HLMP-LG3V, HLMP-LM3V, HLMP-LB3V

Red, Green, and Blue
4 mm Standard Oval LEDs

Data Sheet

Description

These Oval LEDs are specifically designed for billboard sign and full color sign applications. 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

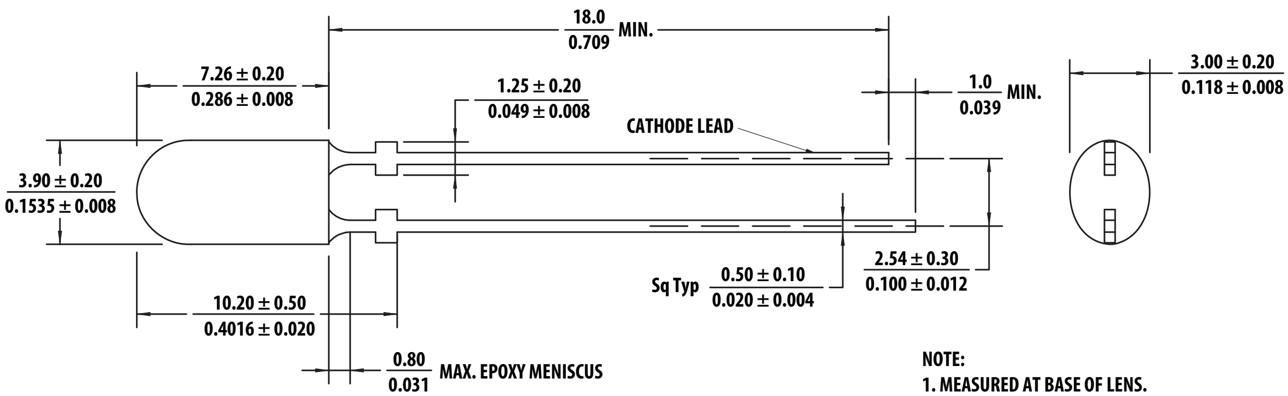
- Full color signs
- Billboard signs

CAUTION InGaN devices are ESD sensitive per the JEDEC Standard. Please observe appropriate precautions during handling and processing. Refer to Application Note AN-1142 for additional details.

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 VF range for InGaN
- Superior resistance to moisture
- Standoff package
- Tinted and diffused
- Typical viewing angle 42° × 95°

Package Dimensions



NOTE

- All dimensions in millimeters (inches).
- Tolerance is ± 0.20 mm unless otherwise specified.

Device Selection Guide

Part Number	Color and Dominant Wavelength λ_d (nm) Typ[a]	Luminous Intensity Iv (mcd) at 20 mA[b,c,d]		
		Min	Typ	Max
HLMP-LG3V-WX0DD	Red 621	1380	1700	1990
HLMP-LM3V-23PDD	Green 525	3500	4400	5040
HLMP-LM3V-24PDD	Green 525	3500	4600	6050
HLMP-LB3V-TUPDD	Blue 470	800	960	1150
HLMP-LB3V-TVPDD	Blue 470	800	1060	1380

a. Dominant wavelength, λ_d, is derived from the CIE Chromaticity Diagram and represents the color of the lamp.

b. The luminous intensity is measured on the mechanical axis of the lamp package and it is tested with pulsing condition.

c. The optical axis is closely aligned with the package mechanical axis.

d. Tolerance for each bin limit is ± 15%.

Part Numbering System

HLMP – L x 3V – x x x xx

Packaging Option
DD: Ammopack

Color Bin Selection
0: Full Distribution
P: Special Color Bin

Maximum Intensity Bin
See Device Selection Guide

Minimum Intensity Bin
See Device Selection Guide

Color
G : Red
M: Green
B : Blue

Package
L: 4 mm Oval 42° × 95°

Absolute Maximum Rating, T_J = 25 °C

Parameter	Red	Green	Blue	Unit
DC Forward Current [a]	25	25	20	mA
Peak Forward Current	100[b]	100[b]	100[b]	mA
Power Dissipation	60	82.5	66	mW
LED Junction Temperature	100			°C
Operating Temperature Range	–40 to +85			°C
Storage Temperature Range	–40 to +100			°C

a. Derate linearly as shown in Figure 4 and Figure 8.

b. Duty Factor 10%, frequency 1 kHz.

Electrical/Optical Characteristics, T_J = 25 °C

Parameter	Symbol	Min.	Typ.	Max.	Units	Test Conditions
Forward Voltage Red Green Blue	V_F	 1.8 2.8 2.9	 2.1 3.1 3.0	 2.4 3.3 3.2	V	I_F = 20 mA
Reverse Voltage[a] Red Green and Blue	V_R	 5 5			V	 I_R = 100 µA I_R = 10 µA
Dominant Wavelength[b] Red Green Blue	λ_d	 618.0 525.0 465.0	 621.0 530.0 470.0	 630.0 535.0 475.0	nm	I_F = 20 mA
Peak Wavelength Red Green Blue	λ_{PEAK}		 629 522 465		nm	Peak of Wavelength of Spectral Distribution at I_F = 20 mA
Thermal Resistance Red Green Blue	$R\theta_{J\text{-}PIN}$		 600 400 400		°C/W	LED Junction-to-Pin

a. Indicates product final testing condition. Long-term reverse bias is not recommended.

b. The dominant wavelength is derived from the Chromaticity Diagram and represents the color of the lamp.

AlInGaP Red

Figure 1 Relative Intensity vs. Wavelength

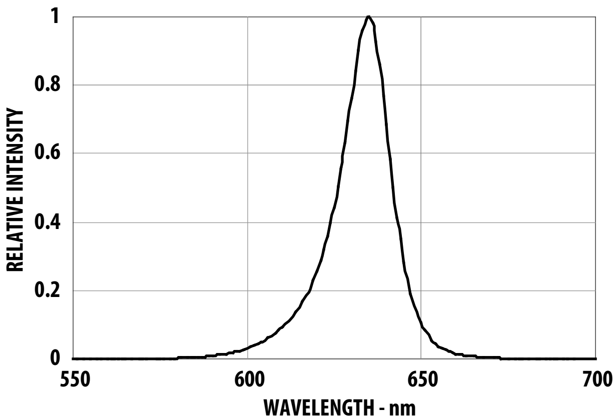


Figure 2 Forward Current vs. Forward Voltage

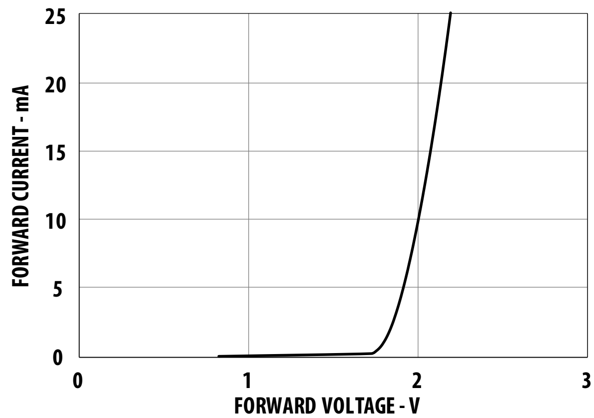


Figure 3 Relative Intensity vs. Forward Current

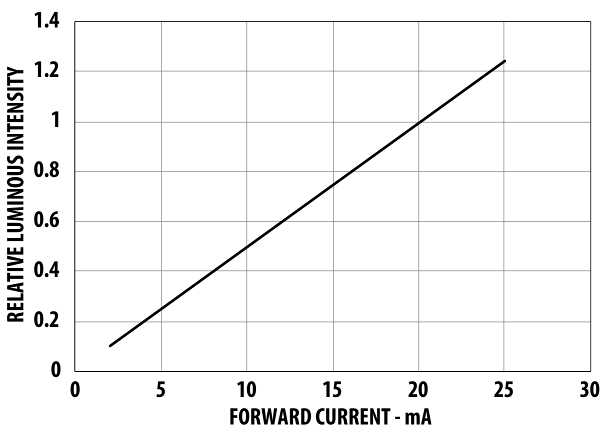
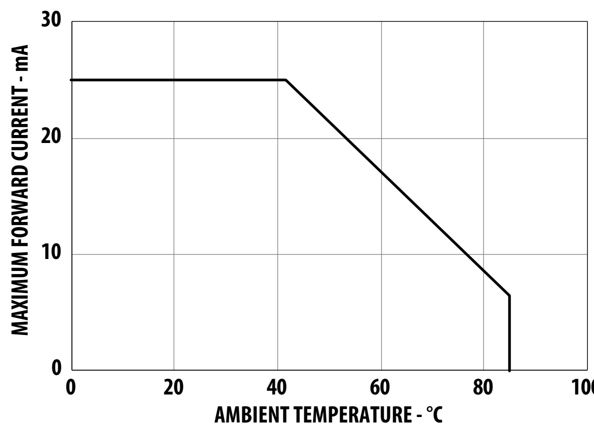


Figure 4 Maximum Forward Current vs. Ambient Temperature



InGaN Green and Blue

Figure 5 Relative Intensity vs. Wavelength

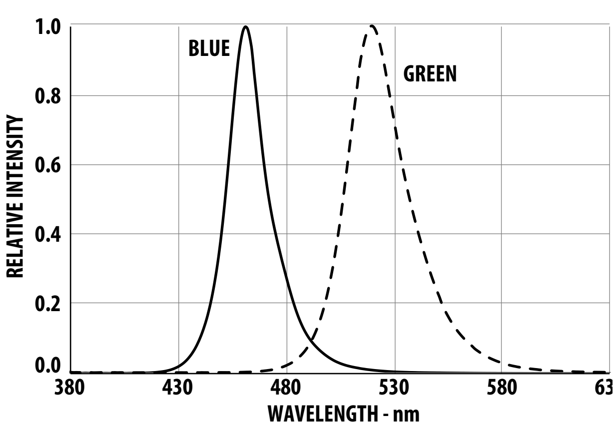
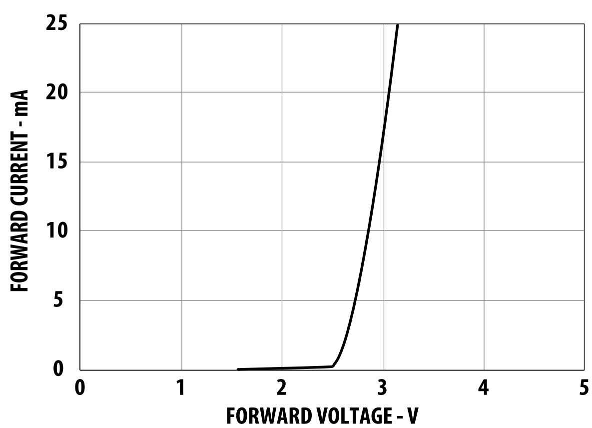


Figure 6 Forward Current vs. Forward Voltage



InGaN Green and Blue (Continued)

Figure 7 Relative Intensity vs. Forward Current

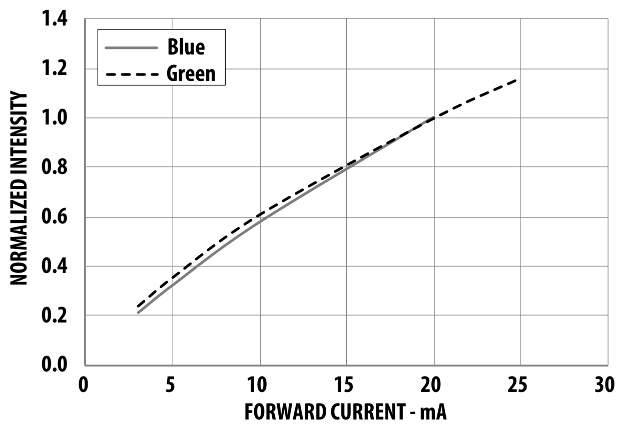


Figure 8 Maximum Forward Current vs. Ambient Temperature

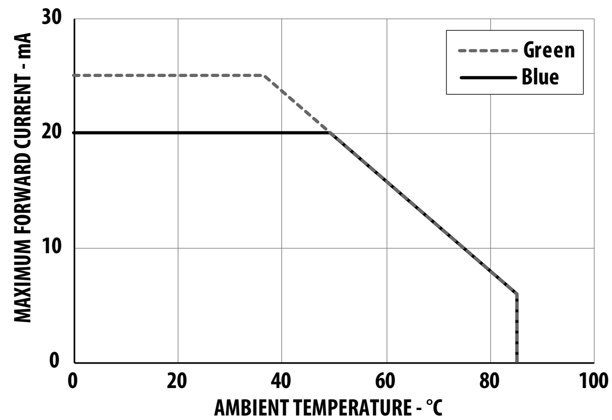


Figure 9 Relative Dominant Wavelength vs. Forward Current

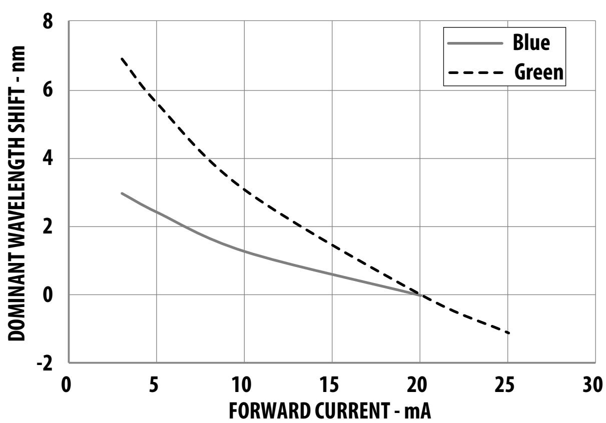


Figure 10 Radiation Pattern – Major Axis

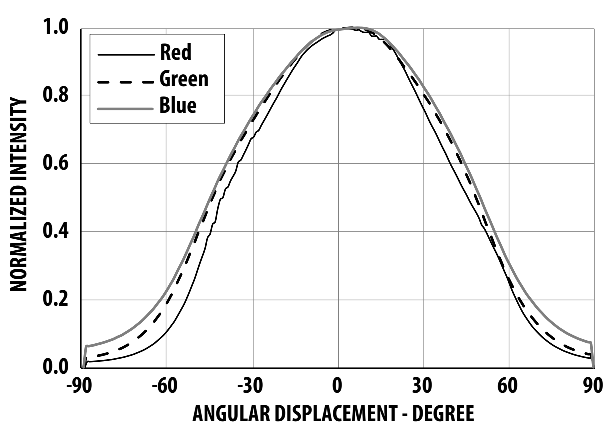


Figure 11 Radiation Pattern – Minor Axis

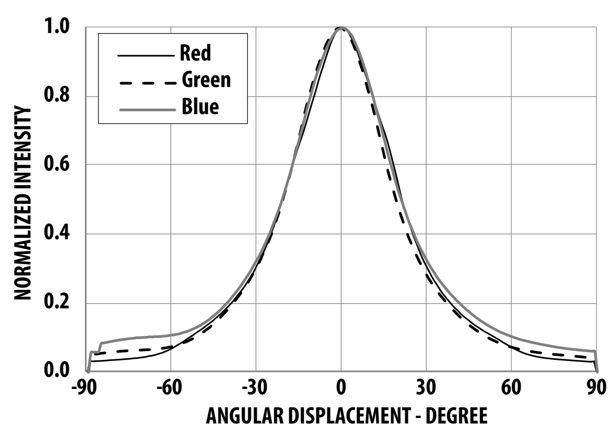


Figure 12 Relative Light Output vs. Junction Temperature

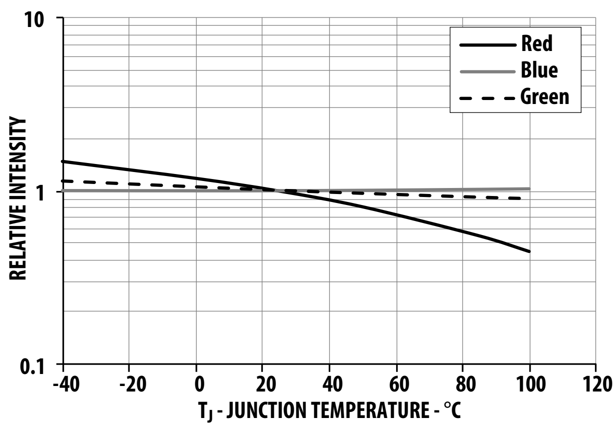
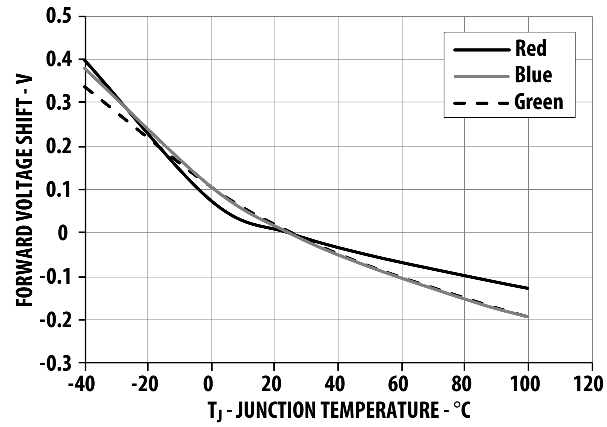


Figure 13 Forward Voltage Shift vs. Junction Temperature



Red Intensity Bin

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

Tolerance for each bin limit is ± 15%.

Green Intensity Bin

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

Tolerance for each bin limit is ± 15%.

Blue Intensity Bin

Bin	Intensity (mcd) at 20 mA	
	Min.	Max.
T	800	960
U	960	1150
V	1150	1380

Tolerance for each bin limit is ± 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

NOTE

1. Tomerance for each bin limit is ± 0.05 V.
2. V_F binning only applicable 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.

Special Green Color Range

Bin	Min Dom	Max Dom	Chromaticity Coordinate				
2B	523.0	528.0	x	0.0979	0.1685	0.1971	0.1387
			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.

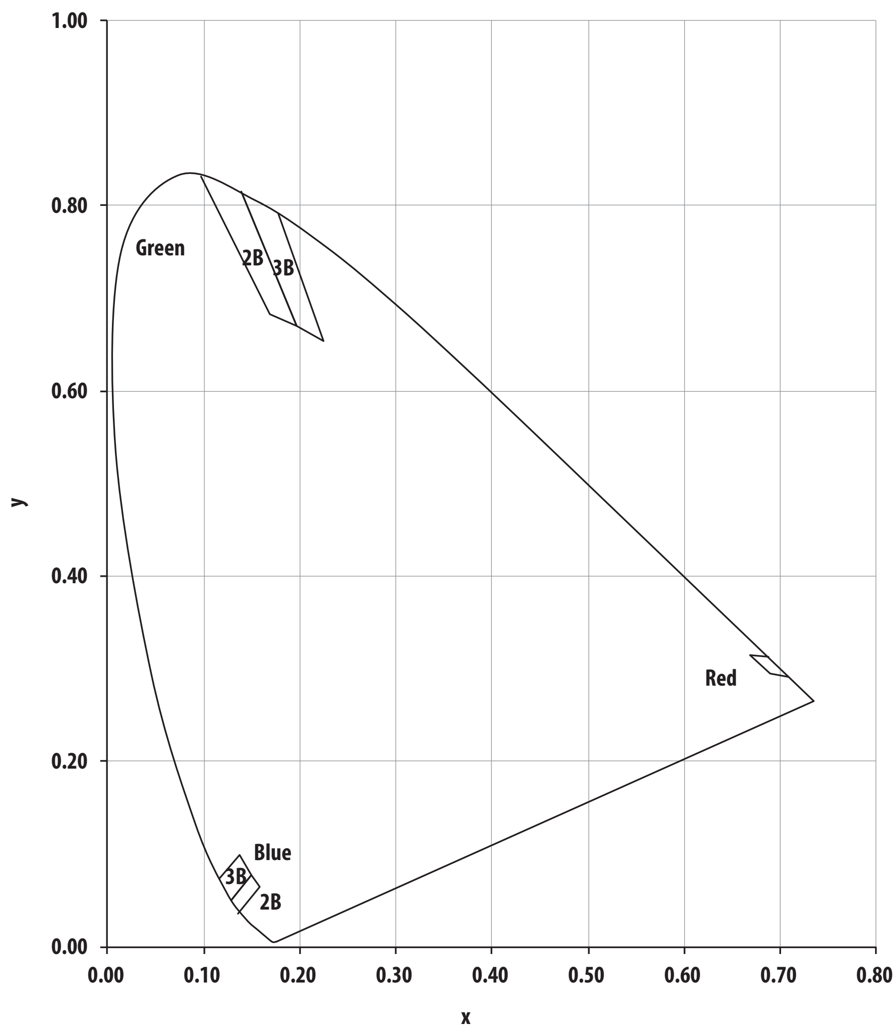
Special Blue Color Range

Bin	Min Dom	Max Dom	Chromaticity Coordinate				
2B	463.0	468.0	x	0.1361	0.1585	0.1495	0.1291
			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 All bin categories are established for classification of products. Products may not be available in all bin categories. Contact your Avago representative for further information.

Avago Color Bin on CIE 1931 Chromaticity Diagram



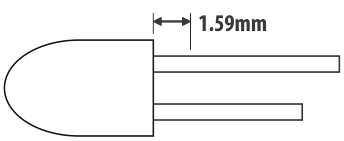
Precautions

Lead Forming

- You may preform or cut to length the leads of the LED lamp prior to insertion and soldering on the PC board.
- For better control, you should use the proper tool to precisely form and cut the leads to an 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 that prevents mechanical stress due to lead cutting from traveling into LED package. Cutting the leads after hand soldering is highly recommended because the excess lead length also acts as small heat sink.

Soldering and Handling

- Take care during the PCB assembly and soldering process to prevent damage to the LED component.
- The LED component may be effectively hand soldered to PCB. However, you should only do it under unavoidable circumstances, such as rework. The closest manual soldering distance of the soldering heat source (the 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.
- The recommended soldering conditions follow.

	Wave Soldering[a, b]	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

a. The above conditions refer to measurements with a thermocouple mounted at the bottom of PCB.

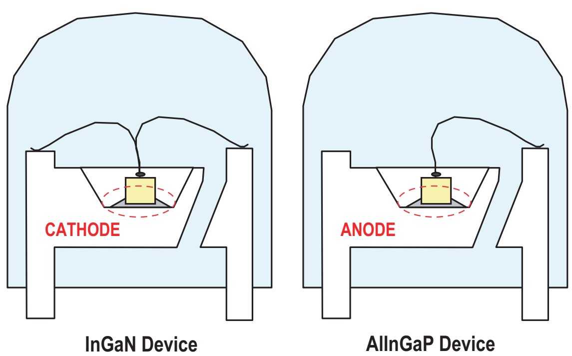
b. Use only bottom preheaters to reduce thermal stress experienced by the LED.

- Set and maintain wave soldering parameters according to the recommended temperature and dwell time.You are advised to check daily on the soldering profile to ensure that it always conforms to recommended soldering conditions.

NOTE

1. PCBs 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 the same wave soldering setting is used. Therefore, you should to re-calibrate the soldering profile again before loading a new type of PCB.
2. Avago's AlInGaP high brightness LEDs use high efficiency LED dies with single wire bond as shown on the next page. Take extra precautions during wave soldering to ensure that the maximum wave temperature does not exceed 260 °C and the solder contact time does not exceed 5 sec. Over-stressing the LED during the soldering process might cause premature failure to the LED due to delamination.

Avago Technologies LED Configuration



- Any alignment fixture that is 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 temperatures, the LED is more susceptible to mechanical stress. Therefore, PCB must be cooled down to room temperature prior to handling, which includes the removal of the alignment fixture or pallet.

- If the PCB board contains both through-hole (TH) LEDs and other surface mount components, you should solder the surface mount components on the top side of the PCB. If the surface mount must be on the bottom side, you should solder these components using reflow soldering prior to inserting the TH LED.
- The recommended PC board plated through-holes (PTH) size for LED component leads follows.

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)

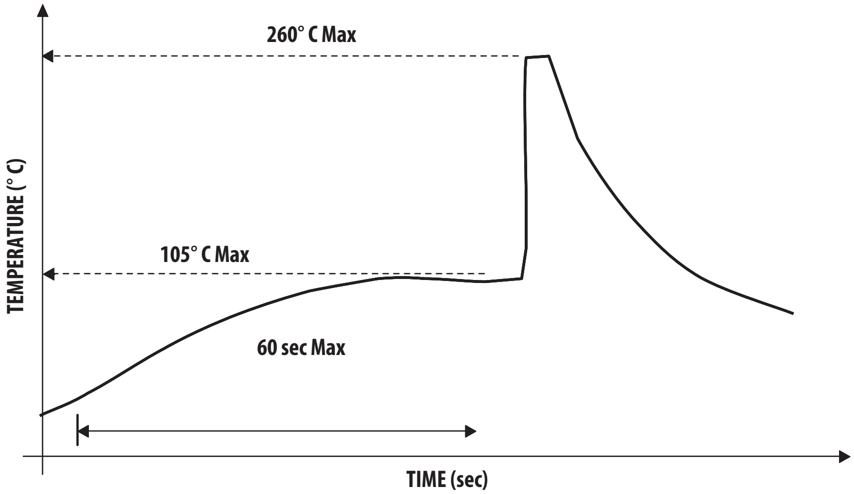
- Over-sizing the PTH can lead to a twisted LED after clinching. In addition, undersizing the PTH can make it difficult to insert the TH LED.

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

Application Precautions

- The drive current of the LED must not exceed the maximum allowable limit across temperature as stated in the data sheet. Constant current driving is recommended to ensure consistent performance.
- LEDs exhibit slightly different characteristics at different drive currents that might result in larger performance variations (i.e., intensity, wavelength, and forward voltage). You should set the application current as close as possible to the test current to minimize these variations.
- The LED is not intended for reverse bias. Use other appropriate components for such purposes. When driving the LED in matrix form, ensure that the reverse bias voltage does not exceed the allowable limit of the LED.

Example of Wave Soldering Temperature Profile for TH LED



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

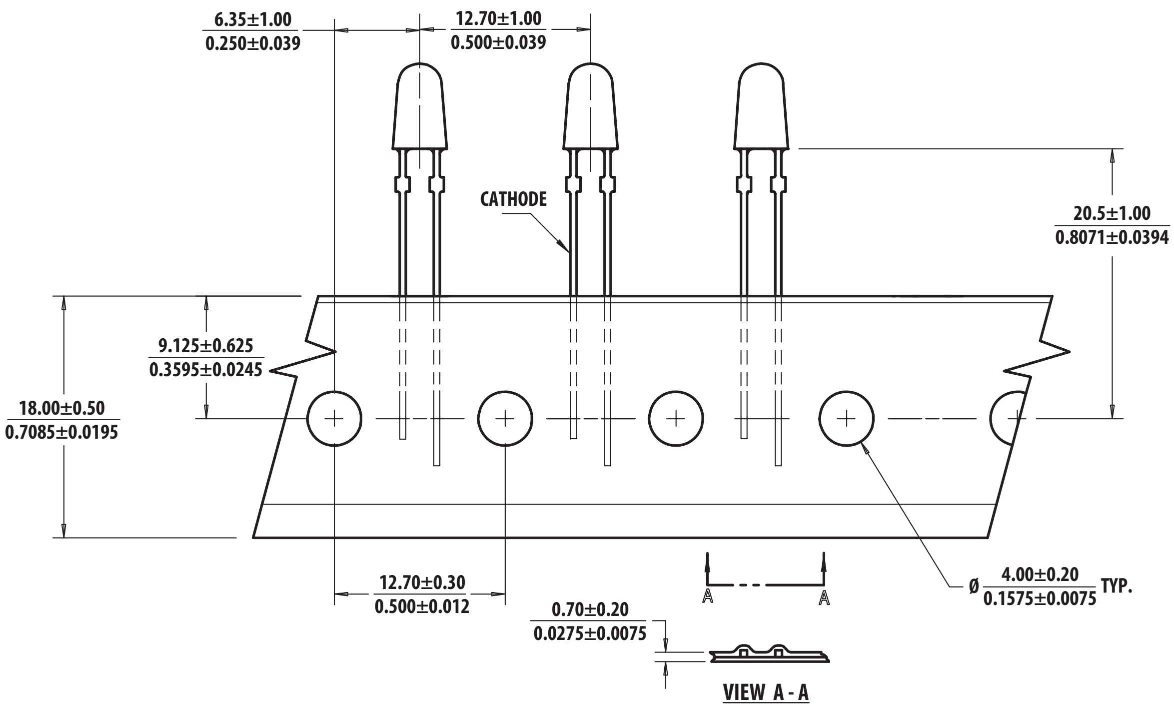
Flux: Rosin flux

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

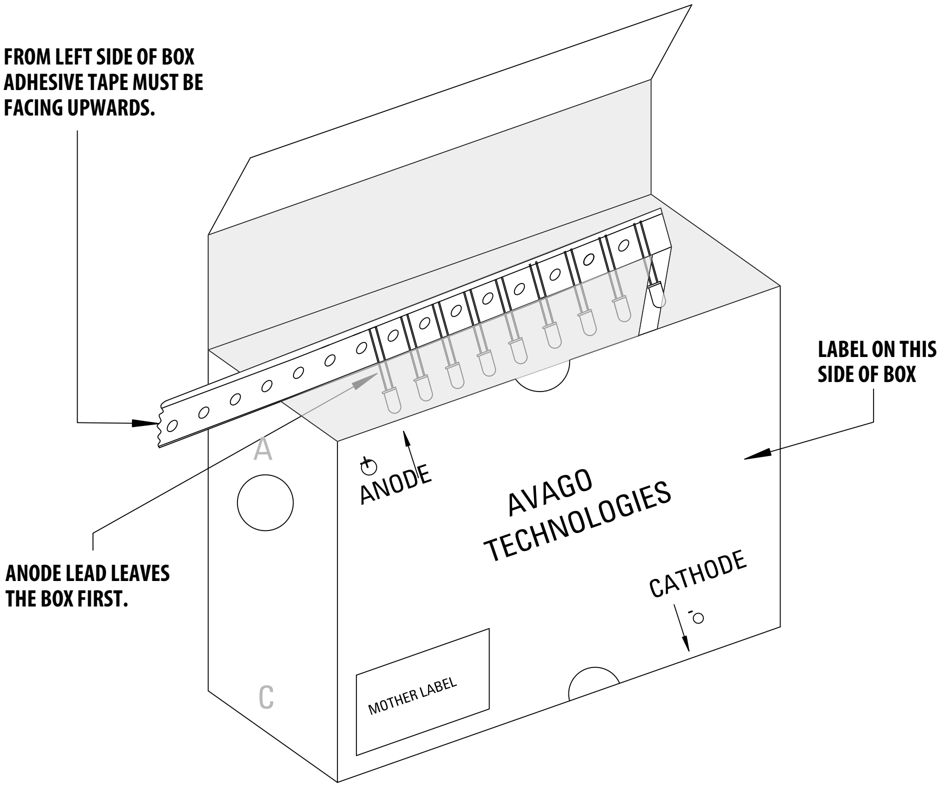
Dwell time: 3.0 sec - 5.0 sec
(maximum = 5 sec)

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

Ammo Packs Drawing



Packaging Box for Ammo Packs

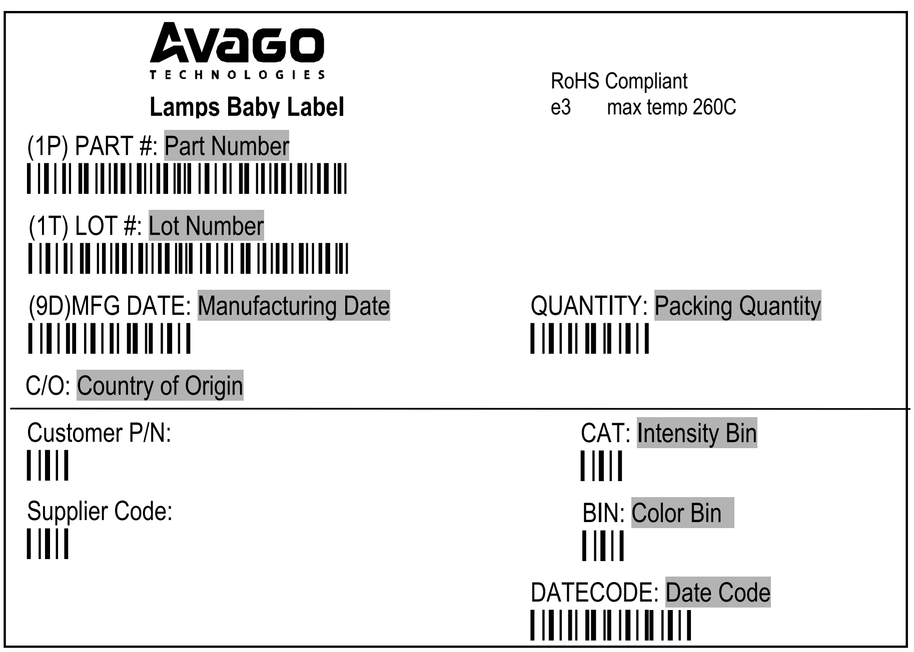


NOTE For InGaN device, the ammo pack packaging box contains the ESD logo.

Packaging Label

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

(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

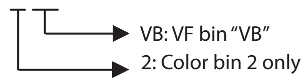
(i) Color bin only or VF bin only

BIN: 2 (represent color bin 2 only)

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

(ii) Color bin incorporate with VF Bin

BIN: 2VB



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Lead (Pb) Free
RoHS 6 fully compliant