HLMP-LD15, HLMP-LM15, HLMP-LB15

4mm Precision Optical Performance Red, Green and Blue Standard Oval LEDs

Data Sheet

Description

These Precision Optical Performance Oval LEDs are specifically designed for full color/video and passenger information signs. The oval shaped radiation pattern 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, message uniformity across the viewing angle of the sign. High efficiency LED material is used in these lamps: Aluminum Indium Gallium Phosphide (AlInGaP II) for red and Indium Gallium Nitride for blue and green. 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.

Features

- Well defined spatial radiation pattern
- High brightness material
- Available in red, green and blue color.
  - Red AlInGaP 630mm
  - Green InGaN 525nm
  - Blue InGaN 470nm
- Superior resistance to moisture

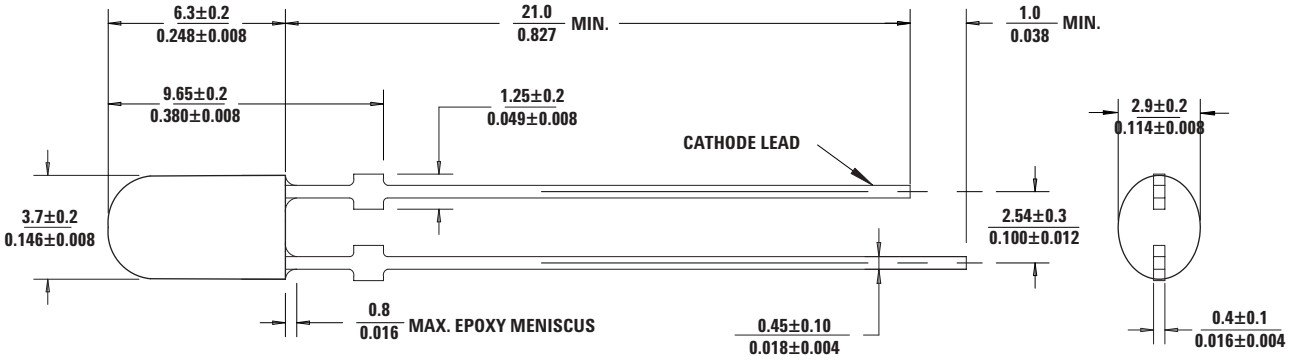
Benefits

- Viewing angle designed for wide filed of view applications
- Superior performance for outdoor environments

Applications

- Full color signs
- Commercial outdoor advertising.

Package Dimension



Notes:
1. Dimension in millimeters (inches).

Caution: InGaN devices are Class I ESD sensitive. Please observe appropriate precautions during handling and processing. Refer to Application Note AN-1142 for additional details.

Device Selection Guide

Part Number	Color and Dominant Wavelength λd (nm) Typ.	Luminous Intensity Iv (mcd) at 20 mA		Tinting Type
		Min.	Max	
HLMP-LD15-NRTxx	Red 630	680	1900	Red
HLMP-LM15-QT0xx	Green 525	1150	3200	Green
HLMP-LB15-KN0xx	Blue 470	310	880	Blue

Notes:
1. The luminous intensity is measured on the mechanical axis of the lamp package
2. The tolerance for intensity limit is ±15%
3. The optical axis is closely aligned with the package mechanical axis
4. The dominant wavelength, λ_d, is derived from the Chromaticity Diagram and represents the color of the lamp.

Part Numbering System

HLMP - L X 15 - X X X XX

Mechanical Option
00: Bulk
ZZ: Flexi-Bin, Ammo pack

Color Bin Options
0: No color bin limitation
T: Red Color with max V_F of 2.6V

Maximum Intensity Bin
Refer to Device Selection Guide

Minimum Intensity Bin
Refer to Device Selection Guide

Color
B: 470nm Blue
M: 525nm Green
D: 630nm Red

Package
L: 4mm standard Oval

Absolute Maximum Rating $T_A = 25^oC$

Parameter	Red	Blue and Green	Unit
DC Forward Current [1]	50	30	mA
Peak Forward Current	100[2]	100[3]	mA
Power Dissipation	120	130	mW
Reverse Voltage	5 (I_R = 100 μA)	5 (I_R = 10 μA)	V
LED Junction Temperature	130	130	°C
Operating Temperature Range	-40 to +100	-40 to +80	°C
Storage Temperature Range	-40 to +120	-40 to +100	°C

Notes:
1. Derate linearly as shown in Figure 4 and Figure 8.
2. Duty Factor 30%, frequency 1Khz.
3. Duty Factor 10%, frequency 1kHz.

Electrical/Optical Characteristics

Parameter	Symbol	Min.	Typ.	Max.	Units	Test Condition
Forward Voltage	V_F				V	I_F = 20 mA
Red (λ_d = 630nm)[1]			2.3	2.6		
Blue (λ_d = 470nm)			3.8	4.0		
Green (λ_d = 525nm)			3.8	4.0		
Reverse Voltage	V_R	5			V	
Red (λ_d = 630nm)						I_R = 100 μA
Blue (λ_d = 470nm)						I_R = 10 μA
Green (λ_d = 525nm)						I_R = 10 μA
Peak Wavelength	λ_{peak}				nm	Peak of wavelength of spectral
Red (λ_d = 630nm)			639			distribution at I_F = 20 mA
Blue (λ_d = 470nm)			467			
Green (λ_d = 525nm)			520			
Spectral Half width	$\Delta\lambda_{1/2}$				nm	Wavelength width at spectral
Red (λ_d = 630nm)			17			distribution power point at
Blue (λ_d = 470nm)			24			I_F = 20 mA
Green (λ_d = 525nm)			35			
Capacitance	C				pF	V_F = 0, F = 1 MHz
Red (λ_d = 630nm)			40			
Blue (λ_d = 470nm)			43			
Green (λ_d = 525nm)			43			
Thermal Resistance	$R\theta_{J\text{-}PIN}$		240		°C/W	LED Junction to cathode lead
Luminous Efficacy [2]	η_v				lm/W	Emitted luminous power/emitted
Red (λ_d = 630nm)			155			radiant power
Blue (λ_d = 470nm)			75			
Green (λ_d = 525nm)			520			

Notes:
1. Refer to VF bin table.
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.

AlInGaP Red 630nm

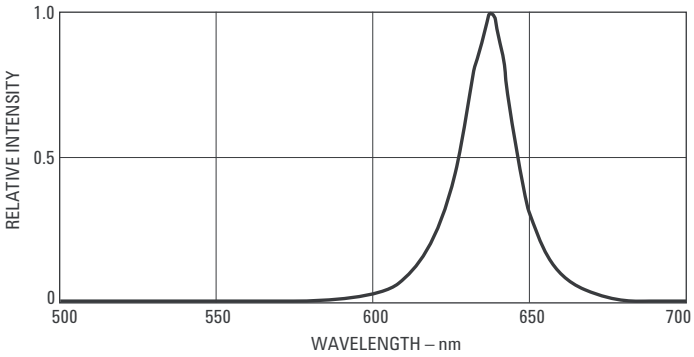


Figure 1. Relative intensity vs. wavelength

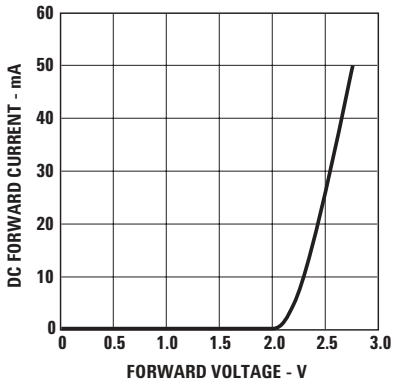


Figure 2. Forward current vs. forward voltage

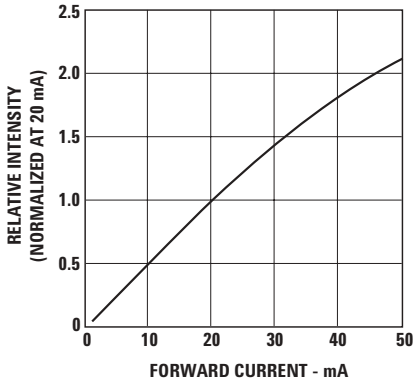


Figure 3. Relative luminous intensity vs. forward current

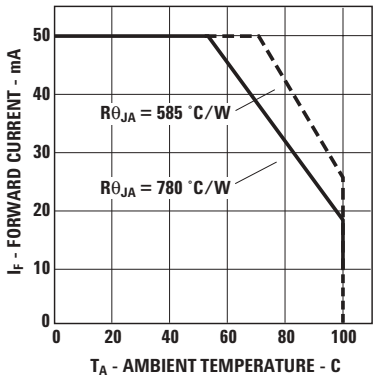


Figure 4. Forward current vs. ambient temperature

InGaN Blue and Green

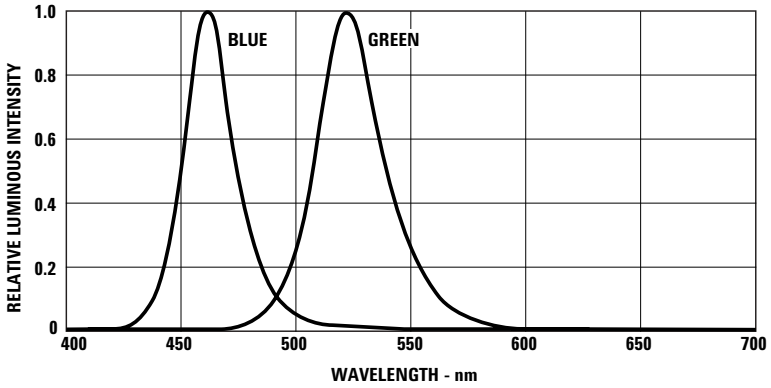


Figure 5. Relative intensity vs. wavelength

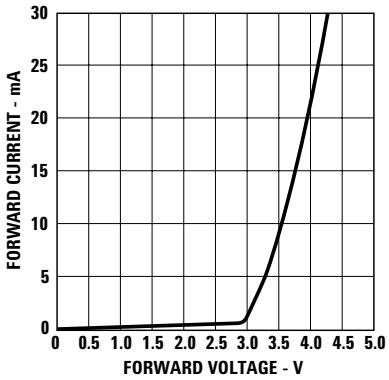


Figure 6. Forward current vs. forward voltage.

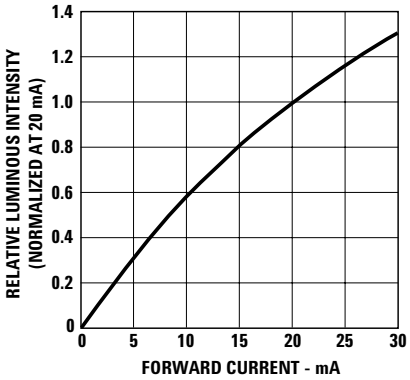


Figure 7. Relative luminous intensity vs. forward current.

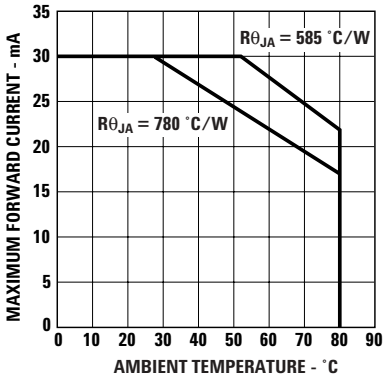


Figure 8. Forward current vs. ambient temperature.

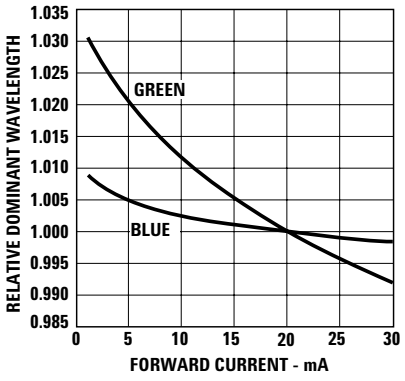


Figure 9. Relative dominant wavelength vs. forward current

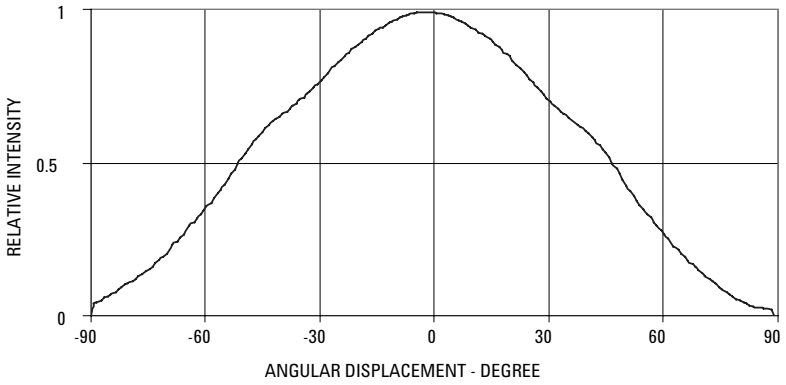


Figure 10a. Spatial radiation pattern – major axis for RBG

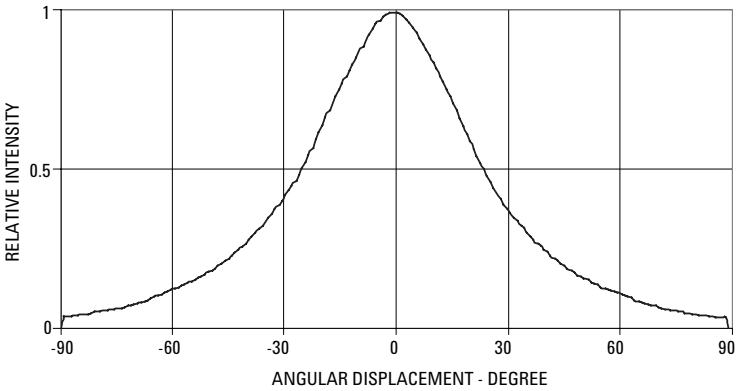


Figure 10b. Spatial radiation pattern – minor axis for RGB

Intensity Bin Limit Table

	Intensity (mcd) at 20 mA	
Bin	**Min**	**Max**
K	310	400
L	400	520
M	520	680
N	680	880
P	880	1150
Q	1150	1500
R	1500	1900
S	1900	2500
T	2500	3200
U	3200	4200

Tolerance for each bin limit is ± 15%

VF bin Table [2] (V at 20mA)

Bin ID	Min.	Max.
VA	2.0	2.2
VB	2.2	2.4
VC	2.4	2.6

Tolerance for each bin limit is ±0.05V.

Blue Color Bin Table

Bin	Min Dom	Max Dom	Xmin	Ymin	Xmax	Ymax
1	460.0	464.0	0.1440	0.0297	0.1766	0.0966
			0.1818	0.0904	0.1374	0.0374
2	464.0	468.0	0.1374	0.0374	0.1699	0.1062
			0.1766	0.0966	0.1291	0.0495
3	468.0	472.0	0.1291	0.0495	0.1616	0.1209
			0.1699	0.1062	0.1187	0.0671
4	472.0	476.0	0.1187	0.0671	0.1517	0.1423
			0.1616	0.1209	0.1063	0.0945
5	476.0	480.0	0.1063	0.0945	0.1397	0.1728
			0.1517	0.1423	0.0913	0.1327

Tolerance for each bin limit is ±0.5nm

Green Color Bin Table

Bin	Min Dom	Max Dom	Xmin	Ymin	Xmax	Ymax
1	520.0	524.0	0.0743	0.8338	0.1856	0.6556
			0.1650	0.6586	0.1060	0.8292
2	524.0	528.0	0.1060	0.8292	0.2068	0.6463
			0.1856	0.6556	0.1387	0.8148
3	528.0	532.0	0.1387	0.8148	0.2273	0.6344
			0.2068	0.6463	0.1702	0.7965
4	532.0	536.0	0.1702	0.7965	0.2469	0.6213
			0.2273	0.6344	0.2003	0.7764
5	536.0	540.0	0.2003	0.7764	0.2659	0.6070
			0.2469	0.6213	0.2296	0.7543

Tolerance for each bin limit is ±0.5 nm

Red Color Range

Bin	Min Dom	Max Dom	Xmin	Ymin	Xmax	Ymax
	622	634	0.6904	0.3094	0.6945	0.2888
			0.6726	0.3106	0.7135	0.2865

Tolerance for each bin limit is ±0.5 nm

Note:

1. All bin categories are established for classification of products. Products may not be available in all bin categories. Please contact your Avago Technologies representative for further information.
2. VF bin table only available for those AlInGaP Red devices with options –xxTxx.

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 Condition:

- 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 1.59mm below the body (encapsulant epoxy) for those parts without standoff.
- Recommended soldering condition:

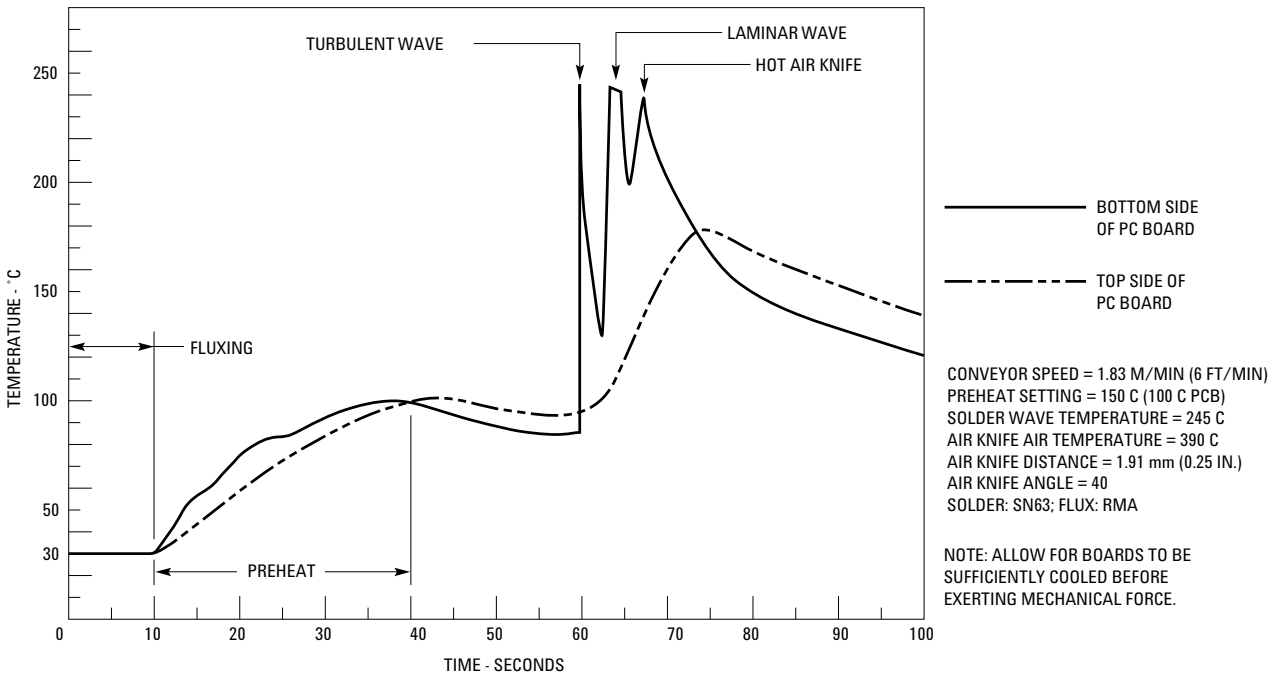
	Wave Soldering	Manual Solder Dipping
Pre-heat temperature	105 °C Max.	–
Preheat time	30 sec Max	–
Peak temperature	250 °C Max.	260 °C Max.
Dwell time	3 sec Max.	5 sec Max

- Wave soldering parameter must be set and maintain 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 holes size for LED component leads.

LED component ead size	Diagonal	Plated through hole diameter
0.457 x 0.457mm (0.018 x 0.018inch)	0.646 mm (0.025 inch)	0.976 to 1.078 mm (0.038 to 0.042 inch)
0.508 x 0.508mm (0.020 x 0.020inch)	0.718 mm (0.028 inch)	1.049 to 1.150mm (0.041 to 0.045 inch)

Note: Refer to application note AN1027 for more information on soldering LED components.

Recommended Wave Soldering Profile



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

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