

# Cree® XLamp® MH-B LEDs



## PRODUCT DESCRIPTION

The XLamp® MH-B LED is a new generation of high-power LED that delivers a more effective way to achieve low-cost systems than mid-power (MP) LEDs. Built using Cree’s high-reliability ceramic-package technology, the XLamp MH-B LED is able to operate at higher temperatures than MP LEDs with no reduction in rated lifetime, enabling an impressive 60% reduction in heat sink size and cost. Using up to 26 times fewer LEDs than MP LEDs to achieve the same performance, the XLamp MH-B LED is optimized to simplify LED system designs for directional and semi-directional applications.

## FEATURES

- Maximum drive current: 175 mA
- Low thermal resistance: 5.5 °C/W
- Maximum junction temperature: 150 °C
- Viewing angle: 115°
- Available in 80-CRI minimum warm white and 90-CRI minimum warm white
- ANSI-compatible chromaticity bins
- Unlimited floor life at ≤ 30 °C/85% RH
- Reflow solderable - JEDEC J-STD-020C
- Electrically neutral thermal path
- UL-recognized component (E349212)



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**CHARACTERISTICS**

Characteristics	Unit	Minimum	Typical	Maximum
Thermal resistance, junction to solder point	°C/W		5.5	
Viewing angle (FWHM)	degrees		115	
Temperature coefficient of voltage	mV/°C		-16	
ESD withstand voltage (HBM per Mil-Std-883D)	V			8000
DC forward current	mA		120	175
Reverse current	mA			0.1
Forward voltage (@ 120 mA, 85 °C)	V		37	
Forward voltage (@ 120 mA, 25 °C)	V			42
LED junction temperature	°C			150

## FLUX CHARACTERISTICS, EASYWHITE® ORDER CODES AND BINS (T<sub>j</sub> = 85 °C)

The following tables provide order codes for XLamp MH-B LEDs. For a complete description of the order code nomenclature, please reference Bin and Order Code Formats (page 11).

CCT Range	CRI	Base Order Codes Min. Luminous Flux @ 120 mA			2-Step Order Code		4-Step Order Code		5-Step Order Code	
		Min	Group	Flux (lm) @ 85 °C	Flux (lm) @ 25 °C*	Chromaticity Region		Chromaticity Region		Chromaticity Region
6500 K	80	C4	475	538			65F	MHBAWT-0000-000N0HC465F		
		D2	510	577				MHBAWT-0000-000N0HD265F		
5700 K	80	C4	475	538			57F	MHBAWT-0000-000N0HC457F		
		D2	510	577				MHBAWT-0000-000N0HD257F		
5000 K	80	C4	475	538			50F	MHBAWT-0000-000N0HC450F		
		D2	510	577				MHBAWT-0000-000N0HD250F		
4000 K	80	C4	475	538	40H	MHBAWT-0000-000N0HC440H	40F	MHBAWT-0000-000N0HC440F	40E	MHBAWT-0000-000N0HC440E
		D2	510	577		MHBAWT-0000-000N0HD240H		MHBAWT-0000-000N0HD240F		MHBAWT-0000-000N0HD240E
3500 K	80	C4	475	538	35H	MHBAWT-0000-000N0HC435H	35F	MHBAWT-0000-000N0HC435F	35E	MHBAWT-0000-000N0HC435E
		D2	510	577		MHBAWT-0000-000N0HD235H		MHBAWT-0000-000N0HD235F		MHBAWT-0000-000N0HD235E
3000 K	80	C2	440	498	30H	MHBAWT-0000-000N0HC230H	30F	MHBAWT-0000-000N0HC230F	30E	MHBAWT-0000-000N0HC230E
		C4	475	538		MHBAWT-0000-000N0HC430H		MHBAWT-0000-000N0HC430F		MHBAWT-0000-000N0HC430E
	90	A2	330	374	30H	MHBAWT-0000-000N0UA230H	30F	MHBAWT-0000-000N0UA230F	30E	MHBAWT-0000-000N0UA230E
		A4	355	402		MHBAWT-0000-000N0UA430H		MHBAWT-0000-000N0UA430F		MHBAWT-0000-000N0UA430E
2700 K	80	C2	440	498	27H	MHBAWT-0000-000N0HC227H	27F	MHBAWT-0000-000N0HC227F	27E	MHBAWT-0000-000N0HC227E
		C4	475	538		MHBAWT-0000-000N0HC427H		MHBAWT-0000-000N0HC427F		MHBAWT-0000-000N0HC427E
	90	A2	330	374	27H	MHBAWT-0000-000N0UA227H	27F	MHBAWT-0000-000N0UA227F	27E	MHBAWT-0000-000N0UA227E
		A4	355	402		MHBAWT-0000-000N0UA427H		MHBAWT-0000-000N0UA427F		MHBAWT-0000-000N0UA427E

### Notes

- Cree maintains a tolerance of ±7% on flux and power measurements, ±0.005 on chromaticity (CC<sub>x</sub>, CC<sub>y</sub>) measurements and a tolerance of ±2 on CRI measurements.

\* Flux values @ 25 °C are calculated and for reference only.

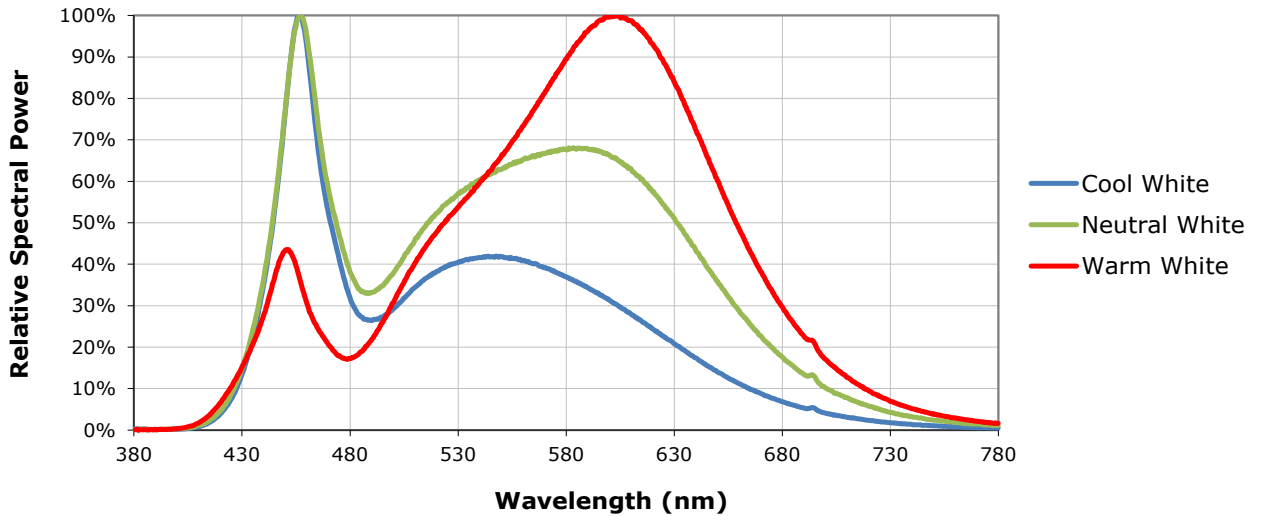
## FLUX CHARACTERISTICS, ANSI WHITE ORDER CODES AND BINS (T<sub>j</sub> = 85 °C)

CCT Range	CRI		Base Order Codes Min. Luminous Flux @ 120 mA			Chromaticity Regions	Order Code
	Min	Typ	Group	Flux (lm) @ 85 °C	Flux (lm) @ 25 °C*		
6500 K	80	---	C4	475	538	1A0, 1B0, 1C0, 1D0	MHBAWT-0000-000N0HC40E1
			D2	510	577		MHBAWT-0000-000N0HD20E1
5700 K	80	---	C4	475	538	2A0, 2B0, 2C0, 2D0	MHBAWT-0000-000N0HC40E2
			D2	510	577		MHBAWT-0000-000N0HD20E2
5000 K	80	---	C4	475	538	3A0, 3B0, 3C0, 3D0	MHBAWT-0000-000N0HC40E3
			D2	510	577		MHBAWT-0000-000N0HD20E3

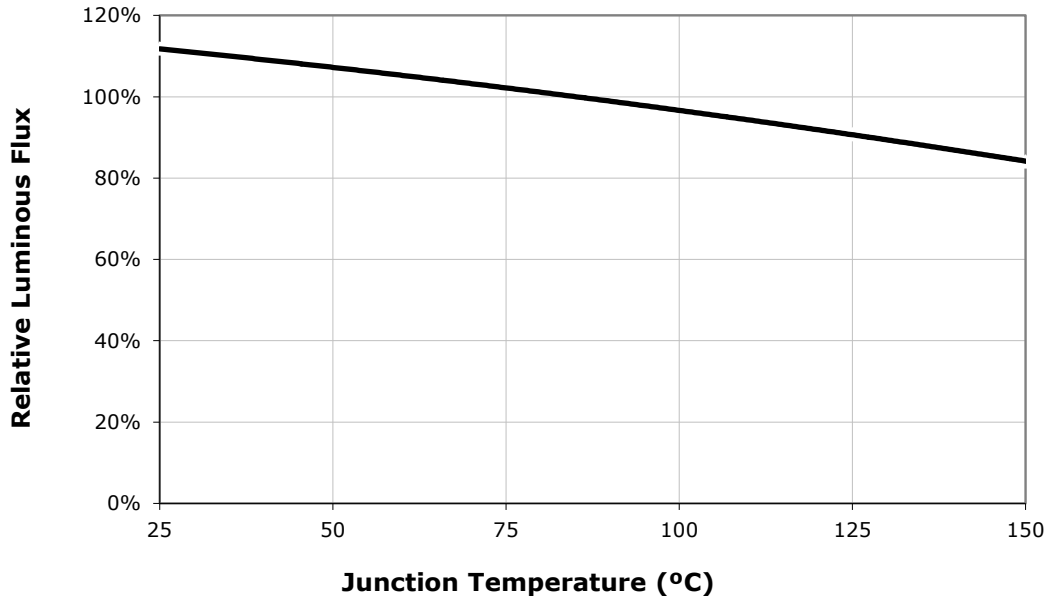
### Notes

- Cree maintains a tolerance of ±7% on flux and power measurements, ±0.005 on chromaticity (CC<sub>x</sub>, CC<sub>y</sub>) measurements and a tolerance of ±2 on CRI measurements.
- \* Flux values @ 25 °C are calculated and for reference only.

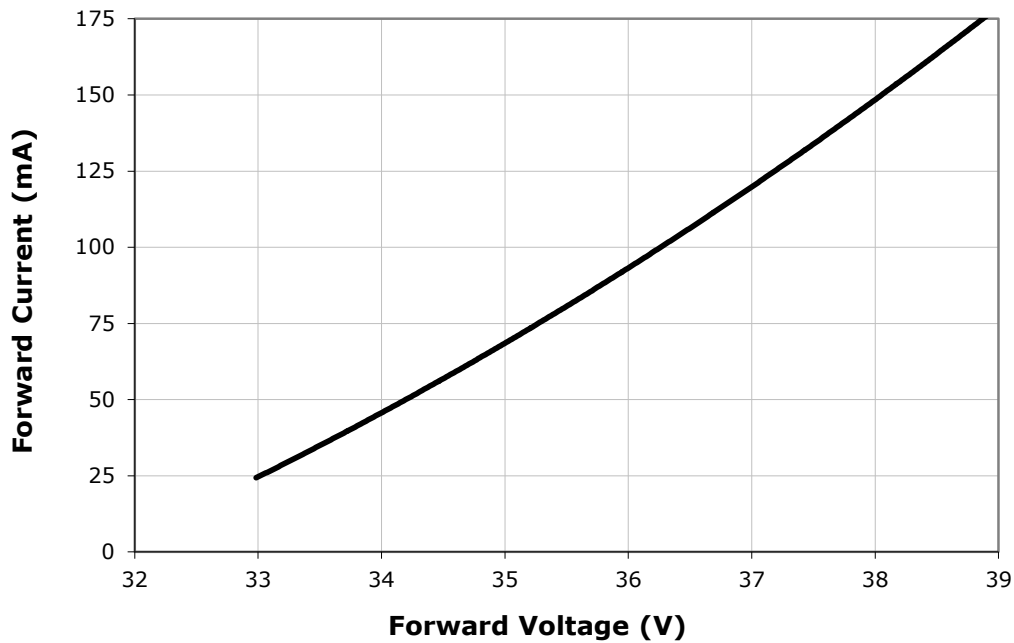
## RELATIVE SPECTRAL POWER DISTRIBUTION



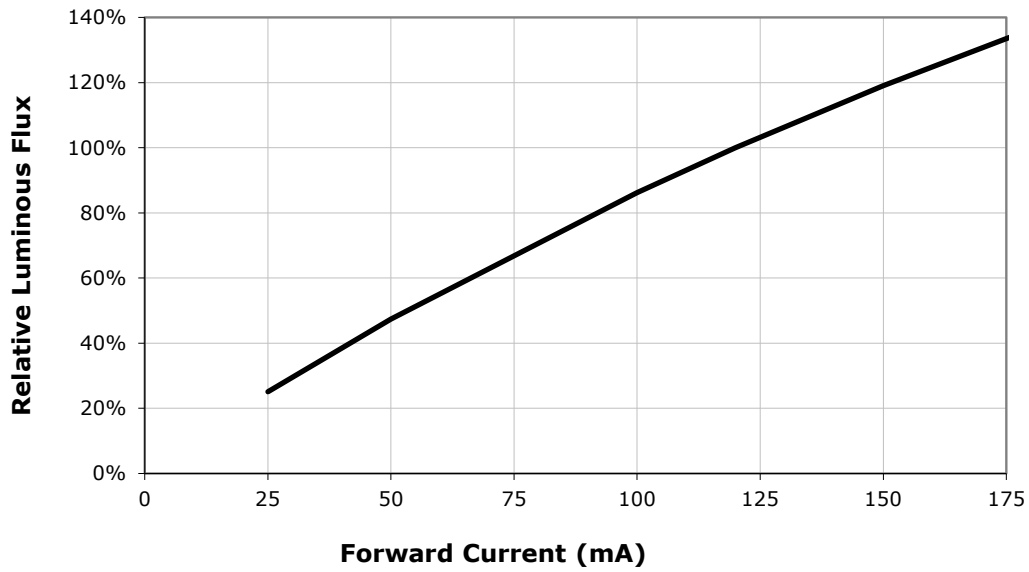
**RELATIVE FLUX VS. JUNCTION TEMPERATURE ( $I_F = 120 \text{ mA}$ )**



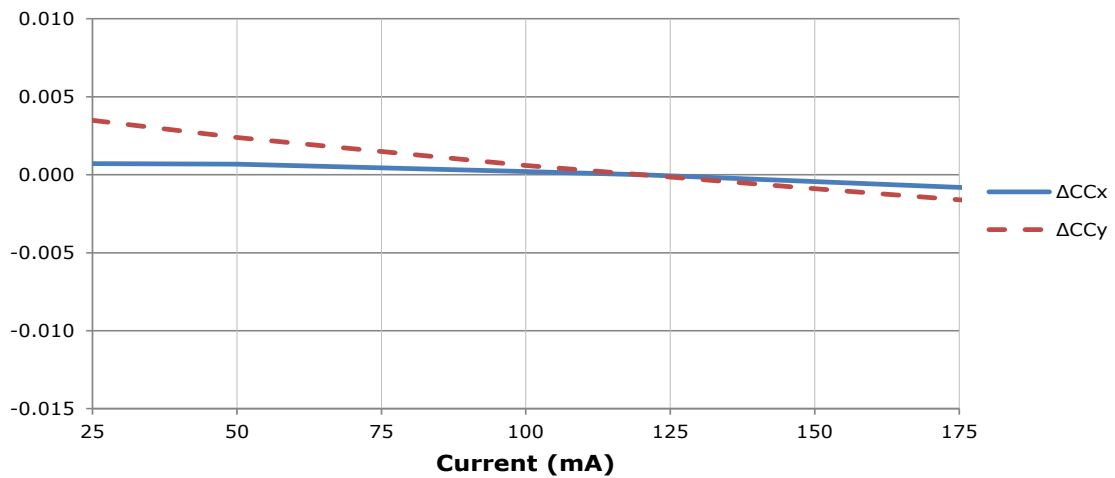
**ELECTRICAL CHARACTERISTICS ( $T_J = 85 \text{ °C}$ )**



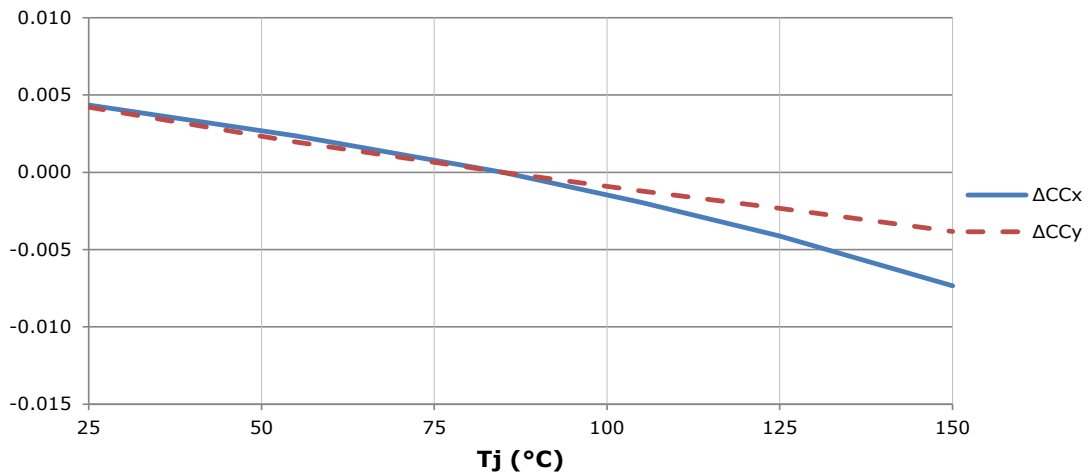
## RELATIVE FLUX VS. CURRENT ( $T_j = 85\text{ }^\circ\text{C}$ )



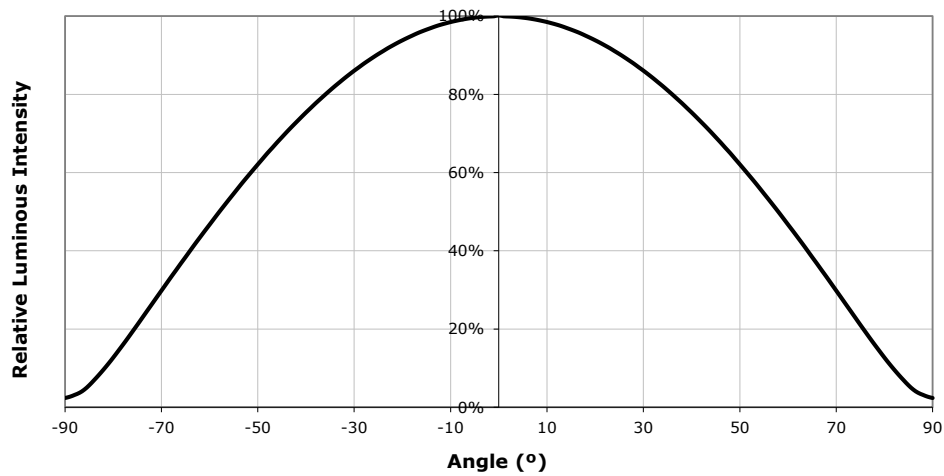
## RELATIVE CHROMATICITY VS. CURRENT (WARM WHITE)



## RELATIVE CHROMATICITY VS. TEMPERATURE (WARM WHITE)

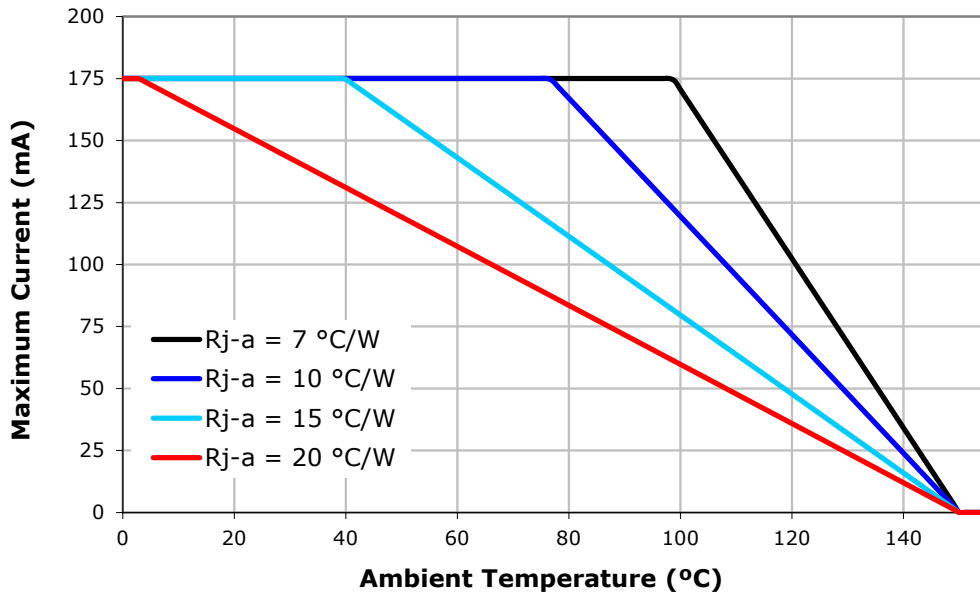


## TYPICAL SPATIAL DISTRIBUTION



### 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 - BRIGHTNESS ( $T_j = 85\text{ °C}$ )

XLamp MH-B LEDs are tested for luminous flux and placed into one of the following bins.

Group Code	Min. Luminous Flux	Max. Luminous Flux
94	308	330
A2	330	355
A4	355	380
B2	380	410
B4	410	440
C2	440	475
C4	475	510
D2	510	550
D4	550	590



**PERFORMANCE GROUPS - CHROMATICITY ( $T_j = 85\text{ °C}$ )**

XLamp MH-B LEDs are tested for chromaticity and placed into one of the regions defined by the following bounding coordinates.

EasyWhite Color Temperatures – 5-Step					
CCT	Center Point		Major Axis	Minor Axis	Rotation Angle (°)
	x	y	a	b	
4000 K	0.3825	0.3799	0.0157	0.0067	53.72
3500 K	0.4081	0.3917	0.0155	0.0069	53.22
3000 K	0.4343	0.4029	0.0139	0.0068	53.22
2700 K	0.4583	0.4100	0.0135	0.0070	53.70

EasyWhite Color Temperatures – 4-Step			
Code	CCT	x	y
65F	6500 K	0.3097	0.3196
		0.3079	0.3297
		0.3164	0.3382
		0.3176	0.3275
57F	5700 K	0.3253	0.3325
		0.3249	0.3439
		0.3331	0.3514
		0.3330	0.3393
50F	5000 K	0.3407	0.3459
		0.3415	0.3586
		0.3499	0.3654
		0.3484	0.3521
40F	4000 K	0.3744	0.3685
		0.3782	0.3837
		0.3912	0.3917
		0.3863	0.3758
35F	3500 K	0.3981	0.3800
		0.4040	0.3966
		0.4186	0.4037
		0.4116	0.3865
30F	3000 K	0.4242	0.3919
		0.4322	0.4096
		0.4449	0.4141
		0.4359	0.3960
27F	2700 K	0.4475	0.3994
		0.4573	0.4178
		0.4695	0.4207
		0.4589	0.4021

EasyWhite Color Temperatures – 2-Step			
Code	CCT	x	y
40H	4000 K	0.3784	0.3741
		0.3804	0.3818
		0.3867	0.3857
		0.3844	0.3778
35H	3500 K	0.4030	0.3857
		0.4061	0.3941
		0.4132	0.3976
		0.4099	0.3890
30H	3000 K	0.4291	0.3973
		0.4333	0.4062
		0.4395	0.4084
		0.4351	0.3994
27H	2700 K	0.4528	0.4046
		0.4578	0.4138
		0.4638	0.4152
		0.4586	0.4060

## PERFORMANCE GROUPS - CHROMATICITY ( $T_j = 85\text{ }^\circ\text{C}$ ) - CONTINUED

ANSI White Bins				
Code	CCT	Bin Code	x	y
0E1	6500 K	1A0	0.3048	0.3207
			0.3130	0.3290
			0.3144	0.3186
			0.3068	0.3113
		1B0	0.3028	0.3304
			0.3115	0.3391
			0.3130	0.3290
			0.3048	0.3207
		1C0	0.3115	0.3391
			0.3205	0.3481
			0.3213	0.3373
			0.3130	0.3290
		1D0	0.3130	0.3290
			0.3213	0.3373
			0.3221	0.3261
			0.3144	0.3186

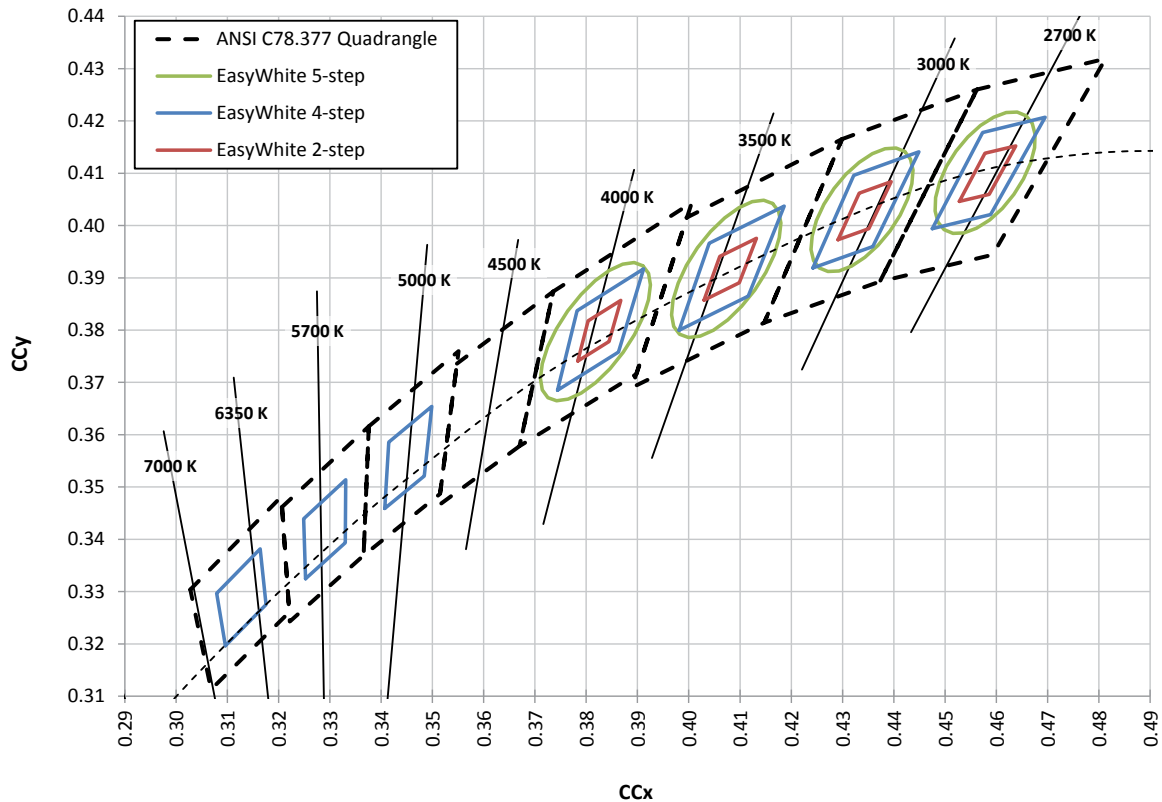
  

ANSI White Bins				
Code	CCT	Bin Code	x	y
0E2	5700 K	2A0	0.3215	0.3350
			0.3290	0.3417
			0.3290	0.3300
			0.3222	0.3243
		2B0	0.3207	0.3462
			0.3290	0.3538
			0.3290	0.3417
			0.3215	0.3350
		2C0	0.3290	0.3538
			0.3376	0.3616
			0.3371	0.3490
			0.3290	0.3417
		2D0	0.3290	0.3417
			0.3371	0.3490
			0.3366	0.3369
			0.3290	0.3300

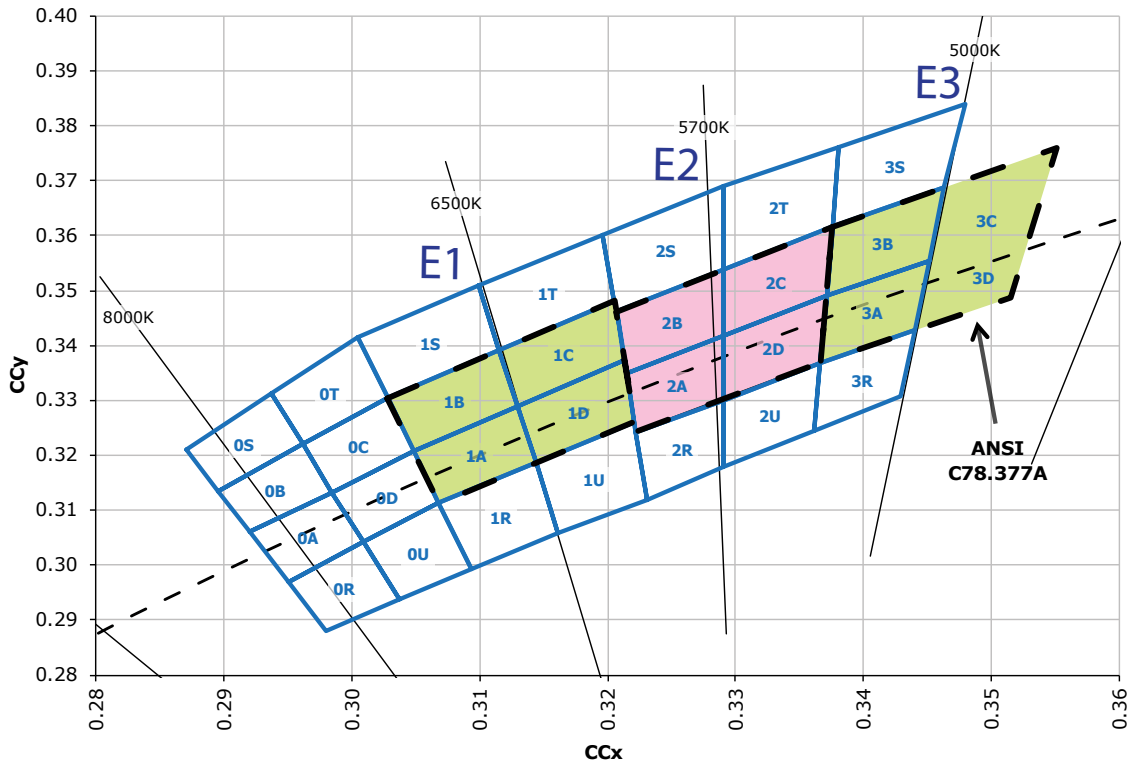
  

ANSI White Bins				
Code	CCT	Bin Code	x	y
0E3	5000 K	3A0	.3371	.3490
			.3451	.3554
			.3440	.3427
			.3366	.3369
		3B0	.3376	.3616
			.3463	.3687
			.3451	.3554
			.3371	.3490
		3C0	.3463	.3687
			.3551	.3760
			.3533	.3620
			.3451	.3554
		3D0	.3451	.3554
			.3533	.3620
			.3515	.3487
			.3440	.3427

## CREE EASYWHITE® BINS PLOTTED ON THE 1931 CIE COLOR SPACE ( $T_j = 85\text{ }^\circ\text{C}$ )



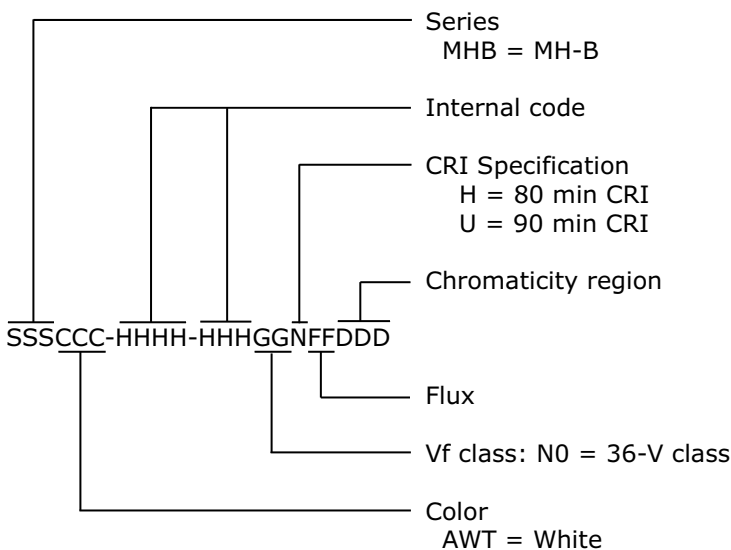
## CREE ANSI WHITE BINS PLOTTED ON THE 1931 CIE COLOR SPACE ( $T_j = 85^\circ\text{C}$ )



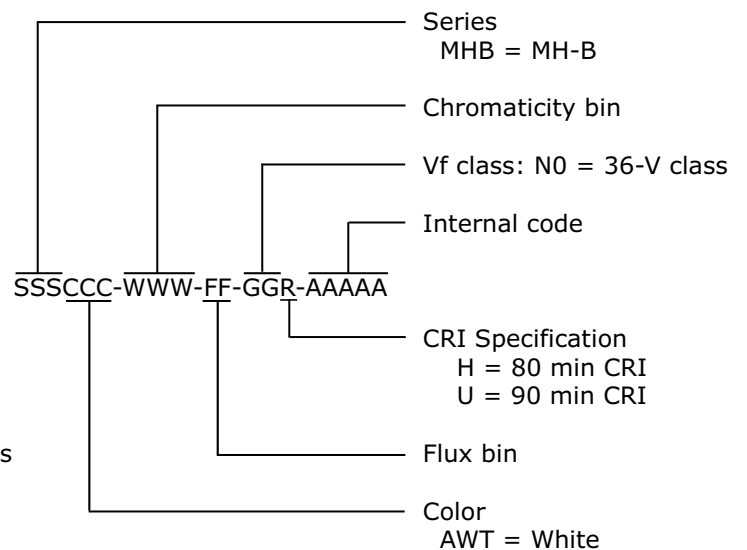
## BIN AND ORDER CODE FORMATS

Bin codes and order codes are configured as follows.

### Order Code



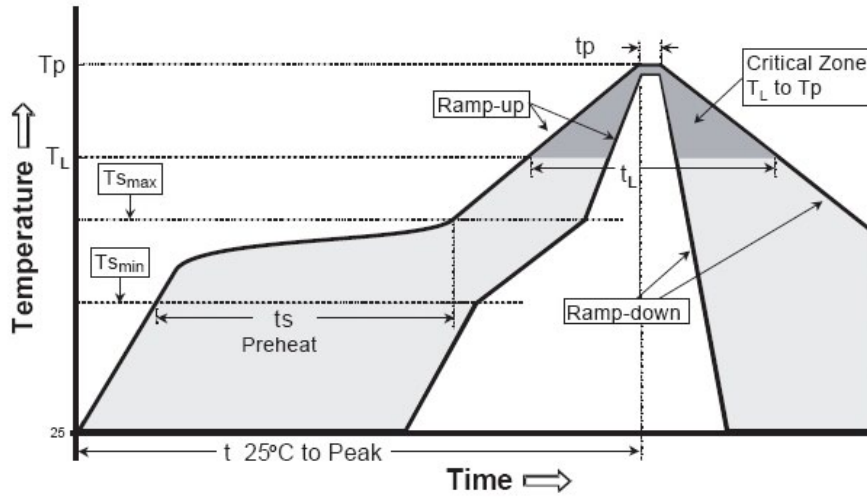
### Bin Code



### REFLOW SOLDERING CHARACTERISTICS

In testing, Cree has found XLamp MH-B LEDs to be compatible with JEDEC J-STD-020C, using the parameters listed below. As a general guideline, Cree recommends that users follow the recommended soldering profile provided by the manufacturer of solder paste used.

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-Based Solder	Lead-Free Solder
Average Ramp-Up Rate ( $T_{Smax}$ to $T_p$ )	3 °C/second max.	3 °C/second max.
Preheat: Temperature Min ( $T_{Smin}$ )	100 °C	150 °C
Preheat: Temperature Max ( $T_{Smax}$ )	150 °C	200 °C
Preheat: Time ( $t_{Smin}$ to $t_{Smax}$ )	60-120 seconds	60-180 seconds
Time Maintained Above: Temperature ( $T_L$ )	183 °C	217 °C
Time Maintained Above: Time ( $t_L$ )	60-150 seconds	60-150 seconds
Peak/Classification Temperature ( $T_p$ )	215 °C	260 °C
Time Within 5 °C of Actual Peak Temperature ( $t_p$ )	10-30 seconds	20-40 seconds
Ramp-Down Rate	6 °C/second max.	6 °C/second max.
Time 25 °C to Peak Temperature	6 minutes max.	8 minutes max.

Note: All temperatures refer to the topside of the package, measured on the package body surface.

## NOTES

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### **Lumen Maintenance Projections**

Cree 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'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**

In testing, Cree has found XLamp MH-B LEDs to have unlimited floor life in conditions  $\leq 30$  °C/85% relative humidity (RH). Moisture testing included a 168-hour soak at 85 °C/85% RH followed by 3 reflow cycles, with visual and electrical inspections at each stage.

Cree recommends keeping XLamp LEDs in their sealed moisture-barrier packaging until immediately prior to use. Cree also recommends returning any unused LEDs to the resealable moisture-barrier bag and closing the bag immediately after use.

### **UL Recognized Component**

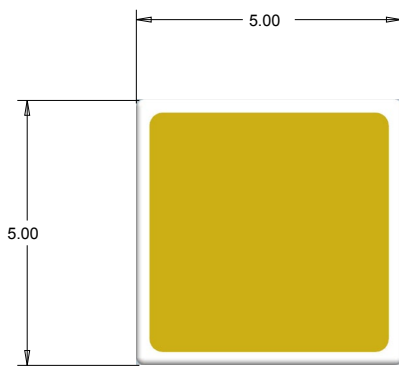
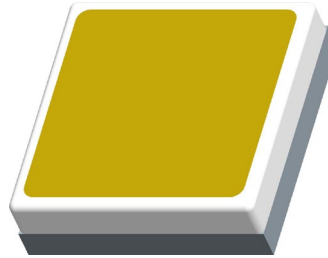
Level 4 enclosure consideration. The LED package or a portion thereof has been investigated as a fire and electrical enclosure per ANSI/UL 8750.

### **Vision Advisory Claim**

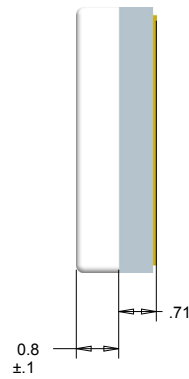
**WARNING:** Do not look at exposed lamp in operation. Eye injury can result. For more information about LEDs and eye safety, please refer to the [LED Eye Safety application note](#).

### MECHANICAL DIMENSIONS

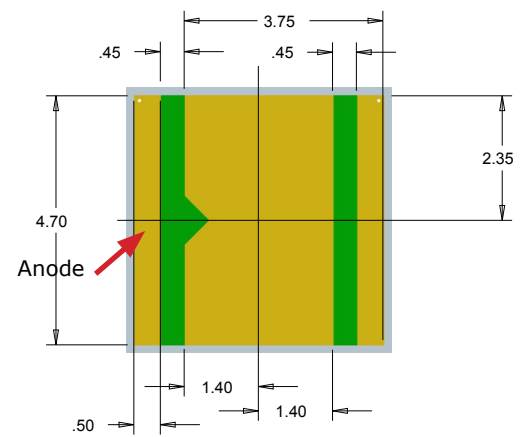
All measurements are  $\pm .25$  mm unless otherwise indicated.



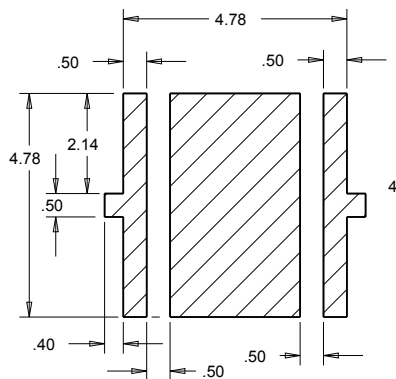
**Top View**



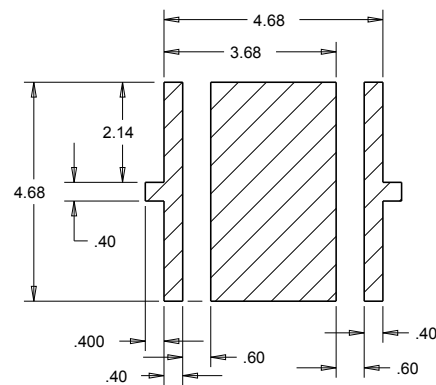
**Side View**



**Bottom View**



**Recommended PCB Solder Pad**

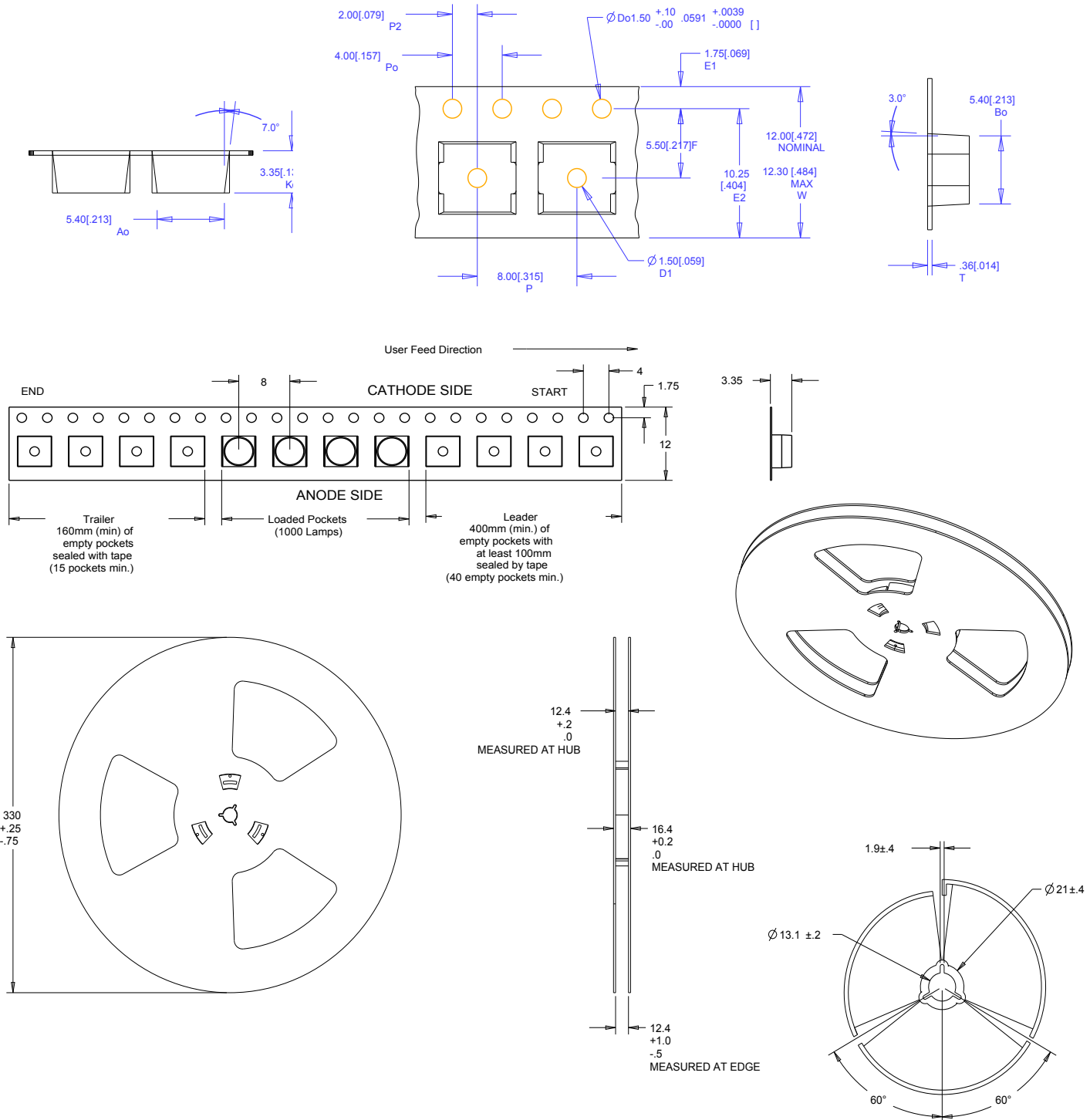


**Recommended Stencil Pattern  
(Shaded Area Is Open)**

### TAPE AND REEL

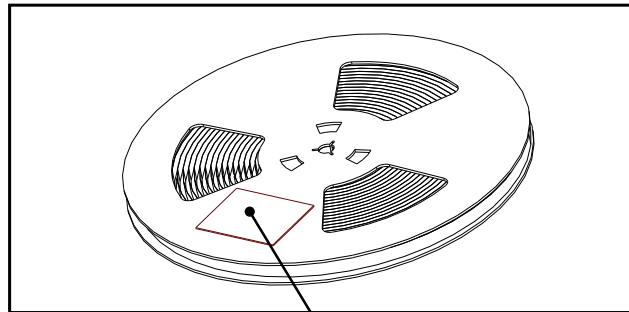
All Cree carrier tapes conform to EIA-481D, Automated Component Handling Systems Standard.

All dimensions in mm.



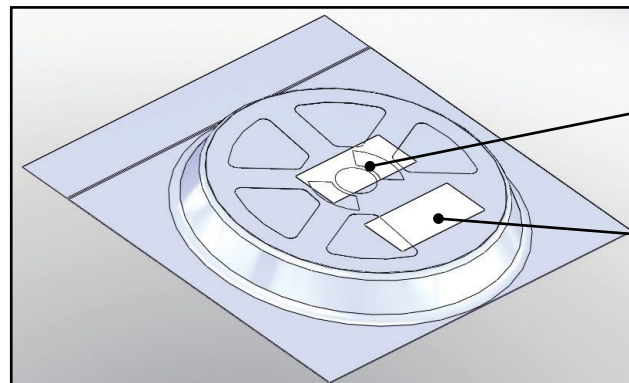
## PACKAGING

### Unpackaged Reel



Label with Cree Bin Code, Qty, Reel ID

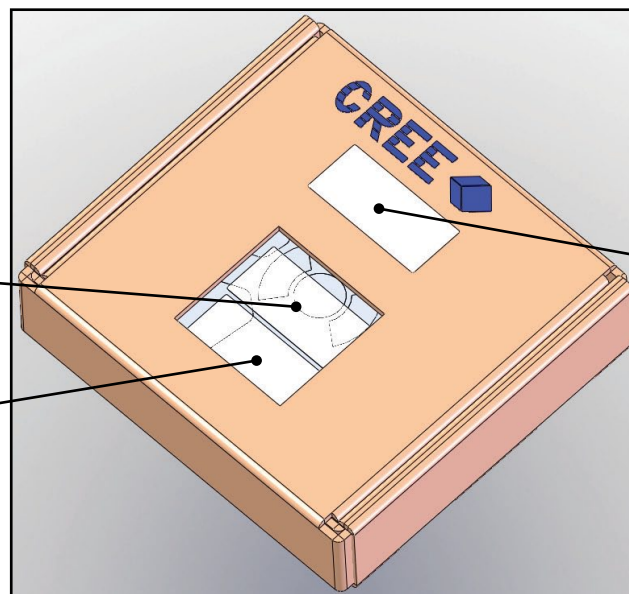
### Packaged Reel



Label with Cree Order Code, Qty, Reel ID, PO #

Label with Cree Bin Code, Qty, Reel ID

### Boxed Reel



Label with Cree Order Code, Qty, Reel ID, PO #

Label with Cree Bin Code, Qty, Reel ID

Patent Label