HLMP-HG65, HLMP-HM65, HLMP-HB65

Precision Optical Performance Red, Green, and Blue
New 5mm Standard 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. The package epoxy contains both UV-A and UV-B inhibitors to reduce the effects of long term exposure to direct sunlight.

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.

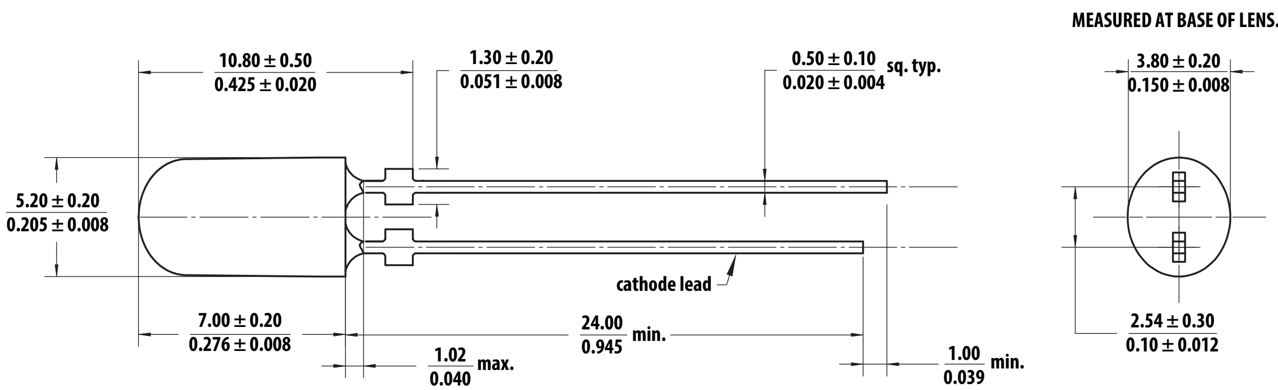
Features

- Well defined spatial radiation pattern
- High brightness material
- Available in Red, Green and Blue color
  - Red AlInGaP 626 nm
  - Green InGaN 525nm
  - Blue InGaN 470nm
- Superior resistance to moisture
- Standoff Package
- Tinted and diffused
- Typical viewing angle 40° × 100°

Applications

- Full color signs

Package Dimensions



NOTE All dimensions in millimeters (inches).

Device Selection Guide

Part Number	Color and Dominant Wavelength λd (nm) Typ[a]	Luminous Intensity Iv (mcd) at 20 mA-Min[b,c,d]]	Luminous Intensity Iv (mcd) at 20 mA-Max[b,c,d]
HLMP-HG65-VY000	Red 626	1150	2400
HLMP-HG65-VY0DD	Red 626	1150	2400
HLMP-HM65-34B00	Green 525	4200	6050
HLMP-HM65-34BDD	Green 525	4200	6050
HLMP-HM65-34CDD	Green 525	4200	6050
HLMP-HB65-QU0DD	Blue 470	460	1150
HLMP-HB65-RU0DD	Blue 470	550	1150

a. Dominant wavelength, λd, 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-H x 65 - x x x xx

Packaging Option
DD: Ammopacks

Color Bin Selection
0: Open distribution
B: Color bin 2 and 3
C: Color bin 3 and 4

Maximum Intensity Bin
0: No maximum intensity limit

Minimum Intensity Bin
Refer to Device Selection Guide.

Standoff/Non Standoff
5: Standoff

Color
G: Red 626
M: Green 525
B: Blue 470

Package
H: 5mm Standard Oval 40° x 100°

NOTE Refer to AB 5337 for complete information about the part numbering system.

Absolute Maximum Ratings

T_J = 25 °C

Parameter	Red	Green and Blue	Unit
DC Forward Current[a]	50	30	mA
Peak Forward Current	100[b]	100[c]	mA
Power Dissipation	120	116	mW
Reverse Voltage	5 (I_R = 100 µA)	5 (I_R = 10 µA)	V
LED Junction Temperature	130	110	°C
Operating Temperature Range	–40 to +100	–40 to +85	°C
Storage Temperature Range	–40 to +100	–40 to +100	°C

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

b. Duty Factor 30%, frequency 1KHz.

c. Duty Factor 10%, frequency 1KHz.

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 2.8	 2.1 3.2 3.2	 2.4 3.8 3.8	V	I_F = 20 mA
Reverse Voltage Red Green and blue	V_R	 5 5			V	 I_R = 100 µA I_R = 10 µA
Dominant Wavelength[a] Red Green Blue	λ_d	 618 520 460	 626 525 470	 630 540 480	nm	IF = 20 mA
Peak Wavelength Red Green Blue	λ_{PEAK}		 634 516 464		nm	Peak of Wavelength of Spectral Distribution at I_F = 20 mA
Thermal Resistance	$R\theta_{J\text{-}PIN}$		240		°C/W	LED Junction-to-Pin
Luminous Efficacy[b] Red Green Blue	η_V		 150 530 65		lm/W	Emitted Luminous Power/Emitted Radiant Power

a. The dominant wavelength is derived from the chromaticity Diagram and represents the color of the lamp.

b. The radiant intensity, Ie in watts per steradian, may be found from the equation $Ie = I_V/\eta V$ where I_V is the luminous intensity in candelas and η_V is the luminous efficacy in lumens/watt.

AlInGaP Red

Figure 1 Relative Intensity vs. Wavelength

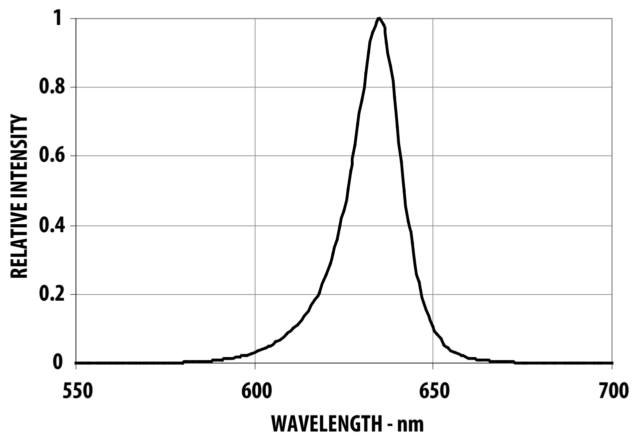


Figure 2 Forward Current vs. Forward Voltage

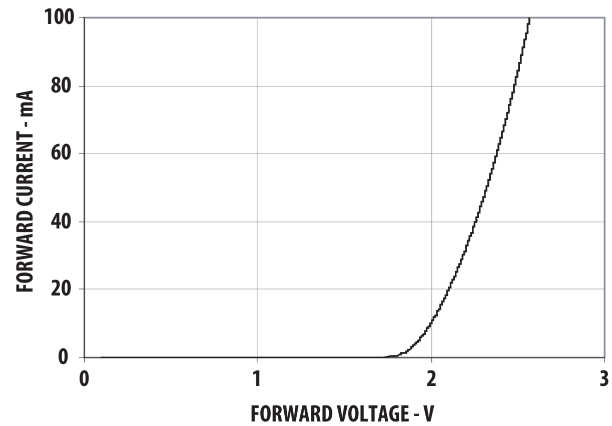


Figure 3 Relative Intensity vs. Forward Current

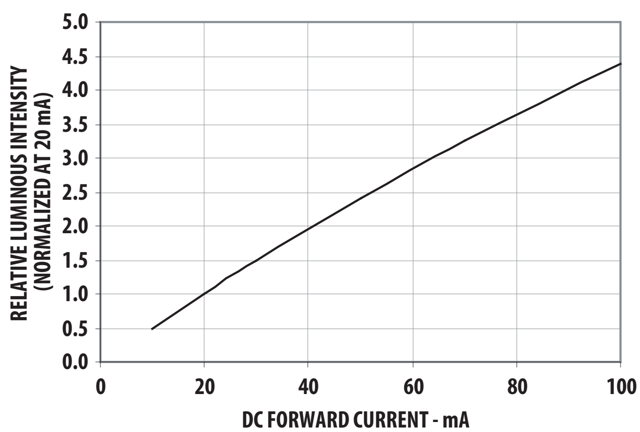
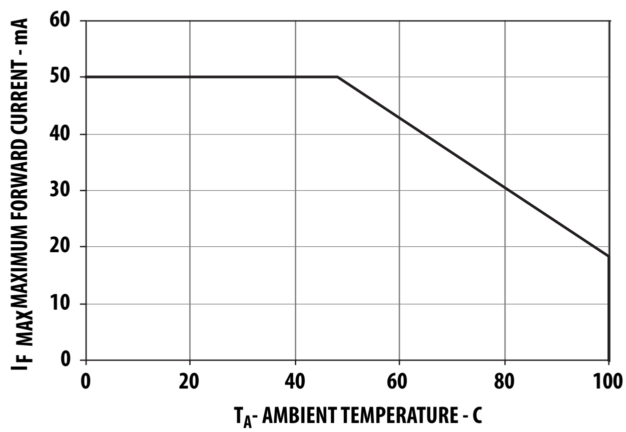


Figure 4 Maximum Forward Current vs. Ambient Temperature



InGaN Blue and Green

Figure 5 Relative Intensity vs. Wavelength

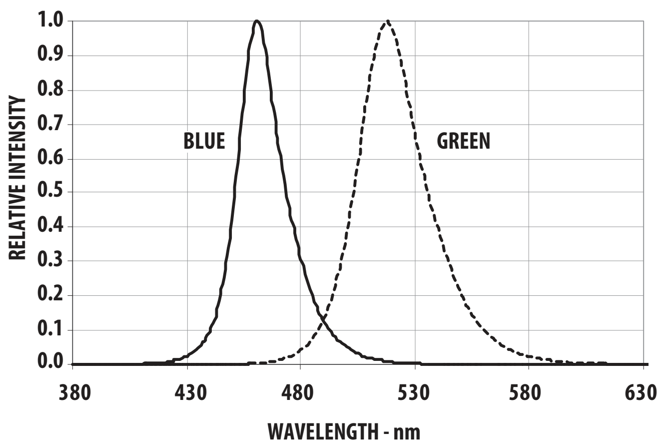


Figure 6 Forward Current vs. Forward Voltage

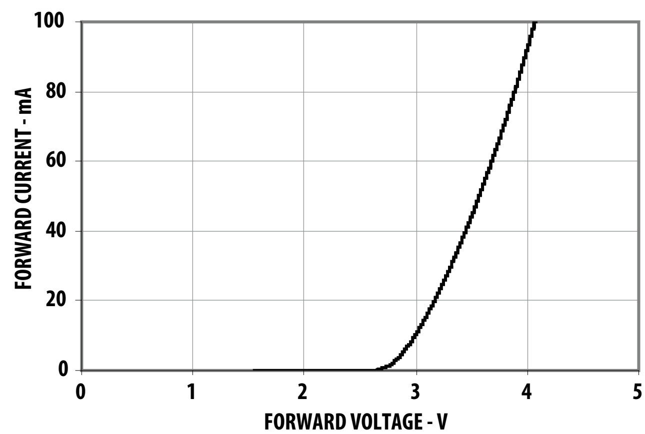


Figure 7 Relative Intensity vs. Forward Current

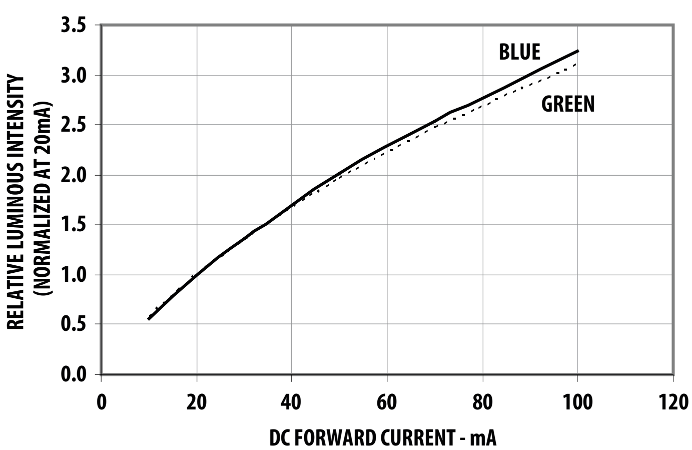


Figure 8 Maximum Forward Current vs. Ambient Temperature

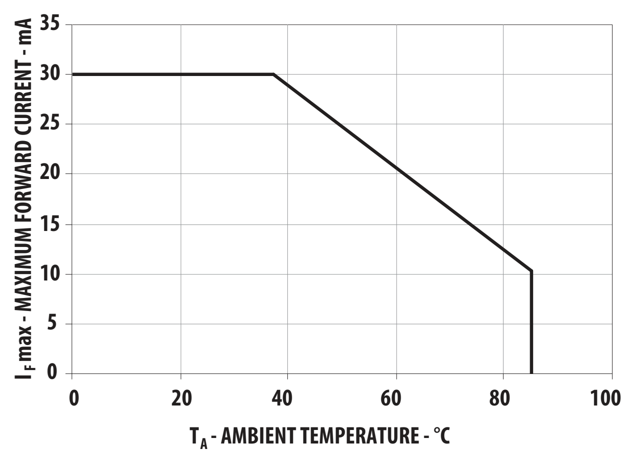


Figure 9 Relative Dominant Wavelength vs. Forward Current

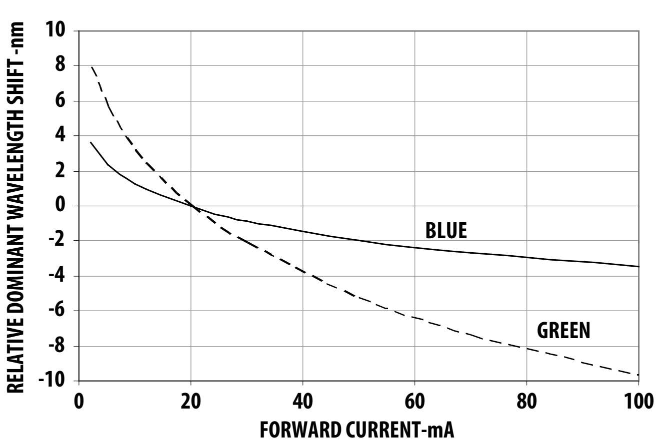


Figure 10 Radiation Pattern – Major Axis

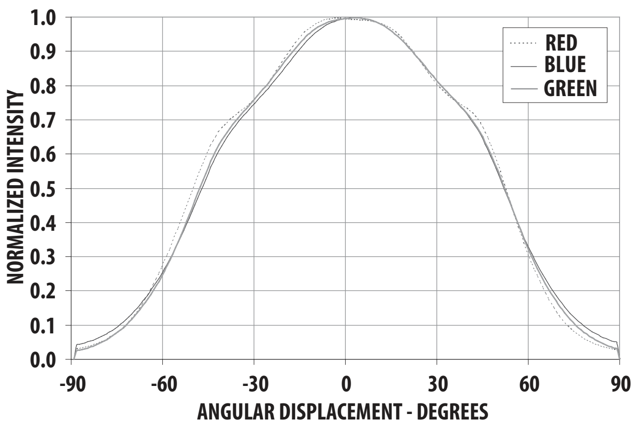


Figure 11 Radiation Pattern – Minor Axis

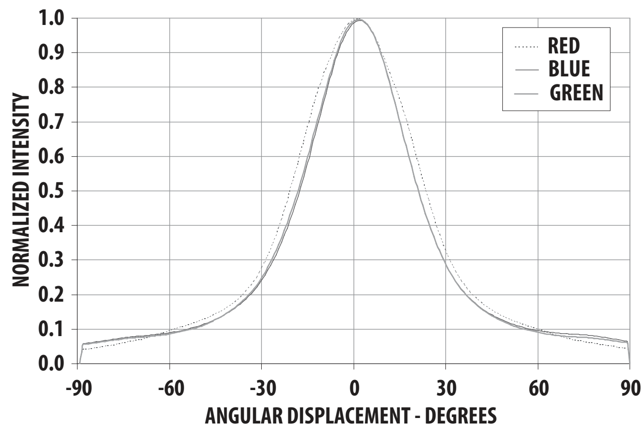


Figure 12 Relative Light Output vs. Junction Temperature

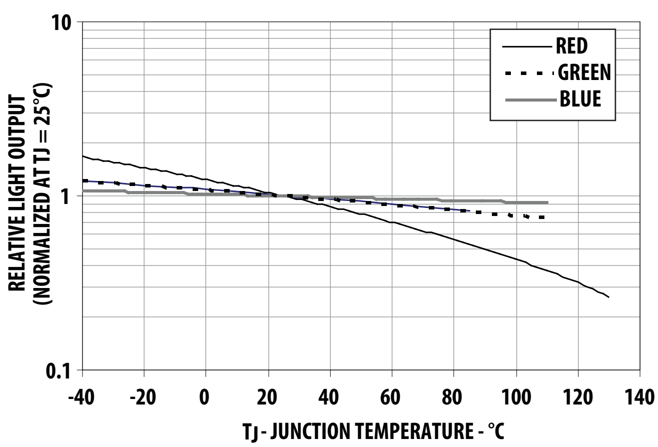
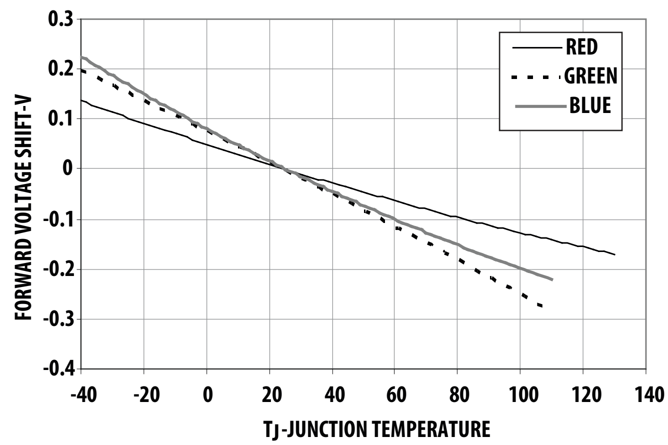


Figure 13 Relative Forward Voltage vs. Junction Temperature



Intensity Bin Limit Table (1.2:1 lv 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
4	5040	6050

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

Red Color Range

MinDom	Max Dom	Xmin	Ymin	Xmax	Ymax
618	630	0.6872	0.3126	0.6890	0.2943
		0.6690	0.3149	0.7080	0.2920

Tolerance for each bin limit is ± 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

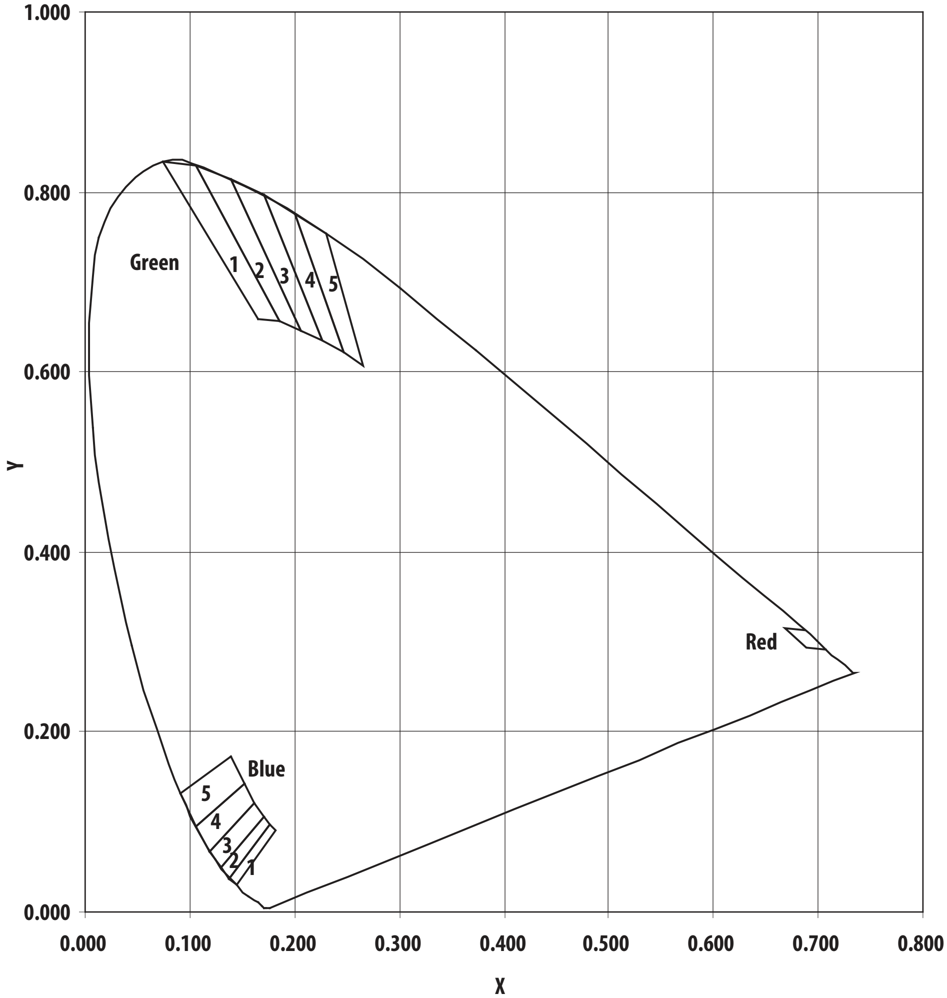
Tolerance for each bin limit is ± 5 nm.

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 ± 5 nm.

Avago Color Bin on CIE 1931 Chromaticity Diagram



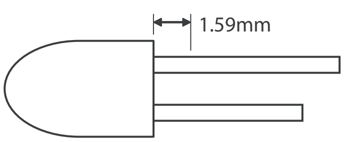
Precautions

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 the proper tool to precisely form and cut the leads to the 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. This is highly recommended for hand soldering operation, as the excess lead length also acts as small heat sink.

Soldering and Handling:

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

	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. Above conditions refers to measurement with thermocouple mounted at the bottom of PCB.

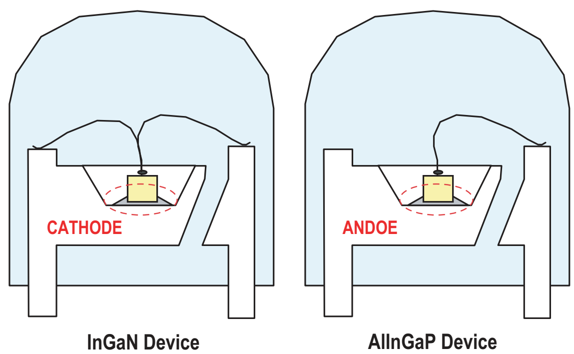
b. It is recommended to use only bottom preheaters in order to reduce thermal stress experienced by LED.

- Wave soldering parameters must be set and maintained according to the recommended temperature and dwell time. The customer is advised to perform daily checks on the soldering profile to ensure that it is always conforming 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. So, it is recommended to recalibrate the soldering profile again before loading a new type of PCB.
2. Avago Technologies' AllnGaP high brightness LEDs are using a high efficiency LED die with a single wire bond as shown below. The customer is advised to 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 s. Overstressing 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 being applied during wave soldering should be loosely fitted and should not apply weight or force on LED. Nonmetal material is recommended as it will absorb less heat during wave soldering process.
- At elevated temperature, LED is more susceptible to mechanical stress. Therefore, the PCB must allowed to cool down to room temperature prior to handling, which includes removal of alignment fixture or pallet.

- If the 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 the surface mount must be on the bottom side, these components should be soldered using reflow soldering prior to insertion the TH LED.
- The following table shows the recommended PC board plated through holes (PTH) size for LED component leads.

LED Component Lead Size	Diagonal	Plated through Hole Diameter
0.45 × 0.45 mm (0.018 × 0.018 inch)	0.636 mm (0.025 in.)	0.98 to 1.08 mm (0.039 to 0.043 in.)
0.50 x 0.50 mm (0.020 × 0.020 inch)	0.707 mm (0.028 in.)	1.05 to 1.15 mm (0.041 to 0.045 in.)

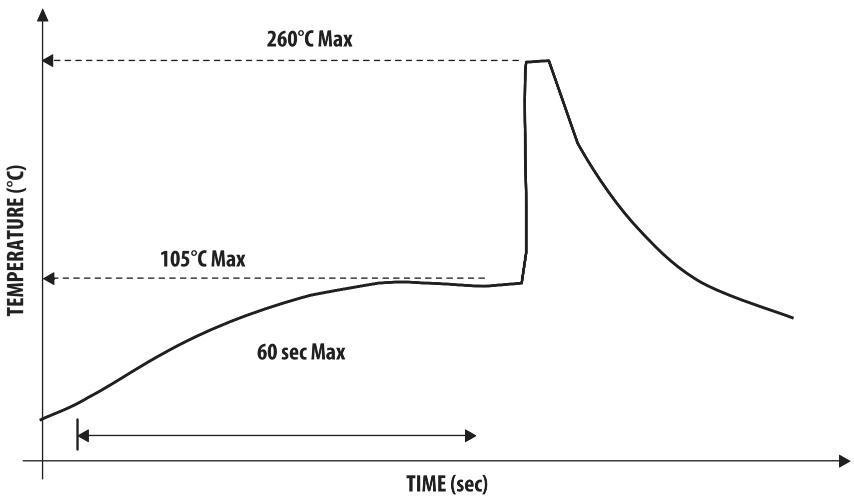
- Over-sizing the PTH can lead to a twisted LED after clinching. On the other hand, under-sizing the PTH can cause difficulty when inserting the TH LED.

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

Application Precautions

1. 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.
2. LEDs do exhibit slightly different characteristics at different drive currents that might result in larger performance variations (such as intensity, wavelength, and forward voltage). The user is recommended to set the application current as close as possible to the test current to minimize these variations.
3. The LED is not intended for reverse bias. Use other appropriate components for such purposes. When driving the LED in matrix form, it is crucial to 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)

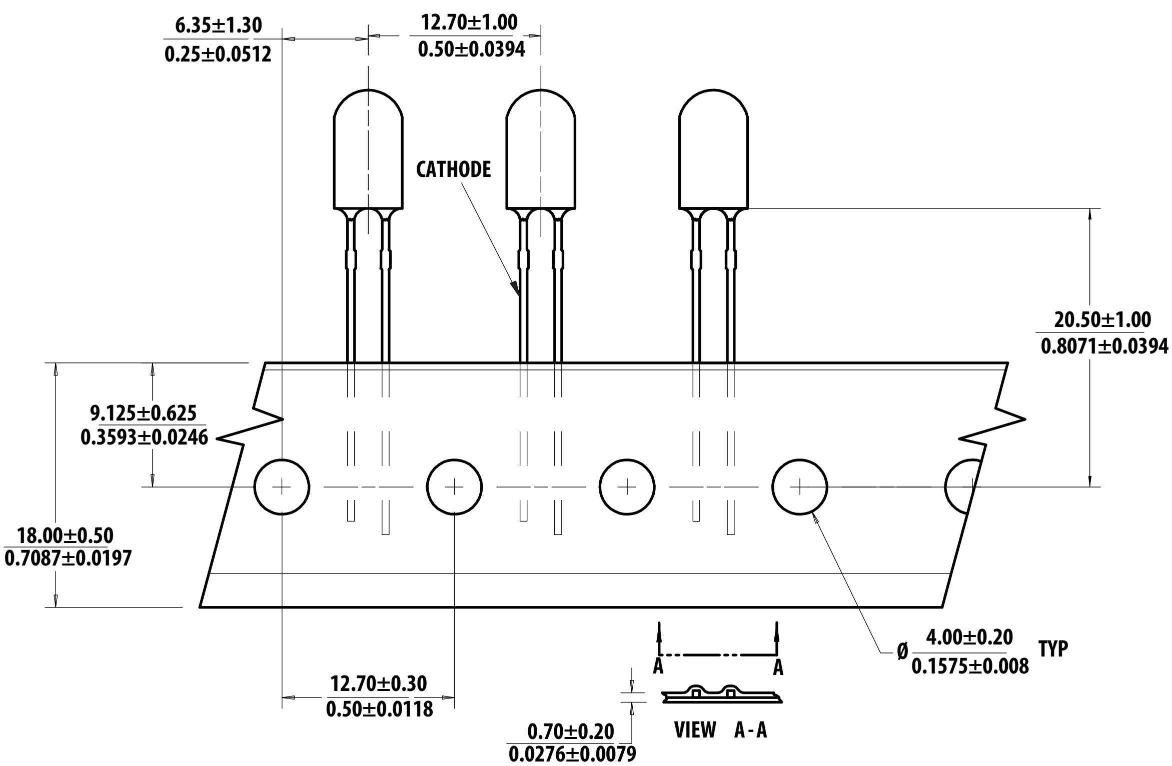
Flux: Rosin flux

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

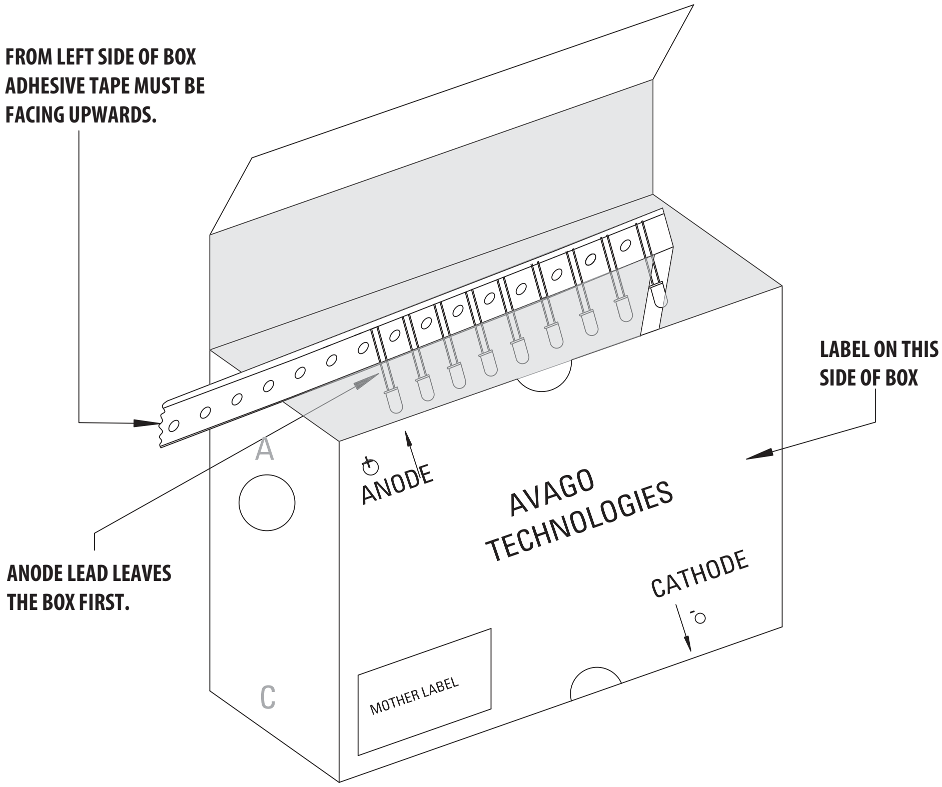
Dwell time: 3.0 sec - 5.0 sec
(maximum = 5sec)

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

Ammo Packs Drawing



Packaging Box for Ammo Packs



Packaging Label

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

AVAGO TECHNOLOGIES

(1P) Item: Part Number

STANDARD LABEL LS0002
RoHS Compliant
e3 max temp 260C

(1T) Lot: Lot Number

(Q) QTY: Quantity

LPN:

CAT: Intensity Bin

(9D)MFG Date: Manufacturing Date

BIN: Refer to below information

(P) Customer Item:

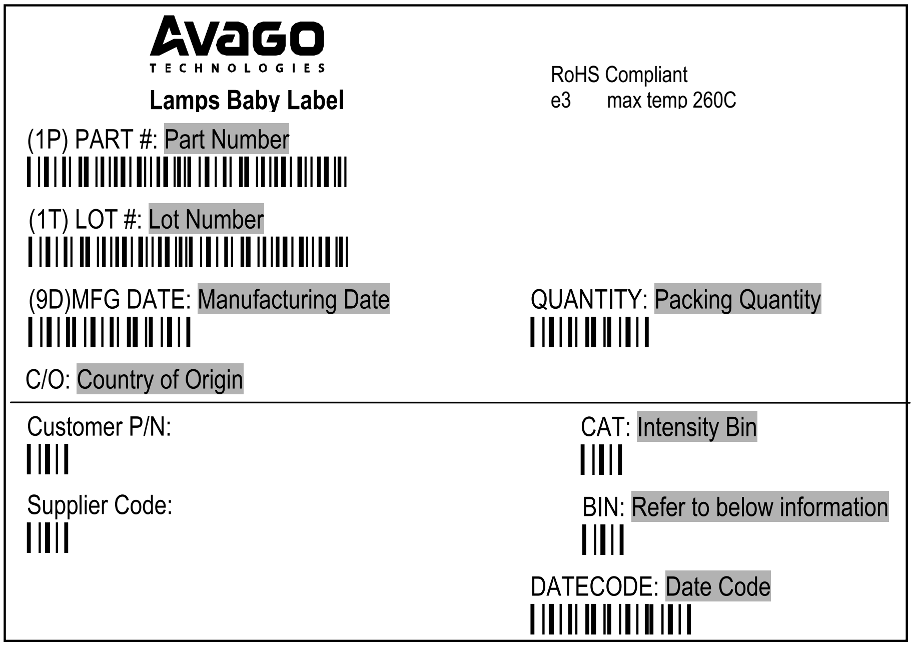
(V) Vendor ID:

(9D) Date Code: Date Code

DeptID:

Made In: Country of Origin

(i) 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

where 2 is color bin 2 only and VB is VF bin "VB"

***DISCLAIMER**: AVAGO’S PRODUCTS AND SOFTWARE ARE NOT SPECIFICALLY DESIGNED, MANUFACTURED OR AUTHORIZED FOR SALE AS PARTS, COMPONENTS OR ASSEMBLIES FOR THE PLANNING, CONSTRUCTION, MAINTENANCE OR DIRECT OPERATION OF A NUCLEAR FACILITY OR FOR USE IN MEDICAL DEVICES OR APPLICATIONS. CUSTOMER IS SOLELY RESPONSIBLE, AND WAIVES ALL RIGHTS TO MAKE CLAIMS AGAINST AVAGO OR ITS SUPPLIERS, FOR ALL LOSS, DAMAGE, EXPENSE OR LIABILITY IN CONNECTION WITH SUCH USE.*

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

AV02-1485EN – June 7, 2016

Lead (Pb) Free
RoHS 6 fully
compliant