

LUXEON 3535L Color Line

Color LEDs that deliver the perfect amount of color you need. No More. No less.

The LUXEON 3535L 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 3535L Color Line enables RGBW applications. This product line extends the comprehensive LUXEON Color Family.



FEATURES AND BENEFITS

- Industry standard package enables drop-in replacement for existing 3535 packages
- Single die and single source architecture for optical control
- Common focal length with LUXEON Rebel and LUXEON Z Color LEDs
- Full color palette for a wider spectrum range

PRIMARY APPLICATIONS

- Architectural & Entertainment
- Lamps
 - Color Tunable Illumination
- Specialty Lighting
 - Emergency Vehicle
 - Signage

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General Product Information

Product Test Conditions

LUXEON 3535L Color Line LEDs are tested and binned with a 20ms monopulse of 100mA at a junction temperature, T_j , of 25°C.

Part Number Nomenclature

Part numbers for LUXEON 3535L Color Line follow the convention below:

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

Where:

A A A A – designates color (R625=Red, O615=Red Orange, A589=PC Amber, L567=Lime, G525=Green, B475=Blue, U450=Royal Blue)

B – designates a Lumileds internal code (either 0 or 1)

Therefore, the following part number is used for a Red LUXEON 3535L:

L 1 3 5 – **R 6 2 5** 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 3535L 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 1. Product performance of LUXEON 3535L Color Line at 100mA, T_j=25°C.

| COLOR | DOMINANT or PEAK WAVELENGTH ^[1] (nm) | | LUMINOUS FLUX ^[2] (lm) or RADIOMETRIC POWER ^[3] (mW) | | PART NUMBER |
|------------|--|---------|---|---------|--------------------|
| | MINIMUM | MAXIMUM | MINIMUM | TYPICAL | |
| Red | 620 | 630 | 10.0 | 13.5 | L135-R625003500000 |
| Red-Orange | 610 | 620 | 13.0 | 15.5 | L135-O615003500000 |
| PC Amber | – | – | 24.0 | 35.0 | L135-A589003500000 |
| Lime | – | – | 44.0 | 56.0 | L135-L567003500000 |
| Green | 520 | 540 | 21.0 | 35.0 | L135-G525003500000 |
| Blue | 469 | 480 | 8.2 | 11.0 | L135-B475003500000 |
| Royal Blue | 440 | 455 | 130 | 155 | L135-U450003500000 |

Notes for Table 1:

1. Lumileds maintains a tolerance of ±1nm on dominant wavelength measurements. PC Amber and Lime are binned by chromaticity coordinates. Royal Blue is binned by peak wavelength. All other colors are binned by dominant wavelength.
2. Lumileds maintains a tolerance of ±7.5% on luminous flux measurements.
3. Royal Blue is binned by radiometric power. All other colors are binned by luminous flux.

Optical Characteristics

Table 2. Optical characteristics for LUXEON 3535L Color Line at 100mA, T_j=25°C.

| COLOR | PART NUMBER | TYPICAL SPECTRAL HALF-WIDTH ^[1] (nm) | TYPICAL TEMPERATURE COEFFICIENT OF DOMINANT WAVELENGTH (nm/°C) | TYPICAL TOTAL INCLUDED ANGLE ^[2] | TYPICAL VIEWING ANGLE ^[3] |
|------------|--------------------|---|--|--|---|
| Red | L135-R625003500000 | 20 | 0.04 | 140° | 115° |
| Red-Orange | L135-O615003500000 | 20 | 0.07 | 140° | 115° |
| PC Amber | L135-A589003500000 | 95 | 0.01 | 140° | 115° |
| Lime | L135-L567003500000 | 110 | 0.01 | 140° | 115° |
| Green | L135-G525003500000 | 35 | 0.04 | 140° | 115° |
| Blue | L135-B475003500000 | 25 | 0.04 | 140° | 115° |
| Royal Blue | L135-U450003500000 | 25 | 0.04 | 140° | 115° |

Notes for Table 2:

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 3535L Color Line at 100mA, T_j=25°C.

| COLOR | PART NUMBER | FORWARD VOLTAGE ^[1] (V) | | | TYPICAL TEMPERATURE COEFFICIENT OF FORWARD VOLTAGE ^[2] (mV/°C) | TYPICAL THERMAL RESISTANCE — JUNCTION TO SOLDER PAD (°C/W) |
|------------|--------------------|------------------------------------|---------|---------|---|--|
| | | MINIMUM | TYPICAL | MAXIMUM | | |
| Red | L135-R625003500000 | 1.75 | 2.10 | 2.50 | -2.0 | 20 |
| Red-Orange | L135-O615003500000 | 1.75 | 2.10 | 2.50 | -1.7 | 20 |
| PC Amber | L135-A589003500000 | 2.80 | 3.05 | 3.50 | -1.7 | 25 |
| Lime | L135-L567003500000 | 2.80 | 3.05 | 3.50 | -1.7 | 25 |
| Green | L135-G525003500000 | 2.50 | 3.20 | 3.50 | -3.0 | 42 |
| Blue | L135-B475003500000 | 2.50 | 3.00 | 3.50 | -2.5 | 35 |
| Royal Blue | L135-U450003500000 | 2.50 | 3.05 | 3.50 | -2.5 | 35 |

Notes for Table 3:

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

Absolute Maximum Ratings

Table 4. Absolute maximum ratings for LUXEON 3535L Color Line.

| PARAMETER | RED AND RED-ORANGE | PC AMBER AND LIME | GREEN | BLUE AND ROYAL BLUE |
|--|---|----------------------|---------------|------------------------|
| DC Forward Current ^[1,2] | 125mA | 200mA | 200mA | 200mA |
| Peak Pulsed Forward Current ^[1,3] | 300mA | 240mA | 300mA | 480mA |
| LED Junction Temperature ^[1] (DC & Pulse) | 125°C | 125°C | 115°C | 125°C |
| ESD Sensitivity (ANSI/ESDA/JEDEC JS-001-2012) | Class 2 | Class 2 | Class 2 | Class 2 |
| Operating Case Temperature ^[1] | 105°C | 105°C | 95°C | 95°C |
| LED Storage Temperature | -40°C to 105°C | -40°C to 105°C | -40°C to 95°C | -40°C to 95°C |
| Soldering Temperature | JEDEC 020c 260°C | | | |
| Allowable Reflow Cycles | 3 | | | |
| Reverse Voltage (V _{reverse}) | LUXEON 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

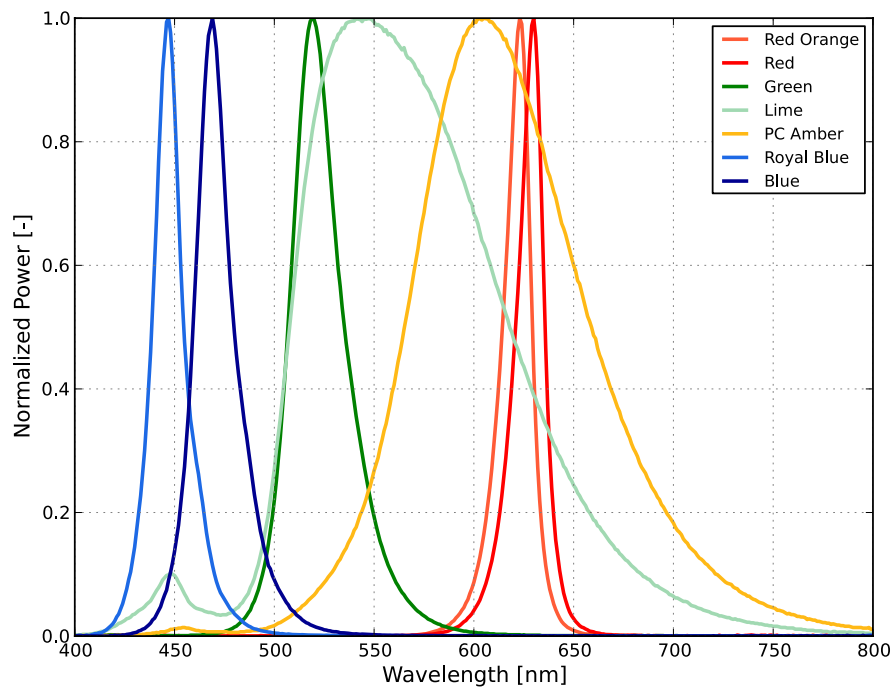


Figure 1. Typical normalized power vs. wavelength for LUXEON 3535L Color Line at 100mA, $T_j=25^{\circ}\text{C}$.

Light Output Characteristics

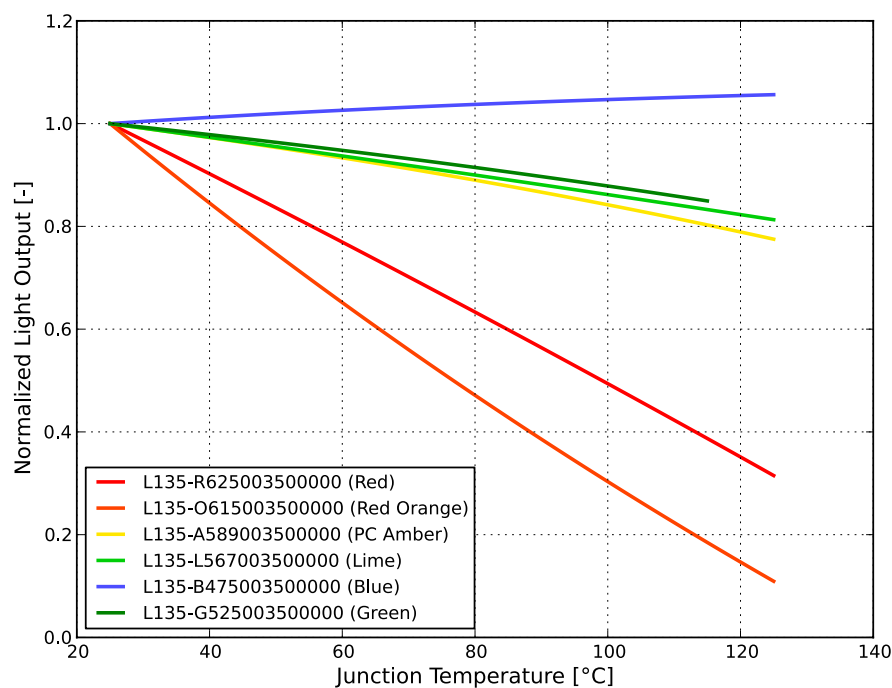


Figure 2a. Typical normalized light output vs. junction temperature for LUXEON 3535L Red, Red-Orange, PC Amber, Lime, Blue, Green at 100mA.

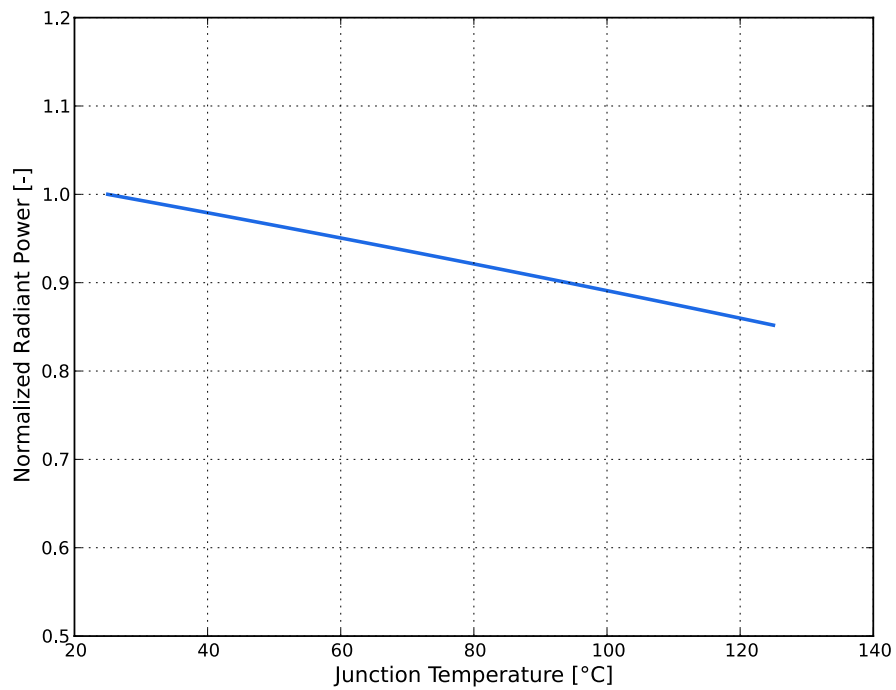


Figure 2b. Typical normalized light output vs. junction temperature for LUXEON 3535L Royal Blue at 100mA.

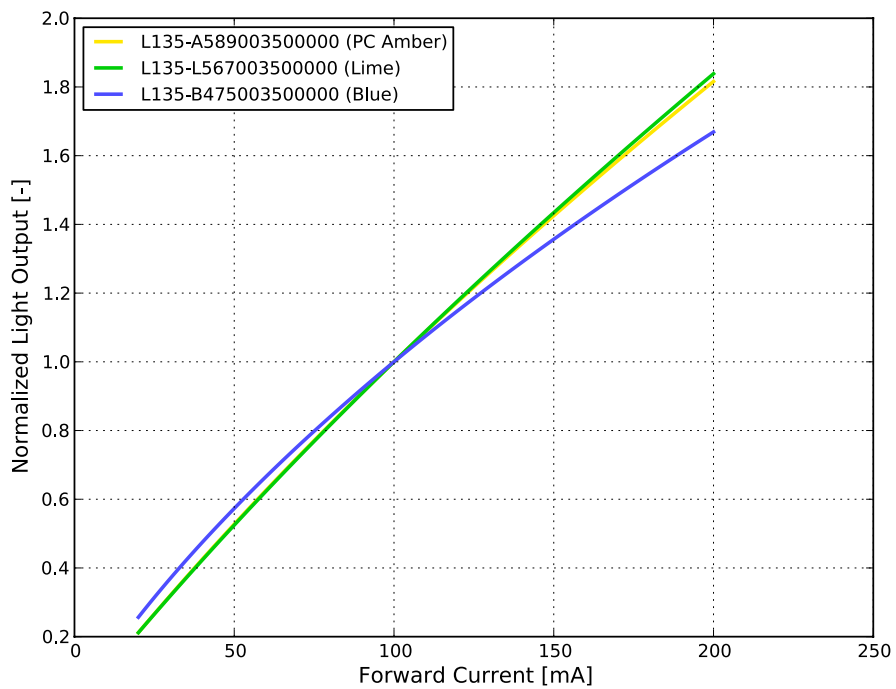


Figure 3a. Typical normalized light output vs. forward current for LUXEON 3535L PC Amber, Lime and Blue at $T_j=25^{\circ}\text{C}$.

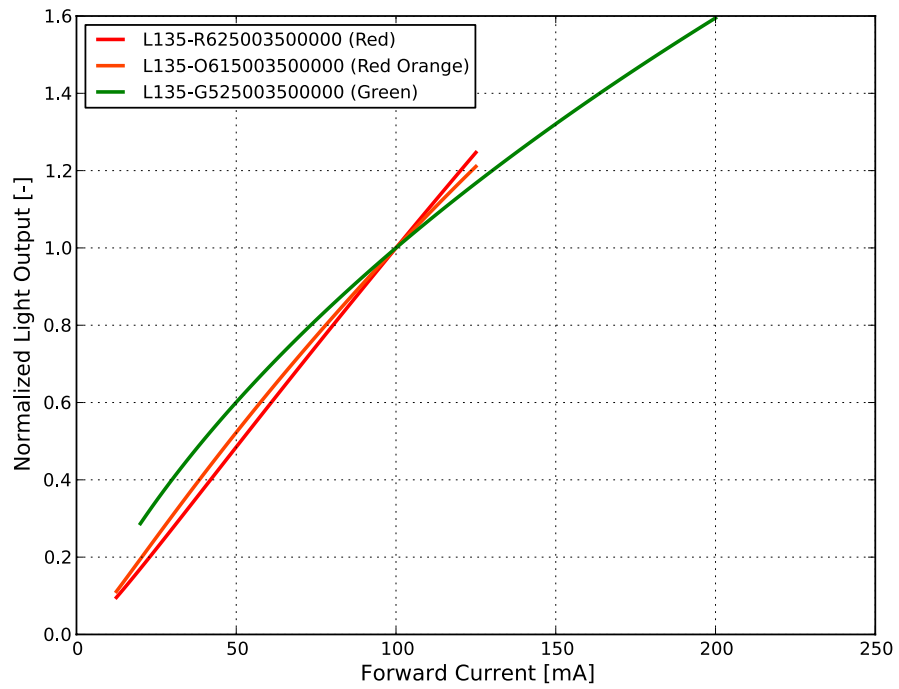


Figure 3b. Typical normalized light output vs. forward current for LUXEON 3535L Red, Red-Orange, Green at $T_j=25^{\circ}\text{C}$.

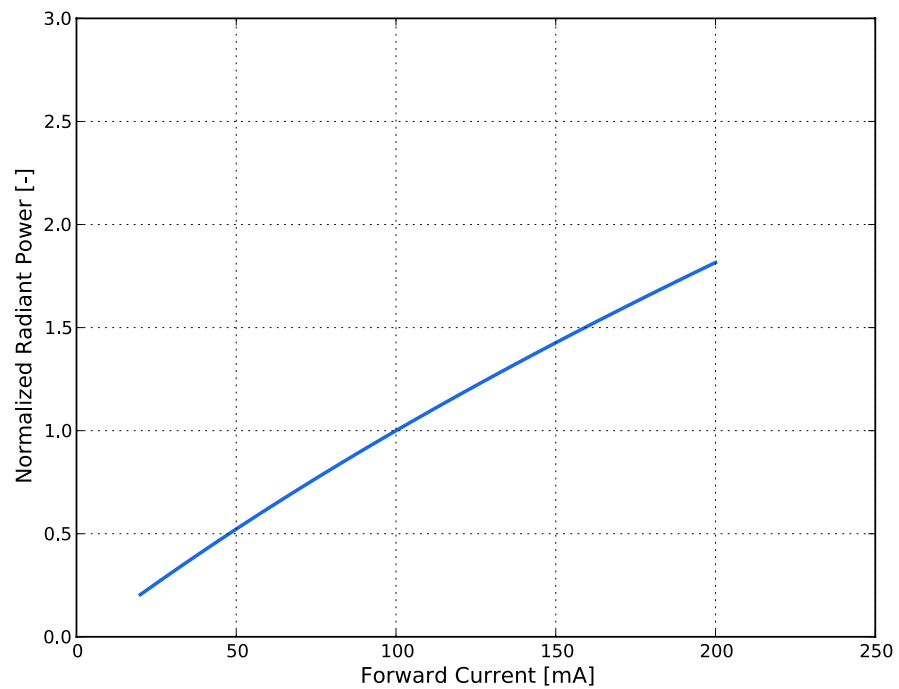


Figure 3c. Typical normalized light output vs. forward current for LUXEON 3535L Royal Blue at $T_j=25^{\circ}\text{C}$.

Forward Current Characteristics

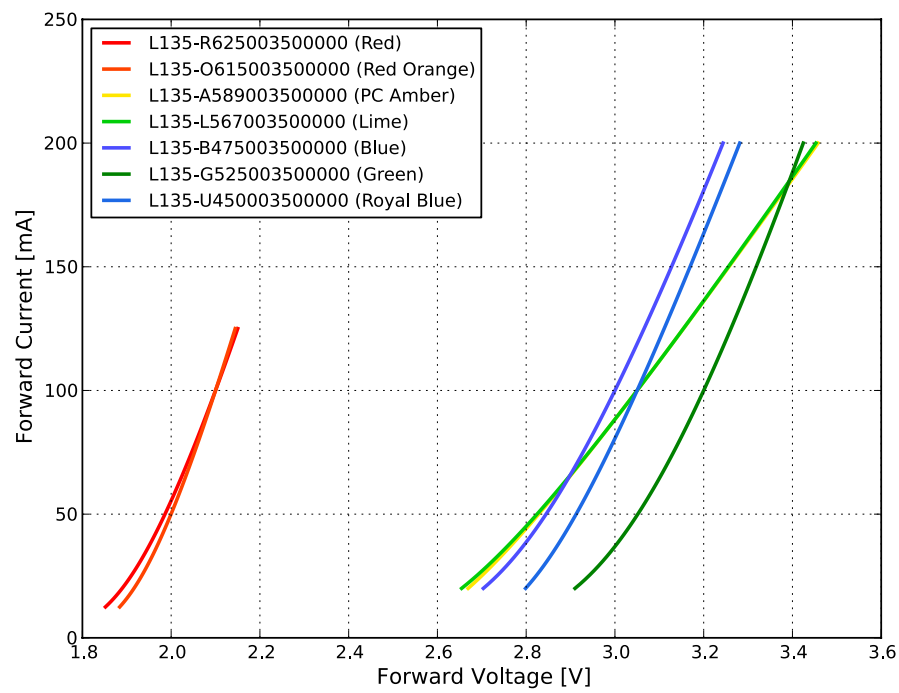


Figure 4. Typical forward current vs. forward voltage for LUXEON 3535L Color Line at $T_j=25^{\circ}\text{C}$.

Radiation Pattern Characteristics

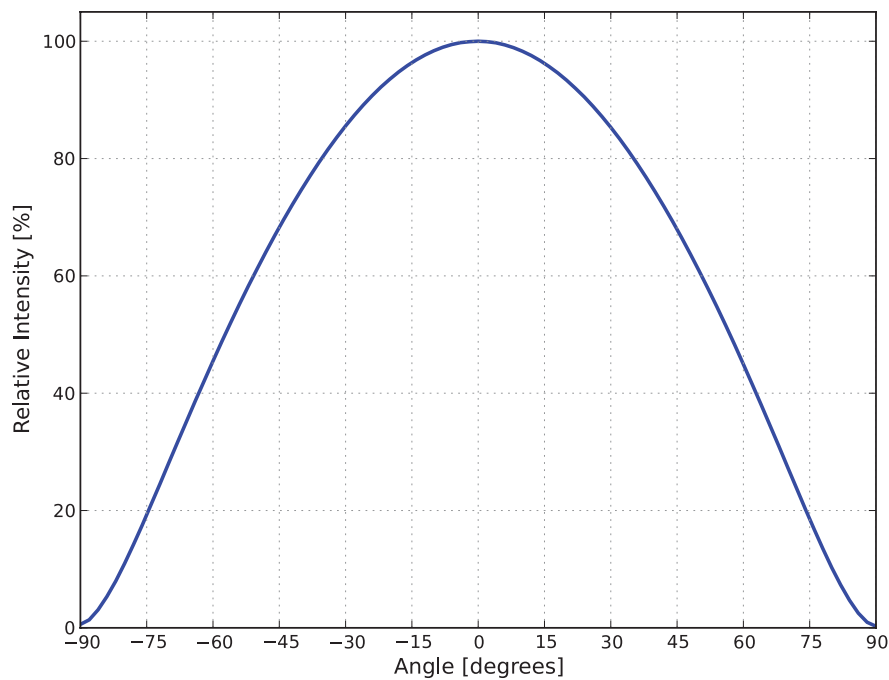


Figure 5. Typical radiation pattern for LUXEON 3535L Color Line at 100mA, $T_j=25^{\circ}\text{C}$.

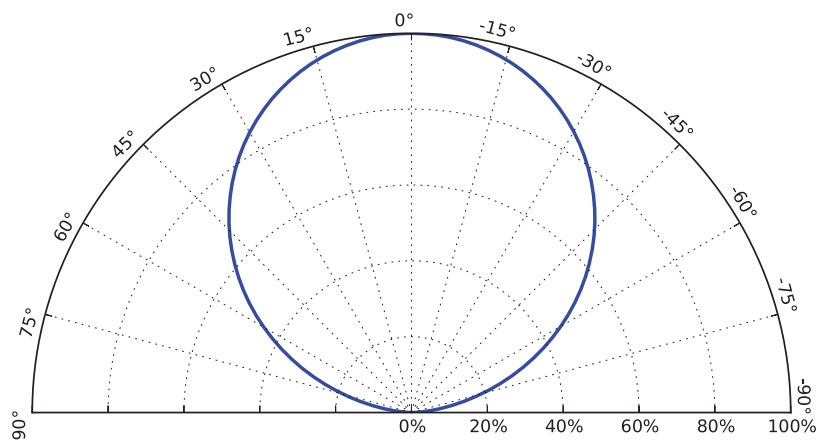


Figure 6. Typical polar radiation pattern for LUXEON 3535L Color Line at 100mA, $T_j=25^{\circ}\text{C}$.

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 3535L Red, Red-Orange, Green, Blue and Royal Blue LEDs are labeled using a 3-digit alphanumeric CAT code following the format below:

A B C

Where:

- A** – designates luminous flux bin (example: L=32.0 to 36.0 lumens, R=48.0 to 52.0 lumens)
- B** – designates radiometric bin (example: B, C, D, E, F, G, H) or dominant/peak wavelength bin (example: 1, 2, 3, 4, 5)
- C** – designates forward voltage bin (example: C=2.00 to 2.25V, G=3.00 to 3.25V)

Therefore, a Red-Orange LUXEON 3535L LED with a lumen range of 15.0 to 17.0, dominant wavelength range of 610 to 620nm and a forward voltage range of 2.00 to 2.25V has the following CAT code:

E 2 C

LUXEON 3535L PC Amber and Lime LEDs are labeled using a 4-digit alphanumeric CAT code following the format below:

A B C D

Where:

- A** – designates luminous flux bin (example: L=32.0 to 36.0 lumens, R=48.0 to 52.0 lumens)
- B C** – designates color bin (example: A0, L0 or L1)
- D** – designates forward voltage bin (example: W=3.00 to 3.10V, Z=3.30 to 3.50V)

Therefore, a Lime LUXEON 3535L LED with a lumen range of 32.0 to 36.0, color bin of L0 and a forward voltage range of 3.00 to 3.10V has the following CAT code:

L L 0 W

Luminous Flux Bins

Table 5 lists the standard luminous flux bins for LUXEON 3535L 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 3535L Color Line, at $T_j=25^{\circ}\text{C}$.

| BIN | LUMINOUS FLUX ^[1] (lm) | |
|-----|-----------------------------------|---------|
| | MINIMUM | MAXIMUM |
| A | 8.2 | 10.0 |
| B | 10.0 | 11.5 |
| C | 11.5 | 13.0 |
| D | 13.0 | 15.0 |
| E | 15.0 | 17.0 |
| F | 17.0 | 19.0 |
| G | 19.0 | 21.0 |
| H | 21.0 | 24.0 |
| J | 24.0 | 28.0 |
| K | 28.0 | 32.0 |
| L | 32.0 | 36.0 |
| M | 36.0 | 40.0 |
| P | 40.0 | 44.0 |
| Q | 44.0 | 48.0 |
| R | 48.0 | 52.0 |
| S | 52.0 | 56.0 |
| T | 56.0 | 60.0 |
| V | 60.0 | 65.0 |
| W | 65.0 | 70.0 |

Notes for Table 5:

1. Lumileds maintains a tolerance of $\pm 7.5\%$ on luminous flux measurements.

Radiometric Power Bins

Table 6. Radiometric power bin definitions for LUXEON 3535L Color Line.

| BIN | RADIOMETRIC POWER ^[1] (mW) | |
|-----|---------------------------------------|---------|
| | MINIMUM | MAXIMUM |
| B | 130 | 140 |
| C | 140 | 150 |
| D | 150 | 160 |
| E | 160 | 170 |
| F | 170 | 180 |
| G | 180 | 190 |
| H | 190 | 200 |

Notes for Table 6:

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

Dominant Wavelength Bins

Table 7. Dominant wavelength bin definitions for LUXEON 3535L Red, Red-Orange, Green and Blue.

| COLOR | PART NUMBER | BIN | DOMINANT WAVELENGTH ⁽¹⁾ (nm) | |
|------------|--------------------|-----|---|---------|
| | | | MINIMUM | MAXIMUM |
| Red | L135-R625003500000 | 4 | 620 | 630 |
| Red-Orange | L135-O615003500000 | 2 | 610 | 620 |
| Green | L135-G525003500000 | 1 | 520 | 525 |
| | | 2 | 525 | 530 |
| | | 3 | 530 | 535 |
| | | 4 | 535 | 540 |
| Blue | L135-B475003500000 | 3 | 469 | 475 |
| | | 4 | 475 | 480 |

Notes for Table 7:

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

Peak Wavelength Bins

Table 8. Peak wavelength bin definitions for LUXEON 3535L Royal Blue.

| COLOR | PART NUMBER | BIN | PEAK WAVELENGTH ⁽¹⁾ (nm) | |
|------------|--------------------|-----|-------------------------------------|---------|
| | | | MINIMUM | MAXIMUM |
| Royal Blue | L135-U450003500000 | 3 | 440 | 445 |
| | | 4 | 445 | 450 |
| | | 5 | 450 | 455 |

Notes for Table 8:

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

Color Bin Definitions

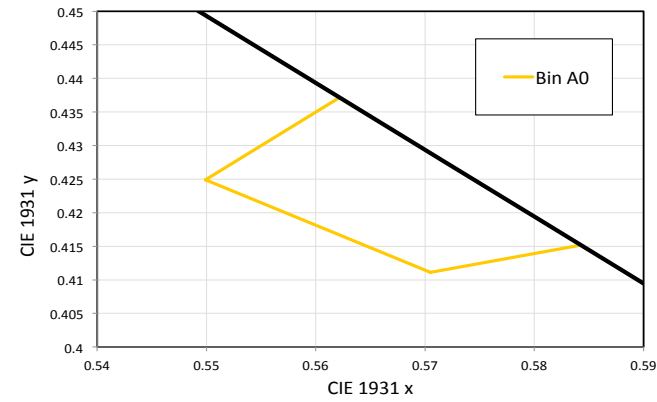


Figure 7. Color Bin Structure for LUXEON 3535L PC Amber for Table 9.

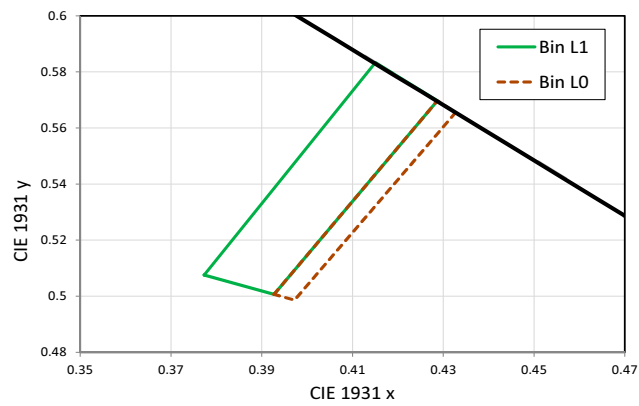


Figure 8. Color Bin Structure for LUXEON 3535L Lime for Table 9.

Table 9. Color bin definitions for LUXEON 3535L PC Amber and Lime.

| COLOR | PART NUMBER | BIN | x | y |
|----------|--------------------|-----|--------|--------|
| PC Amber | L135-A589003500000 | A0 | 0.5622 | 0.4372 |
| | | | 0.5843 | 0.4152 |
| | | | 0.5705 | 0.4111 |
| | | | 0.5499 | 0.4249 |
| Lime | L135-L567003500000 | L0 | 0.3927 | 0.5007 |
| | | | 0.4287 | 0.5697 |
| | | | 0.4327 | 0.5655 |
| | | | 0.3972 | 0.4986 |
| | | L1 | 0.3773 | 0.5076 |
| | | | 0.3927 | 0.5007 |
| | | | 0.4287 | 0.5697 |
| | | | 0.4150 | 0.5833 |

Notes for Table 9:
1. Lumileds maintains a tolerance of ±0.01 on x and y coordinates in the CIE 1931 color space.

Forward Voltage Bins

Table 10a. Forward voltage bin definitions for LUXEON 3535L Red, Red-Orange, Green, Blue and Royal Blue.

| BIN | FORWARD VOLTAGE ⁽¹⁾ (V _F) | |
|-----|--|---------|
| | MINIMUM | MAXIMUM |
| A | 1.50 | 1.75 |
| B | 1.75 | 2.00 |
| C | 2.00 | 2.25 |
| D | 2.25 | 2.50 |
| E | 2.50 | 2.75 |
| F | 2.75 | 3.00 |
| G | 3.00 | 3.25 |
| H | 3.25 | 3.50 |

Table 10b. Forward voltage bin definitions for LUXEON 3535L PC Amber and Lime.

| BIN | FORWARD VOLTAGE ⁽¹⁾ (V _F) | |
|-----|--|---------|
| | MINIMUM | MAXIMUM |
| T | 2.80 | 2.90 |
| V | 2.90 | 3.00 |
| W | 3.00 | 3.10 |
| X | 3.10 | 3.20 |
| Y | 3.20 | 3.30 |
| Z | 3.30 | 3.50 |

Notes for Tables 10a and 10b:

1. Lumileds maintains a tolerance of $\pm 0.1V$ on forward voltage measurements.

Mechanical Dimensions

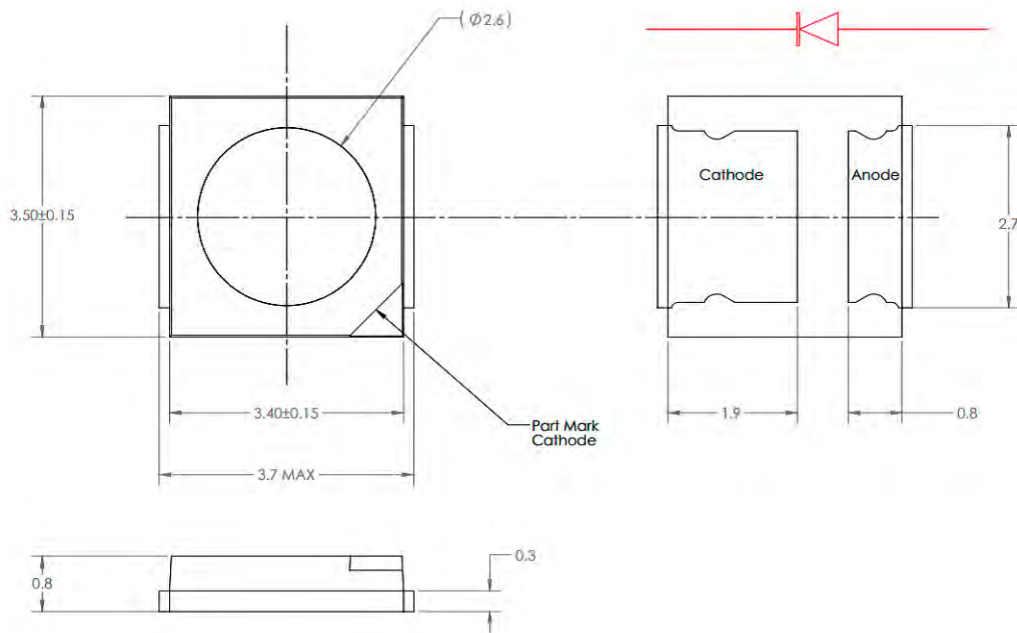


Figure 9. Mechanical dimensions for LUXEON 3535L Color Line.

Notes for Figure 9:

1. Drawings are not to scale.
2. All dimensions are in millimeters.
3. Tolerance of $\pm 0.1mm$.

Reflow Soldering Guidelines

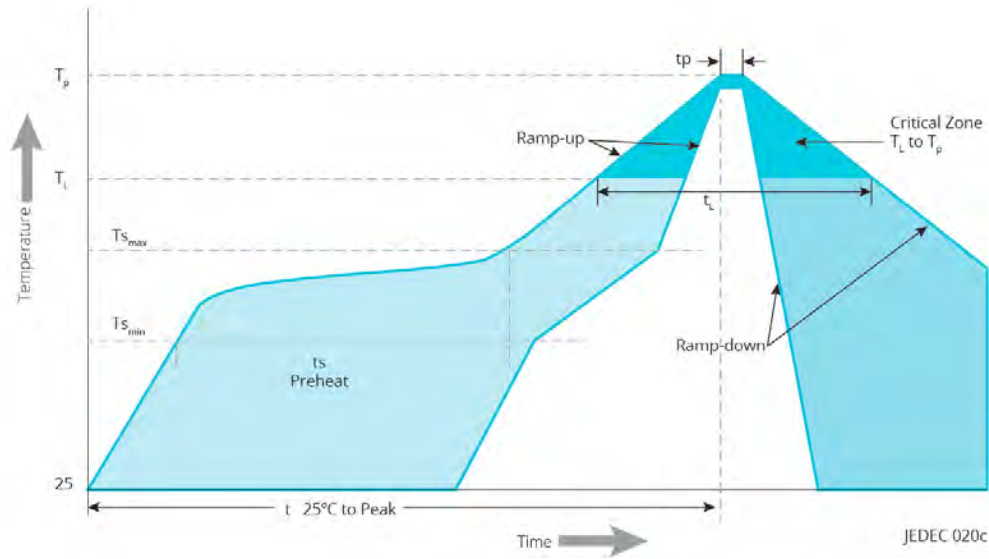


Figure 10. Visualization of the acceptable reflow temperature profile as specified in Table 11.

Table 11. Reflow profile characteristics for LUXEON 3535L 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) | 10 to 30 seconds |
| Peak / Classification Temperature (T_p) | 260°C |
| Time Within 5°C of Actual Temperature (t_p) | 30 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 12. Moisture sensitivity levels for LUXEON 3535L Color Line.

| LEVEL | FLOOR LIFE | | SOAK REQUIREMENTS STANDARD | |
|-------|------------|----------------|----------------------------|----------------|
| | TIME | CONDITIONS | TIME | CONDITIONS |
| 2 | 1 Year | ≤30°C / 60% RH | 168 Hours +5 / -0 | ≤85°C / 60% RH |

Solder Pad Design

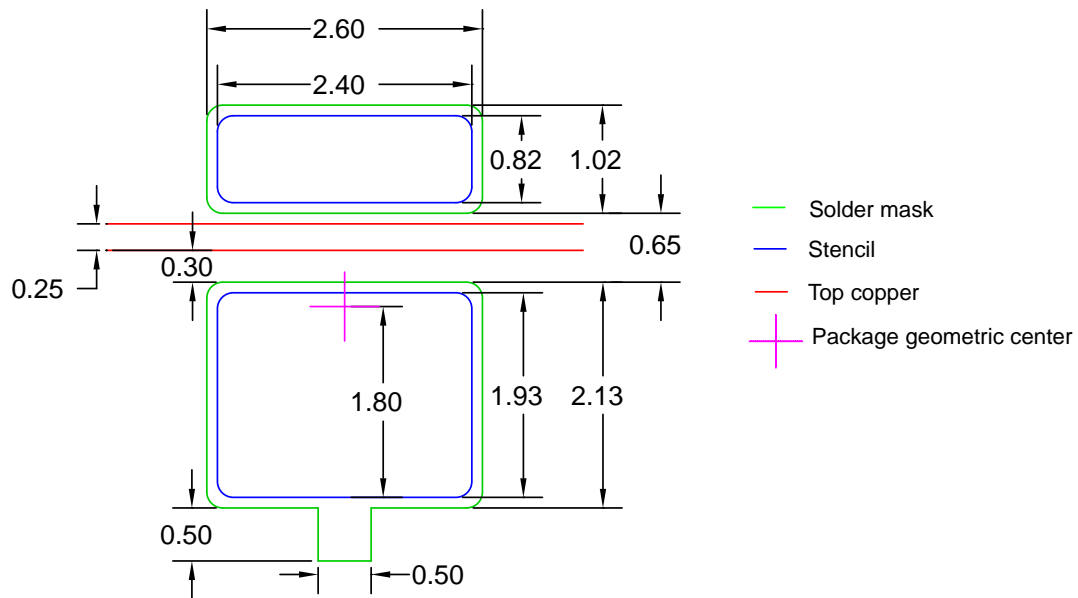


Figure 11. Recommended PCB solder pad layout for LUXEON 3535L Color Line.

Notes for Figure 11:

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

Packaging Information

Pocket Tape Dimensions

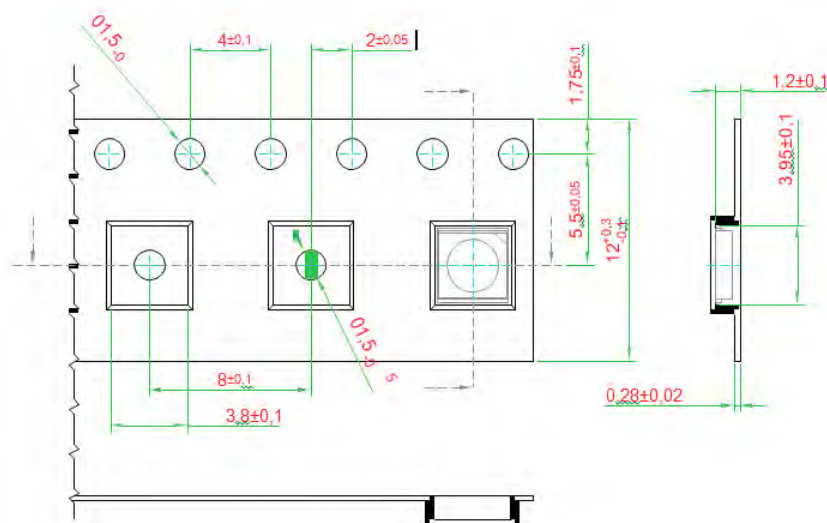


Figure 12. Pocket Tape dimensions for LUXEON 3535L Color Line.

Notes for Figure 12:

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

Reel Dimensions

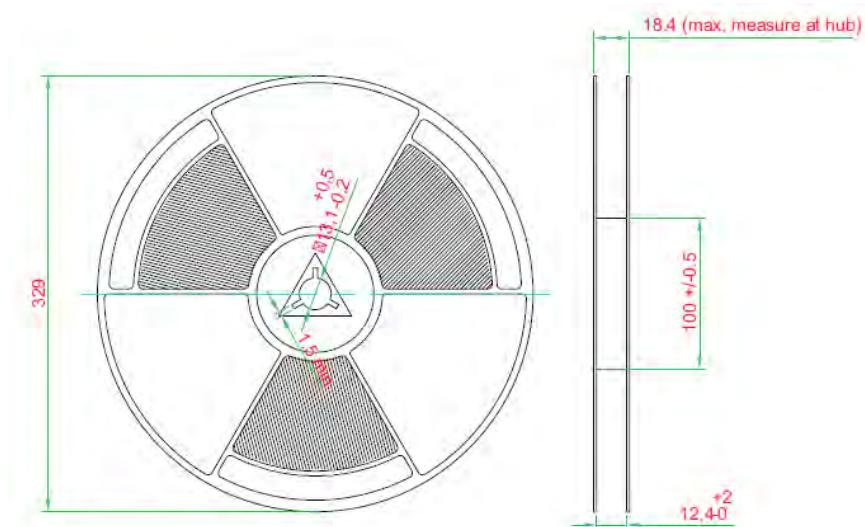


Figure 13. Reel dimensions for LUXEON 3535L Color Line.

Notes for Figure 13:

1. Drawings are not to scale.
2. All dimensions are in millimeters.
3. Empty component pockets sealed with top cover tape.
4. 329 mm reel — 5000 pieces per reel.
5. Minimum packing quantity is 5000 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.

To learn more about our lighting solutions, visit lumileds.com.



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