FEATURES

- **SMD Package with Industry Standard Pinout**
- **Package Dimension:**
  32.3 x 14.8 x 10.2 mm (1.27x 0.58x 0.38 inches)
- **Ultra-wide 4:1 Input Range**
- **Efficiency up to 83%**
- **I/O-isolation 1500VDC**
- **Operating Temp. Range -40℃ to +85℃**
- **Qualified for lead-free Reflow Solder Process according IPC/JEDEC J-STD-020D.1**
- **3 Years Product Warranty**

PRODUCT OVERVIEW

The MINMAX MSIW2000 series is a range of isolated 3W DC-DC converter modules featuring fully regulated output voltages and ultra-wide 4:1 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-20D.1. An excellent efficiency allows an operating temperature range of–40℃ to +85℃ (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	%
MSIW2021	24 (9 ~ 36)	3.3	750	75	138	20	10	3000	75
MSIW2022		5	600	60	158				79
MSIW2023		12	250	25	154				81
MSIW2024		15	200	20	154				81
MSIW2025		±5	±300	±30	160			180#	78
MSIW2026		±12	±125	±12.5	154				81
MSIW2027		±15	±100	±10	154				81
MSIW2031	48 (18 ~ 75)	3.3	750	75	68	10	5	3000	76
MSIW2032		5	600	60	78				80
MSIW2033		12	250	25	75				83
MSIW2034		15	200	20	75				83
MSIW2035		±5	±300	±30	78			180#	80
MSIW2036		±12	±125	±12.5	75				83
MSIW2037		±15	±100	±10	75				83

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 Voltage	24V Input Models	4.5	6	8.5	
	48V Input Models	8.5	12	17	
Under Voltage Shutdown	24V Input Models	---	---	8	
	48V Input Models	---	---	16	
Short Circuit Input Power	All Models	---	---	2000	mW
Internal Power Dissipation		---	---	2500	mW
Conducted EMI		Compliance to EN 55022, class A			

Output Specifications

Parameter	Conditions	Min.	Typ.	Max.	Unit
Output Voltage Accuracy		---	±0.5	±1.0	%Vom.
Output Voltage Balance	Dual Output, Balanced Loads	---	±0.5	±2.0	%
Line Regulation	Vin=Min. to Max. @Full Load	---	±0.2	±0.5	%
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	---	150	500	µsec
Transient Response Deviation		---	±2	±6	%
Temperature Coefficient		---	±0.01	±0.02	%/°C
Over Load Protection	Foldback	120	---	---	%
Short Circuit Protection	Continuous				

General Specifications

Parameter	Conditions	Min.	Typ.	Max.	Unit
I/O Isolation Voltage	60 Seconds	1500	---	---	VDC
I/O Isolation Resistance	500 VDC	1000	---	---	MΩ
I/O Isolation Capacitance	100kHz, 1V	---	350	500	pF
Switching Frequency		180	300	580	kHz
MTBF (calculated)	MIL-HDBK-217F@25°C, Ground Benign	1,000,000			Hours
Moisture Sensitivity Level (MSL)	IPC/JEDEC J-STD-020D.1	Level 2			

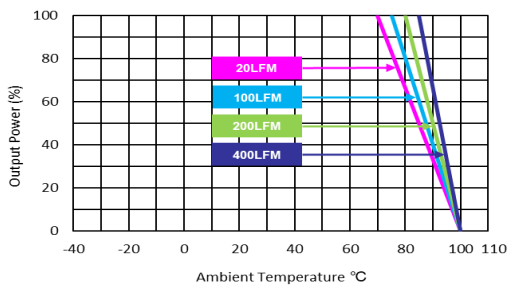
Remote On/Off Control

Parameter	Conditions	Min.	Typ.	Max.	Unit
Converter On	2.5V ~ 5.5V or Open Circuit				
Converter Off	-0.7V ~ 0.8V or Short Circuit				
Control Input Current (on)	Vctrl = 5.0V	---	---	-400	µA
Control Input Current (off)	Vctrl = 0V	---	---	-400	µA
Control Common	Referenced to Negative Input				
Standby Input Current	Nominal Vin	---	---	5	mA

Environmental Specifications

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

Power Derating Curve

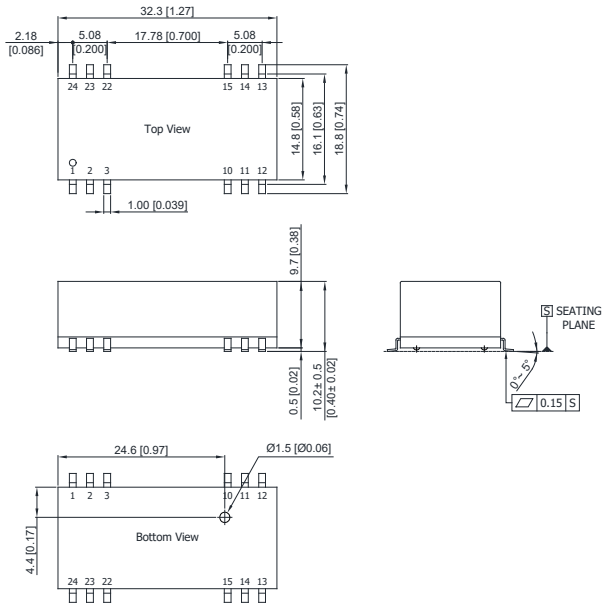


Notes

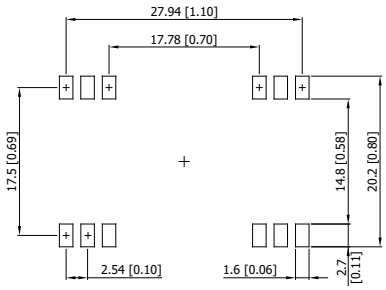
1 Specifications typical at Ta=+25℃, resistive load, nominal input voltage and rated output current unless otherwise noted.
2 Transient recovery time is measured to within 1% error band for a step change in output load of 75% to 100%.
3 These power converters require a minimum output loading to maintain specified regulation, operation under no-load conditions will not damage these 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
1,2	-Vin	-Vin
3	Remote On/Off	Remote On/Off
10	NC	Common
11,14,22	NC	NC
12	NC	-Vout
13	+Vout	+Vout
15	-Vout	Common
23,24	+Vin	+Vin

NC : No Connection

Physical Characteristics

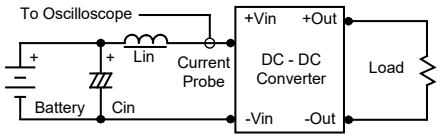
Case Size	:	32.3x14.8x10.2mm (1.27x0.58x0.4 inches)
Case Material	:	Plastic resin (flammability to UL 94V-0 rated)
Pin Material	:	Phosphor Bronze
Weight	:	8.8g

Order Code Table	
Standard	For water-washable process
MSIW2021	MSIW2021-W
MSIW2022	MSIW2022-W
MSIW2023	MSIW2023-W
MSIW2024	MSIW2024-W
MSIW2025	MSIW2025-W
MSIW2026	MSIW2026-W
MSIW2027	MSIW2027-W
MSIW2031	MSIW2031-W
MSIW2032	MSIW2032-W
MSIW2033	MSIW2033-W
MSIW2034	MSIW2034-W
MSIW2035	MSIW2035-W
MSIW2036	MSIW2036-W
MSIW2037	MSIW2037-W

Test Setup

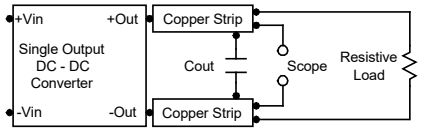
Input Reflected-Ripple Current Test Setup

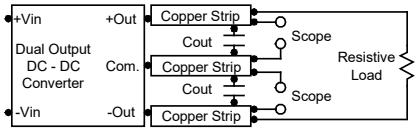
Input reflected-ripple current is measured with a inductor Lin (4.7μH) and Cin (220μF, ESR < 1.0Ω at 100 kHz) to simulate source impedance.
Capacitor Cin, offsets possible battery impedance. Current ripple is measured at the input terminals of the module, measurement bandwidth is 0-500 kHz.



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

Remote On/Off

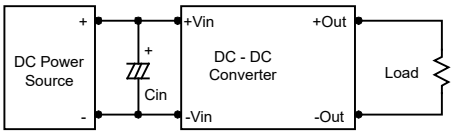
Positive logic remote on/off turns the module on during a logic high voltage on the remote on/off pin, and off during a logic low. To turn the power module on and off, the user must supply a switch to control the voltage between the on/off terminal and the -Vin terminal. The switch can be an open collector or equivalent.
A logic low is -0.7V to 0.8V. A logic high is 2.5V to 5.5V.
The maximum sink current of the switch at on/off terminal during a logic low is -400 μA. The maximum sink current of the switch at on/off terminal during a logic high is -400μA or open.

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.

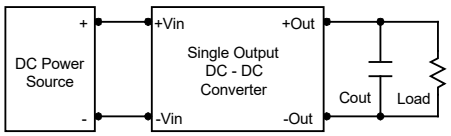
Input Source Impedance

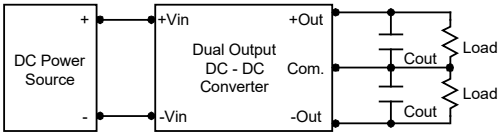
The power module should be connected to a low ac-impedance input source. Highly inductive source impedances can affect the stability of the power module.
In applications where power is supplied over long lines and output loading is high, it may be necessary to use a capacitor at the input to ensure startup.
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 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 MSIW2000 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 180uF maximum capacitive load for dual outputs and 3000μF 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 100°C. The derating curves are determined from measurements obtained in a test setup.