FEATURES

- ▶ **Industrial Standard DIP-24 Package**
- ▶ **Wide 2:1 Input Voltage Range**
- ▶ **Fully Regulated Output Voltage**
- ▶ **I/O Isolation 4000VAC with Reinforced Insulation, rated for 1000Vrms Working Voltage**
- ▶ **Low Leakage Current < 2μA**
- ▶ **Operating Ambient Temp. Range -40℃ to +85℃**
- ▶ **Overload and Short Circuit Protection**
- ▶ **Designed-in Conducted EMI meets EN55022 Class A & FCC Level A**
- ▶ **Medical EMC Standard meets 4th Edition of EMI EN55011 and EMS EN60601-1-2**
- ▶ **Medical Safety meets 1xMOPP & 2xMOOP per 3rd Edition of IEC/EN 60601-1 & ANSI/AAMI ES60601-1**
- ▶ **UL/cUL/IEC/EN 60950-1 Safety Approval & CE Marking**

PRODUCT OVERVIEW

The MINMAX MIHW1000 series is a range of high performance DC/DC converter modules with a reinforced insulation system .The I/O- isolation voltage is specified for 4000VACrms.The product comes in a small DIP-24 package. All 20 models features wide 2:1 input voltage range and fully regulated output voltage.

The MIHW1000 DC/DC converters offer an economical solution for demanding applications in industrial and medical instrumentation requesting a certified supplementary or reinforced insulation system to comply with relative industrial or medical safety standards.

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	%
MIHW1002	5 (4.5 ~ 9)	5	600	90	857	40	60	1000	70
MIHW1003		12	250	37.5	800			470	75
MIHW1008		24	125	18.8	800			470	76
MIHW1006		±12	±125	±18.8	800			220#	75
MIHW1007		±15	±100	±15	800			220#	75
MIHW1012	12 (9 ~ 18)	5	600	90	338	30	30	1000	74
MIHW1013		12	250	37.5	313			470	80
MIHW1018		24	125	18.8	313			470	81
MIHW1016		±12	±125	±18.8	313			220#	80
MIHW1017		±15	±100	±15	313			220#	80
MIHW1022	24 (18 ~ 36)	5	600	90	160	20	15	1000	78
MIHW1023		12	250	37.5	151			470	83
MIHW1028		24	125	18.8	151			470	84
MIHW1026		±12	±125	±18.8	151			220#	83
MIHW1027		±15	±100	±15	151			220#	83
MIHW1032	48 (36 ~ 75)	5	600	90	80	10	10	1000	78
MIHW1033		12	250	37.5	75			470	83
MIHW1038		24	125	18.8	75			470	84
MIHW1036		±12	±125	±18.8	75			220#	83
MIHW1037		±15	±100	±15	75			220#	83

For each output

Input Specifications

Parameter	Model	Min.	Typ.	Max.	Unit
Input Surge Voltage (1 sec. max.)	5V Input Models	-0.7	---	11	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	3.7	4	4.5	
	12V Input Models	8	8.5	9	
	24V Input Models	15	17	18	
	48V Input Models	30	33	36	
Under Voltage Shutdown	5V Input Models	---	---	4	
	12V Input Models	---	---	8.5	
	24V Input Models	---	---	17	
	48V Input Models	---	---	34	
Short Circuit Input Power	All Models	---	---	2000	mW
Input Filter		Internal Pi Type			
Conducted EMI		Compliance to EN 55022,class A and FCC part 15,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.		---	±0.3	±0.5	%
Load Regulation	Io=25% to 100%		---	±0.5	±1.0	%
Ripple & Noise	0-20 MHz Bandwidth	5V Output Models	---	75	100	mV_{P-P}
		Other Output Models	---	100	150	mV_{P-P}
Transient Recovery Time	25% Load Step Change		---	150	500	µsec
Transient Response Deviation			---	±3	±6	%
Temperature Coefficient			---	±0.02	±0.05	%/°C
Over Load Protection	Foldback		120	150	---	%
Short Circuit Protection	Continuous, Automatic Recovery					

Isolation, Safety Standards

Parameter	Conditions	Min.	Typ.	Max.	Unit
I/O Isolation Voltage	60 Seconds Reinforced insulation, rated for 1000Vrms working voltage	4000	---	---	VACrms
Leakage Current	240VAC, 60Hz	---	---	2	µA
I/O Isolation Resistance	500 VDC	10	---	---	GΩ
I/O Isolation Capacitance	100KHz, 1V	---	7	13	pF
Safety Standards	UL/cUL 60950-1, CSA C22.2 No. 60950-1				
	ANSI/AAMI ES60601-1, CAN/CSA-C22.2 No. 60601-1				
	IEC/EN 60950-1, IEC/EN 60601-1 3rd Edition 1xMOPP & 2xMOOP				
Safety Approvals	UL/cUL 60950-1 recognition (UL certificate), IEC/EN 60950-1 (CB-report)				
	ANSI/AAMI ES60601-1 1xMOPP & 2xMOOP recognition (UL certificate), IEC/EN 60601-1 3rd Edition (CB-report)				

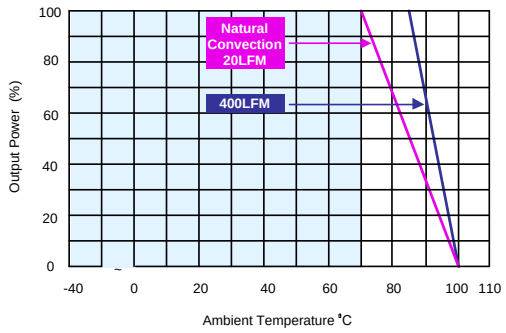
General Specifications

Parameter	Conditions	Min.	Typ.	Max.	Unit
Switching Frequency		---	150	---	KHz
MTBF(calculated)	MIL-HDBK-217F@25°C, Ground Benign	1,000,000	---	---	Hours

Environmental Specifications

Parameter	Conditions	Min.	Max.	Unit
Operating Ambient Temperature Range (See Power Derating Curve)	Natural Convection	-40	+85	℃
Case Temperature		---	+100	℃
Storage Temperature Range		-50	+125	℃
Humidity (non condensing)		---	95	% rel. H
Cooling	Natural Convection			
Lead Temperature (1.5mm from case for 10Sec.)		---	260	℃

Power Derating Curve

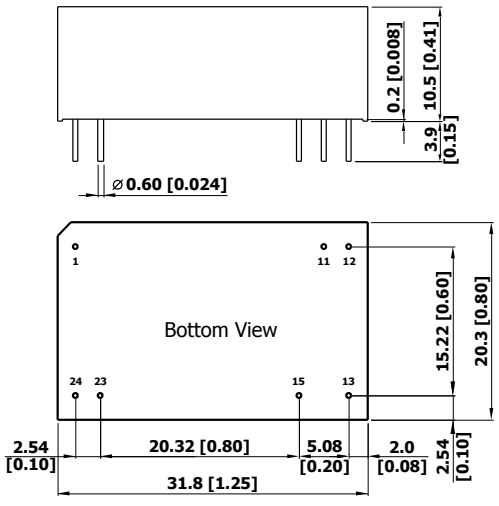


Notes

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 75% 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 factory.
6. That “natural convection” is about 20LFM but is not equal to still air (0 LFM).
7. Specifications are subject to change without notice.

Package Specifications

Mechanical Dimensions



Pin Connections

Pin	Single Output	Dual Output
1	+Vin	+Vin
11	No Pin	Common
12	-Vout	No Pin
13	+Vout	-Vout
15	No Pin	+Vout
23	-Vin	-Vin
24	-Vin	-Vin

- All dimensions in mm (inches)
- Tolerance: X.X±0.25 (X.XX±0.01)
  X.XX±0.13 (X.XXX±0.005)
- Pin diameter ∅ 0.6 ±0.05 (0.024±0.002)

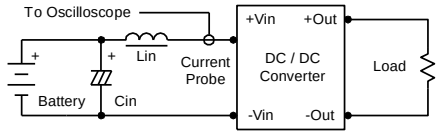
Physical Characteristics

Case Size	:	31.8x20.3x10.5mm (1.25x0.8x0.41 inches)
Case Material	:	Non-Conductive Black Plastic (flammability to UL 94V-0 rated)
Pin Material	:	Copper Alloy with Gold Plate Over Nickel Subplate
Weight	:	13g

Test Setup

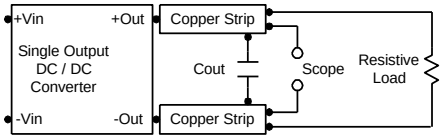
Input Reflected-Ripple Current Test Setup

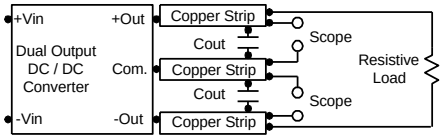
Input reflected-ripple current is measured with a inductor Lin (4.7μH) and Cin (220μF, ESR < 1.0Ω at 100 KHz) to simulate source impedance. Capacitor Cin, offsets possible battery impedance. Current ripple is measured at the input terminals of the module, measurement bandwidth is 0-500 KHz.



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.





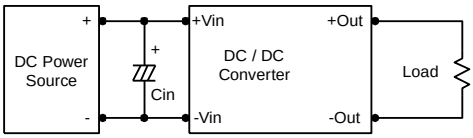
Technical Notes

Overload 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.

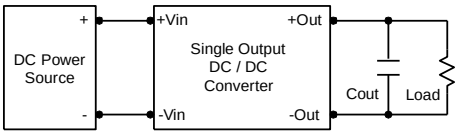
Input Source Impedance

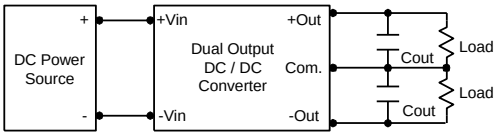
The power module should be connected to a low ac-impedance input source. Highly inductive source impedances can affect the stability of the power module. In applications where power is supplied over long lines and output loading is high, it may be necessary to use a capacitor on the input to insure startup. 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 10μF for the 5V input devices and a 4.7μF for the 12V input devices and 2.2μF 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 3.3μF capacitors at the output.





Maximum Capacitive Load

The MIHW1000 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. Connect capacitors at the point of load for best performance. 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 100℃. The derating curves are determined from measurements obtained in a test setup.