

#### KEY FEATURES

- Highest Sensitivity in 1-3 Micron Region
- Provides High Signal to Noise Performance for Wide Measurement Dynamic Range
- High Durability Ensures Long Operation in the Field
- Minimizes Maintenance and Repair Costs
- Multiple Flat Panel, Cooled, and Uncooled Package Options

The A Series single channel infrared detectors integrate PbS technology with proven manufacturing processes to provide the highest sensitivity detectors across the spectral range from one to three microns. In addition, the product line minimizes maintenance costs and provides dependable operation with industry leading quality, durability, and reliability.

Many of today's demanding applications including industrial, environmental, and medical uses require a high level of performance. The A Series IR Detectors provide a higher level of sensitivity in a tighter spectral band meeting the challenge to detect trace elements, gases, fire, flame, and emissions.

Available in a variety of standard configurations, customers can choose from an assortment of options including, element size, cooling alternatives and package size to suit numerous system and application requirements. Cooled units provide additional sensitivity for very low-level signal detection and enhanced stability for environments where temperatures are in constant flux.

Opto Diode has been manufacturing and selling high performance PbS and PbSe infrared detectors for over 25 years. Having established a reputation for highly controlled manufacturing processes, customers can rely on consistent, repeatable performance and superior customer service. Opto Diode works with customers from prototype to production to help deliver valuable instruments. Custom requirements can be addressed by contacting the Opto Diode sales team.

#### Applications

- Gas analysis
  - Medical
  - Industrial
- Emissions monitoring
- Spectroscopy
- Process control systems
- Thermal imaging
- Flame Monitoring and Detection

# IR Detectors – A Series

## High Sensitivity Lead Sulfide (PbS) Single Channel

### Uncooled and Cooled Devices

#### A Series Specifications

| Model #  | Part # | Description - Size | Package Type | Active Element Area (mm <sup>2</sup> ) | Element Operating Temp. (°C) | Peak Sensitivity Wavelength $\lambda_p$ (μm) |      | D* $\lambda_p$ , 650 Hz, 1 Hz (cm HZ <sup>1/2</sup> W <sup>-1</sup> ) |                      | Responsivity <sup>1</sup> $\lambda_p$ , 650 Hz, 25-50 V/mm (V/W) | Resistance (MΩ) | Time Constant (μsec) |       | Window Type                    | Absolute Ratings Storage & Operating Temperature (°C) <sup>2,3</sup> |
|--|--------|--------------------|--------------|--|------------------------------|--|------|---|----------------------|--|-----------------|----------------------|-------|--------------------------------|--|
|  |        |                    |              |  |                              | Min.   | Typ. | Min.  | Typ.                 |  |                 | Min.                 | Range |                                |  |
| <b>AP Series - Uncooled PbS Packaged IR Detectors</b>          |        |                    |              | Typ.                                   | Ambient 23                   | Min.   | Typ. | Min.  | Typ.                 | Min.   | Range           | Typ.                 | Max.  |                                | Range  |
| AP-15G   | 40725  | 1 mm x 1 mm        | TO5          | 1                                      | +23                          | 2.2  | 2.4  | 8x10 <sup>10</sup>  | 1x10 <sup>11</sup>   | 5.3x10 <sup>5</sup>  | 0.5-2.0         | 200                  | 400   | Glass Molded Lens <sup>4</sup> | -40 to +65   |
| AP-25G   | 40370  | 2 mm x 2 mm        | TO5          | 4                                      | +23                          | 2.2  | 2.4  | 8x10 <sup>10</sup>  | 1x10 <sup>11</sup>   | 2.7x10 <sup>5</sup>  | 0.5-2.0         | 200                  | 400   | Glass Molded Lens <sup>4</sup> | -40 to +65   |
| AP-35  | 40363  | 3 mm x 3 mm        | TO5          | 9                                      | +23                          | 2.2  | 2.4  | 8x10 <sup>10</sup>  | 1x10 <sup>11</sup>   | 1.7x10 <sup>5</sup>  | 0.5-2.0         | 200                  | 400   | Glass Molded Lens <sup>4</sup> | -40 to +65   |
| AP-20505   | 40009  | 2 mm x 5 mm        | TO5          | 10                                     | +23                          | 2.2  | 2.4  | 7x10 <sup>10</sup>  | -                    | 8.0x10 <sup>4</sup>  | 0.5-2.0         | 200                  | 400   | Flat Glass <sup>4</sup>        | -40 to +65   |
| AP-58E   | 40736  | 5 mm x 5 mm        | TO8          | 25                                     | +23                          | 2.2  | 2.4  | 7x10 <sup>10</sup>  | -                    | 1.1x10 <sup>5</sup>  | 0.5-2.0         | 200                  | 400   | Flat Si                        | -40 to +65   |
| AP-68  | 40368  | 6 mm x 6 mm        | TO8          | 36                                     | +23                          | 2.2  | 2.4  | 7x10 <sup>10</sup>  | -                    | 9.0x10 <sup>4</sup>  | 0.5-2.0         | 200                  | 400   | Flat Si                        | -40 to +65   |
| <b>AT1 Series - One Stage Cooled PbS Packaged IR Detectors</b> |        |                    |              | Typ.                                   | Ambient 25                   | Min.   | Typ. | Min.  | Typ.                 | Min.   | Range           | Typ.                 | Max.  |                                | Range  |
| AT1-27TE   | 40373  | 2 mm x 2 mm        | TO37         | 4                                      | -25                          | 2.4  | 2.5  | 1x10 <sup>11</sup>  | 1.5x10 <sup>11</sup> | 6.3x10 <sup>5</sup>  | 1.5-10.0        | 800                  | 1600  | Flat Sapphire                  | -40 to +85   |
| AT1-37T  | 40147  | 3 mm x 3 mm        | TO37         | 9                                      | -25                          | 2.4  | 2.5  | 1x10 <sup>11</sup>  | 1.5x10 <sup>11</sup> | 4.2x10 <sup>5</sup>  | 1.5-10.0        | 800                  | 1600  | Flat Sapphire                  | -40 to +85   |
| <b>AT2 Series - Two Stage Cooled PbS Packaged IR Detectors</b> |        |                    |              | Typ.                                   | Ambient 25                   | Min.   | Typ. | Min.  | Typ.                 | Min.   | Range           | Typ.                 | Max.  |                                | Range  |
| AT2-28TE   | 40028  | 2 mm x 2 mm        | TO8          | 4                                      | -35                          | 2.5  | 2.6  | 1.5x10 <sup>11</sup>  | 2.5x10 <sup>11</sup> | 6.6x10 <sup>5</sup>  | 2.5-15.0        | 1250                 | 2500  | Flat Sapphire                  | -40 to +85   |
| AT2-37T  | 40193  | 3 mm x 3 mm        | TO37         | 9                                      | -35                          | 2.5  | 2.6  | 1.5x10 <sup>11</sup>  | 2.5x10 <sup>11</sup> | 4.3x10 <sup>5</sup>  | 2.5-15.0        | 1250                 | 2500  | Flat Sapphire                  | -40 to +85   |
| AT2S-38T   | 40029  | 3 mm x 3 mm        | TO8          | 9                                      | -45                          | 2.6  | 2.7  | 2x10 <sup>11</sup>  | 3x10 <sup>11</sup>   | 4.3x10 <sup>5</sup>  | 3.0-20.0        | 1750                 | 3500  | Flat Sapphire                  | -40 to +85   |

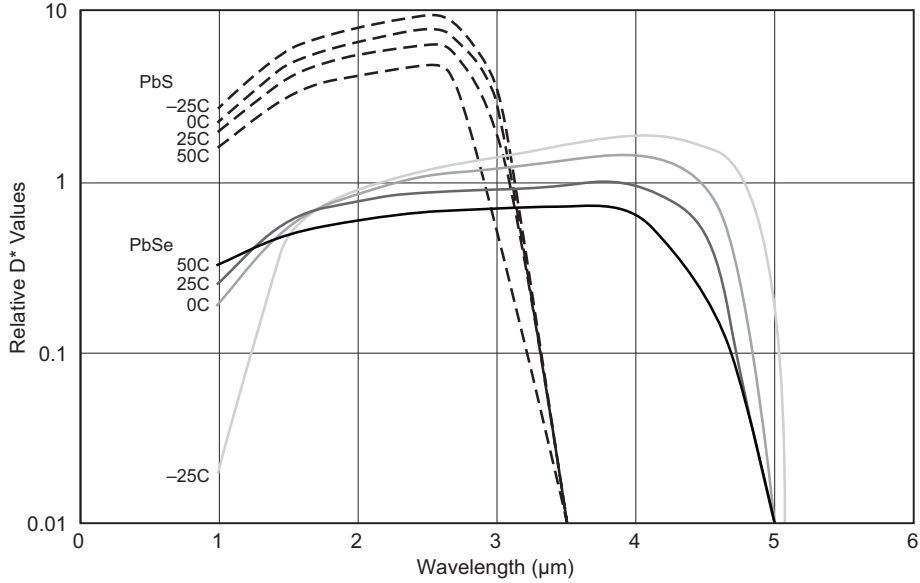
<sup>1</sup> Specifications apply at a bias voltage of 50 V/mm directly across the detector with a 1 MΩ load resistor in series. Except 40009 uses a 0.5 MΩ load.

<sup>2</sup> Specifications apply at maximum cooling with a heat sink at +25 °C. Typical cooler power at max cooling: AT1 0.8 V @ 1.5 A, AT2 0.8 V 1.2 A, AT2S 1.9 V @ 1.2 A.

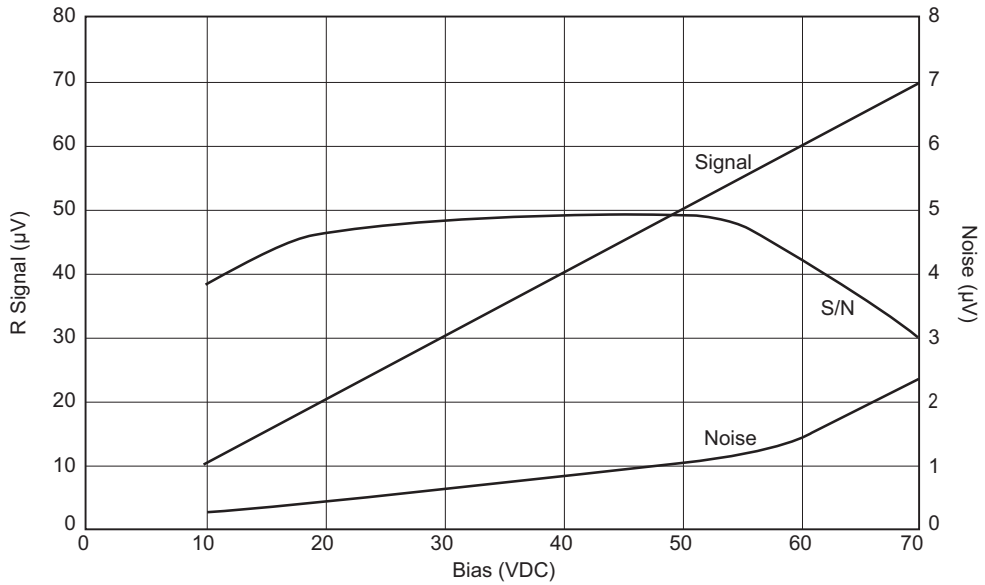
<sup>3</sup> Max rated element temperature is 65 °C.

<sup>4</sup> Borosilicate glass.

**Detector Spectral Response**



**S/N vs Bias Voltage**

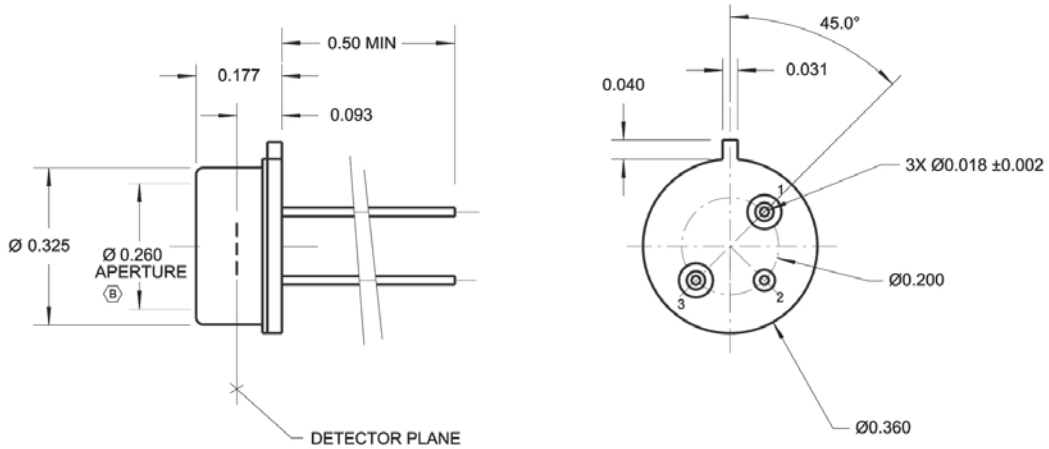


**T05 Packages**

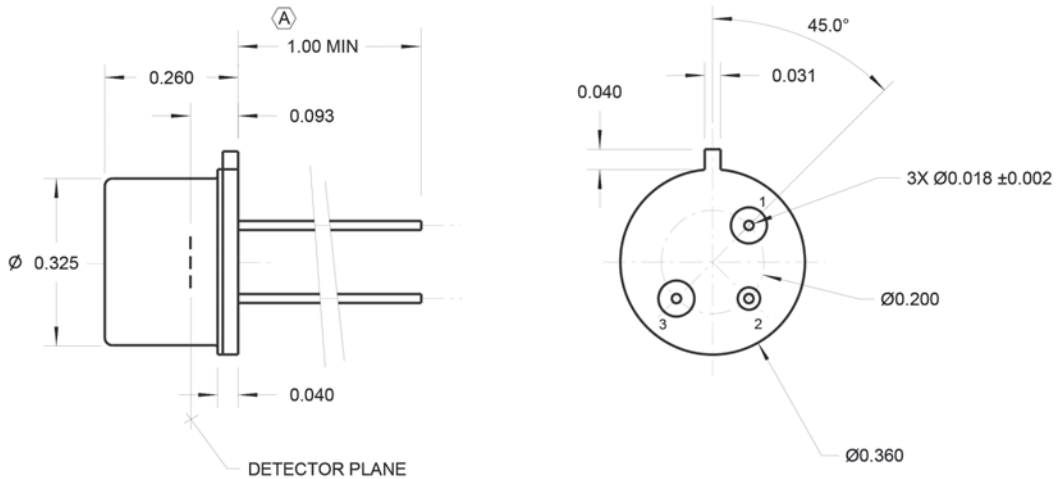
**Package and Pin Out Information**

| Pin No. | Function | Color |
|---------|----------|-------|
| 1       | Detector | Bare  |
| 2       | Case Gnd | Bare  |
| 3       | Detector | Bare  |

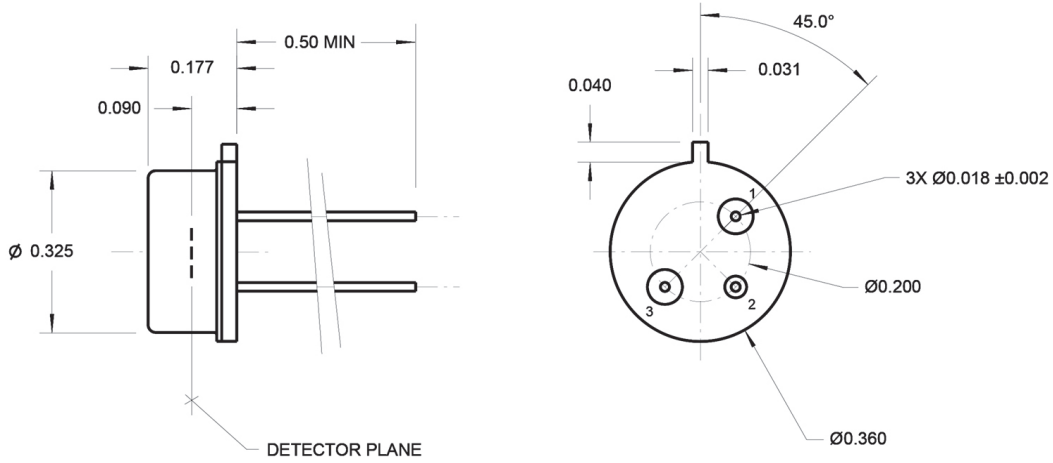
**40370**



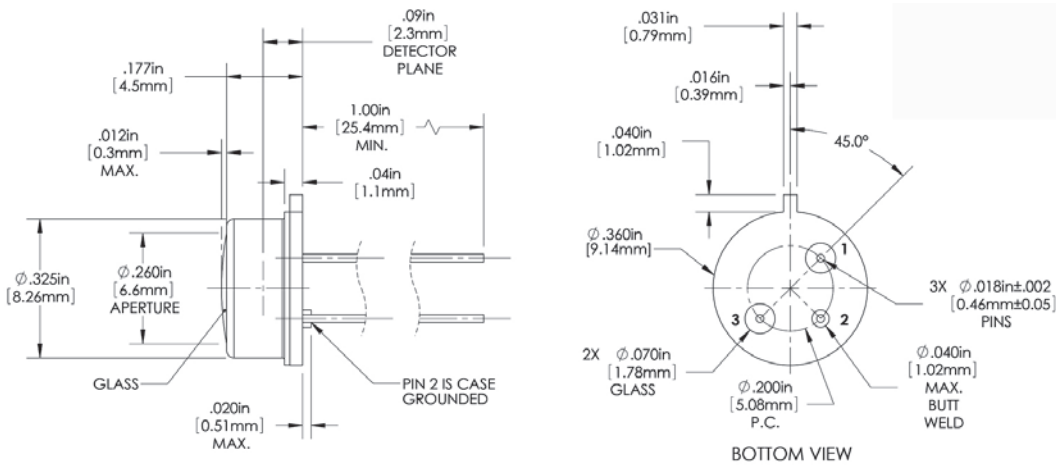
**40363**



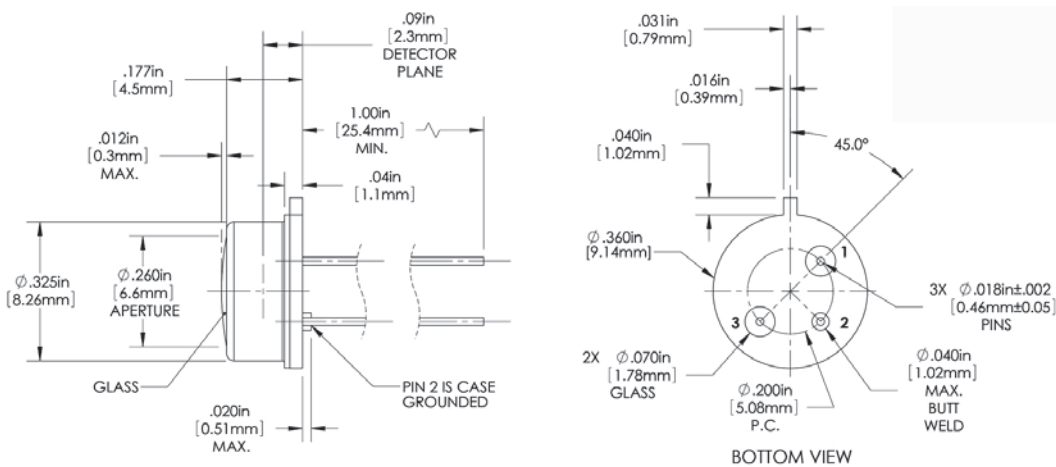
40009



40725



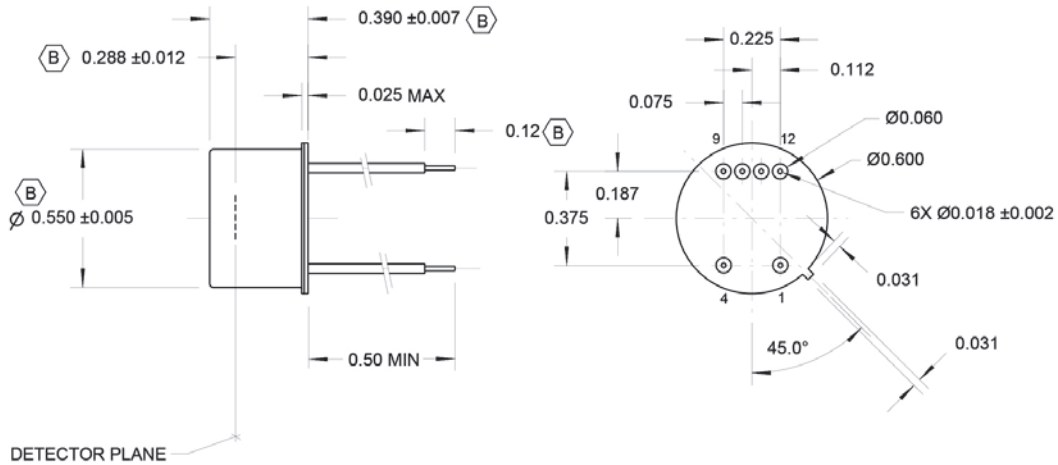
40029



**TO8 Packages**

**40029**

| Pin No. | Function   | Color  |
|---------|------------|--------|
| 1       | Cooler (-) | Black  |
| 4       | Cooler (+) | Red    |
| 9       | Detector   | White  |
| 10      | Thermistor | Yellow |
| 11      | Thermistor | Yellow |
| 12      | Detector   | White  |



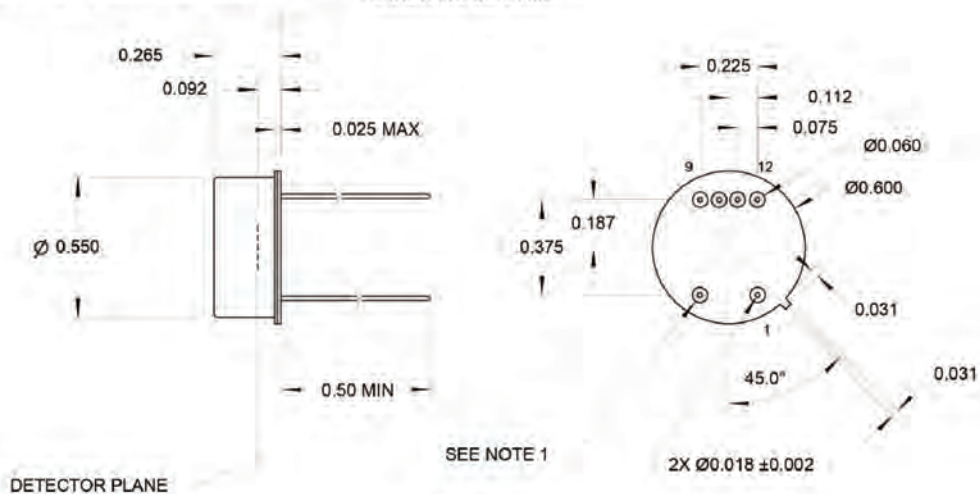
**40368**

| Pin No. | Function   | Color |
|---------|------------|-------|
| 1       | Detector   | Bare  |
| 9       | Detector   | Bare  |
| 12      | Gnd (Case) | Bare  |

**NOTES:**

- PIN POSITIONS 4, 10, & 11 NOT USED  
 TRIM FLUSH TO MOUNTING SURFACE

MOUNTING SURFACE

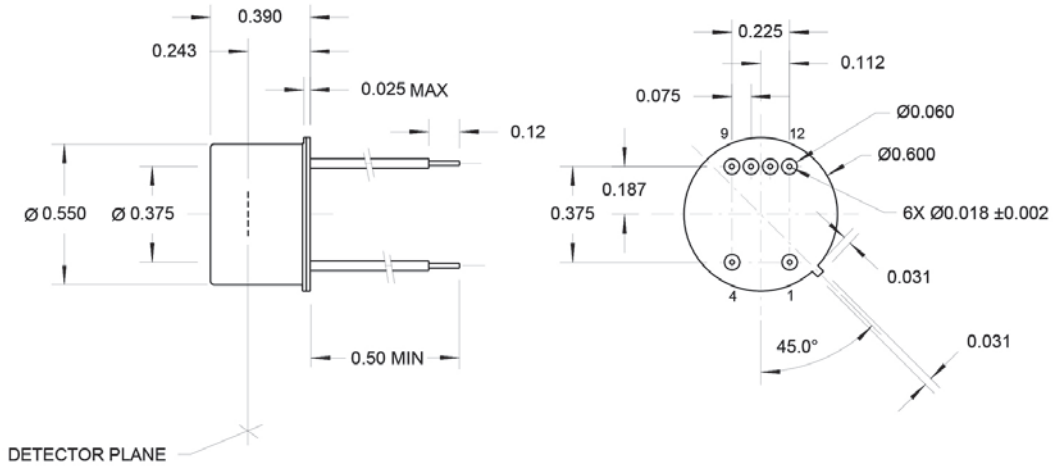


**40028**

| Pin No. | Function   | Color  |
|---------|------------|--------|
| 1       | Cooler (-) | Black  |
| 4       | Cooler (+) | Red    |
| 9       | Detector   | White  |
| 10      | Thermistor | Yellow |
| 11      | Thermistor | Yellow |
| 12      | Detector   | White  |

NOTES:

- OPTICAL WINDOW TO BE SOLDER SEALED INTO UNIT.

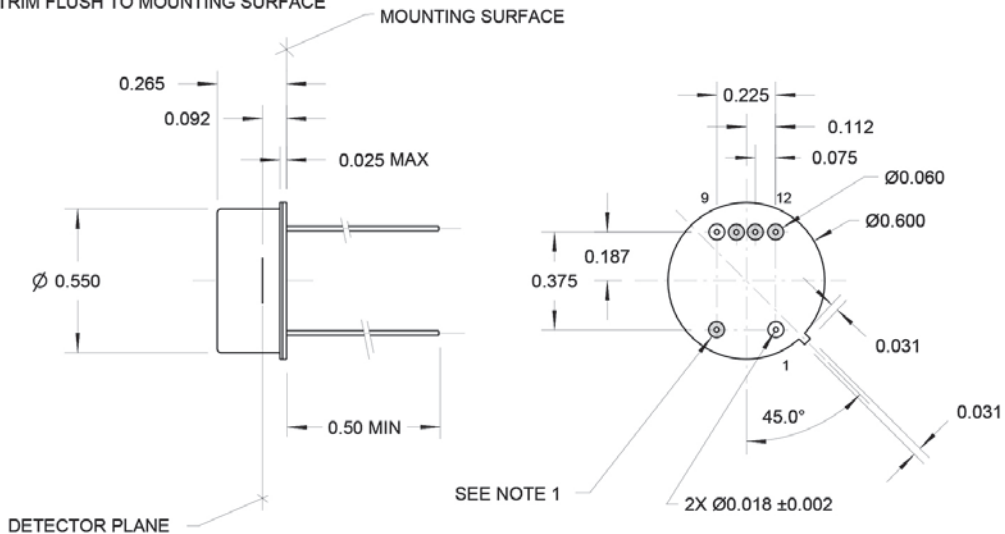


**40736**

| Pin No. | Function | Color |
|---------|----------|-------|
| 1       | Detector | Bare  |
| 9       | Detector | Bare  |

NOTES:

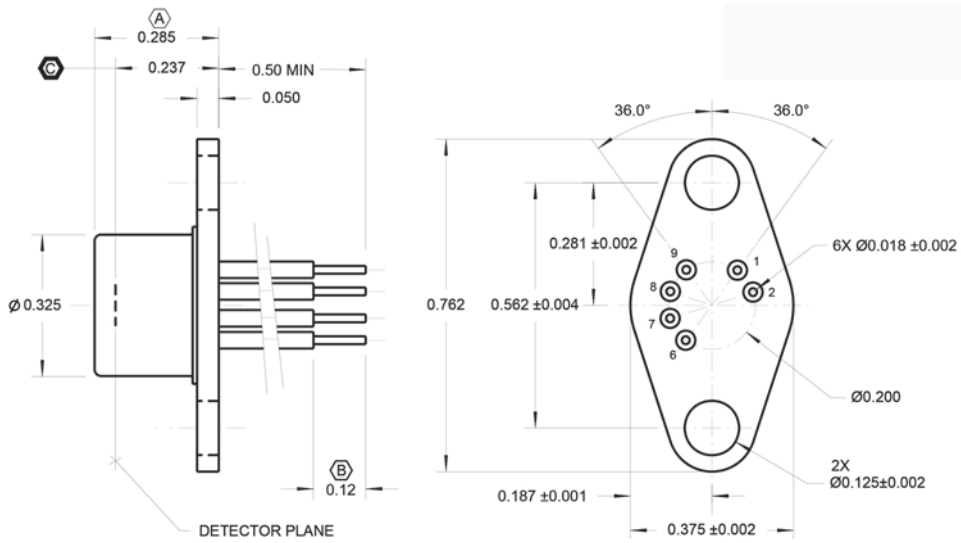
- PIN POSITIONS 4, 10, 11, & 12 NOT USED  
 TRIM FLUSH TO MOUNTING SURFACE



**T037 Packages**

| Pin No. | Function   | Color  |
|---------|------------|--------|
| 1       | Thermistor | Yellow |
| 2       | Thermistor | Yellow |
| 6       | Detector   | White  |
| 7       | Detector   | White  |
| 8       | Cooler (-) | Black  |
| 9       | Cooler (+) | Red    |

**40147, 40373**



**40193**

