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

Technical Data

SunPower Series
HLMA-CHXX/CJXX/ CLXX/CGXX
HLMA-GHXX/GJXX/ GLXX/GGXX

Features

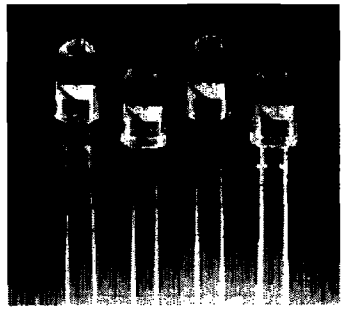
- **Well Defined Spatial Radiation Patterns**
- **Viewing Angles: 8°, 15°**
- **High Luminous Output**
- **Colors:**
  590 nm Amber
  605 nm Portland Orange
  615 nm Reddish-Orange
  622 nm Red
- **High Operating Temperature:**
  $T_{J\,LED}$ = +130°C
- **Superior Resistance to Moisture**
- **Four Package Options:**
  With or Without Flange Base;
  With or Without Lead Stand-Offs

Benefits

- **Viewing Angles Match Outdoor Sign Requirements**
- **Colors Meet Automotive and Pedestrian Signal Specifications**
- **Superior Performance in Outdoor Environments**
- **Suitable for Autoinsertion onto PC Boards**

Applications

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



Description

These precision performance lamps utilize the absorbing substrate aluminum indium gallium phosphide (AS AlInGaP) LED technology. The luminous flux produced by AS AlInGaP technology provides sufficient light output for readability in sunlight. AS AlInGaP LED technology provides extremely stable light output over very long periods of time.

These LED lamps are untinted, nondiffused, T-1 3/4 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 four package options to give the designer flexibility with device mounting.

Device Selection Guide

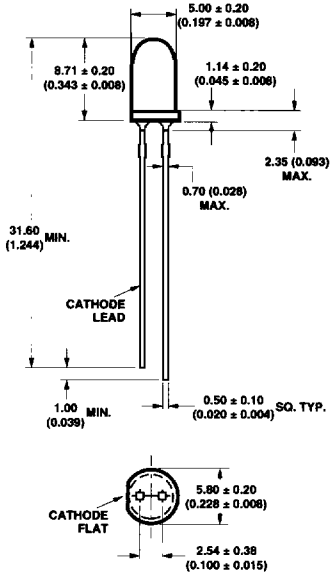
Part Number HLMA-	Viewing Angle, $2\theta_{1/2}$ (Deg.),[5] Typ.	Color, Dominant Wavelength, λ_d (nm),[4] Typ.	Luminous Intensity, I_V (mcd),[1,2] @ 20 mA		Total Flux, ϕ_V (mlm),[3] @ 20 mA, Typ.	Leads with Stand-Offs	Flanged Base	Package Drawing
			Min.	Typ.				
CL20	8	Amber, 590	1600	4000	400	No	Yes	A
GL20	8	Amber, 590	1600	4000	400	No	No	B
CL22	8	Amber, 590	1600	4000	400	Yes	Yes	C
GL22	8	Amber, 590	1600	4000	400	Yes	No	D
CH20	8	Red-Orange, 615	1400	4000	300	No	Yes	A
GH20	8	Red-Orange, 615	1400	4000	300	No	No	B
CH22	8	Red-Orange, 615	1400	4000	300	Yes	Yes	C
GH22	8	Red-Orange, 615	1400	4000	300	Yes	No	D
CL15	15	Amber, 590	700	1700	400	No	Yes	A
GL15	15	Amber, 590	700	1700	400	No	No	B
CL17	15	Amber, 590	700	1700	400	Yes	Yes	C
GL17	15	Amber, 590	700	1700	400	Yes	No	D
CJ15[6]	15	Orange, 605	500	1300	350	No	Yes	A
GJ15[6]	15	Orange, 605	500	1300	350	No	No	B
CJ17[6]	15	Orange, 605	500	1300	350	Yes	Yes	C
GJ17[6]	15	Orange, 605	500	1300	350	Yes	No	D
CH15	15	Red-Orange, 615	500	1300	300	No	Yes	A
GH15	15	Red-Orange, 615	500	1300	300	No	No	B
CH17	15	Red-Orange, 615	500	1300	300	Yes	Yes	C
GH17	15	Red-Orange, 615	500	1300	300	Yes	No	D
CG15	15	Red, 622	290	800	200	No	Yes	A
GG15	15	Red, 622	290	800	200	No	No	B
CG17	15	Red, 622	290	800	200	Yes	Yes	C
GG17	15	Red, 622	290	800	200	Yes	No	D

Notes:

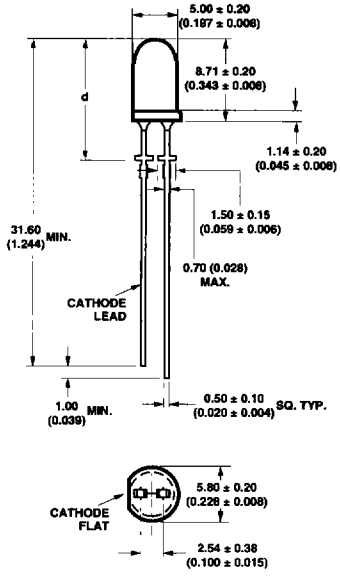
1. The luminous intensity is measured on the mechanical axis of the lamp package.
2. The optical axis is closely aligned with the package mechanical axis.
3. ϕ_V is the total luminous flux output as measured by an integrating sphere.
4. The dominant wavelength, λ_d, is derived from the CIE Chromaticity Diagram and represents the color of the lamp.
5. $\theta_{1/2}$ is the off-axis angle where the luminous intensity is one half the on-axis intensity.
6. These 15°, Portland Orange lamps are specifically designed for use in the **HAND** symbol of pedestrian signals.

Package Dimensions

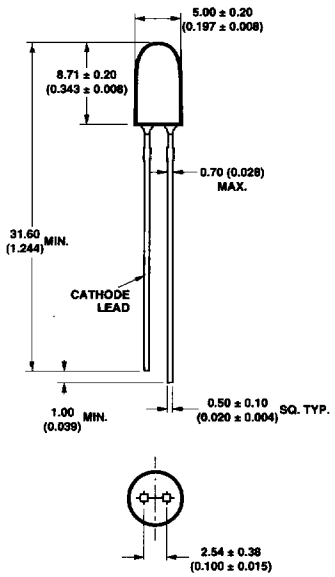
A



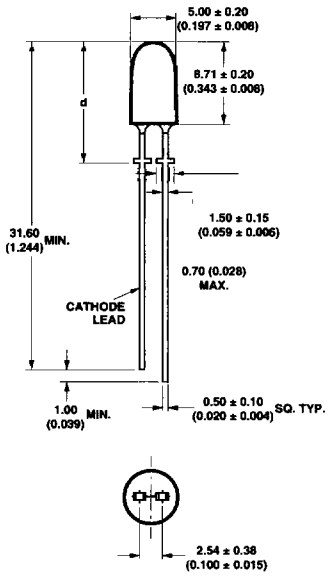
C



B



D



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 PACKAGES A AND B WITHOUT STAND-OFFS: FLUSH MOUNTING AT BASE OF LAMP PACKAGE = 1.143/1.067 (0.044/0.042).
   - LAMP PACKAGES C AND D WITH STAND-OFFS: MOUNTING AT LEAD STAND-OFFS = 0.965/0.889 (0.038/0.035).
5. FOR DOME HEIGHTS ABOVE LEAD STAND-OFF SEATING PLANE, d, LAMP PACKAGES C AND D, SEE TABLE.

PART NO.	d
HLMA-XX22	12.37 ± 0.25 (0.487 ± 0.010)
HLMA-XX17	12.42 ± 0.25 (0.489 ± 0.010)

Absolute Maximum Ratings at T_A = 25°C

DC Forward Current[1,2,5,6] ..... 50 mA
Peak Forward Current[2,3] ..... 200 mA
Average Forward Current (at I_{PEAK} = 100 mA, f ≥ 1 kHz)[3] ..... 45 mA
Transient Forward Current (10 μs Pulse)[4] ..... 500 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
Soldering Temperature ..... 260°C for 5 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 at or less than 30 mA are recommended.
3. Refer to Figure 5 for pulsed operating conditions.
4. The transient peak current is the maximum non-recurring pulse over a 10 μs duration that the device can withstand without damage to the LED die or wire bond.
5. Drive currents between 10 mA and 30 mA are recommended for best long term performance.
6. Operation at currents below 10 mA is not recommended, please contact your Hewlett-Packard sales representative.

Electrical/Optical Characteristics at T_A = 25°C

Parameter	Symbol	Min.	Typ.	Max.	Units	Test Conditions
Forward Voltage	V_F		1.9	2.4	V	I_F = 20 mA
Reverse Voltage	V_R	5	20		V	I_R 100 μA
Peak Wavelength:						
Amber (λ_d = 590 nm)	λ_{PEAK}		592		nm	Peak of Wavelength Spectral Distribution
Portland Orange (λ_d = 605 nm)			609			
Red-Orange (λ_d = 615 nm)			621			
Red (λ_d = 622 nm)			630			
Spectral Halfwidth:						
Amber	$\Delta\lambda_{1/2}$		17		nm	Wavelength Width at Spectral Distribution 1/2 Power Point
Portland Orange			17			
Red-Orange			18			
Red			20			
Speed of Response	τ_s		13		ns	Exponential Time Constant, e^{-t/τ_s}
Capacitance	C		40		pF	V_F = 0, f = 1 MHz
Thermal Resistance	$R\theta_{J\text{-}PIN}$		237		°C/W	LED Junction-to-Cathode Lead
Luminous Efficacy[1]						
Amber	η_v		480		lm/W	Emitted Luminous Power/Emitted Radiant Power
Portland Orange			370			
Red-Orange			263			
Red			197			

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.

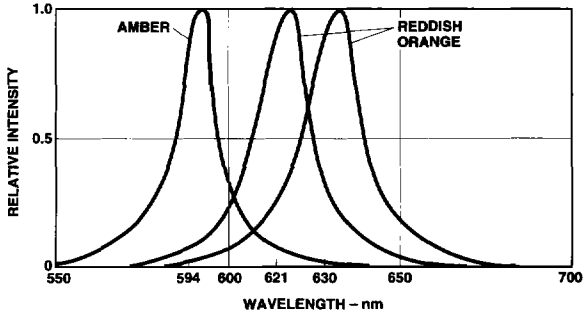


Figure 1. Relative Intensity vs. Wavelength.

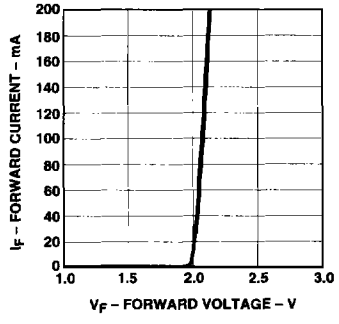


Figure 2. Forward Current vs. Forward Voltage.

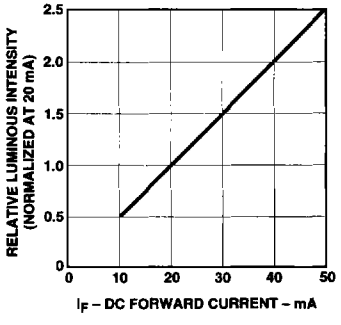


Figure 3. Relative Luminous Intensity vs. Forward Current.

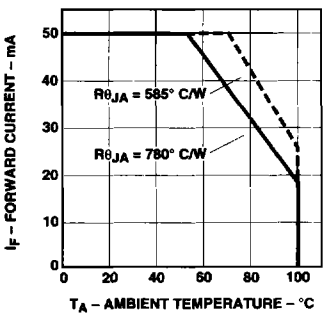


Figure 4. Maximum Forward Current vs. Ambient Temperature. Derating Based on T_{JMAX} = 130°C.

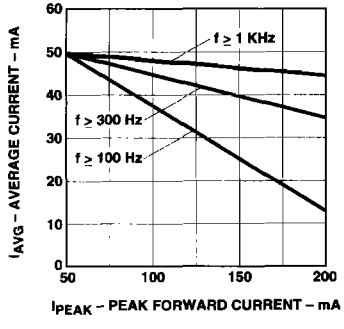


Figure 5. Maximum Average Current vs. Peak Forward Current.

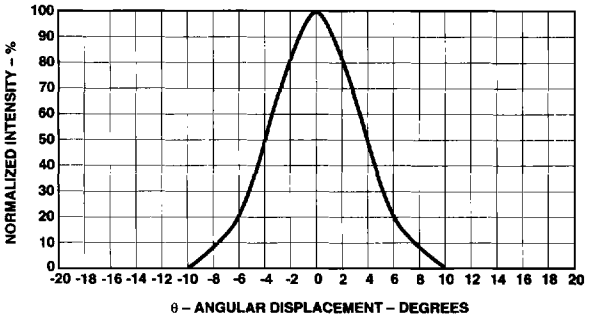


Figure 6. Spatial Radiation Pattern for 8° Viewing Angle Lamps.

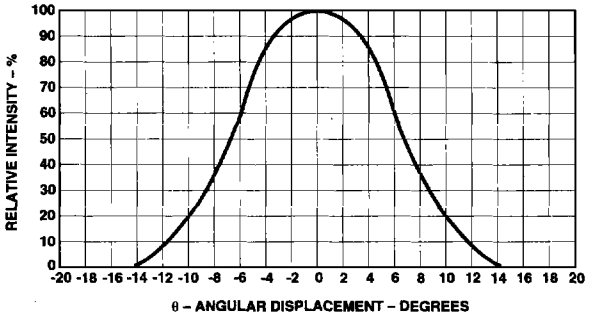


Figure 7. Spatial Radiation Pattern for 15° Viewing Angle Lamps.