HLMP-HD55

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

Data Sheet

HLMP-HD55, HLMP-HM57, HLMP-HB57

Description

These Extra Bright 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 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: higher performance Aluminum Indium Gallium Phosphide (AlInGaP II) for red color, Indium Gallium Nitride (InGaN) for blue and green. Each lamp is made with an advance optical grade epoxy offering superior high temperature and high moisture resistance in outdoor applications.

Features

- **Well defined spatial radiation pattern**
- **High brightness material**
- **Available in red, green and blue color**

Benefits

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

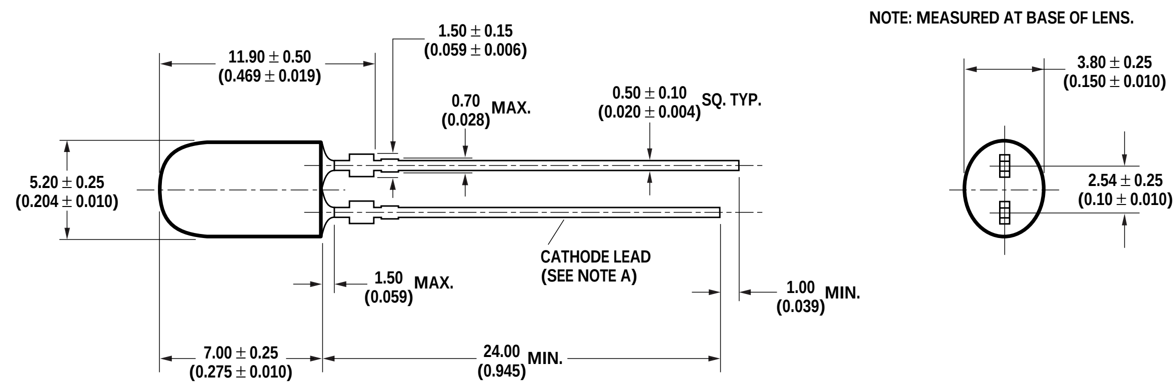
Applications

- **Full color signs**
- **Commercial outdoor advertising**

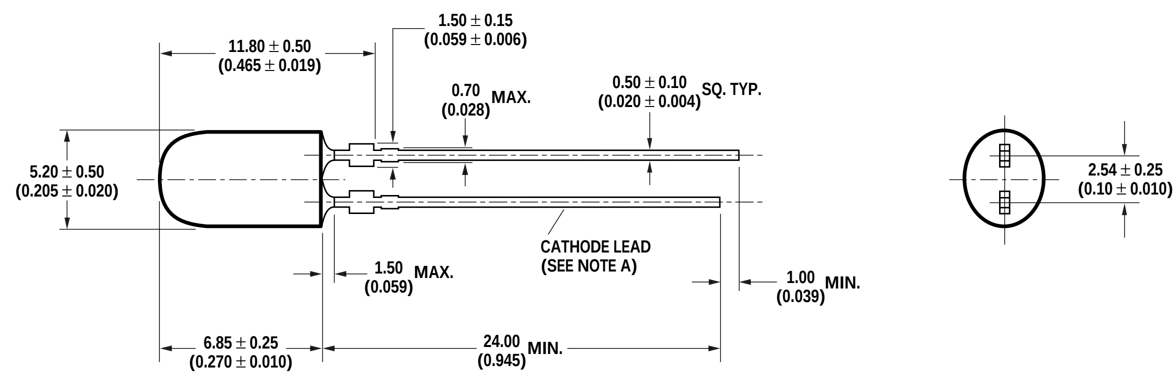
> ***Caution***: *InGaN devices are Class I ESD sensitive. Please observe appropriate precautions during handling and processing. Refer to Application Note AN-1142 for additional details.*

Package Dimensions

A



B



NOTES:
1. DIMENSIONS IN MILLIMETERS (INCHES).
2. FOR InGaN BLUE AND GREEN (PACKAGE B), IF HEAT-SINKING APPLICATION IS REQUIRED, THE TERMINAL FOR HEAT SINK IS ANODE.

Device Selection Guide

Part Number	Color	Typical Dominant Wavelength λ_d (nm)	Luminous Intensity Iv (mcd) at 20 mA		Lens Type	Package Dimension
			Minimum	Maximum		
HLMP-HD55-NR0xx	Red	630	680	1900	Tinted, Diffused	A
HLMP-HB57-KN0xx	Blue	470	310	880	Tinted, Diffused	B
HLMP-HB57-LMCxx	Blue	470	400	680	Tinted, Diffused	B
HLMP-HB57-LP0xx	Blue	470	400	1150	Tinted, Diffused	B
HLMP-HM57-SV0xx	Green	525	1900	5500	Tinted, Diffused	B
HLMP-HM57-RSCxx	Green	525	1500	2500	Tinted, Diffused	B
HLMP-HM57-RU0xx	Green	525	1500	4200	Tinted, Diffused	B

Notes:
1. Tolerance for luminous intensity measurement is ±15%.
2. The luminous intensity is measured on the mechanical axis of the lamp package.
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.
5. LED light output is bright enough to cause injuries to the eyes. Precautions must be taken to prevent looking directly at the LED with unaided eyes.

Part Numbering System

HLMP - x x 5x - x x x xx

Mechanical Option
00: Bulk
DD: Ammo Pack
ZZ: Flexi-Bin; Ammo Pack

Color Bin Option
0: Full Color Bin Distribution
C: Color Bin 3 & 4

Maximum Intensity Bin
Refer to Device Selection Guide

Minimum Intensity Bin
Refer to Device Selection Guide

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

Package
H: 5 mm Standard Oval

Absolute Maximum Rating at T_A = 25ºC

Parameters	Blue and Green	Red	Unit
DC Forward Current[1]	30	50	mA
Peak Pulsed Forward Current	100[2]	100[3]	mA
Power Dissipation	116	120	mW
LED Junction Temperature	130	130	°C
Operating Temperature Range	-40 to +85	-40°C to 100°C	°C
Storage Temperature Range	-40 to +100	-40°C to 120°C	°C

Notes:
1. Derate linearly as shown in Figures 2 and 7.
2. Duty factor 10%, frequency 1 KHz.
3. Duty factor 30%, frequency 1 KHz.

Electrical / Optical Characteristics

T_A = 25°C

		Value				
Parameters	**Symbol**	**Min.**	**Typ.**	**Max.**	**Units**	**Test Condition**
Forward Voltage	V_F				V	I_F = 20 mA
Red			2.20	2.40		
Green			3.30	3.85		
Blue			3.20	3.85		
Reverse Voltage[1]	V_R				V	
Red		5.0				I_R = 100 µA
Green, Blue		5.0				I_R = 10 µA
Capacitance	C				pF	V_F = 0, f = 1 MHz
Red			40			
Green			65			
Blue			64			
Thermal Resistance[2]	$R\theta_{J\text{-}PIN}$		240		°C/W	LED Junction to Cathode Lead
Dominant Wavelength[3,4]	λ_d				nm	I_F = 20 mA
Red		622	630	634		
Green		520	525	540		
Blue		460	470	480		
Peak Wavelength	λ_{PEAK}				nm	Peak of Wavelength of Spectral Distribution at I_F = 20 mA
Red			639			
Green			516			
Blue			464			
Spectral Half Width	$\Delta\lambda_{1/2}$				nm	Wavelength Width at Spectral Distribution Power Point at I_F = 20 mA
Red			17			
Green			32			
Blue			23			
Luminous Efficacy[4]	η_v				lm/W	Emitted Luminous Power/Emitted Radiant Power
Red			155			
Green			484			
Blue			74			

Notes:
1. The reverse voltage of blue and green is equivalent to the forward voltage of the protective chip at I_R = 10 µA. The reverse voltage of red is equivalent to the forward voltage of the protective chip at I_R = 100 µA.
2. For AlInGaP Red, the thermal resistance applied to LED junction to cathode lead. For InGaN Blue and Green, the thermal resistance applied to LED junction to anode lead.
3. The dominant wavelength, λ_d, is derived from the Chromaticity Diagram and represents the color of the lamp.
4. Tolerance for each color bin limit is ± 0.5 nm.
5. The radiant intensity, Ie in watts/steradian, may be found from the equation $Ie = Iv/\eta_v$, where Iv is the luminous intensity in candelas and η_v is the luminous efficacy in lumens/watt.

AlInGaP Red 630nm

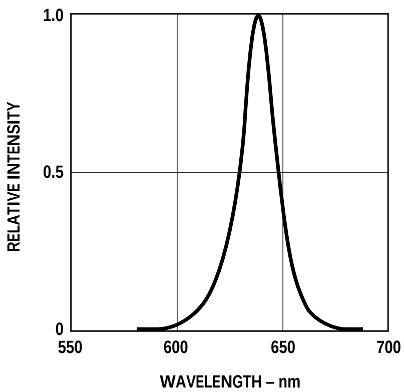


Figure 1. Relative intensity vs. wavelength.

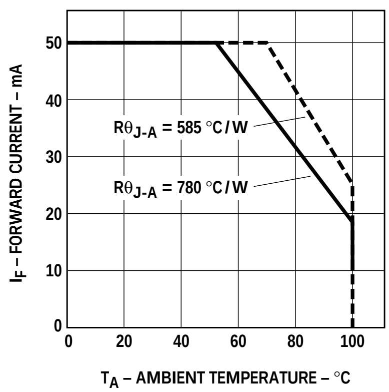


Figure 2. Forward current vs. ambient temperature.

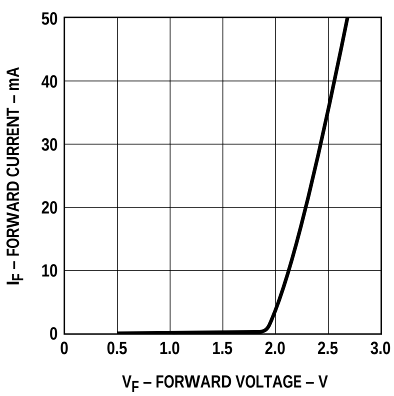


Figure 3. Forward current vs. forward voltage.

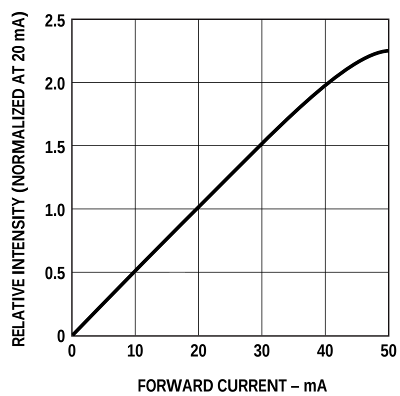


Figure 4. Relative luminous intensity vs. forward current.

InGaN Blue and Green

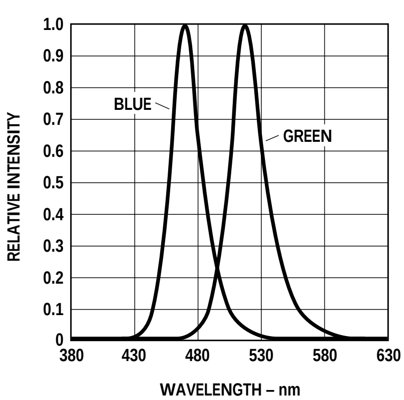


Figure 5. Relative intensity vs. wavelength.

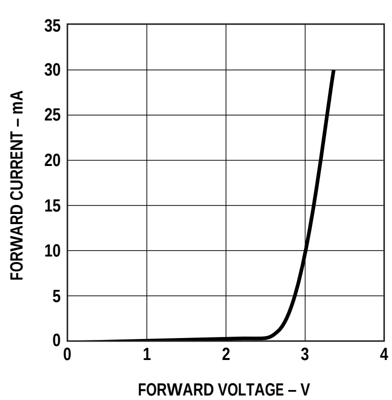


Figure 6. Forward current vs. forward voltage.

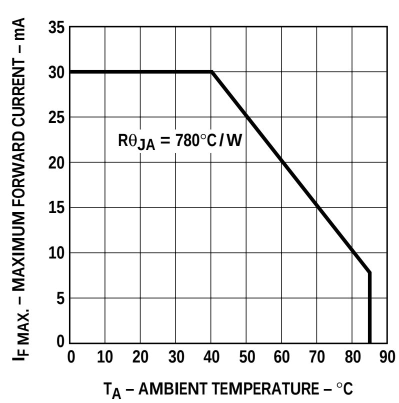


Figure 7. Forward current vs. ambient temperature.

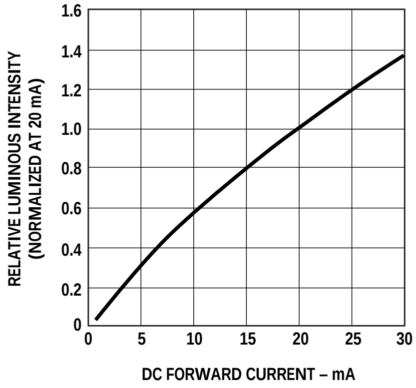


Figure 8. Relative intensity vs. forward current.

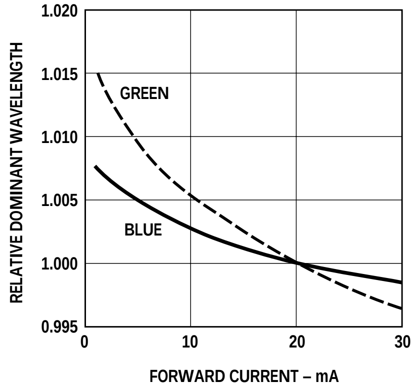


Figure 9. Relative dominant wavelength vs. DC forward current.

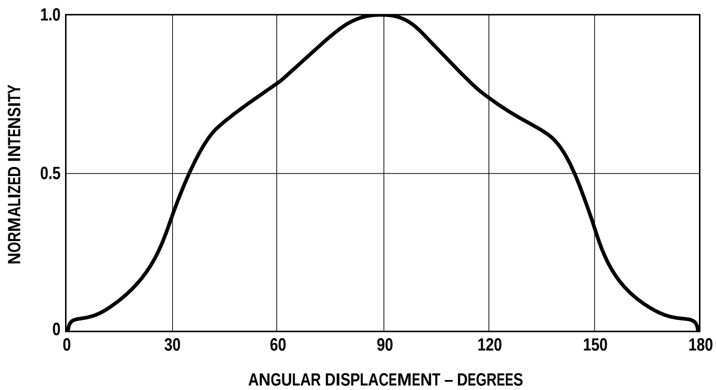


Figure 10. Spatial radiation pattern – major axis.

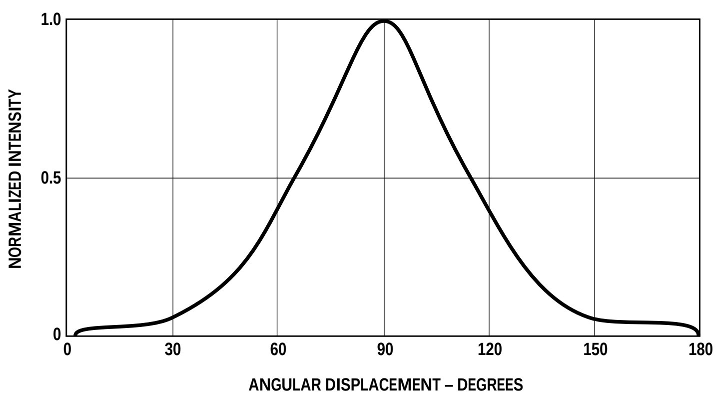


Figure 11. Spatial radiation pattern – minor axis.

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
V	4200	5500

Tolerance for each bin limit is ± 15%.

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 ± 0.5 nm.

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

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.

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.

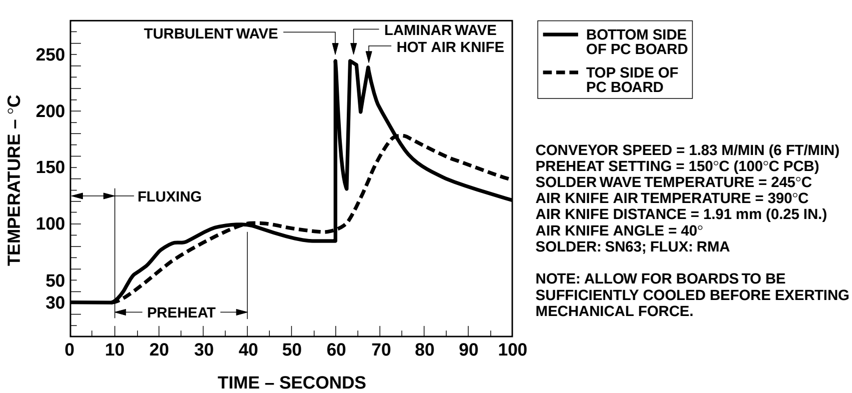


Figure 12. Recommended wave soldering profile.

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