Data Sheet

HSMF-C11B

Tricolor Top Mount ChipLED

Overview

The Broadcom® HSMF-C11B is a high brightness tricolor ChipLED in a top view package. It uses Aluminum Indium Gallium Phosphide (AlInGaP) and Indium Gallium Nitride chip technology which enables this product deliver industry-leading light output performance.

This LED comes with very small package size of 1.08 mm × 1.08 mm and it has the thinnest package height in Broadcom's tricolor ChipLED family. This ultra-thin profile feature makes this LED ideal for applications that require low package height, and the small package footprint allows the LEDs to be capable of supporting assembly in a close pitch configuration.

This chipLED is compatible with reflow soldering processes. For easy pick-and-place, the parts are packed in tape and reel. Every reel is shipped from a single intensity and color bin for better uniformity control.

Features

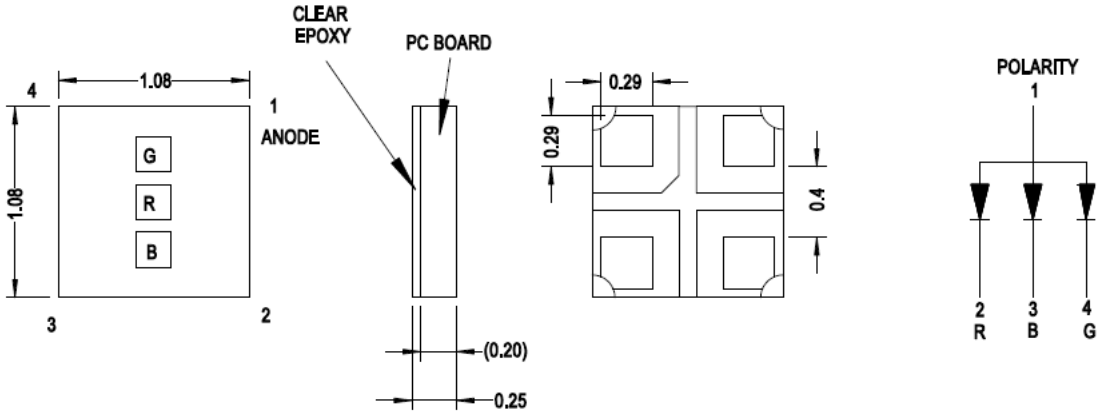
- LED with AlInGaP Red, InGaN Green and Blue
- Compatible with reflow soldering
- Available in 8-mm tape and 7-in. diameter reel

Applications

- Indicator
- 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.

Package Dimensions



NOTE:

1. All dimensions are in millimeters (mm).
2. Tolerance is ± 0.10 mm unless otherwise specified.
3. Dimensions in brackets are for reference only.

Absolute Maximum Ratings

Parameters	Red	Green/Blue	Units
DC Forward Current[a]	10		mA
Power Dissipation	24	31	mW
LED Junction Temperature	95		°C
Operating/Storage Temperature Range	–40 to +85		°C

a. Derate linearly as shown in Figure 4.

Optical Characteristics (T_J = 25°C, I_F = 5 mA)

Color	Luminous Intensity, I_V (mcd)[a]		Dominant Wavelength, λ_d (nm)[b]	Peak Wavelength, λ_p (nm)	Viewing Angle, $2\theta_{1/2}$ (°)[c]
	Min.	Max.	Typ.	Typ.	Typ.
Red	45.0	285.0	626	635	140
Green	112.5	450.0	527	520	140
Blue	18.0	112.5	473	469	140

a. The luminous intensity, I_V, is measured at the mechanical axis of the LED 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.

b. The dominant wavelength, λ_d, is derived from the CIE Chromaticity diagram and represents the perceived color of the device.

c. $\theta_{1/2}$ is the off axis angle where the luminous intensity is half of the peak intensity.

Electrical Characteristics (T_J = 25°C, I_F = 5 mA)

Color	Forward Voltage, V_F (V)[a]		Reverse Current, I_R (µA) at V_R = 5V[b]	Thermal Resistance, $R\theta_{J-S}$ (°C/W)[c]
	Min.	Max.	Max.	Typ.
Red	1.60	2.40	10	600
Green	2.55	3.15	10	600
Blue	2.55	3.15	10	600

a. Forward voltage tolerance = ± 0.1V.

b. Indicates product final test condition only. Long term reverse bias is not recommended.

c. Thermal resistance from LED junction to solder point.

Bin Information

Intensity Bin Limit (CAT)

Bin ID	Luminous Intensity (mcd)	
	Min.	Max.
M	18.00	28.50
N	28.50	45.00
P	45.00	71.50
Q	71.50	112.50
R	112.50	180.00
S	180.0	285.0
T	285.0	450.0

Tolerance = ± 15%.

Color Bin Limit (BIN)

Bin ID	Dominant Wavelength (nm)	
	Min.	Max.
Red		
—	620	635
Green		
A	515	520
B	520	525
C	525	530
D	530	535
Blue		
A	460	465
B	465	470
C	470	475
D	475	480

Tolerance = ± 1.0 nm.

CAUTION! The above optical specifications are valid in the case where a single LED is lighted up.
The above product specifications *do not* provide any guarantee on color mixing, color consistency over time or uniformity in luminous intensity when more than one LED is lighted up.

Figure 1: Spectral Power Distribution

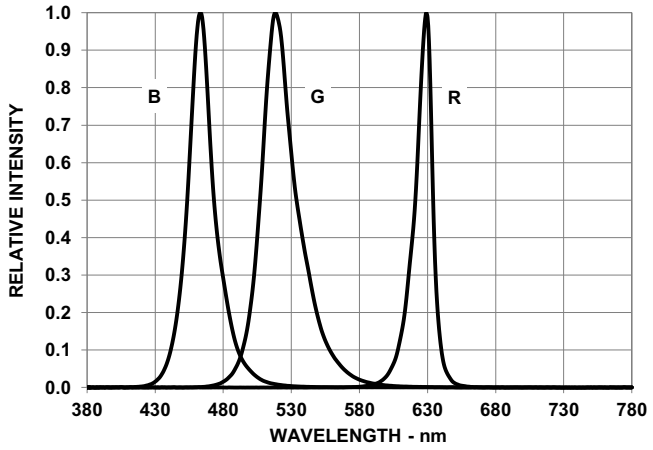


Figure 2: Forward Current vs. Forward Voltage

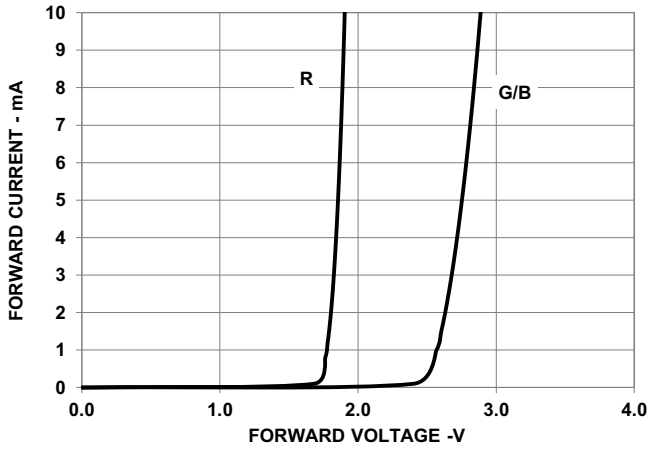


Figure 3: Relative Luminous Intensity vs. Forward Current

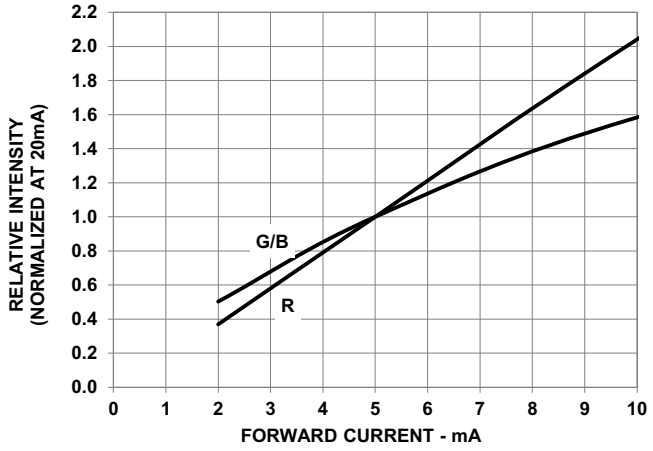


Figure 4: Derating Curve

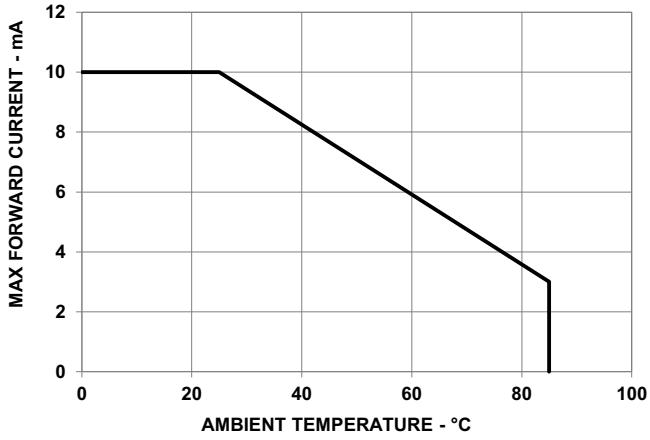


Figure 5: Recommended Soldering Land Pattern

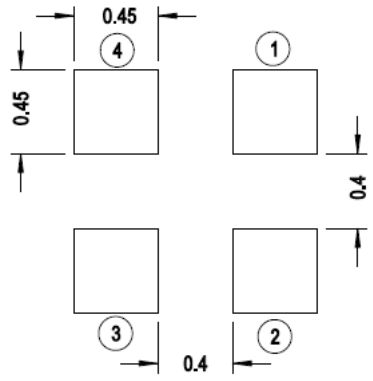


Figure 6: Radiation Pattern

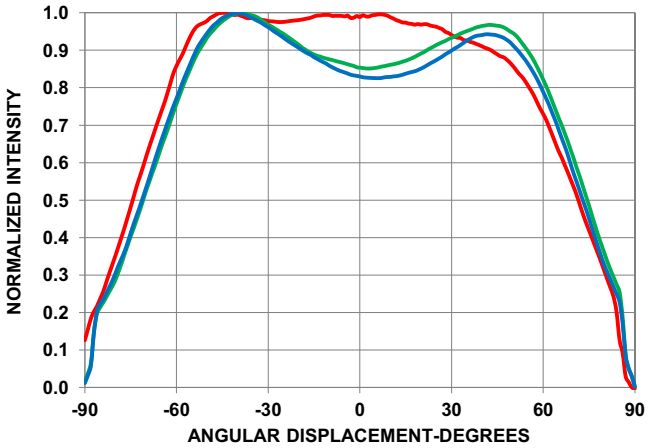
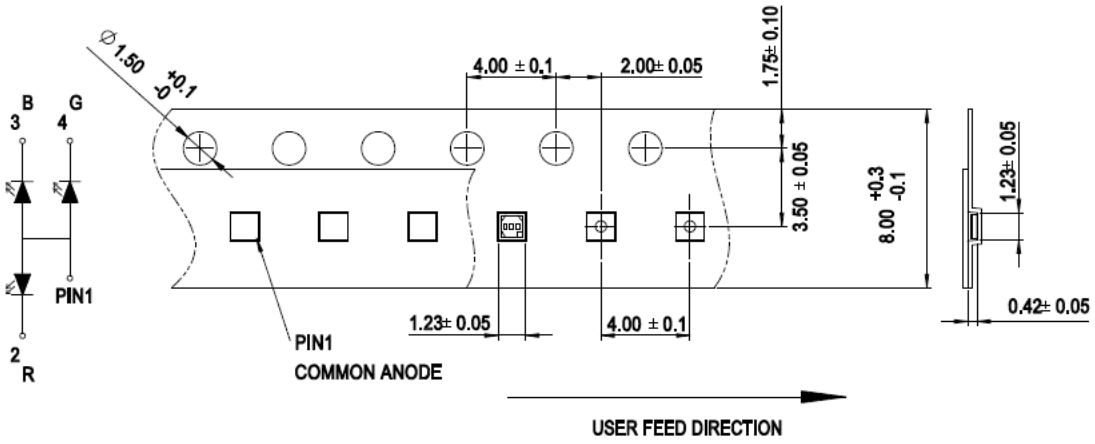


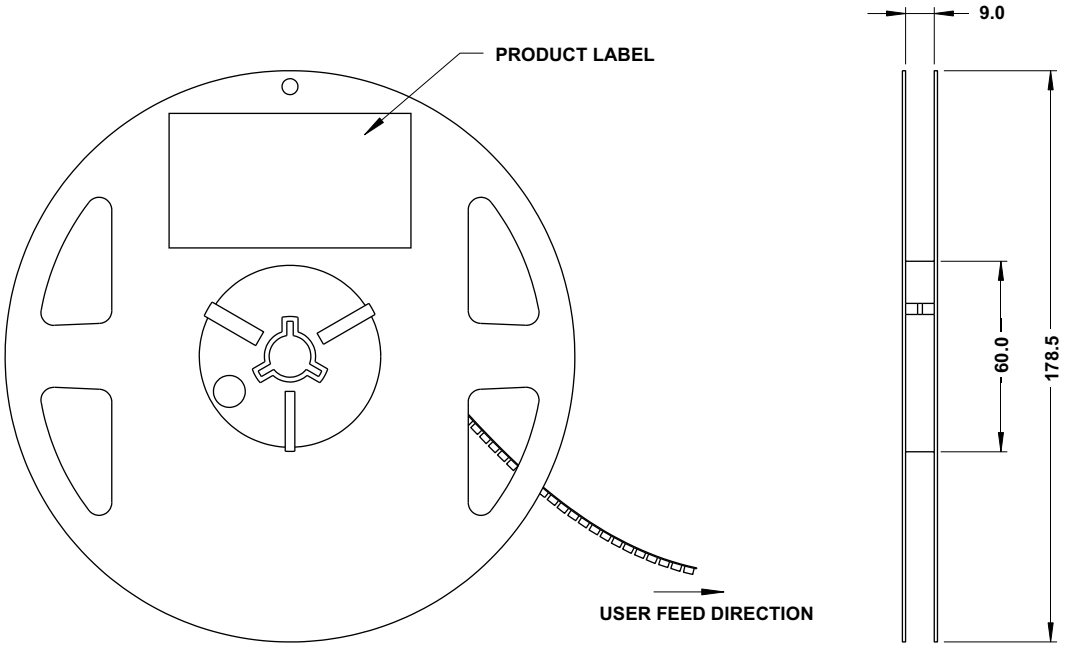
Figure 7: Carrier Tape Dimensions



NOTE:

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

Figure 8: Reel Dimensions



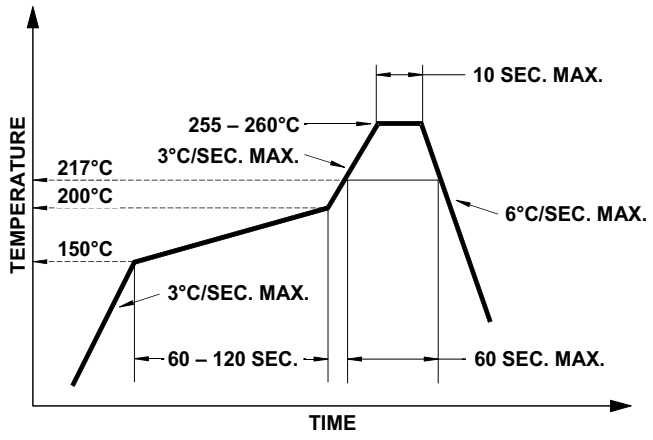
NOTE: All dimensions in are in millimeters.

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 = 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 hand soldering.

Figure 9: Recommended Lead-Free Reflow Soldering Profile



Handling Precautions

This product has a Moisture Sensitive Level 4 rating per JEDEC J-STD-020. Refer to the 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 72 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 72 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 LED's floor life exceeded 72 hours.

The recommended baking condition is: 60°C ± 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.
- The LED is not intended for reverse bias. Use other appropriate components for such purposes. When driving the LED in matrix form, ensure that 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 for use in harsh or outdoor environments, protect the LED against damage 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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