

**FEATURES**

- ▶ DIP-24 Metal Package  
31.8 x 20.3 x 10.2 mm (1.25 x 0.8 x 0.4 inches)
- ▶ Wide 2:1 Input Range
- ▶ Operating Ambient Temp. Range -40°C to +85°C
- ▶ Short Circuit Protection
- ▶ I/O-isolation 1500VDC
- ▶ UL/cUL/IEC/EN 60950-1 Safety Approval


**PRODUCT OVERVIEW**

The MINMAX MIW3000 series is a range of isolated 5-6W DC-DC converter modules featuring fully regulated output voltages and wide 2:1 input voltage ranges. The product comes in a shielded metal DIP-24 package with industry standard pinout. An excellent efficiency allows an operating temperature range of -40°C to +85°C (with derating). Typical applications for these converters are in battery operated equipment and instrumentation, distributed power systems, data communication and general industrial electronics.

**Model Selection Guide**

Model Number	Input Voltage (Range) VDC	Output Voltage VDC	Output Current		Input Current		Reflected Ripple Current mA(typ.)	Max. capacitive Load µF	Efficiency (typ.) @Max. Load %
			Max.	Min.	@Max. Load	@No Load			
			mA	mA	mA(typ.)	mA(typ.)			
MIW3011	5 (4.5 ~ 7)	3.3	1200	60	1056	80	100	6800	75
MIW3012		5	1000	50	1265				79
MIW3013		12	500	25	1463				82
MIW3014		15	400	20	1463				82
MIW3015		±5	±500	±25	1265				79
MIW3016		±12	±250	±12.5	1463				82
MIW3017		±15	±200	±10	1463				82
MIW3021	12 (9 ~ 18)	3.3	1200	60	429	30	25	6800	77
MIW3022		5	1000	50	514				81
MIW3023		12	500	25	595				84
MIW3024		15	400	20	595				84
MIW3025		±5	±500	±25	514				81
MIW3026		±12	±250	±12.5	595				84
MIW3027		±15	±200	±10	595				84
MIW3031	24 (18 ~ 36)	3.3	1200	60	209	15	15	6800	79
MIW3032		5	1000	50	251				83
MIW3033		12	500	25	291				86
MIW3034		15	400	20	291				86
MIW3035		±5	±500	±25	251				83
MIW3036		±12	±250	±12.5	291				86
MIW3037		±15	±200	±10	291				86
MIW3041	48 (36 ~ 75)	3.3	1200	60	104	8	10	6800	79
MIW3042		5	1000	50	126				83
MIW3043		12	500	25	145				86
MIW3044		15	400	20	145				86
MIW3045		±5	±500	±25	126				83
MIW3046		±12	±250	±12.5	145				86
MIW3047		±15	±200	±10	145				86

# For each output

**Input Specifications**

Parameter	Model	Min.	Typ.	Max.	Unit
Input Surge Voltage (1 sec. max.)	5V Input Models	-0.7	---	10	VDC
	12V Input Models	-0.7	---	25	
	24V Input Models	-0.7	---	50	
	48V Input Models	-0.7	---	100	
Start-Up Threshold Voltage	5V Input Models	3	3.5	4.4	
	12V Input Models	4.5	6	8	
	24V Input Models	8	12	16	
	48V Input Models	16	24	32	
Under Voltage Shutdown	5V Input Models	---	---	4	
	12V Input Models	---	---	8	
	24V Input Models	---	---	16	
	48V Input Models	---	---	32	
Short Circuit Input Power	All Models	---	1000	3000	mW
Internal Power Dissipation		---	---	2500	mW
Input Filter		Internal Pi Type			
Conducted EMI		Compliance to EN 55022, class A			

**Output Specifications**

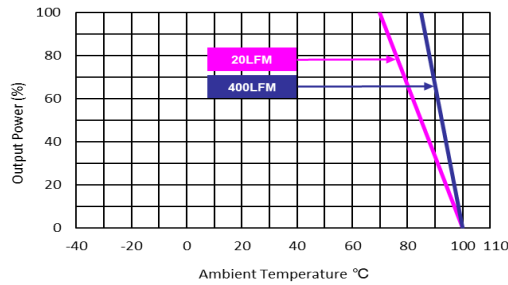
Parameter	Conditions	Min.	Typ.	Max.	Unit
Output Voltage Setting Accuracy		---	---	±1.0	%Vnom.
Output Voltage Balance	Dual Output, Balanced Loads	---	±0.5	±2.0	%
Line Regulation	Vin=Min. to Max. @Full Load	---	±0.1	±0.3	%
Load Regulation	Io=20% to 100%	---	±0.3	±1.0	%
Ripple & Noise	0-20 MHz Bandwidth	---	50	75	mV <sub>P-P</sub>
Transient Recovery Time	25% Load Step Change	---	150	300	μsec
Transient Response Deviation		---	±2	±6	%
Temperature Coefficient		---	±0.01	±0.02	%/°C
Over Current Protection	Foldback	120	150	---	%
Short Circuit Protection	Continuous, Automatic Recovery				

**General Specifications**

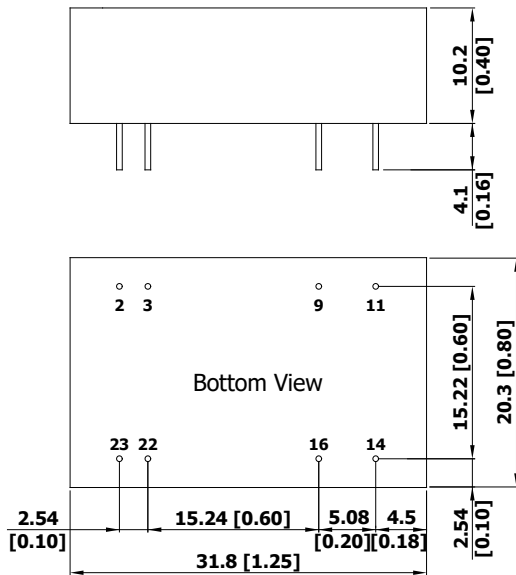
Parameter	Conditions	Min.	Typ.	Max.	Unit
I/O Isolation Voltage	60 Seconds	1500	---	---	VDC
	1 Seconds	1800	---	---	VDC
I/O Isolation Resistance	500 VDC	1000	---	---	MΩ
I/O Isolation Capacitance	100kHz, 1V	---	380	500	pF
Switching Frequency		---	300	---	kHz
MTBF (calculated)	MIL-HDBK-217F@25°C, Ground Benign	1,000,000			Hours
Safety Approvals	UL/cUL 60950-1 recognition (CSA certificate), IEC/EN 60950-1(CB-report)				

**Environmental Specifications**

Parameter	Min.	Max.	Unit
Operating Ambient Temperature Range (See Power Derating Curve)	-40	+85	°C
Case Temperature	---	+90	°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 Transient recovery time is measured to within 1% error band for a step change in output load of 50% to 100%.
- 3 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.
- 4 We recommend to protect the converter by a slow blow fuse in the input supply line.
- 5 Other input and output voltage may be available, please contact MINMAX.
- 6 Specifications are subject to change without notice.

**Package Specifications**
**Mechanical Dimensions**

**Pin Connections**

Pin	Single Output	Dual Output	Diameter mm (inches)
2	-Vin	-Vin	Ø 0.50 [0.02]
3	-Vin	-Vin	Ø 0.50 [0.02]
9	No Pin	Common	Ø 0.50 [0.02]
11	NC	-Vout	Ø 0.50 [0.02]
14	+Vout	+Vout	Ø 0.50 [0.02]
16	-Vout	Common	Ø 0.50 [0.02]
22	+Vin	+Vin	Ø 0.50 [0.02]
23	+Vin	+Vin	Ø 0.50 [0.02]

NC: No Connection

- ▶ All dimensions in mm (inches)
- ▶ Tolerance: X.X±0.25 (X.XX±0.01)  
X.XX±0.13 (X.XXX±0.005)
- ▶ Pin diameter Ø 0.5 ±0.05 (0.02±0.002)

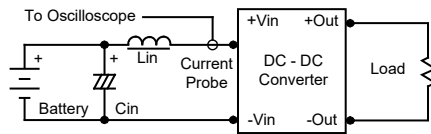
**Physical Characteristics**

Case Size	: 31.8x20.3x10.2mm (1.25x0.80x0.40 inches)
Case Material	: Metal With Non-Conductive Baseplate
Pin Material	: Phosphor Bronze
Weight	: 16.9g

## Test Setup

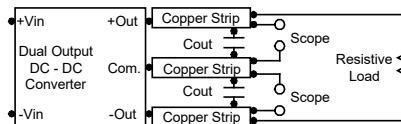
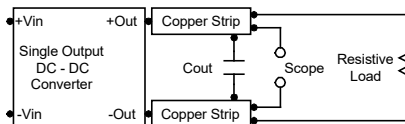
### Input Reflected-Ripple Current Test Setup

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  $C_{out}$  0.47 $\mu$ 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.



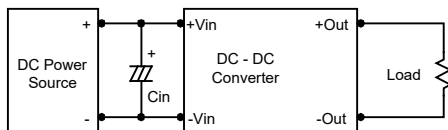
## Technical Notes

### Overcurrent Protection

To provide protection in a fault (output overload) 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 into its specified range.

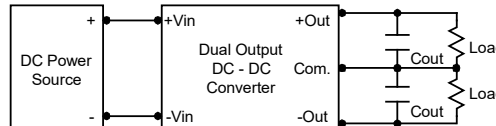
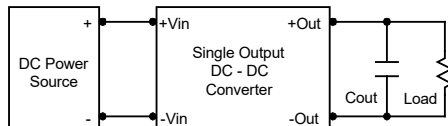
### Input Source Impedance

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 10 $\mu$ F for the 5V input devices, a 3.3 $\mu$ F for the 12V input devices and a 2.2 $\mu$ F for the 24V and 48V 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 3.3 $\mu$ F capacitors at the output.



### Maximum Capacitive Load

The MIW3000 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. For optimum performance we recommend 1000 $\mu$ F maximum capacitive load for dual outputs and 6800 $\mu$ F capacitive load for single outputs. The maximum capacitance can be found in the data sheet.

### 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 a test setup.

