

FEATURES

- ▶ High Power Density in SIP-8 Package
- ▶ Small Footprint: 21.8 x 9.3 mm (0.86"x 0.37")
- ▶ Wide 2:1 Input Range
- ▶ Fully Regulated Output
- ▶ Operating Temp. Range -40°C to +85°C
- ▶ Overload Protection
- ▶ Remote On/Off Control
- ▶ I/O-Isolation Voltage 1000VDC
- ▶ 3 Years Product Warranty



PRODUCT OVERVIEW

The MCW1000 series is a range of isolated 2W DC/DC converter modules featuring fully regulated output and wide 2:1 input voltage ranges. The product comes in a SIP-8 package with a very small footprint occupying only 2.0 cm² (0.3 square in.) on the PCB.

An excellent efficiency allows an operating temperature range of -40°C to +85°C. Further features include remote On/Off control and over load protection. The very compact dimensions of these DC/DC converters make them an ideal solution for many space critical applications in battery-powered equipment and instrumentation.

Model Selection Guide

| Model Number | Input Voltage (Range) VDC | Output Voltage VDC | Output Current | | Input Current | | Reflected Ripple Current mA(typ.) | Max. capacitive Load µF | Efficiency (typ.) @Max. Load % |
|--------------|------------------------------|-----------------------|----------------|------|---------------|----------|--------------------------------------|----------------------------|--------------------------------------|
| | | | Max. | Min. | @Max. Load | @No Load | | | |
| | | | mA | mA | mA(typ.) | mA(typ.) | | | |
| MCW1011 | 5 (4.5 ~ 9) | 3.3 | 500 | 125 | 471 | 40 | 400 | 2200 | 70 |
| MCW1012 | | 5 | 400 | 100 | 548 | | | | |
| MCW1013 | | 12 | 167 | 42 | 534 | | | | |
| MCW1021 | 12 (9 ~ 18) | 3.3 | 500 | 125 | 184 | 20 | 300 | 2200 | 73 |
| MCW1022 | | 5 | 400 | 100 | 217 | | | | |
| MCW1023 | | 12 | 167 | 42 | 209 | | | | |
| MCW1031 | 24 (18 ~ 36) | 3.3 | 500 | 125 | 96 | 10 | 200 | 2200 | 72 |
| MCW1032 | | 5 | 400 | 100 | 109 | | | | |
| MCW1033 | | 12 | 167 | 42 | 103 | | | | |
| MCW1041 | 48 (36 ~ 75) | 3.3 | 500 | 125 | 49 | 8 | 500 | 2200 | 71 |
| MCW1042 | | 5 | 400 | 100 | 57 | | | | |
| MCW1043 | | 12 | 167 | 42 | 53 | | | | |

Input Specifications

| Parameter | Model | Min. | Typ. | Max. | Unit |
|-----------------------------------|------------------|----------------|------|------|------|
| Input Surge Voltage (1 sec. max.) | 5V Input Models | -0.7 | --- | 15 | 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 | 3.5 | 4 | 4.5 | VDC |
| | 12V Input Models | 4.5 | 7 | 9 | |
| | 24V Input Models | 8 | 12 | 18 | |
| | 48V Input Models | 16 | 24 | 36 | |
| Under Voltage Shutdown | 5V Input Models | --- | 3.5 | 4 | VDC |
| | 12V Input Models | --- | 6.5 | 8.5 | |
| | 24V Input Models | --- | 11 | 17 | |
| | 48V Input Models | --- | 22 | 34 | |
| Reverse Polarity Input Current | All Models | --- | --- | 1 | A |
| Short Circuit Input Power | | --- | --- | 1500 | mW |
| Internal Filter Type | | Capacitor type | | | |
| Internal Power Dissipation | | --- | --- | 3500 | mW |



| Output Specifications | | | | | |
|---------------------------------|-----------------------------|------|-------|-------|-------------------|
| Parameter | Conditions | Min. | Typ. | Max. | Unit |
| Output Voltage Setting Accuracy | At 50% Load and Nominal Vin | --- | --- | ±2.0 | %Vom. |
| Line Regulation | Vin=Min. to Max. | --- | ±0.3 | ±0.5 | % |
| Load Regulation | I _o =25% to 100% | --- | ±0.5 | ±0.75 | % |
| Ripple & Noise | max. 20MHz Bandwidth | --- | 30 | 50 | mV _{P-P} |
| Transient Recovery Time | 25% Load Step Change | --- | 100 | 300 | µsec |
| Transient Response Deviation | | --- | ±3 | ±5 | % |
| Temperature Coefficient | | --- | ±0.01 | ±0.02 | %/°C |
| Short Circuit Protection | Continuous | | | | |

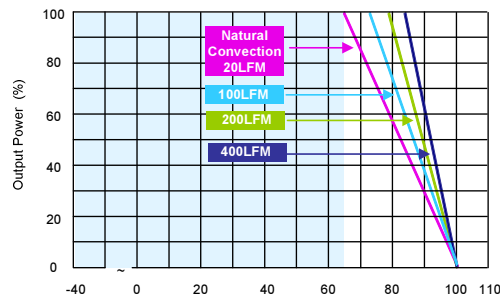
| General Specifications | | | | | |
|-------------------------------|-----------------------------------|-----------|------|------|-------|
| Parameter | Conditions | Min. | Typ. | Max. | Unit |
| I/O Isolation Voltage (rated) | 60 Seconds | 1000 | --- | --- | VDC |
| I/O Isolation Resistance | 500 VDC | 1000 | --- | --- | MΩ |
| I/O Isolation Capacitance | 100KHz, 1V | --- | 65 | 120 | pF |
| Switching Frequency | | 100 | 300 | 650 | KHz |
| MTBF (calculated) | MIL-HDBK-217F@25°C, Ground Benign | 1,000,000 | --- | --- | Hours |

| Input Fuse | | | |
|-----------------------|----------------------|----------------------|----------------------|
| 5V Input Models | 12V Input Models | 24V Input Models | 48V Input Models |
| 1500mA Slow-Blow Type | 700mA Slow-Blow Type | 350mA Slow-Blow Type | 135mA Slow-Blow Type |

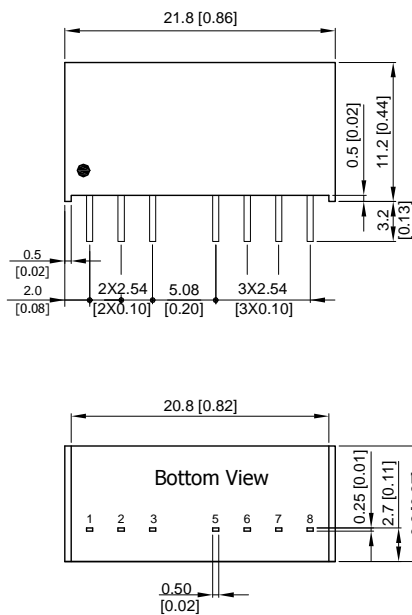
| Remote On/Off Control | | | | | |
|-------------------------------|---|------|------|------|------|
| Parameter | Conditions | Min. | Typ. | Max. | Unit |
| Converter On | Under 0.6 VDC or Open Circuit, drops down to 0VDC by 2mV/°C | | | | |
| Converter Off | 2.7 to 15 VDC | | | | |
| Standby Input Current | | --- | 0.1 | 0.2 | mA |
| Control Input Current (on) | Vin = 0V | --- | --- | -0.4 | mA |
| Control Input Current (off) | Vin = 5.0V | --- | --- | 1 | mA |
| Control Common | Referenced to Negative Input | | | | |

| Environmental Specifications | | | | |
|--|---------------------|------|------|----------|
| Parameter | Conditions | Min. | Max. | Unit |
| Operating Ambient Temperature Range (See Power Derating Curve) | Natural Convection | -40 | +85 | °C |
| Case Temperature | | --- | +90 | °C |
| Storage Temperature Range | | -55 | +105 | °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

- Specifications typical at $T_a = +25^\circ\text{C}$, resistive load, nominal input voltage and rated output current unless otherwise noted.
- Transient recovery time is measured to within 1% error band for a step change in output load of 75% to 100%.
- Ripple & Noise measurement bandwidth is 0-20 MHz.
- These power converters require a minimum output loading to maintain specified regulation, operation under no-load conditions will not damage these.
- All DC/DC converters should be externally fused at the front end for protection.
- Other input and output voltage may be available, please contact factory.
- That "natural convection" is about 20LFM but is not equal to still air (0 LFM).
- Specifications are subject to change without notice.

Package Specifications
Mechanical Dimensions

Pin Connections

| Pin | Function |
|-----|---------------|
| 1 | -Vin |
| 2 | +Vin |
| 3 | Remote On/Off |
| 5 | NC |
| 6 | +Vout |
| 7 | -Vout |
| 8 | NC |

NC: No Connection

- ▶ All dimensions in mm (inches)
- ▶ Tolerance: X.X±0.5 (X.XX±0.02)
X.XX±0.25 (X.XXX±0.01)
- ▶ Pins ±0.1(±0.004)

Physical Characteristics

| | |
|---------------|---|
| Case Size | : 21.8x9.3x11.2 mm (0.86x0.37x0.44 inches) |
| Case Material | : Non-Conductive Black Plastic (flammability to UL 94V-0 rated) |
| Pin Material | : Alloy 42 |
| Weight | : 4.8g |

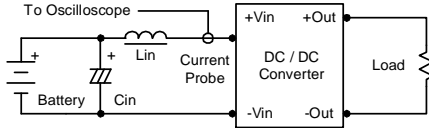


Test Setup

Input Reflected-Ripple Current Test Setup

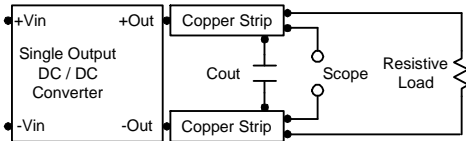
Input reflected-ripple current is measured with an inductor L_{in} (4.7 μ H) and C_{in} (220 μ F, ESR < 1.0 Ω at 100 KHz) to simulate source impedance. Capacitor C_{in} , offsets possible battery impedance.

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

Remote On/Off

Negative logic remote on/off turns the module off during a logic high voltage on the remote on/off pin, and on during a logic low. To turn the power module on and off, the user must supply a switch to control the voltage between the on/off terminal and the -Vin terminal. The switch can be an open collector or equivalent.

A logic high is 2.7V to 15V. A logic low is under 0.6 VDC or open circuit, drops down to 0VDC by 2mV/ $^{\circ}$ C. The maximum sink current at on/off terminal during a logic low is 1 mA. The maximum allowable leakage current of the switch at on/off terminal= (under 0.6VDC or open circuit) is 0.4mA.

Maximum Capacitive Load

The MCW1000 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.

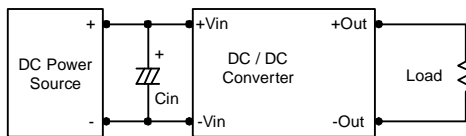
Overcurrent Protection

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

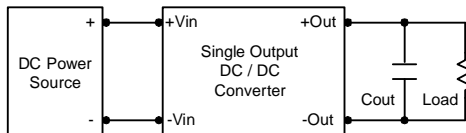
The power module should be connected to a low ac-impedance input source. Highly inductive source impedances can affect the stability of the power module. In applications where power is supplied over long lines and output loading is high, it may be necessary to use a capacitor at the input to ensure startup.

Capacitor mounted close to the power module helps ensure stability of the unit, it is commended 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 device, 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.



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 $^{\circ}$ C. The derating curves are determined from measurements obtained in a test setup.

