

FEATURES

- ▶ Industrial Standard DIP-24 Package
- ▶ Ultra-wide 4:1 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
- ▶ Under-voltage, Overload and Short Circuit Protection
- ▶ EMI Emission EN 55032 Class A & FCC Level A Approved
- ▶ UL/cUL/IEC/EN 62368-1(60950-1) Safety Approval & CE-Marking


PRODUCT OVERVIEW

The MINMAX MIWI03 series is a range of high performance 3W DC-DC converter modules, designed as a cost optimized replacement for the highly popular MIW2300 series. The converter features ultra-wide 4:1 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			
	VDC	VDC	mA	@Max. Load mA(typ.)	@No Load mA(typ.)	mA(typ.)	μF	@Max. Load %
MIWI03-24S033	24 (9 - 36)	3.3	750	134	30	15	680	77
MIWI03-24S05		5	600	158			470	79
MIWI03-24S12		12	250	152			330	82
MIWI03-24S15		15	200	151			220	83
MIWI03-24S24		24	125	154			100	81
MIWI03-24D05		±5	±250	130			220#	80
MIWI03-24D12		±12	±125	152			150#	82
MIWI03-24D15		±15	±100	152			100#	82
MIWI03-48S033		48 (18 - 75)	3.3	750			67	20
MIWI03-48S05	5		600	78	470	80		
MIWI03-48S12	12		250	75	330	83		
MIWI03-48S15	15		200	74	220	84		
MIWI03-48S24	24		125	76	100	82		
MIWI03-48D05	±5		±250	65	220#	80		
MIWI03-48D12	±12		±125	76	150#	82		
MIWI03-48D15	±15		±100	76	100#	82		

For each output

Input Specifications

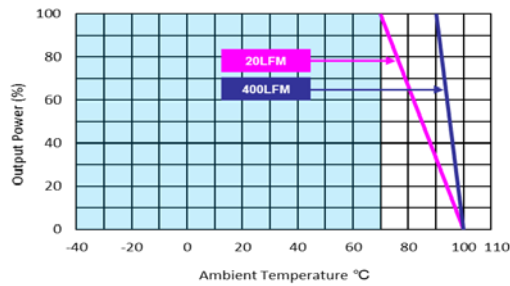
Parameter	Model	Min.	Typ.	Max.	Unit
Input Surge Voltage (1 sec. max.)	24V Input Models	-0.7	---	50	VDC
	48V Input Models	-0.7	---	100	
Start-up Threshold Voltage	24V Input Models	---	---	9	
	48V Input Models	---	---	18	
Under Voltage Shutdown	24V Input Models	---	---	8.5	
	48V Input Models	---	---	17.5	
Short Circuit Input Power		---	---	2000	mW
Input Filter	All Models	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	0-20MHz Bandwidth	---	---	70	mV _{p-p}
Transient Recovery Time	25% Load Step Change	---	200	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				

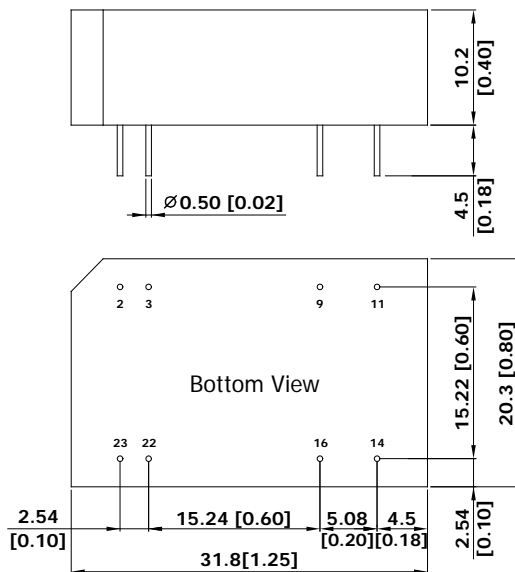
General Specifications						
Parameter	Conditions	Min.	Typ.	Max.	Unit	
I/O Isolation Voltage	60 Seconds	Standard	1500	---	---	VDC
		Suffix H	3000	---	---	VDC
	1 Second	Standard	1800	---	---	VDC
I/O Isolation Resistance	500 VDC	1000	---	---	MΩ	
I/O Isolation Capacitance	100kHz, 1V	---	---	300	pF	
Switching Frequency		90	---	---	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)					
	UL/cUL 62368-1 recognition (UL certificate), IEC/EN 62368-1 (CB-report)					

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

EMC Specifications			
Parameter	Standards & Level	Performance	
EMI	Conduction and Radiation	EN 55032, FCC part 15	
EMS	EN 55024		
	ESD	EN 61000-4-2 Air ± 8kV , Contact ± 6kV	A
	Radiated immunity	EN 61000-4-3 10V/m	A
	Fast transient (5)	EN 61000-4-4 ±2kV	A
	Surge (5)	EN 61000-4-5 ±1kV	A
	Conducted immunity	EN 61000-4-6 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 EN 61000-4-4 & EN 61000-4-5 an external capacitor across the input pins is required, please contact MINMAX.
- 6 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±0.5 (X.XX±0.02)
X.XX±0.25 (X.XXX±0.01)
- ▶ Pin diameter $\varnothing 0.5 \pm 0.05$ (0.02±0.002)

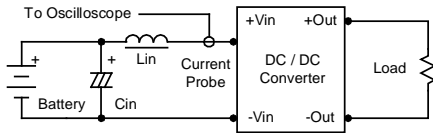
Physical Characteristics

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

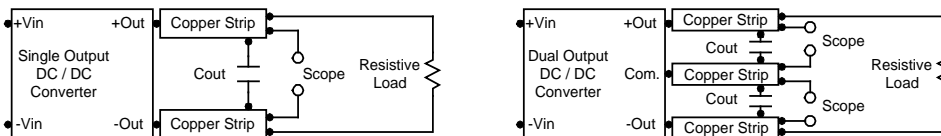
Order Code Table	
Standard	3KVDC Isolation
MIWI03-24S033	MIWI03-24S033H
MIWI03-24S05	MIWI03-24S05H
MIWI03-24S12	MIWI03-24S12H
MIWI03-24S15	MIWI03-24S15H
MIWI03-24S24	MIWI03-24S24H
MIWI03-24D05	MIWI03-24D05H
MIWI03-24D12	MIWI03-24D12H
MIWI03-24D15	MIWI03-24D15H
MIWI03-48S033	MIWI03-48S033H
MIWI03-48S05	MIWI03-48S05H
MIWI03-48S12	MIWI03-48S12H
MIWI03-48S15	MIWI03-48S15H
MIWI03-48S24	MIWI03-48S24H
MIWI03-48D05	MIWI03-48D05H
MIWI03-48D12	MIWI03-48D12H
MIWI03-48D15	MIWI03-48D15H

Test Setup
Input Reflected-Ripple Current Test Setup

Input reflected-ripple current is measured with an inductor L_{in} ($4.7\mu\text{H}$) and C_{in} ($220\mu\text{F}$, $\text{ESR} < 1.0\Omega$ 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 $0\text{-}500\text{ kHz}$.


Peak-to-Peak Output Noise Measurement Test

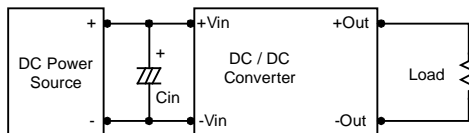
Use a C_{out} $0.47\mu\text{F}$ ceramic capacitor. Scope measurement should be made by using a BNC socket, measurement bandwidth is $0\text{-}20\text{ MHz}$. Position the load between 50 mm and 75 mm from the DC-DC Converter.


Technical Notes
Overload Protection

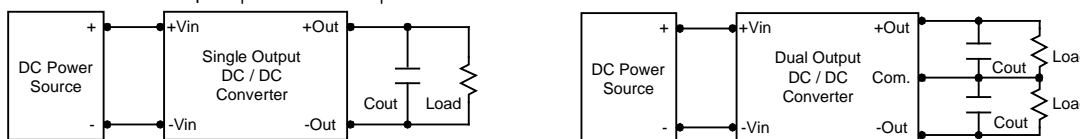
To provide protection in a fault (output overload) condition, the unit is equipped with internal current limiting circuitry and can endure current limiting for an unlimited duration. At the point of current-limit inception, the unit shifts from voltage control to current control. The unit operates normally 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 ($\text{ESR} < 1.0\Omega$ at 100 kHz) capacitor of a $4.7\mu\text{F}$ for the 24V input devices and a $2.2\mu\text{F}$ 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 $3.3\mu\text{F}$ capacitors at the output.


Maximum Capacitive Load

The MIWI03 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.

