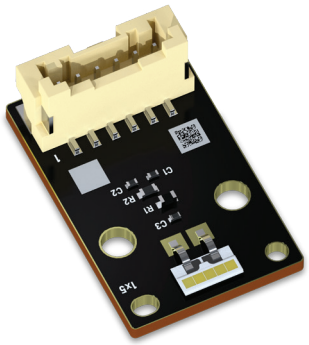
LUMILEDS

AUTOMOTIVE

LUXEON Altilon TopContact PnP

An Integrated Automotive Front Lighting Solution



LUXEON Altilon TopContact PnP is an integrated solution designed to meet the growing needs of high power automotive front lighting applications and systems. It enables design simplification and minimizes design lead times.

As a part of the established LUXEON Altilon LED product family, TopContact PnP provides a solution for challenging thermal designs and helps in keeping overall systems costs low.

The TopContact PnP product meets both SAE and ECE color specifications and is AEC-Q102 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
- Designed for direct heat sink mount
- LED is hot binned at 85 °C monopulse (MP) to match closer to operating conditions
- IEC/PAS 62707-1 white LED
- Available in 1x2, 1x3, 1x4 and 1x5 configurations

PRIMARY APPLICATIONS

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

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General Product Information

Product Test Conditions

LUXEON Altilon TopContact PnP utilizes an LED that is binned using a 20 ms monopulse (MP) of 1000 mA drive current. The temperature is set to 85 °C at the beginning of the pulse. Unless otherwise noted, the same test conditions apply to all data in this document.

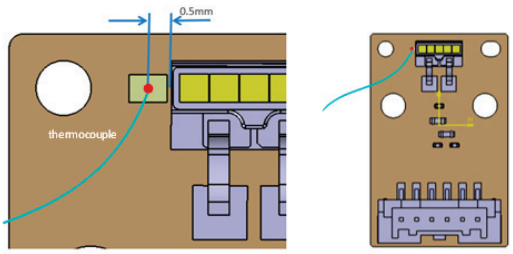

Figure 1. Thermocouple measurement point

In a typical application, it may be difficult to measure the junction temperature T_j or the temperature at the bottom of the board Tb directly. Therefore, temperature Tsensor is measured at a predetermined position on the PCB show in figure 1.

Part Number Nomenclature

Part numbers for LUXEON Altilon TopContact PnP follow the convention below:

A 2 F 1 – **S 0 0 0 C D E F G G G G 0**

Where:

A 2	–	Designates Automotive Integrated Solution
F 1	–	Designates Front Lighting
S 0 0 0	–	Designated code for LUXEON Altilon TopContact LED in PnP module
C	–	Number of Chips (2 - 5)
D	–	Designates binning current (D = 1000 mA)
E	–	Designates binning condition (H = 85 °C)
F	–	Designates options for detailed product specification (default = 0)
G G G G	–	Designates minimum luminous flux or custom part number
H	–	Designates options for detailed product specification (default = 0)

Therefore, the following part number is used for a Altilon TopContact PnP 1x5 with a minimum luminous flux of 1700 lm with 1000 mA binning current at 85 °C:

A 2 F 1 – **S 0 0 0 5 B H 0 1 7 0 0 0**

Environmental Compliance

Lumileds LLC is committed to providing environmentally friendly products to the solid-state lighting market. LUXEON Altilon TopContact PnP 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 LUXEON Altilon TopContact PnP: lead, mercury, cadmium, hexavalent chromium, polybrominated biphenyls (PBB) or polybrominated diphenyl ethers (PBDE).

Performance Characteristics

Product Selection Guide

Table 1 lists the standard luminous flux bins for LUXEON Altilon TopContact PnP 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 1. Product selection for LUXEON Altilon TopContact PnP at 20 ms MP, 1000 mA, T_c = 85 °C

MINIMUM LUMINOUS FLUX [1] (lm)	PART NUMBER
660	A2F1-S0002BH006600
990	A2F1-S0003BH009900
1320	A2F1-S0004BH013200
1650	A2F1-S0005BH016500

Notes for Table 1:
1. Lumileds maintains a tolerance of ±6,5% on luminous flux measurements.

Optical Characteristics

Table 2. Optical characteristics for LUXEON Altilon TopContact PnP (all configurations)

PART NUMBER	CORRELATED COLOR TEMPERATURE (K)		TYPICAL TOTAL INCLUDED ANGLE [1] $2\theta_{0.90\ V}$	TYPICAL VIEWING ANGLE [2] $2\theta_{1/2}$
	MINIMUM	MAXIMUM		
A2F1-S000xBH0xxxxx	5180	6680	140°	120°

Notes for Table 2:
1. Correlated color temperature is measured at binning condition.
2. $2\theta_{0.90\ V}$ denotes the total angle at which 90% of total luminous flux is captured, i.e. the cone defined by the off-axis angle $\theta_{0.90\ V}$ from the LED centerline includes 90% of the total flux.
3. $2\theta_{1/2}$ denotes the viewing angle, with $\theta_{1/2}$ being the off-axis angle from the LED centerline where the luminous intensity is ½ of the peak value.

Electrical Characteristics

Table 3. Electrical characteristics for LUXEON Altilon TopContact PnP (all configurations)

PART NUMBER	FORWARD VOLTAGE[1] (V_f)	
	MINIMUM	MAXIMUM
A2F1-S0002BH0xxxxx	5.8	7.6
A2F1-S0003BH0xxxxx	8.7	11.4
A2F1-S0004BH0xxxxx	11.6	15.2
A2F1-S0005BH0xxxxx	14.5	19.0

Notes for Table 3:
1. Lumileds maintains a tolerance of ±0.06 V on forward voltage measurements.

Thermal Characteristics

Table 4. Thermal characteristics for LUXEON Altilon TopContact PnP derived from thermal transient measurements at 1000 mA (DC) and 25 °C stage temperature

PARAMETER	THERMAL RESISTANCE JUNCTION TO BOARD ($R_{th,j\text{-}b}$) (K/W)[4]			
	$R\Theta_{J\text{-}C}$ el [1]		$R\Theta_{J\text{-}C}$ real [2]	
	TYPICAL	MAXIMUM	TYPICAL	MAXIMUM
A2F1-S0002BHLxxxxx	2.2	3.2	3.2	4.5
A2F1-S0003BHLxxxxx	1.4	2.0	2.0	2.8
A2F1-S0004BHLxxxxx	1.1	1.6	1.6	2.2
A2F1-S0005BHLxxxxx	0.9	1.3	1.3	1.8

Notes for Table 4:
1. Ratio between temperature difference (junction↔board) and electrical input power (references JESD51-51, JESD51-14).
2. Ratio between temperature difference (junction↔board) and dissipated heat, i.e. emitted light taken into account (references JESD51-51, JESD51-14)
3. Rth j-b el: Electrical thermal resistance (junction to board).

Absolute Ratings

Table 5. Absolute ratings for LUXEON Altilon TopContact PnP

PARAMETER	PERFORMANCE
Minimum DC Forward Current	50 mA
Maximum DC Forward Current	1500 mA
Maximum Junction Temperature [1, 2]	150 °C
Maximum Board Temperature Performance	125 °C
Maximum Junction Temperature for Short Time Applications [3]	180 °C
LED Storage Temperature	-40 °C to 150 °C
ESD Sensitivity [4]	±8 kV HBM, ±2 kV CDM
Reverse Voltage ($V_{reverse}$)	LUXEON LEDs are not designed to be driven in reverse bias

Notes for Table 5:
1. Proper current derating must be observed to maintain junction temperature below the maximum allowable temperature. LUXEON Altilon TopContact PnP LEDs driven at or above maximum LED case temperature may have shorter lifetime.
2. Please consult with Lumileds for more information on maximum time durations and forward currents for these temperatures.
3. Short time operations of less than 200 hours
4. Measured using human body model (per ANSI/ANSI/ESDA/JEDEC JS-001-2010), charged device model (AEC Q101-005 rev_A).

JEDEC Moisture Sensitivity

Table 6. Moisture sensitivity levels for LUXEON Altilon TopContact PnP

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

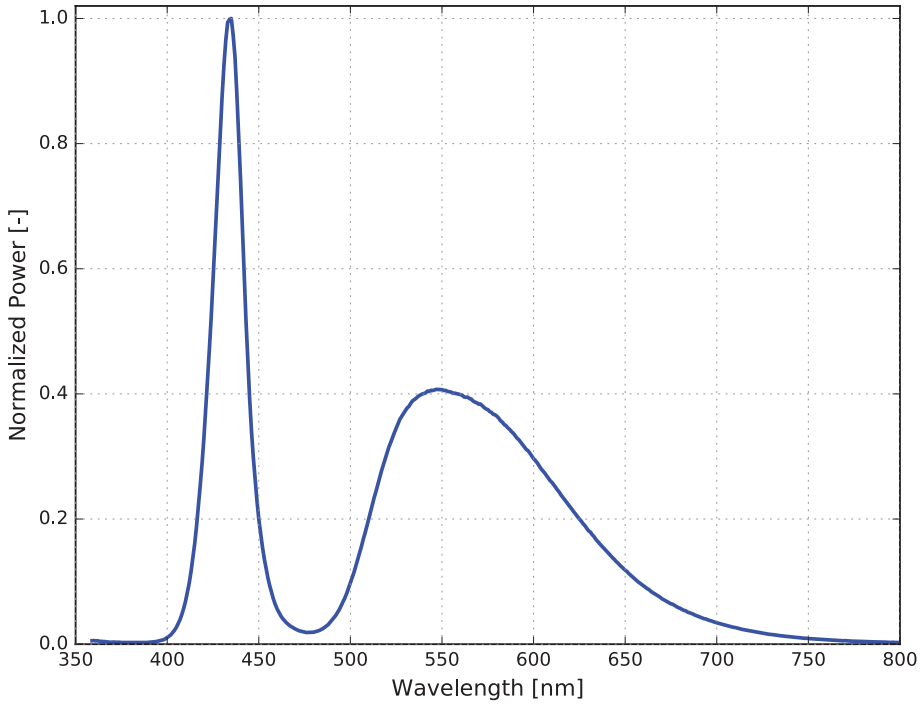

Figure 2. Typical normalized power vs. wavelength for all LUXEON Altilon TopContact PnP products at 20 ms MP, 1000 mA, 85 °C

Light Output Characteristics

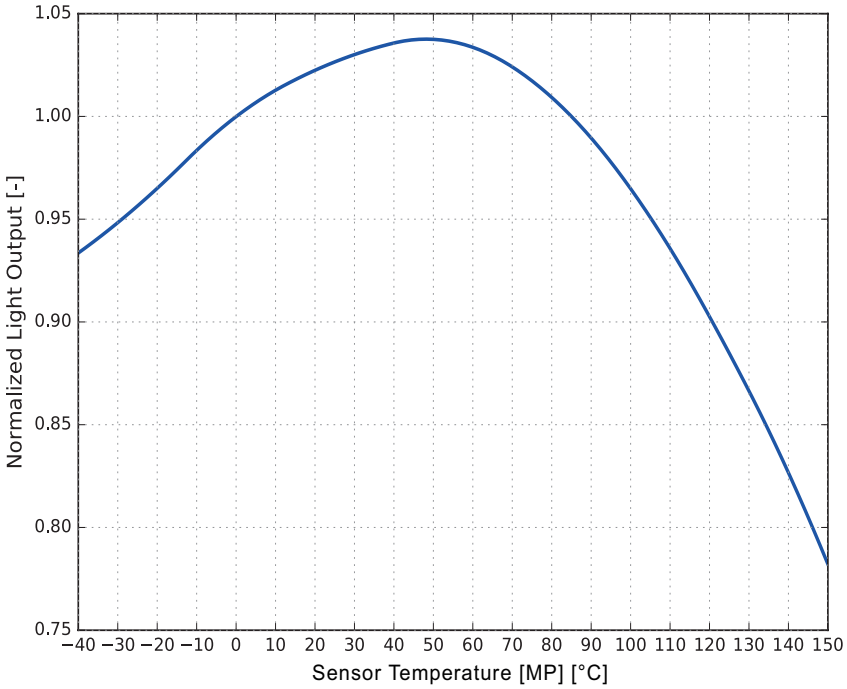

Figure 3a. Typical normalized light output vs. temperature for all LUXEON Altilon TopContact PnP products at 20 ms MP, 1000 mA

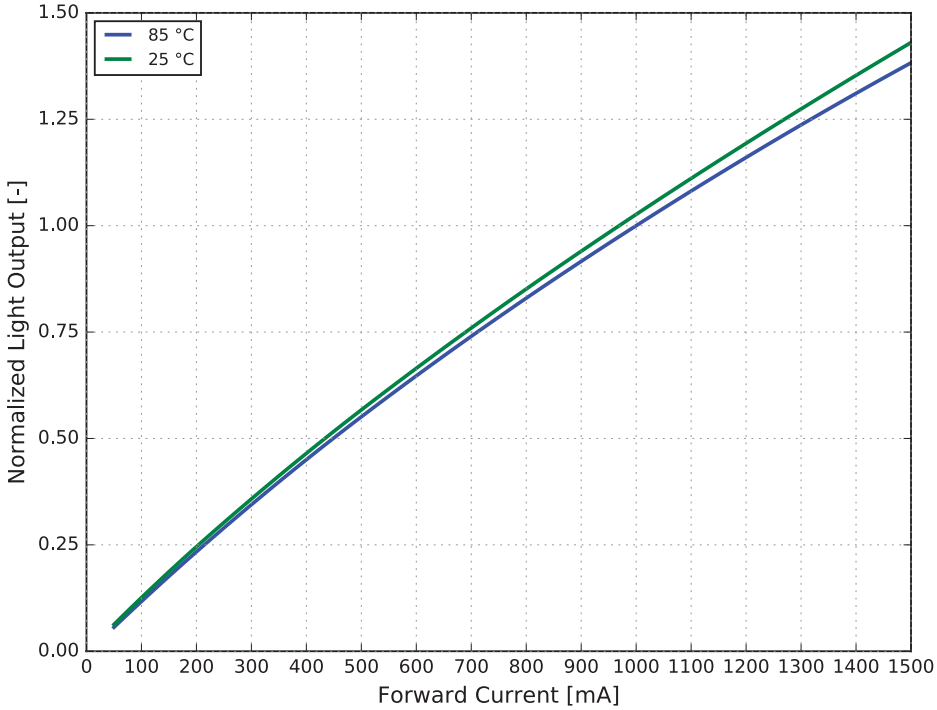

Figure 3b. Typical normalized light output vs. forward current for all LUXEON Altilon TopContact PnP products at 20 ms MP, 25 °C and 85 °C

Forward Current and Voltage Characteristics

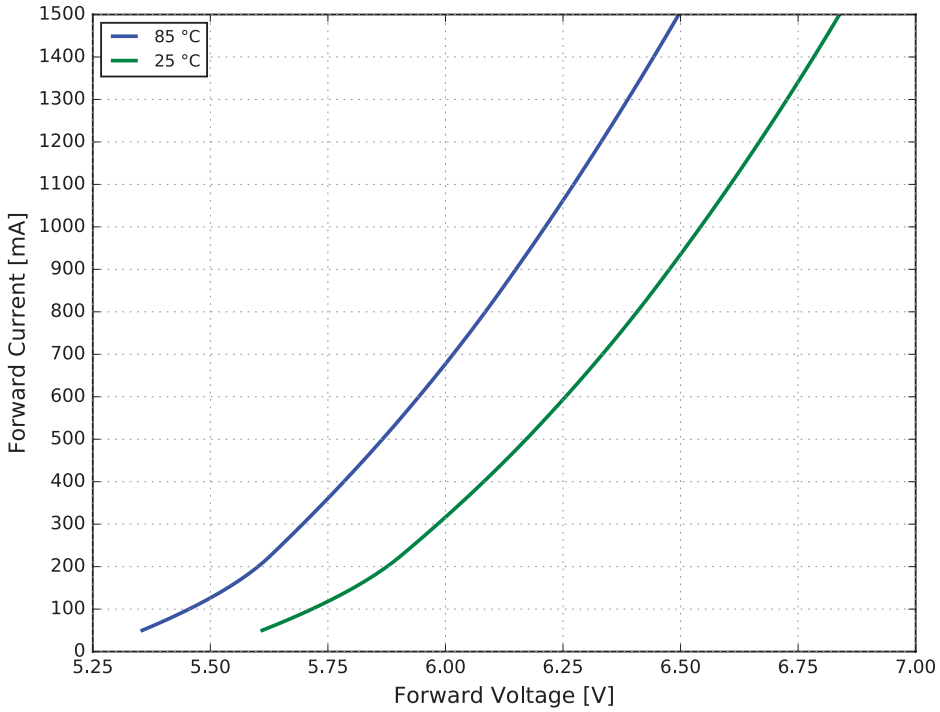

Figure 4a. Typical forward current vs. forward voltage for LUXEON Altilon TopContact PnP 1x2 at 20 ms MP, 85 °C and 25 °C

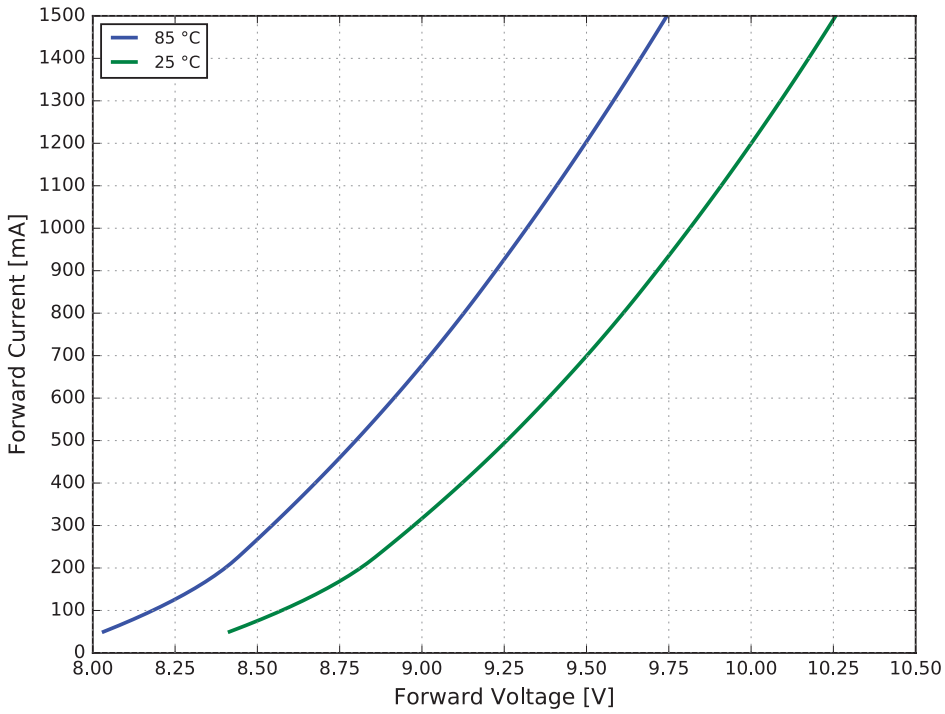

Figure 4b. Typical forward current vs. forward voltage for LUXEON Altilon TopContact PnP 1x3 at 20 ms MP, 85 °C and 25 °C

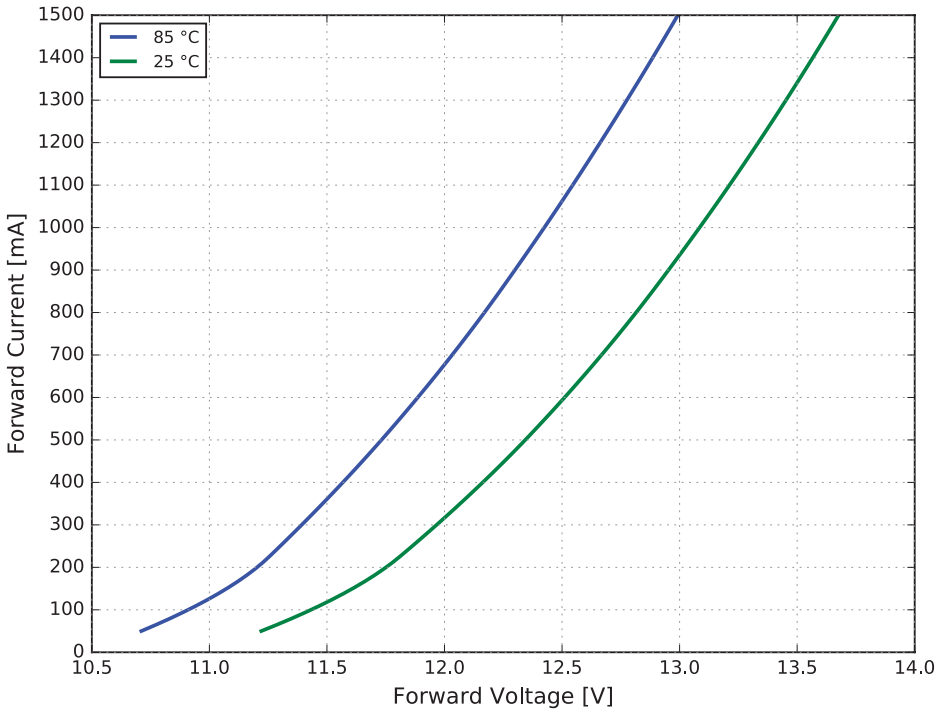

Figure 4c. Typical forward current vs. forward voltage for LUXEON Altilon TopContact PnP 1x4 at 20 ms MP, 85 °C and 25 °C

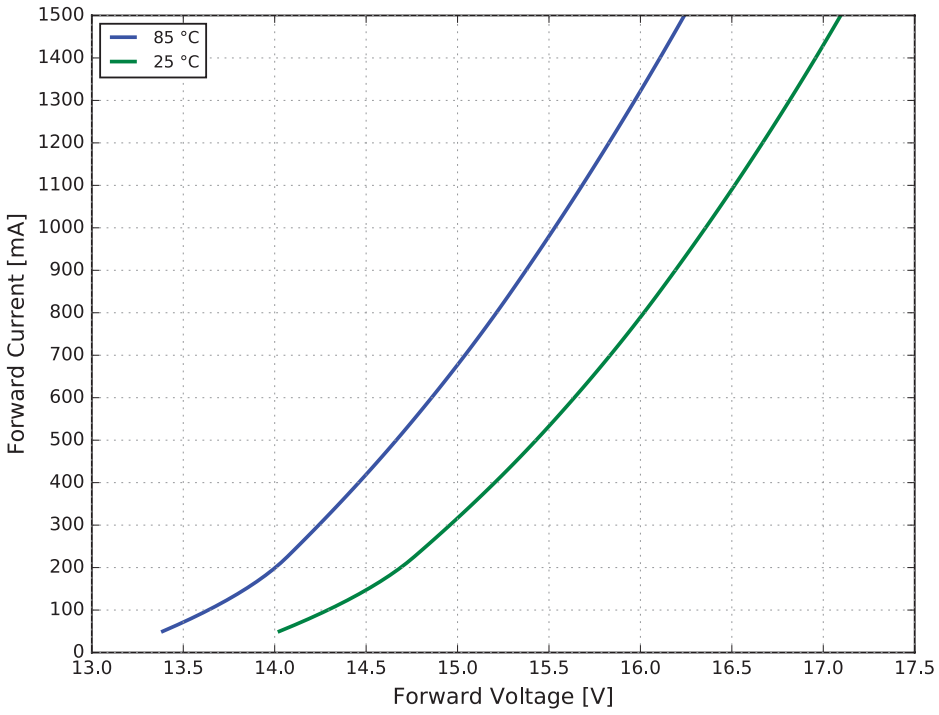

Figure 4d. Typical forward current vs. forward voltage for LUXEON Altilon TopContact PnP 1x5 at 20 ms MP, 85 °C and 25 °C

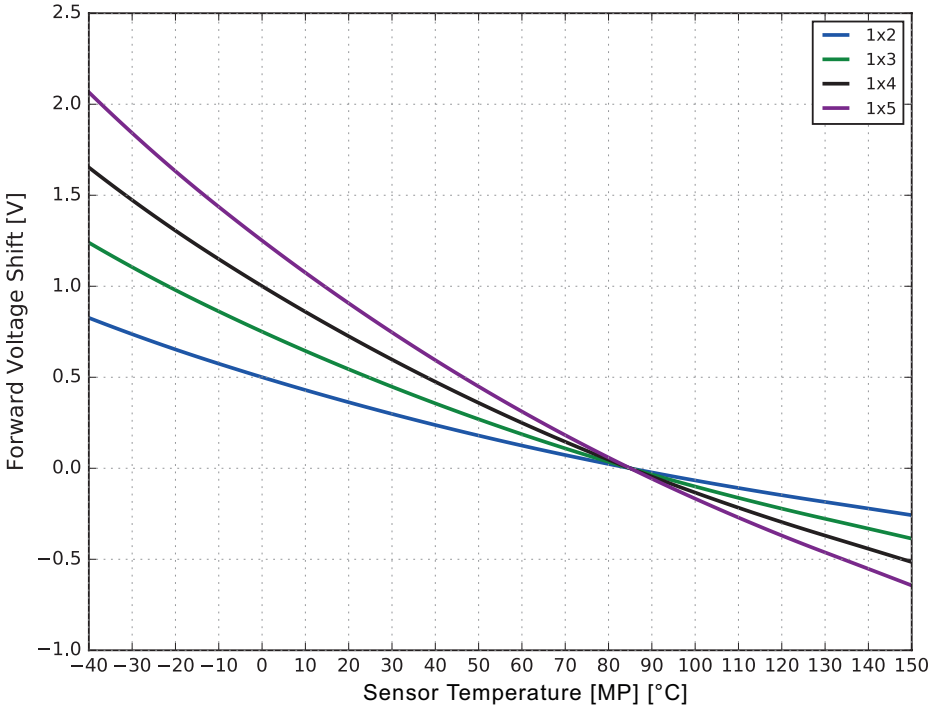

Figure 4e. Typical forward voltage shift vs. temperature for all LUXEON Altilon TopContact PnP configurations at 1000 mA, 20 ms MP

Color Shift Characteristics

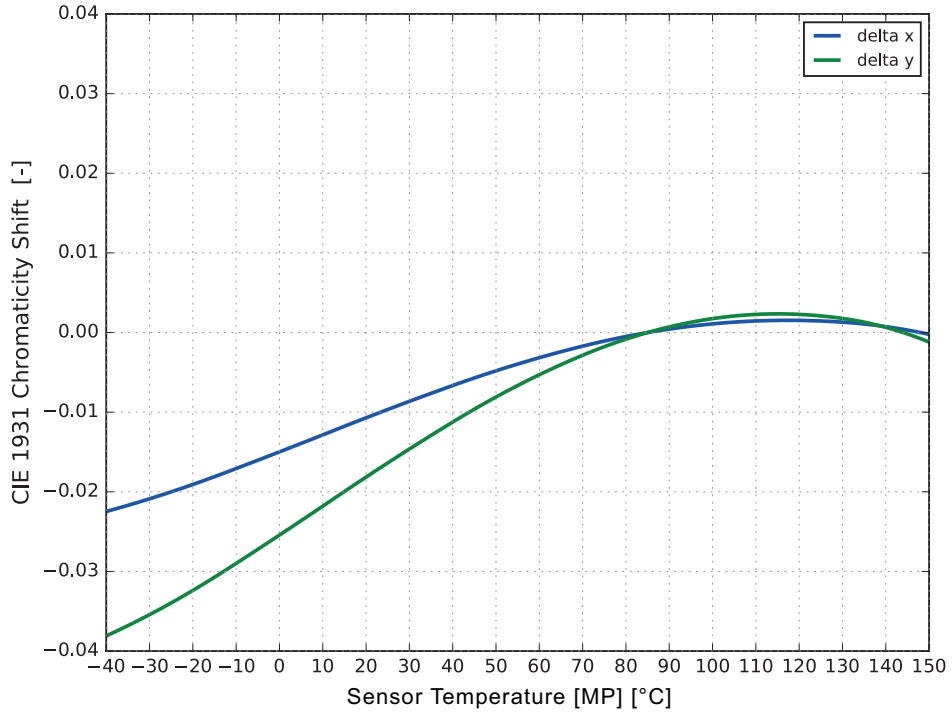

Figure 5a. Typical color shift in CIE 1931 coordinates over temperature for all LUXEON Altilon TopContact PnP products at 20 ms MP, 1000 mA

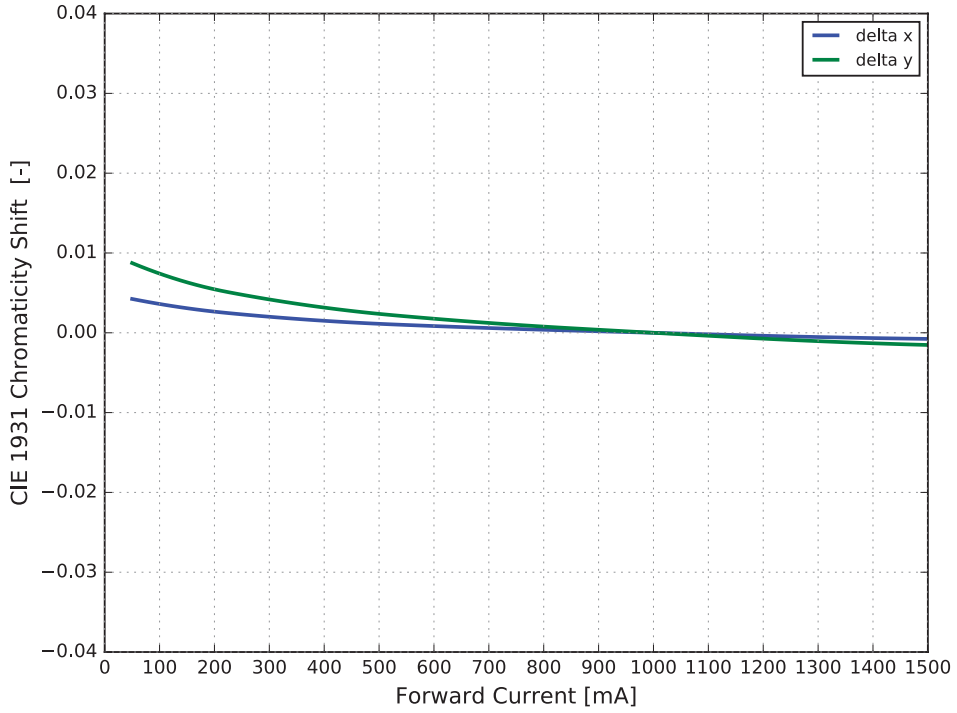

Figure 5b. Typical color shift in CIE 1931 coordinates over temperature for all LUXEON Altilon TopContact PnP products at 20 ms MP, 1000 mA

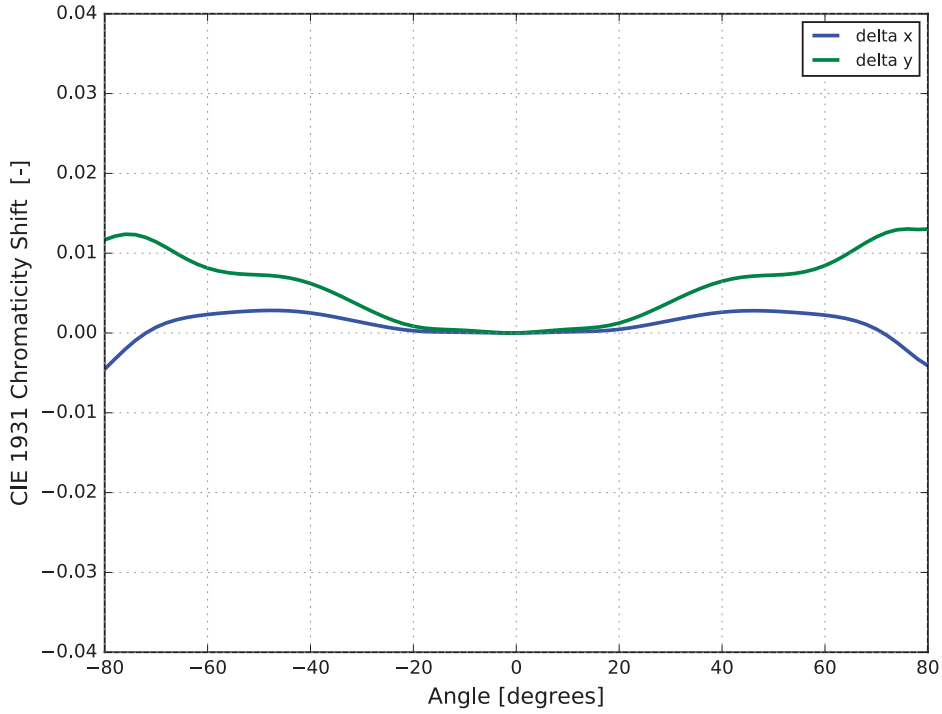

Figure 5c. Typical color shift in CIE 1931 *x*, *y* coordinates over angle for all LUXEON Altilon TopContact PnP products at 1000 mA

Radiation Pattern Characteristics

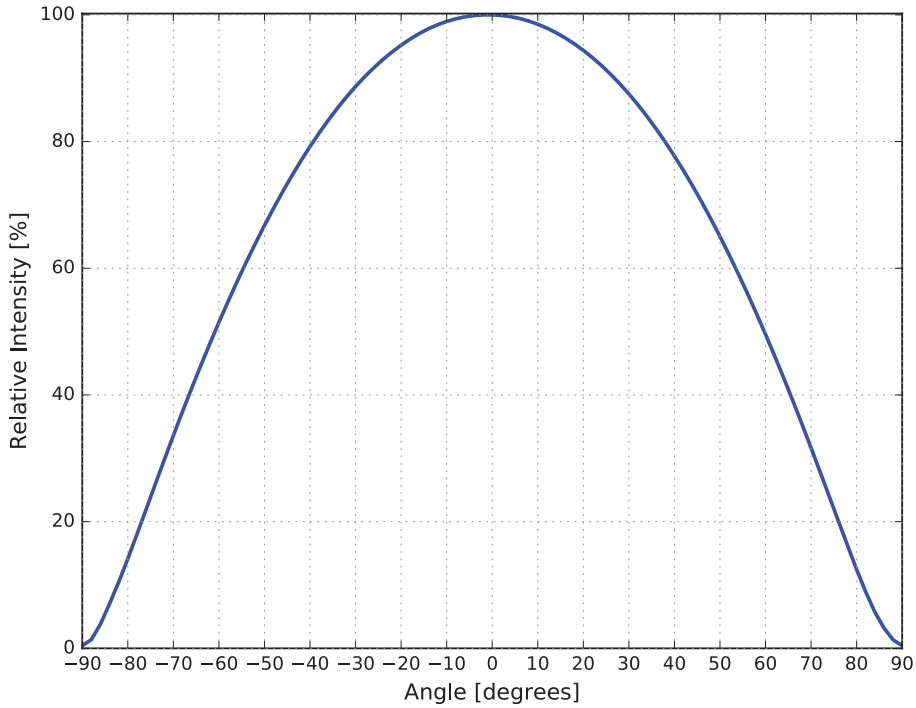

Figure 6. Typical radiation pattern for all LUXEON Altilon TopContact PnP products at 1000 mA

Operating Limits Characteristics

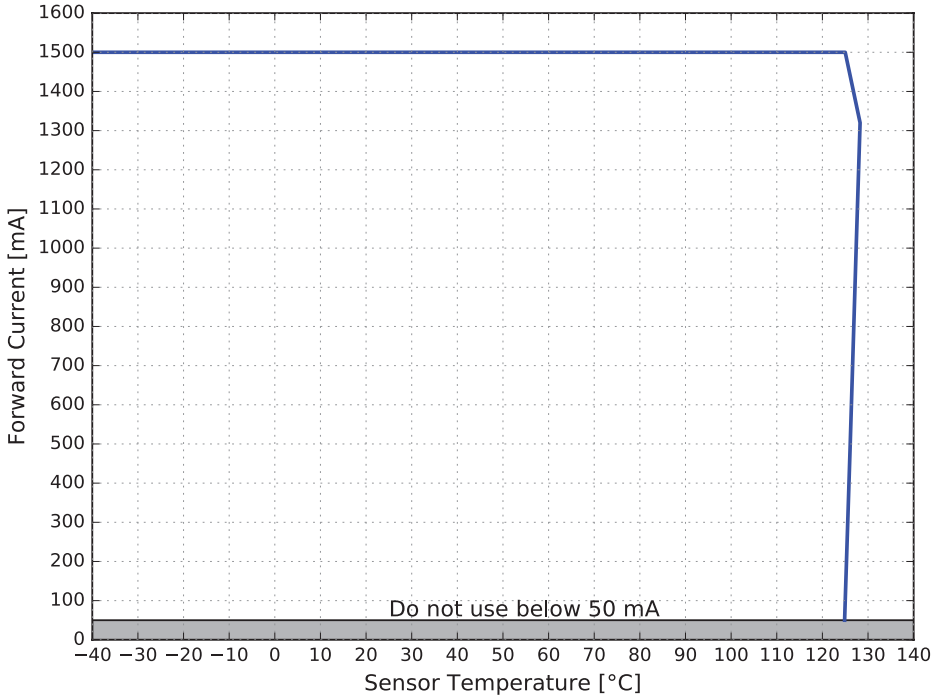

Figure 7a. Maximum forward current vs. temperature for LUXEON Altilon TopContact PnP 1x2 product

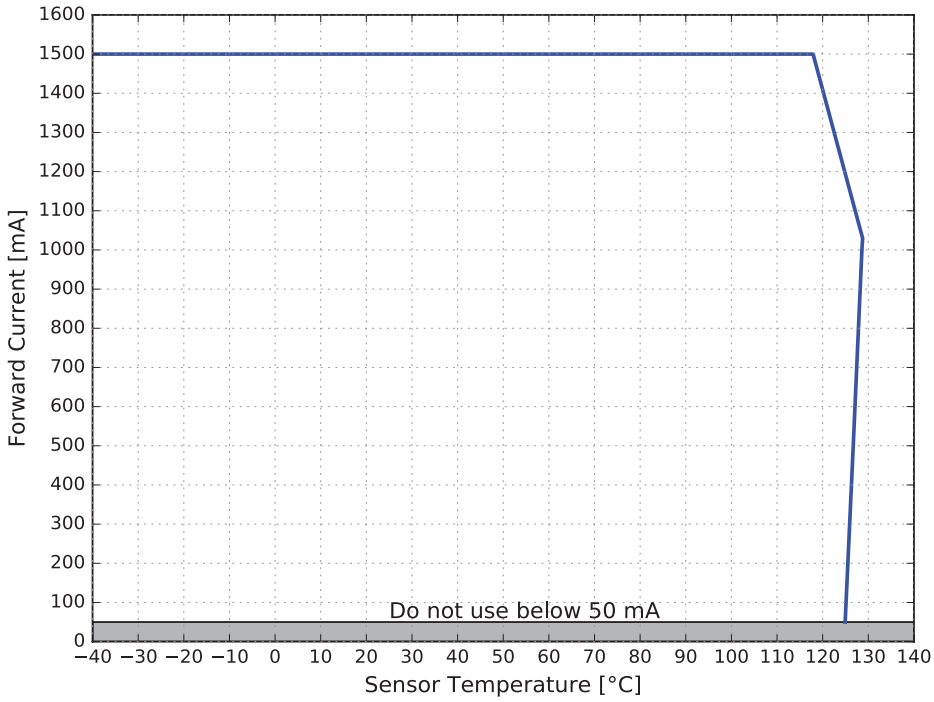

Figure 7b. Maximum forward current vs. temperature for LUXEON Altilon TopContact PnP 1x3

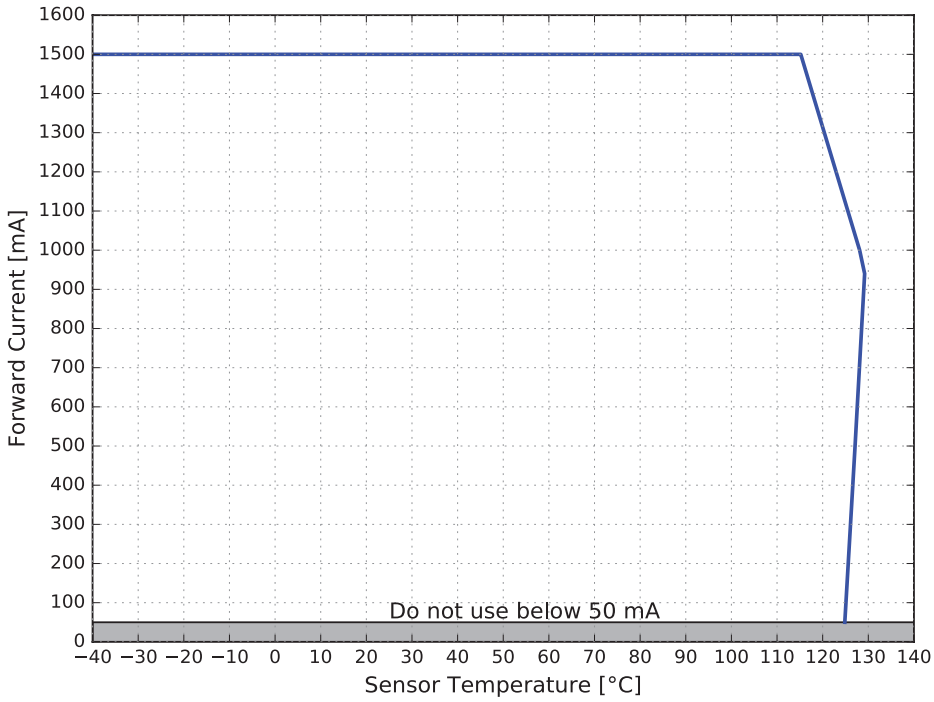

Figure 7c Maximum forward current vs. temperature for LUXEON Altilon TopContact PnP 1x4

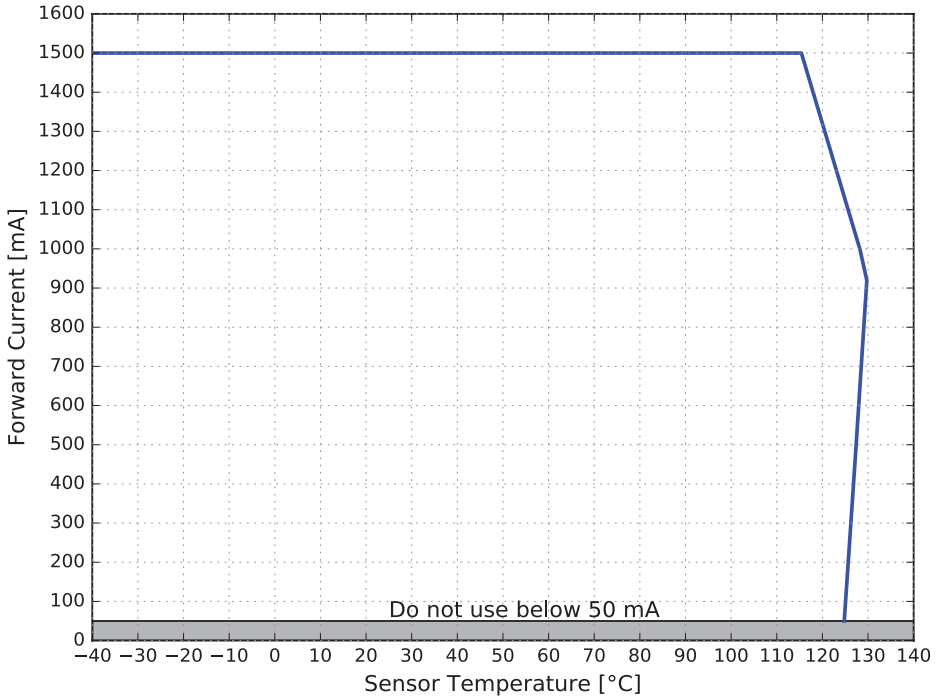

Figure 7d. Maximum forward current vs. temperature for LUXEON Altilon TopContact PnP 1x5

Permissible Pulse Handling Characteristics

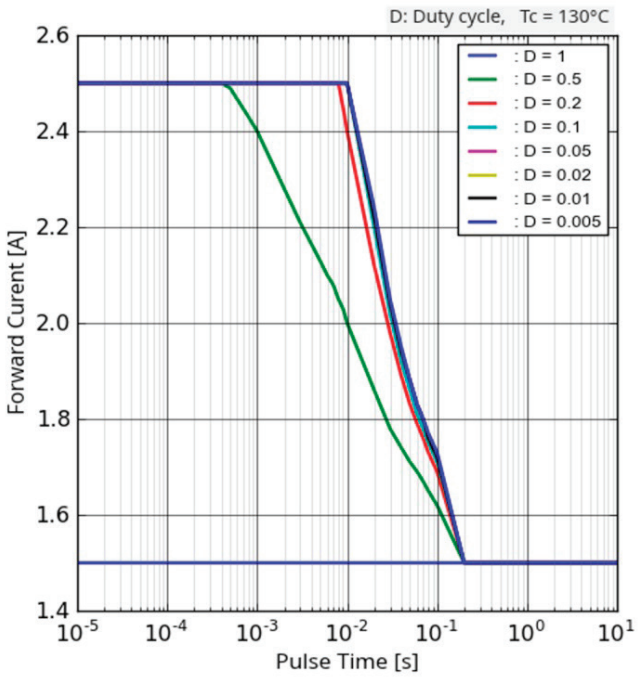

Figure 8. Permissible pulse handling capability for LUXEON Altilon TopContact PnP

Product Bin and Labeling Definitions

Designing with LUXEON Altilon TopContact PnP

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, color and forward voltage.

LUXEON Altilon TopContact PnP 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: P = 370 to 380 lumens) per die
- **B C** – designates color bin (example: 1D, 2C, 3B, 4A)
- **D** – designates forward voltage bin (example: B = 16.00 V to 17.50 V)

Therefore, a LUXEON Altilon TopContact PnP with a lumen range of 1850 to 1900, color bin of 2C, and a forward voltage range of 16.00 V to 17.50 V has the following CAT code:

P 2 C B

Luminous Flux Bins

Table 7 lists the standard luminous flux bins for LUXEON Altilon TopContact PnP emitters. To obtain the flux of the product this number needs to be multiplied with the chip count. 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 7. Luminous flux bin definitions for LUXEON Altilon TopContact PnP at 1000 mA, 20 ms MP, T_c = 85 °C

BIN	LUMINOUS FLUX [1] (lm) PER DIE	
	MINIMUM	MAXIMUM
L	330	340
M	340	350
N	350	360

Notes for Table 7:
1. Lumileds maintains a tolerance of ±6.5% on luminous flux measurements.

Color Bin Structure

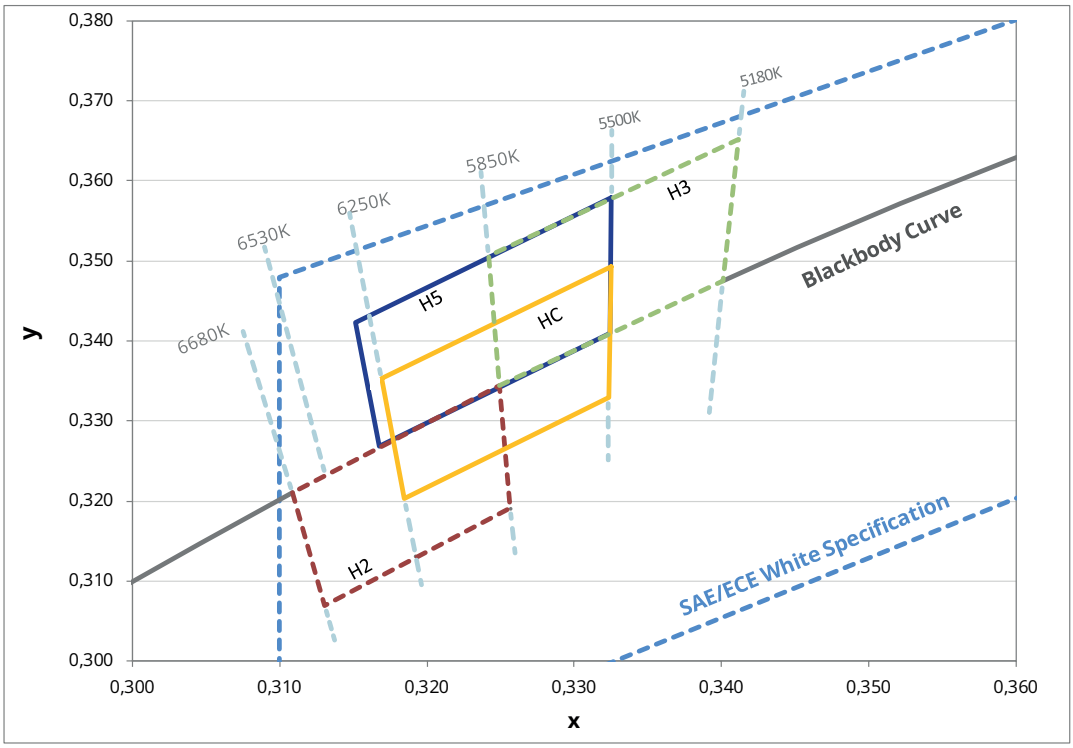

Figure 9. Color bin structure in CIE 1931 color space for LUXEON Altilon TopContact PnP

Notes for Figure 9:
1. Lumileds supports the following bins for LUXEON Atlilon TopContact PnP: H2, H3, HC, H5

Color Codes

Table 8a. Color code definitions for LUXEON Altilon TopContact PnP

BIN	*x* [1, 2]	*y* [1, 2]	TYPICAL CCT (K)
HC	0.3325	0.3493	5850
	0.3169	0.3353	
	0.3185	0.3203	
	0.3323	0.3329	
H5	0.3325	0.3579	5900
	0.3151	0.3423	
	0.3168	0.3268	
	0.3324	0.3410	
H2	0.3109	0.3211	6250
	0.3131	0.3070	
	0.3256	0.3191	
	0.3249	0.3344	
H3	0.3249	0.3344	5500
	0.3401	0.3476	
	0.3412	0.3652	
	0.3242	0.3506	

Table 8b. Optional color bin definitions for LUXEON Altilon TopContact PnP

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	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	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	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	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	
1E	0.3169	0.3353	5970	1F	0.3208	0.3388	5780
	0.3285	0.3458			0.3325	0.3493	
	0.3288	0.3298			0.3323	0.3329	
	0.3185	0.3203			0.3219	0.3234	

Notes for Table 7b:
1. LUXEON Altilon emitters are tested and binned by x and y coordinates.
2. Lumileds maintains a tester tolerance of ±0.005 on x and y coordinates.

Forward Voltage Bins

Table 9. Forward voltage bin definitions for LUXEON Altilon TopContact PnP at 20 ms MP, 1000 mA, T_c = 85 °C

BIN	1x2		1x3		1x4		1x5	
	MINIMUM	MAXIMUM	MINIMUM	MAXIMUM	MINIMUM	MAXIMUM	MINIMUM	MAXIMUM
A	5.8	6.4	8.7	9.6	11.6	12.8	14.5	16.0
B	6.4	7.0	9.6	10.5	12.8	14.0	16.0	17.5
C	7.0	7.6	10.5	11.4	14.0	15.2	17.5	19.0

Notes for Table 9:
1. Lumileds maintains a tolerance of ±0.06 V 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

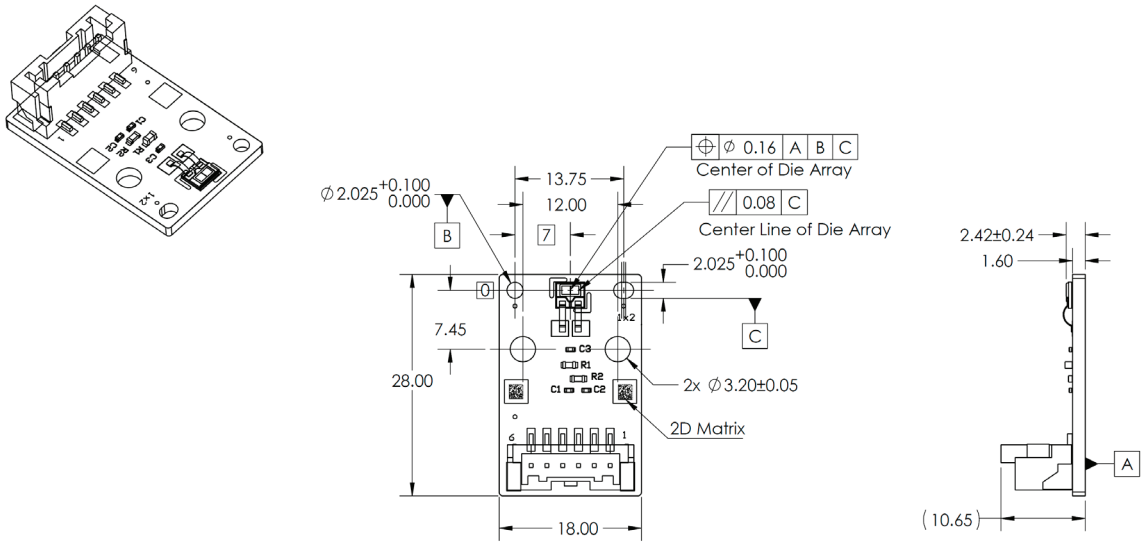

Figure 10a. Mechanical dimensions for LUXEON Altilon TopContact PnP 1x2

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

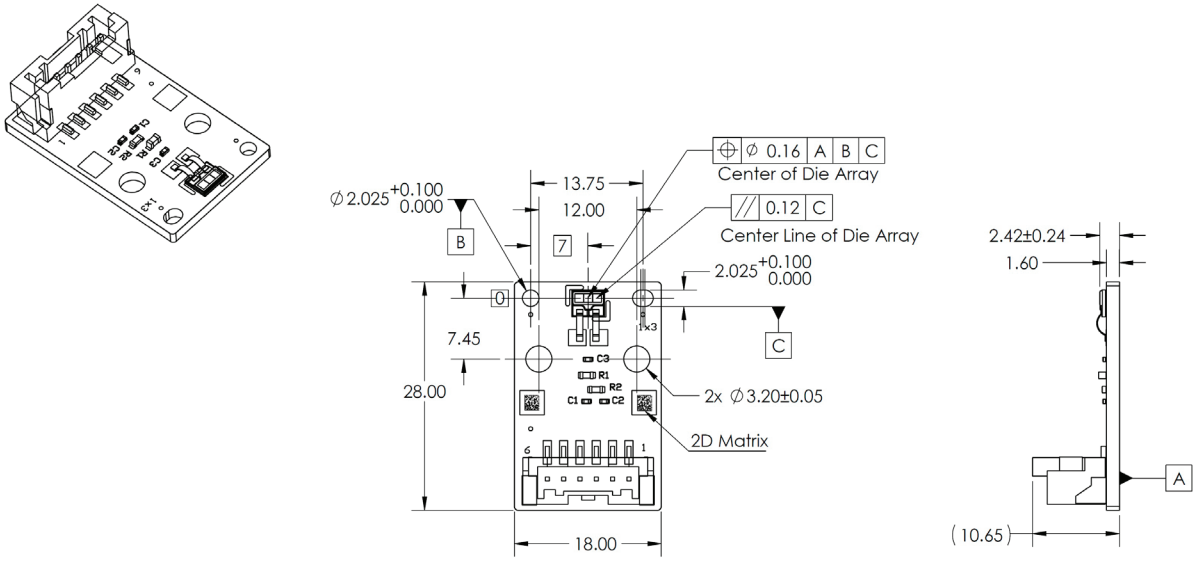

Figure 10b. Mechanical dimensions for LUXEON Altilon TopContact PnP 1x3

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

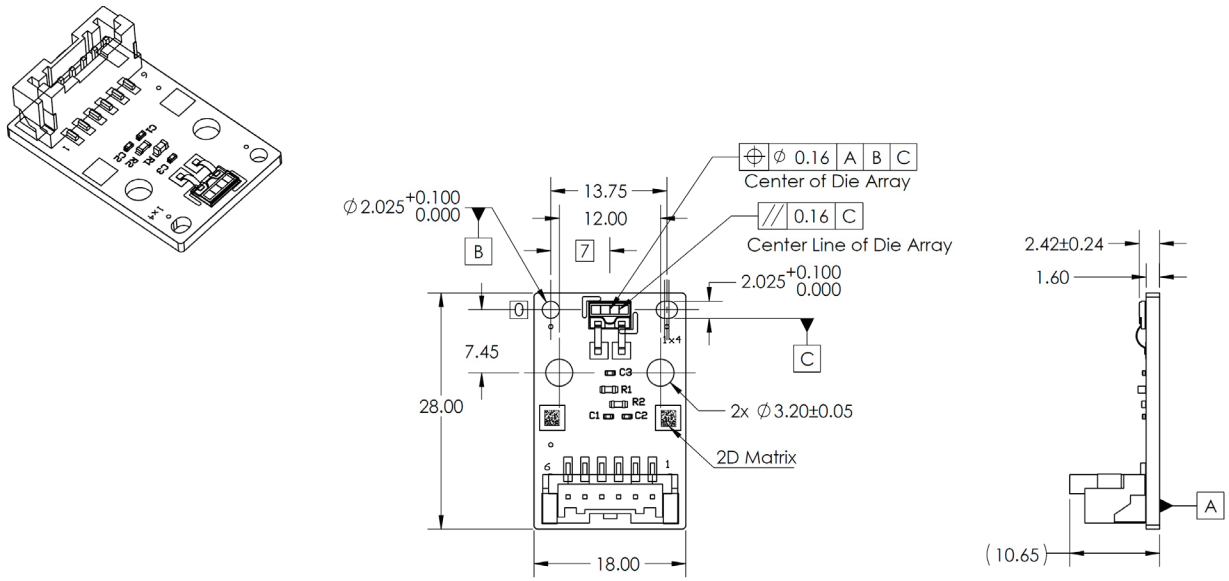

Figure 10c. Mechanical dimensions for LUXEON Altilon TopContact PnP 1x4

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

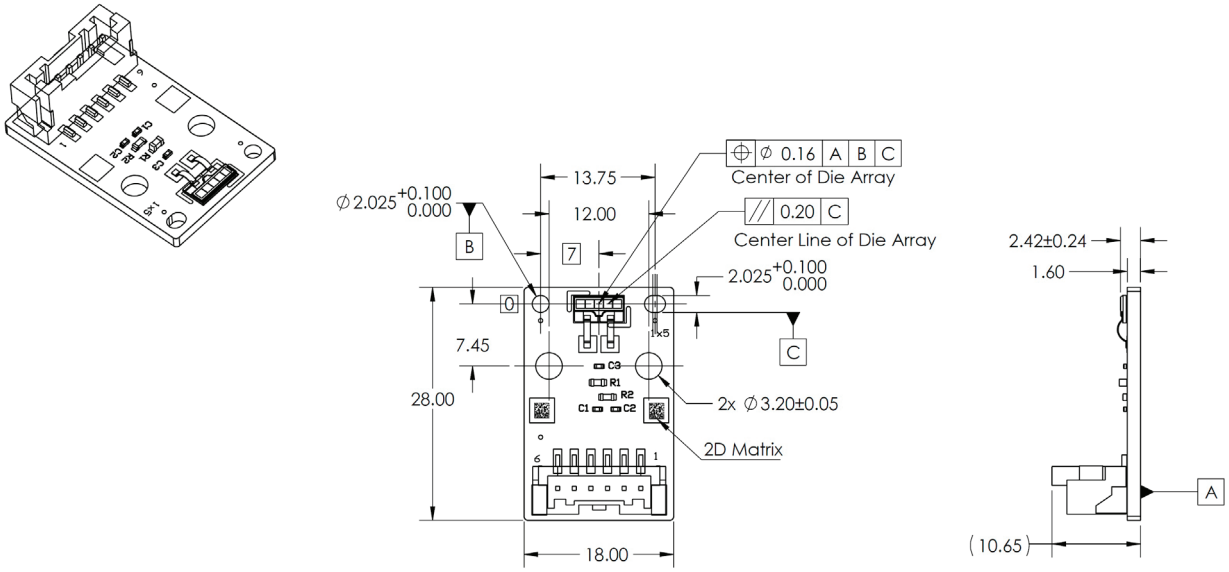

Figure 10d. Mechanical dimensions for LUXEON Altilon TopContact PnP 1x5

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

Packaging Information

Tray Dimensions

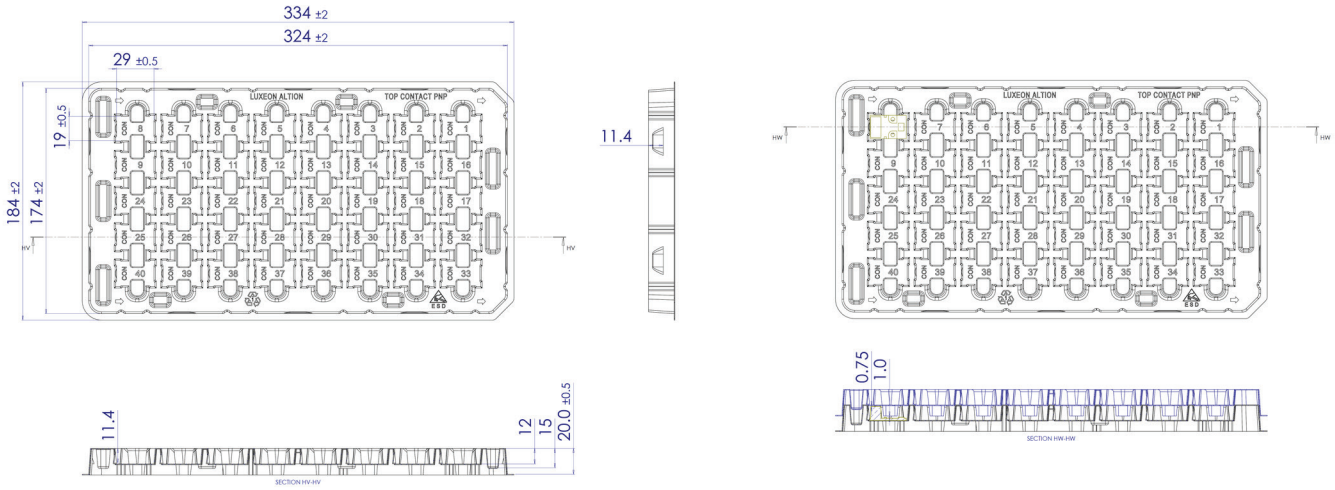

Figure 11. Tray dimensions for LUXEON Altilon TopContact PnP

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

Product Labeling

LUXEON Altilon TopContact 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.

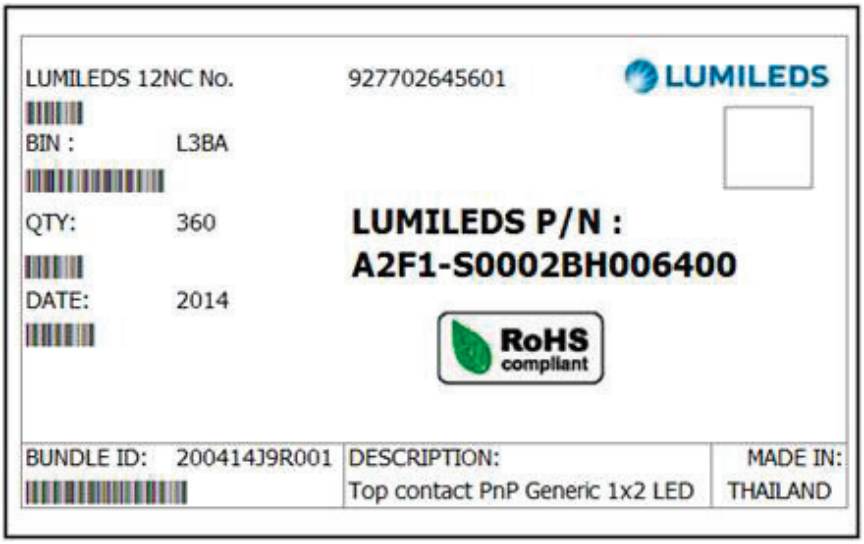

Figure 13. Example of a product label for LUXEON Altilon TopContact PnP

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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