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

Description
Generally, LEDs 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

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
   • 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. Storage
   • 25 °C and <40% RH in proper package

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

<table>
<thead>
<tr>
<th></th>
<th>Solder Dipping</th>
</tr>
</thead>
<tbody>
<tr>
<td>Soldering iron</td>
<td>35 W max</td>
</tr>
<tr>
<td>Temperature</td>
<td>300 ºC max</td>
</tr>
<tr>
<td>Soldering time</td>
<td>3 seconds max</td>
</tr>
<tr>
<td>Position</td>
<td>Not less than 3 mm from the base of the package.</td>
</tr>
</tbody>
</table>

## Solder Dipping

<table>
<thead>
<tr>
<th></th>
<th>Preheat</th>
</tr>
</thead>
<tbody>
<tr>
<td>Preheat time</td>
<td>60 seconds max</td>
</tr>
<tr>
<td>Solder-bath temperature</td>
<td>260 ºC Max</td>
</tr>
<tr>
<td>Dipping time</td>
<td>5 seconds max</td>
</tr>
<tr>
<td>Position</td>
<td>Not less than 3 mm from the base of the package.</td>
</tr>
</tbody>
</table>

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

![Wave Soldering Diagram](image)

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.
- The LEDs must not be re used once they have been extracted from PCB.
- After LED soldering, the package should be protected against mechanical shock or vibration until the LEDs have reached 40 ºC 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 is exerted on the LEDs.
- Lead cutting must be performed at normal room temperature. Lead cutting at an elevated temperature may lead to LED failures.
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. 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 the LED 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.

7. Other Notes

- 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

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 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

- Do not open the sealed bag before you are ready to use the products.
• Shelf life in the original sealed bag at the storage condition of ≤40 °C and ≤90% RH is 12 months. Baking is required whenever shelf life is expired.

• Before opening the sealed bag, please check whether or not the bag leaked air.

• After opening the sealed bag, the SMD LED must be stored under the condition < 30 °C and < 60% RH. Under these conditions, the SMD LEDs must be used (subject to reflow) within 24 hours after bag opening, and baking is required when exceeding 24 hours.

• For baking, place the SMD LEDs in an oven at 80 °C ±5 °C and relative humidity <=10% RH for 24 hours.

• Take the material out of the packaging bag for re-bake. Do not open the oven door frequently during the baking process.

• Please refer to the product specifications for more detailed information.

4. Soldering

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 at below 315 °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 °C or less. This is to prevent LED failures due to thermal-mechanical stress during handling.

Reflow Soldering

• The temperature profile (1) is as below (for SMD LED CLV1A-FKB/CLV1L-FKB/CLV6B-FKB/CLV6D-FKB/CLX6B-FKC/CLX6C-FKB/CLX6D-FKB/CLX6E-FKC/CLX6F-FKC/CLY6C-FKC/CLY6D-FKC/CLYBA-FKA):

![Temperature-Time Graph](image-url)
Solder

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average ramp-up rate</td>
<td>4 °C/second max.</td>
</tr>
<tr>
<td>Preheat temperature</td>
<td>150 °C~200 °C</td>
</tr>
<tr>
<td>Preheat time</td>
<td>120 seconds max.</td>
</tr>
<tr>
<td>Ramp-down rate</td>
<td>6 °C/second max.</td>
</tr>
<tr>
<td>Peak temperature</td>
<td>250 °C max.</td>
</tr>
<tr>
<td>Time within 5 °C of peak temperature</td>
<td>10 seconds max.</td>
</tr>
<tr>
<td>Duration above 217 °C</td>
<td>60 seconds max.</td>
</tr>
</tbody>
</table>

- The temperature profile (2) is as below (for SMD LED CLMVB-DKA/CLMVB-FKA/CLMVC-FKA/CLMUC-FKA/CLP6CFKB/CLV1S-FKB/CLV6A-FKB/CLX6A-FKB/CLVBA-FKA and other products not listed herein):

```plaintext
Solder

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average ramp-up rate</td>
<td>4 °C/s max.</td>
</tr>
<tr>
<td>Preheat temperature</td>
<td>150 °C~200 °C</td>
</tr>
<tr>
<td>Preheat time</td>
<td>120 seconds max.</td>
</tr>
<tr>
<td>Ramp-down rate</td>
<td>6 °C/s max.</td>
</tr>
<tr>
<td>Peak temperature</td>
<td>235 °C max.</td>
</tr>
<tr>
<td>Time within 5 °C of peak temperature</td>
<td>10 seconds max.</td>
</tr>
<tr>
<td>Duration above 217 °C</td>
<td>45 seconds max.</td>
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</tbody>
</table>
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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 mm² 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 mm² 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:

![LT6 series diagram](image1.png)

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

![LMV series diagram](image2.png)
**LMU series** recommended solder-pad design for heat dissipation:

![LMU series diagram]

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

![LV6 series diagram]
**LX6 series** recommended solder-pad design for heat dissipation:

![LX6 series diagram](image)

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

![LY6 series diagram](image)
• 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 to allow natural cooling down to 40°.

5. Important Notes (Small-top and Mini-side 0.8-mm 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, 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

• SMD 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. Before opening the vacuum-sealed bag, check for air leakage.

5. 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 24 hours.
• 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 usage.

![Humidity Indication Card](image1)

2. Record the date and time on the reel.

3. The product should be used within 24 hours.

4. If SMD products can't be used within 24 hours, 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 change color 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 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.
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 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 included in each product specification.
8. SMD Screen Product Moisture Sensitivity Level

<table>
<thead>
<tr>
<th>Product Family</th>
<th>P/N</th>
<th>Moisture Sensitivity Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>SMD LEDs</td>
<td>CLMVBDKA</td>
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<tr>
<td></td>
<td>CLMVBFKA</td>
<td></td>
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<td></td>
<td>CLMVCFKA</td>
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<tr>
<td></td>
<td>CLV1LFKB</td>
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<td>CLV1SFKB</td>
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<td></td>
<td>CLVBAFKA</td>
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The information in this document is subject to change without notice.