



# Data Sheet

## MI-J00

### DC-DC Converters

### 10 to 50 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/in<sup>3</sup>
- MIL-STD-810 environments
- Up to 90% efficiency
- Remote sense
- Current limit
- 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)

#### Product Highlights

The MI-J00 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-J00 family offers exceptional performance in terms of power density, efficiency, noise, ease of use, and reliability.

The MI-J00 family meets all steady-state, transient and under/overvoltage requirements of MIL-STD-704D/E/F for both 28 Vdc input (MI-J2X) and 270 Vdc input (MI-J6X), and the worst case envelope of MIL-STD-1399A for 155 Vdc input (MI-J5X).

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.

Fully encapsulated in Vicor's industry standard package, the MI-J00 family meets MIL-STD-810 environmental testing requirements for humidity, fungus, salt-fog, explosive atmosphere, acceleration, vibration, and shock.

#### Packaging Options

**Standard:** Slotted baseplate

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

**FinMod:** Finned heat sink, option suffix:  
- F1, -F2, -F3 and - F4

Examples:

- MI - JXX - XX -F1, 0.25" fins, longitudinal
- MI - JXX - XX -F2, 0.50" fins, longitudinal
- MI - JXX - XX -F3, 0.25" fins, transverse
- MI - JXX - XX -F4, 0.50" fins, transverse

#### Converter Selection Chart

### MI-J

Semi-custom modules available, consult factory.

#### Input Voltage

Nominal	Range	Transient <sup>[a]</sup>	Notes
2 = 28 V	18 – 50 V <sup>[b]</sup>	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 <sup>[c]</sup>	475 V	270 Vdc input per MIL-STD-704D/E/F
7 = 165 V	100 – 310 V	n/a	

<sup>[a]</sup> Transient voltage for 1 second.

<sup>[b]</sup> 16 V operation at 75% load.

<sup>[c]</sup> These units rated at 75% load from 125 – 150 Vin: MI-J6Z-xY, MI-J6Y-xY, MI-J60-xY

#### 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	J = 36 V
R = 7.5 V	K = 40 V
M = 10 V	4 = 48 V

#### Product Grade Temperatures (°C)

Operating	Storage
I = -40 to +100	I = -55 to +125
M = -55 to +100	M = -65 to +125

#### Output Power/Current Vout

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

## CONVERTER SPECIFICATIONS

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

### INPUT SPECIFICATIONS

Parameter	Min	Typ	Max	Units	Test Conditions
Inrush charge		$60 \times 10^{-6}$	$100 \times 10^{-6}$	Coulombs	Nominal line
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	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	% / $^{\circ}\text{C}$	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 <sup>[a]</sup>	50		110	% $V_{NOM}$	
Total remote sense compensation	0.5			Volts	
Current limit	105		125	% $I_{NOM}$	Automatic restart
Short circuit current	105		130	% $I_{NOM}$	

<sup>[a]</sup> 10 V, 12 V and 15 V outputs, standard trim range  $\pm 10\%$ . Consult factory for wider trim range.

### CONTROL PIN SPECIFICATIONS

Parameter	Min	Typ	Max	Units	Test Conditions
Gate out impedance		50		$\Omega$	
Gate in impedance		1000		$\Omega$	
Gate in high threshold			6	Volts	Use open collector
Gate in low threshold	0.65			Volts	
Gate in low current			6	mA	

## CONVERTER SPECIFICATIONS (cont.)

### ■ DIELECTRIC WITHSTAND CHARACTERISTICS

Parameter	Min	Typ	Max	Units	Test Conditions
Input to output	3,000			V <sub>RMS</sub>	Baseplate earthed
Output to baseplate	500			V <sub>RMS</sub>	
Input to baseplate	1,500			V <sub>RMS</sub>	
Input to output capacitance		50	75	pF	

### ■ THERMAL CHARACTERISTICS

Parameter	Min	Typ	Max	Units	Test Conditions
Efficiency		80 – 90%			
Baseplate to sink		0.14		°C/Watt	With thermal pads

### ■ ENVIRONMENTAL – MIL-STD-810D

Parameter	Min	Typ	Max	Units	Test Conditions
Altitude - method 500.2	70,000			feet	Procedure II
Humidity - method 507.2	88/240			%/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-J2L-MY)

Parameter	Min	Typ	Max	Units	Test Conditions
25°C Ground Benign: G.B.		3,732		1,000 hours	
50°C Naval Sheltered: N.S.		672		1,000 hours	
65°C Airborne Inhabited Cargo: A.I.C.		526		1,000 hours	

### ■ MECHANICAL SPECIFICATIONS

Parameter	Min	Typ	Max	Units	Test Conditions
Weight		3.0 (85)		Ounces (Grams)	

## CONVERTER SPECIFICATIONS (cont.)

### ■ PRODUCT GRADE SPECIFICATIONS

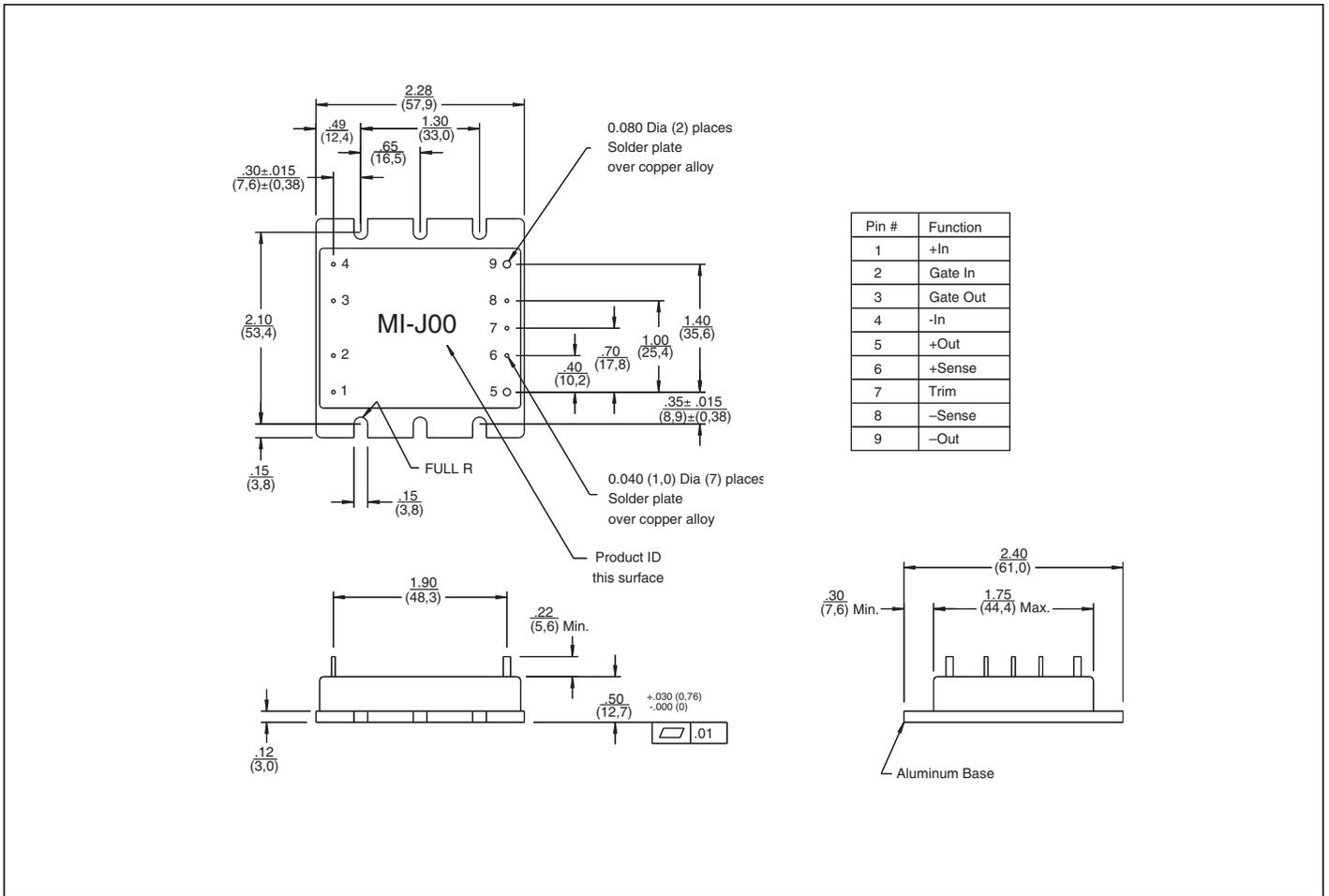
Parameter	I-Grade	M-Grade
Storage temperature	-55°C to +125°C	-65°C to +125°C
Operating temperature (baseplate)	-40°C to +100°C	-55°C to +100°C
Power cycling burn-in	12 hours, 29 cycles	96 hours, 213 cycles
Temperature cycled with power off 17°C per minute rate of change	12 cycles -65°C to +100°C	12 cycles -65°C to +100°C
Test data supplied at these temperatures <sup>[a]</sup>	-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

<sup>[a]</sup> 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 <sup>2</sup> /Hz, 2000 Hz @ 0.002 g <sup>2</sup> /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
Salt-Fog	MIL-STD-810C, Method 509.1

# MECHANICAL DRAWING



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

## **Warranty**

Vicor products are guaranteed for two years from date of shipment against defects in material or workmanship when in normal use and service. This warranty does not extend to products subjected to misuse, accident, or improper application or maintenance. Vicor shall not be liable for collateral or consequential damage. This warranty is extended to the original purchaser only.

EXCEPT FOR THE FOREGOING EXPRESS WARRANTY, VICOR MAKES NO WARRANTY, EXPRESS OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, THE WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE.

Vicor will repair or replace defective products in accordance with its own best judgement. For service under this warranty, the buyer must contact Vicor to obtain a Return Material Authorization (RMA) number and shipping instructions. Products returned without prior authorization will be returned to the buyer. The buyer will pay all charges incurred in returning the product to the factory. Vicor will pay all reshipment charges if the product was defective within the terms of this warranty.

Information published by Vicor has been carefully checked and is believed to be accurate; however, no responsibility is assumed for inaccuracies. Vicor reserves the right to make changes to any products without further notice to improve reliability, function, or design. Vicor does not assume any liability arising out of the application or use of any product or circuit; neither does it convey any license under its patent rights nor the rights of others. Vicor general policy does not recommend the use of its components in life support applications wherein a failure or malfunction may directly threaten life or injury. Per Vicor Terms and Conditions of Sale, the user of Vicor components in life support applications assumes all risks of such use and indemnifies Vicor against all damages.

## **Vicor's comprehensive line of power solutions includes high density AC-DC and DC-DC modules and accessory components, fully configurable AC-DC and DC-DC power supplies, and complete custom power systems.**

Information furnished by Vicor is believed to be accurate and reliable. However, no responsibility is assumed by Vicor for its use. Vicor components are not designed to be used in applications, such as life support systems, wherein a failure or malfunction could result in injury or death. All sales are subject to Vicor's Terms and Conditions of Sale, which are available upon request.

**Specifications are subject to change without notice.**

## **Intellectual Property Notice**

Vicor and its subsidiaries own Intellectual Property (including issued U.S. and Foreign Patents and pending patent applications) relating to the products described in this data sheet. Interested parties should contact Vicor's Intellectual Property Department.

**Vicor Corporation**  
25 Frontage Road  
Andover, MA, USA 01810  
Tel: 800-735-6200  
Fax: 978-475-6715

### **email**

Customer Service: [custserv@vicorpower.com](mailto:custserv@vicorpower.com)  
Technical Support: [apps@vicorpower.com](mailto:apps@vicorpower.com)