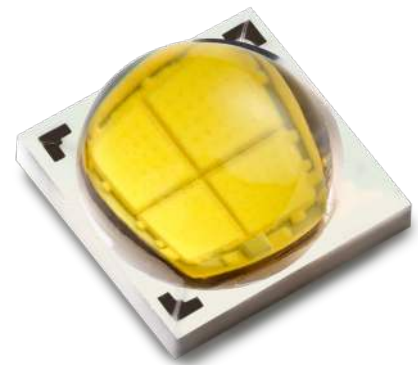


# LUXEON M

Brightest, most uniform and highest efficacy multi-die emitter

LUXEON M is an illumination grade multi-die LED designed to enable outdoor and industrial applications targeting either high efficiency or low cost. With *Freedom from Binning* and leading performance, LUXEON M falls within a single 3- or 5-step MacAdam ellipse centered in ANSI to ensure color consistency from LED to LED, delivering high efficacy and high flux density from a uniform source with tight correlated color temperature control. The superior quality of light, volume of lumens, and real world efficacy enable leading performance and efficient solution development in a wide variety of lighting segments.



## FEATURES AND BENEFITS

- Uniform image enables tight beam control in MR16 and spotlight applications
- High flux density from a 3mm<sup>2</sup> area enables reduced emitter count and compact fixture designs
- 11.2V and 5.6V package options puts high performance within reach with high efficiency and low cost drivers
- Leading thermal resistance allows flexible system design to optimize for lm/\$ and lm/W
- Exceeds ENERGY STAR® lumen maintenance requirements

## PRIMARY APPLICATIONS

- Architectural
- High Bay & Low Bay
- Lamps
- Outdoor
- Specialty Lighting
- Spotlights

# Table of Contents

<b>General Product Information</b> .....	<b>2</b>
Product Test Conditions .....	2
Part Number Nomenclature .....	2
Lumen Maintenance .....	2
Environmental Compliance .....	2
<b>Performance Characteristics</b> .....	<b>3</b>
Product Selection Guide .....	3
Optical Characteristics .....	4
Electrical and Thermal Characteristics .....	4
<b>Absolute Maximum Ratings</b> .....	<b>4</b>
Operating Conditions .....	5
<b>Characteristic Curves</b> .....	<b>6</b>
Spectral Power Distribution Characteristics .....	6
Light Output Characteristics .....	8
Forward Current Characteristics .....	10
Radiation Pattern Characteristics .....	11
<b>Product Bin and Labeling Definitions</b> .....	<b>12</b>
Decoding Product Bin Labeling .....	12
Luminous Flux Bins .....	13
Radiometric Power Bins .....	13
Color Bin Definitions .....	14
Dominant Wavelength Bins .....	14
Forward Voltage Bins .....	15
<b>Mechanical Dimensions</b> .....	<b>15</b>
<b>Reflow Soldering Guidelines</b> .....	<b>16</b>
JEDEC Moisture Sensitivity .....	16
Solder Pad Design .....	17
<b>Packaging Information</b> .....	<b>18</b>
Pocket Tape Dimensions .....	18
Reel Dimensions .....	19

# General Product Information

## Product Test Conditions

LUXEON M LEDs are tested and binned with a DC drive current of 700mA for LUXEON M 12V and 1400mA for LUXEON M 6V at a junction temperature,  $T_j$ , of 85°C.

## Part Number Nomenclature

Part numbers for LUXEON M follow the convention below:

**L X R A - B C D D - E E E E**

Where:

- A** – designates minimum CRI (7=70, 8=80, 9=90, 0=Royal Blue)
- B** – designates voltage (S=12V, R=6V)
- C** – designates color (W=White, R=Royal Blue)
- D D** – designates CCT (27=2700K, 30=3000K, 35=3500K, 40=4000K, 50=5000K, 57=5700K, 65=6500K, 00=Royal Blue)
- E E E E** – designates minimum luminous flux (optional) (example: 1040=1,040 lumens, 0000=full distribution)

Therefore, the following part number is used for a white LUXEON M 12V, 3000K 80CRI, full distribution LED:

**L X R 8 - S W 3 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 M 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 for LUXEON M White at specified test current,  $T_j=85^\circ\text{C}$ .

VOLTAGE	NOMINAL CCT [2]	MINIMUM CRI	LUMINOUS FLUX [1] (lm)		TEST CURRENT (mA)	PART NUMBER	
			MINIMUM	TYPICAL			
12V	3000K	70	900	1000	700	LXR7-SW30	
	4000K	70	970	1076	700	LXR7-SW40	
	5000K	70	1040	1100	700	LXR7-SW50	
	5700K	70	1040	1110	700	LXR7-SW57	
	6500K	70	1040	1130	700	LXR7-SW65	
	2700K	80	730	800	700	LXR8-SW27	
	3000K	80	780	850	700	LXR8-SW30	
	3500K	80	780	870	700	LXR8-SW35	
	4000K	80	840	905	700	LXR8-SW40	
	5000K	80	840	920	700	LXR8-SW50	
	2700K	90	600	660	700	LXR9-SW27	
	3000K	90	640	736	700	LXR9-SW30	
	5700K	90	800	880	700	LXR9-SW57	
	6V	3000K	70	900	1000	1400	LXR7-RW30
		4000K	70	970	1076	1400	LXR7-RW40
5000K		70	1040	1100	1400	LXR7-RW50	
5700K		70	1040	1110	1400	LXR7-RW57	
6500K		70	1040	1130	1400	LXR7-RW65	
2700K		80	730	800	1400	LXR8-RW27	
3000K		80	780	850	1400	LXR8-RW30	
3500K		80	780	870	1400	LXR8-RW35	
4000K		80	840	920	1400	LXR8-RW40	
5000K		80	840	920	1400	LXR8-RW50	
2700K		90	600	660	1400	LXR9-RW27	
3000K		90	640	736	1400	LXR9-RW30	
5700K		90	800	880	1400	LXR9-RW57	

**Notes for Table 1a:**

- Lumileds maintains a tolerance of  $\pm 2$  on CRI and  $\pm 6.5\%$  on luminous flux measurements.
- Typical CRI is approximately 2 points higher than the minimum CRI specified, but this is not guaranteed.

Table 1b. Product performance for LUXEON M Royal Blue at specified test current,  $T_j=85^\circ\text{C}$ .

VOLTAGE	DOMINANT WAVELENGTH (nm)		RADIOMETRIC POWER (mW)		TEST CURRENT (mA)	PART NUMBER
	MINIMUM	MAXIMUM	MINIMUM	TYPICAL		
12V	445	460	4200	4500	700	LXR0-SR00
6V	445	460	4200	4500	1400	LXR0-RR00

**Notes for Table 1b:**

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

# Optical Characteristics

Table 2. Optical characteristics for LUXEON M at specified test current,  $T_j=85^\circ\text{C}$ .

PART NUMBER	TYPICAL TOTAL INCLUDED ANGLE <sup>[1]</sup>	TYPICAL VIEWING ANGLE <sup>[2]</sup>
LXRx-xxxx	140°	120°

Notes for Table 2:

- 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 3. Electrical and thermal characteristics for LUXEON M at specified test current,  $T_j=85^\circ\text{C}$ .

PART NUMBER	FORWARD VOLTAGE ( $V_f$ ) <sup>[1]</sup>			TYPICAL TEMPERATURE COEFFICIENT OF FORWARD VOLTAGE ( $\text{mV}/^\circ\text{C}$ ) <sup>[2]</sup>	TYPICAL THERMAL RESISTANCE — JUNCTION TO SOLDER PAD ( $^\circ\text{C}/\text{W}$ )
	MINIMUM	TYPICAL	MAXIMUM		
LXRx-Sxxx	10.50	11.20	11.70	-5.50	1.25
LXRx-Rxxx	5.25	5.60	6.00	-2.75	1.25

Notes for Table 3:

- Lumileds maintains a tolerance of  $\pm 0.06\text{V}$  on forward voltage measurements.
- Measured between  $25^\circ\text{C}$  and  $135^\circ\text{C}$ .

# Absolute Maximum Ratings

Table 4. Absolute maximum ratings for LUXEON M.

PARAMETER	MAXIMUM PERFORMANCE
DC Forward Current at $T_j=110^\circ\text{C}$ <sup>[1][2]</sup>	1200mA for LXRx-SWxx 2400mA for LXRx-RWxx
DC Forward Current at $T_j=135^\circ\text{C}$ <sup>[1][2]</sup>	1050mA for LXRx-Sxxx 2100mA for LXRx-Rxxx
Peak Pulsed Forward Current <sup>[3]</sup>	1375mA for LXRx-SWxx 2750mA for LXRx-RWxx 1200mA for LXR0-SR00 2400mA for LXR0-RR00
LED Junction Temperature (DC & Pulse)	$-40^\circ\text{C}$ to $135^\circ\text{C}$
ESD Sensitivity (ANSI/ESDA/JEDEC JS-001-2012)	Class 3B
Operating Case Temperature <sup>[1]</sup>	$120^\circ\text{C}$
Storage Temperature	$-40^\circ\text{C}$ to $120^\circ\text{C}$
Soldering Temperature	JEDEC 020c $260^\circ\text{C}$
Allowable Reflow Cycles	3
Reverse Voltage ( $V_{\text{reverse}}$ )	LUXEON LEDs are not designed to be driven in reverse bias

Notes for Table 4:

- See Figure 1 for more details on the maximum permissible operating conditions for LUXEON M White.
- 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 at this junction temperature
  - The maximum amplitude of the ripple does not exceed 15% of the maximum allowable DC forward current at this junction temperature
- At 10% duty cycle with pulse width of 10ms.

# Operating Conditions

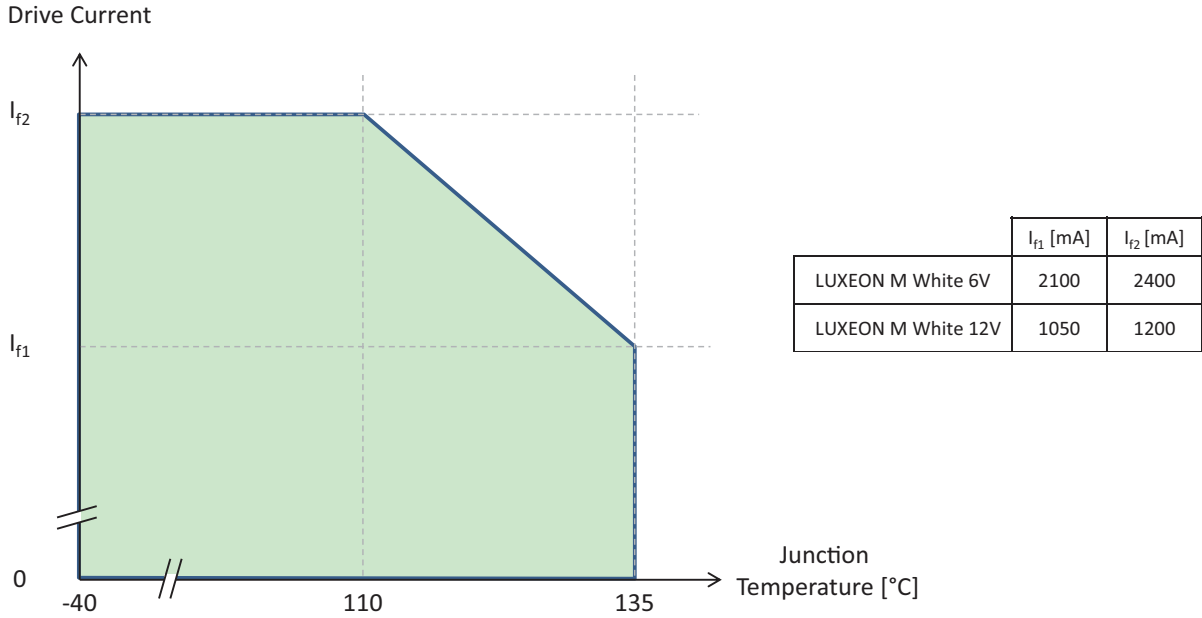


Figure 1. Maximum permissible operating conditions for LUXEON M White.

Notes for Figure 1:  
 1. The green shaded area in this graph reflects the maximum permissible operating conditions for LUXEON M White.

# Characteristic Curves

## Spectral Power Distribution Characteristics

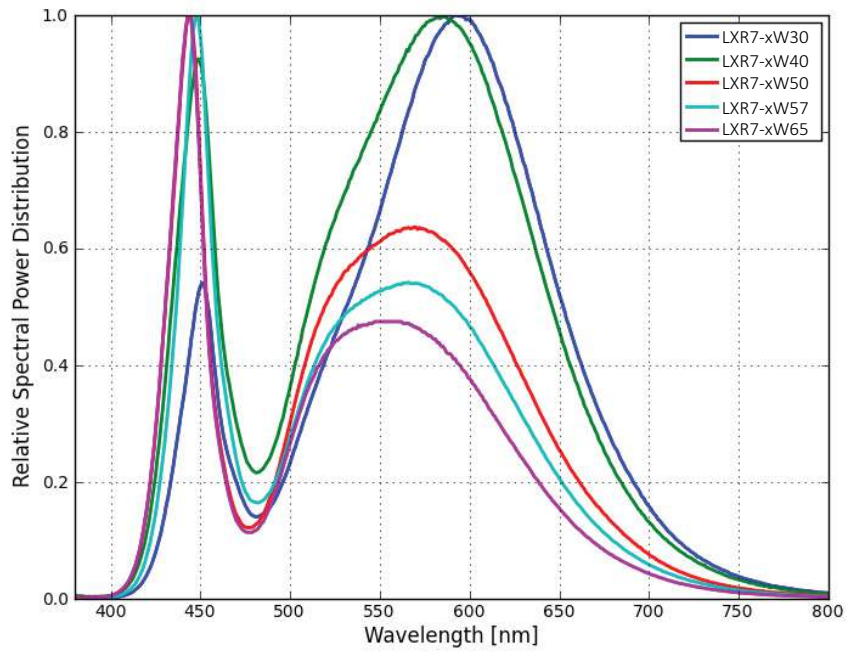


Figure 2a. Typical normalized power vs. wavelength for LXR7-xWxx at test current,  $T_j=85^{\circ}\text{C}$ .

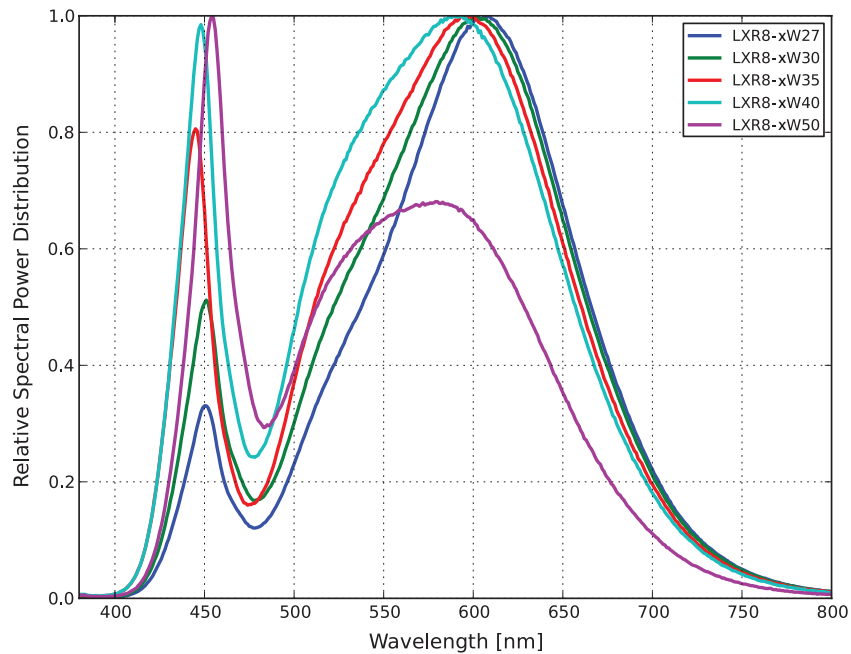


Figure 2b. Typical normalized power vs. wavelength for LXR8-xWxx at test current,  $T_j=85^{\circ}\text{C}$ .

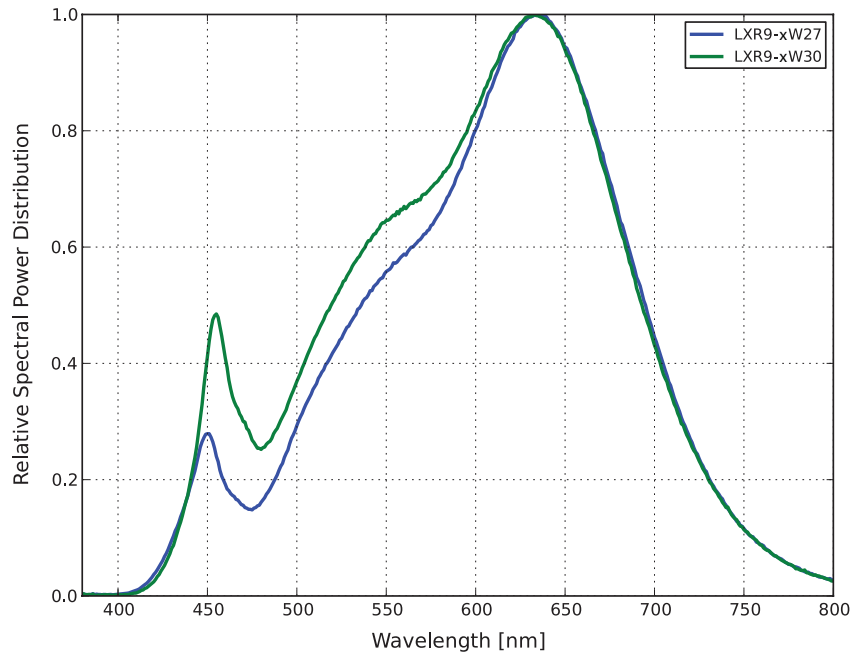


Figure 2c. Typical normalized power vs. wavelength for LXR9-xWxx at test current,  $T_j=85^\circ\text{C}$ .

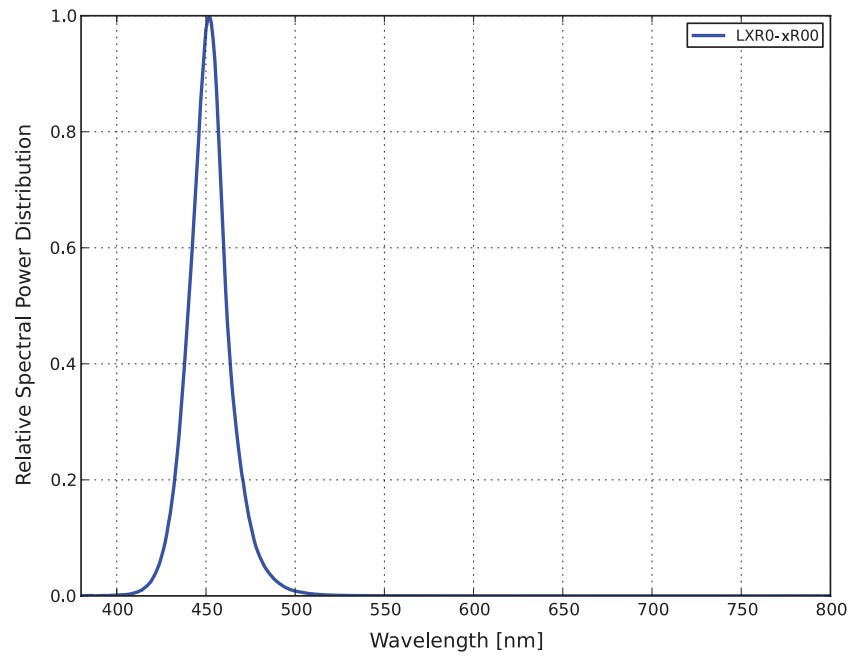


Figure 2d. Typical normalized power vs. wavelength for LXR0-xR00 at test current,  $T_j=85^\circ\text{C}$ .



# Light Output Characteristics

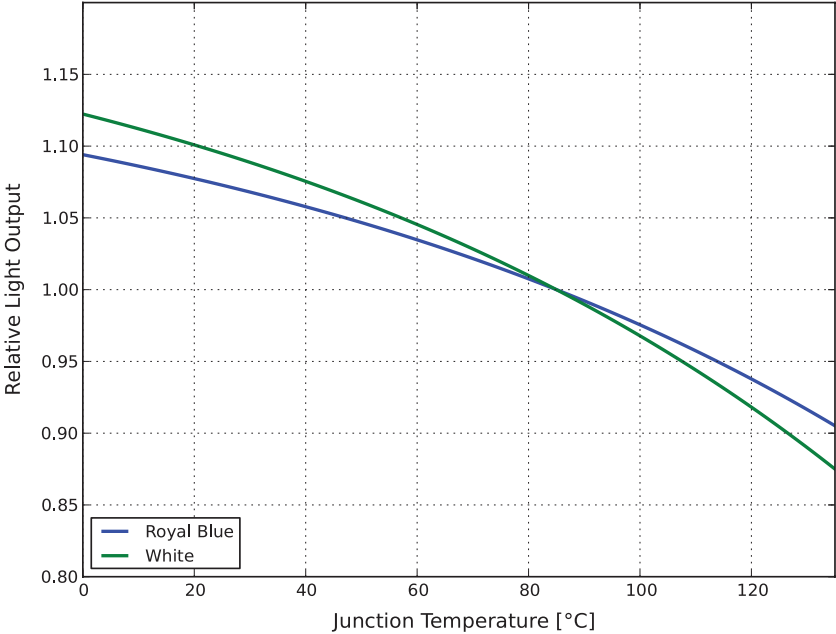


Figure 3. Typical normalized light output vs. junction temperature for LXRx-xxxx at test current,  $T_j=85^\circ\text{C}$ .

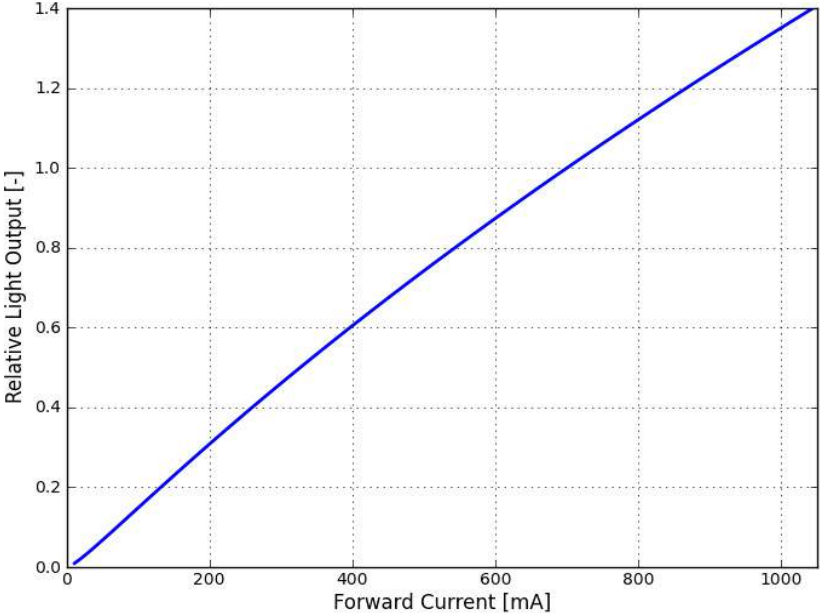


Figure 4a. Typical normalized light output vs. forward current for LXRx-Sxxx at test current,  $T_j=85^\circ\text{C}$ .

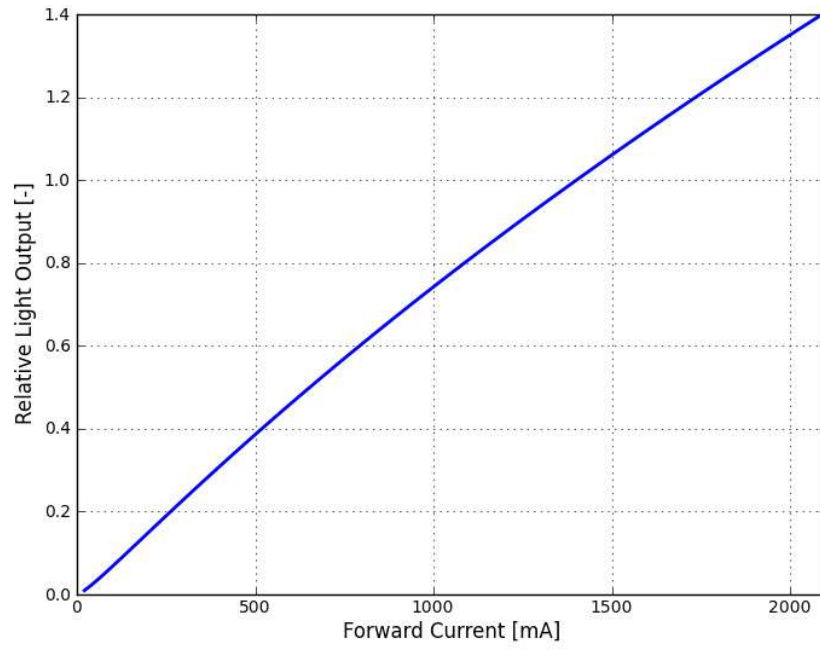


Figure 4b. Typical normalized light output vs. forward current for LXR-Rxxx at test current,  $T_j=85^\circ\text{C}$ .

# Forward Current Characteristics

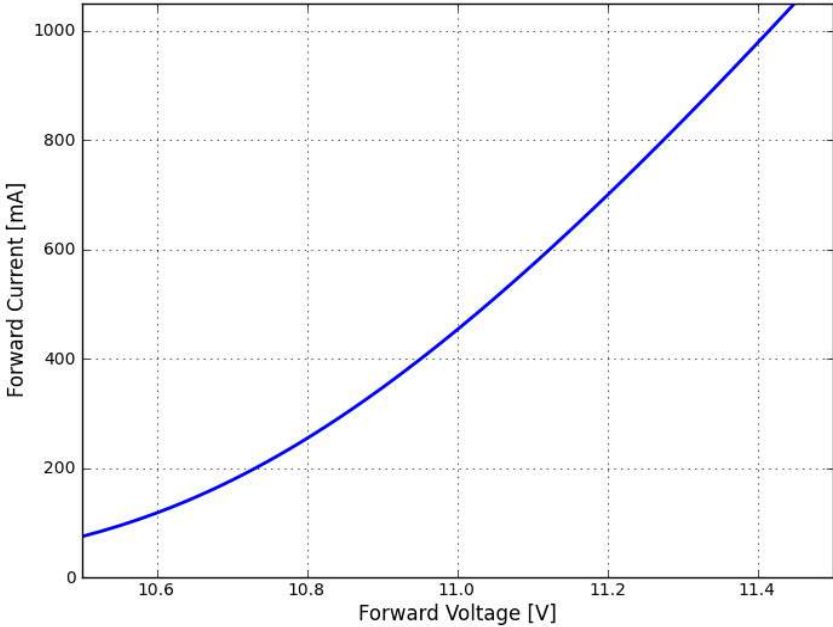


Figure 5a. Typical forward current vs. forward voltage for LXRx-Sxxx at  $T_j=85^\circ\text{C}$ .

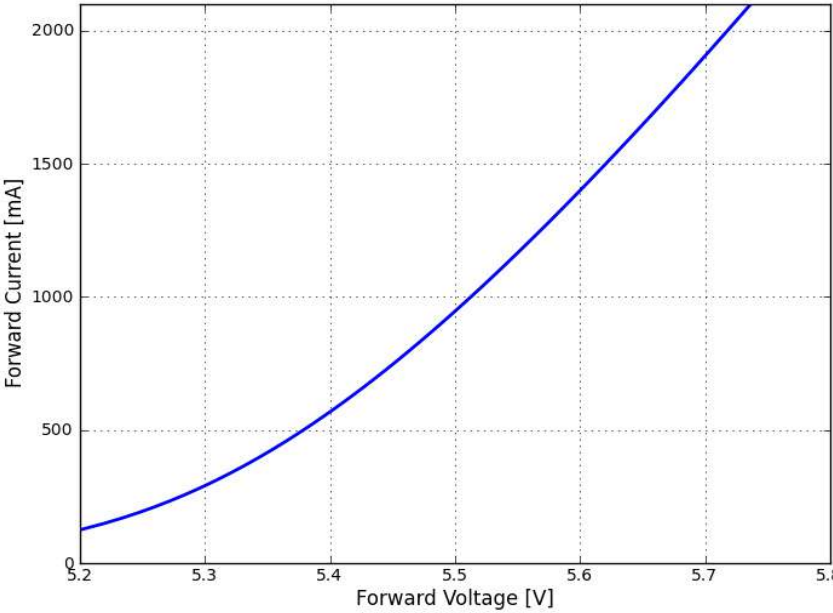


Figure 5b. Typical forward current vs. forward voltage for LXRx-Rxxx at  $T_j=85^\circ\text{C}$ .

# Radiation Pattern Characteristics

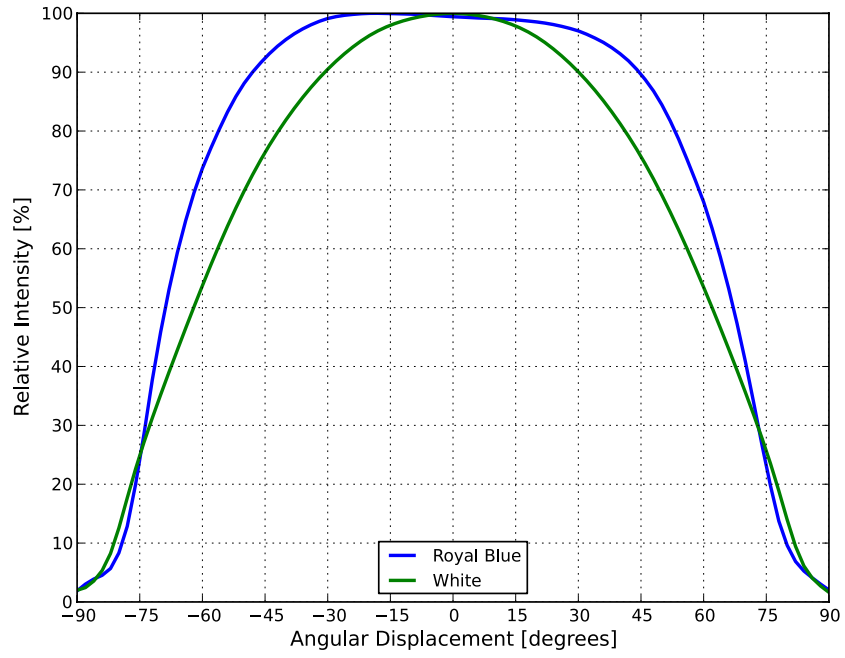


Figure 6. Typical radiation pattern for LXRx-xxxx at test current,  $T_j=85^\circ\text{C}$ .

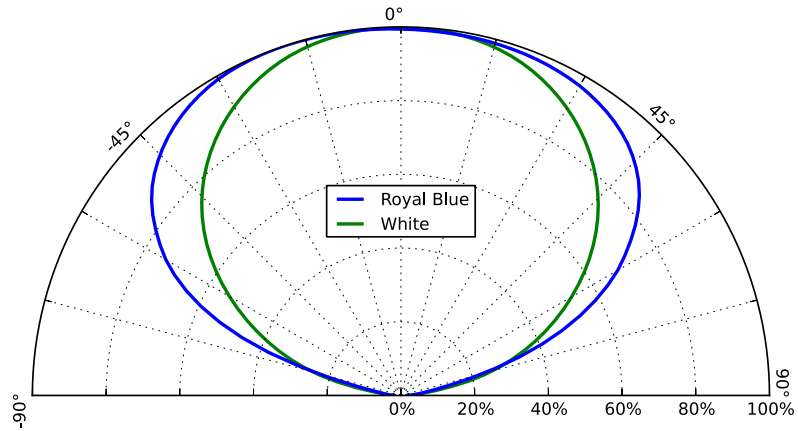


Figure 7. Typical polar radiation pattern for LXRx-xxxx at test current,  $T_j=85^\circ\text{C}$ .

# 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.

Reels with LUXEON M White 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: M=630 to 680 lumens, T=970 to 1040 lumens)
- B** – designates color bin (example: 1=6500K, 2=5700K, 3=5000K, 5=4000K, 6=3500K, 7=3000K, 8=2700K)
- C** – designates color space (example: 5=5-step MacAdam Ellipse, 3=3-step MacAdam Ellipse)
- D** – designates forward voltage bin (example: F=10.50 to 11.00V, G=11.00 to 11.50V, H=11.50 to 11.70V for 12V parts)

Therefore, a white LUXEON M LED with a lumen range of 630 to 680 lumens, 3000K color bin, 5-step MacAdam ellipse and a forward voltage range of 10.50V to 11.00V for 12 volt parts has the following CAT code:

### M 7 5 F

Reels of LUXEON M Royal Blue LEDs are labeled using a 3-digit alphanumeric CAT code following the format below:

### A B C

Where:

- A** – designates radiometric power bin (example: B=4200 to 4400mW, D=4600 to 4800mW)
- B** – designates dominant wavelength bin (example: 5=450 to 455nm, 6=455 to 460nm)
- C** – designates forward voltage bin (example: F=10.50 to 11.00V, G=11.00 to 11.50V, H=11.50 to 11.70V for 12V parts)

Therefore, a Royal Blue LUXEON M LED with a radiometric power range of 4200 to 4400mW, dominant wavelength of 450 to 455nm and a forward voltage range of 11.50 to 11.70V for 12 volt parts has the following CAT code:

### B 5 H

## Luminous Flux Bins

Table 5 lists the standard photometric luminous flux bins for LUXEON M 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 M White.**

BIN	LUMINOUS FLUX (lm)	
	MINIMUM	MAXIMUM
J	510	550
K	550	590
L	590	630
M	630	680
N	680	730
P	730	780
Q	780	840
R	840	900
S	900	970
T	970	1040
U	1040	1120
V	1120	1200
W	1200	1290

**Notes for Table 5:**

1. Lumileds maintains a tolerance of  $\pm 6.5\%$  on luminous flux measurements.

## Radiometric Power Bins

**Table 6. Radiometric power bin definitions for LUXEON M Royal Blue.**

BIN	RADIOMETRIC POWER (mW)	
	MINIMUM	MAXIMUM
A	4000	4200
B	4200	4400
C	4400	4600
D	4600	4800
E	4800	5000

**Notes for Table 6:**

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

## Color Bin Definitions

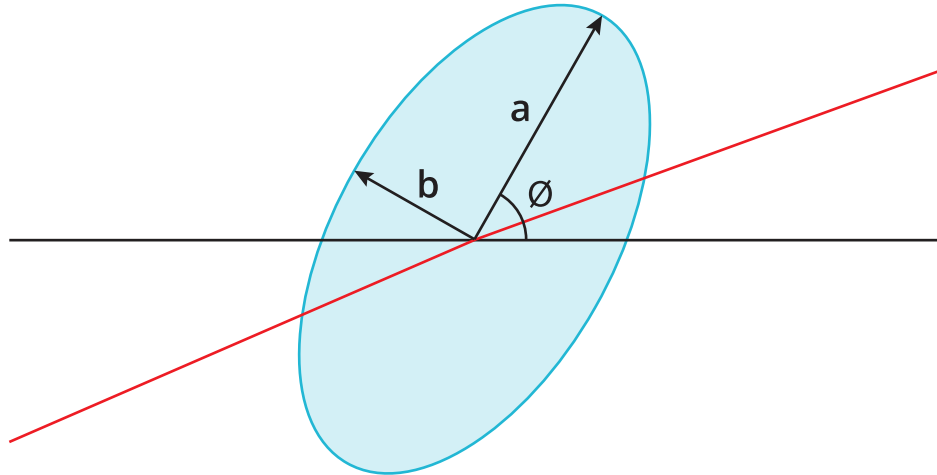


Figure 8. 3- and 5-step MacAdam ellipse illustration for Table 7.

Table 7. 3- and 5-step MacAdam ellipse color bin definitions for LUXEON M.

NOMINAL CCT	COLOR SPACE	CENTER POINT (cx, cy)	MAJOR AXIS, a	MINOR AXIS, b	ELLIPSE ROTATION ANGLE, $\theta$
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	53.22
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	53.72
5000K	Single 3-step MacAdam ellipse	0.3447, 0.3553	0.00822	0.00354	59.62
3000K	Single 5-step MacAdam ellipse	0.4338, 0.4030	0.01390	0.00680	53.22
4000K	Single 5-step MacAdam ellipse	0.3818, 0.3797	0.01565	0.00670	53.72
5000K	Single 5-step MacAdam ellipse	0.3447, 0.3553	0.01370	0.00590	59.62
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 7:**

1. Lumileds maintains a tolerance of  $\pm 0.005$  on x and y coordinates in the CIE 1931 color space.

## Dominant Wavelength Bins

Table 8. Dominant wavelength bins for LUXEON M Royal Blue.

BIN	DOMINANT WAVELENGTH (nm) <sup>(1)</sup>	
	MINIMUM	MAXIMUM
4	445	450
5	450	455
6	455	460

**Notes for Table 8:**

1. Lumileds maintains a tolerance of  $\pm 0.5$ nm on dominant wavelength measurements.

# Forward Voltage Bins

Table 9. Forward voltage bin definitions for LUXEON M.

PART NUMBER	BIN	FORWARD VOLTAGE (V) <sup>(1)</sup>	
		MINIMUM	MAXIMUM
LXR <sub>x</sub> -SW <sub>xx</sub> and LXR0-SR00	F	10.50	11.00
	G	11.00	11.50
	H	11.50	11.70
LXR <sub>x</sub> -RW <sub>xx</sub> and LXR0-RR00	F	5.25	5.50
	G	5.50	5.75
	H	5.75	6.00

**Notes for Table 9:**

1. Lumileds maintains a tolerance of ±0.06V on forward voltage measurements.

# Mechanical Dimensions

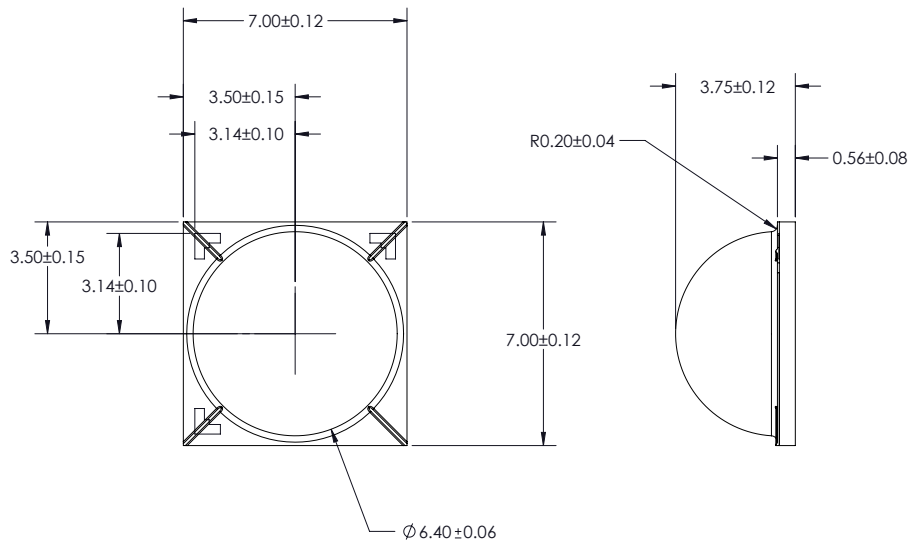


Figure 9. Mechanical dimensions for LUXEON M.

**Notes for Figure 9:**

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



# Reflow Soldering Guidelines

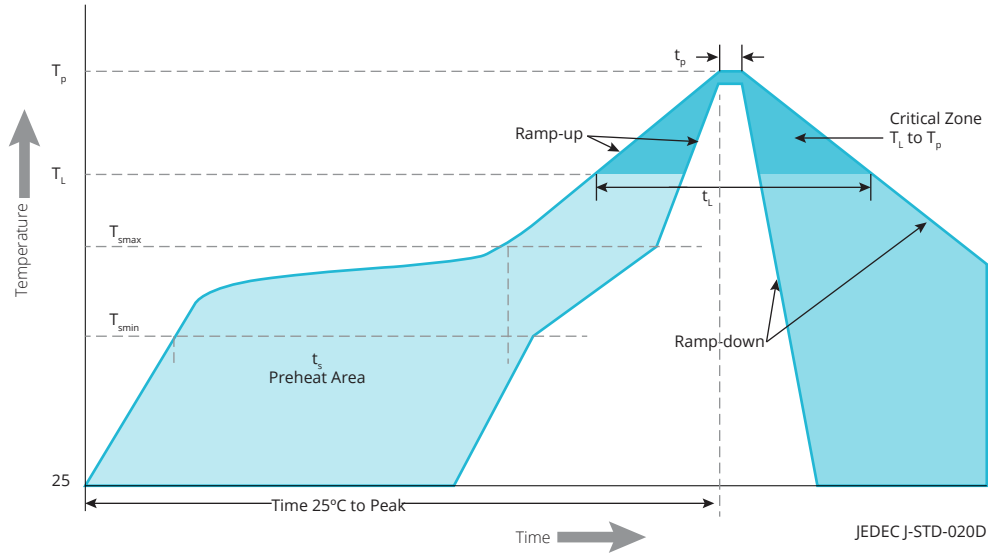


Figure 10. Visualization of the acceptable reflow temperature profile as specified in Table 10.

Table 10. Reflow profile characteristics for LUXEON M.

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 ( $T_{smax}$ to $T_p$ )	3°C / second maximum
Liquidus Temperature ( $T_L$ )	217°C
Time Maintained Above Temperature $T_L$ ( $t_t$ )	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	6°C / second maximum
Time 25°C to Peak Temperature	8 minutes maximum

**Notes for Table 10:**

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

## JEDEC Moisture Sensitivity

Table 11. Moisture sensitivity levels for LUXEON M.

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

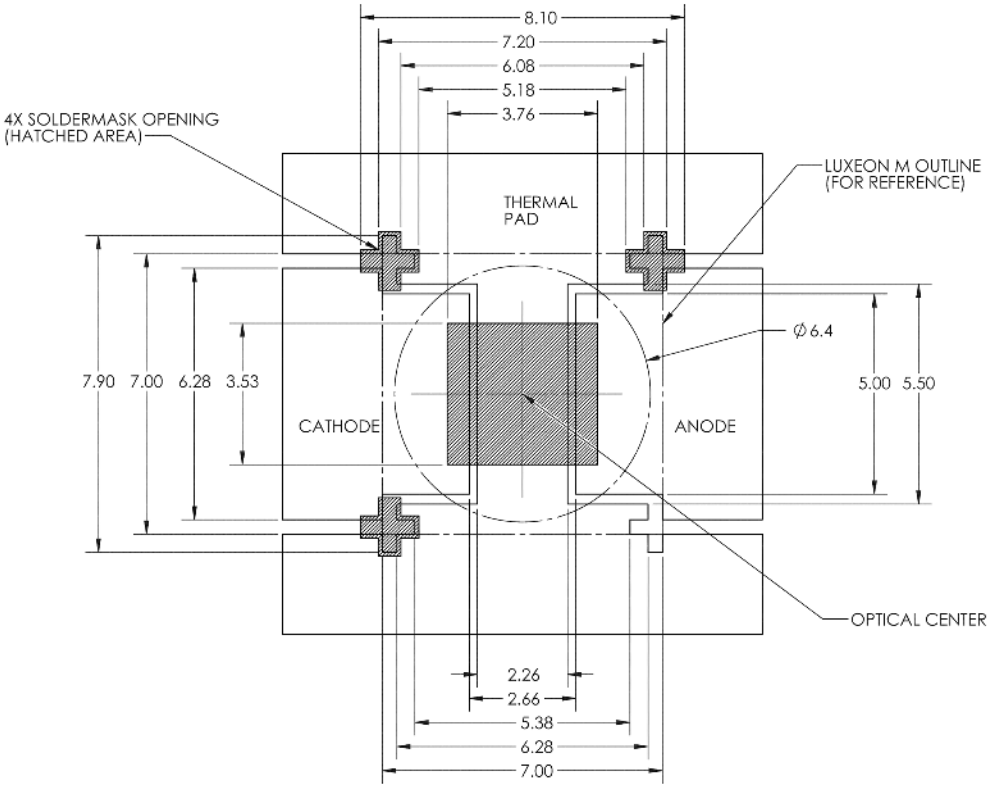


Figure 11. Recommended PCB solder pad layout for LUXEON M.

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

# Packaging Information

## Pocket Tape Dimensions

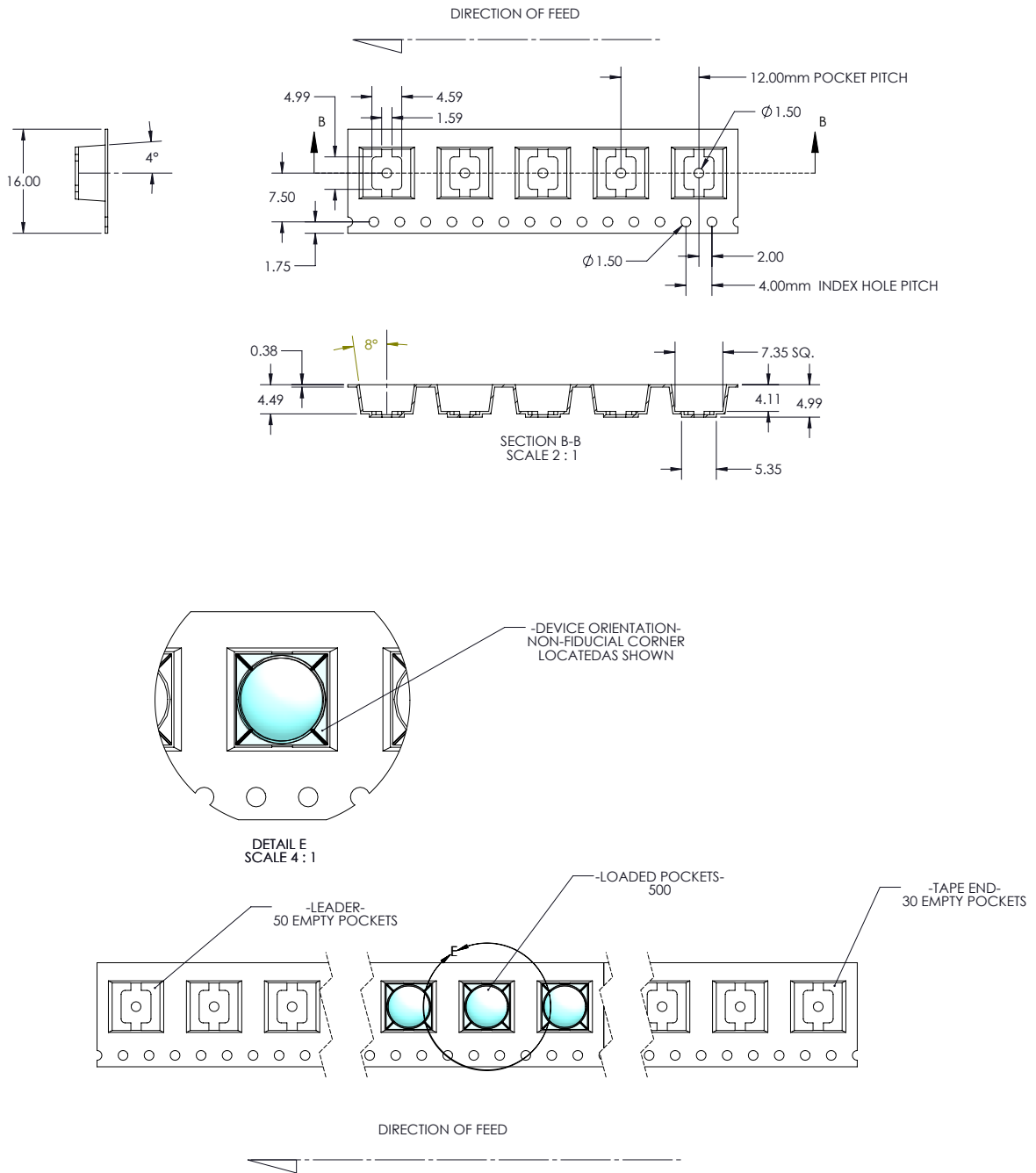


Figure 12. Pocket Tape dimensions for LUXEON M.

**Notes for Figure 12:**

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

# Reel Dimensions

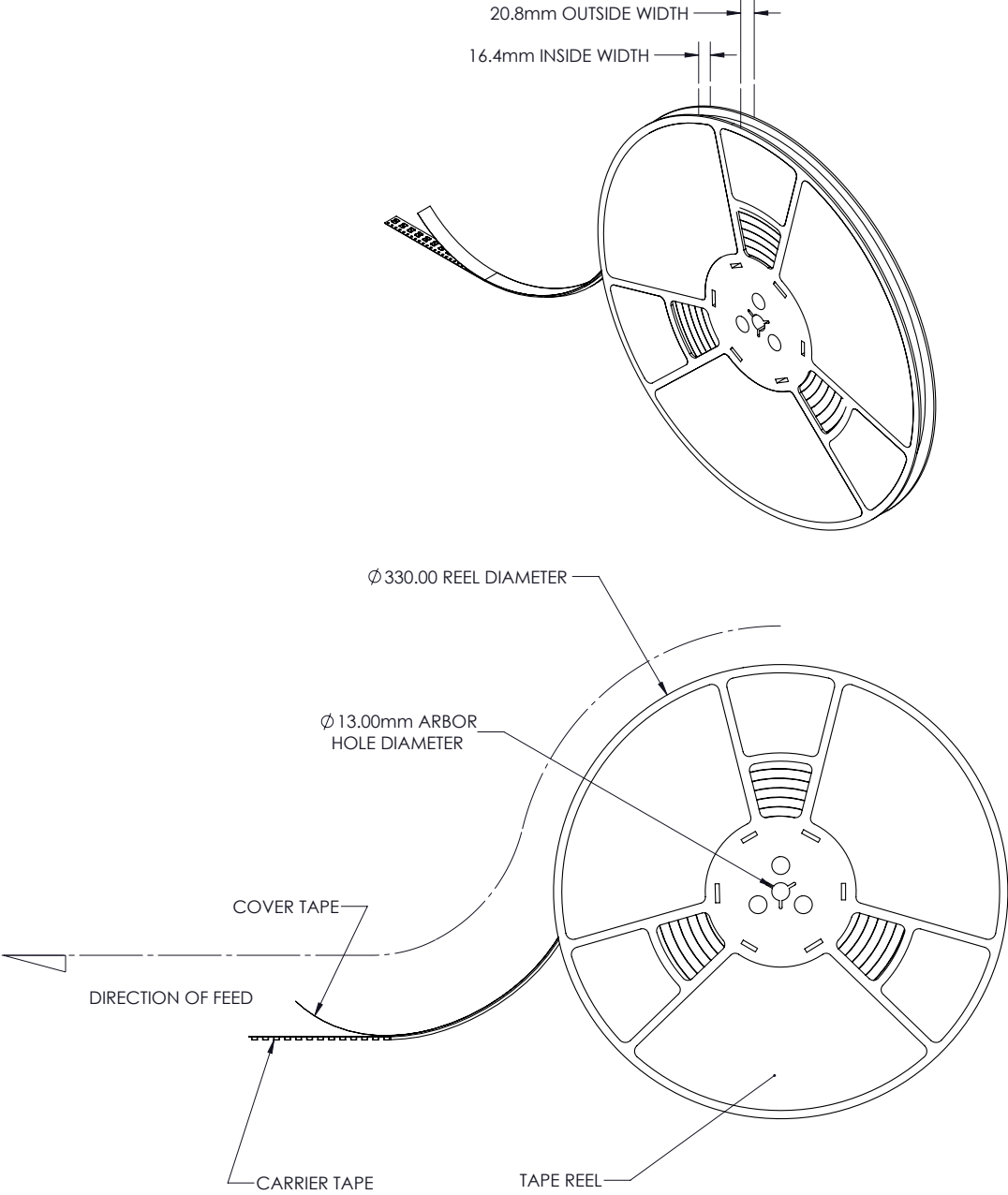


Figure 13. Reel dimensions for LUXEON M.

Notes for Figure 13:  
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 better, safer, more beautiful—with light.

To learn more about our lighting solutions, visit [lumileds.com](http://lumileds.com).



©2020 Lumileds Holding B.V. All rights reserved.  
LUXEON is a registered trademark of the Lumileds Holding B.V. in the United States and other countries.

[lumileds.com](http://lumileds.com)

Neither Lumileds Holding B.V. nor its affiliates shall be liable for any kind of loss of data or any other damages, direct, indirect or consequential, resulting from the use of the provided information and data. Although Lumileds Holding B.V. and/or its affiliates have attempted to provide the most accurate information and data, the materials and services information and data are provided "as is," and neither Lumileds Holding B.V. nor its affiliates warrants or guarantees the contents and correctness of the provided information and data. Lumileds Holding B.V. and its affiliates reserve the right to make changes without notice. You as user agree to this disclaimer and user agreement with the download or use of the provided materials, information and data. A listing of Lumileds product/patent coverage may be accessed at [lumileds.com/patents](http://lumileds.com/patents).