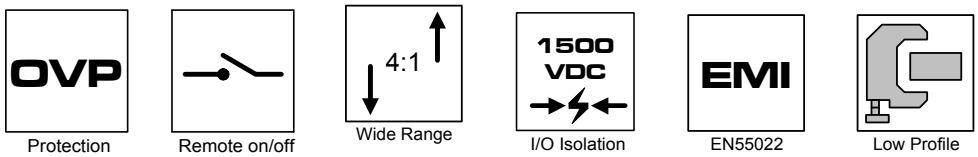
MPW2100 Series

20W, Wide Input Range, Single & Dual Output DC/DC Converters



Key Features

- *Efficiency up to 87%*
- *1500VDC Isolation*
- *MTBF > 1,000,000 Hours*
- *Complies with EN55022 Class A*
- *Six−Sided Shielding*
- *Remote On/Off Control*
- *Over Voltage Protection*
- *Output Trim*
- *Low Profile: 0.37" (9.3mm)*
- *Soft Start*



Minmax's MPW2100−Series power modules are low−profile dc−dc converters that operate over input voltage ranges of 10−40VDC and 18−75VDC which provide precisely regulated output voltages of 3.3V, 5V, 12V, 15V, ±12V and ±15VDC, specially addressing data communication equipments, mobile battery driven equipments, distributed power systems, telecommunication equipments, mixed analog/digital subsystems, process/machine control equipments, computer peripheral systems and industrial robot systems.

Packing up to 20W of power into a 2x1.6x0.37inch package, with efficiencies as high as 87%, the MPW2100 includes continuous short circuit protection, overvoltage protection, output trim function, remote on/off, six−sided shielded case and EN55022 Class A conducted noise compliance minimize design−in time, cost and eliminate the need for external filtering.

Absolute Maximum Ratings

Parameter		Min.	Max.	Unit
Input Surge Voltage (1000 mS)	24VDC Input Models	−0.7	50	VDC
	48VDC Input Models	−0.7	100	VDC
Lead Temperature (1.5mm from case for 10 Sec.)		−−−	260	℃
Internal Power Dissipation		−−−	4500	mW

Exceeding the absolute maximum ratings of the unit could cause damage. These are not continuous operating ratings.

Environmental Specifications

Parameter	Conditions	Min.	Max.	Unit
Operating Temperature	Ambient	−40	+65	℃
Operating Temperature	Case	−40	+105	℃
Storage Temperature		−50	+125	℃
Humidity		−−−	95	%
Cooling	Free−Air Convection			
RFI	Six−Sided Shielded, Metal Case			
Conducted EMI	EN55022 Class A			

Model Selection Guide

Model Number	Input Voltage	Output Voltage	Output Current		Input Current		Reflected Ripple Current	Over Voltage Protection	Efficiency
			Max.	Min.	@Max. Load	@No Load			@Max. Load
	VDC	VDC	mA	mA	mA (Typ.)	mA (Typ.)	mA (Typ.)	VDC	% (Typ.)
MPW2131	24 (10 ~ 40)	3.3	4000	240	688	20	50	3.9	80
MPW2132		5	4000	240	1004			6.8	83
MPW2133		12	1670	100	960			15	87
MPW2134		15	1340	80	962			18	87
MPW2136		±12	±835	±50	960			±15	87
MPW2137		±15	±670	±40	962			±18	87
MPW2141	48 (18 ~ 75)	3.3	4000	240	344	10	25	3.9	80
MPW2142		5	4000	240	502			6.8	83
MPW2143		12	1670	100	480			15	87
MPW2144		15	1340	80	481			18	87
MPW2146		±12	±835	±50	480			±15	87
MPW2147		±15	±670	±40	481			±18	87

Capacitive Load

Models by Vout	3.3V	5V	12V	15V	±12V #	±15V #	Unit
Maximum Capacitive Load	5000	5000	500	500	330	330	uF

 # For each output

Input Fuse Selection Guide

24V Input Models	48V Input Models
5000mA Slow − Blow Type	3000mA Slow − Blow Type

Input Specifications

Parameter	Model	Min.	Typ.	Max.	Unit
Start Voltage	24V Input Models	9.4	9.7	10	VDC
	48V Input Models	17	17.5	18	
Under Voltage Shutdown	24V Input Models	9	9.3	9.5	
	48V Input Models	16	16.5	17	
Reverse Polarity Input Current	All Models	---	---	2	A
Short Circuit Input Power		---	---	4500	mW
Input Filter		Pi Filter			

Output Specifications

Parameter	Conditions	Min.	Typ.	Max.	Unit
Output Voltage Accuracy		---	±0.5	±1.0	%
Output Voltage Balance	Dual Output, Balanced Loads	---	±0.5	±2.0	%
Line Regulation	Vin=Min. to Max.	---	±0.2	±0.5	%
Load Regulation	Io=50% to 100%	---	±0.3	±1.0	%
Ripple & Noise (20MHz)		---	55	80	mV P-P
Ripple & Noise (20MHz)	Over Line, Load & Temp.	---	---	100	mV P-P
Ripple & Noise (20MHz)		---	---	10	mV rms
Over Power Protection		120	---	220	%
Transient Recovery Time	25% Load Step Change	---	150	300	uS
Transient Response Deviation		---	±2	±4	%
Temperature Coefficient		---	±0.01	±0.02	%/°C
Output Short Circuit	Continuous				

General Specifications

Parameter	Conditions	Min.	Typ.	Max.	Unit
Isolation Voltage Rated	60 Seconds	1500	---	---	VDC
Isolation Voltage Test	Flash Tested for 1 Second	1650	---	---	VDC
Isolation Resistance	500VDC	1000	---	---	MΩ
Isolation Capacitance	100KHz,1V	---	1200	1500	pF
Switching Frequency		290	330	360	KHz
MTBF	MIL-HDBK-217F @ 25°C, Ground Benign	1000	---	---	K Hours

Remote On/Off Control

Parameter	Conditions	Min.	Typ.	Max.	Unit
Supply On	2.5 to 50VDC or Open Circuit				VDC
Supply Off		-1	---	1	VDC
Device Standby Input Current		---	2	5	mA
Control Input Current (on)	Vin -RC = 5.0V	---	---	5	uA
Control Input Current (off)	Vin -RC = 0V	---	---	-100	uA
Control Common	Referenced to Negative Input				

Output Voltage Trim

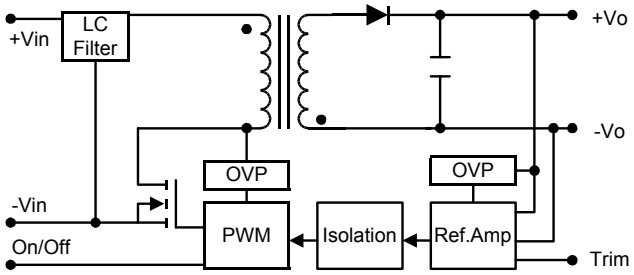
Parameter	Conditions	Min.	Typ.	Max.	Unit
Trim Up / Down Range	% of nominal output voltage	±9.0	±10.0	±11.0	%

Notes1:

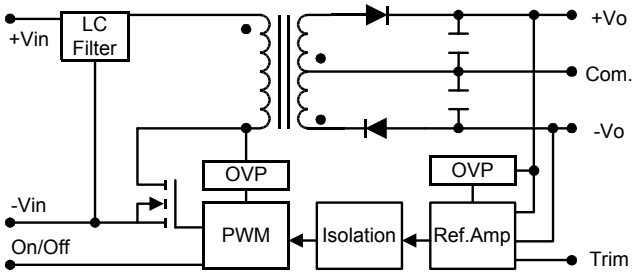
1. Specifications typical at Ta=+25°C, resistive load, nominal input voltage, rated output current unless otherwise noted.
2. Transient recovery time is measured to within 1% error band for a step change in output load of 75% to 100%.
3. Ripple & Noise measurement bandwidth is 0-20 MHz.
4. These power converters require a minimum output loading to maintain specified regulation.
5. Operation under no-load conditions will not damage these modules; however, they may not meet all specifications listed.
6. All DC/DC converters should be externally fused at the front end for protection.
7. Other input and output voltage may be available, please contact factory.
8. Specifications subject to change without notice.

Block Diagram

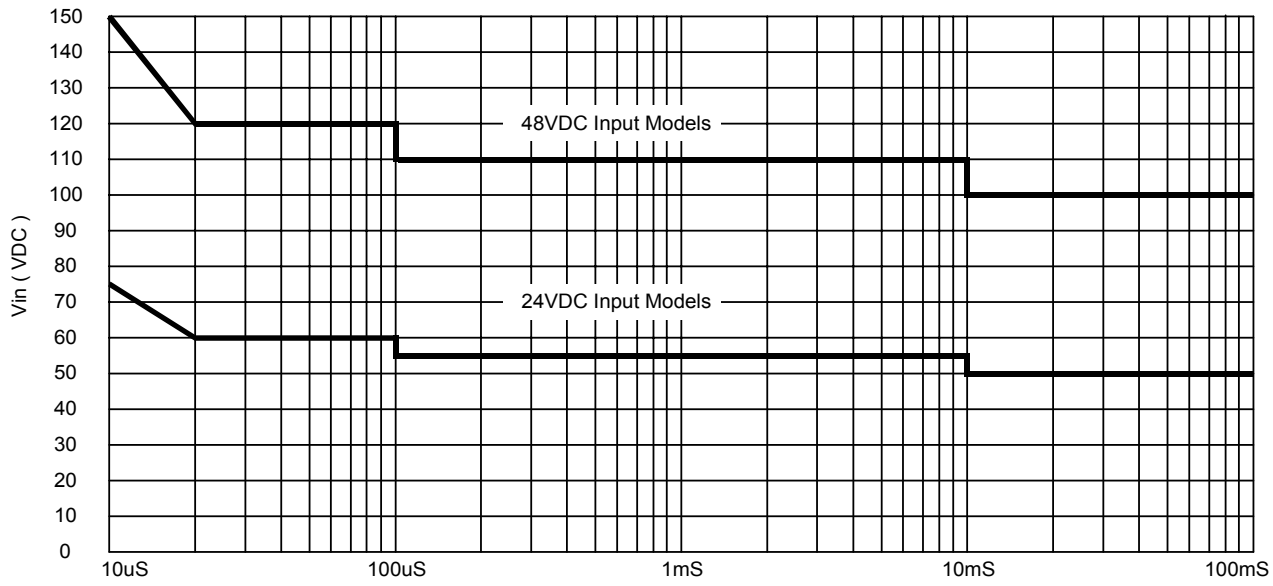
Single Output

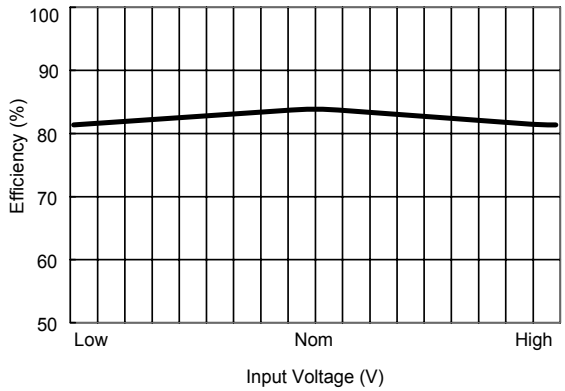


Dual Output

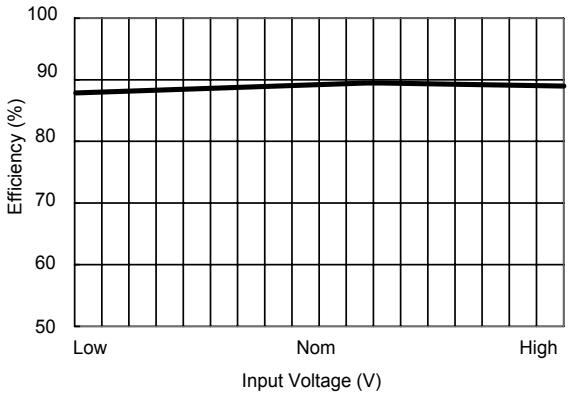


Input Voltage Transient Rating

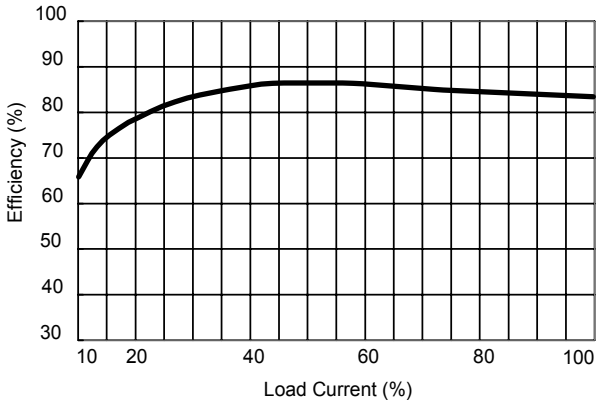




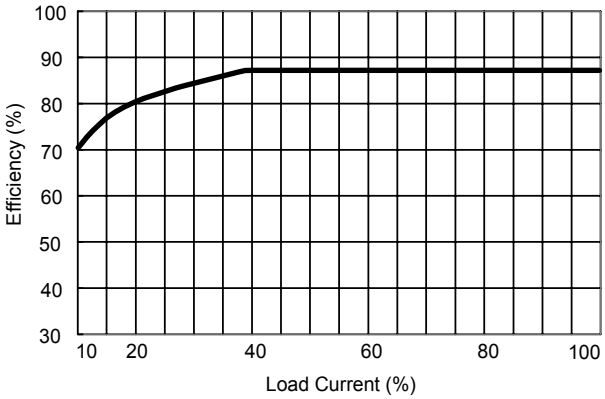
Efficiency vs Input Voltage (Single Output)



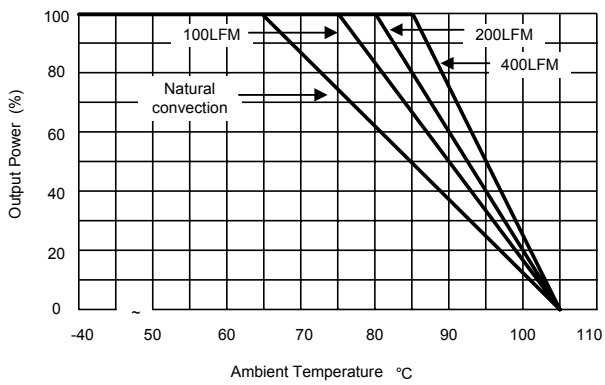
Efficiency vs Input Voltage (Dual Output)



Efficiency vs Output Load (Single Output)



Efficiency vs Output Load (Dual Output)



Derating Curve

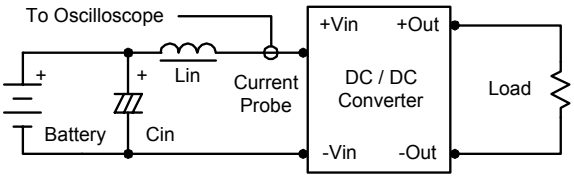
Test Configurations

Input Reflected-Ripple Current Test Setup

Input reflected−ripple current is measured with a inductor Lin (4.7uH) and Cin (220uF, ESR < 1.0Ω at 100 KHz) to simulate source impedance.

Capacitor Cin, offsets possible battery impedance.

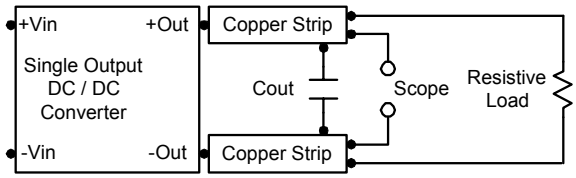
Current ripple is measured at the input terminals of the module, measurement bandwidth is 0−500 KHz.

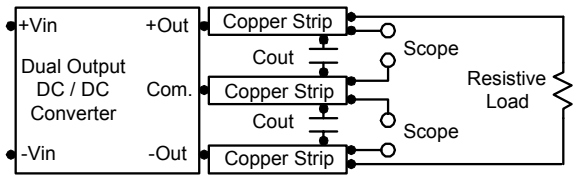


Peak-to-Peak Output Noise Measurement Test

Use a Cout 1.0uF 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.





Design & Feature Considerations

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.

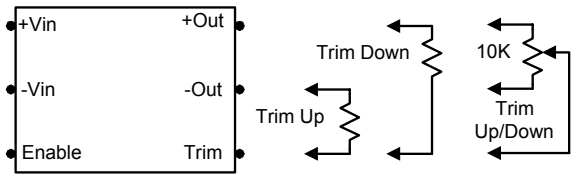
The maximum sink current at the on/off terminal (Pin 4) during a logic low is −100 uA.

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

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:

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

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

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

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.

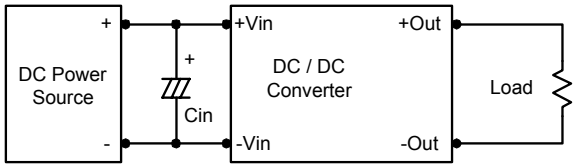
The OVP level can be found in the output data.

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.

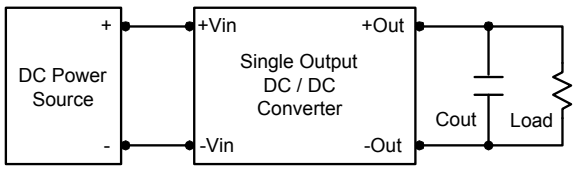
Capacitor mounted close to the power module helps ensure stability of the unit, it is recommended to use a good quality low Equivalent Series Resistance (ESR < 1.0Ω at 100 KHz) capacitor of a 33uF for the 24V input devices and a 10uF for the 48V devices.

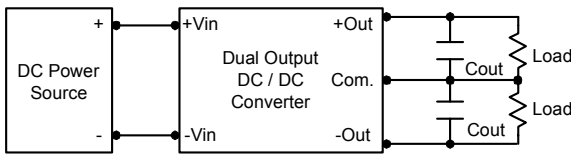


Output Ripple Reduction

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 4.7uF capacitors at the output.





Maximum Capacitive Load

The MPW2100 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.

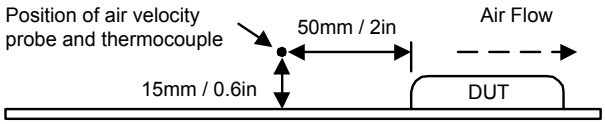
For optimum performance we recommend 330uF maximum capacitive load for dual outputs, 500uF capacitive load for 12V & 15V outputs and 5000uF capacitive load for 3.3V & 5V outputs.

The maximum capacitance can be found in the data sheet.

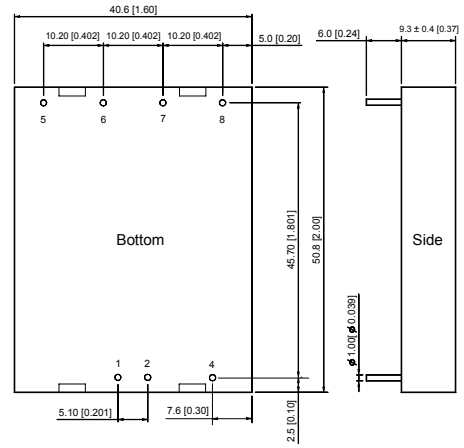
Thermal Considerations

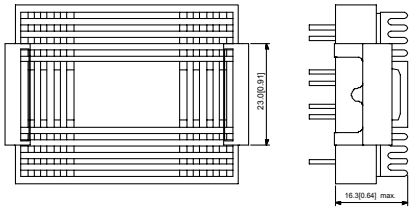
Many conditions affect the thermal performance of the power module, such as orientation, airflow over the module and board spacing. To avoid exceeding the maximum temperature rating of the components inside the power module, the case temperature must be kept below 105° C.

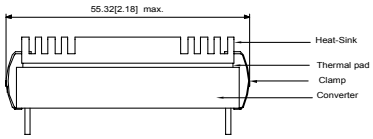
The derating curves are determined from measurements obtained in an experimental apparatus.



Mechanical Dimensions







Tolerance	Millimeters	Inches
	X.X±0.25	X.XX±0.01
	X.XX±0.13	X.XXX±0.005
Pin	±0.05	±0.002

Physical Characteristics

Case Size	:	50.8×40.6×9.3 mm 2.0×1.6×0.37 inches
Case Material	:	Metal With Non−Conductive Baseplate
Weight	:	48g
Flammability	:	UL94V−0

Heat-sink Material	:	Aluminum
Finish	:	Anodic treatment (black)
Weight	:	2g

The advantages of adding a heatsink are:

1. To help heat dissipation and increase the stability and reliability of DC/DC converters at high operating temperature atmosphere.
2. To upgrade the operating temperature of DC/DC converters, please refer to Derating Curve.

Notes2:

1. To order the converter with Heatsink, please add a suffix H (e.g. MPW2142H).

Pin Connections

Pin	Single Output	Dual Output
1	+Vin	+Vin
2	−Vin	−Vin
4	Remote On/Off	Remote On/Off
5	No Pin	+Vout
6	+Vout	Common
7	−Vout	−Vout
8	Trim	Trim