

# MIW1000 Series

## 2-3W, Wide Input Range DIP, Single & Dual Output DC/DC Converters

### Key Features

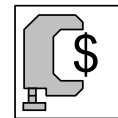
- Efficiency up to 84%
- 1500VDC Isolation
- MTBF > 1,000,000 Hours
- 2:1 Wide Input Range
- UL 1950 Safety Approval
- Low Cost
- Temperature Performance  $-40^{\circ}\text{C}$  to  $+71^{\circ}\text{C}$
- Industry Standard Pinout
- UL 94V-0 Package Material
- Interanal SMD Construction



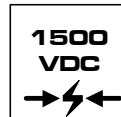
Minimax's MIW1000-Series power modules are low-profile dc-dc converters that operate over input voltage ranges of 4.5–9VDC, 9–18VDC, 18–36VDC and 36–72VDC which provide precisely regulated output voltages of 3.3V, 5V, 12V, 15V,  $\pm 5\text{V}$ ,  $\pm 12\text{V}$  and  $\pm 15\text{VDC}$ .

The  $-40^{\circ}\text{C}$  to  $+71^{\circ}\text{C}$  operating temperature range makes it ideal for data communication equipments, mobile battery driven equipments, distributed power systems, telecommunication equipments, mixed analog/digital subsystems, process/machine control equipments, computer peripheral systems and industrial robot systems.

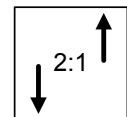
The modules have a maximum power rating of 3W and a typical full-load efficiency of 84%, continuous short circuit, 45mV output ripple, built-in filtering for both input and output minimize the need for external filtering.



Low Cost



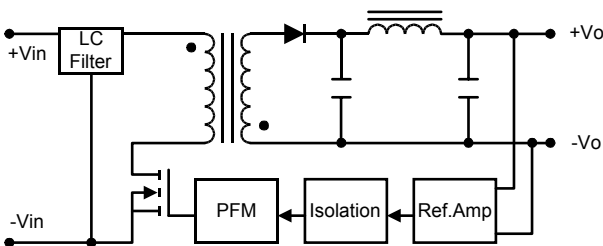
1500 VDC I/O Isolation



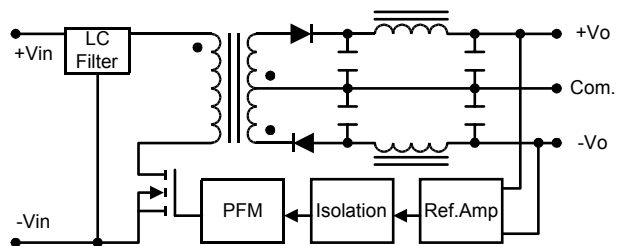
Wide Range

### Block Diagram

#### Single Output



#### Dual Output



## Model Selection Guide

Model Number	Input Voltage	Output Voltage	Output Current		Input Current		Reflected Ripple Current	Efficiency
			Max.	Min.	@Max. Load	@No Load		@Max. Load
	VDC	VDC	mA	mA	mA (Typ.)	mA (Typ.)	mA (Typ.)	% (Typ.)
MIW1011	5 (4.5 ~ 9)	3.3	600	60	566	40	100	70
MIW1012		5	500	50	685			73
MIW1013		12	250	25	779			77
MIW1014		15	200	20	779			77
MIW1015		±5	±250	±25	694			72
MIW1016		±12	±125	±12.5	800			75
MIW1017		±15	±100	±10	800			75
MIW1021	12 (9 ~ 18)	3.3	600	60	223	20	30	74
MIW1022		5	500	50	267			78
MIW1023		12	250	25	305			82
MIW1024		15	200	20	305			82
MIW1025		±5	±250	±25	271			77
MIW1026		±12	±125	±12.5	313			80
MIW1027		±15	±100	±10	313			80
MIW1031	24 (18 ~ 36)	3.3	600	60	109	5	15	76
MIW1032		5	500	50	132			79
MIW1033		12	250	25	149			84
MIW1034		15	200	20	149			84
MIW1035		±5	±250	±25	132			79
MIW1036		±12	±125	±12.5	152			82
MIW1037		±15	±100	±10	152			82
MIW1041	48 (36 ~ 72)	3.3	600	60	55	3	10	76
MIW1042		5	500	50	66			79
MIW1043		12	250	25	75			84
MIW1044		15	200	20	75			84
MIW1045		±5	±250	±25	65			80
MIW1046		±12	±125	±12.5	75			84
MIW1047		±15	±100	±10	75			84

### Absolute Maximum Ratings

Parameter	Min.	Max.	Unit	
Input Surge Voltage (1000 mS)	5VDC Input Models	-0.7	11	VDC
	12VDC Input Models	-0.7	25	VDC
	24VDC Input Models	-0.7	50	VDC
	48VDC Input Models	-0.7	100	VDC
Lead Temperature (1.5mm from case for 10 Sec.)	---	260	°C	
Internal Power Dissipation	---	2,500	mW	

Exceeding the absolute maximum ratings of the unit could cause damage.  
These are not continuous operating ratings.

### Environmental Specifications

Parameter	Conditions	Min.	Max.	Unit
Operating Temperature	Ambient	-40	+71	°C
Operating Temperature	Case	-40	+90	°C
Storage Temperature		-40	+125	°C
Humidity		---	95	%
Cooling	Free-Air Convection			

### Notes :

- Specifications typical at Ta=+25°C, resistive load, nominal input voltage, rated output current unless otherwise noted.
- Transient recovery time is measured to within 1% error band for a step change in output load of 50% to 100%.
- Ripple & Noise measurement bandwidth is 0-20 MHz.
- 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.
- All DC/DC converters should be externally fused at the front end for protection.
- Other input and output voltage may be available, please contact factory.
- Specifications subject to change without notice.

# MIW1000 Series

## Input Specifications

Parameter	Model	Min.	Typ.	Max.	Unit
Start Voltage	5V Input Models	3.5	4	4.5	VDC
	12V Input Models	4.5	7	9	
	24V Input Models	8	12	18	
	48V Input Models	16	24	36	
Under Voltage Shutdown	5V Input Models	---	3.5	4	
	12V Input Models	---	6.5	8.5	
	24V Input Models	---	11	17	
	48V Input Models	---	22	34	
Reverse Polarity Input Current	All Models	---	---	1	A
Short Circuit Input Power		---	1000	2000	mW
Input Filter		Pi Filter			

## Output Specifications

Parameter	Conditions	Min.	Typ.	Max.	Unit
Output Voltage Accuracy		---	$\pm 0.5$	$\pm 1.0$	%
Output Voltage Balance	Dual Output, Balanced Loads	---	$\pm 0.5$	$\pm 2.0$	%
Line Regulation	$V_{in} = \text{Min. to Max.}$	---	$\pm 0.2$	$\pm 0.5$	%
Load Regulation	$I_o = 10\% \text{ to } 100\%$	---	$\pm 0.2$	$\pm 0.5$	%
Ripple & Noise (20MHz)		---	45	60	mV P-P
Ripple & Noise (20MHz)	Over Line, Load & Temp.	---	---	100	mV P-P
Ripple & Noise (20MHz)		---	---	15	mV rms
Over Power Protection		120	---	---	%
Transient Recovery Time	50% Load Step Change	---	300	500	$\mu\text{S}$
Transient Response Deviation		---	$\pm 3$	$\pm 5$	%
Temperature Coefficient		---	$\pm 0.01$	$\pm 0.02$	%/°C
Output Short Circuit	Continuous				

## General Specifications

Parameter	Conditions	Min.	Typ.	Max.	Unit
Isolation Voltage Rated	60 Seconds	1500	---	---	VDC
Isolation Voltage Test	Flash Tested for 1 Second	1650	---	---	VDC
Isolation Resistance	500VDC	1000	---	---	M $\Omega$
Isolation Capacitance	100KHz, 1V	---	65	100	pF
Switching Frequency		---	300	---	KHz
MTBF	MIL-HDBK-217F @ 25°C, Ground Benign	1000	---	---	K Hours

## Capacitive Load

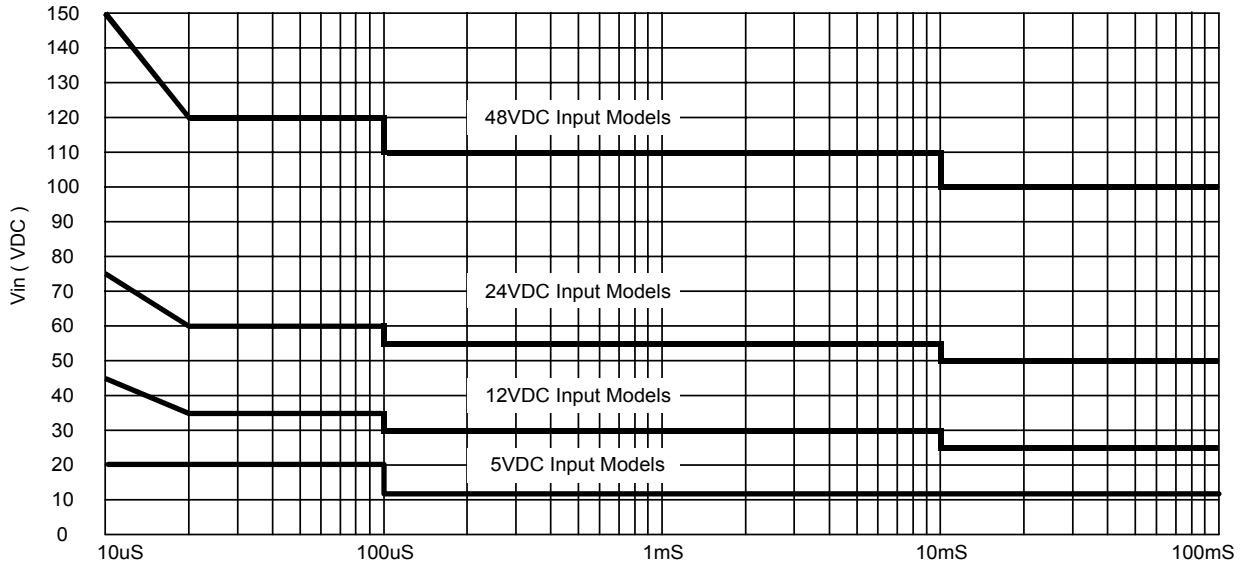
Models by Vout	3.3V	5V	12V	15V	$\pm 5V$ #	$\pm 12V$ #	$\pm 15V$ #	Unit
Maximum Capacitive Load	4000	4000	4000	4000	1000	1000	1000	$\mu\text{F}$

# For each output

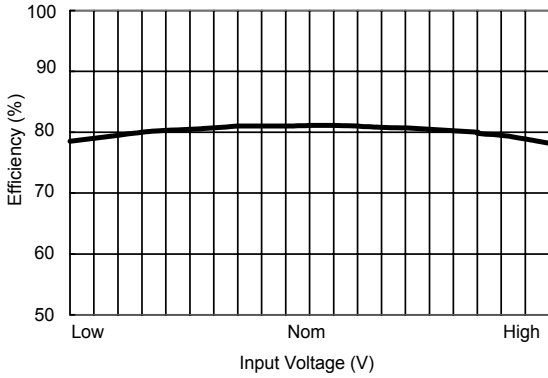
## Input Fuse Selection Guide

5V Input Models	12V Input Models	24V Input Models	48V Input Models
1500mA Slow – Blow Type	700mA Slow – Blow Type	350mA Slow – Blow Type	135mA Slow – Blow Type

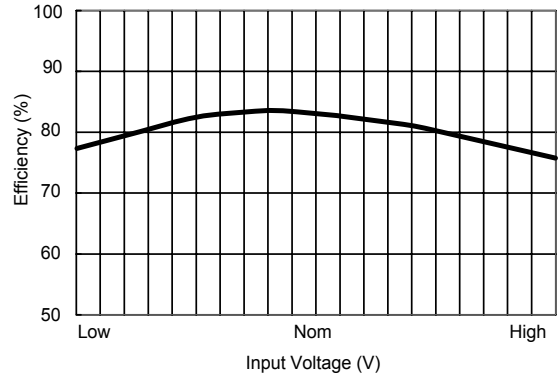
## Input Voltage Transient Rating



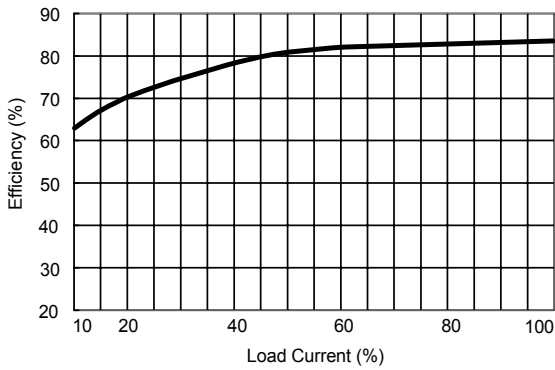
# MIW1000 Series



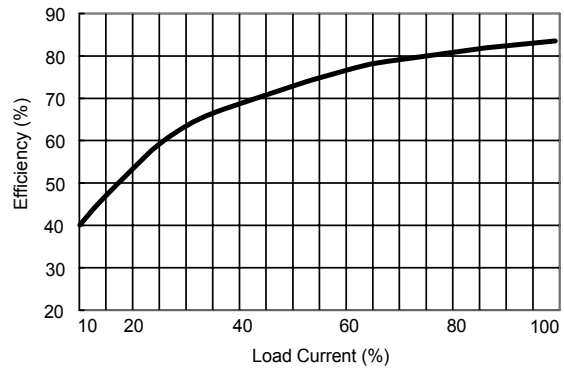
**Efficiency vs Input Voltage ( Single Output )**



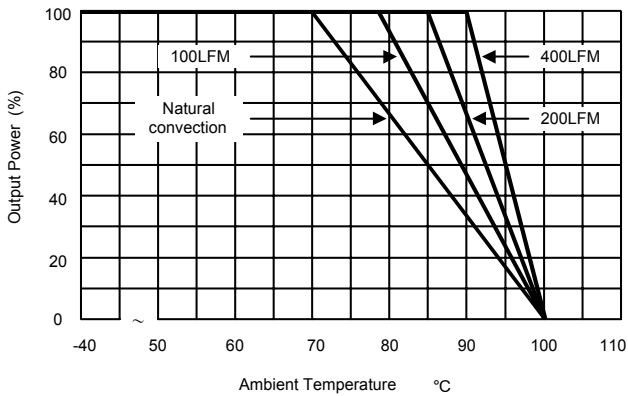
**Efficiency vs Input Voltage ( Dual Output )**



**Efficiency vs Output Load ( Single Output )**



**Efficiency vs Output Load ( Dual Output )**



**Derating Curve**

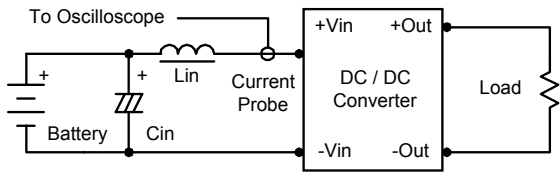
## Test Configurations

### 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.

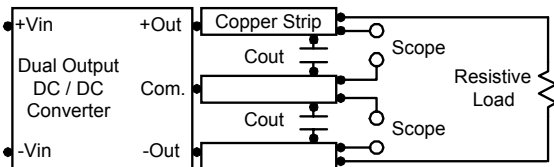
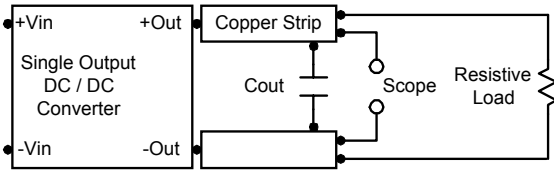
Current ripple is measured at the input terminals of the module, measurement bandwidth is 0–500 KHz.



### 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.



## Design & Feature Considerations

### Maximum Capacitive Load

The MIW1000 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 4000 $\mu$ F capacitive load for single outputs.

The maximum capacitance can be found in the data sheet.

### Overcurrent Protection

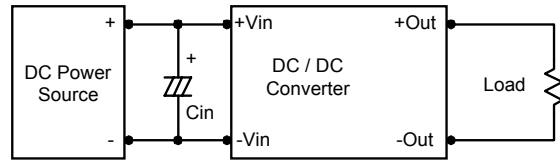
To provide protection in a fault (output overload) condition, the unit is equipped with internal current limiting circuitry and can endure current limiting for an unlimited duration. At the point of current-limit inception, the unit shifts from voltage control to current control. The unit operates normally 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.

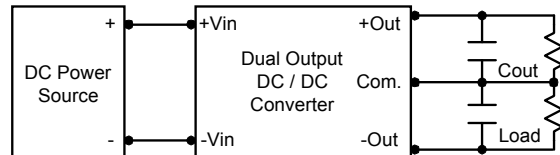
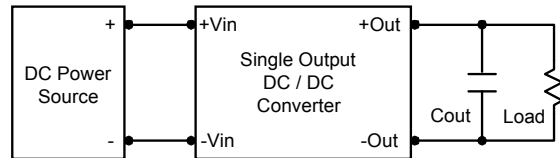
Capacitor mounted close to the power module helps ensure stability of the unit, it is recommended to use a good quality low Equivalent Series Resistance (ESR < 1.0 $\Omega$  at 100 KHz) capacitor of a 8.2 $\mu$ F for the 5V input devices, a 3.3 $\mu$ F for the 12V input devices and a 1.5 $\mu$ F for 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.



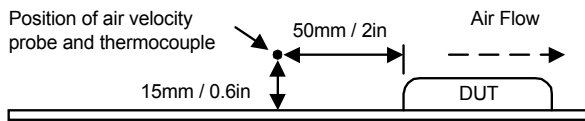
# MIW1000 Series

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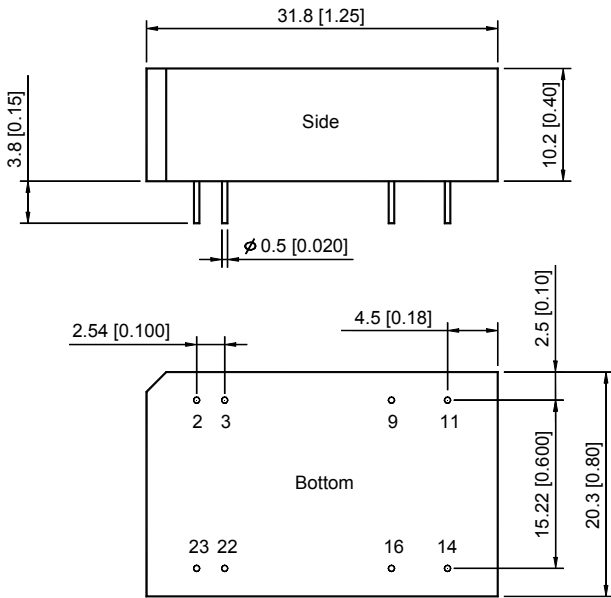
## Thermal Considerations

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 an experimental apparatus.



## Mechanical Dimensions

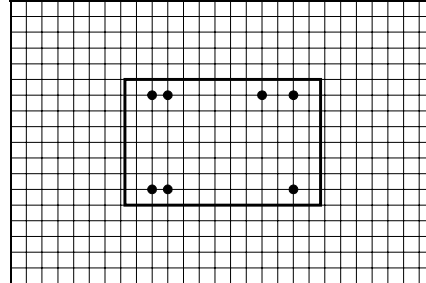


Tolerance	Millimeters	Inches
	X.X±0.25	X.XX±0.01
	X.XX±0.13	X.XXX±0.005
Pin	±0.05	±0.002

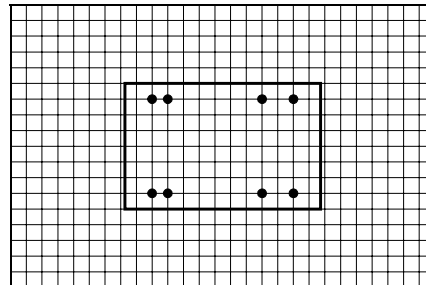
## Connecting Pin Patterns

Top View ( 2.54 mm / 0.1 inch grids )

### Single Output



### Dual Output



## Pin Connections

Pin	Single Output	Dual Output
2	-Vin	-Vin
3	-Vin	-Vin
9	No Pin	Common
11	NC	-Vout
14	+Vout	+Vout
16	-Vout	Common
22	+Vin	+Vin
23	+Vin	+Vin

NC: No Connection

## Physical Characteristics

Case Size	: 31.8×20.3×10.2 mm 1.25×0.80×0.40 inches
Case Material	: Non-Conductive Black Plastic
Weight	: 12g
Flammability	: UL94V-0

The MIW1000 converter is encapsulated in a low thermal resistance molding compound that has excellent resistance/electrical characteristics over a wide temperature range or in high humidity environments. The encapsulant and unit case are both rated to UL 94V-0 flammability specifications. Leads are tin plated for improved solderability.