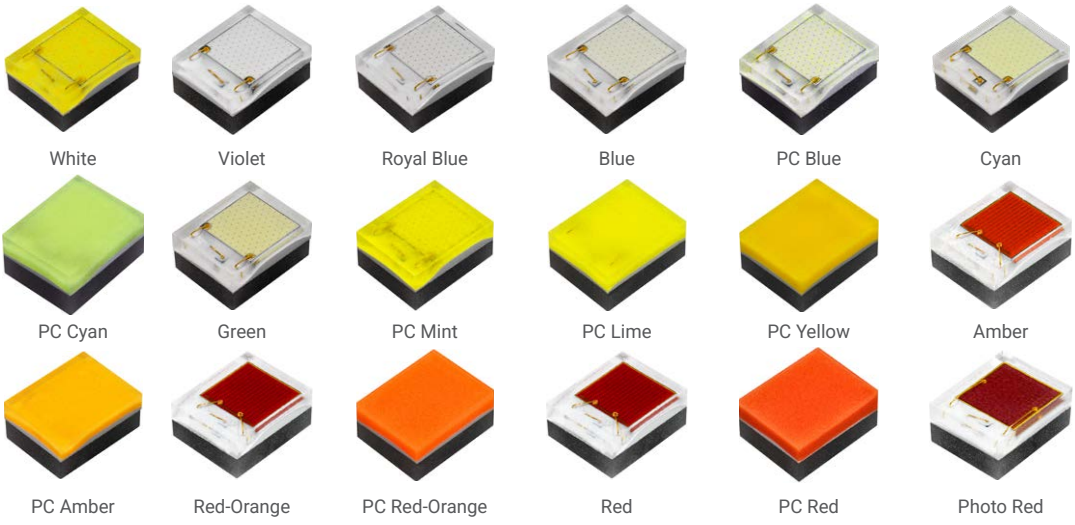
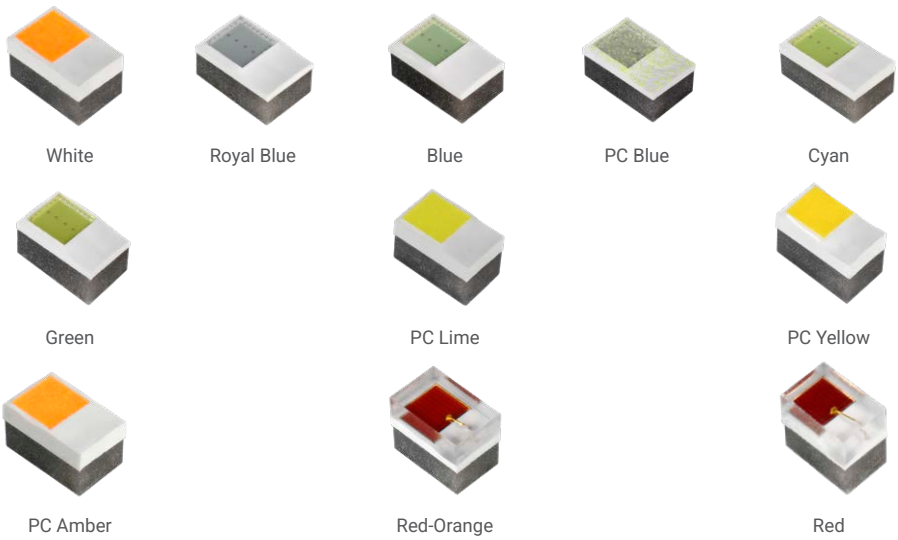
XLamp® Element Family LEDs

XE-G



XE-B



INTRODUCTION

This application note applies to XLamp® Element Family LEDs, referred to as XE Family LEDs in this document, which have order codes in the following format.

XEBxxx-xx-xxxx-xxxxxxxxx
XEGxxx-xx-xxxx-xxxxxxxxx

This application note explains how XLamp Element Family LEDs and assemblies containing these LEDs should be handled during manufacturing.

Cree LED / 4001 E. Hwy. 54, Suite 2000 / Durham, NC 27713 USA / +1.919.313.5330 / www.cree-led.com

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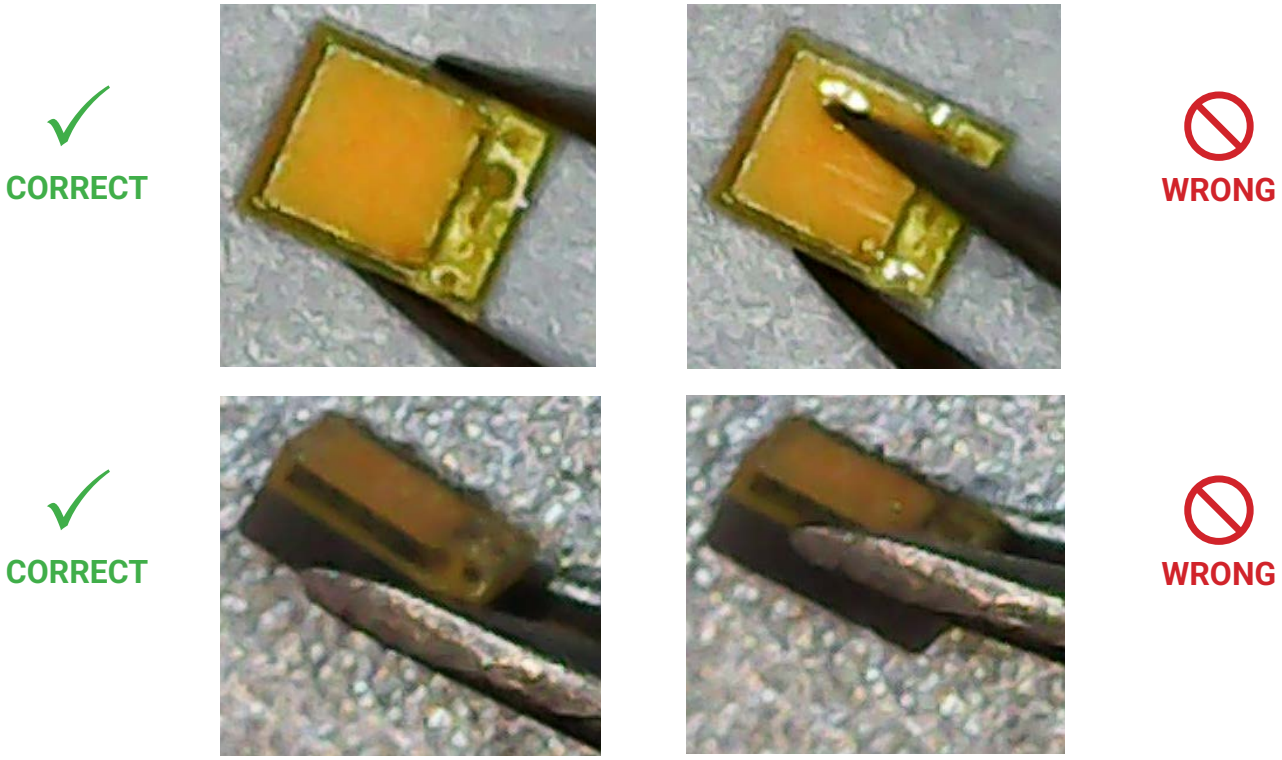
HANDLING XLAMP® XE FAMILY LEDS

Manual Handling

Use tweezers to grab XLamp XE 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 600 g of shear force onto the lens. Excessive force on the lens could damage the LED.



Cree LED recommends the following at all times when handling XLamp XE Family LEDs or assemblies containing these LEDs:

- Avoid putting excessive 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.
- Cree LED recommends always handling XE Family LEDs with appropriate ESD grounding.
- Cree LED recommends handling XE Family LEDs wearing clean, lint-free gloves.

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

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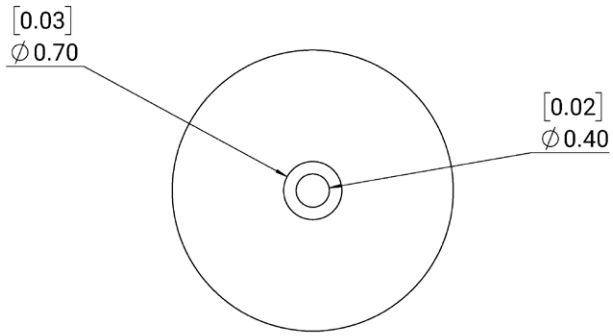
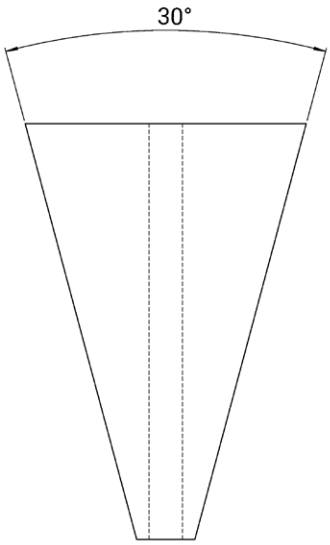
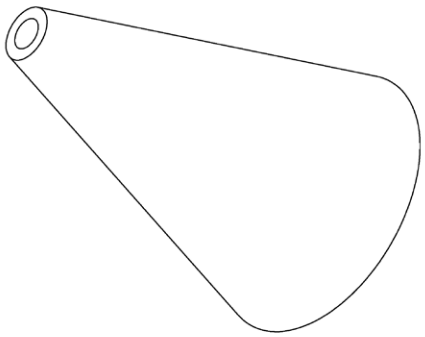
PICK & PLACE NOZZLE (XE-B)

For pick and place nozzles coming into contact with silicone-covered LED components, Cree LED recommends nozzles be constructed of non-metallic materials. Cree LED and several of Cree LED's customers have had good success using nozzles fabricated from 95a urethane.

All dimensions in mm.
Measurement tolerances: .xx = .05 mm







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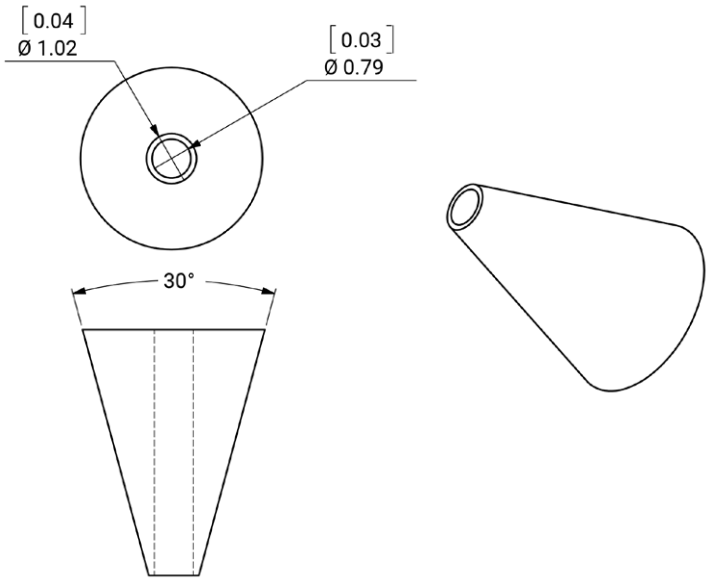
PICK & PLACE NOZZLE (XE-G)

For pick and place nozzles coming into contact with silicone-covered LED components, Cree LED recommends nozzles be constructed of non-metallic materials. Cree LED and several of Cree LED's customers have had good success using nozzles fabricated from 95a urethane.

All dimensions in mm.

Measurement tolerances: .xxx = .001 mm



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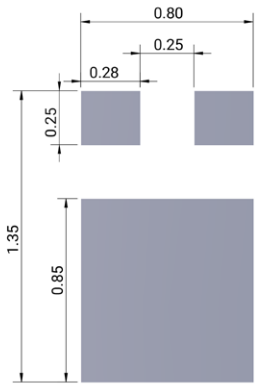
CIRCUIT BOARD PREPARATION & LAYOUTS

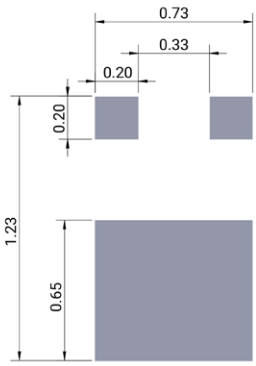
Printed circuit boards (PCBs) should be prepared and/or cleaned according to the manufacturer's specifications before placing or soldering XLamp XE Family LEDs onto the PCB.

All dimensions in mm.
Measurement tolerance: .xx = .±13 mm

XE-B

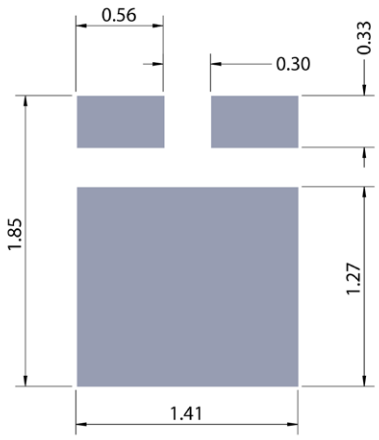


Recommended PCB Footprint

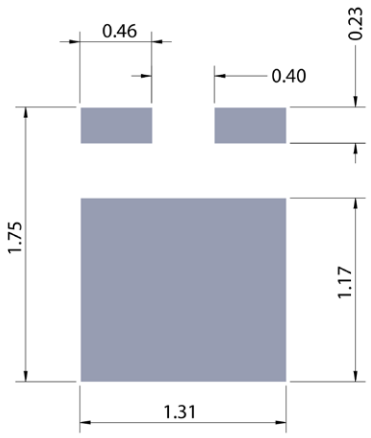


Recommended Stencil Openings

XE-G



Recommended PCB Footprint



Recommended Stencil Openings

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CASE TEMPERATURE (T_S) MEASUREMENT POINT

XLamp XE Family LED case temperature (Ts) should be measured on the PCB surface, as close to the LED's thermal pad as possible. Connect the thermocouple at a point where the voltage potential is below the rating for the meter. Cree LED recommends using a 36 AWG (0.01267 mm^2) thermocouple wire for Ts measurements.

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

NOTES ON SOLDERING XLAMP® XE FAMILY LEDS

XLamp XE 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 page 9.

Do not wave solder XLamp XE Family LEDs. Do not hand solder XLamp XE Family LEDs.

✓ CORRECT

WRONG

✓ CORRECT

Solder Paste Type

Cree LED strongly recommends using "no clean" solder paste with XLamp XE Family LEDs so that cleaning the PCB after reflow soldering is not required. Cree LED uses Kester® R276 solder paste internally.

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

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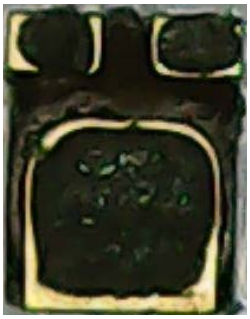
NOTES ON SOLDERING XLAMP® XE FAMILY LEDS (CONTINUED)

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 LED has seen positive results using solder thickness that results in a 4-mil (102-µm) bond line, i.e., the solder joint thickness after reflow soldering.

✓ CORRECT



WRONG

After Soldering

After soldering, allow XLamp XE Family LEDs to return to room temperature before subsequent handling. Handling of the device, especially around the lens, before cooling could result in damage to the LED.

Cree LED recommends verifying the solder process by checking the consistency of the solder bond of several trial PCBs after reflow. This can be done by X-ray or by shearing selected devices from the circuit board. The solder should appear completely re-flowed (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 LED recommends using "no clean" solder paste so that flux cleaning is not necessary after reflow soldering. If PCB cleaning is necessary, Cree LED recommends the use of isopropyl alcohol (IPA).

Do not use ultrasonic cleaning.

MOISTURE SENSITIVITY

Cree LED recommends keeping XLamp LEDs in the provided, resealable moisture-barrier packaging (MBP) until immediately prior to soldering. Unopened MBPs that contain XLamp LEDs do not need special storage for moisture sensitivity. Bare XLamp LEDs have a storage temperature range of -40 °C to 100 °C. However, the MBP, reel, tape and box have a more limited storage temperature range.

Once the MBP is opened, XLamp XE Family LEDs may be stored as MSL 1 per JEDEC J-STD-033, meaning they have unlimited floor life in conditions of ≤ 30 ºC/85% relative humidity (RH). Regardless of storage condition, Cree LED recommends sealing any unsoldered LEDs in the original MBP.

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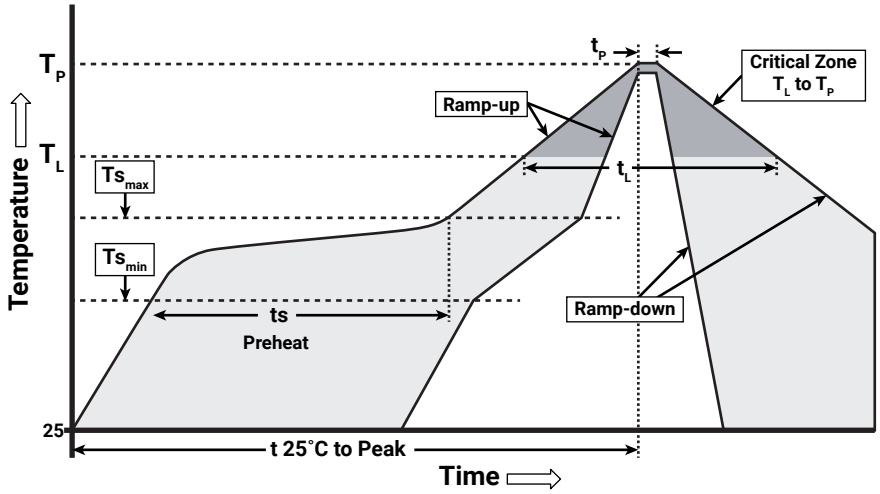
XLAMP® XE FAMILY LED REFLOW SOLDERING CHARACTERISTICS

In testing, Cree LED has found XLamp XE Family LEDs to be compatible with JEDEC J-STD-020C, using the parameters listed below. As a general guideline, Cree LED recommends that users follow the recommended soldering profile provided by the manufacturer of the solder paste used, and therefore it is the lamp or luminaire manufacturer's responsibility to determine applicable soldering requirements.

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



IPC/JEDEC J-STD-020C

Profile Feature	Lead-Free Solder
Average Ramp-Up Rate (Ts_{max} to T_p)	1.2 °C/second
Preheat: Temperature Min (Ts_{min})	120 °C
Preheat: Temperature Max (Ts_{max})	170 °C
Preheat: Time (ts_{min} to ts_{max})	65-150 seconds
Time Maintained Above: Temperature (T_L)	217 °C
Time Maintained Above: Time (t_L)	45-90 seconds
Peak/Classification Temperature (Tp)	235 - 245 °C
Time Within 5 °C of Actual Peak Temperature (tp)	20-40 seconds
Ramp-Down Rate	1 - 6 °C/second
Time 25 °C to Peak Temperature	4 minutes max.

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

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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 LED's Chemical Compatibility Application Note.

Recommended Chemicals

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

- Water
- Isopropyl alcohol (IPA)

Chemicals Tested as Harmful

In general, subject to the specifics in Cree LED's Chemical Compatibility Application Note, Cree LED has found certain chemicals to be harmful to XLamp XE Family LEDs. Cree LED recommends not using these chemicals anywhere in an LED system containing XLamp XE 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)

Hermetically Sealing Luminaires

For proper LED operation and to avoid potential lumen depreciation and/or color shift, LEDs of all types must operate in an environment that contains oxygen. Simply allowing the LEDs to ventilate to air is sufficient; no extraordinary measures are required. Hermetically sealing LEDs in an enclosed space is not recommended.

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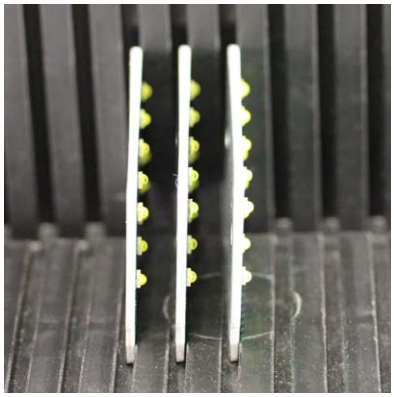
ASSEMBLY STORAGE & HANDLING

Do not stack PCBs or assemblies containing XLamp XE 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 XE Family LEDs should be stacked in a way to allow at least 1 cm clearance above the LED lens.

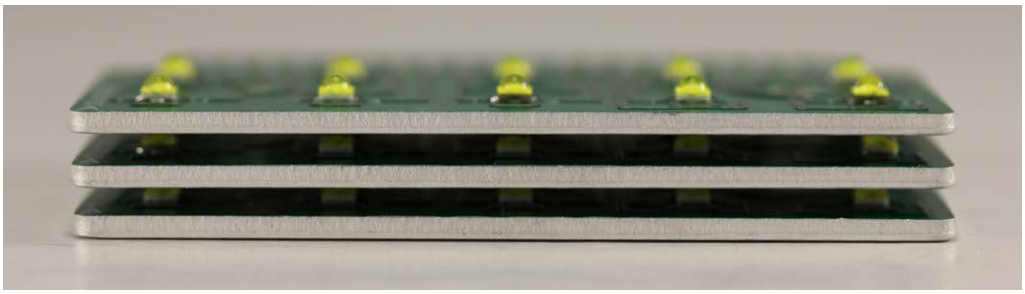
Do not use bubble wrap directly on top of XLamp XE Family LEDs. Force from the bubble wrap can potentially damage the LED.

✓ CORRECT



✓ CORRECT

⊘ WRONG



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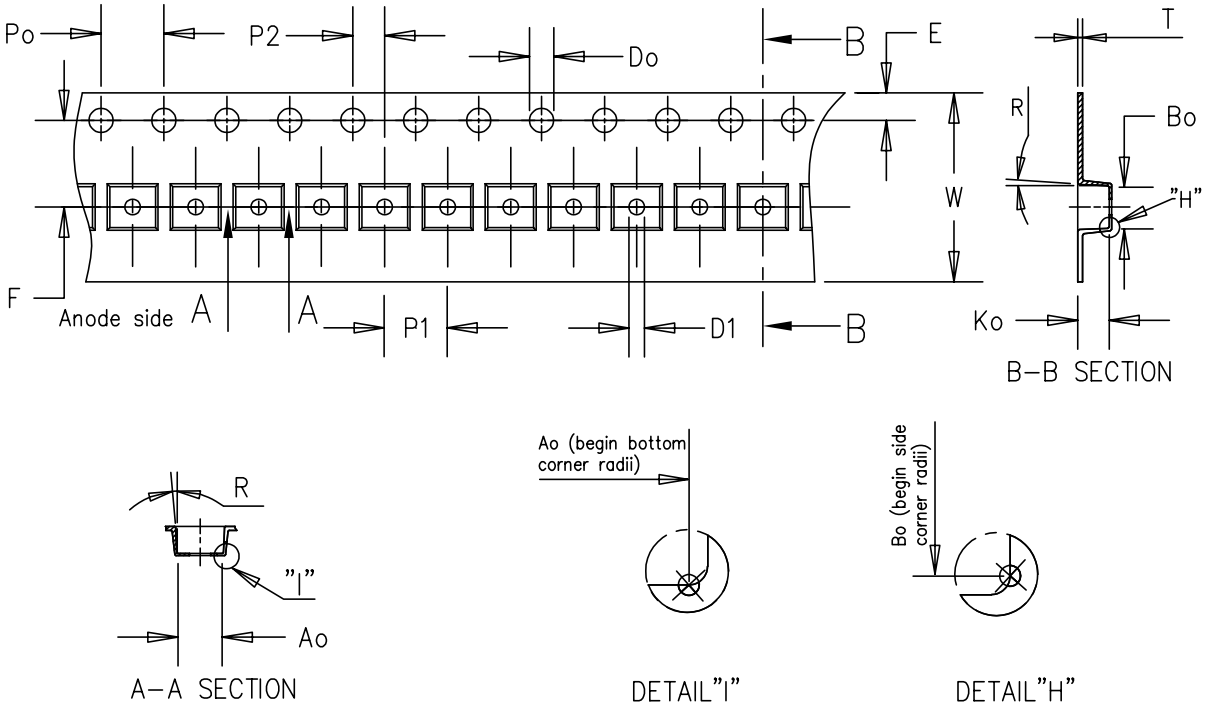
TAPE DIMENSIONS (XE-B)

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

Except as noted, all dimensions in mm

Measurement tolerances unless indicated otherwise: .xx = ±.15 mm



All XE-B products except XEBARD and XEBARO:

Item	Ao	Bo	Ko	Po	P1	P2	T	E	F	Do	D1	W	R
Dimension	1.05	1.55	0.93	4.00	4.00	2.00	0.25	1.75	3.50	1.50	0.50	8.00	3°

XEBARD and XEBARO

Item	Ao	Bo	Ko	Po	P1	P2	T	E	F	Do	D1	W	R
Dimension	1.05	1.55	1.15	4.00	4.00	2.00	0.25	1.75	3.50	1.50	0.50	8.00	3°

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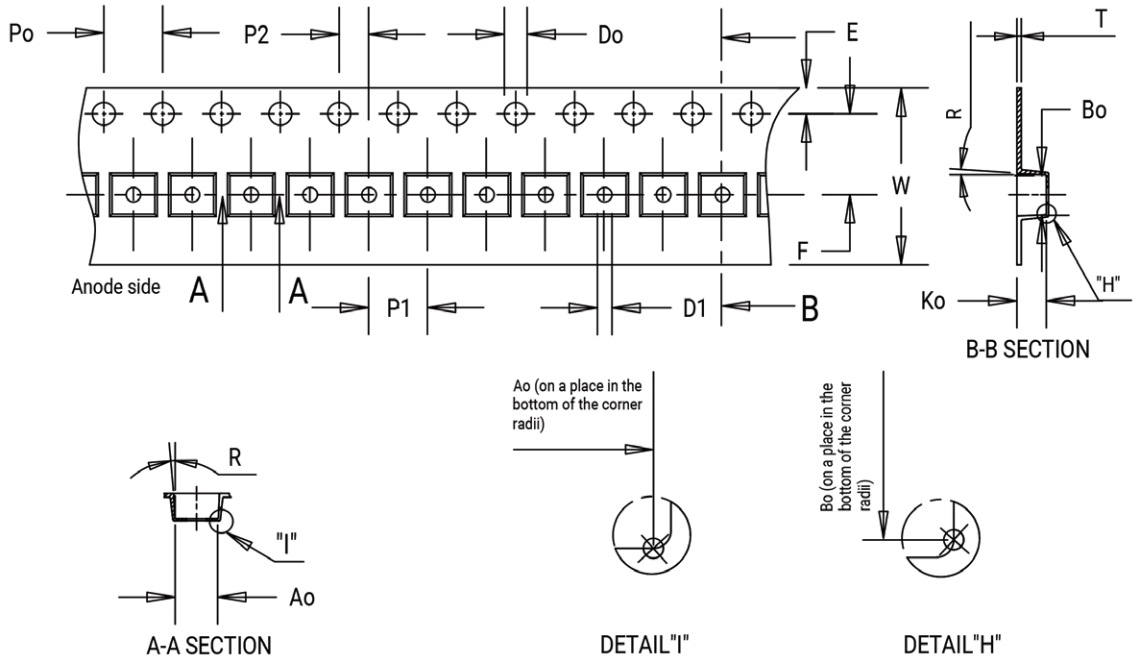
TAPE DIMENSIONS (XE-G)

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

Except as noted, all dimensions in mm [in].

Measurement tolerances unless indicated otherwise: .xx = ±.15 mm



Item	Ao	Bo	Ko	Po	P1	P2	T	E	F	Do	D1	W	R
Dim.	1.85	2.30	1.30	4.00	4.00	2.00	0.30	1.75	3.50	1.50	1.00	8.00	3°

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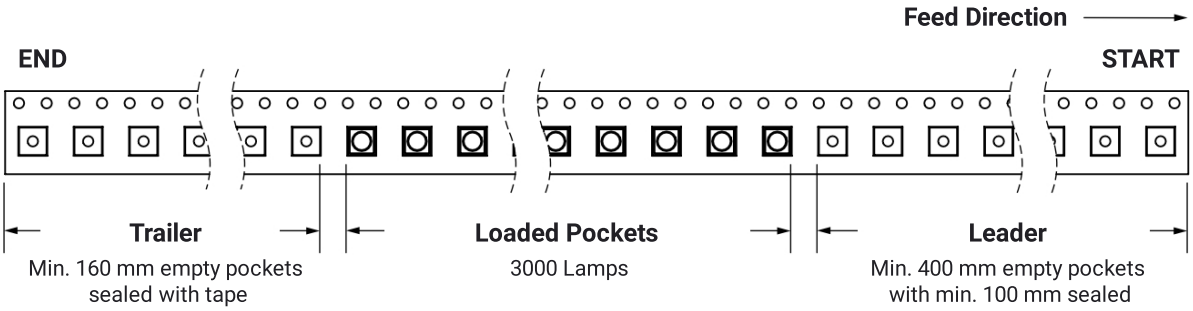
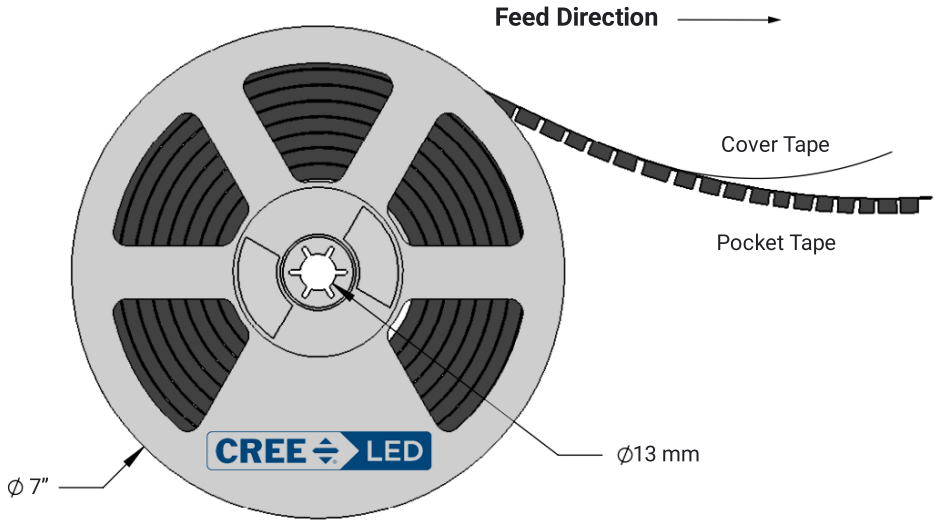
REEL DIMENSIONS





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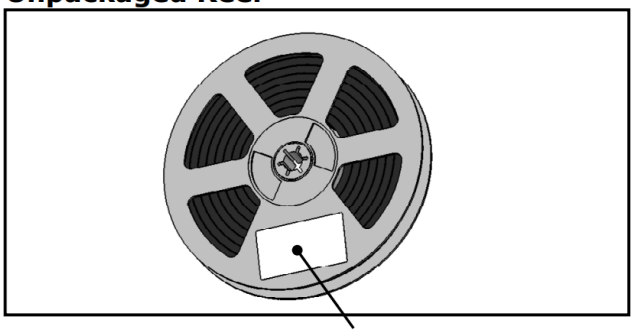
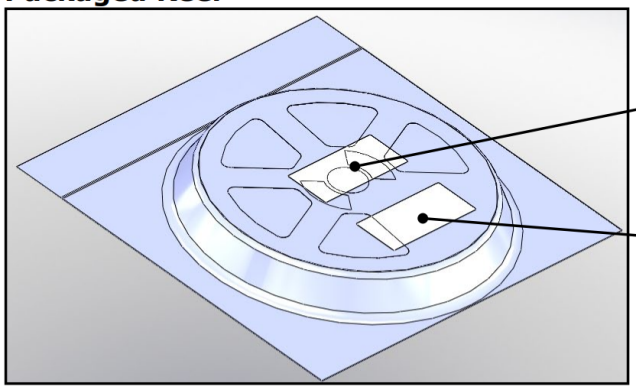
PACKAGING & LABELS

The diagrams below show the packaging and labels Cree LED uses to ship XLamp XE Family LEDs. XLamp XE Family LEDs are shipped in tape loaded on a reel. Each box contains only one reel in a moisture barrier bag.

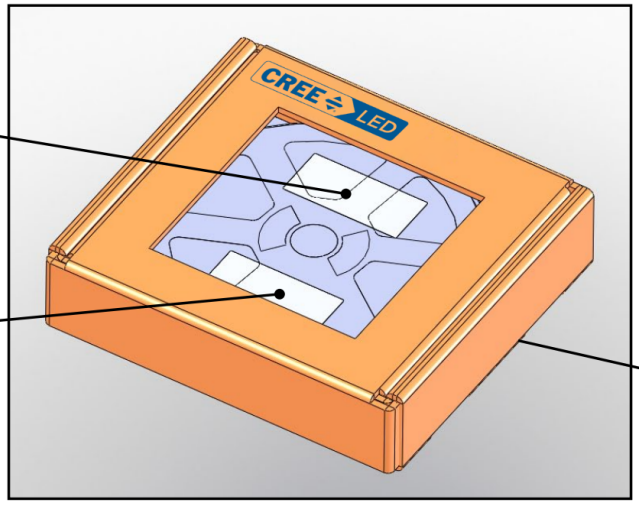
Unpackaged Reel



Packaged Reel



Boxed Reel



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