Agilent Technologies
Innovating the HP Way

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

Technical Data

Sun Power Series
HLMP-ABxx HLMP-BBxx
HLMP-ADxx HLMD-BDxx
HLMP-AGxx HLMP-BGxx
HLMP-ALxx HLMP-BLxx
HLMP-AMxx HLMP-BMxx

Features

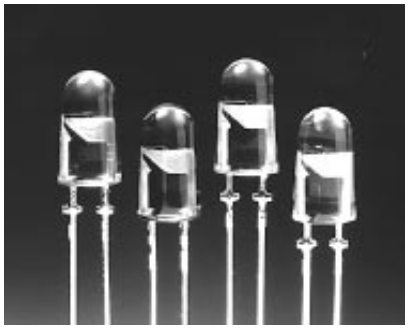
- **Smooth, Consistent Spatial Radiation Patterns**
- **Wide Viewing Angle**
  Major Axis 70˚
  Minor Axis 35˚
- **High Luminous Output**
- **Two Red and Amber Intensity Levels Available:**
  AlInGaP (bright) and
  AlInGaP II (brightest)
- **Colors:**
  472 nm Blue
  526 nm Green
  590/592 nm Amber
  626/630 nm Red
- **Superior Resistance to Moisture**
- **UV Resistant Epoxy**
- **Choice of Package Options**

Applications

- **Full Color/Video Signs**
- **Variable Message Signs**
  Passenger Information
  Advertising
  Time/Temperature

Benefits

- **Viewing Angle Designed for Wide Field of View Applications**
- **Red, Green, and Blue Radiation Patterns Matched for Full Color Signs**
- **Superior Outdoor Environmental Performance**



Description

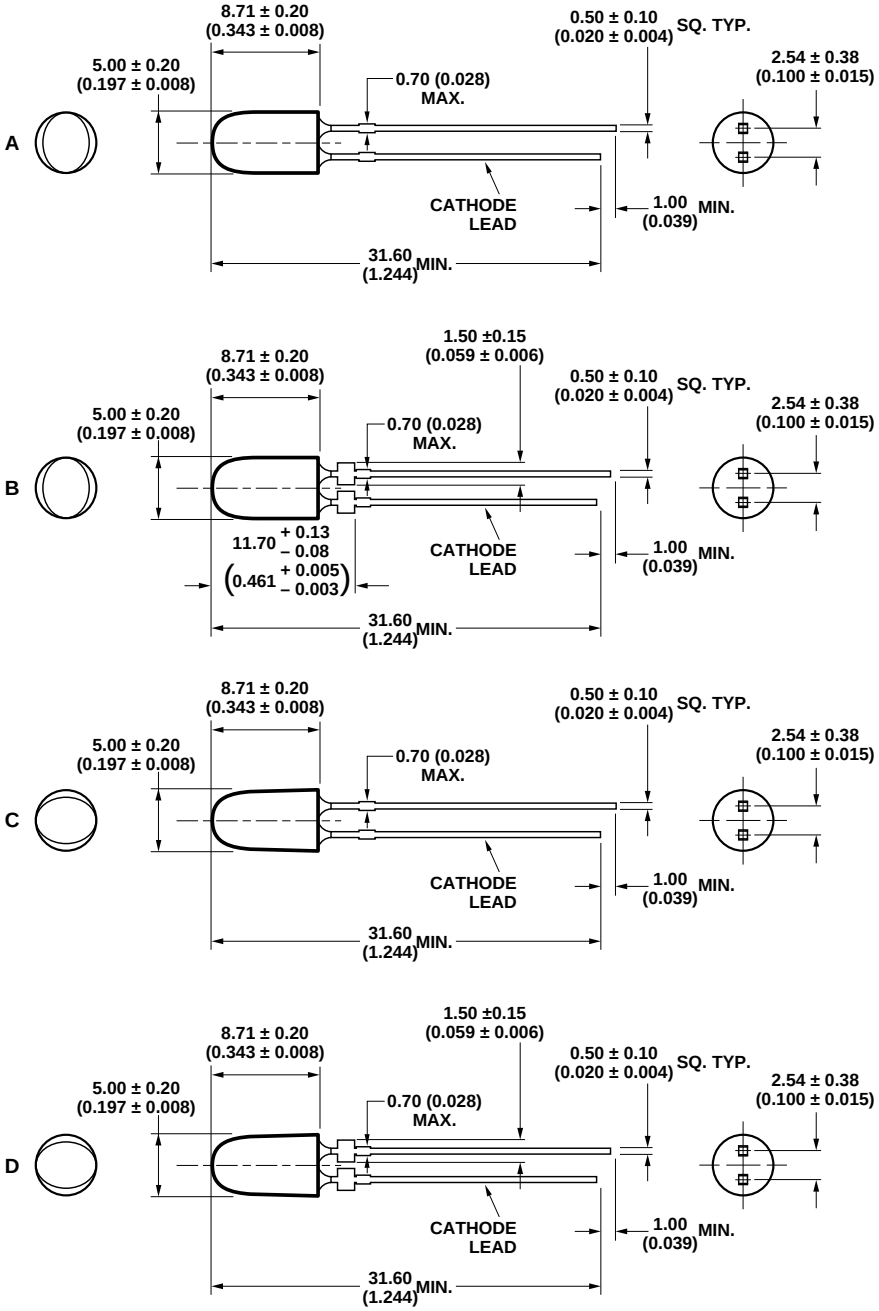
These Precision Optical Performance oval LEDs are specifically designed for Full Color/Video and Passenger Information signs. The oval shaped radiation pattern (35˚ x 70˚) and high luminous intensity ensure that these devices are excellent for wide field of view outdoor applications where a wide viewing angle and readability in sunlight are essential. These lamps have very smooth, matched radiation patterns ensuring consistent color mixing in full color applications, and message uniformity across the viewing angle of the sign.

High efficiency LED materials are used in these lamps: Aluminum Indium Gallium Phosphide (AlInGaP) for amber and red, and Indium Gallium Nitride (InGaN) for blue and green. There are two families of red and amber lamps, AlInGaP and the higher performance AlInGaP II. Each lamp is made with an advanced optical grade epoxy offering superior high temperature and high moisture resistance in outdoor applications. The package epoxy contains both UV-a and UV-b inhibitors to reduce the effects of long term exposure to direct sunlight.

Designers can select parallel (where the axis of the leads is parallel to the wide axis of the oval radiation pattern) or perpendicular orientation. Designers can also choose between lamps with or without standoffs. The red and amber lamps are available in tinted versions.

CAUTION: The Blue and Green LEDs are Class 1 ESD sensitive. Please observe appropriate precautions during handling and processing. Refer to Agilent Application Note AN-1142 for additional details.

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 PACKAGES A AND C WITHOUT STAND-OFFS: FLUSH MOUNTING AT BASE OF LAMP PACKAGE = 1.143/1.067 mm (0.044/0.042 IN.).
   – LAMP PACKAGES B AND D WITH STAND-OFFS: MOUNTING AT LEAD STAND-OFFS.

Part Numbering Scheme

HLMP-(1)(2)(3)(4)

where (1) = Leadframe Orientation

"A" = Parallel
"B" = Perpendicular

where (2) = Color Option

"L" = 590/592 nm Amber
"G" = 626 nm Red
"D" = 630 nm Red
"M" = 525 nm Green
"B" = 472 nm Blue

where (3) = Standoff Option

"0" = Without
"1" = With

where (4) = Tint Option

"1" or "6" = Matching Color Tints

Refer to selection guides for available combinations.

AlInGaP Device Selection Guide (Amber, Red)

Part Number	Color and Typical Dominant Wavelength λ_d(nm)	Luminous Intensity I_V(mcd) at 20 mA Min.	Luminous Intensity I_V(mcd) at 20 mA Typ.	Tinting Type	Leads with Stand-Offs	Lead Frame Orientation	Package Drawing
HLMP-AL01	Amber 590	270	600	Amber	No	Parallel	A
HLMP-AL11	Amber 590	270	600	Amber	Yes	Parallel	B
HLMP-BL01	Amber 590	270	600	Amber	No	Perpendicular	C
HLMP-BL11	Amber 590	270	600	Amber	Yes	Perpendicular	D
HLMP-AG01	Red 626	270	600	Red	No	Parallel	A
HLMP-AG11	Red 626	270	600	Red	Yes	Parallel	B
HLMP-BG01	Red 626	270	600	Red	No	Perpendicular	C
HLMP-BG11	Red 626	270	600	Red	Yes	Perpendicular	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. The dominant wavelength λ_d, is derived from the CIE Chromaticity Diagram and represents the color of the lamp.

AlInGaP2 Device Selection Guide (Amber, Red)

Part Number	Color and Typical Dominant Wavelength λ_d(nm)	Luminous Intensity I_V(mcd) at 20 mA Min.	Luminous Intensity I_V(mcd) at 20 mA Typ.	Tinting Type	Leads with Stand-Offs	Lead Frame Orientation	Package Drawing
HLMP-AL06	Amber 592	590	1300	Amber	No	Parallel	A
HLMP-AL16	Amber 592	590	1300	Amber	Yes	Parallel	B
HLMP-BL06	Amber 592	590	1300	Amber	No	Perpendicular	C
HLMP-BL16	Amber 592	590	1300	Amber	Yes	Perpendicular	D
HLMP-AD06	Red 630	590	1300	Red	No	Parallel	A
HLMP-AD16	Red 630	590	1300	Red	Yes	Parallel	B
HLMP-BD06	Red 630	590	1300	Red	No	Perpendicular	C
HLMP-BD16	Red 630	590	1300	Red	Yes	Perpendicular	D

InGaN Device Selection Guide (Blue, Green)

Part Number	Color and Typical Dominant Wavelength λ_d(nm)	Luminous Intensity I_V(mcd) at 20 mA Min.	Luminous Intensity I_V(mcd) at 20 mA Typ.	Tinting Type	Leads with Stand-Offs	Lead Frame Orientation	Package Drawing
HLMP-AM01	Green 526	590	1300	Green	No	Parallel	A
HLMP-AM11	Green 526	590	1300	Green	Yes	Parallel	B
HLMP-BM01	Green 526	590	1300	Green	No	Perpendicular	C
HLMP-BM11	Green 526	590	1300	Green	Yes	Perpendicular	D
HLMP-AB01	Blue 472	205	400	Blue	No	Parallel	A
HLMP-AB11	Blue 472	205	400	Blue	Yes	Parallel	B
HLMP-BB01	Blue 472	205	400	Blue	No	Perpendicular	C
HLMP-BB11	Blue 472	205	400	Blue	Yes	Perpendicular	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. The dominant wavelength λ_d, is derived from the CIE Chromaticity Diagram and represents the color of the lamp.

Absolute Maximum Ratings at 25˚C

	Amber and Red	Blue and Green
DC Forward Current	50 mA	30 mA
Peak Pulsed Forward Current	70 mA	100 mA
Average Forward Current (Pulsed Operation)	30 mA[1]	30 mA
Reverse Voltage (I_R = 100 µA)	5 V	
Reverse Voltage (I_R = 10 µA)		5 V
Power Dissipation	120 mW	120 mW
LED Junction Temperature	130˚C	100˚C
Operating Temperature Range	–40˚C to +100˚C	–40˚C to +80˚C
Storage Temperature Range	–40˚C to +120˚C	–40˚C to +100˚C
Soldering Temperature	260˚C for 5 sec.	260˚C for 5 sec.

Note:
1. Higher pulsed average currents can be used under certain conditions. Refer to Agilent Application Brief I-024.

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
Q	1150	1500
R	1500	1900
S	1900	2500

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. Please contact your Agilent representative for information on currently available bins.

Electrical/Optical Characteristics at T_A = 25°C

Parameter	Symbol	Min.	Typ.	Max.	Units	Test Conditions
Typical Viewing Angle						
Major	$2\theta_{1/2}$		70		°C	
Minor			35			
Forward Voltage						
Amber (λ_d = 590 nm)	V_F		2.02	2.4	V	I_F = 20 mA
Amber (λ_d = 592 nm)			2.15	2.4		
Red (λ_d = 626 nm)			1.90	2.4		
Red (λ_d = 630 nm)			2.00	2.4		
Blue (λ_d = 472 nm)			3.5	4.0		
Green (λ_d = 526 nm)			3.5	4.0		
Reverse Voltage						
Amber, Red	V_R	5	20		V	I_F = 100 µA
Blue, Green		5	–			I_F = 10 µA
Peak Wavelength						
Amber (λ_d = 590 nm)			592			Peak of
Amber (λ_d = 592 nm)	λ_{peak}		594		nm	Wavelength of
Red (λ_d = 626 nm)			635			Spectral
Red (λ_d = 630 nm)			639			Distribution at
Blue (λ_d = 472 nm)			470			I_F = 20 mA
Green (λ_d = 526 nm)			524			
Spectral Halfwidth						Wavelength
Amber (λ_d = 590/592 nm)	$\Delta\lambda_{1/2}$		17		nm	Width at
Red (λ_d = 626/630 nm)			17			Spectral
Blue (λ_d = 472 nm)			35			Distribution
Green (λ_d = 526 nm)			47			1/2 Power Point
						at I_F = 20 mA
Capacitance						V_F = 0, F = 1 MHz
Amber, Red	C		40		pF	
Blue, Green			43			
Thermal Resistance						LED Junction-
Amber, Red	$R\theta_{J\text{-}PIN}$		240		°C/W	to-Cathode Lead
Blue, Green			240			
Luminous Efficacy						Emitted
Amber (λ_d = 590 nm)			480			Luminous
Amber (λ_d = 592 nm)	η_V		500		Im/W	Power/Emitted
Red (λ_d = 626 nm)			150			Radiant Power
Red (λ_d = 630 nm)			155			
Blue (λ_d = 472 nm)			75			
Green (λ_d = 526 nm)			520			

Notes:
1. $2\theta_{1/2}$ is the off-axis angle where the luminous intensity is 1/2 the on-axis intensity.
2. 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.

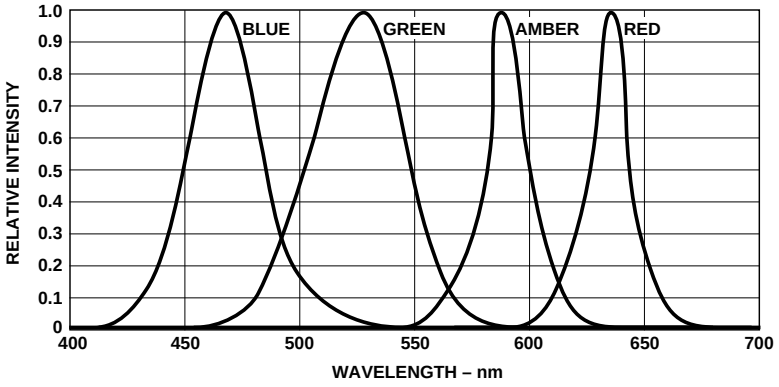


Figure 1. Relative Intensity vs. Wavelength.

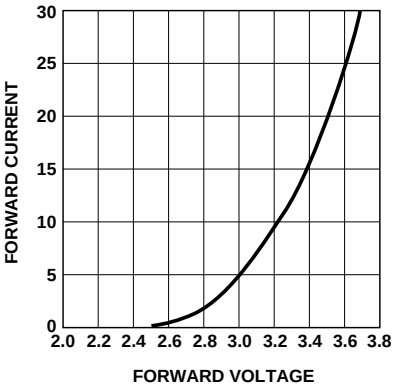


Figure 2. Blue, Green Forward Current vs. Forward Voltage.

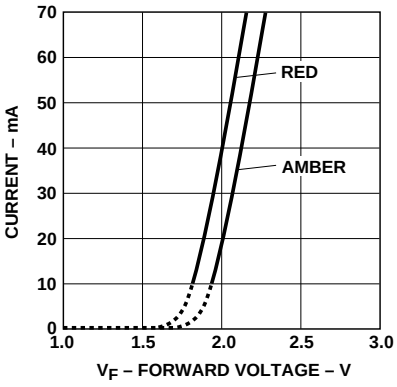


Figure 3. Amber, Red Forward Current vs. Forward Voltage.

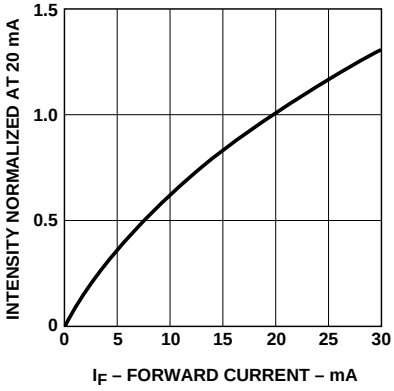


Figure 4. Blue, Green Relative Luminous Intensity vs. Forward Current.

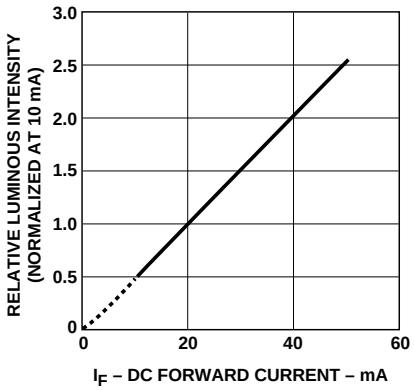


Figure 5. Amber, Red Relative Luminous Intensity vs. Forward Current.

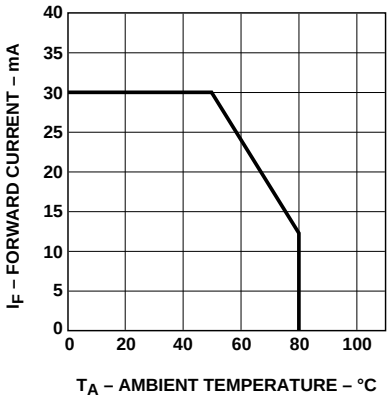


Figure 6. Blue, Green Maximum Forward Current vs. Ambient Temperature.

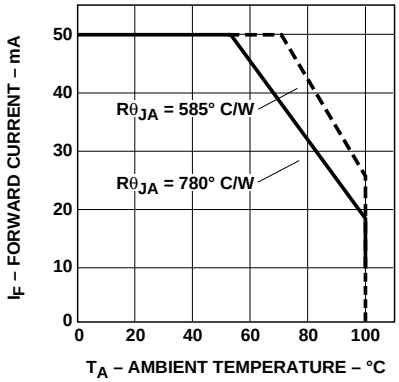


Figure 7. Amber, Red Maximum Forward Current vs. Ambient Temperature.

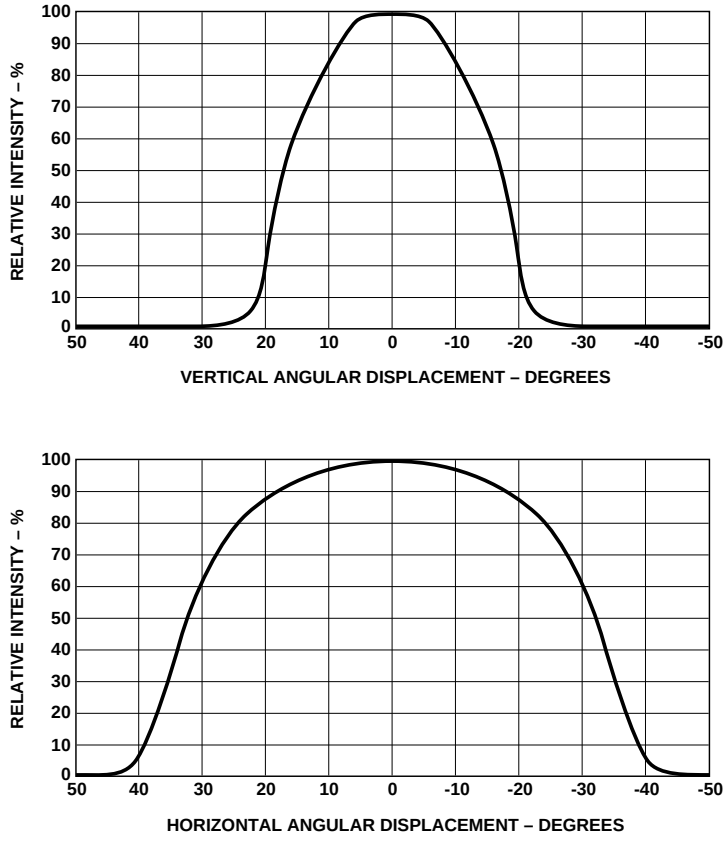


Figure 8. Spatial Radiation Pattern – 35 x 70 Degree Lamps.

www.semiconductor.agilent.com

Obsoletes 5967-5678E

5980-0672E (6/00)