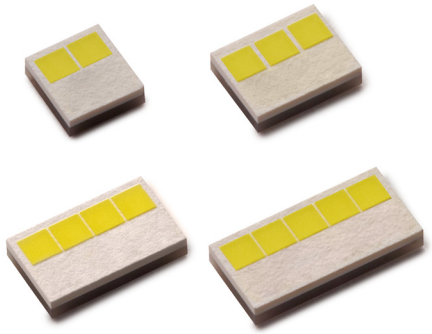
LUMILEDS

AUTOMOTIVE

LUXEON Altilon SMD

Automotive forward lighting source



LUXEON Altilon SMD is specifically designed and tested to meet and exceed expectations for reliability, performance, and lifetime in automotive forward lighting applications. It is designed to be assembled with industry standard soldering reflow lines simplifying system integration and lowering assembly costs.

LUXEON Altilon SMD provides industry-best thermal performance in LED forward lighting applications, meeting both SAE and ECE color specifications with finer granularity than existing systems. PPAP documentation is available upon request. All LUXEON Altilon SMD LEDs are AEC-Q101 qualified.

FEATURES AND BENEFITS

- Higher drive current capability for increased flux performance
- Low thermal resistance and power consumption results in simplified thermal management and system cost
- High flux output provides flexibility in styling and optical design
- Surface mount device to reduce overall costs

PRIMARY APPLICATIONS

- Adaptive Lighting
  - AFS
- Daytime Running Lights
- Front Fog
- Headlight
  - Low Beam
  - High Beam
  - Static Bending

Table of Contents

General Product Information

Product Test Conditions

LUXEON Altilon SMD LEDs are tested and binned using a 20ms monopulse (MP) at 1000mA drive current, case temperature, T_c, of 85ºC.

Part Number Nomenclature

Part numbers for LUXEON Altilon SMD follow the convention below:

A 1 S B – 5 8 5 0 **B** D H 0 **C C C C** 0

Where:

B – designates number of die (2, 3, 4 or 5)

C C C C – designates minimum flux bin

Therefore, the following part number is used for a LUXEON Altilon SMD with 3 die and a minimum of 780 lumens:

A 1 S B – 5 8 5 0 **3** D H 0 **0 7 8 0** 0

Environmental Compliance

Lumileds LLC is committed to providing environmentally friendly products to the solid-state lighting market. LUXEON Altilon SMD 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 Altilon SMD at 1000mA, 20ms MP, T_c=85°C.

CONFIGURATION	PART NUMBER
1x2	A1SB-58502DH0xxxx0
1x3	A1SB-58503DH0xxxx0
1x4	A1SB-58504DH0xxxx0
1x5	A1SB-58505DH0xxxx0

Optical Characteristics

Table 2. Typical optical characteristics for LUXEON Altilon SMD at 1000mA, T_c=85°C.

PART NUMBER	CORRELATED COLOR TEMPERATURE		TYPICAL TOTAL INCLUDED ANGLE [1] $\theta_{0.90V}$	TYPICAL VIEWING ANGLE [2] $\theta_{1/2}$
	MINIMUM	MAXIMUM		
A1SB-58502DH0xxxx0	5500K	6250K	140°	120°
A1SB-58503DH0xxxx0	5500K	6250K	140°	120°
A1SB-58504DH0xxxx0	5500K	6250K	140°	120°
A1SB-58505DH0xxxx0	5500K	6250K	140°	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. Typical electrical and thermal characteristics for LUXEON Altilon SMD at 1000mA, 20ms MP, T_c=85°C.

PARAMETER		PERFORMANCE			
		1x2	1x3	1x4	1x5
Forward Voltage, V_f	min	5.5V	8.1V	10.9V	13.6V
	max	6.5V	9.7V	12.9V	16.2V
Electrical Thermal Resistance, $R_{th\ j\text{-}c\ electr}$ [1]	typ	2.2°C/W	1.8°C/W	1.5°C/W	1.2°C/W
	max	2.5°C/W	2.1°C/W	1.8°C/W	1.5°C/W
Real Thermal Resistance, $R_{th\ j\text{-}c\ real}$ [2]	typ	3.2°C/W	2.6°C/W	2.2°C/W	1.8°C/W
	max	3.5°C/W	3.0°C/W	2.6°C/W	2.2°C/W

Notes for Table 3:
1. $R_{th\ j\text{-}c\ electr}$: Electrical thermal resistance (junction to case).
2. $R_{th\ j\text{-}c\ real}$: Real thermal resistance (junction to case) with wall plug efficiency included. Reference JESD51-51, JESD51-14, 4.1.3.

Absolute Ratings

Table 4. Absolute ratings for LUXEON Altilon SMD.

PARAMETER	PERFORMANCE			
	1x2	1x3	1x4	1x5
Minimum DC Forward Current	100mA			
Maximum DC Forward Current	1500mA			
Operating Case Temperature at 700mA [1, 2]	-40°C to 130°C			
Maximum Junction Temperature [1, 2. 3]	150°C			
Operating Case Temperature at Maximum Current	-40°C to 125°C			
Maximum Junction Temperature for Short Time Applications [4]	175°C			
Maximum V_f at 1500mA & -40°C [1, 3]	7.7V	11.5V	15.3V	19.2V
Minimum V_f at 1500mA & 150°C	5.5V	8.2V	11.0V	13.7V
LED Storage Temperature	-40°C to 130°C			
Soldering Temperature	JEDEC 020c 260°C			
Allowable Reflow Cycles	2			
ESD Sensitivity [5]	8kV HBM, 2kV CDM, 400V MM			
Reverse Voltage ($V_{reverse}$)	LUXEON Altilon SMD LEDs are not designed to be driven in reverse bias			

Notes for Table 4:
1. Proper current derating must be observed to maintain junction temperature below the maximum, so that the LED is maintained below the maximum rated operating case temperature.
2. LUXEON Altilon SMD LEDs driven at or above the maximum rated operating case temperature may have shorter lifetime.
3. Please consult with Lumileds for more information on maximum time durations and forward currents for these temperatures.
4. Short time operations of less than 200hrs.
5. Measured using human body model (per JESD22 A114), machine model (per JESD22 A115) and charged device model (per JESD22 C101).

Characteristic Curves

Spectral Power Distribution Characteristics

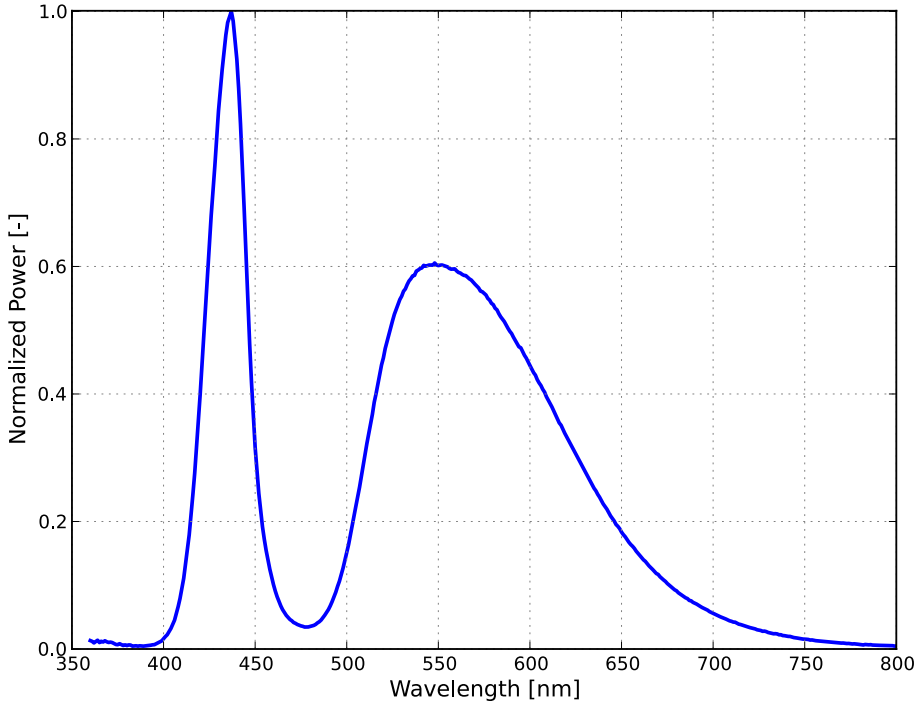


Figure 1. Typical normalized power vs. wavelength for LUXEON Altilon SMD at 1000mA, 20ms MP, T_c=85°C.

Light Output Characteristics

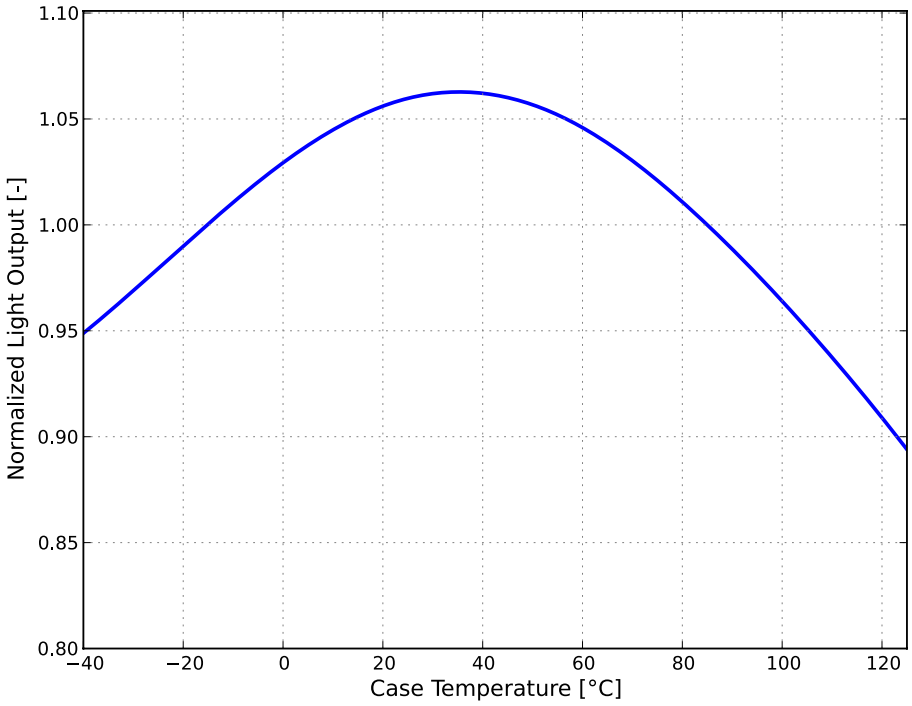


Figure 2a. Typical normalized light output vs. case temperature for LUXEON Altilon SMD at 1000mA, 20ms MP.

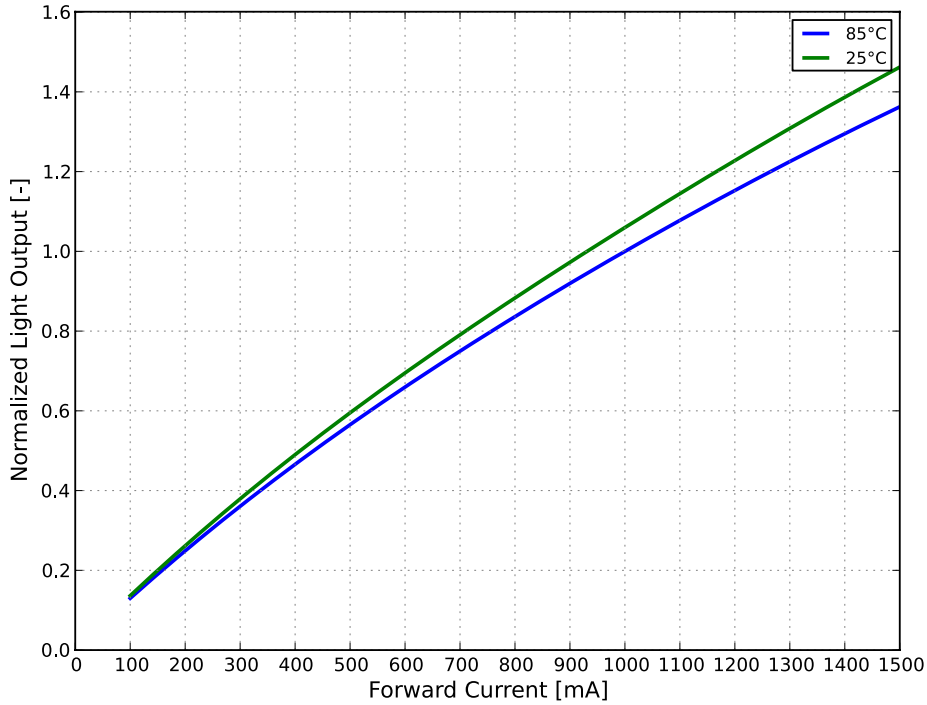


Figure 2b. Typical normalized light output vs. forward current for LUXEON Altilon SMD at T_c=85°C.

Forward Current and Voltage and Characteristics

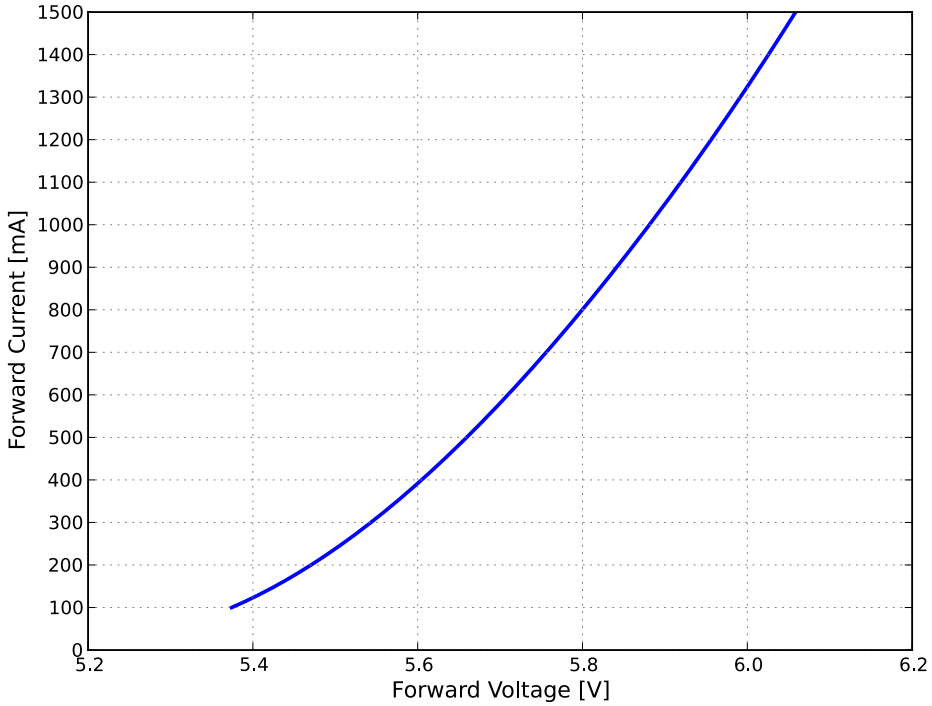


Figure 3a. Typical forward current vs. forward voltage for LUXEON Altilon SMD 1x2 at T_c=85°C.

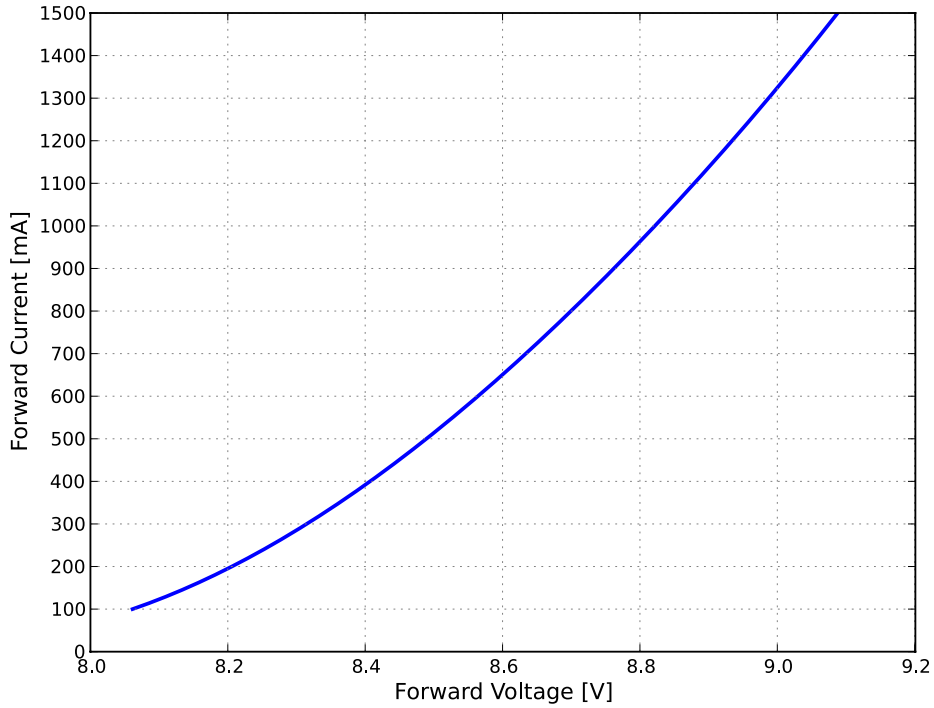


Figure 3b. Typical forward current vs. forward voltage for LUXEON Altilon SMD 1x3 at T_c=85°C.

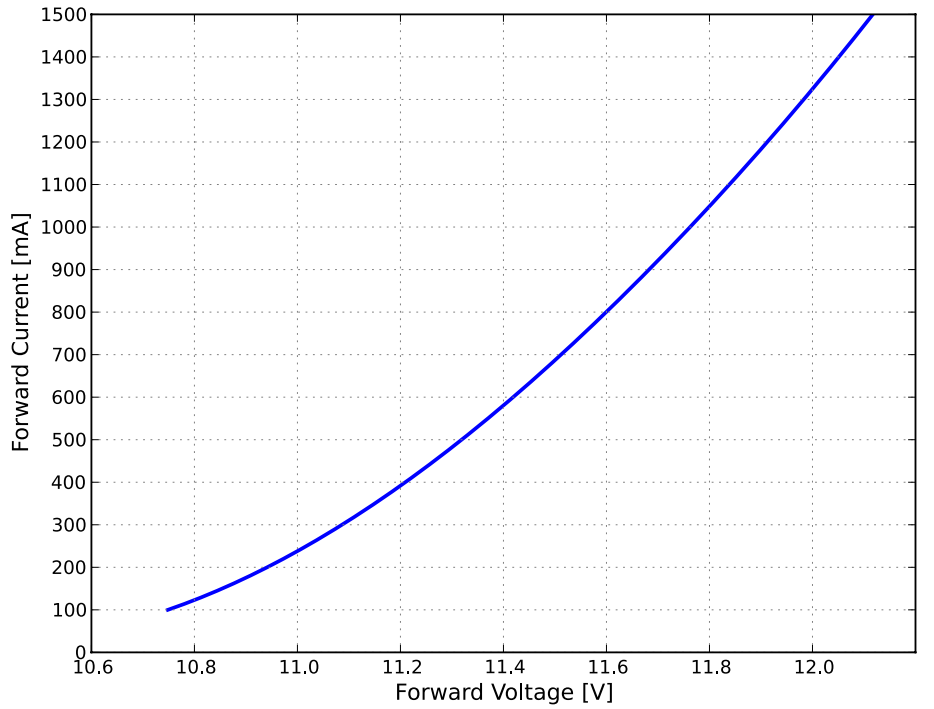


Figure 3c. Typical forward current vs. forward voltage for LUXEON Altilon SMD 1x4 at T_c=85°C.

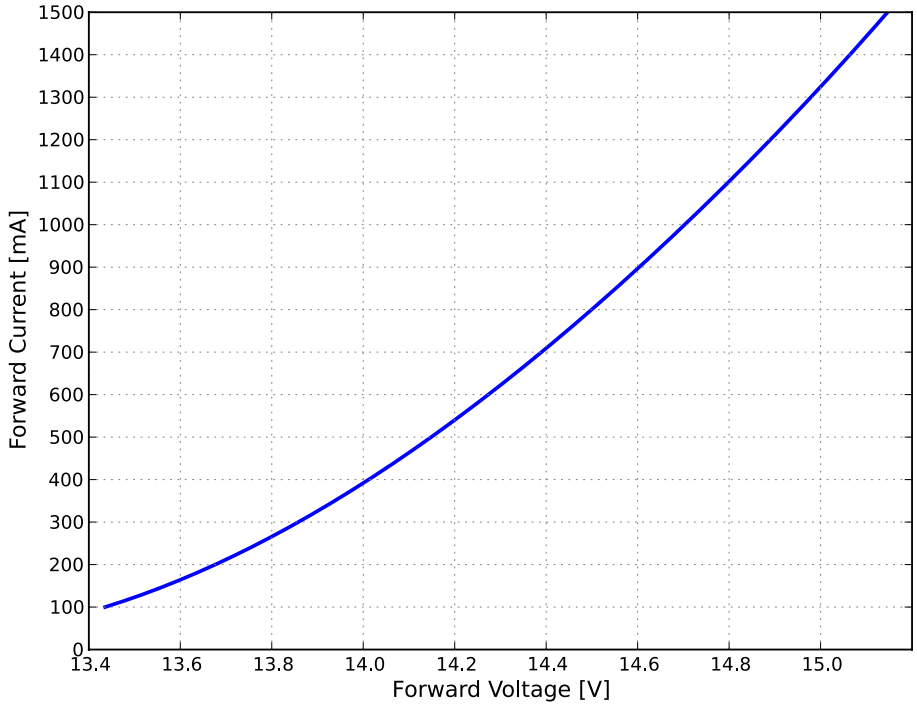


Figure 3d. Typical forward current vs. forward voltage for LUXEON Altilon SMD 1x5 at T_c=85°C.

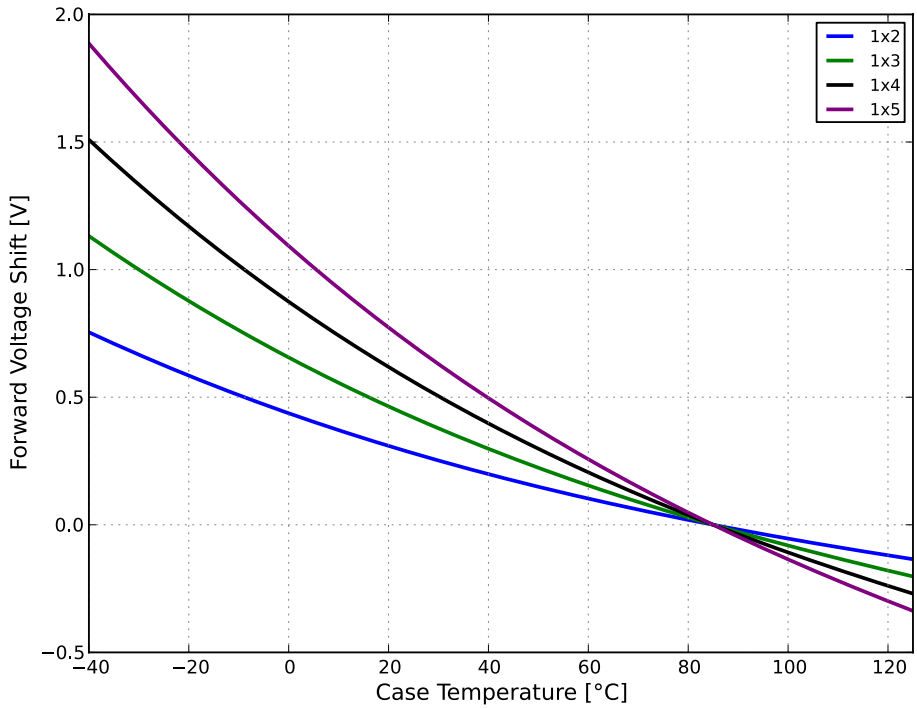


Figure 3e. Typical forward voltage shift vs. case temperature for LUXEON Altilon SMD at 1000mA, 20ms MP, T_c=85°C.

Color Shift Characteristics

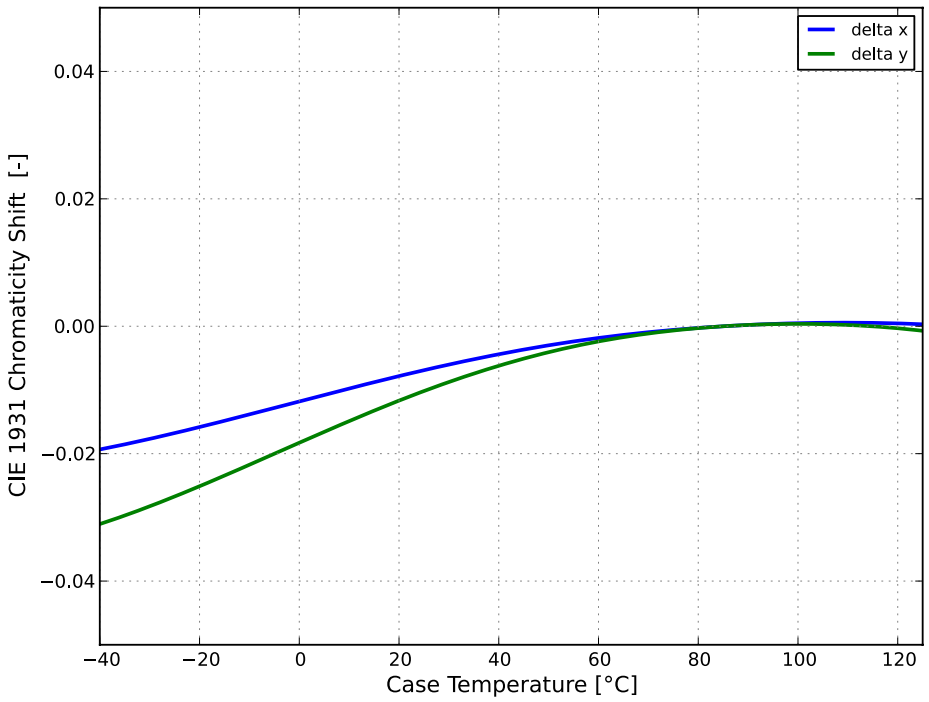


Figure 4a. Typical color shift in CIE 1931 x and y coordinates for LUXEON Altilon SMD at 1000mA, 20ms MP.

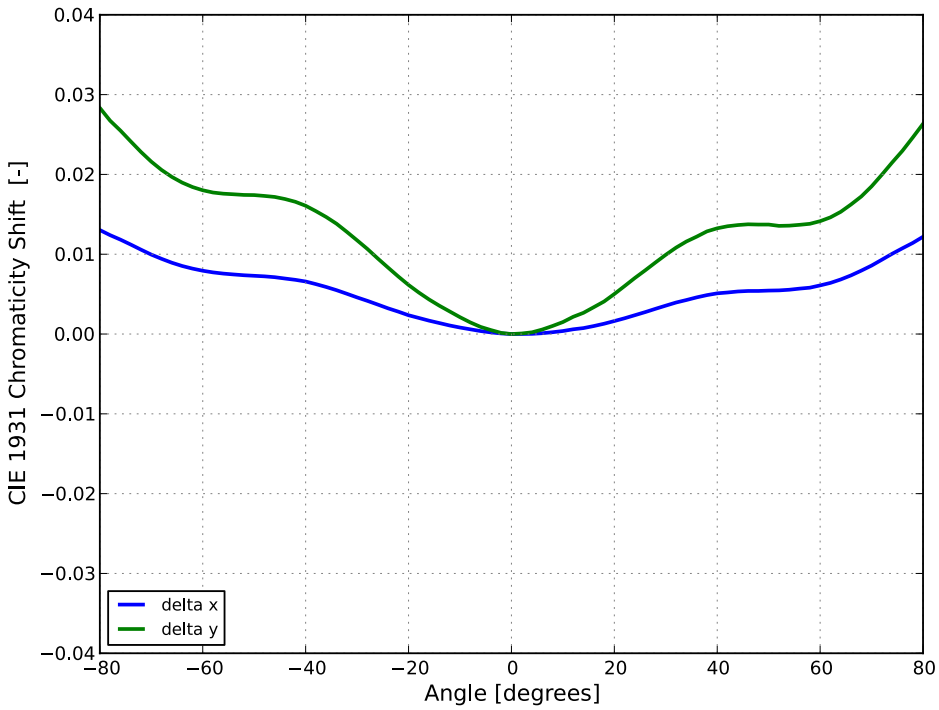


Figure 4b. Typical color shift over angle for LUXEON Altilon SMD at 1000mA, 20ms MP, T_c=85°C.

Radiation Pattern Characteristics

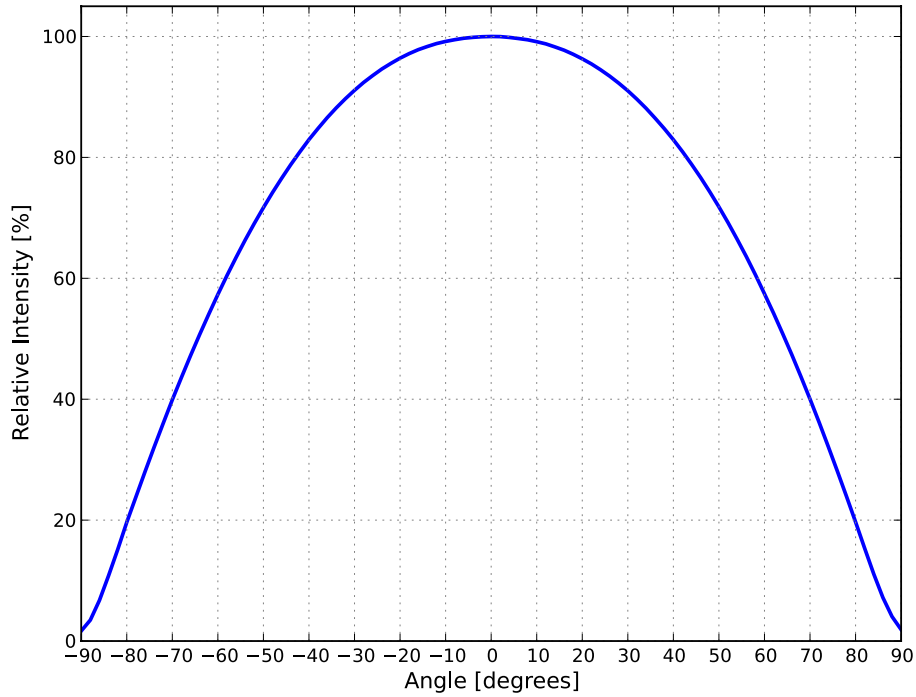


Figure 5. Typical radiation pattern for LUXEON Altilon SMD at 1000mA, 20ms MP.

Operating Limits Characteristics

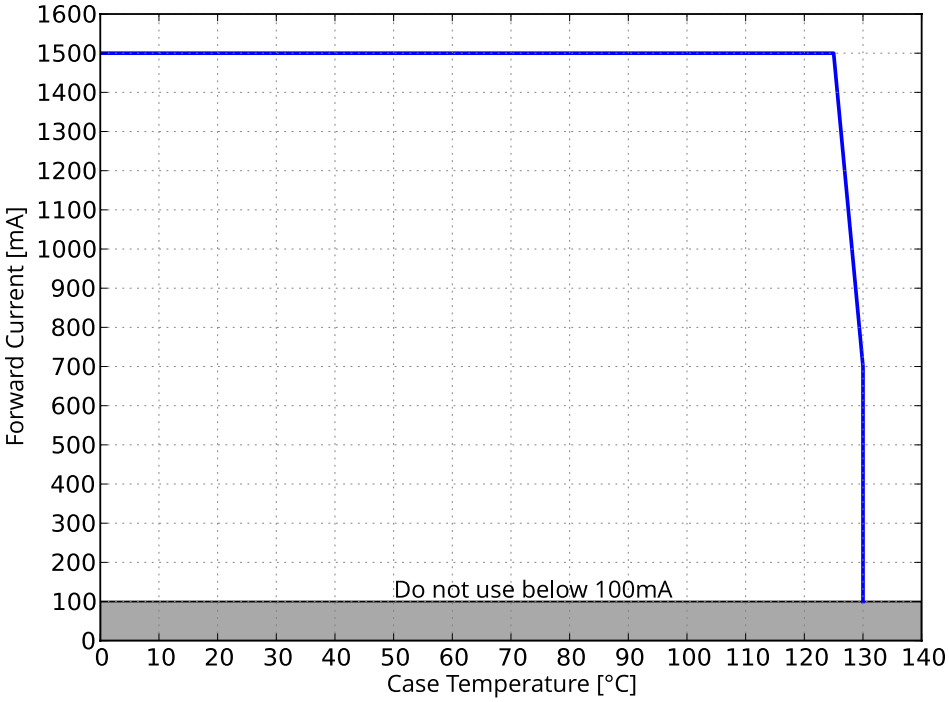


Figure 6. Maximum forward current vs. case temperature for LUXEON Altilon SMD.

Product Bin and Labeling Definitions

Designing with LUXEON Altilon SMD

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 a 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 or radiometric power, forward voltage, color point, peak wavelength, or dominant wavelength.

The CAT code identifies the flux and color bin of each part. The CAT code can be found in two distinct places, the package label and the TnR label. LUXEON Altilon SMD LEDs are labeled using a 4-digit alphanumeric CAT code following the format below:

A B C D

Where:

A – designates minimum luminous flux per die (E=270, G=290, K=320, etc.)

B – designates number of die (2, 3, 4 or 5)

C D – designates color bin (example: 1D, 2C, 3B, 4A, etc.)

Therefore, a LUXEON Altilon SMD 1x5 with a minimum luminous flux of 270 and a color bin of 3B has the following CAT code:

E 5 3 B

Luminous Flux Bins

Table 5 lists the standard luminous flux bins for LUXEON Altilon SMD 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 5a. Luminous flux bin definitions for LUXEON Altilon SMD at 1000mA, 20ms MP, T_c=85°C.

BIN	LUMINOUS FLUX [1] (lm) PER DIE	
	MINIMUM	MAXIMUM
D	260	270
E	270	280
F	280	290
G	290	300
H	300	310
J	310	320
K	320	330
L	330	340
M	340	350
N	350	360

Notes for Table 5:
1. Lumileds maintains a tolerance of ±6.5% on luminous flux measurements.
2. Product availability in a particular bin varies by color and platform start of production date.
3. Contact local sales representative for best supportability of programs.

Table 5b. Luminous flux bin definitions for LUXEON Altilon SMD at 1000mA, 20ms MP, T_c=85°C.

BIN	2 (1x2)	3 (1x3)	4 (1x4)	5 (1x5)
D	520	780	1040	1300
E	540	810	1080	1350
F	560	840	1120	1400
G	580	870	1160	1450
H	600	900	1200	1500
J	620	930	1240	1550
K	640	960	1280	1600

The total flux bin is defined on a per die basis, the first letter on the flux bin will define the minimum flux per die and the second letter will define the number of die in the device, i.e. C4 where C will designate a minimum flux per die of 250 lm and 4 will designate that the part has four die, therefore the total flux from the device will be a minimum of 1000 lm.

This will allow for better flux bin granularity, as a 1x2 will have 20 lm flux bin increments, a 1x3 30 lm, a 1x4 40 lm and a 1x5 50 lm. The flux bin is defined on the total flux of the device as die are not individually measured.

Color Bin Structure

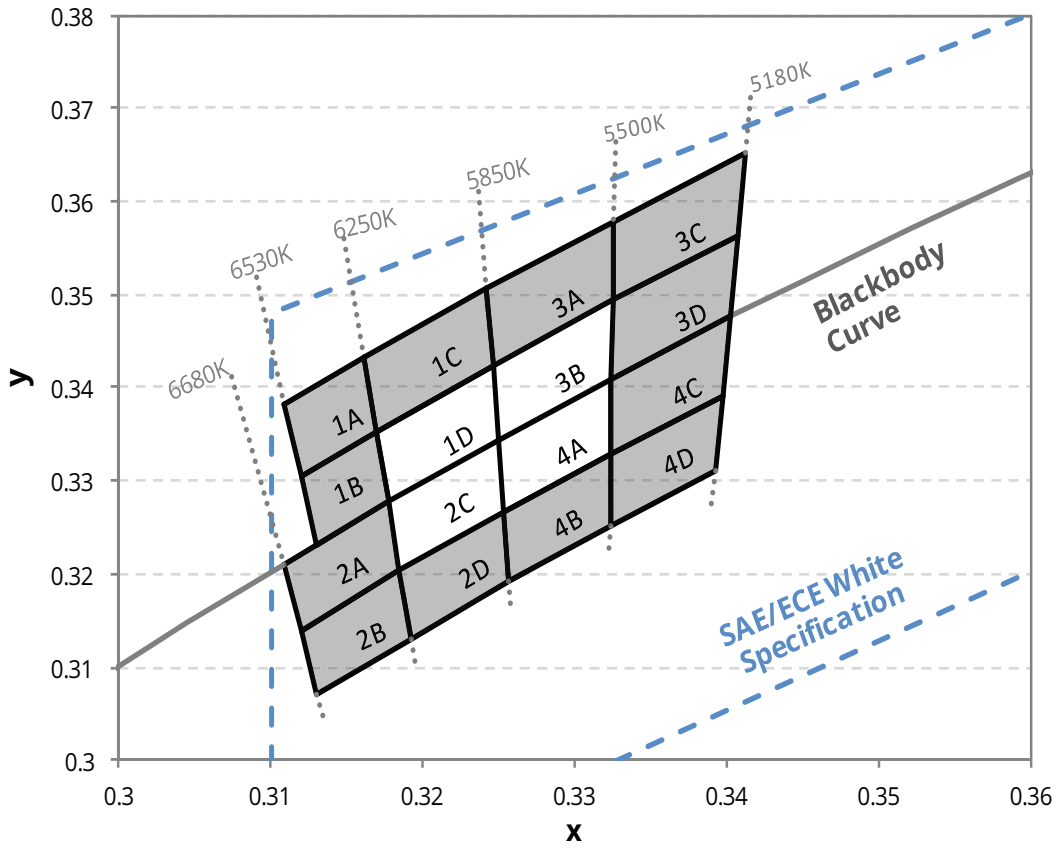


Figure 7. Color bin structure in CIE 1931 color space for LUXEON Altilon SMD at 1000mA, 20ms MP, T_c=85°C.

Color Codes

Table 6. Color code definitions for LUXEON Altilon SMD at 1000mA 20ms MP, T_c=85°C.

CODE	x [1, 2]	y [1, 2]	TYPICAL CCT (K)	CODE	x [1, 2]	y [1, 2]	TYPICAL CCT (K)
1A	0.3109	0.3382	6390	3A	0.3242	0.3506	5680
	0.3161	0.3432			0.3325	0.3579	
	0.3169	0.3353			0.3325	0.3493	
	0.3120	0.3306			0.3246	0.3424	
1B	0.3120	0.3306	6390	3B [3]	0.3246	0.3424	5680
	0.3169	0.3353			0.3325	0.3493	
	0.3177	0.3277			0.3324	0.3410	
	0.3131	0.3232			0.3249	0.3344	
1C	0.3161	0.3432	6050	3C	0.3325	0.3579	5350
	0.3242	0.3506			0.3412	0.3652	
	0.3246	0.3424			0.3406	0.3562	
	0.3169	0.3353			0.3325	0.3493	
1D [3]	0.3169	0.3353	6050	3D	0.3325	0.3493	5350
	0.3246	0.3424			0.3406	0.3562	
	0.3249	0.3344			0.3401	0.3476	
	0.3177	0.3277			0.3324	0.3410	
2A	0.3109	0.3211	6460	4A [3]	0.3249	0.3344	5680
	0.3177	0.3277			0.3324	0.3410	
	0.3185	0.3203			0.3323	0.3329	
	0.3120	0.3139			0.3253	0.3266	
2B	0.3120	0.3139	6460	4B	0.3253	0.3266	5680
	0.3185	0.3203			0.3323	0.3329	
	0.3192	0.3131			0.3323	0.3251	
	0.3131	0.3070			0.3256	0.3191	
2C [3]	0.3177	0.3277	6050	4C	0.3324	0.3410	5350
	0.3249	0.3344			0.3401	0.3476	
	0.3253	0.3266			0.3396	0.3392	
	0.3185	0.3203			0.3323	0.3329	
2D	0.3185	0.3203	6050	4D	0.3323	0.3329	5350
	0.3253	0.3266			0.3396	0.3392	
	0.3256	0.3191			0.3392	0.3310	
	0.3192	0.3131			0.3323	0.3251	

Notes for Table 6:
1. LUXEON Altilon SMD emitters are tested and binned by x and y coordinates.
2. Lumileds maintains a tester tolerance of ±0.005 on x and y coordinates.
3. Color bins 1D, 2C, 3B and 4A are currently supportable. Ask your sales representative about supportability of the different color bins.

Mechanical Dimensions

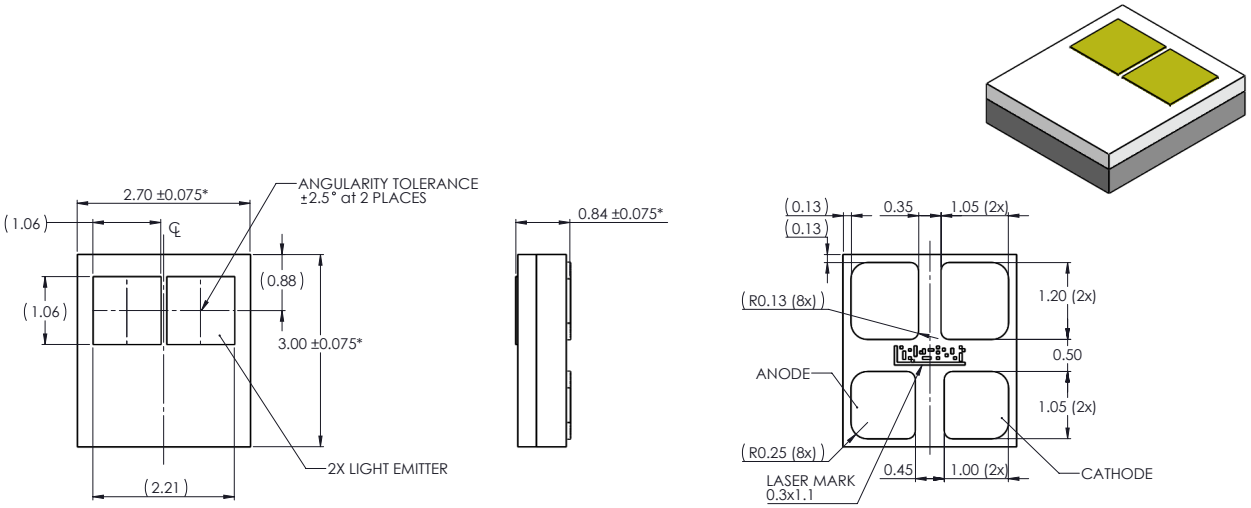


Figure 8. Mechanical dimensions for LUXEON Altilon SMD 1x2.

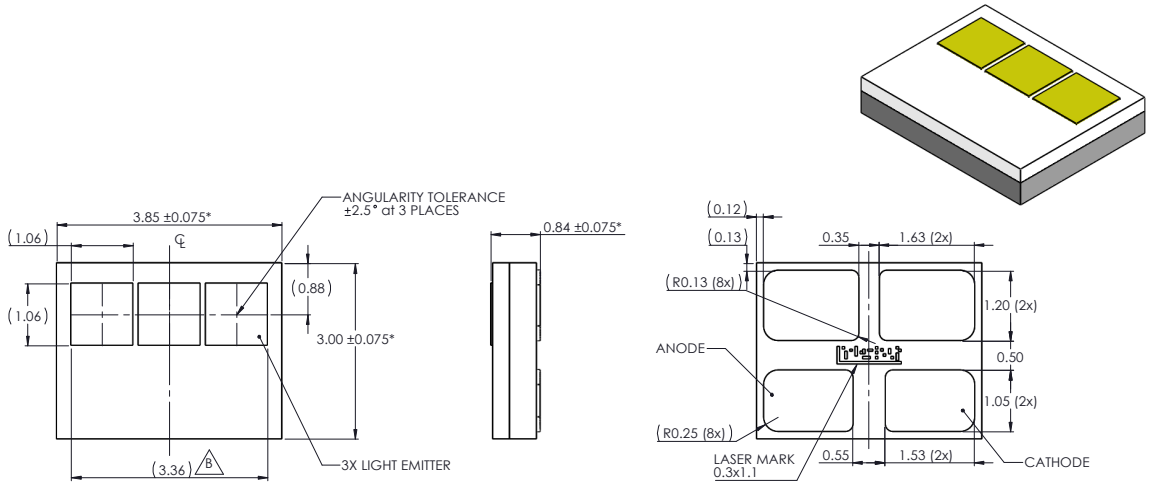


Figure 9. Mechanical dimensions for LUXEON Altilon SMD 1x3.

Notes for Figures 8 and 9:
1. Drawings are not to scale.
2. All dimensions are in millimeters.

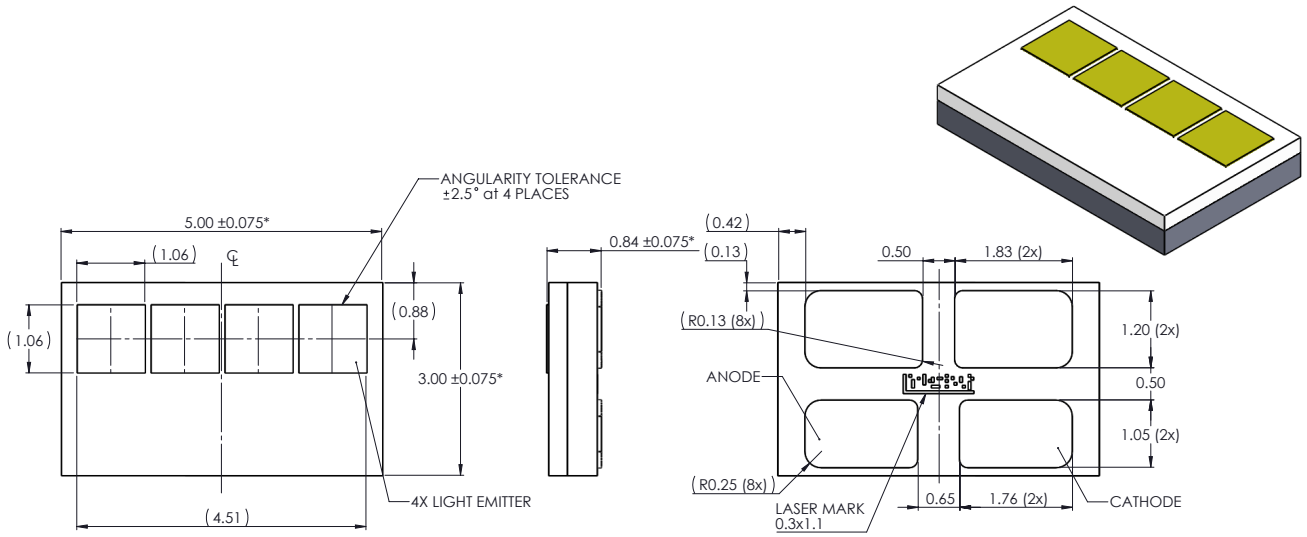


Figure 10. Mechanical dimensions for LUXEON Altilon SMD 1x4.

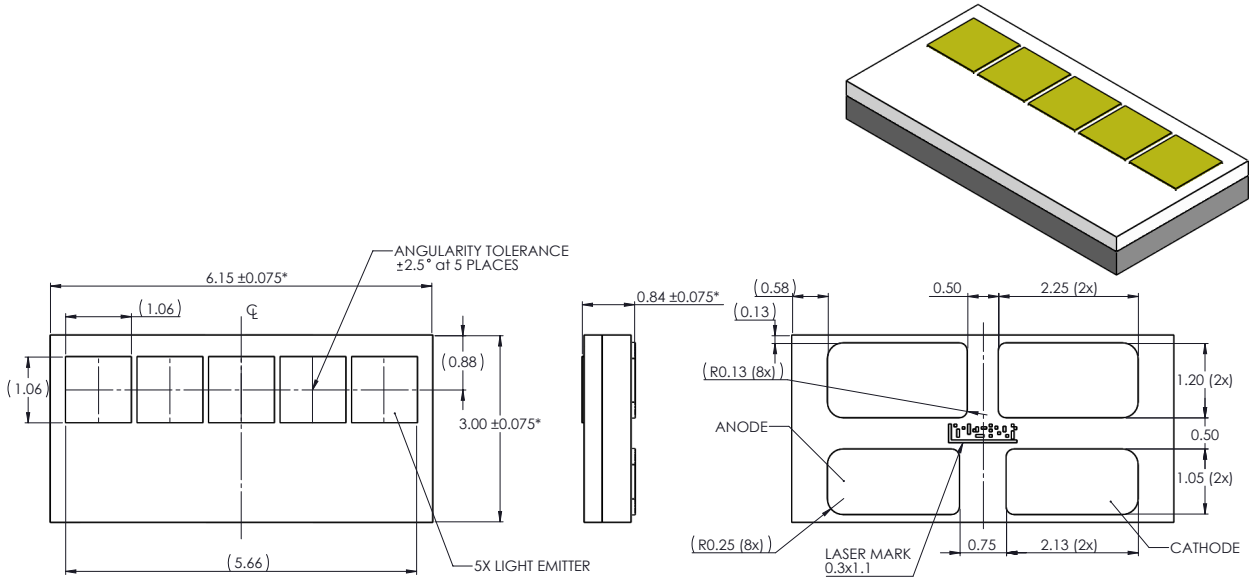


Figure 11. Mechanical dimensions for LUXEON Altilon SMD 1x5.

Notes for Figures 10 and 11:
1. Drawings are not to scale.
2. All dimensions are in millimeters.

Reflow Soldering Guidelines

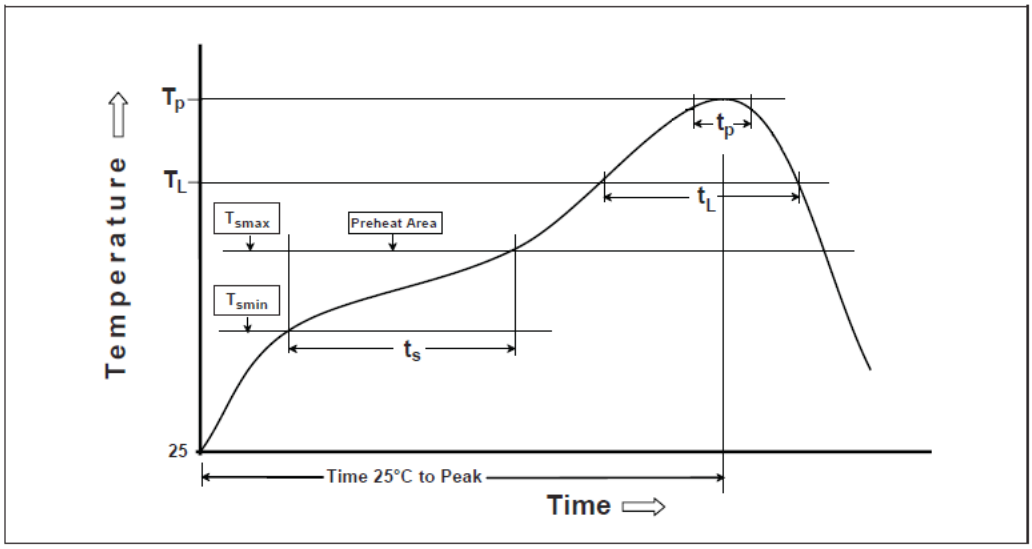


Figure 12. Visualization of the acceptable reflow temperature profile as specified in Table 7.

Table 7. Reflow profile characteristics for LUXEON Altilon SMD.

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 180 seconds
Ramp-Up Rate (T_{smax} 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	6°C / second maximum
Time 25°C to Peak Temperature	8 minutes maximum

Notes for Table 7:
1. All temperatures refer to the application Printed Circuit Board (PCB), measured on the surface adjacent to the package body.

JEDEC Moisture Sensitivity

Table 8. Moisture sensitivity levels for LUXEON Altilon SMD.

LEVEL	FLOOR LIFE	
	TIME	CONDITIONS
1	Unlimited	≤30°C / 85% RH

Solder Pad Design

Details for recommended solder pad designs that provide low thermal resistance will be published in a separate application brief. These recommendations are not intended to represent specifications for soldering LUXEON Altilon SMD LEDs.

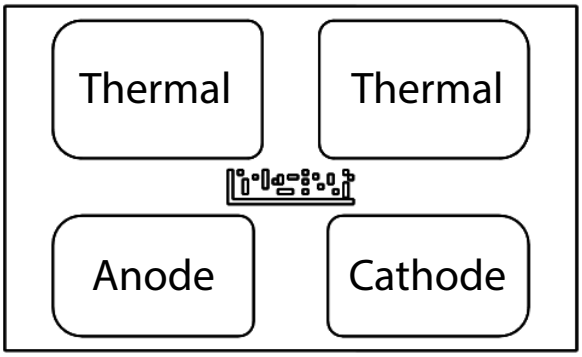


Figure 13. Recommended PCB solder pad layout for LUXEON Altilon SMD.

Notes for Figure 13:
1. All dimensions are in millimeters.
2. The thermal pads are electrically isolated from the anode and cathode contact pads.

Packaging Information

Pocket Tape Dimensions

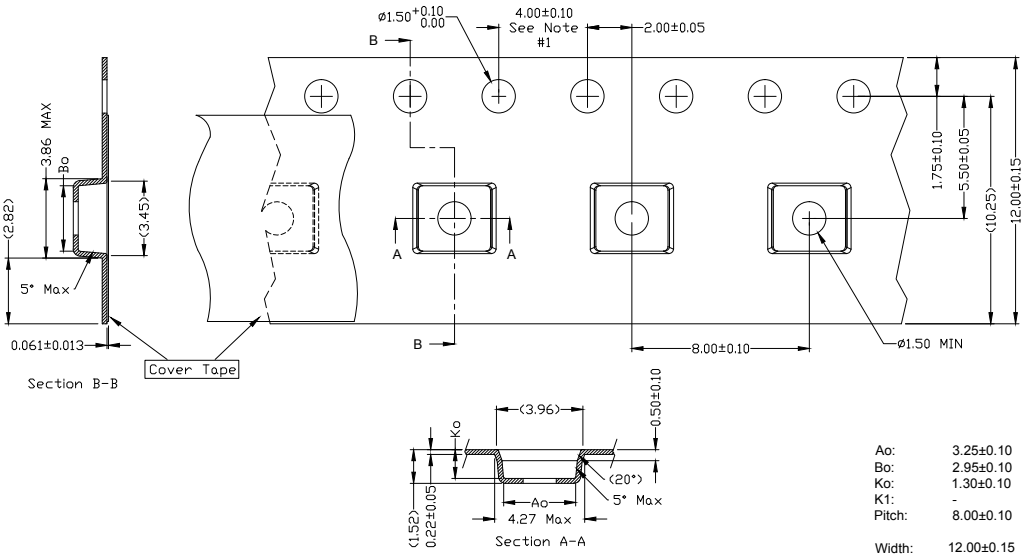


Figure 14. Pocket tape dimensions for LUXEON Altilon SMD 1x2.

Notes for Figure 14:
1. Drawings are not to scale.
2. All dimensions are in millimeters.

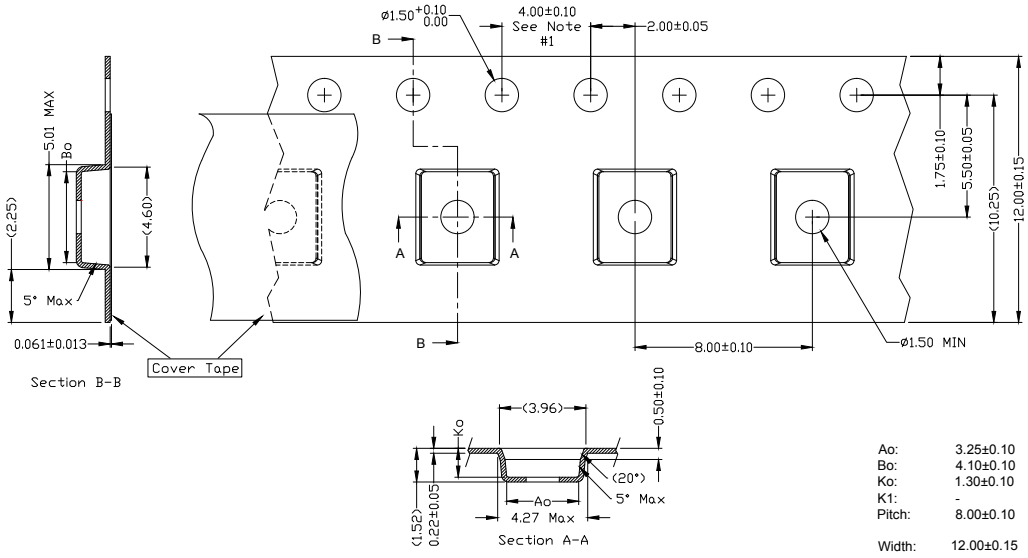


Figure 15. Pocket tape dimensions for LUXEON Altilon SMD 1x3.

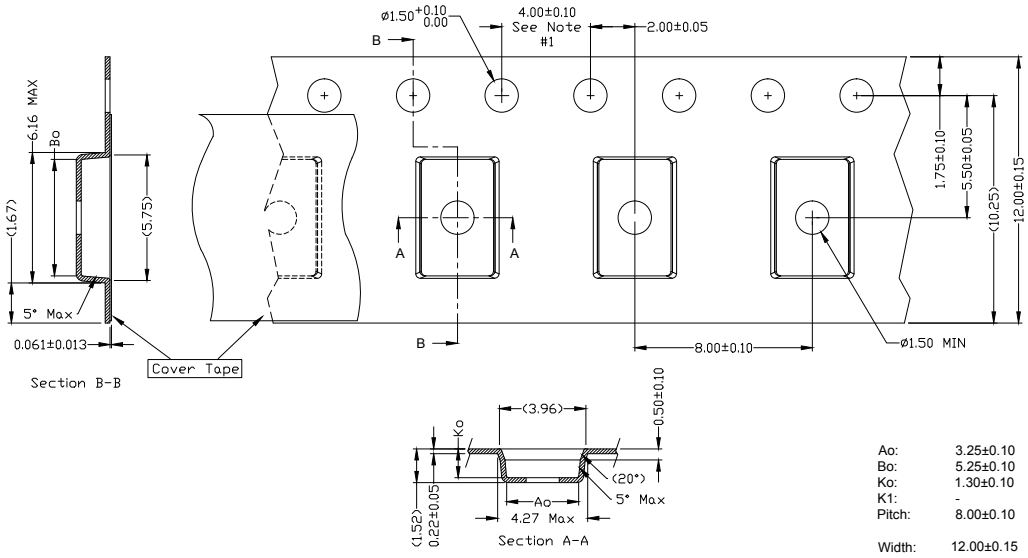


Figure 16. Pocket tape dimensions for LUXEON Altilon SMD 1x4.

Notes for Figures 15 and 16:
1. Drawings are not to scale.
2. All dimensions are in millimeters.

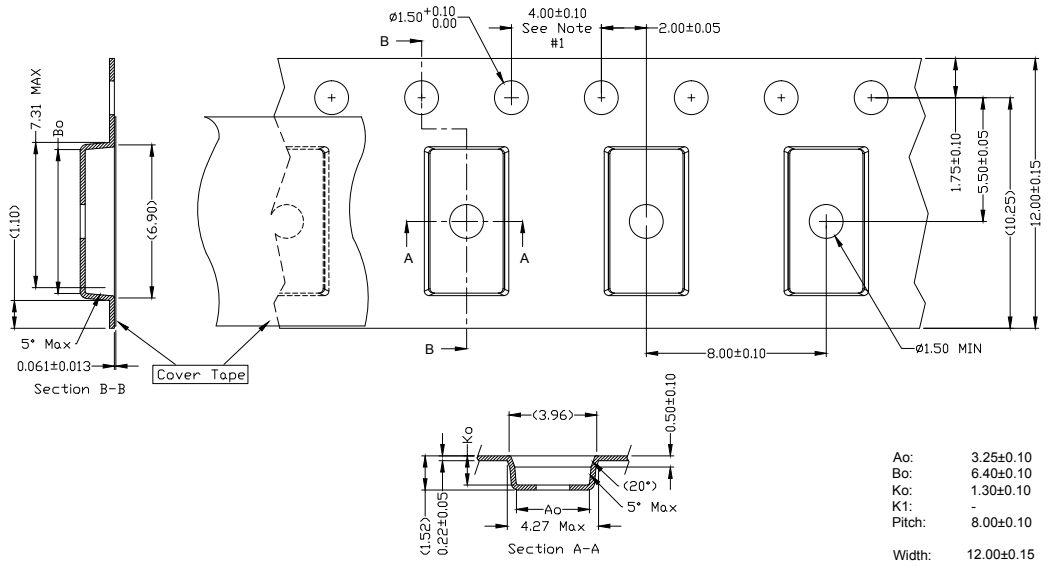


Figure 17. Pocket tape dimensions for LUXEON Altilon SMD 1x5.

Notes for Figure 17:
1. Drawings are not to scale.
2. All dimensions are in millimeters.

Reel Dimensions

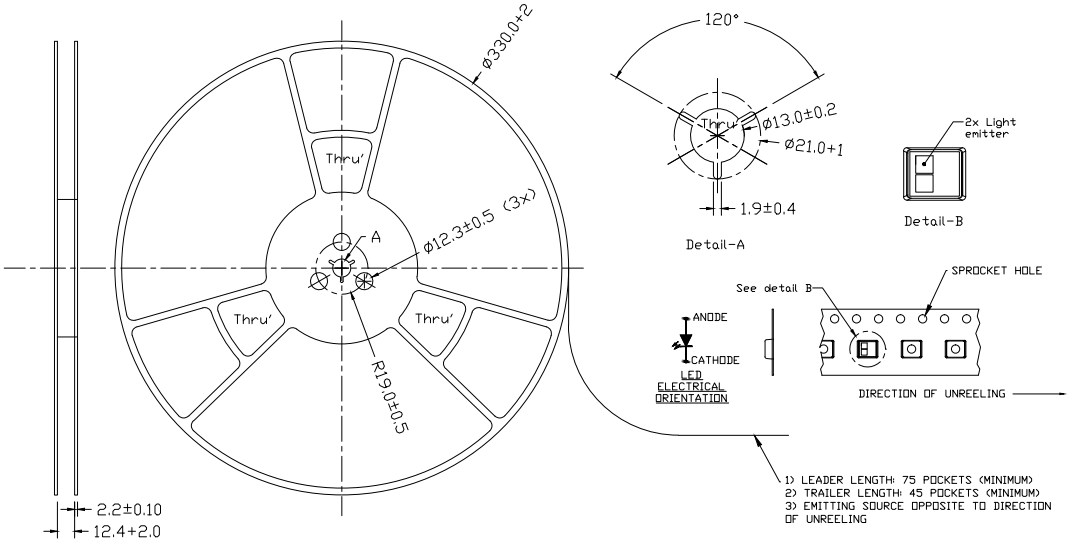


Figure 18. Reel dimensions for LUXEON Altilon SMD 1x2.

Notes for Figure 18:
1. Drawings are not to scale.
2. All dimensions are in millimeters.

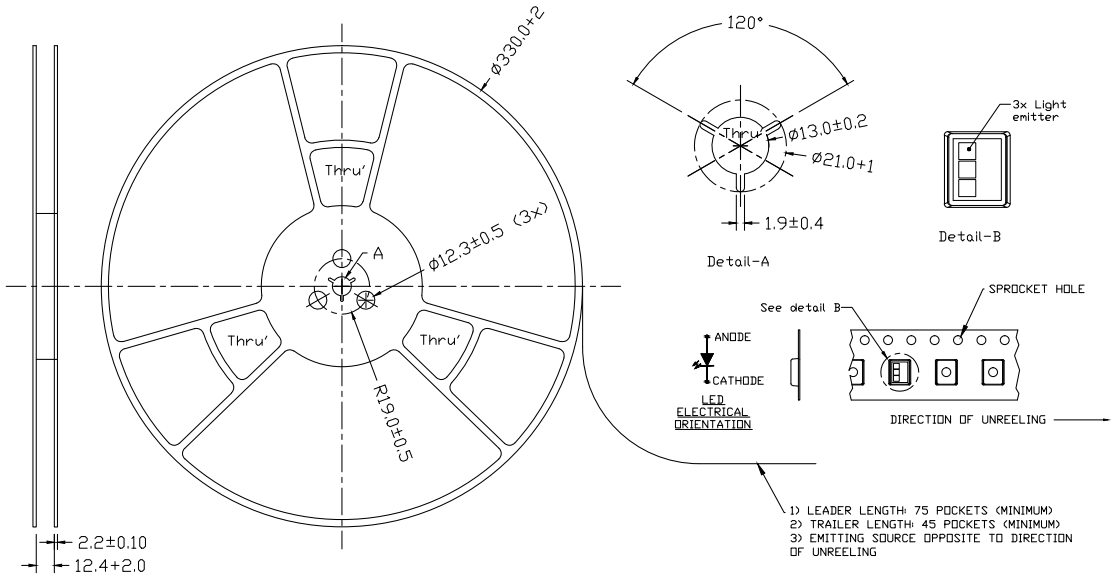


Figure 19. Reel dimensions for LUXEON Altilon SMD 1x3.

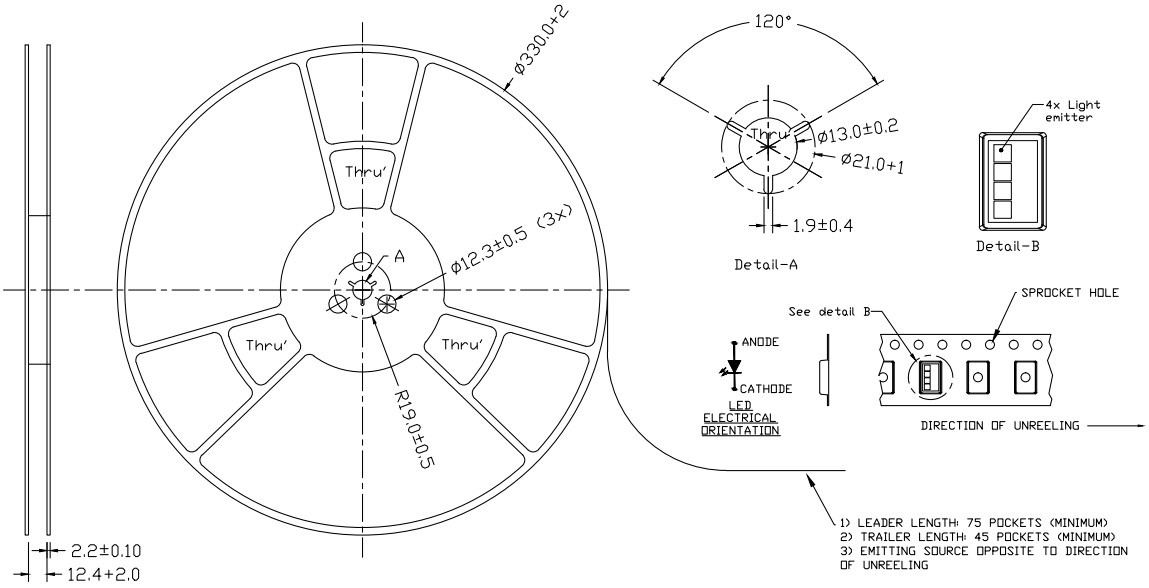


Figure 20. Reel dimensions for LUXEON Altilon SMD 1x4.

Notes for Figures 19 and 20:
1. Drawings are not to scale.
2. All dimensions are in millimeters.

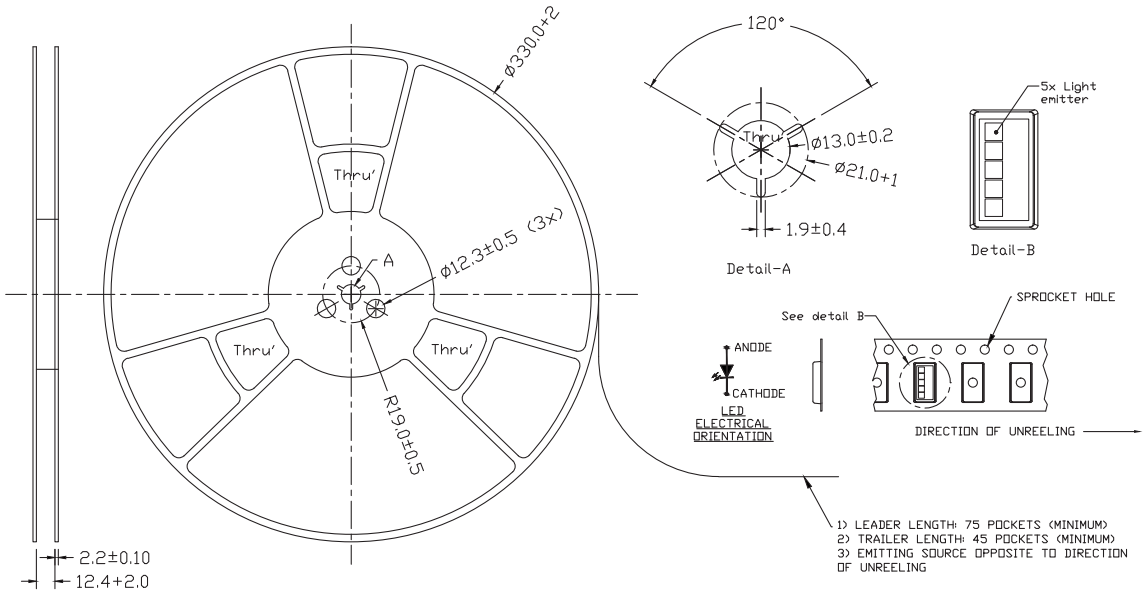


Figure 21. Reel dimensions for LUXEON Altilon SMD 1x5.

Notes for Figure 21:
1. Drawings are not to scale.
2. All dimensions are in millimeters.

Product Labeling

LUXEON Altilon SMD 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.

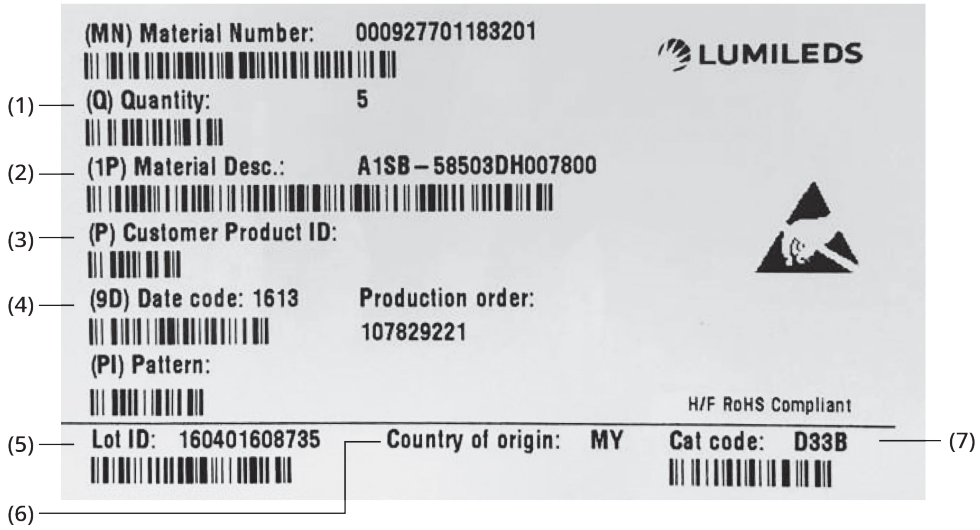


Figure 22. Example of a product label for LUXEON Altilon SMD.

Notes for Figure 22 – Outer 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

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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