

# LUXEON Versat 2020 140

Smallest, lambertian flat top emitter

LUXEON Versat 2020 is the industry-leading compact solution for modern automotive signaling applications. Its superior luminance, thermal management, and compact size offer unparalleled design flexibility by maximizing ease-of-integration with optical systems. All LUXEON Versat 2020 are AEC-Q102 qualified.

LUXEON Versat 2020 140 is available in the following color wavelengths:

- Red Orange (615 nm)
- Red (623 nm)
- Long Red (630 nm)
- Super Red (635 nm)



## FEATURES AND BENEFITS

Low thermal resistance and power consumption results in simplified thermal management and system cost

Lambertian flat top emitter

High flux output provides flexibility in styling and optical design

Higher drive current capability for increased flux performance

## PRIMARY APPLICATIONS

Rear Fog

Stop/Tail

CHMSL

Turn

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# General Product Information

## Product Test Conditions

LUXEON Versat 2020 140 LEDs are tested and binned using a 20 ms monopulse (MP) at 140 mA drive current, case temperature,  $T_c$  of 25 °C.

## Part Number Nomenclature

Part numbers for LUXEON Versat 2020 140 follow the convention below:

A 1 V B – **A B C D E F G H J K M N P**

Where:

- A – designates product segment (A = Automotive)
- 1 – designates product level (1 = Level 1)
- V – designates product line/family (V = LUXEON Versat)
- B – designates package size (B = 2020)
- A B C D** – designates color variant (O612 = 612 nm minimum)
- E** – designates binning current (C = 140 mA)
- F** – designates binning configuration (1 = single binning)
- G** – open space (0 = Gen3E, A = Gen4, etc.)
- H** – designates minimum luminous flux (refer to luminous flux bins)
- J** – designates maximum luminous flux (refer to luminous flux bins)
- K** – designates minimum forward voltage (refer to forward voltage bins)
- M** – designates maximum forward voltage (refer to forward voltage bins)
- N P** – reserved for custom part numbers (00 = standard part)

Therefore, the following part number is used for a LUXEON Versat 2020 140 Red-Orange with a luminous flux range of 21 lumens to 36 lumens, and a forward voltage range of 1.90–2.50 volts:

A 1 V B – **O 6 1 2 C 1 0 N R A D 0 0**

## Environmental Compliance

Lumileds LLC is committed to providing environmentally friendly products to the solid-state lighting market. LUXEON Versat 2020 140 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 selection for LUXEON Versat 2020 140 at 20 ms MP, 140 mA,  $T_c = 25\text{ }^\circ\text{C}$

COLOR	DOMINANT WAVELENGTH <sup>[1,2]</sup> (nm)	PART NUMBER
Red Orange	615	A1VB - O612C
Red	623	A1VB - R620C
Long Red	630	A1VB - S627C
Super Red	635	A1BV - S632C

**Notes for Table 1:**

- Dominant wavelength is derived from the CIE 1931 Chromaticity diagram and represents perceived color.
- Lumileds maintains a tolerance of  $\pm 1\text{ nm}$  for dominant wavelength measurements.

## Optical Characteristics

Table 2. Typical optical characteristics for LUXEON Versat 2020 140 at 20 ms MP, 140 mA,  $T_c = 25\text{ }^\circ\text{C}$

PART NUMBER	TYPICAL TOTAL INCLUDED ANGLE <sup>[1]</sup> $\theta_{0.90V}$	TYPICAL VIEWING ANGLE <sup>[2]</sup> $2\theta_{1/2}$
A1VB-xxxxC	138°	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  $\frac{1}{2}$  of the peak value.

## Electrical and Thermal Characteristics

Table 3. Typical electrical and thermal characteristics for LUXEON Versat 2020 140 at 20 ms MP, 140 mA  $T_c = 25\text{ }^\circ\text{C}$

PART NUMBER	FORWARD VOLTAGE ( $V_f$ )		THERMAL RESISTANCE - JUNCTION TO CASE ( $^\circ\text{C/W}$ )			
			$R\theta_{j-c}$ ELEC <sup>[2]</sup>		$R\theta_{j-c}$ REAL <sup>[3]</sup>	
	MINIMUM	MAXIMUM	TYPICAL	MAXIMUM	TYPICAL	MAXIMUM
A1VB-xxxxCx0xxxxxx	1.90	2.50	18.8	20.0	26.3	28.0

**Notes for Table 3:**

- $R_{\theta_{j-c}}^{\text{elec}}$ : Electrical thermal resistance (junction to case).
- $R_{\theta_{j-c}}^{\text{real}}$ : Real thermal resistance (junction to case) with wall plug efficiency included. Reference JESD51-51, JESD51-14, 4.1.3.
- All values are typical unless otherwise stated.

# Absolute Ratings

Table 4. Absolute ratings for LUXEON Versat 2020 140

PARAMETER	PERFORMANCE
Minimum DC Forward Current	5 mA
Maximum DC Forward Current	200 mA
Maximum Junction Temperature <sup>[1]</sup>	150 °C
Operating Case Temperature at Test Current <sup>[1]</sup>	-40 to 135 °C
LED Storage Temperature	-40 to 135 °C
Soldering Temperature	JEDEC 020c 260 °C
Allowable Reflow Cycles	3
Minimum ESD Sensitivity <sup>[2]</sup>	8 kV HBM
Reverse Voltage <sup>[3]</sup> (V <sub>reverse</sub> )	-15 V

**Notes for Table 4:**

1. Proper current derating must be observed to maintain junction temperature below the maximum, so that the LED is maintained below the maximum rated operating case temperature. LUXEON Versat 2020 140 LEDs driven at or above the maximum rated operating case temperature may have shorter lifetime.
2. Measured using human body model (per ANSI/ESDA/JEDEC JS-001-2010) and charged device model (per JESD22-C101F).
3. LUXEON Versat 2020 is not designed to be driven in reverse bias.

# JEDEC Moisture Sensitivity

Table 5. Moisture sensitivity levels for LUXEON Versat 2020 140

LEVEL	FLOOR LIFE		STANDARD SOAK REQUIREMENTS	
	TIME	CONDITIONS	TIME	CONDITIONS
2	1 Year	≤30 °C / 60% RH	168 Hours +5 / -0	85 °C / 60% RH

# Characteristic Curves

## Spectral Power Distribution Characteristics

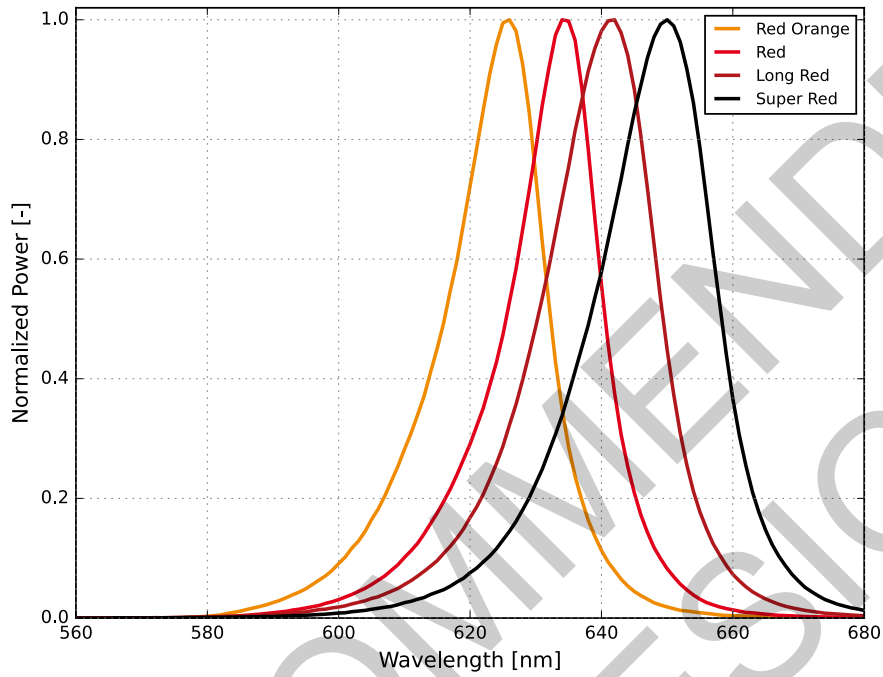


Figure 1. Typical normalized power vs. wavelength for LUXEON Versat 2020 140 at 140 mA,  $T_c = 25\text{ }^\circ\text{C}$

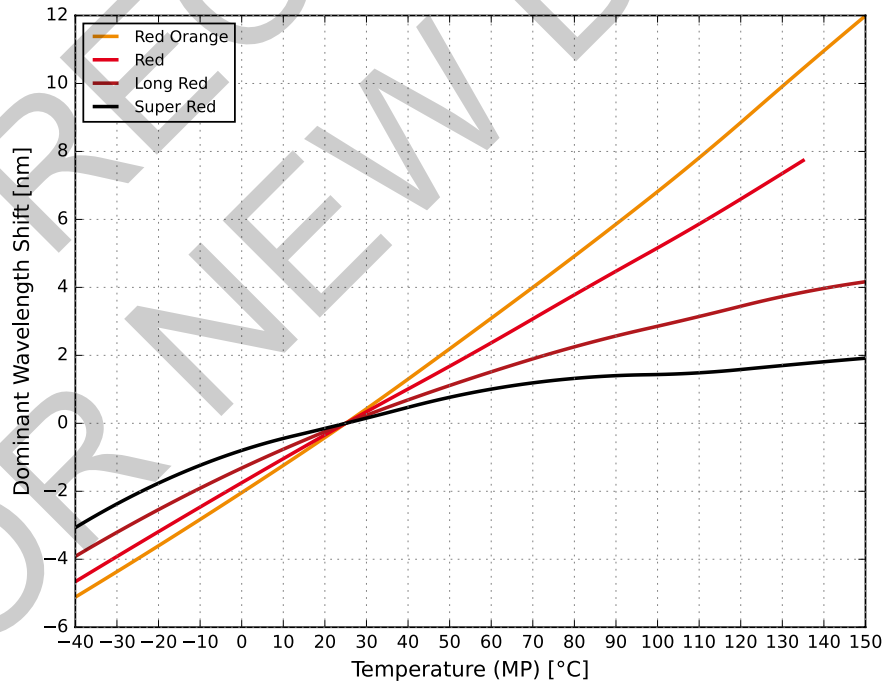


Figure 2. Typical wavelength shift vs. junction temperature for LUXEON Versat 2020 140 at 140 mA

# Light Output Characteristics

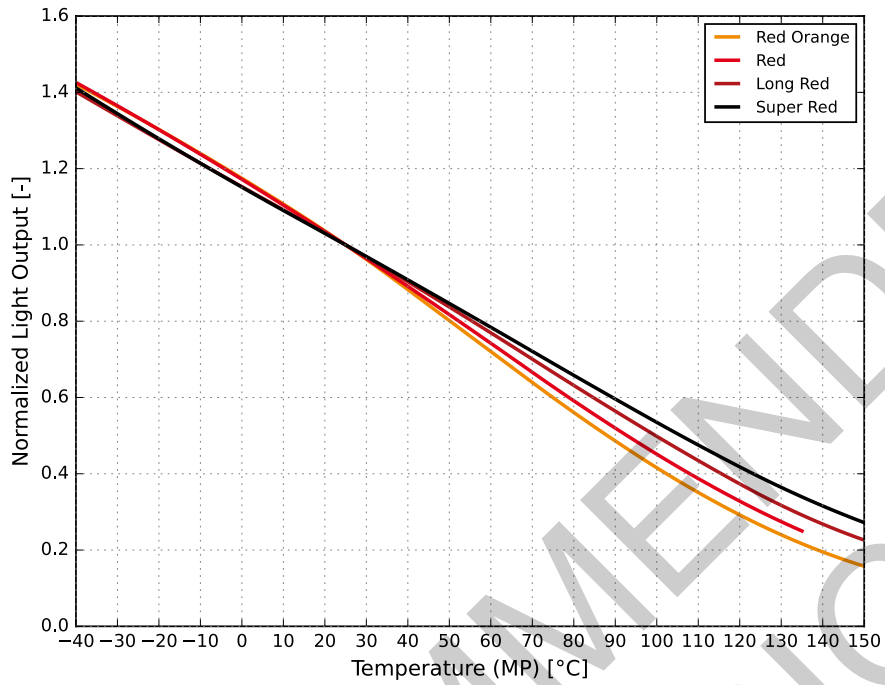


Figure 3. Typical normalized light output vs. junction temperature for LUXEON Versat 2020 140 at 140 mA

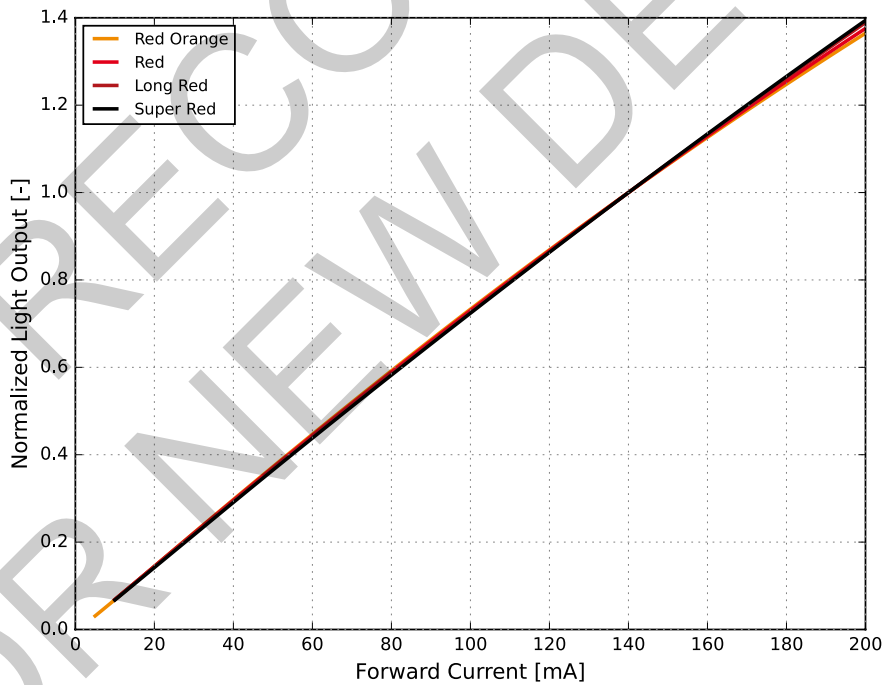


Figure 4. Typical normalized light output vs. forward current for LUXEON Versat 2020 140 at  $T_c = 25^\circ\text{C}$

## Forward Current and Voltage Characteristics

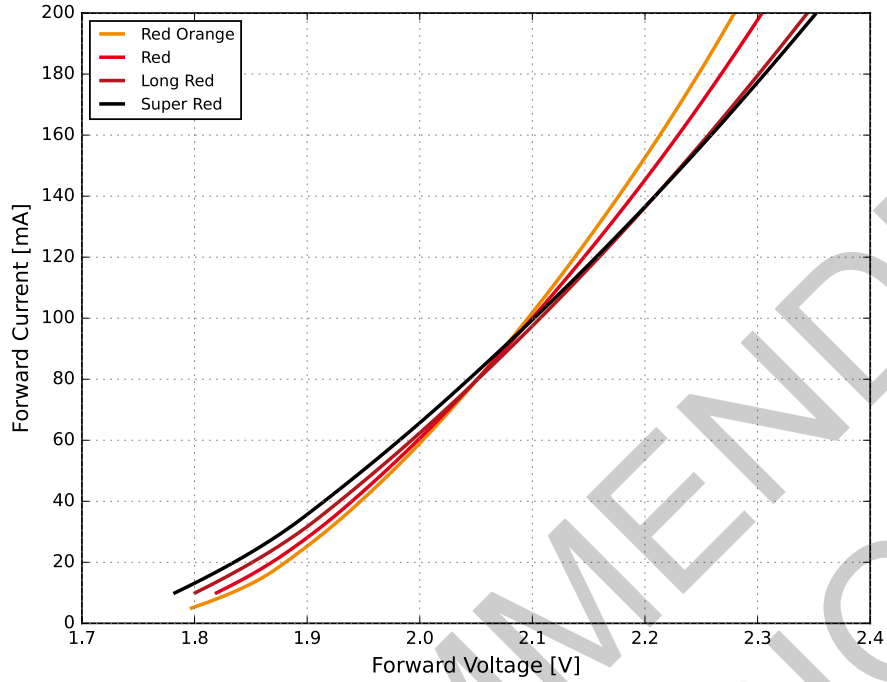


Figure 5. Typical forward current vs. forward voltage for LUXEON Versat 2020 140 at  $T_c = 25\text{ }^\circ\text{C}$

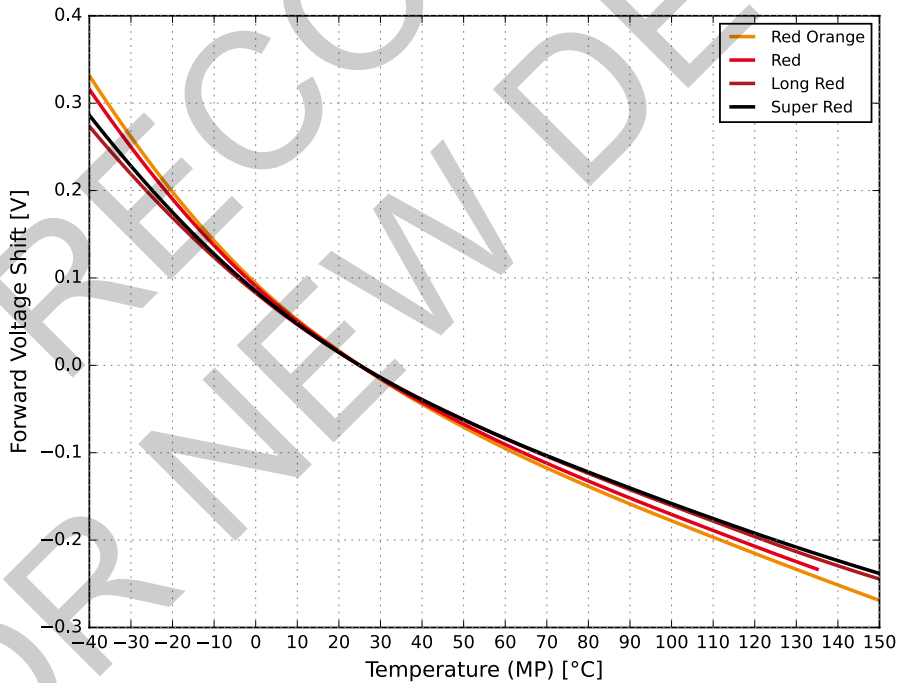


Figure 6. Typical forward voltage shift vs. junction temperature for LUXEON Versat 2020 140 at 140 mA

## Radiation Pattern Characteristics

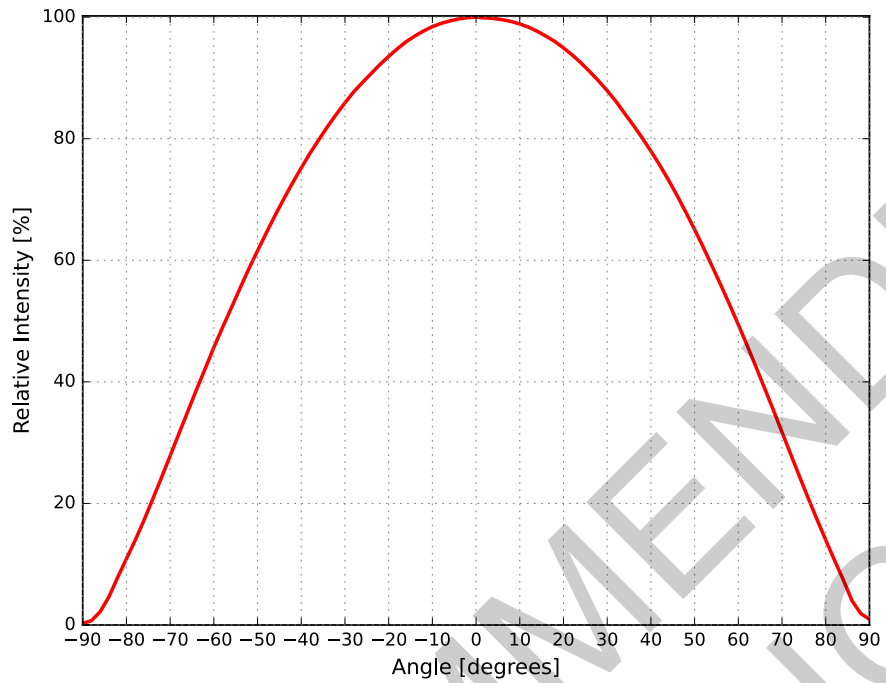


Figure 7. Typical radiation pattern for LUXEON Versat 2020 140 at 140 mA

## Operating Limits Characteristics

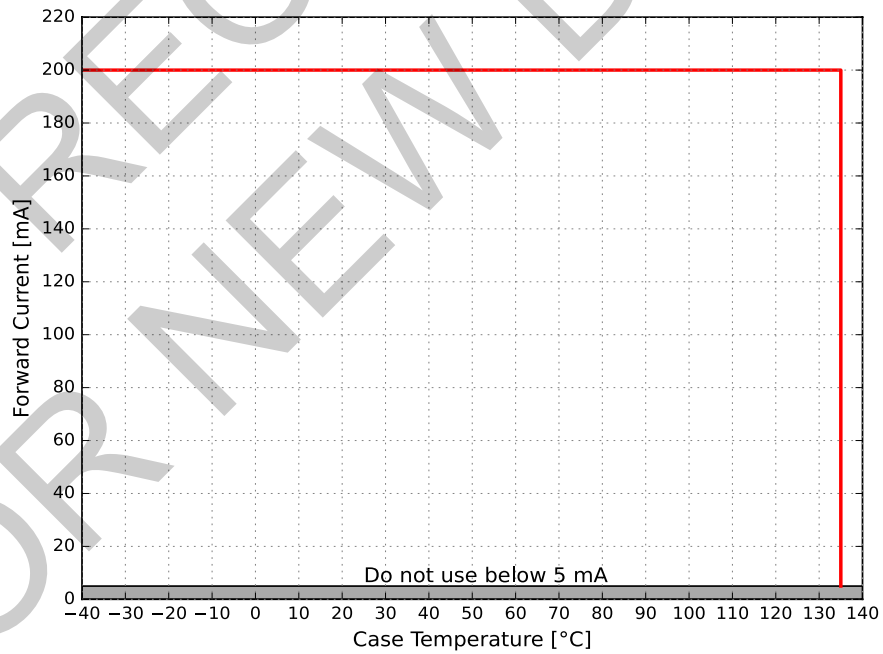


Figure 8. Maximum forward current vs. case temperature for LUXEON Versat 2020 140

# Product Bin and Labeling Definitions

## Designing with LUXEON Versat 2020 140

Flux bins supportable for car programs depend on product color and program start-of-production and end-of-production dates. Flux roadmaps by year and product color are maintained and available from the sales representative. Please contact a local sales representative to request the flux bin range with best supportability for program timing.

## Decoding Product Bin Labeling

In the manufacturing of semiconductor products, there are variations in performance around the average values given in the technical datasheets. For this reason, Lumileds bins the LED components for luminous flux or radiometric power, color point, peak or dominant wavelength and forward voltage.

LUXEON Versat 2020 140 LEDs are labeled using a 3-digit alphanumeric CAT code following the format below:

**A B C**

Where:

- A** – designates luminous flux bin (example: N = 21 lumens to 25 lumens)
- B** – designates color code (example: 3 = 612 nm to 620 nm)
- C** – designates forward voltage bin (example: D = 2.35 V to 2.50 V)

Therefore, a LUXEON Versat 2020 140 with a lumen range of 21 to 25, color code of 3 and a forward voltage of 2.35 to 2.50 has the following CAT code:

**N 3 D**

Additionally, a LUXEON Versat 2020 140 LEDs with divided or split flux bins are labeled using a 4-digit alphanumeric CAT code following the format below:

**A B C D**

Where:

- A B** – designates luminous flux bin (example: N2 = 23.0 lumens to 25.0 lumens)
- C** – designates color code
- D** – designates forward voltage bin (example: C = 2.20 V to 2.35 V)

Therefore, a LUXEON Versat 2020 140 with a lumen range of 23.0 to 25.0, a color code of 3 and forward voltage of 2.20 to 2.35 has the following CAT code:

**N 2 3 C**

Please contact a local sales representative to request the flux bin range with best supportability for program timing.

## Luminous Flux Bins

Table 6 lists the standard luminous flux bins for LUXEON Versat 2020 140 emitters. Product availability in a particular bin varies by color and platform start-of-production date. Contact your local sales representative for best supportability of programs.

Table 6a. Luminous flux bin definitions for LUXEON Versat 2020 140,  $T_c = 25\text{ °C}$

BIN	LUMINOUS FLUX <sup>[1][2]</sup> (lm)	
	MINIMUM	MAXIMUM
G	10.4	12.5
H	12.5	15.0
J	15.0	18.0
M	18.0	21.0
N	21.0	25.0
P	25.0	30.0
R	30.0	36.0
U	36.0	43.0

**Notes for Table 6a:**

1. Lumileds maintains a tolerance of  $\pm 10\%$  on luminous flux measurements.

Table 6b. Luminous flux bin definitions for LUXEON Versat 2020 140,  $T_c = 25\text{ °C}$

BIN	LUMINOUS FLUX <sup>[1][2]</sup> (lm)	
	MINIMUM	MAXIMUM
G1	10.4	11.4
G2	11.4	12.5
H1	12.5	13.5
H2	13.5	15.0
J1	15.0	16.5
J2	16.5	18.0
M1	18.0	19.5
M2	19.5	21.0
N1	21.0	23.0
N2	23.0	25.0
P1	25.0	27.5
P2	27.5	30.0
R1	30.0	33.0
R2	33.0	36.0
U1	36.0	39.5
U2	39.5	43.0

**Notes for Table 6b:**

1. Lumileds maintains a tolerance of  $\pm 10\%$  on luminous flux measurements.
2. Lumileds offers half-bin flux options subject to review and implementation.

## Color Codes

Table 7. Color code definitions for LUXEON Versat 2020 140 at 20 ms MP, 140mA,  $T_c = 25\text{ }^\circ\text{C}$

CODE	DOMINANT WAVELENGTH <sup>(1)</sup> (nm)	
	MINIMUM	MAXIMUM
3	612	620
6	620	627
4	627	632
5	632	638

**Notes for Table 7:**

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

## Forward Voltage Bins

Table 8. Forward voltage bin definitions for LUXEON Versat 2020 140 at 20 ms MP, 140mA,  $T_c = 25\text{ }^\circ\text{C}$

BIN	FORWARD VOLTAGE <sup>(1)</sup> (V <sub>f</sub> )	
	MINIMUM	MAXIMUM
A	1.90	2.05
B	2.05	2.20
C	2.20	2.35
D	2.35	2.50

**Notes for Table 8:**

1. Lumileds maintains a tolerance of  $\pm 0.06\text{V}$  on forward voltage measurements.

## Mechanical Dimensions

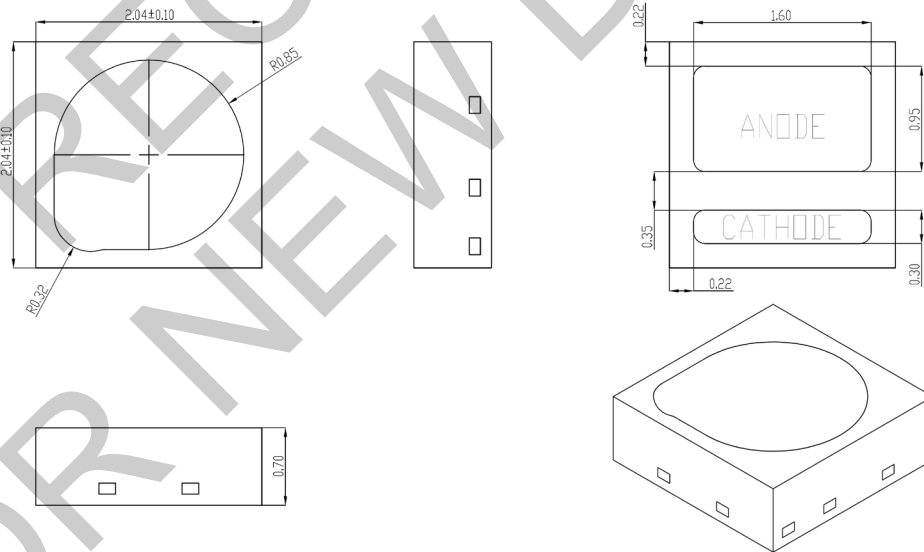


Figure 9. Mechanical dimensions for LUXEON Versat 2020 140

**Notes for Figure 9:**

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

# Packaging Information

## Pocket Tape Dimensions

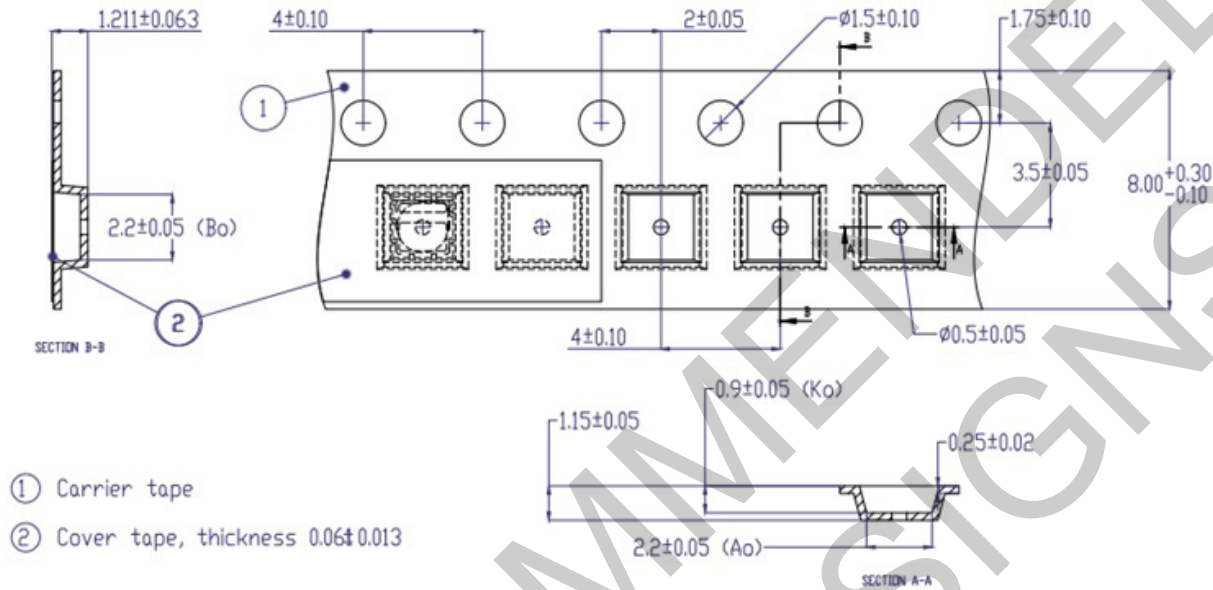


Figure 10. Pocket tape dimensions for LUXEON Versat 2020 140

### Notes for Figure 10:

1. Drawings are not to scale.
2. All dimensions are in millimeters.
3. Ao is the width of pocket, Ko is the depth of pocket, and Bo is the height of pocket.

## Reel Dimensions

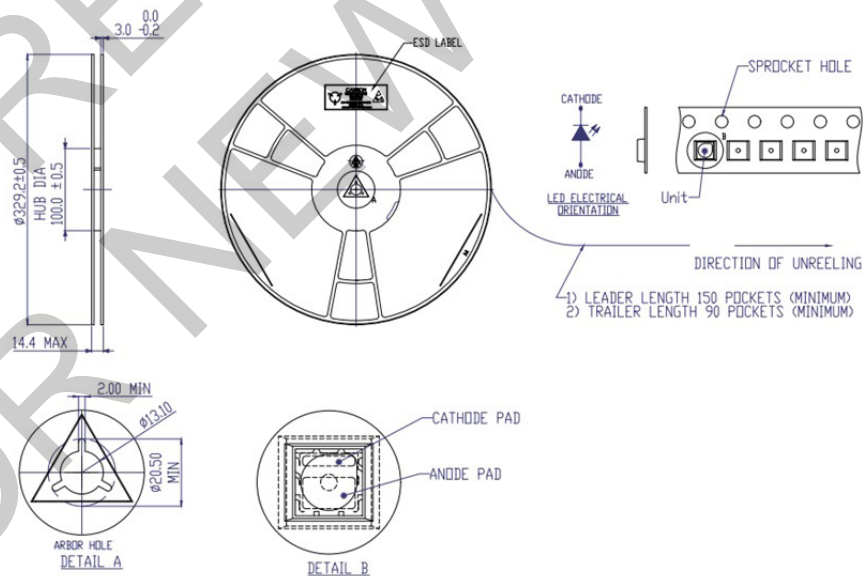


Figure 11. Reel dimensions for LUXEON Versat 2020 140

### Notes for Figure 11:

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

## Product Labelling

LUXEON Versat 2020 LEDs are packaged in moisture barrier bags on reels. Both moisture barrier bag and reels have printed information providing part numbers with CAT codes that indicate luminous flux bin, color bins and forward voltage bins.



Figure 12. Example of a moisture barrier bag and reel label for LUXEON Versat 2020 140

### Notes for Figure 12:

Field labels not described are for Lumileds internal use only.

1. Total number of LED emitters in a shipment box.
2. Lumileds part number
3. Customer part number for custom requests only.
4. LED test date in YYWW format.
5. Unique product lot identification number. This number is required for traceability purposes.
6. Country code of origin of manufacturing of part (e.g. MY for Malaysia, CN for China) according to ISO 3166-1 alpha-2 document.
7. Product bin n-digit alphanumeric CAT code.

## 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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