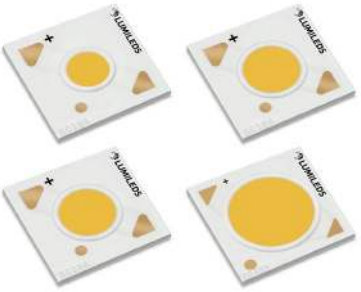
LUMILEDS

ILLUMINATION

LUXEON CX Plus CoB – High Density (Below BBL)

Higher lumen density with industry standard footprint



LUXEON CX Plus CoB – High Density (Below BBL) creates remarkable and impressive white color at 95CRI, 2- and 3-step MacAdam ellipse Below Black Body Line. Using the same mechanical dimensions as LUXEON CX Plus CoB – High Density, Light Emitting Surfaces of 4.5mm, 6mm, and 9mm, and an industry standard footprint of 13.35mm x 13.35mm, LUXEON CX Plus CoB – High Density (Below BBL) benefits from an existing ecosystem allowing immediate and effortless upgrades to a premium luminaire design.

FEATURES AND BENEFITS

- Industry's smallest Light Emitting Surfaces (LES) for highest lumen densities at CRI 95
- 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 (Below BBL) 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 S02H4
175mA	–	LUXEON CX Plus CoB – HD S02H6L
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 (Below BBL) 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)
B B	–	designates minimum CRI (95=95CRI)
C	–	designates SDCM (2=2-step MacAdam ellipse, 3=3-step MacAdam ellipse)
D D D	–	designates product configuration (example: 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 (B0=Below Black Body Line)

Therefore, the following part number is used for a LUXEON CX Plus CoB – High Density (Below BBL), 3000K 95CRI, 2-step MacAdam ellipse, S02H4, 4.5mm LES:

L 2 C 4 – **3 0 9 5 2 S 0 2 F 0 4 B 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 (Below BBL) 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 (Below BBL) 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 S02H4	2700K	95	508	552	89	175	4.5	G	L2C4-2795xS02F04B0
	3000K	95	540	587	94	175	4.5	F	L2C4-3095xS02F04B0
	3500K	95	558	606	98	175	4.5	F	L2C4-3595xS02F04B0
	4000K	95	578	628	101	175	4.5	F	L2C4-4095xS02F04B0
LUXEON CX Plus CoB – HD S02H6L	2700K	95	532	578	93	175	6.0	F	L2C4-2795xS02FH6B0
	3000K	95	564	613	99	175	6.0	F	L2C4-3095xS02FH6B0
	3500K	95	588	639	103	175	6.0	F	L2C4-3595xS02FH6B0
	4000K	95	609	662	107	175	6.0	F	L2C4-4095xS02FH6B0
LUXEON CX Plus CoB – HD S02H6	2700K	95	1053	1145	87	350	6.0	Note 8	L2C4-2795xS02F06B0
	3000K	95	1104	1200	91	350	6.0	Note 8	L2C4-3095xS02F06B0
	3500K	95	1141	1240	94	350	6.0	Note 8	L2C4-3595xS02F06B0
	4000K	95	1182	1285	98	350	6.0	F	L2C4-4095xS02F06B0
LUXEON CX Plus CoB – HD S04H9	2700K	95	2171	2360	90	700	9.0	Note 8	L2C4-2795xS04F09B0
	3000K	95	2309	2510	96	700	9.0	Note 8	L2C4-3095xS04F09B0
	3500K	95	2392	2600	99	700	9.0	Note 8	L2C4-3595xS04F09B0
	4000K	95	2484	2700	103	700	9.0	F	L2C4-4095xS04F09B0

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 95CRI products is >60.
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 (Below BBL) at specified test current, and T_j=85°C.

PART NUMBER	TYPICAL TOTAL INCLUDED ANGLE [1]	TYPICAL VIEWING ANGLE [2]
L2C4-xx95xS0xFxxB0	160°	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 (Below BBL) 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-xx95xS02F04B0	32.5	35.5	37.0	-16	1.70
L2C4-xx95xS02FH6B0	32.5	35.5	37.0	-16	1.70
L2C4-xx95xS02F06B0	34.0	37.5	39.0	-16	0.80
L2C4-xx95xS04F09B0	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 (Below BBL).

PARAMETER	MAXIMUM PERFORMANCE
DC Forward Current [1, 2]	2x Typical 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
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.

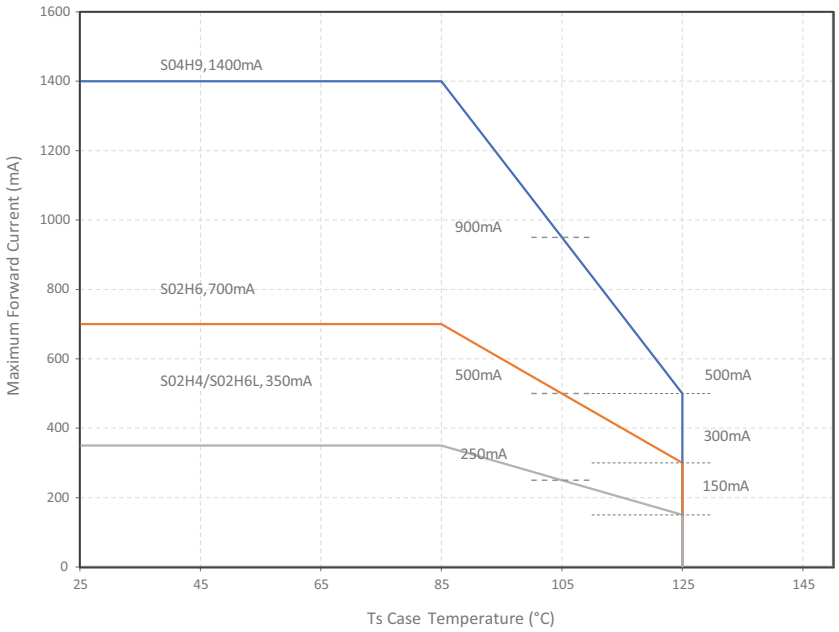


Figure 1. Maximum forward current vs. case temperature for LUXEON CX Plus CoB - High Density (Below BBL) at specified test current.

Characteristic Curves

Spectral Power Distribution Characteristics

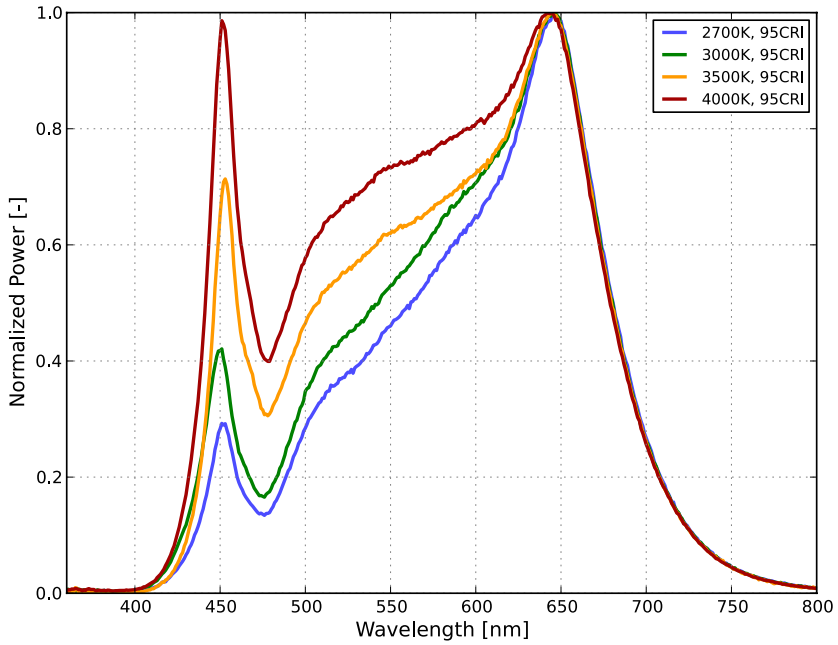


Figure 2. Typical normalized power vs. wavelength for LUXEON CX Plus CoB – High Density (Below BBL) at specified test current, T_j=85°C.

Light Output Characteristics

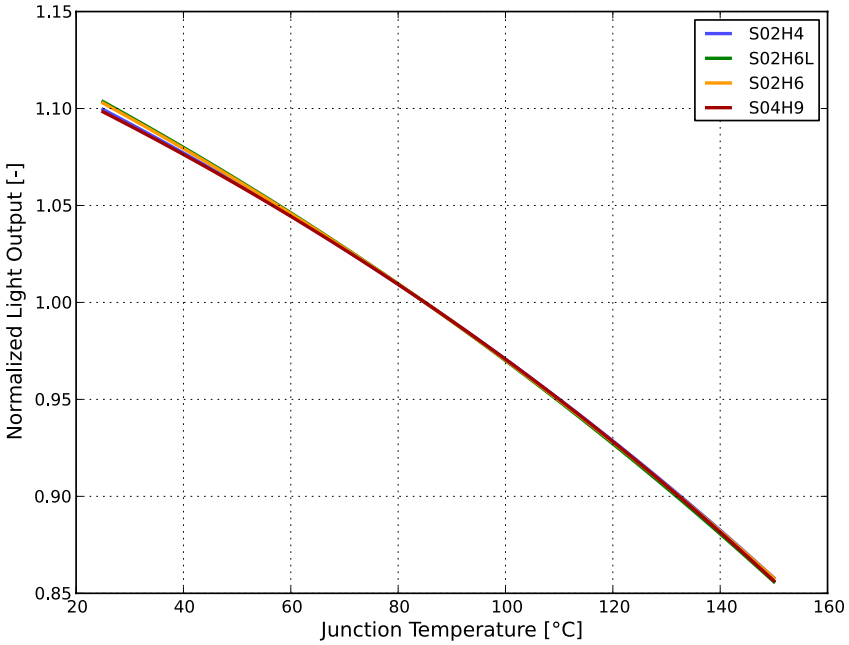


Figure 3. Typical normalized light output vs. junction temperature for LUXEON CX Plus CoB – High Density (Below BBL) at specified test current.

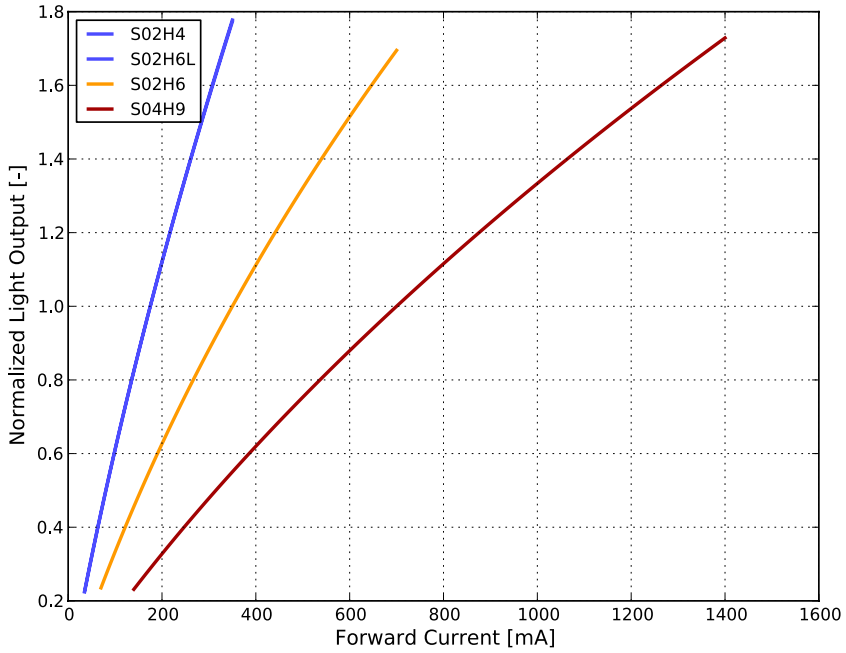


Figure 4. Typical normalized light output vs. forward current for LUXEON CX Plus CoB – High Density (Below BBL) at T_j=85°C.

Forward Current Characteristics

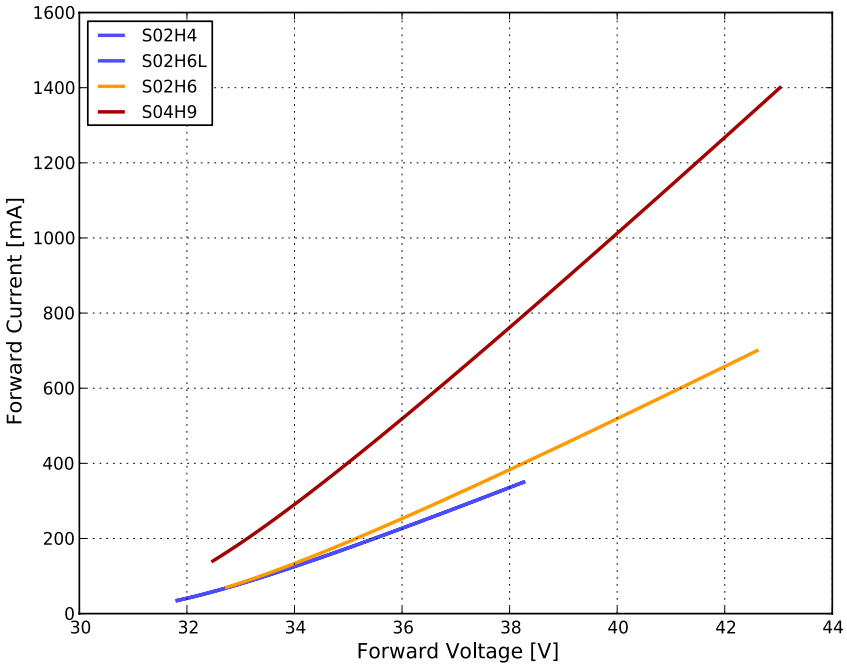


Figure 5. Typical forward current vs. forward voltage for LUXEON CX Plus CoB – High Density (Below BBL) at T_j=85°C.

Radiation Pattern Characteristics

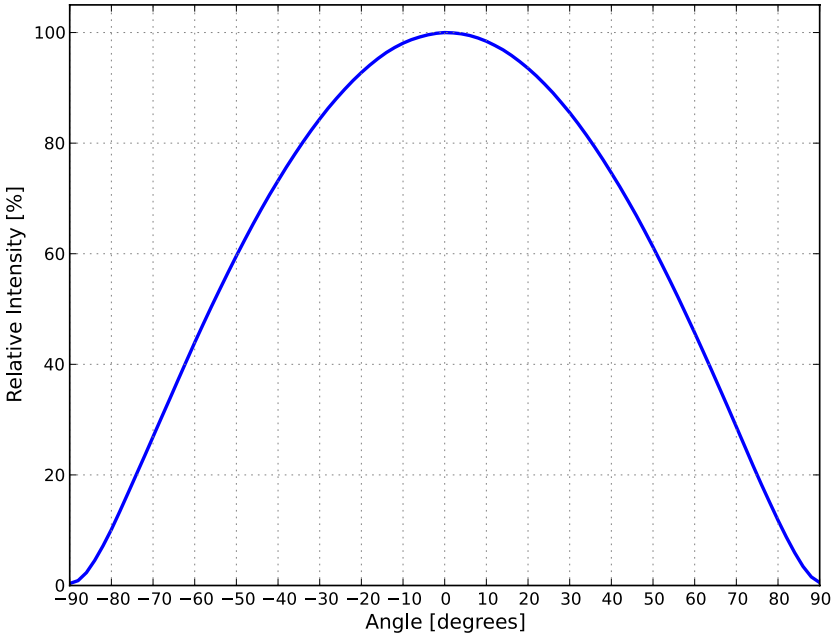


Figure 6. Typical radiation pattern for LUXEON CX Plus CoB – High Density (Below BBL) at specified test current, T_j=85°C.

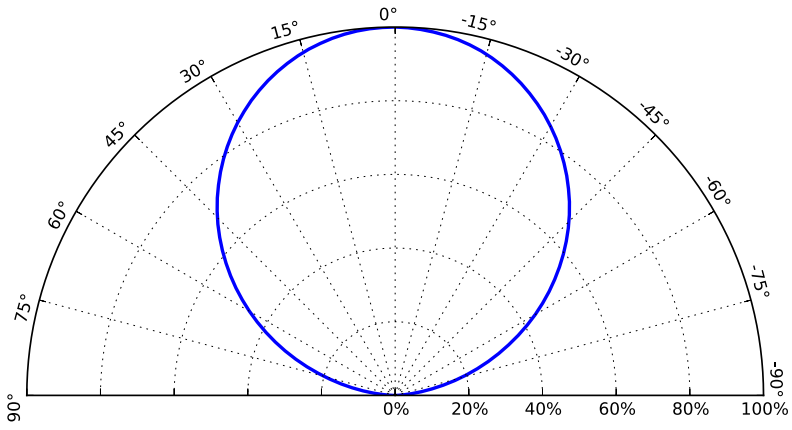


Figure 7. Typical polar radiation pattern for LUXEON CX Plus CoB – High Density (Below BBL) at specified test current, T_j=85°C.

Color Bin Definitions

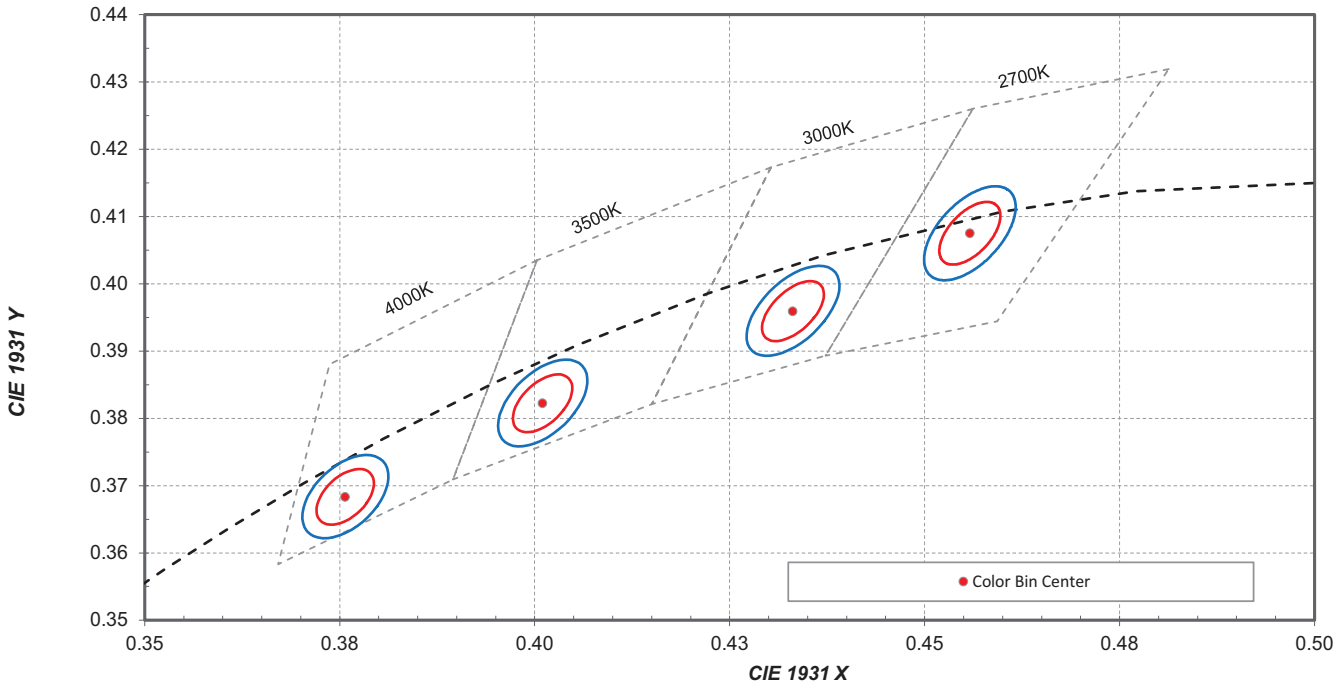


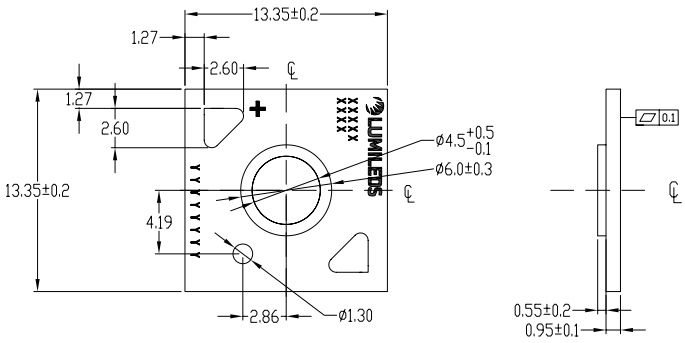
Figure 8. 2- and 3-step MacAdam ellipse illustration for Table 5.

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

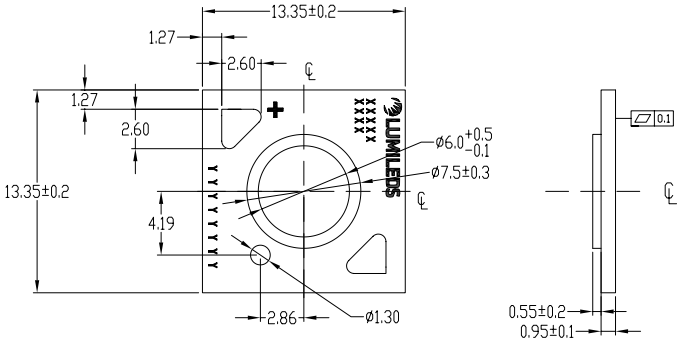
NOMINAL CCT	CENTER POINT [1] (cx, cy)	2 SDCM		3 SDCM		ELLIPSE ROTATION ANGLE, θ
		MAJOR AXIS, a	MINOR AXIS, b	MAJOR AXIS, a	MINOR AXIS, b	
2700K	(0.4558,0.4075)	0.00540	0.00280	0.00810	0.00420	53.70°
3000K	(0.4331,0.3959)	0.00556	0.00272	0.00834	0.00408	53.20°
3500K	(0.4010,0.3822)	0.00618	0.00276	0.00927	0.00414	54.00°
4000K	(0.3757,0.3683)	0.00626	0.00268	0.00939	0.00402	53.70°

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

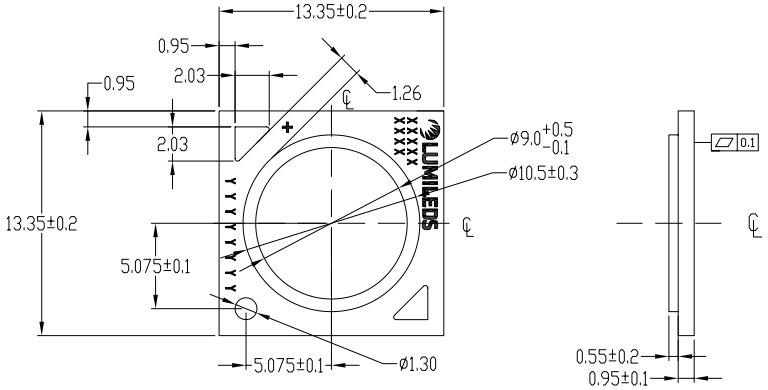
Mechanical Dimensions



L2C4-xx95xS02F04B0



L2C4-xx95xS02FH6B0, L2C4-xx95xS02F06B0



L2C4-xx95xS04F09B0

Figure 9. Mechanical dimensions for LUXEON CX Plus CoB – High Density (Below BBL).

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 for LUXEON CX Plus CoB – High Density (Below BBL).

PART NUMBER	TOTAL UNITS PER TRAY	TOTAL TRAYS PER INNER BOX	TOTAL UNITS PER INNER BOX
L2C4-xx95xS02F04B0	90	2	180
L2C4-xx95xS02FH6B0	90	2	180
L2C4-xx95xS02F06B0	90	2	180
L2C4-xx95xS04F09B0	90	2	180

Tray Dimensions

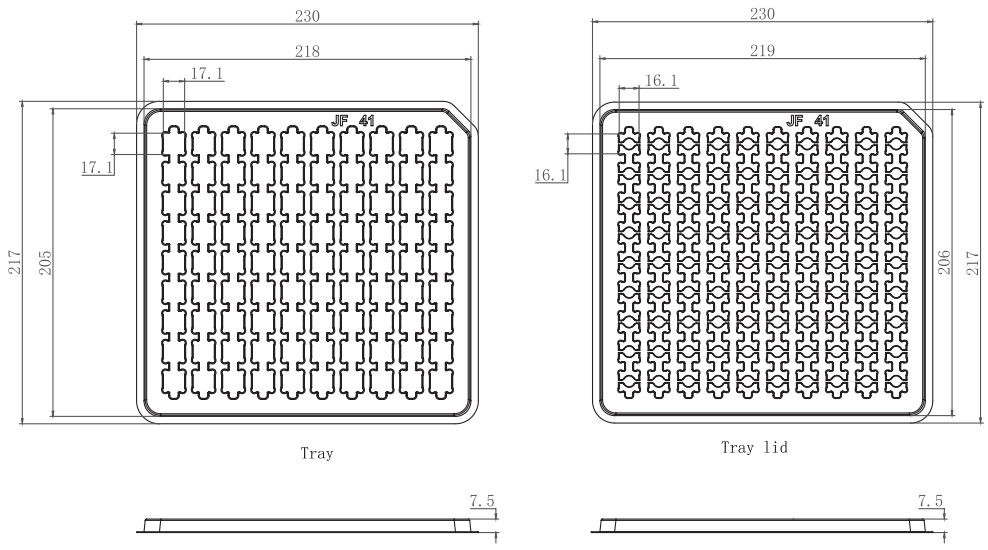


Figure 10. Tray dimensions for LUXEON CX Plus CoB – High Density (Below BBL).

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

Inner Box

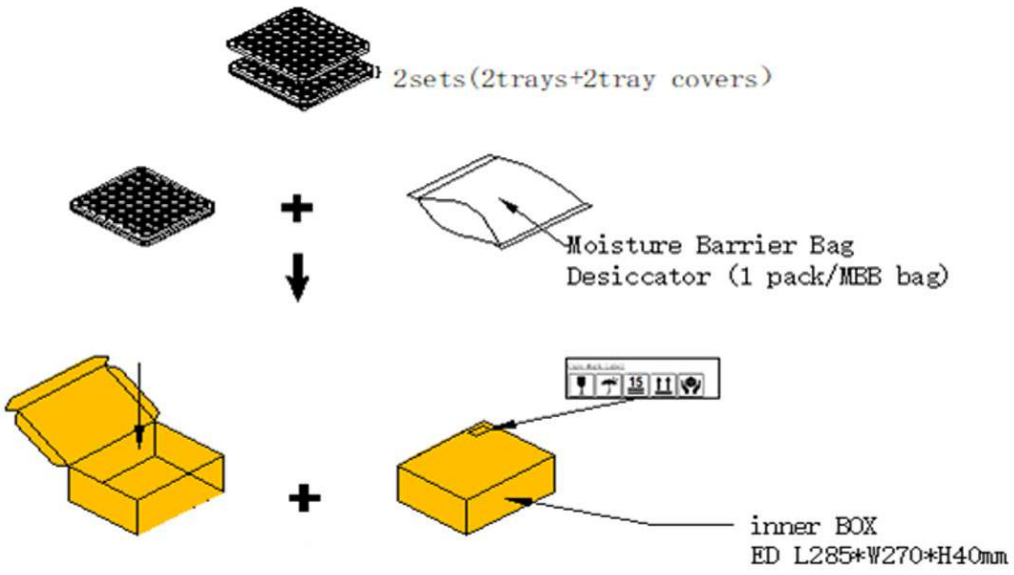


Figure 11. Dimensions for inner box packaging for LUXEON CX Plus CoB – High Density (Below BBL).

Table 7. Inner box information for LUXEON CX Plus CoB – High Density (Below BBL).

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

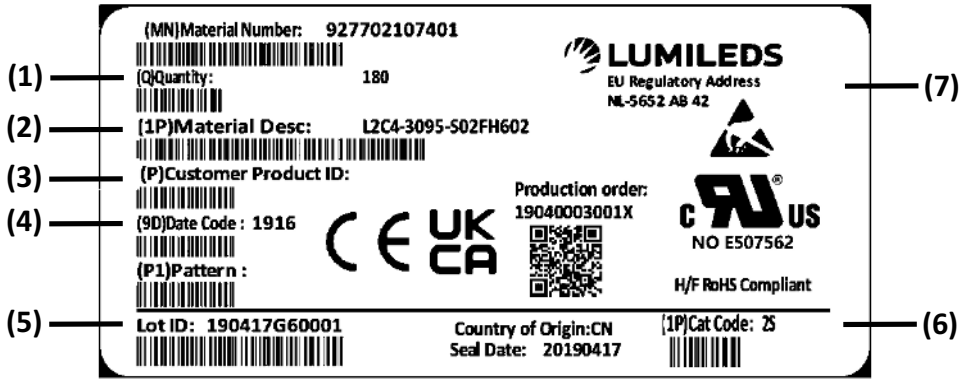


Figure 12. Example of a tray, MBB bag and inner box label for LUXEON CX Plus CoB – High Density (Below BBL).

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

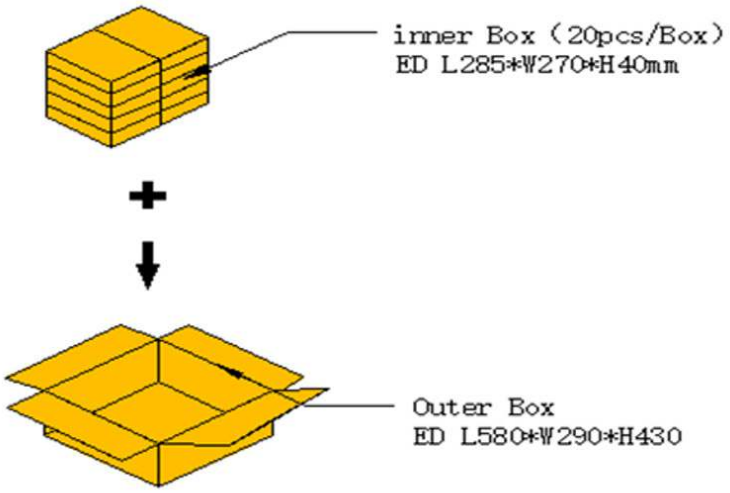


Figure 13. Dimensions for outer box packaging for LUXEON CX Plus CoB – High Density (Below BBL).

Table 8. Outer box information for LUXEON CX Plus CoB – High Density (Below BBL).

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

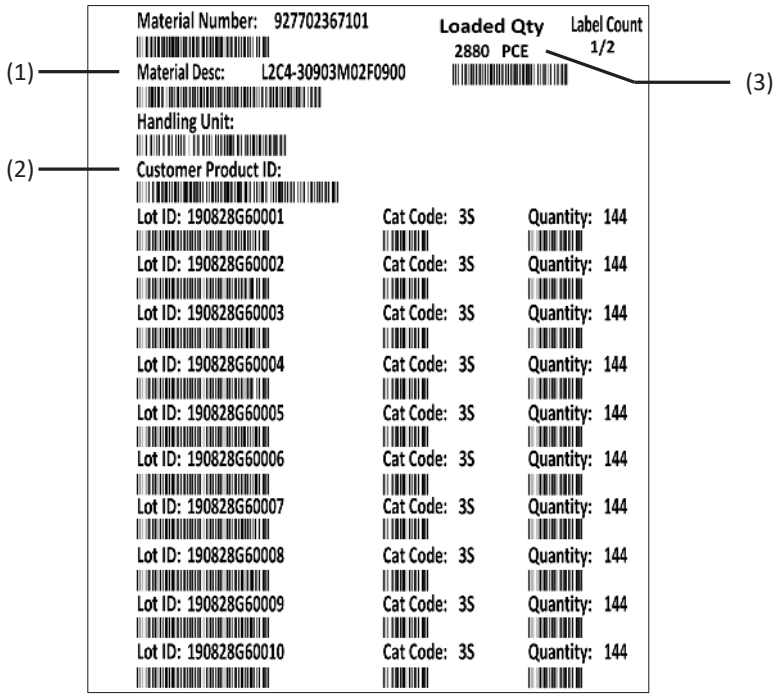


Figure 14. Example of outer box label for LUXEON CX Plus CoB – High Density (Below BBL).

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.