FEATURES

- ▶ **Smallest Encapsulated 5W Converter**
- ▶ **Ultra-compact SIP-8 Package**
- ▶ **Ultra-wide 4 : 1 Input Voltage Range**
- ▶ **Fully Regulated Output Voltage**
- ▶ **I/O Isolation 1500 VDC**
- ▶ **Operating Ambient Temp. Range-40℃ to +75℃**
- ▶ **No Min. Load Requirement**
- ▶ **Under-Voltage, Overload and Short Circuit Protection**
- ▶ **Remote On/Off Control**
- ▶ **UL/cUL/IEC/EN 62368-1(60950-1) Safety Approval**

UL 62368-1 CSA 60950-1 CB Scheme

PRODUCT OVERVIEW

The MINMAX MCWI05 series is a range of isolated 5W DC-DC converter modules featuring fully regulated output voltages and ultra-wide 4:1 input voltage ranges. The converters come in a very small SIP-8 package which occupies only 2.0 cm2 of PCB space. An excellent efficiency allows operating temperatures up to +75°C. Further features include remote ON/OFF, under-voltage, overload and short circuit protection. The very 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		Max. capacitive Load	Efficiency (typ.)
			Max.	@Max. Load	@No Load		@Max. Load
	VDC	VDC	mA	mA(typ.)	mA(typ.)	μF	%
MCWI05-12S033	12 (4.5 ~ 18)	3.3	1075	389	60	1000	76
MCWI05-12S05		5	1000	514		1000	81
MCWI05-12S12		12	417	502		220	83
MCWI05-12S15		15	334	503		100	83
MCWI05-12S24		24	209	510		100	82
MCWI05-12D12		±12	±209	516		100#	81
MCWI05-12D15		±15	±167	509		47#	82
MCWI05-24S033	24 (9 ~ 36)	3.3	1075	194	30	1000	76
MCWI05-24S05		5	1000	257		1000	81
MCWI05-24S12		12	417	251		220	83
MCWI05-24S15		15	334	249		100	84
MCWI05-24S24		24	209	252		100	83
MCWI05-24D12		±12	±209	255		100#	82
MCWI05-24D15		±15	±167	255		47#	82
MCWI05-48S033	48 (18 ~ 75)	3.3	1075	97	20	1000	76
MCWI05-48S05		5	1000	130		1000	80
MCWI05-48S12		12	417	126		220	83
MCWI05-48S15		15	334	124		100	84
MCWI05-48S24		24	209	127		100	82
MCWI05-48D12		±12	±209	127		100#	82
MCWI05-48D15		±15	±167	126		47#	83

For each output

Input Specifications

Parameter	Conditions / Model	Min.	Typ.	Max.	Unit
Input Surge Voltage (1 sec. max.)	12V Input Models	-0.7	---	36	VDC
	24V Input Models	-0.7	---	50	
	48V Input Models	-0.7	---	100	
Start-Up Threshold Voltage	12V Input Models	---	---	4.5	
	24V Input Models	---	---	9	
	48V Input Models	---	---	18	
Under Voltage Shutdown	12V Input Models	---	---	4	
	24V Input Models	---	---	8.5	
	48V Input Models	---	---	17.5	
Short Circuit Input Power	All Models	---	---	2500	mW
Input Filter		Internal Capacitor			

Remote On/Off Control

Parameter	Conditions	Min.	Typ.	Max.	Unit
Converter On	Under 0.6 VDC or Open Circuit				
Converter Off	3.7 to 15 VDC				
Standby Input Current	Nominal Vin	---	---	3	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	---	±0.3	±0.5	%
Load Regulation	Io=0% to 100%	---	±0.5	±1.0	%
Minimum Load	No minimum Load Requirement				
Ripple & Noise	0-20 MHz Bandwidth	---	---	100	mV P-P
Transient Recovery Time	25% Load Step Change	---	500	---	µs
Transient Response Deviation		---	±3	±5	%
Temperature Coefficient		---	±0.01	±0.02	%/℃
Over Load Protection	Foldback	---	170	---	%
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	---	250	---	pF
Switching Frequency		100	---	---	kHz
MTBF (calculated)	MIL-HDBK-217F@25℃, Ground Benign	2,400,000			Hours
Safety Approvals	UL/cUL 60950-1 recognition (CSA certificate), IEC/EN 60950-1 (CB-report)				
	UL/cUL 62368-1 recognition (UL certificate), IEC/EN 62368-1 (CB-report)				

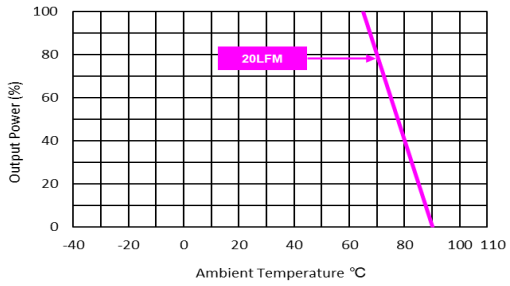
EMC Specifications

Parameter	Standards & Level			Performance
EMI(5)	Conduction	EN 55032	With external components	Class A
	Radiation			
EMS(5)	EN 55035			
	ESD	Direct discharge	Indirect discharge HCP & VCP	A
		EN 61000-4-2 Air ± 8kV	Contact ± 6kV	
	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 100A/m for Continuous; 1000 A/m for 1 s		A

Environmental Specifications

Parameter	Min.	Max.	Unit
Operating Ambient Temperature Range (See Power Derating Curve)	-40	+75	℃
Case Temperature	---	+90	℃
Storage Temperature Range	-55	+125	℃
Humidity (non condensing)	---	95	% rel. H
Lead Temperature (1.5mm from case for 10Sec.)	---	260	℃

Power Derating Curve

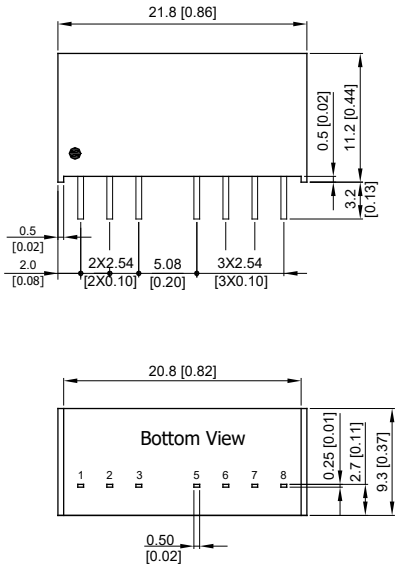


Notes

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 We recommend to protect the converter by a slow blow fuse in the input supply line.
4 Other input and output voltage may be available, please contact MINMAX.
5 The external components might be required to meet EMI/EMS standard for some of test items. Please contact MINMAX for the solution in detail.
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



Pin Connections

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

NC: No Connection

- All dimensions in mm (inches)
- Tolerance: X.X±0.5 (X.XX±0.02)
  X.XX±0.25 (X.XXX±0.01)
- Pins ±0.1(±0.004)

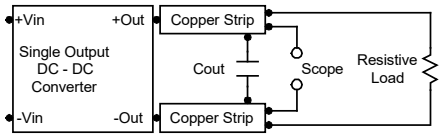
Physical Characteristics

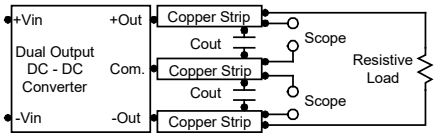
Case Size	:	21.8x9.3x11.2 mm (0.86x0.37x0.44 inches)
Case Material	:	Plastic resin (flammability to UL 94V-0 rated)
Pin Material	:	Phosphor Bronze
Weight	:	4.8g

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

Negative logic remote on/off turns the module off during a logic high voltage on the remote on/off pin, and on 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.
A logic high is 2~4mA current applied via 1Kohm resistor. A logic low is open circuit or high impedance.

Maximum Capacitive Load

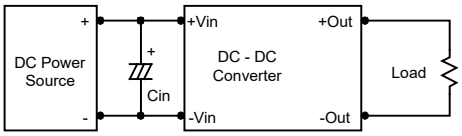
The MCWI05 series has limitation of maximum connected capacitance at the output. The power module may be operated in current limiting mode during start-up, affecting the ramp-up and the startup time. The maximum capacitance can be found in the data sheet.

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.

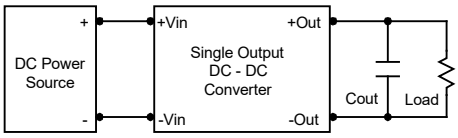
Input Source Impedance

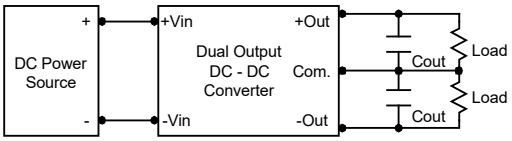
The power module should be connected to a low ac-impedance input source. Highly inductive source impedances can affect the stability of the power module. In applications where power is supplied over long lines and output loading is high, it may be necessary to use a capacitor at the input to ensure startup.
Capacitor mounted close to the power module helps ensure stability of the unit, it is commended to use a good quality low Equivalent Series Resistance (ESR < 1.0Ω at 100 kHz) capacitor of a 4.7μF for the 12V 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 105°C. The derating curves are determined from measurements obtained in a test setup.