

Precision Optical Performance AlInGaP II LED Lamps

Technical Data

HLMP-ELxx
HLMP-EHxx
HLMP-EDxx

Features

- **Well Defined Spatial Radiation Patterns**
- **Viewing Angles: 15°, 23°, 30°**
- **High Luminous Output**
- **Colors:**
592 nm Amber
617 nm Reddish-Orange
630 nm Red
- **High Operating Temperature:**
 $T_{JLED} = +130^{\circ}\text{C}$
- **Superior Resistance to Moisture**

Benefits

- **Viewing Angles Match Traffic Management Requirements**
- **Colors Meet Automotive and Traffic Signal Specifications**
- **Superior Light Output Performance in Outdoor Environments**
- **Suitable for Autoinsertion into PC Boards**

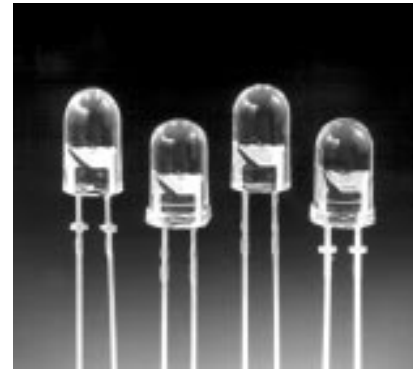
Applications

- **Traffic Management:**
Traffic Signals
Work Zone Warning Lights
Variable Message Signs
- **Commercial Outdoor Advertising:**
Signs
Marquees
- **Automotive:**
Exterior and Interior Lights

Description

Precision Optical Performance AlInGaP II (aluminum indium gallium phosphide) LEDs offer superior light output for excellent readability in sunlight and dependable performance. The AlInGaP II technology provides extremely stable light output over long periods of time.

These LED lamps are untinted, nondiffused, T-1^{3/4} packages incorporating second generation optics which produce well defined radiation patterns at specific viewing cone angles.



These lamps are made with an advanced optical grade epoxy offering superior high temperature and high moisture resistance performance in outdoor signal and sign applications. The maximum LED junction temperature limit of +130°C enables high temperature operation in bright sunlight conditions. The epoxy contains both uv-a and uv-b inhibitors to reduce the effects of long term exposure to direct sunlight.

T-1³/₄ (5 mm) Precision Optical Performance AlInGaP II LED Lamps Selection Guide

| Typical Viewing Angle $2\theta_{1/2}$ (Deg.) ^[2] | Color and Dominant Wavelength (nm), Typ. ^[1] | Lamps Without Standoffs (Outline Drawing A) | Lamps With Standoffs (Outline Drawing B) | Luminous Intensity I_v (mcd) ^[3,4] @ $I(f) = 20$ mA | | |
|---|--|--|---|---|-------|-------|
| | | | | Min. | Max. | |
| 15° | Amber 592 | HLMP-EL16-TW000 | HLMP-EL18-TW000 | 2170 | 8300 | |
| | | HLMP-EL16-TWR00 | HLMP-EL18-TWR00 | 2170 | 8300 | |
| | | HLMP-EL16-TWK00* | | 2170 | 8300 | |
| | | HLMP-EL16-TWS00 | | 2170 | 8300 | |
| | | HLMP-EL16-TUS00 | | 2170 | 4800 | |
| | | HLMP-EL16-TV400** | | 2170 | 6300 | |
| | | HLMP-EL16-TVU00 | | 2170 | 6300 | |
| | | HLMP-EL16-UX000 | HLMP-EL18-UX000 | 2750 | 10700 | |
| | | HLMP-EL16-UXR00 | HLMP-EL18-UXR00 | 2750 | 10700 | |
| | | HLMP-EL16-VW000 | | 3600 | 8300 | |
| | | HLMP-EL16-VWR000 | | 3600 | 8300 | |
| | | HLMP-EL16-VWK00* | | 3600 | 8300 | |
| | | HLMP-EL16-VWS00 | | 3600 | 8300 | |
| | | HLMP-EL16-VX000 | | 3600 | 10700 | |
| | | HLMP-EL16-VXR00 | | 3600 | 10700 | |
| | | HLMP-EL16-VX400** | | 3600 | 10700 | |
| | | HLMP-EL16-VXK00* | | 3600 | 10700 | |
| | | HLMP-EL16-VXS00 | | 3600 | 10700 | |
| | | HLMP-EL16-VY000 | HLMP-EL18-VY000 | 3600 | 13800 | |
| | | HLMP-EL16-VYR00 | HLMP-EL18-VYR00 | 3600 | 13800 | |
| | HLMP-EL16-VYK00* | | 3600 | 13800 | | |
| | HLMP-EL16-VYS00 | | 3600 | 13800 | | |
| | Red-Orange 615 | | | HLMP-EH18-TW000 | 2170 | 8300 |
| | | | HLMP-EH16-UX000 | HLMP-EH18-UX000 | 2750 | 10700 |
| | Red 630 | | HLMP-ED16-TW000 | HLMP-ED18-TW000 | 2170 | 8300 |
| | | | HLMP-ED16-TWT00 | HLMP-ED18-TWT00 | 2170 | 8300 |
| | | | HLMP-ED16-UX000 | HLMP-ED18-UX000 | 2750 | 10700 |
| | | | HLMP-ED16-UXT00 | HLMP-ED18-UXT00 | 2750 | 10700 |

T-1³/₄ (5 mm) Precision Optical Performance AlInGaP II Led Lamps (Continued) Selection Guide

| Typical Viewing Angle $2\theta_{1/2}$ (Deg.) ^[2] | Color and Dominant Wavelength (nm), Typ. ^[1] | Lamps Without Standoffs (Outline Drawing A) | Lamps With Standoffs (Outline Drawing B) | Luminous Intensity I_v (mcd) ^[3,4] @ $I(f) = 20$ mA | |
|---|--|--|---|---|------|
| | | | | Min. | Max |
| 23° | Amber 592 | HLMP-EL25-QS400** | | 1000 | 2900 |
| | | HLMP-EL25-QSU00 | | 1000 | 2900 |
| | | HLMP-EL25-QSK00* | | 1000 | 2900 |
| | | HLMP-EL25-QSS00 | | 1000 | 2900 |
| | | HLMP-EL25-QT000 | | 1000 | 3700 |
| | | HLMP-EL25-QTR00 | HLMP-EL27-QTR00 | 1000 | 3700 |
| | | HLMP-EL25-RU000 | HLMP-EL27-RU000 | 1300 | 4800 |
| | | HLMP-EL25-RUR00 | HLMP-EL27-RUR00 | 1300 | 4800 |
| | | HLMP-EL25-RUK00* | | 1300 | 4800 |
| | | HLMP-EL25-RUS00 | | 1300 | 4800 |
| | | HLMP-EL25-ST000 | | 1650 | 3700 |
| | | HLMP-EL25-STR00 | | 1650 | 3700 |
| | | HLMP-EL25-STK00* | | 1650 | 3700 |
| | | HLMP-EL25-STS00 | | 1650 | 3700 |
| | | HLMP-EL25-SU000 | | 1650 | 4800 |
| | | HLMP-EL25-SUR00 | | 1650 | 4800 |
| | | HLMP-EL25-SU400** | | 1650 | 4800 |
| | | HLMP-EL25-SUU00 | | 1650 | 4800 |
| | | HLMP-EL25-SUK00* | | 1650 | 4800 |
| | | HLMP-EL25-SUS00 | | 1650 | 4800 |
| | | HLMP-EL25-SVK00* | | 1650 | 6300 |
| | | HLMP-EL25-SVS00 | | 1650 | 6300 |
| | | HLMP-EL25-SV000 | HLMP-EL27-SV000 | 1650 | 6300 |
| | | HLMP-EL25-SVR00 | HLMP-EL27-SVR00 | 1650 | 6300 |
| | | HLMP-EL25-TW000 | HLMP-EL27-TW000 | 2170 | 8300 |
| | | HLMP-EL25-TWR00 | HLMP-EL27-TWR00 | 2170 | 8300 |
| HLMP-EL25-TWK00* | | 2170 | 8300 | | |
| HLMP-EL25-TWS00 | | 2170 | 8300 | | |

Notes:

1. Dominant Wavelength, λ_d , is derived from the CIE Chromaticity Diagram and represents the color of the lamp.
2. $\theta_{1/2}$ is the off-axis angle where the luminous intensity is one half the on-axis intensity.
3. The luminous intensity is measured on the mechanical axis of the lamp package.
4. The optical axis is closely aligned with the package mechanical axis.

Part numbers in **bold** are recommended for new designs.

*HLMP-xLxx-xxK00 are selected to amber color bins 2 and 4 only.

**HLMP-xLxx-xx400 are selected to amber color bin 4 only.

T-1³/₄ (5 mm) Precision Optical Performance AlInGaP II Led Lamps (Continued) Selection Guide

| Typical Viewing Angle 2 θ _{1/2} (Deg.) ^[2] | Color and Dominant Wavelength (nm), Typ. ^[1] | Lamps Without Standoffs (Outline Drawing A) | Lamps With Standoffs (Outline Drawing B) | Luminous Intensity I _v (mcd) ^[3,4] @ I(f) = 20 mA | | |
|---|--|--|---|--|------|------|
| | | | | Min. | Max | |
| 23° | Red-Orange 615 | HLMP-EH25-QT000 | | 1000 | 3700 | |
| | | HLMP-EH25-RU000 | | 1300 | 4800 | |
| | | | HLMP-EH27-SV000 | 1650 | 6300 | |
| | | HLMP-EH25-TW000 | HLMP-EH27-TW000 | 2170 | 8300 | |
| | Red 630 | HLMP-ED25-QT000 | | 1000 | 3700 | |
| | | HLMP-ED25-QTT00 | | 1000 | 3700 | |
| | | HLMP-ED25-RU000 | HLMP-ED27-RU000 | 1300 | 4800 | |
| | | HLMP-ED25-RUT00 | HLMP-ED27-RUT00 | 1300 | 4800 | |
| | | HLMP-ED25-SV000 | HLMP-ED27-SV000 | 1650 | 6300 | |
| | | HLMP-ED25-SVT00 | HLMP-ED27-SVT00 | 1650 | 6300 | |
| | | HLMP-ED25-TW000 | HLMP-ED27-TW000 | 2170 | 8300 | |
| | | HLMP-ED25-TWT00 | HLMP-ED27-TWT00 | 2170 | 8300 | |
| | 30° | Amber 592 | HLMP-EL31-QRS00 | | 1000 | 2200 |
| | | | HLMP-EL31-QS000 | | 1000 | 2900 |
| HLMP-EL31-QSR00 | | | | 1000 | 2900 | |
| HLMP-EL31-QS400** | | | | 1000 | 2900 | |
| HLMP-EL31-QSU00 | | | | 1000 | 2900 | |
| HLMP-EL31-QT000 | | | HLMP-EL33-QT000 | 1000 | 3700 | |
| HLMP-EL31-QTR00 | | | HLMP-EL33-QTR00 | 1000 | 3700 | |
| HLMP-EL31-QTK00* | | | | 1000 | 3700 | |
| HLMP-EL31-QTS00 | | | | 1000 | 3700 | |
| HLMP-EL31-SV000 | | | HLMP-EL33-SV000 | 1650 | 6300 | |
| HLMP-EL31-SVR00 | | | HLMP-EL33-SVR00 | 1650 | 6300 | |
| HLMP-EL31-ST000 | | | | 1650 | 3700 | |
| HLMP-EL31-STR00 | | | | 1650 | 3700 | |
| HLMP-EL31-STK00* | | | | 1650 | 3700 | |
| HLMP-EL31-STS00 | | | | 1650 | 3700 | |
| HLMP-EL31-SUK00* | | | | 1650 | 4800 | |

Notes:

1. Dominant Wavelength, λ_d , is derived from the CIE Chromaticity Diagram and represents the color of the lamp.
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3. The luminous intensity is measured on the mechanical axis of the lamp package.
4. The optical axis is closely aligned with the package mechanical axis.

Part numbers in **bold** are recommended for new designs.

*HLMP-xLxx-xxK00 are selected to amber color bins 2 and 4 only.

**HLMP-xLxx-xx400 are selected to amber color bin 4 only.

T-1³/₄ (5 mm) Precision Optical Performance AlInGaP II Led Lamps (Continued) Selection Guide

| Typical Viewing Angle $2\theta_{1/2}$ (Deg.) ^[2] | Color and Dominant Wavelength (nm), Typ. ^[1] | Lamps Without Standoffs (Outline Drawing A) | Lamps With Standoffs (Outline Drawing B) | Luminous Intensity I_v (mcd) ^[3,4] @ $I(f) = 20$ mA | | |
|---|--|--|---|---|------|------|
| | | | | Min. | Max. | |
| 30° | Amber 592 | HLMP-EL31-SUS00 | | 1650 | 4800 | |
| | | HLMP-EL31-SU400** | | 1650 | 4800 | |
| | | HLMP-EL31-SUU00 | | 1650 | 4800 | |
| | | HLMP-EL31-SU000 | | 1650 | 4800 | |
| | | HLMP-EL31-SUR00 | | 1650 | 4800 | |
| | | HLMP-EL31-SVK00* | | 1650 | 6300 | |
| | | HLMP-EL31-SVS00 | | 1650 | 6300 | |
| | Red-Orange 615 | HLMP-EH31-PS000 | | | 765 | 2900 |
| | | HLMP-EH31-QT000 | HLMP-EH33-QT000 | | 1000 | 3700 |
| | | HLMP-EH31-RU000 | HLMP-EH33-RU000 | | 1300 | 4800 |
| | | HLMP-EH31-SV000 | HLMP-EH33-SV000 | | 1650 | 6300 |
| | | HLMP-EH31-SU000 | | | 1650 | 4800 |
| | Red 630 | | | HLMP-ED33-QT000 | 1000 | 3700 |
| | | HLMP-ED31-QTT00 | HLMP-ED33-QTT00 | | 1000 | 3700 |
| | | HLMP-ED31-ST000 | | | 1650 | 3700 |
| | | HLMP-ED31-STT00 | | | 1650 | 3700 |
| | | HLMP-ED31-SU000 | | | 1650 | 4800 |
| | | HLMP-ED31-SUT00 | | | 1650 | 4800 |
| | | HLMP-ED31-RU000 | HLMP-ED33-RU000 | | 1300 | 4800 |
| | | HLMP-ED31-RUT00 | HLMP-ED33-RUT00 | | 1300 | 4800 |
| | | HLMP-ED31-SV000 | HLMP-ED33-SV000 | | 1650 | 6300 |
| | | HLMP-ED31-SVT00 | HLMP-ED33-SVT00 | | 1650 | 6300 |

Notes:

1. Dominant Wavelength, λ_d , is derived from the CIE Chromaticity Diagram and represents the color of the lamp.
2. $\theta_{1/2}$ is the off-axis angle where the luminous intensity is one half the on-axis intensity.
3. The luminous intensity is measured on the mechanical axis of the lamp package.
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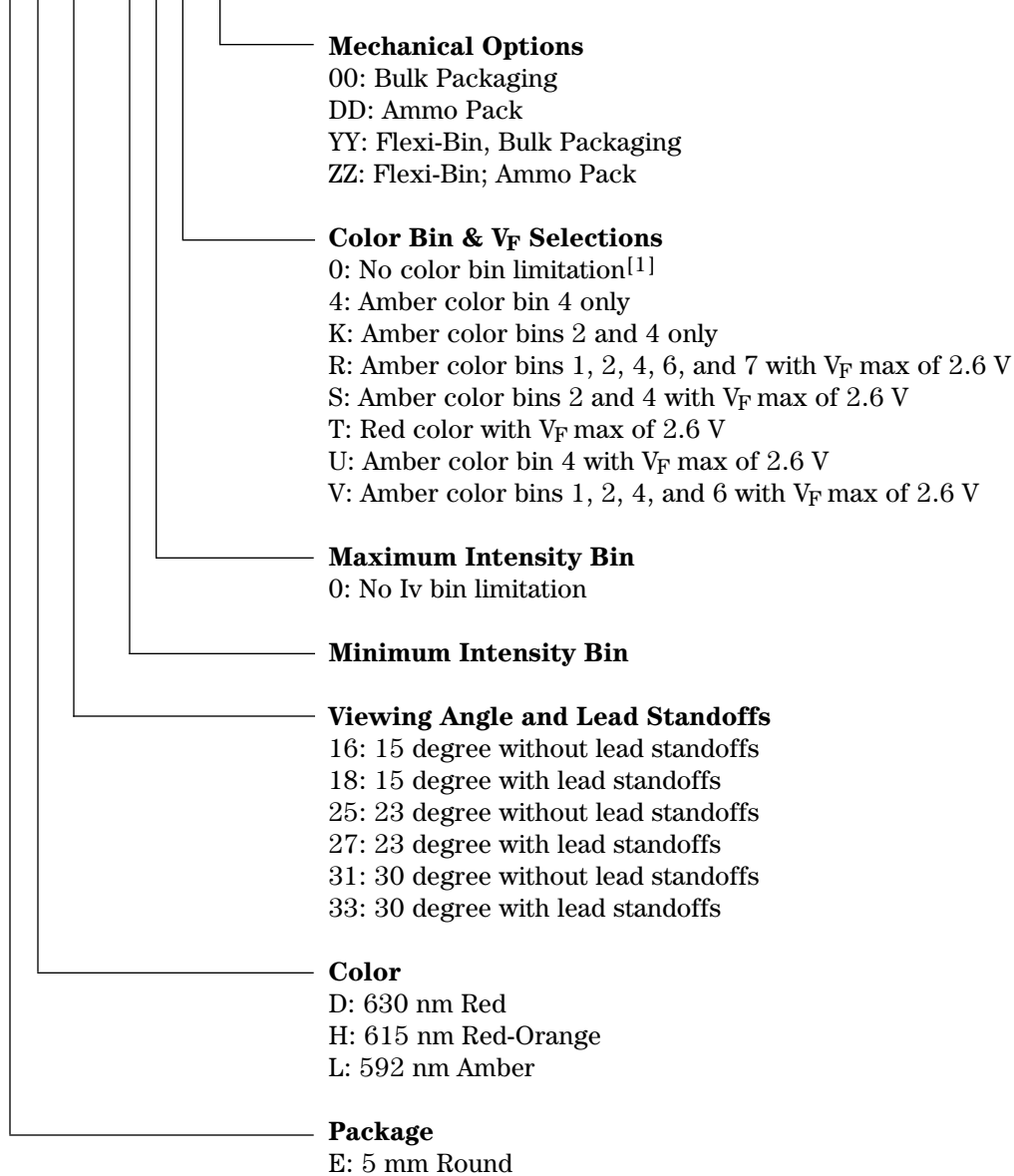
Part numbers in **bold** are recommended for new designs.

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**HLMP-xLxx-xx400 are selected to amber color bin 4 only.

Part Numbering System

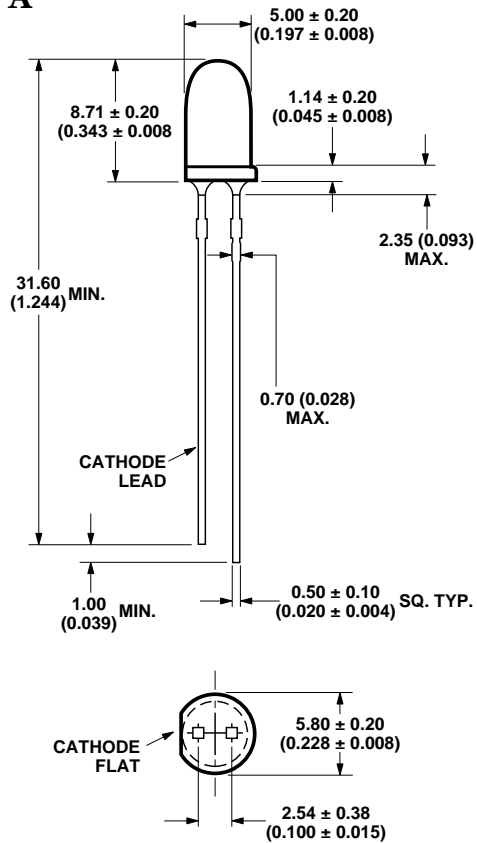
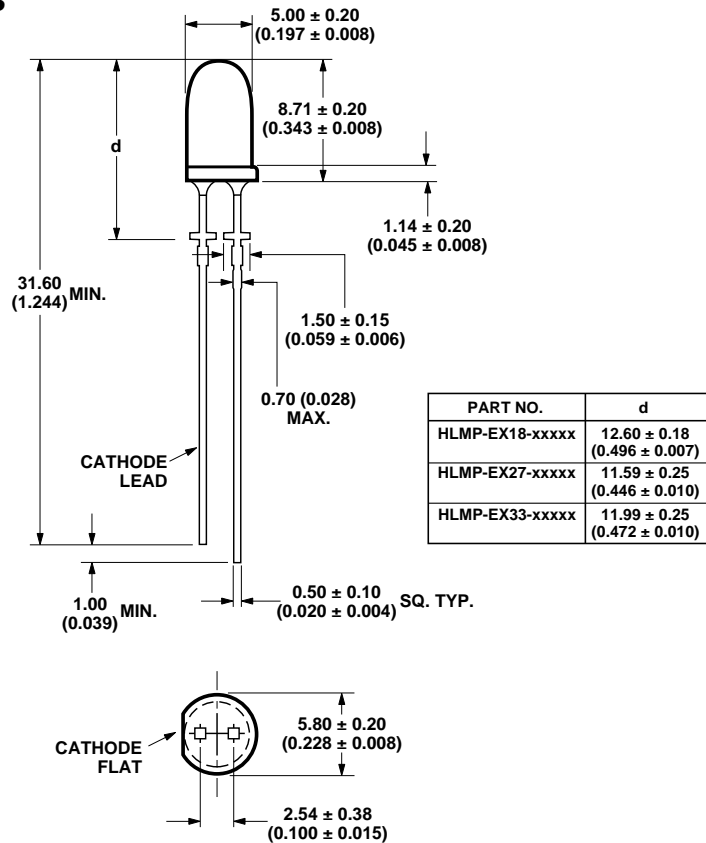
HLMP- x x xx - x x x xx



Note:

1. For amber color, "0" includes color bins 1, 2, 4, and 6 only.

Package Dimensions

A

B


Absolute Maximum Ratings at $T_A = 25^\circ\text{C}$

| | |
|--|---|
| DC Forward Current ^[1,2,3] | 50 mA |
| Peak Pulsed Forward Current ^[2,3] | 100 mA |
| Average Forward Current | 30 mA |
| Reverse Voltage ($I_R = 100 \mu\text{A}$) | 5 V |
| LED Junction Temperature | 130°C |
| Operating Temperature | -40°C to +100°C |
| Storage Temperature | -40°C to +120°C |
| Dip/Drag Solder Temperature | 260°C for 6 seconds |
| Through-the-Wave Preheat Temperature | 145°C |
| Through-the-Wave Solder Temperature | 245°C for 3 seconds |
| | [1.59 mm (0.060 in.) below seating plane] |

Notes:

- Derate linearly as shown in Figure 4.
- For long term performance with minimal light output degradation, drive currents between 10 mA and 30 mA are recommended. For more information on recommended drive conditions, please refer to Application Brief I-024 (5966-3087E).
- Please contact your sales representative about operating currents below 10 mA.

Electrical/Optical Characteristics at $T_A = 25^\circ\text{C}$

| Parameter | Symbol | Min. | Typ. | Max. | Units | Test Conditions |
|--|--------------------------|------|----------------------|--------------------|--------------------|--|
| Forward Voltage Amber ($\lambda_d = 592 \text{ nm}$) Red-Orange ($\lambda_d = 617 \text{ nm}$) Red ($\lambda_d = 630 \text{ nm}$) | V_F | | 2.15 2.08 2.00 | 2.4 ^[1] | V | $I_F = 20 \text{ mA}$ |
| Reverse Voltage | V_R | 5 | 20 | | V | $I_R = 100 \mu\text{A}$ |
| Peak Wavelength Amber Red-Orange Red | λ_{PEAK} | | 594 623 639 | | nm | Peak of Wavelength of Spectral Distribution at $I_F = 20 \text{ mA}$ |
| Spectral Halfwidth | $\Delta\lambda_{1/2}$ | | 17 | | nm | Wavelength Width at Spectral Distribution $1/2$ Power Point at $I_F = 20 \text{ mA}$ |
| Speed of Response | τ_s | | 20 | | ns | Exponential Time Constant, e^{-t/τ_s} |
| Capacitance | C | | 40 | | pF | $V_F = 0, f = 1 \text{ MHz}$ |
| Thermal Resistance | $R_{\theta\text{J-PIN}}$ | | 240 | | $^\circ\text{C/W}$ | LED Junction-to-Cathode Lead |
| Luminous Efficacy ^[2] Amber Red-Orange Red | η_v | | 500 235 155 | | lm/W | Emitted Luminous Power/Emitted Radiant Power at $I_F = 20 \text{ mA}$ |

Note:

- For options -xxRxx, -xxSxx, -xxTxx, -xxUxx, and -xxVxx, max forward voltage (Vf) is 2.6 V.
- The radiant intensity, I_e , in watts per steradian, may be found from the equation $I_e = I_v/\eta_v$, where I_v is the luminous intensity in candelas and η_v is the luminous efficacy in lumens/watt.

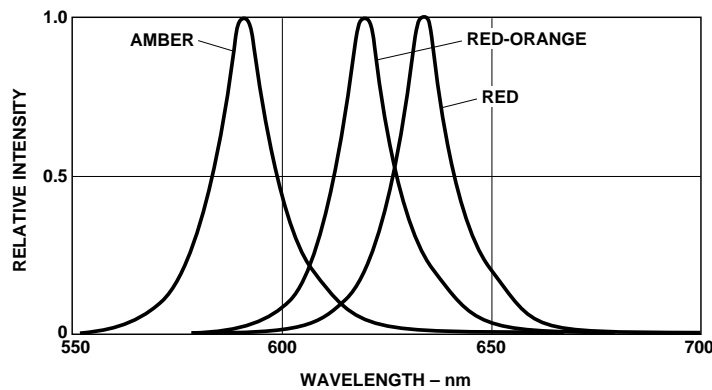


Figure 1. Relative Intensity vs. Peak Wavelength.

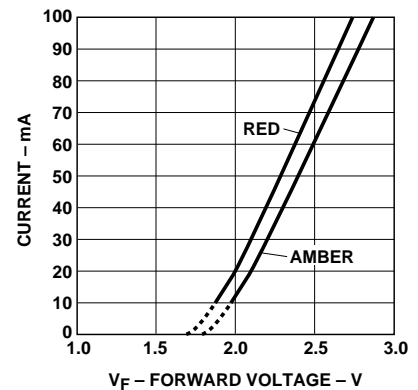


Figure 2. Forward Current vs. Forward Voltage.

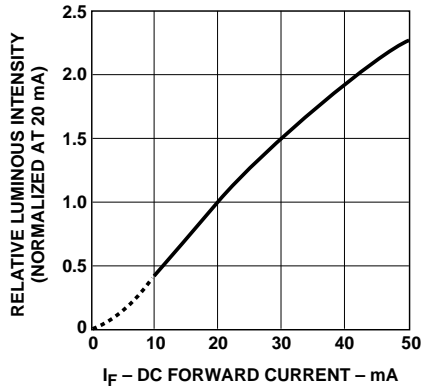


Figure 3. Relative Luminous Intensity vs. Forward Current.

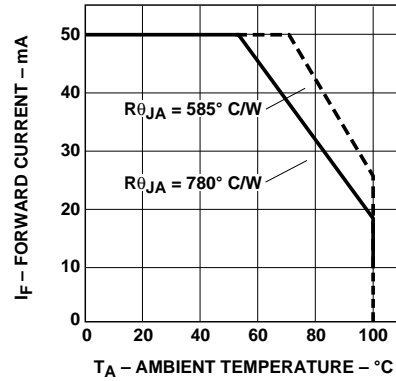


Figure 4. Maximum Forward Current vs. Ambient Temperature. Derating Based on T_{JMAX} = 130°C.

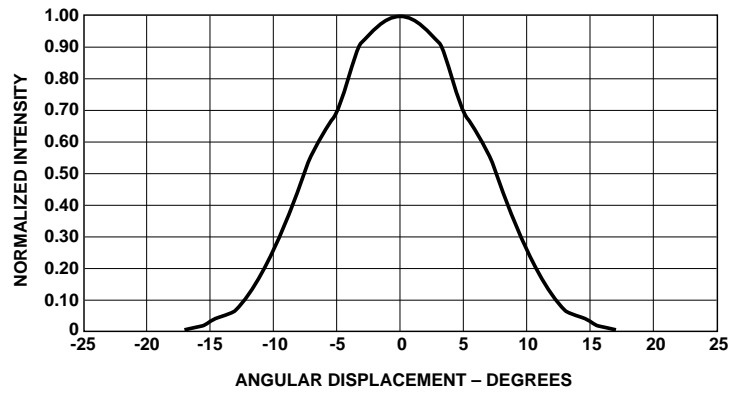


Figure 5. Representative Spatial Radiation Pattern for 15° Viewing Angle Lamps.

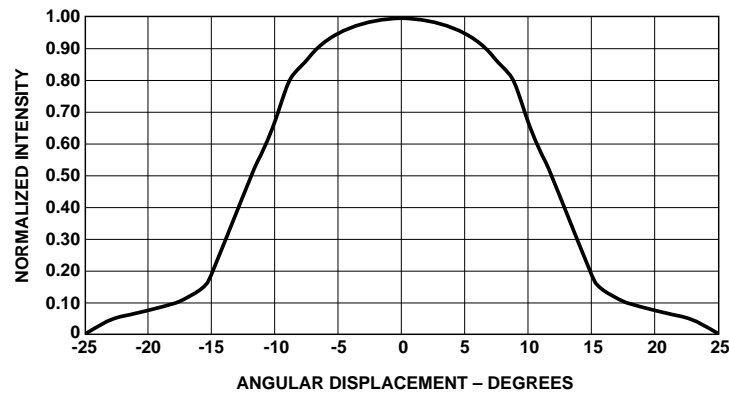


Figure 6. Representative Spatial Radiation Pattern for 24° Viewing Angle Lamps.

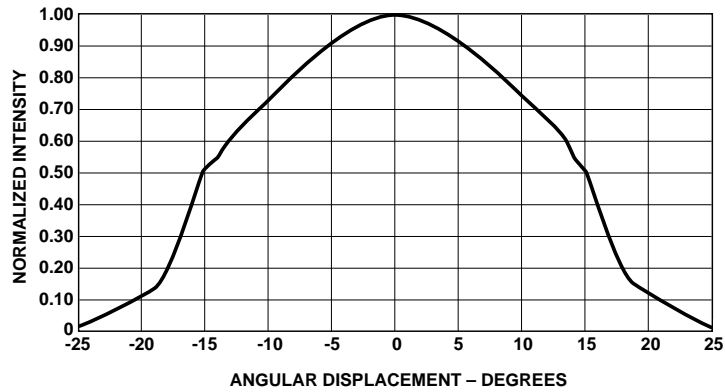


Figure 7. Representative Spatial Radiation Pattern for 30° Viewing Angle Lamps.

**Intensity Bin Limits
(mcd at 20 mA)**

| Bin Name | Min. | Max. |
|----------|-------|-------|
| P | 880 | 1150 |
| Q | 1150 | 1500 |
| R | 1500 | 1900 |
| S | 1900 | 2500 |
| T | 2500 | 3200 |
| U | 3200 | 4200 |
| V | 4200 | 5500 |
| W | 5500 | 7200 |
| X | 7200 | 9300 |
| Y | 9300 | 12000 |
| Z | 12000 | 16000 |

Tolerance for each bin limit is ± 15%.

**Amber Color Bin Limits
(nm at 20 mA)**

| Bin Name | Min. | Max. |
|----------|-------|-------|
| 1 | 584.5 | 587.0 |
| 2 | 587.0 | 589.5 |
| 4 | 589.5 | 592.0 |
| 6 | 592.0 | 594.5 |
| 7 | 594.5 | 597.0 |

Tolerance for each bin limit is ± 0.5 nm.

Note:

1. Bin categories are established for classification of products. Products may not be available in all bin categories.

