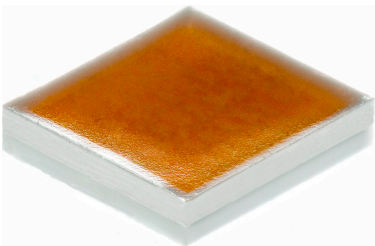# XLamp® MH Family LED

INTRODUCTION

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

MHxxxx-xxxx-xxxxxxxxxxx

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

Manual Handling

Use plastic, not metal, tweezers to grab XLamp MH Family LEDs at the sides of the substrate, i.e., at the base. Do not touch the optical surface with tweezers. Do not touch the optical surface with fingers. Do not push on the optical surface.

✓
CORRECT
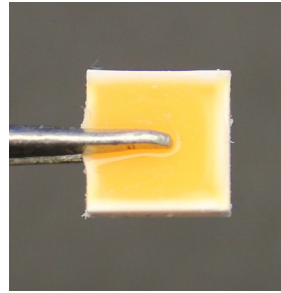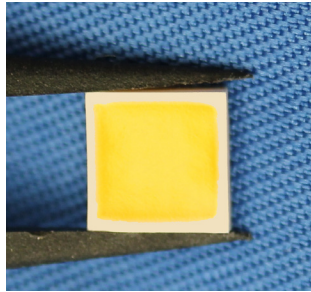
🚫
WRONG

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

- Avoid putting mechanical stress on the LED optical surface.
- Never touch the optical surface with fingers or sharp objects. The LED optical surface could become soiled or damaged, which would affect the optical performance of the LED.
- Cree LED recommends always handling MH Family LEDs with appropriate ESD grounding.
- Cree LED recommends handling MH Family LEDs wearing clean, lint-free gloves.

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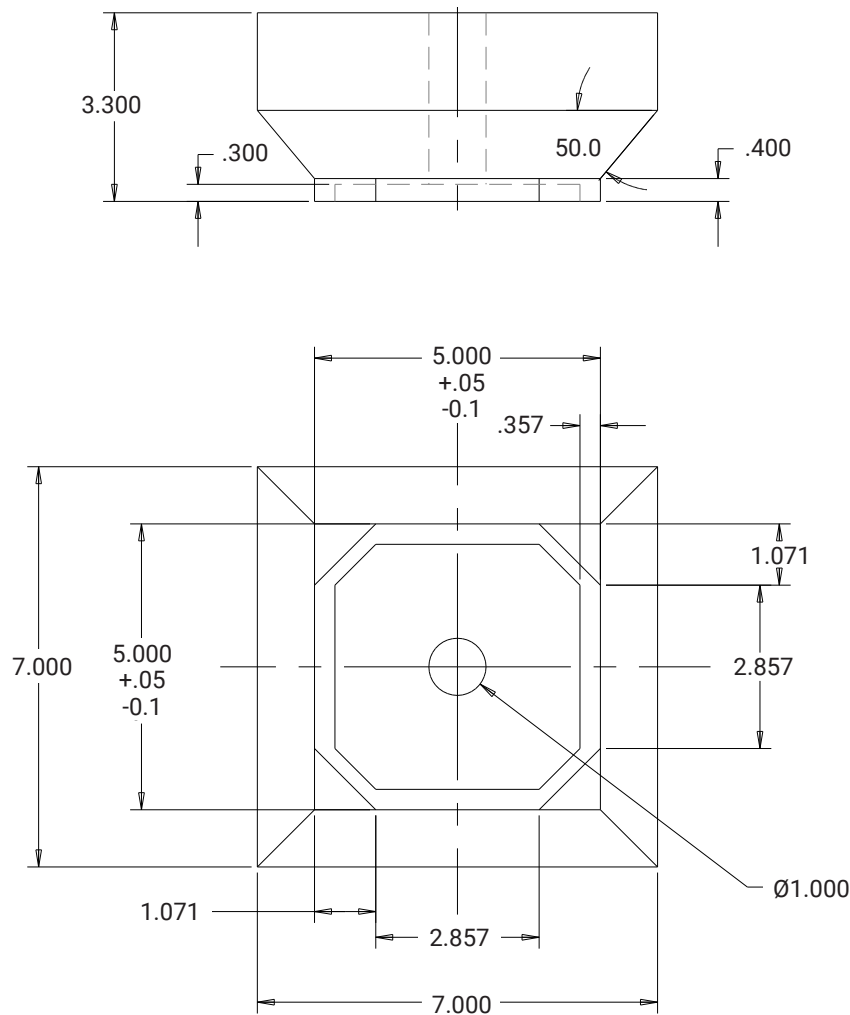
Pick & Place Nozzle

The following diagrams show examples of pick & place tools to remove MH Family LEDs from the factory tape and reel packaging. Cree LED recommends using a spring-relieved pick and place nozzle with a spring constant of 0.519 lb-ft (0.704 N-m). 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.
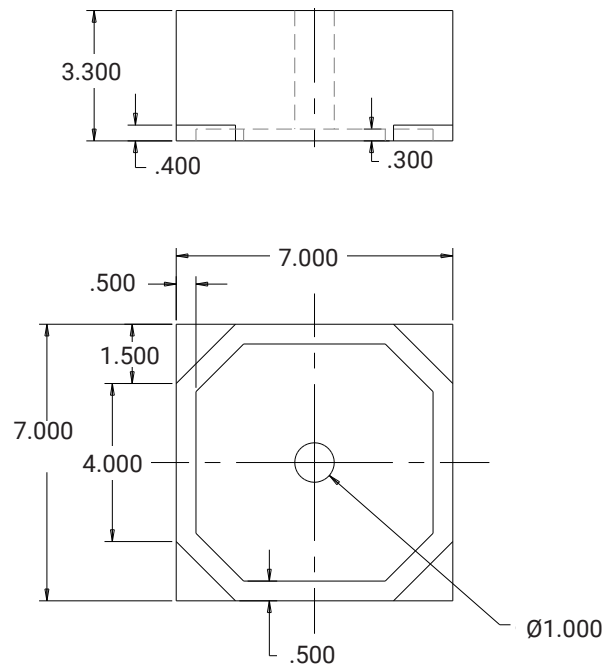
All dimensions in mm.

Measurement tolerance unless indicated otherwise:= ±0.2 mm

MHB-A & MHB-B

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HANDLING XLAMP® MH FAMILY LEDS - CONTINUED

MHD-E & MHD-G

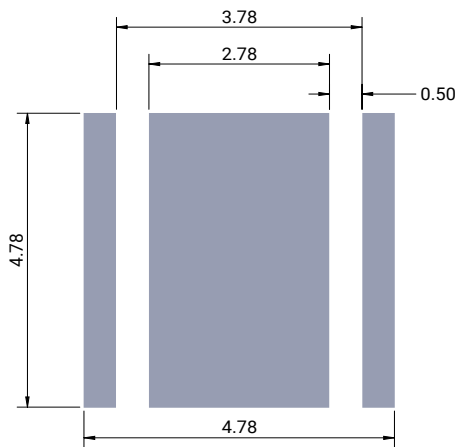## CIRCUIT BOARD PREPARATION & LAYOUTS

Printed circuit boards (PCBs) should be prepared and/or cleaned according to the manufacturer's specifications before placing or soldering XLamp MH Family LEDs onto the PCB. The diagrams below show the recommended PCB solder pad layouts for XLamp MH Family LEDs. The diagrams are not to scale.
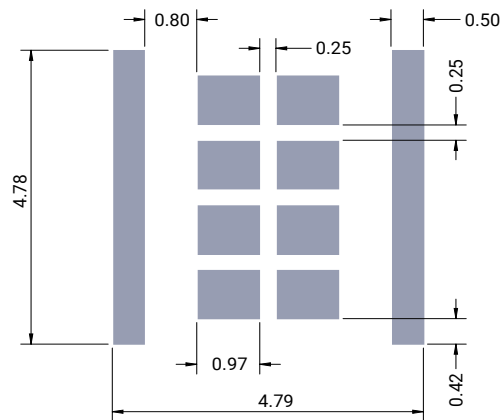
All dimensions in mm

Tolerance: +0.13 mm

MHB-A 9-V, 18-V & 36-V Class
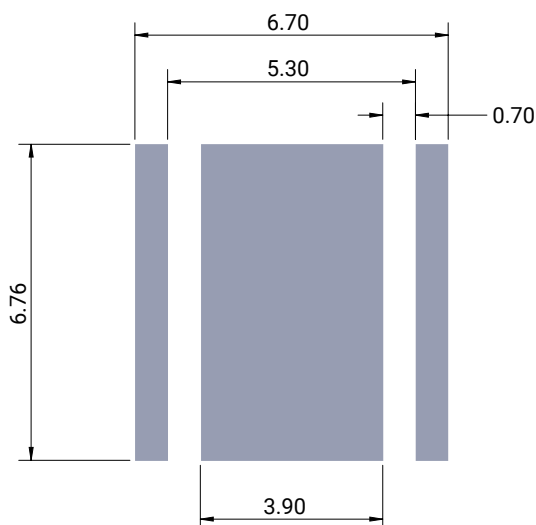**MHB-B 9-V, 18-V & 36-V Class**

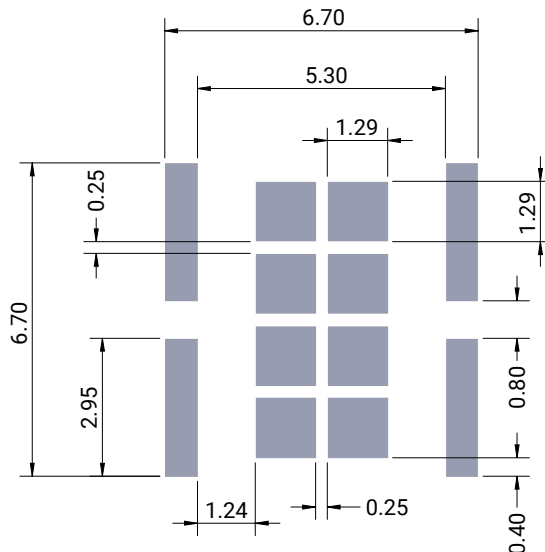Recommended PCB Footprint

Recommended Stencil Opening

MHD-E 9-V/18-V Class - 9-V Configuration
MHD-E 36-V Class
MHD-G 18-V/36-V Class - 18-V Configuration
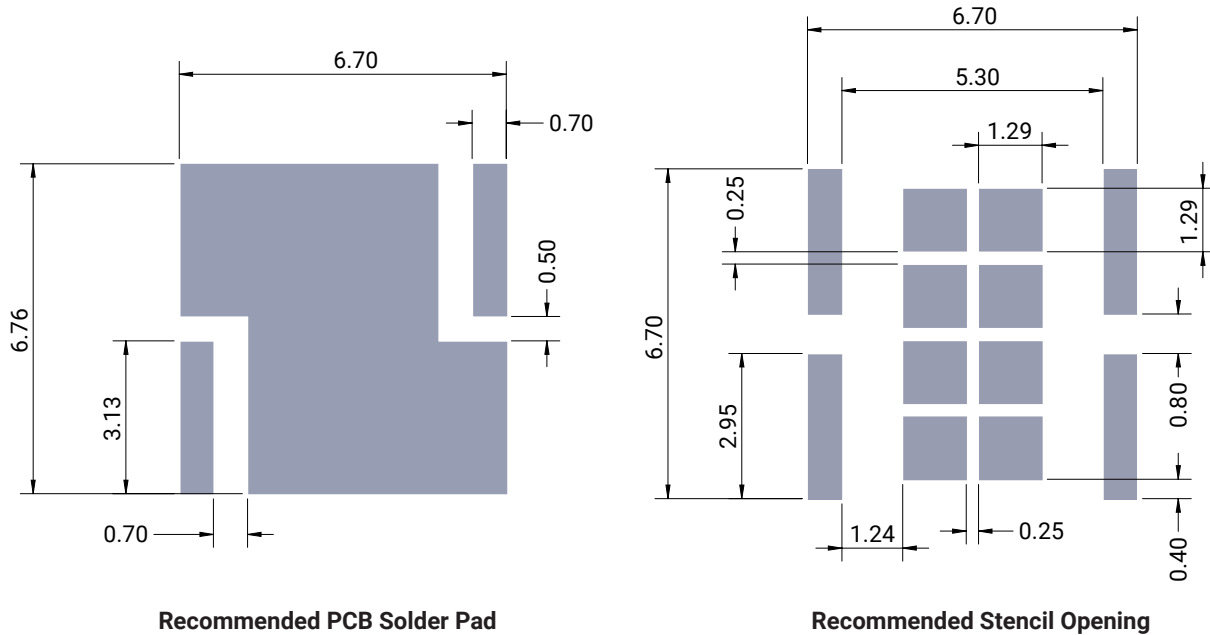

Recommended PCB Footprint

Recommended Stencil Opening

CIRCUIT BOARD PREPARATION & LAYOUTS - CONTINUED

MHD-E 9-V/18-V Class - 18-V Configuration

MHD-G 18-V/36-V Class - 36-V Configuration

This configuration should not be used for 36-V class MHD-E LEDs.

Recommended PCB Solder Pad

Recommended Stencil Opening

CASE TEMPERATURE (T$_s$) MEASUREMENT POINT

XLamp MH Family LED case temperature (Ts) 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.
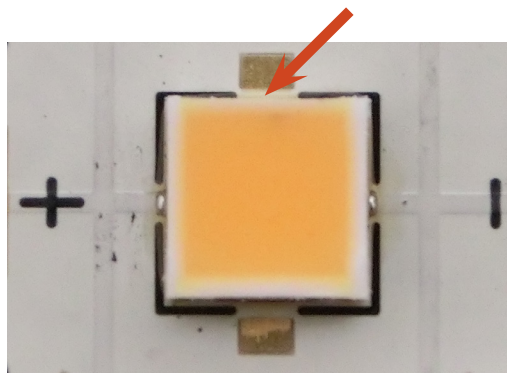
It is not required to use a solder footprint for the thermal pad that is larger than the XLamp MH Family LED itself. In testing, Cree LED has found such a solder pad to have insignificant impact on the resulting Ts measurement.

NOTES ON SOLDERING XLAMP® MH FAMILY LEDS

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

✓ CORRECT

✓ CORRECT

🚫 WRONG

Solder Paste Type

Cree LED strongly recommends using "no clean" solder paste with XLamp MH 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
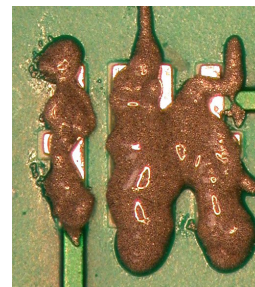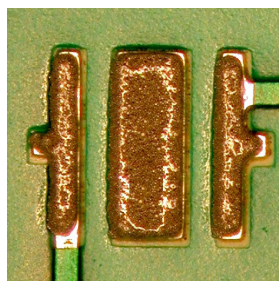
🚫 WRONG

NOTES ON SOLDERING XLAMP® MH FAMILY LEDS - CONTINUED

After Soldering

After soldering, allow XLamp MH Family LEDs to return to room temperature before subsequent handling. Premature handling of the device, especially around the optical surface, could result in damage to the LED.

Cree LED recommends verifying that soldered LEDs are not tilted, a situation called tombstoning. As a general guideline, an LED is tilted when the part has a low edge touching the PCB surface and a high edge above the PCB surface.

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 MH Family LEDs may be stored as MSL 1 per JEDEC J-STD-033, meaning they have unlimited floor life in conditions of ≤ 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® MH FAMILY LED REFLOW SOLDERING CHARACTERISTICS

IIn testing, Cree LED has found XLamp MH 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.
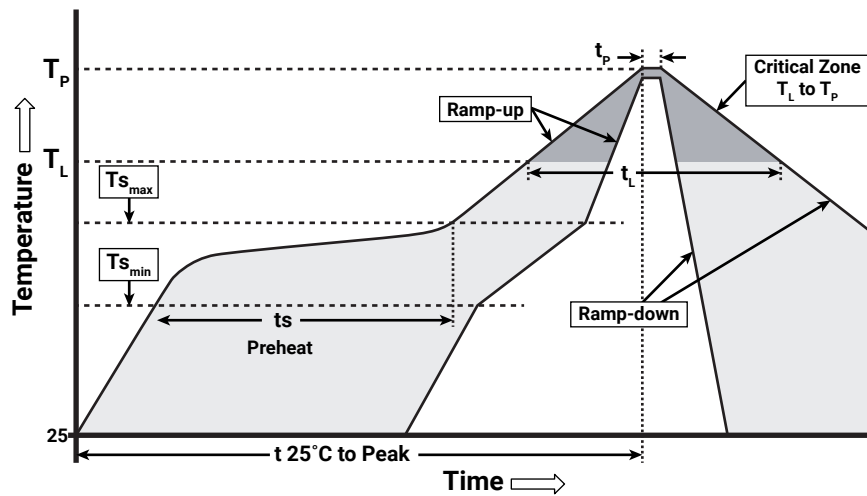
IPC/JEDEC J-STD-020C

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.

Note: While the high reflow temperatures (above) have been approved, Cree LED's best practice guideline for reflow is to use as low a temperature as possible during the reflow soldering process for these LEDs.

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 MH 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 MH Family LEDs. Cree LED recommends not using these chemicals anywhere in an LED system containing XLamp MH 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 MH Family LEDs so that anything rests on the LED optical surface. PCBs or assemblies containing XLamp MH Family LEDs should be stacked in a way to allow at least 1-cm clearance above the LED optical surface.

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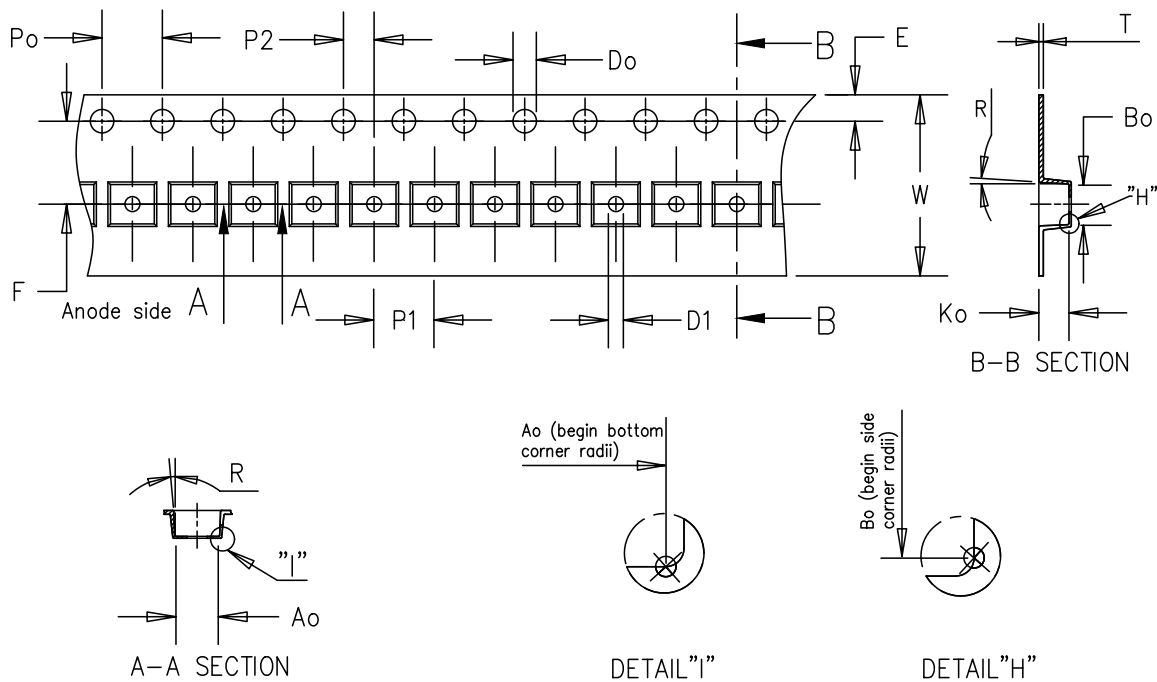

✓ CORRECT
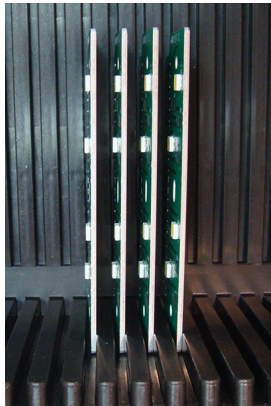
✓ CORRECT
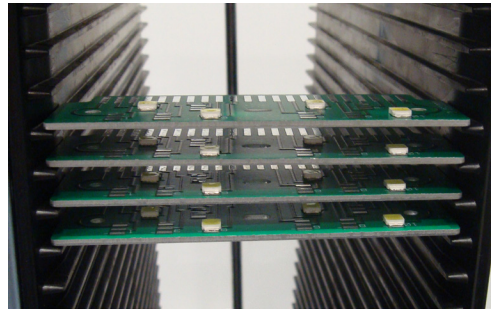
🚫 WRONG

TAPE AND REEL

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

All dimensions in mm
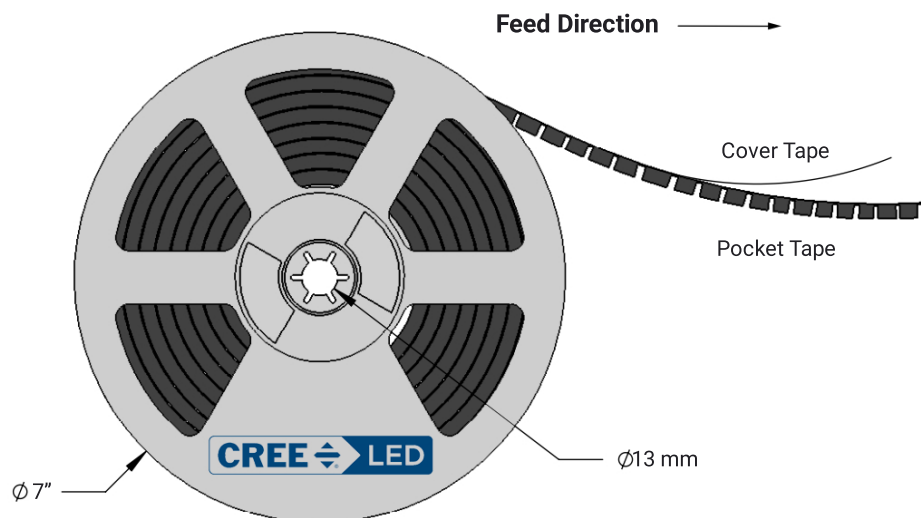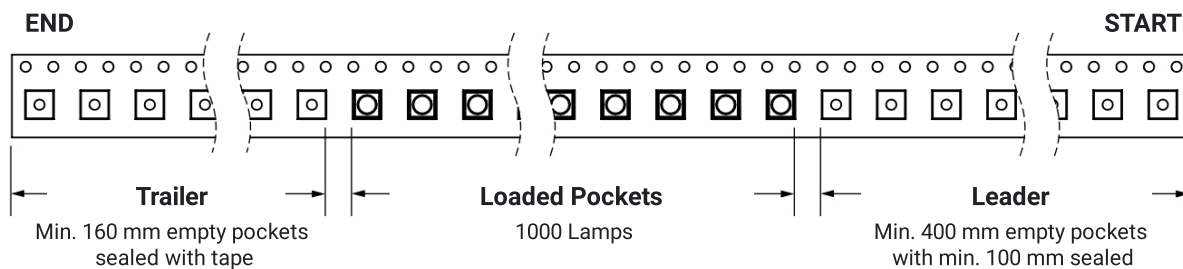
All dimensions are ±.13 mm unless otherwise indicated.

MHB-A & MHB-B

Item	Ao	Bo	Ko	Po	P1	P2	T	E	F	Do	D1	W	R
Dim.	5.4	5.40	1.50	4.00	8.00	2.00	0.30	1.75	5.50	1.50	1.50	12.00	7°

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TAPE AND REEL - CONTINUED

MHB-A & MHB-B

Trailer	**Loaded Pockets**	**Leader**
Min. 160 mm empty pockets sealed with tape	1000 Lamps	Min. 400 mm empty pockets with min. 100 mm sealed

Feed Direction

TAPE AND REEL - CONTINUED
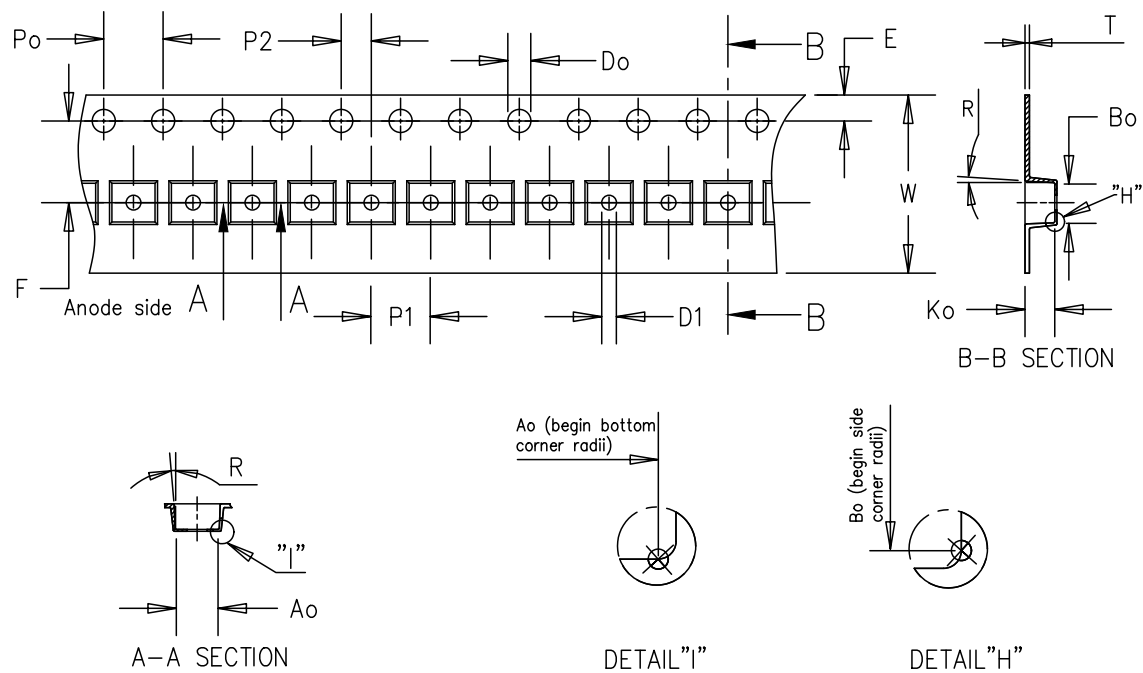
MHD-E & MHD-G

Item	Ao	Bo	Ko	Po	P1	P2	T	E	F	Do	D1	W	R
Dim.	7.60	7.60	1.70	4.00	12.00	2.00	0.30	1.75	7.50	1.50	1.50	16.00	3°

TAPE AND REEL - CONTINUED

MHD-E & MHD-G

Trailer

Min. 160 mm empty pockets
sealed with tape

Loaded Pockets

1000 Lamps

Leader

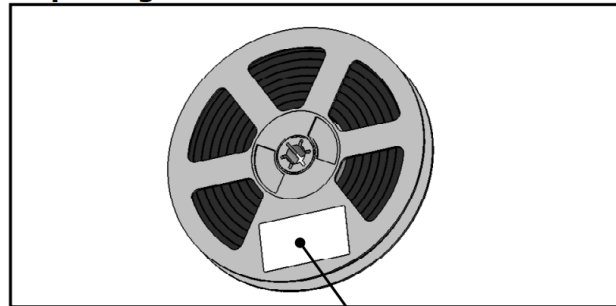Min. 400 mm empty pockets
with min. 100 mm sealed

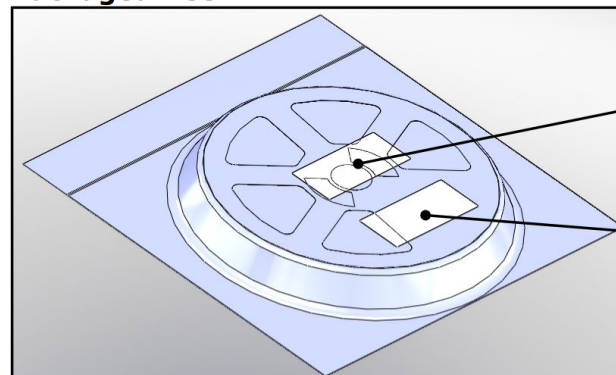**Feed Direction**
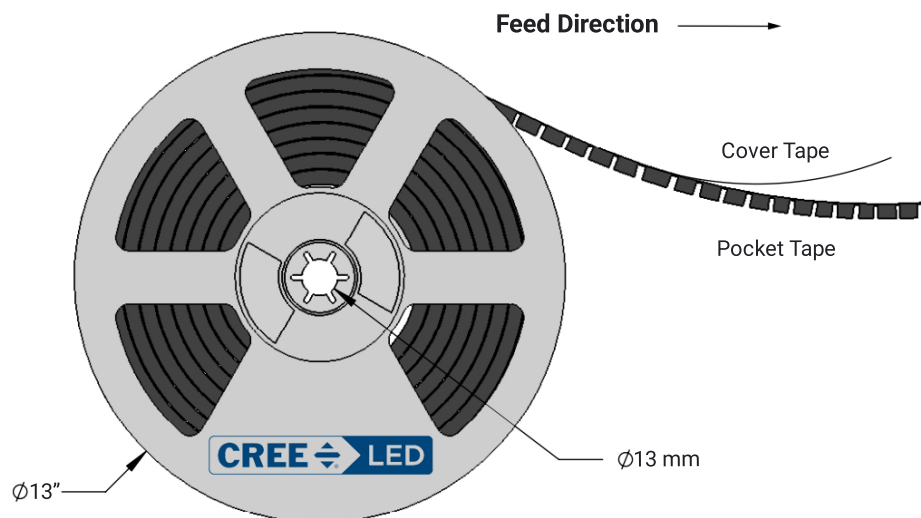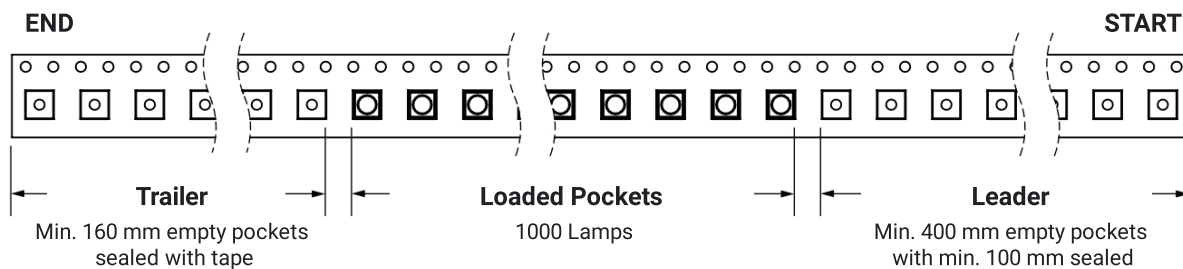
PACKAGING & LABELS

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

Unpackaged Reel

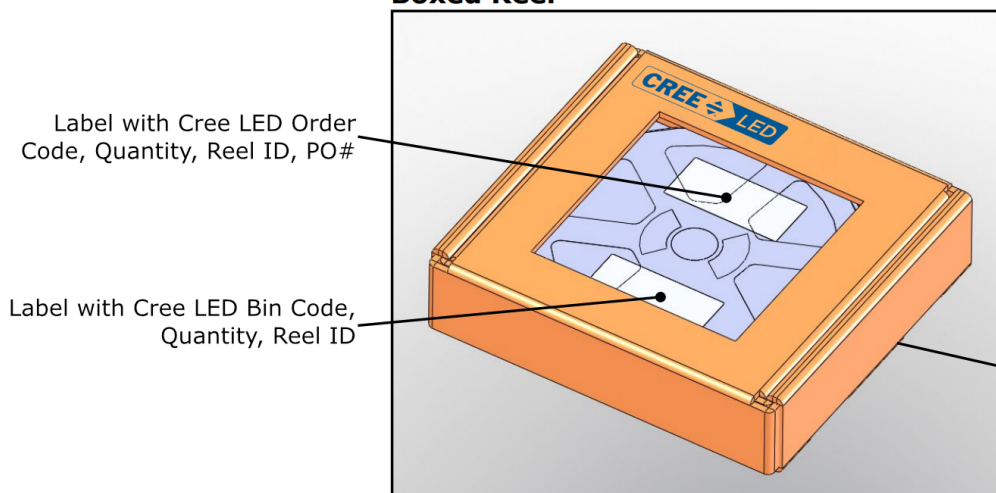Label with Cree LED Bin Code, Quantity, Reel ID

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)