LUMILEDS

ILLUMINATION

LUXEON 3020

Industry's most compact, highest drive current 3V mid power 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
  - Troffer
  - TLED
- Lamps
- Specialty Lighting

DS209 LUXEON 3020 Product Datasheet ©2017 Lumileds Holding B.V. All rights reserved.

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General Product Information

Product Test Conditions

LUXEON 3020 LEDs are tested with a 20ms monopulse of 120mA at junction temperature, T_j, of 25ºC. Forward voltage and luminous flux are binned at a T_j of 25°C, while color is hot targeted at a T_j of 85°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 (22=2200K, 25=2500K, 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 at specified temperature.

NOMINAL CCT [1]	MINIMUM CRI [2, 3]	LUMINOUS FLUX [2, 3] (lm)		TYPICAL LUMINOUS EFFICACY (lm/W)	TYPICAL LUMINOUS FLUX (lm)	TYPICAL LUMINOUS EFFICACY (lm/W)	PART NUMBER
		MINIMUM	TYPICAL				
	120mA				100mA		
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	40	46	125	40	133	L130-2280002011001
2500K	80	44	50	135	43	143	L130-2580002011001
2700K	80	42	52	134	42	140	L130-2780002011001
3000K	80	44	53	134	43	143	L130-3080002011001
3500K	80	45	55	139	44	147	L130-3580002011001
4000K	80	46	57	145	46	153	L130-4080002011001
5000K	80	46	58	145	46	153	L130-5080002011001
5700K	80	46	57	145	46	153	L130-5780002011001
6500K	80	46	57	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 hot targeted at T_j=85°C.
2. Luminous flux and CRI are based upon mounted package on highly reflective surface at T_j=25°. Typical CRI is approximately 2 points higher than the minimum CRI specified, but this is not guaranteed.
3. Lumileds maintains a tolerance of ±2 on CRI and ±7.5% on luminous flux measurements.

Optical Characteristics

Table 2. Optical characteristics for LUXEON 3020 at 120mA, T_j=25°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 ½ of the peak value.

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Electrical and Thermal Characteristics

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

PART NUMBER	FORWARD VOLTAGE (V_f) [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 (ANSI/ESDA/JEDEC JS-001-2012)	Class 2
Operating Case Temperature [1, 2]	-40°C to 105°C
LED 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.

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Characteristic Curves

Spectral Power Distribution Characteristics

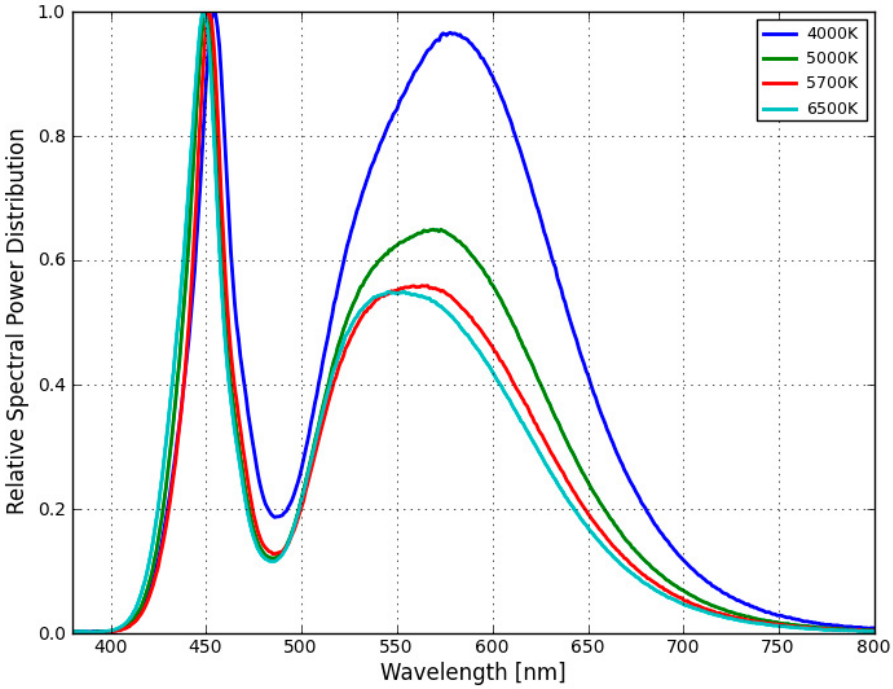


Figure 1a. Typical normalized power vs. wavelength for L130-xx7000201 at 120mA, T_j=25°C.

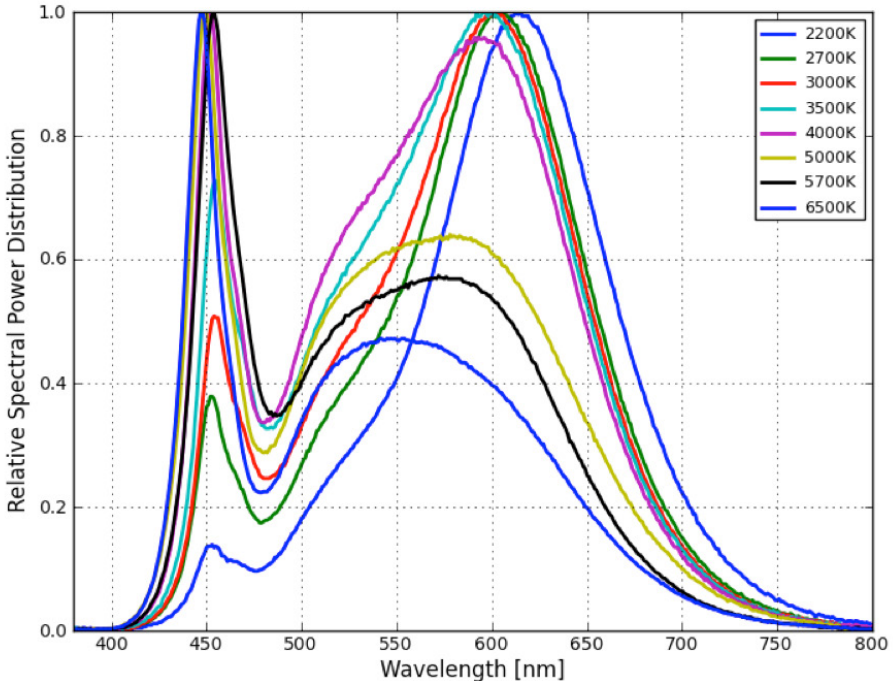


Figure 1b. Typical normalized power vs. wavelength for L130-xx8000201 at 120mA, T_j=25°C.

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Light Output Characteristics

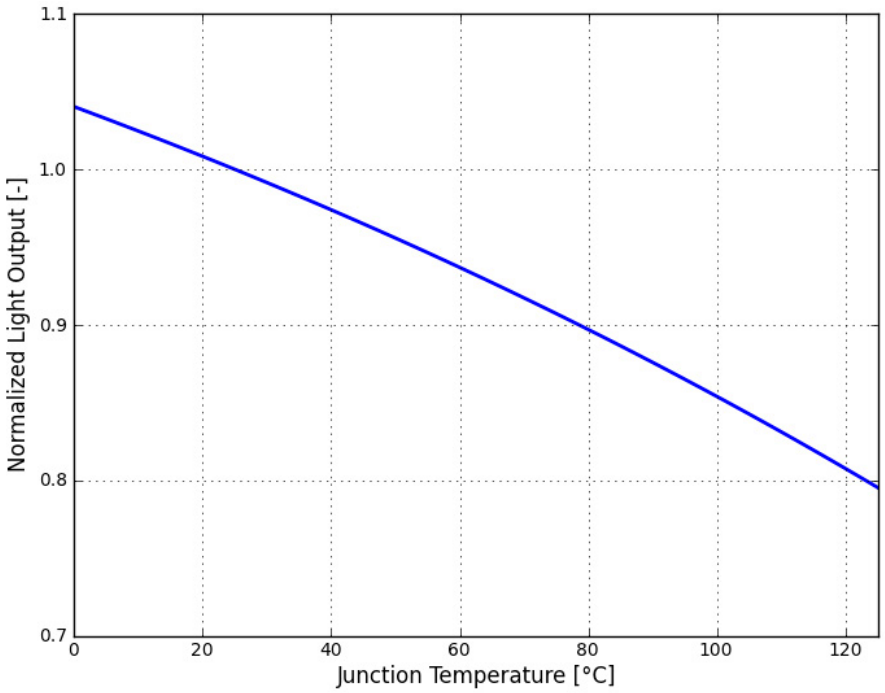


Figure 2. Typical normalized light output vs. junction temperature for L130-xxxx00201101 at 120mA.

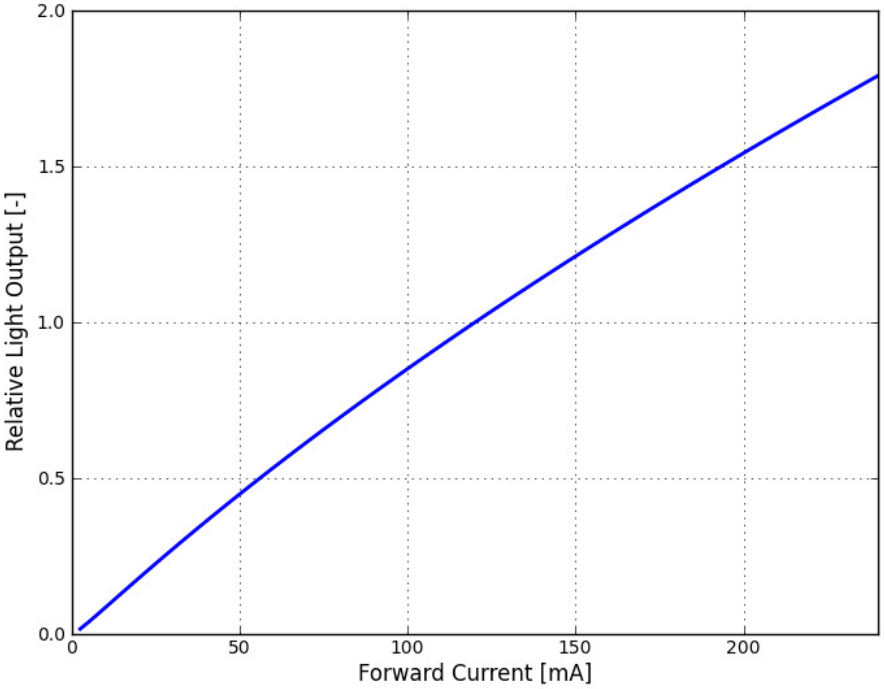


Figure 3. Typical normalized light output vs. forward current for L130-xxxx002011001 at T_j=25°C.

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Forward Current Characteristics

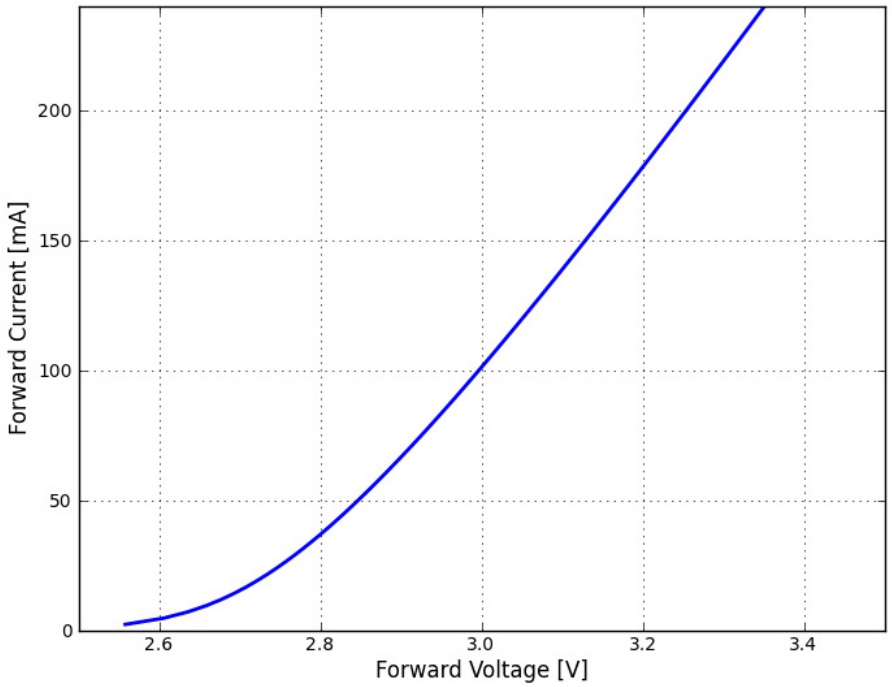


Figure 4. Typical forward current vs. forward voltage for L130-xxxx002011001 at 120mA, T_j=25ºC.

Radiation Pattern Characteristics

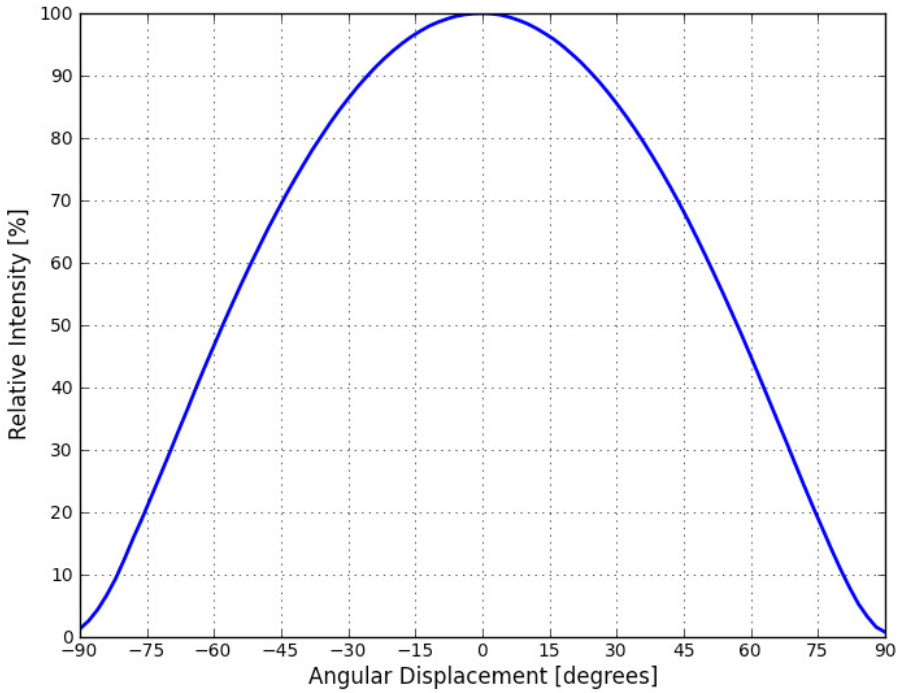


Figure 5. Typical radiation pattern for LUXEON 3020 at 120mA, T_j=25ºC.

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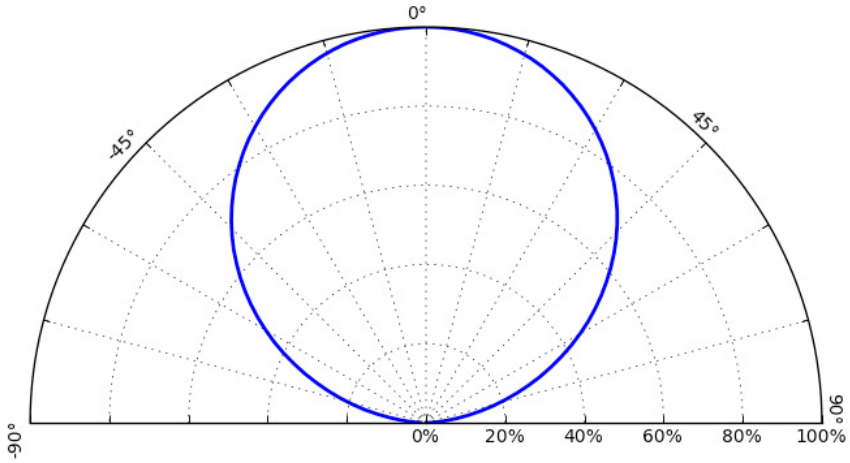


Figure 6. Typical polar radiation pattern for LUXEON 3020 at 120mA, T_j=25ºC.

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 3020 LEDs are labeled using a 4-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 at 120mA, T_j=25°C.

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 ±7.5% on luminous flux measurements.

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Color Bin Definitions

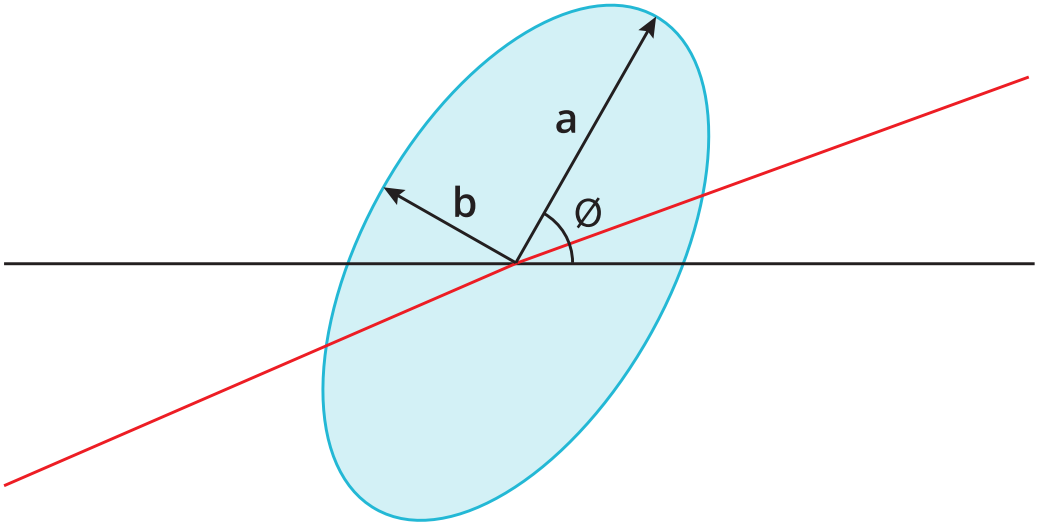


Figure 7. 3- and 5-step MacAdam ellipse illustration for Tables 6a-6i.

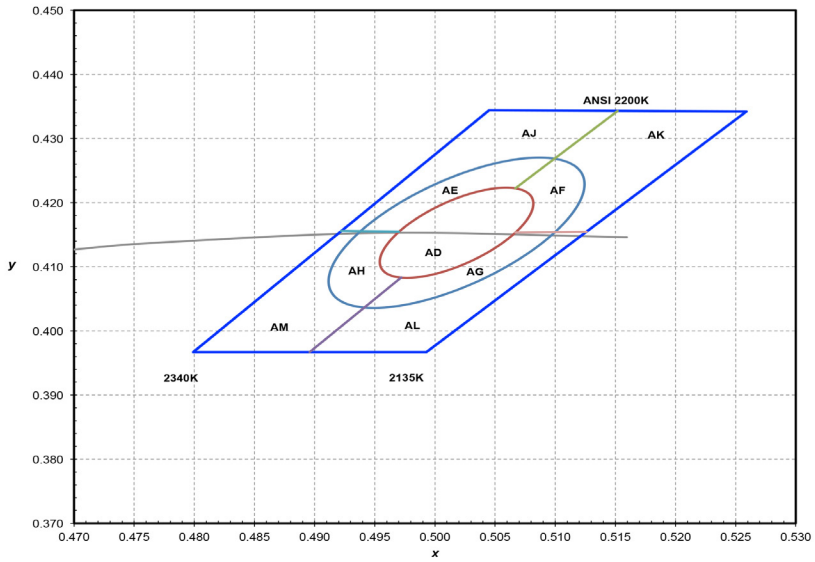


Figure 8a. 1/9th color bin structure for LUXEON 3020 2200K, hot-color targeted at 85°C.

Table 6a. 3- and 5-step MacAdam ellipse color bin definitions for L130-22xx002011001 at test current hot-color targeted at 85°C.

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)	0.00863	0.00398	49.27°
2200K	Single 5-step MacAdam ellipse	(0.5018, 0.4153)	0.01438	0.00663	49.27°

Notes for Table 6a:
1. Lumileds maintains a tolerance of ±0.007 on x and y color coordinates.

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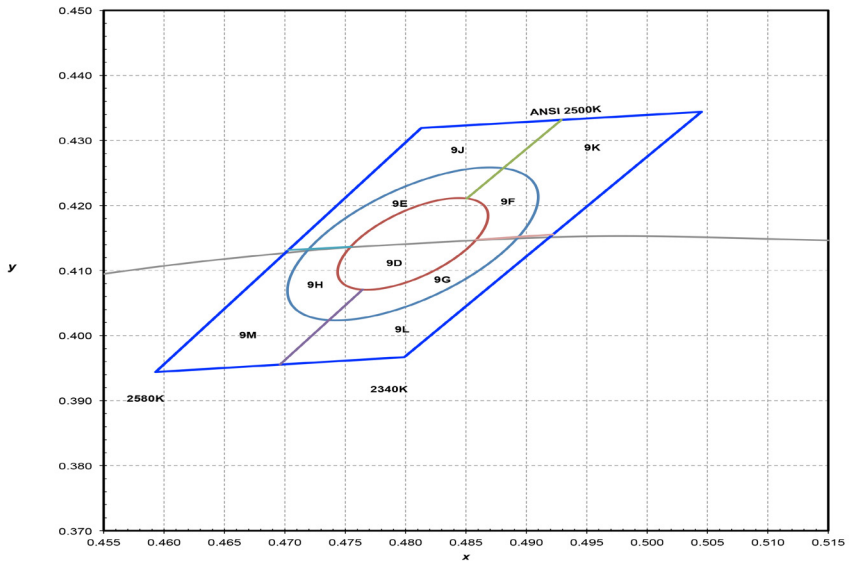


Figure 8b. 1/9th color bin structure for LUXEON 3020 2500K, hot-color targeted at 85°C.

Table 6b. 3- and 5-step MacAdam ellipse color bin definitions for L130-25xx002011001 at test current hot-color targeted at 85°C.

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)	0.00847	0.00410	50.71°
2500K	Single 5-step MacAdam ellipse	(0.4806, 0.4141)	0.01412	0.00683	50.71°

Notes for Table 6b:
1. Lumileds maintains a tolerance of ±0.007 on x and y color coordinates.

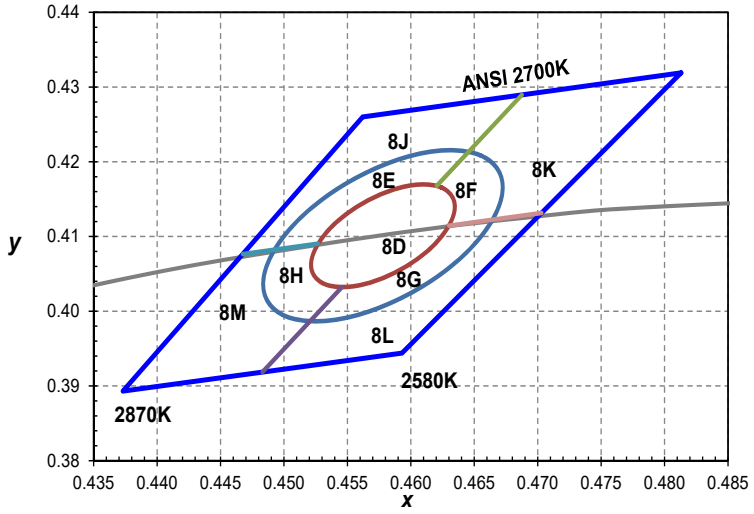


Figure 8c. 1/9th color bin structure for LUXEON 3020 2700K, hot-color targeted at 85°C.

Table 6c. 3- and 5-step MacAdam ellipse color bin definitions for L130-27xx002011001 at test current hot-color targeted at 85°C.

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 6c:
1. Lumileds maintains a tolerance of ±0.007 on x and y color coordinates.

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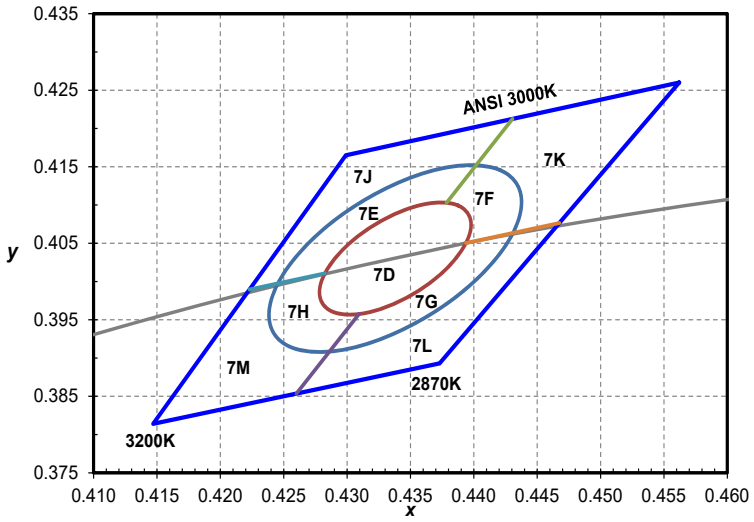


Figure 8d. 1/9th color bin structure for LUXEON 3020 3000K, hot-color targeted at 85°C.

Table 6d. 3- and 5-step MacAdam ellipse color bin definitions for L130-30xx002011001 at test current hot-color targeted at 85°C.

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	0.00680	53.22°

Notes for Table 6d:
1. Lumileds maintains a tolerance of ±0.007 on x and y color coordinates.

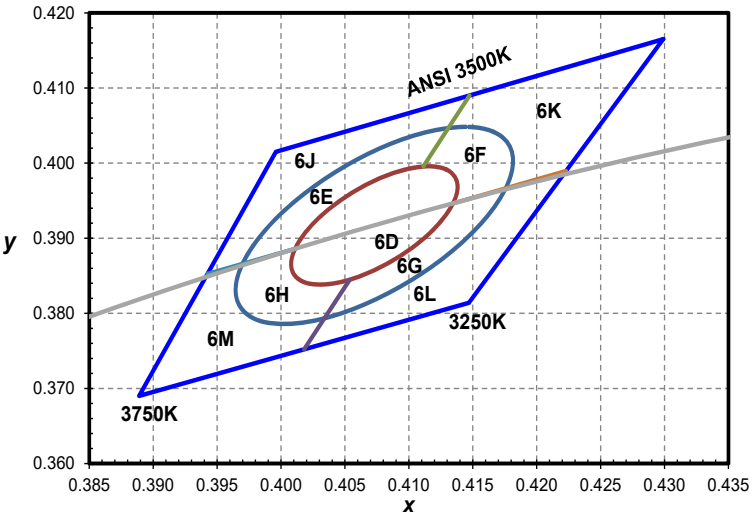


Figure 8e. 1/9th color bin structure for LUXEON 3020 3500K, hot-color targeted at 85°C.

Table 6e. 3- and 5-step MacAdam ellipse color bin definitions for L130-35xx002011001 at test current hot-color targeted at 85°C.

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	0.00690	54.00°

Notes for Table 6e:
1. Lumileds maintains a tolerance of ±0.007 on x and y color coordinates.

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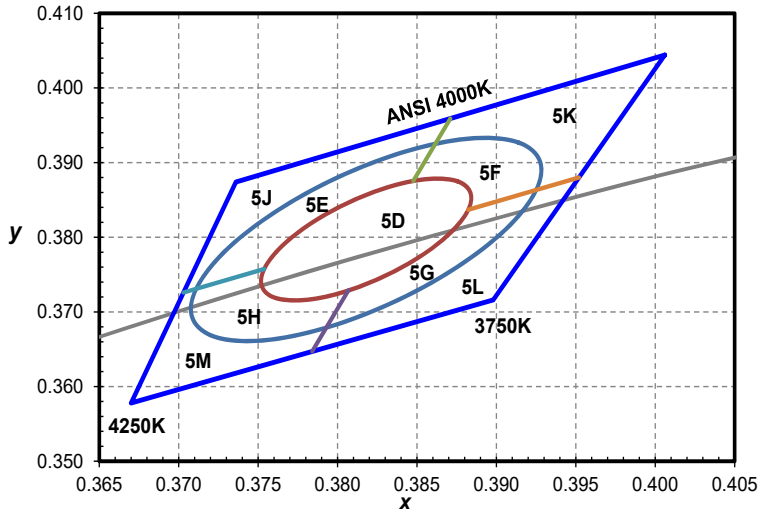


Figure 8f. 1/9th color bin structure for LUXEON 3020 4000K, hot-color targeted at 85°C.

Table 6f. 3- and 5-step MacAdam ellipse color bin definitions for L130-40xx002011001 at test current hot-color targeted at 85°C.

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 6f:
1. Lumileds maintains a tolerance of ±0.007 on x and y color coordinates.

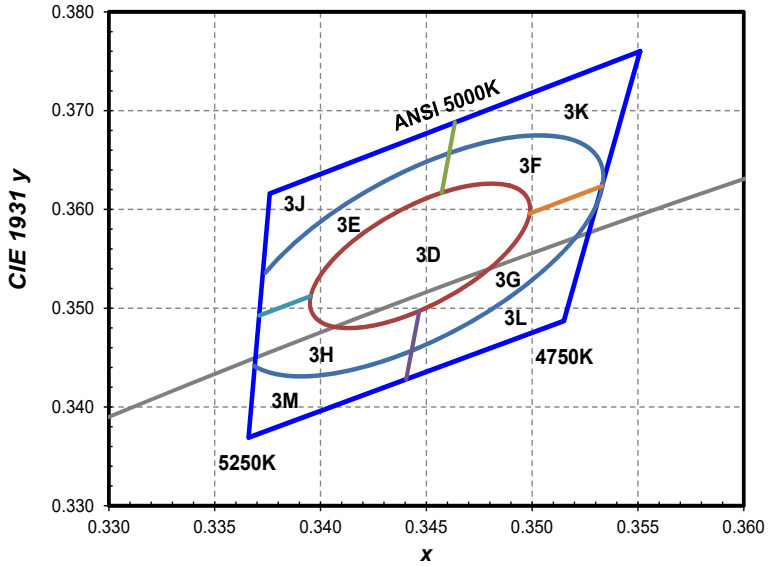


Figure 8g. 1/9th color bin structure for LUXEON 3020 5000K, hot-color targeted at 85°C.

Table 6g. 3- and 5-step MacAdam ellipse color bin definitions for L130-50xx002011001 at test current hot-color targeted at 85°C.

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, 0.3553)	0.00822	0.00354	59.62°
5000K	Single 5-step MacAdam ellipse	(0.3447, 0.3553)	0.01370	0.00590	59.62°

Notes for Table 6g:
1. Lumileds maintains a tolerance of ±0.007 on x and y color coordinates.

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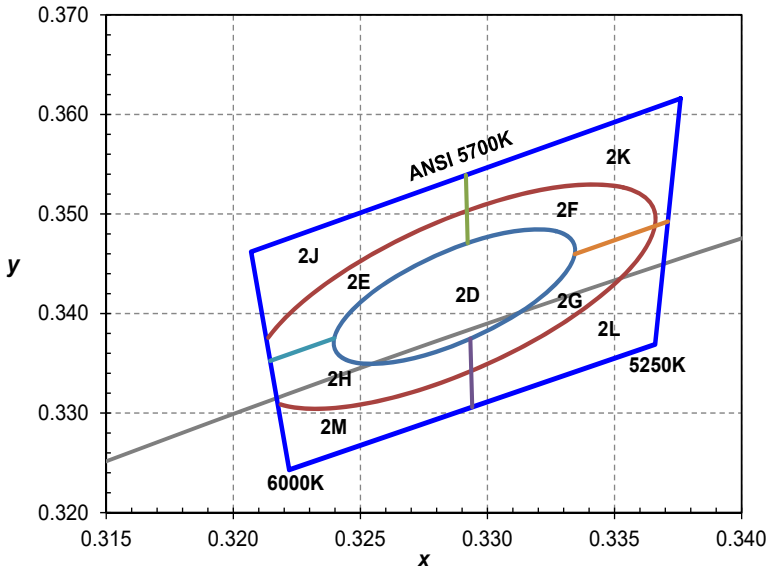


Figure 8h. 1/9th color bin structure for LUXEON 3020 5700K, hot-color targeted at 85°C.

Table 6h. 3- and 5-step MacAdam ellipse color bin definitions for L130-57xx002011001 at test current hot-color targeted at 85°C.

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 6h:
1. Lumileds maintains a tolerance of ±0.007 on x and y color coordinates.

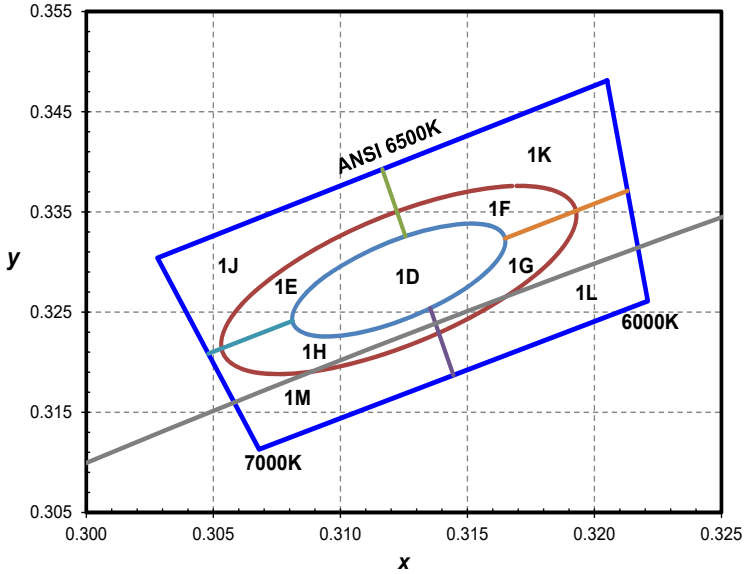


Figure 8i. 1/9th color bin structure for LUXEON 3020 6500K, hot-color targeted at 85°C.

Table 6i. 3- and 5-step MacAdam ellipse color bin definitions for L130-65xx002011001 at test current hot-color targeted at 85°C.

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 6i:
1. Lumileds maintains a tolerance of ±0.007 on x and y color coordinates.

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Forward Voltage Bins

Table 7. Forward voltage bin definitions for LUXEON 3020, T_j=25°C.

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 7:
1. Lumileds maintains a tolerance of ±0.1V on forward voltage measurements.

Mechanical Dimensions

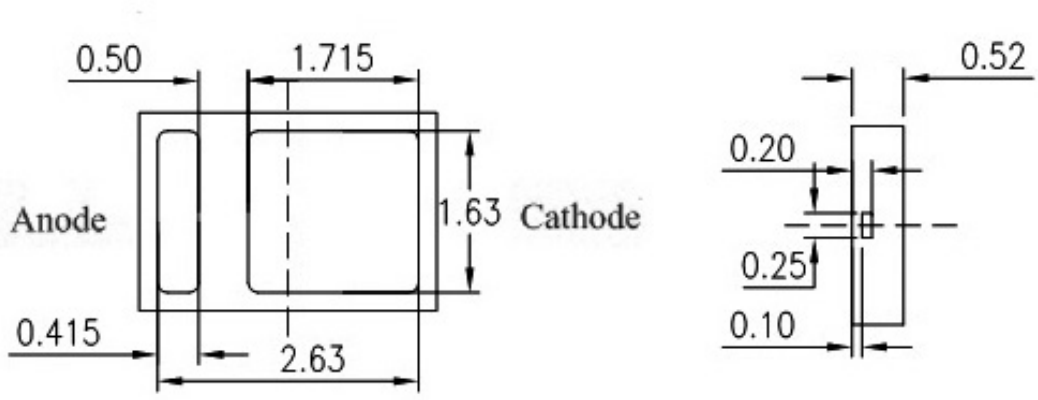


Figure 9. Mechanical dimensions for LUXEON 3020.

Notes for Figure 9:
1. Drawings are not to scale.
2. All dimensions are in millimeters.
3. Tolerance: ±0.10mm.

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Reflow Soldering Guidelines

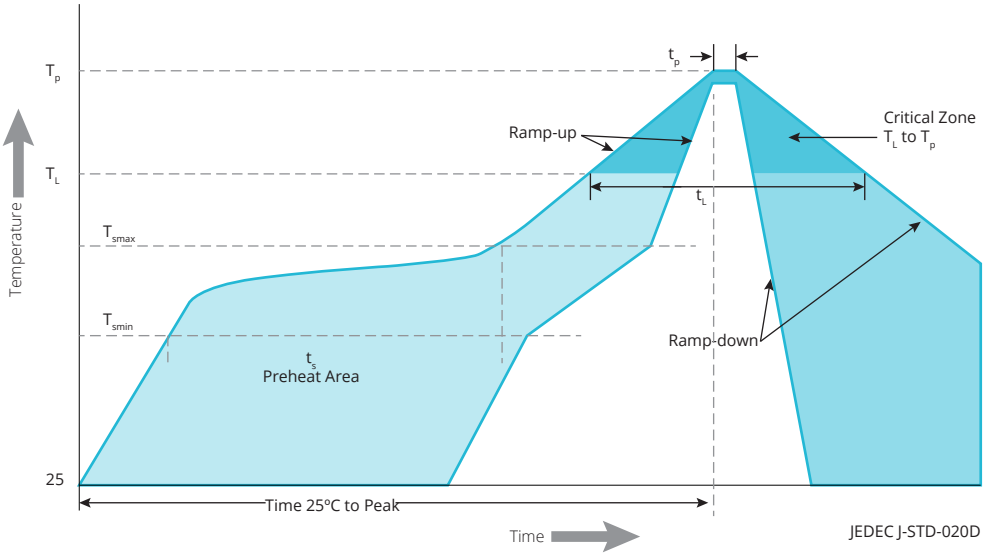


Figure 10. Visualization of the acceptable reflow temperature profile as specified in Table 8.

Table 8. Reflow profile characteristics for LUXEON 3020.

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})	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)	<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 (T_p to T_L)	6°C / second maximum
Time 25°C to Peak Temperature	8 minutes maximum

Notes for Table 14:
1. All temperatures refer to the application Printed Circuit Board (PCB), measured on the surface adjacent to the package body.

JEDEC Moisture Sensitivity

Table 9. 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

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Solder Pad Design

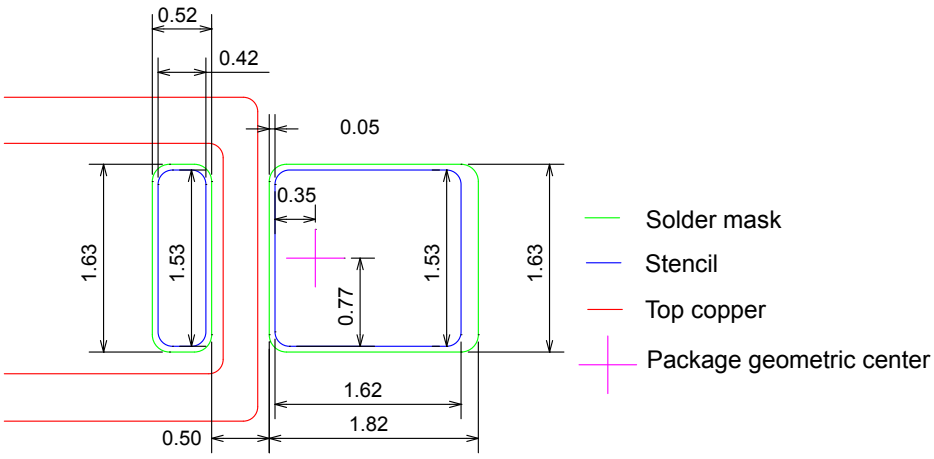


Figure 11. Recommended PCB solder pad layout for LUXEON 3020.

Packaging Information

Pocket Tape Dimensions

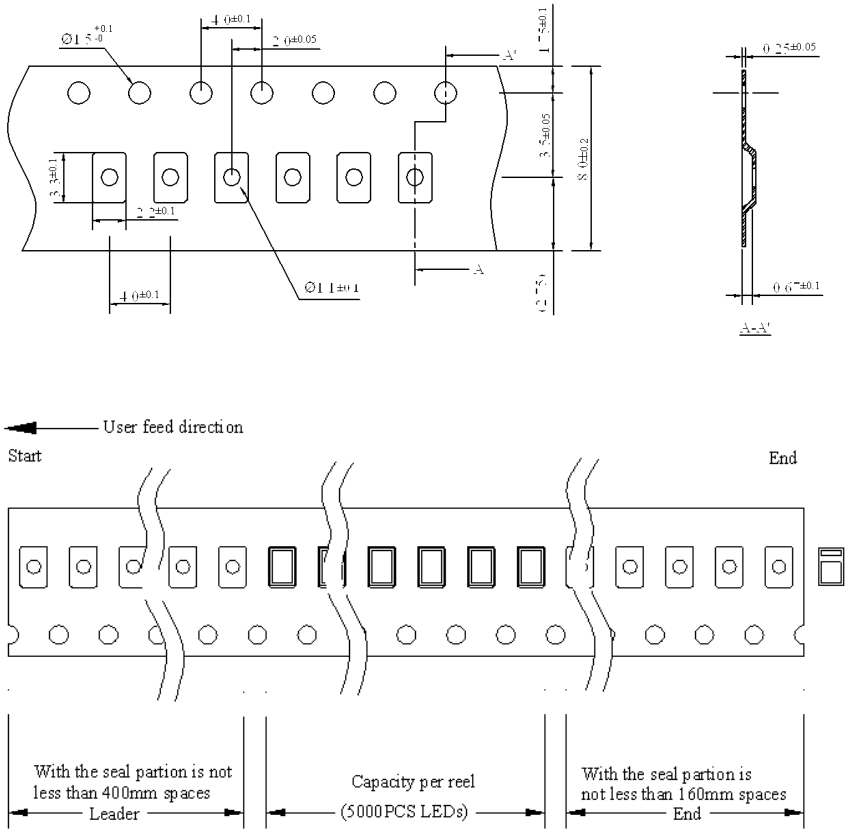


Figure 12. Tape dimensions for LUXEON 3020.

Notes for Figures 11 and 12:
1. Drawings are not to scale.
2. All dimensions are in millimeters.

Reel Dimensions

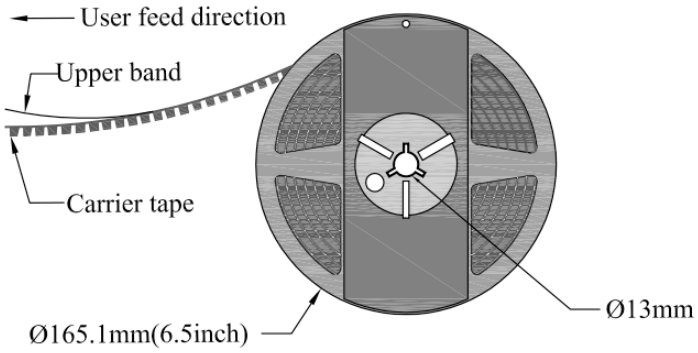


Figure 13. Reel dimensions for LUXEON 3020.

Notes for Figure 13:
1. Drawings are not to scale.
2. All dimensions are in millimeters.

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About Lumileds

Lumileds is the global leader in light engine technology. The company develops, manufactures and distributes groundbreaking LEDs and automotive lighting products that shatter the status quo and help customers gain and maintain a competitive edge.

With a rich history of industry "firsts," Lumileds is uniquely positioned to deliver lighting advancements well into the future by maintaining an unwavering focus on quality, innovation and reliability.

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

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