

Cree® XLamp® CXA Family LEDs



INTRODUCTION

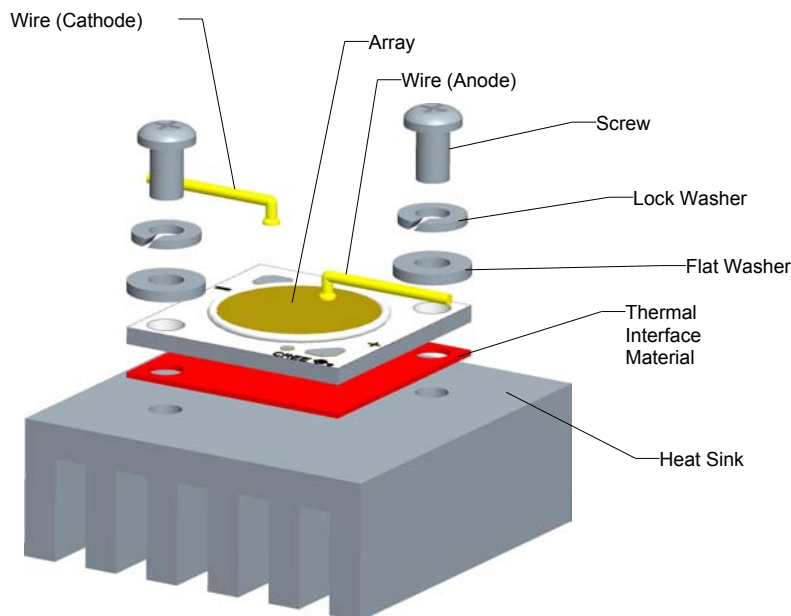
This application note applies to XLamp CXA family LEDs which have order codes in the following format:

CXAXXXX-XXXX-XXXXXXXXXX

This application note explains how XLamp CXA LEDs and assemblies containing XLamp CXA LEDs should be handled during manufacturing. In general, CXA LEDs are attached directly to a heatsink and discrete wires are used to deliver power to the LED, as illustrated below. Please read this entire document to understand how to properly handle XLamp CXA family LEDs.

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HANDLING XLAMP CXA FAMILY LEDs

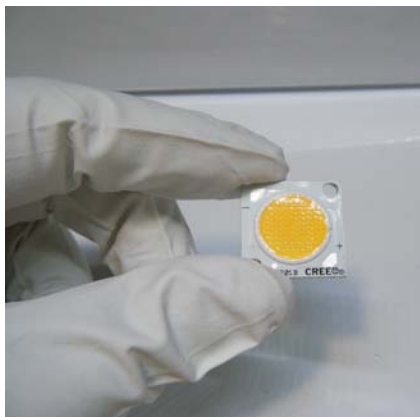
Cree recommends the following at all times when handling XLamp CXA LEDs or assemblies containing XLamp CXA LEDs:

- Avoid putting mechanical stress on the LED.
- 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
- In low-humidity work environments, Cree recommends always handling CXA family LEDs with appropriate ESD grounding.
- Cree recommends handling CXA family LEDs wearing powderless latex gloves.

Manual Handling

Do not touch the lens with fingers. Do not push on the lens.

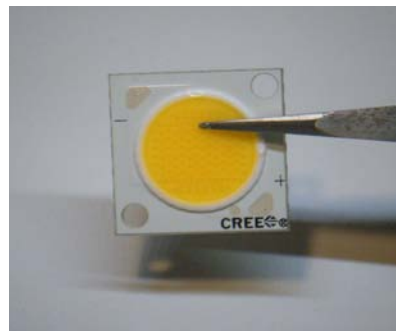
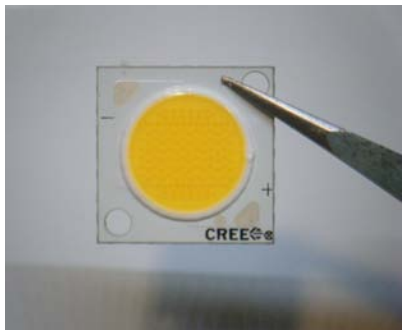
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When using tweezers to handle XLamp CXA LEDs, do not touch the lens with the tweezers.

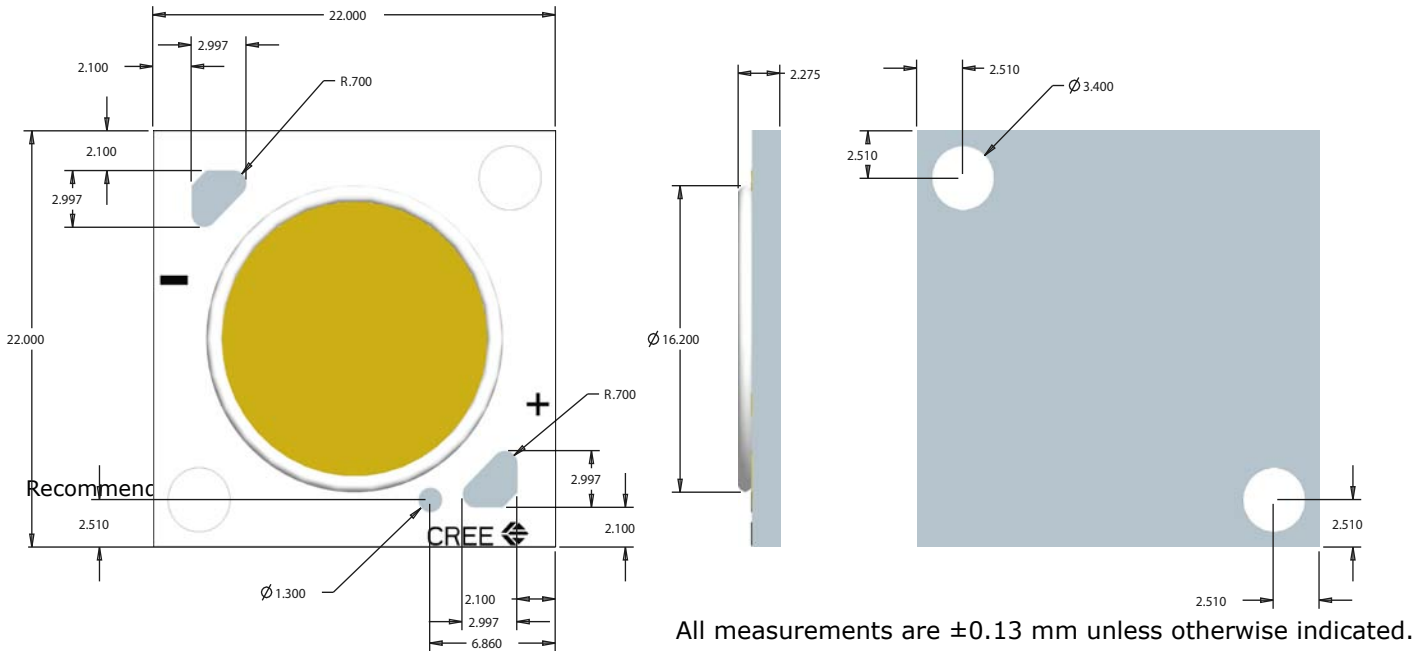
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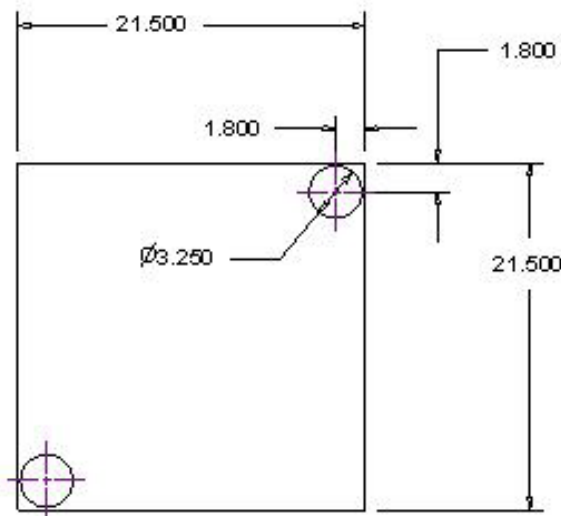
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HEAT SINK, LAYOUT, THERMAL INTERFACE

In order to insure effective thermal management for CXA LEDs, Cree recommends the CXA LED be attached to an appropriately sized heat sink, dependent on drive voltage, current and intended operating environment. Attachment is most often accomplished by inserting a pad of thermal interface material (TIM), thermally conductive epoxy, or thermal grease between the CXA LED and heat sink. The diagram below shows mechanical information on the CXA20XX package.



Depending on the characteristics of the TIM the stencil pattern for the materials is below.



CXA family LEDs and thermal interface materials are secured either by the pair of diagonally opposite screw holes or by the use of an LED holder (see section on LED Connectors). When using the screw holes to secure CXA LEDs, Cree recommends #4 (/40) or M2.5 screws. Among other factors, appropriate screw torque is dependent on the thickness, size and type of thermal interface material, the planarity of these materials as well as that of the heat sink. Representative vendors of Thermal Interface Materials include 3M, GrafTech, Laird, Lord and others. To prevent loosening of screws during vibration or thermal cycles, Cree recommends non-conductive lock washers or self-locking fasteners. Cree DOES NOT RECOMMEND the use of chemical thread lockers to secure CXA LEDs as several of these compounds have been shown to be chemically incompatible with LEDs.

CASE TEMPERATURE (T_s) MEASUREMENT POINT

XLamp CXA LEDs case temperature (T_s) can be measured at the designated case temperature measurement point, immediately adjacent to the anode or plus (+) solder pad. This measurement point is shown in the picture below. Cree recommends attaching the thermocouple with conductive epoxy.



NOTES ON SOLDERING XLAMP CXA LEDs

XLamp CXA family LEDs are designed for wire-attach soldering. Cree recommends the use of a temperature controlled soldering iron with solder tip on the order of 0.07" (1.8 mm). Cree personnel have had success using temperature controlled soldering equipment held at 750 °F (399 °C) and working with a variety of lead-free solders. Cree makes no specific soldering recommendations because there are so many variables in the system of heat sink, LED, solder and solder gun. After soldering, allow XLamp CXA2011 LEDs to return to room temperature before subsequent handling. Premature handling of the device could result in damage to the solder joints.

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Solder Paste Type

Cree strongly recommends using “no clean” solder paste with XLamp CXA2011 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.

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 post reflow 3-mil (75-µm) bond line.

NOTES ON CXA LED CONNECTORS

A number of manufacturing firms have developed or are developing connectors to simplify the mechanical and electrical attachment of the CXA family of LEDs. For example Molex (www.molex.com) has developed the LED Array Holder for Cree XLamp CXA20XX Arrays with and without a lens cover¹. For additional information see the product page in the footnote below.



¹ http://www.molex.com/molex/products/datasheet.jsp?part=active/1802200000_SOLID_STATE_LIGHTI.xml&channel=Products

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 CXA family LEDs.

- Water
- Isopropyl alcohol (IPA)
- Non-silicon thermal grease
- Arctic Silver® & Arctic Alumina™ brand thermal adhesive
- 3M™ Scotch™-Weld epoxy adhesive DP-190 (polymeric diamante, kaolin)

Recommended Conformal Coatings

In testing, Cree has found the following conformal coatings to be safe to use with XLamp CXA family 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 XLamp CXA family LEDs. Cree recommends not using these chemicals anywhere in an LED system containing XLamp CXA family LEDs. The fumes from even small amounts of these chemicals may damage the LEDs.

- Chemicals that might outgas hydrocarbons (e.g., toluene, benzene, xylene)
- Methyl acetate or ethyl acetate (ie., 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
- Loctite 384 adhesive
- Loctite 7387 activator
- Loctite 242 threadlocker

Potential of Silver Tarnishing

XLamp CXA family 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.

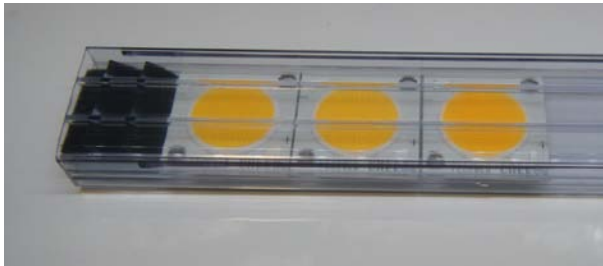
To reduce the potential of tarnishing for XLamp CXA family LEDs, Cree recommends that customers minimize exposure of the LEDs to oxidizing substances at all times, including storage, manufacturing and product testing. Potential sources of oxidizing substances include paper, air filters, some cleaning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

ASSEMBLY STORAGE & HANDLING

Do not stack assemblies containing XLamp CXA family LEDs so that anything rests on the LED lens. Force applied to the LED lens may result in the lens being damaged. Assemblies containing XLamp CXA family LEDs should be stacked in a way to allow at least 2 cm clearance above the LED.

Do not use bubble wrap directly on top of the XLamp CXA family LEDs. Force transferred through the bubble wrap can potentially damage the LED.

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PACKAGING

Cree CXA2011 LEDs are packaged in tubes of 20, which are then combined in boxes of 5 tubes, or 100 LEDs. Boxes of 100 LEDs are of the same performance bin.

