



## J3 SERIES 3 WATT PROPORTIONAL HV DC/DC CONVERTERS

### FEATURES

- ▶ **Customer Selects Output Voltage**
- ▶ Single Outputs to + or - 6000 Vdc
- ▶ Dual Outputs to +/- 1000 Vdc
- ▶ High Reliability
- ▶ Wide Temperature Range (-25 to +85°C)
- ▶ Low Profile
- ▶ 500 Vdc Output Isolation
- ▶ Continuous Short Circuit Protection



The J3 Series of miniature DC/DC converters offers a 3 Watt isolated high voltage output directly proportional to input voltage. Isolation permits  $\pm 500V$  bias on output return. All models will tolerate a short circuit indefinitely.

### ELECTRICAL SPECIFICATIONS

Voltage Accuracy .....	+/- 5%	Input Filter .....	Low ESR Capacitor
Line Regulation .....	Proportional	Efficiency .....	>65% (typ.)
Load Regulation .....	< 10%	Short Circuit Protection .....	Continuous
Output Ripple .....	< 5% P-P	Switching Frequency .....	125-250 kHz
Startup Voltage .....	< 0.7Vdc	Output Isolation .....	500 Vdc
		Input / Output Capacitance .....	< 30pF

### GENERAL SPECIFICATIONS

Temp. Stability .....	+/-0.05%/°C	EMI/RFI .....	Shielded Version Available ( <i>Suffix /S</i> )
Temp. (Operating , Case) .....	-25 to +85°C	Derating .....	None
Temp. (Storage) .....	-40 to +100°C	Cooling .....	Free-Air Convection
Humidity .....	0 to 95% (Non-Condensing)		

### PHYSICAL SPECIFICATIONS

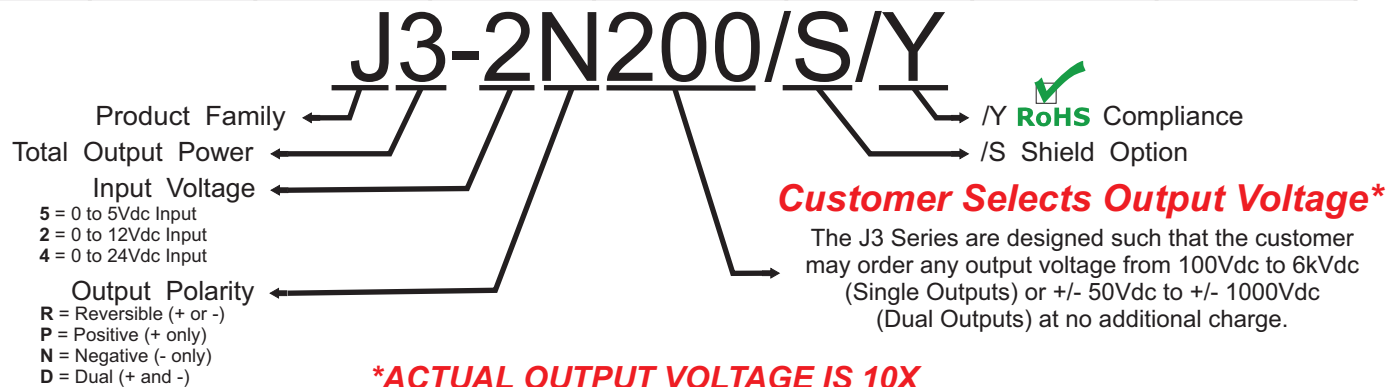
Dimensions & Weight .....	0.8 x 1.25 x 0.5 inches @ 0.7 Oz	Encapsulation Material .....	UL 94V-0 Epoxy
Dimensions & Weight .....	1.0 x 2.15 x 0.47Inches @1.3 Oz	Case Material .....	Black Phenolic



## J3 SERIES 3 WATT PROPORTIONAL HV DC/DC CONVERTERS

### 5V INPUT SINGLE OUTPUTS

REPRESENTATIVE MODEL LISTING							
MODEL NUMBER		INPUT SPECIFICATIONS			OUTPUT SPECIFICATIONS		
Non-RoHs	RoHs	VOLTAGE	NO LOAD	FULL LOAD	VOLTAGE	RIPPLE	CURRENT
J3-5R10	J3-5R10/Y	0V to 5Vdc	<200 mA	<1.1 A	0V to 100Vdc	<1% P-P	30 mA
J3-5R15	J3-5R15/Y	0V to 5Vdc	<200 mA	<1.1 A	0V to 150Vdc	<0.5% P-P	20 mA
J3-5R20	J3-5R20/Y	0V to 5Vdc	<200 mA	<1.1 A	0V to 200Vdc	<0.25% P-P	15 mA
J3-5R25	J3-5R25/Y	0V to 5Vdc	<200 mA	<1.1 A	0V to 250Vdc	<0.25% P-P	12 mA
J3-5R30	J3-5R30/Y	0V to 5Vdc	<200 mA	<1.1 A	0V to 300Vdc	<0.25% P-P	10 mA
J3-5R40	J3-5R40/Y	0V to 5Vdc	<200 mA	<1.1 A	0V to 400Vdc	<0.1% P-P	7.5 mA
J3-5R50	J3-5R50/Y	0V to 5Vdc	<200 mA	<1.1 A	0V to 500Vdc	<0.15% P-P	6 mA
J3-5R60	J3-5R60/Y	0V to 5Vdc	<200 mA	<1.1 A	0V to 600Vdc	<0.1% P-P	5 mA
J3-5R80	J3-5R80/Y	0V to 5Vdc	<200 mA	<1.1 A	0V to 800Vdc	<0.3% P-P	3.75 mA
J3-5R100	J3-5R100/Y	0V to 5Vdc	<200 mA	<1.1 A	0V to 1kVdc	<0.25% P-P	3 mA
J3-5R120	J3-5R120/Y	0V to 5Vdc	<200 mA	<1.1 A	0V to 1.2kVdc	<0.25% P-P	2.5 mA
J3-5R150	J3-5R150/Y	0V to 5Vdc	<200 mA	<1.1 A	0V to 1.5kVdc	<0.25% P-P	2 mA
J3-5R200	J3-5R200/Y	0V to 5Vdc	<200 mA	<1.1 A	0V to 2kVdc	<0.25% P-P	1.5 mA
J3-5P300	J3-5P300/Y	0V to 5Vdc	<200 mA	<1.1 A	0V to +3kVdc	<0.25% P-P	1 mA
J3-5N300	J3-5N300/Y	0V to 5Vdc	<200 mA	<1.1 A	0V to -3kVdc	<0.25% P-P	1 mA
J3-5P400	J3-5P400/Y	0V to 5Vdc	<200 mA	<1.1 A	0V to +4kVdc	<0.25% P-P	0.75 mA
J3-5N400	J3-5N400/Y	0V to 5Vdc	<200 mA	<1.1 A	0V to -4kVdc	<0.25% P-P	0.75 mA
J3-5P500	J3-5P500/Y	0V to 5Vdc	<200 mA	<1.1 A	0V to +5kVdc	<0.25% P-P	0.6 mA
J3-5N500	J3-5N500/Y	0V to 5Vdc	<200 mA	<1.1 A	0V to -5kVdc	<0.25% P-P	0.6 mA
J3-5P600	J3-5P600/Y	0V to 5Vdc	<200 mA	<1.1 A	0V to +6kVdc	<0.25% P-P	0.5 mA
J3-5N600	J3-5N600/Y	0V to 5Vdc	<200 mA	<1.1 A	0V to -6kVdc	<0.25% P-P	0.5 mA





## J3 SERIES 3 WATT PROPORTIONAL HV DC/DC CONVERTERS

### 12V INPUT SINGLE OUTPUTS

REPRESENTATIVE MODEL LISTING							
MODEL NUMBER		INPUT SPECIFICATIONS			OUTPUT SPECIFICATIONS		
Non-RoHs	RoHs	VOLTAGE	NO LOAD	FULL LOAD	VOLTAGE	RIPPLE	CURRENT
J3-2R10	J3-2R10/Y	0V to 12Vdc	<170 mA	<350mA	0V to 100Vdc	<1% P-P	30 mA
J3-2R15	J3-2R15/Y	0V to 12Vdc	<120 mA	<350mA	0V to 150Vdc	<0.5% P-P	20 mA
J3-2R20	J3-2R20/Y	0V to 12Vdc	<120 mA	<350mA	0V to 200Vdc	<0.25% P-P	15 mA
J3-2R25	J3-2R25/Y	0V to 12Vdc	<120 mA	<350mA	0V to 250Vdc	<0.25% P-P	12 mA
J3-2R30	J3-2R30/Y	0V to 12Vdc	<120 mA	<350mA	0V to 300Vdc	<0.25% P-P	10 mA
J3-2R40	J3-2R40/Y	0V to 12Vdc	<120 mA	<350mA	0V to 400Vdc	<0.1% P-P	7.5 mA
J3-2R50	J3-2R50/Y	0V to 12Vdc	<120 mA	<350mA	0V to 500Vdc	<0.15% P-P	6 mA
J3-2R60	J3-2R60/Y	0V to 12Vdc	<120 mA	<350mA	0V to 600Vdc	<0.1% P-P	5 mA
J3-2R80	J3-2R80/Y	0V to 12Vdc	<120 mA	<350mA	0V to 800Vdc	<0.3% P-P	3.75 mA
J3-2R100	J3-2R100/Y	0V to 12Vdc	<120 mA	<350mA	0V to 1kVdc	<0.25% P-P	3 mA
J3-2R120	J3-2R120/Y	0V to 12Vdc	<120 mA	<350mA	0V to 1.2kVdc	<0.25% P-P	2.5 mA
J3-2R150	J3-2R150/Y	0V to 12Vdc	<150 mA	<350mA	0V to 1.5kVdc	<0.25% P-P	2 mA
J3-2R200	J3-2R200/Y	0V to 12Vdc	<170 mA	<350mA	0V to 2kVdc	<0.25% P-P	1.5 mA
J3-2P300	J3-2P300/Y	0V to 12Vdc	<170 mA	<350mA	0V to +3kVdc	<0.25% P-P	1 mA
J3-2N300	J3-2N300/Y	0V to 12Vdc	<170 mA	<350mA	0V to -3kVdc	<0.25% P-P	1 mA
J3-2P400	J3-2P400/Y	0V to 12Vdc	<170 mA	<350mA	0V to +4kVdc	<0.25% P-P	0.75 mA
J3-2N400	J3-2N400/Y	0V to 12Vdc	<170 mA	<350mA	0V to -4kVdc	<0.25% P-P	0.75 mA
J3-2P500	J3-2P500/Y	0V to 12Vdc	<170 mA	<380mA	0V to +5kVdc	<0.25% P-P	0.6 mA
J3-2N500	J3-2N500/Y	0V to 12Vdc	<170 mA	<380mA	0V to -5kVdc	<0.25% P-P	0.6 mA
J3-2P600	J3-2P600/Y	0V to 12Vdc	<170 mA	<380mA	0V to +6kVdc	<0.25% P-P	0.5 mA
J3-2N600	J3-2N600/Y	0V to 12Vdc	<170 mA	<380mA	0V to -6kVdc	<0.25% P-P	0.5 mA



## J3 SERIES 3 WATT PROPORTIONAL HV DC/DC CONVERTERS

### 24V INPUT SINGLE OUTPUTS

REPRESENTATIVE MODEL LISTING							
MODEL NUMBER		INPUT SPECIFICATIONS			OUTPUT SPECIFICATIONS		
Non-RoHs	RoHs	VOLTAGE	NO LOAD	FULL LOAD	VOLTAGE	RIPPLE	CURRENT
J3-4R10	J3-4R10/Y	0V to 24Vdc	<90 mA	<210mA	0V to 100Vdc	<1% P-P	30 mA
J3-4R15	J3-4R15/Y	0V to 24Vdc	<90 mA	<210mA	0V to 150Vdc	<0.5% P-P	20 mA
J3-4R20	J3-4R20/Y	0V to 24Vdc	<90 mA	<210mA	0V to 200Vdc	<0.25% P-P	15 mA
J3-4R25	J3-4R25/Y	0V to 24Vdc	<90 mA	<210mA	0V to 250Vdc	<0.25% P-P	12 mA
J3-4R30	J3-4R30/Y	0V to 24Vdc	<90 mA	<210mA	0V to 300Vdc	<0.25% P-P	10 mA
J3-4R40	J3-4R40/Y	0V to 24Vdc	<90 mA	<210mA	0V to 400Vdc	<0.1% P-P	7.5 mA
J3-4R50	J3-4R50/Y	0V to 24Vdc	<100 mA	<210mA	0V to 500Vdc	<0.15% P-P	6 mA
J3-4R60	J3-4R60/Y	0V to 24Vdc	<100 mA	<210mA	0V to 600Vdc	<0.1% P-P	5 mA
J3-4R80	J3-4R80/Y	0V to 24Vdc	<100 mA	<210mA	0V to 800Vdc	<0.3% P-P	3.75 mA
J3-4R100	J3-4R100/Y	0V to 24Vdc	<100 mA	<210mA	0V to 1kVdc	<0.25% P-P	3 mA
J3-4R120	J3-4R120/Y	0V to 24Vdc	<100 mA	<220mA	0V to 1.2kVdc	<0.25% P-P	2.5 mA
J3-4R150	J3-4R150/Y	0V to 24Vdc	<110 mA	<220mA	0V to 1.5kVdc	<0.25% P-P	2 mA
J3-4R200	J3-4R200/Y	0V to 24Vdc	<120 mA	<220mA	0V to 2kVdc	<0.25% P-P	1.5 mA
J3-4P300	J3-4P300/Y	0V to 24Vdc	<120 mA	<220mA	0V to +3kVdc	<0.25% P-P	1 mA
J3-4N300	J3-4N300/Y	0V to 24Vdc	<120 mA	<220mA	0V to -3kVdc	<0.25% P-P	1 mA
J3-4P400	J3-4P400/Y	0V to 24Vdc	<120 mA	<220mA	0V to +4kVdc	<0.25% P-P	0.75 mA
J3-4N400	J3-4N400/Y	0V to 24Vdc	<120 mA	<220mA	0V to -4kVdc	<0.25% P-P	0.75 mA
J3-4P500	J3-4P500/Y	0V to 24Vdc	<150 mA	<250mA	0V to +5kVdc	<0.25% P-P	0.6 mA
J3-4N500	J3-4N500/Y	0V to 24Vdc	<150 mA	<250mA	0V to -5kVdc	<0.25% P-P	0.6 mA
J3-4P600	J3-4P600/Y	0V to 24Vdc	<150 mA	<250mA	0V to +6kVdc	<0.25% P-P	0.5 mA
J3-4N600	J3-4N600/Y	0V to 24Vdc	<150 mA	<250mA	0V to -6kVdc	<0.25% P-P	0.5 mA



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### DUAL OUTPUTS

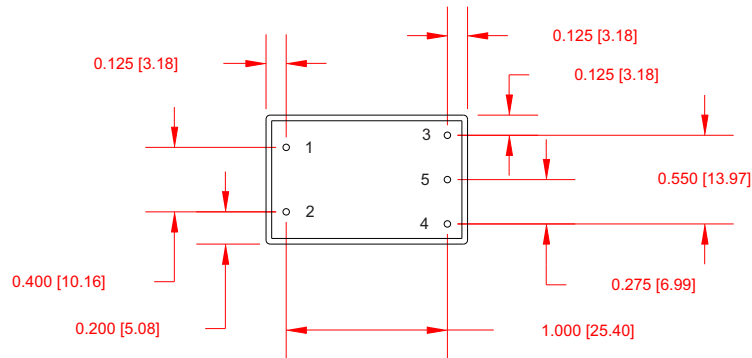
REPRESENTATIVE MODEL LISTING							
MODEL NUMBER		INPUT SPECIFICATIONS			OUTPUT SPECIFICATIONS		
Non-RoHs	RoHs	VOLTAGE	NO LOAD	FULL LOAD	VOLTAGE	RIPPLE	CURRENT
J3-5D5	J3-5D5/Y	0V to 5Vdc	<200 mA	<1.1 A	0V to +/-50Vdc	<1% P-P	30 mA
J3-2D5	J3-2D5/Y	0V to 12Vdc	<170 mA	<350 mA	0V to +/-50Vdc	<1% P-P	30 mA
J3-4D5	J3-4D5/Y	0V to 24Vdc	<90 mA	<210 mA	0V to +/-50Vdc	<1% P-P	30 mA
J3-5D10	J3-5D10/Y	0V to 5Vdc	<200 mA	<1.1 A	0V to +/-100Vdc	<0.25% P-P	15 mA
J3-2D10	J3-2D10/Y	0V to 12Vdc	<120 mA	<350 mA	0V to +/-100Vdc	<0.25% P-P	15 mA
J3-4D10	J3-4D10/Y	0V to 24Vdc	<90 mA	<210 mA	0V to +/-100Vdc	<0.25% P-P	15 mA
J3-5D15	J3-5D15/Y	0V to 5Vdc	<200 mA	<1.1 A	0V to +/-150Vdc	<0.25% P-P	10 mA
J3-2D15	J3-2D15/Y	0V to 12Vdc	<120 mA	<350 mA	0V to +/-150Vdc	<0.25% P-P	10 mA
J3-4D15	J3-4D15/Y	0V to 24Vdc	<90 mA	<210 mA	0V to +/-150Vdc	<0.25% P-P	10 mA
J3-5D20	J3-5D20/Y	0V to 5Vdc	<200 mA	<1.1 A	0V to +/-200Vdc	<0.1% P-P	7.5 mA
J3-2D20	J3-2D20/Y	0V to 12Vdc	<120 mA	<350 mA	0V to +/-200Vdc	<0.1% P-P	7.5 mA
J3-4D20	J3-4D20/Y	0V to 24Vdc	<90 mA	<210 mA	0V to +/-200Vdc	<0.1% P-P	7.5 mA
J3-5D30	J3-5D30/Y	0V to 5Vdc	<200 mA	<1.1 A	0V to +/-300Vdc	<0.1% P-P	5 mA
J3-2D30	J3-2D30/Y	0V to 12Vdc	<120 mA	<350 mA	0V to +/-300Vdc	<0.1% P-P	5 mA
J3-4D30	J3-4D30/Y	0V to 24Vdc	<100 mA	<210 mA	0V to +/-300Vdc	<0.1% P-P	5 mA
J3-5D40	J3-5D40/Y	0V to 5Vdc	<200 mA	<1.1 A	0V to +/-400Vdc	<0.3% P-P	3.75 mA
J3-2D40	J3-2D40/Y	0V to 12Vdc	<120 mA	<350 mA	0V to +/-400Vdc	<0.3% P-P	3.75mA
J3-4D40	J3-4D40/Y	0V to 24Vdc	<100 mA	<210 mA	0V to +/-400Vdc	<0.3% P-P	3.75 mA
J3-5D50	J3-5D50/Y	0V to 5Vdc	<200 mA	<1.1 A	0V to +/-500Vdc	<0.3% P-P	3 mA
J3-2D50	J3-2D50/Y	0V to 12Vdc	<120 mA	<350 mA	0V to +/-500Vdc	<0.3% P-P	3 mA
J3-4D50	J3-4D50/Y	0V to 24Vdc	<100 mA	<210 mA	0V to +/-500Vdc	<0.3% P-P	3 mA
J3-5D100	J3-5D100/Y	0V to 5Vdc	<200 mA	<1.1 A	0V to +/-1kVdc	<0.3% P-P	1.5 mA
J3-2D100	J3-2D100/Y	0V to 12Vdc	<170 mA	<350 mA	0V to +/-1kVdc	<0.3% P-P	1.5 mA
J3-4D100	J3-4D100/Y	0V to 24Vdc	<120 mA	<220 mA	0V to +/-1kVdc	<0.25% P-P	1.5 mA

**NOTE:** Ripple on dual output units are measured between the positive and negative output pins.

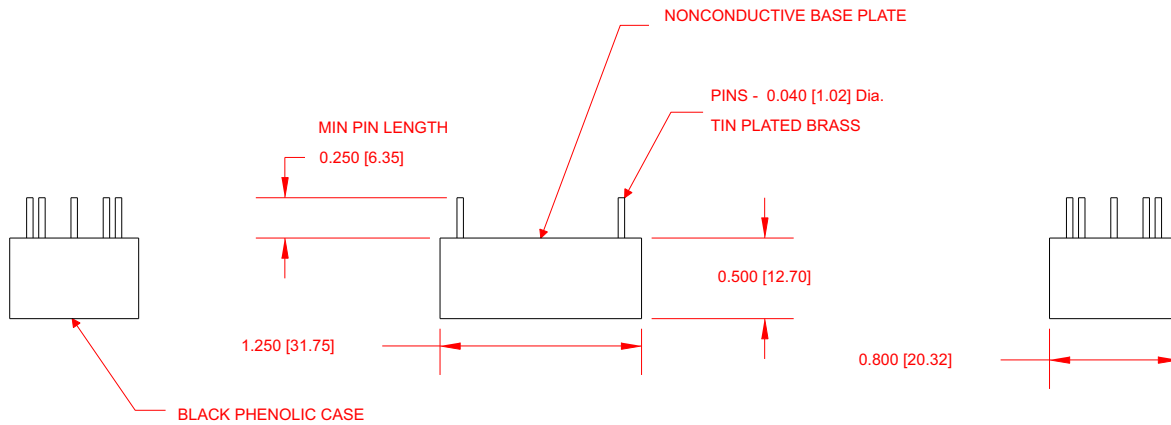


**J3 SERIES 3 WATT PROPORTIONAL HV DC/DC CONVERTERS**

**OUTPUT VOLTAGES FROM 100V TO 4000V**



Bottom View



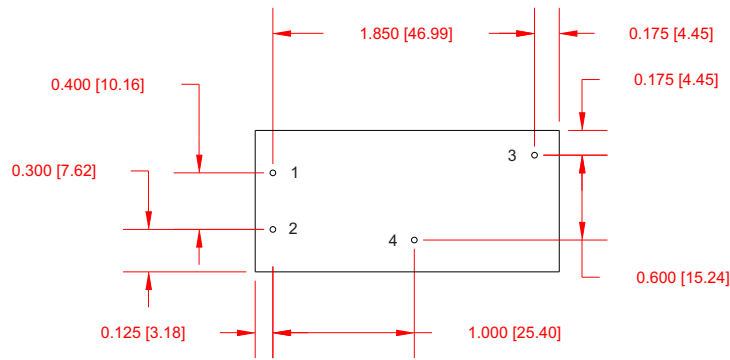
PIN #	100V TO 2KV OUTPUTS	DUAL OUTPUTS	POSITIVE 3KV TO 4KV OUTPUTS	NEGATIVE 3KV TO 4KV OUTPUTS
1	- INPUT	- INPUT	- INPUT	- INPUT
2	+ INPUT	+ INPUT	+ INPUT	+ INPUT
3	+ OUTPUT	+ OUTPUT	+ OUTPUT	- OUTPUT
4	- OUTPUT	- OUTPUT	HV RTN	HV RTN
5	NO PIN	COM	NO PIN	NO PIN

Dimensions are in Inches  
 [Metric equivalents in brackets]

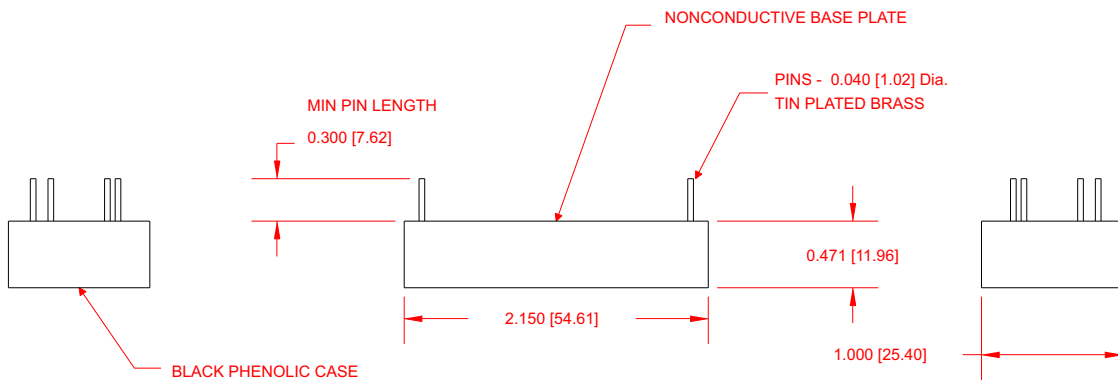


**J3 SERIES 3 WATT PROPORTIONAL HV DC/DC CONVERTERS**

**OUTPUT VOLTAGES FROM 5000V TO 6000V**



Bottom View



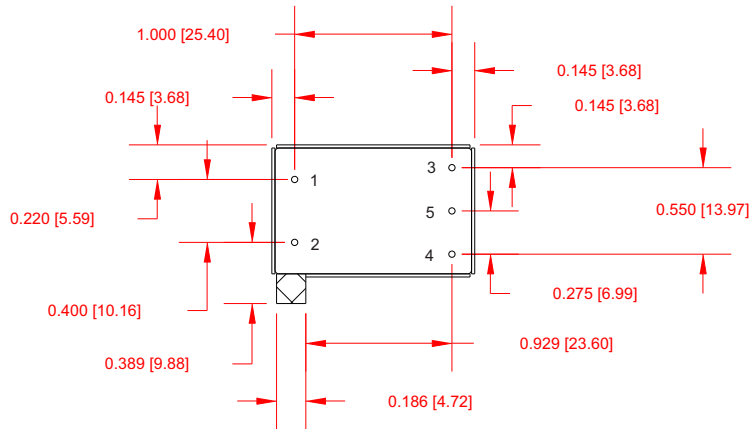
PIN #	POSITIVE 5KV TO 6KV OUTPUTS	NEGATIVE 5KV TO 6KV OUTPUTS
1	- INPUT	- INPUT
2	+ INPUT	+ INPUT
3	+ OUTPUT	- OUTPUT
4	HV RTN	HV RTN

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

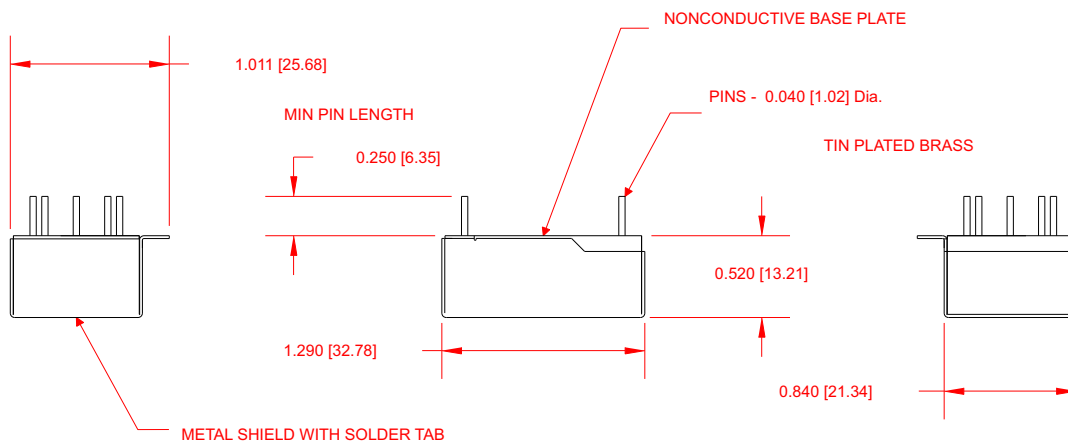


**J3 SERIES 3 WATT PROPORTIONAL HV DC/DC CONVERTERS**

**SHIELD OPTION (/S)**



Bottom View



PIN #	100V TO 2KV OUTPUTS	DUAL OUTPUTS	POSITIVE 3KV TO 4KV OUTPUTS	NEGATIVE 3KV TO 4KV OUTPUTS
1	- INPUT	- INPUT	- INPUT	- INPUT
2	+ INPUT	+ INPUT	+ INPUT	+ INPUT
3	+ OUTPUT	+ OUTPUT	+ OUTPUT	- OUTPUT
4	- OUTPUT	- OUTPUT	HV RTN	HV RTN
5	NO PIN	COM	NO PIN	NO PIN

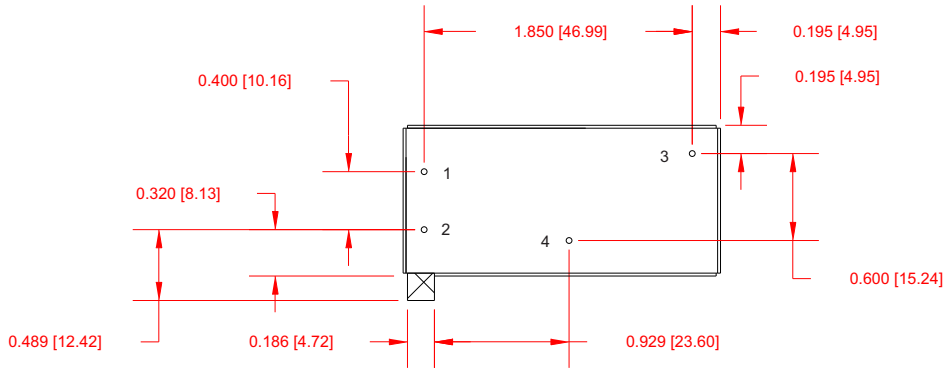
Dimensions are in Inches  
 [Metric equivalents in brackets]



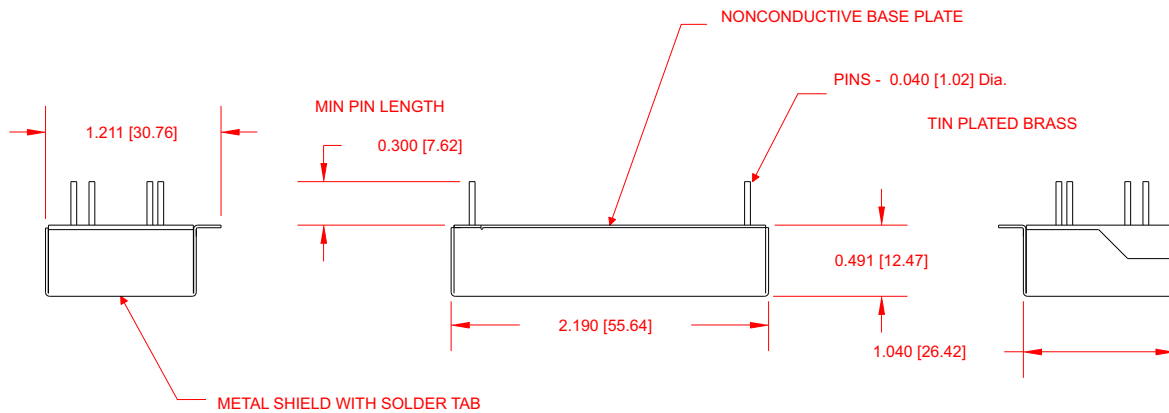


**J3 SERIES 3 WATT PROPORTIONAL HV DC/DC CONVERTERS**

**SHIELD OPTION (/S)**



Bottom View



PIN #	POSITIVE 5KV TO 6KV OUTPUTS	NEGATIVE 5KV TO 6KV OUTPUTS
1	- INPUT	- INPUT
2	+ INPUT	+ INPUT
3	+ OUTPUT	- OUTPUT
4	HV RTN	HV RTN

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



## J3 SERIES 3 WATT PROPORTIONAL HV DC/DC CONVERTERS

### APPLICATION NOTES

#### INPUT AND OUTPUT IMPEDANCE

The J3 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 10  $\mu$ F electrolytic capacitor with an ESR <1 Ohm across the input helps ensure stability of the converter. In some applications, the user may need to use decoupling capacitance at the load.

#### SHORT CIRCUIT PROTECTION

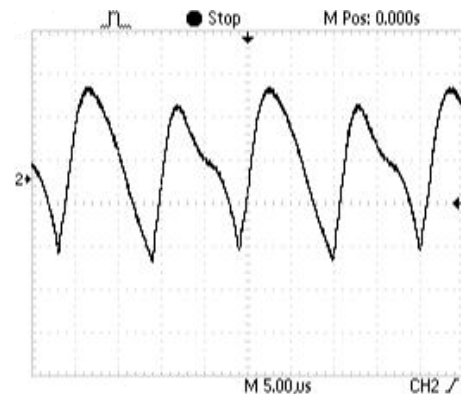
The J3 Series is equipped with short circuit protection. The converter will fold-back the input power whenever a short circuit is applied to its output and automatically recover after the overload condition is removed.

#### ISOLATION

The Output of the J3 Series is galvanically isolated from the input, capacitance is < 30pF and resistance is > 10G Ohm. Isolation permits up to a 500V bias on the output return.

#### 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.



#### INRUSH CURRENT

The inrush current of the J3 Series has been kept as low as possible. However, a series resistor may be inserted in the input line to limit this current further.

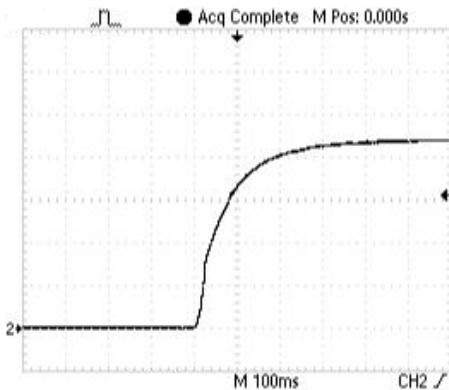


## J3 SERIES 3 WATT PROPORTIONAL HV DC/DC CONVERTERS

### APPLICATION NOTES

#### STARTUP TRANSIENT

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



#### 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.

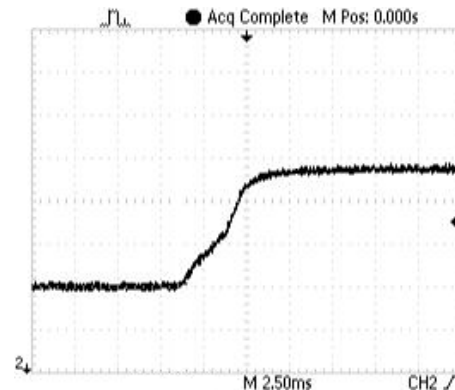


Figure below shows a typical output voltage during turn-on, measured at full rated load current with no additional output filtering.

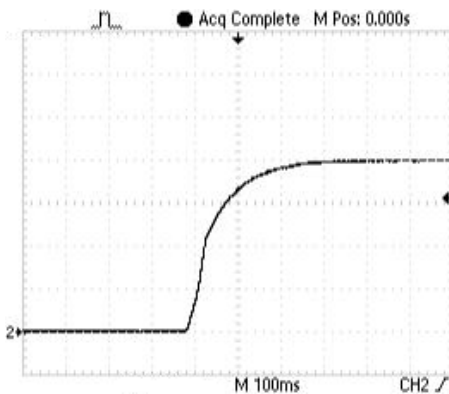
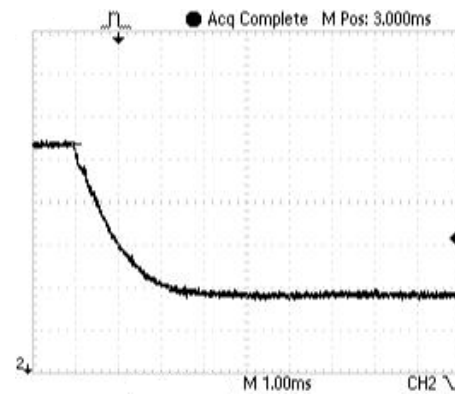


Figure below shows a typical output voltage response, measured during a transition from no load current to full rated load current with no additional output filtering.





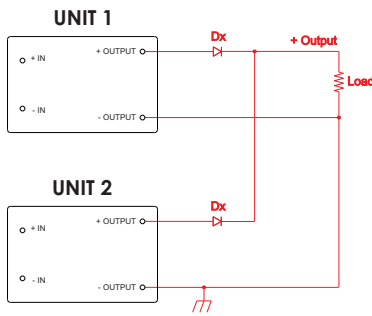
J3 SERIES 3 WATT PROPORTIONAL HV DC/DC CONVERTERS

APPLICATION NOTES

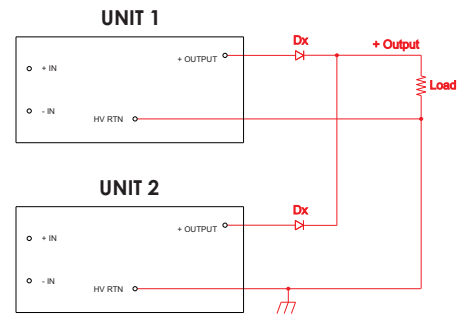
CONNECTION IN PARALLEL

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

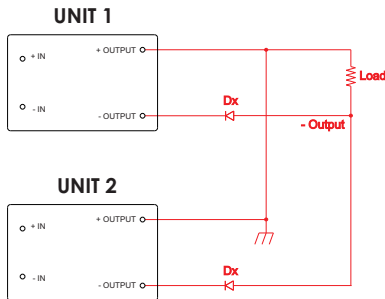
POSITIVE OUTPUT (100V TO 4KV)



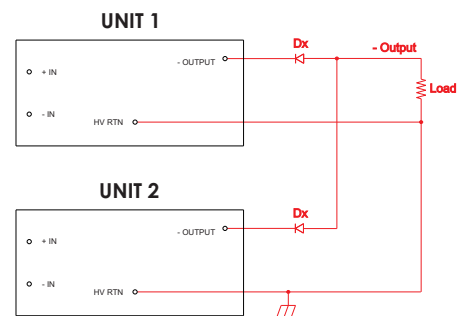
POSITIVE OUTPUT (5KV TO 6KV)



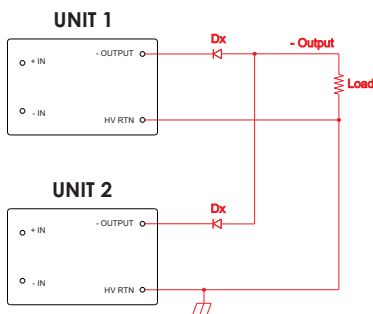
NEGATIVE OUTPUT (100V TO 2KV)



NEGATIVE OUTPUT (5KV TO 6KV)



NEGATIVE OUTPUT (3KV TO 4KV)



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



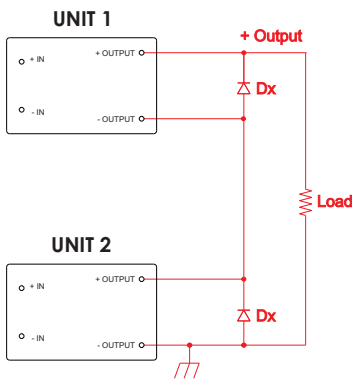
# J3 SERIES 3 WATT PROPORTIONAL HV DC/DC CONVERTERS

## APPLICATION NOTES

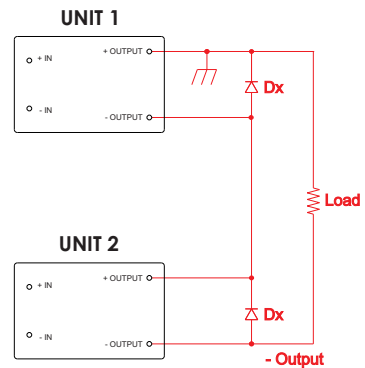
### CONNECTION IN SERIES

Figures 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 (500V).

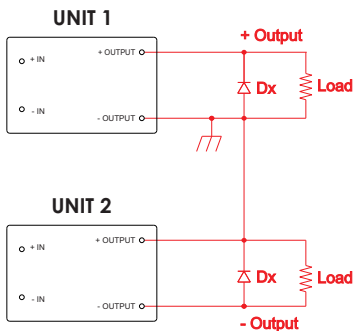
#### POSITIVE OUTPUT



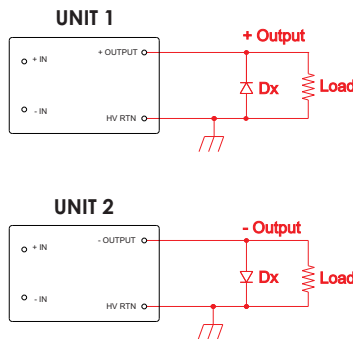
#### NEGATIVE OUTPUT



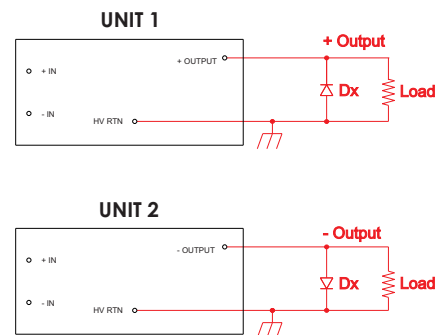
#### DUAL OUTPUTS (100V TO 2KV)



#### DUAL OUTPUTS (3KV TO 4KV)



#### DUAL OUTPUTS (5KV TO 6KV)



**NOTE:**

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



## J3 SERIES 3 WATT PROPORTIONAL HV DC/DC CONVERTERS

### 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
0 to 5Vdc	2A
0 to 12Vdc	0.5A
0 to 24Vdc	0.2A

If one input fuse is used for a group of modules, the maximum fuse rating should not exceed 5A.

#### 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.