HLMP-LL65 and HLMP-LH65

Precision Optical Performance Amber and Red Orange New 4 mm Standard Oval LEDs

Data Sheet

Description

This Precision Optical Performance Oval LED is 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.

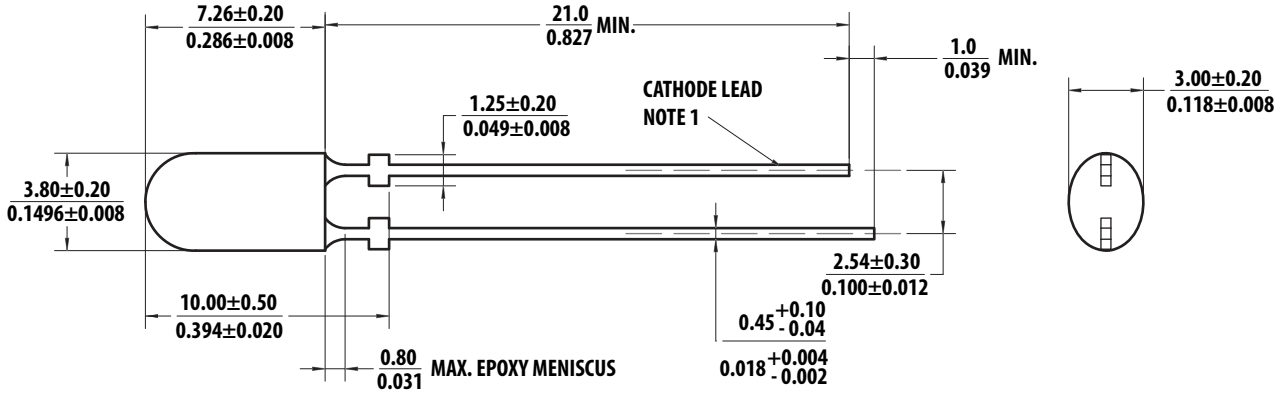
Features

- Well-defined spatial radiation pattern
- High brightness material
- Colors:
  - 590 nm Amber
  - 615 nm Red Orange
- Superior resistance to moisture
- Standoff package
- Tinted and diffused
- Typical viewing angle 50° x100°

Applications

- Full color signs

Package Dimensions



Notes:
All dimensions in millimeters (inches).
Tolerance is ±0.20 mm unless other specified.

Device Selection Guide

Part Number	Color and Dominant Wavelength λ_d (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-LL65-XYKDD	Amber 590	1660	2400
HLMP-LL65-XYLDD	Amber 590	1660	2400
HLMP-LH65-XY0DD	Red Orange 615	1660	2400
HLMP-LL65-YZKDD	Amber 590	1990	2900
HLMP-LL65-YZLDD	Amber 590	1990	2900

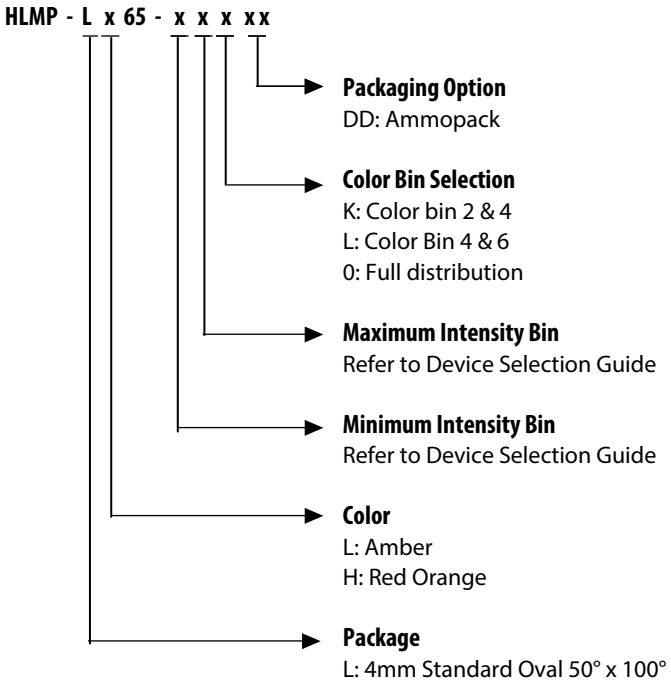
a. Dominant wavelength, λ_d, is derived from the CIE Chromaticity Diagram and represents the color of the lamp.

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



Absolute Maximum Ratings

T_J = 25 °C.

Parameter	Red	Unit
DC Forward Current[a]	50	mA
Peak Forward Current	100[b]	mA
Power Dissipation	120	mW
Reverse Voltage	5	V
LED Junction Temperature	130	°C
Operating Temperature Range	–40 to +100	°C
Storage Temperature Range	–40 to +100	°C

a. Derate linearly as shown in Figure 4.

b. Duty Factor 30%, frequency 1 kHz.

Electrical/Optical Characteristics

T_J = 25 °C.

Parameter	Symbol	Min	Typ	Max	Unit	Test Conditions
Forward Voltage, Amber/Red Orange	V_F	1.8	2.1	2.4	V	I_F = 20 mA
Reverse Voltage	V_R	5	—	—	V	I_R = 100 µA
Dominant Wavelength[a]	λ_d				nm	I_F = 20 mA
Amber		587.0	590.0	594.5		
Red Orange		612.0	615.0	619.0		
Peak Wavelength	λ_{PEAK}				nm	Peak of Wavelength of Spectral Distribution at I_F = 20 mA
Amber		—	594	—		
Red Orange		—	621	—		
Thermal Resistance	$R\theta_{J\text{-}PIN}$	—	240	—	°C/W	LED Junction-to-Anode lead
Luminous Efficacy[b]	η_V				lm/W	Emitted Luminous Power/ Emitted Radiant Power
Amber		—	500	—		
Red Orange		—	265	—		
Thermal Coefficient of λ_d					nm/°C	I_F = 20 mA +25 °C ≤ T_J ≤ +100 °C
Amber		—	0.08	—		
Red Orange		—	0.07	—		

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

b. 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 η_V is the luminous efficacy in lumens/watt.

Figure 1 Relative Intensity vs Wavelength

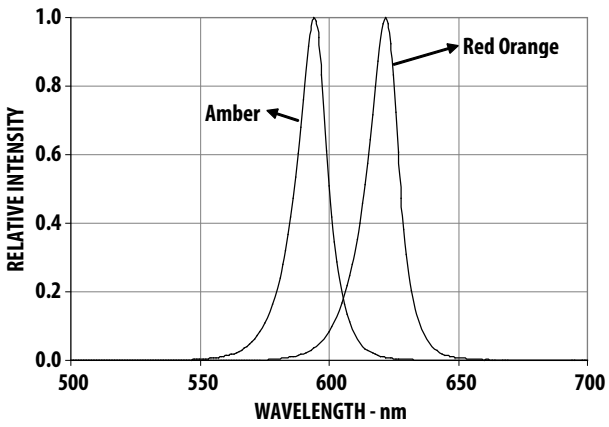


Figure 2 Forward Current vs Forward Voltage

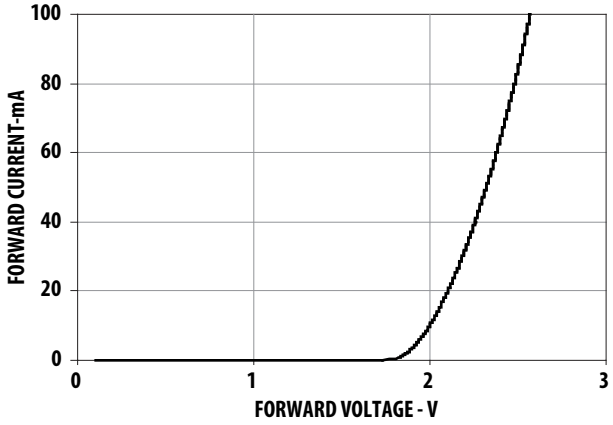


Figure 3 Relative Intensity vs Forward Current

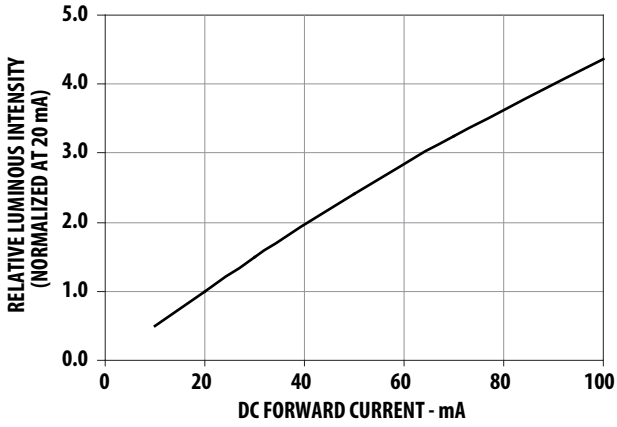


Figure 4 Maximum Forward Current vs Ambient Temperature

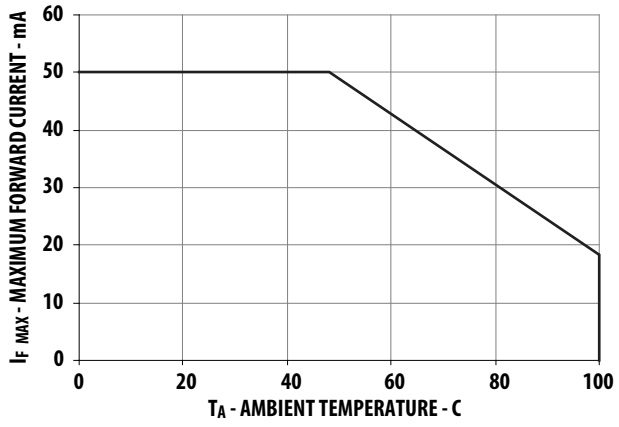


Figure 5 Radiation Pattern—Major Axis

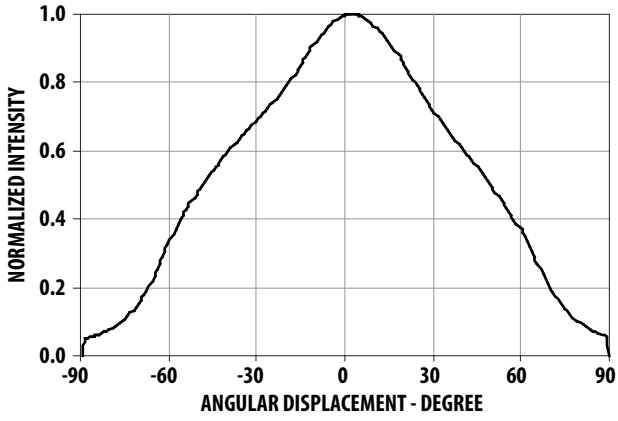
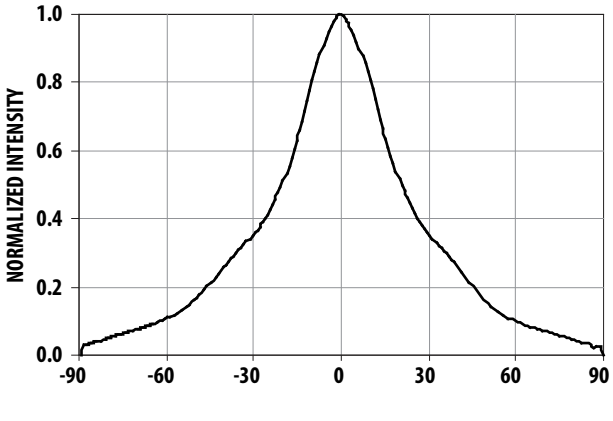


Figure 6 Radiation Pattern—Minor Axis



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

Bin[a]	Intensity (mcd) at 20 mA	
	Min	Max
X	1660	1990
Y	1990	2400
Z	2400	2900

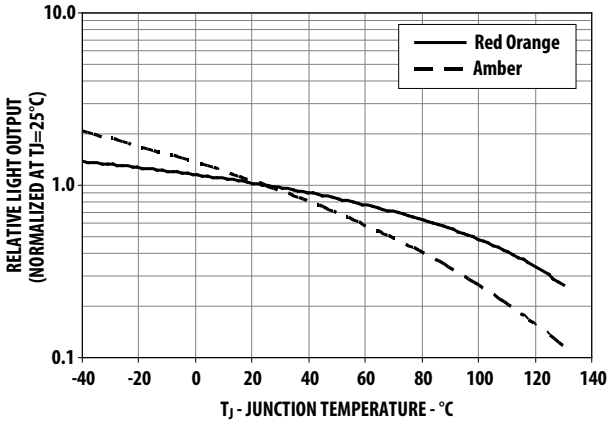
a. Tolerance for each bin limit is ±15%.

VF Bin Table (V at 20 mA)

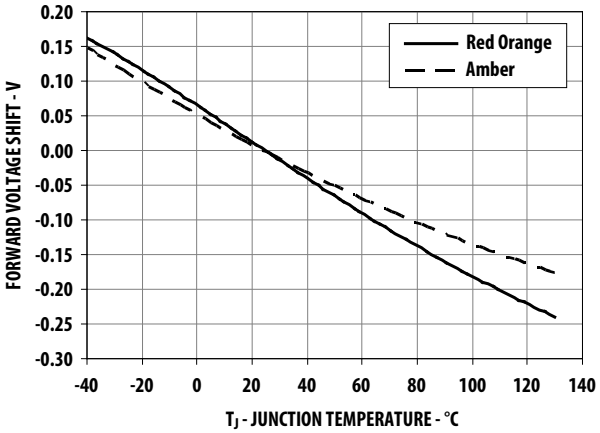
Bin ID[a]	Min	Max
VD	1.8	2.0
VA	2.0	2.2
VB	2.2	2.4

a. Tolerance for each bin limit is ±0.05 V.

Relative Light Output vs Junction Temperature



Relative Forward Voltage vs Junction Temperature



Amber Color Range

Bin[a]	Min Dom	Max Dom	X Min	Y Min	X Max	Y Max
2	587	589.5	0.5570	0.4420	0.5670	0.4250
			0.5530	0.4400	0.5720	0.4270
4	589.5	592	0.5720	0.4270	0.5820	0.4110
			0.5670	0.4250	0.5870	0.4130
6	592	594.5	0.5870	0.4130	0.5950	0.3980
			0.5820	0.4110	0.6000	0.3990

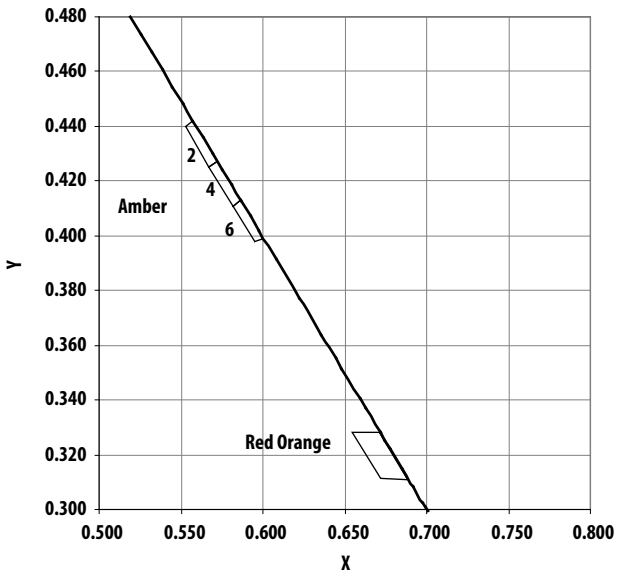
a. Tolerance for each bin limit is ±0.5 nm.

Red Orange Color Range

Min Dom	Max Dom	X Min	Y Min	X Max	Y Max
612.0	619.0	0.6712	0.3280	0.6716	0.6549
		0.6887	0.3109	0.3116	0.3282

Note: Tolerance for each bin limit is ±0.5 nm.

Avago Color Bin on CIE 1931 Chromaticity Diagram



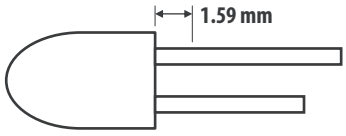
Precautions

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 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.
- The LED component may be effectively hand soldered to the 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 a 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. 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 refer to measurement with thermocouple mounted at the bottom of PCB.

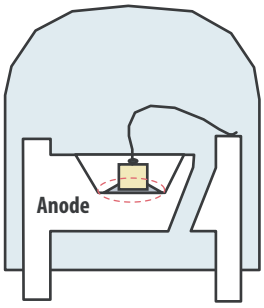
b. It is recommended to use only bottom preheaters in order to reduce thermal stress experienced by LED.

- Wave soldering parameters must be set and maintained according to the recommended temperature and dwell time. Customers are advised to perform a daily check on the soldering profile to ensure that it is always conforming to recommended soldering conditions.

NOTE 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 same wave soldering setting is used. So, it is recommended to recalibrate the soldering profile again before loading a new type of PCB.

Avago Technologies' high brightness LED uses a high efficiency LED die with single wire bond as shown below. Customers are 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



NOTE Electrical connection between bottom surface of LED die and the lead frame is achieved through conductive paste.

- 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.

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

- At elevated temperature, the LED is more susceptible to mechanical stress. Therefore, the PCB must be 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 a surface-mount component must 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.

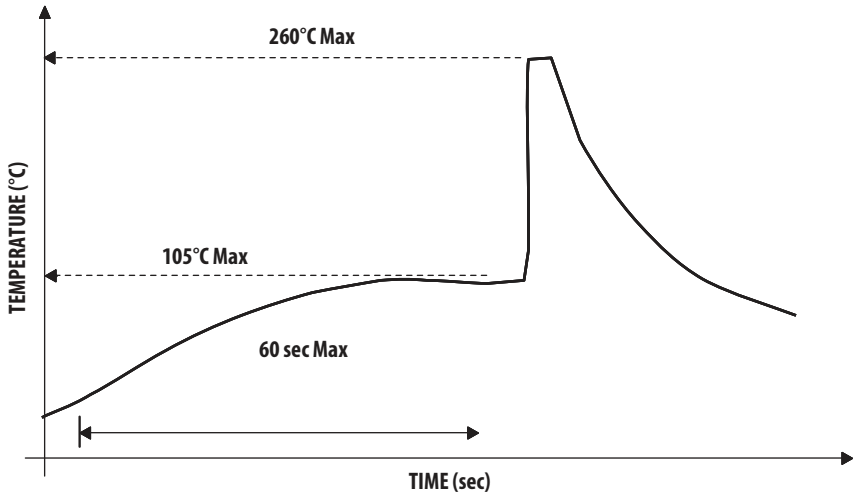
LED Component Lead Size	Diagonal	Plated Through Hole Diameter
0.45 x 0.45 mm (0.018 x 0.018 inch)	0.636 mm (0.025 inch)	0.98 to 1.08 mm (0.039 to 0.043 inch)
0.50 x 0.50 mm (0.020 x 0.020 inch)	0.707 mm (0.028 inch)	1.05 to 1.15 mm (0.041 to 0.045 inch)

- 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.

Application Precautions

- 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 current, which might result in larger performance variation (i.e., intensity, wavelength, and forward voltage). The user is recommended to set the application current as close as possible to the test current in order to minimize these variations.
- The LED is not intended for reverse bias. Use other appropriate components for such purpose. When driving the LED in matrix form, it is crucial to ensure that the reverse bias voltage is not exceeding 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

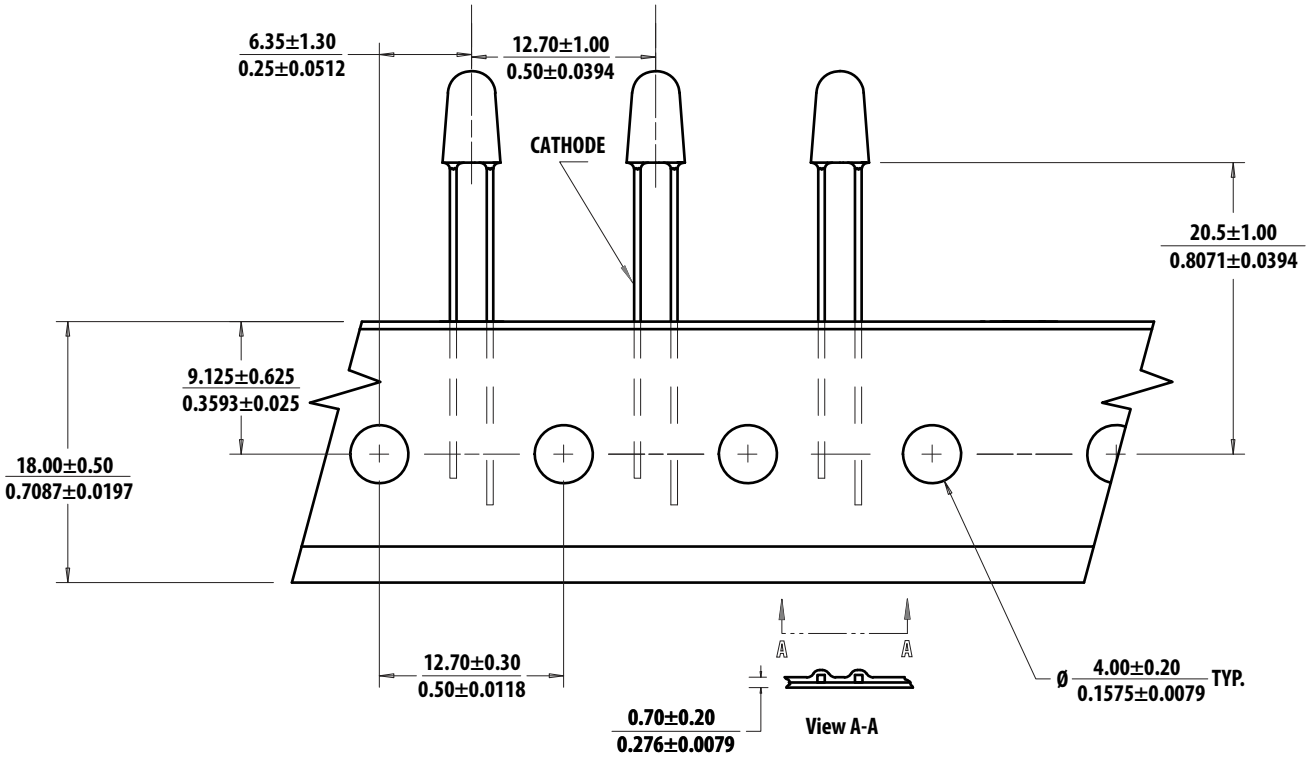
Solder bath temperature: 255°C ± 5°C
(maximum peak temperature = 260°C)

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

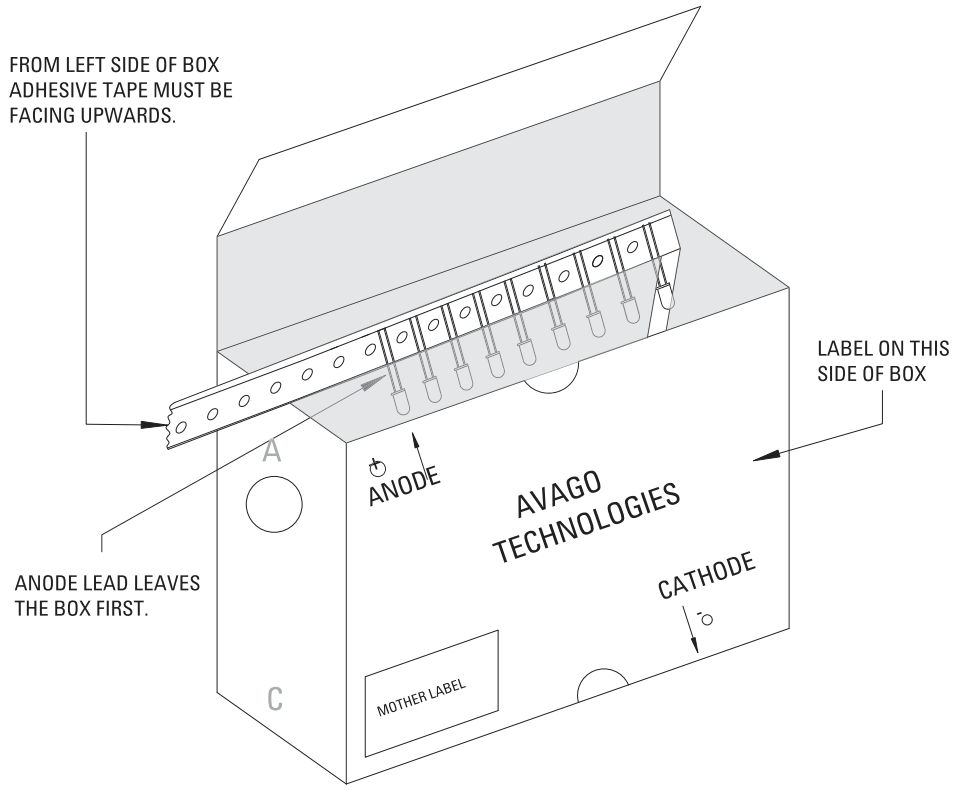
Note: Allow for board to be sufficiently cooled to room temperature before exerting mechanical force.

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

Ammo Packs Drawing



Packaging Box for Ammo Packs

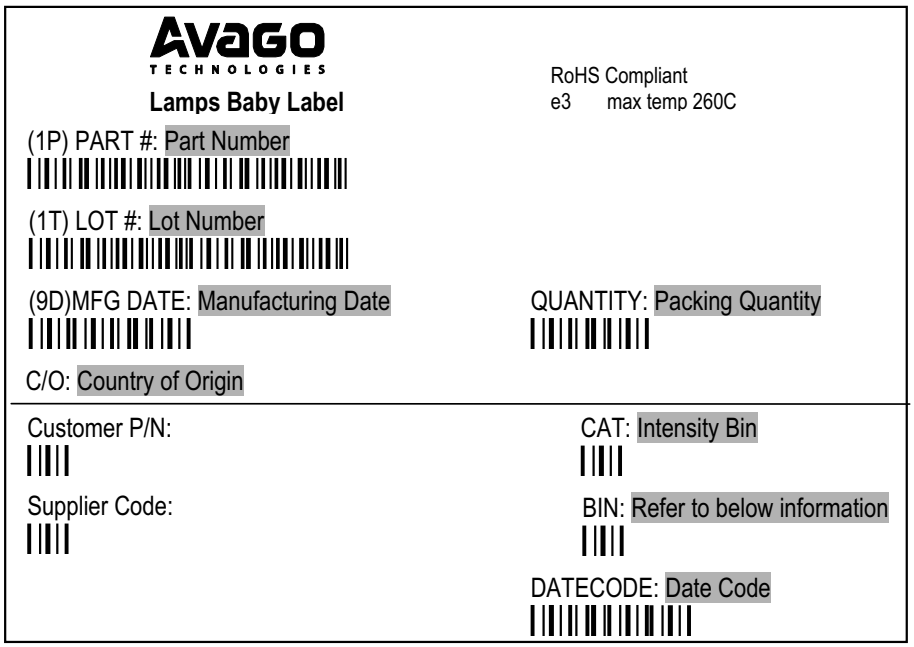


Note: The dimension for ammo pack is applicable for the device with standoff and without standoff.

Packaging Label

(i) Avago Mother Label: (Available on Packaging Box of Ammo Pack and Shipping Box)

(ii) Avago Baby Label (Only Available on Bulk Packaging)



Acronyms and Definitions

BIN:

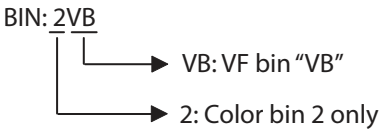
- (i) Color bin only or VF bin only
  (Applicable for part number with color bins but without VF bin OR part number with VF bins and no color bin)

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



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