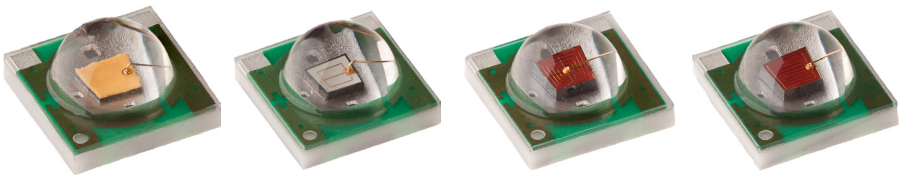
Cree® XLamp® XP-C LEDs



PRODUCT DESCRIPTION

The XLamp® XP-C LED combines the proven lighting-class performance and reliability of the XLamp XR-E LED in a package with 80% smaller footprint. The XLamp XP-C LED continues Cree's history of innovation in LEDs for lighting applications with wide viewing angle, symmetrical package, unlimited floor life and electrically neutral thermal path.

Cree XLamp LEDs bring high performance and quality of light to a wide range of lighting applications, including colo-changing lighting, portable and personal lighting, outdoor lighting, indoor directional lighting, commercial lighting and emergency-vehicle lighting.

FEATURES

- Available in white (2600 K to 10,000 K CCT), royal blue, blue, green, amber, red-orange, red
- Maximum drive current: up to 500 mA
- Low thermal resistance: as low as 10 °C/W
- Wide viewing angle: 110° - 125°
- Unlimited floor life at ≤ 30 °C/85% RH
- Reflow solderable - JEDEC J-STD-020C compatible
- 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 - white, royal blue, blue	°C/W		12	
Thermal resistance, junction to solder point - green	°C/W		20	
Thermal resistance, junction to solder point - amber	°C/W		15	
Thermal resistance, junction to solder point - red, red-orange	°C/W		10	
Viewing angle (FWHM) - white	degrees		115	
Viewing angle (FWHM) - royal blue, blue, green, red, red-orange, amber	degrees		125	
Temperature coefficient of voltage - white, blue, royal blue, green	mV/°C		-4.0	
Temperature coefficient of voltage - amber, red-orange, red	mV/°C		-2.0	
ESD withstand voltage (HBM per Mil-Std-883D) - white, royal blue, blue, green	V			8000
ESD Classification (HBM per Mil-Std-883D) - amber, red-orange, red			Class 2	
DC forward current - white, royal blue, blue, green	mA			500
DC forward current - amber, red-orange, red	mA			350
Reverse voltage	V			5
Forward voltage (@ 350 mA) - white	V		3.2	3.9
Forward voltage (@ 350 mA) - royal blue, blue	V		3.3	3.9
Forward voltage (@ 350 mA) - green	V		3.4	3.9
Forward voltage (@ 350 mA) - amber, red-orange, red	V		2.2	2.5
Forward voltage (@ 125 mA) - royal blue, blue	V		3.1	
Forward voltage (@ 125 mA) - green	V		3.3	
Forward voltage (@ 125 mA) - red-orange, red	V		2.0	
Forward voltage (@ 125 mA) - amber	V		2.1	
Forward voltage (@ 500 mA) - royal blue, blue, white	V		3.5	
Forward voltage (@ 500 mA) - green	V		3.6	
LED junction temperature	°C			150

FLUX CHARACTERISTICS - WHITE (T_J = 25 °C)

The following tables provide order codes for XLamp XP-C white LEDs. For a complete description of the order code nomenclature, please see the Bin and Order Code Formats section (page 27).

Minimum Luminous Flux (lm) @ 350 mA		Chromaticity Regions	Order Codes
Group	Flux (lm)		
Q2	87.4	WA, WB, WC, WD, WE, WF, WG, WH, WJ, WK, WM, WN, WP	XPCWHT-L1-0000-00A01
		WC, WD, WF, WG	XPCWHT-L1-0000-00A02
		WC, WD, WF, WG, WH, WJ, WN, WP	XPCWHT-L1-0000-00A03
Q3	93.9	WA, WB, WC, WD, WE, WF, WG, WH, WJ, WK, WM, WN, WP	XPCWHT-L1-0000-00B01
		WC, WD, WF, WG	XPCWHT-L1-0000-00B02
		WC, WD, WF, WG, WH, WJ, WN, WP	XPCWHT-L1-0000-00B03
Q4	100	WA, WB, WC, WD, WE, WF, WG, WH, WJ, WK, WM, WN, WP	XPCWHT-L1-0000-00C01
		WC, WD, WF, WG	XPCWHT-L1-0000-00C02
		WC, WD, WF, WG, WH, WJ, WN, WP	XPCWHT-L1-0000-00C03
Q5	107	WA, WB, WC, WD, WE, WF, WG, WH, WJ, WK, WM, WN, WP	XPCWHT-L1-0000-00D01
		WC, WD, WF, WG	XPCWHT-L1-0000-00D02
		WC, WD, WF, WG, WH, WJ, WN, WP	XPCWHT-L1-0000-00D03

Notes:

- Cree 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 29).
- Cree XLamp XP-C 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 bin restrictions specified by the order code.

FLUX CHARACTERISTICS - WHITE (T_J = 25 °C) - CONTINUED

The following tables provide order codes for XLamp XP-C white LEDs. For a complete description of the order code nomenclature, please see the Bin and Order Code Formats section (page 27). For definitions of the chromaticity kits, please see the Cree's Standard Chromaticity Kits section (page 27).

Chromaticity		Minimum Luminous Flux (lm) @ 350 mA		Order Codes
Kit	CCT	Code	Flux (lm)	70 CRI Typical
51	6200 K	Q5	107	XPCWHT-L1-0000-00D51
		Q4	100	XPCWHT-L1-0000-00C51
		Q3	93.9	XPCWHT-L1-0000-00B51
		Q2	87.4	XPCWHT-L1-0000-00A51
53	6000 K	Q5	107	XPCWHT-L1-0000-00D53
		Q4	100	XPCWHT-L1-0000-00C53
		Q3	93.9	XPCWHT-L1-0000-00B53
		Q2	87.4	XPCWHT-L1-0000-00A53
50	6200 K	Q5	107	XPCWHT-L1-0000-00D50
		Q4	100	XPCWHT-L1-0000-00C50
		Q3	93.9	XPCWHT-L1-0000-00B50
		Q2	87.4	XPCWHT-L1-0000-00A50
E1	6500 K	Q5	107	XPCWHT-L1-0000-00DE1
		Q4	100	XPCWHT-L1-0000-00CE1
		Q3	93.9	XPCWHT-L1-0000-00BE1
		Q2	87.4	XPCWHT-L1-0000-00AE1
E2	5700 K	Q5	107	XPCWHT-L1-0000-00DE2
		Q4	100	XPCWHT-L1-0000-00CE2
		Q3	93.9	XPCWHT-L1-0000-00BE2
		Q2	87.4	XPCWHT-L1-0000-00AE2

Notes:

- Cree 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 29).
- Cree XLamp XP-C 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 bin restrictions specified by the order code.

FLUX CHARACTERISTICS - WHITE (T_J = 25 °C) - CONTINUED

Chromaticity		Minimum Luminous Flux (lm) @ 350 mA		Order Codes
Kit	CCT	Code	Flux (lm)	75 CRI Typical
E3	5000 K	Q2	87.4	XPCWHT-L1-0000-00AE3
		P4	80.6	XPCWHT-L1-0000-009E3
		P3	73.9	XPCWHT-L1-0000-008E3
F4	4750 K	Q2	87.4	XPCWHT-L1-0000-00AF4
		P4	80.6	XPCWHT-L1-0000-009F4
		P3	73.9	XPCWHT-L1-0000-008F4
E4	4500 K	Q2	87.4	XPCWHT-L1-0000-00AE4
		P4	80.6	XPCWHT-L1-0000-009E4
F5	4250 K	Q2	87.4	XPCWHT-L1-0000-00AF5
		P4	80.6	XPCWHT-L1-0000-009F5
		P3	73.9	XPCWHT-L1-0000-008F5
		P2	67.2	XPCWHT-L1-0000-007F5
E5	4000 K	Q2	87.4	XPCWHT-L1-0000-00AE5
		P4	80.6	XPCWHT-L1-0000-009E5
		P3	73.9	XPCWHT-L1-0000-008E5
		P2	67.2	XPCWHT-L1-0000-007E5

Notes:

- Cree 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 29).
- Cree XLamp XP-C 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 bin restrictions specified by the order code.

FLUX CHARACTERISTICS - WHITE (T_J = 25 °C) - CONTINUED

Chromaticity		Minimum Luminous Flux (lm) @ 350 mA		Order Codes
Kit	CCT	Code	Flux (lm)	80 CRI Typical
F6	3750 K	P4	80.6	XPCWHT-L1-0000-009F6
		P3	73.9	XPCWHT-L1-0000-008F6
		P2	67.2	XPCWHT-L1-0000-007F6
E6	3500 K	P4	80.6	XPCWHT-L1-0000-009E6
		P3	73.9	XPCWHT-L1-0000-008E6
		P2	67.2	XPCWHT-L1-0000-007E6
F7	3250 K	P3	73.9	XPCWHT-L1-0000-008F7
		P2	67.2	XPCWHT-L1-0000-007F7
		N4	62	XPCWHT-L1-0000-006F7
E7	3000 K	P3	73.9	XPCWHT-L1-0000-008E7
		P2	67.2	XPCWHT-L1-0000-007E7
		N4	62	XPCWHT-L1-0000-006E7
F8	2850 K	P2	67.2	XPCWHT-L1-0000-007F8
		N4	62	XPCWHT-L1-0000-006F8
		N3	56.8	XPCWHT-L1-0000-005F8
E8	2700 K	P2	67.2	XPCWHT-L1-0000-007E8
		N4	62	XPCWHT-L1-0000-006E8
		N3	56.8	XPCWHT-L1-0000-005E8

Notes:

- Cree 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 29).
- Cree XLamp XP-C 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 bin restrictions specified by the order code.

FLUX CHARACTERISTICS - COLOR (T_J = 25 °C)

The following tables provide order codes for XLamp XP-C color LEDs. For a complete description of the order code nomenclature, please see the Bin and Order Code Formats section (page 27).

Color	Minimum Radiant Flux @ 350 mA		Calculated Minimum Radiant Flux @ 125 mA*	Dominant Wavelength (nm)				Order Codes
				Minimum		Maximum		
	Group	Flux (mW)	Flux (mW)	Group	DWL (nm)	Group	DWL (nm)	
Royal Blue	12	250	104	D3	450	D5	465	XPCROY-L1-0000-00701
				D3	450	D4	460	XPCROY-L1-0000-00702
				D4	455	D5	465	XPCROY-L1-0000-00703
	13	300	124	D3	450	D5	465	XPCROY-L1-0000-00801
				D3	450	D4	460	XPCROY-L1-0000-00802
				D4	455	D5	465	XPCROY-L1-0000-00803
	14	350	145	D3	450	D5	465	XPCROY-L1-0000-00901
				D3	450	D4	460	XPCROY-L1-0000-00902

Color	Minimum Luminous Flux (@ 350 mA		Calculated Minimum Luminous Flux @ 125 mA*	Dominant Wavelength (nm)				Order Codes
				Minimum		Maximum		
	Group	Flux (lm)	Flux (lm)	Group	DWL (nm)	Group	DWL (nm)	
Blue	J	23.5	10.8	B3	465	B6	485	XPCBLU-L1-0000-00W01
				B3	465	B5	480	XPCBLU-L1-0000-00W02
				B4	470	B5	480	XPCBLU-L1-0000-00W05
	K2	30.6	13.8	B3	465	B6	485	XPCBLU-L1-0000-00Y01
				B3	465	B5	480	XPCBLU-L1-0000-00Y02
				B4	470	B5	480	XPCBLU-L1-0000-00Y05
	K3	35.2	15.9	B3	465	B6	485	XPCBLU-L1-0000-00Z01
				B3	465	B5	480	XPCBLU-L1-0000-00Z02
				B4	470	B5	480	XPCBLU-L1-0000-00Z05

Notes:

- Cree 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 29).
- Cree XLamp XP-C 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 bin restrictions specified by the order code.

* Flux values at 125 mA are calculated and for reference only.

FLUX CHARACTERISTICS - COLOR (T_J = 25 °C) - CONTINUED

Color	Minimum Luminous Flux (@ 350 mA		Calculated Minimum Luminous Flux @ 125 mA*	Dominant Wavelength (nm)				Order Codes
				Minimum		Maximum		
	Group	Flux (lm)	Flux (lm)	Group	DWL (nm)	Group	DWL (nm)	
Green	N3	56.8	28.2	G2	520	G4	535	XPCGRN-L1-0000-00501
				G2	520	G3	530	XPCGRN-L1-0000-00502
				G3	525	G4	535	XPCGRN-L1-0000-00503
	N4	62.0	30.8	G2	520	G4	535	XPCGRN-L1-0000-00601
				G2	520	G3	530	XPCGRN-L1-0000-00602
				G3	525	G4	535	XPCGRN-L1-0000-00603
	P2	67.2	33.3	G2	520	G4	535	XPCGRN-L1-0000-00701
				G2	520	G3	530	XPCGRN-L1-0000-00702
				G3	525	G4	535	XPCGRN-L1-0000-00703
	P3	73.9	36.7	G2	520	G4	535	XPCGRN-L1-0000-00801
				G2	520	G3	530	XPCGRN-L1-0000-00802
				G3	525	G4	535	XPCGRN-L1-0000-00803
	P4	80.6	40.0	G2	520	G4	535	XPCGRN-L1-0000-00901
				G2	520	G3	530	XPCGRN-L1-0000-00902
				G3	525	G4	535	XPCGRN-L1-0000-00903

Color	Minimum Luminous Flux (@ 350 mA		Calculated Minimum Luminous Flux @ 125 mA*	Dominant Wavelength (nm)				Order Codes
				Minimum		Maximum		
	Group	Flux (lm)	Flux (lm)	Group	DWL (nm)	Group	DWL (nm)	
Amber	M2	39.8	14.9	A2	585	A3	595	XPCAMB-L1-0000-00201
				A3	590	A3	595	XPCAMB-L1-0000-00203
	M3	45.7	17.1	A2	585	A3	595	XPCAMB-L1-0000-00301
				A3	590	A3	595	XPCAMB-L1-0000-00303
	N2	51.7	19.4	A2	585	A3	595	XPCAMB-L1-0000-00401
				A3	590	A3	595	XPCAMB-L1-0000-00403
	N3	56.8	21.3	A2	585	A3	595	XPCAMB-L1-0000-00501
				A3	590	A3	595	XPCAMB-L1-0000-00503
	N4	62.0	23.3	A2	585	A3	595	XPCAMB-L1-0000-00601
				A3	590	A3	595	XPCAMB-L1-0000-00603

Notes:

- Cree 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 29).
- Cree XLamp XP-C 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 bin restrictions specified by the order code.

* Flux values at 125 mA are calculated and for reference only.

FLUX CHARACTERISTICS - COLOR (T_J = 25 °C) - CONTINUED

Color	Minimum Luminous Flux (@ 350 mA		Calculated Minimum Luminous Flux @ 125 mA*	Dominant Wavelength (nm)				Order Codes
				Minimum		Maximum		
	Group	Flux (lm)	Flux (lm)	Group	DWL (nm)	Group	DWL (nm)	
Red-Orange	N2	51.7	19.8	O3	610	O4	620	XPCRDO-L1-0000-00401
				O3	610	O3	615	XPCRDO-L1-0000-00402
				O4	615	O4	620	XPCRDO-L1-0000-00403
	N3	56.8	21.7	O3	610	O4	620	XPCRDO-L1-0000-00501
				O3	610	O3	615	XPCRDO-L1-0000-00502
				O4	615	O4	620	XPCRDO-L1-0000-00503
	N4	62.0	23.7	O3	610	O4	620	XPCRDO-L1-0000-00601
				O3	610	O3	615	XPCRDO-L1-0000-00602
				O4	615	O4	620	XPCRDO-L1-0000-00603
	P2	67.2	25.7	O3	610	O4	620	XPCRDO-L1-0000-00701
				O3	610	O3	615	XPCRDO-L1-0000-00702
				O4	615	O4	620	XPCRDO-L1-0000-00703

Color	Minimum Luminous Flux (@ 350 mA		Calculated Minimum Luminous Flux @ 125 mA*	Dominant Wavelength (nm)				Order Codes
				Minimum		Maximum		
	Group	Flux (lm)	Flux (lm)	Group	DWL (nm)	Group	DWL (nm)	
Red	M2	39.8	15.2	R2	620	R3	630	XPCRED-L1-0000-00201
				R2	620	R2	625	XPCRED-L1-0000-00202
	M3	45.7	17.5	R2	620	R3	630	XPCRED-L1-0000-00301
				R2	620	R2	625	XPCRED-L1-0000-00302
	N2	51.7	19.7	R2	620	R3	630	XPCRED-L1-0000-00401
				R2	620	R2	625	XPCRED-L1-0000-00402
	N3	56.8	21.7	R2	620	R3	630	XPCRED-L1-0000-00501
				R2	620	R2	625	XPCRED-L1-0000-00502

Notes:

- Cree 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 29).
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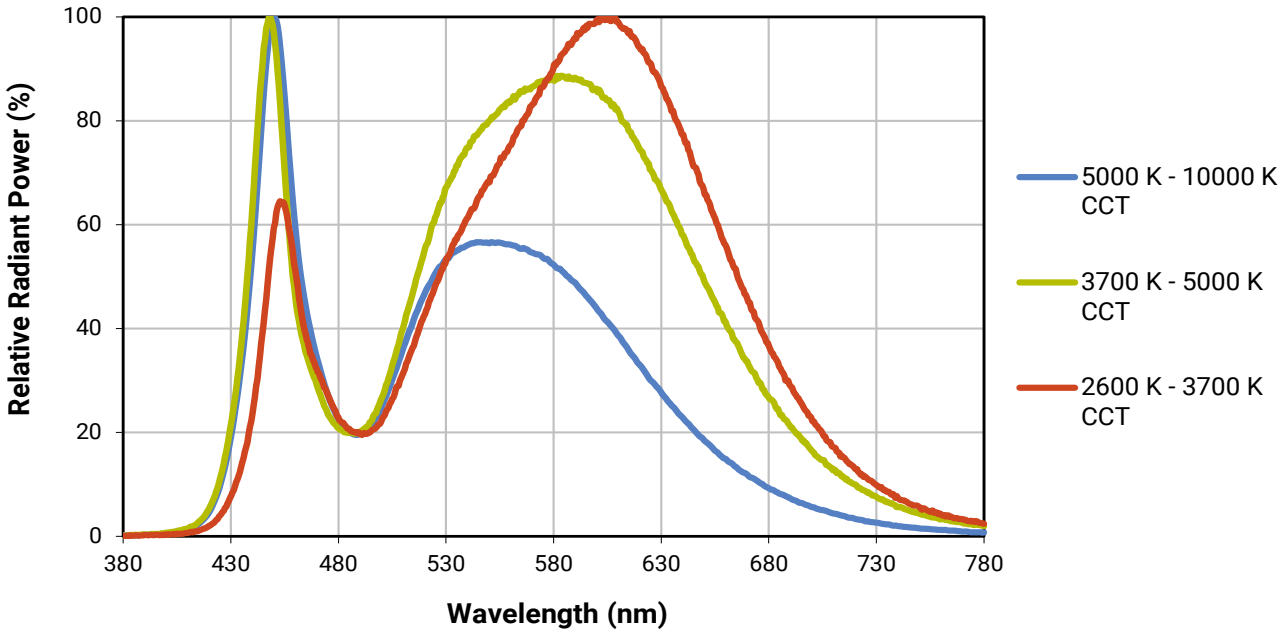
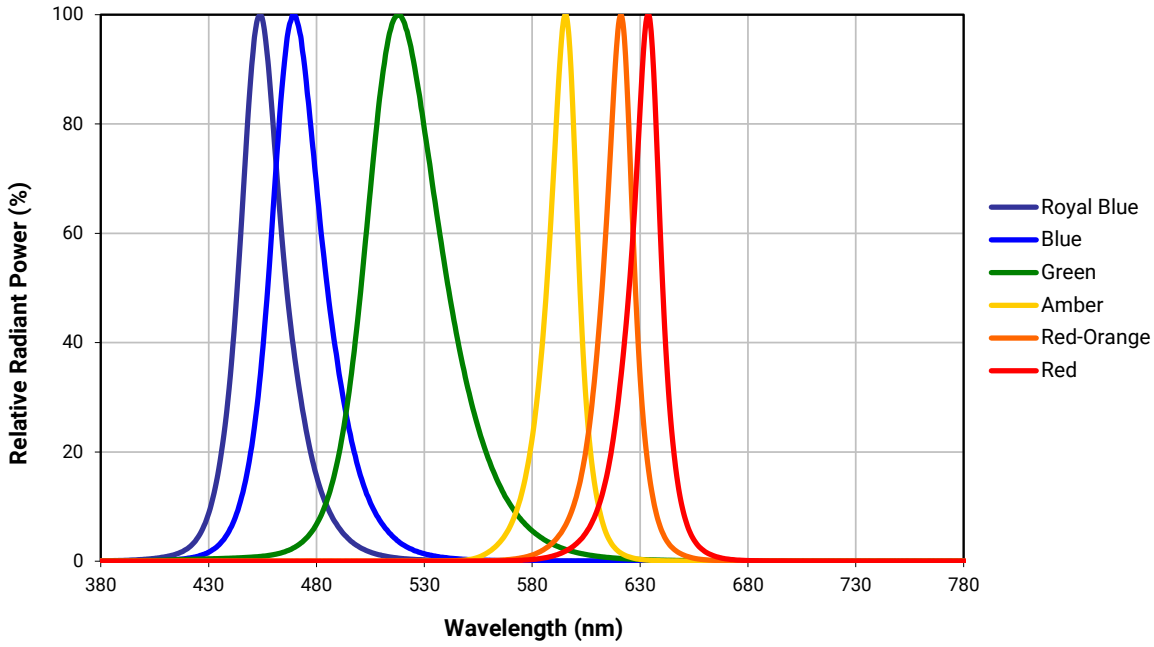
* Flux values at 125 mA are calculated and for reference only.

RELATIVE SPECTRAL POWER DISTRIBUTION

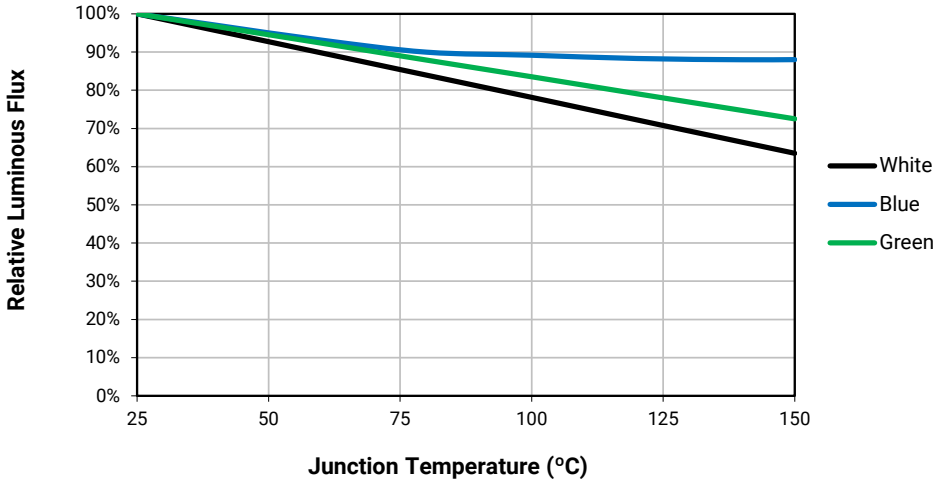
White

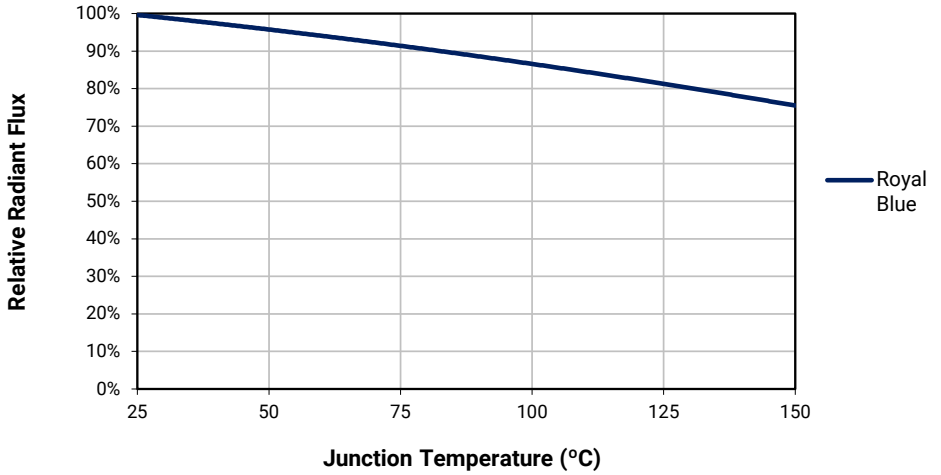


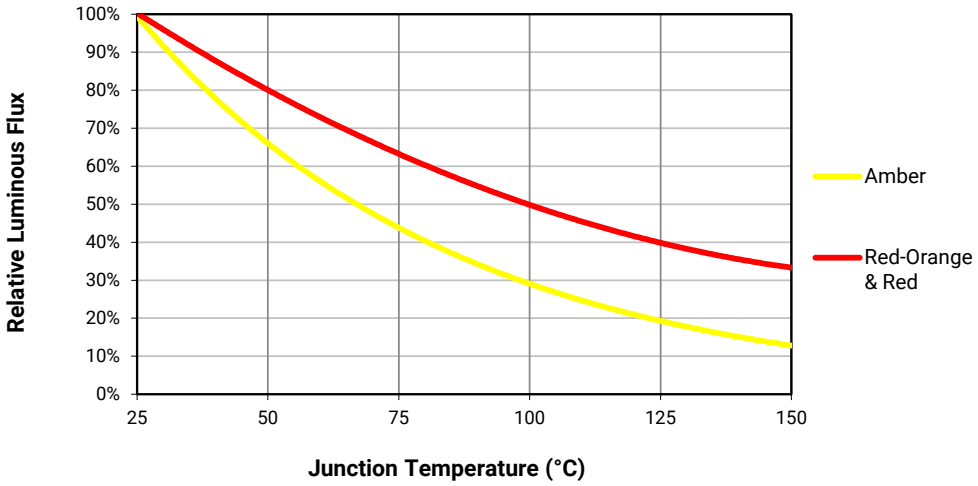
Color



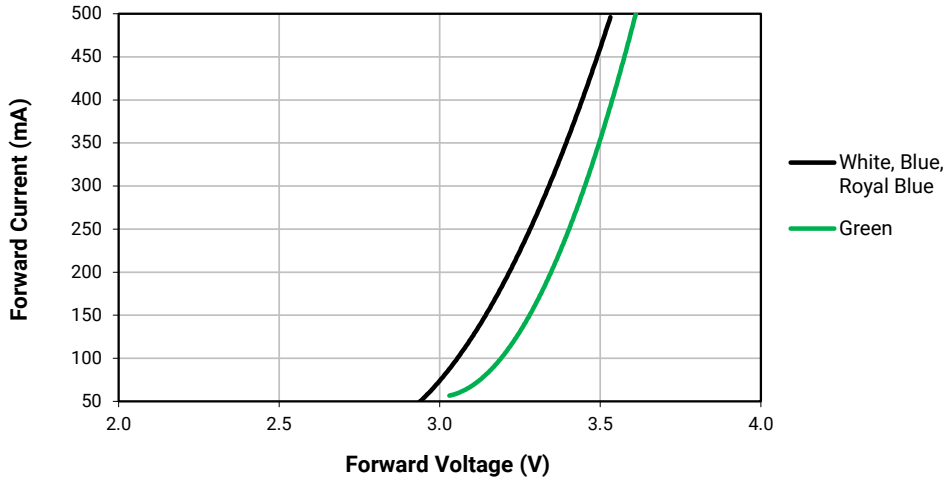
RELATIVE FLUX VS. JUNCTION TEMPERATURE (I_F = 350 mA)

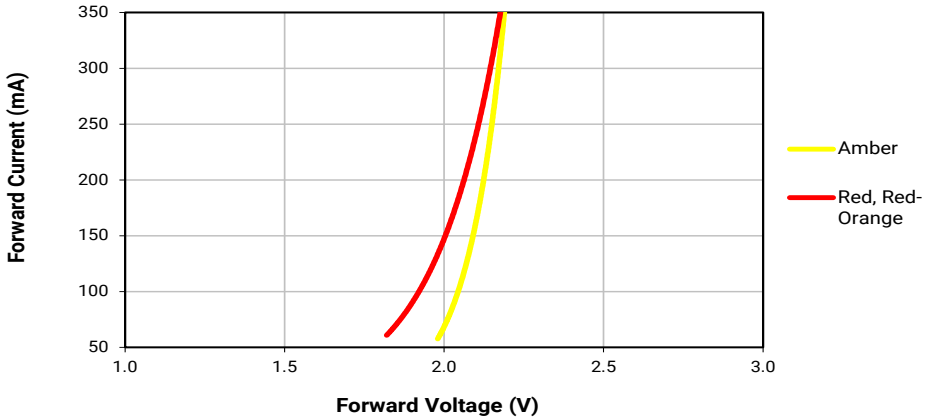




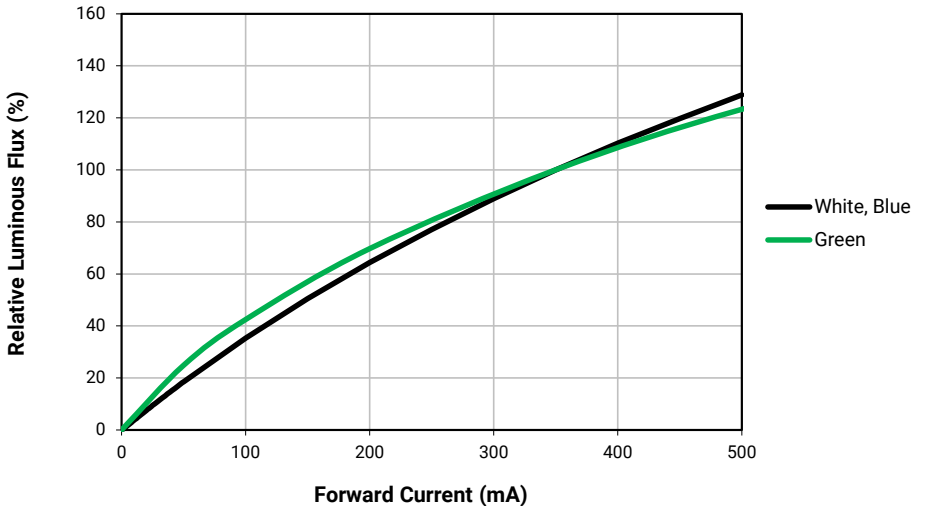


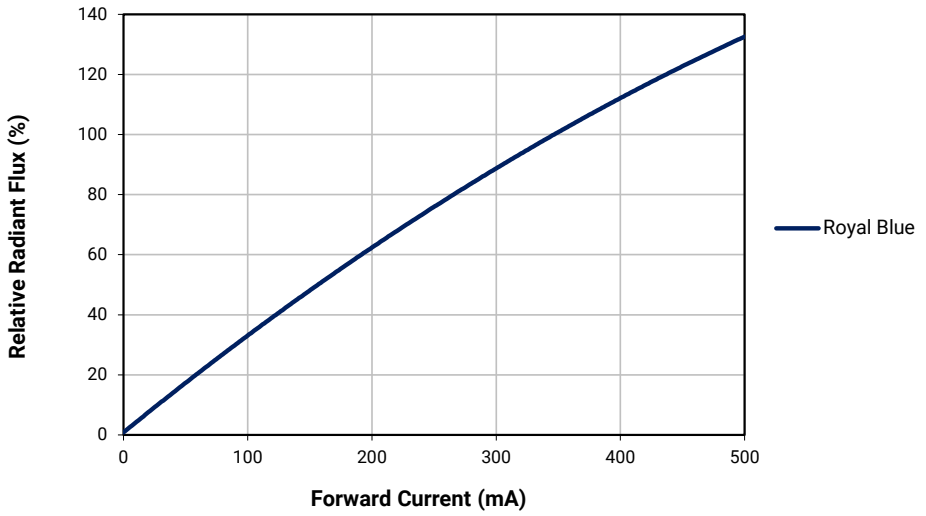
ELECTRICAL CHARACTERISTICS (T_J = 25 °C)

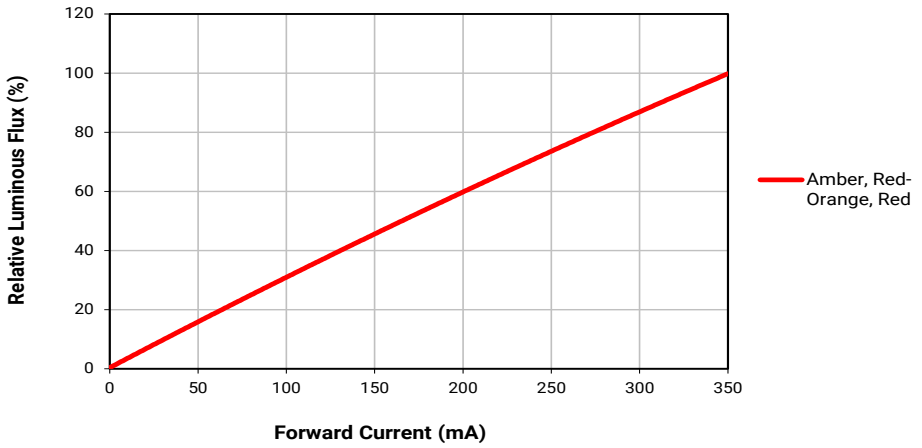




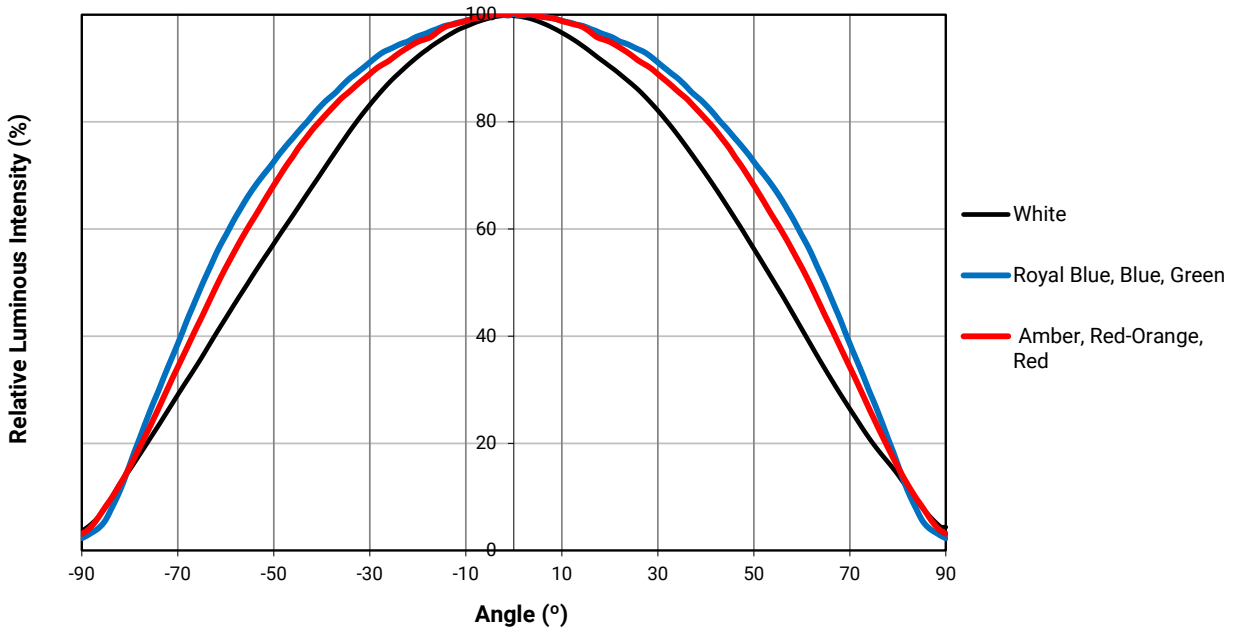
RELATIVE FLUX VS. CURRENT (T_J = 25 °C)







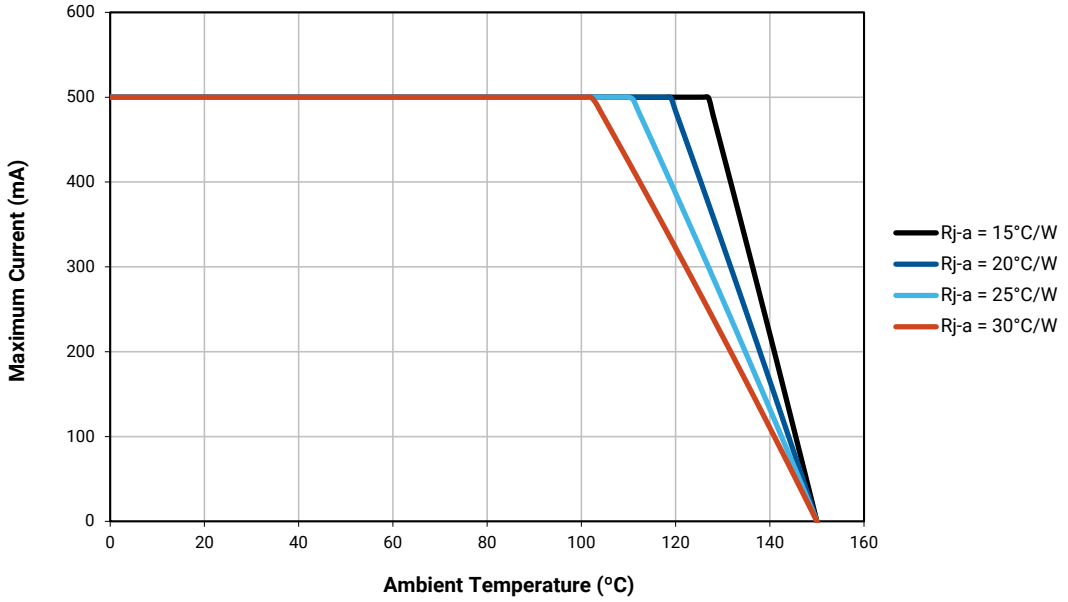
TYPICAL SPATIAL DISTRIBUTION



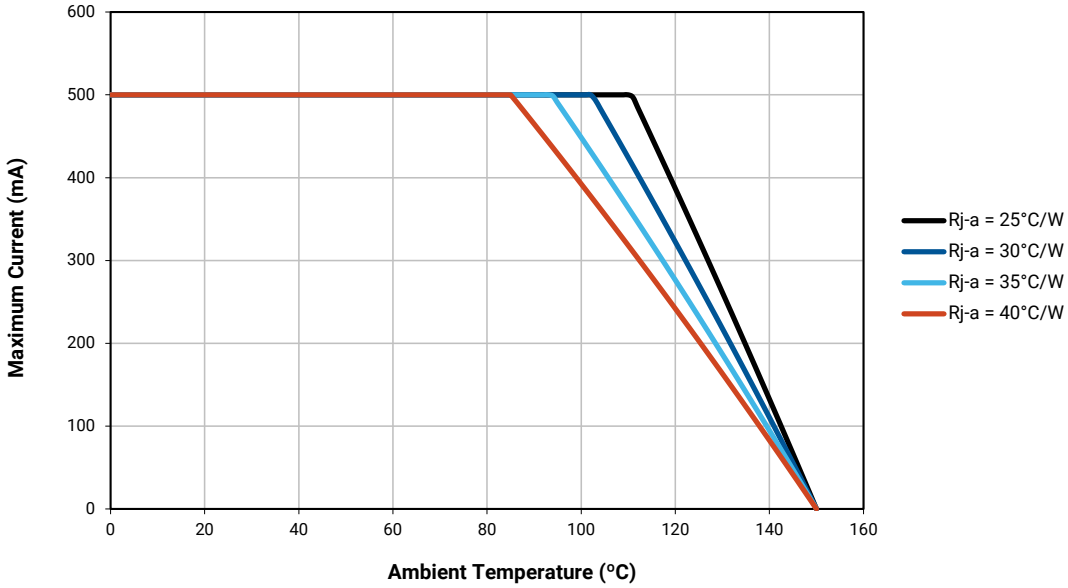
THERMAL DESIGN

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.

White, Royal Blue, Blue

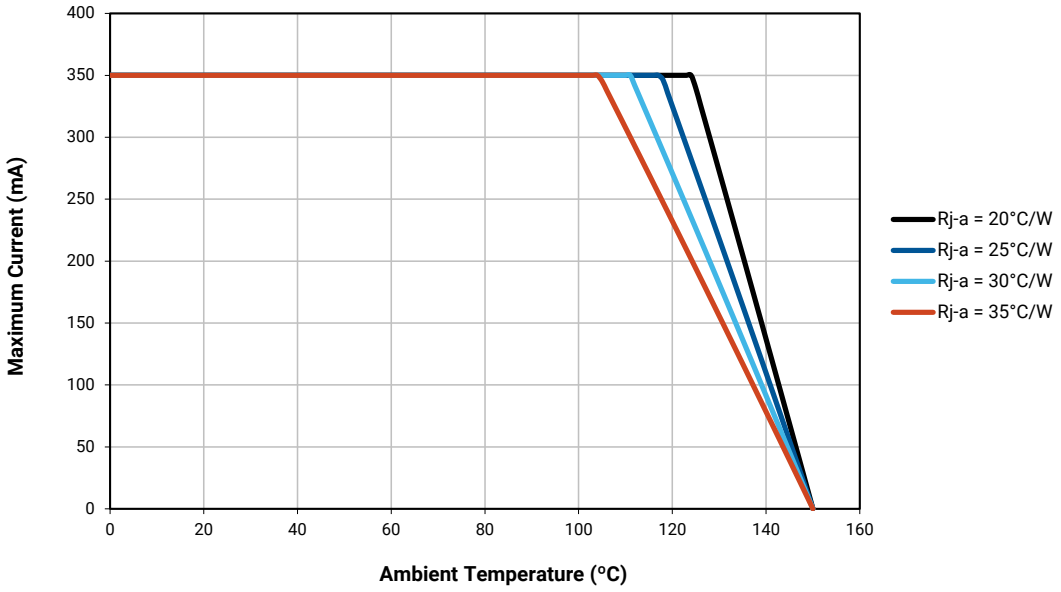


Green

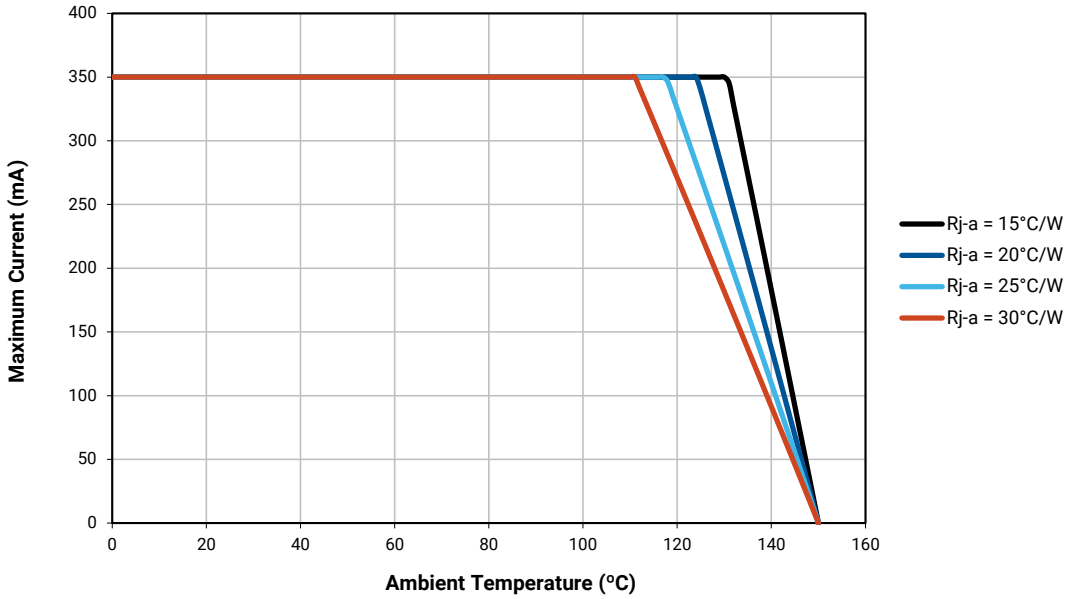


THERMAL DESIGN - CONTINUED

Amber



Red-Orange, Red



PERFORMANCE GROUPS - LUMINOUS FLUX

XLamp XP-C LEDs (except royal blue) are tested for luminous flux and placed into one of the following luminous-flux groups:

Group Code	Minimum Luminous Flux (lm) @ 350 mA	Maximum Luminous Flux (lm) @ 350 mA
J	23.5	30.6
K2	30.6	35.2
K3	35.2	39.8
M2	39.8	45.7
M3	45.7	51.7
N2	51.7	56.8
N3	56.8	62.0
N4	62.0	67.2
P2	67.2	73.9
P3	73.9	80.6
P4	80.6	87.4
Q2	87.4	93.9
Q3	93.9	100
Q4	100	107
Q5	107	114
R2	114	122

PERFORMANCE GROUPS - RADIANT FLUX (T_J = 25 °C)

XLamp XP-C royal blue LEDs are tested for radiant flux and sorted into one of the following radiant-flux bins:

Group	Minimum Radiant Flux (mW) @ 350 mA	Maximum Radiant Flux (mW) @ 350 mA
12	250	300
13	300	350
14	350	425

PERFORMANCE GROUPS - CHROMATICITY

White XLamp XP-C LEDs are tested for chromaticity and placed into one of the regions defined by the bounding coordinates on the following pages.

Region	x	y	Region	x	y
WK	.283	.284	WF	.314	.355
	.295	.297		.316	.332
	.298	.288		.306	.322
	.287	.276		.301	.342
WA	.292	.306	WP	.317	.319
	.295	.297		.329	.330
	.283	.284		.329	.318
	.279	.291		.318	.308
WM	.295	.297	WD	.329	.345
	.308	.311		.329	.330
	.310	.300		.317	.319
	.298	.288		.316	.332
WB	.306	.322	WG	.329	.369
	.308	.311		.329	.345
	.295	.297		.316	.332
	.292	.306		.314	.355
WE	.301	.342	WJ	.329	.330
	.306	.322		.329	.345
	.292	.306		.346	.359
	.287	.321		.344	.342
WN	.308	.311	WH	.348	.384
	.317	.319		.346	.359
	.318	.308		.329	.345
	.310	.300		.329	.369
WC	.316	.332			
	.317	.319			
	.308	.311			
	.306	.322			

PERFORMANCE GROUPS - CHROMATICITY (CONTINUED)

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	3C	0.3463	0.3687	3D	0.3451	0.3554
	0.3451	0.3554		0.3463	0.3687		0.3551	0.3760		0.3533	0.3620
	0.3440	0.3427		0.3451	0.3554		0.3533	0.3620		0.3515	0.3487
	0.3366	0.3369		0.3371	0.3490		0.3451	0.3554		0.3440	0.3427
3R	0.3366	0.3369	3S	0.3381	0.3762						
	0.3440	0.3428		0.3480	0.3840						
	0.3429	0.3307		0.3463	0.3687						
	0.3361	0.3245		0.3376	0.3616						
4A	0.3530	0.3597	4B	0.3548	0.3736	4C	0.3641	0.3804	4D	0.3615	0.3659
	0.3615	0.3659		0.3641	0.3804		0.3736	0.3874		0.3702	0.3722
	0.3590	0.3521		0.3615	0.3659		0.3702	0.3722		0.3670	0.3578
	0.3512	0.3465		0.3530	0.3597		0.3615	0.3659		0.3590	0.3521
5A1	0.3670	0.3578	5A2	0.3686	0.3649	5A3	0.3744	0.3685	5A4	0.3726	0.3612
	0.3686	0.3649		0.3702	0.3722		0.3763	0.3760		0.3744	0.3685
	0.3744	0.3685		0.3763	0.3760		0.3825	0.3798		0.3804	0.3721
	0.3726	0.3612		0.3744	0.3685		0.3804	0.3721		0.3783	0.3646

PERFORMANCE GROUPS - CHROMATICITY (CONTINUED)

Region	x	y	Region	x	y	Region	x	y	Region	x	y
5B1	0.3702	0.3722	5B2	0.3719	0.3797	5B3	0.3782	0.3837	5B4	0.3763	0.3760
	0.3719	0.3797		0.3736	0.3874		0.3802	0.3916		0.3782	0.3837
	0.3782	0.3837		0.3802	0.3916		0.3869	0.3958		0.3847	0.3877
	0.3763	0.3760		0.3782	0.3837		0.3847	0.3877		0.3825	0.3798
5C1	0.3825	0.3798	5C2	0.3847	0.3877	5C3	0.3912	0.3917	5C4	0.3887	0.3836
	0.3847	0.3877		0.3869	0.3958		0.3937	0.4001		0.3912	0.3917
	0.3912	0.3917		0.3937	0.4001		0.4006	0.4044		0.3978	0.3958
	0.3887	0.3836		0.3912	0.3917		0.3978	0.3958		0.3950	0.3875
5D1	0.3783	0.3646	5D2	0.3804	0.3721	5D3	0.3863	0.3758	5D4	0.3840	0.3681
	0.3804	0.3721		0.3825	0.3798		0.3887	0.3836		0.3863	0.3758
	0.3863	0.3758		0.3887	0.3836		0.3950	0.3875		0.3924	0.3794
	0.3840	0.3681		0.3863	0.3758		0.3924	0.3794		0.3898	0.3716
6A1	0.3889	0.3690	6A2	0.3915	0.3768	6A3	0.3981	0.3800	6A4	0.3953	0.3720
	0.3915	0.3768		0.3941	0.3848		0.4010	0.3882		0.3981	0.3800
	0.3981	0.3800		0.4010	0.3882		0.4080	0.3916		0.4048	0.3832
	0.3953	0.3720		0.3981	0.3800		0.4048	0.3832		0.4017	0.3751
6B1	0.3941	0.3848	6B2	0.3968	0.3930	6B3	0.4040	0.3966	6B4	0.4010	0.3882
	0.3968	0.3930		0.3996	0.4015		0.4071	0.4052		0.4040	0.3966
	0.4040	0.3966		0.4071	0.4052		0.4146	0.4089		0.4113	0.4001
	0.4010	0.3882		0.4040	0.3966		0.4113	0.4001		0.4080	0.3916
6C1	0.4080	0.3916	6C2	0.4113	0.4001	6C3	0.4186	0.4037	6C4	0.4150	0.3950
	0.4113	0.4001		0.4146	0.4089		0.4222	0.4127		0.4186	0.4037
	0.4186	0.4037		0.4222	0.4127		0.4299	0.4165		0.4259	0.4073
	0.4150	0.3950		0.4186	0.4037		0.4259	0.4073		0.4221	0.3984
6D1	0.4017	0.3751	6D2	0.4048	0.3832	6D3	0.4116	0.3865	6D4	0.4082	0.3782
	0.4048	0.3832		0.4080	0.3916		0.4150	0.3950		0.4116	0.3865
	0.4116	0.3865		0.4150	0.3950		0.4221	0.3984		0.4183	0.3898
	0.4082	0.3782		0.4116	0.3865		0.4183	0.3898		0.4147	0.3814
7A1	0.4147	0.3814	7A2	0.4183	0.3898	7A3	0.4242	0.3919	7A4	0.4203	0.3833
	0.4183	0.3898		0.4221	0.3984		0.4281	0.4006		0.4242	0.3919
	0.4242	0.3919		0.4281	0.4006		0.4342	0.4028		0.4300	0.3939
	0.4203	0.3833		0.4242	0.3919		0.4300	0.3939		0.4259	0.3853
7B1	0.4221	0.3984	7B2	0.4259	0.4073	7B3	0.4322	0.4096	7B4	0.4281	0.4006
	0.4259	0.4073		0.4299	0.4165		0.4364	0.4188		0.4322	0.4096
	0.4322	0.4096		0.4364	0.4188		0.4430	0.4212		0.4385	0.4119
	0.4281	0.4006		0.4322	0.4096		0.4385	0.4119		0.4342	0.4028
7C1	0.4342	0.4028	7C2	0.4385	0.4119	7C3	0.4449	0.4141	7C4	0.4403	0.4049
	0.4385	0.4119		0.4430	0.4212		0.4496	0.4236		0.4449	0.4141
	0.4449	0.4141		0.4496	0.4236		0.4562	0.4260		0.4513	0.4164
	0.4403	0.4049		0.4449	0.4141		0.4513	0.4164		0.4465	0.4071

PERFORMANCE GROUPS - CHROMATICITY (CONTINUED)

Region	x	y	Region	x	y	Region	x	y	Region	x	y
7D1	0.4259	0.3853	7D2	0.4300	0.3939	7D3	0.4359	0.3960	7D4	0.4316	0.3873
	0.4300	0.3939		0.4342	0.4028		0.4403	0.4049		0.4359	0.3960
	0.4359	0.3960		0.4403	0.4049		0.4465	0.4071		0.4418	0.3981
	0.4316	0.3873		0.4359	0.3960		0.4418	0.3981		0.4373	0.3893
8A1	0.4373	0.3893	8A2	0.4418	0.3981	8A3	0.4475	0.3994	8A4	0.4428	0.3906
	0.4418	0.3981		0.4465	0.4071		0.4523	0.4085		0.4475	0.3994
	0.4475	0.3994		0.4523	0.4085		0.4582	0.4099		0.4532	0.4008
	0.4428	0.3906		0.4475	0.3994		0.4532	0.4008		0.4483	0.3919
8B1	0.4465	0.4071	8B2	0.4513	0.4164	8B3	0.4573	0.4178	8B4	0.4523	0.4085
	0.4513	0.4164		0.4562	0.4260		0.4624	0.4274		0.4573	0.4178
	0.4573	0.4178		0.4624	0.4274		0.4687	0.4289		0.4634	0.4193
	0.4523	0.4085		0.4573	0.4178		0.4634	0.4193		0.4582	0.4099
8C1	0.4582	0.4099	8C2	0.4634	0.4193	8C3	0.4695	0.4207	8C4	0.4641	0.4112
	0.4634	0.4193		0.4687	0.4289		0.4750	0.4304		0.4695	0.4207
	0.4695	0.4207		0.4750	0.4304		0.4813	0.4319		0.4756	0.4221
	0.4641	0.4112		0.4695	0.4207		0.4756	0.4221		0.4700	0.4126
8D1	0.4483	0.3919	8D2	0.4532	0.4008	8D3	0.4589	0.4021	8D4	0.4538	0.3931
	0.4532	0.4008		0.4582	0.4099		0.4641	0.4112		0.4589	0.4021
	0.4589	0.4021		0.4641	0.4112		0.4700	0.4126		0.4646	0.4034
	0.4538	0.3931		0.4589	0.4021		0.4646	0.4034		0.4593	0.3944

PERFORMANCE GROUPS - DOMINANT WAVELENGTH

Color XLamp XP-C LEDs are tested for dominant wavelength (DWL) and sorted into one of the DWL bins defined below.

Color	DWL Group	Minimum DWL (nm) @ 350 mA	Maximum DWL (nm) @ 350 mA
Royal Blue	D3	450	455
	D4	455	460
	D5	460	465
Blue	B3	465	470
	B4	470	475
	B5	475	480
	B6	480	485
Green	G2	520	525
	G3	525	530
	G4	530	535
Amber	A2	585	590
	A3	590	595
Red-Orange	O3	610	615
	O4	615	620
Red	R2	620	625
	R3	625	630

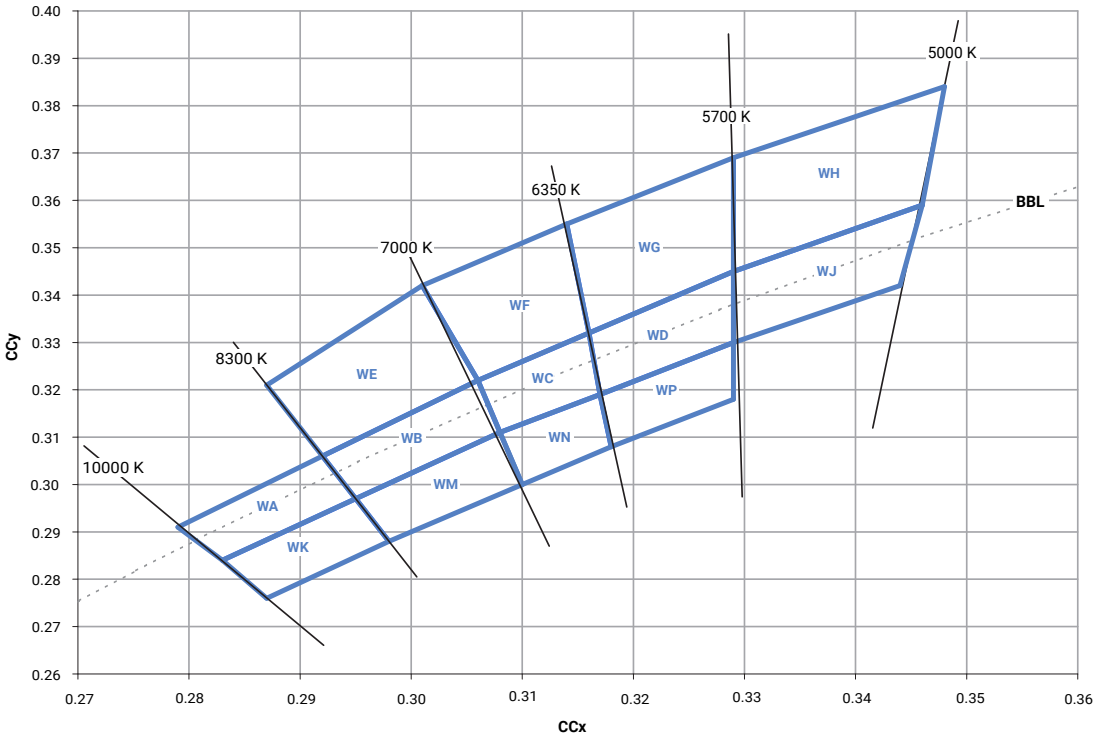
PERFORMANCE GROUPS - FORWARD VOLTAGE

Amber, red-orange and, red XLamp XP-C LEDs are tested for forward voltage and sorted into one of the forward voltage bins defined below.

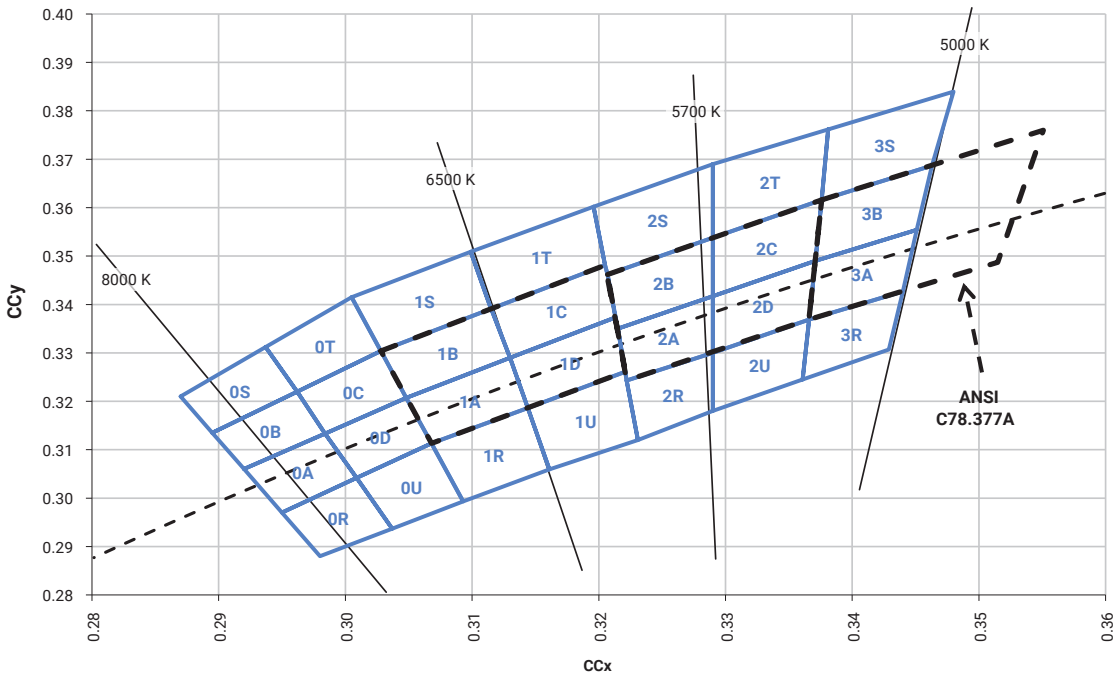
Forward Voltage Group	Minimum Forward Voltage (V) @ 350 mA	Maximum Forward Voltage (V) @ 350 mA
B	1.75	2.0
C	2.0	2.25
D	2.25	2.5
E	2.5	2.75
F	2.75	3.0
G	3.0	3.25
H	3.25	3.5
J	3.5	3.75

CREE'S STANDARD CHROMATICITY REGIONS PLOTTED ON THE 1931 CIE CURVE

Cool White

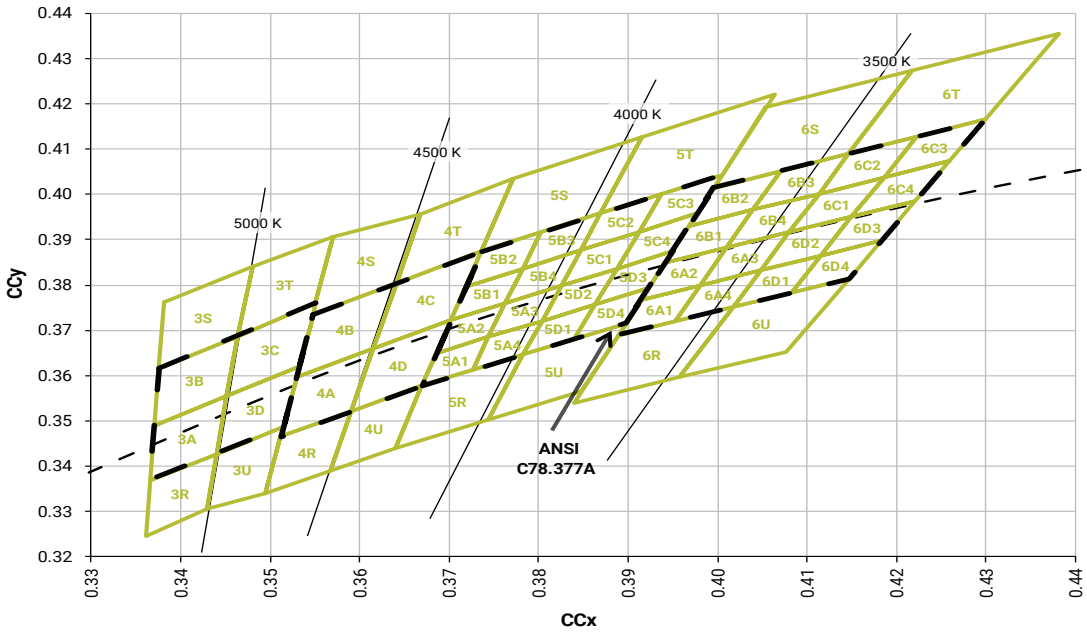


ANSI Cool White

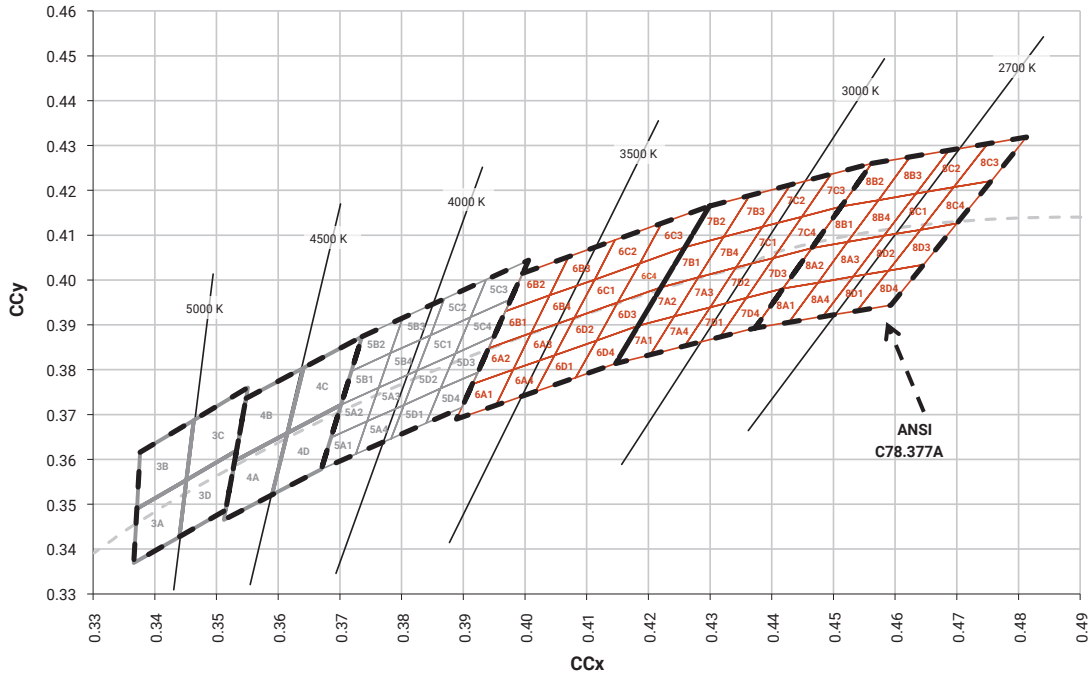


CREE'S STANDARD CHROMATICITY REGIONS PLOTTED ON THE 1931 CIE CURVE - CONTINUED

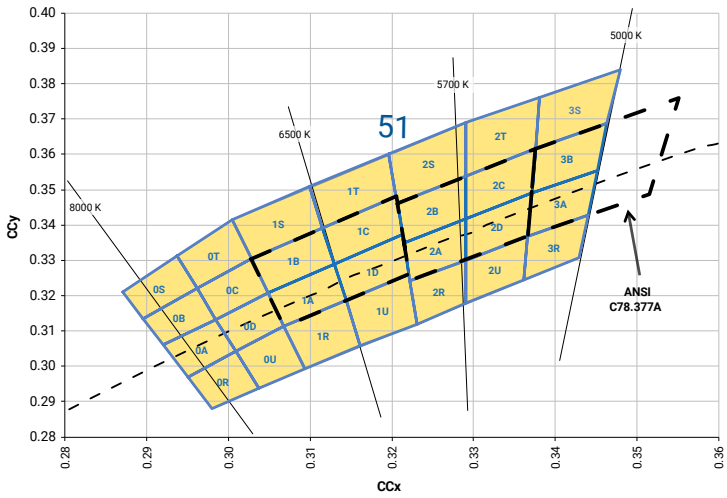
Neutral White

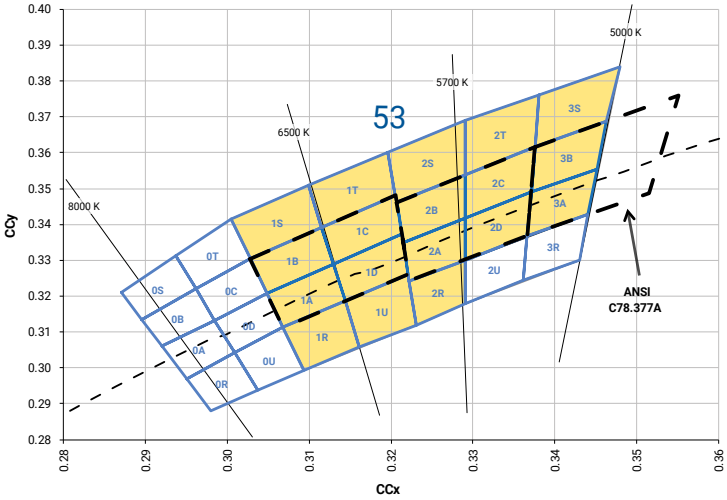


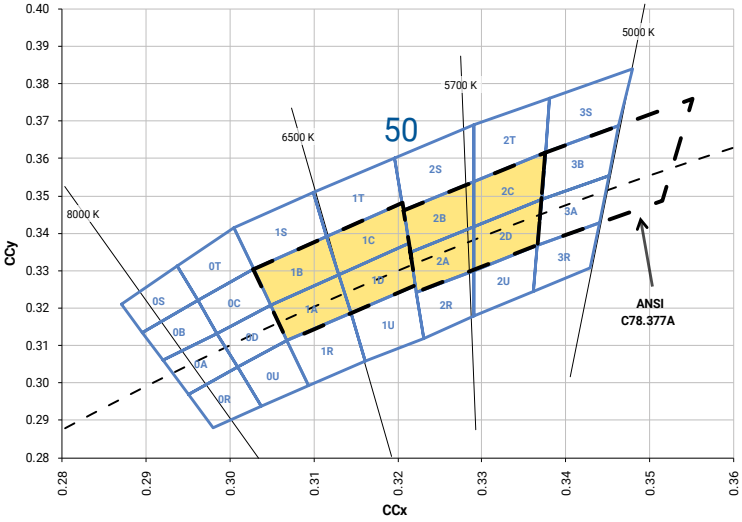
ANSI Neutral White and ANSI Warm White

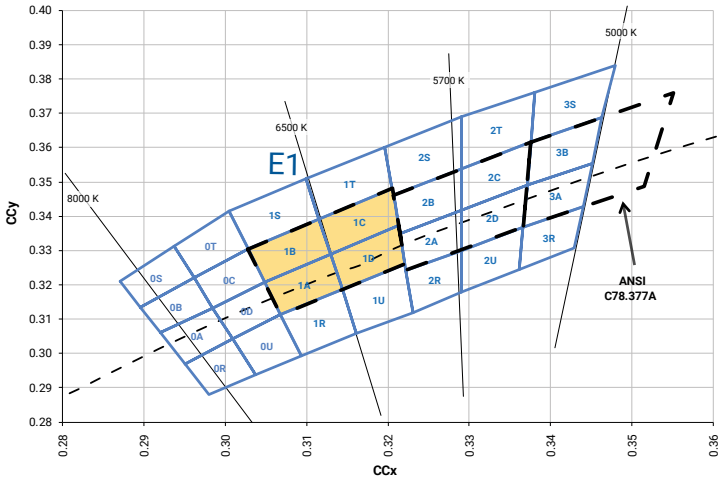


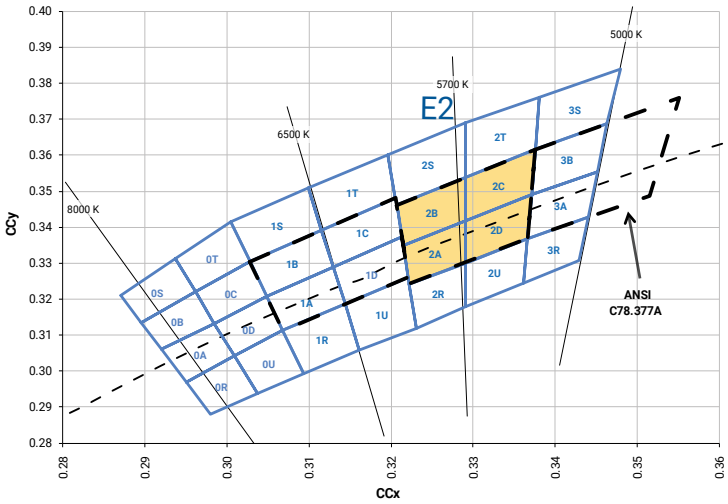
CREE'S STANDARD COOL WHITE KITS PLOTTED ON ANSI STANDARD CHROMATICITY REGIONS



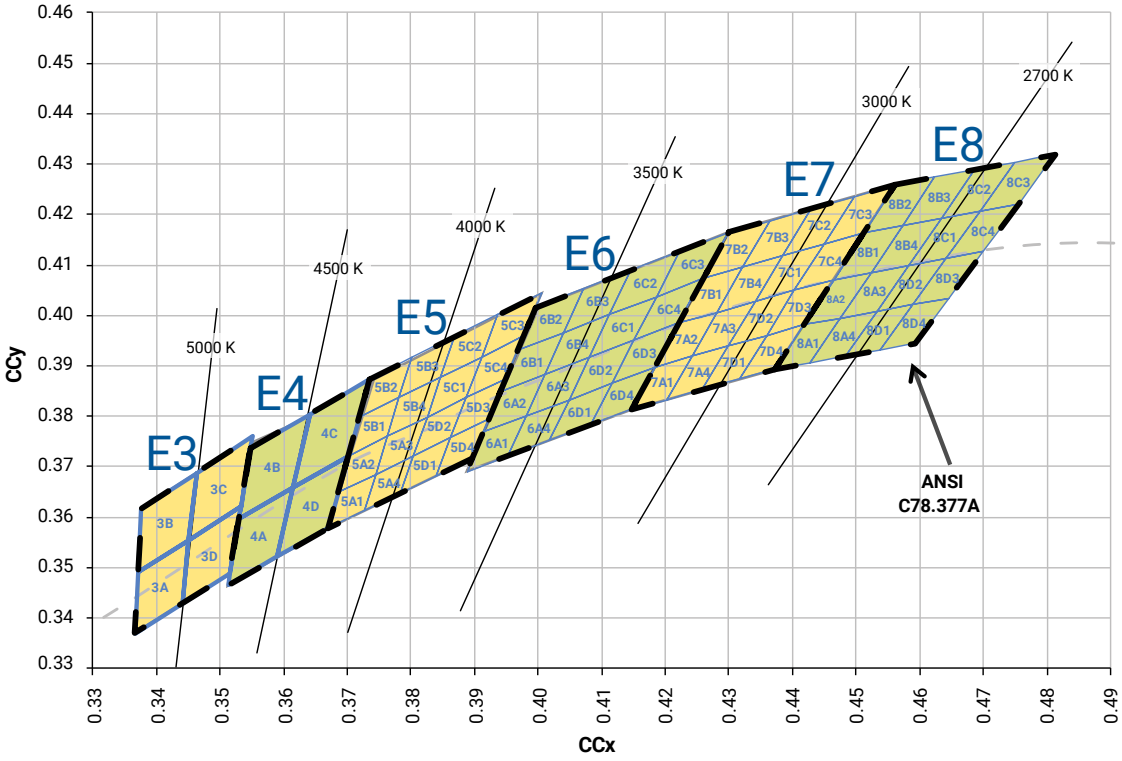


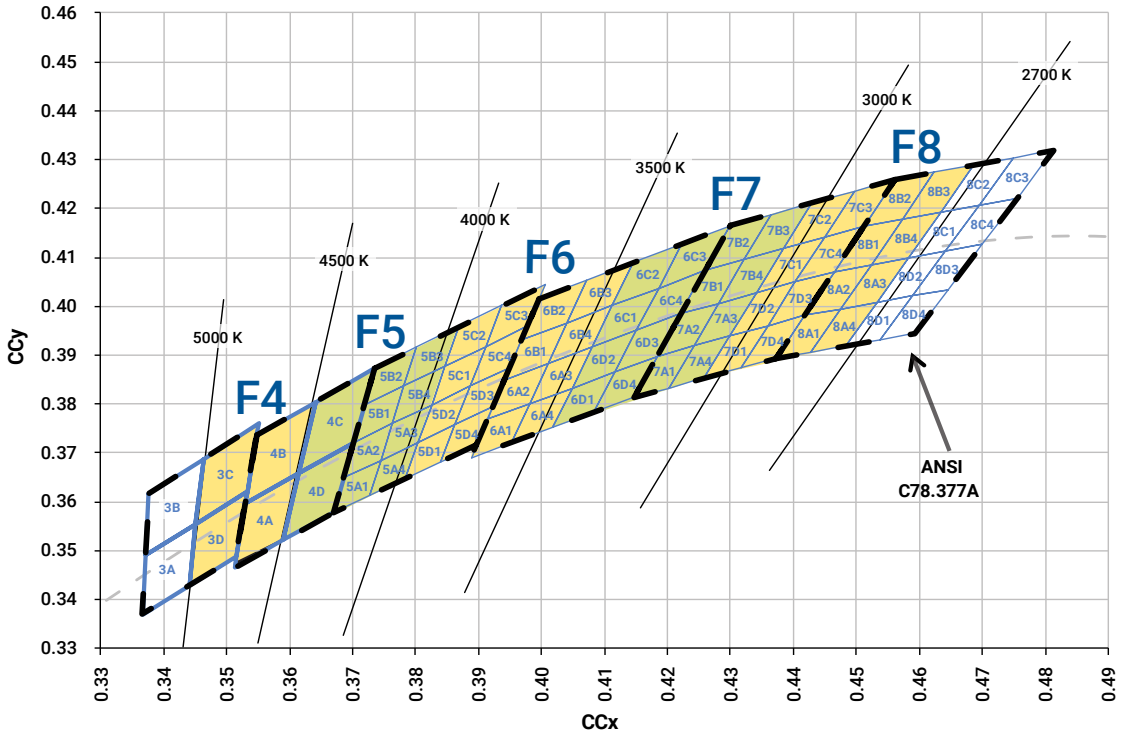






CREE'S STANDARD WARM AND NEUTRAL WHITE KITS PLOTTED ON ANSI STANDARD CHROMATICITY REGIONS





CREE'S STANDARD CHROMATICITY KITS

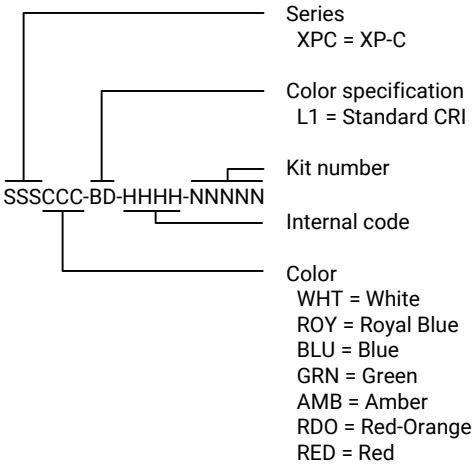
The following table provides the chromaticity bins associated with chromaticity kits.

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
	6000 K	53	1A, 1B, 1C, 1D, 1R, 1S, 1T, 1U, 2A, 2B, 2C, 2D, 2R, 2S, 2T, 3A, 3B, 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
Neutral White	5000 K	E3	3A, 3B, 3C, 3D
	4750 K	F4	3C, 3D, 4A, 4B
	4500 K	E4	4A, 4B, 4C, 4D
	4250 K	F5	4C, 4D, 5A1, 5A2, 5A3, 5A4, 5B1, 5B2, 5B3, 5B4
	4000 K	E5	5A1, 5A2, 5A3, 5A4, 5B1, 5B2, 5B3, 5B4, 5C1, 5C2, 5C3, 5C4, 5D1, 5D2, 5D3, 5D4
Warm White	3750 K	F6	5C1, 5C2, 5C3, 5C4, 5D1, 5D2, 5D3, 5D4, 6A1, 6A2, 6A3, 6A4, 6B1, 6B2, 6B3, 6B4
	3500 K	E6	6A1, 6A2, 6A3, 6A4, 6B1, 6B2, 6B3, 6B4, 6C1, 6C2, 6C3, 6C4, 6D1, 6D2, 6D3, 6D4
	3250 K	F7	6C1, 6C2, 6C3, 6C4, 6D1, 6D2, 6D3, 6D4, 7A1, 7A2, 7A3, 7A4, 7B1, 7B2, 7B3, 7B4
	3000 K	E7	7A1, 7A2, 7A3, 7A4, 7B1, 7B2, 7B3, 7B4, 7C1, 7C2, 7C3, 7C4, 7D1, 7D2, 7D3, 7D4
	2850 K	F8	7C1, 7C2, 7C3, 7C4, 7D1, 7D2, 7D3, 7D4, 8A1, 8A2, 8A3, 8A4, 8B1, 8B2, 8B3, 8B4
	2700 K	E8	8A1, 8A2, 8A3, 8A4, 8B1, 8B2, 8B3, 8B4, 8C1, 8C2, 8C3, 8C4, 8D1, 8D2, 8D3, 8D4

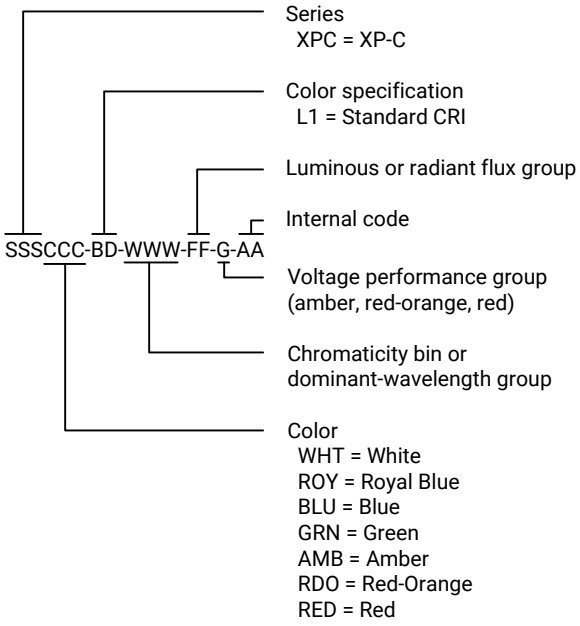
BIN AND ORDER CODE FORMATS

XP-C bin codes and order codes are configured in the following manner:

Order Code



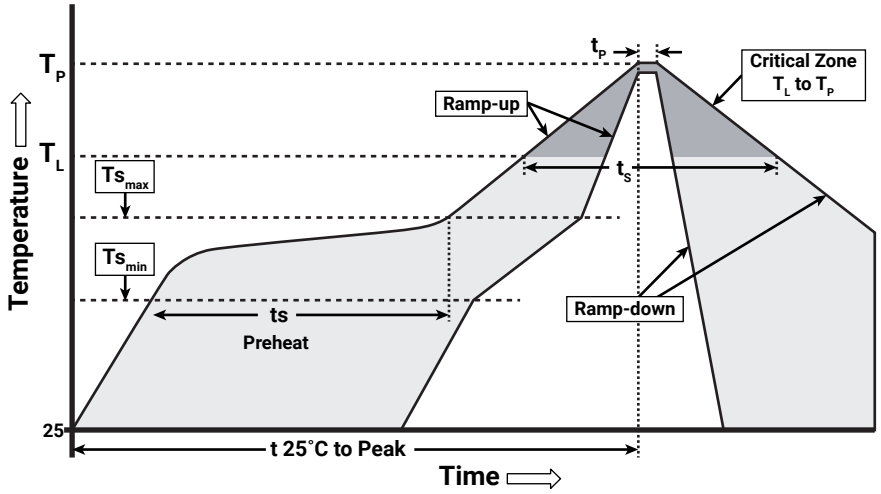
Bin Code



REFLOW SOLDERING CHARACTERISTICS

In testing, Cree has found XLamp XP-C 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, 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 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'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 applies to ensure long-term reliability for XLamp LEDs and details of Cree's pre-release qualification testing for XLamp LEDs.

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 XP-C 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 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 Ecology section of the Cree 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 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.

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.

NOTES - CONTINUED

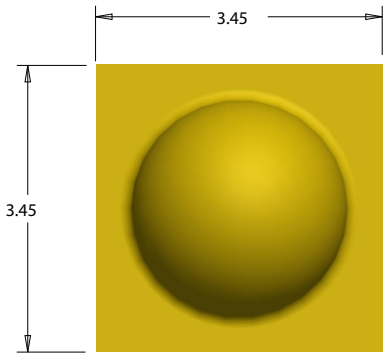
Intellectual Property

For remote phosphor applications, a separate license to certain Cree patents is required.

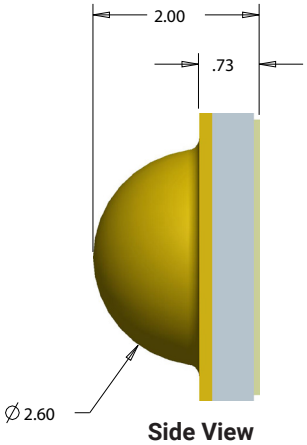
MECHANICAL DIMENSIONS (T_A = 25 °C)

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

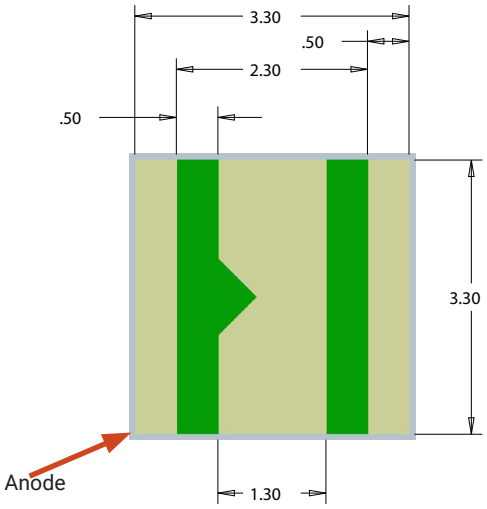
All measurements are ±.13 mm unless otherwise indicated.



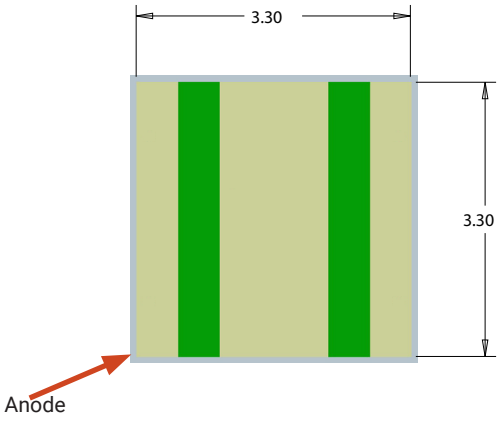
Top View



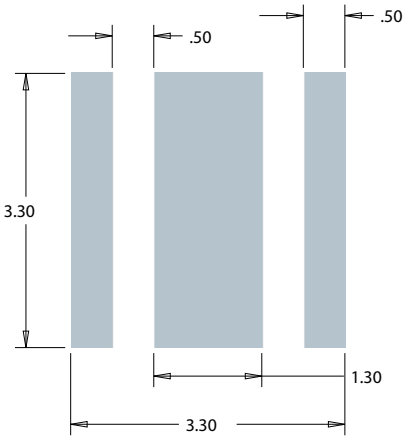
Side View



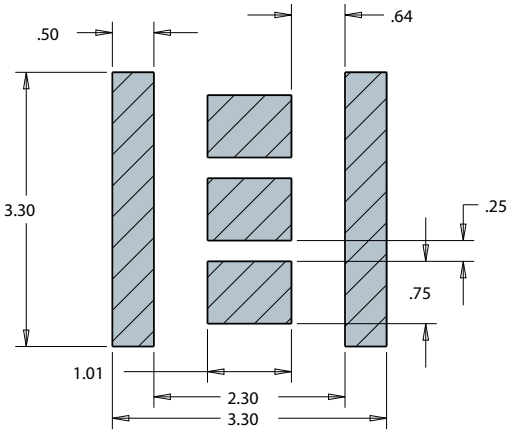
Bottom View



Alternate Bottom View



Recommended PCB Solder Pad

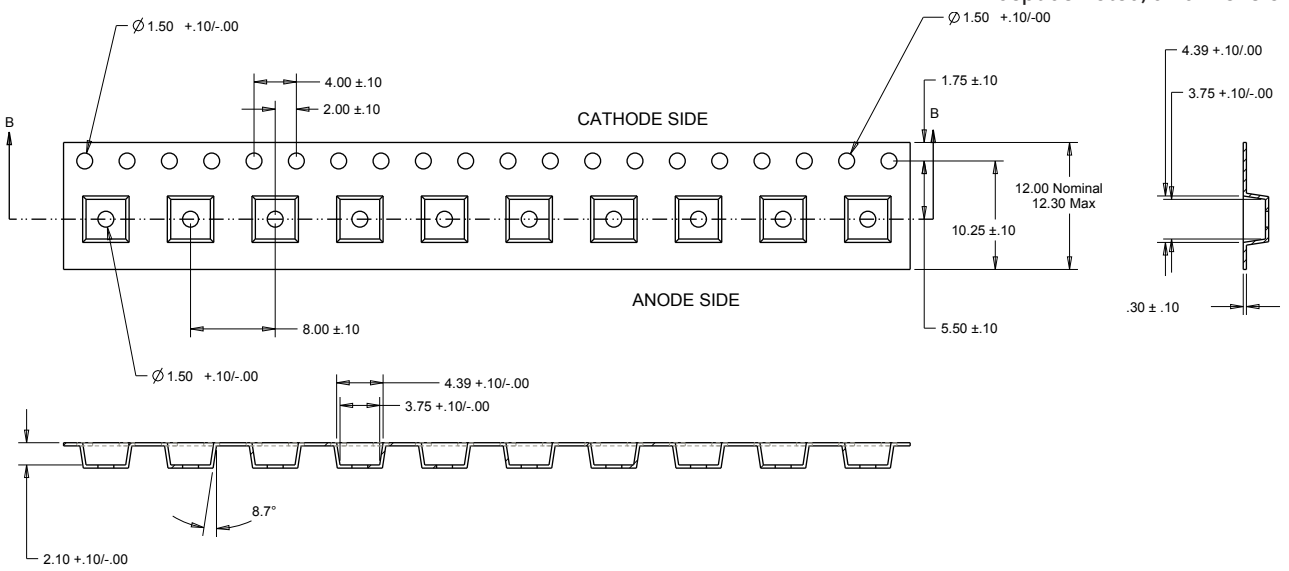


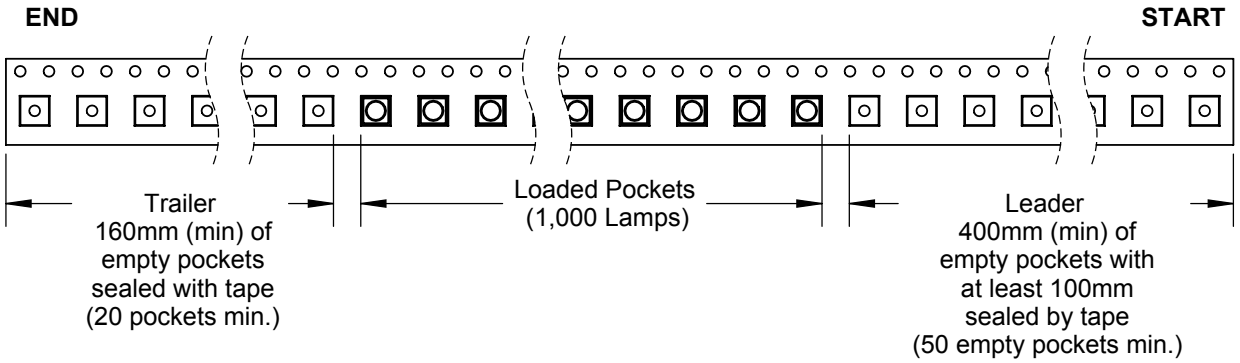
Recommended Stencil Pattern
(Hatched Area is Open)

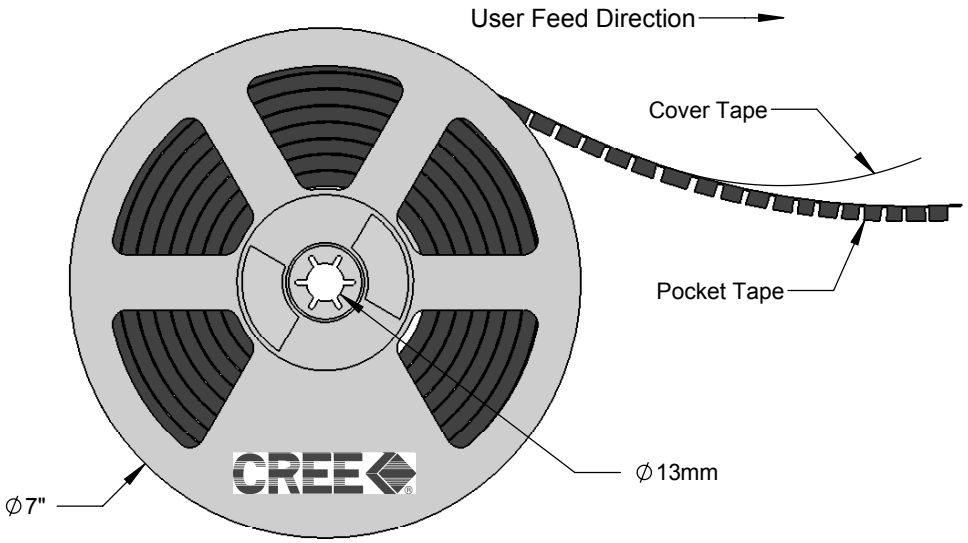
TAPE AND REEL

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

Except as noted, all dimensions in mm.

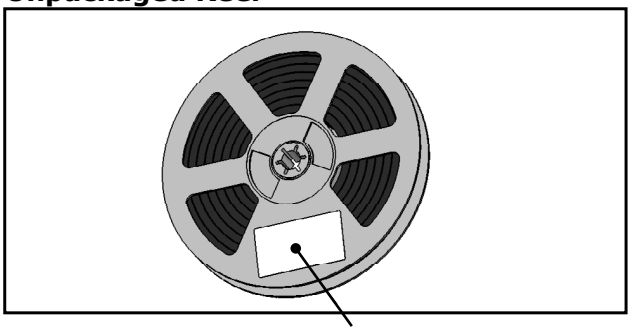






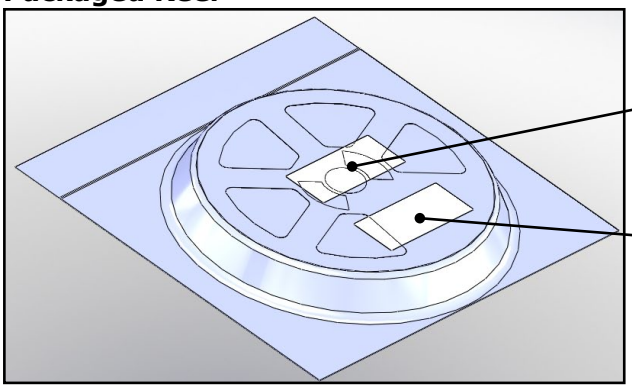
PACKAGING

Unpackaged Reel



Label with Cree Bin Code,
Quantity, Reel ID

Packaged Reel



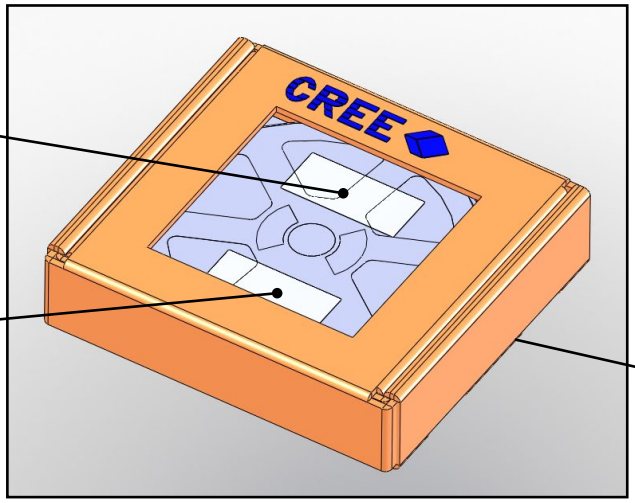
Label with Cree Order Code,
Quantity, Reel ID, PO #

Label with Cree Bin Code,
Quantity, Reel ID

Boxed Reel

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

Label with Cree Bin Code,
Quantity, Reel ID



Patent Label
(on bottom of box)

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Click to view products by Cree ***manufacturer:***

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