

HLMP-LG3V, HLMP-LM3V, HLMP-LB3V

Red, Green and Blue

4 mm Oval LEDs



Data Sheet



Lead (Pb) Free
RoHS 6 fully
compliant



Description

These Oval LEDs are specifically designed for billboard sign and full color sign application. The oval shaped radiation pattern and high luminous intensity ensure that these devices are excellent for outdoor applications where a wide viewing angle and readability in sunlight are essential. The package epoxy contains UV inhibitors to reduce the effects of long term exposure to direct sunlight.

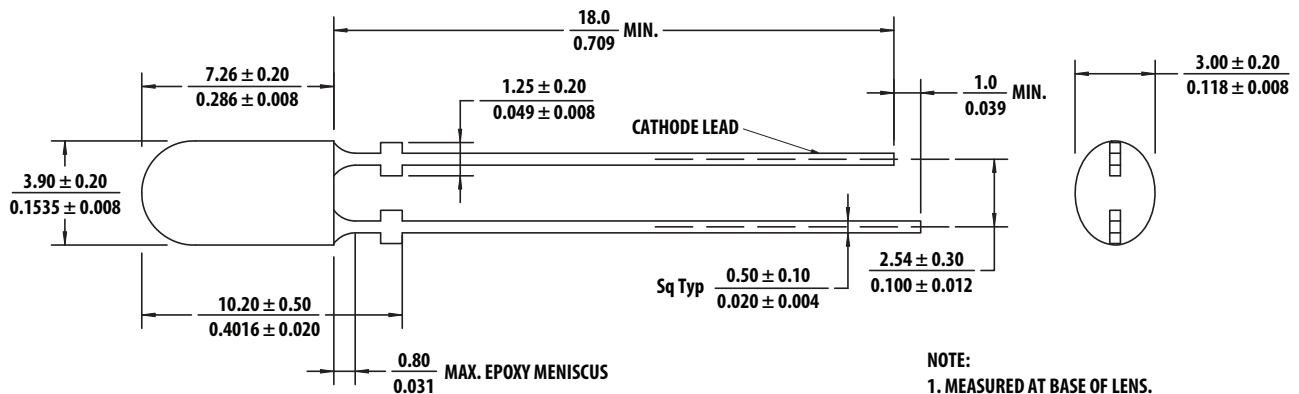
Applications

- Full color signs
- Billboard signs

Features

- Well-defined spatial radiation pattern
- High brightness material
- Available in red, green and blue color
 - Red AlInGaP 621 nm
 - Green InGaN 525 nm
 - Blue InGaN 468 nm
- Lower and tighter V_F range for InGaN
- Superior resistance to moisture
- Standoff Package
- Tinted and diffused
- Typical viewing angle $42^\circ \times 95^\circ$

Package Dimensions



Notes:

1. All dimensions in millimeters (inches).
2. Tolerance is ± 0.20 mm, unless other specified.

Caution: LED are 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

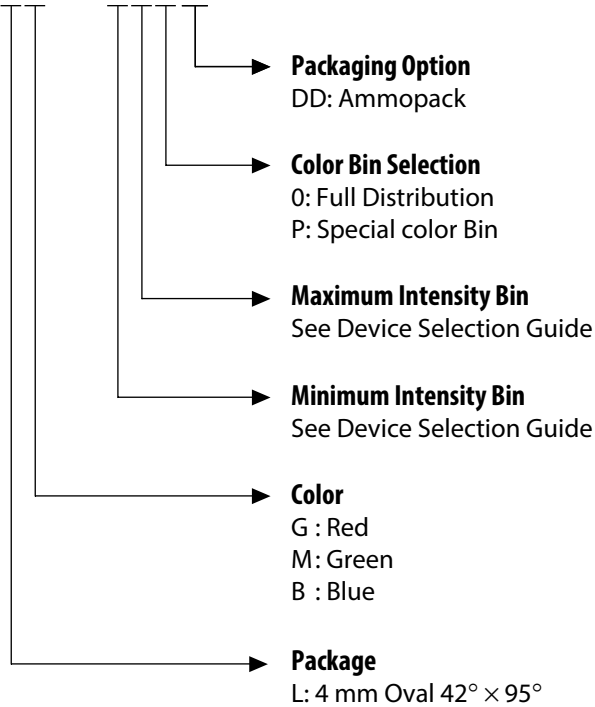
Part Number	Color and Dominant Wavelength λ_d (nm) Typ. [3]	Luminous Intensity I_v (mcd) at 20 mA [1,2,4]		
		Min.	Typ.	Max.
HLMP-LG3V-WX0DD	Red 621	1380	1700	1990
HLMP-LM3V-24PDD	Green 525	3500	4700	6050
HLMP-LB3V-TVPDD	Blue 468	800	960	1380

Notes:

1. The luminous intensity is measured on the mechanical axis of the lamp package and it is tested with pulsing condition.
2. The optical axis is closely aligned with the package mechanical axis.
3. Dominant wavelength, λ_d , is derived from the CIE Chromaticity Diagram and represents the color of the lamp.
4. Tolerance for each bin limit is $\pm 15\%$.

Part Numbering System

HLMP – L x 3V – x x x xx



Absolute Maximum Ratings $T_J = 25\text{ }^\circ\text{C}$

Parameter	Red	Green	Blue	Unit
DC Forward Current ^[1]	25	25	20	mA
Peak Forward Current	100 ^[2]	100 ^[2]	100 ^[2]	mA
Power Dissipation	60	82.5	66	mW
LED Junction Temperature		100		$^\circ\text{C}$
Operating Temperature Range		-40 to +85		$^\circ\text{C}$
Storage Temperature Range		-40 to +100		$^\circ\text{C}$

Notes:

1. Derate linearly as shown in Figure 4 and Figure 8.
2. Duty Factor 10%, frequency 1 kHz.

Electrical / Optical Characteristics $T_J = 25\text{ }^\circ\text{C}$

Parameter	Symbol	Min.	Typ.	Max.	Units	Test Conditions
Forward Voltage	V_F				V	$I_F = 20\text{ mA}$
Red		1.8	2.1	2.4		
Green		2.7	3.1	3.3		
Blue		2.8	3.1	3.3		
Reverse Voltage ^[2]	V_R				V	
Red		5				$I_R = 100\text{ }\mu\text{A}$
Green & Blue		5				$I_R = 10\text{ }\mu\text{A}$
Dominant Wavelength ^[1]	λ_d				nm	$I_F = 20\text{ mA}$
Red		618.0	621.0	630.0		
Green		523.0	525.0	533.0		
Blue		463.0	468.0	473.0		
Peak Wavelength	λ_{PEAK}				nm	Peak of Wavelength of Spectral Distribution at $I_F = 20\text{ mA}$
Red			629			
Green			517			
Blue			463			
Thermal Resistance	$R\theta_{J-PIN}$				$^\circ\text{C/W}$	LED Junction-to-Pin
Red			600			
Green			400			
Blue			400			

Notes:

1. The dominant wavelength is derived from the chromaticity Diagram and represents the color of the lamp.
2. Indicates product final testing condition. Long-term reverse bias is not recommended.

AllnGaP Red

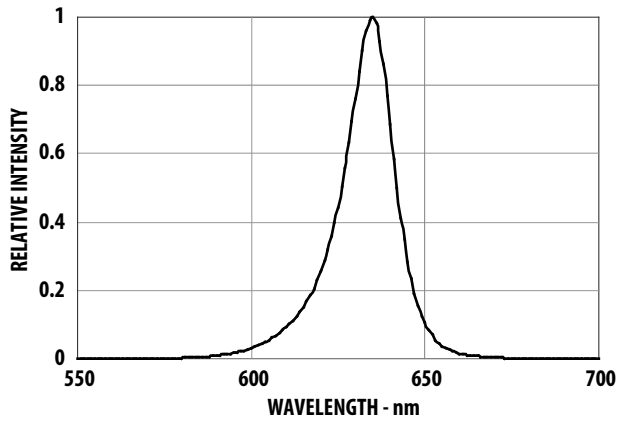


Figure 1. Relative Intensity vs. Wavelength

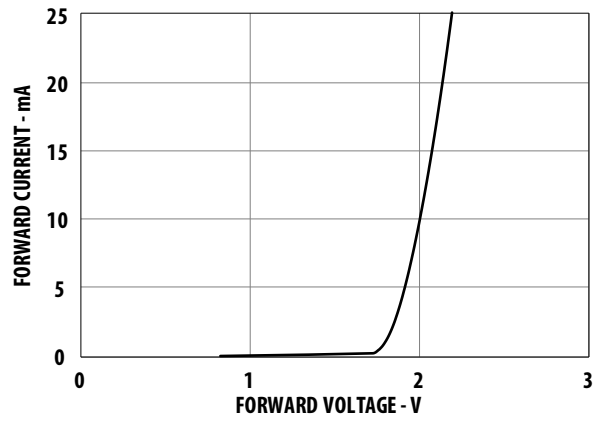


Figure 2. Forward Current vs. Forward Voltage

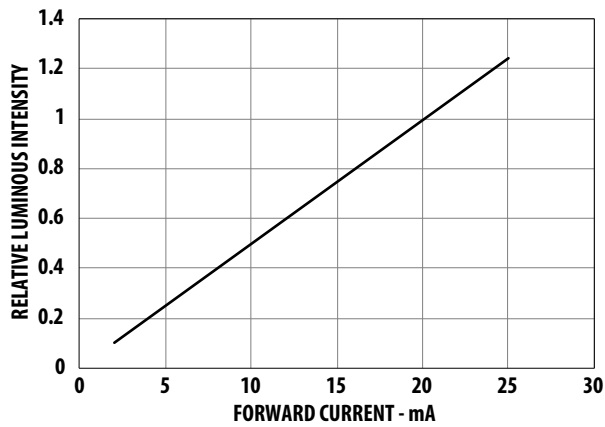


Figure 3. Relative Intensity vs. Forward Current

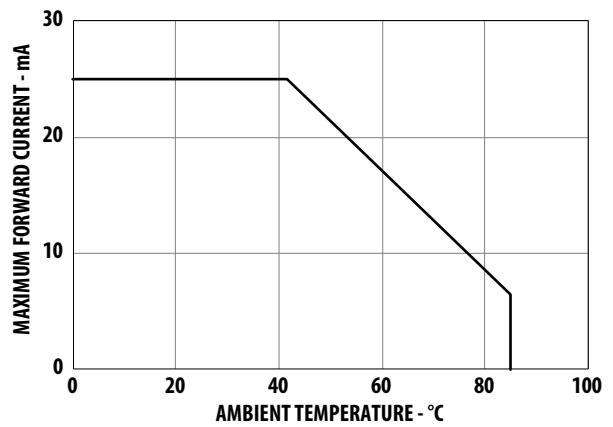


Figure 4. Maximum Forward Current vs. Ambient Temperature

InGaN Green and Blue

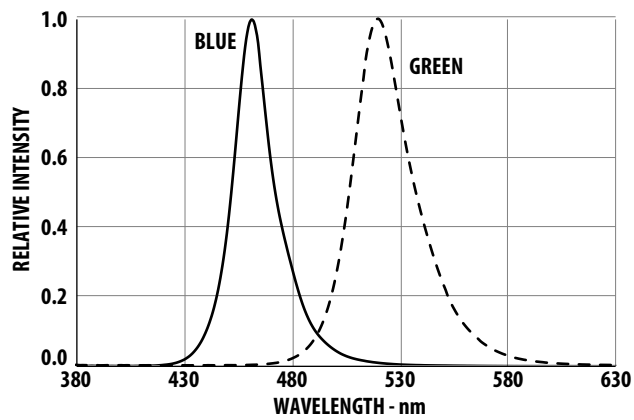


Figure 5. Relative Intensity vs. Wavelength

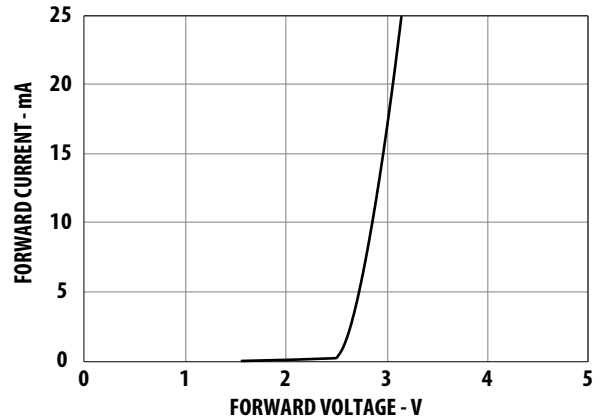


Figure 6. Forward Current vs. Forward Voltage

InGaN Green and Blue (Cont.)

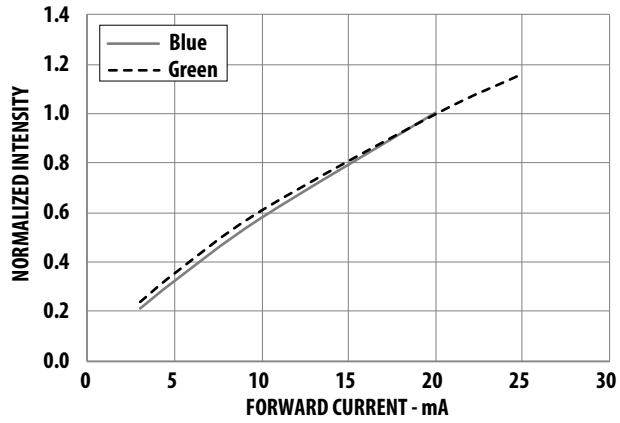


Figure 7. Relative Intensity vs. Forward Current

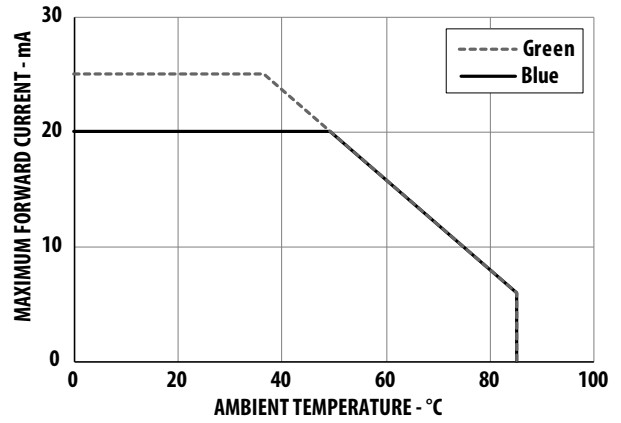


Figure 8. Maximum Forward Current vs. Ambient Temperature

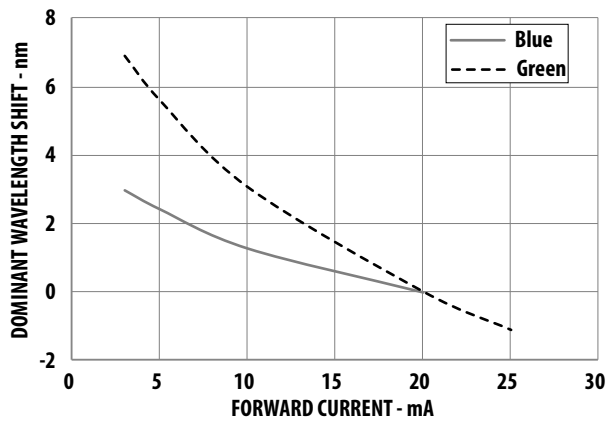


Figure 9. Dominant Wavelength Shift vs. Forward Current

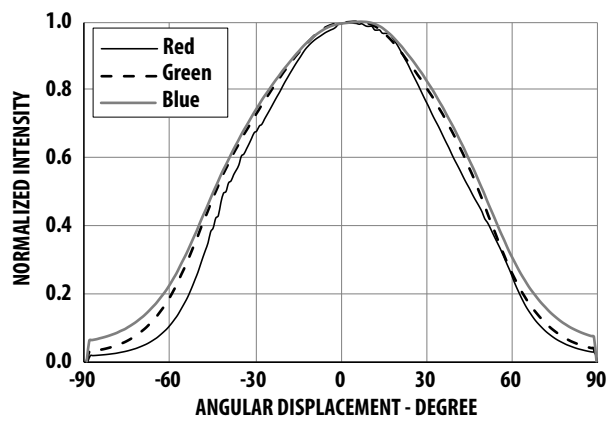


Figure 10. Radiation pattern-Major Axis

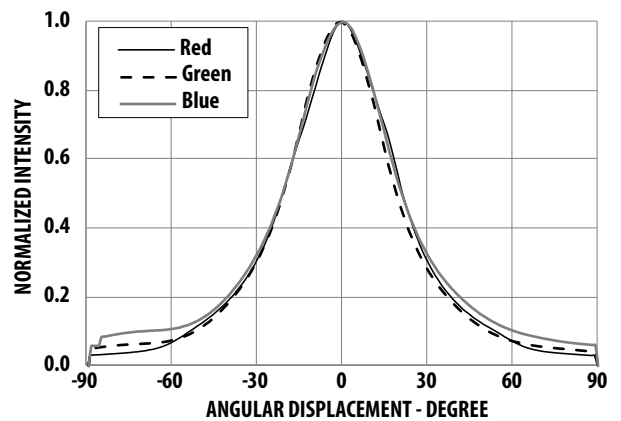


Figure 11. Radiation pattern-Minor Axis

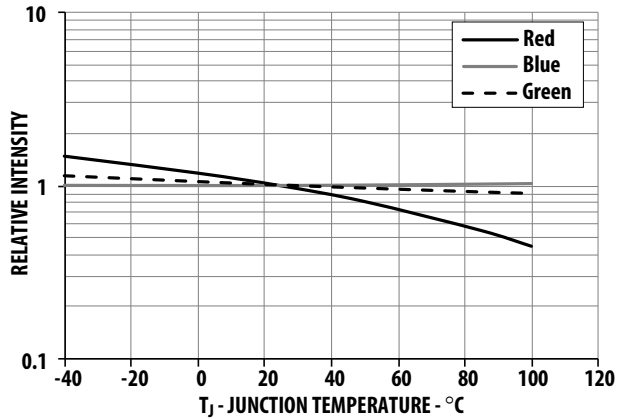


Figure 12. Relative Light Output vs. Junction Temperature

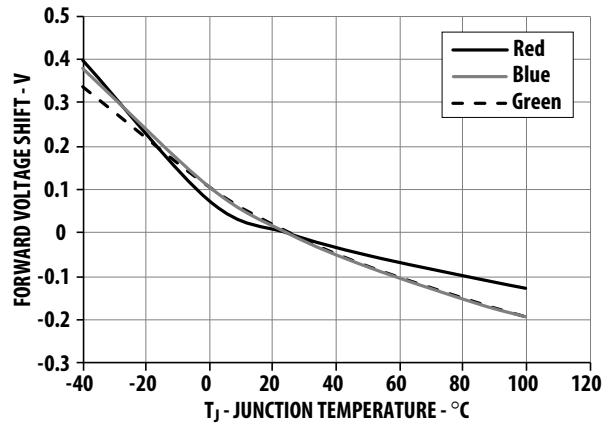


Figure 13. Forward Voltage Shift vs. Junction Temperature

Red Intensity Bin

Bin	Intensity (mcd) at 20 mA	
	Min.	Max.
W	1380	1660
X	1660	1990

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

Green Intensity Bin

Bin	Intensity (mcd) at 20 mA	
	Min.	Max.
2	3500	4200
3	4200	5040
4	4050	6050

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

Blue Intensity Bin

Bin Name	Min.	Max.
T	800	960
U	960	1150
V	1150	1380

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

V_F Bin Table (V at 20 mA)

Bin ID	Min.	Max.
VD	1.8	2.0
VA	2.0	2.2
VB	2.2	2.4

Notes:

1. Tolerance for each bin limit is ± 0.05 V.
2. V_F binning applicable only to Red color.

Red Color Range

Min Dom	Max Dom	Chromaticity Coordinate				
618.0	630.0	x	0.6872	0.6690	0.6890	0.7080
		y	0.3126	0.3149	0.2943	0.2920

Tolerance for each bin limit is ± 0.5 nm

Green Color Range

Bin	Min Dom	Max Dom	Chromaticity Coordinate				
			2B	523.0	528.0	x	0.0979
			y	0.8316	0.6821	0.6703	0.8148
3B	528.0	533.0	x	0.1387	0.1971	0.2245	0.1779
			y	0.8148	0.6703	0.6542	0.7917

Tolerance for each bin limit is ± 0.5 nm

Blue Color Range

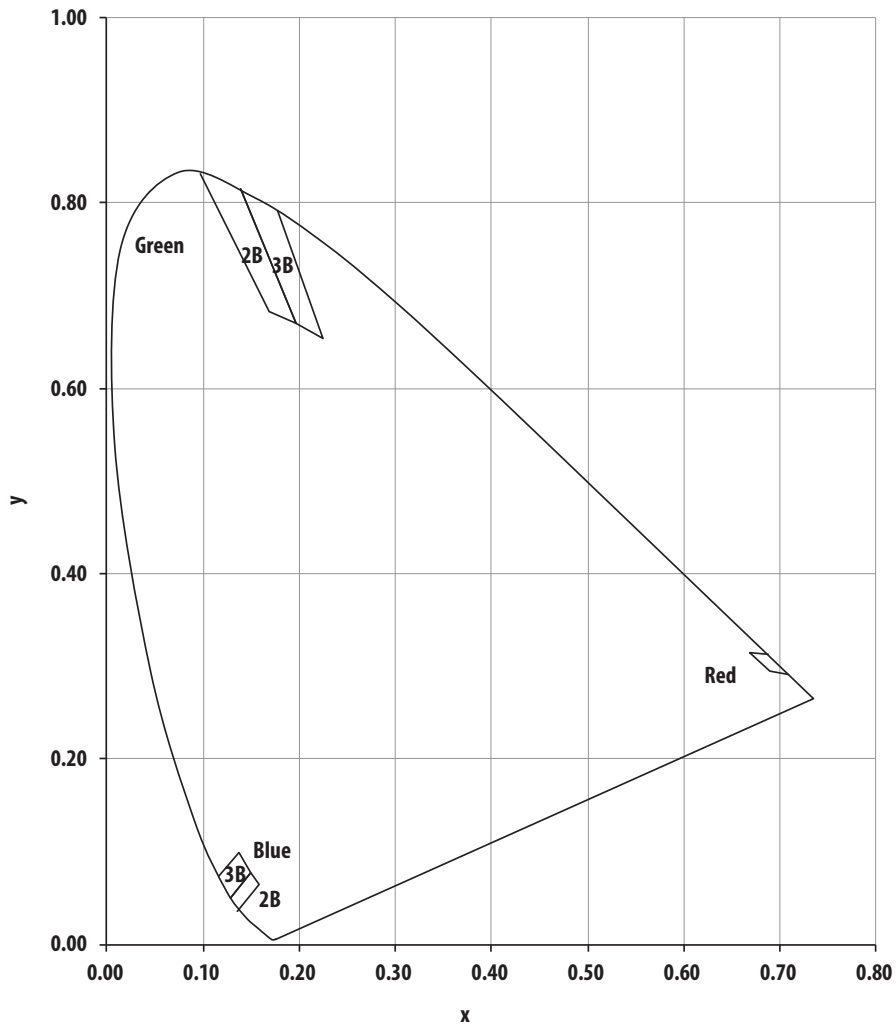
Bin	Min Dom	Max Dom	Chromaticity Coordinate				
			2B	463.0	468.0	x	0.1361
			y	0.0352	0.0650	0.0778	0.0495
3B	468.0	473.0	x	0.1291	0.1495	0.1376	0.1158
			y	0.0495	0.0778	0.0996	0.0736

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 representative for further information.

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 on PC board.
- For better control, it is recommended to use proper tool to precisely form and cut the leads to applicable length rather than doing it manually.
- If manual lead cutting is necessary, cut the leads after the soldering process. The solder connection forms a mechanical ground which prevents mechanical stress due to lead cutting from traveling into LED package. This is highly recommended for hand solder operation, as the excess lead length also acts as small heat sink.

Soldering and Handling:

- Care must be taken during PCB assembly and soldering process to prevent damage to the LED component.
- LED component may be effectively hand soldered to PCB. However, it is only recommended under unavoidable circumstances such as rework. The closest manual soldering distance of the soldering heat source (soldering iron's tip) to the body is 1.59 mm. Soldering the LED using soldering iron tip closer than 1.59 mm might damage the LED.



- ESD precaution must be properly applied on the soldering station and personnel to prevent ESD damage to the LED component that is ESD sensitive. Do refer to Avago application note AN 1142 for details. The soldering iron used should have grounded tip to ensure electrostatic charge is properly grounded.
- Recommended soldering condition:

	Wave Soldering [1, 2]	Manual Solder Dipping
Pre-heat temperature	105 °C Max.	–
Preheat time	60 sec Max	–
Peak temperature	260 °C Max.	260 °C Max.
Dwell time	5 sec Max.	5 sec Max

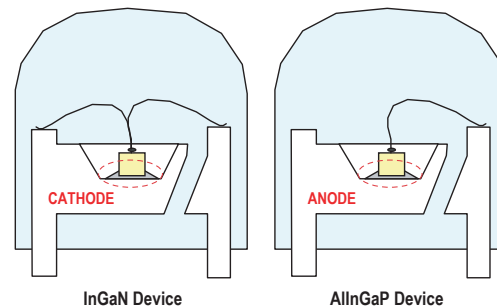
Notes:

1. Above conditions refers to measurement with thermocouple mounted at the bottom of PCB.
 2. It is recommended to use only bottom preheaters in order to reduce thermal stress experienced by LED.
- Wave soldering parameters must be set and maintained according to the recommended temperature and dwell time. Customer is advised to perform a daily check on the soldering profile to ensure that it is always conforming to recommended soldering conditions.

Notes:

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 before loading a new type of PCB.
2. Avago's AllnGaP 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 does not exceed 260 °C and the solder contact time does not exceeding 5 sec. Over-stressing the LED during soldering process might cause premature failure to the LED due to delamination.

Avago Technologies LED configuration



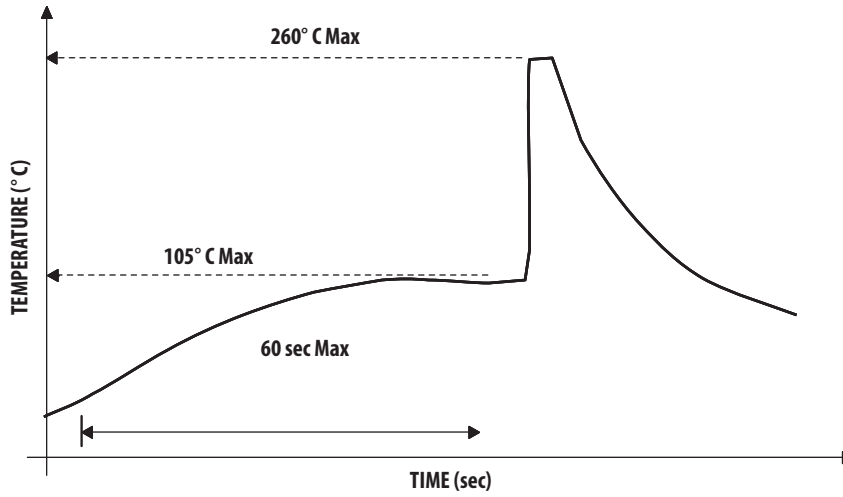
- Any alignment fixture that is being applied during wave soldering should be loosely fitted and should not apply weight or force on LED. Non-metallic material is recommended as it will absorb less heat during wave soldering process.
- At elevated temperature, LED is more susceptible to mechanical stress. Therefore, PCB must allowed to cool down to room temperature prior to handling, which includes removal of alignment fixture or pallet.
- If PCB board contains both through-hole (TH) LED and other surface mount components, it is recommended that surface mount components be soldered on the top side of the PCB. If surface mount need to be on the bottom side, these components should be soldered using reflow soldering prior to insertion the TH LED.
- Recommended PC board plated through-holes (PTH) size for LED component leads.

LED component lead size	Diagonal	Plated through hole diameter
0.45 x 0.45 mm (0.018× 0.018 inch)	0.636 mm (0.025 inch)	0.98 to 1.08 mm (0.039 to 0.043 inch)
0.50 x 0.50 mm (0.020× 0.020 inch)	0.707 mm (0.028 inch)	1.05 to 1.15 mm (0.041 to 0.045 inch)

- Over-sizing the PTH can lead to twisted LED after clinching. On the other hand, undersizing the PTH can make it difficult to insert the TH LED.

Refer to application note AN5334 for more information about soldering and handling of high brightness TH LED lamps.

Example of Wave Soldering Temperature Profile for TH LED



Recommended solder:
 Sn63 (Leaded solder alloy)
 SAC305 (Lead free solder alloy)

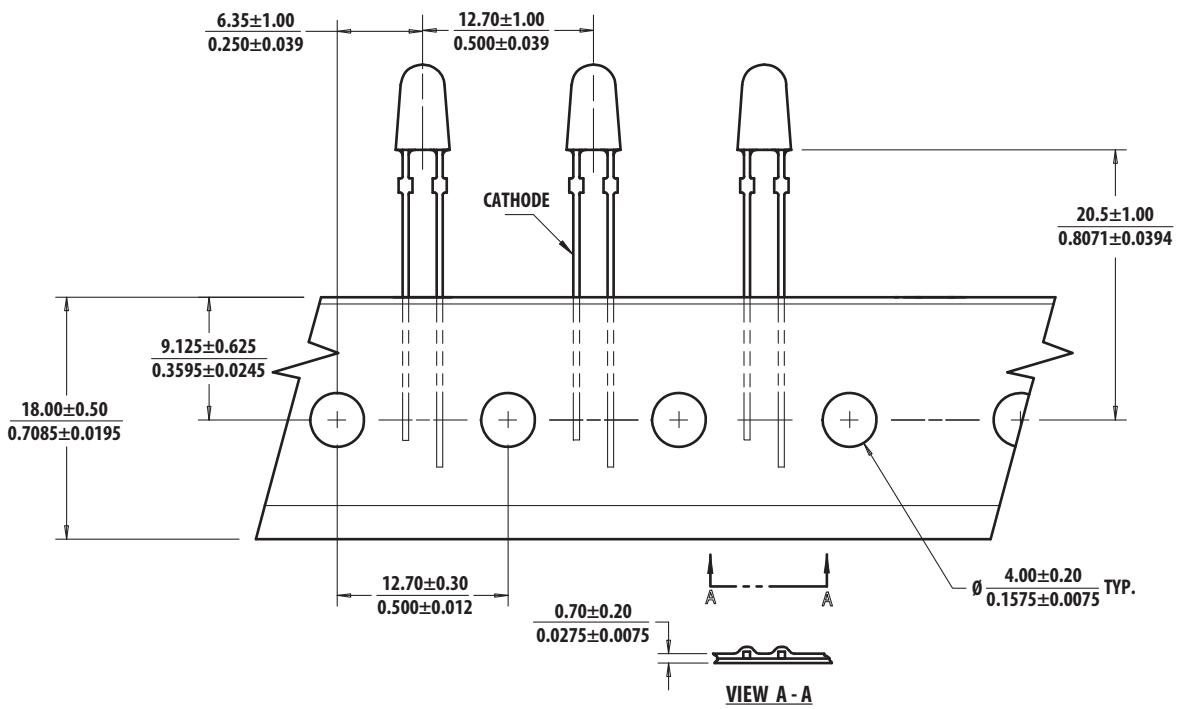
Flux: Rosin flux

Solder bath temperature: 255° C ± 5° C
 (maximum peak temperature = 260° C)

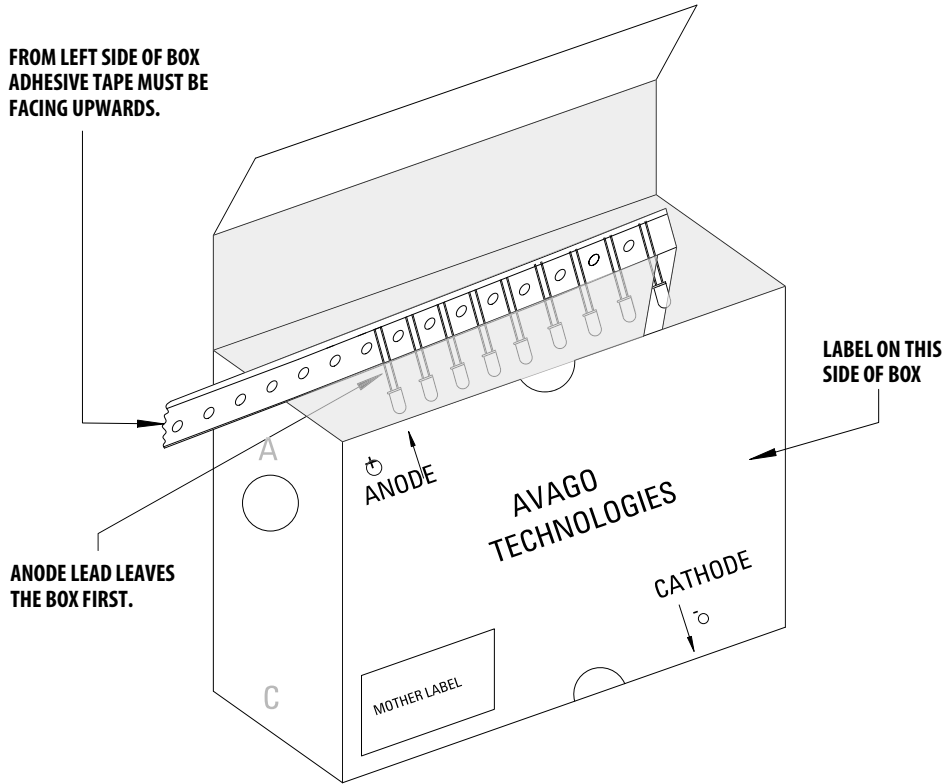
Dwell time: 3.0 sec - 5.0 sec
 (maximum = 5 sec)

Note: Allow for board to be sufficiently cooled to room temperature before exerting mechanical force.

Ammo Packs Drawing



Packaging Box for Ammo Packs













Note: For InGaN device, the ammo pack packaging box contain ESD logo

Packaging Label

(i) Avago Mother Label: (Available on packaging box of ammo pack and shipping box)

AVAGO TECHNOLOGIES	
STANDARD LABEL LS0002	
RoHS Compliant	
e3 max temp 260C	
(1P) Item: Part Number	(Q) QTY: Quantity
(1T) Lot: Lot Number	CAT: Intensity Bin
LPN:	BIN: Color Bin
(9D)MFG Date: Manufacturing Date	
<hr/>	
(P) Customer Item:	
(V) Vendor ID:	(9D) Date Code: Date Code
<hr/>	
DeptID:	Made In: Country of Origin

(ii) Avago Baby Label (Only available on bulk packaging)

 Avago TECHNOLOGIES		RoHS Compliant e3 max temp 260C
Lamps Baby Label		
(1P) PART #: Part Number		
		
(1T) LOT #: Lot Number		
		
(9D)MFG DATE: Manufacturing Date	QUANTITY: Packing Quantity	
		
C/O: Country of Origin		
Customer P/N:	CAT: Intensity Bin	
		
Supplier Code:	BIN: Color Bin	
		
	DATECODE: Date Code	
		

Acronyms and Definition:

BIN:

- (i) Color bin only or V_F bin only
 (Applicable for part number with color bins but without VF bin OR part number with VF bins and no color bin)
- OR
- (ii) Color bin incorporated with V_F Bin
 (Applicable for part number that have both color bin and VF bin)

Example:

- (i) Color bin only or V_F bin only
 BIN: 2 (represent color bin 2 only)
 BIN: VB (represent VF bin "VB" only)
- (ii) Color bin incorporate with V_F Bin
 BIN: 2VB

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