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℃**
- **Short Circuit Protection**
- **Water-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 CB Scheme

PRODUCT OVERVIEW

The MINMAX MSIW1000 series is a range of isolated 3W DC/DC converter modules featuring fully regulated output voltages and wide 2:1 input voltage ranges.

These products are in a low profile SMD package with dimensions of 32.3 x 14.8 x 10.2 mm. All models are qualified for lead free reflow solder processes according IPC J-STD-020D.1. An excellent efficiency allows an operating temperature range of–40° to +85°C (with derating).

Typical applications for these converters are battery operated equipment and instrumentation, communication and general 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.	Min.	@Max. Load	@No Load			@Max. Load
	VDC	VDC	mA	mA	mA(typ.)	mA(typ.)	mA(typ.)	μF	%
MSIW1021	12 (9 ~ 18)	3.3	700	70	257	20	25	4700	75
MSIW1022		5	600	60	316				79
MSIW1023		12	250	25	305				82
MSIW1024		15	200	20	305				82
MSIW1025		±5	±300	±30	321			180#	78
MSIW1026		±12	±125	±12.5	309				81
MSIW1027		±15	±100	±10	309				81
MSIW1031	24 (18 ~ 36)	3.3	700	70	127	5	15	4700	76
MSIW1032		5	600	60	156				80
MSIW1033		12	250	25	151				83
MSIW1034		15	200	20	151				83
MSIW1035		±5	±300	±30	158			180#	79
MSIW1036		±12	±125	±12.5	152				82
MSIW1037		±15	±100	±10	152				82
MSIW1041	48 (36 ~ 75)	3.3	700	70	63	3	10	4700	76
MSIW1042		5	600	60	78				80
MSIW1043		12	250	25	75				83
MSIW1044		15	200	20	75				83
MSIW1045		±5	±300	±30	79			180#	79
MSIW1046		±12	±125	±12.5	76				82
MSIW1047		±15	±100	±10	76				82

For each output

Input Specifications

Parameter	Model	Min.	Typ.	Max.	Unit
Input Surge Voltage (1 sec. max.)	12V Input Models	-0.7	---	25	VDC
	24V Input Models	-0.7	---	50	
	48V Input Models	-0.7	---	100	
Start-Up Threshold Voltage	12V Input Models	4.5	6	8	
	24V Input Models	8	12	18	
	48V Input Models	16	24	36	
Under Voltage Shutdown	12V Input Models	---	---	8	
	24V Input Models	---	---	16	
	48V Input Models	---	---	32	
Short Circuit Input Power	All Models	---	---	1500	mW
Input Filter		Internal Pi Type			

Output Specifications

Parameter	Conditions	Min.	Typ.	Max.	Unit
Output Voltage Setting Accuracy		---	---	±1.0	%Vnom.
Output Voltage Balance	Dual Output, Balanced Loads	---	±0.5	±2.0	%
Line Regulation	Vin=Min. to Max. @Full Load	---	±0.1	±0.3	%
Load Regulation	Io=10% to 100%	---	±0.3	±1.0	%
Ripple & Noise	0-20 MHz Bandwidth	---	---	75	mV_{P-P}
Transient Recovery Time	25% Load Step Change	---	200	500	µsec
Transient Response Deviation		---	±2	±6	%
Temperature Coefficient		---	±0.01	±0.02	%/℃
Short Circuit Protection	Continuous, Automatic Recovery				

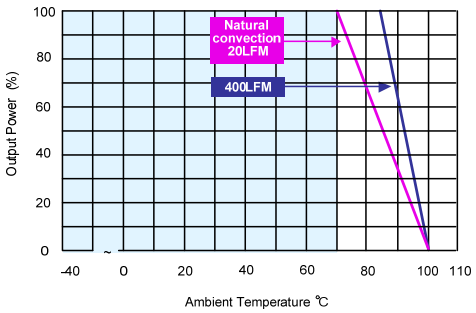
General Specifications

Parameter	Conditions	Min.	Typ.	Max.	Unit
I/O Isolation Voltage	60 Seconds	1500	---	---	VDC
	1 Second	1800	---	---	VDC
I/O Isolation Resistance	500 VDC	1000	---	---	MΩ
I/O Isolation Capacitance	100KHz, 1V	---	65	100	pF
Switching Frequency		---	300	---	KHz
MTBF (calculated)	MIL-HDBK-217F@25℃, Ground Benign	1,000,000			Hours
Moisture Sensitivity Level (MSL)	IPC/JEDEC J-STD-020D.1	Level 2			
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	℃
Case Temperature		---	+90	℃
Storage Temperature Range		-50	+125	℃
Humidity (non condensing)		---	95	% rel. H
Cooling	Natural Convection			
Lead-free Reflow Solder Process	IPC/JEDEC J-STD-020D.1			

Power Derating Curve

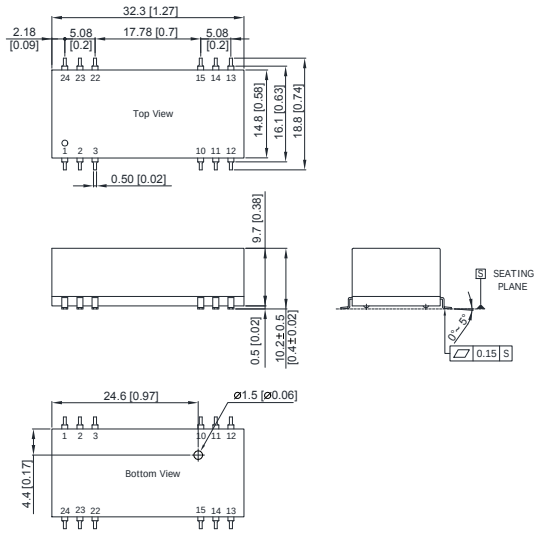


Notes

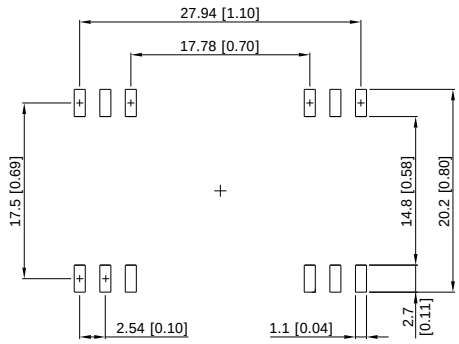
1 Specifications typical at Ta=+25℃, resistive load, nominal input voltage and rated output current unless otherwise noted.
2 Transient recovery time is measured to within 1% error band for a step change in output load of 75% to 100%
3 These power converters require a minimum output loading to maintain 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 factory.
6 That "natural convection" is about 20LFM but is not equal to still air (0 LFM).
7 Specifications are subject to change without notice.

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
1,2	-Vin	-Vin
3,11,14,22	NC	NC
10	NC	Common
12	NC	-Vout
13	+Vout	+Vout
15	-Vout	Common
23,24	+Vin	+Vin

NC : No Connection

Physical Characteristics

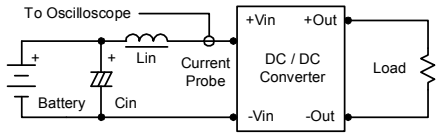
Case Size	:	32.3x14.8x10.2mm (1.27x0.58x0.4 inches)
Case Material	:	Non-Conductive Black Plastic (flammability to UL 94V-0 rated)
Pin Material	:	Phosphor bronze
Weight	:	8.8g

Order Code Table	
Standard	For water-washable process
MSIW1021	MSIW1021-W
MSIW1022	MSIW1022-W
MSIW1023	MSIW1023-W
MSIW1024	MSIW1024-W
MSIW1025	MSIW1025-W
MSIW1026	MSIW1026-W
MSIW1027	MSIW1027-W
MSIW1031	MSIW1031-W
MSIW1032	MSIW1032-W
MSIW1033	MSIW1033-W
MSIW1034	MSIW1034-W
MSIW1035	MSIW1035-W
MSIW1036	MSIW1036-W
MSIW1037	MSIW1037-W
MSIW1041	MSIW1041-W
MSIW1042	MSIW1042-W
MSIW1043	MSIW1043-W
MSIW1044	MSIW1044-W
MSIW1045	MSIW1045-W
MSIW1046	MSIW1046-W
MSIW1047	MSIW1047-W

Test Setup

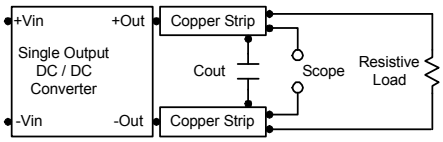
Input Reflected-Ripple Current Test Setup

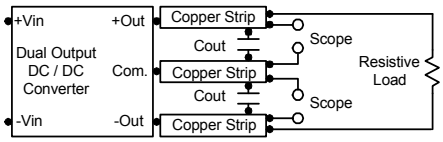
Input reflected-ripple current is measured with a inductor Lin (4.7μH) and Cin (220μF, ESR < 1.0Ω at 100 KHz) to simulate source impedance. Capacitor Cin, offsets possible battery impedance. Current ripple is measured at the input terminals of the module, measurement bandwidth is 0-500 KHz.



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.





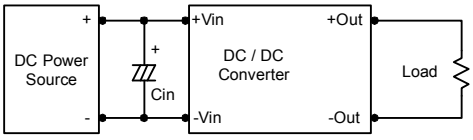
Technical Notes

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.

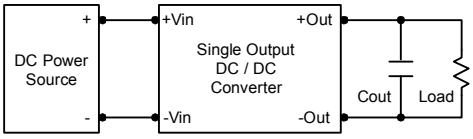
Input Source Impedance

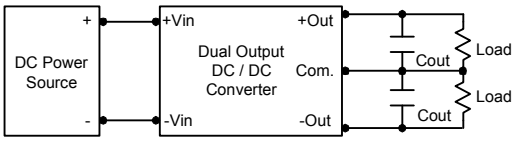
The power module should be connected to a low ac-impedance input source. Highly inductive source impedances can affect the stability of the power module. In applications where power is supplied over long lines and output loading is high, it may be necessary to use a capacitor at the input to ensure startup. 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 < 1.0Ω at 100 KHz) capacitor of a 3.3μF for the 12V input devices and a 1.5μF 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 3.3μF capacitors at the output.





Maximum Capacitive Load

The MSIW1000 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. For optimum performance we recommend 180μF maximum capacitive load for dual outputs and 4700μF capacitive load for single outputs. 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.