CREE ⇕ LED
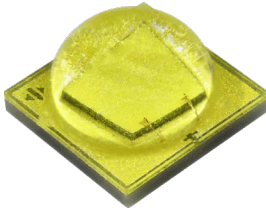
XLamp® XM-L3 LEDs

PRODUCT DESCRIPTION

The XLamp® XM-L3 LED delivers a massive 55% upgrade in maximum light output over the XM-L2 LED, providing a single-die LED point source for precise optical control. The XM-L3 LED shares the same mechanical and optical footprint as the original XM-L® and XM-L2 LEDs, providing a seamless upgrade path and shortened design cycle.

XLamp XM-L3 LEDs are the ideal choice for lighting applications requiring maximum light output from an easily controlled source, including torch, aftermarket automotive and outdoor spotlight.

FEATURES

- ANSI-compatible chromaticity bins
- Binned at 85 °C
- Maximum drive current: 5000 mA
- Low thermal resistance: 0.8 °C/W
- Wide viewing angle: 125°
- Unlimited floor life at ≤ 30 ºC/85% RH
- Reflow solderable - JEDEC J-STD-020C
- Electrically neutral thermal path
- RoHS and REACH compliant
- UL® recognized component (E349212)

Cree LED / 4001 E. Hwy. 54, Suite 2000 / Durham, NC 27709 USA / +1.919.313.5330 / www.cree-led.com

TABLE OF CONTENTS

CHARACTERISTICS

Characteristics	Unit	Minimum	Typical	Maximum
Thermal resistance, junction to solder point◊	°C/W		0.8	
Viewing angle (FWHM)	degrees		125	
Temperature coefficient of voltage	mV/°C		-1.4	
ESD withstand voltage (HBM per Mil-Std-883D)			Class 3B	
DC forward current	mA			5000
Reverse voltage	V			1
Forward voltage (@ 700 mA, 85 °C)	V		2.75	2.9
Forward voltage (@ 1500 mA, 85 °C)	V		2.9	
Forward voltage (@ 3000 mA, 85 °C)	V		3.14	
Forward voltage (@ 5000 mA, 85 °C)	V		3.42	
LED junction temperature	°C			150

Note

◊ Thermal resistance measurement was performed per the JEDEC JESD51-14 standard. See the Thermal Resistance Measurement application note for more details.

## ORDER CODES SUGGESTED FOR NEW DESIGNS (T$_J$ = 85 °C)

The following table provides order codes for XLamp XM-L3 LEDs. For a complete description of the order-code nomenclature, please consult the Bin and Orer Code Formats section (page 10)

Chromaticity		Minimum Luminous Flux (lm) @ 700 mA			Order Codes
Kit	CCT	Code	Flux (lm) @ 85 °C	Flux (lm) @25 °C*	
E1	6500 K	U5	360	390	XMLDWT-00-0000-0000U50E1
		U4	340	369	XMLDWT-00-0000-0000U40E1
51	6200 K	U5	360	390	XMLDWT-00-0000-0000U5051
		U4	340	369	XMLDWT-00-0000-0000U4051
50	6200 K	U5	360	390	XMLDWT-00-0000-0000U5050
		U4	340	369	XMLDWT-00-0000-0000U4050
E2	5700 K	U5	360	390	XMLDWT-00-0000-0000U50E2
		U4	340	369	XMLDWT-00-0000-0000U40E2

Notes
- Cree LED maintains a tolerance of ±7% on flux and power measurements, ±0.005 on chromaticity (CCx, CCy) measurements and a tolerance of ±2 on CRI measurements. See the Measurements section (page 12).
- XLamp XM-L3 LED order codes specify only a minimum flux bin and not a maximum. Cree LED may ship reels in flux bins higher than the minimum specified by the order code without advance notice. Shipments will always adhere to the chromaticity bin restrictions specified by the order code.
- * Flux values @ 25 °C are calculated and for reference only.

RELATIVE SPECTRAL POWER DISTRIBUTION
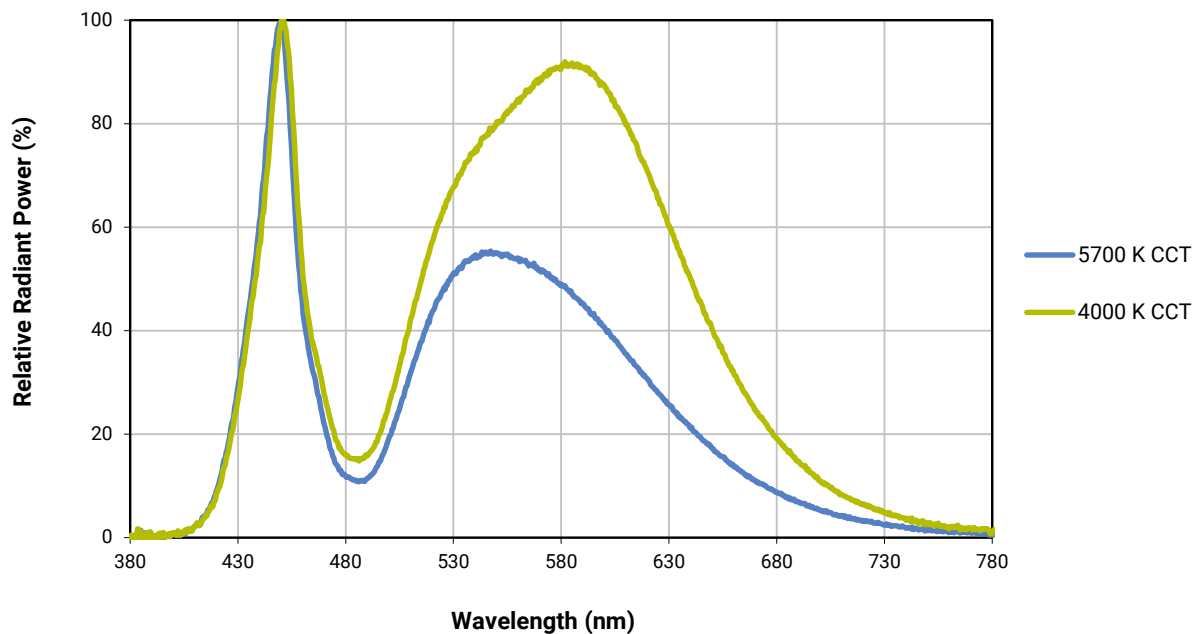
RELATIVE FLUX VS. JUNCTION TEMPERATURE (I_F = 700 mA)
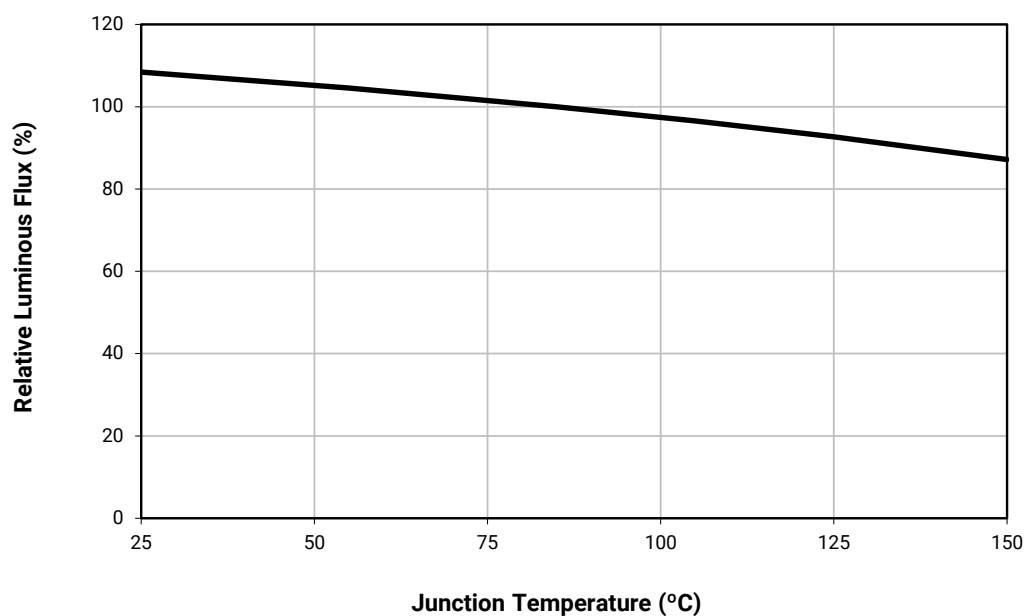
ELECTRICAL CHARACTERISTICS (T$_J$ = 85 °C)
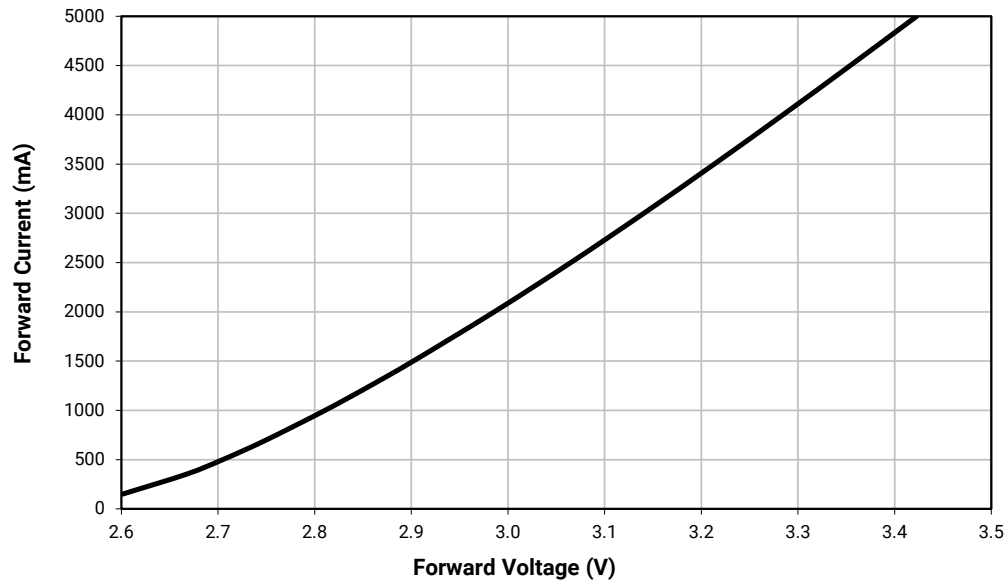
RELATIVE FLUX VS. CURRENT (T$_J$ = 85 °C)
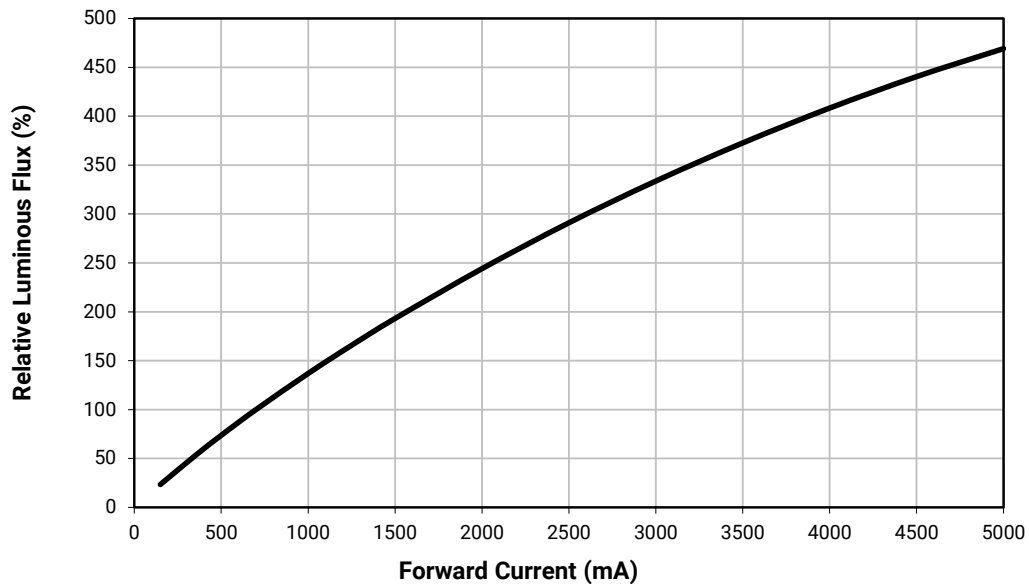
TYPICAL SPATIAL DISTRIBUTION
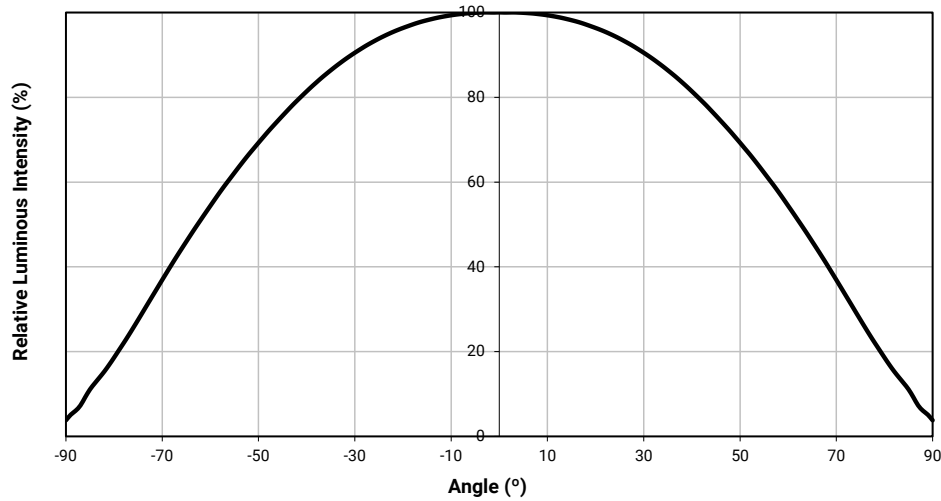
THERMAL DESIGN

The maximum forward current is determined by the thermal resistance between the LED junction and ambient. It is crucial for the end product to be designed in a manner that minimizes the thermal resistance from the solder point to ambient in order to optimize lamp life and optical characteristics.
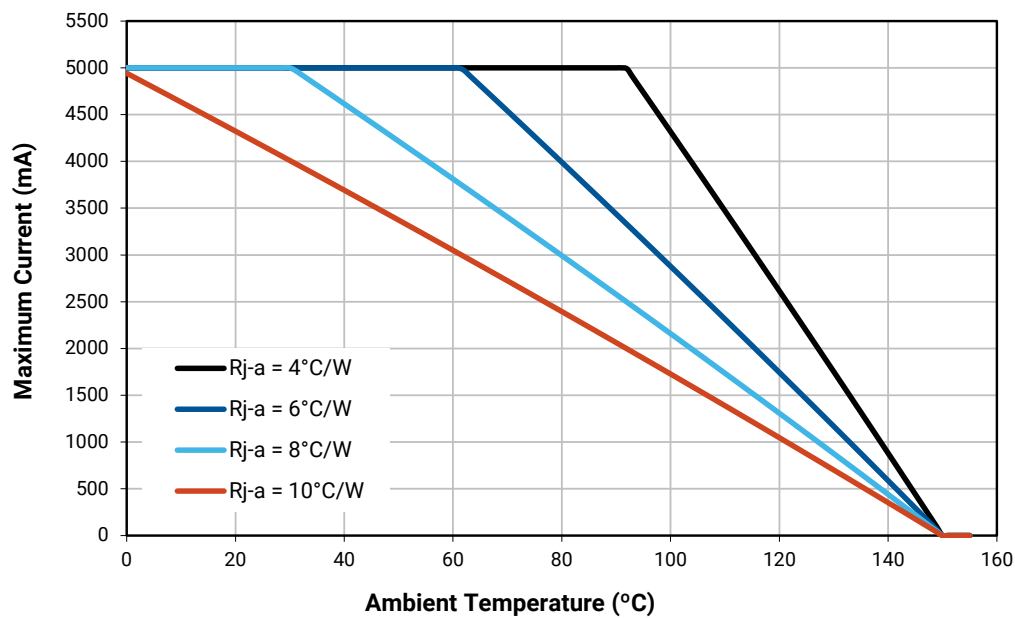
PERFORMANCE GROUPS – LUMINOUS FLUX

XLamp XM-L3 LEDs are tested for luminous flux and placed into one of the following luminous-flux groups:

Group Code	Minimum Luminous Flux @ 700 mA (lm)	Maximum Luminous Flux @ 700 mA (lm)
U3	320	340
U4	340	360
U5	360	380
U6	380	400

PERFORMANCE GROUPS – CHROMATICITY

| Region	x	y	Region	x	y	Region	x	y	Region	x	y
0A	0.2950	0.2970	0B	0.2920	0.3060	0C	0.2984	0.3133	0D	0.2984	0.3133
	0.2920	0.3060		0.2895	0.3135		0.2962	0.3220		0.3048	0.3207
	0.2984	0.3133		0.2962	0.3220		0.3028	0.3304		0.3068	0.3113
	0.3009	0.3042		0.2984	0.3133		0.3048	0.3207		0.3009	0.3042
0R	0.2980	0.2880	0S	0.2895	0.3135	0T	0.2962	0.3220	0U	0.3037	0.2937
	0.2950	0.2970		0.2870	0.3210		0.2937	0.3312		0.3009	0.3042
	0.3009	0.3042		0.2937	0.3312		0.3005	0.3415		0.3068	0.3113
	0.3037	0.2937		0.2962	0.3220		0.3028	0.3304		0.3093	0.2993
1A	0.3048	0.3207	1B	0.3028	0.3304	1C	0.3115	0.3391	1D	0.3130	0.3290
	0.3130	0.3290		0.3115	0.3391		0.3205	0.3481		0.3213	0.3373
	0.3144	0.3186		0.3130	0.3290		0.3213	0.3373		0.3221	0.3261
	0.3068	0.3113		0.3048	0.3207		0.3130	0.3290		0.3144	0.3186
1R	0.3068	0.3113	1S	0.3005	0.3415	1T	0.3099	0.3509	1U	0.3144	0.3186
	0.3144	0.3186		0.3099	0.3509		0.3196	0.3602		0.3221	0.3261
	0.3161	0.3059		0.3115	0.3391		0.3205	0.3481		0.3231	0.3120
	0.3093	0.2993		0.3028	0.3304		0.3115	0.3391		0.3161	0.3059
2A	0.3215	0.3350	2B	0.3207	0.3462	2C	0.3290	0.3538	2D	0.3290	0.3417
	0.3290	0.3417		0.3290	0.3538		0.3376	0.3616		0.3371	0.3490
	0.3290	0.3300		0.3290	0.3417		0.3371	0.3490		0.3366	0.3369
	0.3222	0.3243		0.3215	0.3350		0.3290	0.3417		0.3290	0.3300
2R	0.3222	0.3243	2S	0.3196	0.3602	2T	0.3290	0.3690	2U	0.3290	0.3300
	0.3290	0.3300		0.3290	0.3690		0.3381	0.3762		0.3366	0.3369
	0.3290	0.3180		0.3290	0.3538		0.3376	0.3616		0.3361	0.3245
	0.3231	0.3120		0.3207	0.3462		0.3290	0.3538		0.3290	0.3180
3A	0.3371	0.3490	3B	0.3376	0.3616	3R	0.3366	0.3369	3S	0.3381	0.3762
	0.3451	0.3554		0.3463	0.3687		0.3440	0.3428		0.3480	0.3840
	0.3440	0.3427		0.3451	0.3554		0.3429	0.3307		0.3463	0.3687
	0.3366	0.3369		0.3371	0.3490		0.3361	0.3245		0.3376	0.3616

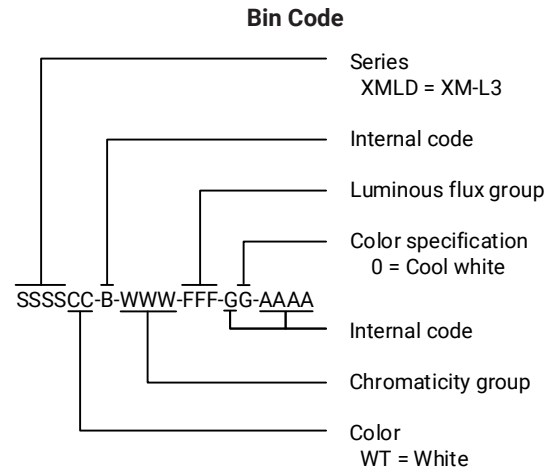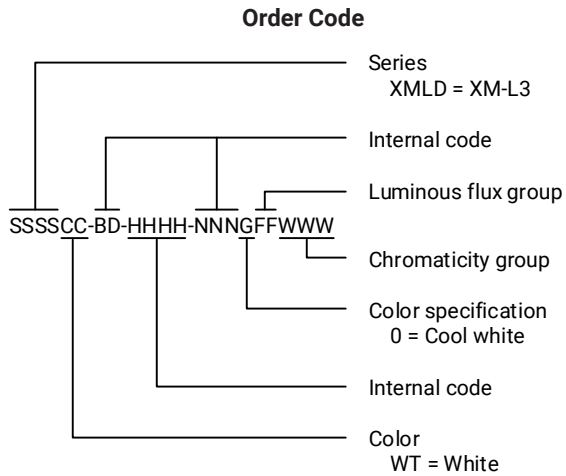## STANDARD COOL WHITE KITS PLOTTED ON ANSI STANDARD CHROMATICITY REGIONS
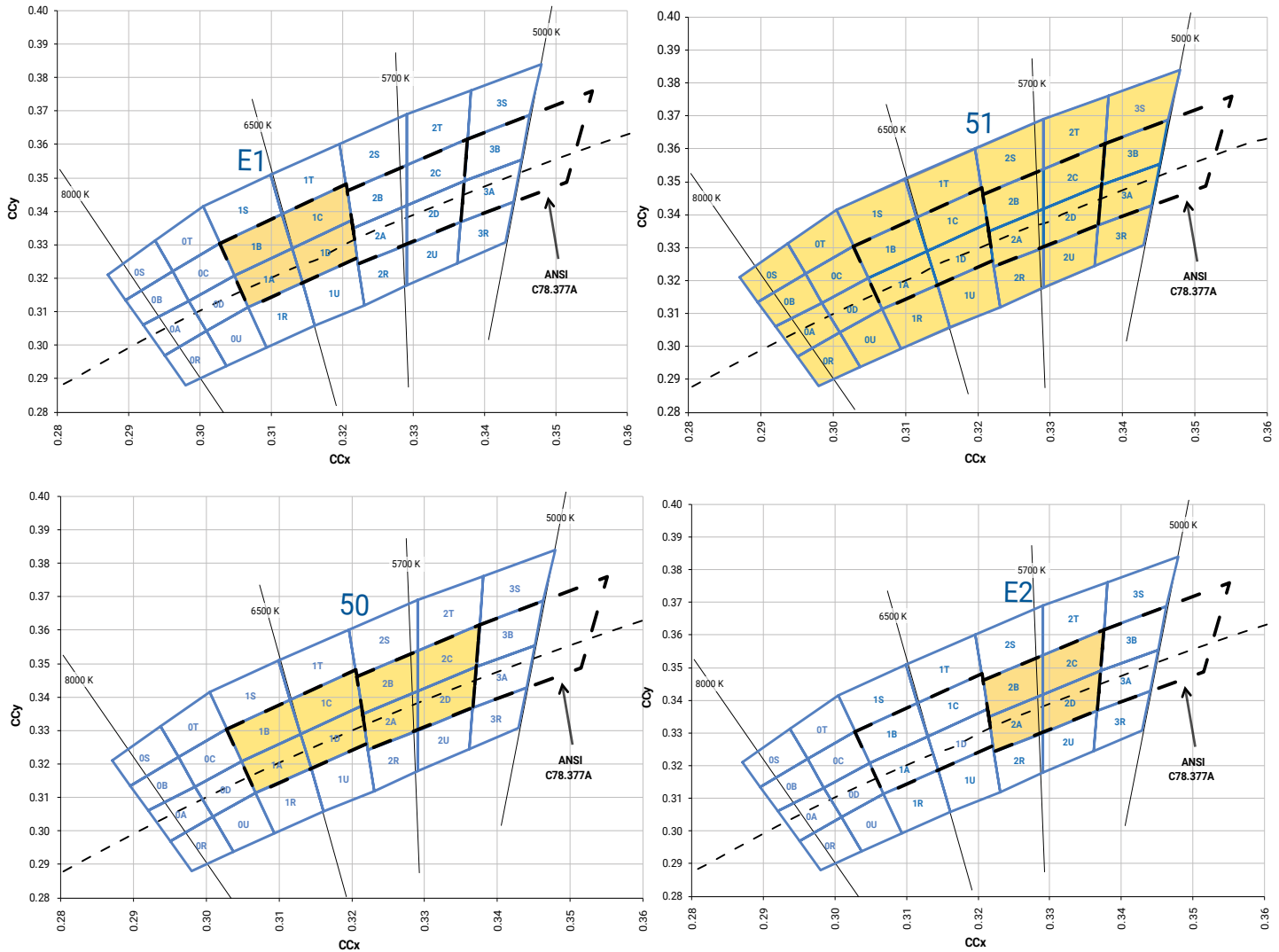
STANDARD CHROMATICITY KITS

The following table provides the chromaticity bins associated with chromaticity kits.

Color	CCT	Kit	Chromaticity Bins
Cool White	6200 K	51	0A, 0B, 0C, 0D, 0R, 0S, 0T, 0U, 1A, 1B, 1C, 1D, 1R, 1S, 1T, 1U, 2A, 2B, 2C, 2D, 2R, 2S, 2T, 2U, 3A, 3B, 3R, 3S
	6200 K	50	1A, 1B, 1C, 1D, 2A, 2B, 2C, 2D
	6500 K	E1	1A, 1B, 1C, 1D
	5700 K	E2	2A, 2B, 2C, 2D

BIN AND ORDER CODE FORMATS

Bin codes and order codes for XM-L3 LEDs are configured in the following manner:

Order Code

SSSSCC-BD-HHHH-NNNGFFWWW

- Series
  XMLD = XM-L3
- Internal code
- Luminous flux group
- Chromaticity group
- Color specification
  0 = Cool white
- Internal code
- Color
  WT = White

Bin Code

SSSSCC-B-WWW-FFF-GG-AAAA

- Series
  XMLD = XM-L3
- Internal code
- Luminous flux group
- Color specification
  0 = Cool white
- Internal code
- Chromaticity group
- Color
  WT = White

REFLOW SOLDERING CHARACTERISTICS

In testing, Cree LED has found XLamp XM-L3 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.
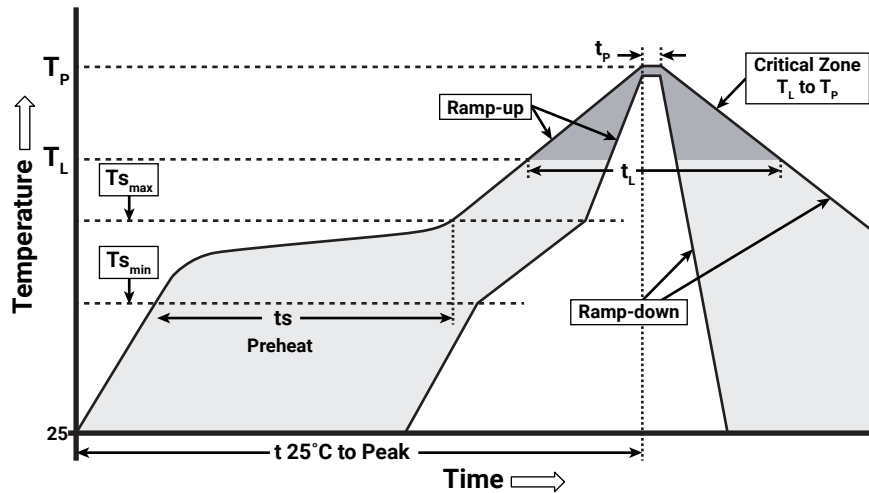
IPC/JEDEC J-STD-020C

Profile Feature	Lead-Free Solder
Average Ramp-Up Rate (Ts$_{max}$ to Tp)	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 the topside of the package, measured on the package body surface.

NOTES

Measurements

The luminous flux, radiant power, chromaticity, forward voltage and CRI measurements in this document are binning specifications only and solely represent product measurements as of the date of shipment. These measurements will change over time based on a number of factors that are not within Cree LED's control and are not intended or provided as operational specifications for the products. Calculated values are provided for informational purposes only and are not intended or provided as specifications.

Pre-Release Qualification Testing

Please read the LED Reliability Overview for details of the qualification process Cree LED applies to ensure long-term reliability for XLamp LEDs and details of Cree LED's pre-release qualification testing for XLamp LEDs.

Lumen Maintenance

Cree LED now uses standardized IES LM-80-08 and TM-21-11 methods for collecting long-term data and extrapolating LED lumen maintenance. For information on the specific LM-80 data sets available for this LED, refer to the public LM-80 results document.

Please read the Long-Term Lumen Maintenance application note for more details on Cree LED's lumen maintenance testing and forecasting. Please read the Thermal Management application note for details on how thermal design, ambient temperature, and drive current affect the LED junction temperature.

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-L3 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 the storage condition, Cree LED recommends sealing any unsoldered LEDs in the original MBP.

RoHS Compliance

The levels of RoHS restricted materials in this product are below the maximum concentration values (also referred to as the threshold limits) permitted for such substances, or are used in an exempted application, in accordance with EU Directive 2011/65/EC (RoHS2), as implemented January 2, 2013. RoHS Declarations for this product can be obtained from your Cree LED representative or from the Product Ecology section of the Cree LED website.

REACH Compliance

REACH substances of very high concern (SVHCs) information is available for this product. Since the European Chemical Agency (ECHA) has published notice of their intent to frequently revise the SVHC listing for the foreseeable future, please contact a Cree LED representative to insure you get the most up-to-date REACH SVHC Declaration. REACH banned substance information (REACH Article 67) is also available upon request.

NOTES - CONTINUED

UL® Recognized Component

This product meets the requirements to be considered a UL Recognized Component with Level 4 enclosure consideration. The LED package or a portion thereof has been investigated as a fire and electrical enclosure per ANSI/UL 8750.
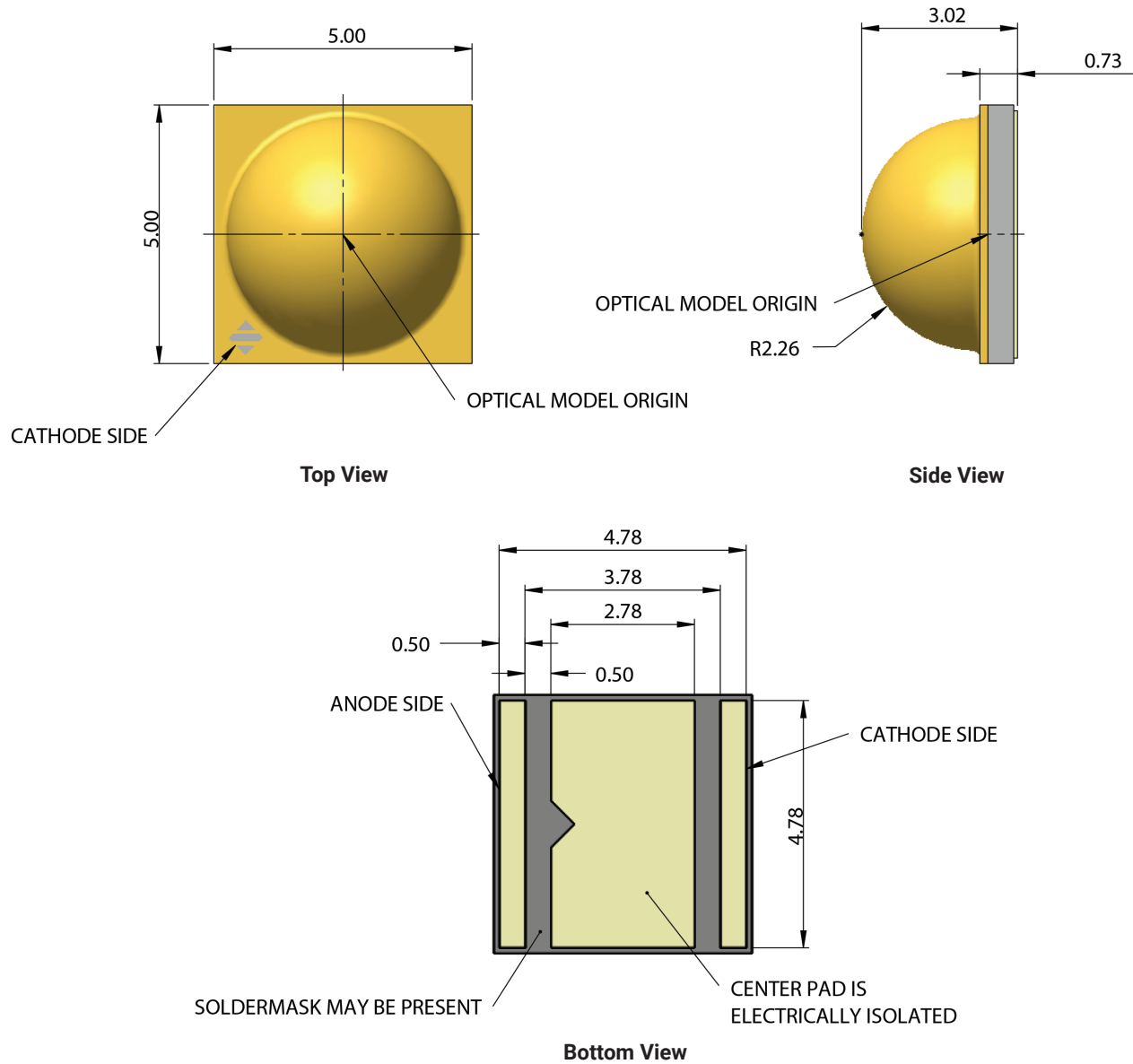
Vision Advisory

WARNING: Do not look at an exposed lamp in operation. Eye injury can result. For more information about LEDs and eye safety, please refer to the LED Eye Safety application note.
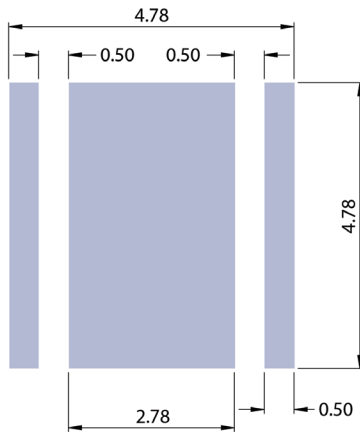
MECHANICAL DIMENSIONS

Thermal vias, if present, are not shown on these drawings.

All measurements are ±.13 mm unless otherwise indicated.

5.00

5.00

CATHODE SIDE

OPTICAL MODEL ORIGIN

Top View

3.02

0.73

OPTICAL MODEL ORIGIN

R2.26

Side View

4.78

3.78

2.78

0.50

0.50

ANODE SIDE

CATHODE SIDE

4.78

SOLDERMASK MAY BE PRESENT

CENTER PAD IS
ELECTRICALLY ISOLATED

Bottom View

MECHANICAL DIMENSIONS - CONTINUED
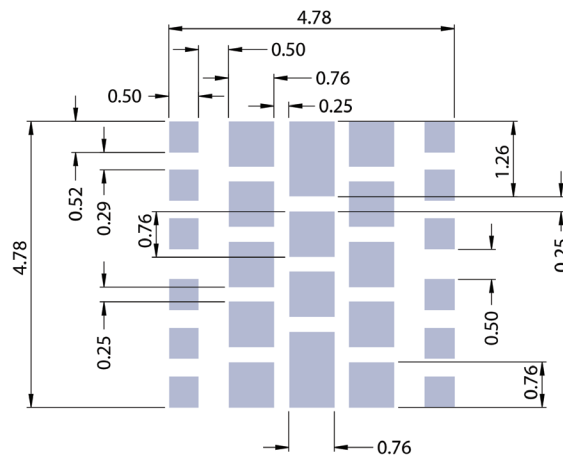
All measurements are ±.13 mm unless otherwise indicated.

Recommended PCB Footprint
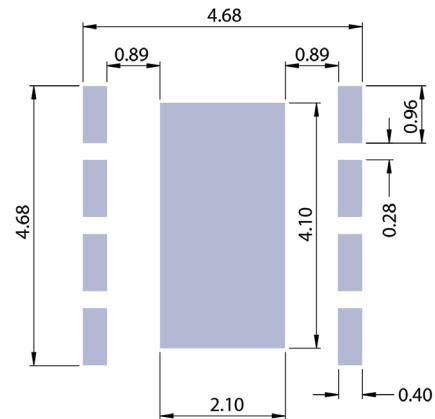
**Recommended Solder Stencil**

Optional Solder Stencil

Notes:
- Cree LED recommends using thermal pad kickouts to maximize component thermal performance.
- Cree LED recommends using white solder mask material to minimize system optical loss.
- * This stencil has been tested and optimized for the avoidance of voiding when using ALPHA® LUMET® P30 Maxrel solder paste. For other solder pastes, a "window pane" design for the thermal pad stencil may result in a lower voiding percentage. Contact your local Cree LED Field Applications Engineer for consultation regarding your specific application.

TAPE AND REEL

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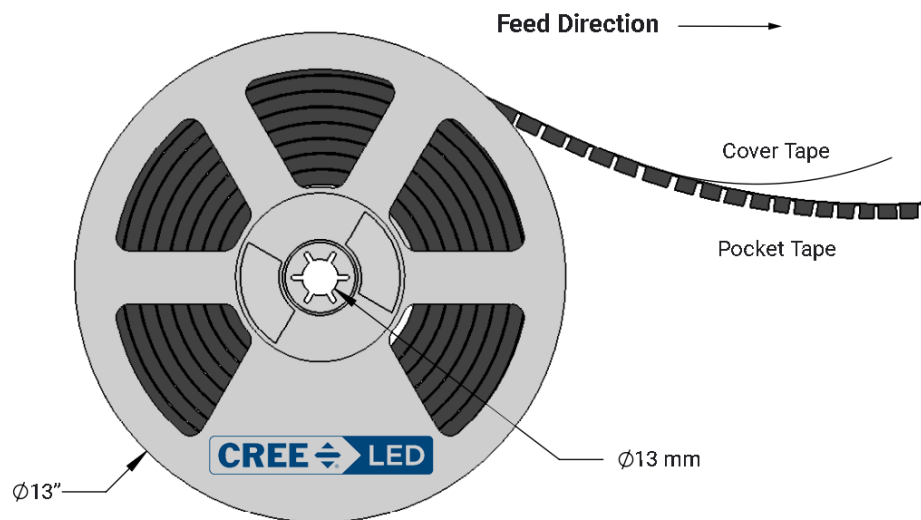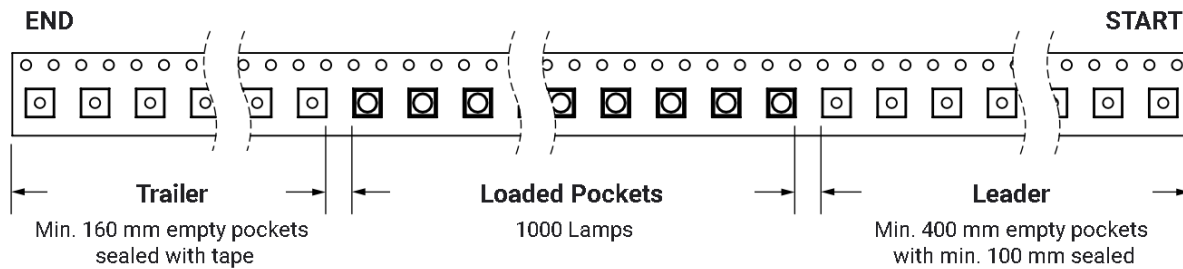
Except as noted, all dimensions in mm.

All measurements are ±.15 mm unless otherwise indicated.
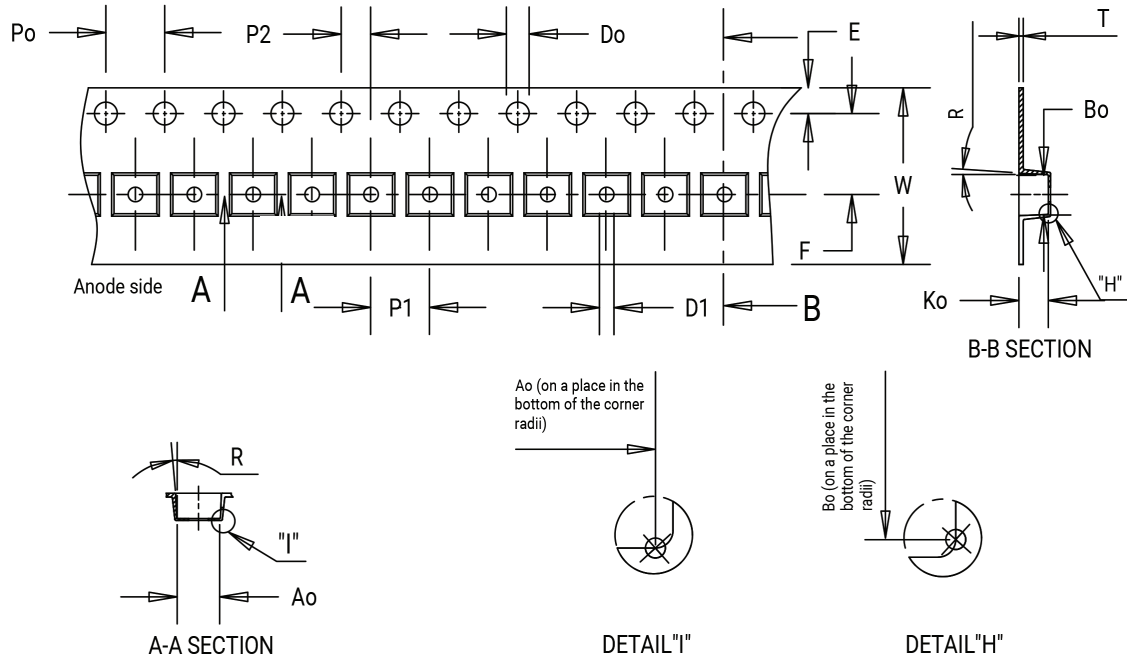
Item	Ao	Bo	Ko	Po	P1	P2	T	E	F	Do	D1	W	R
Dim.	5.40	5.40	3.35	4.00	8.00	2.00	0.36	1.75	5.50	1.50	1.50	12.00	3°

TAPE AND REEL - CONTINUED

END   **START**

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 →

Cover Tape

Pocket Tape
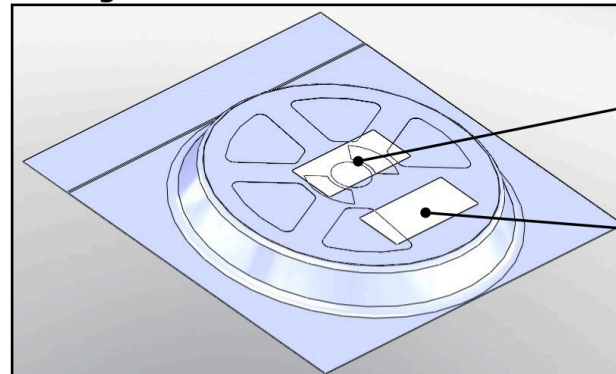
∅13 mm

∅13"

PACKAGING

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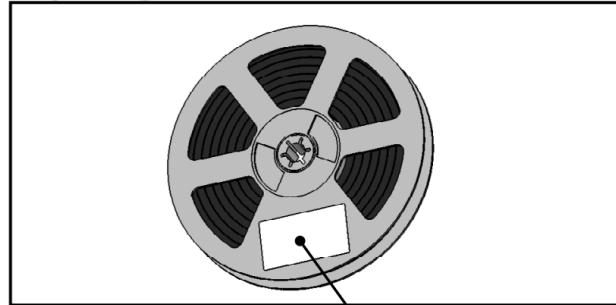
Label with Cree LED Bin
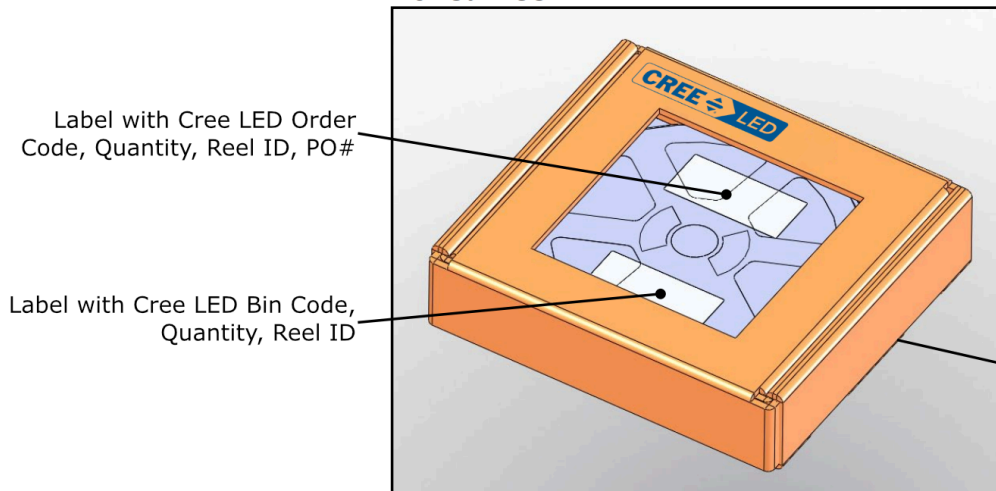Code, Quantity, Reel ID

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)

APPENDIX - ORDER CODES NOT FOR NEW DESIGNS

The following order codes are active and valid order codes, but higher performance options are also available. Please see page 4 for order codes of XLamp XM-L3 LEDs that could serve as alternatives for the order codes set forth below.

Chromaticity		Minimum Luminous Flux (lm) @ 700 mA		Order Codes
Kit	CCT	Code	Flux (lm) @ 85 °C	
E1	6500 K	U3	320	XMLDWT-00-0000-0000U30E1
51	6200 K	U3	320	XMLDWT-00-0000-0000U3051
50	6200 K	U3	320	XMLDWT-00-0000-0000U3050
E2	5700 K	U3	320	XMLDWT-00-0000-0000U30E2

Notes
• Cree LED maintains a tolerance of ±7% on flux and power measurements, ±0.005 on chromaticity (CCx, CCy) measurements and a tolerance of ±2 on CRI measurements. See the Measurements section (page 12).

Mouser Electronics

Authorized Distributor

Click to View Pricing, Inventory, Delivery & Lifecycle Information:

[Cree LED](#):

XMLDWT-00-0000-0000U3050 XMLDWT-00-0000-0000U3051 XMLDWT-00-0000-0000U30E1 XMLDWT-00-0000-0000U30E2 XMLDWT-00-0000-0000U40E2 XMLDWT-00-0000-0000U4050 XMLDWT-00-0000-0000U4051 XMLDWT-00-0000-0000U40E1 XMLDWT-00-0000-0000U2050 XMLDWT-00-0000-0000U2051 XMLDWT-00-0000-0000U20E1 XMLDWT-00-0000-0000U20E2 XMLDWT-00-0000-0000U50E1 XMLDWT-00-0000-0000U50E2 XMLDWT-00-0000-0000U5051 XMLDWT-00-0000-0000U5050