HLMP-EL55/EG55/EL57/EH57/ED57

T-1 3/4 (5 mm) Precision Optical Performance AlInGaP LED Lamps

Data Sheet

Lead (Pb) Free
RoHS 6 fully compliant

Description

These Precision Optical Performance AlInGaP LEDs provide superior light output for excellent readability in sunlight and are extremely reliable. AlInGaP LED technology provides extremely stable light output over long periods of time. Precision Optical Performance lamps utilize the aluminum indium gallium phosphide (AlInGaP) technology.

These LED lamps are tinted, diffused, T-1 3/4 packages incorporating second generation optics producing well defined radiation patterns at specific viewing cone angles.

There are two families of amber, red, and red-orange lamps; AlInGaP and the higher performance AlInGaP II.

The high maximum LED junction temperature limit of +130°C enables high temperature operation in bright sunlight conditions.

These lamps are available in two package options to give the designer flexibility with device mounting.

Benefits

- Viewing angles match traffic management sign requirements
- Colors meet automotive specifications
- Superior performance in outdoor environments
- Suitable for autoinsertion onto PC boards

Features

- Well defined and smooth spatial radiation patterns
- Wide viewing angle
- Tinted diffused lamp
- High luminous output
- Colors:
  - 590/592 nm Amber
  - 617 nm Reddish-Orange
  - 626/630 nm Red
- High operating temperature: T_{JLED} = +130°C
- Superior resistance to moisture

Applications

- Traffic management:
  - Variable message signs
  - Traffic management signs
- Commercial indoor/outdoor advertising:
  - Signs
  - Marquees
  - Passenger information
- Automotive:
  - Exterior and interior lights

Part Numbering System

HLMP - x x xx - x x x xx

Mechanical Options
00: Bulk Packaging
DD: Ammo Pack

Color Bin Selections
0: No color bin limitation
K: Amber color bins 2 and 4 only
L: Amber Color Bins 4 and 6 only

Maximum Intensity Bin

Minimum Intensity Bin

Viewing Angle & Lead Stand Offs
55: 55 deg without lead stand offs; AlInGaP
57: 55 deg without lead stand offs; AlInGaP II

Color
D: 630 nm Red
G: 626 nm Red
H: 617 nm Red-Orange
L: 590/592 Amber

Package
E: 5 mm Round

Device Selection Guide for AlInGaP

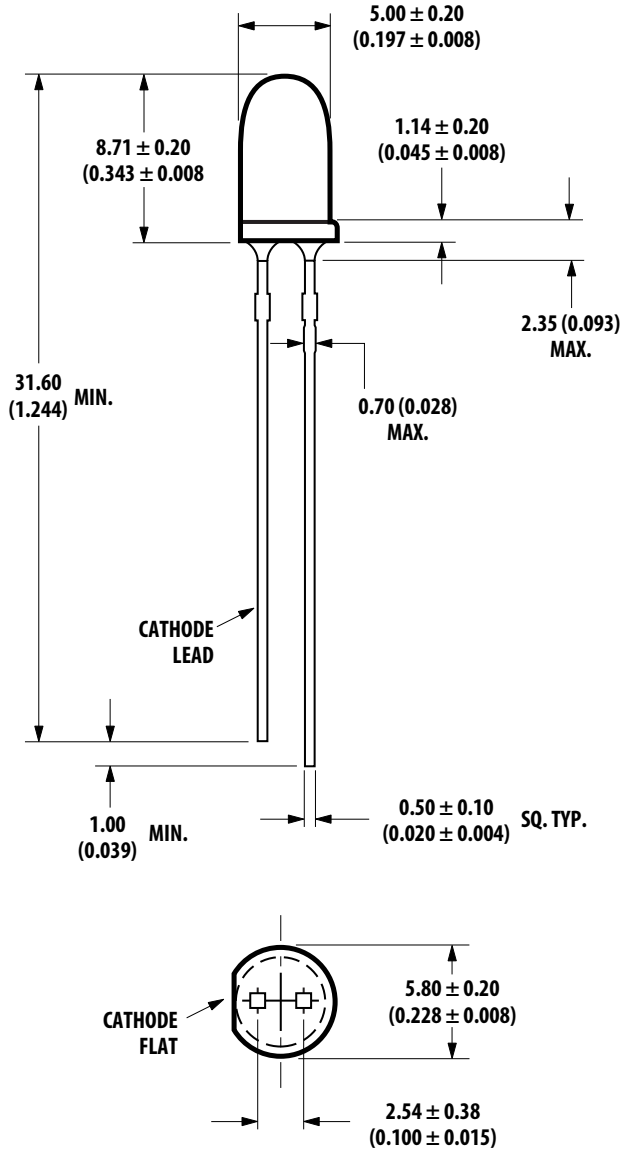
Part Number	Color and Dominant Wavelength λd (nm) Typ. [3]	Luminous Intensity Iv (mcd) at 20 mA Min. [1,2]	Luminous Intensity Iv (mcd) at 20 mA Max. [1,2]
HLMP-EL55-GK0DD	Amber 590	140	400
HLMP-EL55-GHKDD	Amber 590	140	240
HLMP-EL55-HJKxx	Amber 590	180	310
HLMP-EL55-JKLDD	Amber 590	240	400
HLMP-EL55-LP000	Amber 590	400	1150
HLMP-EG55-GK0DD	Red 626	140	400
HLMP-EG55-HJ0xx	Red 626	180	310
HLMP-EG55-JK0xx	Red 626	240	400

Device Selection Guide for AlInGaPII

Part Number	Color and Dominant Wavelength λd (nm) Typ. [3]	Luminous Intensity Iv (mcd) at 20 mA Min. [1,2]	Luminous Intensity Iv (mcd) at 20 mA Max. [1,2]
HLMP-EL57-LP0xx	Amber 592	400	1150
HLMP-EH57-LP000	Red-Orange 617	400	1150
HLMP-ED57-LP0xx	Red 630	400	1150
HLMP-ED57-LPT00	Red 630	400	1150

Notes:
1. The luminous intensity is measured on the mechanical axis of the lamp package.
2. The optical axis is closely aligned with the package mechanical axis.
3. The dominant wavelength, λ_d, is derived from the CIE Chromaticity Diagram and represents the color of the lamp.

Package Dimensions



NOTES:

1. **ALL DIMENSIONS ARE IN MILLIMETERS (INCHES).**
2. **TAPERS SHOWN AT TOP OF LEADS (BOTTOM OF LAMP PACKAGE) INDICATE AN EPOXY MENISCUS THAT MAY EXTEND ABOUT 1 mm (0.040 in.) DOWN THE LEADS.**
3. **RECOMMENDED PC BOARD HOLE DIAMETERS:**
   LAMP PACKAGE WITHOUT STAND-OFFS: FLUSH MOUNTING AT BASE OF LAMP PACKAGE = 1.143/1.067 (0.044/0.042).

Absolute Maximum Ratings at $T_A = 25°C$

DC Forward Current[1,2,3] ..... 50 mA
Peak Pulsed Forward Current[2,3] ..... 100 mA
Average Forward Current[3] ..... 30 mA
Reverse Voltage (I_R = 100 µA) ..... 5 V
LED Junction Temperature ..... 130°C
Operating Temperature ..... –40°C to +100°C
Storage Temperature ..... –40°C to +100°C

Notes:
1. Derate linearly as shown in Figure 4.
2. For long term performance with minimal light output degradation, drive currents between 10 mA and 30 mA are recommended. For more information on recommended drive conditions, please refer to Application Brief I-024 (5966-3087E).
3. Please contact your Avago Technologies sales representative about operating currents below 10 mA.

Electrical/Optical Characteristics at $T_A = 25°C$

Parameter	Symbol	Min.	Typ.	Max.	Units	Test Conditions
Forward Voltage	V_F				V	I_F = 20 mA
Amber (λ_d = 590 nm)			2.02	2.4		
Amber (λ_d = 592 nm)			2.15	2.4		
Red-Orange (λ_d = 617 nm)			2.08	2.4		
Red (λ_d = 626 nm)			1.90	2.4		
Red (λ_d = 630 nm)			2.00	2.4		
Reverse Voltage	V_R	5	20		V	I_R = 100 µA
Peak Wavelength	λ_{PEAK}				nm	Peak of Wavelength of Spectral
Amber (λ_d = 590 nm)			592			Distribution at I_F = 20 mA
Amber (λ_d = 592 nm)			594			
Red-Orange (λ_d = 617 nm)			623			
Red (λ_d = 626 nm)			635			
Red (λ_d = 630 nm)			639			
Spectral Halfwidth	$\Delta\lambda_{1/2}$		17		nm	Wavelength Width at Spectral Distribution $^1/_2$ Power Point at I_F = 20 mA
Speed of Response	τ_s		20		ns	Exponential Time Constant, e^{-t/τ_s}
Capacitance	C		40		pF	V_F = 0, f = 1 MHz
Thermal Resistance	$R\theta_{J\text{-}PIN}$		240		°C/W	LED Junction-to-Cathode Lead
Luminous Efficacy[1]	η_v				lm/W	Emitted Luminous Power/Emitted
Amber (λ_d = 590 nm)			480			Radiant Power
Amber (λ_d = 592 nm)			500			
Red-Orange (λ_d = 617 nm)			235			
Red (λ_d = 626 nm)			150			
Red (λ_d = 630 nm)			155			

Note:
1. 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.

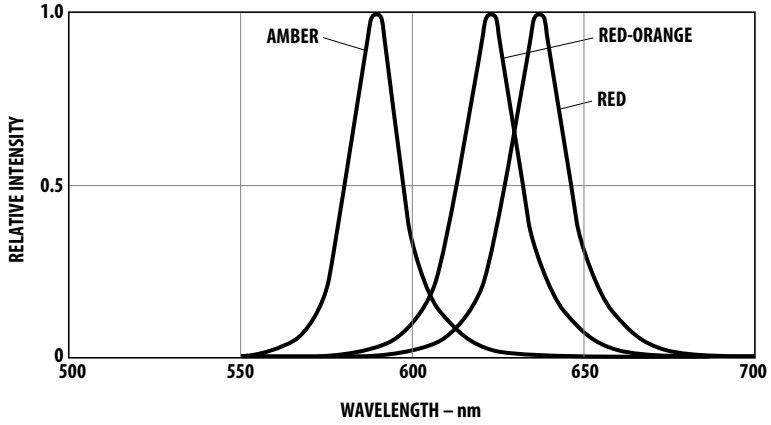


Figure 1. Relative intensity vs. peak wavelength.

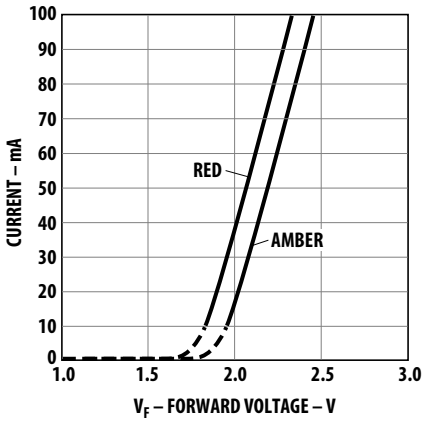


Figure 2. Forward current vs. forward voltage.

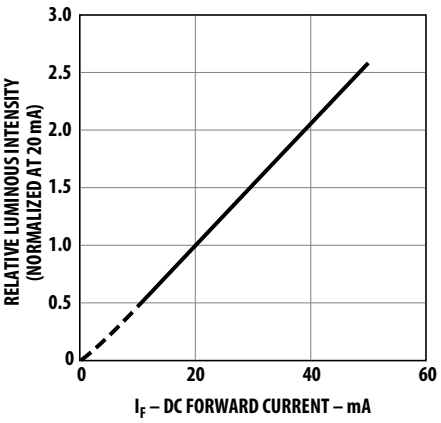


Figure 3. Relative luminous intensity vs. forward current.

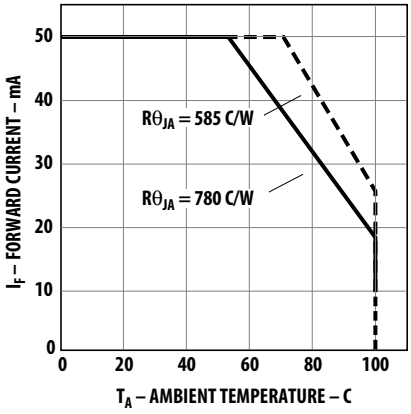


Figure 4. Maximum forward current vs. ambient temperature. Derating based on T_{JMAX} = 130°C.

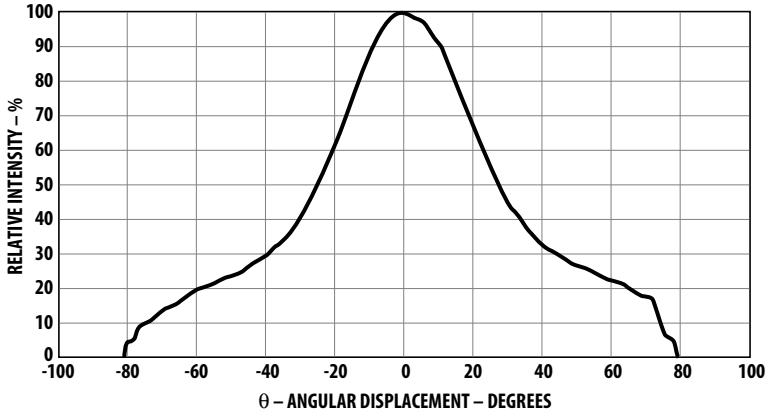


Figure 5. Representative spatial radiation pattern for 55° viewing angle lamps.

Intensity Bin Limits (mcd at 20 mA)

Bin Name	Min.	Max.
G	140	180
H	180	240
J	240	310
K	310	400
L	400	520
M	520	680
N	680	880
P	880	1150

Tolerance for each bin limit is ± 15%.

Amber Color Bin Limits (nm at 20 mA)

Bin Name	Min.	Max.
1	584.5	587.0
2	587.0	589.5
4	589.5	592.0
6	592.0	594.5

Tolerance for each bin limit is ± 0.5 nm.

Note:

1. Bin categories are established for classification of products. Products may not be available in all bin categories.

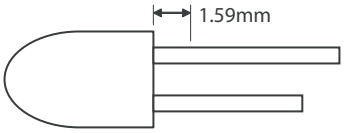
Precautions:

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.
- 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 1.59mm.



  Soldering the LED using soldering iron tip closer than 1.59mm 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.
- Recommended soldering condition:

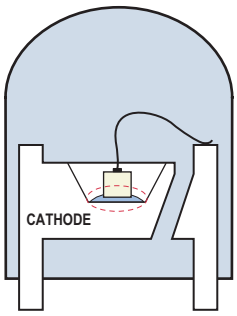
	Wave Soldering [1, 2]	Manual Solder Dipping
Pre-heat temperature	105 °C Max.	-
Preheat time	60 sec Max	-
Peak temperature	250 °C Max.	260 °C Max.
Dwell time	3 sec Max.	5 sec Max

Note:
1) Above conditions refers to measurement with thermocouple mounted at the bottom of PCB.
2) 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. Customer is advised to perform daily check on the soldering profile to ensure that it is always conforming to recommended soldering conditions.

Note:
1. PCB 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 re-calibrate the soldering profile again before loading a new type of PCB.
2. Avago Technologies' high brightness LED are using high efficiency LED die with single wire bond as shown below. Customer is advised to take extra precaution during wave soldering to ensure that the maximum wave temperature does not exceed 250°C and the solder contact time does not exceeding 3sec. 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.

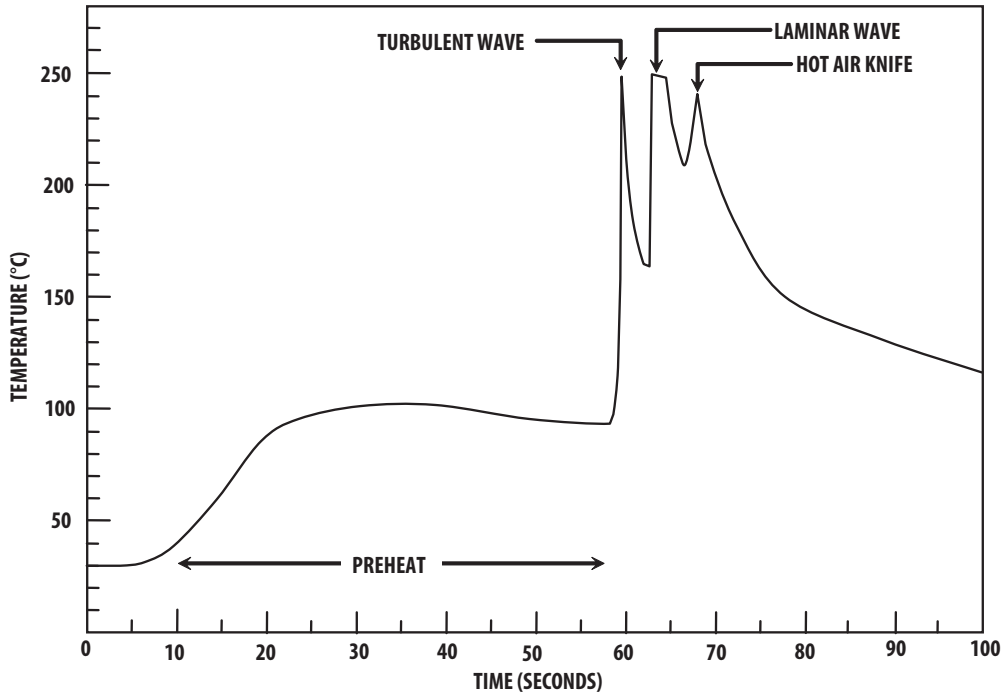
- Any alignment fixture that is being applied during wave soldering should be loosely fitted and should not apply weight or force on LED. Non metal material is recommended as it will absorb less heat during wave soldering process.
- At elevated temperature, LED is more susceptible to mechanical stress. Therefore, PCB must allowed to cool down to room temperature prior to handling, which includes removal of alignment fixture or pallet.
- If 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 surface mount need to 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 (0.018x 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 (0.020x 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.

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)

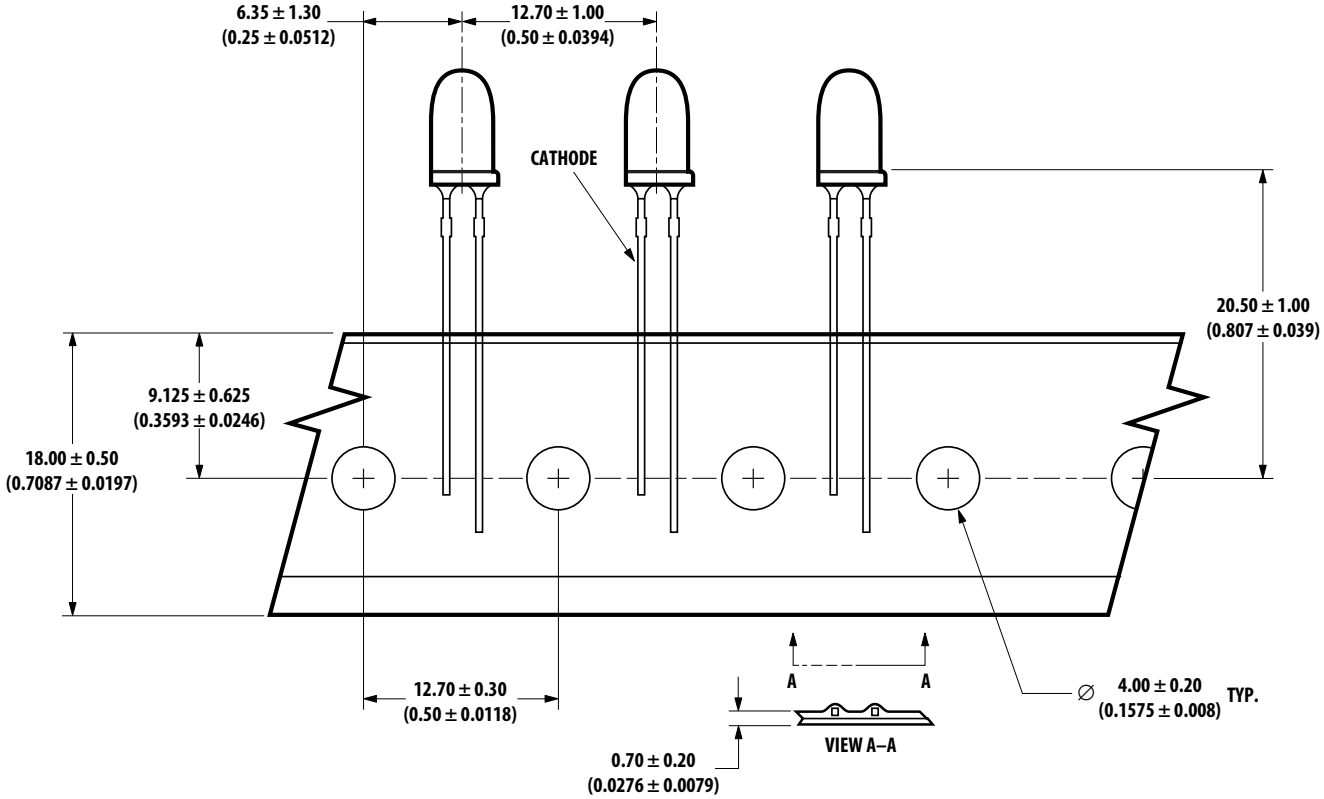
Flux: Rosin flux

Solder bath temperature:
245°C± 5°C (maximum peak temperature = 250°C)

Dwell time: 1.5 sec - 3.0 sec (maximum = 3sec)

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

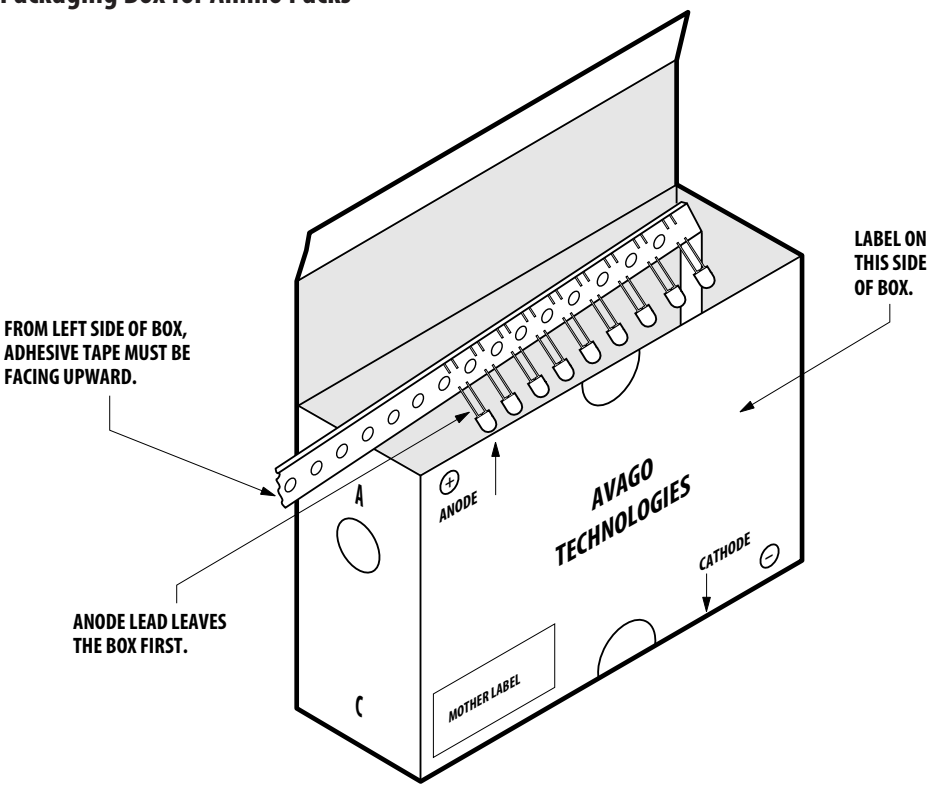
Ammo Pack Drawing



ALL DIMENSIONS IN MILLIMETERS (INCHES).

NOTE: THE AMMO-PACKS DRAWING IS APPLICABLE FOR PACKAGING OPTION -DD & -ZZ AND REGARDLESS OF STANDOFF OR NON-STANDOFF.

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)

AVAGO TECHNOLOGIES

(1P) Item: Part Number

STANDARD LABEL LS0002
RoHS Compliant
e3 max temp 250C

(1T) Lot: Lot Number

(Q) QTY: Quantity

LPN:

CAT: Intensity Bin

(9D)MFG Date: Manufacturing Date

BIN: Refer to below information

(P) Customer Item:

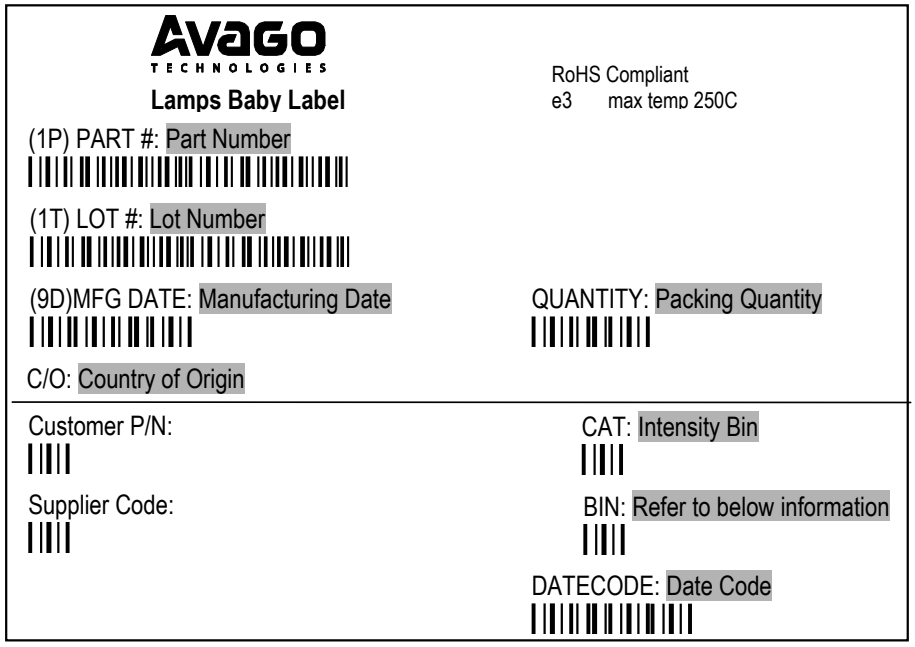
(V) Vendor ID:

(9D) Date Code: Date Code

DeptID:

Made In: Country of Origin

(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

VB: VF bin "VB"

2: Color bin 2 only

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

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