HLMP-LG3Y-Y10DD, HLMP-LM3U-46PDD, HLMP-LB3Y-VWPDD,

Red, Green and Blue
4mm 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 wide field of view 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.

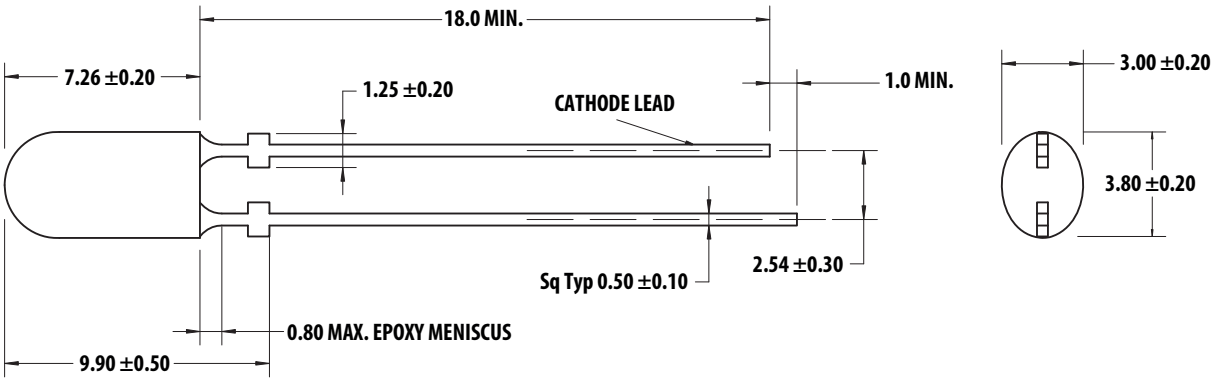
Applications

- Billboard signs
- Full color signs

Features

- Well defined spatial radiation pattern
- High brightness material
- Available in red, green and blue color
  - Red AlInGaP 621nm
  - Green InGaN 525nm
  - Blue InGaN 468nm
- Superior resistance to moisture
- Standoff package
- Tinted and diffused
- Nominal viewing angle 45x 90°

Package Dimensions



Notes:
1. All dimensions in millimeters (inches).
2. Tolerance is ± 0.20mm unless otherwise 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 Iv (mcd) at 20 mA [1,2,4]		
		Min.	Typ.	Max.
HLMP-LG3Y-Y10DD	Red 621	1990	2500	3500
HLMP-LM3U-46PDD	Green 525	5040	7000	8710
HLMP-LB3Y-VWPDD	Blue 468	1150	1380	1660

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 ± 15%

Part Numbering System

HLMP - L x 3Y/3U – x x x x x

Packaging Option
DD: Ammopack

Color Bin Selection
0: Full Distribution
P: Special color bin range

Maximum Intensity Bin
Refer to Device Selection Guide

Minimum Intensity Bin
Refer to Device Selection Guide

Color
G: Red
B: Blue
M: Green

Package
L: 4mm Oval

Absolute Maximum Ratings

T_J = 25°C

Parameter	Red	Green / Blue	Unit
DC Forward Current [1]	50	30	mA
Peak Forward Current	100 [2]	100 [3]	mA
Power Dissipation	120	99	mW
LED Junction Temperature	105		°C
Operating Temperature Range	-40 to + 100	-40 to + 85	°C
Storage Temperature Range	-40 to +100	-40 to +100	°C

Notes:
1. Derate linearly as shown in Figure 4 & 9
2. Duty Factor 30%, frequency 1KHz
3. Duty Factor 10%, frequency 1KHz

Electrical / Optical Characteristics

T_J = 25°C

Parameter	Symbol	Min.	Typ.	Max.	Units	Test Conditions
Forward Voltage	V_F				V	I_F = 20 mA
Red		1.80	2.10	2.40		
Green		2.60	2.90	3.10		
Blue		2.80	3.10	3.30		
Reverse Voltage [2]	V_R				V	
Red		5				I_R = 100 μA
Green & Blue		5				I_R = 10 μA
Dominant Wavelength [1]	λ_d				nm	I_F = 20 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
Red			629			Distribution at I_F = 20 mA
Green			517			
Blue			465			
Thermal Resistance	$R\theta_{J\text{-}PIN}$				°C/W	LED Junction-to-Pin
Red			240			
Green			360			
Blue			360			

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

AlInGaP Red

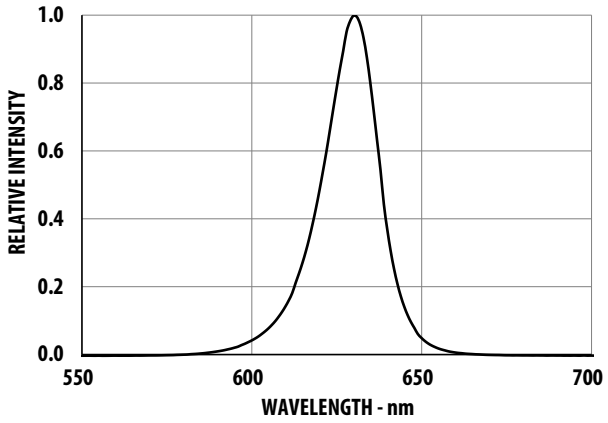


Figure 1. Relative Intensity vs Wavelength

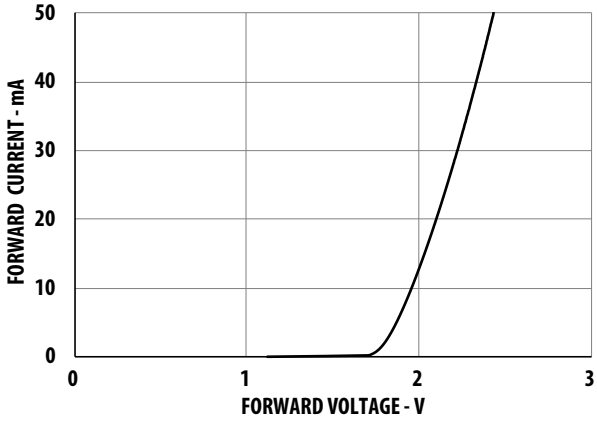


Figure 2. Forward Current vs Forward Voltage

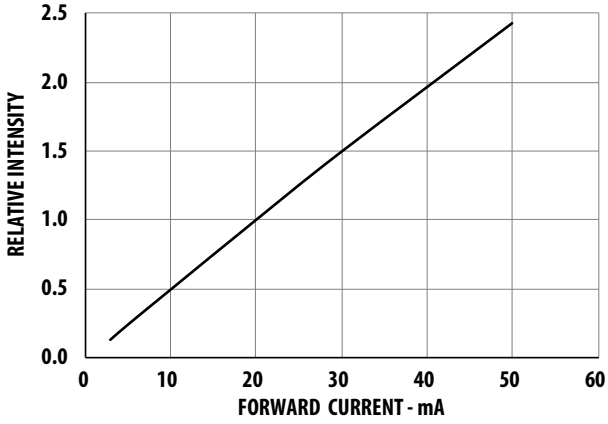


Figure 3. Relative Intensity vs Forward Current

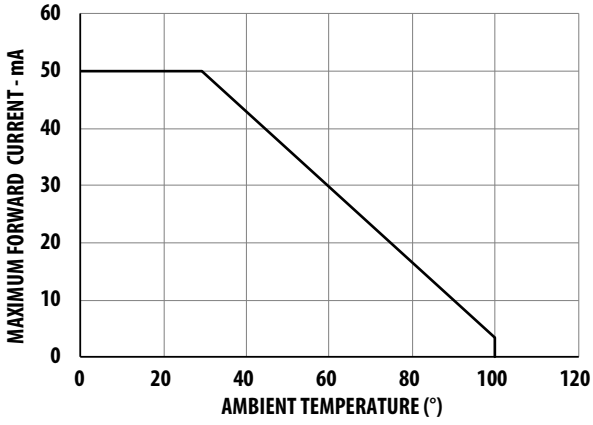


Figure 4. Maximum Forward Current vs Ambient Temperature

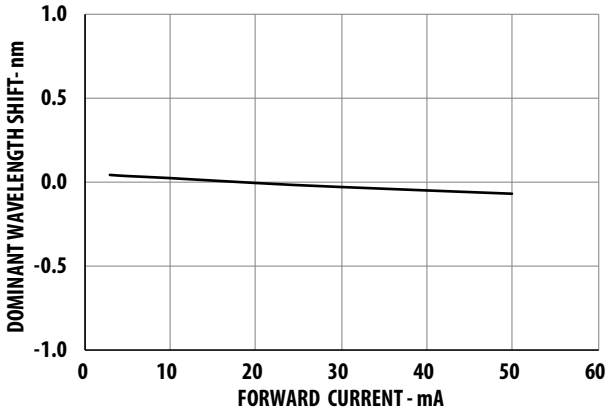


Figure 5. Dominant Wavelength Shift vs Forward Current

InGaN Green and Blue

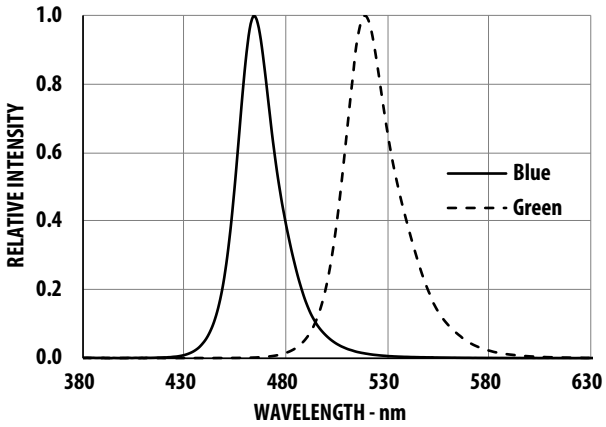


Figure 6. Relative Intensity vs Wavelength

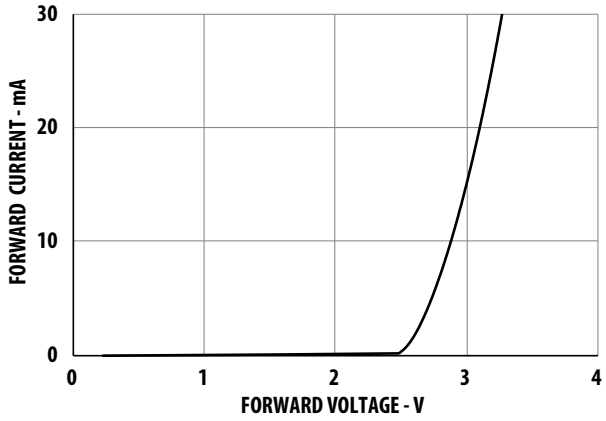


Figure 7. Forward Current vs Forward Voltage

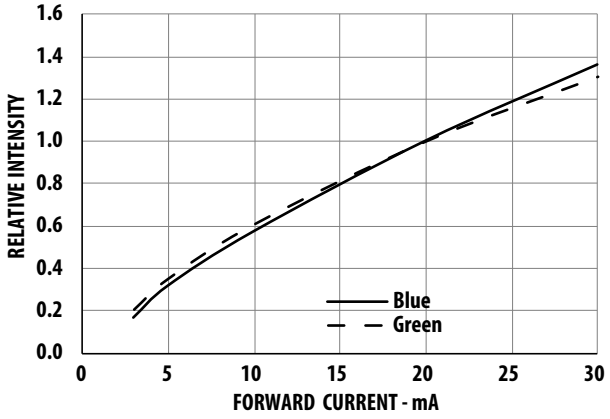


Figure 8. Relative Intensity vs Forward Current

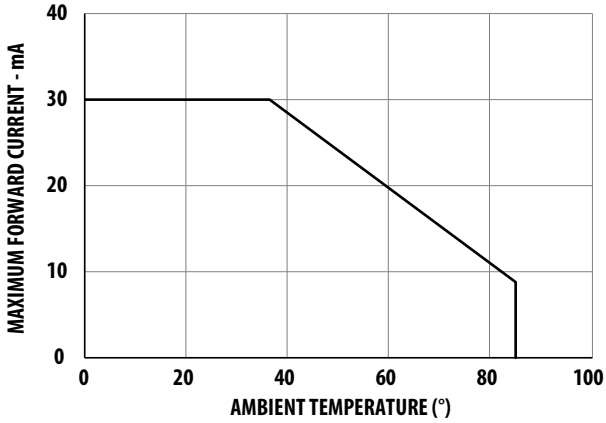


Figure 9. Maximum Forward Current vs Ambient Temperature

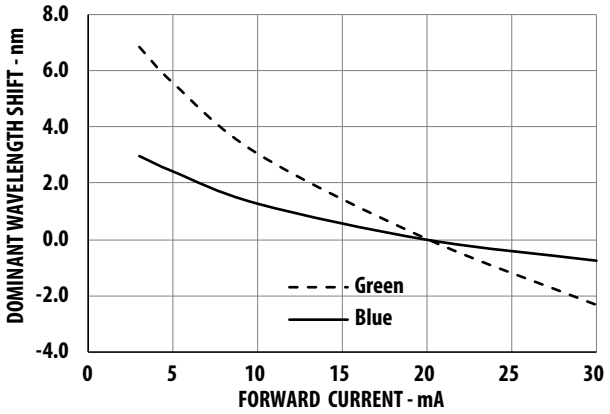


Figure 10. Dominant Wavelength Shift vs Forward Current

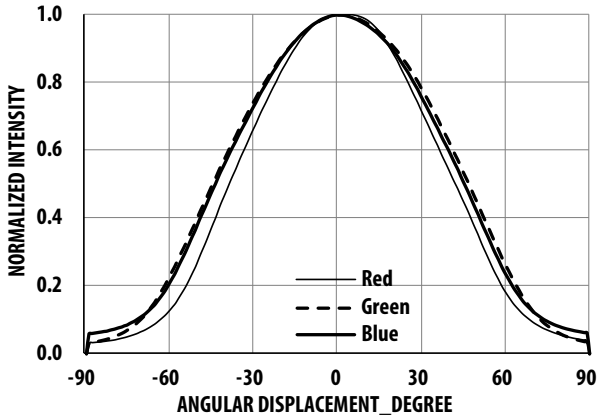


Figure 11. Radiation pattern-Major Axis

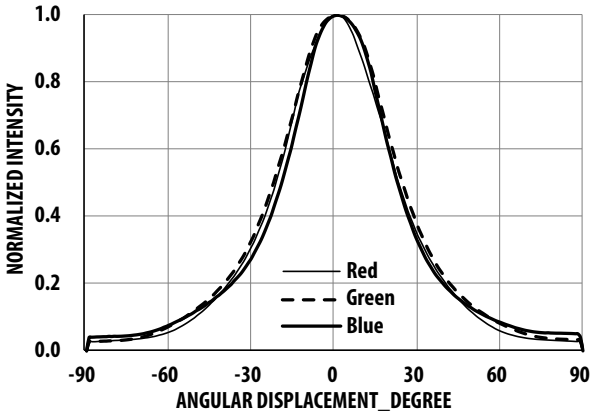


Figure 12. Radiation pattern-Minor Axis

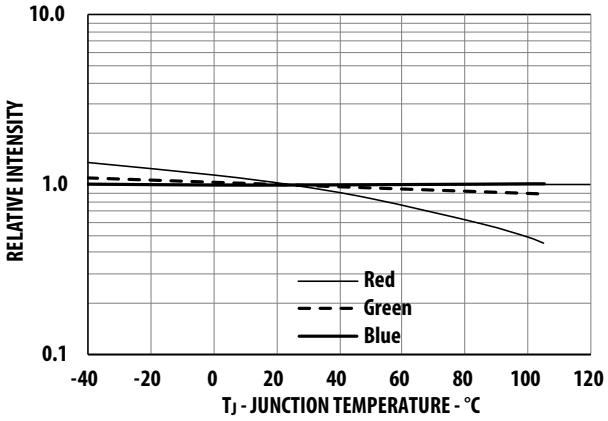


Figure 13. Relative Light Output vs Junction Temperature

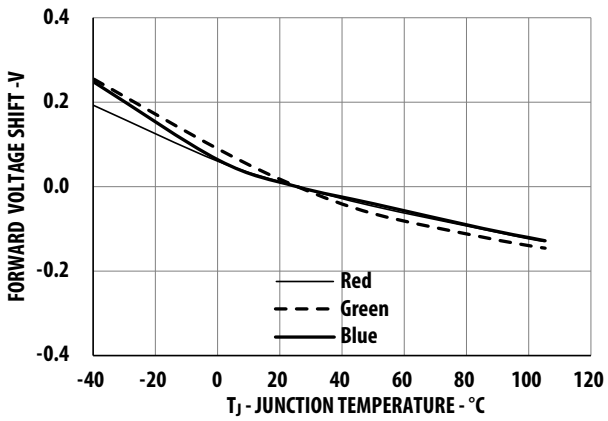


Figure 14. Forward Voltage Shift vs Junction Temperature

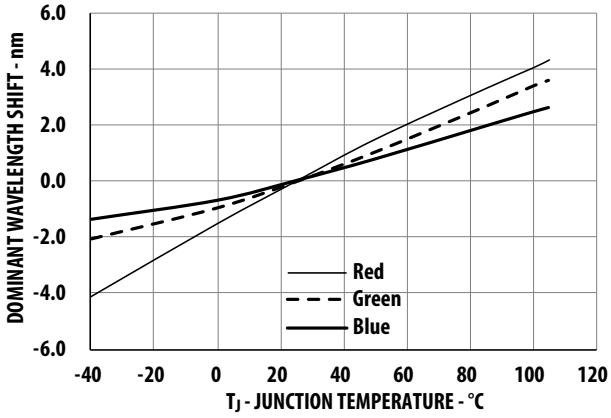


Figure 15. Dominant Wavelength Shift vs Junction Temperature

Red Intensity Bin:

	Intensity (mcd) at 20 mA	
Bin	**Min.**	**Max.**
Y	1990	2400
Z	2400	2900
1	2900	3500

Tolerance for each bin limit is ± 15%

Green Intensity Bin:

	Intensity (mcd) at 20 mA	
Bin	**Min.**	**Max.**
4	5040	6050
5	6050	7260
6	7260	8710

Tolerance for each bin limit is ± 15%

Red Color Range

Bin	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	

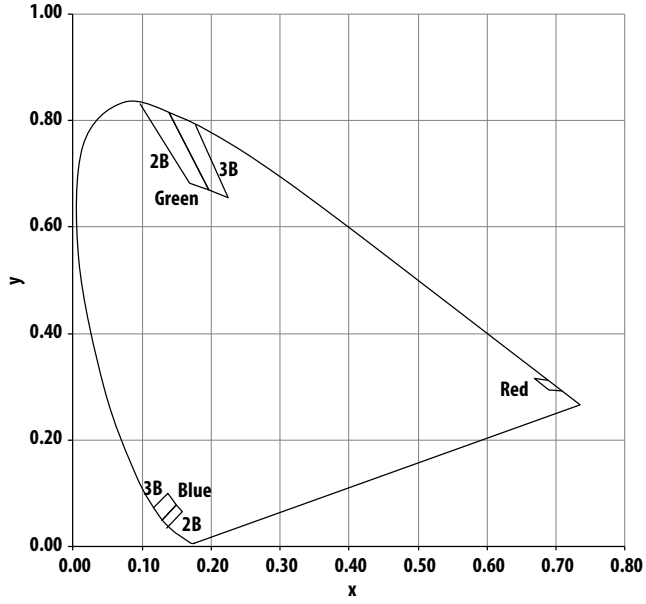
Tolerance for each bin limit is ± 0.5nm

Green Color Range

Bin	Min Dom	Max Dom	Chromaticity Coordinate					
2B	523.0	528.0	x	0.0979	0.1685	0.1971	0.1387	0.1387
			y	0.8316	0.6821	0.6703	0.8148	0.8148
3B	528.0	533.0	x	0.1387	0.1971	0.2245	0.1779	0.1779
			y	0.8148	0.6703	0.6542	0.7917	0.7917

Tolerance for each bin limit is ± 0.5nm

Avago Color Bin on CIE 1931 Chromaticity Diagram



Blue Intensity Bin:

	Intensity (mcd) at 20 mA	
Bin	**Min.**	**Max.**
V	1150	1380
W	1380	1660

Tolerance for each bin limit is ± 15%

VF Bin Table

	Forward Voltage (V) at20mA	
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 ±0.05V
2. VF binning only applicable to Red color

Blue Color Range

Bin	Min Dom	Max Dom	Chromaticity Coordinate					
2B	463.0	468.0	x	0.1361	0.1585	0.1495	0.1291	0.1387
			y	0.0352	0.0650	0.0778	0.0495	0.8148
3B	468.0	473.0	x	0.1291	0.1495	0.1376	0.1158	0.1779
			y	0.0495	0.0778	0.0996	0.0736	0.7917

Tolerance for each bin limit is ± 0.5nm

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.

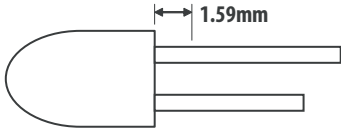
Precautions:

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 1.59mm. Soldering the LED using soldering iron tip closer than 1.59mm might damage the LED.



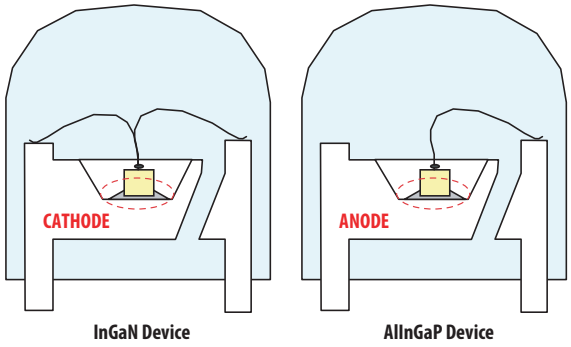
- ESD precaution must be properly applied on the soldering station and personnel to prevent ESD damage to the LED component that is ESD sensitive. Do refer to Avago application note AN 1142 for details. The soldering iron used should have grounded tip to ensure electrostatic charge is properly grounded.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

Note:
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 daily check on the soldering profile to ensure that it is always conforming to recommended soldering conditions.

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 before 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 does not exceed 260°C and the solder contact time does not exceeding 5sec. Over-stressing the LED during soldering process might cause premature failure to the LED due to delamination.



Avago Technologies LED Configuration

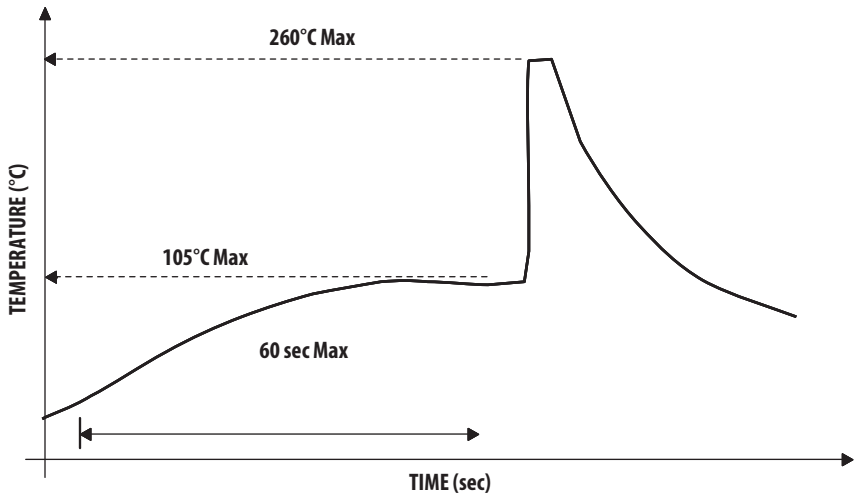
- Any alignment fixture that is being applied during wave soldering should be loosely fitted and should not apply weight or force on LED. Non metal material is recommended as it will absorb less heat during wave soldering process.
- At elevated temperature, LED is more susceptible to mechanical stress. 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 x 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 x 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 under sizing the PTH can cause difficulty inserting 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)

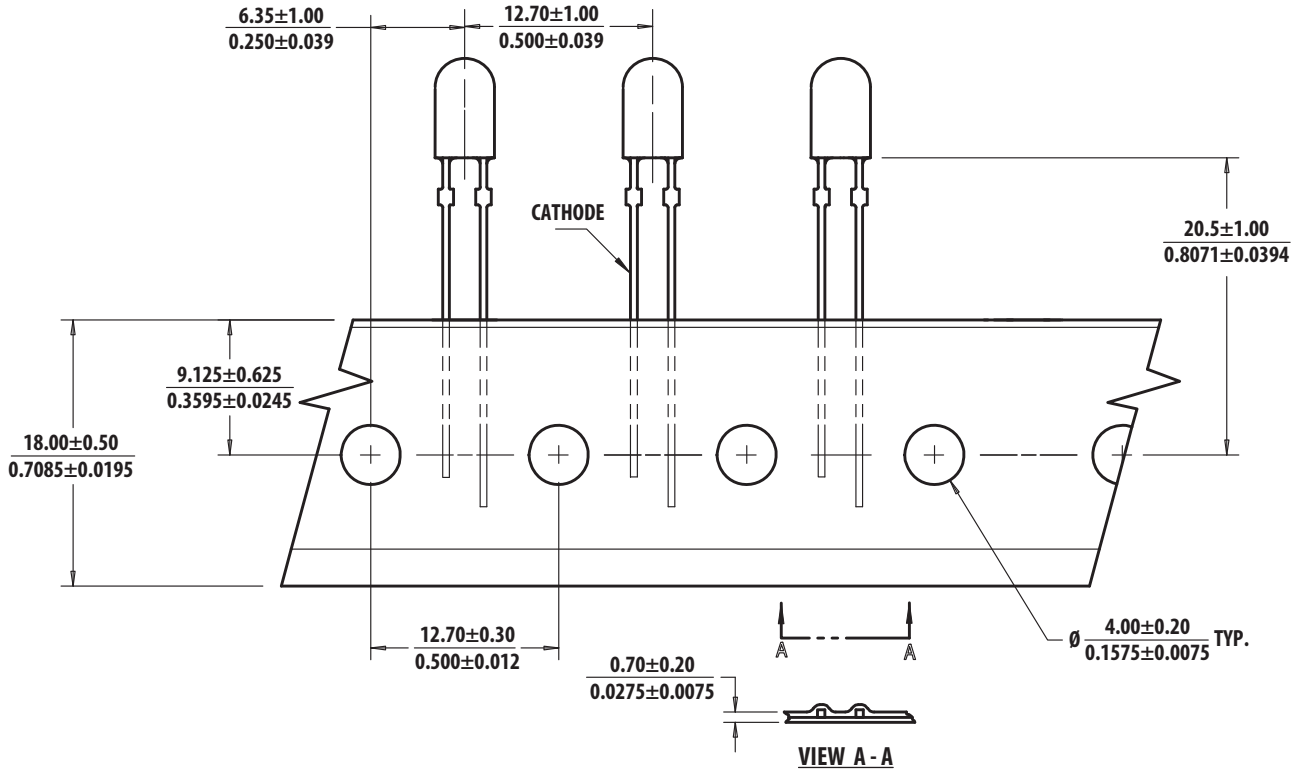
Flux: Rosin flux

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

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

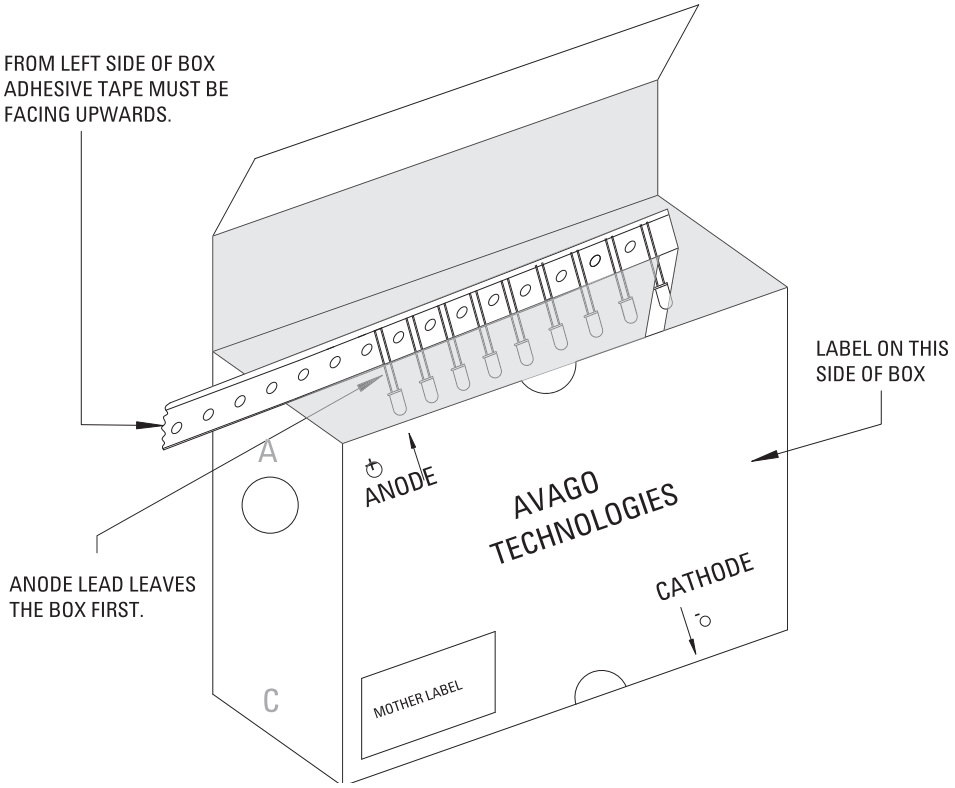
Note: Allow for board to be sufficiently cooled to room temperature before exerting mechanical force.

Ammo Packs Drawing



Note: All dimensions in millimeters (inches)

Packaging Box for Ammo Packs



Note: The dimension for ammo pack is applicable for the device with standoff and without standoff.

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

LPN:

CAT: Intensity Bin

(9D)MFG Date: Manufacturing Date

BIN: Refer to below information

(P) Customer Item:

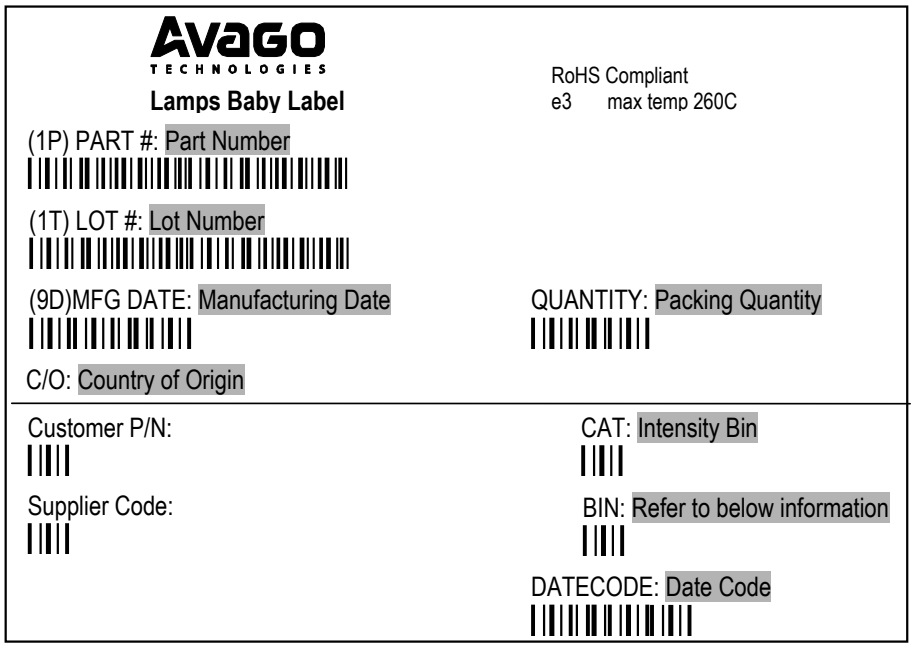
(V) Vendor ID:

(9D) Date Code: Date Code

DeptID:

Made In: Country of Origin

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



Acronyms and Definition:

BIN:

(i) Color bin only or VF 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 VF Bin

(Applicable for part number that have both color bin and VF bin)

Example:

(i) Color bin only or VF bin only

BIN: 2 (represent color bin 2 only)

BIN: VB (represent VF bin "VB" only)

(ii) Color bin incorporated with VF Bin

BIN: 2VB

VB: VF bin "VB"

2: Color bin 2 only

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

AV02-4811EN - March 12, 2015