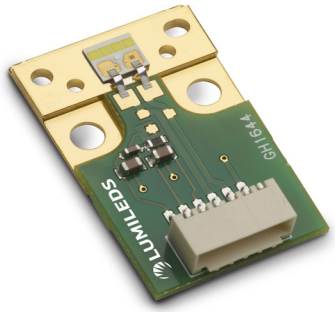
LUMILEDS

AUTOMOTIVE

LUXEON Altilon H1K PnP

Integrated functionality for headlight solutions



LUXEON Altilon H1K PnP is a fully integrated solution optimized for headlight applications, meeting both SAE and ECE color specifications. This solution minimizes time to market and simplifies supply chain by reducing optical and mechanical design efforts with electrical connectors. Combined with LUXEON Altilon LEDs, LUXEON Altilon H1K PnP provides the same powerful performance guaranteed by LUXEON LEDs.

FEATURES AND BENEFITS

- Easy plug and play design for a reduction in design costs
- Industry's lowest thermal resistance enables smaller heatsinks for smaller designs
- Customizable interface, available with connector, flux bin resistor and thermistor
- Available in 1x4 and 1x5 configuration
- IEC-60810 qualified and PPAP documentation available

PRIMARY APPLICATIONS

- Adaptive Lighting
- Front Fog
- Headlight

Table of Contents

General Product Information

Product Test Conditions

LUXEON Altilon H1K PnP LEDs are tested and binned using a 20ms monopulse (MP) at 1000mA drive current at a case temperature, T_c, of 85°C.

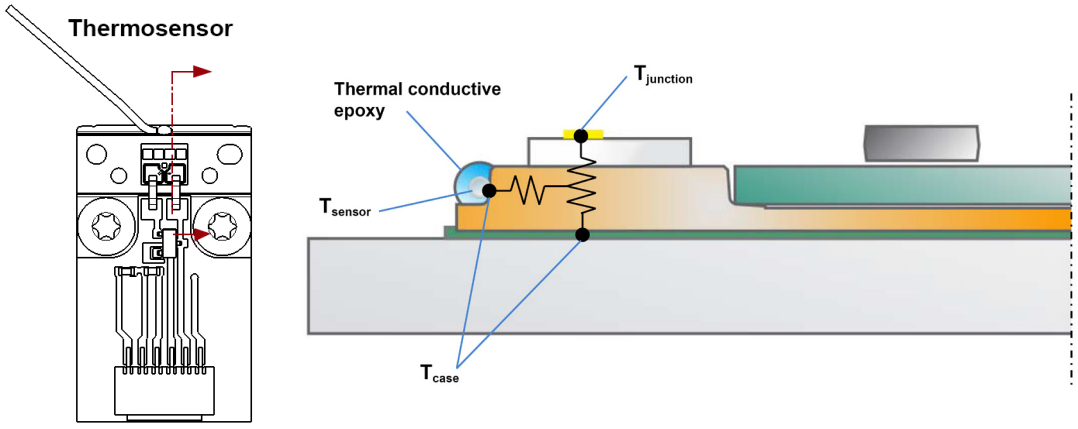


Figure 1. Typical case temperature measurement location for LUXEON Altilon H1K PnP.

Part Number Nomenclature

Part numbers for LUXEON Altilon H1K PnP follow the convention below:

L A P H – **M A B** – **C C C C**

Where:

M	–	designates future product offerings
A	–	designates number of chips (4 or 5)
B	–	designates number of pins in connector
C C C C	–	designates minimum flux bin

Therefore, the following part number is used for a LUXEON Altilon H1K PnP 1x4 with a 6-pin connector and a minimum luminous flux of 1107 lumens:

L A P H – **M 4 6** – **1 1 0 7**

Environmental Compliance

Lumileds LLC is committed to providing environmentally friendly products to the solid-state lighting market. LUXEON Altilon H1K 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 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 H1K PnP at 20ms MP, 1000mA, T_c= 85°C.

MINIMUM LUMINOUS FLUX [1] (lm)	FORM FACTOR	PART NUMBER [2]
1107	1x4	LAPH-M46-1107
1145	1x4	LAPH-M46-1145
1183	1x4	LAPH-M46-1183
1221	1x4	LAPH-M46-1221
1412	1x5	LAPH-M56-1412
1450	1x5	LAPH-M56-1450
1489	1x5	LAPH-M56-1489
1527	1x5	LAPH-M56-1527

Notes for Table 1:
1. Lumileds maintains a tolerance of ±10% on luminous flux measurements.
2. Each part number includes up to 4 luminous flux bins.

Optical Characteristics

Table 2. Typical optical characteristics for LUXEON Altilon H1K PnP at 20ms MP, 1000mA, T_c= 85°C.

PART NUMBER	CORRELATED COLOR TEMPERATURE (CCT)		TYPICAL TOTAL INCLUDED ANGLE [1] $\theta_{0.90V}$	TYPICAL VIEWING ANGLE [2] $2\theta_{1/2}$
	MINIMUM	MAXIMUM		
LAPH-Mxx-xxxx	5500K	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. Typical electrical and thermal characteristics for LUXEON Altilon H1K PnP at 20ms MP, 1000mA, T_c= 85°C.

PART NUMBER	FORWARD VOLTAGE [1] (V_f)		MINIMUM V_f at 1500mA 130°C [2] (V)	MAXIMUM V_f at 1500mA -40°C [3] (V)	ELECTRICAL THERMAL RESISTANCE—JUNCTION TO CASE [4] (K/W)		REAL THERMAL RESISTANCE—JUNCTION TO CASE [5] (K/W)	
	MINIMUM	MAXIMUM			TYPICAL	MAXIMUM	TYPICAL	MAXIMUM
LAPH-M4x-xxxx	11.10	13.60	12.4	16.2	1.0	1.3	1.4	1.8
LAPH-M5x-xxxx	13.90	17.00	15.5	20.2	0.8	1.1	1.1	1.5

Notes for Table 3:
3. Lumileds maintains a tolerance of ±0.06V on forward voltage measurements.
4. Product minimum V_f at 1500mA operation, T_c 130°C after 1,000 hours of operation at rated conditions.
5. Product maximum V_f at 1500mA operation, T_c -40°C after 1,000 hours of operation at rated conditions.
6. $R_{th\ j\text{-}c\ el}$: Electrical thermal resistance (junction to case).
7. $R_{th\ j\text{-}c\ real}$: Real thermal resistance (junction to case) with wall plug efficiency included (reference JESD51-51, JESD51-14, 4.1.3).
8. Dynamic resistance is the inverse of the slope in linear forward voltage model for LEDs.
9. Measured between 80°C and 90°C at binning current.

Absolute Ratings

Table 4. Absolute ratings for LUXEON Altilon H1K PnP.

PARAMETER	PERFORMANCE
Minimum DC Forward Current	100mA
Maximum DC Forward Current	1500mA
Peak Pulsed Forward Current [3]	2000mA
Maximum Transient Peak Current	2000mA for ≤10ms
Maximum AC Ripple [2]	50mA rms at ≥10kHs
LED Junction Temperature	-40 to 150°C
Maximum Junction Temperature for Short Time Applications (1500mA) [1]	175°C
Maximum Operating Case Temperature at Test Current [1]	130°C
Maximum Operating Case Temperature at Maximum Current [1]	130°C
LED Storage Temperature	130°C
ESD Sensitivity [4]	±8kV HBM, ±400V MM, ±2kV CDM
Reverse Voltage ($V_{reverse}$)	LUXEON 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 allowable. LUXEON Altilon H1K PnP LEDs driven at or above maximum LED case temperature may have a shorter lifetime.
2. Residual periodic variations due to power conversion from alternating current (AC) to direct current (DC), also called "ripple," are acceptable if the following conditions are met:
   - The frequency of the ripple current is 100Hz or higher
   - The average current for each cycle does not exceed the maximum allowable DC forward current
   - The maximum amplitude of the ripple does not exceed 15% of the maximum allowable DC forward current
3. A 10% duty cycle with pulse width of 10ms.
4. 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 Altilon H1K 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

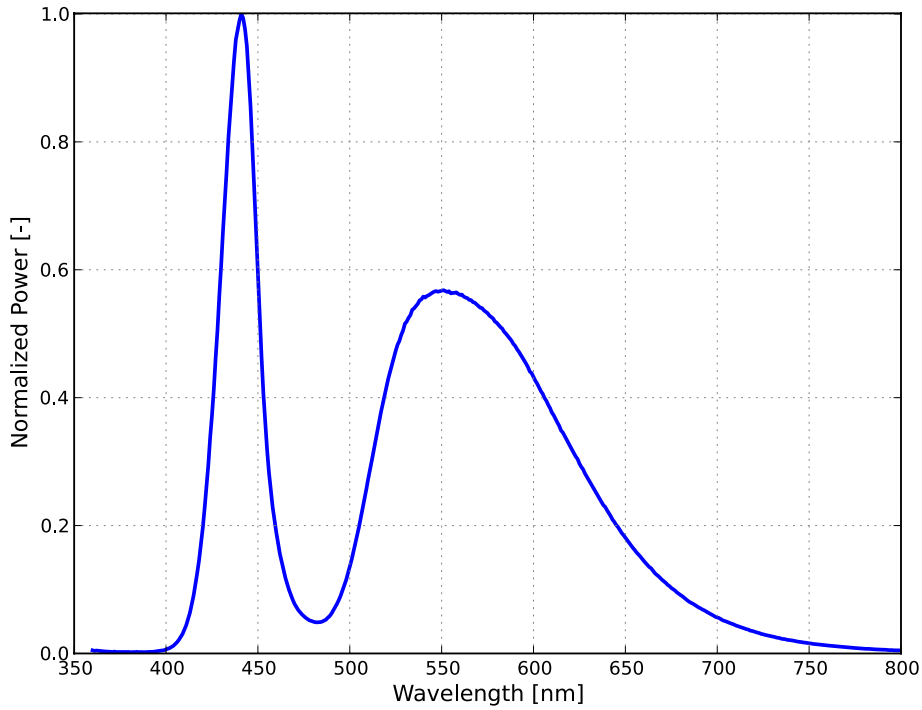


Figure 2. Typical normalized power vs. wavelength for LUXEON Altilon H1K PnP at 20ms MP, 1000mA, T_C=85°C.

Light Output Characteristics

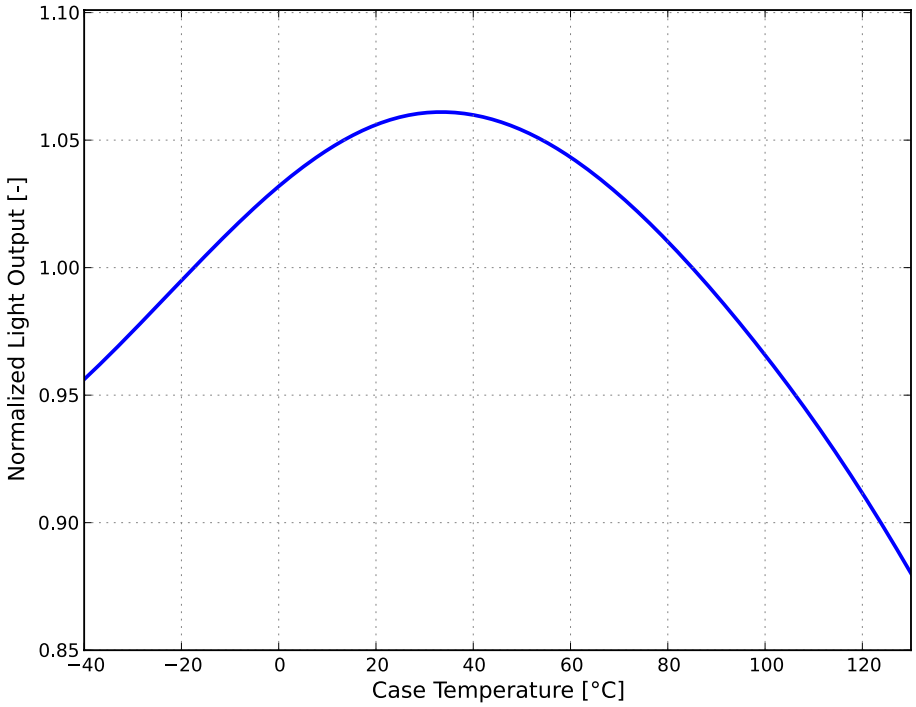


Figure 3a. Typical normalized light output vs. case temperature for LUXEON Altilon H1K PnP at 20ms MP, 1000mA.

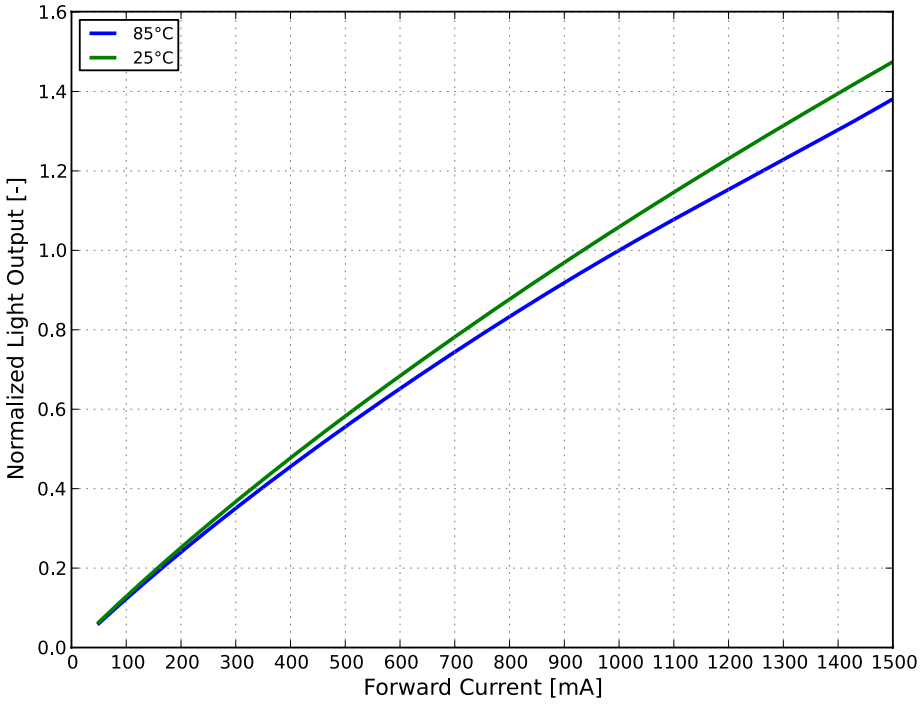


Figure 3b. Typical normalized light output vs. forward current for LUXEON Altilon H1K PnP at T_c=85°C.

Forward Current and Voltage Characteristics

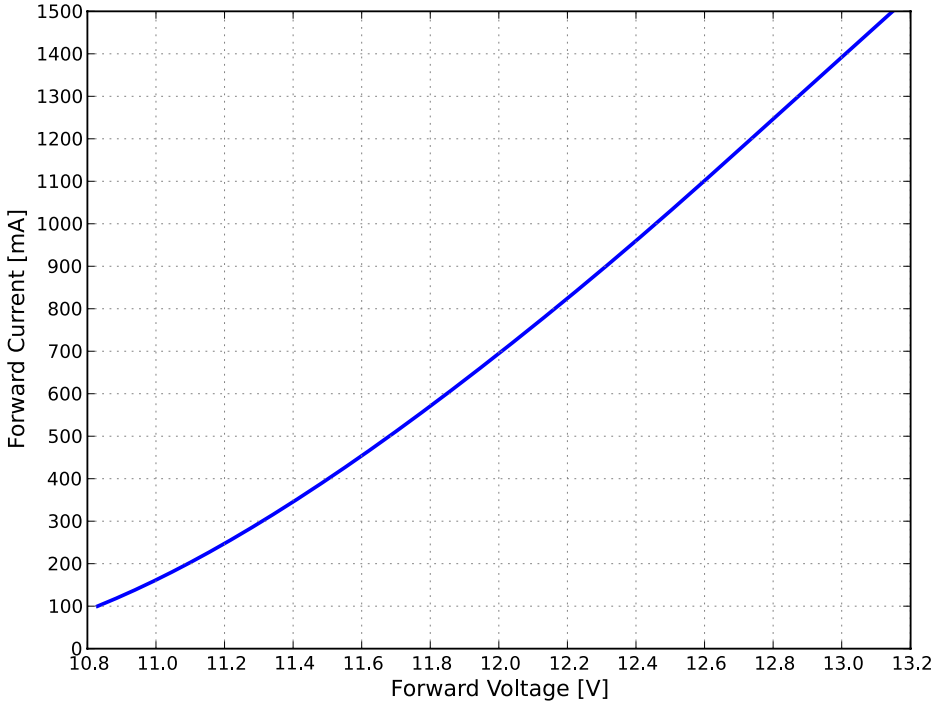


Figure 4a. Typical forward current vs. forward voltage for LUXEON Altilon H1K PnP 1x4 at T_c=85°C.

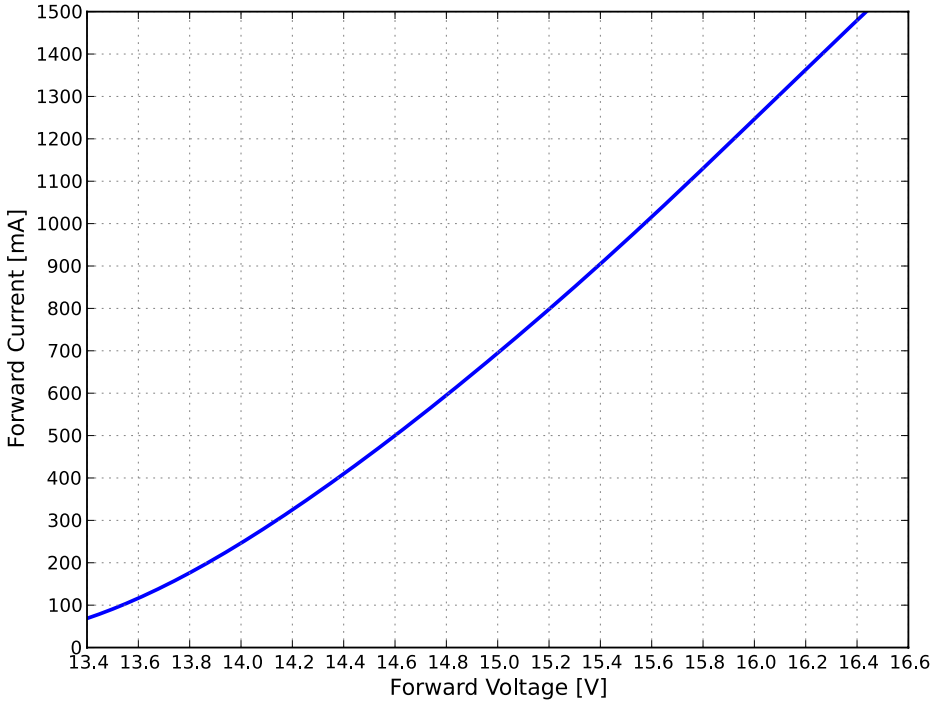


Figure 4b. Typical forward current vs. forward voltage for LUXEON Altilon H1K PnP 1x5 at T_C=85°C.

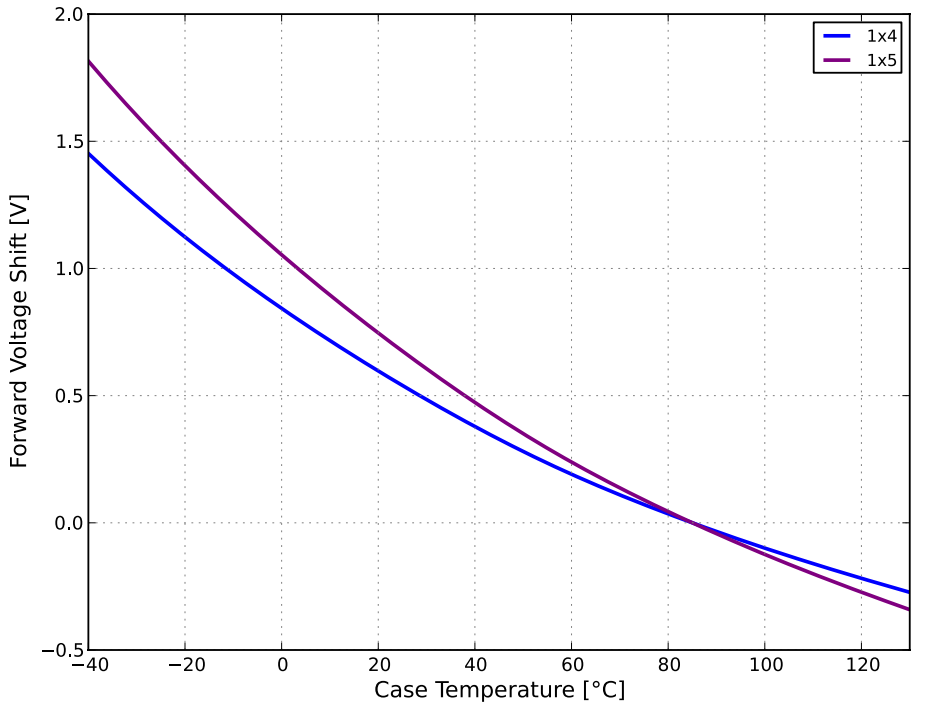


Figure 4c. Typical forward voltage vs. case temperature for LUXEON Altilon H1K PnP at 20ms MP, 1000mA, T_C=85°C.

Color Shift Characteristics

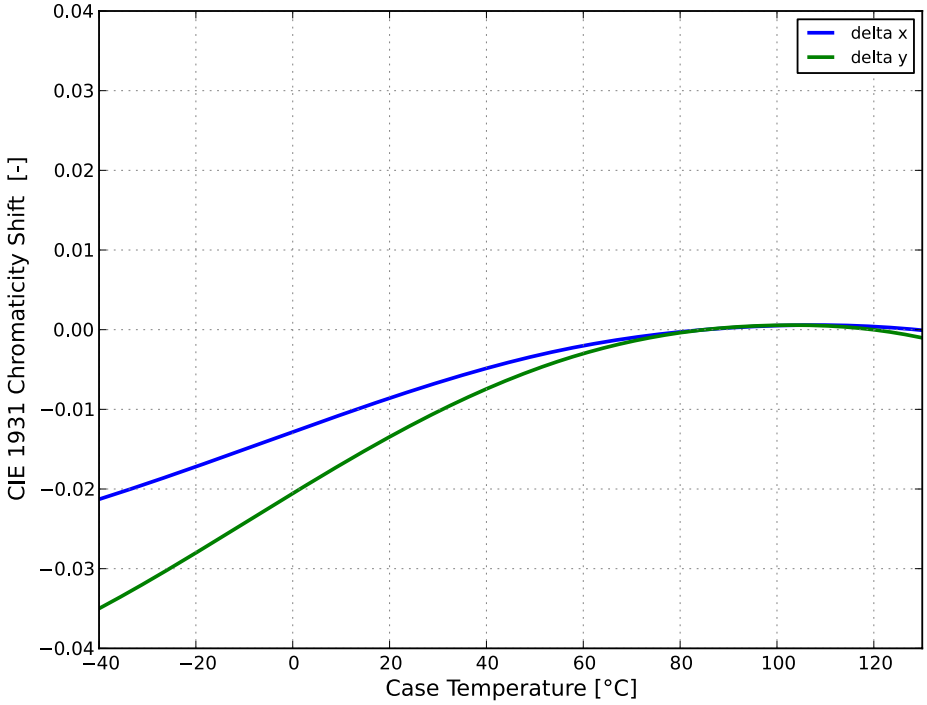


Figure 5a. Typical color shift in CIE 1931 x and y coordinates for LUXEON Altilon H1K PnP at 20ms MP, 1000mA.

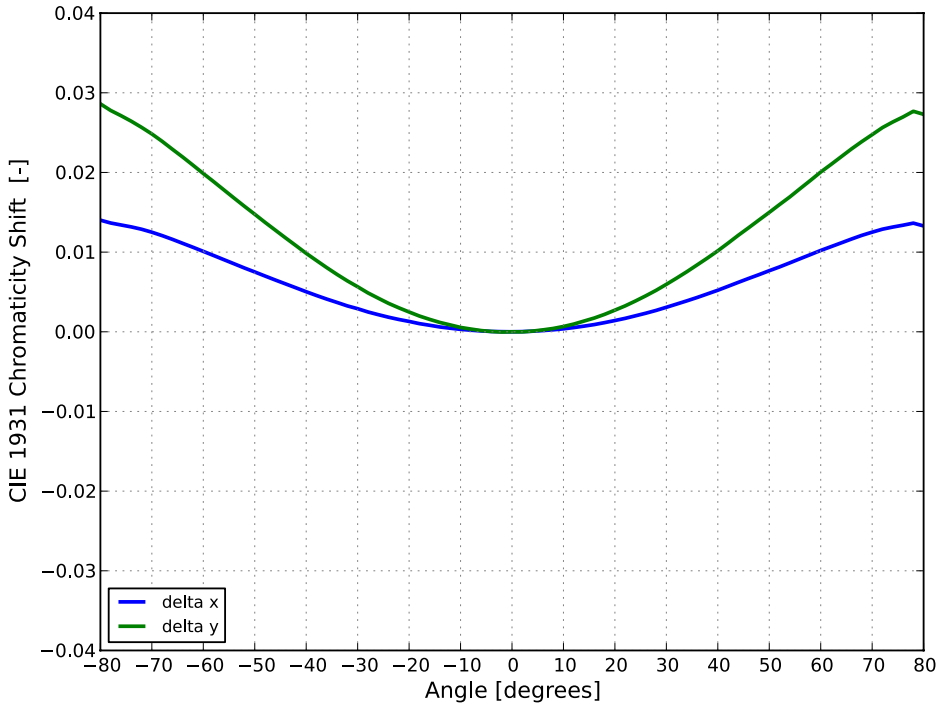


Figure 5b. Typical color shift in CIE 1931 x and y coordinates over angle for LUXEON Altilon H1K PnP at 20ms MP, 1000mA.

Radiation Pattern Characteristics

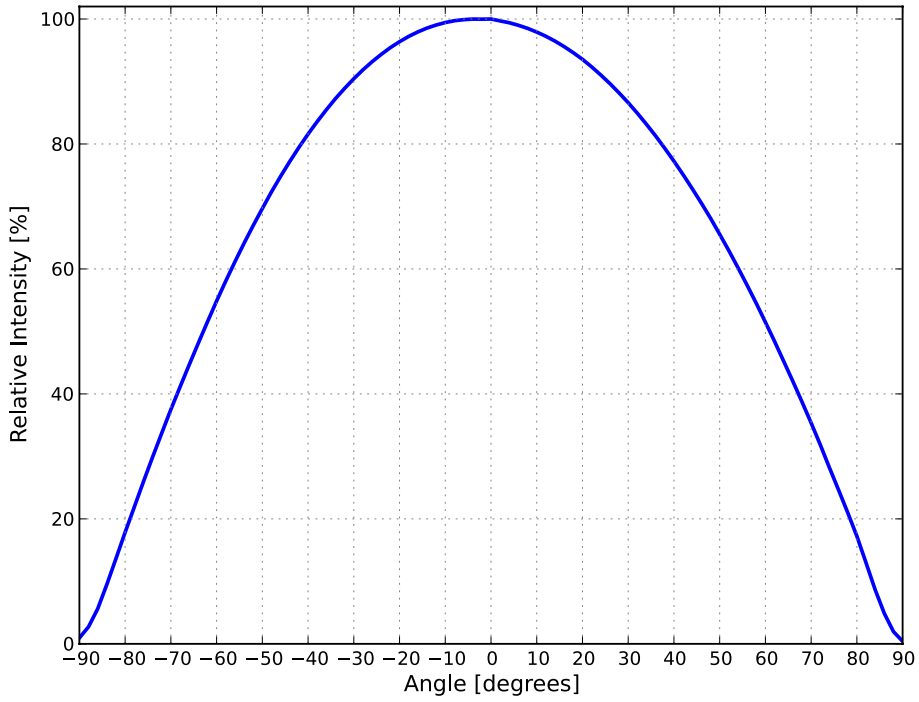


Figure 6. Typical radiation pattern for LUXEON Altilon H1K PnP at 20ms MP, 1000mA, T_c=85°C.

Operating Limits Characteristics

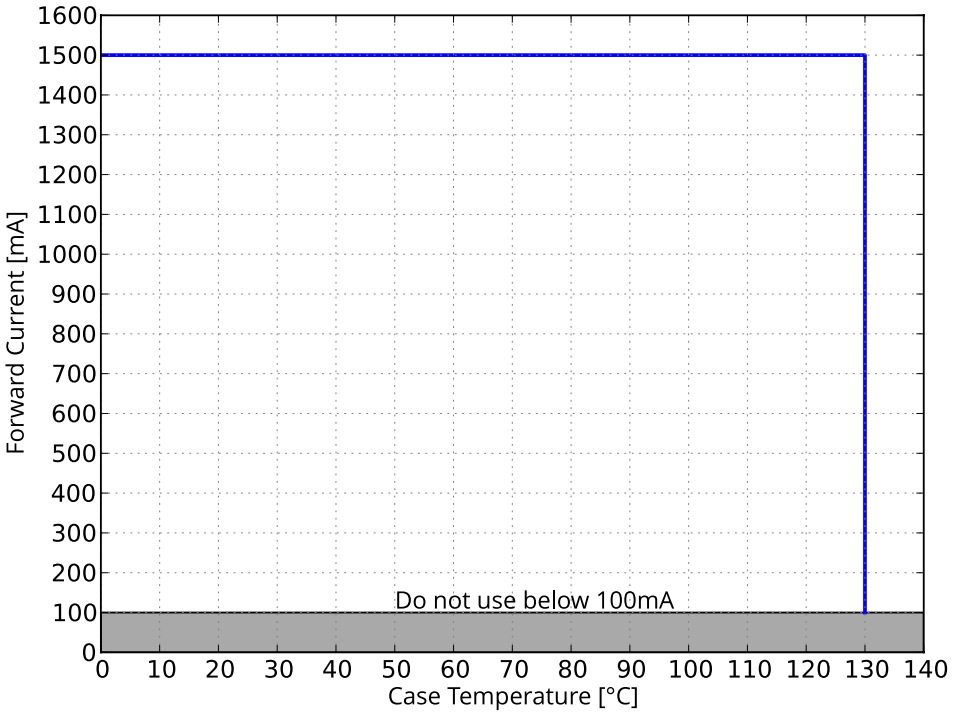


Figure 7. Maximum forward current vs. case temperature for LUXEON Altilon H1K PnP.

Product Bin and Labeling Definitions

Designing with LUXEON Altilon H1K 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 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 LED components for luminous flux or radiometric power, color point or dominant wavelength and forward voltage.

LUXEON Altilon H1K PnP LEDs are labeled using a 4-digit alphanumeric CAT code following the format below:

A B C D

Where:

A B – designates luminous flux bin (example: M1=1221 to 1260 lumens, Q2=1489 to 1527 lumens)

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

Therefore, a LUXEON Altilon H1K PnP with a lumen range of 1221 to 1260, and color bin of 3B has the following CAT code:

M 1 3 B

Luminous Flux Bins

Table 6 lists the standard luminous flux bins for LUXEON Altilon H1K 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 6. Luminous flux bin definitions for LUXEON Altilon H1K PnP.

BIN	LUMINOUS FLUX [1] (lm)	
	MINIMUM	MAXIMUM
K2	1107	1145
L1	1145	1183
L2	1183	1221
M1	1221	1260
M2	1260	1298
N1	1298	1336
N2	1336	1374
P1	1374	1412
P2	1412	1450
Q1	1450	1489
Q2	1489	1527
R1	1527	1565
R2	1565	1603
S1	1603	1641
S2	1641	1679

Notes for Table 6:
1. Lumileds maintains a tolerance of ±10% on luminous flux measurements.

Color Codes

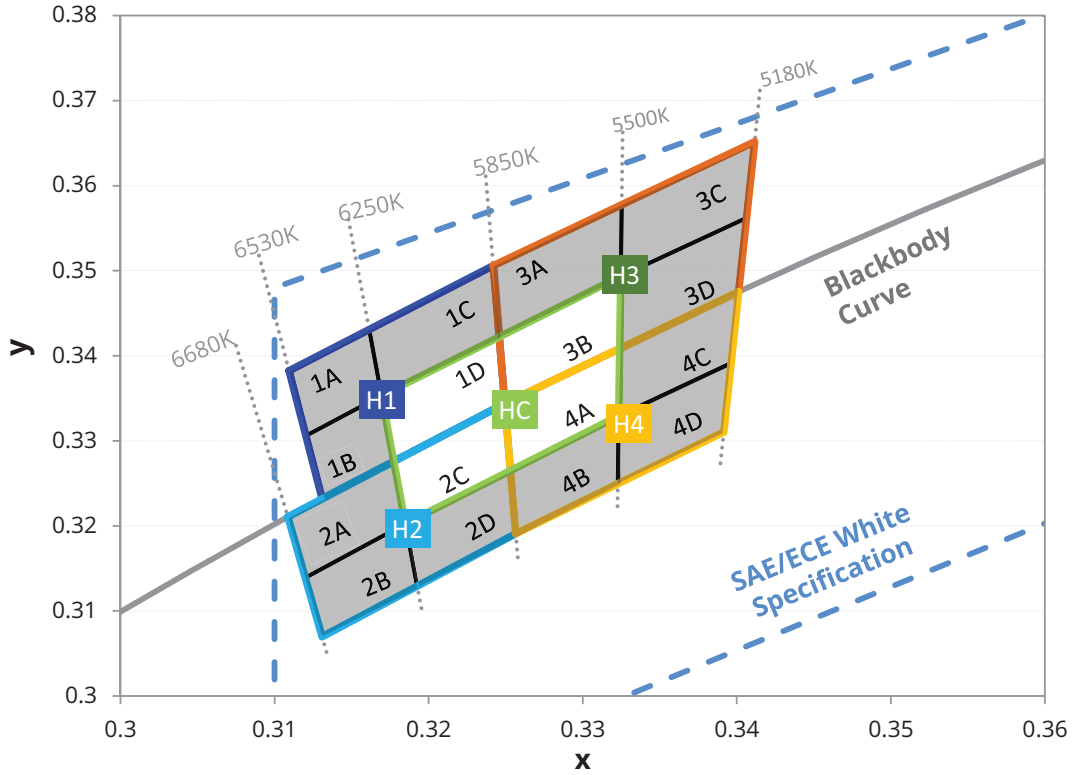


Figure 8. Color bin structure in CIE 1931 color space for LUXEON Altilon H1K PnP at 20ms MP, 1000mA, T_C=85°C.

Notes for Figure 8:
1. Lumileds supports the following bins for LUXEON Altilon H1K PnP: 1D, 2C, 3B and 4A.
2. LUXEON Altilon H1K PnP 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

Color Bin Definitions

Table 7. Color bin definitions for LUXEON Altilon H1K PnP at 20ms MP, 1000mA, T_c=85°C.

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.

Table 8. Laser marking definitions for LUXEON Altilon H1K PnP 1x2, 1x4 and 1x5.

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

Mechanical Dimensions

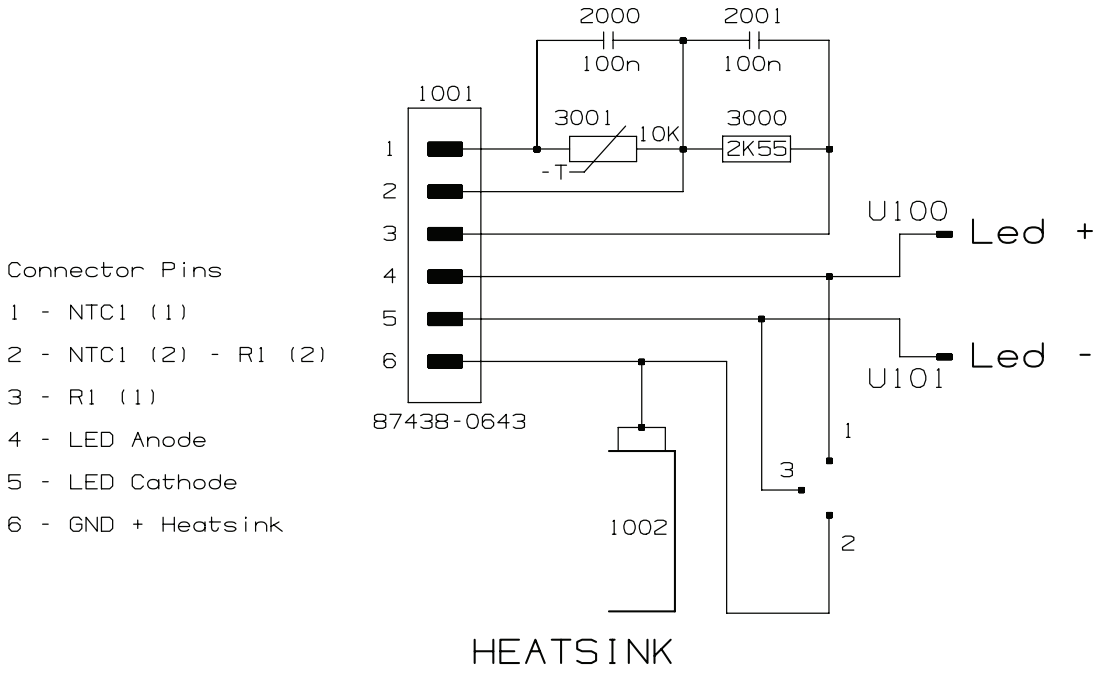


Figure 9. Example of PCB schematic for LUXEON Altilon H1K PnP.

Notes for Figure 9:
1. Components can be selected by the customer.
2. Please refer to your sales representative for recommendations and requirements.

Lumileds provides the flexibility to our customers to add or remove components on the PCB; typical components are:

- Thermistor – Protect module by detecting overheating and controlling current derating.
- Bin Code Resistor – Enables driver to provide needed current according to flux bin for desired lumen output.
- Grounding – Electrically conductive connection between PCB top side and Cu core through electrical via.
- Enhanced ESD protection level – Provides ESD protection if the device is used in environments not ESD-protected, like repair shops.
- Connector – To allow for an easy connection to the LED driver.

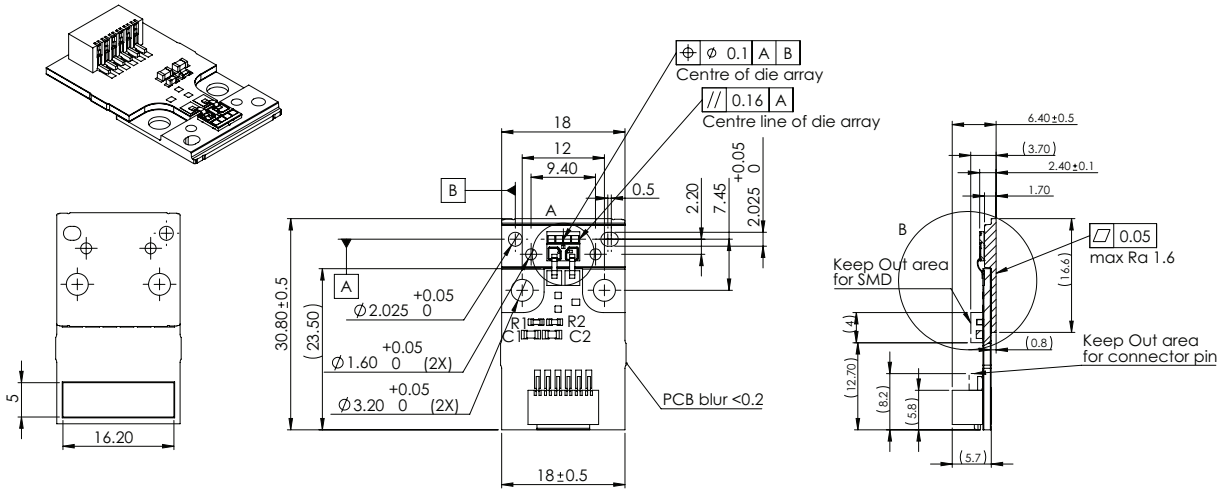


Figure 10. Mechanical dimensions for LUXEON Altilon H1K PnP 1x4 (LAPH-M4x-xxxx).

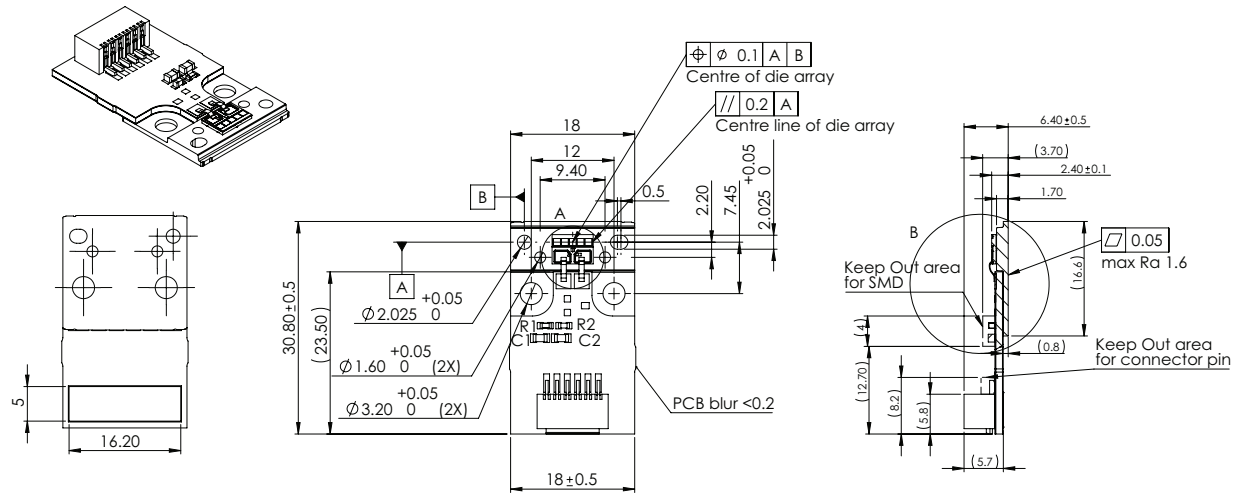


Figure 11. Mechanical dimensions for LUXEON Altilon H1K PnP 1x5 (LAPH-M5x-xxxx).

Notes for Figures 10 and 11:
1. Drawings are not to scale.
2. All dimensions are in millimeters.
3. Tolerance, unless otherwise specified: ± 0.05 mm.
4. Materials: copper (base), ceramic (substrate).

Packaging and Labeling Information

Tray Dimensions

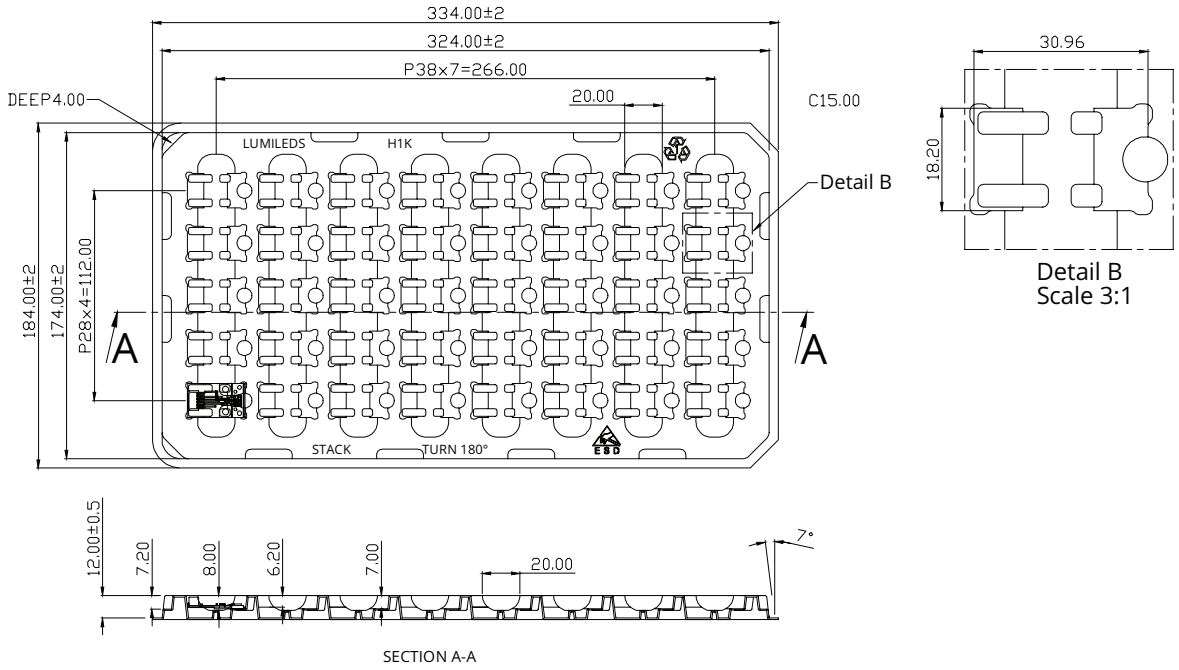


Figure 12. Tray dimensions for LUXEON Altilon H1K PnP.

Notes for Figure 12:
1. Drawings are not to scale.
2. All dimensions are in millimeters.
3. Tray dimensions: 200 x 340 x 12mm.
4. Box dimensions: 210 x 350 x 120mm.
5. Tray quantity per box: 10 trays; units per Tray=40 pcs.
6. Weight (full packing) approximately 2.4 kg.

Product Labeling

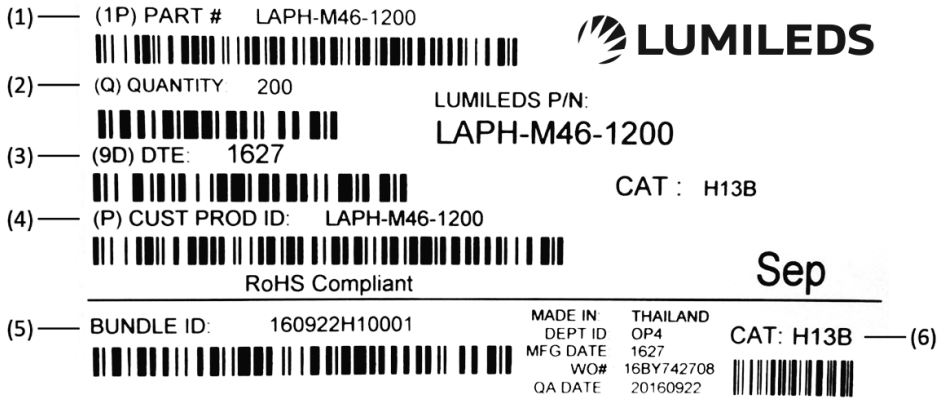


Figure 13. Example of box label for LUXEON Altilon H1K PnP.

Notes for Figure 13 – 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

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.com