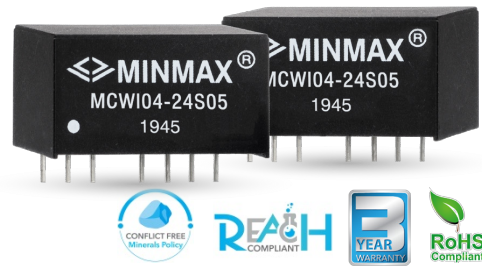


**FEATURES**

- ▶ Compact SIP-8 Package
- ▶ Ultra-wide 4:1 Input Voltage Range
- ▶ Fully Regulated Output Voltage
- ▶ I/O Isolation 1600 VDC
- ▶ Operating Ambient Temp. Range -40°C to +85°C
- ▶ No Min. Load Requirement
- ▶ Overload and Short Circuit Protection
- ▶ Remote On/Off Control
- ▶ UL/cUL/IEC/EN 62368-1 Safety Approval, CE Marking (Pending)

**NEW**

**PRODUCT OVERVIEW**

The MINMAX MCWI04 series is a range of isolated 4W 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 cm<sup>2</sup> of PCB space. An excellent efficiency allows operating temperatures up to +85°C. Further features include remote ON/OFF, 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 Power	Output Current		Input Current		Max. capacitive Load	Efficiency (typ.)
				Max.	@No Load	@Max. Load	@No Load		
				mA	mA(typ.)	mA(typ.)	mA(typ.)		
	VDC	VDC	W					μF	%
MCWI04-24S05	24 (9 ~ 36)	5	4	800	211	20	1800	79	
MCWI04-24S12		12	4	333	201		1000	83	
MCWI04-24S15		15	3.99	266	200		820	83	
MCWI04-24S24		24	3.98	166	200		470	83	
MCWI04-24D12		±12	3.98	±166	200		560#	83	
MCWI04-24D15		±15	3.99	±133	200		390#	83	
MCWI04-48S05	48 (18 ~ 75)	5	4	800	107	10	1800	78	
MCWI04-48S12		12	4	333	102		1000	82	
MCWI04-48S15		15	3.99	266	101		820	82	
MCWI04-48S24		24	3.98	166	101		470	82	
MCWI04-48D12		±12	3.98	±166	101		560#	82	
MCWI04-48D15		±15	3.99	±133	101		390#	82	

# For each output

**Input Specifications**

Parameter	Conditions / 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	---	---	9	
	48V Input Models	---	---	18	
Start-Up Time (Power On)	Nominal Vin and Constant Resistive Load	---	30	---	ms
Input Filter	All Models	Internal Capacitor			

**Remote On/Off Specifications**

Parameter	Conditions	Min.	Typ.	Max.	Unit
Converter On	Under 0.6 VDC or Open Circuit				
Converter Off	6 to 15VDC				
Standby Input Current	Nominal Vin	---	2.5	---	mA

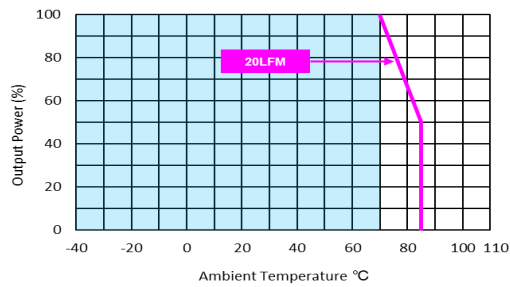
Output Specifications					
Parameter	Conditions	Min.	Typ.	Max.	Unit
Output Voltage Setting Accuracy		---	---	±1.0	%Vnom.
Output Voltage Balance	Dual Output, Balanced Loads	---	---	±2.0	%
Line Regulation	Vin=Min. to Max. @Full Load	---	---	±0.5	%
Load Regulation	Io=0% to 100%	---	---	±1.0	%
Load Cross Regulation (Dual Output)	Asymmetrical Load 25/100% Full Load	---	---	±5.0	%
Minimum Load	No minimum Load Requirement				
Ripple & Noise	0-20 MHz Bandwidth	---	---	80	mV <sub>P-P</sub>
Transient Recovery Time	25% Load Step Change	---	250	---	µsec
Transient Response Deviation		---	±3	±5	%
Temperature Coefficient		---	---	±0.02	%/°C
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	1600	---	---	VDC
	1 Second	1920	---	---	VDC
I/O Isolation Resistance	500 VDC	1000	---	---	MΩ
I/O Isolation Capacitance	100kHz, 1V	---	200	---	pF
Switching Frequency	PFM Mode	100	---	---	kHz
MTBF(calculated)	MIL-HDBK-217F@25°C, Ground Benign	2,859,569	---	---	Hours
Safety Approvals (Pending)	UL/cUL 62368-1 recognition(UL certificate), IEC/EN 62368-1 & 60950-1(CB report)				

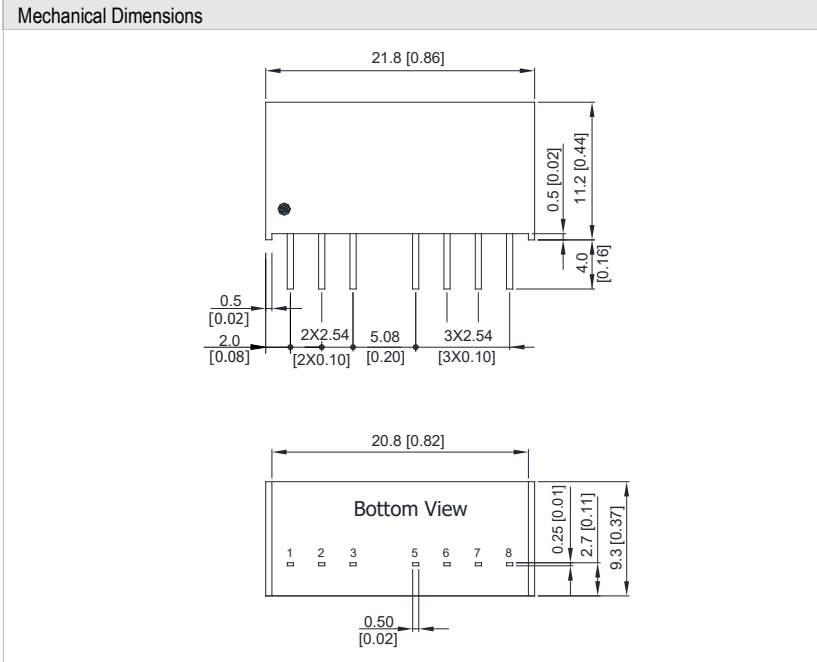
EMC Specifications				
Parameter	Standards & Level			Performance
EMI	Conduction	EN 55032	With external components	Class A <sub>(1)</sub>
	Radiation			
EMS	EN 55024, EN 55035			
	ESD	Direct discharge	Indirect discharge HCP & VCP	
		EN 61000-4-2 Air ± 8kV	Contact ± 6kV	
	Radiated immunity	EN 61000-4-3 10V/m		
	Fast transient <sup>(2)</sup>	EN 61000-4-4 ±2kV		
	Surge <sup>(2)</sup>	EN 61000-4-5 ±1kV		
	Conducted immunity	EN 61000-4-6 10Vrms		
PFMF	EN 61000-4-8 3A/m			

**Environmental Specifications**

Parameter	Min.	Max.	Unit
Operating Ambient Temperature Range (See Power Derating Curve)	-40	+85	°C
Case Temperature	---	+100	°C
Storage Temperature	-55	+125	°C
Humidity (non condensing)	---	95	% rel. H

**Power Derating Curve**

**Notes**

- 1 To meet EN 55032 Class A with an external filter, please contact MINMAX.
- 2 To meet EN 61000-4-4 & EN 61000-4-5 an external filter requested, please contact MINMAX.
- 3 Specifications typical at Ta=+25°C, resistive load, nominal input voltage, rated output current unless otherwise noted.
- 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.

**Package Specifications**


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)

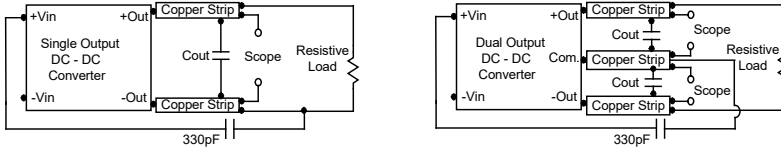
**Physical Characteristics**

Case Size	: 21.8x9.3x11.2 mm (0.86x0.37x0.44 inches)
Case Material	: Non-Conductive Black Plastic (flammability to UL 94V-0 rated)
Pin Material	: Tinned Copper
Weight	: 4.8g

## Test Setup

### Peak-to-Peak Output Noise Measurement Test

Use a  $C_{out}$  0.47 $\mu$ F 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. The switch can be an open collector or equivalent.

A logic high is 2.7V to 15V. A logic low is under 0.6 VDC or open circuit, drops down to 0VDC by 2mV/°C. The maximum sink current at on/off terminal during a logic low is 1 mA. The maximum allowable leakage current of the switch at on/off terminal= (under 0.6VDC or open circuit) is 1mA.

### Maximum Capacitive Load

The MCWI04 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.

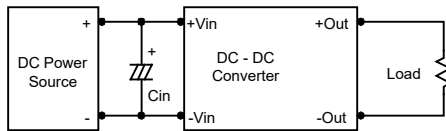
### Overcurrent Protection

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

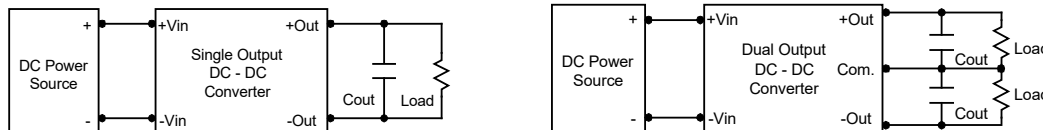
The power module should be connected to a low ac-impedance input source. Highly inductive source impedances can affect the stability of the power module. In applications where power is supplied over long lines and output loading is high, it may be necessary to use a capacitor at the input to ensure startup.

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 < 1.0 $\Omega$  at 100 kHz) capacitor of a 1.5 $\mu$ F 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 3.3 $\mu$ F 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.

