# MINMAX®

## FEATURES

► DIP-24 Metal Package
   31.8 x 20.3 x 10.2 mm (1.25 x 0.8 x 0.4 inches)
► Wide 2:1 Input Range
► Operating Ambient Temp. Range –40℃ to +85℃
► Short Circuit Protection
► I/O-isolation 1500VDC
► UL/cUL/IEC/EN 60950-1 Safety Approval

## PRODUCT OVERVIEW

The MINMAX MIW3000 series is a range of isolated 5-6W DC-DC converter modules featuring fully regulated output voltages and wide 2:1 input voltage ranges. The product comes in a shielded metal DIP-24 package with industry standard pinout. An excellent efficiency allows an operating temperature range of -40℃ to +85℃ (with derating). Typical applications for these converters are in battery operated equipment and instrumentation, distributed power systems, data communication and general industrial electronics.

### Model Selection Guide

| Model Number | Input Voltage (Range) | Output Voltage | Output Current | | Input Current | | Reflected Ripple Current | Max. capacitive Load | Efficiency (typ.) |
|---|---|---|---|---|---|---|---|---|---|
| | | | Max. | Min. | @Max. Load | @No Load | | | @Max. Load |
| | VDC | VDC | mA | mA | mA(typ.) | mA(typ.) | mA(typ.) | µF | % |
| MIW3011 | 5 (4.5 ~ 7) | 3.3 | 1200 | 60 | 1056 | 80 | 100 | 6800 | 75 |
| MIW3012 | | 5 | 1000 | 50 | 1265 | | | | 79 |
| MIW3013 | | 12 | 500 | 25 | 1463 | | | | 82 |
| MIW3014 | | 15 | 400 | 20 | 1463 | | | | 82 |
| MIW3015 | | ±5 | ±500 | ±25 | 1265 | | | 1000# | 79 |
| MIW3016 | | ±12 | ±250 | ±12.5 | 1463 | | | | 82 |
| MIW3017 | | ±15 | ±200 | ±10 | 1463 | | | | 82 |
| MIW3021 | 12 (9 ~ 18) | 3.3 | 1200 | 60 | 429 | 30 | 25 | 6800 | 77 |
| MIW3022 | | 5 | 1000 | 50 | 514 | | | | 81 |
| MIW3023 | | 12 | 500 | 25 | 595 | | | | 84 |
| MIW3024 | | 15 | 400 | 20 | 595 | | | | 84 |
| MIW3025 | | ±5 | ±500 | ±25 | 514 | | | 1000# | 81 |
| MIW3026 | | ±12 | ±250 | ±12.5 | 595 | | | | 84 |
| MIW3027 | | ±15 | ±200 | ±10 | 595 | | | | 84 |
| MIW3031 | 24 (18 ~ 36) | 3.3 | 1200 | 60 | 209 | 15 | 15 | 6800 | 79 |
| MIW3032 | | 5 | 1000 | 50 | 251 | | | | 83 |
| MIW3033 | | 12 | 500 | 25 | 291 | | | | 86 |
| MIW3034 | | 15 | 400 | 20 | 291 | | | | 86 |
| MIW3035 | | ±5 | ±500 | ±25 | 251 | | | 1000# | 83 |
| MIW3036 | | ±12 | ±250 | ±12.5 | 291 | | | | 86 |
| MIW3037 | | ±15 | ±200 | ±10 | 291 | | | | 86 |
| MIW3041 | 48 (36 ~75) | 3.3 | 1200 | 60 | 104 | 8 | 10 | 6800 | 79 |
| MIW3042 | | 5 | 1000 | 50 | 126 | | | | 83 |
| MIW3043 | | 12 | 500 | 25 | 145 | | | | 86 |
| MIW3044 | | 15 | 400 | 20 | 145 | | | | 86 |
| MIW3045 | | ±5 | ±500 | ±25 | 126 | | | 1000# | 83 |
| MIW3046 | | ±12 | ±250 | ±12.5 | 145 | | | | 86 |
| MIW3047 | | ±15 | ±200 | ±10 | 145 | | | | 86 |

# For each output

## Input Specifications

| Parameter | Model | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|
| Input Surge Voltage (1 sec. max.) | 5V Input Models | -0.7 | --- | 10 | 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 | 3 | 3.5 | 4.4 | |
| | 12V Input Models | 4.5 | 6 | 8 | |
| | 24V Input Models | 8 | 12 | 16 | |
| | 48V Input Models | 16 | 24 | 32 | |
| Under Voltage Shutdown | 5V Input Models | --- | --- | 4 | |
| | 12V Input Models | --- | --- | 8 | |
| | 24V Input Models | --- | --- | 16 | |
| | 48V Input Models | --- | --- | 32 | |
| Short Circuit Input Power | All Models | --- | 1000 | 3000 | mW |
| Internal Power Dissipation | | --- | --- | 2500 | mW |
| Input Filter | | Internal Pi Type | | | |
| Conducted EMI | | Compliance to EN 55022, class A | | | |

## Output Specifications

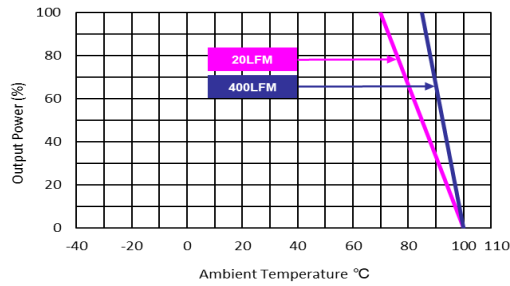| Parameter | Conditions | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|
| Output Voltage Setting Accuracy | | --- | --- | ±1.0 | %Vnom. |
| Output Voltage Balance | Dual Output, Balanced Loads | --- | ±0.5 | ±2.0 | % |
| Line Regulation | Vin=Min. to Max. @Full Load | --- | ±0.1 | ±0.3 | % |
| Load Regulation | Io=20% to 100% | --- | ±0.3 | ±1.0 | % |
| Ripple & Noise | 0-20 MHz Bandwidth | --- | 50 | 75 | mV$_{P-P}$ |
| Transient Recovery Time | 25% Load Step Change | --- | 150 | 300 | µsec |
| Transient Response Deviation | | --- | ±2 | ±6 | % |
| Temperature Coefficient | | --- | ±0.01 | ±0.02 | %/℃ |
| Over Current Protection | Foldback | 120 | 150 | --- | % |
| Short Circuit Protection | Continuous, Automatic Recovery | | | | |

## General Specifications

| Parameter | Conditions | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|
| I/O Isolation Voltage | 60 Seconds | 1500 | --- | --- | VDC |
| | 1 Seconds | 1800 | --- | --- | VDC |
| I/O Isolation Resistance | 500 VDC | 1000 | --- | --- | MΩ |
| I/O Isolation Capacitance | 100kHz, 1V | --- | 380 | 500 | pF |
| Switching Frequency | | --- | 300 | --- | kHz |
| MTBF (calculated) | MIL-HDBK-217F@25℃, Ground Benign | 1,000,000 | | | Hours |
| Safety Approvals | UL/cUL 60950-1 recognition (CSA certificate), IEC/EN 60950-1(CB-report) | | | | |

## Environmental Specifications

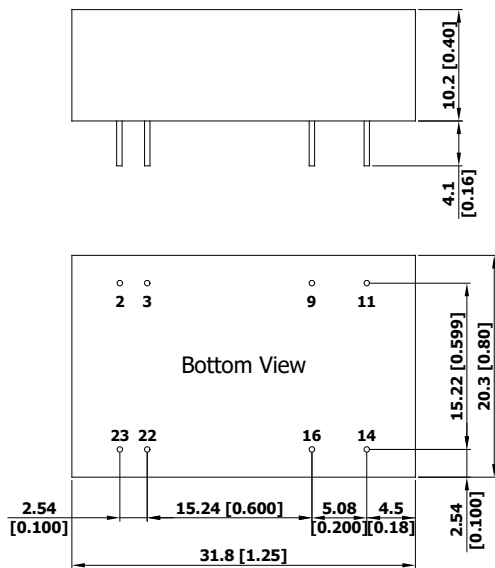| Parameter | Min. | Max. | Unit |
|---|---|---|---|
| Operating Ambient Temperature Range (See Power Derating Curve) | -40 | +85 | ℃ |
| Case Temperature | --- | +90 | ℃ |
| Storage Temperature Range | -50 | +125 | ℃ |
| Humidity (non condensing) | --- | 95 | % rel. H |
| Lead Temperature (1.5mm from case for 10Sec.) | --- | 260 | ℃ |

## Power Derating Curve



## Notes

1  Specifications typical at Ta=+25℃, 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 50% 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 MINMAX.

6  Specifications are subject to change without notice.

## Package Specifications

### Mechanical Dimensions



### Pin Connections

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

NC: No Connection

► All dimensions in mm (inches)
► Tolerance: X.X±0.25 (X.XX±0.01)
        X.XX±0.13 (X.XXX±0.005)
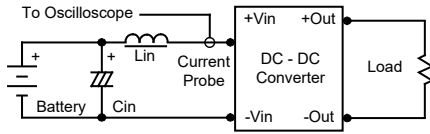► Pin diameter tolerance: X.X±0.05 (X.XX±0.002)

## Physical Characteristics

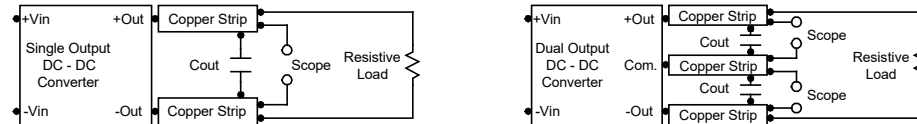| | | |
|---|---|---|
| Case Size | : | 31.8x20.3x10.2mm (1.25x0.80x0.40 inches) |
| Case Material | : | Metal With Non-Conductive Baseplate |
| Pin Material | : | Phosphor Bronze |
| Weight | : | 16.9g |

## Test Setup

### Input Reflected-Ripple Current Test Setup

Input reflected-ripple current is measured with a inductor Lin (4.7μH) and Cin (220μF, ESR < 1.0Ω at 100 kHz) to simulate source impedance.
Capacitor Cin, 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 Cout 0.47μF 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.
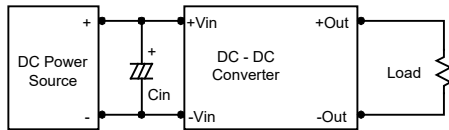


## Technical Notes

### Overcurrent 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.
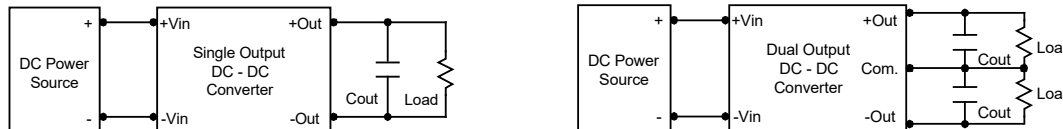
### Input Source Impedance

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 < 1.0Ω at 100 kHz) capacitor of a 10μF for the 5V input devices, a 3.3μF for the 12V input devices and a 2.2μF 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 3.3μF capacitors at the output.



### Maximum Capacitive Load

The MIW3000 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. For optimum performance we recommend 1000μF maximum capacitive load for dual outputs and 6800μF capacitive load for single outputs. 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 90℃.
The derating curves are determined from measurements obtained in a test setup.

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