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BROADCOM®

Data Sheet

ASMG-PT00-00001

1W Tri-Color High Power LED

Description

The Broadcom® 1W Tri-Color High Power LED Light Source is a high-performance, energy-efficient device that can handle high thermal and high driving current.

The low-profile package design is suitable for a wide variety of applications, especially where height is a constraint.

The package is compatible with the reflow soldering process. This will give more freedom and flexibility to the light source designer.

Features

- Available in tri-color
- Energy efficient
- Compatible with reflow soldering process
- High current operation
- Long operation life
- Silicone encapsulation
- Moisture sensitivity level 1

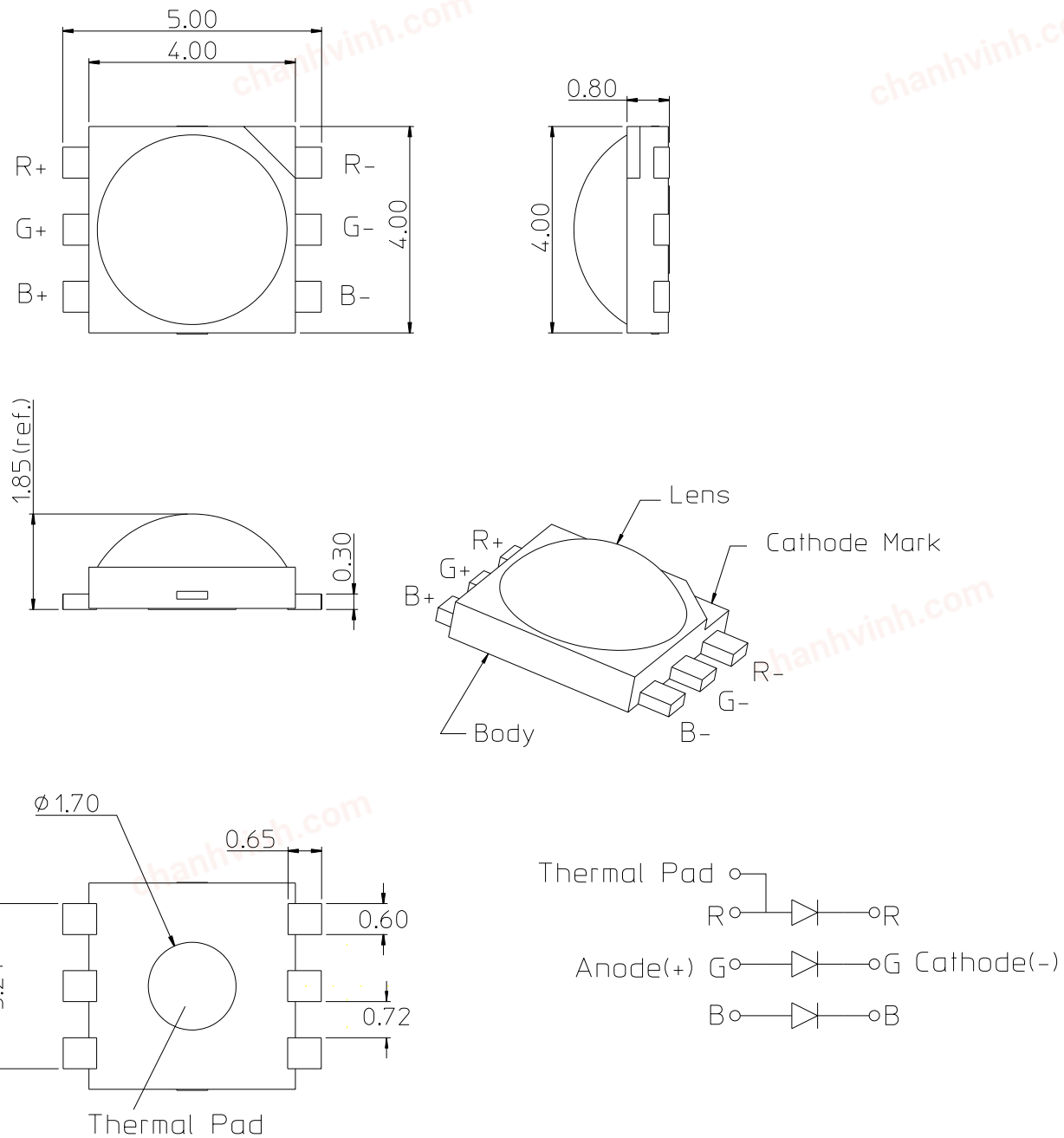
Applications

- Sign backlight
- Retail display
- Commercial lighting
- Decorative lighting
- Architectural lighting

CAUTION! This LED is Class 3B 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.

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Package Dimensions



NOTE:

1. All dimensions are in millimeters (mm).
2. Tolerance is ± 0.2 mm unless otherwise specified.
3. Encapsulation = silicone.
4. Terminal finish = silver plating.
5. Thermal pad is connected to the anode of red.

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Device Selection Guide

T_J = 25°C, I_F = 150 mA.

Part Number	Color	Luminous Flux, $Ø_V$ (lm[a, b]			Dice Technology
		Min.	Typ.	Max.	
ASMG-PT00-00001	Red	25.0	28.0	35.0	AlInGaP
	Green	38.0	45.0	54.0	InGaN
	Blue	8.1	9.5	11.5	InGaN

a. Luminous flux is the total flux output as measured with an integrating sphere at a mono pulse condition.

b. Luminous flux tolerance = ±10%.

Absolute Maximum Ratings

Parameter	Rating	Units
DC Forward Current[a]	200	mA
Peak Forward Current[b]	250	mA
Reverse Voltage	Not designed for reverse bias	
LED Junction Temperature	120	°C
Operating Temperature Range	-40 to +105	°C
Storage Temperature Range	-40 to +120	°C

a. Derate linearly as shown in Figure 7 and Figure 8.

b. Duty factor = 10%, frequency = 1 kHz.

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Optical and Electrical Characteristics

T_J = 25°C.

Parameter	Min.	Typ.	Max.	Units	Test Conditions
Viewing Angle, 2θ½[a]	—	155	—	Deg	I_F = 150 mA
Forward Voltage, V_F[b]				V	I_F = 150 mA
Red	1.8	2.2	2.8		
Green	2.8	3.1	3.7		
Blue	2.8	3.0	3.7		
Dominant Wavelength, λ_d[c]				nm	I_F = 150 mA
Red	620.0	623.0	630.0		
Green	525.0	530.0	535.0		
Blue	455.0	458.0	460.0		
Peak Wavelength, λ_p				nm	I_F = 150 mA
Red	—	630.0	—		
Green	—	522.0	—		
Blue	—	455.0	—		
Thermal Resistance, $R_{\theta J-S}$				°C/W	LED junction to solder point
Red	—	10	—		
Green	—	20	—		
Blue	—	10	—		

a. 2θ½ is the off axis angle where the luminous intensity is half of the peak intensity.

b. Forward voltage tolerance = ±0.1V.

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

Part Numbering System

A	S	M	G	-	P	x_1	0	0	-	0	x_2	x_3	x4	1

Code	Description	Option		
x_1	Color	T	Tri-color	
x_2	Minium flux bin (lm)	00	Red:	25.0–35.0 lm
x_3	Maximum flux bin (lm)		Green:	38.0–54.0 lm
			Blue:	8.1–11.5 lm
x_4	Color bin	0	Full distribution	

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Bin Information

Flux Bin Limit (CAT)

Color	Bin	Luminous flux (lm)	
		Min.	Max.
Red	—	25.0	35.0
Green	—	38.0	54.0
Blue	—	8.1	11.5

Tolerance = ±10%.

Color Bin Limit (BIN)

Color	Bin ID	Forward Volage (V)	
		Min.	Max.
Red	4	620.0	630.0
Green	2	525.0	535.0
Blue	A	455.0	460.0

Tolerance = ±1 nm.

Example of bin information on reel and packaging label:

BIN: 42A → Red color bin 4
→ Green color bin 2
→ Blue color bin A

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Figure 1: Relative Luminous Flux vs. Mono Pulse Current

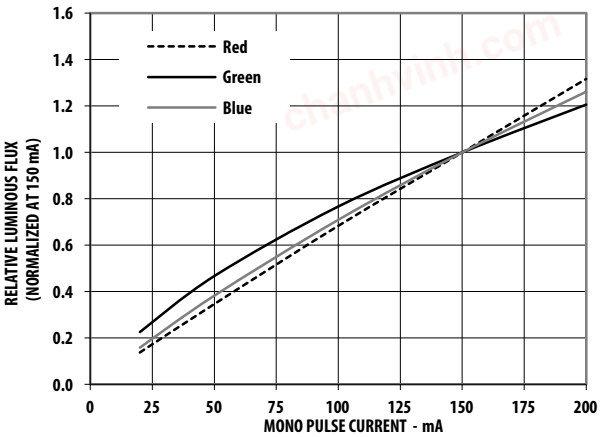


Figure 2: Forward Current vs. Forward Voltage

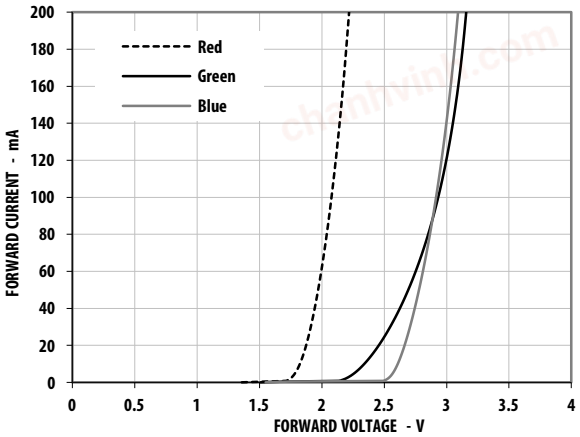


Figure 3: Dominant Wavelength Shift vs. Mono Pulse Current

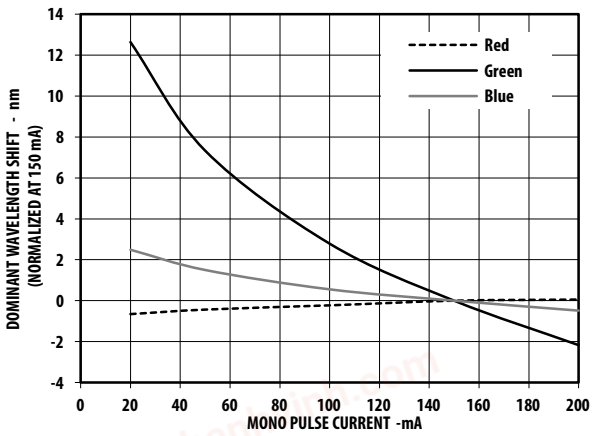


Figure 4: Relative Light Output vs. Junction Temperature

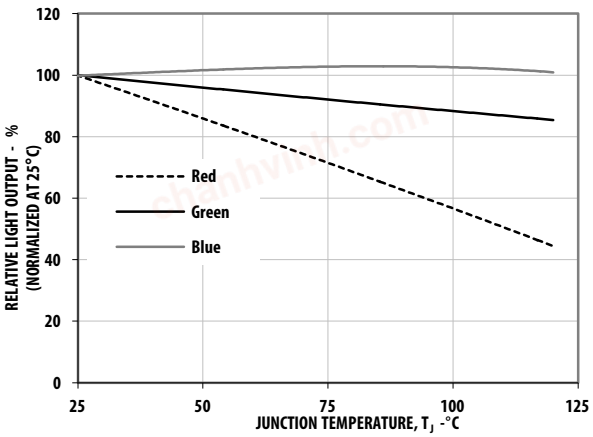


Figure 5: Forward Voltage Shift vs. Junction Temperature

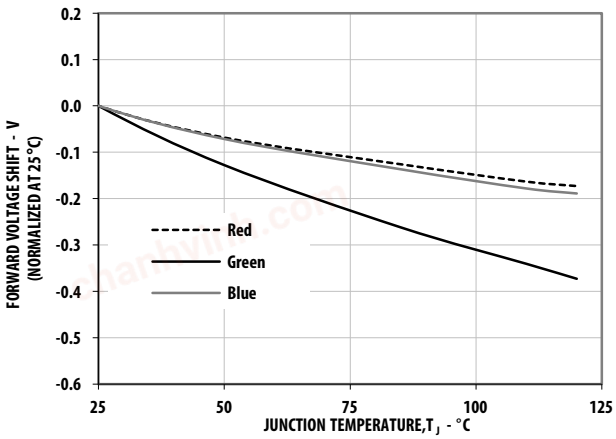
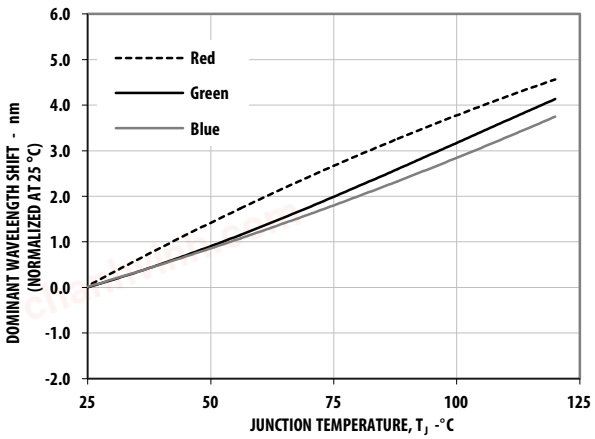


Figure 6: Dominant Wavelength Shift vs. Junction Temperature



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Figure 7: Derating Curve According to Solder Point Temperature (T_S)

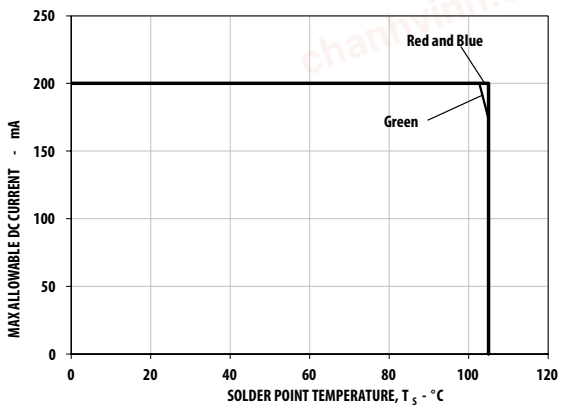


Figure 8: Derating Curve According to Ambient Temperature (T_A) . Derated based on T_{JMAX} = 120°C, $R\theta_{J-A}$ = 50°C/W for Red and Blue and $R\theta_{J-A}$ = 60°C/W for Green.

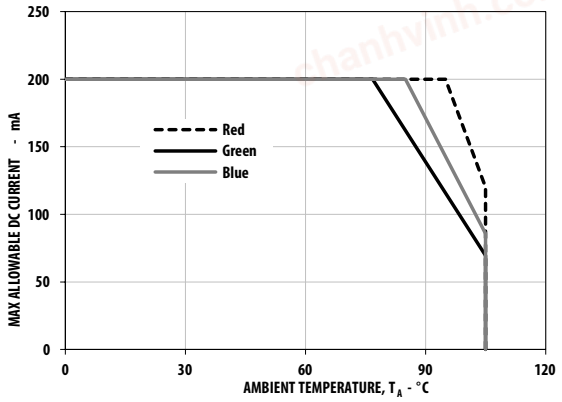


Figure 9: Pulse Handling Capability at $T_S \leq 100°C$ for AlInGaP

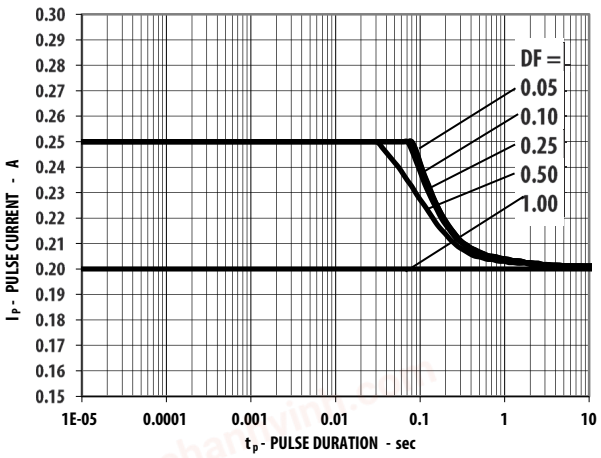


Figure 10: Pulse Handling Capability at $T_S \leq 100°C$ for InGaN

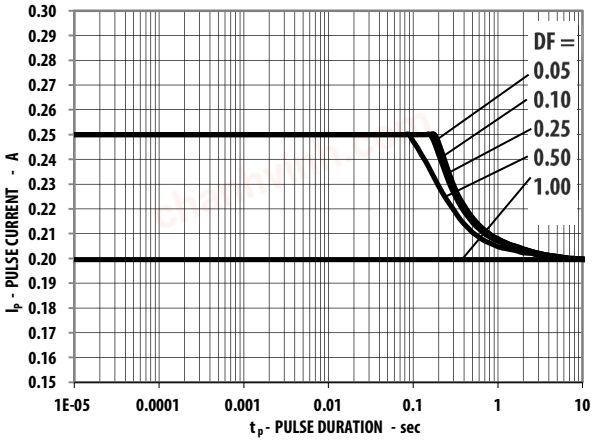


Figure 11: Radiation Pattern for Red

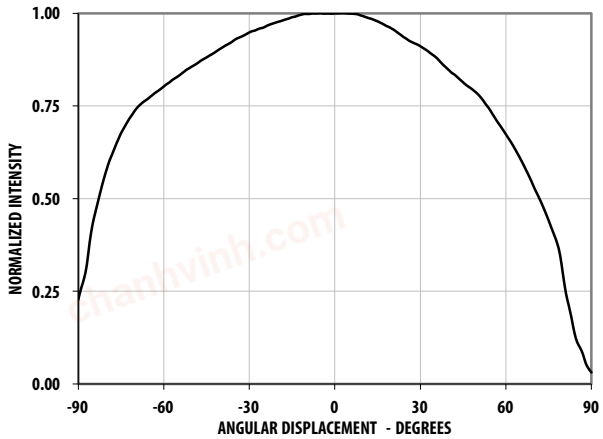
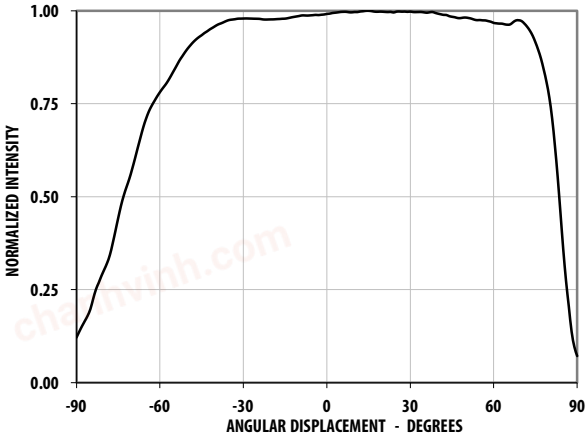


Figure 12: Radiation Pattern for Green



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Figure 13: Radiation Pattern for Blue

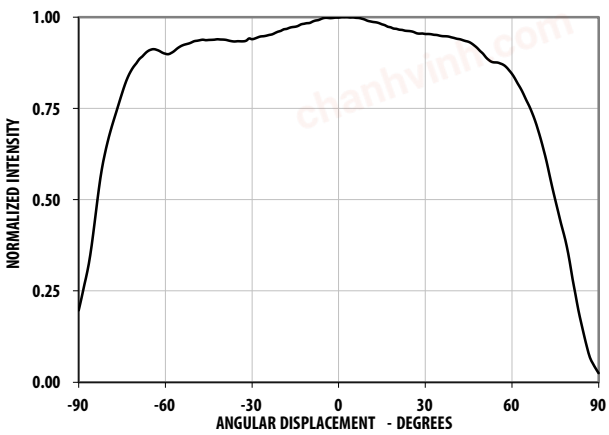


Figure 14: Spectral Power Distribution

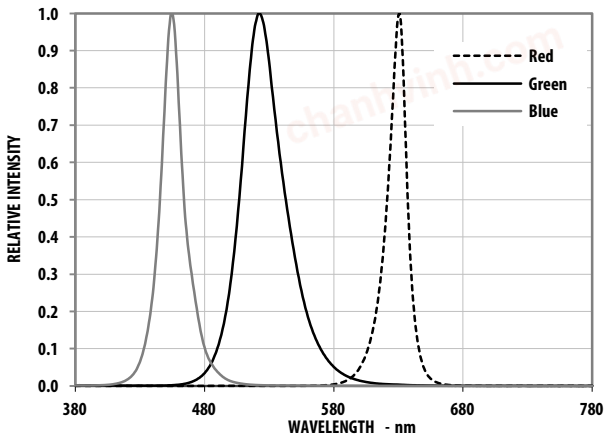
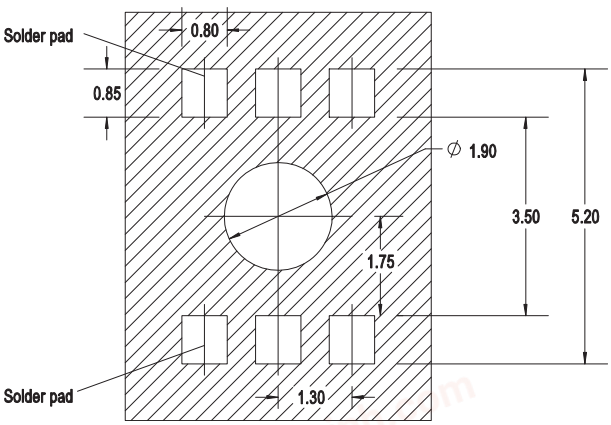


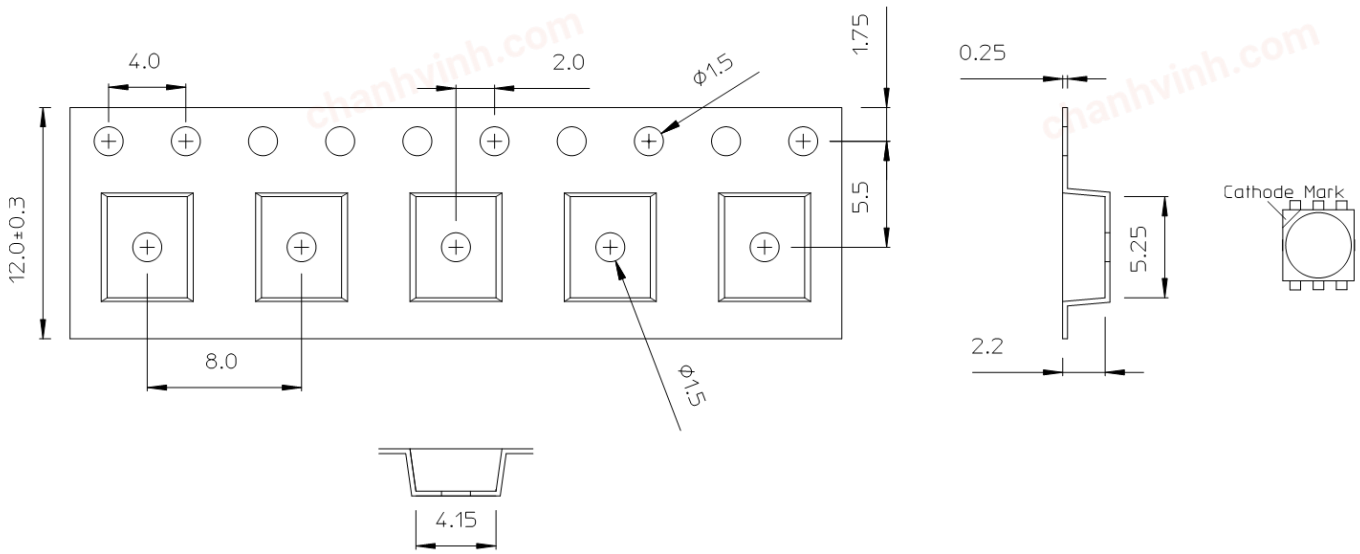
Figure 15: Recommended Soldering Land Pattern (mm)



Units: mm.

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Figure 16: Carrier Tape Dimensions

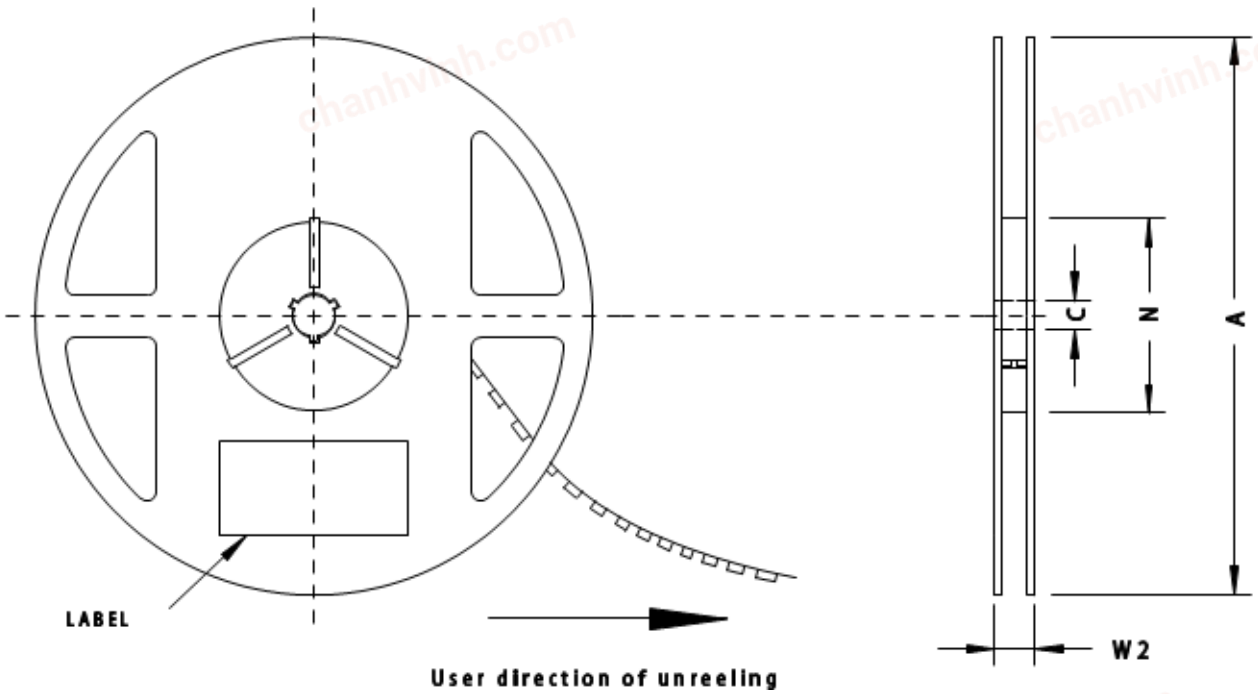


NOTE:

1. Drawing not to scale.
2. All dimensions are in millimeters.
3. Tolerance is ± 0.10 mm unless otherwise specified.

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Figure 17: Reel Dimensions



A	C	N	W2
178.0±1.0	13.1±0.5	60.0±0.5	16.2±0.5

NOTE:

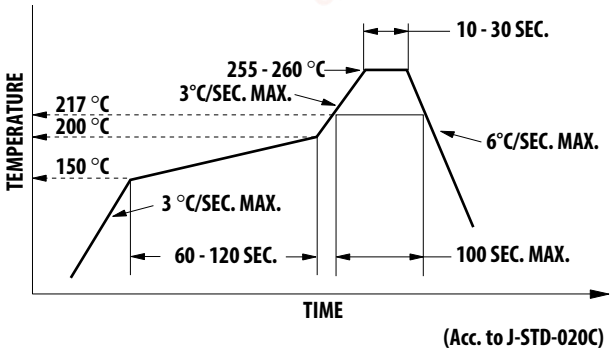
1. 500 pieces per reel.
2. Drawing not to scale
3. All dimensions are in millimeters.

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Soldering

Recommended reflow soldering conditions:

Figure 18: Recommended Reflow Soldering Profile



- Do not perform reflow soldering more than twice.
- 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. Hot plate should only be used for rework if unavoidable but must be strictly controlled to the following conditions:
  - LED temperature = 260°C max.
  - Time at maximum temperature = 20s max.
- Confirm beforehand whether the functionality and performance of the LED is affected by soldering with hot plate.
- Hand soldering is not recommended.

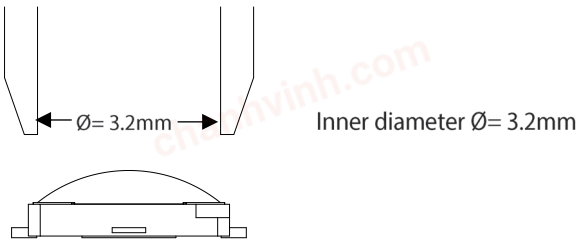
Precautionary Notes

Handling Precautions

The encapsulation material of the LED is made of silicone for better product reliability. Compared to epoxy encapsulant that is hard and brittle, silicone is softer and flexible. Observe special handling precautions during assembly of silicone encapsulated LED products. Failure to comply might lead to damage and premature failure of the LED. Do refer to Application Note AN5288, S*ilicone Encapsulation for LED: Advantages and Handling Precautions* for more information.

- Do not poke sharp objects into the silicone encapsulant. Sharp objects, such as tweezers or syringes, might apply excessive force or even pierce through the silicone and induce failures to the LED die or wire bond.
- Do not touch the silicone encapsulant. Uncontrolled force acting on the silicone encapsulant might result in excessive stress on the wire bond. Hold the LED only by the body.
- Do not stack assembled PCBs together. Use an appropriate rack to hold the PCBs.
- The surface of the silicone material attracts dust and dirt easier than epoxy due to its surface tackiness. To remove foreign particles on the surface of silicone, use a cotton bud with isopropyl alcohol (IPA). During cleaning, rub the surface gently without putting too much pressure on the silicone. Ultrasonic cleaning is not recommended.
- For automated pick-and-place, Broadcom has tested the following nozzle size to work well with this LED. However, due to the possibility of variations in other parameters, such as pick-and-place machine maker/ model and other settings of the machine, verify that the selected nozzle will not cause damage to the LED.

Figure 19: Nozzle Size



- Storage

  The soldering terminals of these LEDs are silver plated. If the LEDs are exposed in an ambient environment for too long, the silver plating might be oxidized and thus affecting its solderability performance. As such, keep unused LEDs in a sealed moisture barrier bag (MBB) with desiccant or in 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.
- 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.

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- Do not use the LED in the vicinity of material with sulfur content, in environments of high gaseous sulfur compound and corrosive elements. Examples of materials that may contain sulfur are rubber gaskets, RTV (room temperature vulcanizing) silicone rubber, rubber gloves, and so on. Prolonged exposure to such environments may affect the optical characteristics and product life.
- Avoid rapid changes in ambient temperature especially in high-humidity environments as this will cause condensation on the LED.
- If the LED is intended to be used in harsh or outdoor environments, protect the LED by means of protective cover against damages caused by rain water, dust, oil, corrosive gases, external mechanical stress, and so on.

Thermal Management

Optical, electrical and reliability characteristics of LED are affected by temperature. The junction temperature (T_J) of the LED must be kept below allowable limit at all times. T_J can be calculated as follows:

$$T_J = T_S + R_{\theta J\text{-}S} \times I_F \times V_{Fmax}$$

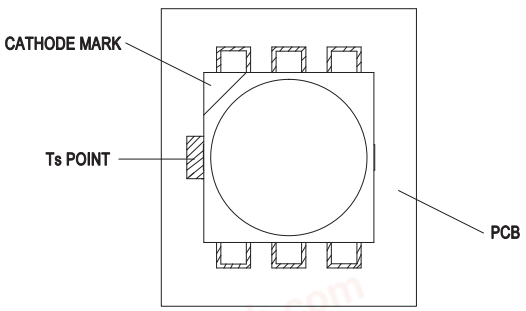
where T_S = LED solder point temperature as shown in the following figure (°C)

$R_{\theta J\text{-}S}$ = Thermal resistance from junction to solder point (°C/W)

I_F = Forward current (A)

V_{Fmax} = Maximum forward voltage (V)

Figure 20: Thermal Management



To measure the soldering point temperature, a thermocouple can be mounted on the T_S point as shown in the preceding figure. Verify the T_S of the LED in the final product to ensure that the LEDs are operated within all maximum ratings stated in the datasheet.

Eye Safety and Precautions

LEDs may pose optical hazards when in operation. Do not look directly at operating LEDs as it may be harmful to the eyes. For safety reasons, use appropriate shielding or personnel protection equipment.

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