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-XXXXXXXXX

This application note explains how XLamp CXA family LEDs and assemblies containing these LEDs should be handled during manufacturing. Please read this entire document to understand how to properly handle XLamp CXA family LEDs.

TABLE OF CONTENTS

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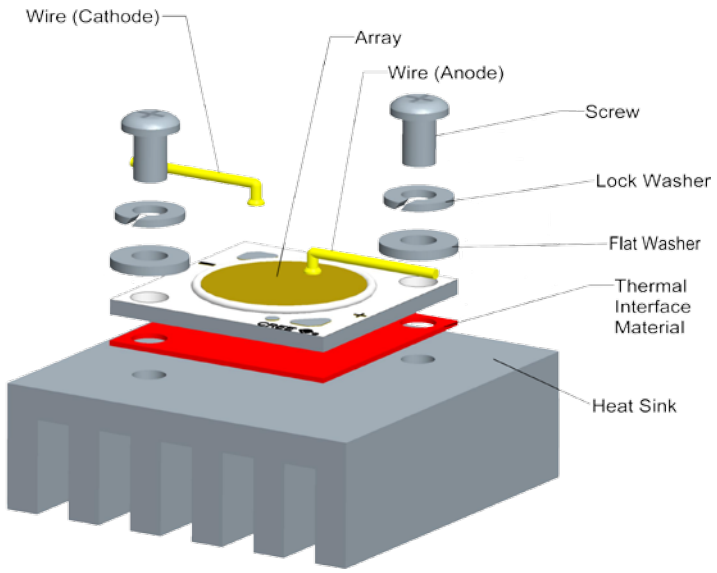
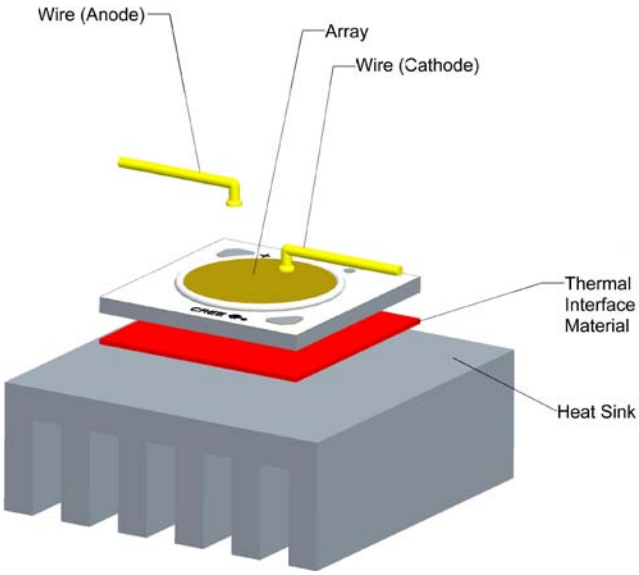
HANDLING XLAMP CXA FAMILY LEDS

In general, CXA family LEDs are attached directly to a heat sink and discrete wires are used to deliver power to the LED, as illustrated below.

CXA2011



CXA15xx and CXA25xx



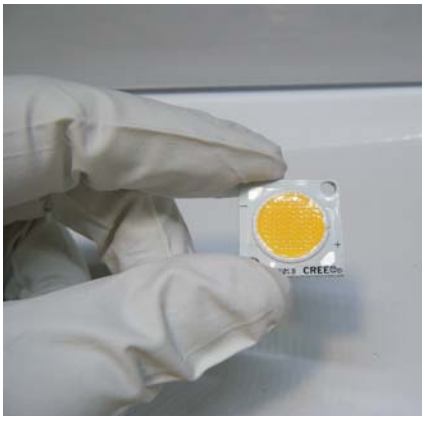
Cree recommends the following at all times when handling XLamp CXA family LEDs or assemblies containing XLamp CXA family LEDs:

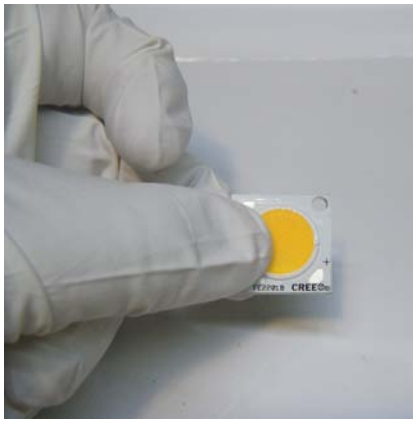
- Avoid putting mechanical stress on the LED.
- Never touch the optical surface with fingers or sharp objects. The LED surface could be soiled or damaged, which could affect the optical performance of the LED
- Cree recommends always handling CXA family LEDs with appropriate ESD grounding.
- Cree recommends handling CXA family LEDs wearing powderless latex gloves.

Manual Handling

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

CORRECT

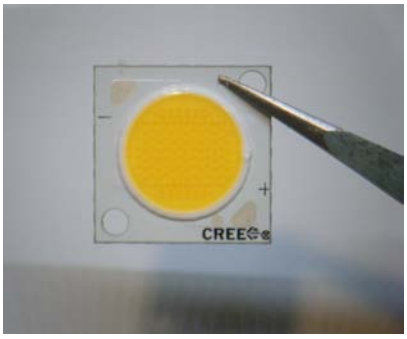


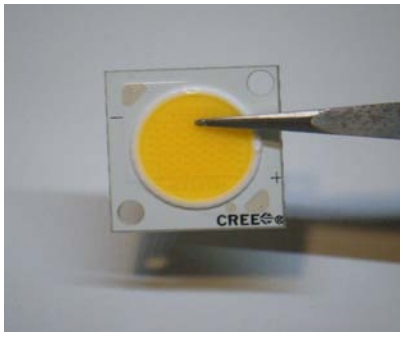


WRONG

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

CORRECT



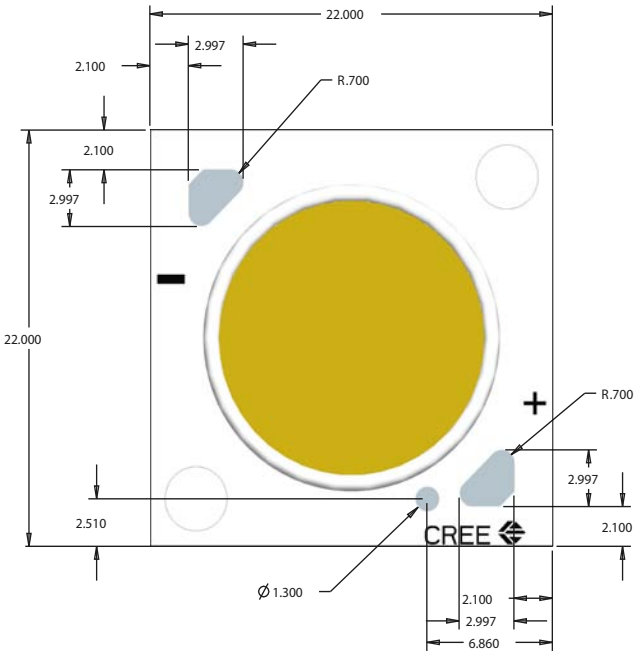


WRONG

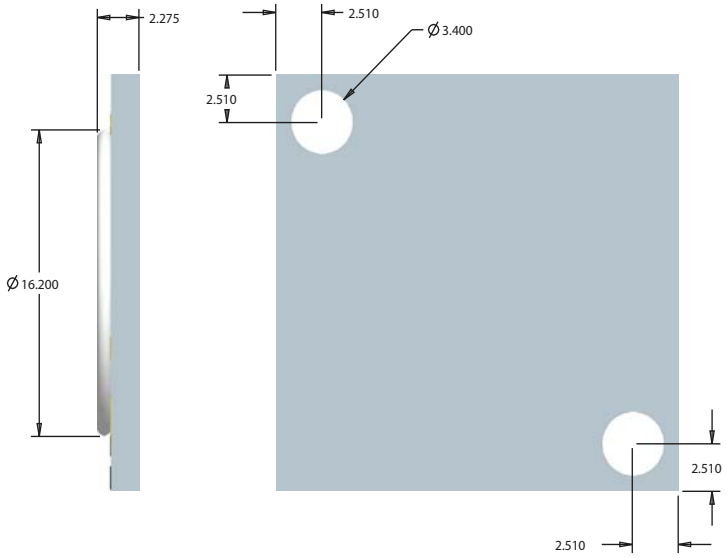
HEAT SINK, LAYOUT, THERMAL INTERFACE

In order to insure effective thermal management for CXA family LEDs, Cree recommends the CXA family LED be attached to an appropriately sized heat sink, depending 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 family LED and heat sink. For best thermal results, the TIM thickness should be kept to a minimum while assuring there are no voids. For CXA15xx and CXA25xx LEDs, a reflective TIM or other backing should be used; light output and efficiency may be slightly less if a very dark TIM is used. The following diagrams show mechanical information for the CXA family packages.

CXA2011



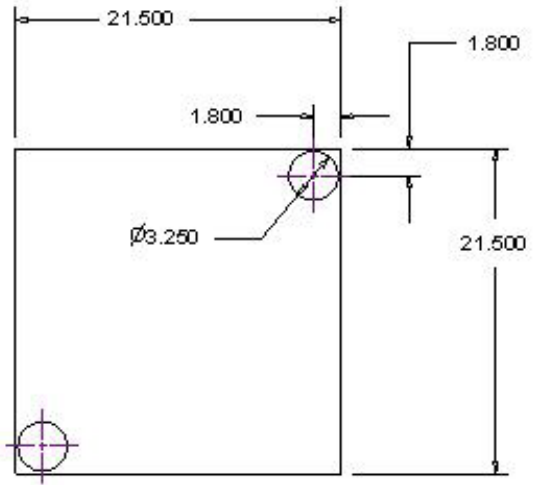
Recommended MCPCB Pad



Recommended Thermal Interface Material Stencil Pattern

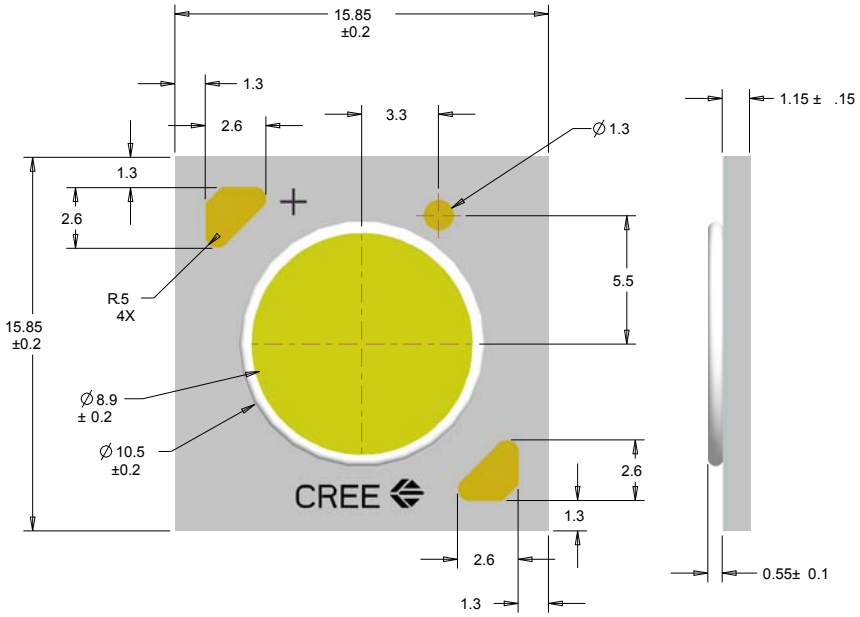
All measurements are ±0.13 mm unless otherwise indicated.

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



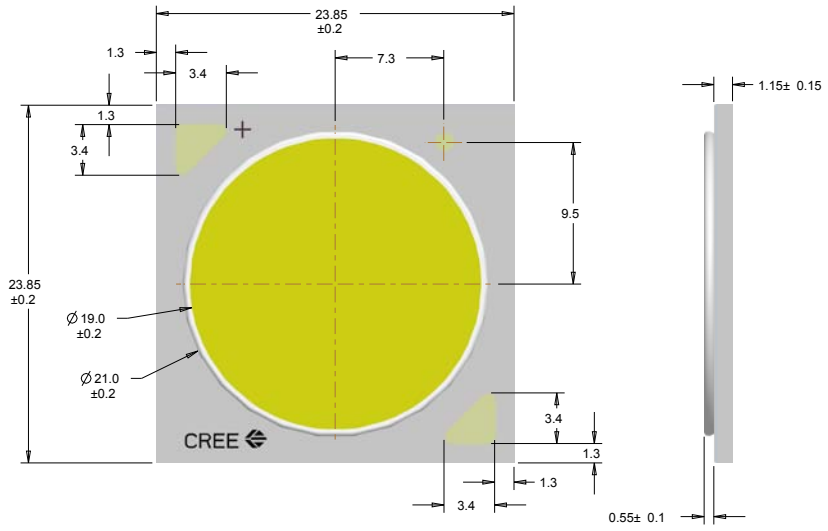
CXA2011 LEDs and thermal interface materials are secured either by the pair of diagonally opposite screw holes or by the use of an LED holder (see the section on LED Connectors). When using the screw holes to secure CXA2011 LEDs, Cree recommends #4 (/40) or M2.5 screws. Among other factors, appropriate screw torque depends 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 CXA2011 LEDs as several of these compounds have been shown to be chemically incompatible with LEDs.

CXA15xx



CXA15xx LEDs and thermal interface materials can be secured by the use of epoxy or an LED holder. (See the section on LED Connectors.) CXA15xx LEDs and thermal interface materials can also be secured by the structure of the lamp or luminaire.

CXA25xx



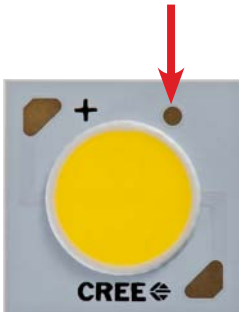
CXA25xx LEDs and thermal interface materials can be secured by the use of epoxy or an LED holder. (See the section on LED Connectors.) CXA25xx LEDs and thermal interface materials can also be secured by the structure of the lamp or luminaire.

CASE TEMPERATURE (T_S) MEASUREMENT POINT

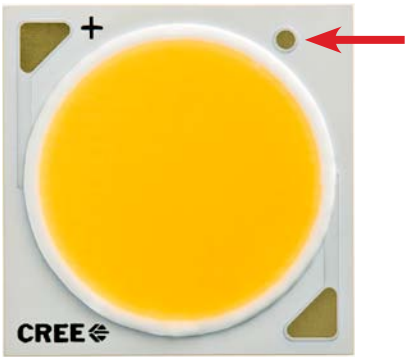
XLamp CXA family LED case temperature (T_S) can be measured at the designated case temperature measurement point, adjacent to the anode or plus (+) solder pad. This measurement point is shown in the pictures below. Cree recommends attaching the thermocouple with conductive epoxy.

CXA2011

CXA15xx



CXA25xx



NOTES ON SOLDERING XLAMP CXA FAMILY 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 engineers have had success using temperature controlled soldering equipment held at 572 °F (300 °C) for the CXA2011 LED and at 482 °F (250 °C) for the CXA15xx and CXA25xx LEDs 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 CXA family LEDs to return to room temperature before subsequent handling. Premature handling of the device could result in damage to the solder joints.

Cree recommends that CXA family LEDs not be exposed to temperatures higher than 350 °C.

✓
CORRECT

Solder Paste Type

Cree strongly recommends using "no clean" solder paste with XLamp CXA family LEDs so that cleaning the PCB after soldering is not required. Cree uses Kester r276 solder paste internally.[1]

Cree recommends the following solder paste compositions: SnAgCu (tin/silver/copper) and SnAg (tin/silver).

1 kester.com/Portals/0/documents/Electronic-Assembly-Materials.pdf

NOTES ON CXA FAMILY LED CONNECTORS

A number of manufacturing firms have developed or are developing connectors to simplify the mechanical and electrical attachment of CXA family LEDs. For example, Molex[2] and TE Connectivity[3] have developed connectors for CXA family LEDs. For additional information, contact the connector manufacturer.

CXA2011 with Molex LED Array Holder[4]

CXA1507 with TE Connectivity 1-piece scalable connector

If CXA family LEDs are to be attached with wired leads, the horizontal and vertical pull force of the attached solder leads should not exceed 1000 g.

2 www.molex.com
3 www.te.com/en/home.html
4 www.molex.com/molex/products/datasheet.jsp?part=active/1802200000_SOLID_STATE_LIGHTI.xml&channel=Products

CHEMICALS & CONFORMAL COATINGS

Below are representative lists 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.[5] The video at www.youtube.com/watch?v=t24bf9D_1SA illustrates the process Cree has developed for testing the compatibility of chemicals and materials with LEDs. 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)

Chemicals Tested as Harmful

In general, subject to the specifics in Cree's Chemical Compatibility Application Note, Cree has found certain 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 the 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)

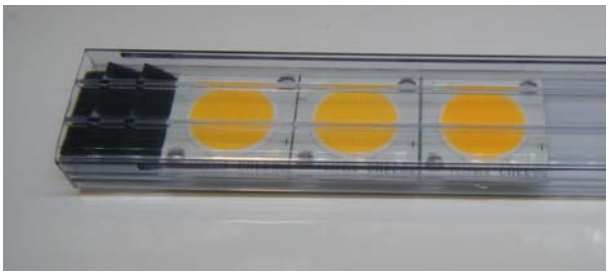
5 www.cree.com/products/pdf/XLamp_Chemical_Comp.pdf

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.

✓ **CORRECT**



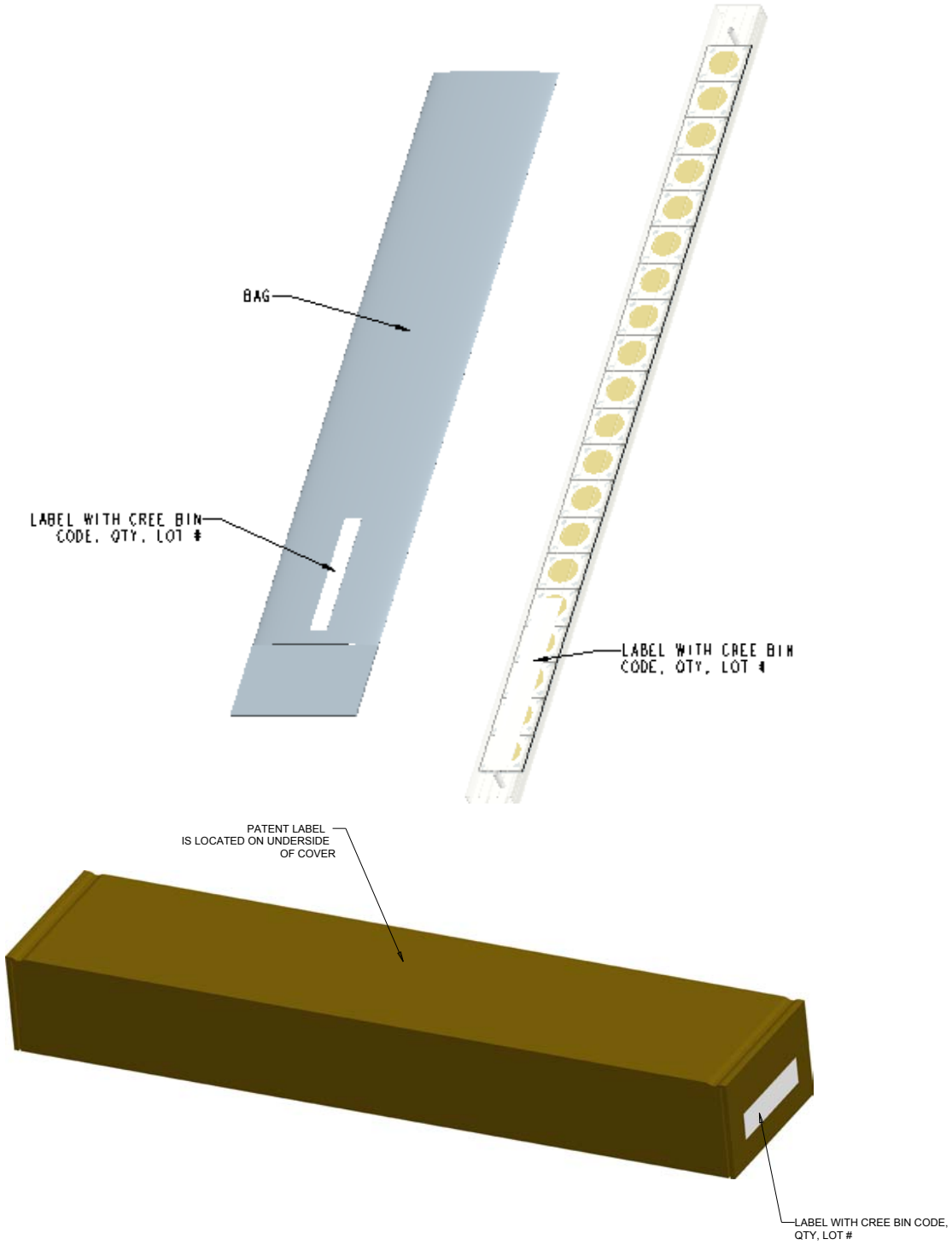
WRONG

✓ **CORRECT**

WRONG

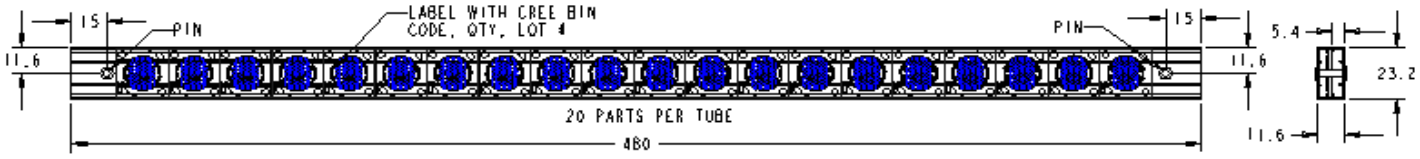
PACKAGING

Cree CXA 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.

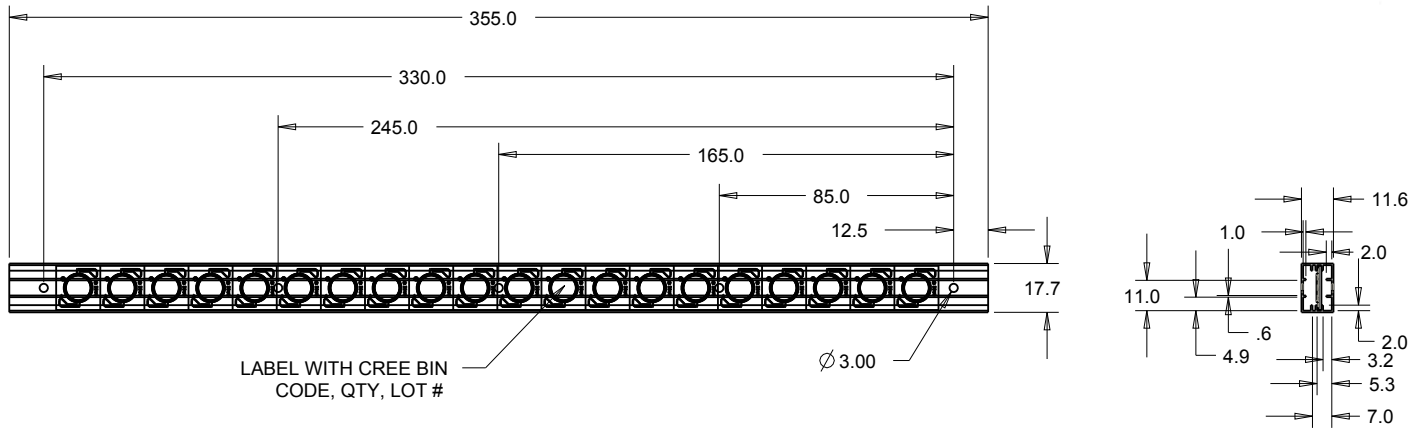


PACKAGING - CONTINUED

CXA2011



CXA15xx



CXA25xx