## FEATURES

- **DIP-24 Metal Package**
  **31.8 x 20.3 x 10.2 mm (1.25 x 0.8 x 0.4 inches)**
- **Ultra-wide 4:1 Input Range**
- **Excellent Load and Line Regulation**
- **Operating Temp. Range –40°C to +85°C**
- **Short Circuit Protection**
- **I/O-isolation 1500VDC**
- **Input Filter meets EN55022,class A and FCC, level A**
- **3 Years Product Warranty**




## PRODUCT OVERVIEW

The MINMAX MIW2300 series is a range of isolated 3W DC/DC converter modules featuring fully regulated output voltages and ultra-wide 4:1 input voltage ranges. The product comes in a shielded metal DIP-24 package with standard pinout. An high efficiency allows an operating temperature range of –40°C to +85°C. The product features an input filter meeting EN 55022,class A and FCC, level A.
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.) | uF | % |
| **MIW2321** | 24 (9 ~ 36) | 3.3 | 750 | 93 | 138 | 20 | 15 | 680 | 75 |
| **MIW2322** | | 5 | 600 | 75 | 158 | | | 470 | 79 |
| **MIW2323** | | 12 | 250 | 32 | 154 | | | 330 | 81 |
| **MIW2324** | | 15 | 200 | 25 | 152 | | | 220 | 82 |
| **MIW2326** | | ±12 | ±125 | ±16 | 156 | | | 150# | 80 |
| **MIW2327** | | ±15 | ±100 | ±13 | 156 | | | 100# | 80 |
| **MIW2331** | 48 (18 ~ 75) | 3.3 | 750 | 93 | 68 | 10 | 10 | 680 | 76 |
| **MIW2332** | | 5 | 600 | 75 | 78 | | | 470 | 80 |
| **MIW2333** | | 12 | 250 | 32 | 75 | | | 330 | 83 |
| **MIW2334** | | 15 | 200 | 25 | 74 | | | 220 | 84 |
| **MIW2336** | | ±12 | ±125 | ±16 | 76 | | | 150# | 82 |
| **MIW2337** | | ±15 | ±100 | ±13 | 76 | | | 100# | 82 |

# For each output

### Input Specifications

| Parameter | Model | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|
| Input Surge Voltage (1 sec. max.) | 24V Input Models | -0.7 | --- | 50 | VDC |
| | 48V Input Models | -0.7 | --- | 100 | |
| Start-Up Voltage | 24V Input Models | 6 | 7.5 | 9 | |
| | 48V Input Models | 12 | 15 | 18 | |
| Under Voltage Shutdown | 24V Input Models | --- | --- | 8.5 | |
| | 48V Input Models | --- | --- | 16 | |
| Reverse Polarity Input Current | All Models | --- | --- | 0.5 | A |
| Short Circuit Input Power | | --- | --- | 2000 | mW |
| Internal Power Dissipation | | --- | --- | 2500 | mW |
| Conducted EMI | | Compliance to EN 55022,class A and FCC part 15,class A | | | |

## Output Specifications

| Parameter | Conditions | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|
| Output Voltage Accuracy | | --- | ±0.5 | ±2.0 | % |
| Output Voltage Balance | Dual Output, Balanced Loads | --- | ±0.5 | ±3.0 | % |
| Line Regulation | Vin=Min. to Max. | --- | ±0.2 | ±1.0 | % |
| Load Regulation | Io=Min. to Max. | --- | ±0.3 | ±1.0 | % |
| Ripple & Noise (20MHz) | | --- | 40 | 75 | mV P-P |
| Ripple & Noise (20MHz) | Over Line, Load & Temp. | --- | --- | 150 | mV P-P |
| Ripple & Noise (20MHz) | | --- | --- | 15 | mV rms |
| Transient Recovery Time | 25% Load Step Change | --- | 150 | 500 | uS |
| Transient Response Deviation | | --- | ±3 | --- | % |
| Temperature Coefficient | | --- | ±0.01 | ±0.02 | %/℃ |
| Over Load Protection | Foldback | 110 | 300 | --- | % |
| Short Circuit Protection | Continuous | | | | |

## General Specifications

| Parameter | Conditions | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|
| I/O Isolation Voltage (rated) | 60 Seconds | 1500 | --- | --- | VDC |
| I/O Isolation Resistance | 500 VDC | 1000 | --- | --- | MΩ |
| I/O Isolation Capacitance | 100KHz, 1V | --- | 380 | 500 | pF |
| Switching Frequency | | --- | 350 | --- | 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 | | | | |

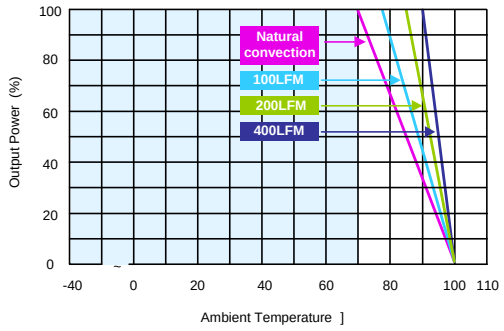
## Input Fuse

| 24V Input Models | 48V Input Models |
|---|---|
| 1000mA Slow-Blow Type | 500mA Slow-Blow Type |

## Environmental Specifications

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

## Power Derating Curve

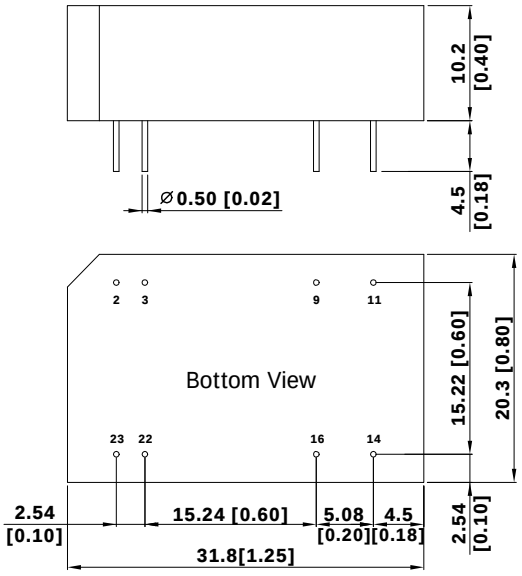


## Notes

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 75% to 100%
3 Ripple & Noise measurement bandwidth is 0-20MHz.
4 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.
5 All DC/DC converters should be externally fused at the front end for protection.
6 Other input and output voltage may be available, please contact factory.
7 Specifications subject to change without notice.

## Package Specifications

Mechanical Dimensions




Pin Connections

| Pin | Single Output | Dual Output |
|---|---|---|
| 2 | -Vin | -Vin |
| 3 | -Vin | -Vin |
| 9 | No Pin | Common |
| 11 | NC | -Vout |
| 14 | +Vout | +Vout |
| 16 | -Vout | Common |
| 22 | +Vin | +Vin |
| 23 | +Vin | +Vin |

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 ⌀ 0.5 ±0.05 (0.02±0.002)

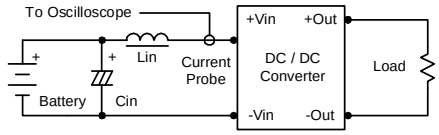
## Physical Characteristics

| | | |
|---|---|---|
| Case Size | : | 31.8x20.3x10.2mm (1.25x0.80x0.40 Inches) |
| Case Material | : | Non-Conductive Black Plastic (flammability to UL 94V-0 rated) |
| Weight | : | 12.2g |

## Test Configurations

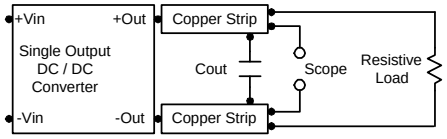
### Input Reflected-Ripple Current Test Setup

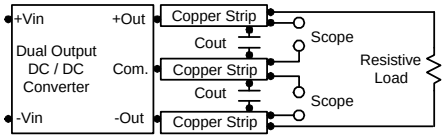
Input reflected-ripple current is measured with a inductor Lin (4.7uH) and Cin (220uF, ESR < 1.0Ω at 100 KHz) to simulate source impedance.
Capacitor Cin, offsets possible battery impedance. Current ripple is measured at the input terminals of the module, measurement bandwidth is 0-500 KHz.




### Peak-to-Peak Output Noise Measurement Test

Use a Cout 0.47uF 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.



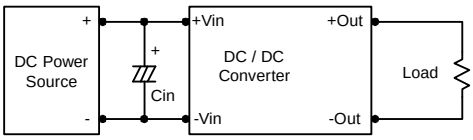

## Design & Feature Considerations

### 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.

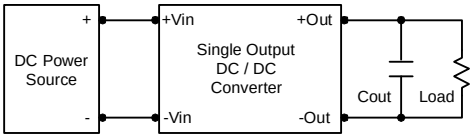
### Input Source Impedance

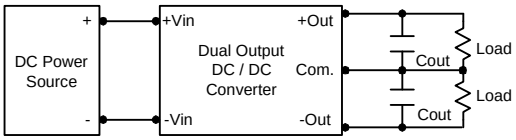
The power module should be connected to a low ac-impedance input source. Highly inductive source impedances can affect the stability of the power module.
In applications where power is supplied over long lines and output loading is high, it may be necessary to use a capacitor at the input to ensure startup.
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 4.7uF for the 24V input devices and a 2.2uF for the 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 3.3uF capacitors at the output.




### Maximum Capacitive Load

The MIW2300 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 680uF maximum capacitive load for 3.3V output, 470uF for 5V output, 330uF for 12V output, 220uF for 15V output, 150uF for ±12V output and 100uF for ±15V output. 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°C.
The derating curves are determined from measurements obtained in a test setup.

