LUXEON FX Plus PC Amber

Industry-leading Chip Scale Package solutions for turn applications

LUXEON FX LEDs with their Chip Scale Package (CSP) form factor are designed to meet present and future Automotive requirements. 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. LUXEON FX Plus PC Amber provides industry-leading solutions for your front and rear turn applications. All LUXEON FX LEDs are IEC-60810 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 mono pulse (MP) drive current to match closer to operating conditions

PRIMARY APPLICATIONS

- Side Marker
- Turn
  - Front Turn
  - Rear Turn

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General Product Information

Product Test Conditions

LUXEON FX Plus PC Amber LEDs are tested and binned using a 20 ms monopulse (MP) at at 1000 mA drive current, with a case temperature, T_C, of 85 °C.

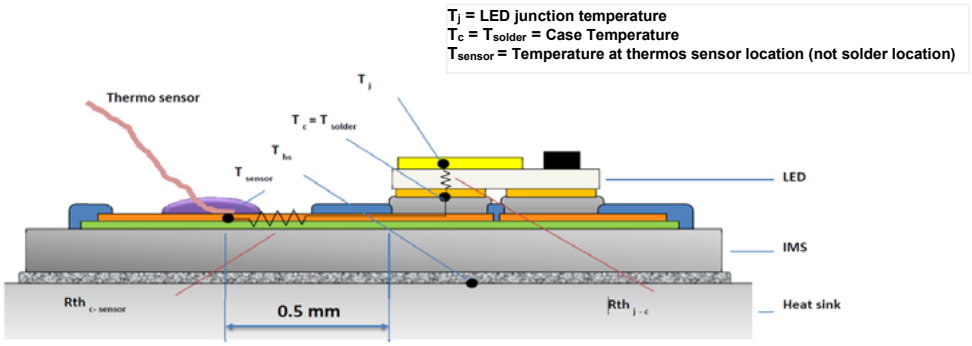

Figure 1. Example of case temperature location on sample board for LUXEON FX

Part Number Nomenclature

Part numbers for LUXEON FX Plus PC Amber follow the convention below:

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

Where:

- A – designates Automotive
- 1 – designates level 1
- F X – designates LUXEON FX product family
- B C D E – designates wavelength (0591 = PC Amber)
- F – designates generation (B = Gen6)
- G – designates test current (G = 1000 mA)
- H – designates test temperature (H = 85 °C)
- **J** – designates future product offerings
- **K M N P** – designates minimum flux value (0170, 0180, 0190, 0200 and 0210)
- **Q** – designates option code for distribution

Therefore, the following part number is used for a LUXEON FX Plus PC Amber with a minimum luminous flux of 190 lumens:

A 1 F X – 0 5 9 1 B D H **0 0 1 9 0 0**

Environmental Compliance

Lumileds LLC is committed to providing environmentally friendly products to the solid-state lighting market. LUXEON FX 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 FX Plus PC Amber at 20 ms MP, 1000 mA, T_C = 85 °C

PRODUCT	MINIMUM LUMINOUS FLUX [1] (lm)	TEST CURRENT (mA)	PART NUMBER
LUXEON FX Plus PC Amber	170	1000	A1FX-0591BDH001700
	180	1000	A1FX-0591BDH001800
	190	1000	A1FX-0591BDH001900
	200	1000	A1FX-0591BDH002000
	210	1000	A1FX-0591BDH002100
	220	1000	A1FX-0591BDH002200
	230	1000	A1FX-0591BDH002300

Notes for Table 1:
1. Lumileds maintains a tolerance of ±6.5% on luminous flux measurements.

Optical Characteristics

Table 2. Typical optical characteristics for LUXEON FX Plus PC Amber at 20 ms MP, 1000 mA, T_C = 85 °C

PART NUMBER	DOMINANT WAVELENGTH (nm)		SPECTRAL HALF-WIDTH [1] (nm) $\Delta\lambda_{1/2}$	TOTAL INCLUDED ANGLE [2] $\theta_{0.90V}$	TYPICAL VIEWING ANGLE [3] $2\theta_{1/2}$
	MINIMUM	MAXIMUM			
A1FX-0591BDHxxxxxx	588.8	592.6	77	140°	117°

Notes for Table 2:
1. Spectral width at ½ of the peak intensity.
2. Total angle at which 90% of total luminous flux is captured.
3. 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. Typical electrical and thermal characteristics for LUXEON FX Plus PC Amber at MP, 1000 mA, T_c = 85 °C

PART NUMBER	FORWARD VOLTAGE [1] (V_f)		THERMAL RESISTANCE— JUNCTION TO CASE (°C/W)			
			$R\theta_{J-C}$ el [2]		$R\theta_{J-C}$ real [3]	
	MINIMUM	MAXIMUM	TYPICAL	MAXIMUM	TYPICAL	MAXIMUM
A1FX-0591BDHxxxxxx	2.55	3.51	3.8	4.6	5.1	6.2

Notes for Table 3:
1. Lumileds maintains a tolerance of ±0.06V 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 JESD51-51, JESD51-14, 4.1.3.
4. Calculated (5s).

Absolute Ratings

Table 4. Absolute ratings for LUXEON FX Plus PC Amber

PARAMETER	PERFORMANCE
Minimum DC Forward Current	50 mA
Maximum DC Forward Current	1000 mA
Maximum Junction Temperature [1]	150 °C
Operating Case Temperature at Test Current	-40 °C to 125 °C
Operating Case Temperature at Maximum Current	-40 °C to 125 °C
Maximum Junction Temperature for <200 Hours (1000 mA) [1]	180 °C
LED Storage Temperature	-40 °C to 130 °C
Soldering Temperature	260 °C
Allowable Reflow Cycles	3
ESD Sensitivity [2]	±8 kV HBM, ±400 V MM, ±2 kV CDM
Reverse Voltage ($V_{reverse}$)	LUXEON FX 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:
1. Given for reference only, LUXEON FX LEDs driven above maximum LED case temperature and/or maximum If may have shorter lifetime.
2. 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 PC Amber.

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

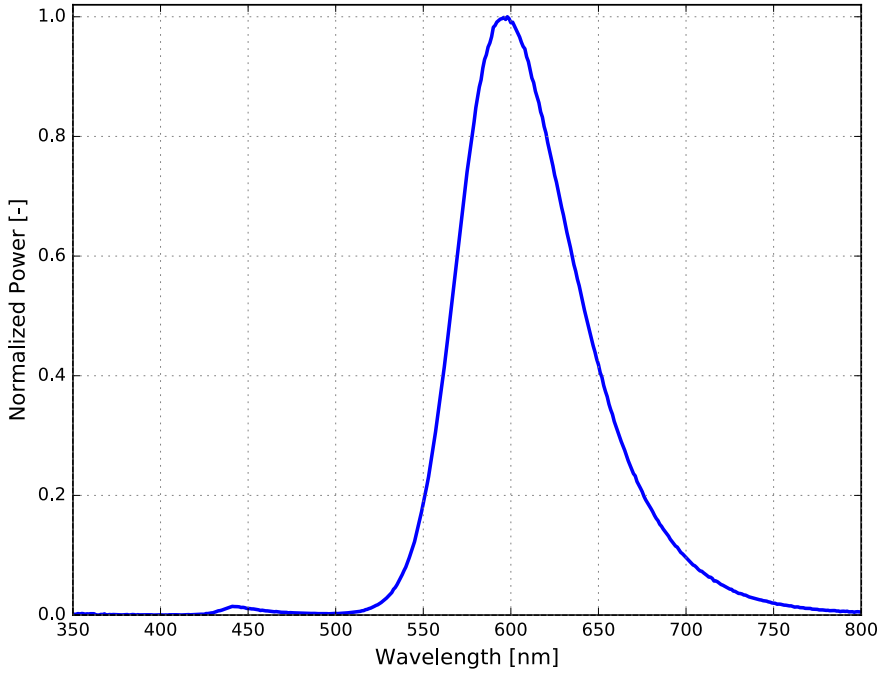

Figure 1a. Typical normalized power vs. wavelength for LUXEON FX Plus PC Amber at 20 ms MP, 1000 mA, T_c = 85 °C

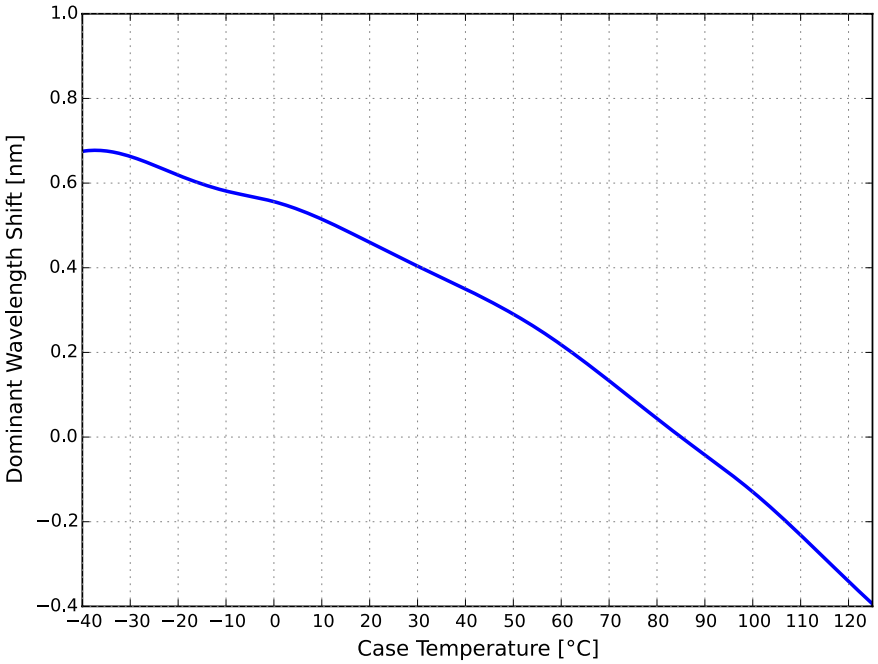

Figure 1b. Typical dominant wavelength shift vs. case temperature for LUXEON FX Plus PC Amber LUXEON FX Plus PC Amber at 20 ms MP, 1000 mA

Light Output Characteristics

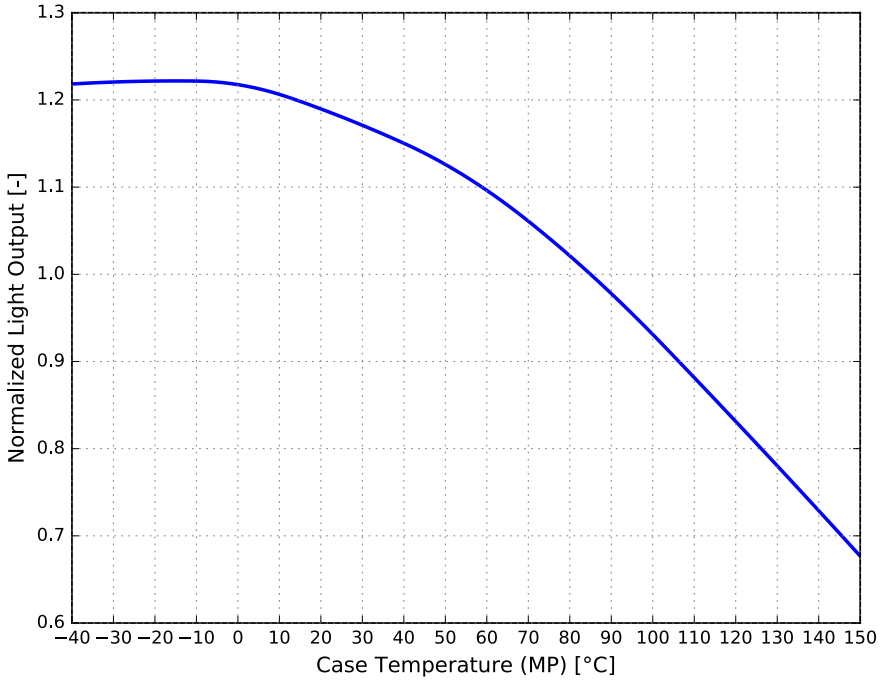

Figure 2a. Typical normalized light output vs. case temperature for LUXEON FX Plus PC Amber at 20 ms MP, 1000 mA

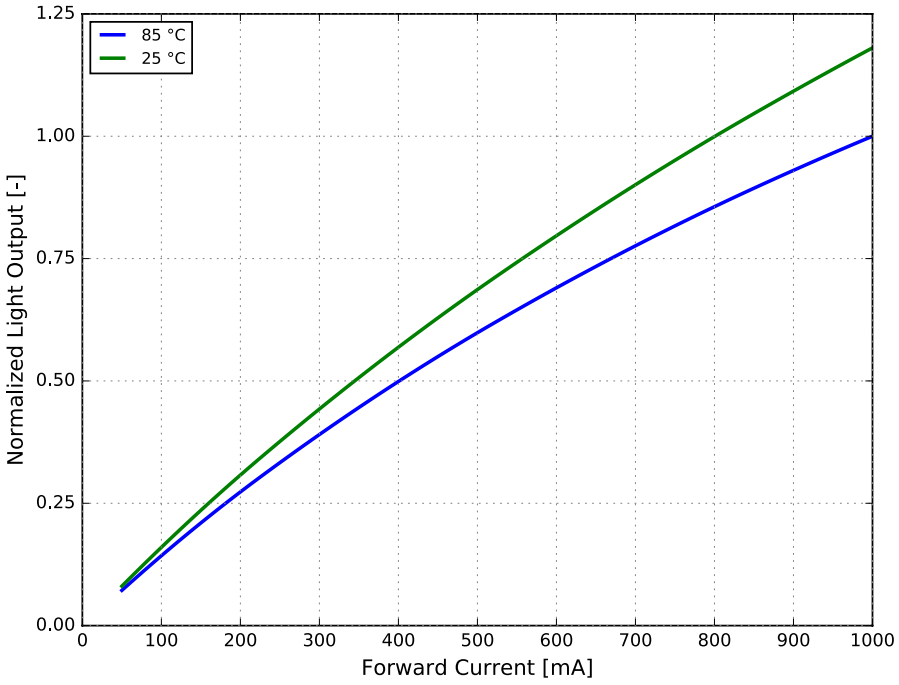

Figure 2b. Typical normalized light output vs. forward current for LUXEON FX Plus PC Amber at T_C = 85 °C

Forward Current Characteristics

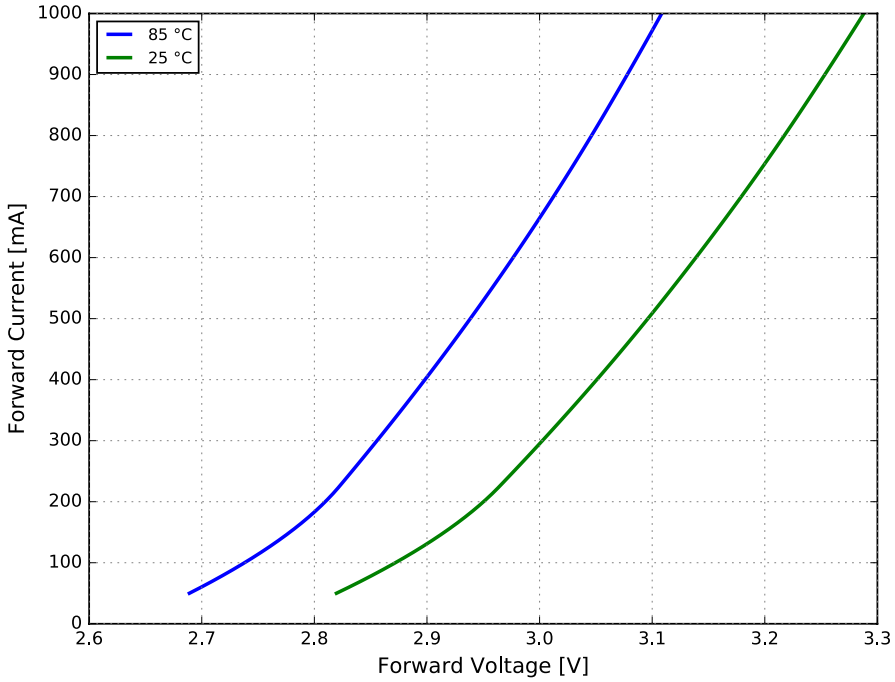

Figure 3a. Typical forward current vs. forward voltage for LUXEON FX Plus PC Amber, LUXEON FX Plus PC Amber at 20 ms MP, 1000 mA

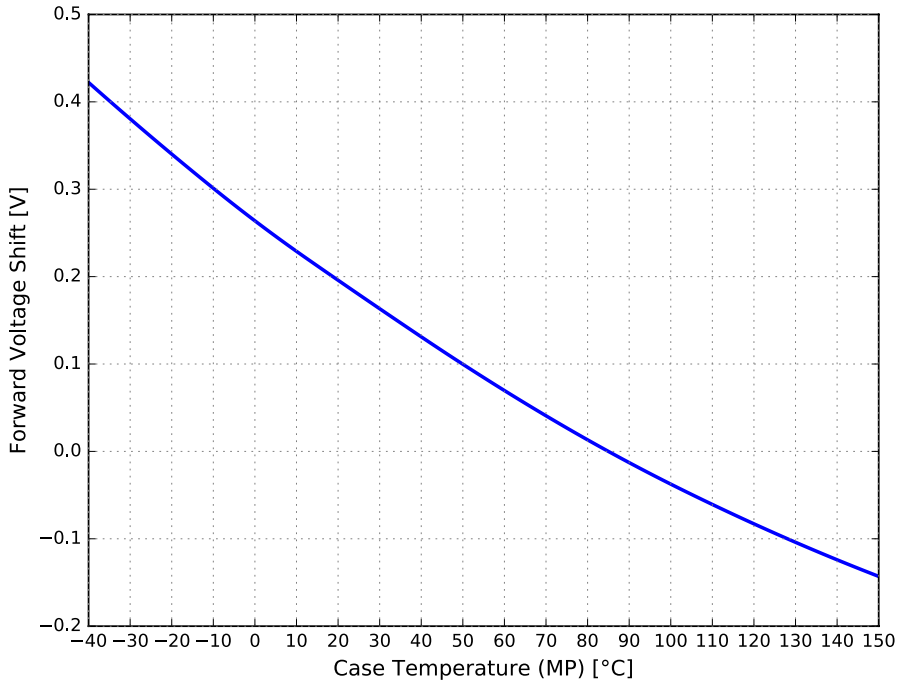

Figure 3b. Typical forward voltage shift vs. case temperature for LUXEON FX Plus PC Amber at 20 ms MP, 1000 mA

Color Shift Characteristics

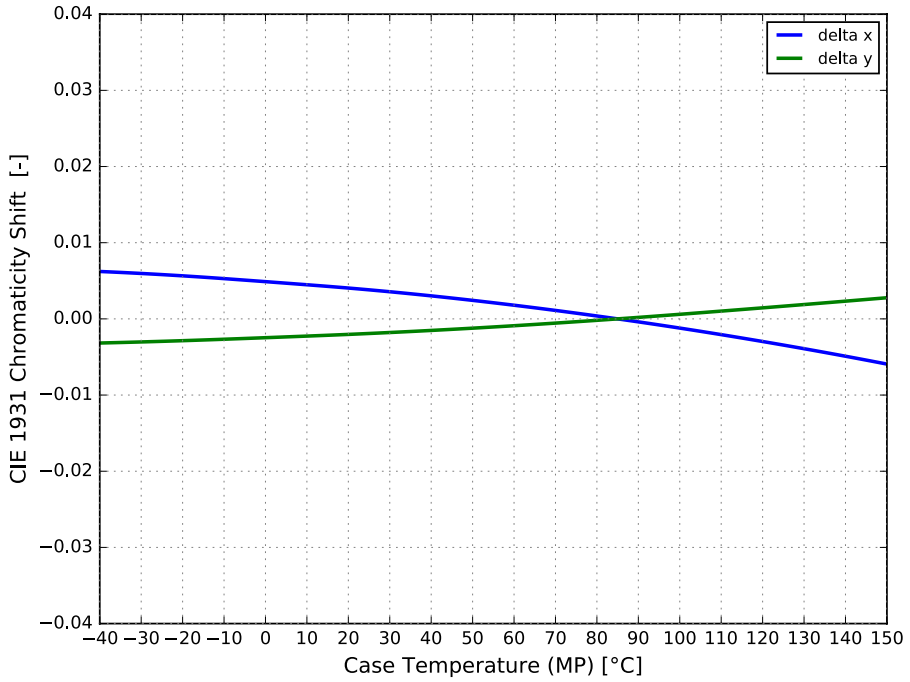

Figure 4a. Typical color shift in CIE 1931 x and y coordinates over temperature for LUXEON FX Plus PC Amber at 20 ms MP, 1000 mA.

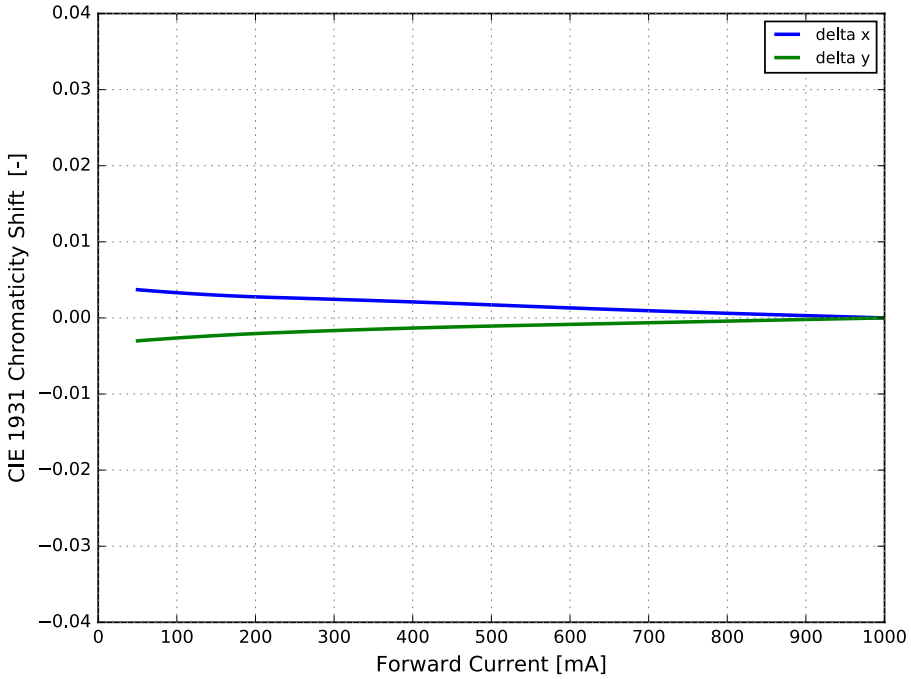

Figure 4b. Typical color shift in CIE 1931 x and y coordinates over current for LUXEON FX Plus PC Amber at 20 ms MP, 85 °C

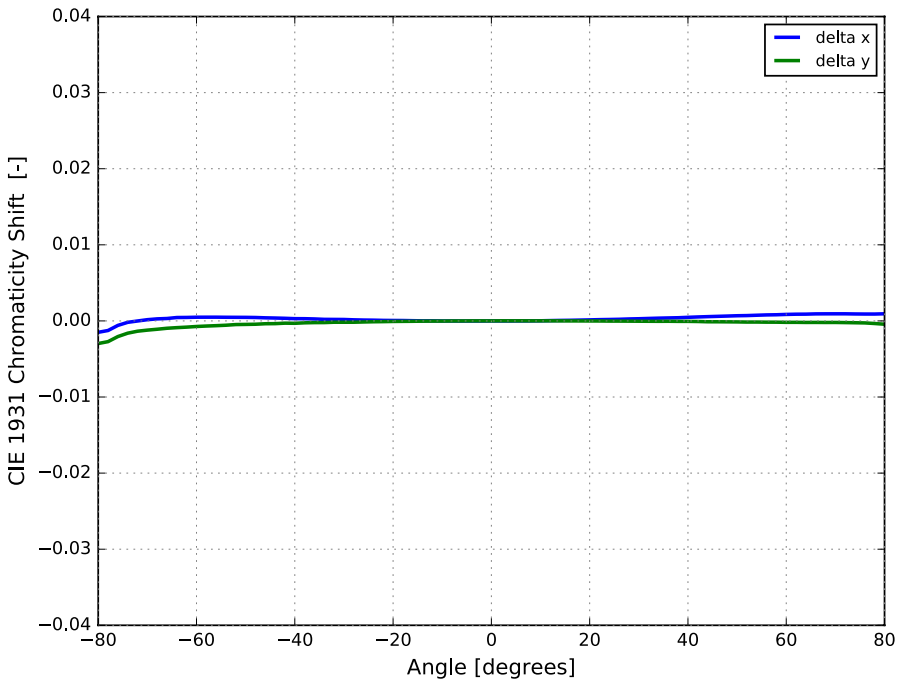

Figure 4c. Typical color shift in CIE 1931 x and y coordinates over angle for LUXEON FX Plus PC Amber at 20 ms MP, 1000 mA

Radiation Pattern Characteristics

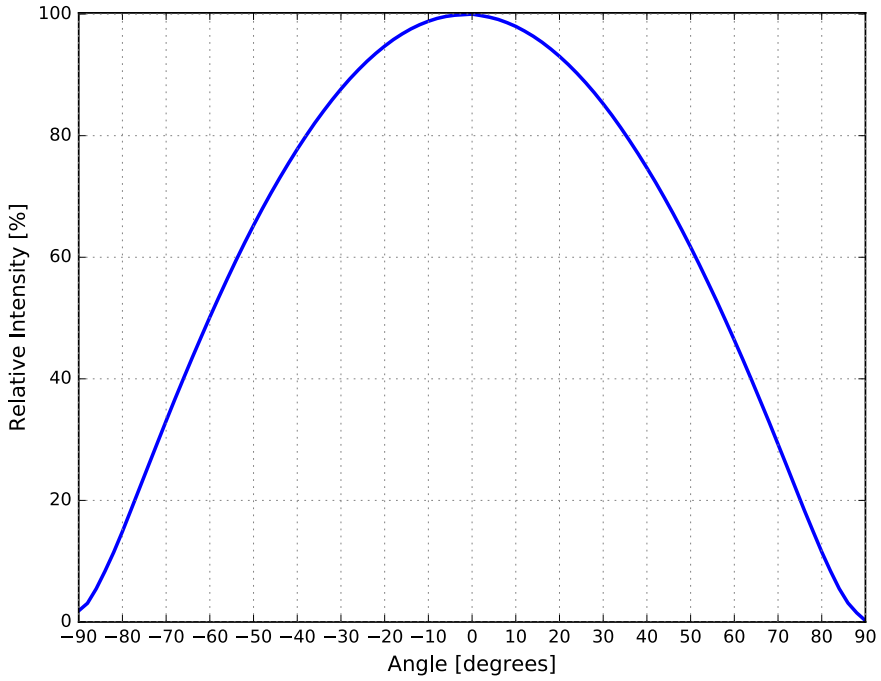

Figure 5. Typical Radiation Pattern for LUXEON FX Plus PC Amber at 20 ms MP, 1000 mA

Operating Limits Characteristics

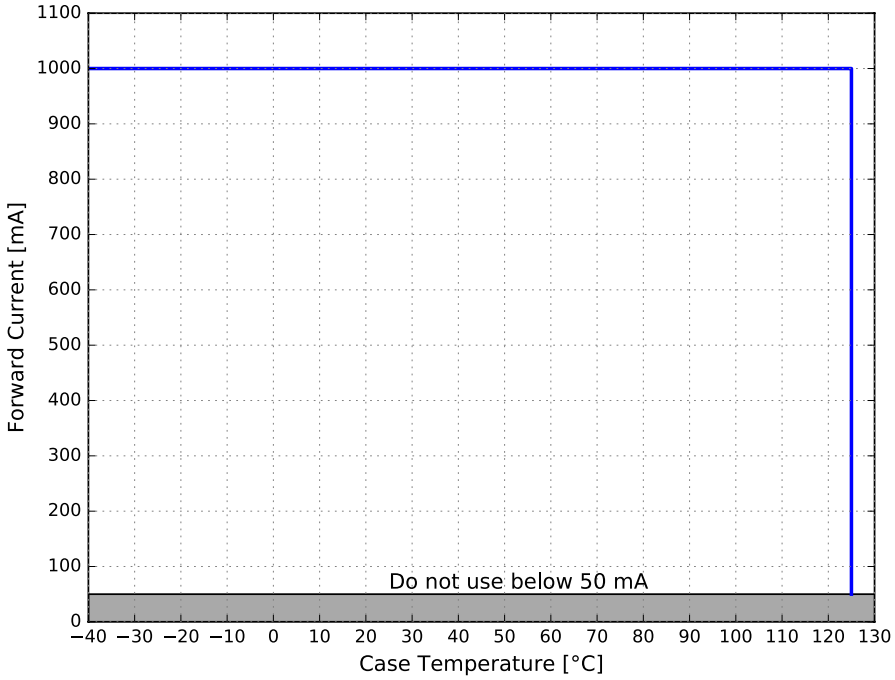

Figure 6. Maximum forward current vs. case temperature for LUXEON FX PC Amber

Permissible Pulse Handling Characteristics

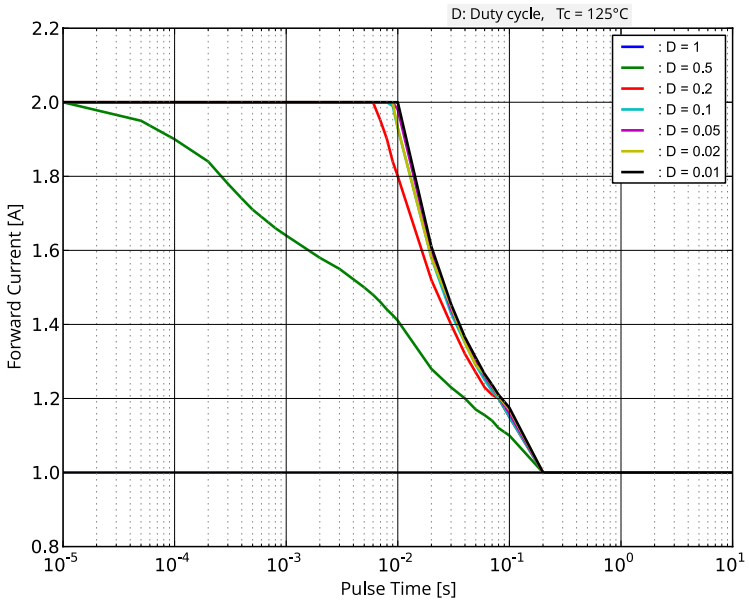

Figure 7. Permissible pulse handling capability for LUXEON FX Plus PC Amber

Product Bin and Labeling Definitions

Designing with LUXEON FX Plus PC Amber

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 PC Amber are labeled using a 3-digit alphanumeric CAT code following the format below.

A B C

Where:

A – designates luminous flux bin (example: B = 170 lumens to 180 lumens)

B – designates color code (example: A or B)

C – designates forward voltage bin (example: B = 2.55 V to 2.79 V)

Therefore, a LUXEON FX Plus PC Amber with a lumen range of 190 to 200, color bin of A and a forward voltage range of 2.55 to 2.79 has the following CAT code:

D A B

Luminous Flux Bins

Table 6 lists the standard luminous flux bins for LUXEON FX Plus PC Amber emitters. Product availability in a particular bin varies by color and platform start-of-production date. Contact your local sales representative for best supportability of programs.

Table 6. Luminous flux bin definitions for LUXEON FX Plus PC Amber at 20 ms MP specified test current, T_c = 85 °C [1]

BIN	LUMINOUS FLUX (lm)	
	MINIMUM	MAXIMUM
B	170	180
C	180	190
D	190	200
E	200	210
F	210	220
G	220	230
H	230	240

Notes for Table 6:
1. Lumileds maintains a tolerance of ±6.5 on luminous flux measurements.

Color Codes

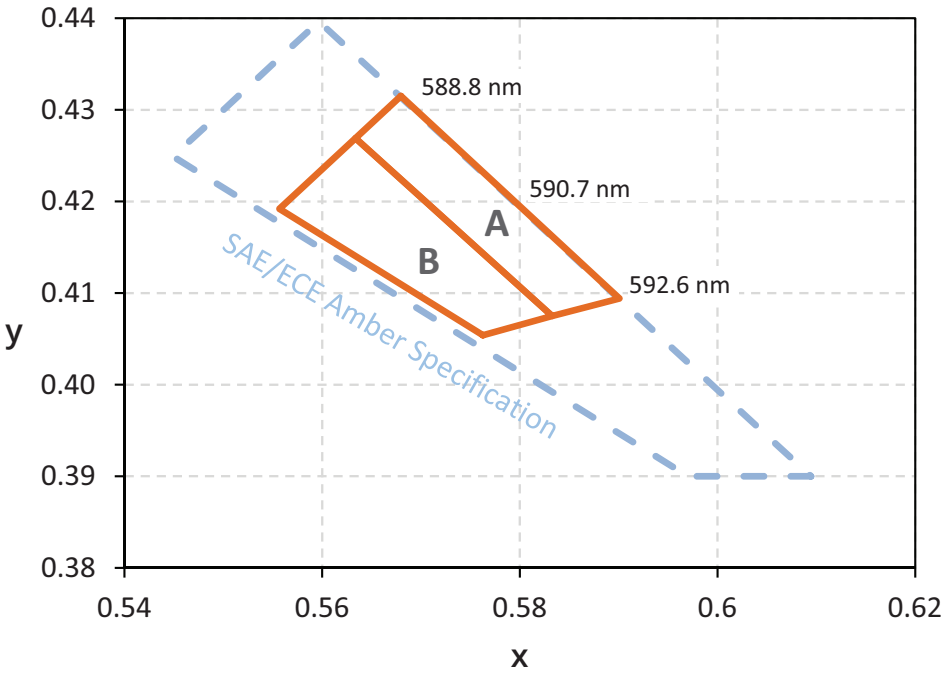

Figure 8. Color bin structure in CIE 1931 color space for LUXEON FX Plus PC Amber

Table 7. Color code definitions for LUXEON FX Plus PC Amber at 20 ms MP, 1000 mA

CODE	x [1]	y [2]
A	0.5680	0.4315
	0.5634	0.4269
	0.5833	0.4075
	0.5901	0.4094
B	0.5763	0.4054
	0.5833	0.4075
	0.5634	0.4269
	0.5557	0.4192

Notes for Table 7:
1. Lumileds maintains a tolerance of ±0.005 on x and y coordinates in the CIE 1931 color space.

Forward Voltage Bins

Table 8. Forward voltage bin definitions for LUXEON FX Plus PC Amber

BIN [1]	FORWARD VOLTAGE (V_f) [2]	
	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. Although several bins are outlined, product availability in a particular bin varies by production run and by product performance.
2. Lumileds maintains a tolerance of ±0.06V on forward voltage measurements.

Mechanical Dimensions

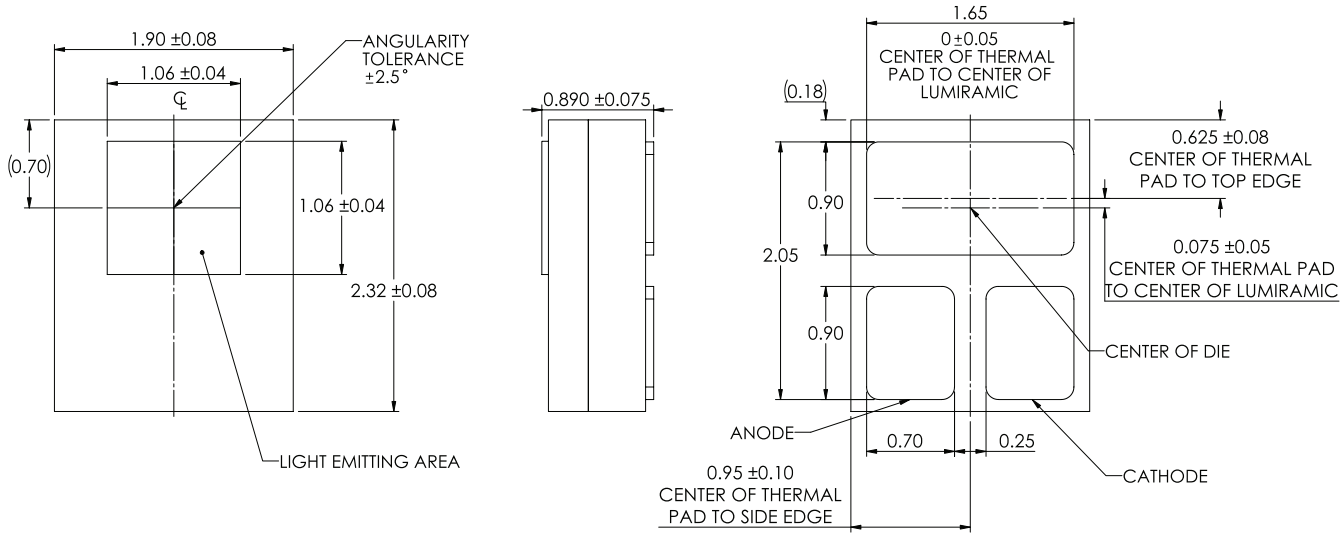

Figure 9. Mechanical dimensions for LUXEON FX Plus PC Amber

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

Packaging Information

Pocket Tape Dimensions

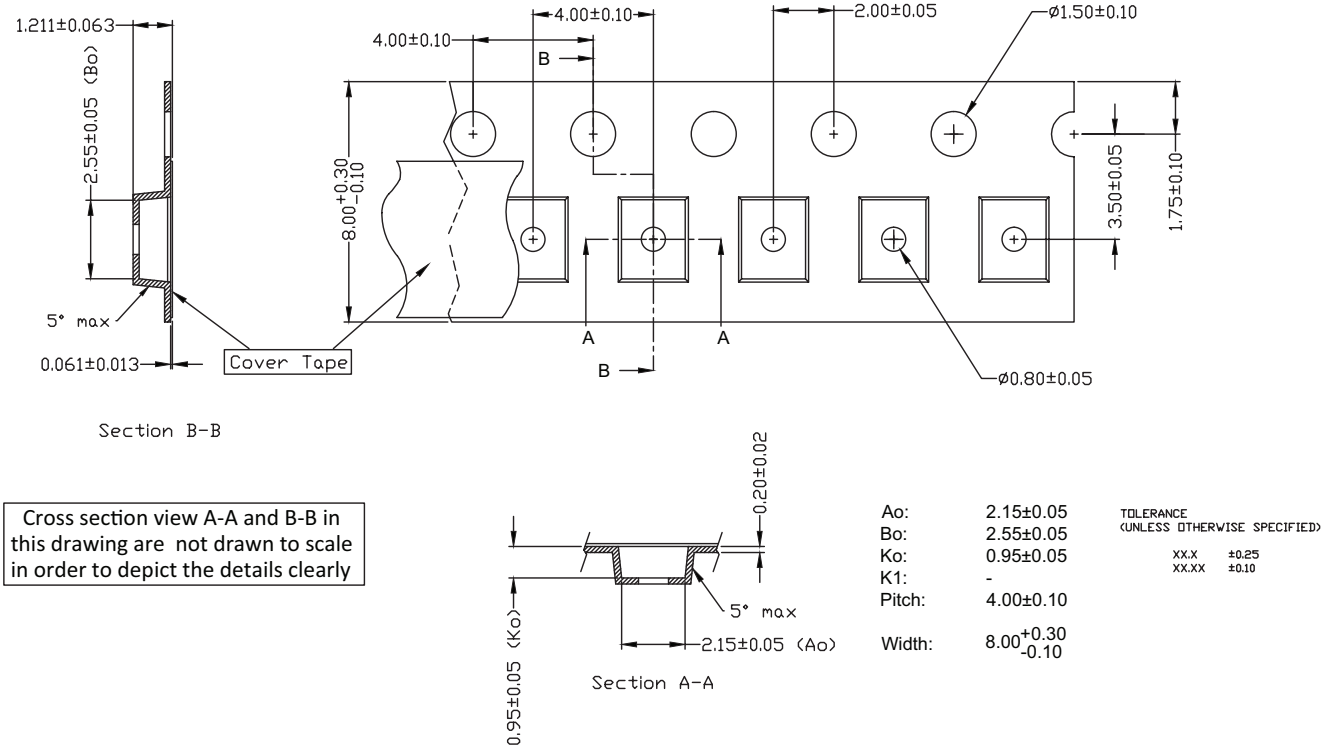

Figure 10. Emitter pocket tape dimensions for LUXEON FX Plus PC Amber

Reel Dimensions

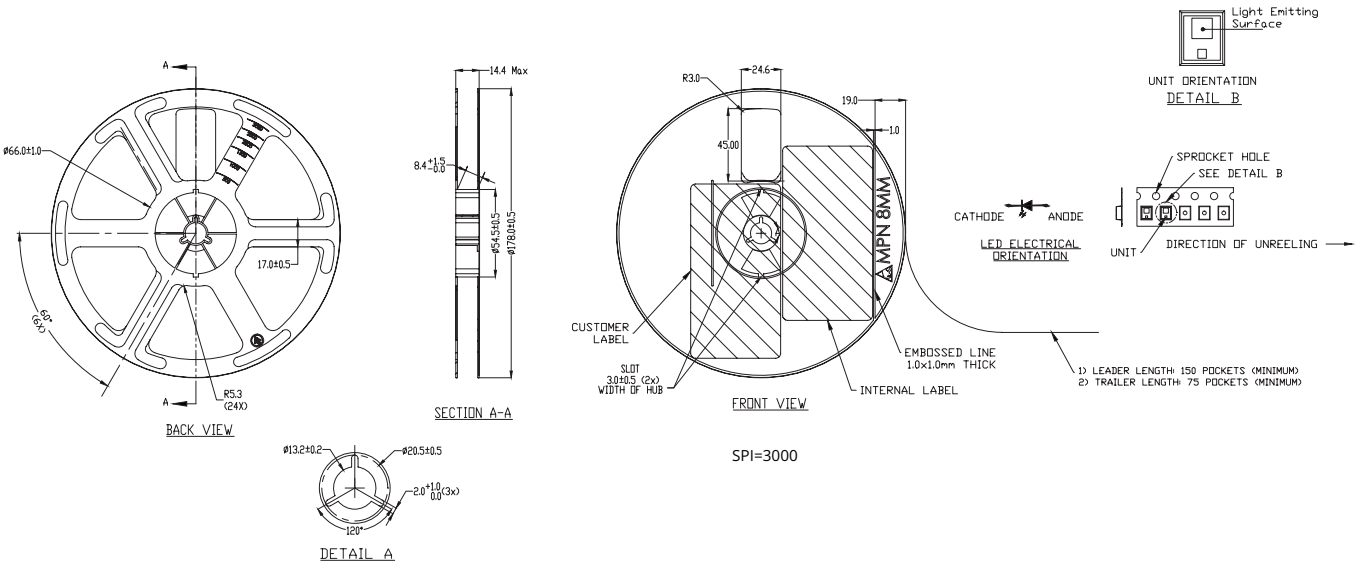

Figure 11. Reel dimensions for LUXEON FX Plus PC Amber

Notes for Figures 10 and 11:
1. All dimensions are in millimeters.
2. A_o is the width of pocket. K_o is the depth of pocket. B_o is the height of pocket.
3. SPI is the number of LEDS per reel.
4. For LUXEON FX, all reels ship with 3000 LEDs.

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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