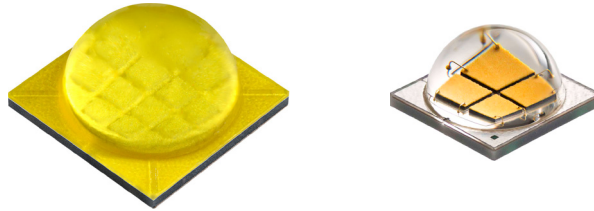# XLamp® MT-G2 and MK-R LEDs

INTRODUCTION

This application note applies to XLamp® MT-G2 and MK-R LEDs, which have order codes in the following formats.

MTxxxx-xx-xxxx-xxxxxxxxx

MKxxxx-xx-xxxx-xxxxxxxxx

This application note explains how XLamp MT-G2 and MK-R LEDs and assemblies containing these LEDs should be handled during manufacturing. Please read the entire document to understand how to properly handle XLamp MT-G2 and MK-R LEDs.

TABLE OF CONTENTS

Cree LED / 4001 E. Hwy. 54, Suite 2000 / Durham, NC 27709 USA / +1.919.313.5330 / www.cree-led.com
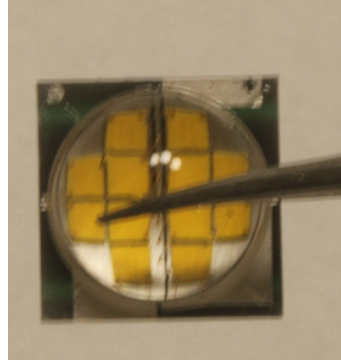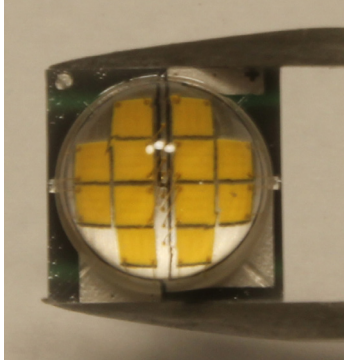
HANDLING XLAMP® MT-G2 AND MK-R LEDS

Manual Handling

Use tweezers to grab XLamp MT-G2 or MK-R 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 LED recommends the following at all times when handling XLamp MT-G2 or MK-R 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 XLamp MT-G2 or MK-R LEDs with appropriate ESD grounding.
- Cree LED recommends handling XLamp MT-G2 or MK-R LEDs wearing clean, lint-free gloves.

HANDLING XLAMP® MT-G2 AND MK-R LEDS - CONTINUED

Whenever possible, Cree LED recommends the use of the following pick and place tool to remove XLamp MT-G2 LEDs from the factory tape and reel packaging.
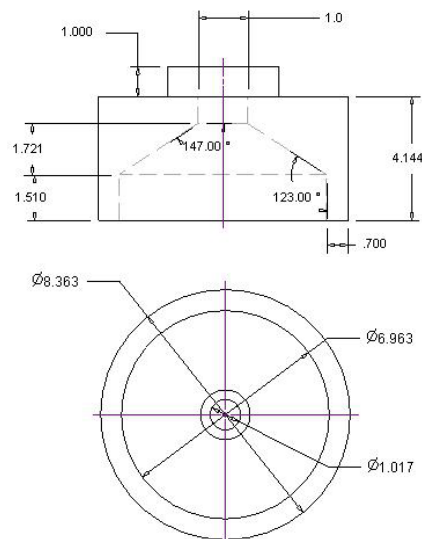
All measurements are ±.13 mm unless otherwise indicated.
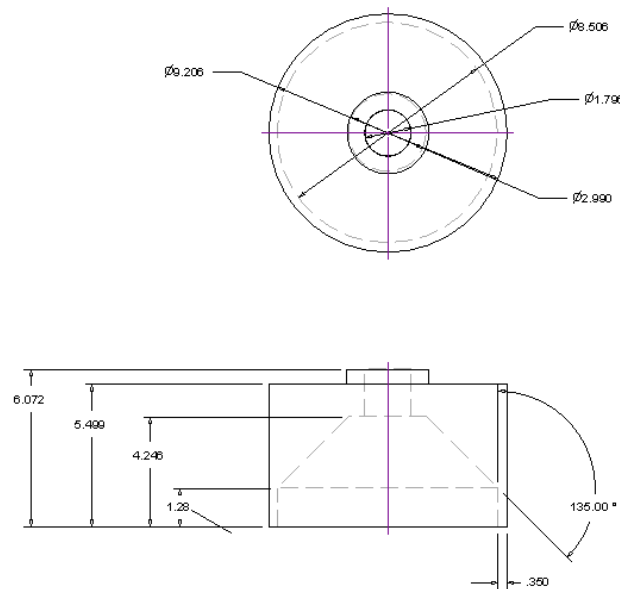
Whenever possible, Cree LED recommends the use of the following pick and place tool to remove XLamp MK-R LEDs from the factory tape and reel packaging.
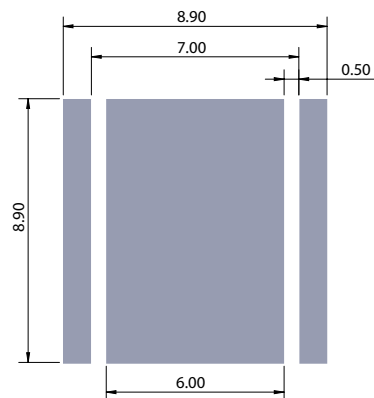
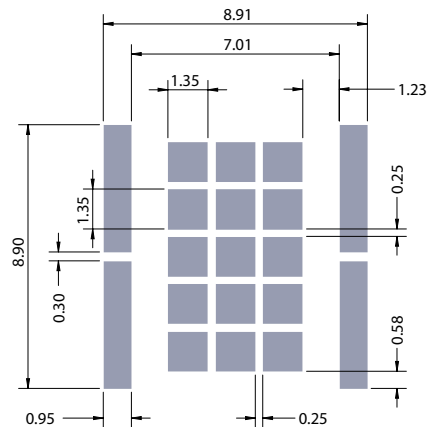All measurements are ±.13 mm unless otherwise indicated.

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 MT-G2 or MK-R LEDs onto the PCB. The diagrams below show the recommended PCB solder pad layout for XLamp MT-G2 LEDs.

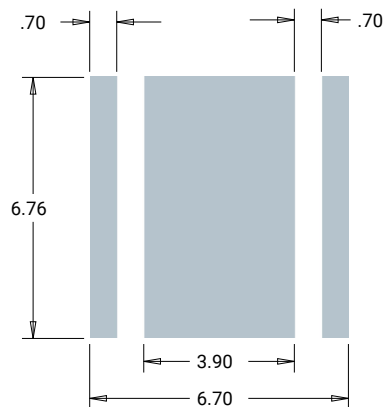All measurements are ±.13 mm unless otherwise indicated.
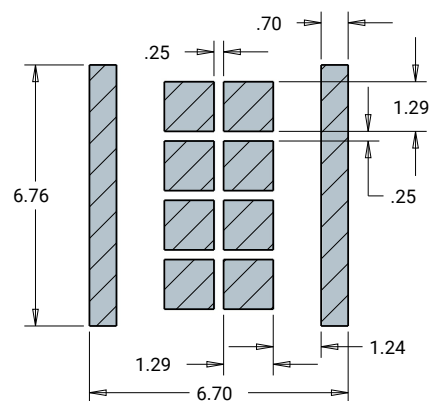

Recommended PCB Footprint

Recommended Stencil Opening

The diagrams below show the recommended PCB solder pad layout for XLamp MK-R LEDs.

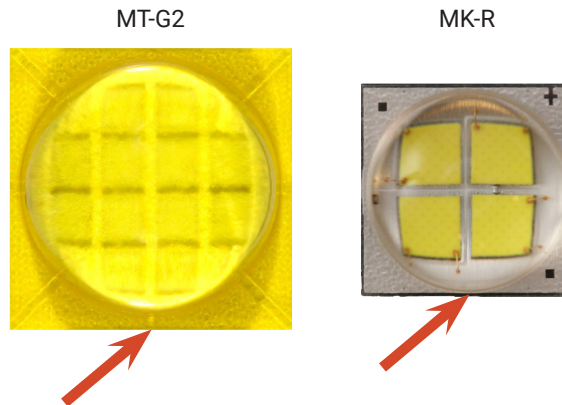All measurements are ±.13 mm unless otherwise indicated.

Recommended PCB Solder Pad

**Recommended Stencil Pattern
(Shaded Area Is Open)**

CASE TEMPERATURE (T_s) MEASUREMENT POINT

XLamp MT-G2 and MK-R 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 pictures below.

MT-G2   MK-R

It is not required to use a solder footprint for the thermal pad that is larger than the XLamp MT-G2 or MK-R 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® MT-G2 AND MK-R LEDS

XLamp MT-G2 and MK-R 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 MT-G2 or MK-R LEDs. Do not hand solder XLamp MT-G2 or MK-R LEDs.

✓ **CORRECT**

✓ **CORRECT**

🚫 **WRONG**

## NOTES ON SOLDERING XLAMP® MT-G2 AND MK-R LEDS - CONTINUED

Solder Paste Type

Cree LED strongly recommends using "no clean" solder paste with XLamp MT-G2 or MK-R 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**
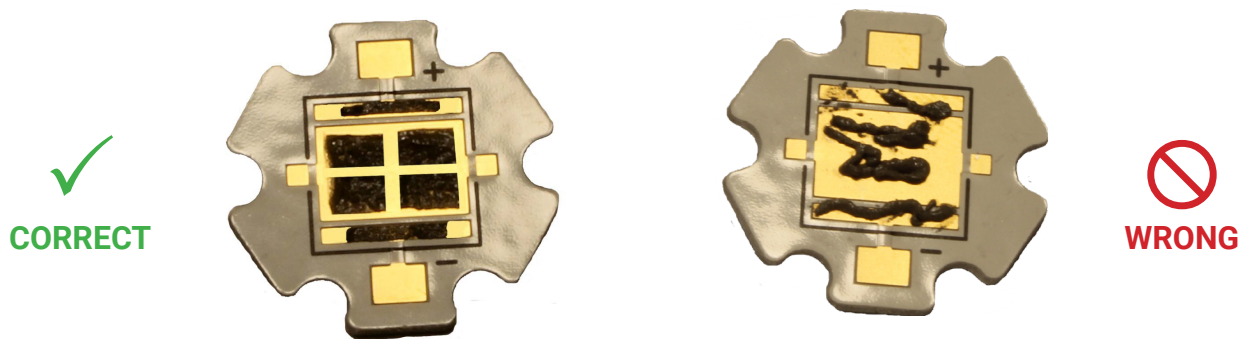
After Soldering

After soldering, allow XLamp MT-G2 and MK-R 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 MT-G2 and MK-R 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.

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® MT-G2 AND MK-R LED REFLOW SOLDERING CHARACTERISTICS

In testing, Cree LED has found XLamp MT-G2 and MK-R 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.
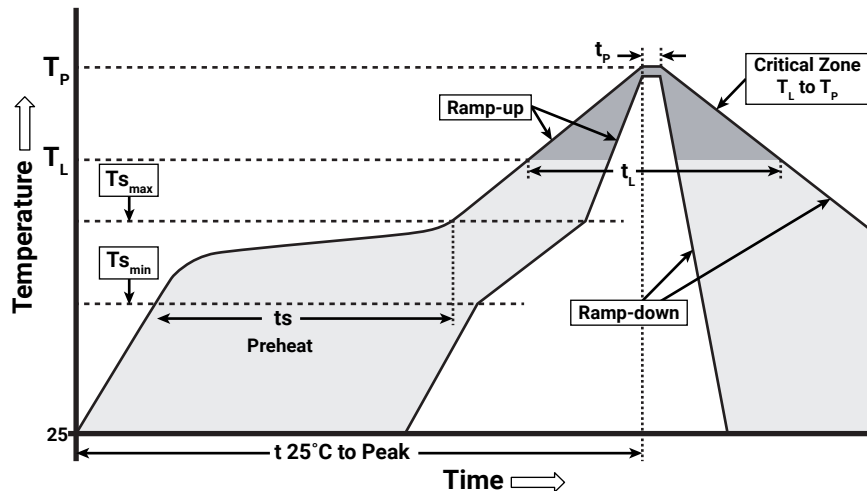
IPC/JEDEC J-STD-020C

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.

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. The video at www.youtube.com/watch?v=t24bf9D_1SA illustrates the process Cree LED has developed for testing the compatibility of chemicals and materials with LEDs. You should also consult your regional Cree LED Field Applications Engineer.

Recommended Chemicals

In testing, Cree LED has found the following chemicals to be safe to use with XLamp MT-G2 and MK-R 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 MT-G2 and MK-R LEDs. Cree LED recommends not using these chemicals anywhere in an LED system containing XLamp MT-G2 and MK-R 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 MT-G2 or MK-R LEDs so that anything rests on the LED lens. Force applied to the LED lens may result in the lens being damaged or displaced. PCBs or assemblies containing XLamp MT-G2 or MK-R 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 MT-G2 and MK-R LEDs. Force from the bubble wrap can potentially damage the LED.
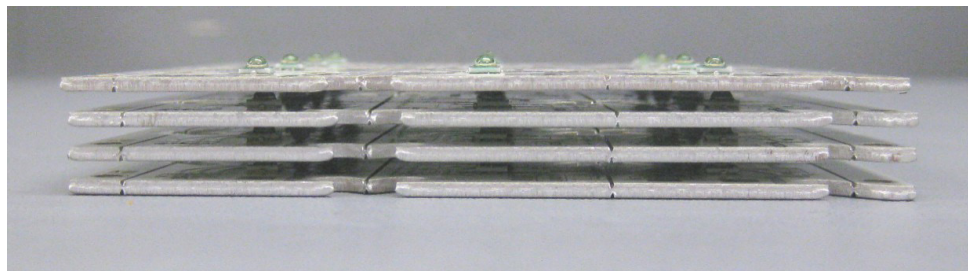
✓
CORRECT
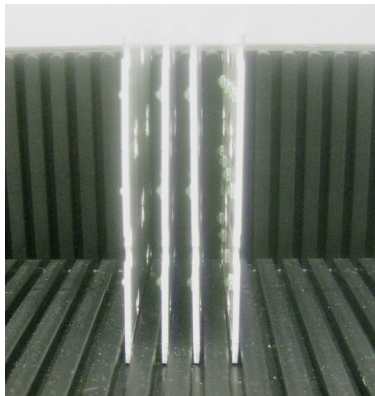
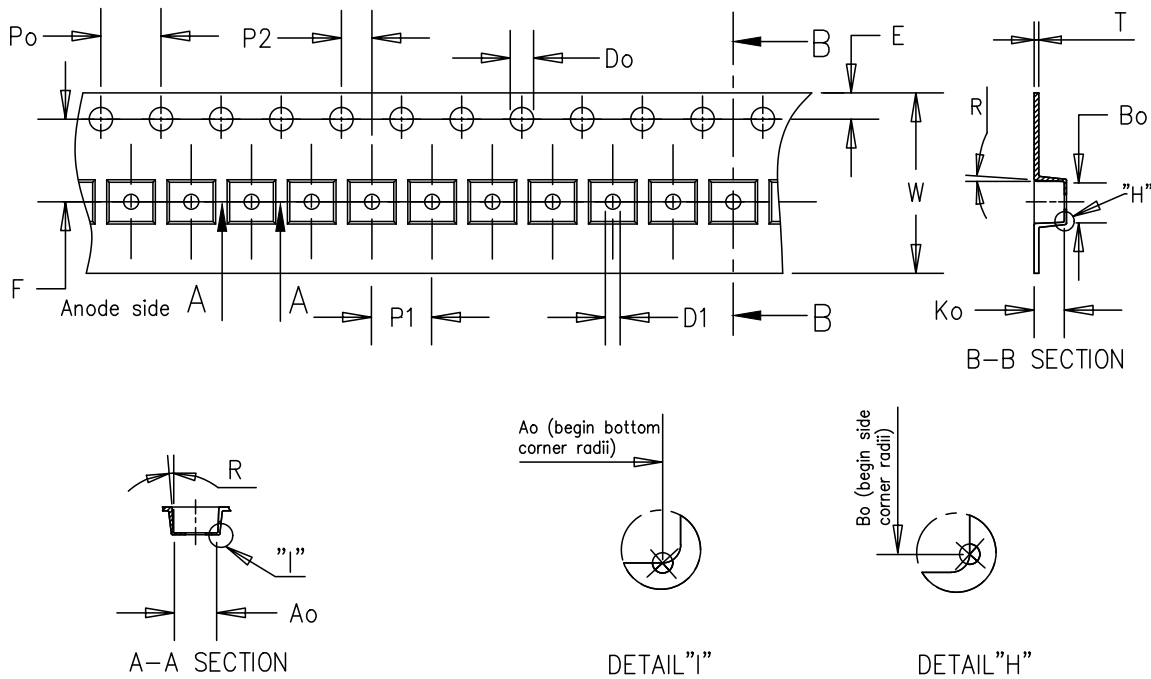
✓
CORRECT
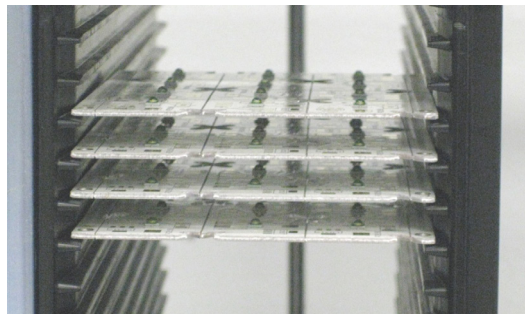
🚫
WRONG

TAPE AND REEL

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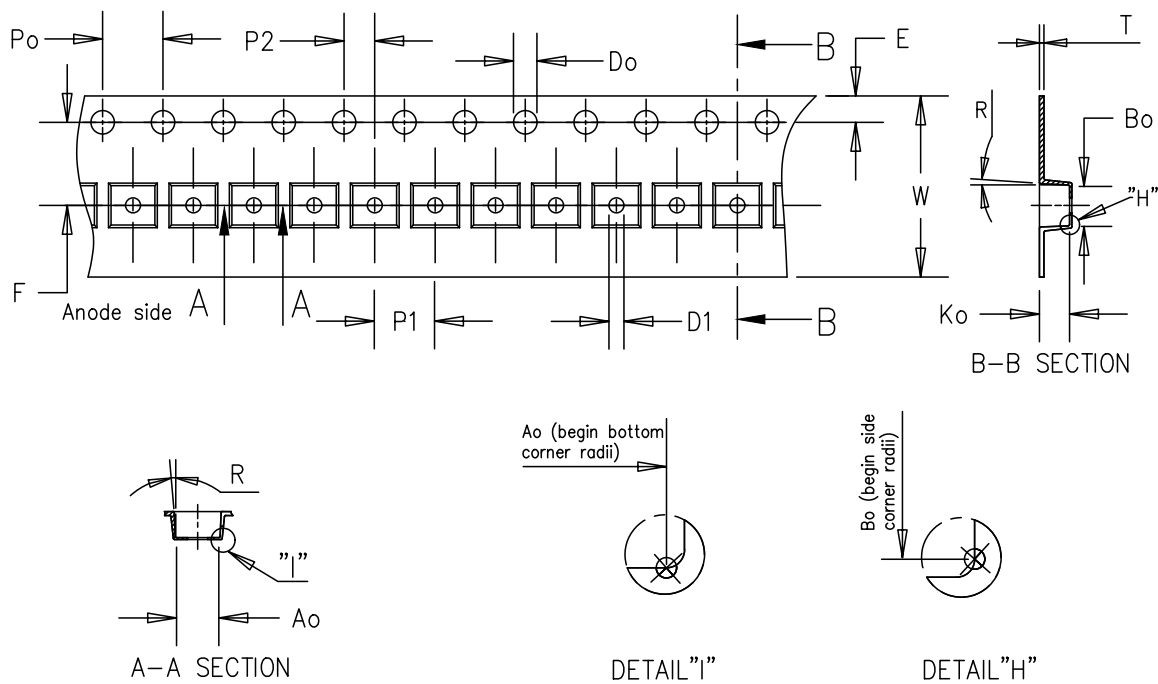
All dimensions in mm.

MT-G2 Carrier Tape

A–A SECTION

DETAIL"I"

DETAIL"H"

B–B SECTION

Item	Ao	Bo	Ko	Po	P1	P2	T	E	F	Do	D1	W	R
Dim.	9.40	9.40	5.25	4.00	12.00	2.00	0.36	1.75	7.50	1.50	1.50	16.00	5°

TAPE AND REEL - CONTINUED

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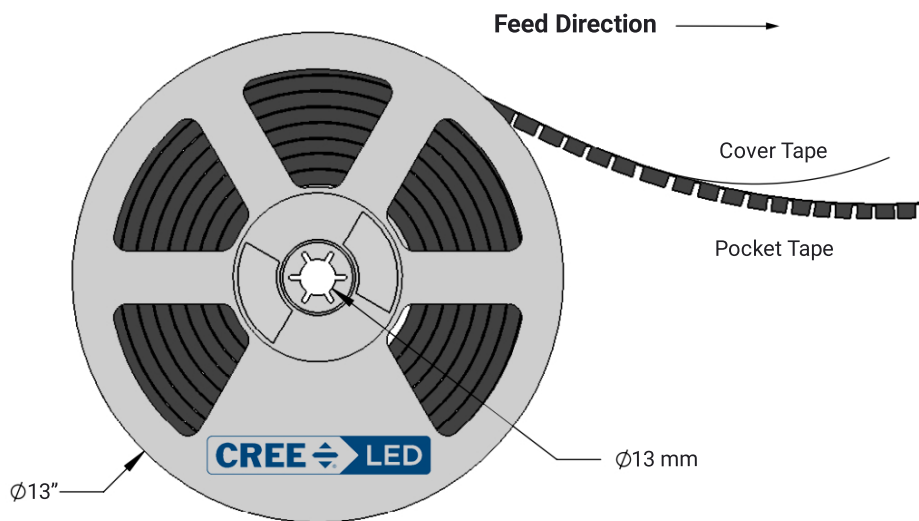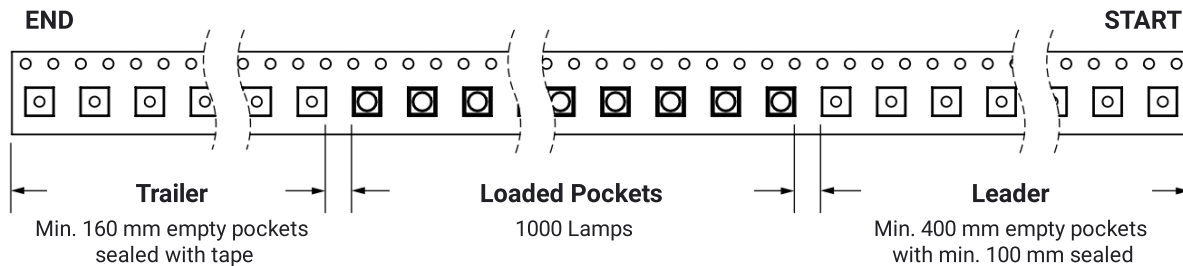
All dimensions in mm.

MK-R Carrier Tape

A–A SECTION   DETAIL"I"   DETAIL"H"

Item	Ao	Bo	Ko	Po	P1	P2	T	E	F	Do	D1	W	R
Dim.	7.40	7.40	4.31	4.00	12.00	2.00	0.36	1.75	7.50	1.50	1.50	16.00	5°

TAPE AND REEL - CONTINUED

Trailer

Min. 160 mm empty pockets
sealed with tape

Loaded Pockets

1000 Lamps

Leader

Min. 400 mm empty pockets
with min. 100 mm sealed

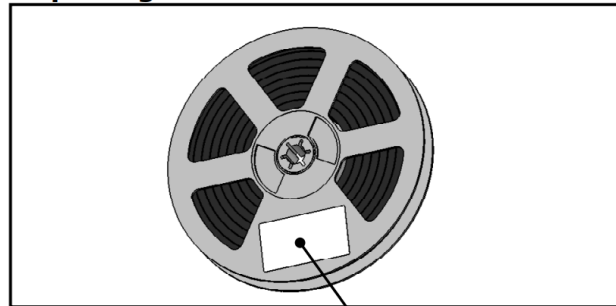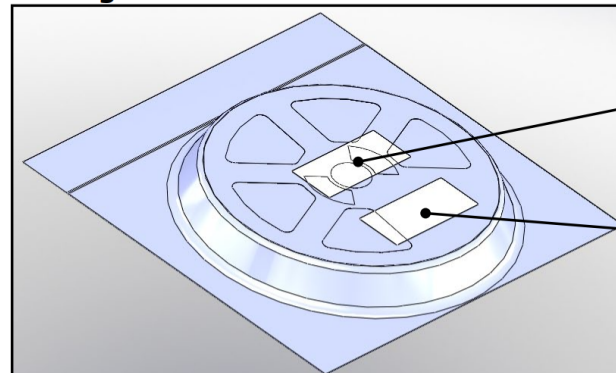**Feed Direction**

PACKAGING & LABELS

The diagrams below show the packaging and labels Cree LED uses to ship XLamp MT-G2 and MK-R LEDs. XLamp MT-G2 and MK-R LEDs are shipped in tape loaded on a reel. Each box contains only one reel in a moisture barrier bag.

Unpackaged Reel
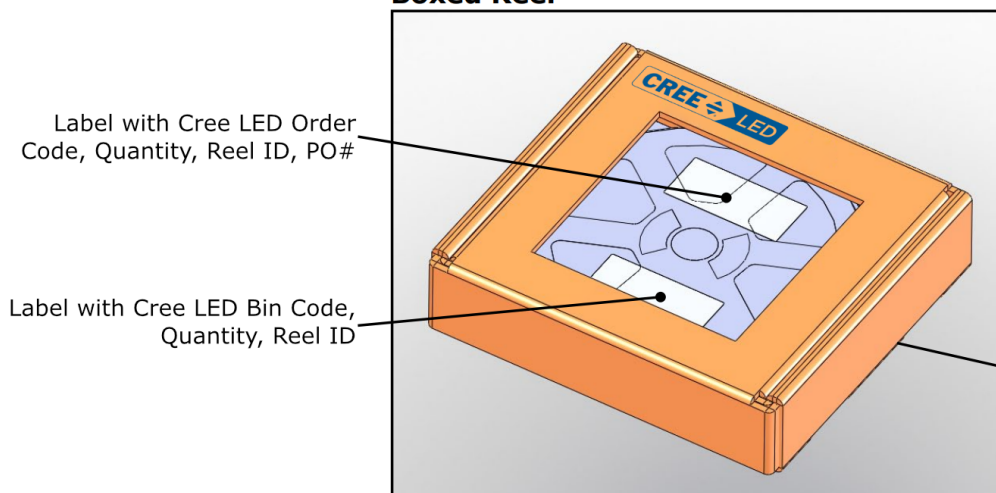
Label with Cree LED Bin Code, Quantity, Reel ID

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)