CLD-DS219 REV 0C

Cree® XLamp® CMA1303 LED

PRODUCT DESCRIPTION

Cree's XLamp® High-Current LED Array family is optimized for best-in-class lumen output, efficacy and reliability at high drive currents. XLamp CMA LEDs share the same package design and LES sizes as Cree's industry-leading CXA2 Standard Density LEDs, enabling lighting manufacturers to address a range of performance requirements for applications such as track, downlight and outdoor lighting using a single easy-to-use platform. XLamp High-Current LED Arrays are available in 2-step, 3-step and 5-step EasyWhite® bins.

FEATURES

- 4.5-mm optical source
- Mechanical and optical design consistent with CXA13 and CXB13 LEDs
- Cree EasyWhite® 2-, 3- and 5-step binning
- Premium Color 2- and 3-step binning
- Standard & Premium Color LEDs available in 70, 80, 90 and 95 CRI minimum options
- Forward voltage options: 9-V class, 18-V class & 36-V class
- 85 °C binning and characterization
- Maximum drive current: 1400 mA (9 V), 700 mA (18 V), 350 mA (36 V)
- 116° viewing angle, uniform chromaticity profile
- Top-side solder connections
- RoHS compliant

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CHARACTERISTICS

Characteristics	Unit	Minimum	Typical	Maximum
Viewing angle (FWHM)	degrees		116	
ESD withstand voltage (JEDEC JS-001-2012)			Class 3A	
DC forward current (9 V)	mA			1400*
DC forward current (18 V)	mA			700*
DC forward current (36 V)	mA			350*
Reverse current	mA			0.1
Forward voltage (9 V, 700 mA, 85 °C)	V		9.35	10.675
Forward voltage (18 V, 350 mA, 85 °C)	V		18.7	21.35
Forward voltage (36 V, 175 mA, 85 °C)	V		37.4	42.7

* Refer to the Operating Limits section.

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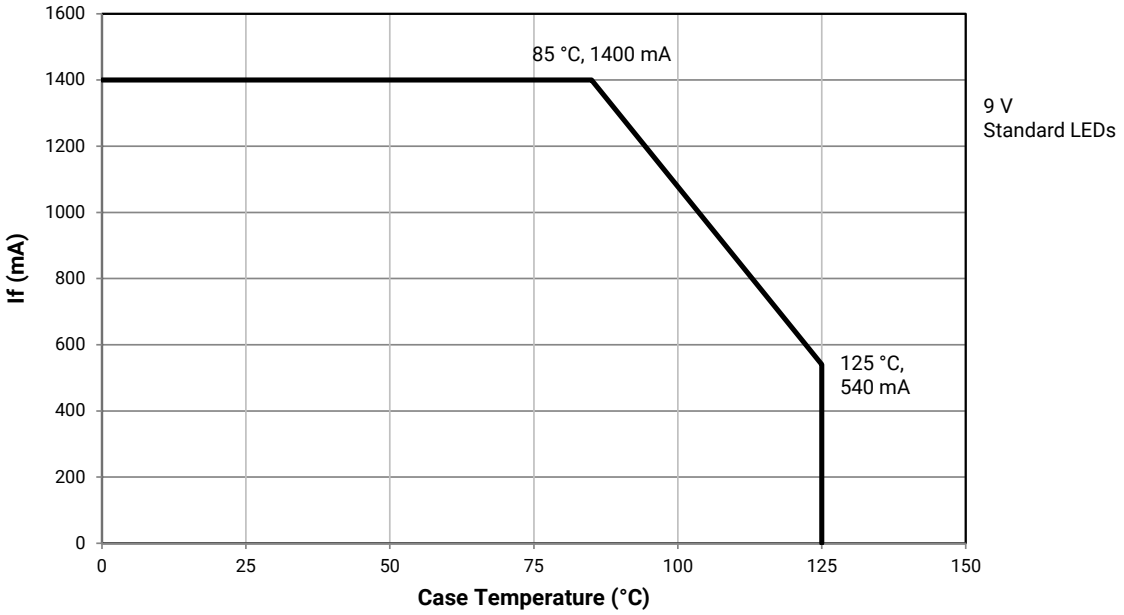
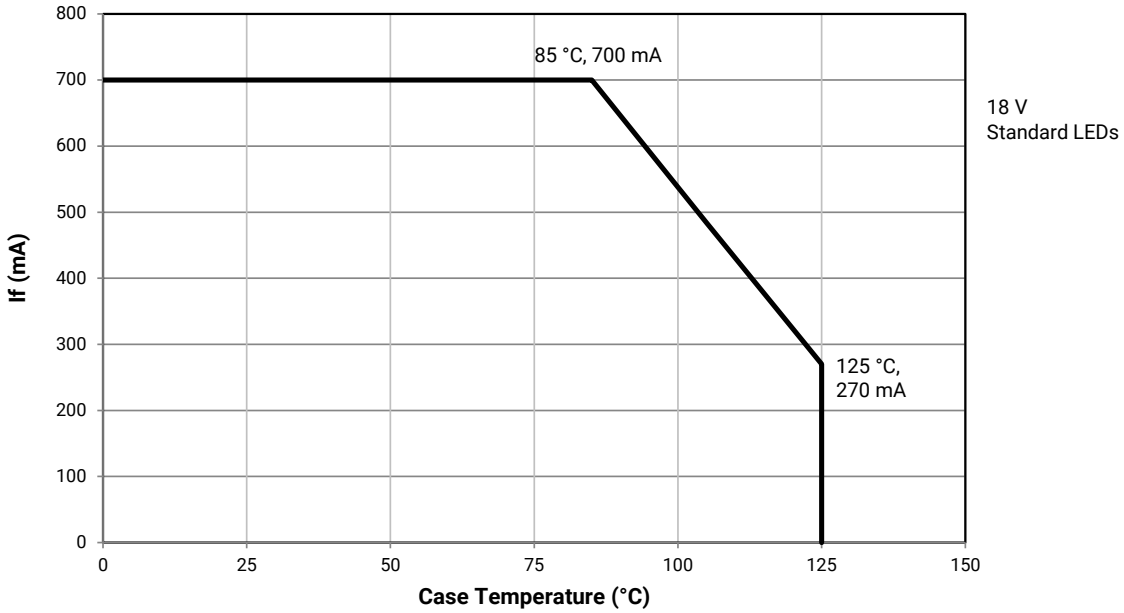
OPERATING LIMITS

The maximum current rating of the CMA1303 depends on the case temperature (Tc) when the LED has reached thermal equilibrium under steady-state operation. The graph shown below assumes that the system design employs good thermal management (thermal interface material and heat sink) and may vary when poor thermal management is employed. Either solder pad shown in the Mechanical Dimensions section on page 26 can be used as the Tc measurement point.

Another important factor in good thermal management is the temperature of the Light Emitting Surface (LES). Cree recommends a maximum LES temperature of 140 °C to ensure optimal LED lifetime. Please refer to the Thermal Design section on page 27 for more information on LES temperature measurement.





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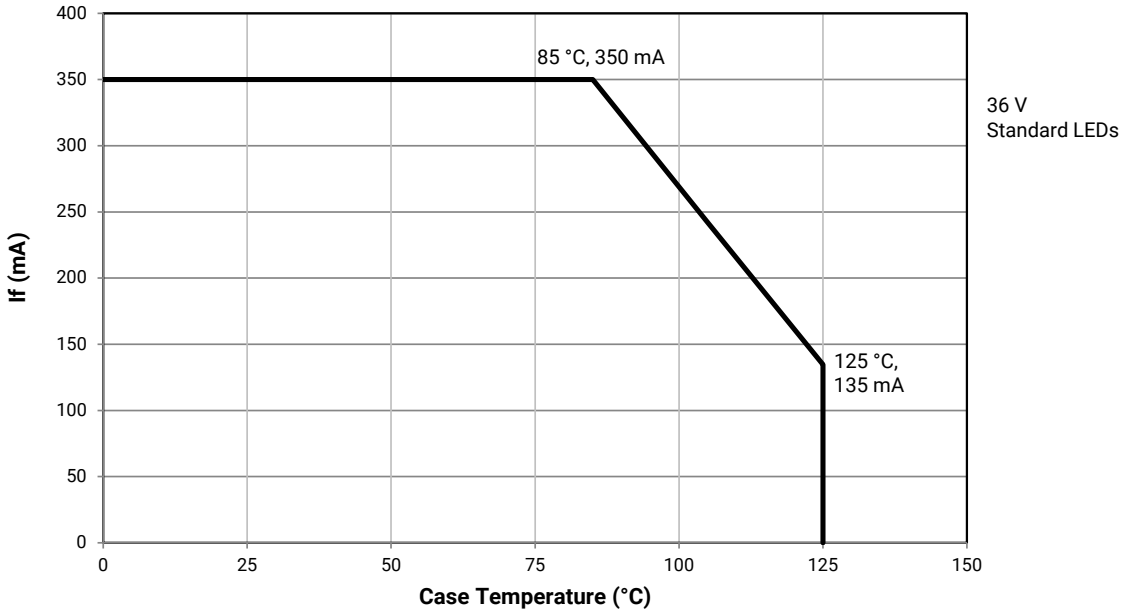
OPERATING LIMITS - CONTINUED



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FLUX CHARACTERISTICS, ORDER CODES & BINS - STANDARD LEDS - 9 V (I_F = 700 mA, T_J = 85 °C)

The following table provides order codes for XLamp CMA1303 LEDs. For a complete description of the order code nomenclature, please see the Bin and Order Code Formats section (page 25).

Nominal CCT	CRI		Minimum Luminous Flux (lm)	Typical Luminous Flux (lm)	2-Step		3-Step		5-Step	
	Min.	Typ.			Group	Order Code	Group	Order Code	Group	Order Code
6500 K	70	73	847	891					65E	CMA1303-0000-000C0B0A65E
	80	82	791	833					65E	CMA1303-0000-000C0H0A65E
5700 K	70	73	847	891					57E	CMA1303-0000-000C0B0A57E
	80	82	791	833					57E	CMA1303-0000-000C0H0A57E
	90	92	693	729			57G	CMA1303-0000-000C0U0A57G		
5000 K	70	73	847	891					50E	CMA1303-0000-000C0B0A50E
	80	82	791	833			50G	CMA1303-0000-000C0H0A50G		
	90	92	693	729			50G	CMA1303-0000-000C0U0A50G		
4000 K	70	73	840	885					40E	CMA1303-0000-000C0B0A40E
	80	82	782	823	40H	CMA1303-0000-000C0H0A40H	40G	CMA1303-0000-000C0H0A40G		
	90	92	673	709	40H	CMA1303-0000-000C0U0A40H	40G	CMA1303-0000-000C0U0A40G		
3500 K	80	82	763	803	35H	CMA1303-0000-000C0H0A35H	35G	CMA1303-0000-000C0H0A35G		
	90	92	655	689	35H	CMA1303-0000-000C0U0A35H	35G	CMA1303-0000-000C0U0A35G		
3000 K	70	73	820	860					30E	CMA1303-0000-000C0B0A30E
	80	82	741	780	30H	CMA1303-0000-000C0H0A30H	30G	CMA1303-0000-000C0H0A30G		
	90	92	626	659	30H	CMA1303-0000-000C0U0A30H	30G	CMA1303-0000-000C0U0A30G		
2700 K	80	82	711	748	27H	CMA1303-0000-000C0H0A27H	27G	CMA1303-0000-000C0H0A27G		
	90	92	598	630	27H	CMA1303-0000-000C0U0A27H	27G	CMA1303-0000-000C0U0A27G		
2200 K	80	82	598	630			22G	CMA1303-0000-000C0H0A22G		
	90	92	520	547	22H		22G	CMA1303-0000-000C0U0A22G		

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).
- For 80 CRI minimum LEDs, CRI R9 minimum is 0 with a ±2 tolerance. For 90 CRI minimum LEDs, CRI R9 typical is 60.

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FLUX CHARACTERISTICS, ORDER CODES & BINS - STANDARD LEDS, PREMIUM COLOR - 9 V (I_F = 700 mA, T_J = 85 °C)

Fidelity

Nominal CCT	CRI*		Minimum Luminous Flux (lm)	Typical Luminous Flux (lm)	2-Step	
	Min.	Typ			Group	Order Code
4000 K	95	98	603	635	L5A	CMA1303-0000-000C0Z0AL5A
3500 K	95	98	587	618	35H	CMA1303-0000-000C0Z0A35H
3000 K	95	98	549	578	30H	CMA1303-0000-000C0Z0A30H
2700 K	95	98	520	547	27H	CMA1303-0000-000C0Z0A27H

Specialty

Nominal CCT	CRI		Minimum Luminous Flux (lm)	Typical Luminous Flux (lm)	2-Step		3-Step			
	Min.	Typ			Group	Order Code	Group	Order Code	Group	Order Code
3100 K	90	92	630	665			31Q	CMA1303-0000-000C0U0A31Q		
3000 K	80	82	741	780	L7B	CMA1303-0000-000C0H0AL7B				
	90	92	626	650			30Q	CMA1303-0000-000C0U0A30Q	30U	CMA1303-0000-000C0U0A30U
	95	98	535	560	L7C	CMA1303-0000-000C0Z0AL7C				

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).
- For 80 CRI minimum LEDs, CRI R9 minimum is 0 with a ±2 tolerance. For 90 CRI minimum LEDs, CRI R9 typical is 60.

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FLUX CHARACTERISTICS, ORDER CODES & BINS - STANDARD LEDS - 18 V (I_F = 350 mA, T_J = 85 °C)

The following table provides order codes for XLamp CMA1303 LEDs. For a complete description of the order code nomenclature, please see the Bin and Order Code Formats section (page 25).

Nominal CCT	CRI		Minimum Luminous Flux (lm)	Typical Luminous Flux (lm)	2-Step		3-Step		5-Step	
	Min.	Typ			Group	Order Code	Group	Order Code	Group	Order Code
6500 K	70	73	847	891					65E	CMA1303-0000-000F0B0A65E
	80	82	791	833					65E	CMA1303-0000-000F0H0A65E
5700 K	70	73	847	891					57E	CMA1303-0000-000F0B0A57E
	80	82	791	833					57E	CMA1303-0000-000F0H0A57E
	90	92	693	729			57G	CMA1303-0000-000F0U0A57G		
5000 K	70	73	847	891					50E	CMA1303-0000-000F0B0A50E
	80	82	791	833			50G	CMA1303-0000-000F0H0A50G		
	90	92	693	729			50G	CMA1303-0000-000F0U0A50G		
4000 K	70	73	840	885					40E	CMA1303-0000-000F0B0A40E
	80	82	782	823	40H	CMA1303-0000-000F0H0A40H	40G	CMA1303-0000-000F0H0A40G		
	90	92	673	709	40H	CMA1303-0000-000F0U0A40H	40G	CMA1303-0000-000F0U0A40G		
3500 K	80	82	763	803	35H	CMA1303-0000-000F0H0A35H	35G	CMA1303-0000-000F0H0A35G		
	90	92	655	689	35H	CMA1303-0000-000F0U0A35H	35G	CMA1303-0000-000F0U0A35G		
3000 K	70	73	820	860					30E	CMA1303-0000-000F0B0A30E
	80	82	741	780	30H	CMA1303-0000-000F0H0A30H	30G	CMA1303-0000-000F0H0A30G		
	90	92	626	659	30H	CMA1303-0000-000F0U0A30H	30G	CMA1303-0000-000F0U0A30G		
2700 K	80	82	711	748	27H	CMA1303-0000-000F0H0A27H	27G	CMA1303-0000-000F0H0A27G		
	90	92	598	630	27H	CMA1303-0000-000F0U0A27H	27G	CMA1303-0000-000F0U0A27G		
2200 K	80	82	598	630			22G	CMA1303-0000-000F0H0A22G		
	90	92	520	547	22H		22G	CMA1303-0000-000F0U0A22G		

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).
- For 80 CRI minimum LEDs, CRI R9 minimum is 0 with a ±2 tolerance. For 90 CRI minimum LEDs, CRI R9 typical is 60.

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FLUX CHARACTERISTICS, ORDER CODES & BINS - STANDARD LEDS, PREMIUM COLOR - 18 V (I_F = 350 mA, T_J = 85 °C)

Fidelity

Nominal CCT	CRI*		Minimum Luminous Flux (lm)	Typical Luminous Flux (lm)	2-Step	
	Min.	Typ			Group	Order Code
4000 K	95	98	603	635	L5A	CMA1303-0000-000F0Z0AL5A
3500 K	95	98	587	618	35H	CMA1303-0000-000F0Z0A35H
3000 K	95	98	549	578	30H	CMA1303-0000-000F0Z0A30H
2700 K	95	98	520	547	27H	CMA1303-0000-000F0Z0A27H

Specialty

Nominal CCT	CRI		Minimum Luminous Flux (lm)	Typical Luminous Flux (lm)	2-Step		3-Step			
	Min.	Typ			Group	Order Code	Group	Order Code	Group	Order Code
3100 K	90	92	630	665			31Q	CMA1303-0000-000F0U0A31Q		
3000 K	80	82	741	780	L7B	CMA1303-0000-000F0H0AL7B				
	90	92	626	650			30Q	CMA1303-0000-000F0U0A30Q	30U	CMA1303-0000-000F0U0A30U
	95	98	535	560	L7C	CMA1303-0000-000F0Z0AL7C				

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).
- For 80 CRI minimum LEDs, CRI R9 minimum is 0 with a ±2 tolerance. For 90 CRI minimum LEDs, CRI R9 typical is 60.

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FLUX CHARACTERISTICS, ORDER CODES & BINS - STANDARD LEDS - 36 V (I_F = 175 mA, T_J = 85 °C)

The following table provides order codes for XLamp CMA1303 LEDs. For a complete description of the order code nomenclature, please see the Bin and Order Code Formats section (page 25).

Nominal CCT	CRI		Minimum Luminous Flux (lm)	Typical Luminous Flux (lm)	2-Step		3-Step		5-Step	
	Min.	Typ			Group	Order Code	Group	Order Code	Group	Order Code
6500 K	70	73	847	891					65E	CMA1303-0000-000N0B0A65E
	80	82	791	833					65E	CMA1303-0000-000N0H0A65E
5700 K	70	73	847	891					57E	CMA1303-0000-000N0B0A57E
	80	82	791	833					57E	CMA1303-0000-000N0H0A57E
	90	92	693	729			57G	CMA1303-0000-000N0U0A57G		
5000 K	70	73	847	891					50E	CMA1303-0000-000N0B0A50E
	80	82	791	833			50G	CMA1303-0000-000N0H0A50G		
	90	92	693	729			50G	CMA1303-0000-000N0U0A50G		
4000 K	70	73	840	885					40E	CMA1303-0000-000N0B0A40E
	80	82	782	823	40H	CMA1303-0000-000N0H0A40H	40G	CMA1303-0000-000N0H0A40G		
	90	92	673	709	40H	CMA1303-0000-000N0U0A40H	40G	CMA1303-0000-000N0U0A40G		
3500 K	80	82	763	803	35H	CMA1303-0000-000N0H0A35H	35G	CMA1303-0000-000N0H0A35G		
	90	92	655	689	35H	CMA1303-0000-000N0U0A35H	35G	CMA1303-0000-000N0U0A35G		
3000 K	70	73	820	860					30E	CMA1303-0000-000N0B0A30E
	80	82	741	780	30H	CMA1303-0000-000N0H0A30H	30G	CMA1303-0000-000N0H0A30G		
	90	92	626	659	30H	CMA1303-0000-000N0U0A30H	30G	CMA1303-0000-000N0U0A30G		
2700 K	80	82	711	748	27H	CMA1303-0000-000N0H0A27H	27G	CMA1303-0000-000N0H0A27G		
	90	92	598	630	27H	CMA1303-0000-000N0U0A27H	27G	CMA1303-0000-000N0U0A27G		
2200 K	80	82	598	630			22G	CMA1303-0000-000N0H0A22G		
	90	92	520	547	22H		22G	CMA1303-0000-000N0U0A22G		

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).
- For 80 CRI minimum LEDs, CRI R9 minimum is 0 with a ±2 tolerance. For 90 CRI minimum LEDs, CRI R9 typical is 60.

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FLUX CHARACTERISTICS, ORDER CODES & BINS - STANDARD LEDS, PREMIUM COLOR - 36 V (I_F = 175 mA, T_J = 85 °C)

Fidelity

Nominal CCT	CRI*		Minimum Luminous Flux (lm)	Typical Luminous Flux (lm)	2-Step	
	Min.	Typ			Group	Order Code
4000 K	95	98	603	635	L5A	CMA1303-0000-000N0Z0AL5A
3500 K	95	98	587	618	35H	CMA1303-0000-000N0Z0A35H
3000 K	95	98	549	578	30H	CMA1303-0000-000N0Z0A30H
2700 K	95	98	520	547	27H	CMA1303-0000-000N0Z0A27H

Specialty

Nominal CCT	CRI		Minimum Luminous Flux (lm)	Typical Luminous Flux (lm)	2-Step		3-Step			
	Min.	Typ			Group	Order Code	Group	Order Code	Group	Order Code
3100 K	90	92	630	665			31Q	CMA1303-0000-000N0U0A31Q		
3000 K	80	82	741	780	L7B	CMA1303-0000-000N0H0AL7B				
	90	92	626	650			30Q	CMA1303-0000-000N0U0A30Q	30U	CMA1303-0000-000N0U0A30U
	95	98	535	560	L7C	CMA1303-0000-000N0Z0AL7C				

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).
- For 80 CRI minimum LEDs, CRI R9 minimum is 0 with a ±2 tolerance. For 90 CRI minimum LEDs, CRI R9 typical is 60.

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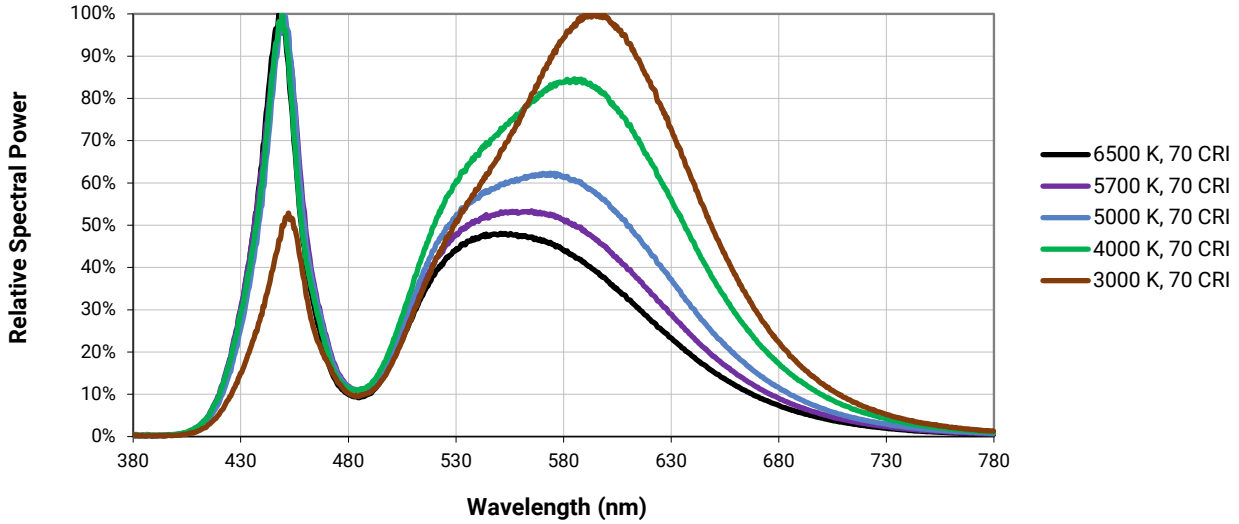
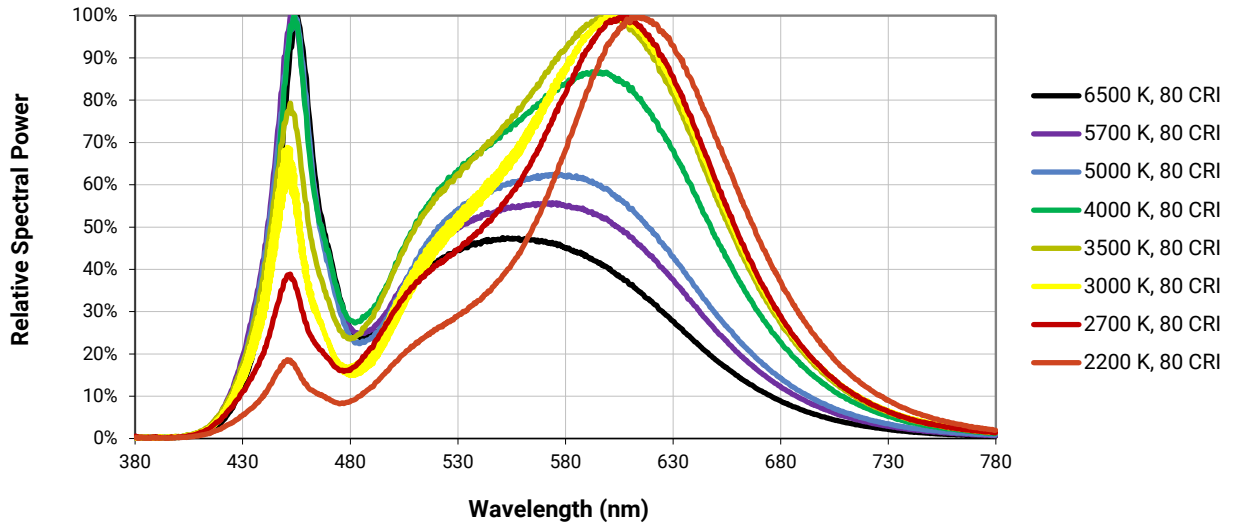
RELATIVE SPECTRAL POWER DISTRIBUTION - STANDARD LEDS

The following graphs are the result of a series of pulsed measurements at 700 mA for the 9-V CMA1303 LED, 350 mA for the 18-V CMA1303 LED and 175 mA for the 36-V CMA1303 LED and T_J = 85 °C.





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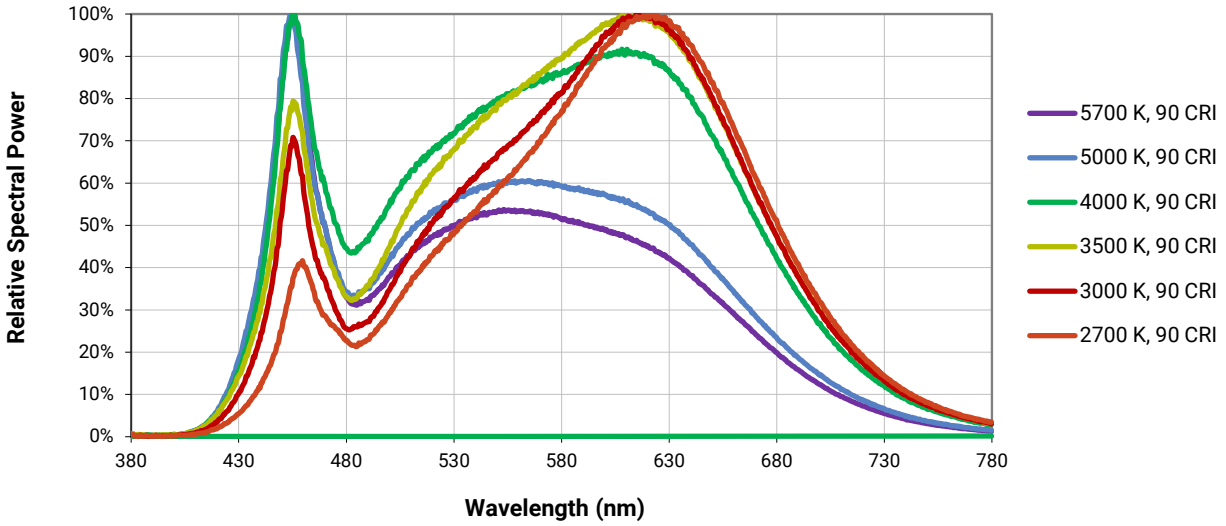
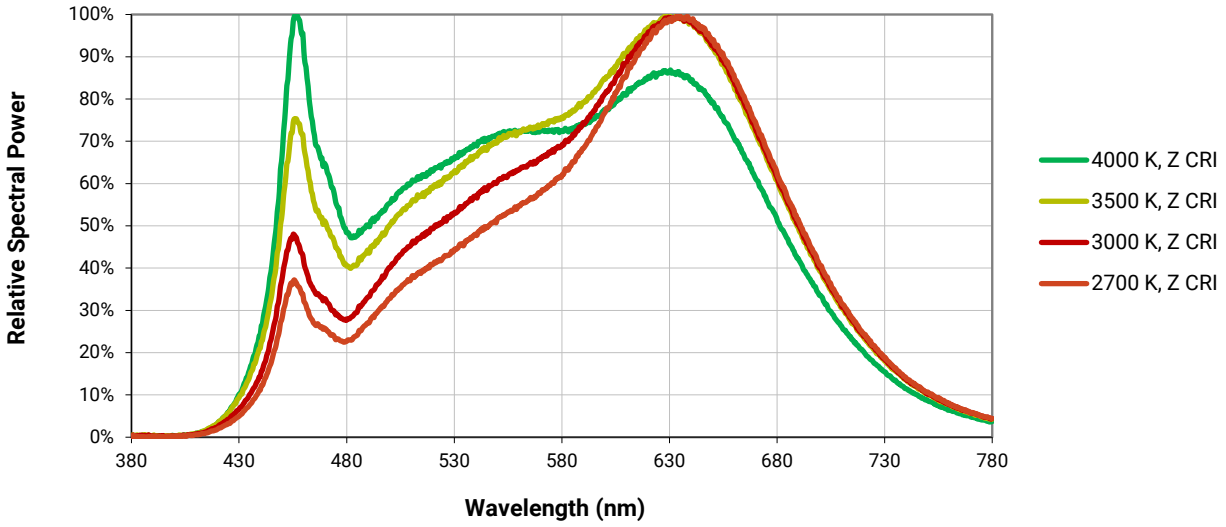
RELATIVE SPECTRAL POWER DISTRIBUTION - STANDARD LEDS (CONTINUED)



RELATIVE SPECTRAL POWER DISTRIBUTION - STANDARD LEDS, PREMIUM COLOR

The following graphs are the result of a series of pulsed measurements at 700 mA for the 9-V CMA1303 LED, 350 mA for the 18-V CMA1303 LED and 175 mA for the 36-V CMA1303 LED and T_J = 85 °C.

Fidelity



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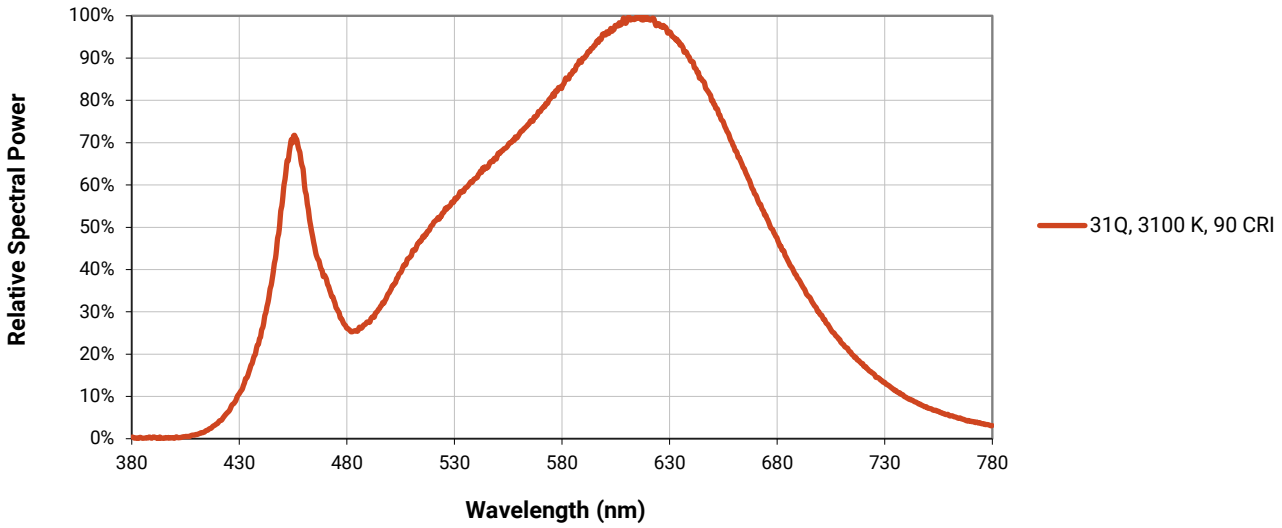
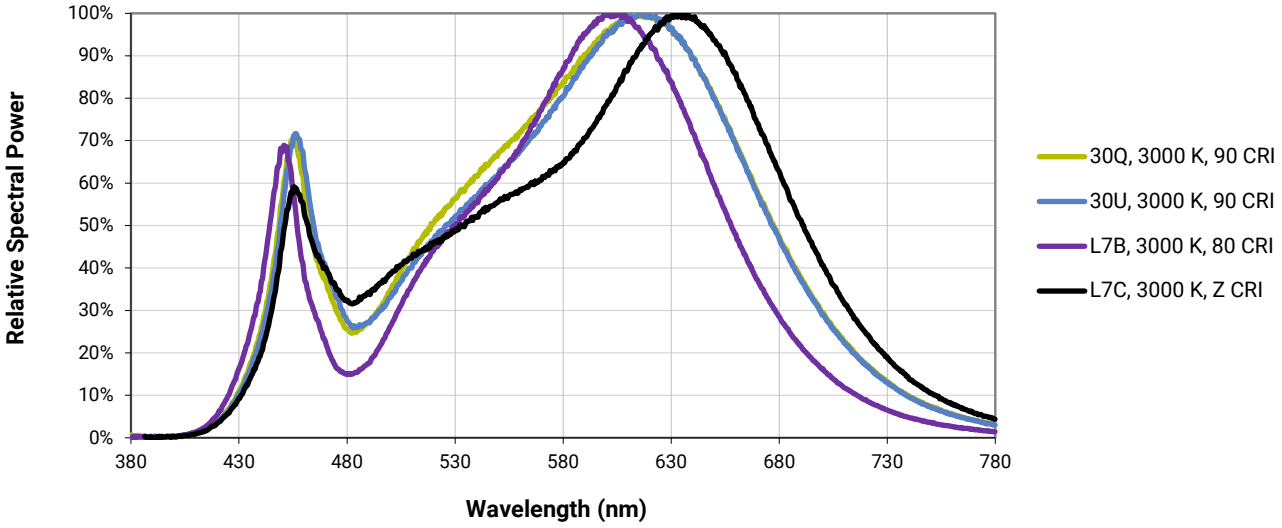
RELATIVE SPECTRAL POWER DISTRIBUTION - STANDARD LEDS, PREMIUM COLOR (CONTINUED)

Specialty





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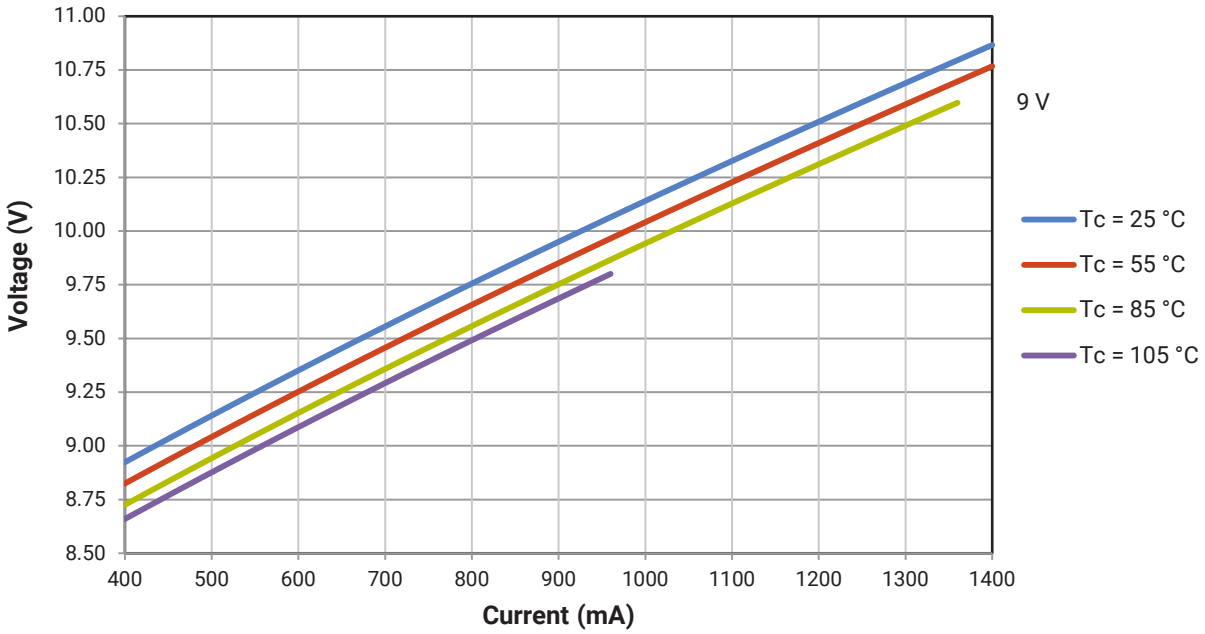
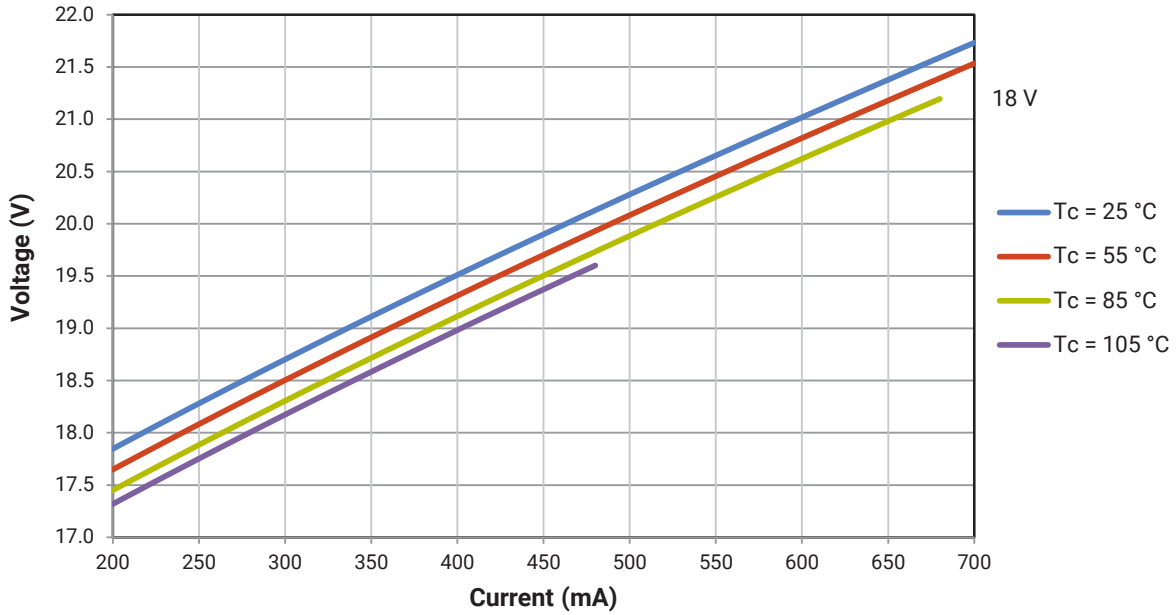
ELECTRICAL CHARACTERISTICS

The following graphs are the result of a series of steady-state measurements.





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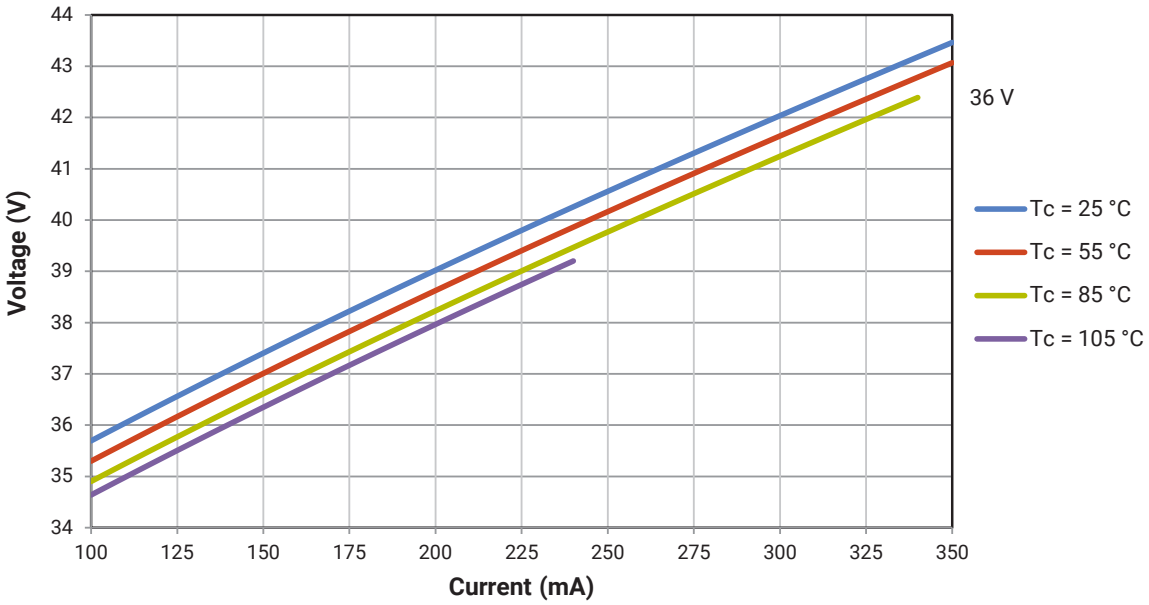
ELECTRICAL CHARACTERISTICS - CONTINUED



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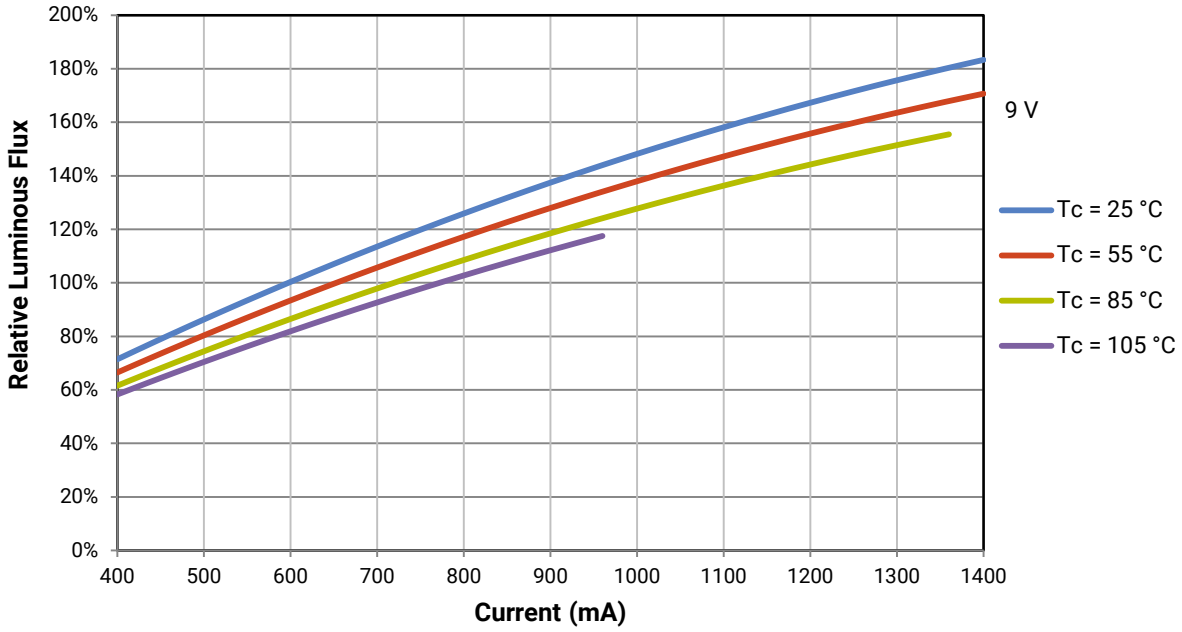
RELATIVE LUMINOUS FLUX

The relative luminous flux values provided below are the ratio of:

- Measurements of CMA1303 at steady-state operation at the given conditions, divided by
- Flux measured during binning, which is a pulsed measurement at 700 mA at T_J = 85 °C for the 9-V CMA1303 LED.

Using the 9-V CMA1303 LED as an example, at steady-state operation of Tc = 25 °C, I_F = 900 mA, the relative luminous flux ratio is 140% in the chart below. A 9-V CMA1303 LED that measures 860 lm during binning will deliver 1204 lm (860 * 1.4) at steady-state operation of Tc = 25 °C, I_F = 900 mA.



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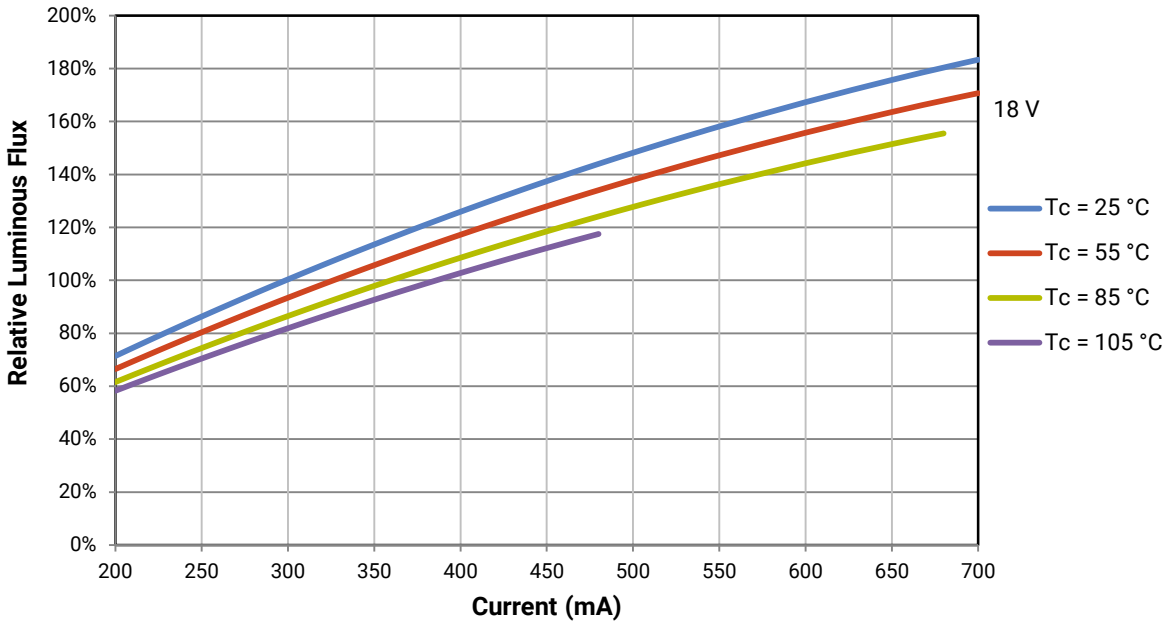
RELATIVE LUMINOUS FLUX - CONTINUED

The relative luminous flux values provided below are the ratio of:

- Measurements of CMA1303 at steady-state operation at the given conditions, divided by
- Flux measured during binning, which is a pulsed measurement at 350 mA at T_J = 85 °C for the 18-V CMA1303 LED.

Using the 18-V CMA1303 LED as an example, at steady-state operation of Tc = 25 °C, I_F = 450 mA, the relative luminous flux ratio is 140% in the chart below. An 18-V CMA1303 LED that measures 860 lm during binning will deliver 1204 lm (860 * 1.4) at steady-state operation of Tc = 25 °C, I_F = 450 mA.



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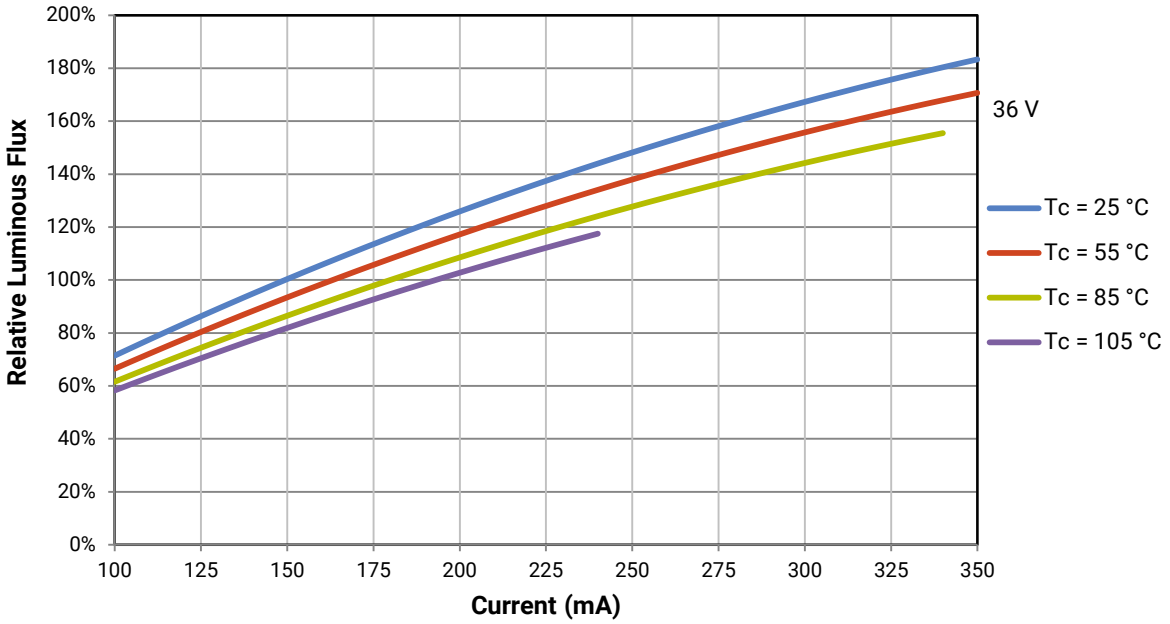
RELATIVE LUMINOUS FLUX - CONTINUED

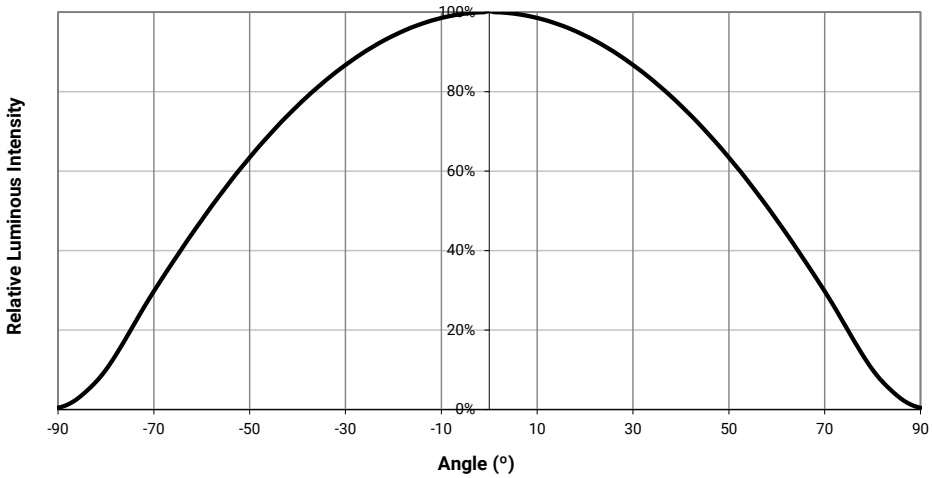
The relative luminous flux values provided below are the ratio of:

- Measurements of CMA1303 at steady-state operation at the given conditions, divided by
- Flux measured during binning, which is a pulsed measurement at 175 mA at T_J = 85 °C for the 36-V CMA1303 LED.

Using the 36-V CMA1303 LED as an example, at steady-state operation of Tc = 25 °C, I_F = 225 mA, the relative luminous flux ratio is 140% in the chart below. A 36-V CMA1303 LED that measures 860 lm during binning will deliver 1204 lm (860 * 1.43) at steady-state operation of Tc = 25 °C, I_F = 225 mA.



TYPICAL SPATIAL DISTRIBUTION



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EASYWHITE® PERFORMANCE GROUPS - CHROMATICITY (T_J = 85 °C)

XLamp CMA1303 LEDs are tested for chromaticity and placed into one of the regions defined by the following bounding coordinates.

EasyWhite Color Temperatures – 2-Step			
Code	CCT	x	y
40H	4000 K	0.3777	0.3739
		0.3797	0.3816
		0.3861	0.3855
		0.3838	0.3777
35H	3500 K	0.4022	0.3858
		0.4053	0.3942
		0.4125	0.3977
		0.4091	0.3891
30H	3000 K	0.4287	0.3975
		0.4328	0.4064
		0.4390	0.4086
		0.4347	0.3996
27H	2700 K	0.4524	0.4048
		0.4574	0.4140
		0.4633	0.4154
		0.4581	0.4062

EasyWhite Color Temperatures – 3-Step Ellipse						
Bin Code	CCT	Center Point		Major Axis	Minor Axis	Rotation Angle (°)
		x	y	a	b	
65G	6500 K	0.3123	0.3282	0.00666	0.00330	61.0
57G	5700 K	0.3287	0.3417	0.00738	0.00360	72.0
50G	5000 K	0.3447	0.3553	0.00840	0.00312	65.0
40G	4000 K	0.3818	0.3797	0.00939	0.00402	53.7
35G	3500 K	0.4073	0.3917	0.00927	0.00414	54.0
30G	3000 K	0.4338	0.4030	0.00834	0.00408	53.2
27G	2700 K	0.4577	0.4099	0.00834	0.00420	48.5
22G	2200 K	0.5066	0.5066	0.00980	0.00480	45.5

EasyWhite Color Temperatures – 5-Step Ellipse						
Bin Code	CCT	Center Point		Major Axis	Minor Axis	Rotation Angle (°)
		x	y	a	b	
65E	6500 K	0.3123	0.3282	0.01110	0.00550	61.0
57E	5700 K	0.3287	0.3417	0.01230	0.00600	72.0
50E	5000 K	0.3447	0.3553	0.01400	0.00520	65.0
40E	4000 K	0.3818	0.3797	0.01565	0.00670	53.7
30E	3000 K	0.4338	0.4030	0.01390	0.00680	53.2

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PREMIUM COLOR PERFORMANCE GROUPS - CHROMATICITY (T_J = 85 °C)

XLamp CMA1303 LEDs are tested for chromaticity and placed into one of the regions defined by the following bounding coordinates.

Fidelity

EasyWhite Color Temperatures – 2-Step			
Code	CCT	x	y
L5A	4000 K	0.3764	0.3711
		0.3784	0.3787
		0.3847	0.3826
		0.3825	0.3748
35H	3500 K	0.4022	0.3858
		0.4053	0.3942
		0.4125	0.3977
		0.4091	0.3891
30H	3000 K	0.4287	0.3975
		0.4328	0.4064
		0.4390	0.4086
		0.4347	0.3996
27H	2700 K	0.4524	0.4048
		0.4574	0.4140
		0.4633	0.4154
		0.4581	0.4062

Specialty

EasyWhite Color Temperatures – 2-Step			
Code	CCT	x	y
L7B	3000 K	0.4263	0.3848
		0.4296	0.3916
		0.4361	0.3938
		0.4326	0.3868
L7C	3000 K	0.4192	0.3754
		0.4224	0.3823
		0.4291	0.3847
		0.4257	0.3777

EasyWhite Color Temperatures – 3-Step Ellipse						
Bin Code	CCT	Center Point		Major Axis	Minor Axis	Rotation Angle (°)
		x	y	a	b	
31Q	3100 K	0.4236	0.3888	0.00848	0.00455	50.3
30Q	3000 K	0.4305	0.3935	0.00834	0.00408	53.2
30U	3000 K	0.4274	0.3837	0.00834	0.00408	53.2

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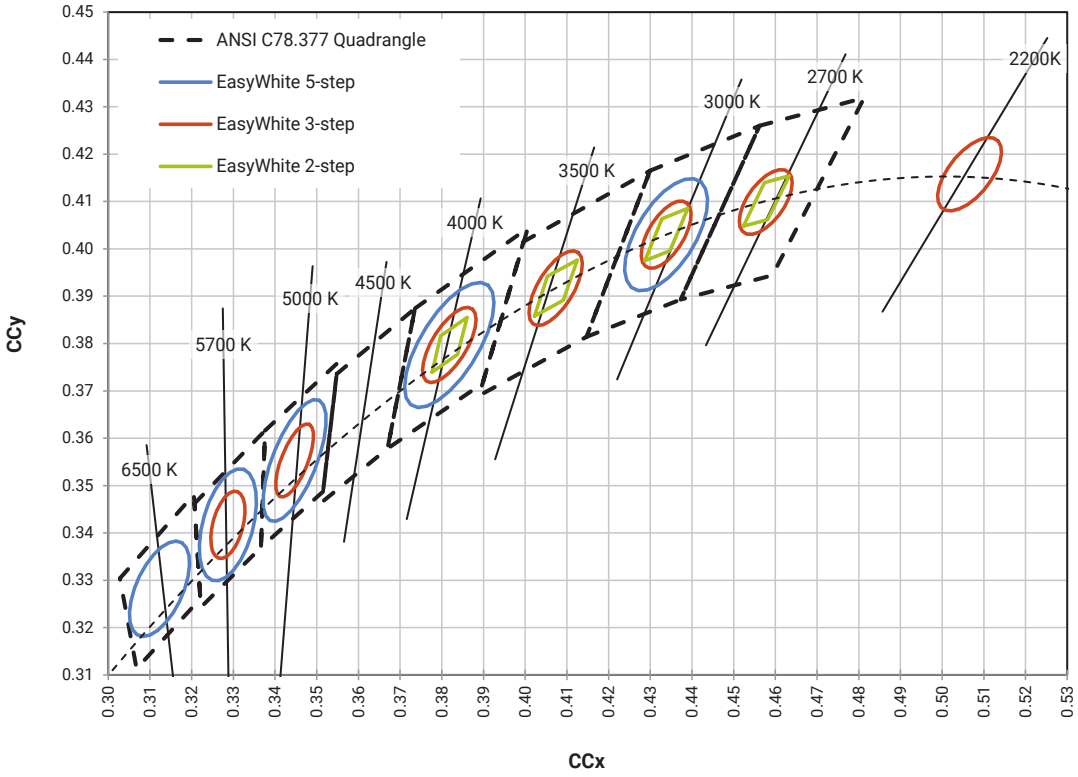
CREE EASYWHITE® BINS PLOTTED ON THE 1931 CIE COLOR SPACE (T_J = 85 °C)



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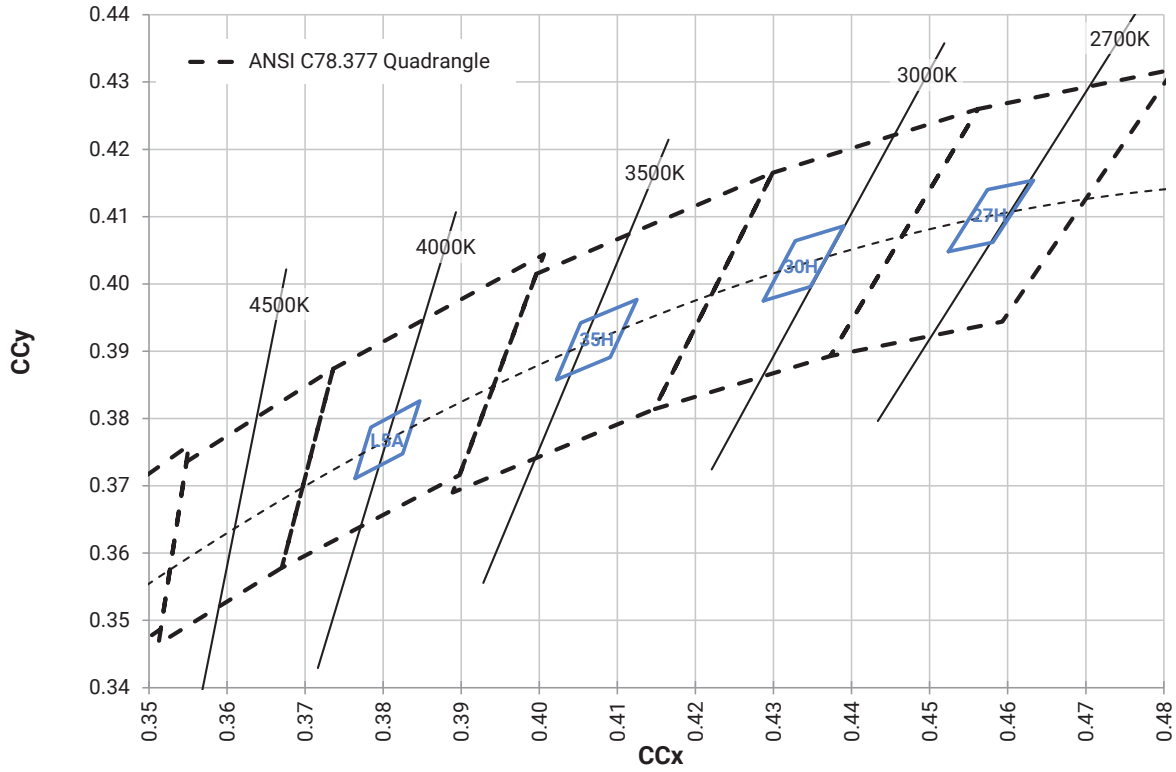
CREE PREMIUM COLOR BINS PLOTTED ON THE 1931 CIE COLOR SPACE (T_J = 85 °C)

Fidelity (2-step)



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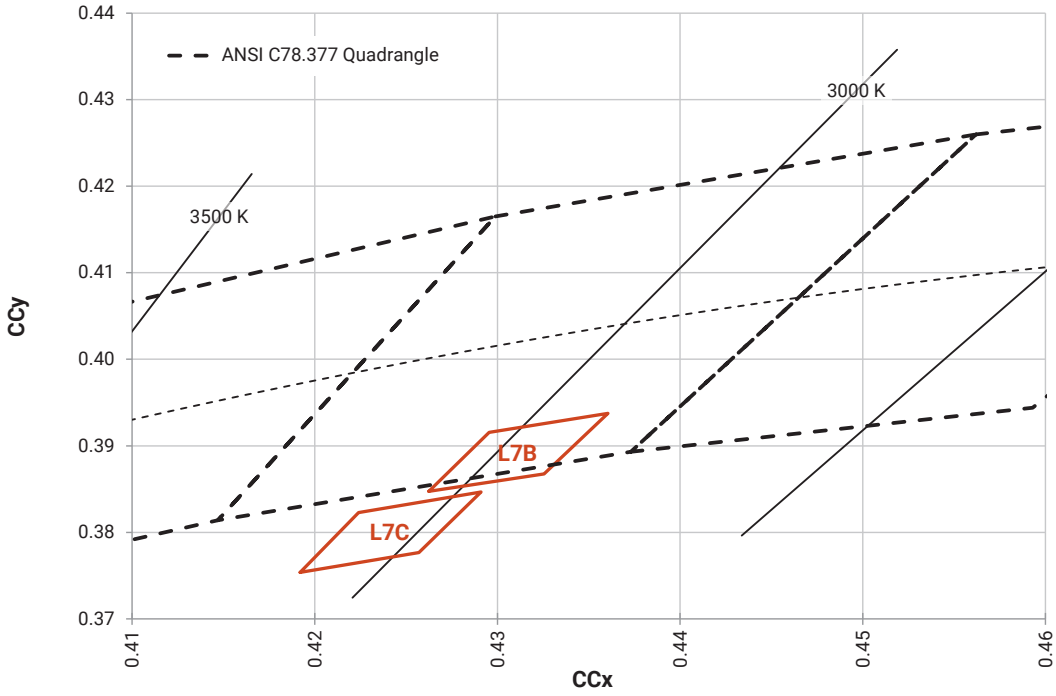
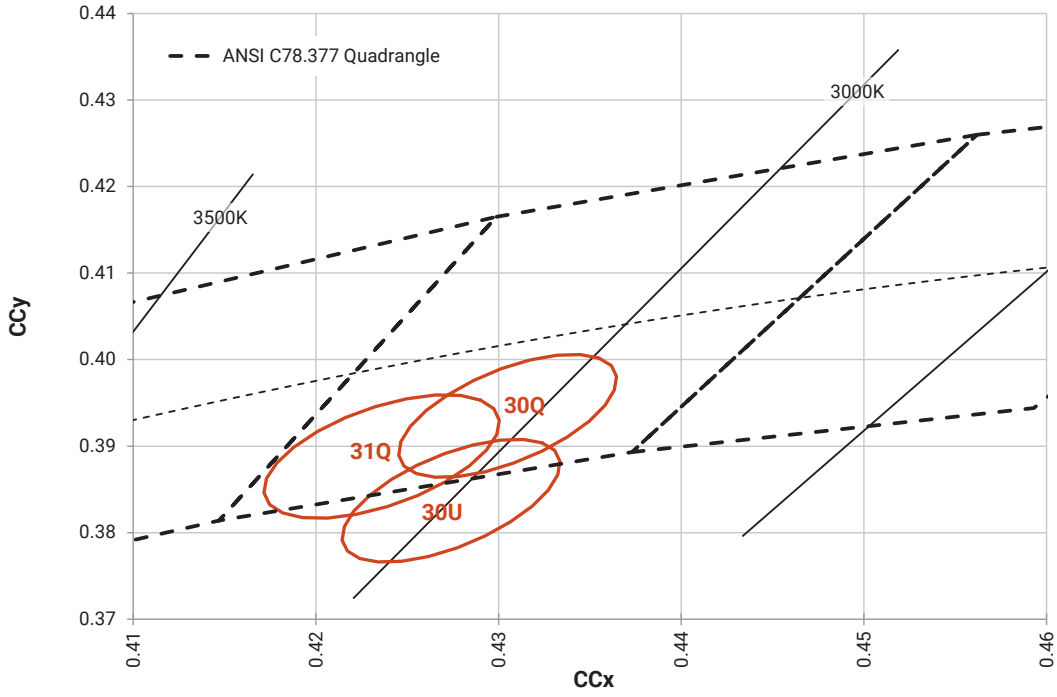
CREE PREMIUM COLOR BINS PLOTTED ON THE 1931 CIE COLOR SPACE (T_J = 85 °C) - CONTINUED

Speciality (2-step)



Speciality (3-step)



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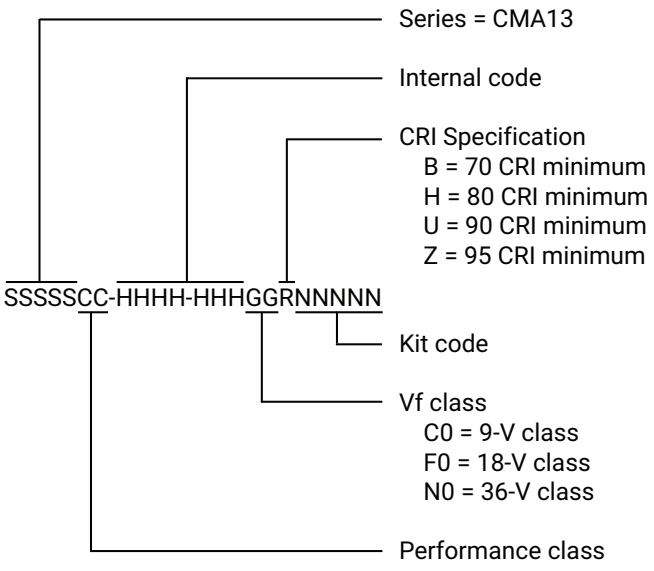
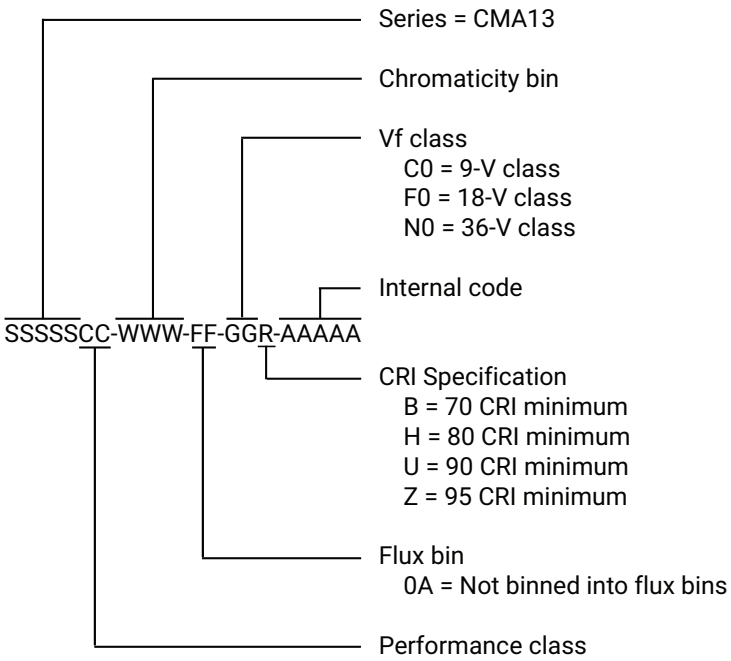
BIN AND ORDER CODE FORMATS

Bin codes and order codes are configured as follows:

Order Code



Bin Code



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MECHANICAL DIMENSIONS

Dimensions are in mm.

Tolerances unless otherwise specified: ±.13

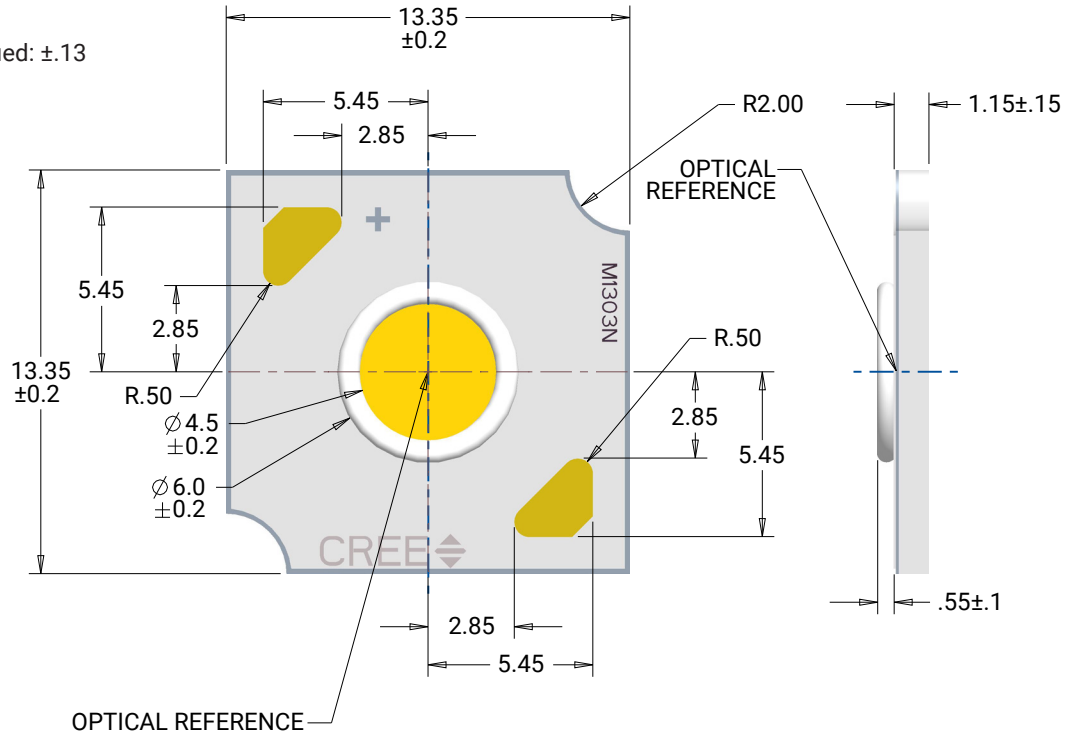
x° ± 1°

Meaning of LED Marking

M1303C = 9-V CMA1303

M1303C = 18-V CMA1303

M1303N = 36-V CMA1303



Tc measurement point: either the anode or cathode solder pad

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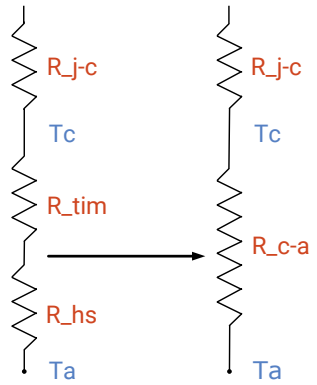
THERMAL DESIGN

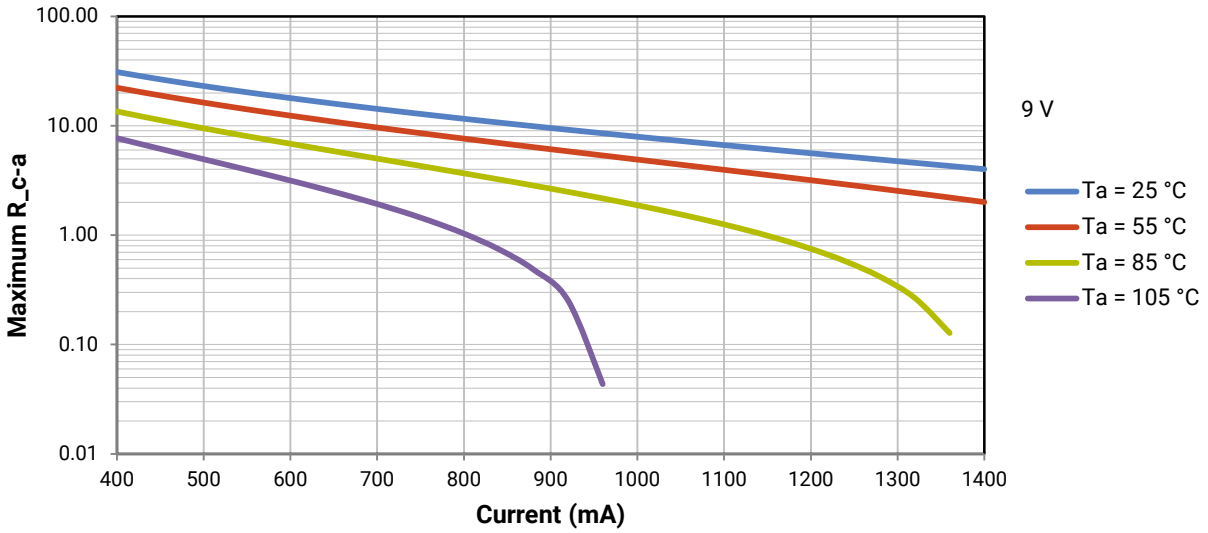
The CMA family of LED arrays can include over a hundred different LED die inside one package, and thus over a hundred different junction temperatures (T_J). Cree has intentionally removed junction-temperature-based operating limits and replaced the commonplace maximum T_J calculations with maximum ratings based on forward current (I_F) and case temperature (Tc). No additional calculations are required to ensure that the CMA LED is being operated within its designed limits. LES temperature measurement provides additional verification of good thermal design. Please refer to page 4 for the Operating Limit specifications.

There is no need to calculate for T_J inside the package, as the thermal management design process, specifically from solder point (T_{SP}) to ambient (T_a), remains identical to any other LED component. For more information on thermal management of Cree XLamp LEDs, please refer to the Thermal Management application note. For CMA soldering recommendations and information on thermal interface materials (TIM), LES temperature measurement, and connection methods, please refer to the Cree XLamp CM Family LEDs soldering and handling document.

To keep the CMA1303 LED at or below the maximum rated Tc, the case to ambient temperature thermal resistance (R_c-a) must be at or below the maximum R_c-a value shown on the following graphs, depending on the operating environment. The y-axis in each graph is a base 10 logarithmic scale.

As the figure at right shows, the R_c-a value is the sum of the thermal resistance of the TIM (R_tim) plus the thermal resistance of the heat sink (R_hs).





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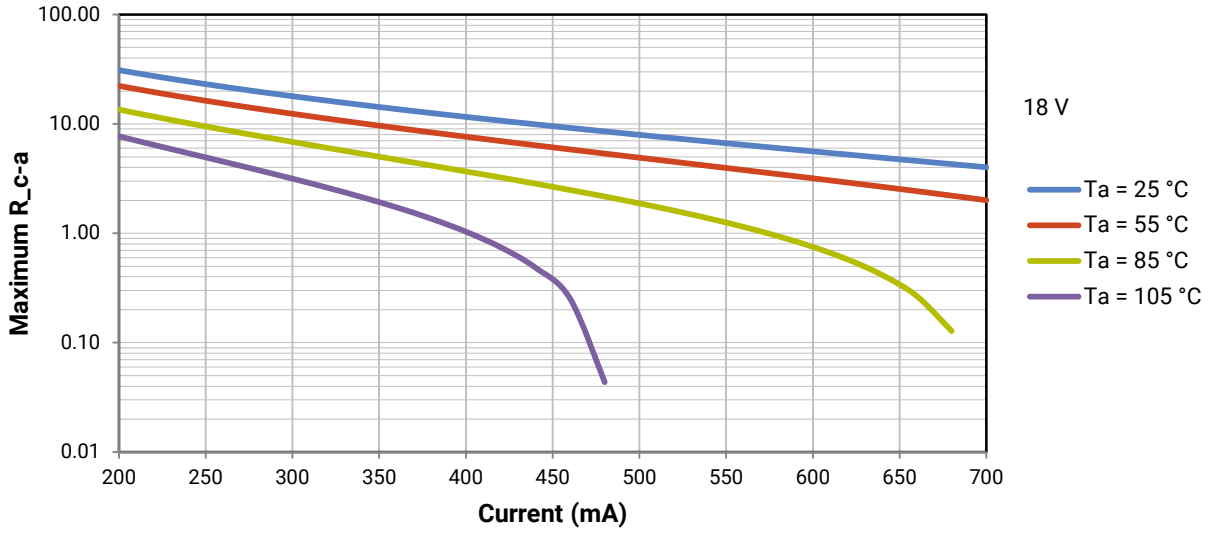
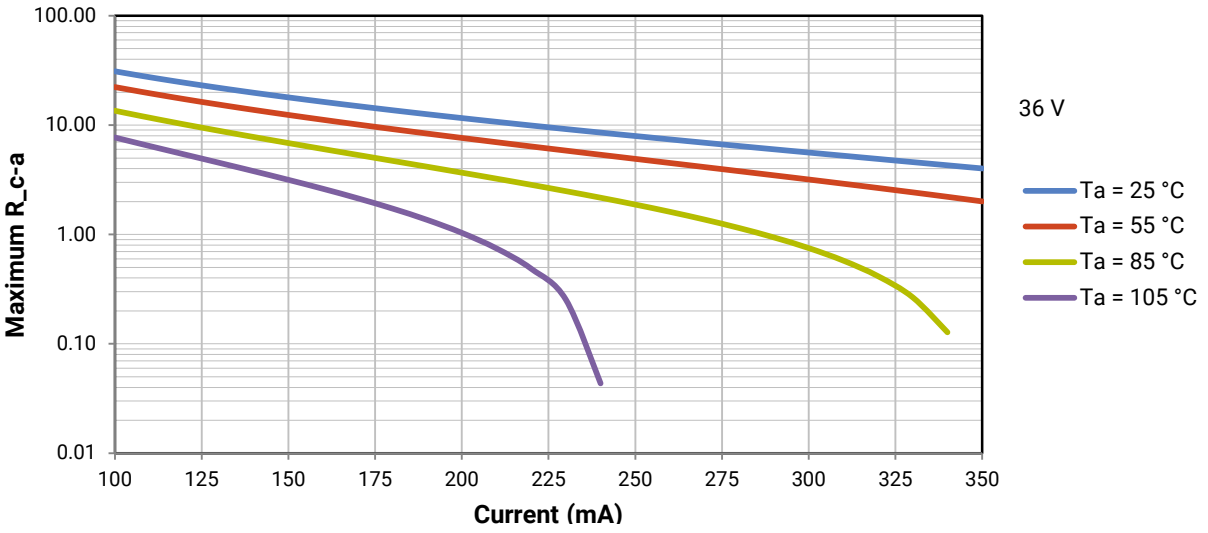
THERMAL DESIGN - CONTINUED





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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. Cree did not perform Room Temperature Operating Life (RTOL) testing on the CMA1303 LED.

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.

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

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.

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.

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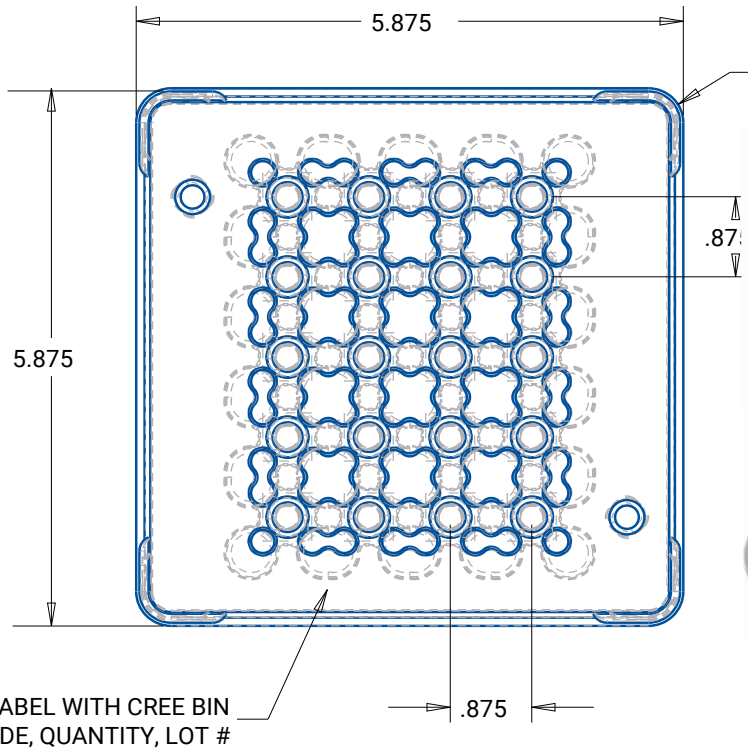
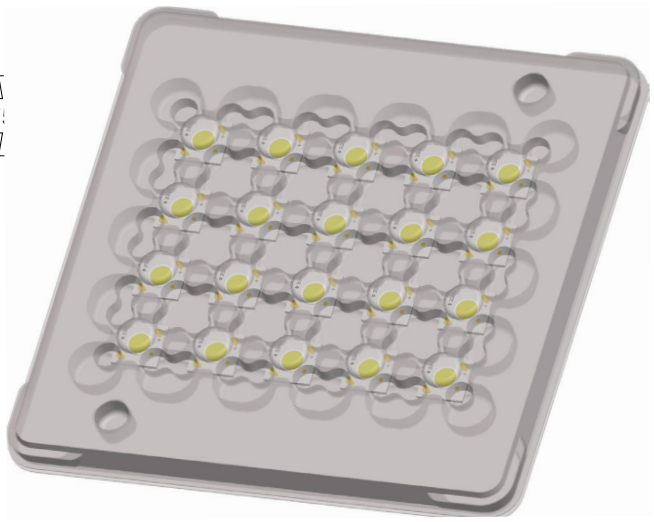
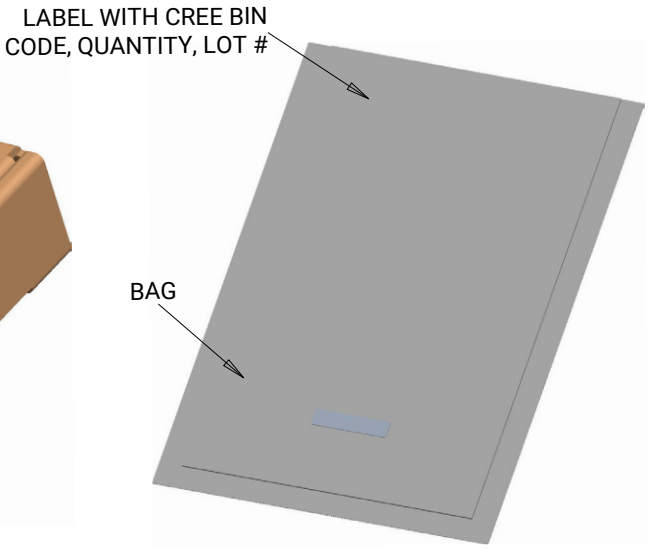
PACKAGING

Cree CMA1303 LEDs are packaged in trays of 20. Five trays are sealed in an anti-static bag and placed inside a carton, for a total of 100 LEDs per carton. Each carton contains 100 LEDs from the same performance bin.

Dimensions are in inches.
Tolerances: ±.13
x° ±1°







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