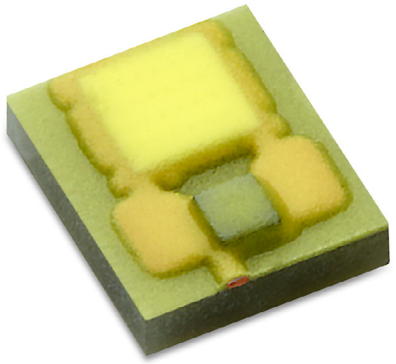
LUMILEDS

AUTOMOTIVE

LUXEON F Cool White

Industry-leading solutions for light guide DRL, and signature lamps



LUXEON F Cool White LEDs are the only automotive LEDs that deliver design flexibility and advanced functionality. These products, with their miniaturized form factor, are designed to support backup/reverse, daytime running lights, and license plate applications. 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 F Cool White provides an industry-leading solution for your front and rear applications. All LUXEON F LEDs are AEC-Q101 qualified.

FEATURES AND BENEFITS

- Low thermal resistance for better hot lumen performance
- Standard packaging for low cost and ease of manufacturability
- Hot binned at 85°C monopulse (MP) to match closer to operating conditions
- IEC/PAS 62707-1 White LED

PRIMARY APPLICATIONS

- Backup/Reverse
- Daytime Running Lights
- License Plate

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General Product Information

Product Test Conditions

LUXEON F Cool White LEDs are tested and binned using a 20ms monopulse (MP) at 350mA drive current, case temperature, T_c, of 85ºC.

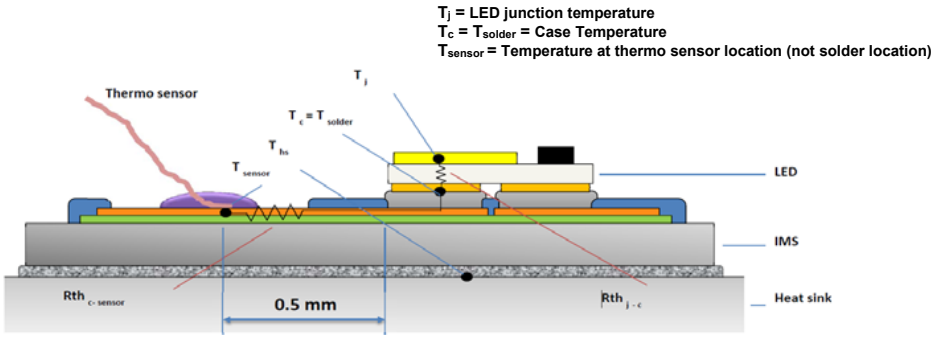

Figure 1. Example of case temperature location on sample board for LUXEON F Cool White.

Part Number Nomenclature

Part numbers for LUXEON F Cool White follow the convention below:

L F M H – A B **C** – **E F G H**

Where:

L	–	designates LUXEON
F	–	designates LUXEON F product family
M H	–	designates hot binning
A	–	designates color variant (C=White)
B	–	designates die size (1=1mm^2)
C	–	designates binning current (A=350mA)
E	–	designates future product offerings
F G H	–	designates minimum luminous flux

Therefore, the following part number is used for a LUXEON F Cool White with a minimum luminous flux of 100 lumens:

L F M H – C 1 **A** – **0 1 0 0**

Environmental Compliance

Lumileds LLC is committed to providing environmentally friendly products to the solid-state lighting market. LUXEON F Cool White 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).

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Performance Characteristics

Product Selection Guide

Table 1. Product selection for LUXEON F Cool White at 20ms MP test current, T_c= 85°C.

MINIMUM LUMINOUS FLUX [1] (lm)	TEST CURRENT (mA)	PART NUMBER
100	350	LFMH-C1A-0100
110	350	LFMH-C1A-0110
120	350	LFMH-C1A-0120

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 F Cool White at 20ms MP test current, T_c=85°C.

PART NUMBER	CORRELATED COLOR TEMPERATURE		TOTAL INCLUDED ANGLE [1] $\theta_{0.90V}$	VIEWING ANGLE [2] $2\theta_{1/2}$
	MINIMUM	MAXIMUM		
LFMH-C1A-0xxx	5180K	6250K	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 ½ of the peak value.

Electrical and Thermal Characteristics

Table 3. Electrical characteristics for LUXEON F Cool White at 20ms MP test current, T_c = 85°C.

PART NUMBER	FORWARD VOLTAGE [1] (V_f)		DYNAMIC RESISTANCE [2] (Ω) R_D	TEMPERATURE COEFFICIENT OF FORWARD VOLTAGE [3] (mV/°C) $\Delta V_f / \Delta T_j$	TYPICAL THERMAL RESISTANCE—JUNCTION TO CASE (°C/W)			
					$R\theta_{j\text{-}c}$ el [4]		$R\theta_{j\text{-}c}$ real [5]	
	MINIMUM	MAXIMUM			TYPICAL	MAXIMUM	TYPICAL	MAXIMUM
LFMH-C1A-0xxx	2.55	3.27	0.3	-2.1	2.4	2.7	3.4	3.8

Notes for Table 3:
1. Lumileds maintains a tolerance of ±0.06V on forward voltage measurements.
2. Dynamic resistance is the inverse of the slope in linear forward voltage model for LEDs (see Figure 4a. Typical forward current vs. forward voltage).
3. Measured between T_c=80°C and T_c=90°C at binning current.
4. $R\theta_{j\text{-}c}$ el: Electrical thermal resistance (junction to case).
5. $R\theta_{j\text{-}c}$ real: Real thermal resistance (junction to case) with wall plug efficiency included. Reference JESD51-51, JESD51-14, 4.1.3.

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Absolute Ratings

Table 4. Absolute ratings for LUXEON F Cool White.

PARAMETER	PERFORMANCE
Minimum DC Forward Current	50mA
Maximum DC Forward Current	1000mA
Maximum Junction Temperature [1]	150°C
Operating Case Temperature at 700mA [1]	-40°C to 130°C
Operating Case Temperature at Maximum Current [1]	-40°C to 105°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 F 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. Proper current derating must be observed to maintain junction temperature below the maximum. LUXEON F LEDs driven at or above maximum LED case temperature may have a 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 F Cool White.

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

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Characteristic Curves

Spectral Power Distribution Characteristics

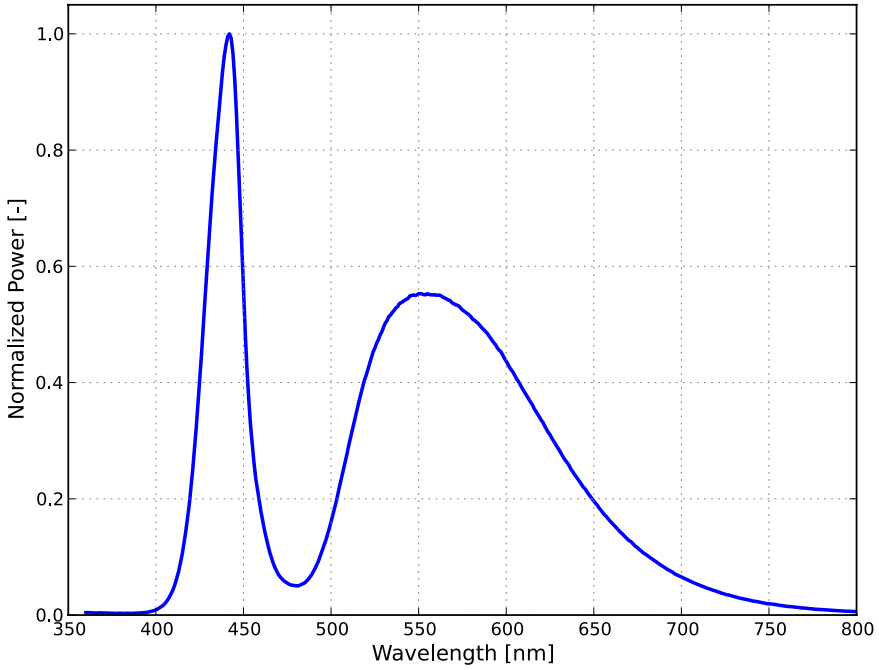

Figure 2. Typical normalized power vs. wavelength for LUXEON F Cool White at 20ms MP 350mA, T_C=85°C.

Light Output Characteristics

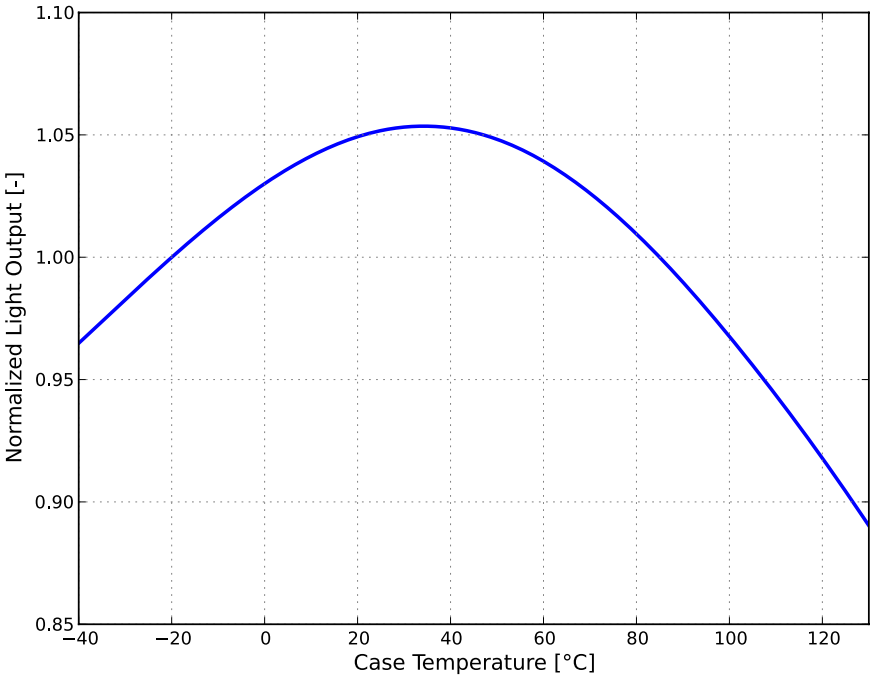

Figure 3a. Typical normalized light output vs. case temperature for LUXEON F Cool White at 20ms MP, 350mA.

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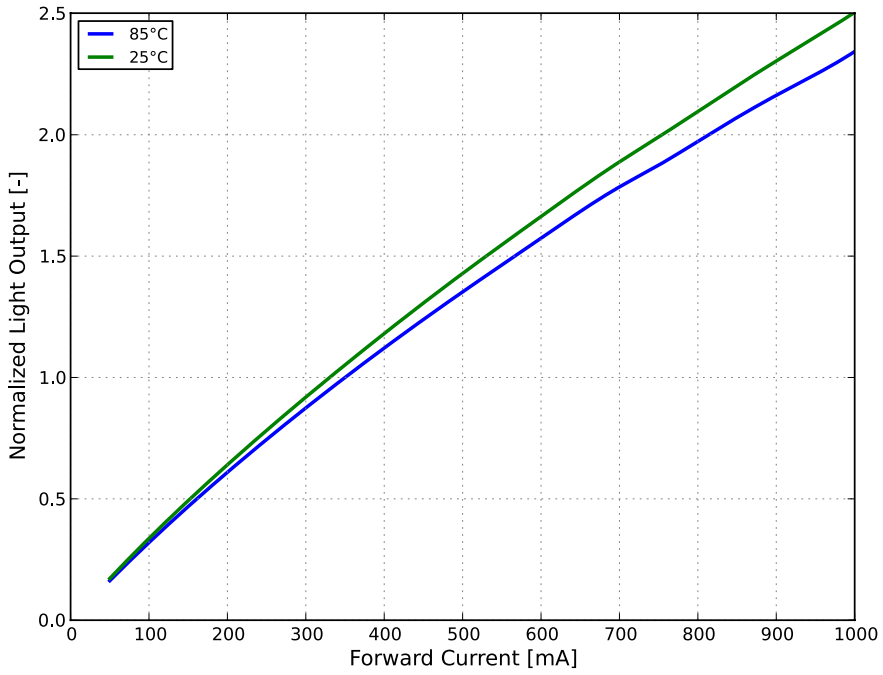

Figure 3b. Typical normalized light output vs. forward current for LUXEON F Cool White at T_c=85°C.

Forward Current and Voltage Characteristics

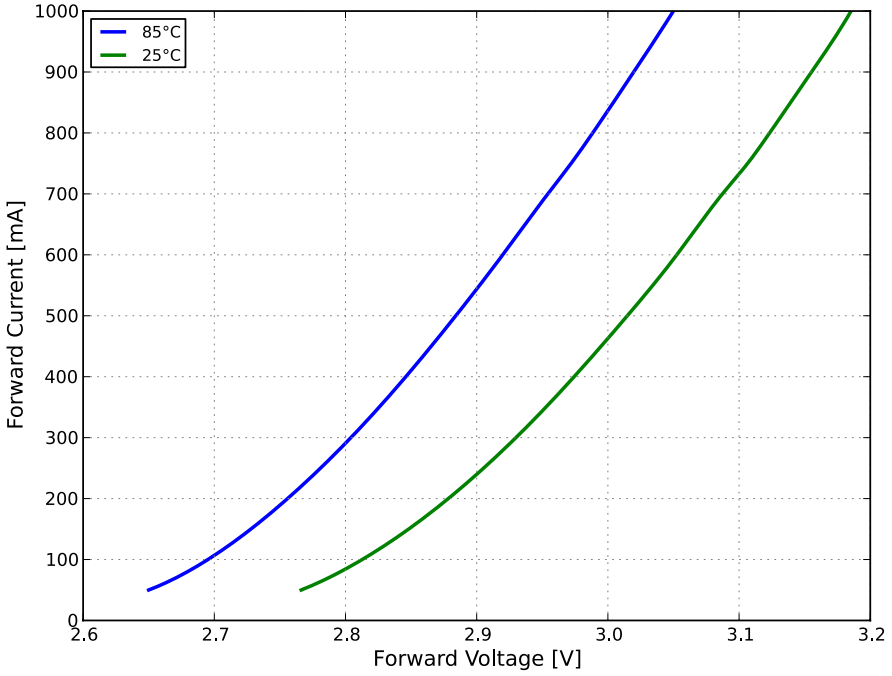

Figure 4a. Typical forward current vs. forward voltage for LUXEON F Cool White at T_c=85°C.

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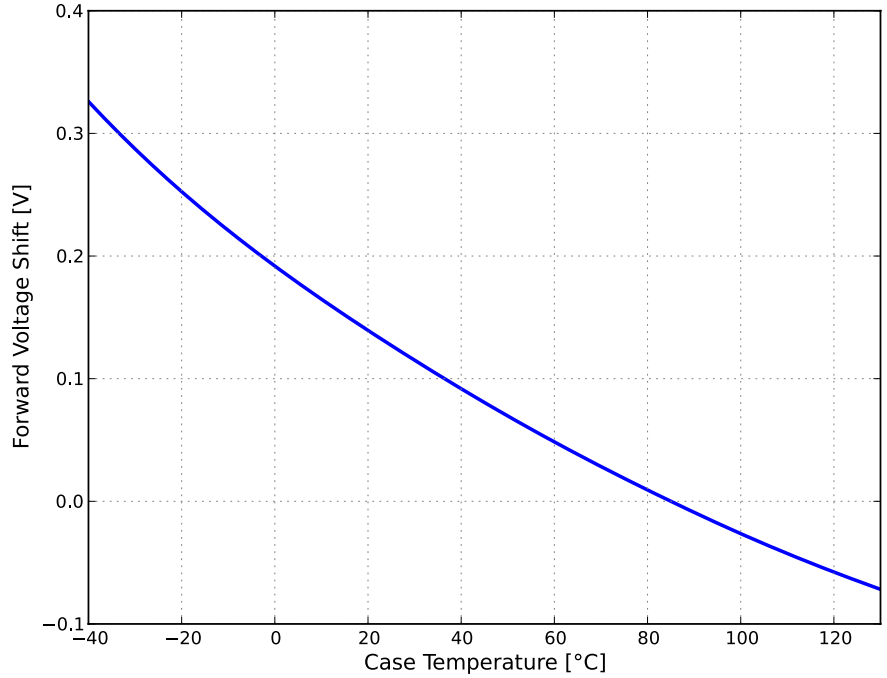

Figure 4b. Typical forward voltage shift vs. case temperature for LUXEON F Cool White.

Color Shift Characteristics

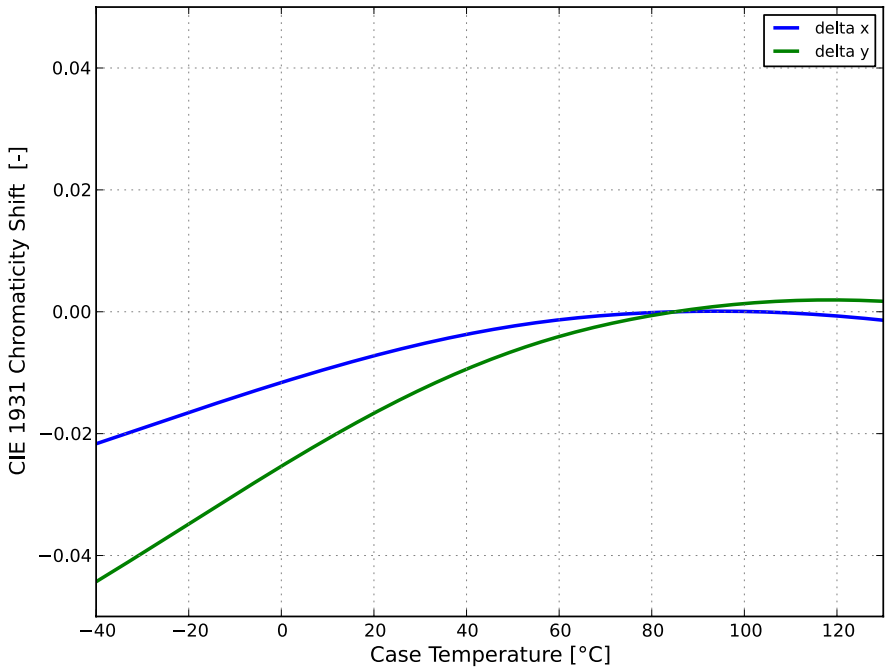

Figure 5a. Typical color shift in CIE 1931 x and y coordinates for LUXEON F Cool White at 20ms MP, 350mA.

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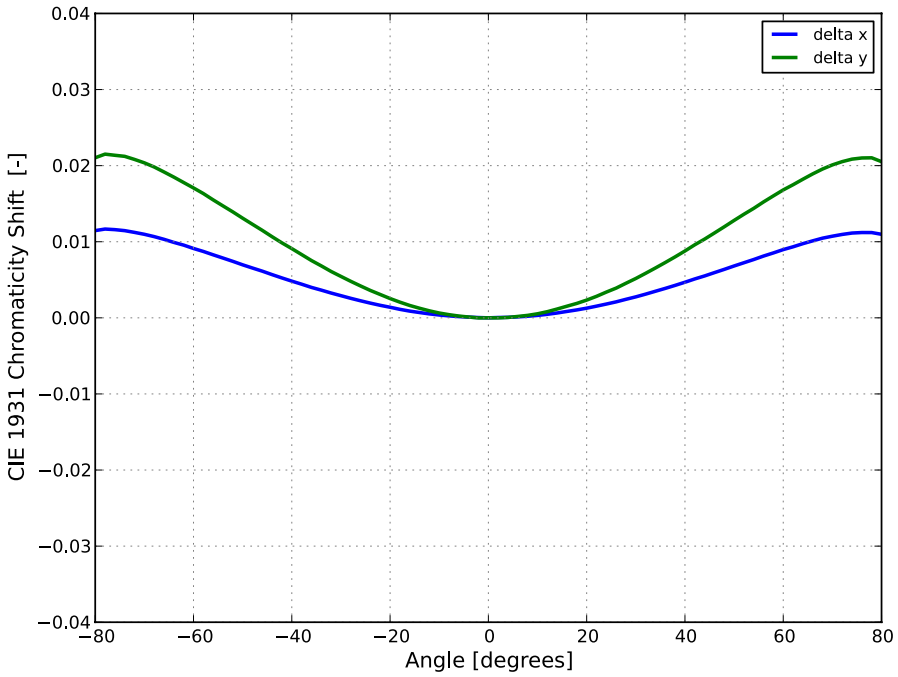

Figure 5b. Typical color shift in CIE 1931 x and y coordinates over angle for LUXEON F Cool White at 20ms MP, 350mA.

Radiation Pattern Characteristics

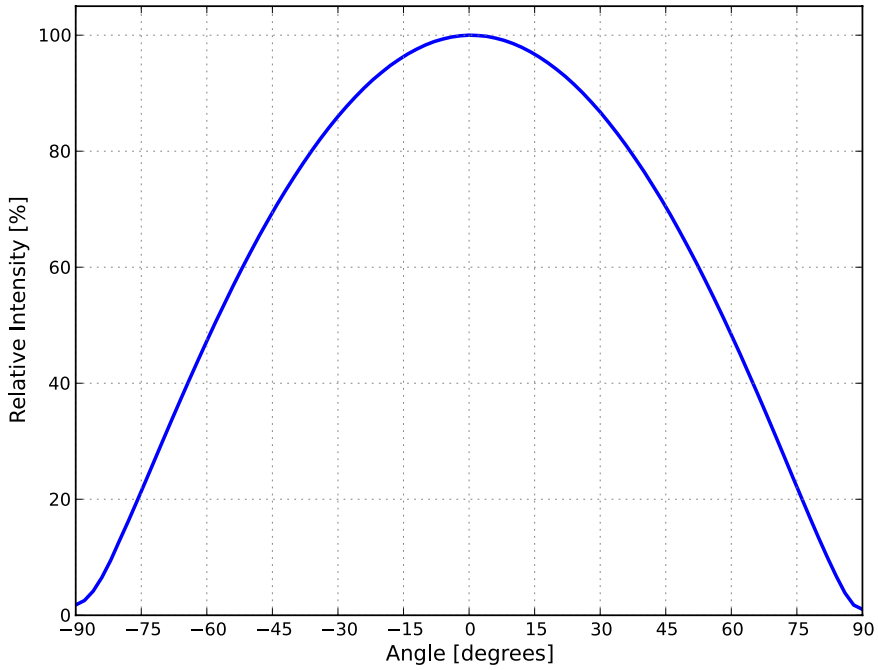

Figure 6. Typical radiation pattern for LUXEON F Cool White at 20ms MP 350mA, T_C=85°C.

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Operating Limits Characteristics

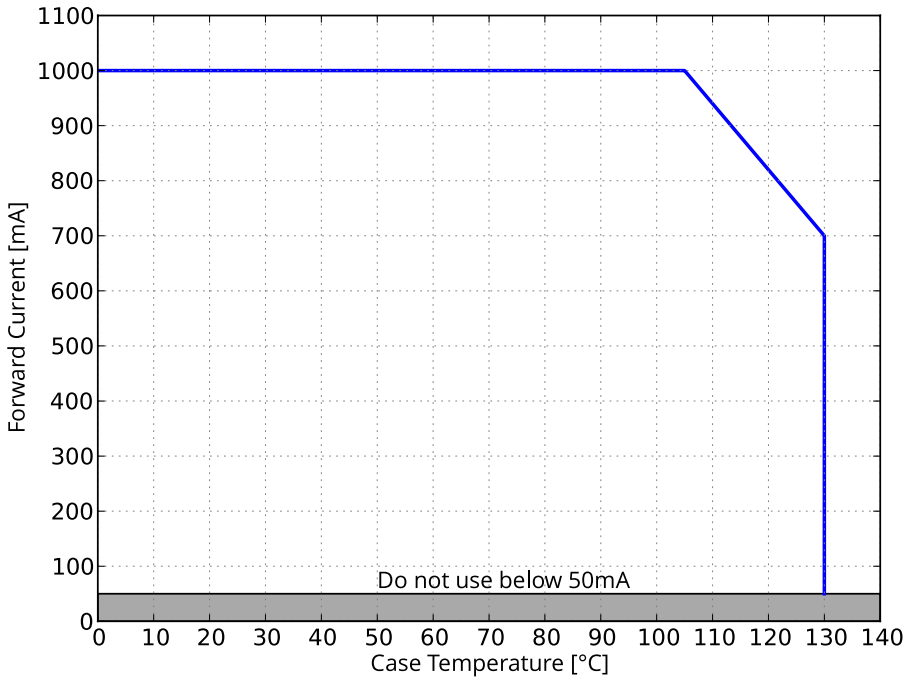

Figure 7. Maximum forward current vs. case temperature for LUXEON F Cool White.

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Permissible Pulse Handling Characteristics

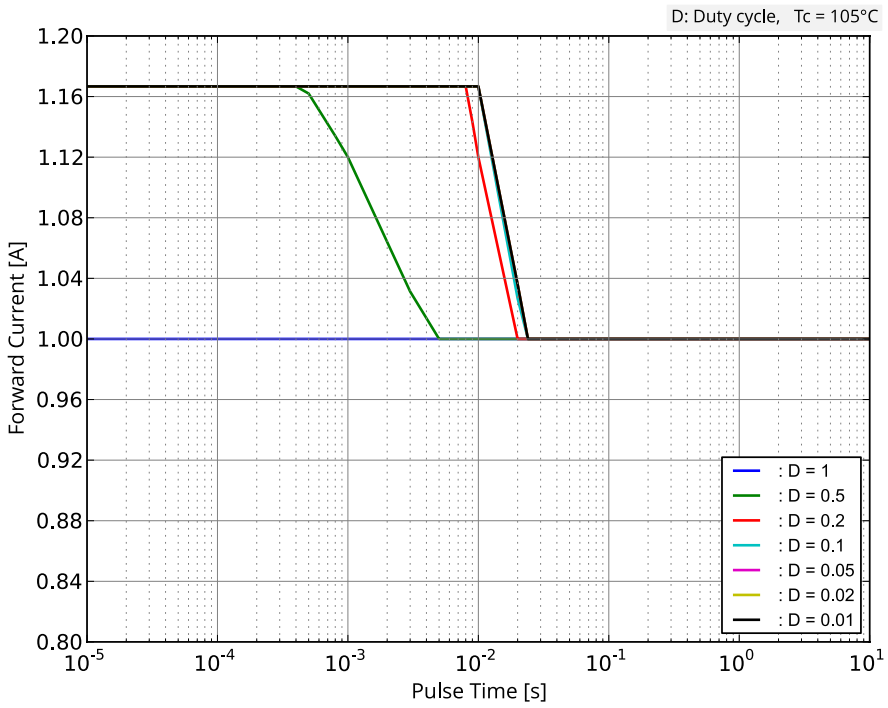

Figure 8a. Permissible pulse handling capability for LUXEON F Cool White, T_c=105°C.

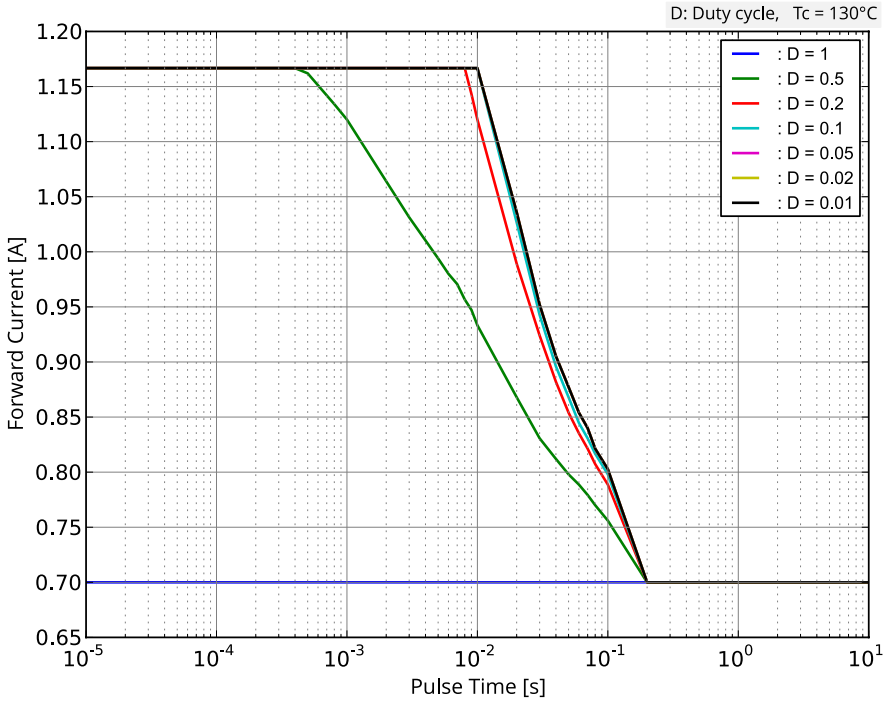

Figure 8b. Permissible pulse handling capability for LUXEON F Cool White, T_c=130°C.

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Product Bin and Labeling Definitions

Designing with LUXEON F 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 F 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: G=100 to 110 lumens, J=120 to 130 lumens)

B C – designates color bin (example: 1A, 1B, 1C, 1D)

D – designates forward voltage bin (example: B=2.55 to 2.79V, D=3.03 to 3.27V)

Therefore, a LUXEON F Cool White with a lumen range of 100 to 110, color bin of 1D, and a forward voltage range of 2.55 to 2.79V has the following CAT code:

G 1 D B

Luminous Flux Bins

Table 6 lists the standard luminous flux bins for LUXEON F 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 F Cool White at 20ms MP test current, T_c=85°C.

BIN	LUMINOUS FLUX [1] (lm)	
	MINIMUM	MAXIMUM
G	100	110
H	110	120
J	120	130

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

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Color Codes

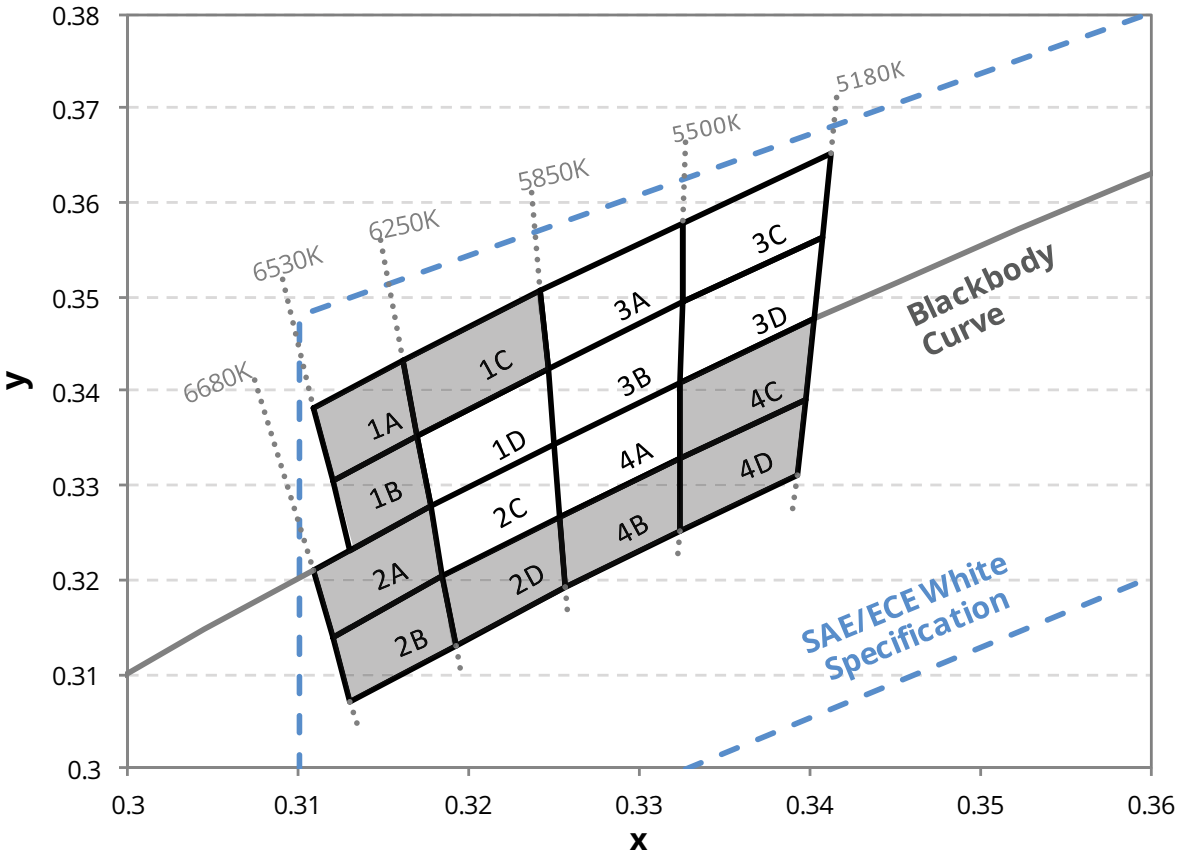

Figure 9. Color bin structure in CIE 1931 color space for LUXEON F Cool White.

Notes for Figure 9:
1. Lumileds supports the following bins for LUXEON F Cool White: H3 and HC.
2. LUXEON F historical large color notations. Color bins must be ordered by fine bin designators, shown below.
   H1 = 1A, 1B, 1C, 1D
   H2 = 2A, 2B, 2C, 2D
   H3 = 3A, 3B, 3C, 3D
   H4 = 4A, 4B, 4C, 4D
   HC = 1D, 2C, 3B, 4A

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Color Bin Definitions

Table 7. Color bin definitions for LUXEON F Cool White.

BIN	x	y	6-DIGIT IEC CODE	TYPICAL CCT	BIN	x	y	6-DIGIT IEC CODE	TYPICAL CCT
2B	0.3120	0.3139	ebvG33	6460K	1B	0.3120	0.3306	fbwA23	6390K
	0.3185	0.3203				0.3169	0.3353		
	0.3192	0.3131				0.3177	0.3277		
	0.3131	0.3070				0.3131	0.3232		
2D	0.3185	0.3203	ebyG33	6050K	1D	0.3169	0.3353	fbyA33	6050K
	0.3253	0.3266				0.3246	0.3424		
	0.3256	0.3191				0.3249	0.3344		
	0.3192	0.3131				0.3177	0.3277		
4B	0.3253	0.3266	ecbG33	5680K	3B	0.3246	0.3424	fcbA33	5680K
	0.3323	0.3329				0.3325	0.3493		
	0.3323	0.3251				0.3324	0.3410		
	0.3256	0.3191				0.3249	0.3344		
4D	0.3323	0.3329	eceG33	5350K	3D	0.3325	0.3493	fceA33	5350K
	0.3396	0.3392				0.3406	0.3562		
	0.3392	0.3310				0.3401	0.3476		
	0.3323	0.3251				0.3324	0.3410		
2A	0.3109	0.3211	ebvD33	6460K	1A	0.3109	0.3382	fbwD23	6390K
	0.3177	0.3277				0.3161	0.3432		
	0.3185	0.3203				0.3169	0.3353		
	0.3120	0.3139				0.3120	0.3306		
2C	0.3177	0.3277	ebyD33	6050K	1C	0.3161	0.3432	fbyD33	6050K
	0.3249	0.3344				0.3242	0.3506		
	0.3253	0.3266				0.3246	0.3424		
	0.3185	0.3203				0.3169	0.3353		
4A	0.3249	0.3344	ecbD33	5680K	3A	0.3242	0.3506	fcbD33	5680K
	0.3324	0.3410				0.3325	0.3579		
	0.3323	0.3329				0.3325	0.3493		
	0.3253	0.3266				0.3246	0.3424		
4C	0.3324	0.3410	eceD33	5350K	3C	0.3325	0.3579	fceD33	5350K
	0.3401	0.3476				0.3412	0.3652		
	0.3396	0.3392				0.3406	0.3562		
	0.3323	0.3329				0.3325	0.3493		

Notes for Table 7:
1. Lumileds maintains a tester tolerance of ± 0.005 on x and y color coordinates.
2. CIE 1931 x and y coordinate frame.

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Forward Voltage Bins

Table 8. Forward voltage bin definitions for LUXEON F 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

Notes for Table 8:
1. Lumileds maintains a tolerance of ±0.06V on forward voltage measurements.
2. Several bins are outlined; product availability in a particular bin varies by production run and product performance.

Mechanical Dimensions

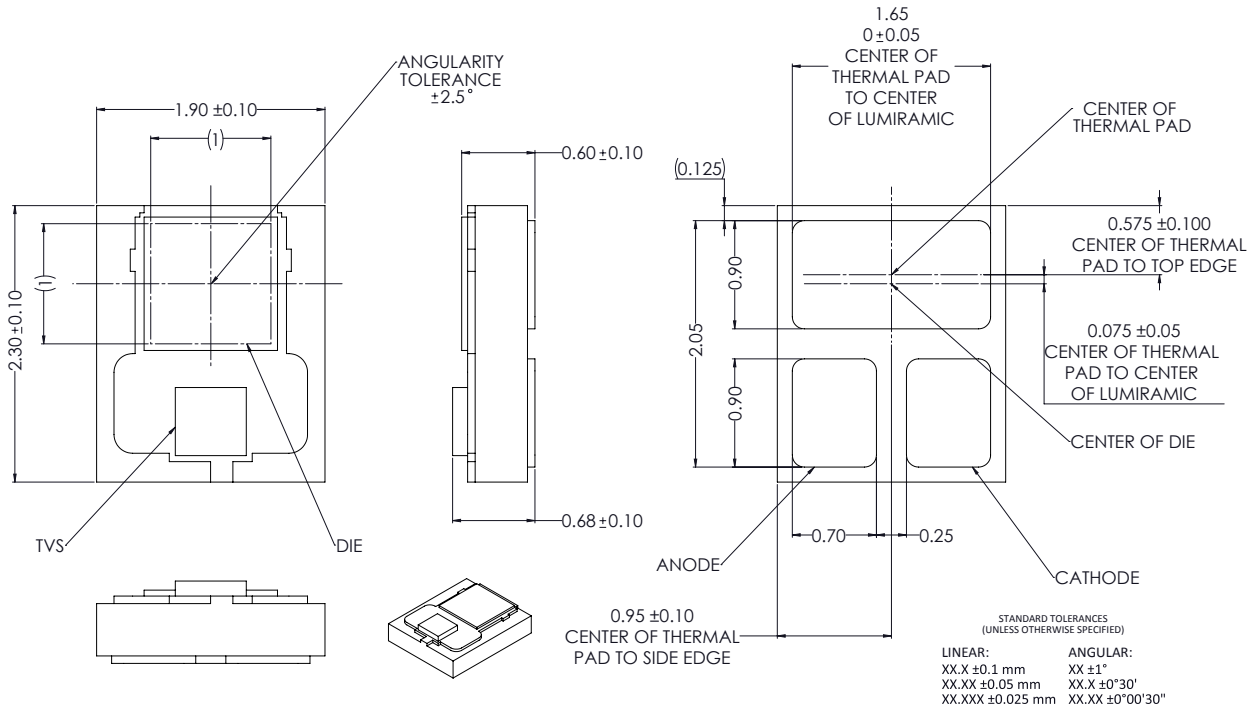

Figure 10. Mechanical dimensions for LUXEON F Cool White.

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

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Packaging Information

Pocket Tape Dimensions

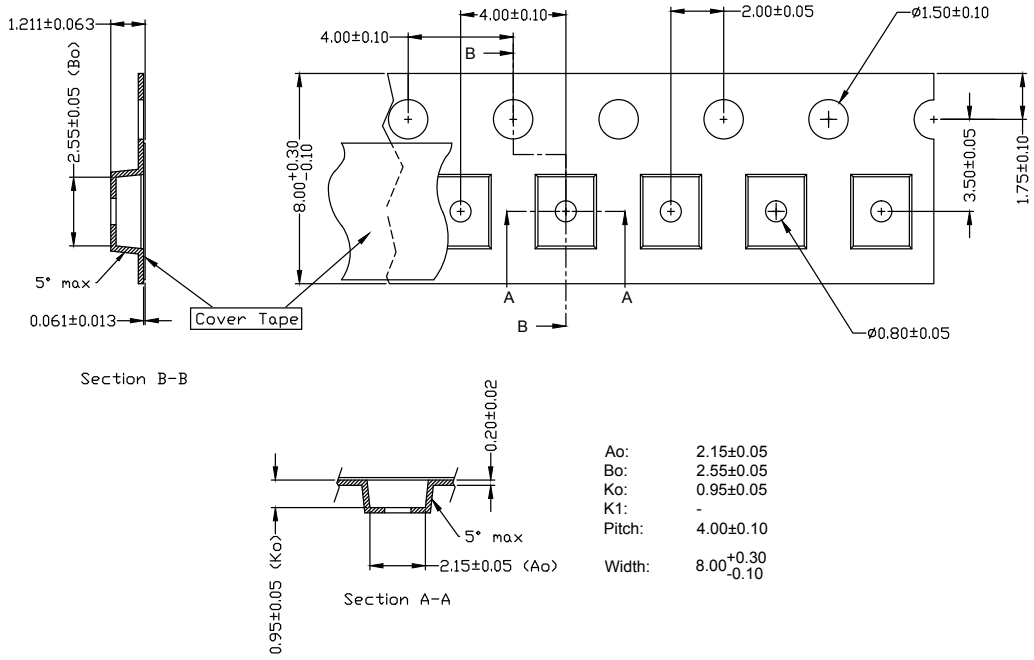

Figure 11. Pocket Tape dimensions for LUXEON F Cool White.

Notes for Figure 11:
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

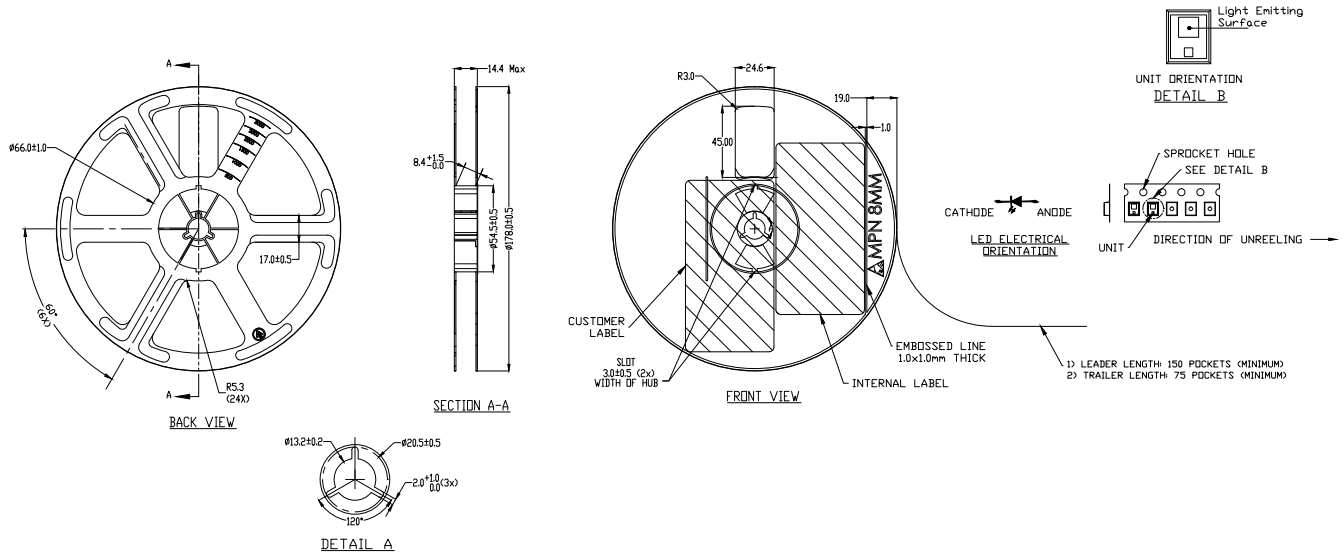

Figure 12. Reel dimensions for LUXEON F Cool White.

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

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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.

LUMILEDS

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