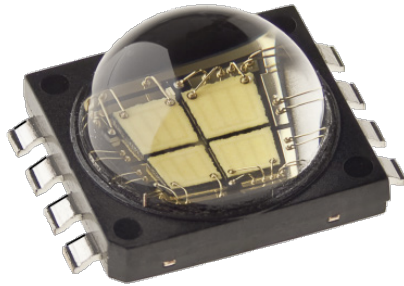
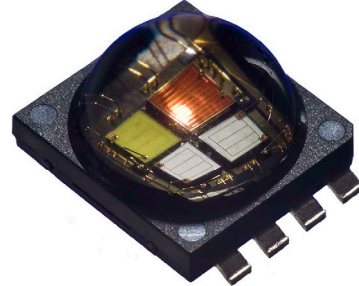


## XLamp® MC-E LED



MC-E White



MC-E Color

### PRODUCT DESCRIPTION

The XLamp® MC-E LED is a family of lighting-class, multi-chip LEDs that provides high lumen output in a small package. Compared to discrete LEDs, MC-E LEDs reduce the distance between LED die, creating a small optical source for excellent optical control and efficient color mixing. MC-E LEDs can reduce LED system complexity by reducing the number of components required.

XLamp LEDs bring high performance and quality of light to a wide range of lighting applications, including color-changing lighting, portable and personal lighting, outdoor lighting, indoor directional lighting, and entertainment lighting.

### FEATURES

- Available in white (2600 K–10,000 K CCT), EasyWhite®, or color (RGBW)
- ANSI-compatible neutral & warm white chromaticity bins
- Individually addressable LEDs
- MC-E EasyWhite LEDs available in 2- and 4-step bins, up to 85 CRI
- Maximum drive current: 700 mA per LED die
- Reflow solderable - JEDEC J-STD-020
- Electrically neutral thermal path
- RoHS and REACH compliant
- UL® recognized component (E349212)



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### CHARACTERISTICS - COMPLETE PACKAGE

The following table lists the product characteristics for the MC-E LED package.

Characteristics	Unit	Minimum	Typical	Maximum
Thermal Resistance, junction to solder point - white	°C/W		3	
Thermal Resistance, junction to solder point - color	°C/W		4	
Viewing Angle (FWHM) - white	degrees		110	
Viewing Angle (FWHM) - color	degrees		115	
ESD Withstand Voltage (HBM per Mil-Std-883D)	V			8000
LED Junction Temperature	°C			150

### CHARACTERISTICS - PER LED DIE (WHITE, EASYWHITE®)

The following table lists the product characteristics of each individual LED die within the MC-E white LED package.

Characteristics	Unit	Minimum	Typical	Maximum
Temperature Coefficient of Voltage	mV/°C		-4	
DC Forward Current	mA			700
Reverse Voltage	V			1
Forward Voltage (@ 350 mA)	V		3.1	3.9
Forward Voltage (@ 700 mA)	V		3.4	

### CHARACTERISTICS - PER LED DIE (COLOR)

The following table lists the product characteristics for each LED die within the MC-E color LED package.

Characteristics	Unit		Red	Green	Blue	White
Temperature Coefficient of Voltage	mV/°C	Typical	-2	-4	-4	-4
DC Forward Current	mA	Maximum	700	700	700	700
Reverse Voltage	V	Maximum	5	5	5	1
Forward Voltage (@ 350 mA)	V	Typical	2.1	3.4	3.2	3.1
		Maximum	2.5	3.9	3.9	3.9
Forward Voltage (@ 700 mA)	V	Typical	2.3	3.7	3.5	3.5

### FLUX CHARACTERISTICS - WHITE ( $T_j = 25\text{ }^\circ\text{C}$ )

The following tables provides order codes for MC-E white LEDs. Kit numbers completely describe an order code's chromaticity regions and luminous flux range. For more order codes, as well as a complete description of the order-code nomenclature, please consult Bin and Order Code Format section (page 19).

Minimum Luminous Flux (lm) @ 350 mA*		Chromaticity Regions	Kit Number	Order Code
Group	Flux (lm)			
Cool White (5000 K - 10,000 K)				
K	370	WA, WB, WC, WD, WE, WF, WG, WH, WJ, WK, WM, WN, WP	000K01	MCE4WT-A2-0000-000K01
		WC, WD, WF, WG	000K02	MCE4WT-A2-0000-000K02
		WC, WD, WF, WG, WH, WJ, WN, WP	000K03	MCE4WT-A2-0000-000K03
M	430	WA, WB, WC, WD, WE, WF, WG, WH, WJ, WK, WM, WN, WP	000M01	MCE4WT-A2-0000-000M01
		WC, WD, WF, WG	000M02	MCE4WT-A2-0000-000M02
		WC, WD, WF, WG, WH, WJ, WN, WP	000M03	MCE4WT-A2-0000-000M03

Minimum Luminous Flux (lm) @ 350 mA*		Chromaticity Regions	Kit Number	Order Code	Order Code
Group	Flux (lm)				
Neutral White (3700 K - 5000 K)					
H	280	5C, 5D, 6A, 6B	3700 K	000HF6	MCE4WT-A2-0000-000HF6
J	320	3A, 3B, 3C, 3D	5000 K	000JE3	MCE4WT-A2-0000-000JE3
		3C, 3D, 4A, 4B	4750 K	000JF4	MCE4WT-A2-0000-000JF4
		4A, 4B, 4C, 4D	4500 K	000JE4	MCE4WT-A2-0000-000JE4
		4C, 4D, 5A, 5B	4300 K	000JF5	MCE4WT-A2-0000-000JF5
		5A, 5B, 5C, 5D	4000 K	000JE5	MCE4WT-A2-0000-000JE5
		5C, 5D, 6A, 6B	3700 K	000JF6	MCE4WT-A2-0000-000JF6
K	370	3A, 3B, 3C, 3D	5000 K	000KE3	MCE4WT-A2-0000-000KE3
		3C, 3D, 4A, 4B	4750 K	000KF4	MCE4WT-A2-0000-000KF4
		4A, 4B, 4C, 4D	4500 K	000KE4	MCE4WT-A2-0000-000KE4
		4C, 4D, 5A, 5B	4300 K	000KF5	MCE4WT-A2-0000-000KF5
		5A, 5B, 5C, 5D	4000 K	000KE5	MCE4WT-A2-0000-000KE5
		5C, 5D, 6A, 6B	3700 K	000KF6	MCE4WT-A2-0000-000KF6
M	430	3A, 3B, 3C, 3D	5000 K	000ME3	MCE4WT-A2-0000-000ME3
		3C, 3D, 4A, 4B	4750 K	000MF4	MCE4WT-A2-0000-000MF4
		4A, 4B, 4C, 4D	4500 K	000ME4	MCE4WT-A2-0000-000ME4

- Notes
- For other flux and chromaticity combinations, contact Cree or an authorized distributor.
  - Cree LED maintains a tolerance of  $\pm 7\%$  on flux and power measurements,  $\pm 0.005$  on chromaticity (CCx, CCy) measurements and a tolerance of  $\pm 2$  on CRI measurements. See the Measurements section (page 22).
  - Typical CRI for cool white and neutral white (3700 K - 10,000 K CCT) is 75.
  - \* Flux and chromaticity are measured with each LED die connected to independent drive circuits at 350 mA and with all LEDs lit simultaneously.
  - \* MC-E LED order codes specify only a minimum flux bin and not a maximum. Cree LED may ship reels in flux bins higher than the minimum specified by the order code without advance notice. Shipments will always adhere to the chromaticity or DWL bin restrictions specified by the order code.

**FLUX CHARACTERISTICS - WHITE ( $T_j = 25\text{ }^\circ\text{C}$ ) - CONTINUED**

Minimum Luminous Flux (lm) @ 350 mA*		Chromaticity Regions	CCT	Kit Number	Order Code
Group	Flux (lm)				
Warm White (2600 K - 3700 K)					
G	240	7C, 7D, 8A, 8B	2900 K	000GF8	MCE4WT-A2-0000-000GF8
		8A, 8B, 8C, 8D	2700 K	000GE8	MCE4WT-A2-0000-000GE8
H	280	6A, 6B, 6C, 6D	3500 K	000HE6	MCE4WT-A2-0000-000HE6
		6C, 6D, 7A, 7B	3200 K	000HF7	MCE4WT-A2-0000-000HF7
		7A, 7B, 7C, 7D	3000 K	000HE7	MCE4WT-A2-0000-000HE7
		7C, 7D, 8A, 8B	2900 K	000HF8	MCE4WT-A2-0000-000HF8
		8A, 8B, 8C, 8D	2700 K	000HE8	MCE4WT-A2-0000-000HE8
		6A, 6B, 6C, 6D	3500 K	000JE6	MCE4WT-A2-0000-000JE6
J	320	6C, 6D, 7A, 7B	3200 K	000JF7	MCE4WT-A2-0000-000JF7
		7A, 7B, 7C, 7D	3000 K	000JE7	MCE4WT-A2-0000-000JE7
		7C, 7D, 8A, 8B	2900 K	000JF8	MCE4WT-A2-0000-000JF8
		8A, 8B, 8C, 8D	2700 K	000JE8	MCE4WT-A2-0000-000JE8
		6A, 6B, 6C, 6D	3500 K	000KE6	MCE4WT-A2-0000-000KE6
K	370	6A, 6B, 6C, 6D	3500 K	000KE6	MCE4WT-A2-0000-000KE6

- Notes
- For other flux and chromaticity combinations, contact Cree or an authorized distributor.
  - Cree LED maintains a tolerance of  $\pm 7\%$  on flux and power measurements,  $\pm 0.005$  on chromaticity (CCx, CCy) measurements and a tolerance of  $\pm 2$  on CRI measurements. See the Measurements section (page 22).
  - Typical CRI for warm white (2600 K - 3700 K CCT) is 80.
  - \* Flux and chromaticity are measured with each LED die connected to independent drive circuits at 350 mA and with all LEDs lit simultaneously.
  - \* MC-E LED order codes specify only a minimum flux bin and not a maximum. Cree LED may ship reels in flux bins higher than the minimum specified by the order code without advance notice. Shipments will always adhere to the chromaticity or DWL bin restrictions specified by the order code.

**FLUX CHARACTERISTICS - EASYWHITE® MC-E LEDS (T<sub>J</sub> = 25 °C)**

The following table provides order codes for MC-E EasyWhite LEDs. For a complete description of the order-code nomenclature, please consult the Bin and Order Code Format section (page 19).

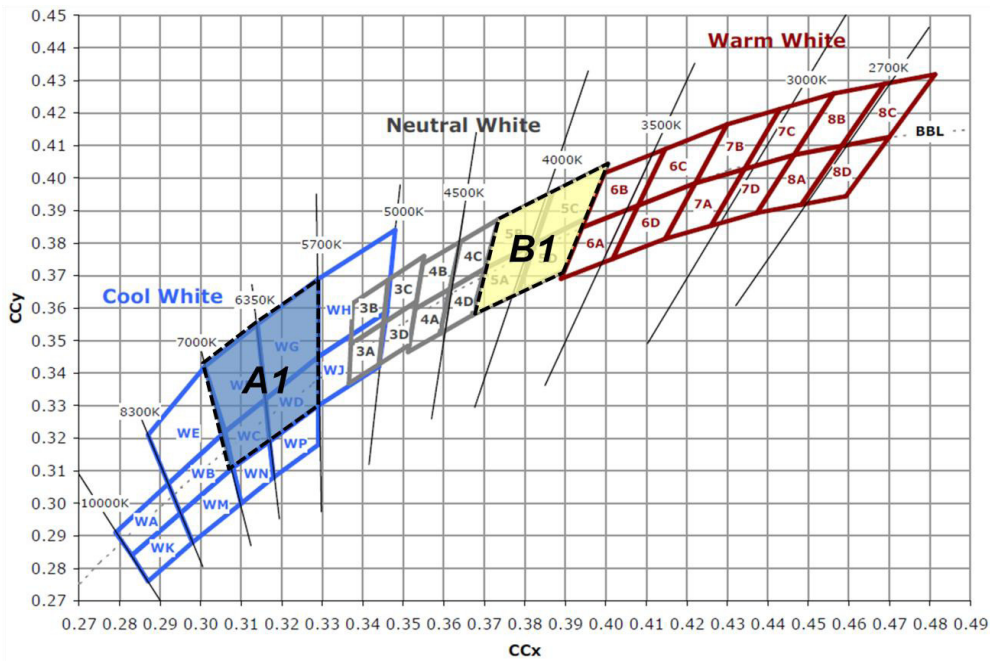
Color	CCT Range	Minimum Luminous Flux @ 350 mA, 25 °C*		2-Step		4-Step		
		Group	Flux (lm)	Chromaticity Region	Order Code	Chromaticity Region	Order Code	
Standard CRI EasyWhite	4000 K	K	370	40H	MCEEZW-A1-0000-0000K040H	40F	MCEEZW-A1-0000-0000K040F	
		J	320		MCEEZW-A1-0000-0000J040H		MCEEZW-A1-0000-0000J040F	
	3500 K	J	320	35H	MCEEZW-A1-0000-0000J035H	35F	MCEEZW-A1-0000-0000J035F	
		H	280		MCEEZW-A1-0000-0000H035H		MCEEZW-A1-0000-0000H035F	
	3000 K	J	320	30H	MCEEZW-A1-0000-0000J030H	30F	MCEEZW-A1-0000-0000J030F	
		H	280		MCEEZW-A1-0000-0000H030H		MCEEZW-A1-0000-0000H030F	
	2700 K	J	320	27H	MCEEZW-A1-0000-0000J027H	27F	MCEEZW-A1-0000-0000J027F	
		H	280		MCEEZW-A1-0000-0000H027H		MCEEZW-A1-0000-0000H027F	
	80-CRI Minimum EasyWhite	4000 K	K	370	40H	MCEEZW-H1-0000-0000K040H	40F	MCEEZW-H1-0000-0000K040F
			J	320		MCEEZW-H1-0000-0000J040H		MCEEZW-H1-0000-0000J040F
3500 K		J	320	35H	MCEEZW-H1-0000-0000J035H	35F	MCEEZW-H1-0000-0000J035F	
		H	280		MCEEZW-H1-0000-0000H035H		MCEEZW-H1-0000-0000H035F	
3000 K		J	320	30H	MCEEZW-H1-0000-0000J030H	30F	MCEEZW-H1-0000-0000J030F	
		H	280		MCEEZW-H1-0000-0000H030H		MCEEZW-H1-0000-0000H030F	
2700 K		J	320	27H	MCEEZW-H1-0000-0000J027H	27F	MCEEZW-H1-0000-0000J027F	
		H	280		MCEEZW-H1-0000-0000H027H		MCEEZW-H1-0000-0000H027F	
85-CRI Minimum EasyWhite		3000 K	H	280	30H	MCEEZW-P1-0000-0000H030H	30F	MCEEZW-P1-0000-0000H030F
			G	240		MCEEZW-P1-0000-0000G030H		MCEEZW-P1-0000-0000G030F
	2700 K	H	280	27H	MCEEZW-P1-0000-0000H027H	27F	MCEEZW-P1-0000-0000H027F	
		G	240		MCEEZW-P1-0000-0000G027H		MCEEZW-P1-0000-0000G027F	

- Notes
- For other flux and chromaticity combinations, contact Cree or an authorized distributor.
  - Cree LED maintains a tolerance of ±7% on flux and power measurements, ±0.005 on chromaticity (CCx, CCy) measurements and a tolerance of ±2 on CRI measurements. See the Measurements section (page 22).
  - For Standard CRI parts, the typical CRI is 80 for 4000 K and 3500 K CCT parts and the typical CRI is 82 for 3000 K and 2700 K CCT parts.
  - \* Flux and chromaticity are measured with each LED die connected to independent drive circuits at 350 mA and with all LEDs lit simultaneously.
  - \* MC-E LED order codes specify only a minimum flux bin and not a maximum. Cree LED may ship reels in flux bins higher than the minimum specified by the order code without advance notice. Shipments will always adhere to the chromaticity or DWL bin restrictions specified by the order code.

**FLUX CHARACTERISTICS - COLOR ( $T_j = 25\text{ }^\circ\text{C}$ )**

The following table provides order codes for MC-E color LEDs. Kit numbers completely describe an order code's color or chromaticity bins and luminous flux range. For a complete description of the order-code nomenclature, please consult the Bin and Order Code Format section (page 20).

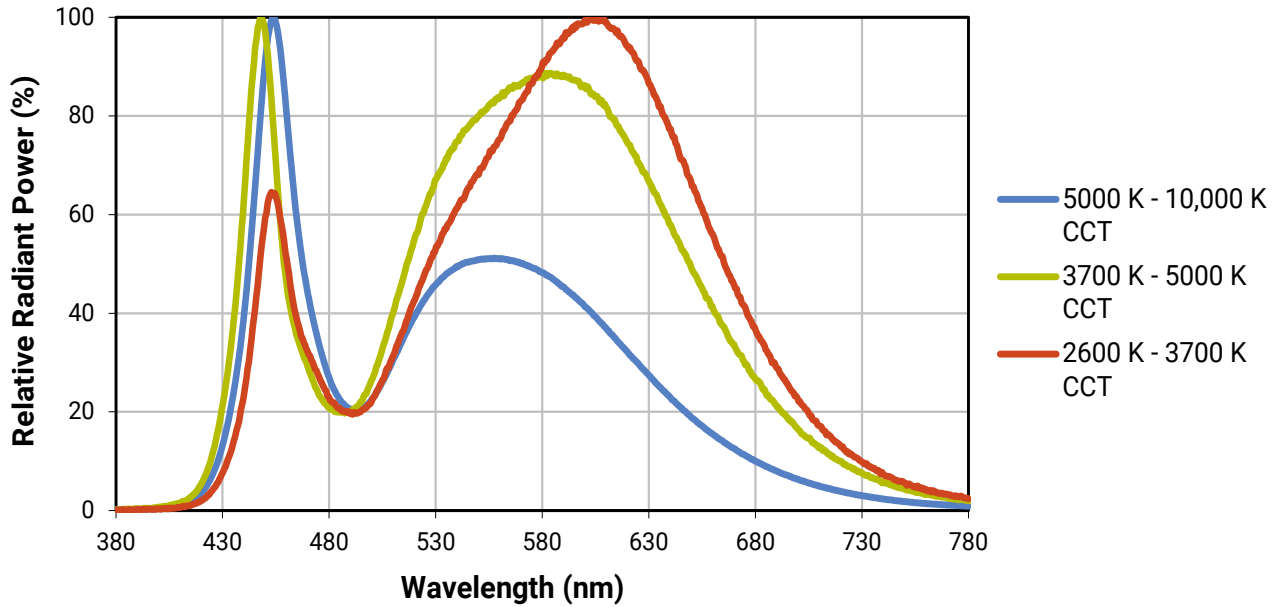
Color	CCT/Dominant Wavelength Range		DWL / Chromaticity Bins	Minimum Luminous Flux @ 350 mA*		Kit Number / Order Code
	Minimum	Maximum		Group	Flux (lm)	
Red	620 nm	630 nm	A	A5	30.6	00A5AAAA1 / MCE4CT-A2-0000-00A5AAAA1
Green	520 nm	535 nm	2, 3, 4		67.2	
Blue	450 nm	465 nm	K, L, M		8.2	
Cool White	5700 K	7000 K	WC, WD, WF, WG		100	
Red	620 nm	630 nm	A	A4	30.6	00A4AAAA1 / MCE4CT-A2-0000-00A4AAAA1
Green	520 nm	535 nm	2, 3, 4		67.2	
Blue	450 nm	465 nm	K, L, M		8.2	
Neutral White	3700 K	4300 K	5A, 5B, 5C, 5D		80	



- Notes
- For other flux and chromaticity combinations, contact Cree or an authorized distributor.
  - Cree LED maintains a tolerance of  $\pm 7\%$  on flux and power measurements,  $\pm 0.005$  on chromaticity (CCx, CCy) measurements and a tolerance of  $\pm 2$  on CRI measurements. See the Measurements section (page 22).
  - \* Flux and chromaticity are measured with each LED die connected to independent drive circuits at 350 mA. The flux and color of each LED in MC-E color LEDs are measured individually.
  - \* MC-E LED order codes specify only a minimum flux bin and not a maximum. Cree LED may ship reels in flux bins higher than the minimum specified by the order code without advance notice. Shipments will always adhere to the chromaticity or DWL bin restrictions specified by the order code.

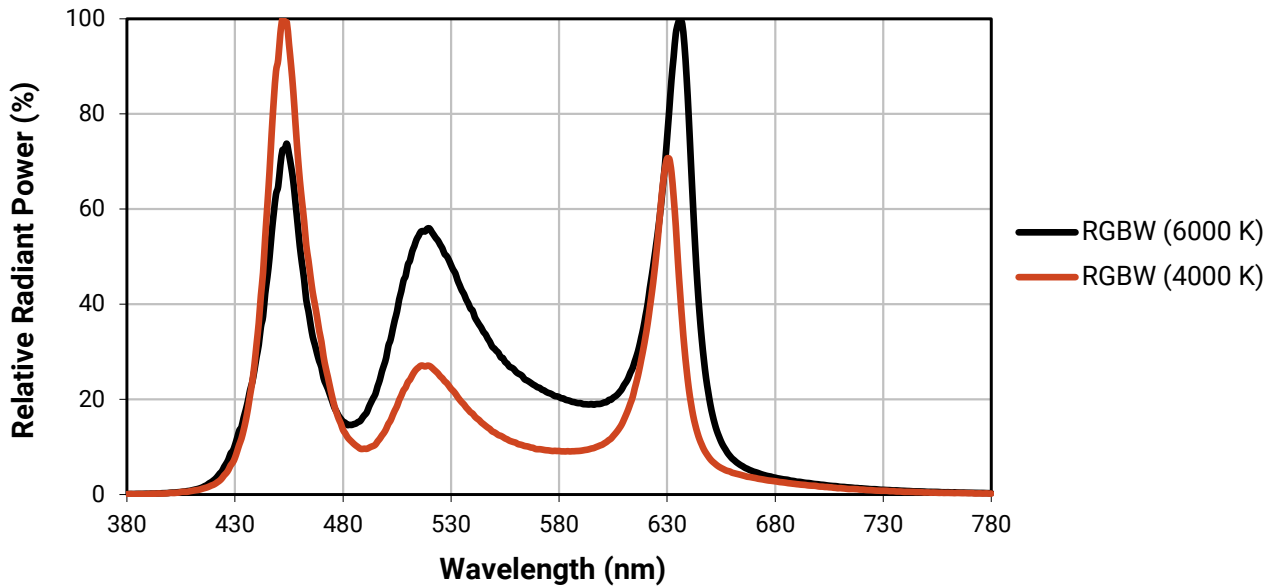
**RELATIVE SPECTRAL POWER DISTRIBUTION ( $I_F = 350$  mA PER LED) - WHITE**

The following graph represents typical spectral output of the MC-E white LED with all four LEDs on simultaneously.



**RELATIVE SPECTRAL POWER DISTRIBUTION ( $I_F = 350$  mA PER LED) - COLOR**

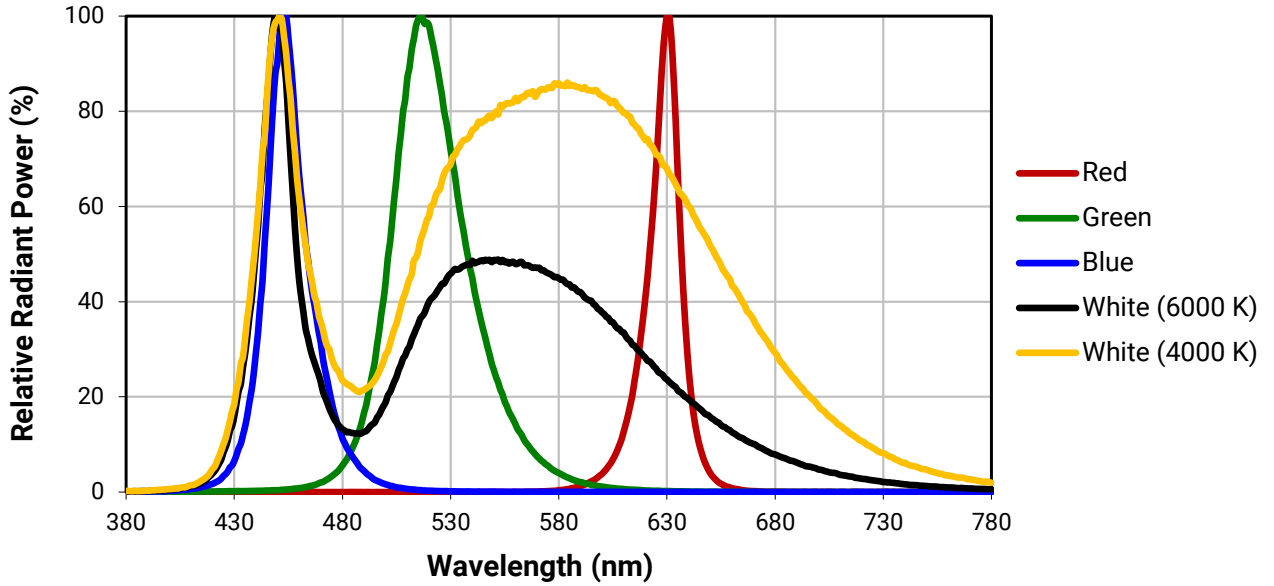
The following graph represents typical spectral output of the MC-E color LED with all four LEDs on simultaneously.





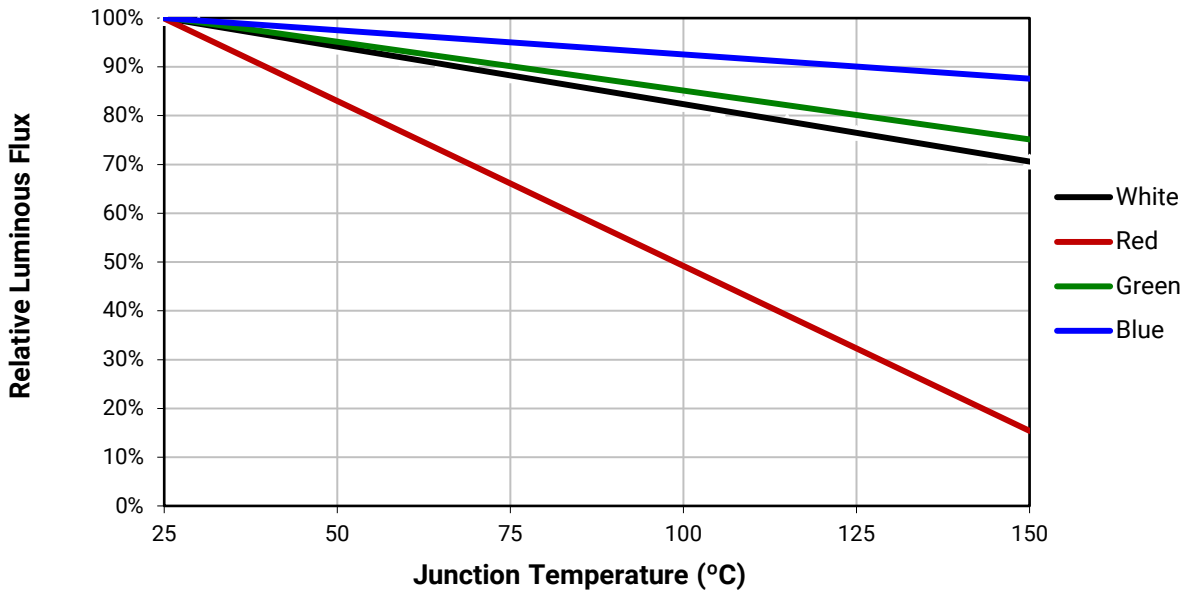
**RELATIVE SPECTRAL POWER DISTRIBUTION ( $I_F = 350$  mA PER LED) - COLOR (CONTINUED)**

The following graph represents typical spectral output of the MC-E color LED with each LED on independently.



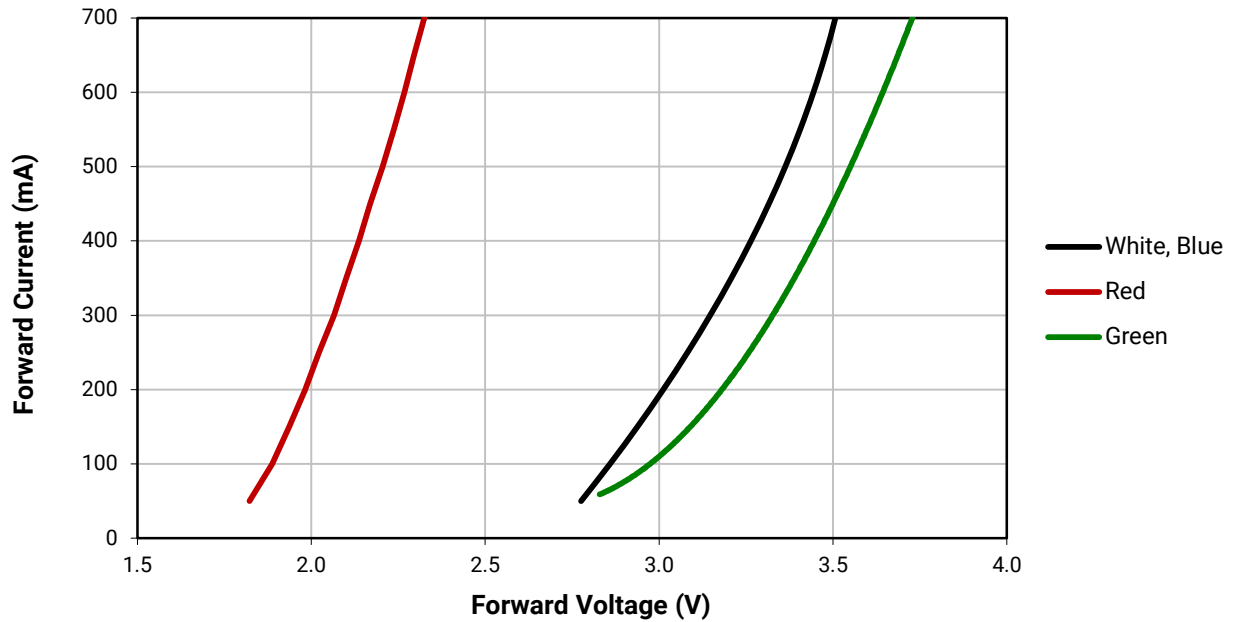
**RELATIVE FLUX OUTPUT VS JUNCTION TEMPERATURE ( $I_F = 350$  mA)**

The following graph represents typical performance of each LED die in the MC-E LED.



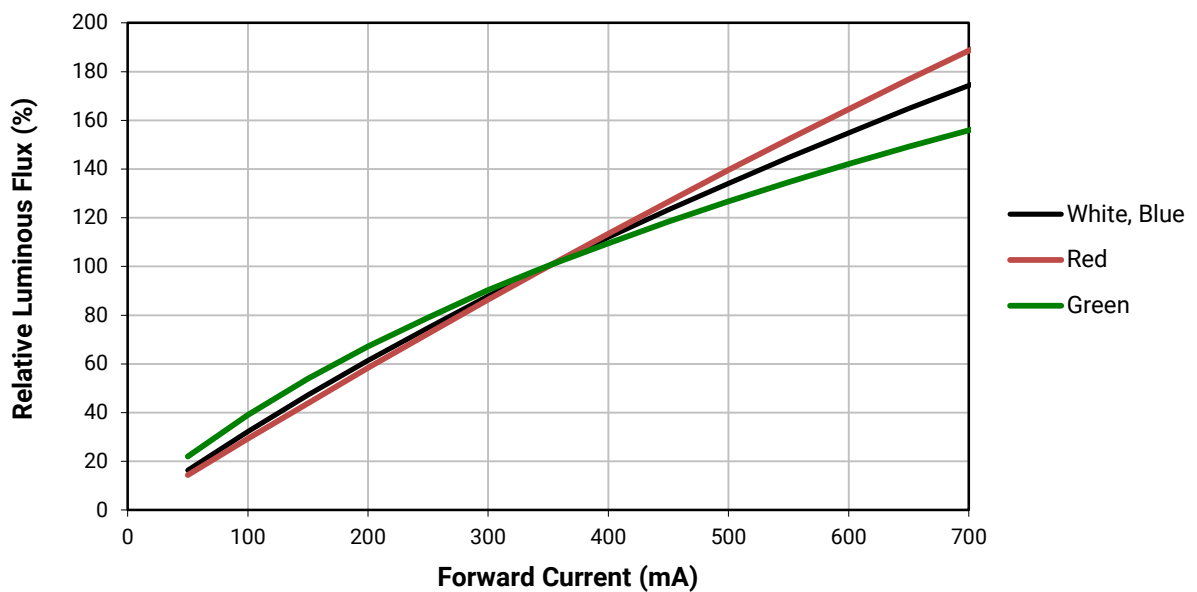
**ELECTRICAL CHARACTERISTICS ( $T_j = 25\text{ }^\circ\text{C}$ )**

The following graph represents typical performance of each LED die in the MC-E LED.



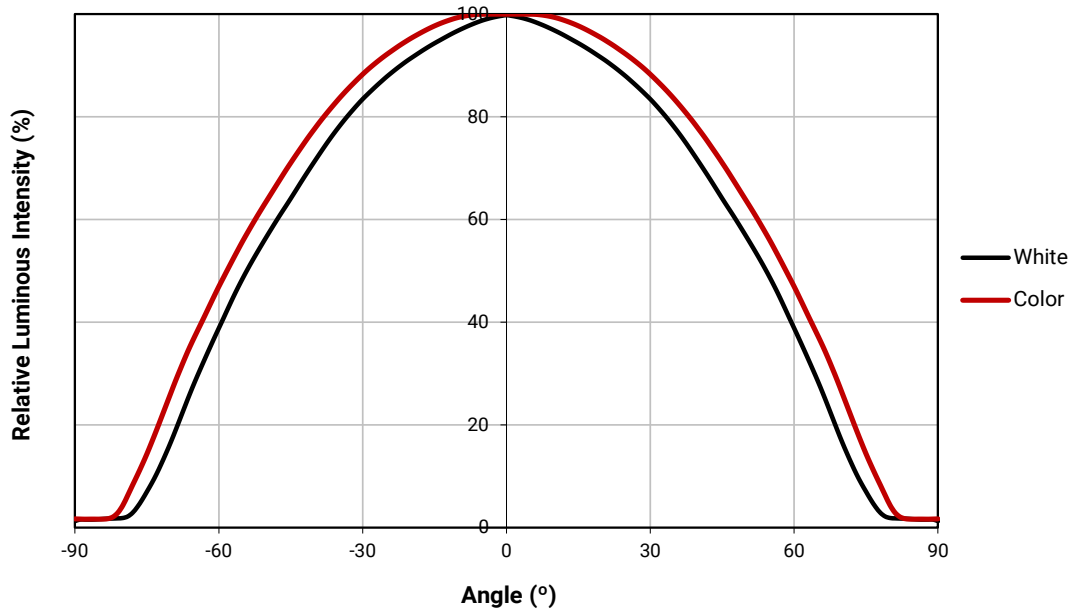
**RELATIVE INTENSITY VS. CURRENT ( $T_j = 25\text{ }^\circ\text{C}$ )**

The following graph represents typical performance of each LED die in the MC-E LED.



**TYPICAL SPATIAL RADIATION PATTERN**

The following graph represents typical output of the MC-E LED with all four LEDs on simultaneously.



## PERFORMANCE GROUPS – BRIGHTNESS

MC-E white and EasyWhite® LEDs are tested for luminous flux and placed into one of the following luminous-flux groups:

Group Code	Minimum Luminous Flux @ 350 mA (lm)	Maximum Luminous Flux @ 350 mA (lm)
F	210	240
G	240	280
H	280	320
J	320	370
K	370	430
M	430	490

- Flux and chromaticity are measured with each LED die connected to independent drive circuits at 350 mA.
- The flux and chromaticity are measured with all LEDs lit simultaneously.

Each LED die in the MC-E color LED is tested individually for luminous flux and placed into one of the following luminous-flux groups. The luminous-flux groups for the MC-E color LED specify only minimum flux and do not have a maximum.

Color	Group Code	Minimum Luminous Flux @ 350 mA
Red	K	30.6
Green	P	67.2
Blue	E	8.2
White	J	80
	K	100

**PERFORMANCE GROUPS – CHROMATICITY ( $I_F = 350$  mA PER EMITTER)**

MC-E white LEDs and the white LED in the MC-E color LED are tested for chromaticity and placed into one of the regions defined by the bounding coordinates on the following pages. The MC-E white and EasyWhite LEDs are tested with each LED die connected to independent drive circuits at 350 mA and all LED die lit simultaneously. The white LED in the MC-E Color LED is tested individually.

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		
3A	.3371	.3490	3B	.3376	.3616	3C	.3463	.3687	3D	.3451	.3554		
	.3451	.3554		.3463	.3687		.3551	.3760		.3533	.3620		
	.3440	.3428		.3451	.3554		.3533	.3620		.3451	.3554	.3515	.3487
	.3366	.3369		.3371	.3490		.3451	.3554		.3440	.3428		
4A	.3512	.3465	4B	.3529	.3597	4C	.3615	.3659	4D	.3590	.3521		
	.3529	.3597		.3548	.3736		.3641	.3804		.3615	.3659		
	.3615	.3659		.3641	.3804		.3736	.3874		.3702	.3722	.3702	.3722
	.3590	.3521		.3615	.3659		.3702	.3722		.3670	.3578		
5A	.3670	.3578	5B	.3702	.3722	5C	.3825	.3798	5D	.3783	.3646		
	.3702	.3722		.3736	.3874		.3869	.3958		.3825	.3798		
	.3825	.3798		.3869	.3958		.4006	.4044		.3950	.3875	.3950	.3875
	.3783	.3646		.3825	.3798		.3950	.3875		.3898	.3716		
6A	.3889	.3690	6B	.3941	.3848	6C	.4080	.3916	6D	.4017	.3751		
	.3941	.3848		.3996	.4015		.4146	.4089		.4080	.3916	.4080	.3916
	.4080	.3916		.4146	.4089		.4299	.4165		.4221	.3984	.4221	.3984
	.4017	.3751		.4080	.3916		.4221	.3984		.4147	.3814		
7A	.4147	.3814	7B	.4221	.3984	7C	.4342	.4028	7D	.4259	.3853		
	.4221	.3984		.4299	.4165		.4430	.4212		.4342	.4028		
	.4342	.4028		.4430	.4212		.4562	.4260		.4465	.4071	.4465	.4071
	.4259	.3853		.4342	.4028		.4465	.4071		.4373	.3893		
8A	.4373	.3893	8B	.4465	.4071	8C	.4582	.4099	8D	.4483	.3919		
	.4465	.4071		.4562	.4260		.4687	.4289		.4582	.4099		
	.4582	.4099		.4687	.4289		.4813	.4319		.4700	.4126	.4700	.4126
	.4483	.3919		.4582	.4099		.4700	.4126		.4593	.3944		
40F	.3744	.3685	35F	.3981	.3800	30F	.4242	.3919	27F	.4475	.3994		
	.3782	.3837		.4040	.3966		.4322	.4096		.4573	.4178		
	.3912	.3917		.4186	.4037		.4449	.4141		.4695	.4207		
	.3863	.3758		.4116	.3865		.4359	.3960		.4589	.4021		
40H	.3784	.3741	35H	.4030	.3857	30H	.4291	.3973	27H	.4528	.4046		
	.3804	.3818		.4061	.3941		.4333	.4062		.4578	.4138		
	.3867	.3857		.4132	.3976		.4395	.4084		.4638	.4152		
	.3844	.3778		.4099	.3890		.4351	.3994		.4586	.4021		

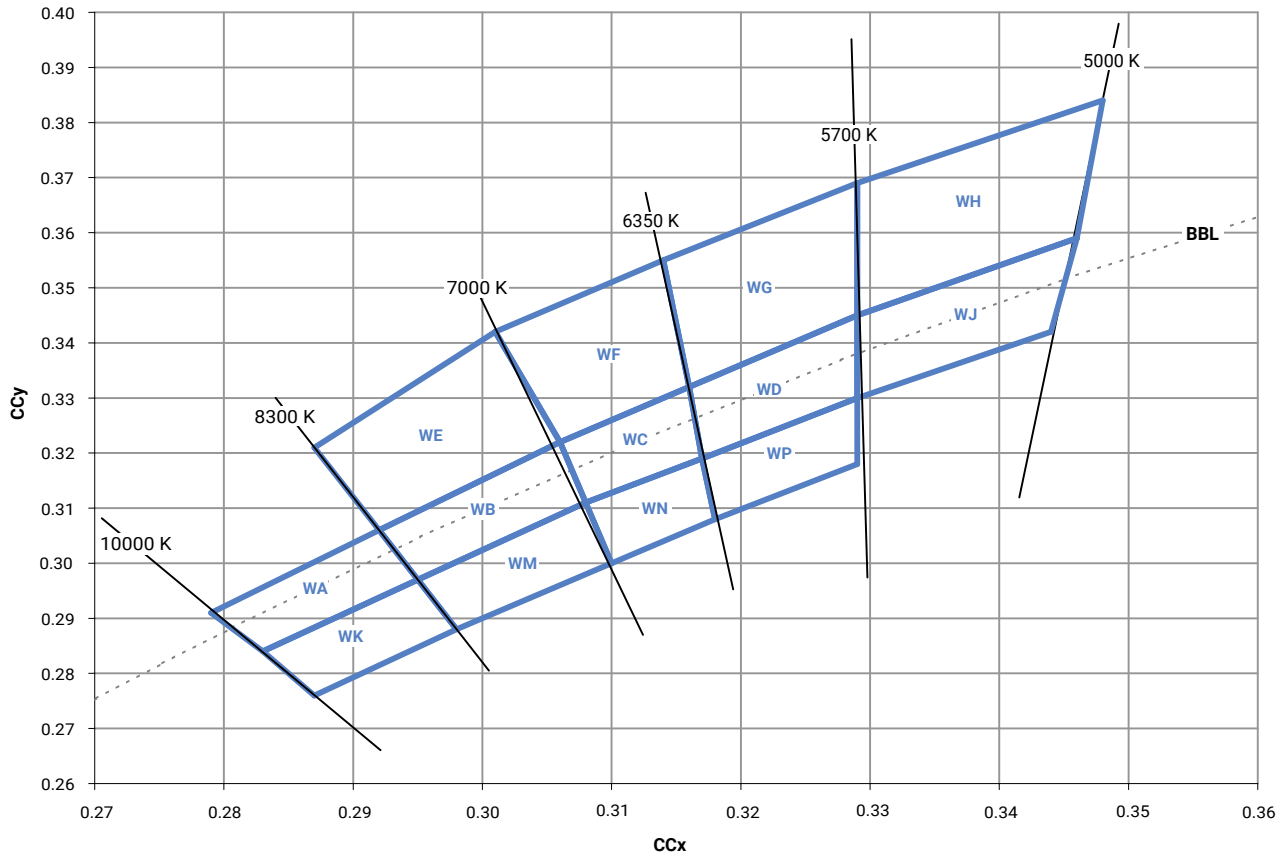
**PERFORMANCE GROUPS - DOMINANT WAVELENGTH**

The red, green and blue LEDs in the MC-E color LED are tested individually for dominant wavelength (DWL) and sorted into one of the DWL bins defined below.

Color	DWL Group	Minimum DWL @ 350 mA	Maximum DWL @ 350 mA
Blue	K	450	455
	L	455	460
	M	460	465
Green	2	520	525
	3	525	530
	4	530	535
Red	A	620	630

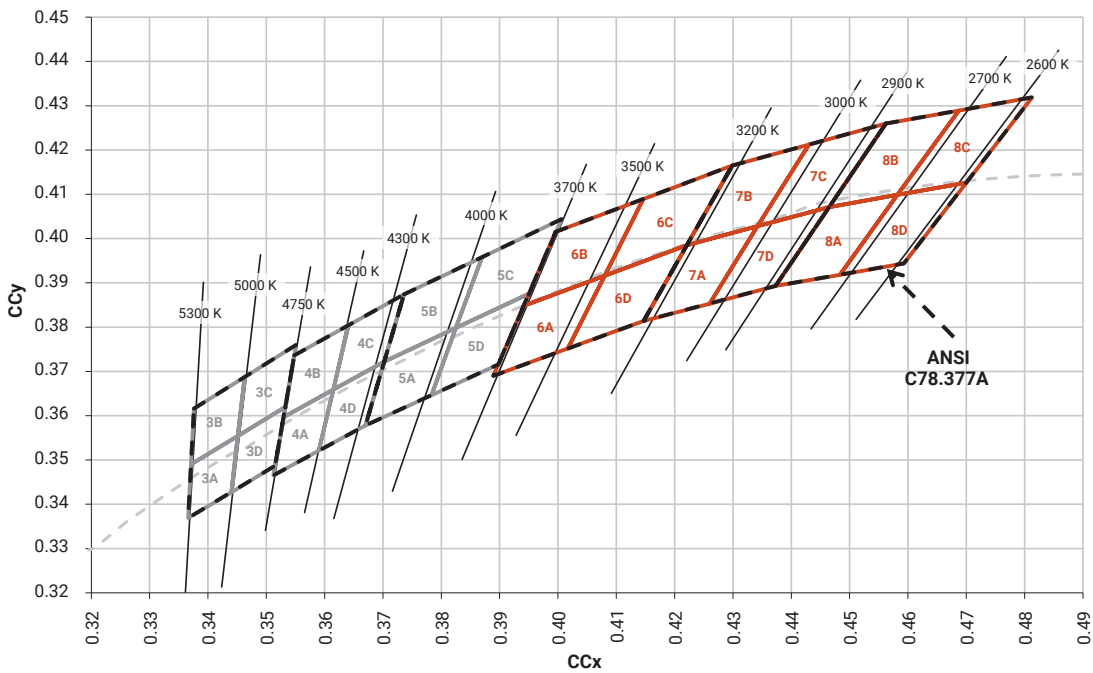
**CREE LED'S STANDARD CHROMATICITY REGIONS PLOTTED ON THE 1931 CIE CURVE**

Cool White



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

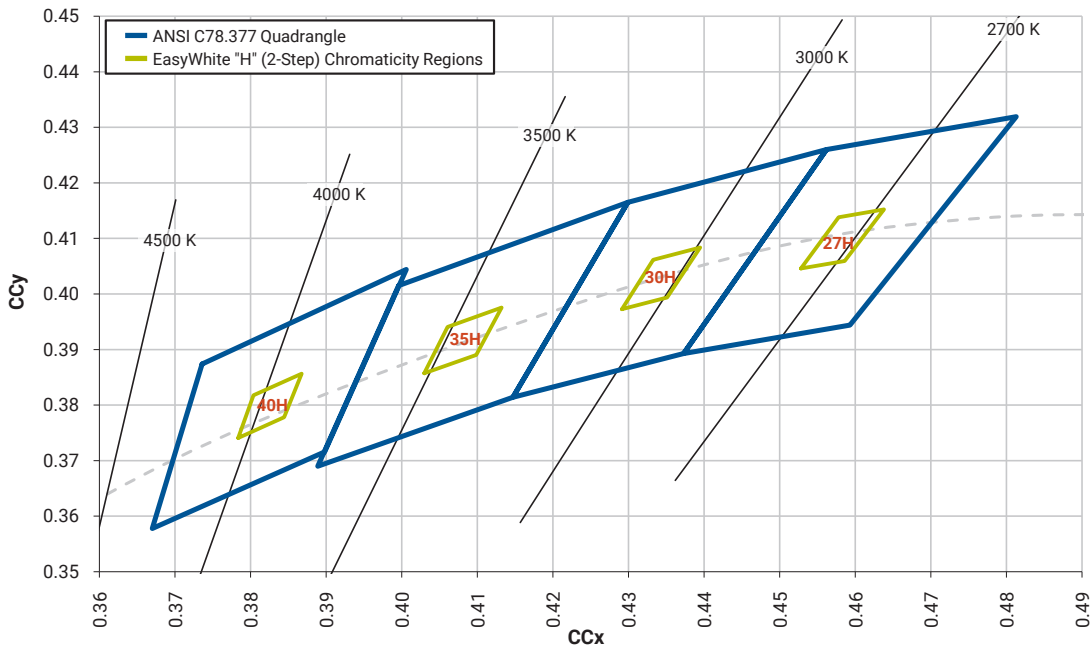
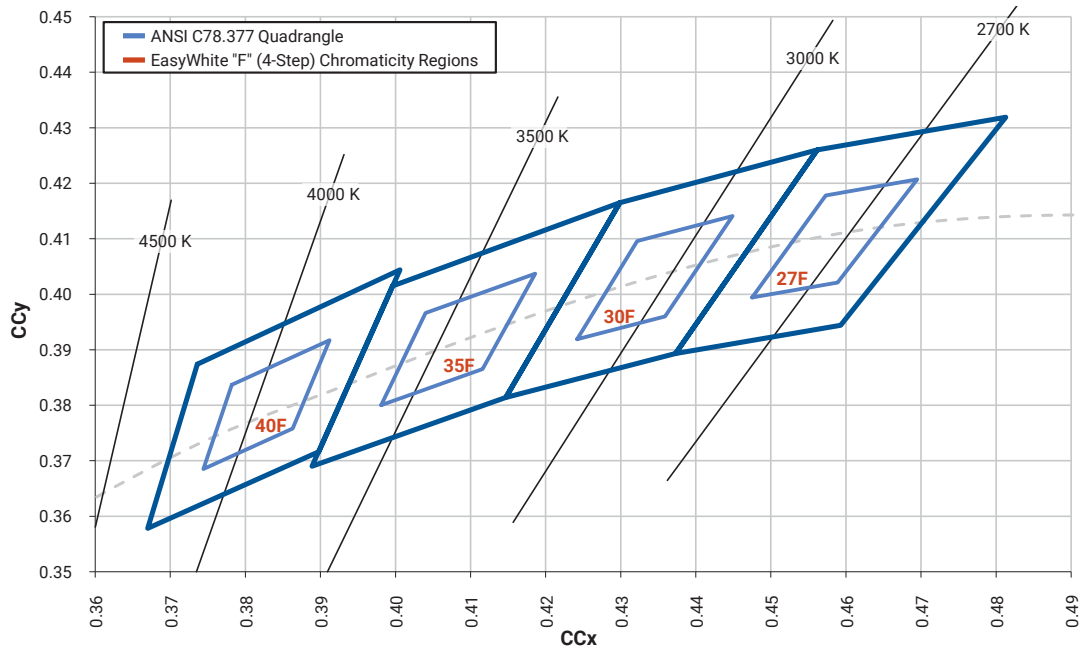
Neutral and Warm White





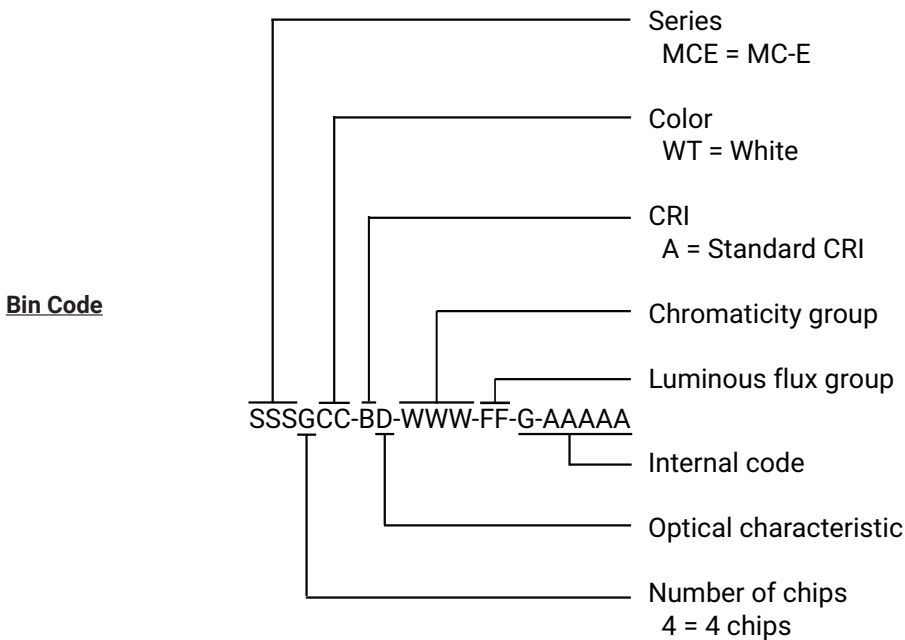
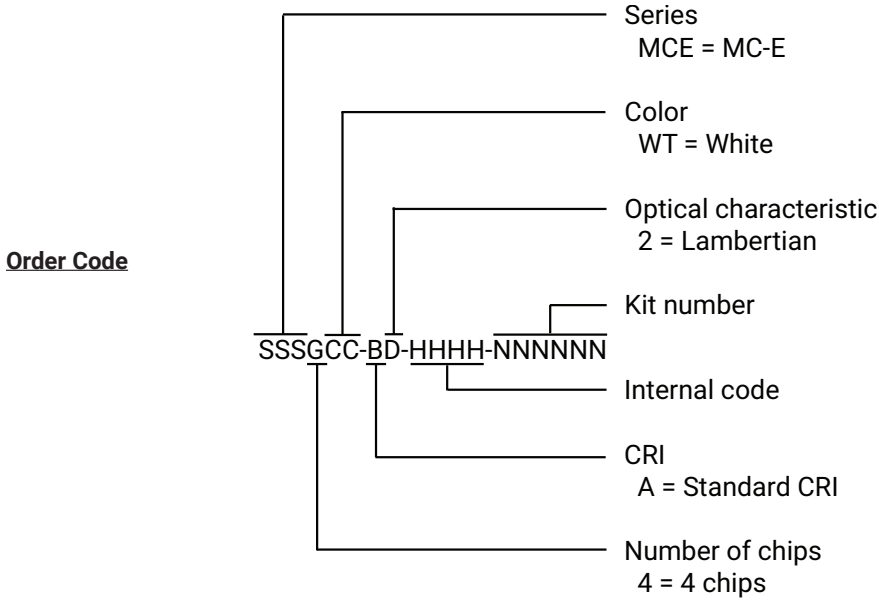
**CREE LED'S STANDARD CHROMATICITY REGIONS PLOTTED ON THE 1931 CIE CURVE - CONTINUED**

EasyWhite



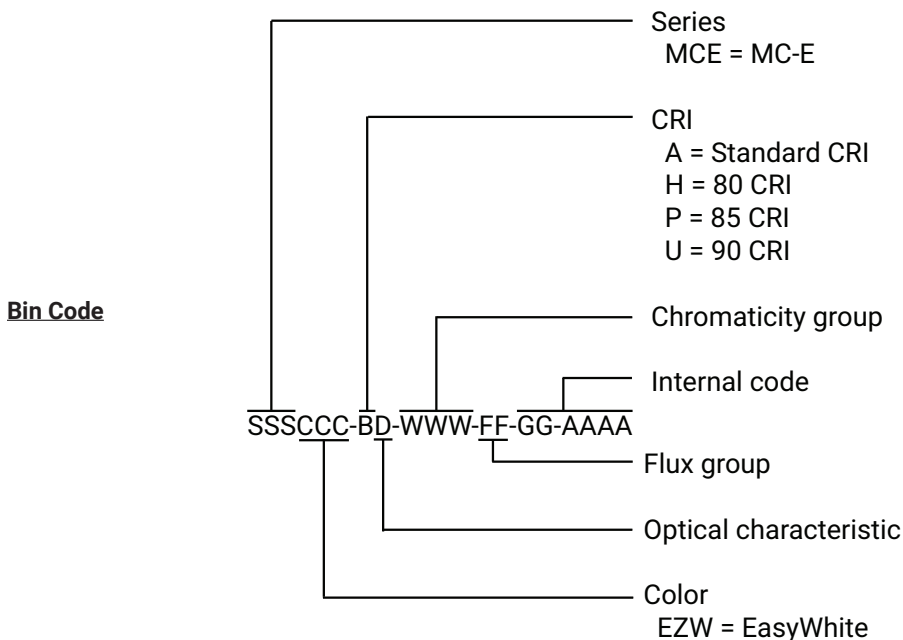
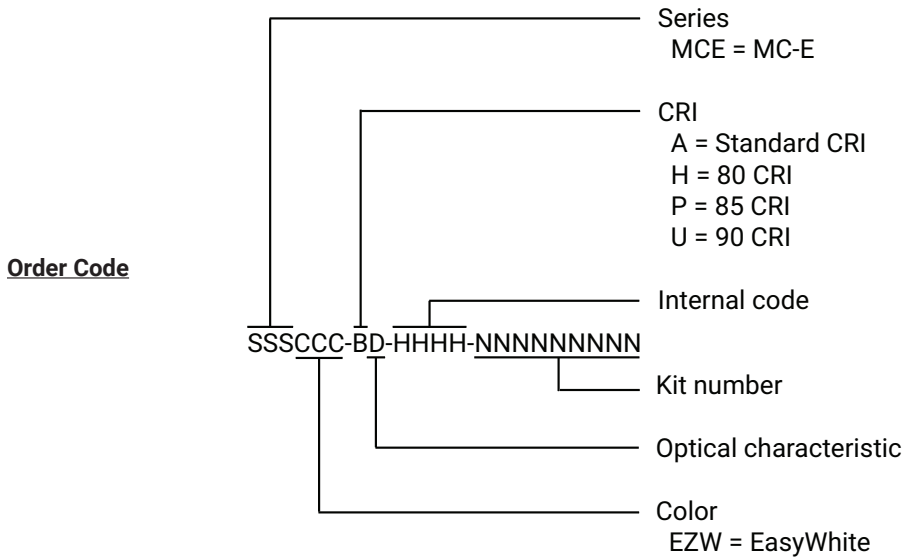
**BIN AND ORDER CODE FORMAT (WHITE)**

Bin codes and order codes are configured in the following manner:



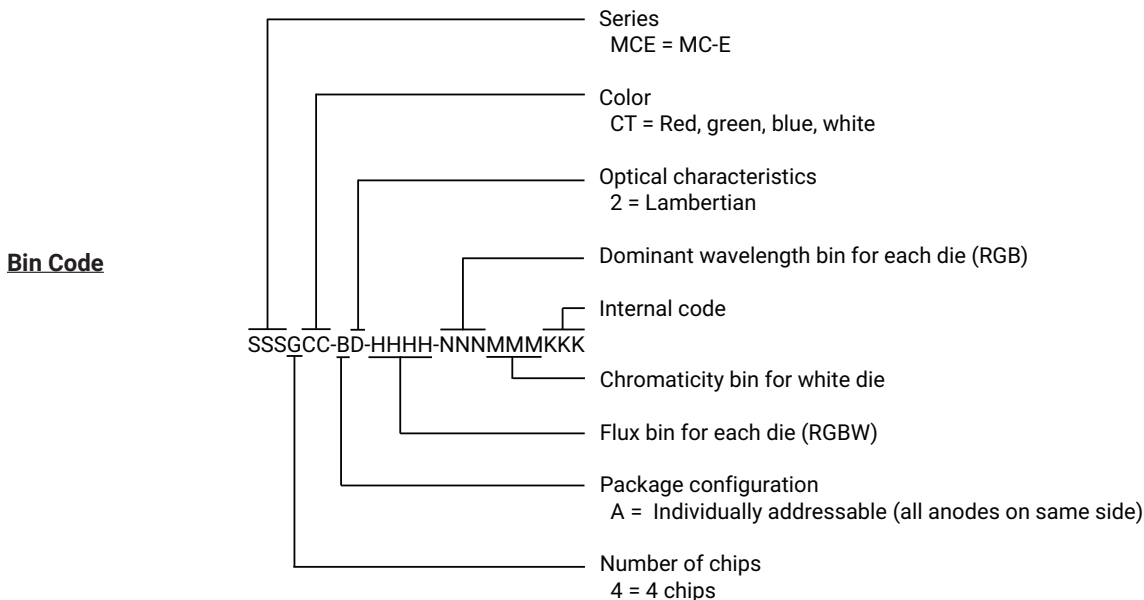
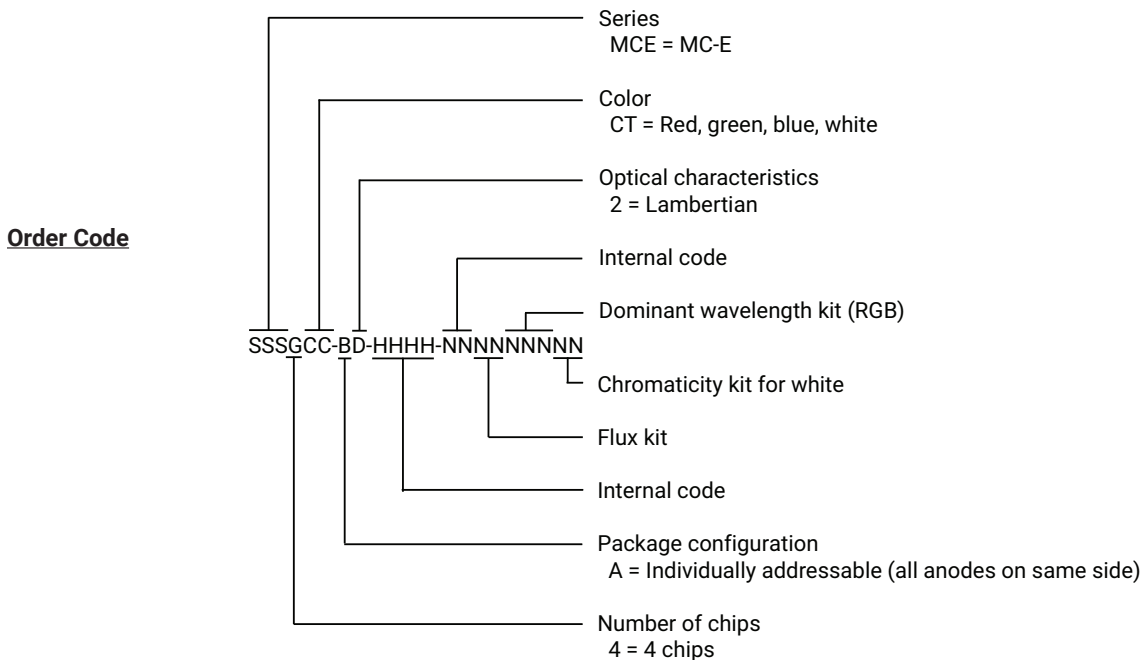
**BIN AND ORDER CODE FORMAT (EASYWHITE®)**

Bin codes and order codes are configured in the following manner:



**BIN AND ORDER CODE FORMAT (COLOR)**

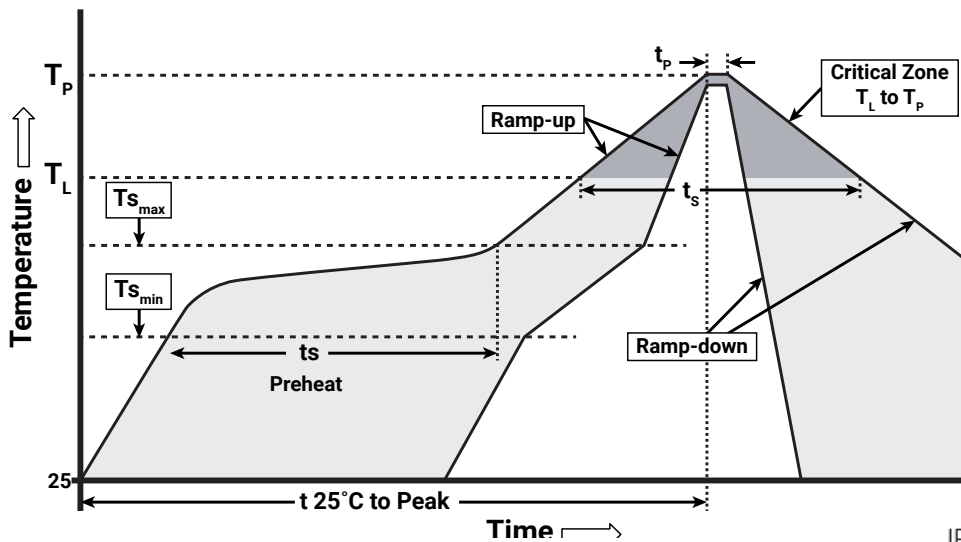
Bin codes and order codes are configured in the following manner:



**REFLOW SOLDERING CHARACTERISTICS**

In testing, Cree LED has found MC-E LEDs to be compatible with JEDEC J-STD-020C, using the parameters listed below. As a general guideline, Cree LED recommends that users follow the recommended soldering profile provided by the manufacturer of the solder paste used, and therefore it is the lamp or luminaire manufacturer’s responsibility to determine applicable soldering requirements.

Note that this general guideline may not apply to all PCB designs and configurations of reflow soldering equipment.



IPC/JEDEC J-STD-020C

Profile Feature	Lead-Free Solder
Average Ramp-Up Rate ( $T_{s_{max}}$ to $T_p$ )	1.2 °C/second
Preheat: Temperature Min ( $T_{s_{min}}$ )	120 °C
Preheat: Temperature Max ( $T_{s_{max}}$ )	170 °C
Preheat: Time ( $t_{s_{min}}$ to $t_{s_{max}}$ )	65-150 seconds
Time Maintained Above: Temperature ( $T_l$ )	217 °C
Time Maintained Above: Time ( $t_l$ )	45-90 seconds
Peak/Classification Temperature ( $T_p$ )	235 - 245 °C
Time Within 5 °C of Actual Peak Temperature ( $t_p$ )	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 LED's control and are not intended or provided as operational specifications for the products. Calculated values are provided for informational purposes only and are not intended or provided as specifications.

### Pre-Release Qualification Testing

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

### Lumen Maintenance

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

### Moisture Sensitivity

Cree LED recommends keeping MC-E LEDs in the provided, resealable moisture-barrier packaging (MBP) until immediately prior to soldering. Unopened MBPs that contain LEDs do not need special storage for moisture sensitivity.

Once the MBP is opened, MC-E LEDs should be handled and stored as MSL 4 per JEDEC J-STD-033, meaning they have limited exposure time before damage to the LED may occur during the soldering operation. The table on the right specifies the maximum exposure time in days depending on temperature and humidity conditions. LEDs with exposure time longer than the specified maximums must be baked according to the baking conditions listed below.

Temperature	Maximum Percent Relative Humidity						
	30%	40%	50%	60%	70%	80%	90%
30 °C	9	5	4	3	1	1	1
25 °C	12	7	5	4	2	1	1
20 °C	17	9	7	6	2	2	1

### Baking Conditions

It is not necessary to bake all MC-E LEDs. Only the LEDs that meet all of the following criteria must be baked:

- LEDs that have been removed from the original MBP.
- LEDs that have been exposed to a humid environment longer than listed in the Moisture Sensitivity section above.
- LEDs that have not been soldered.

LEDs should be baked at 70 °C for 24 hours. LEDs may be baked on the original reels. Remove LEDs from the MBP before baking. Do not bake parts at temperatures higher than 70 °C. This baking operation resets the exposure time as defined in the Moisture Sensitivity section above.

## NOTES - CONTINUED

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### Storage Conditions

MC-E LEDs that have been removed from the original MBP but not soldered yet should be stored in a room or cabinet that will maintain an atmosphere of  $25 \pm 5$  °C and no greater than 10% RH. For LEDs stored in these conditions, storage time does not add to exposure time as defined in the above Moisture Sensitivity section.

### RoHS Compliance

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

### REACH Compliance

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

### UL® Recognized Component

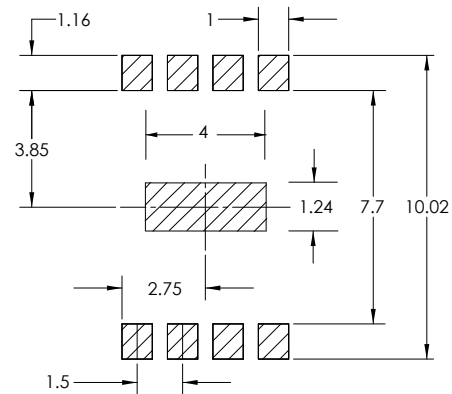
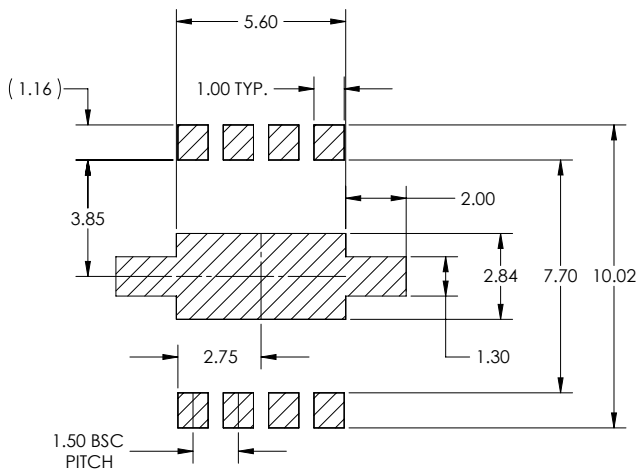
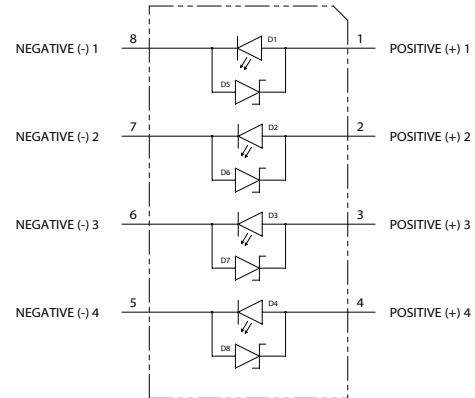
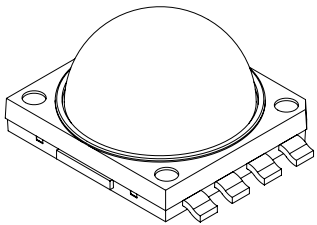
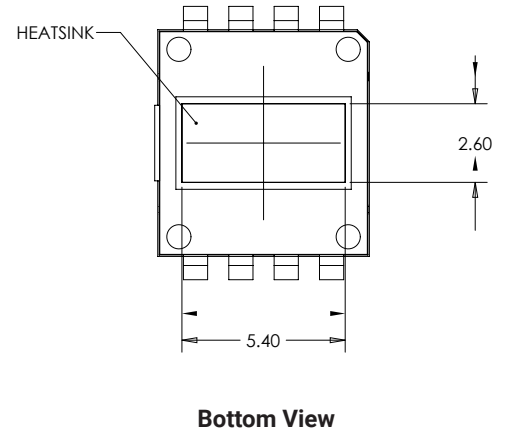
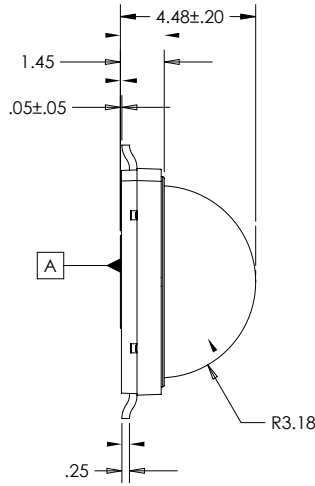
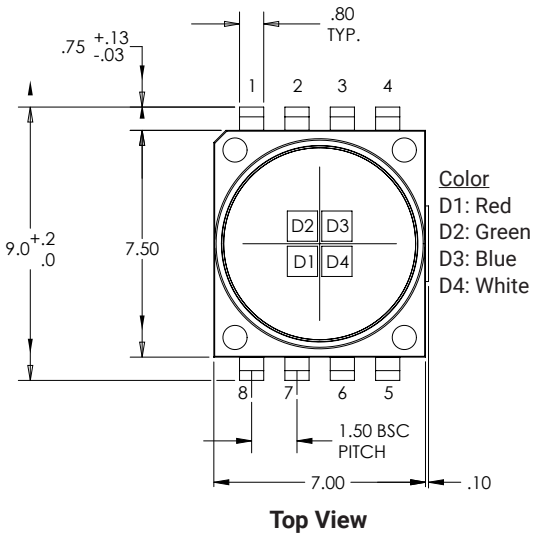
This product meets the requirements to be considered a UL Recognized Component with Level 1 enclosure consideration. The LED package or a portion thereof has not been investigated as a fire enclosure or a fire and electrical enclosure per ANSI/UL 8750.

### Vision Advisory

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

**MECHANICAL DIMENSIONS**

All measurements are ±.1 mm unless otherwise indicated.

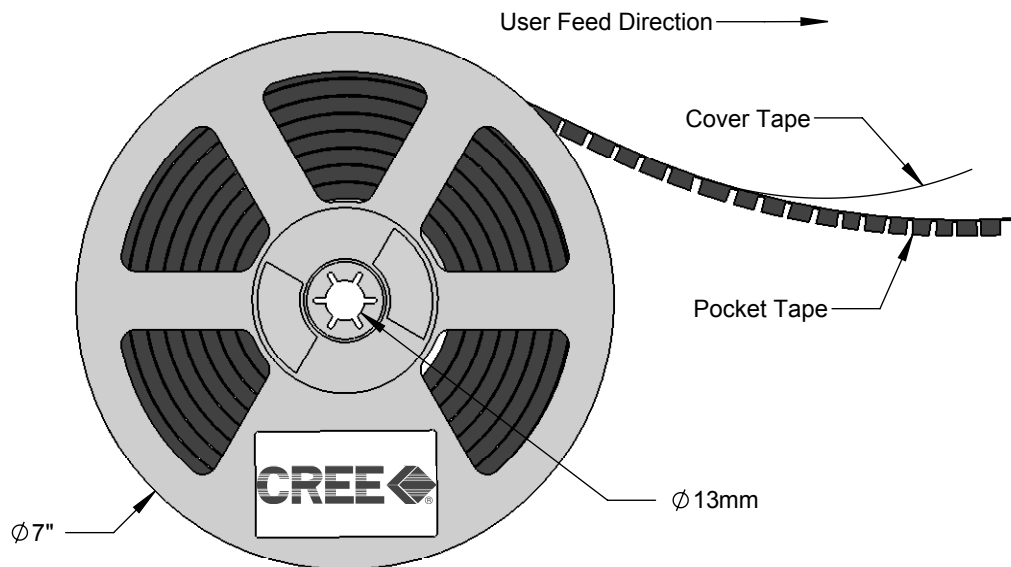
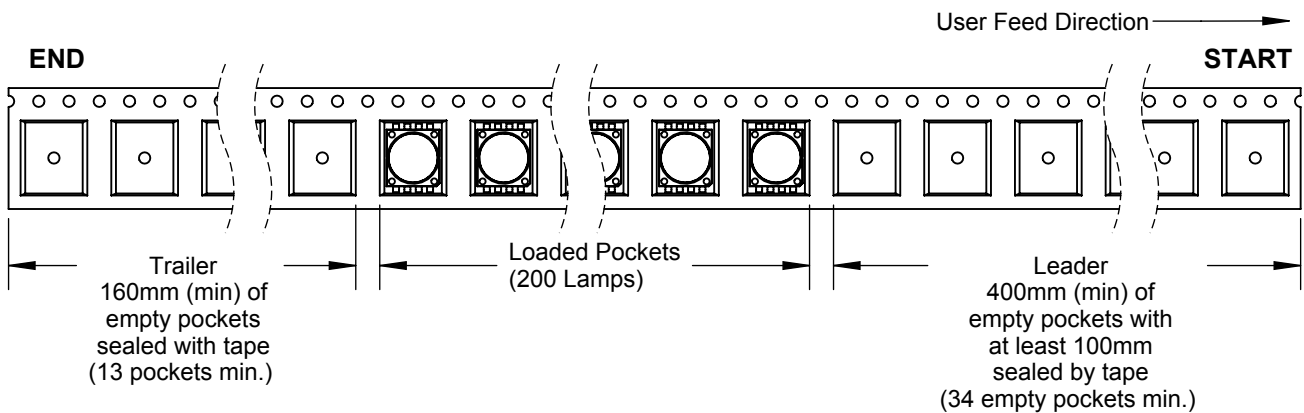
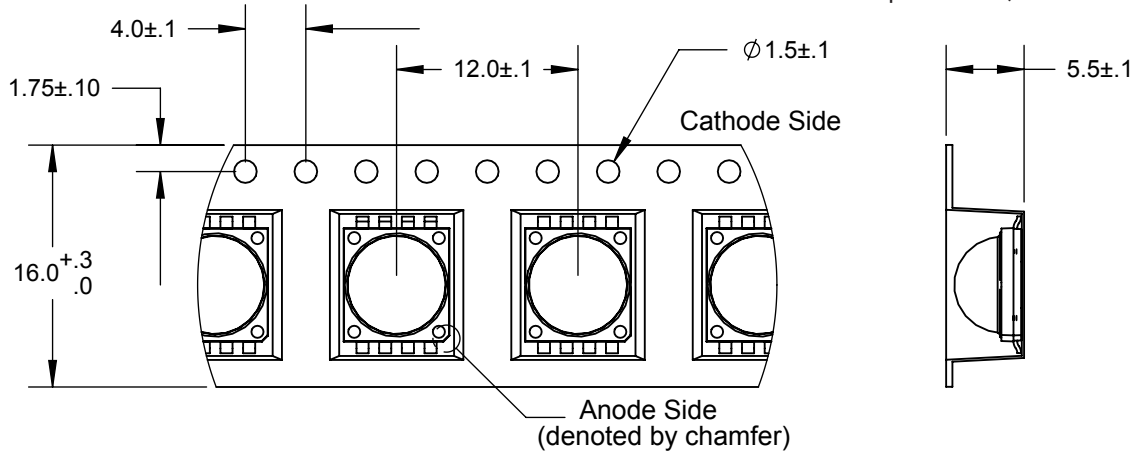




**TAPE AND REEL**

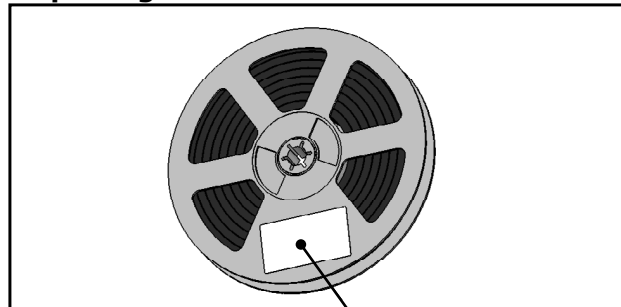
All Cree LED carrier tapes conform to EIA-481D, Automated Component Handling Systems Standard.

Except as noted, all measurements in mm.



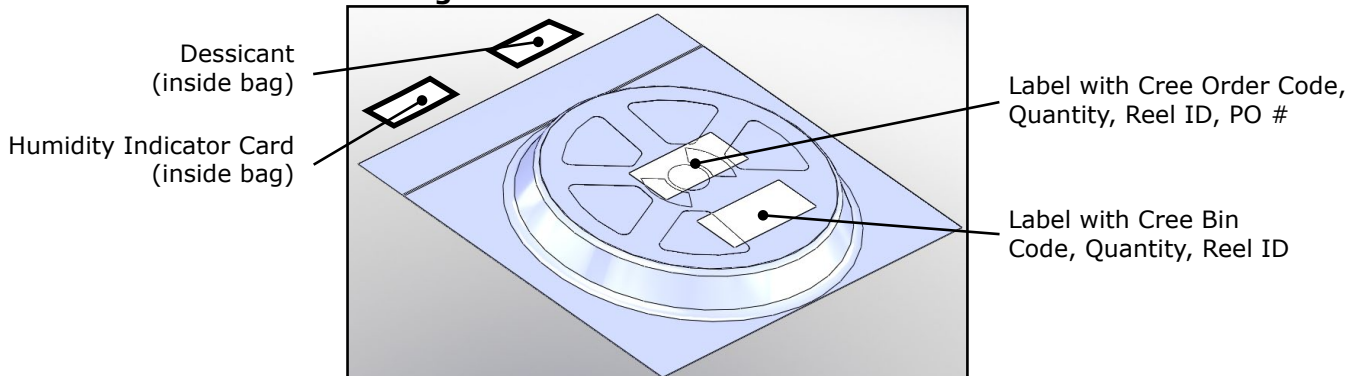
**PACKAGING**

**Unpackaged Reel**



Label with Cree Bin Code,  
Quantity, Reel ID

**Packaged Reel**



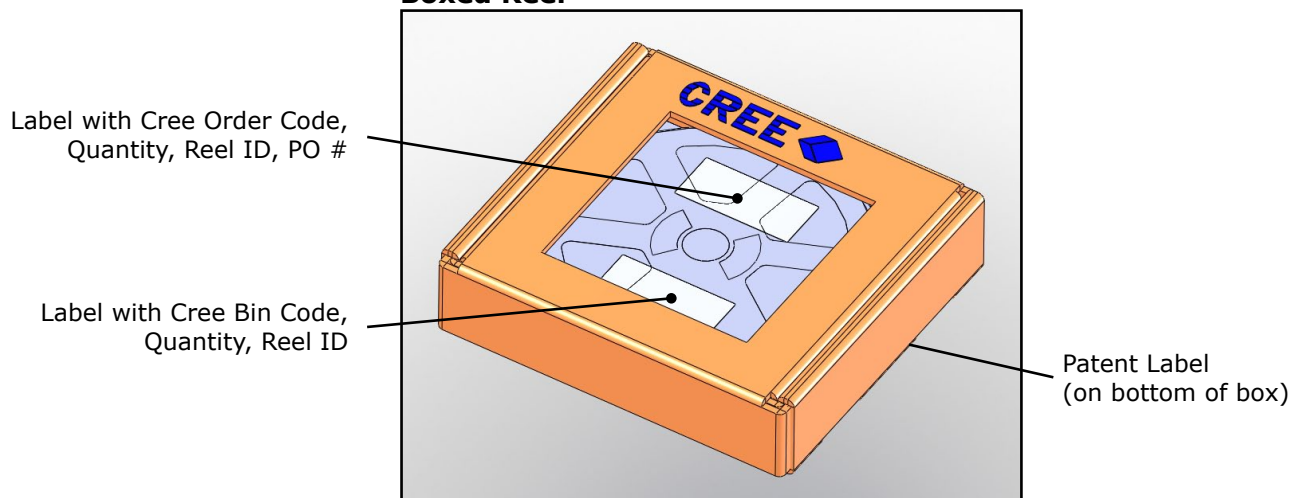
Desiccant  
(inside bag)

Humidity Indicator Card  
(inside bag)

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)