LUXEON 2835 Line

Perfected performance, built on a proven legacy

LUXEON 2835 Line is a collection of compact devices that allows for design freedom and provide a superior overall system solution when a project requires high lumen output and good efficacy. With an industry standard footprint, the LUXEON 2835 Line is the perfect upgrade for other 2835 products and other common mid power offerings. The LUXEON 2835 Line is color targeted for application needs and delivers efficacy and reliability for a variety of applications. It is available in two product offerings, LUXEON 2835C for higher output and LUXEON 2835E for lower output ranges.

FEATURES AND BENEFITS

- 4 different configurations of voltage and die count to meet a wide range of application requirements
- Industry standard footprint for drop-in replacement designs
- Maximum drive current of up to 240mA allows for reduction of LED count
- Hot-color targeting and 1/9th micro-color binning enables tight color control
- 3-, 4- and 5-step MacAdam ellipse color kits available

PRIMARY APPLICATIONS

- Downlights
- Indoor Area Lighting
  - TLEDs
  - Troffers
- Lamps

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General Product Information

Product Test Conditions

LUXEON 2835 Line LEDs are tested with a 20ms monopulse specified below at a junction temperature, T_j, of 25°C. Forward voltage and luminous flux are binned at a T_j of 25°C, while color is hot-targeted at a T_j of 85°C with the exception of LUXEON 2835C 3V which is targeted at T_j of 25°C.

60mA – LUXEON 2835E

120mA – LUXEON 2835C

Part Number Nomenclature

Part numbers for LUXEON 2835 Line follow the convention below:

L 1 2 8 – **A A B B C D** 3 5 0 0 0 **E** 1

Where:

A A – designates nominal ANSI CCT (27=2700K, 30=3000K, 35=3500K, 40=4000K, 50=5000K, 57=5700K, 65=6500K)

B B – designates minimum CRI (80=80CRI and 90=90CRI)

C – designates binning current (C=120mA and E=60mA)

D – designates voltage of the part (A=3V, B=6V and C=9V)

E – designates parts with Transient Voltage Suppressor (TVS) (T=TVS included)

Therefore, the following part number is used for a LUXEON 2835C 3000K 80CRI, 6V:

L 1 2 8 – **3 0 8 0 C B** 3 5 0 0 0 **0** 1

Lumen Maintenance

Please contact your local Sales Representative or Lumileds Technical Solutions Manager for more information about the long-term performance of this product.

Environmental Compliance

Lumileds LLC is committed to providing environmentally friendly products to the solid-state lighting market. LUXEON 2835 Line is compliant to the European Union directives on the restriction of hazardous substances in electronic equipment, namely the RoHS Directive 2011/65/EU and REACH Regulation (EC) 1907/2006. Lumileds LLC will not intentionally add the following restricted materials to its products: lead, mercury, cadmium, hexavalent chromium, polybrominated biphenyls (PBB) or polybrominated diphenyl ethers (PBDE).

Performance Characteristics

Product Selection Guide

Table 1. Product performance of LUXEON 2835 Line at specified test current, T_j=25°C.

PRODUCT	VOLTAGE	NOMINAL CCT [1]	MINIMUM CRI [2, 3]	LUMINOUS FLUX [2, 3] (lm)		TYPICAL LUMINOUS EFFICACY (lm/W)	TEST CURRENT (mA)	PART NUMBER
				MINIMUM	TYPICAL			
LUXEON 2835E	9V	2700K	80	67	75	137	60	L128-2780EC3500001
		3000K	80	70	78	142	60	L128-3080EC3500001
		3500K	80	72	80	147	60	L128-3580EC3500001
		4000K	80	74	82	150	60	L128-4080EC3500001
		5000K	80	74	82	150	60	L128-5080EC3500001
		5700K	80	74	82	150	60	L128-5780EC3500001
		6500K	80	74	82	150	60	L128-6580EC3500001
		2700K	90	54	62	114	60	L128-2790EC3500001
		3000K	90	57	65	119	60	L128-3090EC3500001
		3500K	90	60	68	124	60	L128-3590EC3500001
		4000K	90	62	70	128	60	L128-4090EC3500001
		5000K	90	62	70	128	60	L128-5090EC3500001
	6V	2700K	80	43	48	129	60	L128-2780EB3500001
		3000K	80	44	49	132	60	L128-3080EB3500001
		3500K	80	46	50	134	60	L128-3580EB3500001
		4000K	80	47	52	140	60	L128-4080EB3500001
		5000K	80	47	52	140	60	L128-5080EB3500001
		5700K	80	47	52	140	60	L128-5780EB3500001
		6500K	80	47	52	140	60	L128-6580EB3500001
LUXEON 2835C	6V	2700K	80	93	105	141	120	L128-2780CB3500001
		3000K	80	96	108	145	120	L128-3080CB3500001
		3500K	80	99	111	149	120	L128-3580CB3500001
		4000K	80	103	115	155	120	L128-4080CB3500001
		5000K	80	103	115	155	120	L128-5080CB3500001
		5700K	80	103	115	155	120	L128-5780CB3500001
		6500K	80	103	115	155	120	L128-6580CB3500001
	3V	2700K	80	51	56	154	120	L128-2780CA3500001
		3000K	80	53	58	160	120	L128-3080CA3500001
		3500K	80	54	59	164	120	L128-3580CA3500001
		4000K	80	56	60	168	120	L128-4080CA3500001
		5000K	80	56	60	168	120	L128-5080CA3500001
		5700K	80	56	60	168	120	L128-5780CA3500001
		6500K	80	56	60	168	120	L128-6580CA3500001
	3V TVS	2700K	80	48	54	149	120	L128-2780CA35000T1
		3000K	80	50	56	154	120	L128-3080CA35000T1
		3500K	80	52	57	158	120	L128-3580CA35000T1
		4000K	80	54	58	163	120	L128-4080CA35000T1
		5000K	80	54	58	163	120	L128-5080CA35000T1
		5700K	80	54	58	163	120	L128-5780CA35000T1
		6500K	80	54	58	163	120	L128-6580CA35000T1

Notes for Table 1:
1. Correlated color temperature is cold-targeted at T_j=25°C for LUXEON 2835C 3V & LUXEON 2835C 3V TVS products and hot-targeted at T_j=85°C for everything else.
2. Luminous flux and CRI specs are based upon mounted package on highly reflective surface at T_j=25°C. Typical CRI is approximately 2 points higher than the minimum CRI specified, but this is not guaranteed.
3. Lumileds maintains a tolerance of ±2 on CRI and ±7.5% on luminous flux measurements.

Optical Characteristics

Table 2. Optical characteristics for LUXEON 2835 Line at test current, T_j=25°C.

PART NUMBER	TYPICAL TOTAL INCLUDED ANGLE [1]	TYPICAL VIEWING ANGLE [2]
L128-xxxxxx35000x1	160°	120°

Notes for Table 2:
1. Total angle at which 90% of total luminous flux is captured.
2. Viewing angle is the off axis angle from the LED centerline where the luminous intensity is ½ of the peak value.

Electrical and Thermal Characteristics

Table 3. Electrical and thermal characteristics for LUXEON 2835 Line at test current, T_j=25°C.

PART NUMBER	FORWARD VOLTAGE [1] (V_f)			TYPICAL TEMPERATURE COEFFICIENT OF FORWARD VOLTAGE [2] (mV/°C)	TYPICAL THERMAL RESISTANCE—JUNCTION TO SOLDER PAD (°C/W)
	MINIMUM	TYPICAL	MAXIMUM		
L128-xxxxCA35000x1	2.9	3.0	3.2	-3.0 to -6.0	21
L128-xxxxCB3500001	5.8	6.1	6.6	-2.0 to -4.0	11
L128-xxxxEB3500001	5.8	6.1	6.6	-2.0 to -4.0	20
L128-xxxxEC3500001	8.7	9.1	9.9	-3.0 to -6.0	15

Notes for Table 3:
1. Lumileds maintains a tolerance of ±0.1V on forward voltage measurements.
2. Measured between 25°C and 85°C.

Absolute Maximum Ratings

Table 4. Absolute maximum ratings for LUXEON 2835 Line.

PARAMETER	MAXIMUM PERFORMANCE
DC Forward Current [1, 2]	120mA for L128-xxxxEx3500001 240mA for L128-xxxxCx35000x1
Peak Pulsed Forward Current [1, 3]	200mA for L128-xxxxEx3500001 300mA for L128-xxxxCx35000x1
LED Junction Temperature [1] (DC & Pulse)	125°C for L128-xxxxEx3500001 125°C for L128-xxxxCx35000x1
ESD Sensitivity (ANSI/ESDA/JEDEC JS-001-2012)	Class 3B for LUXEON 2835C 3V TVS with ESD protection Class 2 for all other LUXEON 2835 parts
Operating Case Temperature [1]	-40°C to 105°C
LED Storage Temperature	-40°C to 125°C
Soldering Temperature	JEDEC 020c 260°C
Allowable Reflow Cycles	3
Reverse Voltage [4, 5] ($V_{reverse}$)	5

Notes for Table 4:
1. Proper current derating must be observed to maintain the junction temperature below the maximum allowable junction temperature.
2. Residual periodic variations due to power conversion from alternating current (AC) to direct current (DC), also called "ripple," are acceptable if the following conditions are met:
   – The frequency of the ripple current is 100Hz or higher
   – The average current for each cycle does not exceed the maximum allowable DC forward current
   – The maximum amplitude of the ripple does not exceed the maximum peak pulsed forward current
3. At ≤50% duty cycle with pulse width of 5ms.
4. Transient reverse voltages and surge currents due to electrical switching or supply interruptions are acceptable if these events do not last for more than 10ms, the amplitude of the reverse voltage does not exceed 5V and the reverse current is less than 220uA.
5. Max 5V reverse for up to 10s is an acceptable beginning of life, one time test condition.

Characteristics Curves

Spectral Power Distribution Characteristics

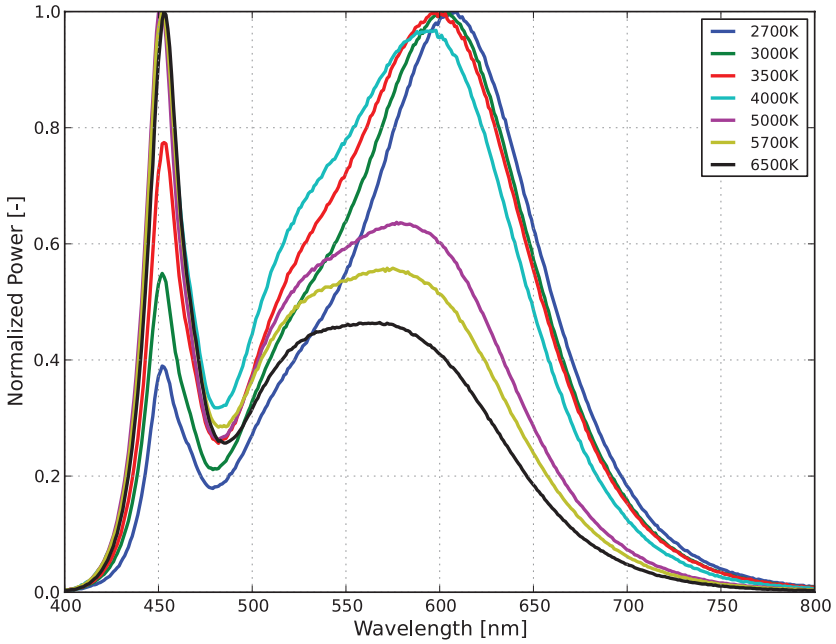

Figure 1a. Typical normalized power vs. wavelength for 80CRI LUXEON 2835 Line at test current, T_j=25°C.

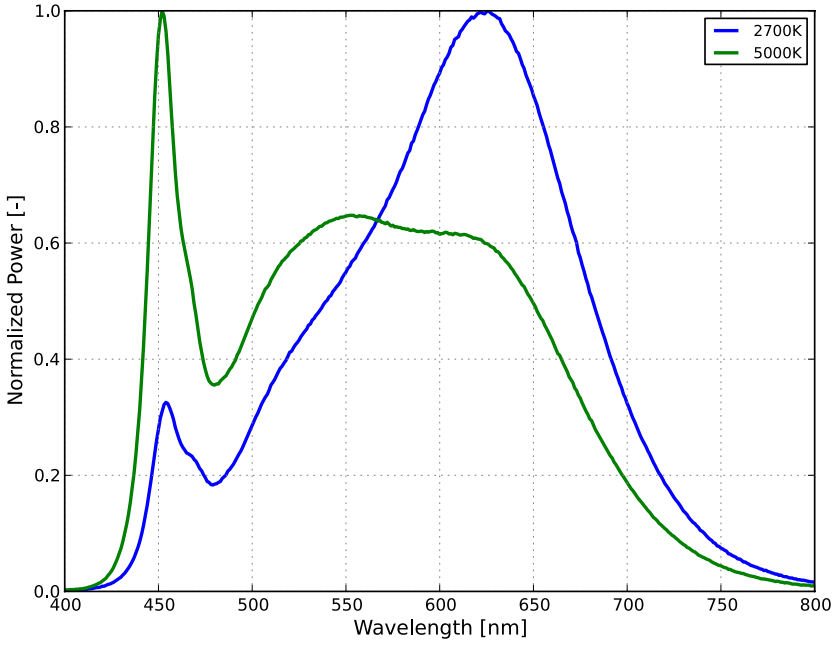

Figure 1b. Typical normalized power vs. wavelength for 90CRI LUXEON 2835 Line at test current, T_j=25°C.

Light Output Characteristics

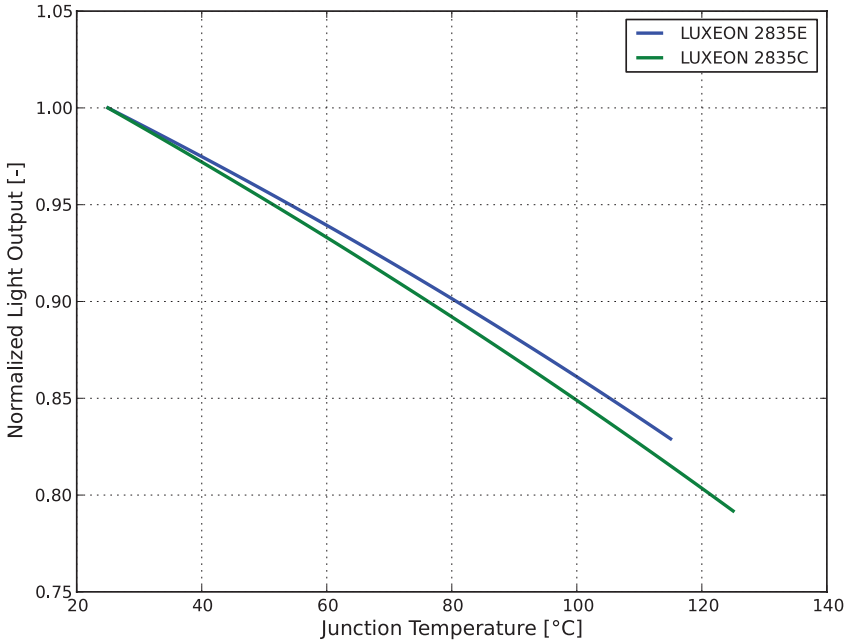

Figure 2. Typical normalized light output vs. junction temperature for LUXEON 2835 Line at test current.

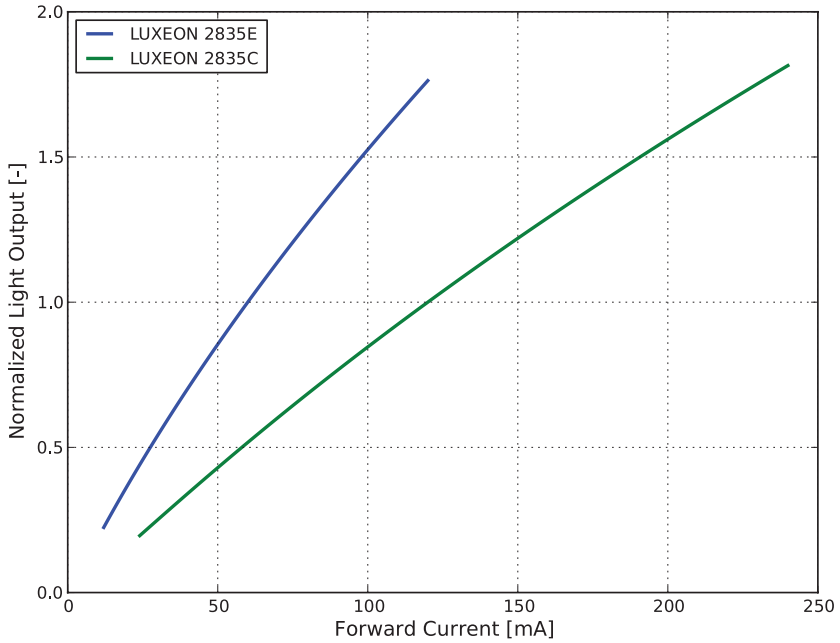

Figure 3. Typical normalized light output vs. forward current for LUXEON 2835 Line at T_j=25°C.

Forward Current Characteristics

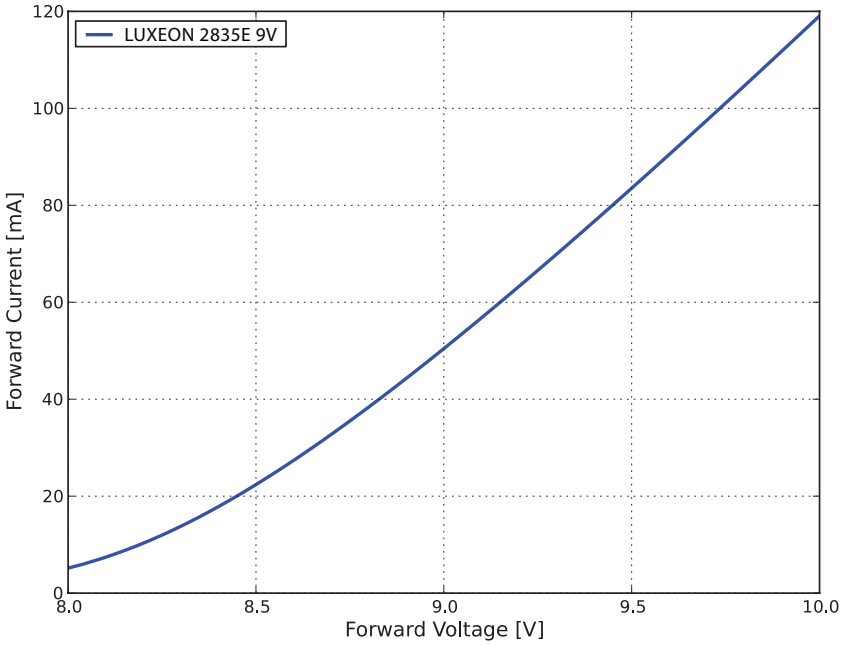

Figure 4a. Typical forward current vs. forward voltage for LUXEON 2835E 9V at T_j=25°C.

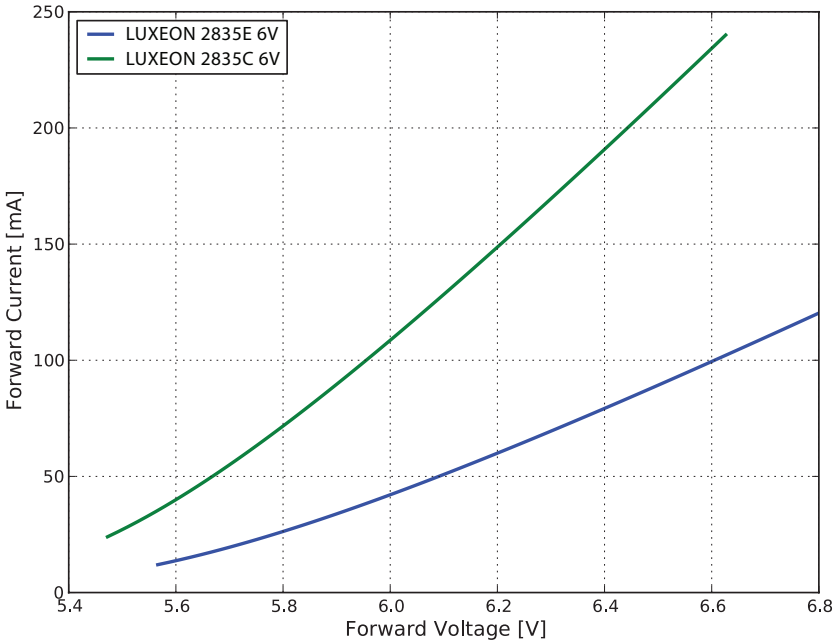

Figure 4b. Typical forward current vs. forward voltage for LUXEON 2835E 6V and LUXEON 2835C 6V at T_j=25°C.

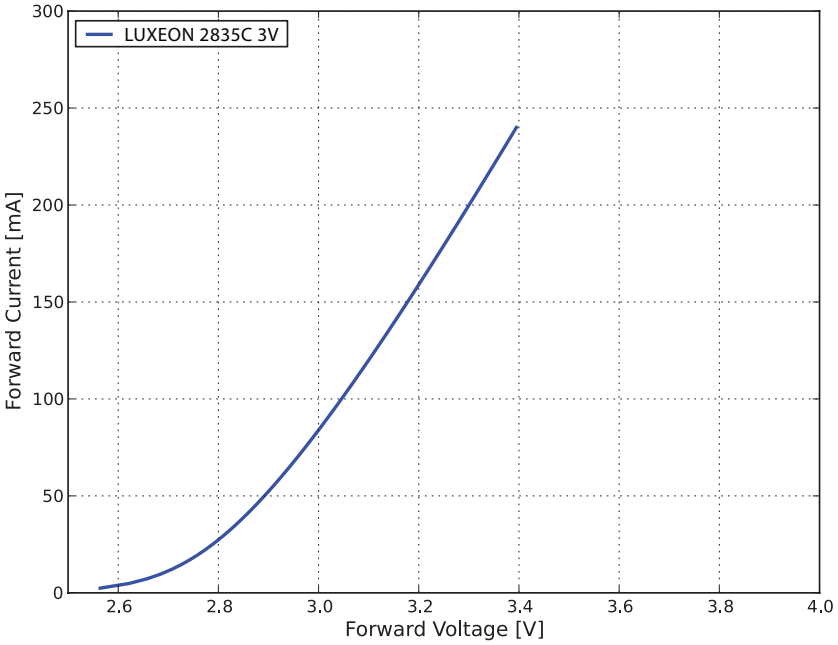

Figure 4c. Typical forward current vs. forward voltage for LUXEON 2835C 3V at T_j=25°C.

Radiation Pattern Characteristics

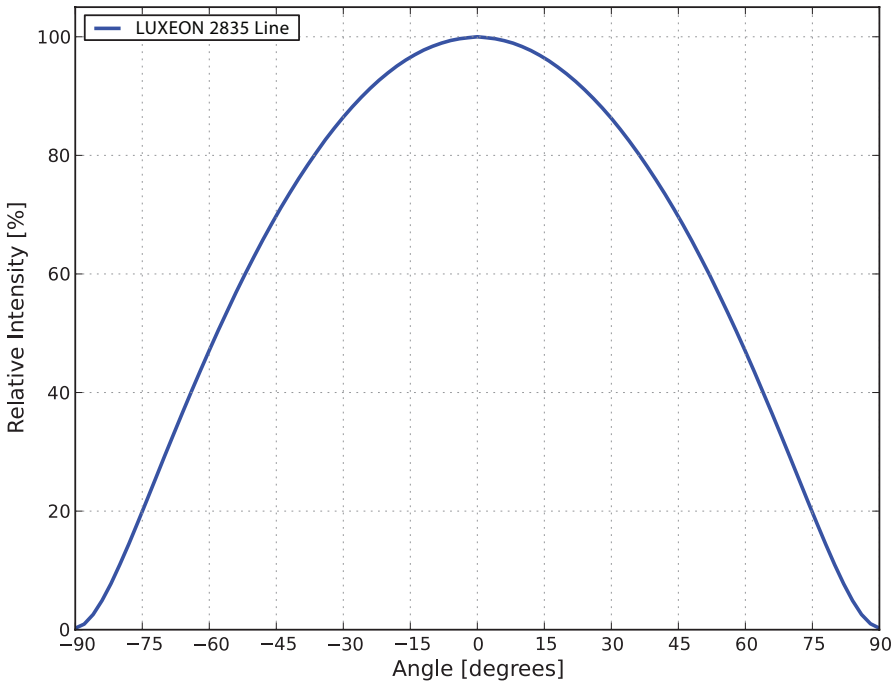

Figure 5. Typical radiation pattern for LUXEON 2835 Line at test current, T_j=25°C.

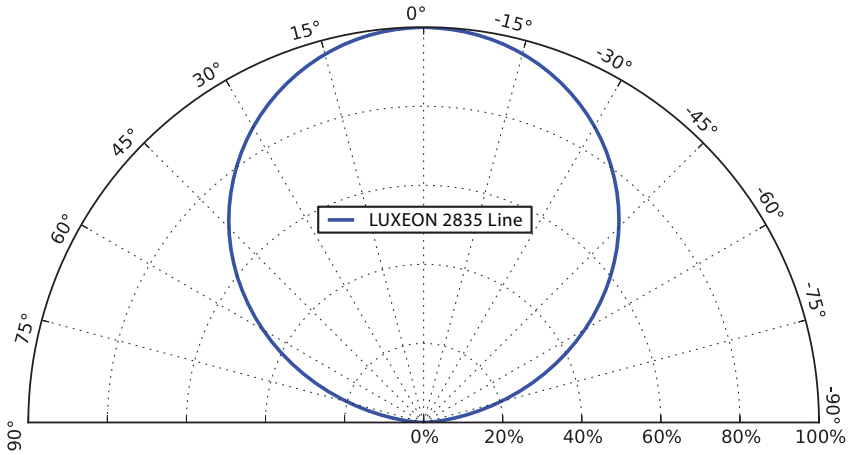

Figure 6. Typical polar radiation pattern for LUXEON 2835 Line at test current, T_j=25°C.

Product Bin and Labeling Definitions

Decoding Product Bin Labeling

In the manufacturing of semiconductor products, there are variations in performance around the average values given in the technical datasheet. For this reason, Lumileds bins LED components for luminous flux or radiometric power, color point, peak or dominant wavelength and forward voltage.

LUXEON 2835 Line LEDs are labeled using a 4-digit alphanumeric CAT code following the format below:

Where:

A B C D

A – designates luminous flux bin (example: T=56 to 60 lumens, U=60 to 65 lumens)

B C – designates correlated color bin (example: 5D, 5E, 5F, 5G, 5H, 5J, 5K, 5L, 5M for 4000K parts)

D – designates forward voltage bin (example: W=3.0 to 3.1V, X=3.1 to 3.2V)

Therefore, a LUXEON 2835C 3V with a lumen range of 56 to 60, color bin of 5D and a forward voltage range of 3.0 to 3.1V has the following CAT code:

T 5 D W

Luminous Flux Bins

Table 5 lists the standard luminous flux bins for LUXEON 2835 Line emitters. Although several bins are outlined, product availability in a particular bin varies by production run and by product performance. Not all bins are available in all CCTs.

Table 5. Luminous flux bin definitions for LUXEON 2835 Line.

PRODUCT	BIN	LUMINOUS FLUX [1] (lm)	
		MINIMUM	MAXIMUM
LUXEON 2835C 3V LUXEON 2835C 3V TVS LUXEON 2835E 6V	P	40	44
	Q	44	48
	R	48	52
	S	52	56
	T	56	60
	U	60	65
	V	65	70
	W	70	75
LUXEON 2835C 6V LUXEON 2835E 9V	C	65	70
	D	70	75
	E	75	80
	F	80	85
	G	85	90
	H	90	95
	J	95	100
	K	100	105
	L	105	110
	M	110	115
	N	115	120
	P	120	125
	Q	125	130

Notes for Table 5:
1. Lumileds maintains a tolerance of ±7.5% on luminous flux measurements.

Color Bin Definition

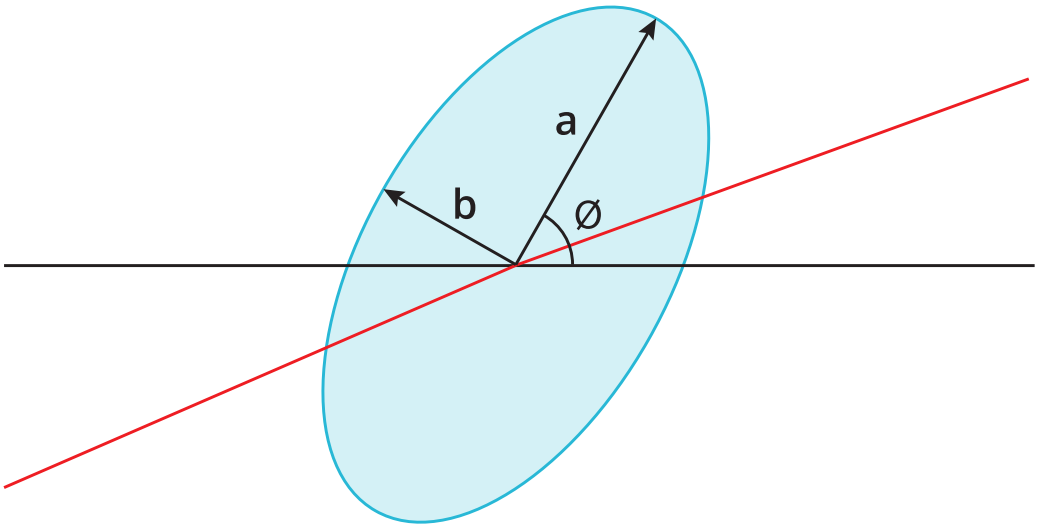

Figure 7. 3- and 5-step MacAdam ellipse illustration for Tables 6a–6g.

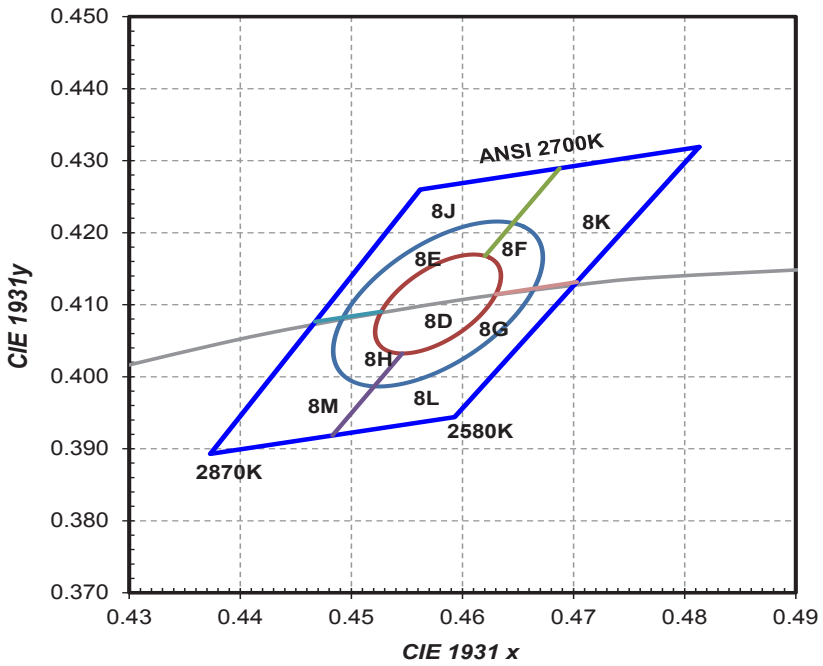

Figure 8a. 1/9th color bin structure for LUXEON 2835 Line 2700K at test current and binning temperatures of T_j=25°C and T_j=85°C.

Table 6a. 3- and 5-step MacAdam ellipse color bin definitions for LUXEON 2835 Line 2700K, at test and binning conditions.

NOMINAL CCT	COLOR SPACE	CENTER POINT [1] (cx, cy)	MAJOR AXIS, a	MINOR AXIS, b	ELLIPSE ROTATION ANGLE, Θ
2700K	Single 3-step MacAdam ellipse	(0.4578, 0.4101)	0.00810	0.00420	53.70°
2700K	Single 5-step MacAdam ellipse	(0.4578, 0.4101)	0.01350	0.00700	53.70°

Notes for Table 6a:
1. Lumileds maintains a tolerance of ±0.007 on x and y color coordinates in the CIE 1931 color space.

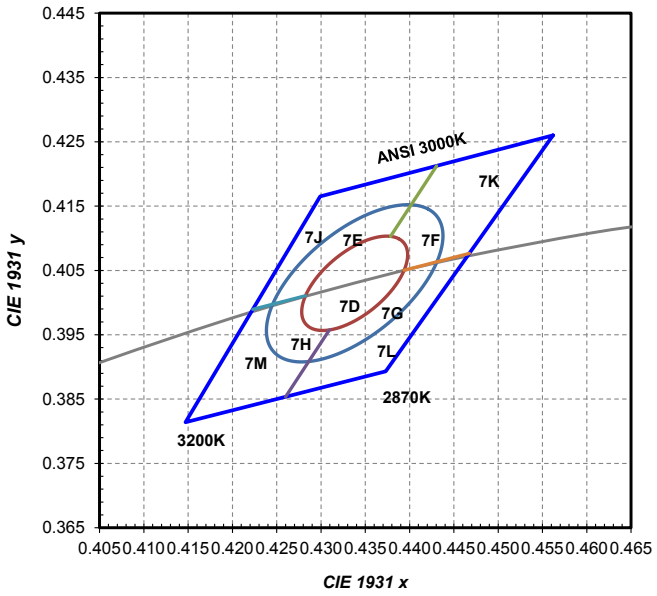

Figure 8b. 1/9th color bin structure for LUXEON 2835 Line 3000K at test current and binning temperatures of T_j=25°C and T_j=85°C.

Table 6b. 3- and 5-step MacAdam ellipse color bin definitions for LUXEON 2835 Line 3000K, at test and binning conditions.

NOMINAL CCT	COLOR SPACE	CENTER POINT [1] (cx, cy)	MAJOR AXIS, a	MINOR AXIS, b	ELLIPSE ROTATION ANGLE, Θ
3000K	Single 3-step MacAdam ellipse	(0.4338, 0.4030)	0.00834	0.00408	53.22°
3000K	Single 5-step MacAdam ellipse	(0.4338, 0.4030)	0.01390	0.00680	53.22°

Notes for Table 6b:
1. Lumileds maintains a tolerance of ±0.007 on x and y color coordinates in the CIE 1931 color space.

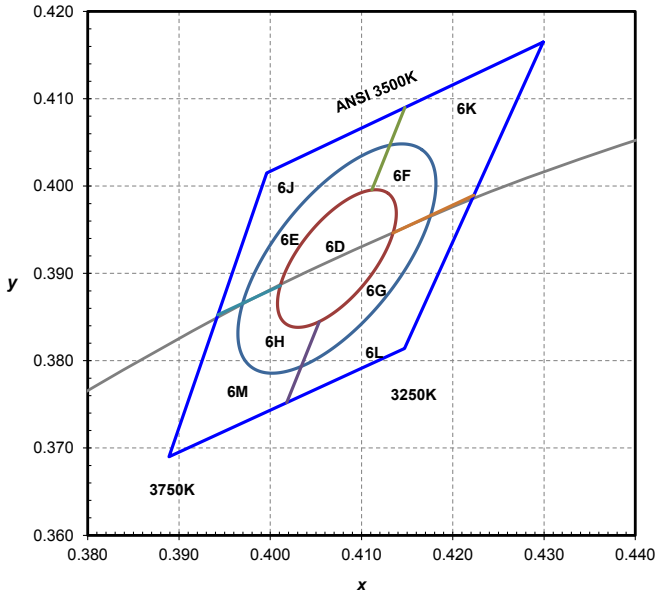

Figure 8c. 1/9th color bin structure for LUXEON 2835 Line 3500K at test current and binning temperatures of T_j=25°C and T_j=85°C.

Table 6c. 3- and 5-step MacAdam ellipse color bin definitions for LUXEON 2835 Line 3500K, at test and binning conditions.

NOMINAL CCT	COLOR SPACE	CENTER POINT [1] (cx, cy)	MAJOR AXIS, a	MINOR AXIS, b	ELLIPSE ROTATION ANGLE, Θ
3500K	Single 3-step MacAdam ellipse	(0.4073, 0.3917)	0.00927	0.00414	54.00°
3500K	Single 5-step MacAdam ellipse	(0.4073, 0.3917)	0.01545	0.00690	54.00°

Notes for Table 6c:
1. Lumileds maintains a tolerance of ±0.007 on x and y color coordinates in the CIE 1931 color space.

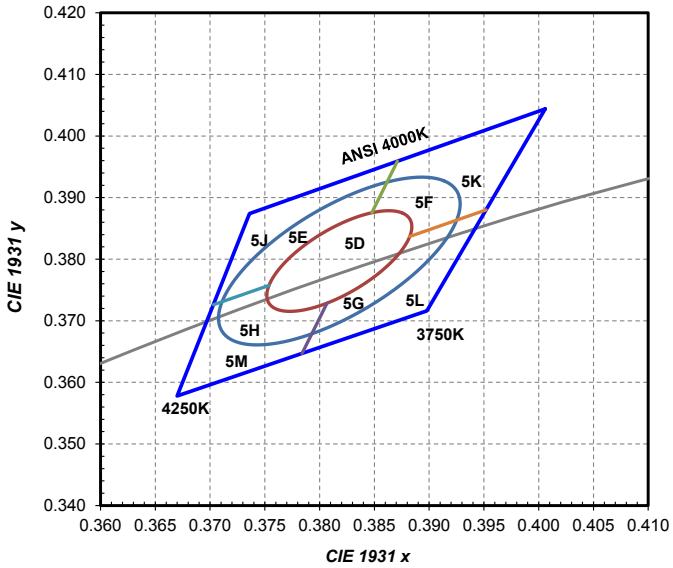

Figure 8d. 1/9th color bin structure for LUXEON 2835 Line 4000K at test current and binning temperatures of T_j=25°C and T_j=85°C.

Table 6d. 3- and 5-step MacAdam ellipse color bin definitions for LUXEON 2835 Line 4000K, at test and binning conditions.

NOMINAL CCT	COLOR SPACE	CENTER POINT [1] (cx, cy)	MAJOR AXIS, a	MINOR AXIS, b	ELLIPSE ROTATION ANGLE, Θ
4000K	Single 3-step MacAdam ellipse	(0.3818, 0.3797)	0.00939	0.00402	53.72°
4000K	Single 5-step MacAdam ellipse	(0.3818, 0.3797)	0.01565	0.00670	53.72°

Notes for Table 6d:
1. Lumileds maintains a tolerance of ±0.007 on x and y color coordinates in the CIE 1931 color space.

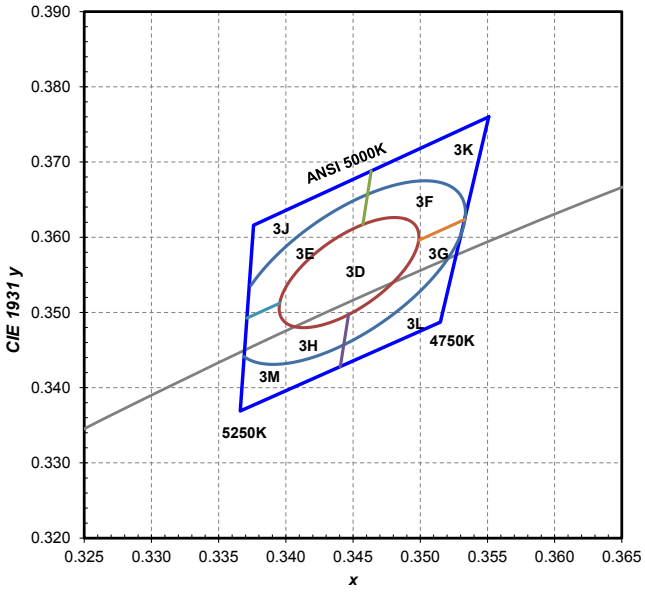

Figure 8e. 1/9th color bin structure for LUXEON 2835 Line 5000K at test current and binning temperatures of T_j=25°C and T_j=85°C.

Table 6e. 3- and 5-step MacAdam ellipse color bin definitions for LUXEON 2835 Line 5000K, at test and binning conditions.

NOMINAL CCT	COLOR SPACE	CENTER POINT [1] (cx, cy)	MAJOR AXIS, a	MINOR AXIS, b	ELLIPSE ROTATION ANGLE, Θ
5000K	Single 3-step MacAdam ellipse	(0.3447, 0.3553)	0.00822	0.00354	59.62°
5000K	Single 5-step MacAdam ellipse	(0.3447, 0.3553)	0.01370	0.00590	59.62°

Notes for Table 6e:
1. Lumileds maintains a tolerance of ±0.007 on x and y color coordinates in the CIE 1931 color space.

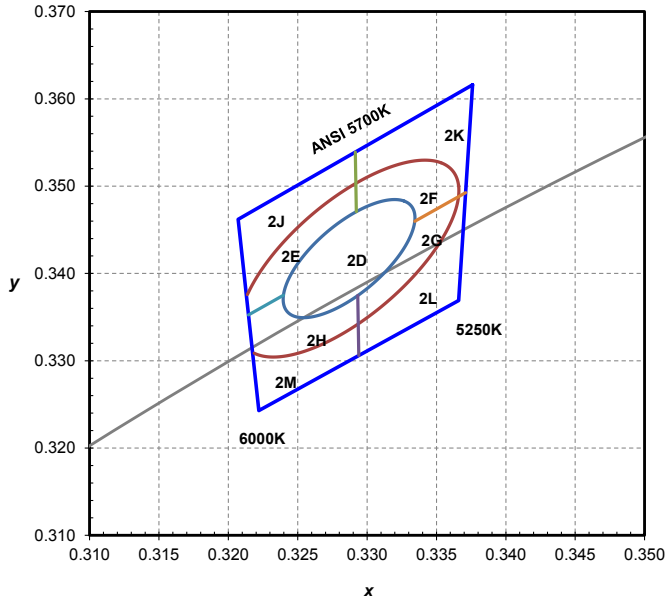

Figure 8f. 1/9th color bin structure for LUXEON 2835 Line 5700K at test current and binning temperatures of T_j=25°C and T_j=85°C.

Table 6f. 3- and 5-step MacAdam ellipse color bin definitions for LUXEON 2835 Line 5700K, at test and binning conditions.

NOMINAL CCT	COLOR SPACE	CENTER POINT [1] (cx, cy)	MAJOR AXIS, a	MINOR AXIS, b	ELLIPSE ROTATION ANGLE, Θ
5700K	Single 3-step MacAdam ellipse	(0.3287, 0.3417)	0.00746	0.00320	59.09°
5700K	Single 5-step MacAdam ellipse	(0.3287, 0.3417)	0.01243	0.00533	59.09°

Notes for Table 6f:
1. Lumileds maintains a tolerance of ±0.007 on x and y color coordinates in the CIE 1931 color space.

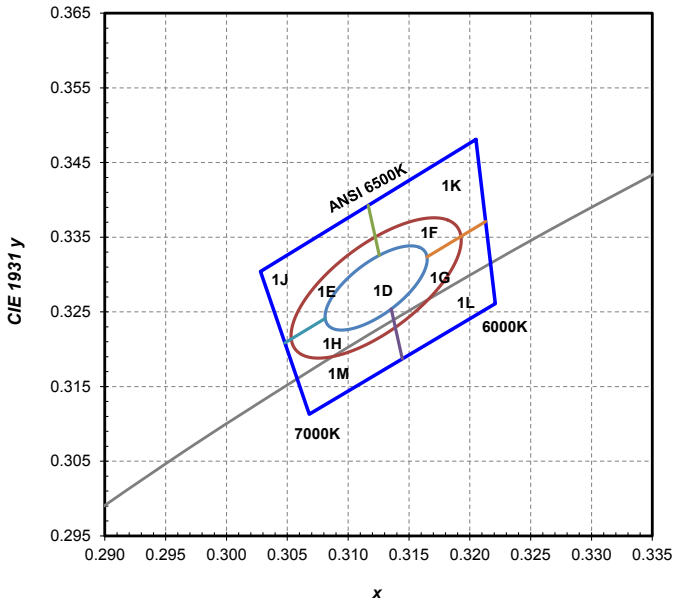

Figure 8g. 1/9th color bin structure for LUXEON 2835 Line 6500K at test current and binning temperatures of T_j=25°C and T_j=85°C.

Table 6g. 3- and 5-step MacAdam ellipse color bin definitions for LUXEON 2835 Line 6500K, at test and binning conditions.

NOMINAL CCT	COLOR SPACE	CENTER POINT [1] (cx, cy)	MAJOR AXIS, a	MINOR AXIS, b	ELLIPSE ROTATION ANGLE, Θ
6500K	Single 3-step MacAdam ellipse	(0.3123, 0.3282)	0.00669	0.00285	58.57°
6500K	Single 5-step MacAdam ellipse	(0.3123, 0.3282)	0.01115	0.00475	58.57°

Notes for Table 6g:
1. Lumileds maintains a tolerance of ±0.007 on x and y color coordinates in the CIE 1931 color space.

Forward Voltage Bins

Table 7. Forward voltage bin definitions for LUXEON 2835 Line at test current, T_j=25°C.

PRODUCT NUMBER	BIN	FORWARD VOLTAGE [1] (V_f)	
		MINIMUM	MAXIMUM
LUXEON 2835E 9V	V	8.70	9.00
	W	9.00	9.30
	X	9.30	9.60
	Y	9.60	9.90
LUXEON 2835E 6V	V	5.80	6.00
	W	6.00	6.20
	X	6.20	6.40
	Y	6.40	6.60
LUXEON 2835C 6V	F	5.60	5.80
	G	5.80	6.00
	H	6.00	6.20
	J	6.20	6.40
LUXEON 2835C 3V LUXEON 2835C 3V TVS	V	2.90	3.00
	W	3.00	3.10
	X	3.10	3.20
	Y	3.20	3.30

Notes for Table 7:
1. Lumileds maintains a tolerance of ±0.10V on forward voltage measurements.

Mechanical Dimensions

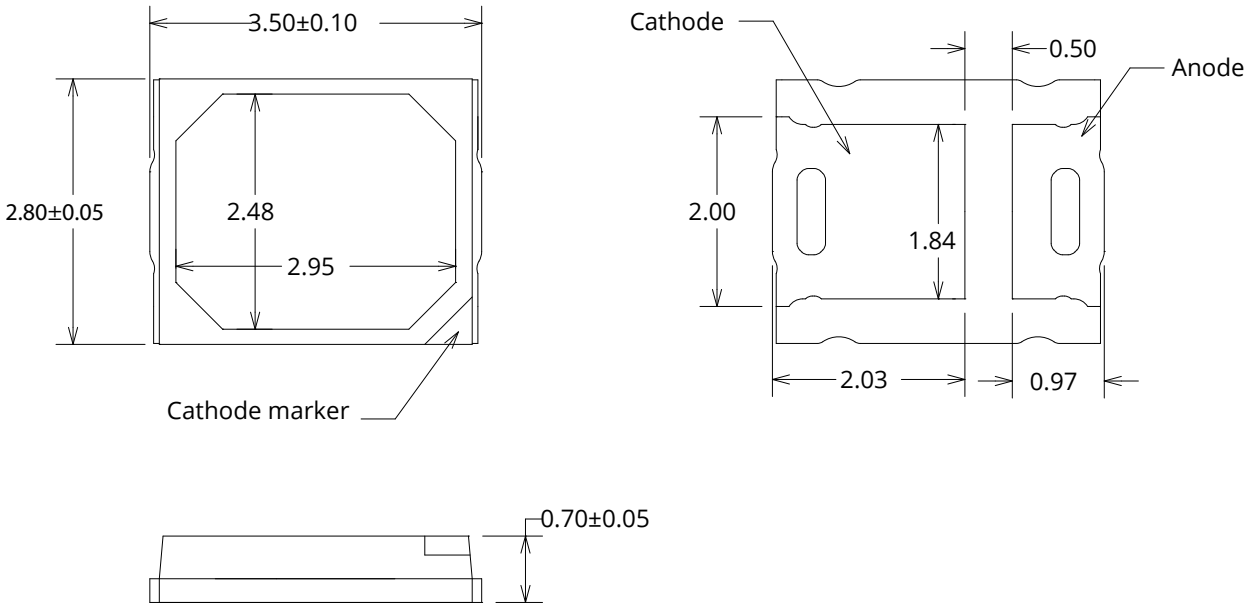

Figure 9. Mechanical dimensions for LUXEON 2835 Line.

Notes for Figure 9:
1. Drawings are not to scale.
2. All dimensions are in millimeters.

Reflow Soldering Guidelines

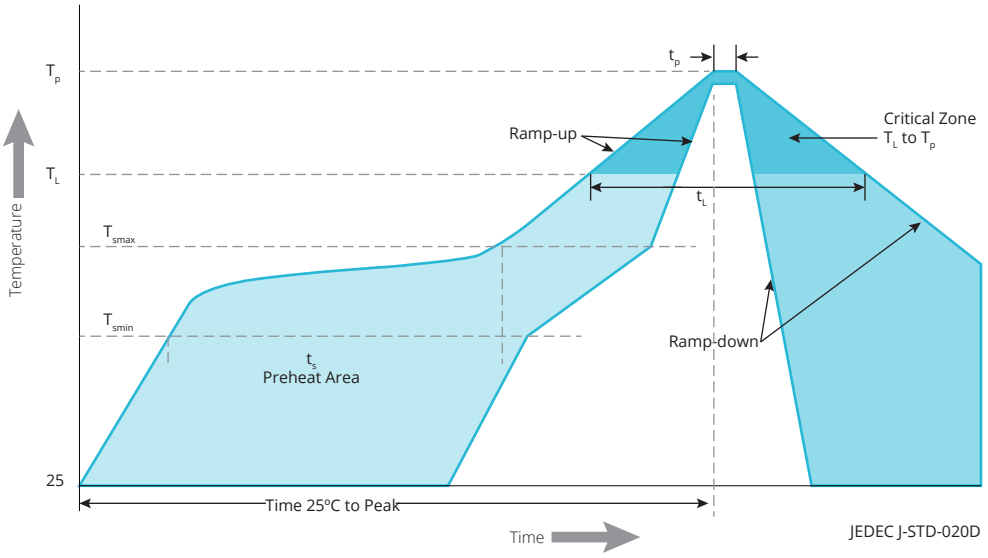

Figure 10. Visualization of the acceptable reflow temperature profile as specified in Table 8.

Table 8. Reflow profile characteristics for LUXEON 2835 Line.

PROFILE FEATURE	LEAD-FREE ASSEMBLY
Preheat Minimum Temperature (T_{smin})	150°C
Preheat Maximum Temperature (T_{smax})	200°C
Preheat Time (t_{smin} to t_{smax})	60 to 120 seconds
Ramp-Up Rate (T_L to T_p)	3°C / second maximum
Liquidus Temperature (T_L)	217°C
Time Maintained Above Temperature T_L (t_L)	60 to 150 seconds
Peak / Classification Temperature (T_p)	260°C
Time Within 5°C of Actual Temperature (t_p)	20 to 40 seconds
Ramp-Down Rate (T_p to T_L)	6°C / second maximum
Time 25°C to Peak Temperature	8 minutes maximum

JEDEC Moisture Sensitivity

Table 9. Moisture sensitivity levels for LUXEON 2835 Line.

LEVEL	FLOOR LIFE		SOAK REQUIREMENTS STANDARD	
	TIME	CONDITIONS	TIME	CONDITIONS
2	1 Year	≤30°C / 85% RH	168 Hours +5 / -0	85°C / 85% RH

Solder Pad Design

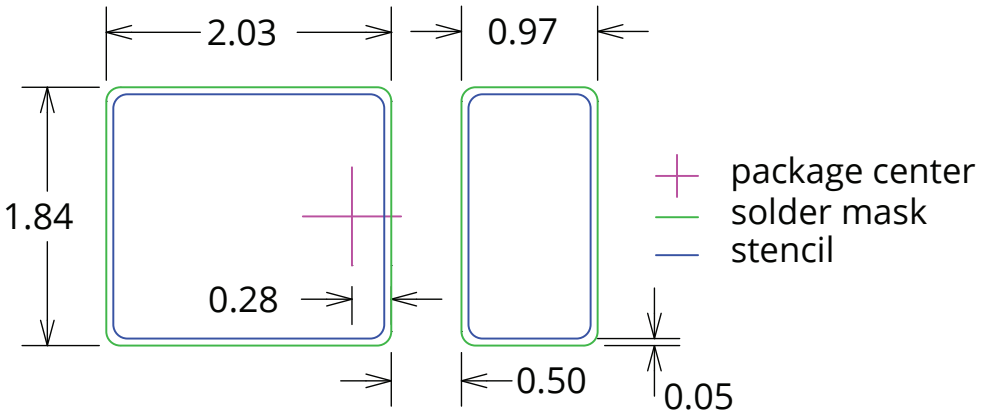

Figure 11. Recommended PCB solder pad layout for LUXEON 2835 Line.

Notes for Figure 11:
1. Drawings are not to scale.
2. All dimensions are in millimeters.

Packaging Information

Pocket Tape Dimensions

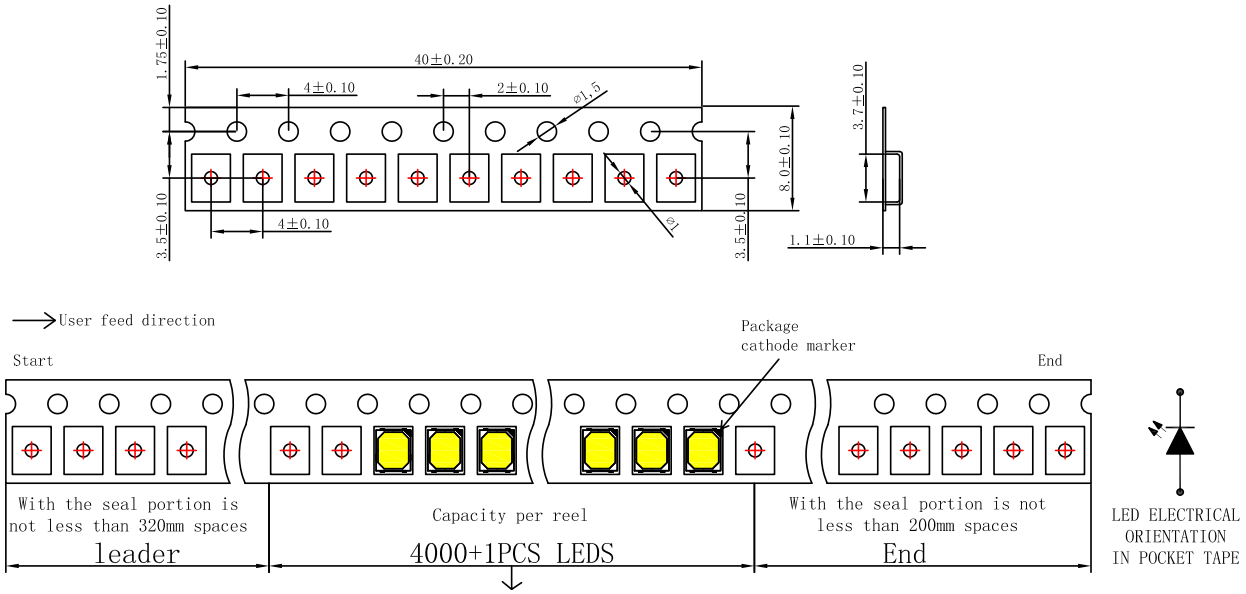

Figure 12. Pocket tape dimensions for LUXEON 2835 Line.

Notes for Figure 12:
1. Drawings are not to scale.
2. All dimensions are in millimeters.

Reel Dimensions

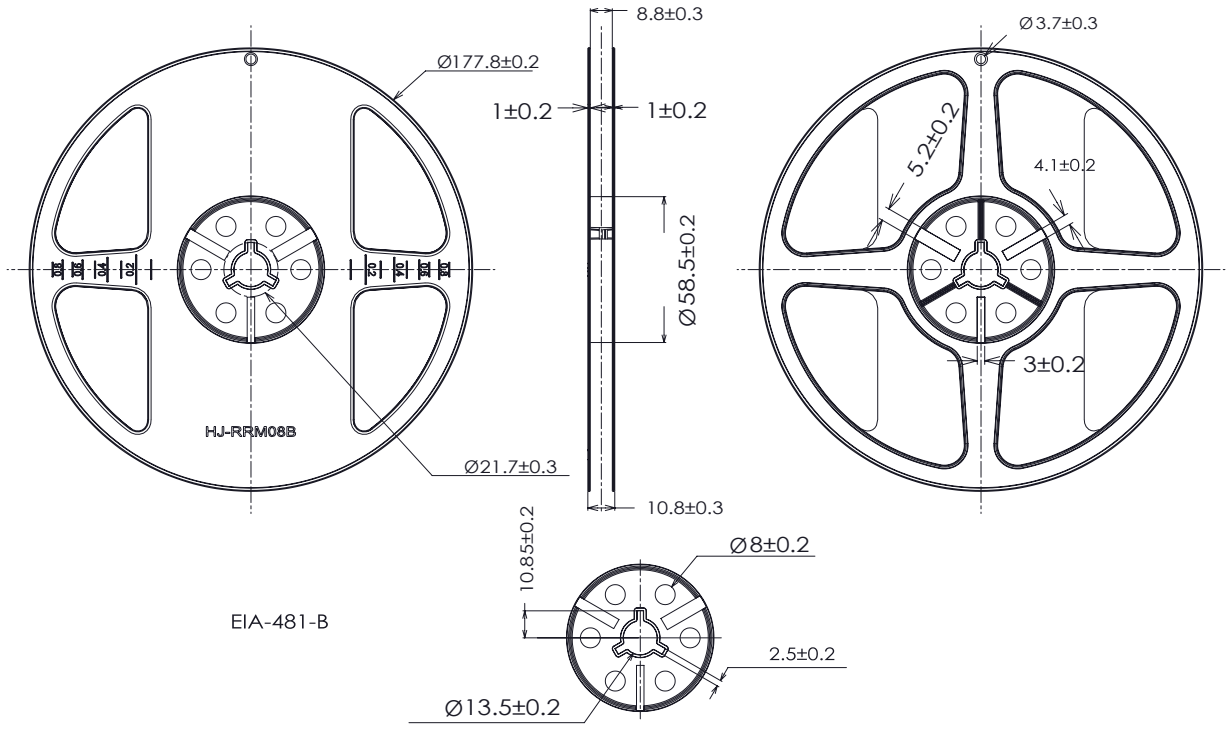

Figure 13. Reel dimensions for LUXEON 2835 Line.

Notes for Figure 13:
1. Drawings are not to scale.
2. All dimensions are in millimeters.

About Lumileds

Lumileds is the global leader in light engine technology. The company develops, manufactures and distributes groundbreaking LEDs and automotive lighting products that shatter the status quo and help customers gain and maintain a competitive edge.

With a rich history of industry "firsts," Lumileds is uniquely positioned to deliver lighting advancements well into the future by maintaining an unwavering focus on quality, innovation and reliability.

To learn more about our portfolio of light engines, visit lumileds.com.

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