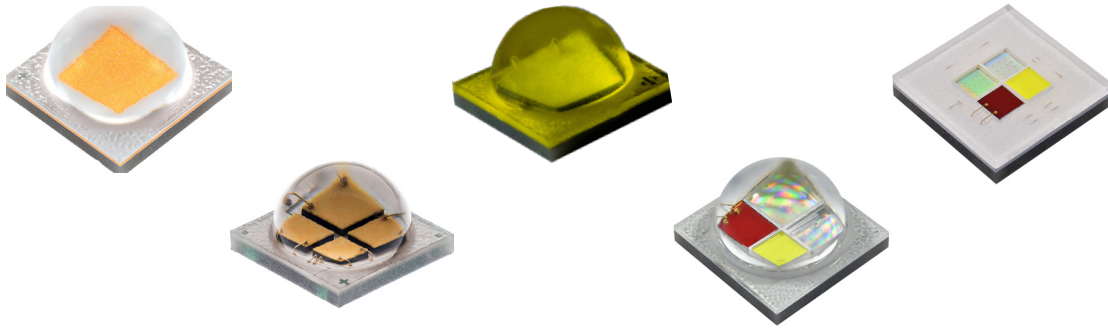


## XLamp® XM Family LED



### INTRODUCTION

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

XMxxxx-xx-xxxx-xxxxxxxxxx

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

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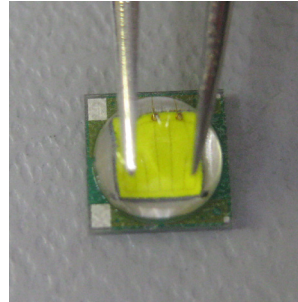
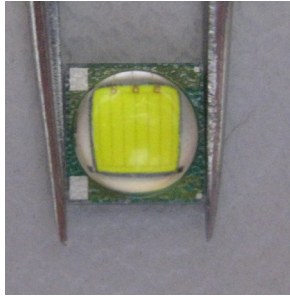
## HANDLING XLAMP® XM FAMILY LEDs

### Manual Handling

Use tweezers to grab XLamp XM 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.



**CORRECT**



**WRONG**

Cree LED recommends the following at all times when handling XLamp XM 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.
- Cree LED recommends always handling XM family LEDs with appropriate ESD grounding.
- Cree LED recommends handling XM family LEDs wearing clean, lint-free gloves.

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

## HANDLING XLAMP® XM FAMILY LEDs (CONTINUED)

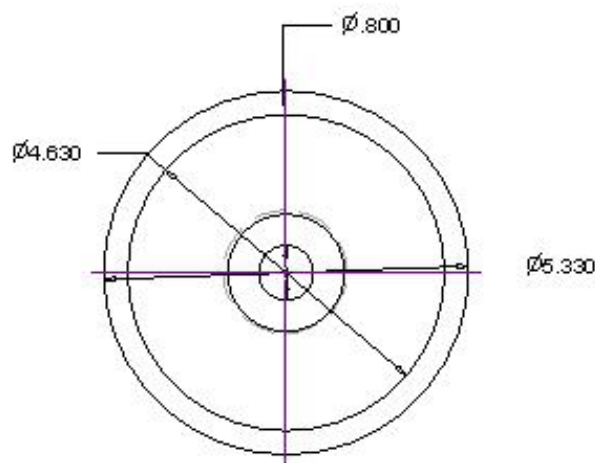
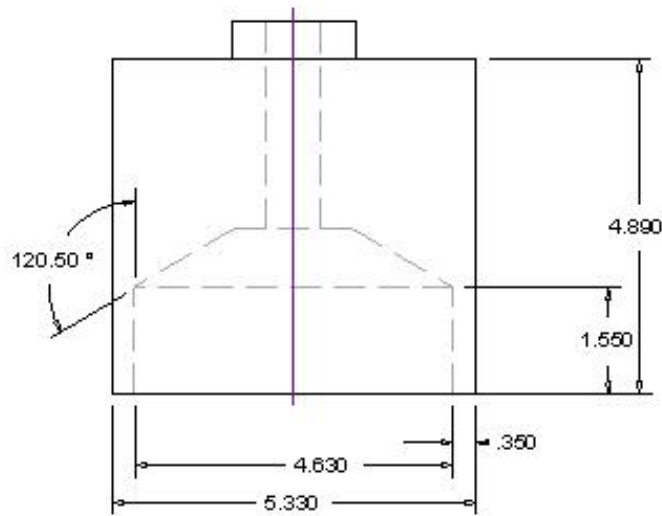
**Pick & Place Nozzle**

The following diagrams show examples of pick & place tools to remove XM family LEDs from the factory tape and reel packaging. For pick and place nozzles coming into contact with silicone-covered LED components, Cree LED recommends nozzles be constructed of non-metallic materials.

**XM-L2, XM-L2 EZW, XM-L3, XM-L® Color Gen 2 High Density**

All dimensions in mm

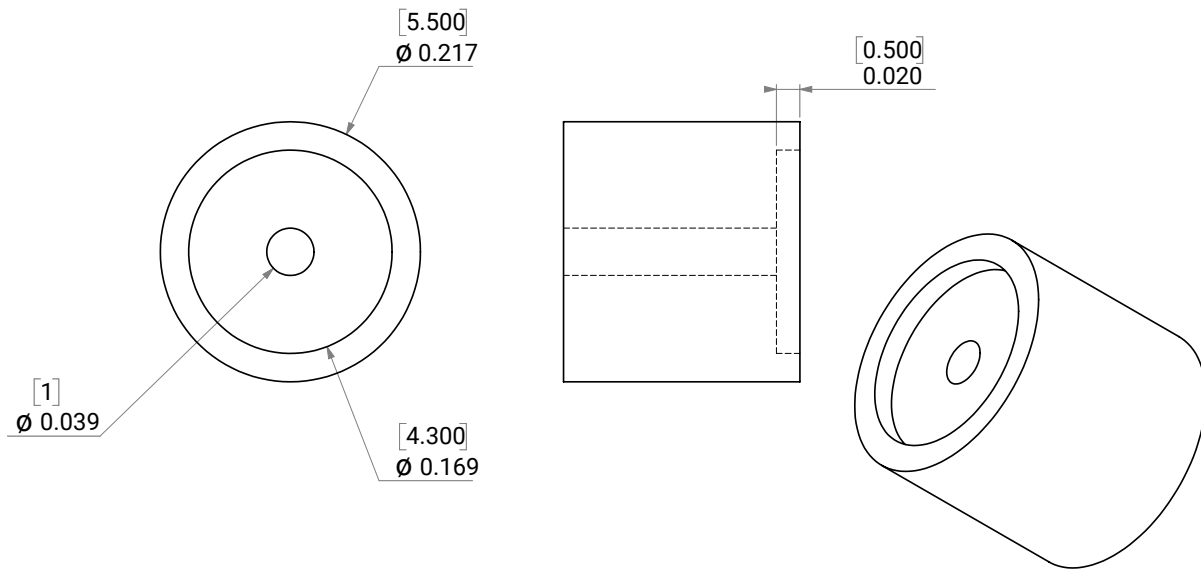
Tolerance:  $\pm 0.01$  mm



## HANDLING XLAMP® XM FAMILY LEDS (CONTINUED)

## XM-L Color Gen 2 High Intensity

All dimensions in mm [in]



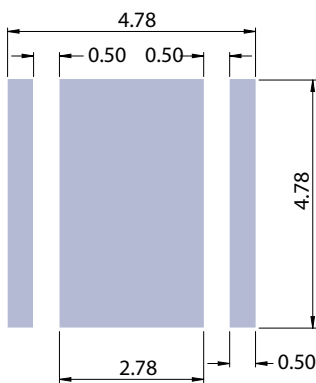
## CIRCUIT BOARD PREPARATION & LAYOUTS

Printed circuit boards (PCBs) should be prepared and/or cleaned according to the manufacturer's specifications before placing or soldering XLamp XM Family LEDs onto the PCB. When designing PCBs for XM LEDs, make sure solder masks are used to prevent solder bridges from forming between closely spaced solder pads. The diagrams below show the recommended PCB solder pad layout for XLamp XM Family LEDs.

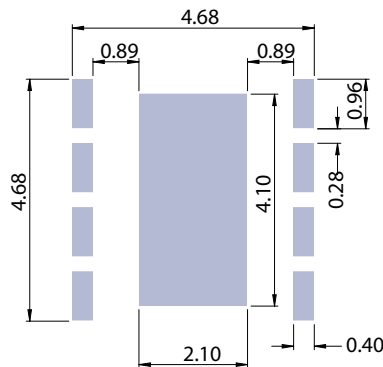
All dimensions in mm

Tolerance: + 0.13 mm

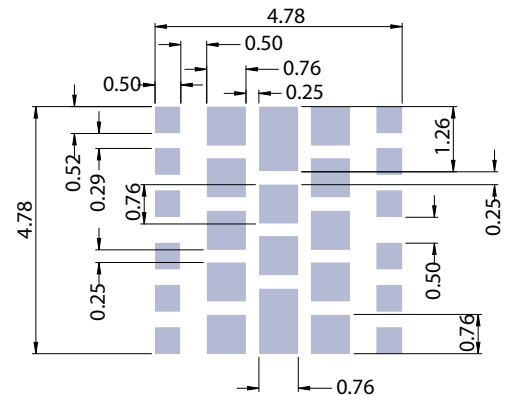
### XM-L2, XM-L2 EZW, XM-L3



Recommended PCB Footprint

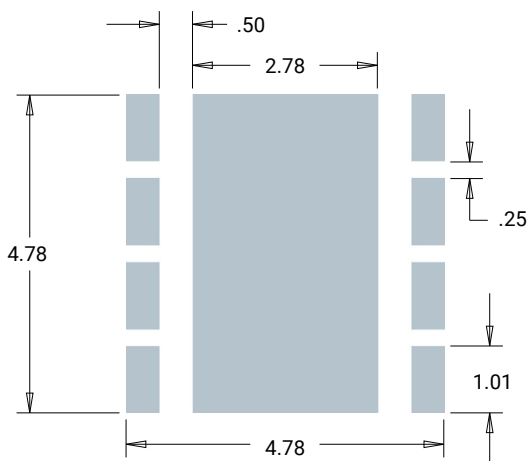


Recommended Solder Stencil\*

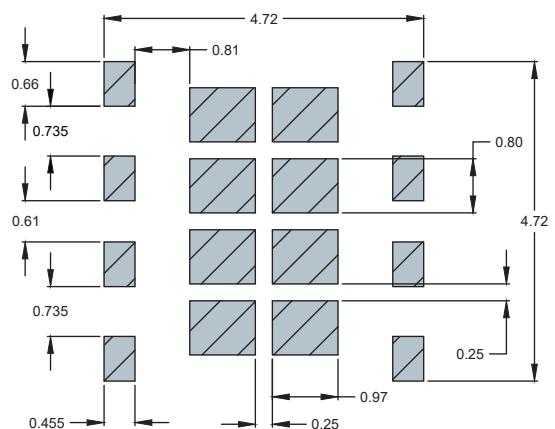


Optional Solder Stencil\*

### XM-L Color Gen 2



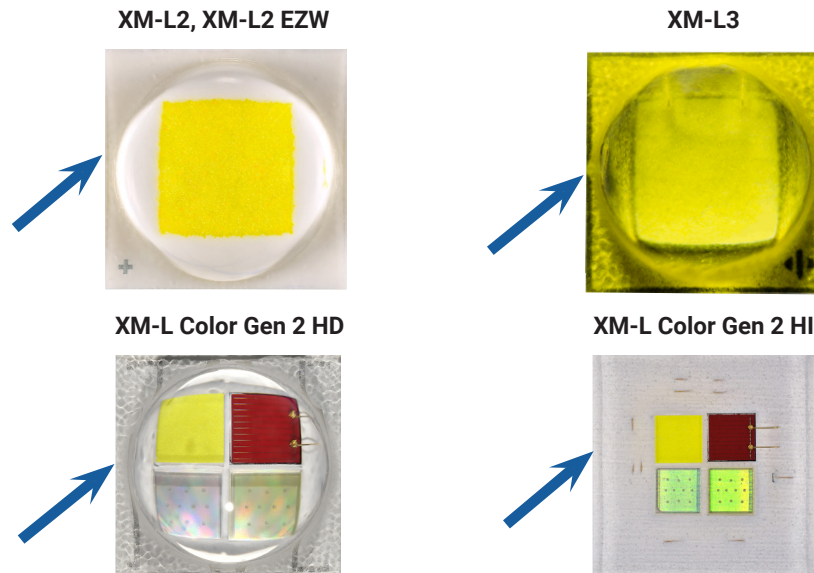
Recommended PCB Footprint



Recommended Solder Stencil

## CASE TEMPERATURE ( $T_s$ ) MEASUREMENT POINT

XLamp XM 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 XM Family LED itself. In testing, Cree LED has found such a solder pad to have insignificant impact on the resulting  $T_s$  measurement.

## NOTES ON SOLDERING XLAMP® XM FAMILY LEDS

XLamp XM 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 XM Family LEDs. Do not hand solder XLamp XM Family LEDs.

✓  
**CORRECT**



✓  
**CORRECT**



✗  
**WRONG**

### Solder Paste Type

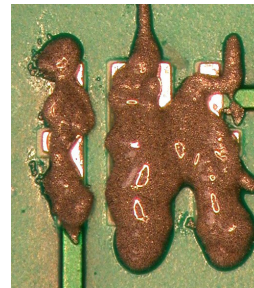
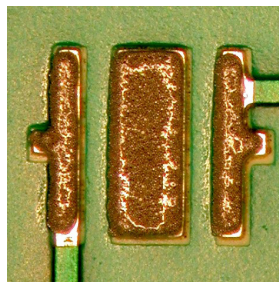
Cree LED strongly recommends using “no clean” solder paste with XLamp XM Family LEDs so that cleaning the PCB after reflow soldering is not required. Cree LED uses [Kester® R276 solder paste](#) internally.

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

### 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**

## NOTES ON SOLDERING XLAMP® XM FAMILY LEDS (CONTINUED)

### After Soldering

After soldering, allow XLamp XM 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 LED 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-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.

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

## LOW TEMPERATURE OPERATION

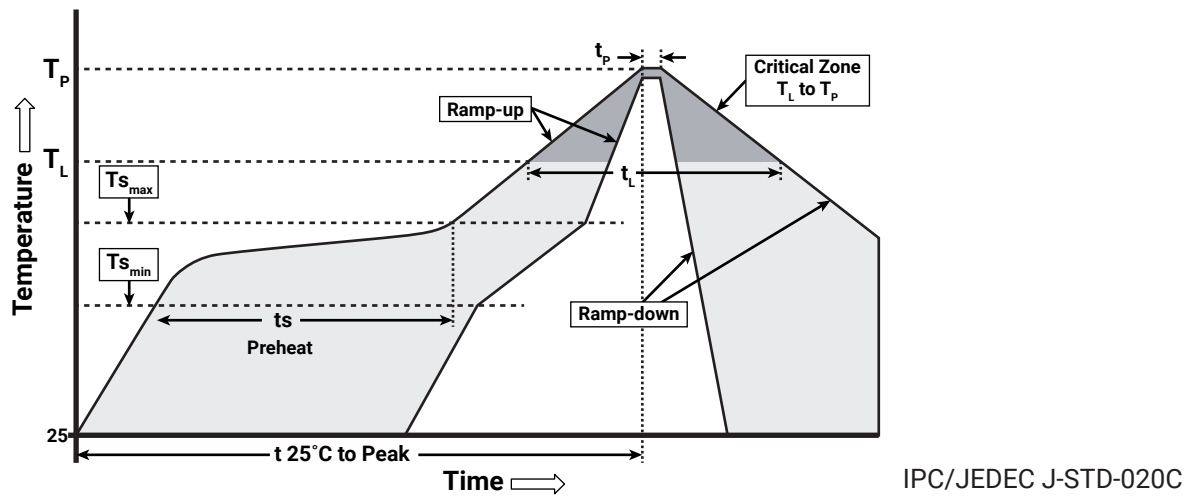
The minimum operating temperature of these XLamp LED components is -40 °C. To maximize lifetime, Cree LED recommends avoiding applications where the lamps are cycled on and off more than 10,000 cycles at temperatures below 0 °C.



## XLAMP® XM FAMILY LED REFLOW SOLDERING CHARACTERISTICS

In testing, Cree LED has found XLamp XM 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.



| Profile Feature                                       | Lead-Free Solder |
|---|------------------|
| Average Ramp-Up Rate ( $T_{s_{max}}$ to $T_P$ )       | 1.2 °C/second    |
| Preheat: Temperature Min ( $T_{s_{min}}$ )            | 120 °C           |
| Preheat: Temperature Max ( $T_{s_{max}}$ )            | 170 °C           |
| Preheat: Time ( $t_{s_{min}}$ to $t_{s_{max}}$ )      | 65-150 seconds   |
| Time Maintained Above: Temperature ( $T_L$ )          | 217 °C           |
| Time Maintained Above: Time ( $t_L$ )                 | 45-90 seconds    |
| Peak/Classification Temperature ( $T_P$ )             | 235 - 245 °C     |
| Time Within 5 °C of Actual Peak Temperature ( $t_p$ ) | 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.

## 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 XM 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 XM Family LEDs. Cree LED recommends not using these chemicals anywhere in an LED system containing XLamp XM 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

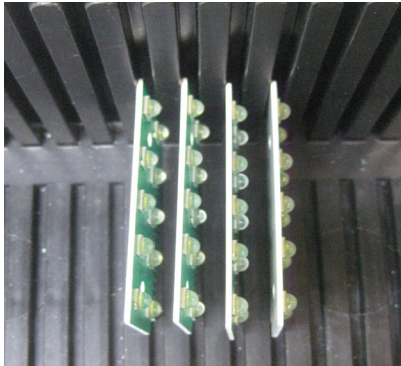
For proper LED operation and to avoid potential lumen depreciation and/or color shift, LEDs of all types must operate in an environment that contains oxygen. Simply allowing the LEDs to ventilate to air is sufficient; no extraordinary measures are required. Hermetically sealing LEDs in an enclosed space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

## ASSEMBLY STORAGE & HANDLING

Do not stack PCBs or assemblies containing XLamp XM 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 XM 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 XM Family LEDs. Force from the bubble wrap can potentially damage the LED.

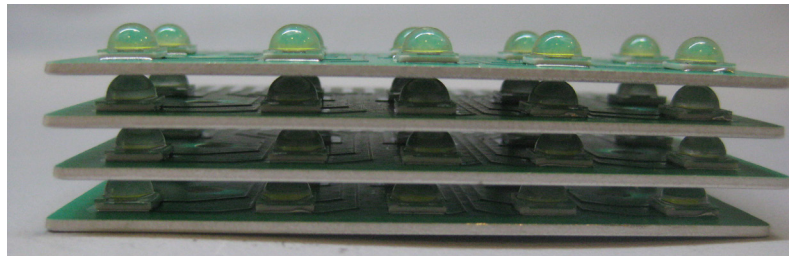
✓  
**CORRECT**



✓  
**CORRECT**



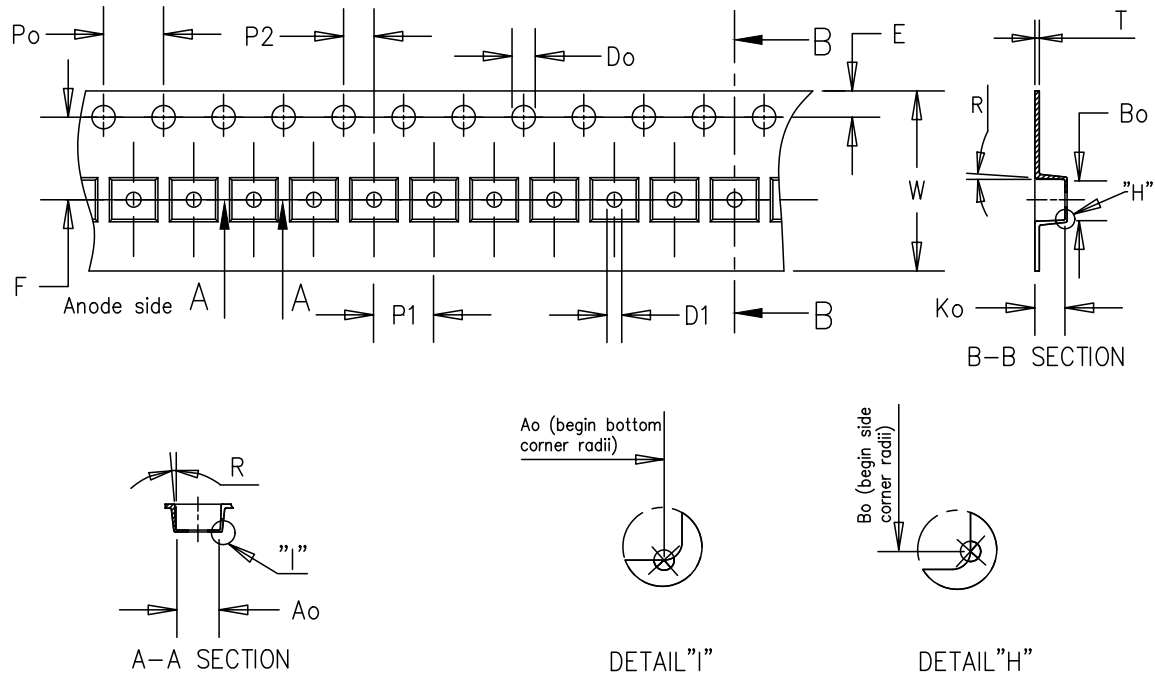
✗  
**WRONG**



## TAPE AND REEL

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

Except as noted, all dimensions in mm.



## XM-L2, XM-L2 EZW, XM-L3, XM-L Color Gen 2 High Density

| Item | Ao   | Bo   | Ko   | Po   | P1   | P2   | T    | E    | F    | Do   | D1   | W     | R  |
|------|------|------|------|------|------|------|------|------|------|------|------|-------|----|
| Dim. | 5.40 | 5.40 | 3.35 | 4.00 | 8.00 | 2.00 | 0.36 | 1.75 | 5.50 | 1.50 | 1.50 | 12.00 | 3° |

## XM-L Color Gen 2 High Intensity

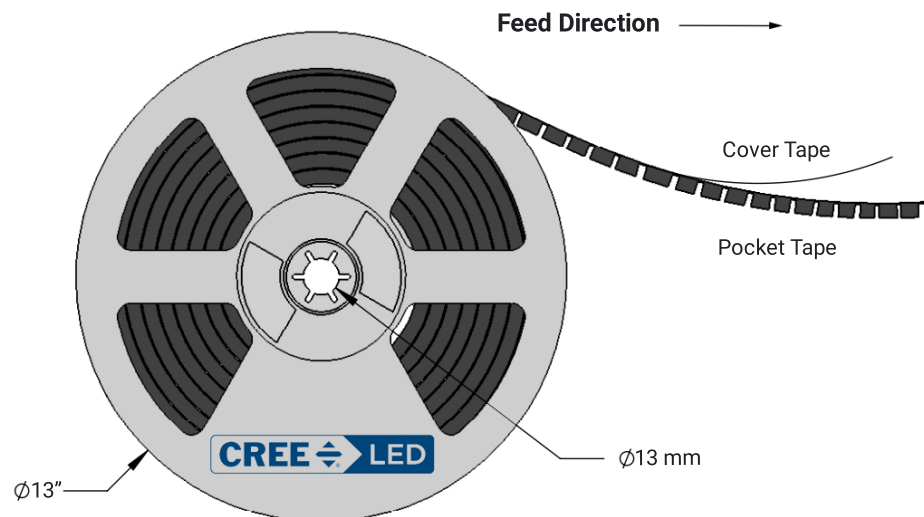
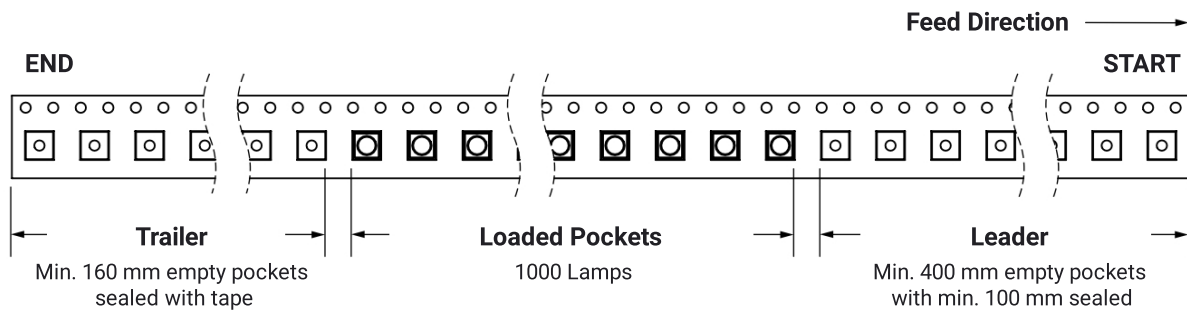
| Item | Ao   | Bo   | Ko   | Po   | P1   | P2   | T    | E    | F    | Do   | D1   | W     | R  |
|------|------|------|------|------|------|------|------|------|------|------|------|-------|----|
| Dim. | 5.40 | 5.40 | 1.50 | 4.00 | 8.00 | 2.00 | 0.30 | 1.75 | 5.50 | 1.50 | 1.50 | 12.00 | 7° |

## TAPE AND REEL - CONTINUED

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

Except as noted, all dimensions in mm.

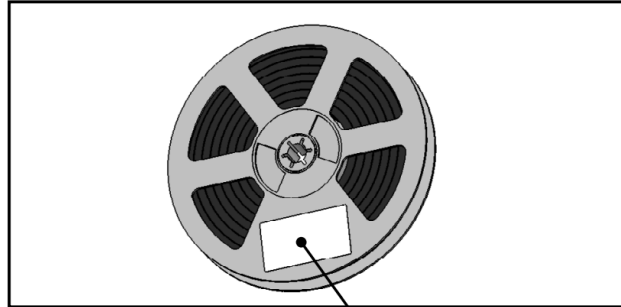
## XM-L2, XM-L EZW, XM-L3, XM-L Color Gen 2 High Density &amp; High Intensity



## PACKAGING & LABELS

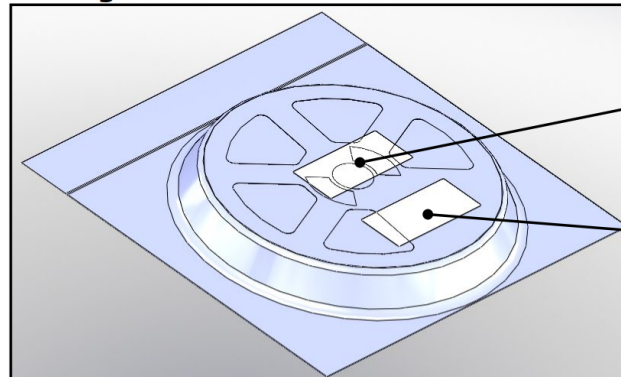
The diagrams below show the packaging and labels Cree LED uses to ship XLamp XM Family LEDs. XLamp XM Family LEDs are shipped in tape loaded on a reel. Each box contains only one reel in a moisture barrier bag.

### Unpackaged Reel



Label with Cree LED Bin Code, Quantity, Reel ID

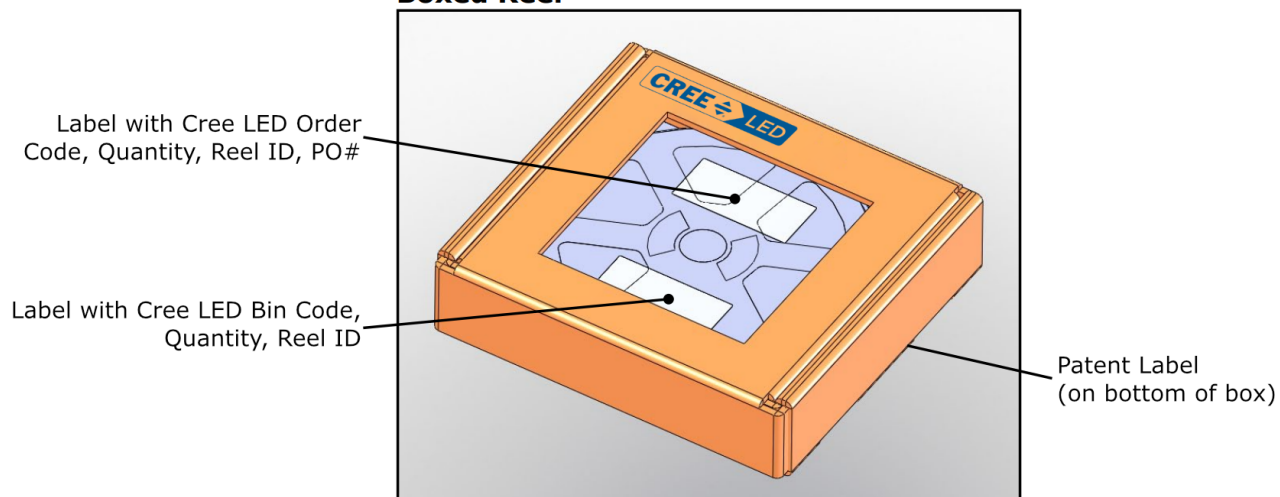
### Packaged Reel



Label with Cree LED Order Code, Quantity, Reel ID, PO#

Label with Cree LED Bin Code, Quantity, Reel ID

### Boxed Reel



Label with Cree LED Order Code, Quantity, Reel ID, PO#

Label with Cree LED Bin Code, Quantity, Reel ID

Patent Label (on bottom of box)