

FEATURES

- ▶ Reinforced Insulation rated for 300VAC Working Voltage
- ▶ I/O-isolation Voltage 4000VACrms
- ▶ Industrial & Medical Safety Approval
- ▶ Wide 2:1 Input Voltage Range
- ▶ Fully regulated Output Voltage
- ▶ Low Leakage Current
- ▶ Operating Temp. Range -40°C to +75 °C
- ▶ Input Filter meets EN 55022, class A and FCC, level A
- ▶ Overload Protection
- ▶ 3 Years Product Warranty



PRODUCT OVERVIEW

The MINMAX MIHW3000 series is a range of high performance DC/DC converter modules with a reinforced insulation system. The I/O- isolation voltage is specified for 4000VACrms. The product comes in a small DIP-24 package. All 12 models features wide 2:1 input voltage range and fully regulated output voltage.

The MIHW3000 DC/DC converters offer an economical solution for demanding applications in industrial and medical instrumentation requesting a certified high supplementary or reinforced insulation system to comply with relative industrial or medical safety standards.

Model Selection Guide

| Model Number | Input Voltage (Range) VDC | Output Voltage VDC | Output Current | | Input Current | | Reflected Ripple Current mA (typ.) | Max. capacitive Load μ F | Efficiency (typ.) % |
|--------------|------------------------------|-----------------------|----------------|----------|------------------------|----------------------|---------------------------------------|-----------------------------|------------------------|
| | | | Max. mA | Min. mA | @Max. Load mA(typ.) | @No Load mA(typ.) | | | |
| | | | @Max. Load | @No Load | | | | | |
| MIHW3022 | 12 (9 ~ 18) | 5 | 1000 | 200 | 570 | 30 | 60 | 1000 | 75 |
| MIHW3023 | | 12 | 500 | 100 | 641 | | | 470 | 78 |
| MIHW3026 | | ±12 | ±250 | ±50 | 641 | | | 220# | 78 |
| MIHW3027 | | ±15 | ±200 | ±40 | 641 | | | 220# | 78 |
| MIHW3032 | 24 (18 ~ 36) | 5 | 1000 | 200 | 278 | 20 | 30 | 1000 | 77 |
| MIHW3033 | | 12 | 500 | 100 | 313 | | | 470 | 80 |
| MIHW3036 | | ±12 | ±250 | ±50 | 313 | | | 220# | 80 |
| MIHW3037 | | ±15 | ±200 | ±40 | 313 | | | 220# | 80 |
| MIHW3042 | 48 (36 ~ 75) | 5 | 1000 | 200 | 139 | 10 | 15 | 1000 | 77 |
| MIHW3043 | | 12 | 500 | 100 | 156 | | | 470 | 80 |
| MIHW3046 | | ±12 | ±250 | ±50 | 156 | | | 220# | 80 |
| MIHW3047 | | ±15 | ±200 | ±40 | 156 | | | 220# | 80 |

For each output

Input Specifications

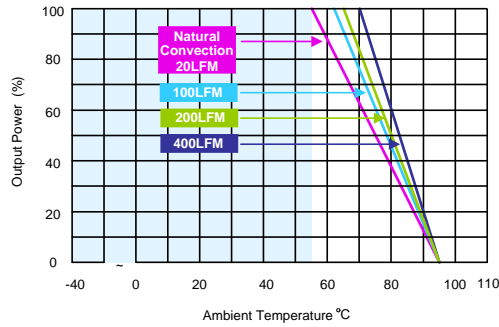
| Parameter | Model | Min. | Typ. | Max. | Unit |
|-----------------------------------|------------------|---|------|------|------|
| Input Surge Voltage (1 sec. max.) | 12V Input Models | -0.7 | --- | 25 | VDC |
| | 24V Input Models | -0.7 | --- | 50 | |
| | 48V Input Models | -0.7 | --- | 100 | |
| Start-Up Threshold Voltage | 12V Input Models | 7 | 8 | 9 | |
| | 24V Input Models | 13 | 15 | 18 | |
| | 48V Input Models | 30 | 33 | 36 | |
| Under Voltage Shutdown | 12V Input Models | --- | --- | 8.5 | |
| | 24V Input Models | --- | --- | 16 | |
| | 48V Input Models | --- | --- | 34 | |
| Short Circuit Input Power | All Models | --- | --- | 3000 | mW |
| Internal Power Dissipation | | --- | --- | 2500 | mW |
| Conducted EMI | | Compliance to EN55022,class A and FCC part 15,class A | | | |

| Output Specifications | | | | | | |
|---------------------------------|-----------------------------|---------------------|-------|-------|--------|-------------------|
| Parameter | Conditions | Min. | Typ. | Max. | Unit | |
| Output Voltage Setting Accuracy | | --- | --- | ±1.0 | %Vnom. | |
| Output Voltage Balance | Dual Output, Balanced Loads | --- | ±0.5 | ±2.0 | % | |
| Line Regulation | Vin=Min. to Max. | --- | ±0.3 | ±0.5 | % | |
| Load Regulation | Io=25% to 100% | --- | ±0.5 | ±1.0 | % | |
| Ripple & Noise (20MHz) | 0-20 MHz Bandwidth | 5V Output Models | --- | 75 | 100 | mV _{P-P} |
| | | Other Output Models | --- | 100 | 150 | mV _{P-P} |
| Transient Recovery Time | 25% Load Step Change | --- | 300 | 500 | μ sec | |
| Transient Response Deviation | | --- | ±3 | ±6 | % | |
| Temperature Coefficient | | --- | ±0.02 | ±0.05 | %/°C | |
| Over Current Protection | Foldback | 120 | 150 | --- | % | |
| Short Circuit Protection | | Continuous | | | | |

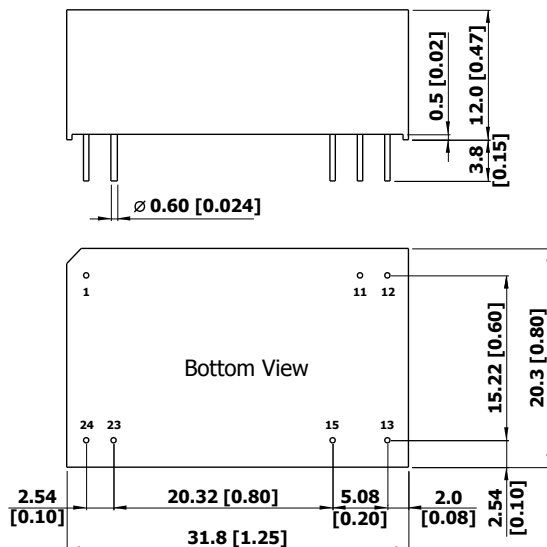
| Isolation, Safety Standards | | | | | |
|-------------------------------|--|------|------|------|--------|
| Parameter | Conditions | Min. | Typ. | Max. | Unit |
| I/O Isolation Voltage (rated) | 60 Seconds | 4000 | --- | --- | VACrms |
| Leakage Current | 240VAC, 60Hz | --- | --- | 2 | μ A |
| I/O Isolation Resistance | 500 VDC | 10 | --- | --- | GΩ |
| I/O Isolation Capacitance | 100KHz, 1V | --- | 7 | 13 | pF |
| Safety Standards | cUL/UL60950-1, CSA C22.2 No. 60950-1-03 | | | | |
| | UL60601-1, CSA C22.2 No.601-1, | | | | |
| | IEC/EN 60950-1, IEC/EN 60601-1 | | | | |
| Approvals | IEC60950-1 CB report, cUL/UL 60950-1 certificate | | | | |
| | UL60601-1 UL certificate | | | | |

| General Specifications | | | | | |
|------------------------|-----------------------------------|---------|------|------|-------|
| Parameter | Conditions | Min. | Typ. | Max. | Unit |
| Switching Frequency | | --- | 150 | --- | KHz |
| MTBF(calculated) | MIL-HDBK-217F@25°C, Ground Benign | 700,000 | --- | --- | Hours |

| Environmental Specifications | | | | | |
|---|---------------------|------|------|----------|--|
| Parameter | Conditions | Min. | Max. | Unit | |
| Operating Ambient Temperature Range (See Power Derating Curve) | Natural Convection | -40 | +75 | °C | |
| Case Temperature | | --- | +95 | °C | |
| Storage Temperature Range | | -50 | +125 | °C | |
| Humidity (non condensing) | | --- | 95 | % rel. H | |
| Cooling | Free-Air convection | | | | |
| Lead Temperature (1.5mm from case for 10Sec.) | | --- | 260 | °C | |

Power Derating Curve

Notes

- 1 Specifications typical at $T_a = +25^\circ\text{C}$, resistive load, nominal input voltage and rated output current unless otherwise noted.
- 2 Transient recovery time is measured to within 1% error band for a step change in output load of 75% to 100%.
- 3 These power converters require a minimum output loading to maintain specified regulation, operation under no-load conditions will not damage these modules; however, they may not meet all specifications listed.
- 4 We recommend to protect the converter by a slow blow fuse in the input supply line.
- 5 Other input and output voltage may be available, please contact factory.
- 6 That "natural convection" is about 20LFM but is not equal to still air (0 LFM).
- 7 Specifications are subject to change without notice.

Package Specifications
Mechanical Dimensions

Pin Connections

| Pin | Single Output | Dual Output |
|-----|---------------|-------------|
| 1 | +Vin | +Vin |
| 11 | No Pin | Common |
| 12 | -Vout | No Pin |
| 13 | +Vout | -Vout |
| 15 | No Pin | +Vout |
| 23 | -Vin | -Vin |
| 24 | -Vin | -Vin |

- All dimensions in mm (inches)
- Tolerance: $X.X \pm 0.25$ ($X.XX \pm 0.01$)
 $X.XX \pm 0.13$ ($X.XXX \pm 0.005$)
- Pin diameter $\varnothing 0.6 \pm 0.05$ (0.024 ± 0.002)

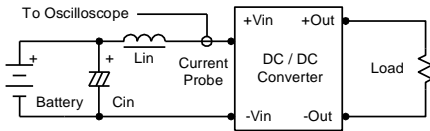
Physical Characteristics

| | |
|---------------|---|
| Case Size | : 31.8x20.3x12.0mm (1.25x0.8x0.47 inches) |
| Case Material | : Non-Conductive Black Plastic (flammability to UL 94V-0 rated) |
| Pin Material | : Copper Alloy with Gold Plate Over Nickel Subplate |
| Weight | : 18g |

Test Setup

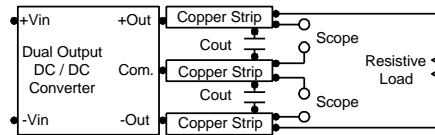
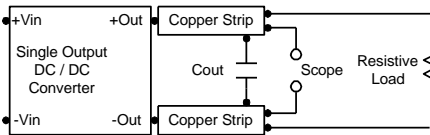
Input Reflected-Ripple Current Test Setup

Input reflected-ripple current is measured with an inductor L_{in} (4.7 μ H) and C_{in} (220 μ F, ESR < 1.0 Ω at 100 KHz) to simulate source impedance. Capacitor C_{in} , offsets possible battery impedance. Current ripple is measured at the input terminals of the module, measurement bandwidth is 0-500 KHz.



Peak-to-Peak Output Noise Measurement Test

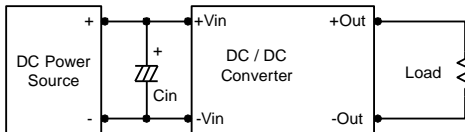
Use a C_{out} 0.47 μ F ceramic capacitor. Scope measurement should be made by using a BNC socket, measurement bandwidth is 0-20 MHz. Position the load between 50 mm and 75 mm from the DC/DC Converter.



Technical Notes

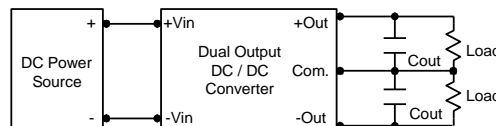
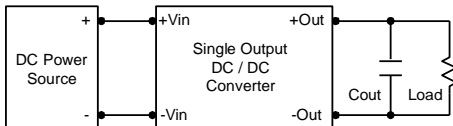
Input Source Impedance

The power module should be connected to a low ac-impedance input source. Highly inductive source impedances can affect the stability of the power module. In applications where power is supplied over long lines and output loading is high, it may be necessary to use a capacitor on the input to insure startup. By using a good quality low Equivalent Series Resistance (ESR < 1.0 Ω at 100 kHz) capacitor of a 10 μ F for the 12V input devices and a 4.7 μ F for the 24V input devices and a 2.2 μ F for the 48V devices, capacitor mounted close to the power module helps ensure stability of the unit.



Output Ripple Reduction

A good quality low ESR capacitor placed as close as practicable across the load will give the best ripple and noise performance. To reduce output ripple, it is recommended to use 3.3 μ F capacitors at the output.

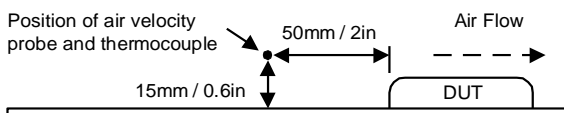


Maximum Capacitive Load

The MIHW3000 series has limitation of maximum connected capacitance on the output. The power module may operate in current limiting mode during start-up, affecting the ramp-up and the startup time. Connect capacitors at the point of load for best performance. The maximum capacitance can be found in the data sheet.

Thermal Considerations

Many conditions affect the thermal performance of the power module, such as orientation, airflow over the module and board spacing. To avoid exceeding the maximum temperature rating of the components inside the power module, the case temperature must be kept below 95°C. The derating curves are determined from measurements obtained in a test setup.



Design & Feature Considerations

Conducted and radiated emissions < A
with external coupling capacitor C_{io} =1 nF < B