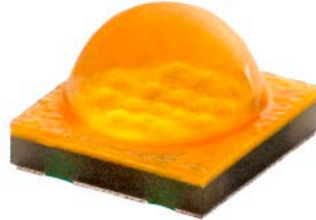


Cree® XLamp® XP and XT Family LEDs



INTRODUCTION

This application note applies to XLamp XP and XT Family LEDs: XLamp XP-C, XP-E, XP-G and XT-E LEDs, which have order codes in the following format.

XPxxxx-xx-xxxx-xxxxxx

XTxxxx-xx-xxxx-xxxxxx

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

TABLE OF CONTENTS

- Handling XLamp XP and XT Family LEDs2
- Circuit Board Preparation & Layouts5
- Case Temperature (T_s) Measurement Point5
- Notes on Soldering XLamp XP and XT Family LEDs ..6
- Moisture Sensitivity7
- XLamp XP and XT Family LED Reflow Soldering Characteristics8
- Chemicals & Conformal Coatings9
- Assembly Storage & Handling..... 10
- Tape and Reel - XP Family..... 11
- Tape and Reel - XT Family..... 12
- Packaging & Labels 13

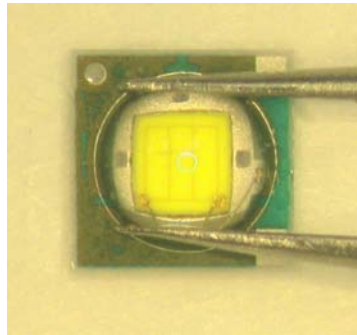
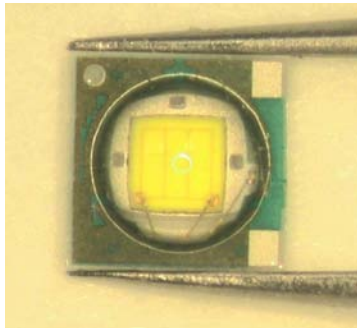
HANDLING XLAMP XP AND XT FAMILY LEDs

Manual Handling

Use tweezers to grab XLamp XP and XT Family LEDs at the base. Do not touch the lens with the tweezers. Do not touch the lens with fingers. Do not push on the lens.

Do not apply more than 1000 g of shear force directly onto the lens. Excessive force on the lens could damage the LED.

✓
CORRECT



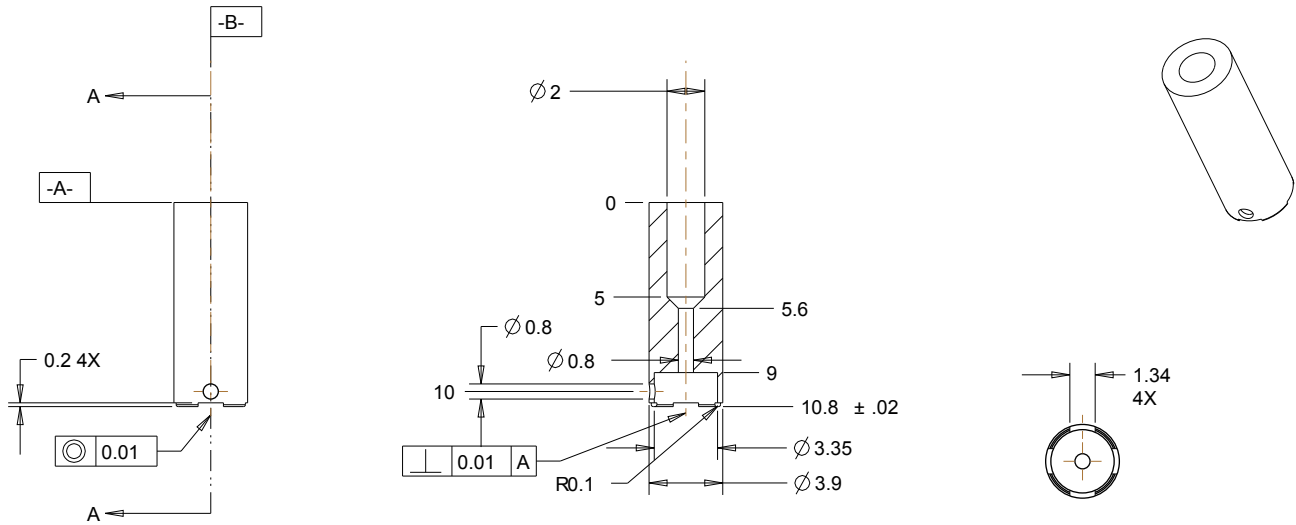
⊘
WRONG

Cree recommends the following at all times when handling XLamp XP and XT Family LEDs or assemblies containing these LEDs:

- Avoid putting mechanical stress on the LED lens.
- Never touch the optical surface with fingers or sharp objects. The LED lens surface could be soiled or damaged, which would affect the optical performance of the LED.

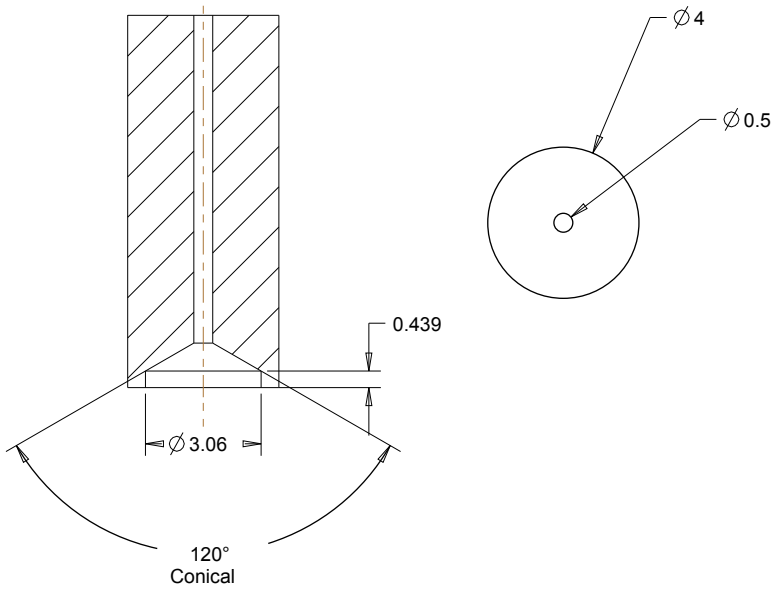
Whenever possible, Cree recommends the use of one of the following pick & place tools to remove XLamp XP and XT Family LEDs from the factory tape & reel packaging.

Pick & Place Nozzle #1



All dimensions in mm

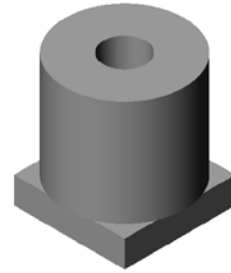
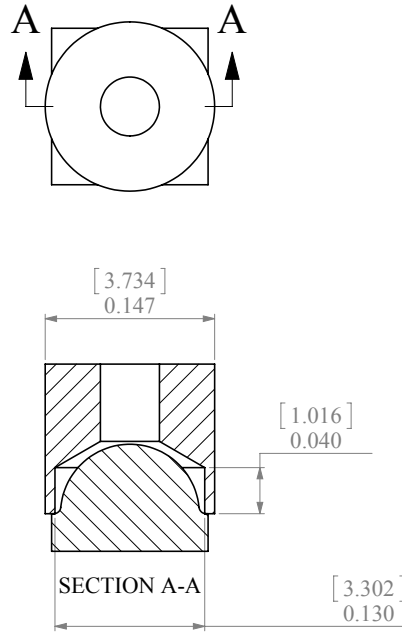
Pick & Place Nozzle #2



The following pick & place tool is specific to the XT Family LEDs The nozzle is implemented in urethane.

Pick & Place Nozzle #3

All dimensions in mm

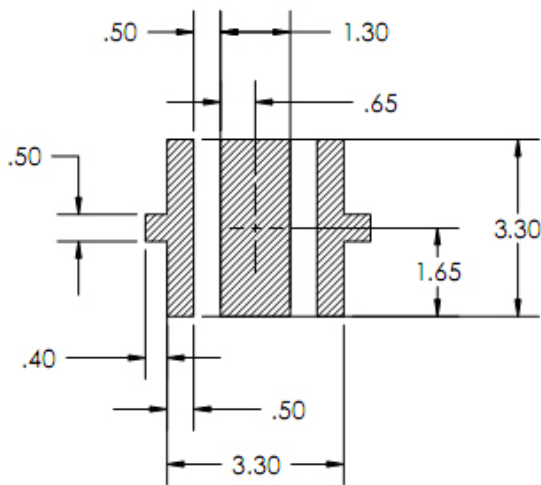


CIRCUIT BOARD PREPARATION & LAYOUTS

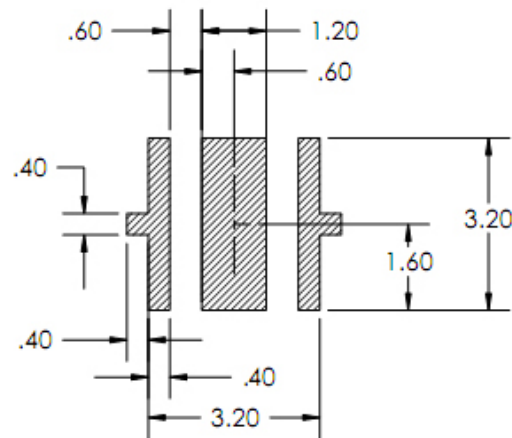
Printed circuit boards (PCBs) should be prepared and/or cleaned according to the manufacturer’s specifications before placing or soldering XLamp XP and XT Family LEDs onto the PCB.

The diagram below shows the recommended PCB solder pad layout for XLamp XP and XT Family LEDs.

All dimensions in mm



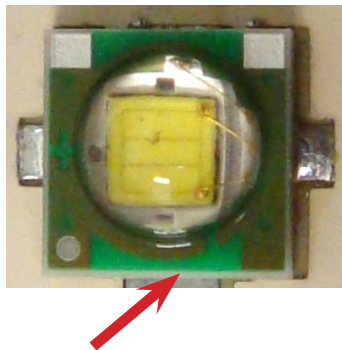
Recommended PCB Solder Pad



Recommended Stencil Pattern
(hatched area is opening)

CASE TEMPERATURE (T_s) MEASUREMENT POINT

XLamp XP and XT Family 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 XP or XT Family 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 XP AND XT FAMILY LEDS

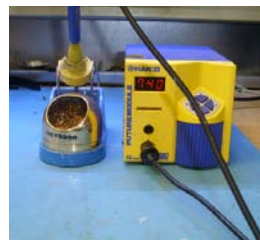
XLamp XP and XT Family LEDs are designed to be reflow soldered to a PCB. Reflow soldering may be done by a reflow oven or by placing the PCB on a hotplate and following the reflow soldering profile listed on the previous page.

Do not wave solder XLamp XP and XT Family LEDs. Do not hand solder XLamp XP and XT Family LEDs.

✓
CORRECT



✓
CORRECT



Solder Paste Type

Cree strongly recommends using “no clean” solder paste with XLamp XP and XT Family 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

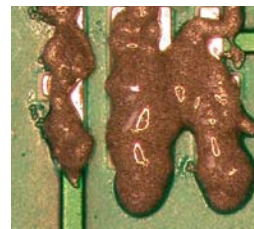
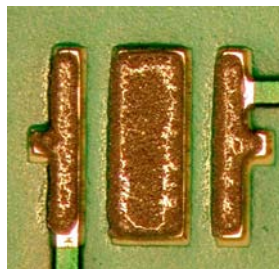
- Sn62/Pb36/Ag2 composition
- Flux: NC-SMQ92J

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 3-mil (75-µm) bond line.

✓
CORRECT



⊘
WRONG

NOTES ON SOLDERING XLAMP XP AND XT FAMILY LEDS (CONTINUED)

After Soldering

After soldering, allow XLamp XP and XT Family LEDs to return to room temperature before subsequent handling. Premature handling of the device, especially around the lens, 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

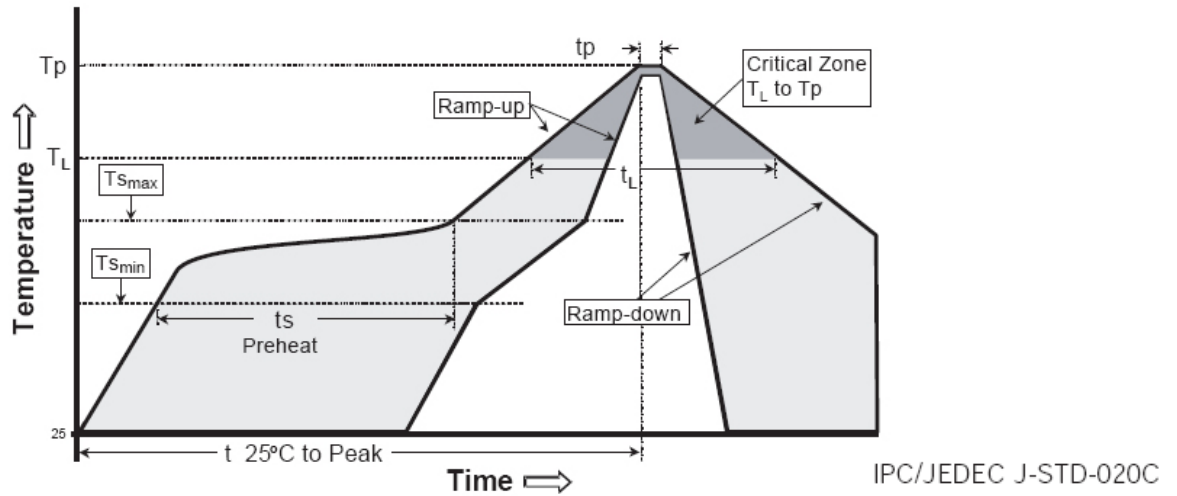
In testing, Cree has found XLamp XP and XT Family LEDs to have unlimited floor life in conditions ≤ 30 °C / 85% relative humidity (RH). Moisture testing included a 168 hour soak at 85 °C / 85% RH followed by 3 reflow cycles, with visual and electrical inspections at each stage.

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 XP AND XT FAMILY LED REFLOW SOLDERING CHARACTERISTICS

In testing, Cree has found XLamp XP and XT Family 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 XP and XT Family LEDs.

- Water
- Isopropyl alcohol (IPA)
- Arctic Silver & Arctic Alumina brand thermal grease
- 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 XP and XT 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
- TechSpray Turbo-Coat Acrylic Conformal Coating (2108-P)

Chemicals Tested as Harmful

In testing, Cree has found the following chemicals to be harmful to XLamp XP and XT Family LEDs. Cree recommends not using these chemicals anywhere in an LED system containing XLamp XP and XT Family 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 XP and XT 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.

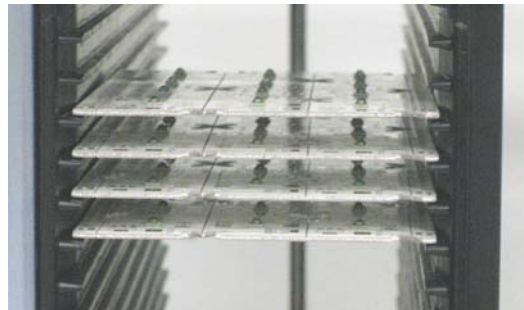
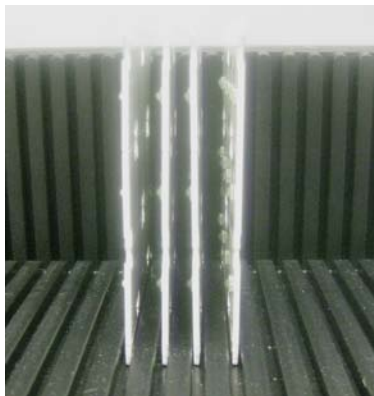
To reduce the potential of tarnishing for XLamp XP and XT Family LEDs, Cree recommends that customers minimize exposure of the LEDs to oxidizing substances at all times, including storage, manufacturing and product testing. Potential sources of oxidizing substances include paper, air filters, some cleaning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

ASSEMBLY STORAGE & HANDLING

Do not stack PCBs or assemblies containing XLamp XP and XT Family LEDs so that anything rests on the LED lens. Force applied to the LED lens may result in the lens being knocked off. PCBs or assemblies containing XLamp XP and XT Family LEDs should be stacked in a way to allow at least 2 cm clearance above the LED lens.

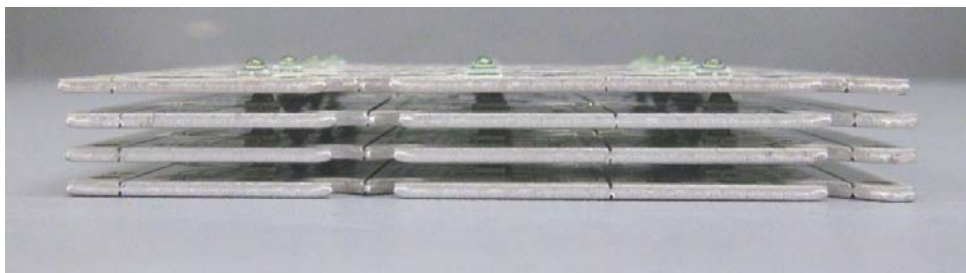
Do not use bubble wrap directly on top of XLamp XP and XT Family LEDs. Force from the bubble wrap can potentially damage the LED.

✓
CORRECT



✓
CORRECT

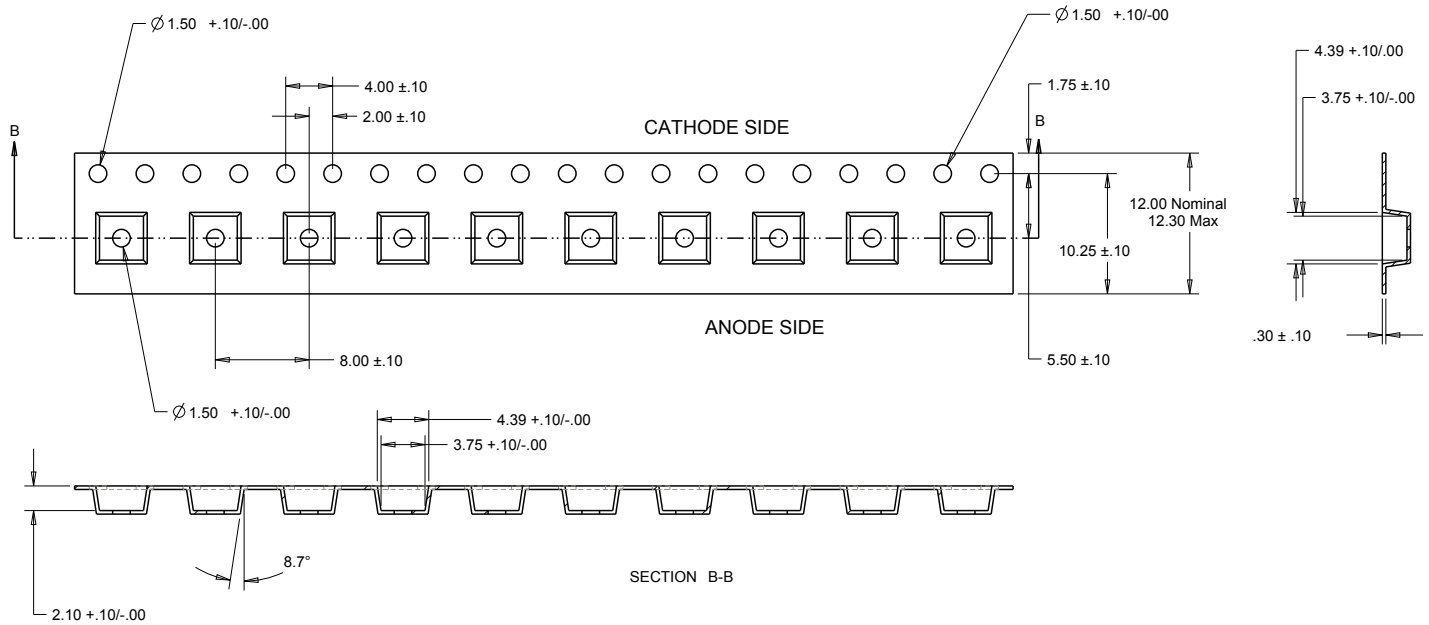
✗
WRONG



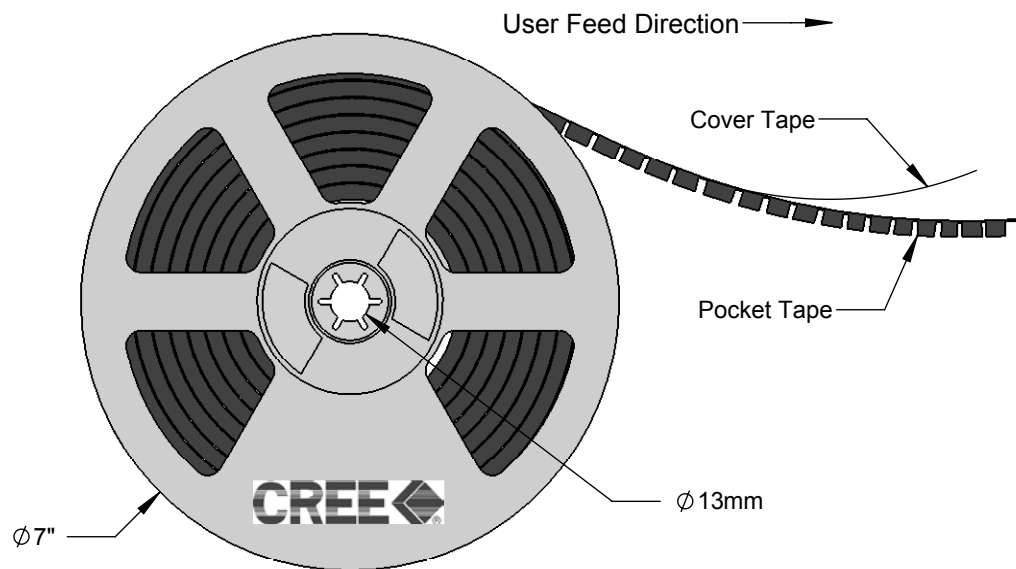
TAPE AND REEL - XP FAMILY

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

All dimensions in mm.



Notes:
1. 10 sprocket hole pitch cumulative tolerance ± 0.2mm



PACKAGING & LABELS

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

