FEATURES

- ▶ **DIP-24 Metal Package**
- ▶ **31.8 x 20.3 x 10.2 mm (1.25 x 0.8 x 0.4 inches)**
- ▶ **Ultra-wide 4:1 Input Range**
- ▶ **Operating Temp. Range –40℃ to +85℃**
- ▶ **Short Circuit Protection**
- ▶ **I/O-isolation 1500VDC**
- ▶ **3 Years Product Warranty**

c US
UL 60950-1

3 YEAR WARRANTY

RoHS Compliant

PRODUCT OVERVIEW

The MINMAX MIW2000 series is a range of isolated 3-4W DC-DC converter modules featuring fully regulated output voltages and ultra-wide 4:1 input voltage ranges.

The product comes in a shielded metal DIP-24 package with standard pinout. An high efficiency allows an operating temperature range of -40℃ to +85℃(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)	Output Voltage	Output Current		Input Current		Reflected Ripple Current	Max. capacitive Load	Efficiency (typ.)
			Max.	Min.	@Max. Load	@No Load			@Max. Load
	VDC	VDC	mA	mA	mA(typ.)	mA(typ.)	mA(typ.)	μF	%
MIW2021	24 (9 ~ 36)	3.3	900	90	161	20	5	3000	77
MIW2022		5	660	66	170				81
MIW2023		12	333	33	201				83
MIW2024		15	267	27	201				83
MIW2025		±5	±300	±30	156			680#	80
MIW2026		±12	±167	±17	201				83
MIW2027		±15	±133	±13	201				83
MIW2031	48 (18 ~ 75)	3.3	900	90	79	10	5	3000	78
MIW2032		5	660	66	84				82
MIW2033		12	333	33	98				85
MIW2034		15	267	27	98				85
MIW2035		±5	±300	±30	76			680#	82
MIW2036		±12	±167	±17	98				85
MIW2037		±15	±133	±13	98				85

For each output

Input Specifications

Parameter	Model	Min.	Typ.	Max.	Unit
Input Surge Voltage (1 sec. max.)	24V Input Models	-0.7	---	50	VDC
	48V Input Models	-0.7	---	100	
Start-Up Voltage	24V Input Models	4.5	6	8.5	
	48V Input Models	8.5	12	17	
Under Voltage Shutdown	24V Input Models	---	---	8	
	48V Input Models	---	---	16	
Short Circuit Input Power	All Models	---	1000	2000	mW
Internal Power Dissipation		---	---	2500	mW
Conducted EMI		Compliance to EN 55022, class A			

Output Specifications

Parameter	Conditions	Min.	Typ.	Max.	Unit
Output Voltage Accuracy		---	±0.5	±1.0	%
Output Voltage Balance	Dual Output, Balanced Loads	---	±0.5	±2.0	%
Line Regulation	Vin=Min. to Max.	---	±0.2	±0.5	%
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
Transient Recovery Time	25% Load Step Change	---	150	500	μS
Transient Response Deviation		---	±2	---	%
Temperature Coefficient		---	±0.01	±0.02	%/℃
Over Load Protection	Foldback	120	---	---	%
Short Circuit Protection	Continuous				

General Specifications

Parameter	Conditions	Min.	Typ.	Max.	Unit
I/O Isolation Voltage (rated)	60 Seconds	1500	---	---	VDC
I/O Isolation Resistance	500 VDC	1000	---	---	MΩ
I/O Isolation Capacitance	100kHz, 1V	---	380	500	pF
Switching Frequency		---	350	---	kHz
MTBF (calculated)	MIL-HDBK-217F@25℃, Ground Benign	1,000,000	---	---	Hours
Safety Approvals	UL/cUL 60950-1 recognition(UL certificate)				

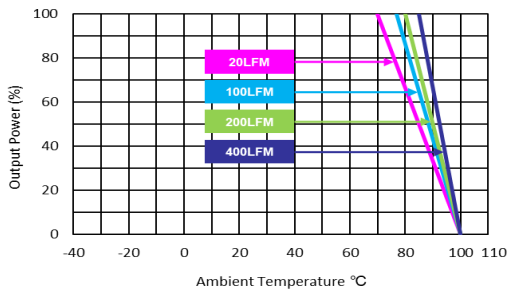
Input Fuse

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

Environmental Specifications

Parameter	Conditions	Min.	Max.	Unit
Operating Temperature Range (with Derating)	Ambient	-40	+85	℃
Case Temperature		---	+90	℃
Storage Temperature Range		-50	+125	℃
Humidity (non condensing)		---	95	% rel. H
Cooling	Free-Air convection			
Lead Temperature (1.5mm from case for 10Sec.)		---	260	℃

Power Derating Curve

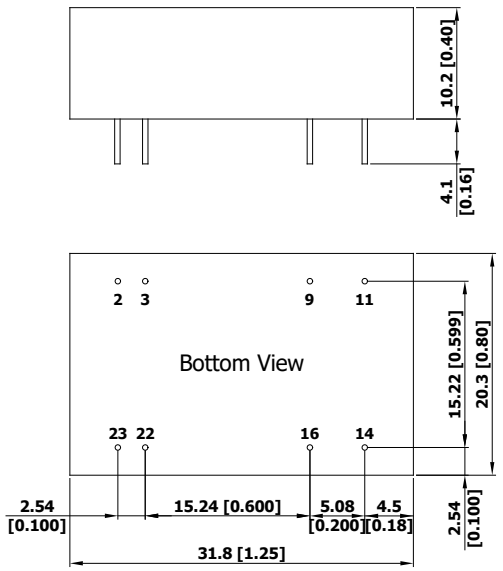


Notes

1 Specifications typical at Ta=+25℃, 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 Ripple & Noise measurement bandwidth is 0-20MHz.
4 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.
5 All DC-DC converters should be externally fused at the front end for protection.
6 Other input and output voltage may be available, please contact MINMAX.
7 Specifications subject to change without notice.

Package Specifications

Mechanical Dimensions



Pin Connections

Pin	Single Output	Dual Output	Diameter mm (inches)
2	-Vin	-Vin	Ø 0.5 [0.02]
3	-Vin	-Vin	Ø 0.5 [0.02]
9	No Pin	Common	Ø 0.5 [0.02]
11	NC	-Vout	Ø 0.5 [0.02]
14	+Vout	+Vout	Ø 0.5 [0.02]
16	-Vout	Common	Ø 0.5 [0.02]
22	+Vin	+Vin	Ø 0.5 [0.02]
23	+Vin	+Vin	Ø 0.5 [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 tolerance: X.X±0.05 (X.XX±0.002)

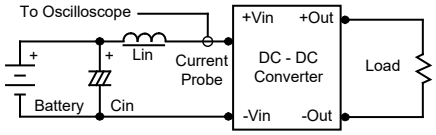
Physical Characteristics

Case Size	:	31.8x20.3x10.2mm (1.25x0.80x0.40 Inches)
Case Material	:	Metal With Non-Conductive Baseplate
Pin Material	:	Phosphor Bronze
Weight	:	16.2g

Test Setup

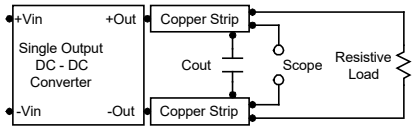
Input Reflected-Ripple Current Test Setup

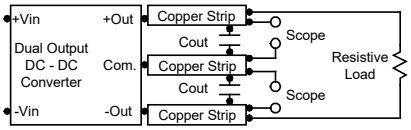
Input reflected-ripple current is measured with a inductor Lin (4.7μH) and Cin (220μF, ESR < 1.0Ω at 100 kHz) to simulate source impedance.
Capacitor Cin, offsets possible battery impedance. Current ripple is measured at the input terminals of the module, measurement bandwidth is 0-500 kHz.



Peak-to-Peak Output Noise Measurement Test

Use a Cout 0.47μF 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.





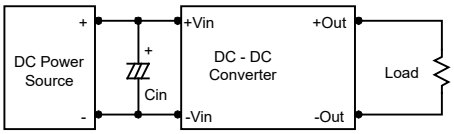
Technical Notes

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.

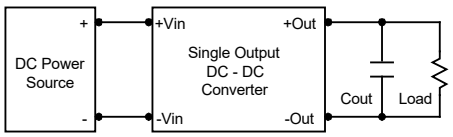
Input Source Impedance

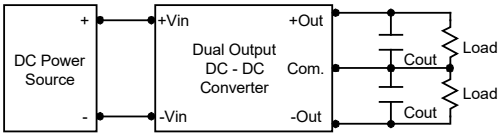
The power module should be connected to a low ac-impedance input source. Highly inductive source impedances can affect the stability of the power module.
In applications where power is supplied over long lines and output loading is high, it may be necessary to use a capacitor at the input to ensure startup.
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 < 1.0Ω at 100 kHz) capacitor of a 4.7μF for the 24V input devices and a 2.2μF 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 3.3μF capacitors at the output.





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 680μF maximum capacitive load for dual outputs and 3000μF 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.