HLMP-EL55

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

Data Sheet

SunPower Series

HLMP-EL55 HLMP-EL57
HLMP-EH55 HLMP-EH57
HLMP-EG55 HLMP-EG57

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 tinted, diffused, T-1 3/4 packages incorporating second generation optics producing well defined radiation patterns at specific viewing cone angles.

There are two families of amber, red, and red-orange lamps; AlInGaP and the higher performance AlInGaP II.

The high maximum LED junction temperature limit of +130° C enables high temperature operation in bright sunlight conditions.

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

Features

- **Well defined and smooth spatial radiation patterns**
- **Wide viewing angle**
- **Tinted diffused lamp**
- **High luminous output**
- **Colors:**
  590/592 nm Amber
  615/617 nm Reddish-Orange
  626/630 nm Red
- **High operating temperature: T_{JLED} = +130°C**
- **Superior resistance to moisture**

Benefits

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

Applications

- **Traffic management:**
  Variable message signs
  Traffic management signs
- **Commercial indoor / outdoor advertising:**
  Signs
  Marquees
  Passenger information
- **Automotive:**
  Exterior and interior lights

Part Numbering System

HLMP - x x xx - x x x xx

Mechanical Options
00: Bulk Packaging
DD: 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

Minimum Intensity Bin

Viewing Angle & Lead Stand Offs
55: 55 deg without lead stand offs; AlInGaP
57: 55 deg without lead stand offs; AlInGaP II

Color
D: 630 nm Red
G: 626 nm Red
H: 615/617 nm Red-Orange
L: 590/592 Amber

Package
E: 5 mm Round

Device Selection Guide (AlInGaP)

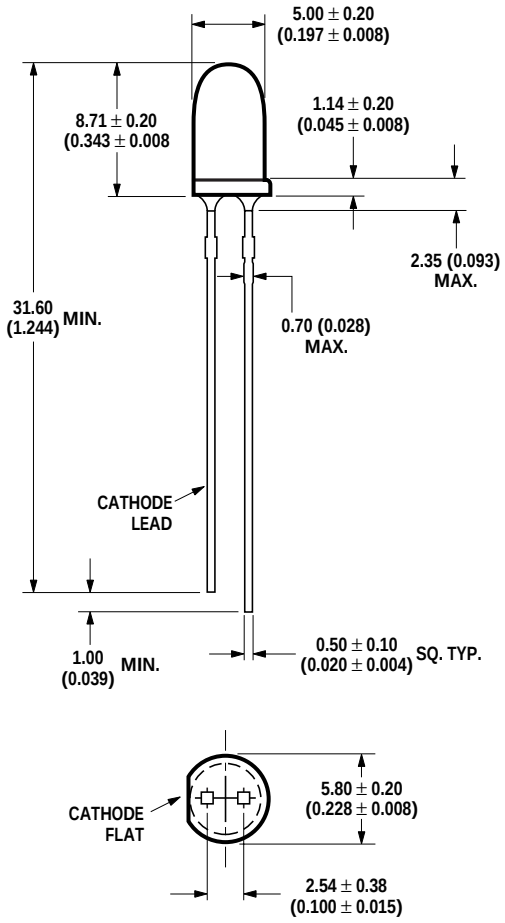
Typical Viewing Angle $2\theta_{1/2}$ (Deg.)[4]	Color and Dominant Wavelength (nm), Typ.[3]	Lamps Without Standoffs on Leads (Outline Drawing A)	Luminous Intensity Iv (mcd)[1,2] @ 20 mA	
			Min.	Max.
55°	Amber 590	HLMP-EL55-GHKxx	140	240
		HLMP-EL55-GK0xx	140	400
	Red-Orange 615	HLMP-EH55-GK0xx	140	400
	Red 626	HLMP-EG55-GK0xx	140	400
		HLMP-EG55-HJ0DD	180	310

Device Selection Guide (AlInGaP)

Typical Viewing Angle $2\theta_{1/2}$ (Deg.)[4]	Color and Dominant Wavelength (nm), Typ.[3]	Lamps Without Standoffs on Leads (Outline Drawing A)	Luminous Intensity Iv (mcd)[1,2] @ 20 mA	
			Min.	Max.
55°	Amber 592	HLMP-EL57-LP0xx	400	1150
	Red-Orange 617	HLMP-EH57-LP0xx	400	1150
	Red 630	HLMP-ED57-LP0xx	400	1150
		HLMP-ED57-LPTxx	400	1150

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, λ_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 one half the on-axis intensity.

Package Dimensions



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. RECOMMENDED PC BOARD HOLE DIAMETERS:
   LAMP PACKAGE WITHOUT STAND-OFFS: FLUSH MOUNTING AT BASE OF LAMP PACKAGE = 1.143 / 1.067 (0.044 / 0.042).

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[3] ..... 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 Application Brief I-024 (5966-3087E).
3. Please contact your Avago Technologies 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	V_F				V	I_F = 20 mA
Amber (λ_d = 590 nm)			2.02	2.4		
Amber (λ_d = 592 nm)			2.15	2.4		
Red-Orange (λ_d = 615 nm)			1.94	2.4		
Red-Orange (λ_d = 617 nm)			2.08	2.4		
Red (λ_d = 626 nm)			1.90	2.4		
Red (λ_d = 630 nm)			2.00	2.4		
Reverse Voltage	V_R	5	20		V	I_R = 100 μA
Peak Wavelength	λ_{PEAK}				nm	Peak of Wavelength of Spectral Distribution at I_F = 20 mA
Amber (λ_d = 590 nm)			592			
Amber (λ_d = 592 nm)			594			
Red-Orange (λ_d = 615 nm)			621			
Red-Orange (λ_d = 617 nm)			623			
Red (λ_d = 626 nm)			635			
Red (λ_d = 630 nm)			639			
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	$R\theta_{J\text{-}PIN}$		240		°C/W	LED Junction-to-Cathode Lead
Luminous Efficacy[1]	η_v				lm/W	Emitted Luminous Power / Emitted Radiant Power
Amber (λ_d = 590 nm)			480			
Amber (λ_d = 592 nm)			500			
Red-Orange (λ_d = 615 nm)			260			
Red-Orange (λ_d = 617 nm)			235			
Red (λ_d = 626 nm)			150			
Red (λ_d = 630 nm)			155			

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.

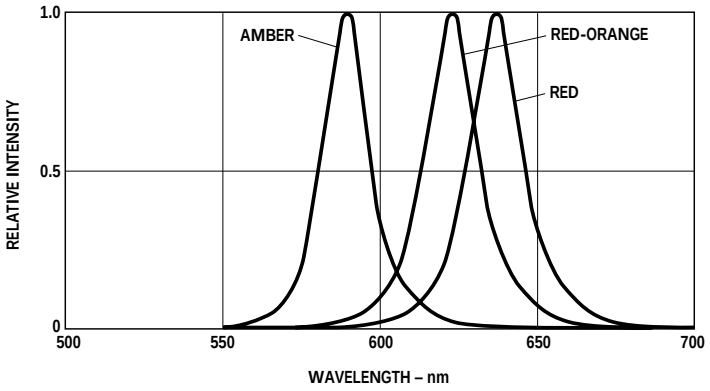


Figure 1. Relative intensity vs. peak wavelength.

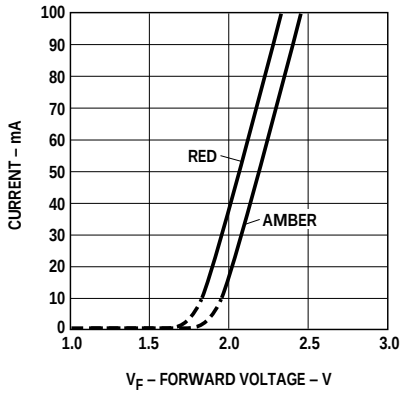


Figure 2. Forward current vs. forward voltage.

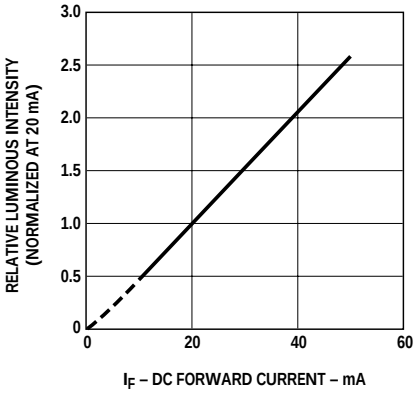


Figure 3. Relative luminous intensity vs. forward current.

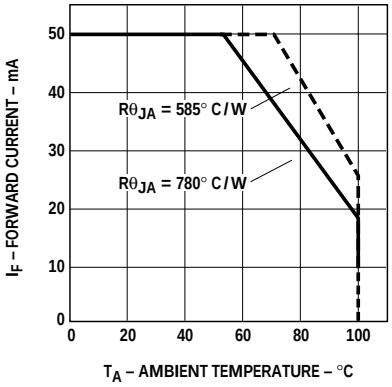


Figure 4. Maximum forward current vs. ambient temperature. Derating based on T_{JMAX} = 130°C.

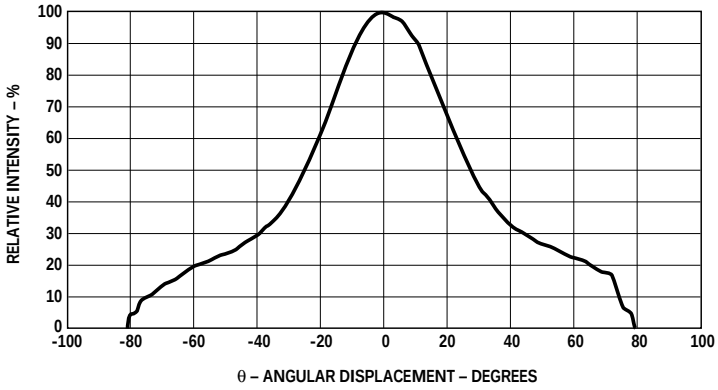


Figure 5. Representative spatial radiation pattern for 55° viewing angle lamps.

Intensity Bin Limits (mcd at 20 mA)

Bin Name	Min.	Max.
G	140	180
H	180	240
J	240	310
K	310	400
L	400	520
M	520	680
N	680	880
P	880	1150

Tolerance for each bin limit is ± 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 ± 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 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.

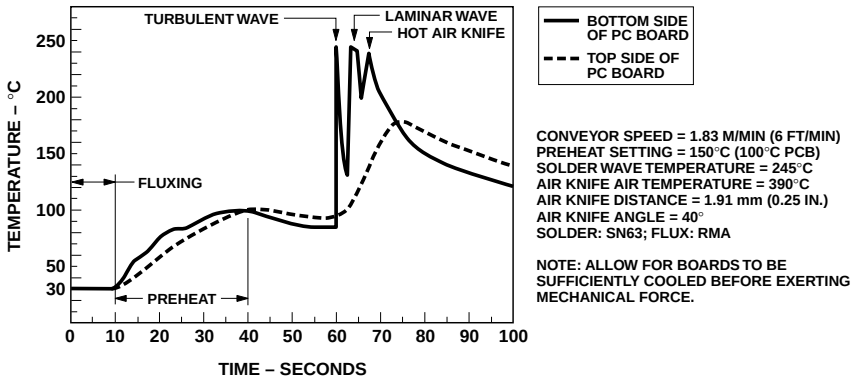


Figure 6. Recommended wave soldering profile.

For product information and a complete list of distributors, please go to our website: **www.avagotech.com**

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