

ALMD-CZ4G-VW002

High Brightness White SMT Round Lamps

Overview

The new Broadcom® ALMD- CZ4G series is essentially like conventional high brightness through-hole LEDs in the form of surface-mount devices. It can be assembled using common SMT assembly processes and is compatible with an industrial reflow soldering process.

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

- High brightness InGaN
- Typical viewing angle: 40°
- Diffused lens
- Support EN15153 color bin, color ratio
- MSL3

Applications

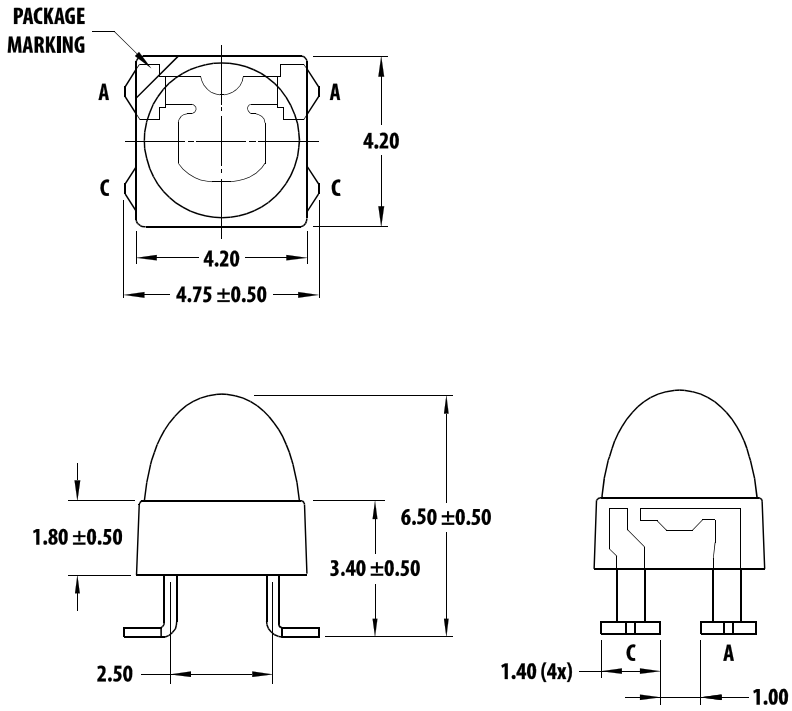
- Railway head lamps, marker lamps
- Variable message sign

CAUTION!

This LED is ESD sensitive. Please observe appropriate precautions during handling and processing. Refer to application note AN-1142 for additional detail.

The LED must be kept in a moisture barrier bag with < 5% relative humidity (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.

Figure 1: Package Drawing

**NOTE:**

1. All dimensions in millimeters (mm).
2. Tolerance is ± 0.20 mm unless otherwise specified.
3. Mildsteel leadframe

Device Selection Guide ($T_J = 25^\circ\text{C}$, $I_F = 20\text{mA}$)

Part Number	Chromaticity Coordinate	Luminous Intensity, I_V (mcd) ^{a, b}		Color Bin
		Typ	Min.	
ALMD-CZ4G-VW002	0.42, 0.38	4200	7200	1, 2, 3

- a. The luminous intensity is measured on the mechanical axis of the lamp package and it is tested with pulsing condition. The actual peak of the spatial radiation pattern may not align with mechanical axis.
- b. Tolerance for each bin limit is $\pm 15\%$

Absolute Maximum Ratings

Parameters	White	Unit
DC Forward Current ^a	30	mA
Peak Forward Current ^b	100	mA
Power Dissipation	105	mW
Reverse Voltage	Not recommended for reverse bias operation	
LED Junction Temperature	100	$^\circ\text{C}$
Operating Temperature Range	-40 to +85	$^\circ\text{C}$
Storage Temperature Range	-40 to +100	$^\circ\text{C}$

- a. Derate linearly as shown in Figure 12
- b. Duty factor = 10%, frequency = 1kHz.

Optical and Electrical Characteristics ($T_J = 25^\circ\text{C}$, $I_F = 20\text{mA}$)

Parameters	Min.	Typ.	Max.	Unit
Viewing Angle, $2\theta_{1/2}$ ^a		40		$^\circ$
Forward Voltage, V_F ^b	2.70	2.90	3.50	V
Reverse Voltage, V_R at $I_R = 10\mu\text{A}$ ^c	5			V
Chromaticity Coordinate		0.42, 0.38		–
Thermal Resistance, $R_{\theta_{J-P}}$ ^d		350		$^\circ\text{C/W}$

- a. $\theta_{1/2}$ is the off-axis angle where the luminous intensity is $1/2$ the peak intensity. The actual peak of the spatial radiation pattern may not align with the mechanical axis.
- b. Tolerance is $\pm 0.05\text{V}$.
- c. Indicates product final test condition only. Long term reverse bias is not recommended.
- d. Thermal resistance from LED junction to pin.

Part Numbering System

A L M D - C Z

x ₁	x ₂
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x ₃	x ₄	x ₅	x ₆	x ₇
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Code	Description	Option	
x ₁	Viewing angle	4	Typical 40°
x ₂	Lens appearance	G	Diffused
x ₃	Minimum intensity bin	V	4200 - 5500
x ₄	Maximum intensity bin	W	5500 -7200
x ₅	Color Bin Option	0	Bin 1, 2, 3
x ₇ , x ₈	Packaging Option	2	Test Current = 20mA

Part Number Example

ALMD- CZ4G – VW002

x₁ : 4 – 40°
 x₂ : G – Diffused
 x₃ : 1 – Minimum intensity bin V
 x₄ : 2 – Maximum intensity bin W
 x₅ : 0 – Color bin 1, 2, 3
 X₆ x₇: 02 – Tested at 20mA

Bin Information

Intensity Bin Limits (CAT)

Bin ID	Luminous Intensity, I_v (mcd)	
	Min.	Max.
V	4200	5500
W	5500	7200

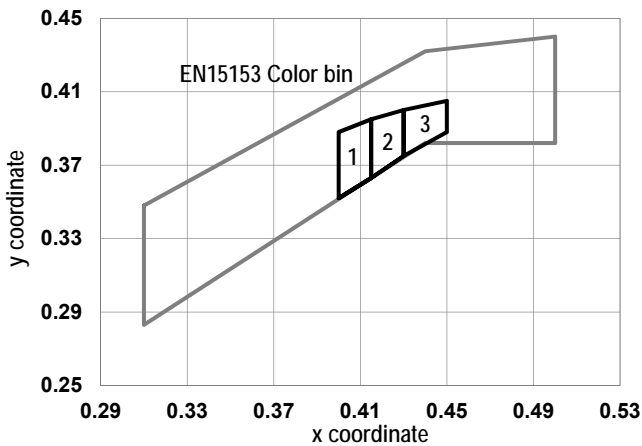
Tolerance = $\pm 15\%$

Example of bin information on reel and packaging label:

CAT : W – Intensity bin W

BIN : 2 – Color bin 2

Figure 2: Chromaticity Diagram



Color Bin Limits (BIN)

Bin ID	Chromaticity Coordinates	
	x	y
1	0.400	0.352
	0.400	0.388
	0.415	0.395
	0.415	0.363
2	0.415	0.363
	0.415	0.395
	0.430	0.400
	0.430	0.375
3	0.430	0.375
	0.430	0.400
	0.450	0.405
	0.450	0.388

Tolerance = ± 0.01

Figure 3: Spectral Power Distribution

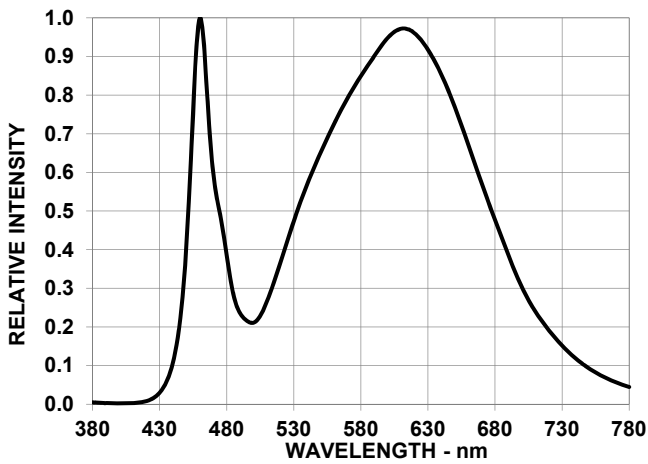


Figure 4: Forward Current vs. Forward Voltage

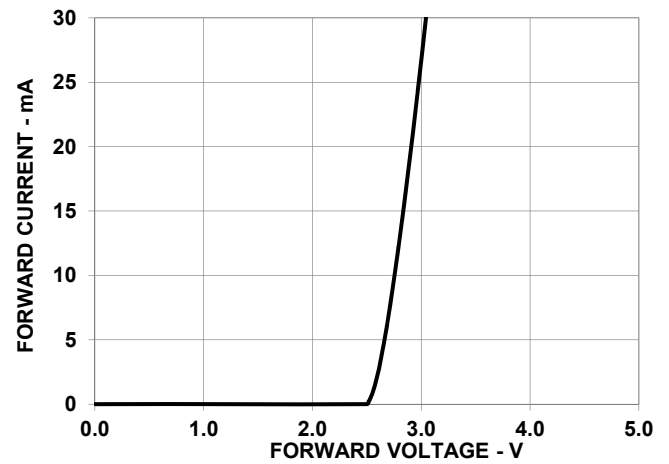


Figure 5: Relative Luminous Intensity vs. Mono Pulse Current

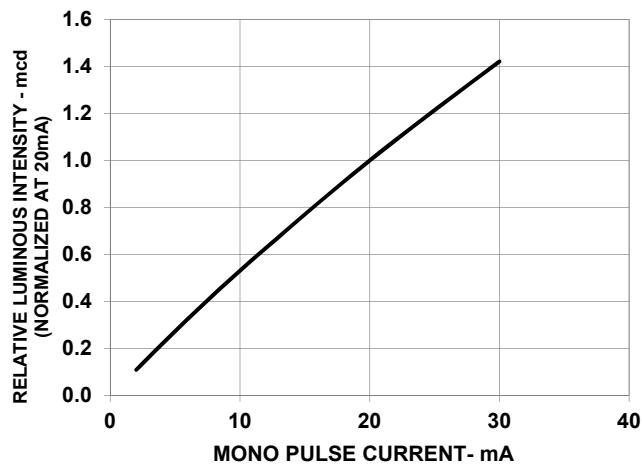


Figure 6: Chromaticity Coordinate Shift vs. Mono Pulse Current

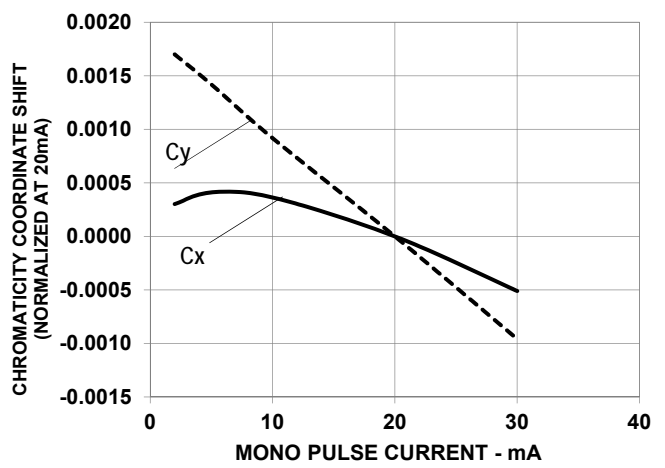


Figure 7: Relative Light Output vs. Junction Temperature

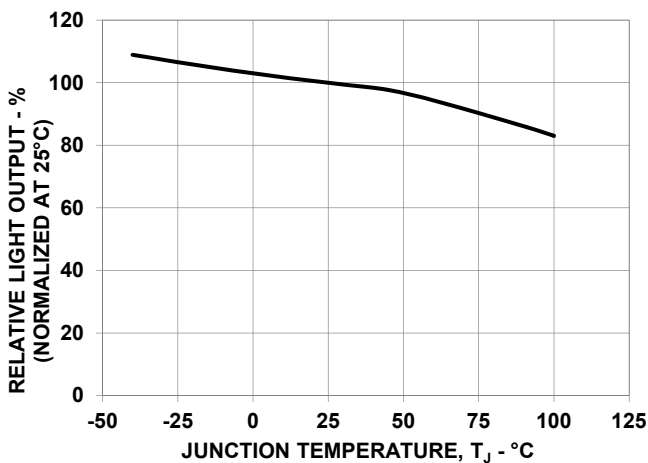


Figure 8: Forward Voltage Shift vs. Junction Temperature

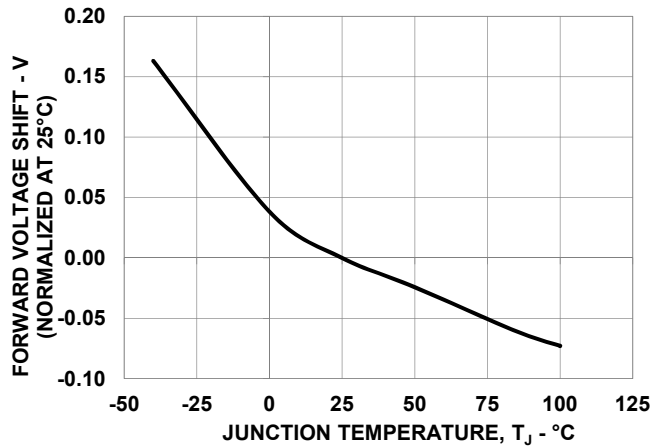


Figure 9: Chromaticity Coordinate Shift vs. Junction Temperature

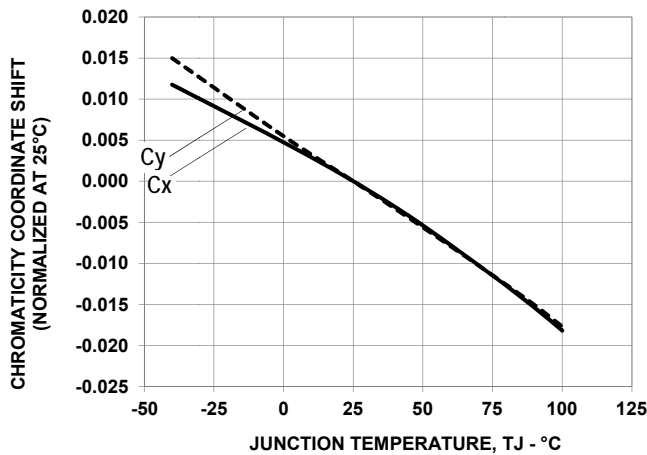


Figure 10: Radiation Pattern

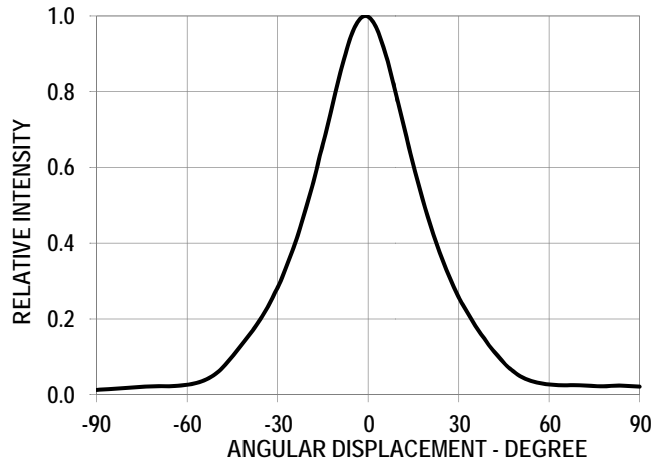
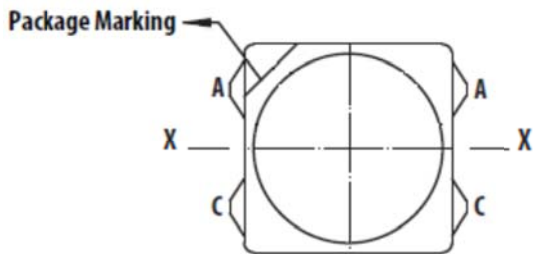


Figure 11: Component Axis for Radiation Pattern



NOTE: All dimensions are in millimeters (mm).

Figure 12: Maximum Forward Current vs. Ambient Temperature. Derated based on T_{JMAX} = 100°C

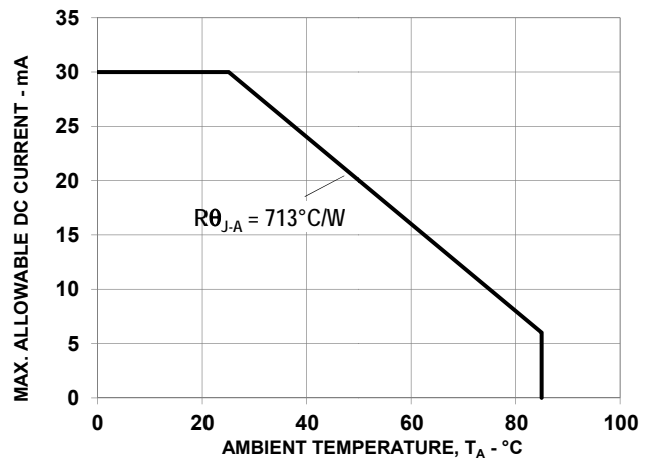
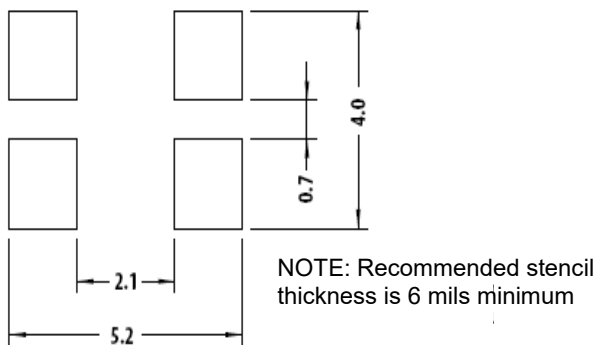
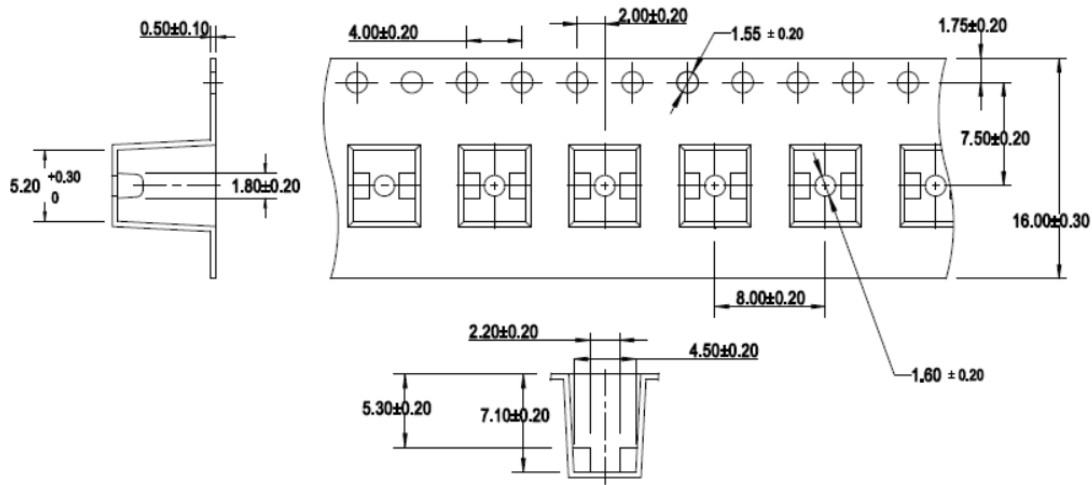


Figure 13: Recommended Soldering Land Pattern



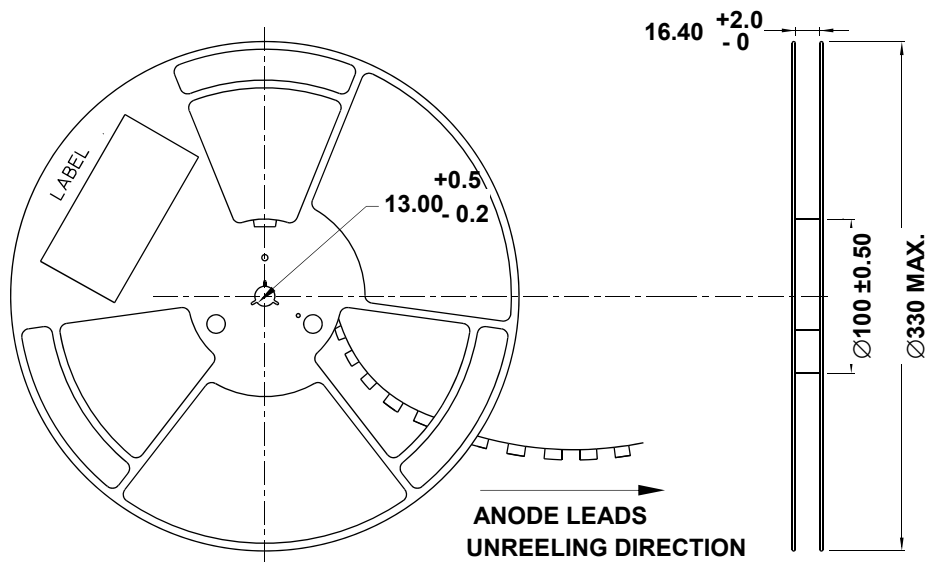
NOTE: All dimensions are in millimeters (mm).

Figure 14: Carrier Tape Dimensions



NOTE: All dimensions in millimeters (mm).

Figure 15: Carrier Tape Dimensions



NOTE All dimensions are in millimeters.

Precautionary Notes

Soldering

- Do not perform reflow soldering more than twice. Observe necessary precautions of handling moisture-sensitive device as stated in the following section.
- Do not apply any pressure or force on the LED during reflow and after reflow when the LED is still hot.
- Use reflow soldering to solder the LED. Use hand soldering only for rework if unavoidable, but it must be strictly controlled to following conditions:
 - Soldering iron tip temperature = 315°C max.
 - Soldering duration = 3sec max.
 - Number of cycles = 1 only
 - Power of soldering iron = 50W max.
- Do not touch the LED package body with the soldering iron except for the soldering terminals, as it may cause damage to the LED.
- Confirm beforehand whether the functionality and performance of the LED is affected by soldering with hand soldering.

Figure 16: Recommended Lead-Free Reflow Soldering Profile

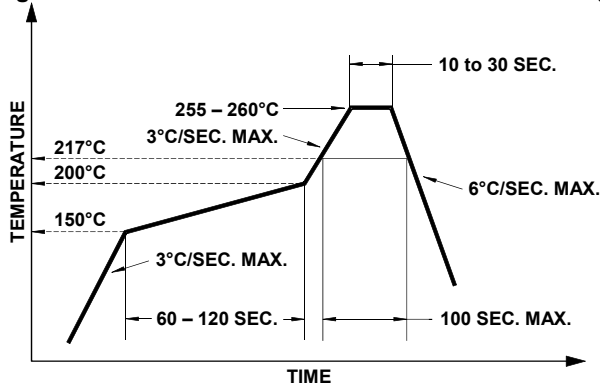
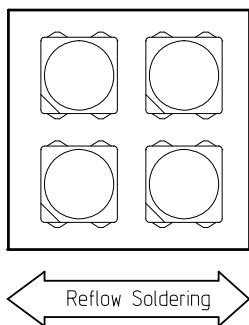


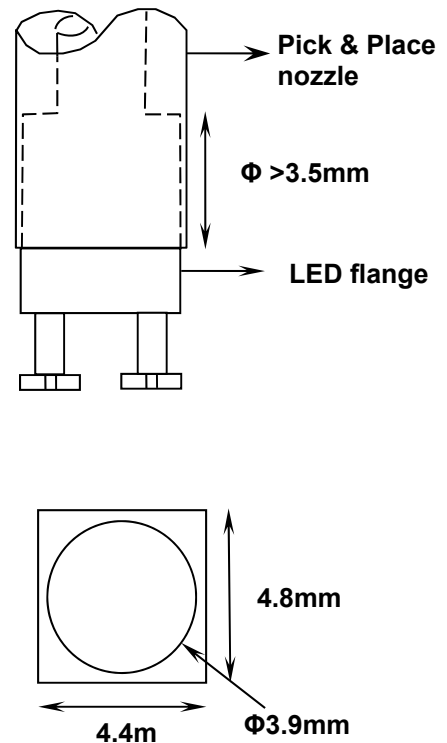
Figure 17: Recommended Board Reflow Direction



Handling Precautions

For automated pick and place, Broadcom has tested following nozzle size to work with this LED. However, due to the possibility of variations in other parameters such as pick and place machine maker/model, and other settings of the machine, verify that the selected nozzle performs as per requirements.

Figure 18: Recommended Nozzle Dimension



NOTE

1. The nozzle tip must touch the LED flange during pick and place.
2. Outer dimensions of the nozzle tip must be able to fit into the carrier tape pocket until it touches the LED flange.
3. All dimensions are in mm.

Handling of Moisture-Sensitive Devices

This product has a Moisture Sensitive Level 3 rating per JEDEC J-STD-020. Refer to Broadcom Application Note AN5305, *Handling of Moisture Sensitive Surface Mount Devices* for additional details and a review of proper handling procedures.

- Before use:
 - An unopened moisture barrier bag (MBB) can be stored at $40^{\circ}\text{C}/90\% \text{ RH}$ 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 the LEDs per the original MSL rating.
 - Do not open the MBB prior to assembly (for example, for IQC). If unavoidable, MBB must be properly resealed with fresh desiccant and HIC. The exposed duration must be taken in as floor life.
- Control after opening the MBB:
 - Read the HIC immediately upon opening of MBB.
 - Keep the LEDs at $30^{\circ}\text{C}/60\% \text{ RH}$ at all times, and complete all high temperature-related processes, including soldering, curing or rework within 168 hours.
- Control for unfinished reel:

Store unused LEDs in a sealed MBB with desiccant or a desiccator at $5\% \text{ RH}$.
- 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 $5\% \text{ RH}$ to ensure that all LEDs have not exceeded their floor life of 168 hours.
- Baking is required if:
 - The HIC indicator indicates a change in color for 10% and 5%, as stated on the HIC.
 - The LEDs are exposed to conditions of $30^{\circ}\text{C}/60\% \text{ RH}$ at any time.
 - The LED's floor life exceeded 168 hours.

The recommended baking condition is: $60 \pm 5^{\circ}\text{C}$ for 20 hours.

Baking can only be done once.
- Storage:

The soldering terminals of these Broadcom LEDs are silver plated. If the LEDs are exposed in ambient environment for too long, the silver plating might be oxidized, thus affecting its solderability performance. As such, keep unused LEDs in a sealed MBB with desiccant or in a desiccator at $5\% \text{ RH}$.

Application Precautions

- 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.
- Circuit design must cater to the whole range of forward voltage (V_F) of the LEDs to ensure the intended drive current can always be achieved.
- The LED exhibits slightly different characteristics at different drive currents, which may result in a larger variation of performance (meaning: intensity, wavelength, and forward voltage). Set the application current as close as possible to the test current to minimize these variations.
- The LED is not intended for reverse bias. Use other appropriate components for such purposes. When driving the LED in matrix form, ensure that the reverse bias voltage does not exceed the allowable limit of the LED.
- White LEDs must not be exposed to acidic environments and must not be used in the vicinity of any compound that may have acidic outgas, such as, but not limited to, acrylate adhesive. These environments have an adverse effect on LED performance.
- Avoid rapid change in ambient temperature, especially in high-humidity environments, because they cause condensation on the LED.
- If the LED is intended to be used in harsh or outdoor environment, protect the LED against damages caused by rain water, water, dust, oil, corrosive gases, external mechanical stresses, and so on.
- The number of reflow cycles and reflow temperature conditions used may affect optical characteristics of the LED. It is recommended to use LED with same number of reflow cycles and the same reflow temperature conditions within the same finished good.

Eye Safety Precautions

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

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