FEATURES

- ▶ **Industrial SMD Package**
- ▶ **Wide 2:1 Input Voltage Range**
- ▶ **Fully Regulated Output Voltage**
- ▶ **I/O Isolation 1500 VDC**
- ▶ **Operating Ambient Temp. Range -40℃ to +85℃**
- ▶ **Under-voltage and Short Circuit Protection**
- ▶ **Cleaning-washable Process Available(option)**
- ▶ **Qualified for Lead-free Reflow Solder Process According to**
- ▶ **IPC/JEDEC J-STD-020D.1**
- ▶ **Tape & Reel Package Available**
- ▶ **UL/cUL/IEC/EN 60950-1 Safety Approval**

CSA 60950-1

PRODUCT OVERVIEW

The MINMAX MSDW1000 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 SMD package with a small footprint and low package height of just 8.0 mm (0.31 inch). All models are qualified for lead free reflow solder processes according IPC J-STD-020D.1 standard. An excellent efficiency allows an operating temperature range of -40℃ to +85℃. The compact dimensions of these DC-DC converters make them 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	%
MSDW1011	5 (4.5 ~ 9)	3.3	500	125	471	40	100	2200	70
MSDW1012		5	400	100	548			1000	73
MSDW1013		12	167	42	534			170	75
MSDW1014		15	134	33	582			110	73
MSDW1015		±5	±200	±50	667			470#	64
MSDW1016		±12	±83	±21	615			100#	69
MSDW1017		±15	±67	±17	598			47#	71
MSDW1021	12 (9 ~ 18)	3.3	500	125	184	20	25	2200	73
MSDW1022		5	400	100	217			1000	77
MSDW1023		12	167	42	209			170	80
MSDW1024		15	134	33	220			110	80
MSDW1025		±5	±200	±50	242			470#	73
MSDW1026		±12	±83	±21	224			100#	78
MSDW1027		±15	±67	±17	226			47#	78
MSDW1031	24 (18 ~ 36)	3.3	500	125	96	10	15	2200	72
MSDW1032		5	400	100	109			1000	77
MSDW1033		12	167	42	109			170	80
MSDW1034		15	134	33	108			110	81
MSDW1035		±5	±200	±50	119			470#	74
MSDW1036		±12	±83	±21	112			100#	78
MSDW1037		±15	±67	±17	110			47#	80
MSDW1041	48 (36 ~ 75)	3.3	500	125	49	8	10	2200	71
MSDW1042		5	400	100	57			1000	73
MSDW1043		12	167	42	53			170	79
MSDW1044		15	134	33	55			110	79
MSDW1045		±5	±200	±50	62			470#	71
MSDW1046		±12	±83	±21	57			100#	77
MSDW1047		±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 Threshold 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
Internal Power Dissipation		---	---	1800	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	%Vom.
Output Voltage Balance	Dual Output, Balanced Loads	---	±1.0	±2.0	%
Line Regulation	Vin=Min. to Max.	---	±0.3	±0.5	%
Load Regulation	Io=25% to 100%	---	±0.5	±0.75	%
Ripple & Noise	0-20 MHz Bandwidth	---	---	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	%/℃
Short Circuit Protection	Continuous, Automatic Recovery				

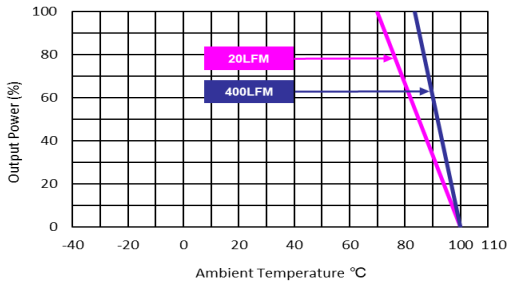
General Specifications

Parameter	Conditions	Min.	Typ.	Max.	Unit
I/O Isolation Voltage	60 Seconds	1500	---	---	VDC
	1 Seconds	1800	---	---	VDC
I/O Isolation Resistance	500 VDC	1000	---	---	MΩ
I/O Isolation Capacitance	100kHz, 1V	---	250	420	pF
Switching Frequency		---	300	---	kHz
MTBF (calculated)	MIL-HDBK-217F@25℃, Ground Benign	1,000,000			Hours
Safety Approvals	UL/cUL 60950-1 recognition(CSA certificate), IEC/EN 60950-1(CB-scheme)				
Moisture Sensitivity Level (MSL)	IPC/JEDEC J-STD-020D.1	Level 2			

Environmental Specifications

Parameter	Min.	Max.	Unit
Operating Ambient Temperature Range (See Power Derating Curve)	-40	+85	℃
Case Temperature	---	+90	℃
Storage Temperature Range	-50	+125	℃
Humidity (non condensing)	---	95	% rel. H
Lead-free Reflow Solder Process	IPC/JEDEC J-STD-020D.1		

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 modules; however they may not meet all specifications listed.

4 We recommend to protect the converter by a slow blow fuse in the input supply line.

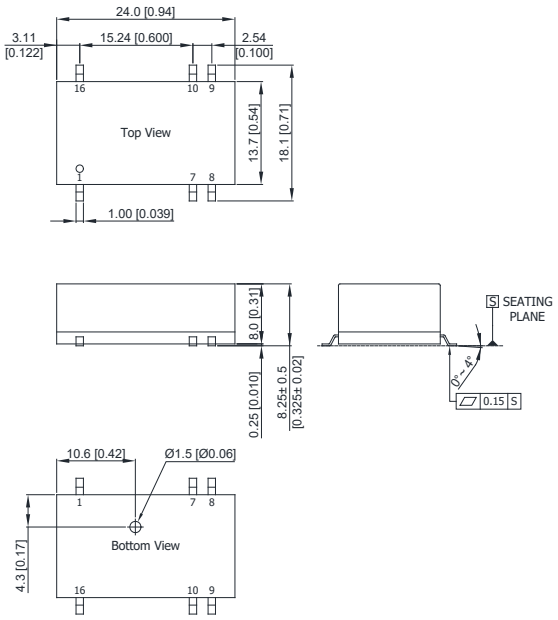
5 Other input and output voltage may be available, please contact MINMAX.

6 Specifications are subject to change without notice.

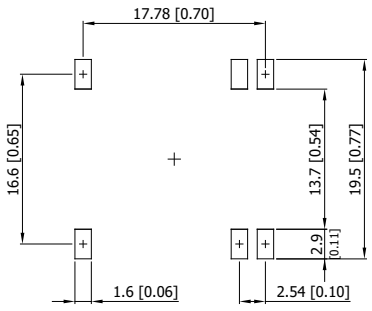
7 The repeated high voltage isolation testing of the converter can degrade isolation capability, to a lesser or greater degree depending on materials, construction, environment and reflow solder process. Any material is susceptible to eventual chemical degradation when subject to very high applied voltages thus implying that the number of tests should be strictly limited. We therefore strongly advise against repeated high voltage isolation testing, but if it is absolutely required, that the voltage be reduced by 20% from specified test voltage. Furthermore, the high voltage isolation capability after reflow solder process should be evaluated as it is applied on system.

Package Specifications

Mechanical Dimensions



Connecting Pin Patterns



- All dimensions in mm (inches)
- Tolerance: X.X±0.25 (X.XX±0.01)
  X.XX±0.13 (X.XXX±0.005)
- Pins ±0.05 (±0.002)

Pin Connections

Pin	Single Output	Dual Output
1	-Vin	-Vin
7	NC	NC
8	NC	Common
9	+Vout	+Vout
10	-Vout	-Vout
16	+Vin	+Vin

NC : No Connection

Physical Characteristics

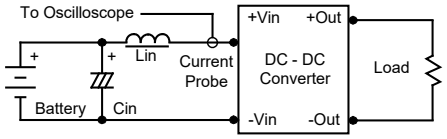
Case Size	:	24.0x13.7x8.0mm (0.94x0.54x0.31 inches)
Case Material	:	Plastic resin (flammability to UL 94V-0 rated)
Pin Material	:	Phosphor Bronze
Weight	:	5.1g

Order Code Table	
Standard	For cleaning-washable process
MSDW1011	MSDW1011-W
MSDW1012	MSDW1012-W
MSDW1013	MSDW1013-W
MSDW1014	MSDW1014-W
MSDW1015	MSDW1015-W
MSDW1016	MSDW1016-W
MSDW1017	MSDW1017-W
MSDW1021	MSDW1021-W
MSDW1022	MSDW1022-W
MSDW1023	MSDW1023-W
MSDW1024	MSDW1024-W
MSDW1025	MSDW1025-W
MSDW1026	MSDW1026-W
MSDW1027	MSDW1027-W
MSDW1031	MSDW1031-W
MSDW1032	MSDW1032-W
MSDW1033	MSDW1033-W
MSDW1034	MSDW1034-W
MSDW1035	MSDW1035-W
MSDW1036	MSDW1036-W
MSDW1037	MSDW1037-W
MSDW1041	MSDW1041-W
MSDW1042	MSDW1042-W
MSDW1043	MSDW1043-W
MSDW1044	MSDW1044-W
MSDW1045	MSDW1045-W
MSDW1046	MSDW1046-W
MSDW1047	MSDW1047-W

Test Setup

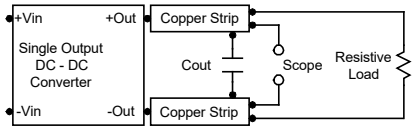
Input Reflected-Ripple Current Test Setup

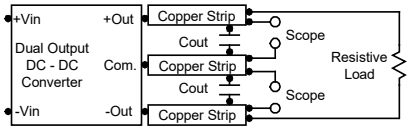
Input reflected-ripple current is measured with a inductor Lin (4.7μH) and Cin (220μF, ESR < 1.0Ω at 100 kHz) to simulate source impedance.
Capacitor Cin, offsets possible battery impedance. Current ripple is measured at the input terminals of the module, measurement bandwidth is 0-500 kHz.



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.





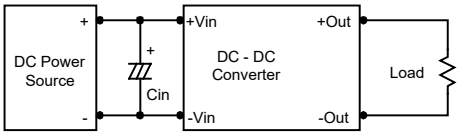
Technical Notes

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.

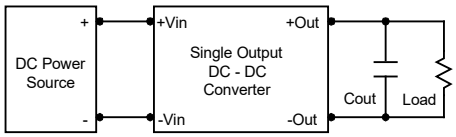
Input Source Impedance

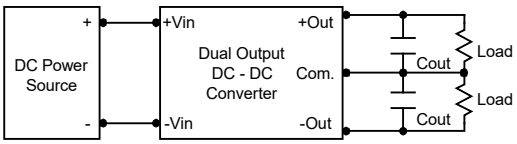
The power module should be connected to a low ac-impedance input source. Highly inductive source impedances can affect the stability of the power module.
In applications where power is supplied over long lines and output loading is high, it may be necessary to use a capacitor on the input to insure startup.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





Maximum Capacitive Load

The MSDW1000 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.

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 90°C. The derating curves are determined from measurements obtained in a test setup.