

# Cree® High-Brightness LED Soldering & Handling

## Features

The purpose of this document is to provide customers and users with a clear understanding about the ways to use our LEDs appropriately.

## Description

Generally, LEDs can be used the same way as other general-purpose semiconductors. When using Cree LEDs, 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 LED; the chemical could harm the LED. When washing is necessary, please wipe the LED with alcohol at normal room temperature 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 the LEDs are mounted. Ultrasonic cleaning should be pre-qualified to ensure this will not cause damage to the LEDs.

### 2. Forming

- When forming leads, 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 any bending stress to 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. Storage

- The shelf life of the LEDs is one year at 20~30 °C and <60% RH. If the LEDs are unpacked, the LEDs need to be stored in a sealed container with desiccant (silica gel).
- The lead may be affected by environments which contain corrosive substances. Please avoid conditions which may cause the LEDs to corrode, tarnish or discolor. The corrosion or discoloration may cause difficulty during soldering operations. It is recommended that the LEDs be used as soon as possible.

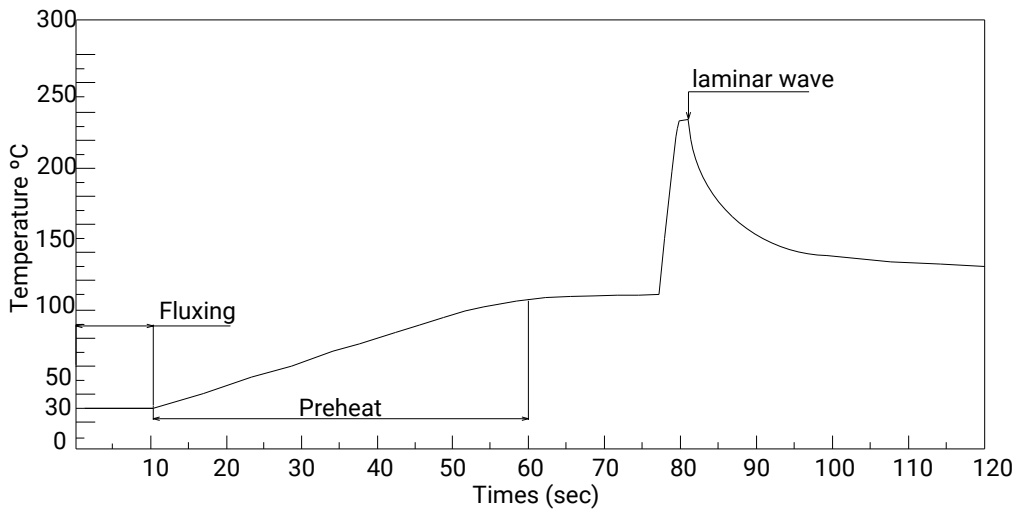
### 4. Soldering

- 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 below (suitable for both leaded solder & lead-free solder).

Manual Soldering		Solder Dipping	
Soldering iron	35 W max	Preheat	110 °C max
Temperature	300 °C max	Preheat time	60 seconds max
		Solder-bath temperature	260 °C Max
Soldering time	3 seconds max	Dipping time	5 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 the PCB is not recommended because soldering time is uncontrollable.
- The recommended wave soldering is as below:



Different lead-free solder requires different solder conditions. Please contact us for details.

- Do not apply any stress to the LED package, particularly when heated.
- It is recommended to use only bottom preheaters in order to reduce thermal stress experienced by the LEDs.
- The LEDs must not be re used once they have been extracted from PCB.
- After soldering the LEDs, the package should be protected from 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 it is necessary to clam the LEDs during soldering, it is important to ensure no mechanical stress is exerted on the LEDs.
- Cut the LED lead at normal room temperature. Lead cutting at high temperature may cause failure of the LEDs.

## 5. Electrostatic Discharge and Surge Current

- Electrostatic discharge (ESD) or electrical overstress (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 electrical overstress during circuitry design.

## 6. Heat Management

- Heat management of LEDs must be taken into consideration during the design stage of an LED application.
- High temperature may cause failure of the LEDs. The driving current should be de-rated appropriately by referring to the de-rating curve included in each product specification.

## 7. Other Notes

- Make sure the reverse voltage will not exceed the absolute maximum rating.
- 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.

## SMD LEDs

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### 1. Cleaning

- Don't use unspecified chemical liquids to clean an SMD LED; the chemical could harm the SMD LED. When washing is necessary, please wipe the LED with alcohol at normal room temperature 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 LEDs.
- Do not use alcohol and/or ultrasonic cleaning to clean UHD1110 series products.

### 2. Moisture-Proof Packing

- To prevent moisture absorption into SMD LEDs during transportation and storage, the LEDs are packed in a moisture-barrier bag. Desiccants and a humidity indicator are packed together with the LEDs as a secondary protection.
- A humidity-indicator card indicates the humidity level.

### 3. Storage

- Do not open the sealed bag before the products are ready to use.
- The shelf life of LEDs stored in the original sealed bag at  $\leq 40$  °C and  $\leq 90$ % RH is 12 months. Baking is required if the shelf life has expired.

- After opening the sealed bag, the SMD LEDs must be stored under the condition  $\leq 30\text{ }^{\circ}\text{C}$  and  $\leq 60\% \text{ RH}$ . Under these conditions, the SMD LEDs must be subjected to reflow within the MSL level floor time after bag opening. Baking is required when this time is exceeded.
- For baking, place the SMD LEDs in the oven at  $75^{\circ}\text{C}$ ,  $\pm 5\text{ }^{\circ}\text{C}$  with a maximum temperature of  $80^{\circ}\text{C}$  and relative humidity  $\leq 10\% \text{ RH}$  for 24 hours.
- Take the material out of the packaging bag before baking. Do not open the oven door frequently during the baking process.
- Please refer to the product specifications for more details.

**4. Soldering**

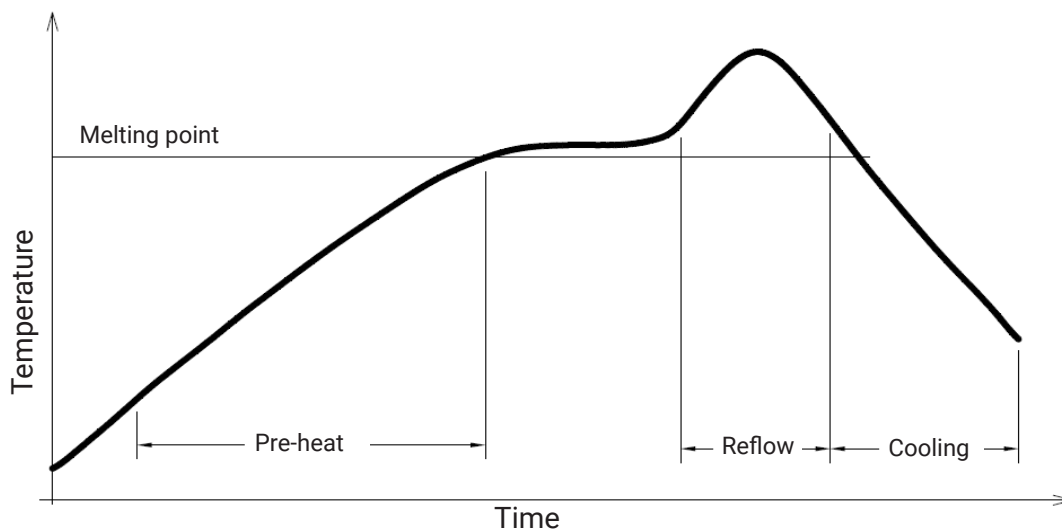
- Reflow soldering should not be done more than two times (according to model’s MSL requirements).

**a. Manual soldering by soldering iron**

- Since the temperature of manual soldering is not stable, manual soldering by soldering iron is not recommended.
- If manual soldering is necessary, the use of a soldering iron of less than 25 W is recommended, and the temperature of the iron must be kept below  $315\text{ }^{\circ}\text{C}$ , with soldering time within 2 seconds.
- The 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 below  $40\text{ }^{\circ}\text{C}$ . This is to prevent LED failures due to thermal-mechanical stress during handling.

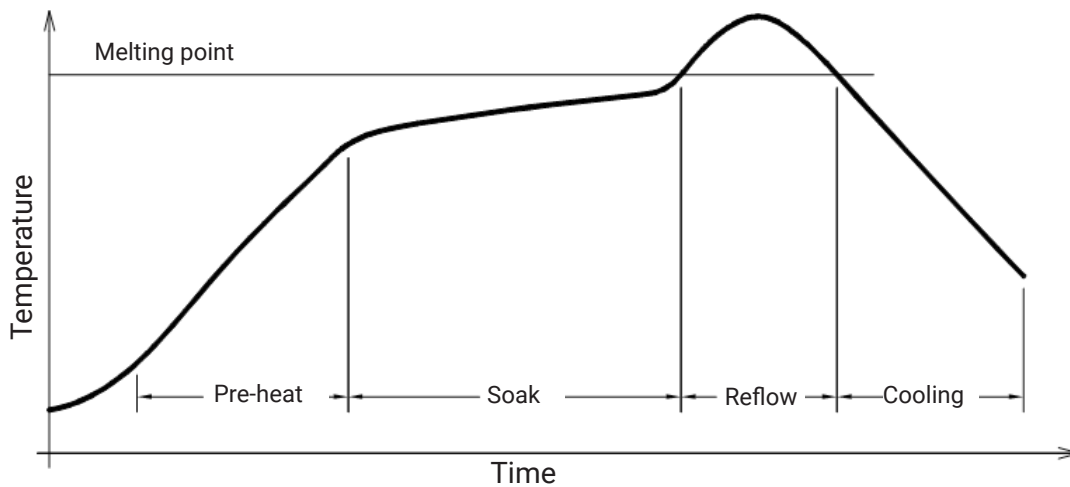
**b. Reflow Soldering**

- The temperature profile (1) is as below (for SMD LED CLMXB-FKA/CLV1A-FKB/CLV1L-FKB/CLV6B-FKB/CLV6D-FKB/CLX6B-FKC/CLX6C-FKB/CLX6D-FKB/CLX6E-FKC/CLX6F-FKC/CLQ6A-TKW/CLQ6A-YKW/CLQ6A-FKW/CLR6A-TKW):



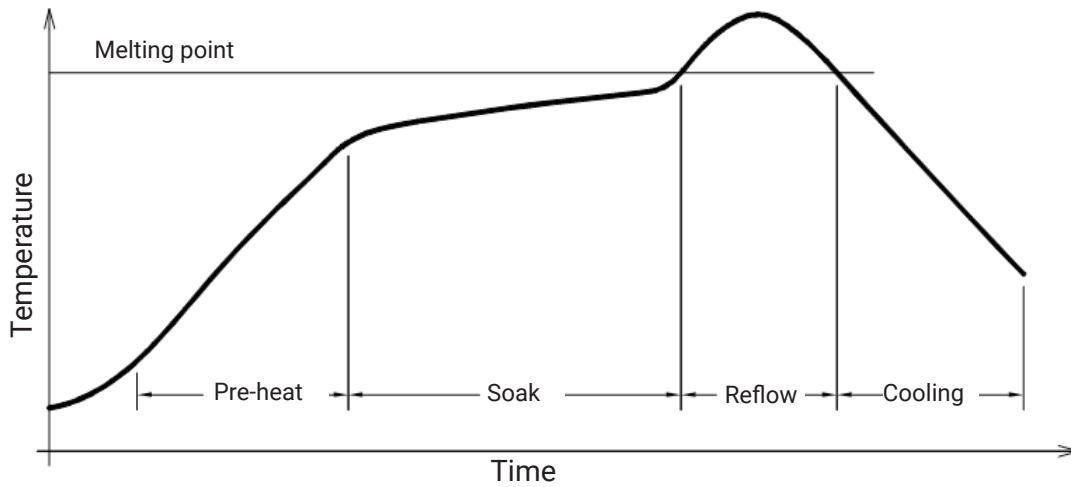
Solder	
Average ramp-up rate	4 °C/second max.
Preheat temperature	150 °C~200 °C
Preheat time	120 seconds max.
Ramp-down rate	6 °C/second max.
Peak temperature	250 °C max.
Time within 5 °C of peak temperature	10 seconds max.
Duration above 217 °C	60 seconds max.

- The temperature profile (2) is as below (for SMD LED CLMVB-DKA/CLMVB-FKA/CLMVC-FKA/CLMVC-FKC/CLMUC-FKA/CLMUD-FKA/CLP6C-FKB/CLV1S-FKB/CLV6A-FKB/CLX6A-FKB/CLVBA-FKA/CLY6C-FKC/CLY6D-FKC/CLYBA-FKA/CLYBB-FKA and other products not listed herein):



Solder	
Average ramp-up rate	4 °C/second max.
Preheat temperature	150 °C~200 °C
Preheat time	120 seconds max.
Ramp-down rate	6 °C/second max.
Peak temperature	235 °C max.
Time within 5 °C of peak temperature	10 seconds max.
Duration above 217 °C	45 seconds max.

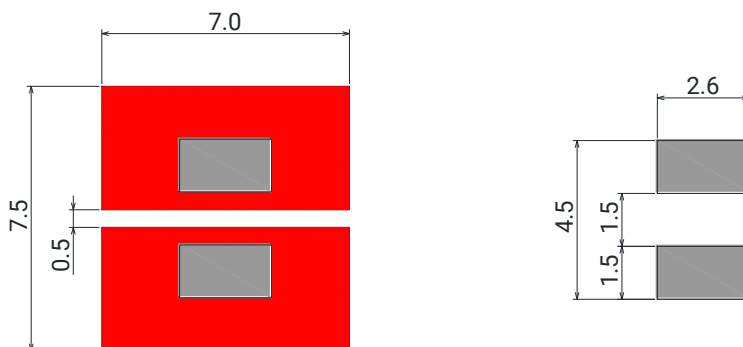
- The temperature profile (3) is as below (for UHD1110-FKA products):



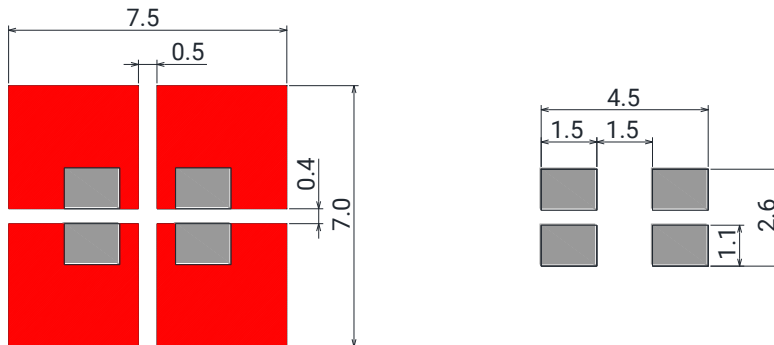
Solder	
Average ramp-up rate	4 °C/second max.
Preheat time	120 seconds max.
Soak temperature	155 °C - 175 °C
Soak time	60-100 seconds max.
Peak temperature	235 °C - 245 °C max.
Duration above 217 °C	60 seconds max.
Ramp-down rate	6 °C/second max.

The units in the graphs below are in millimeters (mm).

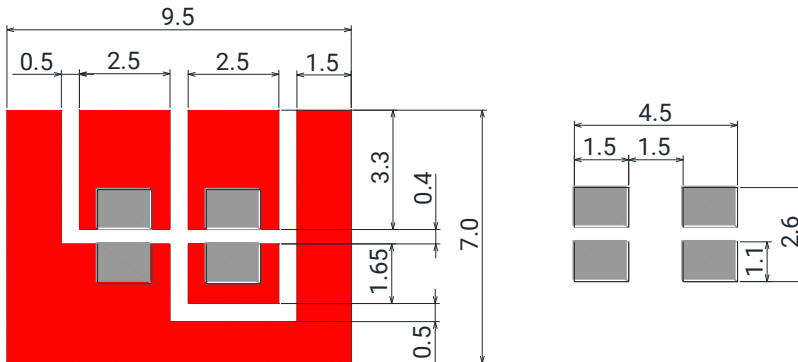
**LM1 series** recommended solder-pad design for heat dissipation:



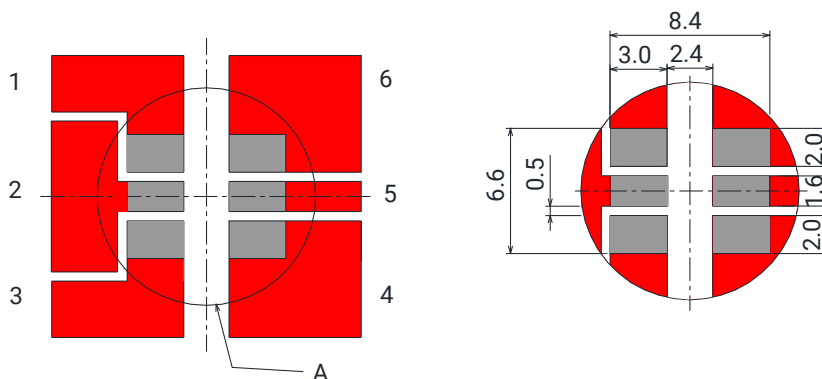
**LM4 & LM2 series** recommended solder-pad design for heat dissipation:



**LV1 & LA1 & LVB series** recommended solder-pad design for heat dissipation:

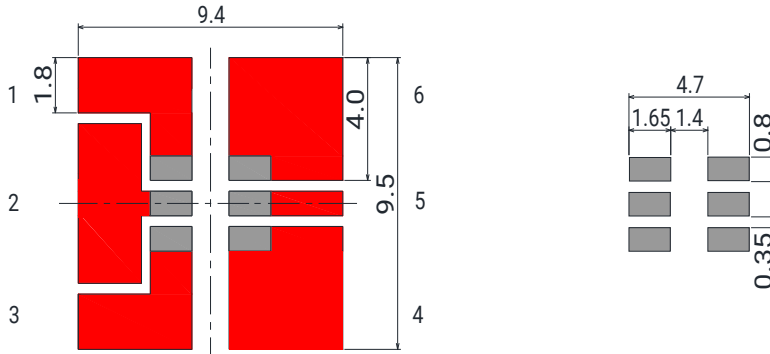


**LP6 series** recommended solder-pad design for heat dissipation:



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

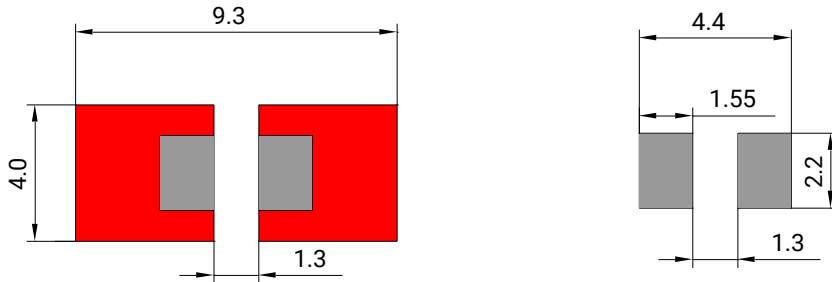
**LU6 series** recommended solder-pad design for heat dissipation:



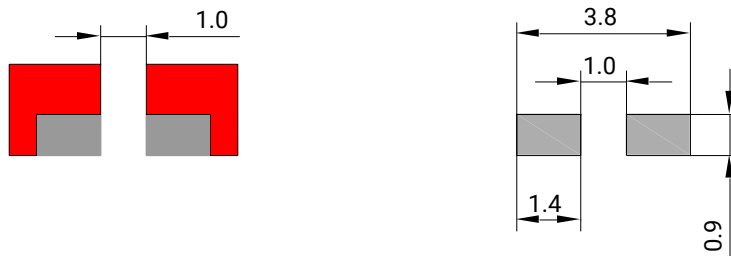
**Note**

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

**Small-top SMD LM3 series** recommended solder-pad design for heat dissipation:

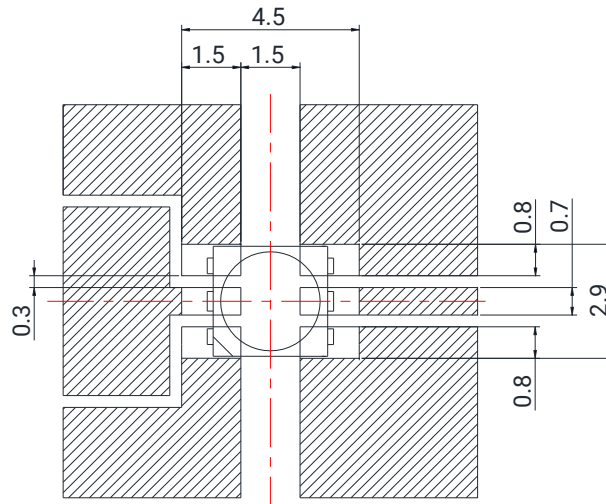


**Mini side 0.8-mm SMD LS8 series** recommended solder-pad design for heat dissipation:

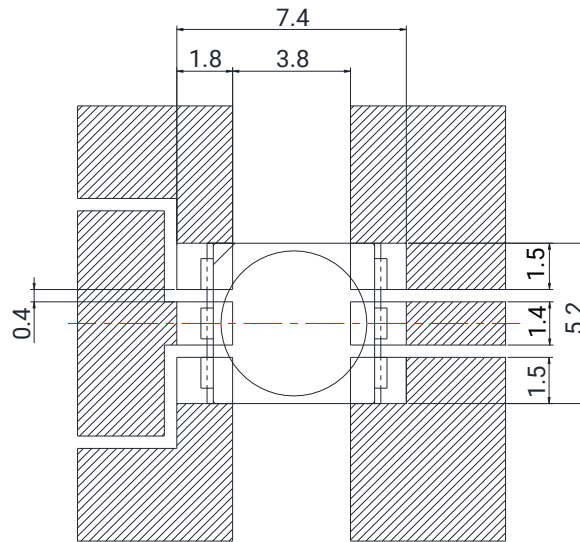




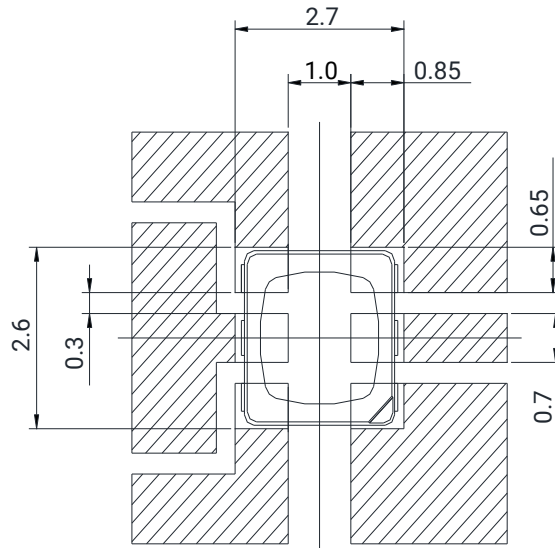
**LA6 series** recommended solder-pad design for heat dissipation:



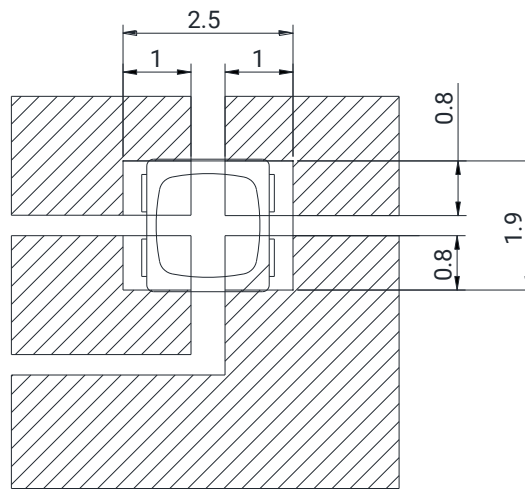
**LB6 series** recommended solder-pad design for heat dissipation:



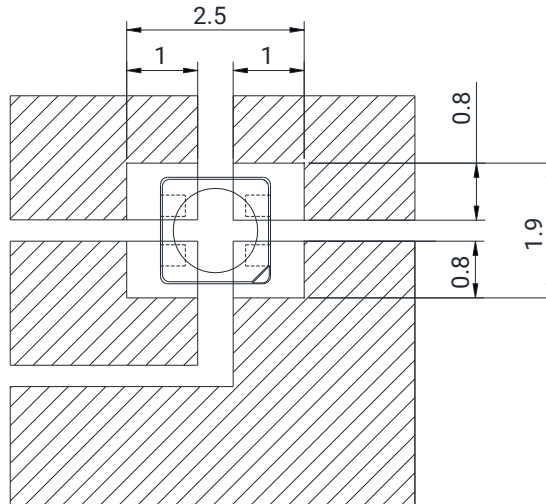
**LT6 series** recommended solder-pad design for heat dissipation:



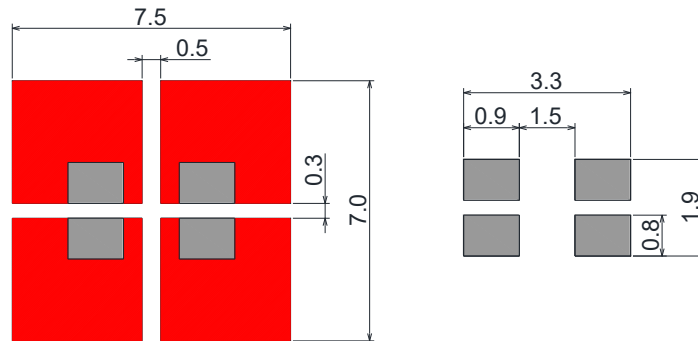
**LMV series** recommended solder-pad design for heat dissipation:



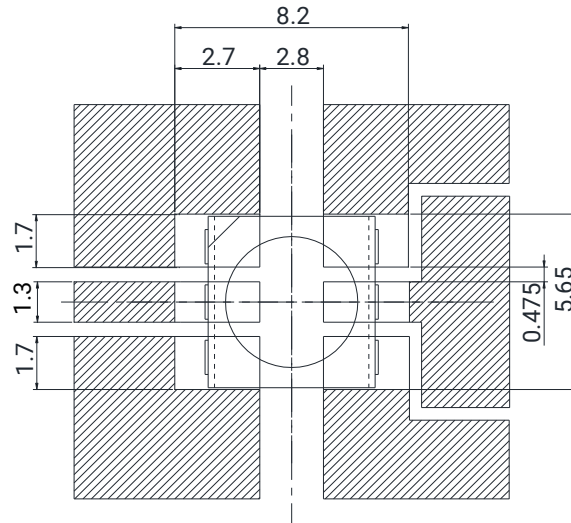
**LMU series** recommended solder-pad design for heat dissipation:



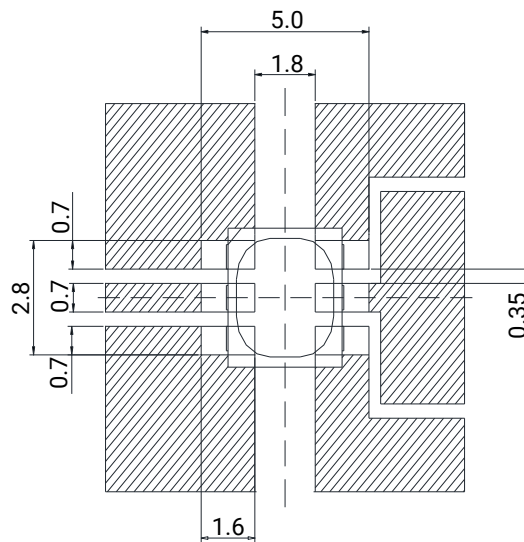
**LMX series** recommended solder pad design for heat dissipation:



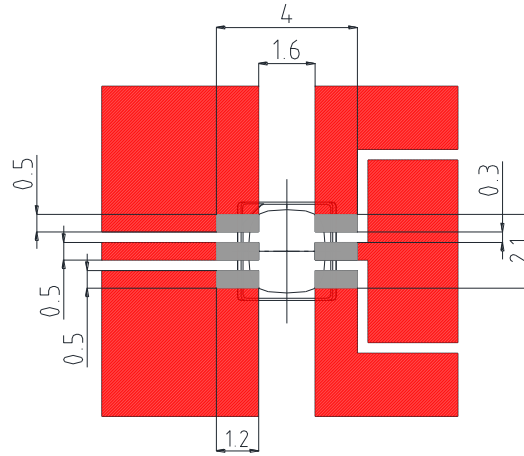
**LV6 series** recommended solder-pad design for heat dissipation:



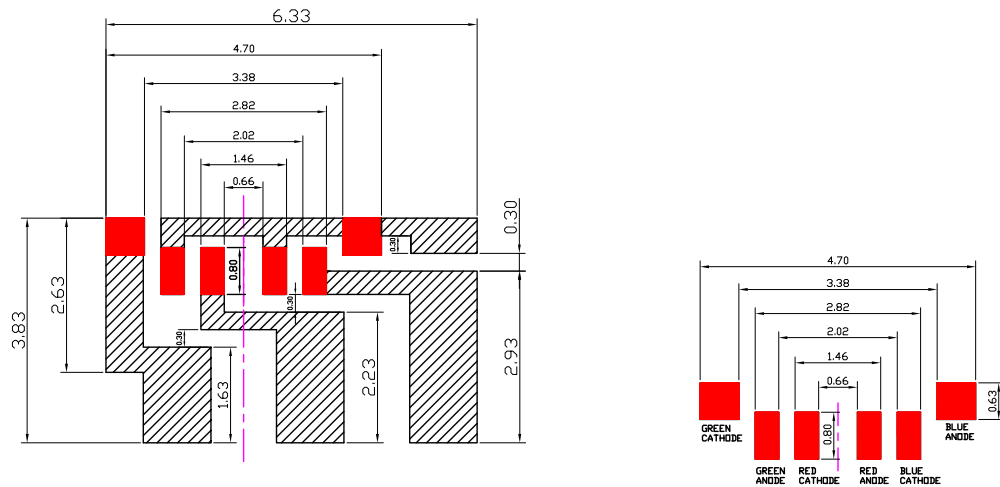
**LX6 series** recommended solder-pad design for heat dissipation:



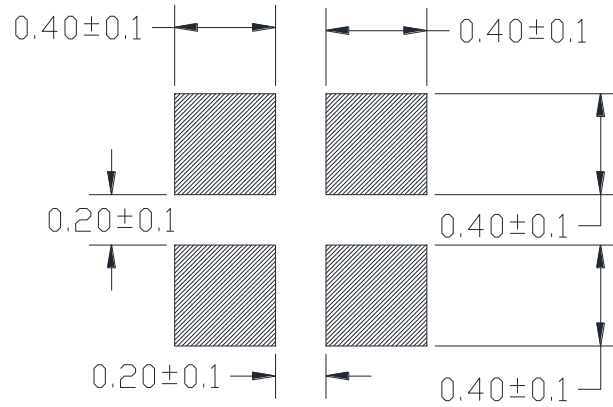
**LY6 series** recommended solder-pad design for heat dissipation:



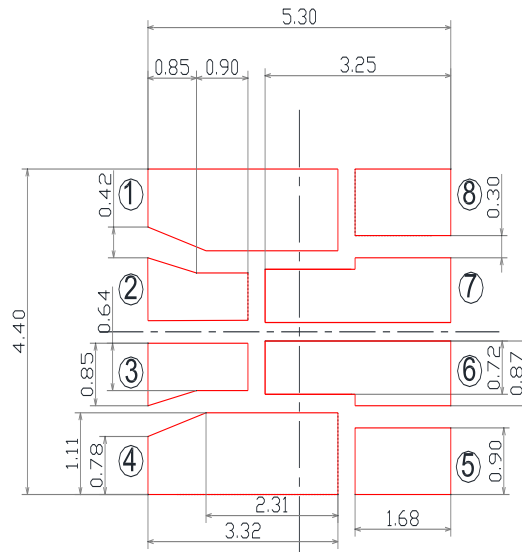
**LS6 series** recommended solder pad design for heat dissipation:



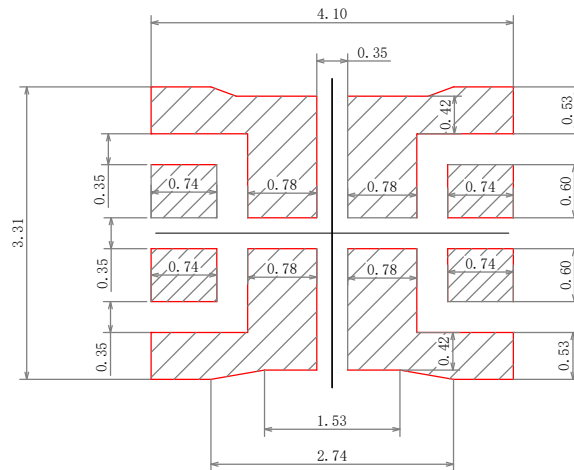
**UHD1110-FKA** recommended solder pad design for heat dissipation:



**LQ6 series** recommended solder pad design for heat dissipation:



**LR6 series** recommended solder pad design for heat dissipation:



**Assembly notes:**

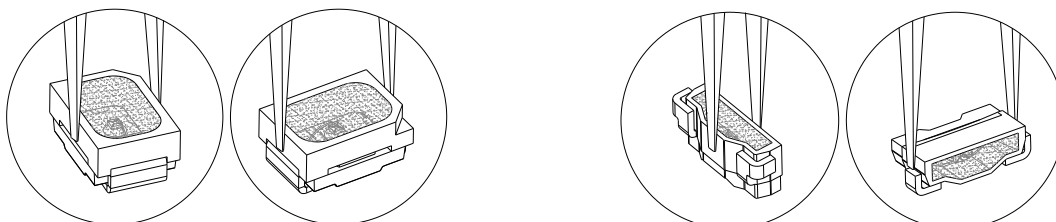
- Modification of an SMD LED is not recommended after soldering. If modification cannot be avoided, the modifications must be pre-qualified to avoid damaging the SMD LED.
- Reflow soldering should not be done more than two times (according to model's MSL requirements).
- No stress should be exerted on the package during soldering.
- The package may be affected by environments & assemblies which contain corrosive substance. Please avoid conditions which may cause the LEDs to corrode, tarnish or discolor.
- The PCB should not be wrapped after soldering to allow natural cooling down to 40°.

**5. Important Notes (Small-top, Mini-side 0.8-mm SMD Products and UHD1110-FKA)**

- 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, take special care when picking up these products. The following two methods are necessary:

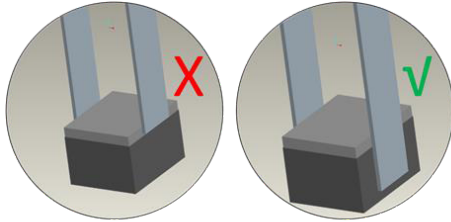
Fig. 1a: For Small Top SMD

Fig. 1b: For Mini-side 0.8 mm SMD



For UHD1110-FKA, touch the package by hand is not suggested and avoid scratch on device surface:

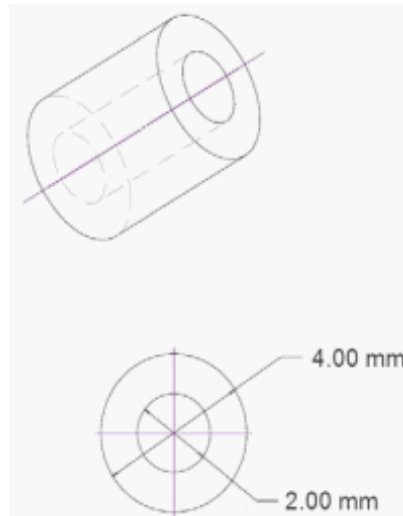
Fig. 1c: For UHD1110-FKA



- SMT nozzle

For example: CLA1B

For silicone-covered SMD LEDs, it is recommended to use non-metallic nozzles. Cree and several of Cree's customers have had success using nozzles fabricated from Teflon or from 90d urethane.





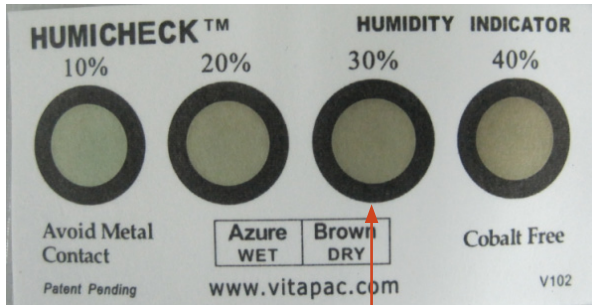
- Items to notice before opening the bag:
  1. Check the shelf life (counting from the FQC stamping date on the product label). If the shelf life is over 12 months, re-baking is required.
  2. Record the lot number of the SMD product to aid investigation.



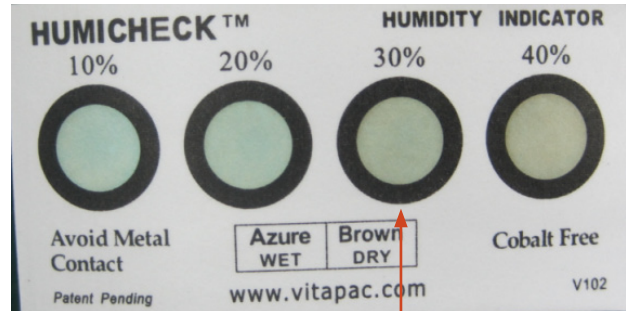
3. Avoid external damage to the packaging bag after product is taken out of the box. For example, many SMD products are stacked without box; re-packing with bubble plastic bag for protection is recommended.
4. Recommendation for product opening and storage: use scissors to cut the bag along the sealing mark in order to re-pack conveniently for product not to be used within the MSL level floor time.



- Items to notice after opening the bag:
  1. Check the color of the humidity-indication card (30% RH) at the time of opening the vacuum-sealed bag. If the color is slight green or blue, baking is required before use.



Normal



Color change

2. Record the date and time on the reel.



3. The product should be used within the MSL level floor time.
  4. If SMD products can't be used within the MSL level floor time, they should be re-packed in a vacuum-sealed bag. Before attempting to use again, baking is required.
- Baking is required when the following conditions occur:
    1. Shelf life has expired (over 12 months).
    2. The vacuum-sealed bag has an air leak.
    3. The humidity-indication card has color change at 30% RH at the time of opening the vacuum-sealed bag.
    4. The vacuum-sealed bag has been opened, but the steps listed under "Notice items after opening the bag" (above) have not been followed.

- Baking method:
  1. The SMD LED should not be baked within the packaging bag. The baking condition is 75°C, +/-5 °C with a maximum temperature of 80°C for 24 hours. The oven door should not be opened frequently during the baking process.
  2. Refer to the photo below for a baking model that can help avoid reel deformation.



For small reels



For large reels

3. Baked products should cool down to 40 °C in the oven before being removed for use.

## 6. Electrostatic Discharge and Electrical Overstress

- Electrostatic discharge (ESD) or electrical overstress (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 electrical overstress during circuit 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 included in each product specification.

**8. SMD Screen Product Moisture Sensitivity Level**

Product Family	P/N	Moisture Sensitivity Level
SMD LEDs	CLA1 series	5a
	CLA2 series	
	CLM1 series	
	CLM2 series	
	CLM3 series	
	CLM4 series	
	CLMU series	
	CLMV series	
	CLMX series	
	CLP6 series	
	CLS8 series	
	CLU6 series	
	CLV1 series	
	CLV6 series	
	CLVB series	
	CLX6 series	
	CLY6 series	
	CLYB series	
CLQ6 series		
CLR6 series		
UHD1110 series		

The information in this document is subject to change without notice.