

FEATURES

- ▶ Industrial Standard SIP-6 Package
- ▶ Wide 2 : 1 Input Voltage Range
- ▶ Fully Regulated Output Voltage
- ▶ I/O Isolation 1500VDC
- ▶ Operating Ambient Temp. Range -40°C to +95°C
- ▶ No Min. Load Requirement
- ▶ Overload and Short Circuit Protection
- ▶ UL/cUL/IEC/EN 60950-1 Safety Approval


PRODUCT OVERVIEW

The MINMAX MAW01 series is a range of isolated 1W dc/dc-converter modules featuring fully regulated output and wide 2:1 input voltage ranges.

This product comes in a very small SIP-6 package occupying only 1.2cm² (0.2 square inch) on the PCB.

A high efficiency allow operating an operating temperature range of -40°C to +85°C without Derating.

The very compact dimensions makes these converters an ideal solution for many space critical applications in battery powered instrumentations.

Model Selection Guide

Model Number	Input Voltage (Range) VDC	Output Voltage VDC	Output Current		Input Current		Max. capacitive Load μF	Reflected Ripple current mA (typ.)	Efficiency (typ.) @Max. Load %
			Max. mA	@Max. Load mA(typ.)	@No Load mA(typ.)				
MAW01-05S05	5 (4.5 ~ 9)	5	200	263	40	1680	80	76	
MAW01-05S12		12	83	259					
MAW01-05S15		15	67	254					
MAW01-05S24		24	42	265					
MAW01-05D12		±12	±42	262					
MAW01-05D15		±15	±33	254					
MAW01-12S05		12 (9 ~ 18)	5	200					108
MAW01-12S12	12		83	108					
MAW01-12S15	15		67	105					
MAW01-12S24	24		42	109					
MAW01-12D12	±12		±42	106					
MAW01-12D15	±15		±33	106					
MAW01-24S05	24 (18 ~ 36)		5	200	54	10	1680	30	77
MAW01-24S12		12	83	52					
MAW01-24S15		15	67	52					
MAW01-24S24		24	42	55					
MAW01-24D12		±12	±42	53					
MAW01-24D15		±15	±33	52					
MAW01-48S05		48 (36 ~ 75)	5	200	27				
MAW01-48S12	12		83	27					
MAW01-48S15	15		67	27					
MAW01-48S24	24		42	28					
MAW01-48D12	±12		±42	27					
MAW01-48D15	±15		±33	26					

For each output

Input Specifications

Parameter	Model	Min.	Typ.	Max.	Unit
Input Surge Voltage (1 sec. max.)	5V Input Models	-0.7	---	15	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	
Input Filter	All Models	Internal Capacitor			

Output Specifications

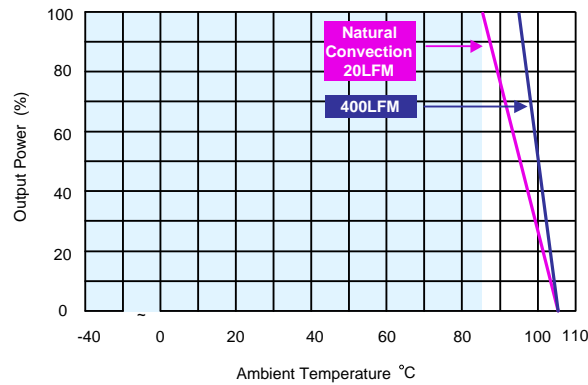
Parameter	Conditions	Min.	Typ.	Max.	Unit	
Output Voltage Setting Accuracy		---	---	±1.0	%Vnom.	
Output Voltage Balance	Dual Output, Balanced Loads	---	---	±1.0	%	
Line Regulation	Vin=Min. to Max. @Full Load	---	---	±0.2	%	
Load Regulation	Io=0% to 100%	Single Output Models	---	---	±1.0	%
		Dual Output Models	---	---	±1.0	%
	Io=10% to 90%	Single Output Models	---	---	±0.5	%
		Dual Output Models	---	---	±0.8	%
Minimum Load	No minimum Load Requirement					
Ripple & Noise	0-20 MHz Bandwidth	---	---	110	mV _{P-P}	
Transient Recovery Time	25% Load Step Change	---	250	---	µsec	
Transient Response Deviation		---	±3	±5	%	
Temperature Coefficient		---	---	±0.02	%/°C	
Over Load Protection	Foldback	---	130	---	%	
Short Circuit Protection	Continuous, Automatic Recovery					

General Specifications

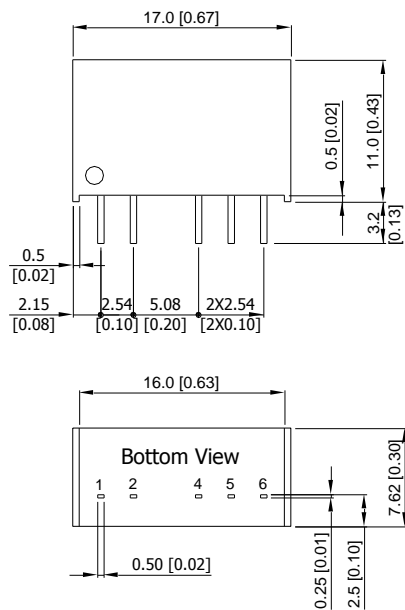
Parameter	Conditions	Min.	Typ.	Max.	Unit
I/O Isolation Voltage	60 Seconds	1500	---	---	VDC
	1 second	1800	---	---	VDC
I/O Isolation Resistance	500 VDC	1000	---	---	MΩ
I/O Isolation Capacitance	100KHz, 1V	---	---	50	pF
Switching Frequency		---	220	---	KHz
MTBF(calculated)	MIL-HDBK-217F@25°C, Ground Benign	2,800,000			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		---	+105	°C
Storage Temperature		-55	+125	°C
Humidity (non condensing)		---	95	% rel. H
Cooling	Natural Convection			
Lead Temperature (1.5mm from case for 10Sec.)		---	260	°C

Power Derating Curve

Notes

- 1 Specifications typical at Ta=+25°C, resistive load, nominal input voltage, rated output current unless otherwise noted.
- 2 We recommend to protect the converter by a slow blow fuse in the input supply line.
- 3 Other input and output voltage may be available, please contact factory.
- 4 That "natural convection" is about 20LFM but is not equal to still air (0 LFM).
- 5 Specifications are subject to change without notice.

Package Specifications
Mechanical Dimensions

Pin Connections

Pin	Single Output	Dual Output
1	-Vin	-Vin
2	+Vin	+Vin
4	+Vout	+Vout
5	No Pin	Common
6	-Vout	-Vout

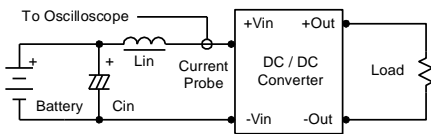
- ▶ All dimensions in mm (inches)
- ▶ Tolerance: X.X±0.5 (X.XX±0.02)
X.XX±0.25 (X.XXX±0.01)
- ▶ Pins ±0.05(±0.002)

Physical Characteristics

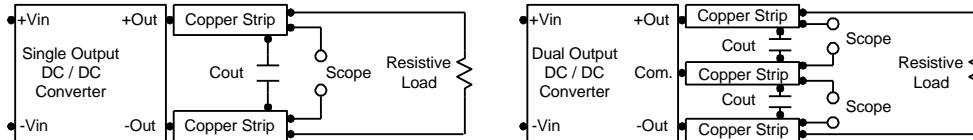
Case Size	: 17.0x7.62x11.0mm (0.67x0.30x0.43 inches)
Case Material	: Non-Conductive Black Plastic (flammability to UL 94V-0 rated)
Pin Material	: Alloy 42
Weight	: 12.9g

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 100KHz) 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 50mm and 75mm from the DC/DC Converter.

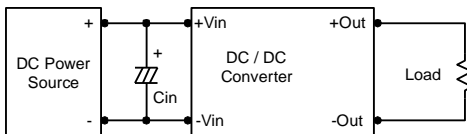

Technical Notes
Maximum Capacitive Load

The MAW01 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.

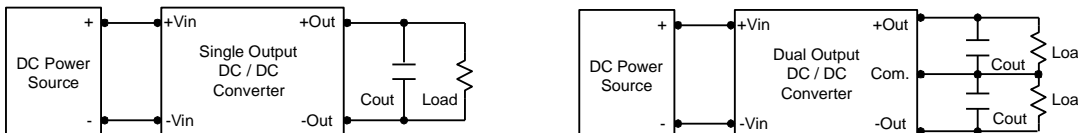
Input Source Impedance

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 commended to use a good quality low Equivalent Series Resistance ($\text{ESR} < 1.0\Omega$ at 100KHz) capacitor of a $8.2\mu\text{F}$ for the 5V input device, a $3.3\mu\text{F}$ for the 12V input devices and a $1.5\mu\text{F}$ 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 $3.3\mu\text{F}$ capacitors at the output.


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 105°C . The derating curves are determined from measurements obtained in a test setup.

