

# Plastic Infrared Emitting Diode

## OP165, OP166 Series



### Features:

- T-1 (3 mm) package style
- Choice of narrow or wide irradiance pattern
- Choice of dome lens or flat lens
- Mechanically and spectrally matched to other OPTEK devices
- Higher power output than GaAs at equivalent drive currents



### Description:

Each device in the **OP165** and **OP166** series is a high intensity gallium arsenide infrared emitting diode (GaAlAs) that is molded in an IR transmissive clear epoxy package with either a dome or flat lens. Devices feature narrow and wide irradiance patterns and a variety of electrical characteristics. The small T-1 package style makes these devices ideal for space-limited applications.

*OP165 and OP166 devices are mechanically and spectrally matched to the OP505 and OP535 series devices.*

*Please refer to Application Bulletins 208 and 210 for additional design information and reliability (degradation) data.*

### Applications:

- Space-limited applications
- Applications requiring coupling efficiency

| Ordering Information |                     |                                                 |                                  |                  |             |  |
|----------------------|---------------------|-------------------------------------------------|----------------------------------|------------------|-------------|--|
| Part Number          | LED Peak Wavelength | Output Power (mW/cm <sup>2</sup> )<br>Min / Max | I <sub>F</sub> (mA)<br>Typ / Max | Total Beam Angle | Lead Length |  |
| OP165A               | 935 nm              | 1.95 / NA                                       | 20 / 50                          | 18°              | 0.50"       |  |
| OP165B               |                     | 1.40 / 2.20                                     |                                  |                  |             |  |
| OP165C               |                     | 0.85 / 1.60                                     |                                  |                  |             |  |
| OP165D               |                     | 0.28 / NA                                       |                                  |                  |             |  |
| OP165W               |                     | 0.50 / NA                                       |                                  | 90°              |             |  |
| OP166A               |                     | 1.95 / NA                                       |                                  | 18°              |             |  |
| OP166B               |                     | 1.40 / 2.20                                     |                                  |                  |             |  |
| OP166W               |                     | 0.50 / NA                                       |                                  | 90°              |             |  |



RoHS

### General Note

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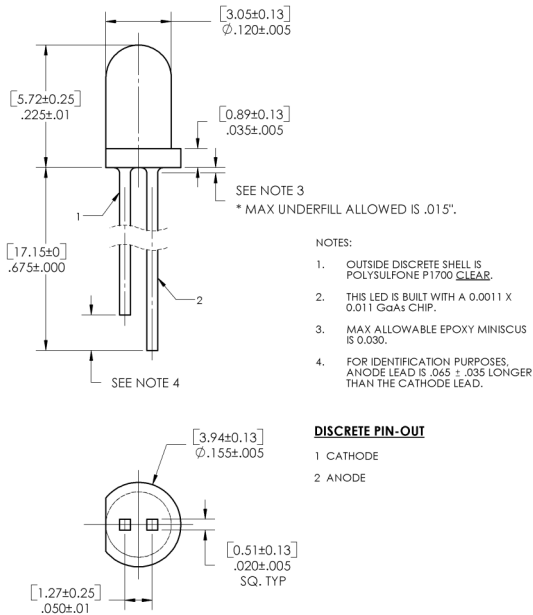
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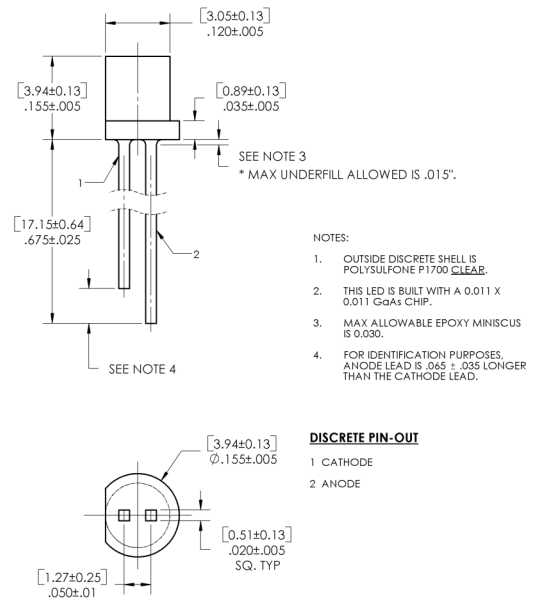
## OP165, OP166 Series



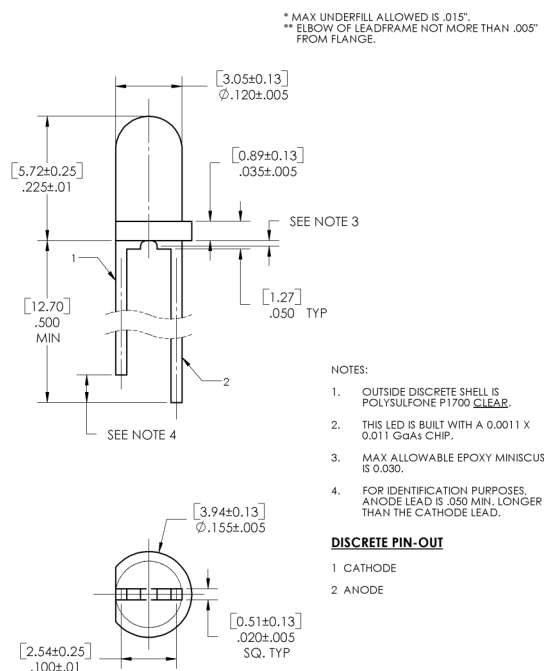
### OP165 (A, B, C, D)



### OP165W

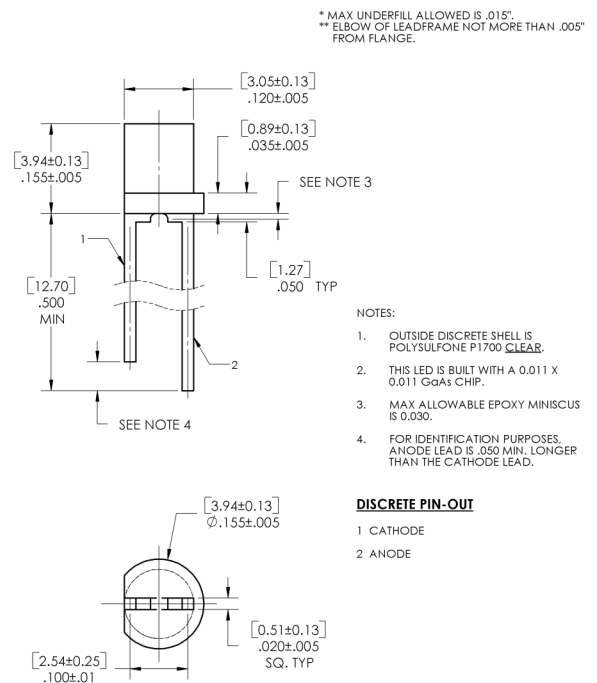


### OP166 (A, B)



DIMENSIONS ARE IN: [MILLIMETERS]  
INCHES

### OP166W



| Pin # | LED     |
|-------|---------|
| 1     | Cathode |
| 2     | Anode   |

#### CONTAINS POLYSULFONE

To avoid stress cracking, we suggest using ND Industries' **Vibra-Tite** for thread-locking. **Vibra-Tite** evaporates fast without causing structural failure in OPTEK'S molded plastics.

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OP165, OP166 Series

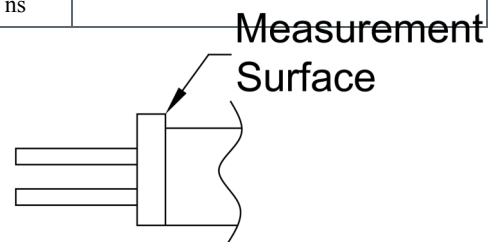


## Electrical Specifications

| Absolute Maximum Ratings ( $T_A = 25^\circ\text{C}$ unless otherwise noted)                 |                                             |
|---------------------------------------------------------------------------------------------|---------------------------------------------|
| Storage and Operating Temperature Range                                                     | $-40^\circ\text{C}$ to $+100^\circ\text{C}$ |
| Reverse Voltage                                                                             | 2.0 V                                       |
| Continuous Forward Current                                                                  | 50 mA                                       |
| Peak Forward Current (1 $\mu\text{s}$ pulse width, 300 pps)                                 | 3.0 A                                       |
| Lead Soldering Temperature [1/16 inch (1.6 mm) from case for 5 seconds with soldering iron] | $260^\circ\text{C}$                         |
| Power Dissipation                                                                           | 100 mW <sup>(1)</sup>                       |

| Electrical Characteristics ( $T_A = 25^\circ\text{C}$ unless otherwise noted) |                                                                                    |        |                 |        |                      |                                                                           |
|-------------------------------------------------------------------------------|------------------------------------------------------------------------------------|--------|-----------------|--------|----------------------|---------------------------------------------------------------------------|
| SYMBOL                                                                        | PARAMETER                                                                          | MIN    | TYP             | MAX    | UNITS                | TEST CONDITIONS                                                           |
| Input Diode                                                                   |                                                                                    |        |                 |        |                      |                                                                           |
| $E_{E(APT)}$                                                                  | Apertured Radiant Incidence<br>OP165A, OP166A                                      | 1.95   | -               | -      | mW/cm <sup>2</sup>   | $I_F = 20\text{ mA}^{(2)}$                                                |
| $P_O$                                                                         | Radiant Power Output<br>OP165W, OP166W                                             | 0.50   | -               | -      | mW                   | $I_F = 20\text{ mA}$                                                      |
| $V_F$                                                                         | Forward Voltage                                                                    | -      | -               | 1.60   | V                    | $I_F = 20\text{ mA}$                                                      |
| $I_R$                                                                         | Reverse Current                                                                    | -      | -               | 100    | $\mu\text{A}$        | $V_R = 2\text{ V}$                                                        |
| $\lambda_p$                                                                   | Wavelength at Peak Emission                                                        | -      | 935             | -      | nm                   | $I_F = 10\text{ mA}$                                                      |
| B                                                                             | Spectral Bandwidth between Half Power Points                                       | -      | 50              | -      | nm                   | $I_F = 10\text{ mA}$                                                      |
| $\Delta\lambda_p/\Delta T$                                                    | Spectral Shift with Temperature<br>OP165, OP166 (A, B, C, D)<br>OP165W, OP166W     | -<br>- | -<br>$\pm 0.30$ | -<br>- | nm/ $^\circ\text{C}$ | $I_F = \text{Constant}$                                                   |
| $\theta_{HP}$                                                                 | Emission Angle at Half Power Points<br>OP165, OP166 (A, B, C, D)<br>OP165W, OP166W | -<br>- | 18<br>90        | -<br>- | Degree               | $I_F = 20\text{ mA}$                                                      |
| $t_r$                                                                         | Output Rise Time                                                                   | -      | 1000            | -      | ns                   | $I_{F(PK)} = 100\text{ mA}$ , $PW = 10\text{ }\mu\text{s}$ , D.C. = 10.0% |
| Notes:                                                                        | Output Fall Time                                                                   | -      | 500             | -      | ns                   |                                                                           |

- Derate linearly 1.33 mW/ $^\circ\text{C}$  above  $25^\circ\text{C}$
- $E_{E(APT)}$  is a measurement of the average apertured radiant incidence upon a sensing area 0.081" (2.06 mm) in diameter, perpendicular to and centered on the mechanical axis of the lens, and 0.590" (14.99 mm) from the measurement surface.  $E_{E(APT)}$  is not necessarily uniform within the measured areas.



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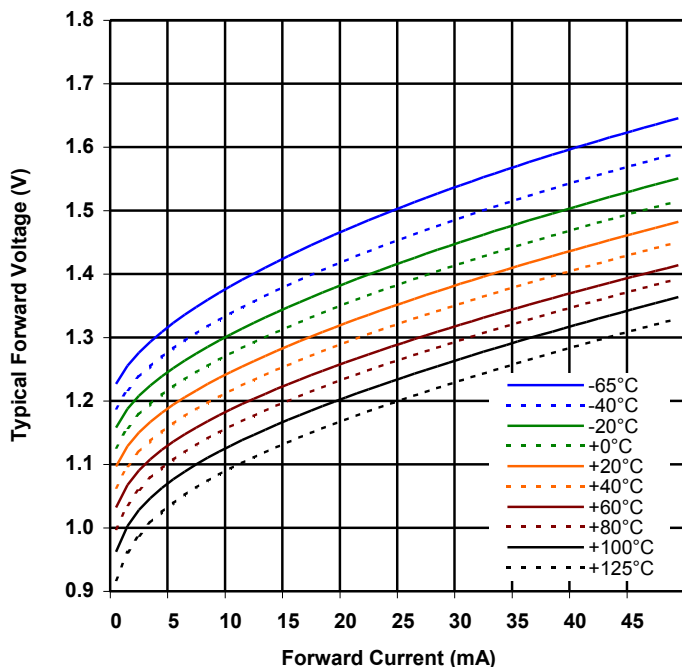
OP165, OP166 Series



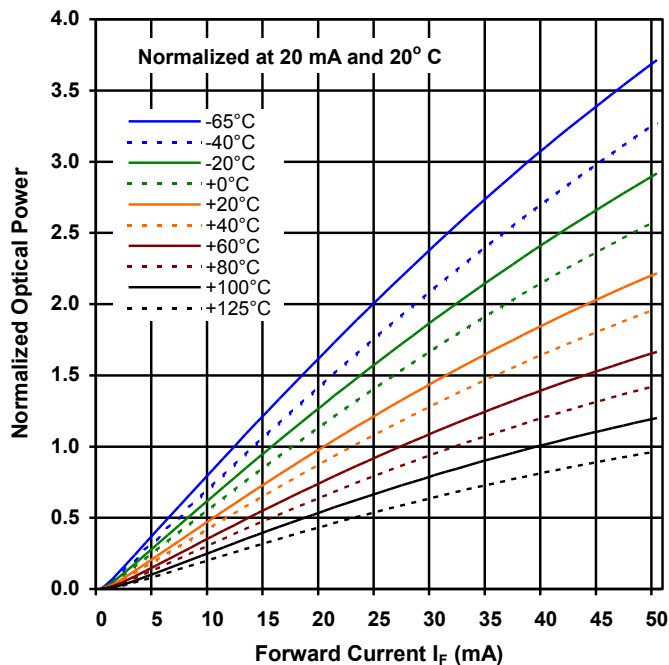
## Performance

OP165, OP166 (A, B, C, D, W)

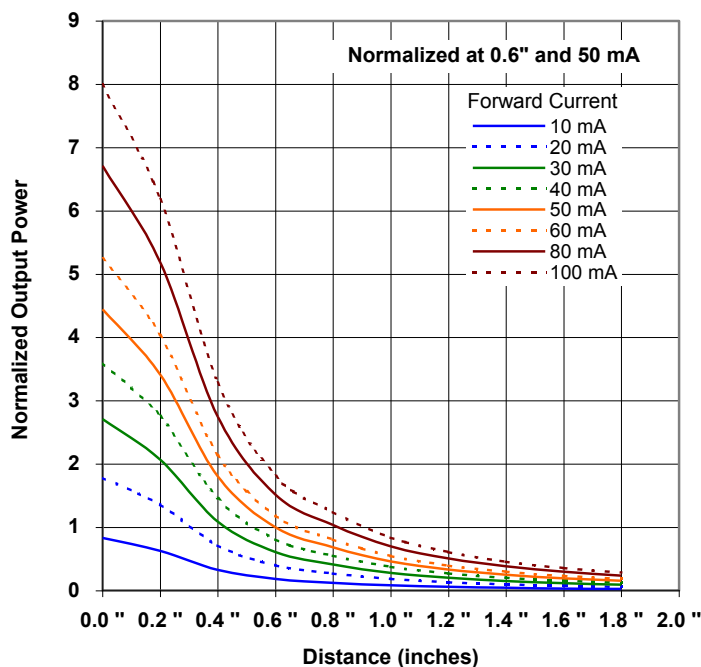
Forward Voltage vs Forward Current vs Temperature



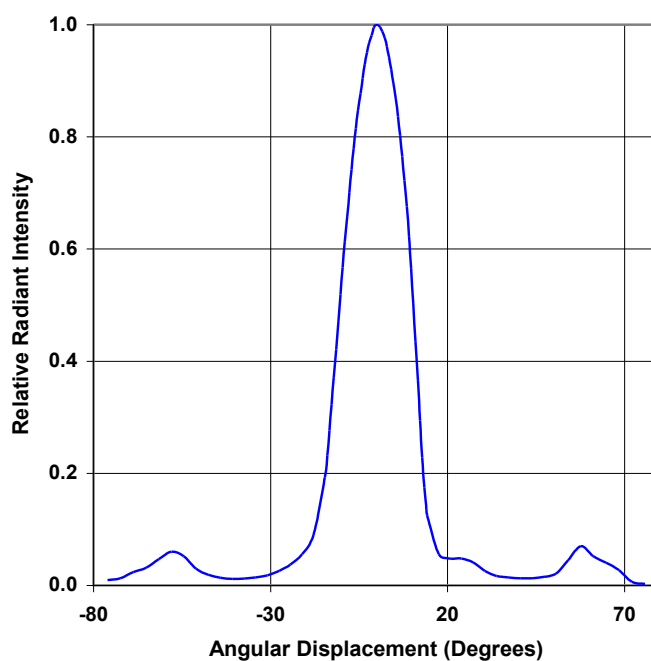
Optical Power vs  $I_F$  vs Temp



Distance vs Output Power vs Forward Current



Relative Radiant Intensity vs Angular Displacement



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