ASMG-ST00-00001

3W Tri-color High Power LED

Datasheet

Lead (Pb) Free
RoHS 6 fully compliant

Description

The 3W Tri-Color High Power LED Light Source is a high performance energy efficient device which 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 reflow soldering process. This will give more freedom and flexibility to the light source designer.

Features

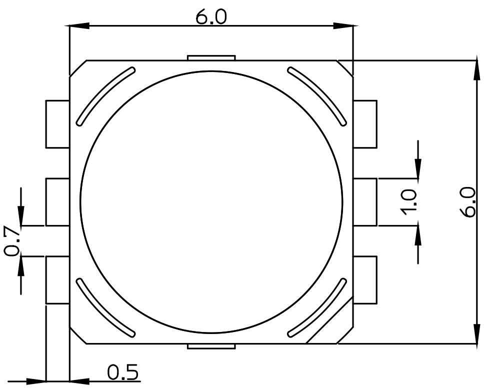
- Available in tri-color
- Energy efficient
- Compatible with reflow soldering process
- High current operation
- Long operation life
- Wide viewing angle
- Silicone encapsulation
- MSL 1 products

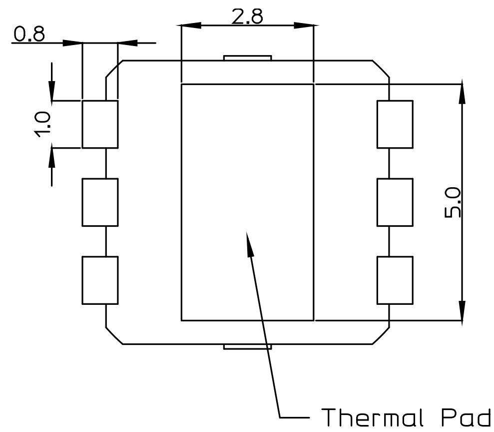
Applications

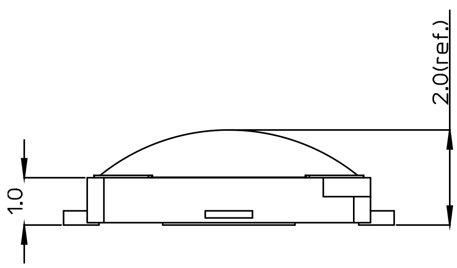
- Sign backlight
- Retail display
- Commercial lighting
- Decorative lighting
- Architectural lighting

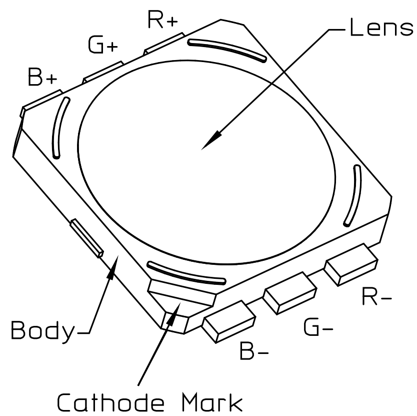
CAUTION This LED is Class 1B ESD sensitive per ANSI/ESDA/JEDEC JS-001. Please observe appropriate precautions during handling and processing. Refer to Application Note AN-1142 for additional details.

Package Dimensions

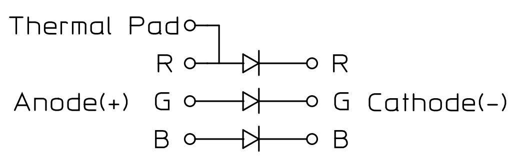








Circuit Diagram



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

Device Selection Guide ($T_J = 25°C$, $I_F = 350mA$)

Part Number	Color	Luminous Flux, $Ø_V$ (lm) @ 350mA [1,2]			Dice Technology
		Min	Typ	Max	
ASMG-ST00-00001	Red	45	55	65	AlInGaP
	Green	80	95	112	InGaN
	Blue	18	20	26	InGaN

Notes:
1. $Φ_V$ is the total luminous flux output as measured with an integrating sphere at 25ms mono pulse condition.
2. Luminous flux tolerance = ±10%.

Absolute Maximum Ratings

Parameter	AlInGaP	InGaN	Unit
DC Forward Current [1]	350	350	mA
Peak Forward Current [2]	500	500	mA
Power Dissipation	980	1330	mW
Reverse Voltage	Not designed for reverse bias		
LED Junction Temperature	120		°C
Operating Temperature Range	-40 to +100		°C
Storage Temperature Range	-40 to +120		°C

Notes:
1. Derate linearly as shown in Figure 7 and 8.
2. Duty factor = 10%, frequency = 1kHz.

Optical Characteristics ($I_F = 350mA$, $T_J = 25°C$)

Color	Dominant Wavelength, $λ_d$ (nm) [1,2]			Peak Wavelength, $λ_p$ (nm)	Viewing Angle, $2θ_{1/2}$ (°) [3]
	Min.	Typ.	Max.	Typ.	Typ.
Red	613.5	623.0	631.0	631.5	135
Green	515.0	525.0	535.0	518.5	170
Blue	455.0	465.0	475.0	456.5	135

Notes:
1. The dominant wavelength is derived from the CIE Chromaticity Diagram and represents the perceived color of the device.
2. Tolerance = ±1nm.
3. $2θ_{½}$ is the off axis angle where the luminous intensity is half of the peak intensity.

Electrical Characteristics ($T_J = 25°C$)

Color	Forward Voltage, V_F (V) [1] @ $I_F = 350mA$			Reverse Current, I_R (μA) @ $V_R = 5V$	Thermal Resistance, $R_{θJ\text{-}S}$ (°C/W) [2]
	Min.	Typ.	Max.		Typ.
Red	1.8	2.2	2.8	Not designed for reverse bias	6
Green	2.8	3.4	3.8		10
Blue	2.8	3.4	3.8		6

Notes:
1. Tolerance = ±0.1V.
2. Thermal resistance from LED junction to solder point.

Part Numbering System

A S M G - S T 0 0 - 0 | x1 | x2 | x3 | 1

Code	Description	Option	
x1 x2	Flux bin selection	00	Red: 45-65lm
			Green: 80-112lm
			Blue: 18-26lm
x3	Color bin selection	0	Red: bin 2 and 4
			Green : bin A,1,2 and 3
			Blue : bin A,1,2 and 3

Bin Information

Luminous Flux Bin Limit

	Luminous flux (lm)@ 350mA	
Color	Min	Max
Red	45	65
Green	80	112
Blue	18	26

Tolerance = ±10%

Color Bin Limits (BIN)

		Dominant Wavelength (nm) @ 350mA	
Color	Bin ID	Min	Max
Red	2	613.5	620.5
	4	620.5	631.0
Green	A	515.0	520.0
	1	520.0	525.0
	2	525.0	530.0
	3	530.0	535.0
Blue	A	455.0	460.0
	1	460.0	465.0
	2	465.0	470.0
	3	470.0	475.0

Tolerance = ±1nm

Example of bin information on reel and packaging label:
BIN: 2A3 → Red color bin 2
→ Green color bin A
→ Blue color bin 3

Figure 1. Relative luminous flux vs. forward current

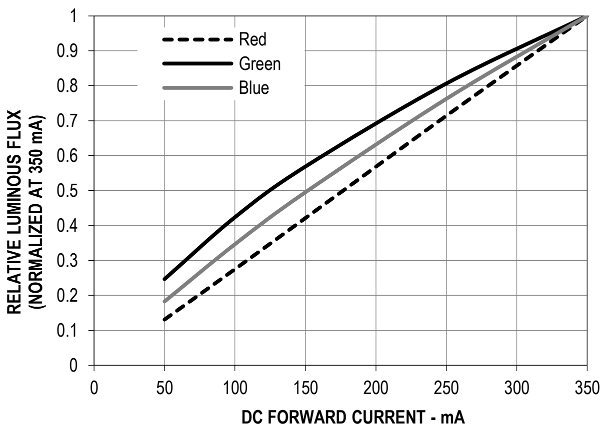


Figure 2. Forward current vs. forward voltage

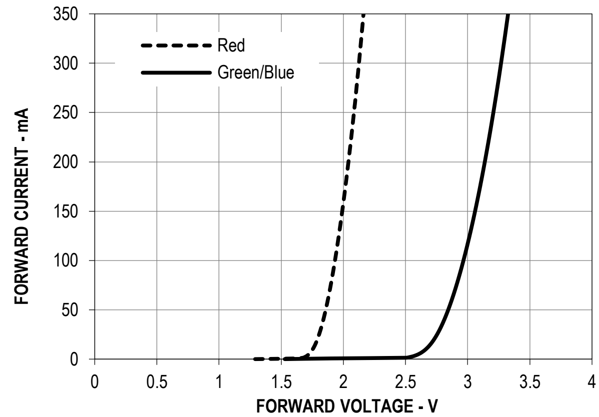


Figure 3. Dominant wavelength shift vs. forward current

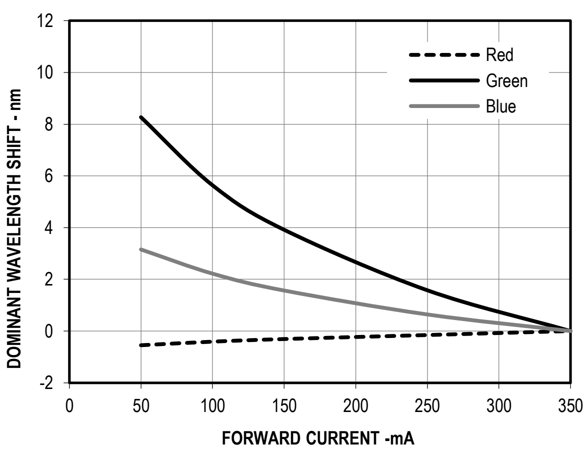


Figure 4. Relative light output vs. junction temperature

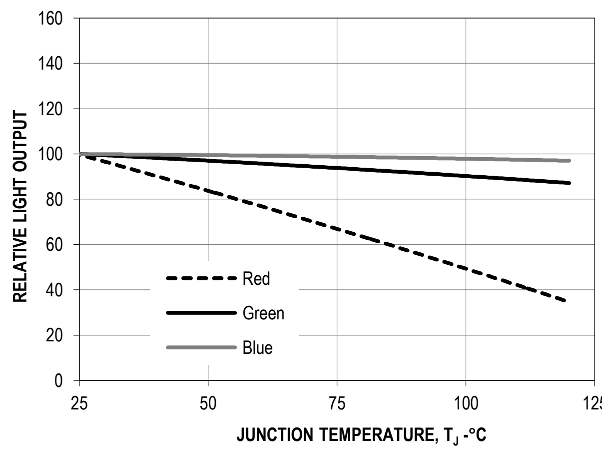


Figure 5. Forward voltage shift vs. junction temperature

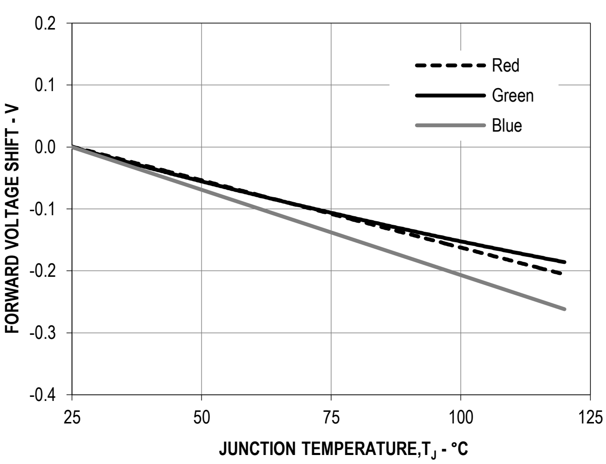


Figure 6. Dominant wavelength shift vs. junction temperature

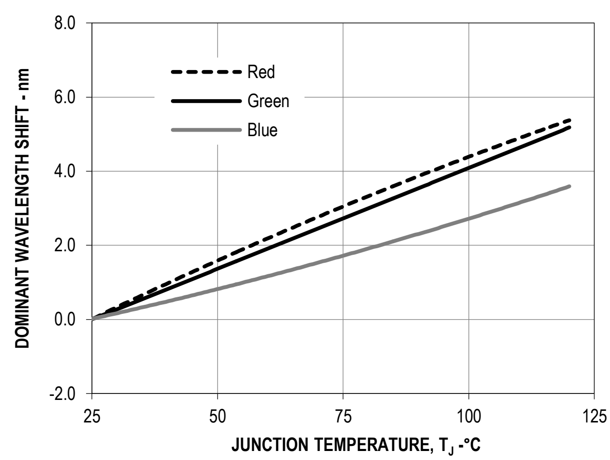


Figure 7. Derating curve according to solder point temperature (T_S)

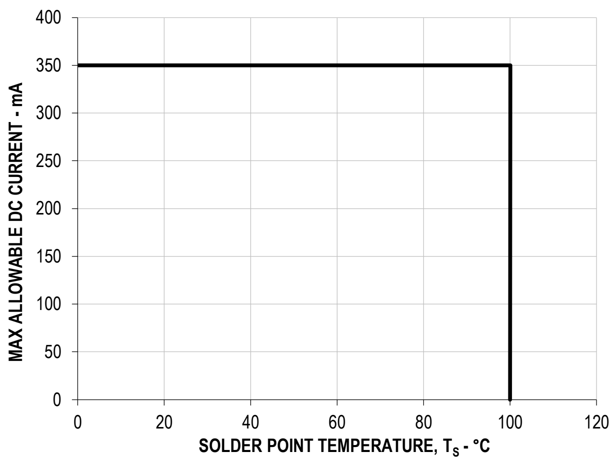


Figure 8. Derating curve according to ambient temperature (T_A) . Derated based on T_{JMAX} = 120°C, $R\theta_{J-A}$ = 30°C/W for Red and Blue and $R\theta_{J-A}$ = 34°C/W for Green.

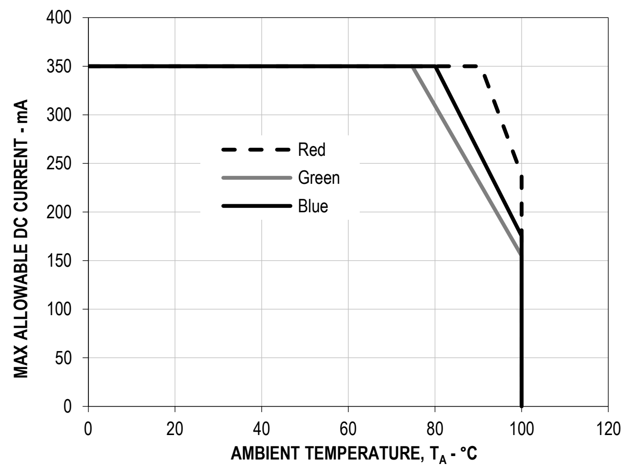


Figure 9. Pulse handling capability at $T_S \leq 100°C$ for AlInGaP

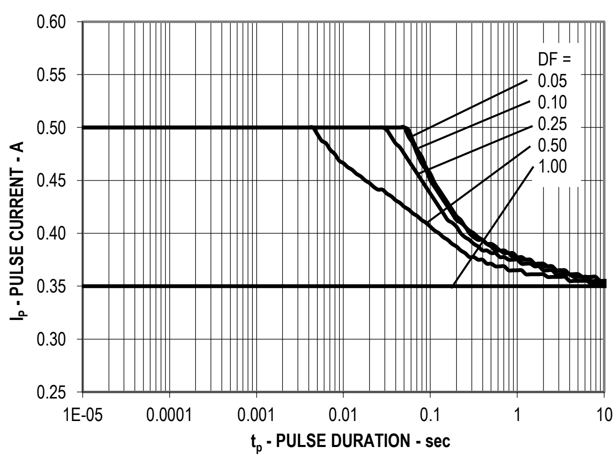


Figure 10. Pulse handling capability at $T_S \leq 100°C$ for InGaN

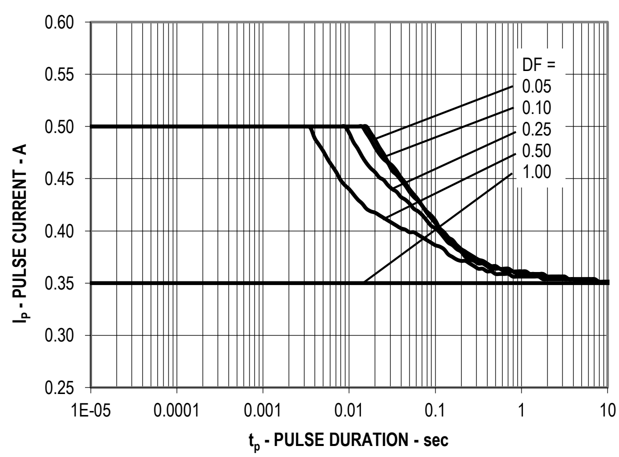


Figure 11. Radiation pattern for Red

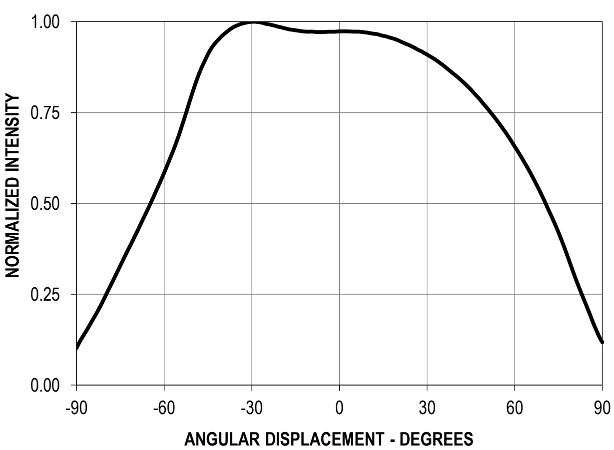


Figure 12. Radiation pattern for Green

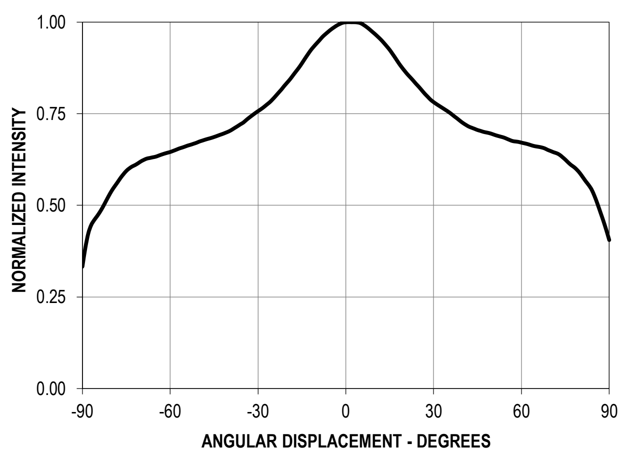


Figure 13. Radiation pattern for Blue

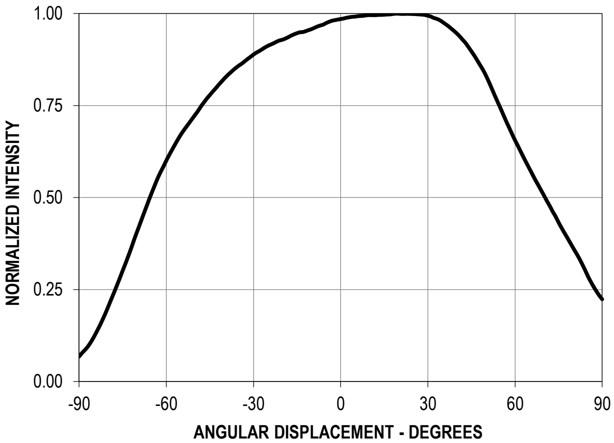


Figure 14. Spectral power distribution

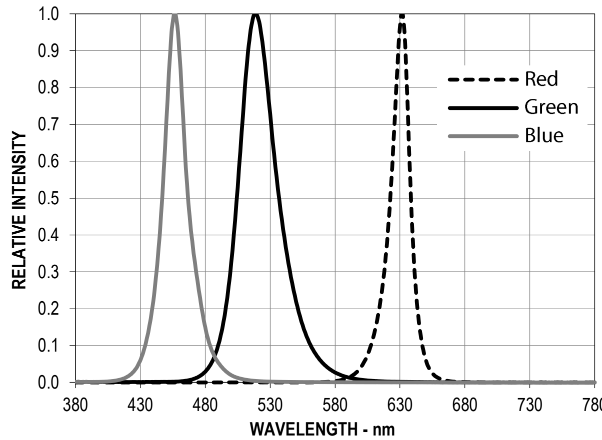
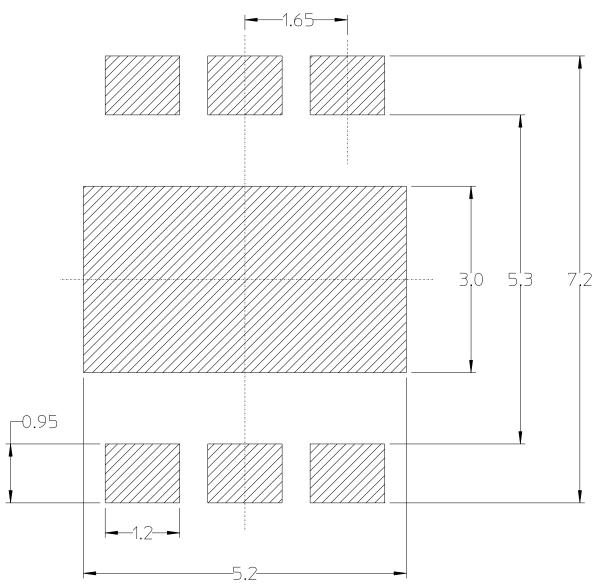
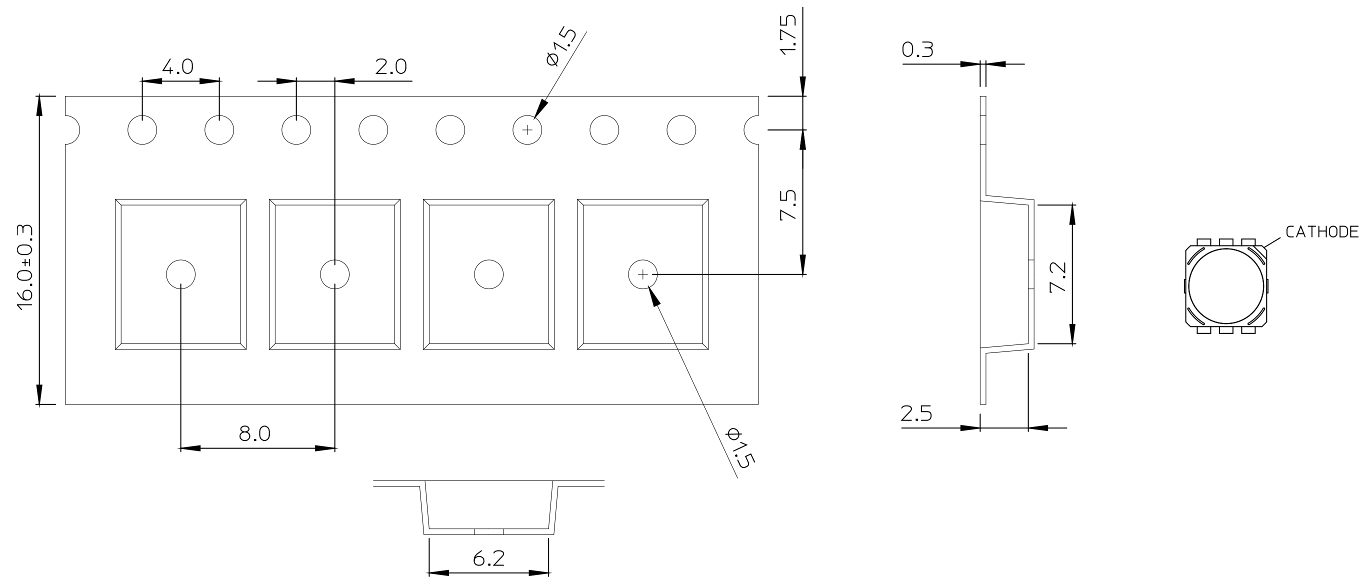


Figure 15. Recommended soldering land pattern (mm)



Unit: mm

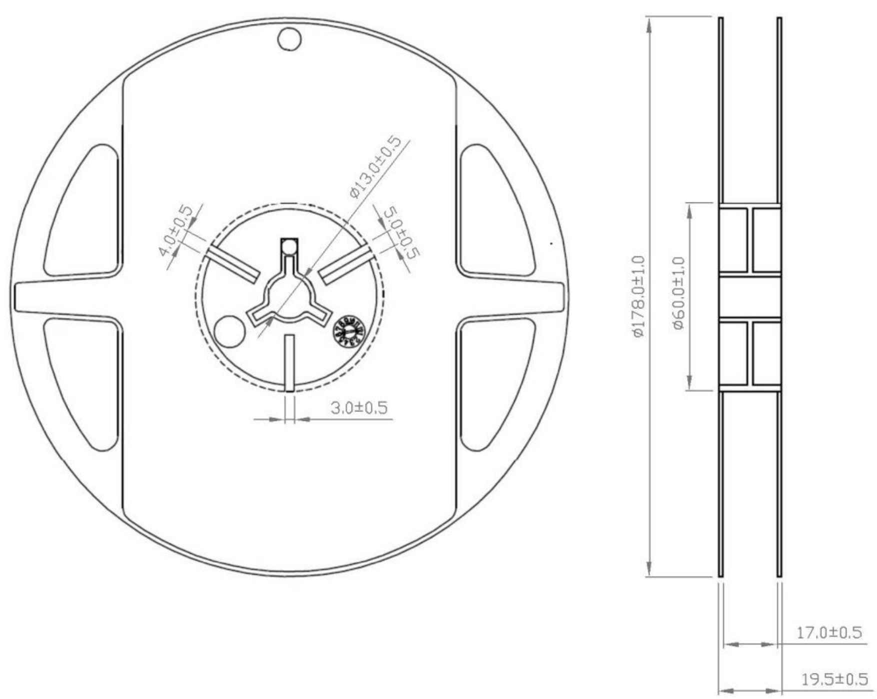
Figure 16. Carrier tape dimensions



Notes:

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

Figure 17. Reel dimensions

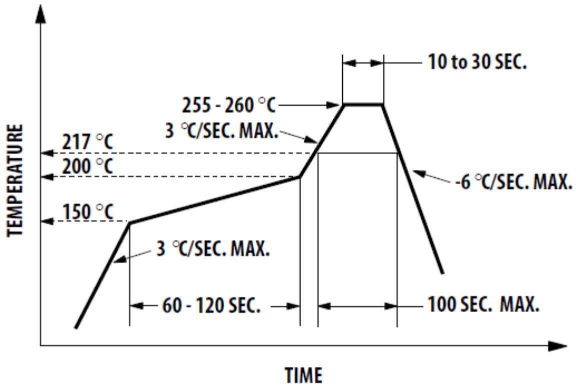


Notes:

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

Soldering

Recommended reflow soldering condition:



(a) Reflow soldering must not be done more than 2 times.
(b) Do not apply any pressure or force on the LED during reflow and after reflow when the LED is still hot.
(c) It is preferred to use reflow soldering to solder the LED. Hot plate shall only be used for rework if unavoidable but must be strictly controlled to conditions below:
- LED temperature = 260°C max
- Time at maximum temperature = 20sec max

(d) User is advised to confirm beforehand whether the functionality and performance of the LED is affected by soldering with hot plate.
(e) Hand soldering is not recommended.

Precautionary Notes

1. 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. Special handling precautions need to be observed 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, *Silicone Encapsulation for LED: Advantages and Handling Precautions* for more information.

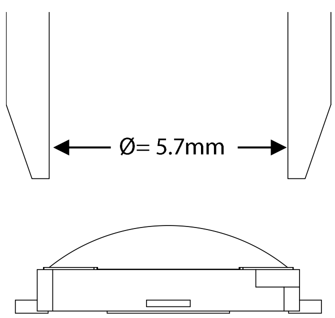
(a) Do not poke sharp objects into the silicone encapsulant. Sharp object like tweezers or syringes might apply excessive force or even pierce through the silicone and induce failures to the LED die or wire bond.

(f) Do not touch the silicone encapsulant. Uncontrolled force acting on the silicone encapsulant might result in excessive stress on the wire bond. The LED should only be held by the body.

(f) Do no stack assembled PCBs together. Use an appropriate rack to hold the PCBs.

(g) Surface of silicone material attracts dusk and dirt easier than epoxy due to its surface tackiness. To remove foreign particles on the surface of silicone, a cotton bud can be used with isopropyl alcohol (IPA). During cleaning, rub the surface gently without putting much pressure on the silicone. Ultrasonic cleaning is not recommended.

(h) For automated pick and place, Broadcom has tested nozzle size below to be working fine 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, customer is recommended to verify the nozzle selected will not cause damage to the LED.



Inner diameter Ø= 5.7mm

(i) Storage
- The soldering terminals of these LEDs are silver plated. If the LEDs are being exposed in ambient environment for too long, the silver plating might be oxidized and thus affecting its solderability performance. As such, unused LEDs must be kept in sealed MBB with desiccant or in desiccator at <5%RH.

2. Application precautions

(a) Drive current of the LED must not exceed the maximum allowable limit across temperature as stated in the datasheet. Constant current driving is recommended to ensure consistent performance.

(b) LED is not intended for reverse bias. Do use other appropriate components for such purpose. When driving the LED in matrix form, it is crucial to ensure that the reverse bias voltage is not exceeding the allowable limit of the LED.

(c) Do not use the LED in the vicinity of material with sulfur content, in environment of high gaseous sulfur compound and corrosive elements. Examples of material that may contain sulfur are rubber gasket, RTV (room temperature vulcanizing) silicone rubber, rubber gloves etc. Prolonged exposure to such environment may affect the optical characteristics and product life.

(d) Avoid rapid change in ambient temperature especially in high humidity environment as this will cause condensation on the LED.

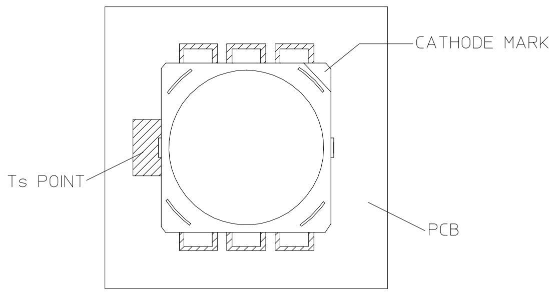
(e) If the LED is intended to be used in harsh or outdoor environment, the LED must be protected by means of protective cover against damages caused by rain water, dust, oil, corrosive gases, external mechanical stress etc.

3. 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 below:

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

where T_S = LED solder point temperature as shown in illustration below [°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]



To measure the soldering point temperature, a thermocouple can be mounted on the T_S point as shown in illustration above. User is advised to 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.

4. Eye Safety and Precautions

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

5. Disclaimer

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21 October 2016