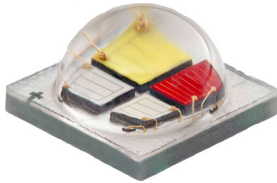# Cree® XLamp® XM-L® Color LEDs

PRODUCT DESCRIPTION

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

Cree XLamp XM-L Color LEDs bring high performance and quality of light to a wide range of lighting applications, including color-changing lighting, stage lighting, architectural lighting, indoor directional lighting, and entertainment lighting.

FEATURES

- Available in red, green, blue and white in a single 5 mm x 5 mm package
- Maximum drive current per LED die: 1 A
- Individually addressable LEDs
- Reflow solderable – JEDEC J-STD-020
- Electrically neutral thermal path
- RoHS and REACh compliant
- UL® recognized component (E349212)

TABLE OF CONTENTS

CHARACTERISTICS - COMPLETE PACKAGE

The following table lists the product characteristics for the XLamp XM-L Color LED package, measured with all LED dies on simultaneously and each LED die connected to independent drive circuits at 350 mA.

Characteristics	Unit	Minimum	Typical	Maximum
Thermal resistance, junction to solder point	°C/W		3.5	
Viewing angle (FWHM)	degrees (°)		130	
ESD withstand voltage (HBM per Mil-Std-883D)	V			8000
LED junction temperature	°C			150

CHARACTERISTICS - PER LED DIE

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

Characteristics	Unit	Minimum	Typical	Maximum
Temperature coefficient of voltage - red	mV/°C		-1.8	
Temperature coefficient of voltage - green	mV/°C		-4	
Temperature coefficient of voltage - blue, white	mV/°C		-3	
DC forward current - red, green, blue, white	mA			1000
Forward voltage (@ 350 mA, 25 °C) - red	V		2.25	2.6
Forward voltage (@ 350 mA, 25 °C) - green	V		3.3	3.9
Forward voltage (@ 350 mA, 25 °C) - blue, white	V		3.1	3.7

FLUX CHARACTERISTICS, (T_J = 25 °C)

The following tables provide several base order codes for XM-L Color LEDs. For a complete description of the order code nomenclature, please refer to the Bin and Order Code Formats section (page 6).

Color		CCT / Dominant Wavelength Range		Minimum Luminous Flux @ 350 mA		Order Code
		Minimum	Maximum	Group	Flux (lm)	
Color + Cool White	Red	620 nm	630 nm	C3	45.7	XMLCTW-A0-0000-00C3AAAA1
	Green	520 nm	535 nm		87.4	
	Blue	450 nm	465 nm		13.9	
	Cool White	5700 K	8000 K		100	
Color + Neutral White	Red	620 nm	630 nm	C2	45.7	XMLCTW-A0-0000-00C2AAAB1
	Green	520 nm	535 nm		87.4	
	Blue	450 nm	465 nm		13.9	
	Neutral White	3700 K	4300 K		80	
Color + Warm White	Red	620 nm	630 nm	C2	45.7	XMLCTW-A0-0000-00C2AAAC1
	Green	520 nm	535 nm		87.4	
	Blue	450 nm	465 nm		13.9	
	Warm White	2700 K	3700 K		80	

Notes:
- Cree maintains a tolerance of ±7% on flux and power measurements, ±0.005 on chromaticity (CCx, CCy) measurements and ±1 nm on dominant wavelength measurements. See the Measurements section (page 11).
- Flux and chromaticity are measured with each LED die connected to independent drive circuits at 350 mA. The flux and chromaticity of each LED die within the XLamp XM-L Color LED package are measured individually.
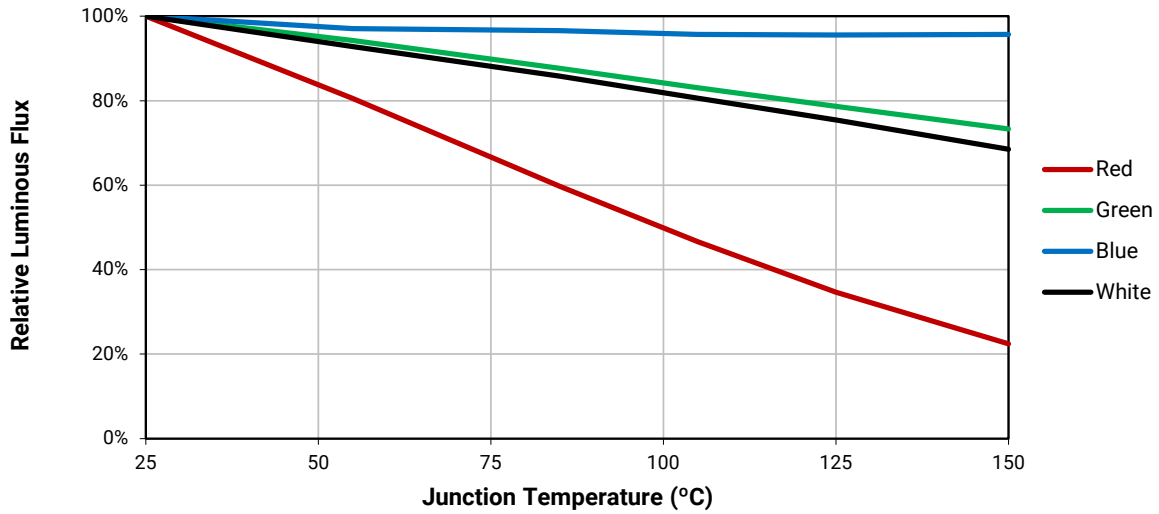
RELATIVE SPECTRAL POWER DISTRIBUTION (I_F = 350 mA PER LED DIE, 25 °C)

The following graph represents typical spectral output of the XLamp XM-L Color LED with each LED die on independently.
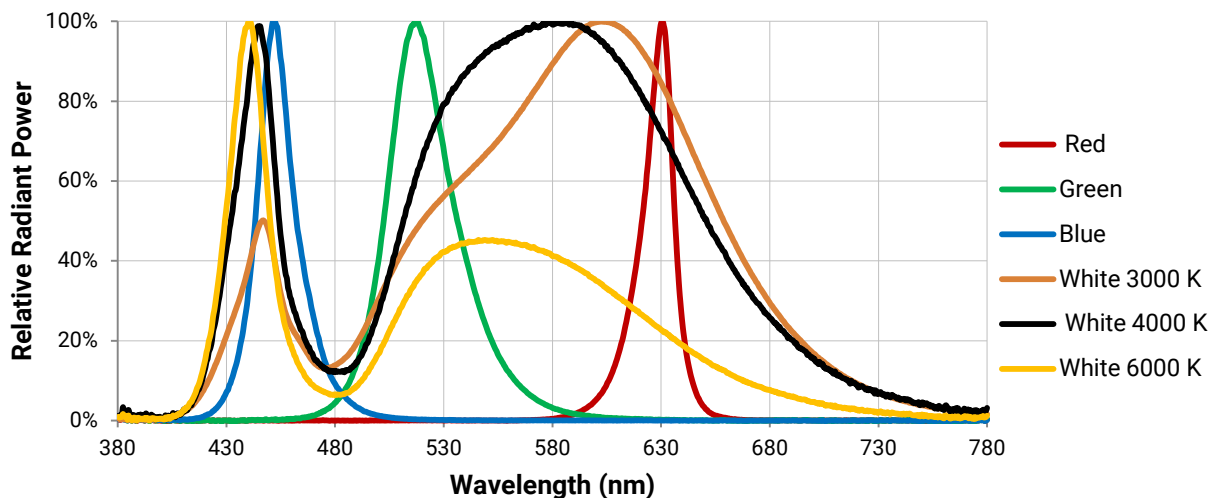
RELATIVE FLUX VS JUNCTION TEMPERATURE (I_F = 350 mA)

The following graph represents typical performance of each LED die in the XLamp XM-L Color LED.

ELECTRICAL CHARACTERISTICS (T_J = 25 °C)

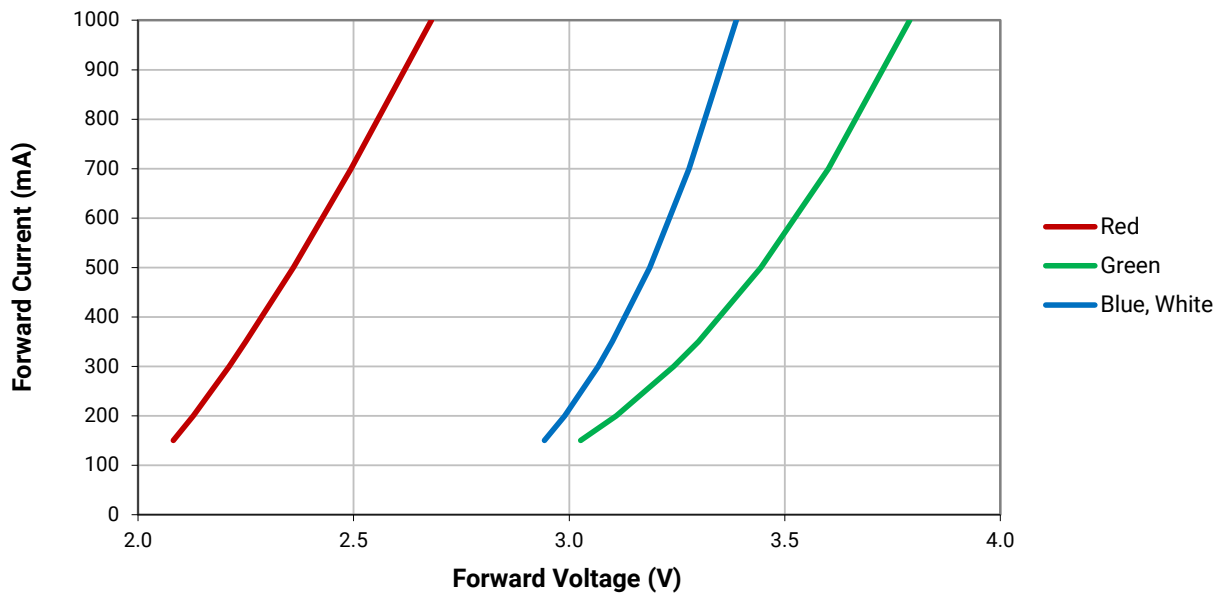The following graph represents typical performance of each LED die in the XLamp XM-L Color LED.

RELATIVE FLUX VS. CURRENT (T$_J$ = 25 ˚C)

The following graph represents typical performance of each LED die in the XLamp XM-L Color LED.

TYPICAL SPATIAL DISTRIBUTION
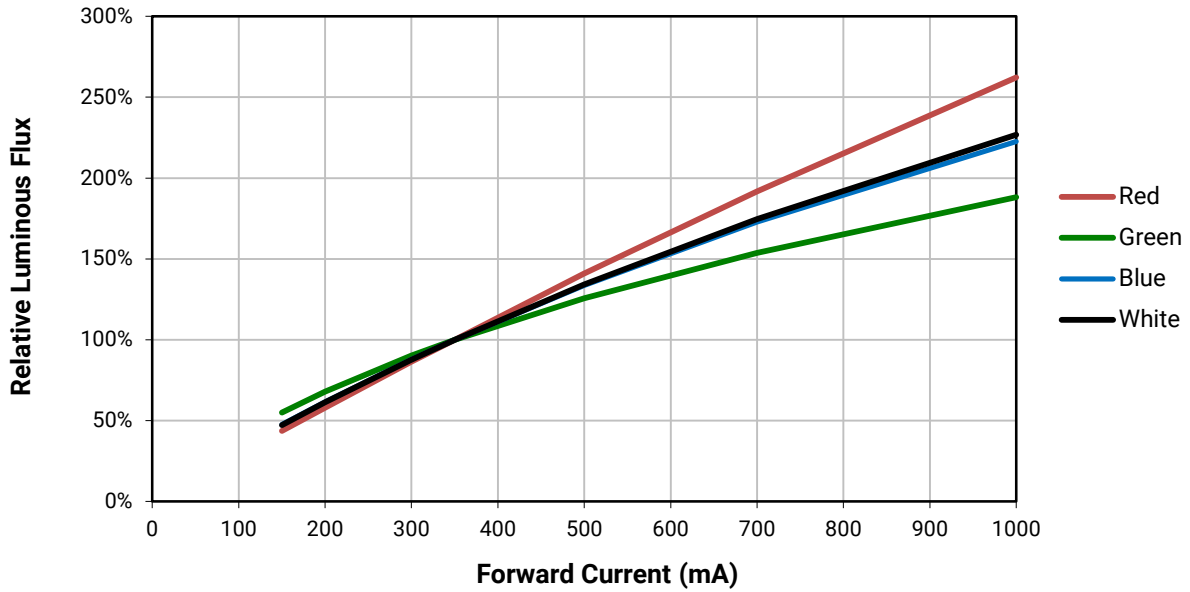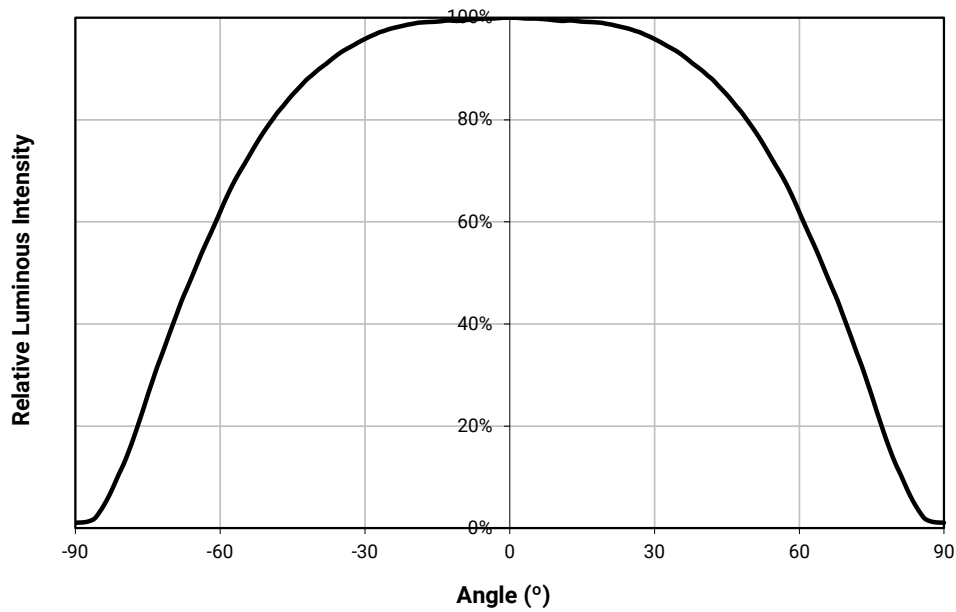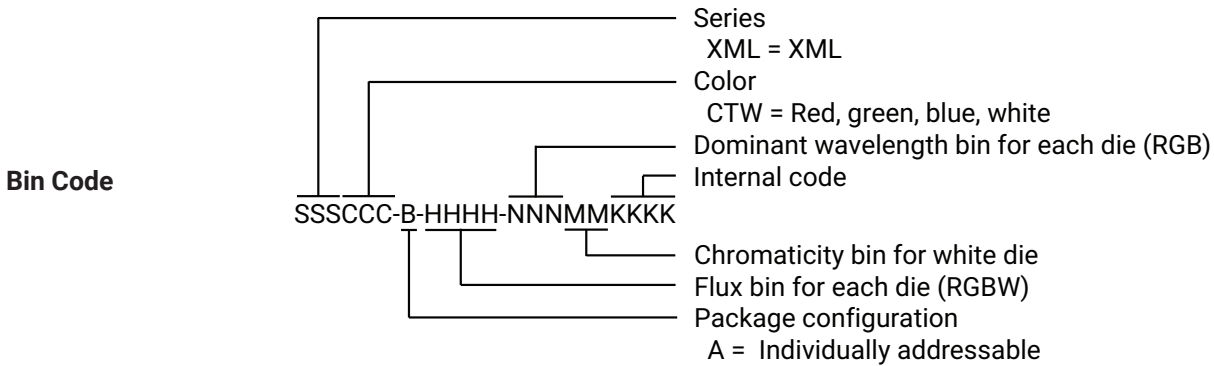
The following graph represents typical output of the XLamp XM-L Color LED with all four LEDs on simultaneously.

BIN AND ORDER CODE FORMATS

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

Order Code

Series
 XML = XML
Color
 CTW = Red, green, blue, white
Reel size
Internal code
Dominant wavelength kit (RGB)

SSSCCC-BD-HHHH-NNNNNNNNN

Chromaticity kit for white
Flux kit
Internal code
Package configuration
 A = Individually addressable

Bin Code

Series
 XML = XML
Color
 CTW = Red, green, blue, white
Dominant wavelength bin for each die (RGB)
Internal code

SSSCCC-B-HHHH-NNNMMKKKK

Chromaticity bin for white die
Flux bin for each die (RGBW)
Package configuration
 A = Individually addressable

PERFORMANCE GROUPS – LUMINOUS FLUX

Each LED die in the XLamp XM-L Color LED is tested individually for luminous flux and placed into one of the following luminous-flux groups.

Color	Group Code	Minimum Luminous Flux (lm) @ 350 mA	Maximum Luminous Flux (lm) @ 350 mA
Red	M	45.7	87.4
	N	87.4	114
Green	N	87.4	114
	P	114	148
Blue	F	13.9	39.8
White	2	80	100
	3	100	120
	4	120	140

• Flux and chromaticity are measured with each LED die connected to independent drive circuits at 350 mA.

PERFORMANCE GROUPS – CHROMATICITY (I_F = 350 mA PER LED DIE)

The white LED die in the XLamp XM-L Color LED is individually tested for chromaticity at 350 mA and placed into one of the regions defined by the bounding coordinates shown below.

Region	x	y	Region	x	y
WM	.295	.297	WC	.316	.332
	.308	.311		.317	.319
	.310	.300		.308	.311
	.298	.288		.306	.322
WB	.306	.322	WF	.314	.355
	.308	.311		.316	.332
	.295	.297		.306	.322
	.292	.306		.301	.342
WE	.301	.342	WD	.329	.345
	.306	.322		.329	.330
	.292	.306		.317	.319
	.287	.321		.316	.332
WN	.308	.311	WG	.329	.369
	.317	.319		.329	.345
	.318	.308		.316	.332
	.310	.300		.314	.355

Region	x	y	Region	x	y	Region	x	y	Region	x	y
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
	.3783	.3646		.3825	.3798		.3950	.3875		.3898	.3716
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
	.4259	.3853		.4342	.4028		.4465	.4071		.4373	.3893

PERFORMANCE GROUPS – DOMINANT WAVELENGTH

The red, green and blue LED dies in the XLamp XM-L 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

## STANDARD ORDER CODES AND BINS

The following table list sstandard kit numbers and performance bins. Kit numbers completely describe an order code's color or chromaticity bins and luminous flux range.

Color	Minimum Luminous Flux (lm) @ 350 mA*		DWL / Chromaticity Bins	Kit Number
	Group	Flux (lm)		
Red	M	45.7	A	00C3AAAA1
Green	N	87.4	2, 3, 4	
Blue	F	13.9	K, L, M	
White	3	100	WC, WD, WF, WG, WB, WE, WM, WN	
Red	M	45.7	A	00C2AAAB1
Green	N	87.4	2, 3, 4	
Blue	F	13.9	K, L, M	
White	2	80	5A, 5B, 5C, 5D	
Red	M	45.7	A	00C2AAAC1
Green	N	87.4	2, 3, 4	
Blue	F	13.9	K, L, M	
White	2	80	7A, 7B, 7C, 7D	

For other flux and chromaticity combinations, contact Cree or an authorized distributor.

* Cree XLamp XM-L Color 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 or DWL bin restrictions specified by the order code.

STANDARD ORDER CODES AND BINS - CONTNUED
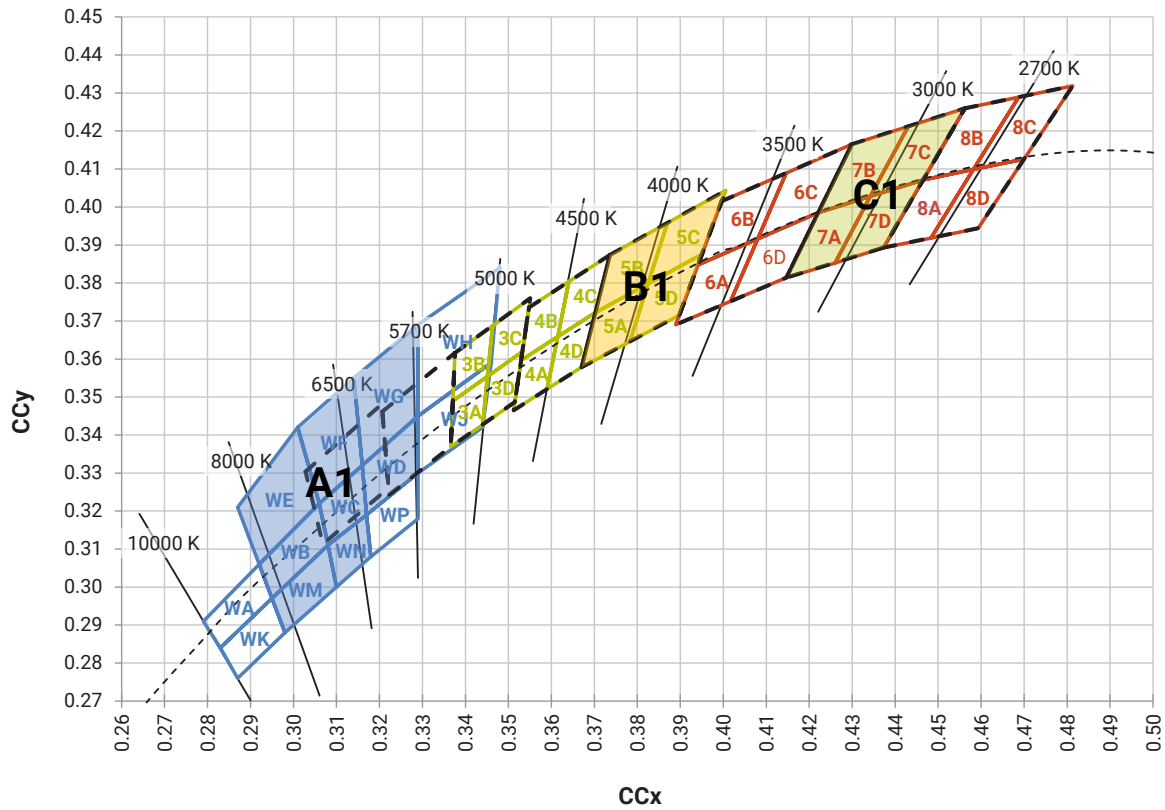
REFLOW SOLDERING CHARACTERISTICS

In testing, Cree has found XLamp XM-L Color 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.
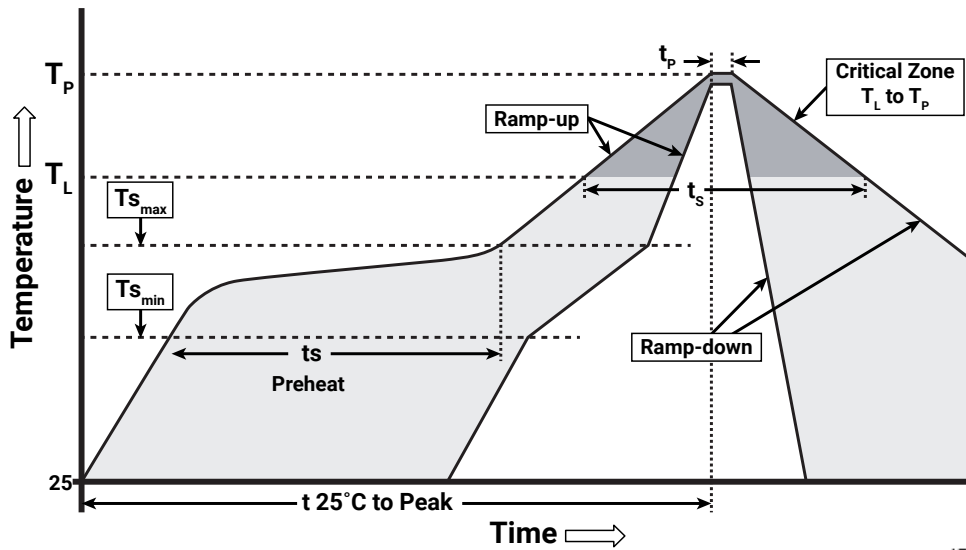
IPC/JEDEC J-STD-020C

Profile Feature	Lead-Free Solder
Average Ramp-Up Rate (Ts$_{max}$ to T$_p$)	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 the 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.

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.
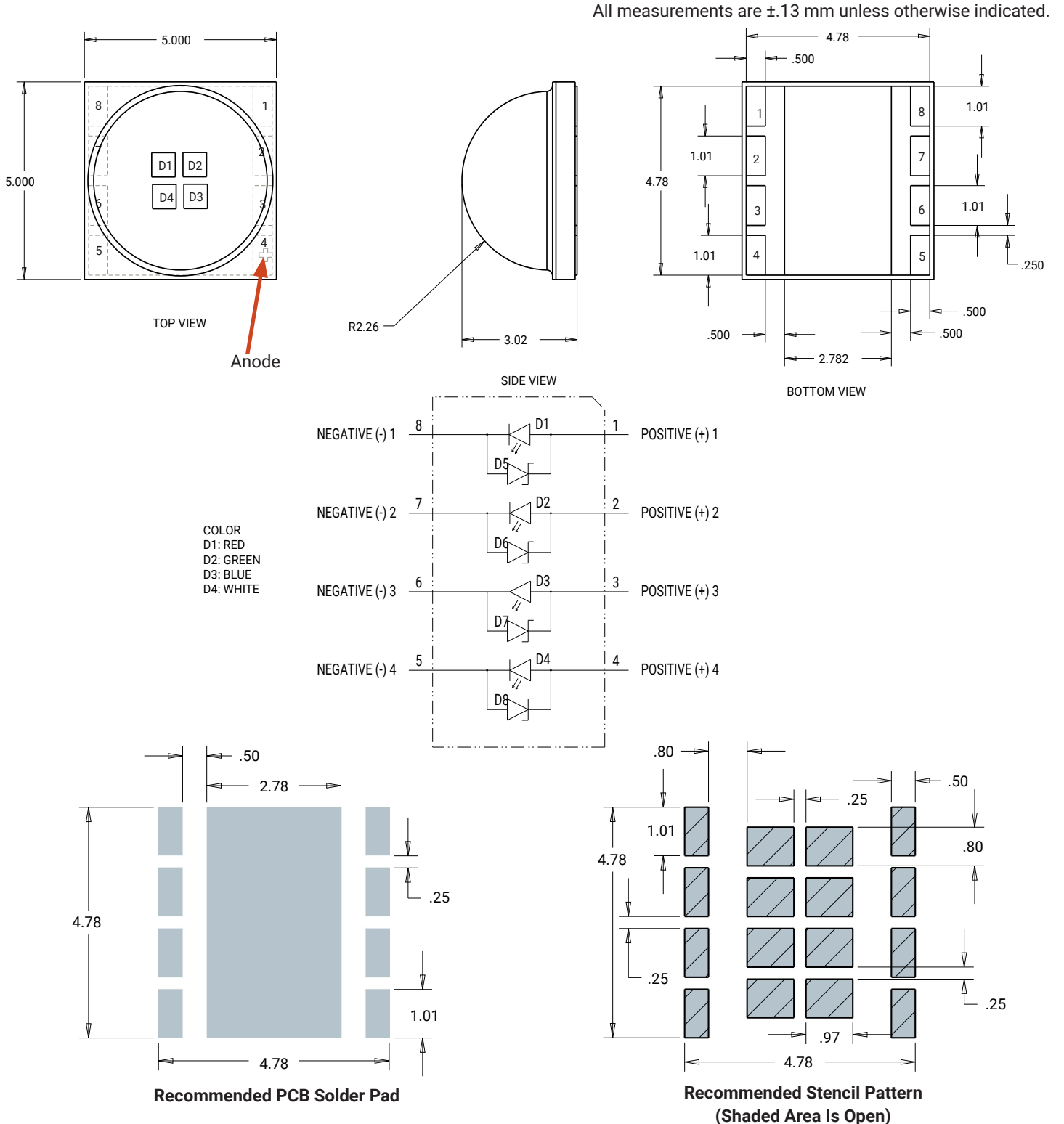
REACh Compliance

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.
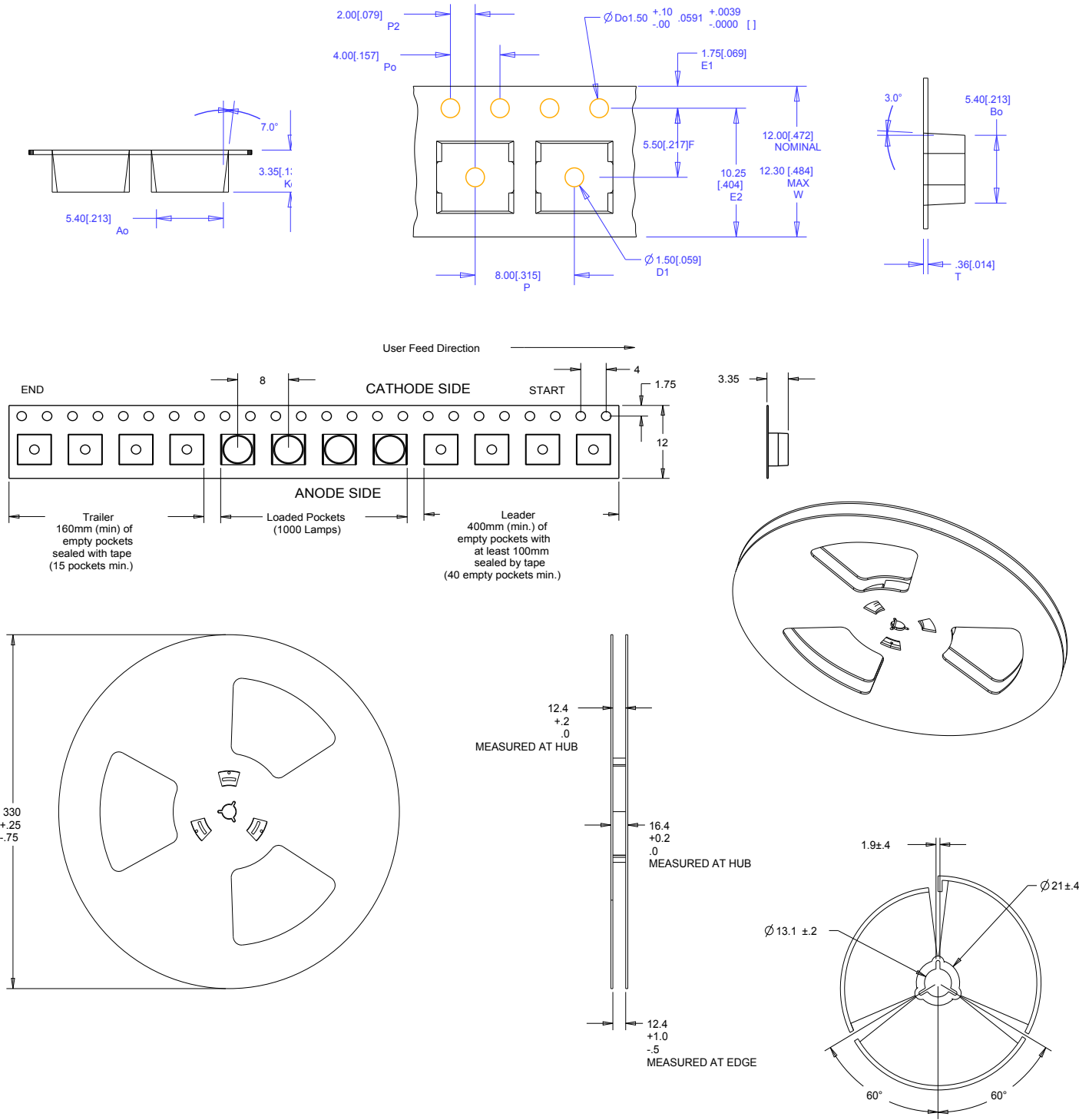
MECHANICAL DIMENSIONS

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

All measurements are ±.13 mm unless otherwise indicated.

TOP VIEW

Anode

R2.26

SIDE VIEW

BOTTOM VIEW

NEGATIVE (-) 1   8   D1   1   POSITIVE (+) 1

D5

NEGATIVE (-) 2   7   D2   2   POSITIVE (+) 2

D6

NEGATIVE (-) 3   6   D3   3   POSITIVE (+) 3

D7

NEGATIVE (-) 4   5   D4   4   POSITIVE (+) 4

D8

COLOR
D1: RED
D2: GREEN
D3: BLUE
D4: WHITE

Recommended PCB Solder Pad

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

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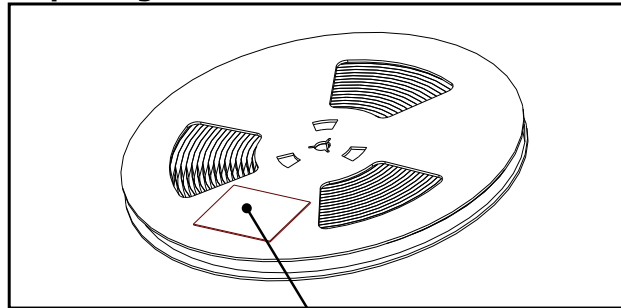
All Cree carrier tapes conform to EIA-481D, Automated Component Handling Systems Standard.

All dimensions in mm.

User Feed Direction

END   8   CATHODE SIDE   START   4   1.75   3.35

12

ANODE SIDE

Trailer
160mm (min) of
empty pockets
sealed with tape
(15 pockets min.)

Loaded Pockets
(1000 Lamps)

Leader
400mm (min.) of
empty pockets with
at least 100mm
sealed by tape
(40 empty pockets min.)

330
+.25
-.75

12.4
+.2
.0
MEASURED AT HUB

16.4
+0.2
.0
MEASURED AT HUB

12.4
+1.0
-.5
MEASURED AT EDGE

1.9±.4

Ø21±.4

Ø13.1 ±.2

60°   60°

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

Mouser Electronics

Authorized Distributor

Click to View Pricing, Inventory, Delivery & Lifecycle Information:

[Cree, Inc.](#):

XMLCTW-A0-0000-00C3ACCA1 XMLCTW-A0-0000-00C3AAB02 XMLCTW-A0-0000-00C2AACB1 XMLCTW-A0-0000-00C3ABC03 XMLCTW-A0-0000-00C3AAC02 XMLCTW-A0-0000-00C3ABB03 XMLCTW-A0-0000-00C3ACA03 XMLCTW-A0-0000-00C2ACCB1 XMLCTW-A0-0000-00C2ABCB1 XMLCTW-A0-0000-00C3ABA02 XMLCTW-A0-0000-00C3AAC03 XMLCTW-A0-0000-00C2ACAB1 XMLCTW-A0-0000-00C3ACBA1 XMLCTW-A0-0000-00C3ABA03 XMLCTW-A0-0000-00C3AAA02 XMLCTW-A0-0000-00C3ABAA1 XMLCTW-A0-0000-00C3AAA03 XMLCTW-A0-0000-00C2ACBB1 XMLCTW-A0-0000-00C2ABAB1 XMLCTW-A0-0000-00C3ABBA1 XMLCTW-A0-0000-00C3ABB02 XMLCTW-A0-0000-00C3ABCA1 XMLCTW-A0-0000-00C3AAAA1 XMLCTW-A0-0000-00C3ABC02 XMLCTW-A0-0000-00C3ACC03 XMLCTW-A0-0000-00C3ACAA1 XMLCTW-A0-0000-00C3ACB03 XMLCTW-A0-0000-00C3ACA02 XMLCTW-A0-0000-00C3AAB03 XMLCTW-A0-0000-00C2AAAB1 XMLCTW-A0-0000-00C3AACA1 XMLCTW-A0-0000-00C3ACB02 XMLCTW-A0-0000-00C3ACC02 XMLCTW-A0-0000-00C2AABB1 XMLCTW-A0-0000-00C2ABBB1 XMLCTW-A0-0000-00C3AABA1 XMLCTW-A2-0000-00C3ABB03 XMLCTW-A2-0000-00C3ACA03 XMLCTW-A2-0000-00C2ABAB1 XMLCTW-A2-0000-00C3AAB02 XMLCTW-A2-0000-00C3AAA02 XMLCTW-A2-0000-00C3AAA03 XMLCTW-A2-0000-00C3AABA1 XMLCTW-A2-0000-00C3AAC02 XMLCTW-A2-0000-00C3AAC03 XMLCTW-A2-0000-00C3AAB03 XMLCTW-A2-0000-00C3ACC03 XMLCTW-A2-0000-00C3ACA02 XMLCTW-A2-0000-00C3ACAA1 XMLCTW-A2-0000-00C3ACBA1 XMLCTW-A2-0000-00C3AAAA1 XMLCTW-A2-0000-00C2AABB1 XMLCTW-A2-0000-00C3ABC02 XMLCTW-A2-0000-00C2ABCB1 XMLCTW-A2-0000-00C3ACB02 XMLCTW-A2-0000-00C3ACB03 XMLCTW-A2-0000-00C3ABCA1 XMLCTW-A2-0000-00C2AAAB1 XMLCTW-A2-0000-00C3AACA1 XMLCTW-A2-0000-00C3ACCA1 XMLCTW-A2-0000-00C3ABBA1 XMLCTW-A2-0000-00C3ABA03 XMLCTW-A2-0000-00C3ABA02 XMLCTW-A2-0000-00C2ACCB1 XMLCTW-A2-0000-00C3ABAA1 XMLCTW-A2-0000-00C2ABBB1 XMLCTW-A2-0000-00C3ABB02 XMLCTW-A2-0000-00C3ABC03 XMLCTW-A2-0000-00C3ACC02 XMLCTW-A2-0000-00C2AACB1 XMLCTW-A2-0000-00C2ACBB1 XMLCTW-A2-0000-00C2ACAB1 XMLCTW-H2-0000-00C2AAAC1 XMLCTW-H0-0000-00C2AAAC1 XMLCTW-A0-0000-00C2AAAC1