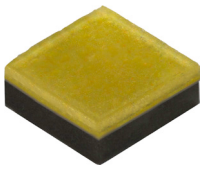
XLamp® XD16 LEDs



INTRODUCTION

This application note applies to XLamp® XD16 LEDs, which have order codes in the following format.

XD16xxx-xx-xxxx-xxxxxxxxx

This application note explains how XLamp XD16 LEDs and assemblies containing these LEDs should be handled during manufacturing. Please read the entire document to understand how to properly handle XLamp XD16 LEDs.

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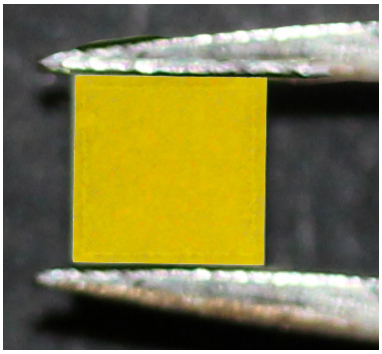
HANDLING XLAMP® XD16 LEDS

Manual Handling

Use tweezers to grab XLamp XD16 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.

Minimize shear force on the lens material. Pick parts at the ceramic panel and not from the lens materials. Excessive force on the lens could damage the LED.

✓
CORRECT



Cree LED recommends the following at all times when handling XLamp XD16 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 XD16 LEDs with appropriate ESD grounding.
- Cree LED recommends handling XD16 LEDs wearing clean, lint-free gloves.

Whenever possible, Cree LED recommends the use of a pick & place tool to remove XLamp XD16 LEDs from the factory tape & reel packaging.

ESD

XD16 LEDs have no electrostatic discharge (ESD) protection and are sensitive to ESD damage. Remove XD16 LEDs from their packaging at an ESD-safe workstation and use appropriate ESD handling protocols and precautions when handling the LED and soldering connections to the LED.

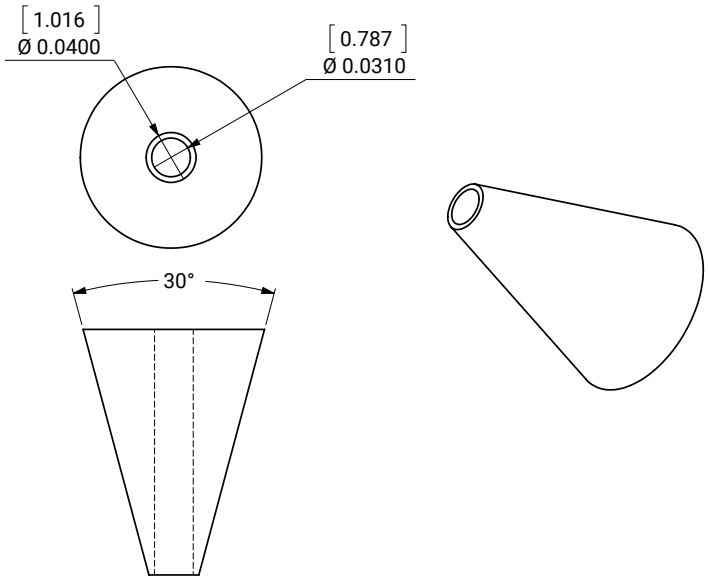
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Pick & Place Nozzle

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. The following pick & place tools are specific to the XD16 LEDs.

All dimensions in mm.

Measurement tolerances: .xxx = .001 mm



Force Limit

When using this recommended nozzle design, do not apply more than 600 gram-force of vertical force to the top of the XLamp XD16 LED. Excessive force on the lens could damage the LED. When using alternate nozzle designs, the vertical force limit could be reduced and the limit should be verified by the user to avoid damage to the LED.

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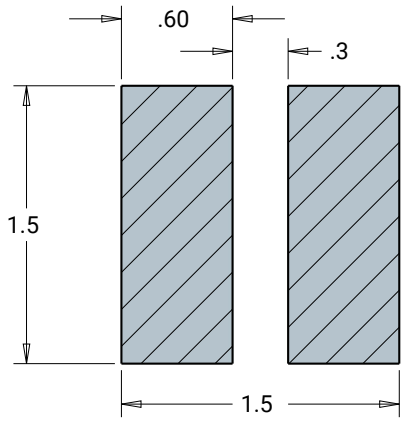
CIRCUIT BOARD PREPARATION & LAYOUTS

Printed circuit boards (PCBs) should be prepared and/or cleaned according to the manufacturer's specifications before placing or soldering XLamp XD16 LEDs onto the PCB.

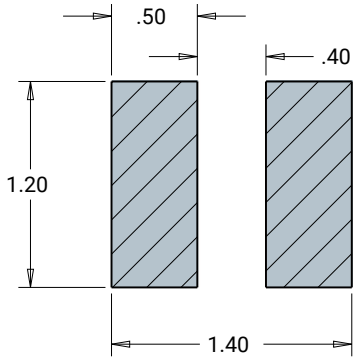
The diagram below shows the recommended PCB solder pad layout for XLamp XD16 LEDs.

All dimensions in mm.

Measurement tolerance: .xx = .±13 mm



Recommended PC Board Solder Pad



Recommended Stencil Pattern

CASE TEMPERATURE (T_S) MEASUREMENT POINT

XLamp XD16 LED case temperature (Ts) should be measured on the PCB surface, as close to the LED's base as possible. Connect the thermocouple at a point where the voltage potential is below the rating for the meter. XD16 LEDs do not have an isolated thermal pad and care should be exercised to avoid bridging the anode and cathode together, which may occur if the thermocouple bead is large. 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 XD16 LED itself. In testing, Cree LED has found such a solder pad to have insignificant impact on the resulting Ts measurement.

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NOTES ON SOLDERING XLAMP® XD16 LEDS

XLamp XD16 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 7.

Do not wave solder XLamp XD16 LEDs. Do not hand solder XLamp XD16 LEDs.

✓ CORRECT





WRONG

✓ CORRECT



Solder Paste Type

Cree LED recommends using one of several solder pastes designed for increased solder joint reliability, for example Alpha® MAXREL™ P30, AIM REL22™ M8 or Indium10.1.

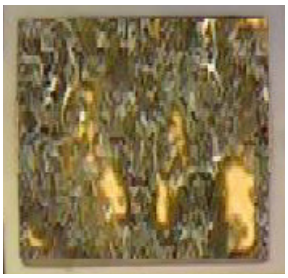
Cree LED recommends the following solder paste compositions: SnAgCu (tin/silver/copper) and SnAg (tin/silver).

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 with a 3-mil stencil thickness for the stencil layout on page 4.

✓ CORRECT





WRONG

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After Soldering

After soldering, allow XLamp XD16 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 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. 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).

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.

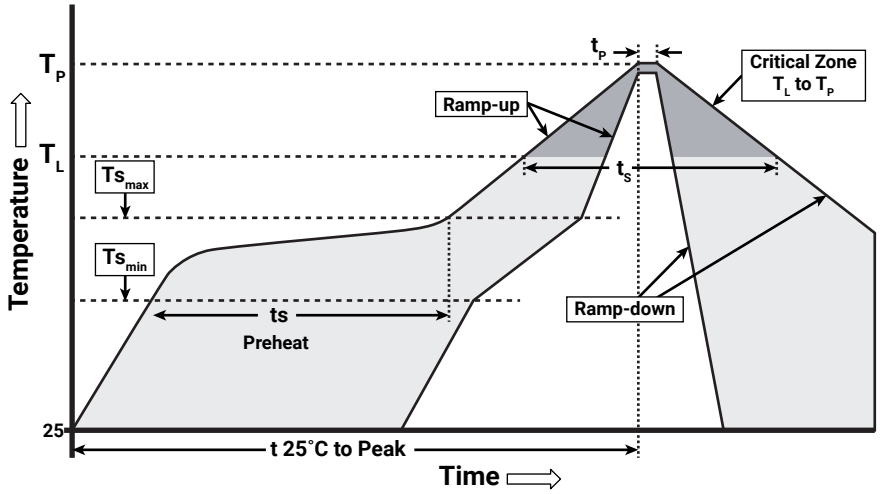
Once the MBP is opened, XLamp XD16 LEDs may be stored as MSL 1 per JEDEC J-STD-033, meaning they have unlimited floor life in conditions of ≤ 30 ºC/85% relative humidity (RH). Regardless of storage condition, Cree LED recommends sealing any unsoldered LEDs in the original MBP.

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XLAMP® XD16 LED REFLOW SOLDERING CHARACTERISTICS

In testing, Cree LED has found XLamp XD16 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. 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 XD16 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 XD16 LEDs. Cree LED recommends not using these chemicals anywhere in an LED system containing XLamp XD16 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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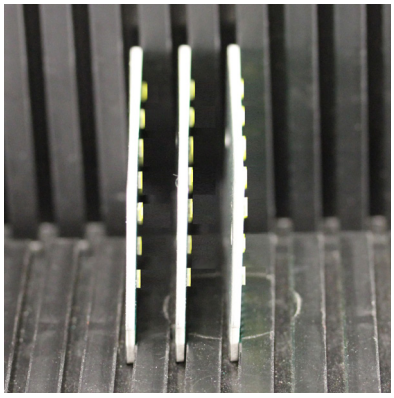
ASSEMBLY STORAGE & HANDLING

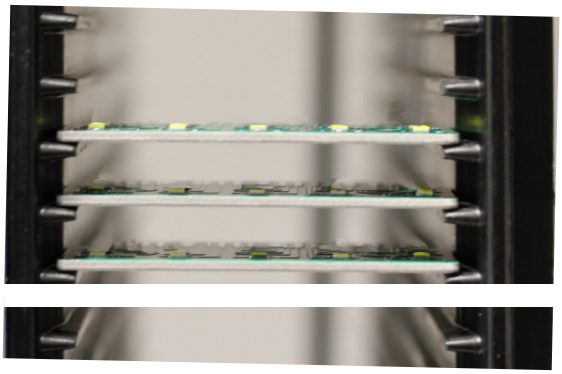
Do not stack PCBs or assemblies containing XLamp XD16 LEDs so that anything rests on the LED lens. Do not handle PCBs or assemblies containing XLamp XD16 LEDs so that anything contacts the LED lens. Force applied to the LED lens may result in latent damage to the LED. PCBs or assemblies containing XLamp XD16 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 XD16 LEDs. Force from the bubble wrap can cause latent damage the LED.

Do not use PCBs or assemblies containing XLamp XD16 LEDs that have been mishandled (for example, PCBs that have been dropped on the floor) due to the risk of latent damage to the LED.

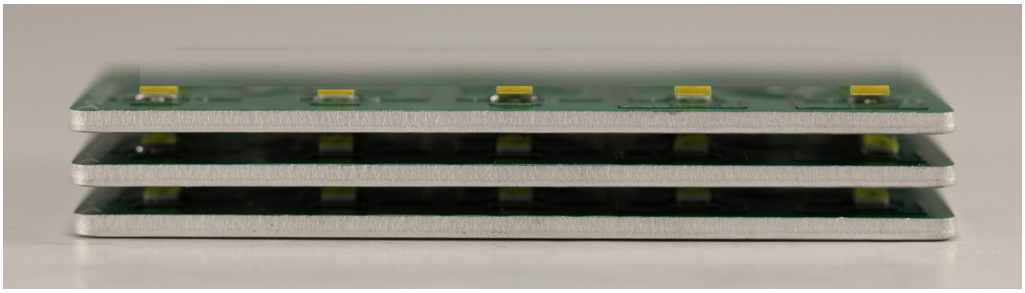
✓ CORRECT





✓ CORRECT

WRONG



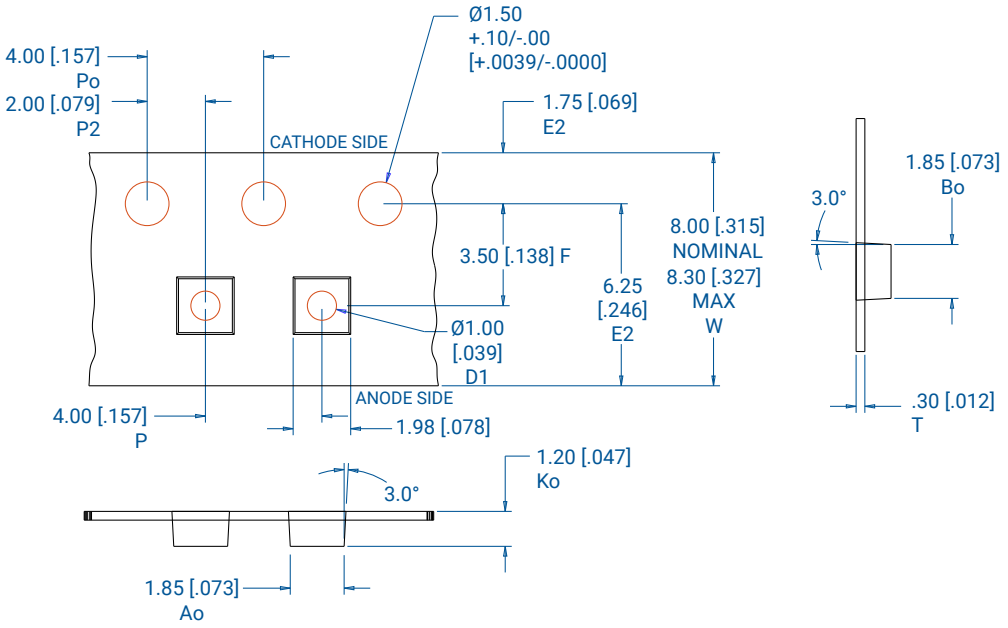
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TAPE AND REEL

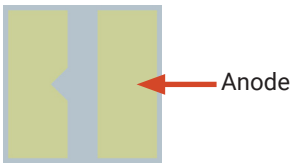
All Cree LED carrier tapes conform to EIA-481D, Automated Component Handling Systems Standard.

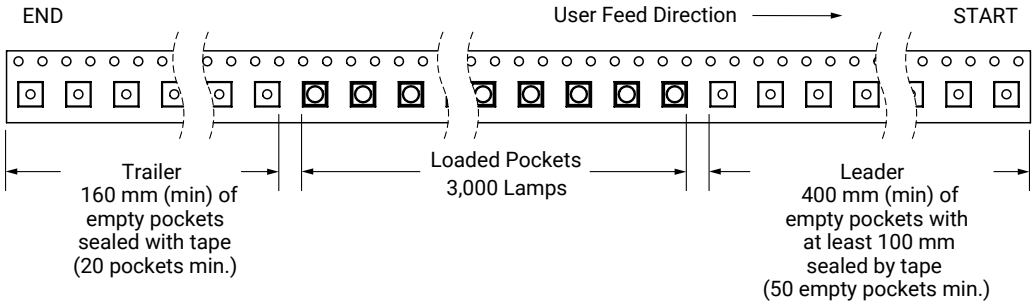
Except as noted, all dimensions in mm [in].

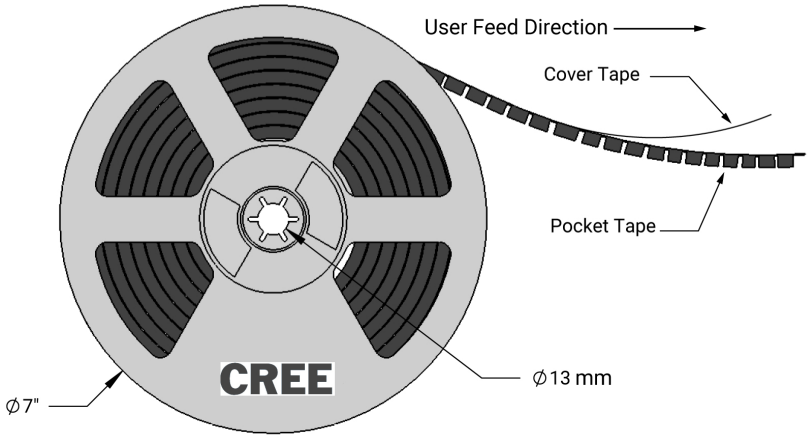
Measurement tolerances unless indicated otherwise: .xx = ±.10 mm



POCKET SIZE	
Ao -	1.85 mm [.073”]
Bo -	1.85 mm [.073”]
Ko -	1.20 mm [.047”]





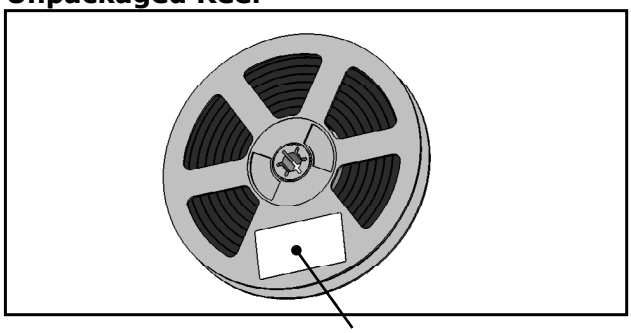


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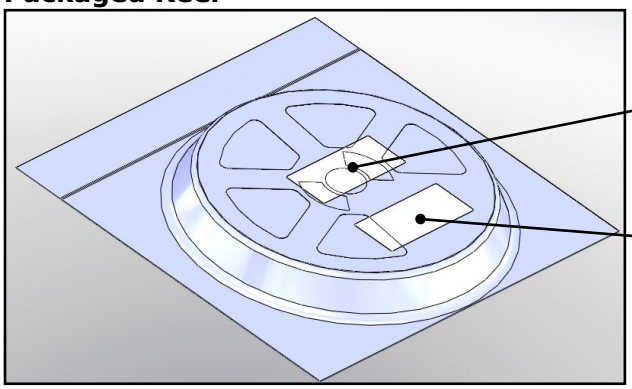
PACKAGING & LABELS

The diagrams below show the packaging and labels Cree LED uses to ship XLamp XD16 LEDs. XLamp XD16 LEDs are shipped in tape loaded on a reel. Each box contains only one reel in a moisture barrier bag.

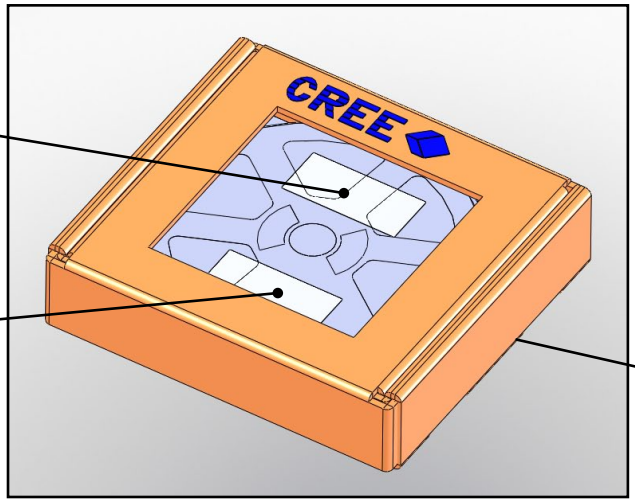
Unpackaged Reel



Packaged Reel



Boxed Reel



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