FEATURES

- ▶ **Very Compact SMD Package**
- ▶ **Ultra-wide 4:1 Input Voltage Range**
- ▶ **Fully Regulated Output Voltage**
- ▶ **I/O Isolation 1500VDC**
- ▶ **Wide Operating Ambient Temp. Range**
- ▶ **No Min. Load Requirement**
- ▶ **Under-voltage, Overload and Short Circuit Protection**
- ▶ **Remote On/Off Control**
- ▶ **EMI Emission EN 55032 Class A Approved**
- ▶ **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 62368-1(60950-1) Safety Approval & CE Marking**

c UL us
UL 62368-1
UL 60950-1
CE

CONFLICT FREE MINERALS POLICY
3 YEAR WARRANTY
RoHS Compliant

PRODUCT OVERVIEW

The MINMAX MSCWI03 series is a range of isolated 3W DC-DC converter modules features ultra-wide input voltage ranges and fully regulated output voltage. The product come in a SMD package with very small footprint occupying only 0.3 in^2 (0.2 cm^2) of PCB space. The converters are qualified to withstand lead free reflow processes according to IPC J-STD-020D.1 standard. High efficiency allows wide operating temperatures range to ensure stability across various conditions. Further features include under-voltage protection, overload protection, short circuit protection, no min. load requirement and remote ON/OFF. These DC-DC converters offer the best solution for many space critical applications in battery-powered equipment, instrumentation, distributed power architectures in communication and industrial electronics.

Model Selection Guide

Model Number	Input Voltage (Range)	Output Voltage	Output Current	Input Current		Max. capacitive Load	Efficiency (typ.)
			Max.	@Max. Load	@No Load		@Max. Load
	VDC	VDC	mA	mA(typ.)	mA(typ.)	μF	%
MSCWI03-05S05	5 (4.5 ~ 12)	5	600	741	40	1680	81
MSCWI03-05S12		12	250	714		820	84
MSCWI03-05S15		15	200	714		680	84
MSCWI03-05S24		24	125	714		390	84
MSCWI03-05D12		±12	±125	723		470#	83
MSCWI03-05D15		±15	±100	723		330#	83
MSCWI03-24S05	24 (9 ~ 36)	5	600	156	20	1680	80
MSCWI03-24S12		12	250	147		820	85
MSCWI03-24S15		15	200	147		680	85
MSCWI03-24S24		24	125	147		390	85
MSCWI03-24D12		±12	±125	149		470#	84
MSCWI03-24D15		±15	±100	149		330#	84
MSCWI03-48S05	48 (18 ~ 75)	5	600	78	13	1680	80
MSCWI03-48S12		12	250	74		820	84
MSCWI03-48S15		15	200	74		680	84
MSCWI03-48S24		24	125	74		390	85
MSCWI03-48D12		±12	±125	75		470#	83
MSCWI03-48D15		±15	±100	76		330#	82

For each output

Input Specifications

Parameter	Conditions / Model	Min.	Typ.	Max.	Unit
Input Surge Voltage (1 sec. max.)	5V Input Models	-0.7	---	15	VDC
	24V Input Models	-0.7	---	50	
	48V Input Models	-0.7	---	100	
Start-Up Threshold Voltage	5V Input Models	---	---	4.5	
	24V Input Models	---	---	9	
	48V Input Models	---	---	18	
Start-Up Time (Power On)	Nominal Vin and Constant Resistive Load	---	---	30	ms
Short Circuit Input Power	All Models	---	---	1500	mW
Input Filter		Internal Pi Type			

Remote On/Off Specifications

Parameter	Conditions	Min.	Typ.	Max.	Unit
Converter On	Under 0.6 VDC or Open Circuit				
Converter Off	4.7 to 15 VDC				
Standby Input Current	Nominal Vin	---	---	3	mA

Output Specifications

Parameter	Conditions	Min.	Typ.	Max.	Unit
Output Voltage Setting Accuracy		---	---	±1.0	%Vnom.
Output Voltage Balance	Dual Output, Balanced Loads	---	---	±2.0	%
Line Regulation	Vin=Min. to Max. @Full Load	---	---	±0.5	%
Load Regulation	Io=0% to 100%	---	---	±1.0	%
Load Cross Regulation (Dual Output)	Asymmetrical Load 25/100% Full Load	---	---	±5.0	%
Minimum Load	No minimum Load Requirement				
Ripple & Noise	0-20 MHz Bandwidth	---	---	50	mV_{P-P}
Transient Recovery Time	25% Load Step Change	---	250	---	μs
Transient Response Deviation		---	±3	±5	%
Temperature Coefficient		---	---	±0.02	%/℃
Over Load Protection	Foldback	---	160	---	%
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	---	500	---	pF
Switching Frequency		100	---	---	kHz
MTBF(calculated)	MIL-HDBK-217F@25℃, Ground Benign	5,086,000	---	---	Hours
Moisture Sensitivity Level (MSL)	IPC/JEDEC J-STD-020D.1	Level 2			
Safety Approvals	UL/cUL 60950-1 recognition(UL certificate), IEC/EN 60950-1(CB-report)				
	UL/cUL 62368-1 recognition(UL certificate), IEC/EN 62368-1(CB-report)				

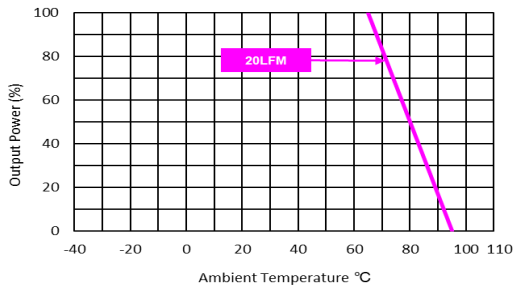
EMC Specifications

Parameter	Standards & Level			Performance
EMI	Conduction	EN 55032	Without external components	Class A
	Radiation			
EMS(4)	EN 55035			
	ESD	EN 61000-4-2 Air ± 8kV, Contact ± 6kV		A
	Radiated immunity	EN 61000-4-3 10V/m		A
	Fast transient	EN 61000-4-4 ±2kV		A
	Surge	EN 61000-4-5 ±1kV		A
	Conducted immunity	EN 61000-4-6 10Vrms		A
	PFMF	EN 61000-4-8 3A/m		A

Environmental Specifications

Parameter	Min.	Max.	Unit
Operating Ambient Temperature Range (See Power Derating Curve)	-40	+80	℃
Case Temperature	---	+95	℃
Storage Temperature	-55	+125	℃
Humidity (non condensing)	---	95	% rel. H
Lead-free reflow solder process	IPC/JEDEC J-STD-020D.1		

Power Derating Curve

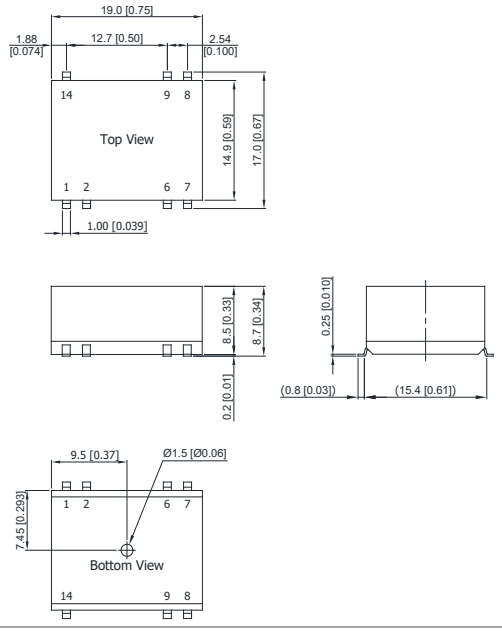


Notes

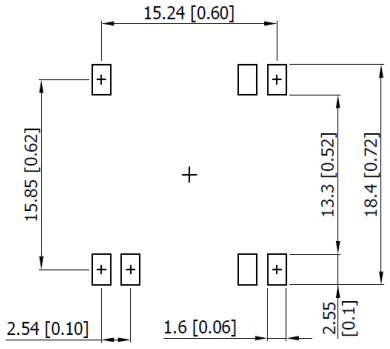
1 Specifications typical at Ta=+25℃, resistive load, nominal input voltage, rated output current unless otherwise noted.
2 We recommend to protect the converter by a slow blow fuse in the input supply line.
3 Other input and output voltage may be available, please contact MINMAX.
4 The external components might be required to meet EMS standard for some of test items. Please contact MINMAX for the solution in detail.
5 Specifications are subject to change without notice.
6 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±0.5 (X.XX±0.02)
  X.XX±0.25 (X.XXX±0.01)
- Pins ±0.05(±0.002)

Pin Connections

Pin	Single Output	Dual Output
1	-Vin	-Vin
2	Remote On/Off	Remote On/Off
6	NC	Common
7	NC	-Vout
8	+Vout	+Vout
9	-Vout	Common
14	+Vin	+Vin

NC: No Connection

Physical Characteristics

Case Size	:	19.0x14.9x8.5mm (0.75x0.59x0.33 inches)
Case Material	:	Plastic resin (flammability to UL 94V-0 rated)
Pin Material	:	Phosphor Bronze
Weight	:	3.5g

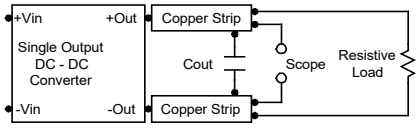
Order Code Table

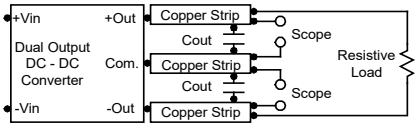
Standard	For cleaning-washable process
MSCWI03-05S05	MSCWI03-05S05-W
MSCWI03-05S12	MSCWI03-05S12-W
MSCWI03-05S15	MSCWI03-05S15-W
MSCWI03-05S24	MSCWI03-05S24-W
MSCWI03-05D12	MSCWI03-05D12-W
MSCWI03-05D15	MSCWI03-05D15-W
MSCWI03-24S05	MSCWI03-24S05-W
MSCWI03-24S12	MSCWI03-24S12-W
MSCWI03-24S15	MSCWI03-24S15-W
MSCWI03-24S24	MSCWI03-24S24-W
MSCWI03-24D12	MSCWI03-24D12-W
MSCWI03-24D15	MSCWI03-24D15-W
MSCWI03-48S05	MSCWI03-48S05-W
MSCWI03-48S12	MSCWI03-48S12-W
MSCWI03-48S15	MSCWI03-48S15-W
MSCWI03-48S24	MSCWI03-48S24-W
MSCWI03-48D12	MSCWI03-48D12-W
MSCWI03-48D15	MSCWI03-48D15-W

Test Setup

Peak-to-Peak Output Noise Measurement Test

Refer to the output specifications or add 4.7μF capacitor if the output specifications undefine Cout. 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

Only one type of remote ON/OFF control is available for MSCWI03. The module will turn on during the ON/OFF pin open or high impedance between ON/OFF pin and -Vin pin. The module will turn off if the ON/OFF pin is applied with a current of 2~4mA.

Maximum Capacitive Load

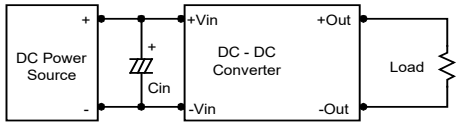
The MSCWI03 series has limitation of maximum connected capacitance at the output. The power module may be operated in current limiting mode during start-up, affecting the ramp-up and the startup time. The maximum capacitance can be found in the data sheet.

Overload 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.

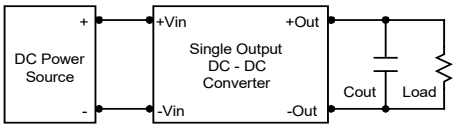
Input Source Impedance

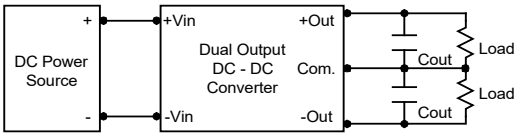
The power module should be connected to a low ac-impedance input source. Highly inductive source impedances can affect the stability of the power module. In applications where power is supplied over long lines and output loading is high, it may be necessary to use a capacitor at the input to ensure startup.
Capacitor mounted close to the power module helps ensure stability of the unit, it is commended to use a good quality low Equivalent Series Resistance (ESR < 1.0Ω at 100 kHz) capacitor of a 4.7μF for the 5V input devices and a 2.2μF for the 24V and 48V devices.

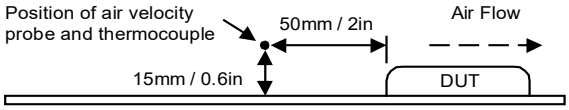


Output Ripple Reduction

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.





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 95℃. The derating curves are determined from measurements obtained in a test setup.