



P10 SERIES 10 WATT HIGH VOLTAGE DC/DC CONVERTERS

FEATURES

- ▶ **Customer Selects Output Voltage**
- ▶ Outputs to 8000 Vdc
- ▶ Proportional Output Voltage
- ▶ Six-Sided Shielded Case
- ▶ 60 kHz Switching Frequency
- ▶ 5000 Vdc Output Isolation
- ▶ Continuous Short Circuit Protection



The P10 Series of DC/DC converters offer a 5000 Vdc isolated high voltage output directly proportional to input voltage. All models will tolerate a short circuit indefinitely. They also include a Pi Network input filter to minimize reflected ripple current.

ELECTRICAL SPECIFICATIONS

Voltage Accuracy	+/-10%	Input Filter	Pi Network
Line Regulation	Proportional	Efficiency	74% (typ.)
Load Regulation	+/- 10%	Short Circuit Protection	Continuous
Output Ripple	< 0.3% P-P	Switching Frequency	60 kHz
		Output Isolation	5000 Vdc
		Input / Output Capacitance	< 60pF

GENERAL SPECIFICATIONS

Temp. Stability	+/-0.02%/°C	EMI/RFI	Six-Sided Shielded
Temp. (Operating , Case)	-25 to +85°C	Derating	None
Temp. (Storage)	-55 to +100°C	Cooling	Free-Air Convection

PHYSICAL SPECIFICATIONS

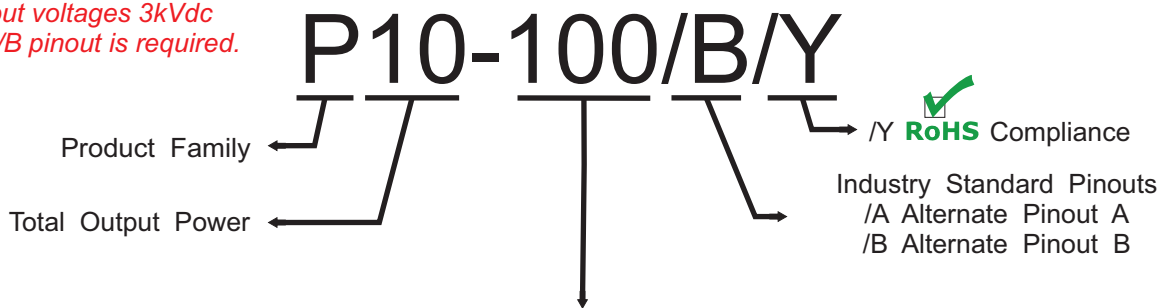
Dimensions	2.5 x 3.5 x 0.88 inches	Encapsulation Material	UL 94V-0 Epoxy
Weight	9.5 Oz	Case Material	Nickel Plated Metal
			<i>(With Non-Conductive Base Plate)</i>



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REPRESENTATIVE MODEL LISTING						
MODEL NUMBER		INPUT SPECIFICATIONS		OUTPUT SPECIFICATIONS		
Non-RoHS	RoHS	VOLTAGE	CURRENT	VOLTAGE	RIPPLE	CURRENT
P10-10	P10-10/Y	4V - 12Vdc	1.1 A	33V - 100Vdc	0.3V p-p	100 mA
P10-50	P10-50/Y	4V - 12Vdc	1.1 A	166V - 500Vdc	1.5V p-p	20 mA
P10-100	P10-100/Y	4V - 12Vdc	1.1 A	333V - 1kVdc	3V p-p	10 mA
P10-150	P10-150/Y	4V - 12Vdc	1.1 A	500V - 1.5kVdc	4.5V p-p	6.6 mA
P10-200	P10-200/Y	4V - 12Vdc	1.1 A	666V - 2kVdc	6V p-p	5 mA
P10-250	P10-250/Y	4V - 12Vdc	1.1 A	833V - 2.5kVdc	7.5V p-p	4 mA
* P10-300/B	* P10-300/B/Y	4V - 12Vdc	1.1 A	1kV - 3kVdc	9V p-p	3.3 mA
* P10-350/B	* P10-350/B/Y	4V - 12Vdc	1.1 A	1.16kV - 3.5kVdc	10V p-p	2.8 mA
* P10-400/B	* P10-400/B/Y	4V - 12Vdc	1.1 A	1.33kV - 4kVdc	10V p-p	2.5 mA
* P10-450/B	* P10-450/B/Y	4V - 12Vdc	1.1 A	1.5kV - 4.5kVdc	10V p-p	2.2 mA
* P10-500/B	* P10-500/B/Y	4V - 12Vdc	1.1 A	1.66V - 5kVdc	10V p-p	2 mA
* P10-550/B	* P10-550/B/Y	4V - 12Vdc	1.1 A	1.83V - 5.5kVdc	10V p-p	1.8 mA
* P10-600/B	* P10-600/B/Y	4V - 12Vdc	1.15 A	2kV - 6kVdc	10V p-p	1.6 mA
* P10-650/B	* P10-650/B/Y	4V - 12Vdc	1.15 A	2.16V - 6.5kVdc	10V p-p	1.5 mA
* P10-700/B	* P10-700/B/Y	4V - 12Vdc	1.15 A	2.33V - 7kVdc	10V p-p	1.4 mA
* P10-800/B	* P10-800/B/Y	4V - 12Vdc	1.15 A	2.66kV - 8kVdc	10V p-p	1.2 mA

* For output voltages 3kVdc to 8kVdc /B pinout is required.



Customer Selects Output Voltage

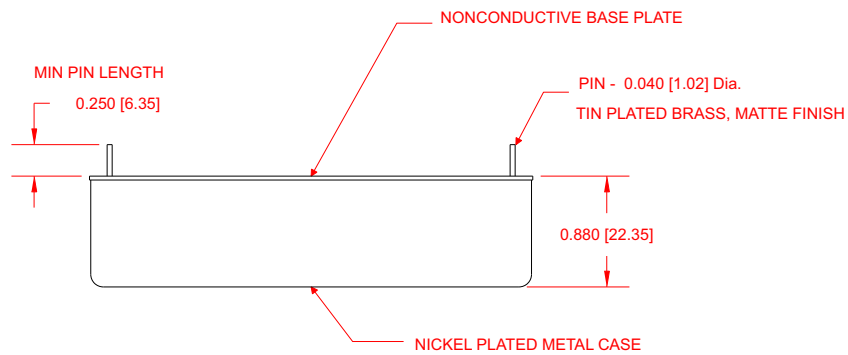
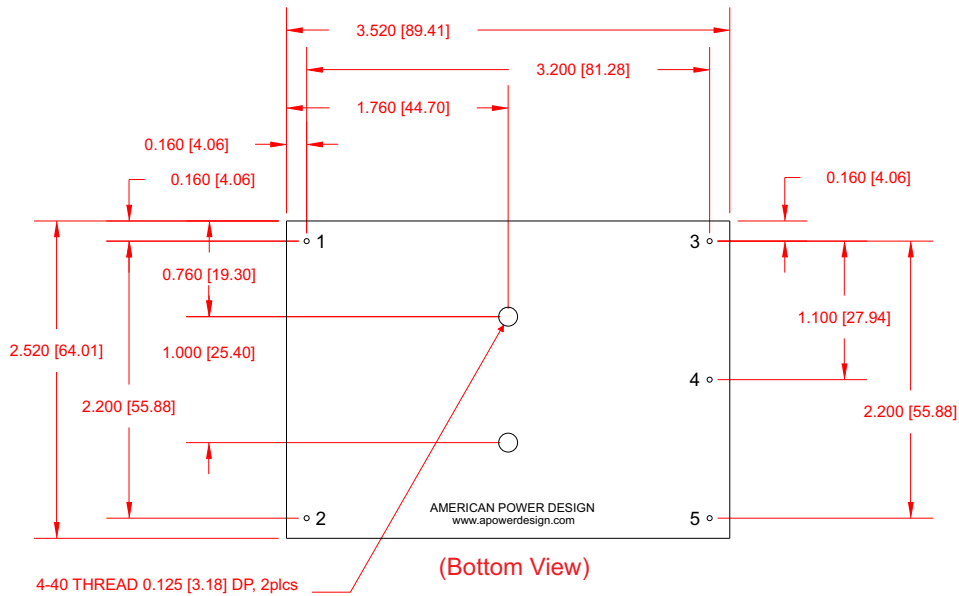
The P10 Series are designed such that the customer may order any output voltage from 100Vdc to 8kVdc at no additional charge.

[ACTUAL OUTPUT VOLTAGE IS 10X]



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STANDARD & ALTERNATE (/A)



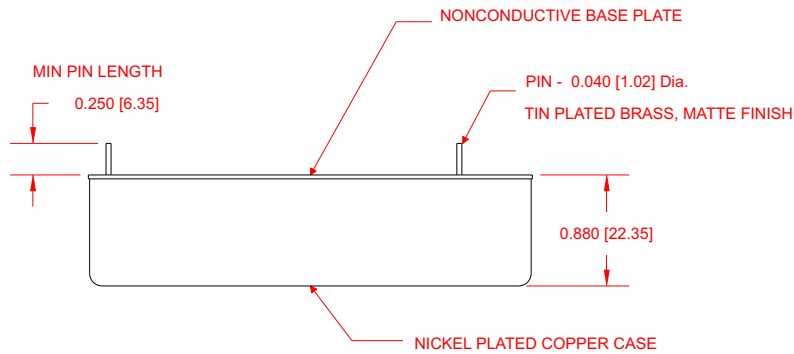
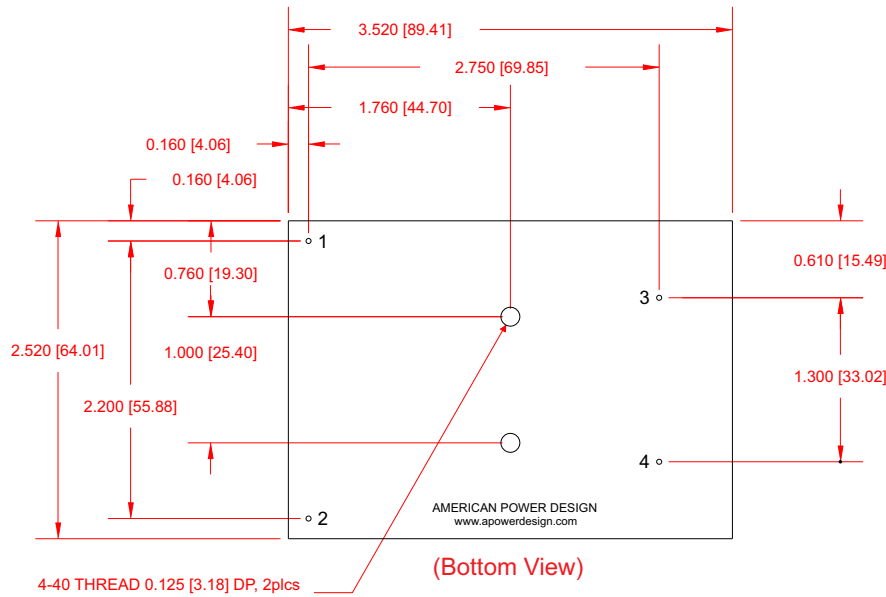
PIN #	STANDARD	ALTERNATE (/A)
1	+ Input	+ Input
2	- Input	- Input
3	+ Output	- Output
4	N/C	N/C
5	- Output	+ Output

*Dimensions are in Inches
 [Metric equivalents in brackets]*



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ALTERNATE (/B) (Required for outputs 3kVdc to 8kVdc)



PIN #	ALTERNATE (/B)
1	+ Input
2	- Input
3	+ Output
4	- Output

Dimensions are in Inches
 [Metric equivalents in brackets]



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APPLICATION NOTES

INPUT AND OUTPUT IMPEDANCE

The P10 Series of power converters have been designed to be stable with no external capacitors when used in low inductance input and output circuits. However, in some applications, the inductance associated with the distribution from the power source to the input of the converter can affect the stability of the converter. The addition of a 100 μ F electrolytic capacitor with an ESR <1 Ohm across the input helps ensure stability of the converter. In many applications, the user has to use decoupling capacitance at the load.

SHORT CIRCUIT PROTECTION

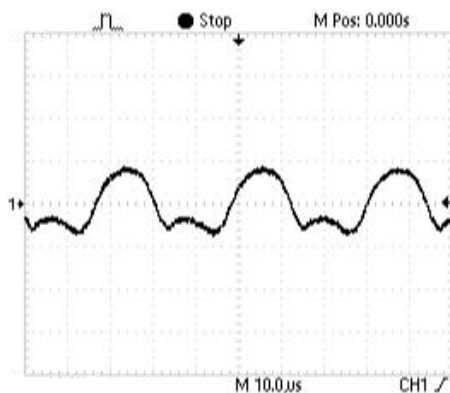
The P10 Series is equipped with short circuit protection. The converter will fold-back the input power whenever a short circuit is applied to its output and automatically recover after the overload condition is removed.

ISOLATION

The output of the P10 Series is galvanically isolated from both the input and case, capacitance is < 60pF and resistance is > 10G Ohm.

RIPPLE AND NOISE

Figure below shows a typical output voltage ripple waveform, measured at full rated load current with no additional output filtering. External low ESR capacitors may be added across output to further reduce ripple.



STARTUP TRANSIENT

Figure below shows a typical output voltage during turn-on, measured at no load current with no additional output filtering.

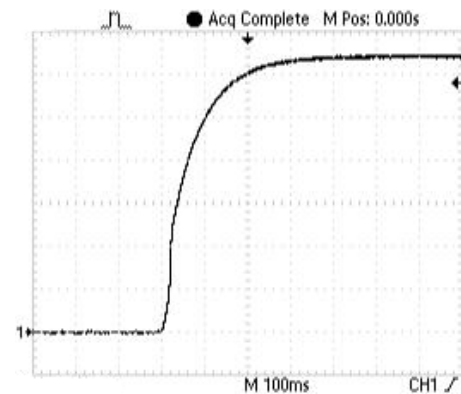
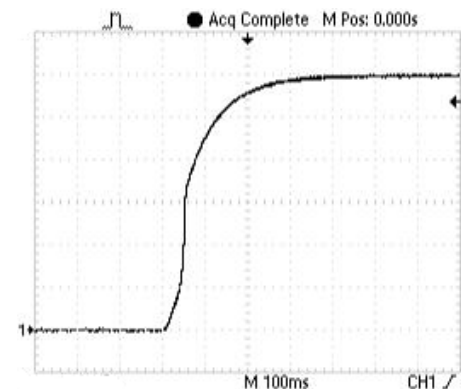


Figure below shows a typical output voltage during turn-on, measured at full rated load current with no additional output filtering.





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APPLICATION NOTES

INRUSH CURRENT

The inrush current of the P10 Series has been kept as low as possible. However, a series resistor may be inserted in the input line to limit this current further.

LOAD TRANSIENT

Figure below shows a typical output voltage response, measured during a transition from full rated load current to no load current with no additional output filtering.

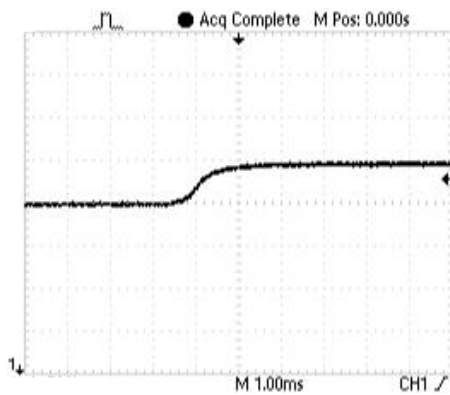
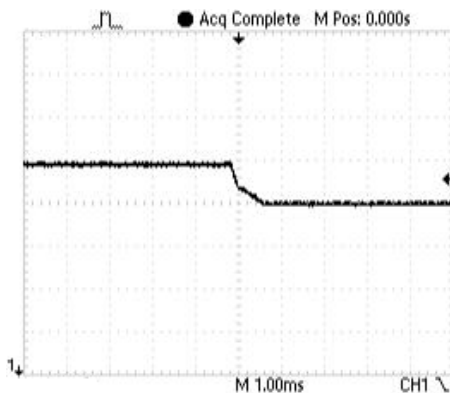
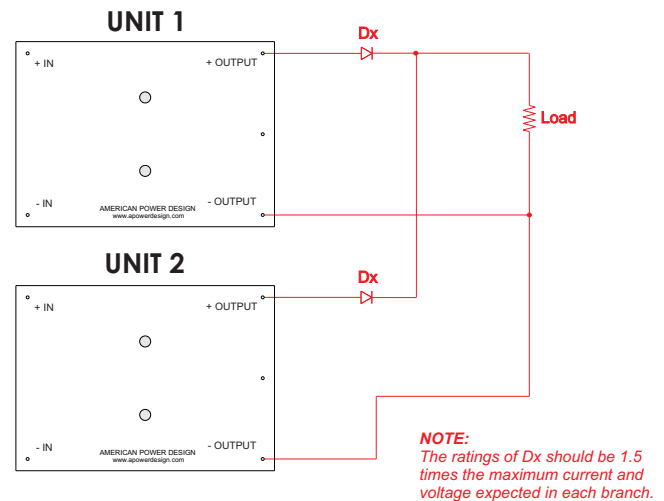


Figure below shows a typical output voltage response, measured during a transition from no load current to full rated load current with no additional output filtering.



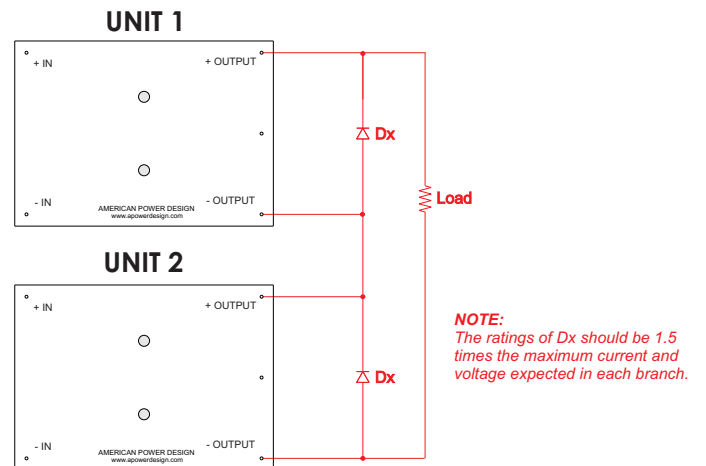
CONNECTION IN PARALLEL

The figure below shows how to connect outputs of several units with equal nominal output voltage in parallel with the use of oring diodes.



CONNECTION IN SERIES

Figure below shows how to connect multiple outputs in series with the use of shunt diodes, taking into consideration that the highest achieved output voltage should remain below the rated isolation voltage.





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APPLICATION NOTES

CLEANING AGENTS

In order to avoid possible damage, any penetration of cleaning fluids must be prevented, since the power supplies are not hermetically sealed.

NUCLEAR AND MEDICAL APPLICATIONS

American Power Design products are not designed, intended for use in, or authorized for use as critical components in life support systems, equipment used in hazardous environments, or nuclear control systems without the express written consent of American Power Design, Inc.

TECHNICAL REVISIONS

The appearance of products, including safety agency certifications pictured on labels, may change depending on the date manufactured. Specifications are subject to change without notice.

SAFETY REQUIREMENTS

The converters are designed to meet North American and International safety regulatory requirements per UL 60950-1/CSA 22.2 No. 60950-1-07 Second Edition, IEC 60950-1:2005, and EN 60950-1:2006. Basic Insulation is provided between input and output. To comply with safety agencies requirements, an input line fuse must be used external to the converter. The table below provides the recommended fuse rating for use with this family of products.

Input Voltage Range	Fuse Rating
4-12Vdc	1.5A

If one input fuse is used for a group of modules, the maximum fuse rating should not exceed 10A.

WARRANTY

All products manufactured by American Power Design, Inc. (APD) are warranted to be free of defects due to material or workmanship for a period of one year from date of shipment. At our option, APD will repair or replace any non-conforming product.

APD expressly disclaims any liability for consequential or incidental damages resulting from the use or misuse of its products by the purchaser or others.

This warranty is in lieu of all warranties expressed or implied, including the warranties of merchantability. No other warranties, obligations, or liabilities are expressed or implied.

All products being returned for repair require a return material authorization(RMA) assigned by APD prior to return shipment.