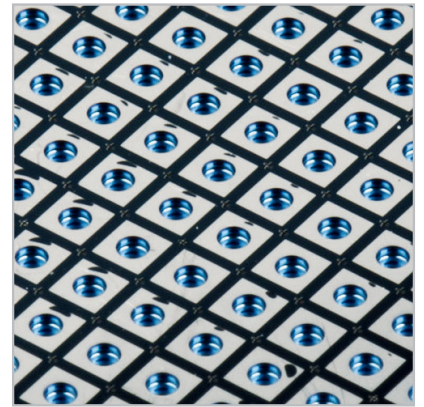


## UV-Enhanced Silicon Avalanche Photodiode SUR-Series

### Description

The SUR-Series is based on a silicon "reach-through" structure with high sensitivity in the DUV/UV wavelength range. Many applications particularly in the medical and bio-medical fields require highly sensitive detectors in the short wavelength range for fluorescent measurements, analytical equipment or scintillation. The benefit of the SUR-Series is an extremely high sensitivity and low noise performance operating in the blue wavelength range and superior to any similar detector available presently on the market.

An important additional advantage of the new reach-through APD is its unmatched noise and sensitivity performance over the widest commercially available wavelength range, from 260 nm to 1000 nm. The diameter of the active area is 0.5 mm. The SUR-Series will be delivered in a special, hermetical sealed TO-46 package optimized for the UV wavelength range.



### Features

- Very high quantum efficiency at DUV / UV
- Low noise
- 500 µm diameter active area
- UV optimized hermetical package

### Applications

- Fluorescent measurements
- Analytical equipment
- Medical
- Scintillation
- High speed photometry

## Absolute Maximum Ratings

|   | SUR500X |     |     |       |
|---|---------|-----|-----|-------|
|   | Min     | Typ | Max | Units |
| Storage temperature   | -55     |     | 100 | °C    |
| Operating temperature*                                      | -40     |     | 85  | °C    |
| Reverse current peak value (CW operation)                   |         |     | 200 | µA    |
| Reverse current peak value (1 sec duration)                 |         |     | 1   | mA    |
| Forward current $I_F$ at 25 °C average value (CW operation) |         |     | 5   | mA    |
| Forward current $I_F$ at 25 °C peak value (1 sec duration)  |         |     | 50  | mA    |
| Max. total power dissipation                                |         |     | 60  | mW    |
| Soldering (for 15 sec.)                                     |         |     | 260 | °C    |

\* Extended operating temperature range possible for special design considerations

## Electrical Characteristics

|   | SUR500X |     |      |              |
|---|---------|-----|------|--------------|
|   | Min     | Typ | Max  | Units        |
| Wavelength range                                      | 260     |     | 1000 | nm           |
| Active area diameter                                  |         | 0.5 |      | mm           |
| Breakdown voltage @ $I_d = 10 \mu A$                  | 100     | 200 | 300  | V            |
| Responsivity @ $M = 100$                              |         |     |      |              |
| 260 nm  |         | 21  |      | A/W          |
| 300 nm  |         | 22  |      | A/W          |
| 350 nm  |         | 25  |      | A/W          |
| 400 nm  |         | 28  |      | A/W          |
| 650 nm  |         | 44  |      | A/W          |
| NEP @ $M = 100$                                       |         |     |      |              |
| 280 nm  |         | 22  |      | fW/sqrt (Hz) |
| 300 nm  |         | 20  |      | fW/sqrt (Hz) |
| 350 nm  |         | 18  |      | fW/sqrt (Hz) |
| 400 nm  |         | 16  |      | fW/sqrt (Hz) |
| Temperature coefficient @ $M = 100$                   |         | 0.9 |      | V/K          |
| Dark current, $I_d$ @ $M = 100$                       |         | 200 |      | pA           |
| Noise current @ $M = 100$                             |         | 0.5 |      | pA/sqrt (Hz) |
| Capacitance @ $M = 100$                               |         | 1.4 |      | pF           |
| Rise time @ $M = 100$ & 400 nm<br>& $R_L = 50 \Omega$ |         | 2   |      | nsec         |
| Cut-off frequency @ $M = 100$                         |         | 150 |      | MHz          |

Fig. 1: Responsivity vs. Noise Relationship

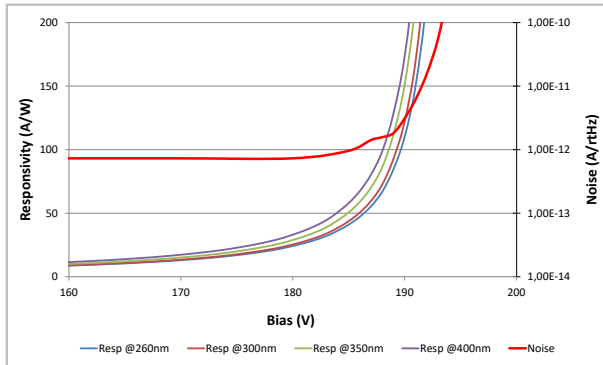


Fig. 2: Responsivity vs. Bias for 405 nm and 905 nm

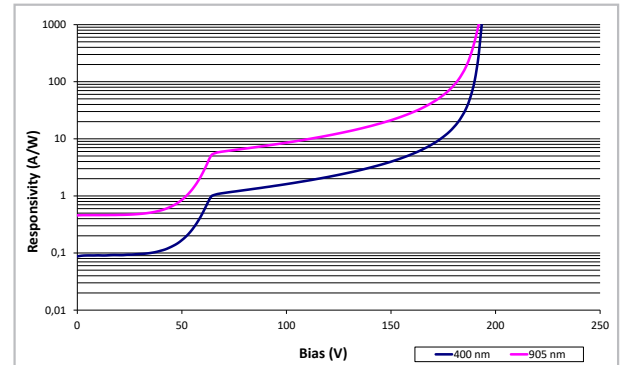


Fig. 3: Typical Capacitance vs. Bias Voltage

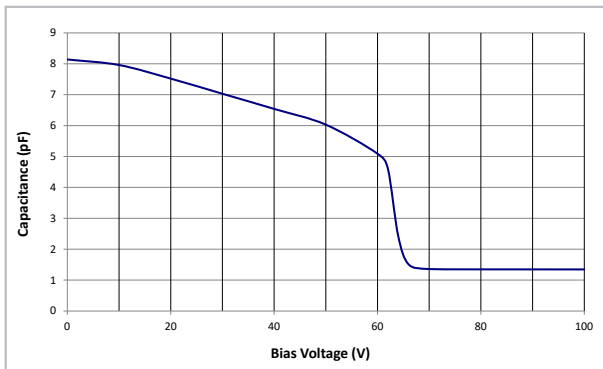


Fig. 4: Spectral vs. Gain

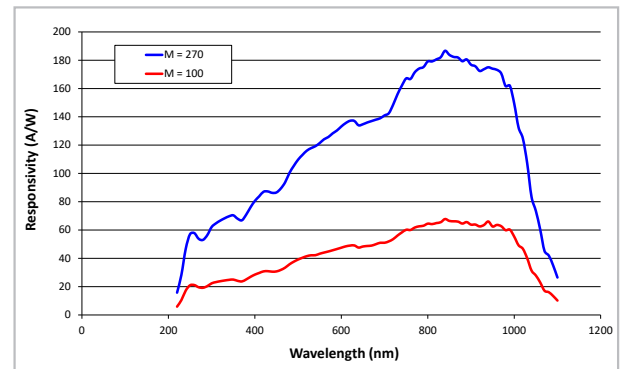
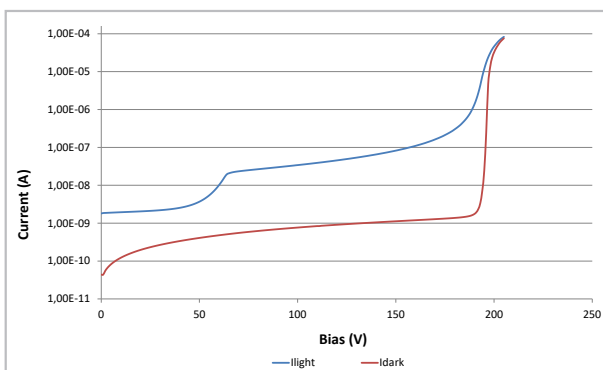
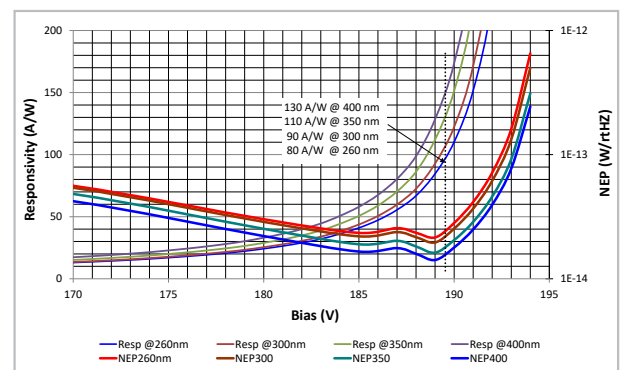
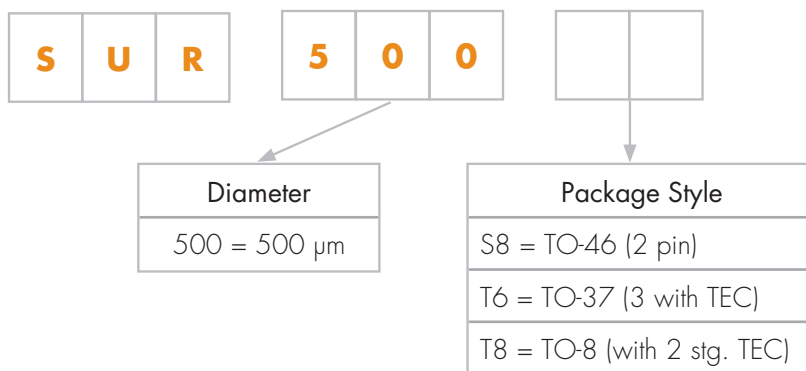


Fig. 5: Current vs. Bias Voltage Wavelength = 260 nm

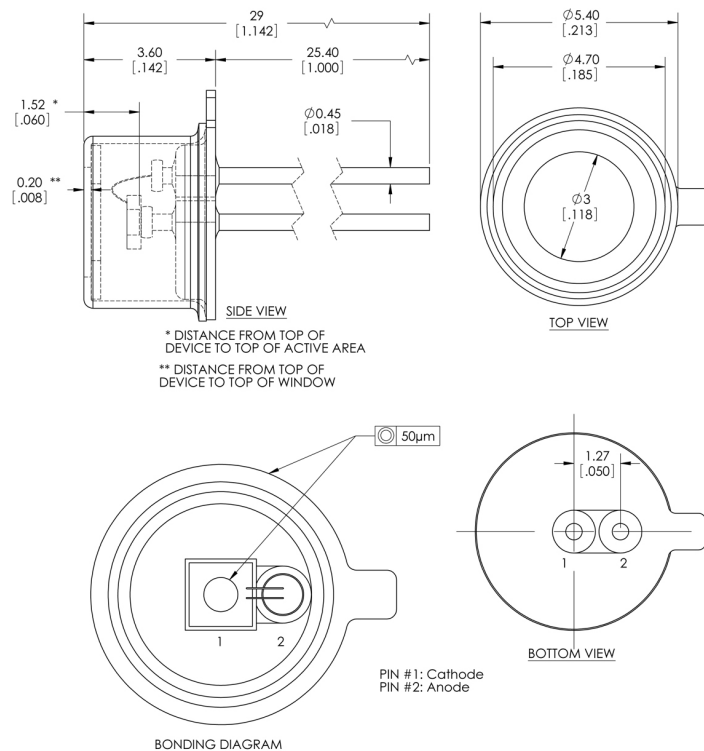
Fig. 6: NEP vs. Bias Voltage ( $I_{ph} = 0$ )

## Product Number Designations



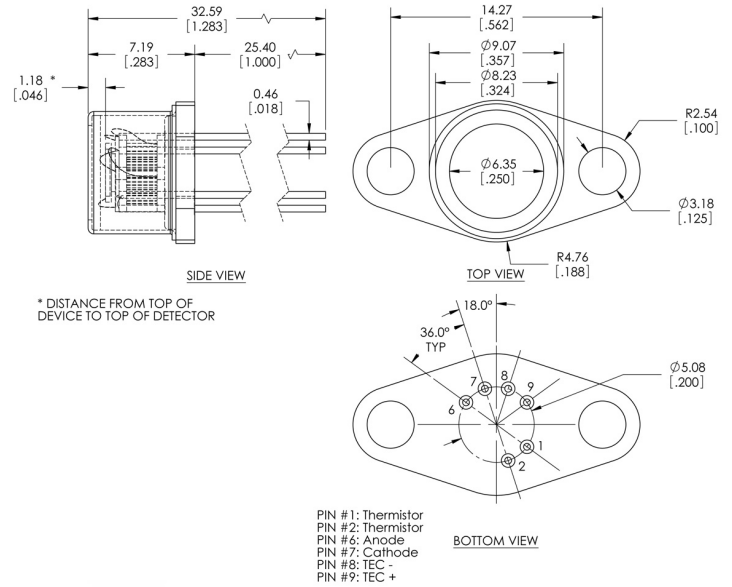
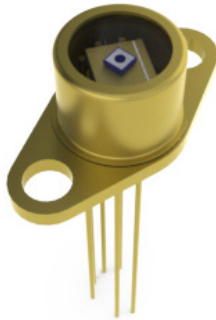
## Package Drawings

Package S8 TO-46 (2 pin)

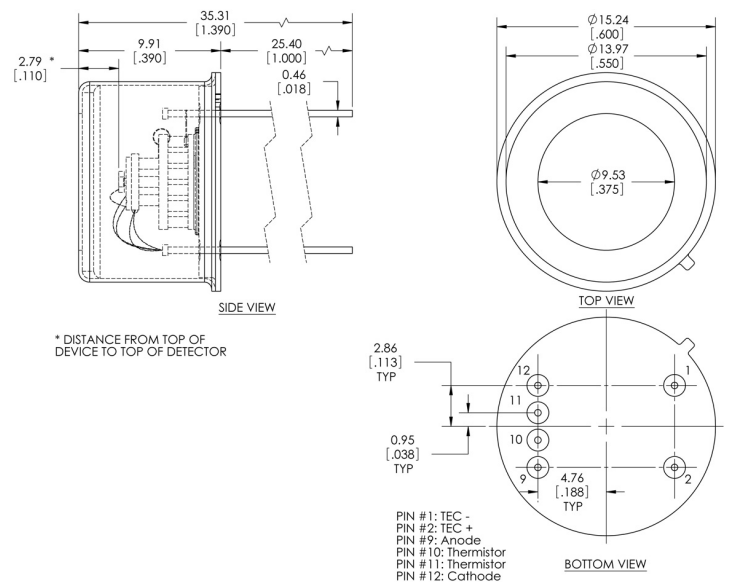
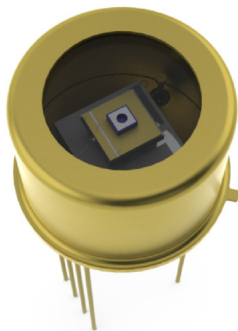


## Package Drawings

Package T6 TO-37 (with TEC)



Package T8 TO-8 (with TEC)



## Cooled Versions

The one stage or two stage thermoelectrically cooled APD can be used for different reasons:

- To reduce the thermal noise for very weak signal detection. The one stage TEC (SUR500T6) has been design to operate the APD down to 0 °C whereas the two stage TEC (SUR500T8) version can be operated at -18 °C when the ambient the ambient temperature is 22 °C.
- To maintain a constant APD temperature irrespective of the ambient temperature. Because APD breakdown voltage decreases with temperature, the TE cooler allows a single operating voltage. Also, this configuration allows constant APD performance over an extended ambient temperature range

The integrated thermistor can be used to monitor the APD temperature and can be used to implement a TE cooler feedback loop to keep the APD at a constant temperature or/and to implement a temperature compensation on the APD bias voltage. A proper heat-sink is required to dissipate the heat generated by the APD and the TE cooler.

## Product Changes

LASER COMPONENTS reserves the right to make changes to the product(s) or information contained herein without notice. No liability is assumed as a result of their use or application.

## Ordering Information

Products can be ordered directly from LASER COMPONENTS or its representatives. For a complete listing of representatives, visit our website at [www.lasercomponents.com](http://www.lasercomponents.com)

Custom designed products are available on request.