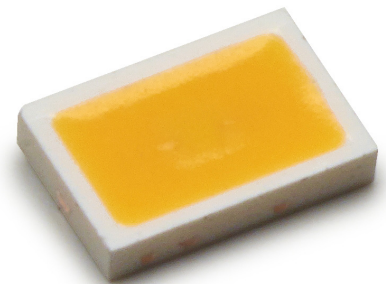




LUXEON 3020

Hot-color targeted with leading lm/\$ 3V LED

LUXEON 3020 is the first and only hot-color targeted EMC-based 3.0mm x 2.0mm QFN, delivering superior efficacy with superior lumen maintenance and assurance of ANSI color compliance at operating conditions — 85°C. Lumileds enables mass production of affordable and reliable bulbs and lamps by simplifying system designs and integration with leading lm/\$ and hot-color targeting.



FEATURES AND BENEFITS

- High efficacy delivers superior lumen maintenance
- Reliable QFN EMC package delivers superior thermal properties and reliability
- 1/9th ANSI micro-color binning enables tight color control
- Hot-color targeted at 85°C which leads to better color accuracy
- Drive at max current for superior value

PRIMARY APPLICATIONS

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

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General Product Information

Product Test Conditions

LUXEON 3020 LEDs are tested and binned with a DC drive current of 120mA at a junction temperature, T_j , of 25°C.

Part Number Nomenclature

Part numbers for LUXEON 3020 follow the convention below:

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

Where:

- A A** – designates nominal CCT (27=2700K, 30=3000K, 35=3500K, 40=4000K, 50=5000K, 57=5700K, 65=6500K)
- B B** – designates minimum CRI (70=70CRI, 80=80CRI, 90=90CRI)

Therefore, the following part number is used for a LUXEON 3020 3000K 80CRI:

L 1 3 0 – **3 0 8 0** 0 0 2 0 1 1 0 0 1

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 3020 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 3020 at 120mA and 100mA, $T_j=25^\circ\text{C}$.

NOMINAL CCT ^[1]	MINIMUM CRI ^[2, 3]	LUMINOUS FLUX ^[2] (lm)		TYPICAL LUMINOUS EFFICACY (lm/W)	TYPICAL LUMINOUS FLUX (lm)	TYPICAL LUMINOUS EFFICACY (lm/W)	PART NUMBER
		MINIMUM	TYPICAL				
		120mA					
4000K	70	51	56	153	48	160	L130-4070002011001
5000K	70	51	56	153	48	160	L130-5070002011001
5700K	70	51	56	153	48	160	L130-5770002011001
6500K	70	51	56	153	48	160	L130-6570002011001
2200K	80	36	41	112	35	117	L130-2280002011001
2500K	80	40	45	123	38	127	L130-2580002011001
2700K	80	42	49	134	42	140	L130-2780002011001
3000K	80	44	49	134	43	143	L130-3080002011001
3500K	80	45	51	139	44	147	L130-3580002011001
4000K	80	46	52	145	46	153	L130-4080002011001
5000K	80	46	53	145	46	153	L130-5080002011001
5700K	80	46	53	145	46	153	L130-5780002011001
6500K	80	46	53	145	46	153	L130-6580002011001
2700K	90	36	41	112	35	117	L130-2790002011001
3000K	90	37	42	115	36	120	L130-3090002011001
3500K	90	38	43	117	37	123	L130-3590002011001
4000K	90	40	45	123	38	127	L130-4090002011001

Notes for Table 1:

1. Correlated color temperature is based upon mounted die on highly reflective surface at $T_j=25^\circ\text{C}$.
2. Lumileds maintains a tolerance of $\pm 2\%$ on CRI and $\pm 7.5\%$ on luminous flux measurements.
3. 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 3020 at 120mA, $T_j=25^\circ\text{C}$.

PART NUMBER	TYPICAL TOTAL INCLUDED ANGLE ^[1]	TYPICAL VIEWING ANGLE ^[2]
L130-xxxx002011001	160°	110°

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 lamp centerline where the luminous intensity is $\frac{1}{2}$ of the peak value.

Electrical and Thermal Characteristics

Table 3. Electrical and thermal characteristics for LUXEON 3020 at 120mA, T_j=25°C.

PART NUMBER	FORWARD VOLTAGE (V) ^[1]			TYPICAL TEMPERATURE COEFFICIENT OF FORWARD VOLTAGE (mV/°C) ^[2]	TYPICAL THERMAL RESISTANCE JUNCTION TO SOLDER PAD (°C/W)
	MINIMUM	TYPICAL	MAXIMUM		
L130-xxxx002011001	2.85	3.05	3.35	-2.0 to -4.0	13

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 3020.

PARAMETER	MAXIMUM PERFORMANCE
DC Forward Current ^[1, 2]	240mA
Peak Pulsed Forward Current ^[1, 3]	300mA
LED Junction Temperature ^[1] (DC & Pulse)	125°C
ESD Sensitivity	Class 2 HBM per ANSI/ESDA/JEDEC JS-001-2012
Operating Case Temperature ^[1, 2]	-40°C to 105°C
Storage Temperature	-40°C to 105°C
Soldering Temperature	JEDEC 020D 260°C
Allowable Reflow Cycles	3
Reverse Voltage (V _{reverse}) ^[4]	-10V

Notes for 4:

1. Proper current derating must be observed to maintain the junction temperature below the maximum allowable junction temperature.
2. Ripple current with a frequency of 50–150Hz is allowed as long as the average of the current waveform is below 240mA and the maximum of the current waveform is lower than 300mA.
3. At 10% duty cycle and pulse width <100µs.
4. At maximum reverse current of 10µA.

Characteristic Curves

Spectral Power Distribution Characteristics

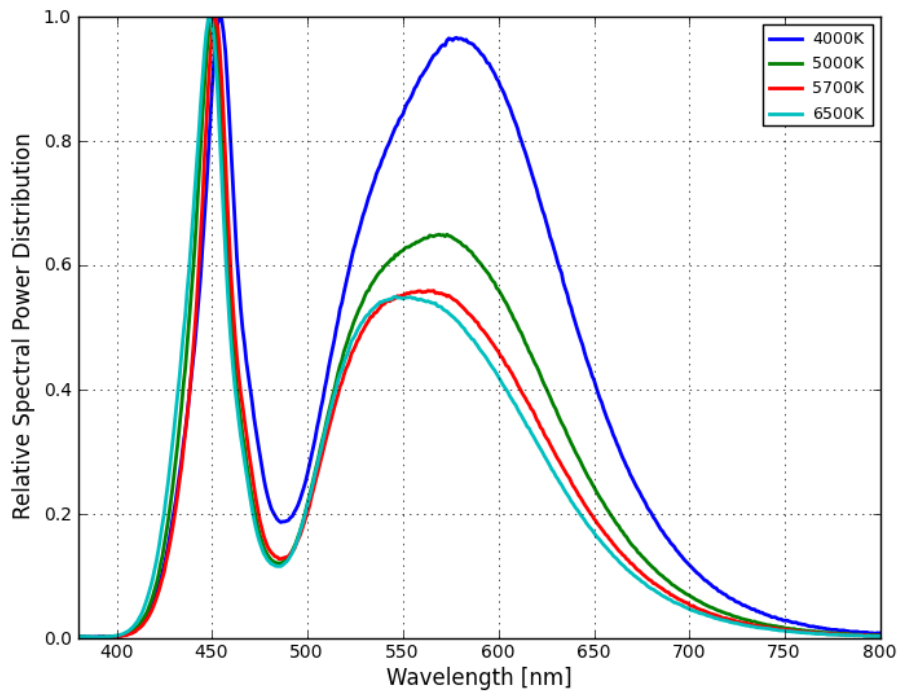


Figure 1: Typical normalized power vs. wavelength for L130-xx7000201 at 120mA, $T_j=25^\circ\text{C}$.

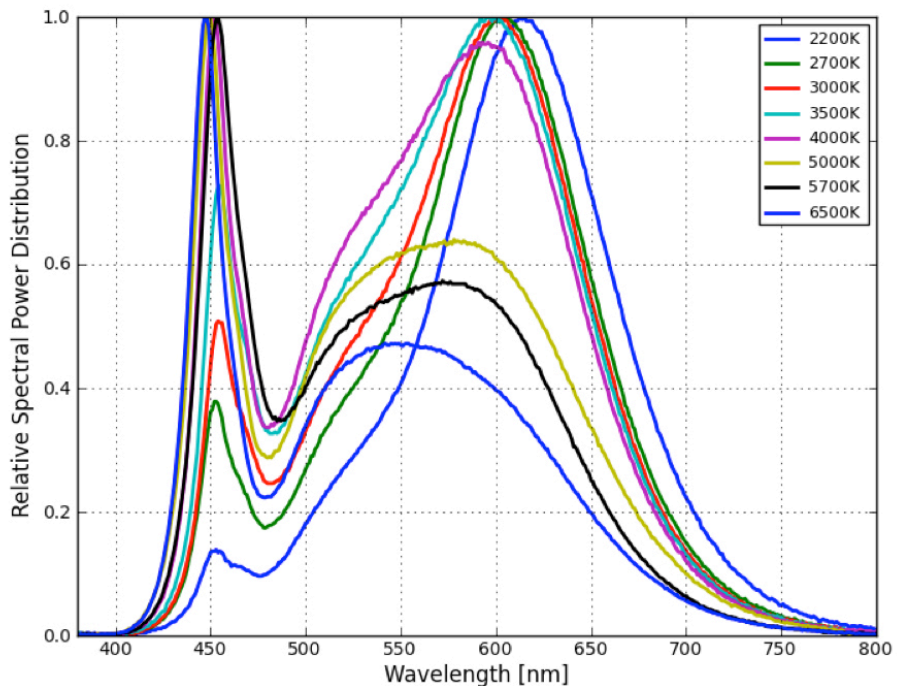


Figure 2: Typical normalized power vs. wavelength for L130-xx8000201 at 120mA, $T_j=25^\circ\text{C}$.

Light Output Characteristics

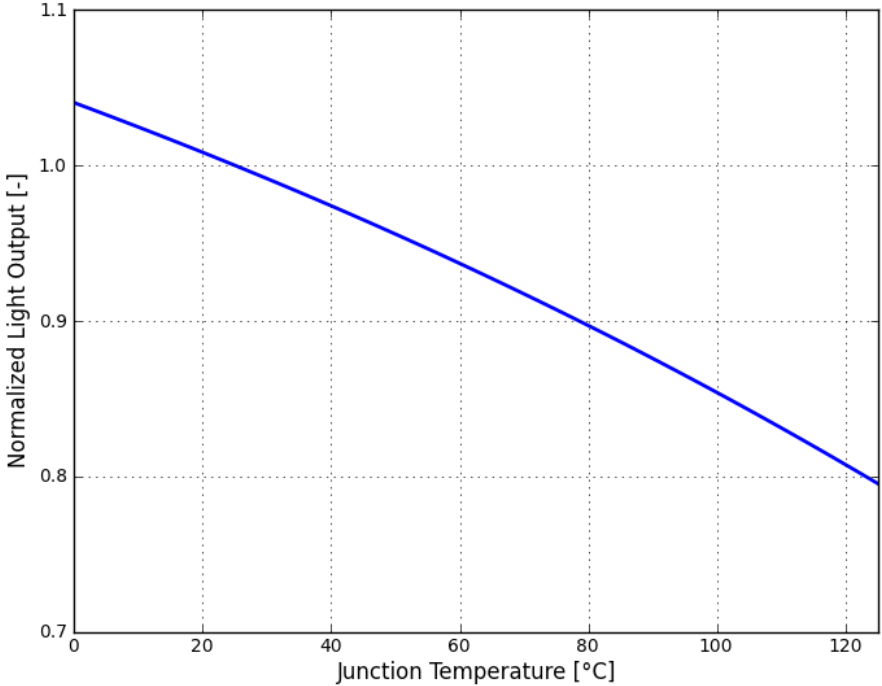


Figure 3: Typical normalized light output vs. junction temperature for L130-xxxx00201101 at 120mA.

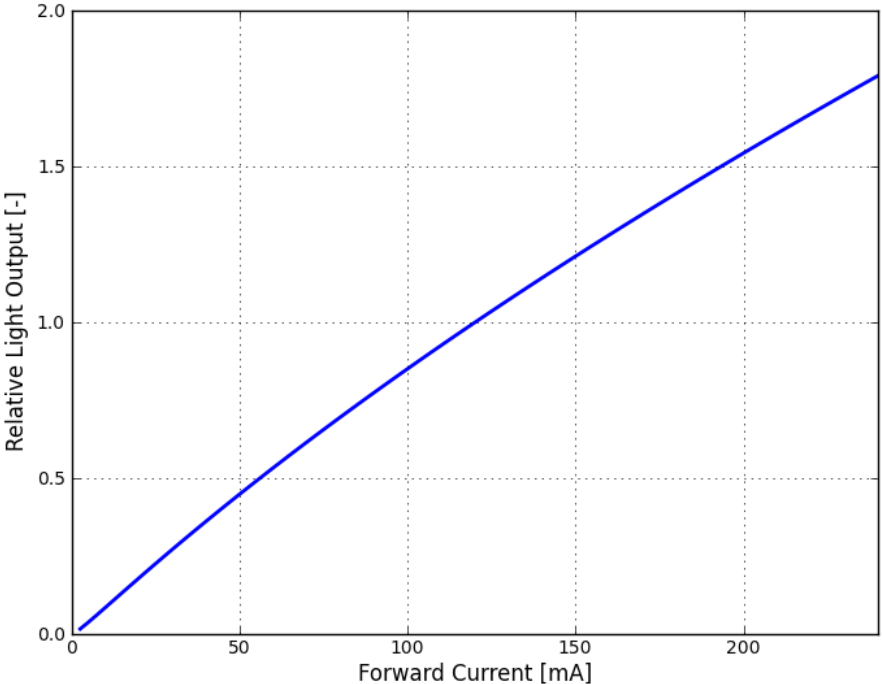


Figure 4: Typical normalized light output vs. forward current for L130-xxxx002011001 at $T_j=25^\circ\text{C}$.

Forward Current Characteristics

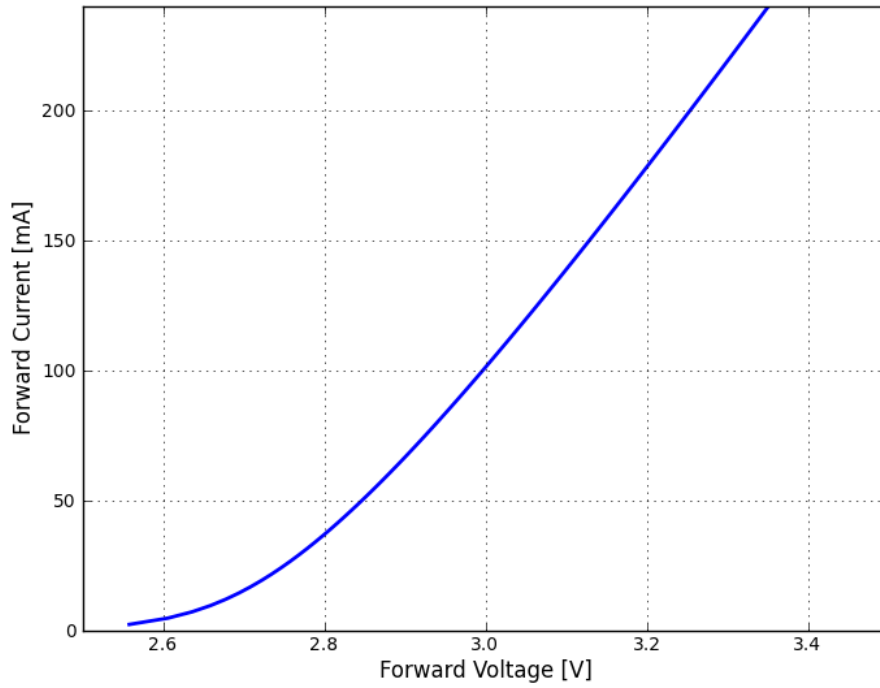


Figure 5: Typical forward current vs. forward voltage for L130-xxxx002011001 at 120mA, $T_j=25^\circ\text{C}$.

Radiation Pattern Characteristics

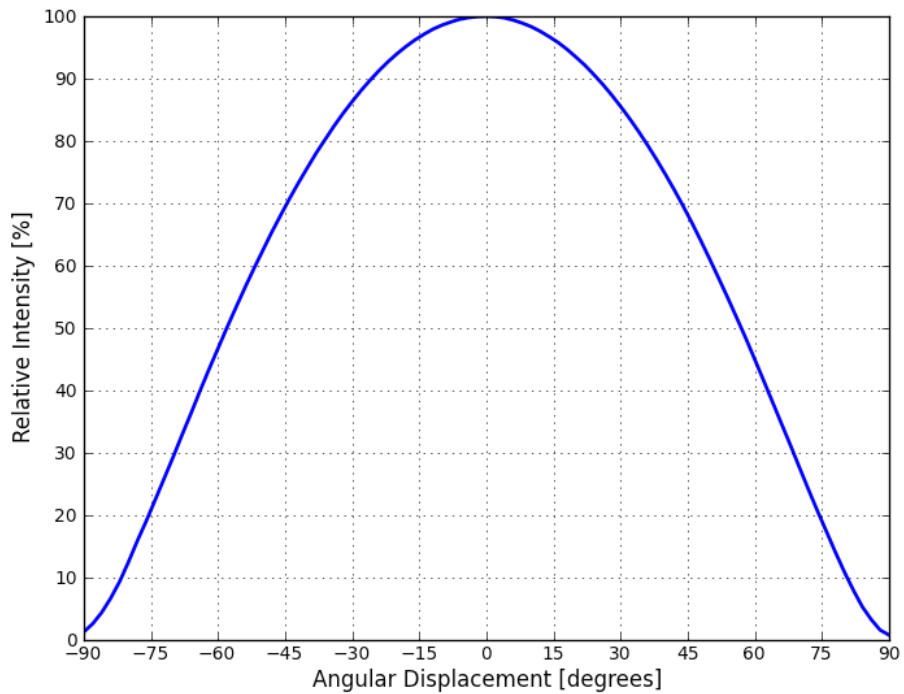


Figure 6: Typical radiation pattern for LUXEON 3020 at 120mA, $T_j=25^\circ\text{C}$.

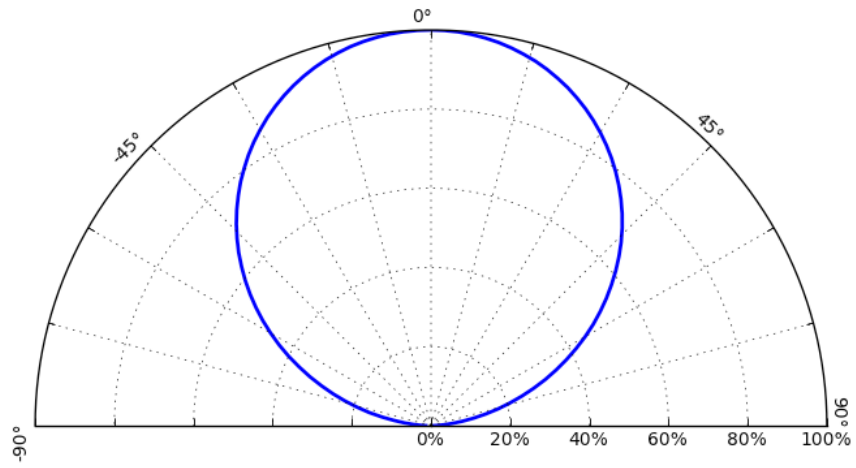


Figure 7: Typical polar radiation pattern for LUXEON 3020 at 120mA, $T_j=25^\circ\text{C}$.

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, forward voltage, and color point, peak wavelength, or dominant wavelength.

LUXEON 3020 LEDs are labeled using a four digit alphanumeric CAT code following the format below:

A B C D

- A** – designates luminous flux bin (ex. M=36 to 40 lumens, R=48 to 52 lumens)
- B C** – designates color bin (ex. 7D, 7E, 7F, 7G, 7H, 7J, 7K, 7L or 7M for 3000K parts)
- D** – designates forward voltage bin (ex. T=2.8 to 2.9V, Y=3.2 to 3.3V)

Therefore, a LUXEON 3020 with a lumen range of 36 to 40, color bin of 7K and forward voltage range of 2.8 to 2.9 has the following CAT code:

M 7 K T

Luminous Flux Bins

Table 5 lists the standard photometric luminous flux bins for LUXEON 3020 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 3020.

BIN	LUMINOUS FLUX (lm)	
	MINIMUM	MAXIMUM
M	36	40
P	40	44
Q	44	48
R	48	52
S	52	56
T	56	60
U	60	65

Notes for Table 5:

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

Color Bin Definition

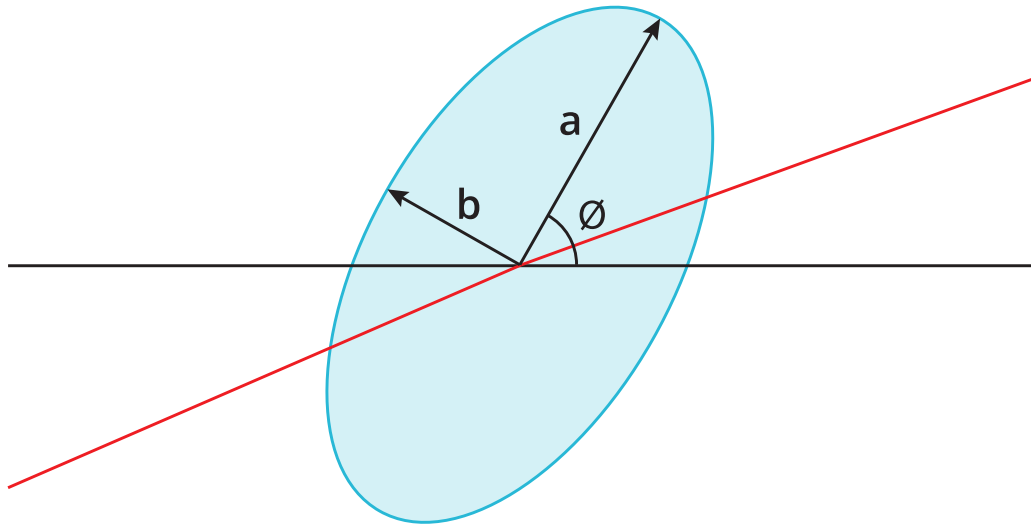


Figure 8: 3- and 5-step MacAdam ellipse illustration for Tables 6-14.

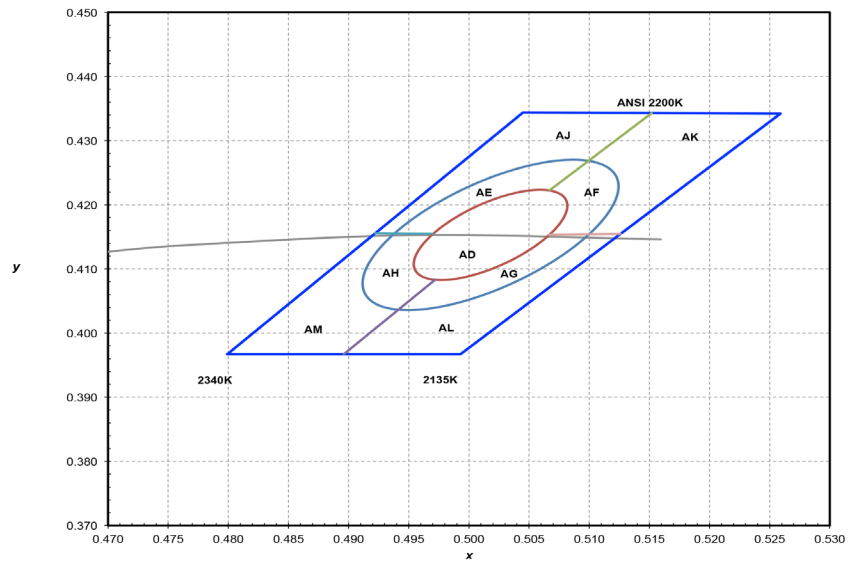


Figure 9: Color bin structure for LUXEON 3020 2200K.

Table 6. 3- and 5-step MacAdam ellipse color bin definitions for L130-22xx002011001.

NOMINAL CCT	COLOR SPACE	CENTER POINT (cx, cy)	MAJOR AXIS, a	MINOR AXIS, b	ELLIPSE ROTATION ANGLE, θ
2200K	Single 3-step MacAdam ellipse	(0.5018, 0.4153)	0.0086	0.0040	49.27°
2200K	Single 5-step MacAdam ellipse	(0.5018, 0.4153)	0.0431	0.0199	49.27°

Notes for Table 6:

1. Lumileds maintains a tolerance of ± 0.007 on x and y color coordinates.

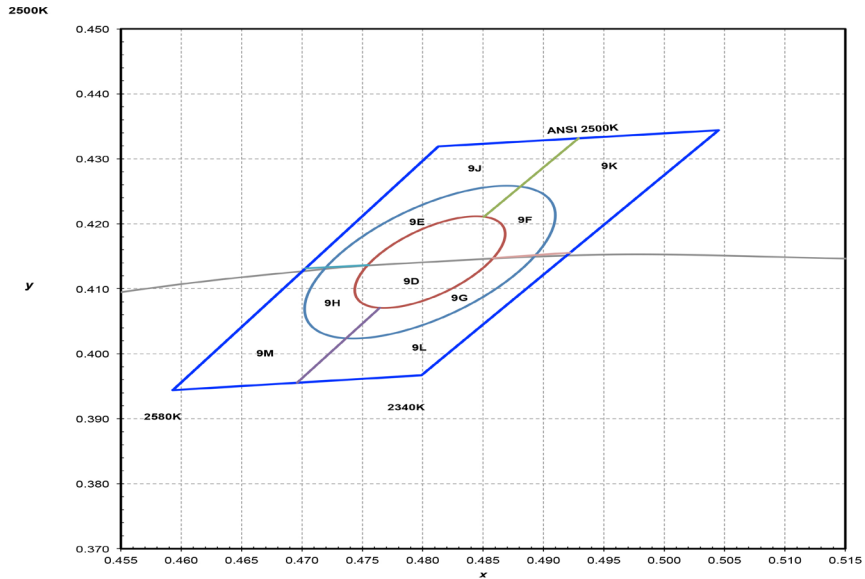


Figure 10: Color bin structure for LUXEON 3020 2500K.

Table 7. 3- and 5-step MacAdam ellipse color bin definitions for L130-25xx002011001.

NOMINAL CCT	COLOR SPACE	CENTER POINT (cx, cy)	MAJOR AXIS, a	MINOR AXIS, b	ELLIPSE ROTATION ANGLE, θ
2500K	Single 3-step MacAdam ellipse	(0.4806, 0.4141)	0.0085	0.0041	50.71°
2500K	Single 5-step MacAdam ellipse	(0.4806, 0.4141)	0.0424	0.0205	50.71°

Notes for Table 7:

1. Lumileds maintains a tolerance of ± 0.007 on x and y color coordinates.

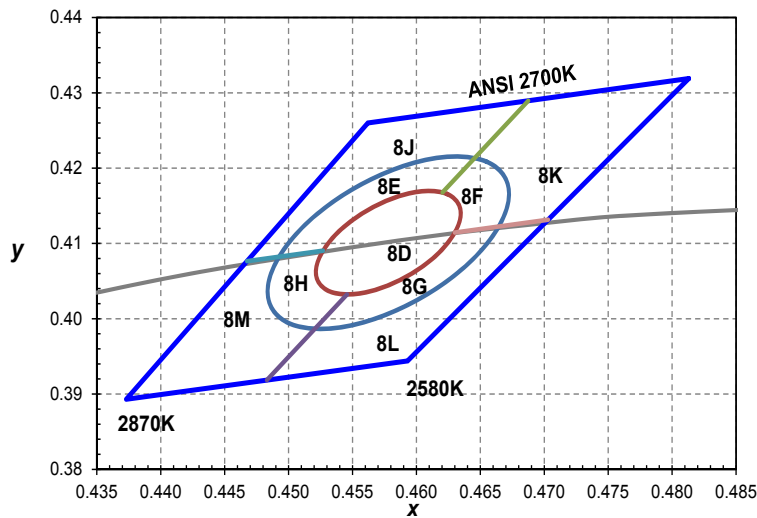


Figure 11: Color bin structure for LUXEON 3020 2700K.

Table 8. 3- and 5-step MacAdam ellipse color bin definitions for L130-27xx002011001.

NOMINAL CCT	COLOR SPACE	CENTER POINT (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°
2700K	Single 5-step MacAdam ellipse	(0.4578, 0.4101)	0.01350	0.00700	53.70°

Notes for Table 8:

1. Lumileds maintains a tolerance of ± 0.007 on x and y color coordinates.

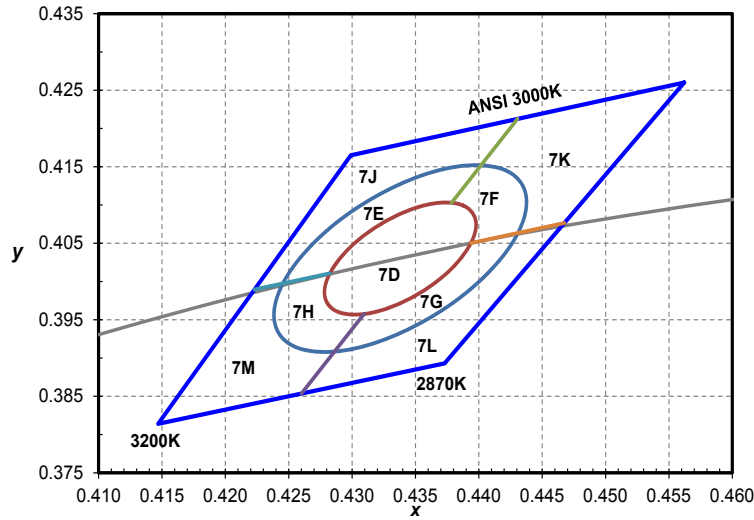


Figure 12: Color bin structure for LUXEON 3020 3000K.

Table 9. 3- and 5-step MacAdam ellipse color bin definitions for L130-30xx002011001.

NOMINAL CCT	COLOR SPACE	CENTER POINT (cx, cy)	MAJOR AXIS, a	MINOR AXIS, b	ELLIPSE ROTATION ANGLE, θ
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	0.06800	53.22°

Notes for Table 9:

1. Lumileds maintains a tolerance of ± 0.007 on x and y color coordinates.

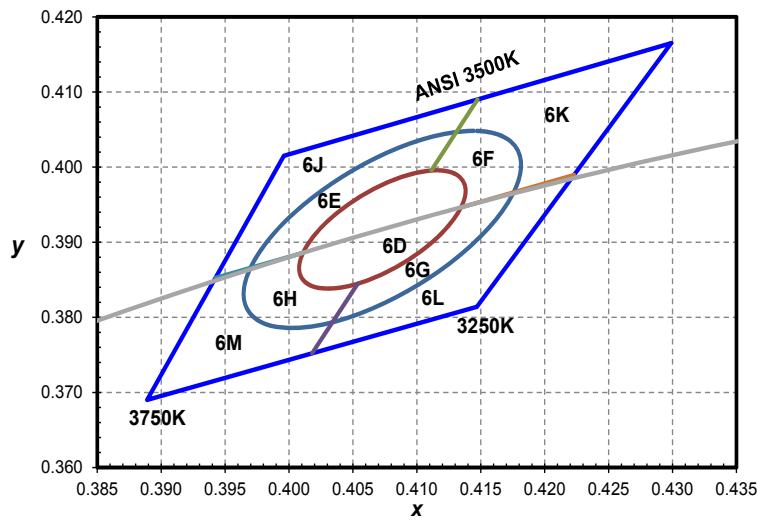


Figure 13: Color bin structure for LUXEON 3020 3500K.

Table 10. 3- and 5-step MacAdam ellipse color bin definitions for L130-35xx002011001.

NOMINAL CCT	COLOR SPACE	CENTER POINT (cx, cy)	MAJOR AXIS, a	MINOR AXIS, b	ELLIPSE ROTATION ANGLE, θ
3500K	Single 3-step MacAdam ellipse	(0.4073, 0.3917)	0.00927	0.00414	54.00°
3500K	Single 5-step MacAdam ellipse	(0.4073, 0.3917)	0.01545	0.0690	54.00°

Notes for Table 10:

1. Lumileds maintains a tolerance of ± 0.007 on x and y color coordinates.

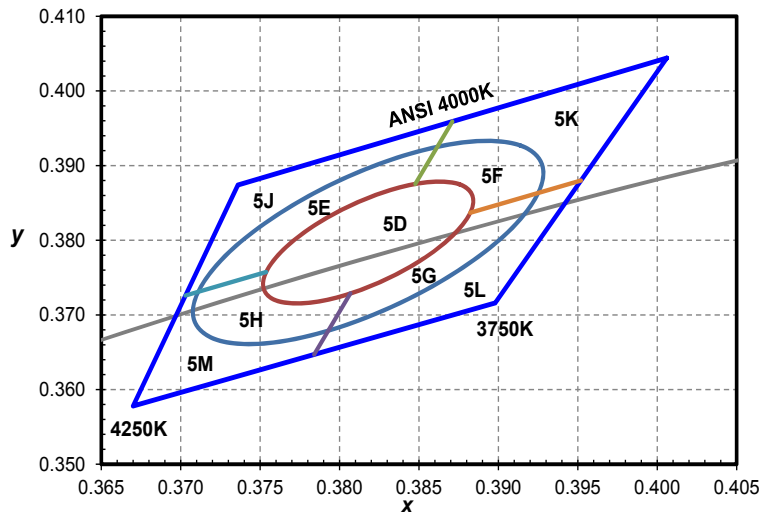


Figure 14: Color bin structure for LUXEON 3020 4000K.

Table 11. 3- and 5-step MacAdam ellipse color bin definitions for L130-40xx002011001.

NOMINAL CCT	COLOR SPACE	CENTER POINT (cx, cy)	MAJOR AXIS, a	MINOR AXIS, b	ELLIPSE ROTATION ANGLE, θ
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 11:

1. Lumileds maintains a tolerance of ± 0.007 on x and y color coordinates.

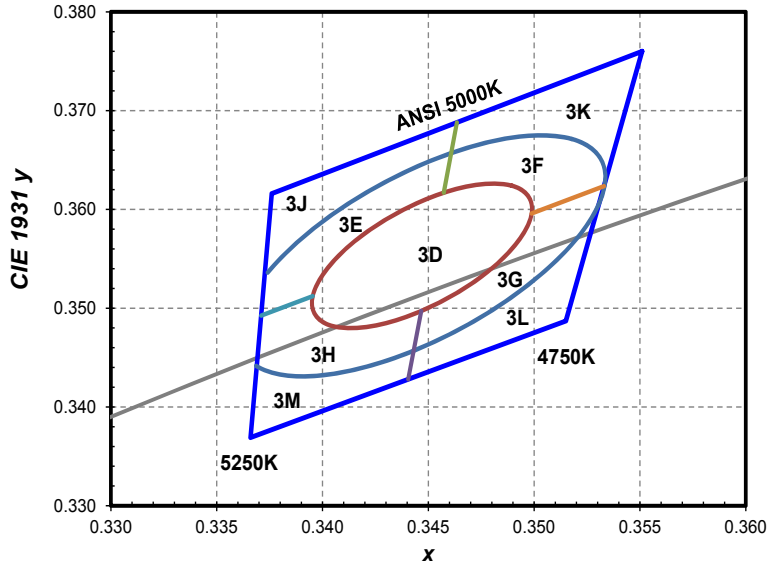


Figure 15: Color bin structure for LUXEON 3020 5000K.

Table 12. 3- and 5-step MacAdam ellipse color bin definitions for L130-50xx002011001.

NOMINAL CCT	COLOR SPACE	CENTER POINT (cx, cy)	MAJOR AXIS, a	MINOR AXIS, b	ELLIPSE ROTATION ANGLE, θ
5000K	Single 3-step MacAdam ellipse	(0.3447, 0.3558)	0.00822	0.00354	59.62°
5000K	Single 5-step MacAdam ellipse	(0.3447, 0.3558)	0.01370	0.00590	59.62°

Notes for Table 12:

1. Lumileds maintains a tolerance of ± 0.007 on x and y color coordinates.

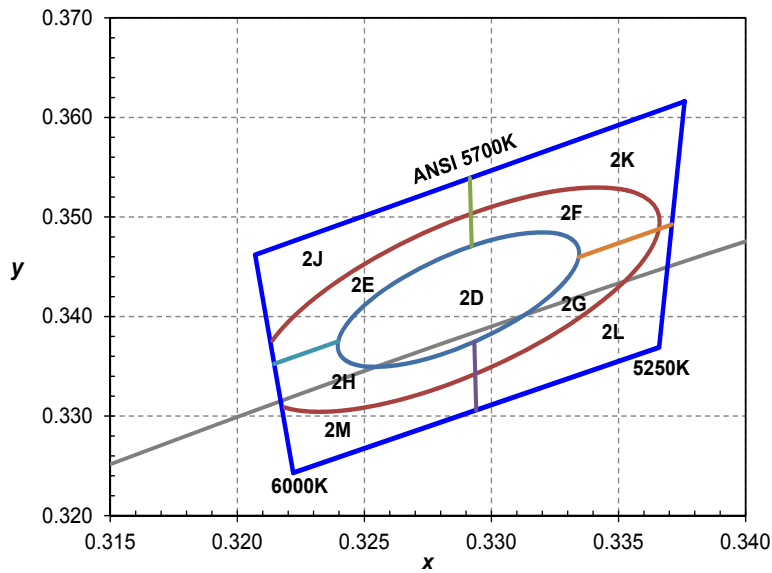


Figure 16: Color bin structure for LUXEON 3020 5700K.

Table 13. 3- and 5-step MacAdam ellipse color bin definitions for L130-57xx002011001.

NOMINAL CCT	COLOR SPACE	CENTER POINT (cx, cy)	MAJOR AXIS, a	MINOR AXIS, b	ELLIPSE ROTATION ANGLE, θ
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 13:

1. Lumileds maintains a tolerance of ± 0.007 on x and y color coordinates.

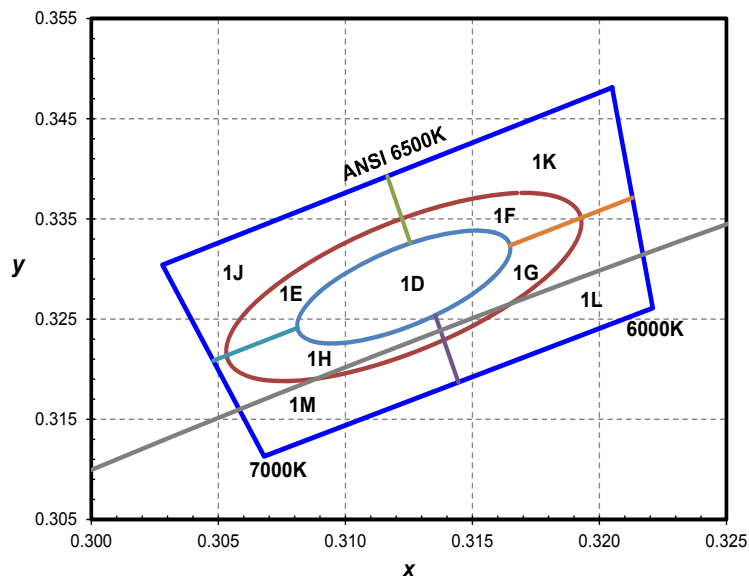


Figure 17 Color bin structure for LUXEON 3020 6500K.

Table 14. 3- and 5-step MacAdam ellipse color bin definitions for L130-65xx002011001.

NOMINAL CCT	COLOR SPACE	CENTER POINT (cx, cy)	MAJOR AXIS, a	MINOR AXIS, b	ELLIPSE ROTATION ANGLE, θ
6500K	Single 3-step MacAdam ellipse	(0.3123, 0.3282)	0.00669	0.00285	58.57°
6500K	Single 5-step MacAdam ellipse	(0.3123, 0.3282)	0.01115	0.00475	58.57°

Notes for Table 14:

1. Lumileds maintains a tolerance of ± 0.007 on x and y color coordinates.

Forward Voltage Bins

Table 15. Forward voltage bin definitions for LUXEON 3020.

BIN	FORWARD VOLTAGE (V)	
	MINIMUM	MAXIMUM
T	2.8	2.9
V	2.9	3.0
W	3.0	3.1
X	3.1	3.2
Y	3.2	3.3
Z	3.3	3.4

Notes for Table 15:

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

Mechanical Dimensions

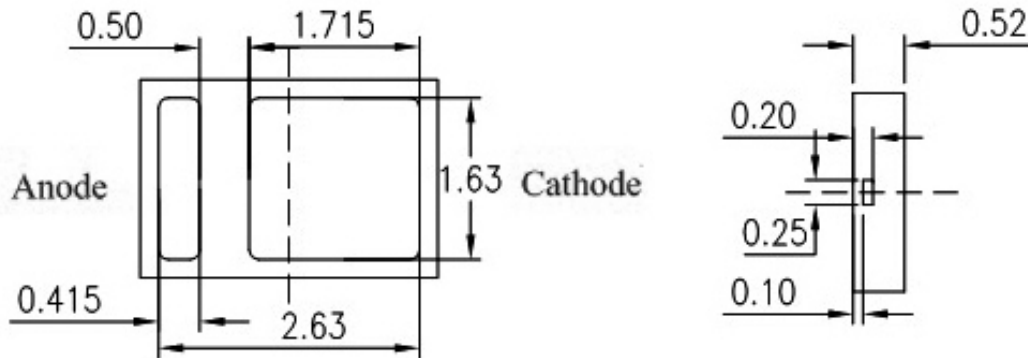


Figure 18: Mechanical dimensions for LUXEON 3020.

Notes for Figure 18:

1. Drawings are not to scale.
2. All dimensions are in millimeters.
3. Tolerance: $\pm 0.10mm$.

Reflow Soldering Guidelines

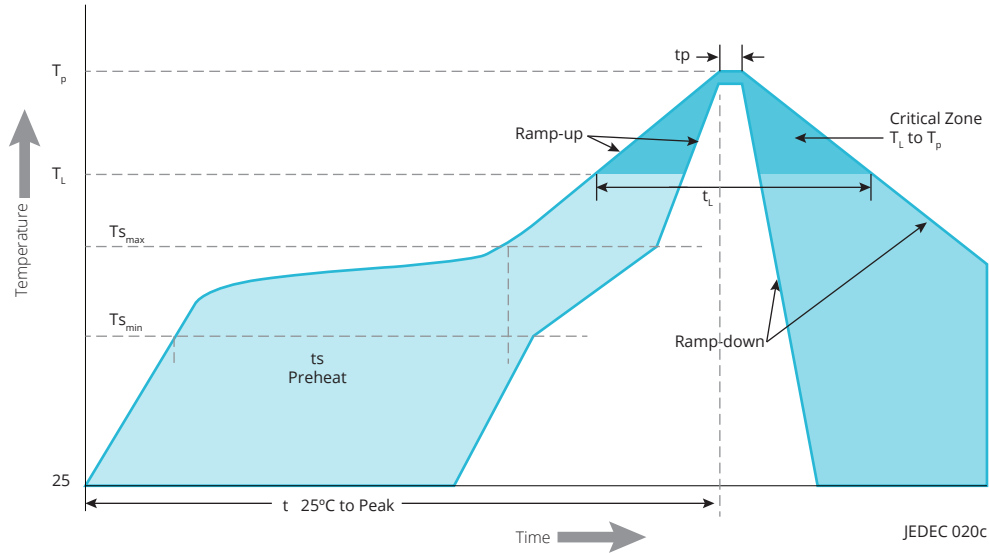


Figure 19: Visualization of the acceptable reflow temperature profile as specified in Table 16.

Table 16. Reflow profile characteristics for LUXEON 3020.

PROFILE FEATURE	LEAD FREE ASSEMBLY
Average Ramp-Up Rate ($T_{s_{max}}$ to T_p)	3°C / second maximum
Minimum Preheat Temperature ($T_{s_{min}}$)	150°C
Maximum Preheat Temperature ($T_{s_{max}}$)	200°C
Preheat Time ($t_{s_{min}}$ to $t_{s_{max}}$)	120 seconds
Liquidus Temperature (T_L)	217°C
Time Maintained Above Temperature T_L (t_L)	<150 seconds (follows J-STD-020 standard)
Peak / Classification Temperature (T_p)	260°C
Time Within 5°C of Actual Temperature (t_p)	10 to 30 seconds
Ramp-Down Rate	6°C / seconds maximum
Time 25°C to Peak Temperature	8 minutes maximum

Notes for Table 16:

1. All temperatures refer to the application Printed Circuit Board (PCB), measured on the surface adjacent to the package body.

JEDEC Moisture Sensitivity

Table 17. Moisture sensitivity levels for LUXEON 3020.

LEVEL	FLOOR LIFE		SOAK REQUIREMENTS STANDARD	
	TIME	CONDITIONS	TIME	CONDITIONS
3	168 Hours	≤30°C / 85% RH	192 Hours + 5 / - 0	30°C / 60% RH

Solder Pad Design

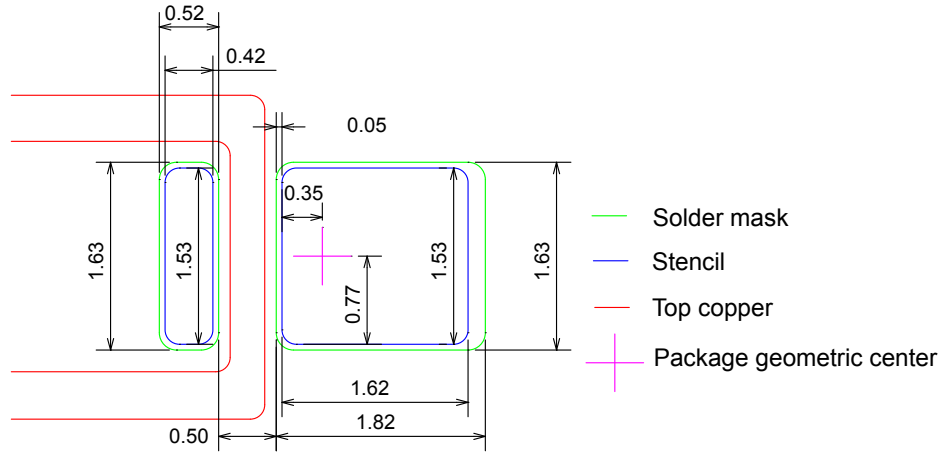


Figure 20: Recommended PCB solder pad layout for LUXEON 3020.

Packaging Information

Pocket Tape Dimensions

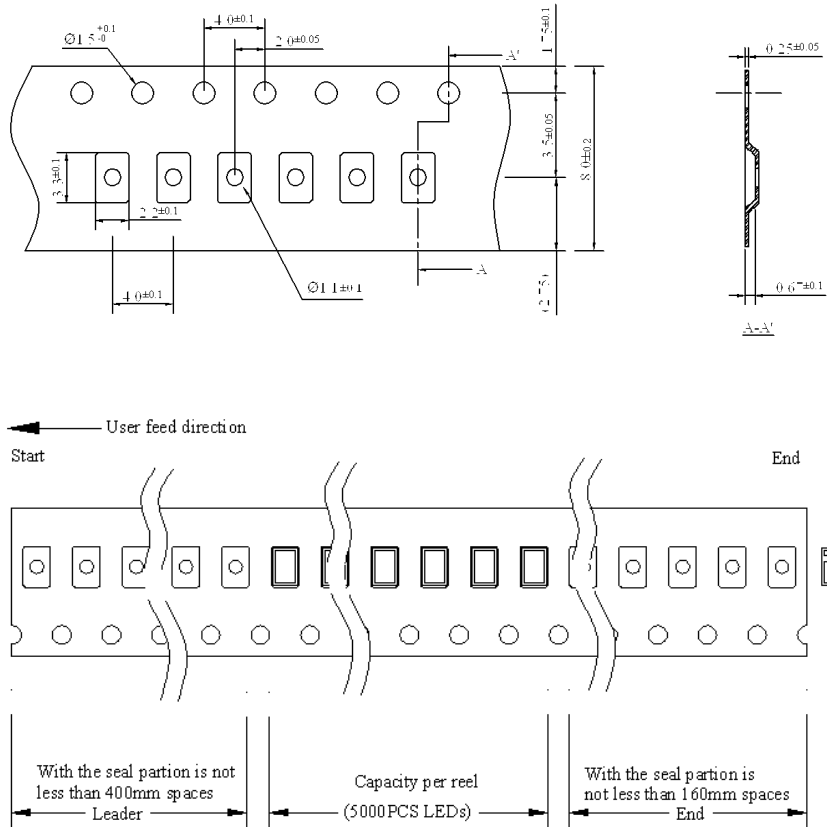


Figure 21: Tape dimensions for LUXEON 3020.

Notes for Figures 20 and 21:
 1. Drawings are not to scale.
 2. All dimensions are in millimeters.

Reel Dimensions

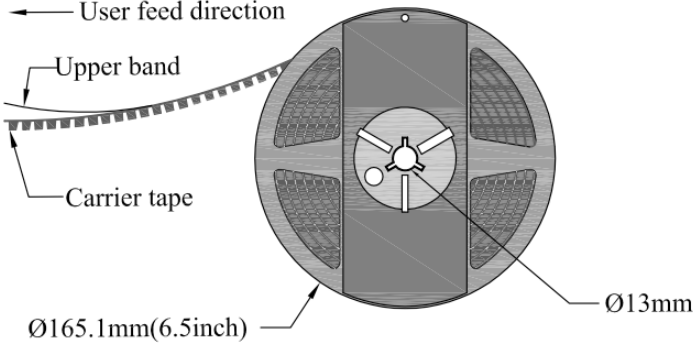


Figure 22: Reel dimensions for LUXEON 3020.

- Notes for Figure 22:
- 1. Drawings are not to scale.
 - 2. All dimensions are in millimeters.

About Lumileds

Lumileds is the light engine leader, delivering innovation, quality and reliability.

For 100 years, Lumileds commitment to innovation has helped customers pioneer breakthrough products in the automotive, consumer and illumination markets.

Lumileds is shaping the future of light with our LEDs and automotive lamps, and helping our customers illuminate how people see the world around them.

To learn more about our portfolio of light engines, visit lumileds.com.



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