

FEATURES

- ▶ Industrial Standard SIP-7 Package
- ▶ Ultra-high I/O Isolation 5200VDC
- ▶ Common Mode Transient Immunity : 15kV/μs
- ▶ Qualified for IGBT and High Isolation Applications
- ▶ Operating Ambient Temp. Range -40°C to +85°C
- ▶ Short Circuit Protection
- ▶ UL/cUL/IEC/EN 62368-1(60950-1) Safety Approval


PRODUCT OVERVIEW

The MINMAX MAEU02-HI series is a range of isolated 2W DC-DC converter modules in SIP-7 package which feature a very high I/O-isolation voltage rated for 5700VDC. A very high common mode transient immunity with 15kV/μs qualifies these product for IGBT driver applications. There are 40 models available for 5, 12, 15 and 24V input. These converters offer a cost-effective solution for wind turbine, solar panel, transportation systems, industrial control equipments and some IGBT driver applications where a very high I/O-isolation is required.

Model Selection Guide

| Model Number | Input Voltage (Range) VDC | Output Voltage VDC | Output Current | | Input Current | | Load Regulation % (max.) | Max. capacitive Load μF | Efficiency (typ.) @Max. Load % |
|------------------|------------------------------|-----------------------|----------------|------------|------------------------|----------------------|-----------------------------|----------------------------|--------------------------------------|
| | | | Max. mA | Min. mA | @Max. Load mA(typ.) | @No Load mA(typ.) | | | |
| MAEU02-05S033HI | 5 ±10% | 3.3 | 500 | 10 | 446 | 35 | 20 | 1650 | 74 |
| MAEU02-05S05HI | | 5 | 400 | 8 | 500 | | 15 | 940 | 80 |
| MAEU02-05S09HI | | 9 | 222 | 4.4 | 493 | | 10 | 940 | 81 |
| MAEU02-05S12HI | | 12 | 168 | 3.4 | 492 | | 10 | 440 | 82 |
| MAEU02-05S15HI | | 15 | 132 | 2.6 | 501 | | 10 | 440 | 79 |
| MAEU02-05D05HI | | ±5 | ±200 | ±4 | 513 | | 15 | 440# | 78 |
| MAEU02-05D09HI | | ±9 | ±112 | ±2.2 | 504 | | 10 | 440# | 80 |
| MAEU02-05D12HI | | ±12 | ±84 | ±1.7 | 504 | | 10 | 200# | 80 |
| MAEU02-05D15HI | | ±15 | ±66 | ±1.3 | 501 | | 10 | 200# | 79 |
| MAEU02-05A1509HI | 15 | 66 | 1.3 | 495 | 10 | 200 | 440 | 80 | |
| | -9 | -110 | -2.2 | | | | | | |
| MAEU02-12S033HI | 12 ±10% | 3.3 | 500 | 10 | 181 | 17 | 20 | 1650 | 76 |
| MAEU02-12S05HI | | 5 | 400 | 8 | 211 | | 15 | 940 | 79 |
| MAEU02-12S09HI | | 9 | 222 | 4.4 | 206 | | 10 | 940 | 81 |
| MAEU02-12S12HI | | 12 | 168 | 3.4 | 202 | | 10 | 440 | 83 |
| MAEU02-12S15HI | | 15 | 132 | 2.6 | 201 | | 10 | 440 | 82 |
| MAEU02-12D05HI | | ±5 | ±200 | ±4 | 211 | | 15 | 440# | 79 |
| MAEU02-12D09HI | | ±9 | ±112 | ±2.2 | 207 | | 10 | 440# | 81 |
| MAEU02-12D12HI | | ±12 | ±84 | ±1.7 | 205 | | 10 | 200# | 82 |
| MAEU02-12D15HI | | ±15 | ±66 | ±1.3 | 199 | | 10 | 200# | 83 |
| MAEU02-12A1509HI | 15 | 66 | 1.3 | 204 | 10 | 200 | 440 | 81 | |
| | -9 | -110 | -2.2 | | | | | | |
| MAEU02-15S033HI | 15 ±10% | 3.3 | 500 | 10 | 143 | 16 | 20 | 1650 | 77 |
| MAEU02-15S05HI | | 5 | 400 | 8 | 169 | | 15 | 940 | 79 |
| MAEU02-15S09HI | | 9 | 222 | 4.4 | 160 | | 10 | 940 | 83 |
| MAEU02-15S12HI | | 12 | 168 | 3.4 | 162 | | 10 | 440 | 83 |
| MAEU02-15S15HI | | 15 | 132 | 2.6 | 155 | | 10 | 440 | 85 |
| MAEU02-15D05HI | | ±5 | ±200 | ±4 | 165 | | 15 | 440# | 81 |
| MAEU02-15D09HI | | ±9 | ±112 | ±2.2 | 160 | | 10 | 440# | 84 |
| MAEU02-15D12HI | | ±12 | ±84 | ±1.7 | 164 | | 10 | 200# | 82 |
| MAEU02-15D15HI | | ±15 | ±66 | ±1.3 | 161 | | 10 | 200# | 82 |
| MAEU02-15A1509HI | 15 | 66 | 1.3 | 159 | 10 | 200 | 440 | 83 | |
| | -9 | -110 | -2.2 | | | | | | |
| MAEU02-24S033HI | 24 ±10% | 3.3 | 500 | 10 | 90 | 12 | 20 | 1650 | 76 |
| MAEU02-24S05HI | | 5 | 400 | 8 | 108 | | 15 | 940 | 77 |
| MAEU02-24S09HI | | 9 | 222 | 4.4 | 103 | | 10 | 940 | 81 |
| MAEU02-24S12HI | | 12 | 168 | 3.4 | 102 | | 10 | 440 | 82 |
| MAEU02-24S15HI | | 15 | 132 | 2.6 | 101 | | 10 | 440 | 82 |
| MAEU02-24D05HI | | ±5 | ±200 | ±4 | 108 | | 15 | 440# | 77 |
| MAEU02-24D09HI | | ±9 | ±112 | ±2.2 | 104 | | 10 | 440# | 81 |
| MAEU02-24D12HI | | ±12 | ±84 | ±1.7 | 104 | | 10 | 200# | 81 |
| MAEU02-24D15HI | | ±15 | ±66 | ±1.3 | 103 | | 10 | 200# | 80 |
| MAEU02-24A1509HI | 15 | 66 | 1.3 | 102 | 10 | 200 | 440 | 81 | |
| | -9 | -110 | -2.2 | | | | | | |

* Min. Output Current for Lower Load Regulation

For each output

E-mail:sales@minmax.com.tw Tel:886-6-2923150

Input Specifications

| Parameter | Model | Min. | Typ. | Max. | Unit |
|-----------------------------------|------------------|--------------------|------|------|------|
| Input Surge Voltage (1 sec. max.) | 5V Input Models | -0.7 | --- | 9 | VDC |
| | 12V Input Models | -0.7 | --- | 18 | |
| | 15V Input Models | -0.7 | --- | 20 | |
| | 24V Input Models | -0.7 | --- | 30 | |
| 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 | |
| Short Circuit Input Power | All Models | --- | --- | 1000 | mW |
| Input Filter | | Internal Capacitor | | | |

Output Specifications

| Parameter | Conditions | Min. | Typ. | Max. | Unit |
|---------------------------------|--------------------------------|---------------------------|-------|-------|-------------------|
| Output Voltage Setting Accuracy | | --- | --- | ±5.0 | %Vnom. |
| Output Voltage Balance | Dual Output, Balanced Loads | --- | ±0.1 | ±1.0 | % |
| Line Regulation | For Vin Change of 1% | --- | ±1.2 | --- | % |
| Load Regulation | Io=20% to 100% | See Model Selection Guide | | | |
| Ripple & Noise | 0-20MHz Bandwidth | --- | --- | 100 | mV _{P-P} |
| Temperature Coefficient | | --- | ±0.01 | ±0.02 | %/°C |
| Short Circuit Protection | Continuous, Automatic Recovery | | | | |

Isolation, Safety Standards

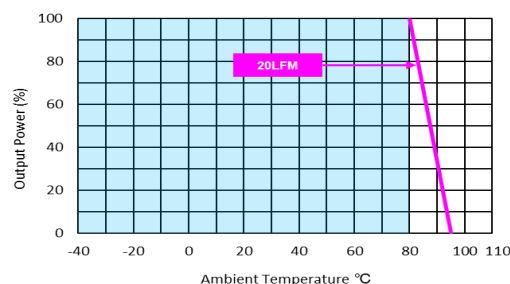
| Parameter | Conditions | Min. | Typ. | Max. | Unit |
|--------------------------------|--|------|------|------|-------|
| I/O Isolation Voltage | Rated for 60 seconds | 5200 | --- | --- | VDC |
| | Tested for 1 second | 5700 | --- | --- | VDC |
| I/O Isolation Resistance | 500 VDC | 10 | --- | --- | GΩ |
| I/O Isolation Capacitance | 100kHz, 1V | --- | 7 | --- | pF |
| Common Mode Transient Immunity | | 15 | --- | --- | kV/μs |
| Safety Approvals | UL/cUL 60950-1 recognition (CSA certificate), IEC/EN 60950-1 (CB-report) | | | | |
| | UL/cUL 62368-1 recognition (UL certificate), IEC/EN 62368-1 (CB-report) | | | | |

General Specifications

| Parameter | Conditions | Min. | Typ. | Max. | Unit |
|---------------------|-----------------------------------|-----------|------|------|-------|
| Switching Frequency | | --- | 100 | --- | kHz |
| MTBF(calculated) | MIL-HDBK-217F@25°C, Ground Benign | 1,109,000 | --- | --- | Hours |

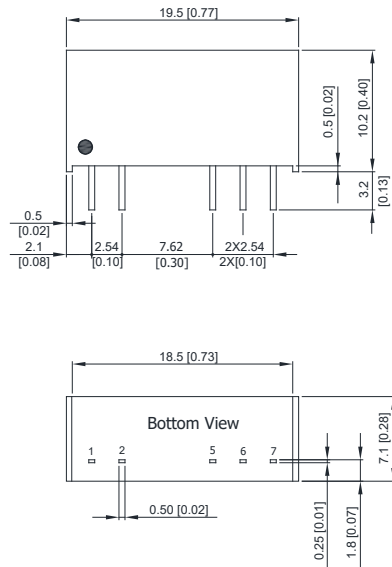
Environmental Specifications

| Parameter | Min. | Max. | Unit |
|---|------|------|----------|
| Operating Ambient Temperature Range (See Power Derating Curve) | -40 | +85 | °C |
| Case Temperature | --- | +95 | °C |
| Storage Temperature Range | -55 | +125 | °C |
| Humidity (non condensing) | --- | 95 | % rel. H |
| Lead Temperature (1.5mm from case for 10Sec.) | --- | 260 | °C |

Power Derating Curve


Notes

- 1 Specifications typical at Ta=+25°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 We recommend to protect the converter by a slow blow fuse in the input supply line.
- 4 Other input and output voltage may be available, please contact factory.
- 5 Specifications are subject to change without notice.

Package Specifications
Mechanical Dimensions

Pin Connections

| Pin | Single Output | Dual Output |
|-----|---------------|-------------|
| 1 | +Vin | +Vin |
| 2 | -Vin | -Vin |
| 5 | -Vout | -Vout |
| 6 | No Pin | Common |
| 7 | +Vout | +Vout |

- ▶ All dimensions in mm (inches)
- ▶ Tolerance: X.X±0.5 (X.XX±0.02)
X.XX±0.25 (X.XXX±0.01)
- ▶ Pins ±0.05(±0.002)

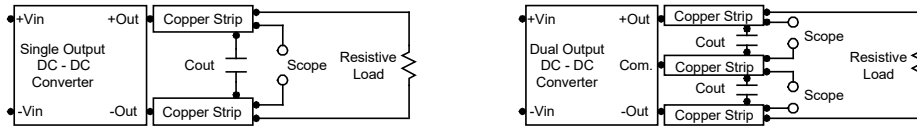
Physical Characteristics

| | |
|---------------|---|
| Case Size | : 19.5x7.1x10.2mm (0.77x0.28x0.40 inches) |
| Case Material | : Non-Conductive Black Plastic (flammability to UL 94V-0 rated) |
| Pin Material | : Tinned Copper |
| Weight | : 2.4g |

Test Setup

Peak-to-Peak Output Noise Measurement Test

Use a Cout 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.



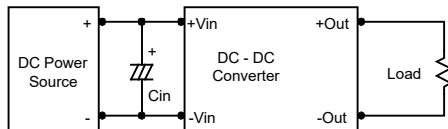
Technical Notes

Maximum Capacitive Load

The MAEU02-HI 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.

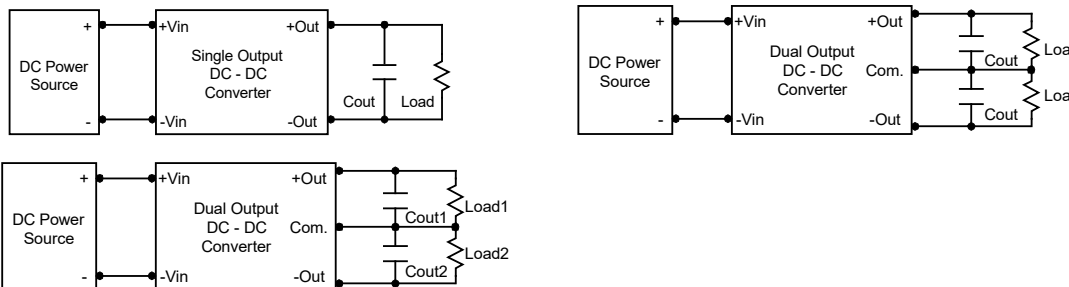
Input Source Impedance

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,15V input devices and a 0.47 μ F for the 24V 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 1.0 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 95°C. The derating curves are determined from measurements obtained in a test setup.

