

## **HSMQ-C230**

### **Green Color Side-Mount ChipLED**

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#### **Description**

The Broadcom® HSMQ-C230 is a side-emitting surface-mount chipLED. This chipLED comes in small package footprint of 1.0 mm × 0.55 mm. Its small form factor allows flexible board design, and the LED can be closely mounted, thus offering maximum miniaturization benefits to the user.

The low package height of 0.3 mm makes it an ideal solution for an application that has limited head room, such as wearables and small portable handheld devices.

By using efficient and high brightness InGaN LED materials, this product is capable of delivering high light output. It is compatible with industry-standard automatic machine placement and reflow soldering.

#### **Features**

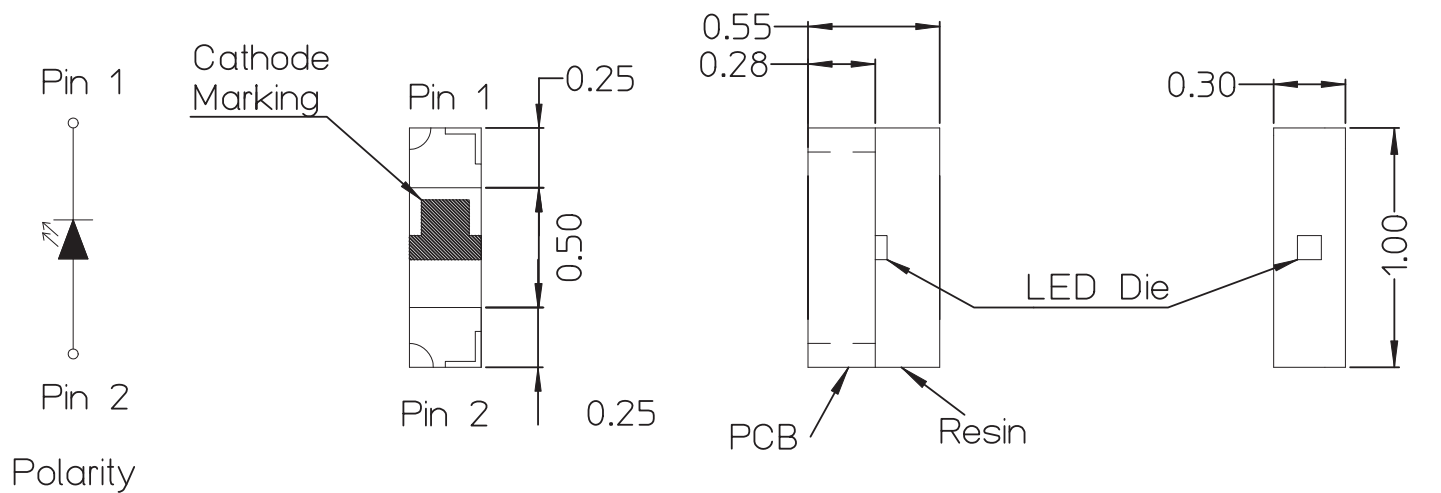
- LEDs with InGaN die
- Surface-mount device with 0.30-mm height
- Compatible with reflow soldering
- Tape in 8-mm carrier tape on a 7-in. diameter reel

#### **Applications**

- Backlighting
- Indicator

**CAUTION!** LEDs are class 1A 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.

Figure 1: Package Dimensions



- NOTE:**
- 1. All dimensions are in millimeters.
  - 2. Tolerance  $\pm 0.1$  mm unless otherwise specified.
  - 3. Encapsulant: clear epoxy

Absolute Maximum Value at  $T_J = 25^{\circ}\text{C}$

| Parameter                         | Rating     | Units              |
|-----------------------------------|------------|--------------------|
| DC Forward Current <sup>a</sup>   | 20         | mA                 |
| Peak Forward Current <sup>b</sup> | 100        | mA                 |
| Power Dissipation                 | 78         | mW                 |
| LED Junction Temperature          | 95         | $^{\circ}\text{C}$ |
| Operating Temperature             | -40 to +85 | $^{\circ}\text{C}$ |
| Storage Temperature               | -40 to +85 | $^{\circ}\text{C}$ |

- a. Derate as shown in [Figure 10](#).
- b. Duty factor = 10%, frequency = 1 kHz.

## Optical/Electrical Characteristics at $T_J = 25^{\circ}\text{C}$ , $I_F = 20\text{ mA}$

| Parameter   | Min.  | Typ. | Max. | Units                |
|---|-------|------|------|----------------------|
| Luminous Intensity, $I_v^a$                                 | 112.5 | —    | —    | mcd                  |
| Dominant Wavelength, $\lambda_d^b$                          | —     | 523  | —    | nm                   |
| Peak Wavelength, $\lambda_p$                                | —     | 517  | —    | nm                   |
| Viewing Angle, $2\theta_{1/2}^c$                            | —     | 140  | —    | degree               |
| Forward Voltage, $V_F$                                      | 2.9   | —    | 3.9  | V                    |
| Reverse Current, $I_R$ (at $V_R = 5\text{V}$ ) <sup>d</sup> | —     | —    | 100  | $\mu\text{A}$        |
| Thermal Resistance, $R\theta_{J-S}$                         | —     | 320  | —    | $^{\circ}\text{C/W}$ |

- a. The luminous intensity is measured at the mechanical axis of the LED package. The actual peak of the spatial radiation pattern may not be aligned with the axis.
- b. The dominant wavelength is derived from the CIE chromaticity diagram and represents the perceived color of the device.
- c. Viewing angle is the off-axis angle where the luminous intensity is  $\frac{1}{2}$  the peak intensity.
- d. Indicates the product final test condition. Long-term reverse bias is not recommended.

## Bin Information

### Intensity Bins (CAT)

| Bin ID | Luminous Intensity (mcd) |        |
|--------|--------------------------|--------|
|        | Min.                     | Max.   |
| R      | 112.5                    | 180.0  |
| S      | 180.0                    | 285.0  |
| T      | 285.0                    | 450.0  |
| U      | 450.0                    | 715.0  |
| V      | 715.0                    | 1125.0 |
| W      | 1125.0                   | 1800.0 |
| X      | 1800.0                   | 2850.0 |
| Y      | 2850.0                   | 4500.0 |

Tolerance  $\pm 15\%$ .

### Forward Voltage Bins

| Bin ID | Forward Voltage (V) |      |
|--------|---------------------|------|
|        | Min.                | Max. |
| 1      | 2.9                 | 3.1  |
| 2      | 3.1                 | 3.3  |
| 3      | 3.3                 | 3.5  |
| 4      | 3.5                 | 3.7  |
| 5      | 3.7                 | 3.9  |

Tolerance  $\pm 0.1\text{V}$ .

### Color Bins (BIN)

| Bin ID | Dominant Wavelength (nm) |      |
|--------|--------------------------|------|
|        | Min.                     | Max. |
| A      | 515                      | 520  |
| B      | 520                      | 525  |
| C      | 525                      | 530  |
| D      | 530                      | 535  |

Tolerance  $\pm 1\text{ nm}$

Figure 2: Intensity vs. Wavelength

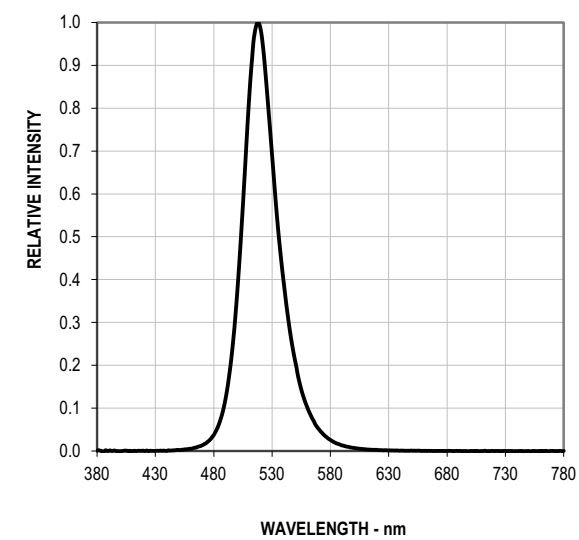


Figure 3: Forward Current vs. Forward Voltage

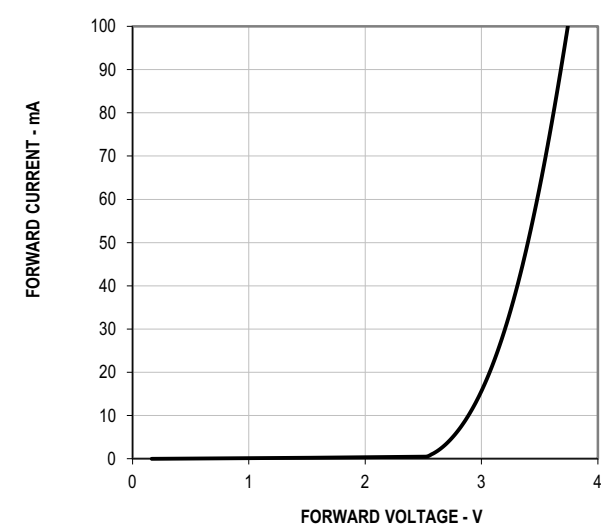


Figure 4: Intensity vs. Forward Current

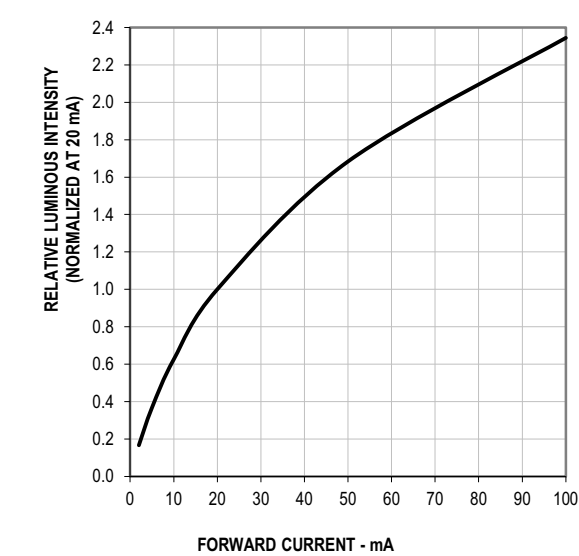


Figure 5: Intensity vs. Angle

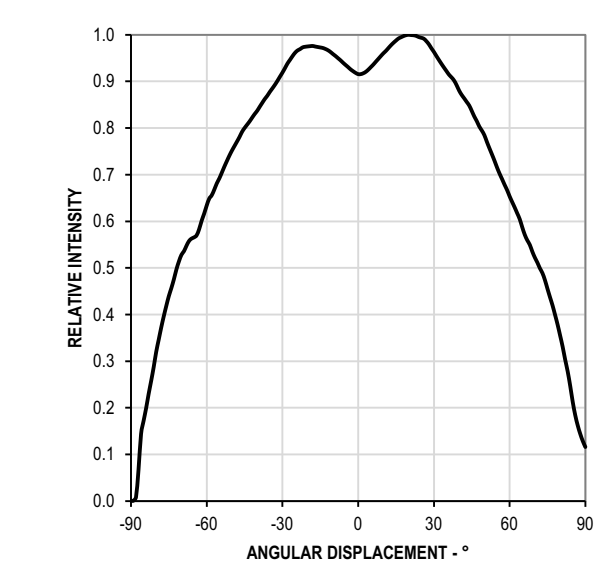


Figure 6: Wavelength vs. Forward Current

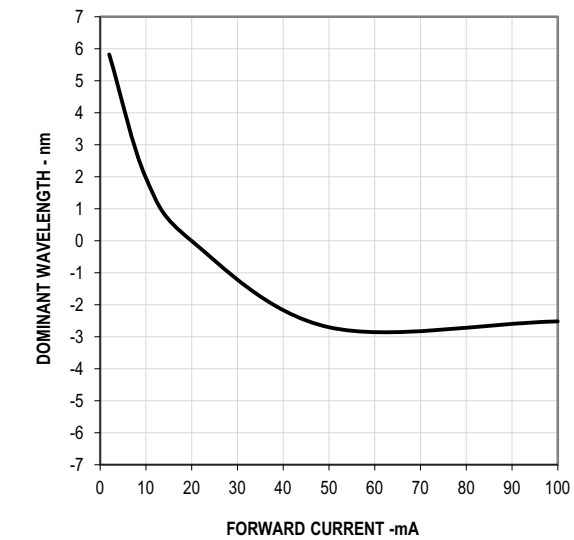


Figure 7: Intensity vs. Temperature

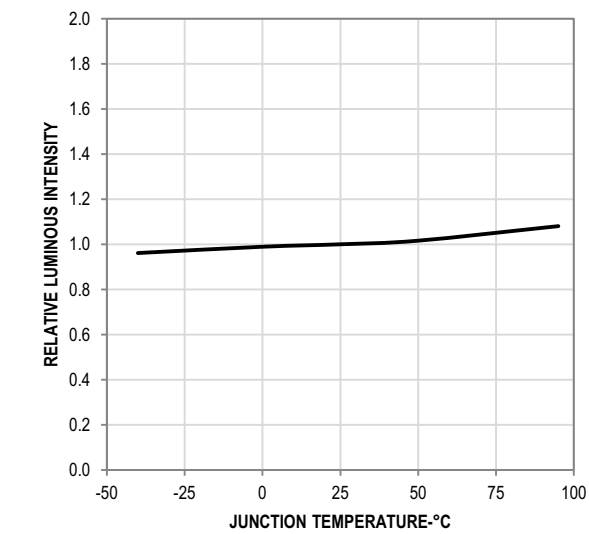


Figure 8: Wavelength vs. Temperature

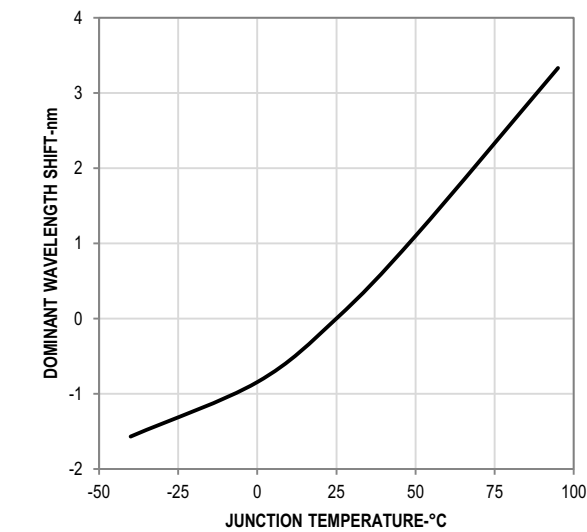


Figure 9: Forward Voltage vs. Temperature

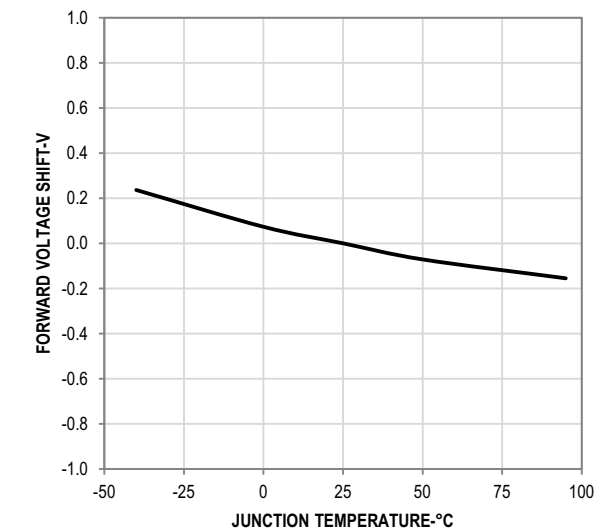


Figure 10: Forward Current vs. Temperature

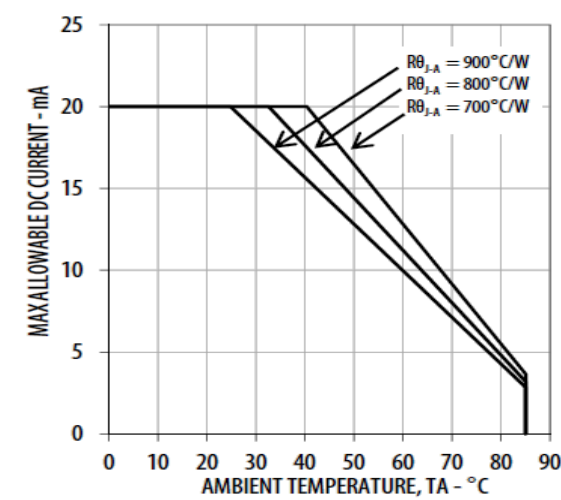
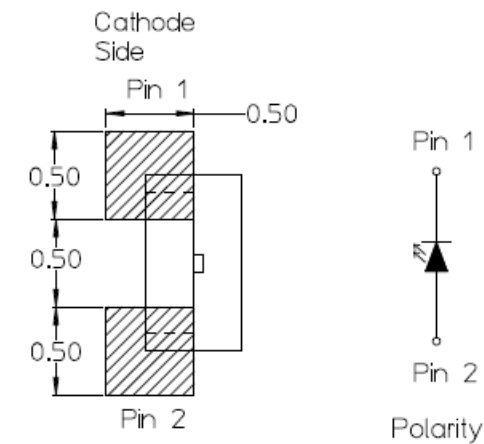
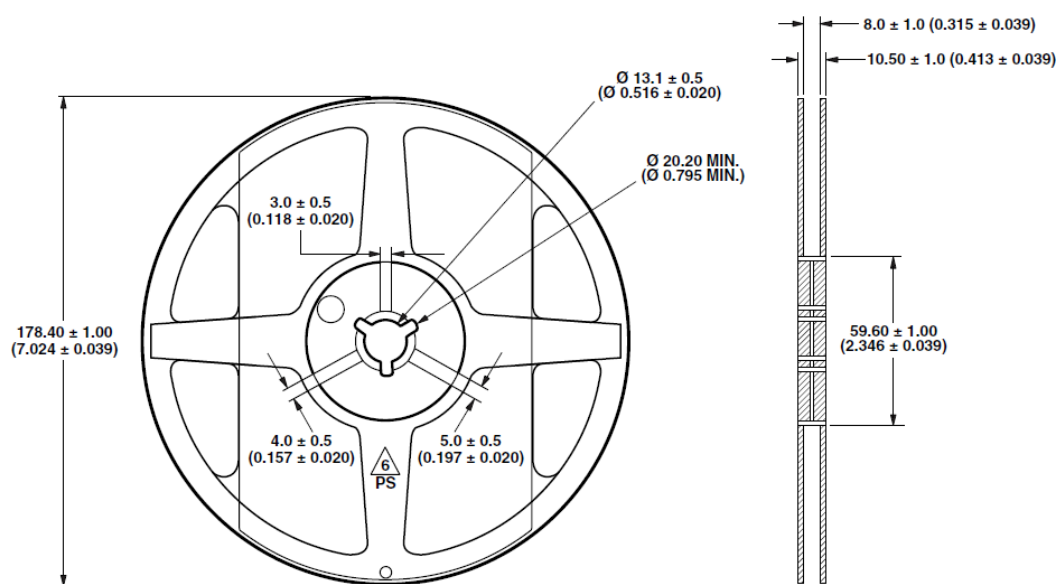


Figure 11: Recommended Solder Pad (Units: mm)

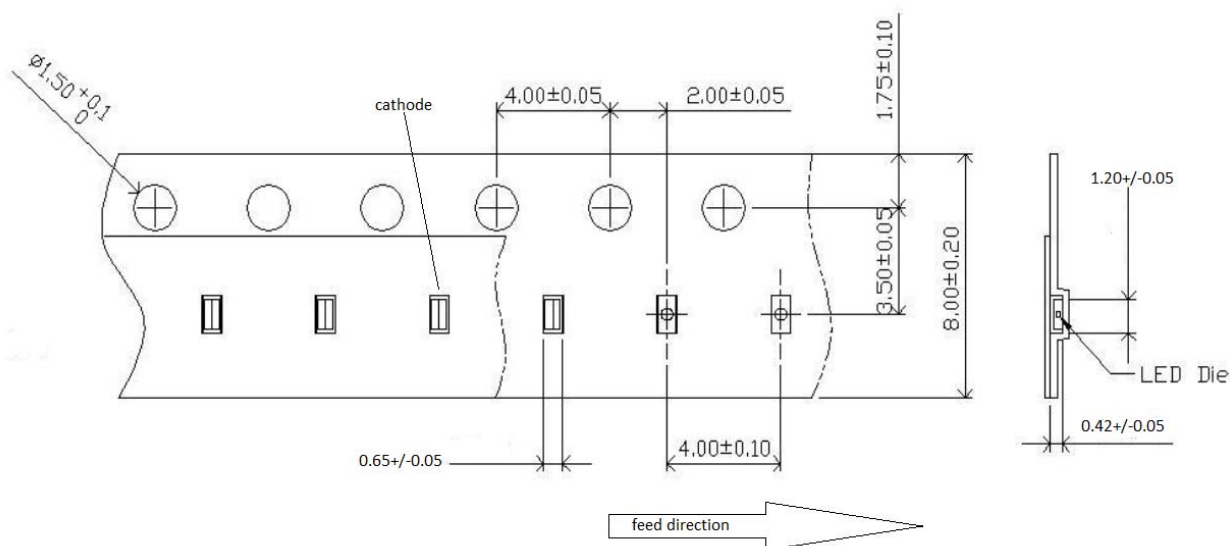


### Figure 12: Reel Dimensions



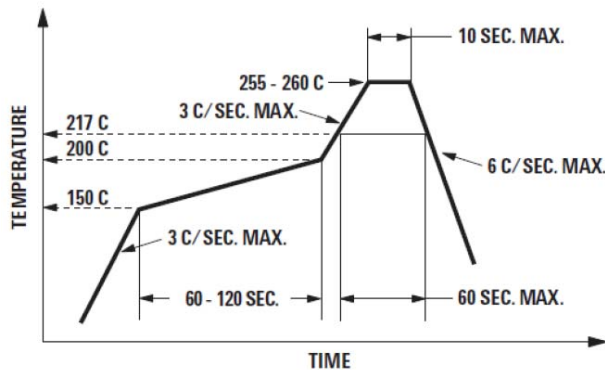
**NOTE:**  
1. ALL DIMENSIONS IN MILLIMETERS (INCHES).

**Figure 13: Carrier Tape Dimensions (Units: mm)**



## Soldering

Figure 14: Recommended Reflow Soldering Conditions



- Reflow soldering must not be done 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. If unavoidable (such as rework), use manual hand soldering strictly controlled to the following conditions:
  - Soldering iron tip temperature = 310°C maximum
  - Soldering duration = 2 seconds maximum
  - Number of cycles = 1 only
  - Power of soldering iron = 50W maximum
- Do not touch the LED package body with the soldering iron except for the soldering terminals because it might cause damage to the LED.
- Confirm beforehand whether the functionality and performance of the LED is affected by hand soldering.

## Precautionary Notes

### Handling of a Moisture-Sensitive Device

This product has a Moisture Sensitive Level 2a 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°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).

#### ■ Control after opening the MBB

- Read the HIC immediately upon opening the MBB.
- Keep the LEDs at < 30°C/60% RH at all times, and all high-temperature-related processes, including soldering, curing, or rework, must be completed within 672 hours.

#### ■ Control for unfinished reel

Store unused LEDs in a sealed MBB with desiccant or desiccator at < 5% 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% RH to ensure that all LEDs have not exceeded their floor life of 672 hours.

#### ■ Baking is required if the following conditions exist:

- 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°C/60% RH at any time.
- The LEDs' floor life exceeded 672 hours.

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

Baking should only be done once.



## 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 (for example intensity, wavelength, and forward voltage). Set the application current as close as possible to the test current to minimize these variations.
- Driving the LED at low current ( $< 2$  mA) will not cause functional failures to the LED (for example, open/short). However, the variation in intensity will be larger than existing intensity bin ratio.
- If the LED is intended to be used along with LED of other color to achieve color mixing, Broadcom does not guarantee the consistency of the resultant color. Contact your Broadcom Sales Representative for such an application.
- 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.
- Avoid rapid changes 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.

## 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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