

**1W** Convection cooled

DC-HVDC converter 

The A Series is a broad line of ultra-miniature, DC to HVDC converters that set an industry standard in high voltage miniaturization. This unique package occupies less than one tenth of a cubic inch of volume, and an extremely low profile of only 6.35mm (0.250 inches).

Controllable output voltages range from 100V to 6kVDC. The output is directly proportional to the input voltage and is linear from <0.7V input to maximum input voltage, allowing for an adjustable output voltage. Output is load dependent. Isolation permits <±500V bias on output return. No external components or minimum load are required.

A separate high impedance control pin is standard and is designed for external error amplifier and/or DAC control in closed or open loop systems. Or simply connect the control pin to the + input for proportional input to output operation. These component-sized converters are ideal for applications requiring minimal size and weight.



## Features

- ▶ Output voltages up to 6kVDC
- ▶ Positive or negative outputs
- ▶ Isolated output voltage proportional to input voltage
- ▶ Input voltage 5V, 12V & 24VDC
- ▶ Low turn on voltage: <0.7VDC
- ▶ Very low I/O leakage current
- ▶ Low noise, quasi-sinewave resonant oscillator
- ▶ Ultra-miniature, low profile
- ▶ MTBF>1.8Mhrs
- ▶ 3 year warranty

## Applications



- ▶ Avalanche photo diodes
- ▶ Photo multiplier tubes
- ▶ Electrophoresis
- ▶ Capacitor charging
- ▶ Sustaining ion pumps
- ▶ Piezo devices
- ▶ Handheld instruments

## Dimensions

All models:

Height x Width: 6.35 x 11.43mm (0.25" x 0.45")

100VDC to 2kVDC outputs: Length: 23.37mm (0.92")

3kVDC to 5kVDC outputs: Length: 28.69mm (1.13")

6kVDC outputs: Length: 33.78mm (1.33")

## Documentation

For further information click the link or scan the code

→ [xppower.com](http://xppower.com)



## Models & ratings

| Model number <sup>(1)</sup> | Output current <sup>(2)</sup> | Output voltage <sup>(3)</sup> | Input voltage | Input current |           | Ripple <sup>(4)</sup> |
|-----------------------------|-------------------------------|-------------------------------|---------------|---------------|-----------|-----------------------|
|                             |                               |                               |               | No load       | Full load |                       |
| A01N-5                      | 10mA                          | 0 to -100VDC                  | 5VDC          | <300mA        | <500mA    | <5%                   |
| A01N-12T                    | 10mA                          | 0 to -100VDC                  | 12VDC         | <100mA        | <185mA    | <5%                   |
| A01P-5T                     | 10mA                          | 0 to +100VDC                  | 5VDC          | <300mA        | <500mA    | <5%                   |
| A01P-12                     | 10mA                          | 0 to +100VDC                  | 12VDC         | <100mA        | <185mA    | <5%                   |
| A01P-12T                    | 10mA                          | 0 to +100VDC                  | 12VDC         | <100mA        | <185mA    | <5%                   |

Cont. on page 2

### Notes:

1. -T represents extended temperature model.
2. Maximum output current is available at maximum rated output voltage, and derates linearly as input voltage is decreased.
3. Output voltage is load dependent. Under light or no-load conditions, reduce the input voltage so maximum rated output voltage is not exceeded.
4. Specifications are after 30 minute warm-up, full-load at +25°C, unless otherwise noted.
5. Other voltages available on request.

## Models & ratings

| Model number <sup>(1)</sup> | Output current <sup>(2)</sup> | Output voltage <sup>(3)</sup> | Input voltage | Input current |           | Ripple <sup>(4)</sup> |
|-----------------------------|-------------------------------|-------------------------------|---------------|---------------|-----------|-----------------------|
|                             |                               |                               |               | No load       | Full load |                       |
| A01P-24T                    | 10mA                          | 0 to +100V                    | 24VDC         | <25mA         | <60mA     | <5%                   |
| A02N-5                      | 5mA                           | 0 to -200V                    | 5VDC          | <300mA        | <500mA    | <1%                   |
| A02N-12                     | 5mA                           | 0 to -200V                    | 12VDC         | <100mA        | <185mA    | <1%                   |
| A02P-5                      | 5mA                           | 0 to +200V                    | 5VDC          | <300mA        | <500mA    | <1%                   |
| A02P-12                     | 5mA                           | 0 to +200V                    | 12VDC         | <100mA        | <185mA    | <1%                   |
| A02P-24                     | 5mA                           | 0 to +200V                    | 24VDC         | <25mA         | <60mA     | <1%                   |
| A025P-5                     | 4mA                           | 0 to +250V                    | 5VDC          | <300mA        | <500mA    | <0.9%                 |
| A03N-12                     | 3.33mA                        | 0 to -300V                    | 12VDC         | <100mA        | <185mA    | <0.7%                 |
| A03P-12                     | 3.33mA                        | 0 to +300V                    | 12VDC         | <100mA        | <185mA    | <0.7%                 |
| A04N-12T                    | 2.5mA                         | 0 to -400V                    | 12VDC         | <100mA        | <185mA    | <0.5%                 |
| A04P-5                      | 2.5mA                         | 0 to +400V                    | 5VDC          | <300mA        | <500mA    | <0.5%                 |
| A05N-12                     | 2mA                           | 0 to -500V                    | 12VDC         | <100mA        | <185mA    | <0.5%                 |
| A05P-5                      | 2mA                           | 0 to +500V                    | 5VDC          | <300mA        | <500mA    | <0.5%                 |
| A05P-12                     | 2mA                           | 0 to +500V                    | 12VDC         | <100mA        | <185mA    | <0.5%                 |
| A05P-12T                    | 2mA                           | 0 to +500V                    | 12VDC         | <100mA        | <185mA    | <0.5%                 |
| A06N-5                      | 1.67mA                        | 0 to -600V                    | 5VDC          | <300mA        | <500mA    | <1%                   |
| A06N-12                     | 1.67mA                        | 0 to -600V                    | 12VDC         | <100mA        | <185mA    | <1%                   |
| A06P-5T                     | 1.67mA                        | 0 to +600V                    | 5VDC          | <300mA        | <500mA    | <1%                   |
| A08N-24                     | 1.25mA                        | 0 to -800V                    | 24VDC         | <25mA         | <60mA     | <1%                   |
| A08P-5                      | 1.25mA                        | 0 to +800V                    | 5VDC          | <300mA        | <500mA    | <1%                   |
| A10N-12                     | 1mA                           | 0 to -1kVDC                   | 12VDC         | <100mA        | <185mA    | <0.8%                 |
| A10P-5                      | 1mA                           | 0 to +1kVDC                   | 5VDC          | <300mA        | <500mA    | <0.8%                 |
| A10P-5T                     | 1mA                           | 0 to +1kVDC                   | 5VDC          | <300mA        | <500mA    | <0.8%                 |
| A10P-12                     | 1mA                           | 0 to +1kVDC                   | 12VDC         | <100mA        | <185mA    | <0.8%                 |
| A12N-5                      | 0.83mA                        | 0 to -1.2kVDC                 | 5VDC          | <300mA        | <500mA    | <0.5%                 |
| A12P-12                     | 0.83mA                        | 0 to +1.2kVDC                 | 12VDC         | <100mA        | <185mA    | <0.5%                 |
| A12P-5                      | 0.83mA                        | 0 to +1.2kVDC                 | 5VDC          | <300mA        | <500mA    | <0.5%                 |
| A15N-12                     | 0.66mA                        | 0 to -1.5kVDC                 | 12VDC         | <100mA        | <185mA    | <0.4%                 |
| A15N-5                      | 0.66mA                        | 0 to -1.5kVDC                 | 5VDC          | <300mA        | <500mA    | <0.4%                 |
| A15P-5                      | 0.66mA                        | 0 to +1.5kVDC                 | 5VDC          | <300mA        | <500mA    | <0.4%                 |
| A15P-12                     | 0.66mA                        | 0 to +1.5kVDC                 | 12VDC         | <100mA        | <185mA    | <0.4%                 |
| A15P-24                     | 0.66mA                        | 0 to +1.5kVDC                 | 24VDC         | <25mA         | <60mA     | <0.4%                 |
| A20N-5                      | 0.5mA                         | 0 to -2kVDC                   | 5VDC          | <300mA        | <500mA    | <0.3%                 |
| A20P-5                      | 0.5mA                         | 0 to +2kVDC                   | 5VDC          | <300mA        | <500mA    | <0.3%                 |
| A20P-12                     | 0.5mA                         | 0 to +2kVDC                   | 12VDC         | <100mA        | <185mA    | <0.3%                 |
| A20P-12T                    | 0.5mA                         | 0 to +2kVDC                   | 12VDC         | <100mA        | <185mA    | <0.3%                 |
| A30N-5                      | 0.33mA                        | 0 to -3kVDC                   | 5VDC          | <300mA        | <500mA    | <0.3%                 |
| A30N-12                     | 0.33mA                        | 0 to -3kVDC                   | 12VDC         | <100mA        | <185mA    | <0.3%                 |
| A30P-5                      | 0.33mA                        | 0 to +3kVDC                   | 5VDC          | <300mA        | <500mA    | <0.3%                 |
| A30P-5T                     | 0.33mA                        | 0 to +3kVDC                   | 5VDC          | <300mA        | <500mA    | <0.3%                 |
| A30P-24                     | 0.33mA                        | 0 to +3kVDC                   | 24VDC         | <25mA         | <60mA     | <0.3%                 |
| A40P-5T                     | 0.25mA                        | 0 to +4kVDC                   | 5VDC          | <300mA        | <500mA    | <0.3%                 |
| A50P-5                      | 0.20mA                        | 0 to +5kVDC                   | 5VDC          | <300mA        | <500mA    | <0.3%                 |
| A60P-5                      | 0.16mA                        | 0 to +6kVDC                   | 5VDC          | <300mA        | <500mA    | <0.3%                 |

### Notes:

- T represents extended temperature model.
- Maximum output current is available at maximum rated output voltage, and derates linearly as input voltage is decreased.
- Output voltage is load dependent. Under light or no-load conditions, reduce the input voltage so maximum rated output voltage is not exceeded.
- Specifications are after 30 minute warm-up, full-load at +25°C, unless otherwise noted.
- Other voltages available on request.

## Input

| Characteristic        | Minimum                                                                                                   | Typical | Maximum   | Units | Notes & conditions         |
|-----------------------|-----------------------------------------------------------------------------------------------------------|---------|-----------|-------|----------------------------|
| Input voltage         | 0.7                                                                                                       |         | 5, 12, 24 | VDC   | See models & ratings table |
| Input current         |                                                                                                           |         | 625       | mA    | See models & ratings table |
| Control voltage input | Analog Control Voltage adjusts output from 0 to 100%, not to exceed Input Voltage, see application notes. |         |           |       |                            |

## Output

| Characteristic           | Minimum                                                             | Typical | Maximum | Units | Notes & conditions         |
|--------------------------|---------------------------------------------------------------------|---------|---------|-------|----------------------------|
| Output voltage           |                                                                     |         | 6000    | VDC   | See models & ratings table |
| Output current           |                                                                     |         | 15      | mA    | See models & ratings table |
| Output voltage tolerance |                                                                     | ±10     |         | %     | At Max Vout, full load     |
| Minimum load             | No minimum load required                                            |         |         |       |                            |
| Regulation               | Unregulated, Output is proportional to Input. See Application Notes |         |         |       |                            |
| Short circuit protection | Protected against short circuit conditions for a minimum 1 minute.  |         |         |       |                            |
| Ripple and noise         |                                                                     |         | 5       | %     | See models & ratings table |

## General

| Characteristic             | Minimum                                     | Typical | Maximum | Units | Notes & conditions             |
|----------------------------|---------------------------------------------|---------|---------|-------|--------------------------------|
| Isolation: input to output |                                             |         | 500     | VDC   | <±500VDC Bias on output return |
| Leakage current            |                                             |         | 100     | mA    |                                |
| Switching frequency        | 50                                          |         | 350     | kHz   |                                |
| Construction               | Solid vacuum encapsulation, UL 94 V-0 rated |         |         |       |                                |
| Mean time between failure  | 1.862                                       |         |         | Mhrs  | Per Bellcore TR 332            |

## Environmental

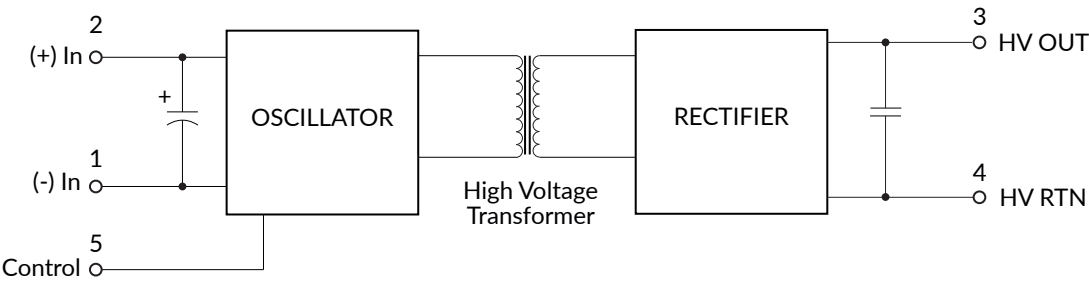
| Characteristic               | Minimum            | Typical | Maximum | Units | Notes & conditions                                                                                                                                |
|------------------------------|--------------------|---------|---------|-------|---------------------------------------------------------------------------------------------------------------------------------------------------|
| Operating temperature (case) | -25                |         | +75     | °C    | Standing operating temp, all models, proper thermal management techniques are required to maintain safe case temperature at maximum power output. |
| Operating temperature (case) | -55                |         | +85     | °C    | Extended operating temp, -T models, proper thermal management techniques are required to maintain safe case temperature at maximum power output.  |
| Storage temperature          | -55                |         | +105    | °C    |                                                                                                                                                   |
| Cooling                      | Natural convection |         |         |       |                                                                                                                                                   |
| Humidity                     |                    |         | 95      | %RH   | Non-condensing                                                                                                                                    |

## Safety approvals

| Certification | Standard                            | Notes & conditions |
|---------------|-------------------------------------|--------------------|
| UL            | IEC/UL/CSA/EN62368                  |                    |
| CE            | Meets all applicable directives     |                    |
| RoHS          | RoHS 2 and 3 Directive (2011/65/EU) | Where applicable   |

Application notes

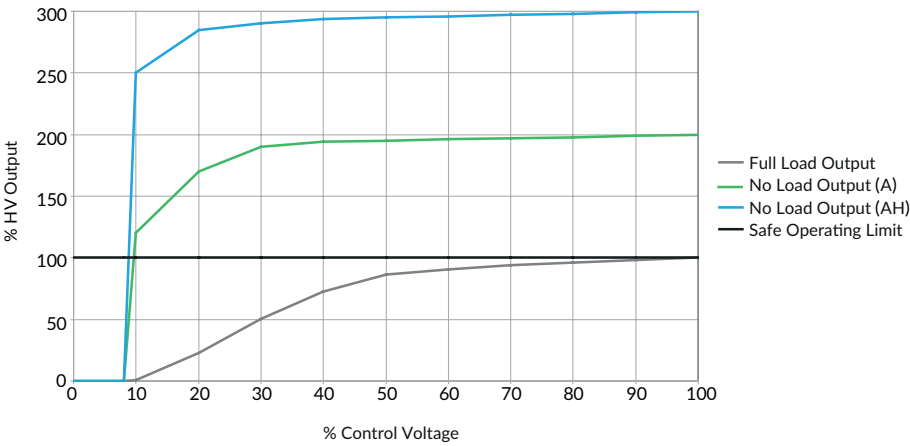
Block diagram



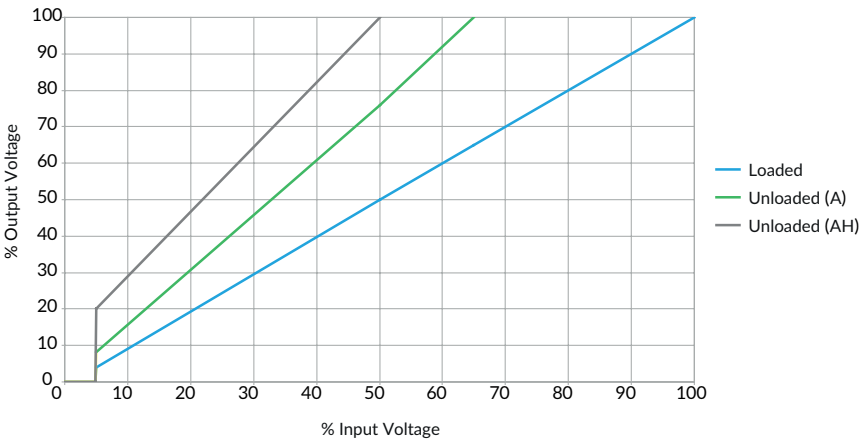
| Pin | Function  |
|-----|-----------|
| 1   | (-) Input |
| 2   | (+) Input |
| 3   | HV Out    |
| 4   | HV RTN    |
| 5   | Control   |

Typical HV output vs. control voltage

For proportional operation, tie the control pin to the input voltage, or use separately for control as shown below. Do not leave floating.



Typical output vs. input voltage



**100VDC - 2kVDC**

Technical drawing of the test specimen showing top and side views with dimensions:

- Top View Dimensions:**
  - Height: 11.43 (0.45)
  - Width: 23.37 (0.92)
- Side View Dimensions:**
  - Total Height: 6.35 (0.25)
  - Height from base to top of specimen: 5.08 (0.20)
- Material and Assembly Details:**
  - EPOXY 94V-0 COMPLIANT**: Indicated for the adhesive used in the assembly.
  - 0.025 (0.64) DIA PINS 5 PLACES**: Indicated for the pins used in the assembly.

Technical drawing of a mechanical part with dimensions in inches and millimeters. The drawing shows a cross-section of a part with a central rectangular section and a semi-circular end on the right. The dimensions are as follows:

- Overall width: 12.8 (0.504)
- Overall height: 8.38 (0.330)
- Top flange thickness: 1.98 (0.08)
- Top flange width: 5.97 (0.235)
- Top flange offset: 1.57 (0.062)
- Bottom flange thickness: 1.52 (0.06)
- Bottom flange width: 10.92 (0.430)
- Bottom flange offset: 11.68 (0.460)
- Radius of the semi-circular end: R 5.72 (0.225)

0.045 DIA PAD  
5 PL

0.889<sup>+0.127</sup><sub>-0.000</sub> (0.035<sup>+0.005</sup><sub>-0.000</sub>)  
CLEARANCE  
HOLE 5PL

1.52  
(0.06)

1.57  
(0.062)

5.97  
(0.235)

8.38  
(0.330)

10.92  
(0.430)

11.68  
(0.460)

12.80  
(0.504)

1.98  
(0.08)

1 (-) IN  
4 HV RTN

2 (+) IN  
5 CNTRL

3 HV OUT

NOTE: It is recommended that no trace be routed within the shaded area on the component side of the PWB.

1. All dimensions are in mm (inches)
2. Weight 5.66g (<0.2oz)

3. Tolerance:  $X.XX \pm 0.51$  (0.02)

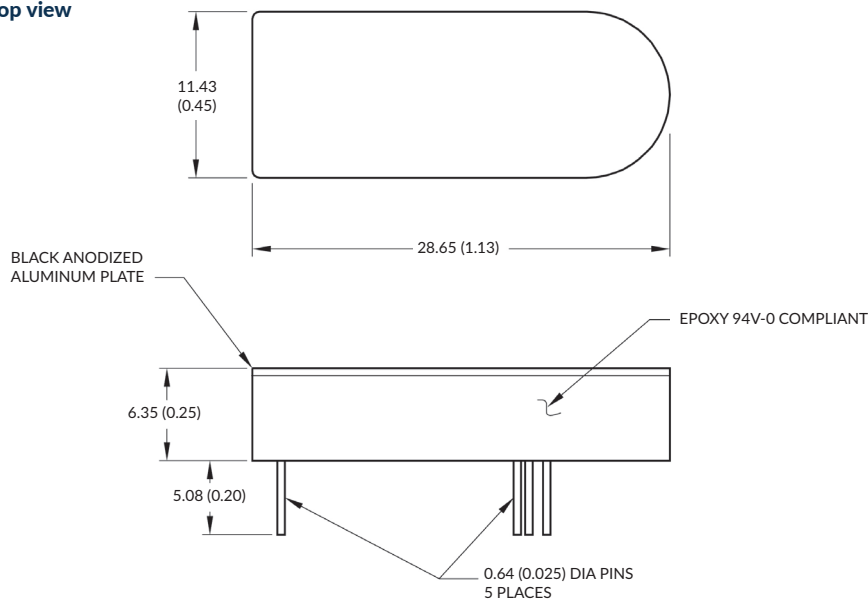
4. Pin Tolerance:  $\pm 0.127$  (0.005)



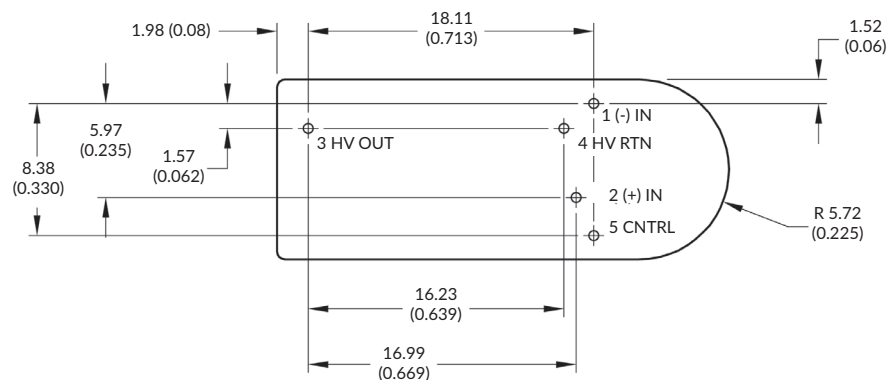
## Mechanical details

### 3kVDC - 5kVDC

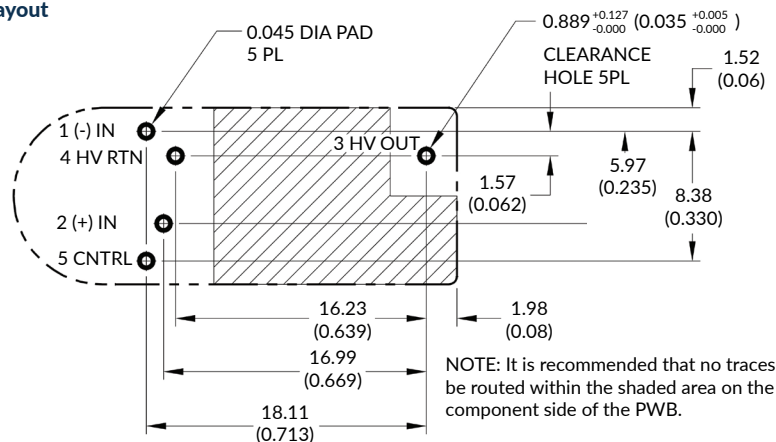
#### Top view



#### Bottom view



#### Recommended layout



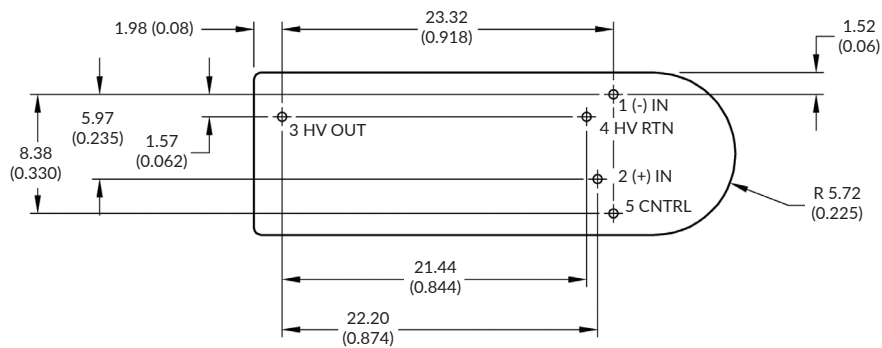
#### Notes:

1. All dimensions are in mm (inches)
2. Weight 7.09g (0.25oz)

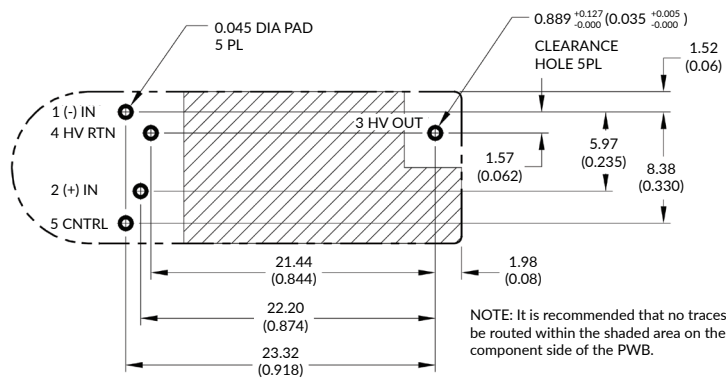
3. Tolerance: X.XX±0.51 (0.02)
4. Pin Tolerance: ±0.127 (0.005)

6kVDC

### Top view



## Recommended layout



### Notes:

1. All dimensions are in mm (inches)
2. Weight 8.49g (<0.3oz)

3. Tolerance:  $X.XX \pm 0.51$  (0.02)  
4. Pin Tolerance:  $\pm 0.127$  (0.005)