FEATURES

- ▶ **High Efficiency up to 88%**
- ▶ **1500VDC Isolation**
- ▶ **MTBF > 1,000,000 Hours**
- ▶ **2:1 Wide Input Range**
- ▶ **CSA60950-1 Safety Approval**
- ▶ **Over Voltage Protection**
- ▶ **Industry Standard Pinout**
- ▶ **UL 94V-0 Package Material**
- ▶ **Internal SMD Construction**
- ▶ **3 Years Product Warranty**

CSA 60950-1 CB Scheme

PRODUCT OVERVIEW

Minmax's MIW5000-Series power modules operate over input voltage ranges of 9-18VDC, 18-36VDC and 36-75VDC which provide precisely regulated output voltages of 2.5V, 3.3V, 5V, 5.1V, 12V, 15V, ±12V and ±15VDC.

The MIW5000 series is an excellent selection 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 10W and a typical full-load efficiency of 88%, continuous short circuit, 50mA output ripple.

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	%
MIW5021	12 (9 ~ 18)	3.3	3000	300	1006	40	60	2200	82
MIW5022		5	2000	200	1004				83
MIW5029		5.1	2000	200	1024				83
MIW5023		12	833	83	957			820	87
MIW5024		15	666	66.6	968			470	86
MIW5026		±12	±416	±42	957			220#	87
MIW5027		±15	±333	±33	968			150#	86
MIW5030	24 (18 ~ 36)	2.5	3000	300	377	20	40	2200	83
MIW5031		3.3	3000	300	485				85
MIW5032		5	2000	200	479				87
MIW5039		5.1	2000	200	489				87
MIW5033		12	833	83	479			820	87
MIW5034		15	666	66.6	478			470	87
MIW5036		±12	±416	±42	473			220#	88
MIW5037		±15	±333	±33	478			150#	87
MIW5040	48 (36 ~ 75)	2.5	3000	300	188	10	40	2200	83
MIW5041		3.3	3000	300	243				85
MIW5042		5	2000	200	239				87
MIW5049		5.1	2000	200	240				87
MIW5043		12	833	83	239			820	87
MIW5044		15	666	66.6	236			470	87
MIW5046		±12	±416	±42	243			220#	88
MIW5047		±15	±333	±33	244			150#	87

For each output

Input Specifications

Parameter	Model	Min.	Typ.	Max.	Unit
Input Surge Voltage (1 sec. max.)	12V Input Models	-0.7	---	25	VDC
	24V Input Models	-0.7	---	50	
	48V Input Models	-0.7	---	100	
Start-Up Threshold Voltage	12V Input Models	7	8	9	
	24V Input Models	14	16	18	
	48V Input Models	30	33	36	
Under Voltage Shutdown	12V Input Models	---	---	8.5	
	24V Input Models	---	---	17	
	48V Input Models	---	---	34	
Short Circuit Input Power	All Models	---	---	2500	mW
Input Filter		Internal LC Type			
Conducted EMI		Compliance to EN 55022, class A			

Output Specifications

Parameter	Conditions	Min.	Typ.	Max.	Unit
Output Voltage Setting Accuracy		---	---	±1.2	%Vnom.
Output Voltage Balance	Dual Output, Balanced Loads	---	±0.5	±2.0	%
Line Regulation	Vin=Min. to Max. @Full Load	---	±0.3	±1.0	%
Load Regulation	Io=10% to 100%	---	±0.5	±1.2	%
	Io=10% to 100% (2.5Vo)	---	±0.7	±1.5	%
Ripple & Noise	0-20 MHz Bandwidth	---	50	85	mV_{P-P}
Transient Recovery Time	25% Load Step Change	---	250	500	µsec
Transient Response Deviation		---	±3	±5	%
Temperature Coefficient		---	±0.01	±0.02	%/℃
Over Load Protection	Foldback	110	150	180	%
Short Circuit Protection	Continuous, Automatic Recovery				

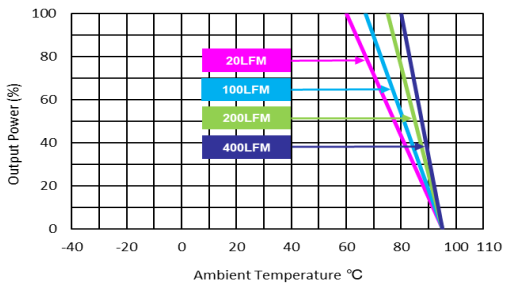
General Specifications

Parameter	Conditions	Min.	Typ.	Max.	Unit
I/O Isolation Voltage	60 Seconds	1500	---	---	VDC
	1 Second	1800	---	---	VDC
I/O Isolation Resistance	500 VDC	1000	---	---	MΩ
I/O Isolation Capacitance	100kHz, 1V	---	1000	1200	pF
Switching Frequency		275	400	450	kHz
MTBF (calculated)	MIL-HDBK-217F@25℃, 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	+75	℃
Case Temperature	---	+95	℃
Storage Temperature Range	-50	+125	℃
Humidity (non condensing)	---	95	% rel. H
Lead Temperature (1.5mm from case for 10Sec.)	---	260	℃

Power Derating Curve

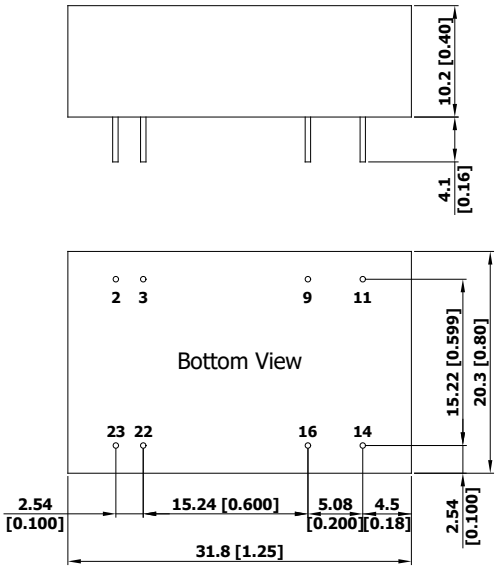


Notes

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 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 0.5 [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)

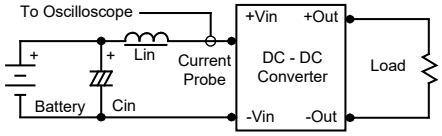
Physical Characteristics

Case Size	:	31.8x20.3x10.2mm (1.25x0.80x0.40 inches)
Case Material	:	Metal With Non-Conductive Baseplate
Pin Material	:	Copper Alloy
Weight	:	17.3g

Test Setup

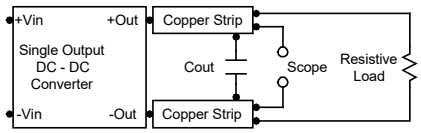
Input Reflected-Ripple Current Test Setup

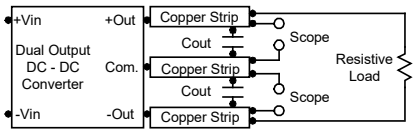
Input reflected-ripple current is measured with a inductor Lin (4.7μH) and Cin (220μF, ESR < 1.0Ω at 100 kHz) to simulate source impedance.
Capacitor Cin, offsets possible battery impedance. Current ripple is measured at the input terminals of the module, measurement bandwidth is 0-500 kHz.



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

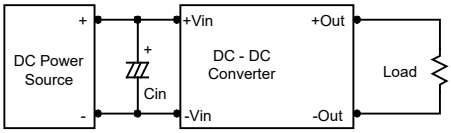
To provide protection in a fault (output overload) condition, the unit is equipped with internal current limiting circuitry and can endure current limiting for an unlimited duration. At the point of current-limit inception, the unit shifts from voltage control to current control. The unit operates normally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

Overvoltage Protection

The output overvoltage clamp consists of control circuitry, which is independent of the primary regulation loop, that monitors the voltage on the output terminals. The control loop of the clamp has a higher voltage set point than the primary loop. This provides a redundant voltage control that reduces the risk of output overvoltage.

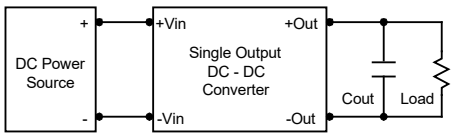
Input Source Impedance

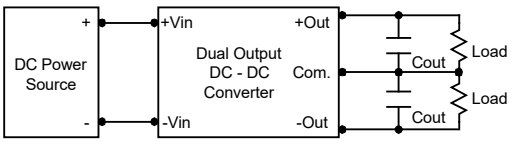
The power module should be connected to a low ac-impedance input source. Highly inductive source impedances can affect the stability of the power module. In applications where power is supplied over long lines and output loading is high, it may be necessary to use a capacitor at the input to ensure startup.
By using a good quality low Equivalent Series Resistance (ESR < 1.0Ω at 100 kHz) capacitor of a 12μF for the 12V, 4.7μF for the 24V input devices and a 2.2μF for the 48V devices, capacitor mounted close to the power module helps ensure stability of the unit.



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 MIW5000 series has limitation of maximum connected capacitance on the output. The power module may operate in current limiting mode during start-up, affecting the ramp-up and the startup time. 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 95°C.
The derating curves are determined from measurements obtained in a test setup.