

Input Attenuator Module

Features

- EMI filtering-MIL-STD-461E^[1]
- Transient protection-MIL-STD-704A/E/F, MIL-STD-1275A/B/D
- Environments-MIL-STD-810, MIL-STD-202
- Environmental stress screening
- Low profile mounting options
- Output power up to 500 W
- Output current up to 18 A
- Mini sized package
- Inrush current limiting

Product Highlights

The M-FIAM9 is a DC front-end module that provides EMI filtering and transient protection. The M-FIAM9 enables designers using Vicor's 24 V or 28 V DC-DC converters to meet conducted emission / conducted susceptibility per MIL-STD-461E; and input transients per MIL-STD-704A/E/F and MIL-STD-1275A/B/D. The M-FIAM9 accepts an input voltage of 10 – 36 Vdc and delivers output power up to 500 W.

M-FIAM9 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 and 28 V Input DC-DC converters or VIPAC Arrays

^[1]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
	100	Vdc	50 mS, See Fig.1
	250	Vdc	70 µS
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
		0.1		°C/Watt
Baseplate to ambient Free convection		7.9		°C/Watt
		2.2		°C/Watt

MTBF per MIL-HDBK-217F (M-FIAM9M21)

Temperature	Environment	MTBF	Unit
25 °C	Ground Benign: G.B.	3,582	1,000 Hrs
50 °C	Naval Sheltered: N.S.	644	1,000 Hrs
65 °C	Airborne Inhabited Cargo: A.I.C.	505	1,000 Hrs

Part Numbering

M-FIAM9	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 ^[2] N = Long ModuMate ^[2] F = Short RoHS G = Long RoHS K = Extra Long RoHS ^[3]	Baseplate 1 = Slotted 2 = Threaded 3 = Through hole

^[2] Compatible with SurfMate and InMate socketing system

^[3] 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	10	28	36	Vdc	Continuous
Inrush limiting			0.007	A/ μF	Intended for use in Military Ground Vehicles where the power available is per MIL-STD-1275D. Internal capacitance is ~50 μF , which precedes the inrush limit circuit. External precautions should be taken if the source cannot tolerate the capacitive charge current associated with this internal capacitance.
Transient immunity			100	Vdc	50 ms per MIL-STD-1275A/B/D, continuous operation
			250	Vdc	70 μs per MIL-STD-1275A/B/D, continuous operation
			70	Vdc	20 ms per MIL-STD-704A, continuous operation
			50	Vdc	12.5 ms per MIL-STD-704E/F, continuous operation

■ OUTPUT SPECIFICATIONS

Parameter	Min	Typ	Max	Unit	Notes
Output power			500	W	See Figure 5 & 6
Output current			18	A	
Efficiency	96	97		%	
Internal voltage drop		0.85	1.5	V	500 W, 25 $^{\circ}\text{C}$ baseplate
External capacitance	330		1000	μF	See Figure 7 on page 5 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 Ω 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	When using with V28 series converters a 27 μH inductor is needed between the filter and converter for compliance below 30% of rated power.
Conducted susceptibility:	CS101, CS114, CS115, CS116	

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SPECIFICATIONS (CONT.)

■ 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, 40,000 ft. and 70,000 ft. 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 5.6 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 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, 11ms 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.

■ 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.

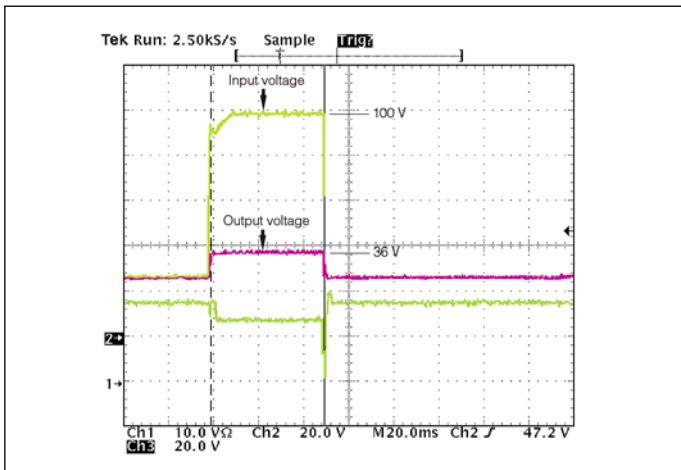


Figure 1 — Transient Immunity: M-FIAM9 output response to an input transient

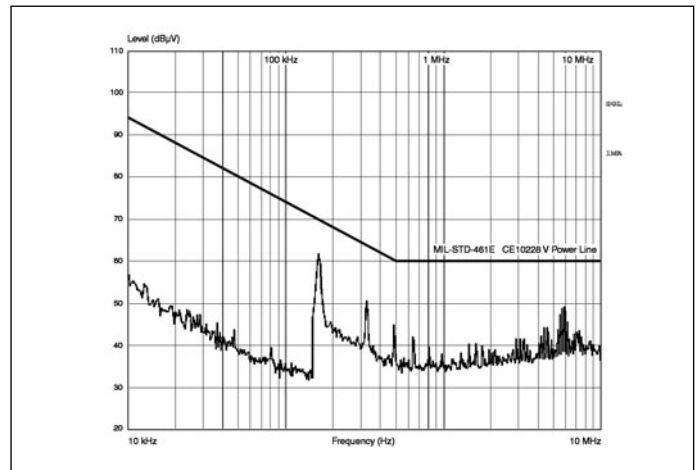


Figure 2 — Conducted Noise; M-FIAM9 and model V28A12M200B DC-DC converter operating at 28 Vdc, 200 W

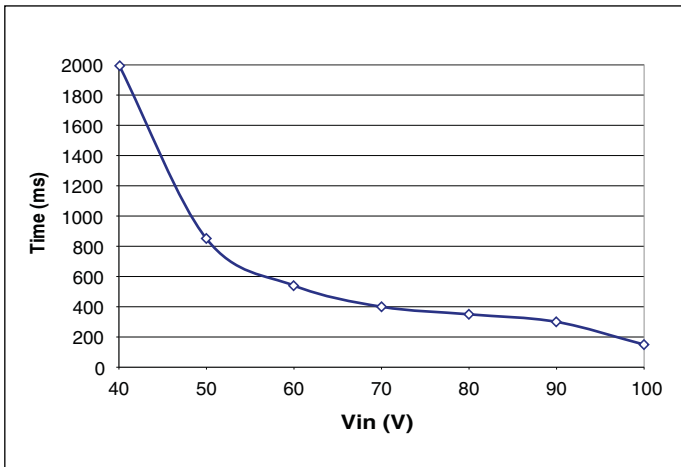


Figure 3 — Shut down time of M-FIAM9 vs. overvoltage

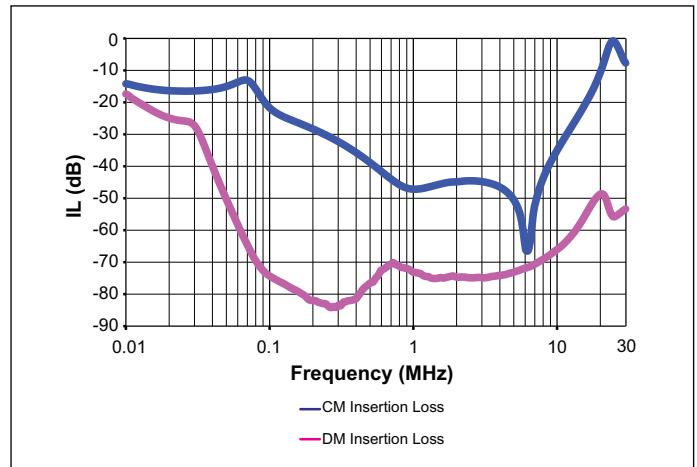


Figure 4 — M-FIAM9 insertion loss

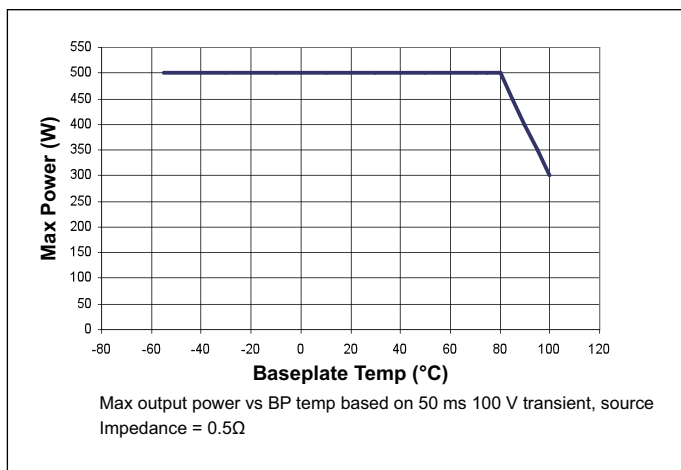


Figure 5 — Temperature de-rating

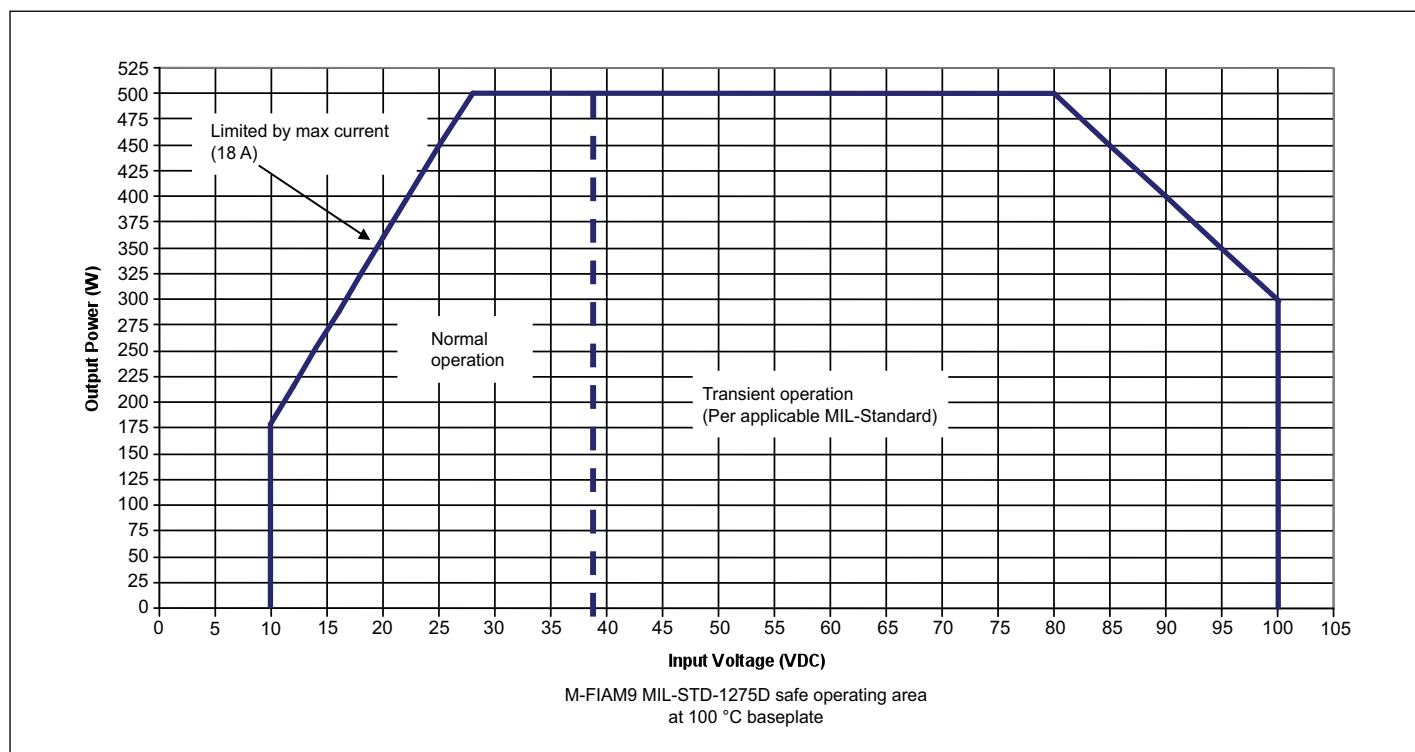


Figure 6 — M-FIAM 9 transient safe operating area at 100 °C baseplate

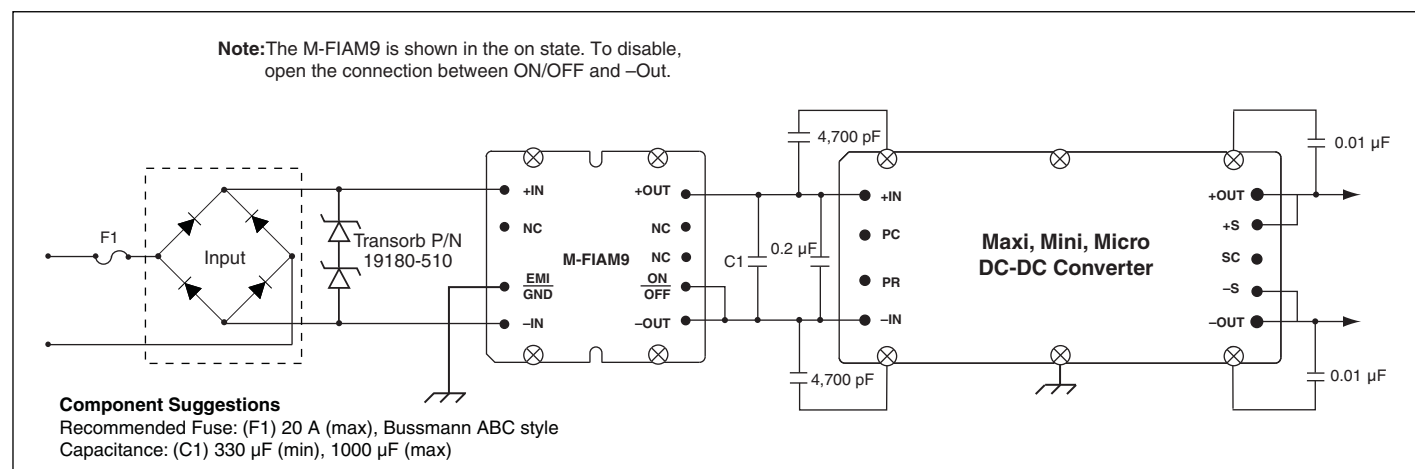


Figure 7 — Transient, surge protection and recommended reverse polarity protection

MECHANICAL DRAWINGS

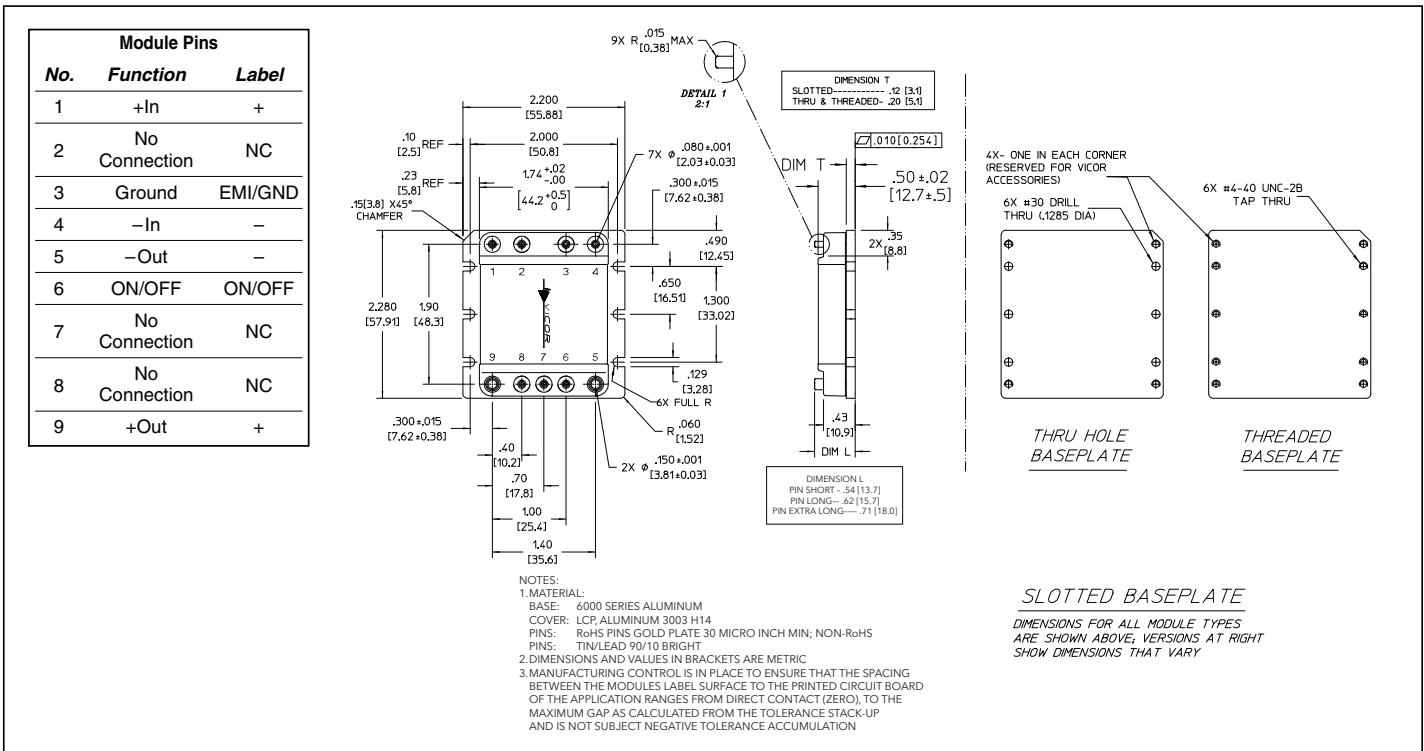


Figure 8 — Mechanical diagram

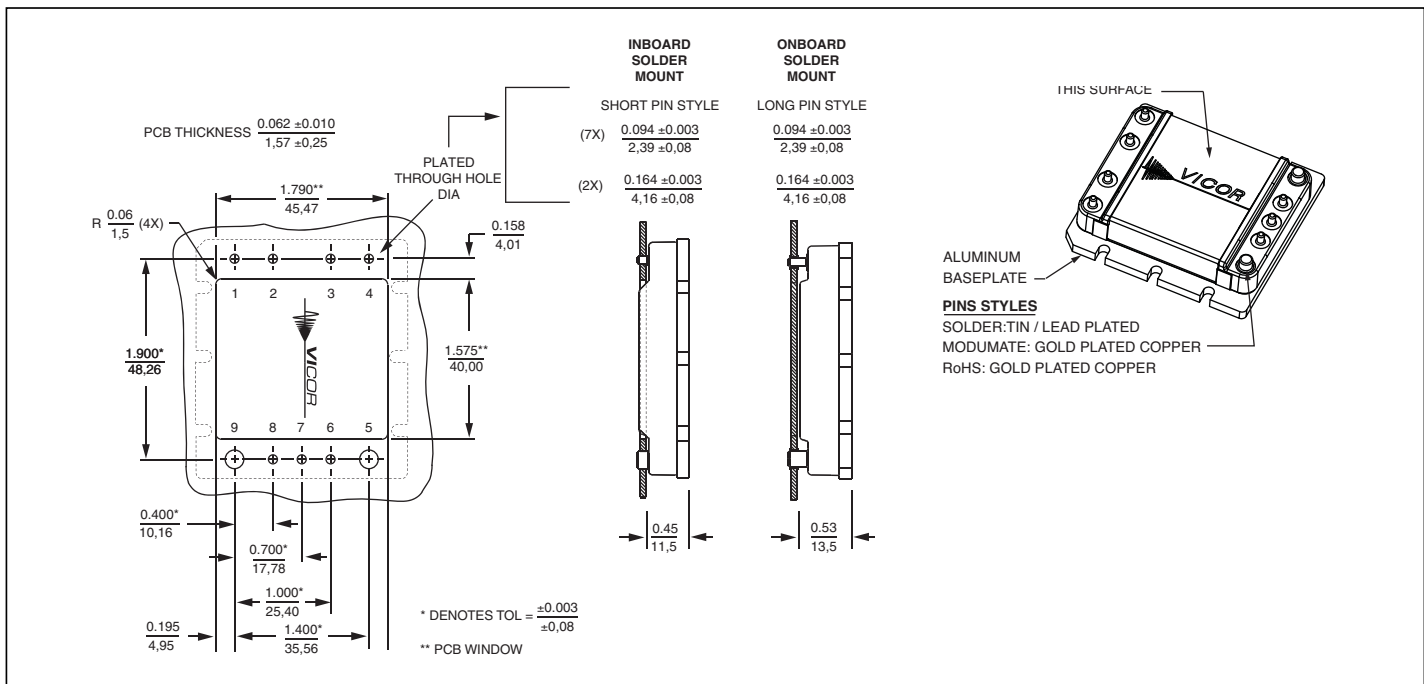


Figure 9 — PCB mounting specifications

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