LUMILEDS

ILLUMINATION

**For NEW designs consider these replacement products:**

- LUXEON CoB Core Range
- LUXEON CX Plus CoB
- LUXEON CoB Core Range – High Density



# LUXEON CoB Compact Range (Gen 2)

## Unsurpassed light quality and CBCP due to small LES

The second generation of LUXEON CoB Compact Range represents a new breakthrough in performance for arrays. It has up to 16% higher efficiency and lumen output at the same drive currents as existing LUXEON CoB Compact Range LEDs. This array offers the industry's smallest Light Emitting Surface (LES) that enables easier and less expensive designs and provides good Center Beam Candle Power (CBCP) for crisp light beams with the best luminance and color uniformity. LUXEON CoB Compact parts are available in 3–step (80CRI and 90CRI) MacAdam ellipse, ensuring uniform optical performance in retrofit lamps and spotlight applications. LUXEON CoB Compact Range LEDs are all hot–tested at 85°C—real world operating conditions—which means that luminaire design is simplified and testing can be minimized.

### FEATURES AND BENEFITS

- Highest flux densities with industry's smallest LES, 6.5mm
- Industry leading thermal resistance allows for smaller heatsinks
- Ceramic substrate that offers better protection in Hi Pot testing
- Supported by a comprehensive optical, mechanical and electrical ecosystem
- 3-step MacAdam ellipse color definition: *Freedom from Binning* for color consistency from luminaire to luminaire
- Tested at $T_j$=85°C for accurate color in application

### PRIMARY APPLICATIONS

- Downlights
- High Bay & Low Bay
- Lamps
  - Directional
- Spotlights

 

cULus No. E352519 RoHS COMPLIANT

# Table of Contents

# General Product Information

## Nomenclature Test Conditions

LUXEON CoB Compact Range (Gen 2) LEDs are tested and binned with a DC drive current specified below at a junction temperature, $T_j$, of 85°C.

150mA – LUXEON CoB 205
250mA – LUXEON CoB 209

## Part Number Nomenclature

Part numbers for LUXEON CoB Compact Range (Gen 2) follow the convention below:

L 2 C 3 – **A A B B D** 0 **F** E 0 6 0 0 0

Where:

**A A** – designates nominal ANSI CCT (22=2200K, 27=2700K, 30=3000K, 35=3500K, 40=4000K, 50=5000K, 57=5700K)

**B B** – designates minimum CRI (80=80CRI, 90=90CRI)

**D** – designates product generation (2=Gen 2)

**F** – designates product wattage (5=5W, 9=9W)

Therefore, the following part number is used for a LUXEON CoB Gen 2, 5W, 3000K 80CRI:

L 2 C 3 – **3 0 8 0 2** 0 **5** E 0 6 0 0 0

## Lumen Maintenance

Lumen maintenance for solid-state lighting devices (LEDs) is typically defined in terms of the percentage of initial light output remaining after a specified period of time. Based on historical data Lumileds projects that LUXEON CoB Compact Range (Gen 2) will deliver—on average—70% lumen maintenance (L70) at 50,000 hours of operation at its nominal, tested conditions. Observation of design limits included in this data sheet is required in order to achieve this projected lumen maintenance.

## Environmental Compliance

Lumileds LLC is committed to providing environmentally friendly products to the solid-state lighting market. LUXEON LEDs are 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 material 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 CoB Compact Range (Gen 2) at specified test current, $T_j$=85ºC.**

| PRODUCT | NOMINAL CCT | MINIMUM CRI [1, 2, 3] | LUMINOUS FLUX [1] (lm) | | TYPICAL LUMINOUS EFFICACY (lm/W) | TEST CURRENT (mA) | LES [4] (mm) | PART NUMBER |
|---|---|---|---|---|---|---|---|---|
| | | | MINIMUM | TYPICAL | | | | |
| LUXEON CoB 205 | 2200 | 80 | 510 | 567 | 105 | 150 | 6.5 | L2C3-2280205E06000 |
| | 2700 | 80 | 585 | 650 | 120 | 150 | 6.5 | L2C3-2780205E06000 |
| | 3000 | 80 | 622 | 691 | 128 | 150 | 6.5 | L2C3-3080205E06000 |
| | 3500 | 80 | 635 | 705 | 131 | 150 | 6.5 | L2C3-3580205E06000 |
| | 4000 | 80 | 653 | 726 | 134 | 150 | 6.5 | L2C3-4080205E06000 |
| | 5000 | 80 | 653 | 726 | 134 | 150 | 6.5 | L2C3-5080205E06000 |
| | 5700 | 80 | 653 | 725 | 134 | 150 | 6.5 | L2C3-5780205E06000 |
| | 2200K [5] | 90 | 452 | 502 | 93 | 150 | 6.5 | L2C3-2290205E06000 |
| | 2700 | 90 | 506 | 562 | 104 | 150 | 6.5 | L2C3-2790205E06000 |
| | 3000 | 90 | 542 | 602 | 111 | 150 | 6.5 | L2C3-3090205E06000 |
| | 3500 | 90 | 573 | 637 | 118 | 150 | 6.5 | L2C3-3590205E06000 |
| | 4000 | 90 | 581 | 646 | 120 | 150 | 6.5 | L2C3-4090205E06000 |
| LUXEON CoB 209 | 2200 | 80 | 826 | 918 | 103 | 250 | 6.5 | L2C3-2280209E06000 |
| | 2700 | 80 | 972 | 1080 | 122 | 250 | 6.5 | L2C3-2780209E06000 |
| | 3000 | 80 | 1008 | 1120 | 126 | 250 | 6.5 | L2C3-3080209E06000 |
| | 3500 | 80 | 1028 | 1142 | 129 | 250 | 6.5 | L2C3-3580209E06000 |
| | 4000 | 80 | 1058 | 1176 | 133 | 250 | 6.5 | L2C3-4080209E06000 |
| | 5000 | 80 | 1058 | 1176 | 133 | 250 | 6.5 | L2C3-5080209E06000 |
| | 5700 | 80 | 1072 | 1191 | 134 | 250 | 6.5 | L2C3-5780209E06000 |
| | 2200K [5] | 90 | 757 | 841 | 95 | 250 | 6.5 | L2C3-2290209E06000 |
| | 2700 | 90 | 828 | 920 | 104 | 250 | 6.5 | L2C3-2790209E06000 |
| | 3000 | 90 | 902 | 1002 | 113 | 250 | 6.5 | L2C3-3090209E06000 |
| | 3500 | 90 | 933 | 1037 | 117 | 250 | 6.5 | L2C3-3590209E06000 |
| | 4000 | 90 | 961 | 1068 | 120 | 250 | 6.5 | L2C3-4090209E06000 |

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 highter than the minimum CRI specified, but this is not guaranteed.
3. R9 value of 90CRI products is >50.
4. Light Emitting Surface (LES) is the inner diameter (phosphor area) inside the dam.
5. AtmoSphere Technology creates the ideal ambiance for restaurants and other hospitality venues.



## Optical Characteristics

**Table 2. Optical characteristics for LUXEON CoB Compact Range (Gen 2) at specified test current, $T_j$=85ºC.**

| PART NUMBER | TYPICAL TOTAL INCLUDED ANGLE [1] | TYPICAL VIEWING ANGLE [2] |
|---|---|---|
| L2C3-xxxx20xE06000 | 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 LED centerline where the luminous intensity is ½ of the peak value.

  

# Electrical and Thermal Characteristics

**Table 3. Electrical and thermal characteristics for LUXEON CoB Compact Range (Gen 2) at specified test current, $T_j$=85°C.**

| PART NUMBER | TEST CURRENT (mA) | 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 | | |
| L2C3-xxxx205E06000 | 150 | 33.6 | 36.0 | 39.0 | -16 | 2.2 |
| L2C3-xxxx209E06000 | 250 | 32.8 | 35.2 | 38.0 | -16 | 1.5 |

Notes for Table 3:
1. Lumileds maintains a tolerance of ±10% on forward voltage measurements.
2. Measured between 25°C and 85°C for coefficient of forward voltage.
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 CoB Compact Range (Gen 2).**

| PARAMETER | MAXIMUM PERFORMANCE |
|---|---|
| DC Forward Current [1, 2] | LUXEON CoB 205: 300mA<br>LUXEON CoB 209: 400mA |
| LED Junction Temperature [1] (DC & Pulse) | 125°C |
| ESD Sensitivity (ANSI/ESDA/JEDEC JS-001-2012) | Class 3B |
| Operating Case Temperature [1] | -40°C to 105°C |
| LED Storage Temperature | -40°C to 105°C |
| Reserve Voltage ($V_{reverse}$) | LUXEON LEDs are not designed to be driven in reverse bias |

Notes for 4:
1. Proper current derating must be observed to maintain 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 15% of the maximum allowable DC forward current

# Characteristics Curves

## Spectral Distribution Characteristics

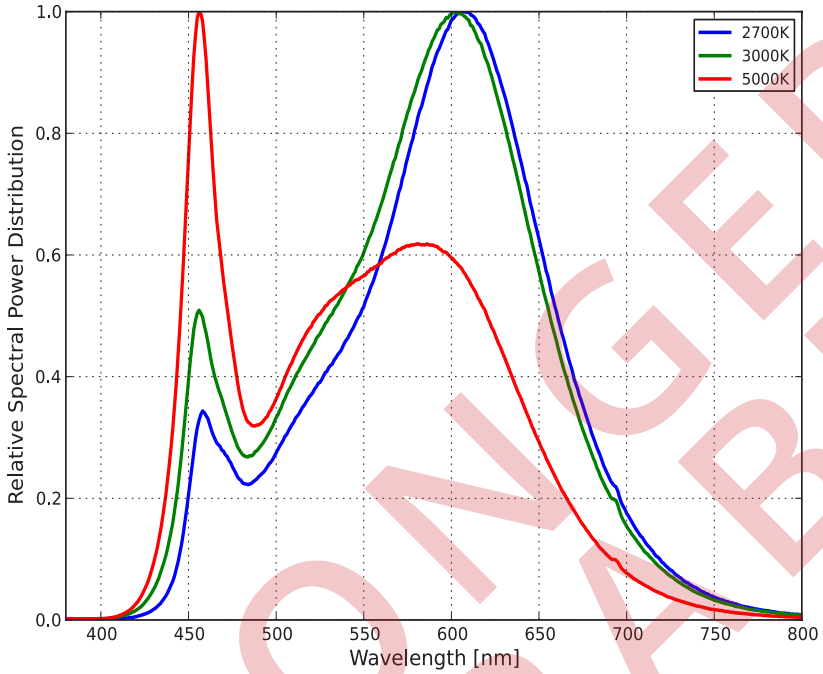


Figure 1a. Typical normalized power vs. wavelength for L2C3-xx8020xE06000 at test current, $T_j$=85°C.

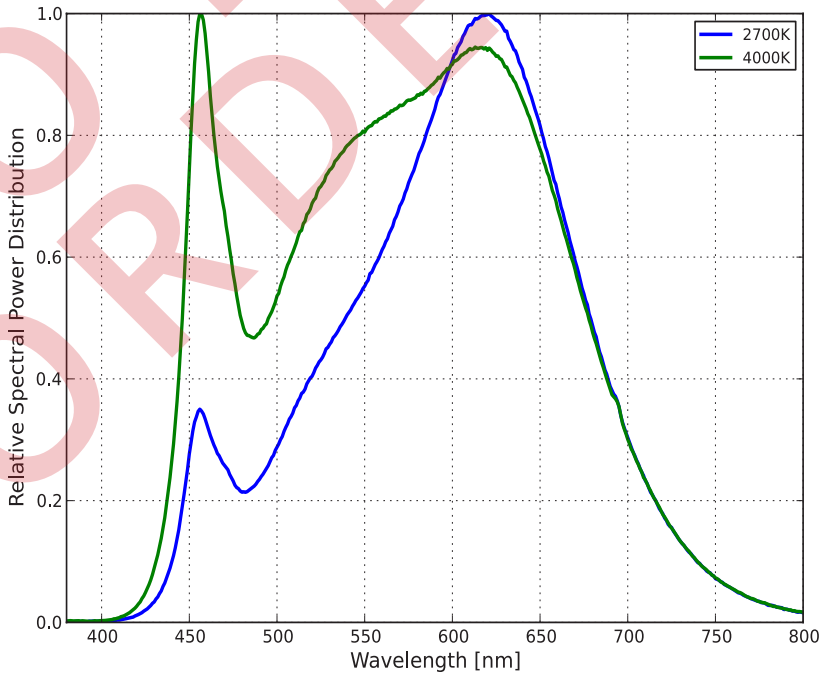


Figure 1b. Typical normalized power vs. wavelength for L2C3-xx9020xE06000 at test current, $T_j$=85°C.

# Light Output Characteristics

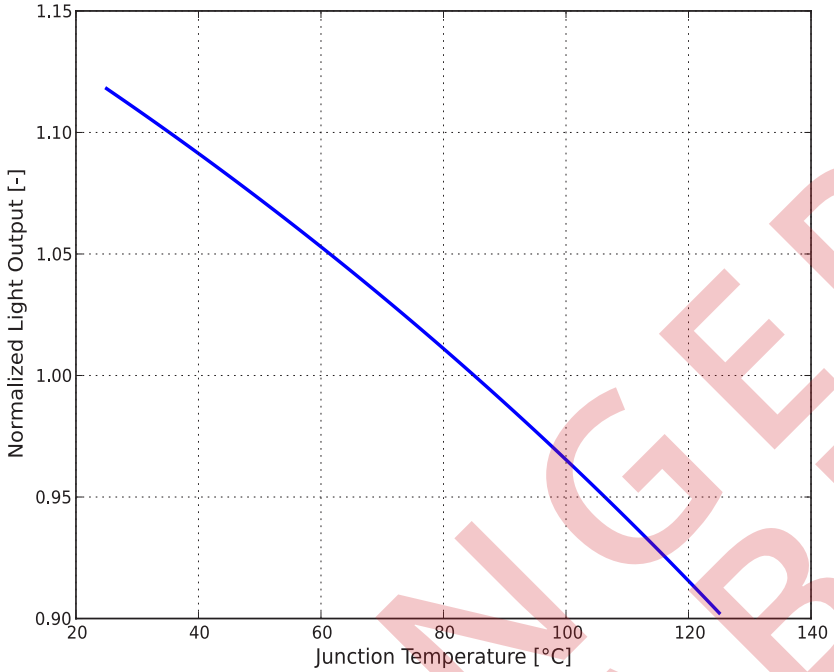


**Figure 2. Typical normalized light output vs. junction temperature for L2C3-xxxx20xE06000 at test current.**

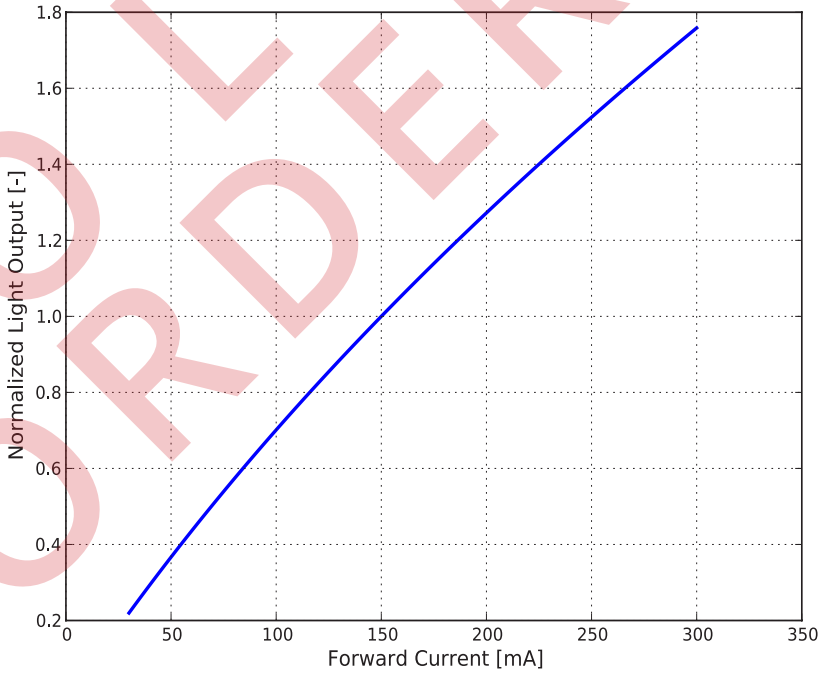


**Figure 3a. Typical normalized light output vs. forward current for L2C3-xxxx205E06000 at $T_j$=85°C.**

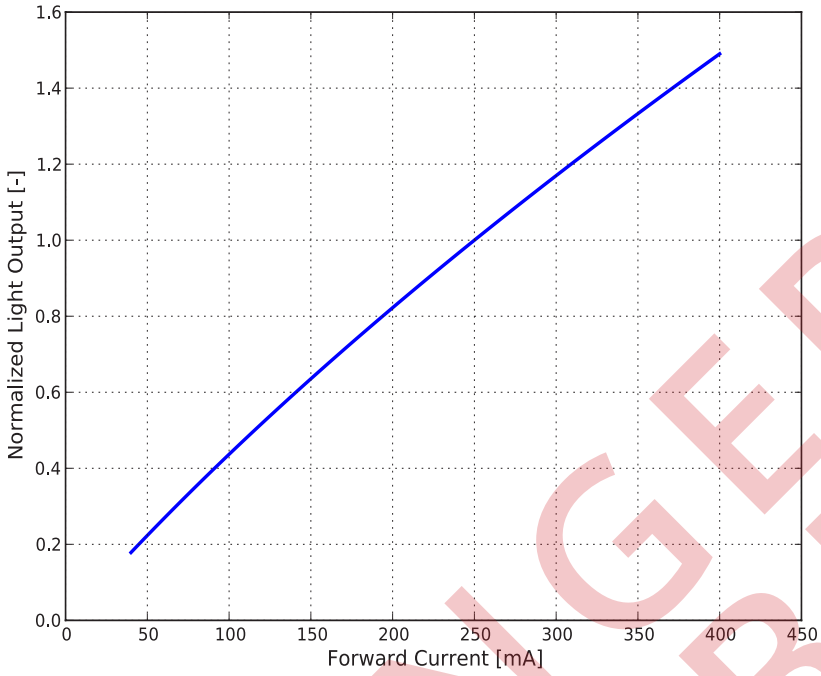


Figure 3b. Typical normalized light output vs. forward current for L2C3-xxxx209E06000 at $T_j$=85°C.

## Forward Current Characteristics

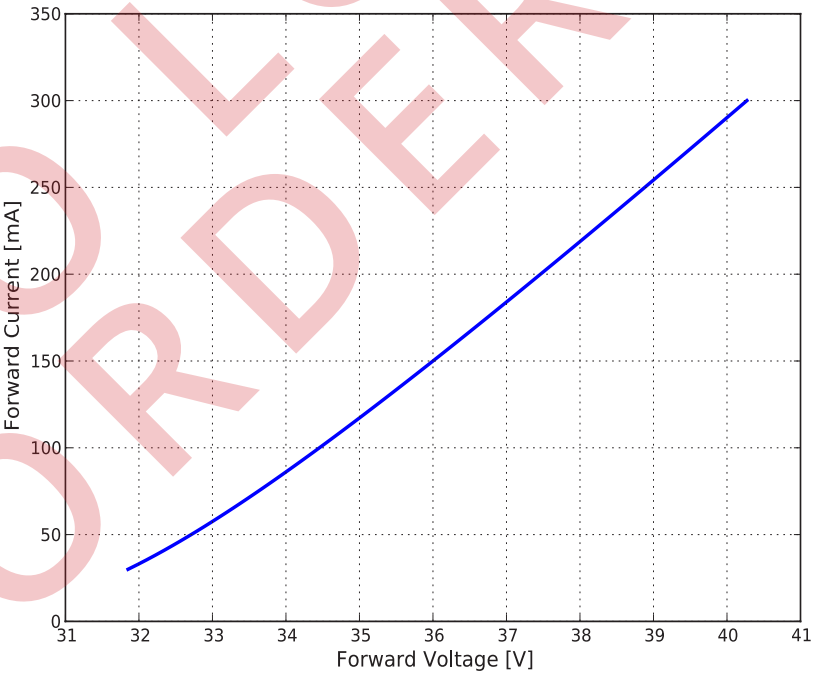


Figure 4a. Typical forward current vs. forward voltage for L2C3-xxxx205E06000 at $T_j$=85°C.

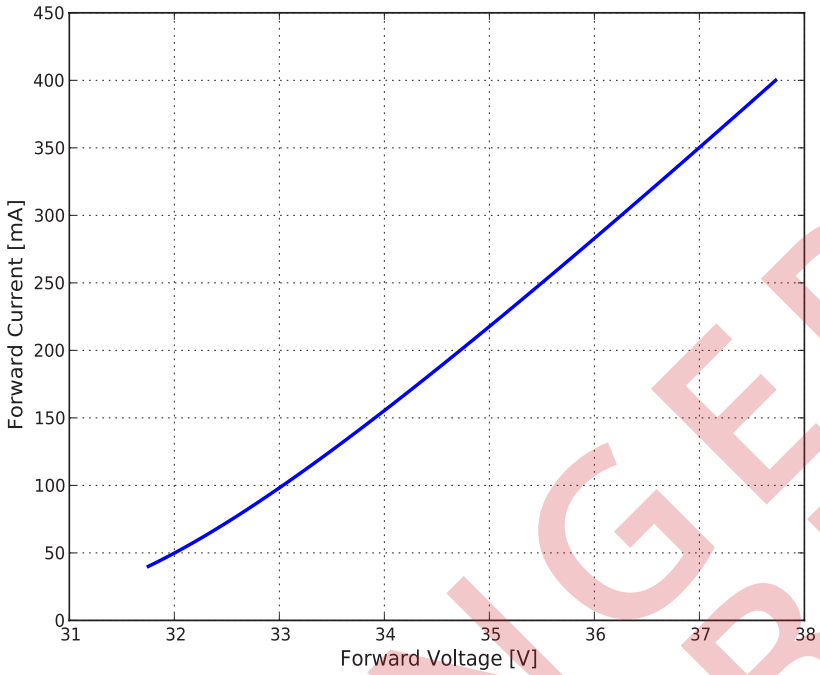


**Figure 4b. Typical forward current vs. forward voltage for L2C3-xxxx209E06000 at $T_j$=85°C.**

## Radiation Patterns

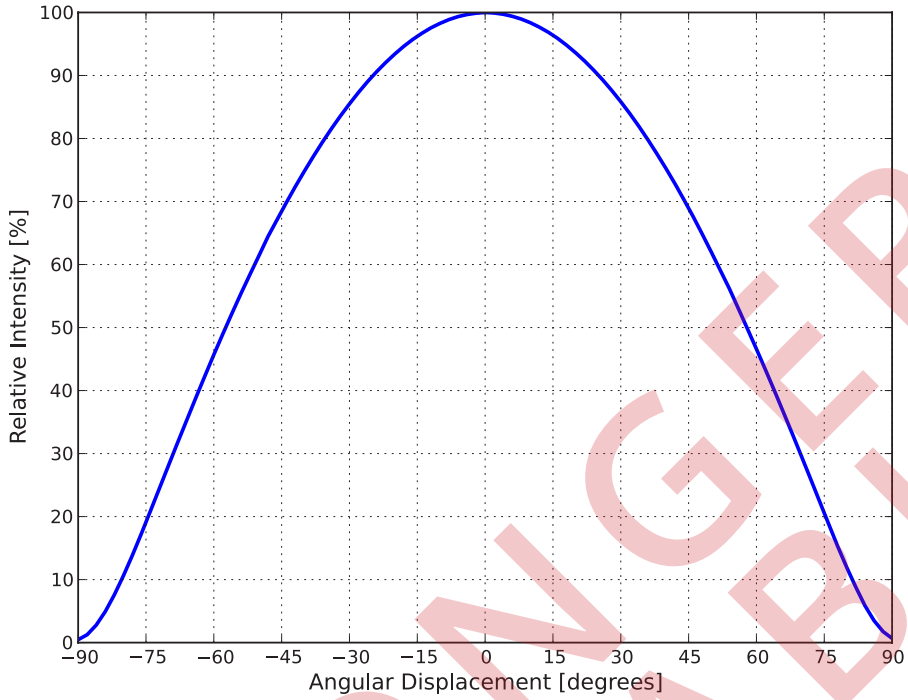


Figure 5. Typical radiation pattern for L2C3-xxxx20xE06000 at test current, $T_j$=85°C.

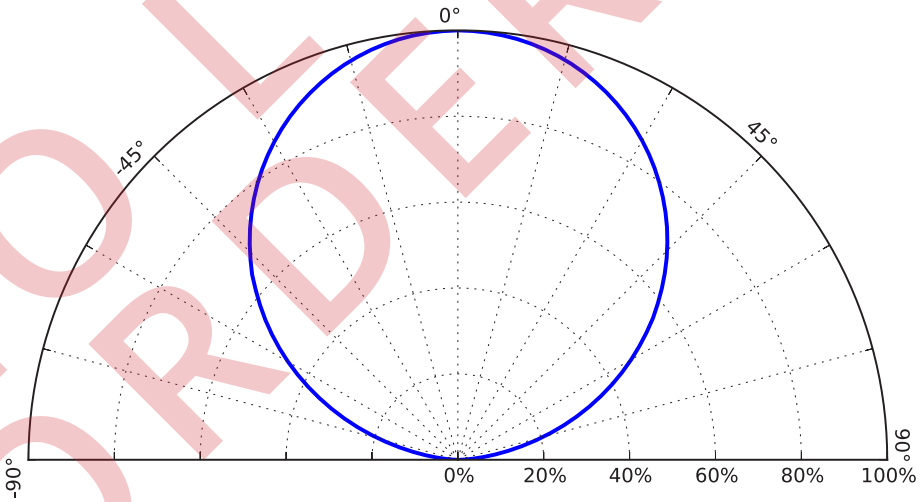


Figure 6. Typical polar radiation pattern for L2C3-xxxx20xE06000 at test current, $T_j$=85°C.

# Color Bin Definitions

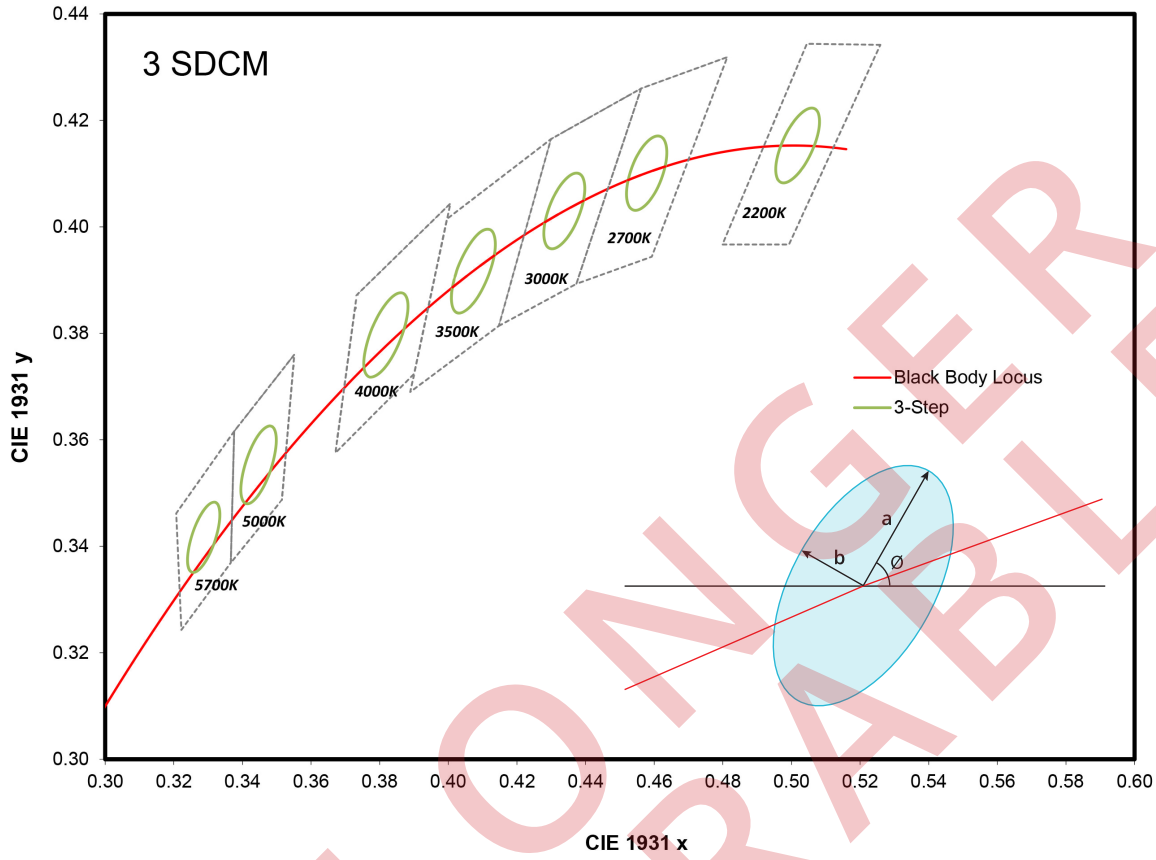


Figure 7. 3-step MacAdam ellipse illustration for Table 5.

Table 5. 3-step MacAdam ellipse color bin definitions for LUXEON CoB Compact Range (Gen 2) at test current, $T_j$=85°C.

| NOMINAL CCT | COLOR SPACE | CENTER POINT [1] (cx, cy) | MAJOR AXIS, a | MINOR AXIS, b | ELLIPSE ROTATION ANGLE, θ |
|---|---|---|---|---|---|
| 2200K | Single 3-step MacAdam ellipse | (0.5020, 0.4155) | 0.00862 | 0.00397 | 49.3° |
| 2700K | Single 3-step MacAdam ellipse | (0.4578, 0.4101) | 0.00810 | 0.00420 | 53.7° |
| 3000K | Single 3-step MacAdam ellipse | (0.4338, 0.4030) | 0.00834 | 0.00408 | 53.2° |
| 3500K | Single 3-step MacAdam ellipse | (0.4073, 0.3917) | 0.00927 | 0.00414 | 54.0° |
| 4000K | Single 3-step MacAdam ellipse | (0.3818, 0.3797) | 0.00939 | 0.00402 | 53.7° |
| 5000K | Single 3-step MacAdam ellipse | (0.3447, 0.3553) | 0.00822 | 0.00354 | 59.6° |
| 5700K | Single 3-step MacAdam ellipse | (0.3287, 0.3417) | 0.00745 | 0.00320 | 59.1° |

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

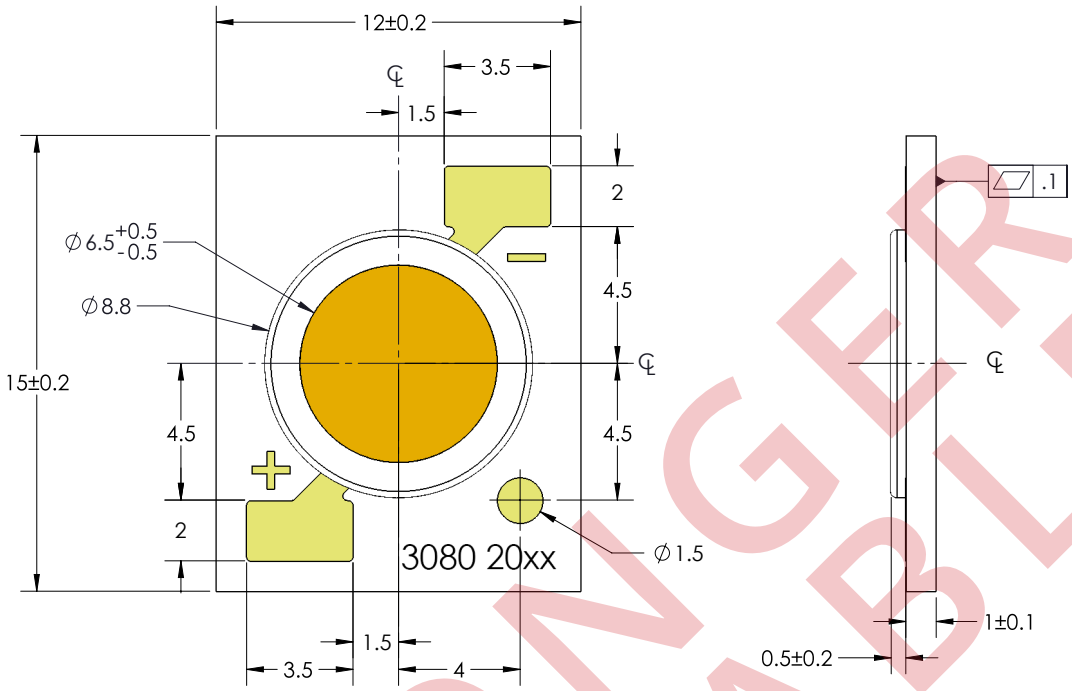


Figure 8. Mechanical dimensions for LUXEON CoB Compact Range (Gen 2).

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

# Packaging and Labeling Information

LUXEON CoB Compact Range (Gen 2) 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 box have printed information providing part numbers with CAT codes that indicate that indicate luminous flux, color and forward voltage bins.

**Table 6. Package information for LUXEON CoB Compact Range (Gen 2).**

| PART NUMBER | TOTAL UNITES PER TUBE | TOTAL TUBES PER INNER BOX | TOTAL UNITS PER INNER BOX |
|---|---|---|---|
| L2C3-xxxx205E06000 | 20 | 5 | 100 |
| L2C3-xxxx209E06000 | 20 | 5 | 100 |

## Tube

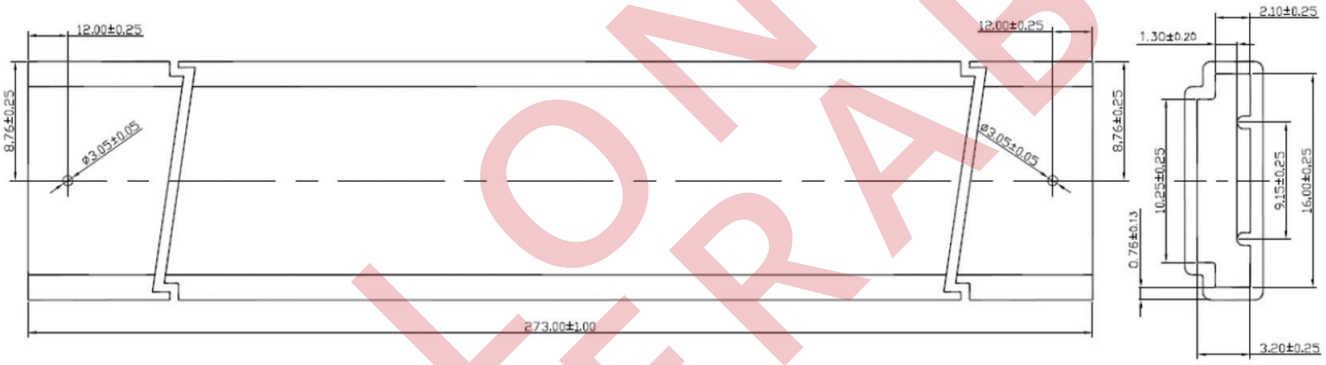


**Figure 9. Tube dimensions for LUXEON CoB Compact Range (Gen 2).**

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

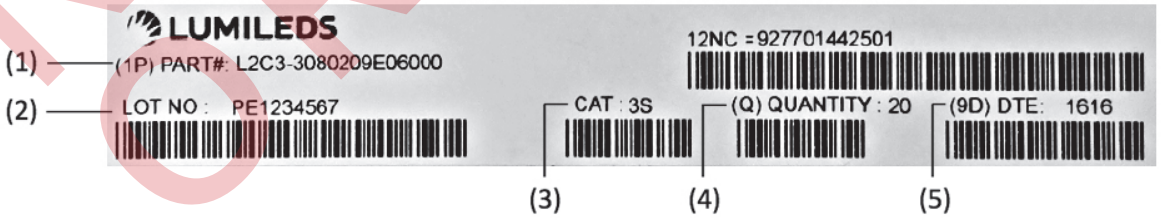


**Figure 10. Example of a tube label for LUXEON CoB Compact Range (Gen 2).**

Notes for Figure 10 – Tube Label descriptions for customer use:
Field labels not described are for Lumileds internal use only.
1. Lumileds part number.
2. Unique production lot identification number. This number is required for traceability purpose.
3. Product category code.
4. Number of LED emitters in a tube.
5. LED test date in YYWW format.

# Inner Box

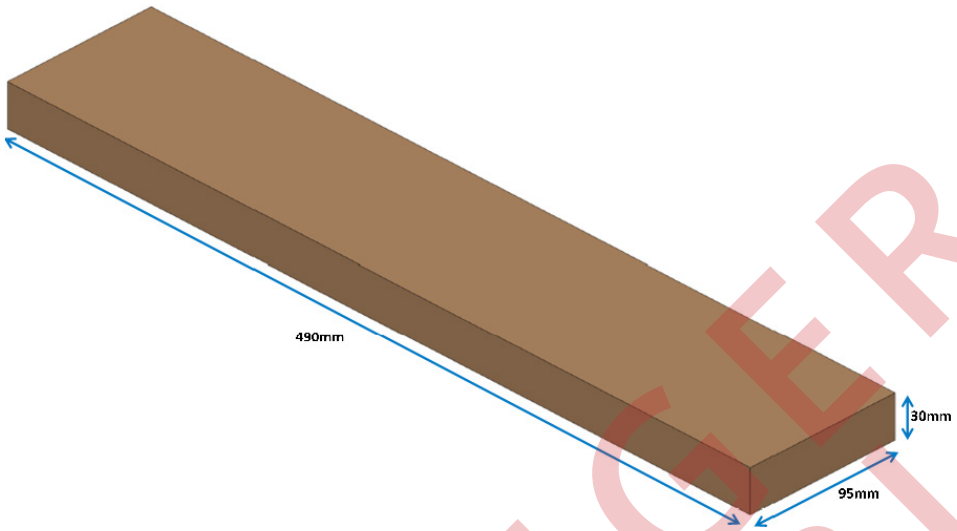


Figure 11. Dimensions for inner box packaging for LUXEON CoB Compact Range (Gen 2).

Table 7. Inner box information for LUXEON CoB Compact Range (Gen 2).

| BOX TYPE | DIMENSIONS (mm) | | | AVERAGE WEIGHT (100pcs/box) |
|---|---|---|---|---|
| | H | L | W | |
| Inner Box | 30 | 490 | 95 | 0.225kg |


Figure 12. Example of inner box label for LUXEON CoB Compact Range (Gen 2).

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

# Outer Box

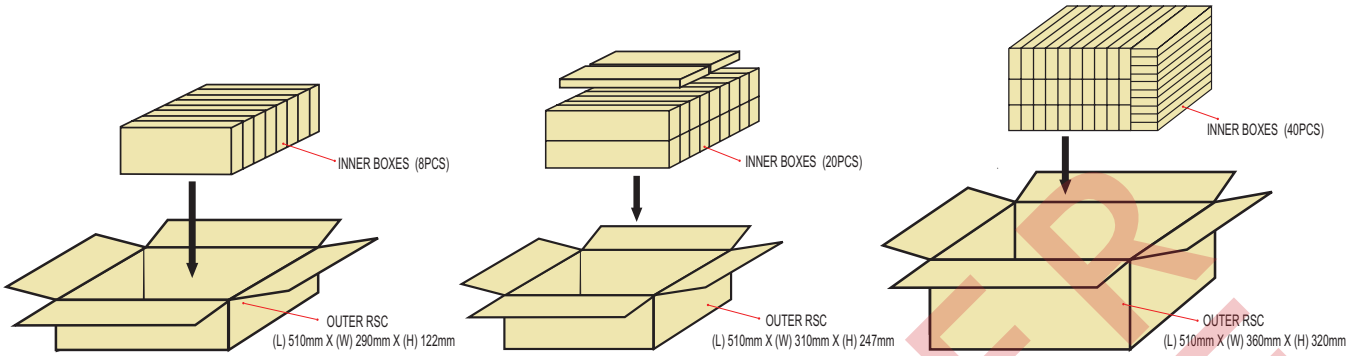


Figure 13. Dimensions for outer box packaging for LUXEON CoB Compact Range (Gen 2).

Table 8. Outer box information for LUXEON CoB Compact Range (Gen 2).

| BOX TYPE | DIMENSIONS (mm) | | | MAXIMUM INNER BOXES PER OUTER BOX | MAXIMUM QUANTITY PER OUTER BOX | AVERAGE WEIGHT |
|---|---|---|---|---|---|---|
| | H | L | W | | | |
| Outer Box 8 PCS | 122 | 510 | 290 | 8 | 800 | 2.13kg |
| Outer Box 20 PCS | 247 | 510 | 310 | 20 | 2000 | 5.24kg |
| Outer Box 40 PCS | 320 | 510 | 360 | 40 | 4000 | 10.46kg |

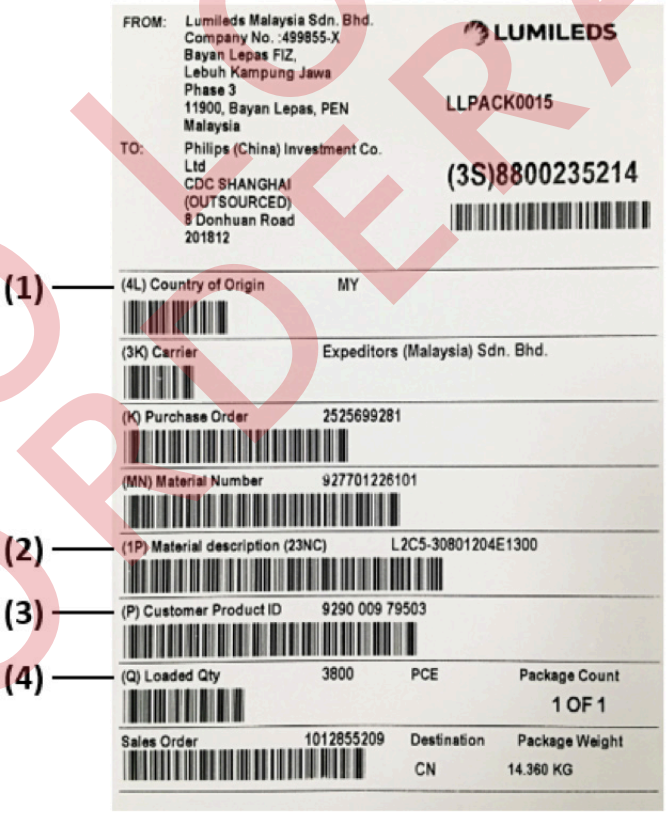


Figure 14. Example of outer box label for LUXEON CoB Compact Range (Gen 2).

Notes for Figure 14 – Outer Box Label descriptions for customer use:
Field labels not described are for Lumileds internal use only.
1. Country code of origin of manufacturing of parts (e.g. MY for Malaysia, CN for China) according to ISO 3166-1 alpha-2 document.
2. Lumileds part number.
3. Customer part number for custom requests only.
4. 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 safer, better and more beautiful—with light.

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



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