

**FEATURES**

- ▶ Industrial Standard DIP-24 Package
- ▶ Fully Regulated Output Voltage
- ▶ Ultra-high I/O Isolation 6000VDC with Reinforced Insulation, rate for 300Vrms Working Voltage
- ▶ Operating Ambient Temp. Range -40°C to +77.5°C
- ▶ No Min. Load Requirement
- ▶ Short Circuit Protection
- ▶ Conducted EMI EN 55032 Class A Approved
- ▶ UL/cUL/IEC/EN 62368-1(60950-1) Safety Approval & CE Marking


**PRODUCT OVERVIEW**

The MINMAX MIDER03-HI series is a range of isolated 3W DC-DC converter modules in DIP-24 package which feature a regulated output and Ultra-high I/O Isolation voltage rated for 6000VDC with reinforced insulation, using for electricity and energy applications. Further features include short circuit protection and no min. load requirement and EN 55032 class A compliant as well. There are 15 Models available for 5, 12, and 24VDC 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 VDC	Output Voltage VDC	Output Current mA	Input Current		Max. capacitive Load μF	Efficiency (typ.) @Max. Load %	
				@Max. Load mA(typ.)	@No Load mA(typ.)			
MIDER03-05S05HI	5 ±10%	5	600	1017	130	470	59	
MIDER03-05S12HI		12	250	984			61	
MIDER03-05S15HI		15	200	960			62	
MIDER03-05D12HI		±12	±125	1000			220 #	60
MIDER03-05D15HI		±15	±100	1000				60
MIDER03-12S05HI	12 ±10%	5	600	424	60	470	59	
MIDER03-12S12HI		12	250	410			61	
MIDER03-12S15HI		15	200	400			62	
MIDER03-12D12HI		±12	±125	420			220 #	60
MIDER03-12D15HI		±15	±100	420				60
MIDER03-24S05HI	24 ±10%	5	600	212	40	470	59	
MIDER03-24S12HI		12	250	198			63	
MIDER03-24S15HI		15	200	195			64	
MIDER03-24D12HI		±12	±125	210			220 #	60
MIDER03-24D15HI		±15	±100	210				60

# For each output

**Input Specifications**

Parameter	Model	Min.	Max.	Unit
Input Voltage Range	5V Input Models	4.5	5.5	VDC
	12V Input Models	10.8	13.2	
	24V Input Models	21.6	26.4	
Input Surge Voltage (1 sec. max.)	5V Input Models	-0.7	7.5	VDC
	12V Input Models	-0.7	15	
	24V Input Models	-0.7	30	
Short Circuit Input Power		---	2500	mW
Input Filter	All Models	Internal Pi Type		
Conducted EMI		Compliance to EN 55032, class A		

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**Output Specifications**

Parameter	Conditions	Min.	Typ.	Max.	Unit
Output Voltage Setting Accuracy		---	---	±4.0	%Vnom.
Output Voltage Balance	Dual Output, Balanced Loads	---	±2.0	±4.0	%
Line Regulation	Vin=Min. to Max. @Full Load	---	±0.3	±0.5	%
Load Regulation	Io=10% to 100%	---	±0.5	±1.0	%
Minimum Load	No minimum Load Requirement				
Ripple & Noise	0-20 MHz Bandwidth	---	---	50	mV <sub>P-P</sub>
Temperature Coefficient		---	±0.01	±0.02	%/°C
Short Circuit Protection	Continuous, Automatic Recovery				

**Isolation, Safety Standards**

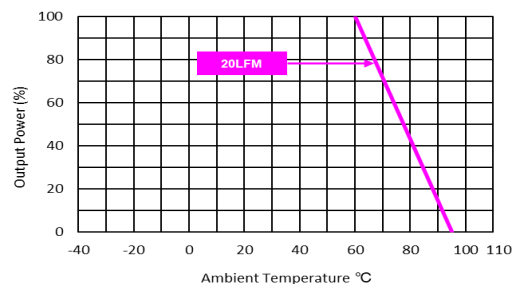
Parameter	Conditions	Min.	Typ.	Max.	Unit
I/O Isolation Voltage	60 Seconds Reinforced insulation, rated for 300Vrms working voltage	3000	---	---	VAC
	Tested for 1 second	6000	---	---	VDC
I/O Isolation Resistance	500 VDC	10	---	---	GΩ
I/O Isolation Capacitance	100kHz, 1V	---	20	---	pF
Safety Approvals	UL/cUL 60950-1 recognition(UL 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		25	60	---	kHz
MTBF(calculated)	MIL-HDBK-217F@25°C, Ground Benign	1,000,000			Hours

**Environmental Specifications**

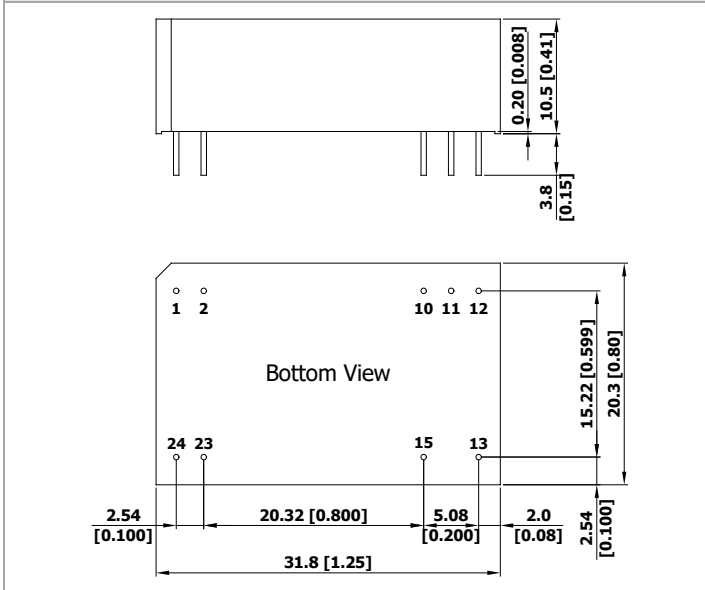
Parameter	Min.	Max.	Unit
Operating Ambient Temperature Range (See Power Derating Curve)	-40	+77.5	°C
Case Temperature	---	+95	°C
Storage Temperature Range	-50	+125	°C
Humidity (non condensing)	---	95	% rel. H
Lead Temperature (1.5mm from case for 10Sec.)	---	260	°C

**Power Derating Curve**

**Notes**

- 1 Specifications typical at Ta=+25°C, resistive load, nominal input voltage and rated output current unless otherwise noted.
- 2 We recommend to protect the converter by a slow blow fuse in the input supply line.
- 3 Other input and output voltage may be available, please contact MINMAX.
- 4 Specifications are subject to change without notice.

**Package Specifications**

## Mechanical Dimensions



## Pin Connections

Pin	Single Output	Dual Output	Diameter mm (inches)
1	+Vin	+Vin	∅ 0.5 [0.02]
2	+Vin	+Vin	∅ 0.5 [0.02]
10	No Pin	Common	∅ 0.5 [0.02]
11	No Pin	Common	∅ 0.5 [0.02]
12	-Vout	No Pin	∅ 0.5 [0.02]
13	+Vout	-Vout	∅ 0.5 [0.02]
15	No Pin	+Vout	∅ 0.5 [0.02]
23	-Vin	-Vin	∅ 0.5 [0.02]
24	-Vin	-Vin	∅ 0.5 [0.02]

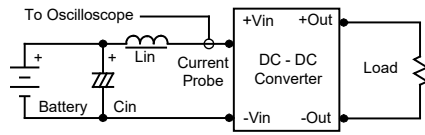
- ▶ All dimensions in mm (inches)
- ▶ Tolerance: X.X±0.25 (X.XX±0.01)  
X.XX±0.13 (X.XXX±0.005)
- ▶ Pin diameter tolerance: X.X±0.05 (X.XX±0.002)

**Physical Characteristics**

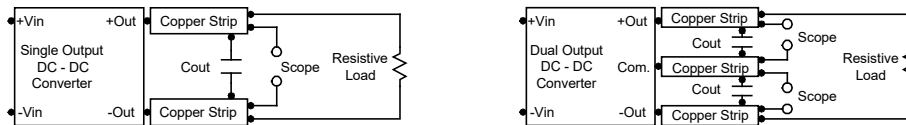
Case Size	: 31.8x20.3x10.5 mm (1.25x0.80x0.41 inches)
Case Material	: Plastic resin (flammability to UL 94V-0 rated)
Pin Material	: Copper Alloy
Weight	: 12.4g

**Test Setup**
**Input Reflected-Ripple Current Test Setup**

Input reflected-ripple current is measured with an inductor  $L_{in}$  (4.7 $\mu$ H) and  $C_{in}$  (220 $\mu$ F, ESR < 1.0 $\Omega$  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 $\mu$ 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.

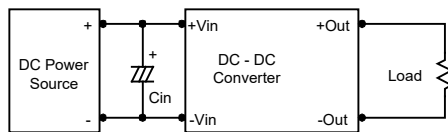

**Technical Notes**
**Maximum Capacitive Load**

The MIDER03-HI series has a 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 220 $\mu$ F maximum capacitive load for dual outputs and 470 $\mu$ F capacitive load for single outputs. 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 $\Omega$  at 100 kHz) capacitor of a 4.7 $\mu$ F for the 5V input devices and a 2.2 $\mu$ F for the 12V and 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 1.5 $\mu$ 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 $^{\circ}$ C. The derating curves are determined from measurements obtained in a test setup.

