

# Cree® High-Brightness LED Soldering & Handling

## Features

The purpose of this document is to provide a clear understanding to the customers and users, on the ways how to use our LED lamps appropriately.

## Description

Generally, LED can be used the same way as other general-purpose semiconductors. When using CREE's Lamps, the following precautions must be taken to protect the LED.

## P2 and P4 LEDs

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### 1. Cleaning

- Don't use unspecified chemical liquids to clean the LEDs; the chemical could harm the LEDs. When washing is necessary, please immerse the LEDs in alcohol at normal room temperature for less than 1 minute and dry at normal room temperature for 15 minutes before use.
- The influence of ultrasonic cleaning on the LEDs depends on factors such as ultrasonic power and the way th LEDs are mounted. Ultrasonic cleaning should be pre-qualified to ensure this will not cause damage to the LEDs.

### 2. Forming

- During leads forming, the leads should be bent at a point at least 3 mm from the base of the package.
- Don't form the leads during or after soldering. If forming is required, this must be done before soldering.
- Avoid stressing the LED package during leads forming.
- When mounting the LEDs onto a PCB, the PCB holes must be aligned exactly with the lead position of the LEDs.

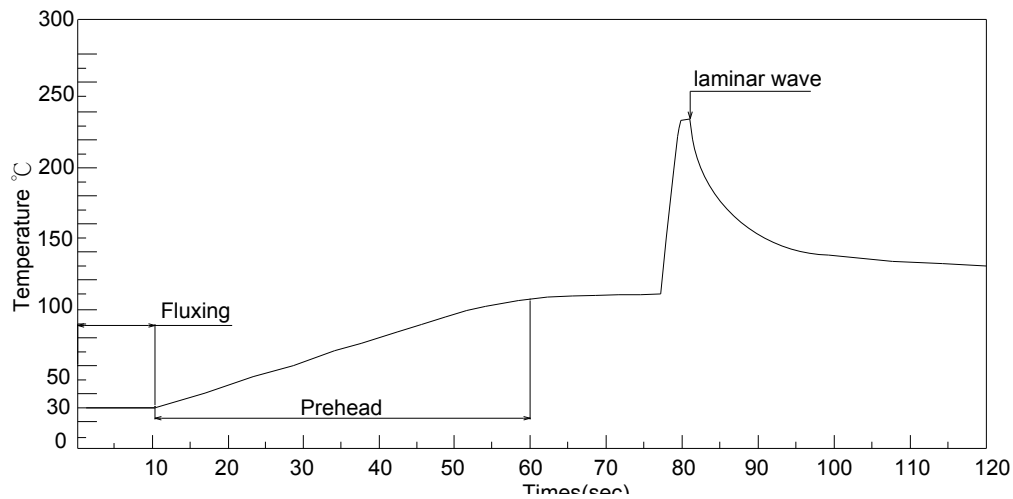
### 3. Soldering

- A minimal cathode pad area of 0.18 × 0.18 inches squared is recommended for P2 LEDs and 0.18 × 0.18 inches squared × 2 for P4 LEDs.
- Soldering LEDs at not less than 3 mm from the base of the package and below the tie-bar is recommended.
- The LED soldering specification is shown as below (suitable for both leaded solder & lead-free solder).



Manual Soldering		Solder Dipping	
Soldering iron	35 W max	Preheat	110°C max
Temperature	<ul style="list-style-type: none"> <li>280°C max (63/37 solder)</li> <li>300°C max (Pb-free solder)</li> </ul>	Preheat Time	60 seconds max
		Solder-bath temperature	<ul style="list-style-type: none"> <li>63/37 solder: 235°C(245°C Max)</li> <li>Pb-free solder : 255°C (260°C Max)</li> </ul>
Soldering time	3 seconds max	Dipping time	3 seconds max
Position	Not less than 3 mm from the base of the package.	Position	Not less than 3 mm from the base of the package.

- Manual soldering onto PCB is not recommended because soldering time is uncontrollable.
- The recommended wave soldering is as below:



Solder = Sn63-Pb37		Solder = lead-free	
Peak preheat temperature	100°~110°C	Peak preheat temperature	100~110°C
Total preheat time	50~60 seconds	Total preheat time	50~ 60 seconds
Peak profile fit temperature	235°C (max 245°C)	Peak profile temperature	260°C (max) *
Dwell time above 200°C	Do not exceed 3 seconds	Dwell time above 200°C	Do not excess 3 seconds
(For individual parts, refer to the product date sheet)		(For individual parts, refer to the product data sheet)	

\* Different lead-free solder is in need of different solder conditions. Please contact us for the details.



- Do not apply any stress to the LED package, particularly when heated.
- The LEDs must not be re-used once they have been extracted from PCB.
- After soldering the LEDs, the package should be protected against mechanical shock or vibration until the LEDs have reached 40°C or below.
- Precautions must be taken as mechanical stress on the LEDs may be caused by PCB warpage or from the clinching and cutting of the LED leads.
- When clamping of LEDs during soldering is required, it is important to ensure no mechanical stress be exerted on the LEDs.
- Lead cutting must be performed at normal room temperature. Lead cutting at an elevated temperature may lead to LED failures.

#### **4. Electrostatic Discharge and Surge Current**

- Electrostatic discharge (ESD) or surge current (EOS) may damage LEDs.
- Precautions such as ESD wrist straps, ESD shoe straps or antistatic gloves must be worn whenever handling the LEDs.
- All devices, equipment and machinery must be properly grounded.
- It is recommended to perform electrical tests to screen out ESD failures at final inspection.
- It is important to eliminate the possibility of surge current during circuitry design.

#### **5. Heat Management**

- Heat management of LEDs must be taken into consideration during the design stage of an LED application. The current should be de-rated appropriately by referring to the de-rating curve included in each product specification.
- The temperature surrounding the LED shouldn't be so high that it will make it fail when used in an application, and the temperature surrounding the LED in the application should conform to the de-rating curve in our LED specification documents.

#### **6. Others**

- Care must be taken so that reverse voltage will not exceed the absolute maximum rating.
- The leads are plated with solder. Leads will become tarnished if in contact hydrogen sulfide and other gaseous chemicals. Precautions must be taken to maintain a clean storage atmosphere.
- The power of high-brightness LEDs is very strong and may injure human eyes. Precautions must be taken such as avoiding looking directly into lit LEDs.
- 3-mm conventional LEDs are not auto-insertable.



## SMD LEDs

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### 1. Cleaning

- Don't use unspecified chemical liquids to clean the SMD LED; the chemical could harm the SMD LED. When washing is necessary, please immerse the SMD LED in alcohol at normal room temperature for less than 1 minute and dry at normal room temperature for 15 minutes before use.
- The influence of ultrasonic cleaning on the SMD LED depends on factors such as ultrasonic power and the way the SMD LEDs are mounted. Ultrasonic cleaning should be pre-qualified to ensure this will not damage the SMD LED.

### 2. Moisture-Proof Packing

- In order to prevent moisture absorption into the SMD LEDs during the transportation and storage, the LEDs are packed in a moisture barrier bag. Desiccants and a humidity indicator are packed together with the SMD LEDs as secondary protection. The humidity-indicator card indicates the humidity within the SMD packing.

### 3. Storage

- Shelf life in the original sealed bag at the storage condition of  $<40^{\circ}\text{C}$  and  $<90\% \text{ RH}$  is 12 months. Baking is required whenever shelf life is expired.
- Before opening the packaging, please check whether the bag leaked air or not.
- After opening the sealed bag, the SMD LED must be stored under the condition  $< 30^{\circ}\text{C}$  and  $< 60\% \text{ RH}$ . Under these conditions, the SMD LEDs must be used (subject to reflow) within 24 hours after bag opening, and re-baking is required when exceeding 24 hours.
- For baking, place the SMD LEDs in an oven at  $80^{\circ}\text{C} \pm 5^{\circ}\text{C}$  and relative humidity  $\leq 10\% \text{ RH}$  for 24 hours.
- Take out the material from packaging bag for re-bake. Do not open the oven door frequently during the baking process.

### 4. Soldering

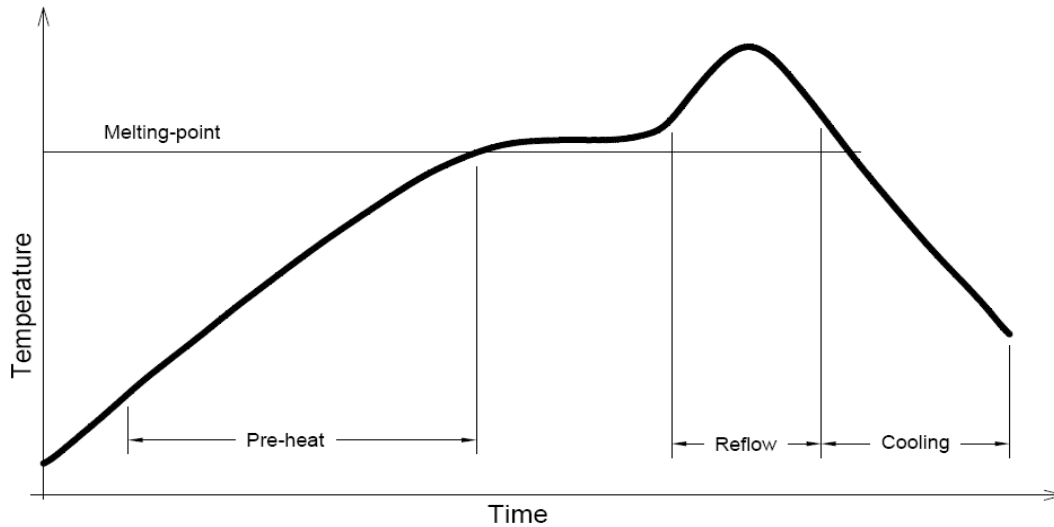
#### Manual soldering by soldering iron

- The use of a soldering iron of less than 25 W is recommended, and the temperature of the iron must be kept at below  $315^{\circ}\text{C}$ , with soldering time within 2 seconds.
- The epoxy resin of the SMD LED should not contact the tip of the soldering iron.
- No mechanical stress should be exerted on the resin portion of the SMD LED during soldering.
- Handling of the SMD LED should be done when the package has been cooled down to below  $40^{\circ}\text{C}$  or less. This is to prevent LED failures due to thermal-mechanical stress during handling.



## Reflow Soldering

- The temperature (top surface of the SMD LED) profile is as below:



For use with all SMD LEDs except LP6-NPP1-01-N1:

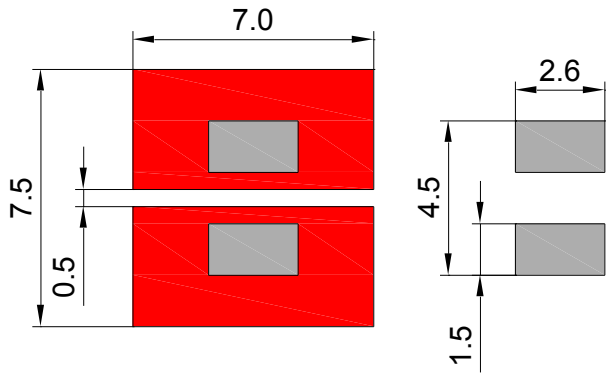
Solder = Sn63-Pb37		Solder = lead-free	
Average ramp-up rate	4°C/s max.	Average ramp-up rate	4°C/s max.
Preheat temperature	100°C~150°C	Preheat temperature	150°C~200°C
Preheat time	120 seconds max.	Preheat time	120 seconds max.
Ramp-down rate	6°C/s max.	Ramp-down rate	6°C/s max.
Peak temperature	230°C max.	Peak temperature	250°C max.
Time within 5°C of actual peak temperature	10 seconds max.	Time within 5°C of actual peak temperature	10 seconds max.
Duration above 183°C i	60 seconds max.	Duration above 217°C	60 seconds max.

## For use only with LP6-NPP1-01-N1

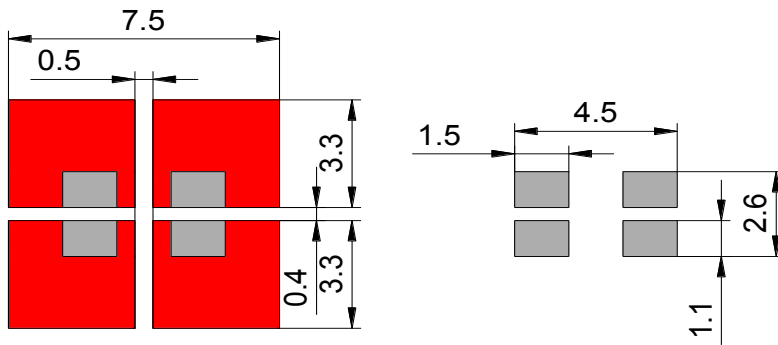
Solder = low lead-free	
Average ramp-up rate	3°C/s max.
Preheat temperature	130°C~170°C
Preheat time	120 seconds max.
Ramp-down rate	6°C/s max.
Peak temperature	213°C max.
Time within 3°C of actual peak temperature	25 seconds max.
Duration above 200°C	40 seconds max.



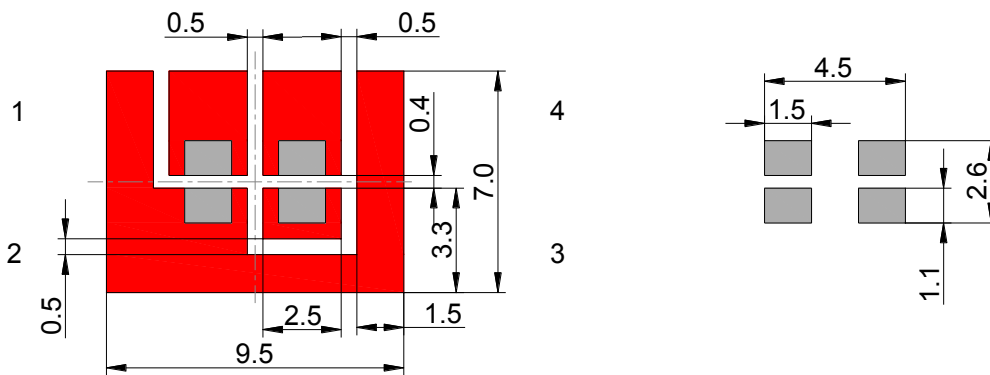
Recommended solder-pad design for heat dissipation (LM1 series):



Recommended solder-pad design for heat dissipation (LM4 & LM2 series):

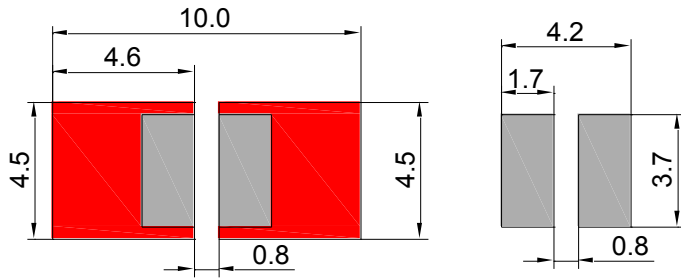


Recommended solder-pad design for heat dissipation (LV1 & LA1 & LVB series):

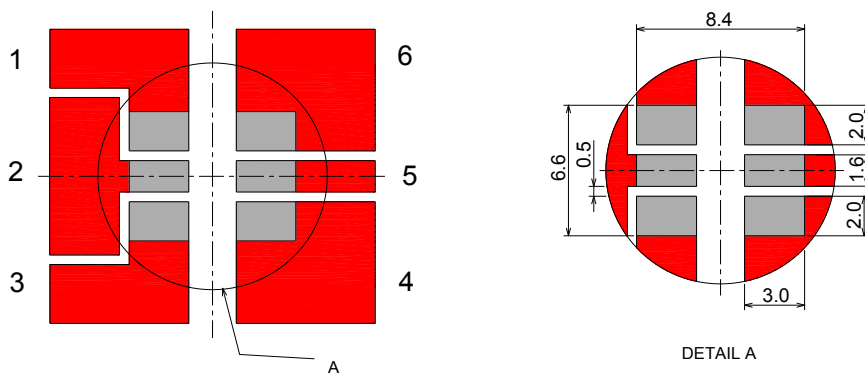




Recommended solder pad design for heat dissipation (LS1 series):



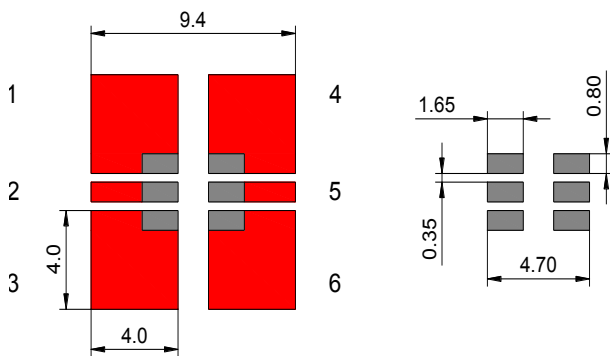
Recommended solder-pad design for heat dissipation (LP6 series):



Note:  
Metal area at 1, 2, 3 should not be less than 40mm<sup>2</sup> each for sufficient heat dissipation.

NOTE:  
Metal area on 1 2 3 should not be less than 40mm<sup>2</sup> for efficient heat dissipation

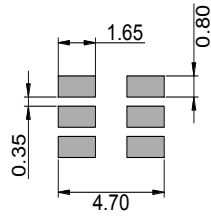
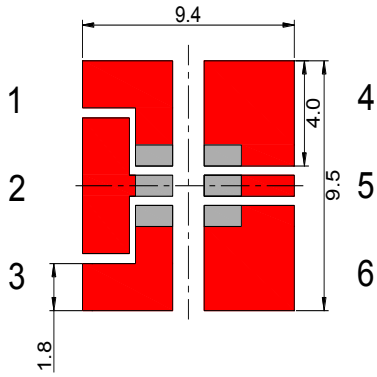
Recommended solder pad design for heat dissipation (LM6 series):



Note:  
Metal area at 1, 4, 6 should not be less than 16mm<sup>2</sup> each for sufficient heat dissipation.

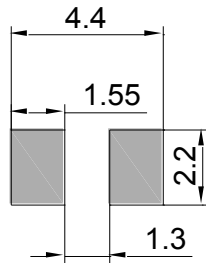
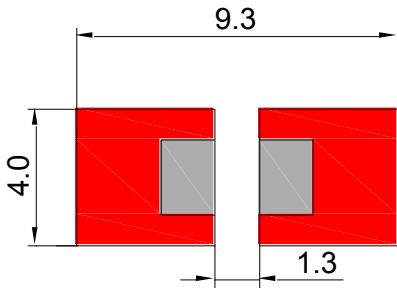


Recommended solder-pad design for heat dissipation (LU6 series):

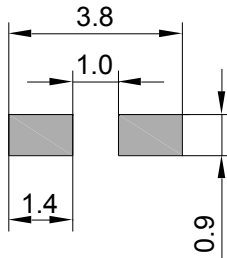
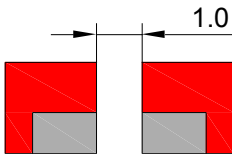


Note:  
Metal area at 1, 2, 3 should not be less than 16mm<sup>2</sup> each for sufficient heat dissipation.

Recommended solder-pad design for heat dissipation (small-top SMD LM3 series):

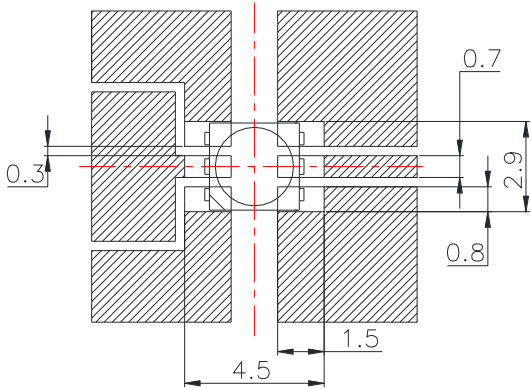


Recommended solder-pad design for heat dissipation (mini side 0.8-mm SMD LS8 series):

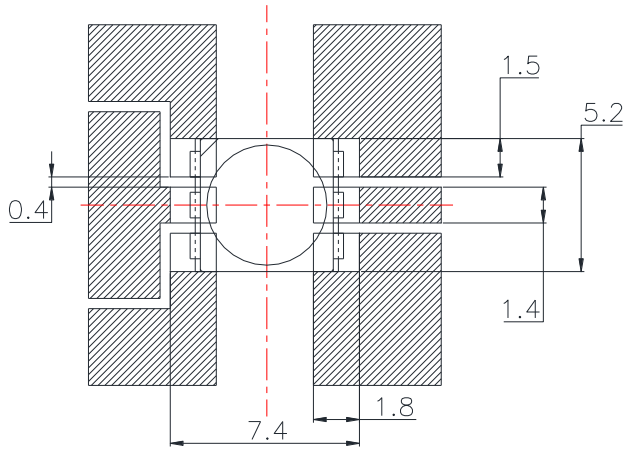




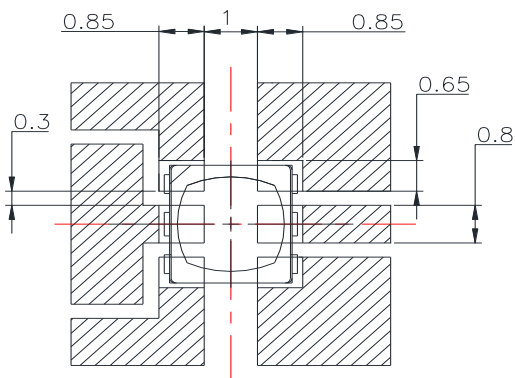
Recommended solder-pad design for heat dissipation (LA6 series)



Recommended solder-pad design for heat dissipation (LB6 series)

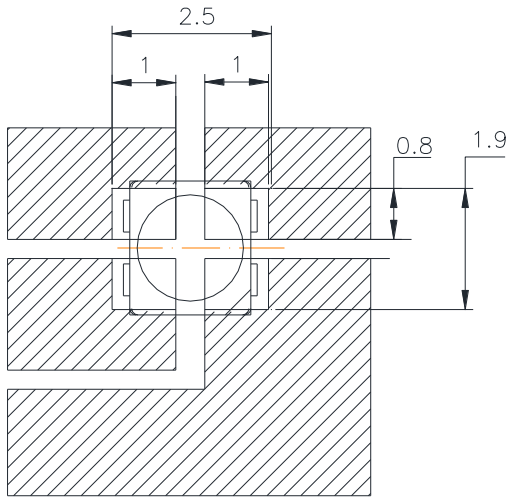


Recommended solder-pad design for heat dissipation (LT6B series)





Recommended solder-pad design for heat dissipation (LMVB series)



- Modification of an SMD LED is not recommended after soldering. If modification cannot be avoided, the modifications must be pre-qualified to avoid damaging the SMD LED.
- Reflow soldering should not be done more than one time.
- No stress should be exerted on the package during soldering.
- The PCB should not be wrapped after soldering; this is to allow natural cooling of the PCB and the SMD LED.

## 5. Important Notes (small top & mini side 0.8mm SMD products)

- The packaging sizes of these SMD products are very small and the resin is still soft after solidification. Users are required to handle with care. Never touch the resin surface of SMD products.
- To avoid damaging the product's surface and interior device, it is recommended to choose a special nozzle to pick up the SMD products during the process of SMT production. If handling is necessary, it should take special care when picking up these products. The following two methods are necessary:

Fig. 1a: For Small Top SMD

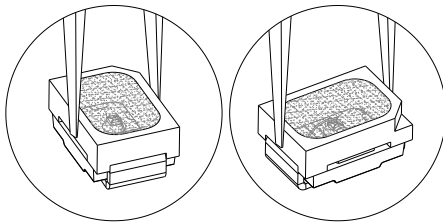
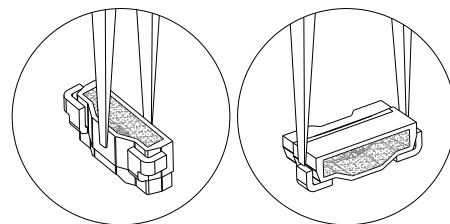


Fig. 1b: For Mini side 0.8mm SMD



- For small top SMD series LEDs, it is recommended to use rubber-material nozzles to pick up the SMD products. Here are two figure sizes for reference:
  - » Circular nozzle: inner diameter =  $\varnothing 1.8 \text{ mm} \pm 0.05 \text{ mm}$ ; outer diameter =  $\varnothing 2.3 \text{ mm} \pm 0.05 \text{ mm}$
  - » Rectangular nozzle: inner size =  $1.3 \text{ mm} \times 2.3 \text{ mm}$ ; outer size > SMD size

## 6. Electrostatic Discharge and Surge Current

- Electrostatic discharge (ESD) or surge current (EOS) may damage an SMD LED.
- Precautions such as ESD wrist straps, ESD shoe straps or antistatic gloves must be worn whenever handling SMD LEDs.
- All devices, equipment and machinery must be properly grounded.
- It is recommended to perform electrical test to screen out ESD failures at final inspection.
- It is important to eliminate the possibility of surge current during circuitry design.

## 7. Heat Management

Heat management of SMD LEDs must be taken into consideration during the design stage of SMD LED applications. The current should be de-rated appropriately by referring to the de-rating curve attached included in each product specification.

Data is subject to change without prior notice.