

FEATURES

- ▶ SMD Package with Industry Standard Pinout
- ▶ Small Footprint:
 - 11.0 x 13.7 mm (0.43"x 0.54") Single Output Models
 - 11.0 x 16.3 mm (0.43"x 0.64") Dual Output Models
- ▶ I/O-Isolation 1500 VDC
- ▶ Single and Dual Output Models
- ▶ Operating Temp. Range -40°C to +85°C
- ▶ High Accuracy of Pin Planarity
- ▶ Qualified for lead-free reflow solder process according IPC/JEDEC J-STD-020D
- ▶ Tape & Reel Package available
- ▶ 3 Year Product Warranty


PRODUCT OVERVIEW

The MINMAX MSLU100 series is a range of 1W DC/DC converters in a SMD- Package featuring I/O-isolation of 1500VDC. The very small footprint makes this product the ideal solution for many applications where a voltage has to be isolated i.e for noise reduction, ground loop elimination, in digital interfaces or where a converted voltage is required.

An excellent efficiency allows an operating temperature range of -40°C to +85°C. with a new package design these converters are fully qualified for the higher temperature profile used in lead-free reflow solder processes. For automated SMD production lines the product can be supplied in tape& reel package.

Model Selection Guide

| Model Number | Input Voltage (Range) VDC | Output Voltage VDC | Output Current | | Input Current | | Load Regulation % (max.) | Max. capacitive Load μ F | Efficiency (typ.) | | | |
|--------------|---------------------------|--------------------|----------------|-----------|---------------------|-------------------|--------------------------|------------------------------|-------------------|-----|--------------|----|
| | | | Max. mA | Min. mA | @Max. Load mA(typ.) | @No Load mA(typ.) | | | | | | |
| | | | | | | | | | | | @Max. Load % | |
| MSLU101 | 5 (4.5 ~ 5.5) | 3.3 | 300 | 6 | 271 | 30 | 10 | 33 | 73 | | | |
| MSLU102 | | 5 | 200 | 4 | 256 | | 10 | | 78 | | | |
| MSLU103 | | 9 | 110 | 2 | 254 | | 10 | | 78 | | | |
| MSLU104 | | 12 | 84 | 1.5 | 259 | | 8 | | 78 | | | |
| MSLU105 | | 15 | 67 | 1 | 254 | | 7 | | 79 | | | |
| MSLU106 | | ± 5 | ± 100 | ± 2 | 270 | | 10 | | 74 | | | |
| MSLU108 | | ± 12 | ± 42 | ± 0.8 | 259 | | 8 | | 78 | | | |
| MSLU109 | | ± 15 | ± 33 | ± 0.7 | 254 | | 7 | | 78 | | | |
| MSLU111 | | 12 (10.8 ~ 13.2) | 3.3 | 300 | 6 | | 112 | | 15 | 8 | 33 | 74 |
| MSLU112 | | | 5 | 200 | 4 | | 109 | | | 8 | | 76 |
| MSLU113 | 9 | | 110 | 2 | 106 | 8 | 78 | | | | | |
| MSLU114 | 12 | | 84 | 1.5 | 106 | 5 | 79 | | | | | |
| MSLU115 | 15 | | 67 | 1 | 105 | 5 | 80 | | | | | |
| MSLU116 | ± 5 | | ± 100 | ± 2 | 113 | 8 | 74 | | | | | |
| MSLU118 | ± 12 | | ± 42 | ± 0.8 | 108 | 5 | 78 | | | | | |
| MSLU119 | ± 15 | | ± 33 | ± 0.7 | 104 | 5 | 79 | | | | | |
| MSLU154 | 15 (13.5 ~ 16.5) | | 12 | 84 | 1.5 | 86 | 14 | 5 | | 33 | | 78 |
| MSLU155 | | | 15 | 67 | 1 | 86 | | 5 | | | | 78 |
| MSLU121 | 24 (21.6 ~ 26.4) | 3.3 | 300 | 6 | 58 | 8 | 8 | 33 | 72 | | | |
| MSLU122 | | 5 | 200 | 4 | 54 | | 8 | | 78 | | | |
| MSLU123 | | 9 | 110 | 2 | 54 | | 8 | | 77 | | | |
| MSLU124 | | 12 | 84 | 1.5 | 55 | | 5 | | 77 | | | |
| MSLU125 | | 15 | 67 | 1 | 53 | | 5 | | 79 | | | |
| MSLU126 | | ± 5 | ± 100 | ± 2 | 57 | | 8 | | 73 | | | |
| MSLU128 | | ± 12 | ± 42 | ± 0.8 | 54 | | 9 | | 5 | 33# | 78 | |
| MSLU129 | | ± 15 | ± 33 | ± 0.7 | 53 | | | | 5 | | 78 | |

For each output

| Input Specifications | | | | | |
|-----------------------------------|------------------|--------------------|------|------|------|
| Parameter | Model | Min. | Typ. | Max. | Unit |
| Input Voltage Range | 5V Input Models | 4.5 | 5 | 5.5 | VDC |
| | 12V Input Models | 10.8 | 12 | 13.2 | |
| | 15V Input Models | 13.5 | 15 | 16.5 | |
| | 24V Input Models | 21.6 | 24 | 26.4 | |
| Input Surge Voltage (1 sec. max.) | 5V Input Models | -0.7 | --- | 9 | |
| | 12V Input Models | -0.7 | --- | 18 | |
| | 15V Input Models | -0.7 | --- | 20 | |
| | 24V Input Models | -0.7 | --- | 30 | |
| Reverse Polarity Input Current | All Models | --- | --- | 0.3 | A |
| Internal Filter Type | | Internal Capacitor | | | |
| Internal Power Dissipation | | --- | --- | 450 | mW |

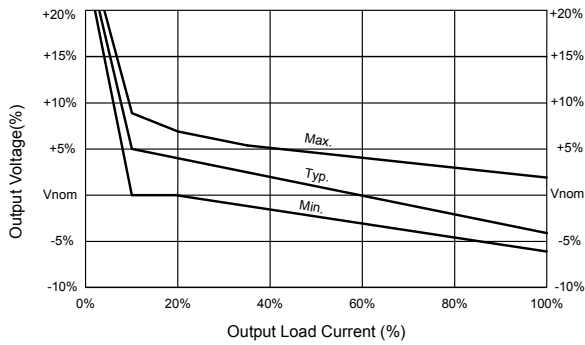
| Output Specifications | | | | | |
|--------------------------|-----------------------------|---------------------------|-------|-------|-------------------|
| Parameter | Conditions | Min. | Typ. | Max. | Unit |
| Output Voltage Balance | Dual Output, Balanced Loads | --- | ±0.1 | ±1.0 | % |
| Line Regulation | For Vin Change of 1% | --- | ±1.2 | ±1.5 | % |
| Load Regulation | Io=20% to 100% | See Model Selection Guide | | | |
| Ripple & Noise | max. 20MHz Bandwidth | --- | --- | 120 | mV _{P-P} |
| Temperature Coefficient | | --- | ±0.01 | ±0.02 | %/°C |
| Short Circuit Protection | | 0.5 Second Max. | | | |

| 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 | --- | 40 | 100 | pF |
| Switching Frequency | | 50 | 100 | 140 | KHz |
| MTBF (calculated) | MIL-HDBK-217F@25°C, Ground Benign | 2,000,000 | --- | --- | Hours |
| Moisture Sensitivity Level (MSL) | IPC/JEDEC J-STD-020D | Level 2 | | | |

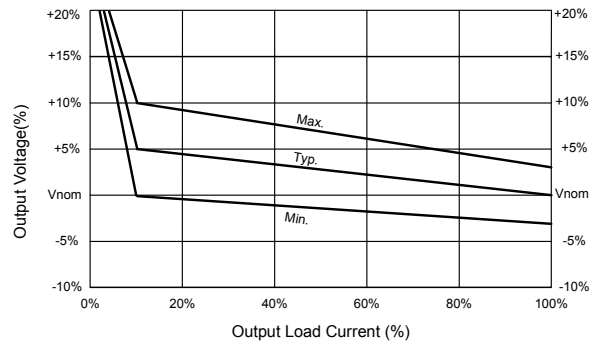
| Input Fuse | | | |
|----------------------|----------------------|----------------------|----------------------|
| 5V Input Models | 12V Input Models | 15V Input Models | 24V Input Models |
| 500mA Slow-Blow Type | 200mA Slow-Blow Type | 150mA Slow-Blow Type | 100mA Slow-Blow Type |

| 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 | | -50 | +125 | °C | |
| Humidity (non condensing) | | --- | 95 | % rel. H | |
| Cooling | Free-Air convection | | | | |
| Lead Temperature (1.5mm from case for 10Sec.) | | --- | 260 | °C | |

Output Voltage Tolerance

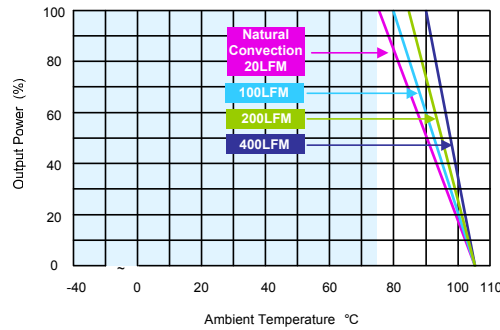


(3.3V & 5V Output)



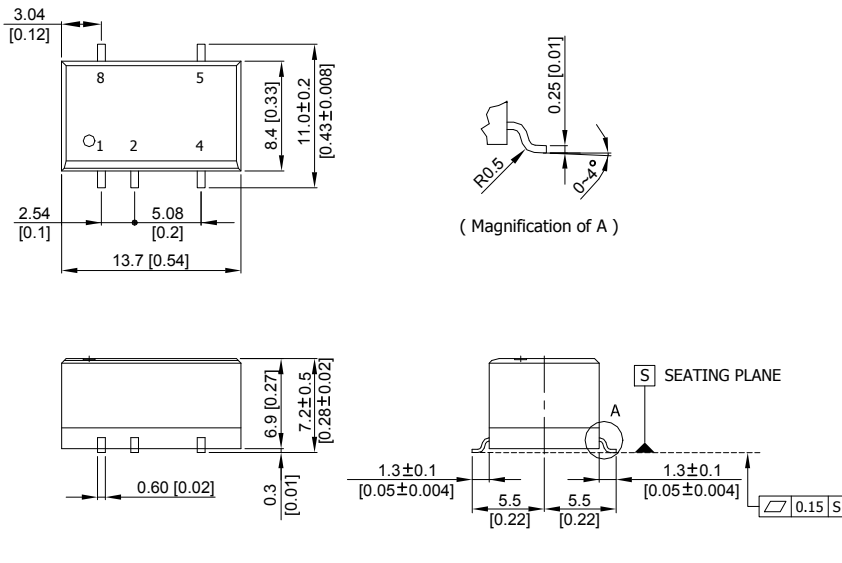
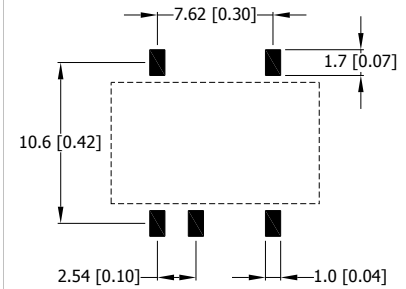
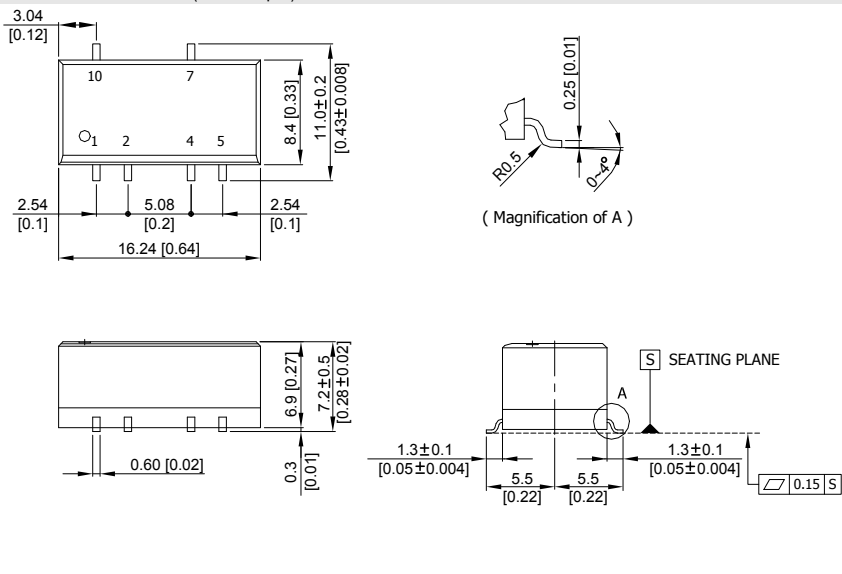
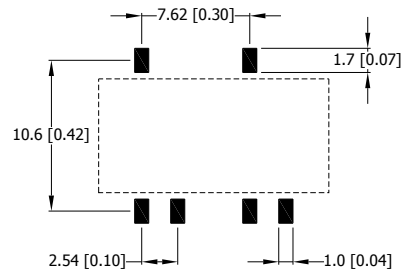
(All other Output)

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 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.
- 3 All DC/DC converters should be externally fused at the front end for protection.
- 4 Other input and output voltage may be available, please contact factory.
- 5 That "natural convection" is about 20LFM but is not equal to still air (0 LFM).
- 6 It is not recommended to use water-washing process on SMT units.
- 7 Specifications are subject to change without notice.

Package Specifications
Mechanical Dimensions (Single Output)

Connecting Pin Patterns

Mechanical Dimensions (Dual Output)

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 |
| 2 | +Vin | +Vin |
| 3 | No Pin | No Pin |
| 4 | -Vout | Common |
| 5 | +Vout | -Vout |
| 6 | No Pin | No Pin |
| 7 | No Pin | +Vout |
| 8 | NA | No Pin |
| 9 | --- | No Pin |
| 10 | --- | NA |

NA : Not Available for Electrical Connection

Physical Characteristics

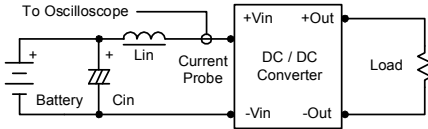
| | |
|---------------------------|---|
| Case Size (Single Output) | : 13.7x8.4x6.9mm (0.54x0.33x0.27 inches) |
| Case Size (Dual Output) | : 16.24x8.4x6.9mm (0.64x0.33x0.27 inches) |
| Case Material | : Non-Conductive Black Plastic (flammability to UL 94V-0 rated) |
| Pin Material | : phosphor bronze |
| Weight (Single Output) | : 1.7g |
| Weight (Dual Output) | : 2.0g |

Test Setup

Input Reflected-Ripple Current Test Setup

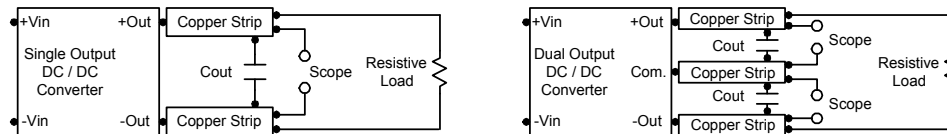
Input reflected-ripple current is measured with an inductor L_{in} (4.7 μ H) and C_{in} (220 μ F, ESR < 1.0 Ω at 100 KHz) to simulate source impedance. Capacitor C_{in} , offsets possible battery impedance.

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} 0.33 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

Maximum Capacitive Load

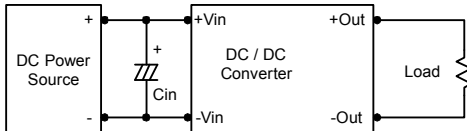
The MSLU100 series has limitation of maximum connected capacitance at the output. The power module may be operated in current limiting mode during start-up, affecting the ramp-up and the startup time. For optimum performance we recommend 33 μ F maximum capacitive load. The maximum capacitance can be found in the data sheet.

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.

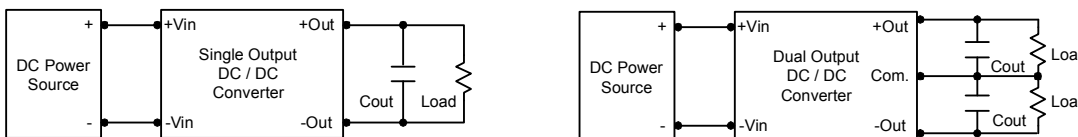
In applications where power is supplied over long lines and output loading is high, it may be necessary to use a capacitor at the input to ensure startup.

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 2.2 μ F for the 5V input devices, a 1.0 μ F for the 12V input devices and a 0.47 μ F for the 24V input 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°C. The derating curves are determined from measurements obtained in a test setup.

