## FEATURES

- SMT Technology
- High Power Density
- Efficiency up to 83%
- 1500VDC I/O Isolation
- Short Circuit Protection
- Remote ON/OFF Control
- MTBF > 1,000,000 Hours
- 4:1 Ultra Wide Input Voltage Range
- EMI Complies with EN55022 Class A
- Operating Temperature: -40°C to +71°C

## DESCRIPTION

The MSKUW series of DC/DC converters provide a maximum of 5 watts in a "gull-wing" SMT package. These converters operate over 4:1 ultra wide input voltage ranges of 9-36 or 18-75VDC. This series also has single output voltages of 3.3, 5, 12, and 15VDC and dual output voltages of ±5, ±12, and ±15VDC. These converters have a typical full load efficiency of 83%, remote ON/OFF control, and continuous short circuit protection. The -40°C~+71°C operating temperature make these converters ideal for data communication equipment, mobile battery driven equipment, process/machine control equipment, telecommunication equipment, computer peripheral systems, distributed power systems, mixed analog/digital subsystems, and industrial robot systems. The EN55022 Class A conducted noise compliance minimizes design time, cost, and eliminates the need for external filter components.

## SPECIFICATIONS: *MSKUW Series*

All specifications are based on 25°C, Nominal Input Voltage, and Maximum Output Current unless otherwise noted.
We reserve the right to change specifications based on technological advances.

| SPECIFICATION | TEST CONDITIONS | Min | Nom | Max | Unit |
|---|---|---|---|---|---|
| **INPUT ($V_{in}$)** | | | | | |
| Input Voltage Range | 24V nominal input models | 9 | 24 | 36 | VDC |
| | 48V nominal input models | 18 | 48 | 75 | |
| Start Voltage | 24V nominal input models | 7 | 8 | 9 | VDC |
| | 48V nominal input models | 14 | 16 | 18 | |
| Under Voltage Shutdown | 24V nominal input models | 6 | 7 | 8 | VDC |
| | 48V nominal input models | 13 | 15 | 17 | |
| Input Surge Voltage (1000ms) | 24V nominal input models | -0.7 | | 50 | VDC |
| | 48V nominal input models | -0.7 | | 100 | |
| Reverse Polarity Input Current | | | | 1 | A |
| Input Filter | | Pi Filter | | | |
| Reflected Ripple Current | | See Rating Chart | | | |
| Short Circuit Input Power | | | 1000 | 3000 | mW |
| **OUTPUT ($V_o$)** | | | | | |
| Output Voltage | | See Rating Chart | | | |
| Output Voltage Accuracy | | | ±0.5 | ±2.0 | % |
| Output Voltage Balance | Dual Output, Balanced Loads | | ±0.5 | ±3.0 | % |
| Load Regulation | Io = 10% to 100% | | ±0.3 | ±1.0 | |
| Line Regulation | Vin = min. to max. | | ±0.2 | ±1.0 | % |
| Output Power | | | | 5 | W |
| Output Current | | See Rating Chart | | | |
| Ripple & Noise (20MHz) | | | 50 | 85 | $mV_{pk-pk}$ |
| Ripple & Noise (20MHz) | Over Line, Over Load, and Over Temperature | | | 100 | $mV_{pk-pk}$ |
| Ripple & Noise (20MHz) | | | | 15 | mVrms |
| Transient Response Deviation | 25% Load Step Change | | ±2 | ±6 | % |
| Transient Recovery Time | 25% Load Step Change | | 250 | 500 | µs |
| **REMOTE ON/OFF CONTROL** | | | | | |
| Supply On | | 2.5 to 5.5VDC or open circuit | | | |
| Supply Off | | -0.7 | | 0.8 | VDC |
| Device Standby Input Current | | | | 10 | mA |
| Control Input Current (ON) | Vin = min to max | | | -600 | µA |
| Control Input Current (OFF) | Vin = min to max | | | -700 | µA |
| Control Common | | Referenced to negative input | | | |
| **PROTECTION** | | | | | |
| Short Circuit Protection | | continuous | | | |
| Over Power Protection | | 115 | | | % |
| Input Fuse Recommendation | 24V nominal input models | 1500mA slow-blow type | | | |
| | 48V nominal input models | 750mA slow-blow type | | | |
| **GENERAL** | | | | | |
| Efficiency | | See Rating Chart | | | |
| Switching Frequency | | | 340 | | KHz |
| Isolation Voltage Rated | 60 seconds | 1500 | | | VDC |
| Isolation Voltage Test | Flash Test for 1 second | 1650 | | | VDC |
| Isolation Resistance | 500VDC | 1000 | | | MΩ |
| Isolation Capacitance | 100KHz, 1V | | 650 | 750 | pF |
| Internal Power Dissipation | | | | 2500 | mW |
| Max. Capacitive Load | | See Rating Chart | | | |
| **ENVIRONMENTAL** | | | | | |
| Operating Temperature (Ambient) | | -40 | | +71 | °C |
| Operating Temperature (Case) | | -40 | | +90 | °C |
| Storage Temperature | | -40 | | +125 | °C |
| Lead Temperature | 1.5mm from case for 10 seconds | | | 260 | °C |
| Humidity | | | | 95 | % |
| Cooling | | Free air convection | | | |
| Temperature Coefficient | | | ±0.01 | ±0.02 | %/°C |
| MTBF | MIL-HDBK-217F @ 25°C, Ground Benign | 1000 | | | Khours |
| Conducted EMI | | EN55022 Class A | | | |
| **PHYSICAL** | | | | | |
| Weight | | 14 grams | | | |
| Dimensions (L x W x H) | | 1.31x0.81x0.40 in (33.4x20.6x10.2 mm) | | | |
| Case Material | | Non-conductive black plastic | | | |
| Flammability | | UL94V-0 | | | |

## OUTPUT VOLTAGE / CURRENT RATING CHARTS

| SINGLE OUTPUT MODELS | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Model Number | Input Voltage | Output Voltage | Output Current | | Input Current | | Reflected Ripple Current | Efficiency (Typ) | Maximum Capacitive Load |
| | | | Min | Max | No Load | Max Load | | | |
| MSKW24S33UW4 | 24 VDC (9 ~ 36 VDC) | 3.3 VDC | 120mA | 1200mA | 20mA | 217mA | 15mA | 76% | 2000µF |
| MSKW24S5UW5 | | 5 VDC | 100mA | 1000mA | | 260mA | | 80% | 2000µF |
| MSKW24S12UW5 | | 12 VDC | 41.7mA | 417mA | | 251mA | | 83% | 470µF |
| MSKW24S15UW5 | | 15 VDC | 33.3mA | 333mA | | 251mA | | 83% | 330µF |
| MSKW48S33UW4 | 48 VDC (18 ~ 75 VDC) | 3.3 VDC | 120mA | 1200mA | 10mA | 109mA | 10mA | 76% | 2000µF |
| MSKW48S5UW5 | | 5 VDC | 100mA | 1000mA | | 130mA | | 80% | 2000µF |
| MSKW48S12UW5 | | 12 VDC | 41.7mA | 417mA | | 126mA | | 83% | 470µF |
| MSKW48S15UW5 | | 15 VDC | 33.3mA | 333mA | | 125mA | | 83% | 330µF |

| DUAL OUTPUT MODELS | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Model Number | Input Voltage | Output Voltage | Output Current | | Input Current | | Reflected Ripple Current | Efficiency (Typ) | Maximum Capacitive Load |
| | | | Min | Max | No Load | Max Load | | | |
| MSKW24D5UW5 | 24 VDC (9 ~ 36 VDC) | ±5 VDC | ±50mA | ±500mA | 20mA | 260mA | 15mA | 80% | 680µF |
| MSKW24D12UW5 | | ±12 VDC | ±20.8mA | ±208mA | | 251mA | | 83% | 330µF |
| MSKW24D15UW5 | | ±15 VDC | ±16.7mA | ±167mA | | 252mA | | 83% | 220µF |
| MSKW48D5UW5 | 48 VDC (18 ~ 75 VDC) | ±5 VDC | ±50mA | ±500mA | 10mA | 130mA | 10mA | 80% | 680µF |
| MSKW48D12UW5 | | ±12 VDC | ±20.8mA | ±208mA | | 125mA | | 83% | 330µF |
| MSKW48D15UW5 | | ±15 VDC | ±16.7mA | ±167mA | | 126mA | | 83% | 220µF |

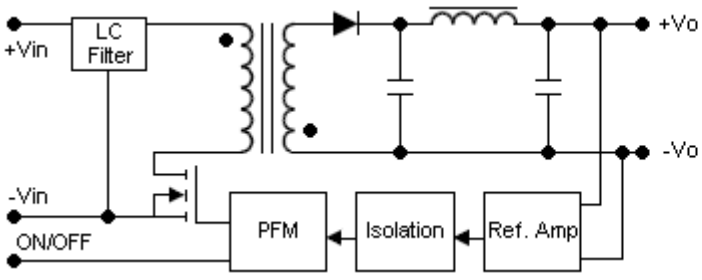
## NOTES

1. Transient recovery time is measured to within 1% error band for a step change in output load of 75% to 100%.
2. The MSKUW series requires a minimum output loading to maintain specified regulations. Operation under no-load conditions will not damage these devices, however they may not meet all listed specifications.
3. All DC/DC converters should be externally fused at the front end for protection.
4. Other input and output voltages may be available, please contact factory.
5. It is not recommended to use the water-washing process on SMT units.

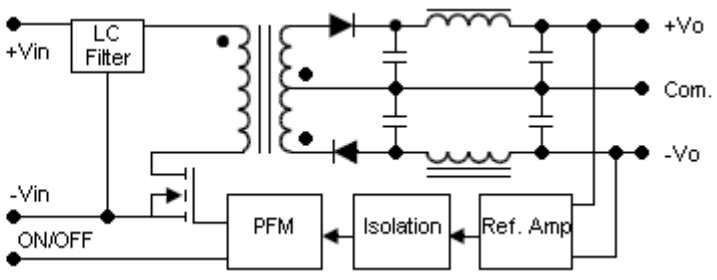
**Due to advances in technology, specifications subject to change without notice.*

## BLOCK DIAGRAMS

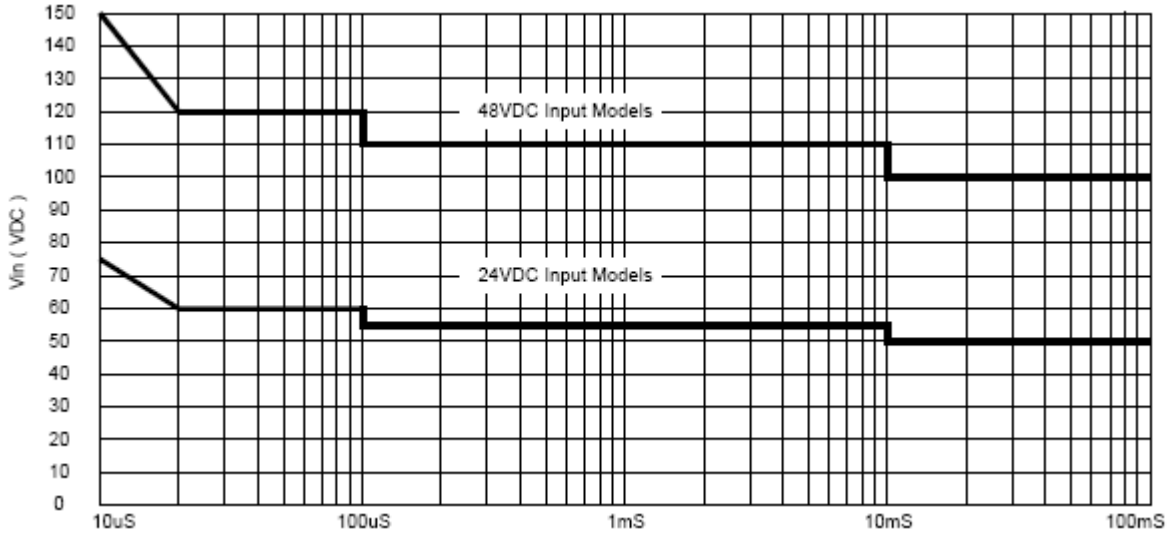
### Single Output



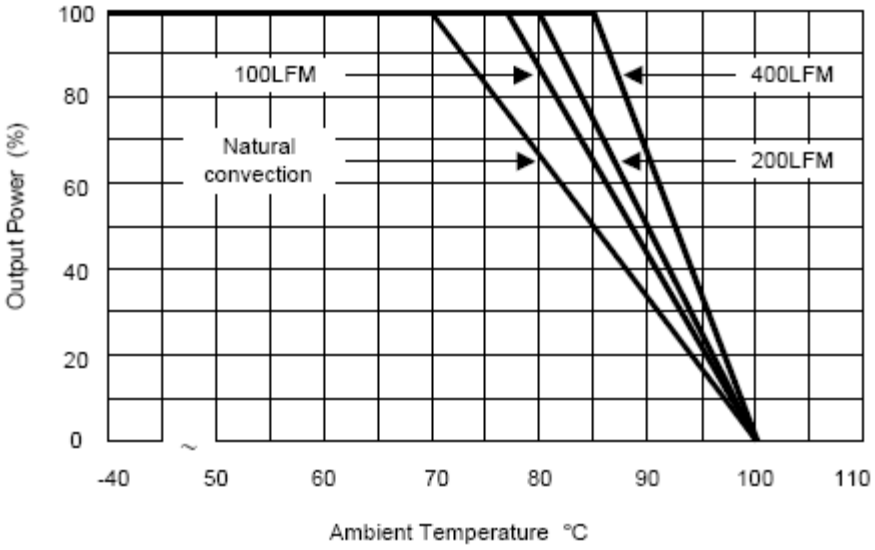

### Dual Output



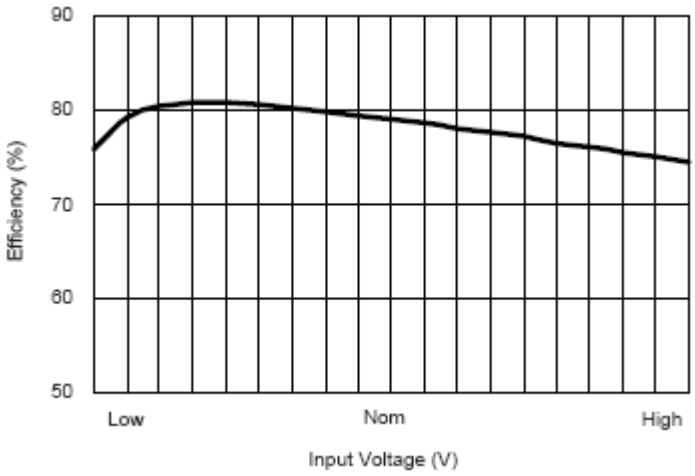
## INPUT VOLTAGE TRANSIENT RATING



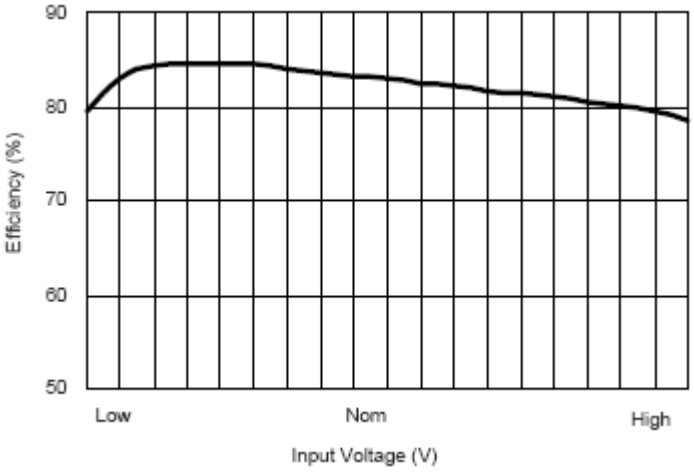

## DERATING CURVE



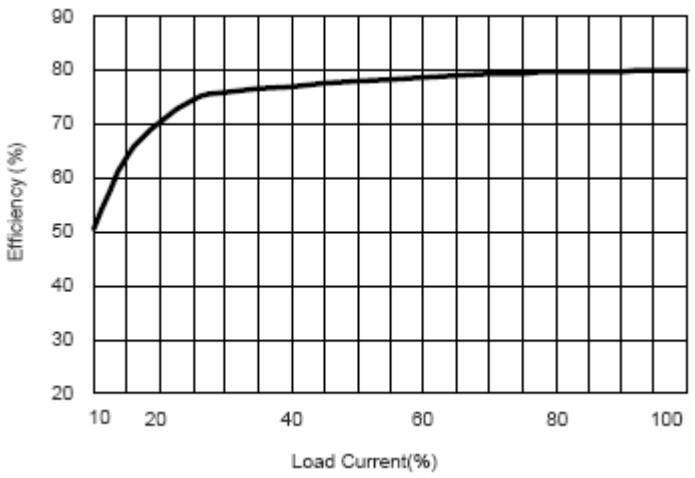
### Efficiency vs Input Voltage (Single Output)



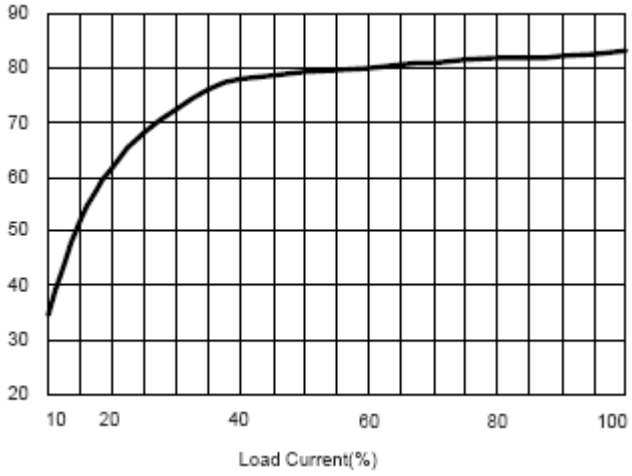

### Efficiency vs Input Voltage (Dual Output)




### Efficiency vs Output Load (Single Output)

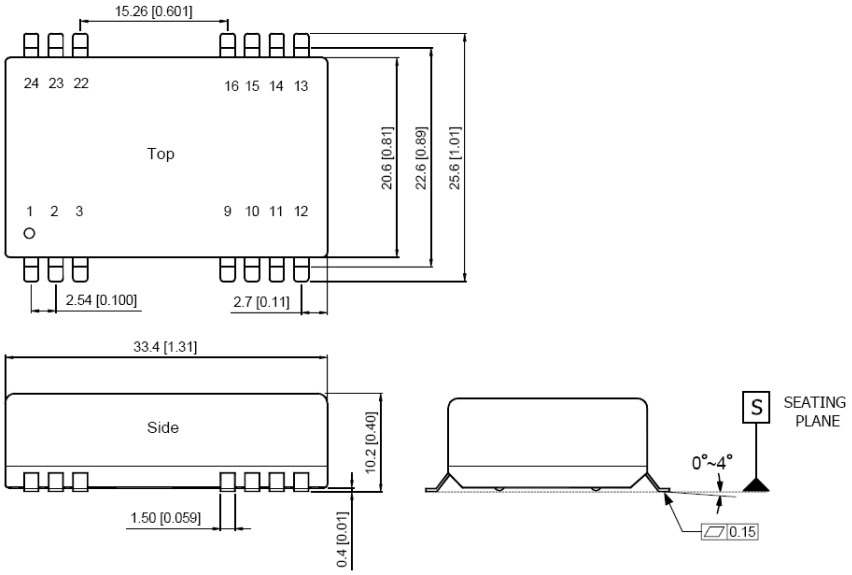



### Efficiency vs Output Load (Dual Output)



## MECHANICAL DRAWING

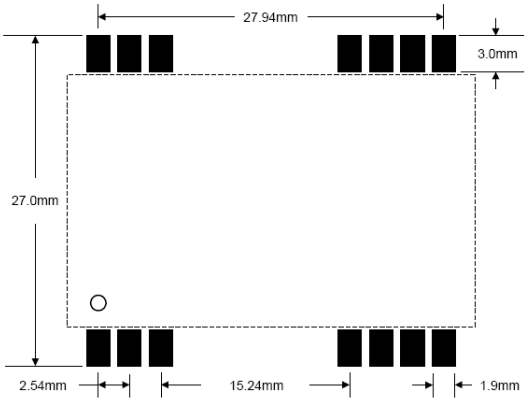
Unit: mm [inches]




1. Tolerance: X.X±0.25 [X.XX±0.01]
   X.XX±0.13 [X.XXX±0.005]
2. Pin: ±0.05 [±0.002]

## CONNECTING PIN PATTERNS

Top View (2.54mm / 0.1 inch grids)




| PIN CONNECTIONS | | |
|---|---|---|
| **PIN** | **Single Output** | **Dual Output** |
| 1 | Remote On/Off | Remote On/Off |
| 2 | -Vin | -Vin |
| 3 | -Vin | -Vin |
| 9 | NC | Common |
| 10 | NC | NC |
| 11 | NC | -Vout |
| 12 | NC | NC |
| 13 | NC | NC |
| 14 | +Vout | +Vout |
| 15 | NC | NC |
| 16 | -Vout | Common |
| 22 | +Vin | +Vin |
| 23 | +Vin | +Vin |
| 24 | NC | NC |

NC: No Connection

## DESIGN & FEATURE CONSIDERATONS

### Over Current Protection

To provide protection in a fault (output over load) 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 to its specified range.

### Input Source / Remote On/Off

Positive logic remote on/off turns the module ON during a logic high voltage on the remote on/off pin, and turns the module OFF during a logic low voltage on the remote on/off pin. 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.

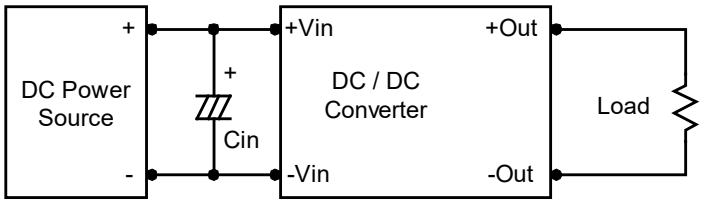
A logic low is –0.7V to 0.8V.

A logic high is 2.5V to 5.5V.

The maximum sink current of the switch at the on/off terminal during a logic low is 300μA. The maximum sink current of the switch at the on/off terminal = 2.5 to 5.5V is 200μA or open.

### 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. A 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 100KHz) capacitor of 3.3μF for the 12V input models and a 2.2μF for the 24V and 48V input models.



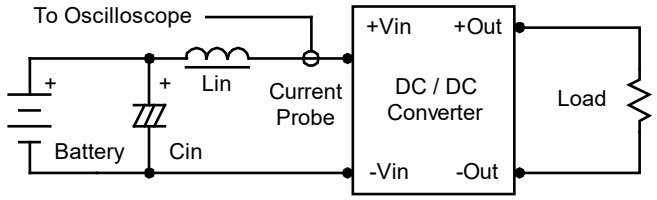

### Maximum Capacitive Load

The MSKUW series has a limit 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 Output Voltage / Current Rating Chart.

## TEST CONFIGURATIONS

### Input Reflected-Ripple Current Test Setup

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



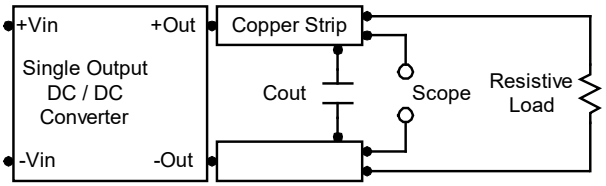

Capacitor Cin offsets possible battery impedance.

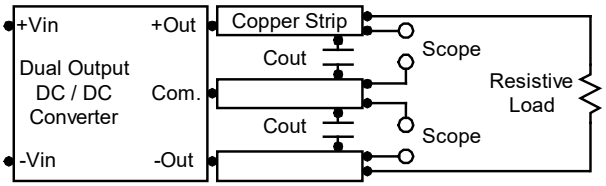
Current ripple is measured at the input terminals of the module. Measurement bandwidth is 0 ~ 500KHz.

**Peak-to-Peak Output Noise Measurement Test**

Use a Cout 0.47µF ceramic capacitor.

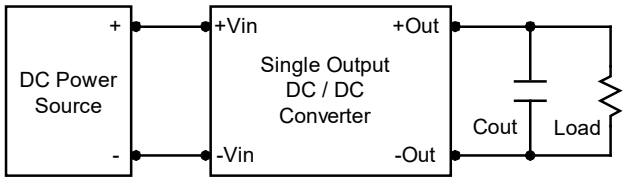
Scope measurement should be made by using a BNC socket; measurement bandwidth is 0 ~ 20MHz. Position the load between 50mm and 75mm from the DC/DC Converter.

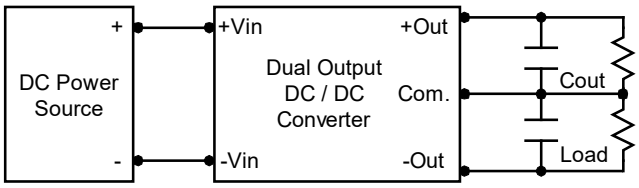



**Output Ripple Reduction**

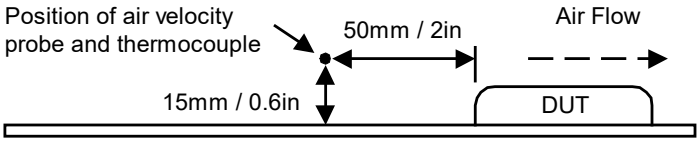
A good quality low ESR capacitor placed as close as possible across the load will give the best ripple and noise performance. To reduce output ripple, it is recommended to use 3.3µF capacitors at the output.




**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 an experimental apparatus.




**COMPANY INFORMATION:**

Wall Industries, Inc. has created custom and modified units for over 50 years. Our in-house research and development engineers will provide a solution that exceeds your performance requirements on-time and on budget. Our ISO9001: 2015 certification is just one example of our commitment to producing a high quality, well-documented product for our customers.

Our past projects demonstrate our commitment to you, our customer. Wall Industries, Inc. has a reputation for working closely with its customers to ensure each solution meets or exceeds form, fit and function requirements. We will continue to provide ongoing support for your project above and beyond the design and production phases. Give us a call today to discuss your future projects.

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