



## S20 SERIES 20 WATT HIGH VOLTAGE DC/DC CONVERTERS

### FEATURES



- ▶ **Customer Selects Output Voltage**
- ▶ Outputs to 1000 Vdc
- ▶ High Power Density
- ▶ Single and Dual Outputs
- ▶ Ultra Wide Input Ranges  
(9-36Vdc , 20-60Vdc , 36-72Vdc)
- ▶ 1000 Vdc Output Isolation
- ▶ Continuous Short Circuit Protection

The S20 Series low profile high voltage DC/DC converter offers a 1000 Vdc isolated single or dual high voltage output in a six-sided metal case. Their small size, wide input, and excellent regulation make them ideally suited for applications that demand a high degree of performance All models will tolerate a short circuit indefinitely.

### ELECTRICAL SPECIFICATIONS

Voltage Accuracy .....	+/- 5%	Input Filter .....	Low ESR Capacitor
Line Regulation .....	+/- 1%	Efficiency .....	84% (typ.)
Load Regulation .....	+/- 3% (20% to full Load)	Short Circuit Protection .....	Continuous
Output Ripple .....	< 0.5 % P-P	Switching Frequency .....	120 kHz
		Output Isolation .....	1000 Vdc
		Input / Output Capacitance .....	< 160pF

### GENERAL SPECIFICATIONS

Temp. Stability .....	+/- 0.02%/°C	EMI/RFI .....	Six Sided Shield
Temp. (Operating , Case) .....	-25 to +70°C	Derating .....	None
Temp. (Storage) .....	-40 to +125°C	Cooling .....	Free-Air Convection

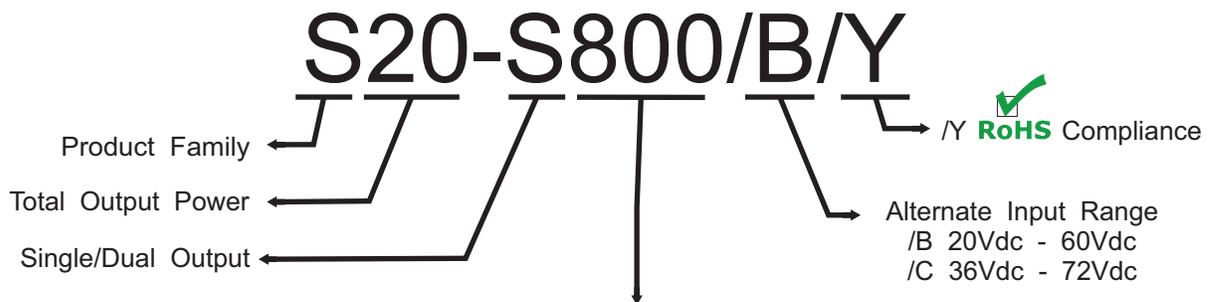
### PHYSICAL SPECIFICATIONS

Dimensions .....	2 x 2 x 0.50 inches	Encapsulation Material .....	UL 94V-0 Epoxy
Weight .....	2.6 Oz	Case Material .....	Nickel Plated Metal <i>(With Non-Conductive Base Plate)</i>



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REPRESENTATIVE MODEL LISTING							
OUTPUT SPECIFICATIONS		MODEL NUMBER / INPUT RANGE					
		9-36VDC		20-60VDC		36-72VDC	
VOLTAGE	CURRENT	Non-RoHs	RoHs	Non-RoHs	RoHs	Non-RoHs	RoHs
24 Vdc	833 mA	S20-S24	S20-S24/Y	S20-S24/B	S20-S24/B/Y	S20-S24/C	S20-S24/C/Y
+/- 24 Vdc	416 mA	S20-D24	S20-D24/Y	S20-D24/B	S20-D24/B/Y	S20-D24/C	S20-D24/C/Y
48 Vdc	416 mA	S20-S48	S20-S48/Y	S20-S48/B	S20-S48/B/Y	S20-S48/C	S20-S48/C/Y
+/- 48 Vdc	208 mA	S20-D48	S20-D48/Y	S20-D48/B	S20-D48/B/Y	S20-D48/C	S20-D48/C/Y
100Vdc	200 mA	S20-S100	S20-S100/Y	S20-S100/B	S20-S100/B/Y	S20-S100/C	S20-S100/C/Y
+/- 100Vdc	100 mA	S20-D100	S20-D100/Y	S20-D100/B	S20-D100/B/Y	S20-D100/C	S20-D100/C/Y
150 Vdc	133 mA	S20-S150	S20-S150/Y	S20-S150/B	S20-S150/B/Y	S20-S150/C	S20-S150/C/Y
+/- 150 Vdc	66 mA	S20-D150	S20-D150/Y	S20-D150/B	S20-D150/B/Y	S20-D150/C	S20-D150/C/Y
200 Vdc	100 mA	S20-S200	S20-S200/Y	S20-S200/B	S20-S200/B/Y	S20-S200/C	S20-S200/C/Y
+/- 200 Vdc	50 mA	S20-D200	S20-D200/Y	S20-D200/B	S20-D200/B/Y	S20-D200/C	S20-D200/C/Y
300 Vdc	66 mA	S20-S300	S20-S300/Y	S20-S300/B	S20-S300/B/Y	S20-S300/C	S20-S300/C/Y
+/- 300 Vdc	33mA	S20-D300	S20-D300/Y	S20-D300/B	S20-D300/B/Y	S20-D300/C	S20-D300/C/Y
400 Vdc	50 mA	S20-S400	S20-S400/Y	S20-S400/B	S20-S400/B/Y	S20-S400/C	S20-S400/C/Y
+/- 400 Vdc	25 mA	S20-D400	S20-D400/Y	S20-D400/B	S20-D400/B/Y	S20-D400/C	S20-D400/C/Y
500 Vdc	40 mA	S20-S500	S20-S500/Y	S20-S500/B	S20-S500/B/Y	S20-S500/C	S20-S500/C/Y
+/- 500 Vdc	20 mA	S20-D500	S20-D500/Y	S20-D500/B	S20-D500/B/Y	S20-D500/C	S20-D500/C/Y
600 Vdc	33 mA	S20-S600	S20-S600/Y	S20-S600/B	S20-S600/B/Y	S20-S600/C	S20-S600/C/Y
800 Vdc	25 mA	S20-S800	S20-S800/Y	S20-S800/B	S20-S800/B/Y	S20-S800/C	S20-S800/C/Y
1000 Vdc	20 mA	S20-S1000	S20-S1000/Y	S20-S1000/B	S20-S1000/B/Y	S20-S1000/C	S20-S1000/C/Y

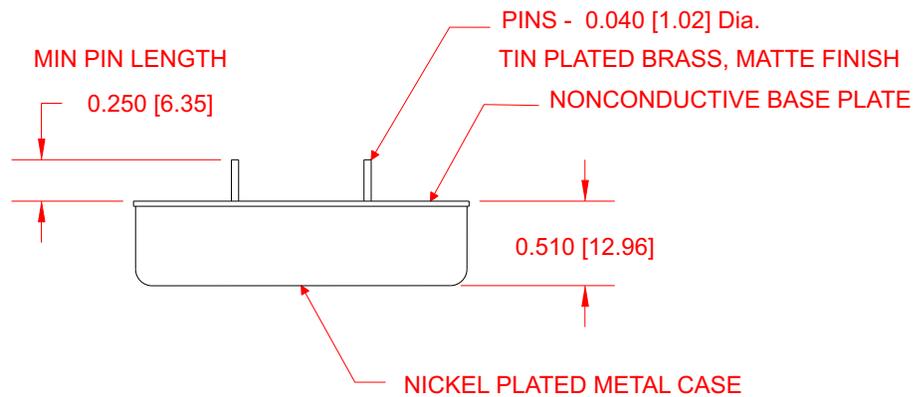
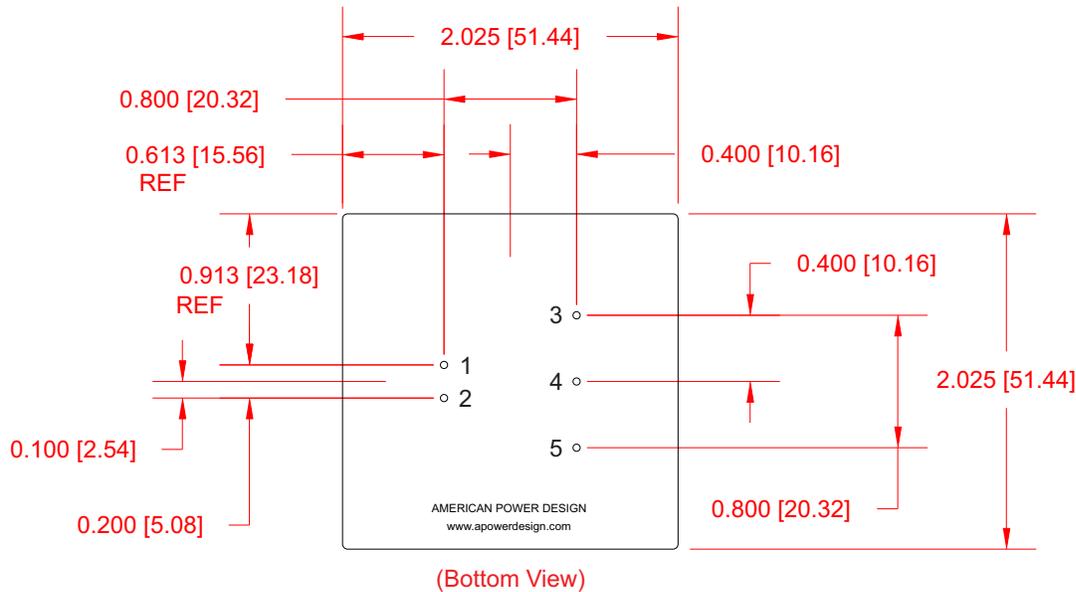


### Customer Selects Output Voltage

The S20 Series are designed such that the customer may order any output voltage from 24Vdc to 1000Vdc at no additional charge. (500Vdc Max. for Dual Outputs)



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PIN #	SINGLE	DUAL
1	+ Input	+ Input
2	- Input	- Input
3	+Output	+Output
4	No Pin	Com
5	- Output	- Output

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



## S20 SERIES 20 WATT HIGH VOLTAGE DC/DC CONVERTERS

### APPLICATION NOTES

#### INPUT AND OUTPUT IMPEDANCE

The S20 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  $\mu\text{F}$  electrolytic capacitor with an ESR  $< 1 \text{ Ohm}$  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

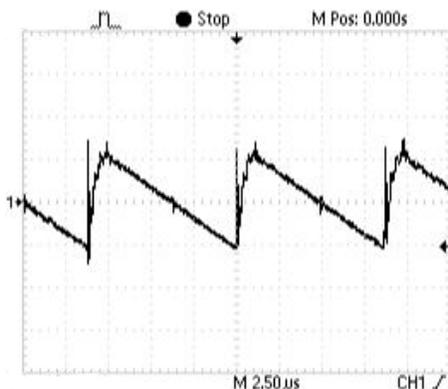
The S20 Series is equipped with short circuit protection. The converter will fold-back the input power whenever a short circuit is applied to its output and automatically recover after the overload condition is removed.

#### ISOLATION

The output of the S20 Series is galvanically isolated from both the input and case, capacitance is  $< 160\text{pF}$  and resistance is  $> 10\text{G Ohm}$ . The converters case is connected directly to -In to aid in reducing unwanted noise.

#### 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 20% load current with no additional output filtering.

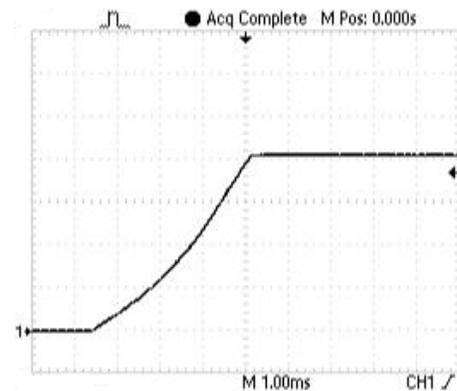
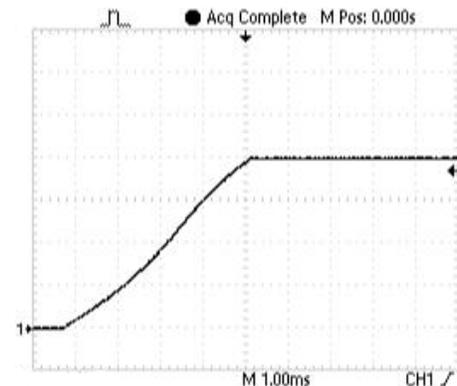


Figure below shows a typical output voltage during turn-on, measured at full rated load current with no additional output filtering.





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### APPLICATION NOTES

#### INRUSH CURRENT

The inrush current of the S20 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 20% load current with no additional output filtering.

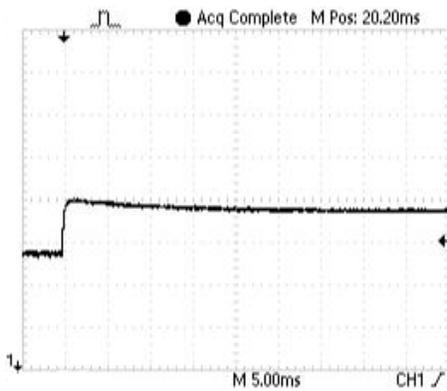
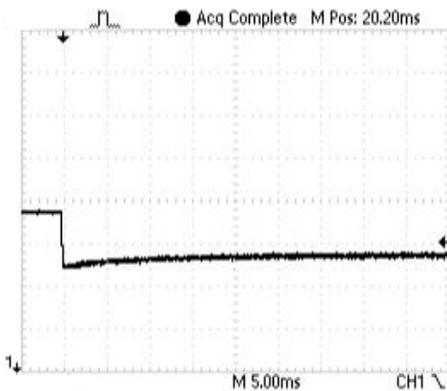
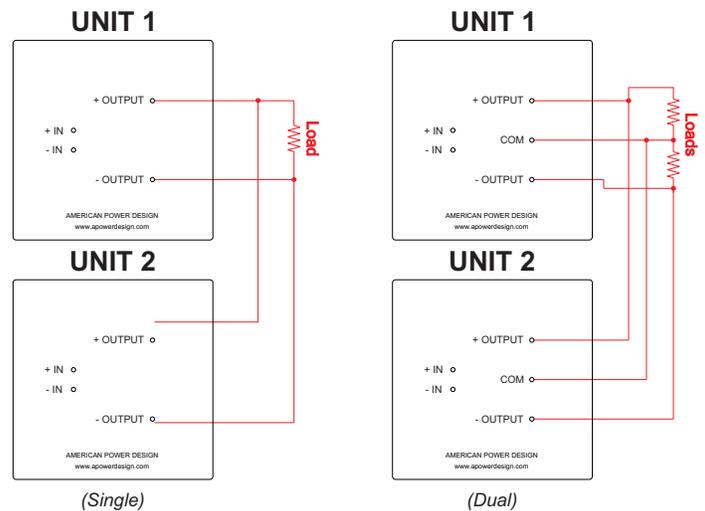


Figure below shows a typical output voltage response, measured during a transition from 20% load current to full rated load current with no additional output filtering.



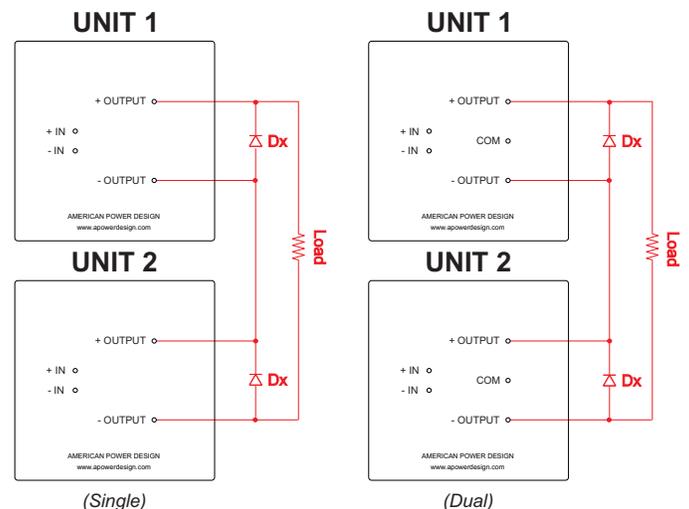
#### CONNECTION IN PARALLEL

The figures below show how to connect both single and dual outputs of several units with equal nominal output voltage in parallel.



#### CONNECTION IN SERIES

Figures below show 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.



**NOTE:**  
The ratings of Dx should be 1.5 times the maximum current and voltage expected in each branch.



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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
9-36Vdc	5A
20-60Vdc	2.5A
36-72Vdc	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.