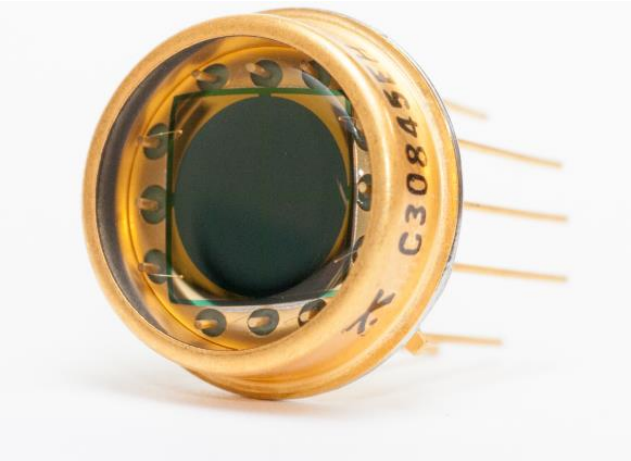
# C30845EH

# Quadrant N-type Silicon PIN Photodetector




## Key Features

- Large Photosensitive Surface Area of 50 mm²
  Low operating Voltage (Vop) of 45 V
- Anti-Reflection Coated to Enhance Responsivity at 900 nm
- Hermetically Sealed Packages
- Spectral Response Range (10% Points) – 400 to 1100 nm
- Very Low Quadrant-Quadrant Separation – 3 mils
- Very Low Cross Talk – 1%

## Applications

- YAG, HeNe and GaAs laser detection systems

## Overview

This quadrant N-type silicon p-i-n photodiode is designed for use in a wide variety of broad band low light level applications covering the spectral range from below 400 to over 1100 nanometers.

Because of the very small quadrant separation and the large surface areas, the devices are useful in obtaining positioned information on the active surface from both focused small spots and defocused large spots. This positioned information can be obtained from either high speed pulsed or CW sources.

These devices can be connected externally to form bicells for use in comparator circuits. These characteristics make the device highly useful in Nd:YAG, HeNe and GaAs laser detection systems.

## Table 1 – Mechanical and Optical Characteristics

| Parameter | Symbol | | Unit |
|---|---|---|---|
| Shape | | Circular | |
| Photosensitive Surface:<br>Useful area | A | 50 | $mm^2$ |
| Field of View:<br>Nominal field of view α (See Figure 9)<br>Nominal field of view α' (See Figure 9) | FoV | <br>74<br>150 | Degrees |

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## Table 2 – Electro-Optical Characteristics

Case Temperature $T_A$ = 22 °C; at the DC reverse operating voltage $V_{op}$=45V unless otherwise specified.

| Parameter | Symbol | Minimum | Typical | Maximum | Unit | Remarks/Conditions |
|---|---|---|---|---|---|---|
| Breakdown Voltage | $V_{br}$ | 100 | | | V | |
| Luminosity Responsivity (2856 K) | | | 85 | | mA/lm | |
| Responsivity<br>at 900 nm<br>at 1060 nm | R | <br>0.5<br>0.13 | <br>0.6<br>0.17 | | A/W | |
| Quantum Efficiency<br>at 900 nm<br>at 1060 nm | Q.E. | <br>70<br>15 | <br>90<br>20 | | % | |
| Total Dark Current<br>at $V_{op}$ = 10 V<br>at $V_{op}$ = 45 V<br>(See Figure 3) | $I_d$ | | <br>70<br>200 | <br>200<br>700 | nA/quad | |
| Noise Current<br>(f=10kHz, Δf=1.0Hz, See Figure 4) | $i_n$ | | 0.26 | 1.1 | pA/√Hz | Per quadrant |
| Capacitance | $C_d$ | | 6 | 10 | pF | Per quadrant |
| Noise Equivalent Power<br>at 900 nm<br>at 1060 nm<br>(f=10kHz, Δf=1.10Hz) | NEP | | <br>0.43<br>1.5 | <br>1.8<br>6.5 | pW/√Hz | |
| Uniformity<br>(See Figure 6) | | | ±2 | ±7 | % | At 900 nm with a 0.10 mm (0.004 inch) diameter spot |
| Transition Width<br>(See Figure 6) | | | 0.25<br>0.010 | 0.52<br>0.020 | mm<br>inch | With a 0.10 mm (0.004 inch) diameter spot |
| Cross Talk<br>(See Figure 6) | | | 1 | 5 | % | 10kΩ load and $f = \sim 100Hz$ |
| Balance<br>(See Figure 6) | | | 1 | 5 | % | |
| Signal Loss<br>(See Figure 7) | | | 10 | 25 | % | |
| Rise/Fall Time, $R_L$ = 50Ω, λ=900nm:<br>10% to 90% points<br>90% to 10% points | <br>$t_r$<br>$t_f$ | | <br>6<br>10 | <br>9<br>14 | ns | |

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## Table 3 – Absolute – Maximum Ratings, Limiting Values

| Parameter | Symbol | Minimum | Maximum | Unit | Remarks/Conditions |
|---|---|---|---|---|---|
| DC Reverse Operating Voltage | $V_{op}$ | | 100 | V | |
| Photocurrent Density :<br>average value<br>peak value | $J_p$ | | <br>5<br>20 | $mA/mm^2$ | Continuous operation |
| Forward Current:<br>average value<br>peak value | $I_F$ | | <br>10<br>100 | mA | Continuous operation<br>(For 1 second duration, non-repetitive) |
| Storage Temperature | $T_{stg}$ | -60 | 100 | °C | |
| Operating Temperature | $T_o$ | -40 | 80 | °C | |
| Soldering | | | 200 | °C | 5 seconds |

## Figure 1 – Typical Spectral Responsivity Characteristics

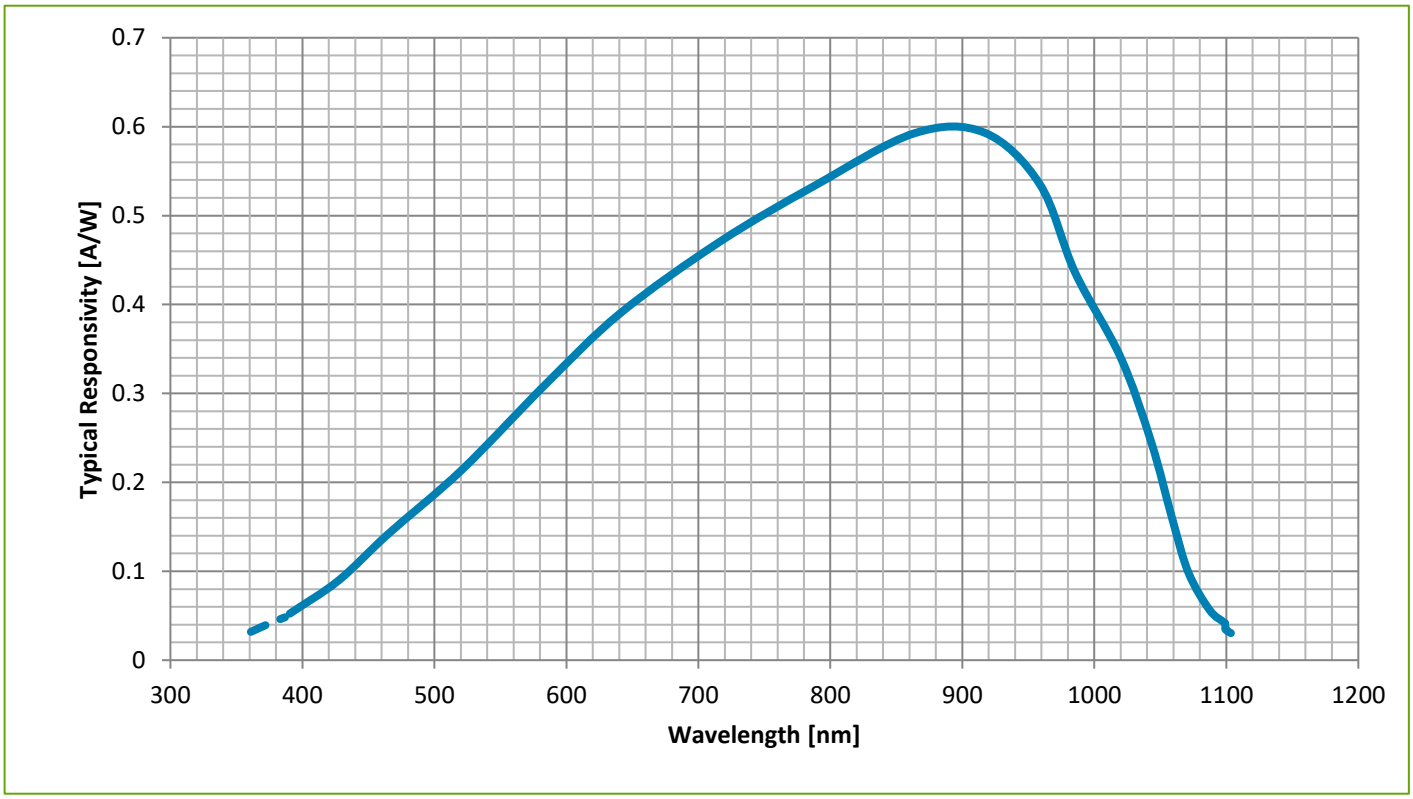

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**Figure 2 – Typical Dark Current as a function of Ambient Temperature, $T_a$ ; $V_{op}$ = 45 V**

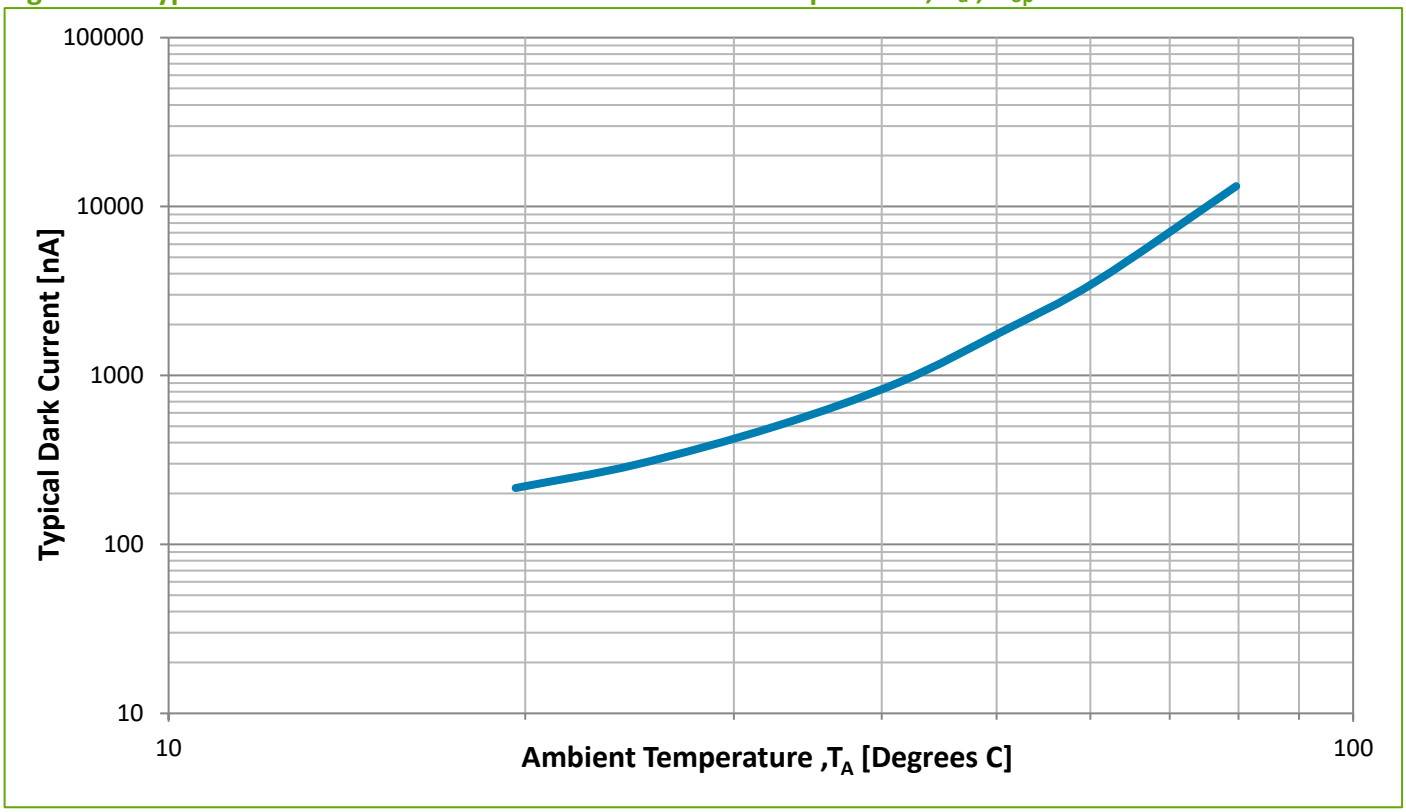
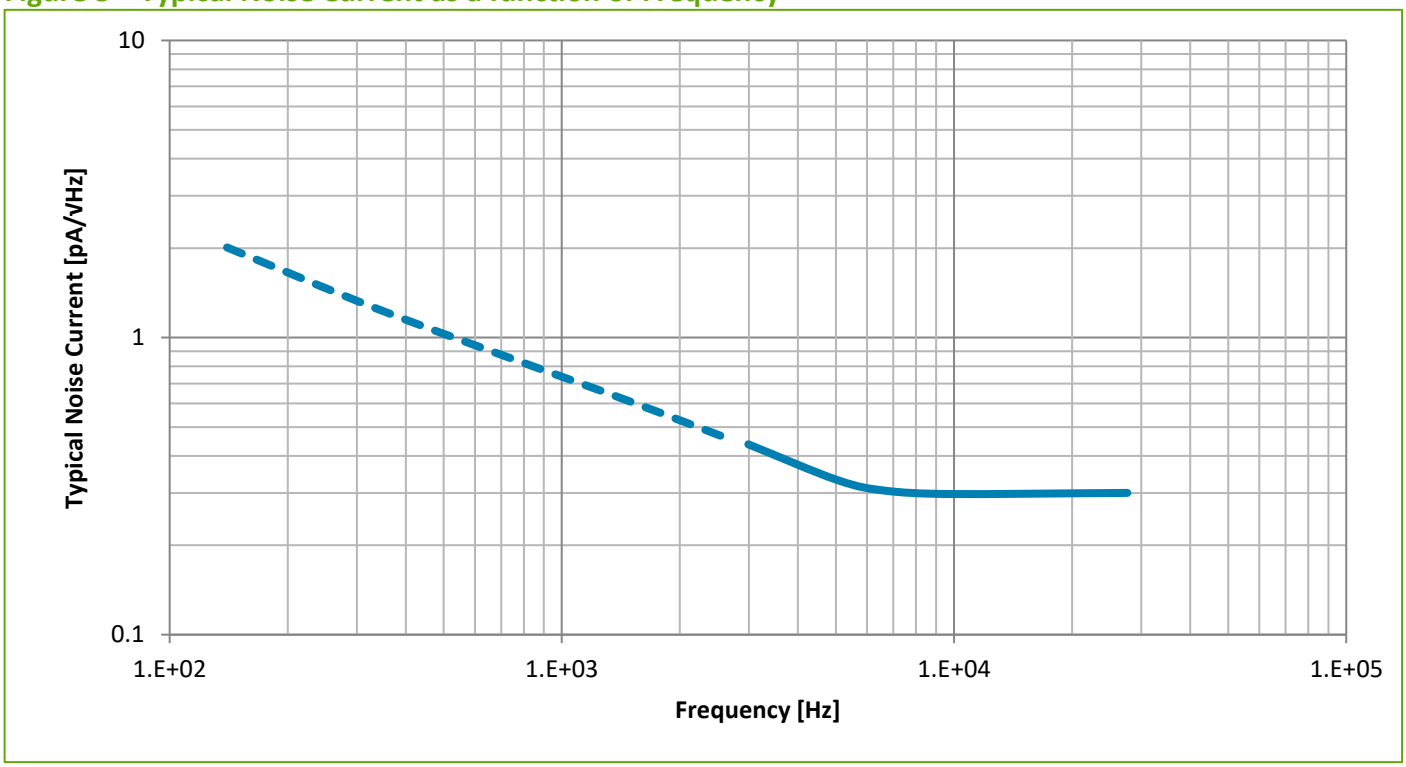



**Figure 3 – Typical Noise Current as a function of Frequency**



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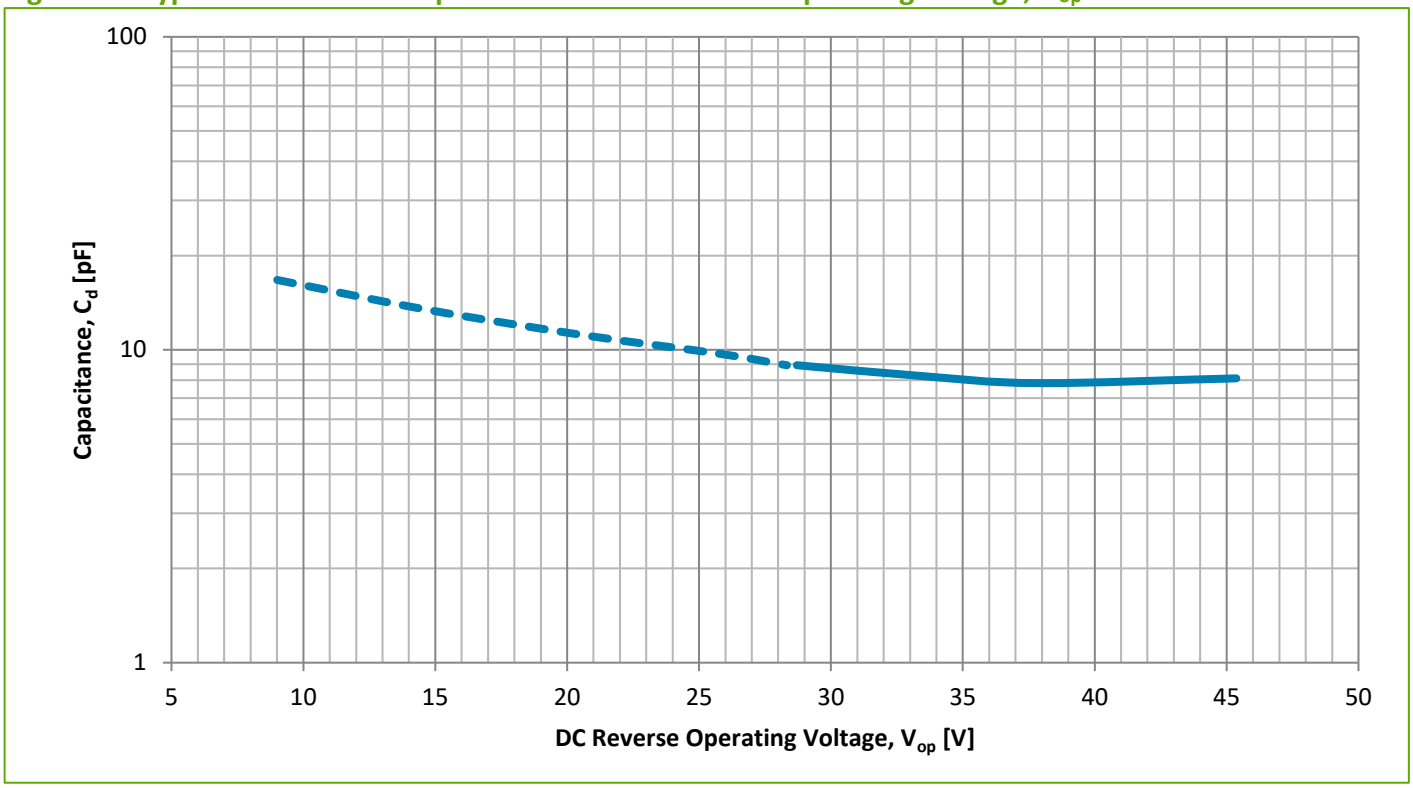
## Figure 4 – Typical Photodiode Capacitance as a function of Operating Voltage, $V_{op}$



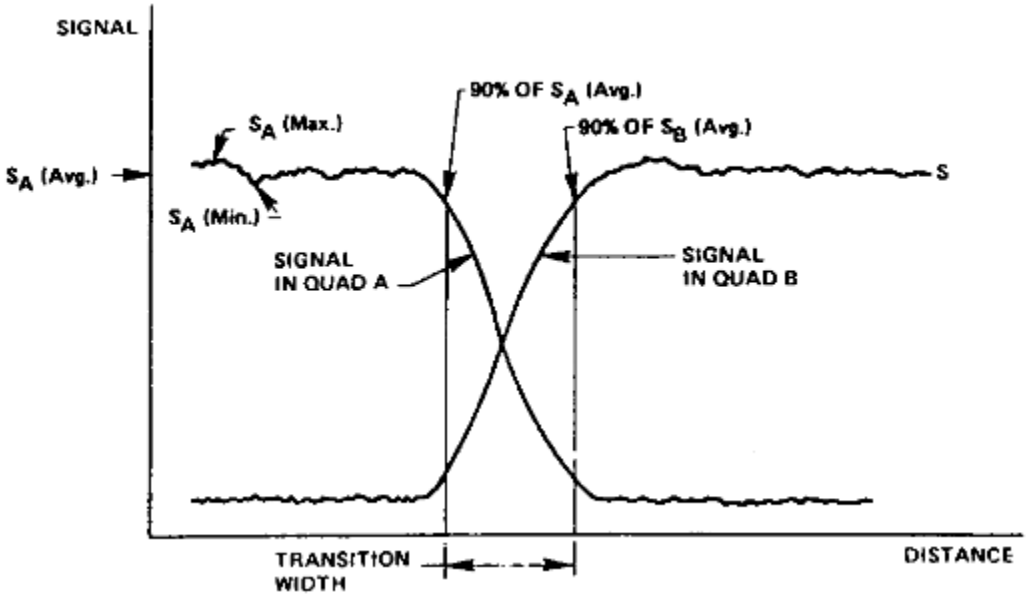

## Figure 5 – Typical Quadrant Transition Characteristics

Transition Width = distance moved in going from 90% signal in one quadrant to 90% signal in adjacent quadrant.

Cross Talk [A → B] = $\frac{Average\ Signal\ in\ Quad\ B}{Average\ Signal\ in\ Quad\ A} \times 100\%$ when the light spot is in quad A.

Uniformity = $\pm\frac{1}{2}x\ \frac{S_A(Max.)-S_A(Min.)}{S_A(Avg.)} \times 100\%$

Balance= $\frac{S_A(Avg.)-S_B(Avg.)}{1/2[S_A(Avg.)+S_B(Avg.)]} \times 100\%$



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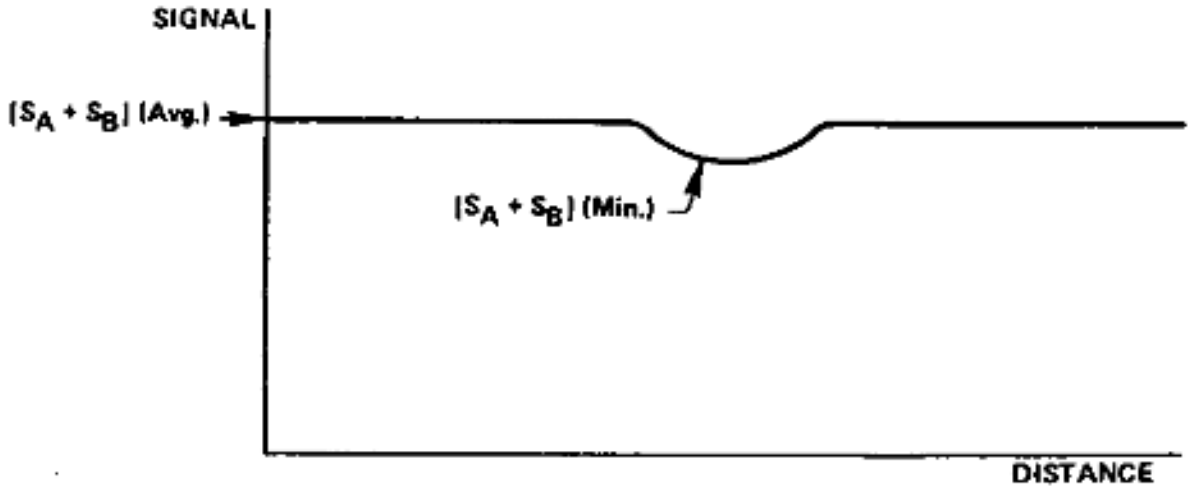
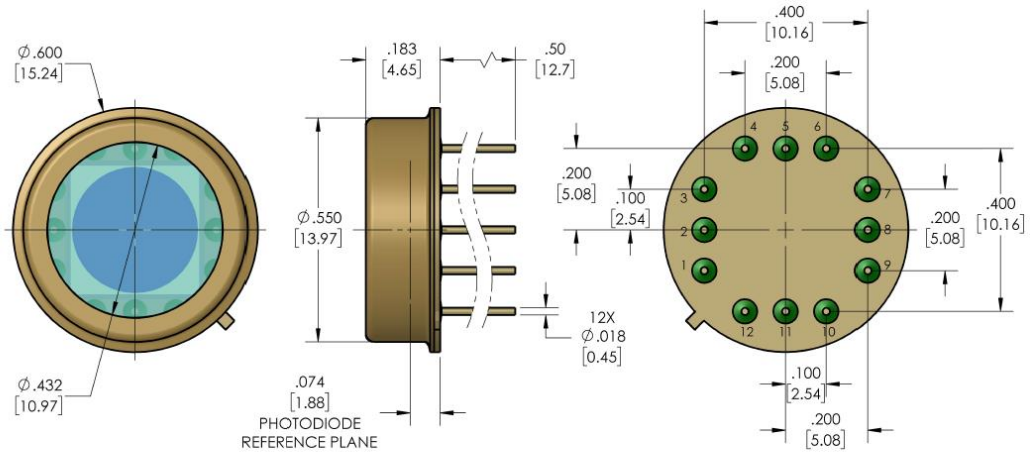
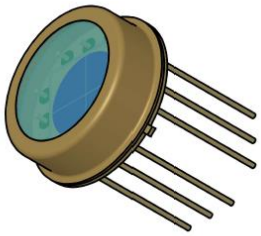
## Figure 6 – Typical Signal Loss Characteristics

$$\text{Signal Loss} = \frac{[S_A+S_B](Avg.)-[S_A+S_B](Min.)}{[S_A+S_B](Avg.)} \times 100\%$$




## Figure 7 – Dimensional Outline



| PIN OUT | | | |
|---|---|---|---|
| PIN # | DESCRIPTION | PIN # | DESCRIPTION |
| 1 | QUAD 2 | 7 | QUAD 4 |
| 2 | NC | 8 | NC |
| 3 | QUAD 1 | 9 | QUAD 3 |
| 4 | NC | 10 | NC |
| 5 | NC | 11 | NC |
| 6 | NC | 12 | CASE/CATHODE |

DIMENSIONS ARE IN INCHES [MILLIMETERS]
AND ARE FOR REFERENCE ONLY

**VS-171R2** (C30845EH)
2022-12-14

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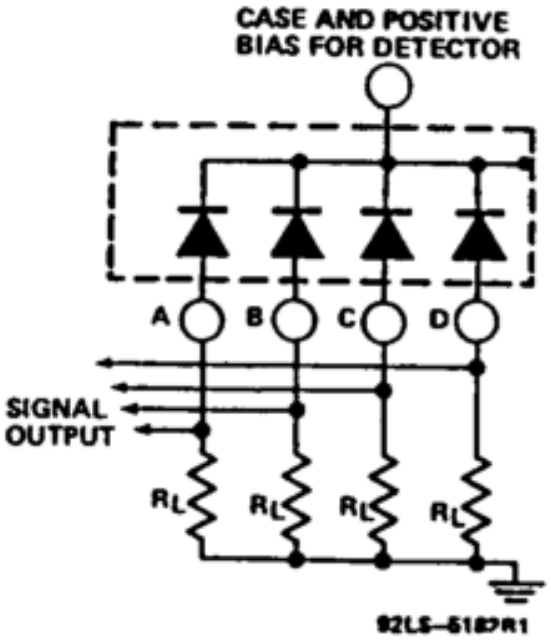
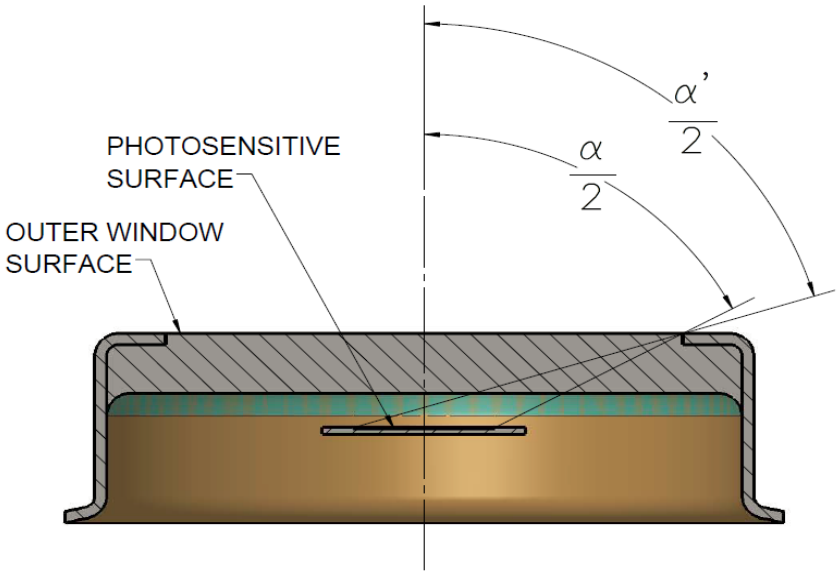
## Figure 8 – Schematic Arrangement of Quadrant Photodiode, $R_L$ = 50 to 50kΩ




## Figure 9 – Approximate Field of View

For incident radiation at angles $\leq \alpha/2$, the photosensitive surface is totally illuminated.
For incident radiation at angles $> \alpha/2$, but $\leq \alpha'/2$, the photosensitive surface is partially illuminated




VS-383

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## RoHS Compliance

The C30845EH Quadrant N-type Silicon PIN Photodetector is designed and built to be fully compliant with the European Union Directive on Restriction of the use of certain Hazardous Substances (RoHS) in Electrical and Electronic equipment.

## Warranty

A standard 12-month warranty following shipment applies. Any warranty is null and void if the photodiode window has been opened.

## About Excelitas Technologies

Excelitas Technologies is a global technology leader focused on delivering innovative, customized solutions to meet the lighting, detection and other high-performance technology needs of OEM customers.

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