LUXEON CoB

Uniform, High Efficacy and Easy-to-Design Array

Introduction

Philips Lumileds high uniformity array solution is a new breakthrough in efficacy for arrays. Due to its industry leading small Light Emitting Surfaces (LES), LUXEON CoB arrays are very easy to work with and will enable easier and less expensive designs. All LUXEON CoBs are available in 3-Step (80 and 90 CRI) as well as 5-Step (70 CRI) MacAdam Ellipse, ensuring uniform optical performance in general lighting applications. Next to that, LUXEON CoB LEDs are all hot-tested at 85°C—real world operating conditions—which means that luminaire design is simplified and testing can be minimized.

This document contains the performance data needed to design and engineer LUXEON CoB based applications.

Features

- Efficacy: >130 lm/W, 35.5 V
- Lumen packages from 1000 to >10,000 lm
- Industry smallest LES (Light Emitting Surface)
- Industry leading thermal resistance
- Best luminous and color uniformity
- Binned within 3-Step and 5-Step MacAdam Ellipse
- Tested at T_j = 85°C
- Robust MCPCB solution
- Mouse-bites available for M2-M3 screws
- Supported by a comprehensive optical, mechanical, and electrical ecosystem
- Recognized under the Component Recognition Program of Underwriters Laboratories Inc. UL listing E327436.

Benefits

- Breakthrough in LED efficacy
- Enabling halogen and CDM replacement
- Enables smaller and less expensive reflectors
- Enables smaller heatsinks in your system
- More uniform and crisp light beams
- Enabling luminaire to luminaire consistency
- Real world application testing
- Easy to handle in manufacturing and operations
- Easy to screw down the arrays
- Drivers, holders and optics readily available

PHILIPS LUMILEDS

Table of Contents

General Information

Product Nomenclature

LUXEON CoB is tested and binned hot at T_j = 85°C with a current pulse duration of 20ms.

The part number designation is explained as follows:

L H C A – B B C C – D D E E

Where:

A — designates the generation of the product family

B B — designates ANSI color point (e.g. 30 for 3000K)

C C — designates minimum CRI level (e.g. 80 for minimum 80 CRI)

D D E E — designates product configuration (e.g. 1203 for the 1000-2000 lm package)

Therefore 3000K, 80 CRI LUXEON CoB products will be:

L H C 1 – 3 0 8 0 – 1 2 0 3

CAT codes of LUXEON CoB:

3S: color within 3 SDCM

5S: color within 5 SDCM

Average Lumen Maintenance Characteristics

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. Philips Lumileds projects that LUXEON CoB 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

Philips Lumileds is committed to providing environmentally friendly products to the solid-state lighting market. LUXEON CoB is compliant to the European Union directives on the restriction of hazardous substances in electronic equipment, namely the RoHS and REACH directives. Philips Lumileds will not intentionally add the following restricted material to the LUXEON CoB: lead, mercury, cadmium, hexavalent chromium, polybrominated biphenyls (PBB) or polybrominated diphenyl ethers (PBDE).

Product Performance and Characterization Guide

Table 1. Performance and Electrical Characteristics

Nominal CCT	Part Number	CRI [1]		Test Current I_f	Luminous Flux [1, 2]		Efficacy	LES [3]
		Minimum	Typical	(mA)	Minimum (lm)	Typical (lm)	Typical (lm/W)	(mm)
2700K	LHC1-2780-1202	80	82	200	675	750	106	9
2700K	LHC1-2780-1203	80	82	300	1025	1125	106	9
2700K	LHC1-2780-1204	80	82	450	1550	1700	106	13
2700K	LHC1-2780-1205	80	82	600	2000	2250	106	13
2700K	LHC1-2780-1208	80	82	900	3050	3400	106	15
2700K	LHC1-2780-1211	80	82	1200	4150	4600	106	19
2700K	LHC1-2790-1202	90	97	200	550	625	90	9
2700K	LHC1-2790-1203	90	97	300	850	950	90	9
2700K	LHC1-2790-1204	90	97	450	1275	1425	90	13
2700K	LHC1-2790-1205	90	97	600	1700	1900	90	13
2700K	LHC1-2790-1208	90	97	900	2550	2850	90	15
2700K	LHC1-2790-1211	90	97	1200	3500	3875	90	19
3000K	LHC1-3080-1202	80	82	200	725	800	115	9
3000K	LHC1-3080-1203	80	82	300	1100	1225	115	9
3000K	LHC1-3080-1204	80	82	450	1625	1825	115	13
3000K	LHC1-3080-1205	80	82	600	2200	2450	115	13
3000K	LHC1-3080-1208	80	82	900	3275	3650	115	15
3000K	LHC1-3080-1211	80	82	1200	4500	5000	115	19
3000K	LHC1-3090-1202	90	97	200	575	650	93	9
3000K	LHC1-3090-1203	90	97	300	900	1000	93	9
3000K	LHC1-3090-1204	90	97	450	1325	1475	93	13
3000K	LHC1-3090-1205	90	97	600	1800	2000	93	13
3000K	LHC1-3090-1208	90	97	900	2625	2950	93	15
3000K	LHC1-3090-1211	90	97	1200	3650	4000	93	19
3500K	LHC1-3580-1202	80	82	200	750	825	119	9
3500K	LHC1-3580-1203	80	82	300	1150	1275	119	9
3500K	LHC1-3580-1204	80	82	450	1725	1900	119	13
3500K	LHC1-3580-1205	80	82	600	2250	2550	119	13
3500K	LHC1-3580-1208	80	82	900	3400	3800	119	15
3500K	LHC1-3580-1211	80	82	1200	4675	5200	119	19
3500K	LHC1-3590-1202	90	97	200	600	675	96	9
3500K	LHC1-3590-1203	90	97	300	925	1025	96	9
3500K	LHC1-3590-1204	90	97	450	1400	1525	96	13
3500K	LHC1-3590-1205	90	97	600	1850	2075	96	13
3500K	LHC1-3590-1208	90	97	900	2775	3075	96	15
3500K	LHC1-3590-1211	90	97	1200	3775	4200	96	19
4000K	LHC1-4080-1202	80	82	200	750	850	122	9
4000K	LHC1-4080-1203	80	82	300	1175	1300	122	9
4000K	LHC1-4080-1204	80	82	450	1725	1950	122	13
4000K	LHC1-4080-1205	80	82	600	2325	2600	122	13
4000K	LHC1-4080-1208	80	82	900	3500	3900	122	15
4000K	LHC1-4080-1211	80	82	1200	4775	5200	122	19
4000K	LHC1-4090-1202	90	97	200	650	725	100	9
4000K	LHC1-4090-1203	90	97	300	1000	1100	100	9
4000K	LHC1-4090-1204	90	97	450	1450	1600	100	13
4000K	LHC1-4090-1205	90	97	600	1925	2150	100	13
4000K	LHC1-4090-1208	90	97	900	2900	3200	100	15
4000K	LHC1-4090-1211	90	97	1200	4050	4400	100	19
5000K	LHC1-5080-1202	80	82	200	775	875	124	9
5000K	LHC1-5080-1203	80	82	300	1175	1325	124	9
5000K	LHC1-5080-1204	80	82	450	1750	1975	124	13
5000K	LHC1-5080-1205	80	82	600	2350	2650	124	13
5000K	LHC1-5080-1208	80	82	900	3500	3950	124	15
5000K	LHC1-5080-1211	80	82	1200	4850	5300	124	19

Table 1 continued on next page.

Notes for Table 1:

1. Philips Lumileds maintains a tolerance of ±6.5% on luminous flux, ±2 on CRI.
2. Maximum luminous flux is 10% above typical luminous flux.
3. Light Emitting Surface (LES) is the inner diameter (phosphor area) inside the dam.

Table 1. Performance and Electrical Characteristics, Continued

Nominal CCT	Part Number	CRI [1]		Test Current I_f	Luminous Flux [1,2]		Efficacy	LES [3]
		Minimum	Typical	(mA)	Minimum (lm)	Typical (lm)	Typical (lm/W)	(mm)
4000K	LHC1-4070-1203	70	73	300	1225	1375	130	9
4000K	LHC1-4070-1204	70	73	450	1825	2050	130	13
4000K	LHC1-4070-1205	70	73	600	2450	2750	130	13
4000K	LHC1-4070-1208	70	73	900	3650	4100	130	15
4000K	LHC1-4070-1211	70	73	1200	5050	5600	130	19
5000K	LHC1-5070-1203	70	73	300	1225	1375	130	9
5000K	LHC1-5070-1204	70	73	450	1825	2050	130	13
5000K	LHC1-5070-1205	70	73	600	2450	2750	130	13
5000K	LHC1-5070-1208	70	73	900	3700	4100	130	15
5000K	LHC1-5070-1211	70	73	1200	5050	5600	130	19
5700K	LHC1-5770-1203	70	73	300	1225	1375	130	9
5700K	LHC1-5770-1204	70	73	450	1825	2050	130	13
5700K	LHC1-5770-1205	70	73	600	2450	2750	130	13
5700K	LHC1-5770-1208	70	73	900	3700	4100	130	15
5700K	LHC1-5770-1211	70	73	1200	5050	5600	130	19

Notes for Table 1:

1. Philips Lumileds maintains a tolerance of ±6.5% on luminous flux, ±2 on CRI.
2. Maximum luminous flux is 10% above typical luminous flux.
3. Light Emitting Surface (LES) is the inner diameter (phosphor area) inside the dam.

Table 2. Optical Characteristics

Nominal CCT	Typical Total Included Angle [1] (degrees)	Typical Viewing Angle [2]
	$\theta_{0.90V}$	$2\theta^{1/2}$
LHC1 - xxxx - xxxx	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 lamp centerline where the luminous intensity is ½ of the peak value.

Electrical Characteristics

Table 3. Electrical Characteristics

Nominal CCT	Part Number	Forward Voltage V, 85°C (V) [1, 2]			Typical Temperature Coefficient of Forward Voltage [1] (mV/°C) $\Delta V_F / \Delta T_J$	Typical Thermal Resistance Junction to Case [3] (°C/W) $R\theta_{J-C}$
		Minimum	Typical	Maximum		
2700K to 5700K	LHC1-xxxx-1202	33	35.5	38	-16	0.67
2700K to 5700K	LHC1-xxxx-1203	33	35.5	38	-16	0.49
2700K to 5700K	LHC1-xxxx-1204	33	35.5	38	-16	0.40
2700K to 5700K	LHC1-xxxx-1205	33	35.5	38	-16	0.32
2700K to 5700K	LHC1-xxxx-1208	33	35.5	38	-16	0.22
2700K to 5700K	LHC1-xxxx-1211	33	35.5	38	-16	0.19

Notes for Table 3:

1. Measured between T_j = 25°C and T_j = 105°C at test current.
2. Voltage tolerance +/- 10%.
3. Junction temperature to back of the PCB and measurement tolerance of ~10%.

Absolute Maximum Ratings

Table 4. Operating Condition and Ratings

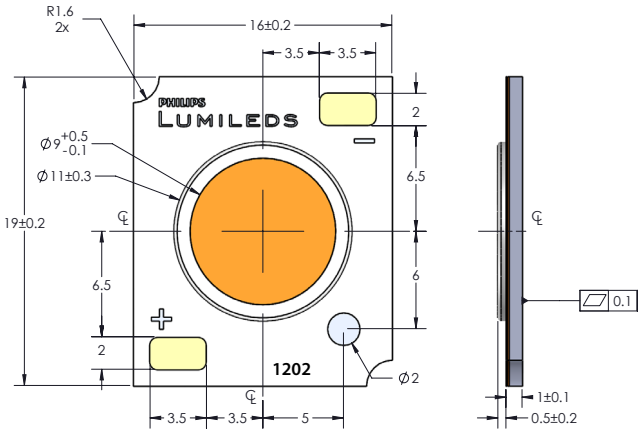
Parameter	Maximum Performance
DC Forward Current	2x test current [2]
ESD Sensitivity	< 8000V Human Body Model (HBM) Class 3A JESD22-A114-E < 400V Machine Model (MM) Class B JESD22-A115-B
Storage Temperature	-40°C - 120°C
LED Junction Temperature [1]	125°C [3]
Operating Case Temperature at Nominal Current	-40°C - 105°C
Reverse Voltage	LUXEON CoB is not designed to be driven in reverse bias

Notes for Table 4:

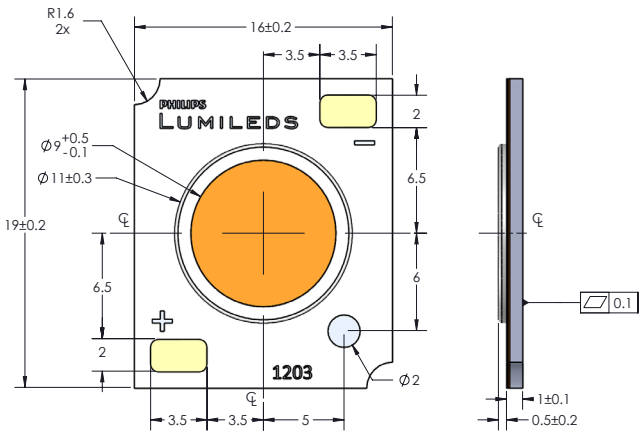
1. Proper current derating must be observed to maintain junction temperature below the maximum, please see preliminary application brief for additional information on thermal measurement guidelines.
2. Residual periodic variations due to power conversion from alternating current (AC) to direct current (DC), also called "ripple', with frequencies ≥ 100 Hz and amplitude ±20% are acceptable, assuming the average current throughout each cycle does not exceed 2x test I_f.
3. For LUXEON CoB 1211, the maximum junction temperature cannot exceed 105°C if driven with a drive current above 1800 mA (1.5x test current).

Mechanical Dimensions

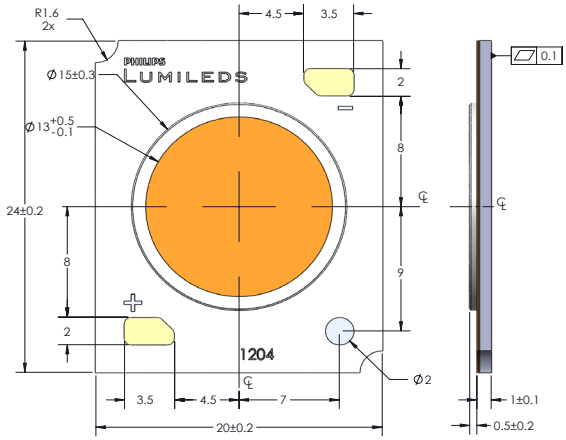
LUXEON CoB: LHC1 – xxxx – 1202



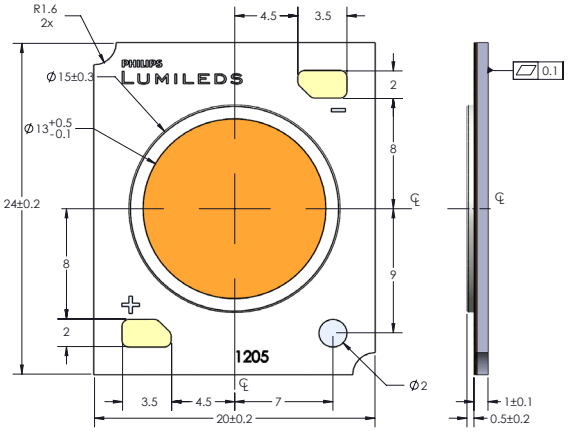
LUXEON CoB: LHC1 – xxxx – 1203



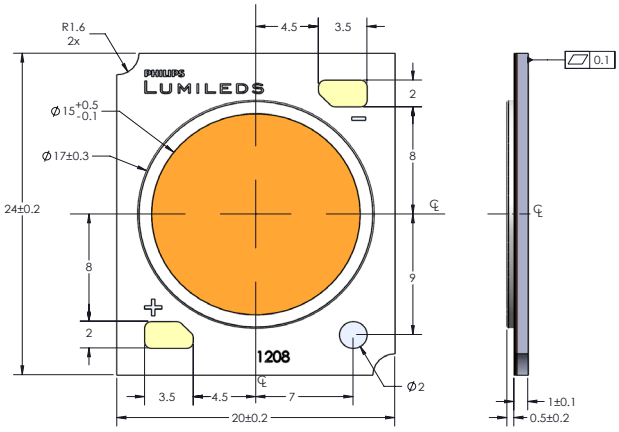
LUXEON CoB: LHC1 – xxxx – 1204



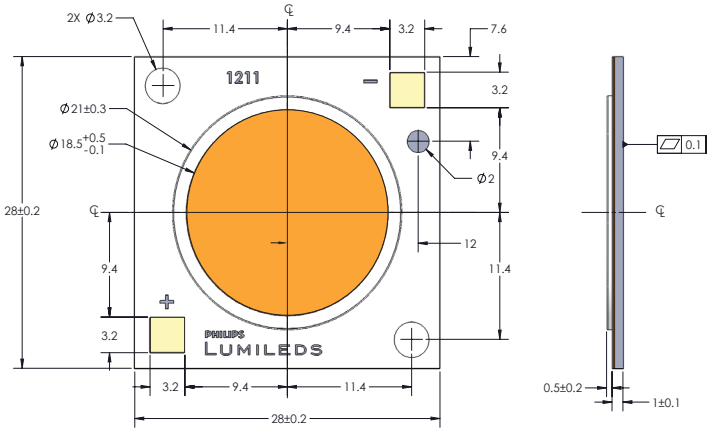
LUXEON CoB: LHC1 – xxxx – 1205



LUXEON CoB: LHC1 – xxxx – 1208



LUXEON CoB: LHC1 – xxxx – 1211



Characteristic Curves

Relative Spectral Distribution vs. Wavelength
Junction Temperature = 85°C, at Test Current

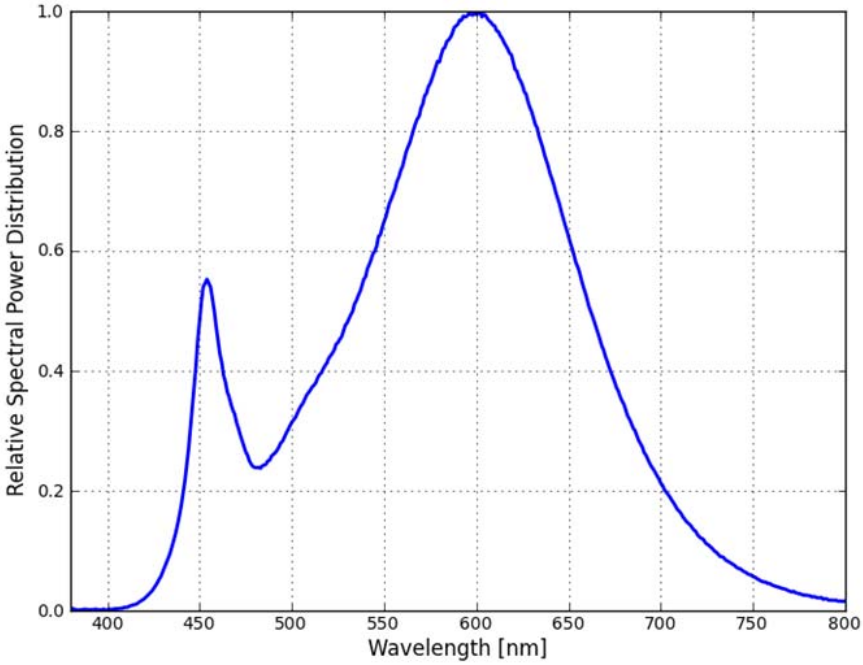


Figure 1. Color spectrum of 3000K, 80 minimum CRI, integrated measurement.

Relative Light Output Characteristics over Temperature at Test Current

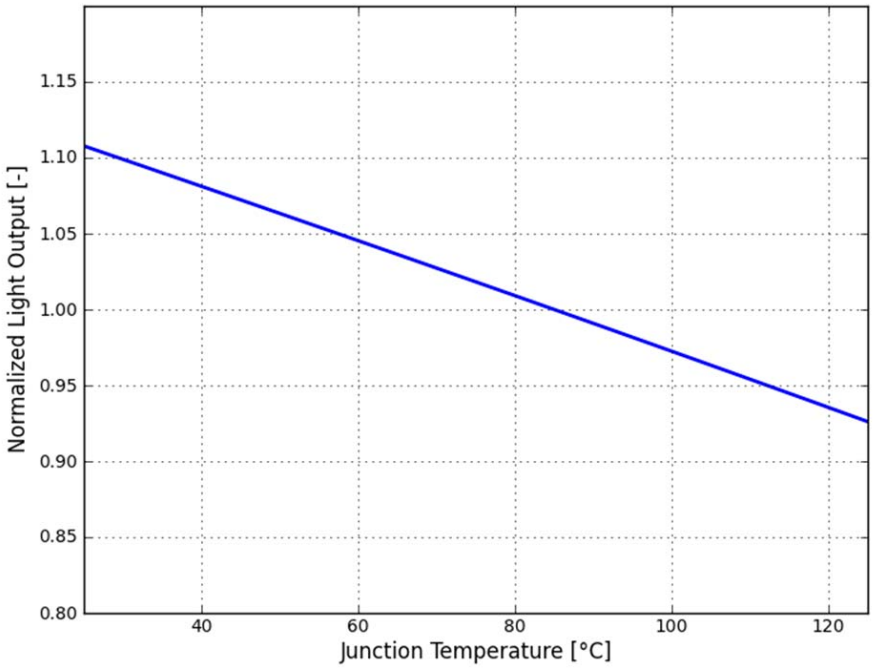
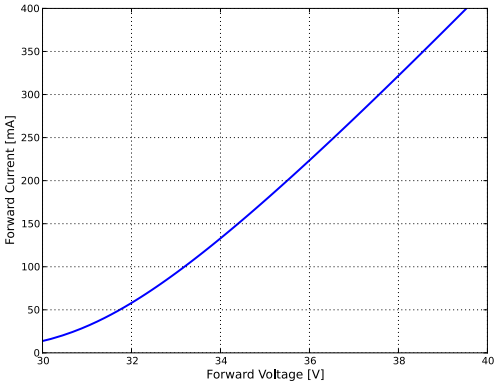


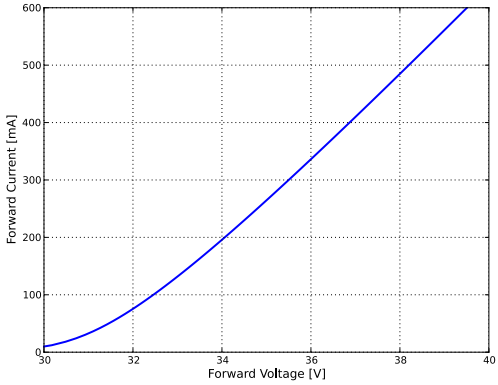
Figure 2. Relative light output vs. junction temperature.

Typical Forward Current Characteristics

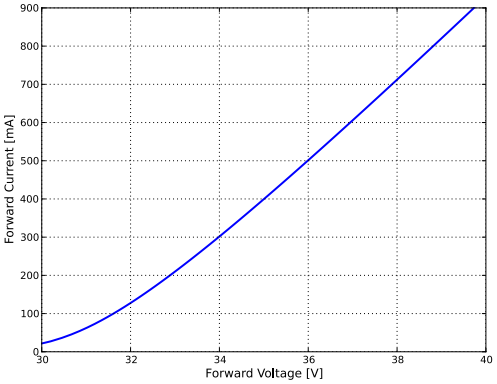
LUXEON CoB LHC1 – xxxx – xxxx, Junction Temperature = 85°C



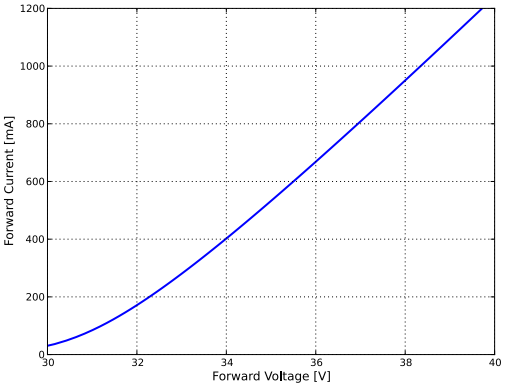
LUXEON CoB: LHC1 – xxxx – 1202



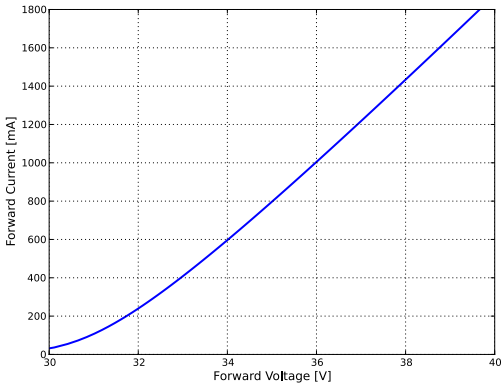
LUXEON CoB: LHC1 – xxxx – 1203



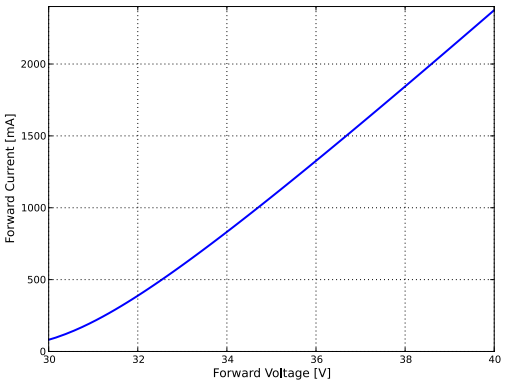
LUXEON CoB: LHC1 – xxxx – 1204



LUXEON CoB: LHC1 – xxxx – 1205



LUXEON CoB: LHC1 – xxxx – 1208

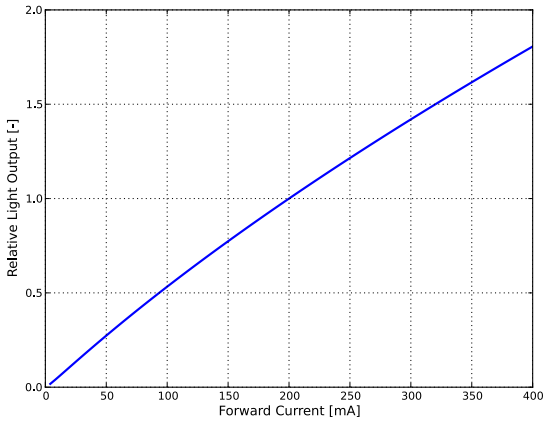


LUXEON CoB: LHC1 – xxxx – 1211

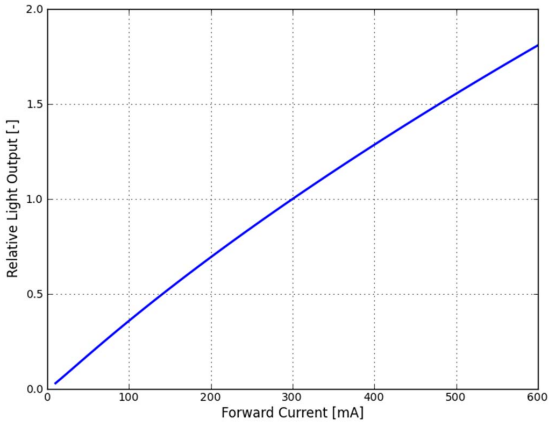
Figure 3. Forward current vs. forward voltage.

Typical Relative Luminous Flux vs. Forward Current

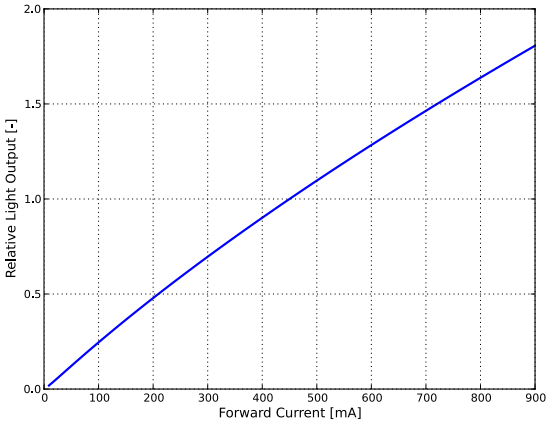
LUXEON CoB LHC1 – xxxx – xxxx, Junction Temperature = 85°C



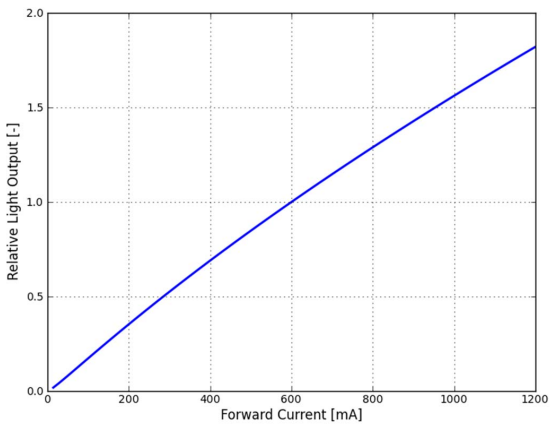
LUXEON CoB: LHC1 – xxxx – 1202



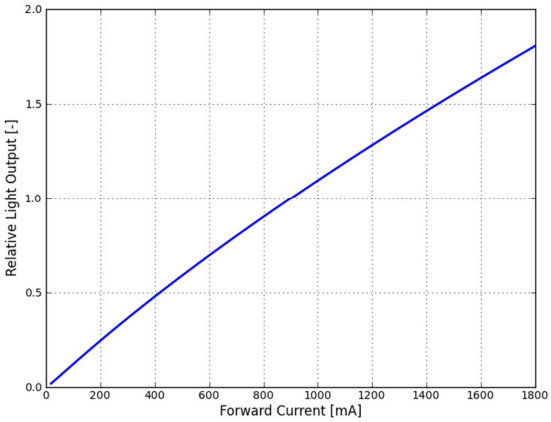
LUXEON CoB: LHC1 – xxxx – 1203



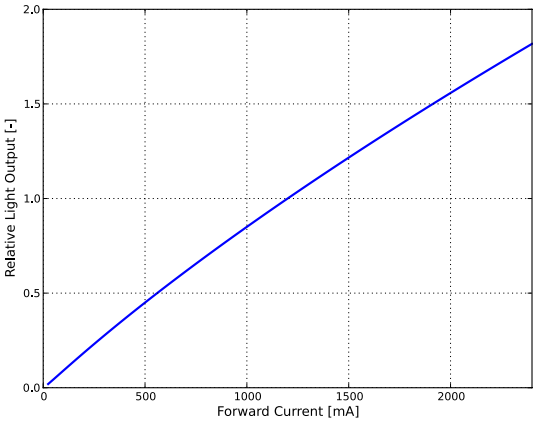
LUXEON CoB: LHC1 – xxxx – 1204



LUXEON CoB: LHC1 – xxxx – 1205



LUXEON CoB: LHC1 – xxxx – 1208



LUXEON CoB: LHC1 – xxxx – 1211

Figure 4. Typical relative luminous flux vs. current.

Typical Radiation Patterns

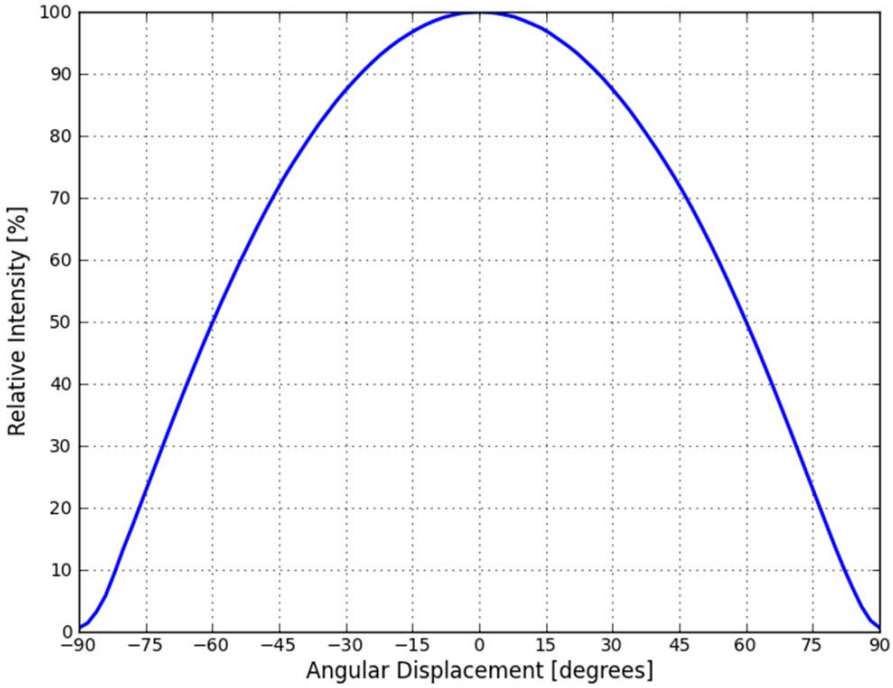


Figure 5. Radiation pattern for LHC1 – xxxx – 120x.

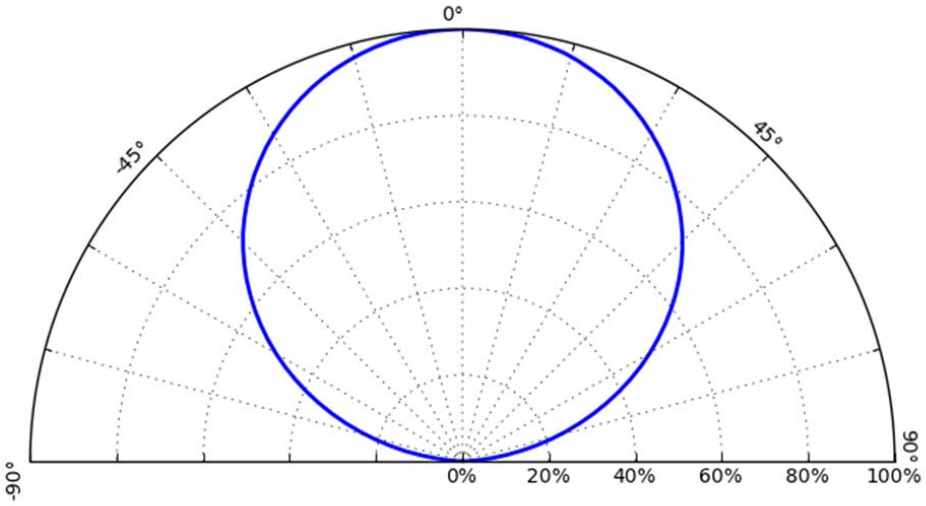


Figure 6. Polar radiation pattern for LHC1 – xxxx – 120x.

Color Bin Definition

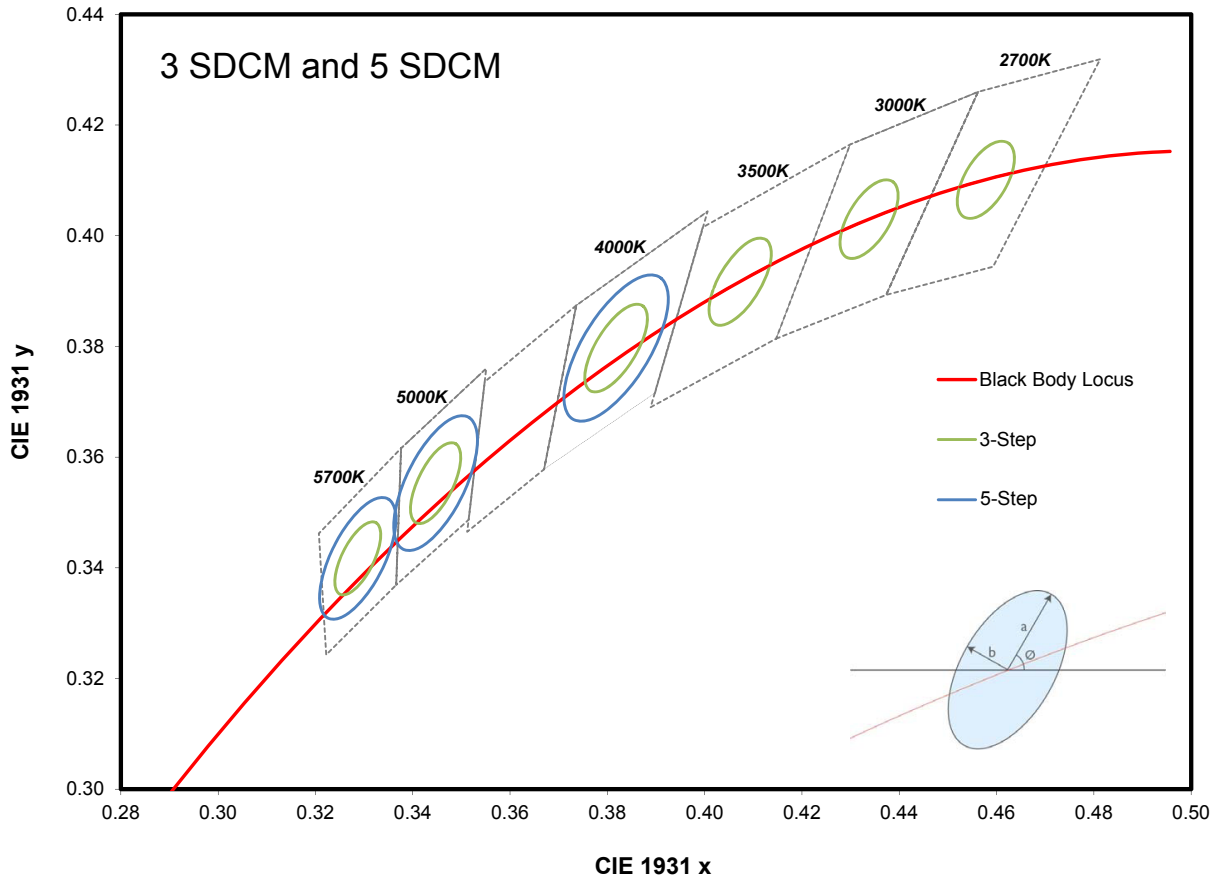


Figure 7. 3-step and 5-step MacAdam ellipse color bins.

Table 5. 3-step and 5-step MacAdam Ellipse Color Definition

Nominal ANSI CCT	Color Space	Center Point (cx, cy)	Major Axis, a	Minor Axis, b	Ellipse Rotation Angle
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

Nominal ANSI CCT	Color Space	Center Point (cx, cy)	Major Axis, a	Minor Axis, b	Ellipse Rotation Angle
2700K	Single 5-step MacAdam ellipse	(0.4578, 0.4101)	0.01350	0.00700	53.7
3000K	Single 5-step MacAdam ellipse	(0.4338, 0.4030)	0.01390	0.00680	53.2
3500K	Single 5-step MacAdam ellipse	(0.4073, 0.3917)	0.01545	0.00690	54.0
4000K	Single 5-step MacAdam ellipse	(0.3818, 0.3797)	0.01565	0.00670	53.7
5000K	Single 5-step MacAdam ellipse	(0.3447, 0.3553)	0.01370	0.00590	59.6
5700K	Single 5-step MacAdam ellipse	(0.3287, 0.3417)	0.01243	0.00533	59.09

Notes for Table 5:

1. Philips Lumileds maintains a tester tolerance of ±0.005 on x,y coordinates.
2. Major and minor axis (a,b) from table 5 are a reference as depicted in figure 7.
3. 3-step for all 80- and 90 CRI part numbers.
4. 5-step for all 70 CRI part numbers.
5. Please contact Philips Lumileds for requests outside 3-step for 80- and 90 CRI parts.

Package Info and Dimensions

Table 6. Package Info

	LHC1 – xxxx - 1202	LHC1 – xxxx - 1203	LHC1 – xxxx - 1204	LHC1 – xxxx - 1205	LHC1 – xxxx - 1208	LHC1 – xxxx - 1211
Total Units per Tube	20	20	20	20	20	10
Total Tubes per Box	5	5	5	5	5	5
Total Units per Box	100	100	100	100	100	50

LUXEON CoB LHC1 – xxxx - 1202 and 1203

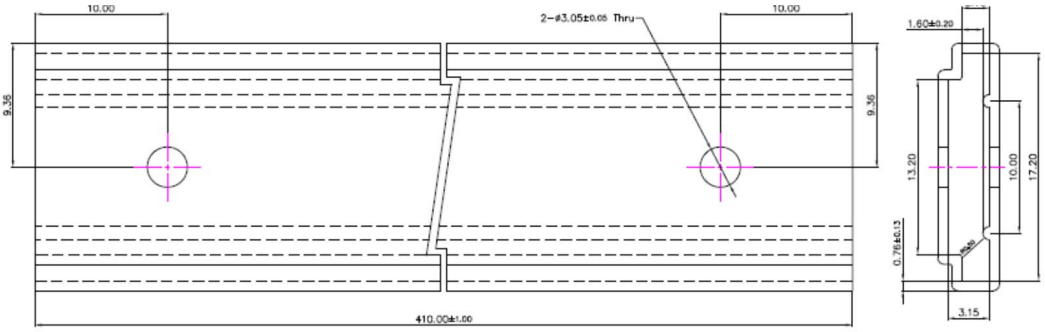


Figure 8. Package ray dimension for LUXEON CoB LHC1 – xxxx - 1202 and 1203.

LUXEON CoB LHC1 – xxxx – 1204, -1205 and -1208

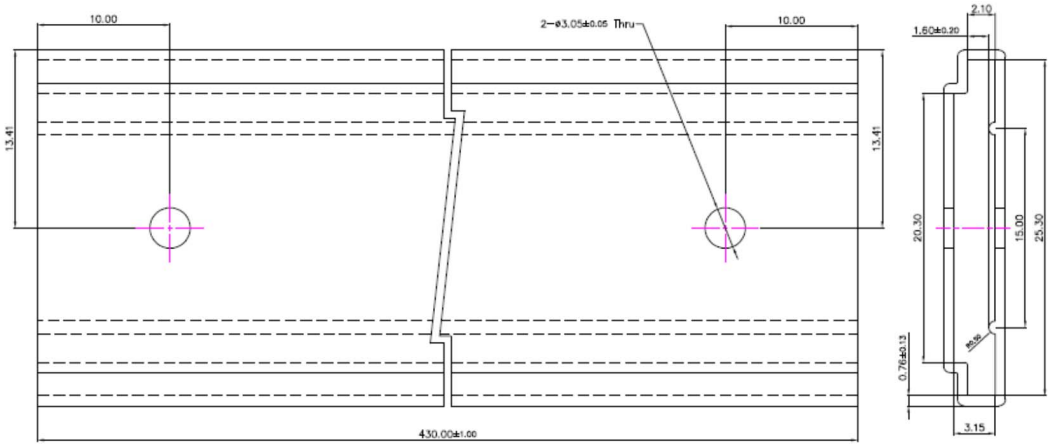


Figure 9. Package ray dimension for LUXEON CoB LHC1 – xxxx – 1204, - 1205 and - 1208.

LUXEON CoB LHC1 – xxxx – 1211

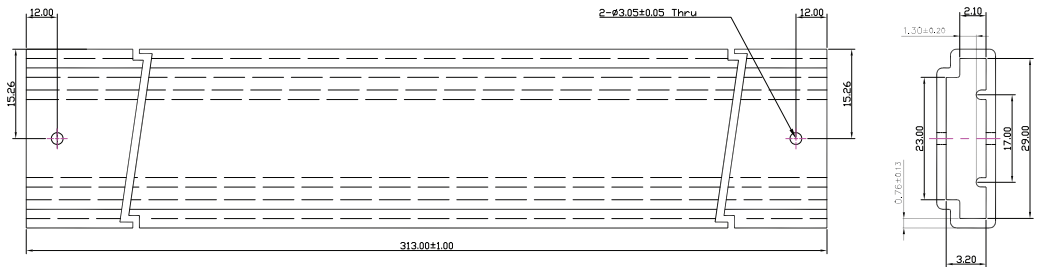


Figure 10. Package ray dimension for LUXEON CoB LHC1 – xxxx – 1211.

PHILIPS
LUMILEDS

Who We Are

Philips Lumileds focuses on one goal: Creating the world's highest performing LEDs. The company pioneered the use of solid-state lighting in breakthrough products such as the first LED backlit TV, the first LED flash in camera phones, and the first LED daytime running lights for cars. Today we offer the most comprehensive portfolio of high quality LEDs and uncompromising service.

Philips Lumileds brings LED's qualities of energy efficiency, digital control and long life to spotlights, downlights, high bay and low bay lighting, indoor area lighting, architectural and specialty lighting as well as retrofit lamps. Our products are engineered for optimal light quality and unprecedented efficacy at the lowest overall cost. By offering LEDs in chip, packaged and module form, we deliver supply chain flexibility to the inventors of next generation illumination.

Philips Lumileds understands that solid state lighting is not just about energy efficiency. It is about elegant design. Reinventing form. Engineering new materials. Pioneering markets and simplifying the supply chain. It's about a shared vision. Learn more about our comprehensive portfolio of LEDs at www.philipslumileds.com.

c UL us No. E352519 RoHS COMPLIANT

PHILIPS

www.philipslumileds.com
www.philipslumileds.cn.com