TOTAL POWER INT'L

3～4 Watts 4:1 Wide Input Range DC/DC Converters

Single and Dual Outputs

Key Features

- *High Efficiency up to 85%*
- *4:1 Input Range*
- *I/O Isolation 1500VDC*
- *Industry Standard Pinout*
- *SMT Technology*
- *Short Circuit Protection*
- *EMI Complies With EN55022 Class A*
- *MTBF > 1,000,000 Hours*



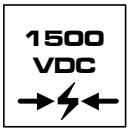
MIW2000−Series power modules are low−profile dc−dc converters that operate over input voltage ranges of 9−36VDC and 18−75VDC and provide precisely regulated output voltages of 3.3V, 5V, 12V, 15V, ±5V, ±12V and ±15V.

The −40°C to +71°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 4W and a typical full−load efficiency of 85%, continuous short circuit, EN55022 level A conducted noise compliance minimize design−in time, cost and eliminate the need for external components.



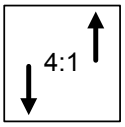
Low Cost



I/O Isolation



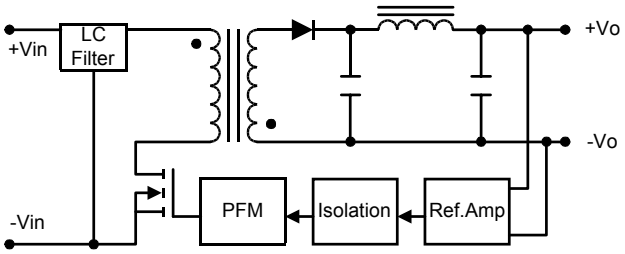
EN55022



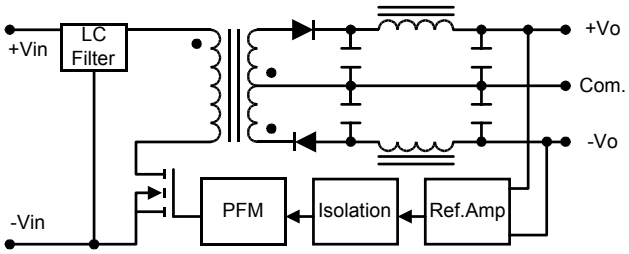
Wide Range

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.)
MIW2021	24 (9 ~ 36)	3.3	900	90	161	20	5	77
MIW2022		5	660	66	170			81
MIW2023		12	333	33	201			83
MIW2024		15	267	27	201			83
MIW2025		±5	±300	±30	156			80
MIW2026		±12	±167	±17	201			83
MIW2027		±15	±133	±13	201			83
MIW2031	48 (18 ~ 75)	3.3	900	90	79	10	5	78
MIW2032		5	660	66	84			82
MIW2033		12	333	33	98			85
MIW2034		15	267	27	98			85
MIW2035		±5	±300	±30	76			82
MIW2036		±12	±167	±17	98			85
MIW2037		±15	±133	±13	98			85

Absolute Maximum Ratings

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

Exceeding these values can damage the module. These are not continuous operating ratings.

Environmental Specifications

Parameter	Conditions	Min.	Max.	Unit
Operating Temperature	Ambient	−40	+71	℃
Operating Temperature	Case	−40	+90	℃
Storage Temperature		−40	+125	℃
Humidity		−−−	95	%
Cooling	Free−Air Convection			
Conducted EMI	EN55022 Class A			

Note :

1. Specifications typical at Ta=+25℃, resistive load, nominal input voltage, 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 75% to 100%.
3. Ripple & Noise measurement bandwidth is 0−20 MHz.
4. These power converters require a minimum output loading to maintain specified regulation.
5. Operation under no−load conditions will not damage these devices; however they may not meet all listed specifications.
6. All DC/DC converters should be externally fused at the front end for protection.
7. Other input and output voltage may be available, please contact factory.
8. Specifications subject to change without notice.

Input Specifications

Parameter	Model	Min.	Typ.	Max.	Unit
Start Voltage	24V Input Models	4.5	6	8.5	VDC
	48V Input Models	8.5	12	17	
Under Voltage Shortdown	24V Input Models	---	---	8	
	48V Input Models	---	---	16	
Reverse Polarity Input Current	All Models	---	---	1	A
Short Circuit Input Power		---	---	2000	mW
Input Filter		Pi Filter			

Output Specifications

Parameter	Conditions	Min.	Typ.	Max.	Unit
Output Voltage Accuracy		---	±0.5	±1.0	%
Output Voltage Balance	Dual Output Balance Load	---	±0.5	±2.0	%
Line Regulation	Vin=Min. to Max.	---	±0.1	±0.3	%
Load Regulation	Io=10% to 100%	---	±0.3	±1.0	%
Ripple & Noise (20MHz)		---	50	75	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	25% Load Step Change	---	150	500	uS
Transient Response Deviation		---	±2	---	%
Temperature Coefficient		---	±0.01	±0.02	%/°C
Output Short Circuit	Continuous				

General Specifications

Parameter	Conditions	Min.	Typ.	Max.	Unit
Isolation Voltage	60 Seconds	1500	---	---	VDC
Isolation Test Voltage	Flash Tested for 1 Second	1650	---	---	VDC
Isolation Resistance	500VDC	1000	---	---	MΩ
Isolation Capacitance	100KHz,1V	---	380	500	pF
Switching Frequency		---	350	---	KHz
MTBF	MIL-HDBK-217F @ 25°C, Ground Benign	1000	---	---	K Hours

Capacitive Load

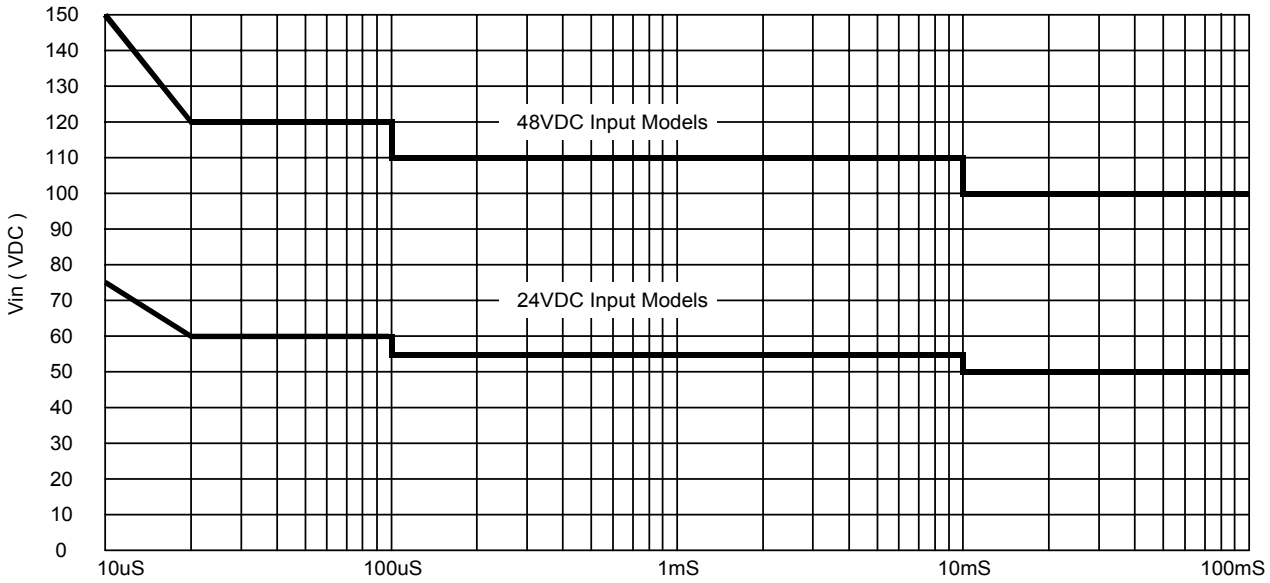
Models by Vout	3.3V	5V	12V	15V	±5V #	±12V #	±15V #	Unit
Maximum Capacitive Load	3000	3000	3000	3000	680	680	680	uF

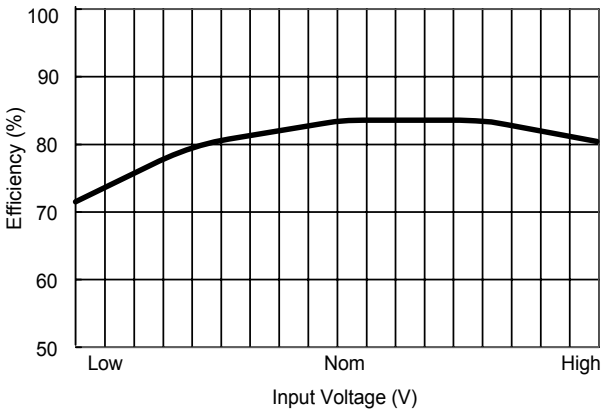
Note: # For each output .

Input Fuse Selection Guide

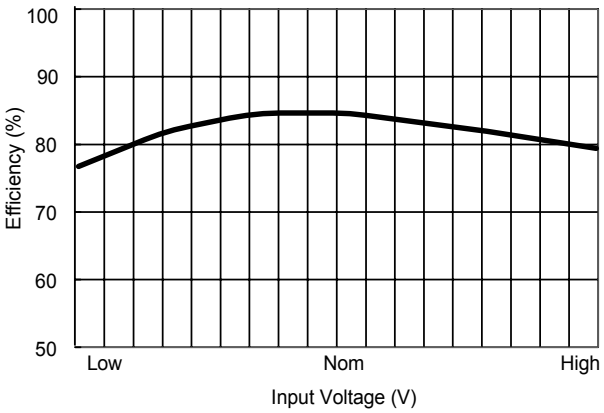
24V Input Models	48V Input Models
1000mA Slow – Blow Type	500mA Slow – Blow Type

Input Voltage Transient Rating

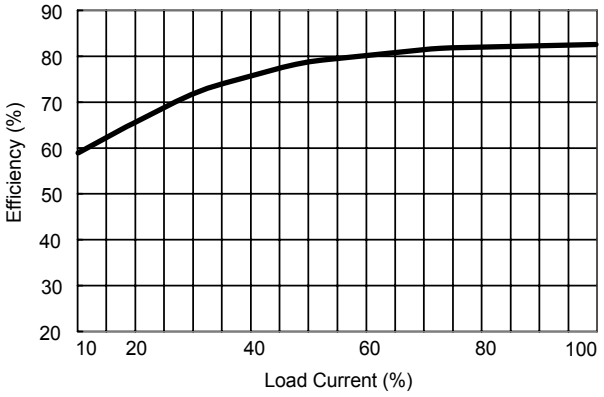




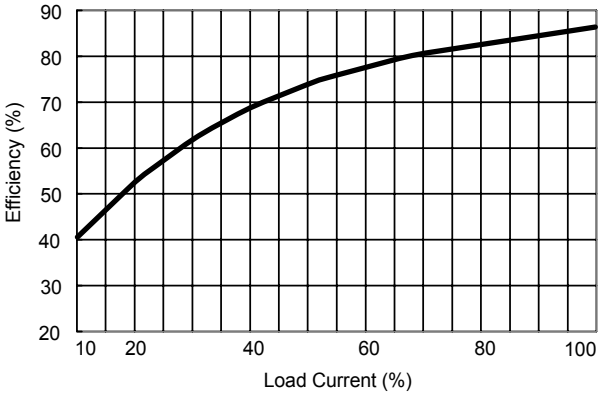
Efficiency vs Input Voltage (Single Output)



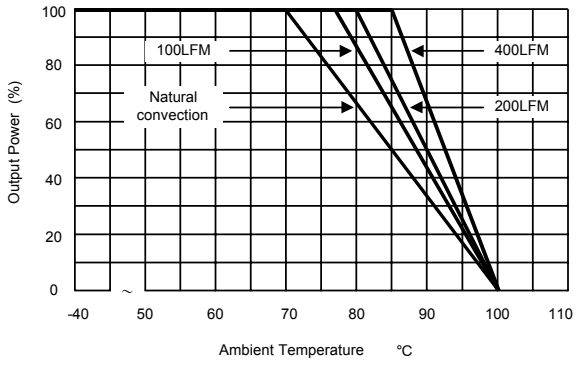
Efficiency vs Input Voltage (Dual Output)



Efficiency vs Output Load (Single Output)



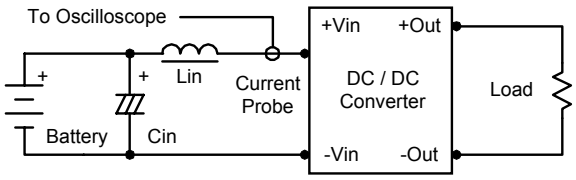
Efficiency vs Output Load (Dual Output)



Derating Curve

Test Configurations

Input Reflected-Ripple Current Test Setup



Input reflected−ripple current is measured with a inductor Lin (4.7uH) and Cin (220uF, ESR < 1.0Ω at 100 KHz) to simulate source impedance.

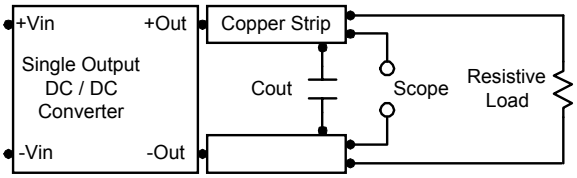
Capacitor Cin, offsets possible battery impedance.

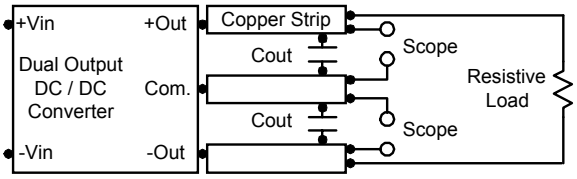
Current ripple is measured at the input terminals of the module, measurement bandwidth is 0−500 KHz.

Peak-to-Peak Output Noise Measurement Test

Use a Cout 0.47uF 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 MIW2000 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 680uF maximum capacitive load for dual outputs and 3000uF capacitive load for single outputs.

The maximum capacitance can be found in the data.

Overcurrent Protection

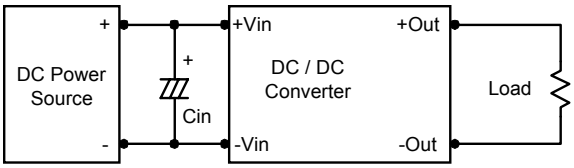
To provide protection in a fault (output overload) condition, the unit is equipped with internal current limiting circuitry and can endure current limiting for an unlimited duration. At the point of current−limit inception, the unit shifts from voltage control to current control. The unit operates normally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

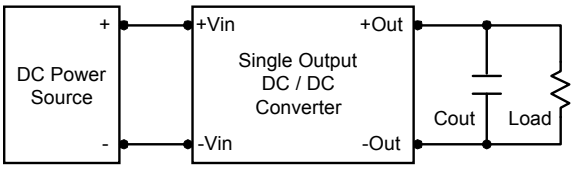
Capacitor mounted close to the power module helps ensure stability of the unit, it is recommended to use a good quality low Equivalent Series Resistance (ESR < 1.0Ω at 100 KHz) capacitor of a 4.7uF for the 24V input devices and a 2.2uF for the 48V devices.

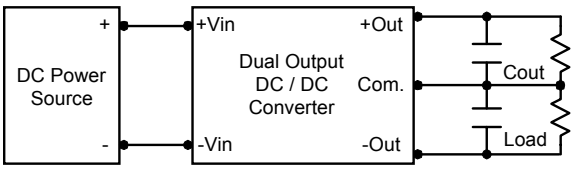


Output Ripple Reduction

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 3.3uF capacitors at the output.

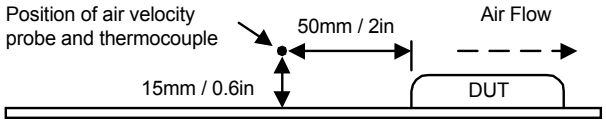




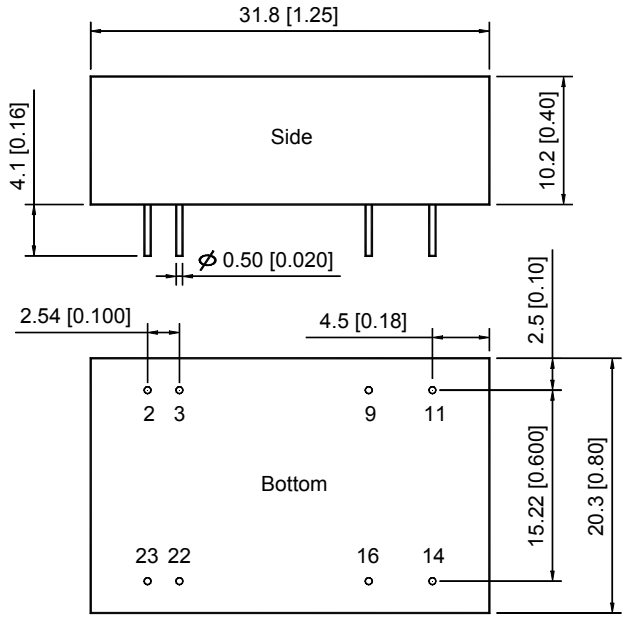
Thermal Considerations

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 85°C.

The derating curves are determined from measurements obtained in an experimental apparatus.



Mechanical Data

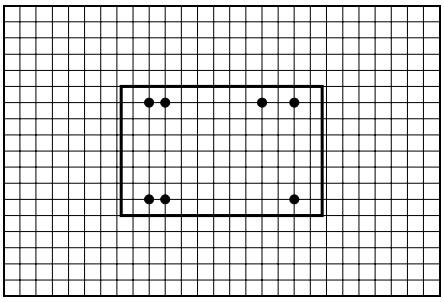


Tolerance	Millimeters	Inches
	.X±0.25	.XX±0.01
	.XX±0.25	.XXX±0.01
Pin	±0.05	±0.002

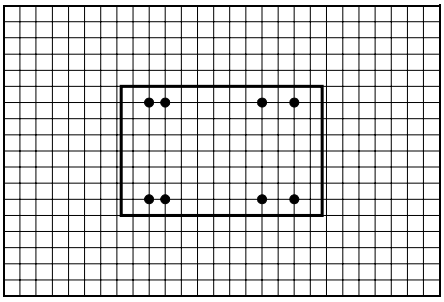
Connecting Pin Patterns

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
1.25×0.8×0.4 inches

Case Material : Metal With Non−Conductive Baseplate

Weight : 16.2g

Flammability : UL94V−0

Units are encapsulated in a low thermal resistance molding compound which has excellent chemical resistance and electrical properties in high humidity environment and over a wide operating temperature range.
The encapsulant and outer shell of the unit have UL94V−0 ratings. The leads are golden plated for better soldering.