LUXEON Altilon

Functional solution for forward lighting systems

LUXEON Altilon delivers distinctive brilliant white light for your automotive forward lighting designs. LUXEON Altilon is designed and tested to withstand extreme temperatures and engineered to simplify optical design and ease of manufacturing and assembly. With advanced phosphor technology, LUXEON Altilon meets both SAE and ECE color specifications and provides finer granularity than existing systems.

FEATURES AND BENEFITS

- 1A drive current enables high light output per package for reduced LED count
- 150°C maximum case temperature, T_c, ensures application performance at extreme conditions
- Industry's lowest thermal resistance enables smaller heatsinks for smaller designs
- 1x2 and 1x4 configuration options with or without spade lugs for design flexibility
- AEC-Q101C qualified and PPAP documentation available

PRIMARY APPLICATIONS

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

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General Product Information

Product Test Conditions

LUXEON Altilon LEDs are tested and binned using a 20ms monopulse (MP) at 1000mA drive current, junction temperature, T_j, of 25°C.

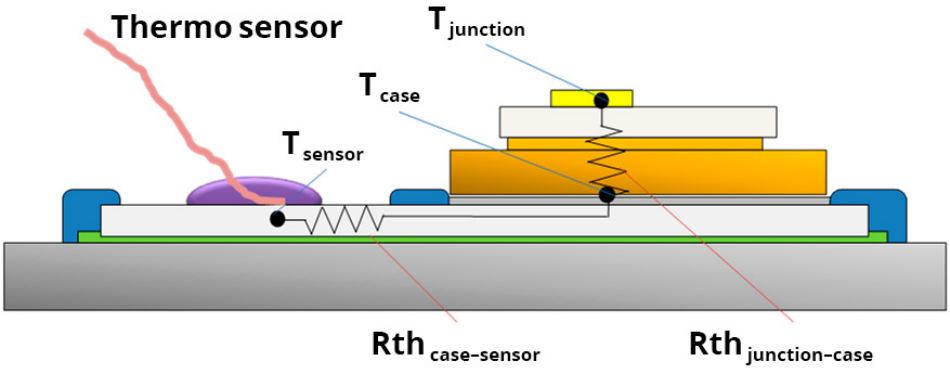

Figure 1. Case temperature location on sample board for LUXEON Altilon.

Part Number Nomenclature

Part numbers for LUXEON Altilon follow the convention below:

L A F L – M **D E** – **F F F F**

Where:

D – designates number of die (2=2 die and 4=4 die)

E – designates connector type (L=spade lugs and S=solder)

F F F F – designates minimum luminous flux bin (see luminous flux bin definitions)

Therefore, a LUXEON Altilon with 4 die, solder connector and 500 minimum luminous flux will have the following part number:

L A F L – M **2 S** – **0 5 0 0**

Environmental Compliance

Lumileds LLC is committed to providing environmentally friendly products to the solid-state lighting market. LUXEON Altilon 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 at 1000mA, 20ms MP, T_c=25°C.

CONFIGURATION	MINIMUM LUMINOUS FLUX [1, 2] (lm)	PART NUMBER
1x2	500	LAFL-M2x-0500
1x4	925	LAFL-M4x-0925
	1000	LAFL-M4x-1000
	1050	LAFL-M4x-1050
	1100	LAFL-M4x-1100
	1150	LAFL-M4x-1150

Notes for Table 1:
1. Lumileds maintains a tolerance of ±10% for luminous flux measurements.
2. Flux levels are tested via a pulsed measurement at a case temperature, T_c, of 25°C.

Optical Characteristics

Table 2. Typical optical characteristics for LUXEON Altilon at 1000mA, 20ms MP, T_c=25°C.

PART NUMBER	CORRELATED COLOR TEMPERATURE (K) or DOMINANT WAVELENGTH (nm)		TOTAL INCLUDED ANGLE [2] $\theta_{0.90V}$	VIEWING ANGLE [3] $2\theta_{1/2}$
	MINIMUM	MAXIMUM		
LAFL-M2x-xxxx	5000K	6150K	142°	120°
LAFL-M4x-xxxx	5000K	6150K	142°	120°

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 lamp centerline where the luminous intensity is ½ of the peak value.

Electrical and Thermal Characteristics

Table 3a. Typical electrical and thermal characteristics for LUXEON Altilon at 1000mA, 20ms MP, T_c=25°C.

PART NUMBER	FORWARD VOLTAGE [1] (V_f)		DYNAMIC RESISTANCE [2] (Ω) R_D	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
LAFL-M2x-xxxx	5.6	7.5	0.53	2.1	2.5	3.0	3.6
LAFL-M4x-xxxx	11.2	15.0	1.07	1.4	1.8	2.0	2.6

Notes for Table 3a:
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.
3. Measured between 80°C and 90°C at binning current, I_f.
4. Electrical thermal resistance.
5. Thermal resistance with wall plug efficiency included. Reference JESD51-51, JESD51-14, 4.1.3.

Typical Electrical Characteristics at Temperature Extremes

Table 3b. Typical electrical and thermal characteristics for LUXEON Altilon at 1000mA, 20ms MP, T_c=25°C.

FORM FACTOR	TYPICAL CONDITION 1000mA DC OPERATION CASE TEMPERATURE, T_c=-40°C FORWARD VOLTAGE [1] (V_f)			TYPICAL CONDITION 1000mA DC OPERATION CASE TEMPERATURE, T_c=130°C FORWARD VOLTAGE [1] (V_f)		
	MINIMUM	TYPICAL	MAXIMUM	MINIMUM	TYPICAL	MAXIMUM
1x2	5.6	6.8	7.9	5.0	5.9	7.3
1x4	11.2	13.2	15.8	10.0	11.8	14.5

Notes for Table 3b:
1. Lumileds tests forward voltage values via a pulsed measurement at junction temperature of 25°C. Typical product performance at maximum and minimum allowable case temperature to allow for electronic driver design. Values provided are guard banded to ensure that minimum and maximum values are not exceeded under stated use conditions.

Absolute Ratings

Table 4. Absolute ratings for LUXEON Altilon.

PARAMETER	PERFORMANCE
Minimum DC Forward Current [1]	100mA
Maximum DC Forward Current [1]	1100mA
Maximum Transient Peak Current	1500mA for ≤10ms
Maximum Forward Voltage at 1000mA and -40°C [2]	15.8V (1x4) 7.9V (1x2)
Maximum Forward Voltage at 1000mA and 130°C [3]	10.0V (1x4) 5.0V (1x2)
Maximum AC Ripple	≤50mA rms at ≥10kHz
ESD Sensitivity [4]	8kV HBM, 2kV CDM, 400V MM
Storage Temperature	-40°C to 130°C
Minimum Operating Case Temperature	-40°C
Maximum Case Temperature (1000mA) [5]	130°C
Maximum Allowable Solder Pad Temperature	270°C/30 seconds maximum

Notes for Table 4:
1. Although no damage to the device will occur, driving these high power LEDs at drive currents below 350mA or above 1000mA may result in unpredictable performance. Please consult your Lumileds sales representative for further information.
2. Product forward voltage at 1000mA operation, case temperature -40°C after 1,000 hours of operation at related conditions.
3. Product forward voltage at 1000mA operation, case temperature 130°C after 1,000 hours of operation at related conditions.
4. Measured using human body model, contact discharge method and machine model per AEC-Q101C.
5. Maximum case temperature for short term operation only. See section on reliability expectation and thermal design requirements for recommendations on maximum case temperature to ensure life of vehicle performance.

Reliability Expectations and Thermal Design Requirements

Table 5. Reliability expectations and thermal design requirements for LUXEON Altilon.

OPERATING CONDITIONS	B50L80	B3L80
1000mA, T_c=130°C	15,000 Hours	5,000 Hours
1000mA, T_c=110°C	40,000 Hours	15,000 Hours
700mA, T_c=110°C	75,000 Hours	25,000 Hours
500mA, T_c=110°C	120,000 Hours	35,000 Hours

Notes for Table 5:
1. As measured at the position indicated in Figure 1.
2. Lumen maintenance is a projected average value based on constant current operation while respecting the specified maximum case temperature. Observation of design limits included in this datasheet is required in order to achieve this projected lumen maintenance.
3. Lifetime shown is an estimation of expected lifetimes (Bxx, Lyy) computed as 90% lower confidence limit of the LUXEON Altilon product as a function of drive current and case temperature. The lifetime estimates in the above table reflect statistical figures based on calculations of technical data and are subject to change.

JEDEC Moisture Sensitivity

Table 6. Moisture sensitivity levels for LUXEON Altilon.

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

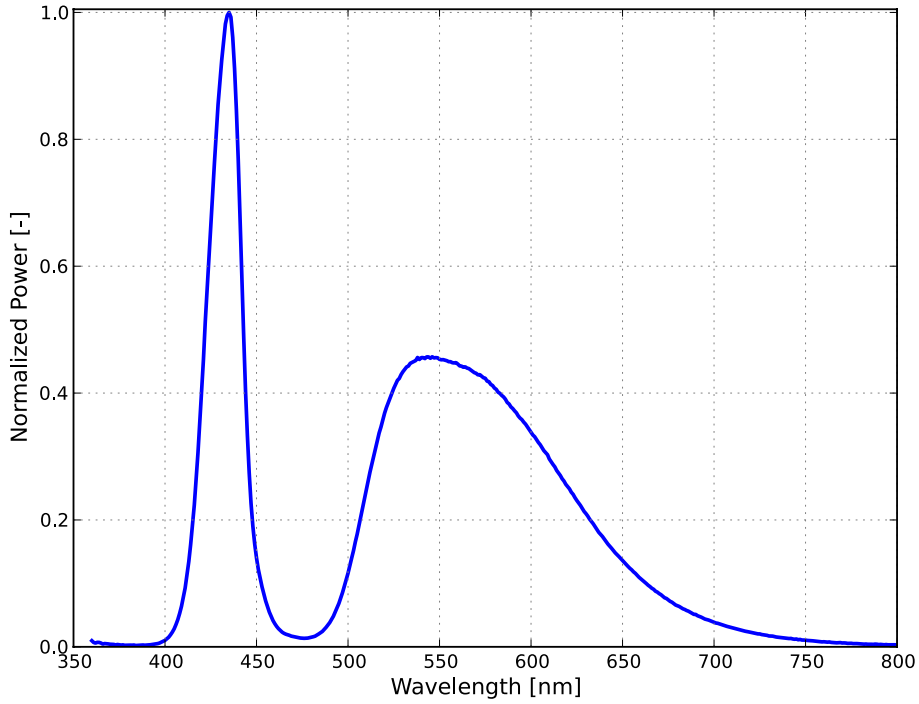

Figure 2. Typical normalized power vs. wavelength for LUXEON Altilon at 1000mA, 20ms MP, T_c=25°C.

Light Output Characteristics

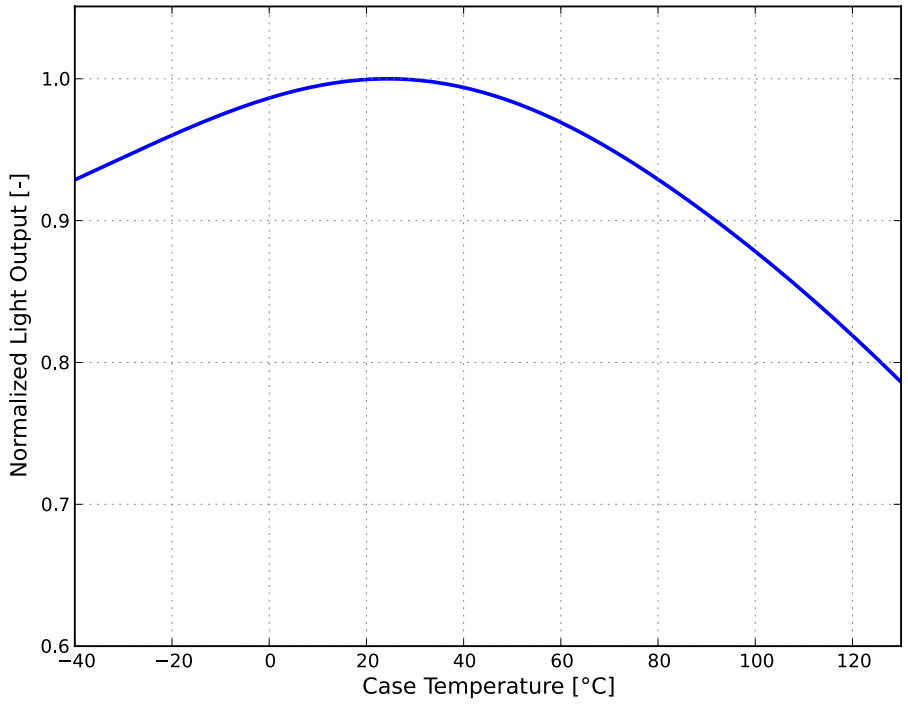

Figure 3a. Typical normalized light output vs. case temperature for LUXEON Altilon at 1000mA, 20ms MP.

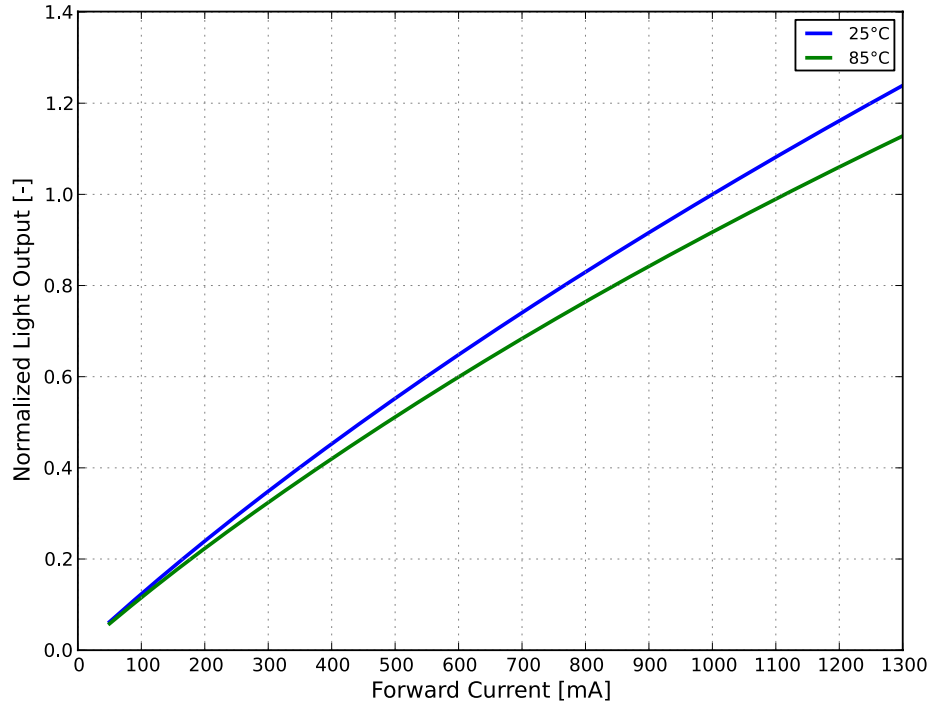

Figure 3b. Typical normalized light output vs. forward current for LUXEON Altilon at T_c=25°C.

Forward Current and Forward Voltage Characteristics

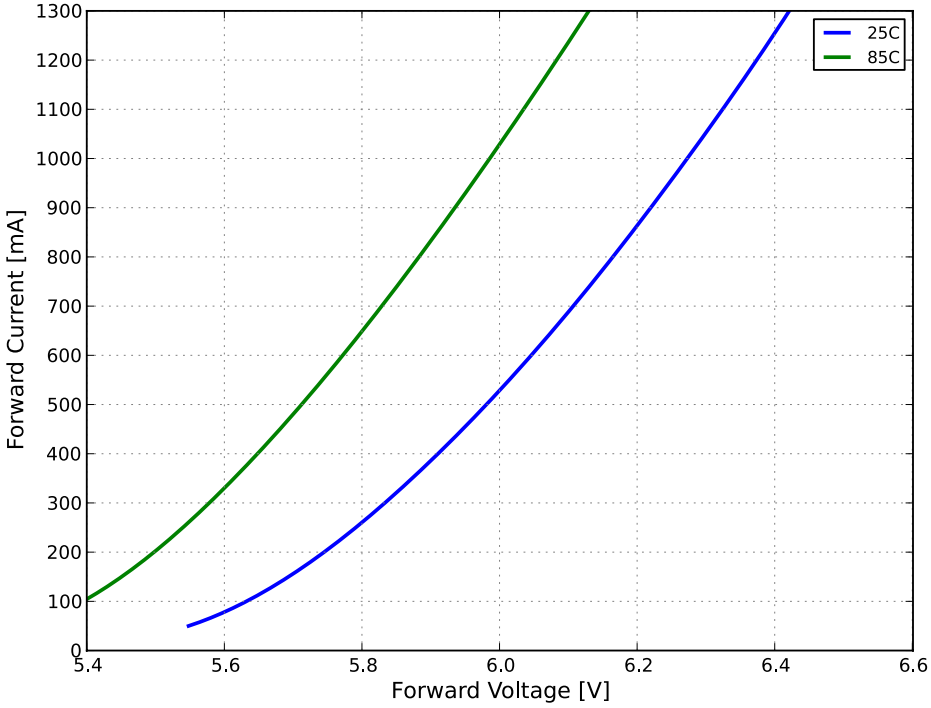

Figure 4a. Typical forward current vs. forward voltage for LUXEON Altilon 1x2 at T_c=25°C.

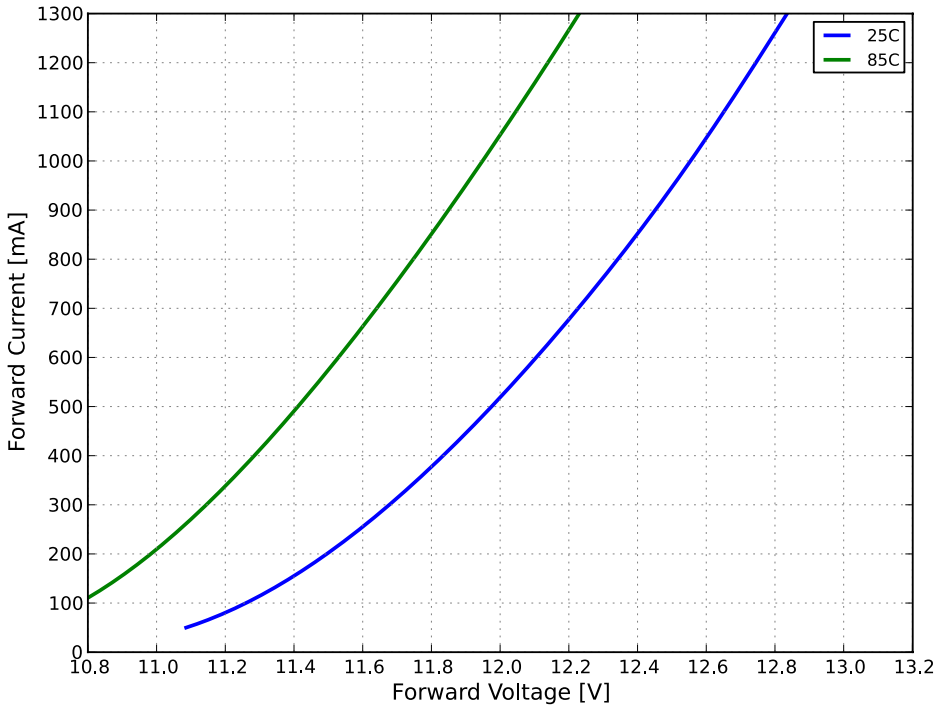

Figure 4b. Typical forward current vs. forward voltage for LUXEON Altilon 1x4 at T_c=25°C.

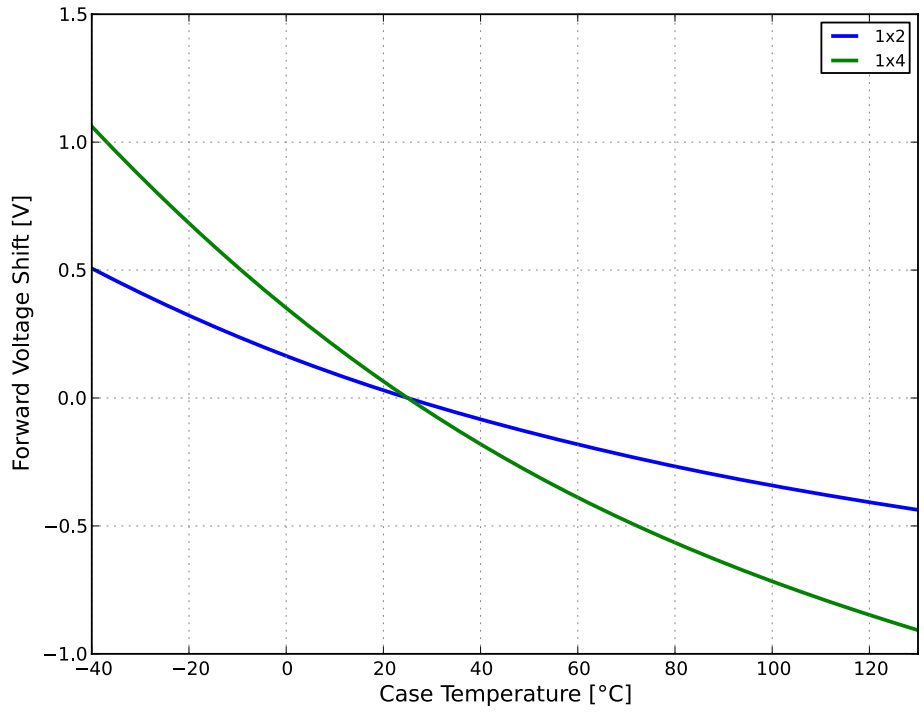

Figure 4c. Typical forward voltage vs. case temperature for LUXEON Altilon at T_c=25°C.

Color Shift Characteristics

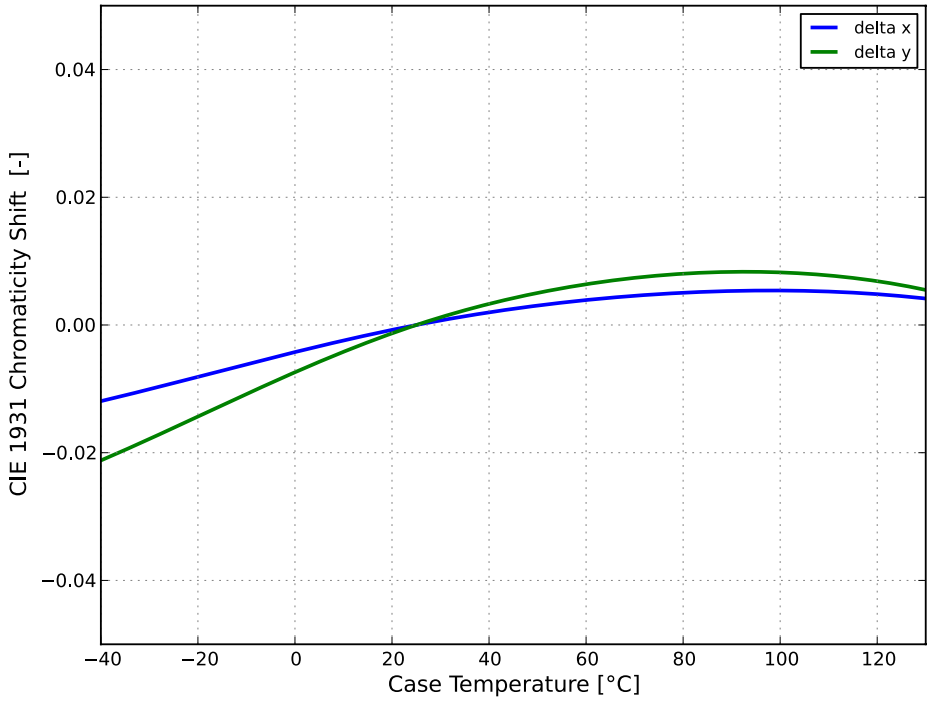

Figure 5a. Typical color shift in CIE 1931 x and y coordinates for LUXEON Altilon at 20ms MP, 1000mA.

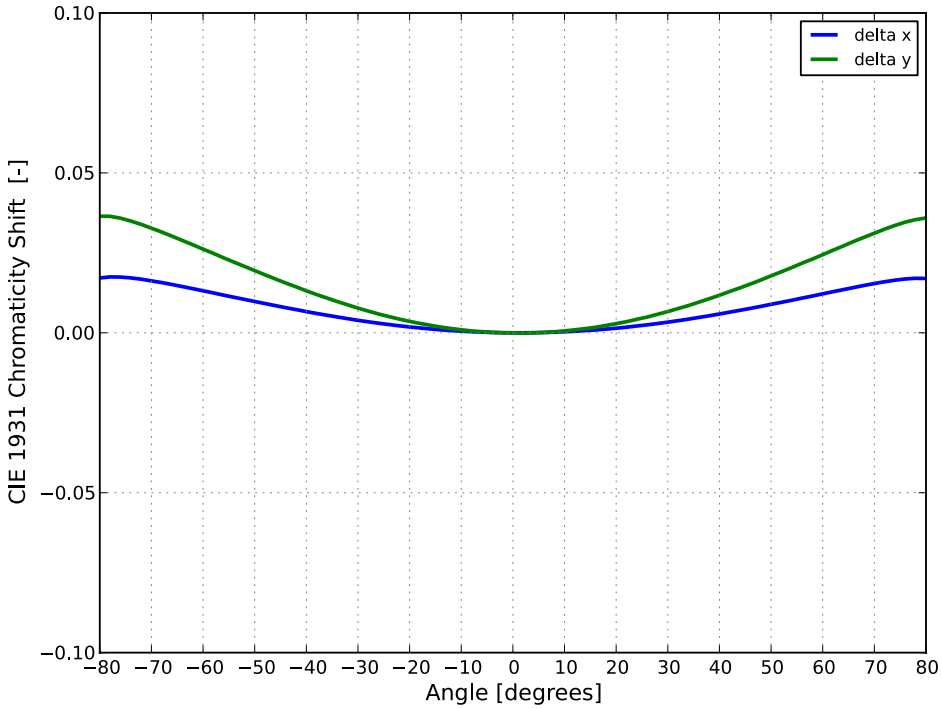

Figure 5b. Typical color shift in CIE 1931 x and y coordinates over angle for LUXEON Altilon 1x2 at 20ms MP, 1000mA.

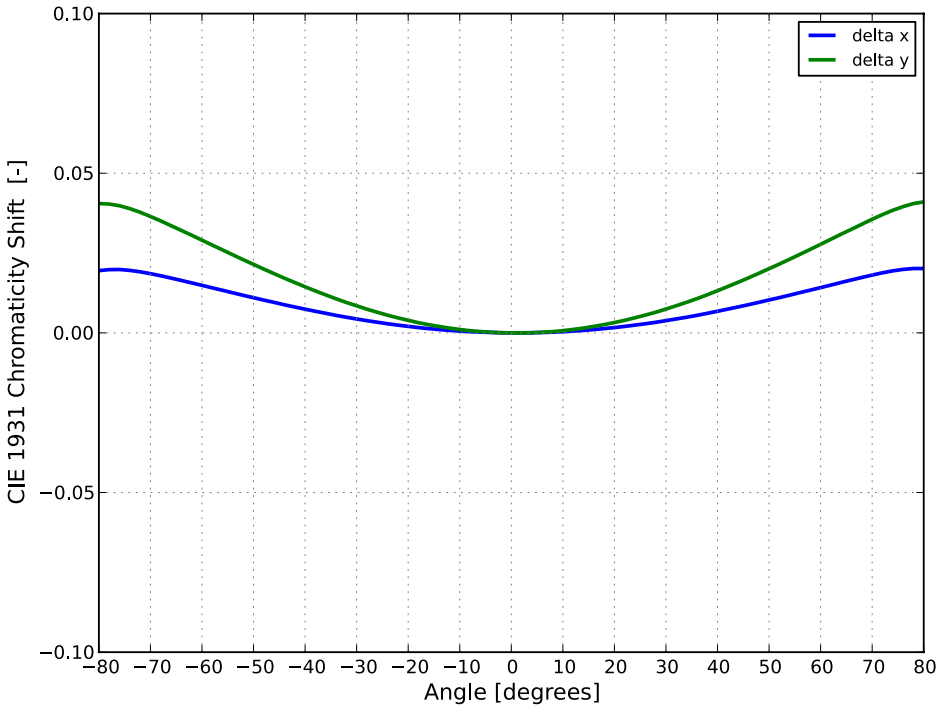

Figure 5c. Typical color shift in CIE 1931 x and y coordinates over angle for LUXEON Altilon 1x4 at 20ms MP, 1000mA.

Radiation Pattern Characteristics

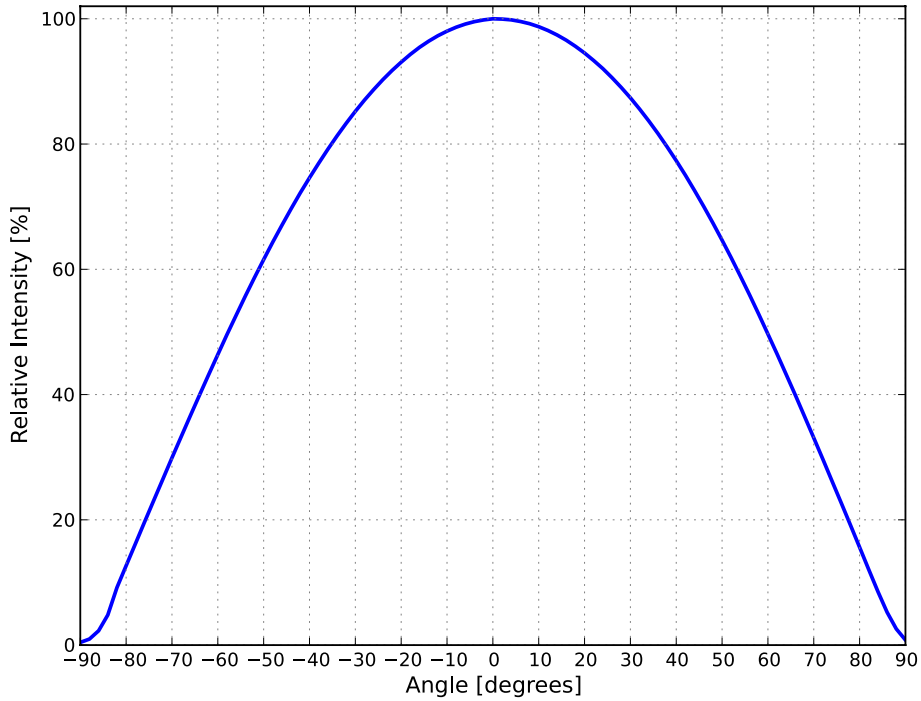

Figure 6. Typical radiation pattern for LUXEON Altilon at 20ms MP, 1000mA, T_c=25°C.

Product Bin Definitions

Laser Marking Definitions

Table 7. Laser marking definitions for LUXEON Altilon.

LASER MARKING DEFINITIONS	
Tile ID + bin code + unit location at tile	123456-000119999
Tile ID (YYMMDD – Serial Running Number)	123456-000
Bin code (presented as PNP bin with lookup table)	11
Unit location at tile	9999

Table 8. Bin codes for LUXEON Altilon 1x2 and 1x4.

PNP BIN (1x2)	CAT CODE	PNP BIN (1x4)	CAT CODE
1	HB1A	51	MB1A
2	JB1A	52	NB1A
3	KB1A	53	PB1A
4	LB1A	54	QB1A
5	HB3A	55	MB3A
6	JB3A	56	NB3A
7	KB3A	57	PB3A
8	LB3A	58	QB3A
9	HA1A	59	MA1A
10	JA1A	60	NA1A
11	KA1A	61	PA1A
12	LA1A	62	QA1A
13	HA3A	63	MA3A
14	JA3A	64	NA3A
15	KA3A	65	PA3A
16	LA3A	66	QA3A
17	RA1A	67	SA1A
18	RA3A	68	SA3A
19	RB1A	69	SB1A
20	RB3A	70	SB3A
		71	WA1A
		72	WA3A
		73	WB1A
		74	WB3A
		75	XA1A
		76	XA3A
		77	XB1A
		78	XB3A
		79	YA1A
		80	YA3A
		81	YB1A
		82	YB3A

Luminous Flux Bins

Table 9 lists the standard luminous flux bins for LUXEON Altilon 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 9. Luminous flux bin definitions for LUXEON Altilon at 1000mA, 20ms MP, T_c=25°C.

BIN	LUMINOUS FLUX (lm) [1]	
	MINIMUM	MAXIMUM
H	350	425
J	425	465
R	465	500
K	500	600
L	600	700
M	700	850
N	850	925
S	925	1000
P	1000	1050
W	1050	1100
X	1100	1150
Y	1150	1200
Q	1200	1400

Notes for Table 9:
1. Lumileds maintains a tolerance of ±10% on luminous flux measurements.

Color Bin Definitions

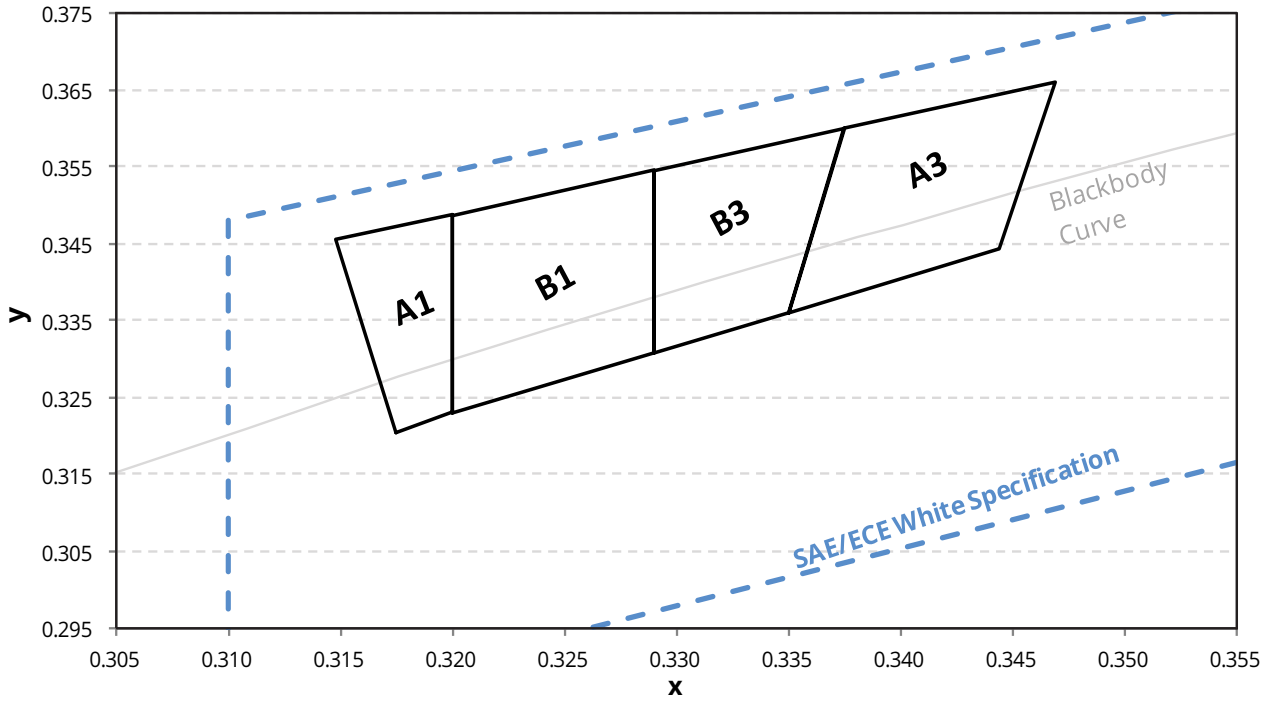

Figure 7. Color bin structure in CIE 1931 color space for LUXEON Altilon.

Table 10. Color bin definitions for LUXEON Altilon.

BIN	x	y	BIN	x	y
A1	0.3175	0.3204	B1	0.3200	0.3230
	0.3148	0.3455		0.3200	0.3488
	0.3200	0.3488		0.3290	0.3546
	0.3200	0.3230		0.3290	0.3308
A3	0.3350	0.3360	B3	0.3290	0.3308
	0.3375	0.3600		0.3290	0.3546
	0.3469	0.3660		0.3375	0.3600
	0.3444	0.3442		0.3350	0.3360

Notes for Table 10:
1. Lumileds maintains a tester tolerance of ±0.005 on x and y color coordinates.
2. CIE 1931 x and y coordinate frame.

Mechanical Dimensions

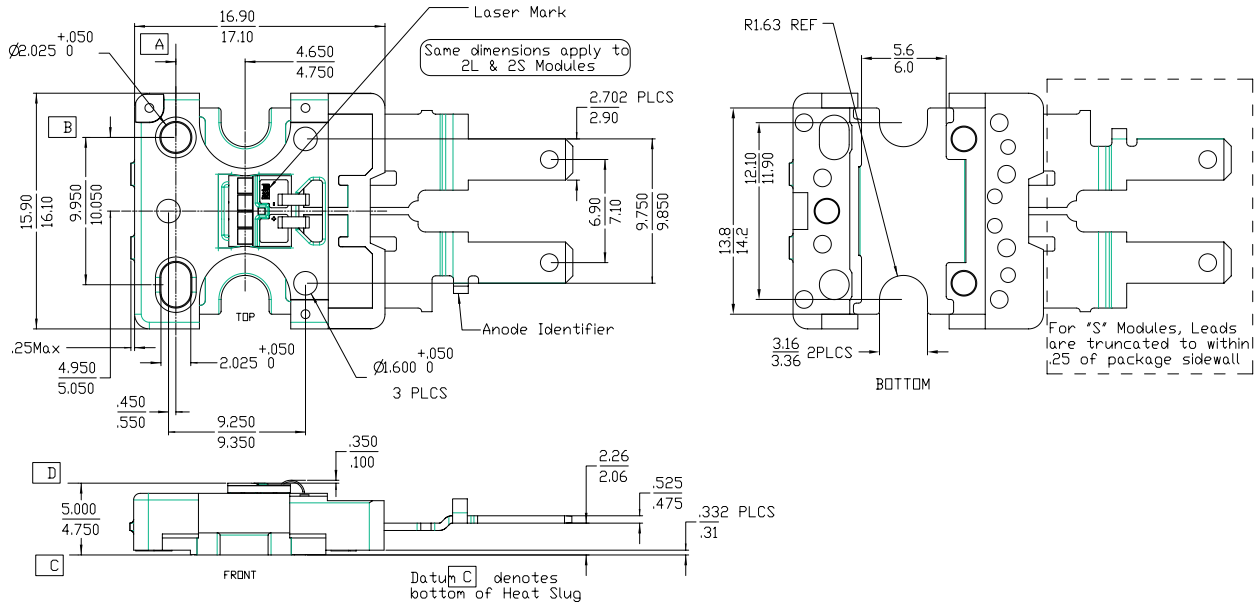

Figure 8. Mechanical dimensions for LUXEON Altilon.

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

Packaging and Labeling Information

LUXEON Altilon LEDs are packaged in tubes then in a carton box. Each tube contains a specified number of LEDs. The LEDs in each tube come from a single category code, ensuring they are all well-matched for light output, color, and forward voltage. Each tube contains a rubber stopper at one end. The tube label has both alphanumeric and bar code information. The carton boxes have printed information providing part numbers with CAT codes that indicate luminous flux, color and forward voltage bins.

Table 11. Number of LEDs per tube and per box for LUXEON Altilon.

PART NUMBER	TOTAL UNITS PER TUBE	TOTAL TUBES PER BOX	TOTAL UNITS PER BOX
LAFL-M2x-xxxx	42	15	630
LAFL-M4x-xxxx	42	15	630

Tube

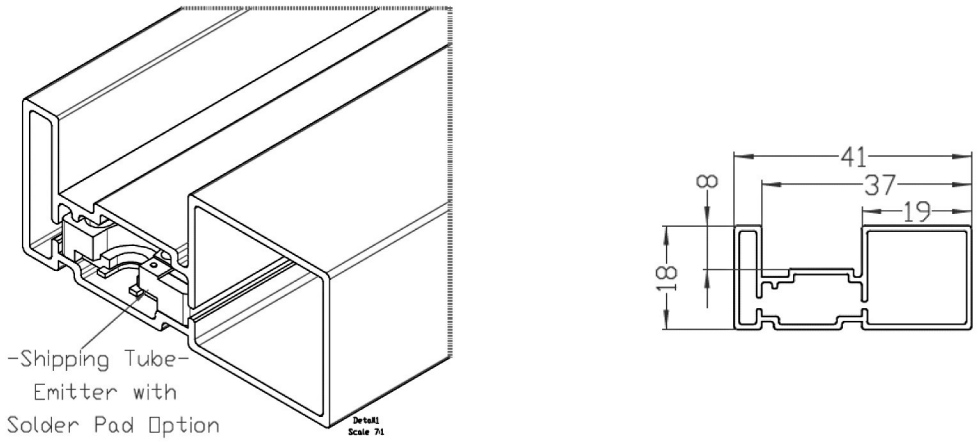

Figure 9. Tube dimensions for LUXEON Altilon.

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

Labels

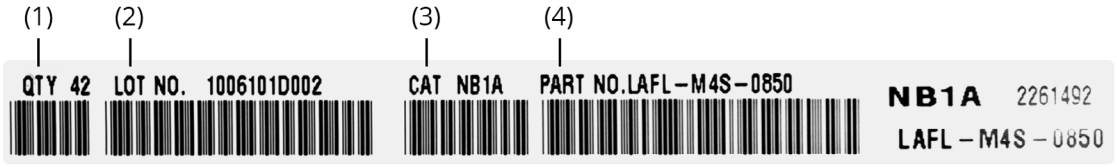

Figure 10. Example of a tube label for LUXEON Altilon.

Notes for Figure 10 – Tube Label descriptions for customer use:
Field labels not described are for Lumileds internal use only.
1. Total number of LED emitters in a Tube.
2. Unique product lot identification number. This number is required for traceability purposes.
3. Product bin 4-digit alphanumeric CAT code.
4. Lumileds part number.

Figure 11. Example of box label for LUXEON Altilon.

Notes for Figure 11 – Box Label descriptions for customer use:
Field labels not described are for Lumileds internal use only.
1. Lumileds part number.
2. Total number of LED emitters in a Box.
3. LED test date in YYWW format.
4. Customer part number for custom requests only.
5. Unique product lot identification number. This number is required for traceability purposes.
6. 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 safer, better and more beautiful—with light.

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

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