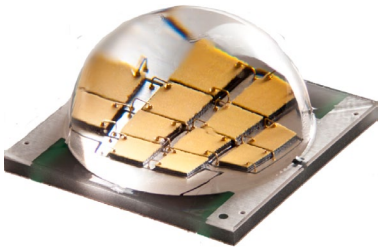
Cree® XLamp® MT-G EasyWhite® LEDs



PRODUCT DESCRIPTION

The XLamp® MT-G EasyWhite® LED maximizes lumen density, eliminates chromaticity binning and enables luminaire and bulb manufacturers to deliver consistent color and high-efficacy light output in a new, compact, multi-die package. XLamp MT-G EasyWhite LEDs can reduce LED-to-LED color variation to within a 2-step MacAdam ellipse, 94% smaller than the total area of the corresponding ANSI C78.377 color region.

The XLamp MT-G EasyWhite LED is the perfect choice for lighting applications where high luminous flux output is required from a single, small point source. Example applications include: LED retrofit bulbs, commercial/retail display spotlights, and other indoor general illumination applications.

FEATURES

- Cree EasyWhite color temperatures from 2700 K to 5000 K CCT
- Wide range of operating power - up to 25 W
- 85 °C binning and characterization
- Two voltage options: 6 V, 36 V
- Low effective thermal resistance: 1.5 °C/W
- High lumen density
- Wide viewing angle: 120°
- 80-minimum CRI at 2700 K and 3000 K CCT
- 85- and 90-minimum CRI available in 2700 K and 3000 K CCT
- Electrically neutral thermal path
- RoHS- and REACh-compliant
- UL® recognized component (E349212)

APPLICATIONS

- MR, PAR and other directional retrofit bulbs
- Commercial/residential directional lighting
- General illumination

TABLE OF CONTENTS

Cree, Inc.
4600 Silicon Drive
Durham, NC 27703
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CHARACTERISTICS

Characteristics	Unit	Minimum	Typical	Maximum
Viewing angle (FWHM)	degrees		120	
ESD withstand voltage (HBM per Mil-Std-883D)	V			8000
Effective thermal resistance, junction to solder point	°C/W		1.5	
LED junction temperature	°C			150
DC forward current (6 V)	mA		1100	4000
DC forward current (36 V)	mA		185	700
Forward voltage (6 V, 1100 mA, 85 °C)	V		5.6	6.7
Forward voltage (36 V, 185 mA, 85 °C)	V		33.5	40.2
Temperature coefficient of voltage (6 V)	mV/°C		-4.5	
Temperature coefficient of voltage (36 V)	mV/°C		-27	
Reverse voltage (6 V)	V			-5
Reverse current (6V, 36 V)	mA			0.1

FLUX CHARACTERISTICS, EASYWHITE® ORDER CODES AND BINS - 6 V (I_F = 1100 mA, T_J = 85 °C)

The following tables provide order codes for 6-volt XLamp MT-G EasyWhite LEDs. For a complete description of the order code nomenclature, please reference page 12 of this document.

Color	CCT Range	Minimum Luminous Flux @ 1100 mA			2-Step		4-Step	
		Group	Flux (lm) @ 85 °C	Flux (lm) @ 25 °C*	Chromaticity Region	Order Code	Chromaticity Region	Order Code
Standard CRI	5000 K	H0	560	642	50H	MTGEZW-00-0000-0B00H050H	50F	MTGEZW-00-0000-0B00H050F
		J0	600	688		MTGEZW-00-0000-0B00J050H		MTGEZW-00-0000-0B00J050F
		K0	650	745		MTGEZW-00-0000-0B00K050H		MTGEZW-00-0000-0B00K050F
	4000 K	F0	480	550	40H	MTGEZW-00-0000-0B00F040H	40F	MTGEZW-00-0000-0B00F040F
		G0	520	596		MTGEZW-00-0000-0B00G040H		MTGEZW-00-0000-0B00G040F
		H0	560	642		MTGEZW-00-0000-0B00H040H		MTGEZW-00-0000-0B00H040F
		J0	600	688		MTGEZW-00-0000-0B00J040H		MTGEZW-00-0000-0B00J040F
	3500 K	E0	440	504	35H	MTGEZW-00-0000-0B00E035H	35F	MTGEZW-00-0000-0B00E035F
		F0	480	550		MTGEZW-00-0000-0B00F035H		MTGEZW-00-0000-0B00F035F
		G0	520	596		MTGEZW-00-0000-0B00G035H		MTGEZW-00-0000-0B00G035F
		H0	560	642		MTGEZW-00-0000-0B00H035H		MTGEZW-00-0000-0B00H035F
	3000 K	E0	440	504	30H	MTGEZW-00-0000-0B00E030H	30F	MTGEZW-00-0000-0B00E030F
		F0	480	550		MTGEZW-00-0000-0B00F030H		MTGEZW-00-0000-0B00F030F
		G0	520	596		MTGEZW-00-0000-0B00G030H		MTGEZW-00-0000-0B00G030F
		H0	560	642		MTGEZW-00-0000-0B00H030H		MTGEZW-00-0000-0B00H030F
	2700 K	D0	400	458	27H	MTGEZW-00-0000-0B00D027H	27F	MTGEZW-00-0000-0B00D027F
		E0	440	504		MTGEZW-00-0000-0B00E027H		MTGEZW-00-0000-0B00E027F
		F0	480	550		MTGEZW-00-0000-0B00F027H		MTGEZW-00-0000-0B00F027F
		G0	520	596		MTGEZW-00-0000-0B00G027H		MTGEZW-00-0000-0B00G027F
85 CRI Minimum	3000 K	D0	400	458	30H	MTGEZW-00-0000-0B0PD030H	30F	MTGEZW-00-0000-0B0PD030F
		E0	440	504		MTGEZW-00-0000-0B0PE030H		MTGEZW-00-0000-0B0PE030F
		F0	480	550		MTGEZW-00-0000-0B0PF030H		MTGEZW-00-0000-0B0PF030F
	2700 K	D0	400	458	27H	MTGEZW-00-0000-0B0PD027H	27F	MTGEZW-00-0000-0B0PD027F
		E0	440	504		MTGEZW-00-0000-0B0PE027H		MTGEZW-00-0000-0B0PE027F

Notes:

- Cree maintains a tolerance of ±7% on flux and power measurements, ±0.005 on chromaticity (CCx, CCy) measurements and ±2 on CRI measurements. See the Measurements section (page 14).
- Minimum CRI for Standard color temperatures 27F, 27H, 30F, 30H is 80.
- Minimum CRI for Standard color temperatures 35F, 35H, 40F, 40H is 77.
- Minimum CRI for Standard color temperature 50F, 50H is 75.
- Typical CRI for Standard color temperatures 35F, 35H, 40F, 40H is 80.
- Minimum CRI for 85 CRI Minimum is 85.
- Minimum CRI for 90 CRI Minimum is 90.

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

FLUX CHARACTERISTICS, EASYWHITE® ORDER CODES AND BINS - 6 V (I_F = 1100 mA, T_J = 85 °C) - CONTINUED

Color	CCT Range	Minimum Luminous Flux @ 1100 mA			2-Step		4-Step	
		Group	Flux (lm) @ 85 °C	Flux (lm) @ 25 °C*	Chromaticity Region	Order Code	Chromaticity Region	Order Code
90 CRI Minimum	3000 K	C0	370	424	30H	MTGEZW-00-0000-0B0UC030H	30F	MTGEZW-00-0000-0B0UC030F
		D0	400	458		MTGEZW-00-0000-0B0UD030H		MTGEZW-00-0000-0B0UD030F
		E0	440	504		MTGEZW-00-0000-0B0UE030H		MTGEZW-00-0000-0B0UE030F
	2700 K	B0	340	390	27H	MTGEZW-00-0000-0B0UB027H	27F	MTGEZW-00-0000-0B0UB027F
		C0	370	424		MTGEZW-00-0000-0B0UC027H		MTGEZW-00-0000-0B0UC027F
		D0	400	458		MTGEZW-00-0000-0B0UD027H		MTGEZW-00-0000-0B0UD027F

Notes:

- Cree maintains a tolerance of ±7% on flux and power measurements, ±0.005 on chromaticity (CCx, CCy) measurements and ±2 on CRI measurements. See the Measurements section (page 14).
- Minimum CRI for Standard color temperatures 27F, 27H, 30F, 30H is 80.
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- Minimum CRI for Standard color temperature 50F, 50H is 75.
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- Minimum CRI for 85 CRI Minimum is 85.
- Minimum CRI for 90 CRI Minimum is 90.

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

FLUX CHARACTERISTICS, EASYWHITE® ORDER CODES AND BINS - 36 V (I_F = 185 mA, T_J = 85 °C)

The following table provide order codes for 36-volt XLamp MT-G EasyWhite LEDs. For a complete description of the order code nomenclature, please reference page 12 of this document.

Color	CCT Range	Minimum Luminous Flux @ 185 mA			2-Step		4-Step	
		Group	Flux (lm) @ 85 °C	Flux (lm) @ 25 °C*	Chromaticity Region	Order Code	Chromaticity Region	Order Code
Standard CRI	5000 K	H0	560	642	50H	MTGEZW-00-0000-0N00H050H	50F	MTGEZW-00-0000-0N00H050F
		J0	600	688		MTGEZW-00-0000-0N00J050H		MTGEZW-00-0000-0N00J050F
		K0	650	745		MTGEZW-00-0000-0N00K050H		MTGEZW-00-0000-0N00K050F
	4000 K	F0	480	550	40H	MTGEZW-00-0000-0N00F040H	40F	MTGEZW-00-0000-0N00F040F
		G0	520	596		MTGEZW-00-0000-0N00G040H		MTGEZW-00-0000-0N00G040F
		H0	560	642		MTGEZW-00-0000-0N00H040H		MTGEZW-00-0000-0N00H040F
		J0	600	688		MTGEZW-00-0000-0N00J040H		MTGEZW-00-0000-0N00J040F
	3500 K	E0	440	504	35H	MTGEZW-00-0000-0N00E035H	35F	MTGEZW-00-0000-0N00E035F
		F0	480	550		MTGEZW-00-0000-0N00F035H		MTGEZW-00-0000-0N00F035F
		G0	520	596		MTGEZW-00-0000-0N00G035H		MTGEZW-00-0000-0N00G035F
		H0	560	642		MTGEZW-00-0000-0N00H035H		MTGEZW-00-0000-0N00H035F
	3000 K	E0	440	504	30H	MTGEZW-00-0000-0N00E030H	30F	MTGEZW-00-0000-0N00E030F
		F0	480	550		MTGEZW-00-0000-0N00F030H		MTGEZW-00-0000-0N00F030F
		G0	520	596		MTGEZW-00-0000-0N00G030H		MTGEZW-00-0000-0N00G030F
		H0	560	642		MTGEZW-00-0000-0N00H030H		MTGEZW-00-0000-0N00H030F
	2700 K	D0	400	458	27H	MTGEZW-00-0000-0N00D027H	27F	MTGEZW-00-0000-0N00D027F
		E0	440	504		MTGEZW-00-0000-0N00E027H		MTGEZW-00-0000-0N00E027F
		F0	480	550		MTGEZW-00-0000-0N00F027H		MTGEZW-00-0000-0N00F027F
		G0	520	596		MTGEZW-00-0000-0N00G027H		MTGEZW-00-0000-0N00G027F
85 CRI Minimum	3000 K	D0	400	458	30H	MTGEZW-00-0000-0B0PD030H	30F	MTGEZW-00-0000-0B0PD030F
		E0	440	504		MTGEZW-00-0000-0B0PE030H		MTGEZW-00-0000-0B0PE030F
		F0	480	550		MTGEZW-00-0000-0B0PF030H		MTGEZW-00-0000-0B0PF030F
	2700 K	D0	400	458	27H	MTGEZW-00-0000-0B0PD027H	27F	MTGEZW-00-0000-0B0PD027F
		E0	440	504		MTGEZW-00-0000-0B0PE027H		MTGEZW-00-0000-0B0PE027F

Notes:

- Cree maintains a tolerance of ±7% on flux and power measurements, ±0.005 on chromaticity (CCx, CCy) measurements and ±2 on CRI measurements. See the Measurements section (page 14).
- Minimum CRI for Standard color temperatures 27F, 27H, 30F, 30H is 80.
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- Minimum CRI for Standard color temperature 50F, 50H is 75.
- Typical CRI for Standard color temperatures 35F, 35H, 40F, 40H is 80.
- Minimum CRI for 85 CRI Minimum is 85.
- Minimum CRI for 90 CRI Minimum is 90.

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

FLUX CHARACTERISTICS, EASYWHITE® ORDER CODES AND BINS - 36 V (I_F = 185 mA, T_J = 85 °C) - CONTINUED

Color	CCT Range	Minimum Luminous Flux @ 185 mA			2-Step		4-Step	
		Group	Flux (lm) @ 85 °C	Flux (lm) @ 25 °C*	Chromaticity Region	Order Code	Chromaticity Region	Order Code
90 CRI Minimum	3000 K	C0	370	424	30H	MTGEZW-00-0000-0B0UC030H	30F	MTGEZW-00-0000-0B0UC030F
		D0	400	458		MTGEZW-00-0000-0B0UD030H		MTGEZW-00-0000-0B0UD030F
		E0	440	504		MTGEZW-00-0000-0B0UE030H		MTGEZW-00-0000-0B0UE030F
	2700 K	B0	340	390	27H	MTGEZW-00-0000-0B0UB027H	27F	MTGEZW-00-0000-0B0UB027F
		C0	370	424		MTGEZW-00-0000-0B0UC027H		MTGEZW-00-0000-0B0UC027F
		D0	400	458		MTGEZW-00-0000-0B0UD027H		MTGEZW-00-0000-0B0UD027F

Notes:

- Cree maintains a tolerance of ±7% on flux and power measurements, ±0.005 on chromaticity (CCx, CCy) measurements and ±2 on CRI measurements. See the Measurements section (page 14).
- Minimum CRI for Standard color temperatures 27F, 27H, 30F, 30H is 80.
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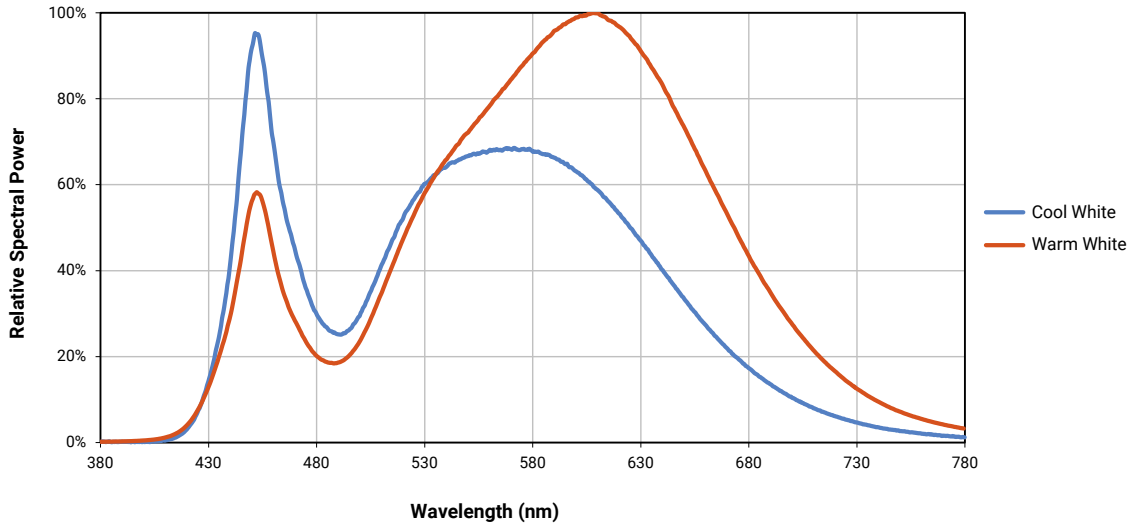
- Minimum CRI for 85 CRI Minimum is 85.
- Minimum CRI for 90 CRI Minimum is 90.

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

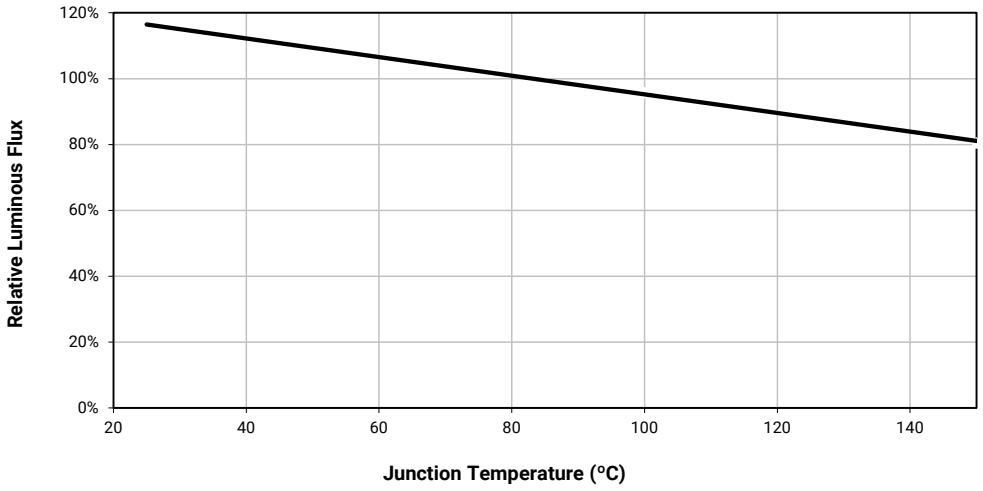
RELATIVE SPECTRAL POWER DISTRIBUTION (6 V, 1100 mA; 36 V, 185 mA; T_j= 85 °C)

The following graph represents typical spectral output of the XLamp MT-G EasyWhite LED.

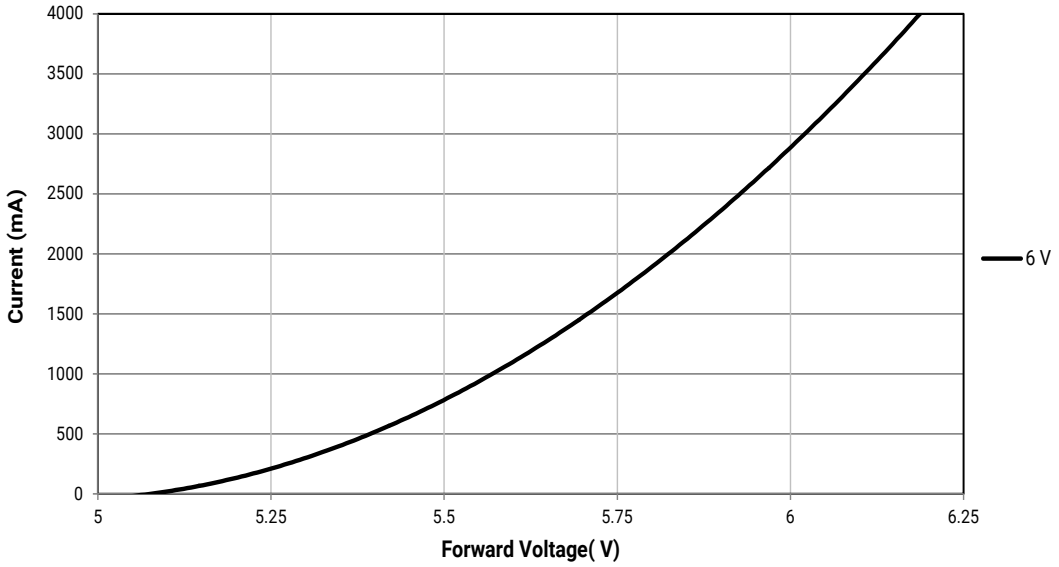


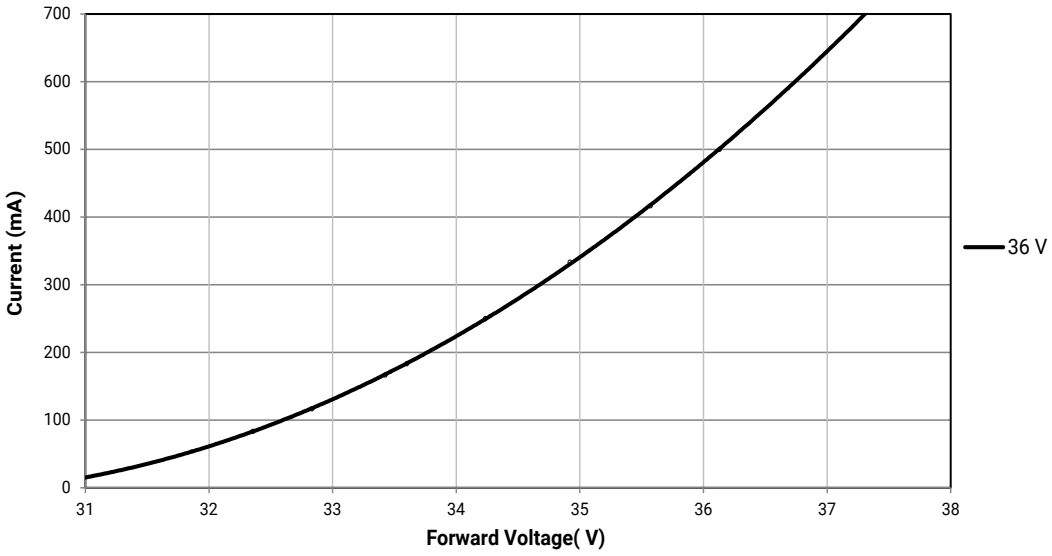
RELATIVE LUMINOUS FLUX VS. JUNCTION TEMPERATURE (6 V, 1100 mA; 36 V, 185 mA)

The following graph represents typical performance of the XLamp MT-G EasyWhite LED.

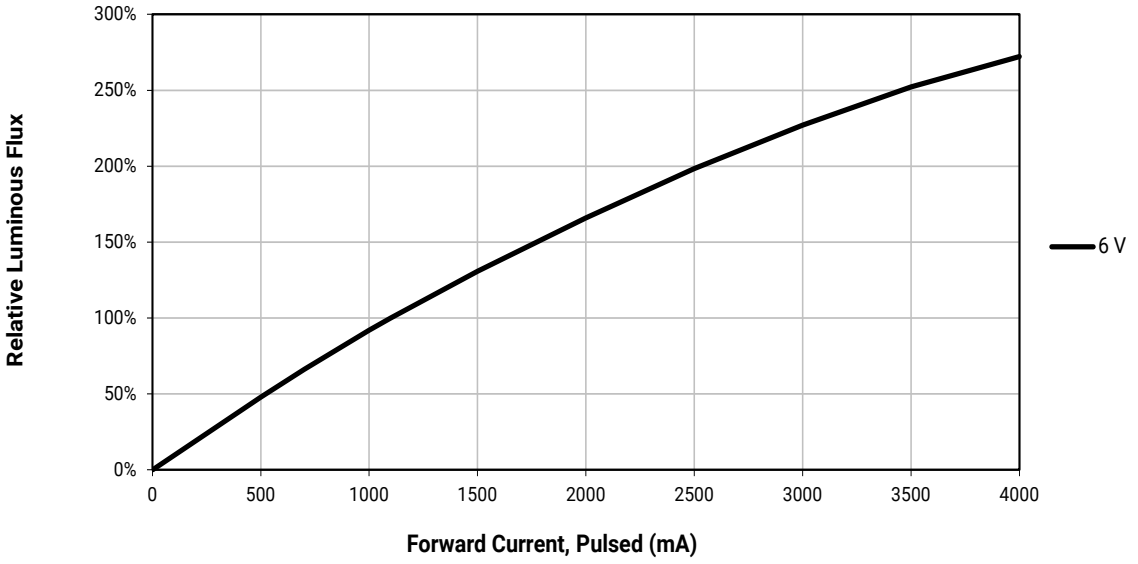


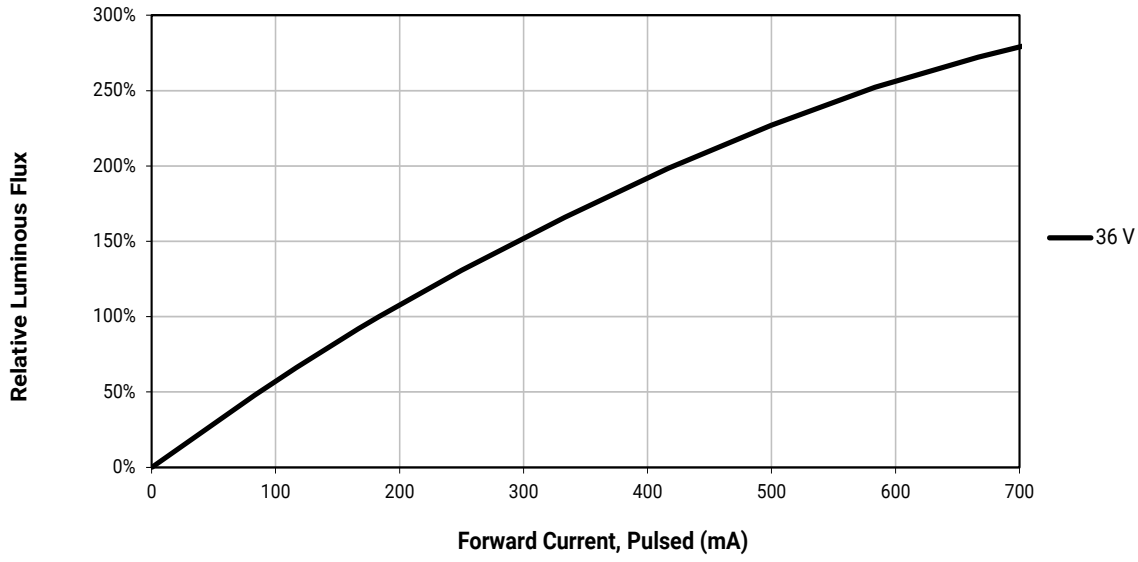
ELECTRICAL CHARACTERISTICS (T_J = 85 °C)





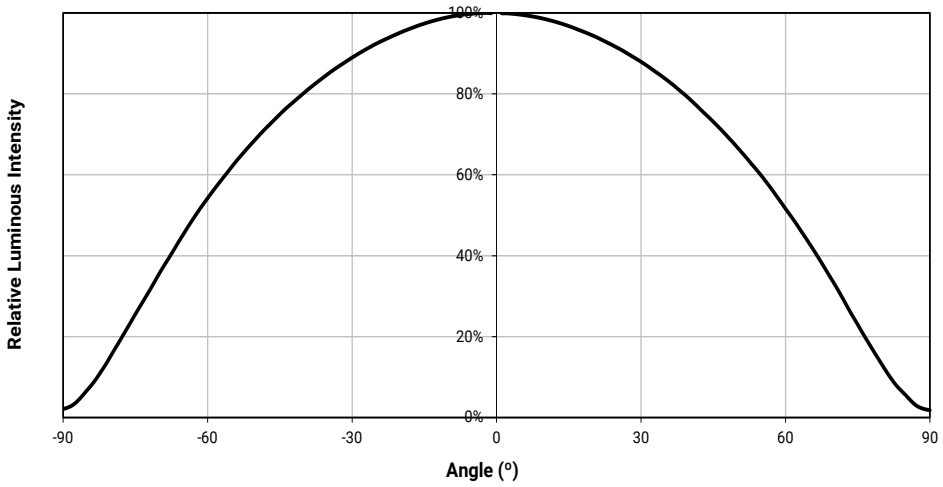
RELATIVE LUMINOUS FLUX VS. CURRENT (T_J = 85 °C)





TYPICAL SPATIAL DISTRIBUTION

The following graph represents typical performance of the XLamp MT-G EasyWhite LED.



PERFORMANCE GROUPS – BRIGHTNESS (T_J = 85 °C)

XLamp MT-G EasyWhite LEDs are tested for luminosity and placed into one of the following bins.

Group Code	Min. Luminous Flux @ 1100 mA, 6 V; @185 mA, 36 V	Max. Luminous Flux @ 1100 mA, 6 V; @185 mA, 36 V
A0	310	340
B0	340	370
C0	370	400
D0	400	440
E0	440	480
F0	480	520
G0	520	560
H0	560	600
J0	600	650
K0	650	700

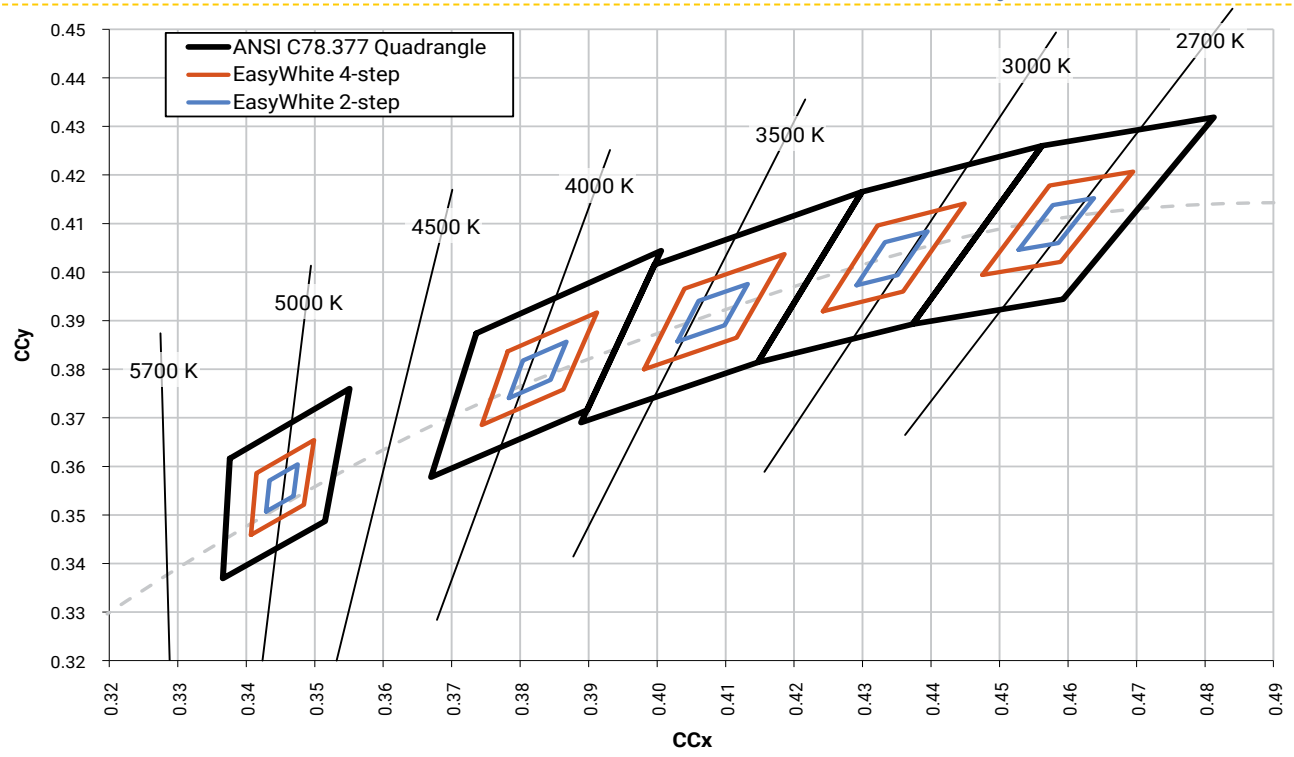
PERFORMANCE GROUPS – CHROMATICITY (T_J = 85 °C)

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

EasyWhite® Color Temperatures – 4-Step			
Code	CCT	x	y
50F	5000 K	0.3407	0.3459
		0.3415	0.3586
		0.3499	0.3654
		0.3484	0.3521
40F	4000 K	0.3744	0.3685
		0.3782	0.3837
		0.3912	0.3917
		0.3863	0.3758
35F	3500 K	0.3981	0.3800
		0.4040	0.3966
		0.4186	0.4037
		0.4116	0.3865
30F	3000 K	0.4242	0.3919
		0.4322	0.4096
		0.4449	0.4141
		0.4359	0.3960
27F	2700 K	0.4475	0.3994
		0.4573	0.4178
		0.4695	0.4207
		0.4589	0.4021

EasyWhite® Color Temperatures – 4-Step			
Code	CCT	x	y
50H	5000 K	0.3429	0.3507
		0.3434	0.3571
		0.3475	0.3604
		0.3469	0.3539
40H	4000 K	0.3784	0.3741
		0.3804	0.3818
		0.3867	0.3857
		0.3844	0.3778
35H	3500 K	0.4030	0.3857
		0.4061	0.3941
		0.4132	0.3976
		0.4099	0.3890
30H	3000 K	0.4291	0.3973
		0.4333	0.4062
		0.4395	0.4084
		0.4351	0.3994
27H	2700 K	0.4528	0.4046
		0.4578	0.4138
		0.4638	0.4152
		0.4586	0.4060

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



BIN AND ORDER CODE FORMATS

Bin codes and order codes are configured as follows:

Order Code

SSSCCC-BB-HHHH-NNNRNNNNN

- Series: MTG = MT-G
- Internal code
- CRI Specification: U = 90 CRI minimum; P = 85 CRI minimum; 0 = Standard CRI
- Kit code
- Vf class: B0 = 6-V class; N0 = 36-V class
- Reel size: 0 = 500 (standard); 1 = 100 (nonstandard)
- Color: EZW = EasyWhite

Bin Code

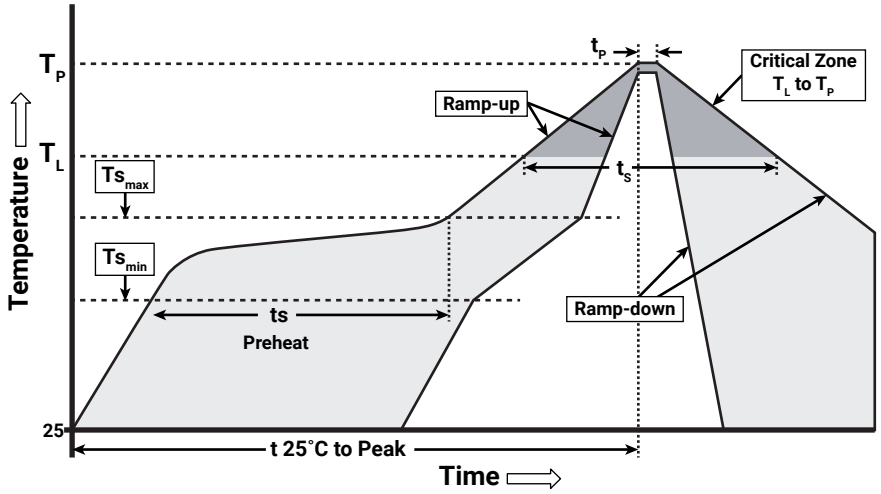
SSSCCC-BB-WWW-FF-NNRAAAA

- Series: MTG = MT-G
- Internal code
- Flux bin
- CRI Specification: U = 90 CRI minimum; P = 85 CRI minimum; H = Standard minimum
- Internal Code
- Vf class: B0 = 6-V class; N0 = 36-V class
- Chromaticity bin
- Color: EZW = EasyWhite

REFLOW SOLDERING CHARACTERISTICS

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

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



IPC/JEDEC J-STD-020C

Profile Feature	Lead-Free Solder
Average Ramp-Up Rate (Ts_{max} to Tp)	1.2 °C/second
Preheat: Temperature Min (Ts_{min})	120 °C
Preheat: Temperature Max (Ts_{max})	170 °C
Preheat: Time (ts_{min} to ts_{max})	65-150 seconds
Time Maintained Above: Temperature (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 and CRI measurements in this document are binning specifications only and solely represent product measurements as of the date of shipment. These measurements will change over time based on a number of factors that are not within Cree's control and are not intended or provided as operational specifications for the products. Calculated values are provided for informational purposes only and are not intended as specifications.

Pre-Release Qualification Testing

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

Lumen Maintenance

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

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 MT-G EasyWhite LEDs may be stored as MSL 1 per JEDEC J-STD-033, meaning they have unlimited floor life in conditions of ≤ 30 ºC/85% relative humidity (RH). Regardless of storage condition, Cree recommends sealing any unsoldered LEDs in the original MBP.

RoHS Compliance

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

REACh Compliance

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

UL® Recognized Component

Level 4 enclosure consideration. The LED package or a portion thereof has been investigated as a fire and electrical enclosure per ANSI/UL 8750.

NOTES - CONTINUED

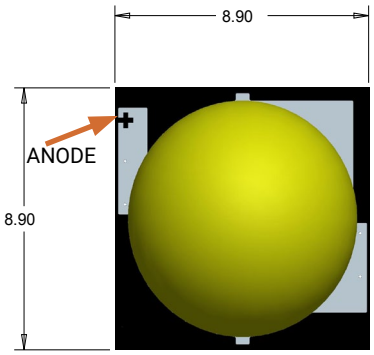
Vision Advisory

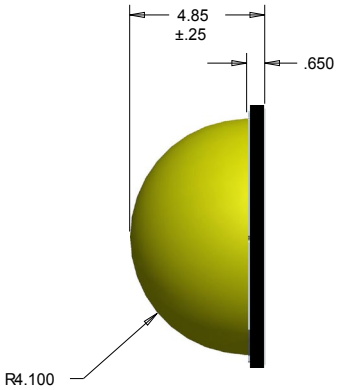
WARNING. Do not look at exposed LED lamps in operation. Eye injury can result. For more information about LEDs and eye safety, please refer to the LED Eye Safety application note.

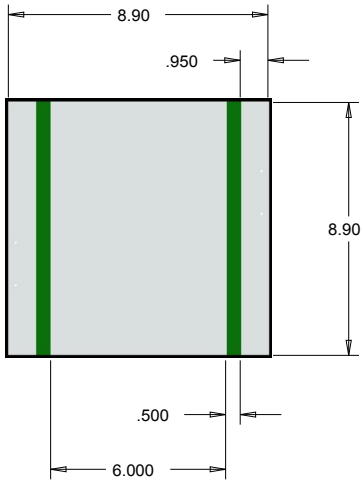
MECHANICAL DIMENSIONS

All measurements are ±.25 mm unless otherwise indicated.

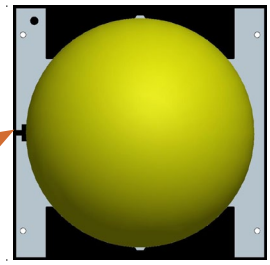
MT-G 6 V

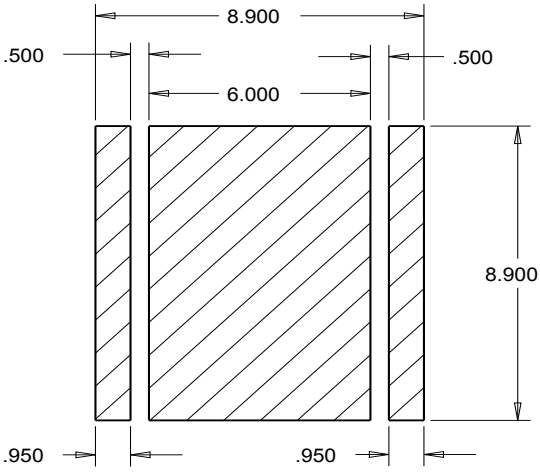




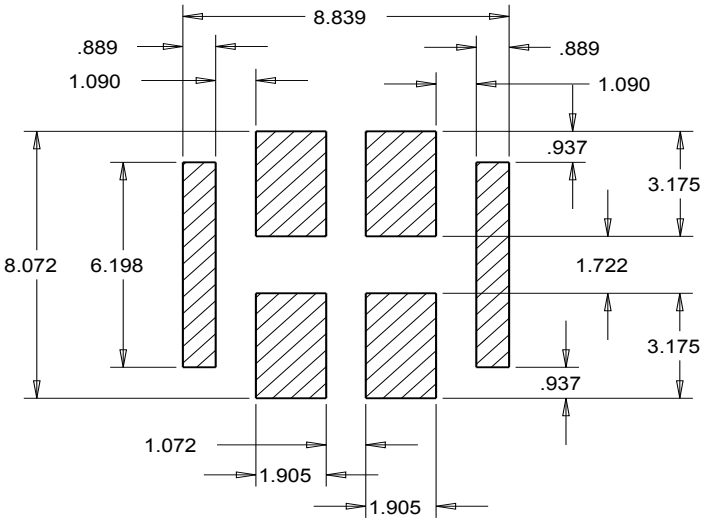


MT-G 36 V





RECOMMENDED PC BOARD SOLDER PAD

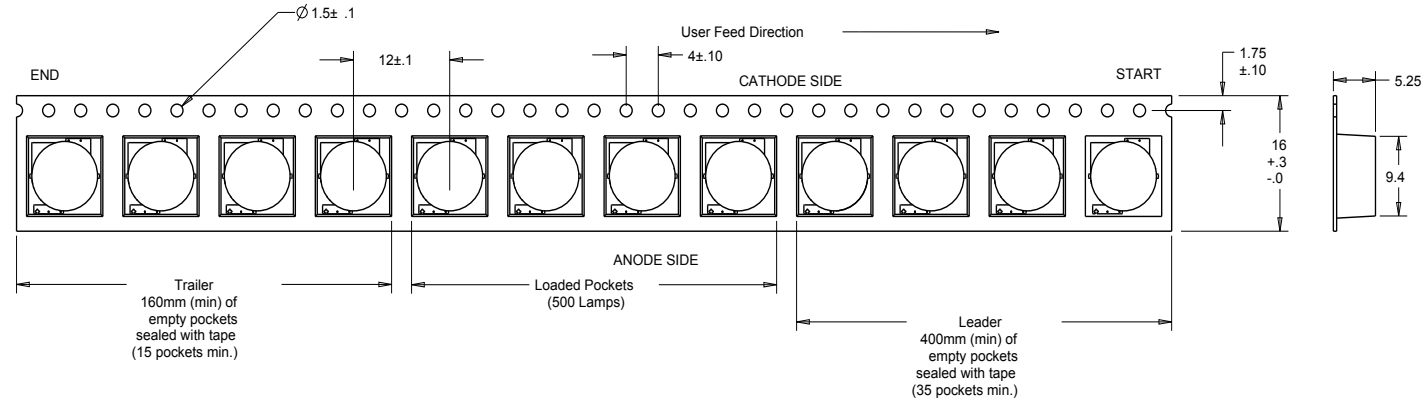


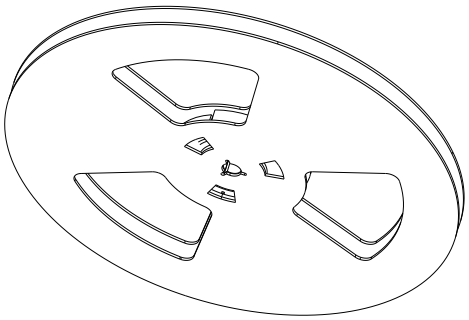
RECOMMENDED STENCIL PATTERN

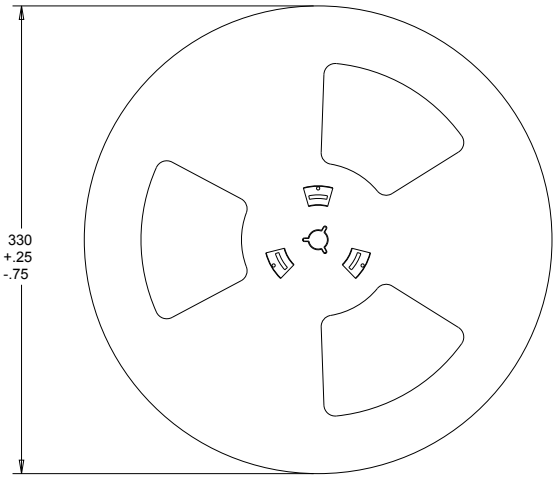
TAPE AND REEL

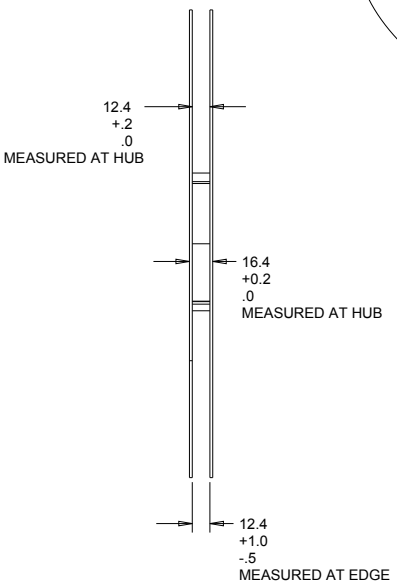
All Cree carrier tapes conform to EIA-481D, Automated Component Handling Systems Standard.

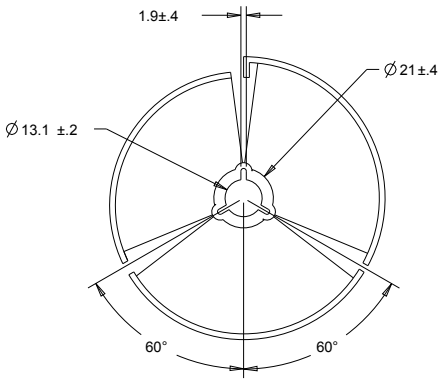
All dimensions in mm.





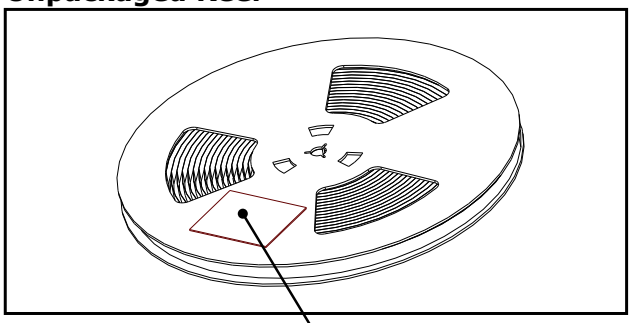




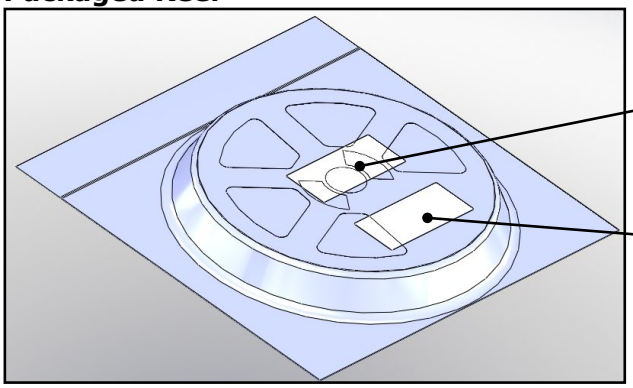


PACKAGING

Unpackaged Reel



Packaged Reel



Boxed Reel