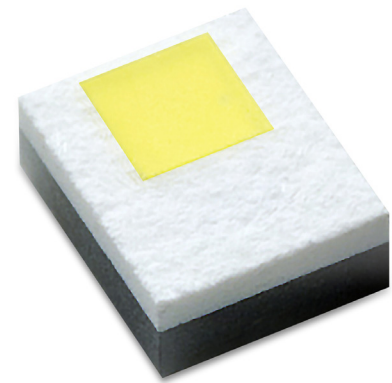
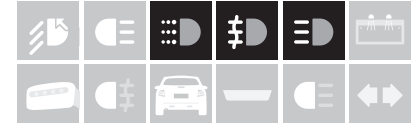


LUXEON FX Plus Ultra Cool White

Industry-leading CSP solutions for low and high beam lamps

LUXEON FX Plus Ultra Cool White LEDs, with their Chip Scale Packaging (CSP) form factor, are designed to support low and high beam applications, daytime running lamps and front fog. The Lumileds automotive binning structure meets both SAE and ECE color specifications and is hot binned at 85°C, consistent with actual automotive operational environments. All LUXEON FX LEDs are AEC-Q102 qualified.



FEATURES AND BENEFITS

- Higher drive current capability for increased flux performance
- Low thermal resistance for better hot lumen performance
- Chip Scale Packaging for low cost and ease of manufacturability
- Hot binned at 85°C MP to match closer to operating conditions
- IEC/PAS 62707-1 White LED

PRIMARY APPLICATIONS

- Daytime Running Lights
- Front Fog
- Headlight
 - Low Beam
 - High Beam
 - Cornering Light

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General Product Information

Product Test Conditions

LUXEON FX Plus Ultra Cool White LEDs are tested and binned using a <20ms monopulse (MP) at 1000mA drive current, case temperature, T_c of 85°C.

Part Number Nomenclature

Part numbers for LUXEON FX Plus Ultra Cool White follow the convention below:

A 1 F X – **A B C D E F G H J K M N P**

Where:

- A B C D** – designates CCT or wavelength (example: 7500 for white)
- E** – designates product generation (example: A=Gen 1, B=Gen 2)
- F** – designates test current (A=350mA, B=500mA, C=700mA, D=1000mA)
- G** – designates test temperature (C=25°C, H=85°C)
- H** – designates future product offerings
- J K M N** – designates minimum luminous flux (example: 0270=270 lumens, 0300=300 lumens, 2=Gen 4+, etc.)
- P** – designates option code for distribution

Therefore, the following part number is used for a first generation LUXEON FX Plus Ultra Cool White LED with a test current of 1000mA, test temperature of 85°C and a minimum luminous flux of 270 lumens:

A 1 F X – **7 5 0 0 A D H 0 0 2 7 0 0**

Environmental Compliance

Lumileds LLC is committed to providing environmentally friendly products to the solid-state lighting market. LUXEON F 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 selection for LUXEON FX Plus Ultra Cool White at <20ms MP test current, $T_c=85^\circ\text{C}$.

MINIMUM LUMINOUS FLUX ^[1] (lm)	TEST CURRENT (mA)	PART NUMBER
290	1000	A1FX-7500ADH002700
300	1000	A1FX-7500ADH002800
310	1000	A1FX-7500ADH002900
320	1000	A1FX-7500ADH003000
330	1000	A1FX-7500ADH003100
340	1000	A1FX-7500ADH003200
350	1000	A1FX-7500ADH003300

Notes for Table 1:

1. Lumileds maintains a tolerance of $\pm 6.5\%$ on luminous flux measurements.

Optical Characteristics

Table 2. Optical Characteristics for LUXEON FX Plus Ultra Cool White at <20ms MP test current, $T_c=85^\circ\text{C}$.

PART NUMBER	CORRELATED COLOR TEMPERATURE		TOTAL INCLUDED ANGLE ^[1] $\theta_{0.90V}$	VIEWING ANGLE ^[2] $2\theta_{1/2}$
	MINIMUM	MAXIMUM		
A1FX-7500ADHxxxxxx	7100K	7900K	142°	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 $\frac{1}{2}$ of the peak value.

Electrical Characteristics

Table 3. Electrical characteristics for LUXEON FX Plus Ultra Cool White at <20ms MP test current, $T_c=85^\circ\text{C}$.

PART NUMBER	FORWARD VOLTAGE ^[1] (V)		THERMAL RESISTANCE— JUNCTION TO CASE ($^\circ\text{C}/\text{W}$)			
			$R\theta_{j-c,el}$ ^[2]		$R\theta_{j-c,real}$ ^[3]	
	MINIMUM	MAXIMUM	TYPICAL	MAXIMUM	TYPICAL	MAXIMUM
A1FX-7500ADHxxxxxx	2.55	3.51	3.5	4.2	5.0	6.0

Notes for Table 3:

1. Lumileds maintains a tolerance of $\pm 0.06\text{ V}$ on forward voltage measurements.
2. $R\theta_{j-c,el}$: Electrical thermal resistance (junction to case).
3. $R\theta_{j-c,real}$: Real thermal resistance (junction to case) with wall plug efficiency included. Reference JE5D51-51, JE5D51-14, 4.1.3.
4. Calculated (5s).

Absolute Ratings

Table 4. Absolute ratings for LUXEON FX Plus Ultra Cool White.

PARAMETER	PERFORMANCE
Minimum DC Forward Current	50mA
Maximum DC Forward Current	1500mA
Maximum Junction Temperature ^[1]	150°C
Maximum Junction Temperature for <200 Hours	180°C
Operating Case Temperature at Test Current	-40°C to 130°C
Operating Case Temperature at Maximum Current	-40°C to 130°C
LED Storage Temperature	-40°C to 130°C
Maximum Soldering Temperature	260°C
Allowable Reflow Cycles	3
ESD Sensitivity ^[2]	±8kV HBM, ±400V MM, ±2kV CDM
Reverse Voltage ($V_{reverse}$)	LUXEON LEDs are not designed to be driven in reverse bias
Autoclave Conditions	121°C at 2 ATM 100% Relative Humidity for 96 Hours Maximum

Notes for Table 4:

- Given for reference only. LUXEON FX LEDs driven above maximum LED case temperature and/or maximum I_f may have a shorter lifetime.
- Measured using human body model (per JESD22 A114), machine model (per JESD22 A115) and charged device model (per JESD22 C101).

JEDEC Moisture Sensitivity

Table 5. Moisture sensitivity levels for LUXEON FX Plus Ultra Cool White.

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

Characteristic Curves

Spectral Power Distribution Characteristics

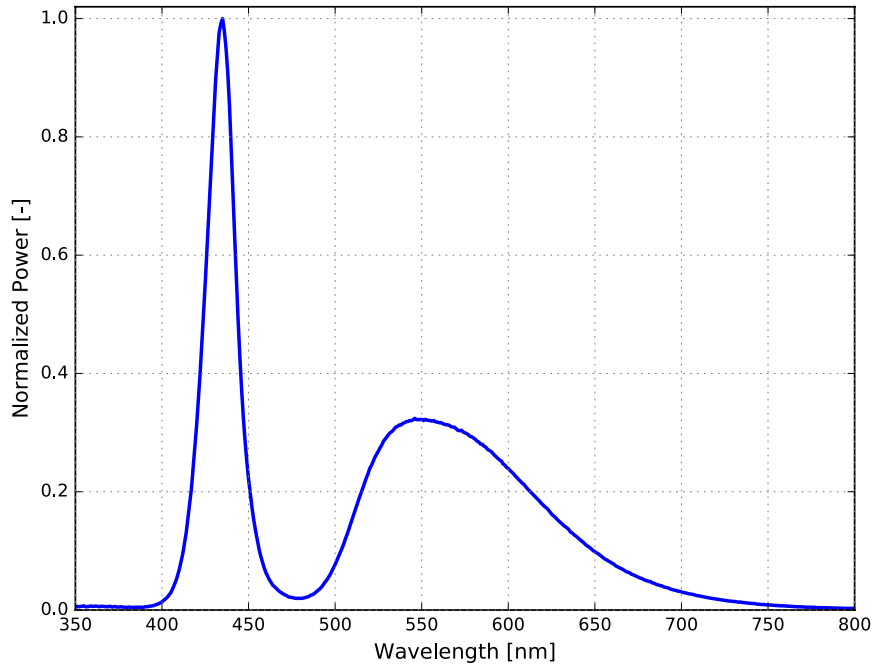


Figure 1. Typical normalized power vs. wavelength for LUXEON FX Plus Ultra Cool White at <20ms MP, 1000mA, $T_c=85^\circ\text{C}$.

Light Output Characteristics

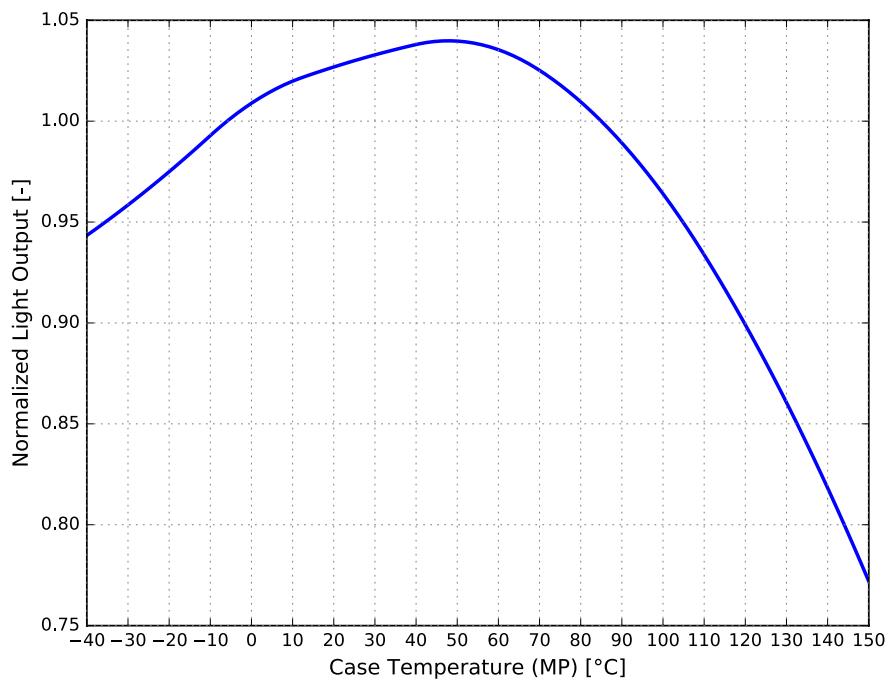


Figure 2. Typical normalized light output vs. case temperature for LUXEON FX Plus Ultra Cool White at <20ms MP, 1000mA.

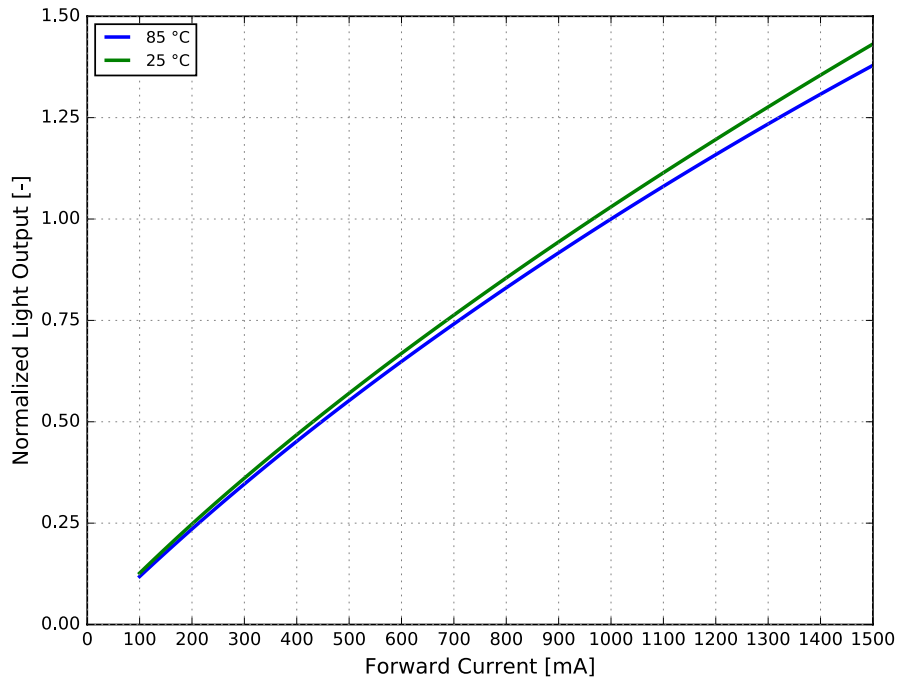


Figure 3. Typical normalized light output vs. forward current for LUXEON FX Plus Ultra Cool White at $T_c=85^\circ\text{C}$.

Forward Current and Forward Voltage Characteristics

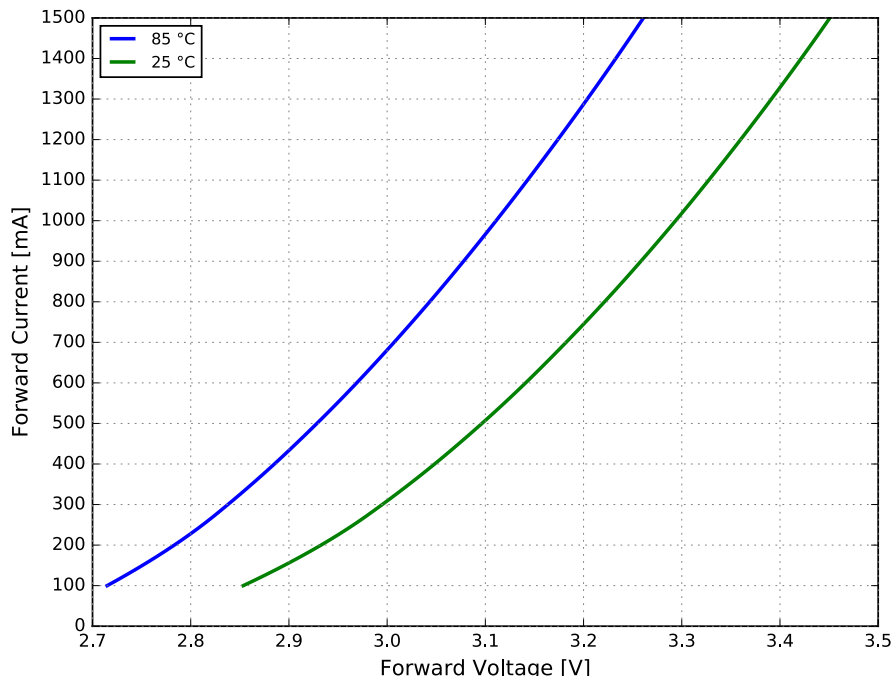


Figure 4. Typical forward current vs. forward voltage for LUXEON FX Plus Ultra Cool White at $T_c=85^\circ\text{C}$.

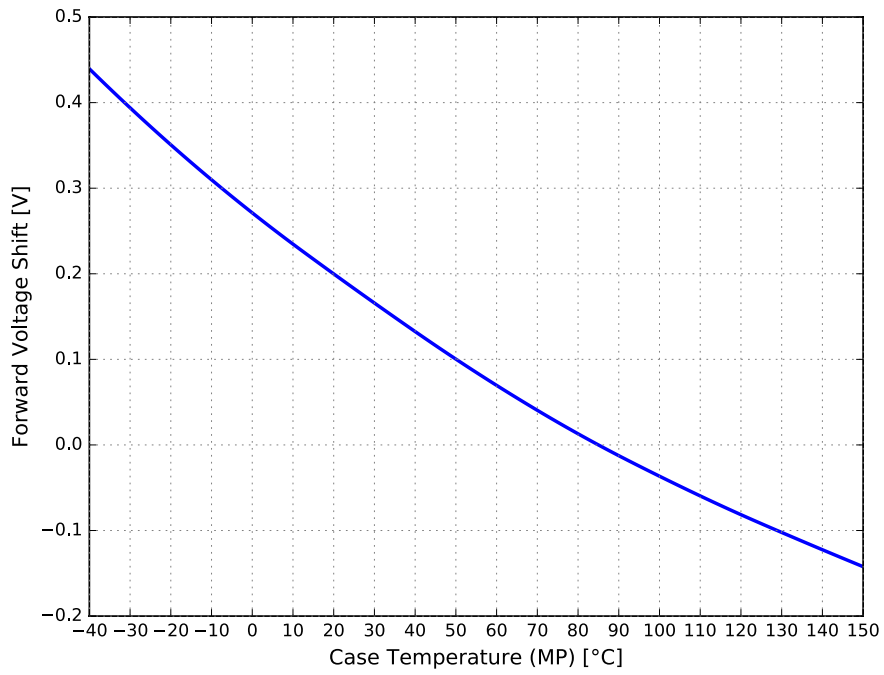


Figure 5. Typical forward voltage shift vs. case temperature for LUXEON FX Plus Ultra Cool White.

Color Shift Characteristics

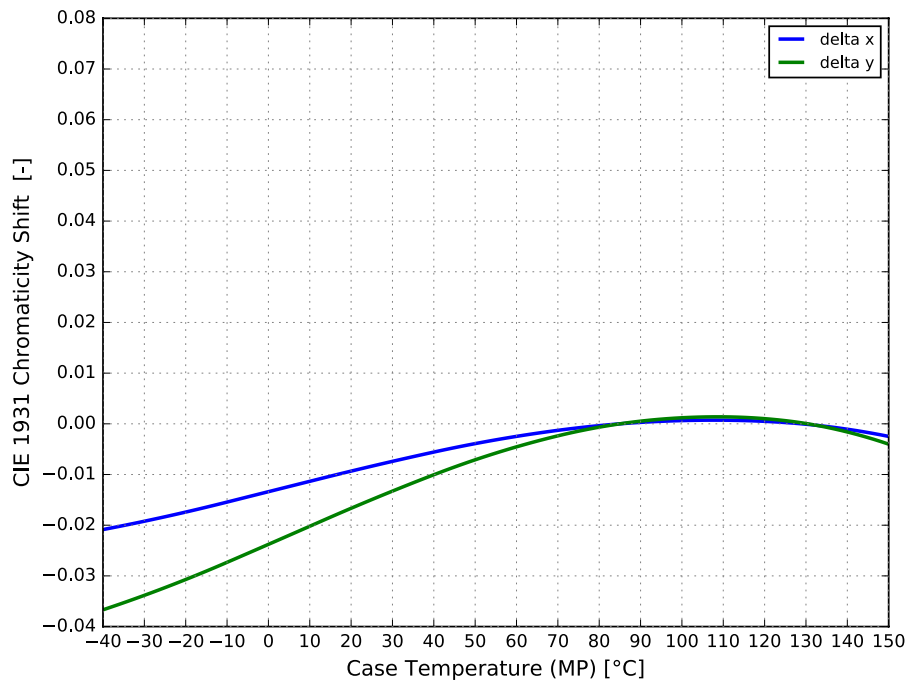


Figure 6. Typical color shift in CIE 1931 x and y coordinates for LUXEON FX Plus Ultra Cool White at <20ms MP, 1000mA.

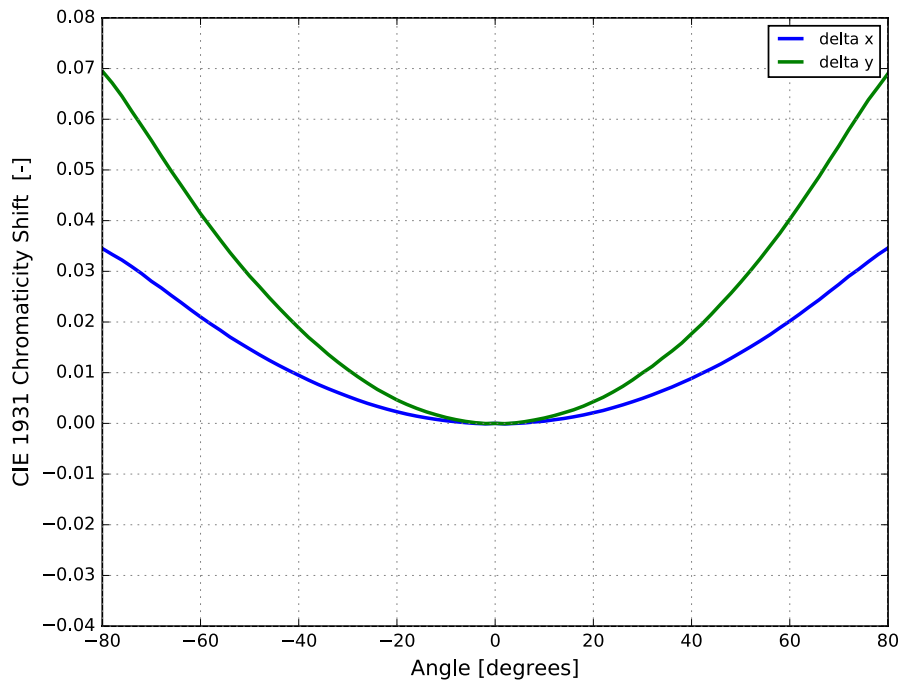


Figure 7. Typical color shift in CIE 1931 x and y coordinates over angle for LUXEON FX Plus Ultra Cool White at <20ms MP, 1000mA.

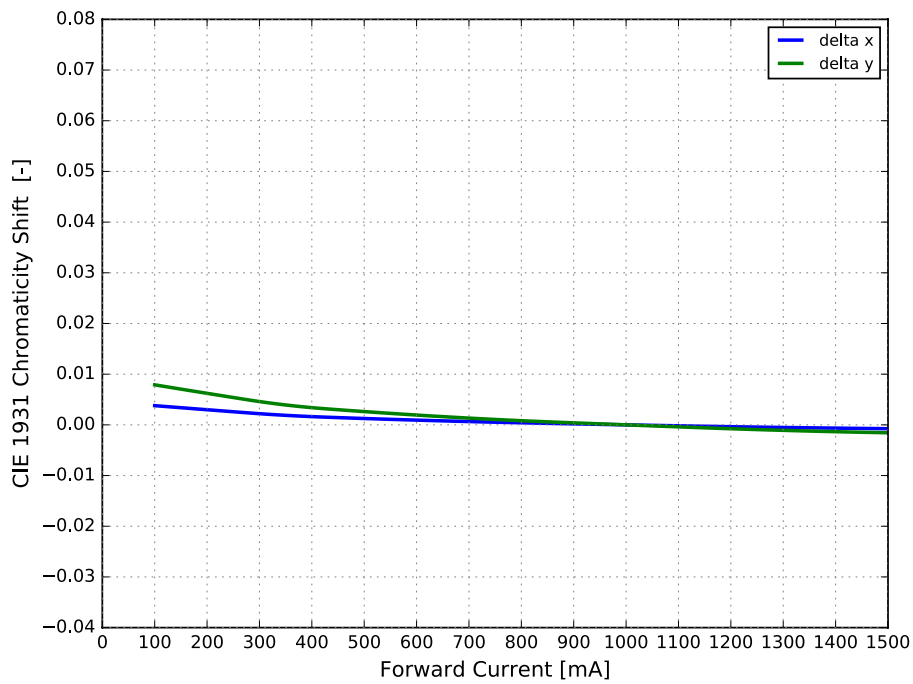


Figure 8. Typical color shift in CIE 1931 x and y coordinates for LUXEON FX Plus Ultra Cool White.

Radiation Pattern Characteristics

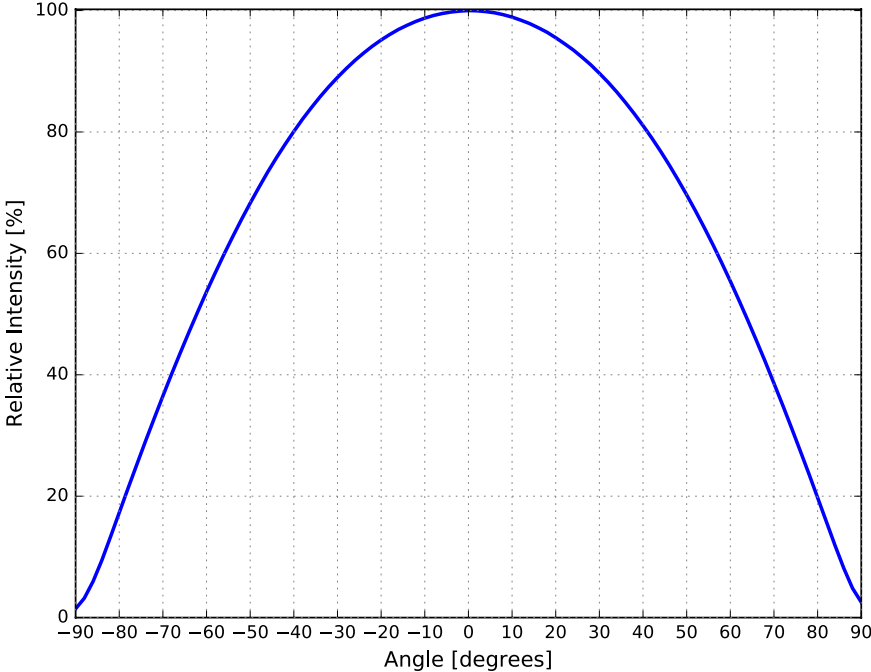


Figure 9. Typical radiation pattern for LUXEON FX Plus Ultra Cool White at <20ms MP, 1000mA, T_c=85°C.

Operating Limits Characteristics

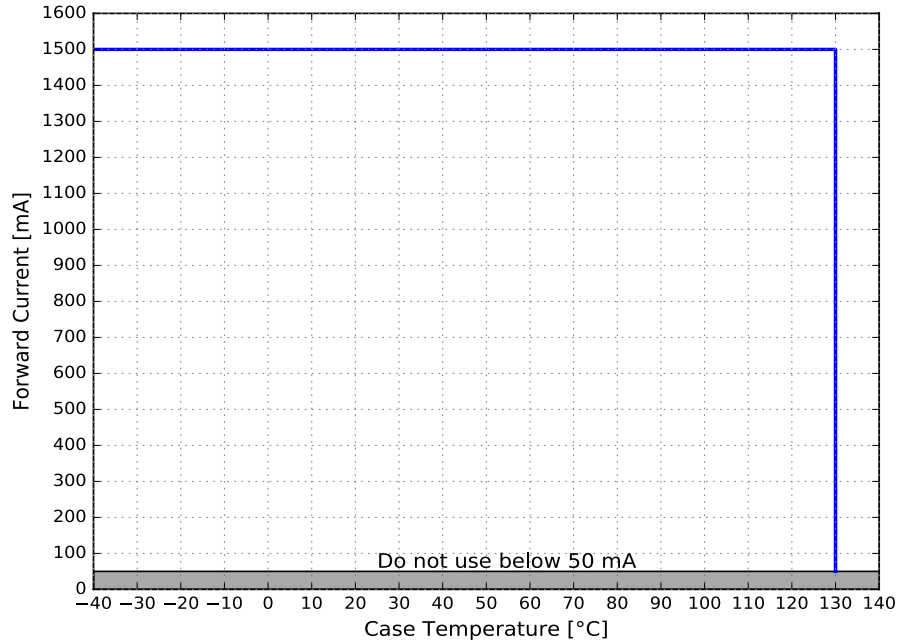


Figure 10. Maximum forward current vs. case temperature for LUXEON FX Plus Ultra Cool White.

Notes for Figure 9:

1. -40°C to 130°C (upgrade to 135°C under consideration).

Permissible Pulse Handling Characteristics

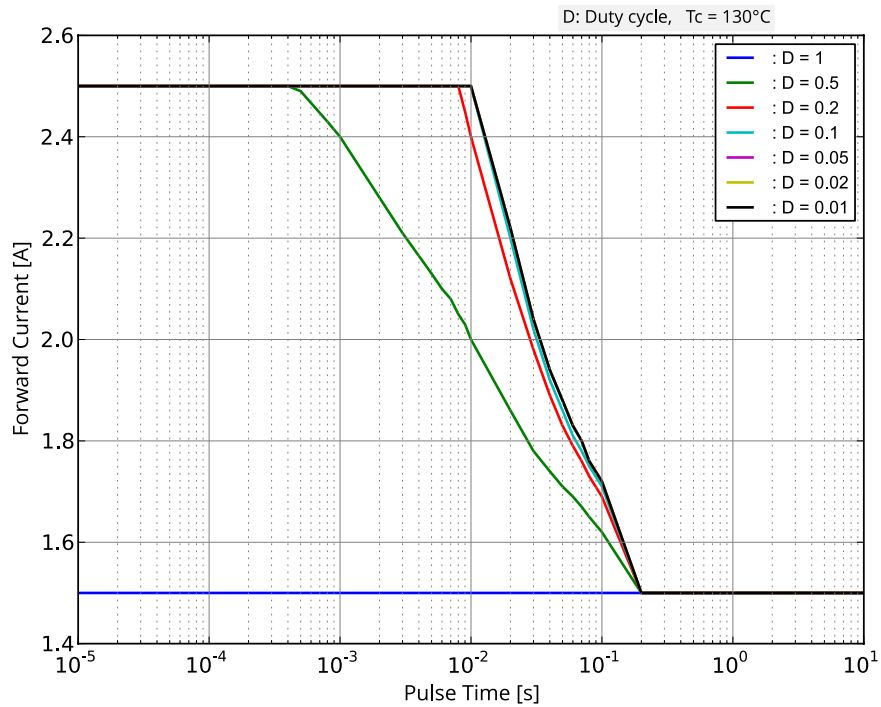


Figure 11. Permissible pulse handling capability for LUXEON FX Plus Ultra Cool White.

Product Bin and Labeling Definitions

Designing with LUXEON FX Plus Ultra Cool White

Flux bins supportable for car programs depend on product color and program start and end of production date. Flux roadmaps by year and product color are maintained and available from the sales representative. Please contact your local sales representative to request the flux bin range with best supportability for program timing.

Decoding Product Bin Labeling

In the manufacturing of semiconductor products, there are variations in performance around the average values given in the technical datasheets. For this reason, Lumileds bins the LED components for luminous flux, color and forward voltage.

LUXEON FX Plus Cool White LEDs are labeled using a 4-digit alphanumeric CAT code following the format below.

A B C D

Where:

- A** – designates luminous flux bin (example: E=270 to 280 lumens, H=300 to 310 lumens)
- B C** – designates color bin (example: U1, U2, U3)
- D** – designates forward voltage bin (example: B=2.55V to 2.79V, D=3.03V to 3.27V)

Therefore, a LUXEON FX Plus Ultra Cool White with a lumen range of 300 to 310, color bin of U2, and a forward voltage range of 2.55V to 2.79V has the following CAT code:

H U 2 B

Luminous Flux Bins

Table 6 lists the standard luminous flux bins for LUXEON FX 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 colors

Table 6. Luminous flux bin definitions for LUXEON FX Plus Ultra Cool White at <20ms MP test current, $T_c=85^\circ\text{C}$.

BIN	LUMINOUS FLUX ⁽¹⁾ (lm)	
	MINIMUM	MAXIMUM
G	290	300
H	300	310
J	310	320
K	320	330
L	330	340
M	340	350
N	350	360

Notes for Table 6:

1. Lumileds maintains a tolerance of $\pm 6.5\%$ on luminous flux measurements.

Color Codes

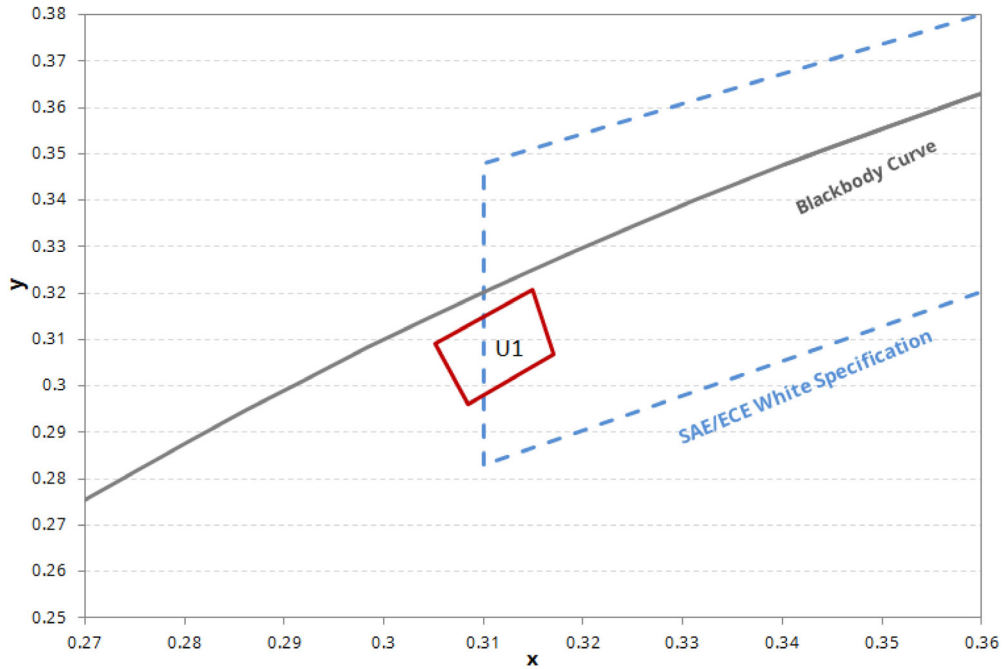


Figure 12a. Color bin structure in CIE 1931 color space for LUXEON FX Plus Ultra Cool White.

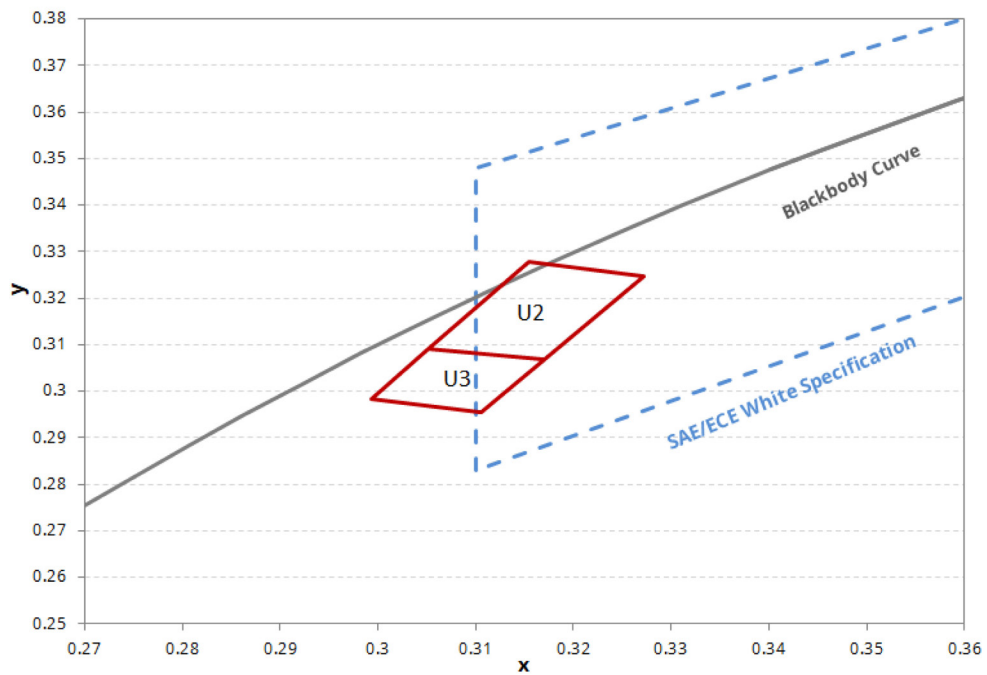


Figure 12b. Additional color bin structure in CIE 1931 color space for LUXEON FX Plus Ultra Cool White.

Notes for Figures 12b:

- LUXEON FX Plus Ultra Cool White color bins must be ordered by fine bin designators, shown below.
 - U4 = U2,U3

Color Bin Definitions

Table 7. Color bin definitions for LUXEON FX Plus Ultra Cool White.

BIN	x	y
U1	0.3149	0.3208
	0.3170	0.3068
	0.3084	0.2961
	0.3052	0.3090
U2	0.3155	0.3278
	0.3272	0.3246
	0.3170	0.3068
	0.3052	0.3090
U3	0.3052	0.3090
	0.3170	0.3068
	0.3106	0.2955
	0.2994	0.2983

Notes for Table 7:

1. Lumileds maintains a tolerance of ± 0.005 on x and y color coordinates in the CIE 1931 color space.
2. CIE 1931 x and y coordinate frame.

Forward Voltage Bins

Table 8. Forward voltage bin definitions for LUXEON FX Plus Ultra Cool White.

BIN	FORWARD VOLTAGE ⁽¹⁾ (V _f)	
	MINIMUM	MAXIMUM
B	2.55	2.79
C	2.79	3.03
D	3.03	3.27
E	3.27	3.51

Notes for Table 8:

1. Lumileds maintains a tolerance of $\pm 0.06V$ on forward voltage measurements.
2. Although several bins are outlined, product availability in a particular bin varies by production run and by product performance.

Mechanical Dimensions

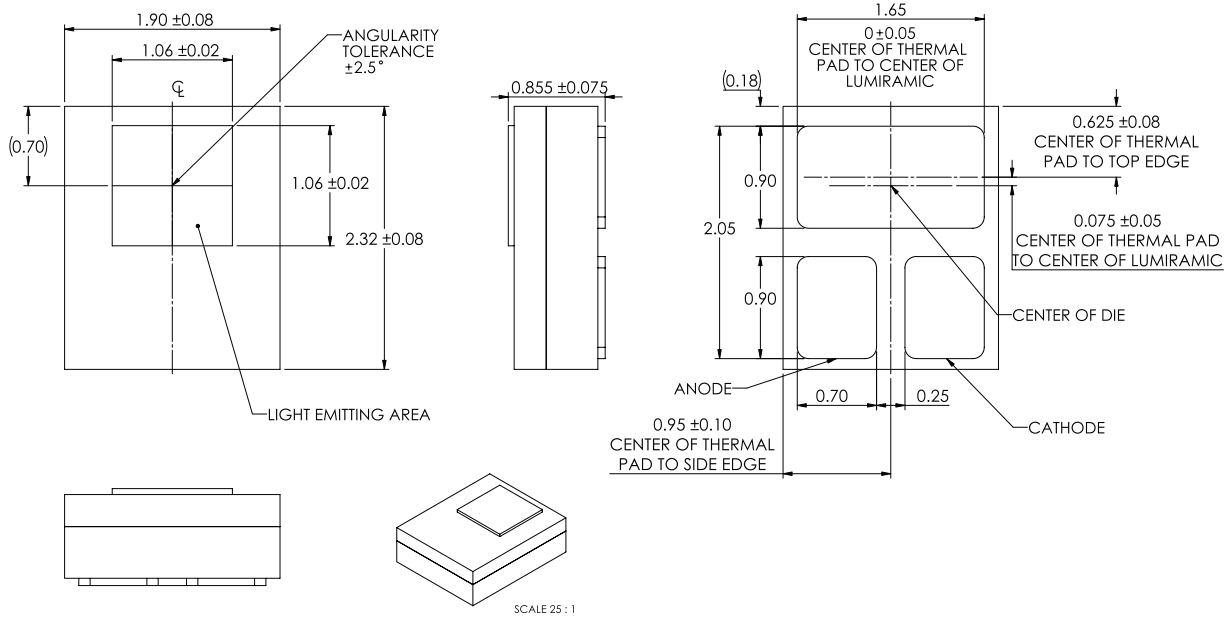


Figure 13. Mechanical dimensions for LUXEON FX Plus Ultra Cool White.

Notes for Figure 13:

1. Drawings are not to scale.
2. All dimensions are in millimeters.

Packaging Information

Pocket Tape Dimensions

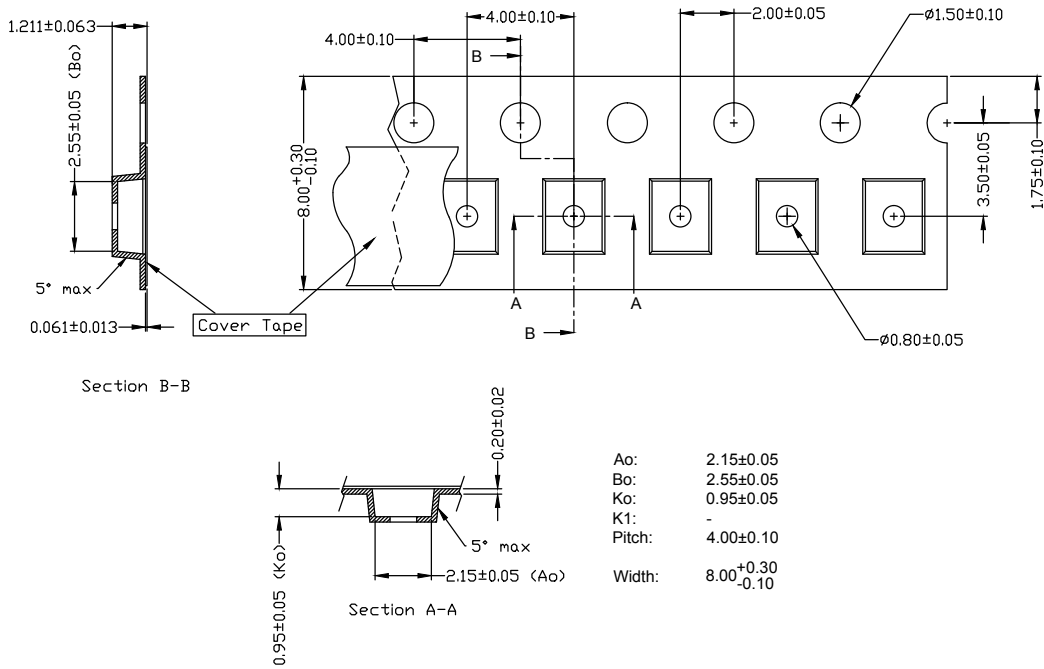


Figure 14. Pocket tape dimensions for LUXEON FX Plus Ultra Cool White.

Notes for Figure 14:

1. Drawings are not to scale.
2. All dimensions are in millimeters.
3. Ao is the width of pocket and Ko is the depth of pocket. Bo is the height of pocket.

Reel Dimensions

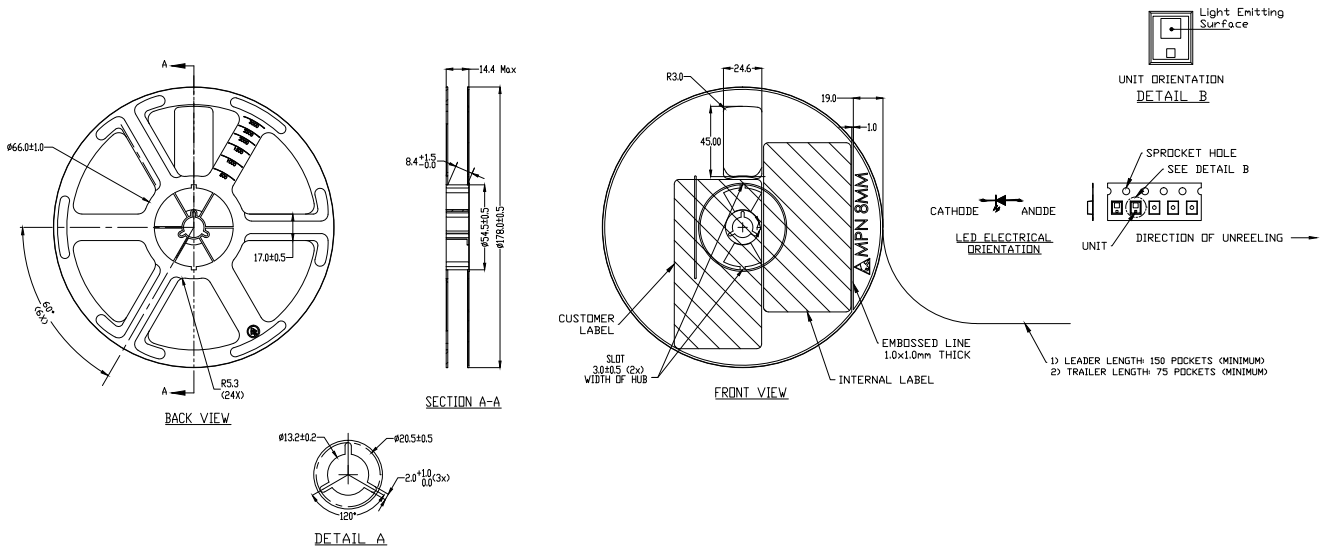


Figure 15. Reel dimensions for LUXEON FX Plus Ultra Cool White.

Notes for Figure 15:

1. Drawings are not to scale.
2. All dimensions are in millimeters.
3. SPI=3,000 (SPI is the number of LEDs per reel).

Product Labeling

LUXEON FX Plus Ultra LEDs are packaged in moisture barrier bags on reels. Both moisture barrier bag and reels have printed information providing part numbers with CAT codes that indicate luminous flux, color and forward voltage bins.

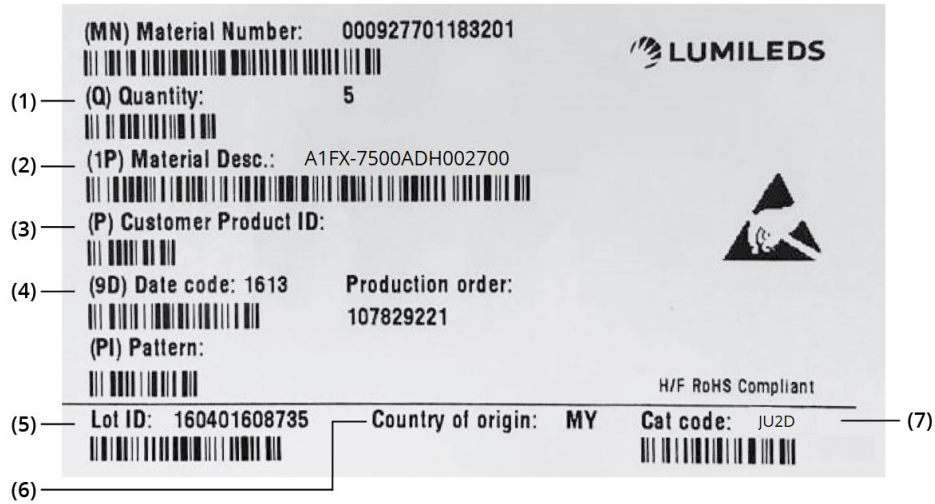


Figure 16. Example of a product label for LUXEON FX Plus Ultra Cool White.

Notes for Figure 16 – Box Label descriptions for customer use:

Field labels not described are for Lumileds internal use only.

1. Total number of LED emitters in a shipment box.
2. Lumileds part number
3. Customer part number for custom requests only.
4. LED test date in YYWW format.
5. Unique product lot identification number. This number is required for traceability purposes.
6. Country code of origin of manufacturing of part (e.g. MY for Malaysia, CN for China) according to ISO 3166-1 alpha-2 document.
7. Product bin 4-digit alphanumeric CAT code.

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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