Precision Optical Performance AlInGaP II LED Lamps

Technical Data

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:**
  $T_{JLED} = +130°C$
- **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**
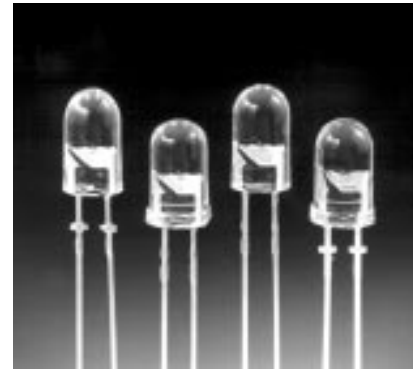- **Suitable for Autoinsertion into PC Boards**

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-1³/4 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.

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-1^3/4 (5 mm) Precision Optical Performance AlInGaP II LED Lamps

Selection Guide

Typical Viewing Angle $2\theta_{1/2}$ (Deg.)[2]	Color and Dominant Wavelength (nm), Typ.[1]	Lamps Without Standoffs (Outline Drawing A)	Lamps With Standoffs Outline Drawing B)	Luminous Intensity Iv (mcd) [3,4] @ I(f) = 20 mA	
				Min.	Max.
15°	Amber 592	HLMP-EL16-VW000		3600	8300
		HLMP-EL16-VWK00*		3600	8300
		HLMP-EL16-VX000		3600	10700
		HLMP-EL16-VX400**		3600	10700
		HLMP-EL16-VXK00*		3600	10700
		HLMP-EL16-VY000	HLMP-EL18-VY000	3600	13800
		HLMP-EL16-VYK00*		3600	13800
		HLMP-EL16-WZ000	HLMP-EL18-WZ000	4700	18400
	Red-Orange 615	**HLMP-EH16-TW000**	HLMP-EH18-TW000	2170	8300
		HLMP-EH16-UX000	HLMP-EH18-UX000	2750	10700
	Red 630	**HLMP-ED16-TW000**	HLMP-ED18-TW000	2170	8300
		HLMP-ED16-UX000	HLMP-ED18-UX000	2750	10700

Notes:
1. Dominant Wavelength, λ_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-1^3/4 (5 mm) Precision Optical Performance AlInGaP II Led Lamps (Continued)
Selection Guide

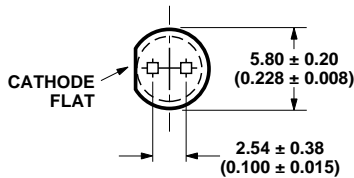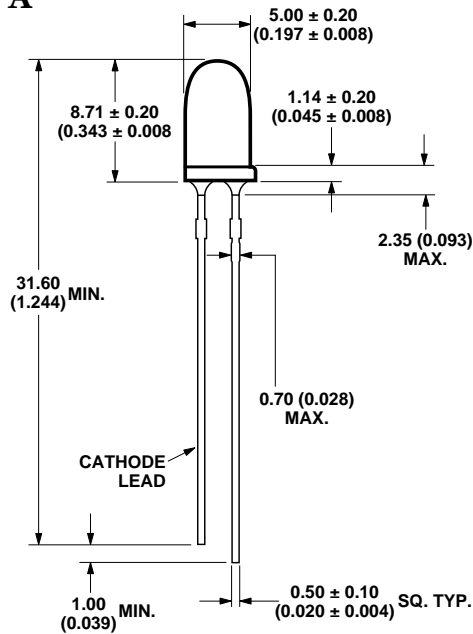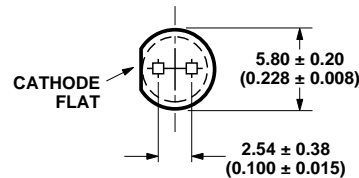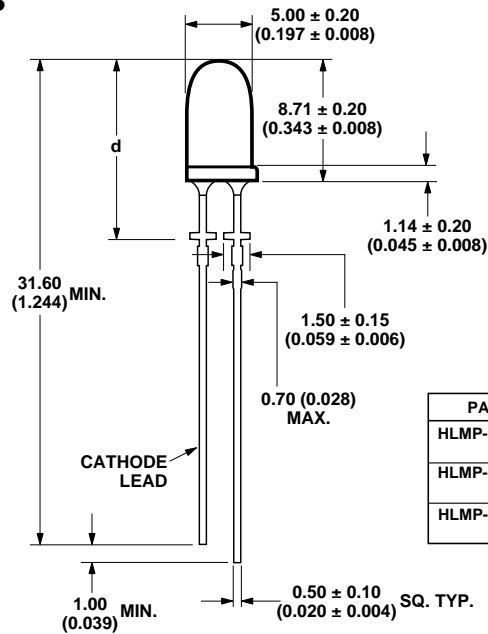| Typical Viewing Angle 2θ^1/2 (Deg.)[2]	Color and Dominant Wavelength (nm), Typ.[1]	Lamps Without Standoffs (Outline Drawing A)	Lamps With Standoffs Outline Drawing B)	Luminous Intensity Iv (mcd) [3,4] @ I(f) = 20 mA	
				Min.	Max.
23°	Amber 592	HLMP-EL25-ST000		1650	3700
		HLMP-EL25-STK00*		1650	3700
		HLMP-EL25-SU000		1650	4800
		HLMP-EL25-SU400**		1650	4800
		HLMP-EL25-SUK00*		1650	4800
		HLMP-EL25-SVK00*		1650	6300
		HLMP-EL25-SV000	HLMP-EL27-SV000	1650	6300
		HLMP-EL25-TW000	HLMP-EL27-TW000	2170	8300
		HLMP-EL25-TWK00*		2170	8300
	Red-Orange 615	HLMP-EH25-SV000	HLMP-EH27-SV000	1650	6300
		HLMP-EH25-TW000	HLMP-EH27-TW000	2170	8300
	Red 630	HLMP-ED25-SV000	HLMP-ED27-SV000	1650	6300
		HLMP-ED25-TW000	HLMP-ED27-TW000	2170	8300
30°	Amber 592	**HLMP-EL31-SV000**	HLMP-EL33-SV000	1650	6300
		HLMP-EL31-ST000		1650	3700
		HLMP-EL31-STK00*		1650	3700
		HLMP-EL31-SUK00*		1650	4800
		HLMP-EL31-SU400**		1650	4800
		HLMP-EL31-SU000		1650	4800
		HLMP-EL31-SVK00*		1650	6300
	Red-Orange 615	HLMP-EH31-RU000	HLMP-EH33-RU000	1300	4800
		HLMP-EH31-SV000	HLMP-EH33-SV000	1650	6300
	Red 630	HLMP-ED31-ST000		1650	3700
		HLMP-ED31-SU000		1650	4800
		HLMP-ED31-RU000	HLMP-ED33-RU000	1300	4800
		HLMP-ED31-SV000	HLMP-ED33-SV000	1650	6300

Notes:

1. Dominant Wavelength, λ_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.

Package Dimensions

A

B

PART NO.	d
HLMP-EX18-xxxxx	12.60 ± 0.18 (0.496 ± 0.007)
HLMP-EX27-xxxxx	11.59 ± 0.25 (0.446 ± 0.010)
HLMP-EX33-xxxxx	11.99 ± 0.25 (0.472 ± 0.010)

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 ($I_R = 100 \, \mu A$) .... 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 Application Brief I-024 (5966-3087E).
3. Please contact your 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 Amber (λ_d = 592 nm) Red-Orange (λ_d = 617 nm) Red (λ_d = 630 nm)	V_F		2.15 2.08 2.00	2.4	V	I_F = 20 mA
Reverse Voltage	V_R	5	20		V	I_R = 100 µA
Peak Wavelength Amber Red-Orange Red	λ_{PEAK}		594 623 639		nm	Peak of Wavelength of Spectral Distribution at I_F = 20 mA
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	τ_s		20		ns	Exponential Time Constant, e^{-t/τ_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[1] Amber Red-Orange Red	η_v		500 235 155		lm/W	Emitted Luminous Power/Emitted Radiant Power at I_f = 20 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 η_v is the luminous efficacy in lumens/watt.
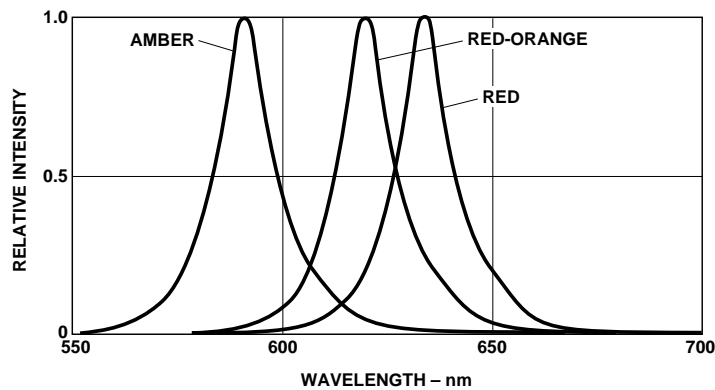

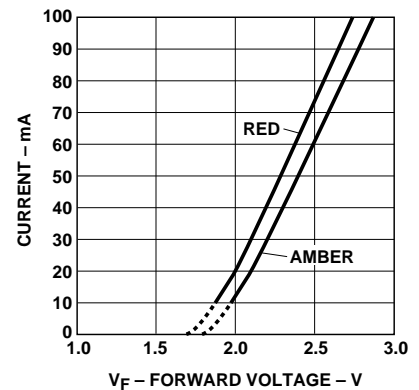**Figure 1. Relative Intensity vs. Peak Wavelength.**

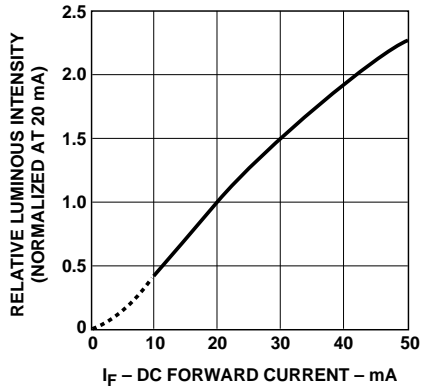**Figure 2. Forward Current vs. Forward Voltage.**

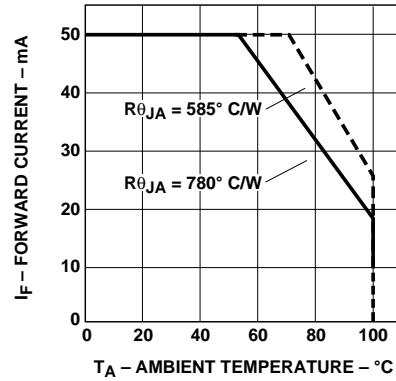**Figure 3. Relative Luminous Intensity vs. Forward Current.**

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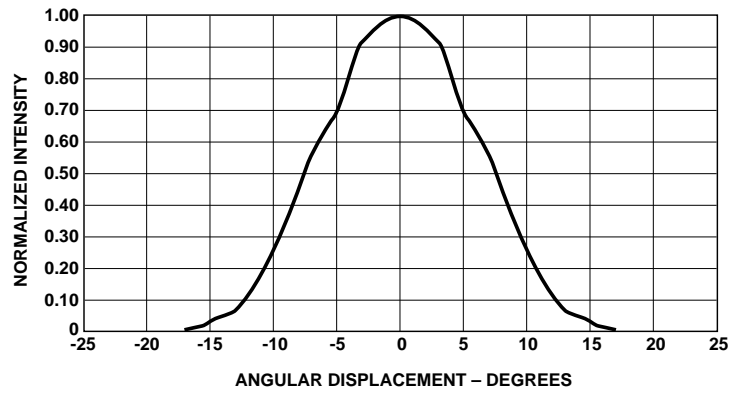

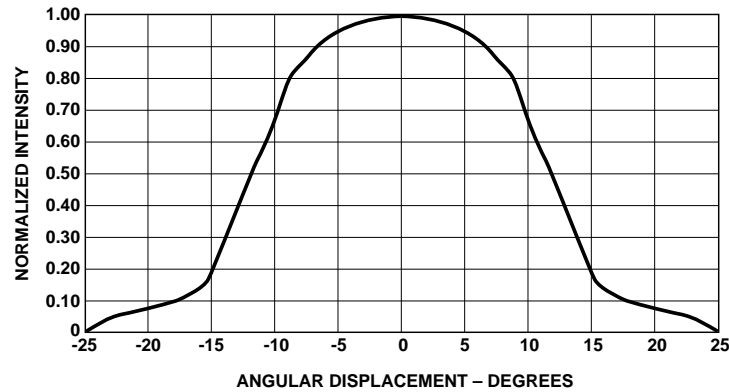**Figure 5. Representative Spatial Radiation Pattern for 15° Viewing Angle Lamps.**

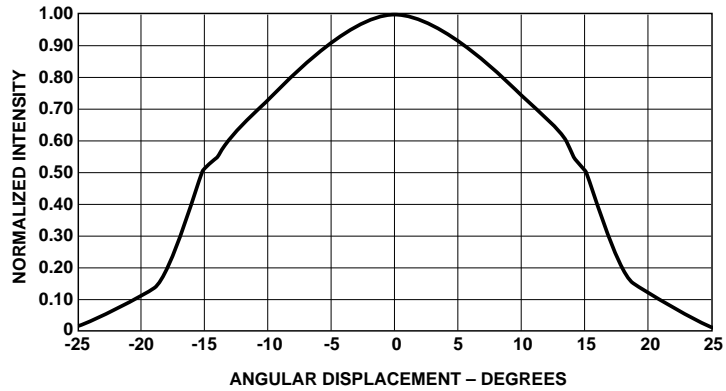**Figure 6. Representative Spatial Radiation Pattern for 24° Viewing Angle Lamps.**

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
Y	9300	12000
Z	12000	16000

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.

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