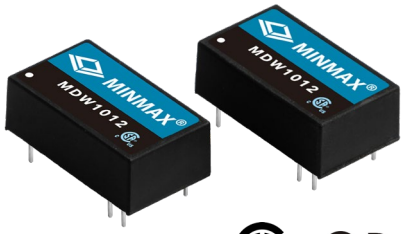
FEATURES

- **Industrial Standard DIP-16 Package**
- **Wide 2:1 Input Voltage Range**
- **Fully Regulated Output Voltage**
- **I/O Isolation 1500 VDC**
- **Operating Ambient Temp. Range -40℃ to +80℃**
- **Short Circuit Protection**
- **UL/cUL/IEC/EN 60950-1 Safety Approval**



CSA 60950-1

CB Scheme

PRODUCT OVERVIEW

The MINMAX MDW1000 series is a range of isolated 2W DC-DC converter modules featuring fully regulated output voltages and wide 2:1 input voltage ranges. The products come in a compact DIP-16 package with a low height of just 8.0 mm (0.31 inch). An excellent efficiency allows an operating temperature range of -40℃ to +80℃.

These DC-DC converters offer an ideal solution for many space critical applications in battery-powered equipment and instrumentation.

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	%
MDW1011	5 (4.5 ~ 9)	3.3	500	125	471	40	100	2200	70
MDW1012		5	400	100	548			1000	73
MDW1013		12	167	42	534			170	75
MDW1014		15	134	33	582			110	73
MDW1015		±5	±200	±50	667			470#	64
MDW1016		±12	±83	±21	615			100#	69
MDW1017		±15	±67	±17	598			47#	71
MDW1021	12 (9 ~ 18)	3.3	500	125	184	20	25	2200	73
MDW1022		5	400	100	217			1000	77
MDW1023		12	167	42	209			170	80
MDW1024		15	134	33	220			110	80
MDW1025		±5	±200	±50	242			470#	73
MDW1026		±12	±83	±21	224			100#	78
MDW1027		±15	±67	±17	226			47#	78
MDW1031	24 (18 ~ 36)	3.3	500	125	96	10	15	2200	72
MDW1032		5	400	100	109			1000	77
MDW1033		12	167	42	109			170	80
MDW1034		15	134	33	108			110	81
MDW1035		±5	±200	±50	119			470#	74
MDW1036		±12	±83	±21	112			100#	78
MDW1037		±15	±67	±17	110			47#	80
MDW1041	48 (36 ~ 75)	3.3	500	125	49	8	10	2200	71
MDW1042		5	400	100	57			1000	73
MDW1043		12	167	42	53			170	79
MDW1044		15	134	33	55			110	79
MDW1045		±5	±200	±50	62			470#	71
MDW1046		±12	±83	±21	57			100#	77
MDW1047		±15	±67	±17	57			47#	77

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 Voltage	5V Input Models	3.5	4	4.5	
	12V Input Models	4.5	7	9	
	24V Input Models	8	12	18	
	48V Input Models	16	24	36	
Under Voltage Shutdown	5V Input Models	---	3.5	4	
	12V Input Models	---	6.5	8.5	
	24V Input Models	---	11	17	
	48V Input Models	---	22	34	
Short Circuit Input Power	All Models	---	---	1500	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	---	±0.3	±0.5	%
Load Regulation	Io=25% to 100%	---	±0.5	±0.75	%
Ripple & Noise	0-20 MHz Bandwidth	---	30	50	mV_{P-P}
Transient Recovery Time	25% Load Step Change	---	100	300	µsec
Transient Response Deviation		---	±3	±5	%
Temperature Coefficient		---	±0.01	±0.02	%/°C
Short Circuit Protection	Continuous, Automatic Recovery				

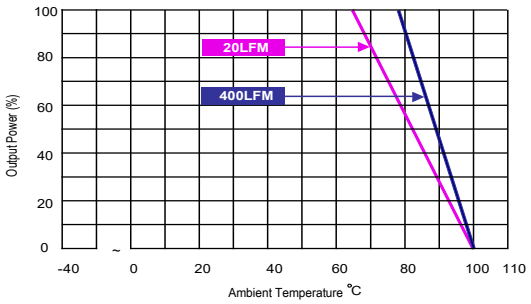
General Specifications

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	---	250	420	pF
Switching Frequency		150	300	550	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	Min.	Max.	Unit
Operating Ambient Temperature Range (See Power Derating Curve)	-40	+80	°C
Case Temperature	---	+100	°C
Storage Temperature Range	-55	+105	°C
Humidity (non condensing)	---	95	% rel. H
Lead Temperature (1.5mm from case for 10Sec.)	---	260	°C

Power Derating Curve

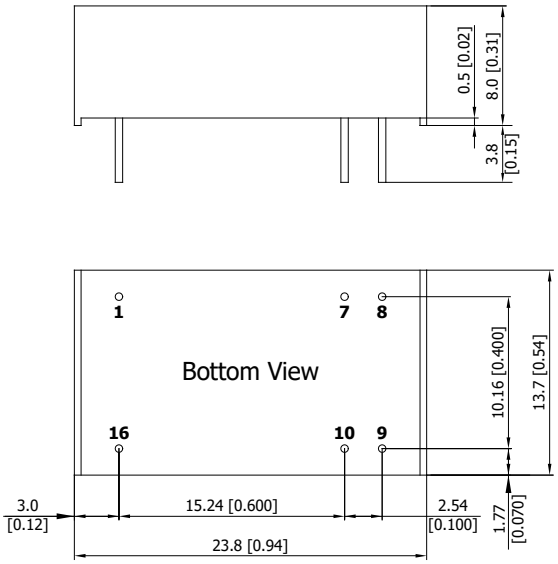


Notes

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. These power converters require a minimum output loading to maintain specified regulation, operation under no-load conditions will not damage these
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.

Package Specifications

Mechanical Dimensions



Pin Connections

Pin	Single Output	Dual Output	Diameter mm (inches)
1	-Vin	-Vin	Ø 0.5 [0.02]
7	NC	NC	Ø 0.5 [0.02]
8	NC	Common	Ø 0.5 [0.02]
9	+Vout	+Vout	Ø 0.5 [0.02]
10	-Vout	-Vout	Ø 0.5 [0.02]
16	+Vin	+Vin	Ø 0.5 [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 tolerance: X.X±0.05 (X.XX±0.002)

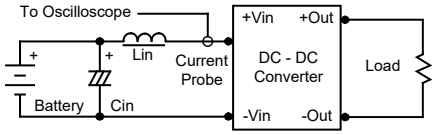
Physical Characteristics

Case Size	:	23.8x13.7x8.0 mm (0.94x0.54x0.31 inches)
Case Material	:	Plastic resin (flammability to UL 94V-0 rated)
Pin Material	:	Phosphor bronze
Weight	:	5.1g

Test Setup

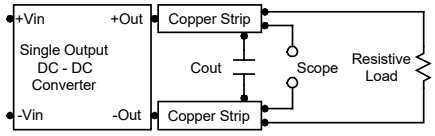
Input Reflected-Ripple Current Test Setup

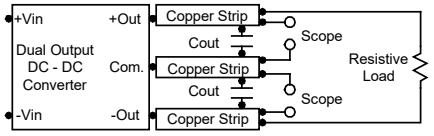
Input reflected-ripple current is measured with a inductor Lin (4.7μH) and Cin (220μF, ESR < 1.0Ω at 100 kHz) to simulate source impedance.
Capacitor Cin, offsets possible battery impedance. Current ripple is measured at the input terminals of the module, measurement bandwidth is 0-500 kHz.



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

Maximum Capacitive Load

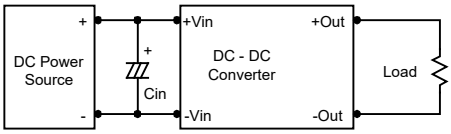
The MDW1000 series has limitation of maximum connected capacitance on the output. The power module may operate in current limiting mode during start-up, affecting the ramp-up and the startup time. The maximum capacitance can be found in the data sheet.

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.

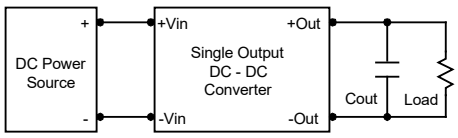
Input Source Impedance

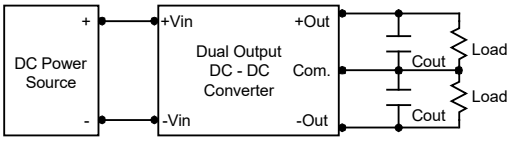
The power module should be connected to a low ac-impedance input source. Highly inductive source impedances can affect the stability of the power module.
In applications where power is supplied over long lines and output loading is high, it may be necessary to use a capacitor on the input to insure startup.
By using a good quality low Equivalent Series Resistance (ESR < 1.0Ω at 100 kHz) capacitor of a 8.2uF for the 5V input devices, a 3.3μF for the 12V input devices and a 1.5μF for the 24V and 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.





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.