

## HSMF-C145

### Side View SMT ChipLED

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#### Overview

The Broadcom® HSMF-C145 is a right-angle bicolor surface-mount chipLED that is available in industrial popular 3.0 mm × 2.0 mm footprint. It comes with Green and Red colors.

This LED delivers high light output performance by using efficient indium gallium nitride (InGaN) and aluminum indium gallium phosphide (AlInGaP) chip technologies. Its wide viewing angle allows good color mixing and coupled with low package height of 1.0 mm, this part is suitable for applications like backlighting and front panel indicators.

This bicolor chipLED is shipped in tape and reel and is compatible with industry-standard automatic machine placement and reflow soldering. Every reel is shipped from a single intensity and color bin for better uniformity control.

#### Features

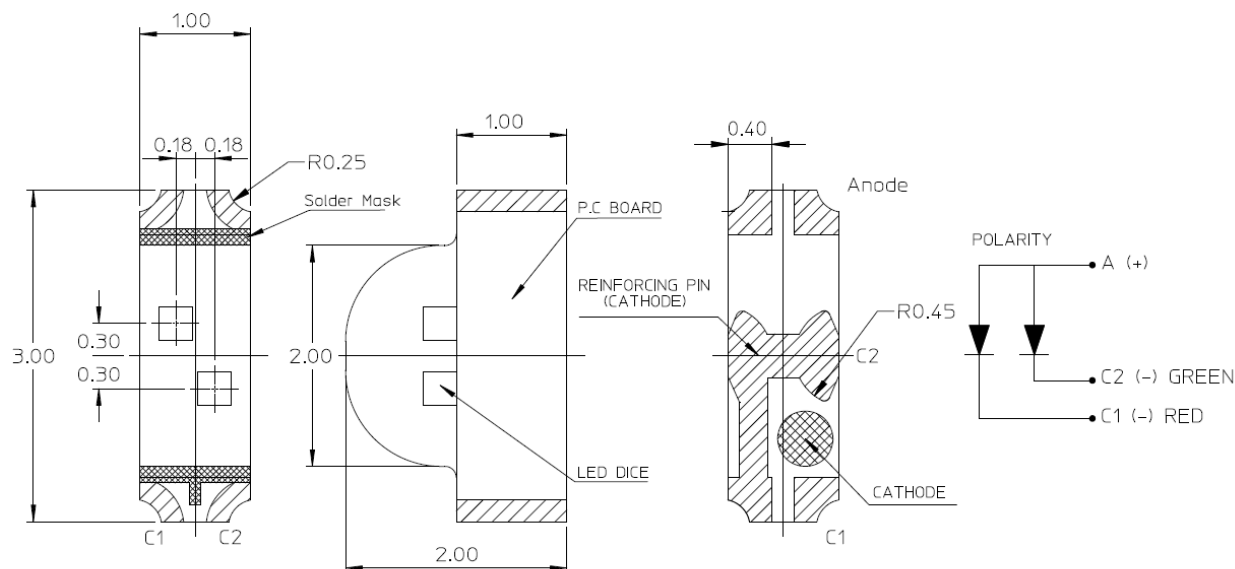
- LED with AlInGaP and InGaN die
- Bicolor right-angle chipLED
- Compatible with reflow soldering
- Tape in an 8-mm carrier tape on a 7-in. diameter reel

#### Applications

- Backlighting
- Status indicator
- Front panel indicator
- Office automation, home appliances, and industrial equipment

**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  $\pm 0.1$  mm unless otherwise specified.

## Absolute Maximum Ratings at $T_A = 25^\circ\text{C}$

Parameters	AlInGaP Red	InGaN Green	Units
Forward Current <sup>a</sup>	30	20	mA
Power Dissipation	72	78	mW
Operating Temperature	-40 to +85		$^\circ\text{C}$
Storage Temperature	-40 to +85		$^\circ\text{C}$

a. Derate linearly as shown in [Figure 5](#).

## Optical Characteristics ( $T_A = 25^\circ\text{C}$ , $I_F = 20$ mA)

Color	Luminous Intensity (mcd) <sup>a</sup>		Peak Wavelength (nm)	Dominant Wavelength (nm) <sup>b</sup>	Viewing Angle ( $^\circ$ ) <sup>c</sup>
	Min.	Typ.	Typ.	Typ.	Typ.
Green	45.0	223.0	517.0	523.0	120
Red	18.0	79.0	644.0	632.0	120

- 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.
- The dominant wavelength is derived from the CIE Chromaticity diagram and represents the perceived color of the device.
- $\theta_{1/2}$  is the off axis angle where the luminous intensity is half of the peak intensity.

## Electrical Characteristics ( $T_A = 25^\circ\text{C}$ , $I_F = 20\text{ mA}$ )

Color	Forward Voltage (V) <sup>a</sup>		Reverse Voltage (V) <sup>b</sup> at 100 $\mu\text{A}$
	Min.	Max.	Max.
Green	2.9	3.9	5
Red	1.6	2.4	5

a. Forward voltage tolerance =  $\pm 0.1\text{V}$ .

b. Reverse voltage indicates product final test. Long term reverse bias is not recommended.

## Bin Information

### Intensity Bin (CAT)

Bin ID	Luminous Intensity (mcd)	
	Min.	Max.
M	18.0	28.5
N	28.5	45.0
P	45.0	71.5
Q	71.5	112.5
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

Tolerance =  $\pm 15\%$ .

### Color Bin (BIN) – Red

Bin ID	Dominant Wavelength (nm)	
	Min.	Max.
—	620.0	635.0

Tolerance =  $\pm 1\text{ nm}$ .

### Color Bin (BIN) – Green

Bin ID	Dominant Wavelength (nm)	
	Min.	Max.
A	515.0	520.0
B	520.0	525.0
C	525.0	530.0
D	530.0	535.0

Tolerance =  $\pm 1\text{ nm}$ .

Figure 1: Spectrum

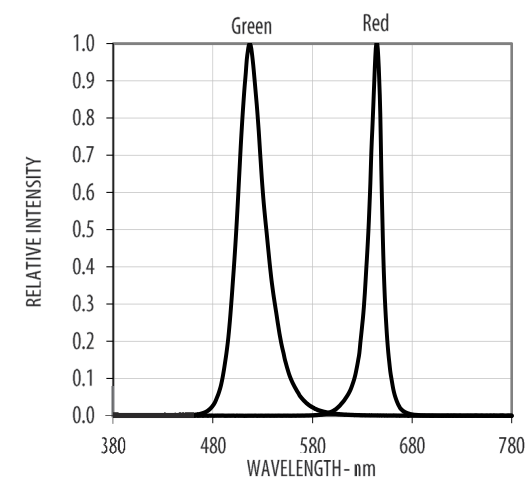


Figure 2: Forward Current vs. Forward Voltage

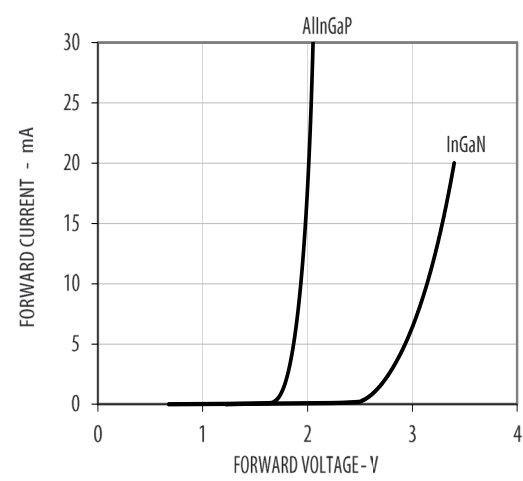


Figure 3: Relative Intensity vs. Forward Current

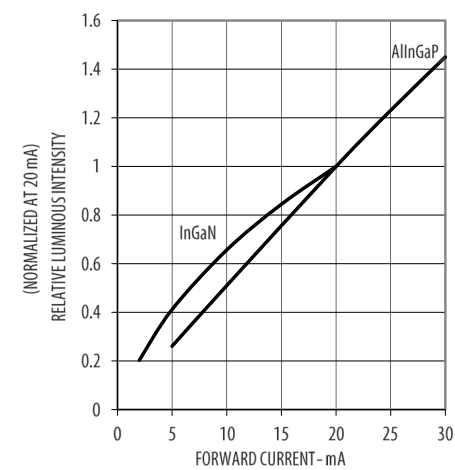


Figure 4: Radiation Pattern

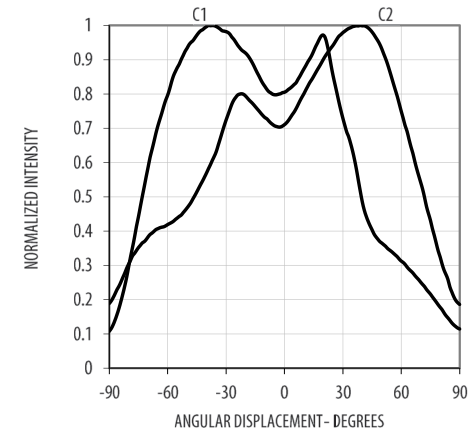


Figure 5: Derating Curve

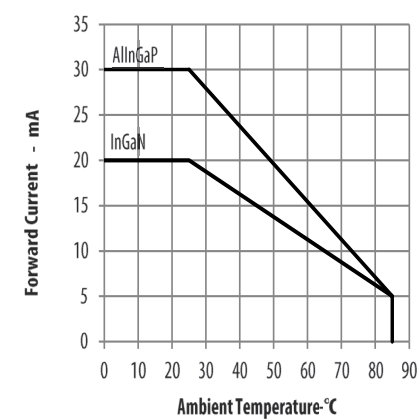


Figure 6: Recommended Solder Pad

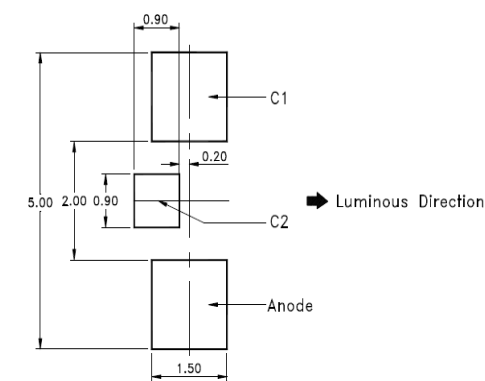


Figure 7: Reel Orientation

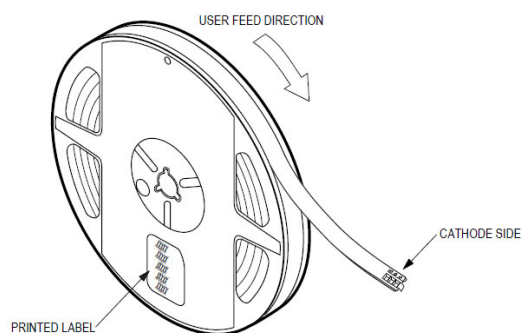


Figure 8: Reel Dimensions

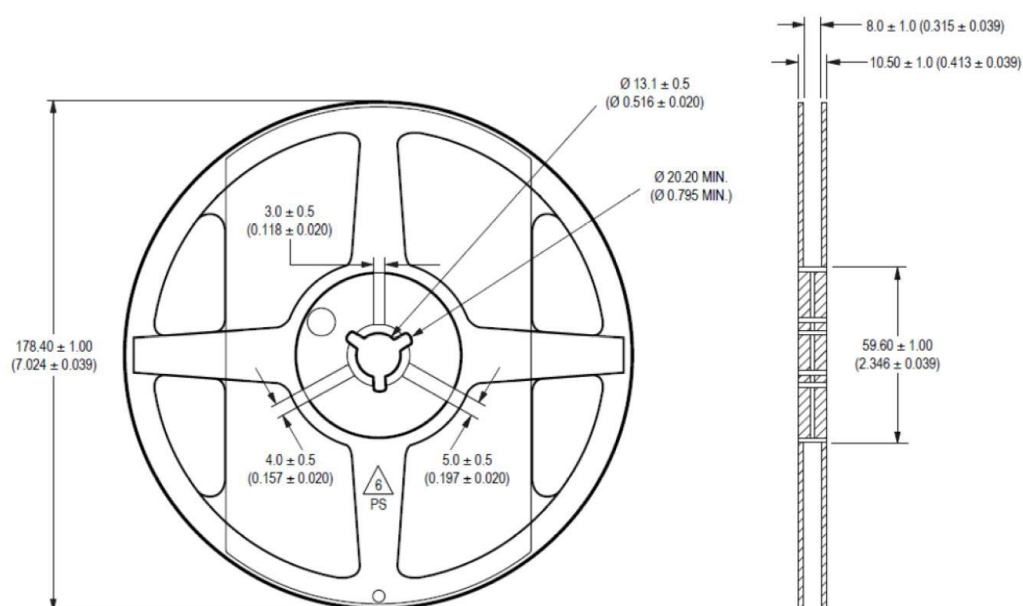
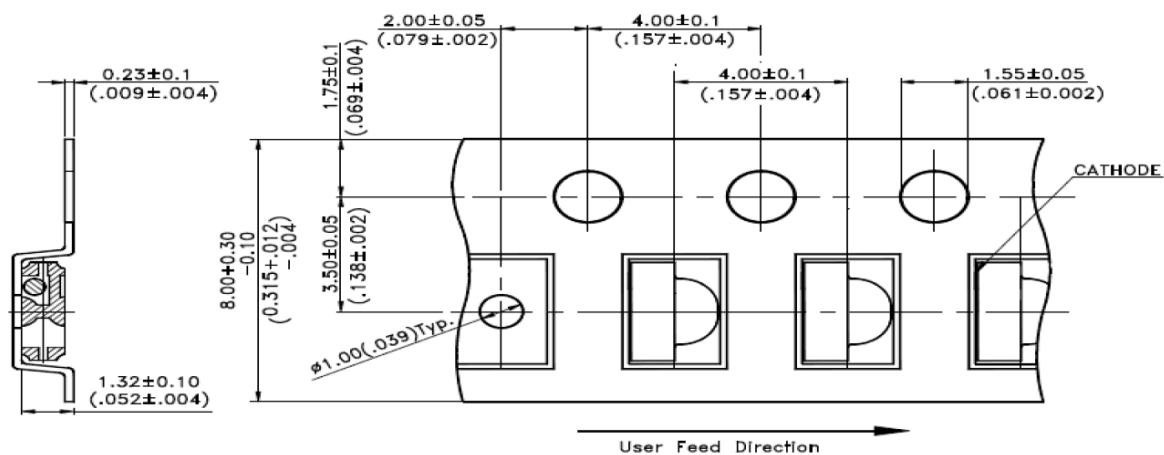


Figure 9: Carrier Tape Dimensions

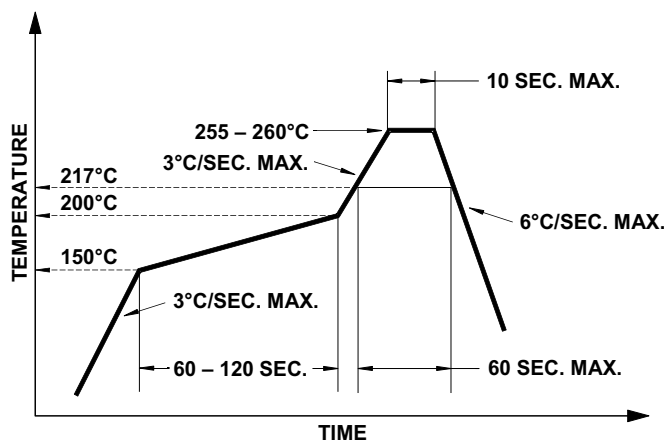


## Precautionary Notes

### 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, because it may cause damage to the LED.
- Confirm beforehand whether the functionality and performance of the LED is affected by hand soldering.

Figure 10: Recommended Lead-Free Reflow Soldering Profile



### Handling Precautions

This product has a Moisture Sensitive Level 2a 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, the 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 the MBB.
- Keep the LEDs at <30°C/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 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 672 hours.

The recommended baking condition is: 60°C ± 5°C 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.
- The circuit design must cater to the entire 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.
- If the LED is intended to be used along with an LED of another color to achieve color mixing, Broadcom does not guarantee the consistency of the resultant color. Contact a Broadcom sales 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 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 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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