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℃ to +85℃
- ▶ No Min. Load Requirement
- ▶ Under-voltage, Overload and Short Circuit Protection
- ▶ UL/cUL/IEC/EN 62368-1(60950-1) Safety Approval

UL 62368-1 CSA 60950-1 CB Scheme

CONFLICT FREE MINERALS POLICY 3 YEAR WARRANTY RoHS Compliant

PRODUCT OVERVIEW

The MINMAX MIWI06 series is a range of high performance DC-DC converter modules with 6W output power, featuring ultra-wide 4:1 input voltage ranges and fixed output voltage regulation. The product comes in a DIP-24 package with industry standard footprint.

Excellent efficiency allows an operation temperature range of -40°C to +85°C. Standard features include under-voltage protection, overload protection, short circuit protection and no min. load requirement as well.

Typical applications for these cost optimized converters are battery powered equipment, instrumentation, datacom and industrial electronics.

Model Selection Guide

Model Number	Input Voltage (Range)	Output Voltage	Output Current	Input Current		Reflected Ripple Current	Max. capacitive Load	Efficiency (typ.)
			Max.	@Max. Load	@No Load			@Max. Load
	VDC	VDC	mA	mA(typ.)	mA(typ.)	mA(typ.)	μF	%
MIWI06-24S033	24 (9 ~ 36)	3.3	1200	214	20	20	470	77
MIWI06-24S05		5	1200	313			470	80
MIWI06-24S12		12	500	298			100	84
MIWI06-24S15		15	400	298			100	84
MIWI06-24S24		24	250	298			47	84
MIWI06-24D05		±5	±500	260			100#	80
MIWI06-24D12		±12	±250	298			100#	84
MIWI06-24D15		±15	±200	298			100#	84
MIWI06-48S033	48 (18 ~ 75)	3.3	1200	107	10	15	470	77
MIWI06-48S05		5	1200	156			470	80
MIWI06-48S12		12	500	149			100	84
MIWI06-48S15		15	400	149			100	84
MIWI06-48S24		24	250	149			47	84
MIWI06-48D05		±5	±500	130			100#	80
MIWI06-48D12		±12	±250	149			100#	84
MIWI06-48D15		±15	±200	149			100#	84

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	7	8	9	
	48V Input Models	14	16	18	
Under Voltage Shutdown	24V Input Models	---	---	8.5	
	48V Input Models	---	---	16	
Short Circuit Input Power	All Models	---	---	3000	mW
Input Filter		Internal Pi Type			
Conducted EMI		Compliance to EN 55022, class A			

Output Specifications

Parameter	Conditions	Min.	Typ.	Max.	Unit
Output Voltage Setting Accuracy		---	---	±2.0	%Vnom.
Output Voltage Balance	Dual Output, Balanced Loads	---	±1.0	±2.0	%
Line Regulation	Vin=Min. to Max. @Full Load	---	±0.1	±0.5	%
Load Regulation	Io=0% to 100%	---	±0.6	±1.2	%
Minimum Load	No minimum Load Requirement				
Ripple & Noise	0-20 MHz Bandwidth	---	---	80	mV_{P-P}
Transient Recovery Time	25% Load Step Change	---	300	600	µsec
Transient Response Deviation		---	±3	±5	%
Temperature Coefficient		---	±0.01	±0.02	%/℃
Over Load Protection	Foldback	110	150	---	%
Short Circuit Protection	Continuous, Automatic Recovery				

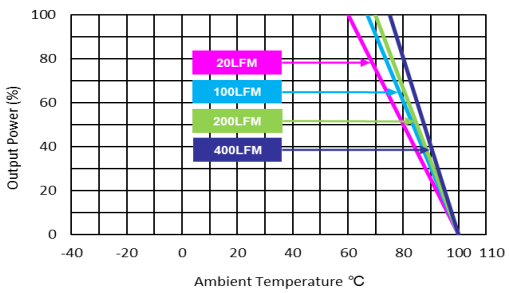
General Specifications

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		---	1000	---	pF
Switching Frequency			290	330	370	kHz
MTBF (calculated)	MIL-HDBK-217F@25℃, Ground Benign		800,000			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)					

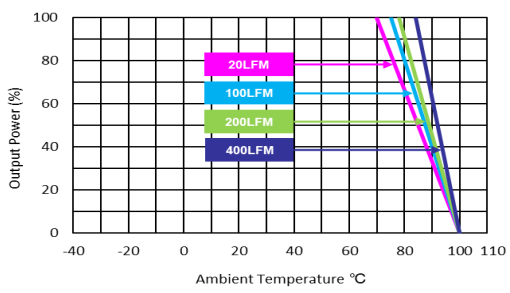
Environmental Specifications

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

Power Derating Curve



(3.3 & 5V Output Models)



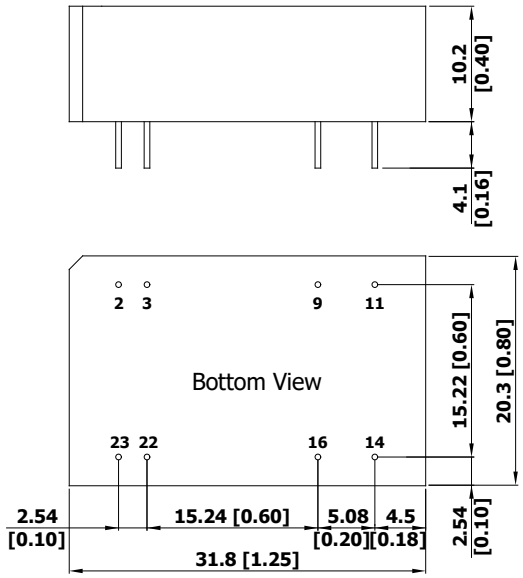
(Other Output Models)

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 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 MINMAX.
5 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 0.50 [0.02]
3	-Vin	-Vin	Ø 0.50 [0.02]
9	No Pin	Common	Ø 0.50 [0.02]
11	NC	-Vout	Ø 0.50 [0.02]
14	+Vout	+Vout	Ø 0.50 [0.02]
16	-Vout	Common	Ø 0.50 [0.02]
22	+Vin	+Vin	Ø 0.50 [0.02]
23	+Vin	+Vin	Ø 0.50 [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 Ø 0.5 ±0.05 (0.02±0.002)

Physical Characteristics

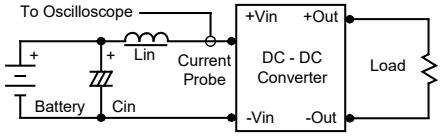
Case Size	:	31.8x20.3x10.2mm (1.25x0.80x0.40 inches)
Case Material	:	Plastic resin (flammability to UL 94V-0 rated)
Pin Material	:	Copper Alloy
Weight	:	12.7g

Order Code Table	
Standard	3kVDC isolation
MIWI06-24S033	MIWI06-24S033H
MIWI06-24S05	MIWI06-24S05H
MIWI06-24S12	MIWI06-24S12H
MIWI06-24S15	MIWI06-24S15H
MIWI06-24S24	MIWI06-24S24H
MIWI06-24D05	MIWI06-24D05H
MIWI06-24D12	MIWI06-24D12H
MIWI06-24D15	MIWI06-24D15H
MIWI06-48S033	MIWI06-48S033H
MIWI06-48S05	MIWI06-48S05H
MIWI06-48S12	MIWI06-48S12H
MIWI06-48S15	MIWI06-48S15H
MIWI06-48S24	MIWI06-48S24H
MIWI06-48D05	MIWI06-48D05H
MIWI06-48D12	MIWI06-48D12H
MIWI06-48D15	MIWI06-48D15H

Test Setup

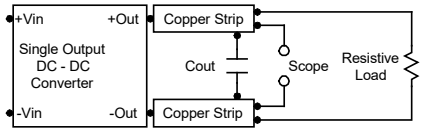
Input Reflected-Ripple Current Test Setup

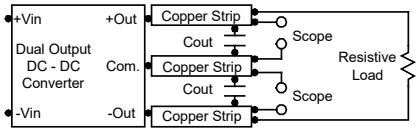
Input reflected-ripple current is measured with a inductor Lin (4.7μH) and Cin (220μF, ESR < 1.0Ω at 100 kHz) to simulate source impedance.
Capacitor Cin, offsets possible battery impedance. Current ripple is measured at the input terminals of the module, measurement bandwidth is 0-500 kHz.



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.





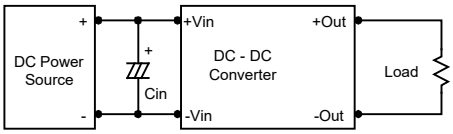
Technical Notes

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.

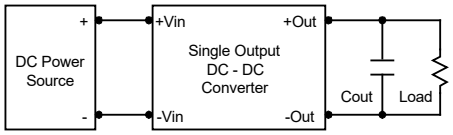
Input Source Impedance

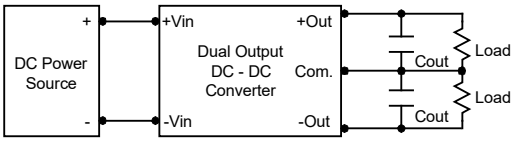
The power module should be connected to a low ac-impedance input source. Highly inductive source impedances can affect the stability of the power module.
In applications where power is supplied over long lines and output loading is high, it may be necessary to use a capacitor at the input to ensure startup.
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 Ω at 100 kHz) capacitor of a 4.7μF for the 24V input devices and a 2.2μF 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 3.3μF capacitors at the output.





Maximum Capacitive Load

The MIWI06 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.