

**FEATURES**

- ▶ Industrial Standard DIP-24 Package
- ▶ Wide 2:1 Input Voltage Range
- ▶ Fully Regulated Output Voltage
- ▶ I/O Isolation 1500 VDC (opt. 3000VDC)
- ▶ Operating Ambient Temp. Range -40°C to +85°C
- ▶ No Min. Load Requirement
- ▶ Overload and Short Circuit Protection
- ▶ Designed-in EMI Emission meets EN55032 Class A & FCC Level A
- ▶ UL/cUL/IEC/EN 60950-1 Safety Approval & CE-Marking



**PRODUCT OVERVIEW**

The MINMAX MIW03 series is a range of high performance dc-dc converter modules, designed as a cost optimized replacement for the highly popular MIW1000 series. The converter features wide 2:1 input ranges and tight output voltage regulation. Excellent efficiency allows an operating temperature up to +70°C at full load. The product comes in a DIP-24 plastic package with industry standard footprint.

Typical applications for these economical priced dc-dc converters are industrial electronics, instrumentation or communication equipment.

**Model Selection Guide**

Model Number	Input Voltage (Range)	Output Voltage	Output Current	Input Current		Reflected Ripple Current	Max. capacitive Load	Efficiency (typ.)			
				Max.	@No Load			@Max. Load			
				mA	mA(typ.)			mA(typ.)	@Max. Load		
MIW03-05S033	5 (4.5 ~ 9)	3.3	750	643	65	100	680	77			
MIW03-05S05		5	600	750			470	80			
MIW03-05S12		12	250	732			330	82			
MIW03-05S15		15	200	732			220	82			
MIW03-05S24		24	125	741			100	81			
MIW03-05D05		±5	±250	625			220#	80			
MIW03-05D12		±12	±125	732			150#	82			
MIW03-05D15		±15	±100	732			100#	82			
MIW03-12S033		12 (9 ~ 18)	3.3	750			261	35	30	680	79
MIW03-12S05			5	600			309			470	81
MIW03-12S12	12		250	294	330	85					
MIW03-12S15	15		200	294	220	85					
MIW03-12S24	24		125	298	100	84					
MIW03-12D05	±5		±250	260	220#	80					
MIW03-12D12	±12		±125	298	150#	84					
MIW03-12D15	±15		±100	298	100#	84					
MIW03-24S033	24 (18 ~ 36)		3.3	750	131	20	15			680	79
MIW03-24S05			5	600	154					470	81
MIW03-24S12		12	250	147	330			85			
MIW03-24S15		15	200	147	220			85			
MIW03-24S24		24	125	149	100			84			
MIW03-24D05		±5	±250	130	220#			80			
MIW03-24D12		±12	±125	149	150#			84			
MIW03-24D15		±15	±100	149	100#			84			
MIW03-48S033		48 (36 ~ 75)	3.3	750	65			15	10	680	79
MIW03-48S05			5	600	77					470	81
MIW03-48S12	12		250	74	330	85					
MIW03-48S15	15		200	74	220	85					
MIW03-48S24	24		125	74	100	84					
MIW03-48D05	±5		±250	65	220#	80					
MIW03-48D12	±12		±125	74	150#	84					
MIW03-48D15	±15		±100	74	100#	84					

# 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	---	---	4.5	
	12V Input Models	---	---	9	
	24V Input Models	---	---	18	
	48V Input Models	---	---	36	
Under Voltage Shutdown	5V Input Models	---	---	4	
	12V Input Models	---	---	8.5	
	24V Input Models	---	---	17.5	
	48V Input Models	---	---	35.5	
Short Circuit Input Power	All Models	---	---	2000	mW
Input Filter		Internal Pi Type			

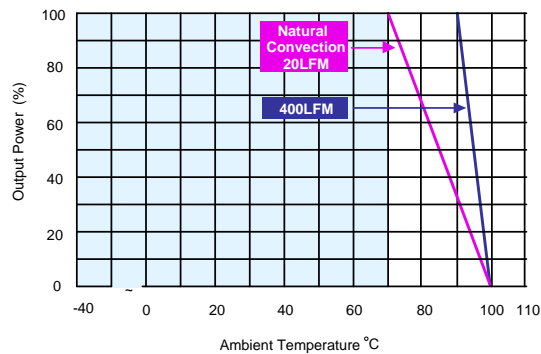
Output Specifications					
Parameter	Conditions	Min.	Typ.	Max.	Unit
Output Voltage Setting Accuracy		---	---	±2.0	%Vnom.
Output Voltage Balance	Dual Output, Balanced Loads	---	±0.5	±2.0	%
Line Regulation	Vin=Min. to Max. @Full Load	---	±0.3	±1.0	%
Load Regulation	Io=0% to 100%	---	±0.3	±1.0	%
Minimum Load	No minimum Load Requirement				
Ripple & Noise	0-20 MHz Bandwidth	---	---	70	mV <sub>P-P</sub>
Transient Recovery Time	25% Load Step Change	---	300	500	μsec
Transient Response Deviation		---	±3	±5	%
Temperature Coefficient		---	±0.01	±0.02	%/°C
Over Load Protection	Foldback	120	150	---	%
Short Circuit Protection	Continuous, Automatic Recovery				

General Specifications						
Parameter	Conditions	Min.	Typ.	Max.	Unit	
I/O Isolation Voltage	60 Seconds	Standard	1500	---	---	VDC
		Suffix H	3000	---	---	VDC
	1 Second	Standard	1800	---	---	VDC
I/O Isolation Resistance	500VDC	1000	---	---	MΩ	
I/O Isolation Capacitance	100KHz, 1V	---	---	300	pF	
Switching Frequency		80	---	---	KHz	
MTBF (calculated)	MIL-HDBK-217F@25°C, Ground Benign	1,000,000			Hours	
Safety Approvals	UL/cUL 60950-1 recognition (CSA certificate), IEC/EN 60950-1 (CB-report)					

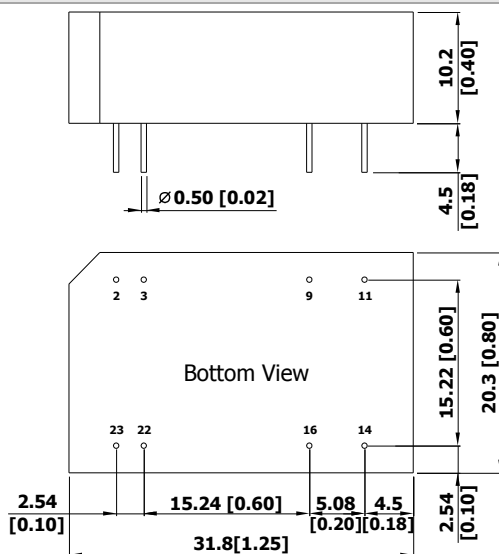
Environmental Specifications				
Parameter	Conditions	Min.	Max.	Unit
Operating Ambient Temperature Range (See Power Derating Curve)	Natural Convection	-40	+85	°C
Case Temperature		---	+100	°C
Storage Temperature Range		-50	+125	°C
Humidity (non condensing)		---	95	% rel. H
Cooling	Natural Convection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

**EMC Specifications**

Parameter	Standards & Level		Performance
EMI	Conduction and Radiation	EN55032, FCC part 15	Class A
EMS	EN55024		
	ESD	EN61000-4-2 Air $\pm$ 8kV , Contact $\pm$ 6kV	A
	Radiated immunity	EN61000-4-3 10V/m	A
	Fast transient (5)	EN61000-4-4 $\pm$ 2kV	A
	Surge (5)	EN61000-4-5 $\pm$ 1kV	A
	Conducted immunity	EN61000-4-6 10Vrms	A

**Power Derating Curve**

**Notes**

- 1 Specifications typical at Ta=+25°C, 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 We recommend to protect the converter by a slow blow fuse in the input supply line.
- 4 Other input and output voltage may be available, please contact factory.
- 5 To meet EN61000-4-4 & EN61000-4-5 an external capacitor across the input pins is required, please contact MINMAX.
- 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
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

- ▶ All dimensions in mm (inches)
- ▶ Tolerance: X.X $\pm$ 0.5 (X.XX $\pm$ 0.02)  
X.XX $\pm$ 0.25 (X.XXX $\pm$ 0.01)
- ▶ Pin diameter  $\varnothing$  0.5  $\pm$ 0.05 (0.02 $\pm$ 0.002)

**Physical Characteristics**

Case Size	: 31.8x20.3x10.2mm (1.25x0.80x0.40 inches)
Case Material	: Non-Conductive Black Plastic (flammability to UL 94V-0 rated)
Pin Material	: Copper Alloy with Gold Plate Over Nickel Subplate
Weight	: 12.8g

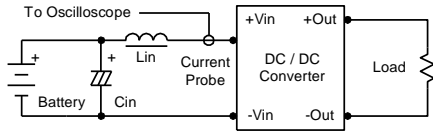
**Order Code Table**

Standard	3KVDC isolation
MIW03-05S033	MIW03-05S033H
MIW03-05S05	MIW03-05S05H
MIW03-05S12	MIW03-05S12H
MIW03-05S15	MIW03-05S15H
MIW03-05S24	MIW03-05S24H
MIW03-05D05	MIW03-05D05H
MIW03-05D12	MIW03-05D12H
MIW03-05D15	MIW03-05D15H
MIW03-12S033	MIW03-12S033H
MIW03-12S05	MIW03-12S05H
MIW03-12S12	MIW03-12S12H
MIW03-12S15	MIW03-12S15H
MIW03-12S24	MIW03-12S24H
MIW03-12D05	MIW03-12D05H
MIW03-12D12	MIW03-12D12H
MIW03-12D15	MIW03-12D15H
MIW03-24S033	MIW03-24S033H
MIW03-24S05	MIW03-24S05H
MIW03-24S12	MIW03-24S12H
MIW03-24S15	MIW03-24S15H
MIW03-24S24	MIW03-24S24H
MIW03-24D05	MIW03-24D05H
MIW03-24D12	MIW03-24D12H
MIW03-24D15	MIW03-24D15H
MIW03-48S033	MIW03-48S033H
MIW03-48S05	MIW03-48S05H
MIW03-48S12	MIW03-48S12H
MIW03-48S15	MIW03-48S15H
MIW03-48S24	MIW03-48S24H
MIW03-48D05	MIW03-48D05H
MIW03-48D12	MIW03-48D12H
MIW03-48D15	MIW03-48D15H

## Test Setup

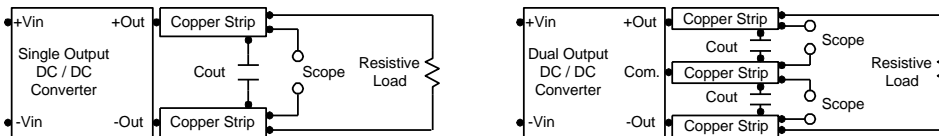
### Input Reflected-Ripple Current Test Setup

Input reflected-ripple current is measured with an inductor  $L_{in}$  (4.7 $\mu$ H) and  $C_{in}$  (220 $\mu$ F, ESR < 1.0 $\Omega$  at 100 KHz) to simulate source impedance. Capacitor  $C_{in}$ , 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  $C_{out}$  0.47 $\mu$ F 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.



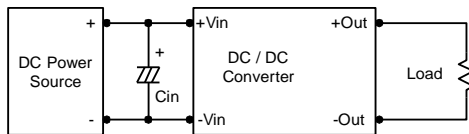
## Technical Notes

### 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.

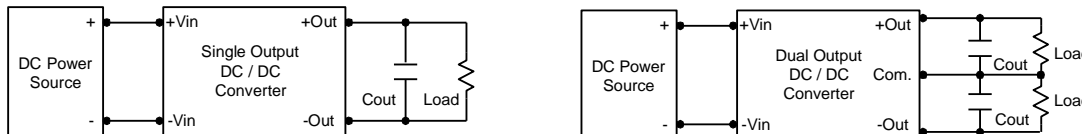
### Input Source Impedance

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 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 < 1.0 $\Omega$  at 100 KHz) capacitor of a 8.2 $\mu$ F for the 5V input devices, a 3.3 $\mu$ F for the 12V input devices and a 1.5 $\mu$ F 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 3.3 $\mu$ F capacitors at the output.



### Maximum Capacitive Load

The MIW03 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. 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°C.

The derating curves are determined from measurements obtained in a test setup.

