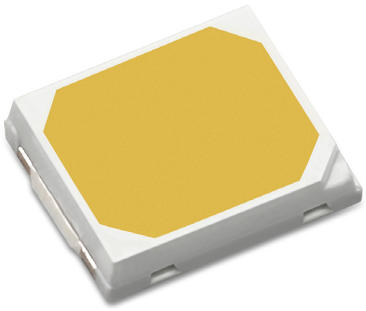
LUMILEDS

ILLUMINATION

LUXEON 2835 Commercial Deep Dimming

Cost Effective 2835 Package Tailor-made For Excellent Dimming Application



LUXEON 2835 Commercial Deep Dimming delivers the industry's most cost effective of standard 2835 package. It is specially designed for dimming applications which require enormously uniform light output throughout rated and deep dimming operating conditions. This innovative product enables not only top-notch lm/W performance and long lifetime, but also 0.05 VF range by default for end applications. Utmost, this product leads its class in flux, color consistency, robustness, and reliability making it the right choice for commercial indoor luminaires.

FEATURES AND BENEFITS

- Dedicated deep dimming bin achieves best-in-class dimming effects at 1% dimming current
- 0.05 VF range by default, free customer from complex driver compatibility design
- Industry standard footprint for drop-in replacement designs
- Complete CCT/CRI offering for various application
- Reliable package design for commercial applications that prioritize lumens per Dollar and lumens per Watt
- 3 & 5-step MacAdam ellipses enable precise color control

PRIMARY APPLICATIONS

- Panel / Soft Lights
- Linear Lights
- Troffers
- Downlights

c UL us No. E507562 RoHS COMPLIANT

Table of Contents

General Product Information

Product Test Conditions

LUXEON 2835 Commercial Deep Dimming LEDs are tested and binned with a 20ms monopulse of 65mA at junction temperature, T_j, of 25°C.

65mA – LUXEON 2835S 3V

120mA – LUXEON 2835S 6V

Part Number Nomenclature

Part numbers for LUXEON 2835 Commercial Deep Dimming follow the convention below:

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

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 (70=70CRI, 80=80CRI and 90=90CRI)

C – designates voltage of the part (A=3V)

D D – designates options for product specification

E E E – designates options for product specification

Therefore, the following part number is used for a LUXEON 2835 Commercial Deep Dimming 4000K 80CRI, 3V F-version LED:

L 1 2 8 – **4 0 8 0** S **A** 3 5 **A 0 D F 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 Commercial Deep Dimming is compliant to the European Union directives on the restriction of hazardous substances in electronic equipment, namely the ROHS Directive 2011/65/EU including amendments 2015/863/EU & 2017/2102/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 Commercial Deep Dimming at specified test conditions.

VOLTAGE	PART	NOMINAL CCT [1]	MINIMUM CRI [2, 3]	LUMINOUS FLUX [2, 3] (lm)		TYPICAL LUMINOUS EFFICACY (lm/W)	TEST CURRENT (mA)	PART NUMBER
				MINIMUM	TYPICAL			
3V	LUXEON 2835 S	2700K	70	35.8	37.4	213.1	65	L128-2770SA35A0DF1
		3000K	70	36.9	38.6	219.9	65	L128-3070SA35A0DF1
		3500K	70	37.3	39.1	222.8	65	L128-3570SA35A0DF1
		4000K	70	38.8	40.6	231.3	65	L128-4070SA35A0DF1
		5000K	70	38.3	40.1	228.5	65	L128-5070SA35A0DF1
		5700K	70	38.3	40.1	228.5	65	L128-5770SA35A0DF1
		6500K	70	37.8	39.6	225.6	65	L128-6570SA35A0DF1
		2700K	80	34.8	35.2	200.6	65	L128-2780SA35A0DF1
		3000K	80	35.7	36.1	205.7	65	L128-3080SA35A0DF1
		3500K	80	36.7	37.3	212.5	65	L128-3580SA35A0DF1
		4000K	80	37.5	38.6	220.0	65	L128-4080SA35A0DF1
		5000K	80	37.7	38.6	220.0	65	L128-5080SA35A0DF1
		5700K	80	37.7	38.6	220.0	65	L128-5780SA35A0DF1
		6500K	80	37.7	39.5	225.1	65	L128-6580SA35A0DF1
		2700K	90	29.8	31.2	177.7	65	L128-2790SA35A0DF1
		3000K	90	30.8	32.4	184.5	65	L128-3090SA35A0DF1
		3500K	90	31.8	32.6	185.6	65	L128-3590SA35A0DF1
		4000K	90	32.3	33.0	187.8	65	L128-4090SA35A0DF1
		5000K	90	32.3	33.0	187.8	65	L128-5090SA35A0DF1
		5700K	90	32.3	33.0	187.8	65	L128-5790SA35A0DF1
		6500K	90	32.3	33.0	187.8	65	L128-6590SA35A0DF1

Notes for Table 1:
1. Correlated color temperature is cold-targeted at T_j=25°C.
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 Commercial Deep Dimming at specified test current, T_j=25°C.

PART NUMBER	TYPICAL TOTAL INCLUDED ANGLE [1]	TYPICAL VIEWING ANGLE [2]
L128-xxxxSx35xxxxx	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 Commercial Deep Dimming at specified 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)
	@ 65MA			@ 0.65MA				
	MINIMUM	TYPICAL	MAXIMUM	MINIMUM	TYPICAL	MAXIMUM		
L128-xxxxSA35A0DFx	2.60	2.70	2.80	2.475	2.50	2.525	-1.0 to -2.0	15.2

Notes for Table 3:
1. Lumileds maintains a tolerance of ±0.05V on forward voltage measurements @ 0.65mA.
2. Measured between 25°C and 85°C.

Absolute Maximum Ratings

Table 4. Absolute maximum ratings for LUXEON 2835 Commercial Deep Dimming.

PARAMETER	MAXIMUM PERFORMANCE
DC Forward Current [1, 2]	300 mA
Peak Pulsed Forward Current [1, 3]	480 mA
LED Junction Temperature [1] (DC & Pulse)	125 °C
ESD Sensitivity (ANSI/ESDA/JEDEC JS-001-2012)	Class 2
Operating Case Temperature [1]	-40 °C to 105 °C
LED Storage Temperature	-40 °C to 105 °C
Soldering Temperature	JEDEC 020C 260 °C
Allowable Reflow Cycles	3
Reverse Voltage ($V_{reverse}$)	LUXEON LEDs are not designed to be driven in reverse bias

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.

Characteristics Curves

Spectral Power Distribution Characteristics

70CRI

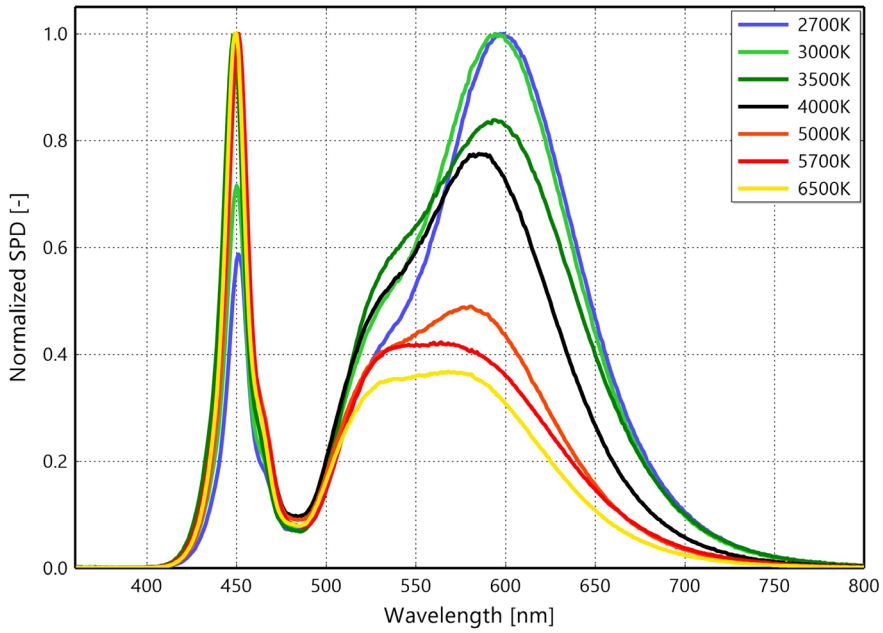


Figure 1a. Typical normalized power vs. wavelength for 70CRI LUXEON 2835 Commercial Deep Dimming at specified test current, T_j=25°C.

80CRI

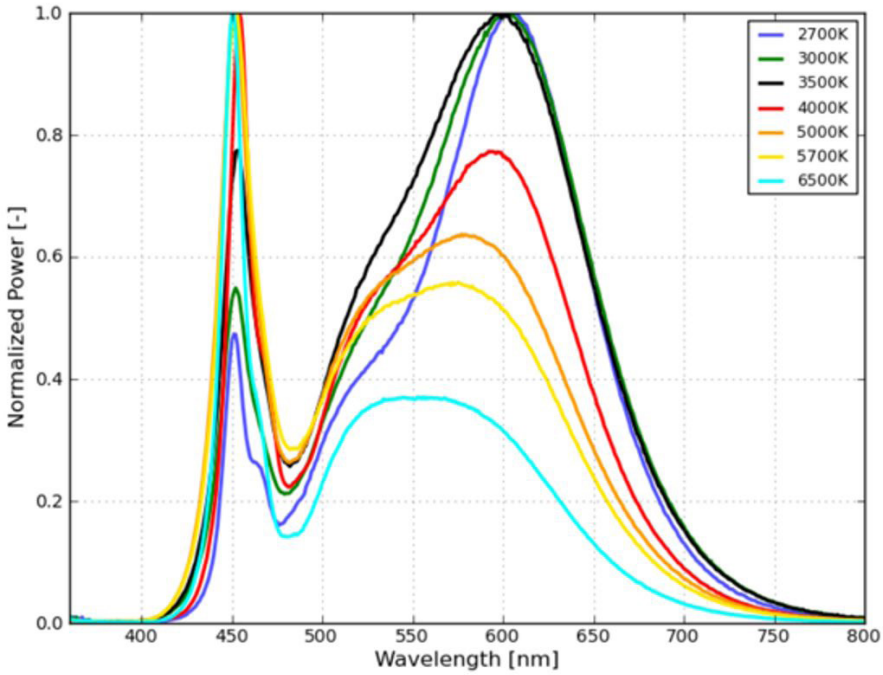


Figure 1b. Typical normalized power vs. wavelength for 80CRI LUXEON 2835 Commercial Deep Dimming at specified test current, T_j=25°C.

90CRI

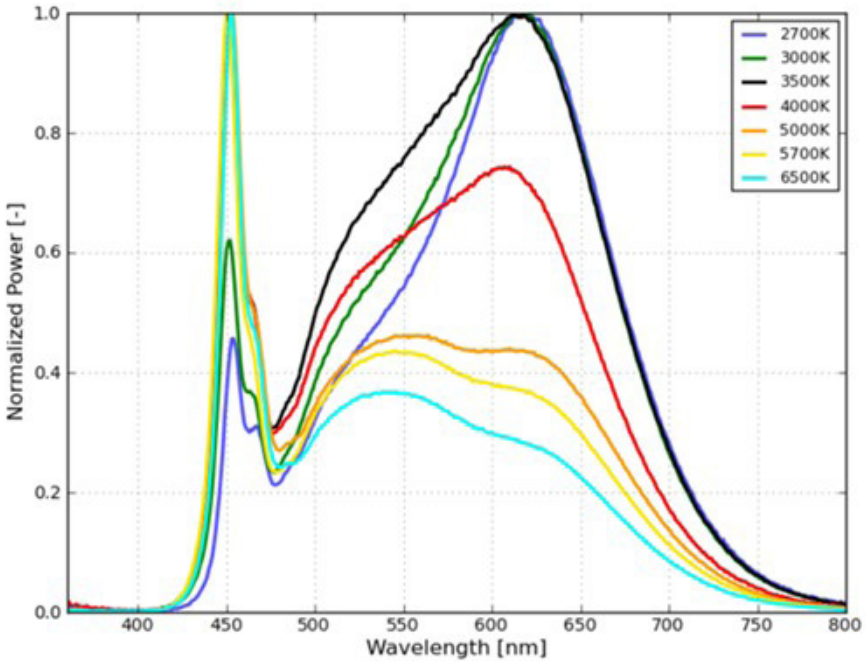


Figure 1c. Typical normalized power vs. wavelength for 90CRI LUXEON 2835 Commercial Deep Dimming at specified test current, T_j=25°C

Light Output Characteristics

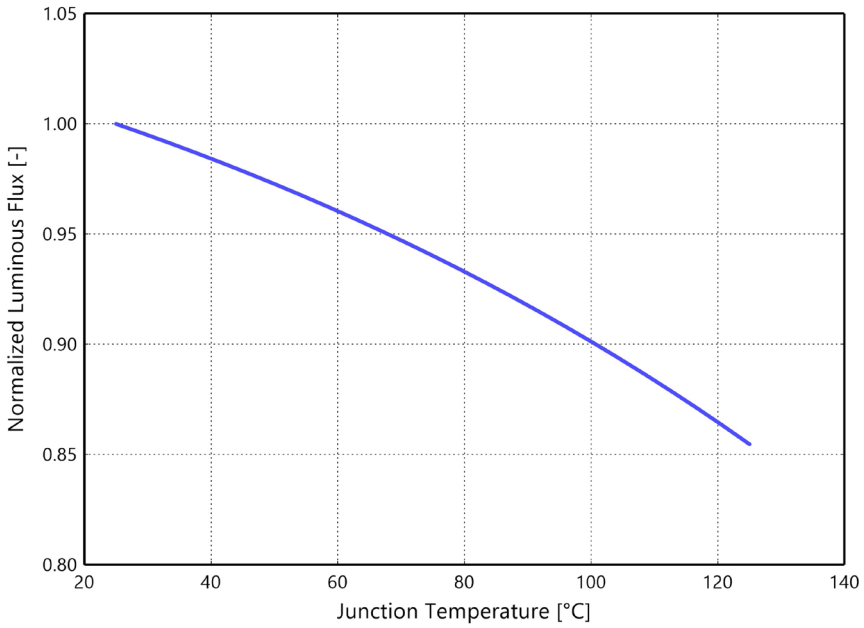


Figure 2. Typical normalized luminous flux vs. junction temperature for LUXEON 2835 Commercial Deep Dimming at 65mA.

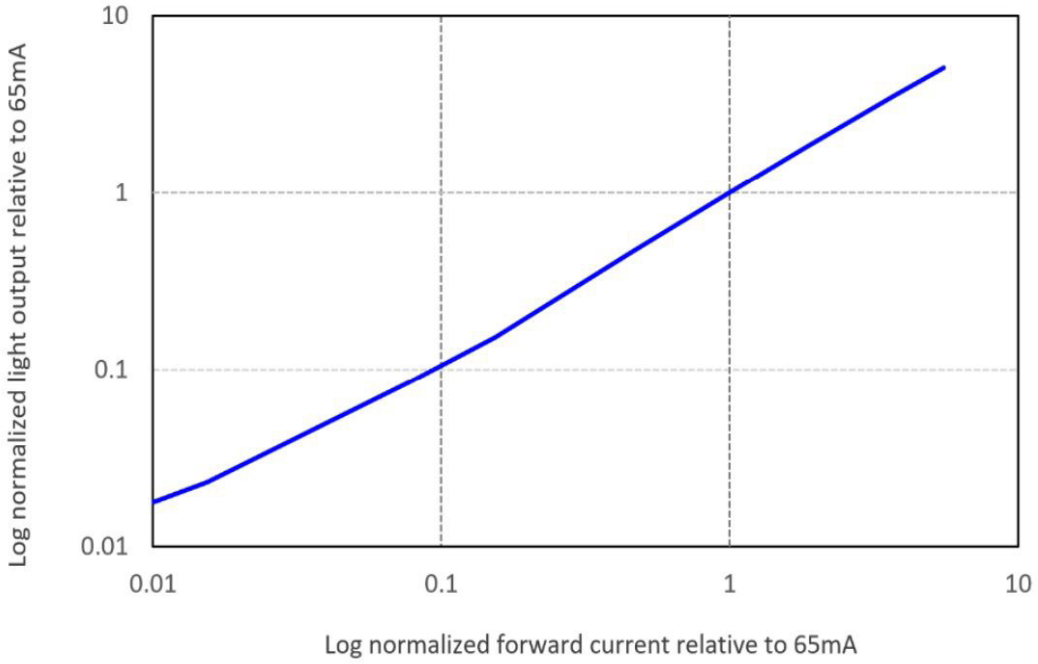


Figure 3. Typical normalized luminous flux vs. forward current for LUXEON 2835 Commercial Deep Dimming at T_j=25°C

Forward Current & Forward Voltage Characteristics

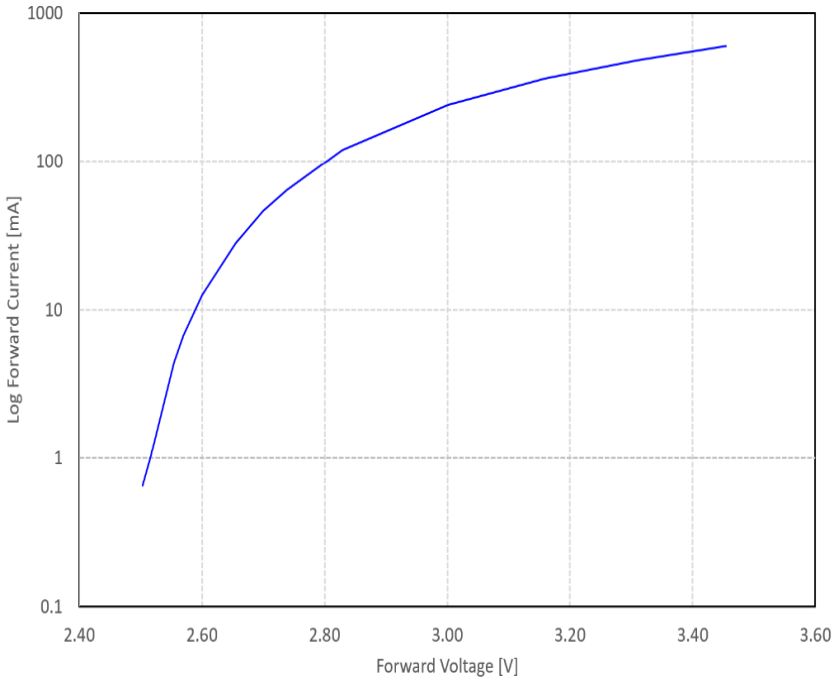


Figure 4. Typical forward current vs. forward voltage for LUXEON 2835 Commercial Deep Dimming at T_j=25°C

Radiation Pattern Characteristics

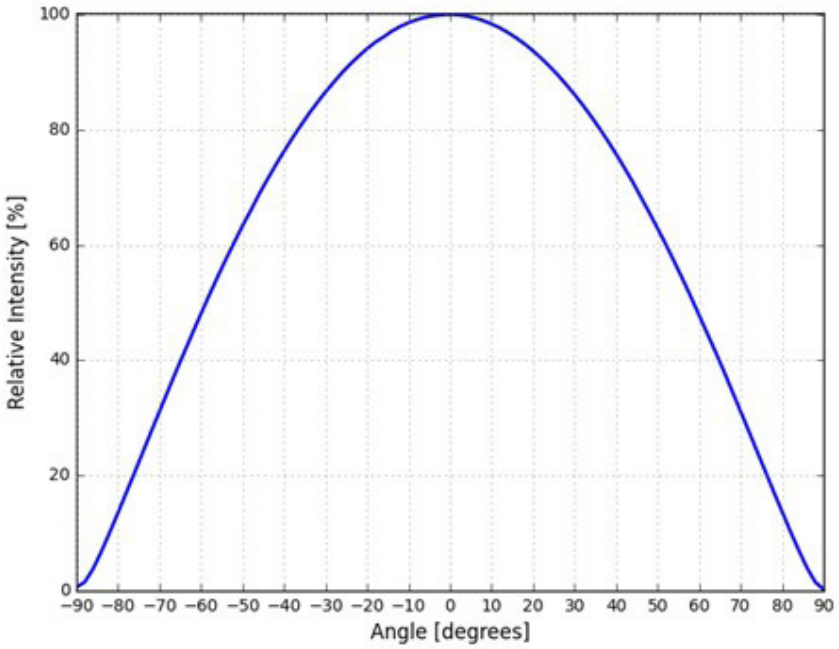


Figure 5. Typical radiation pattern for LUXEON 2835 Commercial Deep Dimming at 65mA, T_j=25°C

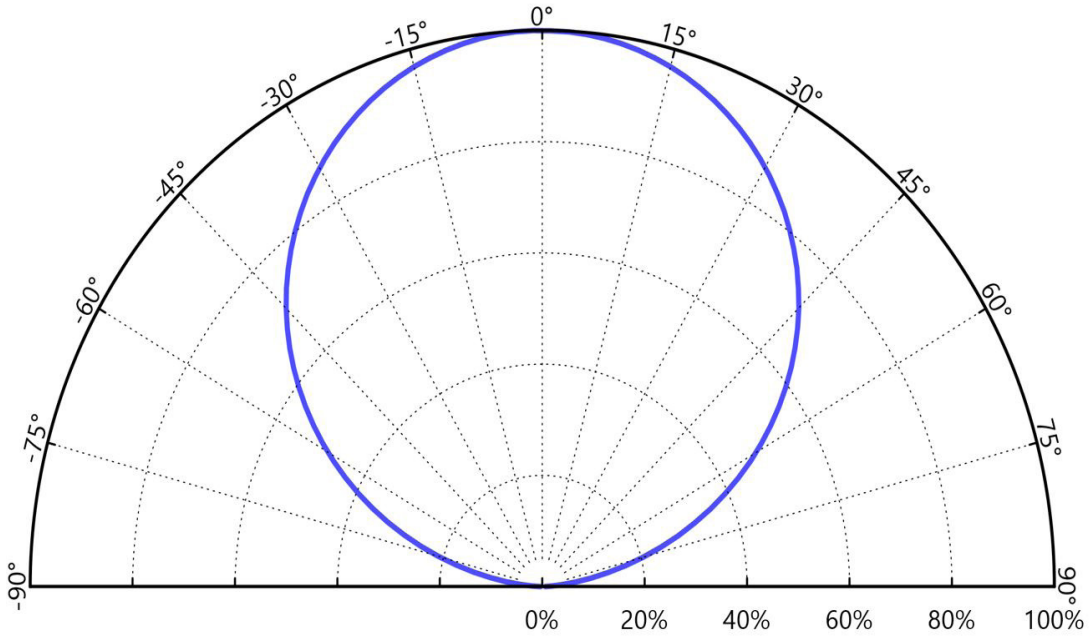


Figure 6. Typical polar radiation pattern for LUXEON 2835 Commercial Deep Dimming at test current, T_j=25°C.

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 Commercial Deep Dimming LEDs are labeled using a 4- or 5-digit alphanumeric CAT code following the format below:

A or Ax B C D

Where:

A or Ax – designates luminous flux bin (example: L=29 to 31 lm, M=31 to 33 lm)

B C – designates correlated color bin (example: 7D, 7E, 7F, 7G, 7H for 3000K parts)

D – designates forward voltage bin (example: 1=2.475 to 2.50V, 2=2.50 to 2.525V)

Therefore, , a LUXEON 2835 Commercial Deep Dimming with a lumen range of 37 to 39 lumens, color bin of 5D and a forward voltage range of 2.50 to 2.525V has the following CAT code:

Q 5 D 2

Luminous Flux Bins

Note : Lumileds will supply LUXEON 2835 Commercial Deep Dimming with full distribution. Advanced bin selection and kitting will not be available for this part

Table 5 the standard luminous flux bins for LUXEON 2835 Commercial Deep Dimming 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 Commercial Deep Dimming, T_j=25°C.

BIN	LUMINOUS FLUX [1] (lm)	
	MINIMUM	MAXIMUM
G	21.0	23.0
H	23.0	25.0
J	25.0	27.0
K	27.0	29.0
L	29.0	31.0
M	31.0	33.0
N	33.0	35.0
P	35.0	37.0
Q	37.0	39.0
R	39.0	41.0
S	41.0	43.0
T	43.0	45.0
U	45.0	47.0

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

Color Bin Definition

Note : Lumileds will supply LUXEON 2835 Commercial Deep Dimming with full distribution. Advanced bin selection and kitting will not be available for this part.

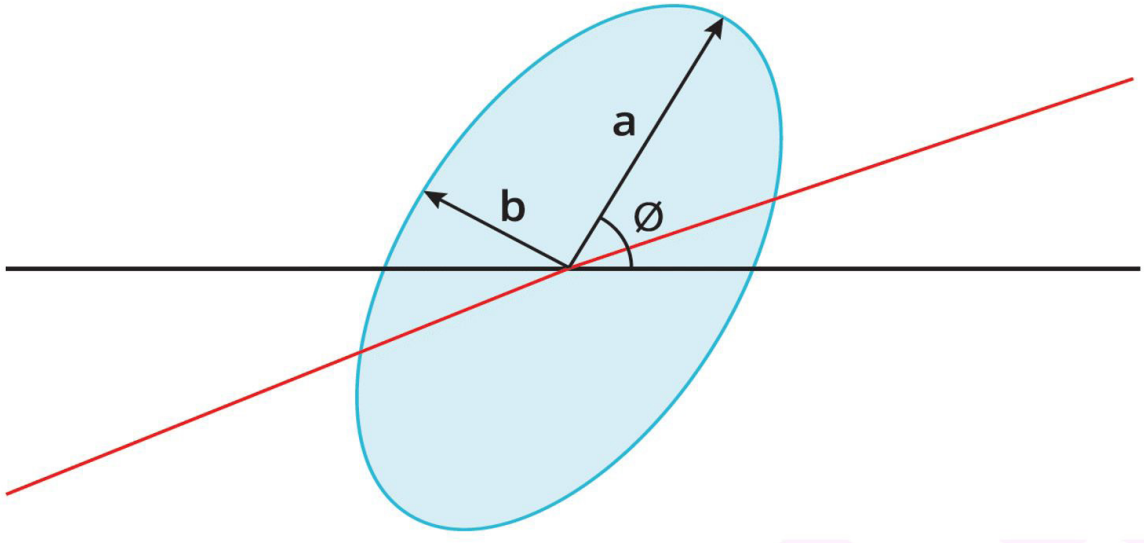


Figure 7a. 3- and 5-step MacAdam ellipse illustration for Tables 6a–6g.

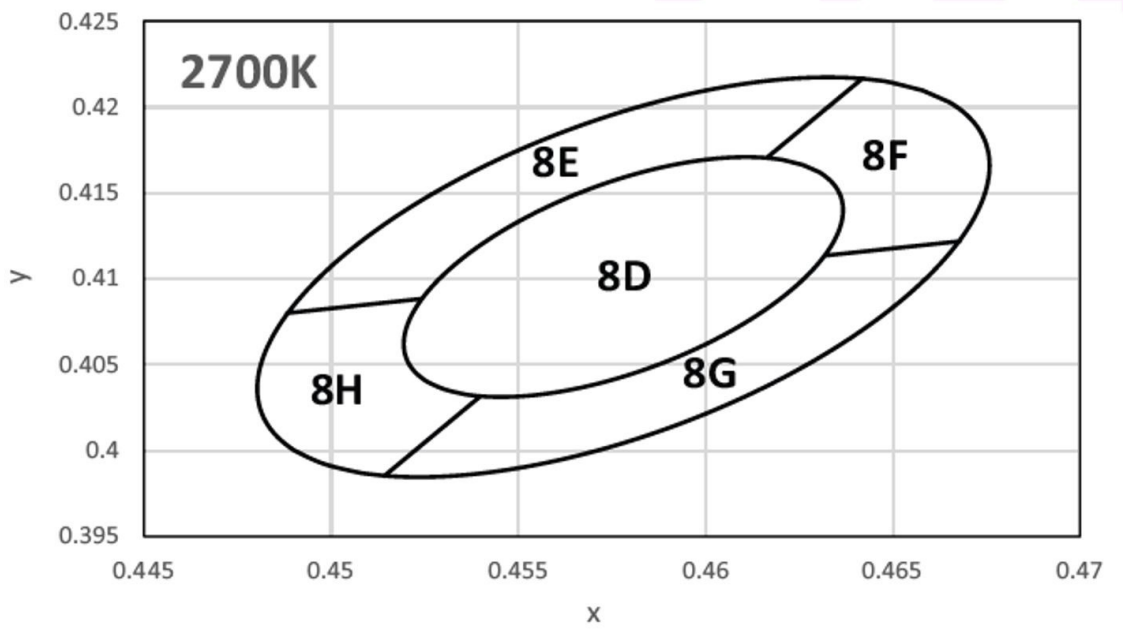


Figure 7b. 1/5th color bin structure for LUXEON 2835 Commercial Deep Dimming 2700K at specified test current and binning temperature of T_j=25°C.

Table 6a-1. 3- and 5-step MacAdam ellipse color bin definitions for LUXEON 2835 Commercial Deep Dimming 2700K, at specified 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°

Table 6a-2. 4 quadrants definition for LUXEON 2835 Commercial Deep Dimming 2700K, at specified test and binning conditions.

POINT	x	y
1	0.4642	0.4217
2	0.4488	0.4080
3	0.4514	0.3985
4	0.4668	0.4122
Center	0.4578	0.4101

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

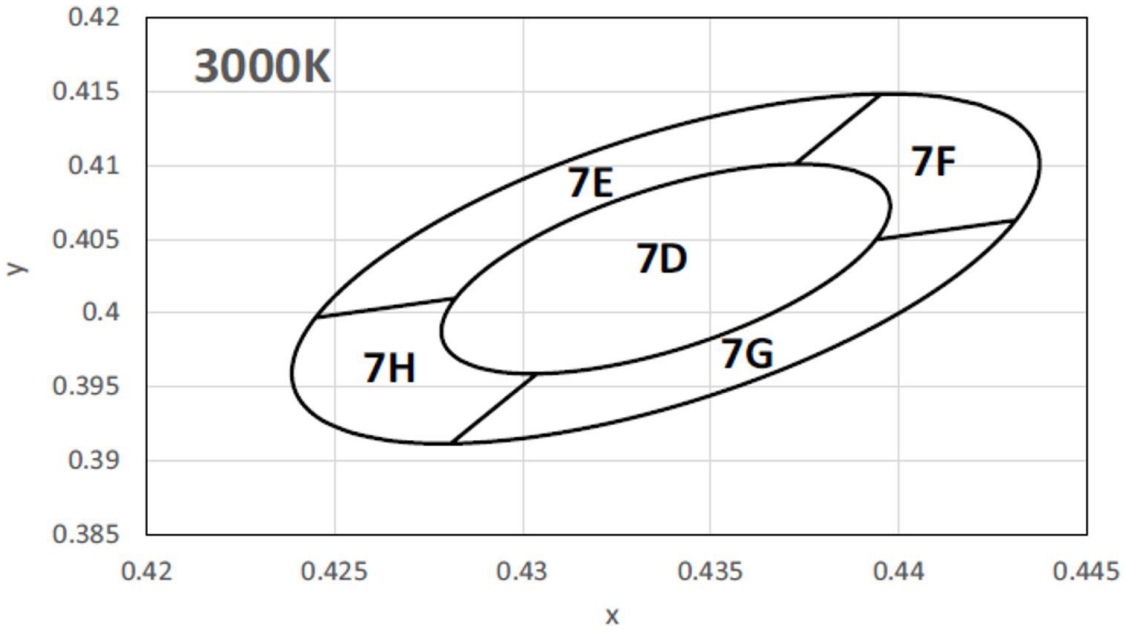


Figure 7c. 1/5th color bin structure for LUXEON 2835 Commercial Deep Dimming 3000K at specified test current and binning temperature of T_j=25°C

Table 6b-1. 3- and 5-step MacAdam ellipse color bin definitions for LUXEON 2835 Commercial Deep Dimming 3000K, at specified 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°

Table 6b-2. 4 quadrants definition for LUXEON 2835 Commercial Deep Dimming 3000K, at specified test and binning conditions

POINT	x	y
1	0.4395	0.4148
2	0.4245	0.3997
3	0.4282	0.3912
4	0.4431	0.4062
Center	0.4338	0.4030

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

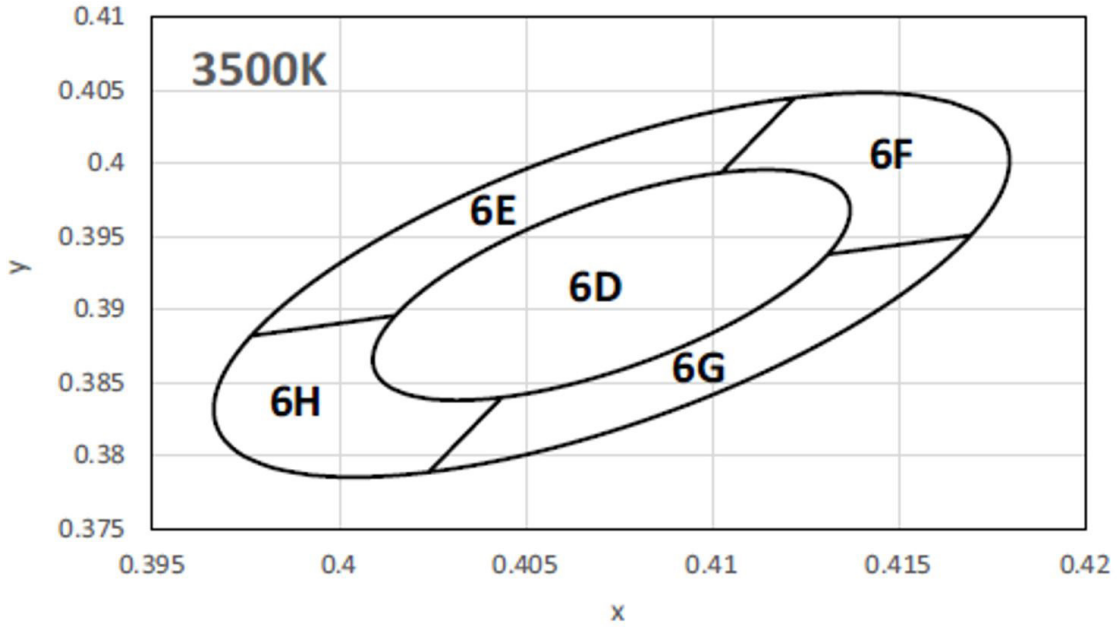


Figure 7d. 1/5th color bin structure for LUXEON 2835 Commercial Deep Dimming 3500K at specified test current and binning temperature of T_j=25°C

Table 6c-1. 3- and 5-step MacAdam ellipse color bin definitions for LUXEON 2835 Commercial Deep Dimming 3500K, at specified 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°

Table 6c-2. 4 quadrants definition for LUXEON 2835 Commercial Deep Dimming 3500K, at specified test and binning conditions

POINT	x	y
1	0.4122	0.4045
2	0.3976	0.3882
3	0.4024	0.3789
4	0.4169	0.3951
Center	0.4073	0.3917

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

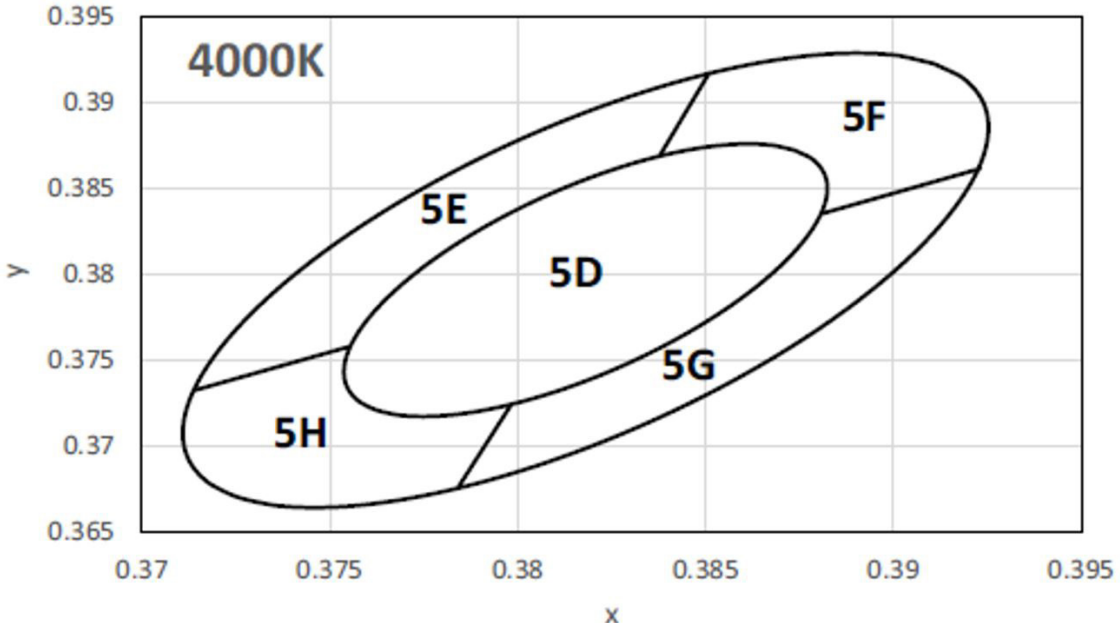


Figure 7e. 1/5th color bin structure for LUXEON 2835 Commercial Deep Dimming 4000K at specified test current and binning temperature of T_j=25°C

Table 6d-1. 3- and 5-step MacAdam ellipse color bin definitions for LUXEON 2835 Commercial Deep Dimming 4000K, at specified 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°

Table 6d-2. 4 quadrants definition for LUXEON 2835 Commercial Deep Dimming 4000K, at specified test and binning conditions

POINT	x	y
1	0.3851	0.3918
2	0.3714	0.3733
3	0.3784	0.3676
4	0.3923	0.3862
Center	0.3818	0.3797

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

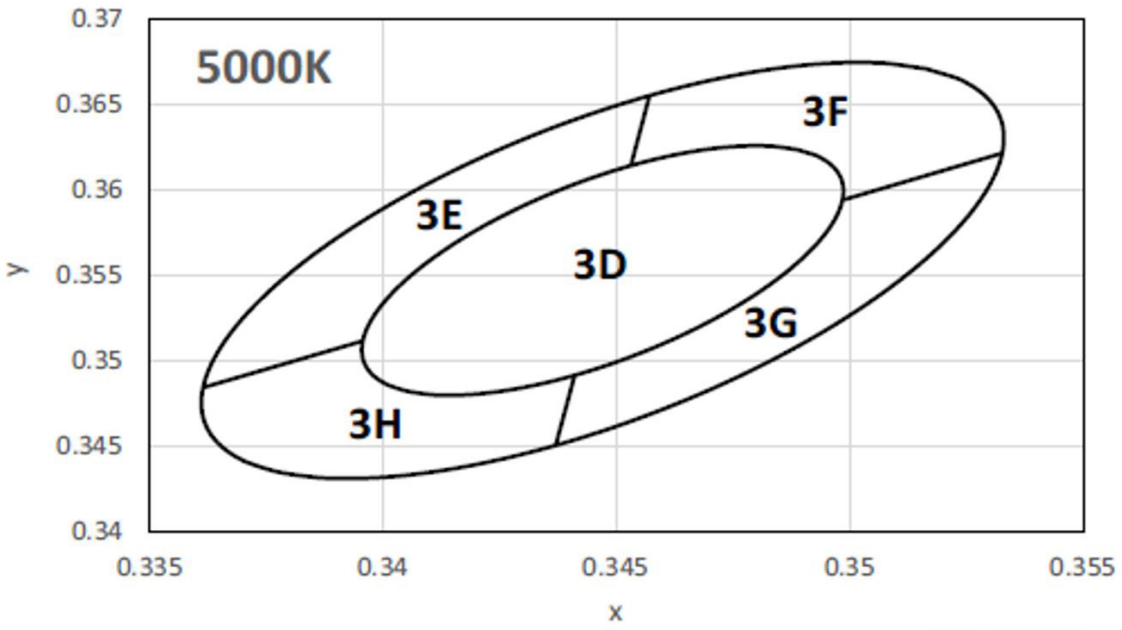


Figure 7f. 1/5th color bin structure for LUXEON 2835 Commercial Deep Dimming 5000K at specified test current and binning temperature of T_j=25°C

Table 6e-1. 3- and 5-step MacAdam ellipse color bin definitions for LUXEON 2835 Commercial Deep Dimming 5000K, at specified 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°

Table 6e-2. 4 quadrants definition for LUXEON 2835 Commercial Deep Dimming 5000K, at specified test and binning conditions

POINT	x	y
1	0.3457	0.3655
2	0.3361	0.3484
3	0.3439	0.3452
4	0.3533	0.3623
Center	0.3447	0.3553

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

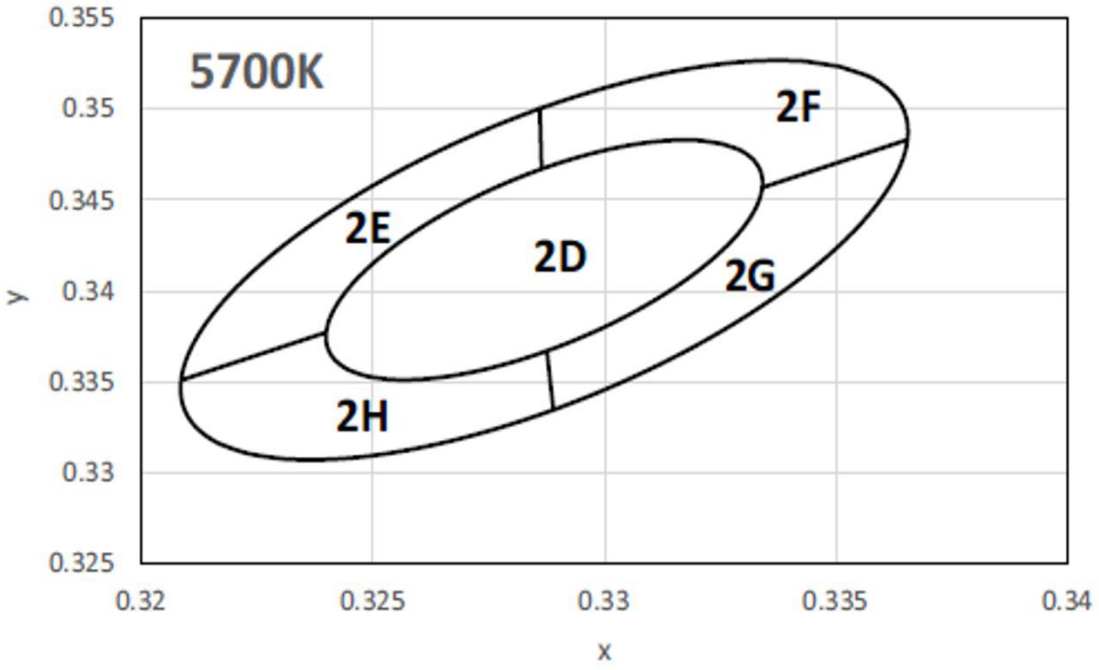


Figure 7g. 1/5th color bin structure for LUXEON 2835 Commercial Deep Dimming 5700K at specified test current and binning temperature of T_j=25°C

Table 6f-1. 3- and 5-step MacAdam ellipse color bin definitions for LUXEON 2835 Commercial Deep Dimming 5700K, at specified 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°

Table 6f-2. 4 quadrants definition for LUXEON 2835 Commercial Deep Dimming 5700K, at specified test and binning conditions

POINT	x	y
1	0.3286	0.3501
2	0.3209	0.3351
3	0.3289	0.3334
4	0.3365	0.3483
Center	0.3287	0.3417

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

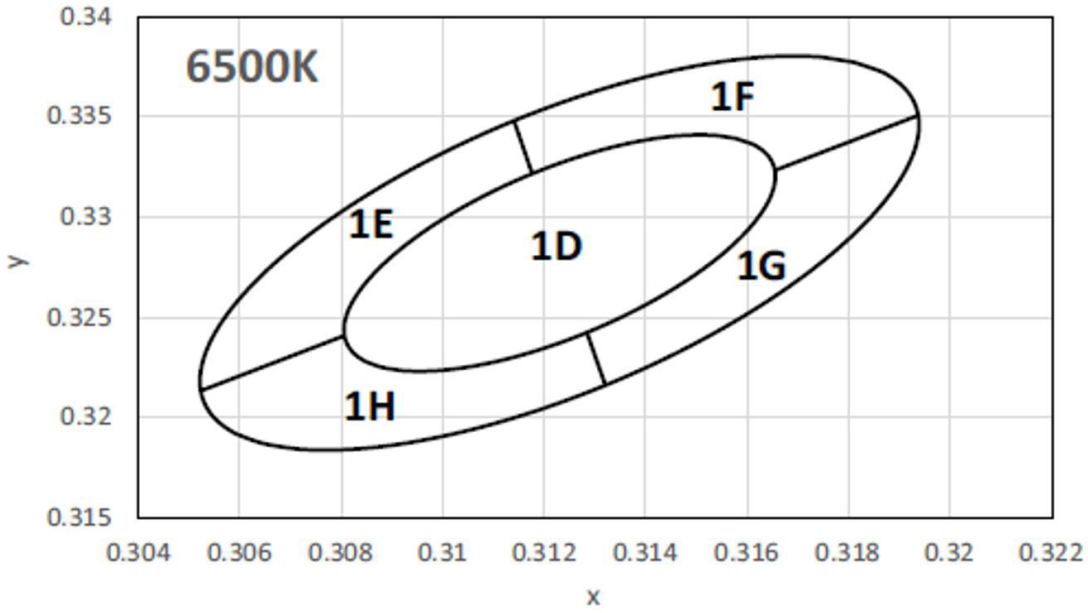


Figure 7h. 1/5th color bin structure for LUXEON 2835 Commercial Deep Dimming 6500K at specified test current and binning temperature of T_j=25°C

Table 6g-1. 3- and 5-step MacAdam ellipse color bin definitions for LUXEON 2835 Commercial Deep Dimming 6500K, at specified 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°

Table 6g-2. 4 quadrants definition for LUXEON 2835 Commercial Deep Dimming 6500K, at specified test and binning conditions

POINT	x	y
1	0.3114	0.3348
2	0.3052	0.3213
3	0.3132	0.3216
4	0.3194	0.3352
Center	0.3123	0.3282

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

Note : Lumileds will supply LUXEON 2835 Commercial Deep Dimming with full distribution. Advanced bin selection and kitting will not be available for this part.

Table 7. Forward voltage bin definitions for LUXEON 2835 Commercial Deep Dimming at 0.65mA, T_j=25°C.

BIN	FORWARD VOLTAGE [1] (V_f)	
	MINIMUM	MAXIMUM
1	2.475	2.50
2	2.50	2.525

Notes for Table 7:
1. Lumileds maintains a tolerance of ±0.05V on forward voltage measurements.

Mechanical Dimensions

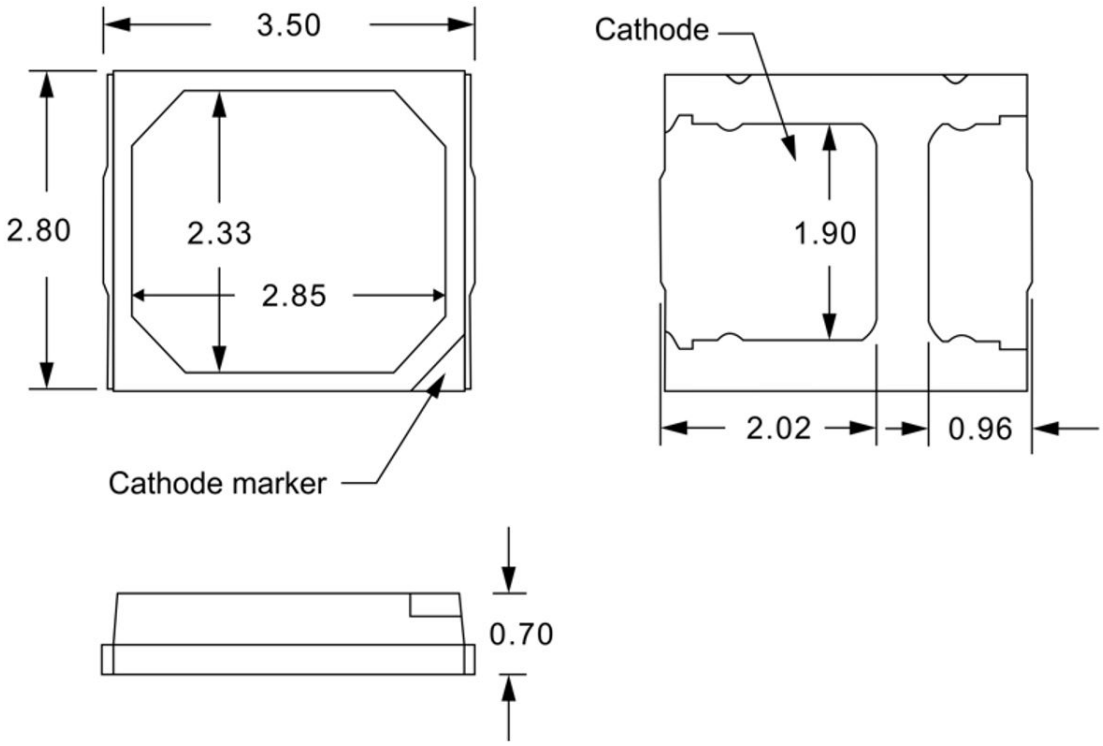


Figure 8. Mechanical dimensions for LUXEON 2835 Commercial Deep Dimming

Notes for Figure 8:
1. Drawings are not to scale.
2. All dimensions are in millimeters.
3. Tolerance: ±0.1mm.

Reflow Soldering Guidelines

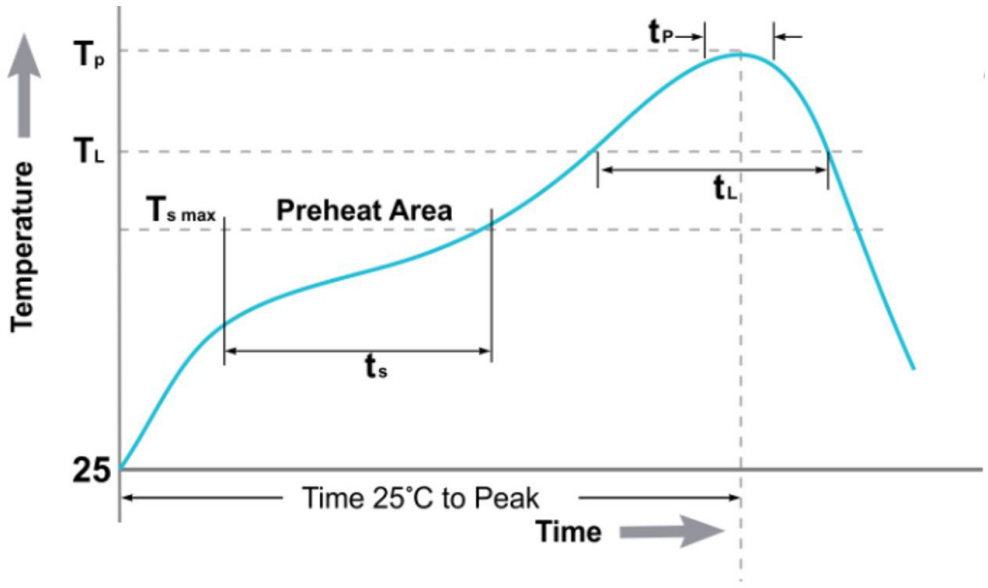


Figure 9. Visualization of the acceptable reflow temperature profile as specified in Table 8

Note for Figure 9:
1. This general guideline may not apply to all designs and configurations of reflow soldering equipment.

Table 8. Reflow profile characteristics for LUXEON 2835 Commercial Deep Dimming

PROFILE FEATURE	LEAD-FREE ASSEMBLY
Preheat Maximum Temperature (T_{smax})	180°C
Preheat Time (t_s)	120 seconds maximum
Ramp-Up Rate (T_{smax} to T_p)	5°C / second maximum
Liquidus Temperature (T_L)	220°C
Time Maintained Above Temperature T_L (t_L)	60 seconds maximum
Peak / Classification Temperature (T_p)	260°C
Time Within 5°C of Actual Peak Temperature (t_p)	10 seconds maximum
Time 25°C to Peak Temperature	3.5 minutes maximum

JEDEC Moisture Sensitivity

Table 9. Moisture sensitivity levels for LUXEON 2835 Commercial Deep Dimming.

LEVEL	FLOOR LIFE		SOAK REQUIREMENTS STANDARD	
	TIME	CONDITIONS	TIME	CONDITIONS
4	72 Hours	≤30°C / 60% RH	96 Hours +2 / -0	30°C / 60% RH

Solder Pad Design

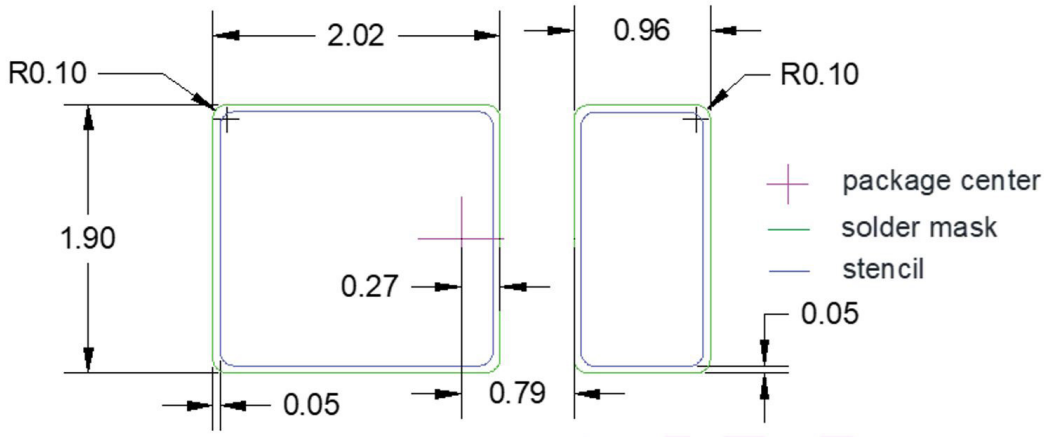


Figure 10. Recommended PCB solder pad layout for LUXEON 2835 Commercial Deep Dimming

Notes for Figure 10:
1. Drawings are not to scale.
2. All dimensions are in millimeters.

Packaging Information

Pocket Tape Dimensions

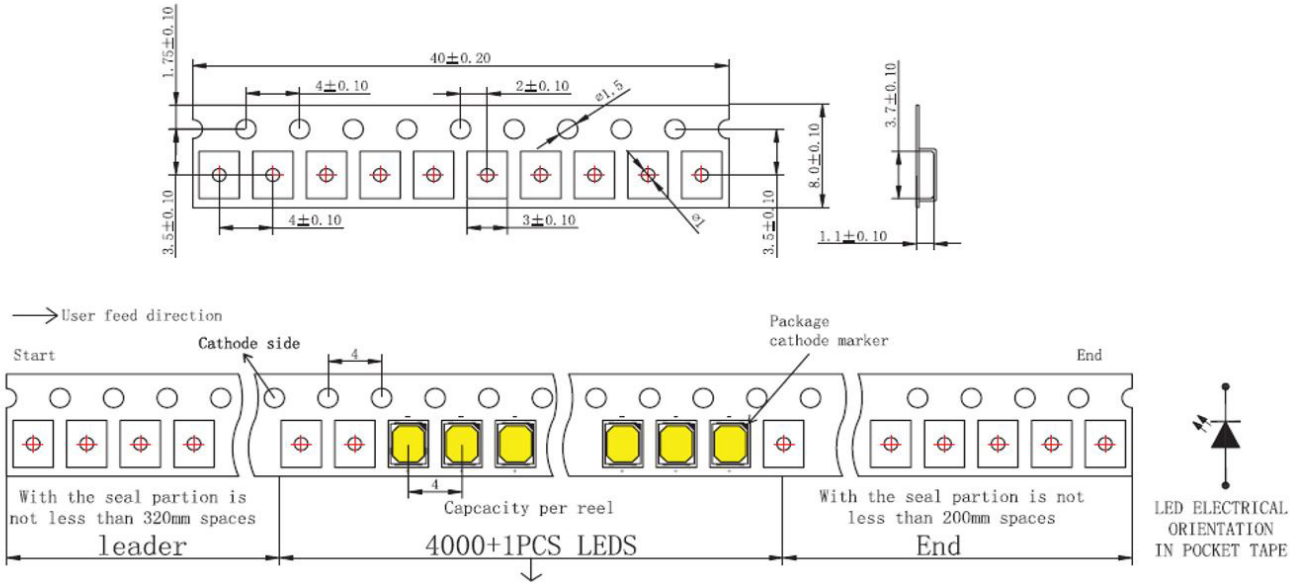


Figure 11. Pocket tape dimensions for LUXEON 2835 Commercial Deep Dimming

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

Reel Dimensions

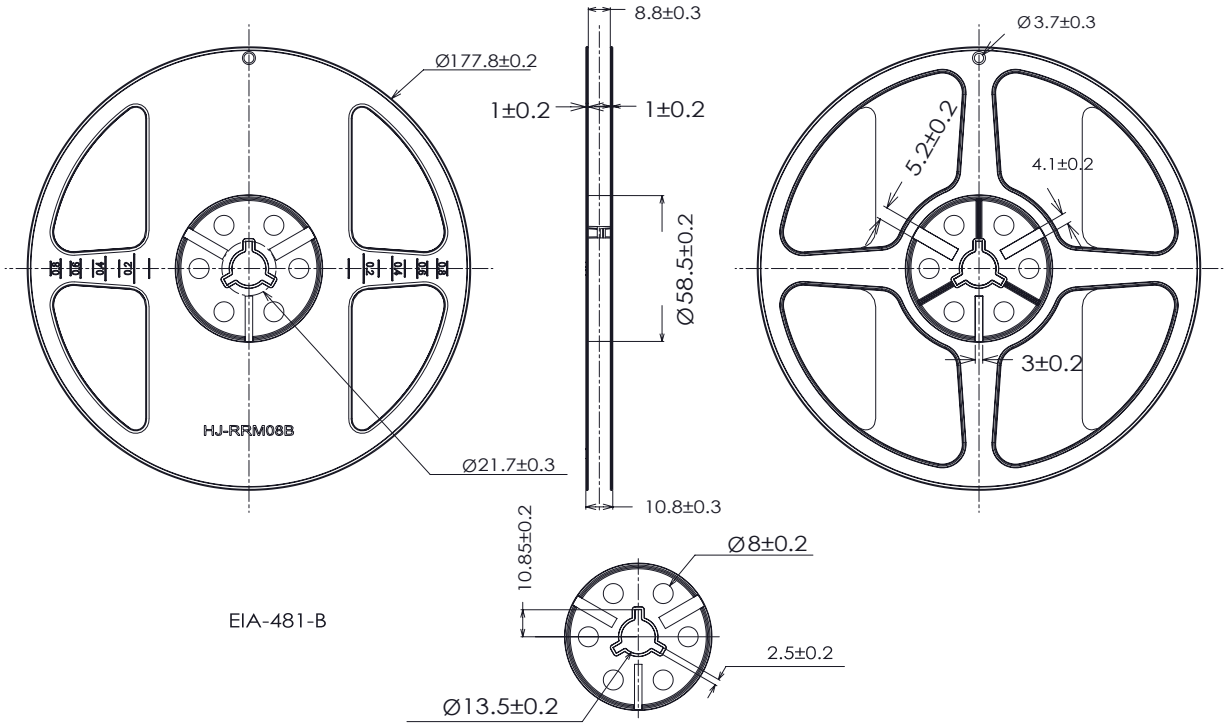


Figure 12. Reel dimensions for LUXEON 2835 Commercial Deep Dimming

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

About Lumileds

Companies developing automotive, mobile, IoT and illumination lighting applications need a partner who can collaborate with them to push the boundaries of light. With over 100 years of inventions and industry firsts, Lumileds is a global lighting solutions company that helps customers around the world deliver differentiated solutions to gain and maintain a competitive edge. As the inventor of Xenon technology, a pioneer in halogen lighting and the leader in high performance LEDs, Lumileds builds innovation, quality and reliability into its technology, products and every customer engagement. Together with its customers, Lumileds is making the world better, safer, more beautiful—with light.

To learn more about our lighting solutions, visit lumileds.com.

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