ALMD-EL3D, ALMD-EG3D, ALMD-CM3D, ALMD-CB3D

High Brightness SMT Round LED Lamps
Amber, Red, Green and Blue Tinted LEDs

Data Sheet

Lead (Pb) Free
RoHS 6 fully compliant

Description

The new Avago ALMD-xx3D LED series has the same or just slightly less luminous intensity than conventional high brightness, through-hole LEDs.

The new LED lamps can be assembled using common SMT assembly processes and are compatible with industrial reflow soldering processes.

The LEDs are made with an advanced optical grade epoxy for superior performance in outdoor sign applications.

For easy pick and place assembly, the LEDs are shipped in EIA-compliant tape and reel. Every reel is shipped from a single intensity and color bin– except the red color–for better uniformity.

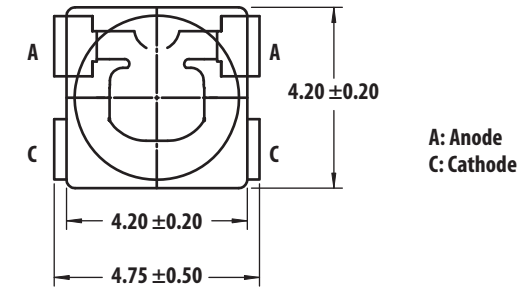
Features

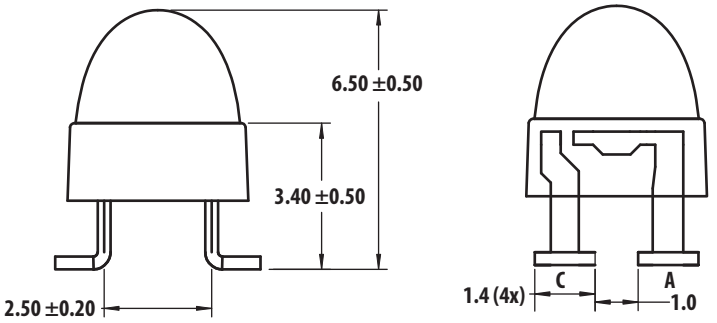
- Compact form factor
- High brightness material
- Available in Red, Amber, Green and Blue color
- Red AlInGaP 626nm
- Amber AlInGaP 590nm
- Green InGaN 525nm
- Blue InGaN 470nm
- Jedec MSL 2A
- Compatible with industrial reflow soldering process
- Typical Viewing angle: 30°
- Tinted, non-diffused

Applications

- Variable Message Signs

Package Dimensions





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

CAUTION: *InGaN devices are Class 1C HBM ESD sensitive; AlInGaP devices are Class 1B 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) [1,2,5]		Viewing Angle Typ (°) [4]
		Min	Max	
ALMD-EG3D-VX002	Red 626	4200	9300	30°
ALMD-EL3D-VX002	Amber 590	4200	9300	
ALMD-CM3D-WY002	Green 525	5500	12000	
ALMD-CB3D-RT002	Blue 470	1500	3200	

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, λd, is derived from the CIE Chromaticity Diagram and represents the color of the lamp.
4. θ½ is the off-axis angle where the luminous intensity is half the on-axis intensity.
5. Tolerance for each bin limit is ± 15%

Part Numbering System

ALMD – X X 3D – x x x xx

Packaging Option
02: tested 20mA, 13 inch carrier tape, 8mm pitch, 16mm carrier width

Color Bin Selection
0: Full Distribution

Maximum Intensity Bin
Refer to Device Selection Guide

Minimum Intensity Bin
Refer to Device Selection Guide

Untinted/Tinted Lens
D: Tinted

Viewing Angle
3: 30°

Color
B: Blue
G: Red
L: Amber
M: Green

Package
C: SMT Round Lamp InGaN
E: SMT Round Lamp AlInGaP

SMT Lamps

Absolute Maximum Rating, $T_J = 25°C$

Parameter	Red and Amber	Blue and Green	Unit
DC Forward Current [1]	50	30	mA
Peak Forward Current	100 [2]	100 [3]	mA
Power Dissipation	120	114	mW
Reverse Voltage	5 (I_R = 100 μA)	5 (I_R = 10 μA)	V
LED Junction Temperature	130	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 and Figure 9
2. Duty Factor 30%, frequency 1KHz.
3. Duty Factor 10%, frequency 1KHz.

Electrical / Optical Characteristics, $T_J = 25°C$

Parameter	Symbol	Min.	Typ.	Max.	Units	Test Conditions
Forward Voltage	V_F				V	I_F = 20 mA
Red		1.8	2.1	2.4		
Amber		1.8	2.1	2.4		
Green		2.8	3.2	3.8		
Blue		2.8	3.2	3.8		
Reverse Voltage	V_R					
Red & Amber		5			V	I_F = 100 μA
Green & blue		5				I_F = 10 μA
Dominant Wavelength [1]	λ_d					I_F = 20 mA
Red		618.0	626.0	630.0		
Amber		584.5	590.0	594.5		
Green		519.0	525.0	539.0		
Blue		460.0	470.0	480.0		
Peak Wavelength						
Red	λ_{PEAK}		634		nm	Peak of Wavelength of Spectral
Amber			594			Distribution at I_F = 20 mA
Green			516			
Blue			464			
Thermal Resistance	$R\theta_{J\text{-}PIN}$		130		°C/W	LED Junction-to-Pin
Luminous Efficacy [2]						
Red	η_V		200		lm/W	Emitted Luminous Power/Emitted
Amber			520			Radiant Power
Green			530			
Blue			65			
Thermal coefficient of λ_d					nm/°C	I_F = 20 mA ; +25°C ≤ T_J ≤ +100°C
Red			0.059			
Amber			0.103			
Green			0.028			
Blue			0.024			

Notes:
1. The dominant wavelength is derived from the chromaticity Diagram and represents the color of the lamp.
2. 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.

AlInGaP

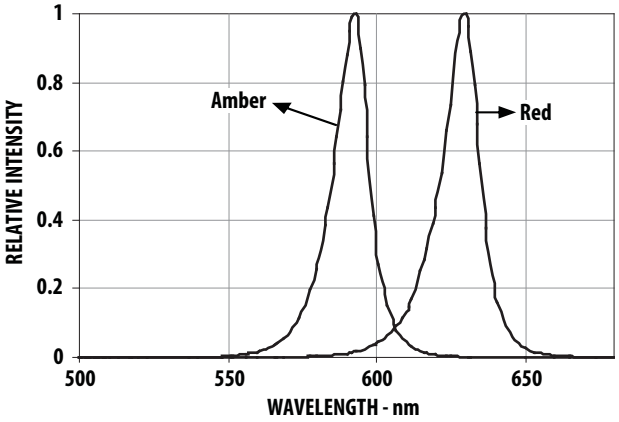


Figure 1. Relative Intensity vs Wavelength

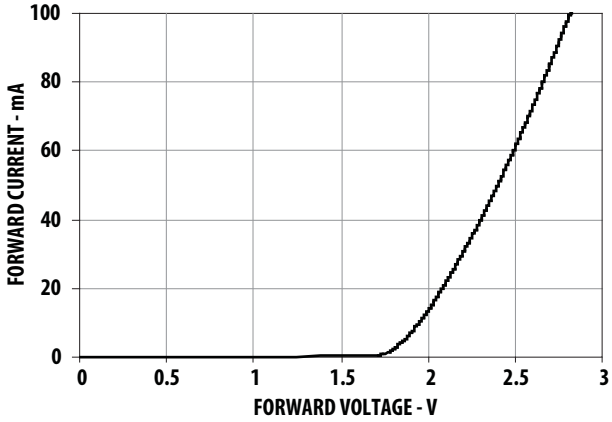


Figure 2. Forward Current vs Forward Voltage

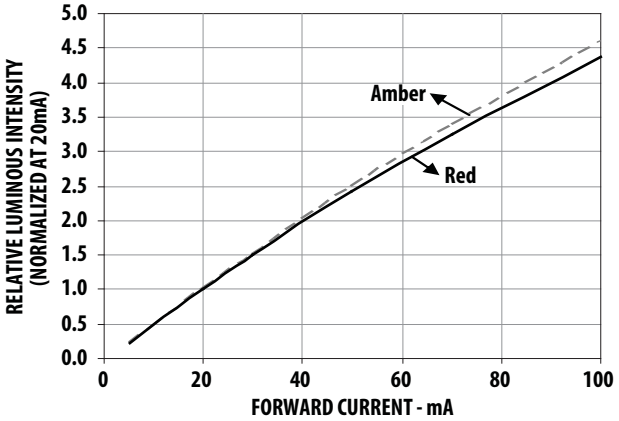


Figure 3. Relative Intensity vs Forward Current

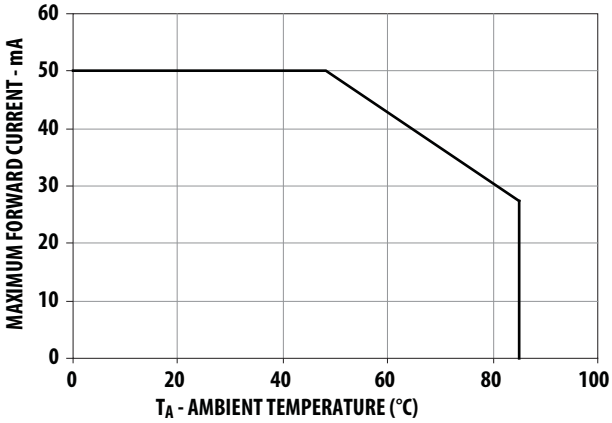


Figure 4. Maximum Forward Current vs Ambient Temperature

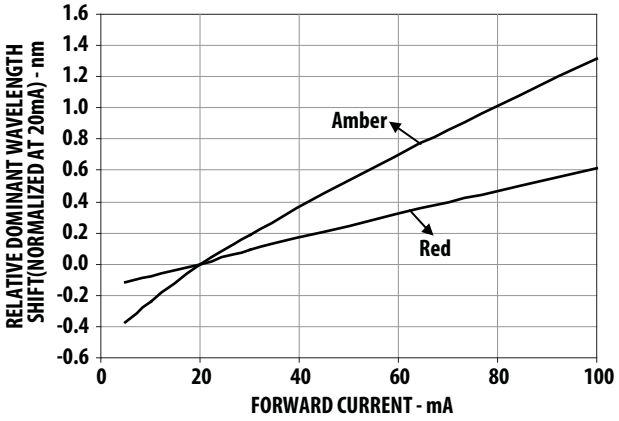


Figure 5. Relative Dominant Wavelength Shift vs Forward Current

InGaN

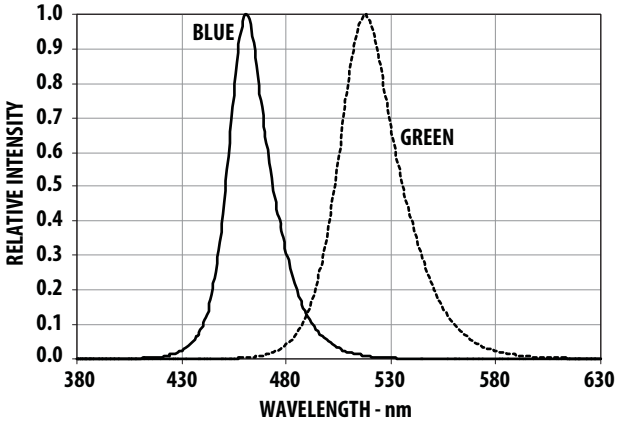


Figure 6. Relative Intensity vs Wavelength

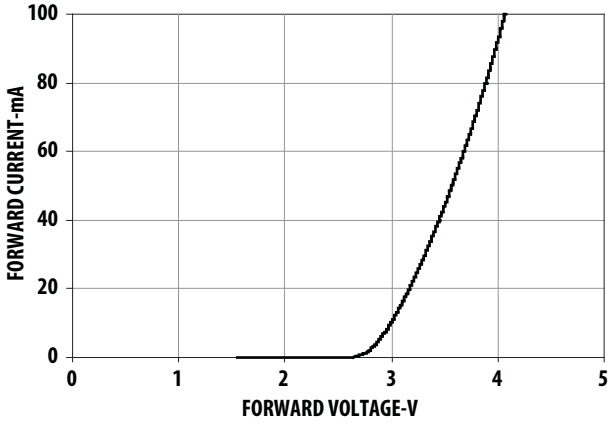


Figure 7. Forward Current vs Forward Voltage

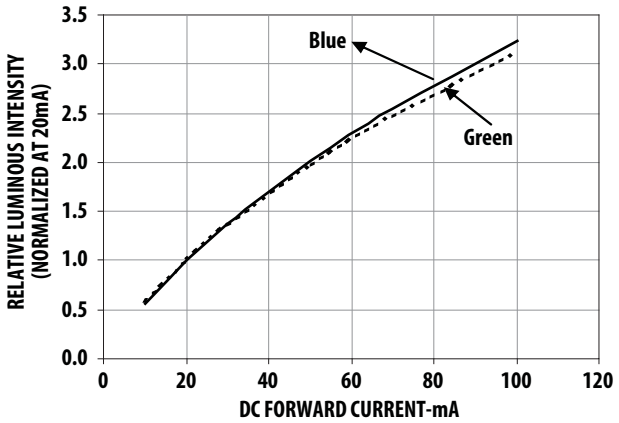


Figure 8. Relative Intensity vs Forward Current

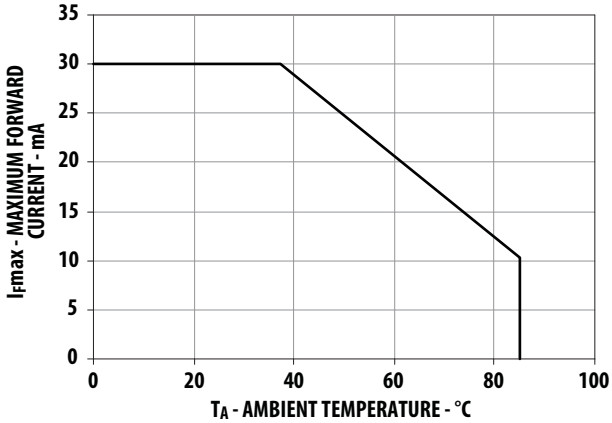


Figure 9. Maximum Forward Current vs Ambient Temperature

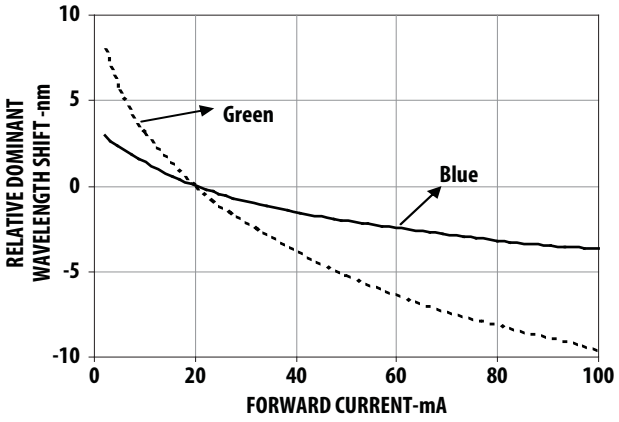


Figure 10. Dominant Wavelength Shift vs Forward Current

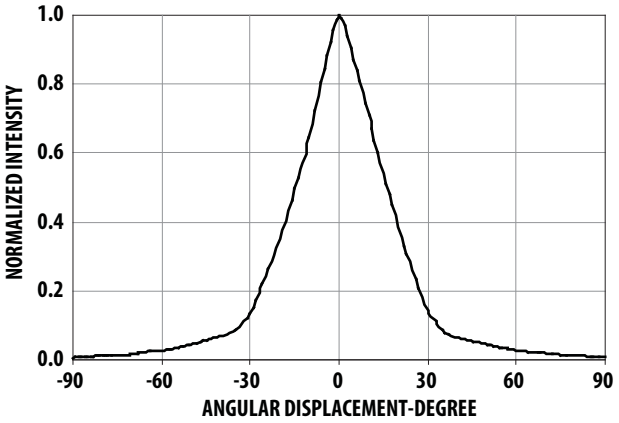


Figure 11a. Radiation Pattern for X axis

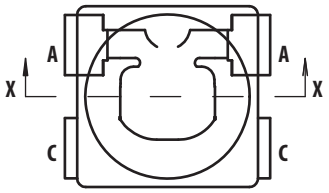


Figure 11b. Component Axis for Radiation Pattern

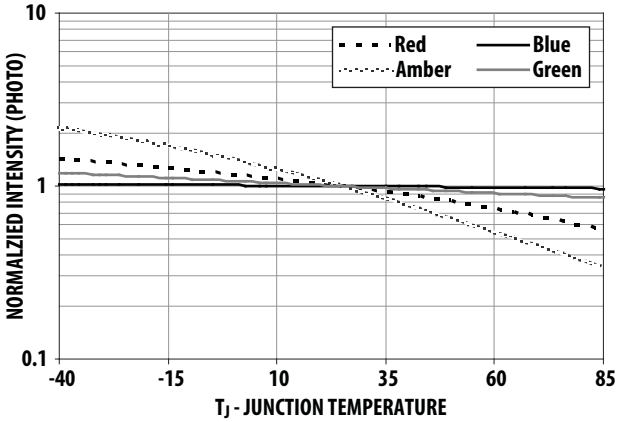


Figure 12. Relative Intensity Shift vs Junction Temperature

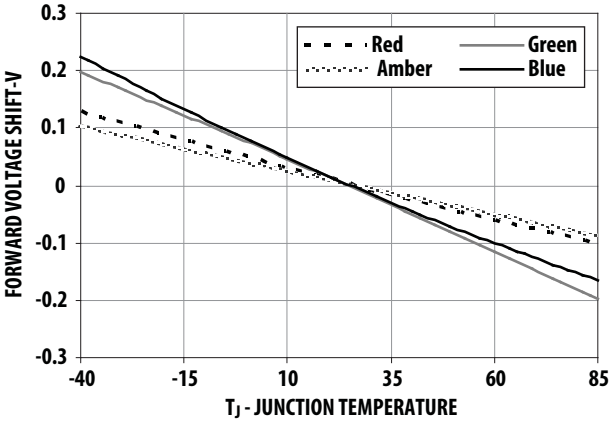
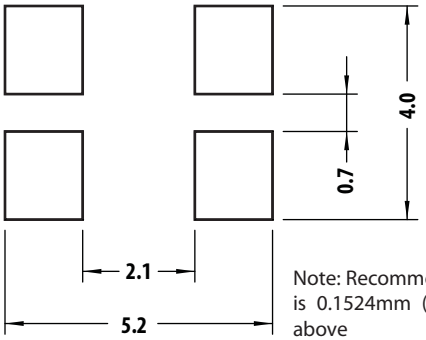


Figure 13. Forward Voltage Shift vs Junction Temperature



Note: Recommended stencil thickness is 0.1524mm (6 mils) minimum and above

Figure 14. Recommended Soldering Land Pattern

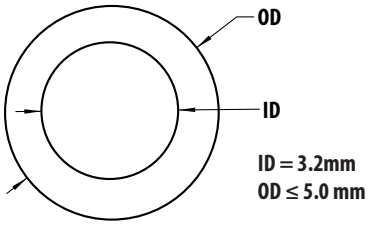


Figure 15. Recommended Pick and Place Nozzle Tip (Urethane PAD Tip)

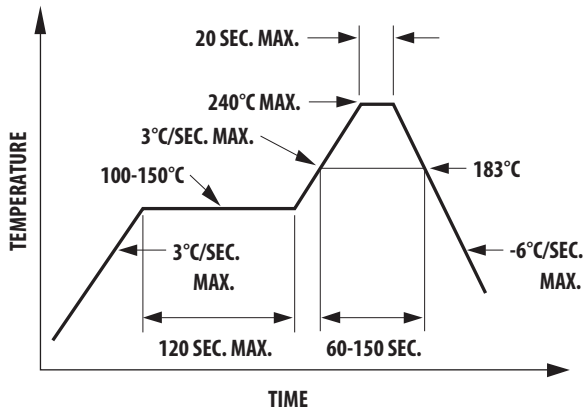


Figure 16. Recommended Leaded Reflow Soldering Profile

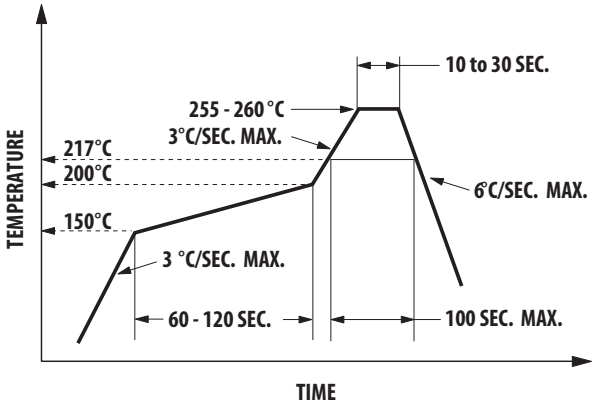


Figure 17. Recommended Pb- Free Reflow Soldering Profile

Note: For detail information on reflow soldering of Avago Surface Mount LED, do refer to Avago Application Note AN1060 Surface Mounting SMT LED Indicator Components.

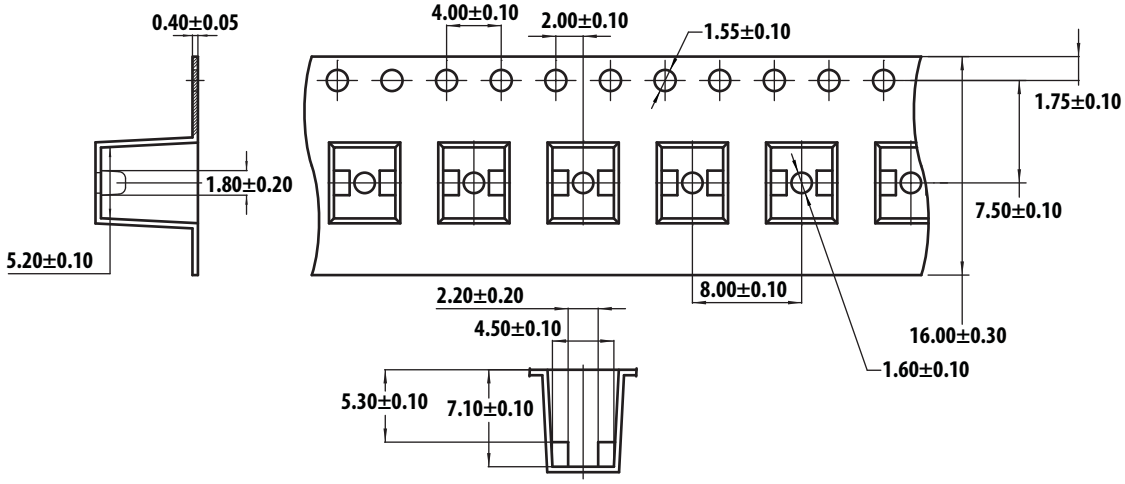


Figure 18. Carrier Tape Dimension

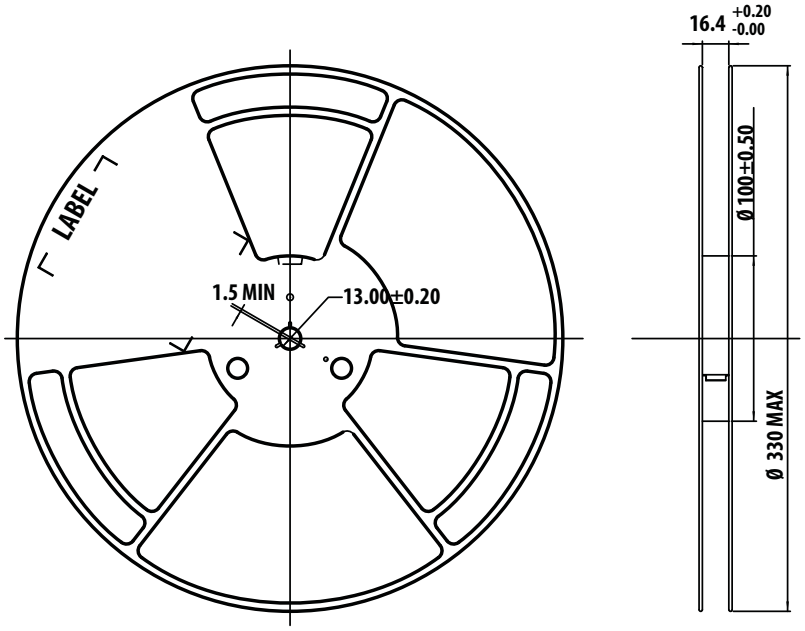


Figure 19. Reel Dimension

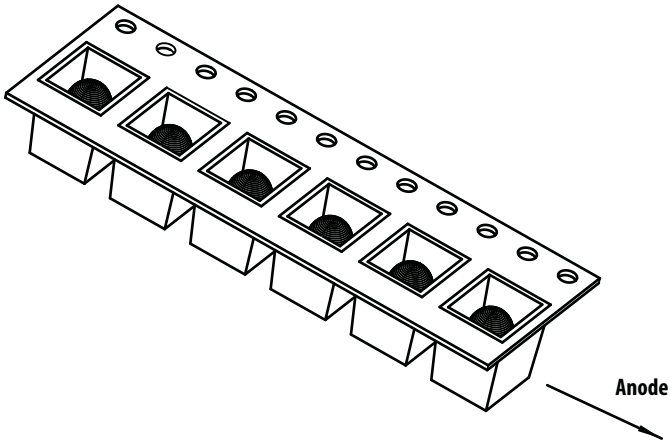


Figure 20. Unit Orientation from reel

Intensity Bin Limit Table (1.3:1 Iv bin ratio)

	Intensity (mcd) at 20mA	
Bin	**Min**	**Max**
R	1500	1900
S	1900	2500
T	2500	3200
U	3200	4200
V	4200	5500
W	5500	7200
X	7200	9300
Y	9300	12000
Z	12000	16000

Tolerance for each bin limit is ± 15%

VF Bin Table (V at 20mA) for Red&Amber

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

Red Color Range

Min Dom	Max Dom	X min	Y Min	X max	Y max
618.0	630.0	0.6872	0.3126	0.6890	0.2943
		0.6690	0.3149	0.7080	0.2920

Tolerance for each bin limit is ± 0.5nm

Amber Color Range

Bin	Min Dom	Max Dom	Xmin	Ymin	Xmax	Ymax
1	584.5	587.0	0.5420	0.4580	0.5530	0.4400
			0.5370	0.4550	0.5570	0.4420
2	587.0	589.5	0.5570	0.4420	0.5670	0.4250
			0.5530	0.4400	0.5720	0.4270
4	589.5	592.0	0.5720	0.4270	0.5820	0.4110
			0.5670	0.4250	0.5870	0.4130
6	592.0	594.5	0.5870	0.4130	0.5950	0.3980
			0.5820	0.4110	0.6000	0.3990

Tolerance for each bin limit is ± 0.5nm

Green Color Range

Bin	Min Dom	Max Dom	Xmin	Ymin	Xmax	Ymax
1	519.0	523.0	0.0667	0.8323	0.1450	0.7319
			0.1200	0.7375	0.0979	0.8316
2	523.0	527.0	0.0979	0.8316	0.1711	0.7218
			0.1450	0.7319	0.1305	0.8189
3	527.0	531.0	0.1305	0.8189	0.1967	0.7077
			0.1711	0.7218	0.1625	0.8012
4	531.0	535.0	0.1625	0.8012	0.2210	0.6920
			0.1967	0.7077	0.1929	0.7816
5	535.0	539.0	0.1929	0.7816	0.2445	0.6747
			0.2210	0.6920	0.2233	0.7600

Tolerance for each bin limit is ± 0.5nm

Blue Color Range

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 ± 0.5nm

Moisture Sensitivity and Handling

The ALMD-xx3D series oval package has a Moisture Sensitive Level 2a rating per JEDEC J-STD-020. Refer to Avago Application Note AN5305, Handling of Moisture Sensitive Surface Mount Devices, for additional details and a review of proper handling procedures.

A. Storage before use

- An unopened moisture barrier bag (MBB) can be stored at < 40° C/90% RH for 12 months. If the actual shelf life has exceeded 12 months and the humidity indicator card (HIC) indicates that baking is not required then it is safe to reflow solder the LEDs per the original MSL rating.
- It is recommended that the MBB not be opened prior to assembly (e.g. for IQC).

B. Control after opening the MBB

- The humidity indicator card (HIC) shall be read immediately upon opening of the MBB.
- The LEDs must be kept at < 30° C/60% RH at all times, and all high temperature related processes including soldering, curing or rework need to be completed within 672 hours.

C. Control for unfinished tape and reel parts

- Unused LEDs must be stored in a sealed MBB with a desiccant or desiccator at < 5% RH.

D. Control of assembled boards

- If the PCB soldered with the LEDs is to be subjected to other high temperature processes, the PCB needs to be stored in a sealed MBB with desiccant or desiccator at < 5% RH to ensure that all LEDs have not exceeded their floor life of 672 hours

E. Baking is required if:

- The HIC indicator is not BROWN at 10% and is AZURE at 5%
- The LEDs are exposed to a condition of > 30° C/60% RH at any time.
- The LED floor life exceeded 672 hours.

The recommended baking condition is: 60 ± 5° C for 20 hours.

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

AV02-2372EN - March 9, 2010