

HLMP-AD61, HLMP-AM61 and HLMP-AB61  
Precision Optical Performance Red, Green and Blue  
5mm Mini 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.

### Features

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

Red AlInGaP 630nm

Green InGaN 525nm

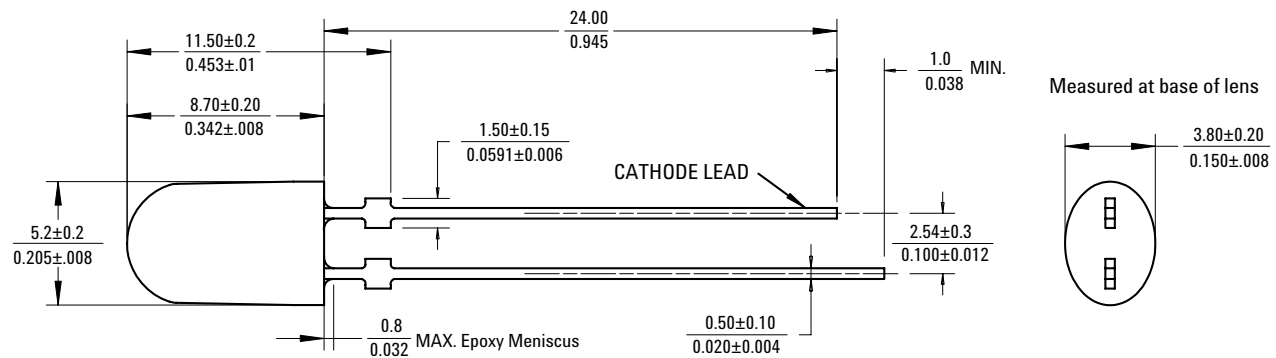
Blue InGaN 470nm

- Superior resistance to moisture
- Standoff package

### Applications

- Full color signs
- Commercial outdoor advertising.

### Package Dimensions



#### NOTES:

Dimensions in Millimeters (Inches)

For Blue and Green if heat-sinking application is required, the terminal for heat sink is anode.

*Caution: InGaN devices are Class 1C HBM ESD Sensitive per JEDEC Standard. Please observe appropriate precautions during handling and processing. Refer to Application Note AN-1142 for additional details.*

## Device Selection Guide

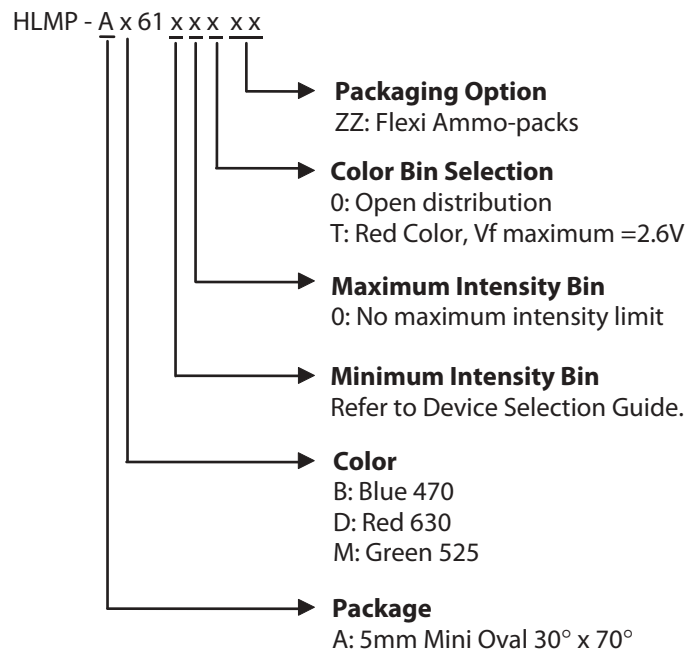
Part Number	Color and Dominant Wavelength $\lambda_d$ (nm) Typ	Luminous Intensity $I_v$ (mcd) at 20 mA Min	Luminous Intensity $I_v$ (mcd) at 20 mA Max
HLMP-AD61-X1TZZ	Red 630	1660	3500
HLMP-AM61-Z30ZZ	Green 525	2400	5040
HLMP-AB61-RU0ZZ	Blue 470	550	1150

Tolerance for each intensity limit is  $\pm 15\%$ .

Notes:

1. The luminous intensity is measured on the mechanical axis of the lamp package

## Part Numbering System



### Absolute Maximum Rating ( $T_A = 25^\circ\text{C}$ )

Parameter	Red	Blue and Green	Unit
DC Forward Current <sup>[1]</sup>	50	30	mA
Peak Forward Current	100 <sup>[2]</sup>	100 <sup>[3]</sup>	mA
Power Dissipation	130	116	mW
Reverse Voltage	5 ( $I_R = 100 \mu\text{A}$ )	5 ( $I_R = 10 \mu\text{A}$ )	V
LED Junction Temperature	130	110	$^\circ\text{C}$
Operating Temperature Range	-40 to +100	-40 to +85	$^\circ\text{C}$
Storage Temperature Range	-40 to +120	-40 to +100	$^\circ\text{C}$

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 ( $T_A = 25^\circ\text{C}$ )

Parameter	Symbol	Min.	Typ.	Max.	Units	Test Conditions
Forward Voltage	$V_F$				V	$I_F = 20 \text{ mA}$
Red		2.0	2.3	2.6 <sup>[1]</sup>		
Green		2.8	3.3	3.8		
Blue		2.8	3.2	3.8		
Reverse Voltage	$V_R$				V	
Red		5				$I_F = 100 \mu\text{A}$
Green & blue		5				$I_F = 10 \mu\text{A}$
Dominant Wavelength	$\lambda_D$					$I_F = 20 \text{ mA}$
Red		622	630	634		
Green		520	525	540		
Blue		460	470	480		
Peak Wavelength	$\lambda_{PEAK}$					
Red			639		nm	Peak of Wavelength of Spectral Distribution at $I_F = 20 \text{ mA}$
Green			516			
Blue			464			
Spectral Half width	$\Delta\lambda_{1/2}$					
Red			17		nm	Wavelength Width at Spectral Distribution 1/2 Power Point at $I_F = 20 \text{ mA}$
Green			32			
Blue			23			
Thermal Resistance,	$R\theta_{J-PIN}$		240		$^\circ\text{C/W}$	LED Junction-to-pin
Luminous Efficacy <sup>[3]</sup>	$\eta_V$					
Red			155		lm/W	Emitted Luminous Power/Emitted Radiant Power
Green			520			
Blue			75			

Notes:

1. For option -xxTxx, the VF maximum is 2.6V, refer to Vf bin table
2. The dominant wavelength is derived from the chromaticity Diagram and represents the color of the lamp
3. 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  $\eta_V$  is the luminous efficacy in lumens/watt
4. Forward voltage allowable tolerance is  $\pm 0.05\text{V}$
5. For AlInGaP Red, thermal resistance applied to LED junction to cathode lead. For InGaP blue and Green, thermal resistance applied to LED junction to anode lead

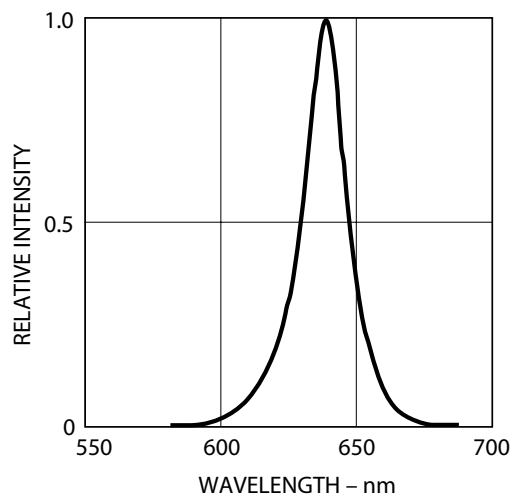


Figure 1. Relative Intensity vs Wavelength

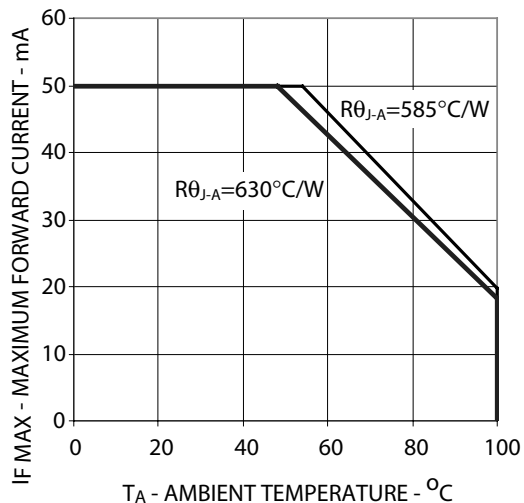


Figure 2. Maximum Forward Current vs Ambient Temperature

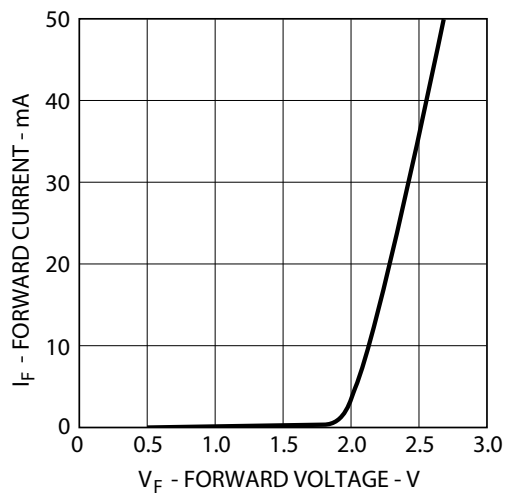


Figure 3. Forward Current vs Forward Voltage

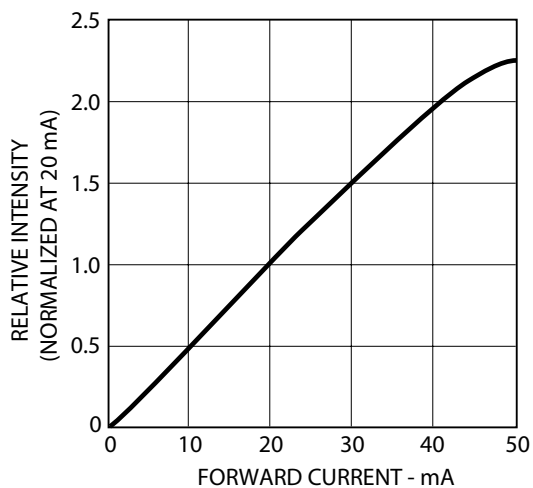


Figure 4. Relative Intensity vs Forward Current

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InGaN Blue and Green

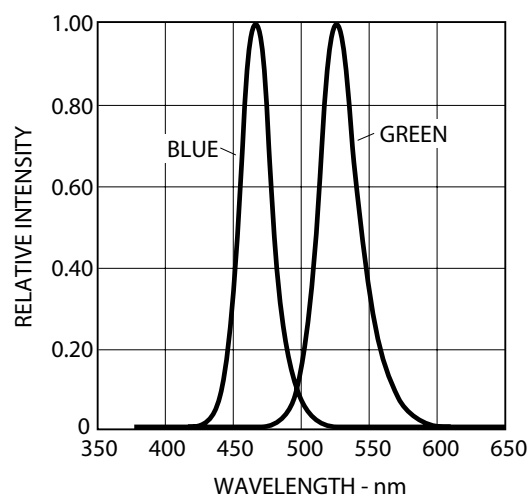


Figure 5. Relative Intensity vs Wavelength

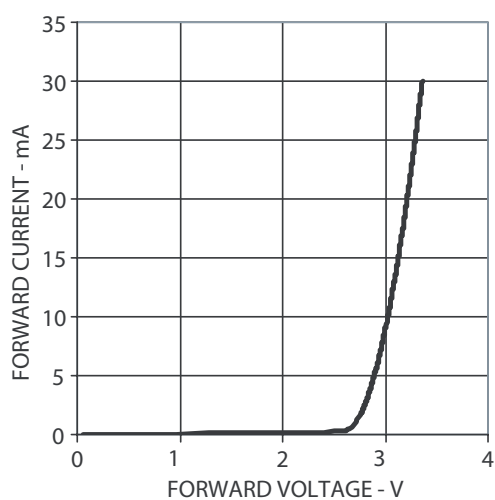


Figure 6. Forward Current vs Forward Voltage

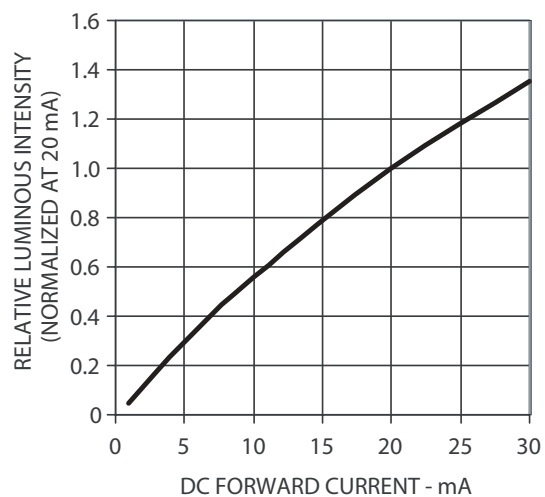


Figure 7. Relative Intensity vs Forward Current

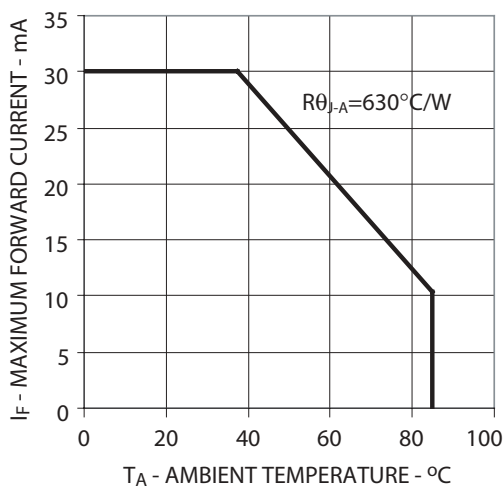
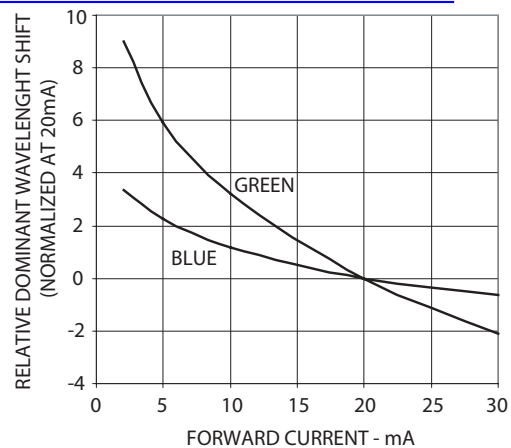
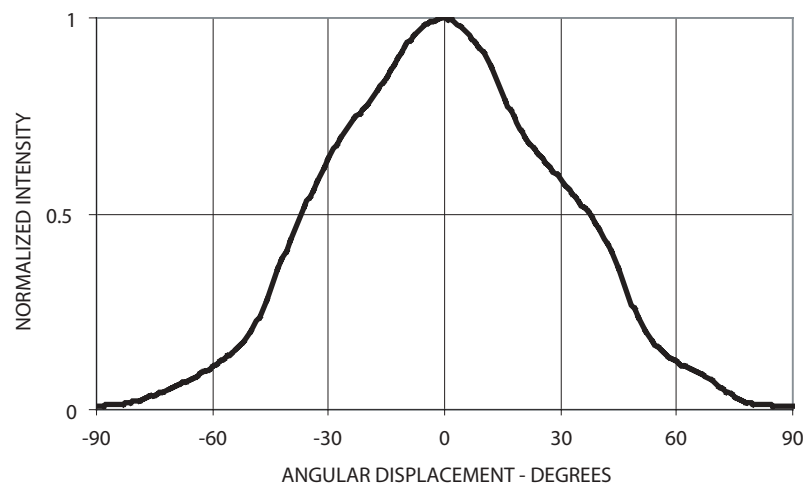


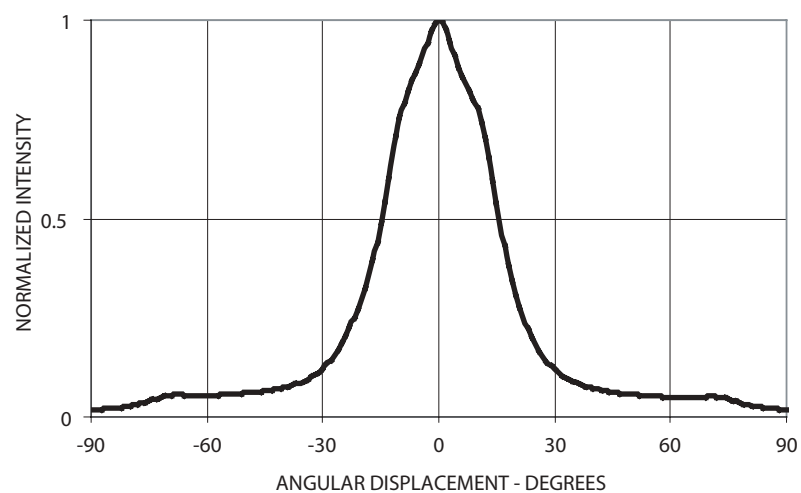
Figure 8. Maximum Forward Current vs Ambient Temperature



**Figure 9. Relative dominant wavelength vs Forward Current**



**Figure 10. Radiation pattern-Major Axis**



**Figure 11. Radiation pattern-Minor Axis**

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**Intensity Bin Limit Table (1.2: 1 Iv Bin Ratio)**

Bin	Intensity (mcd) at 20 mA	
	Min	Max
Q	460	550
R	550	660
S	660	800
T	800	960
U	960	1150
V	1150	1380
W	1380	1660
X	1660	1990
Y	1990	2400
Z	2400	2900
1	2900	3500
2	3500	4200
3	4200	5040

Tolerance for each bin limit is  $\pm 15\%$

**VF bin Table (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  $\pm 0.05$

**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  $\pm 0.5$  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  $\pm 0.5$ nm

**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

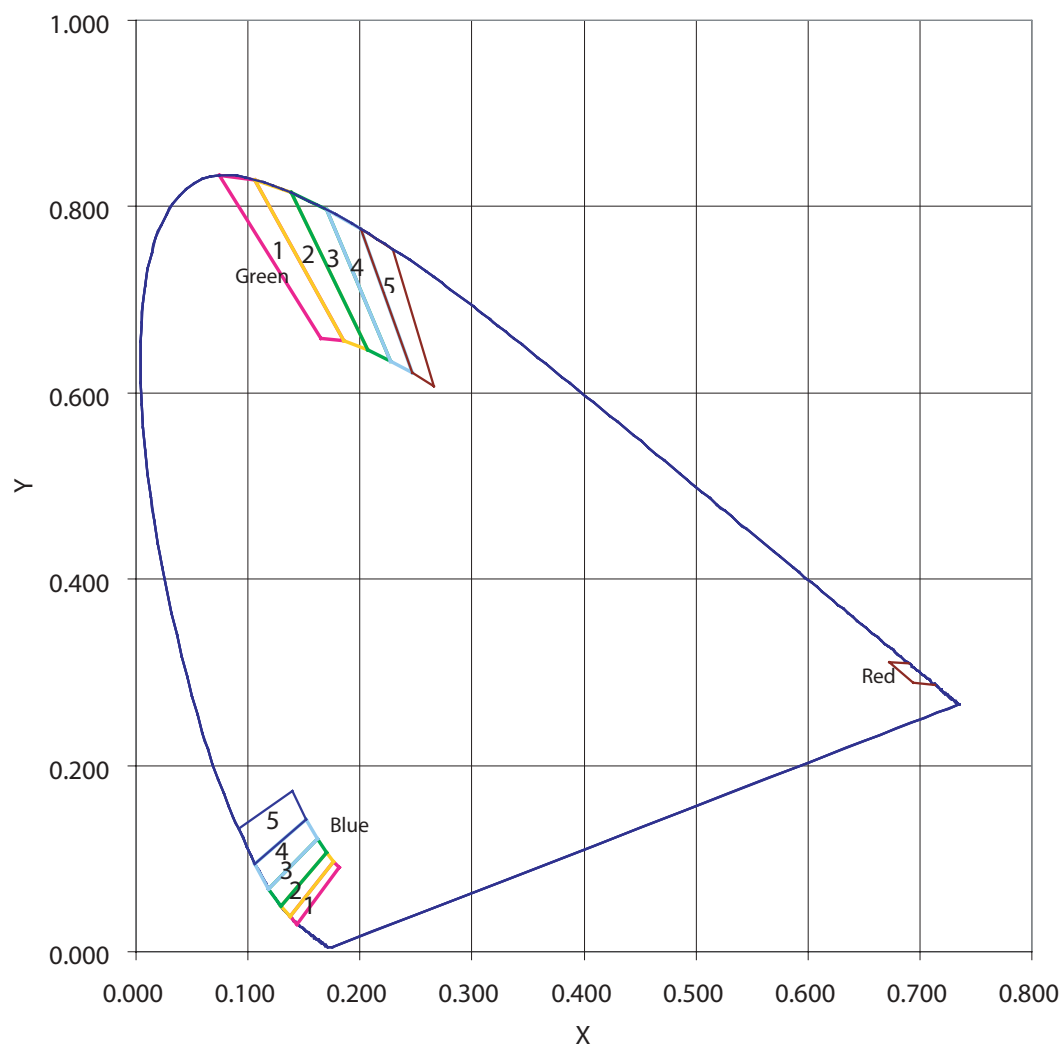
Tolerance for each bin limit is  $\pm 0.5$ nm

Note:

1. All bin categories are established for classification of products. Products may not be available in all bin categories. Please contact your Avago representative for further information

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### Avago Color Bin on CIE 1931 Chromaticity Diagram





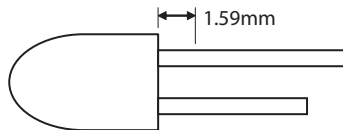
## Precautions

### 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.
- For better control, it is recommended to use proper tool to precisely form and cut the leads to length rather than doing it manually.

### Soldering Condition:

- Care must be taken during PCB assembly and soldering process to prevent damage to LED component.
- The closest manual soldering distance of the soldering heat source (soldering iron's tip) to the body is 1.59mm. Soldering the LED closer than 1.59mm might damage the LED.



- Recommended soldering condition:

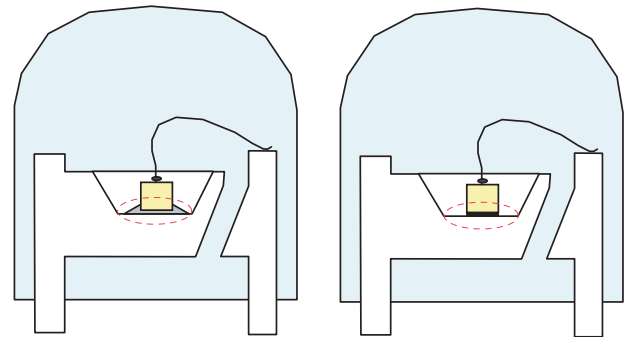
	Wave Soldering	Manual Solder Dipping
Pre-heat temperature	105 °C Max.	-
Preheat time	30 sec Max	-
Peak temperature	250 °C Max.	260 °C Max.
Dwell time	3 sec Max.	5 sec Max

- Wave soldering parameter must be set and maintain according to recommended temperature and dwell time in the solder wave. Customer is advised to daily check on the soldering profile to ensure the soldering profile used is always conforming to recommended soldering condition.

Note:

1. PCB with different size and design (component density) will have different heat mass (heat capacity). This might cause a change in temperature experienced by the board if same wave soldering setting is used. So, it is recommended to re-calibrate the soldering profile again prior to loading a new type of PCB.
2. Avago Technologies' high brightness LED are using high efficiency LED die with single wire bond as shown below. Customer is advised to take extra precaution during wave soldering to ensure that the maximum wave temperature is not exceeding recommendation of 250 °C. Over-stressing the LED during soldering process might cause premature failure to the LED due to delamination.

## Avago Technologies LED configuration



AllnGaP Device

InGaN Device

Note: Electrical connection between bottom surface of LED die and the leadframe material through conductive paste or solder.

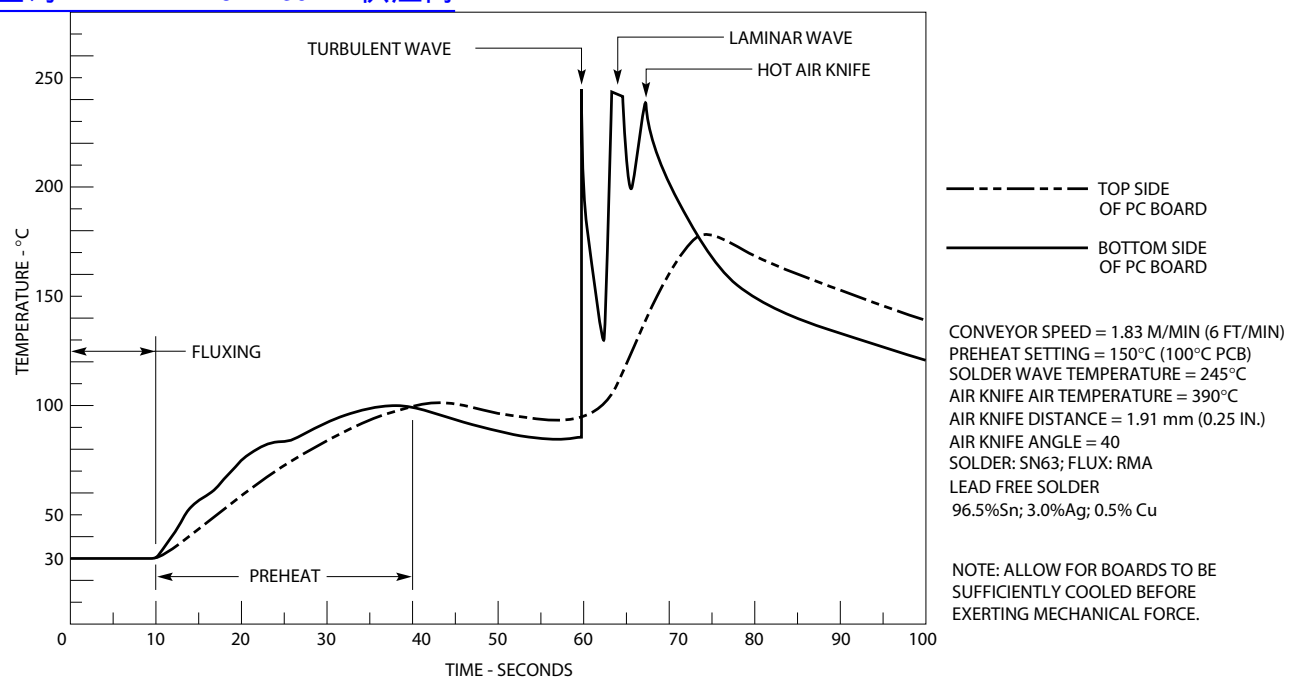
- If necessary, use fixture to hold the LED component in proper orientation with respect to the PCB during soldering process.

Note: In order to further assist customer in designing jig accurately that fit Avago Technologies' product, 3D model of the product is available upon request.

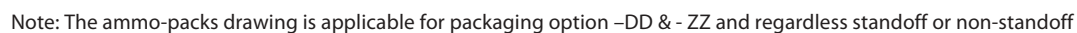
- At elevated temperature, the LED is more susceptible to mechanical stress. Therefore, PCB must be allowed to cool down to room temperature prior to handling, which includes removal of jigs, fixtures or pallet.
- Special attention must be given to board fabrication, solder masking, surface plating and lead holes size and component orientation to assure solderability.
- Recommended PC board plated through holes size for LED component leads.

LED component Lead 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.



### Ammo Packs Drawing



FROM LEFT SIDE OF BOX  
ADHESIVE TAPE MUST BE  
FACING UPWARDS.

ANODE LEAVES  
THE BOX FIRST.

ANODE

AVAGO  
TECHNOLOGIES

CATHODE

MOTHER LABEL

LABEL ON THIS  
SIDE OF BOX

11

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