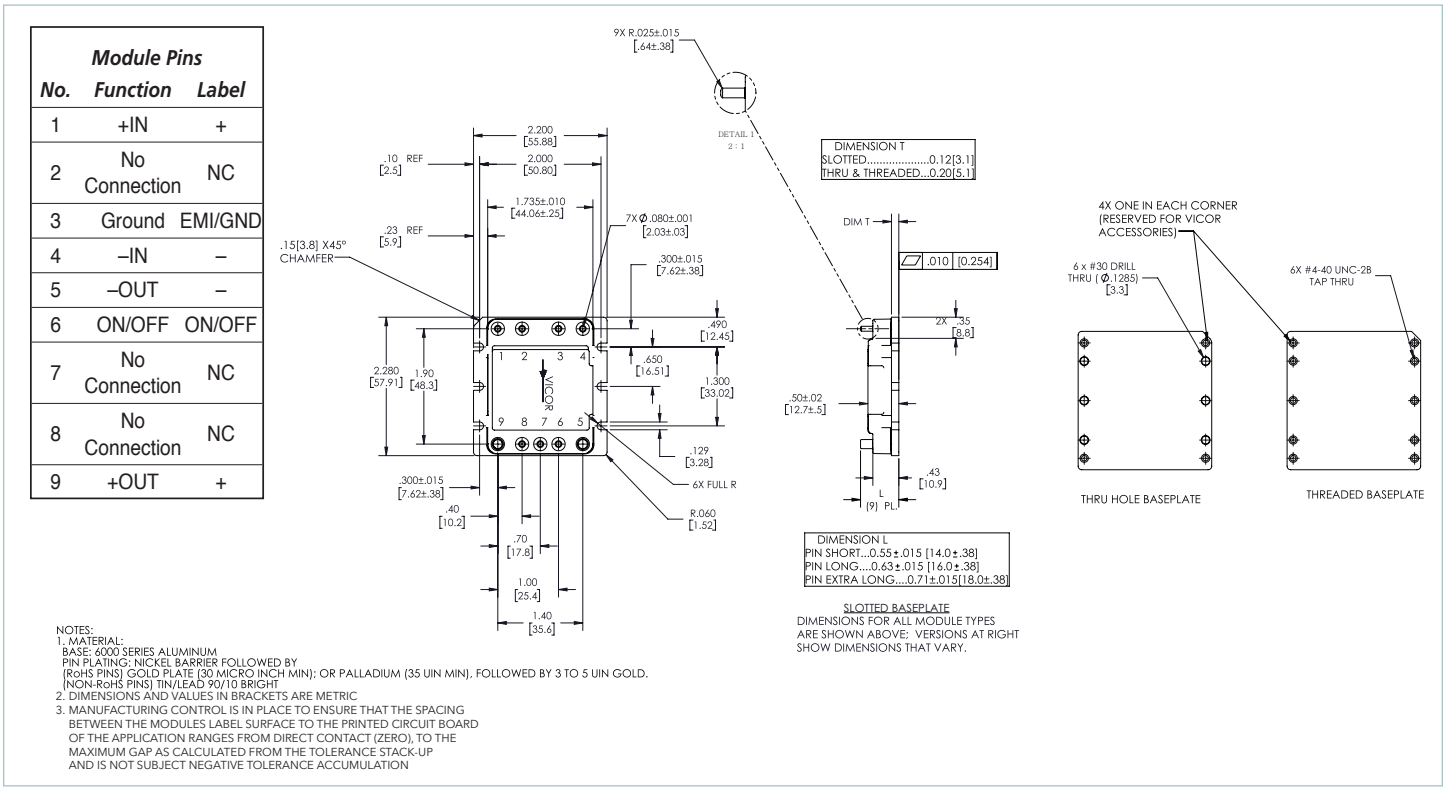


Figure 5 — *Basic connection diagram with transient, surge protection and recommended reverse-polarity protection*

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*

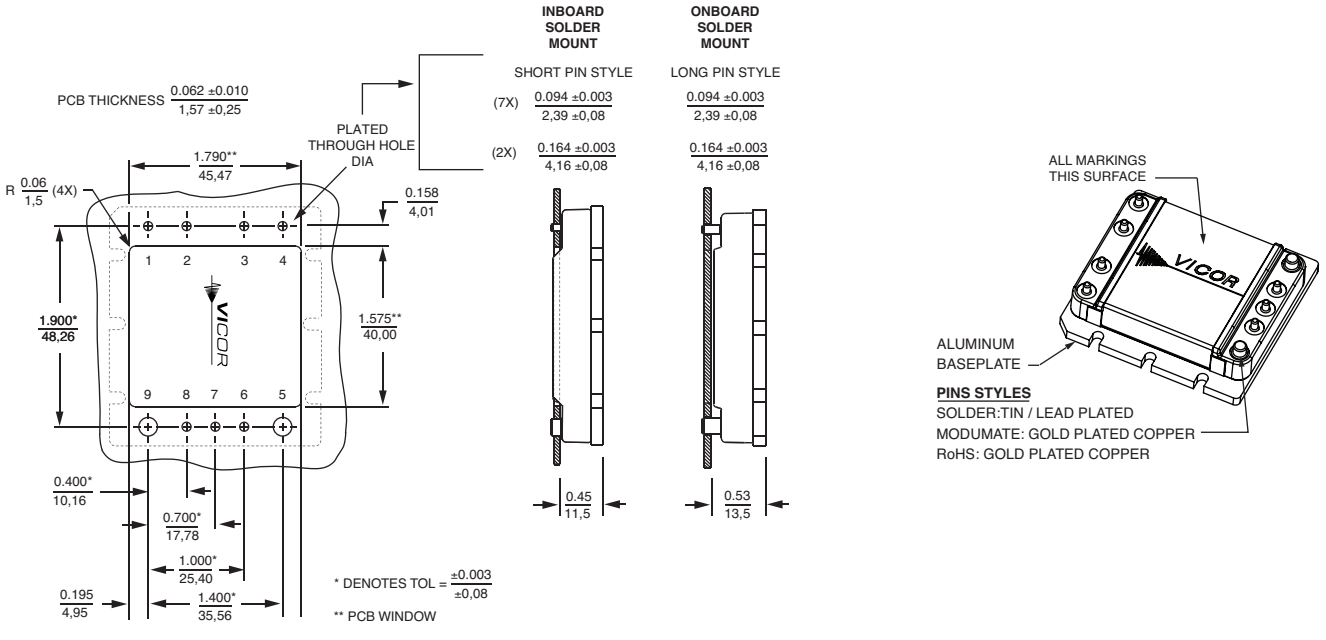


Figure 7 — *PCB mounting specifications*

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Contact Us: http://www.vicorpower.com/contact-us

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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Общество с ограниченной ответственностью «МосЧип» ИНН 7719860671 / КПП 771901001
Адрес: 105318, г.Москва, ул.Щербаковская д.3, офис 1107

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Офис по работе с юридическими лицами:

105318, г.Москва, ул.Щербаковская д.3, офис 1107, 1118, ДЦ «Щербаковский»

Телефон: +7 495 668-12-70 (многоканальный)

Факс: +7 495 668-12-70 (доб.304)

E-mail: info@moschip.ru

Skype отдела продаж:
moschip.ru
moschip.ru_4
moschip.ru_6
moschip.ru_9