FEATURES

- Compact SMD Package
- Ultra-wide 4:1 Input Voltage Range
- Fully Regulated Output Voltage
- I/O Isolation 1500 VDC
- Operating Ambient Temp. Range -40℃ to +80℃
- Under-voltage, Overload and Short Circuit Protection
- Remote On/Off Control
- Cleaning-washable Process Available(option)
- Qualified for Lead-free Reflow Solder Process According to IPC/JEDECJ-STD-020D.1
- Tape & Reel Package Available
- UL/cUL/IEC/EN 62368-1(60950-1) Safety Approval

CSA 60950-1 UL 62368-1 CB Scheme

PRODUCT OVERVIEW

Minmax's MSDWI03 series power modules are in mini-SMD DC-DC converters that operate over input voltage ranges of 9-36VDC and 18-75VDC which provide precisely regulated output voltages of 3.3V, 5V, 12V, 15V, 24V, ±5V, ±12V and ±15VDC. Pin compatible with the MDW1000 series, the MDWI03 offers a power rating up to 3W and a typical full-load efficiency of 80%, under-voltage, over load/short circuit protection and remote on/off control.
The MSDWI03 series is an excellent selection for data communication equipment, mobile battery driven equipment, distributed power system, telecommunication equipment, mixed analog/digital subsystem, process/machine control equipment, computer peripheral equipment and industrial robot system.

Model Selection Guide

Model Number	Input Voltage (Range)	Output Voltage	Output Current		Input Current		Max. capacitive Load	Efficiency (typ.)
			Max.	Min.	@Max. Load	@No Load		@Max. Load
	VDC	VDC	mA	mA	mA(typ.)	mA(typ.)	μF	%
MSDWI03-24S033	24 (9 ~ 36)	3.3	600	90	110	30	220	75
MSDWI03-24S05		5	600	90	160		220	78
MSDWI03-24S12		12	250	38	156		47	80
MSDWI03-24S15		15	200	30	156		47	80
MSDWI03-24S24		24	125	19	156		47	80
MSDWI03-24D05		±5	±300	±45	162		47#	77
MSDWI03-24D12		±12	±125	±19	156		47#	80
MSDWI03-24D15		±15	±100	±15	156		47#	80
MSDWI03-48S033	48 (18 ~ 75)	3.3	600	90	55	20	220	75
MSDWI03-48S05		5	600	90	80		220	78
MSDWI03-48S12		12	250	38	78		47	80
MSDWI03-48S15		15	200	30	78		47	80
MSDWI03-48S24		24	125	19	78		47	80
MSDWI03-48D05		±5	±300	±45	81		47#	77
MSDWI03-48D12		±12	±125	±19	78		47#	80
MSDWI03-48D15		±15	±100	±15	78		47#	80

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 Threshold 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
Input Filter		Internal Pi Type			
Conducted EMI		Compliance to EN 55022, class A			

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				
Control Input Current (on)	Vctrl = Min. to Max.	---	---	-400	μA
Control Input Current (off)	Vctrl = Min. to Max.	---	---	-400	μA
Control Common	Referenced to Negative Input				
Standby Input Current	Nominal Vin	---	---	5	mA

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	---	±0.5	±1.0	%
Load Regulation	Io=15% to 100%	---	±0.5	±1.2	%
Ripple & Noise	0-20 MHz Bandwidth	---	---	100	mV_{P-P}
Transient Recovery Time	25% Load Step Change	---	300	600	μsec
Transient Response Deviation		---	±3	---	%
Temperature Coefficient		---	±0.01	±0.02	%/℃
Over Load Protection	Foldback	110	150	---	%
Short Circuit Protection	Continuous, Automatic Recovery				

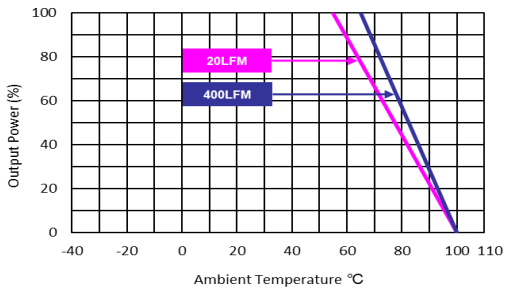
General Specifications

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	---	350	500	pF
Switching Frequency		---	350	---	kHz
MTBF (calculated)	MIL-HDBK-217F@25℃, Ground Benign	300,000			Hours
Moisture Sensitivity Level (MSL)	IPC/JEDEC J-STD-020D.1	Level 2			
Safety Approvals	UL/cUL 62368-1 recognition(UL certificate), IEC/EN 62368-1 & 60950-1(CB-report)				

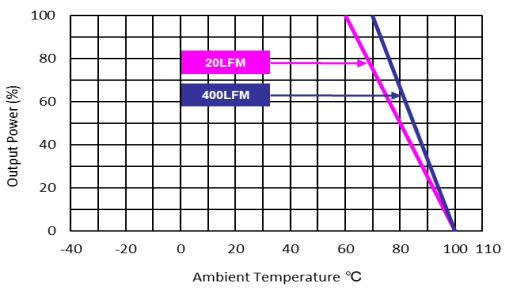
Environmental Specifications

Parameter	Min.	Max.	Unit
Operating Ambient Temperature Range (See Power Derating Curve)	-40	+80	℃
Case Temperature	---	+105	℃
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



(3.3 & 5V Output)



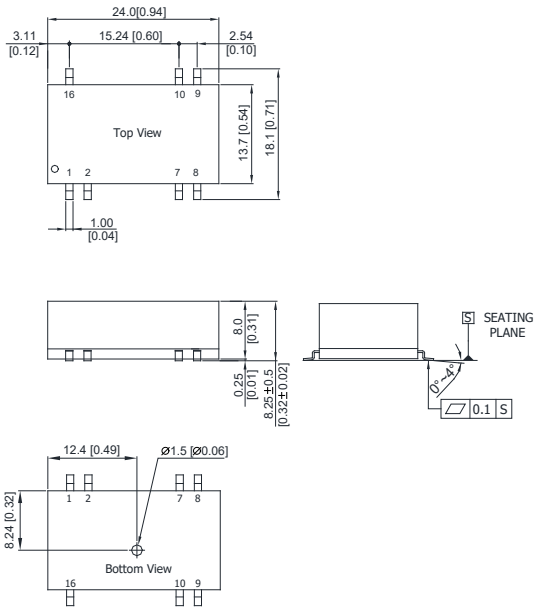
(all other output)

Notes

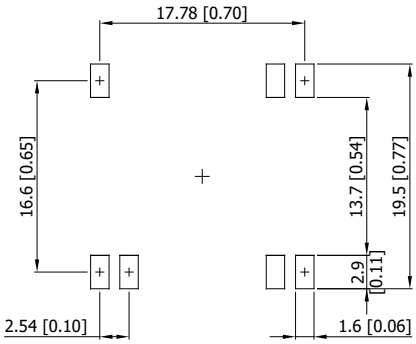
1. Specifications typical at Ta=+25℃, resistive load, nominal input voltage and rated output current unless otherwise noted.
2. Transient recovery time is measured to within 1% error band for a step change in output load of 75% to 100%.
3. These power converters require a minimum output loading to maintain 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 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
2	Remote On/Off	Remote On/Off
7	NC	NC
8	NC	Common
9	+Vout	+Vout
10	-Vout	-Vout
16	+Vin	+Vin

NC: No Connection

Physical Characteristics

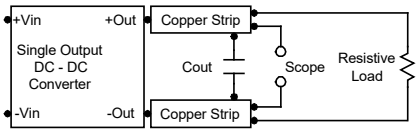
Case Size	:	24.0x13.7x8.0 mm (0.94x0.54x0.31 inches)
Case Material	:	Non-Conductive Black Plastic (flammability to UL 94V-0 rated)
Pin Material	:	Phosphor bronze with Tin Plate Over Nickel Subplate
Weight	:	4.2g

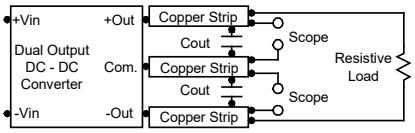
Order Code Table	
Standard	For cleaning-washable process
MSDWI03-24S033	MSDWI03-24S033-W
MSDWI03-24S05	MSDWI03-24S05-W
MSDWI03-24S12	MSDWI03-24S12-W
MSDWI03-24S15	MSDWI03-24S15-W
MSDWI03-24S24	MSDWI03-24S24-W
MSDWI03-24D05	MSDWI03-24D05-W
MSDWI03-24D12	MSDWI03-24D12-W
MSDWI03-24D15	MSDWI03-24D15-W
MSDWI03-48S033	MSDWI03-48S033-W
MSDWI03-48S05	MSDWI03-48S05-W
MSDWI03-48S12	MSDWI03-48S12-W
MSDWI03-48S15	MSDWI03-48S15-W
MSDWI03-48S24	MSDWI03-48S24-W
MSDWI03-48D05	MSDWI03-48D05-W
MSDWI03-48D12	MSDWI03-48D12-W
MSDWI03-48D15	MSDWI03-48D15-W

Test Setup

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

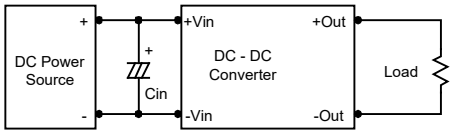
Positive logic remote on/off turns the module on during a logic high voltage on the remote on/off pin, and off during a logic low. To turn the power module on and off, the user must supply a switch to control the voltage between the on/off terminal and the -Vin terminal. The switch can be an open collector 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 -300 μA.
The maximum sink current of the switch at on/off terminal during a logic high is -200μA 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.

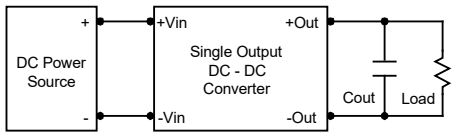
Input Source Impedance

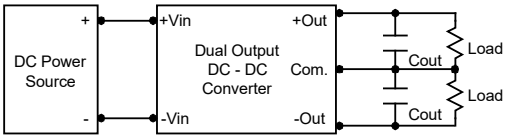
The power module should be connected to a low ac-impedance input source. Highly inductive source impedances can affect the stability of the power module.
In applications where power is supplied over long lines and output loading is high, it may be necessary to use a capacitor at the input to ensure startup.
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 MSDWI03 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.

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 105°C. The derating curves are determined from measurements obtained in a test setup.