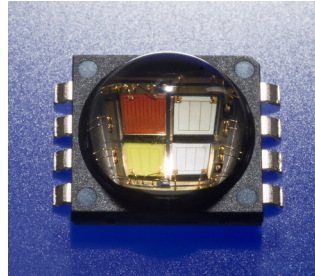
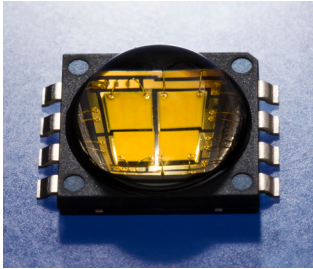


Cree® XLamp® MC-E LED



PRODUCT DESCRIPTION

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

Cree 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
- Maximum drive current: 700 mA per LED die
- Reflow solderable – JEDEC J-STD-020
- Electrically neutral thermal path
- RoHS and REACH-compliant

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FLUX CHARACTERISTICS (T_j = 25°C)

The following tables provide several base order codes for XLamp MC-E. It is important to note that the base order codes listed here are a subset of the total available order codes for the product family. For more order codes, as well as a complete description of the order-code nomenclature, please consult the XLamp MC-E Binning and Labeling document.

Part	Color	CCT / Dominant Wavelength Range		Base order codes Min Luminous Flux (lm) @ 350 mA*		Order Code
		Min.	Max.	Group	Flux (lm)	
White	Cool White	5,000 K	10,000 K	K	370	MCE4WT-A2-0000-000K01
				M	430	MCE4WT-A2-0000-000M01
	Neutral White	3,700 K	5,000 K	J	320	MCE4WT-A2-0000-000JE4
				K	370	MCE4WT-A2-0000-000KE4
	Warm White	2,600 K	3,700 K	G	240	MCE4WT-A2-0000-000GE7
				H	280	MCE4WT-A2-0000-000HE7
				J	320	MCE4WT-A2-0000-000JE7
	EasyWhite (4-Step)		4,000 K	K	370	MCEEZW-A1-0000-0000K040F
				J	320	MCEEZW-A1-0000-0000J035F
				J	320	MCEEZW-A1-0000-0000J030F
				H	280	MCEEZW-A1-0000-0000H027F
	EasyWhite (2-Step)		4,000 K	K	370	MCEEZW-A1-0000-0000K040H
				J	320	MCEEZW-A1-0000-0000J035H
				J	320	MCEEZW-A1-0000-0000J030H
				H	280	MCEEZW-A1-0000-0000H027H
	Color	Red	620 nm	630 nm	A5	30.6
Green		520 nm	535 nm	67.2		
Blue		450 nm	465 nm	8.2		
Cool White		5,700 K	7,000 K	100		
Red		620 nm	630 nm	A4	30.6	MCE4CT-A2-0000-00A4AAAB1
Green		520 nm	535 nm		67.2	
Blue		450 nm	465 nm		8.2	
Neutral White		3,700 K	4,300 K		80	

Notes:

- Cree maintains a tolerance of $\pm 7\%$ on flux and power measurements.
- Typical CRI for cool white and neutral white (3,700 K - 10,000 K CCT) is 75.
- Typical CRI for warm white (2,600 K - 3,700 K CCT) and EasyWhite is 80.
- Flux and chromaticity are measured with each LED die connected to independent drive circuits at 350 mA. The flux and chromaticity of XLamp MC-E White are measured with all LEDs lit simultaneously. The flux and color of each LED in XLamp MC-E Color are measured individually.

CHARACTERISTICS - COMPLETE PACKAGE

The following table lists the product characteristics for the XLamp 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 Classification (HBM per Mil-Std-883D)			Class 2	
LED Junction Temperature	°C			150

CHARACTERISTICS - PER LED DIE (WHITE)

The following table lists the product characteristics of each individual LED die within the XLamp 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			5
Forward Voltage (@ 350 mA)	V		3.2	3.9
Forward Voltage (@ 700 mA)	V		3.4	

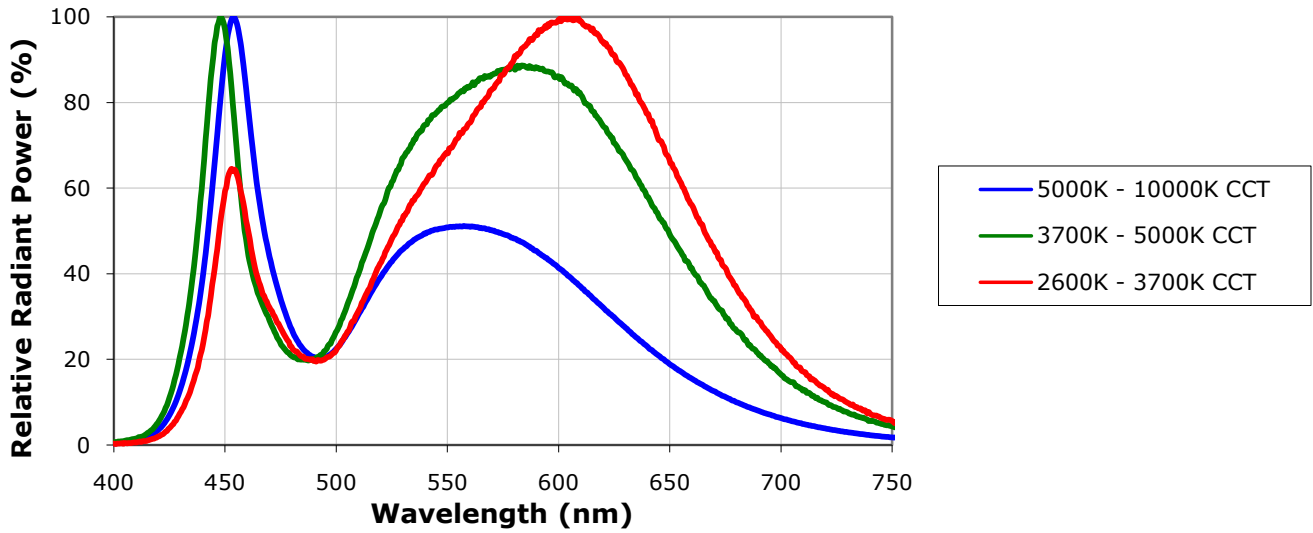
CHARACTERISTICS - PER LED DIE (COLOR)

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

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

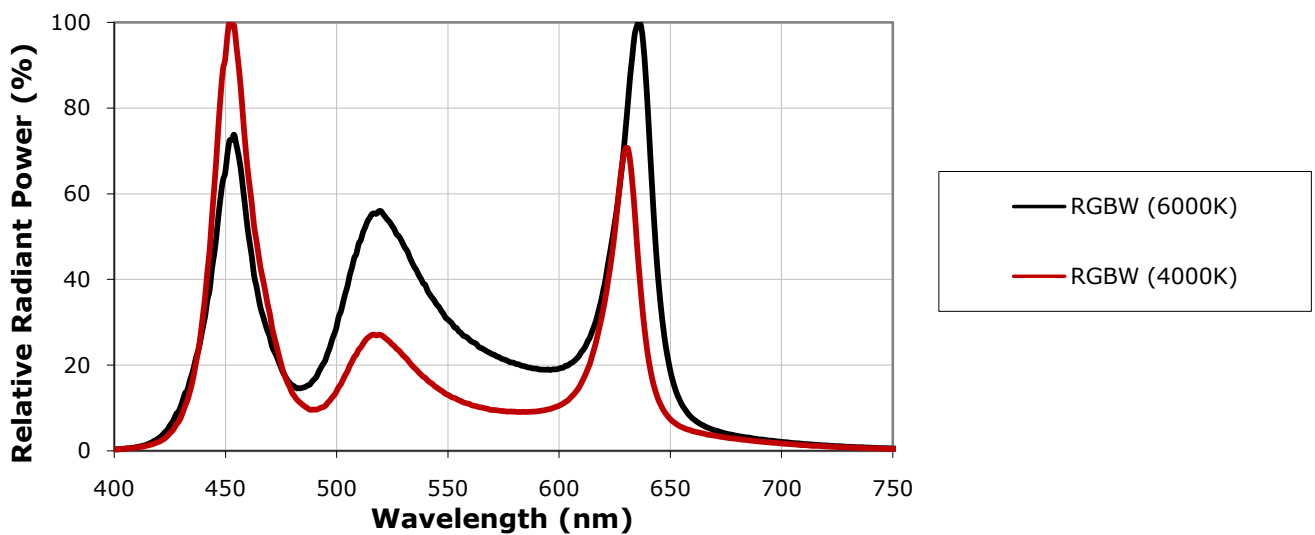
RELATIVE SPECTRAL POWER DISTRIBUTION ($I_f = 350$ MA PER LED) - WHITE

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



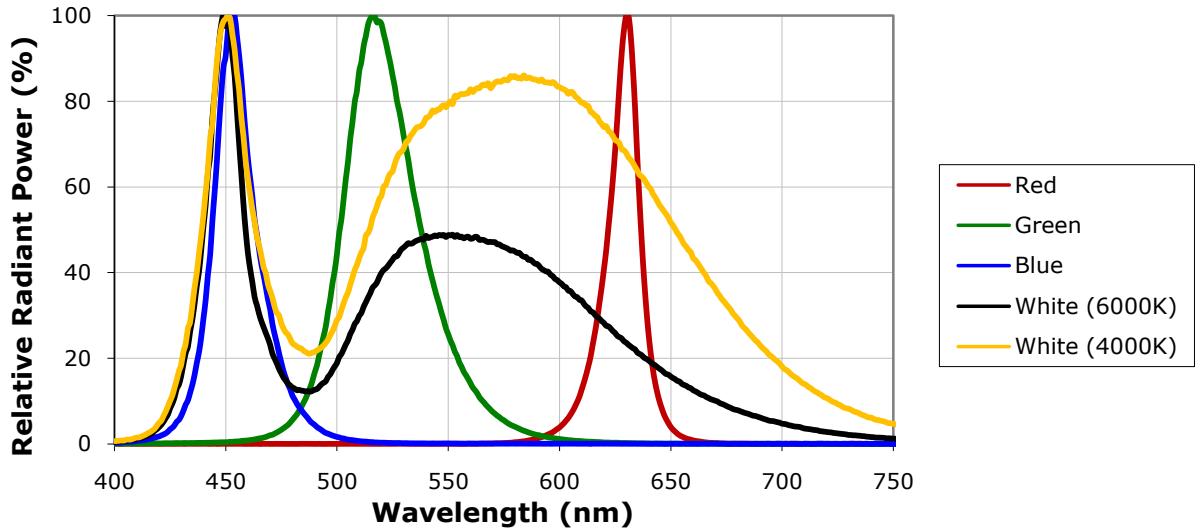
RELATIVE SPECTRAL POWER DISTRIBUTION ($I_f = 350$ MA PER LED) - COLOR

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



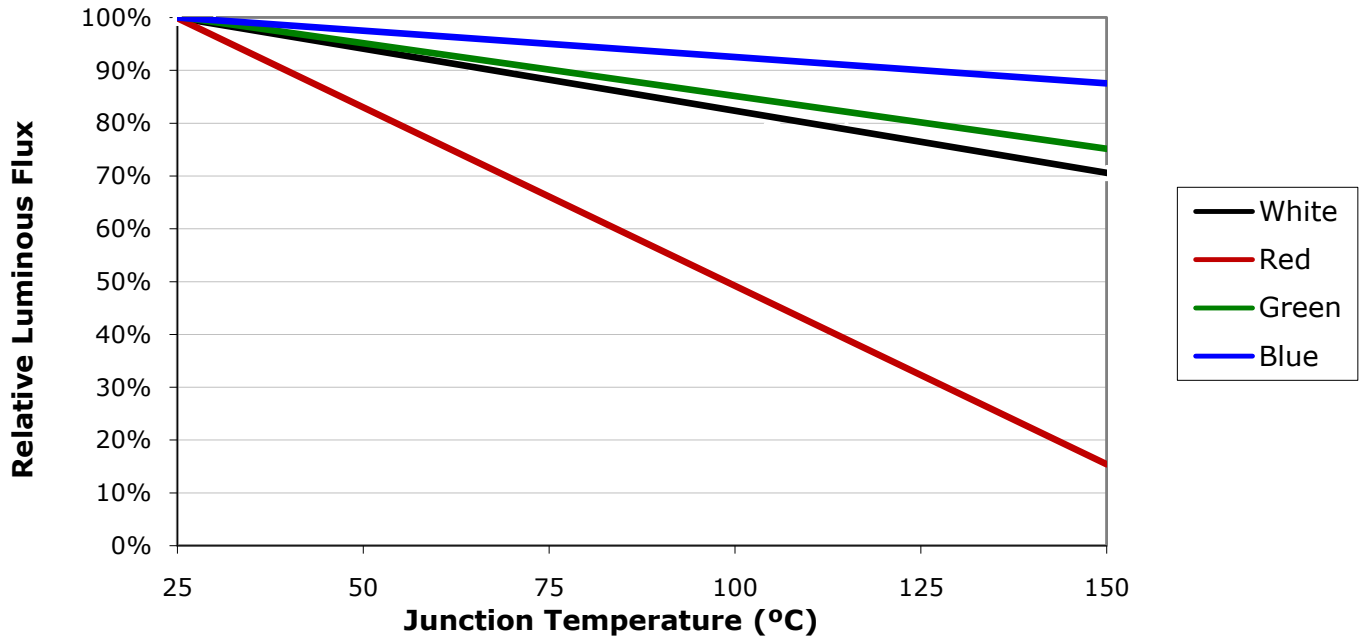
RELATIVE SPECTRAL POWER DISTRIBUTION ($I_f = 350$ MA PER LED) - COLOR (CONTINUED)

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



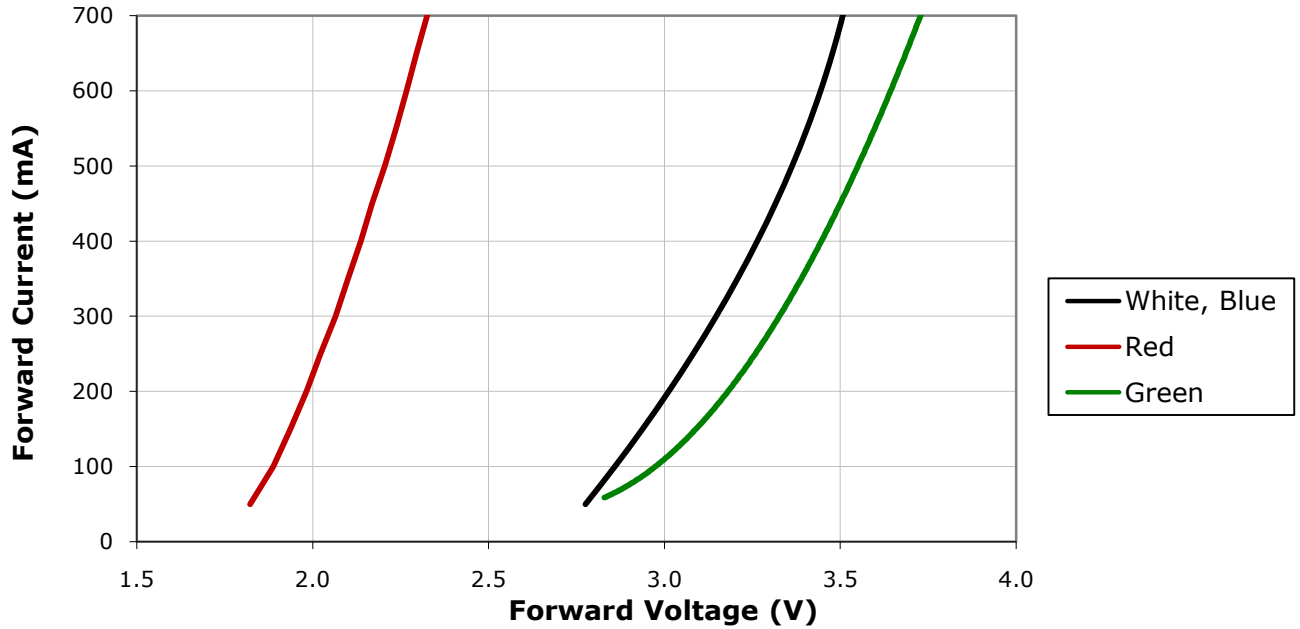
RELATIVE FLUX OUTPUT VS JUNCTION TEMPERATURE ($I_f = 350$ MA)

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



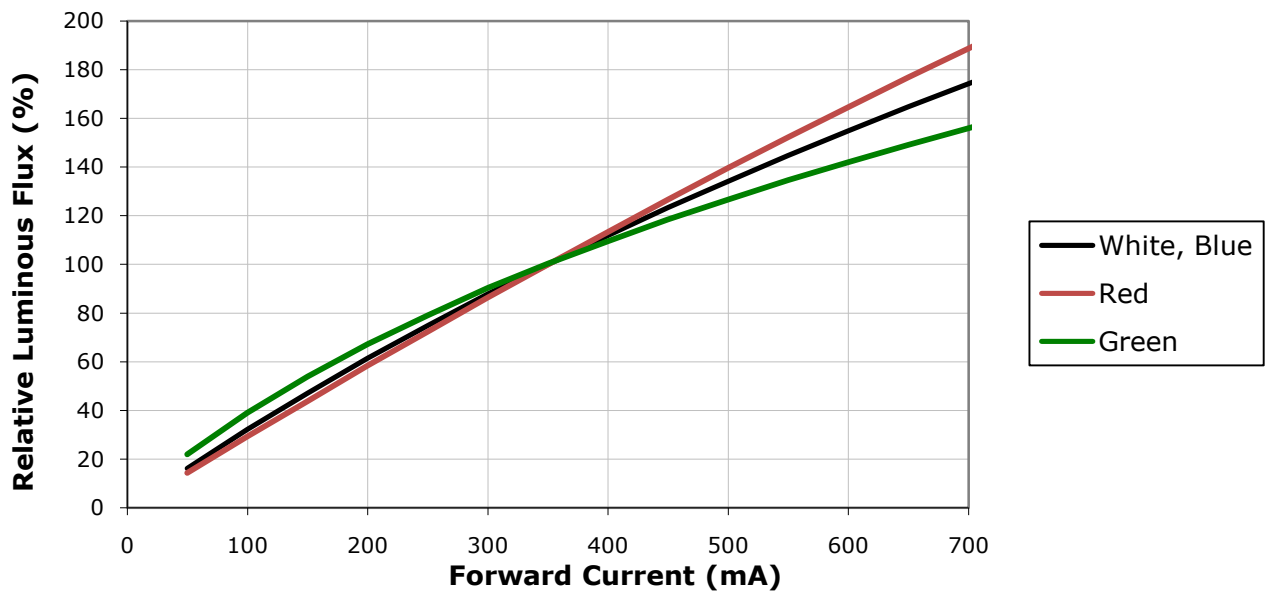
ELECTRICAL CHARACTERISTICS ($T_j = 25^\circ\text{C}$)

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



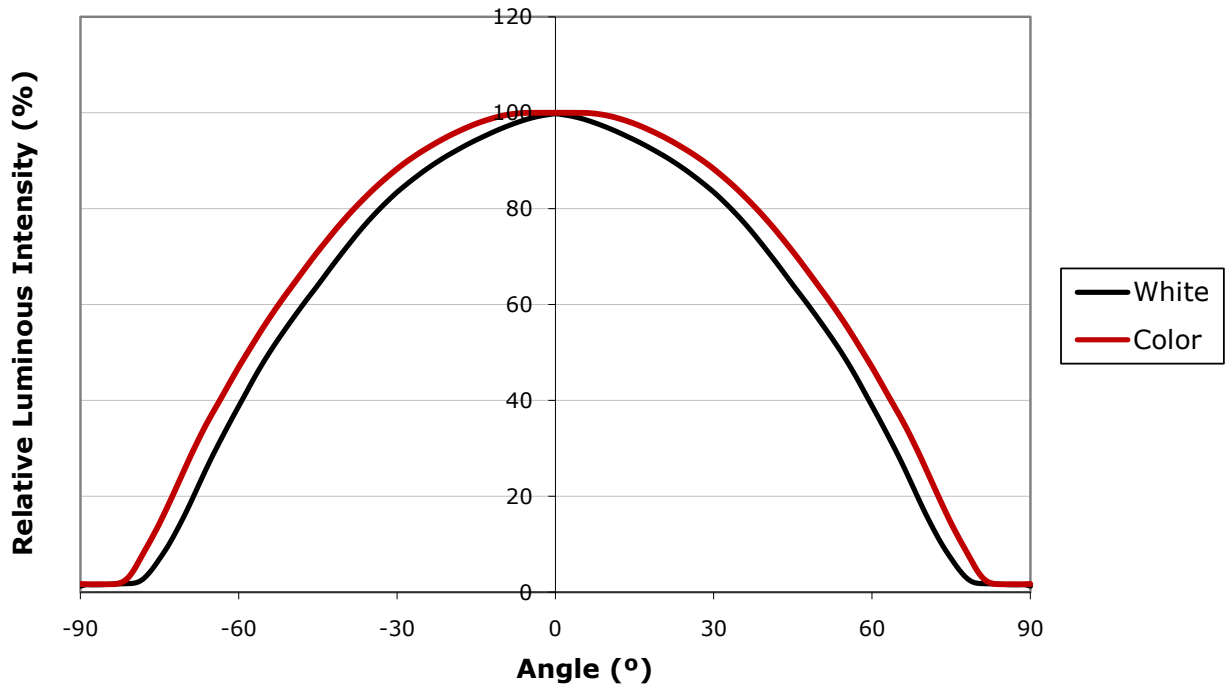
RELATIVE INTENSITY VS. CURRENT ($T_j = 25^\circ\text{C}$)

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



TYPICAL SPATIAL RADIATION PATTERN

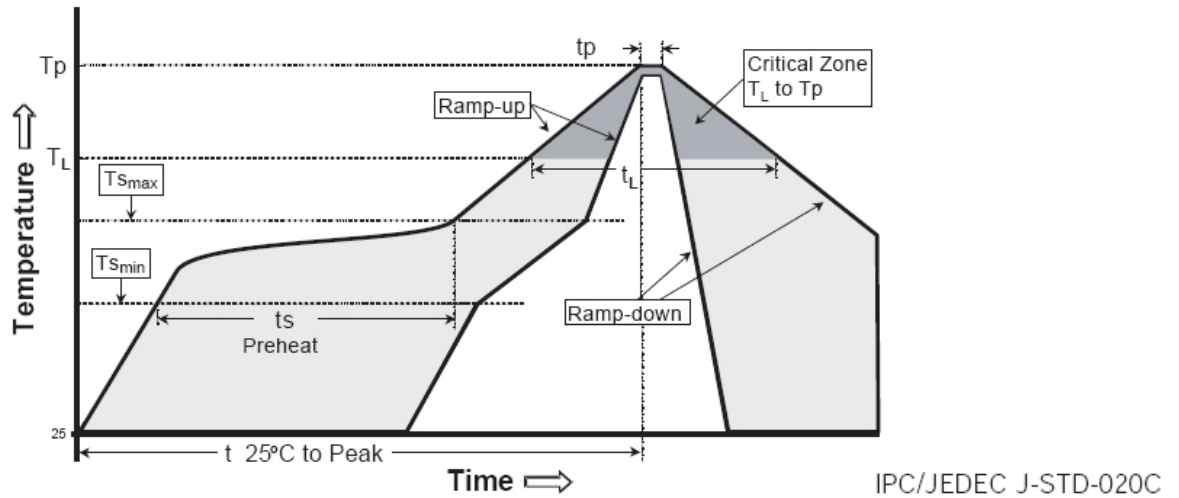
The following graph represents typical output of the XLamp MC-E LED with all four LEDs on simultaneously.



REFLOW SOLDERING CHARACTERISTICS

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

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



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

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

NOTES

Lumen Maintenance Projections

Based on internal long-term reliability testing, Cree projects white XLamp MC-E LEDs to maintain an average of 70% lumen maintenance after 50,000 hours, provided the LED junction temperature is maintained at or below 135°C and each LED is operated with a constant current of up to 700 mA.

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

Moisture Sensitivity

XLamp MC-E LEDs are shipped in sealed, moisture-barrier bags (MBB) designed for long shelf life. If XLamp MC-E LEDs are exposed to moist environments after opening the MBB packaging but before soldering, damage to the LED may occur during the soldering operation. The following de-rating table defines the maximum exposure time (in days)

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

for an XLamp MC-E LED in the listed humidity and temperature conditions. LEDs with exposure time longer than the time specified below must be baked according to the baking conditions listed below.

Baking Conditions

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

- LEDs that have been removed from the original MBB packaging
- 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 80°C for 24 hours. LEDs may be baked on the original reels. Remove LEDs from MBB packaging before baking. Do not bake parts at temperatures higher than 80°C. This baking operation resets the exposure time as defined in the Moisture Sensitivity section above.

Storage Conditions

XLamp MC-E LEDs that have been removed from original MBB packaging but not soldered yet should be stored in a room or cabinet that will maintain an atmosphere of 25 ±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

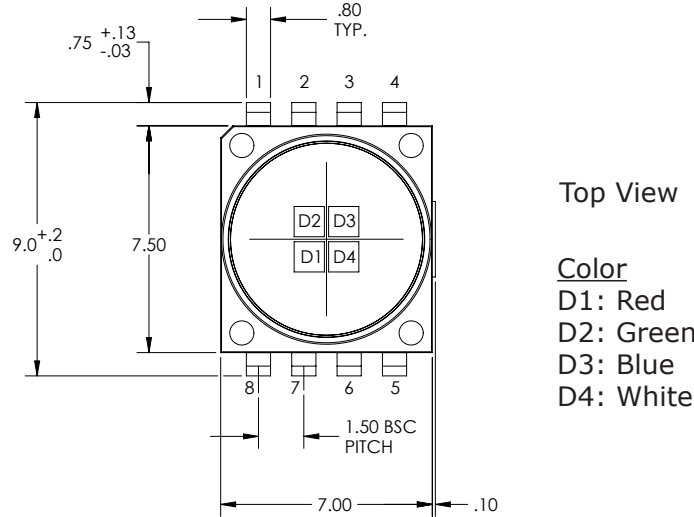
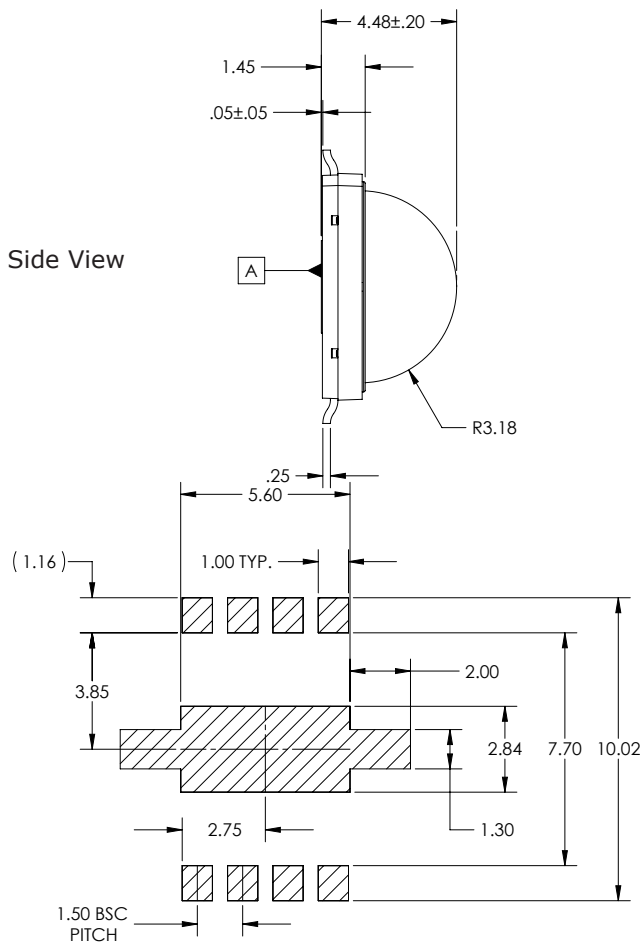
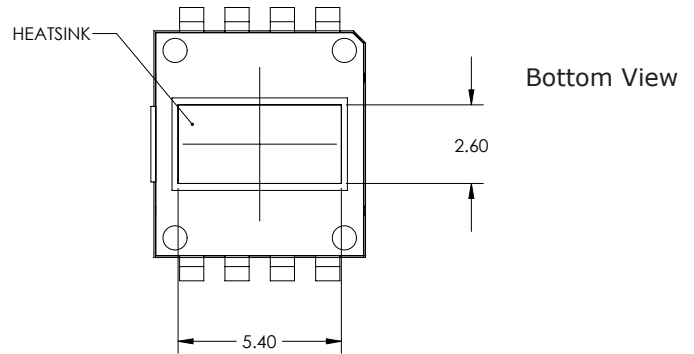
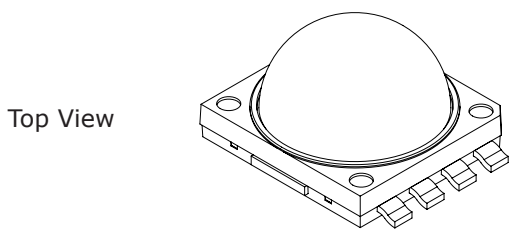
The levels of environmentally sensitive, persistent biologically toxic (PBT), persistent organic pollutants (POP), or otherwise restricted materials in this product are below the maximum concentration values (also referred to as the threshold limits) permitted for such substances, or are used in an exempted application, in accordance with EU Directive 2002/95/EC on the restriction of the use of certain hazardous substances in electrical and electronic equipment (RoHS), as amended through April 21, 2006.

Vision Advisory Claim

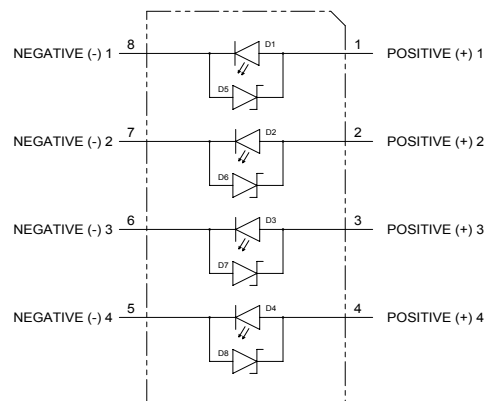
Users should be cautioned not to stare at the light of this LED product. The bright light can damage the eye.

MECHANICAL DIMENSIONS

All measurements are $\pm .1\text{mm}$ unless otherwise indicated.



Color
 D1: Red
 D2: Green
 D3: Blue
 D4: White

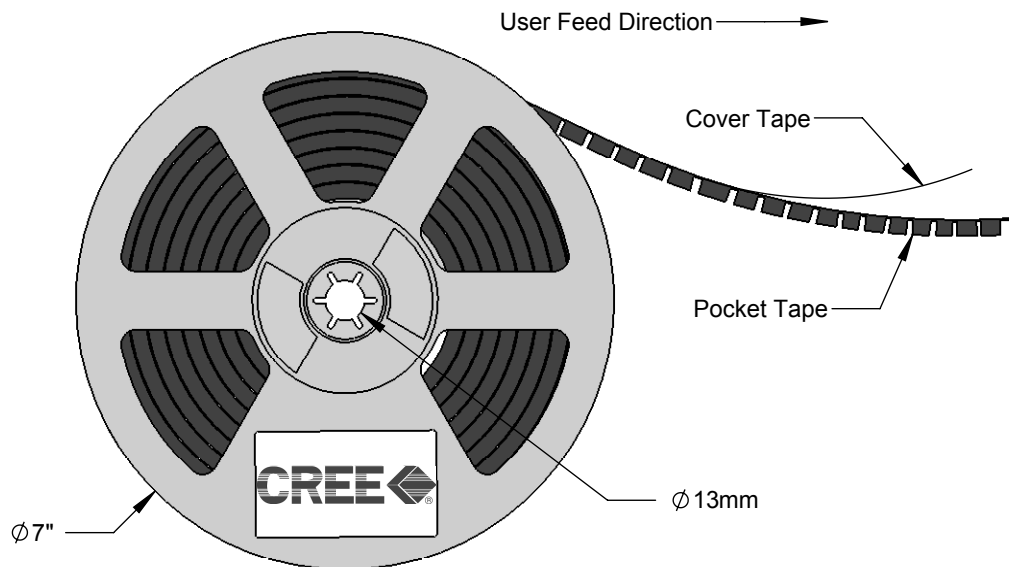
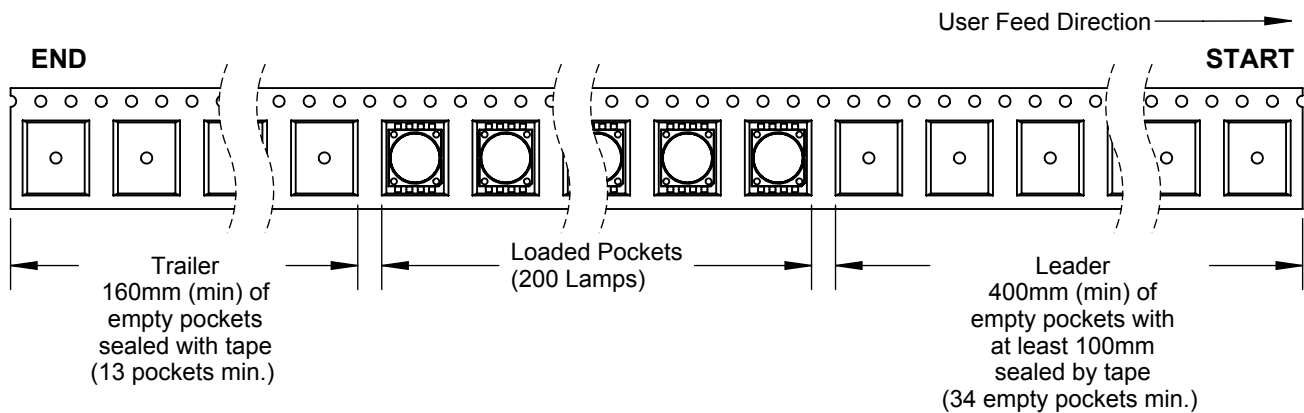
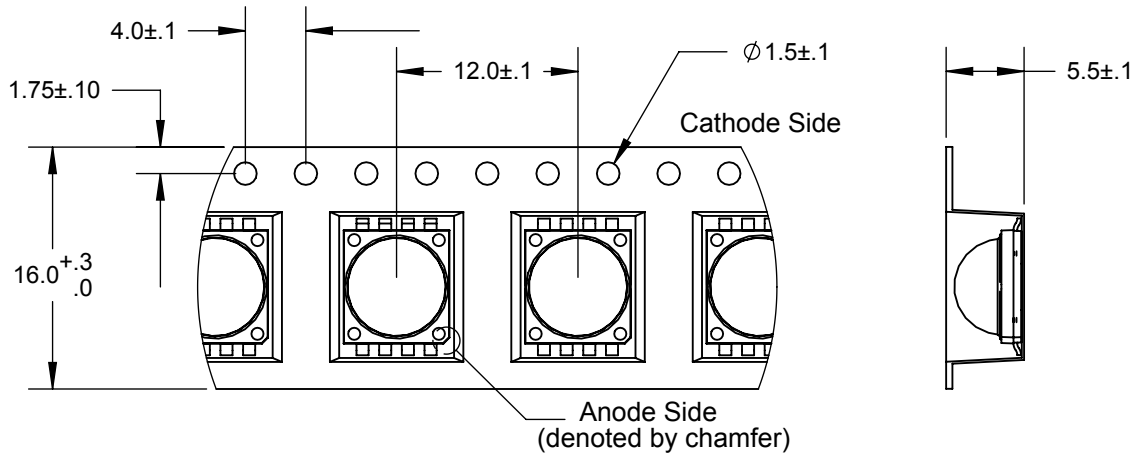


RECOMMENDED PCB SOLDER PAD

1. Tolerances: $\pm .10$
2. Solder mask windows must be $.05\text{ mm}$ bigger than PCB Solder Pad.

TAPE AND REEL

All measurements in mm.



DRY PACKAGING AND PACKAGING

