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Jameco Part Number 1555518

## SunPower Series

**HLMP-ELxx, HLMP-EHxx,**

**HLMP-EJxx, HLMP-EGxx**

T-1<sup>3</sup>/<sub>4</sub> (5 mm) Precision Optical Performance

AlInGaP LED Lamps



## Data Sheet

### Description

These Precision Optical Performance AlInGaP LEDs provide superior light output for excellent readability in sunlight and are extremely reliable. AlInGaP LED technology provides extremely stable light output over long periods of time. Precision Optical Performance lamps utilize the aluminum indium gallium phosphide (AlInGaP) technology.

These LED lamps are untinted, nondiffused, T-1<sup>3</sup>/<sub>4</sub> 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.

These lamps are available in two package options to give the designer flexibility with device mounting.

### Features

- **Well defined spatial radiation patterns**
- **Viewing angles: 8°, 15°, 23°, 30°**
- **High luminous output**
- **Colors:**
  - 590 nm amber
  - 605 nm orange
  - 615 nm reddish-orange
  - 626 nm red
- **High operating temperature: T<sub>J</sub> LED = +130°C**
- **Superior resistance to moisture**
- **Package options:**
  - With or without lead stand-offs

### Benefits

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

### Applications

- **Traffic management:**
  - Traffic signals
  - Pedestrian signals
  - Work zone warning lights
  - Variable message signs
- **Commercial outdoor advertising:**
  - Signs
  - Marquees
- **Automotive:**
  - Exterior and interior lights

## Device Selection Guide

| Typical Viewing Angle $2\theta_{1/2}$ (Deg.) <sup>[4]</sup> | Color and Dominant Wavelength (nm), Typ. <sup>[3]</sup> | Lamps without Standoffs on Leads (Outline Drawing A) | Lamps with Standoffs on Leads (Outline Drawing B) | Luminous Intensity $I_v$ (mcd) <sup>[1,2,5]</sup> @ 20 mA |       |
|-------------------------------------------------------------|---------------------------------------------------------|------------------------------------------------------|---------------------------------------------------|-----------------------------------------------------------|-------|
|                                                             |                                                         |                                                      |                                                   | Min.                                                      | Max.  |
| 8°                                                          | Amber 590                                               | HLMP-EL08-T0000                                      | HLMP-EL10-T0000                                   | 2500                                                      | —     |
|                                                             |                                                         | HLMP-EL08-VY000                                      | HLMP-EL10-VY000                                   | 4200                                                      | 12000 |
|                                                             |                                                         | HLMP-EL08-VYK00                                      |                                                   | 4200                                                      | 12000 |
|                                                             |                                                         | HLMP-EL08-WZ000                                      | HLMP-EL10-WZ000                                   | 5500                                                      | 16000 |
|                                                             |                                                         | HLMP-EL08-X1K00                                      | HLMP-EL10-X1K00                                   | 7200                                                      | 21000 |
|                                                             |                                                         | HLMP-EL08-X1000                                      | HLMP-EL10-X1000                                   | 7200                                                      | 21000 |
|                                                             | Orange 605                                              | HLMP-EJ08-WZ000                                      |                                                   | 5500                                                      | 16000 |
|                                                             |                                                         | HLMP-EJ08-X1000                                      | HLMP-EJ10-X1000                                   | 7200                                                      | 21000 |
|                                                             |                                                         | HLMP-EJ08-Y2000                                      |                                                   | 9300                                                      | 27000 |
|                                                             | Red-Orange 615                                          | HLMP-EH08-UX000                                      | HLMP-EH10-UX000                                   | 3200                                                      | 9300  |
|                                                             |                                                         | HLMP-EH08-WZ000                                      | HLMP-EH10-WZ000                                   | 5500                                                      | 16000 |
|                                                             |                                                         | HLMP-EH08-X1000                                      | HLMP-EH10-X1000                                   | 7200                                                      | 21000 |
|                                                             |                                                         | HLMP-EH08-Y2000                                      | HLMP-EH10-Y2000                                   | 9300                                                      | 27000 |
|                                                             | Red 626                                                 | HLMP-EG08-T0000                                      | HLMP-EG10-T0000                                   | 2500                                                      | —     |
|                                                             |                                                         | HLMP-EG08-VY000                                      |                                                   | 4200                                                      | 12000 |
|                                                             |                                                         | HLMP-EG08-WZ000                                      | HLMP-EG10-WZ000                                   | 5500                                                      | 16000 |
|                                                             |                                                         | HLMP-EG08-X1000                                      | HLMP-EG10-X1000                                   | 7200                                                      | 21000 |
|                                                             |                                                         | HLMP-EG08-YZ000                                      |                                                   | 9300                                                      | 16000 |
|                                                             |                                                         | HLMP-EG08-Y2000                                      | HLMP-EG10-Y2000                                   | 9300                                                      | 27000 |

### Notes:

1. The luminous intensity is measured on the mechanical axis of the lamp package.
2. The optical axis is closely aligned with the package mechanical axis.
3. The dominant wavelength,  $\lambda_d$ , is derived from the CIE Chromaticity Diagram and represents the color of the lamp.
4.  $\theta_{1/2}$  is the off-axis angle where the luminous intensity is half the on-axis intensity.
5. Tolerance for each intensity bin limit is  $\pm 15\%$ .

## Device Selection Guide

| Typical Viewing Angle<br>$2\theta_{1/2}$ (Deg.) <sup>[4]</sup> | Color and Dominant Wavelength (nm), Typ. <sup>[3]</sup> | Lamps without Standoffs on Leads (Outline Drawing A) | Lamps with Standoffs on Leads (Outline Drawing B) | Luminous Intensity $I_v$ (mcd) <sup>[1,2,5]</sup> @ 20 mA |       |
|----------------------------------------------------------------|---------------------------------------------------------|------------------------------------------------------|---------------------------------------------------|-----------------------------------------------------------|-------|
|                                                                |                                                         |                                                      |                                                   | Min.                                                      | Max.  |
| 15°                                                            | Amber 590                                               |                                                      | HLMP-EL17-M0000                                   | 520                                                       | —     |
|                                                                |                                                         | HLMP-EL15-PS000                                      |                                                   | 880                                                       | 2500  |
|                                                                |                                                         | HLMP-EL15-QSK00                                      |                                                   | 1150                                                      | 2500  |
|                                                                |                                                         | HLMP-EL15-QT000                                      |                                                   | 1150                                                      | 3200  |
|                                                                |                                                         | HLMP-EL15-RU000                                      |                                                   | 1500                                                      | 4200  |
|                                                                |                                                         | HLMP-EL15-TW000                                      | HLMP-EL17-TW000                                   | 2500                                                      | 7200  |
|                                                                |                                                         | HLMP-EL15-TWK00                                      |                                                   | 2500                                                      | 7200  |
|                                                                |                                                         | HLMP-EL15-UX000                                      | HLMP-EL17-UX000                                   | 3200                                                      | 9300  |
|                                                                |                                                         | HLMP-EL15-VY000                                      | HLMP-EL17-VY000                                   | 4200                                                      | 12000 |
|                                                                |                                                         | HLMP-EL15-VYK00                                      |                                                   | 4200                                                      | 12000 |
|                                                                |                                                         | HLMP-EL15-VW000                                      |                                                   | 4200                                                      | 7200  |
|                                                                | Orange 605                                              |                                                      | HLMP-EJ17-QT000                                   | 1150                                                      | 3200  |
|                                                                |                                                         | HLMP-EJ15-PS000                                      |                                                   | 880                                                       | 2500  |
|                                                                |                                                         | HLMP-EJ15-RU000                                      |                                                   | 1500                                                      | 4200  |
|                                                                |                                                         | HLMP-EJ15-SV000                                      | HLMP-EJ17-SV000                                   | 1900                                                      | 5500  |
|                                                                | Red-Orange 615                                          | HLMP-EH15-QT000                                      |                                                   | 1150                                                      | 3200  |
|                                                                |                                                         | HLMP-EH15-RU000                                      |                                                   | 1500                                                      | 4200  |
|                                                                |                                                         | HLMP-EH15-TW000                                      | HLMP-EH17-TW000                                   | 2500                                                      | 7200  |
|                                                                |                                                         | HLMP-EH15-UX000                                      | HLMP-EH17-UX000                                   | 3200                                                      | 9300  |
|                                                                | Red 626                                                 | HLMP-EG15-N0000                                      | HLMP-EG17-N0000                                   | 680                                                       | —     |
|                                                                |                                                         | HLMP-EG15-PS000                                      |                                                   | 880                                                       | 2500  |
|                                                                |                                                         | HLMP-EG15-QT000                                      | HLMP-EG17-QT000                                   | 1150                                                      | 3200  |
|                                                                |                                                         | HLMP-EG15-RU000                                      | HLMP-EG17-RU000                                   | 1500                                                      | 4200  |
|                                                                |                                                         | HLMP-EG15-UX000                                      | HLMP-EG17-UX000                                   | 3200                                                      | 9300  |
|                                                                |                                                         | HLMP-EG15-TW000                                      | HLMP-EG17-TW000                                   | 2500                                                      | 7200  |

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1. The luminous intensity is measured on the mechanical axis of the lamp package.
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## Device Selection Guide

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|-----------------------------------------------------------------|------------------------------------------------------------|---------------------------------------------------------|------------------------------------------------------|-----------------------------------------------------------------------|------|
|                                                                 |                                                            |                                                         |                                                      | Min.                                                                  | Max. |
| 23°                                                             | Amber 590                                                  | HLMP-EL24-L0000                                         | HLMP-EL26-L0000                                      | 400                                                                   | –    |
|                                                                 |                                                            | HLMP-EL24-MQ000                                         |                                                      | 520                                                                   | 1500 |
|                                                                 |                                                            | HLMP-EL24-NR000                                         |                                                      | 680                                                                   | 1900 |
|                                                                 |                                                            | HLMP-EL24-PS000                                         | HLMP-EL26-PS000                                      | 880                                                                   | 2500 |
|                                                                 |                                                            | HLMP-EL24-QR000                                         |                                                      | 1150                                                                  | 1900 |
|                                                                 |                                                            | HLMP-EL24-QRK00                                         |                                                      | 1150                                                                  | 1900 |
|                                                                 |                                                            | HLMP-EL24-QS400                                         |                                                      | 1150                                                                  | 2500 |
|                                                                 |                                                            | HLMP-EL24-QT000                                         | HLMP-EL26-QT000                                      | 1150                                                                  | 3200 |
|                                                                 |                                                            | HLMP-EL24-RU000                                         | HLMP-EL26-RU000                                      | 1150                                                                  | 4200 |
|                                                                 |                                                            | HLMP-EL24-RUK00                                         |                                                      | 1150                                                                  | 4200 |
|                                                                 |                                                            | HLMP-EL24-SV000                                         | HLMP-EL26-SV000                                      | 1900                                                                  | 5500 |
|                                                                 |                                                            | HLMP-EL24-SUK00                                         |                                                      | 1900                                                                  | 4200 |
|                                                                 |                                                            | HLMP-EL24-SU400                                         |                                                      | 1900                                                                  | 4200 |
|                                                                 |                                                            | HLMP-EL24-SVK00                                         |                                                      | 1900                                                                  | 5500 |
|                                                                 |                                                            | HLMP-EL24-TW000                                         | HLMP-EL26-TW000                                      | 2500                                                                  | 7200 |
|                                                                 |                                                            | HLMP-EL24-TWK00                                         |                                                      | 2500                                                                  | 7200 |
|                                                                 | Orange 605                                                 | HLMP-EJ24-QT000                                         |                                                      | 1150                                                                  | 3200 |
|                                                                 | Red-Orange 615                                             | HLMP-EH24-PS000                                         | HLMP-EH26-PS000                                      | 880                                                                   | 2500 |
|                                                                 |                                                            | HLMP-EH24-QT000                                         |                                                      | 1150                                                                  | 3200 |
|                                                                 |                                                            | HLMP-EH24-RU000                                         |                                                      | 1500                                                                  | 4200 |
|                                                                 |                                                            | HLMP-EH24-SV000                                         | HLMP-EH26-SV000                                      | 1900                                                                  | 5500 |
|                                                                 | Red 626                                                    | HLMP-EG24-M0000                                         | HLMP-EG26-M0000                                      | 520                                                                   | –    |
|                                                                 |                                                            | HLMP-EG24-PS000                                         | HLMP-EG26-PS000                                      | 880                                                                   | 2500 |
|                                                                 |                                                            | HLMP-EG24-QT000                                         |                                                      | 1150                                                                  | 4200 |
|                                                                 |                                                            | HLMP-EG24-RU000                                         | HLMP-EG26-RU000                                      | 1500                                                                  | 4200 |

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## Device Selection Guide

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|----------------------------------------------------------------|---------------------------------------------------------|------------------------------------------------------|---------------------------------------------------|-----------------------------------------------------------------------|------|
|                                                                |                                                         |                                                      |                                                   | Min.                                                                  | Max. |
| 30°                                                            | Amber 590                                               | HLMP-EL30-K0000                                      | HLMP-EL32-K0000                                   | 310                                                                   | –    |
|                                                                |                                                         | HLMP-EL30-MQ000                                      |                                                   | 520                                                                   | 1500 |
|                                                                |                                                         |                                                      | HLMP-EL32-NR000                                   | 680                                                                   | 1900 |
|                                                                |                                                         | HLMP-EL30-PQ000                                      |                                                   | 880                                                                   | 1500 |
|                                                                |                                                         | HLMP-EL30-PR400                                      |                                                   | 880                                                                   | 1900 |
|                                                                |                                                         | HLMP-EL30-PS000                                      | HLMP-EL32-PS000                                   | 880                                                                   | 2500 |
|                                                                |                                                         | HLMP-EL30-PSK00                                      |                                                   | 880                                                                   | 2500 |
|                                                                |                                                         | HLMP-EL30-QT000                                      | HLMP-EL32-QT000                                   | 1150                                                                  | 3200 |
|                                                                |                                                         | HLMP-EL30-QTK00                                      |                                                   | 1150                                                                  | 3200 |
|                                                                |                                                         | HLMP-EL30-ST000                                      |                                                   | 1900                                                                  | 3200 |
|                                                                |                                                         | HLMP-EL30-SU400                                      |                                                   | 1900                                                                  | 4200 |
|                                                                |                                                         | HLMP-EL30-SUK00                                      |                                                   | 1900                                                                  | 4200 |
|                                                                |                                                         | HLMP-EL30-STK00                                      |                                                   | 1900                                                                  | 3200 |
|                                                                |                                                         | HLMP-EL30-SV000                                      | HLMP-EL32-SV000                                   | 1900                                                                  | 5500 |
|                                                                |                                                         | HLMP-EL30-SVK00                                      |                                                   | 1900                                                                  | 5500 |
|                                                                | Orange 605                                              | HLMP-EJ30-NR000                                      |                                                   | 680                                                                   | 1900 |
|                                                                |                                                         | HLMP-EJ30-PS000                                      | HLMP-EJ32-PS000                                   | 880                                                                   | 2500 |
|                                                                | Red-Orange 615                                          | HLMP-EH30-MQ000                                      | HLMP-EH32-MQ000                                   | 520                                                                   | 1500 |
|                                                                |                                                         | HLMP-EH30-NR000                                      | HLMP-EH32-NR000                                   | 680                                                                   | 1900 |
|                                                                |                                                         | HLMP-EH30-PS000                                      | HLMP-EH32-PS000                                   | 880                                                                   | 2500 |
|                                                                |                                                         | HLMP-EH30-QT000                                      | HLMP-EH32-QT000                                   | 1150                                                                  | 4200 |
|                                                                |                                                         | HLMP-EH30-RU000                                      | HLMP-EH32-RU000                                   | 1500                                                                  | 4200 |
|                                                                | Red 626                                                 | HLMP-EG30-K0000                                      | HLMP-EG32-K0000                                   | 270                                                                   | –    |
|                                                                |                                                         | HLMP-EG30-KN000                                      |                                                   | 310                                                                   | 880  |
|                                                                |                                                         | HLMP-EG30-MQ000                                      | HLMP-EG32-MQ000                                   | 520                                                                   | 1500 |
|                                                                |                                                         | HLMP-EG30-NQ000                                      |                                                   | 680                                                                   | 1500 |
|                                                                |                                                         | HLMP-EG30-NR000                                      | HLMP-EG32-NR000                                   | 680                                                                   | 1900 |
|                                                                |                                                         | HLMP-EG30-PQ000                                      |                                                   | 880                                                                   | 1500 |
|                                                                |                                                         | HLMP-EG30-PR000                                      |                                                   | 880                                                                   | 1900 |
|                                                                |                                                         | HLMP-EG30-PS000                                      |                                                   | 880                                                                   | 2500 |
|                                                                |                                                         | HLMP-EG30-QT000                                      | HLMP-EG32-QT000                                   | 1150                                                                  | 3200 |

### Notes:

1. The luminous intensity is measured on the mechanical axis of the lamp package.
2. The optical axis is closely aligned with the package mechanical axis.
3. The dominant wavelength,  $\lambda_d$ , is derived from the CIE Chromaticity Diagram and represents the color of the lamp.
4.  $\theta_{1/2}$  is the off-axis angle where the luminous intensity is half the on-axis intensity.
5. Tolerance for each intensity bin limit is  $\pm 15\%$ .

## Part Numbering System

HLMP - x x xx - x x x xx

### Mechanical Options

00: Bulk Packaging  
DD: Ammo Pack  
YY: Flexi-Bin; Bulk Packaging  
ZZ: Flexi-Bin; Ammo Pack

### Color Bin Selections

0: No color bin limitation  
4: Amber color bin 4 only  
K: Amber color bins 2 and 4 only

### Maximum Intensity Bin

0: No Iv bin limitation

### Minimum Intensity Bin

### Viewing Angle & Lead Stand Offs

08: 8 deg without lead stand offs  
10: 8 deg with lead stand offs  
15: 15 deg without lead stand offs  
17: 15 deg with lead stand offs  
24: 23 deg without lead stand offs  
26: 23 deg with lead stand offs  
30: 30 deg without lead stand offs  
32: 30 deg with lead stand offs

### Color

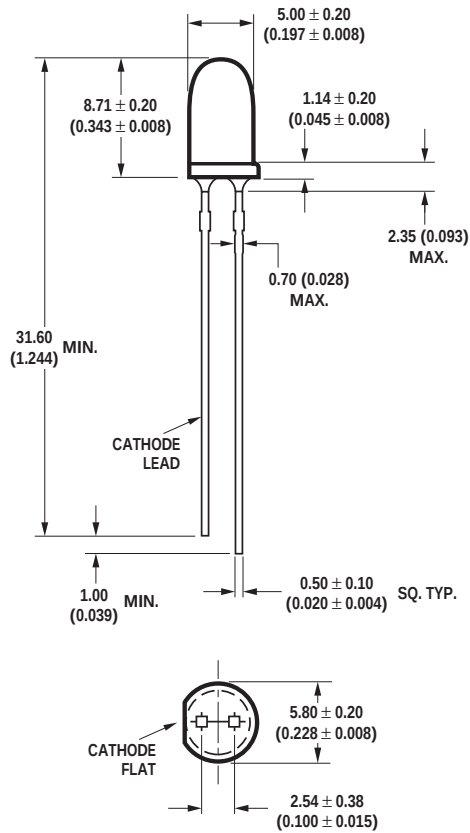
G: 626 nm Red  
H: 615 nm Red-Orange  
J: 605 nm Orange  
L: 590 nm Amber

### Package

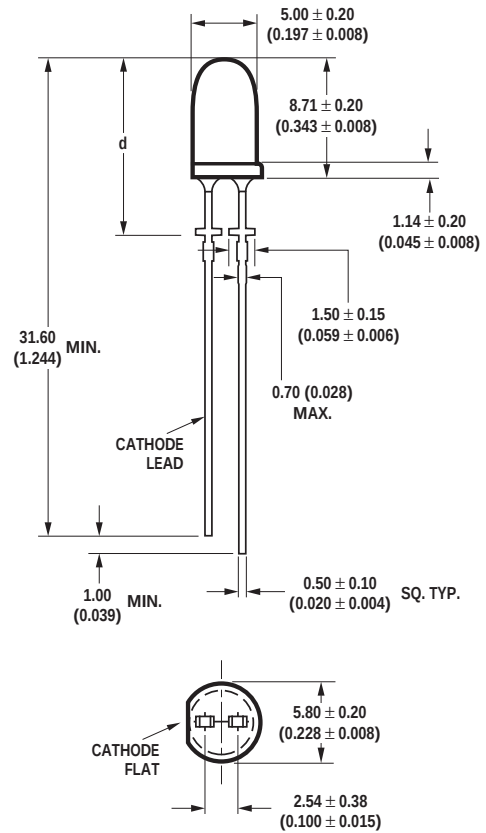
E: 5 mm Round

## Package Dimensions

A



B



### NOTES:

1. ALL DIMENSIONS ARE IN MILLIMETERS (INCHES).
2. LEADS ARE MILD STEEL, SOLDER DIPPED.
3. TAPERS SHOWN AT TOP OF LEADS (BOTTOM OF LAMP PACKAGE) INDICATE AN EPOXY MENISCUS THAT MAY EXTEND ABOUT 1 mm (0.040 in.) DOWN THE LEADS.
4. FOR DOME HEIGHTS ABOVE LEAD STAND-OFF SEATING PLANE, d, LAMP PACKAGE B, SEE TABLE.

| PART NO.  | d                                         |
|-----------|-------------------------------------------|
| HLMP-XX10 | $12.37 \pm 0.25$<br>( $0.487 \pm 0.010$ ) |
| HLMP-XX17 | $12.42 \pm 0.25$<br>( $0.489 \pm 0.010$ ) |
| HLMP-XX26 | $12.52 \pm 0.25$<br>( $0.493 \pm 0.010$ ) |
| HLMP-XX32 | $11.96 \pm 0.25$<br>( $0.471 \pm 0.010$ ) |



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

|                                              |                 |
|----------------------------------------------|-----------------|
| DC Forward Current <sup>[1,2,3]</sup>        | 50 mA           |
| Peak Pulsed Forward Current <sup>[2,3]</sup> | 100 mA          |
| Average Forward Current <sup>[3]</sup>       | 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 |

### 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 on recommended drive conditions, please refer to Application Brief I-024.
3. Operating at currents below 1 mA is not recommended. Please contact your local representative for further information.

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

| Parameter                                   | Symbol                  | Min. | Typ. | Max. | Units                     | Test Conditions                                                                      |
|---------------------------------------------|-------------------------|------|------|------|---------------------------|--------------------------------------------------------------------------------------|
| Forward Voltage                             |                         |      |      |      |                           | $I_F = 20\ \text{mA}$                                                                |
| Amber ( $\lambda_d = 590\ \text{nm}$ )      |                         |      | 2.02 |      |                           |                                                                                      |
| Orange ( $\lambda_d = 605\ \text{nm}$ )     | $V_F$                   |      | 1.98 | 2.4  | V                         |                                                                                      |
| Red-Orange ( $\lambda_d = 615\ \text{nm}$ ) |                         |      | 1.94 |      |                           |                                                                                      |
| Red ( $\lambda_d = 626\ \text{nm}$ )        |                         |      | 1.90 |      |                           |                                                                                      |
| Reverse Voltage                             | $V_R$                   | 5    | 20   |      | V                         | $I_F = 100\ \mu\text{A}$                                                             |
| Peak Wavelength:                            |                         |      |      |      |                           | Peak of Wavelength of Spectral Distribution at $I_F = 20\ \text{mA}$                 |
| Amber ( $\lambda_d = 590\ \text{nm}$ )      |                         |      | 592  |      |                           |                                                                                      |
| Orange ( $\lambda_d = 605\ \text{nm}$ )     | $\lambda_{\text{PEAK}}$ |      | 609  |      | nm                        |                                                                                      |
| Red-Orange ( $\lambda_d = 615\ \text{nm}$ ) |                         |      | 621  |      |                           |                                                                                      |
| Red ( $\lambda_d = 626\ \text{nm}$ )        |                         |      | 635  |      |                           |                                                                                      |
| 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                           | $\tau_s$                |      | 20   |      | ns                        | Exponential Time Constant, $e^{-t/\tau_s}$                                           |
| Capacitance                                 | C                       |      | 40   |      | pF                        | $V_F = 0$ , $f = 1\ \text{MHz}$                                                      |
| Thermal Resistance                          | $R\theta_{J-PIN}$       |      | 240  |      | $^\circ\text{C}/\text{W}$ | LED Junction-to-Cathode Lead                                                         |
| Luminous Efficacy <sup>[1]</sup>            |                         |      |      |      |                           | Emitted Luminous Power / Emitted Radiant Power                                       |
| Amber ( $\lambda_d = 590\ \text{nm}$ )      |                         |      | 480  |      |                           |                                                                                      |
| Orange ( $\lambda_d = 605\ \text{nm}$ )     | $\eta_v$                |      | 370  |      | lm/W                      |                                                                                      |
| Red-Orange ( $\lambda_d = 615\ \text{nm}$ ) |                         |      | 260  |      |                           |                                                                                      |
| Red ( $\lambda_d = 626\ \text{nm}$ )        |                         |      | 150  |      |                           |                                                                                      |
| Luminous Flux                               |                         |      | 500  |      | mlm                       | $I_F = 20\ \text{mA}$                                                                |
| Luminous Efficiency                         |                         |      |      |      |                           | Emitted Luminous Flux / Electrical Power                                             |
| Amber                                       |                         |      | 12   |      | lm/W                      |                                                                                      |
| Orange                                      |                         |      | 13   |      |                           |                                                                                      |
| Red-Orange                                  |                         |      | 13   |      |                           |                                                                                      |
| Red                                         |                         |      | 13   |      |                           |                                                                                      |

### Note:

1. 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.

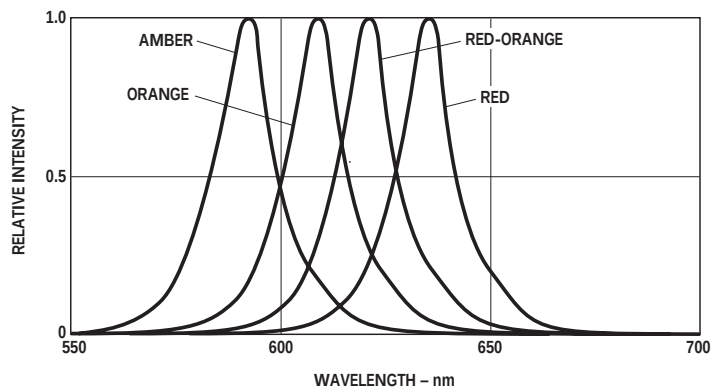


Figure 1. Relative intensity vs. peak wavelength

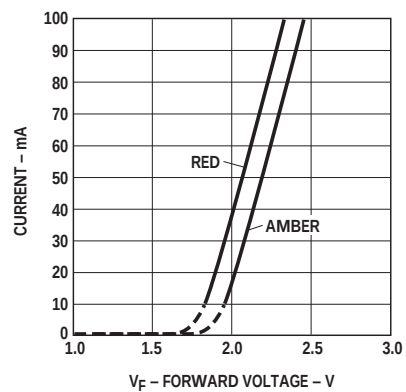


Figure 2. Forward current vs. forward voltage

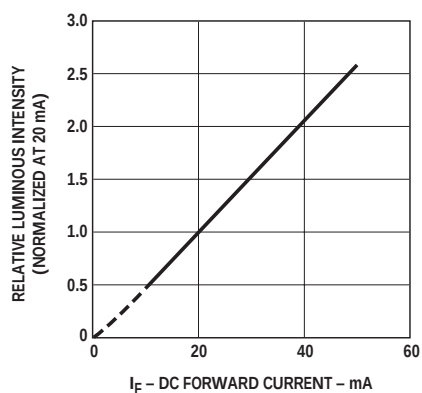


Figure 3. Relative luminous intensity vs. forward current

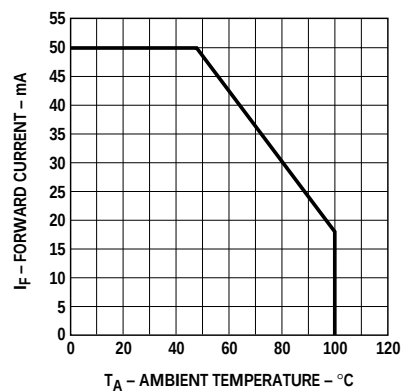


Figure 4. Maximum forward current vs. ambient temperature

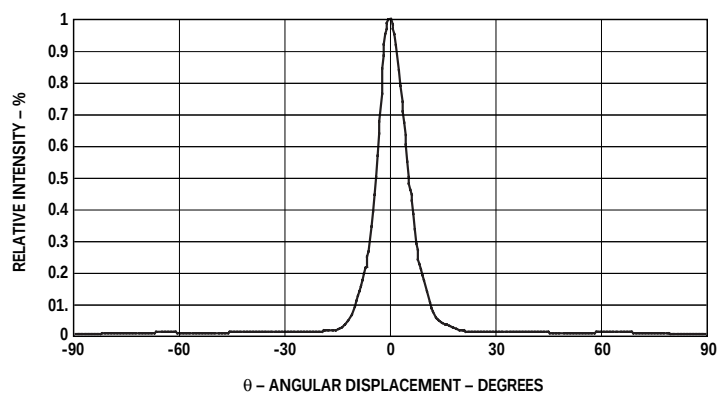


Figure 5. Representative spatial radiation pattern for 8° viewing angle lamps

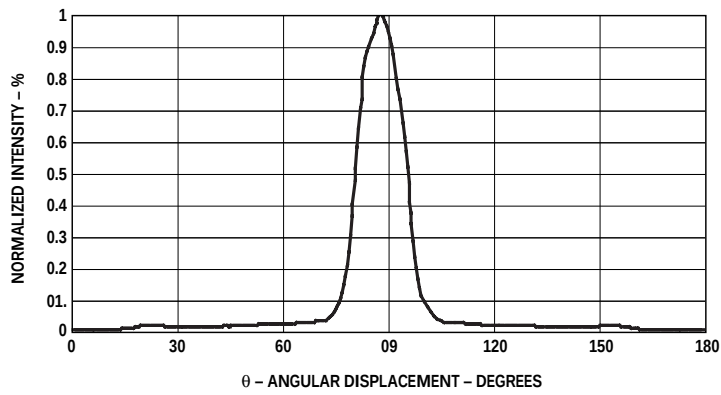


Figure 6. Representative spatial radiation pattern for 15° viewing angle lamps

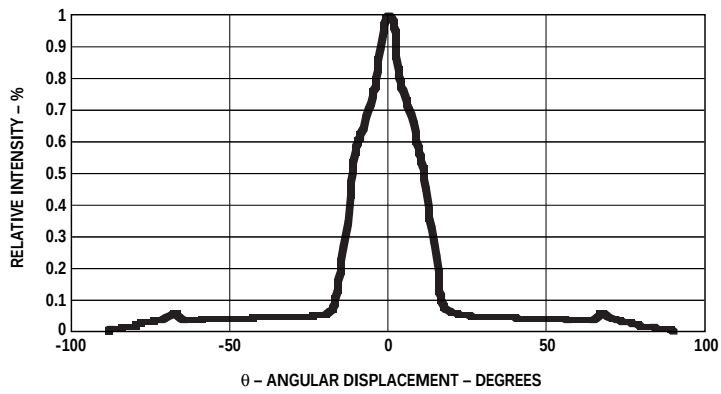


Figure 7. Representative spatial radiation pattern for 23° viewing angle lamps

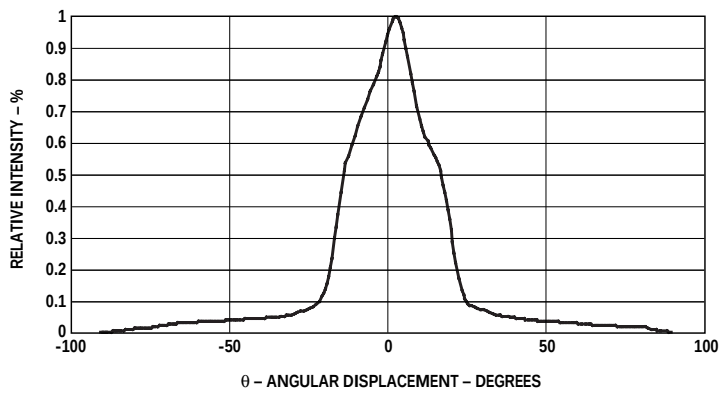


Figure 8. Representative spatial radiation pattern for 30° viewing angle lamps

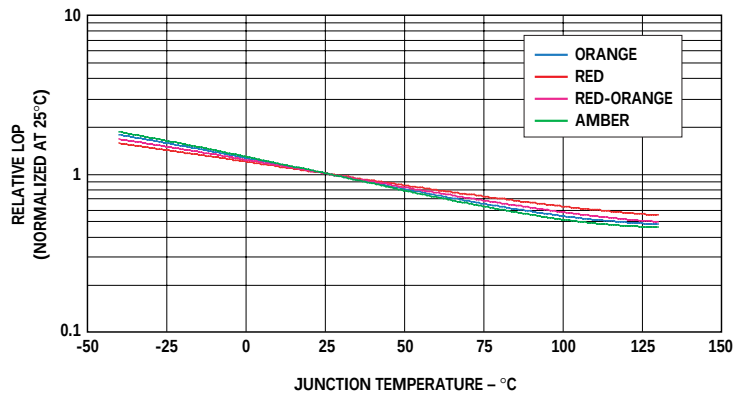


Figure 9. Relative light output vs. junction temperature

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

| Bin Name | 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  |
| W        | 5500  | 7200  |
| X        | 7200  | 9300  |
| Y        | 9300  | 12000 |
| Z        | 12000 | 16000 |
| 1        | 16000 | 21000 |
| 2        | 21000 | 27000 |

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

### 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 |

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

#### Note:

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

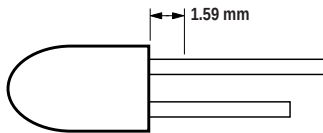
## Precautions

### Lead Forming

- The leads of an LED lamp may be preformed or trimmed to applicable length prior to insertion and soldering on PC board.
- If lead forming is required before soldering, care must be taken to avoid any excessive mechanical stress that is induced into the LED package. Otherwise, trim the leads to applicable length at room temperature after soldering process. The solder joint formed will absorb the mechanical stress, due to the lead cutting, from flowing to the wire bonding area and LED chip die attach.
- For better control, it is recommended to use proper tool to precisely form and cut the leads to applicable length rather than doing it manually.

### Soldering Condition

- Extra care must be taken during PCB assembly and soldering process to prevent damage to the LED component.
- The closest distance of manual soldering from the soldering heat source (soldering iron's tip) to the body is 1.59 mm. Damage might occur if the LED soldering distance is less than 1.59 mm. Please refer to the illustration below.



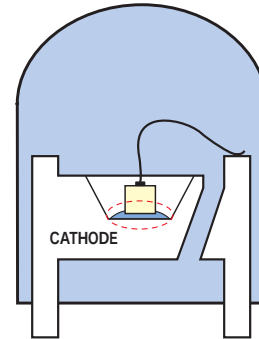
### Recommended Soldering Condition

|                      | Wave Soldering | Manual Solder Dipping |
|----------------------|----------------|-----------------------|
| Pre-Heat Temperature | 105°C max.     | –                     |
| Pre-Heat Time        | 30 sec max.    | –                     |
| Peak Temperature     | 250°C max.     | 260°C max.            |
| Dwell Time           | 3 sec max.     | 5 sec max.            |

- Wave soldering parameter must be set and maintained according to the recommended soldering condition. Customer is advised to daily check on the soldering profile to ensure that the soldering profile is always corresponding to Avago recommended soldering condition.

#### Notes:

1. PCB with different size and design (component density) will have different heat mass (heat capacity). This might cause a change in temperature experienced by the board if same wave soldering setting is used. So, it is recommended to recalibrate the soldering profile again before loading a new type of PCB.
2. Avago Technologies' high brightness LEDs use a high efficiency LED die with single wire bond, as shown below. Customer is advised to take extra precaution during wave soldering to ensure that the maximum wave temperature does not exceed 250°C. Over-stressing the LED during soldering process might cause premature failure to the LED due to delamination.



**Note:** Electrical connection between bottom surface of LED die and the lead frame material through conductive paste of solder.

- Special attention must be given to board fabrication, solder masking, surface plating and lead holes size and component orientation to assure the solderability.

### Recommended PC Board Plated Through Holes Size for LED Component Leads

| LED Component Lead Size                  | Diagonal                 | Plated Through Hole Diameter               |
|------------------------------------------|--------------------------|--------------------------------------------|
| 0.457 x 0.457 mm<br>(0.018 x 0.018 inch) | 0.646 mm<br>(0.025 inch) | 0.976 to 1.078 mm<br>(0.038 to 0.042 inch) |
| 0.508 x 0.508 mm<br>(0.020 x 0.020 inch) | 0.718 mm<br>(0.028 inch) | 1.049 to 1.150 mm<br>(0.041 to 0.045 inch) |

**Note:** Refer to Application Note AN1027 for more information on soldering LED components.

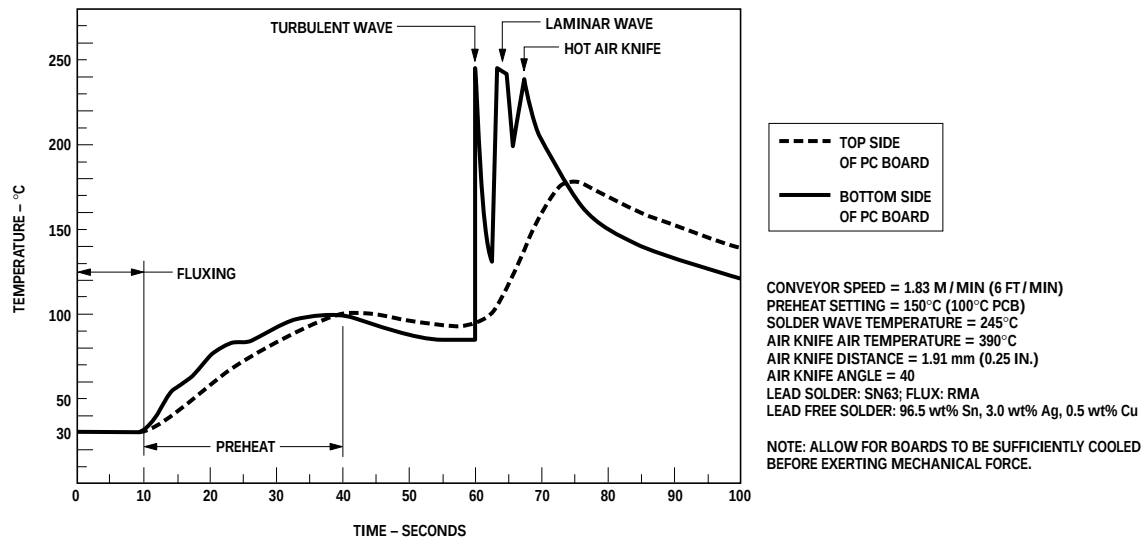
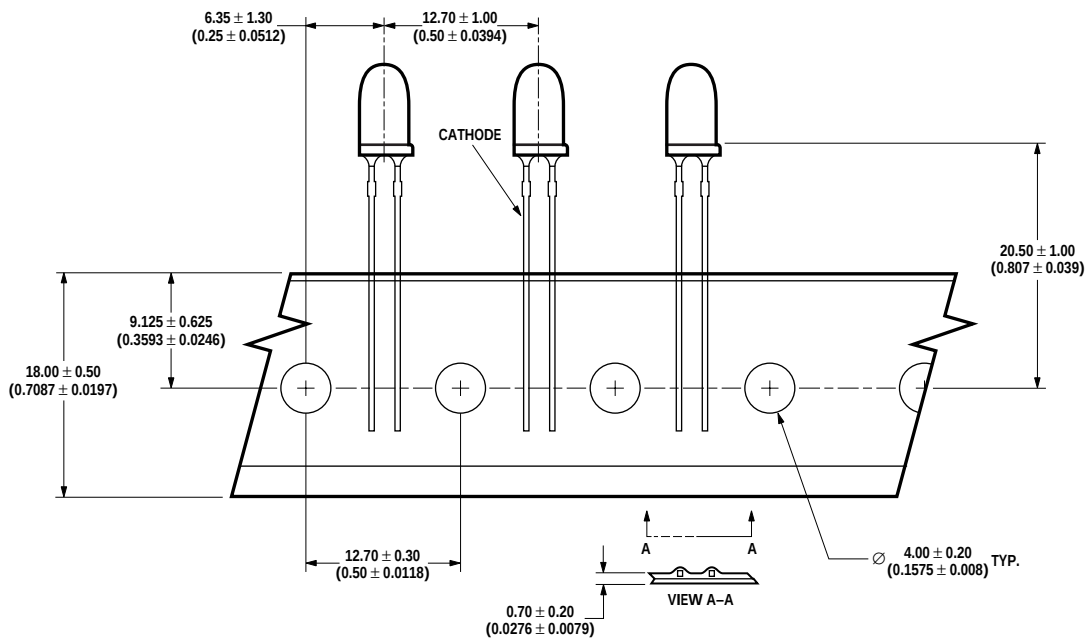


Figure 10. Recommended wave soldering profile

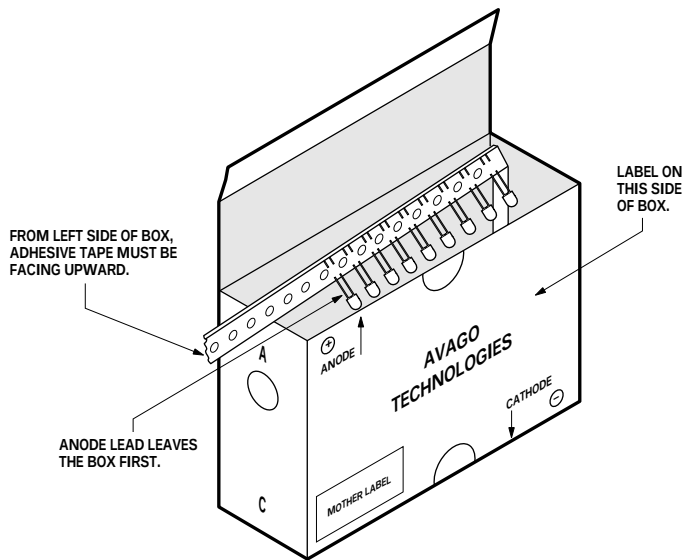
## Ammo Pack Drawing



ALL DIMENSIONS IN MILLIMETERS (INCHES).

NOTE: THE AMMO-PACKS DRAWING IS APPLICABLE FOR PACKAGING OPTION -DD & -ZZ AND REGARDLESS OF STANDOFF OR NON-STANDOFF.

## Packaging Box for Ammo Packs



NOTE:  
THE DIMENSION FOR AMMO PACK IS APPLICABLE FOR THE DEVICE WITH STANDOFF AND WITHOUT STANDOFF.

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