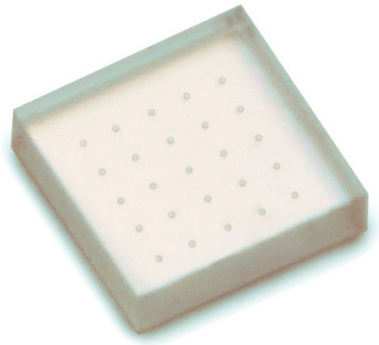
LUMILEDS

GENERAL ILLUMINATION

LUXEON FlipChip Royal Blue

Chip-scale packages for maximum design flexibility



Customers now have complete design flexibility to access Lumileds industry leading performance at the die level and customize the phosphor and packaging to best suit their lighting applications with the 1.0mm^2 LUXEON FlipChip Royal Blue. LUXEON FlipChip is a real chip-scale package LED that can be attached by reflow without additional packaging. Traditional wire bonding limits the packing and power density of LEDs. LUXEON FlipChip LEDs can be packaged closer and can be driven at a higher current density, therefore requiring fewer emitters to achieve a higher lumen output at higher lumen densities.

FEATURES AND BENEFITS
Micro sized CSP: 1.0mm^2 package for design flexibilty and packing density
No wire bonds allows for direct attach and reflow
5-sided emitter enables wide viewing angles
445–460nm wavelength range for dispense and remote phosphor applications
Low thermal resistance of 2.9V for leading system level lm/$

PRIMARY APPLICATIONS
Automotive
Display
Flash
General Illumination

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General Information

Part Number Nomenclature

The part number designation for LUXEON FlipChip Royal Blue follows:

L 0 F 2 - B x x x S I Z E y y y y 1

Where:

L0F2 – designates for package level 0 flip chip generation 2

B – designates for color blue

xxx - designates minimum dominant wavelength bin (450 for 450nm min dominant wavelength bin)

SIZE - designates die dimension (1000 for 1mm^2, 0500 for 0.5mm^2)

yyyy - minimum radiometric power performance (0500 for 500mW power bin)

Environmental Compliance

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

Product Performance and Characterization Guide

Table 1a. 1mm² LUXEON FlipChip Royal Blue Optical Characteristics at T_j = 25°C, I_f = 350mA

Part Number	Dominant Wavelength (nm) [1,2]		Typical Spectra Half-width (nm)	Typical Temperature Coefficient of Peak Wavelength [3] (nm/°C)
	Min.	Max.		
L0F2-B445100000001	445	450	24	0.05
L0F2-B450100000001	450	455		
L0F2-B455100000001	455	460		

Table 1b. 0.5mm² LUXEON FlipChip Royal Blue Optical Characteristics at T_j = 25°C, I_f = 175mA

Part Number	Dominant Wavelength (nm) [1,2]		Typical Spectra Half-width (nm)	Typical Temperature Coefficient of Peak Wavelength [3] (nm/°C)
	Min.	Max.		
L0F2-B445050000001	445	450	24	0.05
L0F2-B450050000001	450	455		
L0F2-B455050000001	455	460		

Notes for Tables 1a and 1b:
1. Lumileds maintains a tolerance of ±2nm for dominant wavelength measurements.
2. Please see Figure 8 for typical translation from peak wavelength to dominant wavelength.
3. Measured between 25°C and 85°C at I_f=350mA (1mm²), I_f=175mA (0.5mm²).

Table 2a. 1mm² LUXEON FlipChip Royal Blue Performance Characteristics at T_j = 25°C, I_f = 350mA

Part Number	Min. Radiometric Power (mW) [1,2]	Typical H/C factor [3]
L0F2-B445100005501	550	0.95
L0F2-B450100005501	550	
L0F2-B455100005501	550	

Table 2b. 0.5mm² LUXEON FlipChip Royal Blue Performance Characteristics at T_j = 25°C, I_f = 175mA

Part Number	Min. Radiometric Power (mW) [1,2]	Typical H/C factor [3]
L0F2-B445050002751	275	0.95
L0F2-B450050002751	275	
L0F2-B455050002751	275	

Notes for Tables 2a and 2b:
1. Radiometric power values are based on a die packaged on ceramic tile with high reflective surface and dome encapsulation.
2. Lumileds maintains a tolerance of ±6.5% on radiometric power measurements.
3. H/C factor is the radiometric power ratio between 25°C and 85°C at I_f= 350mA (1mm²) and I_f=175mA (0.5mm²).

Table 3a. 1mm² LUXEON FlipChip Royal Blue Electrical Characteristics at T_j = 25°C, I_f = 350mA

Part Number	Forward Voltage (V)[1]			Typical Temperature Coefficient of Forward Voltage[2] (mV/°C) $\Delta V_f/\Delta T_j$
	Min.	Typ.	Max.	
L0F2-B445100005501	2.7	2.9	3.1	-2 to -3

Table 3b. 0.5mm² LUXEON FlipChip Royal Blue Electrical Characteristics at T_j = 25°C, I_f = 175mA

Part Number	Forward Voltage (V)[1]			Typical Temperature Coefficient of Forward Voltage[2] (mV/°C) $\Delta V_f/\Delta T_j$
	Min.	Typ.	Max.	
L0F2-B445050002751	2.7	2.9	3.1	-2 to -3

Notes for Tables 3a and 3b:

1. Lumileds maintains a tolerance of ±0.06V on forward voltage measurements.
2. Measured between 25°C and 85°C at I_f= 350mA (1mm²) and I_f=175mA (0.5mm²).

Absolute Maximum Ratings

Table 4. LUXEON FlipChip Royal Blue Operating Condition and Ratings

Parameter	Maximum Performance
DC Forward Current [1] [2]	1050 (1mm²), 500mA (0.5mm²)
Peak Pulsed Forward Current [3]	1300mA (1mm²), 650mA (0.5mm²)
Storage Temperature	-40°C - 135°C
LED Junction Temperature [1]	135°C
ESD Sensitivity [4]	≤ 200V (HBM, CLASS 0B per JS-001-2012)
Reverse Voltage	LUXEON FlipChip is not designed to be driven in reverse bias.

Notes for Table 4:

1. Proper current de-rating must be observed to maintain the junction temperature below the specified maximum junction temperature.
2. Residual periodic variations due to power conversion from alternating current (AC) to direct current (DC), also called "ripple", with frequencies ≥ 100Hz and amplitude ≤ 250mA are acceptable, assuming the average current throughout each cycle does not exceed the specified maximum DC forward current and the junction temperature is kept below the specified maximum junction temperature.
3. Pulsed operation with a peak drive current of 1300mA (1mm²)/650mA (0.5mm²) is acceptable if the pulse on-time is ≤ 5ms per cycle and the duty cycle is ≤ 50%.
4. Please see the LUXEON FlipChip application brief for additional information on ESD protection.

Mechanical Dimensions

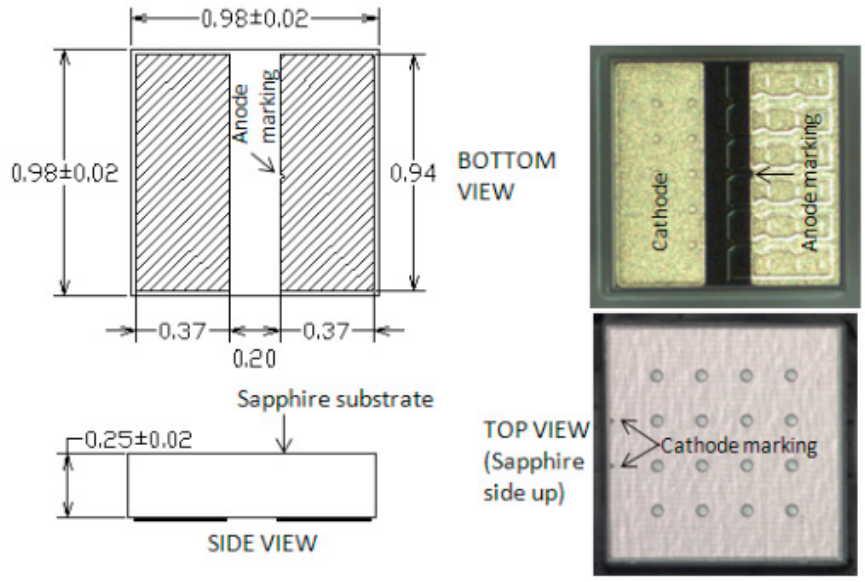

Figure 1a. Mechanical Dimensions, LUXEON FlipChip Royal Blue LHDF-RB10 xxxx xxxx x.

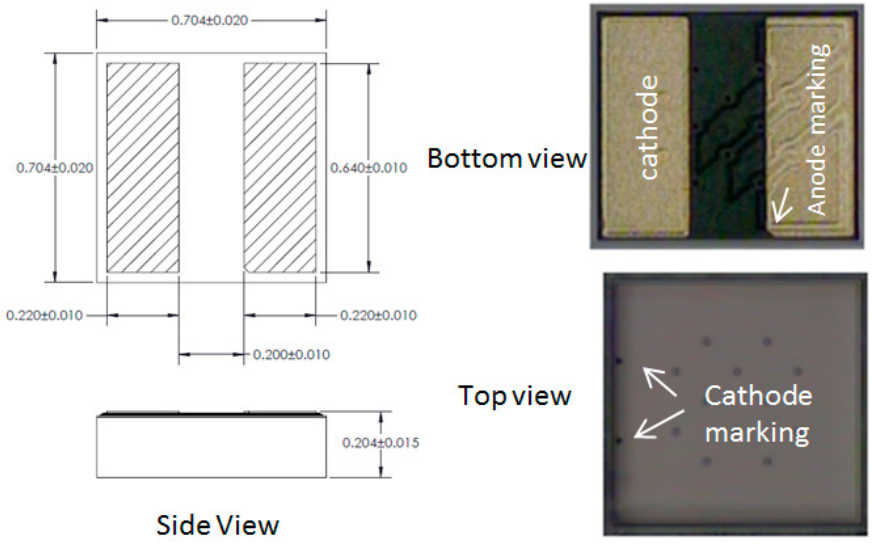

Figure 1b. Mechanical Dimensions, LUXEON FlipChip Royal Blue L0F2-Bxxx0500yyyy1.

Notes for Figures 1a and 1b:

1. Drawing is not scale.
2. All dimensions are in micrometers .
3. A notch in the bond pad center indicates the anode.
4. The bond pads are finished with under bump metallization without solder paste material. Stencil solder paste printing on the substrate is requested before reflow LUXEON FlipChip Royal Blue.
5. LUXEON FlipChip Royal Blue is qualified for AuSn/SAC die attach and reflow on various substrates (Ceramic, MCPCB and even FR4 if uses SAC solder) when AuSn/SAC solder pastes are stencil printed onto the substrate.

Characteristic Curves

Relative Spectral Power Distribution vs. Wavelength

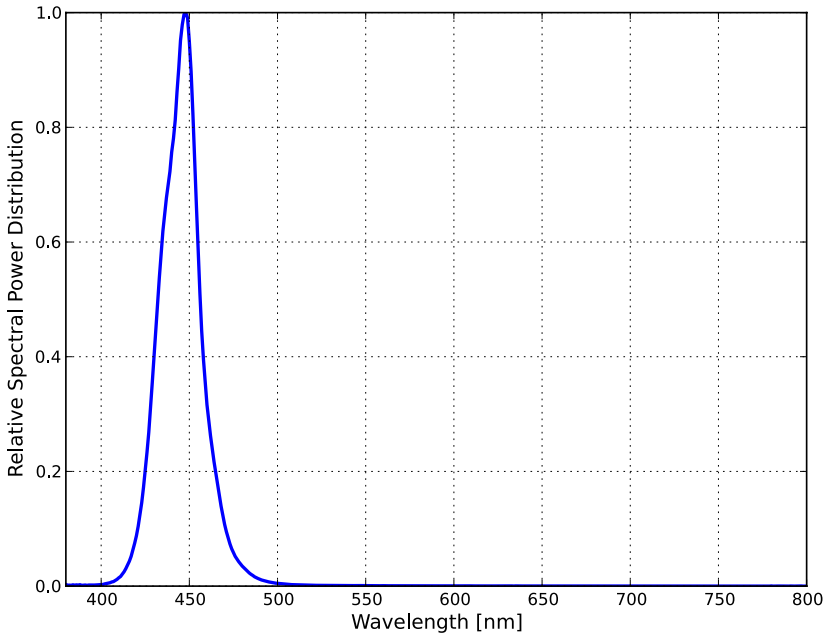

Figure 2. Relative spectral power distribution at T_j = 25°C, I_f = 350mA (L0F2-Bxxx1000yyyy1) or 175mA (L0F2-Bxxx0500yyyy1).

Forward Current vs. Forward Voltage

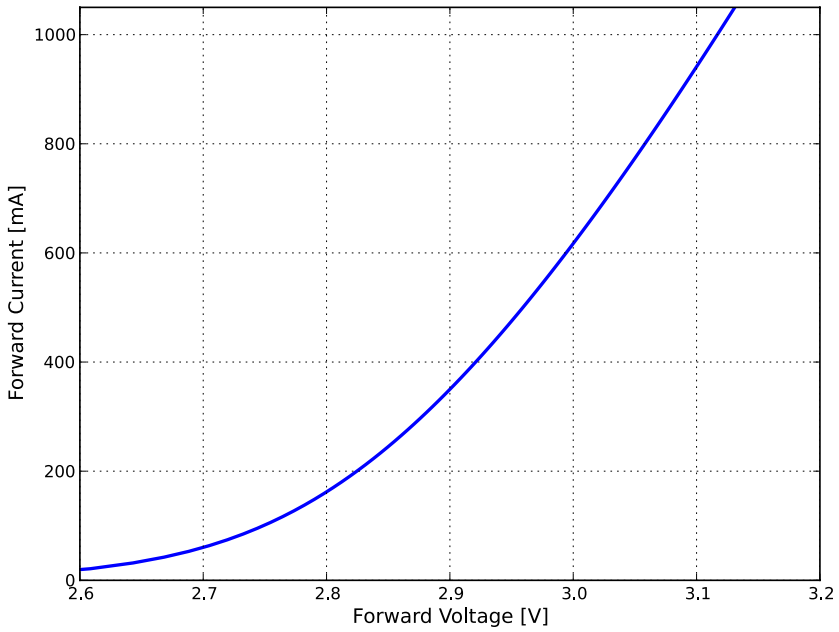

Figure 3a. L0F2-Bxxx1000yyyy1 forward current vs. forward voltage at T_j = 25°C.

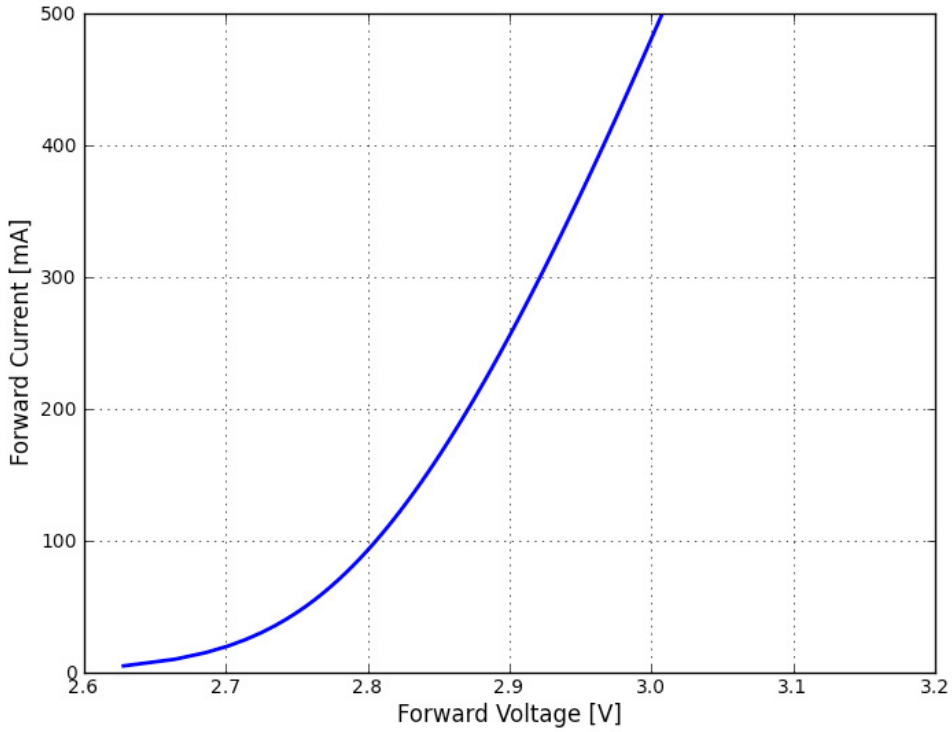

Figure 3b. L0F2-Bxxx0500yyyy1 forward current vs. forward voltage at T_j = 25°C.

Typical Relative Radiometric Power vs. Forward Current

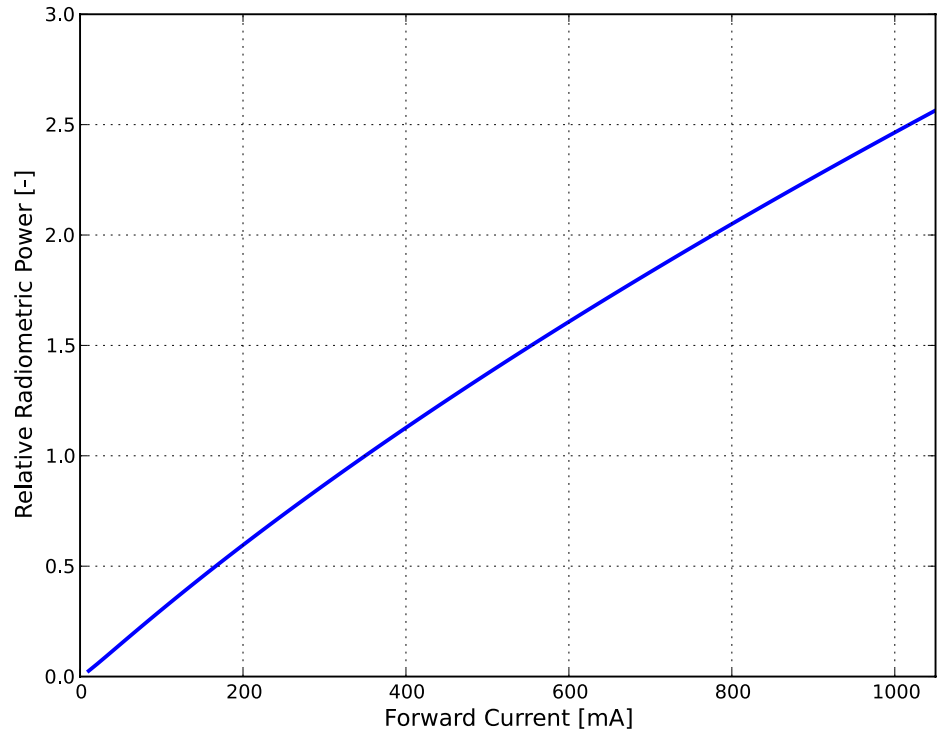

Figure 4a. L0F2-Bxxx1000yyyy1 typical relative radiometric power vs. forward current at T_j = 25°C.

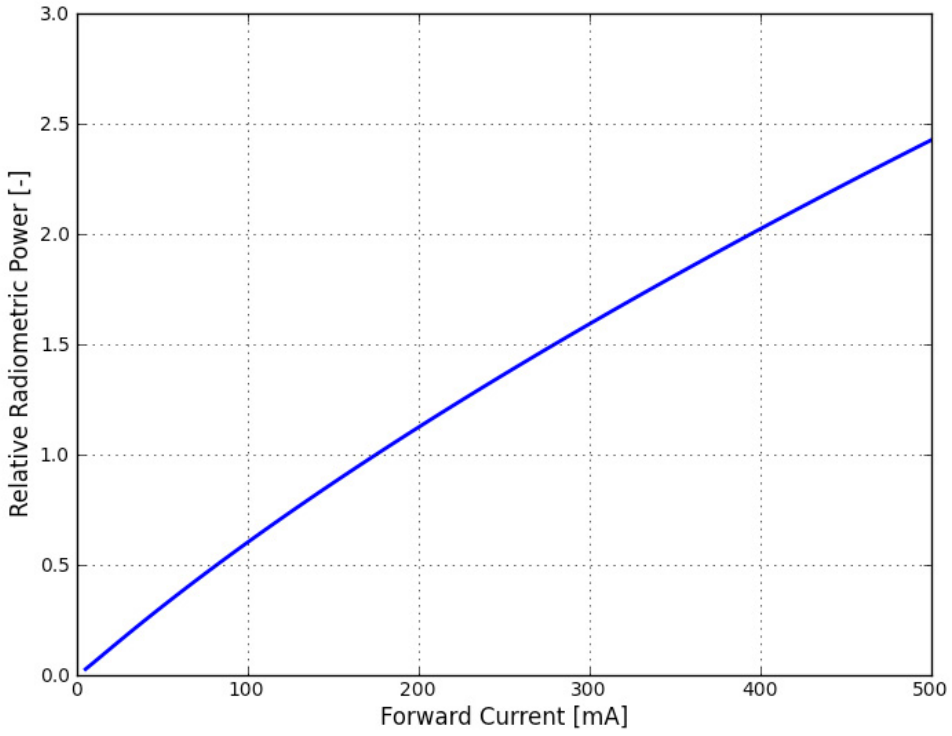

Figure 4b. L0F2-Bxxx0500yyyy1 typical relative radiometric power vs. forward current at T_j = 25°C.

Dominant Wavelength Shift vs. Forward Current

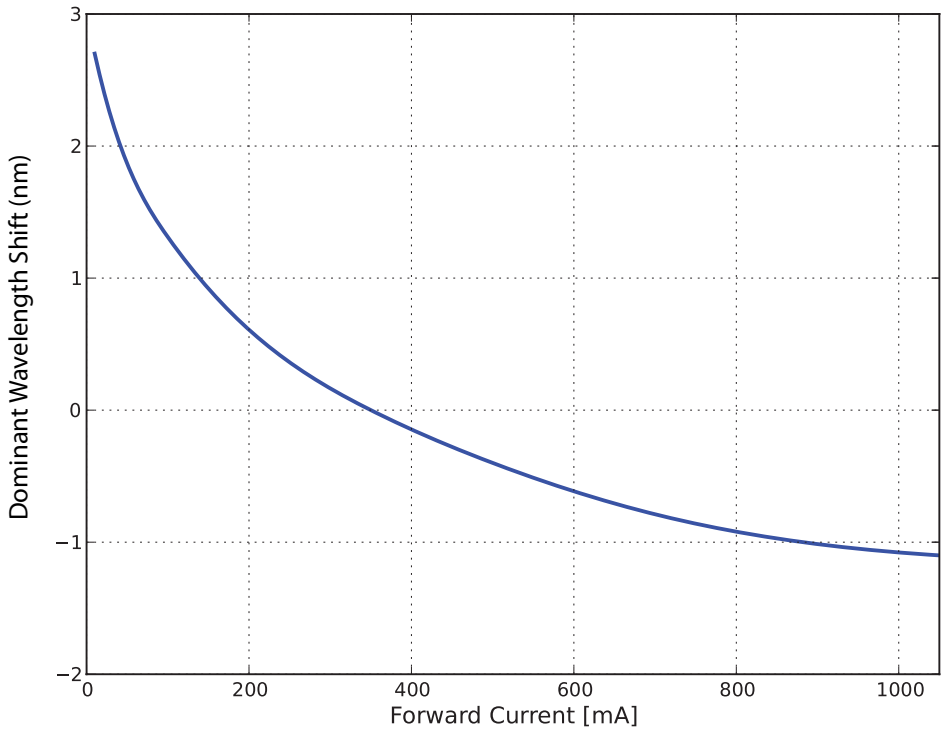

Figure 5a. L0F2-Bxxx1000yyyy1 dominant wavelength shift vs. forward current at T_j = 25°C.

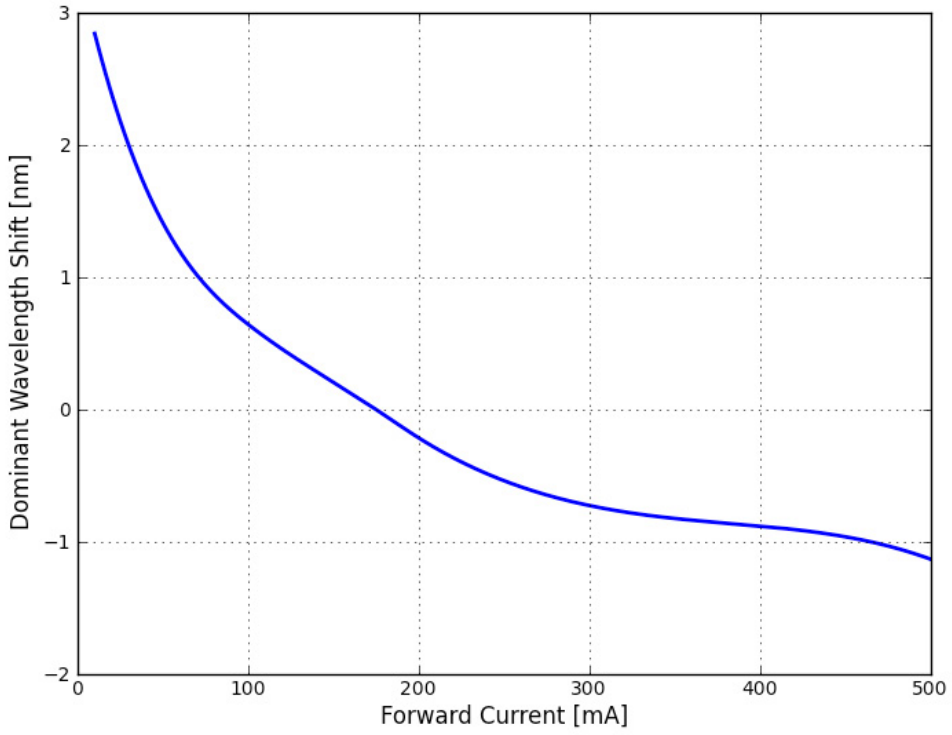

Figure 5b. L0F2-Bxxx1000yyyy1 dominant wavelength shift vs. forward current at T_j = 25°C.

Relative Radiometric Power vs. Junction Temperature

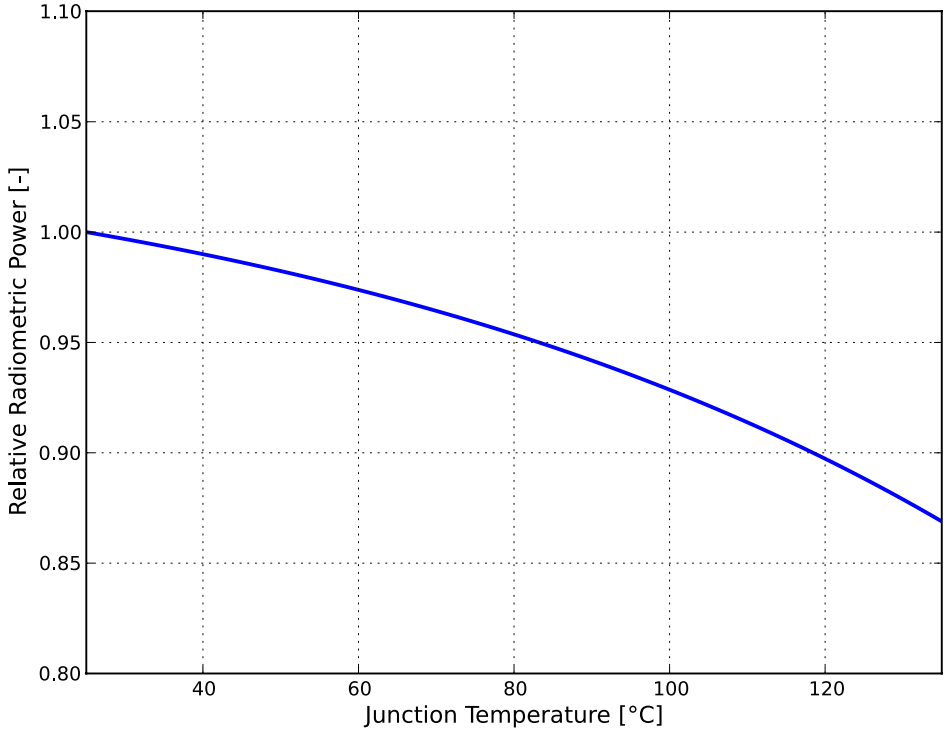

Figure 6a. L0F2-Bxxx1000yyyy1 relative radiometric power vs. junction temperature at I_f = 350mA.

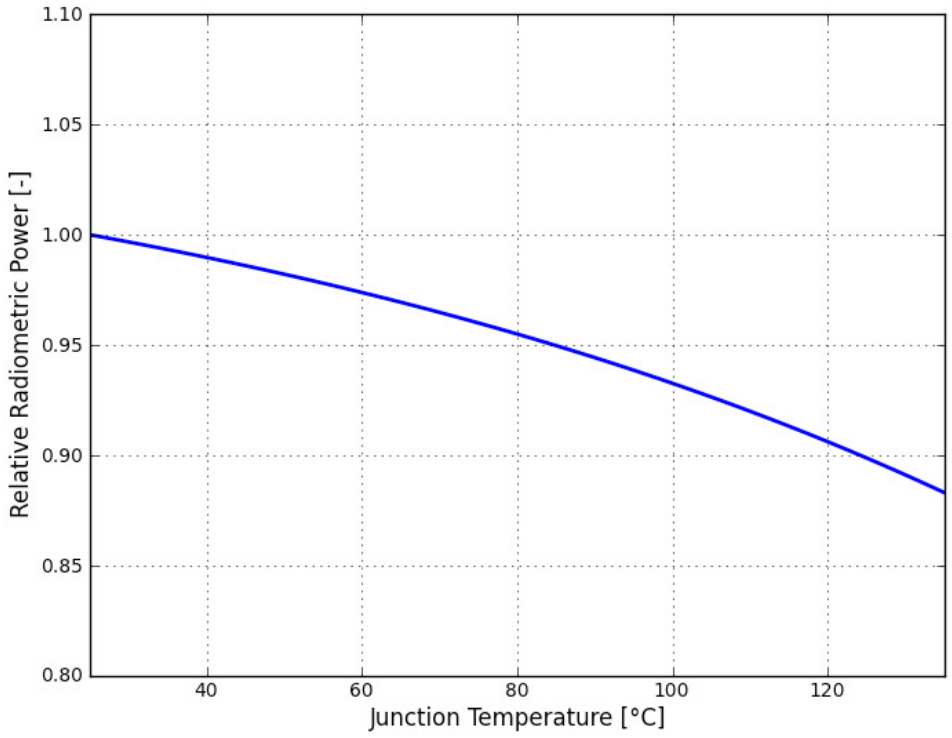

Figure 6b. L0F2-Bxxx0500yyyy1 relative radiometric power vs. junction temperature at I_f = 175mA.

Dominant Wavelength Shift vs. Junction Temperature

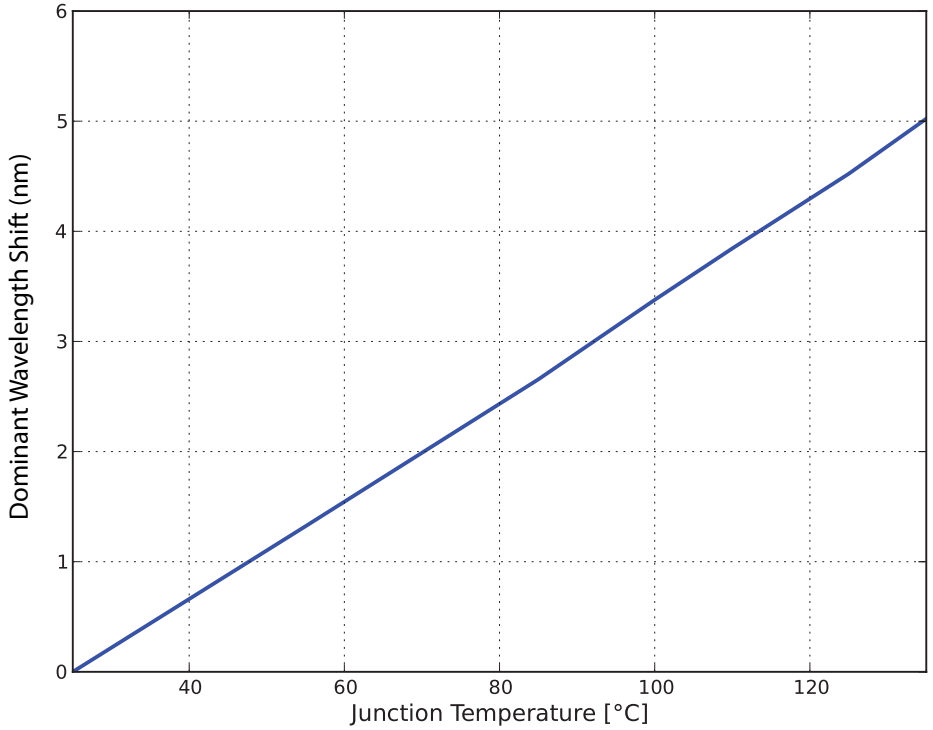

Figure 7a. L0F2-Bxxx1000yyyy1 dominant wavelength shift vs. junction temperature at I_f = 350mA.

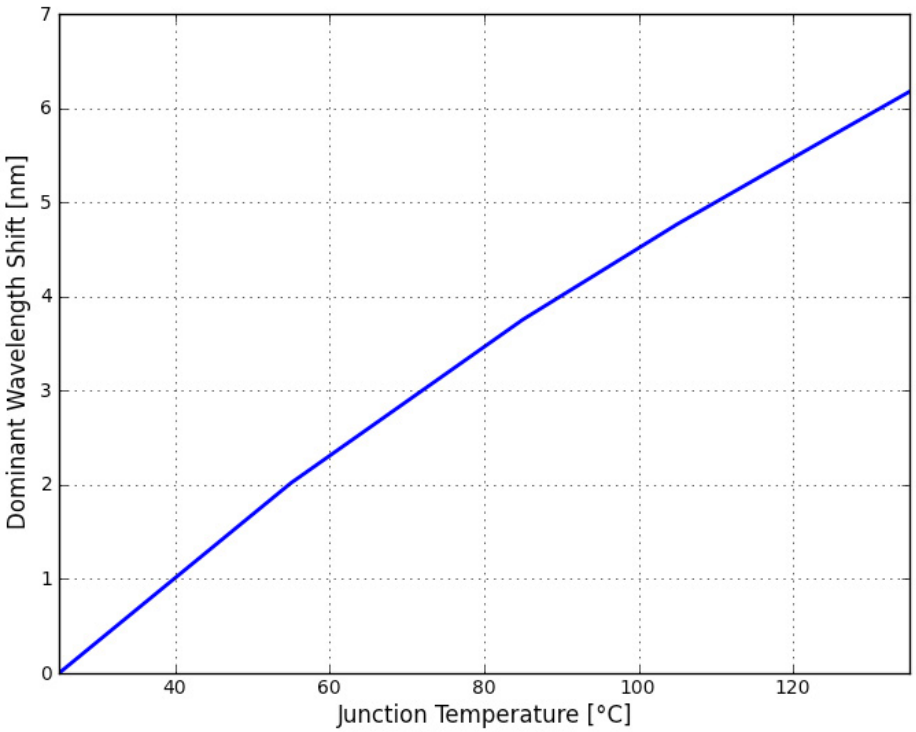

Figure 7b. L0F2-Bxxx0500yyyy1 dominant wavelength shift vs. junction temperature at I_f = 350mA.

Typical Translation from Peak Wavelength to Dominant Wavelength

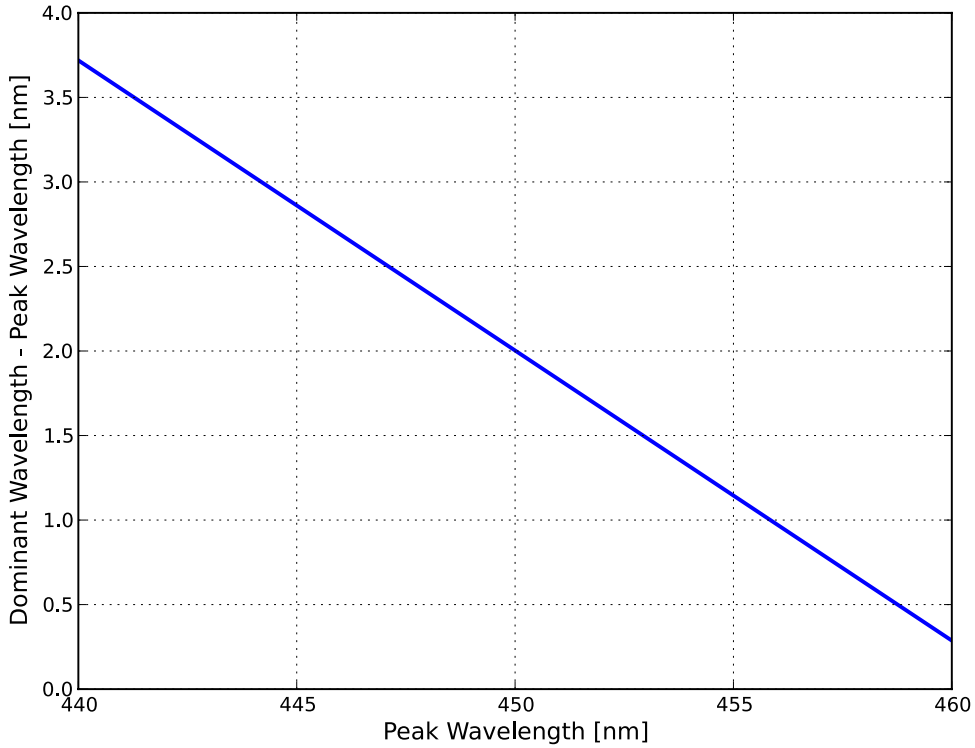

Figure 8. Typical translation from peak wavelength to dominant wavelength at T_j = 25°C, I_f = 350mA (L0F2-Bxxx1000yyyy1) and 175mA (L0F2-Bxxx0500yyyy1).

Radiation Patterns

Spatial Radiation Pattern

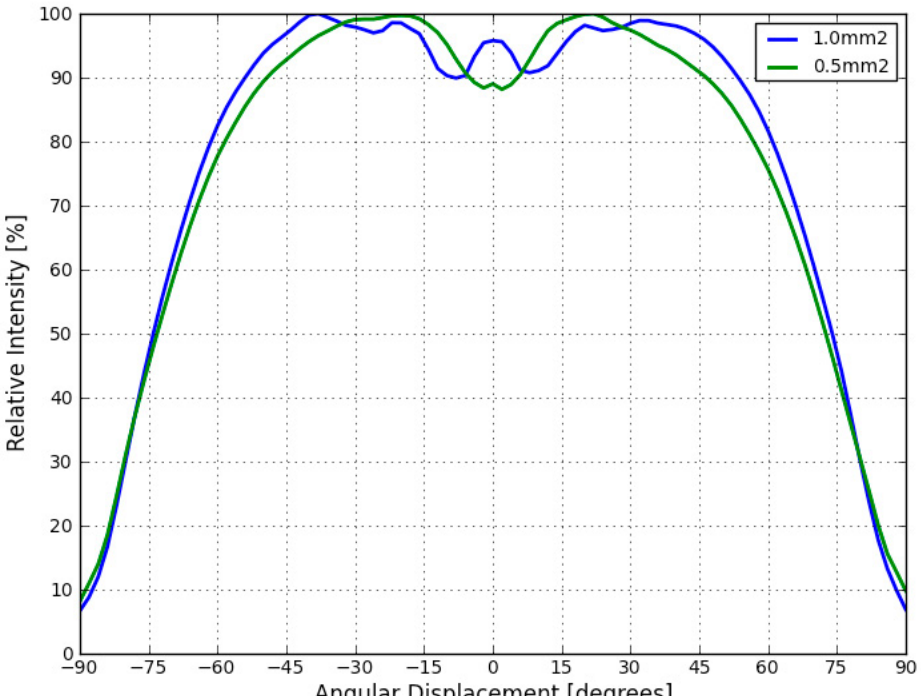

Figure 9. Typical spatial radiation pattern at T_j = 25°C, I_f = 350mA (L0F2-Bxxx1000yyyy1) and 175mA (L0F2-Bxxx0500yyyy1).

Polar Radiation Pattern

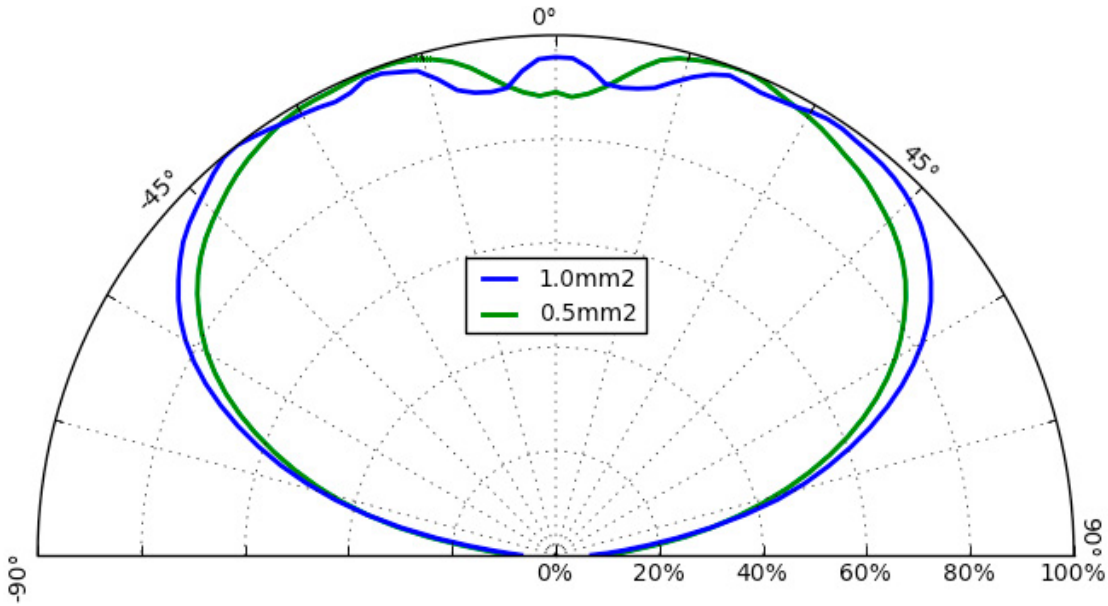

Figure 10. Typical polar radiation pattern for LUXEON FlipChip Royal Blue.

Note for Figures 9 and 10:
1. Radiation pattern is measured for the die packaged on ceramic tile with high reflective surface and dome encapsulation.

Bin Structure for LUXEON FlipChip

LUXEON FlipChip Royal Blue is characterized at T_j = 25°C, I_f = 350mA (1mm^2) and 175mA (0.5mm^2) and sorted on bin sheets. A specific bin sheet only contains LUXEON FlipChip Royal Blue within a single bin for radiometric power, dominant wavelength, and forward voltage. An order for a specific part number at a given dominant wavelength bin can be filled from any bin combination of radiometric flux and forward voltage.

Bin sheets are labeled by a four digit alphanumeric CAT code ABCD following the format below.

Table 5.

A			BC			D		
Radiometric Power (mW) [1]			Dominant Wavelength (nm) [2]			Forward Voltage (V)		
Bin Code	Min.	Max.	Bin Code	Min.	Max.	Bin Code	Min.	Max.
Y	275	300	4x	445	450	8	2.8	2.9
Z	300	325	5x	450	455	9	2.9	3.0
A	325	350	6x	455	460	0	3	3.1
B	350	375						
G	550	600						
H	600	650						
I	650	700						

Notes for Table 5:

1. Radiometric power values are based on a die packaged on ceramic tile with high reflective surface and dome encapsulation. The availability of flux bins will vary depending on dominant wavelength.
2. Limited availability for bin 6x.

About Lumileds

Lumileds is the light engine leader, delivering innovation, quality, and reliability.

For 100 years, Lumileds commitment to innovation has helped customers pioneer breakthrough products in the automotive, consumer and illumination markets.

Lumileds is shaping the future of light with our LEDs and automotive lamps, and helping our customers illuminate how people see the world around them.

To learn more about our portfolio of light engines visit www.lumileds.com.

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