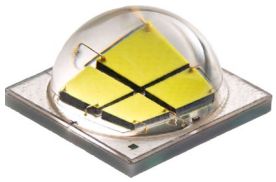
Cree® XLamp® MK-R LEDs



PRODUCT DESCRIPTION

Built on Cree's revolutionary SC³ Technology® platform, the XLamp® MK-R LED brings new levels of price and performance to directional LED arrays, enabling lighting manufacturers to create the next generation of high-lumen indoor and outdoor LED lighting systems. In single-LED systems, the XLamp MK-R LED, with EasyWhite® color binning, provides the LED industry's tightest unit-to-unit color consistency. For systems using multiple LEDs, the MK-R enables manufacturers to use fewer LEDs while maintaining light output and color consistency, which translates to lower system cost.

The XLamp MK-R LED is optimized for directional lighting applications and is a welcome addition to applications requiring high lumen output, a compact optical source and a broad palette of color temperature and CRI values.

FEATURES

- Available in ANSI white bins as well as 4-step and 2-step EasyWhite bins at 2700 K, 3000 K, 3500 K, 4000 K, 4500 K and 5000 K CCT
- Two voltage options: 6 V & 12 V
- Low thermal resistance: 1.7 °C/W
- Maximum junction temperature: 150 °C
- Binned at 85 °C
- Viewing angle: 120°
- Available in cool white, 70-, 80- and 90-CRI minimums
- Unlimited floor life at ≤ 30 °C/85% RH
- Reflow solderable - JEDEC J-STD-020C
- Electrically neutral thermal path
- RoHS and REACh compliant
- UL® recognized component (E349212)

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CHARACTERISTICS

Characteristics	Unit	Minimum	Typical	Maximum
Thermal resistance, junction to solder point	°C/W		1.7	
Viewing angle - full width half maximum (FWHM)	degrees		120	
Temperature coefficient of voltage (6 V, 1400 mA, 85 °C)	mV/°C		-4	
Temperature coefficient of voltage (12 V, 700 mA, 85 °C)	mV/°C		-8	
ESD withstand voltage (HBM per Mil-Std-883D)	V			8000
DC forward current (6 V, 1400 mA, 85 °C)	mA			2500
DC forward current (12 V, 700 mA, 85 °C)	mA			1250
Reverse voltage	V			5
Forward voltage (6 V, 1400 mA, 85 °C)	V		5.85	7
Forward voltage (12 V, 700 mA, 85 °C)	V		11.7	14
LED junction temperature	°C			150

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FLUX CHARACTERISTICS, EASYWHITE® ORDER CODES AND BINS - 6 V (I_F = 1400 mA, T_J = 85 °C)

The following tables provide order codes for XLamp MK-R LEDs. For a complete description of the order code nomenclature, please reference Bin and Order Code Formats (page 27).

Color	CCT Range	Minimum Luminous Flux**			2-Step		4-Step	
		Group	Flux (lm) @ 85 °C	Flux (lm) @ 25 °C*	Chromaticity Region	Order Code	Chromaticity Region	Order Code
80-CRI EasyWhite	5000 K	H4	970	1091	50H	MKRAWT-00-0000-0B0HH450H	50F	MKRAWT-00-0000-0B0HH450F
		H2	900	1012		MKRAWT-00-0000-0B0HH250H		MKRAWT-00-0000-0B0HH250F
		G4	840	945		MKRAWT-00-0000-0B0HG450H		MKRAWT-00-0000-0B0HG450F
	4500 K	H4	970	1091	45H	MKRAWT-00-0000-0B0HH445H	45F	MKRAWT-00-0000-0B0HH445F
		H2	900	1012		MKRAWT-00-0000-0B0HH245H		MKRAWT-00-0000-0B0HH245F
		G4	840	945		MKRAWT-00-0000-0B0HG445H		MKRAWT-00-0000-0B0HG445F
	4000 K	H4	970	1091	40H	MKRAWT-00-0000-0B0HH440H	40F	MKRAWT-00-0000-0B0HH440F
		H2	900	1012		MKRAWT-00-0000-0B0HH240H		MKRAWT-00-0000-0B0HH240F
		G4	840	945		MKRAWT-00-0000-0B0HG440H		MKRAWT-00-0000-0B0HG440F
	3500 K	H4	970	1091	35H	MKRAWT-00-0000-0B0HH435H	35F	MKRAWT-00-0000-0B0HH435F
		H2	900	1012		MKRAWT-00-0000-0B0HH235H		MKRAWT-00-0000-0B0HH235F
		G4	840	945		MKRAWT-00-0000-0B0HG435H		MKRAWT-00-0000-0B0HG435F
		G2	780	877		MKRAWT-00-0000-0B0HG235H		MKRAWT-00-0000-0B0HG235F
	3000 K	H2	900	1012	30H	MKRAWT-00-0000-0B0HH230H	30F	MKRAWT-00-0000-0B0HH230F
		G4	840	945		MKRAWT-00-0000-0B0HG430H		MKRAWT-00-0000-0B0HG430F
		G2	780	877		MKRAWT-00-0000-0B0HG230H		MKRAWT-00-0000-0B0HG230F
	2700 K	H2	900	1012	27H	MKRAWT-00-0000-0B0HH227H	27F	MKRAWT-00-0000-0B0HH227F
		G4	840	945		MKRAWT-00-0000-0B0HG427H		MKRAWT-00-0000-0B0HG427F
		G2	780	877		MKRAWT-00-0000-0B0HG227H		MKRAWT-00-0000-0B0HG227F
		F4	730	821		MKRAWT-00-0000-0B0HF427H		MKRAWT-00-0000-0B0HF427F

Notes:

- Cree maintains a tolerance of ±7% on flux and power measurements, ±0.005 on chromaticity (CCx, CCy) measurements and ±2 on CRI measurements. See the Measurements section (page 29).
- Minimum CRI for 80-CRI White is 80.

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

** Cree XLamp MK-R LED order codes specify only a minimum flux bin and not a maximum. Cree 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 restrictions specified by the order code.

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FLUX CHARACTERISTICS, EASYWHITE® ORDER CODES AND BINS - 6 V (I_F = 1400 mA, T_J = 85 °C) - CONTINUED

Color	CCT Range	Minimum Luminous Flux**			2-Step		4-Step	
		Group	Flux (lm) @ 85 °C	Flux (lm) @ 25 °C*	Chromaticity Region	Order Code	Chromaticity Region	Order Code
90-CRI EasyWhite	3000 K	F4	730	821	30H	MKRAWT-00-0000-0B0UF430H	30F	MKRAWT-00-0000-0B0UF430F
		F2	680	765		MKRAWT-00-0000-0B0UF230H		MKRAWT-00-0000-0B0UF230F
		E4	635	714		MKRAWT-00-0000-0B0UE430H		MKRAWT-00-0000-0B0UE430F
		E2	590	664		MKRAWT-00-0000-0B0UE230H		MKRAWT-00-0000-0B0UE230F
	2700 K	F2	680	765	27H	MKRAWT-00-0000-0B0UF227H	27F	MKRAWT-00-0000-0B0UF227F
		E4	635	714		MKRAWT-00-0000-0B0UE427H		MKRAWT-00-0000-0B0UE427F
		E2	590	664		MKRAWT-00-0000-0B0UE227H		MKRAWT-00-0000-0B0UE227F
		D4	550	619		MKRAWT-00-0000-0B0UD427H		MKRAWT-00-0000-0B0UD427F

Notes:

- Cree maintains a tolerance of ±7% on flux and power measurements, ±0.005 on chromaticity (CCx, CCy) measurements and ±2 on CRI measurements. See the Measurements section (page 29).
- Minimum CRI for 90-CRI White is 90.

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

** Cree XLamp MK-R LED order codes specify only a minimum flux bin and not a maximum. Cree 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 restrictions specified by the order code.

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FLUX CHARACTERISTICS, ANSI WHITE ORDER CODES AND BINS - 6 V (I_F = 1400 mA, T_J = 85 °C)

Chromaticity		Minimum Luminous Flux**			Order Codes			
Kit	CCT	Code	Flux (lm) @ 85 °C	Flux (lm) @ 25 °C*	65 CRI Typical	70 CRI Minimum	80 CRI Minimum	90 CRI Minimum
51	6200 K	J4	1120	1260	MKRAWT-00-0000-0B00J4051	MKRAWT-00-0000-0B0BJ4051		
		J2	1040	1170	MKRAWT-00-0000-0B00J2051	MKRAWT-00-0000-0B0BJ2051		
		H4	970	1091	MKRAWT-00-0000-0B00H4051	MKRAWT-00-0000-0B0BH4051		
		H2	900	1012		MKRAWT-00-0000-0B0BH2051		
E1	6500 K	J4	1120	1260	MKRAWT-00-0000-0B00J40E1			
		J2	1040	1170	MKRAWT-00-0000-0B00J20E1	MKRAWT-00-0000-0B0BJ20E1		
		H4	970	1091	MKRAWT-00-0000-0B00H40E1	MKRAWT-00-0000-0B0BH40E1		
		H2	900	1012		MKRAWT-00-0000-0B0BH20E1		
E2	5700 K	J4	1120	1260	MKRAWT-00-0000-0B00J40E2	MKRAWT-00-0000-0B0BJ40E2		
		J2	1040	1170	MKRAWT-00-0000-0B00J20E2	MKRAWT-00-0000-0B0BJ20E2		
		H4	970	1091	MKRAWT-00-0000-0B00H40E2	MKRAWT-00-0000-0B0BH40E2		
		H2	900	1012		MKRAWT-00-0000-0B0BH20E2		
E3	5000 K	J2	1040	1170	MKRAWT-00-0000-0B00J20E3	MKRAWT-00-0000-0B0BJ20E3		
		H4	970	1091	MKRAWT-00-0000-0B00H40E3	MKRAWT-00-0000-0B0BH40E3	MKRAWT-00-0000-0B0HH40E3	
		H2	900	1012	MKRAWT-00-0000-0B00H20E3	MKRAWT-00-0000-0B0BH20E3	MKRAWT-00-0000-0B0HH20E3	
		G4	840	945			MKRAWT-00-0000-0B0HG40E3	
E4	4500 K	J2	1040	1170	MKRAWT-00-0000-0B00J20E4	MKRAWT-00-0000-0B0BJ20E4		
		H4	970	1091	MKRAWT-00-0000-0B00H40E4	MKRAWT-00-0000-0B0BH40E4	MKRAWT-00-0000-0B0HH40E4	
		H2	900	1012	MKRAWT-00-0000-0B00H20E4	MKRAWT-00-0000-0B0BH20E4	MKRAWT-00-0000-0B0HH20E4	
		G4	840	945			MKRAWT-00-0000-0B0HG40E4	

Notes:

- Cree maintains a tolerance of ±7% on flux and power measurements, ±0.005 on chromaticity (CCx, CCy) measurements and ±2 on CRI measurements. See the Measurements section (page 29).
- For information on chromaticity bins contained in the kits listed above, please reference the Performance Groups - Chromaticity section starting on page 21.

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

** Cree XLamp MK-R LED order codes specify only a minimum flux bin and not a maximum. Cree 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 restrictions specified by the order code.

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FLUX CHARACTERISTICS, ANSI WHITE ORDER CODES AND BINS - 6 V (I_F = 1400 mA, T_J = 85 °C) - CONTINUED

Chromaticity		Minimum Luminous Flux**			Order Codes			
Kit	CCT	Code	Flux (lm) @ 85 °C	Flux (lm) @ 25 °C*	65 CRI Typical	70 CRI Minimum	80 CRI Minimum	90 CRI Minimum
E5	4000 K	J2	1040	1170	MKRAWT-00-0000-0B00J20E5	MKRAWT-00-0000-0B0BJ20E5		
		H4	970	1091	MKRAWT-00-0000-0B00H40E5	MKRAWT-00-0000-0B0BH40E	MKRAWT-00-0000-0B0HH40E5	
		H2	900	1012	MKRAWT-00-0000-0B00H20E5	MKRAWT-00-0000-0B0BH20E	MKRAWT-00-0000-0B0HH20E5	
		G4	840	945	MKRAWT-00-0000-0B00G40E5	MKRAWT-00-0000-0B0BG40E5	MKRAWT-00-0000-0B0HG40E5	
E6	3500 K	H4	970	1091		MKRAWT-00-0000-0B0BH40E6	MKRAWT-00-0000-0B0HH40E6	
		H2	900	1012		MKRAWT-00-0000-0B0BH20E6	MKRAWT-00-0000-0B0HH20E6	
		G4	840	945		MKRAWT-00-0000-0B0BG40E6	MKRAWT-00-0000-0B0HG40E6	
		G2	780	877			MKRAWT-00-0000-0B0HG20E6	
E7	3000 K	H4	970	1091		MKRAWT-00-0000-0B0BH40E7		
		H2	900	1012		MKRAWT-00-0000-0B0BH20E7	MKRAWT-00-0000-0B0HH20E7	
		G4	840	945		MKRAWT-00-0000-0B0BG40E7	MKRAWT-00-0000-0B0HG40E7	
		G2	780	877			MKRAWT-00-0000-0B0HG20E7	
		F4	730	821				MKRAWT-00-0000-0B0UF40E7
		F2	680	765				MKRAWT-00-0000-0B0UF20E7
		E4	635	714				MKRAWT-00-0000-0B0UE40E7
		E2	590	664				MKRAWT-00-0000-0B0UE20E7

Notes:

- Cree maintains a tolerance of ±7% on flux and power measurements, ±0.005 on chromaticity (CCx, CCy) measurements and ±2 on CRI measurements. See the Measurements section (page 29).
- For information on chromaticity bins contained in the kits listed above, please reference the Performance Groups - Chromaticity section starting on page 21.

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

** Cree XLamp MK-R LED order codes specify only a minimum flux bin and not a maximum. Cree 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 restrictions specified by the order code.

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FLUX CHARACTERISTICS, ANSI WHITE ORDER CODES AND BINS - 6 V (I_F = 1400 mA, T_J = 85 °C) - CONTINUED

Chromaticity		Minimum Luminous Flux**			Order Codes			
Kit	CCT	Code	Flux (lm) @ 85 °C	Flux (lm) @ 25 °C*	65 CRI Typical	70 CRI Minimum	80 CRI Minimum	90 CRI Minimum
E8	2700 K	H2	900	1012			MKRAWT-00-0000-0B0HH20E8	
		G4	840	945			MKRAWT-00-0000-0B0HG40E8	
		G2	780	877			MKRAWT-00-0000-0B0HG20E8	
		F4	730	821			MKRAWT-00-0000-0B0HF40E8	
		F2	680	765				MKRAWT-00-0000-0B0UF20E8
		E4	635	714				MKRAWT-00-0000-0B0UE40E8
		E2	590	664				MKRAWT-00-0000-0B0UE20E8
		D4	550	619				MKRAWT-00-0000-0B0UD40E8

Notes:

- Cree maintains a tolerance of ±7% on flux and power measurements, ±0.005 on chromaticity (CCx, CCy) measurements and ±2 on CRI measurements. See the Measurements section (page 29).
- For information on chromaticity bins contained in the kits listed above, please reference the Performance Groups - Chromaticity section starting on page 21.

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FLUX CHARACTERISTICS, EASYWHITE® ORDER CODES AND BINS -12 V (I_F = 700 mA, T_J = 85 °C)

The following tables provide order codes for XLamp MK-R LEDs. For a complete description of the order code nomenclature, please reference Bin and Order Code Formats (page 27).

Color	CCT Range	Minimum Luminous Flux**			2-Step		4-Step	
		Group	Flux (lm) @ 85 °C	Flux (lm) @ 25 °C*	Chromaticity Region	Order Code	Chromaticity Region	Order Code
80-CRI EasyWhite	5000 K	H4	970	1091	50H	MKRAWT-00-0000-0D0HH450H	50F	MKRAWT-00-0000-0D0HH450F
		H2	900	1012		MKRAWT-00-0000-0D0HH250H		MKRAWT-00-0000-0D0HH250F
		G4	840	945		MKRAWT-00-0000-0D0HG450H		MKRAWT-00-0000-0D0HG450F
	4500 K	H4	970	1091	45H	MKRAWT-00-0000-0D0HH445H	45F	MKRAWT-00-0000-0D0HH445F
		H2	900	1012		MKRAWT-00-0000-0D0HH245H		MKRAWT-00-0000-0D0HH245F
		G4	840	945		MKRAWT-00-0000-0D0HG445H		MKRAWT-00-0000-0D0HG445F
	4000 K	H4	970	1091	40H	MKRAWT-00-0000-0D0HH440H	40F	MKRAWT-00-0000-0D0HH440F
		H2	900	1012		MKRAWT-00-0000-0D0HH240H		MKRAWT-00-0000-0D0HH240F
		G4	840	945		MKRAWT-00-0000-0D0HG440H		MKRAWT-00-0000-0D0HG440F
	3500 K	H4	970	1091	35H	MKRAWT-00-0000-0D0HH435H	35F	MKRAWT-00-0000-0D0HH435F
		H2	900	1012		MKRAWT-00-0000-0D0HH235H		MKRAWT-00-0000-0D0HH235F
		G4	840	945		MKRAWT-00-0000-0D0HG435H		MKRAWT-00-0000-0D0HG435F
		G2	780	877		MKRAWT-00-0000-0D0HG235H		MKRAWT-00-0000-0D0HG235F
	3000 K	H2	900	1012	30H	MKRAWT-00-0000-0D0HH230H	30F	MKRAWT-00-0000-0D0HH230F
		G4	840	945		MKRAWT-00-0000-0D0HG430H		MKRAWT-00-0000-0D0HG430F
		G2	780	877		MKRAWT-00-0000-0D0HG230H		MKRAWT-00-0000-0D0HG230F
	2700 K	H2	900	1012	27H	MKRAWT-00-0000-0D0HH227H	27F	MKRAWT-00-0000-0D0HH227F
		G4	840	945		MKRAWT-00-0000-0D0HG427H		MKRAWT-00-0000-0D0HG427F
		G2	780	877		MKRAWT-00-0000-0D0HG227H		MKRAWT-00-0000-0D0HG227F
		F4	730	821		MKRAWT-00-0000-0D0HF427H		MKRAWT-00-0000-0D0HF427F

Notes:

- Cree maintains a tolerance of ±7% on flux and power measurements, ±0.005 on chromaticity (CCx, CCy) measurements and ±2 on CRI measurements. See the Measurements section (page 29).
- Minimum CRI for 80-CRI White is 80.

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

** Cree XLamp MK-R LED order codes specify only a minimum flux bin and not a maximum. Cree 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 restrictions specified by the order code.

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FLUX CHARACTERISTICS, EASYWHITE® ORDER CODES AND BINS - 12 V (I_F = 700 mA, T_J = 85 °C) - CONTINUED

Color	CCT Range	Minimum Luminous Flux**			2-Step		4-Step	
		Group	Flux (lm) @ 85 °C	Flux (lm) @ 25 °C*	Chromaticity Region	Order Code	Chromaticity Region	Order Code
90-CRI EasyWhite	3000 K	F4	730	821	30H	MKRAWT-00-0000-0D0UF430H	30F	MKRAWT-00-0000-0D0UF430F
		F2	680	765		MKRAWT-00-0000-0D0UF230H		MKRAWT-00-0000-0D0UF230F
		E4	635	714		MKRAWT-00-0000-0D0UE430H		MKRAWT-00-0000-0D0UE430F
		E2	590	664		MKRAWT-00-0000-0D0UE230H		MKRAWT-00-0000-0D0UE230F
	2700 K	F2	680	765	27H	MKRAWT-00-0000-0D0UF227H	27F	MKRAWT-00-0000-0D0UF227F
		E4	635	714		MKRAWT-00-0000-0D0UE427H		MKRAWT-00-0000-0D0UE427F
		E2	590	664		MKRAWT-00-0000-0D0UE227H		MKRAWT-00-0000-0D0UE227F
		D4	550	619		MKRAWT-00-0000-0D0UD427H		MKRAWT-00-0000-0D0UD427F

Notes:

- Cree maintains a tolerance of ±7% on flux and power measurements, ±0.005 on chromaticity (CCx, CCy) measurements and ±2 on CRI measurements. See the Measurements section (page 29).
- Minimum CRI for 90-CRI White is 90.

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

** Cree XLamp MK-R LED order codes specify only a minimum flux bin and not a maximum. Cree 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 restrictions specified by the order code.

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FLUX CHARACTERISTICS, ANSI WHITE ORDER CODES AND BINS - 12 V (I_F = 700 mA, T_J = 85 °C)

Chromaticity		Minimum Luminous Flux**			Order Codes			
Kit	CCT	Code	Flux (lm) @ 85 °C	Flux (lm) @ 25 °C*	65 CRI Typical	70 CRI Minimum	80 CRI Minimum	90 CRI Minimum
51	6200 K	J4	1120	1260	MKRAWT-00-0000-0D00J4051	MKRAWT-00-0000-0D0BJ4051		
		J2	1040	1170	MKRAWT-00-0000-0D00J2051	MKRAWT-00-0000-0D0BJ2051		
		H4	970	1091	MKRAWT-00-0000-0D00H4051	MKRAWT-00-0000-0D0BH4051		
		H2	900	1012		MKRAWT-00-0000-0D0BH2051		
E1	6500 K	J4	1120	1260	MKRAWT-00-0000-0D00J40E1			
		J2	1040	1170	MKRAWT-00-0000-0D00J20E1	MKRAWT-00-0000-0D0BJ20E1		
		H4	970	1091	MKRAWT-00-0000-0D00H40E1	MKRAWT-00-0000-0D0BH40E1		
		H2	900	1012		MKRAWT-00-0000-0D0BH20E1		
E2	5700 K	J4	1120	1260	MKRAWT-00-0000-0D00J40E2	MKRAWT-00-0000-0D0BJ40E2		
		J2	1040	1170	MKRAWT-00-0000-0D00J20E2	MKRAWT-00-0000-0D0BJ20E2		
		H4	970	1091	MKRAWT-00-0000-0D00H40E2	MKRAWT-00-0000-0D0BH40E2		
		H2	900	1012		MKRAWT-00-0000-0D0BH20E2		
E3	5000 K	J2	1040	1170	MKRAWT-00-0000-0D00J20E3	MKRAWT-00-0000-0D0BJ20E3		
		H4	970	1091	MKRAWT-00-0000-0D00H40E3	MKRAWT-00-0000-0D0BH40E3	MKRAWT-00-0000-0D0HH40E3	
		H2	900	1012	MKRAWT-00-0000-0D00H20E3	MKRAWT-00-0000-0D0BH20E3	MKRAWT-00-0000-0D0HH20E3	
		G4	840	945			MKRAWT-00-0000-0D0HG40E3	
E4	4500 K	J2	1040	1170	MKRAWT-00-0000-0D00J20E4	MKRAWT-00-0000-0D0BJ20E4		
		H4	970	1091	MKRAWT-00-0000-0D00H40E4	MKRAWT-00-0000-0D0BH40E4	MKRAWT-00-0000-0D0HH40E4	
		H2	900	1012	MKRAWT-00-0000-0D00H20E4	MKRAWT-00-0000-0D0BH20E4	MKRAWT-00-0000-0D0HH20E4	
		G4	840	945			MKRAWT-00-0000-0D0HG40E4	

Notes:

- Cree maintains a tolerance of ±7% on flux and power measurements, ±0.005 on chromaticity (CCx, CCy) measurements and ±2 on CRI measurements. See the Measurements section (page 29).
- For information on chromaticity bins contained in the kits listed above, please reference the Performance Groups - Chromaticity section starting on page 21.

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

** Cree XLamp MK-R LED order codes specify only a minimum flux bin and not a maximum. Cree 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 restrictions specified by the order code.

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FLUX CHARACTERISTICS, ANSI WHITE ORDER CODES AND BINS - 12 V (I_F = 700 mA, T_J = 85 °C) - CONTINUED

Chromaticity		Minimum Luminous Flux**			Order Codes			
Kit	CCT	Code	Flux (lm) @ 85 °C	Flux (lm) @ 25 °C*	65 CRI Typical	70 CRI Minimum	80 CRI Minimum	90 CRI Minimum
E5	4000 K	J2	1040	1170	MKRAWT-00-0000-0D00J20E5	MKRAWT-00-0000-0D0BJ20E5		
		H4	970	1091	MKRAWT-00-0000-0D00H40E5	MKRAWT-00-0000-0D0BH40E	MKRAWT-00-0000-0D0HH40E5	
		H2	900	1012	MKRAWT-00-0000-0D00H20E5	MKRAWT-00-0000-0D0BH20E	MKRAWT-00-0000-0D0HH20E5	
		G4	840	945	MKRAWT-00-0000-0D00G40E5	MKRAWT-00-0000-0D0BG40E5	MKRAWT-00-0000-0D0HG40E5	
E6	3500 K	H4	970	1091		MKRAWT-00-0000-0D0BH40E6	MKRAWT-00-0000-0D0HH40E6	
		H2	900	1012		MKRAWT-00-0000-0D0BH20E6	MKRAWT-00-0000-0D0HH20E6	
		G4	840	945		MKRAWT-00-0000-0D0BG40E6	MKRAWT-00-0000-0D0HG40E6	
		G2	780	877			MKRAWT-00-0000-0D0HG20E6	
E7	3000 K	H4	970	1091		MKRAWT-00-0000-0D0BH40E7		
		H2	900	1012		MKRAWT-00-0000-0D0BH20E7	MKRAWT-00-0000-0D0HH20E7	
		G4	840	945		MKRAWT-00-0000-0D0BG40E7	MKRAWT-00-0000-0D0HG40E7	
		G2	780	877			MKRAWT-00-0000-0D0HG20E7	
		F4	730	821				MKRAWT-00-0000-0D0UF40E7
		F2	680	765				MKRAWT-00-0000-0D0UF20E7
		E4	635	714				MKRAWT-00-0000-0D0UE40E7
		E2	590	664				MKRAWT-00-0000-0D0UE20E7

Notes:

- Cree maintains a tolerance of ±7% on flux and power measurements, ±0.005 on chromaticity (CCx, CCy) measurements and ±2 on CRI measurements. See the Measurements section (page 29).
- For information on chromaticity bins contained in the kits listed above, please reference the Performance Groups - Chromaticity section starting on page 21.

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

** Cree XLamp MK-R LED order codes specify only a minimum flux bin and not a maximum. Cree 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 restrictions specified by the order code.

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FLUX CHARACTERISTICS, ANSI WHITE ORDER CODES AND BINS - 12 V (I_F = 700 mA, T_J = 85 °C) - CONTINUED

Chromaticity		Minimum Luminous Flux**			Order Codes			
Kit	CCT	Code	Flux (lm) @ 85 °C	Flux (lm) @ 25 °C*	65 CRI Typical	70 CRI Minimum	80 CRI Minimum	90 CRI Minimum
E8	2700 K	H2	900	1012			MKRAWT-00-0000-0D0HH20E8	
		G4	840	945			MKRAWT-00-0000-0D0HG40E8	
		G2	780	877			MKRAWT-00-0000-0D0HG20E8	
		F4	730	821			MKRAWT-00-0000-0D0HF40E8	
		F2	680	765				MKRAWT-00-0000-0D0UF20E8
		E4	635	714				MKRAWT-00-0000-0D0UE40E8
		E2	590	664				MKRAWT-00-0000-0D0UE20E8
		D4	550	619				MKRAWT-00-0000-0D0UD40E8

Notes:

- Cree maintains a tolerance of ±7% on flux and power measurements, ±0.005 on chromaticity (CCx, CCy) measurements and ±2 on CRI measurements. See the Measurements section (page 29).
- For information on chromaticity bins contained in the kits listed above, please reference the Performance Groups - Chromaticity section starting on page 21.

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

** Cree XLamp MK-R LED order codes specify only a minimum flux bin and not a maximum. Cree 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 restrictions specified by the order code.

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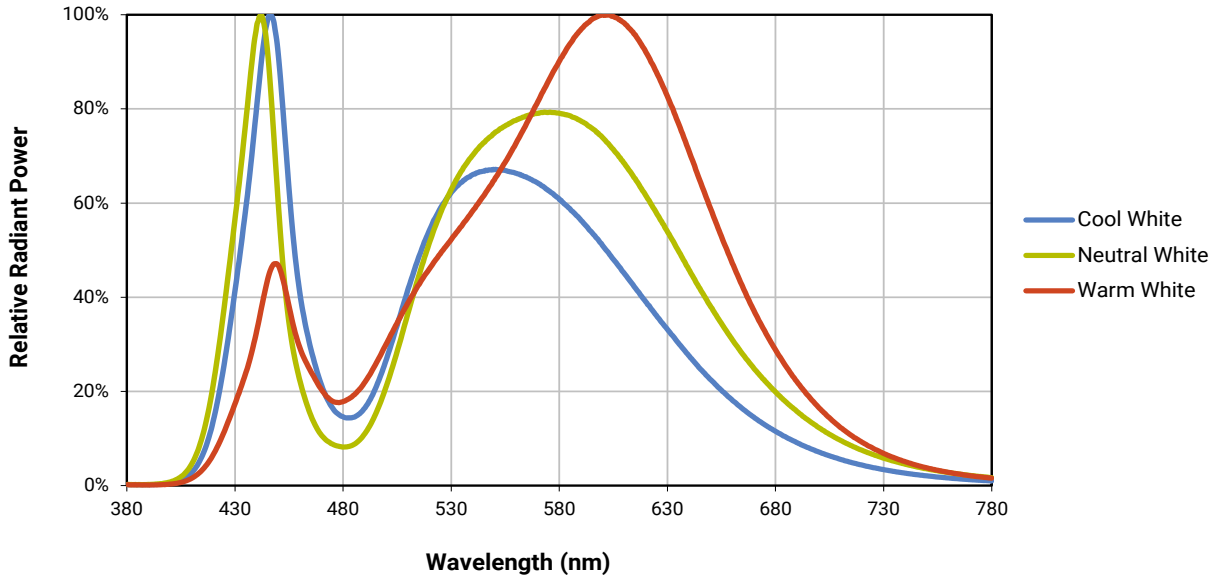
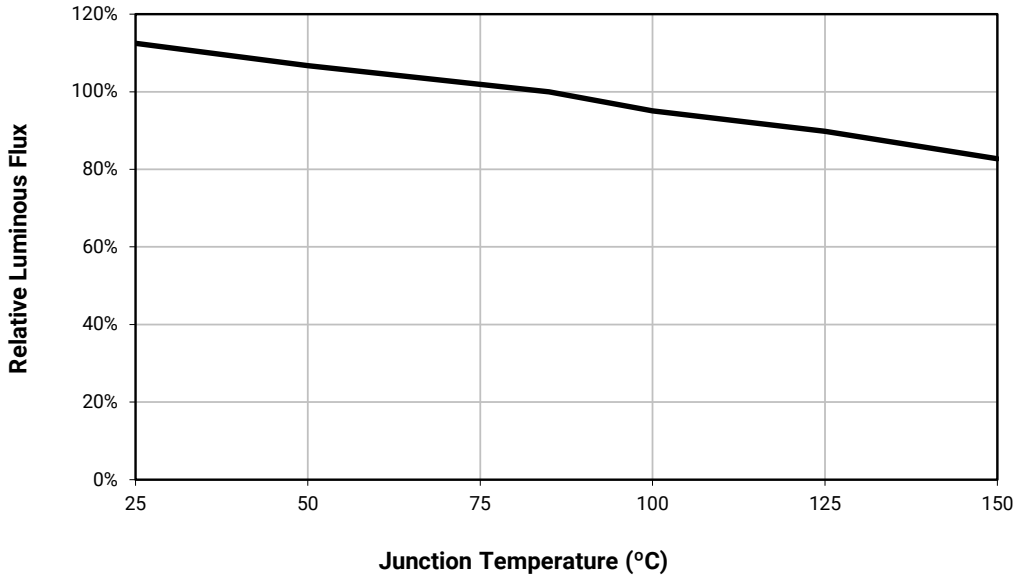
RELATIVE SPECTRAL POWER DISTRIBUTION (6 V, 1400 mA; 12 V, 700 mA; T_J = 85 °C)



RELATIVE FLUX VS. JUNCTION TEMPERATURE (6 V, I_F = 1400 mA; 12 V, I_F = 700 mA)



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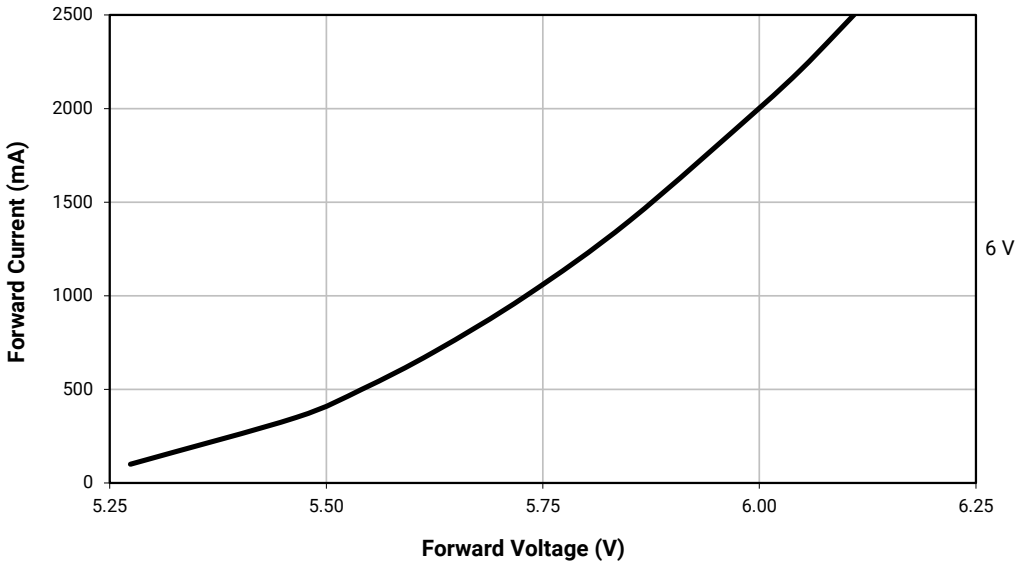
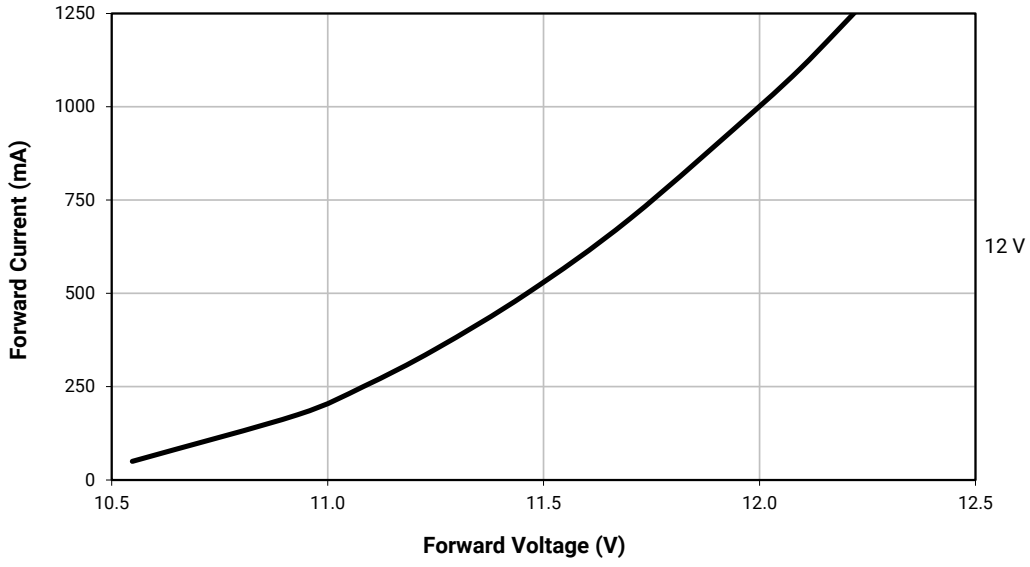
ELECTRICAL CHARACTERISTICS (T_J = 85 °C)





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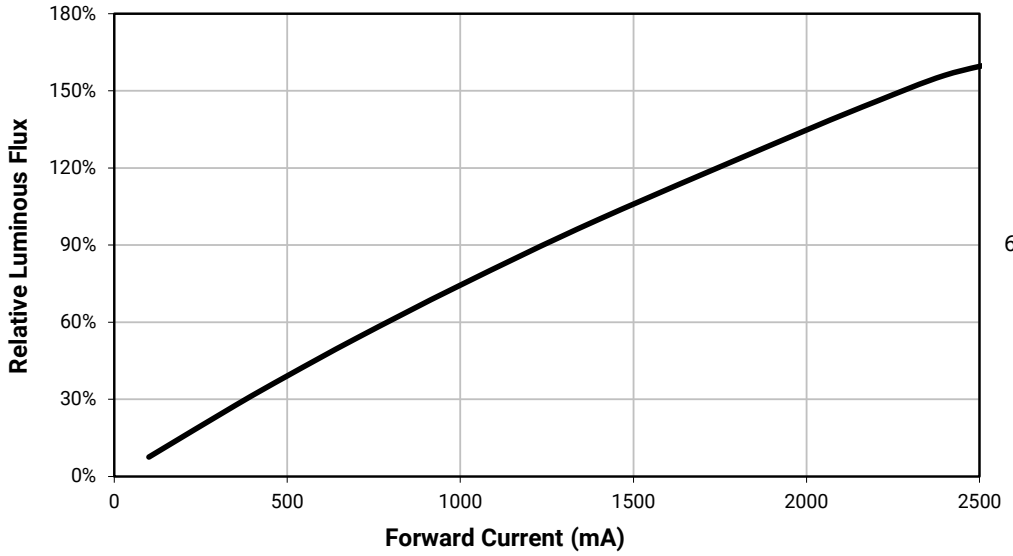
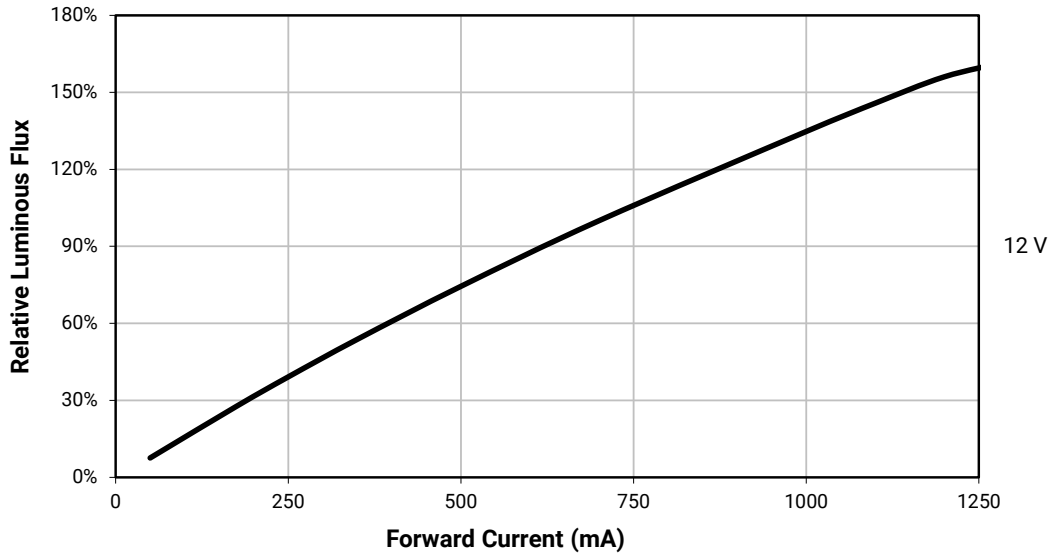
RELATIVE FLUX VS. CURRENT (T_J = 85 °C)





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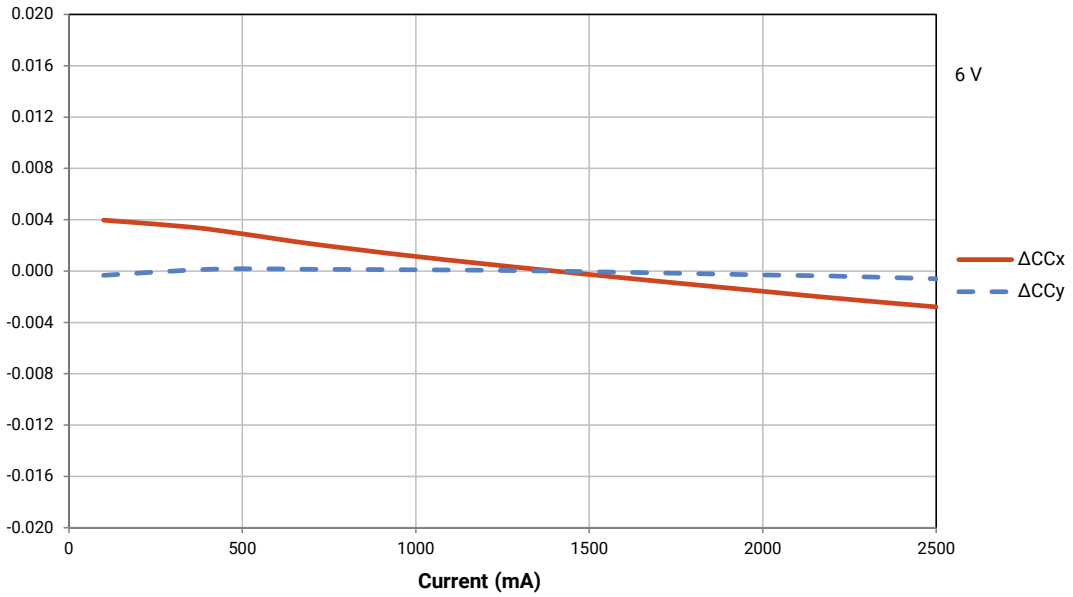
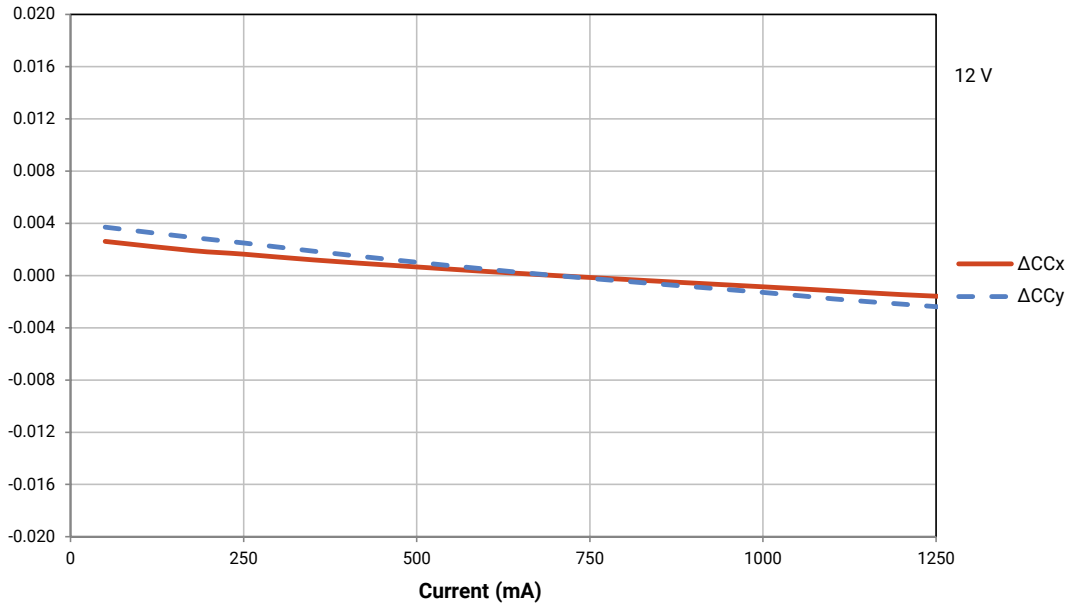
RELATIVE CHROMATICITY VS. CURRENT - WARM WHITE (T_J = 85 °C)





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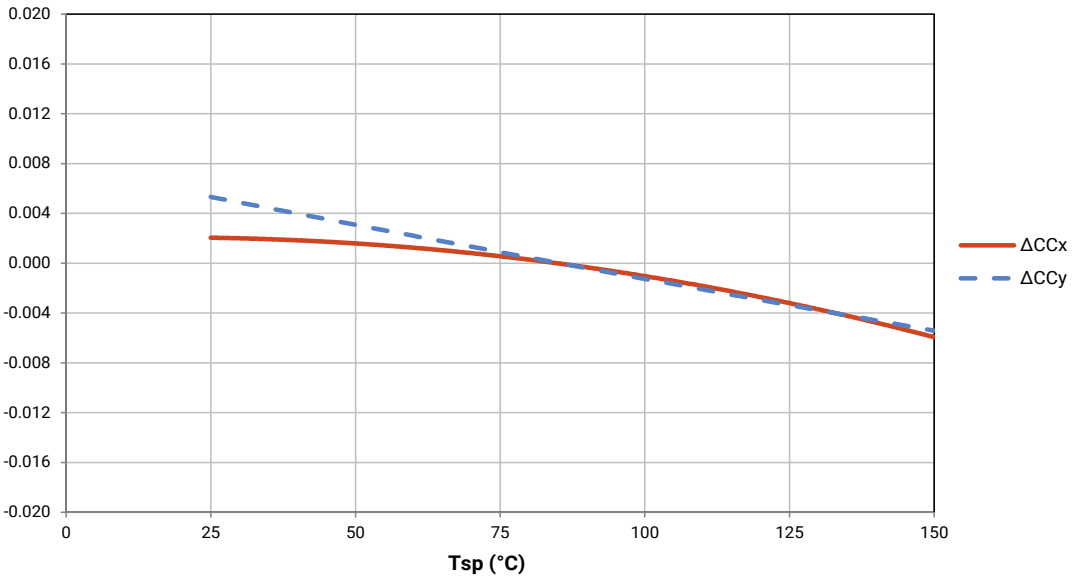
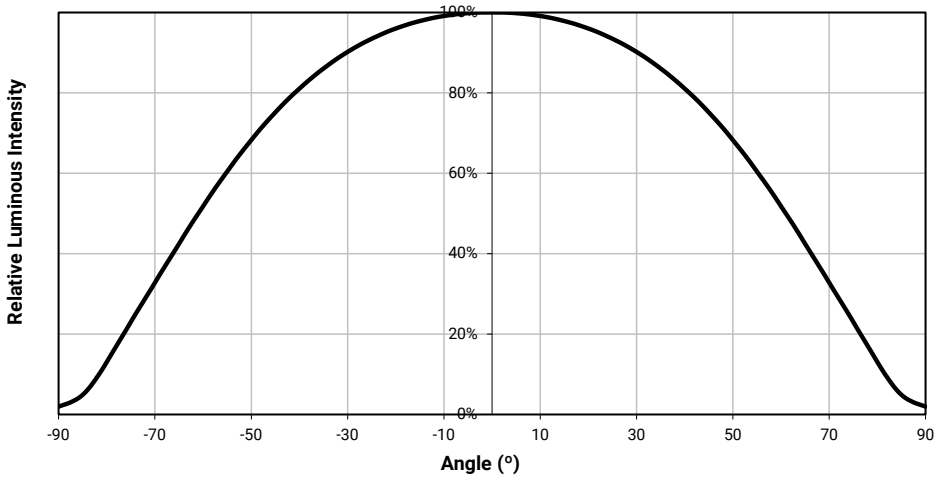
RELATIVE CHROMATICITY VS. TEMPERATURE - WARM WHITE (6 V, I_F = 1400 mA; 12 V, I_F = 700 mA)



TYPICAL SPATIAL DISTRIBUTION



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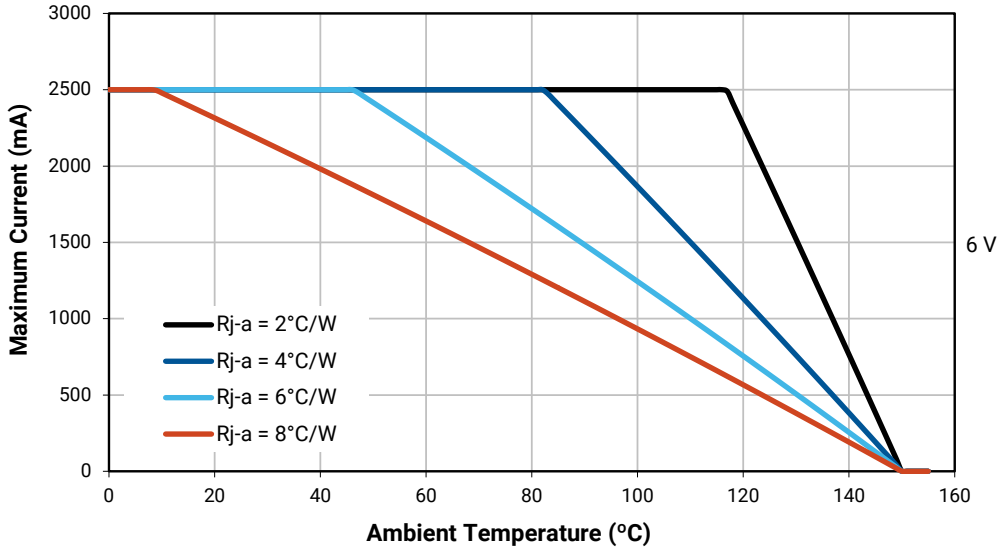
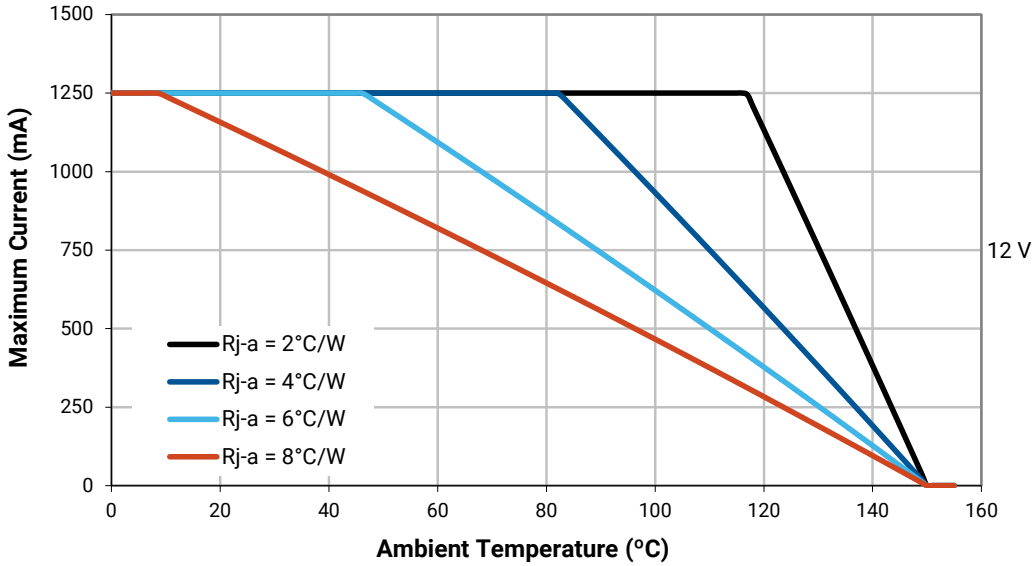
THERMAL DESIGN

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.





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PERFORMANCE GROUPS - LUMINOUS FLUX (T_J = 85 °C)

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

Group Code	Minimum Luminous Flux	Maximum Luminous Flux
D2	510	550
D4	550	590
E2	590	635
E4	635	680
F2	680	730
F4	730	780
G2	780	840
G4	840	900
H2	900	970
H4	970	1040
J2	1040	1120
J4	1120	1200
K2	1200	1290

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PERFORMANCE GROUPS - CHROMATICITY (T_J = 85 °C)

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

EasyWhite Color Temperatures – 4-Step			
Code	CCT	x	y
50H	5000 K	0.3407	0.3459
		0.3415	0.3586
		0.3499	0.3654
		0.3484	0.3521
45H	4500 K	0.3674	0.3772
		0.3582	0.3710
		0.3562	0.3573
		0.3642	0.3625
40H	4000 K	0.3744	0.3685
		0.3782	0.3837
		0.3912	0.3917
		0.3863	0.3758
35H	3500 K	0.3981	0.3800
		0.4040	0.3966
		0.4186	0.4037
		0.4116	0.3865
30H	3000 K	0.4242	0.3919
		0.4322	0.4096
		0.4449	0.4141
		0.4359	0.3960
27H	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
50F	5000 K	0.3429	0.3507
		0.3434	0.3571
		0.3475	0.3604
		0.3469	0.3539
45F	4500 K	0.3643	0.3720
		0.3597	0.3689
		0.3587	0.3620
		0.3628	0.3647
40F	4000 K	0.3784	0.3741
		0.3804	0.3818
		0.3867	0.3857
		0.3844	0.3778
35F	3500 K	0.4030	0.3857
		0.4061	0.3941
		0.4132	0.3976
		0.4099	0.3890
30F	3000 K	0.4291	0.3973
		0.4333	0.4062
		0.4395	0.4084
		0.4351	0.3994
27F	2700 K	0.4528	0.4046
		0.4578	0.4138
		0.4638	0.4152
		0.4586	0.4060

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PERFORMANCE GROUPS - CHROMATICITY (T_J = 85 °C) - CONTINUED

ANSI White Bins												
Code	CCT	Bin Code	x	y	Bin Code	x	y	Bin Code	x	y	Bin Code	x	y
051	6200 K	0A0	0.2920	0.3060	0R0	0.2950	0.2970	1A0	0.3048	0.3207	1R0	0.3068	0.3113
			0.2984	0.3133		0.3009	0.3042		0.3130	0.3290		0.3144	0.3186
			0.3009	0.3042		0.3037	0.2937		0.3144	0.3186		0.3161	0.3059
			0.2950	0.2970		0.2980	0.2880		0.3068	0.3113		0.3093	0.2993
		0B0	0.2895	0.3135	0S0	0.2870	0.3210	1B0	0.3028	0.3304	1S0	0.3005	0.3415
			0.2962	0.3220		0.2937	0.3312		0.3115	0.3391		0.3099	0.3509
			0.2984	0.3133		0.2962	0.3220		0.3130	0.3290		0.3115	0.3391
			0.2920	0.3060		0.2895	0.3135		0.3048	0.3207		0.3028	0.3304
		0C0	0.2962	0.3220	0T0	0.2937	0.3312	1C0	0.3115	0.3391	1T0	0.3099	0.3509
			0.3028	0.3304		0.3005	0.3415		0.3205	0.3481		0.3196	0.3602
			0.3048	0.3207		0.3028	0.3304		0.3213	0.3373		0.3205	0.3481
			0.2984	0.3133		0.2962	0.3220		0.3130	0.3290		0.3115	0.3391
		0D0	0.2984	0.3133	0U0	0.3009	0.3042	1D0	0.3130	0.3290	1U0	0.3144	0.3186
			0.3048	0.3207		0.3068	0.3113		0.3213	0.3373		0.3221	0.3261
			0.3068	0.3113		0.3093	0.2993		0.3221	0.3261		0.3231	0.3120
			0.3009	0.3042		0.3037	0.2937		0.3144	0.3186		0.3161	0.3059

ANSI White Bins										
Code	CCT	Bin Code	x	y	Bin Code	x	y	Bin Code	x	y
051	6200 K	2A0	0.3215	0.3350	2R0	0.3222	0.3243	3A0	.3371	.3490
			0.3290	0.3417		0.3290	0.3300		.3451	.3554
			0.3290	0.3300		0.3290	0.3180		.3440	.3427
			0.3222	0.3243		0.3231	0.3120		.3366	.3369
		2B0	0.3207	0.3462	2S0	0.3196	0.3602	3B0	.3376	.3616
			0.3290	0.3538		0.3290	0.3690		.3463	.3687
			0.3290	0.3417		0.3290	0.3538		.3451	.3554
			0.3215	0.3350		0.3207	0.3462		.3371	.3490
		2C0	0.3290	0.3538	2T0	0.3290	0.3690	3C0	.3463	.3687
			0.3376	0.3616		0.3381	0.3762		.3551	.3760
			0.3371	0.3490		0.3376	0.3616		.3533	.3620
			0.3290	0.3417		0.3290	0.3538		.3451	.3554
		2D0	0.3290	0.3417	2U0	0.3290	0.3300	3D0	.3451	.3554
			0.3371	0.3490		0.3366	0.3369		.3533	.3620
			0.3366	0.3369		0.3361	0.3245		.3515	.3487
			0.3290	0.3300		0.3290	0.3180		.3440	.3427

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PERFORMANCE GROUPS - CHROMATICITY (T_J = 85 °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

ANSI White Bins				
Code	CCT	Bin Code	x	y
0E4	4500 K	4A0	.3530	.3597
			.3615	.3659
			.3590	.3521
			.3512	.3465
		4B0	.3548	.3736
			.3641	.3804
			.3615	.3659
			.3530	.3597
		4C0	.3641	.3804
			.3736	.3874
			.3702	.3722
			.3615	.3659
		4D0	.3668	.3957
			.3771	.4034
			.3736	.3874
			.3641	.3804

ANSI White Bins				
Code	CCT	Bin Code	x	y
0E5	4000 K	5A0	.3670	.3578
			.3702	.3722
			.3825	.3798
			.3783	.3646
		5B0	.3702	.3722
			.3736	.3874
			.3869	.3958
			.3825	.3798
		5C0	.3825	.3798
			.3869	.3958
			.4006	.4044
			.3950	.3875
		5D0	.3783	.3646
			.3825	.3798
			.3950	.3875
			.3898	.3716

ANSI White Bins				
Code	CCT	Bin Code	x	y
0E6	3500 K	6A0	.3889	.3690
			.3941	.3848
			.4080	.3916
			.4017	.3751
		6B0	.3941	.3848
			.3996	.4015
			.4146	.4089
			.4080	.3916
		6C0	.4080	.3916
			.4146	.4089
			.4299	.4165
			.4221	.3984
		6D0	.4017	.3751
			.4080	.3916
			.4221	.3984
			.4147	.3814

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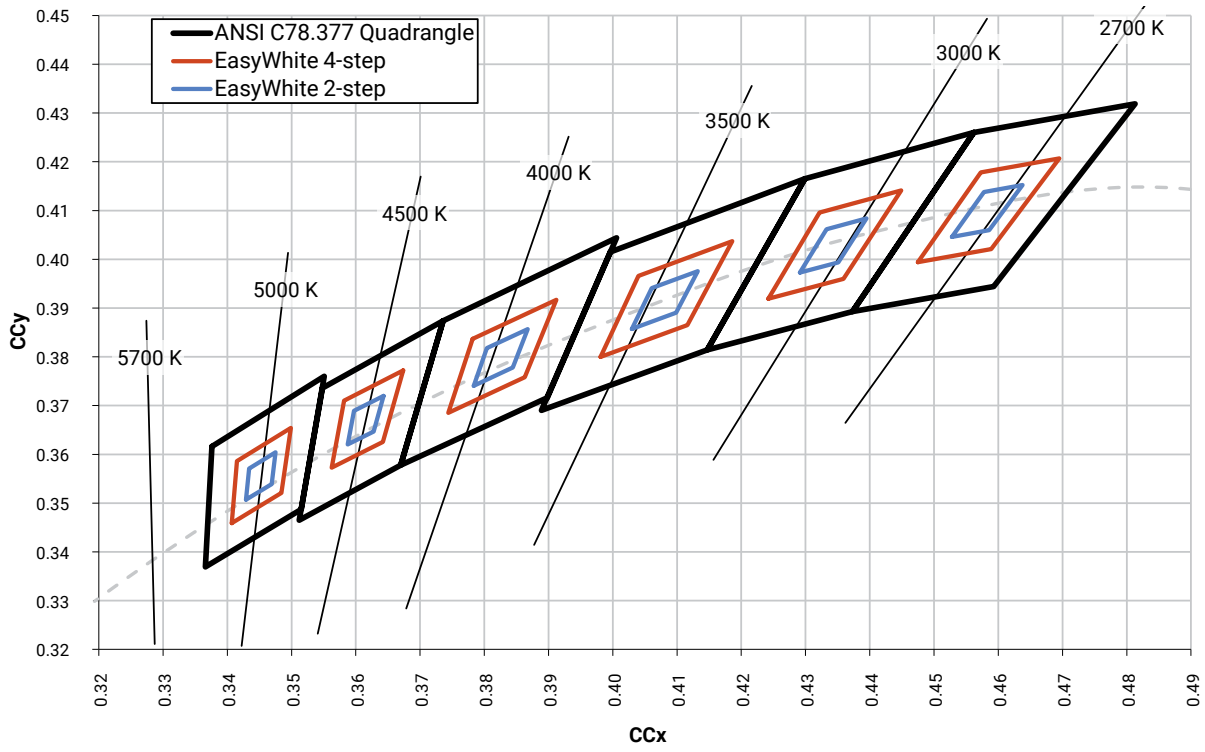
PERFORMANCE GROUPS - CHROMATICITY (T_J = 85 °C) - CONTINUED

ANSI White Bins				
Code	CCT	Bin Code	x	y
0E7	3000 K	7A0	.4147	.3814
			.4221	.3984
			.4342	.4028
			.4259	.3853
		7B0	.4221	.3984
			.4299	.4165
			.4430	.4212
			.4342	.4028
		7C0	.4342	.4028
			.4430	.4212
			.4562	.4260
			.4465	.4071
		7D0	.4259	.3853
			.4342	.4028
			.4465	.4071
			.4373	.3893

ANSI White Bins				
Code	CCT	Bin Code	x	y
0E8	2700 K	8A0	.4373	.3893
			.4465	.4071
			.4582	.4099
			.4483	.3919
		8B0	.4465	.4071
			.4562	.4260
			.4687	.4289
			.4582	.4099
		8C0	.4582	.4099
			.4687	.4289
			.4813	.4319
			.4700	.4126
		8D0	.4483	.3919
			.4582	.4099
			.4700	.4126
			.4593	.3944

CREE EASYWHITE® BINS PLOTTED ON THE 1931 CIE COLOR SPACE (T_J = 85 °C)



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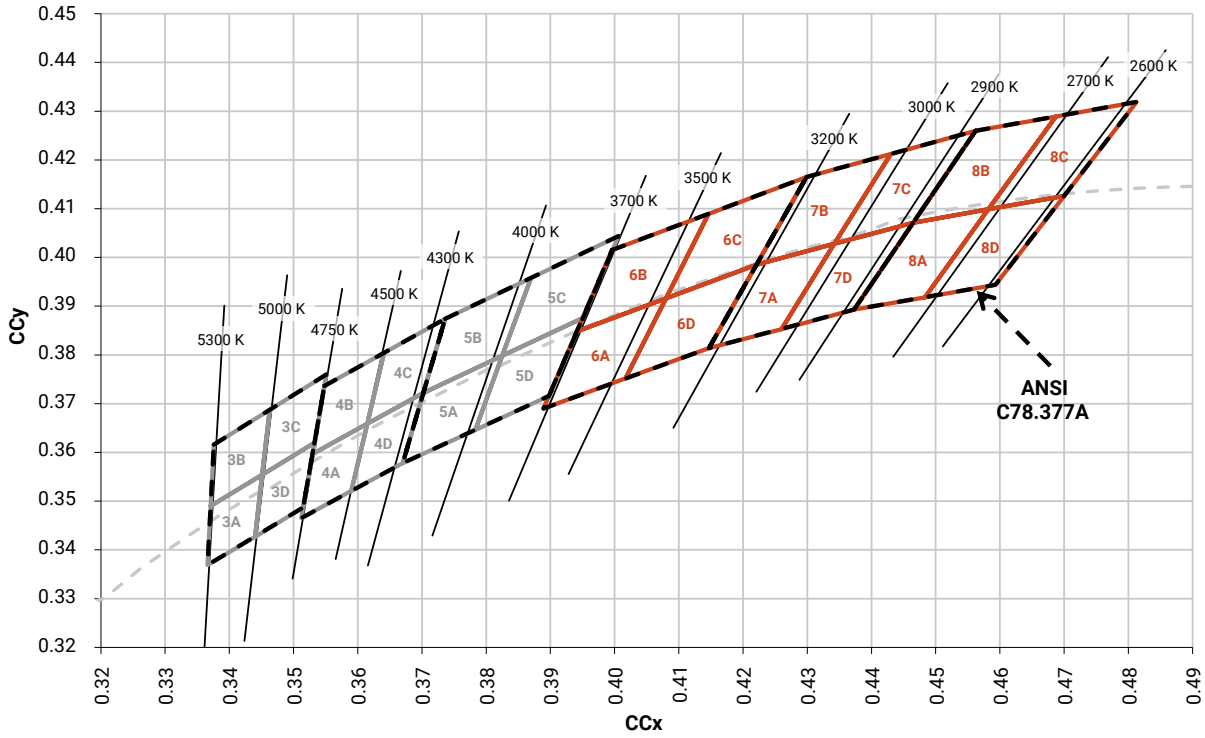
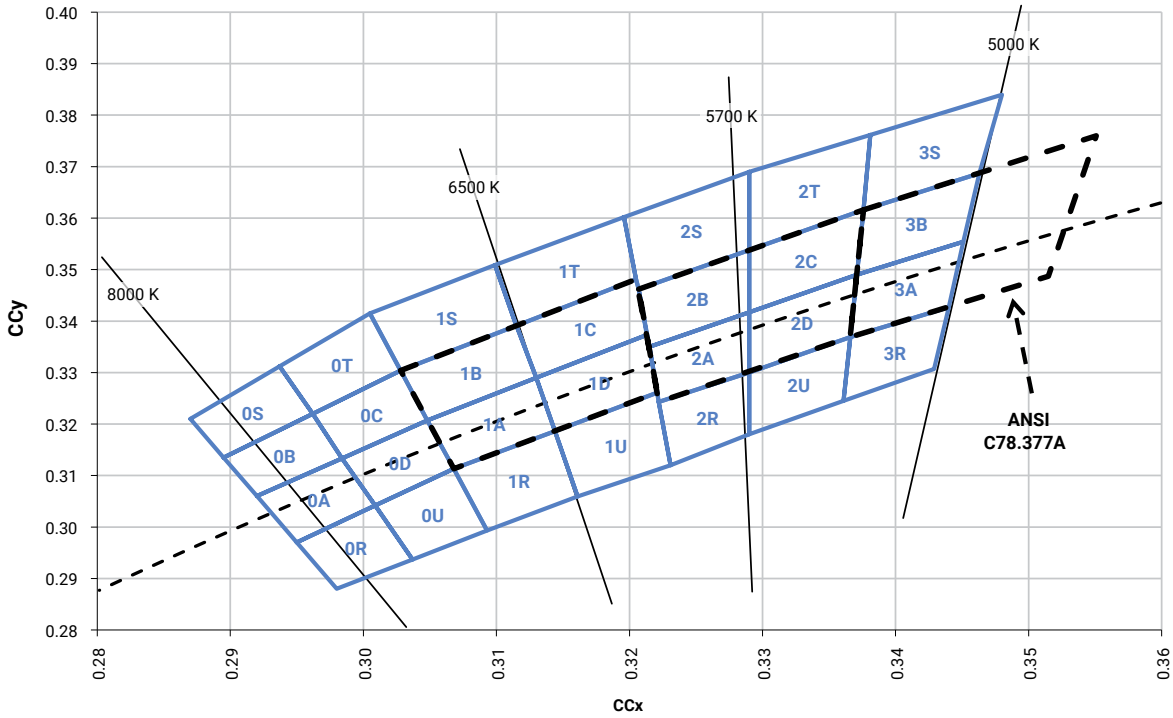
CREE ANSI WHITE BINS PLOTTED ON THE 1931 CIE COLOR SPACE (T_J = 85 °C)





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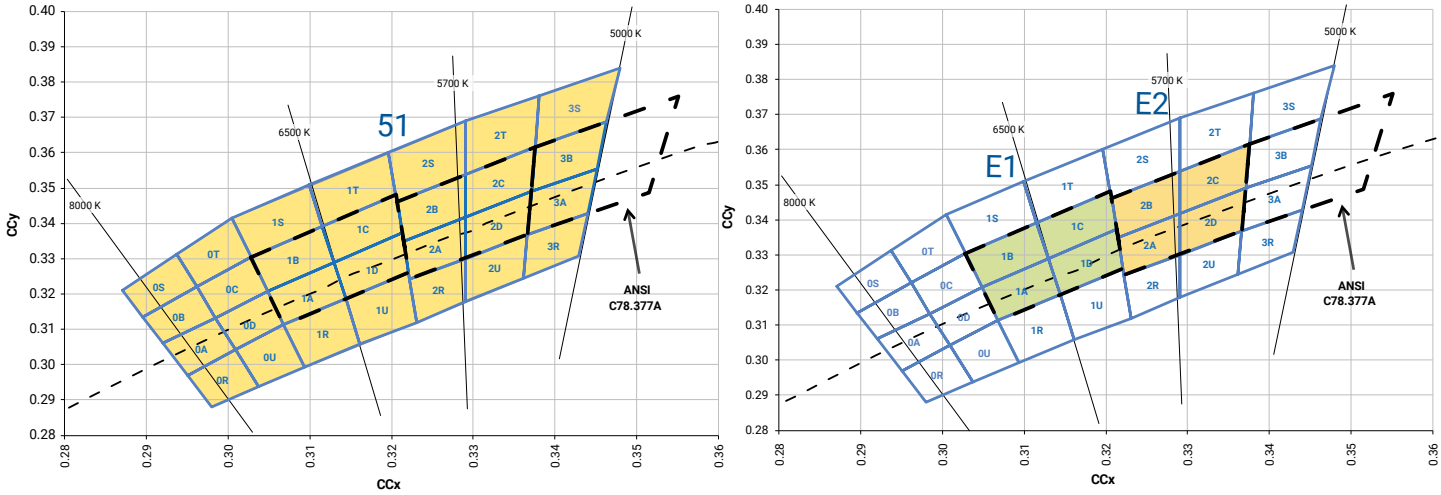
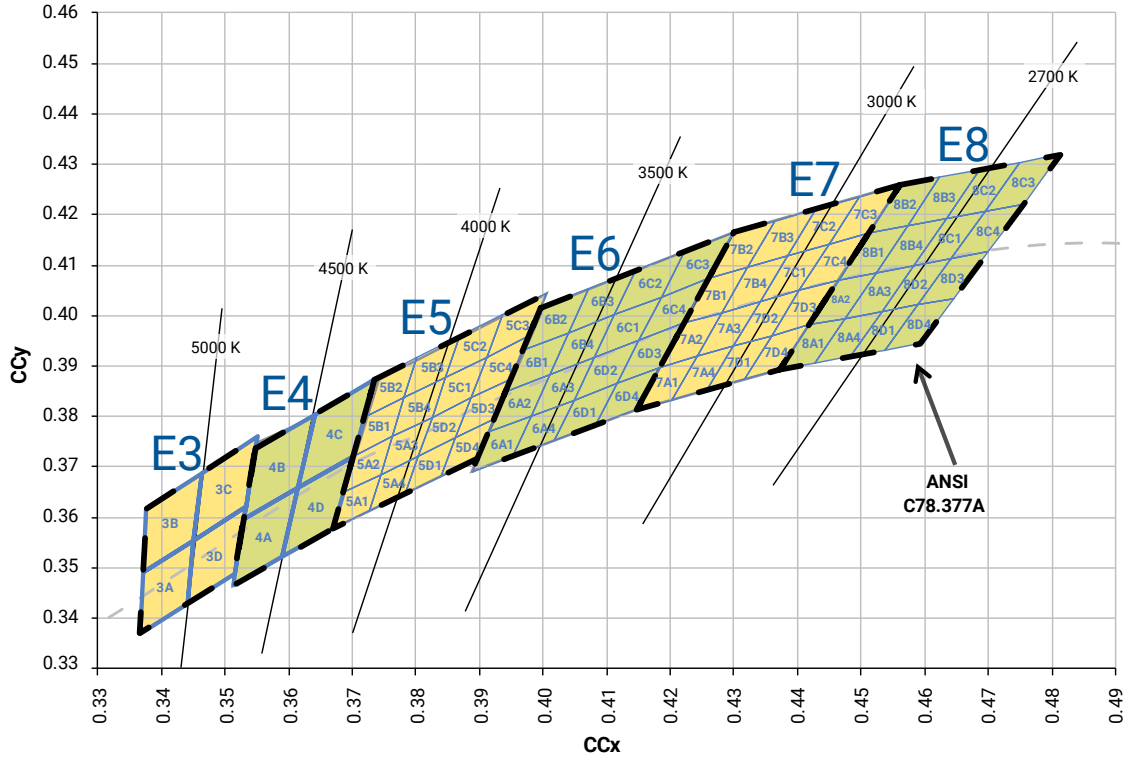
CREE'S STANDARD COOL WHITE KITS PLOTTED ON ANSI STANDARD CHROMATICITY REGIONS



CREE'S STANDARD WARM AND NEUTRAL WHITE KITS PLOTTED ON ANSI STANDARD CHROMATICITY REGIONS



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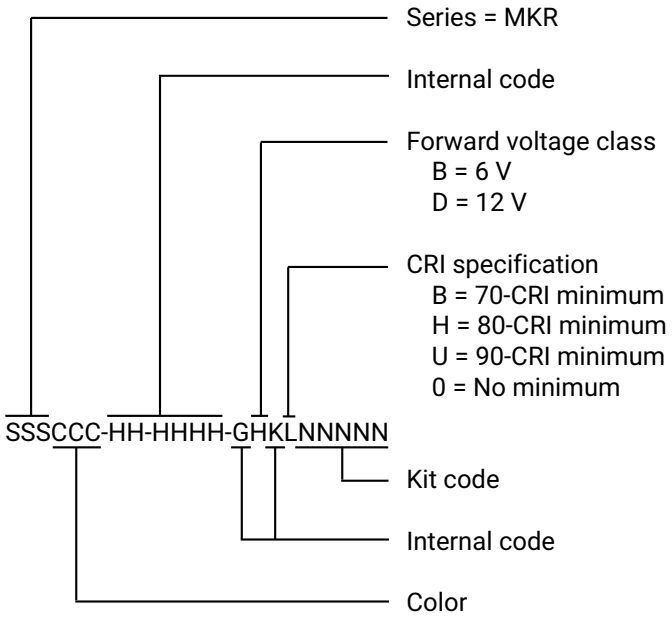
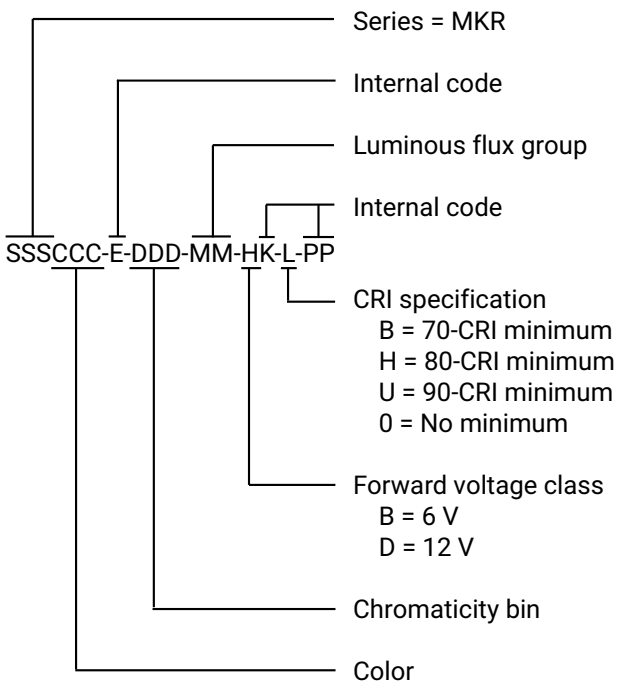
BIN AND ORDER CODE FORMATS

Bin codes and order codes are configured as follows.

Order Code



Bin Code



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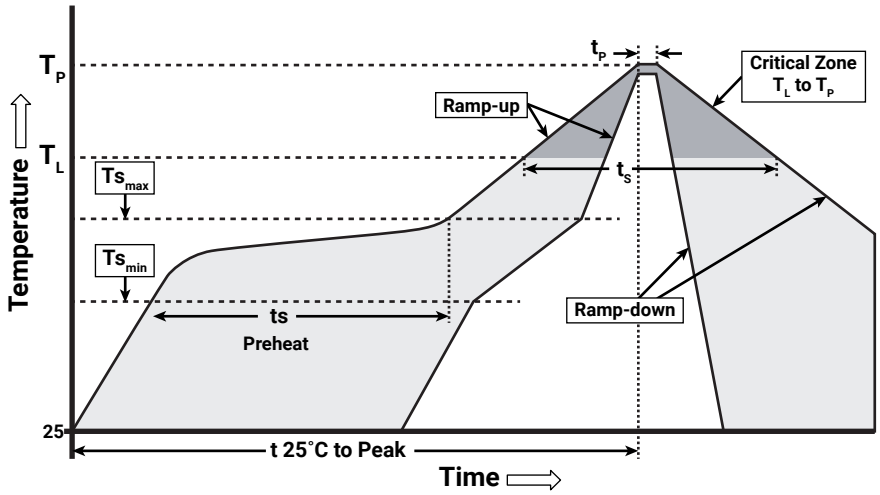
REFLOW SOLDERING CHARACTERISTICS

In testing, Cree has found XLamp MK-R 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 the 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-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 (TL)	217 °C
Time Maintained Above: Time (tL)	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.

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NOTES

Measurements

The luminous flux, radiant power, chromaticity 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'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 as specifications.

Pre-Release Qualification Testing

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

Lumen Maintenance

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 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

Cree 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 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 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 representative or from the Product Documentation sections of www.cree.com.

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 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.

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NOTES - CONTINUED

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

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.

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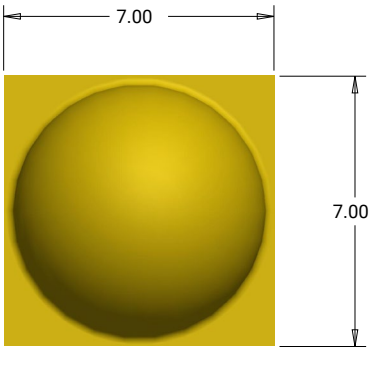
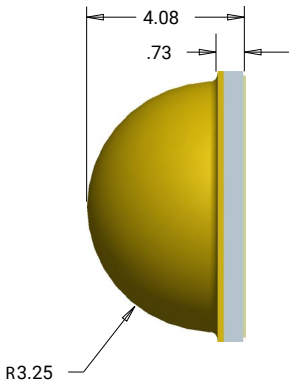
MECHANICAL DIMENSIONS

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

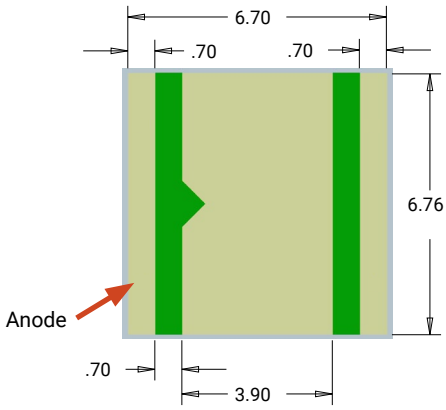
All measurements are ±.13 mm unless otherwise indicated.



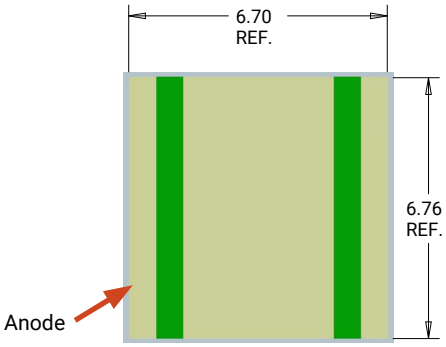
Top View



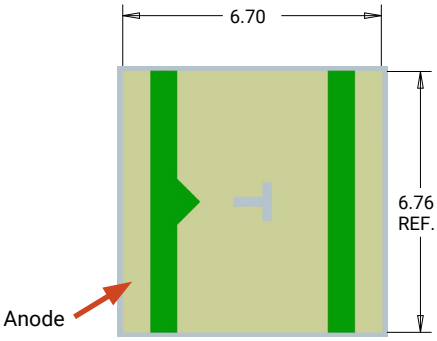
Side View



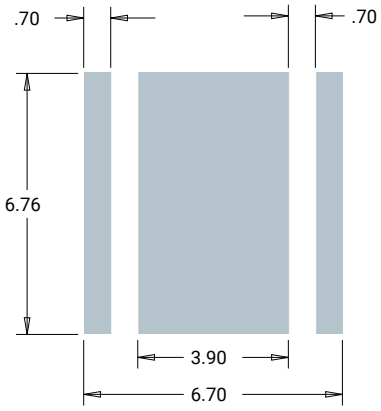
Bottom View



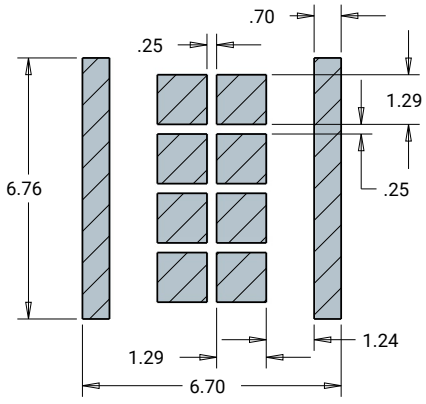
Alternate Bottom View



Alternate Bottom View



Recommended PCB Solder Pad



Recommended Stencil Pattern (Shaded Area Is Open)

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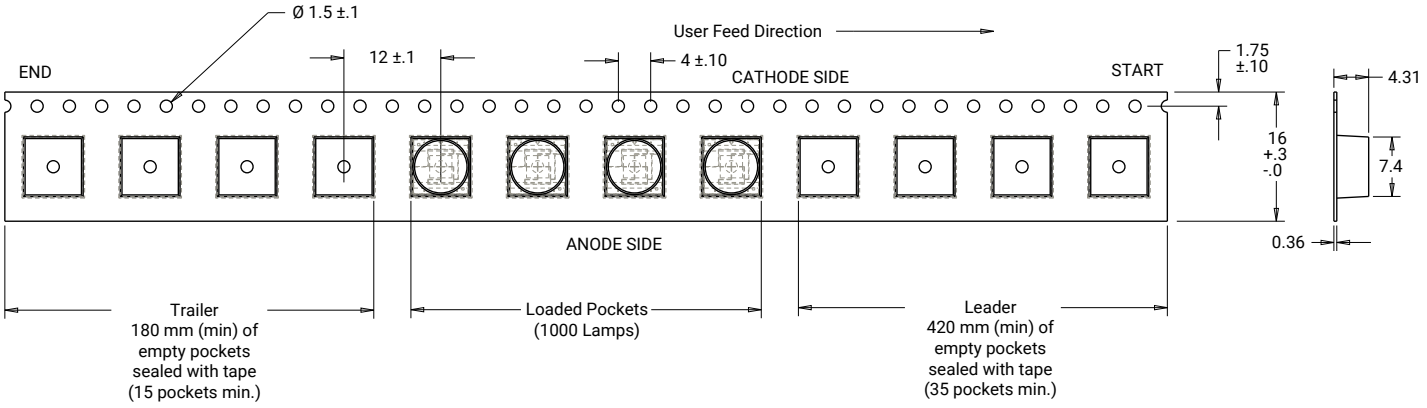
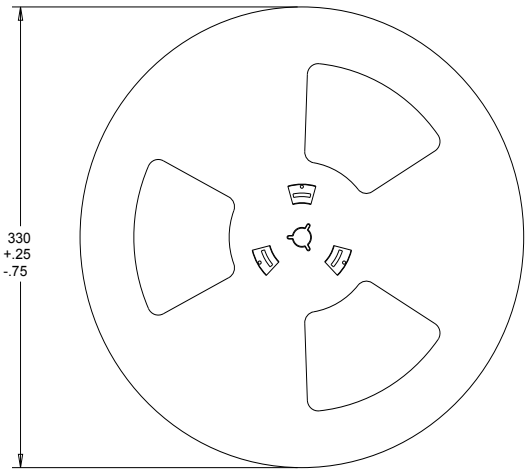
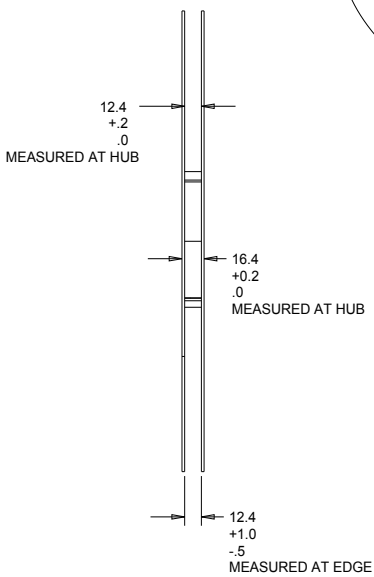
TAPE AND REEL

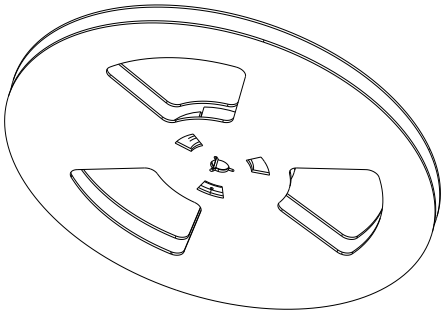
All Cree carrier tapes conform to EIA-481D, Automated Component Handling Systems Standard.

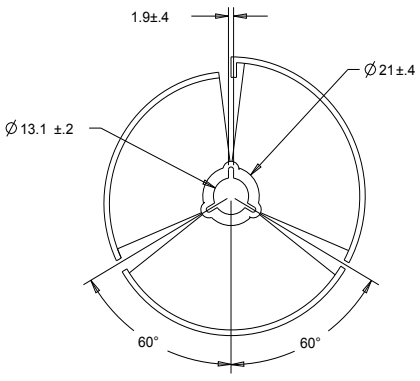
All dimensions in mm.











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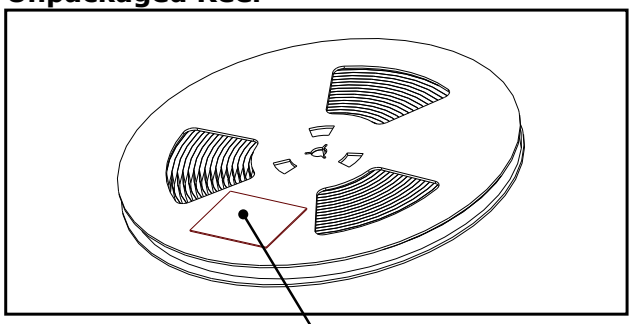
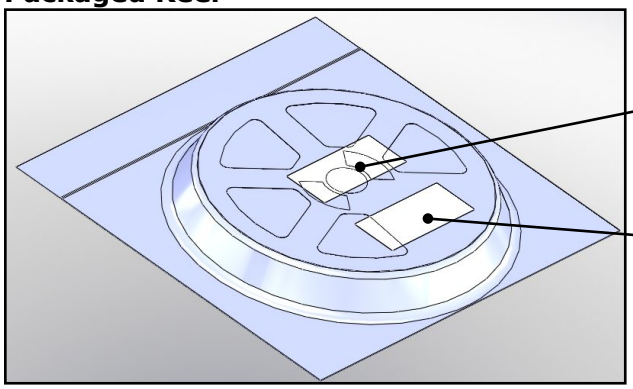
PACKAGING

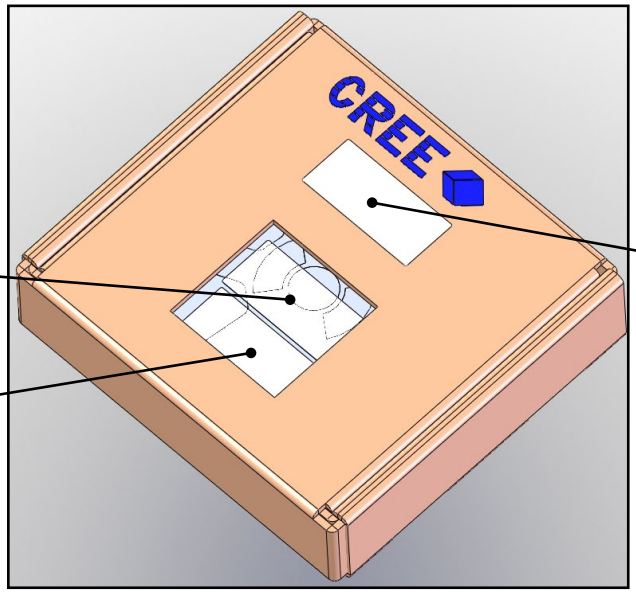
Unpackaged Reel



Packaged Reel



Boxed Reel



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