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**
- **Wide Operating Temperature Range**
- **Under-Voltage, Overload and Short Circuit Protection**
- **Meets EMI EN 55011/32 Class A**
- **Medical EMC Standard with EN 55011 and EN 60601-1-2 (4th Edition) Approved**
- **Medical Safety with 1xMOPP & 2xMOOP per 3rd Edition of IEC/EN 60601-1 & ANSI/AAMI ES60601-1 Approved**
- **UL/cUL 60950-1 Safety Approval & CE Marking**

PRODUCT OVERVIEW

The MIHW3000 Series is a medical-grade isolated 6W DC-DC converter in an industrial-standard DIP-24 package, featuring a wide 2:1 input range and fully regulated output for stable system power. It delivers reinforced insulation with 4000VAC isolation, 1000Vrms working voltage, and ultra-low leakage current (< 2μA) for safety-critical designs.

With a wide operating temperature range and built-in under-voltage, overload, and short-circuit protection, it supports reliable operation in harsh environments. The series is approved to key medical standards, including EN 55011, EN 60601-1-2(4th Edition), and IEC/EN 60601-1 (3rd Edition) with 1×MOPP & 2×MOOP, and also carries UL/cUL 60950-1 and CE marking.

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	%
MIHW3022	12 (9 ~ 18)	5	1000	200	570	30	60	1000	75
MIHW3023		12	500	100	641			470	78
MIHW3026		±12	±250	±50	641			220#	78
MIHW3027		±15	±200	±40	641			220#	78
MIHW3032	24 (18 ~ 36)	5	1000	200	278	20	30	1000	77
MIHW3033		12	500	100	313			470	80
MIHW3036		±12	±250	±50	313			220#	80
MIHW3037		±15	±200	±40	313			220#	80
MIHW3042	48 (36 ~ 75)	5	1000	200	139	10	15	1000	77
MIHW3043		12	500	100	156			470	80
MIHW3046		±12	±250	±50	156			220#	80
MIHW3047		±15	±200	±40	156			220#	80

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	13	15	18	
	48V Input Models	30	33	36	
Under Voltage Shutdown	12V Input Models	---	---	8.5	
	24V Input Models	---	---	16	
	48V Input Models	---	---	34	
Short Circuit Input Power	All Models	---	---	3000	mW
Input Filter		Internal Pi Type			
Conducted EMI		Compliance to EN 55011/32, class A			

Output Specifications

Parameter	Conditions / Model		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. @Full Load		---	±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(2)		---	300	500	µs
Transient Response Deviation			---	±3	±6	%
Temperature Coefficient			---	±0.02	±0.05	%/℃
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	---	---	VAC
Leakage Current	240VAC, 60Hz	---	---	2	µA
I/O Isolation Resistance	500 VDC	10	---	---	GΩ
I/O Isolation Capacitance	100kHz, 1V	---	10	15	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)				
	ANSI/AAMI ES60601-1 1xMOPP & 2xMOOP recognition (UL certificate), IEC/EN 60601-1 3rd Edition (CB-report)				

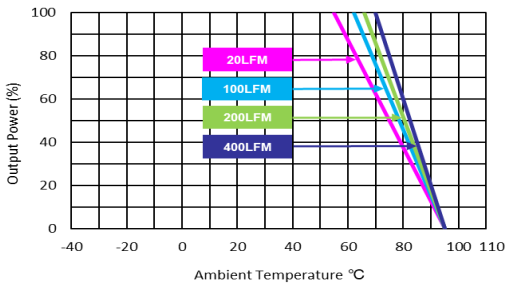
General Specifications

Parameter	Conditions	Min.	Typ.	Max.	Unit
Switching Frequency		---	150	---	kHz
MTBF(calculated)	MIL-HDBK-217F@25°C, Ground Benign	1,033,699	---	---	Hours

Environmental Specifications

Parameter	Min.	Max.	Unit
Operating Ambient Temperature Range (For Power Derating see relative 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

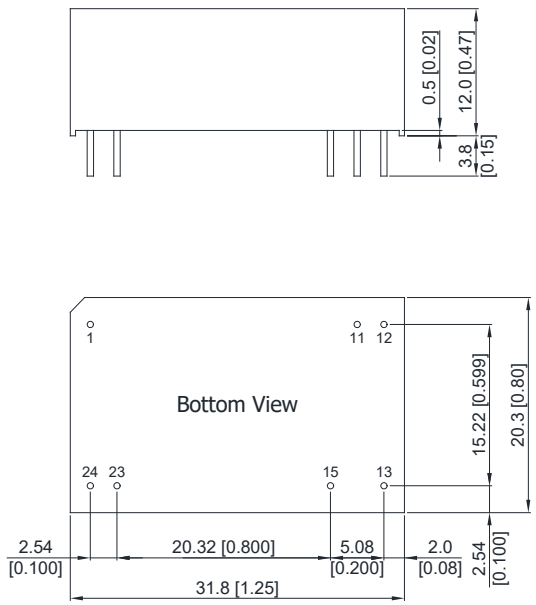


Notes

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 75% to 100%.
3 Please do not operate the product without a minimum load condition.
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.
7 The repeated high voltage isolation testing of the converter can degrade isolation capability, to a lesser or greater degree depending on materials, construction, environment and reflow solder process. Any material is susceptible to eventual chemical degradation when subject to very high applied voltages thus implying that the number of tests should be strictly limited. We therefore strongly advise against repeated high voltage isolation testing, but if it is absolutely required, that the voltage be reduced by 20% from specified test voltage. Furthermore, the high voltage isolation capability after reflow solder process should be evaluated as it is applied on system.

Package Specifications

Mechanical Dimensions



Pin Connections

Pin	Single Output	Dual Output	Diameter mm (inches)
1	+Vin	+Vin	Ø 0.6 [0.02]
11	No Pin	Common	Ø 0.6 [0.02]
12	-Vout	No Pin	Ø 0.6 [0.02]
13	+Vout	-Vout	Ø 0.6 [0.02]
15	No Pin	+Vout	Ø 0.6 [0.02]
23	-Vin	-Vin	Ø 0.6 [0.02]
24	-Vin	-Vin	Ø 0.6 [0.02]

- 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)

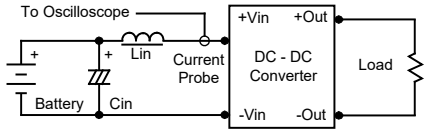
Physical Characteristics

Case Size	:	31.8x20.3x12.0mm (1.25x0.8x0.47 inches)
Case Material	:	Plastic resin (flammability to UL 94V-0 rated)
Pin Material	:	Copper Alloy
Weight	:	18g

Test Setup

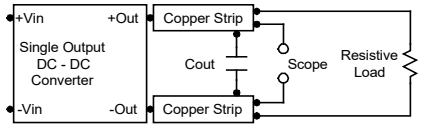
Input Reflected-Ripple Current Test Setup

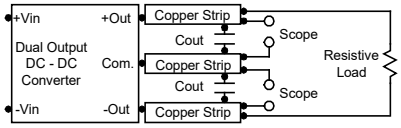
Input reflected-ripple current is measured with a inductor Lin (4.7μH) and Cin (220μF, ESR < 1.0Ω at 100 kHz) to simulate source impedance. Capacitor Cin, offsets possible battery impedance. Current ripple is measured at the input terminals of the module, measurement bandwidth is 0-500 kHz.



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.

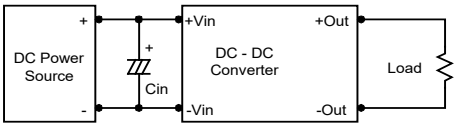




Technical Notes

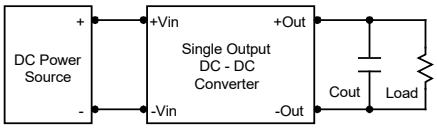
Input Source Impedance

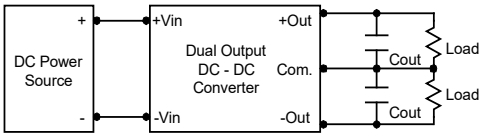
The power module should be connected to a low ac-impedance input source. Highly inductive source impedances can affect the stability of the power module. In applications where power is supplied over long lines and output loading is high, it may be necessary to use a capacitor on the input to insure startup. By using a good quality low Equivalent Series Resistance (ESR < 1.0Ω at 100 kHz) capacitor of a 10μF for the 12V input devices and a 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.



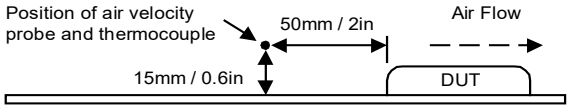


Maximum Capacitive Load

The MIHW3000 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 95°C. The derating curves are determined from measurements obtained in a test setup.



Design & Feature Considerations

Conducted and radiated emissions < A
with external coupling capacitor Cio=1 nF < B