ALMD-CM1F/2F, ALMD-CB1E/2E

High Brightness SMT Round Green and Blue LED Lamps

Data Sheet

Description

The new Avago ALMD-Cx1x/Cx2x series is like a conventional high brightness through-hole LED in the form of surface mount device. It can be assembled using common SMT assembly processes and is 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 tape and reel. Every reel is shipped from a single intensity and color bin for better uniformity.

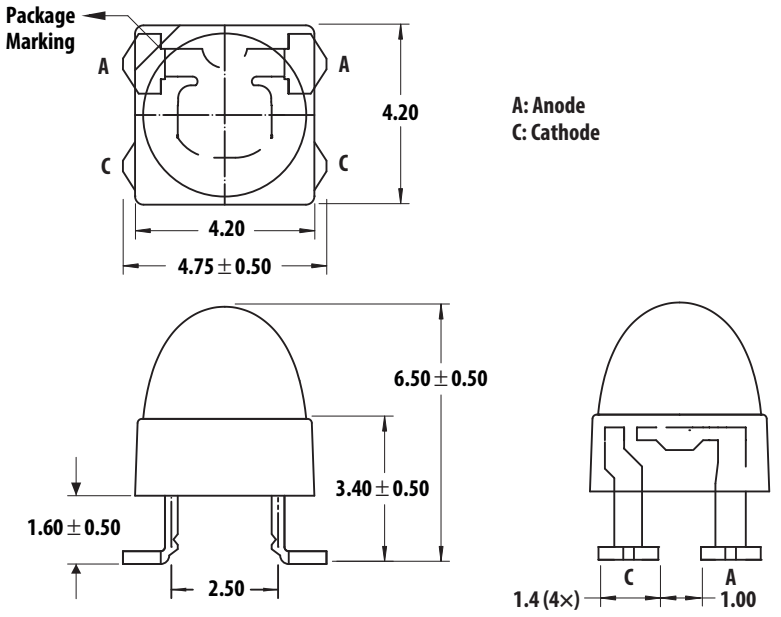
Features

- Using high brightness InGaN
- Available green and blue
  - Green InGaN 525 nm
  - Blue InGaN 470 nm
- Typical viewing angle: 15° and 23°
- JEDEC MSL 2A
- Compatible with a reflow soldering process
- Tinted

Applications

- Variable message signs

Figure 1 Package Dimensions



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

CAUTION The LEDs are ESD sensitive per ANSI/ESDA/JEDEC JS-001. Please observe appropriate precautions during handling and processing. Refer to Application Note AN-1142 for additional details.

CAUTION Always keep the LED in the moisture barrier bag with < 5% RH when not in use because prolonged exposure to the environment might cause the leads to tarnish or rust, which might cause difficulties in soldering.

Device Selection Guide

Table 1 Device Selection Guide

Part Number	Color and Dominant Wavelength, λd (nm) Typ[a]	Luminous Intensity Iv (mcd) [b,c,d]		Viewing Angle Typ (°) [e]
		Min	Max	
ALMD-CM1F-34002	Green 525	27000	45000	15°
ALMD-CM1F-34B02				
ALMD-CM1F-34C02				
ALMD-CB1E-VW002	Blue 470	4200	7200	
ALMD-CB1E-VWB02				
ALMD-CB1E-VWC02				
ALMD-CM2F-12002	Green 525	16000	27000	23°
ALMD-CM2F-12B02				
ALMD-CM2F-12C02				
ALMD-CB2E-UV002	Blue 470	3200	5500	
ALMD-CB2E-UVB02				
ALMD-CB2E-UVC02				

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%.
e. θ½ is the off-axis angle where the luminous intensity is half the on-axis intensity.

Part Numbering System

A L M D - x1 x2 x3 x4 - x5 x6 x7 x8 x9

Table 2 Part Numbering System

Code	Description	Option
x1	Package type	C Round InGaN
x2	Color	B Blue M Green
x3	Viewing angle	1 15° 2 23°
x4	Product specific designation	E F
x5	Minimum intensity bin	Refer to selection guide
x6	Maximum intensity bin	Refer to selection guide
x7	Color bin	0 Full distribution B Color bin 2 and bin 3 C Color bin 3 and bin 4
x8x9	Packaging option	02 Tested 20 mA, 13-in. carrier tape

Table 3 Intensity Bin Limit Table (1.3:1 Iv bin ratio)

Bin	Intensity (mcd) at 20 mA	
	Min	Max
U	3200	4200
V	4200	5500
W	5500	7200
X	7200	9300
Y	9300	12000
Z	12000	16000
1	16000	21000
2	21000	27000
3	27000	35000
4	35000	45000

Tolerance for each bin limit is ± 15%.

Table 4 Green Color Range

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

Tolerance for each bin limit is ± 0.5 nm.

Table 5 Blue Color Range

Bin	Min Dom	Max Dom	Chromaticity Coordinate				
1	460.0	464.0	x	0.1440	0.1818	0.1766	0.1374
			y	0.0297	0.0904	0.0966	0.0374
2	464.0	468.0	x	0.1374	0.1766	0.1699	0.1291
			y	0.0374	0.0966	0.1062	0.0495
3	468.0	472.0	x	0.1291	0.1699	0.1616	0.1187
			y	0.0495	0.1062	0.1209	0.0671
4	472.0	476.0	x	0.1187	0.1616	0.1517	0.1063
			y	0.0671	0.1209	0.1423	0.0945
5	476.0	480.0	x	0.1063	0.1517	0.1397	0.0913
			y	0.0945	0.1423	0.1728	0.1327

Tolerance for each bin limit is ± 0.5nm.

Example of bin information on reel and packaging label:

CAT: X—> Luminous intensity bin X

BIN: 2 —> Color Bin 2

Table 6 Absolute Maximum Rating, T_J = 25°C

Parameter	Green	Blue	Unit
DC Forward Current[a]	30	20	mA
Peak Forward Current	100[b]	100[b]	mA
Power Dissipation	114	76	mW
Reverse Voltage	Not recommended for reverse bias		V
LED Junction Temperature	110	105	°C
Operating Temperature Range	-40 to +85	-40 to +85	°C
Storage Temperature Range	-40 to +100	-40 to +100	°C

a. Derate linearly as shown in Figure 4 and Figure 9.

b. Duty Factor 10%, frequency 1KHz.

Table 7 Electrical / Optical Characteristics, T_J = 25°C

Parameter	Symbol	Min.	Typ.	Max.	Units	Test Conditions
Forward Voltage Green Blue	V_F	 2.8 2.8	 3.2 3.2	 3.8 3.8	V	I_F = 20 mA
Reverse Voltage[a] Green & Blue	V_R	 5			V	I_R = 10 µA
Dominant Wavelength [b] Green Blue	λ_d	 519.0 460.0	 525.0 470.0	 539.0 480.0		I_F = 20 mA
Peak Wavelength Green Blue	λ_{PEAK}		 516.0 464.0		nm	Peak of Wavelength of Spectral Distribution at I_F = 20 mA
Thermal Resistance Green Blue	$R\theta_{J\text{-}PIN}$		 270 480		°C/W	LED Junction-to-Pin

a. Indicates product final testing condition. Long-term reverse bias is not recommended.

b. The dominant wavelength is derived from the chromaticity Diagram and represents the color of the lamp.

Figure 1 Relative Intensity vs. Wavelength

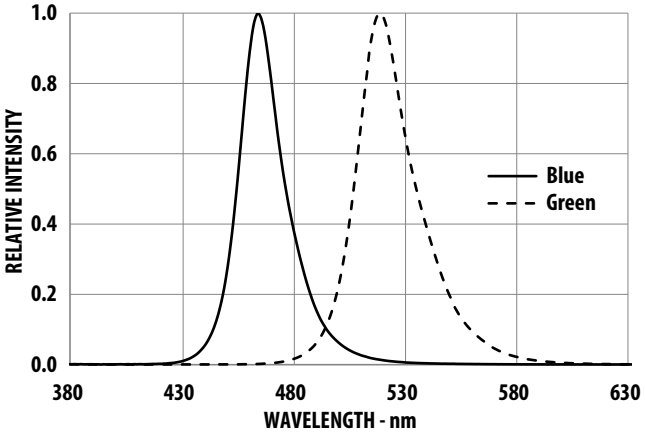


Figure 2 Forward Current vs. Forward Voltage

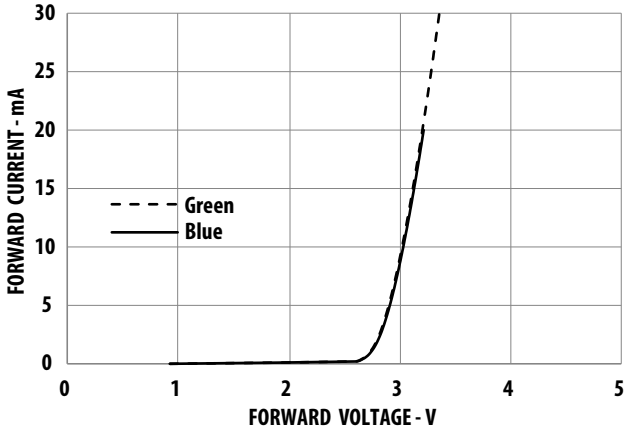


Figure 3 Relative Intensity vs. Forward Current

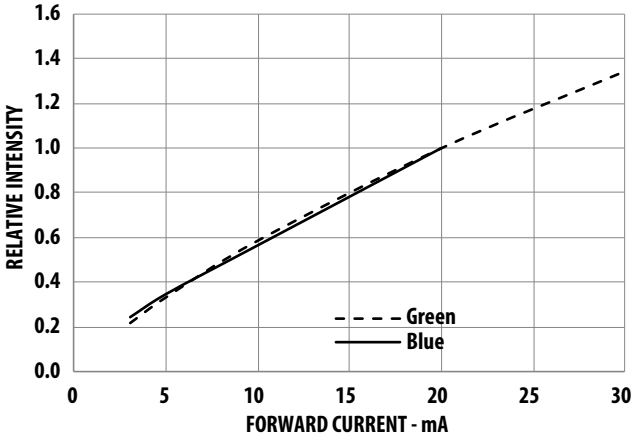


Figure 4 Maximum Forward Current vs. Ambient Temperature

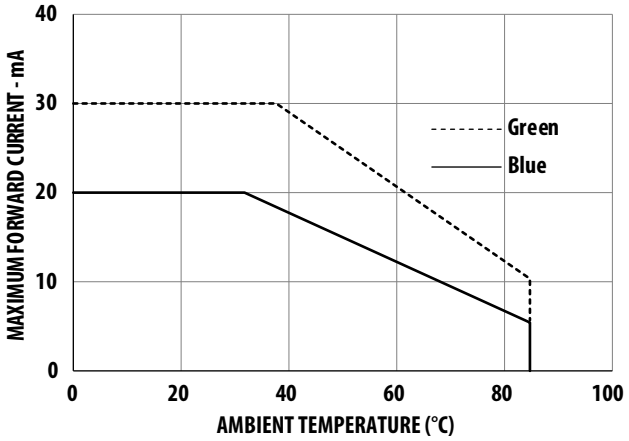


Figure 5 Relative Dominant Wavelength Shift vs. Forward Current

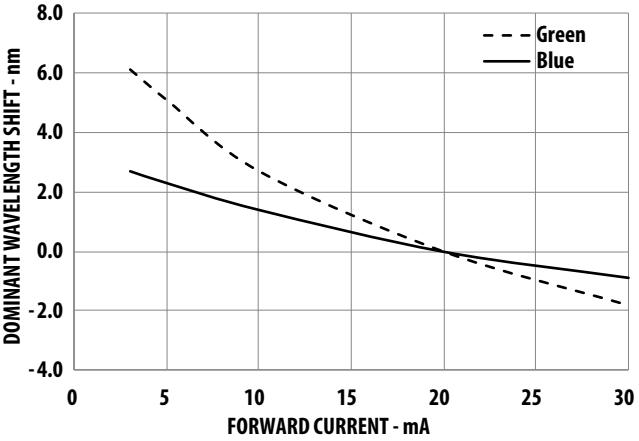


Figure 6 Radiation Pattern for X Axis –15°

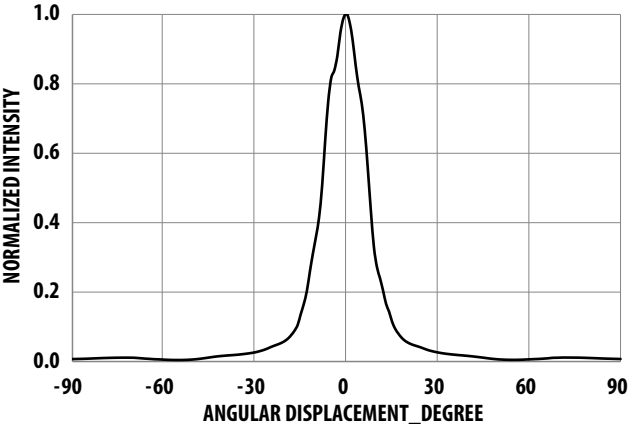


Figure 7 Radiation Pattern for X Axis –23°

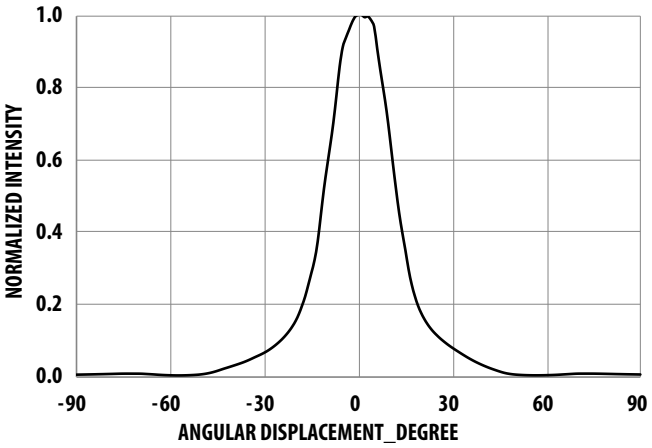


Figure 8 Component Axis for Radiation Pattern

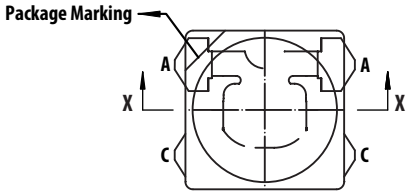


Figure 9 Relative Intensity vs. Junction Temperature

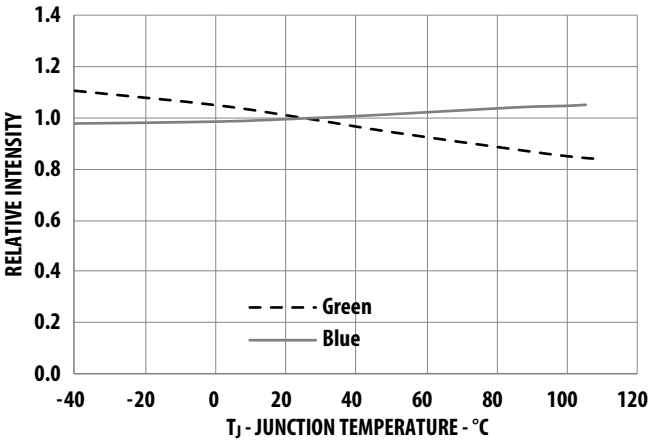


Figure 10 Forward Voltage Shift vs. Junction Temperature

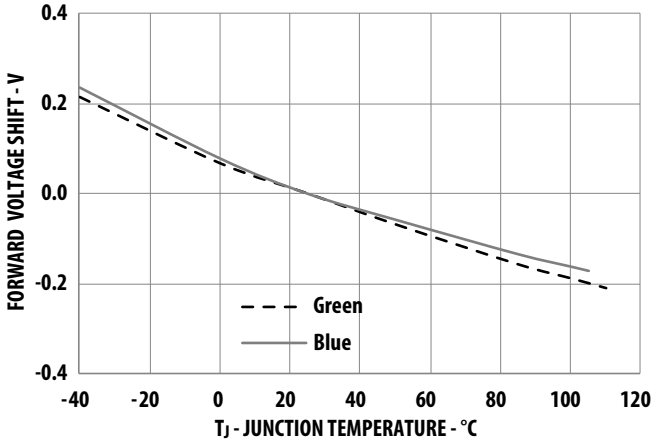
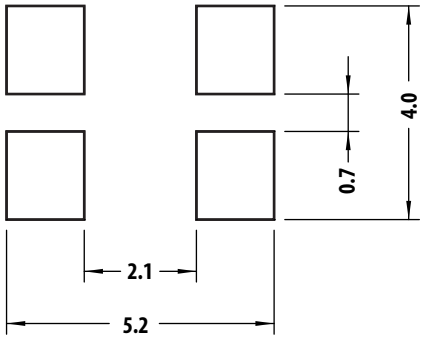


Figure 11 Recommended Soldering Land Pattern



NOTE Recommended stencil thickness is 0.1524 mm (6 mils) minimum and above.

Figure 12 Carrier Tape Dimension

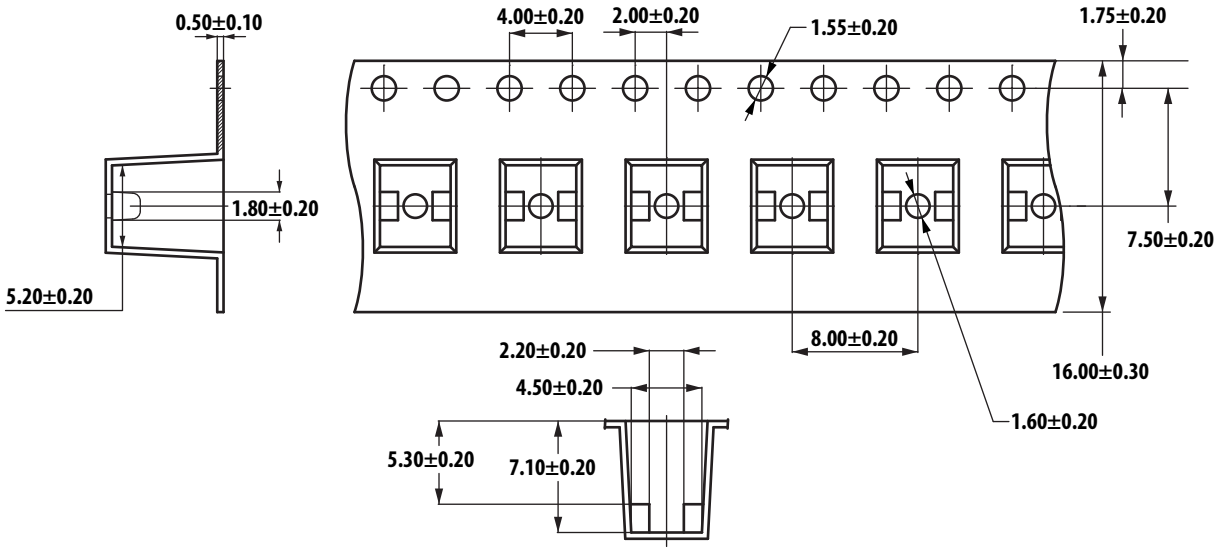


Figure 13 Reel Dimension

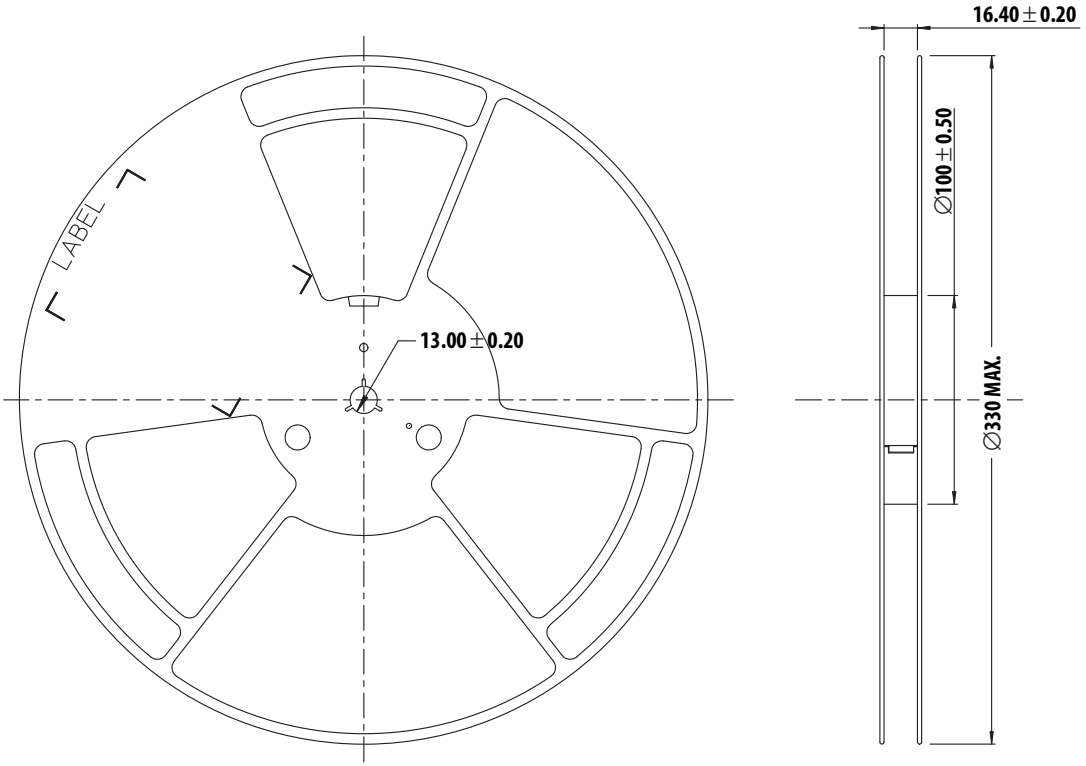
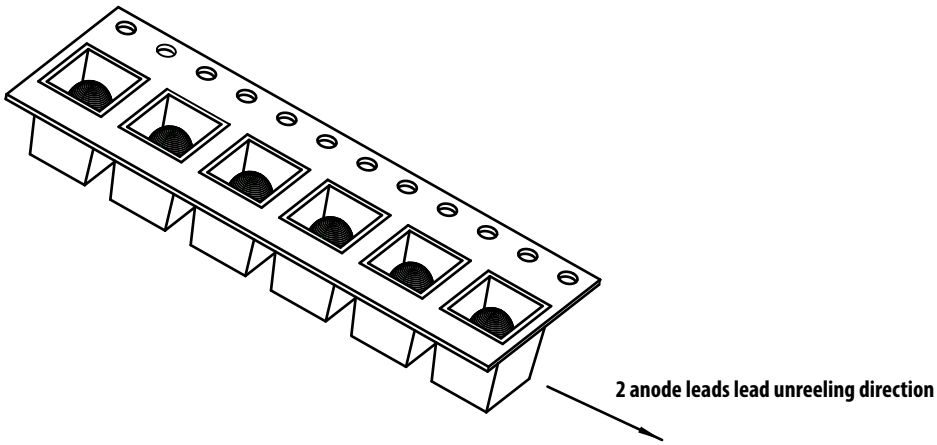


Figure 14 Unit Orientation from Reel



Soldering

Recommended reflow soldering condition:

Figure 15 Leaded Reflow Soldering

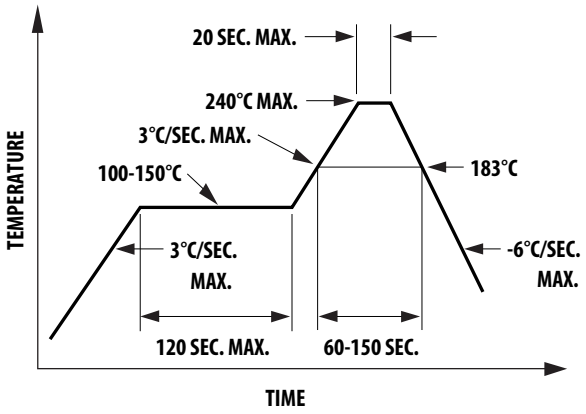
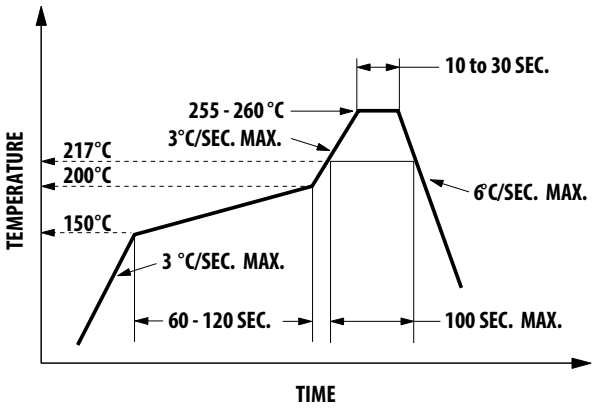
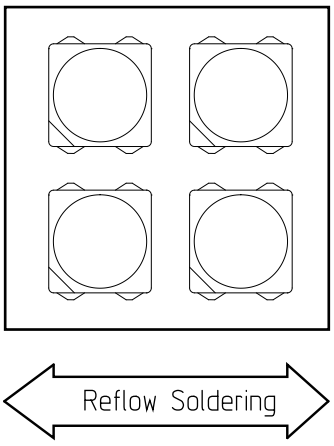


Figure 16 Lead-Free Reflow Soldering



a. Do not perform reflow soldering more than twice. Observe the necessary precautions of handling moisture-sensitive devices as stated in the followingsection.
b. Recommended board reflow direction.

Figure 17 Recommended Board Reflow Direction



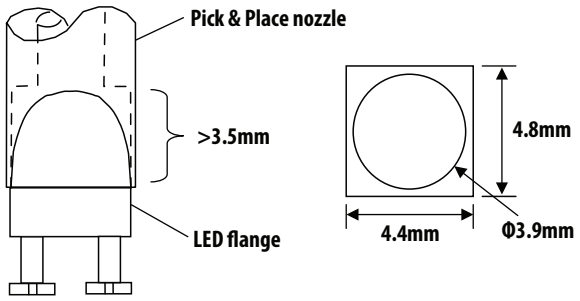
c. Do not apply any pressure or force on the LED during reflow and after reflow while the LED is still hot.
d. Use reflow soldering to solder the LED. Use hand soldering only for rework if it is unavoidable; hand soldering is limited to the following conditions:
   — Soldering iron tip temperature = 320°C max
   — Soldering duration = 3 sec max
   — Number of cycles = 1 only
   — Power of soldering iron = 50W max
e. Do not touch the LED body with the hot soldering iron except the soldering terminals because it might damage the LED.
f. For de-soldering, use an appropriate double-head soldering iron. Confirm beforehand whether the functionality and performance of the LED is affected by hand soldering.

Precautions

Handling Precautions

For automated pick-and-place, Avago has tested the following nozzle size made with urethane material to work well with this LED. However, due to the possibility of variations in other parameters, such as pick-and-place, machine maker and model, and other settings of the machine, verify that the nozzle selected is appropriate.

Figure 18 Nozzle Size



NOTE

1. The nozzle tip should touch the LED flange during pick-and-place.
2. The outer dimensions of the nozzle should fit into the carrier tape pocket.

Handling of Moisture Sensitive Devices

This product has a Moisture Sensitive Level 2a rating per JEDEC J-STD-020. Refer to Avago Application Note AN-5305, *Handling of Moisture Sensitive Surface Mount Devices*, for additional details and a review of proper handling procedures.

1. 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, it is safe to reflow the LEDs per the original MSL rating.
   - Do not open the MBB prior to assembly (for example, for IQC).
2. Control after opening the MBB:
   - Read the HIC immediately upon opening the MBB.
   - Keep the LEDs at < 30°C/60% RH at all times. All high-temperature-related processes, including soldering, curing, or rework, must be completed within 672 hours.
3. Control for the unfinished reel:

   Store unused LEDs in a sealed MBB with desiccant or desiccator at < 5% RH.
4. Control of assembled boards:
   - If the PCB soldered with the LEDs is to be subjected to other high-temperature processes, store the PCB 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.
5. Baking is required if the following conditions exist:
   - The HIC indicator is not BROWN at 10% and is AZURE at 5%.
   - The LEDs are exposed to condition of > 30°C/60% RH at any time.
   - The LED floor life exceeded 672 hours.
   - The recommended baking condition is: 60°C ± 5°C for 20 hours

   Baking should only be done once.
6. Storage:

   The soldering terminals of these Avago LEDs are silver plated. If the LEDs are exposed for too long in an ambient environment, the silver plating might oxidize; thus affecting its solderability performance. Therefore, keep unused LEDs in a sealed MBB with desiccant or in desiccator at < 5% RH.

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, which might result in larger performance variation (that is, intensity, wavelength, and forward voltage). 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, the reverse bias voltage must not exceed the allowable limit of the LED.
4. Avoid rapid changes in ambient temperature, especially in high-humidity environments because this situation causes condensation on the LED.
5. If the LED is intended to be used in outdoor or harsh environments, protect the LED leads with suitable potting material against damages caused by rain water, oil, corrosive gases, and so on. Use a louver or a shade to reduce direct sunlight on the LEDs.
6. The number of reflow cycles and reflow temperature conditions used might affect optical characteristics of the LED. Use LEDs with the same number of reflow cycles and same reflow temperature conditions within the same finished product.

Eye Safety Precautions

LEDs might pose optical hazards when in operation. Do not look directly at an operating LED because it might be harmful to the eyes. For safety reasons, use appropriate shielding or personal protective equipment.

Disclaimer

AVAGO'S PRODUCTS ARE NOT SPECIFICALLY DESIGNED, MANUFACTURED, OR AUTHORIZED FOR SALE AS PARTS, COMPONENTS, OR ASSEMBLIES FOR THE PLANNING, CONSTRUCTION, MAINTENANCE, OR DIRECT OPERATION OF A NUCLEAR FACILITY OR FOR USE IN MEDICAL DEVICES OR APPLICATIONS. THE CUSTOMER IS SOLELY RESPONSIBLE, AND WAIVES ALL RIGHTS TO MAKE CLAIMS AGAINST AVAGO OR ITS SUPPLIERS, FOR ALL LOSS, DAMAGE, EXPENSE, OR LIABILITY IN CONNECTION WITH SUCH USE.

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

pub-005360 – November 11, 2016

Lead (Pb) Free
RoHS 6 fully
compliant