## FEATURES

- Small Footprint:
  24.0 x 18.1 mm (0.94 x 0.71 inches)
- Wide 2:1 Input Range
- Fully regulated Output
- Operating Temp. Range –40°C to +85°C
- Short Circuit Protection
- I/O-isolation 1500 VDC
- Input Filter meets EN55022,class A and FCC, level A
- Qualified for lead-free reflow solder process according IPC/JEDEC J-STD-020D
- 3 Years Product Warranty


CB Scheme  c SA us UL 60950-1  RoHS Compliant

## PRODUCT OVERVIEW

The MSDW1 series is a range of isolated 2W DC/DC converter modules featuring fully regulated output voltages and wide 2:1 input voltage ranges. The products come in a compact SMD package with a small footprint and low package height of just 8.0 mm (0.31 inch). All models are qualified for lead free reflow solder processes according IPC J-STD-020D standard.

An excellent efficiency allows an operating temperature range of–40°C to +85°C. The 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) | 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 | % |
| **MSDW1011** | 5 (4.5 ~ 9) | 3.3 | 500 | 125 | 471 | 40 | 100 | 2200 | 70 |
| **MSDW1012** | | 5 | 400 | 100 | 548 | | | 1000 | 73 |
| **MSDW1013** | | 12 | 167 | 42 | 534 | | | 170 | 75 |
| **MSDW1014** | | 15 | 134 | 33 | 582 | | | 110 | 73 |
| **MSDW1015** | | ±5 | ±200 | ±50 | 667 | | | 470# | 64 |
| **MSDW1016** | | ±12 | ±83 | ±21 | 615 | | | 100# | 69 |
| **MSDW1017** | | ±15 | ±67 | ±17 | 598 | | | 47# | 71 |
| **MSDW1021** | 12 (9 ~ 18) | 3.3 | 500 | 125 | 184 | 20 | 25 | 2200 | 73 |
| **MSDW1022** | | 5 | 400 | 100 | 217 | | | 1000 | 77 |
| **MSDW1023** | | 12 | 167 | 42 | 209 | | | 170 | 80 |
| **MSDW1024** | | 15 | 134 | 33 | 220 | | | 110 | 80 |
| **MSDW1025** | | ±5 | ±200 | ±50 | 242 | | | 470# | 73 |
| **MSDW1026** | | ±12 | ±83 | ±21 | 224 | | | 100# | 78 |
| **MSDW1027** | | ±15 | ±67 | ±17 | 226 | | | 47# | 78 |
| **MSDW1031** | 24 (18 ~ 36) | 3.3 | 500 | 125 | 96 | 10 | 15 | 2200 | 72 |
| **MSDW1032** | | 5 | 400 | 100 | 109 | | | 1000 | 77 |
| **MSDW1033** | | 12 | 167 | 42 | 109 | | | 170 | 80 |
| **MSDW1034** | | 15 | 134 | 33 | 108 | | | 110 | 81 |
| **MSDW1035** | | ±5 | ±200 | ±50 | 119 | | | 470# | 74 |
| **MSDW1036** | | ±12 | ±83 | ±21 | 112 | | | 100# | 78 |
| **MSDW1037** | | ±15 | ±67 | ±17 | 110 | | | 47# | 80 |
| **MSDW1041** | 48 (36 ~ 75) | 3.3 | 500 | 125 | 49 | 8 | 10 | 2200 | 71 |
| **MSDW1042** | | 5 | 400 | 100 | 57 | | | 1000 | 73 |
| **MSDW1043** | | 12 | 167 | 42 | 53 | | | 170 | 79 |
| **MSDW1044** | | 15 | 134 | 33 | 55 | | | 110 | 79 |
| **MSDW1045** | | ±5 | ±200 | ±50 | 62 | | | 470# | 71 |
| **MSDW1046** | | ±12 | ±83 | ±21 | 57 | | | 100# | 77 |
| **MSDW1047** | | ±15 | ±67 | ±17 | 57 | | | 47# | 77 |

# For each output

# Total Power International, Inc.

## MSDW1000 SERIES

**DC/DC CONVERTER 2W,** SMD-Package

### 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 Voltage | 5V Input Models | 3.5 | 4 | 4.5 | |
| | 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 | |
| | 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 Power Dissipation | | --- | --- | 1800 | 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 | | --- | ±1.0 | ±2.0 | % |
| Output Voltage Balance | Dual Output, Balanced Loads | --- | ±1.0 | ±2.0 | % |
| Line Regulation | Vin=Min. to Max. | --- | ±0.3 | ±0.5 | % |
| Load Regulation | Io=25% to 100% | --- | ±0.5 | ±0.75 | % |
| Ripple & Noise (20MHz) | | --- | 30 | 50 | mV P-P |
| Ripple & Noise (20MHz) | Over Line, Load & Temp. | --- | --- | 75 | mV P-P |
| Ripple & Noise (20MHz) | | --- | --- | 15 | mV rms |
| Transient Recovery Time | 25% Load Step Change | --- | 100 | 300 | uS |
| Transient Response Deviation | | --- | ±3 | ±5 | % |
| Temperature Coefficient | | --- | ±0.01 | ±0.02 | %/℃ |
| 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 | --- | 250 | 420 | pF |
| Switching Frequency | | --- | 300 | --- | KHz |
| MTBF (calculated) | MIL-HDBK-217F@25℃, Ground Benign | 1,000,000 | --- | --- | Hours |
| Moisture Sensitivity Level (MSL) | IPC/JEDEC J-STD-020D | Level 2 | | | |

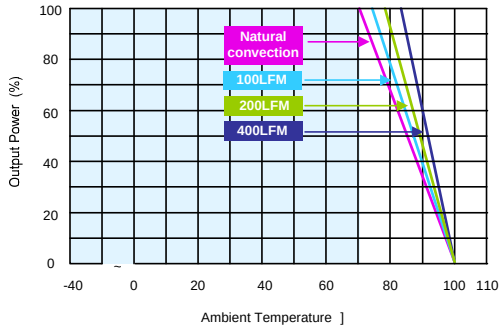
### Input Fuse

| 5V Input Models | 12V Input Models | 24V Input Models | 48V Input Models |
|---|---|---|---|
| 1000mA Slow-Blow Type | 500mA Slow-Blow Type | 250mA Slow-Blow Type | 120mA 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

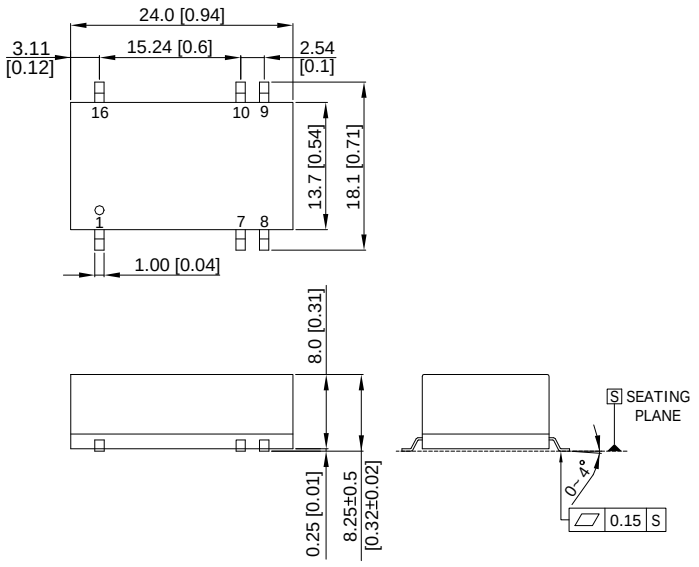



## Notes

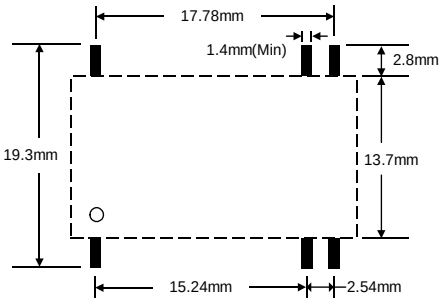
1 Specifications typical at Ta=+25℃, resistive load, nominal input voltage and rated output current unless otherwise noted.
2 Transient recovery time is measured to within 1% error band for a step change in output load of 75% to 100%
3 Ripple & Noise measurement bandwidth is 0-20MHz.
4 These power converters 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.
8 It is not recommended to use water-washing process on SMT units.

## Package Specifications

### Mechanical Dimensions




### Connecting Pin Patterns




- ▶ All dimensions in mm (inches)
- ▶ Tolerance: X.X±0.25 (X.XX±0.01)
  X.XX±0.13 ( X.XXX±0.005)
- ▶ Pins ±0.05 (±0.002)

### Pin Connections

| Pin | Single Output | Dual Output |
|---|---|---|
| 1 | -Vin | -Vin |
| 7 | NC | NC |
| 8 | NC | Common |
| 9 | +Vout | +Vout |
| 10 | -Vout | -Vout |
| 16 | +Vin | +Vin |

NC : No Connection

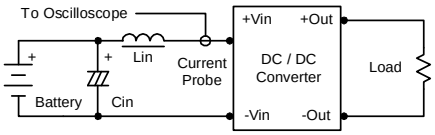
### Physical Characteristics

| | | |
|---|---|---|
| Case Size | : | 24.0x13.7x8.0mm (0.94x0.54x0.31 Inches) |
| Case Material | : | Non-Conductive Black Plastic (flammability to UL 94V-0 rated) |
| Weight | : | 5.1g |

## Test Configurations

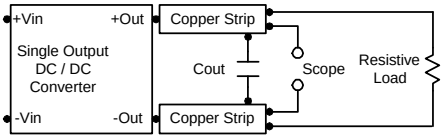
### Input Reflected-Ripple Current Test Setup

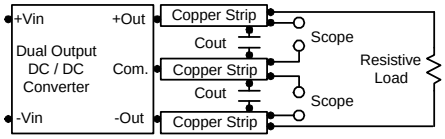
Input reflected-ripple current is measured with a inductor Lin (4.7uH) and Cin (220uF, ESR < 1.0Ω at 100 KHz) to simulate source impedance. Capacitor Cin, offsets possible battery impedance.
Current ripple is measured at the input terminals of the module, measurement bandwidth is 0-500 KHz.




### 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.



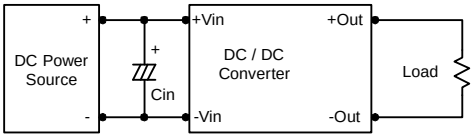

## Design & Feature Considerations

### 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.

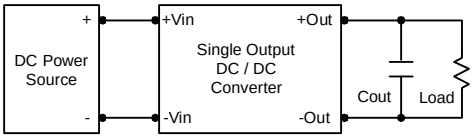
### Input Source Impedance

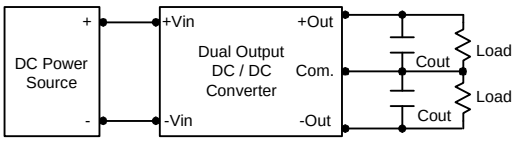
The power module should be connected to a low ac-impedance input source. Highly inductive source impedances can affect the stability of the power module.
In applications where power is supplied over long lines and output loading is high, it may be necessary to use a capacitor on the input to insure startup.
By using a good quality low Equivalent Series Resistance (ESR < 1.0Ω at 100 kHz) capacitor of a 8.2uF for the 5V input devices, a 3.3uF for the 12V input devices and a 1.5uF for the 24V and 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 3.3uF capacitors at the output.




### Maximum Capacitive Load

The MSDW1000 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. 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.