



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/in³
- 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 ^[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] 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 | | 60×10^{-6} | 100×10^{-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 ^[a] | 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} | |

^[a] 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 | | Ω | |
| Gate in impedance | | 1000 | | Ω | |
| 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 _{RMS} | Baseplate earthed |
| Output to baseplate | 500 | | | V _{RMS} | |
| Input to baseplate | 1,500 | | | V _{RMS} | |
| 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 ^[a] | -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 |

^[a] 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 |
| Salt-Fog | MIL-STD-810C, Method 509.1 |

MECHANICAL DRAWING



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

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