# LUXEON CX Plus CoB – High Density

## Higher lumen density with industry standard footprint

LUXEON CX Plus CoB – High Density LEDs focus on delivering the highest flux, up to 5600 lumens, with an industry standard footprint of 13.35mm x 13.35mm and Light Emitting Surfaces of 4.5mm, 6mm, and 9mm. The combination of superior performance and industry standard footprint allows for an immediate and effortless upgrade to higher flux luminaire designs within existing ecosystems. LUXEON CX Plus CoB – High Density is available in 2- and 3-step MacAdam ellipse color definition, enabling color consistency.

### FEATURES AND BENEFITS

- Industry's smallest Light Emitting Surfaces (LES) for highest lumen densities
- An immediate, effortless upgrade to existing designs using legacy CoBs with a square footprint
- 2- and 3-step MacAdam ellipse ensuring color consistency from luminaire to luminaire

### PRIMARY APPLICATIONS

- Spotlights
- Track Lights
- Downlights

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# General Product Information

## Product Test Conditions

LUXEON CX Plus CoB – High Density LEDs are tested and binned with a DC drive current specified below at a junction temperature, $T_j$, of 85°C:

| | | |
|---|---|---|
| 175mA | – | LUXEON CX Plus CoB – HD S01H4 |
| 175mA | – | LUXEON CX Plus CoB – HD S01H6 |
| 350mA | – | LUXEON CX Plus CoB – HD S02H6 |
| 700mA | – | LUXEON CX Plus CoB – HD S04H9 |

## Part Number Nomenclature

Part numbers for LUXEON CX Plus CoB – High Density follow the convention below:

L 2 C 4 – **A A B B C D D D E F F G G**

Where:

| | | |
|---|---|---|
| **A A** | – | designates nominal CCT (27=2700K, 30=3000K, 35=3500K, 40=4000K, 50=5000K) |
| **B B** | – | designates minimum CRI (80=80CRI, 90=90CRI) |
| **C** | – | designates SDCM (2=2-step MacAdam ellipse, 3=3-step MacAdam ellipse) |
| **D D D** | – | designates product configuration (S01, S02, S04) |
| **E** | – | designates options for product specification |
| **F F** | – | designates light emitting surface (LES) size (04=4.5mm, H6=6mm, 06=6mm, 09=9mm) |
| **G G** | – | designates options for product specification |

Therefore, the following part number is used for a LUXEON CX Plus CoB – High Density, 3000K 90CRI, 3-step MacAdam ellipse, S01H4, 4.5mm LES:

L 2 C 4 – **3 0 9 0 3 S 0 1 F 0 4 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 CX Plus CoB – High Density 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 CX Plus CoB – High Density at specified test current, $T_j$=85°C.**

| PRODUCT | NOMINAL CCT | MINIMUM CRI [1, 2, 3] | LUMINOUS FLUX [1] (lm) | | TYPICAL LUMINOUS EFFICACY (lm/W) | TEST CURRENT (mA) | LES [5] (mm) | ENERGY EFFICIENCY CLASS [7] | PART NUMBER [6] |
|---|---|---|---|---|---|---|---|---|---|
| | | | MINIMUM | TYPICAL [4] | | | | | |
| LUXEON CX Plus CoB – HD S01H4 | 2700K | 80 | 667 | 725 | 110 | 175 | 4.5 | F | L2C4-2780xS01F0400 |
| | 3000K | 80 | 713 | 775 | 118 | 175 | 4.5 | F | L2C4-3080xS01F0400 |
| | 3500K | 80 | 727 | 790 | 120 | 175 | 4.5 | E | L2C4-3580xS01F0400 |
| | 4000K | 80 | 750 | 815 | 124 | 175 | 4.5 | E | L2C4-4080xS01F0400 |
| | 5000K | 80 | 750 | 815 | 124 | 175 | 4.5 | E | L2C4-5080xS01F0400 |
| | 2700K | 90 | 580 | 630 | 96 | 175 | 4.5 | F | L2C4-2790xS01F0400 |
| | 3000K | 90 | 603 | 655 | 100 | 175 | 4.5 | F | L2C4-3090xS01F0400 |
| | 3500K | 90 | 639 | 695 | 106 | 175 | 4.5 | F | L2C4-3590xS01F0400 |
| | 4000K | 90 | 653 | 710 | 108 | 175 | 4.5 | F | L2C4-4090xS01F0400 |
| | 5000K | 90 | 644 | 700 | 107 | 175 | 4.5 | F | L2C4-5090xS01F0400 |
| LUXEON CX Plus CoB – HD S01H6 | 2700K | 80 | 699 | 760 | 116 | 175 | 6.0 | F | L2C4-2780xS01FH600 |
| | 3000K | 80 | 741 | 805 | 123 | 175 | 6.0 | E | L2C4-3080xS01FH600 |
| | 3500K | 80 | 750 | 815 | 124 | 175 | 6.0 | E | L2C4-3580xS01FH600 |
| | 4000K | 80 | 759 | 825 | 126 | 175 | 6.0 | E | L2C4-4080xS01FH600 |
| | 5000K | 80 | 759 | 825 | 126 | 175 | 6.0 | E | L2C4-5080xS01FH600 |
| | 2700K | 90 | 593 | 645 | 98 | 175 | 6.0 | F | L2C4-2790xS01FH600 |
| | 3000K | 90 | 621 | 675 | 103 | 175 | 6.0 | F | L2C4-3090xS01FH600 |
| | 3500K | 90 | 649 | 705 | 107 | 175 | 6.0 | F | L2C4-3590xS01FH600 |
| | 4000K | 90 | 672 | 730 | 111 | 175 | 6.0 | F | L2C4-4090xS01FH600 |
| | 5000K | 90 | 667 | 725 | 110 | 175 | 6.0 | F | L2C4-5090xS01FH600 |
| LUXEON CX Plus CoB – HD S02H6 | 2700K | 80 | 1352 | 1470 | 112 | 350 | 6.0 | F | L2C4-2780xS02F0600 |
| | 3000K | 80 | 1426 | 1550 | 118 | 350 | 6.0 | F | L2C4-3080xS02F0600 |
| | 3500K | 80 | 1454 | 1580 | 120 | 350 | 6.0 | E | L2C4-3580xS02F0600 |
| | 4000K | 80 | 1518 | 1650 | 126 | 350 | 6.0 | E | L2C4-4080xS02F0600 |
| | 5000K | 80 | 1518 | 1650 | 126 | 350 | 6.0 | E | L2C4-5080xS02F0600 |
| | 2700K | 90 | 1159 | 1260 | 96 | 350 | 6.0 | Note 8 | L2C4-2790xS02F0600 |
| | 3000K | 90 | 1228 | 1335 | 102 | 350 | 6.0 | F | L2C4-3090xS02F0600 |
| | 3500K | 90 | 1297 | 1410 | 107 | 350 | 6.0 | F | L2C4-3590xS02F0600 |
| | 4000K | 90 | 1334 | 1450 | 110 | 350 | 6.0 | F | L2C4-4090xS02F0600 |
| | 5000K | 90 | 1320 | 1435 | 109 | 350 | 6.0 | F | L2C4-5090xS02F0600 |
| LUXEON CX Plus CoB – HD S04H9 | 2700K | 80 | 2742 | 2980 | 114 | 700 | 9.0 | F | L2C4-2780xS04F0900 |
| | 3000K | 80 | 2926 | 3180 | 121 | 700 | 9.0 | E | L2C4-3080xS04F0900 |
| | 3500K | 80 | 2990 | 3250 | 124 | 700 | 9.0 | E | L2C4-3580xS04F0900 |
| | 4000K | 80 | 3054 | 3320 | 126 | 700 | 9.0 | E | L2C4-4080xS04F0900 |
| | 5000K | 80 | 3054 | 3320 | 126 | 700 | 9.0 | E | L2C4-5080xS04F0900 |
| | 2700K | 90 | 2282 | 2480 | 94 | 700 | 9.0 | Note 8 | L2C4-2790xS04F0900 |
| | 3000K | 90 | 2429 | 2640 | 101 | 700 | 9.0 | Note 8 | L2C4-3090xS04F0900 |
| | 3500K | 90 | 2576 | 2800 | 107 | 700 | 9.0 | F | L2C4-3590xS04F0900 |
| | 4000K | 90 | 2659 | 2890 | 110 | 700 | 9.0 | F | L2C4-4090xS04F0900 |
| | 5000K | 90 | 2631 | 2860 | 109 | 700 | 9.0 | F | L2C4-5090xS04F0900 |

Notes for Table 1:
1. Lumileds maintains a tolerance of ±2 on CRI and ±6.5% on luminous flux measurements.
2. Typical CRI is approximately 2 points higher than the minimum CRI specified, but this is not guaranteed.
3. R9 value of 90CRI products is >50 and for 80CRI products it is >0.
4. Maximum flux is 10% above typical flux.
5. Light Emitting Surface (LES) is the inner diameter (phosphor area) inside the dam.
6. Part number "x" designates SDCM (2=2-step MacAdam ellipse, 3=3-step MacAdam ellipse).
7. Energy efficiency class as specified in Commission Delegated Regulation (EU) 2019/2015. The available range of energy efficiency classes is A-G.
8. Exception: Not available in EU or UK.

# Optical Characteristics

**Table 2. Optical characteristics for LUXEON CX Plus CoB – High Density at specified test current, $T_j$=85°C.**

| PART NUMBER | TYPICAL TOTAL INCLUDED ANGLE [1] | TYPICAL VIEWING ANGLE [2] |
|---|---|---|
| L2C4-xxxxxS0xFxx00 | 135° | 115° |

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. Electrical and thermal characteristics for LUXEON CX Plus CoB – High Density at specified test current, $T_j$=85°C.**

| PART NUMBER | FORWARD VOLTAGE [1] ($V_f$) | | | TYPICAL TEMPERATURE COEFFICIENT OF FORWARD VOLTAGE [2] (mV/°C) | TYPICAL THERMAL RESISTANCE—JUNCTION TO CASE [3] (°C/W) |
|---|---|---|---|---|---|
| | MINIMUM | TYPICAL | MAXIMUM | | |
| L2C4-xxxxxS01F0400 | 34.0 | 37.5 | 39.0 | -16 | 1.80 |
| L2C4-xxxxxS01FH600 | 34.0 | 37.5 | 39.0 | -16 | 1.70 |
| L2C4-xxxxxS02F0600 | 34.0 | 37.5 | 39.0 | -16 | 0.80 |
| L2C4-xxxxxS04F0900 | 34.0 | 37.5 | 39.0 | -16 | 0.55 |

Notes for Table 3:
1. Lumileds maintains a tolerance of ±2% on forward voltage measurements.
2. Measured between 25°C and 85°C.
3. Thermal resistance is measured between junction and the bottom of the LUXEON CoB substrate.

# Absolute Maximum Ratings

**Table 4. Absolute maximum ratings for LUXEON CX Plus CoB – High Density.**

| PARAMETER | MAXIMUM PERFORMANCE |
|---|---|
| DC Forward Current [1, 2] | 2x test current (Refer to derating curve below) |
| LED Junction Temperature [1] (DC & Pulse) | 150°C |
| ESD Sensitivity (ANSI/ESDA/JEDEC JS-001-2012) | Class 3B |
| Operating Case Temperature [1] | -40°C to 125°C |
| LED Storage Temperature | -40°C to 125°C |
| Allowable Reflow Cycles [3] | — |
| Reverse Voltage ($V_{reverse}$) | LUXEON LEDs are not designed to be driven in reverse bias |

Notes for Table 4:
1. Case temperarure is the temperature measured at the $T_s$ point on the substrate. 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," 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 20% of the maximum allowable DC forward current.

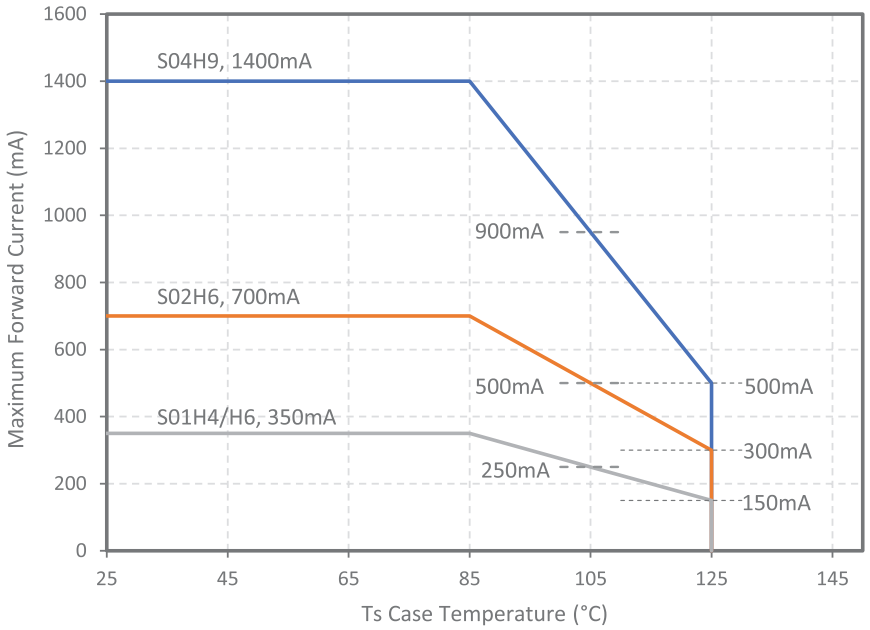



**Figure 1. Maximum forward current vs. case temperature for LUXEON CX Plus CoB – High Density at specified test current.**

# Characteristic Curves

## Spectral Power Distribution Characteristics

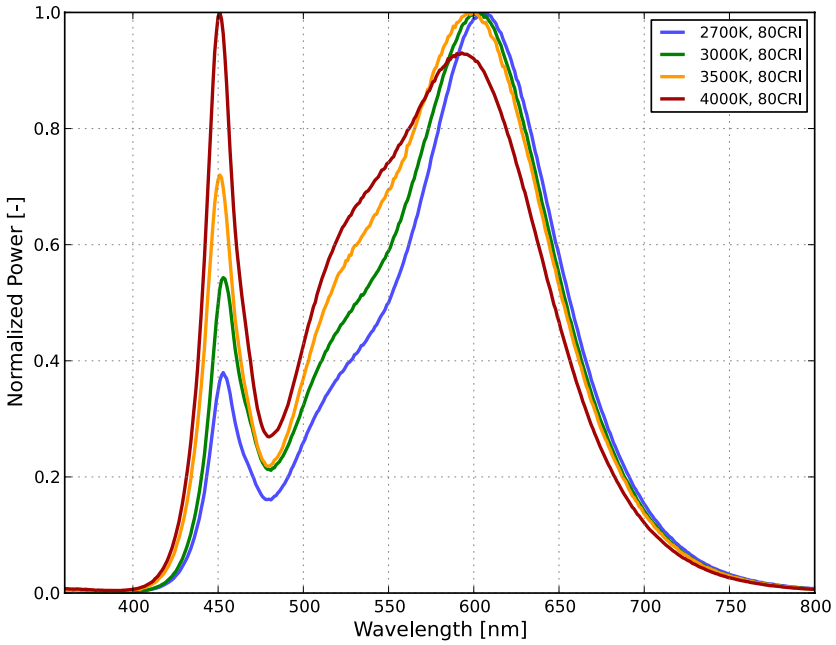



**Figure 2a. Typical normalized power vs. wavelength for LUXEON CX Plus CoB – High Density 80CRI at specified test current, $T_j$=85°C.**

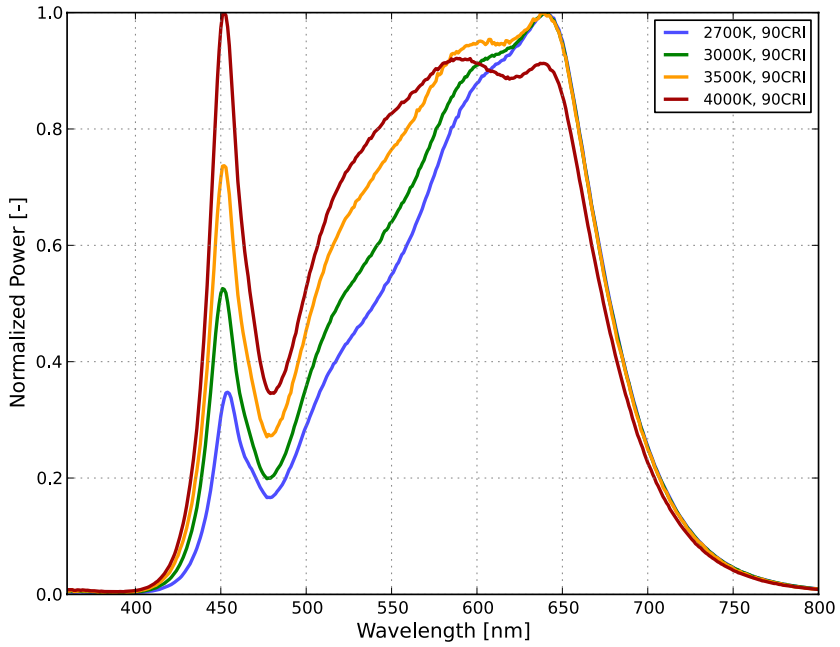



Figure 2b. Typical normalized power vs. wavelength for LUXEON CX Plus CoB – High Density 90CRI at specified test current, $T_j$=85°C.

## Light Output Characteristics

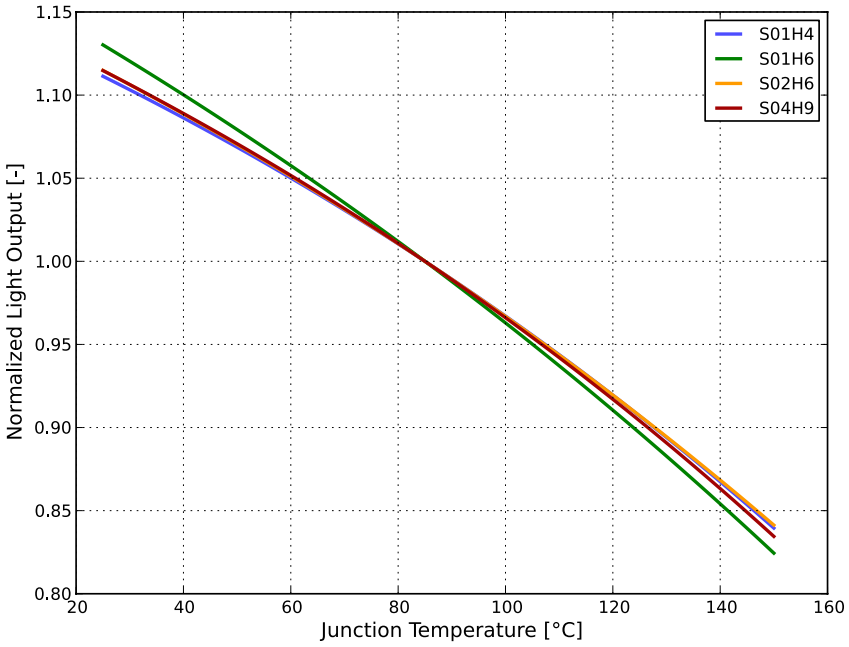



Figure 3. Typical normalized light output vs. junction temperature for LUXEON CX Plus CoB – High Density at specified test current.

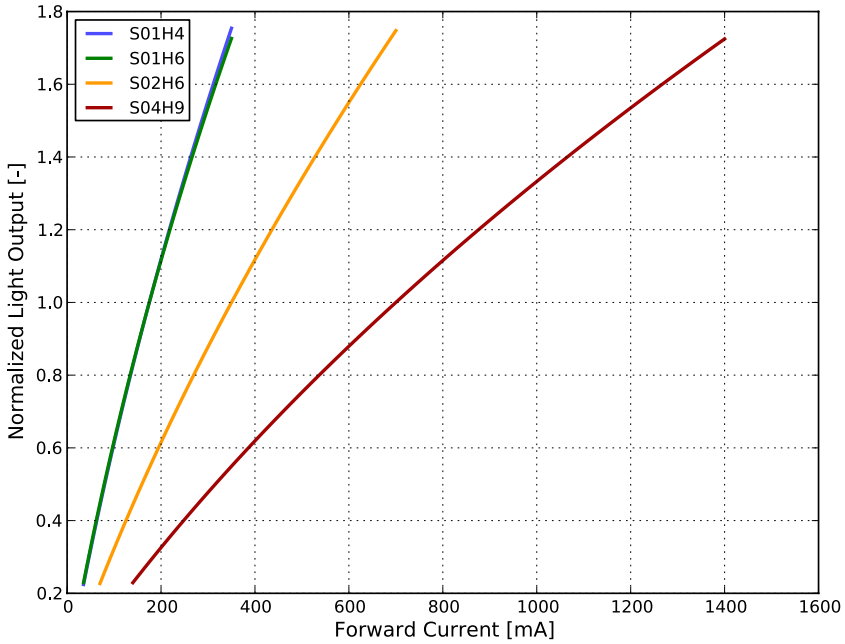



Figure 4. Typical normalized light output vs. forward current for LUXEON CX Plus CoB – High Density at $T_j$=85°C.

## Forward Current Characteristics

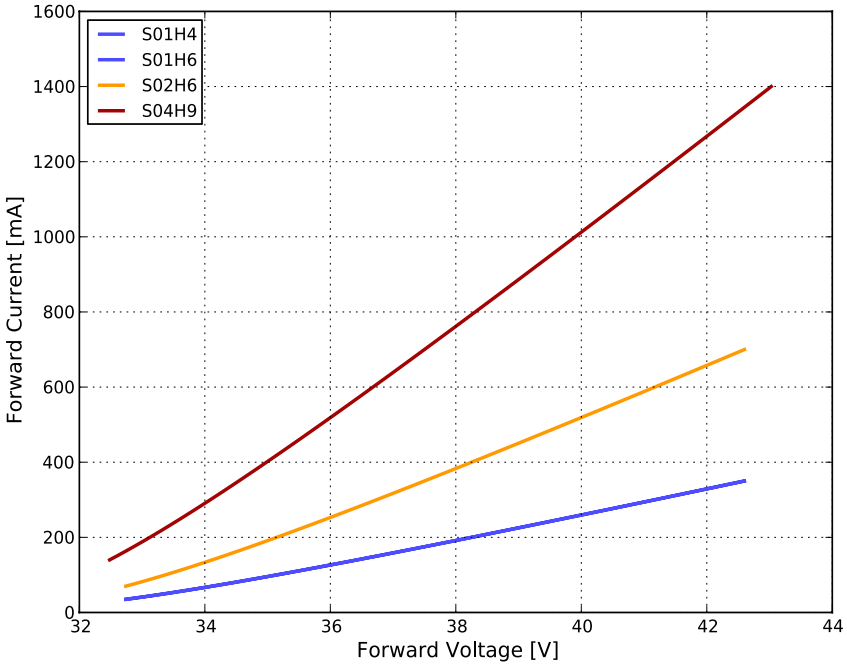



Figure 5. Typical forward current vs. forward voltage for LUXEON CX Plus CoB – High Density at $T_j$=85°C.

# Radiation Pattern Characteristics

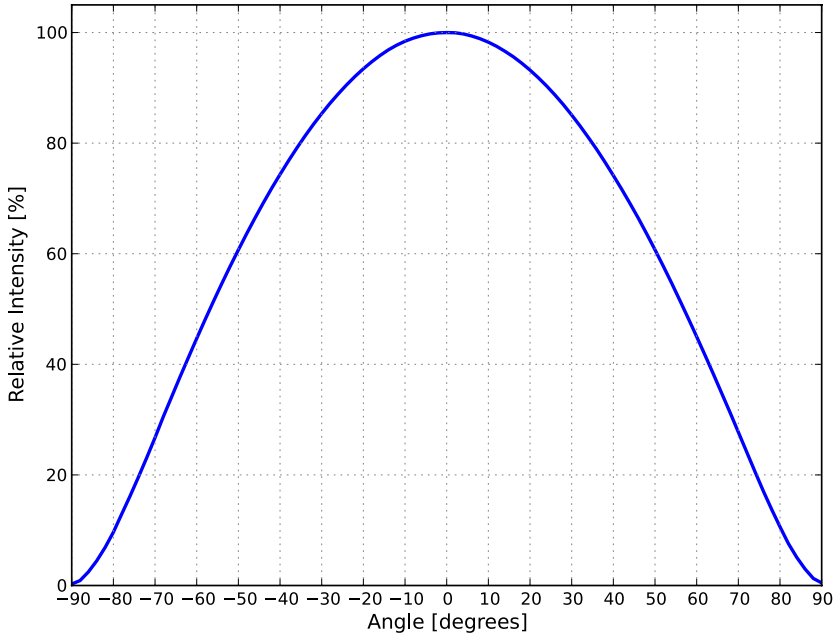



**Figure 6. Typical radiation pattern for LUXEON CX Plus CoB – High Density at specified test current, $T_j$=85°C.**

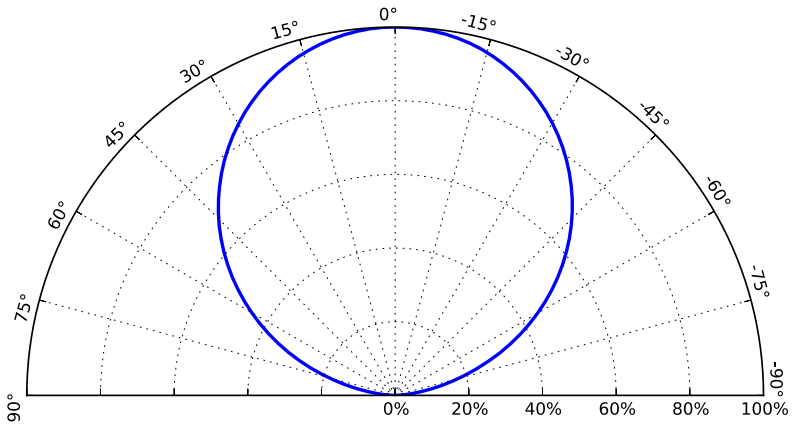



**Figure 7. Typical polar radiation pattern for LUXEON CX Plus CoB – High Density at specified test current, $T_j$=85°C.**

# Color Bin Definitions

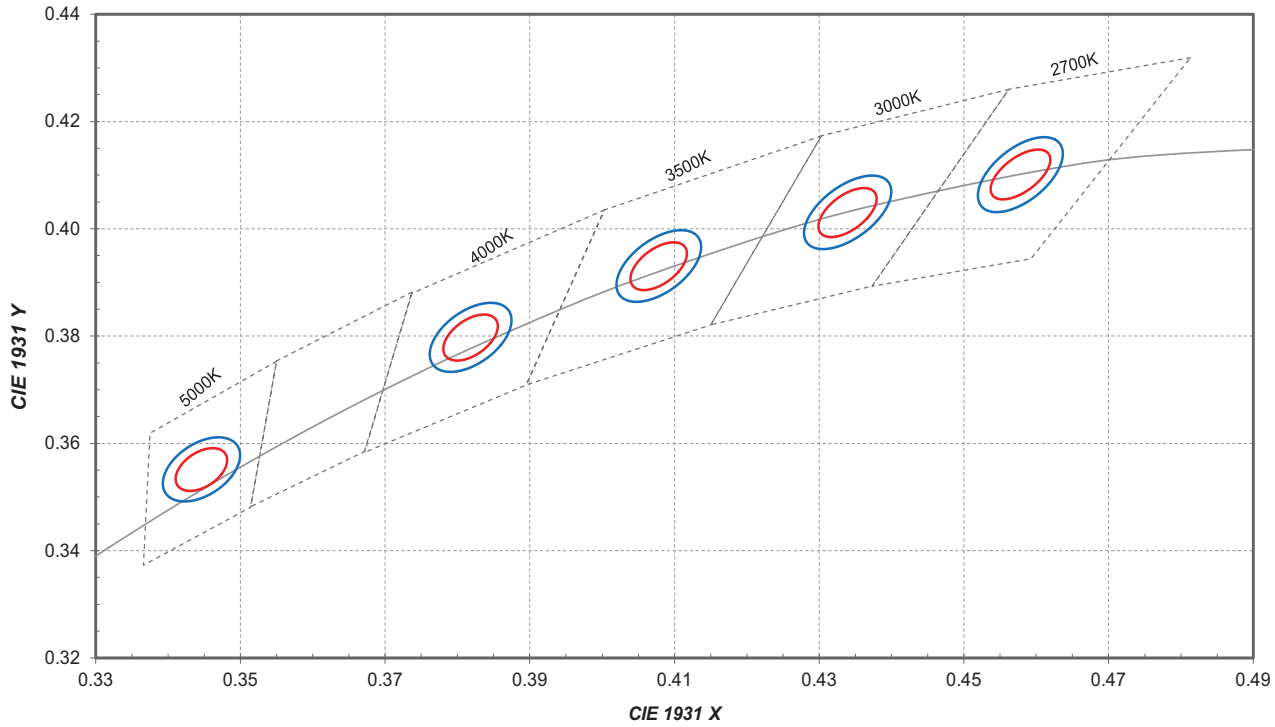



Figure 8. 2- and 3-step MacAdam ellipse illustration for Table 5.

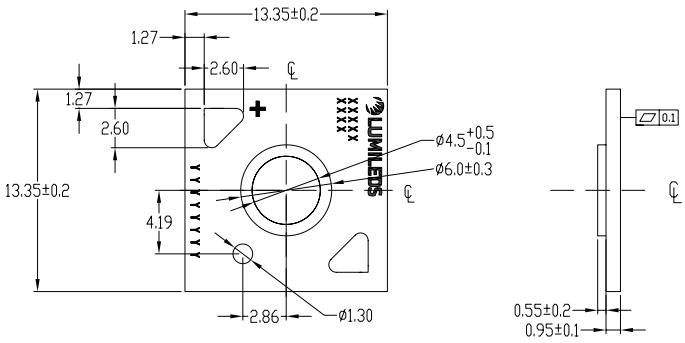
Table 5. 2- and 3-step MacAdam ellipse color bin definitions for LUXEON CX Plus CoB – High Density.

| NOMINAL CCT | CENTER POINT [1] (cx, cy) | 2 SDCM | | 3 SDCM | | ELLIPSE ROTATION ANGLE, θ |
|---|---|---|---|---|---|---|
| | | MAJOR AXIS, a | MINOR AXIS, b | MAJOR AXIS, a | MINOR AXIS, b | |
| 2700K | (0.4578, 0.4101) | 0.00540 | 0.00280 | 0.00810 | 0.00420 | 53.70° |
| 3000K | (0.4338, 0.4030) | 0.00556 | 0.00272 | 0.00834 | 0.00408 | 53.20° |
| 3500K | (0.4073, 0.3917) | 0.00618 | 0.00276 | 0.00927 | 0.00414 | 54.00° |
| 4000K | (0.3818, 0.3797) | 0.00626 | 0.00268 | 0.00939 | 0.00402 | 53.70° |
| 5000K | (0.3447, 0.3553) | 0.00548 | 0.00236 | 0.00822 | 0.00354 | 59.60° |

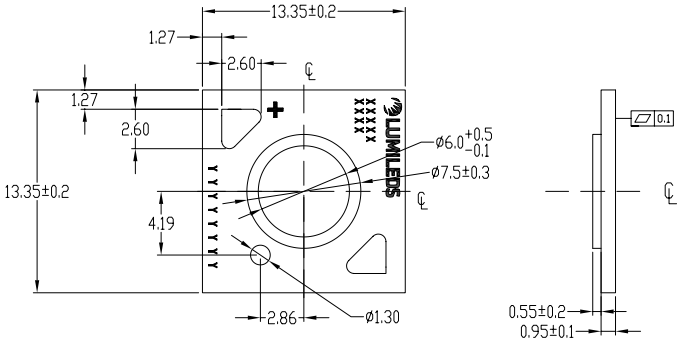
Notes for Table 5:
1. Lumileds maintains a tolerance of ±0.005 on x and y coordinates in the CIE 1931 color space.

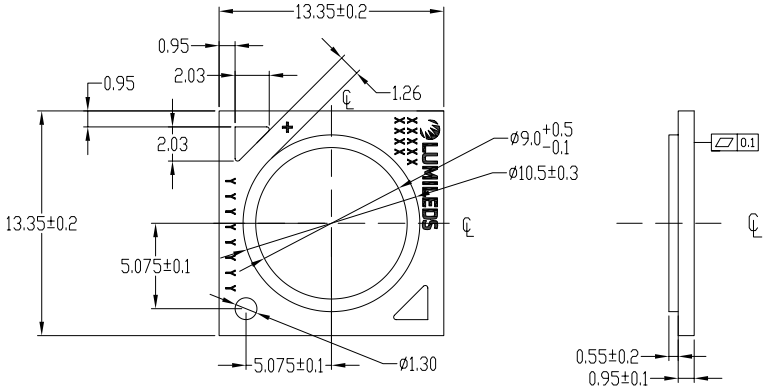
# Mechanical Dimensions




L2C4-xxxxxS01F0400




L2C4-xxxxxS01FH600 and L2C4-xxxxxS02F0600




L2C4-xxxxxS04F0900

**Figure 9. Mechanical dimensions for LUXEON CX Plus CoB – High Density.**

Notes for Figure 9:
1. Drawings are not to scale.
2. All dimensions are in millimeters.
3. Diameter and tolerance refer to dielectric opening.

# Packaging and Labeling Information

Table 6. Number of LEDs per tray and per inner box for LUXEON CX Plus CoB – High Density.

| PART NUMBER | TOTAL UNITS PER TRAY | TOTAL TRAYS PER INNER BOX | TOTAL UNITS PER INNER BOX |
|---|---|---|---|
| L2C4-xxxxxS01F0400 | 90 | 2 | 180 |
| L2C4-xxxxxS01FH600 | 90 | 2 | 180 |
| L2C4-xxxxxS02F0600 | 90 | 2 | 180 |
| L2C4-xxxxxS04F0900 | 90 | 2 | 180 |

## Tray Dimensions

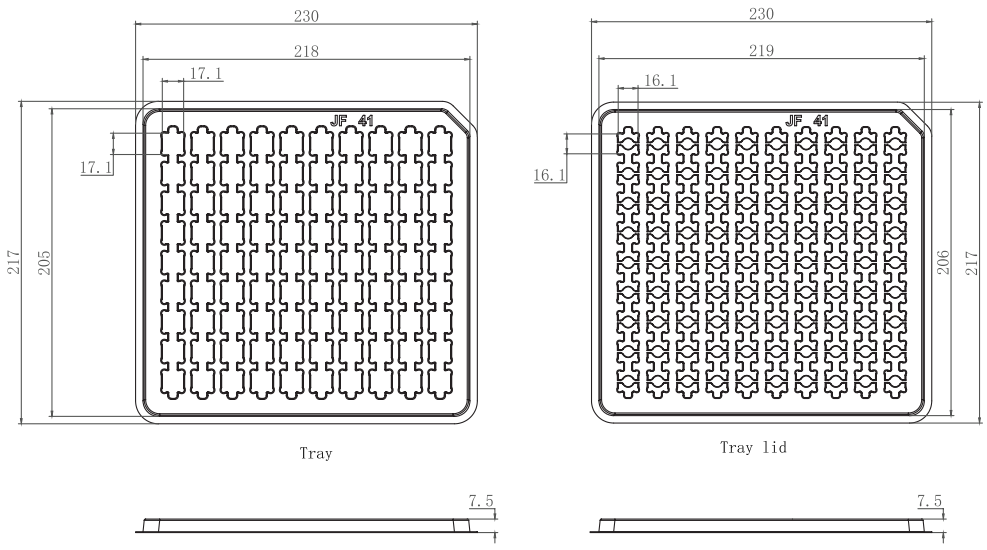



Figure 10. Tray dimensions for LUXEON CX Plus CoB – High Density.

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

# Inner Box

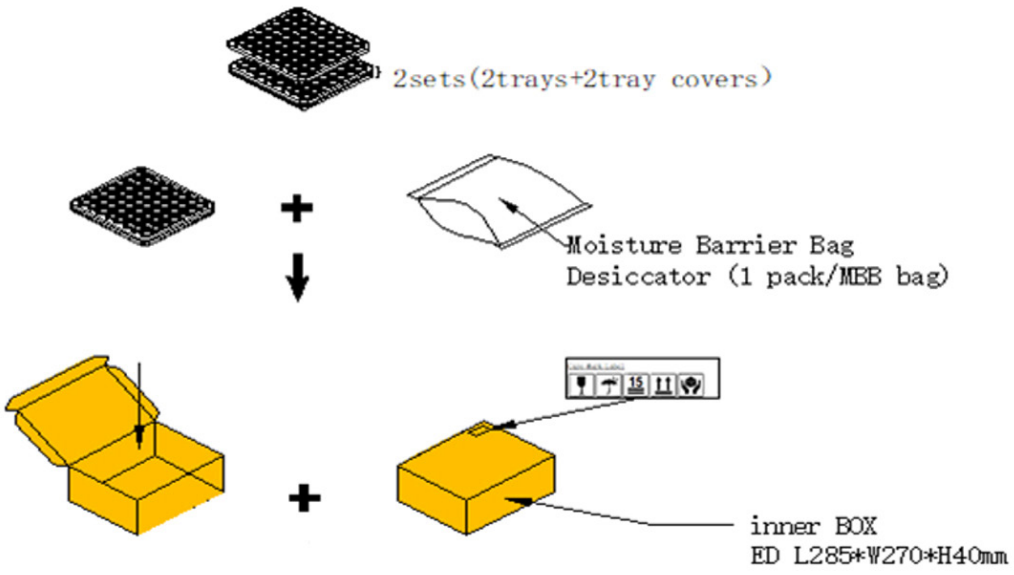



Figure 11. Dimensions for inner box packaging for LUXEON CX Plus CoB – High Density

Table 7. Inner box information for LUXEON CX Plus CoB – High Density.

| BOX TYPE | DIMENSIONS (mm) | | | AVERAGE WEIGHT (180pcs/box) |
|---|---|---|---|---|
| | H | L | W | |
| Inner Box | 40 | 285 | 270 | 0.385Kg |

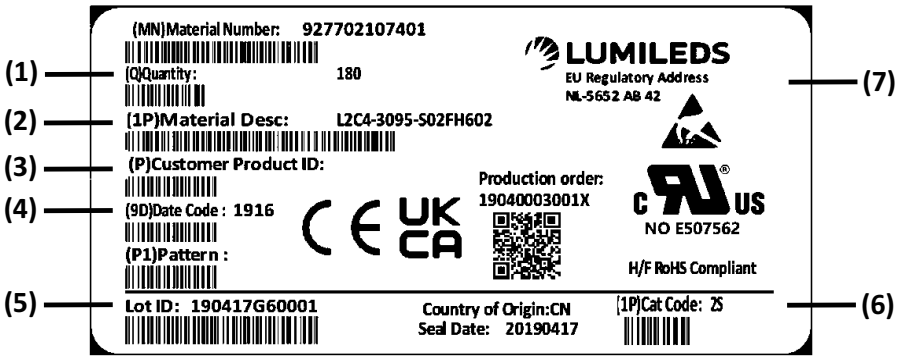



Figure 12. Example of a tray, MBB bag and inner box label for LUXEON CX Plus CoB – High Density.

Notes for Figure 12 – Inner Box Label descriptions for customer use:
Field labels not described are for Lumileds internal use only.
1. Number of LED emitters in an MBB bag.
2. Lumileds part number.
3. Customer part number for custom requests only.
4. LED test date in YYWW format.
5. Unique production lot identification number. This number is required for traceability purpose.
6. Product category code.
7. EU regulatory address.

# Outer Box

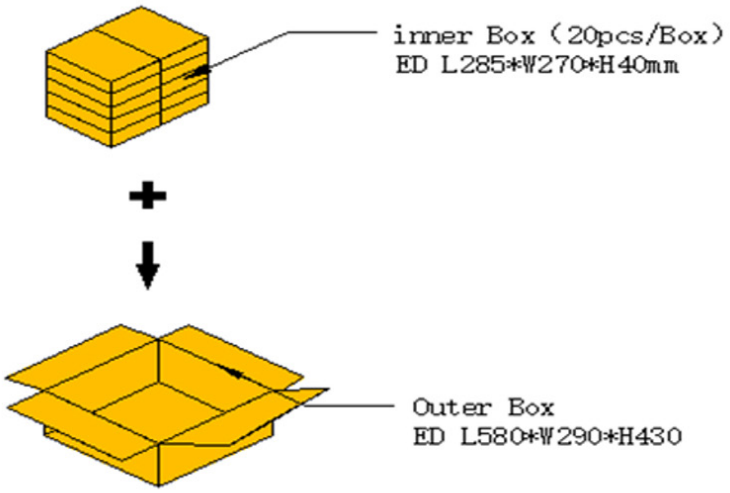



Figure 13. Dimensions for outer box packaging for LUXEON CX Plus CoB – High Density.

Table 8. Outer box information for LUXEON CX Plus CoB – High Density.

| BOX TYPE | DIMENSIONS (mm) | | | MAXIMUM INNER BOXES PER OUTER BOX | MAXIMUM QUANTITY PER OUTER BOX | AVERAGE WEIGHT (3600pcs/box) |
|---|---|---|---|---|---|---|
| | H | L | W | | | |
| Outer Box | 430 | 580 | 290 | 20 | 3600 | 8.6Kg |

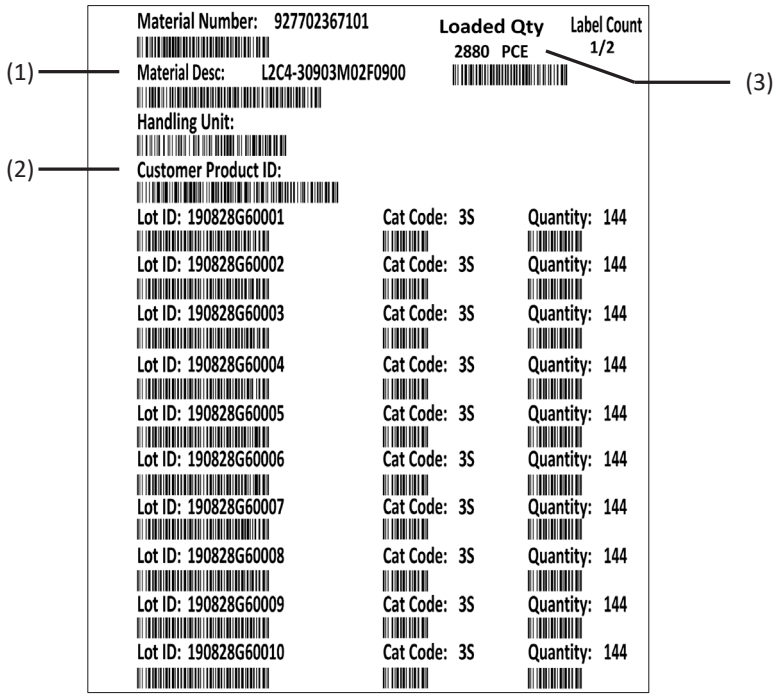



Figure 14. Example of outer box label for LUXEON CX Plus CoB – High Density.

Notes for Figure 14 – Outer Box Label descriptions for customer use:
Field labels not described are for Lumileds internal use only.
1. Lumileds part number.
2. Customer part number for custom requests only.
3. Total number of LED emitters in a shipment box.

# 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.