# HLMP-ED80

Radiometrically Tested AlInGaP II LED Lamps
for Sensor-Based Applications

## Data Sheet

**SunPower Series**
**Precision Optical Performance**
**HLMP-ED80-xxxxx**

## Description

Radiometrically Tested Precision Optical Performance AlInGaP II (aluminum indium gallium phosphide) LEDs offer increased sensor-based application design flexibility. High-resolution radiometric intensity bins (mW/sr) enable customers to precisely match LED lamp performance with sensor functionality.

Visible LEDs offer new styling alternatives – light can be leveraged to develop more attractive products. In comparison to invisible infrared sources, safety concerns are significantly improved by the human autonomic pupil response and reflexive movement away from bright light. Visible LEDs further indidcate system on/off status.

The AlInGaP II technology provides extremely stable light output over very long periods of time, with low power consumption.

These lamps are made with an advanced optical grade epoxy system offering superior high temperature and moisture resistance performance in outdoor systems. The epoxy contains both uv-a and uv-b inhibitors to reduce the effects of long term exposure to direct sunlight.

Please contact your Avago Technologies Representative for more information and design for manufacture advice. Application Brief I-024 *Pulsed Operating Ranges for AlInGaP LEDs vs. Projected Long Term Light Output Performance* and other application information is available at: www.avagotech.com/go/led_lamps.

## Features

- Characterized by radiometric intensity
- High optical power output
- Extremely long useful life
- Low power consumption
- Well defined spatial radiation patterns
- 639 $nm_{PEAK}$ red color
- 30° viewing angle
- High operating temperature: $T_{jLED}$ = +130°C
- Superior tesistance to moisture
- Suitable for outdoor use

## Benefits

- Radiometric LED characterization decreases system variability
- Improved system reliability
- Visual styling
- Visible color for improved application safety
- On / off indication
- Suitable for a variety of sensor-based applications

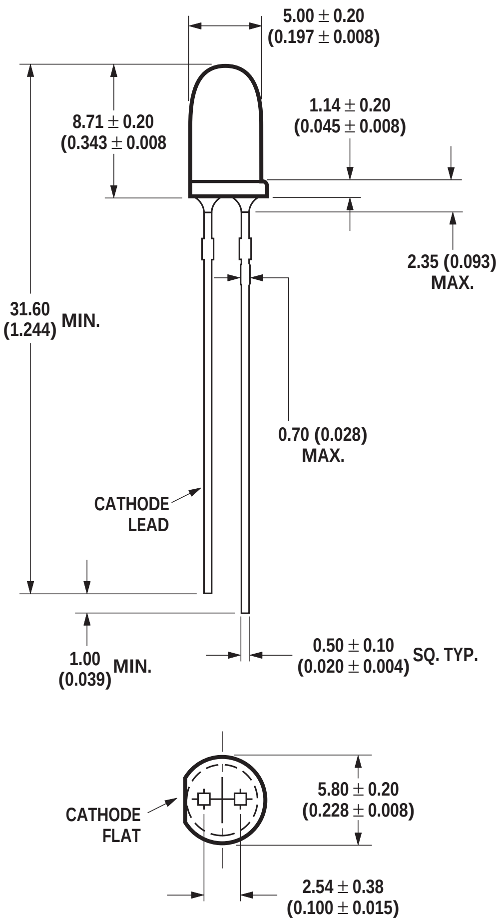
## Applications

- Photo sensor stimulus
- Infrared emitter replacement
- Solid state optical mouse sensors
- Surface imaging sensors
- Optical position and motion sensors
- Human interface devices
- Computer printer dot quality control
- Battery powered systems

## Device Selection Guide

| Part Number | Minimum Radiometric Intensity (mW / Sr) at 20 mA | Maximum Forward Voltage (V) at 20 mA |
|---|---|---|
| HLMP-ED80-K0T00 | 7.2 | 2.6 |
| HLMP-ED80-K0000 | 7.2 | 2.4 |

## Package Dimensions




NOTE:
ALL DIMENSIONS ARE IN mm (INCHES).

## Part Numbering System

HLMP - x x x x - x x x xx

**Mechanical Option**
00: Bulk

**$V_F$ Bin Selections**
0: Maximum $V_F$ 2.4 V
T: Maximum $V_F$ 2.6 V

**Maximum Intensity Bin**
0: No maximum Iv bin limit

**Minimum Intensity Bin**
Refer to device selection guide

**Color**
D: 630 nm red

**Package**
E: T-1 3/4 (5 mm) round lamp

## Absolute Maximum Ratings at $T_A$ = 25°C

| | |
|---|---|
| DC Forward Current[1,2,3] | 50 mA |
| Peak Pulsed Forward Current[2,3] | 100 mA |
| Average Forward Current | 30 mA |
| Reverse Voltage ($I_R$ = 100 µA) | 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 HP Application Brief I-024 (5966-3087E).
3. Please contact your Avago sales representative about operating currents below 10 mA.

## Electrical/Optical Characteristics at $T_A = 25°C$

| Parameter | Symbol | Min. | Typ. | Max. | Units | Test Conditions |
|---|---|---|---|---|---|---|
| Forward Voltage<br>ED80-xx0xx<br>ED80-xxTxx | $V_F$ | | 2.00<br>2.35 | 2.40<br>2.60 | V | $I_F$ = 20 mA |
| Reverse Voltage | $V_R$ | 5 | 20 | | V | $I_R$ = 100 μA |
| Peak Wavelength | $\lambda_{PEAK}$ | | 639 | | nm | Peak of Wavelength of Spectral Distribution at $I_F$ = 20 mA |
| Dominant Wavelength[1] | $\lambda_d$ | | 630 | | nm | |
| Spectral Halfwidth | $\Delta\lambda_{1/2}$ | | 17 | | nm | Wavelength Width at Spectral Distribution 1/2 Power Point at $I_F$ = 20 mA |
| Speed of Response | $\tau_s$ | | 20 | | ns | Exponential Time Constant, $e^{-t/\tau_s}$ |
| Capacitance | C | | 40 | | pF | $V_F$ = 0, f = 1 MHz |
| Thermal Resistance | $R\Theta_{J-PIN}$ | | 240 | | °C/W | LED Junction-to-Cathode Lead |
| Luminous Efficacy[5] | $\eta_v$ | | 155 | | lm/W | Emitted Luminous Power/Emitted Radiant Power at $I_F$ = 20 mA |
| Viewing Angle[2] | $2\,\theta^{1}/_{2}$ | | 30 | | Deg. | |
| Radiometric Intensity | $I_e$ | 7.23 | | 50.50 | mW/sr | Emitted Radiant Power at $I_F$ = 20 mA |

**Notes:**
1. Dominant wavelength, $I_d$, is derived from the CIE Chromaticity Diagram referenced to Illuminant E.
2. $\theta_{1/2}$ is the off-axis angle where the luminous intensity is one half the on-axis intensity.
3. The radiometric intensity is measured on the mechanical axis of the lamp package.
4. The optical axis is closely aligned with the package mechanical axis.
5. The luminous intensity, $I_v$, in candelas, may be found from the equation $I_v = I_e\eta_v$, where $I_e$ is the radiometric intensity in watts per steradian and $\eta_v$ is the luminous efficacy in lumens/watt.
6. For option -xxTxx, max. forward votage (Vf) is 2.6 V. Refer to Vf bin table.

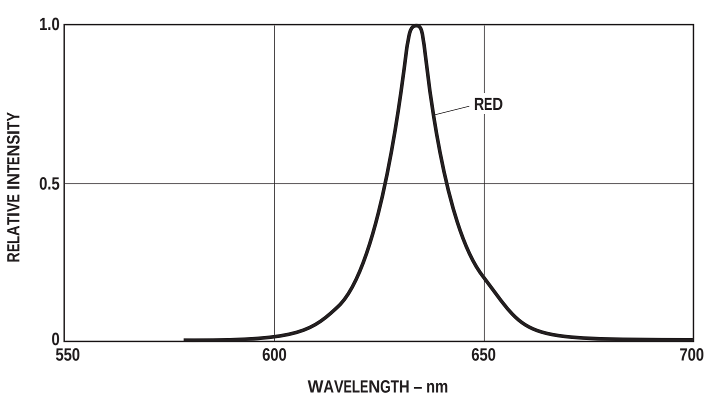



Figure 1. Relative Intensity vs. Peak Wavelength.

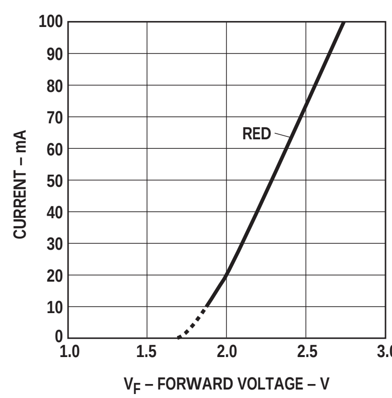



Figure 2a. Forward Current vs. Forward Voltage for Option -xx0xx.

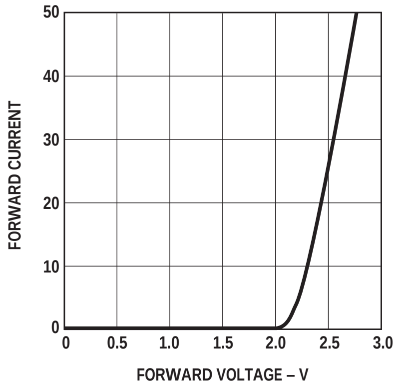



**Figure 2b. Forward Current vs. Forward Voltage for Option -xxTxx.**

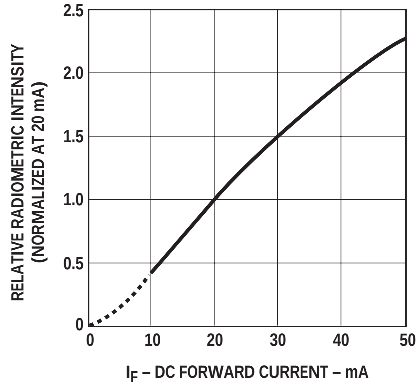



**Figure 3. Relative Luminous Intensity vs. Forward Current.**

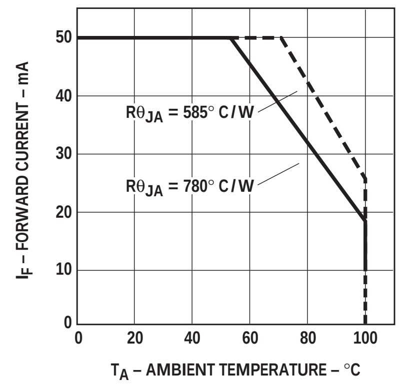



**Figure 4. Maximum Forward Current vs. Ambient Temperature. Derating Based on $T_{JMAX}$ = 130°C.**

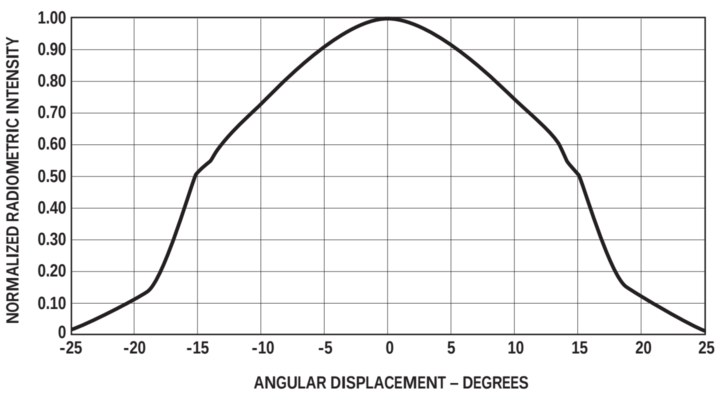



**Figure 5. Representative Spatial Radiation Pattern for 30° Viewing Angle Lamps.**

## Radiometric Intensity Bin Limits (mW/sr at 20 mA)

| Bin ID | Min. | Max. |
|---|---|---|
| K | 8.5 | 10.2 |
| L | 10.2 | 12.2 |
| M | 12.2 | 14.7 |
| N | 14.7 | 17.6 |
| P | 17.6 | 21.2 |
| Q | 21.2 | 25.4 |
| R | 25.4 | 30.5 |
| S | 30.5 | 36.5 |
| T | 36.5 | 43.9 |

## Vf Bin Table[3]

| Bin ID | Min. | Max. |
|---|---|---|
| VA | 2.0 | 2.2 |
| VB | 2.2 | 2.4 |
| VC | 2.4 | 2.6 |

Tolerance for each bin limit is ±0.05 V.

**Notes:**
1. Tolerance for each bin will be ± 15%.
2. Bin categories are established for classification of products. Products may not be available in all bin categories.
3. VF bin table only available for those number with options -xxTxx.

## Precautions:

## Lead Forming

- The leads of an LED lamp may be preformed or cut to length prior to insertion and soldering into PC board.
- If lead forming is required before soldering, care must be taken to avoid any excessive mechanical stress induced to LED package. Otherwise, cut the leads of LED to length after soldering process at room temperature. The solder joint formed will absorb the mechanical stress of the lead cutting from traveling to the LED chip die attach and wirebond.
- It is recommended that tooling made to precisely form and cut the leads to length rather than rely upon hand operation.

## Soldering Conditions

- Care must be taken during PCB assembly and soldering process to prevent damage to LED component.
- The closest LED is allowed to solder on board is 1.59 mm below the body (encapsulant epoxy) for those parts without standoff.
- Recommended soldering conditions:

| | 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 recommended temperature and dwell time in the solder wave. Customer is advised to periodically check on the soldering profile to ensure the soldering profile used is always conforming to recommended soldering condition.
- If necessary, use fixture to hold the LED component in proper orientation with respect to the PCB during soldering process.
- Proper handling is imperative to avoid excessive thermal stresses to LED components when heated. Therefore, the soldered PCB must be allowed to cool to room temperature, 25°C, before handling.
- Special attention must be given to board fabrication, solder masking, surface plating and lead holes size and component orientation to assure solderability.
- Recommended PC board plated through hole sizes for LED component leads:

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

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

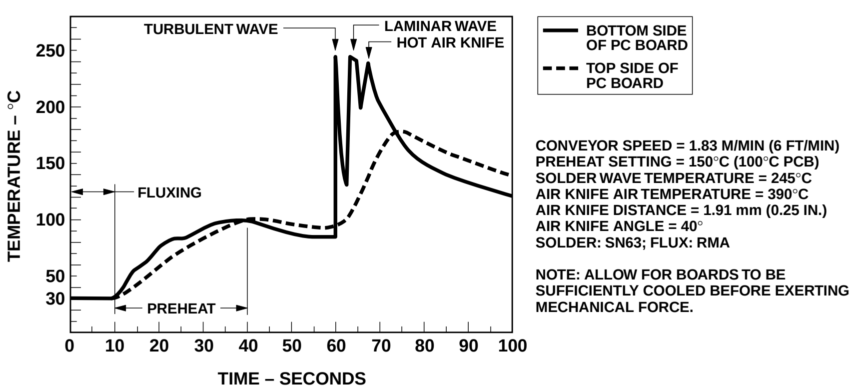



**Figure 6. Recommended wave soldering profile.**

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