

# HLMA-DX05, HLMA-KX05, HLMP-D1XX & HLMP-J100/J150 series



T-1¾ (5 mm), T-1 (3 mm), High Performance, Tinted, Diffused,  
AlInGaP, and TS AlGaAs Red LED Lamps

## Data Sheet

### Description

The HLMA-D/KXXX series tinted, diffused, solid state lamps utilize the newly developed aluminum indium gallium phosphide (AlInGaP) LED technology. This technology has a very high luminous efficiency, capable of producing high light output over a wide range of drive currents. These LED lamps are available with a choice of two colors, 592 nm amber and 615 nm reddish orange, and with two viewing angles, 65° and 60°.

The HLMP-D/JXXX series tinted, diffused solid state lamps utilize the highly optimized transparent substrate aluminum gallium arsenide (TS AlGaAs) LED technology. This technology has a very high luminous efficiency, capable of producing high light output over the wide range of drive currents from 500 mA to 50 mA. The color is deep red at a dominant wavelength of 644 nm. TS AlGaAs is a flip-chip LED technology, die attached to the anode lead and wire bonded to the cathode lead. Available viewing angles are 25°, 40°, and 55°.

### Features

- High Light Output Over a Wide Range of Currents
- Popular T-1 and T-1 3/4 Packages
- Choice of Three Colors
  - Amber
  - Reddish-Orange
  - Deep Red
- Wide Viewing Angles
- Long Life: Solid State Technology
- Available on Tape and Reel

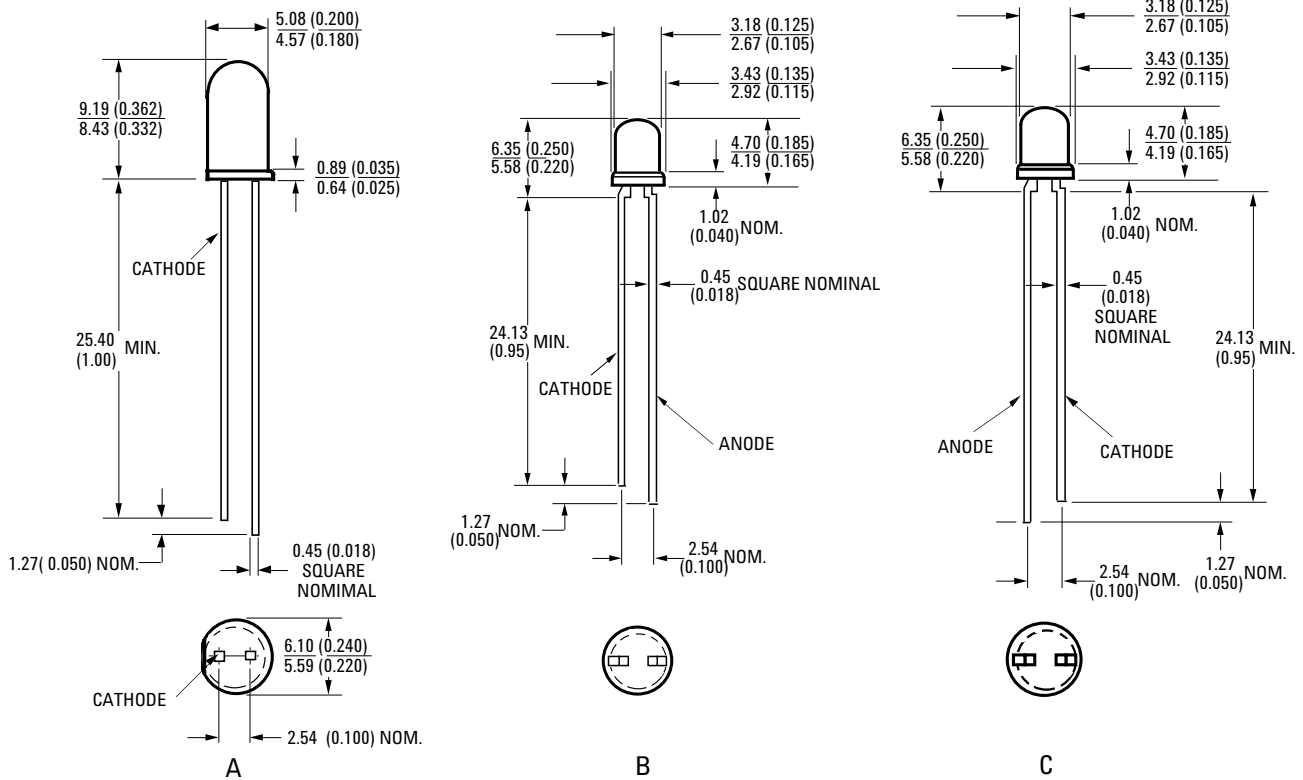
### Applications

- Outdoor Message Boards
- Automotive Lighting
- Portable Equipment
- Medical Equipment
- Changeable Message Signs

### Device Selection Guide

| Package Description                                | Viewing Angle<br>2θ½ | Amber<br>λ <sub>d</sub> = 592 nm | Reddish-Orange<br>λ <sub>d</sub> = 615 nm | Deep Red<br>λ <sub>d</sub> = 644 nm | Package<br>Outline |
|----------------------------------------------------|----------------------|----------------------------------|-------------------------------------------|-------------------------------------|--------------------|
| T-1¾ (5 mm), Tinted,<br>Diffused, Standard Current | 65°                  | HLMA-DL05                        | HLMA-DH05                                 |                                     | A                  |
| T-1 (3 mm), Tinted,<br>Diffused, Standard Current  | 60°                  | HLMA-KL05                        | HLMA-KH05                                 |                                     | B                  |
| T-1¾ (5 mm), Tinted,<br>Diffused, Standard Current | 40°                  |                                  |                                           | HLMP-D115                           | A                  |
| T-1¾ (5 mm), Tinted,<br>Diffused, Standard Current | 25°                  |                                  |                                           | HLMP-D120                           | A                  |
| T-1 (3 mm), Tinted,<br>Diffused, Standard Current  | 55°                  |                                  |                                           | HLMP-J100                           | C                  |
| T-1 (3 mm), Tinted,<br>Diffused, Low Current       | 55°                  |                                  |                                           | HLMP-J150                           |                    |

## Package Dimensions



### NOTES:

1. ALL DIMENSIONS ARE IN MILLIMETERS (INCHES).
2. AN EPOXY MENISCUS MAY EXTEND ABOUT 1 mm (0.040") DOWN THE LEADS.

## HLMA-DL05/DH05/KI05/KH05 AlInGaP Lamps

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

| Parameter                                                     | HLMA-DL05                         | HLMA-DH05   | HLMA-KI05   | HLMA-KH05   | Units            |
|---------------------------------------------------------------|-----------------------------------|-------------|-------------|-------------|------------------|
| DC Forward Current <sup>[1,3,4]</sup>                         | 50                                | 50          | 50          | 50          | mA               |
| Peak Forward Current <sup>[2]</sup>                           | 200                               | 200         | 200         | 200         | mA               |
| Average Input Power <sup>[2]</sup>                            | 103                               | 103         | 103         | 103         | mW               |
| Reverse Voltage ( $I_R = 100$ mA)                             | 5                                 | 5           | 5           | 5           | V                |
| Operating Temperature Range                                   | -40 to +100                       | 40 to +100  | 40 to +100  | 40 to +100  | $^\circ\text{C}$ |
| Storage Temperature Range                                     | -55 to +100                       | -55 to +100 | -55 to +100 | -55 to +100 | $^\circ\text{C}$ |
| Junction Temperature                                          | 110                               |             |             |             | $^\circ\text{C}$ |
| Wave Soldering Temperature<br>[1.59 mm (0.06 in.) below Body] | 250 $^\circ\text{C}$ for 3 second |             |             |             |                  |

### Notes:

1. Derate linearly as shown in Figure 4.
2. Any pulsed operation cannot exceed the Absolute Max Peak Forward current as specified in Figure 5.
3. Drive currents between 10 mA and 30 mA are recommended for best long term performance.
4. Operation at currents below 10 mA is not recommended, please contact your Avago Technologies sales representative.

### Optical Characteristics at T<sub>A</sub> = 25°C

| Part Number<br>HLMA- | Luminous Intensity<br>IV (mcd)<br>@ 20 mA <sup>[1]</sup> |      | Peak Wavelength<br>$\lambda_{peak}$ (nm) | Color, Dominant<br>Wavelength<br>$\lambda_d$ <sup>[2]</sup> (nm) | Viewing Angle<br>2 $\theta_{1/2}$<br>Degrees <sup>[3]</sup> | Luminous<br>Efficacy<br>$\eta_v$<br>(lm/w) |
|----------------------|----------------------------------------------------------|------|------------------------------------------|------------------------------------------------------------------|-------------------------------------------------------------|--------------------------------------------|
|                      | Min.                                                     | Typ. | Typ.                                     | Typ.                                                             | Typ.                                                        |                                            |
| DL05                 | 35                                                       | 100  | 594                                      | 592                                                              | 65                                                          | 480                                        |
| DH05                 | 35                                                       | 100  | 621                                      | 615                                                              | 65                                                          | 263                                        |
| KL05                 | 35                                                       | 100  | 594                                      | 592                                                              | 60                                                          | 480                                        |
| KH05                 | 35                                                       | 100  | 621                                      | 615                                                              | 60                                                          | 26                                         |

Notes:

1. Iv is the total luminous flux output as measured with an integrating sphere.

2. The dominant wavelength,  $\lambda_d$ , is derived from the CIE Chromaticity Diagram and represents the color of the device.

3.  $\theta_{1/2}$  is the off-axis angle where the luminous intensity is 1/2 the peak intensity.

### Electrical Characteristics at T<sub>A</sub> = 25°C

| Part Number<br>HLMA- | Forward Voltage<br>V <sub>F</sub> (Volts)<br>@ I <sub>F</sub> = 20 mA |      | Reverse Breakdown<br>V <sub>R</sub> (Volts)<br>@ I <sub>R</sub> = 100 mA |      | Capacitance<br>C (pF)<br>V <sub>F</sub> = 0, f = 1 MHz | Thermal<br>Resistance<br>R <sub>θJ-PIN</sub><br>(°C/W) | Speed of Response<br>$\tau_s$ (ns)<br>Time Constant $e^{-t/\tau_s}$ |
|----------------------|-----------------------------------------------------------------------|------|--------------------------------------------------------------------------|------|--------------------------------------------------------|--------------------------------------------------------|---------------------------------------------------------------------|
|                      | Typ.                                                                  | Max. | Min.                                                                     | Typ. | Typ.                                                   |                                                        | Typ.                                                                |
| DL05                 | 1.9                                                                   | 2.4  | 5                                                                        | 25   | 60                                                     | 260                                                    | 13                                                                  |
| DH05                 | 1.9                                                                   | 2.4  | 5                                                                        | 25   | 60                                                     | 260                                                    | 13                                                                  |
| KL05                 | 1.9                                                                   | 2.4  | 5                                                                        | 25   | 60                                                     | 260                                                    | 13                                                                  |
| KH05                 | 1.9                                                                   | 2.4  | 5                                                                        | 25   | 60                                                     | 260                                                    | 13                                                                  |

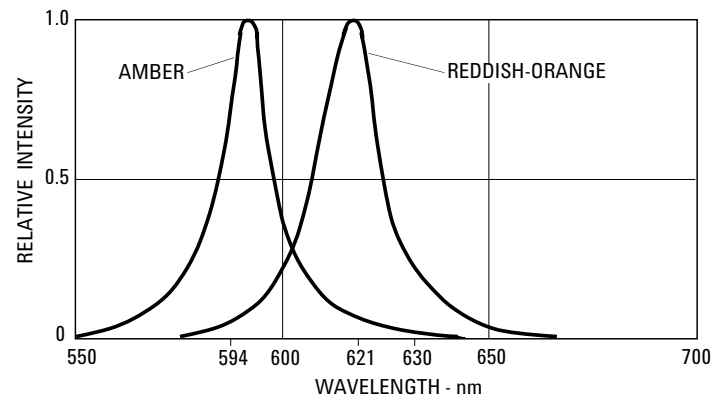


Figure 1. Relative Intensity vs. Wavelength.

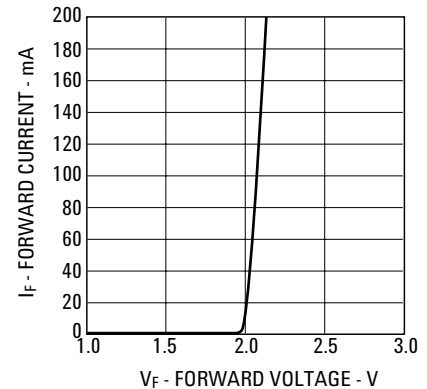
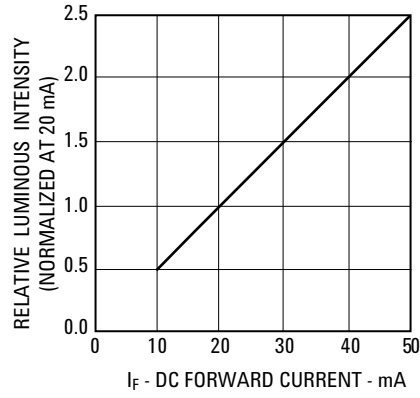
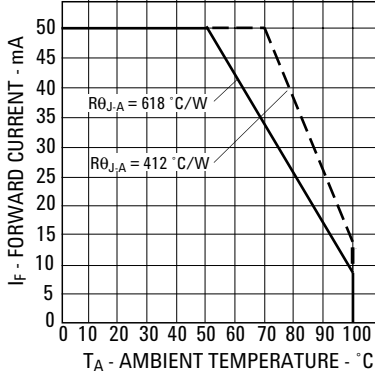


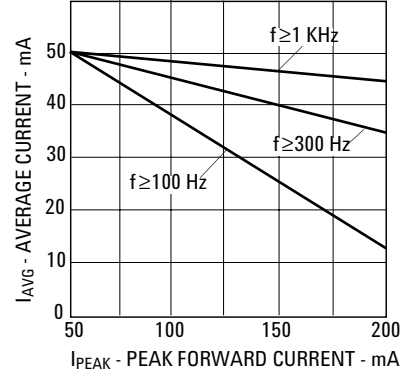
Figure 2. Forward Current vs. Forward Voltage.



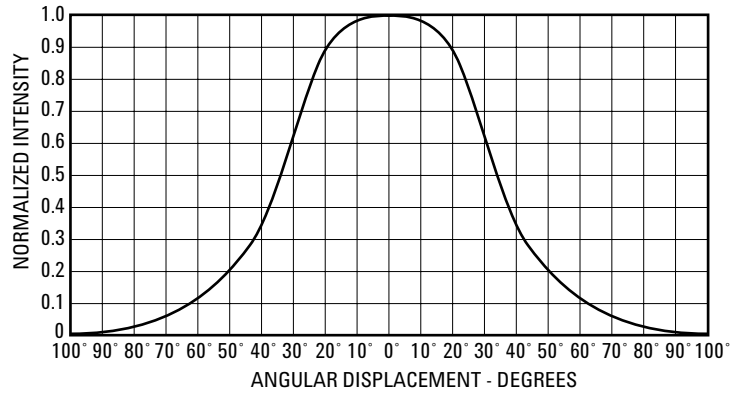
**Figure 3. Relative Luminous Intensity vs. Forward Current.**



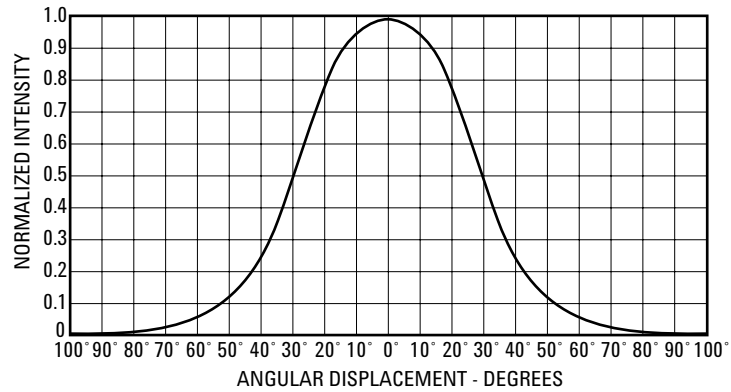
**Figure 4. Maximum Forward Current vs. Ambient Temperature. Derating Based on  $T_{JMax} = 110^{\circ}C$ .**



**Figure 5. Maximum Average Current vs. Peak Forward Current.**



**Figure 6. Spatial Radiation Pattern for HLMA-DL05/DH05 65° Lamps.**



**Figure 7. Spatial Radiation Pattern for HLMA-KL05/KH05 60° Lamps.**

**HLMP-D115/D120/J100/J150 TS AlGaAs Red Lamps**  
**Absolute Maximum Ratings at T<sub>A</sub> = 25°C**

| Parameter                                                     | HLMP-D115          | HLMP-D120   | HLMP-J100   | HLMP-J150   | Units |
|---------------------------------------------------------------|--------------------|-------------|-------------|-------------|-------|
| DC Forward Current <sup>[1]</sup>                             | 50                 | 50          | 50          | 50          | mA    |
| Peak Forward Current <sup>[2]</sup>                           | 300                | 300         | 300         | 300         | mA    |
| Average Input Power <sup>[2]</sup>                            | 100                | 100         | 100         | 100         | mW    |
| Reverse Voltage (I <sub>R</sub> = 100 mA)                     | 5                  | 5           | 5           | 5           | V     |
| Operating Temperature Range                                   | -40 to +100        | 40 to +100  | 40 to +100  | 40 to +100  | °C    |
| Storage Temperature Range                                     | -55 to +100        | -55 to +100 | -55 to +100 | -55 to +100 | °C    |
| Junction Temperature                                          | 110                |             |             |             | °C    |
| Wave Soldering Temperature<br>[1.59 mm (0.06 in.) below body] | 250°C for 3 second |             |             |             |       |

Notes:

- Derate linearly as shown in Figure 12.
- Any pulsed operation cannot exceed the Absolute Max Peak Forward current as specified in Figure 13.

**Optical Characteristics at T<sub>A</sub> = 25°C**

| Part Number | Luminous Intensity<br>IV (mcd)<br>@ 20 mA <sup>[1]</sup> |      | Peak Wavelength<br>λ <sub>peak</sub> (nm) | Color, Dominant<br>Wavelength<br>λ <sub>d</sub> <sup>[2]</sup> (nm) | Viewing Angle<br>2θ <sub>1/2</sub><br>Degrees <sup>[3]</sup> | Luminous<br>Efficacy<br>η <sub>v</sub><br>(lm/w) |
|-------------|----------------------------------------------------------|------|-------------------------------------------|---------------------------------------------------------------------|--------------------------------------------------------------|--------------------------------------------------|
|             | Min.                                                     | Typ. | Typ.                                      | Typ.                                                                | Typ.                                                         |                                                  |
| D115        | 138                                                      | 250  | 654                                       | 644                                                                 | 40                                                           | 85                                               |
| D120        | 138                                                      | 350  | 654                                       | 644                                                                 | 25                                                           | 85                                               |
| J100        | 39                                                       | 175  | 654                                       | 644                                                                 | 55                                                           | 85                                               |
| J150        | 1.3                                                      | 3.0  | 654                                       | 644                                                                 | 55                                                           | 85                                               |

Notes:

- I<sub>v</sub> is the total luminous flux output as measured with an integrating sphere.
- The dominant wavelength, λ<sub>d</sub>, is derived from the CIE Chromaticity Diagram and represents the color of the device.
- θ<sub>1/2</sub> is the off-axis angle where the luminous intensity is 1/2 the peak intensity.

**Electrical Characteristics at T<sub>A</sub> = 25°C**

| Part Number | Forward Voltage<br>V <sub>F</sub> (Volts)<br>@ I <sub>F</sub> = 20 mA |      | Reverse Breakdown<br>V <sub>R</sub> (Volts)<br>@ I <sub>R</sub> = 100 mA |      | Capacitance<br>C (pF)<br>V <sub>F</sub> = 0, f = 1 mHz | Thermal<br>Resistance<br>R <sub>θJ-PIN</sub><br>(°C/W) | Speed of Response<br>τ <sub>s</sub> (ns)<br>Time Constant e <sup>-t/τs</sup> |
|-------------|-----------------------------------------------------------------------|------|--------------------------------------------------------------------------|------|--------------------------------------------------------|--------------------------------------------------------|------------------------------------------------------------------------------|
|             | Typ.                                                                  | Max. | Min.                                                                     | Typ. | Typ.                                                   |                                                        | Typ.                                                                         |
| D115        | 1.85                                                                  | 2.4  | 5                                                                        | 20   | 20                                                     | 260                                                    | 45                                                                           |
| D120        | 1.85                                                                  | 2.4  | 5                                                                        | 20   | 20                                                     | 260                                                    | 45                                                                           |
| J100        | 1.85                                                                  | 2.4  | 5                                                                        | 20   | 20                                                     | 290                                                    | 45                                                                           |
| J150        | 1.6                                                                   | 1.9  | 5                                                                        | 20   | 20                                                     | 290                                                    | 45                                                                           |

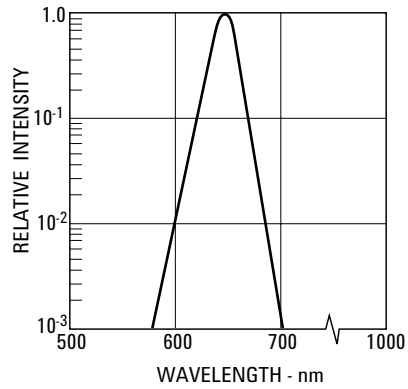


Figure 8. Relative Intensity vs. Wavelength

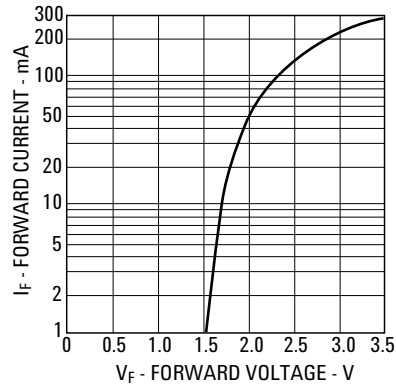


Figure 9. Forward Current vs. Forward Voltage.

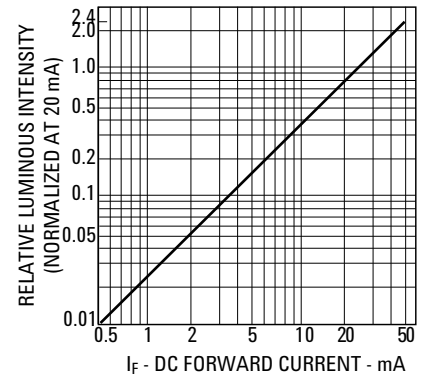


Figure 10. Relative Luminous Intensity vs. DC Forward Current.

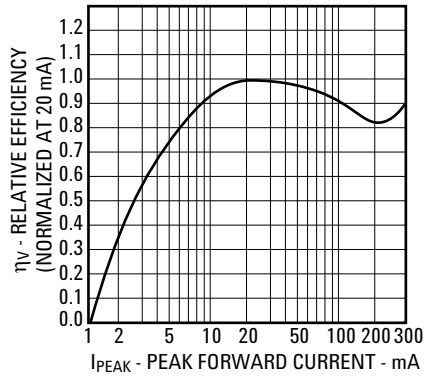


Figure 11. Relative Efficiency vs. Peak Forward Current.

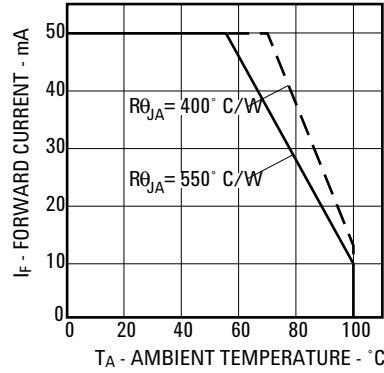


Figure 12. Maximum Forward Current vs. Ambient Temperature. Derating Based on  $T_{JMax} = 110^{\circ}C$ .

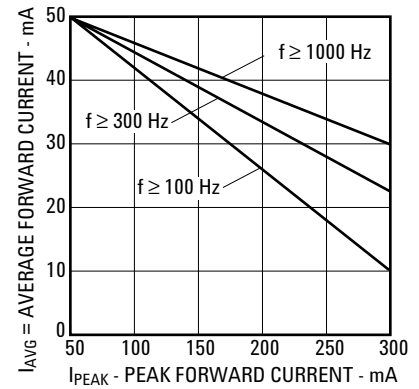
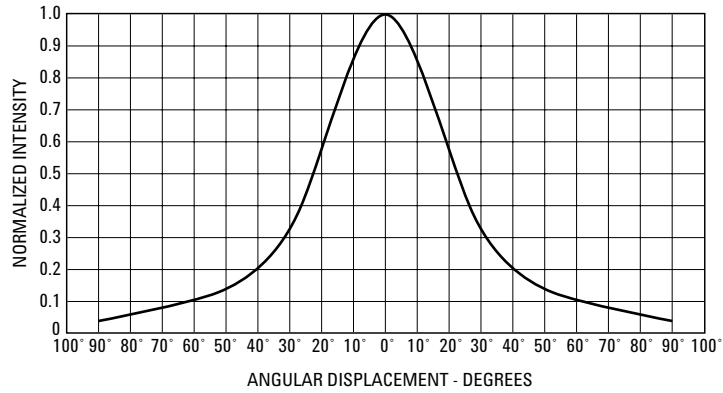
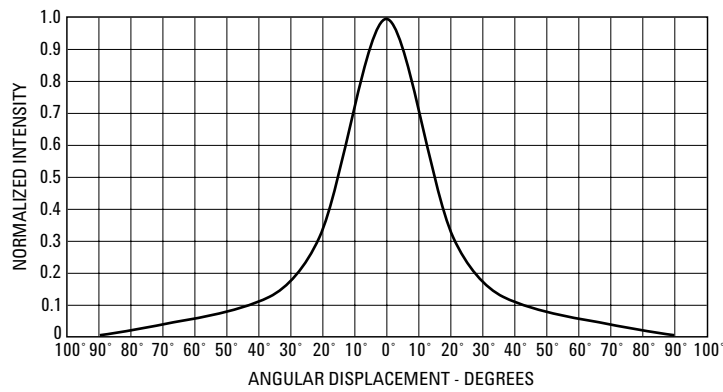


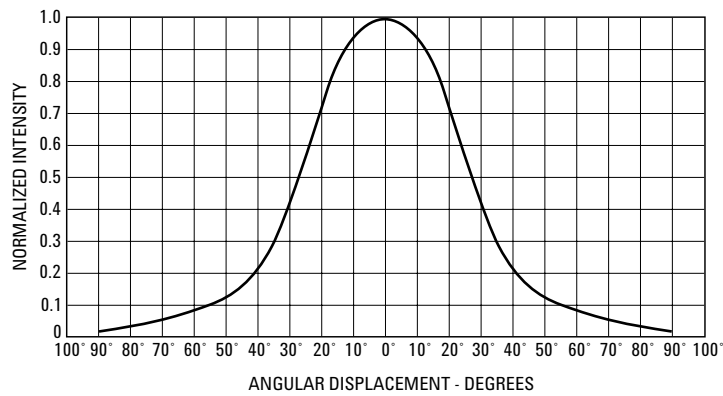
Figure 13. Maximum Average Current vs. Peak Forward Current.



**Figure 14. Spatial Radiation Pattern for 40° HLMP-D115 Lamp.**



**Figure 15. Spatial Radiation Pattern for 25° HLMP-D120 Lamp.**



**Figure 16. Spatial Radiation Pattern for 55° HLMP-J100-J150 Lamps.**

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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