

### 1 & 1.5 Watt

- Output voltages from 100V to 6000V
- Output Proportional to Input
- 0.7VDC Turn-on Voltage
- Extremely Low Profile <0.25"
- Input to Output Isolation
- Short Circuit Protection
- Control Pin
- No minimum load
- 3 Year Warranty



The A Series is a broad line of ultra-miniature, DC to HV DC 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 0.250 inches (6.35mm).

Controllable output voltages range from 100 volts to 6000 volts. 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  $\pm 500V$  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.

#### Dimensions:

##### All models:

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

##### 100V to 2000V outputs:

Length: 0.92" (23.37mm)

##### 6000V outputs:

Length: 1.33" (33.78mm)

##### 3000V to 5000V outputs:

Length: 1.13" (28.69mm)

#### Key Applications:

- Avalanche Photo Diodes
- Photo Multiplier Tubes
- Electrophoresis
- Capacitor Charging
- Sustaining Ion Pumps
- Piezo Devices
- Handheld Instruments

#### Input

| Characteristic        | Minimum                                                                                                   | Typical | Maximum | Units | Notes & Conditions            |
|-----------------------|-----------------------------------------------------------------------------------------------------------|---------|---------|-------|-------------------------------|
| Input Voltage         | 0.7                                                                                                       |         | 5,12,24 | VDC   | See Models and Ratings Table. |
| Input Current         |                                                                                                           |         | 550     | mA    | See Models and 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           |                                                                      |          | 6,000   | VDC   | See Models and Ratings Table  |
| Output Current           |                                                                      |          | 15      | mA    | See Models and Ratings Table  |
| Output Voltage Tolerance |                                                                      | +10, -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 and Ratings Table. |

#### Notes

1. Maximum output current is available at maximum rated output voltage, and derates linearly as input voltage is decreased.
2. Output Voltage is load dependent. Under light or no-load conditions, reduce the Input Voltage so maximum rated Output Voltage is not exceeded.
3. Specifications are after 30 minute warm-up, full-load at 25°C, unless otherwise noted.
4. Proper thermal management techniques are required to maintain safe case temperature at maximum power output.

### Environmental

| Characteristic               | Minimum | Typical | Maximum | Units | Notes & Conditions                  |
|------------------------------|---------|---------|---------|-------|-------------------------------------|
| Operating Temperature (case) | -25     |         | +75     | °C    | Standard operating temp, all models |
| Operating Temperature (case) | -55     |         | +85     | °C    | Extended operating temp, -T models  |
| Storage Temperature          | -55     |         | +105    | °C    |                                     |
| Humidity                     |         |         | 95      | %RH   | Non-condensing                      |
| Cooling                      |         |         |         |       | Natural Convection                  |

### Safety Approvals

| Safety Agency | Safety Standard                     | Notes & Conditions |
|---------------|-------------------------------------|--------------------|
| UL and TUV    | IEC/UL/CSA/EN 62368                 |                    |
| CE            | CE Directive, RoHS and LVD          | Where applicable   |
| RoHS          | RoHS 2 and 3 Directive (2011/65/EU) | Where applicable   |

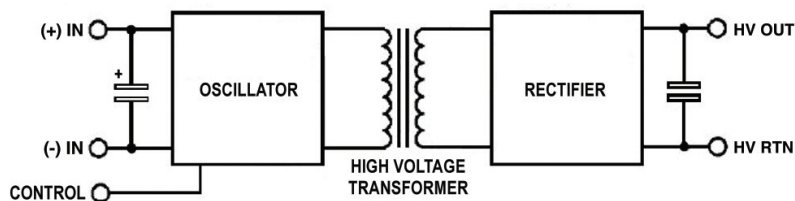
### General

| Characteristic             | Minimum                                      | Typical | Maximum | Units | Notes & Conditions               |
|----------------------------|----------------------------------------------|---------|---------|-------|----------------------------------|
| Isolation: Input to Output |                                              |         | 500     | V     | < ±500 VDC Bias on Output Return |
| Leakage Current            |                                              |         | 100     | nA    |                                  |
| 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              |

### Notes

Refer to page 1.

### Block Diagram



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

### Models & Ratings

| Output Voltage | Output Current | Input Voltage | Input Current |           | Ripple | Model Number |
|----------------|----------------|---------------|---------------|-----------|--------|--------------|
|                |                |               | No Load       | Full Load |        |              |
| 0 to -100V     | 10mA           | 12V           | <100mA        | <185mA    | <5%    | A01N-12      |
| 0 to -100V     | 10mA           | 12V           | <100mA        | <185mA    | <5%    | A01N-12T     |
| 0 to -100V     | 10mA           | 24V           | <25mA         | <60mA     | <5%    | A01N-24T     |
| 0 to -100V     | 10mA           | 5V            | <300mA        | <500mA    | <5%    | A01N-5       |
| 0 to +100V     | 10mA           | 12V           | <100mA        | <185mA    | <5%    | A01P-12      |
| 0 to +100V     | 10mA           | 12V           | <100mA        | <185mA    | <5%    | A01P-12T     |
| 0 to +100V     | 10mA           | 24V           | <25mA         | <60mA     | <5%    | A01P-24T     |
| 0 to +100V     | 10mA           | 5V            | <300mA        | <500mA    | <5%    | A01P-5T      |
| 0 to -100V     | 15mA           | 12V           | <125mA        | <250mA    | <2%    | AH01N-12     |
| 0 to -100V     | 15mA           | 24V           | <40mA         | <120mA    | <2%    | AH01N-24     |
| 0 to +100V     | 15mA           | 12V           | <125mA        | <250mA    | <2%    | AH01P-12     |
| 0 to -200V     | 5mA            | 12V           | <100mA        | <185mA    | <1%    | A02N-12      |
| 0 to -200V     | 5mA            | 12V           | <100mA        | <185mA    | <1%    | A02N-12T     |
| 0 to -200V     | 5mA            | 24V           | <25mA         | <60mA     | <1%    | A02N-24      |
| 0 to -200V     | 5mA            | 24V           | <25mA         | <60mA     | <1%    | A02N-24T     |
| 0 to -200V     | 5mA            | 5V            | <300mA        | <500mA    | <1%    | A02N-5       |
| 0 to -200V     | 5mA            | 5V            | <300mA        | <500mA    | <1%    | A02N-5T      |
| 0 to +200V     | 5mA            | 12V           | <100mA        | <185mA    | <1%    | A02P-12      |
| 0 to +200V     | 5mA            | 12V           | <100mA        | <185mA    | <1%    | A02P-12T     |
| 0 to +200V     | 5mA            | 24V           | <25mA         | <60mA     | <1%    | A02P-24      |
| 0 to +200V     | 5mA            | 24V           | <25mA         | <60mA     | <1%    | A02P-24T     |
| 0 to +200V     | 5mA            | 5V            | <300mA        | <500mA    | <1%    | A02P-5       |
| 0 to +200V     | 5mA            | 5V            | <300mA        | <500mA    | <1%    | A02P-5T      |
| 0 to -200V     | 7.5mA          | 12V           | <125mA        | <250mA    | <3%    | AH02N-12     |
| 0 to -200V     | 7.5mA          | 5V            | <300mA        | <550mA    | <3%    | AH02N-5      |
| 0 to +200V     | 7.5mA          | 24V           | <40mA         | <120mA    | <3%    | AH02P-24     |
| 0 to +200V     | 7.5mA          | 5V            | <300mA        | <550mA    | <3%    | AH02P-5      |
| 0 to +250V     | 4mA            | 5V            | <300mA        | <500mA    | <0.9%  | A025P-5      |
| 0 to +250V     | 6mA            | 12V           | <125mA        | <250mA    | <1.2%  | AH025P-12    |
| 0 to +250V     | 6mA            | 5V            | <300mA        | <550mA    | <1.2%  | AH025P-5     |
| 0 to -300V     | 3.33mA         | 12V           | <100mA        | <185mA    | <0.7%  | A03N-12      |
| 0 to +300V     | 3.33mA         | 12V           | <100mA        | <185mA    | <0.7%  | A03P-12      |
| 0 to +300V     | 3.33mA         | 12V           | <100mA        | <185mA    | <0.7%  | A03P-12T     |
| 0 to -300V     | 5mA            | 12V           | <125mA        | <250mA    | <0.7%  | AH03N-12     |
| 0 to +300V     | 5mA            | 24V           | <40mA         | <120mA    | <0.7%  | AH03P-24     |
| 0 to +300V     | 5mA            | 5V            | <300mA        | <550mA    | <0.7%  | AH03P-5      |
| 0 to -400V     | 2.5mA          | 12V           | <100mA        | <185mA    | <0.5%  | A04N-12T     |
| 0 to +400V     | 2.5mA          | 12V           | <100mA        | <185mA    | <0.5%  | A04P-12T     |
| 0 to +400V     | 2.5mA          | 5V            | <300mA        | <500mA    | <0.5%  | A04P-5       |
| 0 to -400V     | 3.75mA         | 12V           | <125mA        | <250mA    | <0.8%  | AH04N-12     |
| 0 to +400V     | 3.75mA         | 12V           | <125mA        | <250mA    | <0.8%  | AH04P-12     |
| 0 to -500V     | 2mA            | 12V           | <100mA        | <185mA    | <0.5%  | A05N-12      |
| 0 to +500V     | 2mA            | 12V           | <100mA        | <185mA    | <0.5%  | A05P-12      |
| 0 to +500V     | 2mA            | 12V           | <100mA        | <185mA    | <0.5%  | A05P-12T     |
| 0 to +500V     | 2mA            | 5V            | <300mA        | <500mA    | <0.5%  | A05P-5       |
| 0 to +500V     | 2mA            | 5V            | <300mA        | <500mA    | <0.5%  | A05P-5T      |
| 0 to -500V     | 3mA            | 12V           | <125mA        | <250mA    | <0.75% | AH05N-12     |
| 0 to -500V     | 3mA            | 5V            | <300mA        | <550mA    | <0.7%  | AH05N-5      |
| 0 to +500V     | 3mA            | 12V           | <125mA        | <250mA    | <0.7%  | AH05P-12     |
| 0 to +500V     | 3mA            | 5V            | <300mA        | <550mA    | <0.7%  | AH05P-5      |
| 0 to -600V     | 1.67mA         | 12V           | <100mA        | <185mA    | <1%    | A06N-12      |
| 0 to -600V     | 1.67mA         | 5V            | <300mA        | <500mA    | <1%    | A06N-5       |
| 0 to +600V     | 1.67mA         | 5V            | <300mA        | <500mA    | <1%    | A06P-5       |
| 0 to +600V     | 1.67mA         | 5V            | <300mA        | <500mA    | <1%    | A06P-5T      |
| 0 to -600V     | 2.5mA          | 5V            | <300mA        | <550mA    | <2%    | AH06N-5      |
| 0 to +600V     | 2.5mA          | 5V            | <300mA        | <550mA    | <2%    | AH06P-5      |
| 0 to -700V     | 1.43mA         | 24V           | <25mA         | <60mA     | <1%    | A07N-24      |
| 0 to -800V     | 1.25mA         | 24V           | <25mA         | <60mA     | <1%    | A08N-24      |
| 0 to +800V     | 1.25mA         | 12V           | <100mA        | <185mA    | <1%    | A08P-12      |

### Notes

Refer to page 1.

## Models &amp; Ratings

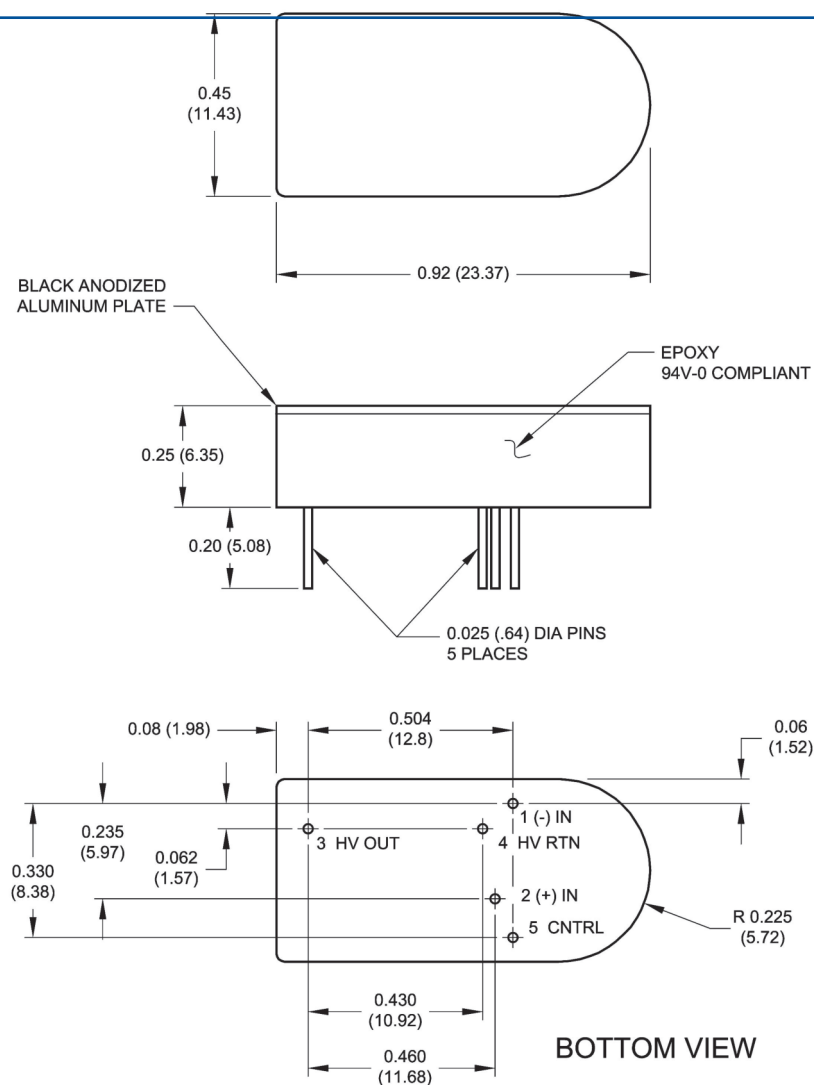
| Output Voltage | Output Current | Input Voltage | Input Current |           | Ripple | Model Number |
|----------------|----------------|---------------|---------------|-----------|--------|--------------|
|                |                |               | No Load       | Full Load |        |              |
| 0 to +800V     | 1.25mA         | 12V           | <100mA        | <185mA    | <1%    | A08P-12      |
| 0 to +800V     | 1.25mA         | 5V            | <300mA        | <500mA    | <1%    | A08P-5       |
| 0 to +800V     | 1.87mA         | 5V            | <300mA        | <550mA    | <1.2%  | AH08P-5      |
| 0 to -900V     | 1.67mA         | 5V            | <300mA        | <550mA    | <1.2%  | AH09N-5      |
| 0 to +900V     | 1.67mA         | 24V           | <40mA         | <120mA    | <1.2%  | AH09P-24     |
| 0 to -1000V    | 1mA            | 12V           | <100mA        | <185mA    | <0.8%  | A10N-12      |
| 0 to +1000V    | 1mA            | 12V           | <100mA        | <185mA    | <0.8%  | A10P-12      |
| 0 to +1000V    | 1mA            | 5V            | <300mA        | <500mA    | <0.8%  | A10P-5       |
| 0 to +1000V    | 1mA            | 5V            | <300mA        | <500mA    | <0.8%  | A10P-5T      |
| 0 to -1000V    | 1.5mA          | 12V           | <125mA        | <250mA    | <1%    | AH10N-12     |
| 0 to +1000V    | 1.5mA          | 12V           | <125mA        | <250mA    | <1%    | AH10P-12     |
| 0 to -1200V    | 0.83mA         | 12V           | <100mA        | <185mA    | <0.5%  | A12N-12      |
| 0 to -1200V    | 0.83mA         | 24V           | <25mA         | <60mA     | <0.5%  | A12N-24      |
| 0 to -1200V    | 0.83mA         | 5V            | <300mA        | <500mA    | <0.5%  | A12N-5       |
| 0 to +1200V    | 0.83mA         | 12V           | <100mA        | <185mA    | <0.5%  | A12P-12      |
| 0 to +1200V    | 0.83mA         | 5V            | <300mA        | <500mA    | <0.5%  | A12P-5       |
| 0 to -1200V    | 1.25mA         | 5V            | <300mA        | <550mA    | <0.6%  | AH12N-5      |
| 0 to +1200V    | 1.25mA         | 24V           | <40mA         | <120mA    | <0.6%  | AH12P-24     |
| 0 to -1500V    | 0.66mA         | 12V           | <100mA        | <185mA    | <0.4%  | A15N-12      |
| 0 to -1500V    | 0.66mA         | 24V           | <25mA         | <60mA     | <0.4%  | A15N-24T     |
| 0 to -1500V    | 0.66mA         | 5V            | <300mA        | <500mA    | <0.4%  | A15N-5       |
| 0 to +1500V    | 0.66mA         | 12V           | <100mA        | <185mA    | <0.4%  | A15P-12      |
| 0 to +1500V    | 0.66mA         | 24V           | <25mA         | <60mA     | <0.4%  | A15P-24      |
| 0 to +1500V    | 0.66mA         | 24V           | <25mA         | <60mA     | <0.4%  | A15P-24T     |
| 0 to +1500V    | 0.66mA         | 5V            | <300mA        | <500mA    | <0.4%  | A15P-5       |
| 0 to +1500V    | 1mA            | 24V           | <40mA         | <120mA    | <0.6%  | AH15P-24     |
| 0 to +1500V    | 1mA            | 5V            | <300mA        | <550mA    | <0.6%  | AH15P-5      |
| 0 to -2000V    | 0.5mA          | 12V           | <100mA        | <185mA    | <0.3%  | A20N-12T     |
| 0 to -2000V    | 0.5mA          | 5V            | <300mA        | <500mA    | <0.3%  | A20N-5       |
| 0 to +2000V    | 0.5mA          | 12V           | <100mA        | <185mA    | <0.3%  | A20P-12      |
| 0 to +2000V    | 0.5mA          | 12V           | <100mA        | <185mA    | <0.3%  | A20P-12T     |
| 0 to +2000V    | 0.5mA          | 5V            | <300mA        | <500mA    | <0.3%  | A20P-5       |
| 0 to -2000V    | 0.75mA         | 12V           | <125mA        | <250mA    | <0.5%  | AH20N-12     |
| 0 to -2000V    | 0.75mA         | 24V           | <40mA         | <120mA    | <0.5%  | AH20N-24     |
| 0 to +2000V    | 0.75mA         | 12V           | <125mA        | <250mA    | <0.5%  | AH20P-12     |
| 0 to +2000V    | 0.75mA         | 5V            | <300mA        | <550mA    | <0.5%  | AH20P-5      |
| 0 to -3000V    | 0.33mA         | 12V           | <100mA        | <185mA    | <0.3%  | A30N-12      |
| 0 to -3000V    | 0.33mA         | 24V           | <25mA         | <60mA     | <0.3%  | A30N-24      |
| 0 to -3000V    | 0.33mA         | 5V            | <300mA        | <500mA    | <0.3%  | A30N-5       |
| 0 to -3000V    | 0.33mA         | 5V            | <300mA        | <500mA    | <0.3%  | A30N-5T      |
| 0 to +3000V    | 0.33mA         | 12V           | <100mA        | <185mA    | <0.3%  | A30P-12      |
| 0 to +3000V    | 0.33mA         | 24V           | <25mA         | <60mA     | <0.3%  | A30P-24      |
| 0 to +3000V    | 0.33mA         | 5V            | <300mA        | <500mA    | <0.3%  | A30P-5       |
| 0 to +3000V    | 0.33mA         | 5V            | <300mA        | <500mA    | <0.3%  | A30P-5T      |
| 0 to -3000V    | 0.5mA          | 24V           | <40mA         | <120mA    | <0.3%  | AH30N-24     |
| 0 to -3000V    | 0.5mA          | 5V            | <300mA        | <550mA    | <0.3%  | AH30N-5      |
| 0 to +3000V    | 0.5mA          | 12V           | <125mA        | <250mA    | <0.3%  | AH30P-12     |
| 0 to +3000V    | 0.5mA          | 5V            | <300mA        | <550mA    | <0.3%  | AH30P-5      |
| 0 to -4000V    | 0.25mA         | 5V            | <300mA        | <500mA    | <0.3%  | A40N-5       |
| 0 to -4000V    | 0.25mA         | 5V            | <300mA        | <500mA    | <0.3%  | A40N-5T      |
| 0 to +4000V    | 0.25mA         | 5V            | <300mA        | <500mA    | <0.3%  | A40P-5       |
| 0 to +4000V    | 0.25mA         | 5V            | <300mA        | <500mA    | <0.3%  | A40P-5T      |
| 0 to -5000V    | 0.20mA         | 5V            | <300mA        | <500mA    | <0.3%  | A50N-5       |
| 0 to -5000V    | 0.20mA         | 5V            | <300mA        | <500mA    | <0.3%  | A50N-5T      |
| 0 to +5000V    | 0.20mA         | 5V            | <300mA        | <500mA    | <0.3%  | A50P-5       |
| 0 to +5000V    | 0.20mA         | 5V            | <300mA        | <500mA    | <0.3%  | A50P-5T      |
| 0 to -6000V    | 0.16mA         | 5V            | <300mA        | <500mA    | <0.3%  | A60N-5       |
| 0 to +6000V    | 0.16mA         | 5V            | <300mA        | <500mA    | <0.3%  | A60P-5       |

## Notes

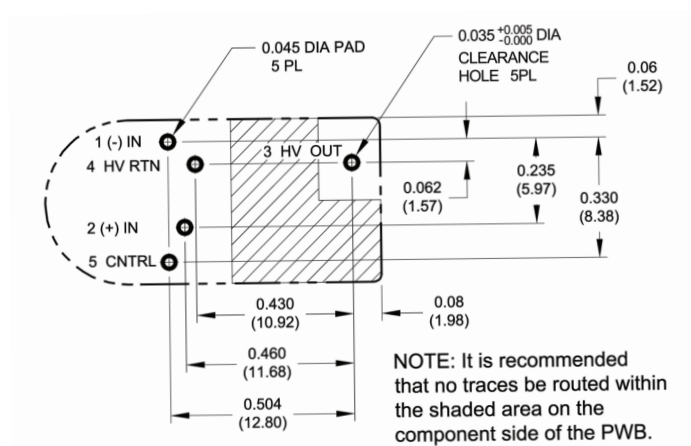
Refer to page 1.

### Mechanical Details

100V – 2,000V



### Recommended Layout



### Notes

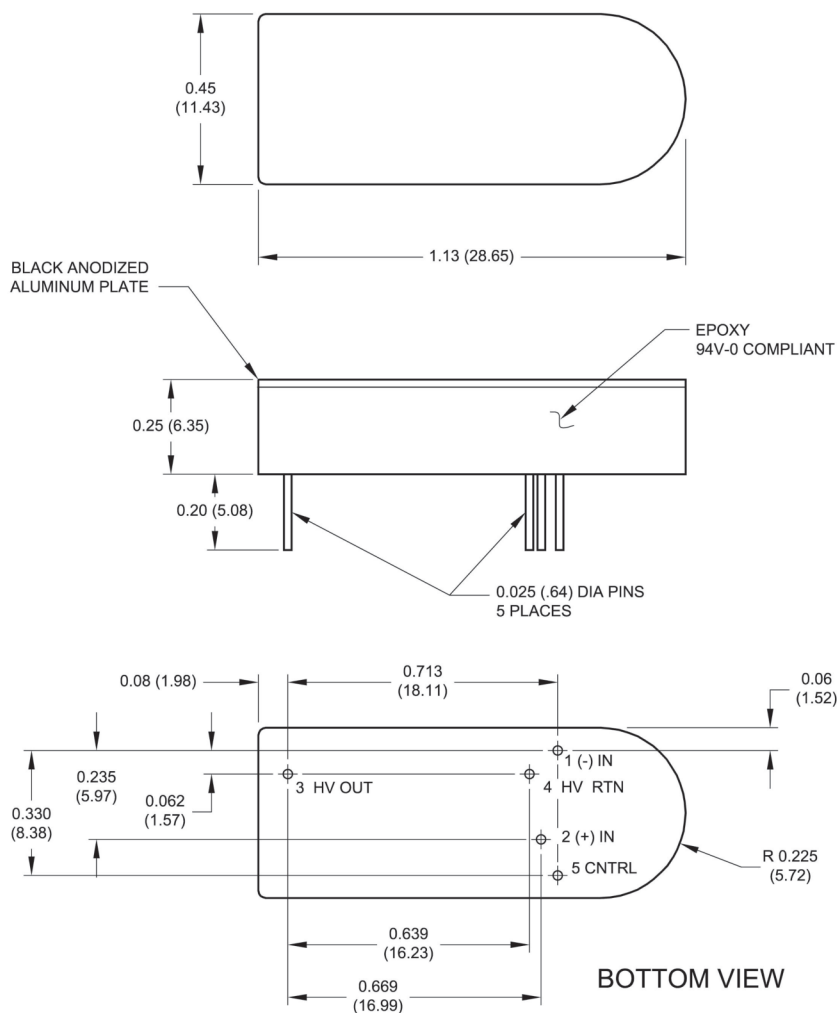
1. All dimensions are in inches (mm)
2. Weight <0.2oz (5.66g)

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

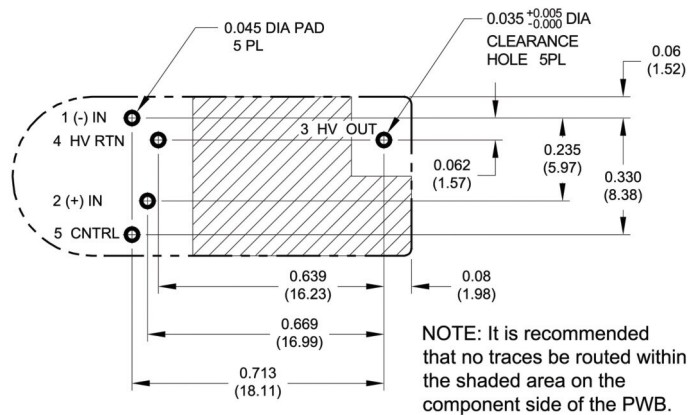
See page 2 for Pin Chart.

### Mechanical Details

3,000V – 5,000V



### Recommended Layout



### Notes

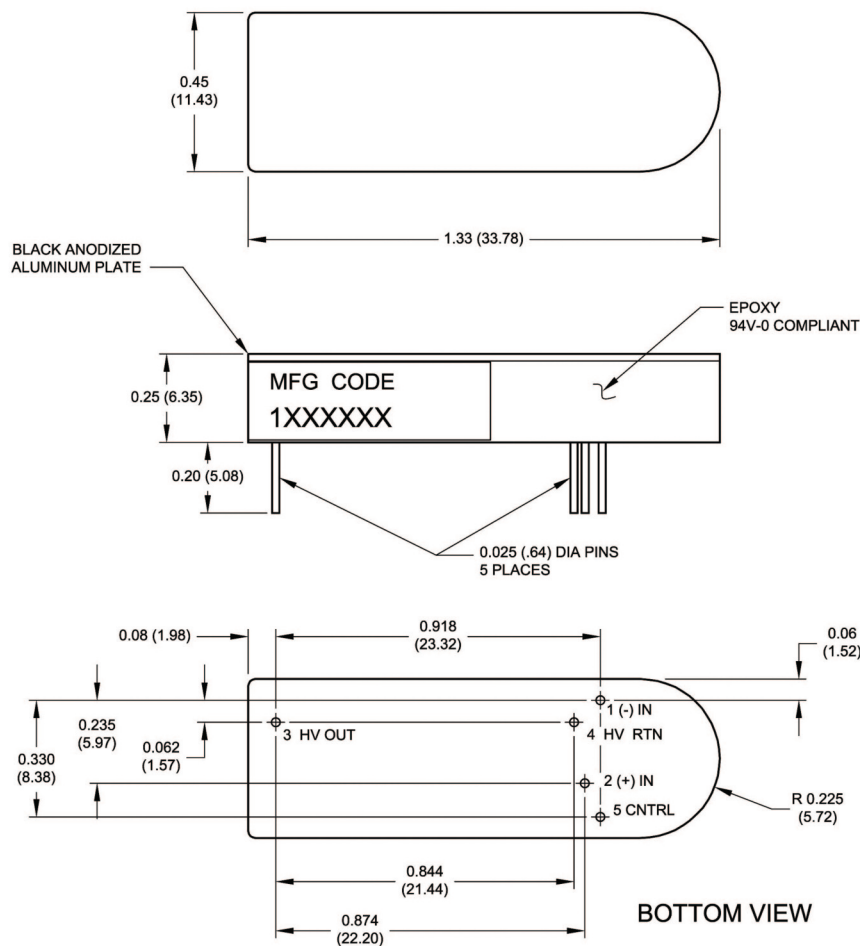
1. All dimensions are in inches (mm)
2. Weight 0.25oz (7.09g)

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

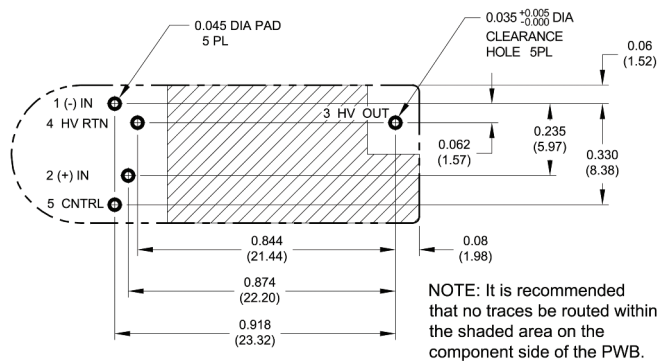
See page 2 for Pin Chart.

### Mechanical Details

6,000V



### Recommended Layout



See page 2 for Pin Chart.

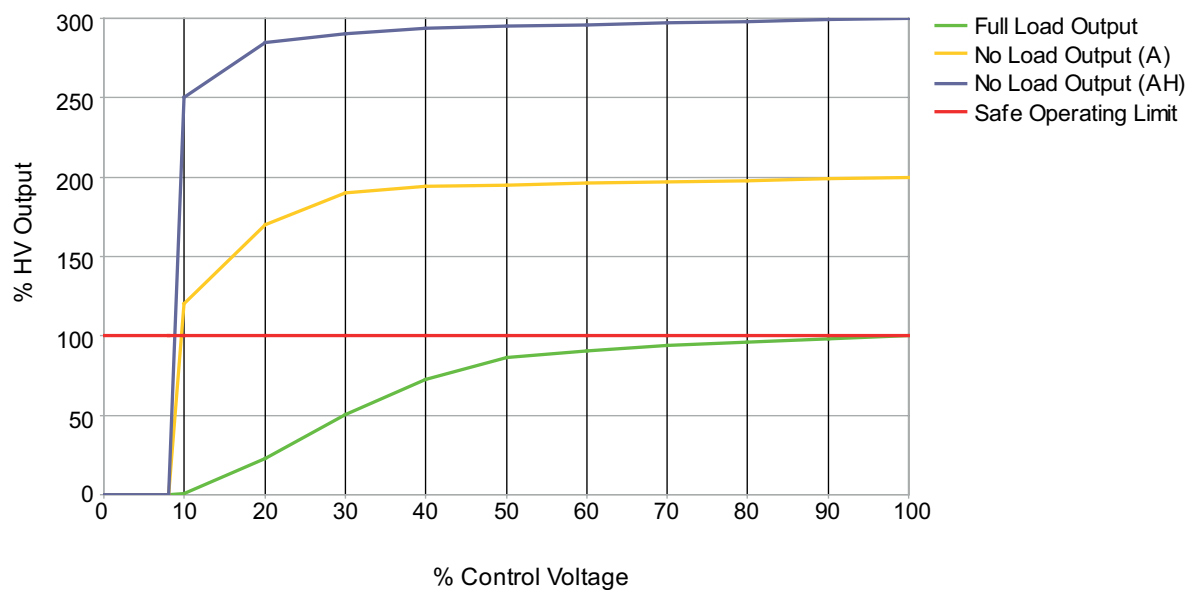
### Notes

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

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

### Application Notes

#### Typical HV Output vs. Control Voltage



#### Typical Output vs Input Voltage

