HLMP-HL64, HLMP-HL65

Precision Optical Performance Amber AlInGaP 5mm 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 UV inhibitors to reduce the effects of long term exposure to direct sunlight.

Features

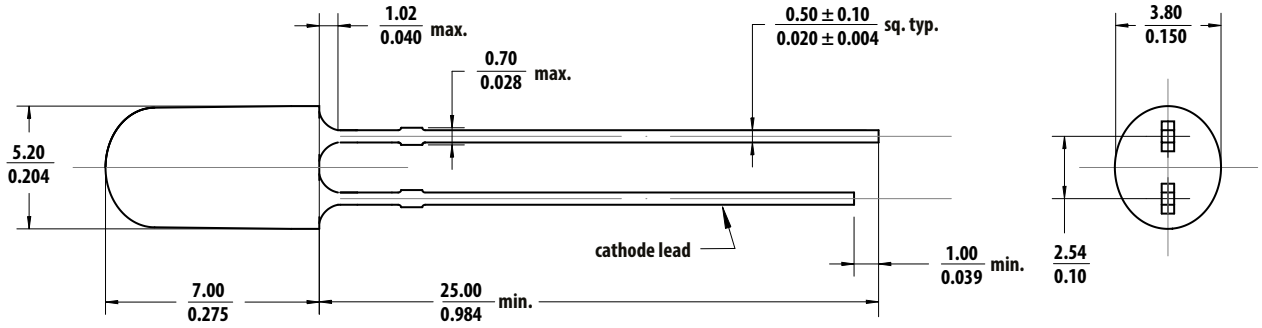
- Well defined spatial radiation pattern
- High brightness material
- Superior resistance to moisture
- Standoff Package
- Tinted and diffused
- Typical viewing angle 40° × 100°

Applications

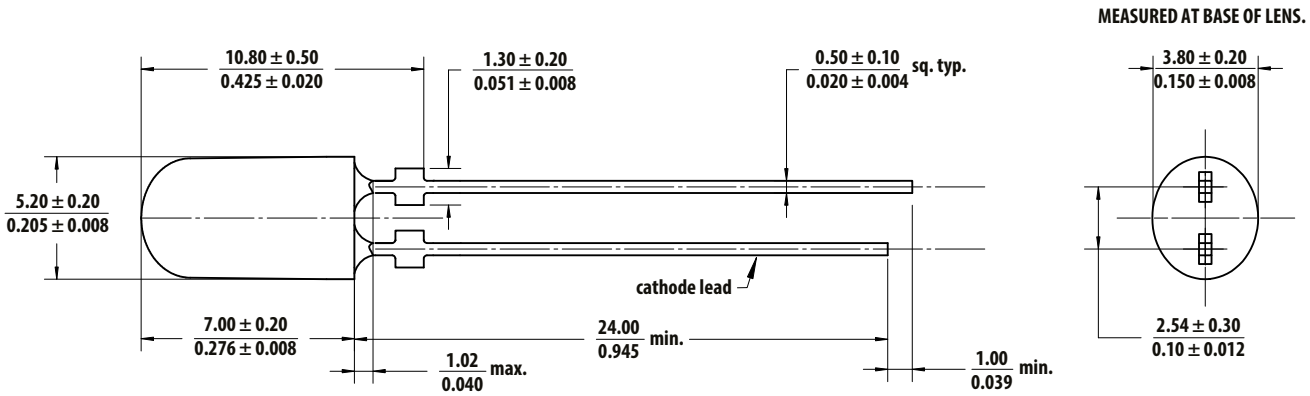
- Mono color signs

Package Dimensions

A: Non stand-off



B: Stand-off



NOTE

1. All dimensions in millimeters (inches).
2. 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 Min[b,c,d]	Luminous Intensity Iv (mcd) at 20 mA Max[b,c,d]	Standoff
HLMP-HL64-XYKDD	Amber 590	1660	2400	No
HLMP-HL64-XYLDD				No
HLMP-HL65-XYKDD				Yes
HLMP-HL65-XYLDD				Yes

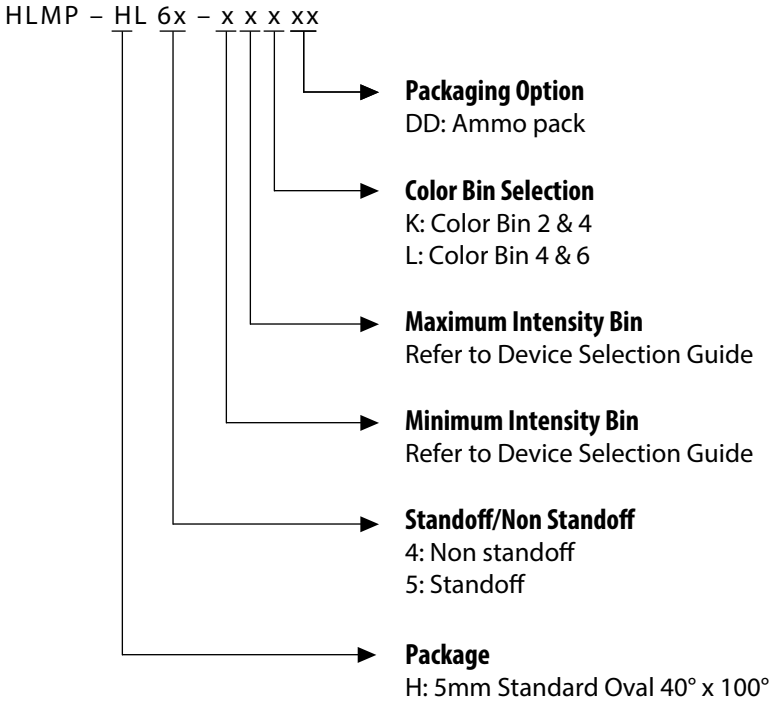
a. Dominant wavelength, λ_d, is derived from the CIE Chromaticity Diagram and represents the color of the lamp.

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



NOTE Please refer to AB 5337 for complete information about part numbering system.

Absolute Maximum Ratings at T_J = 25 °C

Parameter	Amber	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 at T_J = 25 °C

Parameter	Symbol	Min.	Typ.	Max.	Units	Test Conditions
Forward Voltage	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	587.0	590.0	594.5	nm	I_F = 20 mA
Peak Wavelength	λ_{PEAK}		594		nm	Peak of Wavelength of Spectral Distribution at I_F = 20 mA
Thermal Resistance	$R\theta J_{-PIN}$		240		°C/W	LED Junction-to-Anode Lead
Luminous Efficacy[b]	η_V		500		lm/W	Emitted Luminous Power/Emitted Radiant Power
Thermal Coefficient of λ_d			0.08		nm/°C	I_F = 20 mA; + 25 °C ≤ T_J ≤ + 100 °C

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

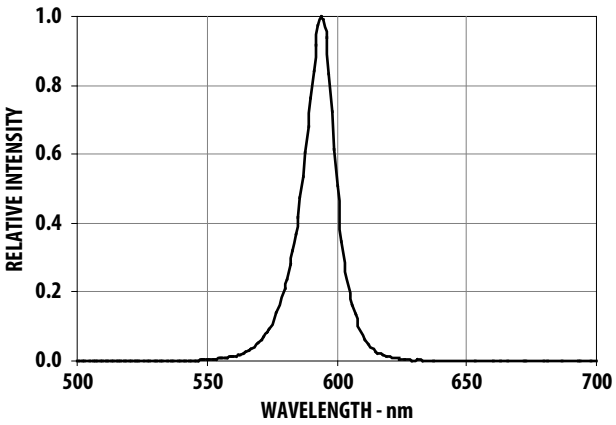


Figure 2 Forward Current vs. Forward Voltage

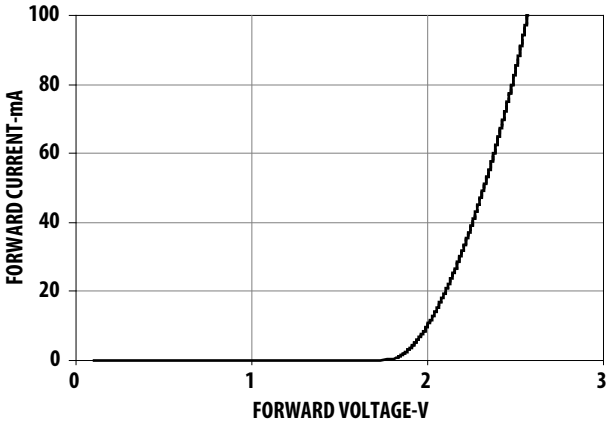


Figure 3 Relative Intensity vs. Forward Current

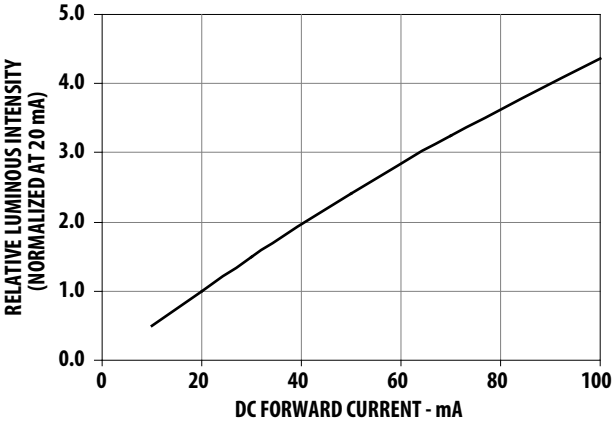


Figure 4 Maximum Forward Current vs. Ambient Temperature

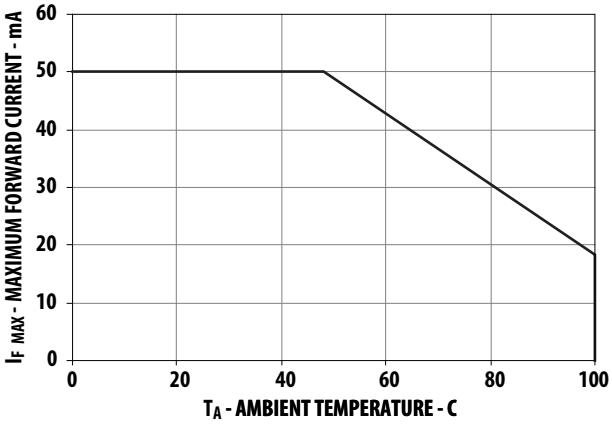


Figure 5 Radiation Pattern – Major Axis

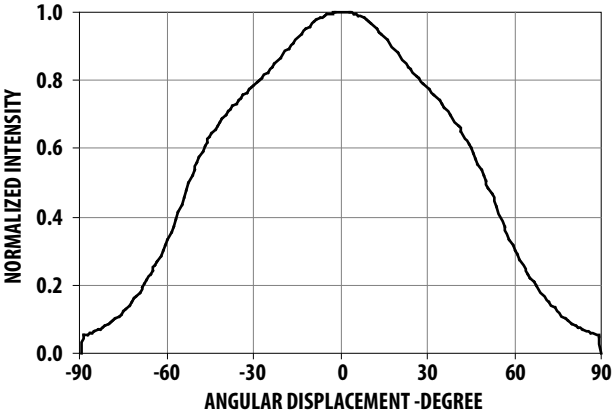


Figure 6 Radiation Pattern – Minor Axis

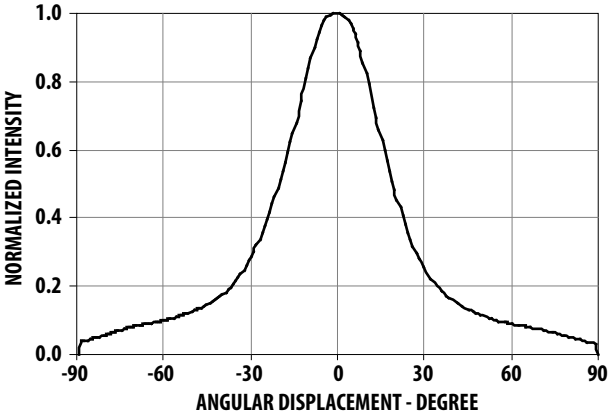


Figure 7 Relative Light Output vs. Junction Temperature

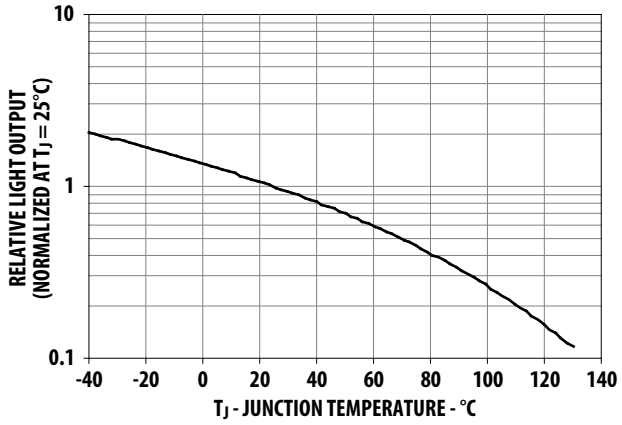
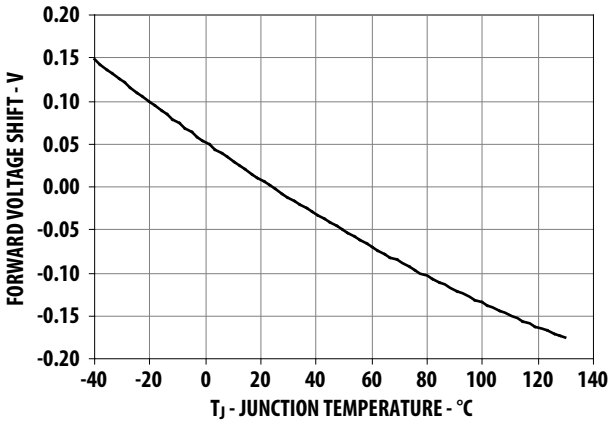


Figure 8 Relative Forward Voltage vs. Junction Temperature



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

Bin	Intensity (mcd) at 20 mA	
	Min	Max
X	1660	1990
Y	1990	2400

Tolerance for each bin limit is ± 15 %.

V_F Bin Table (V at 20mA)

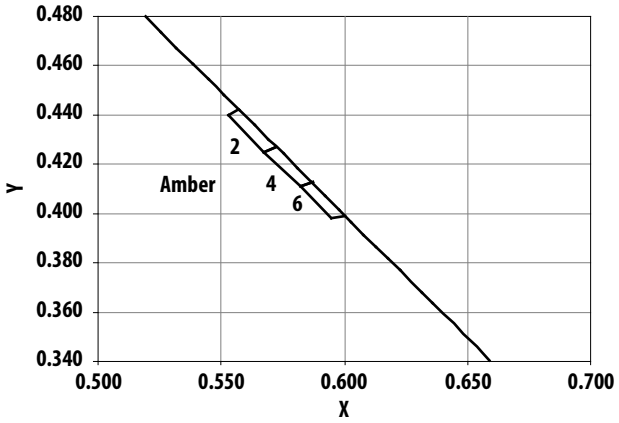
Bin ID	Min	Max
VD	1.8	2.0
VA	2.0	2.2
VB	2.2	2.4

Tolerance for each bin limit is ±0.05V.

Amber Color Range

Bin	Min Dom	Max Dom	Xmin	Ymin	Xmax	Ymax
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

Avago Color Bin on CIE 1931 Chromaticity Diagram



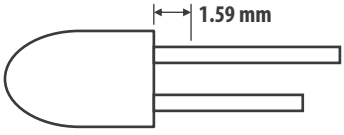
Precautions

Lead Forming

- The leads of an LED lamp may be preformed or cut to length prior to insertion and soldering on the PC board.
- For better control, it is recommended to use the 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 that 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 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. Refer to Avago application note AN 1142 for details. The soldering iron used should have a grounded tip to ensure that electrostatic charge is properly grounded.
- Recommended soldering condition follows.

	Wave Soldering[a, b]	Manual Solder Dipping
Pre-heat temperature	105 °C Max.	—
Preheat time	60 s Max	—
Peak temperature	260 °C Max.	260 °C Max.
Dwell time	5 s Max.	5 s Max

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

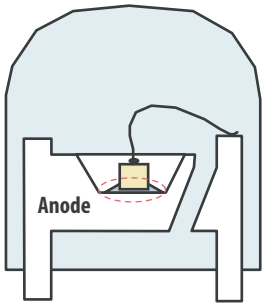
b. It is recommended to use only bottom preheaters to reduce thermal stress experienced by the LED.

- Wave soldering parameters must be set and maintained according to the recommended temperature and dwell time. The customer is advised to perform a daily check on the soldering profile to ensure that it always conforms to the 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 the 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 LEDs use a high efficiency LED die with single wire bond as shown on the next page. 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 exceeding 5 s. Over-stressing the LED during soldering process might cause premature failure to the LED due to delamination.

Avago Technologies LED Configuration



InGaN Device

NOTE Electrical connection between the 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 the LED. Non-metal material is recommended because it will absorb less heat during wave soldering process.

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

- At elevated temperatures, the 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 the alignment fixture or pallet.
- If the PCB board contains both through hole (TH) LEDs and other surface mount components, it is recommended that surface mount components be soldered on the top side of the PCB. If surface mount must be on the bottom side, these components should be soldered using reflow soldering prior to insertion of 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 mm × 0.45 mm (0.018 in. × 0.018 in.)	0.636 mm (0.025 in.)	0.98 mm to 1.08 mm (0.039 in. to 0.043 in.)
0.50 mm × 0.50 mm (0.020 in. × 0.020 in.)	0.707 mm (0.028 in.)	1.05 mm to 1.15 mm (0.041 in. to 0.045 in.)

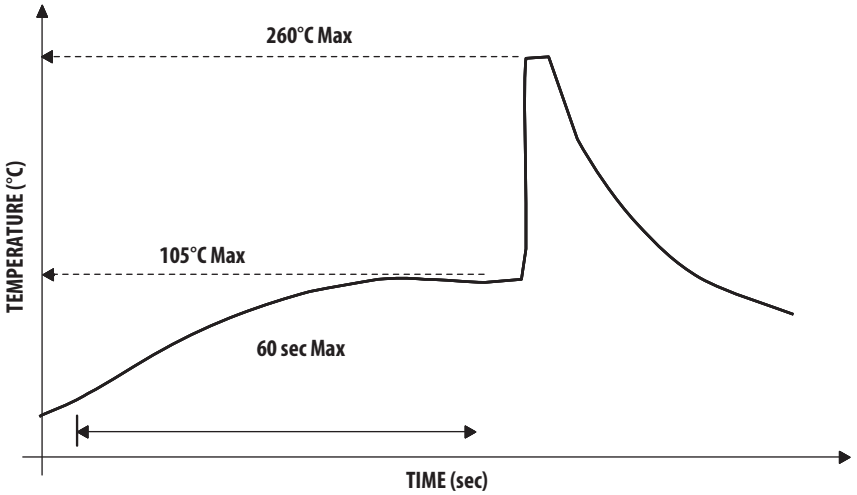
- Over-sizing the PTH can lead to a a twisted LED after clinching. On the other hand, under-sizing the PTH can cause difficulty when inserting the TH LED.

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 exhibit slightly different characteristics at different drive currents that 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 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.

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)

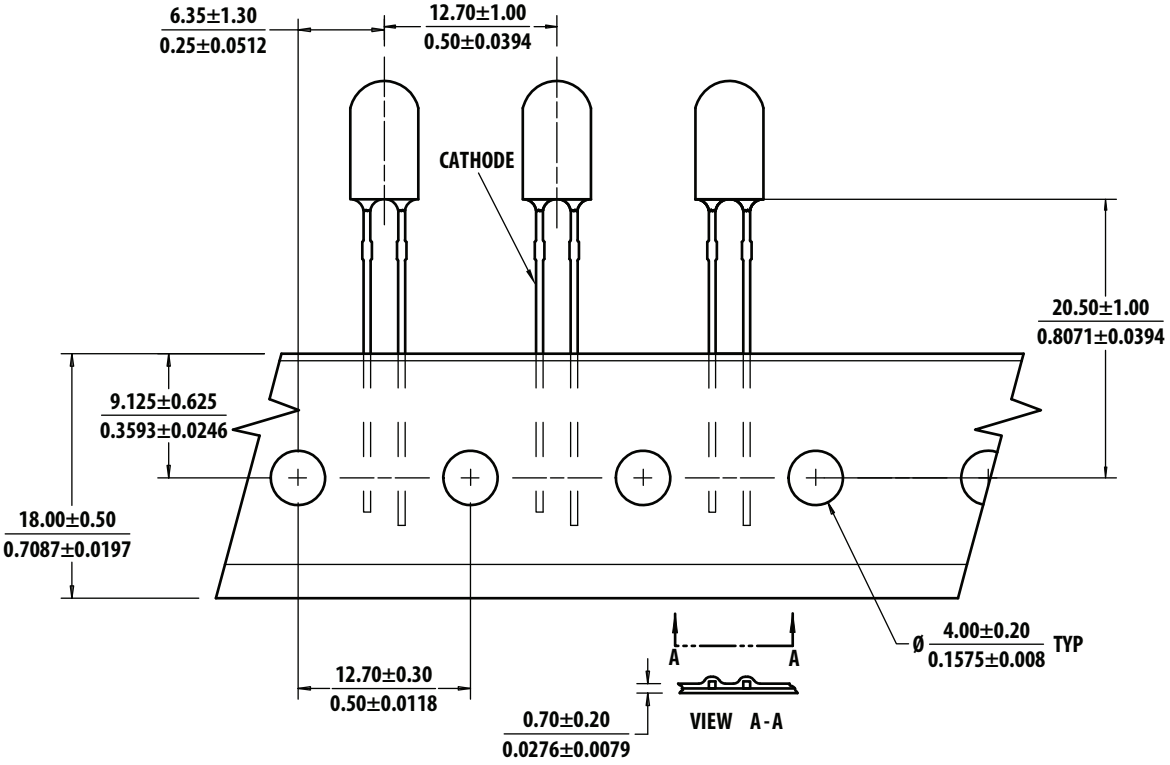
Flux: Rosin flux

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

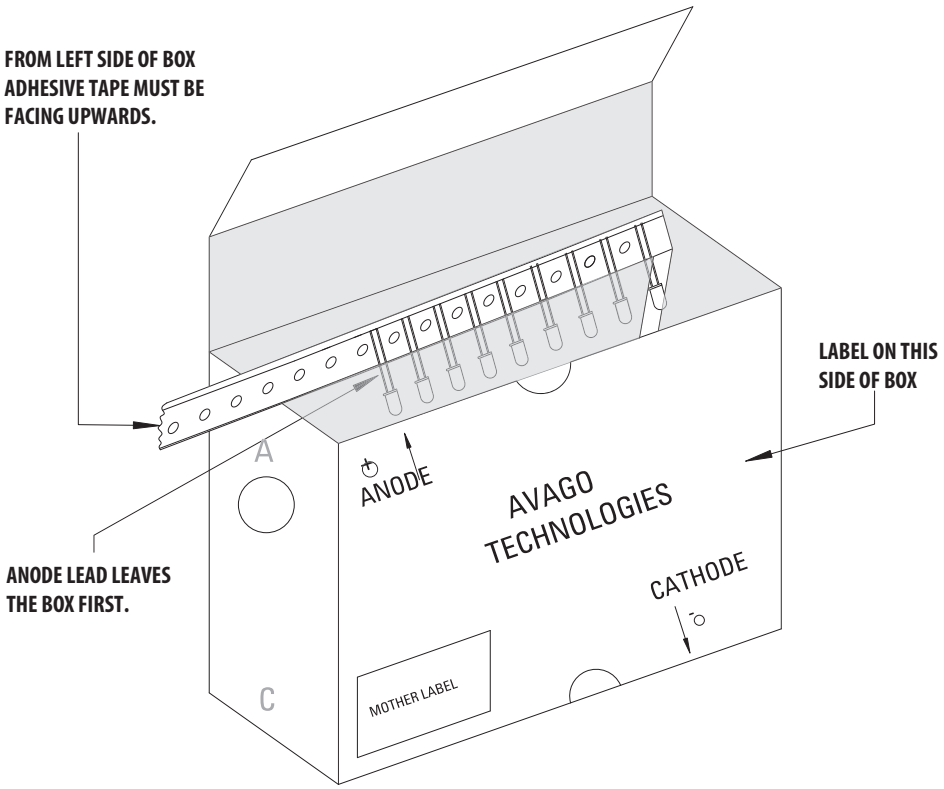
Dwell time: 3.0 sec - 5.0 sec
(maximum = 5sec)

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

Ammo Packs Drawing



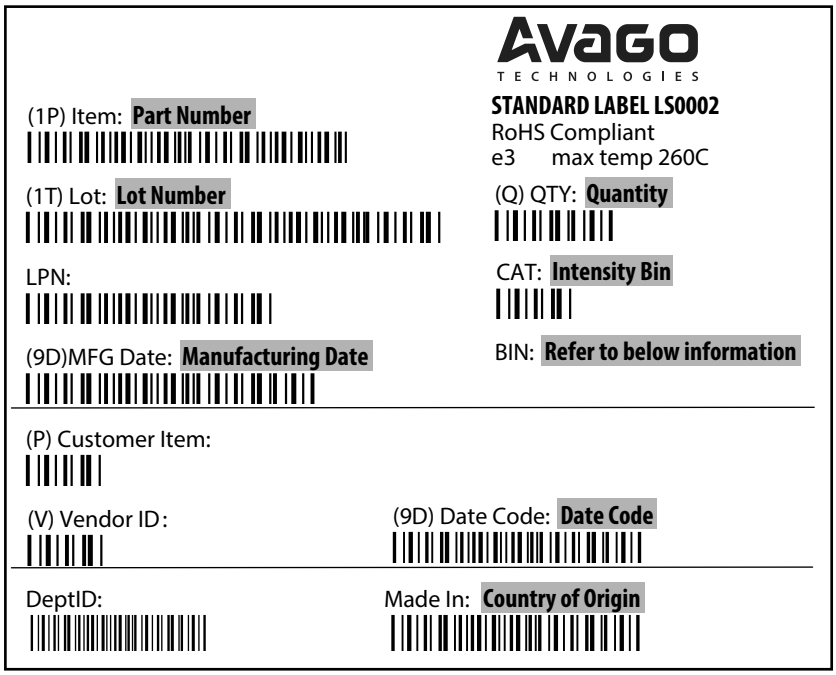
Packaging Box for Ammo Packs



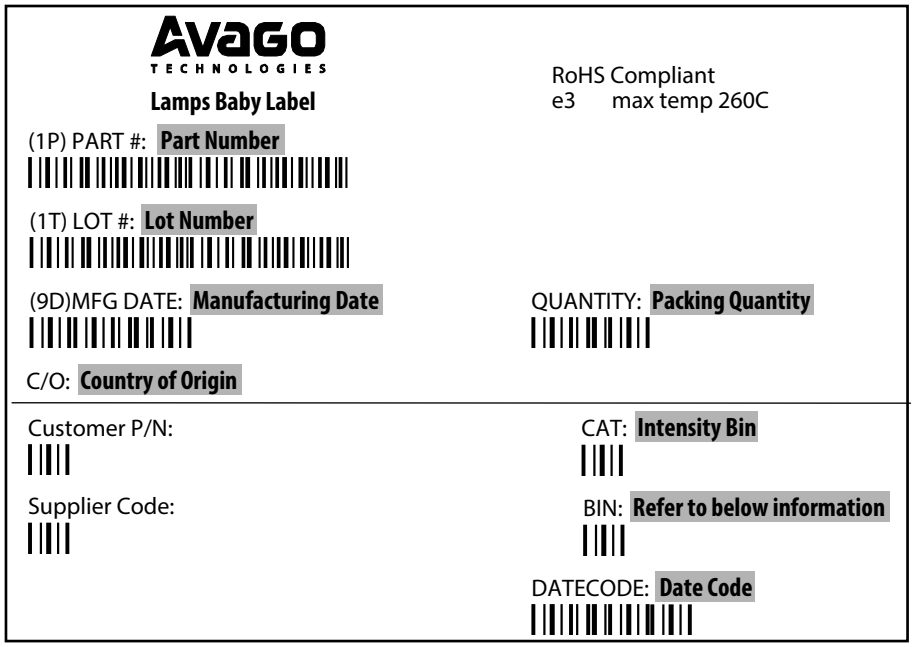
NOTE The dimension for ammo pack is applicable for the device with standoff and without standoff.

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 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
    - VB is VF bin "VB"

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

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Lead (Pb) Free
RoHS 6 fully
compliant