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# Precision Optical Performance AlInGaP II LED Lamps

## Technical Data



**HP SunPower Series**  
**HLMP-ELxx**  
**HLMP-EHxx**  
**HLMP-EDxx**

### Features

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

### Benefits

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

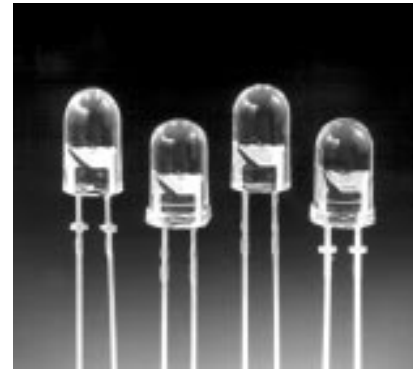
### Applications

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

### Description

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

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



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

The HLMP-Exxx Series replace the HLMP-Dxxx Series products. A cross reference is found on page 4 of this data sheet.

**Part Numbering Scheme**

HLMP-E(1)(2)(3)-  
(4)(5)(6)(7)(8)

where (1) = Color

“L” = 592 nm Amber

“H” = 615 nm Reddish-  
orange

“D” = 630 nm Red

where (2)(3) = Viewing  
Angle and Lead Standoffs

“16” = 15 degree without lead  
standoffs

“18” = 15 degree with lead  
standoffs

“25” = 23 degree without lead  
standoffs

“27” = 23 degree with lead  
standoffs

“31” = 30 degree without lead  
standoffs

“33” = 30 degree with lead  
standoffs

where (4) = Minimum  
Intensity Bin (refer to  
table on page 7)

where (5) = Maximum  
Intensity Bin (refer to  
table on page 7)

where (6) = Color Bin  
Selection

“0” = no color bin limitation

“K” = amber color bins 2  
and 4 only (refer to  
table on page 7)

“4” = amber color bin 4 only  
(refer to table on  
page 7)

where (7)(8) = Mechanical  
or Packaging Option

“00” = bulk packaging,  
minimum increment  
500/bag

“DD” = ammo pack, minimum  
increment 2000/box.  
Available for products  
shown in **BOLD** in  
selection guide.

**Refer to the device selection  
guides for available  
combinations.**

**T-1<sup>3</sup>/<sub>4</sub> (5 mm) Precision Optical Performance AlInGaP II LED Lamps****Selection Guide**

Typical Viewing Angle 2θ <sub>1/2</sub> (Deg.) <sup>[2]</sup>	Color and Dominant Wavelength (nm), Typ. <sup>[1]</sup>	Lamps Without Standoffs (Outline Drawing A)	Lamps With Standoffs (Outline Drawing B)	Luminous Intensity I <sub>v</sub> (mcd) <sup>[3,4]</sup> @ I(f) = 20 mA	
				Min.	Max.
15°	Amber 592	HLMP-EL16-TU000		2170	4800
		HLMP-EL16-TUK00*		2170	4800
		HLMP-EL16-TV000		2170	6300
		HLMP-EL16-TV400**		2170	6300
		HLMP-EL16-TVK00*		2170	6300
		<b>HLMP-EL16-TW000</b>	HLMP-EL18-TW000	2170	8300
		HLMP-EL16-TWK00*		2170	8300
		HLMP-EL16-UX000	HLMP-EL18-UX000	2750	10700
	Red-Orange 615	<b>HLMP-EH16-TW000</b>	HLMP-EH18-TW000	2170	8300
		HLMP-EH16-UX000	HLMP-EH18-UX000	2750	10700
Red 630	<b>HLMP-ED16-TW000</b>	HLMP-ED18-TW000	2170	8300	

**Notes:**

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

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

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

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

## T-1<sup>3</sup>/<sub>4</sub> (5 mm) Precision Optical Performance AlInGaP II Led Lamps (Continued) Selection Guide

Typical Viewing Angle $2\theta_{1/2}$ (Deg.) <sup>[2]</sup>	Color and Dominant Wavelength (nm), Typ. <sup>[1]</sup>	Lamps Without Standoffs (Outline Drawing A)	Lamps With Standoffs (Outline Drawing B)	Luminous Intensity $I_v$ (mcd) <sup>[3,4]</sup> @ $I(f) = 20$ mA	
				Min.	Max.
23°	Amber 592	HLMP-EL25-QR000		1000	2200
		HLMP-EL25-QRK00*		1000	2200
		HLMP-EL25-QS000		1000	2900
		HLMP-EL25-QS400**		1000	2900
		HLMP-EL25-QSK00*		1000	2900
		HLMP-EL25-QT000	HLMP-EL27-QT000	1000	3700
		HLMP-EL25-QTK00*		1000	3700
		<b>HLMP-EL25-RU000</b>	HLMP-EL27-RU000	1300	4800
		HLMP-EL25-RUK00*		1300	4800
		HLMP-EL25-SV000	HLMP-EL27-SV000	1650	6300
	Red-Orange 615	HLMP-EH25-QT000	HLMP-EH27-QT000	1000	3700
		HLMP-EH25-RU000	HLMP-EH27-RU000	1300	4800
		<b>HLMP-EH25-SV000</b>	HLMP-EH27-SV000	1650	6300
	Red 630	HLMP-ED25-QT000	HLMP-ED27-QT000	1000	3700
		<b>HLMP-ED25-RU000</b>	HLMP-ED27-RU000	1300	4800
30°	Amber 592	HLMP-EL31-QR000		1000	2200
		HLMP-EL31-QRK00*		1000	2200
		HLMP-EL31-QS000		1000	2900
		HLMP-EL31-QS400**		1000	2900
		HLMP-EL31-QSK00*		1000	2900
		<b>HLMP-EL31-QT000</b>	HLMP-EL33-QT000	1000	3700
		HLMP-EL31-QTK00*		1000	3700
	Red-Orange 615	HLMP-EH31-PS000	HLMP-EH33-PS000	765	2900
		<b>HLMP-EH31-QT000</b>	HLMP-EH33-QT000	1000	3700
	Red 630	HLMP-ED31-PQ000		765	1730
		HLMP-ED31-PR000		765	2200
		HLMP-ED31-PS000	HLMP-ED33-PS000	765	2900
		<b>HLMP-ED31-QT000</b>	HLMP-ED33-QT000	1000	3700

### Notes:

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

Part numbers in **bold** are recommended for new designs.  
 \*HLMP-xLxx-xxK00 are selected to amber color bins 2 and 4 only.  
 \*\*HLMP-xLxx-xx400 are selected to amber color bin 4 only.

## Part Number Cross Reference

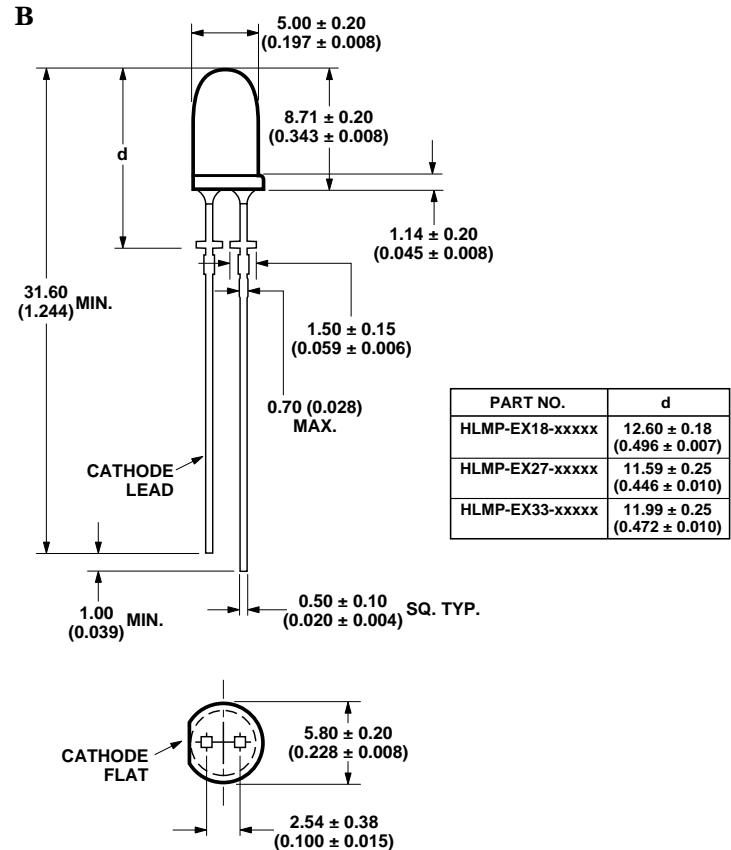
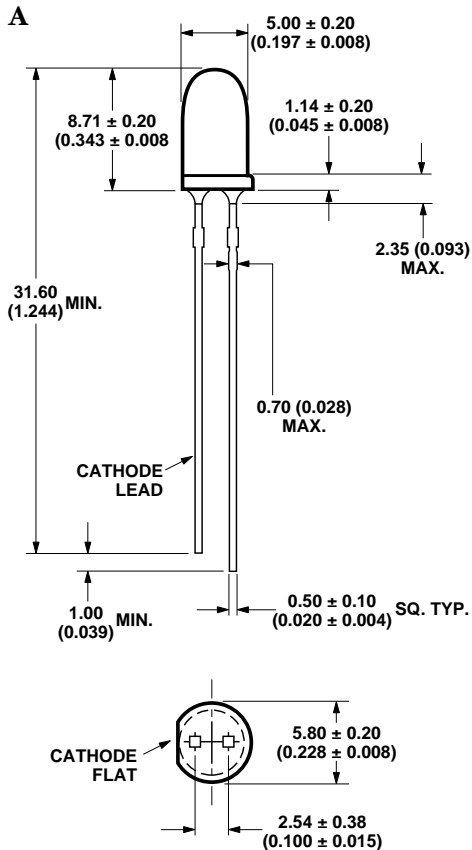
Hewlett-Packard's Precision Optical Performance T-1<sup>3/4</sup> AlInGaP II lamps part numbers are changing. The advantages of the new part numbering system include:

- specification of maximum intensities
- for comparison/substitution purposes, easier recognition of parts which are the same color and viewing angle, but differ only in intensity and/or color bin selection

In each case, the new part number is an exact replacement for the old part number.

Old Part Number	New Part Number
HLMP-DD16	HLMP-ED16-TW000
HLMP-DD18	HLMP-ED18-TW000
HLMP-DD25	HLMP-ED25-QT000
HLMP-DD27	HLMP-ED27-QT000
HLMP-DD31	HLMP-ED31-PS000
HLMP-DD33	HLMP-ED33-PS000
HLMP-DH16	HLMP-EH16-TW000
HLMP-DH18	HLMP-EH18-TW000
HLMP-DH25	HLMP-EH25-QT000
HLMP-DH27	HLMP-EH27-QT000
HLMP-DH31	HLMP-EH31-PS000
HLMP-DH33	HLMP-EH33-PS000
HLMP-DL16	HLMP-EL16-UX000
HLMP-DL18	HLMP-EL18-UX000
HLMP-DL25	HLMP-EL25-SV000
HLMP-DL27	HLMP-EL27-SV000
HLMP-DL31	HLMP-EL31-QT000
HLMP-DL33	HLMP-EL33-QT000

## Package Dimensions



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

#### Notes:

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 Hewlett-Packard sales representative about operating currents below 10 mA.

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

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

#### 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.

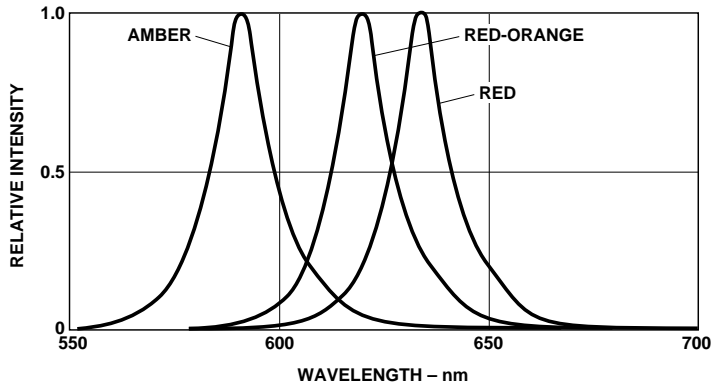


Figure 1. Relative Intensity vs. Peak Wavelength.

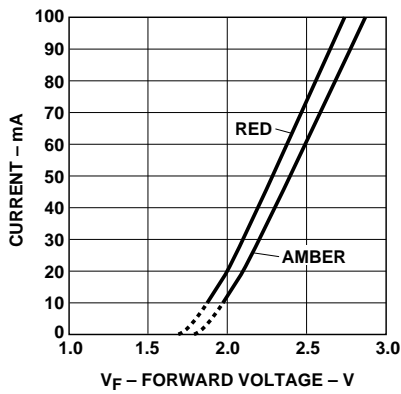


Figure 2. Forward Current vs. Forward Voltage.

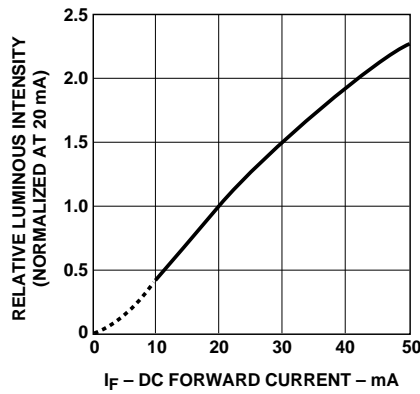


Figure 3. Relative Luminous Intensity vs. Forward Current.

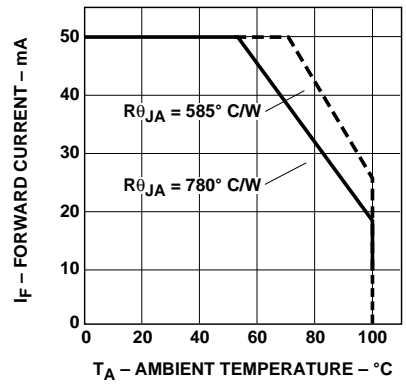


Figure 4. Maximum Forward Current vs. Ambient Temperature. Derating Based on  $T_{JMAX} = 130^\circ\text{C}$ .

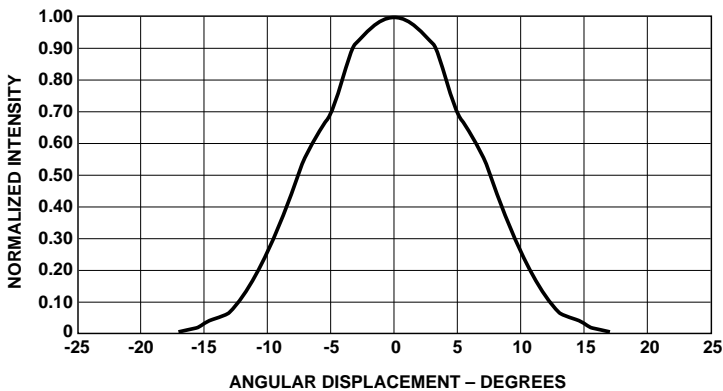


Figure 5. Representative Spatial Radiation Pattern for 15° Viewing Angle Lamps.

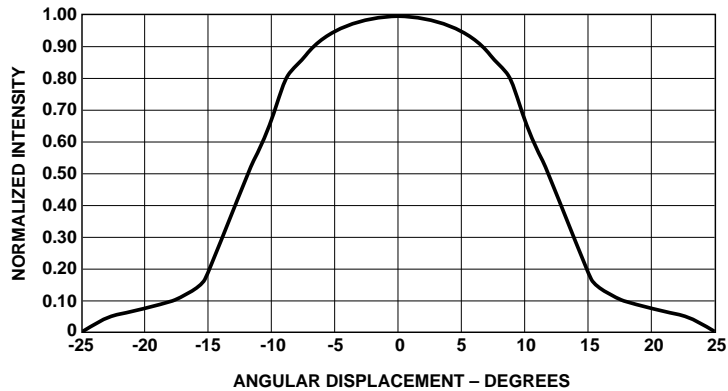


Figure 6. Representative Spatial Radiation Pattern for 24° Viewing Angle Lamps.

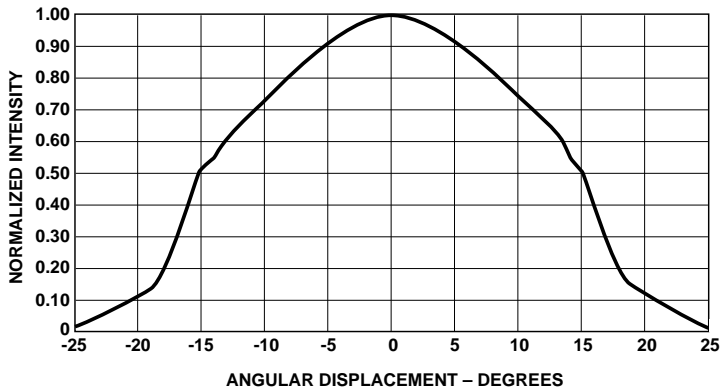


Figure 7. Representative Spatial Radiation Pattern for 30° Viewing Angle Lamps.

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

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

Tolerance for each bin limit is  
± 15%.

### HLMP-xLxx 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  
± 0.5 nm.

**Note:**

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



*[www.hp.com/go/led](http://www.hp.com/go/led)*

For technical assistance or the location of your nearest Hewlett-Packard sales office, distributor or representative call:

**Americas/Canada:** 1-800-235-0312 or 408-654-8675

**Far East/Australasia:** Call your local HP sales office.

**Japan:** (81 3) 3335-8152

**Europe:** Call your local HP sales office.

Data subject to change.

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Obsoletes 5968-3819E (1/99)

5968-7180E (10/99)