

# LUXEON 2835 Color Line

The best performance, the most colors.

The LUXEON 2835 Color Line enables a new era of color lighting. This robust color line provides high performance and is targeted at cost effective designs. Complemented by a broad range of white offerings, the LUXEON 2835 Color Line enables RGBW applications. This product line extends the comprehensive LUXEON Color Family.



## FEATURES AND BENEFITS

Single die and single source architecture for optical control

Full color palette for a wider spectrum range

## PRIMARY APPLICATIONS

Panel / Soft Lights

Wall Grazer

Linear

Wall Wash

Decorative

Retrofit Lamps

Landscape Lighting

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# General Product Information

## Product Test Conditions

LUXEON 2835 Color Line LEDs are tested and binned with a 20ms monopulse of DC drive current and junction temperature specified below:

LUXEON 2835 Color at 2V to 3V forward voltage – drive current 120mA,  $T_j=25^{\circ}\text{C}$

LUXEON 2835 Color at 36V forward voltage – drive current 20mA,  $T_j=25^{\circ}\text{C}$

## Part Number Nomenclature

Part numbers for LUXEON 2835 Color Line follow the convention below:

L 1 2 8 – **A A A B 0 C** 3 5 0 0 0 0 0

Where:

- A A A** – designates color (FRD=Far Red, DRD=Deep Red, RED=Red, RNG=Red-Orange, PCO=PC Red-Orange, PCA=PC Amber, MNT=Mint, LME=Lime, GRN=Green, PCG=PC Green, CYN=Cyan, BLU=Blue, PCB=PC Blue, RYL=Royal Blue)
- B** – designates product option (example 1, 2...etc)
- C** – designates forward voltage category (example: 0=regular 2V to 3V, L=high voltage at 36V)

Therefore, the following part number is used for a LUXEON 2835 Red LED at 2V to 3V forward voltage category:

L 1 2 8 – **R E D** 1 0 0 3 5 0 0 0 0 0

Part numbers for LUXEON 2835 White follow the convention below:

L 1 2 8 – **A A B B** 0 0 3 5 0 0 0 0 0

Where:

- A A** – designates nominal CCT (30=3000K, 40=4000K, 57=5700K)
- B B** – designates minimum CRI (70=70CRI, 80=80CRI)

Therefore, the following part number is used for a LUXEON 2835 White 3000K 80CRI LED:

L 1 2 8 – **3 0 8 0** 0 0 3 5 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 2835 Color Line 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 2835 Colors at 120mA and 200mA, T<sub>j</sub>=25°C.

| COLOR         | DOMINANT or PEAK WAVELENGTH <sup>[1]</sup> (nm) |         | LUMINOUS FLUX <sup>[2]</sup> (lm) or RADIOMETRIC POWER <sup>[3]</sup> (mW) |               |               | PART NUMBER        |
|---------------|-------------------------------------------------|---------|----------------------------------------------------------------------------|---------------|---------------|--------------------|
|               | MINIMUM                                         | MAXIMUM | MINIMUM                                                                    | 120mA TYPICAL | 200mA TYPICAL |                    |
| Far Red       | 720                                             | 740     | 85                                                                         | 98            | 160           | L128-FRD1003500000 |
| Deep Red      | 650                                             | 670     | 98                                                                         | 110           | 181           | L128-DRD1003500000 |
| Red           | 620                                             | 630     | 15                                                                         | 20            | 31            | L128-RED1003500000 |
| Red-Orange    | 610                                             | 620     | 19                                                                         | 27            | 43            | L128-RNG1003500000 |
| PC Red-Orange | -                                               | -       | 21                                                                         | 24            | 36            | L128-PCO1003500000 |
| PC Amber      | -                                               | -       | 44                                                                         | 52            | 83            | L128-PCA1003500000 |
| Mint          | -                                               | -       | 69                                                                         | 77            | 120           | L128-MNT1003500000 |
| Lime          | -                                               | -       | 70                                                                         | 82            | 129           | L128-LME1003500000 |
| Green         | 520                                             | 540     | 40                                                                         | 47            | 62            | L128-GRN1003500000 |
|               | 520                                             | 540     | 48                                                                         | 58            | 85            | L128-GRN2003500000 |
| Cyan          | 490                                             | 510     | 21                                                                         | 30            | 41            | L128-CYN1003500000 |
| Blue          | 469                                             | 480     | 13                                                                         | 18            | 27            | L128-BLU1003500000 |
| PC Blue       | -                                               | -       | 16                                                                         | 20            | 30            | L128-PCB1003500000 |
| Royal Blue    | 440                                             | 455     | 185                                                                        | 230           | 366           | L128-RYL1003500000 |

- Notes for Table 1a:
- Lumileds maintains a tolerance of ±1nm on dominant wavelength measurements. PC Amber, PC Red-Orange, Mint, Lime and PC Blue 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.
  - Lumileds maintains a tolerance of ±7.5% on luminous flux measurements.
  - 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 2835 White at 120mA,T<sub>j</sub>=25°C.

| COLOR | NOMINAL CCT | MINIMUM CRI <sup>[1]</sup> | LUMINOUS FLUX <sup>[1]</sup> (lm) |         | TYPICAL LUMINOUS EFFICACY (lm/W) | PART NUMBER        |
|-------|-------------|----------------------------|-----------------------------------|---------|----------------------------------|--------------------|
|       |             |                            | MINIMUM                           | TYPICAL |                                  |                    |
| White | 5700K       | 70                         | 58                                | 68      | 198                              | L128-5770003500000 |
|       | 3000K       | 80                         | 54                                | 62      | 182                              | L128-3080003500000 |
|       | 4000K       | 80                         | 56                                | 64      | 187                              | L128-4080003500000 |

- Notes for Table 1b:
- Lumileds maintains a tolerance of ±7.5% on luminous flux measurements.

Table 1c. Product performance of LUXEON 2835 Colors 36V at specified test current 20mA, T<sub>j</sub>=25°C.

| COLOR         | DOMINANT or PEAK WAVELENGTH <sup>[1]</sup> (nm) |         | LUMINOUS FLUX <sup>[2]</sup> (lm) or RADIOMETRIC POWER <sup>[3]</sup> (mW) |              | PART NUMBER        |
|---------------|-------------------------------------------------|---------|----------------------------------------------------------------------------|--------------|--------------------|
|               | MINIMUM                                         | MAXIMUM | MINIMUM                                                                    | 20mA TYPICAL |                    |
| PC Red-Orange | 615                                             | 620     | 21                                                                         | 27           | L128-PCO10L3500000 |
| Lime          | 563                                             | 568     | 127                                                                        | 139          | L128-LME10L3500000 |
| PC Green      | 530                                             | 536     | 126                                                                        | 134          | L128-PCG10L3500000 |
|               | 543                                             | 550     | 134                                                                        | 145          | L128-PCG20L3500000 |
| Royal Blue    | 440                                             | 455     | 357                                                                        | 386          | L128-RYL10L3500000 |

- Notes for Table 1c:
- Lumileds maintains a tolerance of ±1nm on dominant wavelength measurements. PC Red-Orange, Lime and PC Green are binned by chromaticity coordinates. Royal Blue is binned by peak wavelength.
  - Lumileds maintains a tolerance of ±7.5% on luminous flux measurements.
  - Royal Blue are binned by radiometric power. All other colors are binned by luminous flux.

# Optical Characteristics

Table 2a. Optical characteristics for LUXEON 2835 Colors at 120mA, T<sub>j</sub>=25°C.

| COLOR         | PART NUMBER        | TYPICAL SPECTRAL HALF-WIDTH <sup>[1]</sup><br>(nm) | TYPICAL TEMPERATURE COEFFICIENT OF WAVELENGTH (nm/°C) | TYPICAL TOTAL INCLUDED ANGLE <sup>[2]</sup> | TYPICAL VIEWING ANGLE <sup>[3]</sup> |
|---------------|--------------------|----------------------------------------------------|-------------------------------------------------------|---------------------------------------------|--------------------------------------|
| Far Red       | L128-FRD1003500000 | 30                                                 | 0.17                                                  | 140°                                        | 130°                                 |
| Deep Red      | L128-DRD1003500000 | 20                                                 | 0.16                                                  | 140°                                        | 130°                                 |
| Red           | L128-RED1003500000 | 15                                                 | 0.05                                                  | 140°                                        | 130°                                 |
| Red-Orange    | L128-RNG1003500000 | 15                                                 | 0.07                                                  | 140°                                        | 130°                                 |
| PC Red-Orange | L128-PCO1003500000 | 75                                                 | -0.01                                                 | 140°                                        | 120°                                 |
| PC Amber      | L128-PCA1003500000 | 95                                                 | 0.01                                                  | 140°                                        | 120°                                 |
| Mint          | L128-MNT1003500000 | 110                                                | 0.01                                                  | 140°                                        | 120°                                 |
| Lime          | L128-LME1003500000 | 110                                                | 0.01                                                  | 140°                                        | 120°                                 |
| Green         | L128-GRN1003500000 | 28                                                 | 0.05                                                  | 140°                                        | 130°                                 |
|               | L128-GRN2003500000 | 28                                                 | 0.05                                                  | 140°                                        | 130°                                 |
| Cyan          | L128-CYN1003500000 | 25                                                 | 0.03                                                  | 140°                                        | 130°                                 |
| Blue          | L128-BLU1003500000 | 20                                                 | 0.03                                                  | 140°                                        | 130°                                 |
| PC Blue       | L128-PCB1003500000 | 20                                                 | 0.03                                                  | 140°                                        | 130°                                 |
| Royal Blue    | L128-RYL1003500000 | 15                                                 | 0.04                                                  | 140°                                        | 130°                                 |

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 2835 White at 120mA, T<sub>j</sub>=25°C.

| COLOR | PART NUMBER        | TYPICAL TOTAL INCLUDED ANGLE <sup>[1]</sup> | TYPICAL VIEWING ANGLE <sup>[1]</sup> |
|-------|--------------------|---------------------------------------------|--------------------------------------|
| White | L128-xxxx003500000 | 160°                                        | 120°                                 |

Notes for Table 2b:  
1. Total angle at which 90% of total luminous flux is captured.  
2. Viewing angle is the off axis angle from the LED centerline where the luminous intensity is ½ of the peak value.

Table 2c. Optical characteristics for LUXEON 2835 Colors 36V at specified test current 20mA, T<sub>j</sub>=25°C.

| COLOR         | PART NUMBER        | TYPICAL SPECTRAL HALF-WIDTH <sup>[1]</sup><br>(nm) | TYPICAL TEMPERATURE COEFFICIENT OF WAVELENGTH (nm/°C) | TYPICAL TOTAL INCLUDED ANGLE <sup>[2]</sup> | TYPICAL VIEWING ANGLE <sup>[3]</sup> |
|---------------|--------------------|----------------------------------------------------|-------------------------------------------------------|---------------------------------------------|--------------------------------------|
| PC Red-Orange | L128-PCO10L3500000 | 83                                                 | -0.01                                                 | 120°                                        | 113°                                 |
| Lime          | L128-LME10L3500000 | 108                                                | 0.01                                                  | 120°                                        | 115°                                 |
| PC Green      | L128-PCG10L3500000 | 63                                                 | 0.02                                                  | 120°                                        | 115°                                 |
|               | L128-PCG20L3500000 | 67                                                 | 0.01                                                  | 120°                                        | 115°                                 |
| Royal Blue    | L128-RYL10L3500000 | 17                                                 | 0.04                                                  | 125°                                        | 129°                                 |

Notes for Table 2c:  
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 3a. Electrical and thermal characteristics for LUXEON 2835 Color Line at 120mA, T<sub>j</sub>=25°C.

| COLOR         | PART NUMBER        | FORWARD VOLTAGE <sup>[1]</sup> (V <sub>f</sub> ) |         |         | TYPICAL TEMPERATURE<br>COEFFICIENT OF FORWARD<br>VOLTAGE <sup>[2]</sup> (mV/°C) | TYPICAL THERMAL<br>RESISTANCE — JUNCTION<br>TO SOLDER PAD (°C/W) |
|---------------|--------------------|--------------------------------------------------|---------|---------|---------------------------------------------------------------------------------|------------------------------------------------------------------|
|               |                    | MINIMUM                                          | TYPICAL | MAXIMUM |                                                                                 |                                                                  |
| Far Red       | L128-FRD1003500000 | 1.80                                             | 2.15    | 2.50    | -2.0                                                                            | 15                                                               |
| Deep Red      | L128-DRD1003500000 | 1.80                                             | 2.15    | 2.50    | -2.0                                                                            | 15                                                               |
| Red           | L128-RED1003500000 | 1.80                                             | 2.10    | 2.50    | -2.0                                                                            | 15                                                               |
| Red-Orange    | L128-RNG1003500000 | 1.80                                             | 2.10    | 2.50    | -1.7                                                                            | 15                                                               |
| PC Red-Orange | L128-PCO1003500000 | 2.80                                             | 3.00    | 3.10    | -1.7                                                                            | 25                                                               |
| PC Amber      | L128-PCA1003500000 | 2.80                                             | 3.00    | 3.10    | -1.7                                                                            | 25                                                               |
| Mint          | L128-MNT1003500000 | 2.80                                             | 3.00    | 3.10    | -2.5                                                                            | 25                                                               |
| Lime          | L128-LME1003500000 | 2.80                                             | 3.00    | 3.10    | -1.7                                                                            | 25                                                               |
| Green         | L128-GRN1003500000 | 2.80                                             | 3.15    | 3.30    | -3.0                                                                            | 69                                                               |
|               | L128-GRN2003500000 | 2.50                                             | 2.65    | 3.10    | -3.0                                                                            | 20                                                               |
| Cyan          | L128-CYN1003500000 | 2.80                                             | 3.10    | 3.30    | -2.5                                                                            | 50                                                               |
| Blue          | L128-BLU1003500000 | 2.80                                             | 3.00    | 3.20    | -2.5                                                                            | 25                                                               |
| PC Blue       | L128-PCB1003500000 | 2.80                                             | 3.00    | 3.20    | -2.5                                                                            | 25                                                               |
| Royal Blue    | L128-RYL1003500000 | 2.80                                             | 3.00    | 3.20    | -2.5                                                                            | 25                                                               |
| White         | L128-xxx003500000  | 2.70                                             | 2.85    | 3.00    | -1.0 to -2.0                                                                    | 13                                                               |

Notes for Table 3a:  
1. Lumileds maintains a tolerance of ±0.1V on forward voltage measurements.  
2. Measured between 25°C and 85°C.

Table 3b. Electrical and thermal characteristics for LUXEON 2835 Color 36V at 20mA, T<sub>j</sub>=25°C.

| COLOR         | PART NUMBER        | FORWARD VOLTAGE <sup>[1]</sup> (V <sub>f</sub> ) |         |         | TYPICAL TEMPERATURE<br>COEFFICIENT OF FORWARD<br>VOLTAGE <sup>[2]</sup> (mV/°C) | TYPICAL THERMAL<br>RESISTANCE — JUNCTION<br>TO SOLDER PAD (°C/W) |
|---------------|--------------------|--------------------------------------------------|---------|---------|---------------------------------------------------------------------------------|------------------------------------------------------------------|
|               |                    | MINIMUM                                          | TYPICAL | MAXIMUM |                                                                                 |                                                                  |
| PC Red-Orange | L128-PCO10L3500000 | 35.0                                             | 36.3    | 37.5    | -19.8                                                                           | 15.4                                                             |
| Lime          | L128-LME10L3500000 | 35.0                                             | 36.3    | 37.5    | -21.3                                                                           | 13.2                                                             |
| PC Green      | L128-PCG10L3500000 | 35.0                                             | 36.3    | 37.5    | -22.9                                                                           | 13.5                                                             |
|               | L128-PCG20L3500000 | 35.0                                             | 36.3    | 37.5    | -20.2                                                                           | 13.5                                                             |
| Royal Blue    | L128-RYL10L3500000 | 35.0                                             | 36.3    | 37.5    | -20.1                                                                           | 10.5                                                             |

Notes for Table 3b:  
1. Lumileds maintains a tolerance of ±0.1V on forward voltage measurements.  
2. Measured between 25°C and 85°C.

# Absolute Maximum Ratings

Table 4a. Absolute maximum ratings for LUXEON 2835 Color Line.

| PARAMETER                                            | FAR RED                                                   | DEEP RED, RED and RED-ORANGE | PC RED-ORANGE, PC AMBER, MINT, LIME, GREEN, CYAN, BLUE, PC BLUE and ROYAL BLUE | WHITE          |
|------------------------------------------------------|-----------------------------------------------------------|------------------------------|--------------------------------------------------------------------------------|----------------|
| DC Forward Current <sup>[1, 2]</sup>                 | 300mA                                                     | 250mA                        | 240mA                                                                          | 480mA          |
| Peak Pulsed Forward Current <sup>[1, 3]</sup>        | 350mA                                                     | 300mA                        | 300mA                                                                          | 500mA          |
| LED Junction Temperature <sup>[1]</sup> (DC & Pulse) | 125°C                                                     | 125°C                        | 125°C                                                                          | 125°C          |
| ESD Sensitivity (ANSI/ESDA/JEDEC JS-001-2012)        | Class 2                                                   | Class 2                      | Class 2                                                                        | Class 2        |
| Operating Case Temperature <sup>[1]</sup>            | 105°C                                                     | 105°C                        | 105°C                                                                          | 105°C          |
| LED Storage Temperature                              | -40°C to 105°C                                            | -40°C to 105°C               | -40°C to 95°C                                                                  | -40°C to 105°C |
| Soldering Temperature                                | JEDEC 020c 260°C                                          |                              |                                                                                |                |
| Allowable Reflow Cycles                              | 3                                                         |                              |                                                                                |                |
| Reverse Voltage (V <sub>reverse</sub> )              | LUXEON LEDs are not designed to be driven in reverse bias |                              |                                                                                |                |

Notes for Table 4a:

- Proper current derating must be observed to maintain the junction temperature below the maximum allowable junction temperature.
- 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
- At 10% duty cycle with pulse width of 10ms.

Table 4b. Absolute maximum ratings for LUXEON 2835 Color 36V.

| PARAMETER                                            | PC RED-ORANGE, PC GREEN, LIME                             | ROYAL BLUE |
|------------------------------------------------------|-----------------------------------------------------------|------------|
| DC Forward Current <sup>[1, 2]</sup>                 | 25mA                                                      | 20mA       |
| Peak Pulsed Forward Current <sup>[1, 3]</sup>        | 30mA                                                      | 30mA       |
| LED Junction Temperature <sup>[1]</sup> (DC & Pulse) | 125°C                                                     |            |
| ESD Sensitivity (ANSI/ESDA/JEDEC JS-001-2012)        | Class 2                                                   |            |
| Operating Case Temperature <sup>[1]</sup>            | 105°C                                                     |            |
| LED Storage Temperature                              | -40°C to 85°C                                             |            |
| Soldering Temperature                                | JEDEC 020c 260°C                                          |            |
| Allowable Reflow Cycles                              | 3                                                         |            |
| Reverse Voltage (V <sub>reverse</sub> )              | LUXEON LEDs are not designed to be driven in reverse bias |            |

Notes for Table 4b:

- Proper current derating must be observed to maintain the junction temperature below the maximum allowable junction temperature.
- 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
- At 10% duty cycle with pulse width of 10ms.



# Characteristic Curves

## Spectral Power Distribution Characteristics

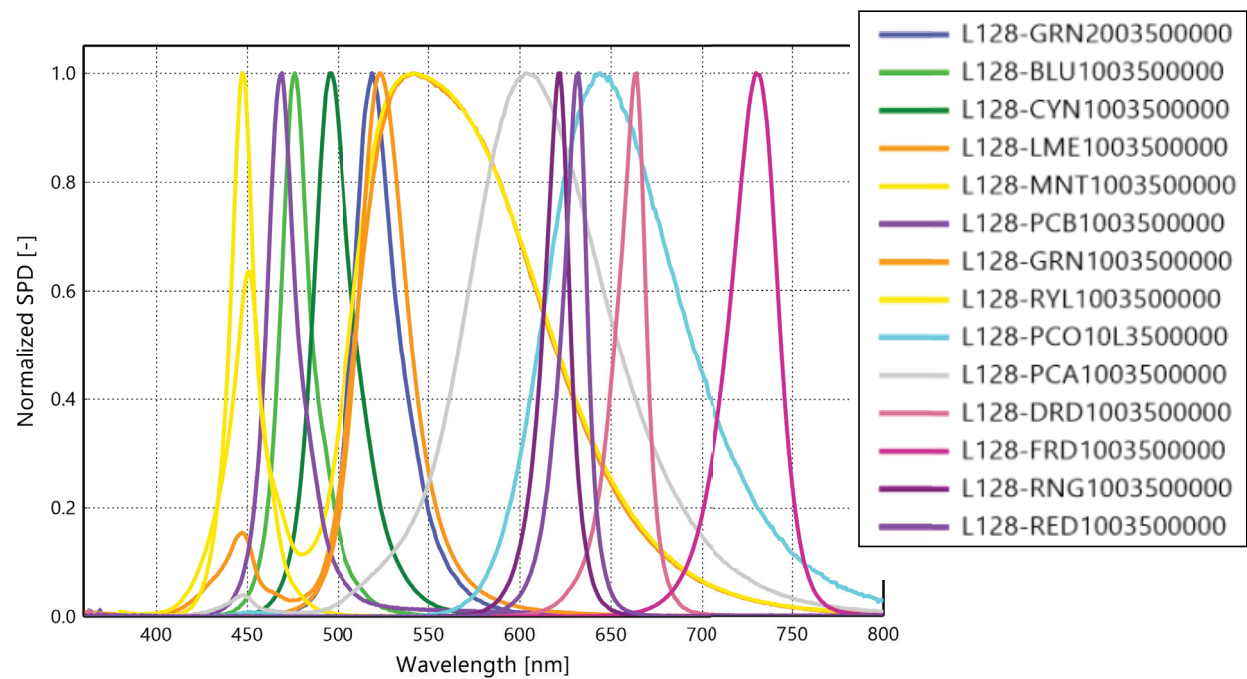


Figure 1a. Typical normalized power vs. wavelength for LUXEON 2835 Colors at 120mA,  $T_j=25^{\circ}\text{C}$ .

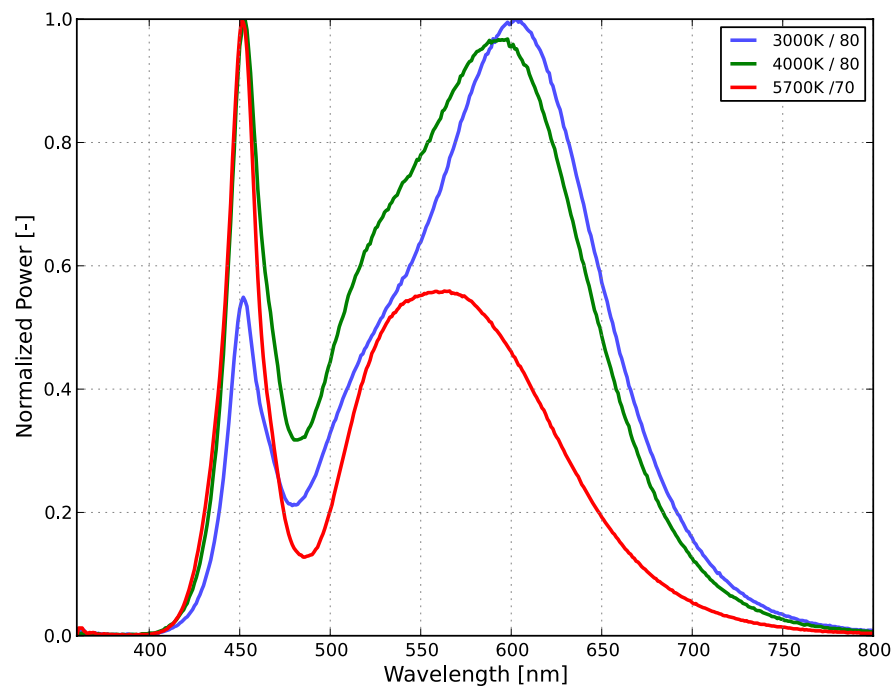


Figure 1b. Typical normalized power vs. wavelength for LUXEON 2835 White at 120mA,  $T_j=25^{\circ}\text{C}$ .

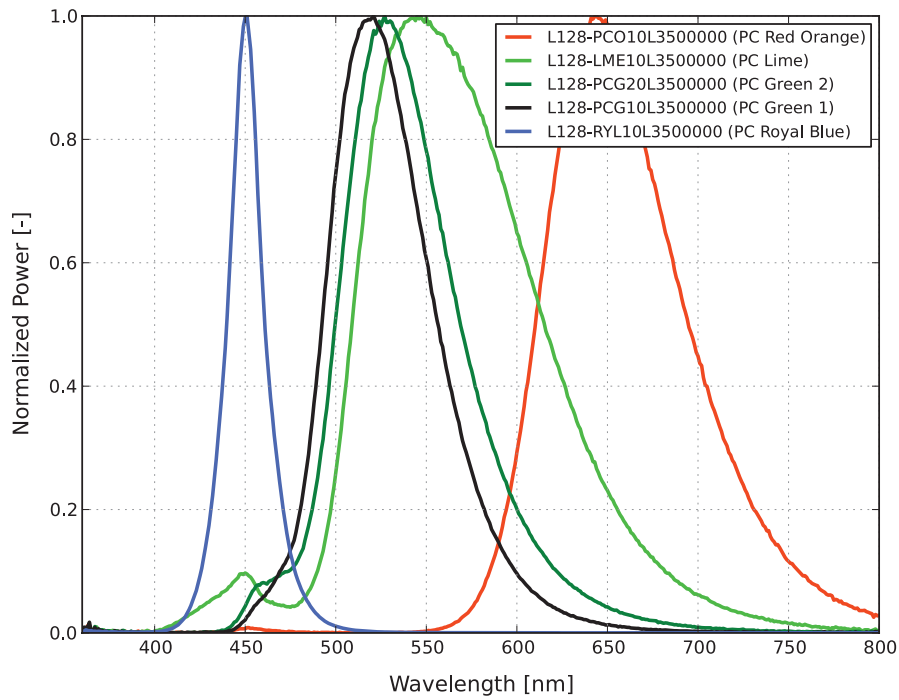


Figure 1c. Typical normalized power vs. wavelength for LUXEON 2835 Colors 36V at 20mA,  $T_j=25^\circ\text{C}$ .

## Light Output Characteristics

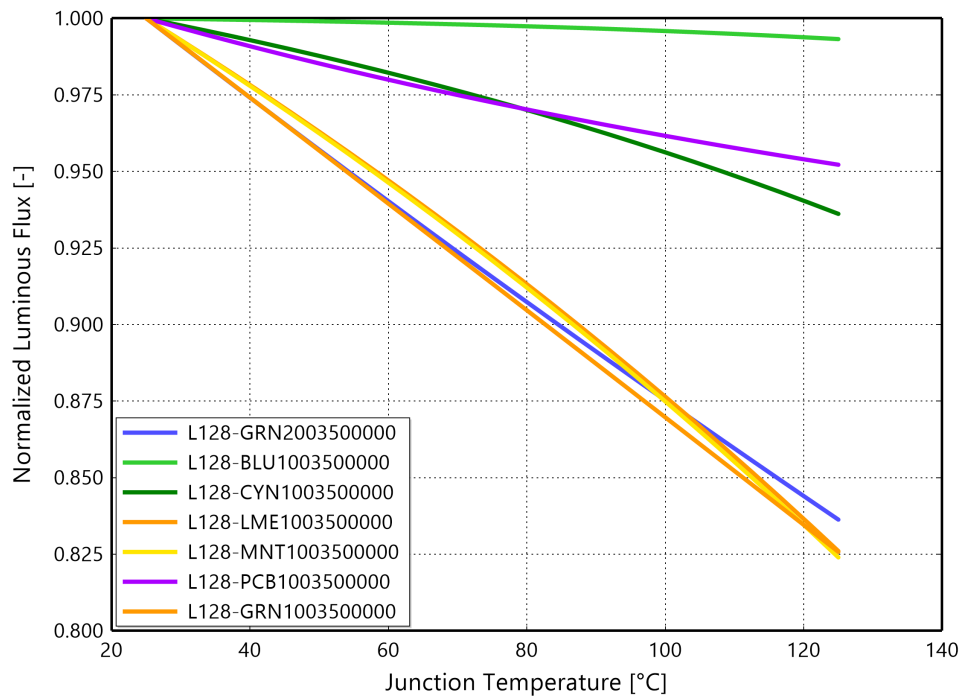


Figure 2a. Typical normalized light output vs. junction temperature for LUXEON 2835 Mint, Lime, Green, Cyan, Blue and PC Blue at 120mA.

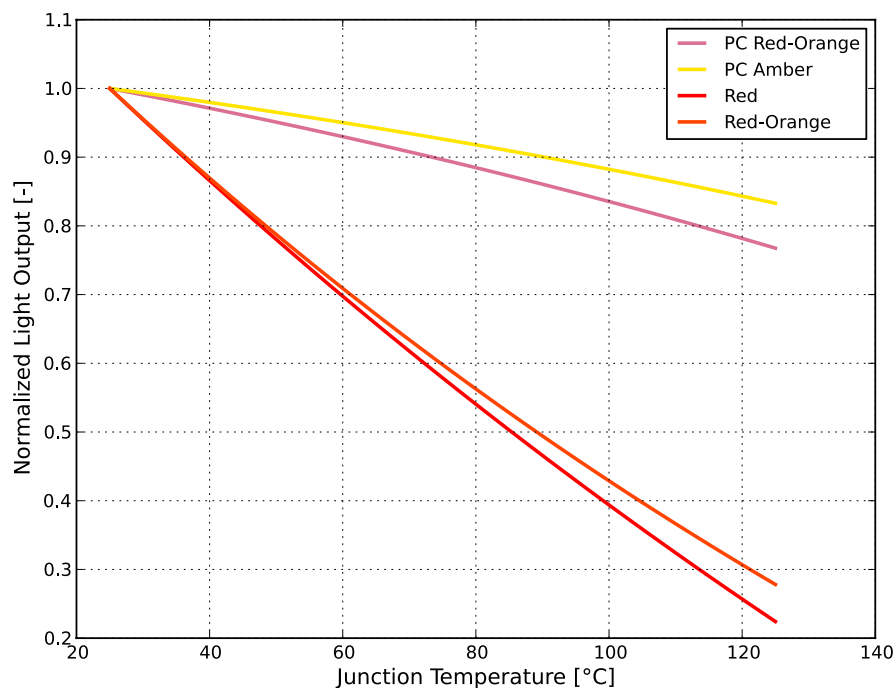


Figure 2b. Typical normalized light output vs. junction temperature for LUXEON 2835 Red, Red-Orange, PC Red-Orange, and PC Amber at 120mA.

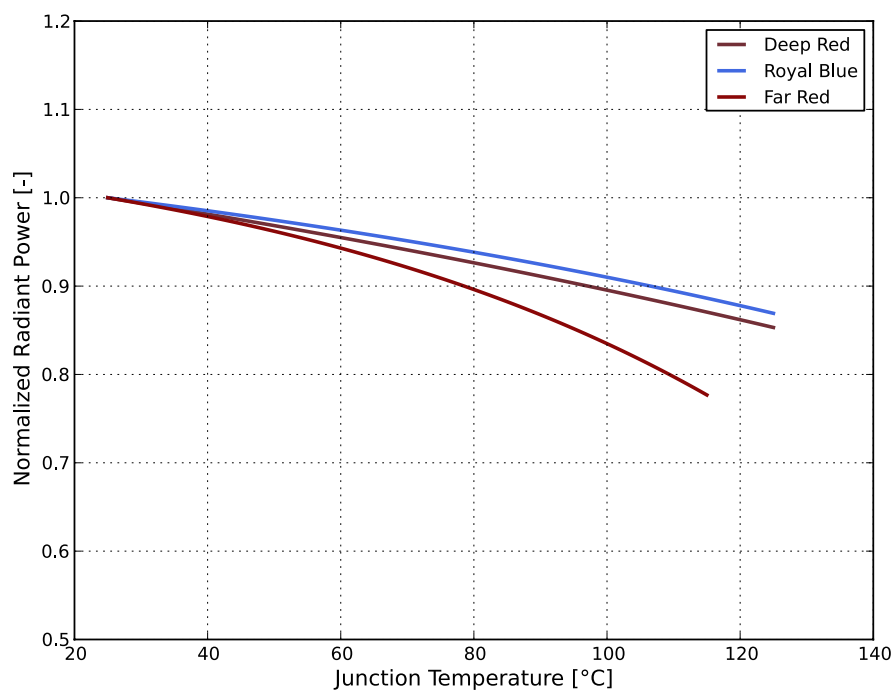


Figure 2c. Typical normalized radiant power vs. junction temperature for LUXEON 2835 Far Red, Deep Red, and Royal Blue at 120mA.

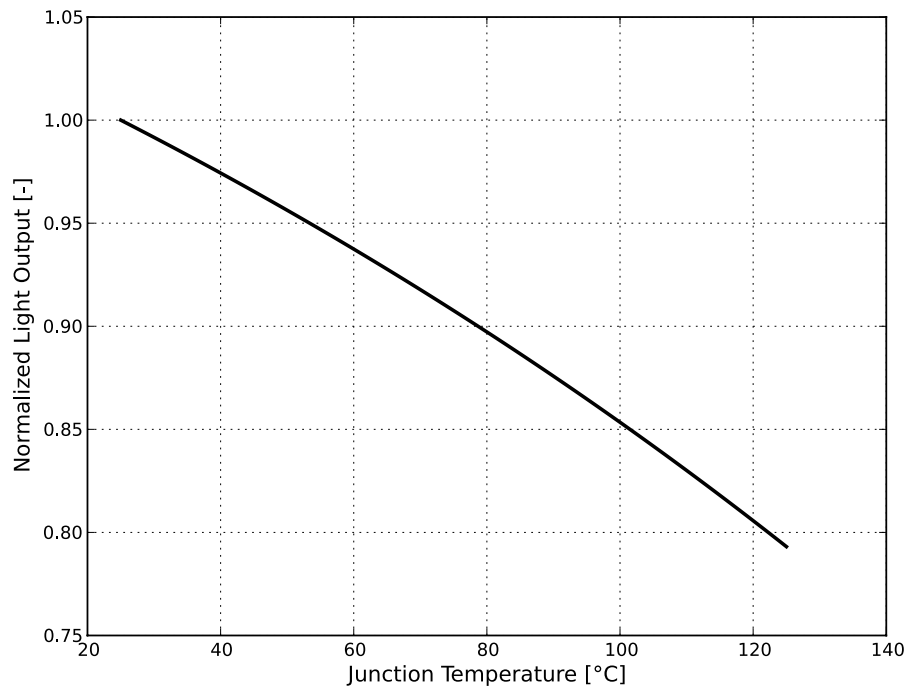


Figure 2d. Typical normalized light output vs. junction temperature for LUXEON 2835 White at 120mA.

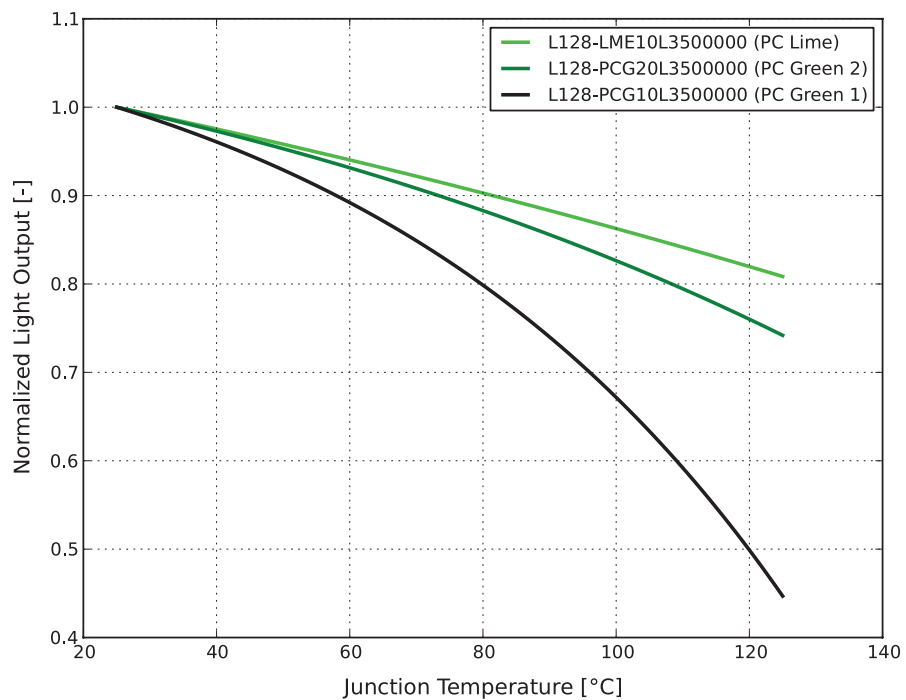


Figure 2e. Typical normalized light output vs. junction temperature for LUXEON 2835 36V Lime, PC Green 2 and PC Green 1 at 20mA.

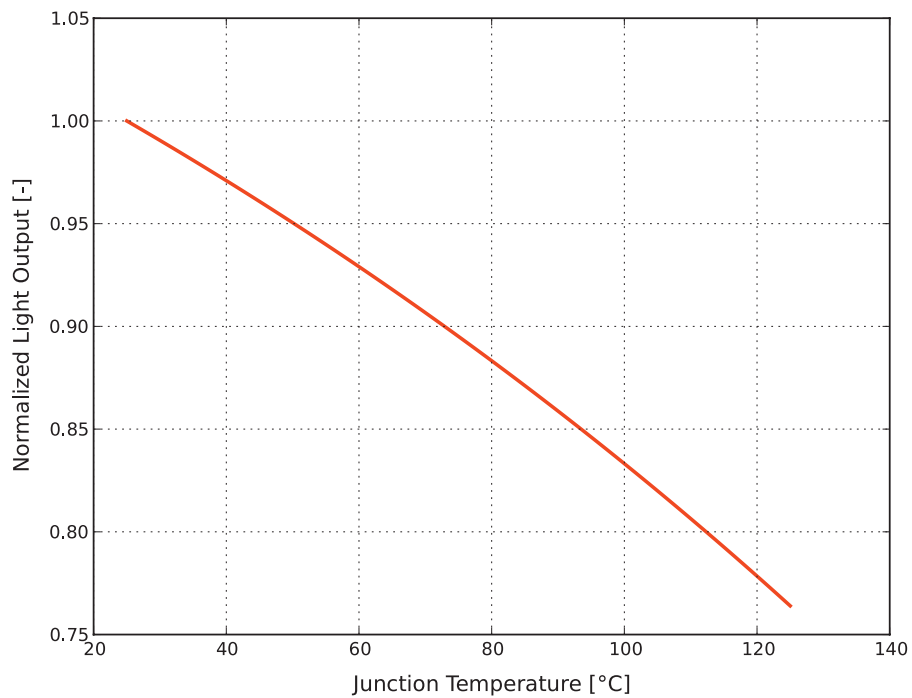


Figure 2f. Typical normalized light output vs. junction temperature for LUXEON 2835 36V PC Red-Orange at 20mA.

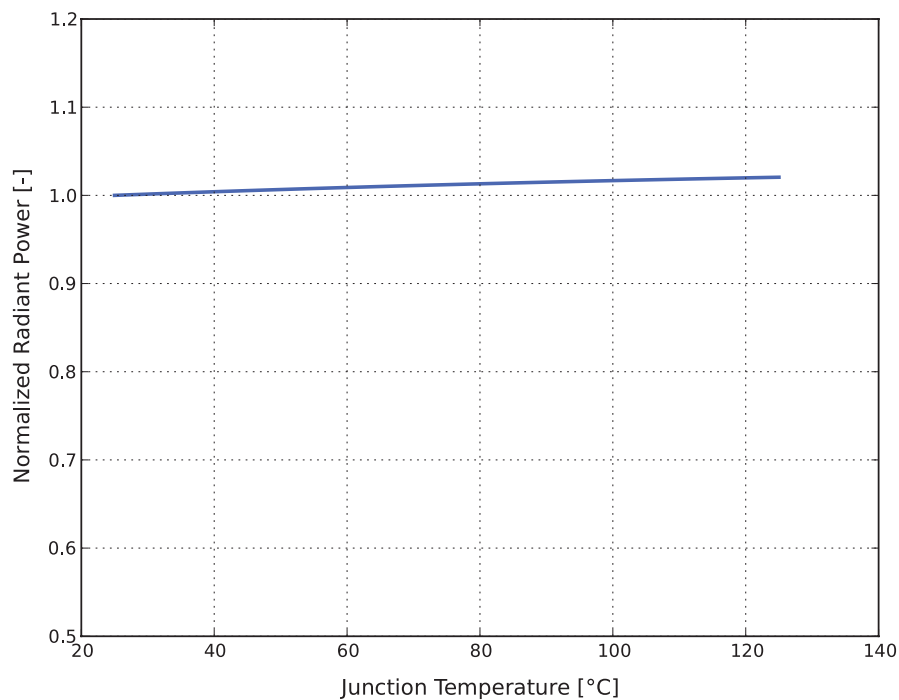


Figure 2g. Typical normalized radiant power vs. junction temperature for LUXEON 2835 36V Royal Blue at 20mA.

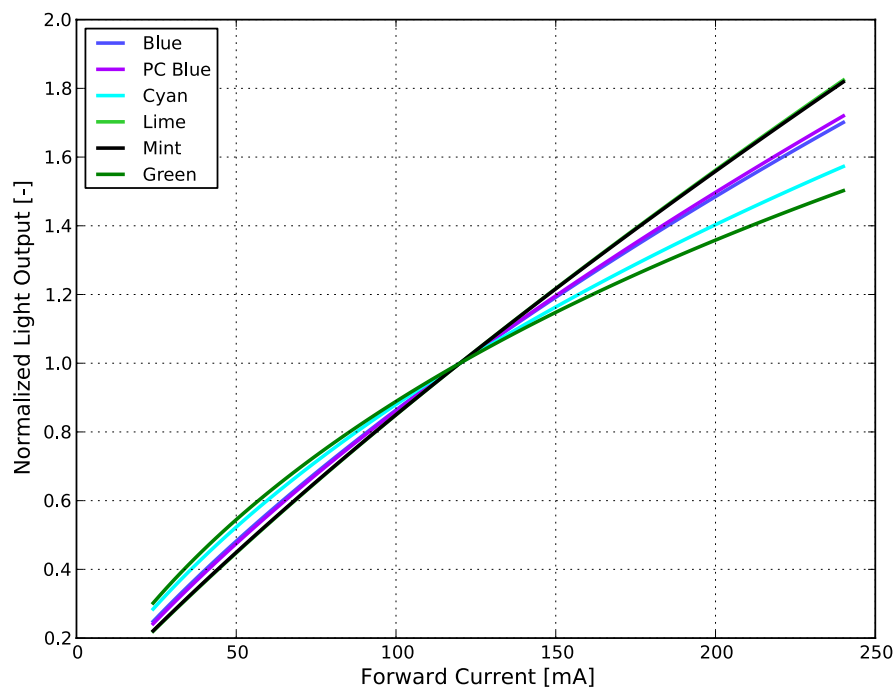


Figure 3a. Typical normalized light output vs. forward current for LUXEON 2835 Mint, Lime, Green, Cyan, Blue and PC Blue at  $T_j=25^{\circ}\text{C}$ .

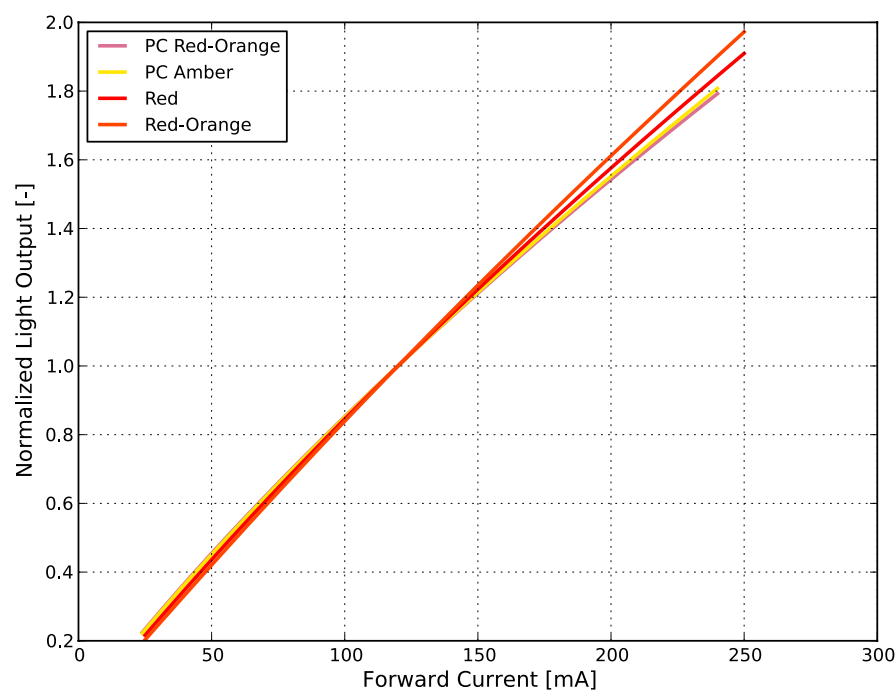


Figure 3b. Typical normalized light output vs. forward current for LUXEON 2835 Red, Red-Orange, PC Red-Orange, and PC Amber at  $T_j=25^{\circ}\text{C}$ .

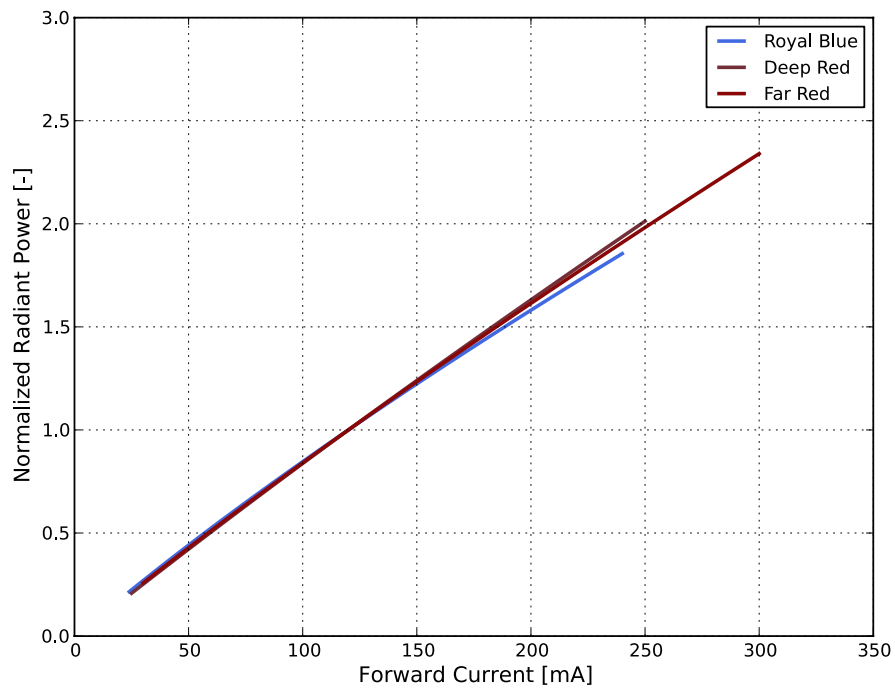


Figure 3c. Typical normalized radiant power vs. forward current for LUXEON 2835 Far Red, Deep Red, and Royal Blue at  $T_j=25^{\circ}\text{C}$ .

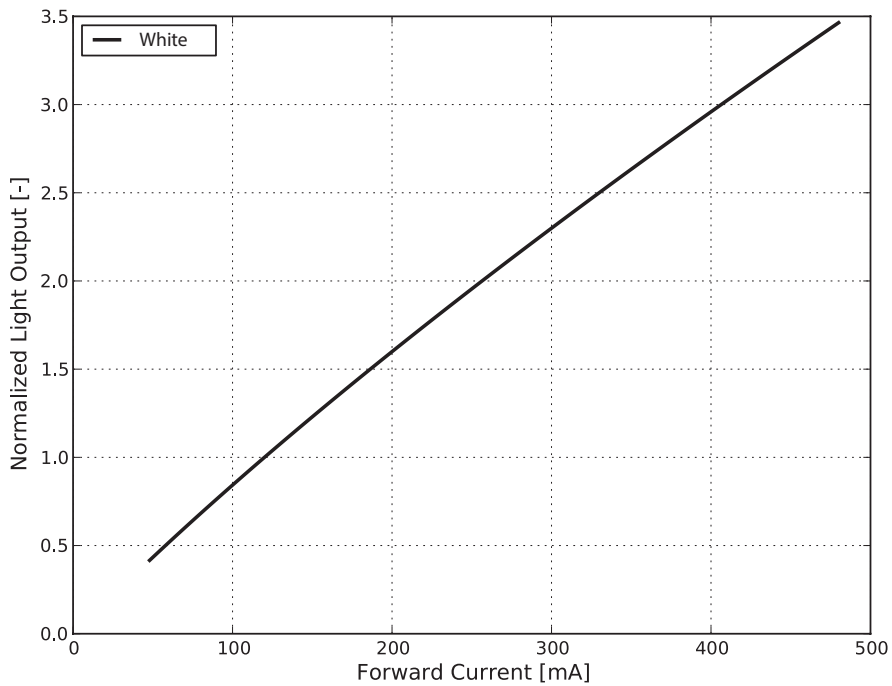


Figure 3d. Typical normalized light output vs. forward current for LUXEON 2835 White at  $T_j=25^{\circ}\text{C}$ .

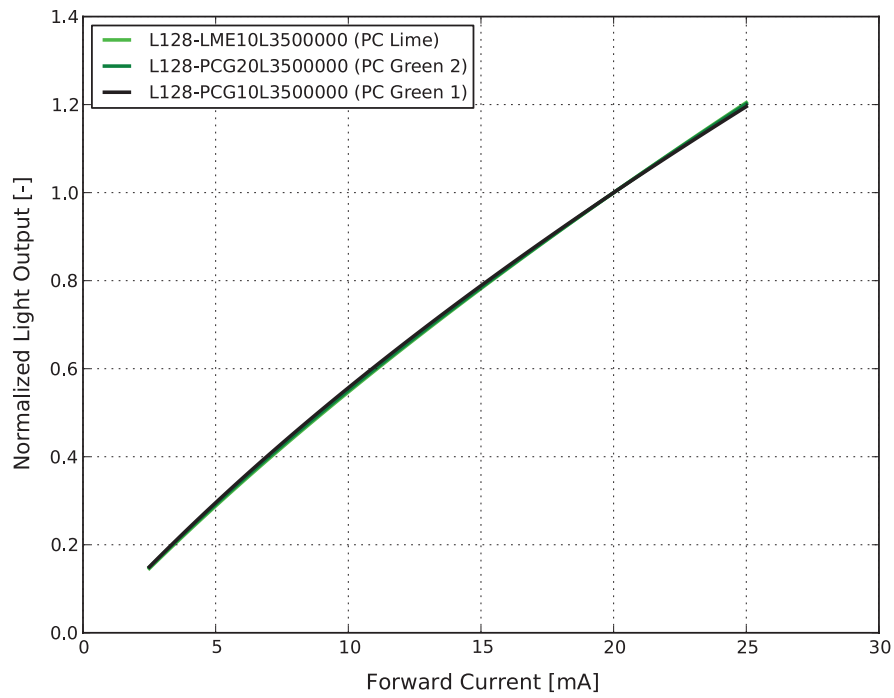


Figure 3e. Typical normalized light output vs. forward current for LUXEON 2835 36V Lime, PC Green 2 and PC Green 1 at  $T_j=25^{\circ}\text{C}$ .

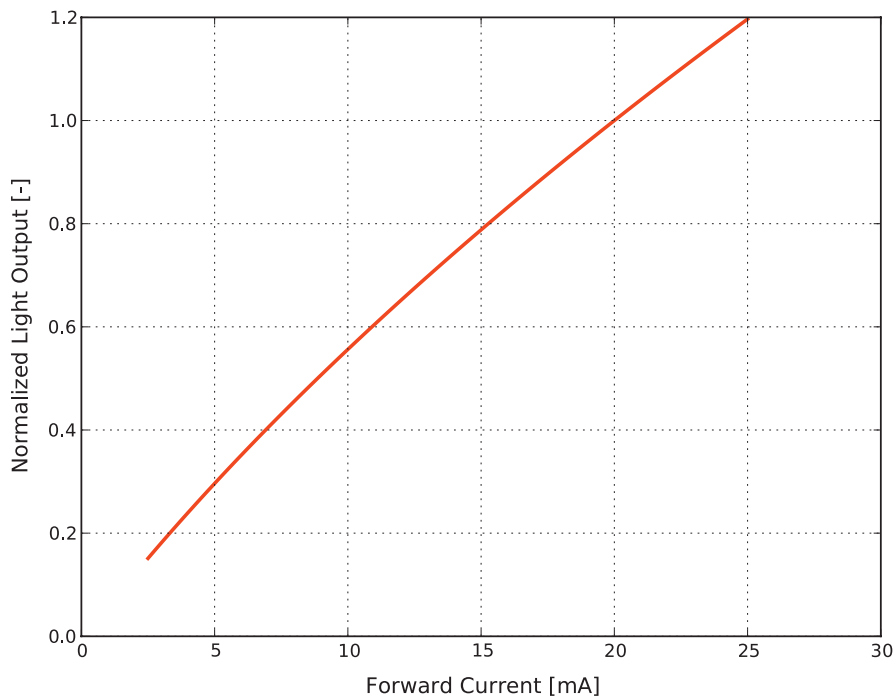


Figure 3f. Typical normalized light output vs. forward current for LUXEON 2835 36V PC Red-Orange at  $T_j=25^{\circ}\text{C}$ .



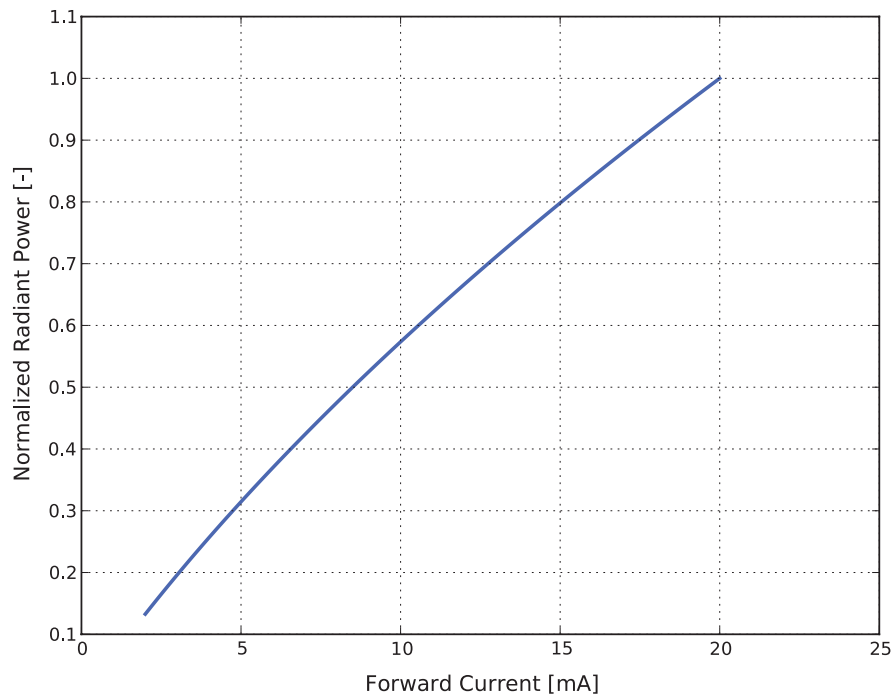


Figure 3g. Typical normalized radiant power vs. forward current for LUXEON 2835 36V Royal Blue at  $T_j = 25^\circ\text{C}$ .

## Forward Current Characteristics

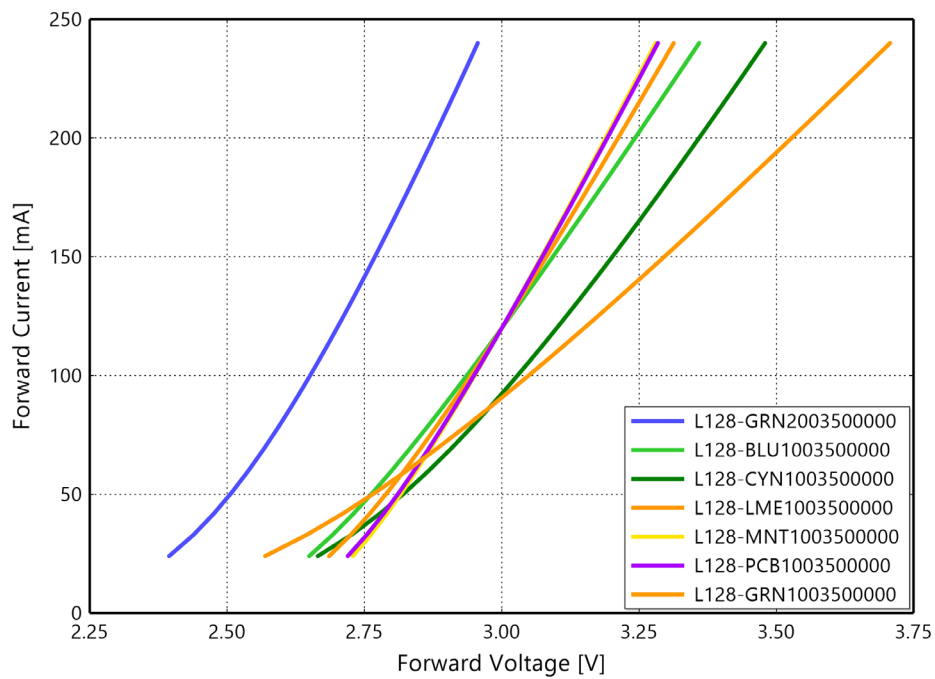


Figure 4a. Typical forward current vs. forward voltage for LUXEON 2835 Mint, Lime, Green, Cyan, Blue and PC Blue at  $T_j = 25^\circ\text{C}$ .

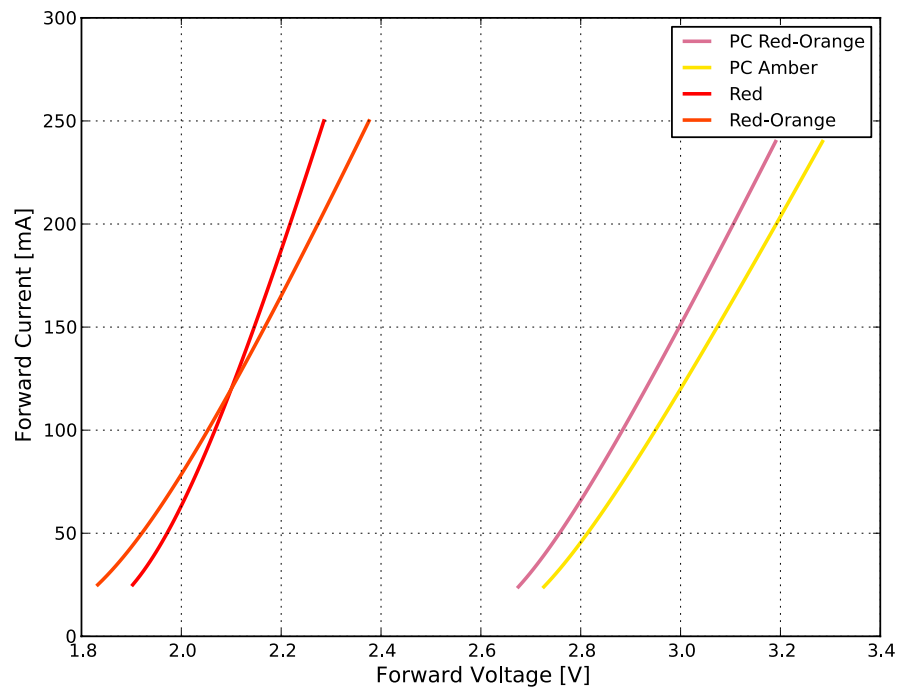


Figure 4b. Typical forward current vs. forward voltage for LUXEON 2835 Red, Red-Orange, and PC Amber at  $T_j = 25^\circ\text{C}$ .

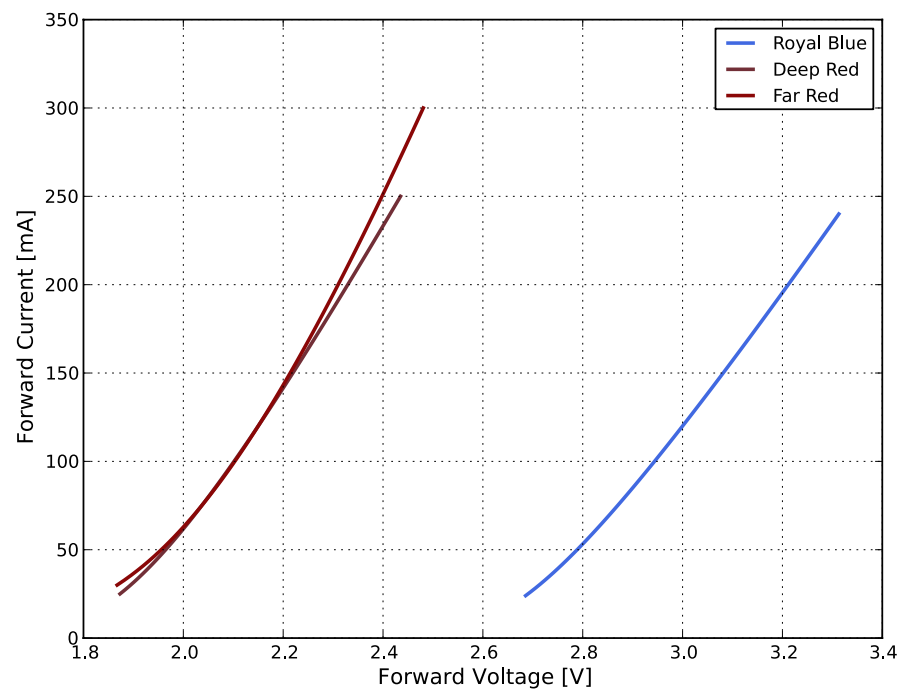


Figure 4c. Typical forward current vs. forward voltage for LUXEON 2835 Far Red, Deep Red, and Royal Blue at  $T_j = 25^\circ\text{C}$ .

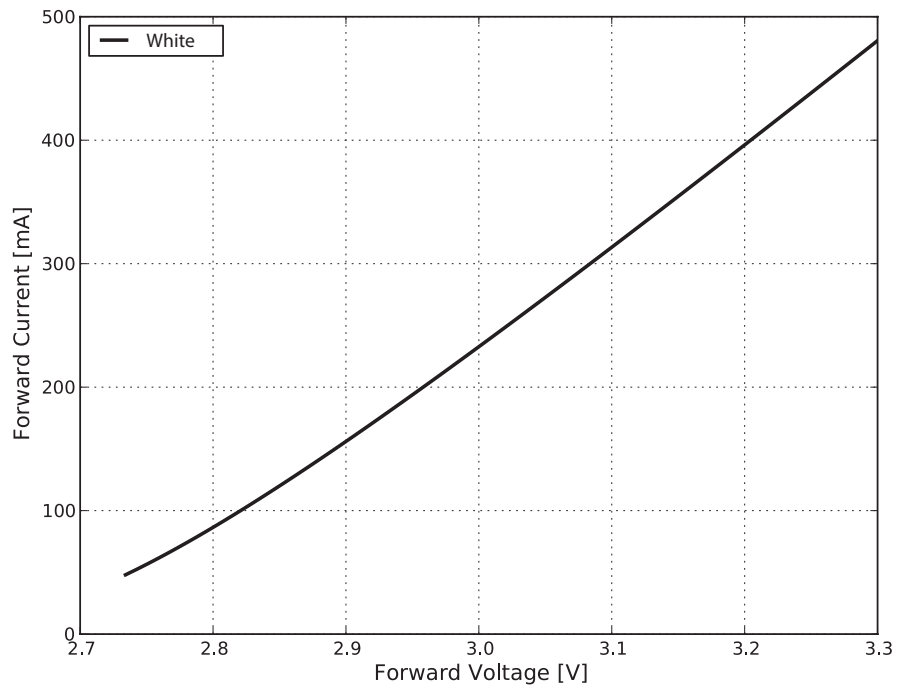


Figure 4d. Typical forward current vs. forward voltage for LUXEON 2835 White at  $T_j=25^{\circ}\text{C}$ .

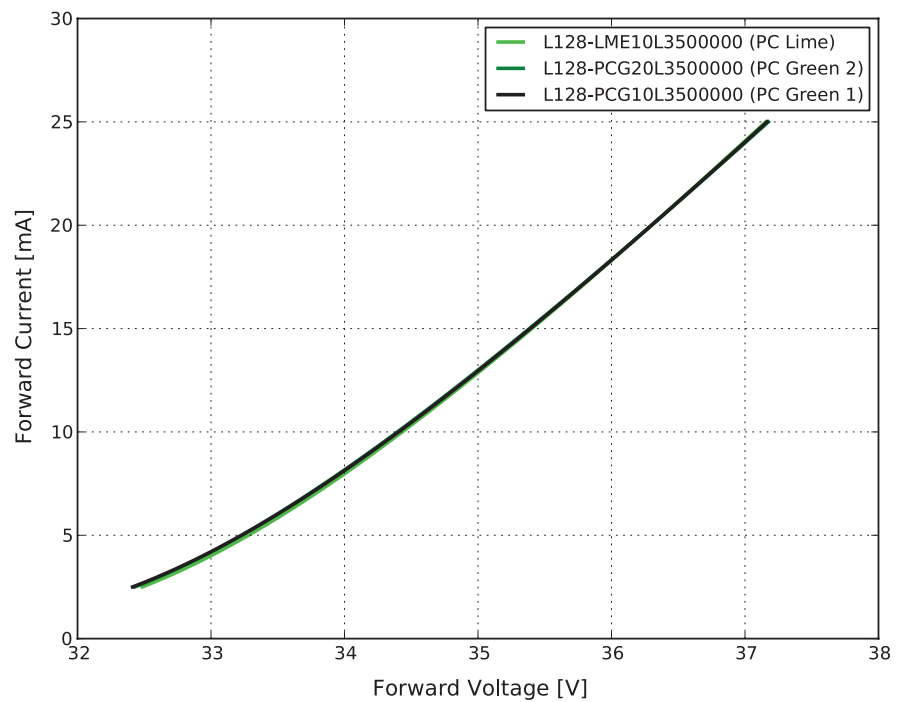


Figure 4e. Typical forward current vs. forward voltage for LUXEON 2835 36V Lime, PC Green 2 and PC Green 1 at  $T_j=25^{\circ}\text{C}$ .

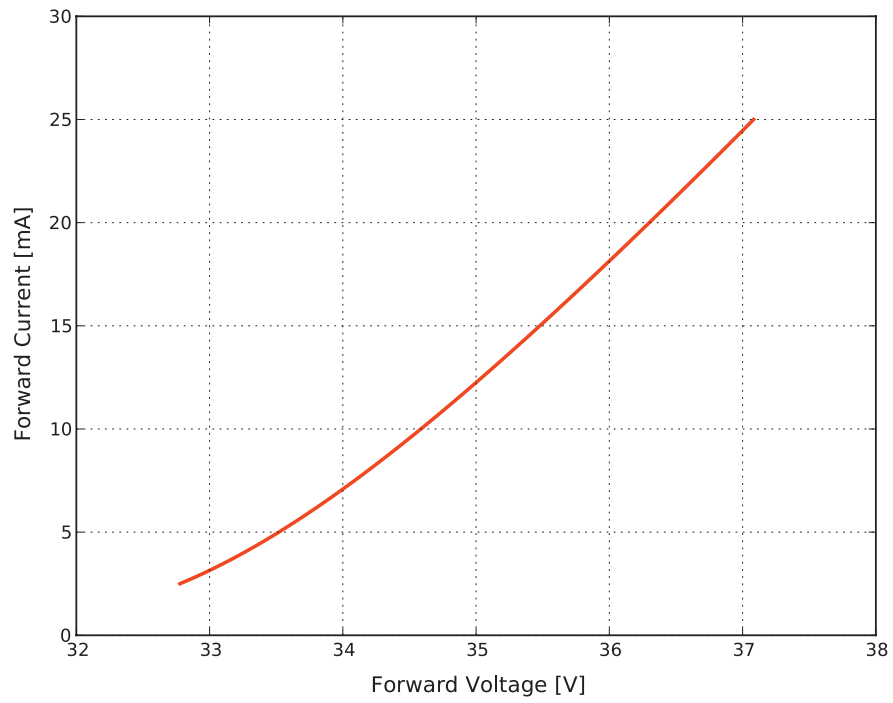


Figure 4f. Typical forward current vs. forward voltage for LUXEON 2835 36V PC Red-Orange at  $T_j=25^{\circ}\text{C}$ .

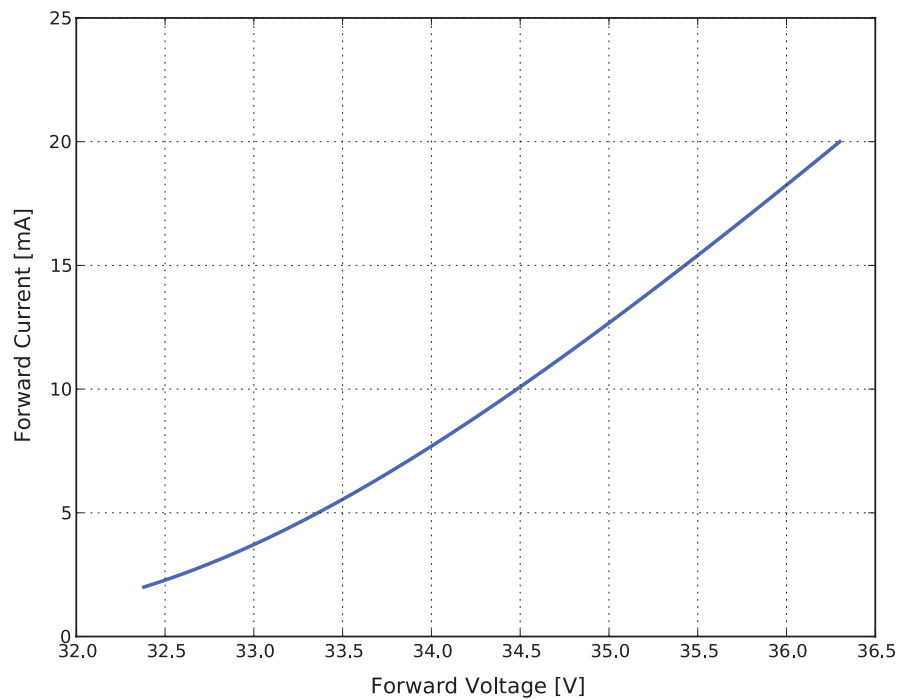


Figure 4g. Typical forward current vs. forward voltage for LUXEON 2835 36V Royal Blue at  $T_j=25^{\circ}\text{C}$ .

# Radiation Pattern Characteristics

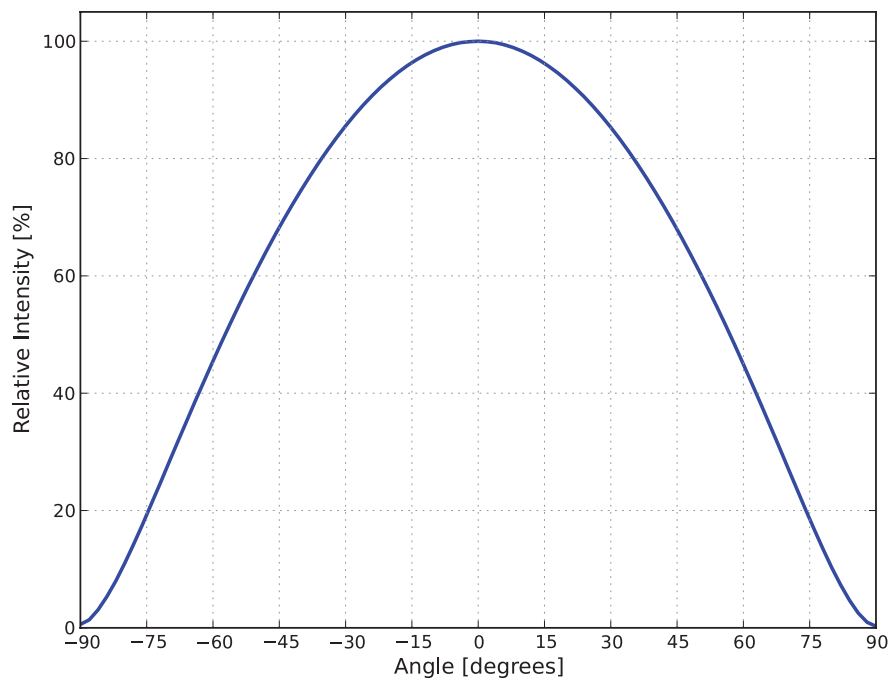


Figure 5a. Typical radiation pattern for LUXEON 2835 Color Line at 120mA,  $T_j=25^{\circ}\text{C}$ .

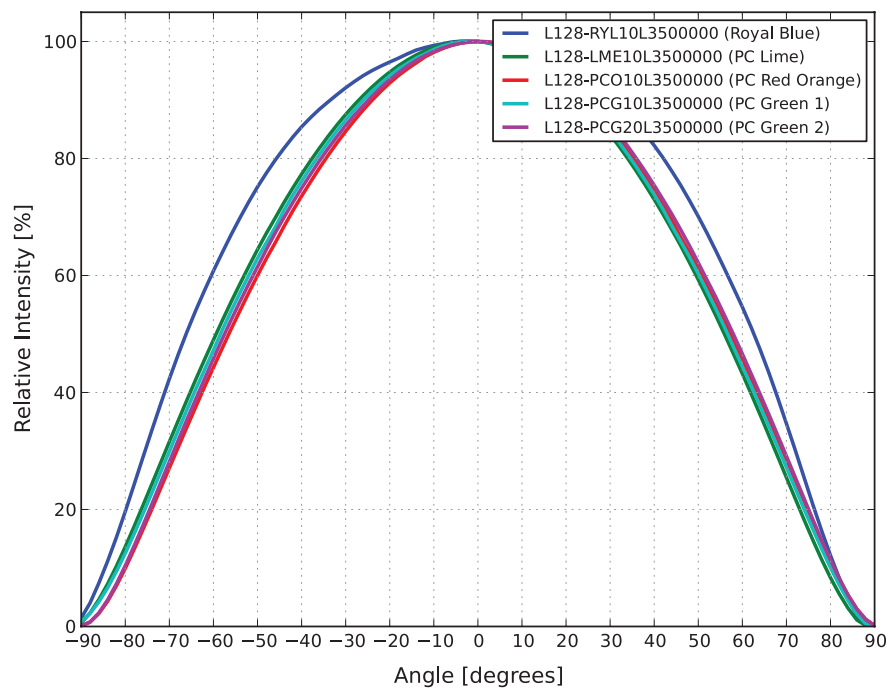


Figure 5b. Typical radiation pattern for LUXEON 2835 Color 36V at 20mA,  $T_j=25^{\circ}\text{C}$ .

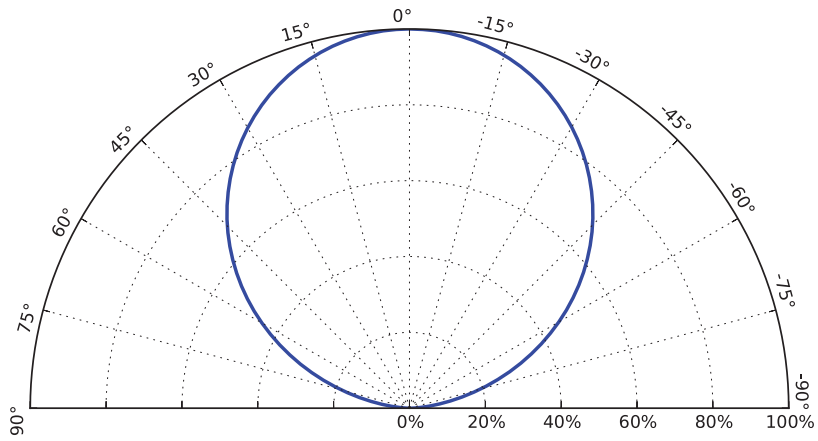


Figure 6a. Typical polar radiation pattern for LUXEON 2835 Color Line at 120mA,  $T_j=25^{\circ}\text{C}$ .

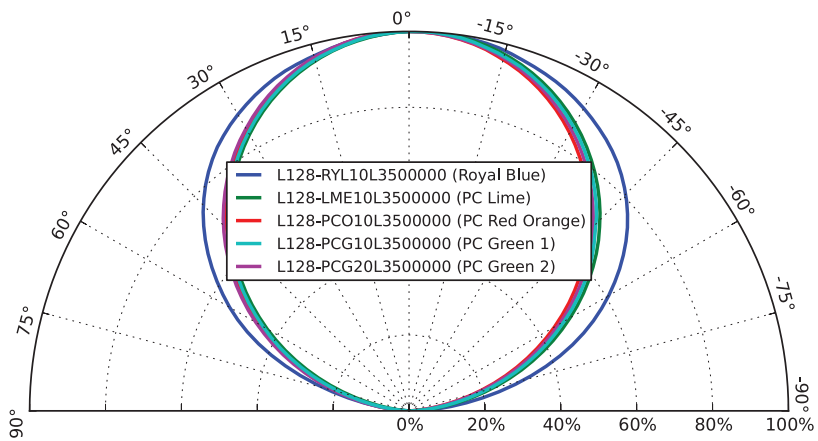


Figure 6b. Typical polar radiation pattern for LUXEON 2835 Color 36V at 20mA,  $T_j=25^{\circ}\text{C}$ .

# 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 or radiometric power, color point, peak or dominant wavelength and forward voltage.

LUXEON 2835 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 bin or radiometric power bin (luminous flux bin example: L=32.0 to 36.0 lm, R=52.0 to 56.0 lm; radiometric power bin example: D=100 to 110mW)
- B C** – designates color bin, peak wavelength bin or dominant wavelength bin (color bin examples: Lime=20, White 3000K example=7D, 7E, 7F, etc.; peak wavelength bin example: Deep Red 10=650 to 670nm; dominant wavelength bin example: Red 40=620 to 630nm)
- D** – designates forward voltage bin (example: A=2.80 to 2.90V, C=3.00 to 3.10V)

Therefore, a LUXEON 2835 Lime LED with a lumen range of 32.0 to 36.0 lumens, color bin of 20 and a forward voltage range of 3.00 to 3.10V has the following CAT code:

**L 2 0 C**

# Luminous Flux Bins

Tables 5a, 5b and 5c list the standard luminous flux bins for LUXEON 2835 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 5a. Luminous flux bin definitions for LUXEON 2835 Color Line at T<sub>j</sub>=25°C.

| BIN | LUMINOUS FLUX <sup>[1]</sup> (lm) |         |
|-----|-----------------------------------|---------|
|     | MINIMUM                           | MAXIMUM |
| D   | 13                                | 15      |
| E   | 15                                | 17      |
| F   | 17                                | 19      |
| G   | 19                                | 21      |
| H   | 21                                | 24      |
| J   | 24                                | 28      |
| K   | 28                                | 32      |
| L   | 32                                | 36      |
| M   | 36                                | 40      |
| N   | 40                                | 44      |
| P   | 44                                | 48      |
| Q   | 48                                | 52      |
| R   | 52                                | 56      |
| S   | 56                                | 60      |
| T   | 60                                | 65      |
| U   | 65                                | 70      |
| V   | 70                                | 75      |
| W   | 75                                | 80      |
| X   | 80                                | 85      |
| Y   | 85                                | 90      |

Notes for Table 5a:

1. Lumileds maintains a tolerance of ±7.5% on luminous flux measurements.

Table 5b. Luminous flux bin definitions for LUXEON 2835 Color 36V PC Red-Orange at T<sub>j</sub>=25°C.

| BIN | LUMINOUS FLUX <sup>[1]</sup> (lm) |         |
|-----|-----------------------------------|---------|
|     | MINIMUM                           | MAXIMUM |
| H   | 21                                | 24      |
| J   | 24                                | 28      |
| K   | 28                                | 32      |

Notes for Table 5b:

1. Lumileds maintains a tolerance of ±7.5% on luminous flux measurements.

Table 5c. Luminous flux bin definitions for LUXEON 2835 Color 36V Lime and PC Green at T<sub>j</sub>=25°C.

| BIN | LUMINOUS FLUX <sup>[1]</sup> (lm) |         |
|-----|-----------------------------------|---------|
|     | MINIMUM                           | MAXIMUM |
| P   | 120                               | 130     |
| Q   | 130                               | 140     |
| R   | 140                               | 150     |
| S   | 150                               | 160     |

Notes for Table 5c:

1. Lumileds maintains a tolerance of ±7.5% on luminous flux measurements.



# Radiometric Power Bins

Table 6a. Radiometric power bin definitions for LUXEON 2835 Far Red, Deep Red and Royal Blue.

| BIN | RADIOMETRIC POWER <sup>[1]</sup> (mW) |         |
|-----|---------------------------------------|---------|
|     | MINIMUM                               | MAXIMUM |
| A   | 70                                    | 80      |
| B   | 80                                    | 90      |
| C   | 90                                    | 100     |
| D   | 100                                   | 110     |
| E   | 110                                   | 120     |
| F   | 120                                   | 130     |
| G   | 130                                   | 150     |
| H   | 150                                   | 170     |
| J   | 170                                   | 190     |
| K   | 190                                   | 210     |
| L   | 210                                   | 230     |
| M   | 230                                   | 250     |

Notes for Table 6a:  
1. Lumileds maintains a tolerance of ±6.5% on radiometric power measurements.

Table 6b. Radiometric power bin definitions for LUXEON 2835 Color 36V Royal Blue.

| BIN | RADIOMETRIC POWER <sup>[1]</sup> (mW) |         |
|-----|---------------------------------------|---------|
|     | MINIMUM                               | MAXIMUM |
| A   | 340                                   | 370     |
| B   | 370                                   | 400     |
| C   | 400                                   | 430     |

Notes for Table 6b:  
1. Lumileds maintains a tolerance of ±6.5% on radiometric power measurements.

Color Bin Definitions

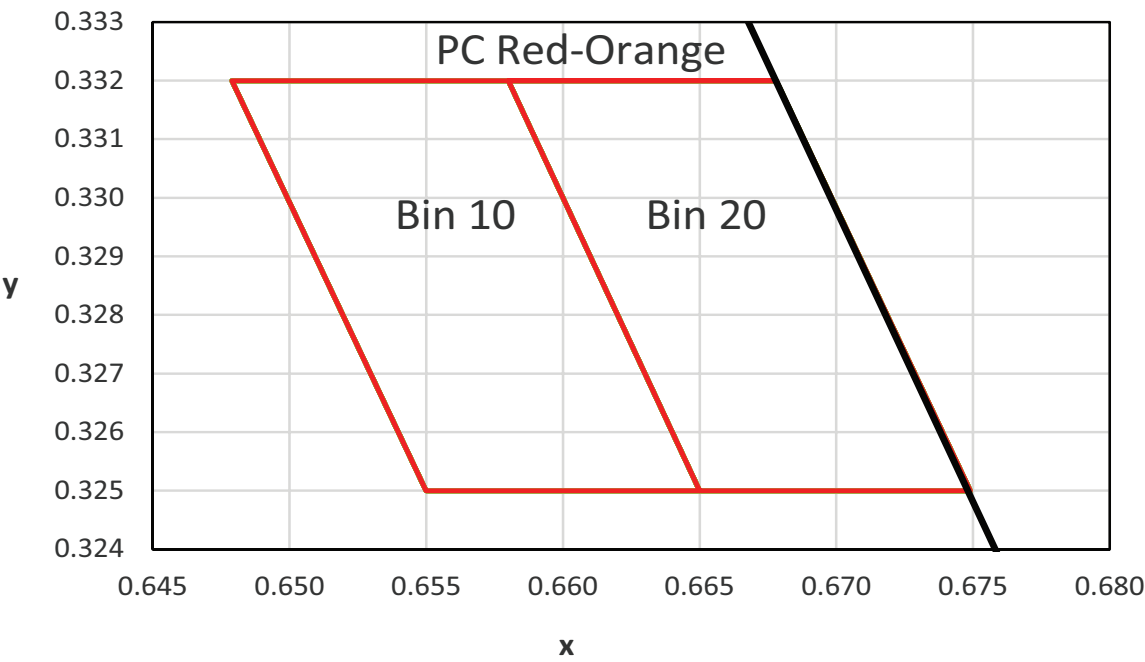


Figure 7. Color Bin Structure for LUXEON 2835 PC Red-Orange for Table 7.

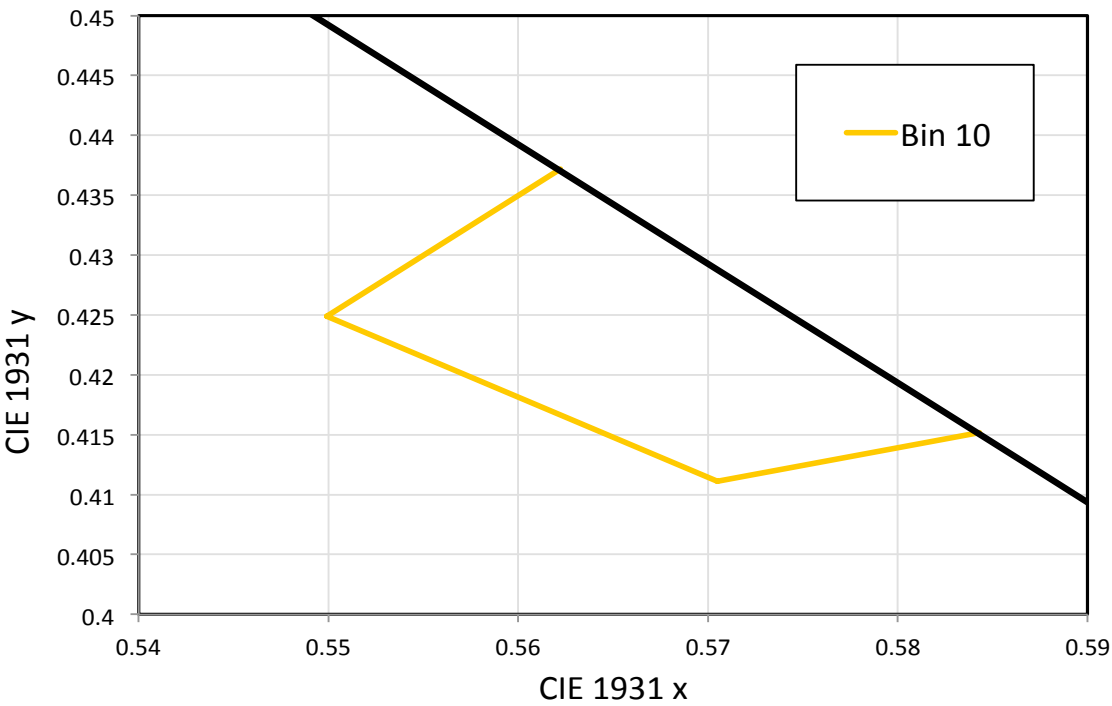


Figure 8. Color Bin Structure for LUXEON 2835 PC Amber for Table 7.

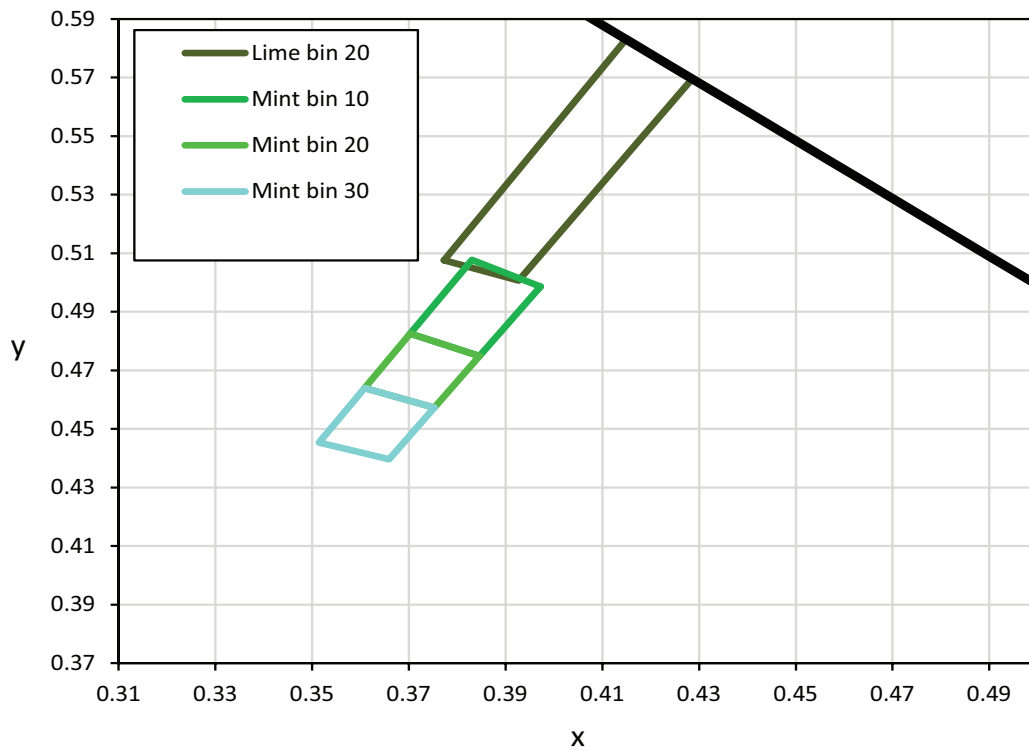


Figure 9. Color Bin Structure for LUXEON 2835 Lime and Mint for Table 7.

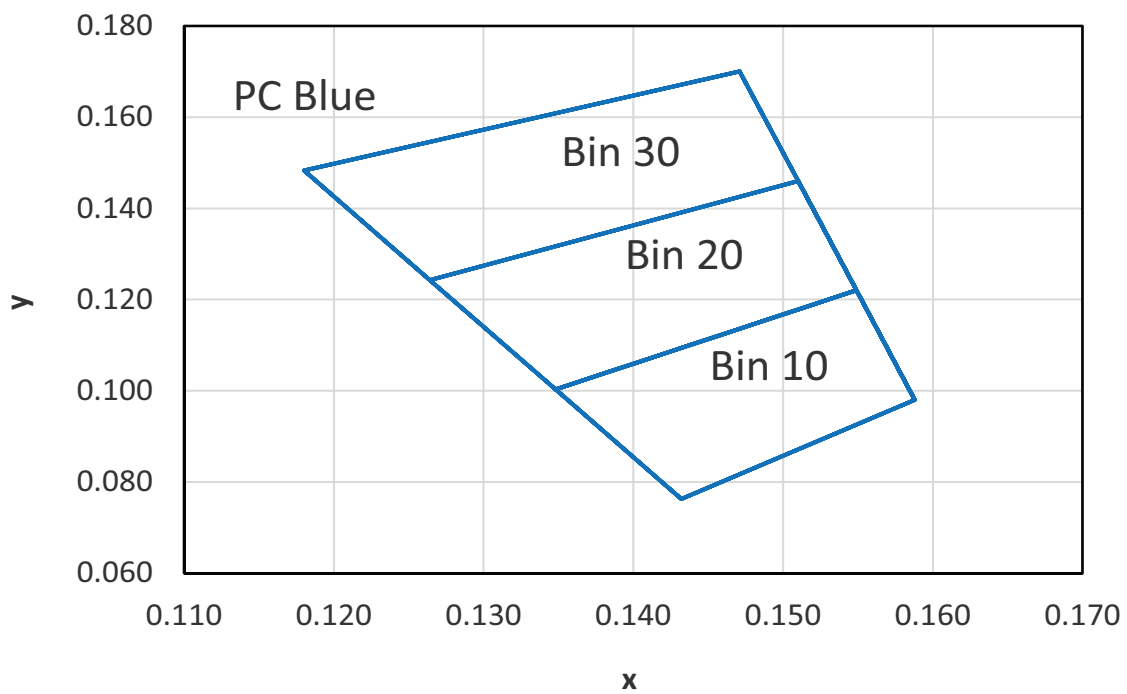


Figure 10. Color Bin Structure for LUXEON 2835 PC Blue for Table 7.

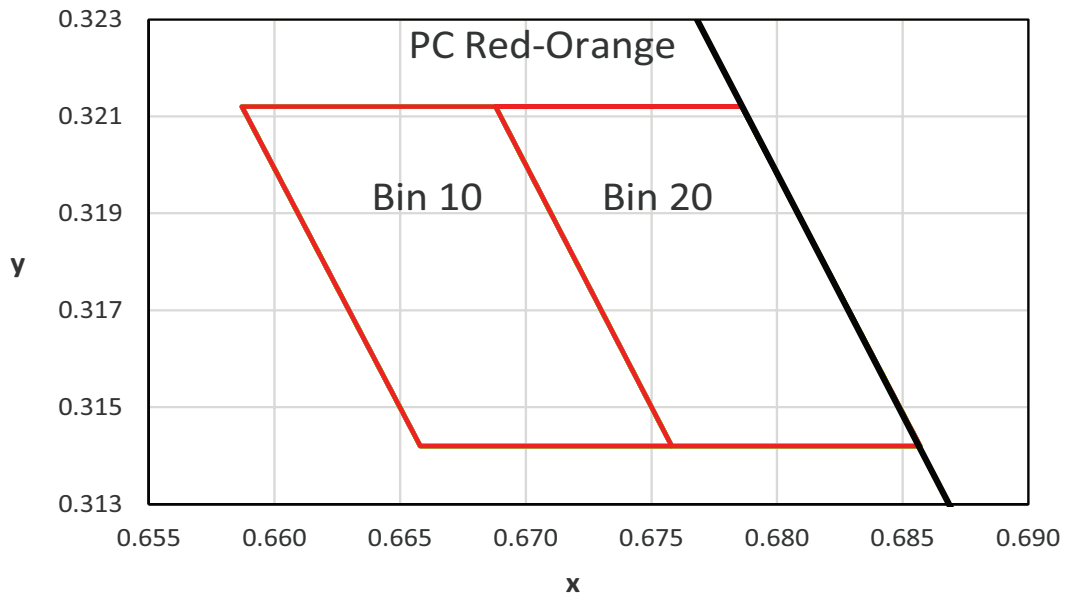


Figure 11. Color Bin Structure for LUXEON 2835 Color 36V PC Red-Orange for Table 8.

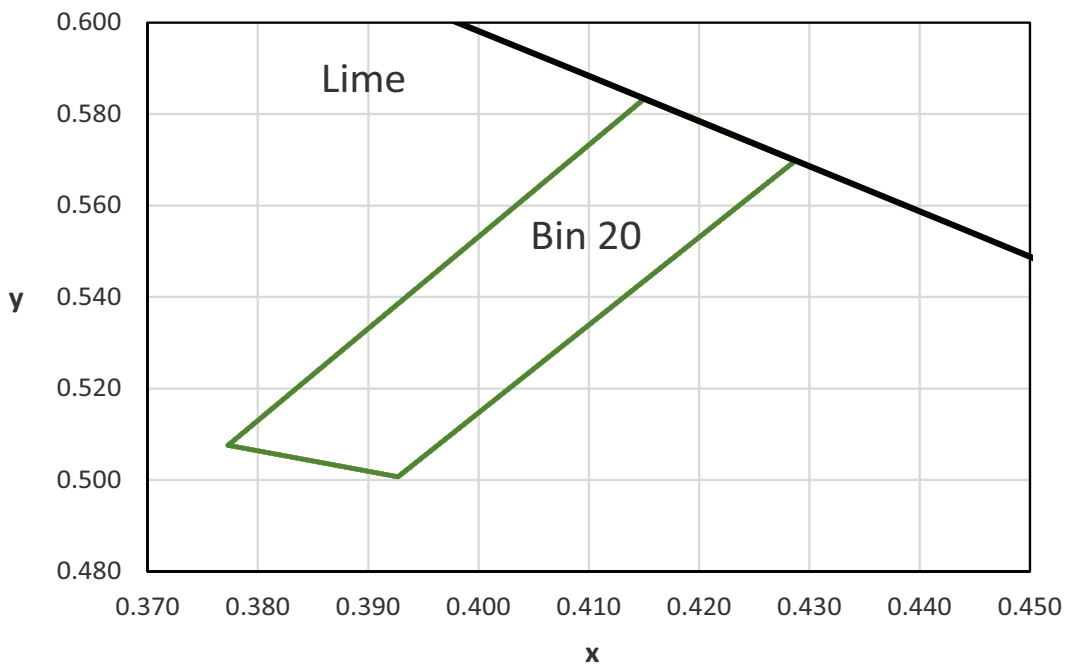


Figure 12. Color Bin Structure for LUXEON 2835 Color 36V Lime for Table 8.

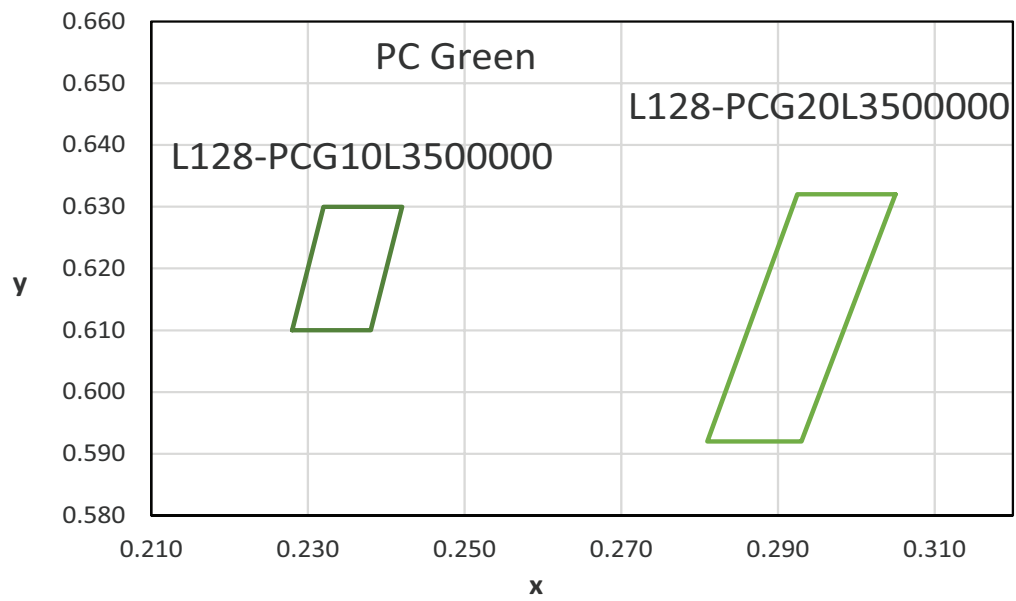


Figure 13. Color Bin Structure for LUXEON 2835 Color 36V PC Green for Table 8.

Table 7. Color bin definitions for LUXEON 2835 PC Red-Orange, PC Amber, Mint, Lime and PC Blue.

| COLOR         | PART NUMBER        | BIN | x      | y      |
|---------------|--------------------|-----|--------|--------|
| PC Red-Orange | L128-PCO1003500000 | 10  | 0.6580 | 0.3320 |
|               |                    |     | 0.6479 | 0.3320 |
|               |                    |     | 0.6550 | 0.3250 |
|               |                    |     | 0.6650 | 0.3250 |
|               |                    | 20  | 0.6678 | 0.3320 |
|               |                    |     | 0.6580 | 0.3320 |
|               |                    |     | 0.6650 | 0.3250 |
|               |                    |     | 0.6749 | 0.3250 |
| PC Amber      | L128-PCA1003500000 | 10  | 0.5622 | 0.4372 |
|               |                    |     | 0.5843 | 0.4152 |
|               |                    |     | 0.5705 | 0.4111 |
|               |                    |     | 0.5499 | 0.4249 |
| Mint          | L128-MNT1003500000 | 10  | 0.3927 | 0.4986 |
|               |                    |     | 0.3830 | 0.5077 |
|               |                    |     | 0.3703 | 0.4825 |
|               |                    |     | 0.3846 | 0.4749 |
|               |                    | 20  | 0.3846 | 0.4749 |
|               |                    |     | 0.3703 | 0.4825 |
|               |                    |     | 0.3608 | 0.4639 |
|               |                    |     | 0.3752 | 0.4572 |
|               |                    | 30  | 0.3752 | 0.4572 |
|               |                    |     | 0.3608 | 0.4639 |
|               |                    |     | 0.3515 | 0.4453 |
|               |                    |     | 0.3659 | 0.4396 |
| Lime          | L128-LME1003500000 | 20  | 0.3773 | 0.5076 |
|               |                    |     | 0.3927 | 0.5007 |
|               |                    |     | 0.4287 | 0.5697 |
|               |                    |     | 0.4150 | 0.5833 |
| PC Blue       | L128-PCB1003500000 | 10  | 0.1588 | 0.0980 |
|               |                    |     | 0.1549 | 0.1220 |
|               |                    |     | 0.1348 | 0.1003 |
|               |                    |     | 0.1432 | 0.0763 |
|               |                    | 20  | 0.1549 | 0.1220 |
|               |                    |     | 0.1510 | 0.1460 |
|               |                    |     | 0.1264 | 0.1243 |
|               |                    |     | 0.1348 | 0.1003 |
|               |                    | 30  | 0.1510 | 0.1460 |
|               |                    |     | 0.1471 | 0.1700 |
|               |                    |     | 0.1180 | 0.1483 |
|               |                    |     | 0.1264 | 0.1243 |

Notes for Table 7:  
1. Lumileds maintains a tolerance of  $\pm 0.01$  on x and y coordinates in the CIE 1931 color space.

Table 8. Color bin definitions for LUXEON 2835 Color 36V PC Red-Orange, Lime and PC Green.

| COLOR         | PART NUMBER        | BIN | x      | y      |
|---------------|--------------------|-----|--------|--------|
| PC Red-Orange | L128-PCO10L3500000 | 10  | 0.6688 | 0.3212 |
|               |                    |     | 0.6587 | 0.3212 |
|               |                    |     | 0.6658 | 0.3142 |
|               |                    |     | 0.6758 | 0.3142 |
|               |                    | 20  | 0.6786 | 0.3212 |
|               |                    |     | 0.6688 | 0.3212 |
|               |                    |     | 0.6758 | 0.3142 |
|               |                    |     | 0.6857 | 0.3142 |
| Lime          | L128-LME10L3500000 | 20  | 0.3773 | 0.5076 |
|               |                    |     | 0.3927 | 0.5007 |
|               |                    |     | 0.4287 | 0.5697 |
|               |                    |     | 0.415  | 0.5833 |
| PC Green      | L128-PCG10L3500000 | 20  | 0.2280 | 0.6100 |
|               |                    |     | 0.2380 | 0.6100 |
|               |                    |     | 0.2420 | 0.6300 |
|               |                    |     | 0.2320 | 0.6300 |
|               | L128-PCG20L3500000 | 20  | 0.3050 | 0.6320 |
|               |                    |     | 0.2925 | 0.6320 |
|               |                    |     | 0.2810 | 0.5920 |
|               |                    |     | 0.2930 | 0.5920 |

Notes for Table 8:

1. Lumileds maintains a tolerance of ±0.01 on x and y coordinates in the CIE 1931 color space.

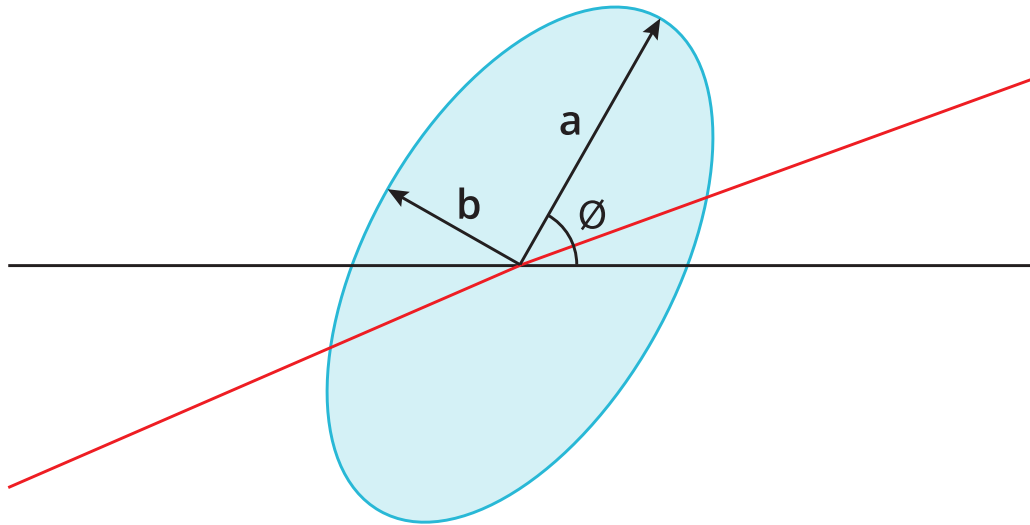


Figure 14. 3- and 5-step MacAdam ellipse illustration for Tables 9a-9c.

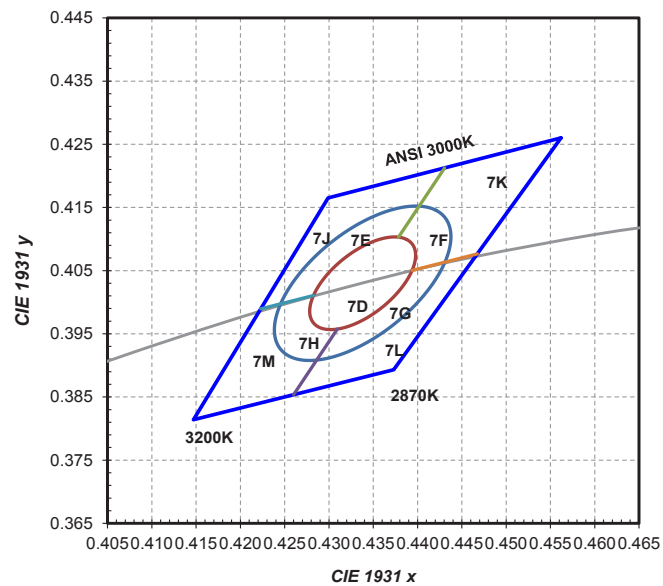


Figure 15a. 1/9<sup>th</sup> color bin structure for LUXEON 2835 White 3000K at test current and binning temperature of  $T_j=25^\circ\text{C}$ .

Table 9a. 3- and 5-step MacAdam ellipse color bin definitions for LUXEON 2835E and LUXEON 2835C 3000K, at test and binning conditions.

| NOMINAL CCT | COLOR SPACE                   | CENTER POINT <sup>(1)</sup><br>(cx, cy) | MAJOR AXIS,<br>a | MINOR AXIS,<br>b | ELLIPSE ROTATION<br>ANGLE, Ø |
|-------------|-------------------------------|-----------------------------------------|------------------|------------------|------------------------------|
| 3000K       | Single 3-step MacAdam ellipse | (0.4338, 0.4030)                        | 0.00834          | 0.00408          | 53.22°                       |
| 3000K       | Single 5-step MacAdam ellipse | (0.4338, 0.4030)                        | 0.01390          | 0.00680          | 53.22°                       |

Notes for Table 9a:

1. Lumileds maintains a tolerance of  $\pm 0.007$  on x and y color coordinates in the CIE 1931 color space.



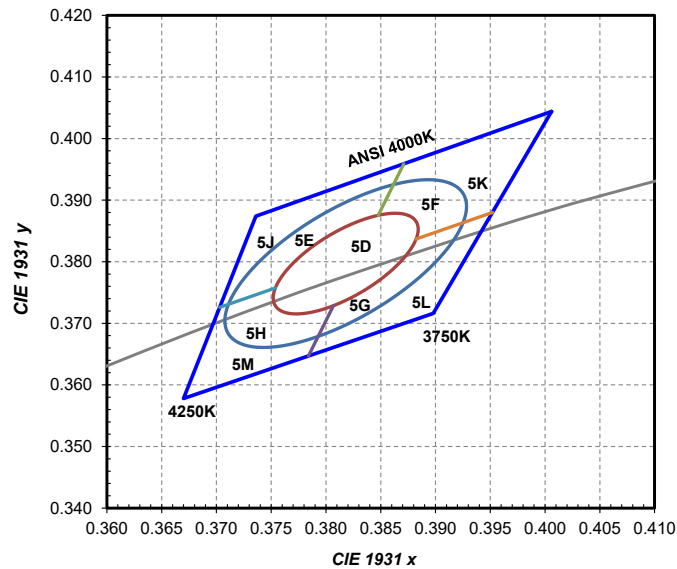


Figure 15b. 1/9<sup>th</sup> color bin structure for LUXEON 2835E and LUXEON 2835C 4000K at test current and binning temperature of  $T_j=25^{\circ}\text{C}$ .

Table 9b. 3- and 5-step MacAdam ellipse color bin definitions for LUXEON 2835E and LUXEON 2835C 4000K, at test and binning conditions.

| NOMINAL CCT | COLOR SPACE                   | CENTER POINT <sup>[1]</sup><br>(cx, cy) | MAJOR AXIS,<br>a | MINOR AXIS,<br>b | ELLIPSE ROTATION<br>ANGLE, $\theta$ |
|-------------|-------------------------------|-----------------------------------------|------------------|------------------|-------------------------------------|
| 4000K       | Single 3-step MacAdam ellipse | (0.3818, 0.3797)                        | 0.00939          | 0.00402          | 53.72°                              |
| 4000K       | Single 5-step MacAdam ellipse | (0.3818, 0.3797)                        | 0.01565          | 0.00670          | 53.72°                              |

Notes for Table 9b:

1. Lumileds maintains a tolerance of  $\pm 0.007$  on x and y color coordinates in the CIE 1931 color space.

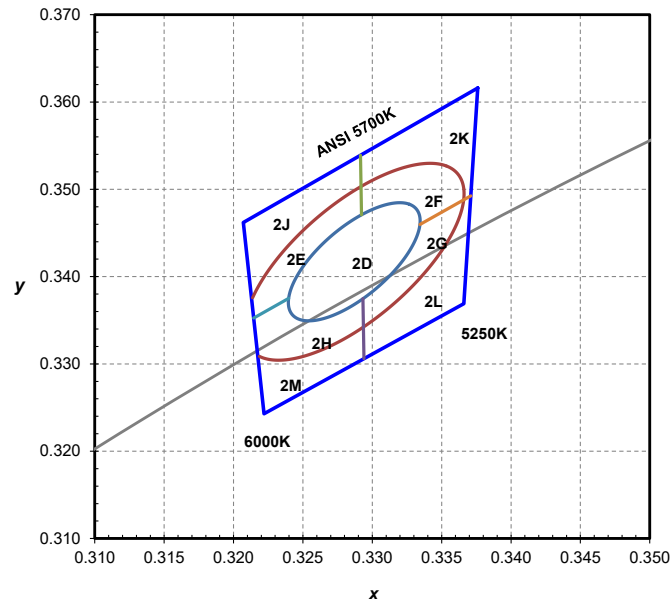


Figure 15c. 1/9<sup>th</sup> color bin structure for LUXEON 2835E and LUXEON 2835C 5700K at test current and binning temperature of  $T_j=25^{\circ}\text{C}$ .

Table 9c. 3- and 5-step MacAdam ellipse color bin definitions for LUXEON 2835E and LUXEON 2835C 5700K, at test and binning conditions.

| NOMINAL CCT | COLOR SPACE                   | CENTER POINT <sup>[1]</sup><br>(cx, cy) | MAJOR AXIS,<br>a | MINOR AXIS,<br>b | ELLIPSE ROTATION<br>ANGLE, $\theta$ |
|-------------|-------------------------------|-----------------------------------------|------------------|------------------|-------------------------------------|
| 5700K       | Single 3-step MacAdam ellipse | (0.3287, 0.3417)                        | 0.00746          | 0.00320          | 59.09°                              |
| 5700K       | Single 5-step MacAdam ellipse | (0.3287, 0.3417)                        | 0.01243          | 0.00533          | 59.09°                              |

Notes for Table 9c:

1. Lumileds maintains a tolerance of  $\pm 0.007$  on x and y color coordinates in the CIE 1931 color space.

# Peak Wavelength Bins

Table 10a. Peak wavelength bin definitions for LUXEON 2835 Far Red, Deep Red and Royal Blue.

| COLOR      | PART NUMBER        | BIN | PEAK WAVELENGTH <sup>(1)</sup> (nm) |         |
|------------|--------------------|-----|-------------------------------------|---------|
|            |                    |     | MINIMUM                             | MAXIMUM |
| Far Red    | L128-FRD1003500000 | 10  | 720                                 | 740     |
| Deep Red   | L128-DRD1003500000 | 10  | 650                                 | 670     |
| Royal Blue | L128-RYL1003500000 | 30  | 440                                 | 445     |
|            |                    | 40  | 445                                 | 450     |
|            |                    | 50  | 450                                 | 455     |

Notes for Table 10a:  
1. Lumileds maintains a tolerance of ±0.5nm on peak wavelength measurements.

Table 10b. Peak wavelength bin definitions for LUXEON 2835 Color 36V Royal Blue.

| COLOR      | PART NUMBER        | BIN | PEAK WAVELENGTH <sup>(1)</sup> (nm) |         |
|------------|--------------------|-----|-------------------------------------|---------|
|            |                    |     | MINIMUM                             | MAXIMUM |
| Royal Blue | L128-RYL1003500000 | 30  | 440                                 | 445     |
|            |                    | 40  | 445                                 | 450     |
|            |                    | 50  | 450                                 | 455     |

Notes for Table 10b:  
1. Lumileds maintains a tolerance of ±0.5nm on peak wavelength measurements.

# Dominant Wavelength Bins

Table 11. Dominant wavelength bin definitions for LUXEON 2835 Red, Red-Orange, Green, Cyan and Blue.

| COLOR      | PART NUMBER                               | BIN | DOMINANT WAVELENGTH <sup>(1)</sup> (nm) |         |
|------------|-------------------------------------------|-----|-----------------------------------------|---------|
|            |                                           |     | MINIMUM                                 | MAXIMUM |
| Red        | L128-RED1003500000                        | 40  | 620                                     | 630     |
| Red-Orange | L128-RNG1003500000                        | 20  | 610                                     | 620     |
| Green      | L128-GRN1003500000/<br>L128-GRN2003500000 | 10  | 520                                     | 525     |
|            |                                           | 20  | 525                                     | 530     |
|            |                                           | 30  | 530                                     | 535     |
|            |                                           | 40  | 535                                     | 540     |
| Cyan       | L128-CYN1003500000                        | 10  | 490                                     | 495     |
|            |                                           | 20  | 495                                     | 500     |
|            |                                           | 30  | 500                                     | 505     |
|            |                                           | 40  | 505                                     | 510     |
| Blue       | L128-BLU1003500000                        | 20  | 469                                     | 475     |
|            |                                           | 30  | 475                                     | 480     |

Notes for Table 11:  
1. Lumileds maintains a tolerance of ±1nm on dominant wavelength measurements.

# Forward Voltage Bins

Table 12a. Forward voltage bin definitions for LUXEON 2835 Far Red, Deep Red, Red and Red-Orange.

| BIN | FORWARD VOLTAGE <sup>(1)</sup> (V <sub>F</sub> ) |         |
|-----|--------------------------------------------------|---------|
|     | MINIMUM                                          | MAXIMUM |
| B   | 1.80                                             | 2.00    |
| C   | 2.00                                             | 2.20    |
| D   | 2.20                                             | 2.40    |
| E   | 2.40                                             | 2.60    |

Table 12b. Forward voltage bin definitions for LUXEON 2835 PC Red-Orange, PC Amber, Mint, Lime, Green, Green 2, Cyan, Blue, Royal Blue and White.

| BIN | FORWARD VOLTAGE <sup>(1)</sup> (V <sub>F</sub> ) |         |
|-----|--------------------------------------------------|---------|
|     | MINIMUM                                          | MAXIMUM |
| X   | 2.50                                             | 2.60    |
| Y   | 2.60                                             | 2.70    |
| Z   | 2.70                                             | 2.80    |
| A   | 2.80                                             | 2.90    |
| B   | 2.90                                             | 3.00    |
| C   | 3.00                                             | 3.10    |
| D   | 3.10                                             | 3.20    |
| E   | 3.20                                             | 3.30    |

Table 12c. Forward voltage bin definitions for LUXEON 2835 Color 36V.

| BIN | FORWARD VOLTAGE <sup>(1)</sup> (V <sub>F</sub> ) |         |
|-----|--------------------------------------------------|---------|
|     | MINIMUM                                          | MAXIMUM |
| A   | 35.0                                             | 35.5    |
| B   | 35.5                                             | 36.0    |
| C   | 36.0                                             | 36.5    |
| D   | 36.5                                             | 37.0    |
| E   | 37.0                                             | 37.5    |

Notes for Tables 12a, 12b and 12c:  
1. Lumileds maintains a tolerance of ±0.1V on forward voltage measurements.

# Mechanical Dimensions

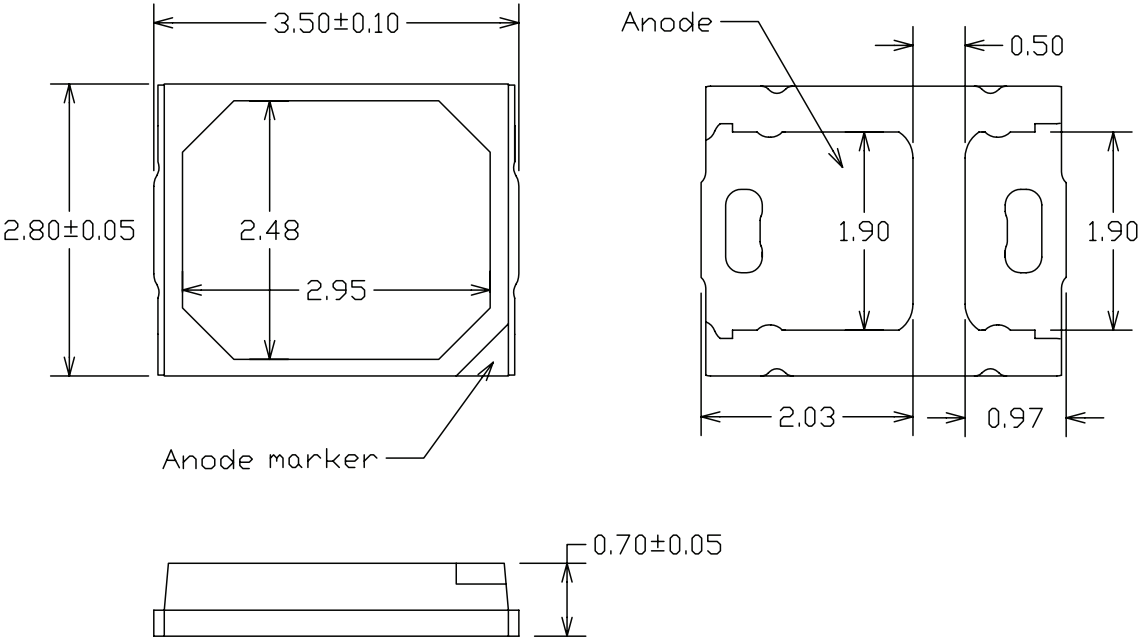


Figure 16. Mechanical dimensions for LUXEON 2835 Color Line.

- Notes for Figure 16:
- 1. Drawings are not to scale.
  - 2. All dimensions are in millimeters.
  - 3. Tolerance of  $\pm 0.1$  mm.

# Reflow Soldering Guidelines

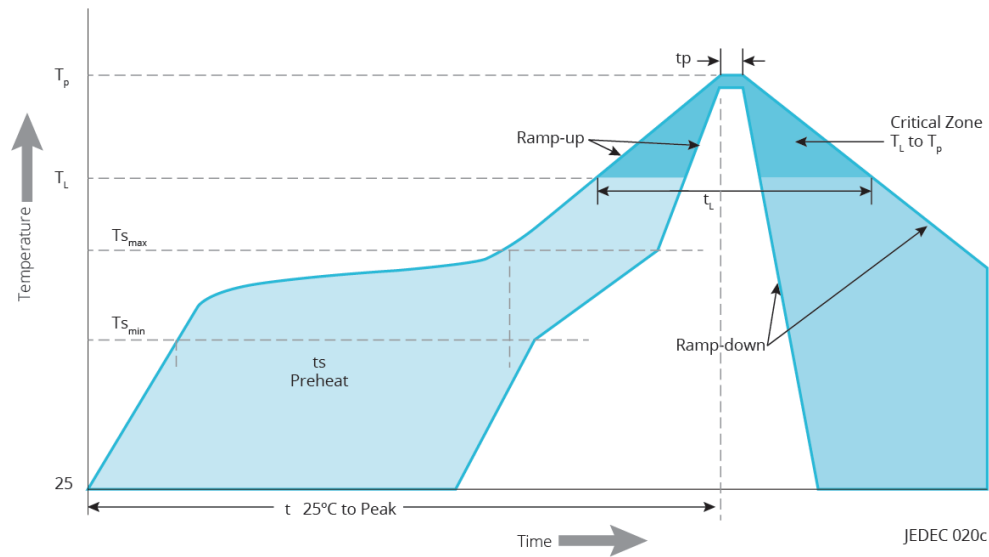


Figure 17. Visualization of the acceptable reflow temperature profile as specified in Table 12.

Table 13. Reflow profile characteristics for LUXEON 2835 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 14. Moisture sensitivity levels for LUXEON 2835 Color Line.

| LEVEL | FLOOR LIFE |                | SOAK REQUIREMENTS STANDARD |               |
|-------|------------|----------------|----------------------------|---------------|
|       | TIME       | CONDITIONS     | TIME                       | CONDITIONS    |
| 3     | 168 Hours  | ≤30°C / 60% RH | 192 Hours +5 / -0          | 30°C / 60% RH |

## Solder Pad Design

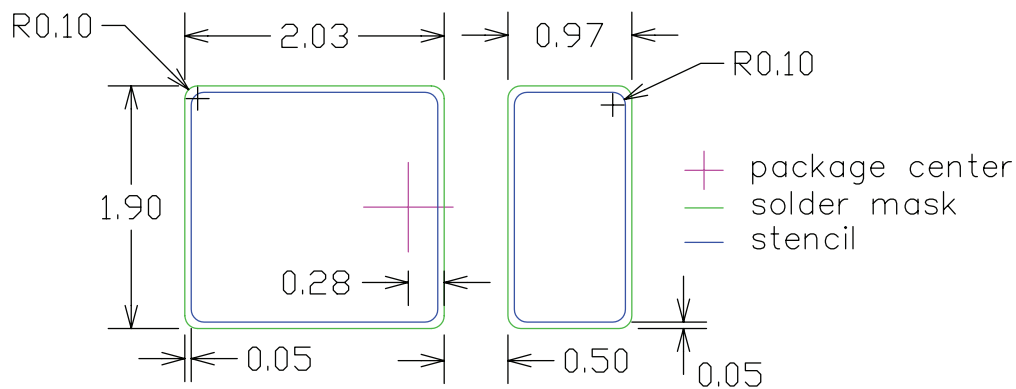


Figure 18. Recommended PCB solder pad layout for LUXEON 2835 Color Line.

Notes for Figure 18:

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

## Packaging Information

## Pocket Tape Dimensions

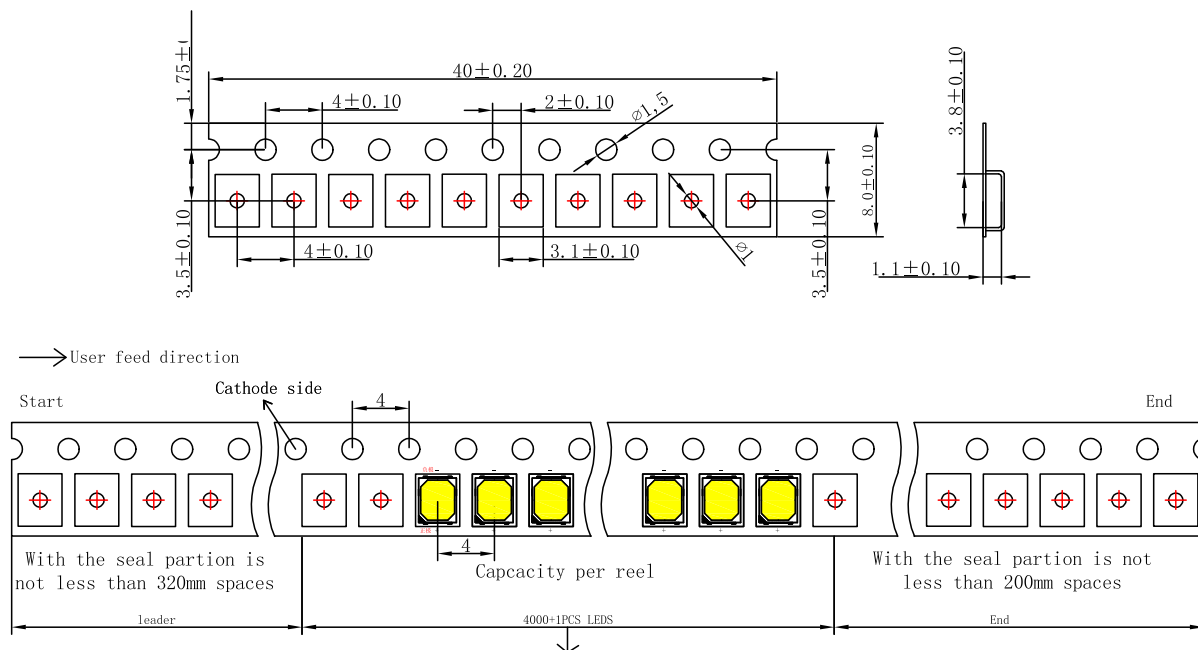


Figure 19. Pocket Tape dimensions for LUXEON 2835 Color Line.

Notes for Figure 19:

1. Drawings are not to scale.
2. All dimensions are in millimeters.
3. Empty components pockets sealed with top cover tape.

Reel Dimensions

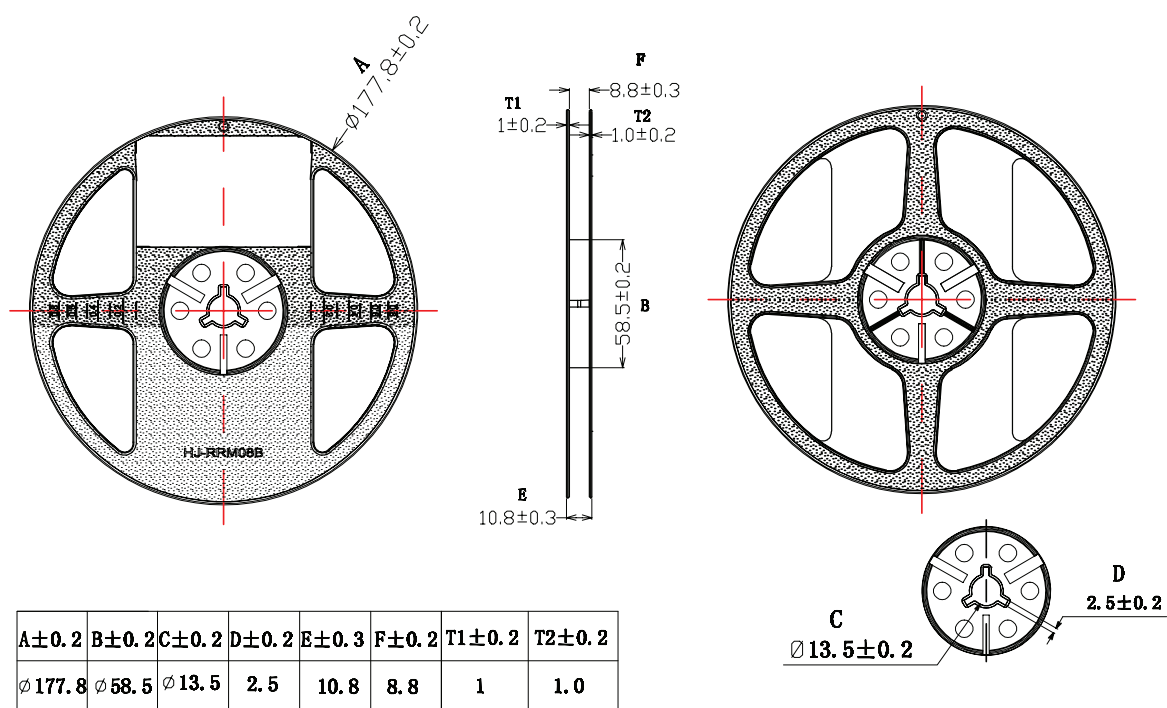


Figure 20. Reel dimensions for LUXEON 2835 Color Line.

- Notes for Figure 20:
- 1. Dra1 wings are not to scale.
  - 2. All dimensions are in millimeters.
  - 3. Empty component pockets sealed with top cover tape.
  - 4. 329mm reel — 4,000 pieces per reel.
  - 5. Minimum packing quantity is 4,000 pieces.
  - 6. The maximum number of consecutive missing LEDs is two.
  - 7. In accordance with EIA-481-1-B specification.

## About Lumileds

Companies developing automotive, mobile, IoT and illumination lighting applications need a partner who can collaborate with them to push the boundaries of light. With over 100 years of inventions and industry firsts, Lumileds is a global lighting solutions company that helps customers around the world deliver differentiated solutions to gain and maintain a competitive edge. As the inventor of Xenon technology, a pioneer in halogen lighting and the leader in high performance LEDs, Lumileds builds innovation, quality and reliability into its technology, products and every customer engagement. Together with its customers, Lumileds is making the world better, safer, more beautiful—with light.

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