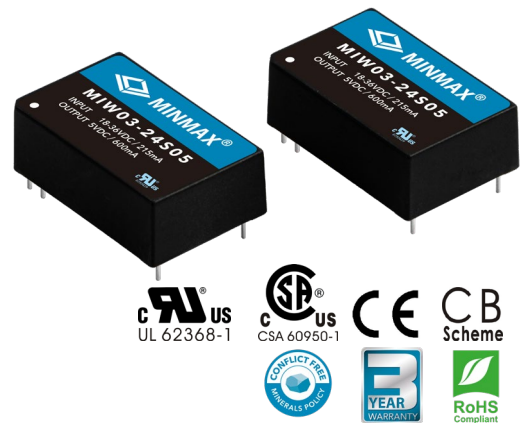


FEATURES

- ▶ Industrial Standard DIP-24 Package
- ▶ Wide 2:1 Input Voltage Range
- ▶ Fully Regulated Output Voltage
- ▶ I/O Isolation 1500 VDC (opt. 3000VDC)
- ▶ Operating Ambient Temp. Range -40°C to +85°C
- ▶ No Min. Load Requirement
- ▶ Under-voltage, Overload and Short Circuit Protection
- ▶ EMI Emission EN 55032 Class A Approved
- ▶ UL/cUL/IEC/EN 62368-1(60950-1) Safety Approval & CE-Marking


PRODUCT OVERVIEW

The MINMAX MIW03 series is a range of high performance DC-DC converter modules, designed as a cost optimized replacement for the highly popular MIW1000 series. The converter features wide 2:1 input ranges and tight output voltage regulation. Excellent efficiency allows an operating temperature up to +70°C at full load. The product comes in a DIP-24 plastic package with industry standard footprint. Typical applications for these economical priced DC-DC converters are industrial electronics, instrumentation or communication equipment.

Model Selection Guide

| Model Number | Input Voltage (Range) VDC | Output Voltage VDC | Output Current Max. mA | Input Current | | Reflected Ripple Current mA(typ.) | Max. capacitive Load μF | Efficiency (typ.) @Max. Load % |
|--------------|------------------------------|-----------------------|------------------------------|------------------------|----------------------|--------------------------------------|----------------------------|--------------------------------------|
| | | | | @Max. Load mA(typ.) | @No Load mA(typ.) | | | |
| MIW03-05S033 | 5 (4.5 ~ 9) | 3.3 | 750 | 643 | 65 | 100 | 680 | 77 |
| MIW03-05S05 | | 5 | 600 | 750 | | | 470 | 80 |
| MIW03-05S12 | | 12 | 250 | 732 | | | 330 | 82 |
| MIW03-05S15 | | 15 | 200 | 732 | | | 220 | 82 |
| MIW03-05S24 | | 24 | 125 | 741 | | | 100 | 81 |
| MIW03-05D05 | | ±5 | ±250 | 625 | | | 220# | 80 |
| MIW03-05D12 | | ±12 | ±125 | 732 | | | 150# | 82 |
| MIW03-05D15 | | ±15 | ±100 | 732 | | | 100# | 82 |
| MIW03-12S033 | 12 (9 ~ 18) | 3.3 | 750 | 261 | 35 | 30 | 680 | 79 |
| MIW03-12S05 | | 5 | 600 | 309 | | | 470 | 81 |
| MIW03-12S12 | | 12 | 250 | 294 | | | 330 | 85 |
| MIW03-12S15 | | 15 | 200 | 294 | | | 220 | 85 |
| MIW03-12S24 | | 24 | 125 | 298 | | | 100 | 84 |
| MIW03-12D05 | | ±5 | ±250 | 260 | | | 220# | 80 |
| MIW03-12D12 | | ±12 | ±125 | 298 | | | 150# | 84 |
| MIW03-12D15 | | ±15 | ±100 | 298 | | | 100# | 84 |
| MIW03-24S033 | 24 (18 ~ 36) | 3.3 | 750 | 131 | 20 | 15 | 680 | 79 |
| MIW03-24S05 | | 5 | 600 | 154 | | | 470 | 81 |
| MIW03-24S12 | | 12 | 250 | 147 | | | 330 | 85 |
| MIW03-24S15 | | 15 | 200 | 147 | | | 220 | 85 |
| MIW03-24S24 | | 24 | 125 | 149 | | | 100 | 84 |
| MIW03-24D05 | | ±5 | ±250 | 130 | | | 220# | 80 |
| MIW03-24D12 | | ±12 | ±125 | 149 | | | 150# | 84 |
| MIW03-24D15 | | ±15 | ±100 | 149 | | | 100# | 84 |
| MIW03-48S033 | 48 (36 ~ 75) | 3.3 | 750 | 65 | 15 | 10 | 680 | 79 |
| MIW03-48S05 | | 5 | 600 | 77 | | | 470 | 81 |
| MIW03-48S12 | | 12 | 250 | 74 | | | 330 | 85 |
| MIW03-48S15 | | 15 | 200 | 74 | | | 220 | 85 |
| MIW03-48S24 | | 24 | 125 | 74 | | | 100 | 84 |
| MIW03-48D05 | | ±5 | ±250 | 65 | | | 220# | 80 |
| MIW03-48D12 | | ±12 | ±125 | 74 | | | 150# | 84 |
| MIW03-48D15 | | ±15 | ±100 | 74 | | | 100# | 84 |

For each output

| Input Specifications | | | | | |
|-----------------------------------|------------------|------------------|------|------|------|
| Parameter | Model | Min. | Typ. | Max. | Unit |
| Input Surge Voltage (1 sec. max.) | 5V Input Models | -0.7 | --- | 11 | VDC |
| | 12V Input Models | -0.7 | --- | 25 | |
| | 24V Input Models | -0.7 | --- | 50 | |
| | 48V Input Models | -0.7 | --- | 100 | |
| Start-Up Threshold Voltage | 5V Input Models | --- | --- | 4.5 | |
| | 12V Input Models | --- | --- | 9 | |
| | 24V Input Models | --- | --- | 18 | |
| | 48V Input Models | --- | --- | 36 | |
| Under Voltage Shutdown | 5V Input Models | --- | --- | 4 | |
| | 12V Input Models | --- | --- | 8.5 | |
| | 24V Input Models | --- | --- | 17.5 | |
| | 48V Input Models | --- | --- | 35.5 | |
| Short Circuit Input Power | All Models | --- | --- | 2000 | mW |
| Input Filter | | Internal Pi Type | | | |

| Output Specifications | | | | | |
|---------------------------------|--------------------------------|------|-------|-------|-------------------|
| Parameter | Conditions | Min. | Typ. | Max. | Unit |
| Output Voltage Setting Accuracy | | --- | --- | ±2.0 | %Vnom. |
| Output Voltage Balance | Dual Output, Balanced Loads | --- | ±0.5 | ±2.0 | % |
| Line Regulation | Vin=Min. to Max. @Full Load | --- | ±0.3 | ±1.0 | % |
| Load Regulation | Io=0% to 100% | --- | ±0.3 | ±1.0 | % |
| Minimum Load | No minimum Load Requirement | | | | |
| Ripple & Noise | 0-20 MHz Bandwidth | --- | --- | 70 | mV _{P-P} |
| Transient Recovery Time | 25% Load Step Change | --- | 300 | 500 | μsec |
| Transient Response Deviation | | --- | ±3 | ±5 | % |
| Temperature Coefficient | | --- | ±0.01 | ±0.02 | %/°C |
| Over Load Protection | Foldback | 120 | 150 | --- | % |
| Short Circuit Protection | Continuous, Automatic Recovery | | | | |

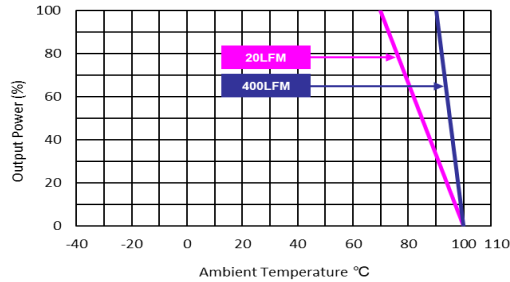
| General Specifications | | | | | | |
|---------------------------|--|-----------|------|------|-------|-----|
| Parameter | Conditions | Min. | Typ. | Max. | Unit | |
| I/O Isolation Voltage | 60 Seconds | Standard | 1500 | --- | --- | VDC |
| | | Suffix H | 3000 | --- | --- | VDC |
| | 1 Second | Standard | 1800 | --- | --- | VDC |
| I/O Isolation Resistance | 500VDC | 1000 | --- | --- | MΩ | |
| I/O Isolation Capacitance | 100kHz, 1V | --- | --- | 300 | pF | |
| Switching Frequency | | 80 | --- | --- | kHz | |
| MTBF (calculated) | MIL-HDBK-217F@25°C, Ground Benign | 1,000,000 | | | Hours | |
| Safety Approvals | UL/cUL 60950-1 recognition (CSA certificate), IEC/EN 60950-1 (CB-report) | | | | | |
| | UL/cUL 62368-1 recognition (UL certificate), IEC/EN 62368-1 (CB-report) | | | | | |

| EMC Specifications | | | | |
|--------------------|--------------------|---------------------------------------|-----------------------------|-------------|
| Parameter | Standards & Level | | | Performance |
| EMI | Conduction | EN 55032 | Without external components | Class A |
| | Radiation | | | |
| EMS ₍₅₎ | EN 55035 | | | |
| | ESD | EN 61000-4-2 Air ± 8kV, Contact ± 6kV | | A |
| | Radiated immunity | EN 61000-4-3 10V/m | | A |
| | Fast transient | EN 61000-4-4 ±2kV | | A |
| | Surge | EN 61000-4-5 ±1kV | | A |
| | Conducted immunity | EN 61000-4-6 10Vrms | | A |

Environmental Specifications

| Parameter | Min. | Max. | Unit |
|--|------|------|----------|
| Operating Ambient Temperature Range (See Power Derating Curve) | -40 | +85 | °C |
| Case Temperature | --- | +100 | °C |
| Storage Temperature Range | -50 | +125 | °C |
| Humidity (non condensing) | --- | 95 | % rel. H |
| Lead Temperature (1.5mm from case for 10Sec.) | --- | 260 | °C |

Power Derating Curve

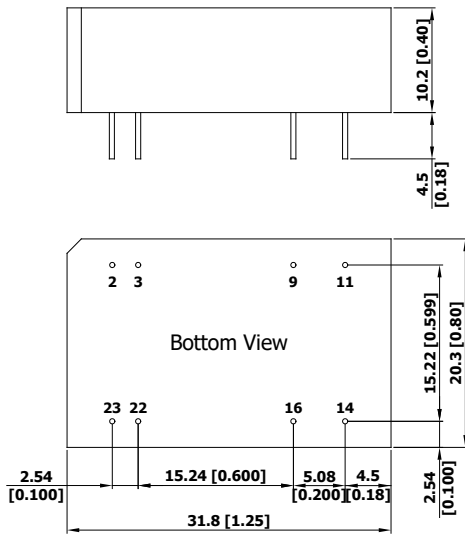


Notes

- 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 We recommend to protect the converter by a slow blow fuse in the input supply line.
- 4 Other input and output voltage may be available, please contact MINMAX.
- 5 The external components might be required to meet EMS standard for some of test items. Please contact MINMAX for the solution in detail.
- 6 Specifications are subject to change without notice.
- 7 The repeated high voltage isolation testing of the converter can degrade isolation capability, to a lesser or greater degree depending on materials, construction, environment and reflow solder process. Any material is susceptible to eventual chemical degradation when subject to very high applied voltages thus implying that the number of tests should be strictly limited. We therefore strongly advise against repeated high voltage isolation testing, but if it is absolutely required, that the voltage be reduced by 20% from specified test voltage. Furthermore, the high voltage isolation capability after reflow solder process should be evaluated as it is applied on system.

Package Specifications

Mechanical Dimensions



Pin Connections

| Pin | Single Output | Dual Output | Diameter mm (inches) |
|-----|---------------|-------------|-------------------------|
| 2 | -Vin | -Vin | ∅ 0.5 [0.02] |
| 3 | -Vin | -Vin | ∅ 0.5 [0.02] |
| 9 | No Pin | Common | ∅ 0.5 [0.02] |
| 11 | NC | -Vout | ∅ 0.5 [0.02] |
| 14 | +Vout | +Vout | ∅ 0.5 [0.02] |
| 16 | -Vout | Common | ∅ 0.5 [0.02] |
| 22 | +Vin | +Vin | ∅ 0.5 [0.02] |
| 23 | +Vin | +Vin | ∅ 0.5 [0.02] |

- ▶ All dimensions in mm (inches)
- ▶ Tolerance: X.X±0.5 (X.XX±0.02)
X.XX±0.25 (X.XXX±0.01)
- ▶ Pin diameter tolerance: X.X±0.05 (X.XX±0.002)

Physical Characteristics

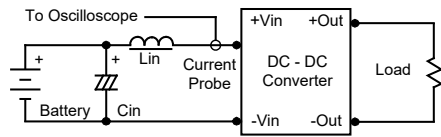
| | |
|---------------|--|
| Case Size | : 31.8x20.3x10.2mm (1.25x0.80x0.40 inches) |
| Case Material | : Plastic resin (flammability to UL 94V-0 rated) |
| Pin Material | : Copper Alloy |
| Weight | : 12.8g |

| Order Code Table | |
|------------------|-----------------|
| Standard | 3kVDC isolation |
| MIW03-05S033 | MIW03-05S033H |
| MIW03-05S05 | MIW03-05S05H |
| MIW03-05S12 | MIW03-05S12H |
| MIW03-05S15 | MIW03-05S15H |
| MIW03-05S24 | MIW03-05S24H |
| MIW03-05D05 | MIW03-05D05H |
| MIW03-05D12 | MIW03-05D12H |
| MIW03-05D15 | MIW03-05D15H |
| MIW03-12S033 | MIW03-12S033H |
| MIW03-12S05 | MIW03-12S05H |
| MIW03-12S12 | MIW03-12S12H |
| MIW03-12S15 | MIW03-12S15H |
| MIW03-12S24 | MIW03-12S24H |
| MIW03-12D05 | MIW03-12D05H |
| MIW03-12D12 | MIW03-12D12H |
| MIW03-12D15 | MIW03-12D15H |
| MIW03-24S033 | MIW03-24S033H |
| MIW03-24S05 | MIW03-24S05H |
| MIW03-24S12 | MIW03-24S12H |
| MIW03-24S15 | MIW03-24S15H |
| MIW03-24S24 | MIW03-24S24H |
| MIW03-24D05 | MIW03-24D05H |
| MIW03-24D12 | MIW03-24D12H |
| MIW03-24D15 | MIW03-24D15H |
| MIW03-48S033 | MIW03-48S033H |
| MIW03-48S05 | MIW03-48S05H |
| MIW03-48S12 | MIW03-48S12H |
| MIW03-48S15 | MIW03-48S15H |
| MIW03-48S24 | MIW03-48S24H |
| MIW03-48D05 | MIW03-48D05H |
| MIW03-48D12 | MIW03-48D12H |
| MIW03-48D15 | MIW03-48D15H |

Test Setup

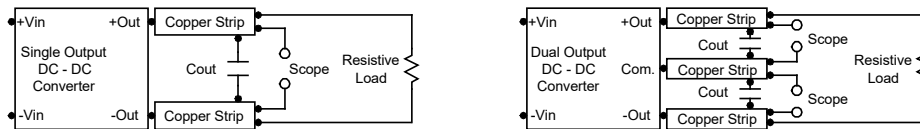
Input Reflected-Ripple Current Test Setup

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.



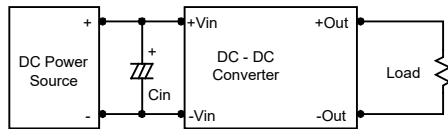
Technical Notes

Overload Protection

To provide protection in a fault (output overload) condition, the unit is equipped with internal current limiting circuitry and can endure current limiting for an unlimited duration. At the point of current-limit inception, the unit shifts from voltage control to current control. The unit operates normally once the output current is brought back into its specified range.

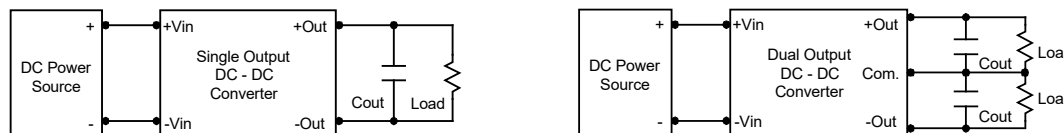
Input Source Impedance

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 at the input to ensure startup. Capacitor mounted close to the power module helps ensure stability of the unit, it is recommended to use a good quality low Equivalent Series Resistance (ESR < 1.0 Ω at 100 kHz) capacitor of a 8.2 μ F for the 5V input devices, a 3.3 μ F for the 12V input devices and a 1.5 μ F for the 24V and 48V devices.



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 MIW03 series has limitation of maximum connected capacitance at the output. The power module may be operated in current limiting mode during start-up, affecting the ramp-up and the startup time. 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 100°C.

The derating curves are determined from measurements obtained in a test setup.

