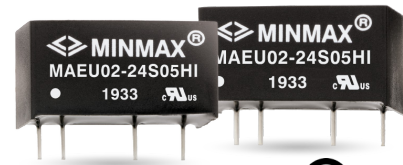


FEATURES

- ▶ Industrial Standard SIP-7 Package
- ▶ Unregulated Output Voltage
- ▶ Ultra-high I/O Isolation 5700VDC
- ▶ 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 high I/O isolation voltage rated for 5700VDC, using for electricity and energy 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 where a 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		200	80	
	-9	-110	-2.2	440					
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		200	81	
	-9	-110	-2.2	440					
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		200	83	
	-9	-110	-2.2	440					
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		200	81	
	-9	-110	-2.2	440					

* Min. Output Current for Lower Load Regulation

For each output

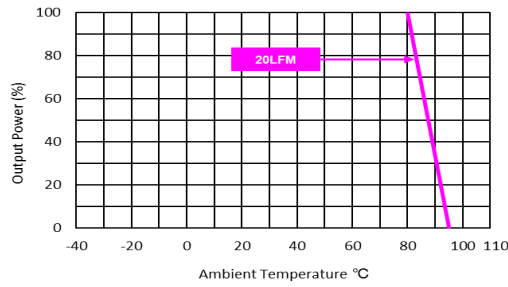
Input Specifications					
Parameter	Model	Min.	Typ.	Max.	Unit
Input Surge Voltage (1 sec. max.)	5V Input Models	-0.7	---	9	VDC
	12V Input Models	-0.7	---	18	
	15V Input Models	-0.7	---	20	
	24V Input Models	-0.7	---	30	
Input Voltage Range	5V Input Models	4.5	5	5.5	VDC
	12V Input Models	10.8	12	13.2	
	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				

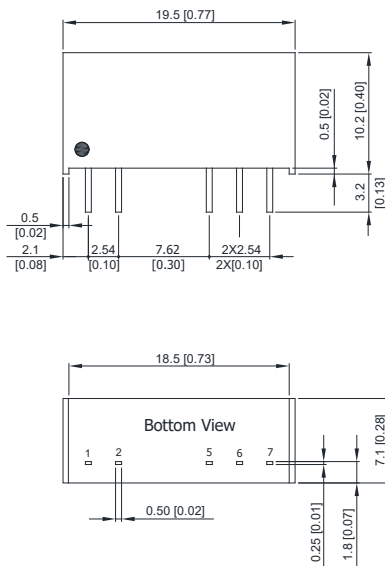
Isolation, Safety Standards					
Parameter	Conditions	Min.	Typ.	Max.	Unit
I/O Isolation Voltage	Rated for 60 seconds	5200	---	---	VDC
	Tested for 1 second	5700	---	---	VDC
I/O Isolation Resistance	500 VDC	10	---	---	GΩ
I/O Isolation Capacitance	100kHz, 1V	---	7	---	pF
Safety Approvals	UL/cUL 60950-1 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 MINMAX.
- 5 Specifications are subject to change without notice.
- 6 The repeated high voltage isolation testing of the converter can degrade isolation capability, to a lesser or greater degree depending on materials, construction, environment and and reflow solder process. Any material is susceptible to eventual chemical degradation when subject to very high applied voltages thus implying that the number of tests should be strictly limited. We therefore strongly advise against repeated high voltage isolation testing, but if it is absolutely required, that the voltage be reduced by 20% from specified test voltage. Furthermore, the high voltage isolation capability after reflow solder process should be evaluated as it is applied on system.

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)

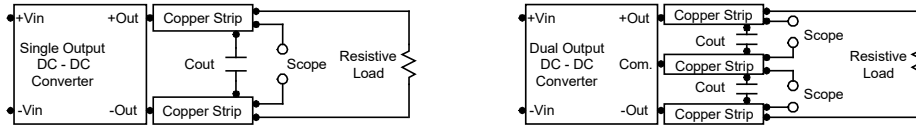
Physical Characteristics

Case Size	: 19.5x7.1x10.2mm (0.77x0.28x0.40 inches)
Case Material	: Plastic resin (flammability to UL 94V-0 rated)
Pin Material	: Alloy 42
Weight	: 2.4g

Test Setup

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.



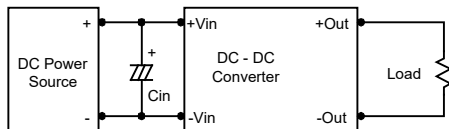
Technical Notes

Maximum Capacitive Load

The 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.

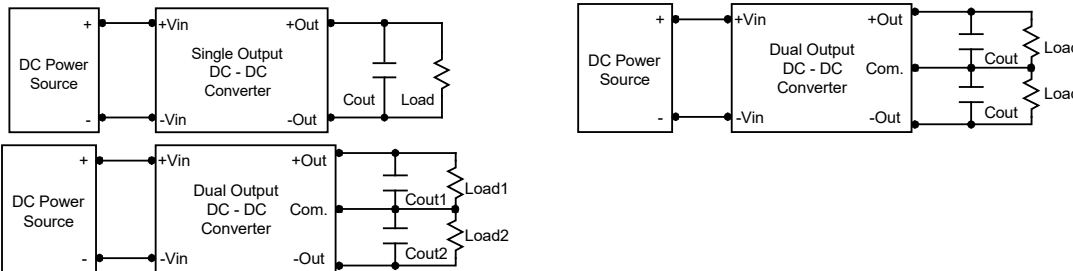
Input Source Impedance

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.

