LUMILEDS

ILLUMINATION

LUXEON Z

Industry's smallest high power emitter for use in close-packed applications requiring an undomed solution



LUXEON Z is a high power 1.3mm x 1.7mm LED that enables never before seen color consistency, luminance, flux density and design flexibility for lighting solutions. LUXEON Z is undomed, a feature that provides un-matched optical flexibility for precise beam angle control. Tested and binned at application conditions 85°C and available in 3- and 5-step MacAdam ellipse color bins. LUXEON Z emitters are an ideal choice for indoor and outdoor light sources requiring superior beam angles, higher efficacy and lower costs.

FEATURES AND BENEFITS

- 1.3mm x 1.7mm micro footprint enables a high degree of design flexibility
- Undomed design allows precise optical control
- 1A max drive current allows for more flux per LED
- 3- and 5-step MacAdam ellipse color binning for superior Quality of Light

PRIMARY APPLICATIONS

- Architectural
- Downlights
- Indoor Area Lighting
- Lamps
- Outdoor
- Specialty Lighting
- Spotlights

c UL us No. E352519 RoHS COMPLIANT

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General Product Information

Product Test Conditions

LUXEON Z LEDs are tested and binned with a DC drive current of 500mA at a junction temperature, T_j, of 85ºC.

Part Number Nomenclature

Part numbers for LUXEON Z follow the convention below:

L X Z 1 – **A A B B** – **C**

Where:

A A – designates nominal ANSI CCT (27=2700K, 30=3000K, 35=3500K, 40=4000K, 50=5000K, 57=5700K, 65=6500K RB=Royal Blue)

B B – designates minimum CRI (65=65CRI, 70=70CRI, 80=80CRI)

C – designates SDCM (3=3 SDCM, 5=5 SDCM).

Therefore, the following part number is used for a LUXEON Z 3000K, 80 CRI, 5 SDCM :

L X Z 1 – **3 0 8 0** – **5**

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 Z 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 Z at 500mA and 700mA, T_j=85°C.

NOMINAL CCT	MINIMUM CRI [1, 2]	LUMINOUS FLUX [1] (lm)		TYPICAL LUMINOUS EFFICACY (lm/W)	TYPICAL LUMINOUS FLUX (lm)	TYPICAL LUMINOUS EFFICACY (lm/W)	PART NUMBER
		MINIMUM	TYPICAL				
		500mA			700mA		
6500K	65	140	154	110	197	99	LXZ1-6565
4000K	70	120	134	96	172	86	LXZ1-4070
5000K	70	130	148	106	189	95	LXZ1-5070
5700K	70	140	152	109	195	98	LXZ1-5770
2700K	80	100	115	82	147	74	LXZ1-2780-y
3000K	80	110	124	89	159	80	LXZ1-3080-y
3500K	80	110	124	89	159	80	LXZ1-3580-y
4000K	80	120	130	93	166	83	LXZ1-4080-y

Notes for Table 1:
1. Lumileds maintains a tolerance of ±2 on CRI and ±6.5% on luminous flux measurements.
2. Typical CRI is approximately 2 points higher than the minimum CRI specified, but this is not guaranteed.

Optical Characteristics

Table 2. Optical characteristics for LUXEON Z at 500mA, T_j=85°C.

PART NUMBER	TYPICAL TOTAL INCLUDED ANGLE [1]	TYPICAL VIEWING ANGLE [2]
LXZ1-xxxx-y	160°	120°
LXZ1-xxxx	160°	120°

Notes for Table 2:
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.

Electrical and Thermal Characteristics

Table 3. Electrical and thermal characteristics for LUXEON Z at 500mA, T_j=85°C.

PART NUMBER	FORWARD VOLTAGE [1] (V_f)			TYPICAL TEMPERATURE COEFFICIENT OF FORWARD VOLTAGE (mV/°C) [2]	TYPICAL THERMAL RESISTANCE — JUNCTION TO SOLDER PAD (°C/W)
	MINIMUM	TYPICAL	MAXIMUM		
LXZ1-xxxx-y	2.5	2.8	3.25	-1.6	6
LXZ1-xxxx	2.5	2.8	3.25	-1.6	6

Notes for Table 3:
1. Lumileds maintains a tolerance of ±0.06V on forward voltage measurements.
2. Measured between 25°C and 85°C.

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Absolute Maximum Ratings

Table 4. Absolute maximum ratings for LUXEON Z.

PARAMETER	MAXIMUM PERFORMANCE
DC Forward Current [1, 2]	1000mA
Peak Pulsed Forward Current [1, 3]	1200mA
LED Junction Temperature [1] (DC & Pulse)	135°C
ESD Sensitivity (ANSI/ESDA/JEDEC JS-001-2012)	Class 3B
Operating Case Temperature [1]	-40°C to 135°C
LED Storage Temperature	-40°C to 135°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 of 10ms.

Characteristic Curves

Spectral Power Distribution Characteristics

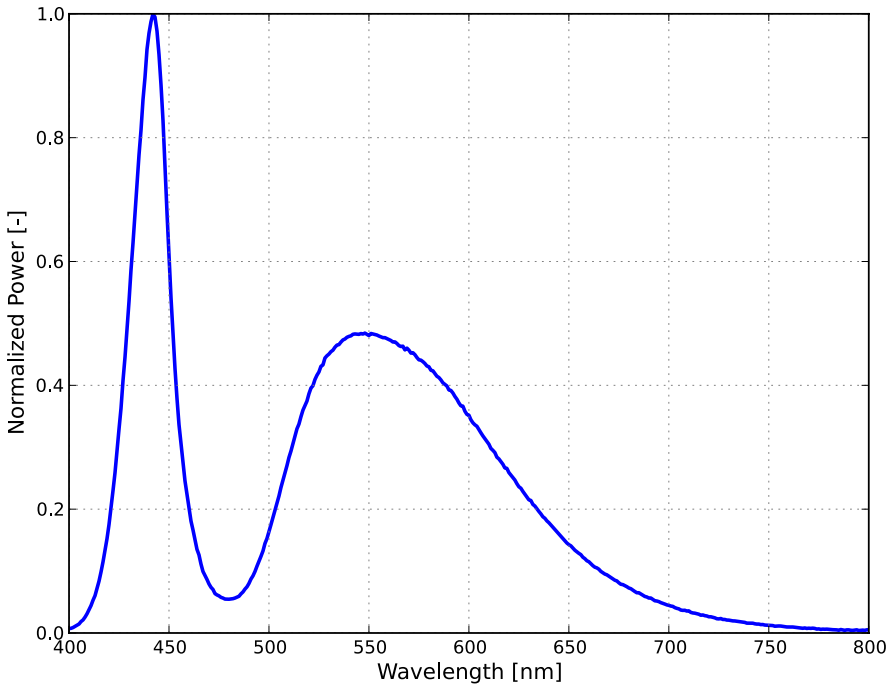


Figure 1a: Typical normalized power vs. wavelength for LXZ1-xx65 at 500mA, T_j=85°C.

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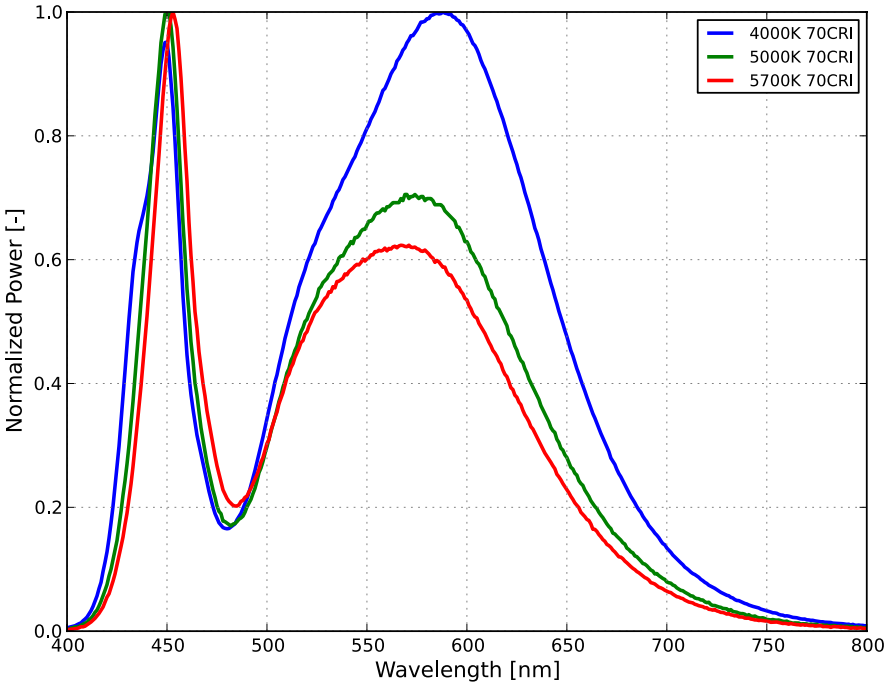


Figure 1b: Typical normalized power vs. wavelength for LXZ1-xx70 at 500mA, T_j=85°C.

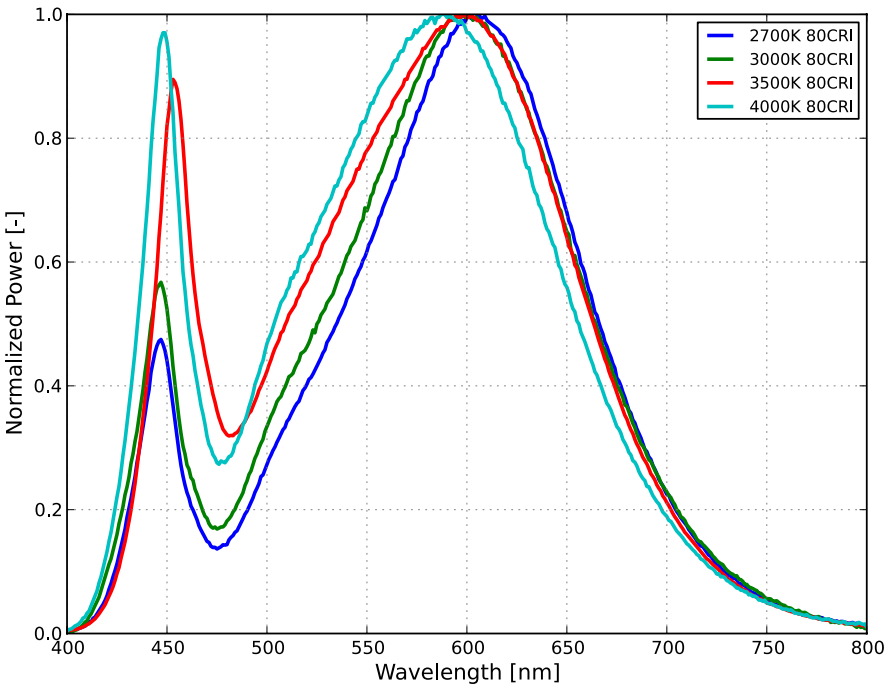


Figure 1c: Typical normalized power vs. wavelength for LXZ1-xx80 at 500mA, T_j=85°C.

Light Output Characteristics

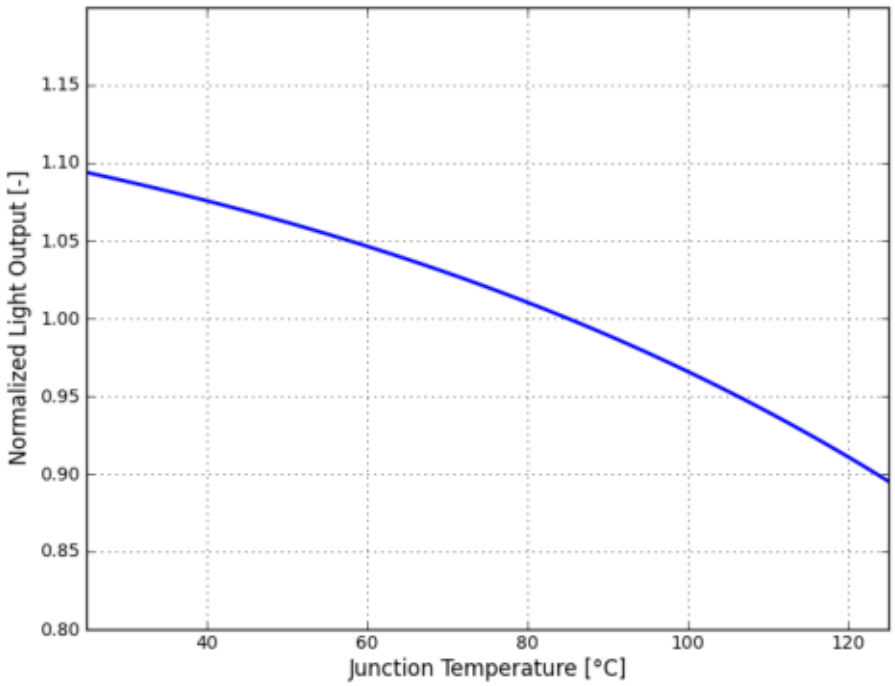


Figure 2: Typical normalized light output vs. junction temperature for LXZ1-xxxx at 500mA.

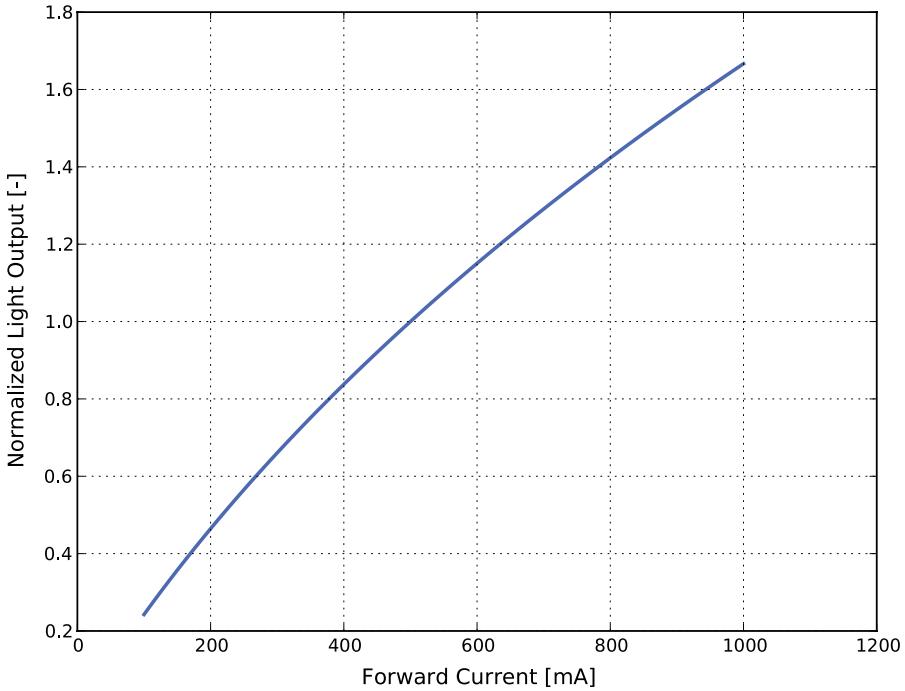


Figure 3: Typical normalized light output vs. forward current for LXZ1-xxxx at T_j=85°C.

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Forward Current Characteristics

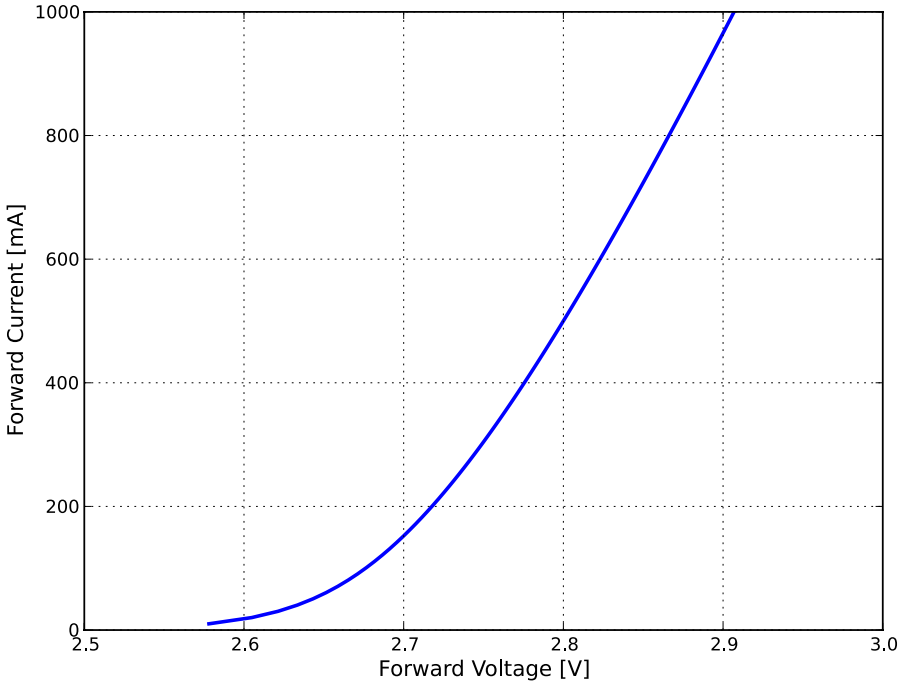


Figure 4: Typical forward current vs. forward voltage for LXZ1-xxxx at T_j=85°C.

Radiation Pattern Characteristics

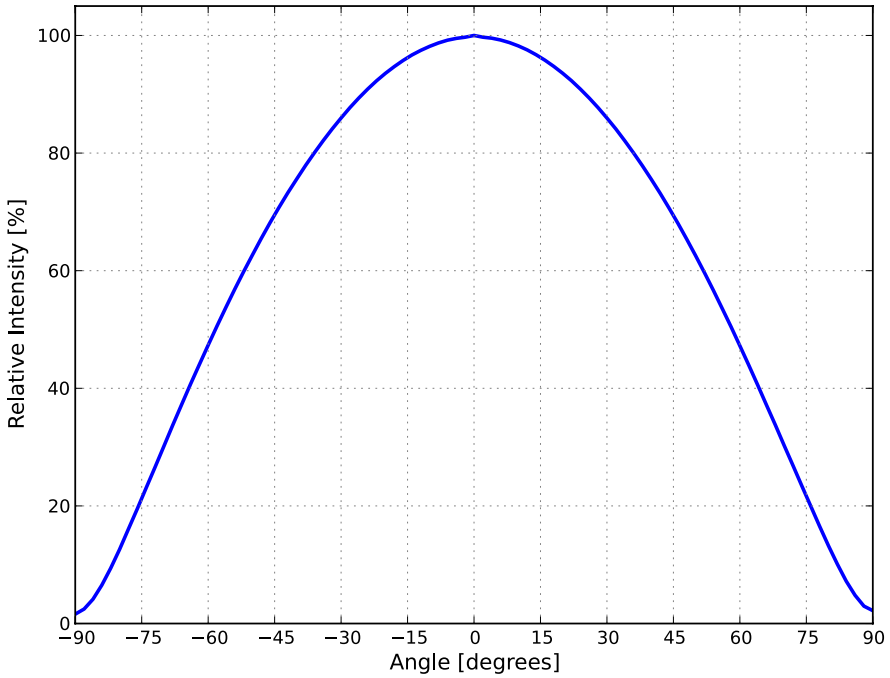


Figure 5: Typical radiation pattern for LXZ1-xxxx at 500mA, T_j=85°C.

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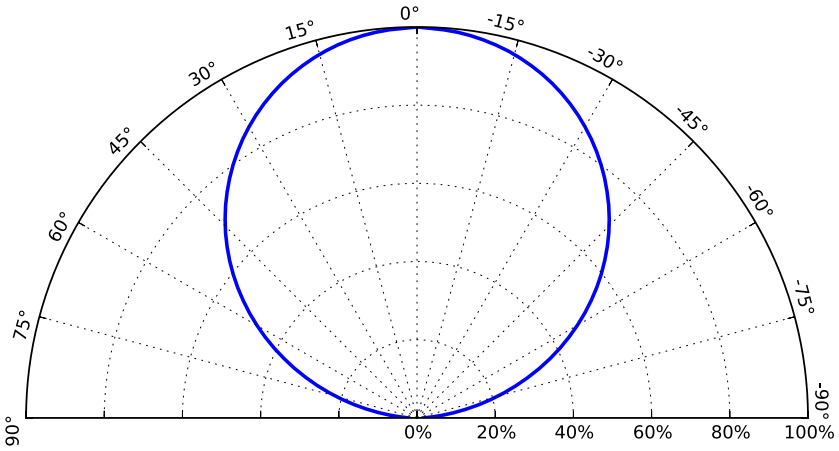


Figure 6: Typical polar radiation pattern for LXZ1-xxxx at 500mA, T_j=85°C.

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

A B C D

A – designates luminous fluxbin (example: B=110 to 120 lumens, C=120 to 130 lumens)

B C – designates color bin (example: 30, 3L, 3U, 5A, 5B, 5C, 5D)

D – designates forward voltage bin (example: P=2.50 to 2.75V, R=2.75 to 3.00V)

Therefore, a LUXEON Z with a lumen range of 110 to 120, color bin of 5A and a forward voltage range of 2.75 to 3.00V has the following CAT code:

B 5 A R

Luminous Flux Bins

Table 5 lists the standard luminous flux bins for LUXEON Z 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.

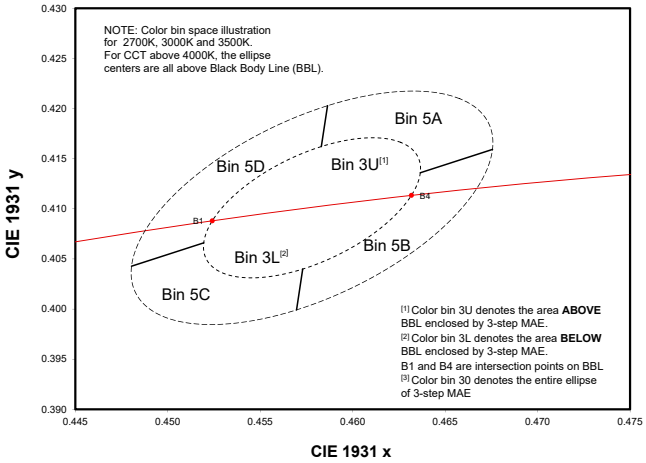
Table 5. Luminous flux bin definitions for LUXEON Z.

BIN	LUMINOUS FLUX [1] (lm)	
	MINIMUM	MAXIMUM
A	100	110
B	110	120
C	120	130
D	130	140
E	140	150
F	150	160
G	160	170
H	170	180
J	180	190
K	190	200

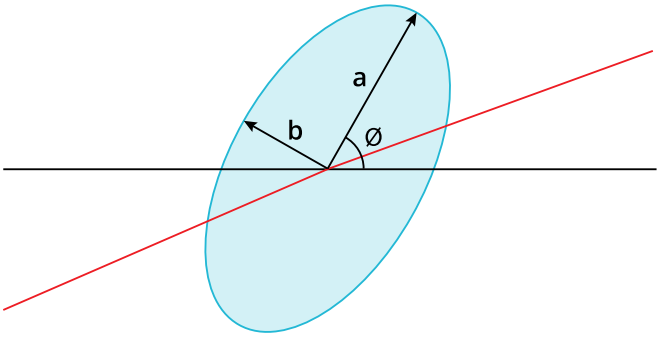
Notes for Table 5:
1. Lumileds maintains a tolerance of ±6.5% on luminous flux measurements.

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Color Bin Definition



Color Space Definition for Above and Below Black Body Line



Parameter Definition of MacAdam Ellipse

Figure 7: 3- and 5-step MacAdam ellipse illustration for Table 6.

Table 6. 3- and 5-step MacAdam ellipse color bin definitions for LUXEON Z.

NOMINAL CCT	COLOR SPACE	CENTER POINT [1] (cx, cy)	MAJOR AXIS, a	MINOR AXIS, b	ELLIPSE ROTATION ANGLE, θ
2700K	Single 3-step MacAdam ellipse	(0.4578, 0.4101)	0.00810	0.00420	53.70
3000K	Single 3-step MacAdam ellipse	(0.4338, 0.4030)	0.00834	0.00408	53.20
3500K	Single 3-step MacAdam ellipse	(0.4073, 0.3917)	0.00927	0.00414	54.00
4000K	Single 3-step MacAdam ellipse	(0.3818, 0.3797)	0.00939	0.00402	53.70
5000K	Single 3-step MacAdam ellipse	(0.3447, 0.3553)	0.00822	0.00354	59.60
2700K	Single 5-step MacAdam ellipse	(0.4578, 0.4101)	0.01350	0.00700	53.70
3000K	Single 5-step MacAdam ellipse	(0.4338, 0.4030)	0.01390	0.00680	53.20
3500K	Single 5-step MacAdam ellipse	(0.4073, 0.3917)	0.01545	0.00690	54.00
4000K	Single 5-step MacAdam ellipse	(0.3818, 0.3797)	0.01565	0.00670	53.70
5000K	Single 5-step MacAdam ellipse	(0.3447, 0.3553)	0.01370	0.00590	59.60
5700K	Single 5-step MacAdam ellipse	(0.3287, 0.3417)	0.01243	0.00533	59.09
6500K	Single 5-step MacAdam ellipse	(0.3123, 0.3282)	0.01115	0.00475	58.57

Notes for Table 6:
1. Lumileds maintains a tolerance of ±0.005 on x and y coordinates in the CIE 1931 color space.

Forward Voltage Bins

Table 7. Forward voltage bin definitions for LUXEON Z.

BIN	FORWARD VOLTAGE [1] (V_f)	
	MINIMUM	MAXIMUM
P	2.50	2.75
R	2.75	3.00
S	3.00	3.25

Notes for Table 7:
1. Lumileds maintains a tolerance of ±0.06V on forward voltage measurements.

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Mechanical Dimensions

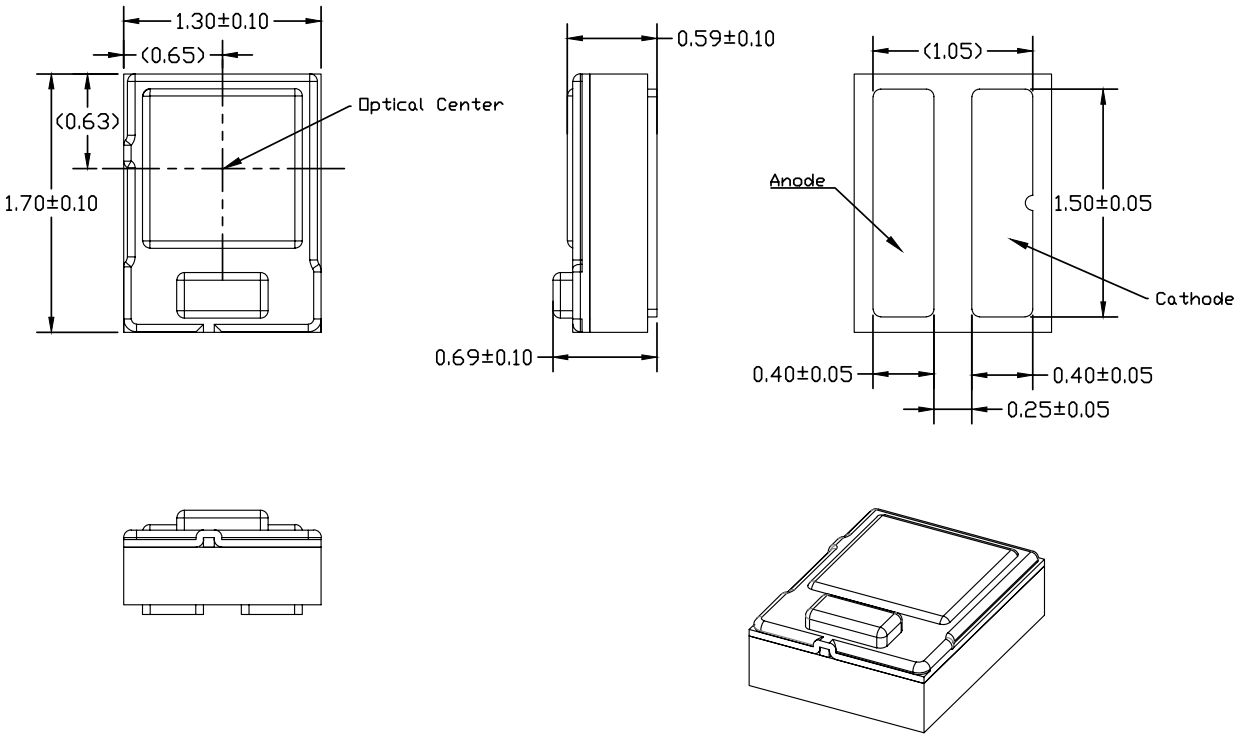


Figure 8: Mechanical dimensions for LUXEON Z.

Notes for Figure 8:
1. Drawings are not to scale.
2. All dimensions are in millimeters.

Reflow Soldering Guidelines

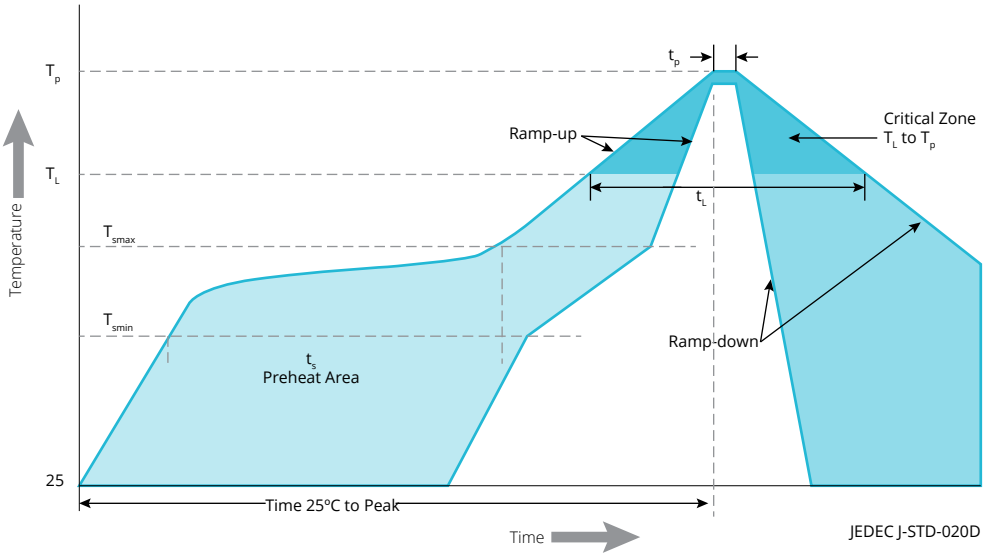


Figure 9: Visualization of the acceptable reflow temperature profile as specified in Table 8.

Table 8. Reflow profile characteristics for LUXEON Z.

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 180 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 Z.

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

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Solder Pad Design

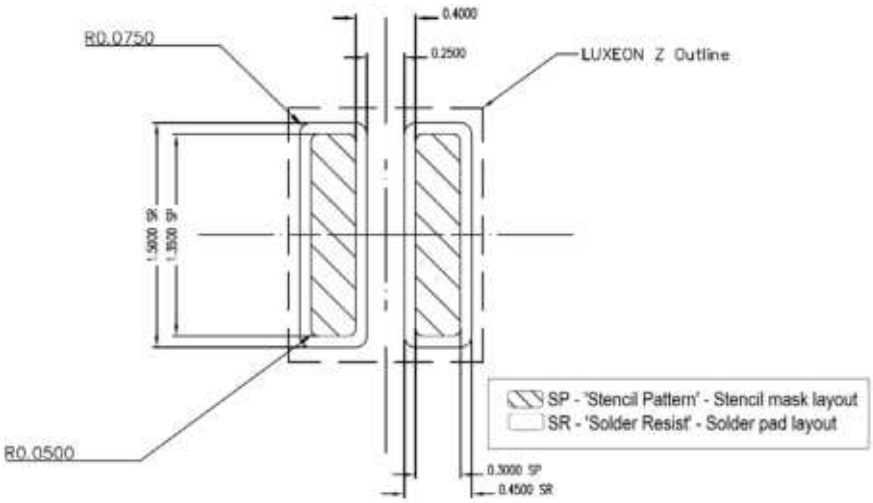


Figure 10: Recommended PCB solder pad layout for LUXEON Z.

Notes for Figure 10:
1. Drawings are not to scale.
2. All dimensions are in millimeters.

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Packaging Information

Pocket Tape Dimensions

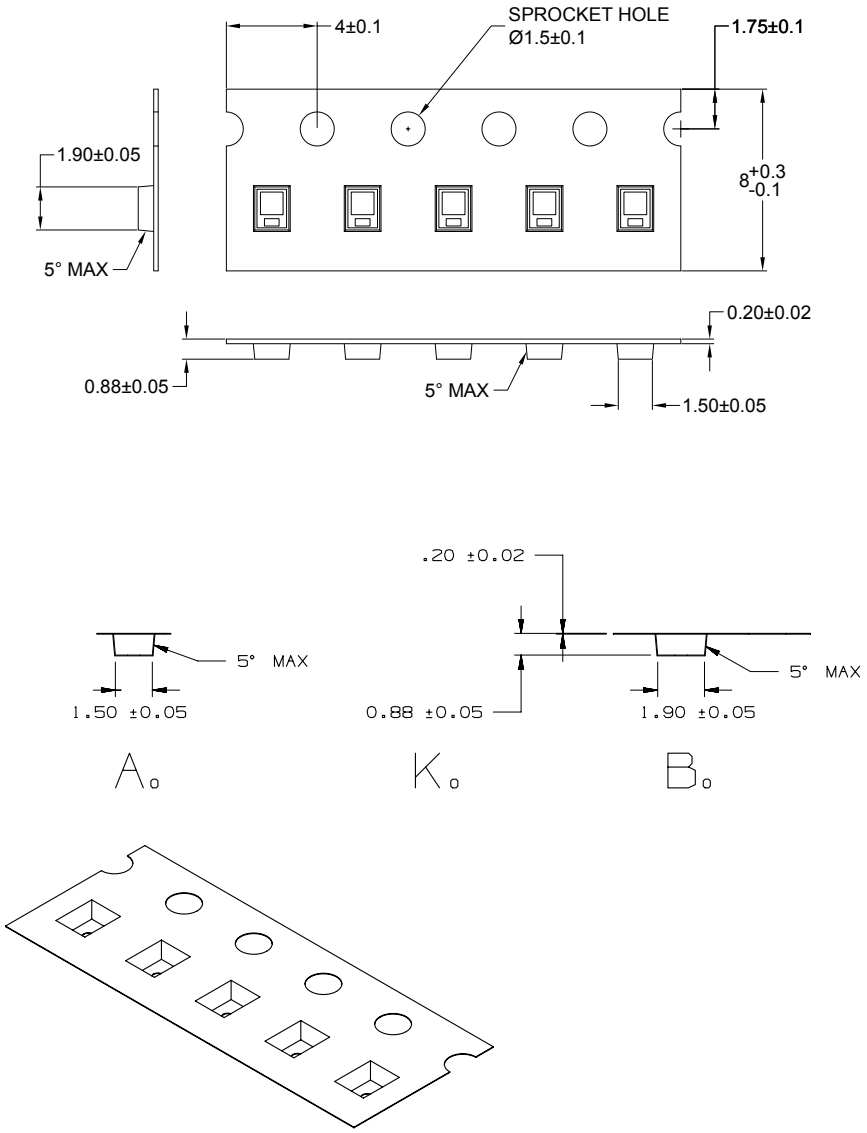


Figure 11: Pocket tape dimensions for LUXEON Z.

Notes for Figure 11:
1. Drawings are not to scale.
2. All dimensions are in millimeters.

Reel Dimensions

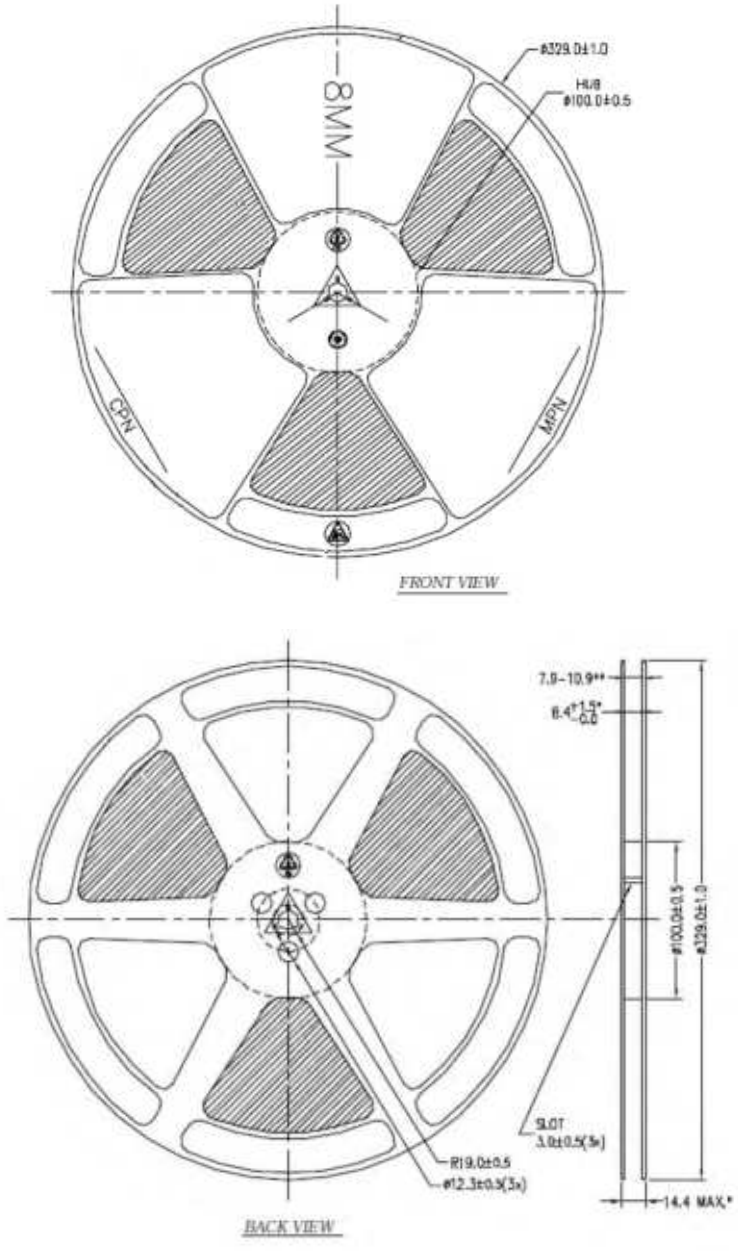


Figure 12: Reel dimensions for LUXEON Z.

Notes for Figure 12:
1. Drawings are not to scale.
2. All dimensions are in millimeters.

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About Lumileds

Lumileds is a global leader in LED and microLED technology, innovation, and solutions for the automotive, display, illumination, mobile, and other markets where light sources are essential. Our approximately 3,500 employees operate in over 15 countries and partner with our customers to deliver never before possible solutions for lighting, safety, and well-being.

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

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