HSMW-C200

Mono-Color Top-Mount ChipLED

Description

The Broadcom® HSMW-C200 is a top-view surface-mount LED with white color and is available in one of the industry's smallest footprints.

In addition to its ultra-small package size, this product is tested and binned at a low test current of 2 mA. The small form factor and low power consumption features offer unmatched flexibility to users and designers, for applications requiring LEDs with the smallest footprint possible and low power consumption, such as wearable and portable consumer electronics.

The HSMW-C200 utilizes efficient, high-performance Indium Gallium Nitrate (InGaN) LED die technology. It comes in tape and reel packing that is compatible with industry-standard automatic machine placement and IR reflow soldering.

Features

- Ultra-small package size
- Low power consumption
- Easy to use
- Compatible with IR reflow soldering
- Available in 8-mm carrier tape and 7-in. diameter

Applications

- Status indicator
- Keypad backlighting
- Push-button backlighting

CAUTION! This LED is 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 Drawing
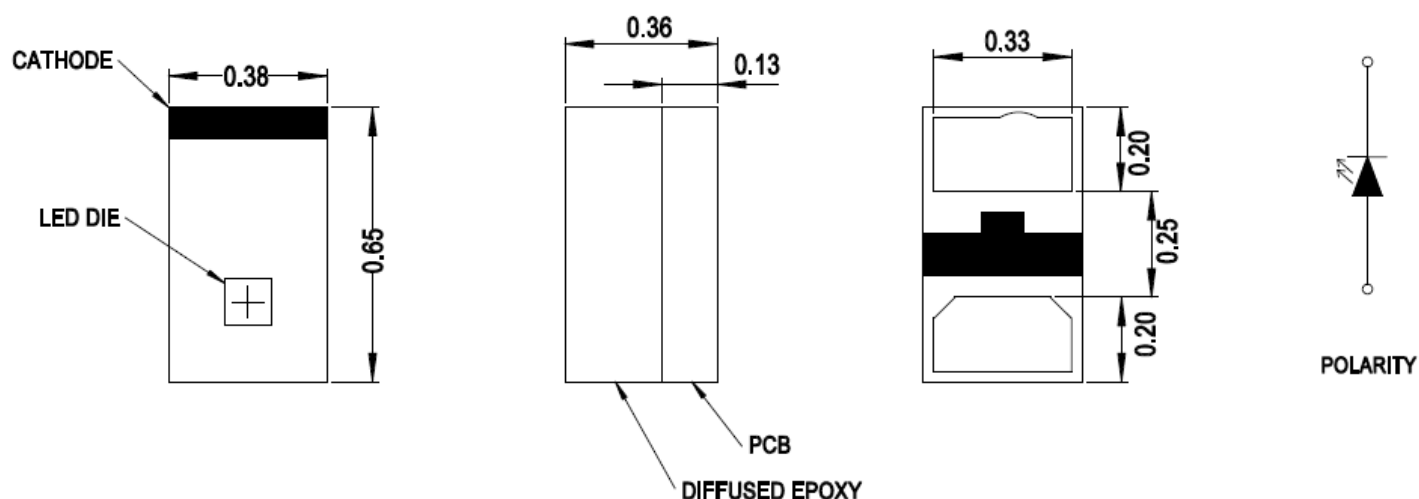
NOTE:

1. All dimensions are in millimeters (mm).
2. Tolerance is ±0.10 mm unless otherwise specified.

Absolute Maximum Ratings

Parameter	Value	Unit
DC Forward Current[a]	5	mA
Power Dissipation	16	mW
LED Junction Temperature	95	°C
Operating/Storage Temperature Range	–40 to +85	°C

a. Derate linearly as shown in Figure 7.

Optical and Electrical Characteristics (T_J = 25°C)

Parameter	Min.	Typ.[a]	Max.	Unit
Luminous Intensity, I_V[b] @ I_F = 2 mA	28.5	—	—	mcd
Viewing Angle, $2\theta_{1/2}$[c]	—	150	—	°
Forward Voltage, V_F[d] @ I_F = 2 mA	2.55	—	3.15	V
Reverse Current, I_R at V_R = 5V[e]	—	—	10	µA
Thermal Resistance, $R\theta_{J-S}$[f]	—	600	—	°C/W

a. Typ. value is for reference only.

b. The luminous intensity, I_V, is measured at the mechanical axis of the package and it is tested with a single current pulse condition. The actual peak of the spatial radiation pattern may not be aligned with the axis.

c. $\theta_{1/2}$ is the off-axis angle where the radiant intensity is ½ the peak intensity.

d. Forward voltage tolerance is ±0.1V.

e. Indicates product final test condition. Long-term reverse bias is not recommended.

f. Thermal resistance is from LED junction to solder point.

Bin Information

Intensity Bin Limits (CAT)

Bin ID	Luminous Intensity (mcd)	
	Min.	Max.
N	28.50	45.00
P	45.00	71.50
Q	71.50	112.50
R	112.50	180.00
S	180.00	285.00
T	285.00	450.00

Tolerance = ± 15%

Forward Voltage Bin Limits (VF)

Bin ID	Forward Voltage (V)	
	Min.	Max.
1	2.55	2.75
2	2.75	2.95
3	2.95	3.15

Tolerance = ± 0.1V

Color Bin Limits (BIN)

Bin ID	Chromaticity Coordinates	
	x	y
A1	0.2700	0.2455
	0.2700	0.2780
	0.2500	0.2500
	0.2500	0.2175
A2	0.2700	0.2455
	0.2700	0.2130
	0.2500	0.1850
	0.2500	0.2175
B1	0.2700	0.2455
	0.2700	0.2780
	0.2900	0.3060
	0.2900	0.2735
B2	0.2700	0.2455
	0.2700	0.2130
	0.2900	0.2410
	0.2900	0.2735
C1	0.2900	0.3060
	0.3100	0.3355
	0.3100	0.3030
	0.2900	0.2735
C2	0.2900	0.2410
	0.3100	0.2705
	0.3100	0.3030
	0.2900	0.2735
D1	0.3100	0.3030
	0.3100	0.3355
	0.3300	0.3650
	0.3300	0.3325
D2	0.3100	0.3030
	0.3100	0.2705
	0.3300	0.3000
	0.3300	0.3325

Tolerance = ± 0.02

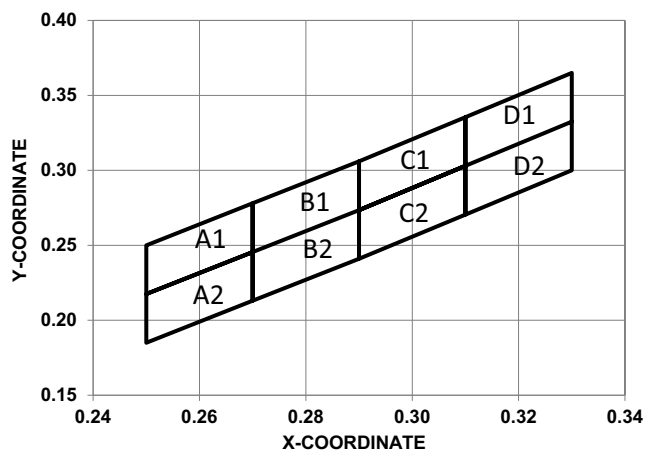**Figure 2: Chromaticity Diagram**

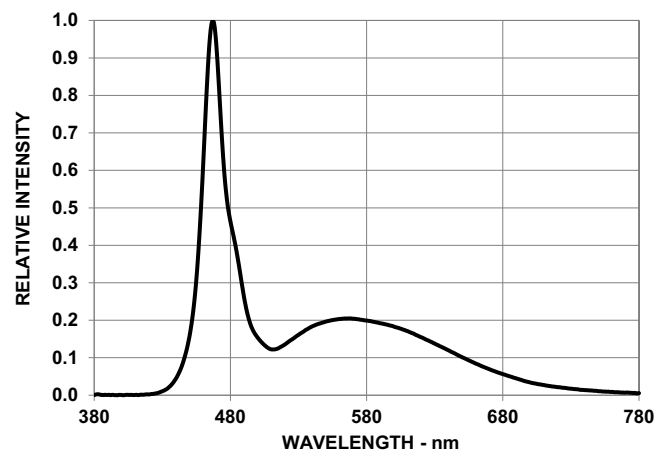**Figure 3: Spectral Power Distribution**
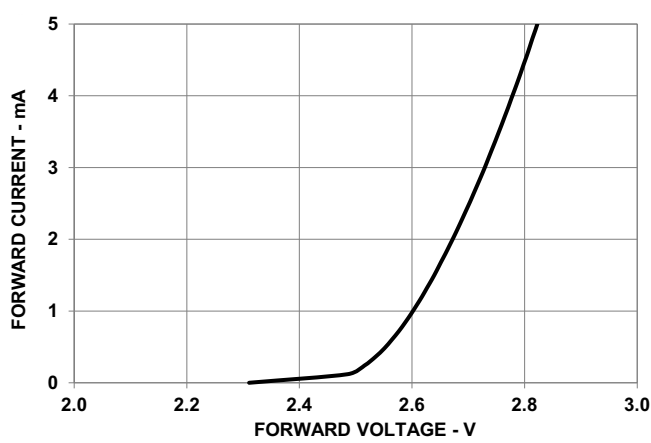

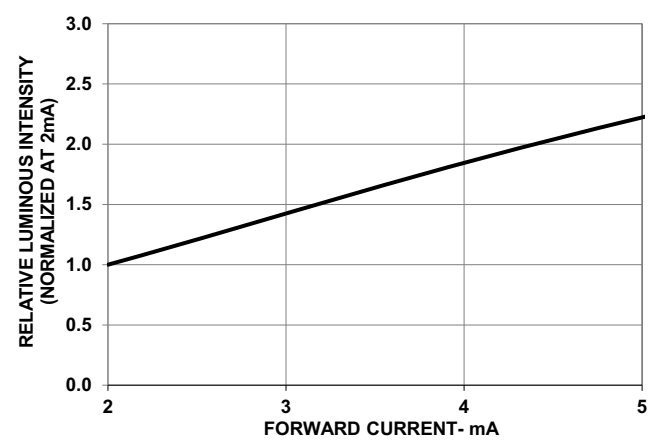**Figure 4: Forward Current vs. Forward Voltage**

Figure 5: Relative Luminous Intensity vs. Forward Current
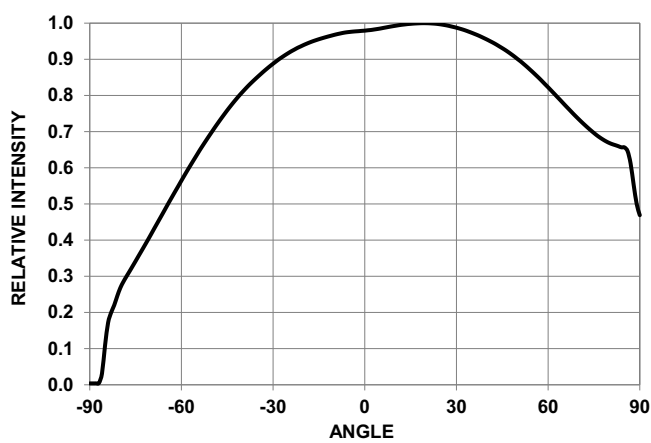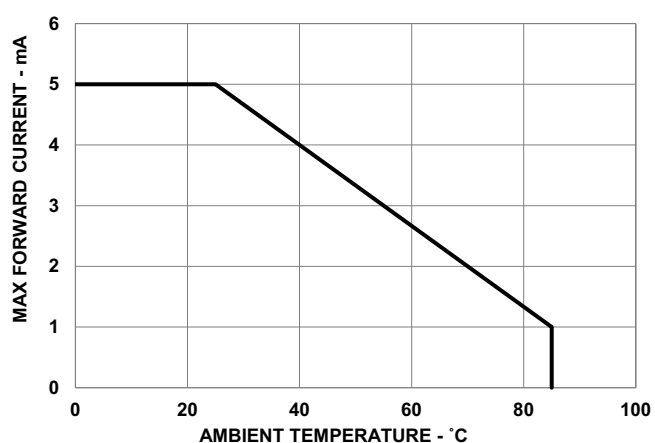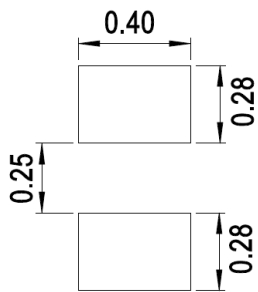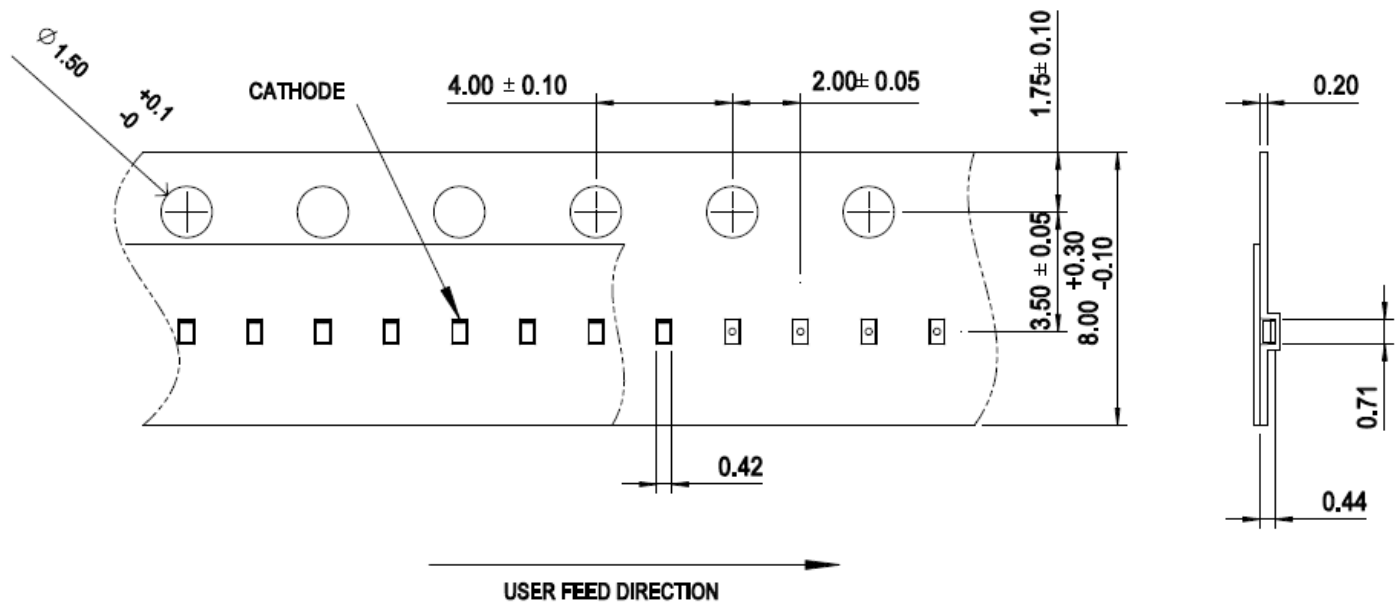

Figure 6: Radiation Pattern

Figure 7: Derating Curve

Figure 8: Recommended Soldering Land Pattern

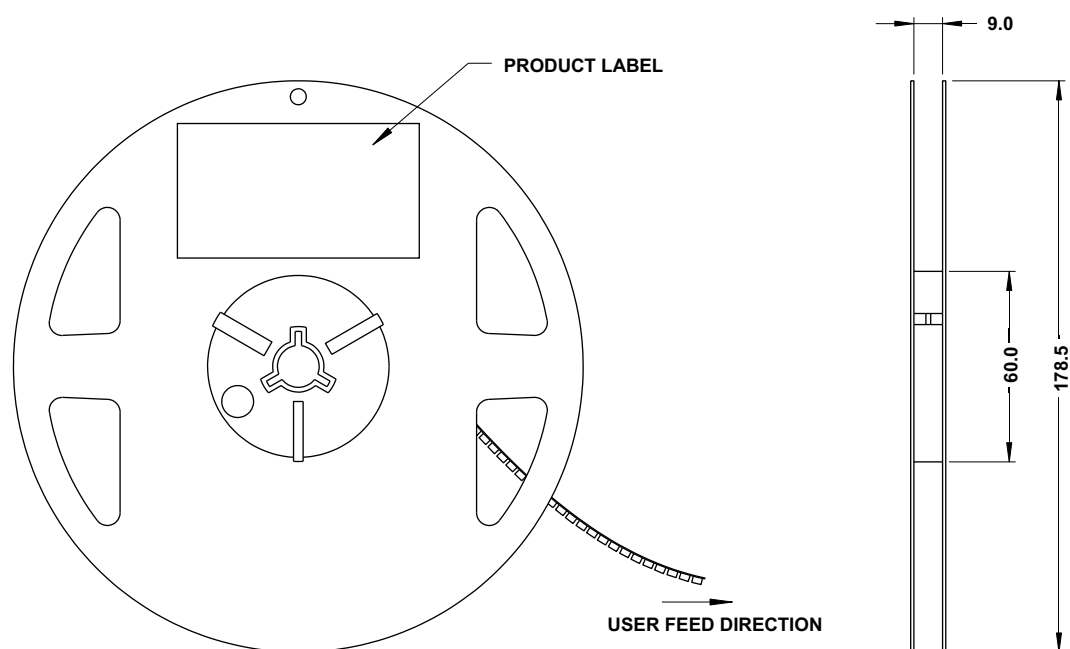**Figure 9: Carrier Tape Dimensions**

NOTE:

1. All dimensions in are millimeters (mm).
2. Tolerance is ±0.10 mm unless otherwise specified.

Figure 10: Reel Dimensions

NOTE: All dimensions are in millimeters (mm).

Precautionary Notes

Soldering

- Do not perform reflow soldering more than twice. Observe necessary precautions of handling moisture-sensitive devices 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 = 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, 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 11: Recommended Lead-Free Reflow Soldering Profile
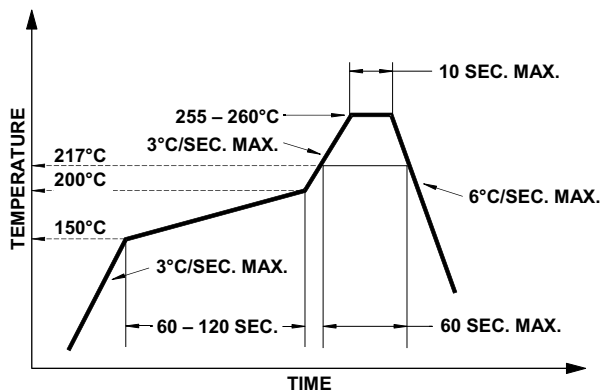
Handling Precautions

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, 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°/60% RH at all times, and complete all high temperature-related processes, including soldering, curing, or rework within 672 hours.
- Control for unfinished reel:

  Store unused LEDs in a sealed MBB with desiccant or a 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 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 LED's floor life exceeded 672 hours.

  The recommended baking condition is 60ºC ± 5ºC for 20 hours.

  Baking can 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 (meaning: 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, such as open or short, to the LED. However, the variation in intensity will be larger than the existing intensity bin ratio.
- If the LED is intended to be used along with LEDs of other colors to achieve color mixing, Broadcom does not guarantee the consistency of the resultant color. Contact your Broadcom Sale Representative for such applications.
- 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 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 a harsh or an 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.

Disclaimer