

## HLMP-EDxx/ELxx

5 mm Precision Optical Performance

Best Value AllnGaP Lamps



## Data Sheet



### Description

These Precision Optical Performance AllnGaP and AllnGaP II LEDs provide superior light output for excellent readability in sunlight and are extremely reliable.

These LED lamps are untinted, nondiffused, T-1 $\frac{3}{4}$  packages incorporating second generation optics producing well defined spatial 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 high maximum LED junction temperature limit of +130° C enables high temperature operation in bright sunlight conditions. The package epoxy contains both uv-a and uv-b inhibitors to reduce the effects of long term exposure to direct sunlight.

### Benefits

- Viewing angles match traffic management sign and requirements
- Colors meet automotive and pedestrian signal and specifications
- Superior performance in outdoor environments
- Suitable for autoinsertion onto PC boards

### Features

- Well defined spatial radiation pattern
- Viewing angles: 6°, 15°, 23°, 30°
- High luminous output
- Two red and amber intensity levels AllnGaP (bright) and AllnGaP II (brightest)
- Colors: 626/630 nm red, 590/592 nm amber
- Superior resistance to moisture
- UV resistant epoxy

### Applications

- Traffic management:
  - Traffic signals
  - Work zone warning lights
  - Variable message signs
- Commercial outdoor advertising: signs, marquees
- Automotive: exterior and interior lights

## Device Selection Guide for AlInGaP

| Part Number     | Typical Viewing Angle $2\theta_{1/2}$ | Color and Dominant Wavelength (nm), Typ. <sup>[4]</sup> | Luminous Intensity $I_v$ (mcd) <sup>[2][3]</sup> at $I_f = 20$ mA Min. | Leads with Standoffs | Package Drawing |
|-----------------|---------------------------------------|---|--|----------------------|-----------------|
| HLMP-EG08-T0000 | 6°                                    | Red 626   | 2170   | No                   | A               |
| HLMP-EG10-T0000 | 6°                                    | Red 626   | 2170   | Yes                  | B               |
| HLMP-EG15-N0000 | 15°                                   | Red 626   | 590  | No                   | A               |
| HLMP-EG17-N0000 | 15°                                   | Red 626   | 590  | Yes                  | B               |
| HLMP-EG24-M0000 | 23°                                   | Red 626   | 450  | No                   | A               |
| HLMP-EG26-M0000 | 23°                                   | Red 626   | 450  | Yes                  | B               |
| HLMP-EG30-K0000 | 30°                                   | Red 626   | 270  | No                   | A               |
| HLMP-EG32-K0000 | 30°                                   | Red 626   | 270  | Yes                  | B               |
| HLMP-EL08-T0000 | 6°                                    | Amber 590   | 2170   | No                   | A               |
| HLMP-EL10-T0000 | 6°                                    | Amber 590   | 2170   | Yes                  | B               |
| HLMP-EL15-M0000 | 15°                                   | Amber 590   | 450  | No                   | A               |
| HLMP-EL17-M0000 | 15°                                   | Amber 590   | 450  | Yes                  | B               |
| HLMP-EL24-L0000 | 23°                                   | Amber 590   | 345  | No                   | A               |
| HLMP-EL26-L0000 | 23°                                   | Amber 590   | 345  | Yes                  | B               |
| HLMP-EL30-K0000 | 30°                                   | Amber 590   | 270  | No                   | A               |
| HLMP-EL32-K0000 | 30°                                   | Amber 590   | 270  | Yes                  | B               |

## Device Selection Guide for AlInGaP II

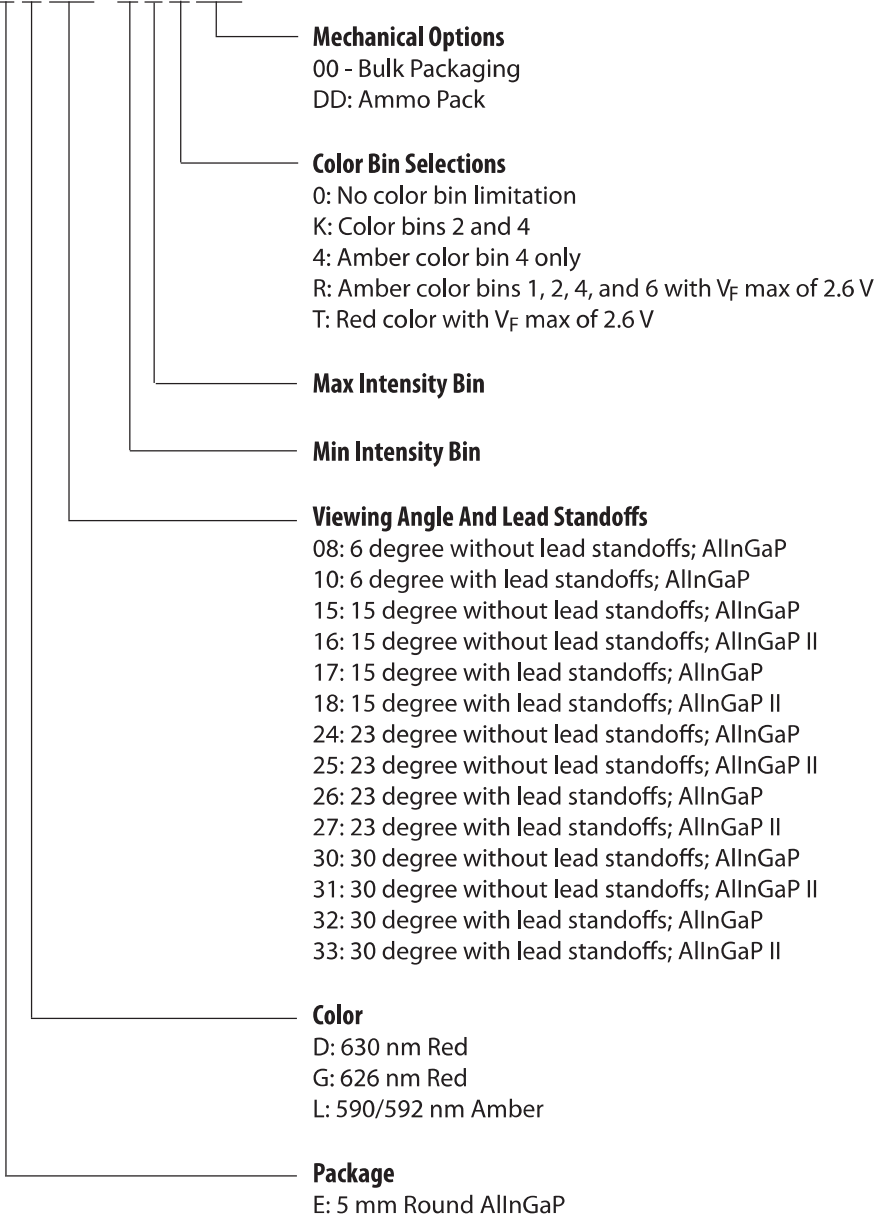
| Part Number     | Typical Viewing Angle $2\theta_{1/2}$ | Color and Dominant Wavelength (nm), Typ. <sup>[4]</sup> | Luminous Intensity $I_v$ (mcd) <sup>[2][3]</sup> at $I_f = 20$ mA Min. | Leads with Standoffs | Package Drawing |
|-----------------|---------------------------------------|---|--|----------------------|-----------------|
| HLMP-ED16-S0000 | 15°                                   | Red 630   | 1650   | No                   | A               |
| HLMP-ED16-S0T00 | 15°                                   | Red 630   | 1650   | No                   | A               |
| HLMP-ED18-S0000 | 15°                                   | Red 630   | 1650   | Yes                  | B               |
| HLMP-ED18-S0T00 | 15°                                   | Red 630   | 1650   | Yes                  | B               |
| HLMP-ED25-R0000 | 23°                                   | Red 630   | 1300   | No                   | A               |
| HLMP-ED25-R0T00 | 23°                                   | Red 630   | 1300   | No                   | A               |
| HLMP-ED27-R0000 | 23°                                   | Red 630   | 1300   | Yes                  | B               |
| HLMP-ED27-R0T00 | 23°                                   | Red 630   | 1300   | Yes                  | B               |
| HLMP-ED31-Q0000 | 30°                                   | Red 630   | 1000   | No                   | A               |
| HLMP-ED31-Q0T00 | 30°                                   | Red 630   | 1000   | No                   | A               |
| HLMP-ED33-Q0000 | 30°                                   | Red 630   | 1000   | Yes                  | B               |
| HLMP-ED33-Q0T00 | 30°                                   | Red 630   | 1000   | Yes                  | B               |
| HLMP-EL16-S0000 | 15°                                   | Amber 592   | 1650   | No                   | A               |
| HLMP-EL16-S0R00 | 15°                                   | Amber 592   | 1650   | No                   | A               |
| HLMP-EL18-S0000 | 15°                                   | Amber 592   | 1650   | Yes                  | B               |
| HLMP-EL18-S0R00 | 15°                                   | Amber 592   | 1650   | Yes                  | B               |
| HLMP-EL25-Q0000 | 23°                                   | Amber 592   | 1000   | No                   | A               |
| HLMP-EL25-Q0R00 | 23°                                   | Amber 592   | 1000   | No                   | A               |
| HLMP-EL27-Q0000 | 23°                                   | Amber 592   | 1000   | Yes                  | B               |
| HLMP-EL27-Q0R00 | 23°                                   | Amber 592   | 1000   | Yes                  | B               |
| HLMP-EL31-P0000 | 30°                                   | Amber 592   | 765  | No                   | A               |
| HLMP-EL31-P0R00 | 30°                                   | Amber 592   | 765  | No                   | A               |
| HLMP-EL33-P0000 | 30°                                   | Amber 592   | 765  | Yes                  | B               |
| HLMP-EL33-P0R00 | 30°                                   | Amber 592   | 765  | Yes                  | B               |
| HLMP-EL31-Q0R00 | 30°                                   | Amber 592   | 1000   | No                   | A               |

### Notes:

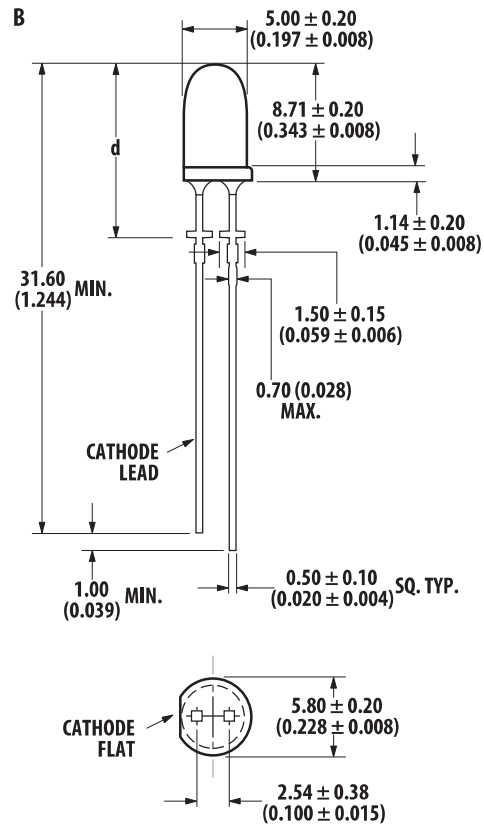
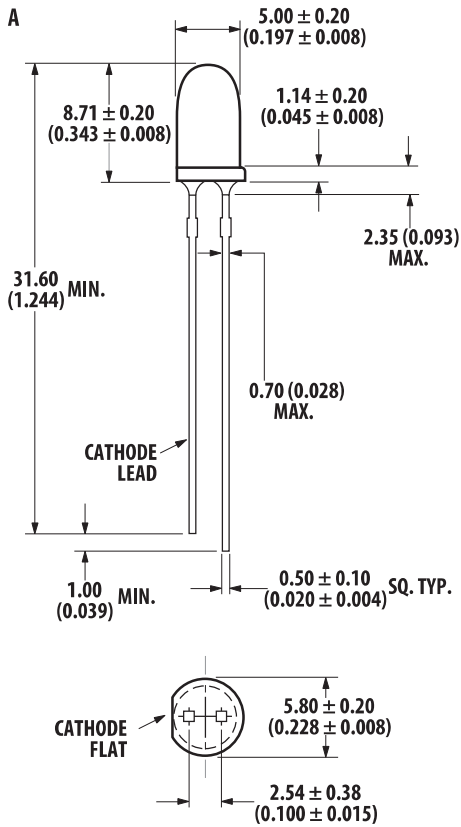
1.  $2\theta_{1/2}$  is the off-axis angle where the luminous intensity is  $\frac{1}{2}$  the on-axis intensity.
2. The luminous intensity is measured on the mechanical axis of the lamp package.
3. The optical axis is closely aligned with the package mechanical axis.
4. The dominant wavelength,  $\lambda_d$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

## Part Numbering System

HLMP- X X XX - X X X XX



## Package Dimensions



### Notes:

- All Dimensions are in millimeters (inches).
- Leads are mild steel, solder dipped.
- Tapers shown at top of leads (bottom of lamp package) indicate an epoxy meniscus that may extend about 1mm (0.040 in.) down the leads.
- Recommended PC board hole diameters:
  - Lamp package A without standoffs: Flush mounting at base of lamp package = 1.143/1.067 (0.044/0.042).
  - Lamp package B with standoffs: Mounting at lead standoffs = 0.965/0.889(0.038/0.035).
- For dome height above lead stand-off seating plane,  $d$ , lamp package B. See table.

| Part Number | $d$                                    |
|-------------|--|
| HLMP-xx10   | $12.37 \pm 0.25$ ( $0.487 \pm 0.010$ ) |
| HLMP-xx17   | $12.43 \pm 0.25$ ( $0.489 \pm 0.010$ ) |
| HLMP-xx26   | $12.52 \pm 0.25$ ( $0.493 \pm 0.010$ ) |
| HLMP-xx32   | $11.96 \pm 0.25$ ( $0.471 \pm 0.010$ ) |
| HLMP-xx18   | $12.60 \pm 0.25$ ( $0.496 \pm 0.010$ ) |
| HLMP-xx27   | $11.59 \pm 0.25$ ( $0.446 \pm 0.010$ ) |
| HLMP-xx33   | $11.99 \pm 0.25$ ( $0.472 \pm 0.010$ ) |

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

| Parameter                                    | Value             |
|--|-------------------|
| DC Forward Current [1,2]                     | 50 mA             |
| Peak Pulsed Forward Current [2]              | 100 mA            |
| Average Forward Current                      | 30 mA             |
| Reverse Voltage ( $I_R = 100\ \mu\text{A}$ ) | 5 V               |
| Power Dissipation                            | 120 mW            |
| 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 secs |
| Through-the-Wave Preheat Temperature         | 145° C            |
| Through-the-Wave Solder Temperature          | 245° C for 3 secs |

Notes:

1. Derate linearly as shown in Figure 4.
2. For long term performance with minimal light output degradation, drive currents between 10 mA and 30 mA are recommended. For more information, please refer to Application Brief I-024.

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

| Parameter                              | Symbol                   | Min. | Typ. | Max.               | Units | Test Conditions  |
|--|--------------------------|------|------|--------------------|-------|--|
| Forward Voltage                        | $V_F$                    |      |      |                    | V     | $I_F = 20\ \text{mA}$  |
| Amber ( $\lambda_d = 590\ \text{nm}$ ) |                          |      | 2.02 | 2.5                |       |  |
| Red ( $\lambda_d = 626\ \text{nm}$ )   |                          |      | 1.90 | 2.5                |       |  |
| Amber ( $\lambda_d = 592\ \text{nm}$ ) |                          |      | 2.15 | 2.5 <sup>[1]</sup> |       |  |
| Red ( $\lambda_d = 630\ \text{nm}$ )   |                          |      | 2.00 | 2.5 <sup>[1]</sup> |       |  |
| Reverse Voltage                        | $V_R$                    | 5    | 20   |                    | V     | $I_R = 100\ \mu\text{A}$   |
| Peak Wavelength                        | $\lambda_{\text{PEAK}}$  |      |      |                    | nm    | Peak of Wavelength of Spectral Distribution at $I_F = 20\ \text{mA}$                         |
| Amber ( $\lambda_d = 590\ \text{nm}$ ) |                          |      |      |                    |       |  |
| Red ( $\lambda_d = 626\ \text{nm}$ )   |                          |      |      |                    |       |  |
| Amber ( $\lambda_d = 592\ \text{nm}$ ) |                          |      |      |                    |       |  |
| Red ( $\lambda_d = 630\ \text{nm}$ )   |                          |      |      |                    |       |  |
| Spectral Halfwidth                     | $\Delta\lambda_{1/2}$    |      | 17   |                    | nm    | Wavelength Width at Spectral Distribution $\frac{1}{2}$ Power Point at $I_F = 20\ \text{mA}$ |
| Speed of Response                      | $\tau_s$                 |      | 20   |                    | ns    | Exponential Time Constant, $e^{-t/\tau_s}$   |
| Capacitance                            | C                        |      | 40   |                    | pF    | $V_F = 0, f = 1\ \text{MHz}$   |
| Luminous Efficacy                      | $\eta_V$                 |      |      |                    | lm/w  | Emitted Luminous Power/Emitted Radiant Power at $I_F = 20\ \text{mA}$                        |
| Amber ( $\lambda_d = 590\ \text{nm}$ ) |                          |      | 480  |                    |       |  |
| Red ( $\lambda_d = 626\ \text{nm}$ )   |                          |      | 150  |                    |       |  |
| Amber ( $\lambda_d = 592\ \text{nm}$ ) |                          |      | 500  |                    |       |  |
| Red ( $\lambda_d = 630\ \text{nm}$ )   |                          |      | 155  |                    |       |  |
| Thermal Resistance                     | $R\theta_{\text{J-PIN}}$ |      | 240  |                    | °C/W  | LED Junction-to-Cathode Lead   |

Notes:

1. For options -xxRxx and -xxTxx, maximum forward voltage,  $V_F$  is 2.6 V.
2.  $2\theta_{1/2}$  is the off-axis angle where the luminous intensity is  $\frac{1}{2}$  the on-axis intensity.
3. 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  $\eta_V$  is the luminous efficacy in lumens/watt.

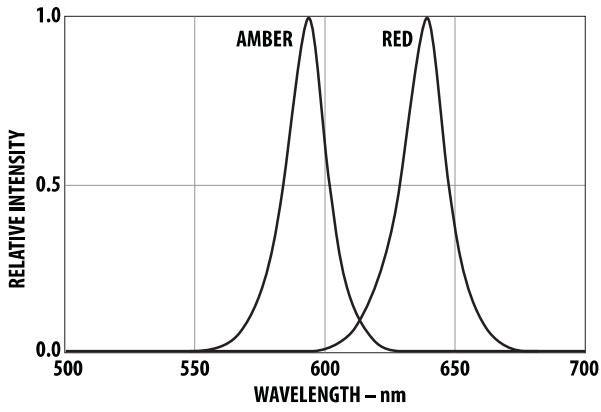


Figure 1. Relative intensity vs. wavelength.

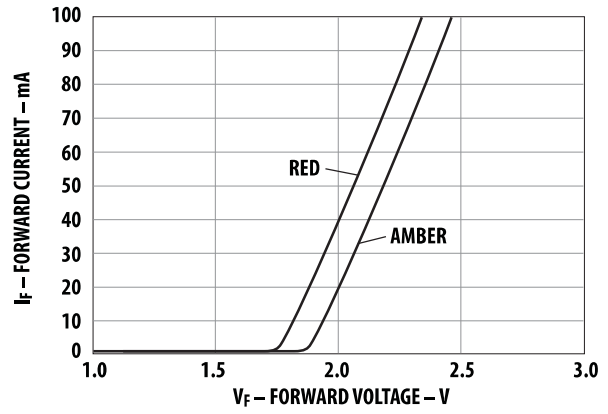


Figure 2. Forward current vs. forward voltage.

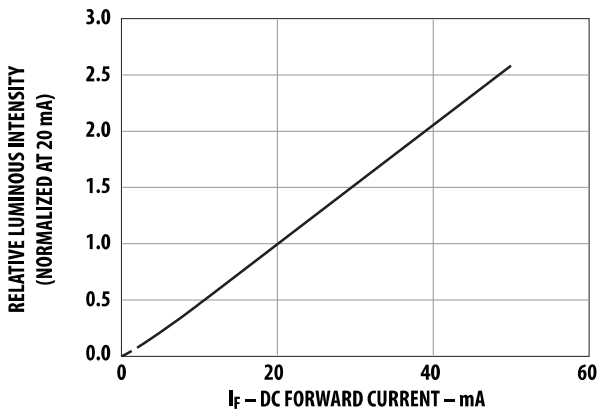


Figure 3. Relative luminous intensity vs. forward current.

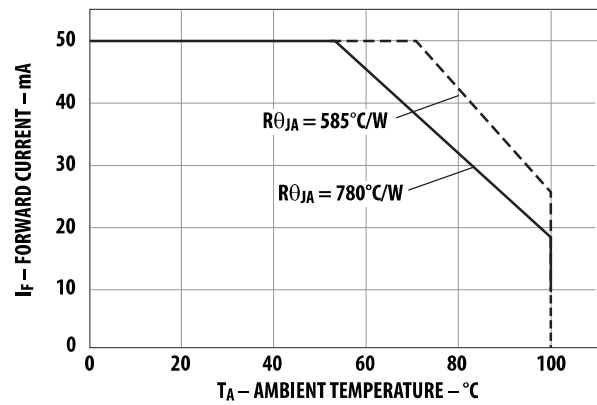


Figure 4. Maximum forward current vs. ambient temperature.

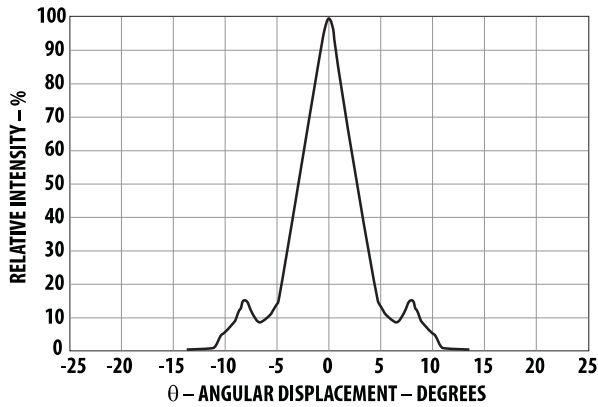


Figure 5. Representative spatial radiation pattern for 6° viewing angle lamps.

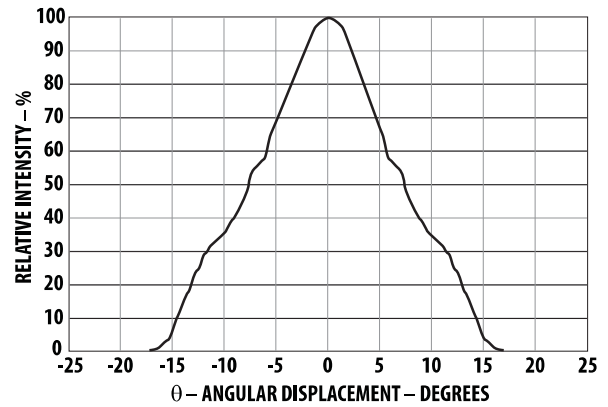


Figure 6. Representative spatial radiation pattern for 15° viewing angle lamps.

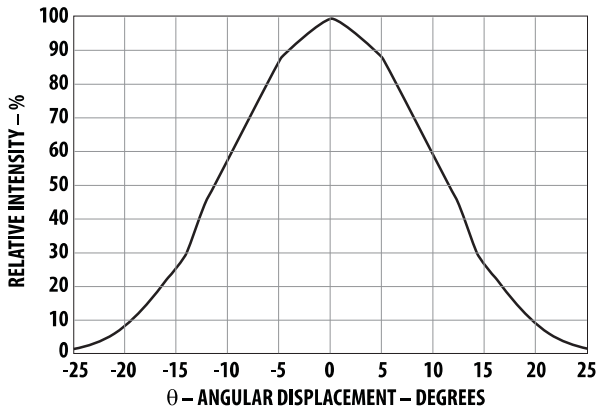


Figure 7. Representative spatial radiation pattern for 23° viewing angle lamps.

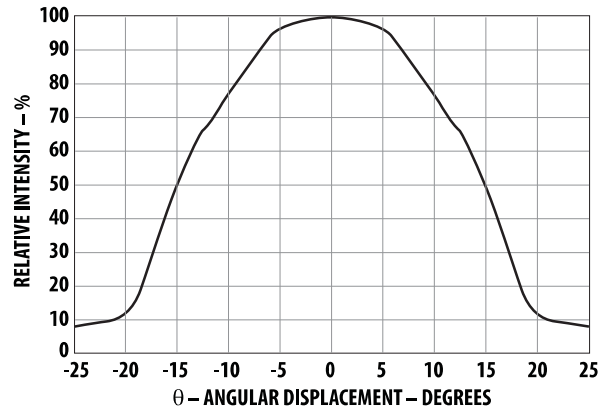


Figure 8. Representative spatial radiation pattern for 30° viewing angle lamps.

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

| Bin ID | Min. | Max. |
|--------|------|------|
| K      | 310  | 400  |
| L      | 400  | 520  |
| M      | 520  | 680  |
| N      | 680  | 880  |
| P      | 880  | 1150 |
| Q      | 1150 | 1500 |
| R      | 1500 | 1900 |
| S      | 1900 | 2500 |
| T      | 2500 | 3200 |
| U      | 3200 | 4200 |
| V      | 4200 | 5500 |

Tolerance for each bin limit is  $\pm 15\%$ .

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

| Bin ID | Min.  | Max.  |
|--------|-------|-------|
| 1      | 584.5 | 587.0 |
| 2      | 587.0 | 589.5 |
| 4      | 589.5 | 592.0 |
| 6      | 592.0 | 594.5 |

Tolerance for each bin limit is  $\pm 0.5$  nm.

Note:

- Bin categories are established for classification of products. Products may not be available in all bin categories. Please contact your local Avago representatives for further information.

For product information and a complete list of distributors, please go to our web site: [www.avagotech.com](http://www.avagotech.com)

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