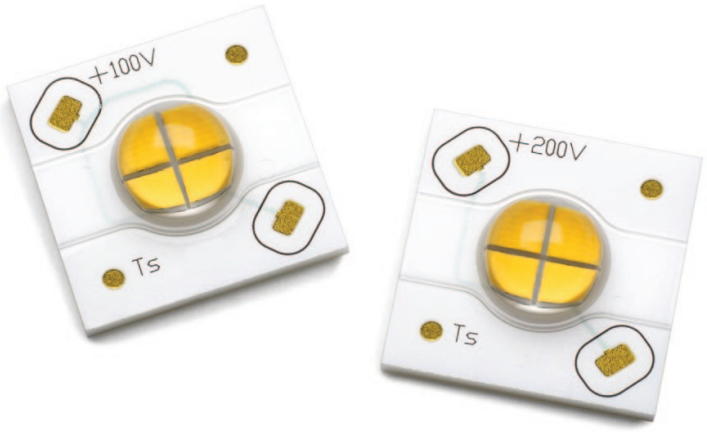

LUXEON H

Easy to use LED on board solutions for directional applications with high voltage drivers

Technical Datasheet DS104

LUXEON
NEVER BEFORE POSSIBLE

RoHS Compliant

LUXEON H

High Voltage (100V and 200V) LED

Introduction

LUXEON® H delivers superior lumen density, color performance and reliability in a high voltage LED on board architecture. For space constrained and cost sensitive retrofit bulbs and luminaires application, LUXEON H is the ideal solution as it minimizes system cost and space requirements through L2 solution and simpler driver.

This document contains the performance data and technical information needed to design and develop LUXEON H based luminaires with products in 100V and 200V options in 2700K, 3000K and 4000K.

LUXEON H 100V and 200V products,

- Provides compact source with single dome for directional lighting designs
- Enables simplified small size solutions with compact, low cost driver
- Ensures exceptional color stability over temperature and current
- Delivers Freedom from CCT binning (3 SDCM), single flux bin and single Vf bin
- Exceed ENERGY STAR® lumen maintenance requirements
- High efficacy for sustainable design
- Guaranteed performance at operating temperature

PHILIPS
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Table of Contents

General Information

Product Nomenclature

LUXEON H are specified at 40 mA (100V parts) and at 20 mA (200V parts), with junction temperature stabilized at 85°C.

The part number designation is explained as follows:

L X V a - P b c d - e f g h

Where:

- a — minimum CRI (8 = 80, 9 = 90, 0 = Royal Blue)
- b — color designation (R = Royal Blue, W = White)
- c, d — CCT (27 = 2700K, 30 = 3000K, 40 = 4000K, 50 = 5000K, 00 = Royal Blue)
- e — reserved for future proliferations
- f — L2 variant (0 for the L2 defined in this datasheet)
- g — voltage of L2 (1 = 100V, 2 = 200V)
- h — number of emitters under the dome lens

Therefore 2700K products specified at 20 mA (200V parts) and at 40 mA (100V parts) follow the part numbering scheme:

L X V 8 - P W 2 7 - 0 0 1 4 for LUXEON H 2700K 80CRI 100V

L X V 8 - P W 2 7 - 0 0 2 4 for LUXEON H 2700K 80CRI 200V

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 H will deliver, on average, 70% lumen maintenance (L70) at 35,000 hours of operation at a forward current of up to 40 mA (LUXEON H 200V) and 80 mA (LUXEON H 100V). This projection is based on constant current operation with junction temperature maintained at or below 135°C. This performance is based on independent test data, Philips Lumileds historical data from tests run on similar material systems, and internal LUXEON reliability testing. 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 H are compliant to the European Union directives on the restriction of hazardous substances in electronic equipment, namely the RoHS directive. Philips Lumileds will not intentionally add the following restricted materials to the LUXEON H: lead, mercury, cadmium, hexavalent chromium, polybrominated biphenyls (PBB) or polybrominated diphenyl ethers (PBDE).

Product Selection

Product Selection Guide for LUXEON H

LUXEON H at Test Current Junction Temperature = 85°C

Table 1.

Nominal CCT	Part Number	Test Curent (mA)	Minimum CRI	Typical CRI	Minimum Flux (lm) ϕ_v	Typical Flux (lm) ϕ_v
2700K	LXV8-PW27-0014	40	80	82	300	320
2700K	LXV8-PW27-0024	20	80	82	300	320
3000K	LXV8-PW30-0014	40	80	85	320	340
3000K	LXV8-PW30-0024	20	80	85	320	340
4000K	LXV8-PW40-0014	40	80	85	340	360
4000K	LXV8-PW40-0024	20	80	85	340	360

Note for Table 1:

- Philips Lumileds maintains a tolerance of ± 6.5% on luminous flux and ± 2 on CRI measurements.

LUXEON H at Elevated Driver Current Junction Temperature = 85°C

Table 2.

Nominal CCT	Part Number	Test Curent (mA)	Typical Flux (lm) ϕ_v
2700K	LXV8-PW27-0014	90	650
2700K	LXV8-PW27-0024	45	650
3000K	LXV8-PW30-0014	90	680
3000K	LXV8-PW30-0024	45	680
4000K	LXV8-PW40-0014	90	720
4000K	LXV8-PW40-0024	45	720

Note for Table 2:

- Philips Lumileds maintains a tolerance of ± 6.5% on luminous flux.

Optical Characteristics

LUXEON H at Test Current [1] Junction Temperature = 85°C

Table 3.

Model	Nominal CCT	Color Temperature CCT Typical	Typical Total Included Angle [2] (degrees) θ_{90V}	Typical Viewing Angle [3] 2θ ½ (degrees)
LXV8-PW27-00*4	2700K	2725K	140	120
LXV8-PW30-00*4	3000K	3045K	140	120
LXV8-PW40-00*4	4000K	3985K	140	120

Notes for Table 3:

1. Test current is 40 mA for 100V LUXEON H products and 20 mA for 200V LUXEON H products.
2. Total angle at which 90% of total luminous flux is captured.
3. Viewing angle is the off axis angle from lamp centerline where the luminous intensity is ½ of the peak value.

Electrical Characteristics

Electrical Characteristics for LUXEON H Junction Temperature = 85°C

Table 4.

Model	Test Current (mA)	Forward Voltage V_f [1] (V) Min.	Typ.	Max.	Typical Temperature Coefficient of Forward Voltage [2] (mV/°C) $\Delta V_F / \Delta T_J$	Typical Thermal Resistance Junction to Case (°C/W)[3] $R\theta_{J-C}$
LXV8-PW27-0014	40	94	96	98	-52	3.7
LXV8-PW27-0024	20	188	192	196	-104	3.7
LXV8-PW30-0014	40	94	96	98	-52	3.7
LXV8-PW30-0024	20	188	192	196	-104	3.7
LXV8-PW40-0014	40	94	96	98	-52	3.7
LXV8-PW40-0024	20	188	192	196	-104	3.7

Notes for Table 4:

1. Philips Lumileds maintains a tolerance of ± 0.5% on forward voltage measurements.
2. Measured between T_j=25°C and T_j =110°C.
3. Use total electrical power as the total heat dissipation.

Typical Electrical Characteristics at High Current for LUXEON H Junction Temperature = 85°C

Table 5.

Model	Test Current (mA)	Typical Forward Voltage V_f (V)
LXV8-PW27-0014	90	100
LXV8-PW27-0024	45	200
LXV8-PW30-0014	90	100
LXV8-PW30-0024	45	200
LXV8-PW40-0014	90	100
LXV8-PW40-0024	45	200

Notes for Table 5:

1. Philips Lumileds maintains a tolerance of ± 0.5% on forward voltage measurements.

Absolute Maximum Ratings

Table 6.

Parameter	Maximum Performance	
	LXV8-PW27-0014 LXV8-PW30-0014 LXV8-PW40-0014	LXV8-PW27-0024 LXV8-PW30-0024 LXV8-PW40-0024
DC Forward Current (mA) [1]	100	50
Peak Forward Current (mA) [2]	200	100
RMS Forward Current (mA) [2]	100	50
ESD Sensitivity	≤ 2000V Human Body Model (HBM) for LXV8-PWXX-0014 ≤4000V Human Body Model (HBM) for LXV8-PWXX-0024 Class 2 JESD22-A114-E ≤ 400V Machine Model (MM) Class B JESD22-A115-B	
LED Junction Temperature[1]	150°C	
Operating Case Temperature at Current	-40°C - 135°C @ 20 mA	-40°C - 135°C @ 40 mA
Storage Temperature	-40°C - 120°C	
Wire Soldering Temperature	JEDEC 020c 260°C	
Allowable Lead Reflow Cycles	Not applicable, not a SMT product	
Autoclave Conditions	121°C at 2 ATM 100% Relative Humidity for 96 Hours Maximum	
Reverse Voltage (V_r)	LUXEON H LEDs are not designed to be driven in reverse bias	
Hi-Pot test capability	2.5mm clearance from all electrically active pads to ground allows 2.5kV Hi-Potential test pass	

Notes for Table 6:

1. Proper current derating must be observed to maintain junction temperature below the maximum.
2. For AC operation with a minimum of 50Hz.

Mechanical Dimensions

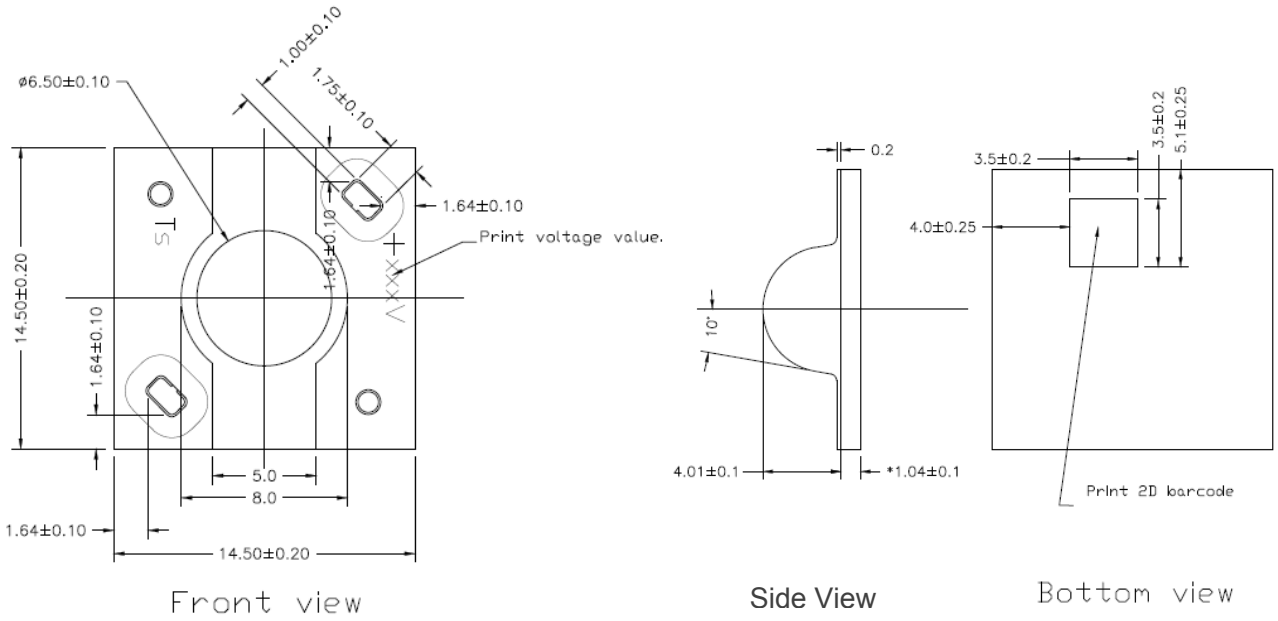


Figure 1. Package outline drawing for LXV8-PWxx-00x4.

Notes for Figure 1:

- Do not handle the device by the lens. Excessive force on the lens may damage the lens itself or the interior of the device.
- All dimensions are in millimeters.

Relative Spectral Distribution vs. Wavelength Characteristics

LXV8-PW27 (2700K) at Test Current, Junction Temperature = 85°C

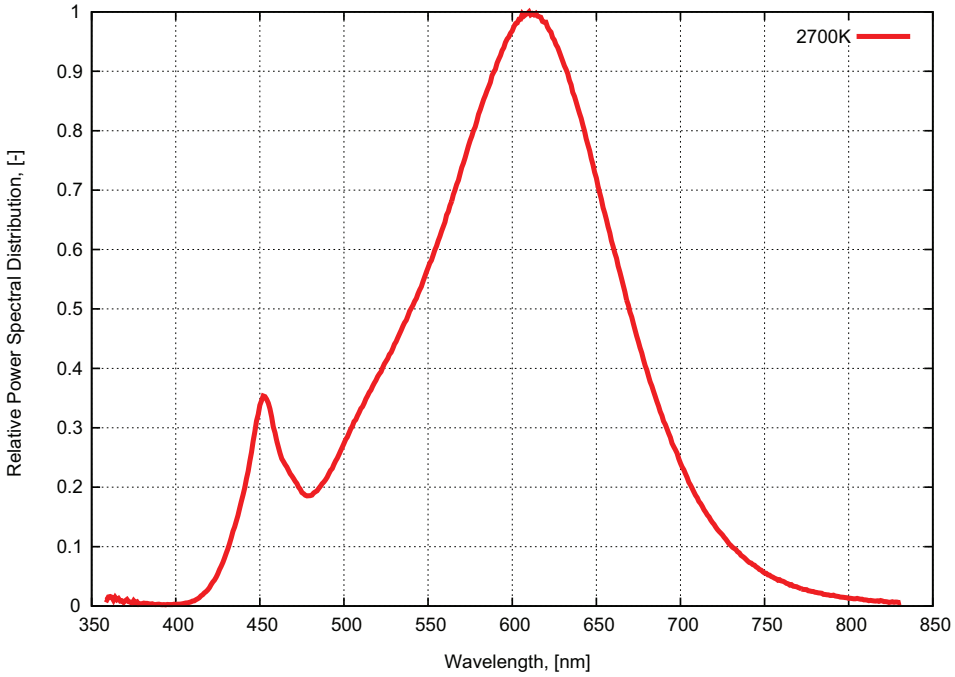


Figure 2. Color spectrum of LXV8-PW27, 2700K emitters, integrated measurement.

LXV8-PW30 (3000K) at Test Current, Junction Temperature = 85°C

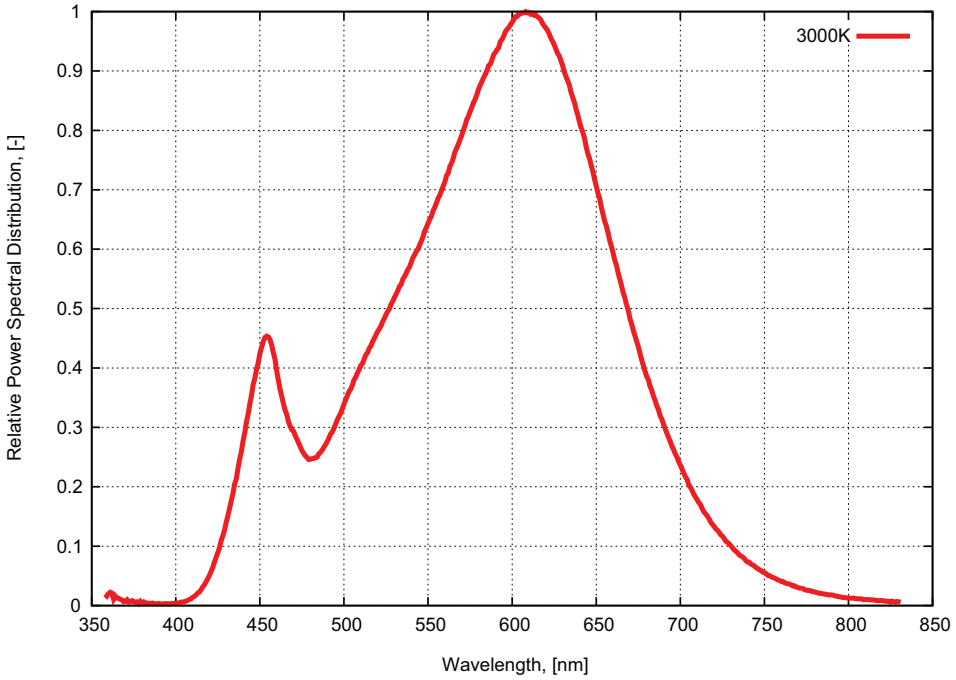


Figure 3. Color spectrum of LXV8-PW30, 3000K emitters, integrated measurement.

LXV8-PW40 (4000K) at Test Current, Junction Temperature = 85°C

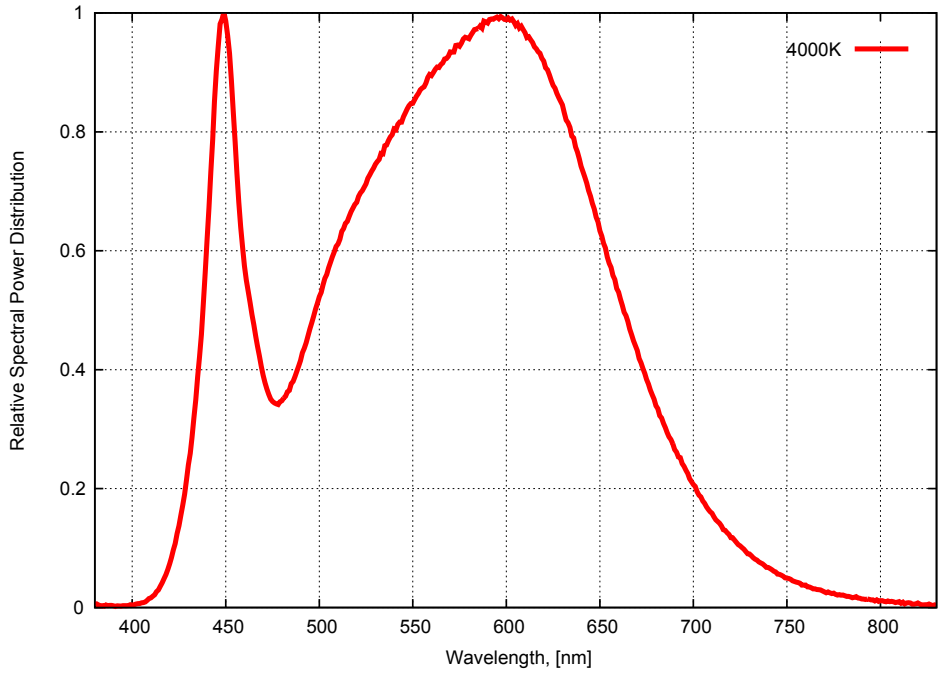


Figure 4. Color spectrum of LXV8-PW40, 4000K emitters, integrated measurement.

Light Output Characteristics over Temperature and Current

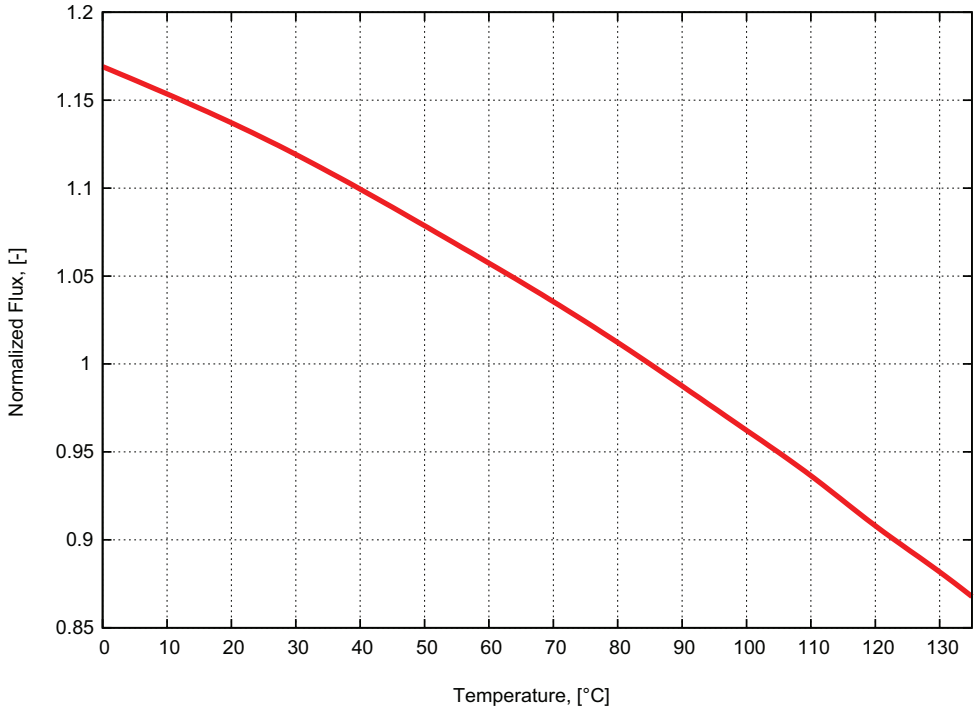


Figure 5. Relative flux vs. junction temperature at test current. Applicable to LXV8-PW27 and LXV8-PW30.

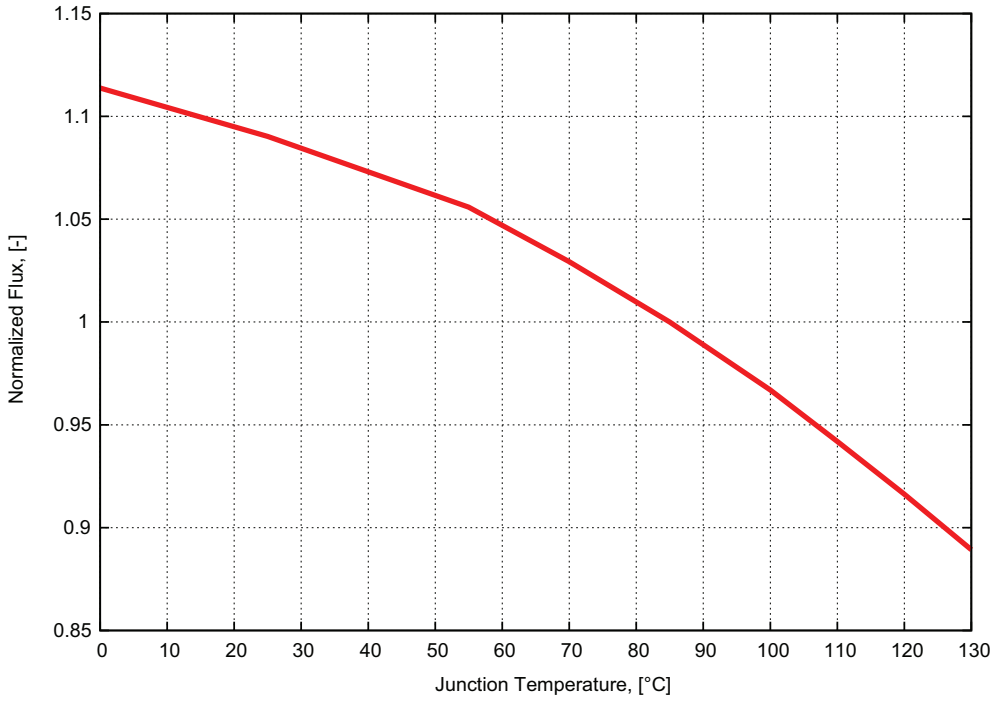


Figure 6. Relative flux vs. junction temperature at test current. Applicable to LXV8-PW40.

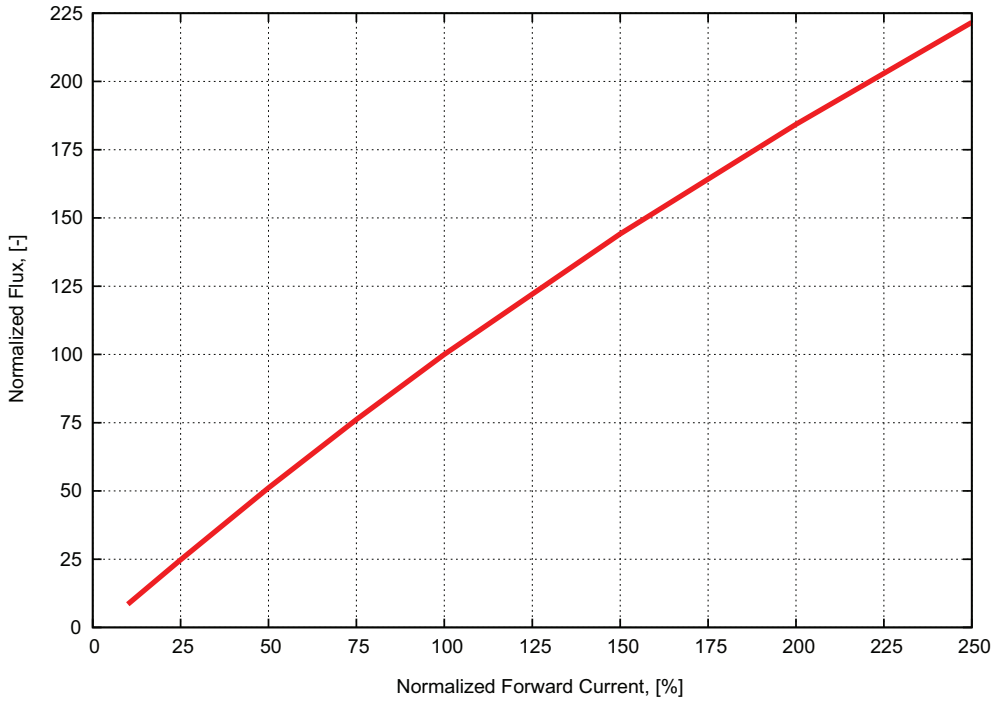


Figure 7. Typical relative luminous flux vs. relative current (operating current / test current) at Junction Temperature = 85°C. Applicable to LXV8-PW27 and LXV8-PW30.

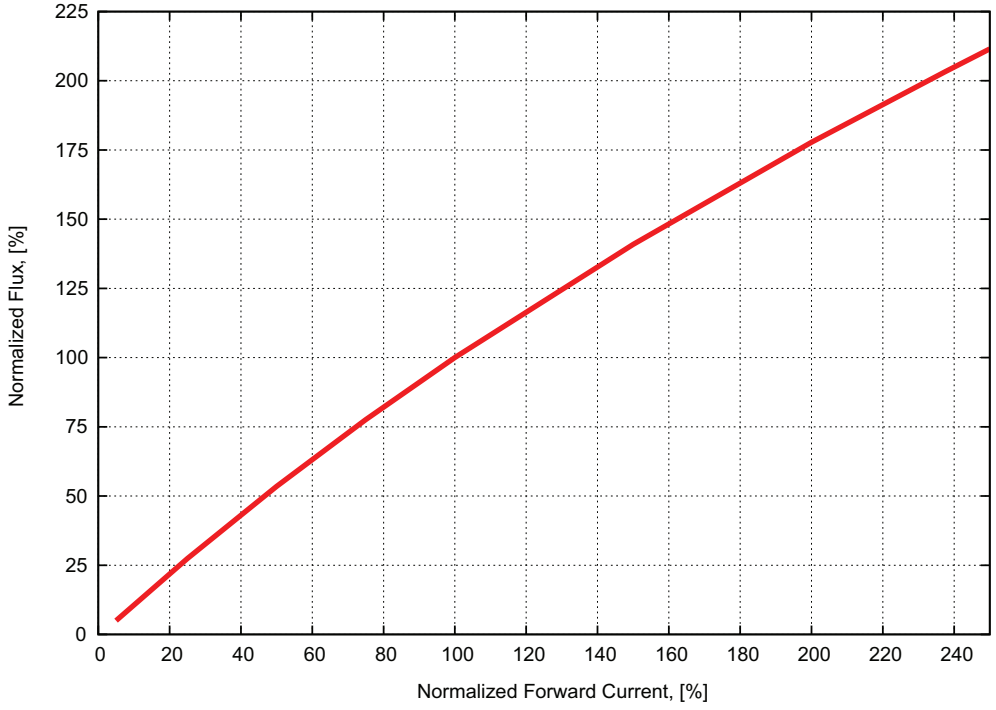


Figure 8. Typical relative luminous flux vs. relative current (operating current / test current) at Junction Temperature = 85°C. Applicable to LXV8-PW40.

Typical Forward Current Characteristics

Typical Forward Current Characteristics, Junction Temperature = 85°C

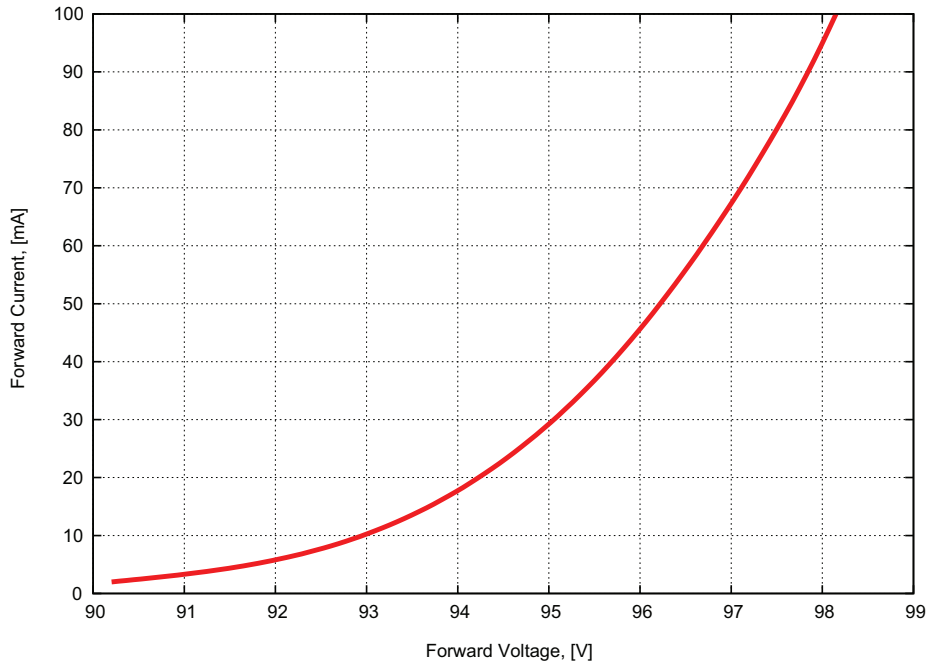


Figure 9. Forward voltage vs. forward current. Applicable to LXV8-PWxx-0014.

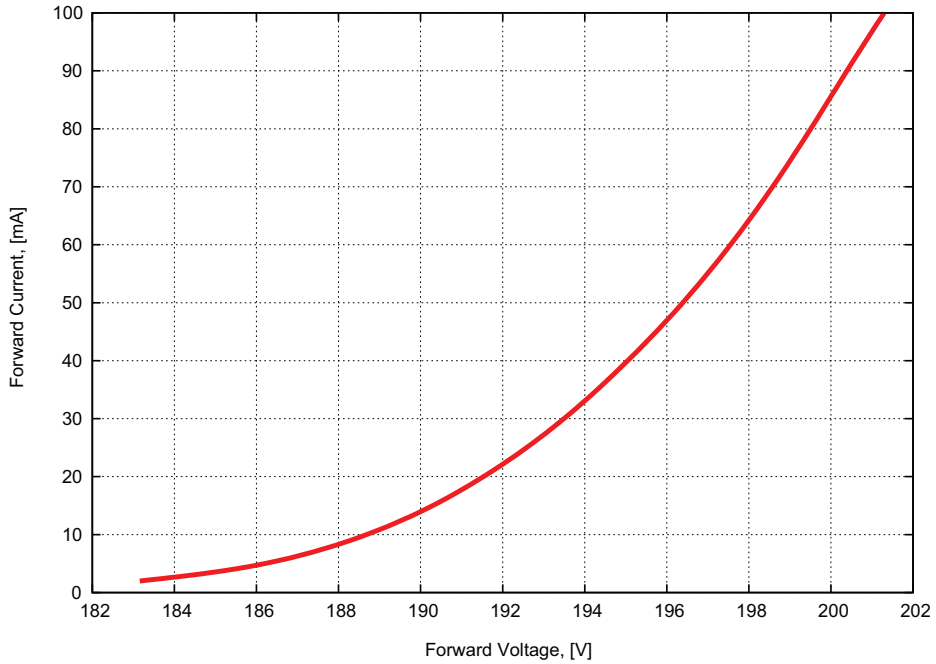


Figure 10. Forward voltage vs. forward current. Applicable to LXV8-PWxx-0024.

Current Derating Curves

Current Derating Curve for LUXEON H Emitters

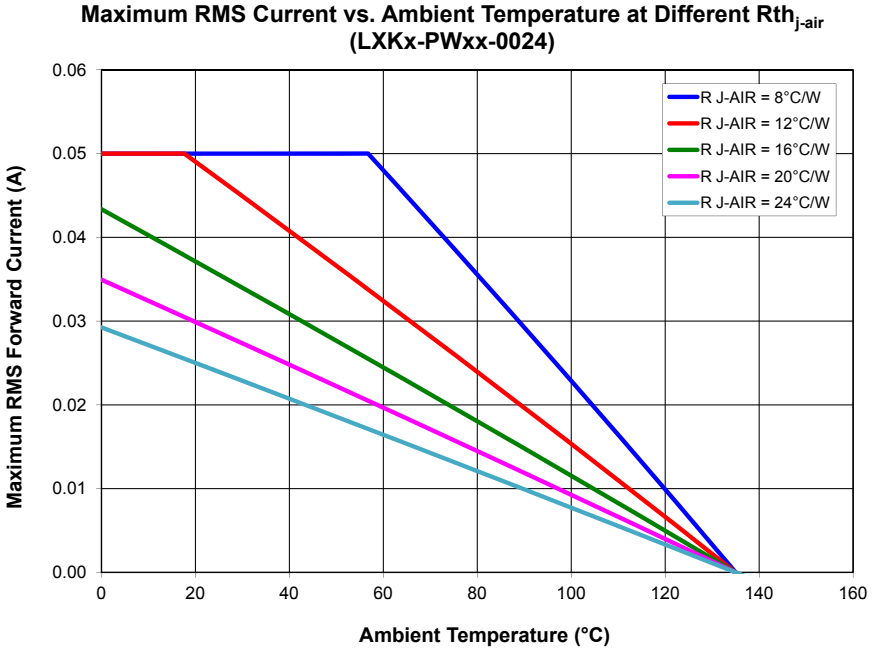


Figure 11. Relative forward current vs. heat sink temperature, based on T_{JMAX} = 150°C. For example, 100% relative forward current for LXV8-PW30-0014 is 40 mA.

Typical Radiation Patterns

Typical Spatial Radiation Pattern for LUXEON H

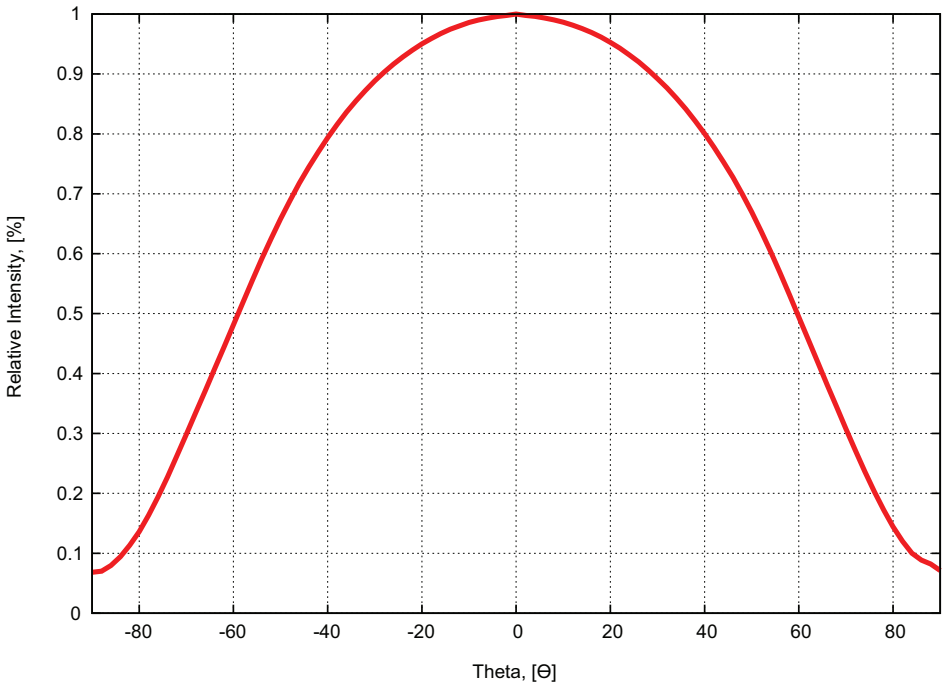


Figure 12. Spatial radiation pattern for LUXEON H.

Typical Polar Radiation Pattern for Lambertian

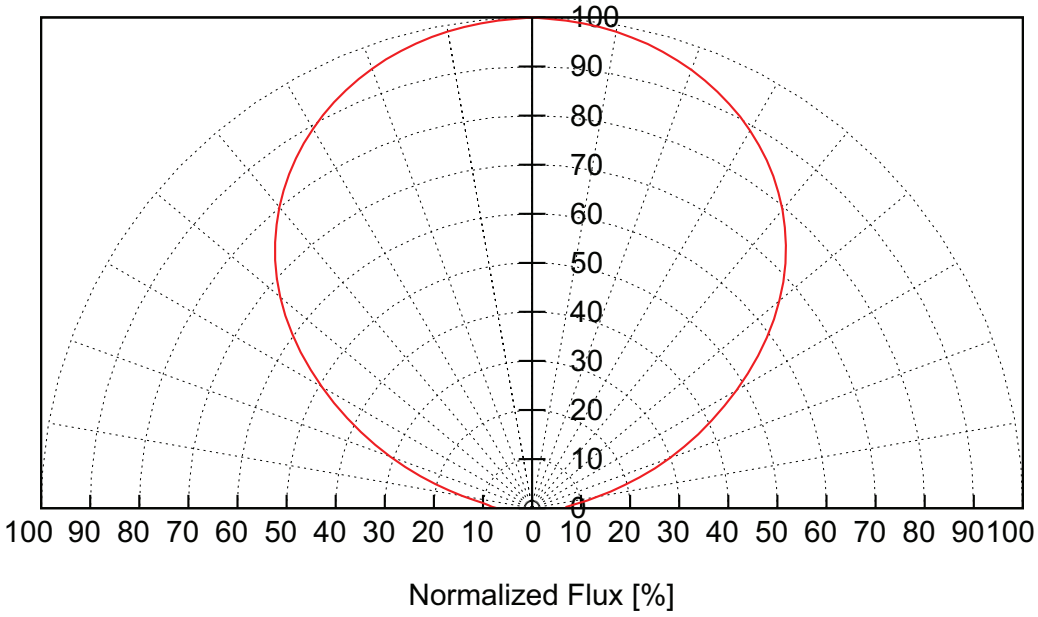


Figure 13. Typical polar radiation pattern for Lambertian.

Final Packaging

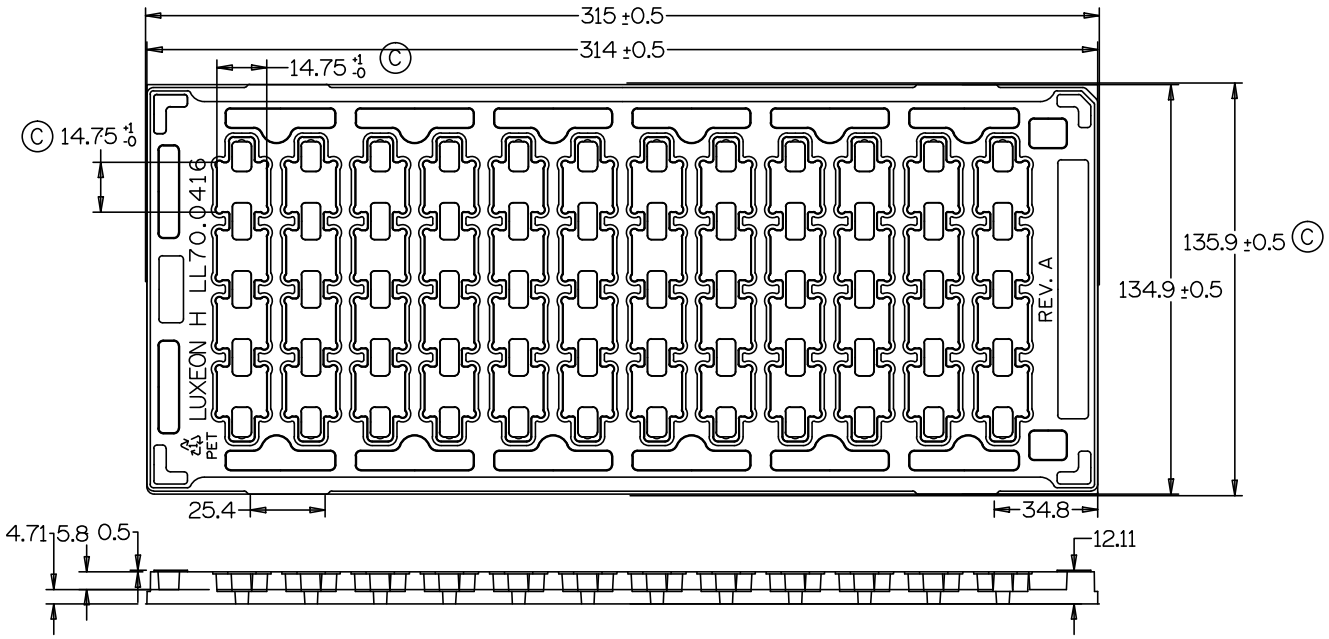


Figure 14. Packing tray for LUXEON H.

Product Binning and Labeling

LUXEON H is a single flux, forward voltage and color bin product. Please refer to table 1 and table 4 for limits and typical for flux and Vf. The color bin structure for LUXEON H is explained on page 18.

LUXEON H Bin Structure

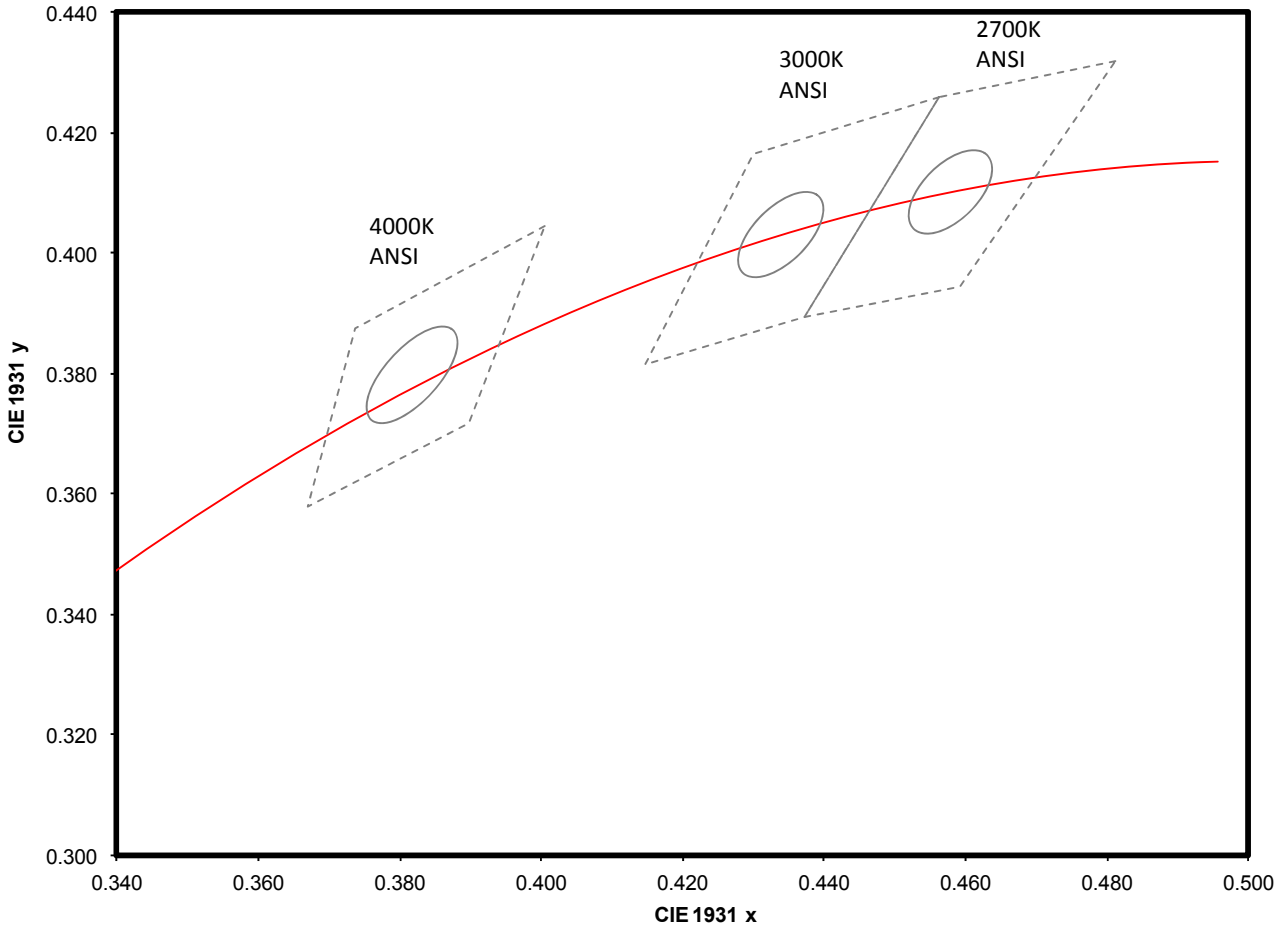
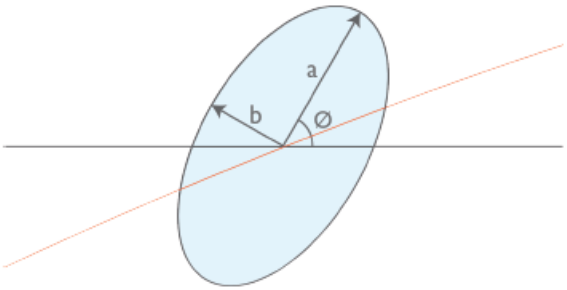


Figure 15. LUXEON H 2700K, 3000K and 4000K 3-step MacAdam ellipse color definition.

Table 7. LUXEON H 3-step MacAdams Ellipse Color Definition

	2700K	3000K	4000K
Center Point (cx, cy)	(0.4578, 0.4101)	(0.4338, 0.4030)	(0.3818,0.3797)
Major Axis, a	0.00810	0.00834	0.00939
Minor Axis, b	0.00420	0.00408	0.00402
Ellipse rotation angle	53.7°	53.22°	53.72°



Company Information

Philips Lumileds is a leading provider of LEDs for everyday lighting applications. The company's records for light output, efficacy and thermal management are direct results of the ongoing commitment to advancing solid-state lighting technology and enabling lighting solutions that are more environmentally friendly, help reduce CO_2 emissions and reduce the need for power plant expansion. Philips Lumileds LUXEON® LEDs are enabling never before possible applications in outdoor lighting, shop lighting, home lighting, consumer electronics, and automotive lighting.

Philips Lumileds is a fully integrated supplier, producing core LED material in all three base colors, (Red, Green, Blue) and white. Philips Lumileds has R&D centers in San Jose, California and in the Netherlands, and production capabilities in San Jose, Singapore and Penang, Malaysia. Founded in 1999, Philips Lumileds is the high flux LED technology leader and is dedicated to bridging the gap between solid-state technology and the lighting world. More information about the company's LUXEON LED products and solid-state lighting technologies can be found at www.philipslumileds.com.

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