

Cree® XLamp® MX Family LEDs



INTRODUCTION

This application note applies to the XLamp MX Family of LEDs, which have order codes in the following format:

MX6xxx-xx-xxxx-xxxxxx
 MX3xxx-xx-xxxx-xxxxxx

This application note explains how XLamp MX Family of LEDs and assemblies containing these LEDs should be handled during manufacturing. Please read the entire document to understand how to properly handle XLamp MX LEDs.

TABLE OF CONTENTS

Handling XLamp MX Family LEDs	2
Circuit Board Preparation & Layouts	3
Case Temperature (T _s) Measurement Point	4
Notes on Soldering XLamp MX Family LEDs	5
Moisture Sensitivity	6
XLamp MX Family LED Reflow Soldering Characteristics	7
Chemicals & Conformal Coatings	8
Assembly Storage & Handling.....	9
Tape and Reel	10
Packaging & Labels	11

HANDLING XLAMP MX FAMILY LEDs

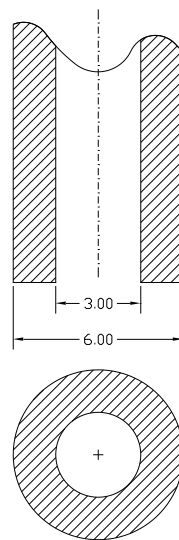
When handling XLamp MX LEDs or assemblies containing these LEDs, never touch the optical surface with fingers or sharp objects. The LED surface could be soiled or damaged, which could affect the optical performance of the LED.

Whenever possible, Cree recommends the use of a pick & place tool to remove the XLamp MX LEDs from the factory tape & reel packaging.

Pick & Place Nozzle

For pick and place nozzles coming into contact with silicone-covered LED components, Cree recommends nozzles be constructed of non-metallic materials. Cree and several of Cree’s customers have had good success using nozzles fabricated from Teflon or from 90d urethane.

Cree recommends the pickup tool shown below for XLamp MX Family of LEDs.

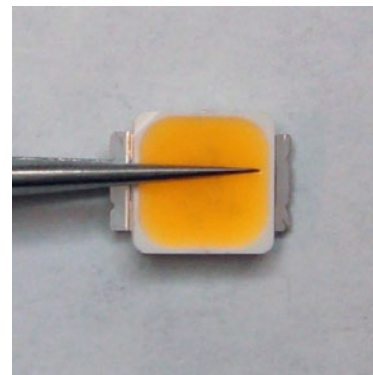
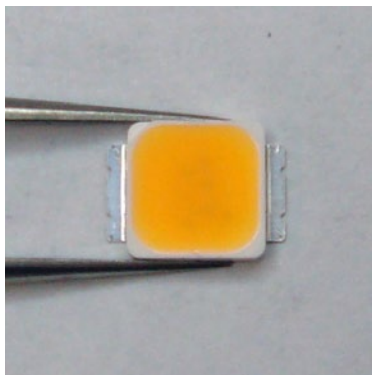


All dimensions in mm.

Manual Handling

Use tweezers to grasp the XLamp MX LEDs at the base. Do not touch the top surface of the LED with tweezers.

✓
CORRECT

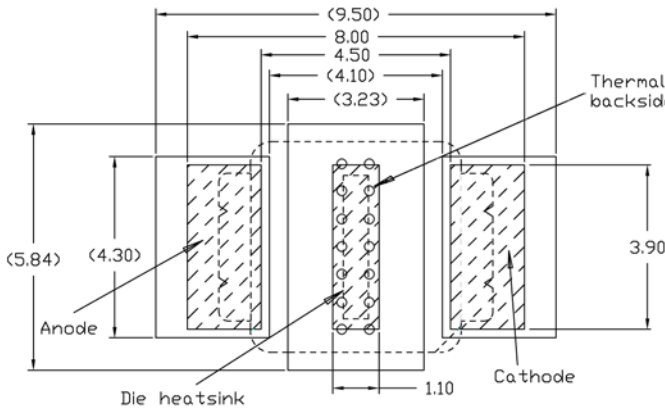


✗
WRONG

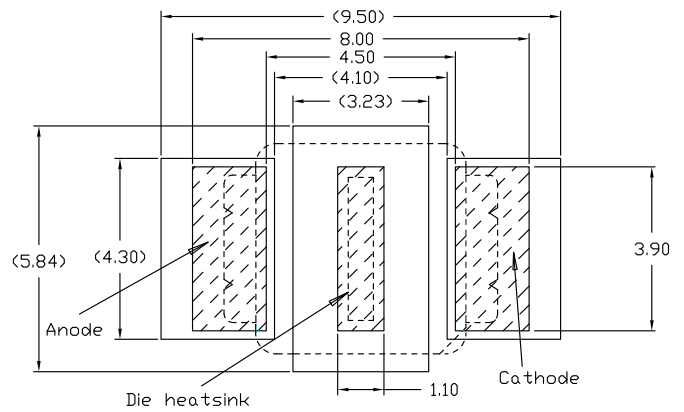
CIRCUIT BOARD PREPARATION & LAYOUTS

Printed circuit boards (PCBs) should be prepared and/or cleaned according to the manufacturer’s specifications before placing or soldering XLamp MX LEDs onto the PCB.

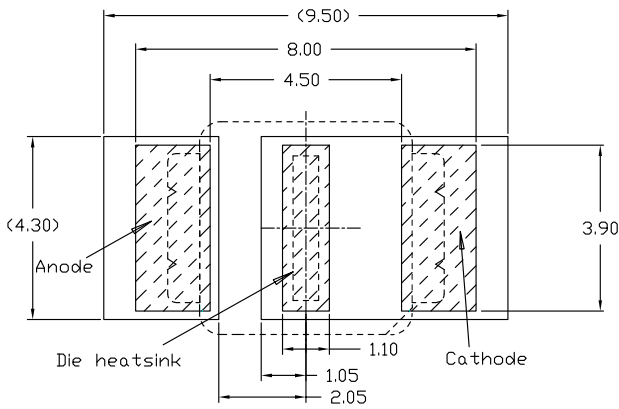
The diagram below shows the recommended PCB solder pad layout for XLamp MX Family of LEDs.



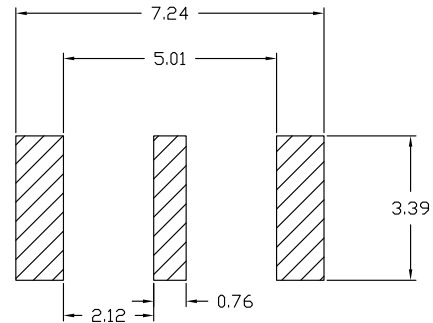
Recommended FR4 Solder Pad



Recommended MCPCB Solder Pad



Alternative Solder Pad



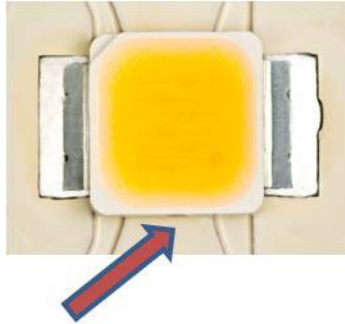
Recommended Stencil Pattern
(Hatched Area Is Opening)

All dimensions in mm

For additional information about FR4 thermal vias, illustrated above, consult Cree Application Note CLD-AP37, “Optimizing PCB Thermal Performance for Cree XLamp LEDs.”

CASE TEMPERATURE (T_s) MEASUREMENT POINT

XLamp MX LED case temperature (T_s) should be measured on the PCB surface, as close to the LED's thermal pad as possible. This measurement point is shown in the picture below.



It is not required to use a solder footprint for the thermal pad that is larger than the XLamp MX LED itself. In testing, Cree has found such a solder pad to have insignificant impact on the resulting T_s measurement.

NOTES ON SOLDERING XLAMP MX FAMILY LEDs

The XLamp MX Family of LEDs are designed to be reflow soldered to a PCB. Reflow soldering may be done by a reflow oven or by placing the PCB on a hotplate and following the reflow soldering profile listed in the XLamp MX Family LED Reflow Soldering Characteristics section (page 7).

Do not wave-solder XLamp MX LEDs. Do not hand-solder XLamp MX LEDs. N2 reflow is recommended.

✓
CORRECT



✓
CORRECT



⊘
WRONG

Solder-Paste Type

Cree strongly recommends using “no clean” solder paste with XLamp MX LEDs so that cleaning the PCB after reflow soldering is not required. Cree uses the following solder paste internally:

Indium Corporation of America® Part number 82676

- Sn62/Pb36/Ag2 composition
- Flux: NC-SMQ92J

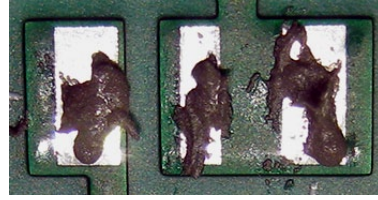
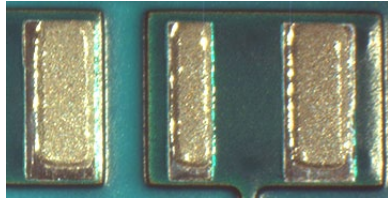
Cree recommends the following solder paste compositions: SnPbAg, SnAgCu and SnAg.

NOTES ON SOLDERING XLAMP MX FAMILY LEDS (CONTINUED)

Solder Paste Thickness

The choice of solder and the application method will dictate the specific amount of solder. For the most consistent results, an automated dispensing system or a solder stencil printer is recommended. Cree has seen positive results using solder thickness that results in a 3-mil (75-µm) bond line.

✓
CORRECT



⊘
WRONG

After Soldering

After soldering, allow XLamp MX LEDs to return to room temperature before subsequent handling. Premature handling of the device could result in damage to the LED.

Cree recommends verifying the solder process by checking the consistency of the solder bond of several trial PCBs after reflow. After shearing selected devices from the circuit board the solder should appear completely re-flown (no solder grains evident). The solder areas should show minimum evidence of voids on the backside of the package and the PCB.

Cleaning PCBs After Soldering

Cree recommends using “no clean” solder paste so that flux cleaning is not necessary after reflow soldering. If PCB cleaning is necessary, Cree recommends the use of isopropyl alcohol (IPA).

Do not use ultrasonic cleaning.

MOISTURE SENSITIVITY

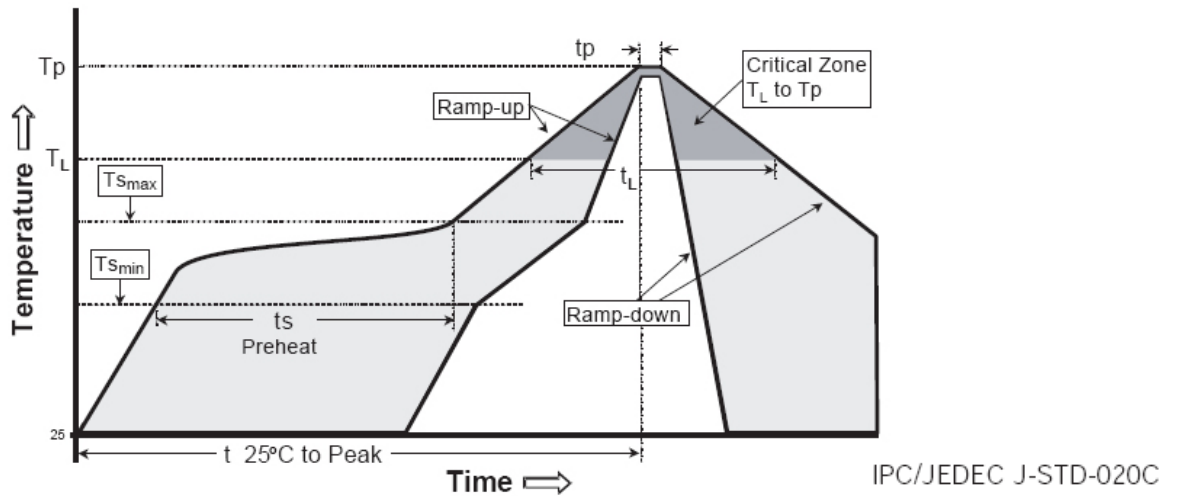
In testing, Cree has found XLamp MX Family of LEDs to have unlimited floor life in conditions ≤ 30 °C/85% relative humidity (RH). Moisture testing included a 168 hour soak at 85 °C/85% RH followed by 3 reflow cycles, with visual and electrical inspections at each stage.

Cree recommends keeping XLamp LEDs in their sealed moisture-barrier packaging until immediately prior to use. Cree also recommends returning any unused LEDs to the resealable moisture-barrier bag and closing the bag immediately after use.

XLAMP MX FAMILY LED REFLOW SOLDERING CHARACTERISTICS

In testing, Cree has found XLamp MX Family of LEDs to be compatible with JEDEC J-STD-020C, using the parameters listed below. As a general guideline, Cree recommends that users follow the recommended soldering profile provided by the manufacturer of solder paste used.

Note that this general guideline may not apply to all PCB designs and configurations of reflow soldering equipment.



Profile Feature	Lead-Based Solder	Lead-Free Solder
Average Ramp-Up Rate ($T_{s_{max}}$ to T_p)	3 °C/second max.	3 °C/second max.
Preheat: Temperature Min ($T_{s_{min}}$)	100 °C	150 °C
Preheat: Temperature Max ($T_{s_{max}}$)	150 °C	200 °C
Preheat: Time ($t_{s_{min}}$ to $t_{s_{max}}$)	60-120 seconds	60-180 seconds
Time Maintained Above: Temperature (T_L)	183 °C	217 °C
Time Maintained Above: Time (t_L)	60-150 seconds	60-150 seconds
Peak/Classification Temperature (T_p)	215 °C	260 °C
Time Within 5 °C of Actual Peak Temperature (t_p)	10-30 seconds	20-40 seconds
Ramp-Down Rate	6 °C/second max.	6 °C/second max.
Time 25 °C to Peak Temperature	6 minutes max.	8 minutes max.

Note: All temperatures refer to topside of the package, measured on the package body surface.

CHEMICALS & CONFORMAL COATINGS

In the sections below we list a representative list of chemicals and materials to be used or avoided in LED manufacturing activities. For a complete and current list of recommended chemicals, conformal coatings and harmful chemicals consult Cree's Chemical Compatibility Application Note (www.cree.com/products/pdf/XLamp_Chemical_Comp.pdf). You should also consult your regional Cree Field Applications Engineer.

Recommended Chemicals

In testing, Cree has found the following chemicals to be safe to use with XLamp MX LEDs.

- Water
- Isopropyl alcohol (IPA)
- Non-silicon thermal grease
- Arctic Silver & Arctic Alumina brand thermal grease
- Acrylic latex caulk

Recommended Conformal Coatings

In testing, Cree has found the following conformal coatings to be safe to use with the XLamp MX Family of LEDs. Conformal coating should not be applied directly to or over the LED lens, as this may affect LED optical performance and reliability.

- Dow Corning 3-1953
- Dow Corning 1-4105
- Dow Corning 1-2577
- Dymax 9-20557
- Humiseal 1H20AR1/S
- Humiseal UV40
- Humiseal 1B51NS
- Humiseal 1B73
- Humiseal 1C49LV
- Shat-R-Shield
- Specialty Coating Systems – Parylene

Chemicals Tested as Harmful

In testing, Cree has found the following chemicals to be harmful to the XLamp MX Family of LEDs. Cree recommends not using these chemicals anywhere in an LED system containing XLamp MX LEDs. The fumes from even small amounts of these chemicals may damage the LEDs.

- Chemicals that might outgas aromatic hydrocarbons (e.g., toluene, benzene, xylene)
- Methyl acetate or ethyl acetate (i.e., nail polish remover)
- Cyanoacrylates (i.e., "Superglue")
- Glycol ethers (including Radio Shack® Precision Electronics Cleaner - dipropylene glycol monomethyl ether)
- Formaldehyde or butadiene (including Ashland PLIOBOND® adhesive)
- Dymax 984-LVUF conformal coating
- Loctite Sumo Glue
- Gorilla Glue
- Clorox bleach
- Clorox Clean-Up Cleaner spray
- Loctite 384 adhesive
- Loctite 7387 activator
- Loctite 242 threadlocker

Potential of Silver Tarnishing

XLamp MX LEDs contain silver plated parts that may tarnish (turn black) over time when exposed to oxidizing substances such as sulfur, chlorine, or other halogen compounds. Oxidation of the leads can reduce the ability to make a good solder connection and affect the light output of the LED. Exposure to oxidizing substances can come from materials used near the LED during manufacturing or from the air around the LEDs during storage.

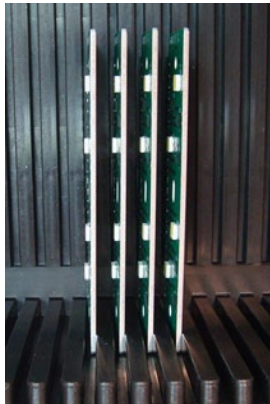
To reduce the potential of tarnishing for XLamp MX LEDs, Cree recommends that customers minimize exposure of the LEDs to oxidizing substances at all times, including storage, manufacturing and product testing. Potential sources of oxidizing substances include paper, air filters, some cleaning chemicals, cardboard boxes and rubber anti-static mats.

ASSEMBLY STORAGE & HANDLING

Do not stack PCBs or assemblies containing XLamp MX Family of LEDs. PCBs or assemblies containing XLamp MX Family of LEDs should be stacked in a way to allow at least 2-cm clearance.

Do not use bubble wrap directly on top of XLamp MX Family of LEDs. Force from the bubble wrap can potentially damage the LED.

✓
CORRECT



✓
CORRECT



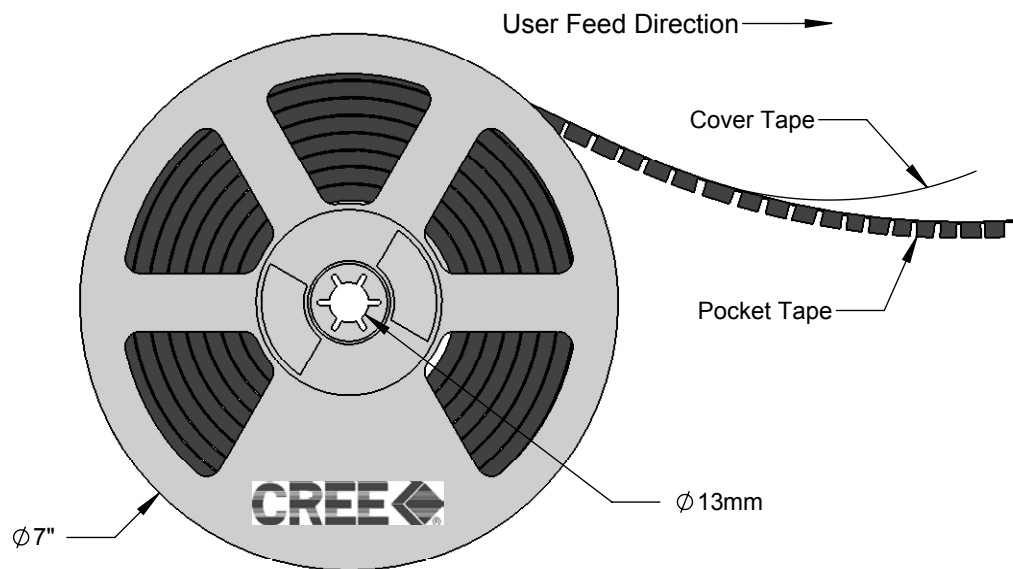
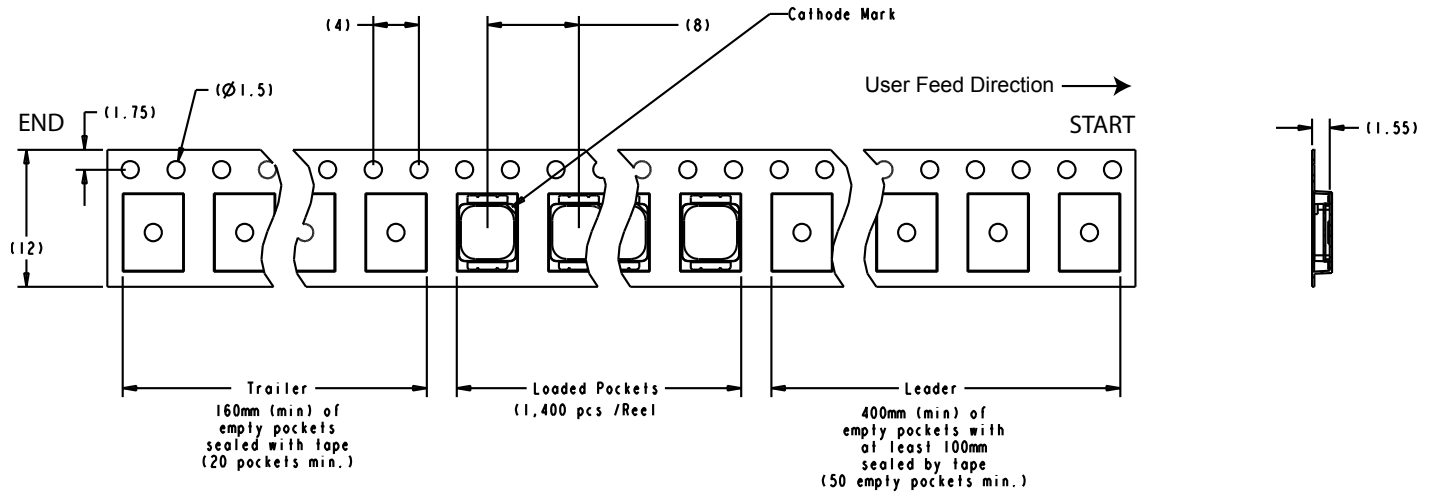
✗
WRONG



TAPE AND REEL

All Cree carrier tapes conform to EIA-481D, Automated Component Handling Systems Standard.

All dimensions in mm.



PACKAGING & LABELS

The diagrams below show the packaging and labels Cree will use to ship XLamp MX LEDs. XLamp MX LEDs are shipped in tape loaded on a reel. Each moisture barrier bag contains only one reel. Each box may contain multiple reels.

