HLMP-AM70/AM71, HLMP-AB70/AB71

Green and Blue
5 mm Mini Oval LEDs

Avago
TECHNOLOGIES

Data Sheet

Lead (Pb) Free
RoHS 6 fully
compliant

Description

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 inhibitors to reduce the effects of long term exposure to direct sunlight.

Applications

- Mono color signs

Features

- Well defined spatial radiation pattern
- High brightness material
- Available in green and blue color.
- Green InGaN 525nm
- Blue InGaN 470nm
- Superior resistance to moisture
- Standoff and non stand-off Package
- Tinted and diffused
- Typical viewing angle 30° x 70°

Package Dimensions

A: No Standoff
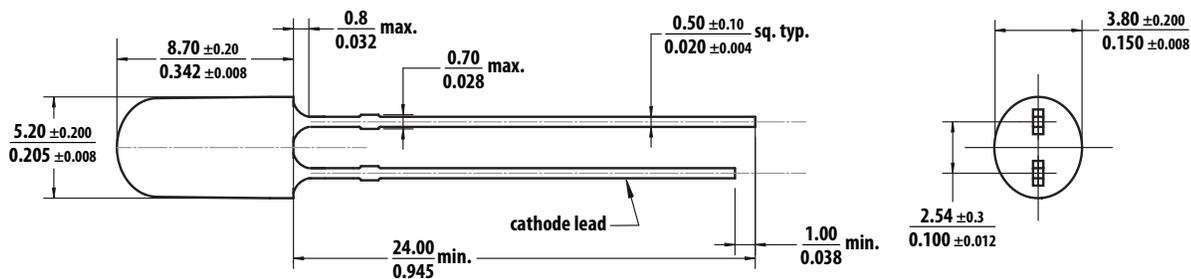
B: Standoff
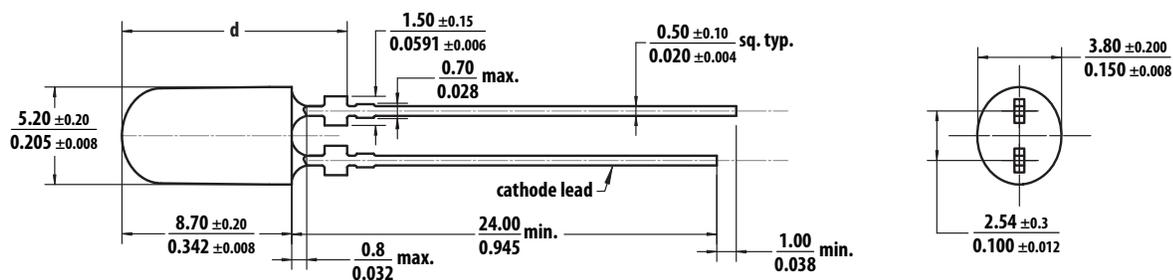
Notes:
1. All dimensions in millimeters (inches).
2. Dimension d = 11.59 mm.
3. Tolerance is ± 0.20 mm unless otherwise specified.

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.*

Device Selection Guide

Part Number	Color and Dominant Wavelength λ_d (nm) Typ [3]	Luminous Intensity Iv (mcd) at 20 mA [1,2,4]		Stand-off	Package Drawing
		Min.	Max.		
HLMP-AB70-TWBDD	Blue 470	800	1660	No	A
HLMP-AB70-TWCDD	Blue 470	800	1660	No	A
HLMP-AB71-TWBDD	Blue 470	800	1660	Yes	B
HLMP-AB71-TWCDD	Blue 470	800	1660	Yes	B
HLMP-AM70-24BDD	Green 525	3500	6050	No	A
HLMP-AM70-24CDD	Green 525	3500	6050	No	A
HLMP-AM71-24BDD	Green 525	3500	6050	Yes	B
HLMP-AM71-24CDD	Green 525	3500	6050	Yes	B

Notes:
1. The luminous intensity is measured on the mechanical axis of the lamp package and it is tested with pulsing condition.
2. The optical axis is closely aligned with the package mechanical axis.
3. Dominant wavelength, λ_d, is derived from the CIE Chromaticity Diagram and represents the color of the lamp.
4. Tolerance for each bin limit is ± 15%

Part Numbering System

HLMP – A x xx – x x x xx

Packaging Option
DD: Ammopack

Color Bin Selection
B : Color bin 2 and 3
C : Color bin 3 and 4

Maximum Intensity Bin
Refer to Device Selection Guide

Minimum Intensity Bin
Refer to Device Selection Guide

Standoff / Non Standoff
70 : Without Standoff
71 : With Standoff

Color
B : Blue
M : Green

Package
A : 5 mm Mini Oval 30° x 70°
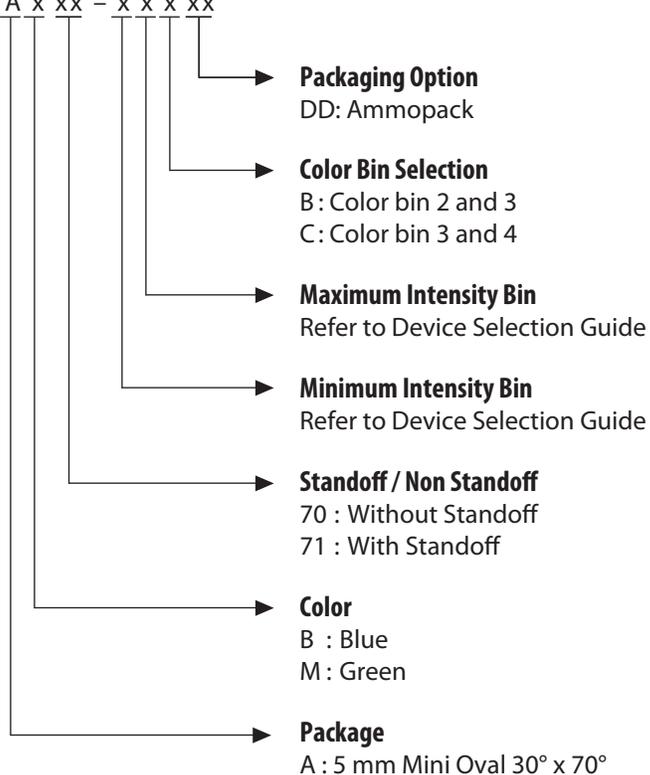
Note:
Please refer to AB 5337 for complete information about part numbering system.

Absolute Maximum Ratings

$T_A = 25°C$

Parameter	Blue and Green	Unit
DC Forward Current [1]	30	mA
Peak Forward Current	100 [2]	mA
Power Dissipation	110	mW
LED Junction Temperature	110	°C
Operating Temperature Range	-40 to +85	°C
Storage Temperature Range	-40 to +100	°C

Notes:
1. Derate linearly as shown in Figure 4.
2. Duty Factor 10%, frequency 1 KHz.

Electrical / Optical Characteristics

$T_A = 25°C$

Parameter	Symbol	Min.	Typ.	Max.	Units	Test Conditions
Forward Voltage Green & blue	V_F	2.8	3.1	3.6	V	$I_F = 20$ mA
Reverse Voltage [1] Green & blue	V_R	5			V	$I_R = 10$ μA

Dominant Wavelength [2]
    Green
    Blue
		
		520
		460
			
			525
			470
				
				540
				480
					nm	$I_F = 20$ mA

Peak Wavelength
    Green
    Blue
	λ_{PEAK}		
			517
			461
					nm	Peak of Wavelength of Spectral Distribution at $I_F = 20$ mA

Thermal resistance	$R\theta_{J-PIN}$		240		°C/W	LED Junction-to pin

Luminous Efficacy [3]
    Green
    Blue
	η_v		
			475
			68
					lm/W	Emitted Luminous Power/ Emitted Radiant Power

Notes:
1. Indicates product final testing condition, long term reverse bias is not recommended.
2. The dominant wavelength is derived from the Chromaticity Diagram and represents the color of the lamp.
3. The radiant intensity, I_e in watts per steradian, maybe found from the equation $I_e = I_v / \eta_V$ where I_v is the luminous intensity in candela and η_V is the luminous efficacy in lumens/ watt.

InGaN Blue and Green
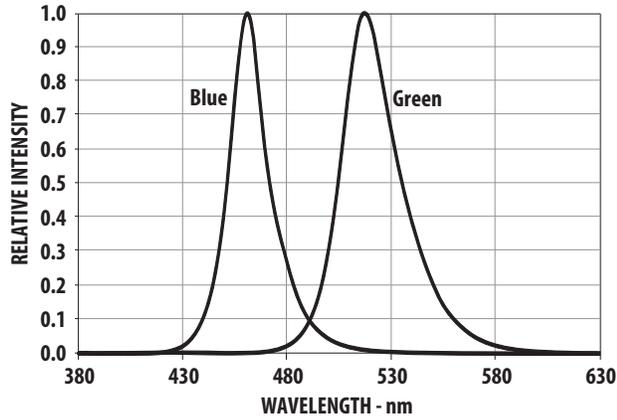
Figure 1. Relative Intensity vs Wavelength
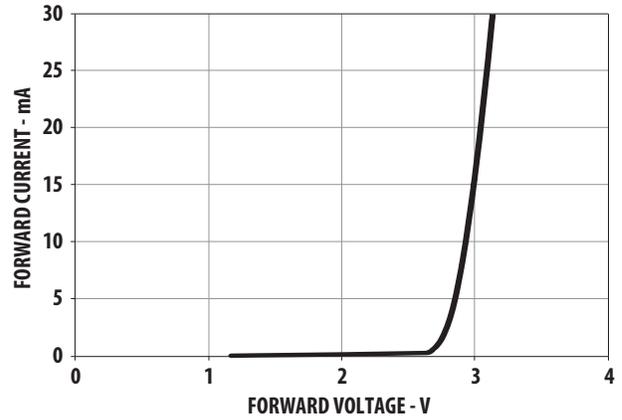
Figure 2. Forward Current vs Forward Voltage
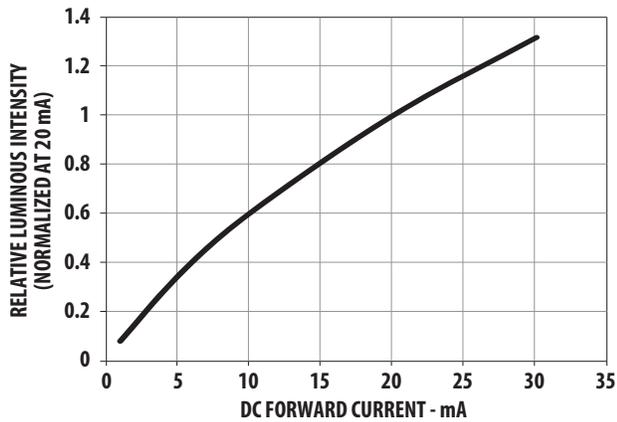
Figure 3. Relative Intensity vs Forward Current
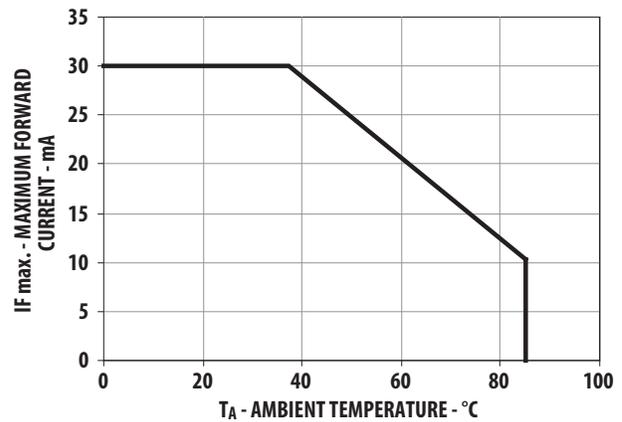
Figure 4. Maximum Forward Current vs Ambient Temperature
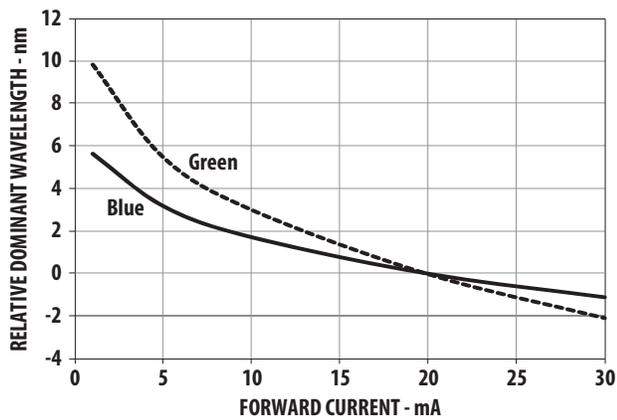
**Figure 5. Relative dominant wavelength vs Forward Current**
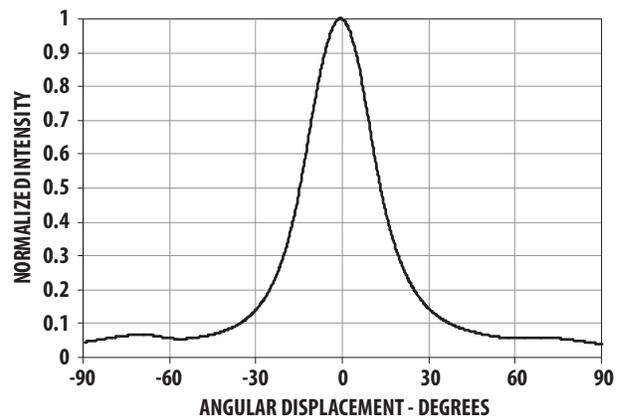
Figure 6. Radiation pattern-Minor Axis
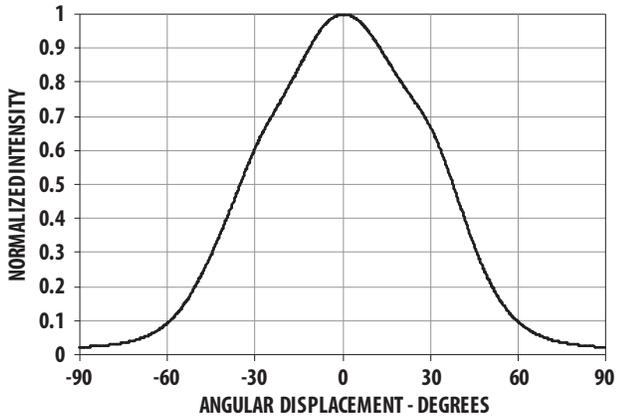
**Figure 7. Radiation pattern-Major Axis**
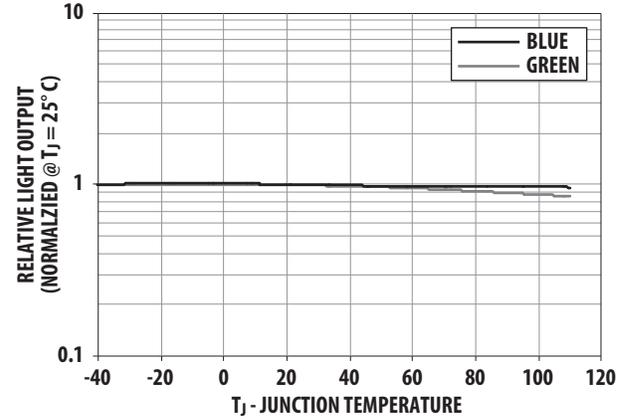


Figure 8. Relative Light Output vs Junction Temperature
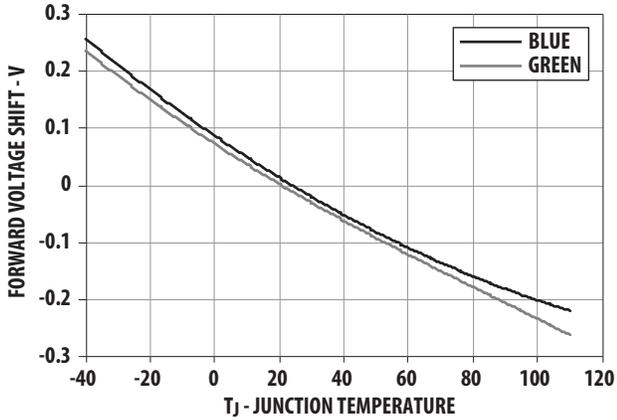
Figure 9. Forward Voltage Shift vs Junction Temperature

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

Bin	Intensity (mcd) at 20 mA	
	Min	Max
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%

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 ± 0.5 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 ± 0.5 nm

Note:
1. All bin categories are established for classification of products. Products may not be available in all bin categories. Please contact your Avago representative for further information.

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 1.59 mm. Soldering the LED using soldering iron tip closer than 1.59 mm might damage the LED.
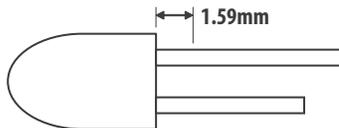
- ESD precaution must be properly applied on the soldering station and personnel to prevent ESD damage to the LED component that is ESD sensitive. Do refer to Avago application note AN 1142 for details. The soldering iron used should have grounded tip to ensure electrostatic charge is properly grounded.

- Recommended soldering condition:

|	Wave Soldering [1, 2]	Manual Solder Dipping
Pre-heat temperature	105° C Max.	–
Preheat time	60 sec Max	–
Peak temperature	260° C Max.	260° C Max.
Dwell time	5 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' AllnGaP 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 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
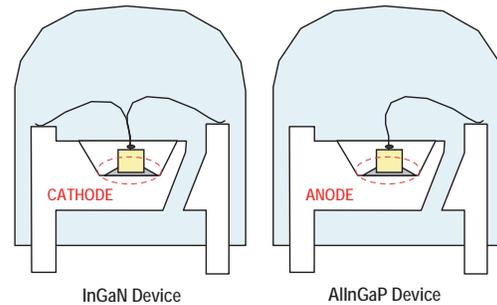
- Any alignment fixture that is being applied during wave soldering should be loosely fitted and should not apply weight or force on LED. Non metal material is recommended as it will absorb less heat during wave soldering process.

- 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
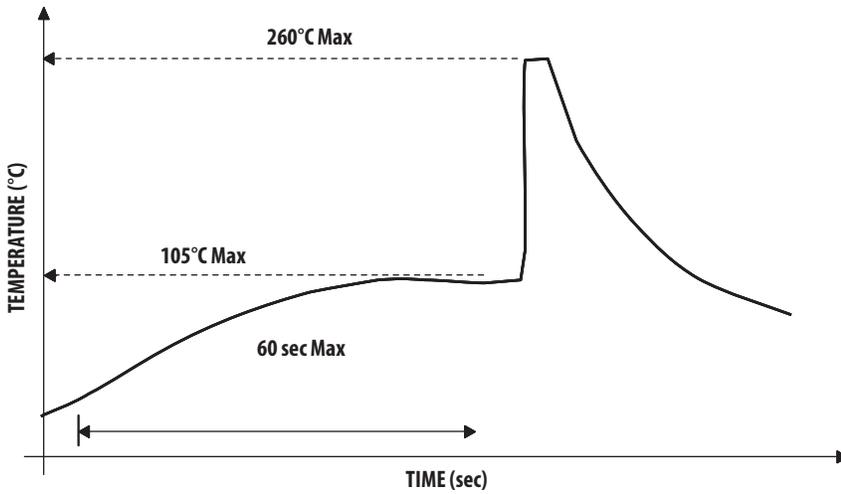
Recommended solder:
Sn63 (Leaded solder alloy)
SAC305 (Lead free solder alloy)

Flux: Rosin flux

Solder bath temperature: 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.

Ammopack Drawing
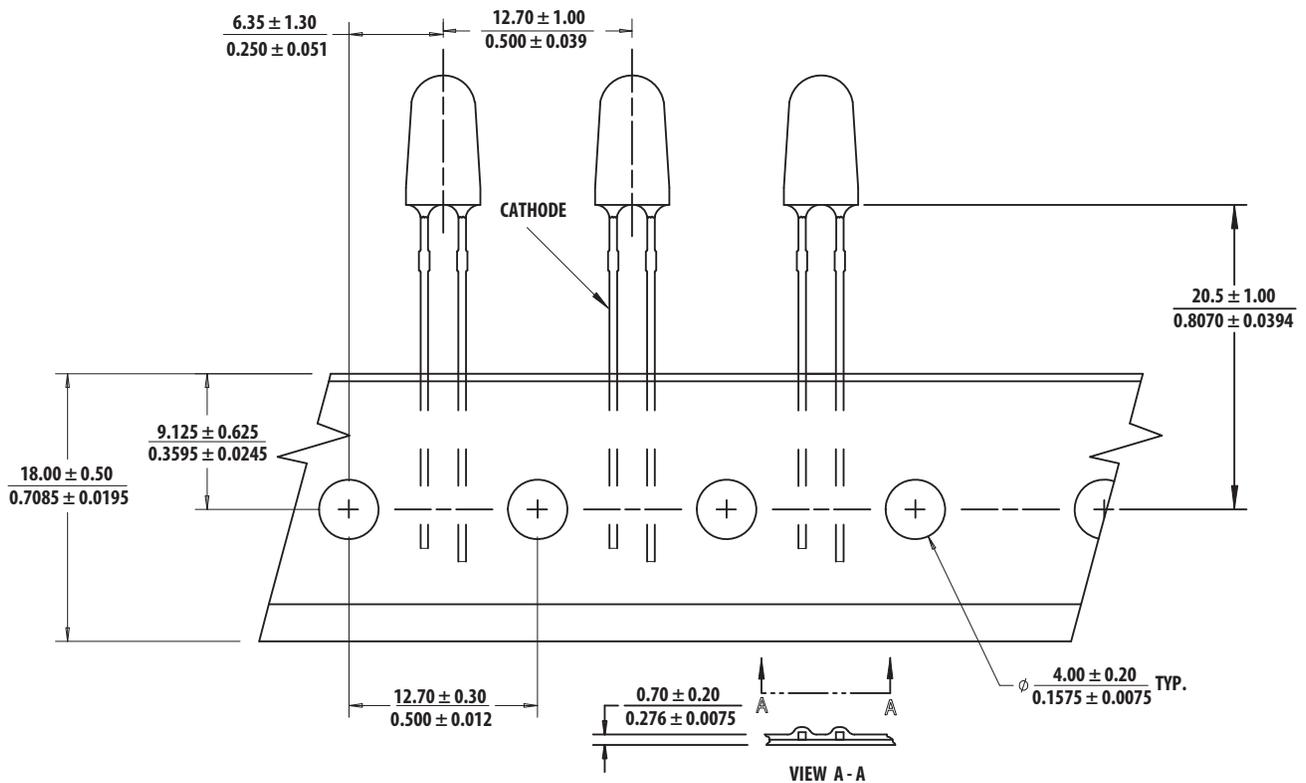
Note: The ammo-packs drawing is applicable for packaging option –DD & -ZZ and regardless standoff or non-standoff

Packaging Box for Ammopack

FROM LEFT SIDE OF BOX
ADHESIVE TAPE MUST BE
FACING UPWARDS.

LABEL ON THIS
SIDE OF BOX

ANODE

A

AVAGO
TECHNOLOGIES

CATHODE

ANODE LEAD LEAVES
THE BOX FIRST.

C
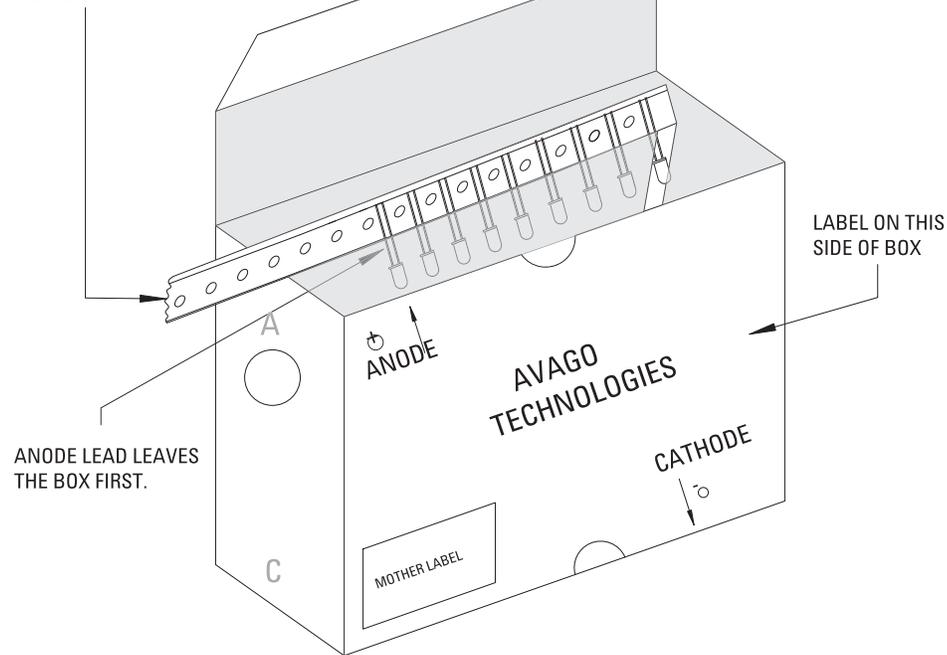
MOTHER LABEL

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)

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(1P) Item: Part Number

(1T) Lot: Lot Number

LPN:

(9D)MFG Date: Manufacturing Date

(P) Customer Item:

(V) Vendor ID:

DeptID:

STANDARD LABEL LS0002
RoHS Compliant
e3   max temp 260C

(Q) QTY: Quantity

CAT: Intensity Bin

BIN: Refer to below information

(9D) Date Code: Date Code

Made In: Country of Origin

(ii) Avago Baby Label (Only available on bulk packaging)

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┌─────────────────────────────────────────────────────────────────┐
│                                                                   │
│         AVAGO                                                     │
│         T E C H N O L O G I E S        RoHS Compliant            │
│         Lamps Baby Label              e3     max temp 260C        │
│                                                                   │
│    (1P) PART #: Part Number                                       │
│    ||||||||||||||||||||||||||||||                                 │
│                                                                   │
│    (1T) LOT #: Lot Number                                         │
│    ||||||||||||||||||||||||||||||                                 │
│                                                                   │
│    (9D)MFG DATE: Manufacturing Date    QUANTITY: Packing Quantity │
│    ||||||||||||||                       ||||||||||||              │
│                                                                   │
│    C/O: Country of Origin                                         │
│  ─────────────────────────────────────────────────────────────── │
│    Customer P/N:                        CAT: Intensity Bin        │
│    |||||                                |||||                     │
│                                                                   │
│    Supplier Code:                       BIN: Refer to below information │
│    |||||                                |||||                     │
│                                                                   │
│                                         DATECODE: Date Code       │
│                                         ||||||||||||||            │
└─────────────────────────────────────────────────────────────────┘
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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
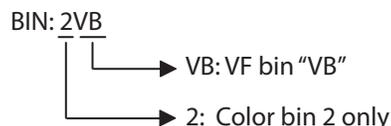
BIN: 2VB

        → VB: VF bin "VB"

        → 2: Color bin 2 only

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

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T E C H N O L O G I E S