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Vicor Corporation
MI-220-IX-F3

For any questions, you can email us directly:
sales@integrated-circuit.com

Data Sheet

MI-200

DC-DC Converters 50 to 100 Watts

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 shutdown
- Power boosters for higher power outputs
- 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)

Product Highlights

The MI-200 family of DC-DC converters is designed for applications utilizing distributed power architectures. Based on Vicor's VI-200 / VI-J00 family of zero-current switching, component level DC-DC converters, the MI-200 family offers exceptional performance in terms of power density, efficiency, noise, ease of use, and reliability.

Fully encapsulated in Vicor's industry standard package, the MI-Series meets MIL-STD-810 environmental requirements for humidity, fungus, salt-fog, explosive atmosphere, acceleration, vibration, and shock.

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

Packaging Options

Standard: Slotted baseplate

SlimMod: Flangeless baseplate, option suffix: **- S**
Example: MI - 2XX - XX **- S**

FinMod: Finned heat sink, option suffix:
- F1, - F2, -F3 or **-F4**
Examples:
MI - 2XX - XX -**F1**, 0.25" fins, longitudinal
MI - 2XX - XX -**F2**, 0.50" fins, longitudinal
MI - 2XX - XX -**F3**, 0.25" fins, transverse
MI - 2XX - XX -**F4**, 0.50" fins, transverse

Converter Selection Chart

MI-2 ▪ ▪ ▪▪ ▪▪

Semi-custom driver and booster modules available, consult factory.

▪ Input Voltage

Nominal	Range	Transient [a]	Notes
2 = 28 V	18 – 50 V [b]	60 V	28 Vdc input per MIL-STD 704D/E/F
5 = 155 V	100 – 210 V	230 V	155 Vdc input per MIL-STD-1399A
6 = 270 V	125 – 400 V [c]	475 V	270 Vdc input per MIL-STD-704D/E/F
7 = 165 V	100 – 310 V	n/a	

[a] Transient voltage for 1 second
[b] 16 V operation at 75% load
[c] MI-26Z-xV, MI-26Y-xV rated at 75% load from 125 – 150 VIN

▪ Output Voltage

Z = 2.0 V	**1** = 12 V
Y = 3.3 V	**P** = 13.8 V
0 = 5.0 V	**2** = 15 V
X = 5.2 V	**N** = 18.5 V
W = 5.5 V	**3** = 24 V
V = 5.8 V	**L** = 28 V
T = 6.5 V [d]	**J** = 36 V
R = 7.5 V [d]	**K** = 40 V
M = 10 V	**4** = 48 V

[d] 75 W max power for 28 V input

▪▪ Product Grade Temperature (°C)

Operating	Storage
I = –40 to +85	**I** = –55 to +100
M = –55 to +85	**M** = –65 to +100

Overtemperature shutdown 95°C typical
(recycle power to restart)

▪▪ Output Power/Current VOUT

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

For additional output power,
100 W and 75 W booster modules available
Change (MI-**2**xx-xx) to (MI-**B**xx-xx)

CONVERTER SPECIFICATIONS

(typical at T_{BP} = 25°C, nominal line and 75% load, unless otherwise specified)

■ INPUT SPECIFICATIONS

Parameter	Min	Typ	Max	Units	Test Conditions
Inrush charge		120×10^{-6}	200×10^{-6}	Coulombs	Nominal line
Input reflected ripple current – pp		10%		I_{IN}	Nominal line, full load
Input ripple rejection		$30+20\,\mathrm{Log}\left(\frac{V_{IN}}{V_{OUT}}\right)$		dB	120 Hz, nominal line
		$20+20\,\mathrm{Log}\left(\frac{V_{IN}}{V_{OUT}}\right)$		dB	2400 Hz, nominal line
No load power dissipation		1.35	2	Watts	

■ OUTPUT CHARACTERISTICS

Parameter	Min	Typ	Max	Units	Test Conditions
Setpoint accuracy		0.5%	1%	V_{NOM}	
Load/line regulation		0.05%	0.2%	V_{NOM}	LL to HL, 10% to Full Load
		0.2%	0.5%	V_{NOM}	LL to HL, No Load to 10%
Output temperature drift		0.01	0.02	% / °C	Over rated temperature
Long term drift		0.02		%/1K hours	
Output ripple – pp		100	150	mV	Whichever is greater 20 MHz bandwidth
		1.0%	1.5%	V_{NOM}	
Trim range [a]	50%		110%	V_{NOM}	
Total remote sense compensation	0.5			Volts	
OVP set point [b]	115%	125%	135%	V_{NOM}	latching
Current limit	105%		125%	I_{NOM}	Automatic restart
Short circuit current [c]	20%		130%	I_{NOM}	

[a] 10 V, 12 V and 15 V outputs, standard trim range ±10%. Consult factory for wider trim range.
3.3 V output trim range 2.20 to 3.63 V

[b] No over temperature or voltage protection in booster modules

[c] Output voltages of 5 V or less incorporate foldback current limiting; outputs of 10 V and above provide constant current limiting.

■ CONTROL PIN SPECIFICATIONS

Parameter	Min	Typ	Max	Units	Test Conditions
Gate out impedance		50		Ohms	
Gate in impedance		1000		Ohms	
Gate in open circuit voltage		6		Volts	Use open collector
Gate in low threshold	0.65			Volts	
Gate in low current			6	mA	
Power sharing accuracy	0.95		1.05		

CONVERTER SPECIFICATIONS (cont.)

■ DIELECTRIC WITHSTAND CHARACTERISTICS

Parameter	Min	Typ	Max	Units	Test Conditions
Input to output	3,000			VRMS	Baseplate earthed
Output to baseplate	500			VRMS	
Input to baseplate	1,500			VRMS	
Input to output capacitance		50	75	pF	

■ THERMAL CHARACTERISTICS

Parameter	Min	Typ	Max	Units	Test Conditions
Efficiency		80 – 90%			
Baseplate to sink thermal impedance		0.07		°C/Watt	With thermal pads
Thermal shutdown [d] (Drivers only)	90	95	105	°C	Cool and recycle power to restart

[d] No over temperature or voltage protection in booster modules

■ ENVIRONMENTAL – MIL-STD-810D

Parameter	Min	Typ	Max	Units	Test Conditions
Altitude - method 500.2	70,000			feet	Procedure II
Humidity - method 507.2	86/240			%/hours	Procedure I, cycle 1
Acceleration - method 513.3	9			g	Procedure II
Vibration - method 514.3	20			g	Procedure I, category 6
Shock - method 516.3	40			g	Procedure I

■ RELIABILITY - MIL-HDBK-217F (MI-22L-MW)

Parameter	Min	Typ	Max	Units	Test Conditions
25°C Ground Benign: G.B.		3,552		1,000 hours	
50°C Naval Sheltered: N.S.		639		1,000 hours	
65°C Airborne Inhabited Cargo: A.I.C.		501		1,000 hours	

■ MECHANICAL SPECIFICATIONS

Parameter	Min	Typ	Max	Units	Test Conditions
Weight	7.2 205	7.3 208	7.4 210	Ounces Grams	

CONVERTER SPECIFICATIONS (cont.)

■ PRODUCT GRADE SPECIFICATIONS

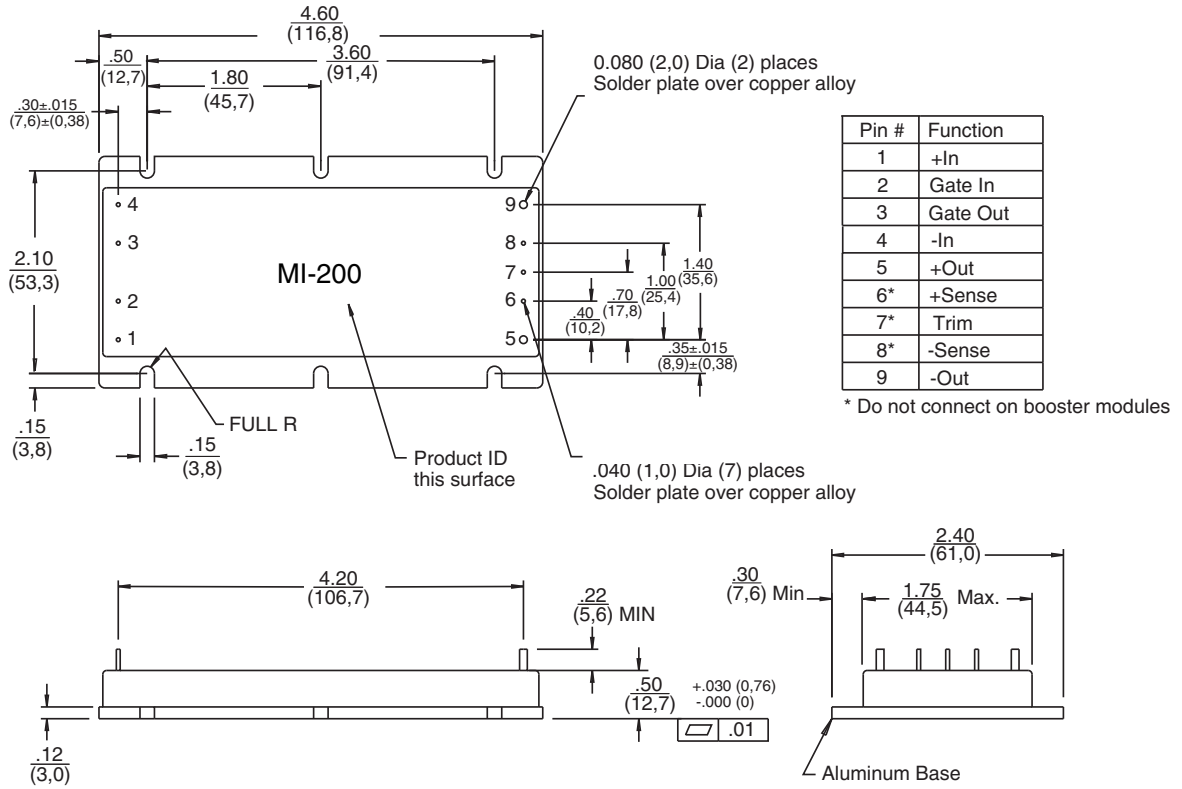
Parameter	I-Grade	M-Grade
Storage temperature	-55°C to +100°C	-65°C to +100°C
Operating temperature (baseplate)	-40°C to +85°C	-55°C to +85°C
Power cycling burn-in	12 hours, 29 cycles	96 hours, 213 cycles
Temperature cycled with power off 17°C per minute rate of change	12 cycles -65°C to +100°C	12 cycles -65°C to +100°C
Test data supplied at these temperatures [e]	-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

[e] Test data available for review or download from vicorpower.com

■ ENVIRONMENTAL QUALIFICATIONS

Parameter	Qualification
Altitude	MIL-STD-810D, Method 500.2, Procedure III, explosive decompression (40 K ft.).
	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 514.3 random: 10 – 300 Hz @ 0.02 g^2/Hz, 2000 Hz @ 0.002 g^2/Hz, 3.9 total G rms 3 hrs/axis. Sine: 30 Hz @ 20 g, 60 Hz @ 10 g, 90 Hz @ 6.6 g, 120 Hz @ 5.0 g, 16.0 total G rms, 3 axes
	MIL-STD-810E, Method 514.4, Table 514.4-VII, ±6 db/octave, 7.7 G rms, 1hr/axis
Shock	MIL-STD-810D, Method 516.3, Procedure I, functional shock, 40 g
	MIL-STD-202F, Method 213B, 18 pulses, 60 g, 9 msec
	MIL-STD-202F, Method 213B, 75 g, 11 ms saw tooth shock
	MIL-STD-202F, Method 207A, 3 impacts / axis, 1, 3, 5 feet
Acceleration	MIL-STD-810D, Method 513.3, Procedure II Operational test, 9 g for 1 minute along 3 mutually perpendicular axes
Humidity	MIL-STD-810D, Method 507.2, Procedure I, cycle I, 240 hrs, 88% relative humidity
Solder Test	MIL-STD-202, Method 208, 8 hr. aging
Fungus	MIL-STD-810C, Method 508.1

MECHANICAL DRAWING



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

* Do not connect on booster modules

Note: For alternate packaging options refer to the mechanical drawing page of vicorpower.com

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