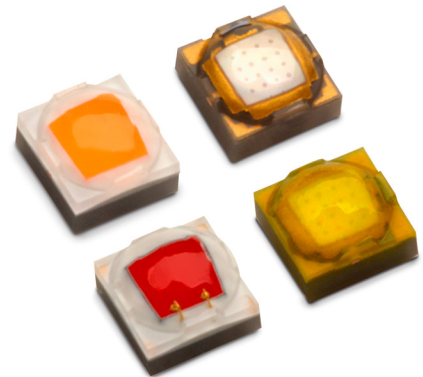




# LUXEON C Color Line

Multiple colors, a single focal length

The LUXEON C Color Line is an optically advanced portfolio of Color and White LEDs. Designed for flawless color mixing, LUXEON C Color Line has one focal length for all colors, which provides consistent radiation patterns from secondary optics and maximizes optical efficiency. With low dome design, it keeps effective source size small while still improving light extraction. Designed for smooth color mixing and maximum punch, LUXEON C Color Line is the optimal LED solution for architecture, entertainment and emergency vehicle lighting applications.



## FEATURES AND BENEFITS

One focal length allows flawless color mixing, maximum optical efficiency and removes halos

Low dome design eliminates trade-offs between flux and source size

Hot tested—removes guesswork for designers

Industry's lowest thermal resistance means greater light output and lower heatsink costs

Small symmetrical 2x2mm<sup>2</sup> package enables dense packing and limits the impact of rotation during reflow

## PRIMARY APPLICATIONS

Architectural & Entertainment

Lamps

– Color Tunable

Specialty Lighting

– Emergency Vehicle

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# General Product Information

## Product Test Conditions

LUXEON C LEDs are tested and binned with a DC drive current of 350mA at a junction temperature,  $T_j$ , of 85°C.

## Part Number Nomenclature

Part numbers for LUXEON C Colors follow the convention below:

L 1 C 1 – **A A A** 1 0 0 0 0 0 0 0 0 0

Where:

**A A A** – designates color (FRD=Far Red, DRD=Deep Red, RED=Red, RNG=Red-Orange, AMB=Amber, PCA=PC Amber, MNT=Mint, LME=Lime, GRN=Green, CYN=Cyan, BLU=Blue, RYL=Royal Blue)

Therefore, the following part number is used for a LUXEON C Red:

L 1 C 1 – **R E D** 1 0 0 0 0 0 0 0 0 0

Part numbers for LUXEON C White follow the convention below:

L 1 C 1 – **A A B B** 0 0 0 0 0 0 0 0 0 0

Where:

**A A** – designates nominal CCT (27= 2700K, 30=3000K, 40=4000K, 50=5000K, 57=5700K, 65=6500K)

**B B** – designates minimum CRI (70=70CRI, 80=80CRI, 90=90CRI)

Therefore, the following part number is used for LUXEON C White at 4000K 70CRI:

L 1 C 1 – **4 0 7 0** 0 0 0 0 0 0 0 0 0 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 C 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 1a. Product performance of LUXEON C Colors at 350mA, T<sub>j</sub>=85°C.

| COLOR      | DOMINANT OR PEAK WAVELENGTH <sup>[1]</sup> (nm) |         | LUMINOUS FLUX (lm) OR RADIOMETRIC POWER <sup>[2]</sup> (mW) |         | PART NUMBER        |
|------------|---|---------|---|---------|--------------------|
|            | MINIMUM   | MAXIMUM | MINIMUM   | TYPICAL |                    |
| Far Red    | 720   | 750     | 190   | 230     | L1C1-FRD1000000000 |
| Deep Red   | 655   | 675     | 280   | 315     | L1C1-DRD1000000000 |
| Red        | 624   | 634     | 35  | 49      | L1C1-RED1000000000 |
| Red-Orange | 614   | 624     | 45  | 60      | L1C1-RNG1000000000 |
| Amber      | 585   | 600     | 20  | 30      | L1C1-AMB1000000000 |
| PC Amber   | -   | -       | 80  | 94      | L1C1-PCA1000000000 |
| Mint       | -   | -       | 140   | 152     | L1C1-MNT1000000000 |
| Lime       | -   | -       | 125   | 135     | L1C1-LME1000000000 |
| Green      | 520   | 540     | 90  | 115     | L1C1-GRN1000000000 |
| Cyan       | 490   | 510     | 65  | 90      | L1C1-CYN1000000000 |
| Blue       | 465   | 485     | 25  | 41      | L1C1-BLU1000000000 |
| Royal Blue | 440   | 460     | 480   | 532     | L1C1-RYL1000000000 |

**Notes for Table 1a:**

- Lumileds maintains a tolerance of ±6.5% on luminous flux measurements. PC Amber, Mint and Lime are binned by chromaticity coordinates. Far Red, Deep Red and Royal Blue are binned by peak wavelength. All other colors are binned by dominant wavelength.
- Far Red, Deep Red and Royal Blue are binned by radiometric power. All other colors are binned by luminous flux.

Table 1b. Product performance of LUXEON C White at 350mA, T<sub>j</sub>=85°C.

| NOMINAL CCT | MINIMUM CRI | LUMINOUS FLUX (lm) |         | TYPICAL LUMINOUS EFFICACY (lm/W) | PART NUMBER         |
|-------------|-------------|--------------------|---------|----------------------------------|---------------------|
|             |             | MINIMUM            | TYPICAL |                                  |                     |
| 4000K       | 70          | 100                | 116     | 121                              | L1C1-40700000000000 |
| 5000K       | 70          | 100                | 117     | 122                              | L1C1-50700000000000 |
| 5700K       | 70          | 100                | 118     | 124                              | L1C1-57700000000000 |
| 6500K       | 70          | 100                | 119     | 124                              | L1C1-65700000000000 |
| 2700K       | 80          | 90                 | 94      | 98                               | L1C1-27800000000000 |
| 3000K       | 80          | 90                 | 102     | 106                              | L1C1-30800000000000 |
| 4000K       | 80          | 100                | 113     | 117                              | L1C1-40800000000000 |
| 5700K       | 90          | 80                 | 93      | 94                               | L1C1-57900000000000 |

**Notes for Table 1b:**

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

# Optical Characteristics

Table 2a. Optical characteristics for LUXEON C Colors at 350mA, T<sub>j</sub>=85°C.

| COLOR      | PART NUMBER        | TYPICAL SPECTRAL HALF-WIDTH <sup>[1]</sup> (nm) | TYPICAL TEMPERATURE COEFFICIENT OF DOMINANT OR PEAK WAVELENGTH (nm/°C) | TYPICAL TOTAL INCLUDED ANGLE <sup>[2]</sup> | TYPICAL VIEWING ANGLE <sup>[3]</sup> |
|------------|--------------------|---|--|---|--------------------------------------|
| Far Red    | L1C1-FRD1000000000 | 20  | 0.06   | 175°  | 162°                                 |
| Deep Red   | L1C1-DRD1000000000 | 20  | 0.06   | 175°  | 162°                                 |
| Red        | L1C1-RED1000000000 | 20  | 0.06   | 175°  | 162°                                 |
| Red-Orange | L1C1-RNG1000000000 | 20  | 0.06   | 175°  | 162°                                 |
| Amber      | L1C1-AMB1000000000 | 20  | 0.06   | 175°  | 162°                                 |
| PC Amber   | L1C1-PCA1000000000 | 80  | -0.01  | 175°  | 150°                                 |
| Mint       | L1C1-MNT1000000000 | 80  | -0.01  | 175°  | 150°                                 |
| Lime       | L1C1-LME1000000000 | 80  | -0.01  | 175°  | 145°                                 |
| Green      | L1C1-GRN1000000000 | 30  | 0.04   | 175°  | 170°                                 |
| Cyan       | L1C1-CYN1000000000 | 30  | 0.03   | 175°  | 170°                                 |
| Blue       | L1C1-BLU1000000000 | 20  | 0.03   | 175°  | 170°                                 |
| Royal Blue | L1C1-RYL1000000000 | 20  | 0.03   | 175°  | 165°                                 |

**Notes for Table 2a:**

1. Spectral half-width is the spectral bandwidth at 50% of the peak intensity.
2. Total angle at which 90% of total luminous flux is captured.
3. Viewing angle is the off axis angle from the LED centerline where the luminous intensity is ½ of the peak value.

Table 2b. Optical characteristics for LUXEON C White at 350mA, T<sub>j</sub>=85°C.

| PART NUMBER        | TYPICAL TOTAL INCLUDED ANGLE <sup>[2]</sup> | TYPICAL VIEWING ANGLE <sup>[3]</sup> |
|--------------------|---|--------------------------------------|
| L1C1-xxx0000000000 | 170°  | 150°                                 |

**Notes for Table 2b:**

1. Spectral half-width is the spectral bandwidth at 50% of the peak intensity.
2. Total angle at which 90% of total luminous flux is captured.
3. 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 C Color Line at 350mA, T<sub>j</sub>=85°C.

| COLOR      | PART NUMBER        | FORWARD VOLTAGE <sup>[1]</sup> (V <sub>f</sub> ) |         |         | TYPICAL TEMPERATURE COEFFICIENT OF FORWARD VOLTAGE <sup>[2]</sup> (mV/°C) | TYPICAL THERMAL RESISTANCE—JUNCTION TO SOLDER PAD (°C/W) |
|------------|--------------------|--|---------|---------|---|--|
|            |                    | MINIMUM  | TYPICAL | MAXIMUM |   |  |
| Far Red    | L1C1-FRD1000000000 | 1.50   | 1.73    | 2.30    | -1.7  | 2.8  |
| Deep Red   | L1C1-DRD1000000000 | 1.50   | 1.95    | 2.30    | -1.7  | 2.8  |
| Red        | L1C1-RED1000000000 | 1.75   | 2.00    | 2.50    | -1.6  | 2.8  |
| Red-Orange | L1C1-RNG1000000000 | 1.75   | 2.05    | 2.50    | -1.6  | 2.8  |
| Amber      | L1C1-AMB1000000000 | 1.75   | 2.05    | 2.50    | -2.0  | 2.8  |
| PC Amber   | L1C1-PCA1000000000 | 2.50   | 2.75    | 3.50    | -1.7  | 3.0  |
| Mint       | L1C1-MNT1000000000 | 2.50   | 2.75    | 3.50    | -2.7  | 2.8  |
| Lime       | L1C1-LME1000000000 | 2.50   | 2.75    | 3.50    | -2.7  | 2.8  |
| Green      | L1C1-GRN1000000000 | 2.50   | 3.05    | 3.50    | -2.4  | 3.5  |
| Cyan       | L1C1-CYN1000000000 | 2.50   | 3.05    | 3.50    | -2.4  | 3.5  |
| Blue       | L1C1-BLU1000000000 | 2.50   | 2.84    | 3.50    | -2.6  | 3.5  |
| Royal Blue | L1C1-RYL1000000000 | 2.50   | 2.75    | 3.50    | -1.7  | 2.8  |
| White      | L1C1-xxx0000000000 | 2.50   | 2.75    | 3.50    | -1.7  | 2.8  |

**Notes for Table 3:**

1. Lumileds maintains a tolerance of ±0.06V on forward voltage measurements.
2. Measured between 25°C and 85°C.

# Absolute Maximum Ratings

Table 4. Absolute maximum ratings for LUXEON C Color Line.

| PARAMETER  | FAR RED AND DEEP RED  | RED, RED-ORANGE, AMBER AND PC AMBER | GREEN AND CYAN | BLUE AND ROYAL BLUE | MINT, LIME AND WHITE |
|--|---|-------------------------------------|----------------|---------------------|----------------------|
| DC Forward Current <sup>[1,2]</sup>                  | 700mA   | 1050mA                              | 1050mA         | 1050mA              | 1225mA               |
| Peak Pulsed Forward Current <sup>[1,3]</sup>         | 875mA   | 1300mA                              | 1300mA         | 1300mA              | 1500mA               |
| LED Junction Temperature <sup>[1]</sup> (DC & Pulse) | 135°C   | 120°C                               | 135°C          | 135°C               | 135°C                |
| ESD Sensitivity (ANSI/ESDA/JEDEC JS-001-2012)        | Class 3B  |                                     |                |                     |                      |
| LED Storage Temperature                              | -40°C to 135°C  |                                     |                |                     |                      |
| Soldering Temperature                                | JEDEC 020c 260°C  |                                     |                |                     |                      |
| Allowable Reflow Cycles                              | 3   |                                     |                |                     |                      |
| Reverse Voltage ( $V_{reverse}$ )                    | LUXEON C LEDs are not designed to be driven in reverse bias |                                     |                |                     |                      |

**Notes for Table 4:**

1. 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 the maximum peak pulsed forward current
3. At 10% duty cycle with pulse width of 10ms.

# Characteristic Curves

## Spectral Power Distribution Characteristics

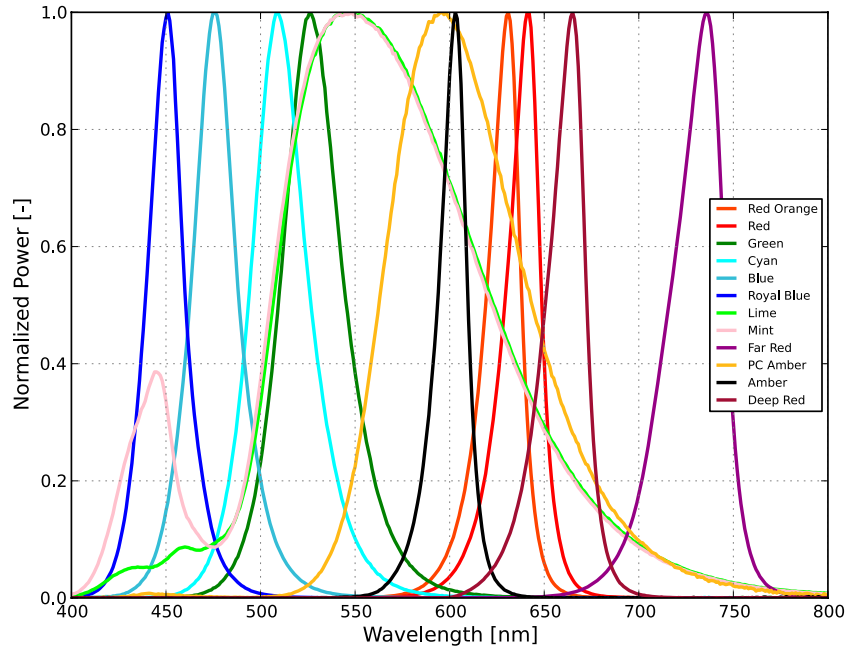


Figure 1a. Typical normalized power vs. wavelength for LUXEON C Colors at 350mA,  $T_j=85^{\circ}\text{C}$ .

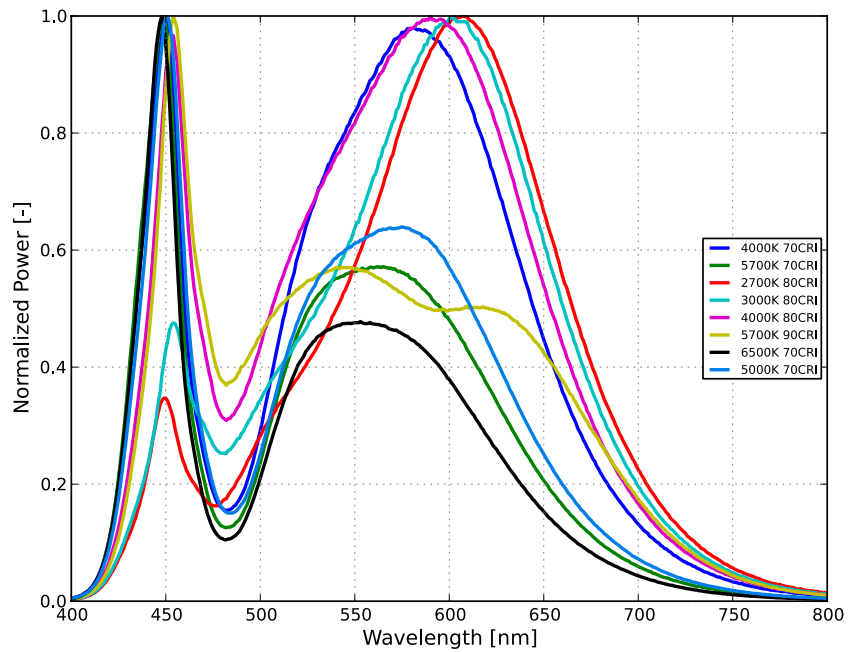


Figure 1b. Typical normalized power vs. wavelength for LUXEON C White at 350mA,  $T_j=85^{\circ}\text{C}$ .

# Light Output Characteristics

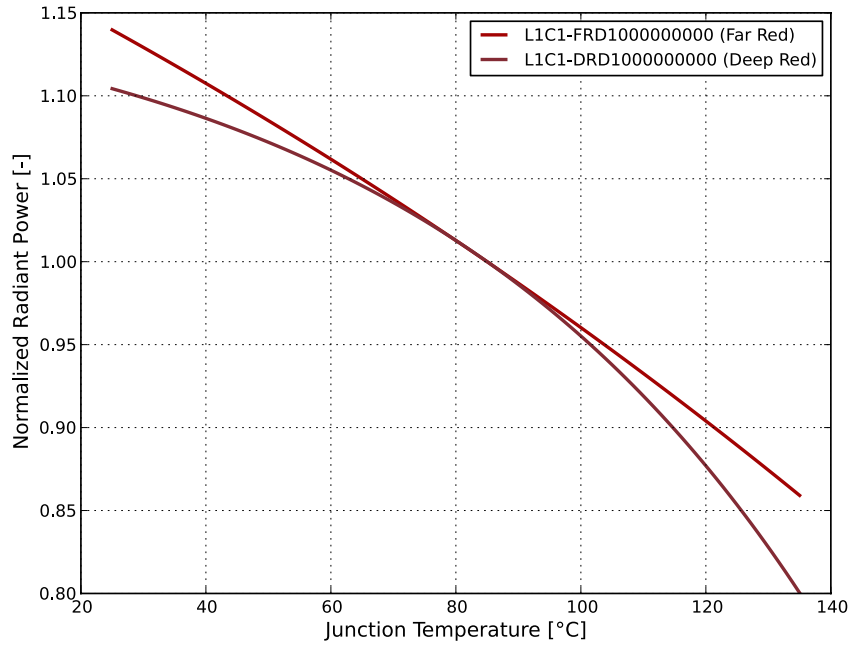


Figure 2a. Typical normalized radiant power vs. junction temperature for LUXEON C Far Red and Deep Red at 350mA.

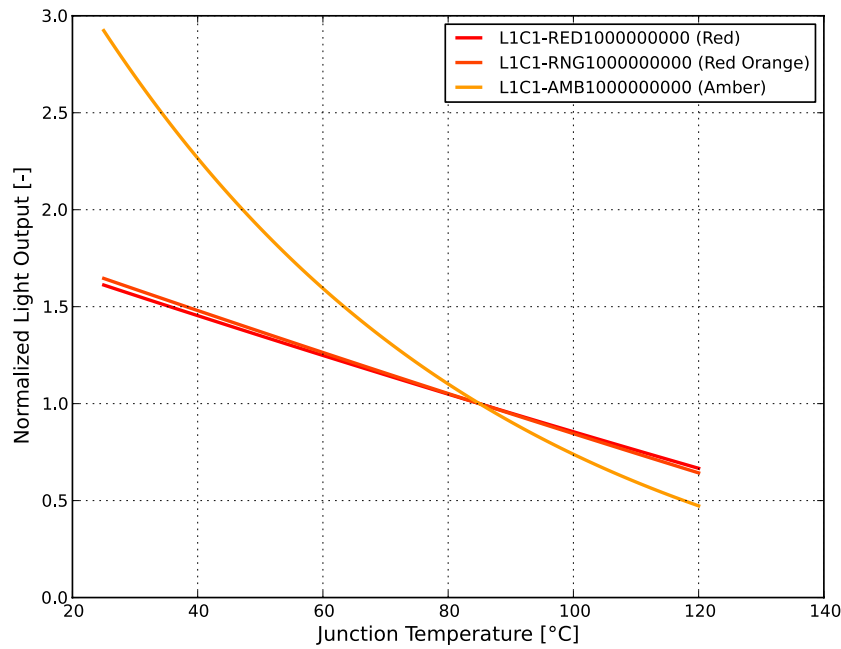


Figure 2b. Typical normalized light output vs. junction temperature for LUXEON C Red, Red-Orange and Amber at 350mA.



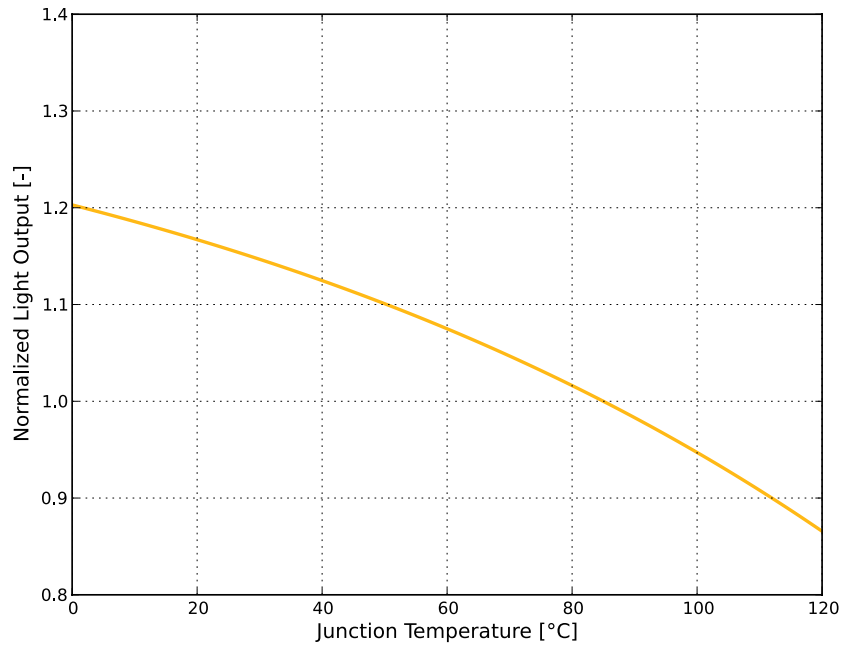


Figure 2c. Typical normalized light output vs. junction temperature for LUXEON C PC Amber at 350mA.

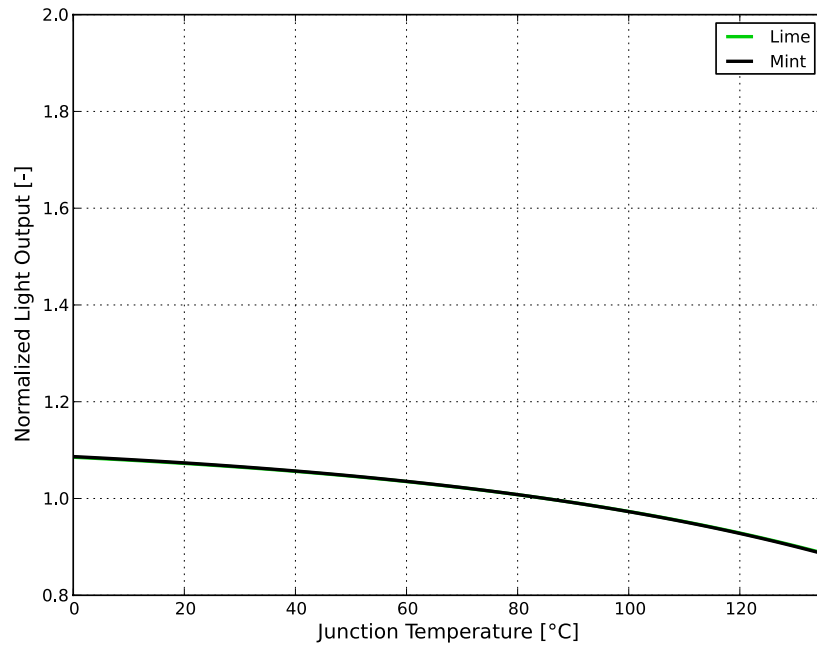


Figure 2d. Typical normalized light output vs. junction temperature for LUXEON C Mint and Lime at 350mA.

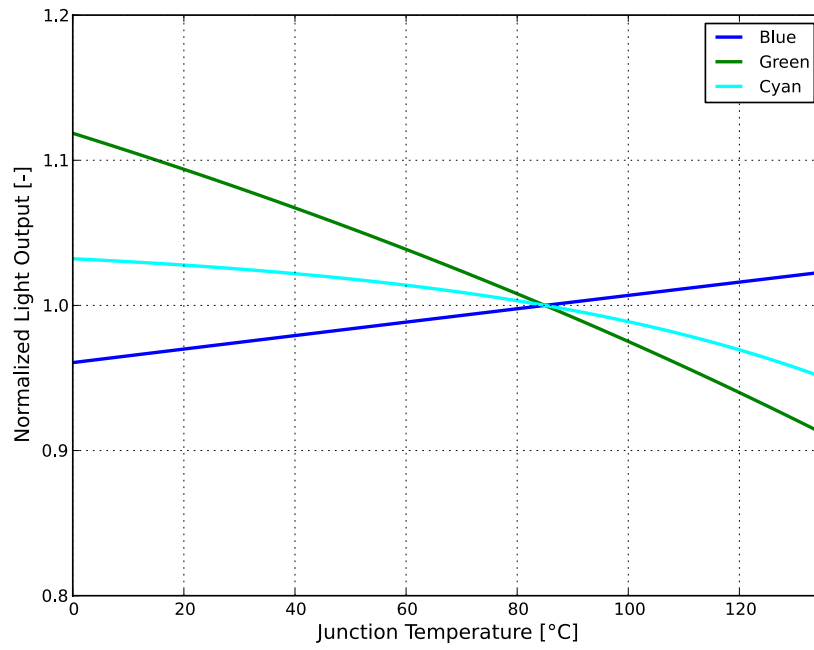


Figure 2e. Typical normalized light output vs. junction temperature for LUXEON C Green, Cyan and Blue at 350mA.

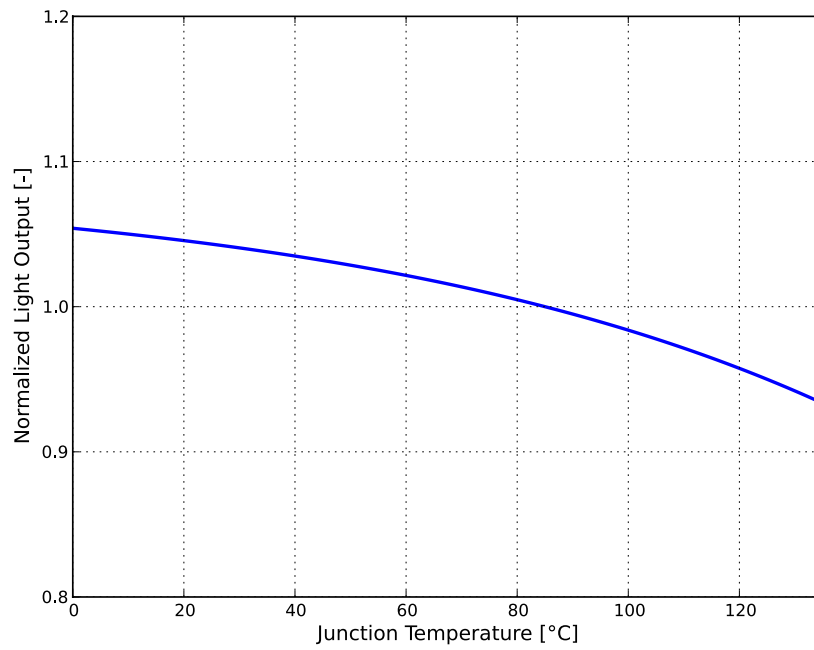


Figure 2f. Typical normalized light output vs. junction temperature for LUXEON C Royal Blue at 350mA.

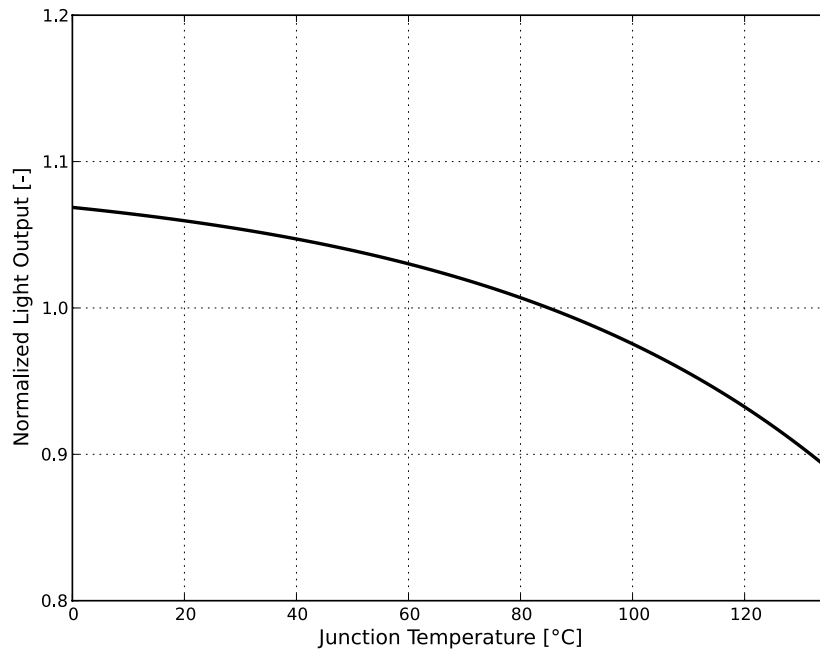


Figure 2g. Typical normalized light output vs. junction temperature for LUXEON C White at 350mA.

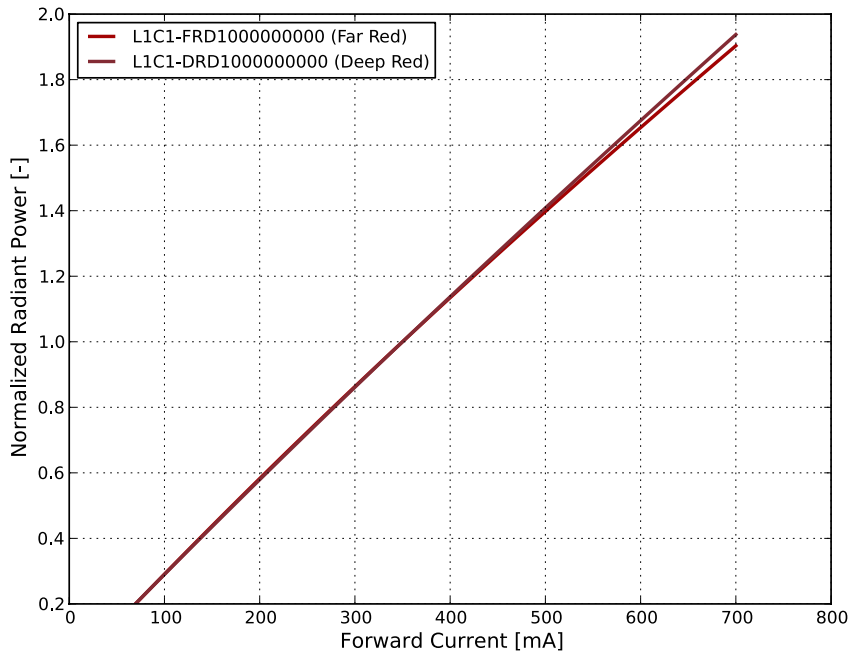


Figure 3a. Typical normalized radiant power vs. forward current for LUXEON C Far Red and Deep Red at  $T_j=85^{\circ}\text{C}$ .

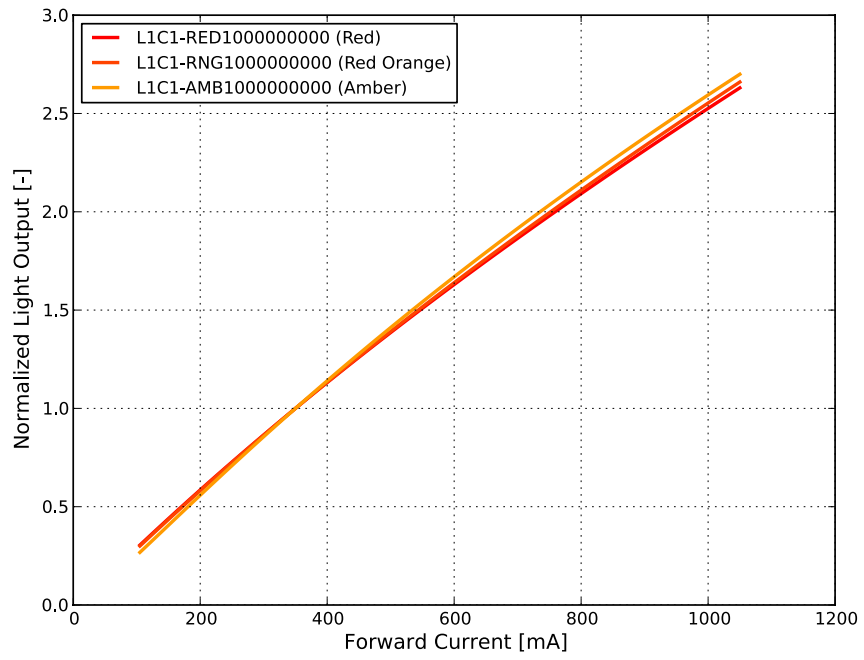


Figure 3b. Typical normalized light output vs. forward current for LUXEON C Red, Red-Orange and Amber at  $T_j=85^\circ\text{C}$ .

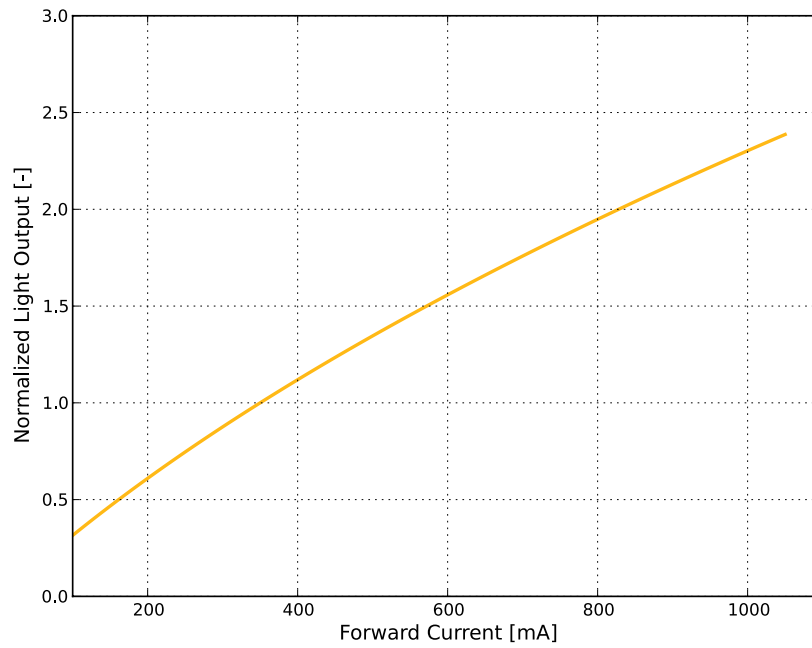


Figure 3c. Typical normalized light output vs. forward current for LUXEON C PC Amber at  $T_j=85^\circ\text{C}$ .

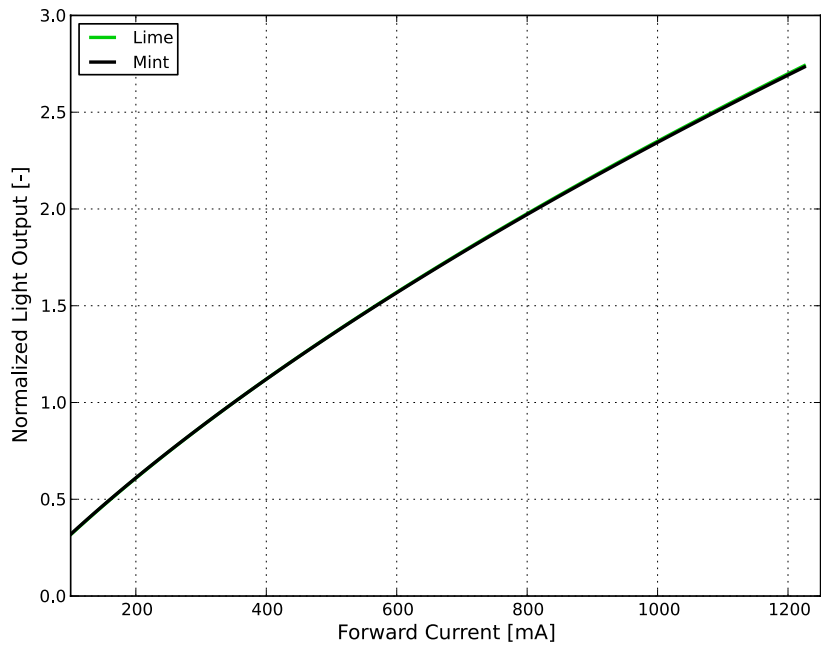


Figure 3d. Typical normalized light output vs. forward current for LUXEON C Mint and Lime at  $T_j=85^\circ\text{C}$ .

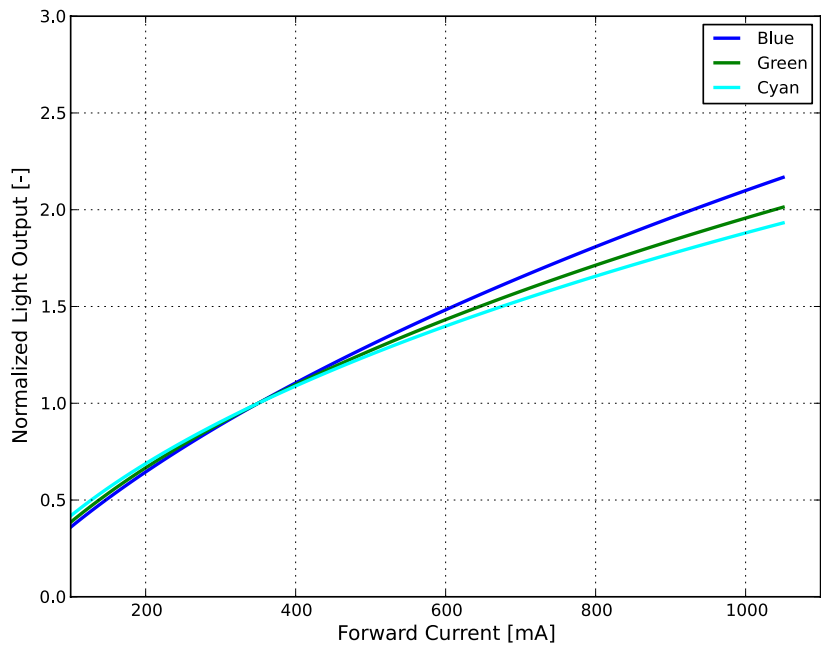


Figure 3e. Typical normalized light output vs. forward current for LUXEON C Green, Cyan and Blue at  $T_j=85^\circ\text{C}$ .

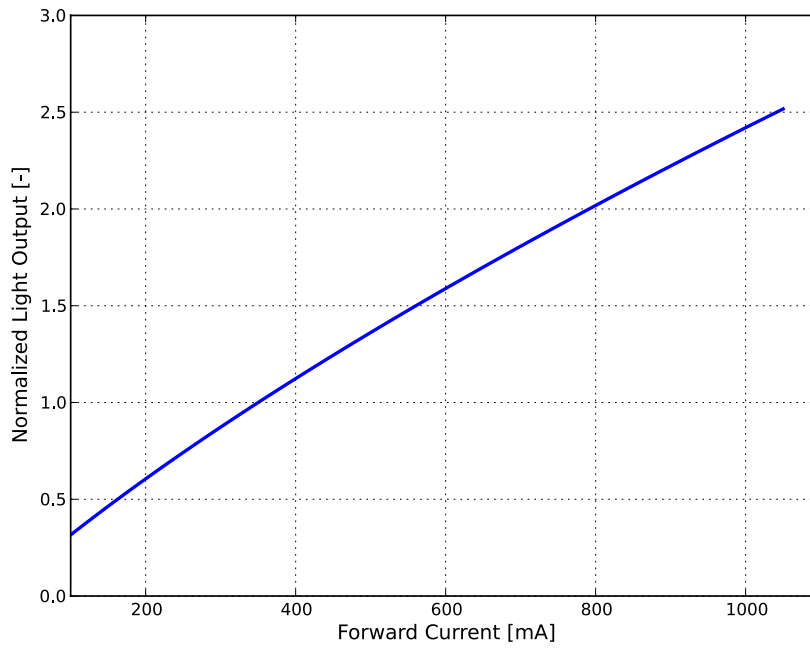


Figure 3f. Typical normalized light output vs. forward current for LUXEON C Royal Blue at  $T_j=85^\circ\text{C}$ .

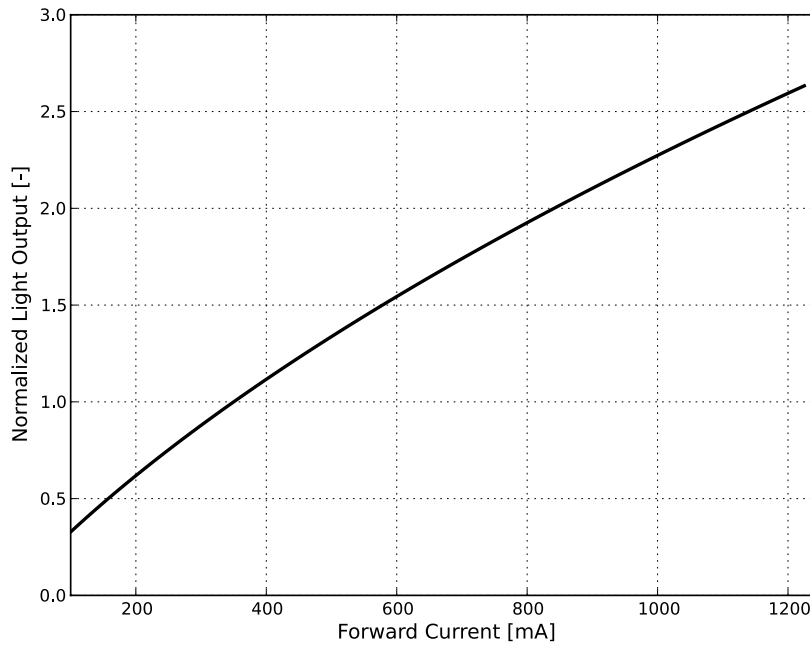


Figure 3g. Typical normalized light output vs. forward current for LUXEON C White at  $T_j=85^\circ\text{C}$ .

# Forward Current Characteristics

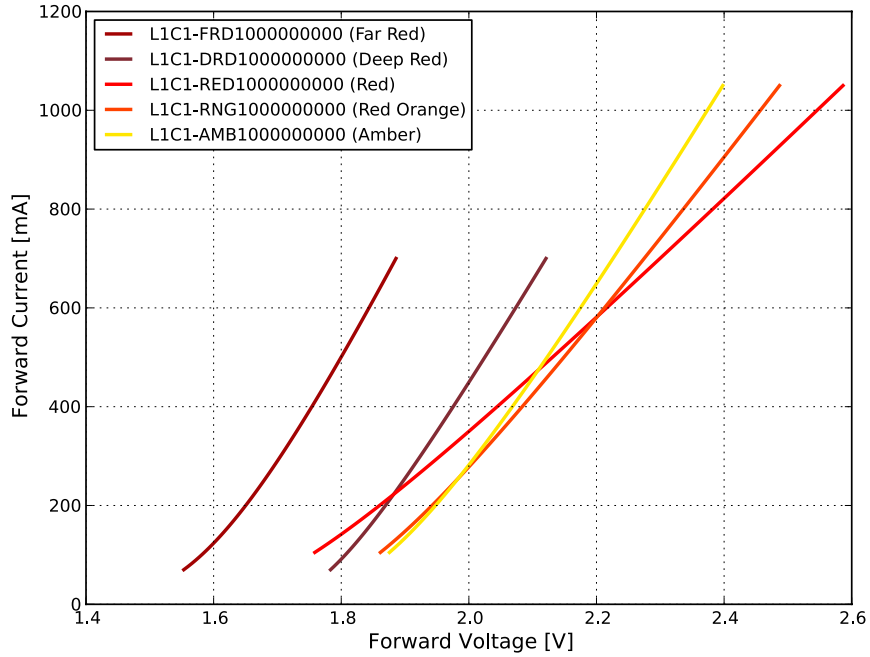


Figure 4a. Typical forward current vs. forward voltage for LUXEON C Far Red, Deep Red, Red, Red-Orange and Amber at  $T_j=85^\circ\text{C}$ .

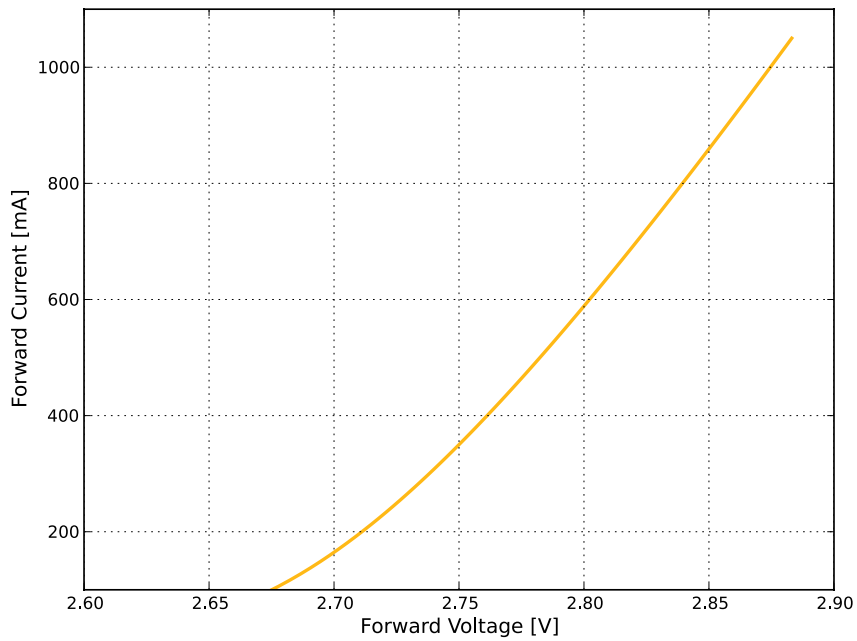


Figure 4b. Typical forward current vs. forward voltage for LUXEON C PC Amber at  $T_j=85^\circ\text{C}$ .

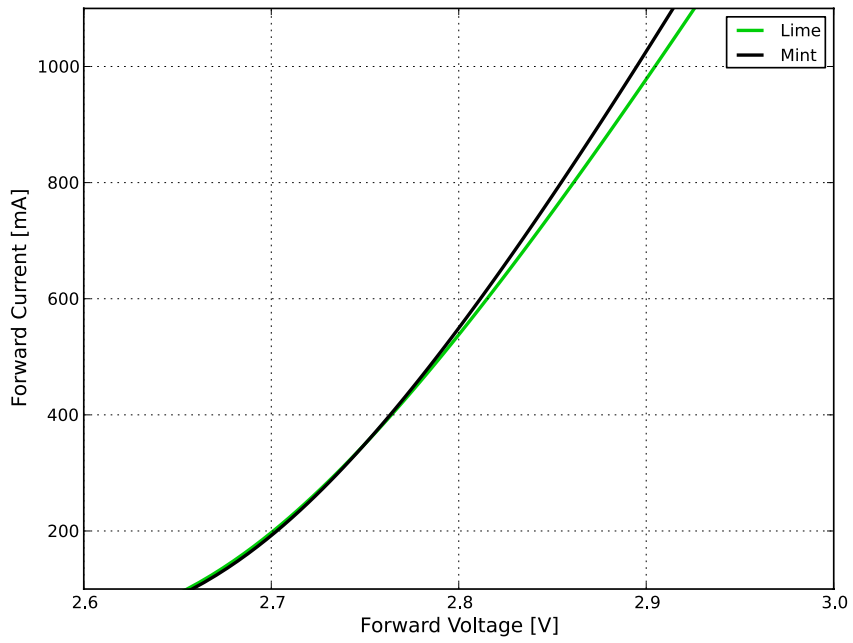


Figure 4c. Typical forward current vs. forward voltage for LUXEON C Mint and Lime at  $T_j=85^\circ\text{C}$ .

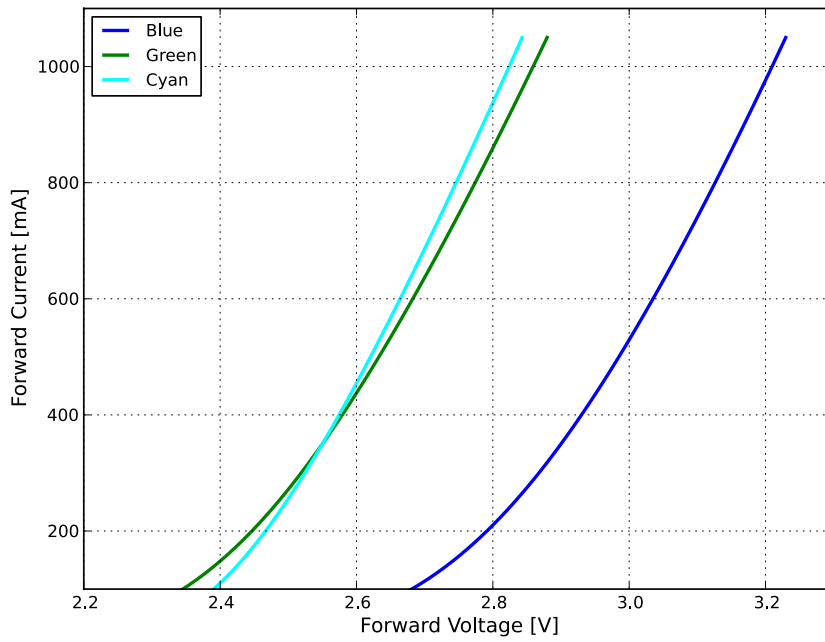


Figure 4d. Typical forward current vs. forward voltage for LUXEON C Green, Cyan and Blue at  $T_j=85^\circ\text{C}$ .



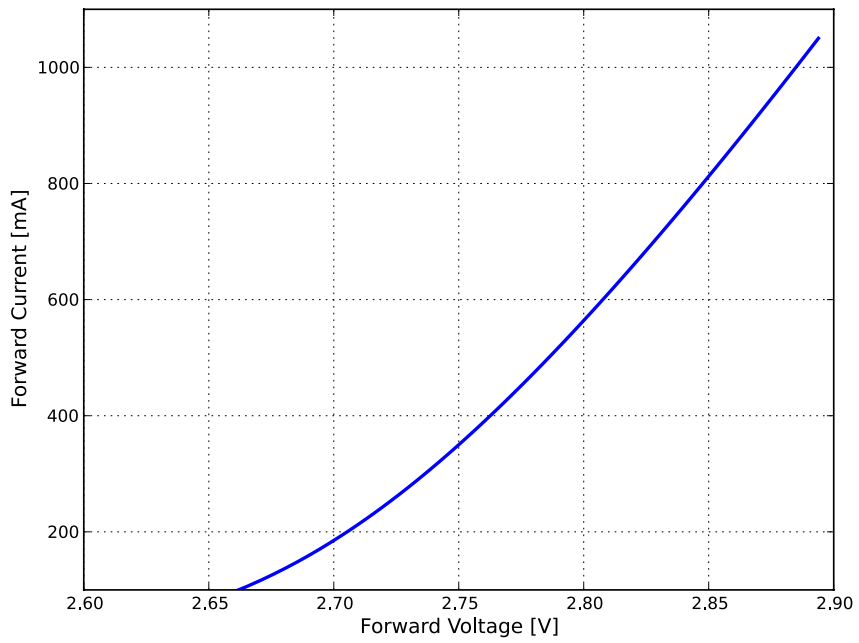


Figure 4e. Typical forward current vs. forward voltage for LUXEON C Royal Blue at  $T_j=85^\circ\text{C}$ .

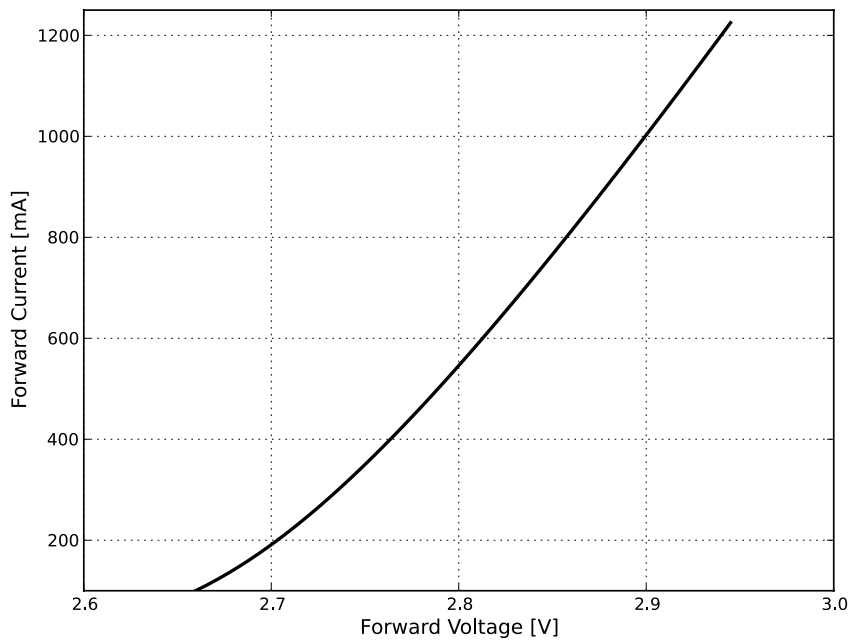


Figure 4f. Typical forward current vs. forward voltage for LUXEON C White at  $T_j=85^\circ\text{C}$ .

# Radiation Pattern Characteristics

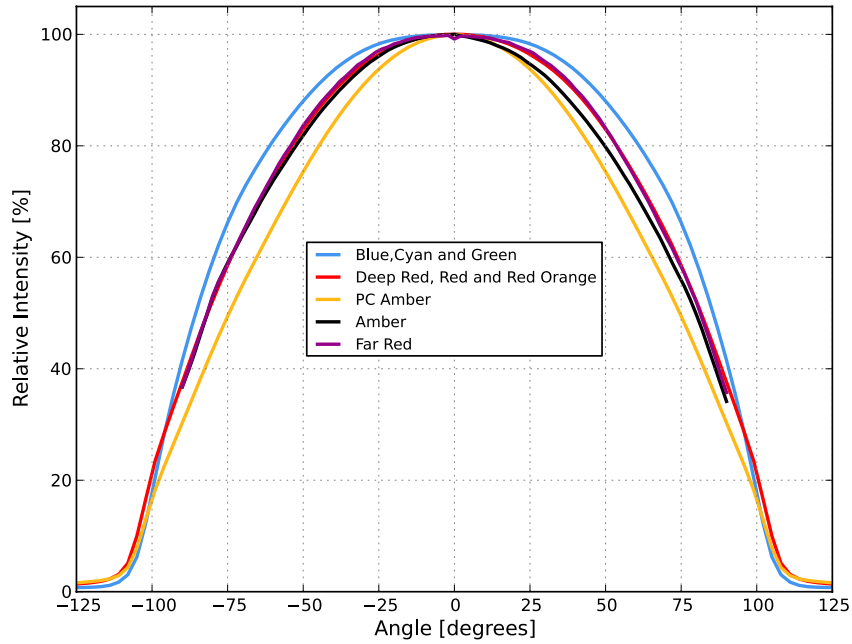


Figure 5a. Typical radiation pattern for LUXEON C Far Red, Deep Red, Red, Red-Orange, Amber, PC Amber, Green, Cyan and Blue at 350mA,  $T_j=85^{\circ}\text{C}$ .

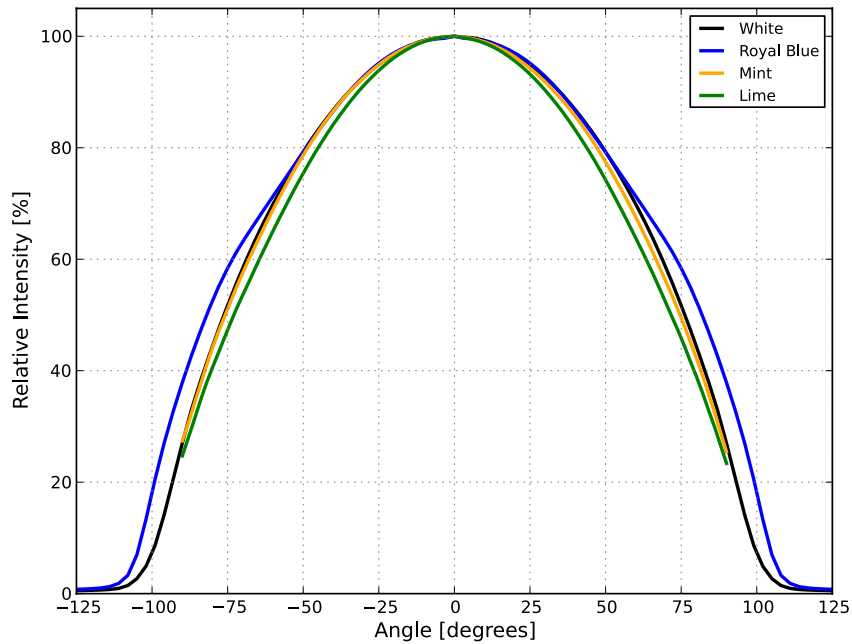


Figure 5b. Typical radiation pattern for LUXEON C Mint, Lime, Royal Blue and White at 350mA,  $T_j=85^{\circ}\text{C}$ .

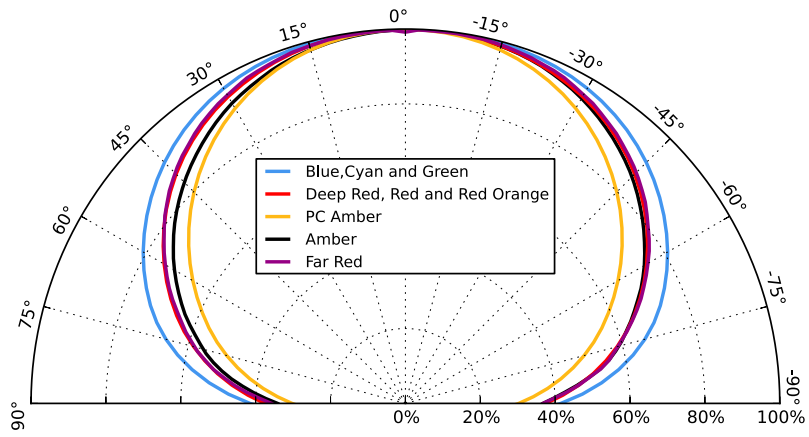


Figure 6a. Typical polar radiation pattern for LUXEON C Far Red, Deep Red, Red, Red-Orange, Amber, PC Amber, Green, Cyan and Blue at 350mA,  $T_j=85^\circ\text{C}$ .

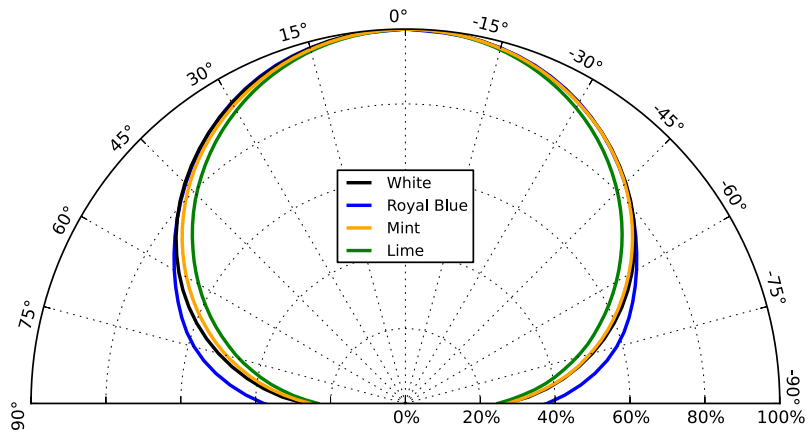


Figure 6b. Typical polar radiation pattern for LUXEON C Mint, Lime, Royal Blue and White at 350mA,  $T_j=85^\circ\text{C}$ .

# Product Bin and Labeling Definitions

## Decoding Product Bin Labeling

In the manufacturing of semiconductor products, there are variations in performance around the average values given in the technical datasheet. For this reason, Lumileds bins LED components for luminous flux, radiometric power, color point, peak wavelength, dominant wavelength and forward voltage.

LUXEON C Color Line LEDs are labeled using a 4-digit alphanumeric CAT code following the format below:

### **A B C D**

Where:

- A** – designates luminous flux or radiometric power bin (example: A=20 to 25 lumens, B= 25 to 30 lumens, H=480 to 520mW, J=520 to 560mW)
- B C** – designates color, peak or dominant wavelength bin (example: Red 40=624 to 634nm, Cyan 20=496 to 500nm, Royal Blue 50=450 to 455nm)
- D** – designates forward voltage bin (example: A=1.7 to 1.9V, B=1.9 to 2.1V)

Therefore, a LUXEON C Red LED with a lumen range of 20 to 25, a dominant wavelength of 624 to 634nm and a forward voltage range of 1.7 to 1.9V has the following CAT code:

**A 4 0 A**

## Luminous Flux Bins

Table 5 lists the standard photometric luminous flux bins for LUXEON C Color Line emitters. Although several bins are outlined, product availability in a particular bin varies by production run and by product performance. Not all bins are available in all CCTs.

Table 5. Luminous flux bin definitions for LUXEON C Color Line.

| BIN | LUMINOUS FLUX <sup>[1]</sup> (lm) |         |
|-----|-----------------------------------|---------|
|     | MINIMUM                           | MAXIMUM |
| A   | 20                                | 25      |
| B   | 25                                | 30      |
| C   | 30                                | 35      |
| D   | 35                                | 40      |
| E   | 40                                | 45      |
| F   | 45                                | 50      |
| G   | 50                                | 55      |
| H   | 55                                | 60      |
| J   | 60                                | 65      |
| K   | 65                                | 70      |
| L   | 70                                | 75      |
| M   | 75                                | 80      |
| N   | 80                                | 90      |
| P   | 90                                | 100     |
| Q   | 100                               | 110     |
| R   | 110                               | 120     |
| S   | 120                               | 130     |
| T   | 130                               | 140     |
| U   | 140                               | 150     |
| V   | 150                               | 170     |
| W   | 170                               | 190     |

Notes for Table 5:

1. Lumileds maintains a tolerance of  $\pm 6.5\%$  on luminous flux measurements.

## Radiometric Power Bins

Table 6. Radiometric power bin definitions for LUXEON C Far Red, Deep Red and Royal Blue.

| COLOR      | PART NUMBER        | BIN | RADIOMETRIC POWER <sup>[1]</sup> (mW) |         |
|------------|--------------------|-----|---------------------------------------|---------|
|            |                    |     | MINIMUM                               | MAXIMUM |
| Far Red    | L1C1-FRD1000000000 | A   | 190                                   | 240     |
|            |                    | B   | 240                                   | 280     |
|            |                    | C   | 280                                   | 320     |
|            |                    | D   | 320                                   | 360     |
|            |                    | E   | 360                                   | 400     |
| Deep Red   | L1C1-DRD1000000000 | C   | 280                                   | 320     |
|            |                    | D   | 320                                   | 360     |
|            |                    | E   | 360                                   | 400     |
|            |                    | F   | 400                                   | 440     |
| Royal Blue | L1C1-RYL1000000000 | G   | 440                                   | 480     |
|            |                    | H   | 480                                   | 520     |
|            |                    | J   | 520                                   | 560     |
|            |                    | K   | 560                                   | 600     |
|            |                    | L   | 600                                   | 640     |

Notes for Table 6:

1. Lumileds maintains a tolerance of  $\pm 6.5\%$  on radiometric power measurements.

# Color Bin Definitions

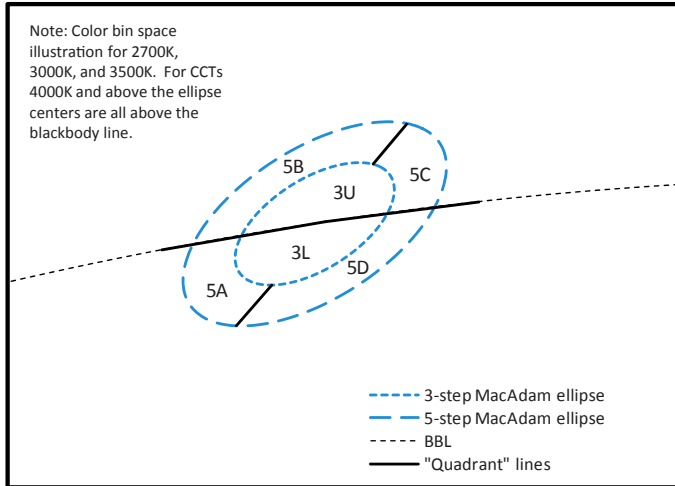


Figure 7. Color bin structure for LUXEON C Color Line.

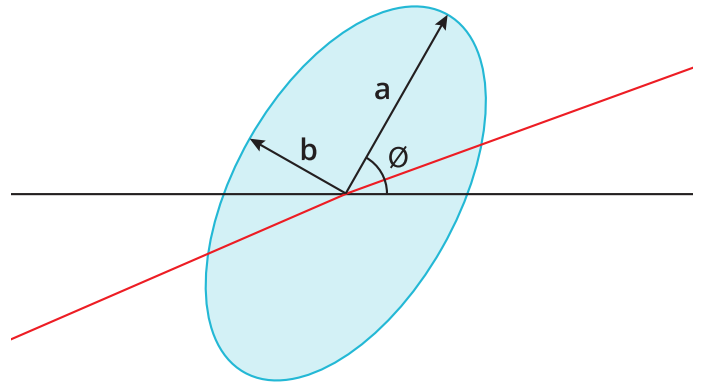


Figure 8. 3- and 5-step MacAdam ellipse illustration for Table 7.

Table 7a. 3- and 5-step MacAdam ellipse color bin definitions for LUXEON C White at 350mA,  $T_j = 85^\circ\text{C}$ .

| NOMINAL CCT | COLOR SPACE                   | CENTER POINT <sup>[1]</sup><br>(cx, cy) | MAJOR AXIS,<br>a | MINOR AXIS,<br>b | ELLIPSE ROTATION<br>ANGLE, $\theta$ |
|-------------|-------------------------------|---|------------------|------------------|-------------------------------------|
| 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°                               |
| 4000K       | Single 3-step MacAdam ellipse | (0.3818, 0.3797)                        | 0.00939          | 0.00402          | 53.7°                               |
| 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°                               |
| 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          | 59.1°                               |
| 6500K       | Single 5-step MacAdam ellipse | (0.3123, 0.3282)                        | 0.01115          | 0.00475          | 58.6°                               |

Notes for Table 7a:

1. Lumileds maintains a tolerance of  $\pm 0.005$  on x and y coordinates in the CIE 1931 color space.

Table 7b. MacAdam ellipse color bin definitions for LUXEON C Color Line.

| BIN | SDCM                                  |
|-----|---------------------------------------|
| 30  | 3-step MacAdam ellipse (90CRI)        |
| 3U  | 3-step MacAdam ellipse (80CRI)        |
| 3L  | 3-step MacAdam ellipse (80CRI)        |
| 50  | 5-step MacAdam ellipse (70 and 90CRI) |
| 5A  | 5-step MacAdam ellipse (80, 90CRI)    |
| 5B  | 5-step MacAdam ellipse (80, 90CRI)    |
| 5C  | 5-step MacAdam ellipse (80, 90CRI)    |
| 5D  | 5-step MacAdam ellipse (80, 90CRI)    |

## Dominant Wavelength Bins

Table 8. Dominant wavelength bins for LUXEON C Red, Red-Orange, Amber, Green, Cyan and Blue at 350mA, T<sub>j</sub>=85°C.

| COLOR      | PART NUMBER        | BIN | DOMINANT WAVELENGTH <sup>(1)</sup> (nm) |         |
|------------|--------------------|-----|---|---------|
|            |                    |     | MINIMUM                                 | MAXIMUM |
| Red        | L1C1-RED1000000000 | 40  | 624.0                                   | 634.0   |
| Red-Orange | L1C1-RNG1000000000 | 20  | 614.0                                   | 624.0   |
| Amber      | L1C1-AMB1000000000 | 10  | 585.0                                   | 590.0   |
|            |                    | 20  | 590.0                                   | 594.5   |
|            |                    | 30  | 594.5                                   | 600.0   |
| Green      | L1C1-GRN1000000000 | 10  | 520.0                                   | 525.0   |
|            |                    | 20  | 525.0                                   | 530.0   |
|            |                    | 30  | 530.0                                   | 535.0   |
|            |                    | 40  | 535.0                                   | 540.0   |
| Cyan       | L1C1-CYN1000000000 | 10  | 490.0                                   | 496.0   |
|            |                    | 20  | 496.0                                   | 500.0   |
|            |                    | 30  | 500.0                                   | 505.0   |
|            |                    | 40  | 505.0                                   | 510.0   |
| Blue       | L1C1-BLU1000000000 | 10  | 460.0                                   | 465.0   |
|            |                    | 20  | 465.0                                   | 470.0   |
|            |                    | 30  | 470.0                                   | 475.0   |
|            |                    | 40  | 475.0                                   | 480.0   |
|            |                    | 50  | 480.0                                   | 485.0   |

**Notes for Table 8:**

1. Lumileds maintains a tolerance of ±0.5nm on dominant wavelength measurements.

## Peak Wavelength Bins

Table 9. Peak wavelength bins for LUXEON C Far Red, Deep Red and Royal Blue.

| COLOR      | PART NUMBER        | BIN | PEAK WAVELENGTH <sup>(1)</sup> (nm) |         |
|------------|--------------------|-----|-------------------------------------|---------|
|            |                    |     | MINIMUM                             | MAXIMUM |
| Far Red    | L1C1-FRD1000000000 | 10  | 720                                 | 730     |
|            |                    | 20  | 730                                 | 740     |
|            |                    | 30  | 740                                 | 750     |
| Deep Red   | L1C1-DRD1000000000 | 10  | 655                                 | 665     |
|            |                    | 20  | 665                                 | 675     |
| Royal Blue | L1C1-RYL1000000000 | 30  | 440                                 | 445     |
|            |                    | 40  | 445                                 | 450     |
|            |                    | 50  | 450                                 | 455     |
|            |                    | 60  | 455                                 | 460     |

**Notes for Table 9:**

1. Lumileds maintains a tolerance of ±2.0nm on peak wavelength measurements.

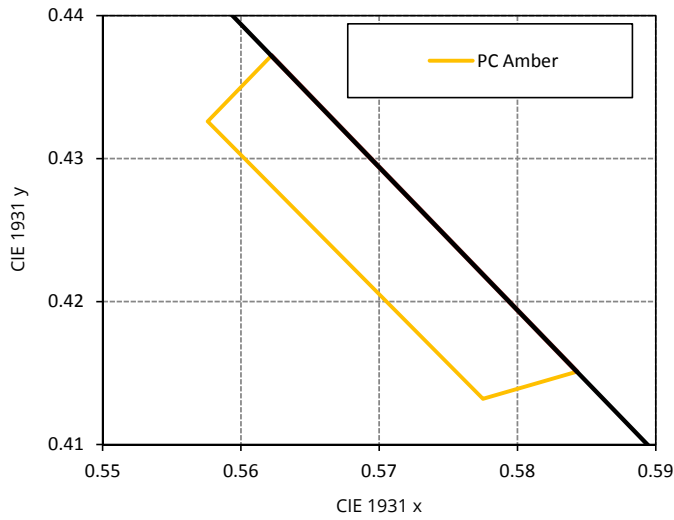


Figure 9. Color bin structure for LUXEON C PC Amber for Table 10.

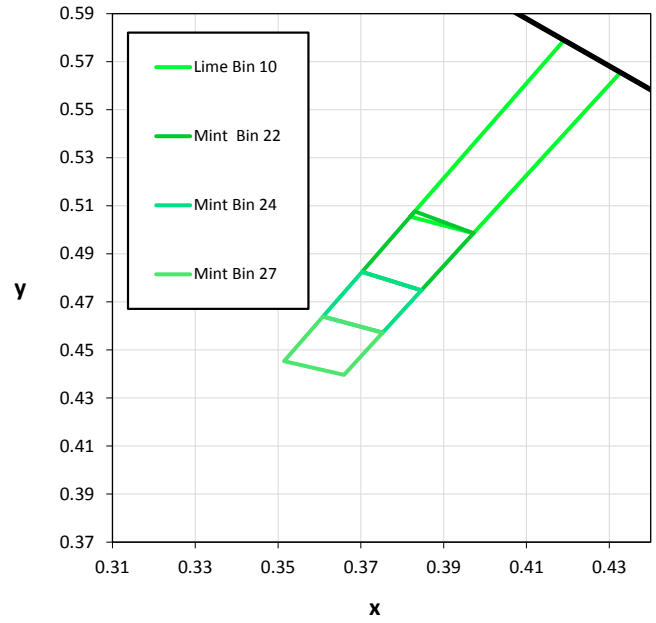


Figure 10. Color bin structure for Mint and Lime for Table 10.

Table 10. Color bin definitions for LUXEON C PC Amber, Mint and Lime.

| COLOR    | PART NUMBER        | BIN    | x      | y      |
|----------|--------------------|--------|--------|--------|
| PC Amber | L1C1-PCA1000000000 | 20     | 0.5622 | 0.4372 |
|          |                    |        | 0.5576 | 0.4326 |
|          |                    |        | 0.5775 | 0.4132 |
|          |                    |        | 0.5843 | 0.4151 |
| Mint     | L1C1-MNT1000000000 | 22     | 0.3972 | 0.4986 |
|          |                    |        | 0.3830 | 0.5077 |
|          |                    |        | 0.3703 | 0.4825 |
|          |                    |        | 0.3846 | 0.4749 |
|          |                    |        | 0.3846 | 0.4749 |
|          |                    | 24     | 0.3703 | 0.4825 |
|          |                    |        | 0.3608 | 0.4639 |
|          |                    |        | 0.3752 | 0.4572 |
|          |                    |        | 0.3752 | 0.4572 |
|          |                    |        | 0.3608 | 0.4639 |
| 27       | 0.3515             | 0.4453 |        |        |
|          | 0.3659             | 0.4396 |        |        |
|          | 0.3819             | 0.5055 |        |        |
|          | 0.4191             | 0.5790 |        |        |
| Lime     | L1C1-LME1000000000 | 10     | 0.4327 | 0.5655 |
|          |                    |        | 0.3972 | 0.4986 |

Notes for Table 10:

1. Lumileds maintains a tolerance of  $\pm 0.005$  on x and y color coordinates measurements.



## Forward Voltage Bins

Table 11. Forward voltage bin definitions for LUXEON C Color Line.

| BIN | FORWARD VOLTAGE <sup>(1)</sup> (V <sub>f</sub> ) |         |
|-----|--|---------|
|     | MINIMUM  | MAXIMUM |
| Z   | 1.50   | 1.70    |
| A   | 1.70   | 1.90    |
| B   | 1.90   | 2.10    |
| C   | 2.10   | 2.30    |
| D   | 2.30   | 2.50    |
| E   | 2.50   | 2.70    |
| F   | 2.70   | 2.90    |
| G   | 2.90   | 3.10    |
| H   | 3.10   | 3.30    |
| J   | 3.30   | 3.50    |

**Notes for Table 11:**

1. Lumileds maintains a tolerance of  $\pm 0.06V$  on forward voltage measurements.

# Mechanical Dimensions

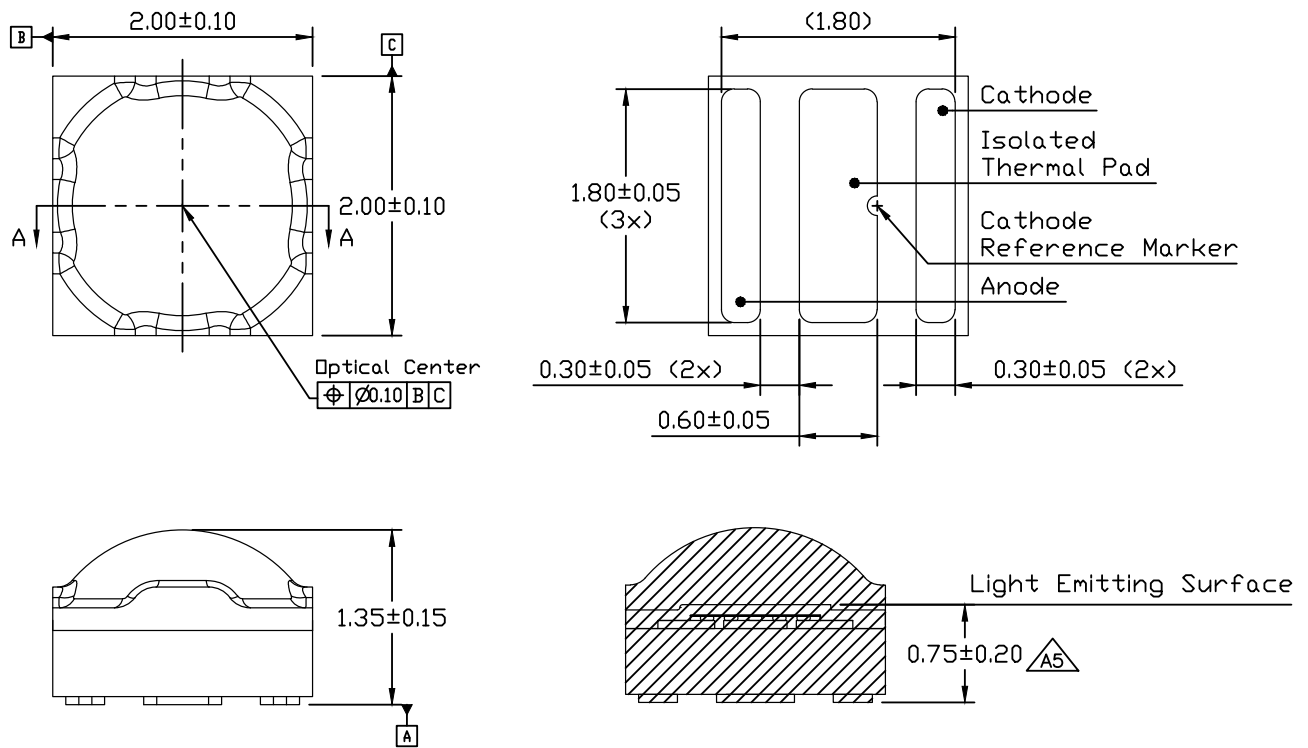


Figure 11. Mechanical dimensions for LUXEON C Color Line.

Notes for Figure 11:

1. Drawings are not to scale.
2. All dimensions are in millimeters.

# Reflow Soldering Guidelines

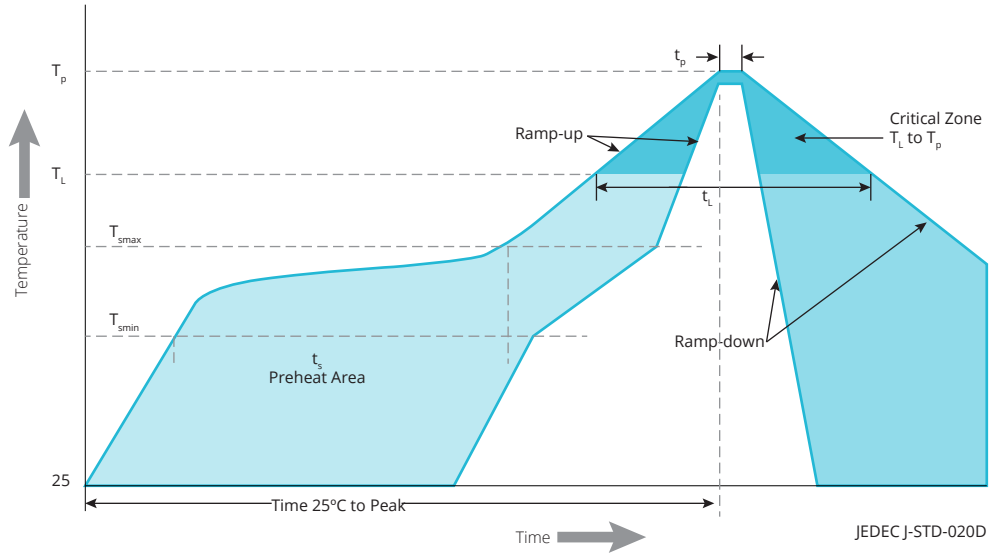


Figure 12. Visualization of the acceptable reflow temperature profile as specified in Table 12.

Table 12. Reflow profile characteristics for LUXEON C Color Line.

| PROFILE FEATURE                                   | LEAD-FREE ASSEMBLY   |
|---|----------------------|
| Preheat Minimum Temperature ( $T_{smin}$ )        | 150°C                |
| Preheat Maximum Temperature ( $T_{smax}$ )        | 200°C                |
| Preheat Time ( $t_{smin}$ to $t_{smax}$ )         | 60 to 120 seconds    |
| Ramp-Up Rate ( $T_L$ to $T_p$ )                   | 3°C / second maximum |
| Liquidus Temperature ( $T_L$ )                    | 217°C                |
| Time Maintained Above Temperature $T_L$ ( $t_L$ ) | 60 to 150 seconds    |
| Peak / Classification Temperature ( $T_p$ )       | 260°C                |
| Time Within 5°C of Actual Temperature ( $t_p$ )   | 20 to 40 seconds     |
| Ramp-Down Rate ( $T_p$ to $T_L$ )                 | 6°C / second maximum |
| Time 25°C to Peak Temperature                     | 8 minutes maximum    |

## JEDEC Moisture Sensitivity

Table 13. Moisture sensitivity levels for LUXEON C Color Line.

| LEVEL | FLOOR LIFE |                | SOAK REQUIREMENTS STANDARD |               |
|-------|------------|----------------|----------------------------|---------------|
|       | TIME       | CONDITIONS     | TIME                       | CONDITIONS    |
| 1     | Unlimited  | ≤30°C / 85% RH | 168 Hours +5 / -0          | 85°C / 85% RH |

# Solder Pad Design

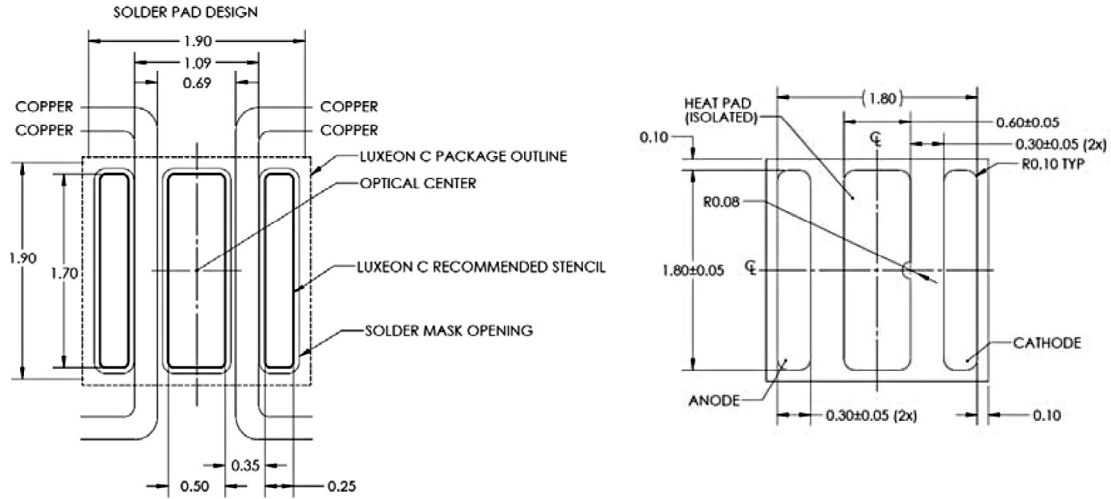


Figure 13. Recommended PCB solder pad layout for LUXEON C Color Line.

Notes for Figure 13:

1. Drawings are not to scale.
2. All dimensions are in millimeters.
3. The drawing above shows the recommended solder pad layout on Printed Circuit Board (PCB).

# Packaging Information

## Pocket Tape Dimensions

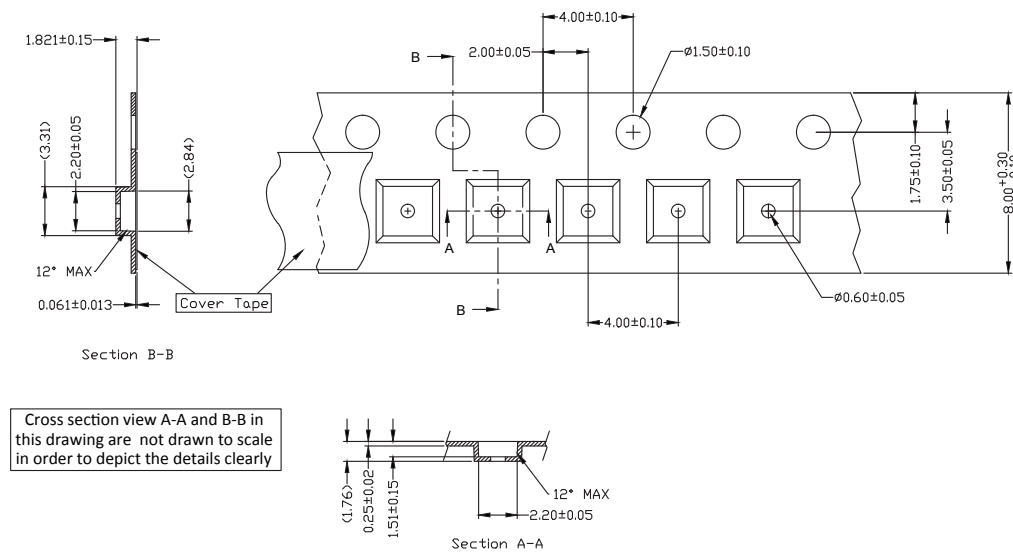


Figure 14. Pocket Tape dimensions for LUXEON C Color Line.

Notes for Figure 14:

1. Drawings are not to scale.
2. All dimensions are in millimeters.

# Reel Dimensions

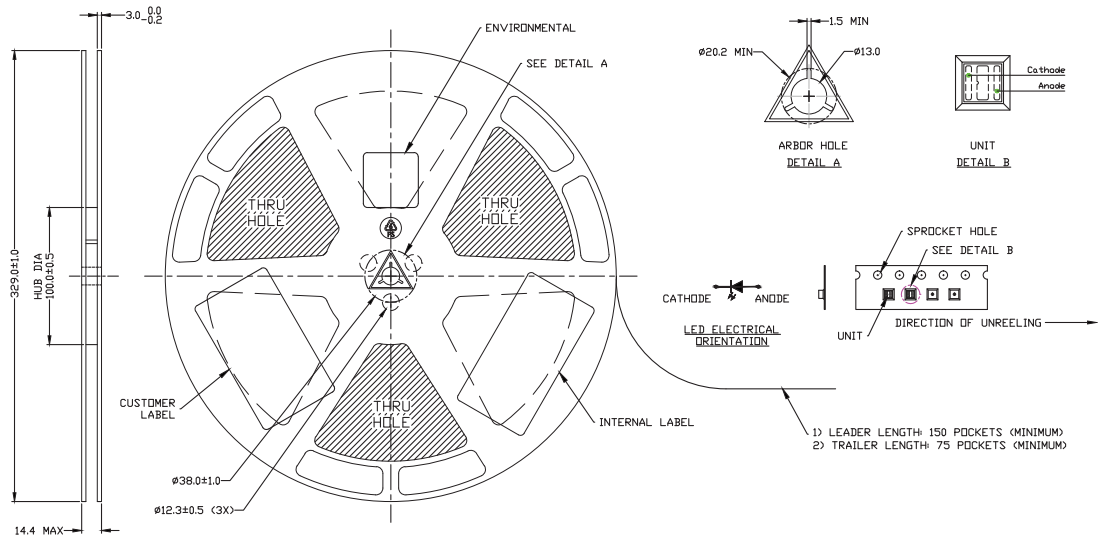


Figure 15. Reel dimensions for LUXEON C Color Line.

**Notes for Figure 15:**

1. Drawings are not to scale.
2. All dimensions are in millimeters.
3. Maximum 1000 pieces per reel.

## 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](http://lumileds.com).



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