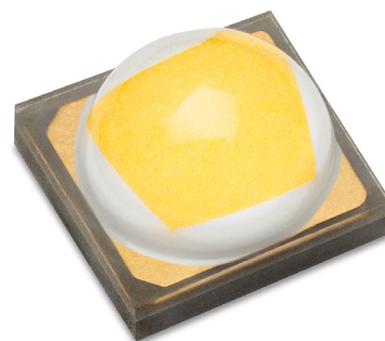


LUXEON HL2X

Best performance. Most usable light.
Proven package.

LUXEON HL2X is a 2mm² CSP high power domed emitter designed specifically for outdoor and industrial applications like street lights and high bay luminaires. The package is optimized for directional lighting with emphasis on “usable light in application”.

LUXEON HL2X delivers high efficacy and robustness in an industrial standard 3535 package with 3-stripe footprint. This is designed to accelerate time to market through compatibility with LUXEON TX optics, while improving system costs through superior performance (flux and efficacy).



FEATURES AND BENEFITS

Most usable light in application with a design emphasis on Beam Angle, Field Angle, Color Over Angle, and Optical Efficiency performance

CSP die technology enables high efficacy and high driving current capability in unique applications

Industry standard 3535 package with 3-stripe footprint and radiation pattern matched to LUXEON TX for ease of design

PRIMARY APPLICATIONS

Roadway

Industrial / Warehouse

Area

Sports

Wall Grazer / Wall Wash

Specialty

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General Product Information

Product Test Conditions

LUXEON HL2X LEDs are tested and binned with a DC drive current of 700mA, at a junction temperature, T_j , of 85°C.

Part Number Nomenclature

Part numbers for LUXEON HL2X follow the convention below:

L 1 H X – **A A B B** 2 0 0 0 0 0 0 0 0

Where:

- A A** – designates nominal ANSI CCT (27=2700K, 30=3000K, 40=4000K, 50=5000K, 57=5700K, 65=6500K)
- B B** – designates minimum CRI (70=70CRI)

Therefore, the following part number is used for a LUXEON HL2X 4000K 70CRI LED:

L 1 H X – **4 0 7 0** 2 0 0 0 0 0 0 0 0

Lumen Maintenance

Please contact your local Sales Representative or Lumileds Technical Solutions Manager for more information about the long-term performance of this product.

Environmental Compliance

Lumileds LLC is committed to providing environmentally friendly products to the solid-state lighting market. LUXEON HL2X 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 performance of LUXEON HL2X at 700mA, $T_j=85^\circ\text{C}$.

| NOMINAL CCT | MINIMUM CRI ^[1] | LUMINOUS FLUX ^[2] (lm) | | TYPICAL LUMINOUS EFFICACY (lm/W) | PART NUMBER |
|----------------|-------------------------------|-----------------------------------|---------|--|--------------------|
| | | MINIMUM | TYPICAL | | |
| | | 700mA | | | |
| 2700K | 70 | 260 | 280 | 141 | L1HX-2770200000000 |
| 4000K | 70 | 300 | 318 | 161 | L1HX-4070200000000 |
| 6500K | 70 | 290 | 313 | 158 | L1HX-6570200000000 |

Notes for Table 1:

1. Lumileds maintains a tolerance of ± 2 on CRI.
2. Lumileds maintains a tester tolerance of $\pm 6.5\%$ on luminous flux measurements.

Optical Characteristics

Table 2. Optical characteristics for LUXEON HL2X at 700mA, $T_j=85^\circ\text{C}$.

| PART NUMBER | TYPICAL TOTAL INCLUDED ANGLE ^[1] | TYPICAL VIEWING ANGLE ^[2] |
|--------------------|---|--------------------------------------|
| L1HX-xxxx200000000 | 160° | 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 $\frac{1}{2}$ of the peak value.

Electrical and Thermal Characteristics

Table 3. Electrical and thermal characteristics for LUXEON HL2X at 700mA, $T_j=85^\circ\text{C}$.

| PART NUMBER | FORWARD VOLTAGE ^[1] (V_f) | | | TYPICAL TEMPERATURE COEFFICIENT OF FORWARD VOLTAGE ^[2] (mV/°C) | TYPICAL THERMAL RESISTANCE—JUNCTION TO SOLDER PAD (°C/W) |
|--------------------|--|---------|---------|---|--|
| | MINIMUM | TYPICAL | MAXIMUM | | |
| L1HX-xxxx200000000 | 2.65 | 2.83 | 3.00 | -1.6 | 3.0 |

Notes for Table 3:

1. Lumileds maintains a tolerance of $\pm 0.06\text{V}$ on forward voltage measurements.
2. Measured between 25°C and 110°C .

Absolute Maximum Ratings

Table 4. Absolute maximum ratings for LUXEON HL2X.

| PARAMETER | MAXIMUM PERFORMANCE |
|--|---|
| DC Forward Current ^[1, 2] | 2000mA |
| Peak Pulsed Forward Current ^[1, 3] | 2400mA |
| LED Junction Temperature ^[1] (DC & Pulse) | 135°C |
| ESD Sensitivity (ANSI/ESDA/JEDEC JS-001-2012) | Class 3B |
| Operating Case Temperature ^[1] | -40°C to 135°C |
| LED Storage Temperature | -40°C to 135°C |
| Soldering Temperature | JEDEC 020c 260°C |
| Allowable Reflow Cycles | 3 |
| Reverse Voltage ^[4] ($V_{reverse}$) | LUXEON LEDs are not designed to be driven in reverse bias |

- Notes for Table 4:
- 1. Proper current derating must be observed to maintain the junction temperature below the maximum allowable junction temperature.
 - 2. Residual periodic variations due to power conversion from alternating current (AC) to direct current (DC), also called "ripple," with frequencies $\geq 100\text{Hz}$ and amplitude $\leq 15\%$ of the maximum allowable DC forward current are acceptable, assuming the average current throughout each cycle does not exceed the maximum allowable DC forward current at the corresponding maximum junction temperature.
 - 3. Pulsed operation with a peak drive current equal to the stated peak pulsed forward current is acceptable if the pulse on-time is $\leq 5\text{ms}$ per cycle and the duty cycle is $\leq 50\%$.
 - 4. Transient reverse voltages and surge currents due to electrical switching or supply interruptions are acceptable if these events do not last for more than 10ms, the amplitude of the reverse voltage does not exceed 5V and the reverse current is less than 220uA.

Operating Conditions

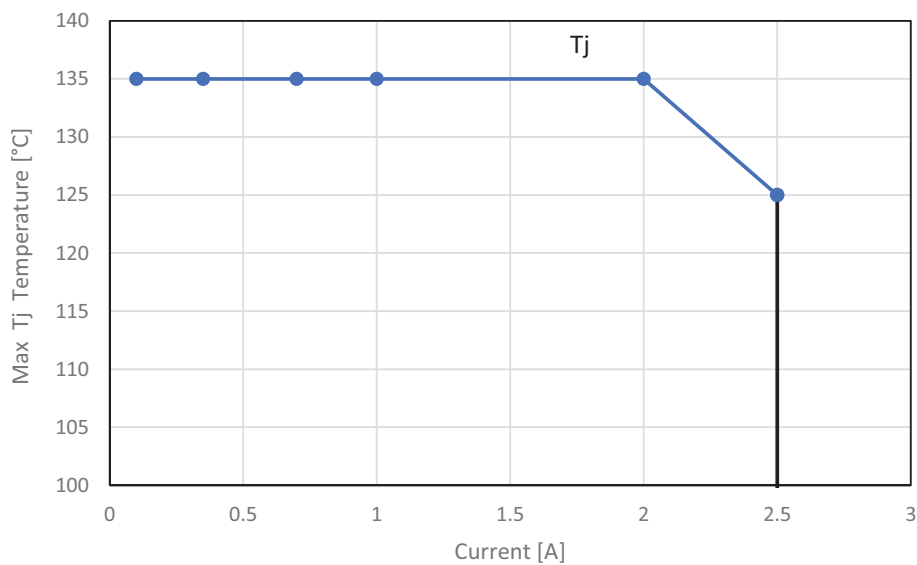


Figure 1. Maximum permissible operating conditions for LUXEON HL2X.

Characteristic Curves

Spectral Power Distribution Characteristics

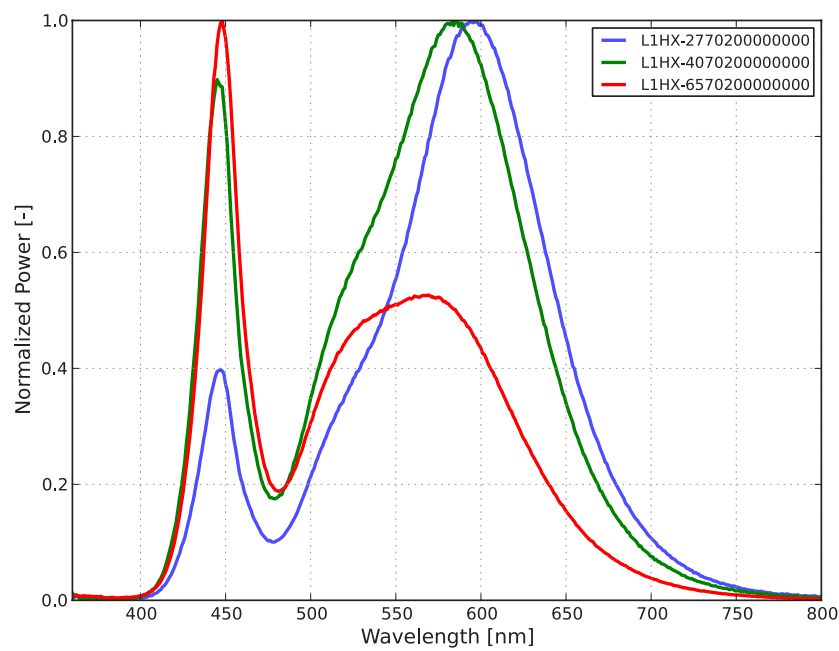


Figure 2. Typical normalized power vs. wavelength for LUXEON HL2X at 700mA, $T_j=85^{\circ}\text{C}$.

Light Output Characteristics

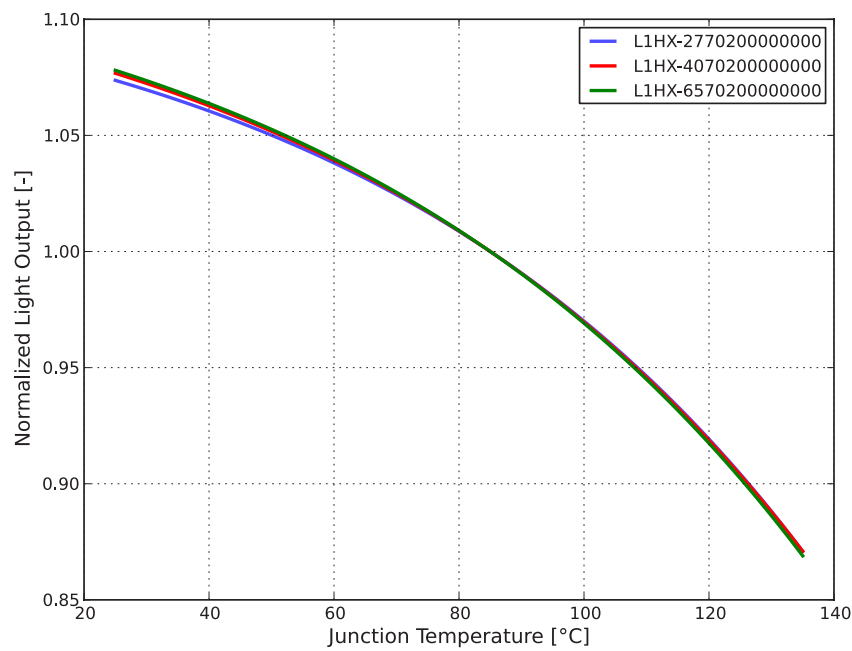


Figure 3. Typical normalized light output vs. junction temperature for LUXEON HL2X at 700mA.

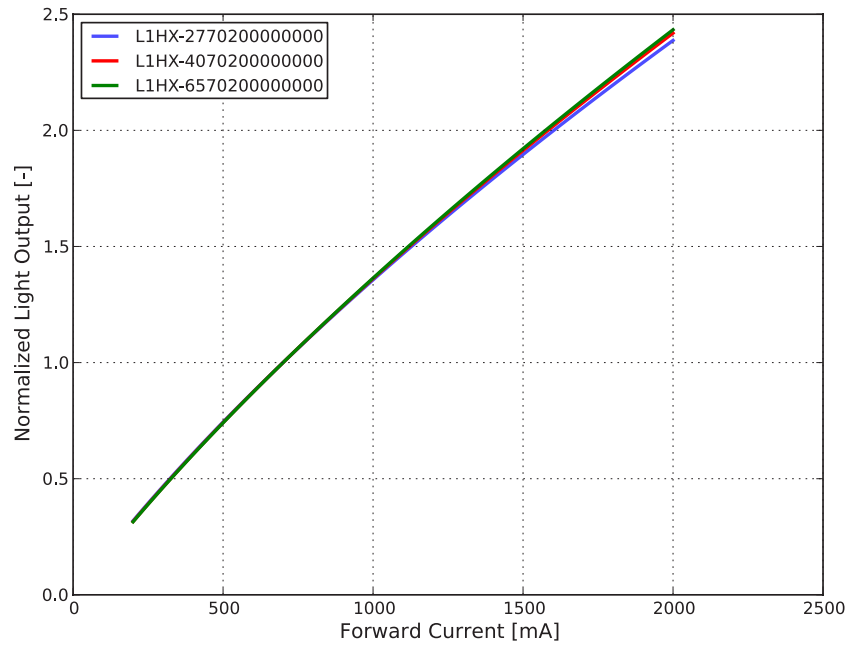


Figure 4. Typical normalized light output vs. forward current for LUXEON HL2X at 700mA, $T_j=85^\circ\text{C}$.

Forward Current Characteristics

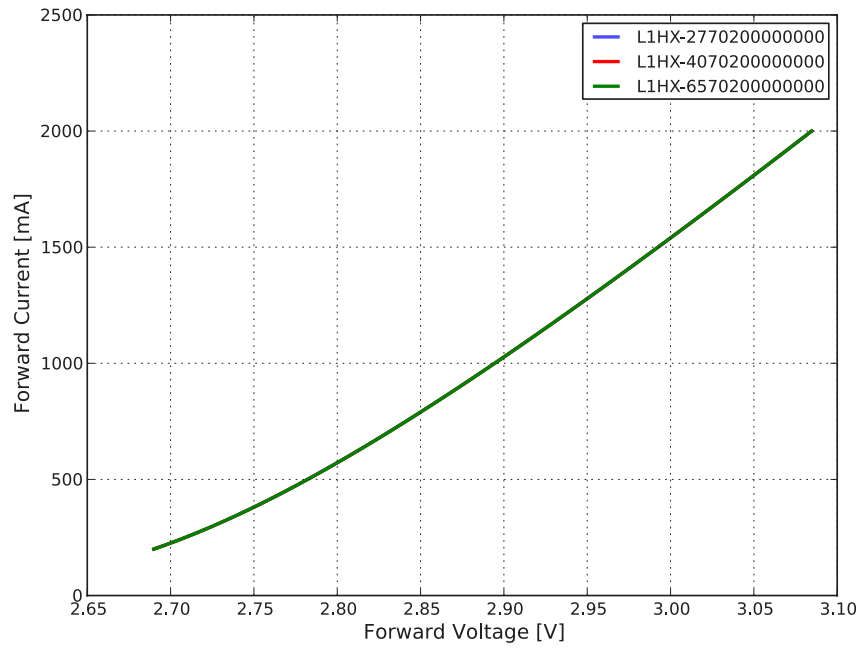


Figure 5. Typical forward current vs. forward voltage for LUXEON HL2X at $T_j=85^\circ\text{C}$.

Radiation Pattern Characteristics

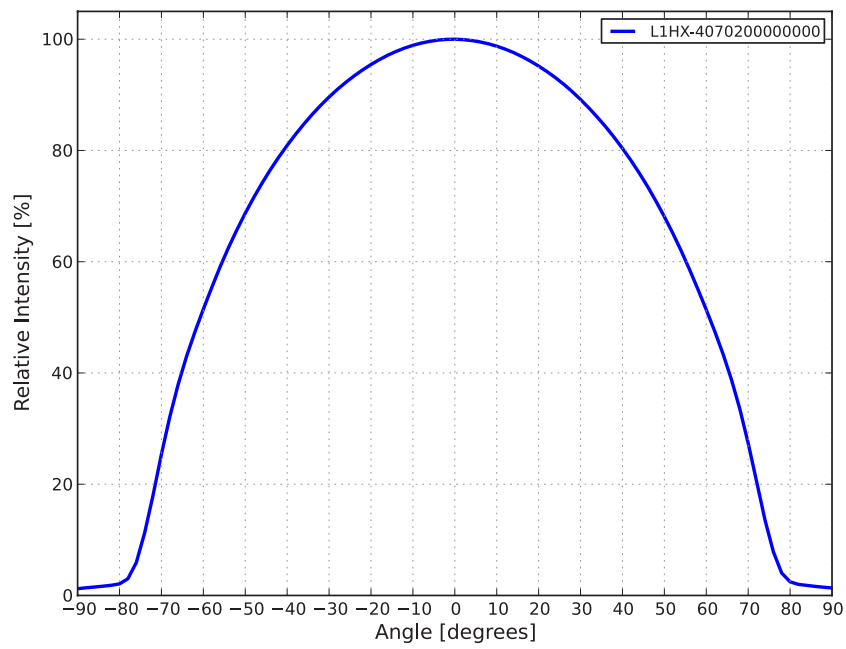


Figure 6. Typical radiation pattern for LUXEON HL2X at 700mA, T_j=85°C.

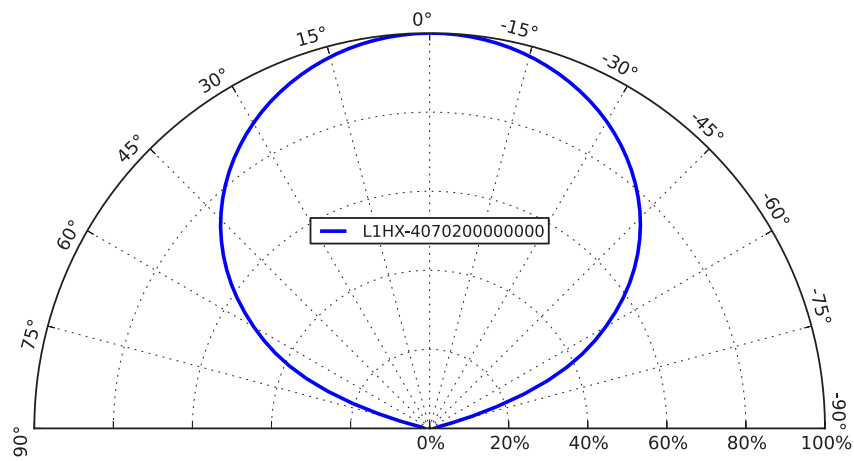


Figure 7. Typical polar radiation pattern for LUXEON HL2X at 700mA, T_j=85°C.

Product Bin and Labeling Definitions

Decoding Product Bin Labeling

In the manufacturing of semiconductor products, there are variations in performance around the average values given in the technical datasheet. For this reason, Lumileds bins LED components for luminous flux or radiometric power, color point, peak or dominant wavelength and forward voltage.

LUXEON HL2X 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: V=290 to 300 lm, W=300 to 310 lm)
- B** – designates color bin (example: 1=6500K, 2=5700K, 3=5000K, 5=4000K, 7=3000K, 8=2700K)
- C** – designates color space (example: 5=5-step MacAdam ellipse)
- D** – designates forward voltage bin (example: X=2.65 to 2.85V, Y=2.85 to 3.00V)

Therefore, a LUXEON HL2X 3000K 70CRI with a lumen range of 290 to 300 lm, color bin of 55 and a forward voltage range of 2.65 to 2.85V has the following CAT code:

V 7 5 X

Luminous Flux Bins

Table 5 lists the standard luminous flux bins for LUXEON HL2X 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 CCTs.

Table 5. Luminous flux bin definitions for LUXEON HL2X.

| BIN | LUMINOUS FLUX ⁽¹⁾ (lm) | |
|-----|-----------------------------------|---------|
| | MINIMUM | MAXIMUM |
| R | 250 | 260 |
| S | 260 | 270 |
| T | 270 | 280 |
| U | 280 | 290 |
| V | 290 | 300 |
| W | 300 | 310 |
| X | 310 | 320 |
| Y | 320 | 330 |
| Z | 330 | 340 |
| A | 340 | 350 |
| B | 350 | 360 |
| C | 360 | 370 |

Notes for Table 5:

1. Lumileds maintains a tolerance of $\pm 6.5\%$ on luminous flux measurements.

Color Bin Definitions

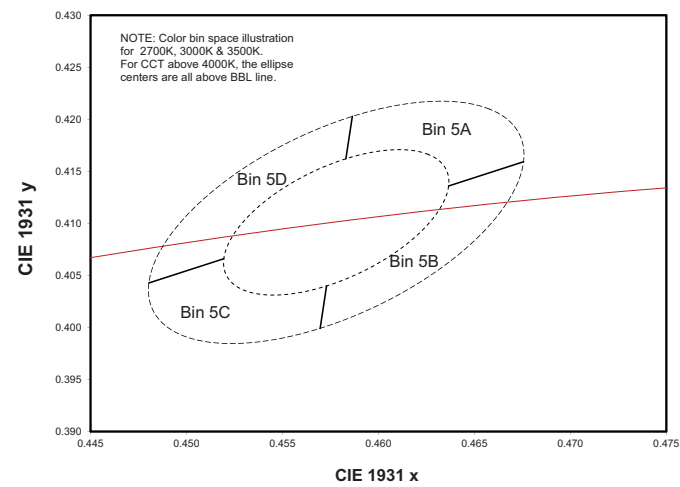


Figure 8. Color space definition for LUXEON HL2X.

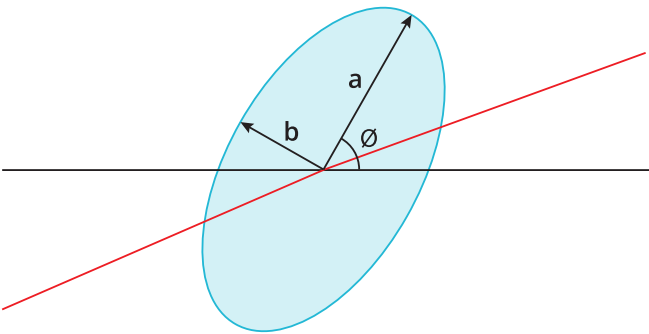


Figure 9. 5-step MacAdam ellipse illustration for Table 6.

Table 6. 5-step MacAdam ellipse color bin definitions for LUXEON HL2X.

| NOMINAL CCT | COLOR SPACE | CENTER POINT ^[1] (cx, cy) | MAJOR AXIS, a | MINOR AXIS, b | ELLIPSE ROTATION ANGLE, θ |
|-------------|-------------------------------|---|------------------|------------------|------------------------------|
| 2700K | Single 5-step MacAdam ellipse | (0.4578, 0.4101) | 0.013500 | 0.007000 | 53.70° |
| 3000K | Single 5-step MacAdam ellipse | (0.4338, 0.4030) | 0.013900 | 0.006800 | 53.22° |
| 4000K | Single 5-step MacAdam ellipse | (0.3818, 0.3797) | 0.015650 | 0.006700 | 53.72° |
| 5000K | Single 5-step MacAdam ellipse | (0.3447, 0.3553) | 0.013700 | 0.005900 | 59.62° |
| 5700K | Single 5-step MacAdam ellipse | (0.3287, 0.3417) | 0.012425 | 0.005325 | 59.09° |
| 6500K | Single 5-step MacAdam ellipse | (0.3123, 0.3282) | 0.011150 | 0.004750 | 58.57° |

Notes for Table 6:
1. Lumileds maintains a tolerance of ±0.005 on x and y coordinates in the CIE 1931 color space.

Table 7. Correlated color temperature bin definitions for LUXEON HL2X.

| BIN | CCT |
|-----|-------|
| 1 | 6500K |
| 2 | 5700K |
| 3 | 5000K |
| 5 | 4000K |
| 6 | 3500K |
| 7 | 3000K |
| 8 | 2700K |

Table 8. MacAdam ellipse color bin definitions for LUXEON HL2X.

| BIN | SDCM |
|-----|--------------------------------|
| 5 | 5-step MacAdam ellipse (70CRI) |

Forward Voltage Bins

Table 9. Forward voltage bin definitions for LUXEON HL2X.

| BIN | FORWARD VOLTAGE ⁽¹⁾ (V _f) | |
|-----|--|---------|
| | MINIMUM | MAXIMUM |
| X | 2.65 | 2.85 |
| Y | 2.85 | 3.00 |

Notes for Table 9:
1. Lumileds maintains a tolerance of ±0.06V on forward voltage measurements.

Mechanical Dimensions

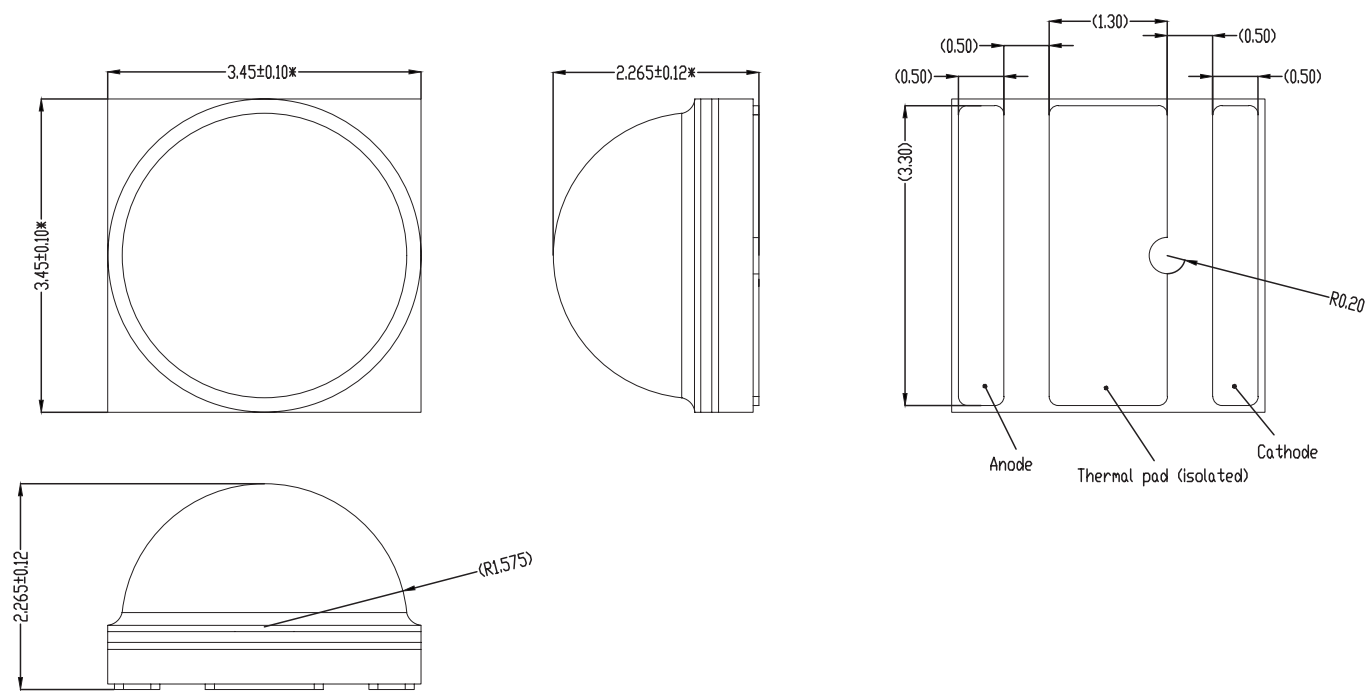


Figure 10. Mechanical dimensions for LUXEON HL2X.

Notes for Figure 10:
1. Drawings are not to scale.
2. All dimensions are in millimeters.
3. Do not handle the device by the dome. Excessive force on the dome may damage the dome itself or the interior of the device.

Reflow Soldering Guidelines

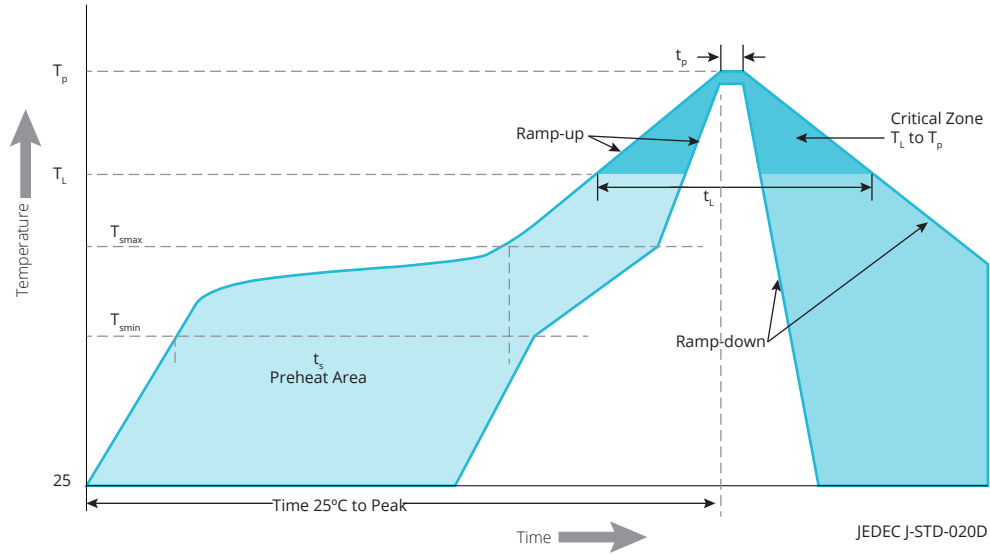


Figure 11. Visualization of the acceptable reflow temperature profile as specified in Table 10.

Table 10. Reflow profile characteristics for LUXEON HL2X.

| 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_L to T_p) | 3°C / second maximum |
| Liquidous 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 Peak Temperature (t_p) | 20 to 40 seconds |
| Ramp-Down Rate (T_p to T_L) | 6°C / second maximum |
| Time 25°C to Peak Temperature | 8 minutes maximum |

Notes for Table 10:

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

JEDEC Moisture Sensitivity

Table 11. Moisture sensitivity levels for LUXEON HL2X.

| LEVEL | FLOOR LIFE | | SOAK REQUIREMENTS STANDARD | |
|-------|------------|----------------------------------|----------------------------|---------------|
| | TIME | CONDITIONS | TIME | CONDITIONS |
| 1 | Unlimited | $\leq 30^\circ\text{C}$ / 85% RH | 168 Hours +5 / -0 | 85°C / 85% RH |

Solder Pad Design

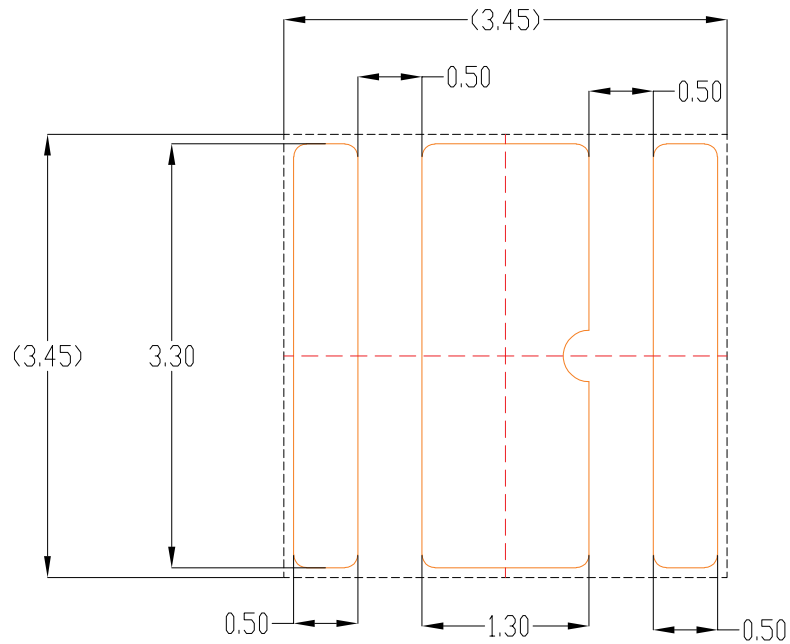


Figure 12. Recommended PCB solder pad layout for LUXEON HL2X.

Notes for Figure 12:

1. Drawings are not to scale.
2. All dimensions are in millimeters.

Packaging Information

Pocket Tape Dimensions

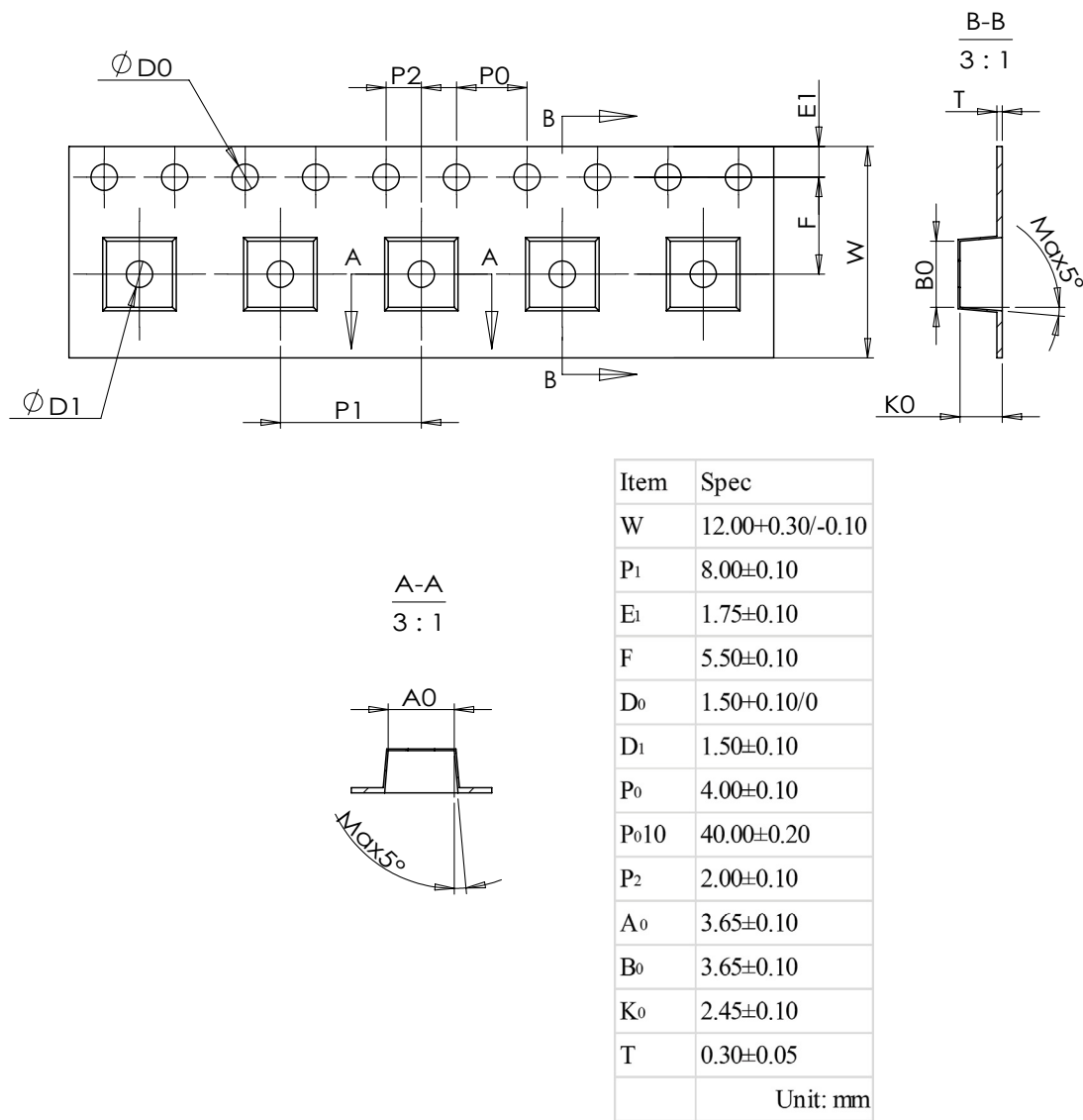


Figure 13. Pocket tape dimensions for LUXEON HL2X.

Notes for Figure 13:
1. Drawings are not to scale.
2. All dimensions are in millimeters.

Reel Dimensions

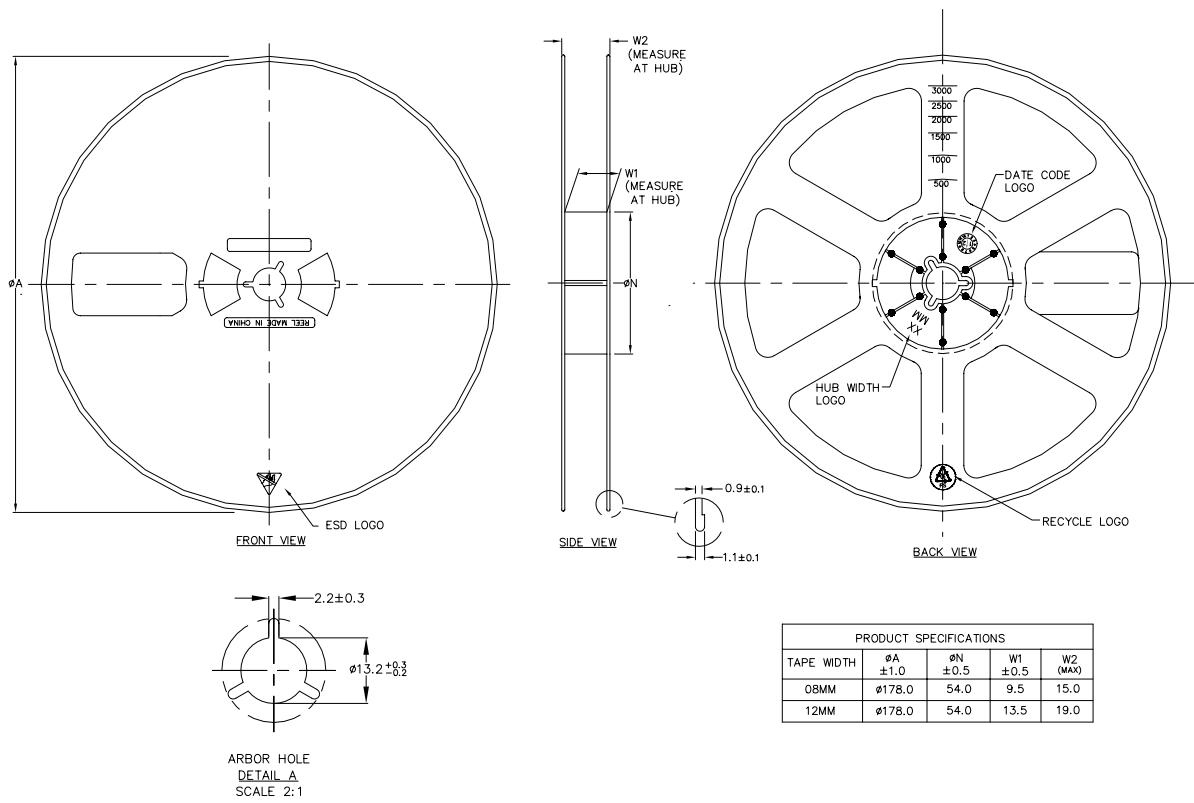


Figure 14. Reel dimensions for LUXEON HL2X.

- Notes for Figure 14:
- 1. Drawings are not to scale.
 - 2. All dimensions are in millimeters.
 - 3. 2,500 pieces per reel.

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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