FEATURES

- ►Industrial Standard 2" X 1.6" Package
- ►Wide 2:1 Input Voltage Range
- ►Fully Regulated Output Voltage
- ►I/O Isolation 1500 VDC
- ►Operating Ambient Temp. Range -40℃ to +80℃
- ►Overload and Short Circuit Protection
- ►Remote On/Off Control, Output Voltage Trim
- ►Shielded Metal Case with Insulated Baseplate
- ►Designed-in Conducted EMI meets EN 55022 Class A
- ►UL/cUL/IEC/EN 60950-1 Safety Approval

CSA 60950-1
CB Scheme

PRODUCT OVERVIEW

The MINMAX MPW1000 series is a range of isolated 30W DC-DC converter modules featuring fully regulated output voltages and wide 2:1 input voltage ranges. The product comes in a 2"x 1.6"x 0.37" metal package with industry standard pinout. An excellent efficiency allows an operating temperature range of –40°C to +80°C (with derating).

Typical applications for these converters are battery operated equipment and instrumentation, distributed power systems, data communication and general industrial electronics.

Model Selection Guide

Model Number	Input Voltage (Range) VDC	Output Voltage VDC	Output Current Max. mA	Output Current Min. mA	Input Current @Max. Load mA(typ.)	Input Current @No Load mA(typ.)	Reflected Ripple Current mA (typ.)	Over Voltage Protection VDC	Max. capacitive Load µF	Efficiency (typ.) @Max. Load %
MPW1021	12 (9 ~ 18)	3.3	5500	400	1867	40	100	3.9	470	81
MPW1022		5	5000	350	2480			6.8		84
MPW1023		12	2500	166	2841			15		88
MPW1024		15	2000	133	2841			18		88
MPW1026		±12	±1250	±83	2841			±15	220#	88
MPW1027		±15	±1000	±65	2841			±18		88
MPW1031	24 (18 ~ 36)	3.3	5500	400	922	20	50	3.9	470	82
MPW1032		5	5000	350	1225			6.8		85
MPW1033		12	2500	166	1404			15		89
MPW1034		15	2000	133	1404			18		89
MPW1036		±12	±1250	±83	1404			±15	220#	89
MPW1037		±15	±1000	±65	1404			±18		89
MPW1041	48 (36 ~ 75)	3.3	5500	400	461	10	25	3.9	470	82
MPW1042		5	5000	350	613			6.8		85
MPW1043		12	2500	166	702			15		89
MPW1044		15	2000	133	702			18		89
MPW1046		±12	±1250	±83	702			±15	220#	89
MPW1047		±15	±1000	±65	702			±18		89

For each output

Input Specifications

Parameter	Model	Min.	Typ.	Max.	Unit
Input Surge Voltage (1 sec. max.)	12V Input Models	-0.7	---	25	VDC
	24V Input Models	-0.7	---	50	
	48V Input Models	-0.7	---	100	
Start-Up Threshold Voltage	12V Input Models	8.6	8.8	9	
	24V Input Models	17	17.5	18	
	48V Input Models	34	35	36	
Under Voltage Shutdown	12V Input Models	8.1	8.3	8.5	
	24V Input Models	16	16.5	17	
	48V Input Models	32	33	34	
Short Circuit Input Power	All Models	---	---	4500	mW
Input Filter		Internal LC Type			
Conducted EMI		Compliance to EN 55022, class A			

Remote On/Off Control

Parameter	Conditions	Min.	Typ.	Max.	Unit
Converter On	3.5V ~ 12V or Open Circuit				
Converter Off	0V ~ 1.2V or Short Circuit				
Control Input Current (on)	Vctrl = 5.0V	---	0.5	---	mA
Control Input Current (off)	Vctrl = 0V	---	-0.5	---	mA
Control Common	Referenced to Negative Input				
Standby Input Current	Nominal Vin	---	2.5	---	mA

Output Specifications

Parameter	Conditions	Min.	Typ.	Max.	Unit
Output Voltage Setting Accuracy		---	---	±1.0	%Vom.
Output Voltage Balance	Dual Output, Balanced Loads	---	±0.5	±2.0	%
Line Regulation	Vin=Min. to Max. @Full Load	---	±0.1	±0.3	%
Load Regulation	Io=10% to 100%	---	±0.1	±0.5	%
Ripple & Noise	0-20 MHz Bandwidth	---	55	80	mV P-P
Transient Recovery Time	25% Load Step Change	---	150	300	μsec
Transient Response Deviation		---	±2	±4	%
Temperature Coefficient		---	±0.01	±0.02	%/°C
Trim Up / Down Range	% of nominal output voltage	±9	±10	±11	%
Over Load Protection		110	---	160	%
Short Circuit Protection	Continuous, Automatic Recovery				

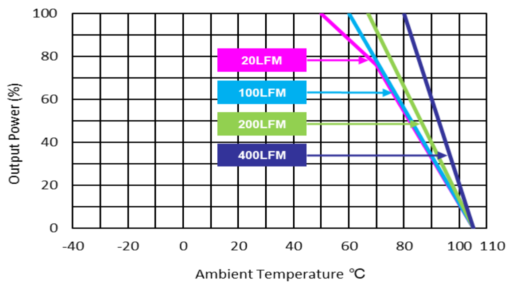
General Specifications

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	---	1200	1500	pF
Switching Frequency		290	330	360	kHz
MTBF(calculated)	MIL-HDBK-217F@25°C, Ground Benign	1,000,000			Hours
Safety Approvals	UL/cUL 60950-1 recognition (CSA certificate), IEC/EN 60950-1(CB-report)				

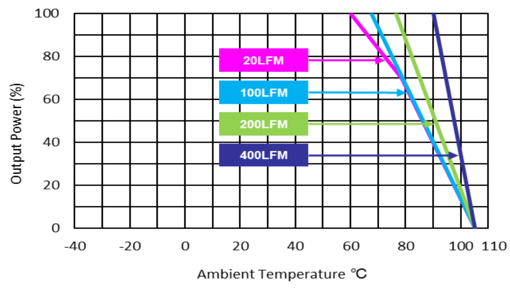
Environmental Specifications

Parameter	Min.	Max.	Unit
Operating Ambient Temperature Range (See Power Derating Curve)	-40	+80	°C
Case Temperature	---	+105	°C
Storage Temperature Range	-50	+125	°C
Humidity (non condensing)	---	95	% rel. H
Lead Temperature (1.5mm from case for 10Sec.)	---	260	°C

Power Derating Curve



Derating Curve without Heatsink



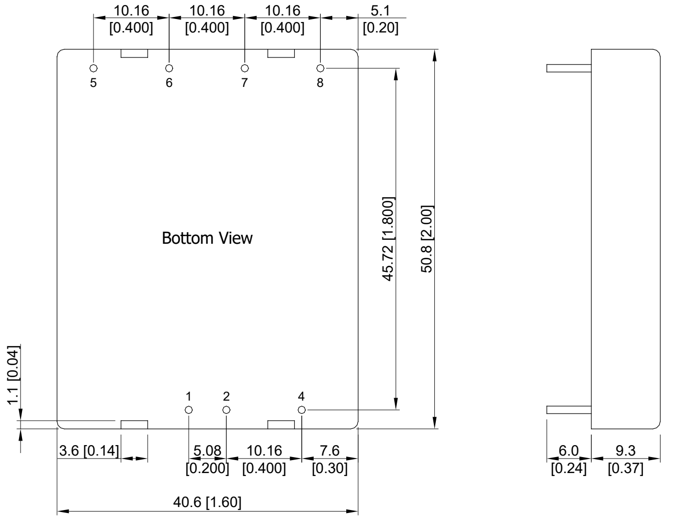
Derating Curve with Heatsink

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



Pin Connections

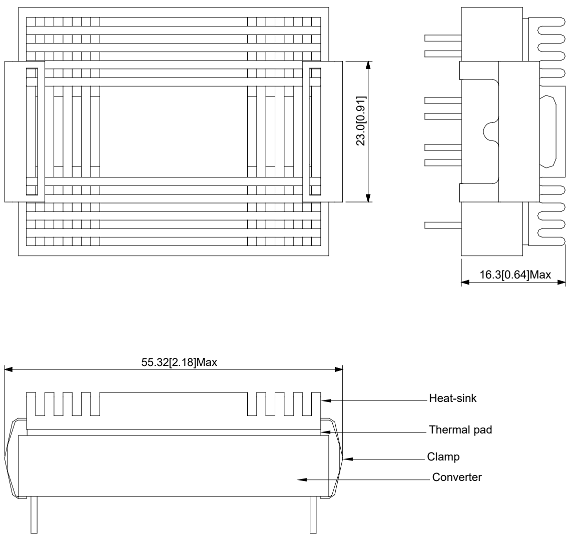
Pin	Single Output	Dual Output	Diameter mm (inches)
1	+Vin	+Vin	Ø 1.0 [0.04]
2	-Vin	-Vin	Ø 1.0 [0.04]
4	Remote On/Off	Remote On/Off	Ø 1.0 [0.04]
5	No Pin	+Vout	Ø 1.0 [0.04]
6	+Vout	Common	Ø 1.0 [0.04]
7	-Vout	-Vout	Ø 1.0 [0.04]
8	Trim	Trim	Ø 1.0 [0.04]

- ▶ All dimensions in mm (inches)
- ▶ Tolerance: X.X±0.5 (X.XX±0.01)
  X.XX±0.25 (X.XXX±0.005)
- ▶ Pin diameter tolerance: X.X±0.05 (X.XX±0.002)

Physical Characteristics

Case Size	:	50.8x40.6x9.3mm (2.0x1.6x0.37 inches)
Case Material	:	Metal With Non-Conductive Baseplate
Base Material	:	FR4 PCB (flammability to UL 94V-0 rated)
Pin Material	:	Copper Alloy
Weight	:	48g

Heatsink (Option H)



Physical Characteristics

Heatsink Material	:	Aluminum
Finish	:	Black Anodized Coating
Weight	:	15g

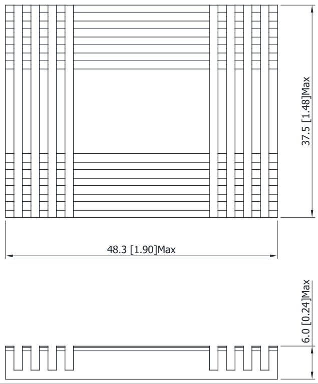
▶ The advantages of adding a heatsink are:

1. To improve heat dissipation and increase the stability and reliability of the DC-DC converters at high operating temperatures.
2. To increase operating temperature of the DC-DC converter, please refer to Derating Curve.

Order Code Table	
Standard	With heatsink
MPW1021	MPW1021H
MPW1022	MPW1022H
MPW1023	MPW1023H
MPW1024	MPW1024H
MPW1026	MPW1026H
MPW1027	MPW1027H
MPW1031	MPW1031H
MPW1032	MPW1032H
MPW1033	MPW1033H
MPW1034	MPW1034H
MPW1036	MPW1036H
MPW1037	MPW1037H
MPW1041	MPW1041H
MPW1042	MPW1042H
MPW1043	MPW1043H
MPW1044	MPW1044H
MPW1046	MPW1046H
MPW1047	MPW1047H

Order Code For Heatsink kit (including: Heatsink x1, Clamp x 2, Thermal Pad x1)

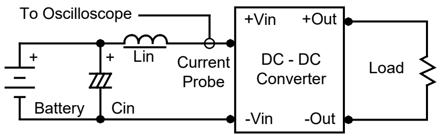
HS-P001



Test Setup

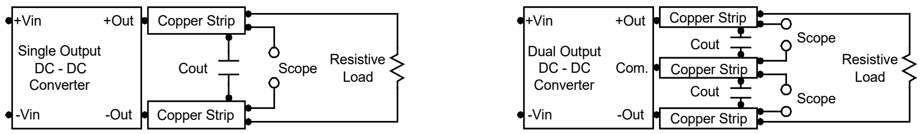
Input Reflected-Ripple Current Test Setup

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 1μF ceramic capacitor and a 10μF tantalum 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

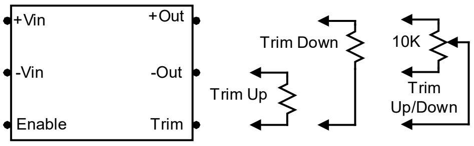
Positive logic remote on/off turns the module on during a logic high voltage on the remote on/off pin, and off during a logic low. To turn the power module on and off, the user must supply a switch to control the voltage between the on/off terminal and the -Vin terminal. The switch can be an open collector or equivalent.

A logic low is -1V to 1.0V. A logic high is 2.5V to 100V.

The maximum sink current at the on/off terminal (Pin 4) during a logic low is -100 μA. The maximum allowable leakage current of a switch connected to the on/off terminal (Pin 4) at logic hight (2.5V to 100V) is 5μA.

Output Voltage Trim

Output voltage trim allows the user to increase or decrease the output voltage set point of a module. The output voltage can be adjusted by placing an external resistor (Radj) between the Trim and +Vout or -Vout terminals. By adjusting Radj, the output voltage can be change by ±10% of the nominal output voltage.



A 10K, 1 or 10 Turn trimpot is usually specified for continuous trimming. Trim pin may be safely left floating if it is not used.

Connecting the external resistor (Radj-up) between the Trim and -Vout pins increases the output voltage to set the point as defined in the following equation:

$$Radj-up = \frac{(33 \times Vout) - (30 \times Vadj)}{Vadj - Vout}$$

Connecting the external resistor (Radj-down) between the Trim and +Vout pins decreases the output voltage set point as defined in the following equation:

$$Radj-down = \frac{(36.667 \times Vadj) - (33 \times Vout)}{Vout - Vadj}$$

Vout: Nominal Output Voltage

Vadj: Adjusted Output Voltage

Units: VDC/kΩ

Overcurrent Protection

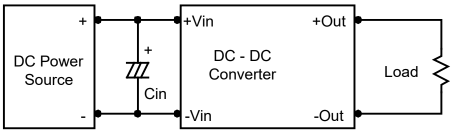
To provide protection in a fault (output overload) condition, the unit is equipped with internal current limiting circuitry and can endure current limiting for an unlimited duration. At the point of current-limit inception, the unit shifts from voltage control to current control. The unit operates normally once the output current is brought back into its specified range.

Overvoltage Protection

The output overvoltage clamp consists of control circuitry, which is independent of the primary regulation loop, that monitors the voltage on the output terminals. The control loop of the clamp has a higher voltage set point than the primary loop. This provides a redundant voltage control that reduces the risk of output overvoltage. The OVP level can be found in the output data.

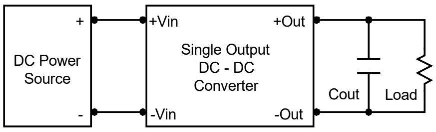
Input Source Impedance

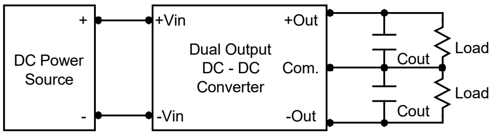
The power module should be connected to a low ac-impedance input source. Highly inductive source impedances can affect the stability of the power module. In applications where power is supplied over long lines and output loading is high, it may be necessary to use a capacitor at the input to ensure startup. 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 33µF for the 12V input devices and a 10µF 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 4.7µF capacitors at the output.





Maximum Capacitive Load

The MPW1000 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.