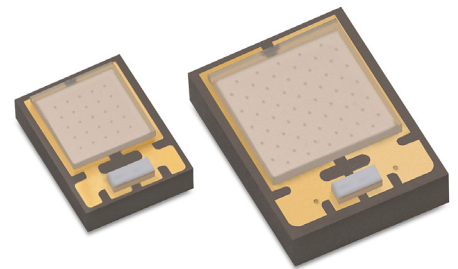




# LUXEON UV U Line

Highest power density, superior efficiency, powered by leading Chip Scale Package (CSP) technology

At a micro package size compared to other ultraviolet and violet LEDs, LUXEON UV U Line LEDs are SMT devices that can be assembled in tight arrays with spacing of only 200 microns, which enables high power density ( $W/cm^2$ ) systems for superior efficiency and design freedom. These products are undomed for precise optical control and include a portfolio of  $1mm^2$  and  $2mm^2$  die sizes covering ultraviolet and violet light. The superior power density, excellent robustness of CSP technology and real world efficacy enable leading performance and efficient solution development in a wide variety of UV specialty lighting applications.



## FEATURES AND BENEFITS

- Offering ultraviolet in 380-400nm and violet (400–420nm) for a range of options
- Small 2.2 to  $3.6mm^2$  SMT footprint enables highest  $W/cm^2$  power density, design freedom
- 1A per  $mm^2$  die size maximum drive current allows more power per LED
- Up to 50%+ efficiency reduces heat output
- AIN package  $R_{th}$  as low as 1.8 K/W for better thermal management

## PRIMARY APPLICATIONS

- Specialty Lighting
  - Analytical Instrumentation
  - Curing
  - Medical
  - Security
  - UV Photoreaction

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# General Product Information

## Product Test Conditions

LUXEON UV U Line LEDs are tested and binned with a DC drive current of 500mA for LUXEON UV U1 and 1000mA for LUXEON UV U2 at a junction temperature,  $T_j$ , of 25°C.

## Part Number Nomenclature

Part numbers for LUXEON UV U1 follow the convention below:

L H U V – **B B B B** – A **C C C**

Where:

**B B B B** – designates peak wavelength (0385=385nm  $\pm$ 5nm, 0395=395nm  $\pm$ 5nm, 0405=405nm  $\pm$ 5nm, 0415=415nm  $\pm$ 5nm)

**C C C** – designates radiometric power bin (040=400mW, 045=450mW, 060=600mW, 065=650mW, 070=700mW)

Therefore, the following part number is used for a LUXEON UV U1 with a peak wavelength of 395nm and radiometric power bin of 400mW:

L H U V – **0 3 9 5** – A **0 4 0**

Part numbers for LUXEON UV U2 follow the convention below:

L 1 F 3 – U **A A A B** 0 0 0 **C C C C** 0

Where:

**A A A** – designates peak wavelength 380=380nm, 390=390nm, 400=400nm and 410=410nm)

**B** – designates product name and die size (2=LUXEON UV U2 with 2mm<sup>2</sup> die size)

**C C C C** – designates radiometric power bin (0600=600mW, 0800=800mW, 1200=1200mW, 1400=1400mW)

Therefore, the following part number is used for a LUXEON UV U2 with a peak wavelength of 390nm and radiometric power bin of 1000mW:

L 1 F 3 – U **3 9 0 2** 0 0 0 **1 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 UV U 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 UV U1 at 500mA and 1000mA,  $T_j=25^{\circ}\text{C}$ .

PEAK WAVELENGTH <sup>[1]</sup>	TYPICAL RADIOMETRIC POWER <sup>[2]</sup> (mW)		PART NUMBER
	500mA	1000mA	
415 ±5nm	725	1378	LHUV-0415-A070
405 ±5nm	675	1283	LHUV-0405-A065
	725	1378	LHUV-0405-A070
395 ±5nm	625	1188	LHUV-0395-A060
	675	1283	LHUV-0395-A065
385 ±5nm	425	808	LHUV-0385-A040
	475	903	LHUV-0385-A045

**Notes for Table 1a:**

1. Lumileds maintains a tolerance of ±2nm for peak wavelength measurements.
2. Lumileds maintains a tolerance of ±10% for radiometric power measurements.

Table 1b. Product performance of LUXEON UV U2 at 1000mA and 2000mA,  $T_j=25^{\circ}\text{C}$ .

PEAK WAVELENGTH <sup>[1]</sup>	TYPICAL RADIOMETRIC POWER <sup>[2]</sup> (mW)		PART NUMBER
	1000mA	2000mA	
410–420nm	1450	2610	L1F3-U410200014000
400–410nm	1300	2340	L1F3-U400200012000
390–400nm	1300	2340	L1F3-U390200012000
380–390nm	700	1260	L1F3-U380200006000
	900	1620	L1F3-U380200008000

**Notes for Table 1b:**

1. Lumileds maintains a tolerance of ±2nm for peak wavelength measurements.
2. Lumileds maintains a tolerance of ±10% for radiometric power measurements.

## Optical Characteristics

Table 2a. Optical characteristics for LUXEON UV U1 at 500mA,  $T_j=25^\circ\text{C}$ .

PART NUMBER	TYPICAL SPECTRAL HALF-WIDTH (nm)	TYPICAL TEMPERATURE COEFFICIENT OF PEAK WAVELENGTH (nm/°C)	TYPICAL TOTAL INCLUDED ANGLE <sup>[1]</sup>	TYPICAL VIEWING ANGLE <sup>[2]</sup>
LHUV-0415-Axxx	13.7	0.05	170°	140°
LHUV-0405-Axxx	12.0	0.05	170°	140°
LHUV-0395-Axxx	11.0	0.05	170°	140°
LHUV-0385-Axxx	9.0	0.05	170°	140°

**Notes for Table 2a:**

- Total angle at which 90% of total luminous flux is captured.
- 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 UV U2 at 1000mA,  $T_j=25^\circ\text{C}$ .

PART NUMBER	TYPICAL SPECTRAL HALF-WIDTH (nm)	TYPICAL TEMPERATURE COEFFICIENT OF PEAK WAVELENGTH (nm/°C)	TYPICAL TOTAL INCLUDED ANGLE <sup>[1]</sup>	TYPICAL VIEWING ANGLE <sup>[2]</sup>
L1F3-U41020000xxxx	13.7	0.05	165°	138°
L1F3-U40020000xxxx	12.0	0.05	165°	138°
L1F3-U39020000xxxx	11.0	0.05	165°	138°
L1F3-U38020000xxxx	9.0	0.05	165°	138°

**Notes for Table 2a:**

- Total angle at which 90% of total luminous flux is captured.
- 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 UV U1 at 500mA,  $T_j=25^\circ\text{C}$ .

PART NUMBER	FORWARD VOLTAGE <sup>[1]</sup> (V)		TYPICAL TEMPERATURE COEFFICIENT OF FORWARD VOLTAGE <sup>[2]</sup> (mV/°C)	TYPICAL THERMAL RESISTANCE—JUNCTION TO SOLDER PAD (°C/W)
	MINIMUM	MAXIMUM		
LHUV-0415-Axxx	2.9	3.4	-1.6	2.5
LHUV-0405-Axxx	2.9	3.4	-1.3	3.0
LHUV-0395-Axxx	2.9	3.4	-1.4	3.5
LHUV-0385-Axxx	2.9	3.4	-1.5	4.5

**Notes for Table 3a:**

- Lumileds maintains a tolerance of  $\pm 0.05\text{V}$  on forward voltage measurements.
- Measured between  $25^\circ\text{C}$  and  $85^\circ\text{C}$ .

Table 3b. Electrical and thermal characteristics for LUXEON UV U2 at 1000mA,  $T_j=25^\circ\text{C}$ .

PART NUMBER	FORWARD VOLTAGE <sup>[1]</sup> (V)		TYPICAL TEMPERATURE COEFFICIENT OF FORWARD VOLTAGE <sup>[2]</sup> (mV/°C)	TYPICAL THERMAL RESISTANCE—JUNCTION TO SOLDER PAD (°C/W)
	MINIMUM	MAXIMUM		
L1F3-U41020000xxxx	2.8	3.4	-1.0 to -2.0	2.1
L1F3-U40020000xxxx	2.8	3.4	-1.0 to -2.0	2.3
L1F3-U39020000xxxx	2.8	3.4	-1.0 to -2.0	2.5
L1F3-U38020000xxxx	2.8	3.6	-1.0 to -2.0	2.7

**Notes for Table 3b:**

- Lumileds maintains a tolerance of  $\pm 0.05\text{V}$  on forward voltage measurements.
- Measured between  $25^\circ\text{C}$  and  $85^\circ\text{C}$ .

# Absolute Maximum Ratings

Table 4. Absolute maximum ratings for LUXEON UV U Line.

PARAMETER	MAXIMUM PERFORMANCE
DC Forward Current <sup>[1,2]</sup>	1000mA for LUXEON UV U1 2000mA for LUXEON UV U2
Peak Pulsed Forward Current <sup>[1,3]</sup>	1300mA for LUXEON UV U1 2600mA for LUXEON UV U2
LED Junction Temperature <sup>[1]</sup> (DC & Pulse)	120°C
ESD Sensitivity (ANSI/ESDA/JEDEC JS-001-2012)	Class 3B
Operating Case Temperature <sup>[1]</sup>	-40°C to 120°C
LED Storage Temperature	-40°C to 135°C
Soldering Temperature	260 ±3°C
Allowable Reflow Cycles	3
Reverse Voltage ( $V_{reverse}$ )	LUXEON UV U Line 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 15% of the maximum allowable DC forward current
3. At 10% duty cycle with pulse width of 10ms.

# Characteristic Curves

## Spectral Power Distribution Characteristics

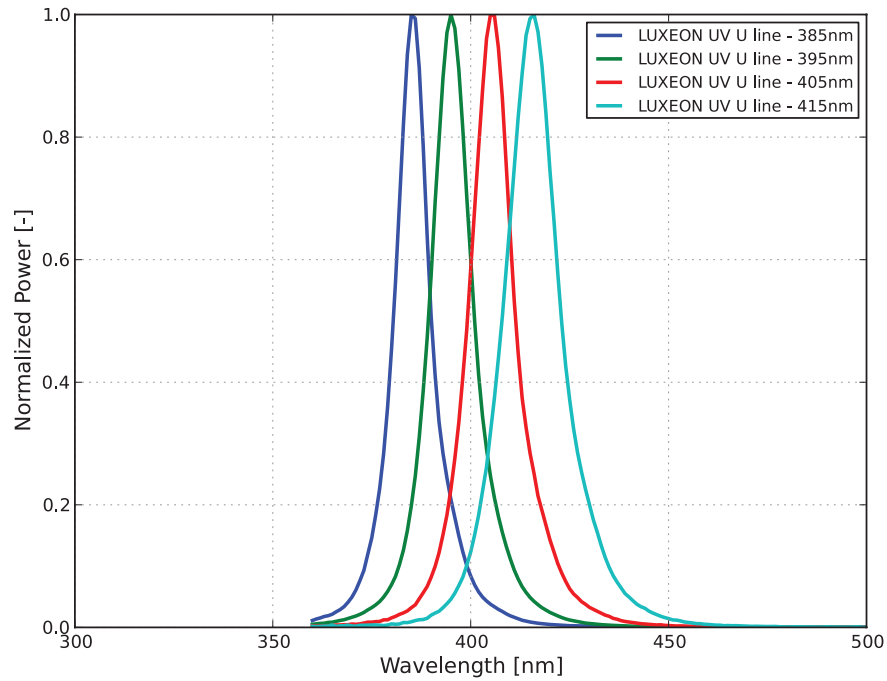


Figure 1. Typical normalized power vs. wavelength for LUXEON UV U1 at 500mA and LUXEON UV U2 at 1000mA,  $T_j=25^{\circ}\text{C}$ .

## Light Output Characteristics

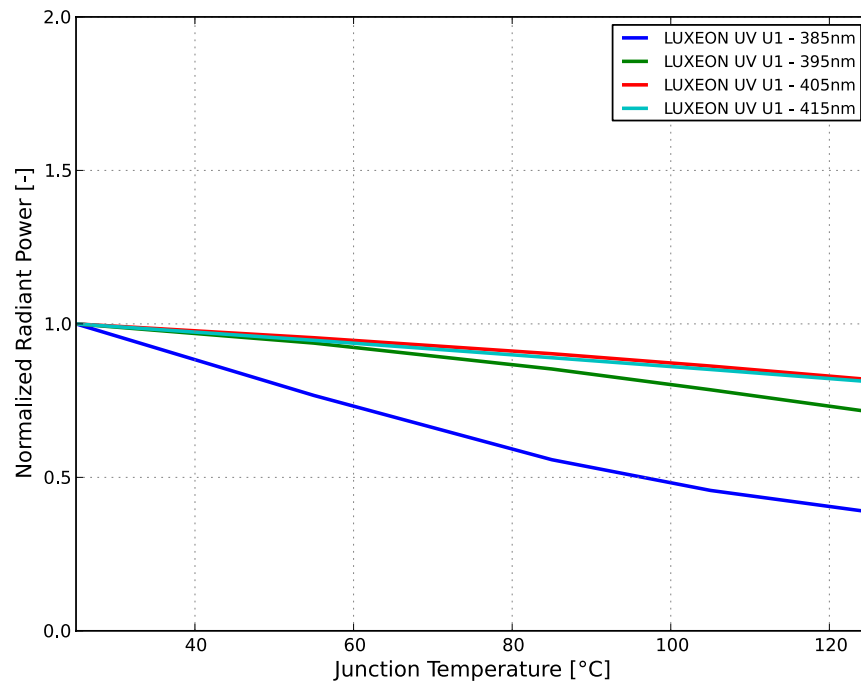


Figure 2a. Typical normalized radiant power vs. junction temperature for LUXEON UV U1 at 500mA.

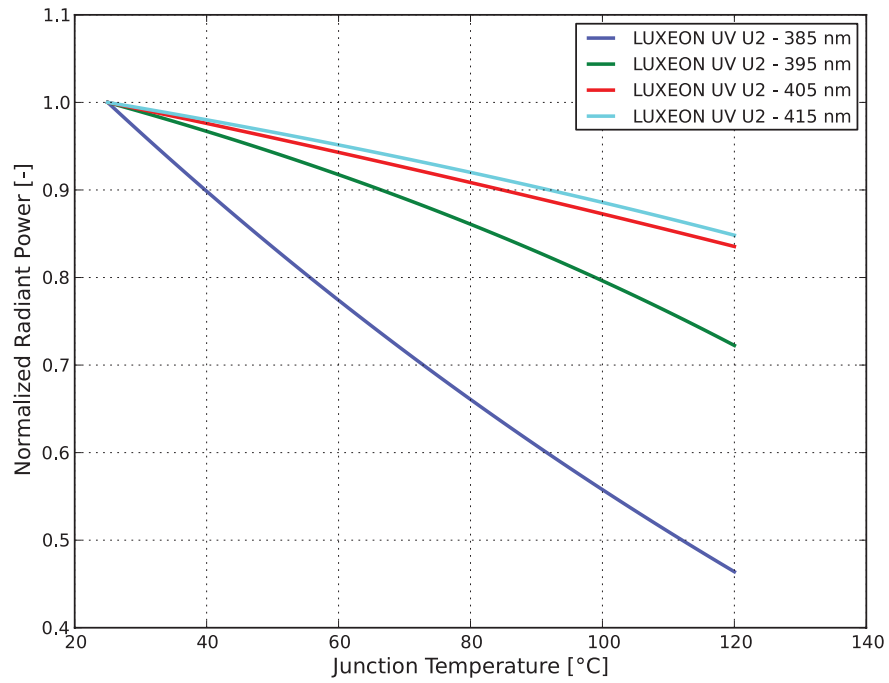


Figure 2b. Typical normalized radiant power vs. junction temperature for LUXEON UV U2 at 1000mA.

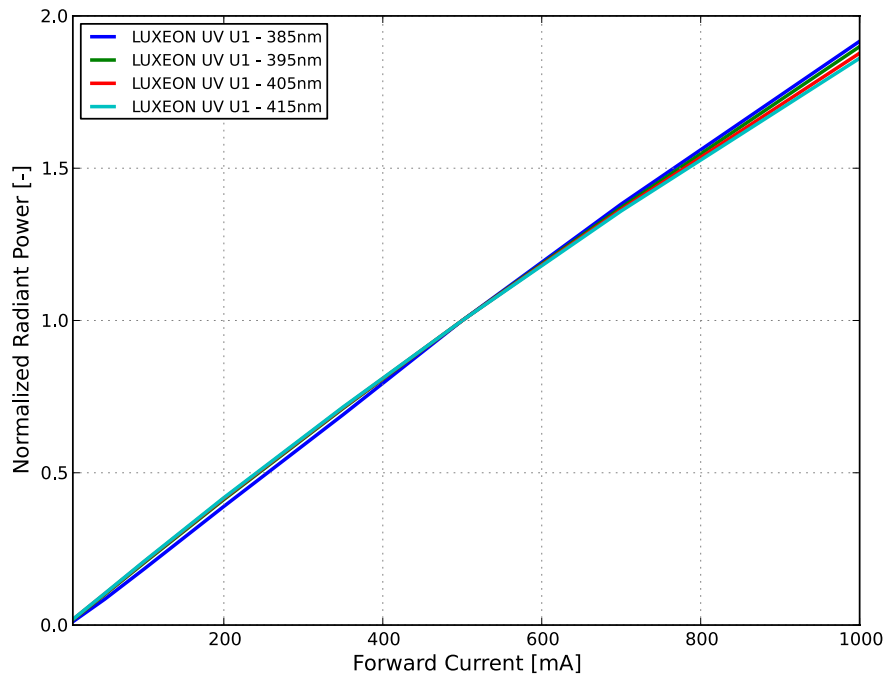


Figure 3a. Typical normalized radiant power vs. forward current for LUXEON UV U1 at  $T_j=25^\circ\text{C}$ .



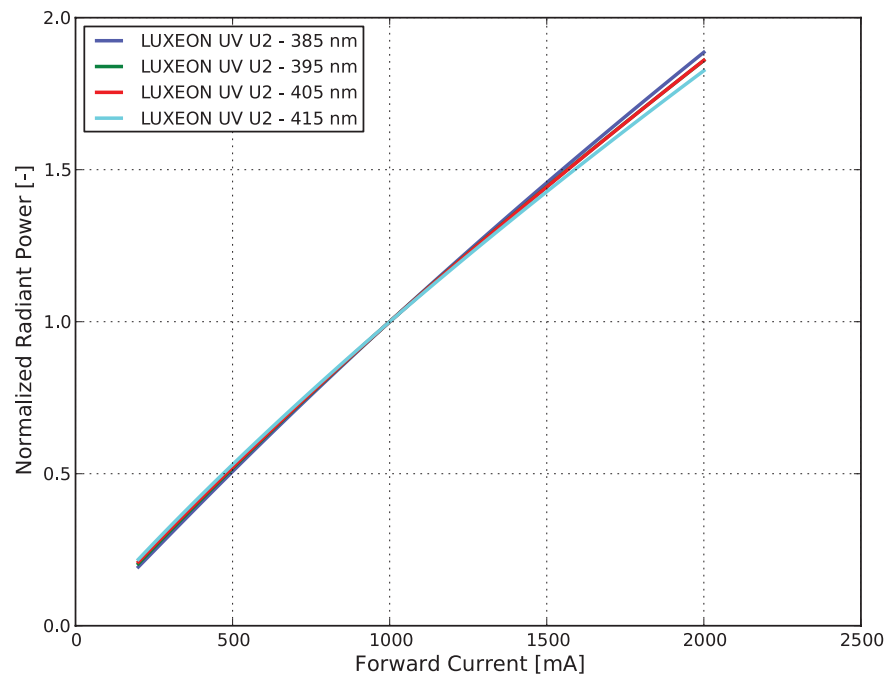


Figure 3b. Typical normalized radiant power vs. forward current for LUXEON UV U2 at  $T_j=25^\circ\text{C}$ .

# Forward Current Characteristics

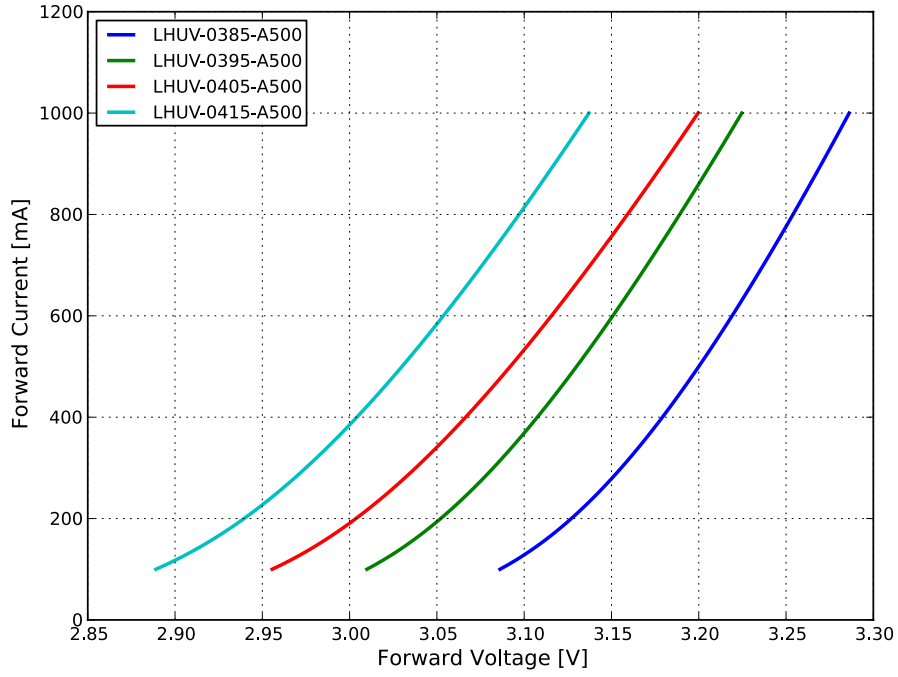


Figure 4a. Typical forward current vs. forward voltage for LUXEON UV U1 at  $T_j=25^\circ\text{C}$ .

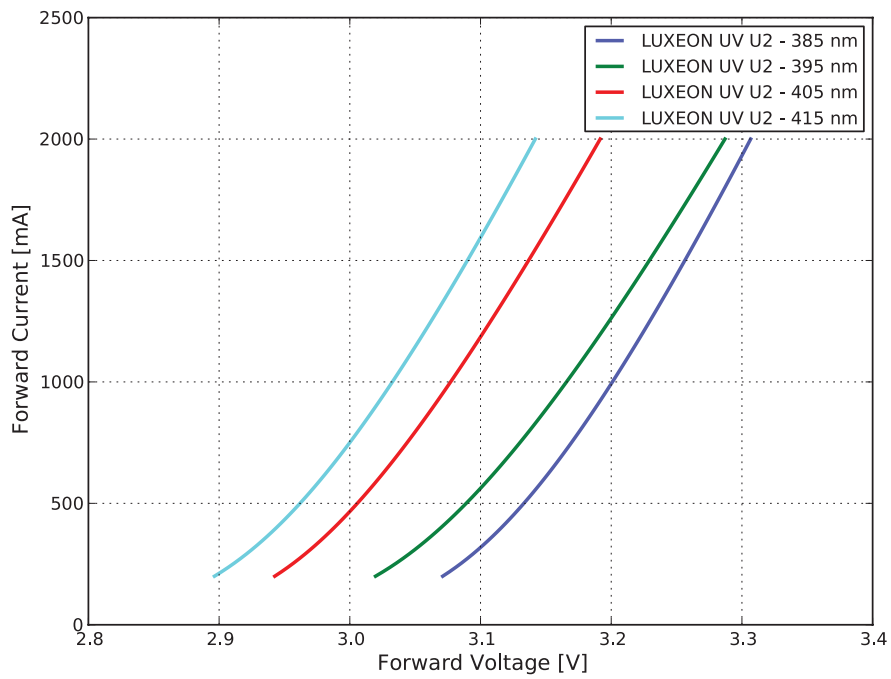


Figure 4b. Typical forward current vs. forward voltage for LUXEON UV U2 at  $T_j=25^\circ\text{C}$ .

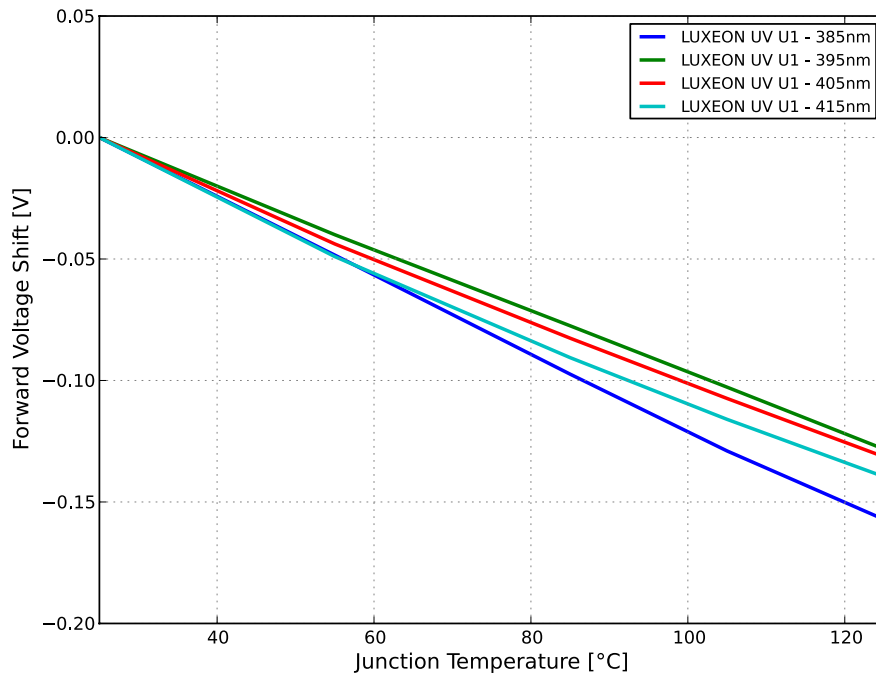


Figure 5a. Typical forward voltage shift vs. junction temperature for LUXEON UV U1 at  $T_j=25^\circ\text{C}$ .

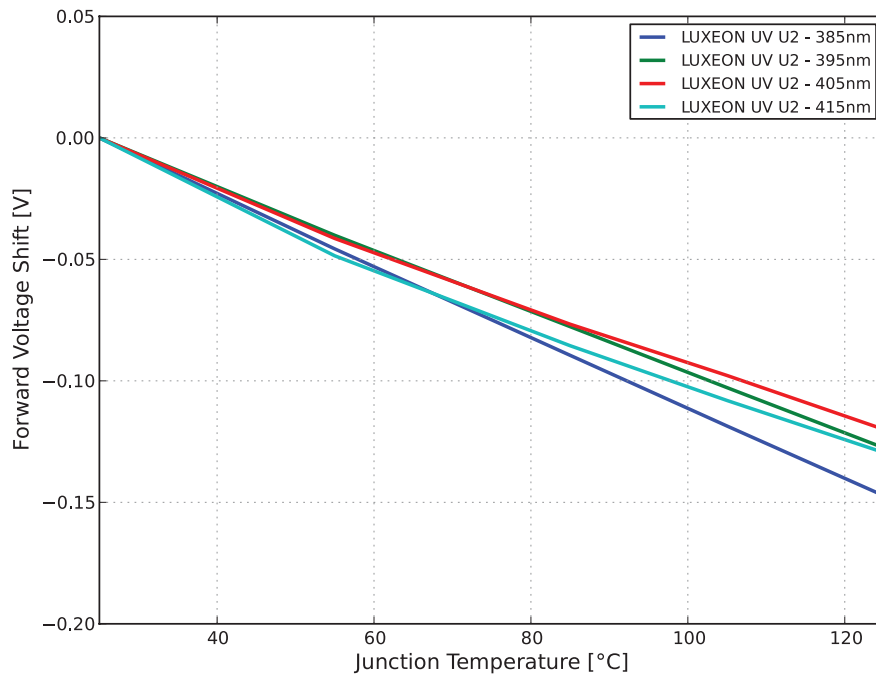


Figure 5b. Typical forward voltage shift vs. junction temperature for LUXEON UV U2 at  $T_j=25^\circ\text{C}$ .

# Wavelength Shift

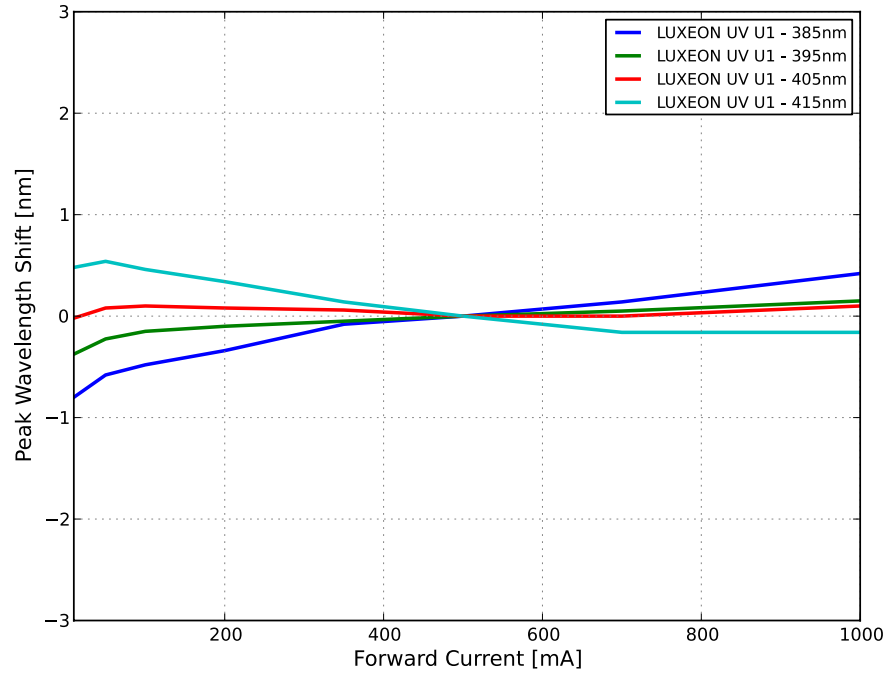


Figure 6a. Typical peak wavelength shift vs. forward current for LUXEON UV U1 at  $T_j=25^\circ\text{C}$ .

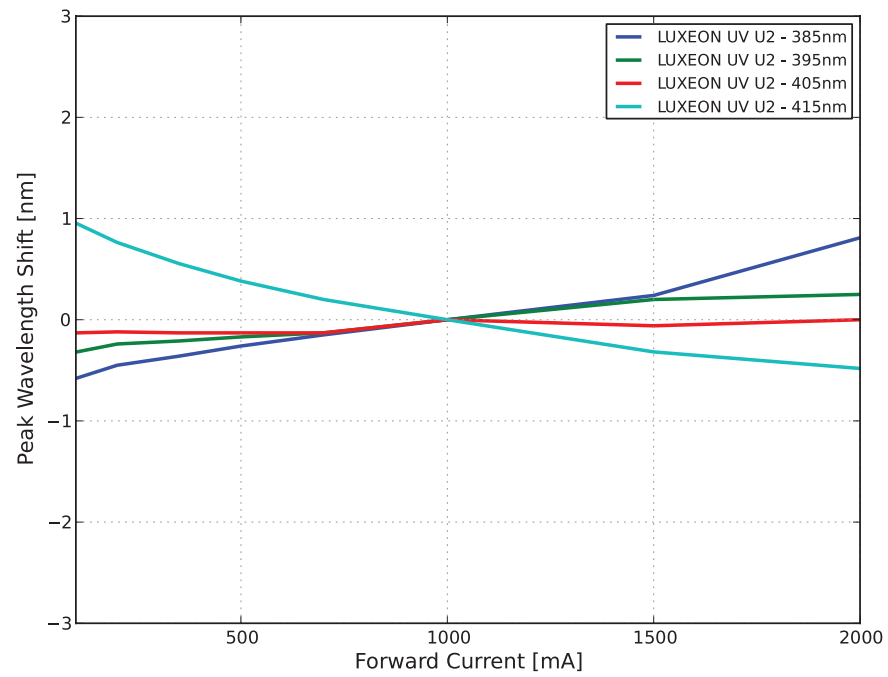


Figure 6b. Typical peak wavelength shift vs. forward current for LUXEON UV U2 at  $T_j=25^\circ\text{C}$ .

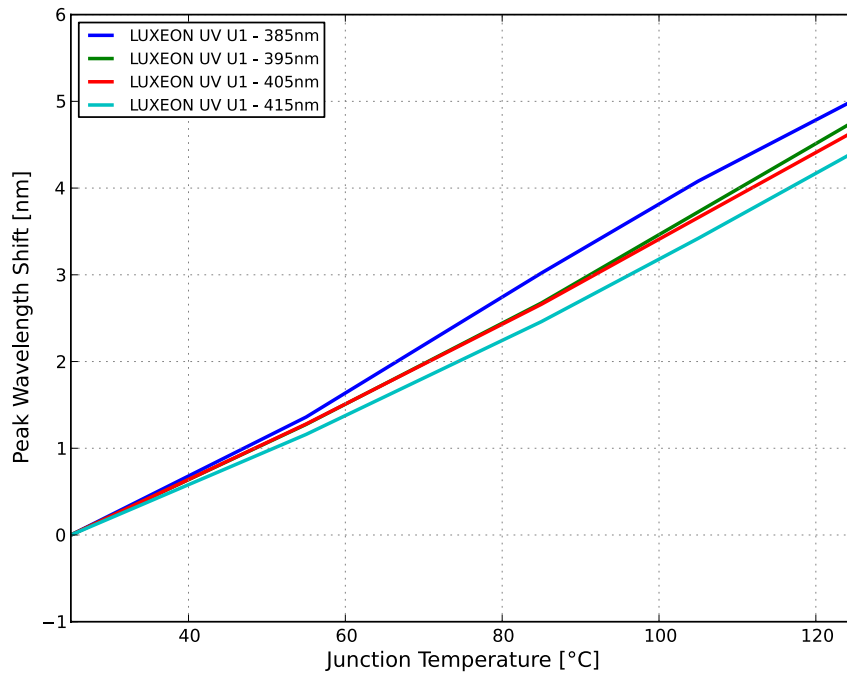


Figure 7a. Typical peak wavelength vs. junction temperature for LUXEON UV U1 at 500mA.

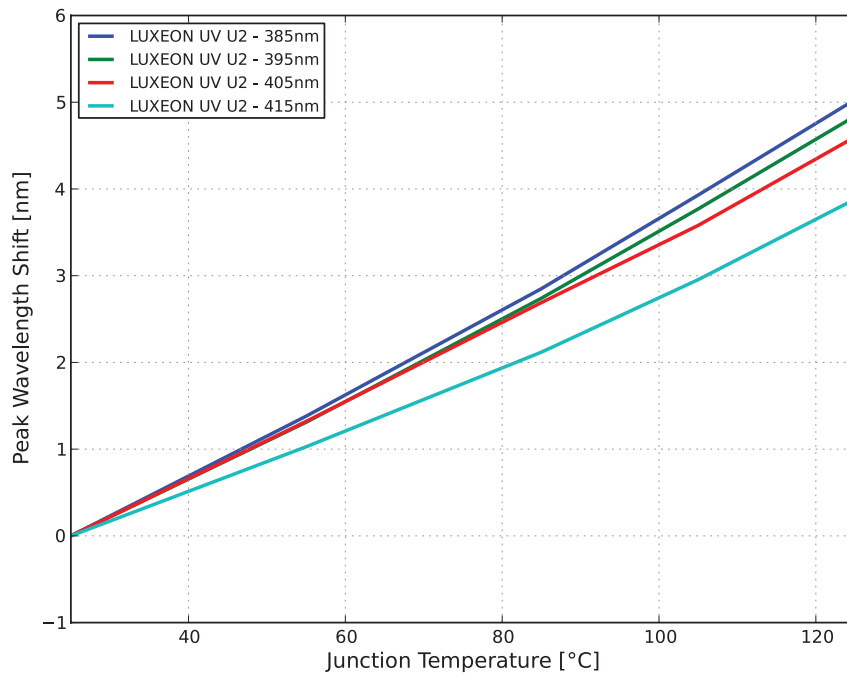


Figure 7b. Typical peak wavelength vs. junction temperature for LUXEON UV U2 at 1000mA.

# Radiation Pattern Characteristics

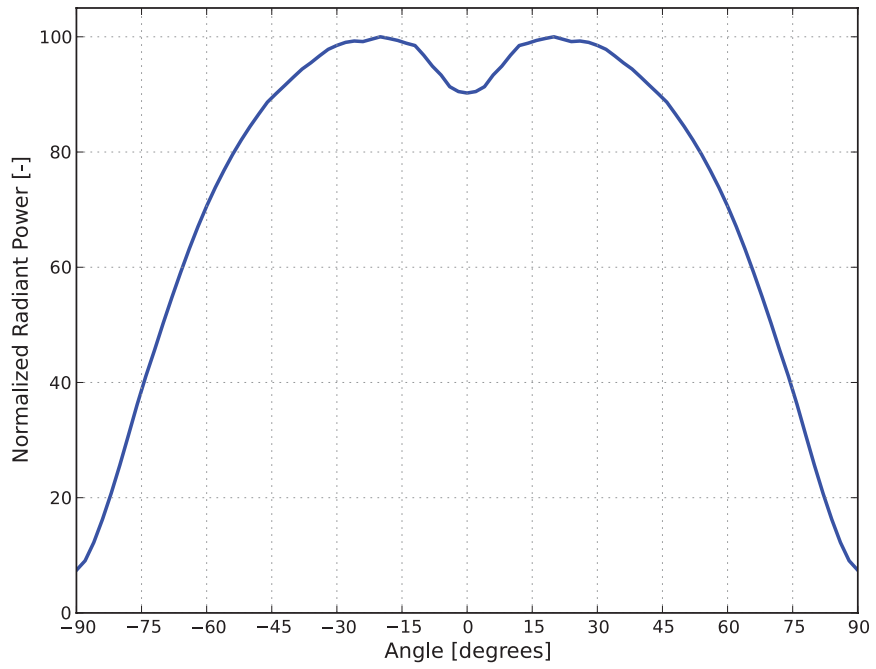


Figure 8. Typical radiation pattern for LUXEON UV U1 at 500mA and LUXEON UV U2 at 1000mA,  $T_j=25^{\circ}\text{C}$ .

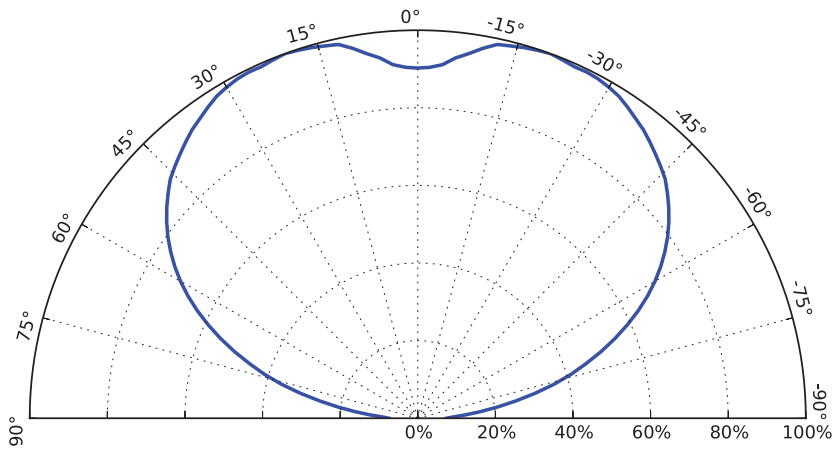


Figure 9. Typical polar radiation pattern for LUXEON UV U1 at 500mA and LUXEON UV U2 at 1000mA,  $T_j=25^{\circ}\text{C}$ .

# 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 UV U1 LEDs are labeled using a 3-digit alphanumeric CAT code following the format below:

### A B C

- A** – designates radiometric power bin (example: D=400 to 450mW, J=700 to 750mW)
- B** – designates peak wavelength bin (example: A=380 to 385nm, E=400 to 405nm)
- C** – designates forward voltage bin (example: 8=2.8 to 2.9V, 0=3.0 to 3.1V)

Therefore, a LUXEON UV U1 with a radiometric power range of 400 to 450mW, peak wavelength range of 400 to 405nm and a forward voltage range of 3.0 to 3.1V has the following CAT code:

### D E 0

LUXEON UV U2 LEDs are labeled using a 4-digit alphanumeric CAT code following the format below:

### A x B C

- A x** – designates radiometric power bin (example: A1=400 to 600mW, D1=1000 to 1200mW)
- B** – designates peak wavelength bin (example: A=380 to 385nm, E=400 to 405nm)
- C** – designates forward voltage bin (example: 8=2.8 to 2.9V, V=3.0 to 3.2V)

Therefore, a LUXEON UV U2 with a radiometric power range of 1000 to 1200mW, peak wavelength range of 400 to 405nm and a forward voltage range of 3.0 to 3.2V has the following CAT code:

### D 1 E V

## Radiometric Power Bins

Table 5 lists the standard radiometric power bins for LUXEON UV U1 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. Radiometric power bin definitions for LUXEON UV U Line.**

BIN	RADIOMETRIC POWER <sup>(1)</sup> (mW)	
	MINIMUM	MAXIMUM
A	250	300
B	300	350
C	350	400
D	400	450
E	450	500
F	500	550
G	550	600
H	600	650
I	650	700
J	700	750
K	750	800
L	800	850
A1	400	600
B1	600	800
C1	800	1000
D1	1000	1200
E1	1200	1400
F1	1400	1600
G1	1600	1800

**Notes for Table 5:**

1. Lumileds maintains a tolerance of ±10% on radiometric power measurements.



## Peak Wavelength Bins

Table 6. Peak wavelength definitions for LUXEON UV U Line.

BIN	PEAK WAVELENGTH <sup>(1)</sup> (nm)	
	MINIMUM	MAXIMUM
A	380	385
B	385	390
C	390	395
D	395	400
E	400	405
F	405	410
G	410	415
H	415	420

**Notes for Table 6:**

1. Lumileds maintains a tolerance of  $\pm 2$ nm on peak wavelength measurements.

## Forward Voltage Bins

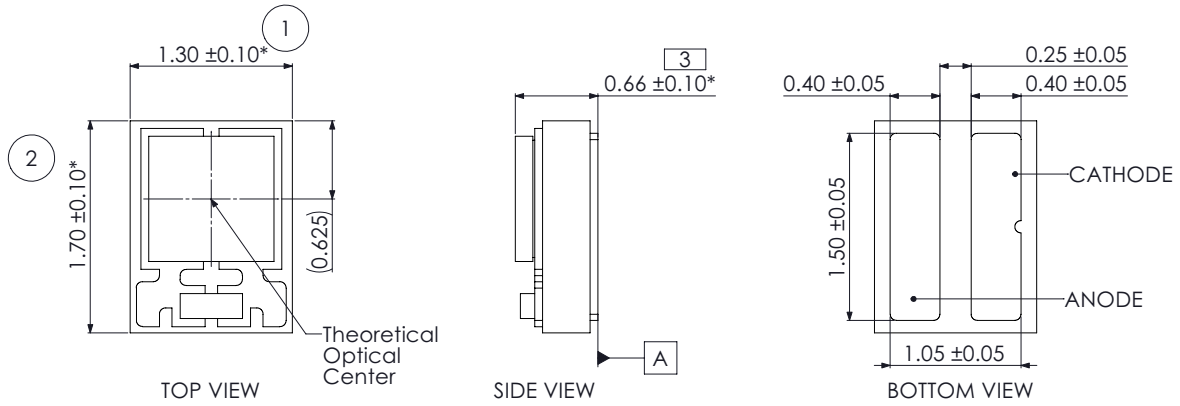
Table 7. Forward voltage bin definitions for LUXEON UV U Line.

BIN	FORWARD VOLTAGE <sup>(1)</sup> (V)	
	MINIMUM	MAXIMUM
7	2.7	2.8
8	2.8	2.9
9	2.9	3.0
0	3.0	3.1
1	3.1	3.2
2	3.2	3.3
3	3.3	3.4
4	3.4	3.5
T	2.8	3.0
V	3.0	3.2
W	3.2	3.4
X	3.4	3.6

**Notes for Table 7:**

1. Lumileds maintains a tolerance of  $\pm 0.05$ V on forward voltage measurements.

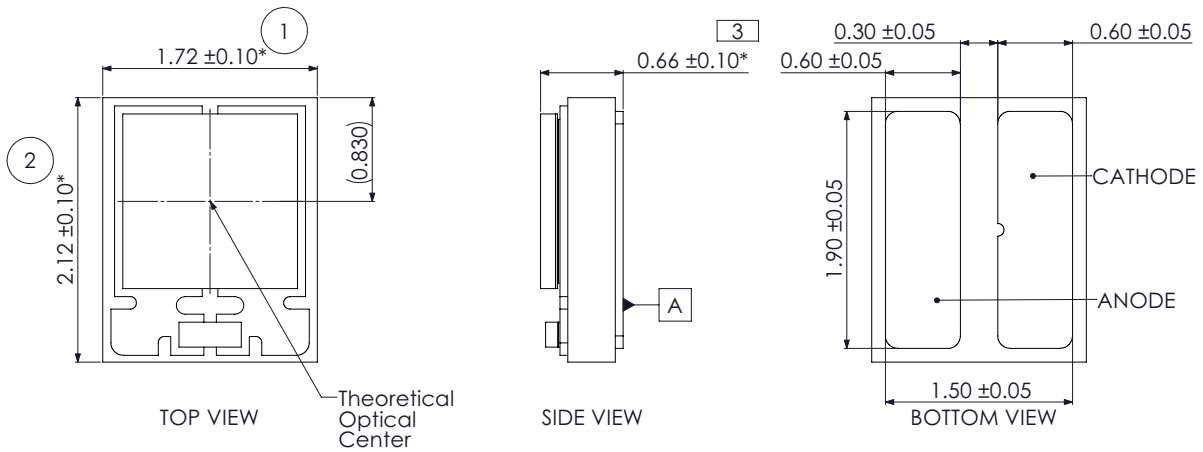
# Mechanical Dimensions



TOLERANCES  
(UNLESS OTHERWISE SPECIFIED)

LINEAR:	ANGULAR:
XX. $\pm 0.25\text{mm}$	XX. $\pm 1^\circ$
XX.X $\pm 0.10\text{mm}$	XX.X $\pm 0^\circ 30'$
XX.XX $\pm 0.05\text{mm}$	XX.XX $\pm 0^\circ 00' 30''$

Figure 10a. Mechanical dimensions for LUXEON UV U1.



TOLERANCES  
(UNLESS OTHERWISE SPECIFIED)

LINEAR:	ANGULAR:
XX. $\pm 0.25\text{mm}$	XX. $\pm 1^\circ$
XX.X $\pm 0.10\text{mm}$	XX.X $\pm 0^\circ 30'$
XX.XX $\pm 0.05\text{mm}$	XX.XX $\pm 0^\circ 00' 30''$

Figure 10b. Mechanical dimensions for LUXEON UV U2.

Notes for Figures 10a and 10b:  
 1. Drawings are not to scale.  
 2. All dimensions are in millimeters.

# Reflow Soldering Guidelines

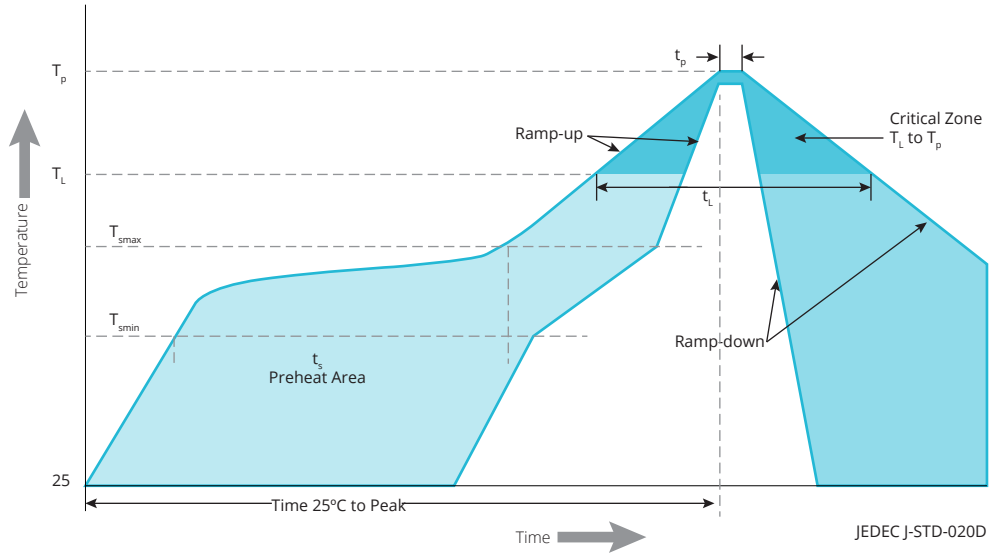


Figure 11. Visualization of the acceptable reflow temperature profile as specified in Table 8.

Table 8. Reflow profile characteristics for LUXEON UV U 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 9. Moisture sensitivity levels for LUXEON UV U 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

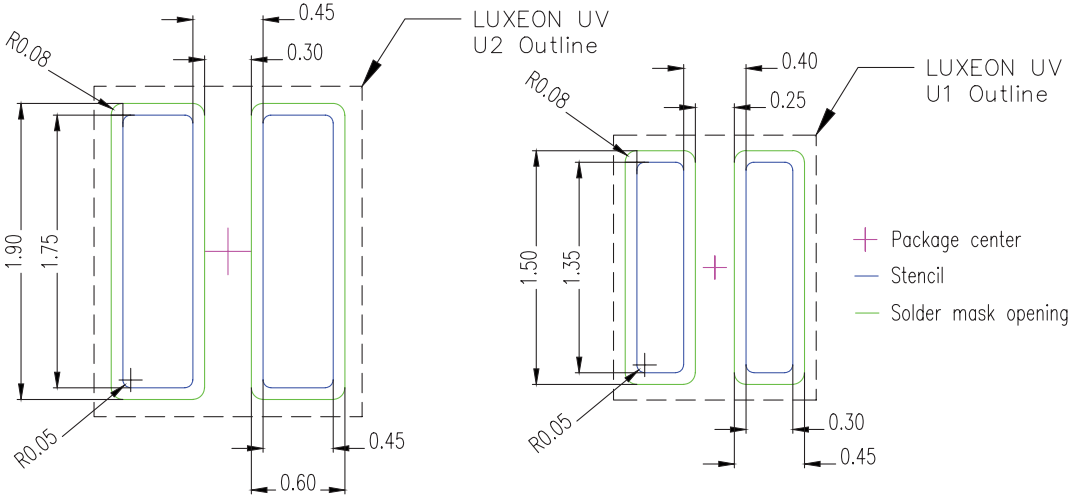


Figure 12. Recommended PCB solder pad layout for LUXEON UV U Line.

- Notes for Figure 12:
1. Drawings are not to scale.
  2. All dimensions are in millimeters.
  3. All layouts are symmetric to package center.

# Packaging Information

## Pocket Tape Dimensions

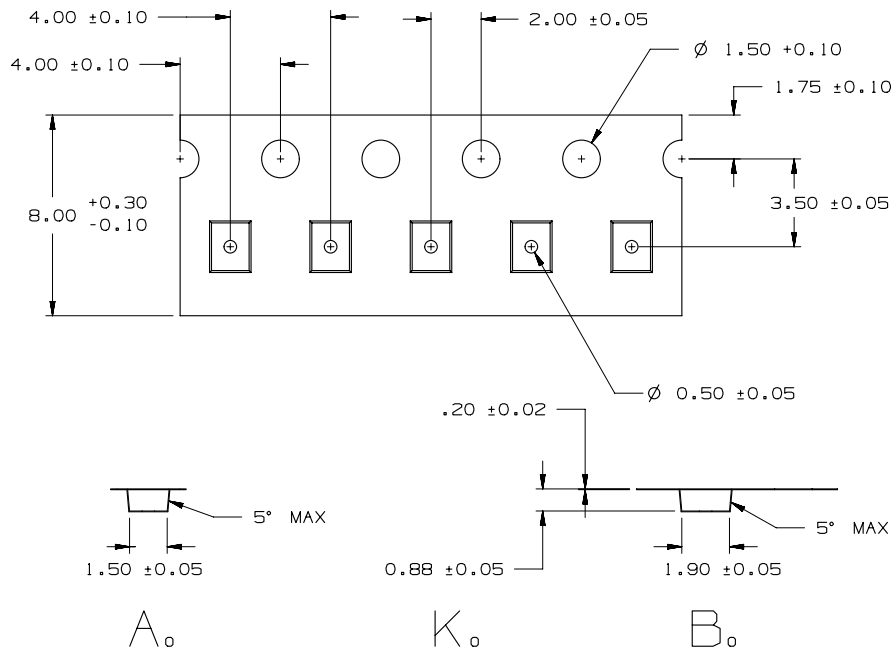


Figure 13a. Pocket tape dimensions for LUXEON UV U1.

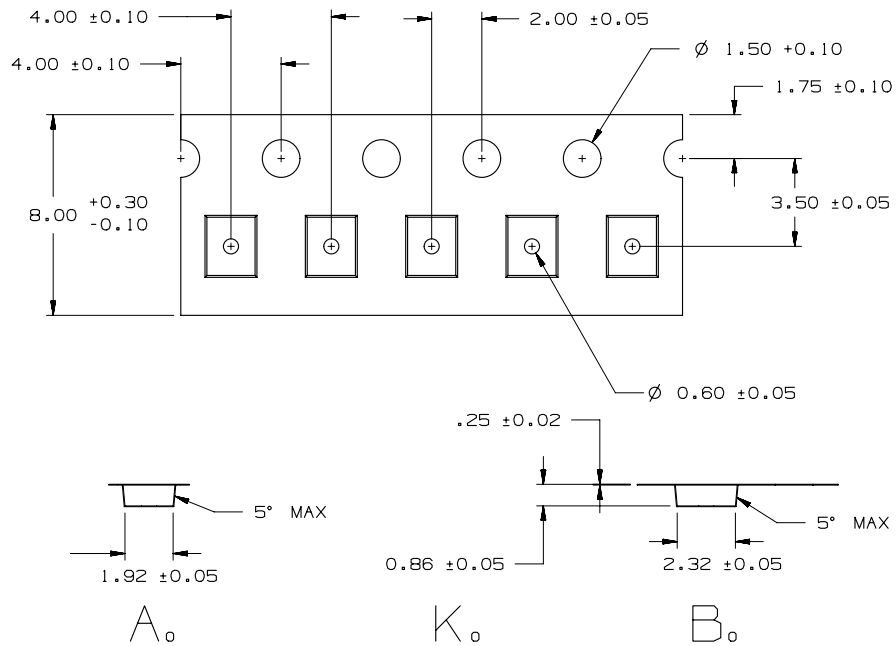


Figure 13b. Pocket tape dimensions for LUXEON UV U2.

**Notes for Figure 13:**

1. Drawings are not to scale.
2. All dimensions are in millimeters.
3. Actual carrier may vary slightly.

# Reel Dimensions

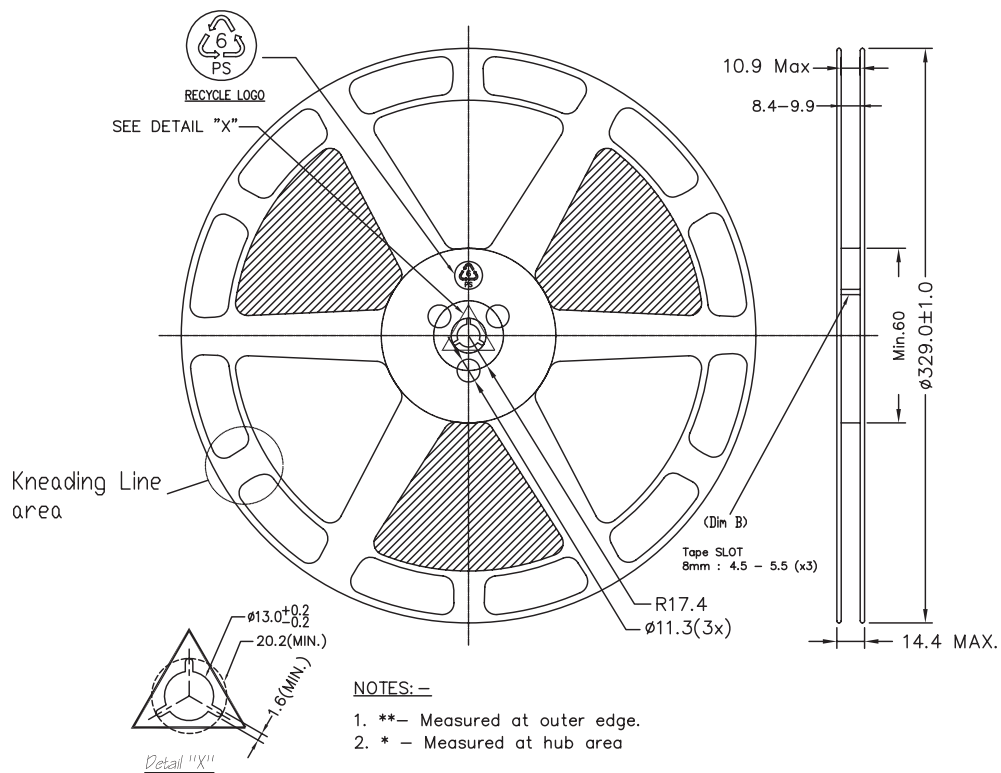
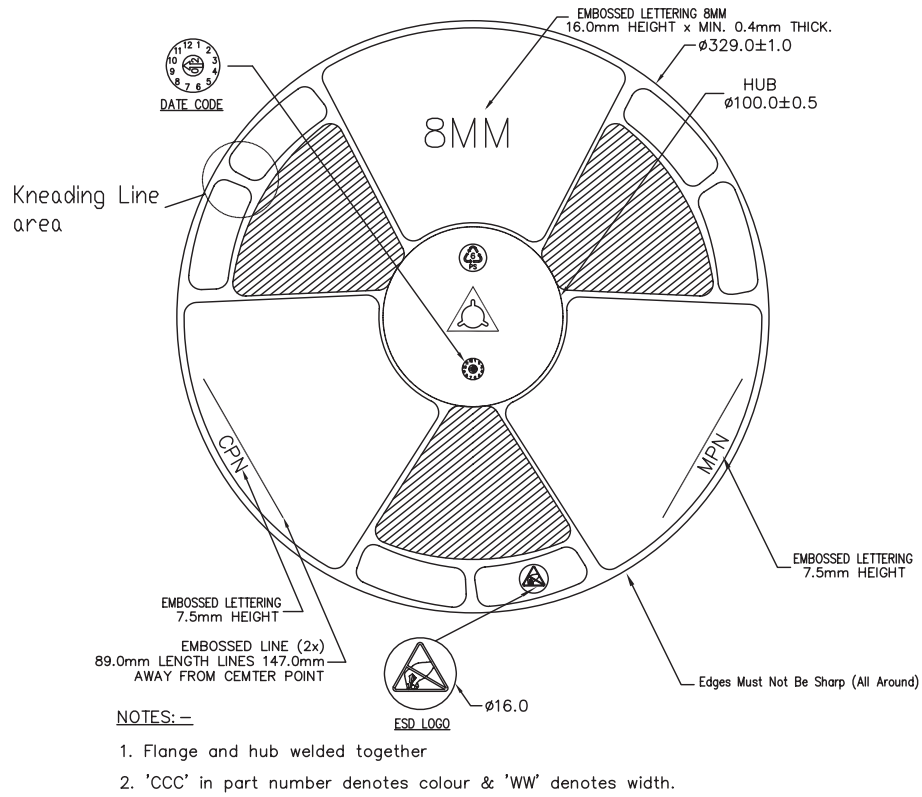


Figure 14. Reel dimensions for LUXEON UV U Line.

Notes for Figure 14:  
1. Drawings are not to scale.  
2. All dimensions are in millimeters.

## 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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