HSMF-C128

Tri-color Top Mount ChipLED

Data Sheet

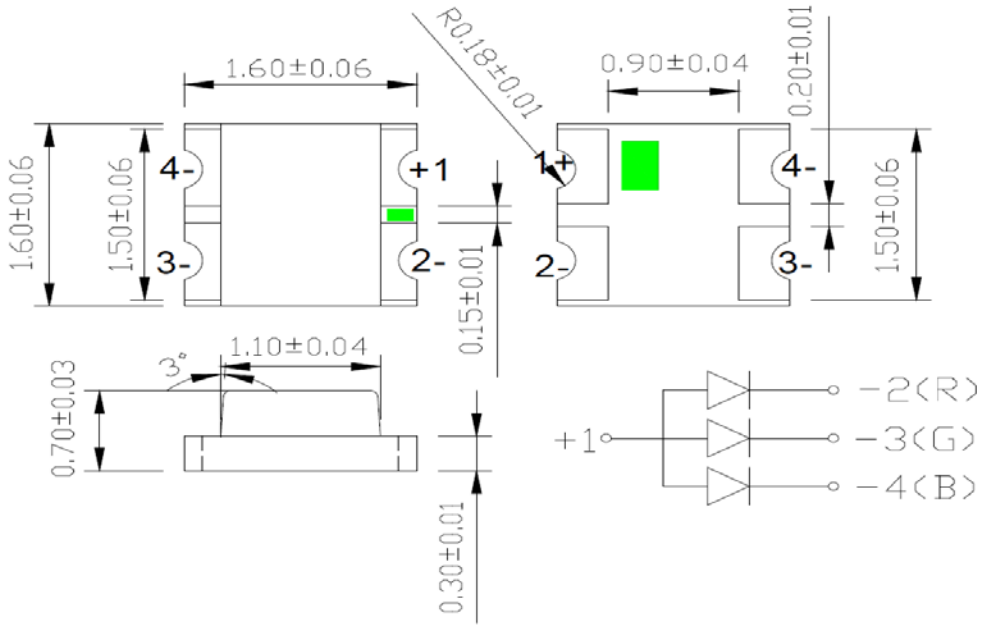
Features

- LED with AlInGaP red, InGaN green and blue.
- Compatible with reflow soldering.
- Available in 8mm tape and 7” diameter reel.

Applications

- Symbol indicator
- Keypad backlighting
- Pushbutton backlighting

Figure 1 Package Drawing



NOTE

1. All dimensions in millimeters (mm).
2. Tolerance is ±0.10mm unless otherwise specified.
3. Encapsulation = Clear epoxy.

CAUTION: This LED is Class 1A ESD sensitive. Please observe appropriate precautions during handling and processing. Refer to application note AN-1142 for additional details.

Performance

Absolute Maximum Ratings

Parameters	AlInGaP	InGaN		Unit
	Red	Green	Blue	
DC Forward Current (single chip on) [a]	20	20	20	mA
DC Forward Current (3 chips on) [a]	15	15	15	mA
Power Dissipation (single chip on)	48	70	70	mW
LED Junction Temperature	95			°C
Operating Temperature Range	-40 to +85			°C
Storage Temperature Range	-40 to +85			°C

a. Derate linearly as shown in Figure 6a & 6b.

Optical Characteristics (T_J = 25°C, I_F = 20mA)

Color	Luminous Intensity, Iv (mcd) [a]	Dominant Wavelength, λ_d (nm) [b]	Peak Wavelength, λ_p (nm)
	Min.	Typ.	Typ.
Red	28.5	626	637
Green	285.0	525	523
Blue	45.0	470	468

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.

Electrical Characteristics (T_J = 25°C, I_F = 20mA)

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	1.6	2.4	100	500
Green	2.7	3.5	100	500
Blue	2.7	3.5	100	500

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 Limits (CAT)

Bin ID	Luminous Intensity (mcd)	
	Min.	Max.
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
W	1125.0	1800.0

Tolerance = ±15%

Forward Voltage Bin Limits (VF)

Bin ID	Forward Voltage (V)	
	Min.	Max.
Red		
1	1.6	1.8
2	1.8	2.0
3	2.0	2.2
4	2.2	2.4
Green / Blue		
Z	2.7	2.9
1	2.9	3.1
2	3.1	3.3
3	3.3	3.5

Tolerance = ±0.1V

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 = ±1.0nm

Indication of bin information on reel and packaging label:

CAT : xxx – Red/Green/Blue Intensity bin
BIN : xxx – Red/Green/Blue Color bin
VF : xxx – Red/Green/Blue Forward Voltage bin

CAUTION:
1. The above optical specifications are valid in the case where single LED is lighted up.
2. The above product specifications DO NOT provide any guarantee on color mixing, color consistency over time or uniformity in luminous intensity when more than 1 LED are lighted up.

Figure 2 Spectral Power Distribution

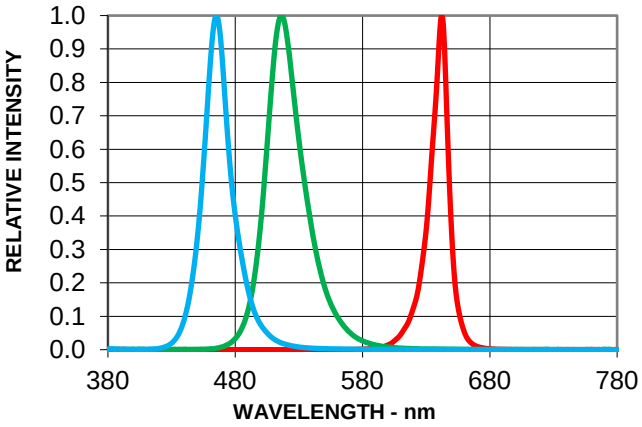


Figure 3 Forward Current vs. Forward Voltage

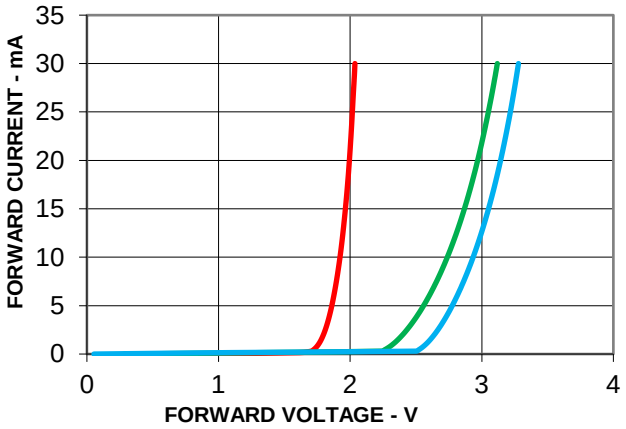


Figure 4 Relative Luminous Intensity vs. Forward Current

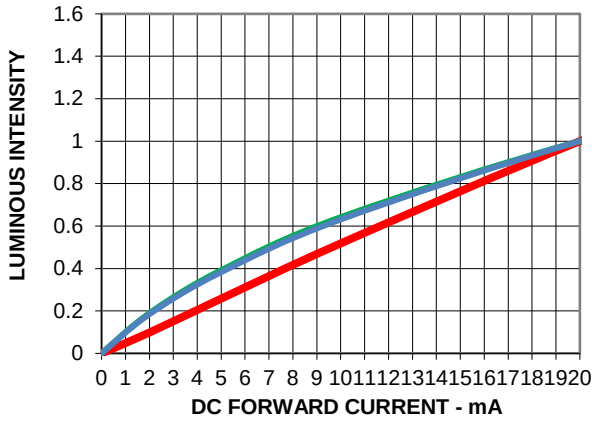


Figure 5 Radiation Pattern

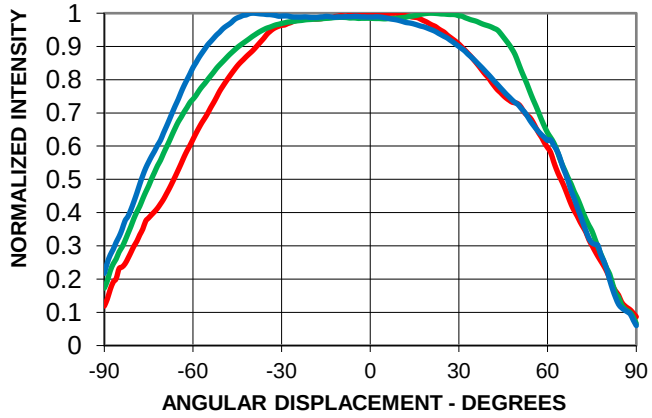


Figure 6a Derating Curve (1 chip on)

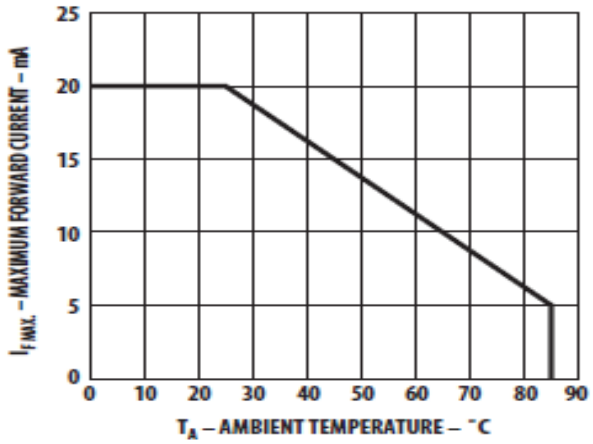


Figure 6b Derating Curve (3 chips on)

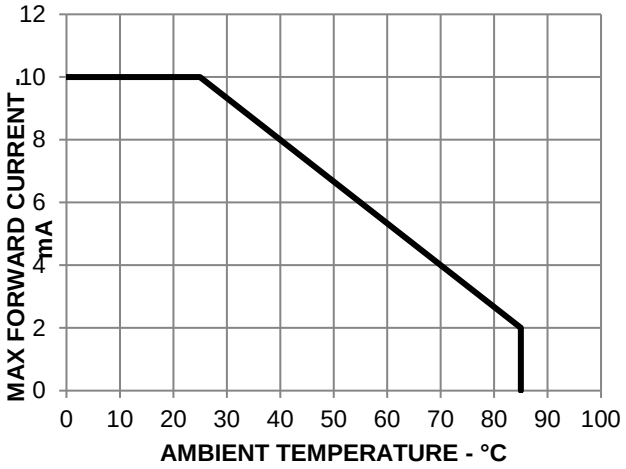


Figure 7 Recommended Soldering Pad Pattern in mm

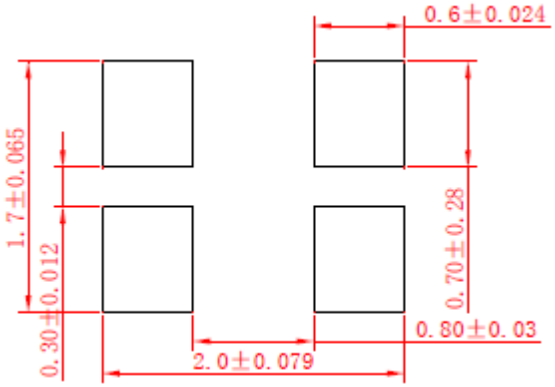


Figure 8 Carrier Tape Dimensions in mm

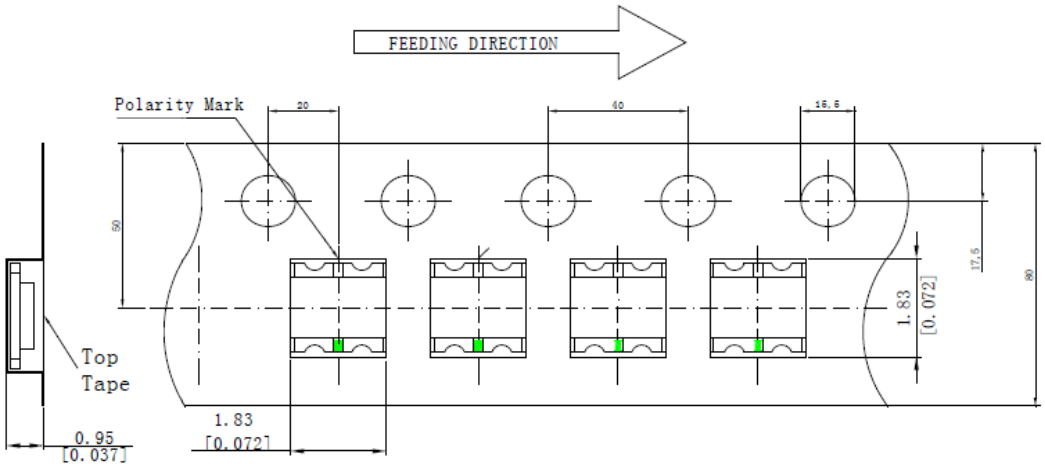
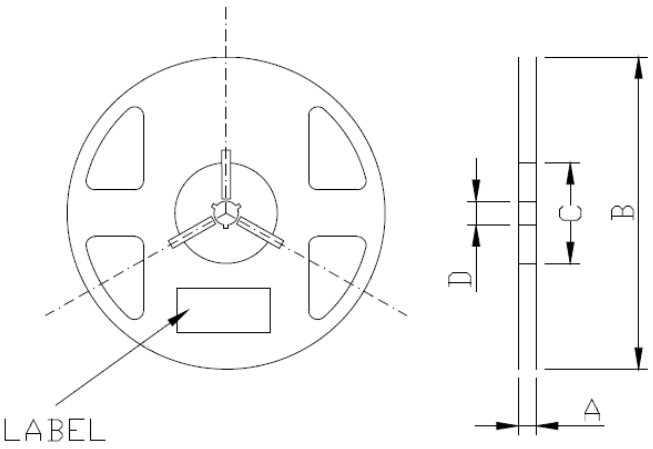


Figure 9 Reel Dimensions in mm



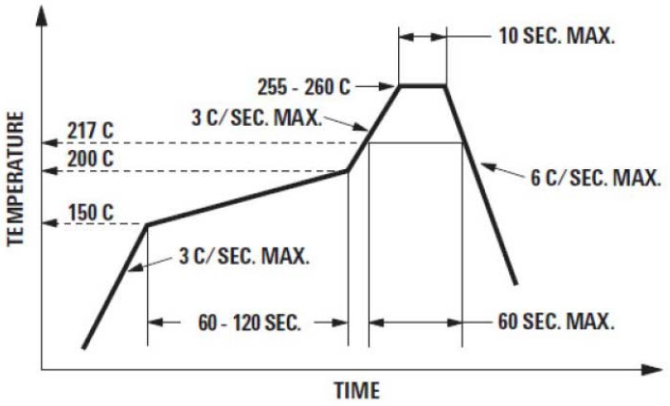
A	8.0±0.1mm
B	178±1mm
C	60±1mm
D	13.0±0.5mm

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 max.
  - Soldering duration = 2sec 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 10 Recommended Lead-Free Reflow Soldering Profile



Handling of Moisture-Sensitive Devices

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 672hours.
- 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: 60±5ºC 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% 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.
- 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.

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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