BROADCOM®

Data Sheet

HLMP-AL64/65, HLMP-AH64/65

Precision Optical Performance Amber and Red Orange
New 5-mm Mini Oval LEDs

Description

These Broadcom® 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.

Features

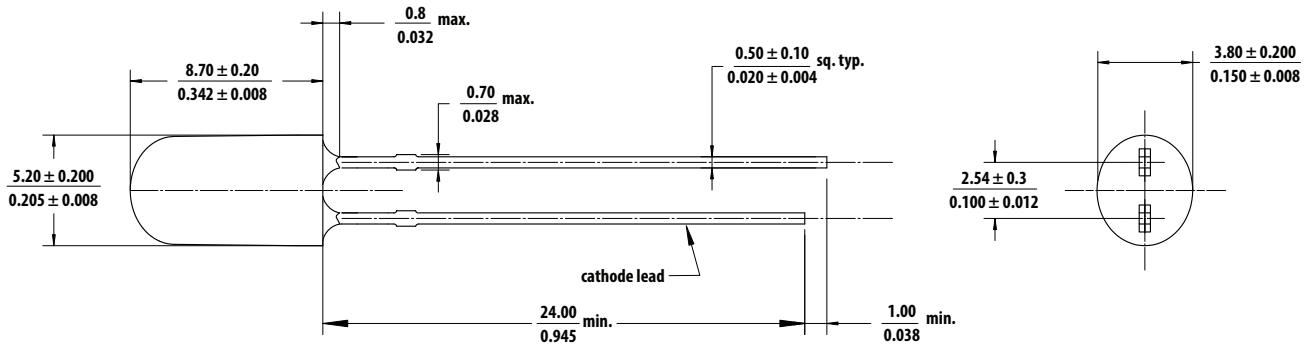
- Well defined spatial radiation pattern
- Colors:
  - Amber – 590 nm
  - Red Orange – 615 nm
- High-brightness material
- Superior resistance to moisture
- Standoff and non-standoff packages
- Tinted and diffused
- Typical viewing angle: 30° × 70°

Applications

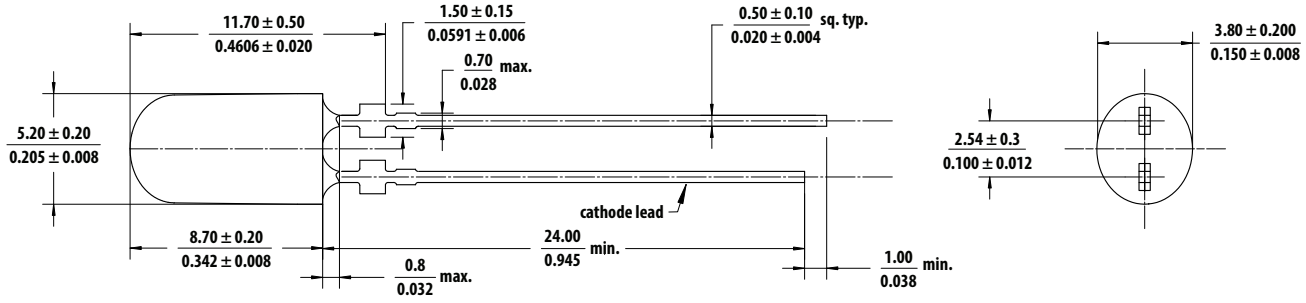
- Full color signs
- Mono color signs

Package Dimensions

Package Drawing A



Package Drawing B



NOTE: All dimensions are in millimeters (inches).

Device Selection Guide

Part Number	Color and Dominant Wavelength λ_d (nm) Typ.[a]	Luminous Intensity Iv (mcd) at 20 mA[b, c, d]		Package Drawing
		Min.	Max.	
HLMP-AL64-23Kxx	Amber 590	3500	5040	A
HLMP-AL64-23LDD	Amber 590	3500	5040	A
HLMP-AL65-23KDD	Amber 590	3500	5040	B
HLMP-AL65-23LDD	Amber 590	3500	5040	B
HLMP-AH64-Z10DD	Red Orange 615	2400	3500	A
HLMP-AH65-Z10DD	Red Orange 615	2400	3500	B

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%.

Absolute Maximum Ratings (T_J = 25°C)

Parameter	Amber/Red Orange	Unit
DC Forward Current[a]	50	mA
Peak Forward Current	100[b]	mA
Power Dissipation	120	mW
Reverse Voltage	5 (I_R = 100 µA)	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.	Units	Test Conditions
Forward Voltage	V_F				V	I_F = 20 mA
Amber/Red Orange		1.8	2.1	2.4		
Reverse Voltage	V_R	5	—	—	V	I_R = 100 µA
Dominant Wavelength[a]	λ_d					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					Emitted luminous power/emitted radiant power
Amber		—	500	—		
Red Orange		—	265	—	lm/W	
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.

Part Numbering System

H	L	M	P	-	x_1	x_2	x_3	x_4	-	x_5	x_6	x_7	x_8	x_9

Code	Description	Option	
x_1	Package Type	A	5-mm Mini Oval 30° × 70°
x_2	Color	H	Red Orange
		L	Amber
x_3x_4	Lead Stand-off	64	Without lead stand-off
		65	With lead stand-off
x_5	Minimum Intensity Bin	See Intensity Bin Limit Table (1.2: 1 Iv Bin Ratio)	
x_6	Maximum Intensity Bin		
x_7	Color Bin Option	0	Full distribution
		K	Color bins 2 and 4
		L	Color bins 4 and 6
x_8x_9	Packing Option	00	Bulk packaging
		DD	Ammopack

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

Bin Limits

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

Bin	Intensity (mcd) at 20 mA	
	Min.	Max.
Z	2400	2900
1	2900	3500
2	3500	4200
3	4200	5040

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

Tolerance for each bin limit is ± 0.05V.

Amber Color Bin Limit

Bin ID	Min.	Max.
2	587.0	589.5
4	589.5	592.0
6	592.0	594.5

Tolerance for each bin limit is ± 0.5 nm.

Red Orange Color Range

Min. Dom	Max. Dom	Xmin	Ymin	Xmax	Ymax
612.0	619.0	0.6712	0.3280	0.6716	0.6549
		0.6887	0.3109	0.3116	0.3282

Tolerance for each bin limit is ± 0.5nm

Color Bin on CIE 1931 Chromaticity Diagram

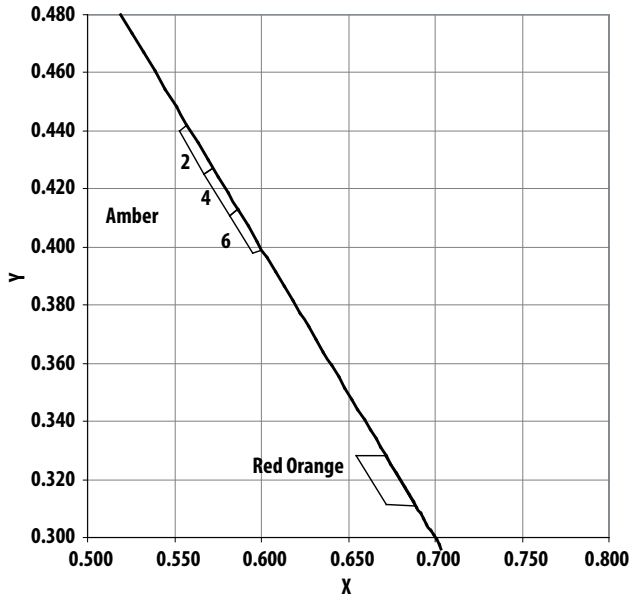


Figure 1: Relative Intensity vs. Wavelength

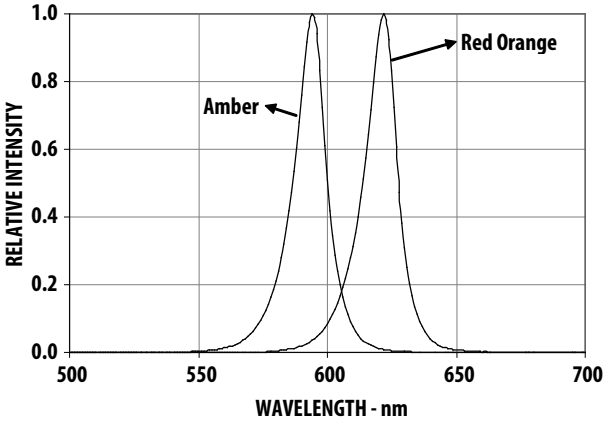


Figure 2: Forward Current vs. Forward Voltage

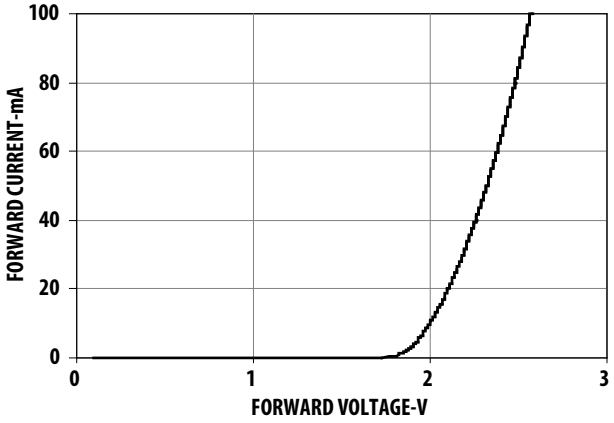


Figure 3: Relative Intensity vs. Forward Current

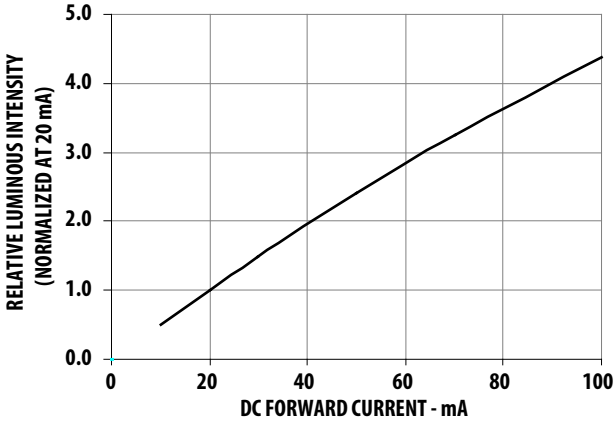


Figure 4: Maximum Forward Current vs. Ambient Temperature

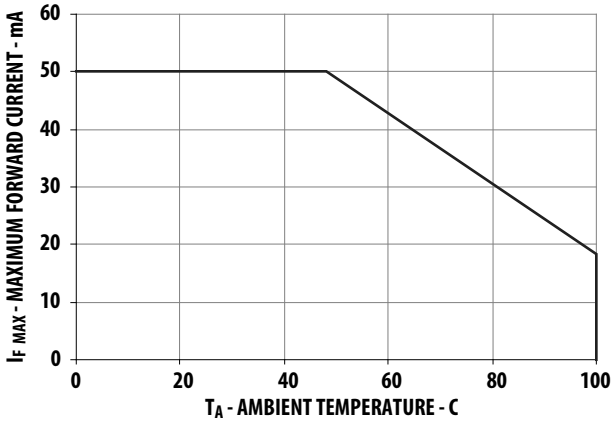


Figure 5: Radiation Pattern – Major Axis

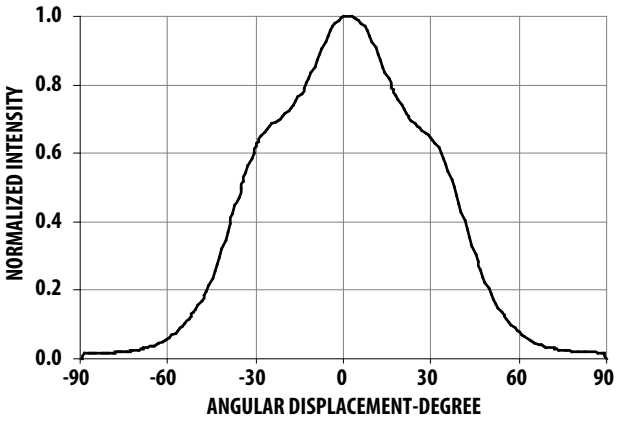


Figure 6: Radiation Pattern – Minor Axis

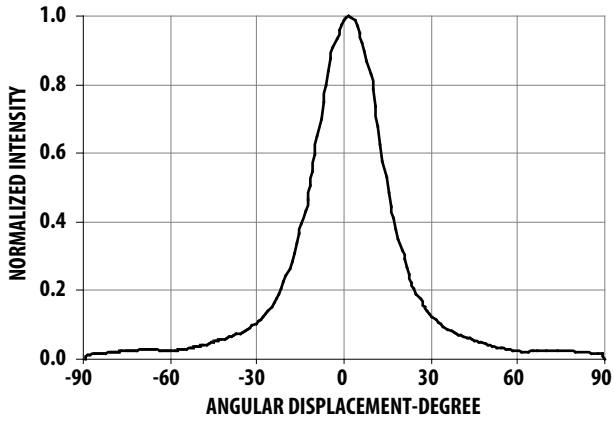


Figure 7: Relative Light Output vs. Junction Temperature

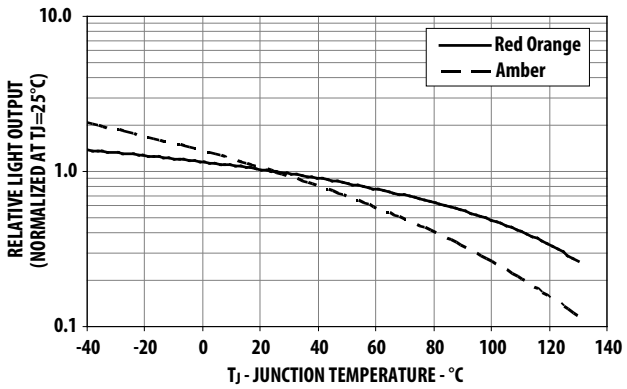
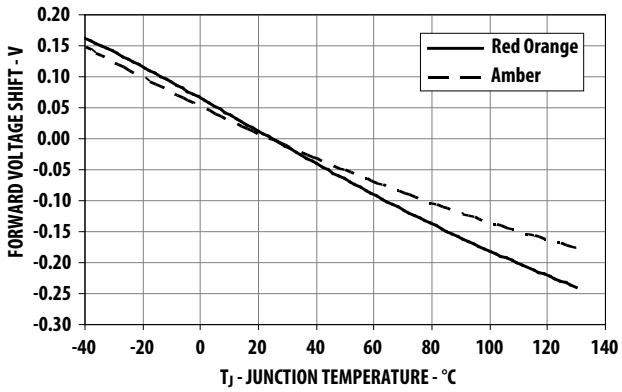


Figure 8: Relative Forward Voltage vs. Junction Temperature



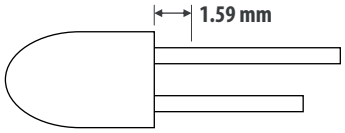
Precautions

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, 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. Do this for the hand-solder operation, because 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, do this 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.



- Properly apply ESD precautions on the soldering station and personnel to prevent ESD damage to the LED component, which is ESD sensitive. Refer to Broadcom application note AN 1142 for details. Use a soldering iron used with a grounded tip to ensure that the electrostatic charge is properly grounded.
- The recommended soldering condition is shown in the following table.

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

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

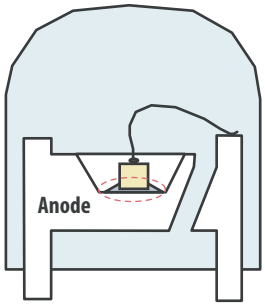
b. Use only bottom preheaters to reduce the thermal stress experienced by the LED.

- Set and maintain wave-soldering parameters according to the recommended temperature and dwell time. Perform daily checks on the soldering profile to ensure that it conforms to the recommended soldering conditions.

NOTE:

1. PCBs with different sizes and designs (component density) have different heat mass (heat capacity). This might cause a change in temperature experienced by the board if same wave soldering setting is used. Therefore, recalibrate the soldering profile again before loading a new type of PCB.
2. Broadcom's high-brightness LEDs use high-efficiency LED dies with a single wire bond as shown. 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 seconds. Over-stressing the LED during soldering process might cause premature failure to the LED due to delamination.

LED Configuration



InGaN Device

NOTE: Electrical connection between the bottom surface of the 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. Use nonmetal material because it absorbs less heat during the wave soldering process.

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

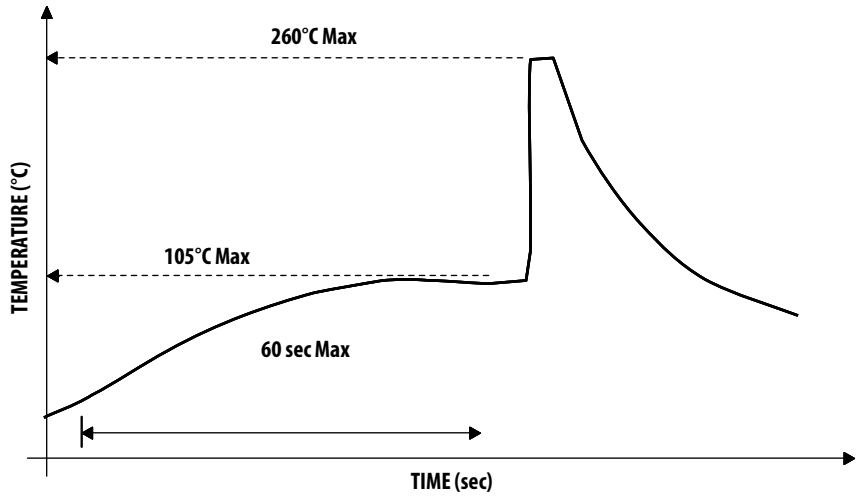
- At elevated temperatures, LED is more susceptible to mechanical stress. Therefore, allow the PCB to cool down to room temperature prior to handling, which includes the removal of the alignment fixture or the pallet.
- If the PCB board contains both through hole (TH) LED and other surface mount components, solder the surface-mount components on the top side of the PCB. If the surface mount must be on the bottom side, solder these components using reflow soldering prior to insertion of the TH LED.
- The following table provides 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 in.)	0.636 mm (0.025 in.)	0.98 to 1.08 mm (0.039 to 0.043 in.)
0.50 × 0.50 mm (0.020 × 0.020 in.)	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 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)

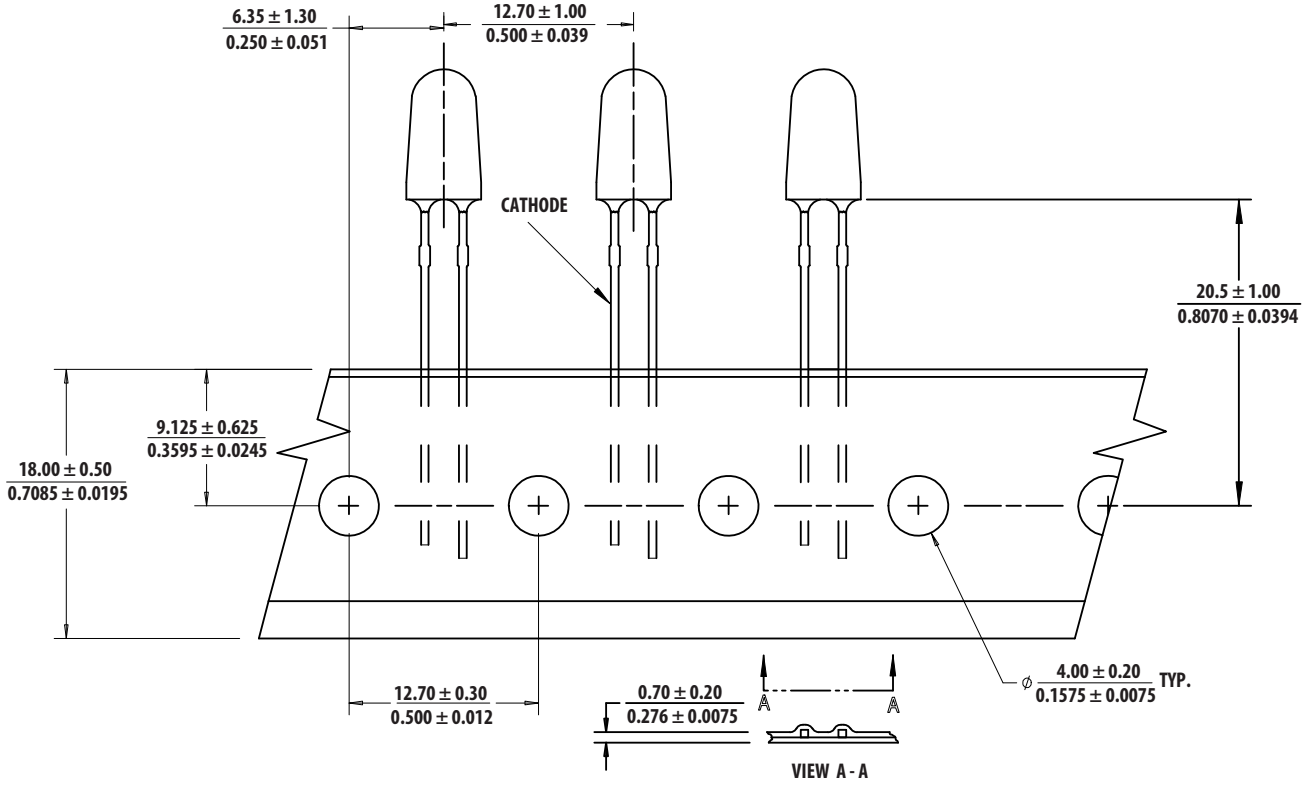
Flux: Rosin flux

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

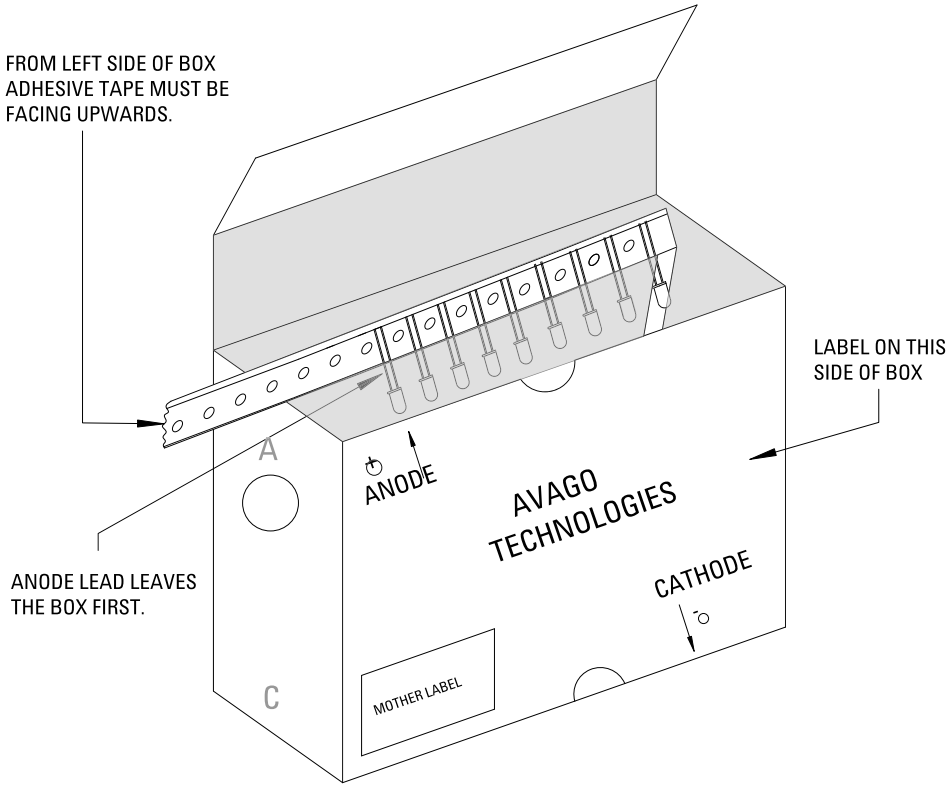
Dwell time: 3.0 sec - 5.0 sec
(maximum = 5sec)

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

Ammo Packs Drawing



Packaging Box for Ammo Packs

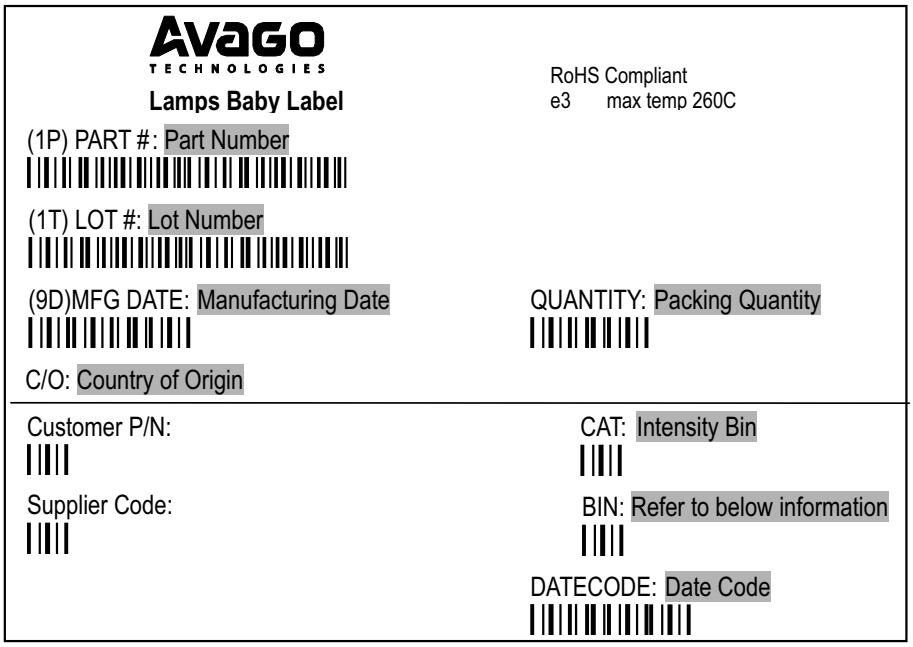


NOTE: The dimensions for the ammo pack are applicable for the device with standoff and without standoff.

Packaging Label

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

(ii) 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

BIN: 2VB

2: Color bin 2 only

VB: VF bin “VB”

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