

### Features

- Wide 2 : 1 Input Voltage Range(9~18V,18~36V,36~75V)
- Input / Output Isolation Voltage: 1.5kVDC
- High Efficiency
- High Power Density
- Extended Operating Temperature Range: -55°C to+95°C
- Output Short Circuit Protection:  
Continuous & Auto Recovery
- Over Voltage Protection: Clamp Mode
- Fixed Switching Frequency
- Input/ Output Isolation 1.5 KVdc
- Shielded Metal Case with Insulated Baseplate
- Lead Free Design, RoHS Compliant
- Industry Standard Pinout
- Customer Design Available
- Safety Standard Approval : IEC / EN 60950



### Description

The MUA5 Series are isolated 5W DC/DC converters. Designed with highly efficiency, allow the operating temperature range of these units to be -55°C to +95°C in a DIP package with industry-standard footprint. Further features include wide 2 : 1 input voltage range, remote on/off control, short-circuit protection and over voltage protection.

### Applications

These converters are well suitable for battery operated equipment, measurement equipment, telecom, wireless network, Industry control system, everywhere where isolated, tightly regulated voltages and compact size are required.

### Technical Specification

All specifications are typical at nominal input, full load and 25°C unless otherwise stated.

| Model Number | Input Voltage Range     | Output Voltage (Vdc) | Output Current (mA)      |            | Input Current (mA) |           | Eff. <sup>(2)</sup> (%) | Capacitive Load, max. <sup>(3)</sup> (uF) |
|--------------|-------------------------|----------------------|--------------------------|------------|--------------------|-----------|-------------------------|---|
|              |                         |                      | Min. Load <sup>(1)</sup> | Full. Load | No Load            | Full Load |                         |   |
| MUA5-12S0    | 9~18V<br>Nominal:12Vdc  | 3.3                  | 20                       | 1500       | 7                  | 558       | 78                      | 4700                                      |
| MUA5-12S1    |                         | 5                    | 0                        | 1000       | 7                  | 549       | 80                      | 2200                                      |
| MUA5-12S2    |                         | 12                   | 0                        | 416        | 18                 | 514       | 85                      | 330                                       |
| MUA5-12S3    |                         | 15                   | 0                        | 333        | 22                 | 514       | 85                      | 220                                       |
| MUA5-12D1    |                         | ±5                   | 57                       | ±500       | 6                  | 535       | 82                      | 1100                                      |
| MUA5-12D2    |                         | ±12                  | 0                        | ±208       | 27                 | 520       | 84                      | 100                                       |
| MUA5-12D3    |                         | ±15                  | 0                        | ±167       | 30                 | 516       | 85                      | 69  |
| MUA5-24S0    | 18~36V<br>Nominal:24Vdc | 3.3                  | 20                       | 1500       | 4                  | 275       | 79                      | 3200                                      |
| MUA5-24S1    |                         | 5                    | 0                        | 1000       | 4                  | 268       | 82                      | 2200                                      |
| MUA5-24S2    |                         | 12                   | 0                        | 416        | 10                 | 254       | 86                      | 330                                       |
| MUA5-24S3    |                         | 15                   | 0                        | 333        | 12                 | 251       | 87                      | 220                                       |
| MUA5-24D1    |                         | ±5                   | 57                       | ±500       | 4                  | 264       | 83                      | 990                                       |
| MUA5-24D2    |                         | ±12                  | 0                        | ±208       | 15                 | 254       | 86                      | 122                                       |
| MUA5-24D3    |                         | ±15                  | 0                        | ±167       | 15                 | 252       | 87                      | 147                                       |
| MUA5-48S0    | 36~75V<br>Nominal:48Vdc | 3.3                  | 20                       | 1500       | 1.6                | 142       | 77                      | 3300                                      |
| MUA5-48S1    |                         | 5                    | 0                        | 1000       | 1.7                | 134       | 82                      | 2200                                      |
| MUA5-48S2    |                         | 12                   | 0                        | 416        | 6                  | 129       | 85                      | 220                                       |
| MUA5-48S3    |                         | 15                   | 0                        | 333        | 7                  | 127       | 86                      | 147                                       |
| MUA5-48D1    |                         | ±5                   | 57                       | ±500       | 22                 | 134       | 82                      | 1000                                      |
| MUA5-48D2    |                         | ±12                  | 0                        | ±208       | 8                  | 127       | 86                      | 220                                       |
| MUA5-48D3    |                         | ±15                  | 0                        | ±167       | 8                  | 127       | 86                      | 13  |

| Input Specifications                           |   |        |                           |
|--|---|--------|---------------------------|
| Input Voltage                                  | 12V nominal input                       |        | 9-18V                     |
|  | 24V nominal input                       |        | 18-36V                    |
|  | 48V nominal input                       |        | 36-75V                    |
| Input filter                                   |   |        | Pi Type                   |
| Input surge voltage<br>(100ms max.)            | 12V nominal input                       |        | 25Vdc                     |
|  | 24V nominal input                       |        | 50Vdc                     |
|  | 48V nominal input                       |        | 100Vdc                    |
| Input reflected ripple current                 | Nominal Vin and full load               |        | 250mA <sub>p-p</sub> typ. |
| Start up time                                  | Nominal Vin and constant resistive load |        | 400ms typ.                |
| Sourcing current of remote control pin         | Nominal Vin                             |        | < 0.2 mA                  |
| Idle input current (at Remote OFF state)       | Nominal Vin                             |        | < 3 mA                    |
| Reverse voltage protection                     |   |        | 1.0A max                  |
| Environmental Specifications                   |   |        |                           |
| Operating ambient temperature                  | -55°C to +95°C (with derating)          |        |                           |
| Maximum case temperature                       | +100°C                                  |        |                           |
| Storage temperature range                      | -55°C to +125°C                         |        |                           |
| Relative humidity                              | 5% to 95% RH                            |        |                           |
| Temperature coefficient                        | ±0.02% / °C max.                        |        |                           |
| Output Specifications                          |   |        |                           |
| Output power                                   | 5 Watts max.                            |        |                           |
| Voltage accuracy                               | Full load and nominal Vin               |        | ±1%                       |
| Minimum load                                   | See table                               |        |                           |
| Line regulation                                | LL to HL at full load                   |        | ±0.8%                     |
| Load Regulation                                | 25% load to full load                   | Single | ±1.0%                     |
|  | Balanced load                           | Dual   | ±1.0%                     |
|  | Unbalanced load 25% to 100% full load   |        | ±5%                       |
| Ripple and Noise                               | 20MHz bandwidth                         |        | 75mV <sub>p-p</sub> max.  |
| Over voltage protection<br>(Zener Diode Clamp) | 3.3V <sub>out</sub> models              |        | 3.9V                      |
|  | 5V <sub>out</sub> models                |        | 6.2V                      |
|  | 12V <sub>out</sub> models               |        | 15V                       |
|  | 15V <sub>out</sub> models               |        | 18V                       |
|  | 24V <sub>out</sub> models               |        | 27V                       |
| Capacitive load                                | See table                               |        |                           |
| Over load protection                           | % of full load at nominal input         |        | 150% typ.                 |
| Short circuit protection                       | Continuous, automatic recovery          |        |                           |
| Transient response settling time               | 50% load step change                    |        | 300us typ.                |
| Transient response over shoot                  | di/dt=0.8A/μs                           |        | ≤ ±5% of V <sub>o</sub>   |

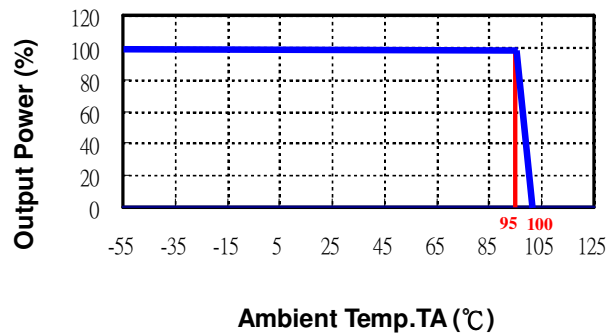
### General Specifications

|                              |                   |                           |
|------------------------------|-------------------|---------------------------|
| Efficiency                   | Nominal input     | See table                 |
| Isolation voltage            | Input to output   | 1500VDC                   |
| Isolation resistance         | 500Vdc            | 10 <sup>9</sup> Ohms min. |
| Isolation capacitance        | 24V nominal input | 580pF typ.                |
| Switching frequency          |                   | 300kHz typ.               |
| Reliability, calculated MTBF |                   | 1.96× 10 <sup>6</sup> Hrs |

### Physical Specifications

|                  |   |
|------------------|---|
| Case material    | Nickel-coated copper                            |
| Base material    | Non-conductive black plastic                    |
| Potting material | Silicon rubber (UL94V-0)                        |
| Dimensions       | 2.0 × 1.0 × 0.4 Inch<br>(50.8 × 25.4 × 10.2 mm) |
| Weight           | 30g (1.06oz) typ.                               |

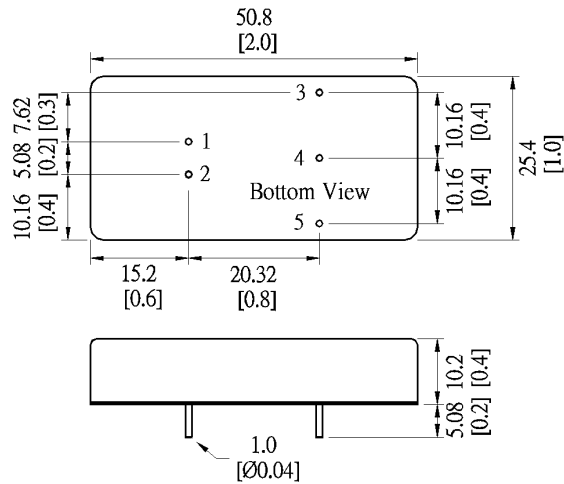
**Power Derating Curve**



### Note

1. Io below this value will not damage these converters, however, they may not meet all listed specifications.
2. Typical value, tested at nominal input and full load.
3. For each output.

### Mechanical Dimensions



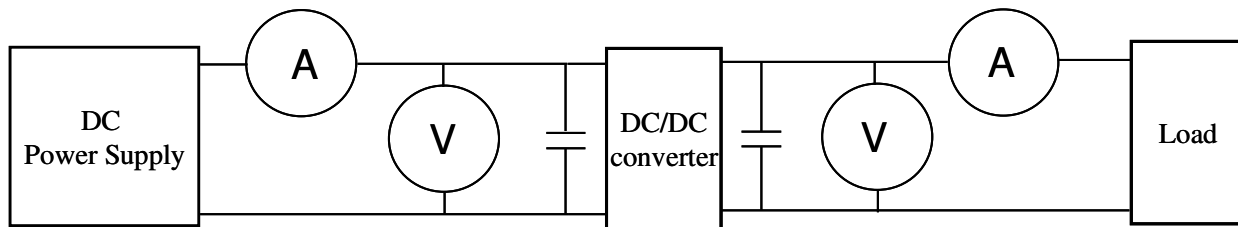
| Pin Assignment |        |        |
|----------------|--------|--------|
| Pin            | Single | Dual   |
| 1              | +Vin   | +Vin   |
| 2              | -Vin   | -Vin   |
| 3              | +Vout  | +Vout  |
| 4              | No pin | Common |
| 5              | -Vout  | -Vout  |

Unit: mm [inch]  
Tolerance: ±0.5 [0.02]

Specifications subject to change without notice.

### Test Configurations

All specifications are typical at nominal input, full load and 25°C unless otherwise stated.



- ⊙DC Power Supply: It offers a wide voltage and current range precisely.
- ⊙Current meter (A): Accuracy → 200μA ~ 200mA 4 ranges ±(0.2% rdg + 2 digits)  
2000mA ~ 20A 2 ranges ±(0.3% rdg + 2 digits).
- ⊙Voltage meter (V): Accuracy → ±(0.03% rdg + 4 digits).
- ⊙Load: At full load.
- ⊙Wires: The resistance of the wires must be small.

#### 1. Input voltage range: Narrow input voltage range (±10%)、wide input voltage range (2:1 and 4:1)。

EX: Narrow input voltage range (±10%)

|                   |   |            |
|-------------------|---|------------|
| 5V nominal input  | → | 4.5~5.5V   |
| 12V nominal input | → | 10.8~13.2V |
| 24V nominal input | → | 21.6~26.4V |

Wide input voltage range 2:1

|                   |   |        |
|-------------------|---|--------|
| 5V nominal input  | → | 4.5~9V |
| 12V nominal input | → | 9~18V  |
| 24V nominal input | → | 18~36V |
| 48V nominal input | → | 36~75V |

Wide input voltage range 4:1 (W)

|                   |   |        |
|-------------------|---|--------|
| 24V nominal input | → | 9~36V  |
| 48V nominal input | → | 18~75V |

#### 2. Input power :

$$P_{in} = V_{in} \times I_{in}$$

$V_{in}$  : Input voltage

$I_{in}$  : Input current

#### 3. Output power :

$$P_{out} = V_{out} \times I_{out}$$

$V_{out}$  : Output voltage

$I_{out}$  : Output current

#### 4. Efficiency :

$$\text{Efficiency} = \frac{P_{out}}{P_{in}} \times 100\%$$

$P_{out}$ : Output power  
 $P_{in}$ : Input power

#### 5. Voltage accuracy:

$$\frac{|V_{out} - V_{out(nominal)}|}{V_{out}} \times 100\%$$

$V_{out}$  : Output voltage  
 $V_{out(nominal)}$  : Nominal output voltage

#### 6. Line regulation: (1) Wide input voltage range and regulated output voltage series.

$$\frac{|V_{out(LL)} - V_{out(HL)}|}{V_{out(LL)}} \times 100\%$$

LL: Low Line input voltage  
HL: High Line input voltage

#### (2) Narrow input voltage range ( $\pm 10\%$ ) and unregulated output voltage series.

$$\text{Line regulation} = \left| \frac{\Delta V_{out}}{\Delta V_{in}} \right|$$

$$\Delta V_{out} = \frac{V_{out(+10\%)} - V_{out(-10\%)}}{V_{out}} \times 100\%$$

$V_{out(+10\%)}$  : Output voltage at  $V_{in} = 1.1 \times V_{in(nominal)}$  & full load

$V_{out(-10\%)}$  : Output voltage at  $V_{in} = 0.9 \times V_{in(nominal)}$  & full load

$V_{out}$  : Output voltage at  $V_{in} = V_{in(nominal)}$  & full load

$$\Delta V_{in} = \frac{V_{in(+10\%)} - V_{in(-10\%)}}{V_{in(nominal)}} \times 100\%$$

$V_{in(+10\%)}$  : Input voltage =  $1.1 \times V_{in(nominal)}$

$V_{in(-10\%)}$  : Input voltage =  $0.9 \times V_{in(nominal)}$

$V_{in(nominal)}$  : Nominal Input voltage

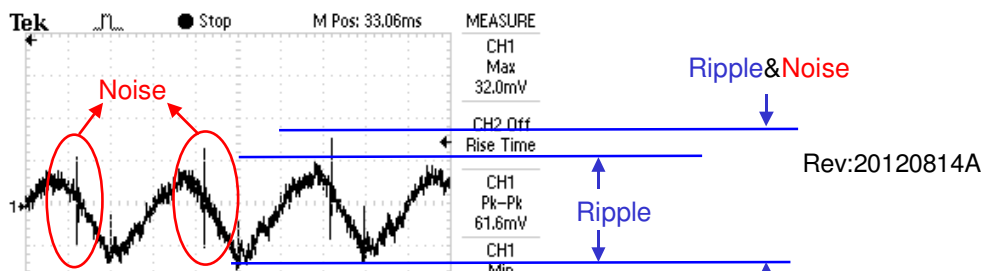
#### 7. Load regulation :

$$\frac{|V_{out(FL)} - V_{out(NL)}|}{V_{out(FL)}} \times 100\%$$

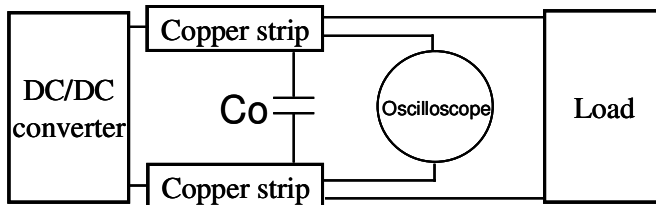
$V_{out(FL)}$ : Output voltage at full load

$V_{out(NL)}$ : Output voltage at 25% full load or 10% full load

#### 8. Ripple and Noise: as shown below. The bandwidth is 0-20MHz.

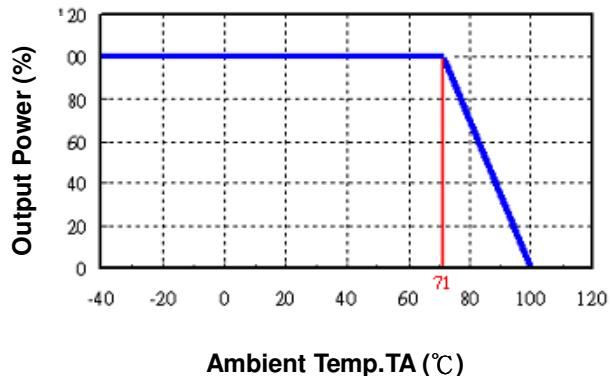


Output Ripple&Noise measurement test circuit: as shown below.



Co: usually 0.47uF.

9. [Temperature derating curve](#): The DC-DC converter will operate over a wider temperature range if less power is drawn from the output and the device is already running. The temperature derating curve shows the operating power-temperature range. As shown below.



10. [Switching frequency](#): The nominal operating frequency of the DC-DC converters.
11. [Input to output isolation](#): The dielectric breakdown strength test between input and output circuits. This is the isolation voltage the device is capable of withstanding for a specified time, usually 1 second or 1 minute.