Data Sheet
110 V FIAM™
Filter Input Attenuator Module

Features

- RoHS Compliant (with F or G pin style)
- EMI filtering-EN50121-3-2*
- Transient protection-EN50155, EN50121-3-2
- Low profile mounting options
- 500 W output power
- 60950-1 compliance
- Mini-size package
- Inrush current limiting

Product Highlights

The FIAM110 is a DC front-end module designed for rail applications providing transient protection, inrush current limiting and EMI filtering (EN50121-3-2) in a Mini-size package. The FIAM enables designers using Vicor 110 Vin Mini, Micro, or Maxi or VI/VE-200 and VI/VE-J00 (T input) DC-DC converters to meet the transient immunity and EMI requirements required for the rail industry and protect system hardware from inrush current. The FIAM110 accepts an input voltage of 66 – 154 Vdc and provide up to 500 W of output power and remote on/off control.

The FIAM110 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 on-board or in-board for height critical applications.

Compatible Products

- Mini, Micro, Maxi 110 V Input DC-DC converters
- VI / VE-200, VI / VE-J00 ("T" input)

**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.*

Shown 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	154	Vdc	Continuous
	385	V	20 ms
+Out to –Out	154	Vdc	Continuous
Mounting torque	5(0.57)	in-lbs	6 each, #4-40 or M3
Operating temperature	– 55 to +100	°C	M -Grade
Storage temperature	– 65 to +125	°C	M -Grade
Pin soldering temperature	500 (260)	°F(°C)	<5 sec; wave solder
	750 (390)	°F(°C)	<7 sec; hand solder

Thermal Resistance

Parameter	Min	Typ	Max	Unit
Baseplate to sink				
flat, greased surface		0.16		°C/Watt
thermal pad (P/N 20264)		0.14		°C/Watt
Baseplate to ambient				
Free Convection		8.0		°C/Watt
1000 LFM		1.9		°C/Watt

Part Numbering

FIAM **110** **C** **1** **1**

- **FIAM** — *Product*
- **110** — *110 Vin Nominal*
- **C** — *Product Grade Temperatures (°C)*

Grade	Operating	Storage
E	–10 to +100	–20 to 125
C	–20 to +100	–40 to 125
T	–40 to +100	–40 to 125
H	–40 to +100	–55 to 125
M	–55 to +100	–65 to 125

- **1** — *Pin Style*
  - 1 = Short
  - 2 = Long
  - S = Short ModuMate
  - N = Long ModuMate
  - F = Short RoHS
  - G = Long RoHS
- **1** — *Baseplate*
  - 1 = Slotted
  - 2 = Threaded
  - 3 = Thru-hole

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	66	110	154	Vdc	Continuous
Inrush limiting			0.06	A/µF	
Transient immunity			176	Vdc	Consistent with 100 ms per NF F 01-510
			165	Vdc	Consistent with 1 s per RIA 12
			385	Vdc	Consistent with 20 ms per RIA 12

■ OUTPUT SPECIFICATIONS

Parameter	Min	Typ	Max	Unit	Notes
Output power			500	W	Output power derates linearly below 77 Vin to 400 W @ 66 Vin
Efficiency		98		%	
Internal Voltage Drop			2.5	V	500 W at 25°C baseplate
External capacitance			100	µF	

■ CONTROL PIN SPECIFICATIONS

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

■ EMI

Standard	Notes
EN50121-3-2	150 kHz to 500 kHz - 99 dBµV quasi-peak 500 kHz to 30 kHz - 93 dBµV quasi-peak

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.

■ IMMUNITY

Parameter	Typ. Value	Units	Notes
EN50121-3-2 (Table 7.3 Surges)	±2,000 ±1,000	Vdc Vdc	Waveform – 1.2 / 50 µs, 42 Ω, 0.5 µF, line to ground Waveform – 1.2 / 50 µs, 42 Ω, 0.5 µF, line to line Performance Criteria B - no damage to the product but a temporary change in the intended DC voltage is acceptable as long as it self-recovers without user intervention.
EN50121-3-2 (Table 7.2 Fast Transients)	±2,000	Vdc	5/50 ns, 5 kHz Performance Criteria A - no damage to the product and no change to the intended DC voltage level for a duration greater than 1.0 µsec.
EN50121-3-2 (Table 7.1 RF Common Mode)			0.15 to 80 MHz, 10 Vrms, 80% AM, 1 kHz Performance Criteria A - no damage to the product and no change to the intended DC voltage level greater than +/- 5%.

■ SAFETY SPECIFICATIONS

Parameter	Min	Typ	Max	Unit	Notes
Dielectric withstand (I/O to baseplate)		1,000		VRMS	
		1,414		Vdc	

Specifications (Cont.)

■ AGENCY APPROVALS

Safety Standards	Markings	Notes
UL60950-1, CSA60950-1, EN60950-1, IEC 60950-1	cTUVus	Pending
EN60950-1	CE	Low Voltage Directive

■ GENERAL SPECIFICATIONS

Parameter	Min	Typ	Max	Unit	Remarks
Weight		3.1 (88)	4 (113)	ounces (grams)	
Warranty			2	years	

■ MODULE ENVIRONMENTAL QUALIFICATION

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

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

Vibration
EN 61373, Random Vibration: Category <0.3Kg, Freq range: 5-150Hz @ 5grms, 5hrs per axis.
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.

Shock
EN 61373, Shock: Long. / Trans. / Vert. Axis, peak acceleration: 5g / 2g / 1g, Duration: 50 ms/ 20 ms.
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.

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

Humidity
MIL-STD-810F, Method 507.4.

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

■ MODULE 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 -65°C to +100°C	12 cycles -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	vicorpower.com	vicorpower.com

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

Conducted Noise

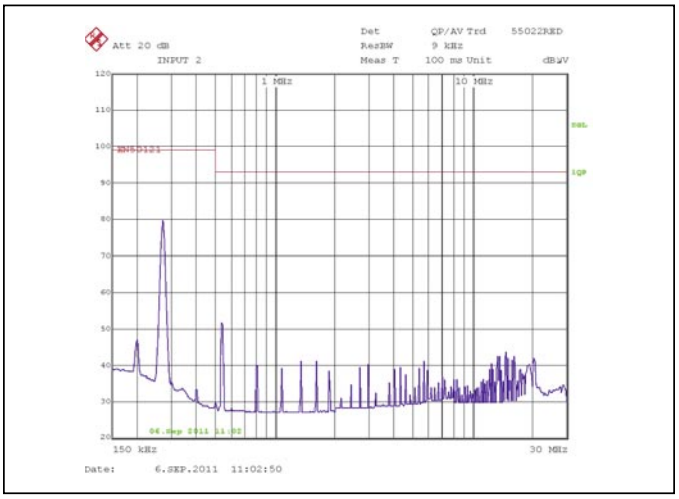


Figure 1 *— Conducted Noise (EN50121-3-2); FIAM110M21 and model V110A24C400BG DC-DC converter operating at 110 Vdc, 375 W.*

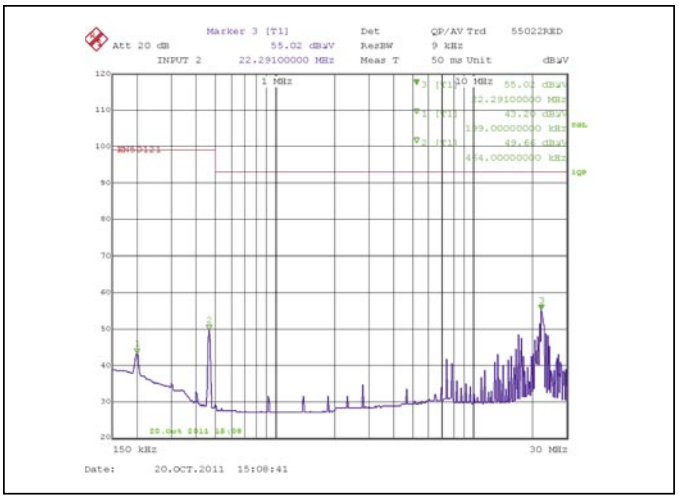


Figure 2 *— Conducted Noise (EN50121-3-2); FIAM110M21 and model VE-2T3-EW + (3) VI-BT3-IW DC-DC converters operating at 110 Vdc, 375 W.*

Insertion Loss

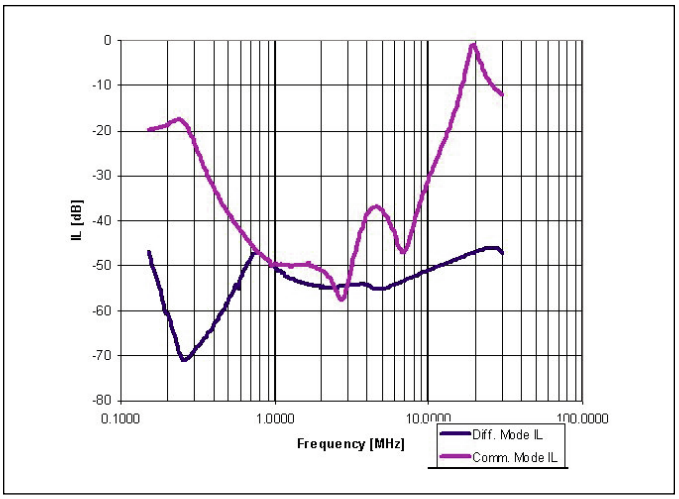


Figure 3 *— Insertion loss curve.*

Transient Immunity

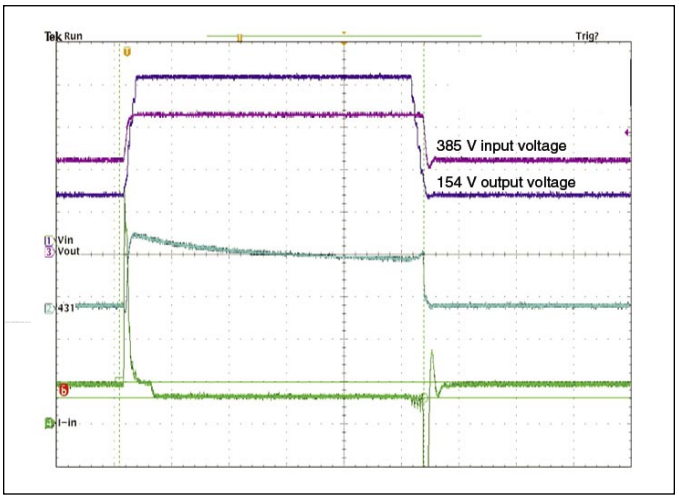


Figure 4 *— Transient Immunity: FIAM output response to an input transient.*

Inrush Limiting

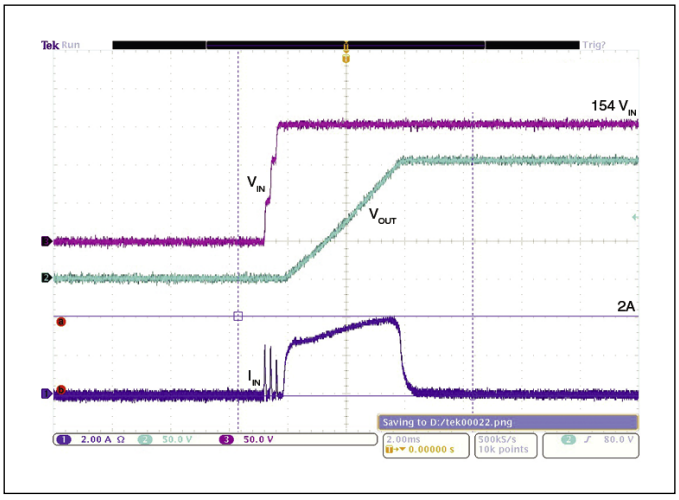


Figure 5 *— Inrush current. (100 µ F external capacitance)*

Transient and Surge Protection

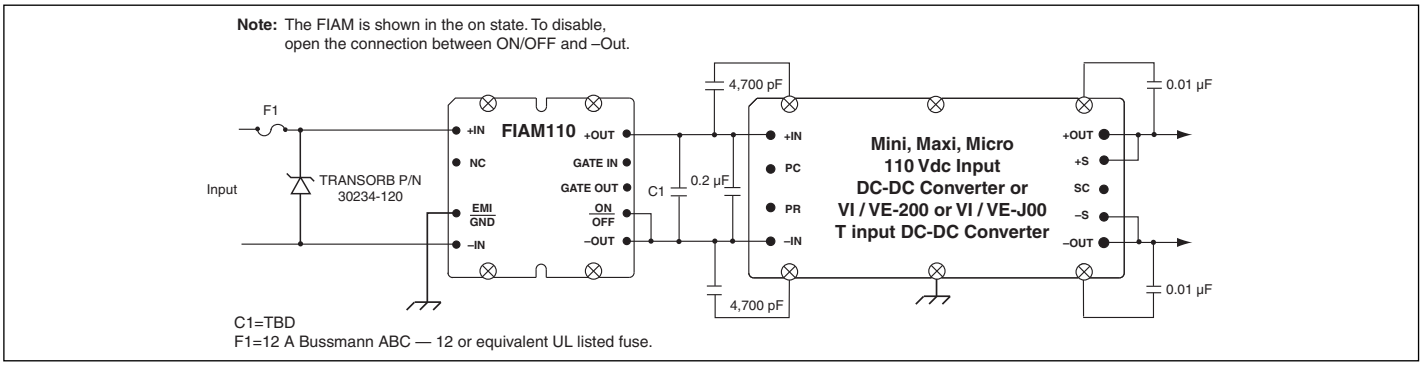
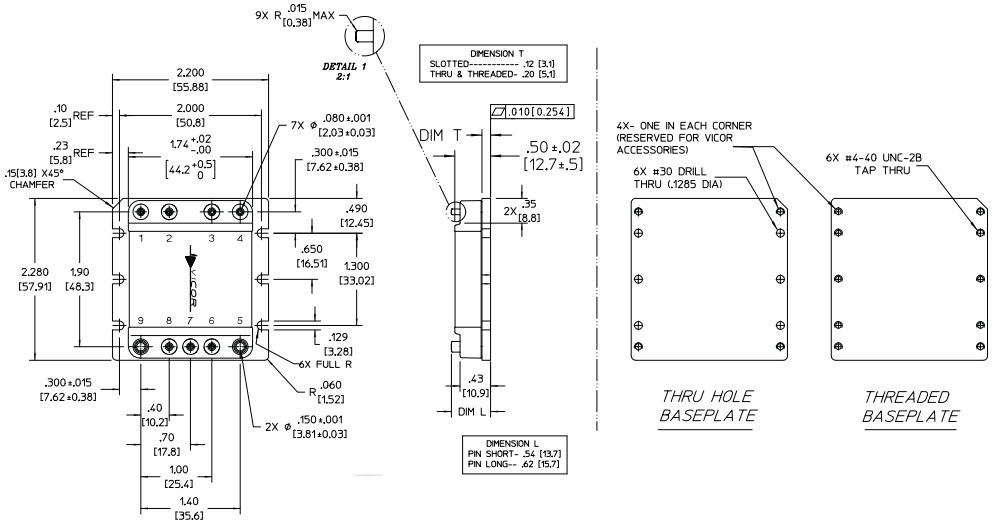


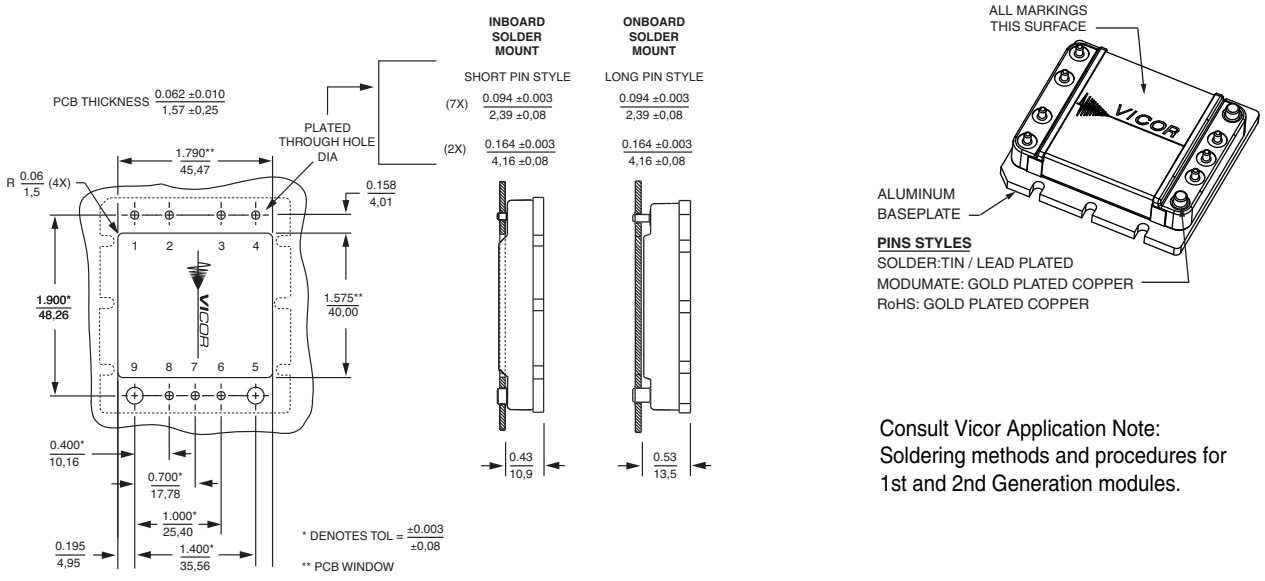
***Figure 6** — Typical connection diagram*

Mechanical Diagram

Converter 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	+



PCB Mounting Specifications



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