

Military COTS Product Catalog



Field Tested... Proven Reliability

Vicor's military COTS products have been and continue to be selected for use in a wide variety of strategic military and aerospace applications.

Partial Listing:

- ★ F-15
- ★ F-16
- ★ F/A-18
- ★ F/A-22
- ★ F-35 JSF
- ★ P-3 Orion
- ★ Tornado
- ★ AWACS
- ★ JSTARS
- ★ Predator UAV
- ★ Eurofighter Typhoon
- ★ Global Hawk UAV
- ★ E-2C Hawkeye
- ★ Nimrod MRA4
- ★ EA-6B Prowler
- ★ B-1B Lancer
- ★ B-52 Stratofortress
- ★ C-130 Hercules
- ★ KC-135 Stratotanker
- ★ C-17 Globemaster
- ★ AH-64 Apache
- ★ Black Hawk
- ★ Bradley M2/M3
- ★ Abrams M1A1/M1A2
- ★ Harpoon Missile
- ★ Sting Ray Torpedo
- ★ Tow Missile
- ★ Tomahawk Cruise Missile
- ★ Patriot Missile Launcher
- ★ THAAD Missile Launcher
- ★ MLRS Missile Launcher
- ★ NASA Space Shuttle
- ★ International Space Station
- ★ SSN Seawolf Class Submarine
- ★ NSSN Virginia Class Submarine
- ★ Aegis Destroyer



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vicorpower.com

Military Standards

MIL-STD-704: Aircraft Electrical Power Characteristics

Module	MIL-STD-704A	MIL-STD-704D	MIL-STD-704E	MIL-STD-704F
MI-J2x-xx		★	★	★
MI-J6x-xx	N/A	★	★	★
MI-22x-xx		★	★	★
MI-26x-xx	N/A	★	★	★
MI-A22-xx	★	★	★	★
MI-A66-xx	N/A	★	★	★
MI-AIM-xx	★	★	★	★
24 Vin Series			★	★
300 Vin Series	N/A		★	★
M-FIAM3	N/A		★	★
M-FIAM5			★	★
MI-ComPAC 28 V	★	★	★	★
MI-ComPAC 270 V	N/A	★	★	★
MI-MegaMod 28 V		★	★	★
MI-MegaMod 270 V	N/A	★	★	★

MIL-STD-1275: Military Vehicle 28 Vdc Electrical Characteristics

Module	MIL-STD-1275A	MIL-STD-1275B
MI-A22-xx	★	★
MI-ComPAC 28 V	★	★

MIL-STD-1399: Interface Standard for Shipboard Systems

Module	MIL-STD-1399A	MIL-STD-1399B	MIL-STD-1399C
MI-J5x-xx	★	★	★
MI-25x-xx	★	★	★
MI-MegaMod 155 V	★	★	★

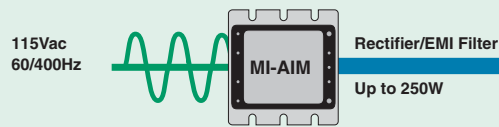
MIL-STD-461: Electromagnetic Emissions and Susceptibility Requirements

Module	MIL-STD-461C	MIL-STD-461D	MIL-STD-461E
MI-A22-xx, MI-A66-xx	CE01, CE03, CE07, CS01, CS02, CS06	CE101, CE102, CS101, CS114, CS116	CE101, CE102, CS101, CS114, CS115, CS116
M-FIAM3, M-FIAM5			CE101, CE102, CS101, CS114, CS115, CS116
MI-AIM-xx		CE102	CE102
MI-ComPAC 28 V, MI-ComPAC 270 V	CE01, CE03, CE07, CS01, CS02, CS06	CE101, CE102, CS101, CS114, CS116	CE101 CS101, CS114, CS116

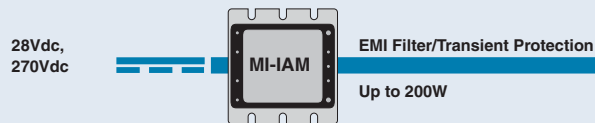
Military COTS Product Overview

Component Power Solutions - 1st Generation

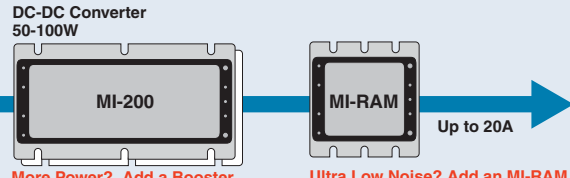
AC-DC Products



28, 155,
165, 270Vdc

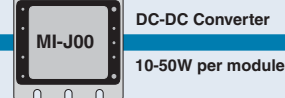


DC-DC Products



More Power? Add a Booster.

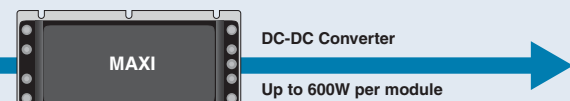
Ultra Low Noise? Add an MI-RAM
to the Output of Any Module.
<3mV pp at 5-50Vdc



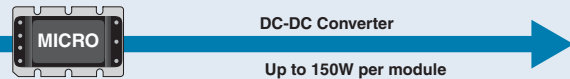
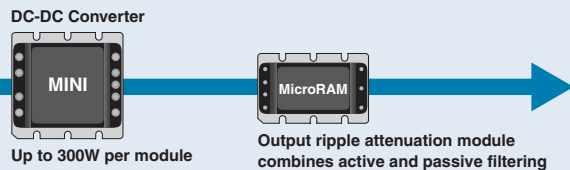
Component Power Solutions - 2nd Generation

DC-DC Products

28, 48, 270,
375Vdc



Single Wire Paralleling for High Power,
Fault Tolerant Arrays



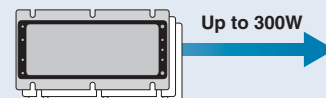
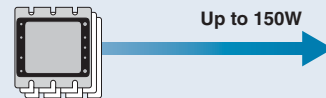
Configurable Power Solutions

MI-MegaMod Family (Chassis Mount)

DC Inputs
28Vdc, 155Vdc,
165Vdc, 270Vdc



1-3 Outputs using
1st Generation
Modules



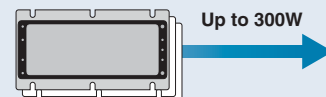
MI-CompAC Family

DC Inputs
28Vdc, 270Vdc



1-3 Outputs using
1st Generation
Modules

Front End Filtering





MI-200TM

Military COTS DC-DC Converters 50 to 100 W

Product Highlights

The MI-Series is designed for applications utilizing distributed power architecture based on Vicor's 1st Generation family of zero-current/zero-voltage switching, component level DC-DC converters. Operating at frequencies in excess of 1 MHz, the MI-Series offers state-of-the-art performance in terms of power density, efficiency, noise, ease of use, and reliability.

All units are manufactured in ISO 9001-registered facilities. Fully encapsulated in Vicor's industry standard package enables the MI-Series to meet MIL-STD-810 environmental requirements for humidity, fungus, salt, fog, explosive atmosphere, acceleration, vibration, and shock. (See page 32.)

Standard features such as wide output trimming/programming, current limiting, remote sense, output inhibit, and latching OVP and OTP combine to offer a high degree of protection, versatility, and reliability for power systems.

Features

- ✧ Inputs:
 - 28 Vdc per MIL-STD-704D/E/F
 - 155 Vdc per MIL-STD-1399A
 - 270 Vdc per MIL-STD-704D/E/F
- ✧ Single output: 2 – 48 Vdc
- ✧ Up to 23 W/in³
- ✧ MIL-STD-810 environments
- ✧ Up to 90% efficiency
- ✧ Remote sense
- ✧ Current limit
- ✧ OVP and thermal shut down
- ✧ Power boosters for higher power outputs
- ✧ ZVS/ZCS power architecture
- ✧ Low noise FM control
- ✧ Size: 4.6" x 2.4" x 0.5" (116,8 x 61,0 x 12,7 mm)

Converter/Booster Specifications

(At $T_{BP} = 25^{\circ}\text{C}$, nominal line and 75% load, unless otherwise specified)

PARAMETER	MIN	TYP	MAX	UNITS	TEST CONDITIONS
Input Characteristics					
Input voltage range	See input voltage chart				
No load power dissipation	1.35	2.0		Watts	
Output Characteristics					
Set point accuracy		0.5	1.0	% Vnom	
Load/line regulation		0.05	0.2	% Vnom	LL to HL, 10% to FL
		0.2	0.5	% Vnom	LL to HL, NL to 10%
Output temperature drift		0.01	0.02	%/°C	
Output noise - pp		1.0	1.5	% Vnom	} Whichever is greater 20 MHz BW
		100	150	mV	
Output voltage trimming ⁽¹⁾	50		110	% Vnom	
Remote sense compensation		0.5		Vdc	
OVP set point ⁽²⁾	115	125	135	% Vnom	Latching
Current limit	105		125	% Inom	Auto restart
Short circuit current ⁽³⁾	20		130	% Inom	
Control Pin Characteristics					
Gate in high threshold		6		Vdc	
Gate in low threshold	0.65			Vdc	
Gate in low current			6	mA	
Power sharing accuracy	0.95		1.05		
Isolation Characteristics					
Isolation (input to output)	3,000			Vrms	
Isolation (output to baseplate)	500			Vrms	
Isolation (input to baseplate)	1,500			Vrms	
Input/output capacitance		50	75	pF	
Environmental – MIL-STD-810					
Altitude - method 500.2	70,000			feet	Procedure II
Humidity - method 507.2	86/240			%/hours	Procedure 1, cycle 1
Acceleration - method 513.3	9			g's	Procedure 2
Vibration - method 514.3	20			g's	Procedure 1, category 6
Shock - method 516.3	40			g's	Procedure 1
Reliability – MIL-HDBK-217F (MI-221-MW)					
25°C Ground Benign: G.B.	3,277			1,000 hours	
50°C Naval Sheltered: N.S.	1,999			1,000 hours	
65°C Airborne Inhabited Cargo: A.I.C.	1,540			1,000 hours	
Thermal Characteristics					
Efficiency		80-90		%	
Baseplate to sink		0.07		°C/W	With thermal pads
Thermal shut down	90	95	105	°C	Latching
Baseplate operating temperature			+85	°C	See product grade
Storage temperature			+100	°C	See product grade
Mechanical Specifications					
Weight		6.0 (170)		ounces (grams)	

⁽¹⁾ 10 V, 12 V, and 15 V outputs, standard trim range $\pm 10\%$. Consult factory for wider trim range.

⁽²⁾ No over temperature or voltage protection in booster modules.

⁽³⁾ Output voltages of 5 V or less incorporate foldback current limiting; outputs of 10 V and above provide constant current limiting.

Configuration Chart

MI-2



Semi-custom driver and booster modules available: *Consult factory.*

(1) 16 V operation at 75% load.

(2) These units rated at 75% load from 125-150 Vin:

MI-26Z-xV

MI-26Y-xV

MI-26O-xW

28 Vdc input per MIL-STD 704D/E/F

155 Vdc input per MIL-STD-1399A

270 Vdc input per MIL-STD-704D/E/F

Input Voltage

Nominal	Range	Transient
2 = 28 V	18 - 50 V ⁽¹⁾	60 V
5 = 155 V	100 - 210 V	230 V
6 = 270 V	125 - 400 V ⁽²⁾	475 V
7 = 165 V	100 - 310 V	

Output Voltage

Z = 2 V	T = 6.5 V	N = 18.5 V
Y = 3.3 V	R = 7.5 V	3 = 24 V
O = 5 V	M = 10 V	L = 28 V
X = 5.2 V	1 = 12 V	J = 36 V
W = 5.5 V	P = 13.8 V	K = 40 V
V = 5.8 V	2 = 15 V	4 = 48 V

Product Grade Operating Temp.

I	=	-40°C to +85°C
M	=	-55°C to +85°C

Output Power/Current

	≥ 5 V	< 5 V
Y	50 W	10 A
X	75 W	15 A
W	100 W	20 A
V	—	30 A

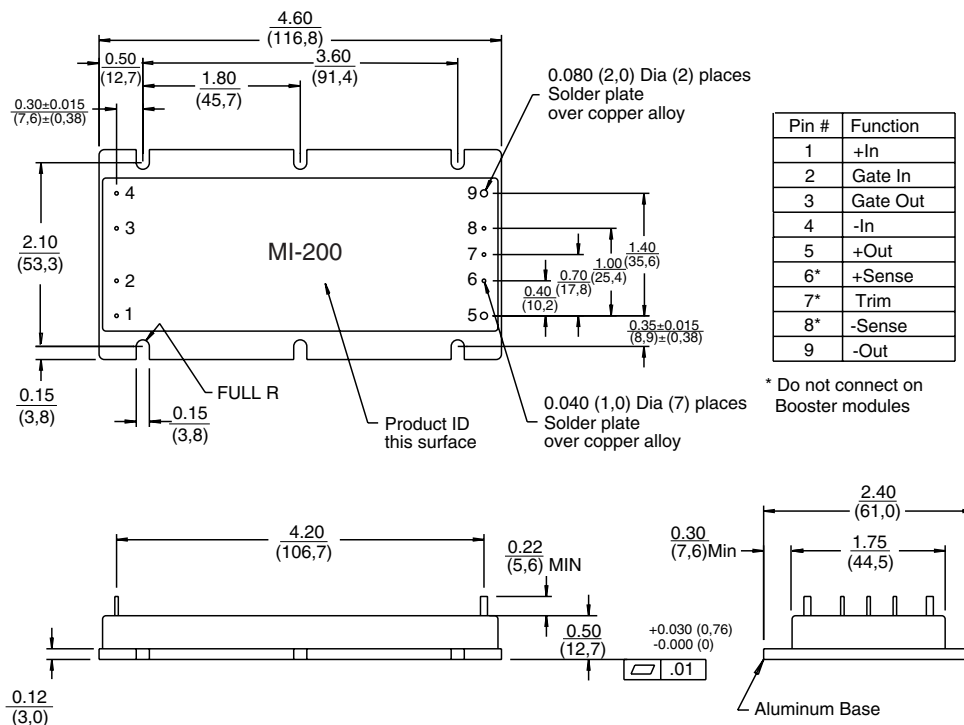
For additional power, 100 W and 75 W booster modules available. Change MI-2xx-xx to MI-Bxx-xx.

Product Grade Specifications

PARAMETER	PRODUCT GRADE	
	I-Grade	M-Grade
Storage temperature	-55°C to +100°C	-65°C to +100°C
Operating temperature (baseplate)	-40°C to +85°C	-55°C to +85°C
Power cycling burn-in	12 hours, 25 cycles	96 hours, 200 cycles
Temperature cycled with power off	12 cycles	12 cycles
17°C per minute rate of change	-65°C to +100°C	-65°C to +100°C
Test data supplied at these temperatures*	-40°C, +80°C	-55°C, +80°C
Warranty	2 years	2 years
Environmental compliance	MIL-STD-810	MIL-STD-810
Derating	NAVMAT P-4855-1A	NAVMAT P-4855-1A

*Test data available for review or download from vicorpower.com

Mechanical Drawing





MI-J00TM

Military COTS DC-DC Converters 10 to 50 W

Product Highlights

The MI-J00 family of miniaturized DC-DC converters is designed for applications utilizing distributed power architectures. Based on Vicor's 1st Generation family of zero-current/zero-voltage switching, component-level, DC-DC converters, the MI-J00 family offers state-of-the-art performance in terms of power density, efficiency, noise, ease of use, and reliability.

The MI-J00 family is designed to exceed all steady-state, transient and under/overvoltage requirements of MIL-STD-704D/E/F for both 28 Vdc input (MI-J20) and 270 Vdc input (MI-J60), and the worst case envelope of MIL-STD-1399A for 155 Vdc input.

The output voltage can be externally trimmed or programmed from 50% to 110% of nominal output. Current limiting, remote sense, and an inhibit pin all combine to offer a high degree of protection, versatility, and reliability for power systems.

All units are manufactured in ISO 9001-registered facilities. Fully encapsulated in Vicor's industry standard package enables the MI-J00 family units to meet MIL-STD810 environmental testing requirements for humidity, fungus, salt fog, explosive atmosphere, acceleration, vibration, and shock. (See page 32.)

Features

- ✧ Inputs:
 - 28 Vdc per MIL-STD-704D/E/F
 - 155 Vdc per MIL-STD-1399A
 - 270 Vdc per MIL-STD-704D/E/F
- ✧ Single output: 2 – 48 Vdc
- ✧ Up to 23 W/in³
- ✧ MIL-STD-810 environments
- ✧ Up to 90% efficiency
- ✧ Remote sense
- ✧ Current limit
- ✧ ZVS/ZCS power architecture
- ✧ Low noise FM control
- ✧ Size: 2.28" x 2.4" x 0.5" (57,9 x 61,0 x 12,7 mm)

Converter Specifications

(At $T_{BP} = 25^{\circ}\text{C}$, nominal line and 75% load, unless otherwise specified)

PARAMETER	MIN	TYP	MAX	UNITS	TEST CONDITIONS
Input Characteristics					
Input voltage range	See input voltage chart				
No load power dissipation		1.35	2.0	Watts	
Output Characteristics					
Set point accuracy		0.5	1.0	% Vnom	
Load/line regulation		0.05	0.2	% Vnom	LL to HL, 10% to FL
		0.2	0.5	% Vnom	LL to HL, NL to 10%
Output temperature drift		0.01	0.02	%/°C	
Output noise - pp		1.0	1.5	% Vnom	} Whichever is greater 20 MHz BW
		100	150	mV	
Output voltage trimming ⁽¹⁾	50		110	% Vnom	
Remote sense compensation	0.5			Vdc	
OVP set point		N/A			
Current limit	105		125	% Inom	Auto restart
Short circuit current	105		130	% Inom	
Control Pin Characteristics					
Gate in high threshold		6		Vdc	
Gate in low threshold	0.65			Vdc	
Gate in low current			6	mA	
Isolation Characteristics					
Isolation (input to output)	3,000			Vrms	
Isolation (output to baseplate)	500			Vrms	
Isolation (input to baseplate)	1,500			Vrms	
Input/output capacitance		50	75	pF	
Environmental - MIL-STD-810					
Altitude - method 500.2	70,000			feet	Procedure II
Humidity - method 507.2	86/240			%/hours	Procedure 1, cycle 1
Acceleration - method 513.3	9			g's	Procedure 2
Vibration - method 514.3	20			g's	Procedure 1, category 6
Shock - method 516.3	40			g's	Procedure 1
Reliability - MIL-HDBK-217F (MI-J21-MY)					
25°C Ground Benign: G.B.		3,619		1,000 hours	
50°C Naval Sheltered: N.S.		2,208		1,000 hours	
65°C Airborne Inhabited Cargo: A.I.C.		1,701		1,000 hours	
Thermal Characteristics					
Efficiency		80-90		%	
Baseplate to sink		0.14		°C/W	With thermal pads
Thermal shut down		N/A			
Baseplate operating temperature			+100	°C	See product grade
Storage temperature			+125	°C	See product grade
Mechanical Specifications					
Weight		3.0 (85)		ounces (grams)	

⁽¹⁾ 10 V, 12 V, and 15 V outputs, standard trim range $\pm 10\%$. Consult factory for wider trim range.

Configuration Chart

MI-J



Semi-custom modules available:
Consult factory.

(1) 16 V operation at 75% load.

(2) These units rated at 75%
load from 125-150 Vin:

MI-J6Z-xY

MI-J6Y-xY

MI-J60-xY

28 Vdc input per MIL-STD 704D/E/F

155 Vdc input per MIL-STD-1399A

270 Vdc input per MIL-STD-704D/E/F

Input Voltage

Nominal	Range	Transient
2 = 28 V	18 - 50 V ⁽¹⁾	60 V
5 = 155 V	100 - 210 V	230 V
6 = 270 V	125 - 400 V ⁽²⁾	475 V
7 = 165 V	100 - 310 V	

Output Voltage

Z = 2 V	T = 6.5 V	N = 18.5 V
Y = 3.3 V	R = 7.5 V	3 = 24 V
O = 5 V	M = 10 V	L = 28 V
X = 5.2 V	1 = 12 V	J = 36 V
W = 5.5 V	P = 13.8 V	K = 40 V
V = 5.8 V	2 = 15 V	4 = 48 V

Product Grade Operating Temp.

I	=	-40°C to +100°C
M	=	-55°C to +100°C

Output Power/Current

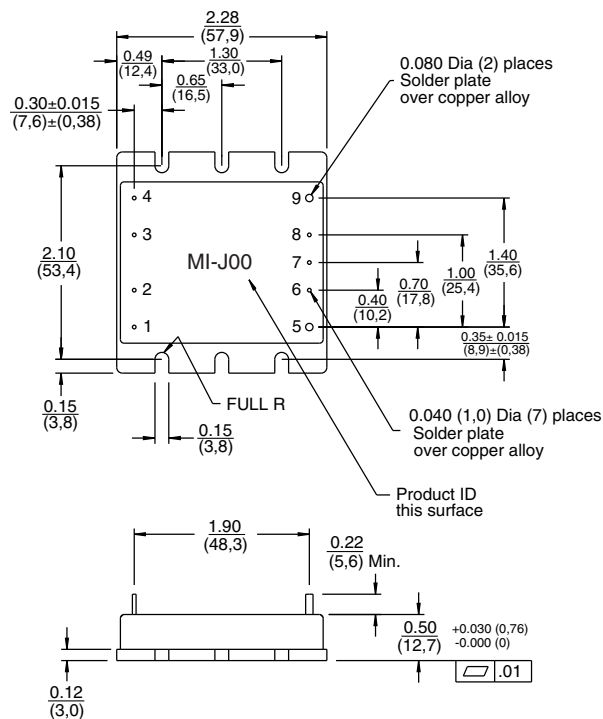
	≥ 5 V	< 5 V
A =	10 W	—
Z =	25 W	5 A
Y =	50 W	10 A

Product Grade Specifications

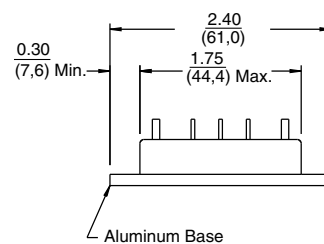
PARAMETER	PRODUCT GRADE	
	I-Grade	M-Grade
Storage temperature	-55°C to +125°C	-65°C to +125°C
Operating temperature (baseplate)	-40°C to +100°C	-55°C to +100°C
Power cycling burn-in	12 hours, 25 cycles	96 hours, 200 cycles
Temperature cycled with power off	12 cycles	12 cycles
17°C per minute rate of change	-65°C to +100°C	-65°C to +100°C
Test data supplied at these temperatures*	-40°C, +80°C	-55°C, +80°C
Warranty	2 years	2 years
Environmental compliance	MIL-STD-810	MIL-STD-810
Derating	NAVMAT P-4855-1A	NAVMAT P-4855-1A

*Test data available for review or download from vicorpower.com

Mechanical Drawing



Pin #	Function
1	+In
2	Gate In
3	Gate Out
4	-In
5	+Out
6	+Sense
7	Trim
8	-Sense
9	-Out





24/28 V, 48 V, 270/300 V, 375 V

Military COTS 2nd Generation DC-DC Converters

Product Highlights

Vicor's 2nd Generation DC-DC converters represent a quantum leap in the performance and flexibility of power components. With advanced power processing, control, and packaging technologies, power density has tripled while reducing the cost per Watt of processed power. A high level of silicon integration reduces parts count to less than a third of 1st Generation converters, increasing reliability.

Fully encapsulated, Vicor 2nd Generation modules utilize a proprietary spin fill process that assures complete, void free encapsulation making them suitable for the most harsh environments. Two grades (H & M) are available with temperatures to -55°C operating and -65°C storage. H & M-grade modules have been subjected to the environmental testing requirements of MIL-STD-810, MIL-S-901, and MIL-STD-202 and undergo 100% environmental stress screening.

Features

- ★ 24/28 and 270/300 Vdc compliant to MIL-STD-704E/F
- ★ Single output: 2 – 48 Vdc
- ★ MIL-STD-810 environments
- ★ Operating temperatures from -55°C to 100°C
- ★ ZVS/ZCS power architecture
- ★ Environmental stress screening
- ★ Programmable output: 10 to 110%
- ★ Power density: Up to 100 W/in³
- ★ OVP and thermal shut down
- ★ Input undervoltage lockout
- ★ Parallelable for increased power

Input Voltage

Nominal	Range	Transient	MIL Compliance
24 V	18 – 36 V	50 V 100 mS	MIL-STD-704E/F for 28 Vin*
48 V	36 – 75 V	100 V 100 mS	
300 V	180 – 375 V	400 V 100 mS	MIL-STD-704E/F for 270 Vin
375 V	250 – 425 V	500 V 100 mS	

* with M-FIAM5B input filter

Part Numbering



For Semi-Custom Models See p.35

Maxi Converter Example: V300A48M500BL
300 Vin, maxi, 48 Vout @ 500 W, long pins

Mini Converter Example: V300B15M250BL
300 Vin, mini, 15 Vout @ 250 W, long pins

Micro Converter Example: V300C24M150B
300 Vin, micro, 24 Vout @ 150 W, short pins

V	300	A	48	M	500	B	L	
	Input Voltage	Package A = Maxi B = Mini C = Micro	Output Voltage	Product Grade H = -40°C to +100°C M = -55°C to +100°C	Output Power		Pin Style Blank = Short Solder L = Long Solder S = Short ModuMate ¹ N = Long ModuMate ¹	Baseplate Blank = Slotted 2 = Threaded 3 = Thru-hole

¹ Compatible with InMate and SurfMate socketing systems.

24 Vin Series		Output Power (Watts)		
Output Voltage (Vdc)		Maxi	Mini	Micro
2 V		160	80	40
3.3 V		264	150	75
5 V		400	200	100
12 V		400	200	100
15 V		400	200	100
24 V		400	200	100
28 V		400	200	100
48 V		400	200	100

300 Vin Series		Output Power (Watts)		
Output Voltage (Vdc)		Maxi	Mini	Micro
2 V		160	100	50
3.3 V		264	150	75
5 V		400	200	100
12 V		500	250	150
15 V		500	250	150
24 V		500	250	150
28 V		500	250	150
48 V		500	250	150

48 Vin Series		Output Power (Watts)		
Output Voltage (Vdc)		Maxi	Mini	Micro
2 V		160	100	50
3.3 V		264	150	75
5 V		400	200	100
12 V		500	250	150
15 V		500	250	150
24 V		500	250	150
28 V		500	250	150
48 V		500	250	150

375 Vin Series		Output Power (Watts)		
Output Voltage (Vdc)		Maxi	Mini	Micro
2 V		160	100	50
3.3 V		264	150	75
5 V		400	200	100
12 V		600	300	150
15 V		600	300	150
24 V		600	300	150
28 V		600	300	150
48 V		600	300	150

Contact factory for availability of 2 V units in red.

General Specifications *(See vicorpower.com for model specific data sheets)*

PARAMETER	MIN	TYP	MAX	UNITS	NOTES
Input Characteristics					
Undervoltage turn-on	24 V	17.5	17.9	Vdc	
	48 V	34.9	35.7	Vdc	
	300 V	174.6	178.2	Vdc	
	375 V	242.5	247.5	Vdc	
Undervoltage turn-off	24 V	14.74	15.3	Vdc	
	48 V	29.4	30.5	Vdc	
	300 V	147.4	152.8	Vdc	
	375 V	204.7	212.2	Vdc	
Overvoltage turn-off/on	24 V	36.3	37.8	Vdc	
	48 V	75.7	78.8	Vdc	
	300 V	Not Included		Vdc	
	375 V	429.2	446.3	467.5	Vdc
Output Characteristics					
Line regulation		±0.02	±0.20	%	Low line to high line; full load
Temperature regulation		±0.002	±0.005	%/°C	Over operating temperature range
Power sharing accuracy		±2	±5	%	10 to 100% of full load
Programming range	10		110	% Vnom	For trimming below 90% of nominal, a minimum load may be required.
Current limit		115		% Iout	Output voltage 95% of nominal
Short circuit current		115		% Iout	Output voltage < 250 mV
Isolation Characteristics					
Isolation voltage (in to out)	3000			Vrms	Complies with reinforced insulation requirements
Isolation voltage (in to base)	1550			Vrms	Complies with basic insulation requirements
Isolation voltage (out to base)	500			Vrms	Complies with operational insulation requirements
Isolation resistance (in to out)		10		Megohms	
Thermal Characteristics					
Operating temperature (H-grade)	-40 to +100			°C	Baseplate
Storage temperature (H-grade)	-55 to +125			°C	
Operating temperature (M-grade)	-55 to +100			°C	Baseplate
Storage temperature (M-grade)	-65 to +125			°C	
Temperature limiting (typical)		115		°C	
Environmental Stress Screening					
See page 30 for details					

Control Functions - PC Pin

Module Enable/Disable. The module may be disabled by pulling PC below 2.3 V with respect to the -Input. This may be done with an open collector transistor, relay, or optocoupler. Multiple converters may be disabled with a single transistor or relay either directly or via “OR’ing” diodes. See Figure 1.

Module Alarm. The module contains “watchdog” circuitry which monitors input voltage, operating temperature, and internal operating parameters. In the event that any of these parameters are outside of their allowable operating range, the module will shut down and PC will go low. PC will periodically go high and the module will check to see if the fault (as an example, overtemperature) has cleared. If the fault has not been cleared, PC will go low again and the cycle will restart. The SC pin will go low in the event of a fault and return to its normal state after the fault has been cleared. See Figures 2 and 3.

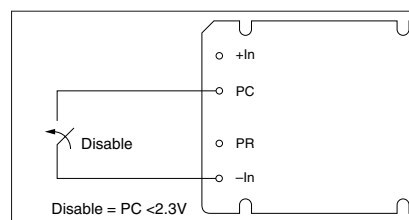


Figure 1 – Module enable/disable

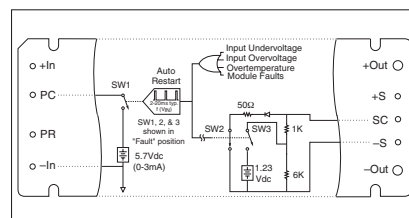


Figure 2 – PC/SC module alarm logic

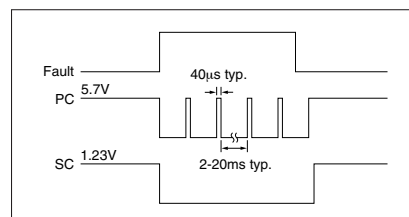


Figure 3 – PC/SC module alarm timing

Output Voltage Programming. The output voltage of the converter can be adjusted or programmed via fixed resistors, potentiometers, or voltage DACs. See Figures 4 and 5.

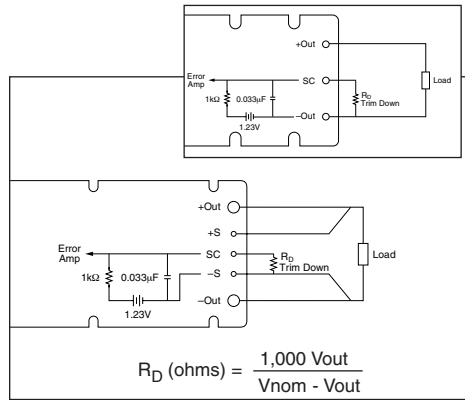


Figure 4 - Output voltage trim-down circuit (Micro inset)

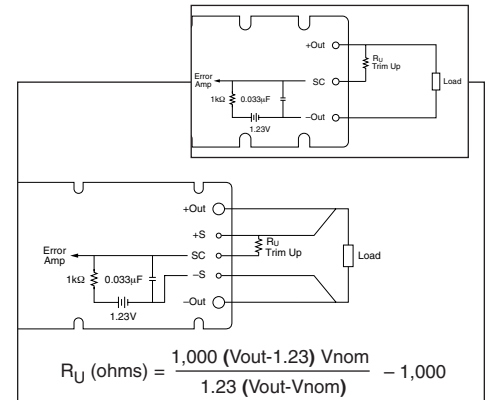


Figure 5 - Output voltage trim-up circuit (Micro inset)

Trim-Down.

1. This converter is not a constant power device – it has a constant current limit. Hence, available output power is reduced by the same percentage that output voltage is trimmed down. Do not exceed maximum rated output current.
2. The trim-down resistor must be connected to the –Sense pin (–Out pin on a micro).

Trim-Up.

1. The converter is rated for a maximum delivered power. To ensure that maximum rated power is not exceeded, reduce maximum output current by the same percentage increase in output voltage.
2. The trim-up resistor must be connected to the +Sense pin (+Out pin on a micro).
3. Do not trim the converter above maximum trim range (typically +10%) or the output overvoltage protection circuitry may be activated.

Control Functions - PR Pin

Note:

Please consult the appropriate Vicor Design Guide for additional information regarding the use of these products.

Parallel Operation.

The PR pin supports paralleling for increased power with N+1 (N+M) redundancy and phased array capability. Modules of the same input voltage, output voltage, and power level will current share if all PR pins are suitably interfaced.

Compatible interface architectures include:

DC coupled single-wire interface. All PR pins are directly connected to one

another. This interface supports current sharing but is not fault tolerant. Minus In pins must be tied to the same electric potential. See Figure 6.

AC coupled single-wire interface. All PR pins are connected to a single communication bus through 0.001 μF (500 V) capacitors. This interface supports current sharing and is fault tolerant except for the communication bus. See Figure 7.

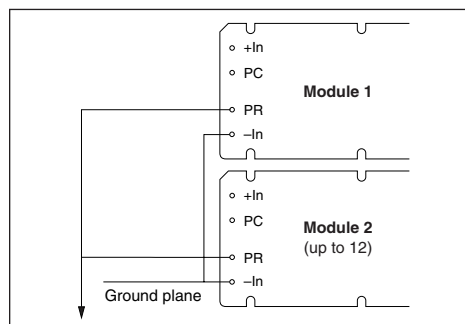


Figure 6 - DC coupled single-wire interface

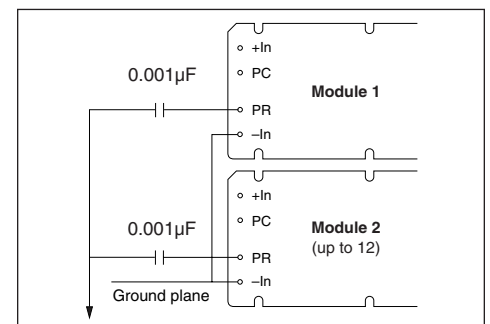


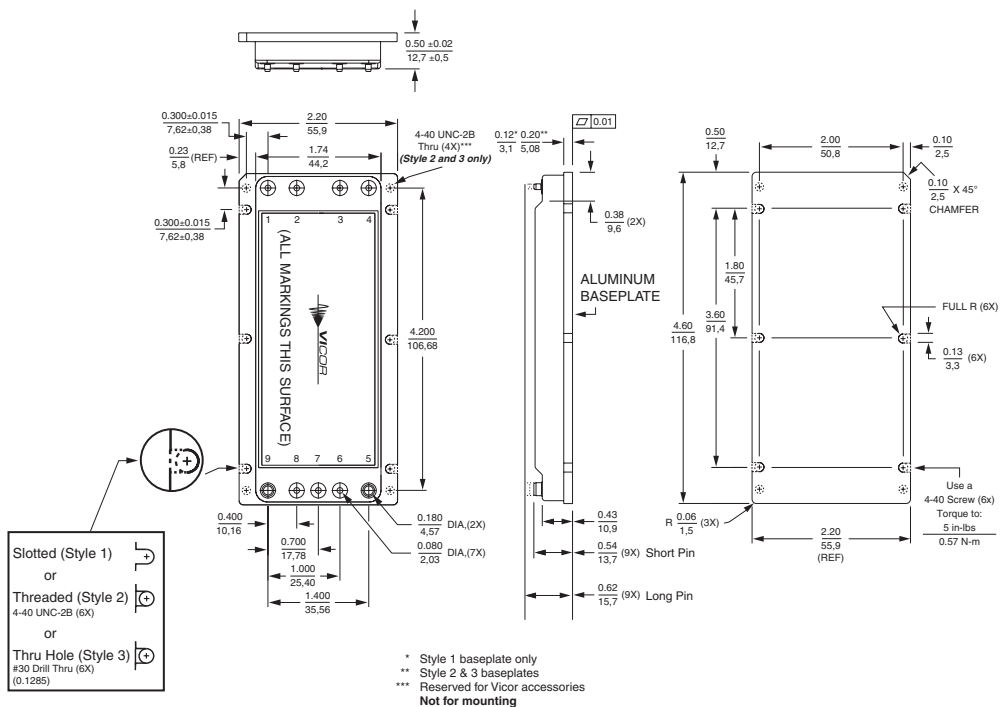
Figure 7 - AC coupled single-wire interface

Maxi

Converter Pins		
No.	Function	Label
1	+In	+
2	Primary Control	PC
3	Parallel	PR
4	−In	−
5	−Out	−
6	−Sense	−S
7	Secondary Control	SC
8	+Sense	+S
9	+Out	+

Pin Styles

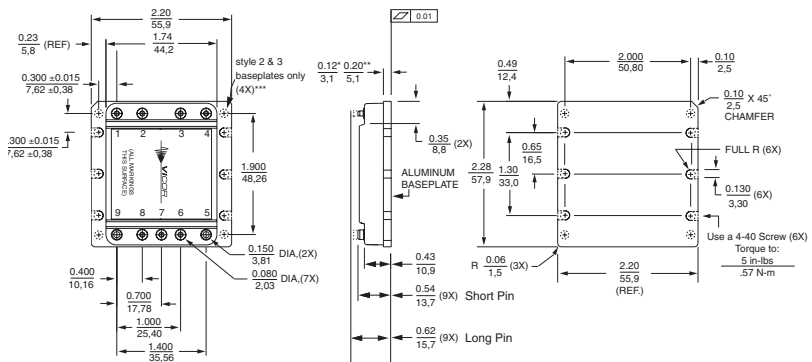
Tin/Lead
Hot Solder Dip
(Pin Style 1&2)
Gold Plated Copper
(Pin Style S&N)



Converter Pins		
No.	Function	Label
1	+In	+
2	Primary Control	PC
3	Parallel	PR
4	-In	-
5	-Out	-
6	-Sense	-S
7	Secondary Control	SC
8	+Sense	+S
9	+Out	+

Pin Styles

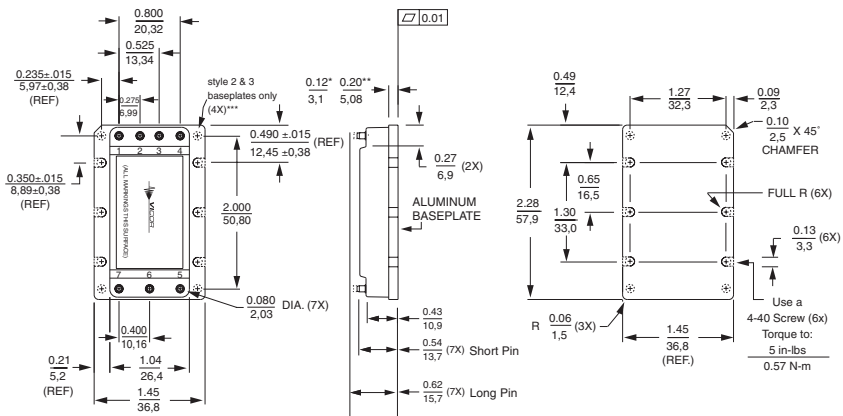
Tin/Lead
Hot Solder Dip
(Pin Style 1&2)
Gold Plated Copper
(Pin Style S&N)



Converter Pins		
No.	Function	Label
1	+In	+
2	Primary Control	PC
3	Parallel	PR
4	−In	−
5	−Out	−
6	Secondary Control	SC
7	+Out	+

Pin Styles

Tin/Lead
Hot Solder Dip
(Pin Style 1&2)
Gold Plated Copper
(Pin Style S&N)





MI-IAMTM

Military COTS Input Attenuator Modules

Product Highlights

The MI-IAM is an accessory product to Vicor's MI-Series of DC-DC converters that provides the EMI/RFI filtering and transient protection. Designed for use with all 28 V and 270 V input MI-200 or MI-J00 converters, the MI-IAM can drive any number of modules with output loads to 200 W.

The MI-IAM meets the conducted emissions specifications of MIL-STD-461C/D/E and offers complete input transient, surge, and spike protection to the most severe levels of MIL-STD-1275A/B and 704A. Reverse polarity protection and overvoltage lockout provide additional safeguards against potentially damaging line conditions. High power arrays can be configured using the expansion port capability of the MI-IAM.

Features

- ✦ Inputs: 28 Vdc and 270 Vdc
- ✦ MIL-STD-461C/D/E EMI compliance
- ✦ MIL-STD-810 environments
- ✦ MIL-STD-704A & MIL-STD-1275A/B transients and spikes
- ✦ Reverse polarity protection
- ✦ Output power: Up to 200W from any combination of MI-200 or MI-J00 modules
- ✦ Expansion port for additional power
- ✦ Short circuit protected
- ✦ Size: 2.28" x 2.4" x 0.5" (57,9 x 61,0 x 12,7 mm)

Specifications

(At $T_{BP} = 25^{\circ}\text{C}$, nominal line and 75% load, unless otherwise specified)

PARAMETER		MIN	TYP	MAX	UNITS	NOTES
Input Characteristics						
28 Vdc modules	Steady state input	18.8	28	50	Vdc	
	Input spike limit	-600		600	Vdc	10 μs, 50 Ω per MIL-STD-704A
		-250		250	Vdc	100 μs, 15mJ per MIL-STD-1275A/B
	Input surge limit			100	Vdc	60 ms, 0.5 Ω per MIL-STD-1275A/B
	Overvoltage shut down*	50			Vdc	100 ms, automatic recovery
	Reverse polarity protection					Shunt diode: input fuse required
	Recommended fuse			20	Amps	F03A type
270 Vdc modules	Steady state input	125	270	400	Vdc	
	Input spike limit			800	Vdc	10 μs, 50 Ω
		-600		600	Vdc	100 μs, 15 mJ
	Input surge limit			500	Vdc	100 ms, 0.5 Ω
	Overvoltage shut down*	400			Vdc	100 ms, automatic recovery
	Reverse polarity protection					Shunt diode: input fuse required
	Recommended fuse			4	Amps	F03A type
All models	No load power dissipation		0.5	1.5	Watts	
	Inrush current		110	125	% I _{IN}	Steady state, I _{IN} 10ms
EMC Characteristics; MIL-STD-461C/D						
Input power leads	Conducted emissions	CE01, CE03, CE07 CE101, CE102				MIL-STD-461C MIL-STD-461D/E
	Conducted susceptibility	CS01, CS02, CS06, CS101, CS114, CS115, CS116				MIL-STD-461C MIL-STD-461D/E
Output Characteristics						
Clamp voltage	28 Vdc input			60	Vdc	
	270 Vdc input			420	Vdc	
Output power				250	Watts	
Overload protection	28 Vdc input			20	Amps	} Foldback threshold; auto recovery with latched shut down after 10 ms
	270 Vdc input			4	Amps	
Isolation Characteristics						
Input to base		1,500			V _{rms}	1 min.
Output to base		1,500			V _{rms}	1 min.
Environmental - MIL-STD-810						
Altitude - method 500.2		70,000			feet	Procedure II
Humidity - method 507.2		86 / 240			% / hours	Procedure 1, cycle 1
Acceleration - method 513.3		9			g's	Procedure II
Vibration - method 514.3		20			g's	Procedure 1, category 6
Shock - method 516.3		40			g's	Procedure 1
Reliability - MIL-HDBK-217F (MI-A22-MU)						
25°C Ground Benign: G.B.			4,719		1,000 hours	
50°C Naval Sheltered: N.S.			849		1,000 hours	
65°C Airborne Inhabited Cargo: A.I.C.			665		1,000 hours	
Thermal Characteristics						
Efficiency			97		%	
Baseplate to sink			0.14		°C/Watt	
Operating temperature, baseplate				100	°C	See product grade specifications
Storage temperature				125	°C	See product grade specifications
Mechanical Specifications						
Weight			3 (85)		ounces (grams)	

*The MI-IAM disables downstream converters and clamps the converter input voltage at a safe level.

MI-IAM Model Selection Chart

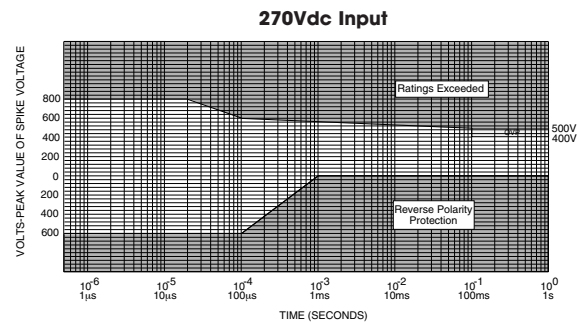
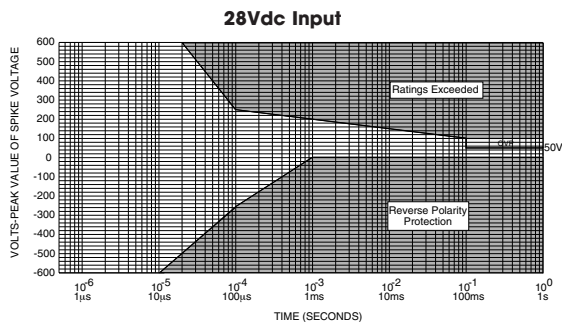
Model Number	Nominal Input Voltage	Input Range	Compatible MI-Series	Converter
MI-A22-MU	28 Vdc	18.8–50 Vdc	MI-22x and MI-J2x-Mx	M-grade
MI-A66-MU	270 Vdc	125–400 Vdc	MI-26x and MI-J6x-Mx	M-grade
MI-A22-IU	28 Vdc	18.8–50 Vdc	MI-22x and MI-J2x-Ix	I-grade
MI-A66-IU	270 Vdc	125–400 Vdc	MI-26x and MI-J6x-Ix	I-grade

Product Grade Specifications

PARAMETER	PRODUCT GRADE	
	I-Grade	M-Grade
Storage temperature	-55°C to +125°C	-65°C to +125°C
Operating temperature (baseplate)	-40°C to +100°C	-55°C to +100°C
Power cycling burn-in	12 hours, 25 cycles	96 hours, 200 cycles
Temperature cycled with power off	12 cycles	12 cycles
17°C per minute rate of change	-65°C to +100°C	-65°C to +100°C
Test data supplied at these temperatures*	-40°C, +80°C	-55°C, +80°C
Warranty	2 years	2 years
Environmental compliance	MIL-STD-810	MIL-STD-810
Derating	NAVMAT P-4855-1A	NAVMAT P-4855-1A

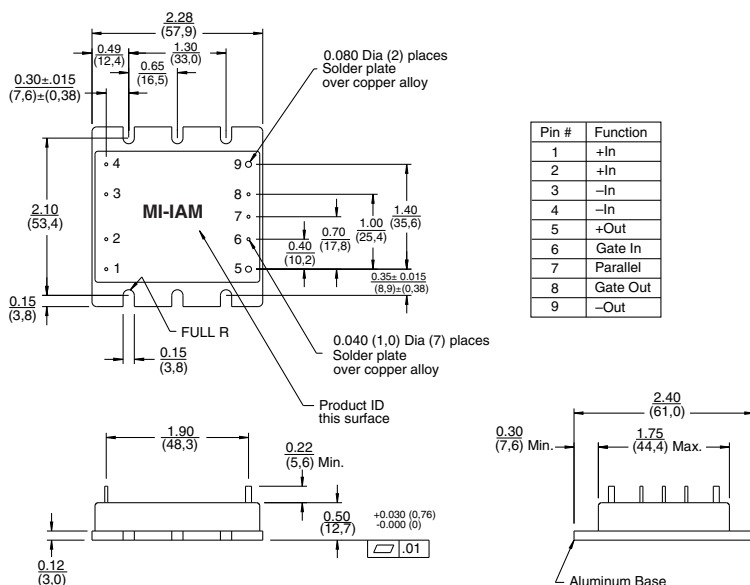
* Test data available for review or download from vicorpower.com

MI-IAM Safe Operating Area*

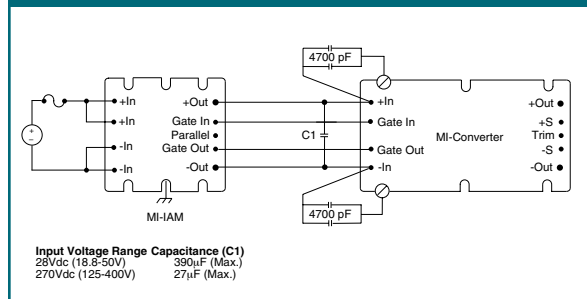


* Refer to input characteristics

Mechanical Drawing



Typical Connection Diagram





M-FIAM3™ & M-FIAM5B™

Military COTS Input Attenuator Modules

Product Highlights

The M-FIAM is a DC front-end module that provides EMI filtering and transient protection. The M-FIAM enables designers using Vicor 2nd Generation 24 and 300 V DC-DC converters to meet conducted emission/conducted susceptibility per MIL-STD-461E; and input transients per MIL-STD-704E/F.

M-FIAM is housed in an industry standard "half brick" module measuring 2.28" x 2.2" x 0.5".

Features

- ★ MIL-STD-461E compliant
- ★ MIL-STD-704E/F input transient protection
- ★ MIL-STD-810, MIL-STD-202 environments
- ★ Environmental stress screening
- ★ Low profile mounting options
- ★ Inrush current limiting
- ★ Size: 2.28" x 2.2" x 0.5" (57,9 x 55,9 x 12,7 mm)
- ★ Reverse polarity protection

Specifications

(At $T_{BP} = 25^{\circ}\text{C}$, nominal line and 75% load, unless otherwise specified)

PARAMETER		MIN	TYP	MAX	UNITS	NOTES
Input Characteristics						
28 Vdc modules	Steady state input	18	28	36	Vdc	
	Input transient			50	Vdc	12.5 ms, MIL-STD-704E/F, continuous operation
	Inrush limiting			0.007	A/ μF	
270 Vdc modules	Steady state input	180	270	375	Vdc	
	Input transient			400	Vdc	100 ms, MIL-STD-704E/F
	Inrush limiting			0.018	A/ μF	
EMC Characteristics; MIL-STD-461E						
Input power leads	Conducted emissions			CE101, CE102		
	Conducted susceptibility			CS101, CS114, CS115, CS116		
Output Characteristics						
Output current	28 Vdc input			20	Amps	
	270 Vdc input			3	Amps	
Internal voltage drop	28 Vdc input		0.5	1.0	Vdc	@ 20 A, 100°C baseplate
	270 Vdc input		3.0	5.0	Vdc	@ 3 A, 100°C baseplate
Isolation Characteristics						
Dielectric withstand		1,500			V_{rms}	Input/output to base
		2,121			Vdc	Input/output to base.
Thermal Characteristics						
Efficiency		96	98		%	
Baseplate to sink; flat, greased surface			0.16		$^{\circ}\text{C}/\text{Watt}$	
Baseplate to sink; thermal pad (P/N 20264)			0.1		$^{\circ}\text{C}/\text{Watt}$	
Baseplate to ambient			7.9		$^{\circ}\text{C}/\text{Watt}$	
Baseplate to sink; 1000 LFM			2.2		$^{\circ}\text{C}/\text{Watt}$	

Part Numbering

M	FIAM	5B	M	2	1
Military Product	Filter Input Attenuator Module	Input Voltage 3 = 270 Vdc 5 = 28 Vdc	Product Grade H = -40°C to $+100^{\circ}\text{C}$ M = -55°C to $+100^{\circ}\text{C}$	Pin Style 1 = Short 2 = Long S = Short ModuMate ¹ N = Long ModuMate ¹	Baseplate 1 = Slotted 2 = Threaded 3 = Thru-hole

¹ Compatible with SurfMate and InMate socketing systems.

M-FIAM Model Selection Chart

Model Number	Nominal Input Voltage	Input Range	Compatible 2nd Generation Converters
M-FIAM5Bxxx	28 Vdc	18 – 36 V	V24 Series
M-FIAM3xxx	270 Vdc	180 – 375 V	V300 Series

Product Grade Specifications

PARAMETER	PRODUCT GRADE	
	H-Grade	M-Grade
Storage temperature	-55°C to +125°C	-65°C to +125°C
Operating temperature (baseplate)	-40°C to +100°C	-55°C to +100°C
Power cycling burn-in	12 hours, 28 cycles	24 hours, 56 cycles
Temperature cycled with power off	12 cycles	12 cycles
17°C per minute rate of change	-65°C to +100°C	-65°C to +100°C
Test data supplied at these temperatures*	-40°C, +100°C	-55°C, +100°C
Warranty	2 years	2 years
Environmental compliance	MIL-STD-810	MIL-STD-810

*Test data available for review or download from vicorpower.com

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

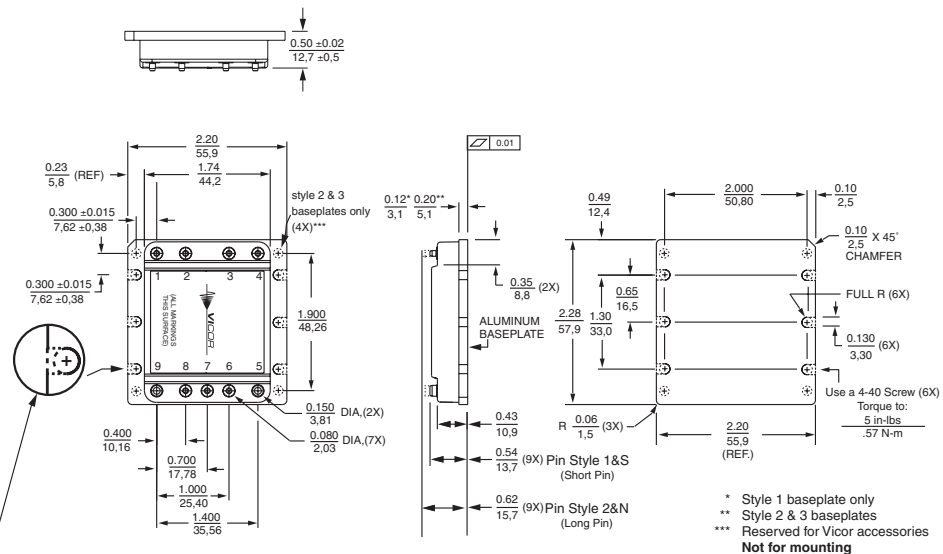
Temperature	Environment	MTBF	Unit
25°C	Ground Benign: G.B.	2,581	1,000 hours
50°C	Naval Sheltered: N.S.	464	1,000 hours
65°C	Airborne Inhabited Cargo: A.I.C	364	1,000 hours

Mechanical Drawing

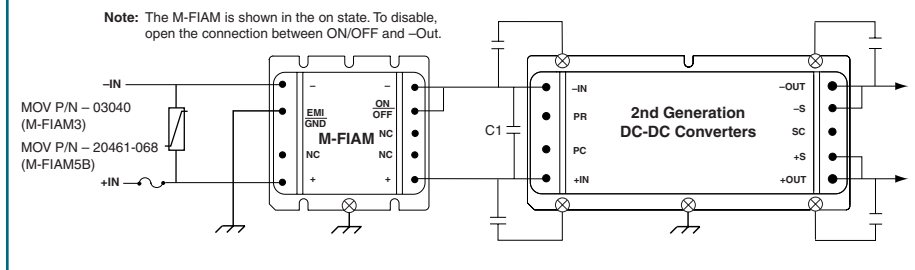
Converter Pins		
No.	Function	Label
1	+In	+
2	No Connection	NC
3	Ground	EMI/GND
4	-In	-
5	-Out	-
6	ON/OFF	ON/OFF
7	No Connection	NC
8	No Connection	NC
9	+Out	+

Pin Styles	
Tin/Lead	
Hot Solder Dip	(Pin Style 1&2)
Gold Plated Copper	(Pin Style S&N)

Slotted (Style 1)	
or	
Threaded (Style 2)	
4-40 UNC-2B (6X)	
or	
Thru Hole (Style 3)	
#30 Drill Thru (6X)	
(0.1285)	



Typical Connection Diagram



Capacitance (C1)

M-FIAM3 10 µF(min), 22 µF(max); M-FIAM5B 330 µF(min), 1000 µF(max)

Recommended Fuse:

M-FIAM3 3 A Max, F03A Type.

M-FIAM5B 20 A Max, F03A Type.



MI-AIMTM

Military COTS Component Front-end Modules

Product Highlights

The MI-AIM AC input module interfaces directly with AC mains to provide line rectification, EMI filtering, transient protection, and inrush limiting. These front-end modules accept 115 Vac and provide 250 W of output power for any of Vicor's MI-x7x family of standard and junior size modules.

The MI-AIM meets CE102 conducted emissions requirements of MIL-STD-461D/E and the transient and spike requirements of MIL-STD-704A.

Produced in ISO 9001-registered facilities, the fully epoxy encapsulated 2.28" x 2.4" x 0.5" (57,9 x 61,0 x 12,7 mm) modules meet the environmental test requirements of MIL-STD-810.

Features

- ✧ Inputs: 115 Vac; 60/400 Hz
- ✧ Output power: 250 W
- ✧ Compatible with MI-x7x family modules
- ✧ MIL-STD-461D/E EMI compliance
- ✧ MIL-STD-810 environments
- ✧ MIL-STD-704A input transient protection
- ✧ 95% efficiency
- ✧ Operating temperature to 100°C
- ✧ Size: 2.28" x 2.4" x 0.5" (57,9 x 61,0 x 12,7 mm)

Specifications

(At $T_{BP} = 25^{\circ}\text{C}$, unless otherwise specified)

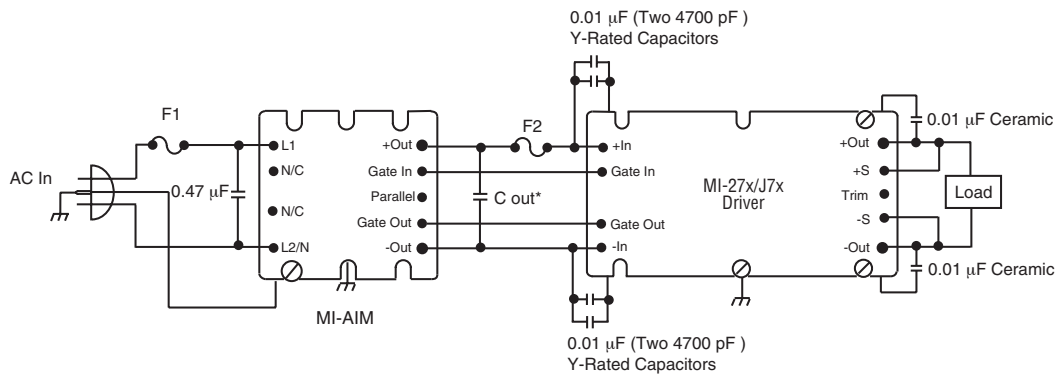
PARAMETER	MIN	TYP	MAX	UNITS	NOTES
Input Characteristics (per MIL-STD-704A)					
Steady state input (V)	85	115	140	V_{rms}	
(f)	47	60/400	440	Hz	
Transient input (V)	80			V_{rms}	0.2 seconds
			180	V_{rms}	5 seconds
(f)			480	Hz	5 seconds
Inrush current			40	A, peak	125 Vac
Conducted EMI	CE102 per MIL-STD-461D/E				100-125 Vac; 60 Hz
Efficiency		95		%	115 Vac; 60/400 Hz
Spikes			±50	%	Nominal line voltage, 50 μs
Output Characteristics					
Power	250			W	100°C
Short circuit protection	no damage				100-125 Vac
Ext. capacitance (C1)			1200	μF	See connection diagram
Isolation					
Input to output	none				Provided by converter
Input to baseplate	1500			V_{rms}	
Environmental - MIL-STD-810					
Altitude - method 500.2	40,000			feet	Procedure 3
Humidity - method 507.2	86/240			% / hours	Procedure 1, cycle 1
Acceleration - method 513.3	9			g's	Procedure 2
Vibration - method 514.3	20			g's	Procedure 1, category 6
Shock - method 516.3	40			g's	Procedure 1
Reliability - MIL-HDBK-217F (MI-AIM-M1)					
25°C Ground Benign: G.B.	4,277			1,000 hours	
50°C Naval Sheltered: N.S.	770			1,000 hours	
65°C Airborne Inhabited Cargo: A.I.C.	603			1,000 hours	
Mechanical Characteristics					
Thermal resistance	0.14			°C/W	Baseplate to sink, with thermal pad
Weight	3 (85)			ounces (grams)	

Product Grade Specifications

PARAMETER	PRODUCT GRADE	
	I-Grade	M-Grade
Part Number	MI-AIM-I1	MI-AIM-M1
Storage temperature	-55°C to +125°C	-65°C to +125°C
Operating temperature (baseplate)	-40°C to +100°C	-55°C to +100°C
Power cycling burn-in	12 hours, 25 cycles	96 hours, 200 cycles
Temperature cycled with power off	12 cycles	12 cycles
17°C per minute rate of change	-65°C to +100°C	-65°C to +100°C
Test data supplied at these temperatures*	-40°C, +80°C	-55°C, +80°C
Warranty	2 years	2 years
Environmental compliance	MIL-STD-810	MIL-STD-810

*Test data available for review or download from vicorpower.com

Connection Diagram

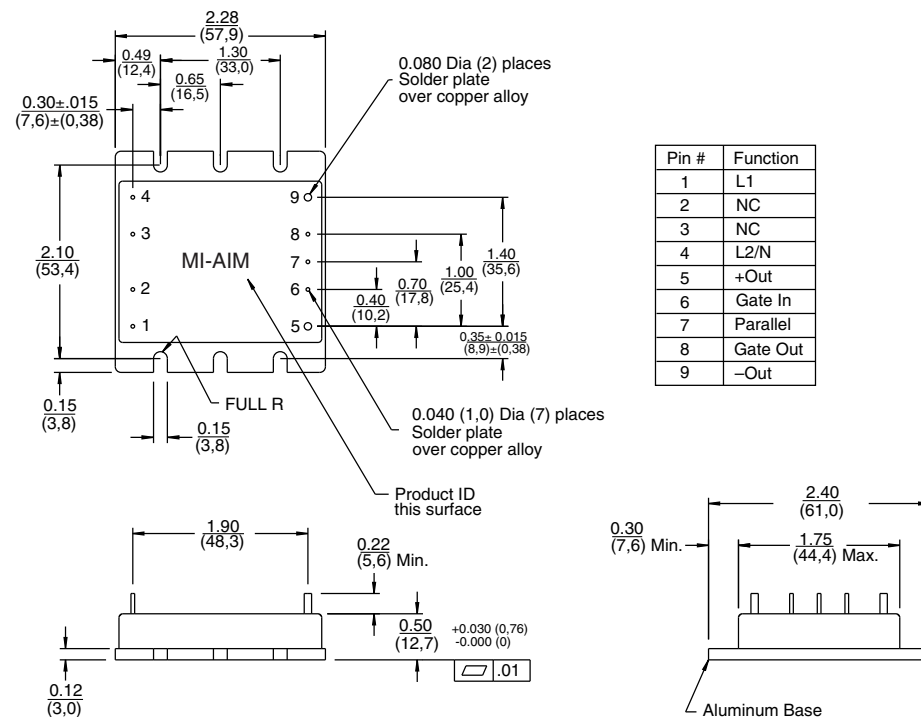


* 1200µF Max. (See Vicor's Applications Manual, page 12-2, Selecting Capacitors for AIM Modules.)

Fuse 1: 7A F03A type recommended.

Fuse 2: For MI-x7x-xx – Buss PC-Tron 2.5A (450V)

Mechanical Drawing





MI-RAMTM

Military COTS Ripple Attenuator Modules

Product Highlights

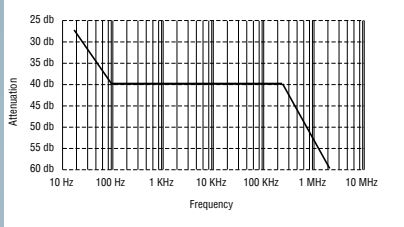
The MI-RAM is designed for applications where extremely low noise outputs are required. When used with any Vicor MI-Series DC-DC converter, the MI-RAM reduces both line frequency related ripple and switching noise to less than 10 mV p-p, DC to 20 MHz.

The combination of the MI-RAM with an MI converter provides the output noise performance of a linear supply at a power density in excess of 15 W/in³.

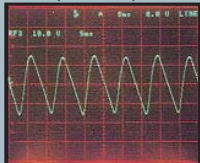
All of the features of the MI-Series converter remain available while using the MI-RAM, including output voltage trimming, OVP and OTP (MI-200 only), current limiting, remote sense, and output inhibit.

All units are manufactured in ISO 9001-registered facilities. Full epoxy encapsulation in a low profile package enables the MI-RAM to meet MIL-STD-810 environmental testing requirements.

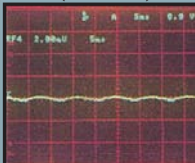
Attenuation vs. Frequency (typical)



Input to the converter
(10 V/cm)



Output from the RAM
(2 mV/cm)



Features

- ★ Reduces output PARD to <10 mV pp
- ★ Full attenuation up to 20 A load
- ★ Compatible with all MI-Series units from 5 to 50 Vdc output
- ★ No adjustments required
- ★ 93%-99% efficiency
- ★ Converter sense, trim, OV and OC retained
- ★ MIL-STD-810 environments
- ★ Size: 2.28" x 2.4" x 0.5" (57,9 x 61,0 x 12,7 mm)

Specifications

(At $T_{BP} = 25^{\circ}\text{C}$, unless otherwise specified)

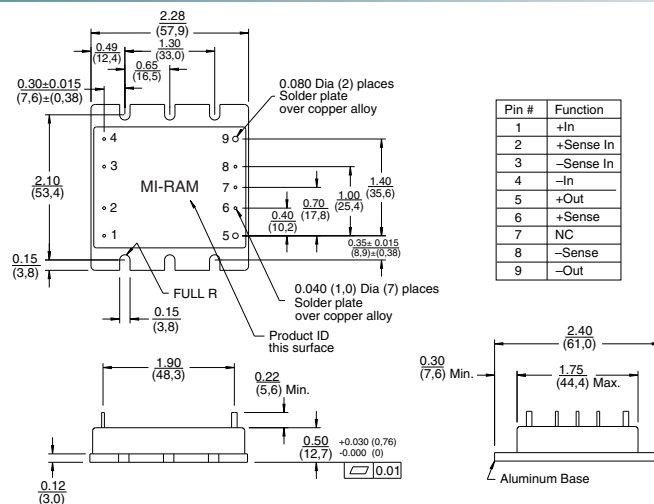
PARAMETER	MIN	TYP	MAX	UNITS	NOTES
Output noise and ripple		2.0	3.0	mV pp	MI-200; 10% to 100% load
		6.0	10.0	mV pp	MI-J00; 10% to 100% load
Input voltage range	5Vdc		50	Vdc	
Output voltage accuracy	99.5		100.5	%	Of MI source converter
Full load current			10	A	MI-RAM-I1 and MI-RAM-M1
			20	A	MI-RAM-I2 and MI-RAM-M2
DC voltage drop	0.34		0.38		10% to full load
Dissipation = (DC voltage drop x load current) + ($V_{in} \times 15 \text{ mA}$)					
Isolation		250		Vrms	Input/output to baseplate
Weight		3.0 (85)		ounces (grams)	

Product Grade Specifications

PARAMETER	PRODUCT GRADE	
	I-Grade	M-Grade
Storage temperature	-55°C to +125°C	-65°C to +125°C
Operating temperature (baseplate)	-40°C to +100°C	-55°C to +100°C
Power cycling burn-in	12 hours, 25 cycles	96 hours, 200 cycles
Temperature cycled with power off	12 cycles	12 cycles
17°C per minute rate of change	-65°C to +100°C	-65°C to +100°C
Test data supplied at these temperatures*	-40°C, +80°C	-55°C, +80°C
Warranty	2 years	2 years
Environmental compliance	MIL-STD-810	MIL-STD-810

*Test data available for review or download from vicorpower.com

Mechanical Drawing





MicroRAM™

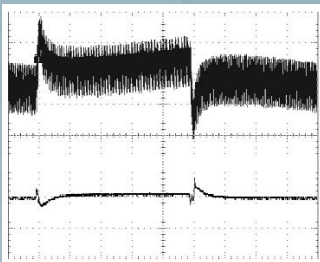
Output Ripple Attenuator Modules

Product Highlights

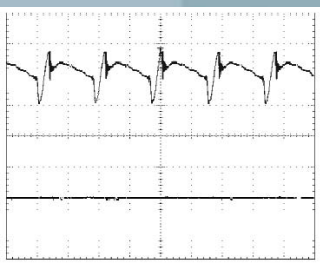
Vicor's MicroRAM output ripple attenuation module combines both active and passive filtering to achieve greater than 40 dB of noise attenuation from 60 Hz to 1 MHz. The MicroRAM operates over a range of 3 to 30 Vdc, is available in either 20 or 30 A models, and is compatible with all manufacturers switching converters including Vicor's 1st and 2nd Generation DC-DC converters.

The MicroRAM's closed loop architecture greatly improves load transient response and with dual mode control, insures precise point of load voltage regulation. The MicroRAM supports redundant and parallel operation with its integrated OR'ing diode function.

It is available in Vicor's standard micro package (quarter brick) with a variety of terminations for through hole, socket, or surface mount applications.



Typical Input and Output Dynamic Response. CTRAN; 35% of load



Typical Input and Output Ripple @50% (10 A) load

Features

- ★ >40 dB ripple attenuation from 60 Hz to 1 MHz
- ★ 20-30 Amp ratings
- ★ 3-30 Vdc input range
- ★ Efficiency up to 98%
- ★ Environmental stress screening
- ★ Integrated OR'ing diode supports N+1 redundancy
- ★ Combined active and passive filtering
- ★ Size: 2.28" x 1.45" x 0.5" (57,9 x 36,8 x 12,7 mm)

Specifications

(At $T_{BP} = 25^{\circ}\text{C}$, unless otherwise specified)

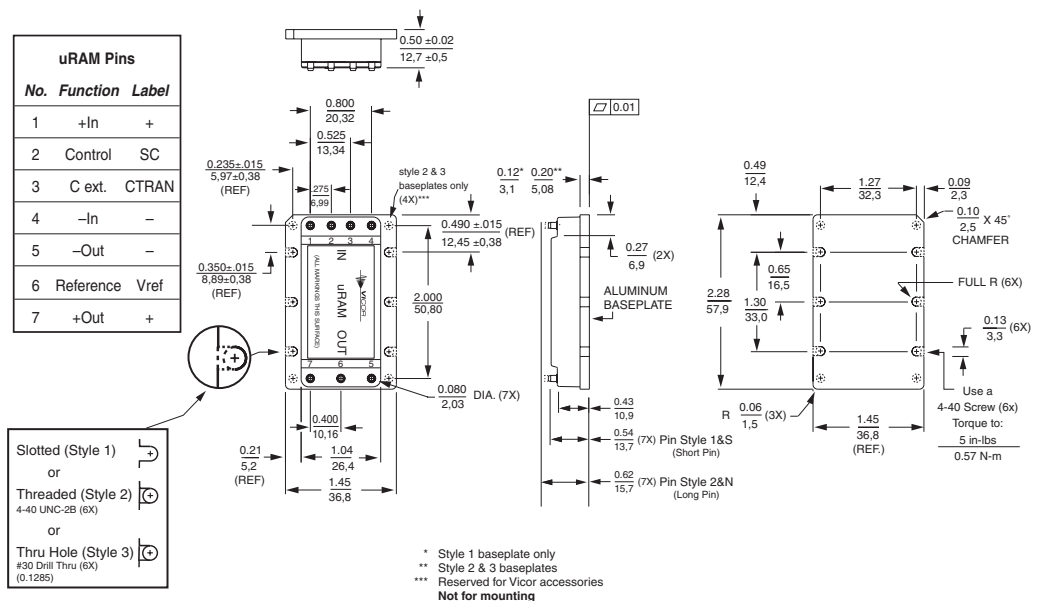
PARAMETER	MIN	TYP	MAX	UNITS	NOTES
Output ripple			10.0	mV p-p	
Input voltage range	3.0		30.0	Vdc	
Operating current					
uRAM2xxx	0.02		20	A	No internal current limiting
uRAM3xxx	0.02		30	A	No internal current limiting
Power Dissipation					
uRAM2xxx V_{HR} 380 mV@1 A		7.5		W	V_{IN} 28 V; I_{OUT} 20 A
uRAM3xxx V_{HR} 380 mV@1 A		11.5		W	V_{IN} 28 V; I_{OUT} 30 A

Part Numbering

uRAM	2	M	2	1
Product Type	Current Rating	Product Grade	Pin Style	Baseplate
	2 = 20 A 3 = 30 A	H = -40°C to $+100^{\circ}\text{C}$ M = -55°C to $+100^{\circ}\text{C}$	1 = Short 2 = Long S = Short ModuMate ¹ N = Long ModuMate ¹	1 = Slotted 2 = Threaded 3 = Thru-hole

¹ Compatible with SurfMate and InMate socketing systems.

Mechanical Drawing





Product Highlights

Vicor's MI-MegaMod family of single, dual, and triple output DC-DC converters provide power system designers with cost-effective, high-performance, off-the-shelf solutions to applications that might otherwise require a custom supply.

Incorporating standard MI-200 or MI-J00 family converters in rugged, chassis mount packages, MegaMods can be ordered with single, dual, or triple outputs, having a combined output power of up to 300 W. Totally isolated outputs eliminate efficiency penalties and output interaction problems.

MI-MegaMod™ Family

**Military COTS Chassis Mount DC-DC Converters 10 to 300 W
Single, Dual, Triple Outputs**

Features

- ✧ Inputs: 28, 155, 165 and 270 Vdc
- ✧ Any output: 2 to 48 Vdc
- ✧ Up to 13.5 W/in³
- ✧ High efficiency
- ✧ Remote sense
- ✧ ZVS/ZCS power architecture
- ✧ Low noise FM control
- ✧ Size — 1-up half-size: 2.58" x 2.5" x 0.62" (65,5 x 63,5 x 15,7 mm)
- ✧ Size — 1-up full-size: 4.9" x 2.5" x 0.62" (124,5 x 63,5 x 15,7 mm)
- ✧ Size — 2-up half-size: 2.58" x 4.9" x 0.62" (65,5 x 124,5 x 15,7 mm)
- ✧ Size — 2-up full-size: 4.9" x 4.9" x 0.62" (124,5 x 124,5 x 15,7 mm)
- ✧ Size — 3-up half-size: 2.58" x 7.3" x 0.62" (65,5 x 185,4 x 15,7 mm)
- ✧ Size — 3-up full-size: 4.9" x 7.3" x 0.62" (124,5 x 185,4 x 15,7 mm)

Configuration Chart

Full-Size MegaMods				Number of Modules
Single Output				
MI-L		50 – 100 W	4.9" x 2.5" x 0.62"	1
MI-M		150 – 200 W	4.9" x 4.9" x 0.62"	2
MI-N		300 W	4.9" x 7.3" x 0.62"	3
Dual Output				
MI-P		100 – 200 W	4.9" x 4.9" x 0.62"	2
MI-Q		200 – 300 W	4.9" x 7.3" x 0.62"	3
Triple Output				
MI-R		150 – 300 W	4.9" x 7.3" x 0.62"	3
Half-Size MegaMods				
Single Output				
MI-LJ		10 – 50 W	2.58" x 2.5" x 0.62"	1
Dual Output				
MI-PJ		20 – 100 W	2.58" x 4.9" x 0.62"	2
Triple Output				
MI-RJ		30 – 150 W	2.58" x 7.3" x 0.62"	3

Input Voltage	Output Voltage	Product Grade
Nominal Range Transient 2=28 Vdc 18–50 V ⁽¹⁾ 60 V 5=155 Vdc 100–210 V 230 V 6=270 Vdc 125–400 V ⁽²⁾ 475 V 7=165 Vdc 100–310 V ⁽³⁾	Z = 2 V T = 6.5 V N = 18.5 V Y = 3.3 V R = 7.5 V 3 = 24 V 0 = 5 V M = 10 V L = 28 V X = 5.2 V 1 = 12 V J = 36 V W = 5.5 V P = 13.8 V K = 40 V V = 5.8 V 2 = 15 V 4 = 48 V	Full-Size I = –40°C to +85°C M = –55°C to +85°C Half-Size I = –40°C to +100°C M = –55°C to +100°C
Output Power/Current	Output Power/Current	Output Power/Current
Full-Size ≥5 V <5 V Y = 50 W 10 A A = 10 W — X = 75 W 15 A Z = 25 W 5 A W = 100 W 20 A Y = 50 W 10 A V = — 30 A	≥5 V <5 V V = 150 W 30 A U = 200 W — S = — 60 A	≥5 V <5 V S = 300 W — P = — 90 A

⁽¹⁾ 16 V operation at 75% load.

⁽²⁾ These units rated at 75% load from 125 – 150 Vin: Full-size – 5 Vout @ 100 W; 2 Vout and 3.3 Vout @ 30 A
Half-Size – 5 Vout @ 50 W; 2 V and 3.3 V @ 10 A.

⁽³⁾ For use with Vicor's MI-AIM

Full-Size

(At $T_{BP} = 25^{\circ}\text{C}$, nominal line and 75% load, unless otherwise specified)

PARAMETER	MIN	TYP	MAX	UNITS	NOTES
Input Characteristics					
Inrush charge		120×10^{-6}	200×10^{-6}	Coulombs	Nominal line, per module
Input reflected ripple current – pp:		10		% I_{in}	Nominal line, full load
Input ripple rejection		$30 + 20\text{Log} \left(\frac{V_{in}}{V_{out}} \right)$		dB	120 Hz, nominal line
		$20 + 20\text{Log} \left(\frac{V_{in}}{V_{out}} \right)$		dB	2400 Hz, nominal line
No load power dissipation		1.35	2.0	Watts	Per module
Output Characteristics					
Setpoint accuracy		0.5	1.0	% V_{nom}	
Load/line regulation		0.05	0.2	% V_{nom}	LL to HL, 10% to FL
Load/line regulation		0.2	0.5	% V_{nom}	LL to HL, NL to 10%
Output temperature drift		0.01	0.02	% / $^{\circ}\text{C}$	Over rated temperature
Long term drift		0.02		%/1K hours	
Output ripple – p-p: $\leq 10\text{ V}$		80	150	mV	20 MHz bandwidth
12-48 V		0.75	1.5	%	20 MHz bandwidth
Output voltage trimming ⁽¹⁾	50		110	% V_{nom}	
Total remote sense compensation	0.5			Vdc	0.25 V max. neg. leg
OVP set point	115	125	135	% V_{nom}	Recycle power
Current limit	105		125	% I_{nom}	Automatic restart
Short circuit current			130	% I_{nom}	
Control Pin Characteristics					
Gate out impedance		50		Ohms	
Gate in impedance		10^3		Ohms	
Gate in open circuit voltage		6.0		Vdc	Use open collector
Gate in low threshold	0.65			Vdc	
Gate in low current			6.0	mA	
Isolation Characteristics					
Isolation (input to output)	3,000			Vrms	
Isolation (output to baseplate)	500			Vrms	
Isolation (input to baseplate)	1,500			Vrms	
Thermal Characteristics					
Efficiency		80-90		%	
Baseplate to chassis		0.1		$^{\circ}\text{C}/\text{Watt}$	
Thermal shut down	90	95	105	$^{\circ}\text{C}$	
Mechanical Specifications					
Weight					
1-up		9.0 (255)		ounces (grams)	
2-up		1.2 (525)		pounds (grams)	
3-up		1.7 (780)		pounds (grams)	

⁽¹⁾ 10 V, 12 V, and 15 V outputs, standard trim range $\pm 10\%$. Consult factory for wider trim range.

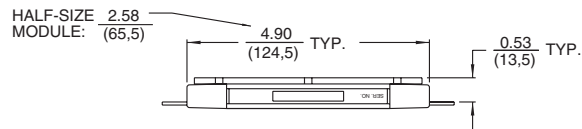
Half-Size

(At $T_{BP} = 25^{\circ}\text{C}$, nominal line and 75% load, unless otherwise specified)

PARAMETER	MIN	TYP	MAX	UNITS	NOTES
Input Characteristics					
Inrush charge		60×10^{-6}	100×10^{-6}	Coulombs	Nominal line, per module
Input reflected ripple current – pp:		10		% I_{in}	Nominal line, full load
Input ripple rejection		$30 + 20\text{Log} \left(\frac{V_{in}}{V_{out}} \right)$		dB	120 Hz, nominal line
		$20 + 20\text{Log} \left(\frac{V_{in}}{V_{out}} \right)$		dB	2400 Hz, nominal line
No load power dissipation		1.35	2.0	Watts	Per module
Output Characteristics					
Set point accuracy		0.5	1.0	% V_{nom}	
Load/line regulation		0.05	0.2	% V_{nom}	LL to HL, 10% to FL
Load/line regulation		0.2	0.5	% V_{nom}	LL to HL, NL to 10%
Output temperature drift		0.01	0.02	% / $^{\circ}\text{C}$	Over rated temperature
Long term drift		0.02		%/1K hours	
Output ripple – p-p: $\leq 10\text{ V}$		80	150	mV	20 MHz bandwidth
12-48 V		0.75	1.5	%	20 MHz bandwidth
Output voltage trimming ⁽¹⁾	50		110	% V_{nom}	
Total remote sense compensation	0.5			Vdc	0.25 V max. neg. leg
Current limit	105		125	% I_{nom}	Automatic restart
Control Pin Characteristics					
Gate out impedance		50		Ohms	
Gate in impedance		10^3		Ohms	
Gate in open circuit voltage		6.0		Vdc	Use open collector
Gate in low threshold	0.65			Vdc	
Gate in low current			6.0	mA	
Isolation Characteristics					
Isolation (input to output)	3,000			Vrms	
Isolation (output to baseplate)	500			Vrms	
Isolation (input to baseplate)	1,500			Vrms	
Thermal Characteristics					
Efficiency		80-90		%	
Baseplate to chassis		0.1		$^{\circ}\text{C}/\text{Watt}$	
Mechanical Specifications					
Weight					
1-up		4.5 (127)		ounces (grams)	
2-up		8.8 (250)		ounces (grams)	
3-up		13.3 (377)		ounces (grams)	

⁽¹⁾ 10 V, 12 V, and 15 V outputs, standard trim range $\pm 10\%$. Consult factory for wider trim range.

Inputs

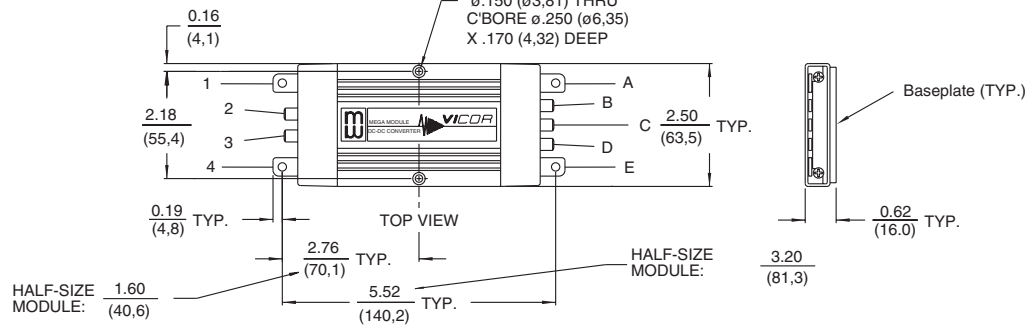


Outputs

Side view (all models)

1-Up

L- and LJ-Series



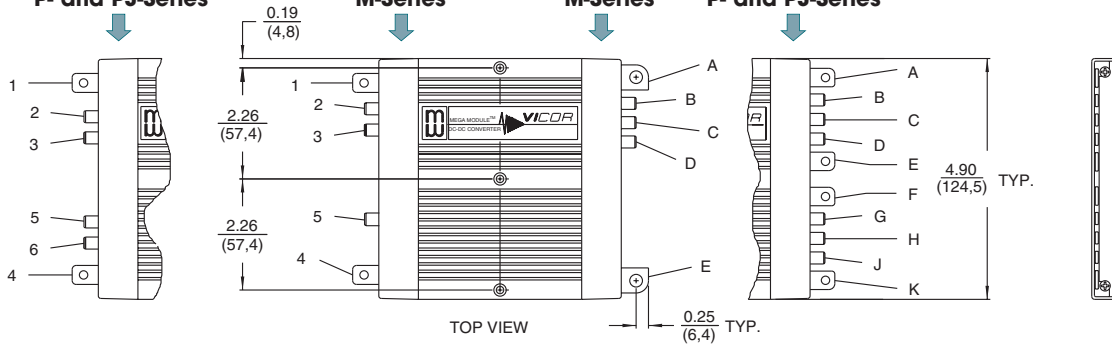
2-Up

P- and PJ-Series

M-Series

M-Series

P- and PJ-Series



3-Up

R- and RJ-Series

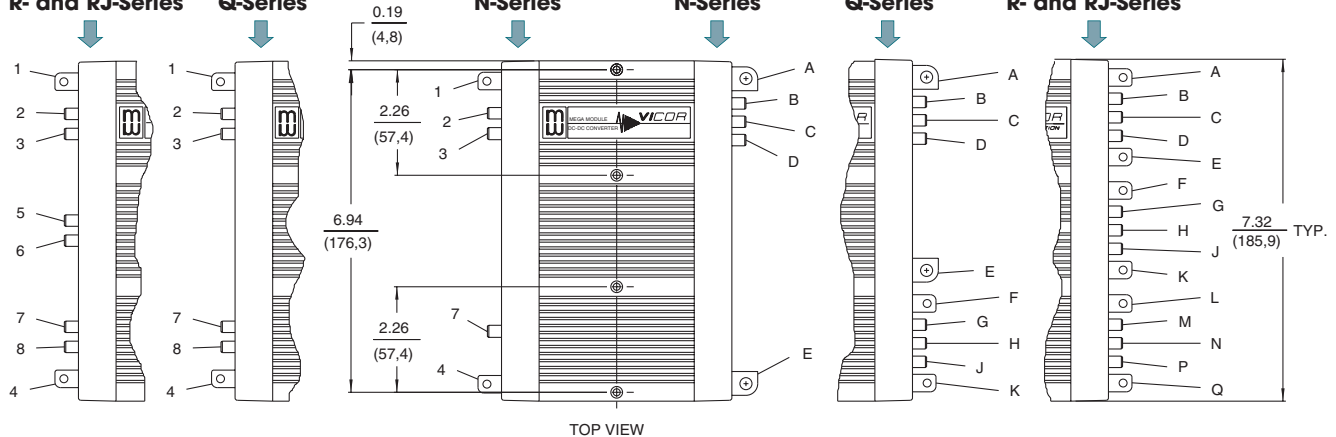
Q-Series

N-Series

N-Series

Q-Series

R- and RJ-Series



Inputs

- 1 -Input
- 2 Gate Out #1
- 3 Gate In #1
- 4 +Input
- 5 Gate Out #2
- 6 Gate In #2
- 7 Gate Out #3
- 8 Gate In #3

Outputs

- Output #1
- A -Output
- B -Sense
- C Trim
- D +Sense
- E +Output
- Output #2
- F -Output
- G -Sense
- H Trim
- J +Sense
- K +Output
- Output #3
- L -Output
- M -Sense
- N Trim
- P +Sense
- Q +Output

Mounting Information

Use #6 machine hardware torqued to 5-7 in.-lbs.



MI-ComPACTM

Military COTS DC-DC Power Supplies

Product Highlights

The MI-ComPAC is a complete single, dual, or triple output DC-DC power supply that delivers up to 300W from inputs of 28Vdc or 270Vdc.

The MI-ComPAC meets the conducted emissions and conducted susceptibility specifications of MIL-STD-461C/D/E and offers complete input transient, surge, and spike protection to the most severe levels of MIL-STD-1275A/B, 704A.

Reverse polarity protection and over/undervoltage lockout provide additional safeguards against potentially damaging line conditions. The MI-ComPAC also features a master disable.

Features

- ✧ Inputs: 28Vdc per MIL-STD-704A, MIL-STD-1275A/B 270Vdc per MIL-STD-704D/E/F
- ✧ Outputs: 1 to 3, 2 to 48Vdc
- ✧ Up to 5W/in³
- ✧ MIL-STD-461C/D/E EMI compliance
- ✧ High efficiency
- ✧ Remote sense
- ✧ ZVS/ZCS power architecture
- ✧ Low noise FM control
- ✧ Reverse polarity protection
- ✧ Size — 1-up: 8.6" x 2.5" x 0.99" (219,2 x 64,5 x 25,1mm)
- ✧ Size — 2-up: 8.6" x 4.9" x 0.99" (219,2 x 126,0 x 25,1mm)
- ✧ Size — 3-up: 8.6" x 7.3" x 0.99" (219,2 x 187,45 x 25,1mm)

Configuration Chart

Single Output				Number of Modules
MI-LC		50 – 100W	8.6" x 2.5" x 0.99"	1
MI-MC		150 – 200W	8.6" x 4.9" x 0.99"	2
MI-NC		300W	8.6" x 7.3" x 0.99"	3
Dual Output				
MI-PC		100 – 200W	8.6" x 4.9" x 0.99"	2
MI-QC		200 – 300W	8.6" x 7.3" x 0.99"	3
Triple Output				
MI-RC		150 – 300W	8.6" x 7.3" x 0.99"	3

Conduction Cooled Models Available Add "-CC" to the end of the part number.

(Consult factory for details.)

Input Voltage			Output Voltage			Product Grade		
Nominal	Range		Z = 2V	T = 6.5V	N = 18.5V	I = -40°C to +85°C M = -55°C to +85°C		
2=28Vdc	18 - 50V		Y = 3.3V	R = 7.5V	3 = 24V			
6=270Vdc	125 - 400V ⁽¹⁾		0 = 5V	M= 10V	L = 28V			
			X = 5.2V	1 = 12V	J = 36V			
			W= 5.5V	P = 13.8V	K = 40V			
			V = 5.8V	2 = 15V	4 = 48V			
Output Power/Current			Output Power/Current			Output Power/Current		
	≥5V	<5V		≥5V	<5V		≥5V	<5V
Y	= 50W	10A	V	= 150W	30A	S	= 300W	—
X	= 75W	15A	U	= 200W	—	P	= —	90A
W	= 100W	20A	S	= —	60A			
V	= —	30A						

⁽¹⁾ These units rated at 75% load from 125-150Vin: 5Vout @ 100W; 2Vout and 3.3Vout @ 30A.

Specifications

(At $T_{BP} = 25^{\circ}\text{C}$, nominal line and 75% load, unless otherwise specified)

PARAMETER	MIN	TYP	MAX	UNITS	NOTES
Input Characteristics					
28 Vdc input modules					
Steady state input	18	28	50	Vdc	
Low line lockout			16	Vdc	Automatic recovery
Input spike limit	-600		+600	Vdc	10 μs, 50 Ω per MIL-STD-704A
	-250		+250	Vdc	100 μs, 15 mJ per MIL-STD-1275A/B
Input surge limit			100	Vdc	60 ms, 0.5 Ω per MIL-STD-1275A/B
Overvoltage shut down	50			Vdc	100 ms automatic recovery
Reverse polarity protection					Shunt diode: input fuse required
Recommended fuse			10 ⁽¹⁾	Amps	F03A type
270 Vdc input modules					
Steady state input	125	270	400	Vdc	
Low line lockout			125	Vdc	Automatic recovery
Input spike limit			+800	Vdc	10 μs, 50 Ω
	-600		+600	Vdc	100 μs, 15 mJ
Input surge limit			500	Vdc	100 ms, 0.5 Ω
Overvoltage shut down	400			Vdc	100 μs automatic recovery
Reverse polarity protection					Shunt diode: input fuse required
Recommended fuse			2 ⁽¹⁾	Amps	F03A type
All models					
No load power dissipation		1.5 ⁽¹⁾	2 ⁽¹⁾	Watts	
Master disable input current ⁽²⁾ (Absolute max., 20 mA)	4			mA	Sink; disables all outputs
Inrush current		110	125	%, I _{IN}	Steady state I _{IN} , 10ms
EMC Characteristics; MIL-STD-461C/D/E					
Input power leads					
Conducted emissions	CE01, CE03, CE07 CE101, CE102 CE101				MIL-STD-461C — 1-up MIL-STD-461D — 1-up MIL-STD-461E — 2-up & 3-up
Conducted susceptibility	CS01, CS02, CS06 CS101, CS114, CS116 CS101, CS114, CS116				MIL-STD-461C — 1-up MIL-STD-461D — 1-up MIL-STD-461E — 2-up & 3-up
Output Characteristics					
Set point accuracy		0.5	1.0	% Vnom	
Load/line regulation		0.2 0.05	0.5 0.2	% Vnom % Vnom	LL to HL, NL to 10% LL to HL, 10% to FL
Output temperature drift		0.01	0.02	%/°C	
Output noise – p-p		1.0	1.5	% Vnom	Whichever is greater 20 MHz BW
		100	150	mV	
Output voltage trimming ⁽³⁾	50		110	% Vnom	
Remote sense compensation	0.5			Vdc	
OVP set point	115	125	135	% Vnom	Latching
Current limit	105		125	% Inom	Auto restart
Short circuit current ⁽⁴⁾	20		130	% Inom	
Isolation Characteristics					
Input to output	4,242			Vrms	1 min.
Input to case					
28 Vdc input	2,121			Vrms	1 min.
270 Vdc input	2,500			Vrms	1 min.
Output to case	500			Vrms	1 min.
Thermal Characteristics					
Efficiency		81		%	
Operating temperature, case			+85	°C	See product grade
Storage temperature			+100	°C	See product grade
Shutdown temperature	+90	+95	+105	°C	Cool and recycle power to restart
Mechanical Specifications					
Weight					
1-up		1.2 (544)		pounds (grams)	
2-up		2.4 (1248)		pounds (grams)	
3-up		3.6 (1633)		pounds (grams)	
Connector screw torque		3.5 (0.4)		inches-pounds (N-M)	

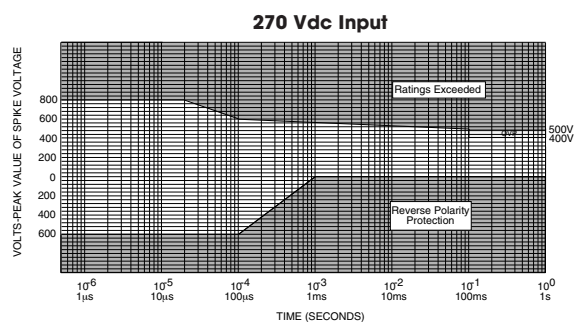
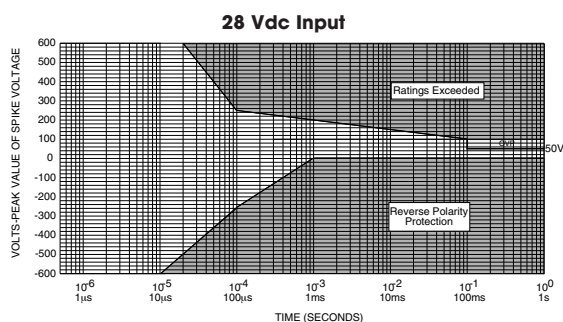
⁽¹⁾ Per internal module configuration.

⁽²⁾ Multiply minimum x 2 for 2-ups and x 3 for 3-ups.

⁽³⁾ 10 V, 12 V, and 15 V outputs, standard trim range $\pm 10\%$. Consult factory for wider trim range.

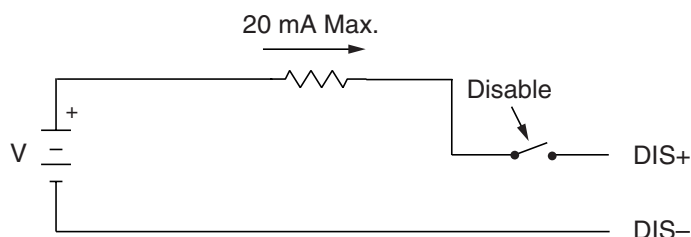
⁽⁴⁾ Output ranges of 5 V or less incorporate foldback current limiting, outputs of 10 V and above incorporate straight line current limiting.

Long Term Safe Operating Area Curves*



* 1% duty cycle max., for short duration transient capability refer to specifications

Disable Circuit



Disable Current

- 4 mA DC minimum for 1-up CompAC
- 8 mA DC minimum for 2-up CompAC
- 12 mA DC minimum for 3-up CompAC

The MI-CompAC incorporates an optically isolated master disable input which will shut down the MI-CompAC when a current is driven through the disable terminals.

Thermal Considerations

Thermal Impedance — Case-to-Air (°C/W)

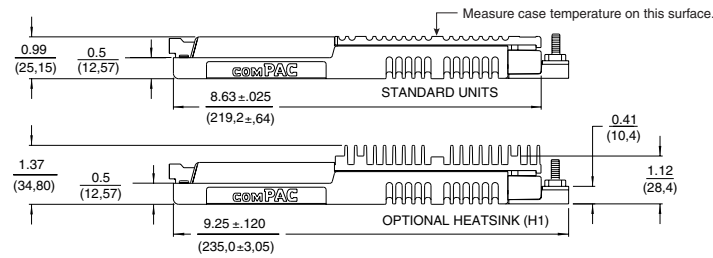
	Standard Units			With Optional Heat Sink ⁽¹⁾		
	1-up	2-up	3-up	1-up	2-up	3-up
Free Air (Horiz.)	3.6	1.7	1.4	2.1	1.3	1.0
Forced Convection Through Heat Sink Fins						
50 LFM	2.7	1.4	1.3	1.5	1.1	0.9
100 LFM	2.3	1.3	1.1	1.2	0.9	0.7
250 LFM	1.6	1.0	0.8	0.7	0.5	0.4
500 LFM	1.2	0.7	0.6	0.4	0.3	0.3
750 LFM	0.9	0.5	0.5	0.3	0.2	0.2
1000 LFM	0.8	0.4	0.4	0.2	0.2	0.2

- Thermal impedance, chassis-to-air, is provided for 1-up, 2-up and 3-up MI-CompAC package configurations as a function of airflow.
- Case temperature = (total power dissipated x thermal impedance) + ambient temperature.
- Watts dissipated per output = (output power ÷ efficiency) – output power.

⁽¹⁾ To order optional heat sink add -H1 to part number

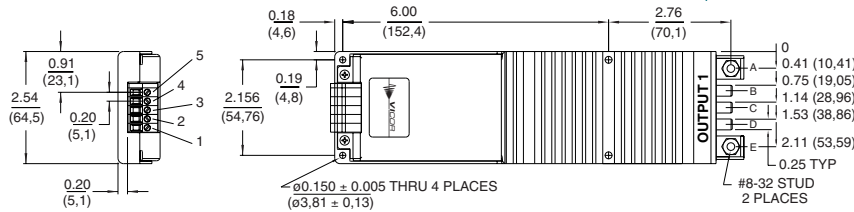
Inputs

Outputs



1-Up

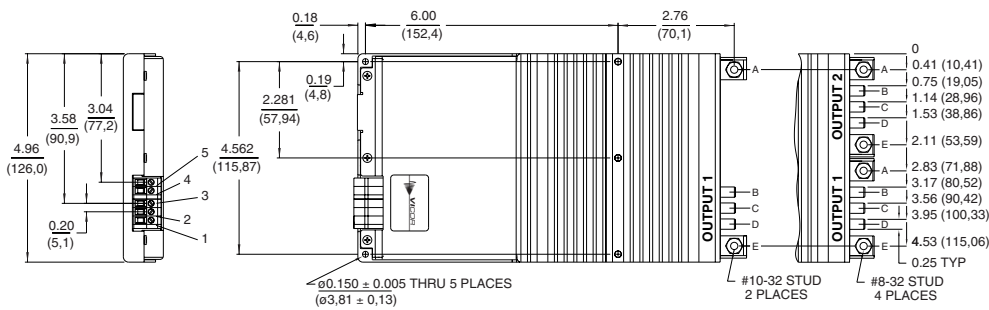
MI-LC



2-Up

MI-MC

MI-PC

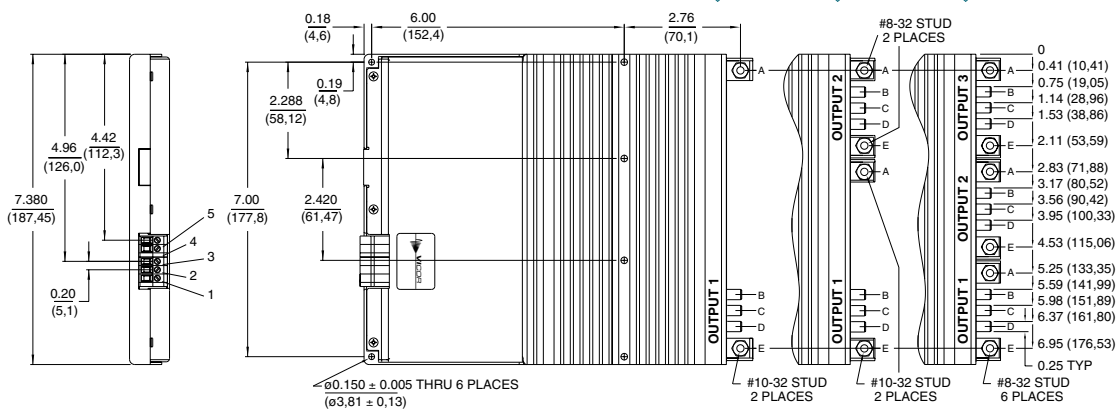


3-Up

MI-NC

MI-QC

MI-RC



Inputs

- 1 Ground
- 2 -Input
- 3 +Input
- 4 Disable-
- 5 Disable+

Outputs

- Output #1
- A +Output
- B +Sense
- C Trim
- D -Sense
- E -Output
- Output #2
- A +Output
- B +Sense
- C Trim
- D -Sense
- E -Output
- Output #3
- A +Output
- B +Sense
- C Trim
- D -Sense
- E -Output

Accessories

1st Generation Product — See vicorpower.com for full accessory line.

Sockets

Sockets are available for all Vicor 1st Generation modules and are intended for applications requiring ease of module installation or removal. Vicor modules have nine pins; seven of which are 0.040" and two are 0.080".



Pin Size	Finish	Part Number	Price
0.040"	Electro-tin	01827	\$0.42
0.080"	Electro-tin	01828	\$0.85

Module Standoffs

For mechanical mounting of 1st Generation modules. Also provides grounding of the module from the baseplate to the printed circuit board. (Sold individually)



Description	Part Number	Price
0.525" Long., 0.25" Hex	10692-01	\$1.07

Inductors, Differential Mode

Output inductors may be used to reduce differential output noise by approximately 20dB.



Inductance(@ max. A)	DC Current (max.)	Part Number	Price
130-150 μ H	40 A	05298	\$3.21

Inductors, Common Mode

Common-mode inductors provide a high level of attenuation of common-mode currents.



Inductance/ Winding	DC Current/ Resistance	Part Number	Price
1000 μ H	12 A/6.5 m Ω	02134	\$14.23
3000 μ H	7 A/18 m Ω	02133	\$14.23

Capacitors, Tantalum

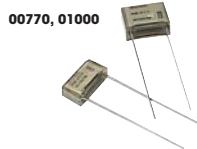
Solid tantalum capacitor used to reduce output ripple.



Description	Part Number	Price
270 μ F/10 V	24252	\$5.50
120 μ F/20 V	24253	\$5.50
68 μ F/30 V	24254	\$5.50
27 μ F/50 V	24255	\$5.50

Capacitors, Y-Type

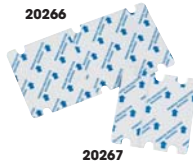
For EMI/RFI considerations, Y capacitors should be used with any of Vicor's DC-DC converter modules.



Description	Part Number	Price
"Y" Cap., 1500 pF	00770	\$1.71
"Y" Cap., 4700 pF	01000	\$1.33

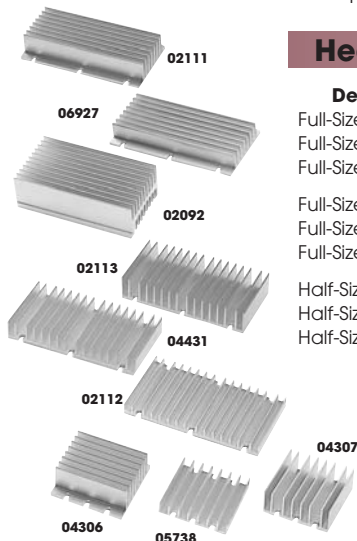
ThermMate Thermal Pads

For use with Vicor modules, ThermMate thermal pads are a "dry" alternative to thermal compound and are pre-cut to the outline dimensions of the module.



Thermal Pad	Thickness	Part Number	Price
Full-Size	0.007"	20266 (10 pc. pkg.)	\$37.50
Half-Size	0.007"	20267 (10 pc. pkg.)	\$30.00

Heat Sinks



Description	Fin Height	Part Number	Price
Full-Size (Longitudinal)	0.90"	02111	\$8.02
Full-Size (Longitudinal)	0.70"	06927	\$8.02
Full-Size (Longitudinal)	1.45"	02092	\$10.70
Full-Size (Transverse)	0.90"	02113	\$8.02
Full-Size (Transverse)	0.70"	04431	\$8.02
Full-Size (Transverse)	0.40"	02112	\$8.02
Half-Size (Longitudinal)	0.90"	04306	\$5.35
Half-Size (Transverse)	0.90"	04307	\$5.35
Half-Size (Transverse)	0.40"	05738	\$5.35

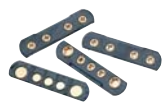
Minimum order quantities may apply.

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Accessories



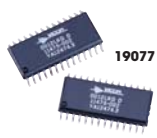
2nd Generation Product — See vicorpower.com for full accessory line.



Design Guides On-line
at vicorpower.com



22400



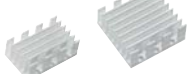
19077

18038
17443



17485
15989

18030
17539



18068
17570

18074
17574



18073
17572

20263



20265

20264

SurfMates - Surface Mount Sockets

Packaged in five pair sets.

Description	Pin Style	Part Number	Price (5-sets)
Maxi	S	16017	\$65.00
Mini	S	16021	\$65.00
Micro	S	16025	\$65.00

InMates - Thru hole Sockets

All sockets are supplied on InMate headers to assure proper alignment during installation. InMate thru hole sockets are available for board thicknesses between 0.063" and 0.125". Min/Max 0.055"/0.071". InMates are packaged in five pair sets. See vicorpower.com for larger quantities and pricing.

Board Thickness	Mounting Style	Pin Style	Module Style	Part Number	Price (5-sets)
0.063"	Inboard	S	Maxi	18362	\$50.00
0.063"	Inboard	S	Mini	18366	\$50.00
0.063"	Inboard	S	Micro	18370	\$38.75
0.063"	Onboard	N	Maxi	18364	\$50.00
0.063"	Onboard	N	Mini	18368	\$50.00
0.063"	Onboard	N	Micro	18372	\$38.75
0.094"	Onboard	N	Maxi	18365	\$50.00
0.094"	Onboard	N	Mini	18369	\$50.00
0.094"	Onboard	N	Micro	18373	\$38.75
0.125"	Onboard	N	Maxi	21510	\$50.00
0.125"	Onboard	N	Mini	21511	\$50.00
0.125"	Onboard	N	Micro	21512	\$38.75

PR Bus Isolation Transformer

Developed for isolation of PR Bus signal when used with 2nd Generation parallel configurations. Consult Vicor for applications instruction.

Part Number	Price
22400	\$7.50

Phased Array Controller (PAC) Chip

For use with arrays of up to 12 converters, the PAC chip provides phased operation to minimize overall noise. (10 piece minimum)

Part Number	Price
19077	\$13.64

Heat Sinks

Fin Style	Baseplate Style	Fin Height	Module Style	Part Number	Price
Longitudinal	Thru Hole	0.4"	Maxi	18038	\$11.25
Longitudinal	Thru Hole	0.9"	Maxi	17443	\$11.25
Longitudinal	Thru Hole	0.4"	Mini	18039	\$9.89
Longitudinal	Thru Hole	0.9"	Mini	17537	\$9.89
Longitudinal	Thru Hole	0.4"	Micro	18030	\$8.29
Longitudinal	Thru Hole	0.9"	Micro	17539	\$8.29
Transverse	Thru Hole	0.4"	Maxi	18068	\$11.25
Transverse	Thru Hole	0.9"	Maxi	17570	\$11.25
Transverse	Thru Hole	0.4"	Mini	18073	\$9.89
Transverse	Thru Hole	0.9"	Mini	17572	\$9.89
Transverse	Thru Hole	0.4"	Micro	18074	\$8.29
Transverse	Thru Hole	0.9"	Micro	17574	\$8.29

ThermMate Thermal Pads

For use with Vicor modules, ThermMate thermal pads are a "dry" alternative to thermal compound and are pre-cut to the outline dimensions of the module baseplate.

Thermal Pad	Thickness	Part Number	Price
Maxi	0.007"	20263 (10 pc. pkg.)	\$37.50
Mini	0.007"	20264 (10 pc. pkg.)	\$30.00
Micro	0.007"	20265 (10 pc. pkg.)	\$26.75

Minimum order quantities may apply.

Environmental Stress Screening & MTBF

Every module undergoes extensive post-production environmental stress screening (ESS) before shipment to verify compliance with Vicor's high quality and performance standards and to eliminate early life failures. To ensure the most effective routine for precipitating module failures, Vicor continually evaluates its ESS program and makes appropriate changes as new data becomes available or as product improvements occur. After burn-in and temperature cycling, each module undergoes final electrical testing over the specified temperature range. The program is outlined below.

1st Generation Module Screening		I-Grade	M-Grade
Operating temperature	MI-200	-40°C to +85°C	-55°C to +85°C
	MI-J00	-40°C to +100°C	-55°C to +100°C
Storage temperature	MI-200	-55°C to +100°C	-65°C to +100°C
	MI-J00	-55°C to +125°C	-65°C to +125°C
Temperature cycling 17°C per minute nominal rate of change, dwell time until product stabilization		12 cycles -65°C to +100°C	12 cycles -65°C to +100°C
Ambient test at 25°C		Yes	Yes
Power cycling burn-in power on 10 minute, off 15 minute; module temperature cycling 35°C to 80°C; load to 50% or 100 W; module output continuously monitored while enabled		12 hours 25 cycles	96 hours 200 cycles
Functional and parametric ATE tests at low/high temperature.		-40°C/+85°C	-55°C/+85°C
Hi-Pot test		Yes	Yes
Visual inspection before packing into ESD containers		Yes	Yes
Test data		vicorpower.com	vicorpower.com

2nd Generation Module Screening		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 17°C per minute nominal rate of change, dwell time until product stabilization		12 cycles -65°C to +100°C	12 cycles -65°C to +100°C
Ambient test at 25°C		Yes	Yes
Power cycling burn-in Power on 10 minutes, off 15 minutes; Module temperature cycling 35°C to 80°C; load up to 125 W; module output continuously monitored while enabled.		12 hours 28 cycles	24 hours 56 cycles
Functional and parametric ATE tests at low/high temperature.		-40°C to +100°C	-55°C to +100°C
Hi-Pot test		Yes	Yes
Visual inspection before packing into ESD containers		Yes	Yes
Test data		vicorpower.com	vicorpower.com





MTBF

Because operating temperature is one of the most important factors in determining overall module reliability, it is imperative that the user's system design allow for efficient heat transfer from the baseplate to system ambient. Since temperature and failure rate are exponentially related, just a 10°C decrease in baseplate temperature can have a dramatic increase in MTBF. Due to patented zero-voltage/zero-current switching topology, Vicor converters are highly efficient compared to those with more traditional topologies. High efficiency translates into both smaller size and lower temperature rises. To minimize thermal impedance, all major power dissipating components are mounted directly to the baseplate.

Below are representative calculated MTBF values based on MIL-HDBK-217F. If you require information about a specific model, contact Vicor with the model number, expected baseplate temperature, and operating environment to obtain an individually prepared report.



1st Generation Modules		MTBF in 1,000 Hours			
Model No.	Baseplate Temp.	G.B.	G.F.	A.I.C.	N.S.
MI-J21-MY	25°C	3,619	1,810	1,086	1,068
	50°C	2,208	1,104	662	651
	65°C	1,701	851	510	502
MI-221-MW	25°C	3,277	1,634	983	966
	50°C	1,999	999	599	590
	65°C	1,540	770	462	454

2nd Generation Modules		MTBF in 1,000 Hours			
Model No.	Baseplate Temp.	G.B.	G.F.	A.I.C.	N.S.
V300C3V3M75BL (Micro)	25°C	4,450	2,225	1,335	1,313
	50°C	2,714	1,357	814	801
	65°C	2,091	1,046	627	617
V300B5M200BL (Mini)	25°C	4,064	2,032	1,219	1,199
	50°C	2,479	1,240	744	731
	65°C	1,910	995	573	564
V300A12M500BL (Maxi)	25°C	3,095	1,548	929	913
	50°C	1,888	944	566	557
	65°C	1,455	727	436	429



Environmental Qualification



Fully encapsulated, Vicor modules utilize a proprietary spin fill process that assures complete, void free encapsulation making them suitable for the harshest environments. In addition to providing mechanical rigidity, the encapsulant is thermally conductive to eliminate hot spots and aid in heat transfer to the baseplate.

To verify the suitability of Vicor products for harsh application environments, modules have been subjected to the environmental testing requirements of MIL-STD-810, MIL-S-901 and MIL-STD-202. These tests, listed below, are performed at an independent laboratory. Additional environmental tests can be done upon individual customer request.

1st Generation Modules

Altitude	MIL-STD-810D, method 500.2, procedure III, explosive decompression (40Kft.). MIL-STD-810D, method 500.2, procedure II, 40,000 ft., 1000-1500 ft./min. to 70,000 ft., unit functioning.
Explosive atmosphere	MIL-STD-810C, method 511.1, procedure I.
Vibration	MIL-STD-810D, method 514.3, procedure I, category 6, helicopter, 20 g. MIL-STD-810D, method 514 random: 10-300 Hz @ 0.02 g ² /Hz, 2000 Hz @ 0.002 g ² /Hz, 3.9 total grms 3 hours/axis. Sine: 30 Hz @ 20 g, 60 Hz @ 10 g, 90 Hz @ 6.6 g, 120 Hz @ 5.0 g, 16.0 total grms, 3 axes. MIL-STD-810E, method 514.4, table 514.4-VII, ±6 db/octave, 7.7 grms, 1hr/axis.
Shock	MIL-STD-810D, method 516.3, proc. I, functional shock, 40 g. MIL-STD-202, method 213, 18 pulses, 60 g, 9 msec. MIL-STD-202, method 213, 75 g, 11 ms saw tooth shock. MIL-STD-202, method 207, 3 impacts/axis, 1,3,5 feet.
Acceleration	MIL-STD-810D, method 513.3, proc. II operational test, 9 g for 1 minute along 3 mutually perpendicular axes.
Humidity	MIL-STD-810D, method 507.2, proc I, cycle I, 240 hrs, 88% relative humidity.
Solder test	MIL-STD-202, method 208, 8 hr. aging.
Fungus	MIL-STD-810C, method 508.
Salt atmosphere	MIL-STD-810C, method 509.1.

2nd Generation Modules

Altitude	MIL-STD-810F, method 500.2, 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 grms 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 grms 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, 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, procedure I, cycle I, 240 hrs, 95% RH.
Solder test	MIL-STD-202G, method 208H, 8 hour aging.
Fungus	MIL-STD-810F, method 508.4, section II.
Salt Fog	MIL-STD-810F, method 509.1



Custom Power

Operating in partnership with Vicor Corporation, North American **Vicor Integration Architects (VIAs)** and International **Value Added Resellers (VARs)**, design and manufacture turnkey custom power systems, specializing in the unique requirements of electronic equipment manufacturers in the military COTS market.

VIAs and VARs design, manufacture, and certify compliance to military standards for your custom or customized solution. By basing their designs on Vicor component power modules, VIAs and VARs can provide prototypes and production quantities in far less time and with far less risk than by conventional discrete approaches. They can also modify existing Vicor configurable products to meet your specialized requirements.



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Mission Power Solutions

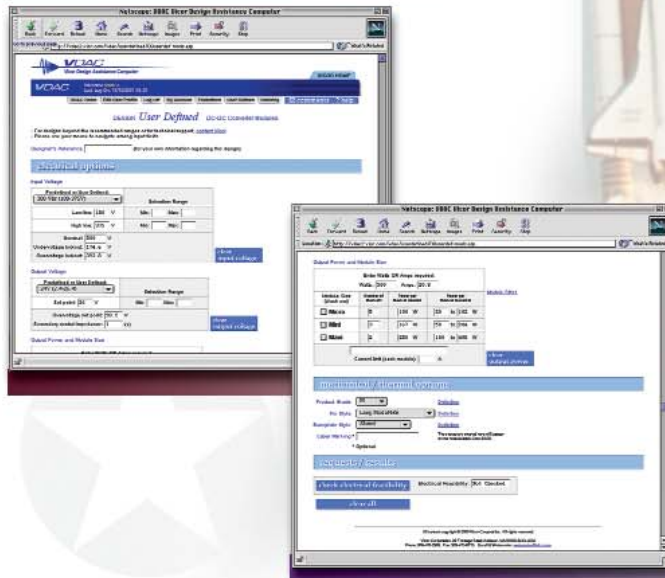
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Configure Semi-Custom 2nd Generation DC-DC Converters



VDAC (Vicor Design Assistance Computer)...

is a patented system which enables Vicor's customers to specify online, and verify in real time, the performance and attributes of 2nd Generation DC-DC converters.

Enter design parameters...

- ★ Input voltage range
- ★ Output voltage set point
- ★ Output power
- ★ Operating temperature
- ★ Mechanical variations

Receive instant feedback on design feasibility

Manufactured on Vicor's automated production line



vicorpower.com/vdac



Technical Support

Vicor global offices are fully equipped and staffed with applications engineers and customer service representatives to provide the product information and technical assistance customers need concerning Vicor products and power solutions.

Applications Engineers ...

- ★ Evaluate specific customer design issues and offer a wide range of component-based power solutions.
- ★ Answer technical questions. (by phone, fax, email, or the Vicor website)
- ★ Assist with component-based power system design.
- ★ Support user needs through visits to customer facilities.

Vicor Express Representatives ...

- ★ Provide product price and delivery information.
- ★ Help select the most appropriate product for your application.
- ★ Can arrange a visit to your site by a Vicor applications engineer or sales representative.
- ★ Fulfill literature requests.
- ★ Process purchase order requirements.
- ★ Order status information.

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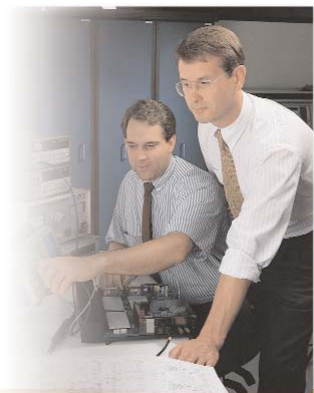
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Vicor Corporation

Vicor designs, manufactures, and markets modular, high density power components and complete configurable power systems used primarily by original equipment manufacturers (OEMs) in the communications, data processing, industrial control, test equipment, medical, and defense electronics markets.

Zero-Voltage/Zero-Current Switching Technology

High frequency operation is the key to reducing energy storage elements to a size practical for implementing power conversion functions in standardized modular packages. The high efficiency of Vicor's zero-voltage/zero-current switching topology allows converters to operate in excess of 1 MHz while avoiding energy losses in the switch element — the cause of electrical and thermal stresses that can undermine the reliability of other high density converters.

Zero-voltage/zero-current switching consequently results in reliable high power density, faster response times, lower conducted and radiated noise, and minimum required cooling volume.

World Class Manufacturing

The standard design common to all Vicor converters enables the company to use high speed automated mass manufacturing to dramatically reduce the time and cost of delivering products that conform to specific customer requirements. Flexible, highly computer-integrated processes allow Vicor to produce thousands of modules a day in thousands of variations. The repeatable precision of automated manufacture ensures the consistent high quality of all our products at the most competitive prices and in the shortest time possible.

Vicor's operations at its headquarters in Andover, Massachusetts are registered to the ISO 9001 international quality standard.

Technical Support

Vicor Technical Support Centers are fully equipped and staffed with applications engineers to provide the product information and technical assistance customers need concerning all of our products and power solutions.

With a worldwide presence, applications engineers support users' needs through visits to customer facilities or our applications labs. They are available to answer technical questions regarding Vicor products and their application in customer products; to assist with component-based power system design; to evaluate specific customer design issues; and to offer a wide range of component-based power solutions.

vicorpower.com

