LUMILEDS

AUTOMOTIVE

LUXEON Versat 2020 140 AM

Smallest, lambertian flat top emitter

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

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

- Amber (586 nm)
- Amber (590 nm)

FEATURES AND BENEFITS

- Low thermal resistance and power consumption results in simplified thermal management and system cost
- Shorter wavelength capability enables enhanced cover lens flexibility
- High flux output provides flexibility in styling and optical design
- Higher drive current capability for increased flux performance

PRIMARY APPLICATIONS

- Rear Turn
- Side Marker

 ©2024 Lumileds Holding B.V. All rights reserved.

Table of Contents

General Product Information 2
- Product Test Conditions 2
- Part Number Nomenclature 2
- Environmental Compliance 2

Performance Characteristics 3
- Product Selection Guide 3
- Optical Characteristics 3
- Electrical and Thermal Characteristics 3
- Absolute Ratings 4
- JEDEC Moisture Sensitivity 4

Characteristic Curves 5
- Spectral Power Distribution Characteristics 5
- Light Output Characteristics 6
- Forward Current and Voltage Characteristics 7
- Radiation Pattern Characteristics 8
- Operating Limits Characteristics 8

Product Bin and Labeling Definitions 9
- Designing with LUXEON Versat 2020 140 AM 9
- Decoding Product Bin Labeling 9
- Luminous Flux Bins 9
- Color Codes 10
- Forward Voltage Bins 10

Mechanical Dimensions 10

Reflow Soldering Guidelines 11

Packaging Information 12
- Pocket Tape Dimensions 12
- Reel Dimensions 12

 ©2024 Lumileds Holding B.V. All rights reserved.

General Product Information

Product Test Conditions

LUXEON Versat 2020 140 AM 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 AM 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 (A584 = 584 nm, A588 = 588 nm)
E	–	designates binning current (C = 140 mA)
F	–	designates binning configuration (1 = single binning)
G	–	open space (0 = standard part)
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 Amber with a luminous flux range of 15 lumens to 18 lumens, and a forward voltage range of 1.90–2.50 volts:

A 1 V B – **A 5 8 4 C 1 0 J N 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 AM 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 AM at 20 ms MP, 140 mA, T_c = 25 °C

COLOR	DOMINANT WAVELENGTH [1,2] (nm)	PART NUMBER
Amber	586	A1VB - A584C
Amber	590	A1VB - A588C

Notes for Table 1:
1. Dominant wavelength is derived from the CIE 1931 Chromaticity diagram and represents perceived color.
2. Lumileds maintains a tolerance of ±0.5nm for dominant wavelength measurements.

Optical Characteristics

Table 2. Typical optical characteristics for LUXEON Versat 2020 140 AM at 20 ms MP, 140 mA, T_c = 25 °C

PART NUMBER	TYPICAL TOTAL INCLUDED ANGLE [1] $\theta_{0.90V}$	TYPICAL VIEWING ANGLE [2] $2\theta_{1/2}$
A1VB-xxxxC	138°	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. Typical electrical and thermal characteristics for LUXEON Versat 2020 140 AM at 20 ms MP, 140 mA T_c = 25 °C

PART NUMBER	FORWARD VOLTAGE (V_f)		THERMAL RESISTANCE – JUNCTION TO CASE (°C/W)			
			$R\Theta_{j\text{-}c}$ ELEC[2]		$R\Theta_{j\text{-}c}$ REAL[3]	
	MINIMUM	MAXIMUM	TYPICAL	MAXIMUM	TYPICAL	MAXIMUM
A1VB-AxxxCx0xxxxxx	1.90	2.50	23.3	27.0	25.6	30.0

Notes for Table 3:
1. $R_{th\ j\text{-}c\ electr}$: Electrical thermal resistance (junction to case).
2. $R_{th\ j\text{-}c\ real}$: Real thermal resistance (junction to case) with wall plug efficiency included. Reference JESD51-51, JESD51-14, 4.1.3.
3. All values are typical unless otherwise stated.

 ©2024 Lumileds Holding B.V. All rights reserved.

Absolute Ratings

Table 4. Absolute ratings for LUXEON Versat 2020 140 AM

PARAMETER	PERFORMANCE
Minimum DC Forward Current	5 mA
Maximum DC Forward Current	200 mA
Maximum Junction Temperature [1]	135 °C
Operating Case Temperature at Test Current [1]	-40 to 120 °C
LED Storage Temperature	-40 to 120 °C
Soldering Temperature	JEDEC 020E 260 °C
Allowable Reflow Cycles	3
Minimum ESD Sensitivity [2]	±3 kV HBM
Reverse Voltage ($V_{reverse}$)	-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 AM 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 140 AM is not designed to be driven in reverse bias.

JEDEC Moisture Sensitivity

Table 5. Moisture sensitivity levels for LUXEON Versat 2020 140 AM

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

 ©2024 Lumileds Holding B.V. All rights reserved.

Characteristic Curves

Spectral Power Distribution Characteristics

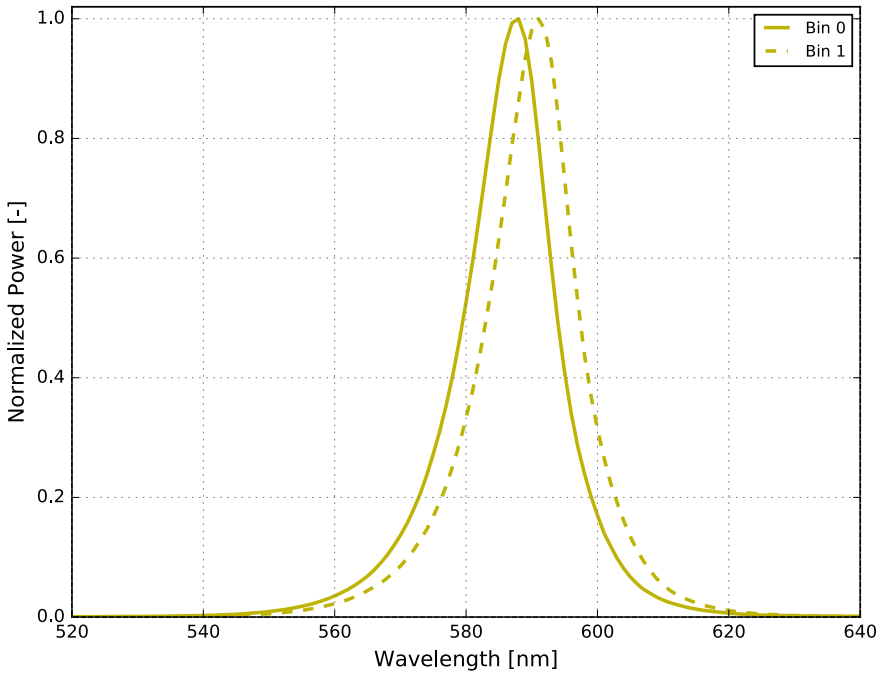

Figure 1. Typical normalized power vs. wavelength for LUXEON Versat 2020 140 AM at 140 mA, T_c = 25 °C

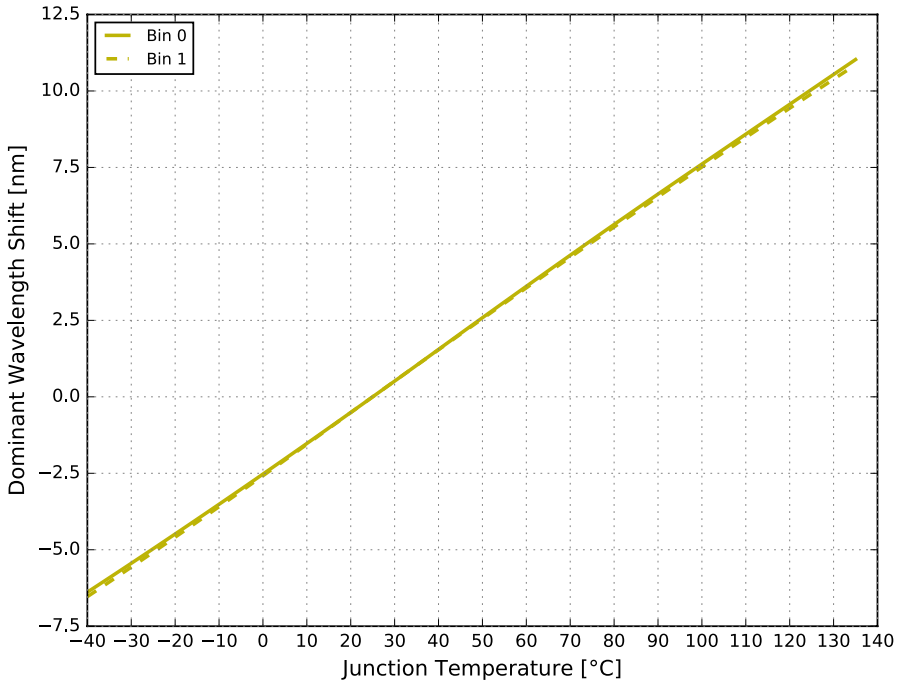

Figure 2. Typical wavelength shift vs. junction temperature for LUXEON Versat 2020 140 AM at 140 mA

 ©2024 Lumileds Holding B.V. All rights reserved.

Light Output Characteristics

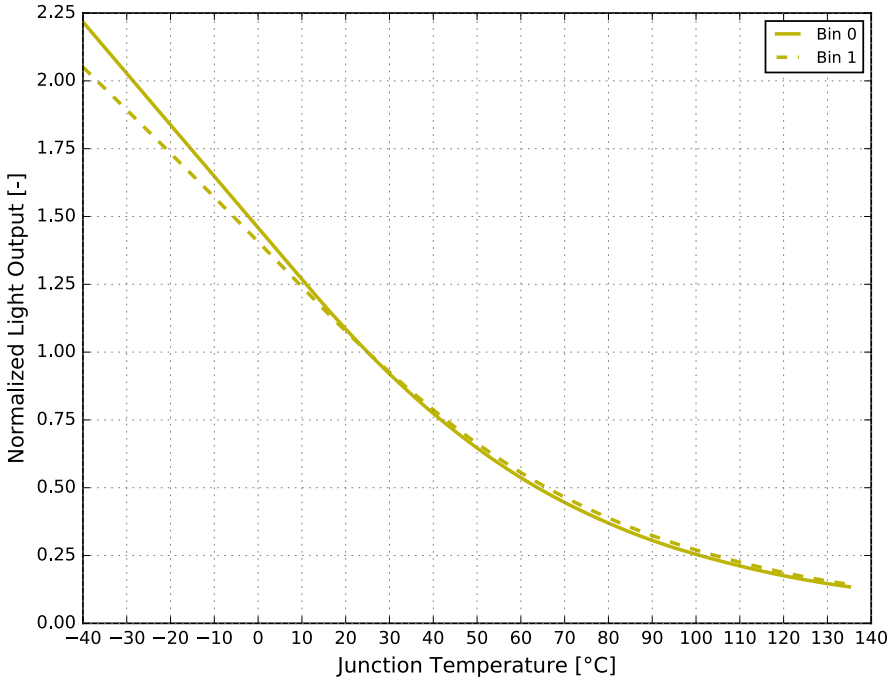

Figure 3. Typical normalized light output vs. junction temperature for LUXEON Versat 2020 140 AM at 140 mA

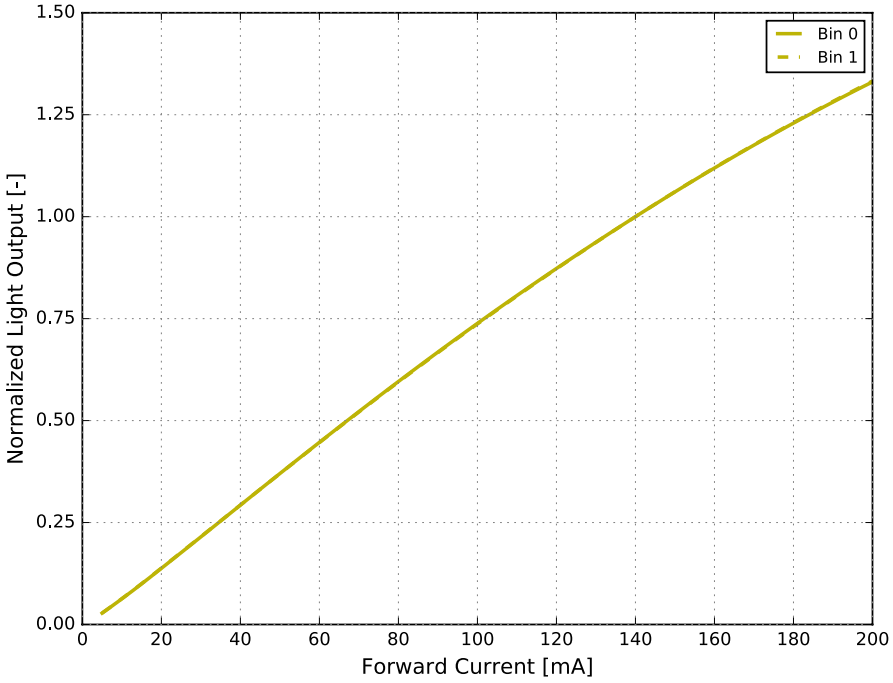

Figure 4. Typical normalized light output vs. forward current for LUXEON Versat 2020 140 AM at T_c = 25 °C

Forward Current and Voltage Characteristics

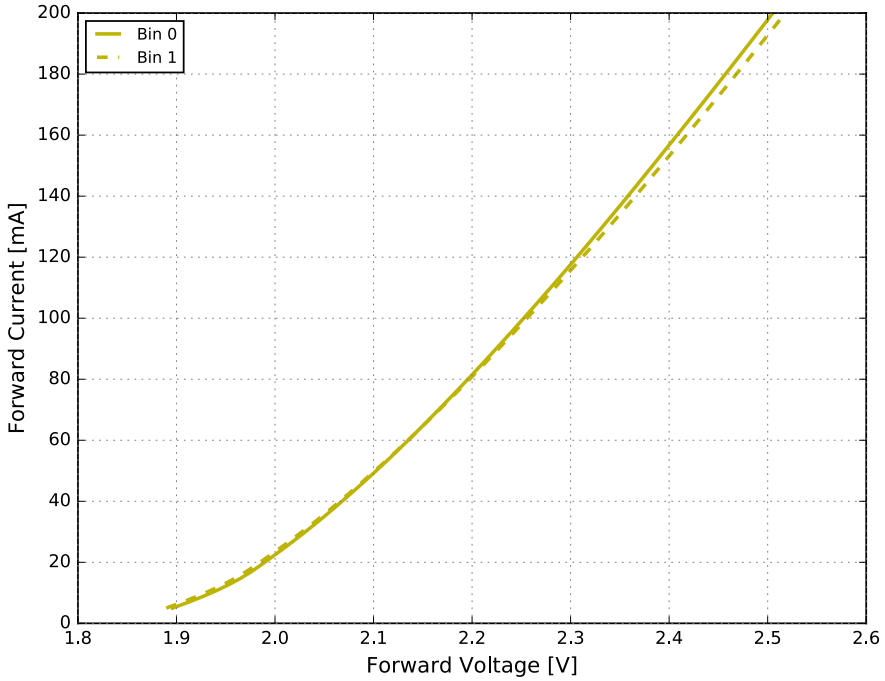

Figure 5. Typical forward current vs. forward voltage for LUXEON Versat 2020 140 AM at T_c = 25 °C

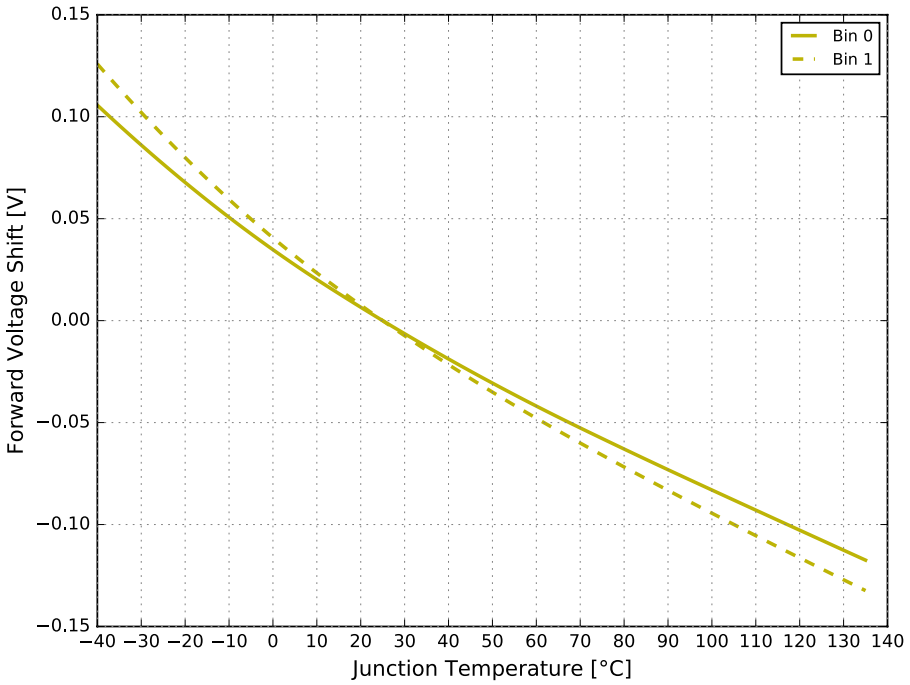

Figure 6. Typical forward voltage shift vs. junction temperature for LUXEON Versat 2020 140 AM at 140 mA

 ©2024 Lumileds Holding B.V. All rights reserved.

Radiation Pattern Characteristics

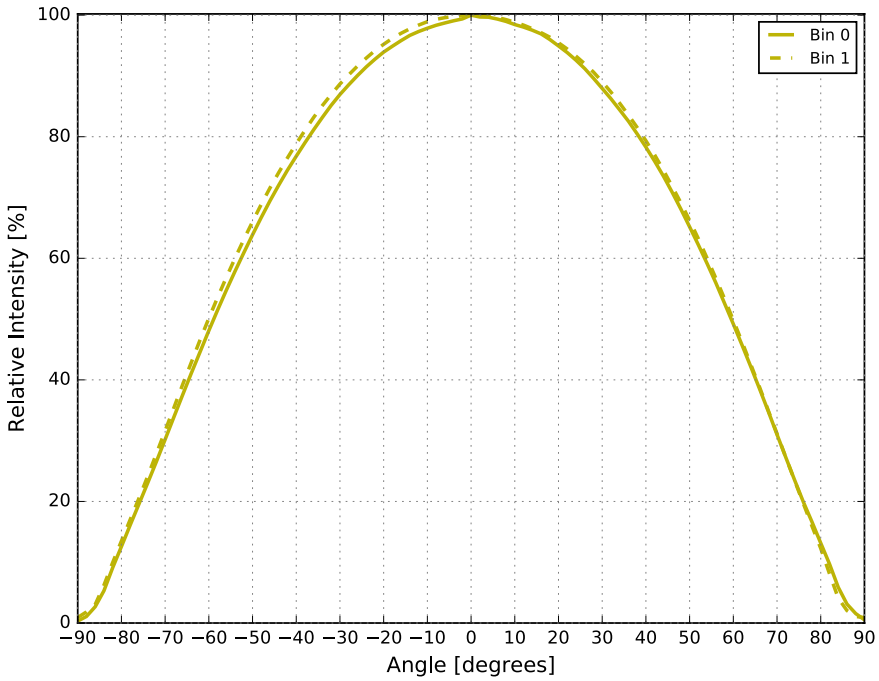

Figure 7. Typical radiation pattern for LUXEON Versat 2020 140 AM at 140 mA

Operating Limits Characteristics

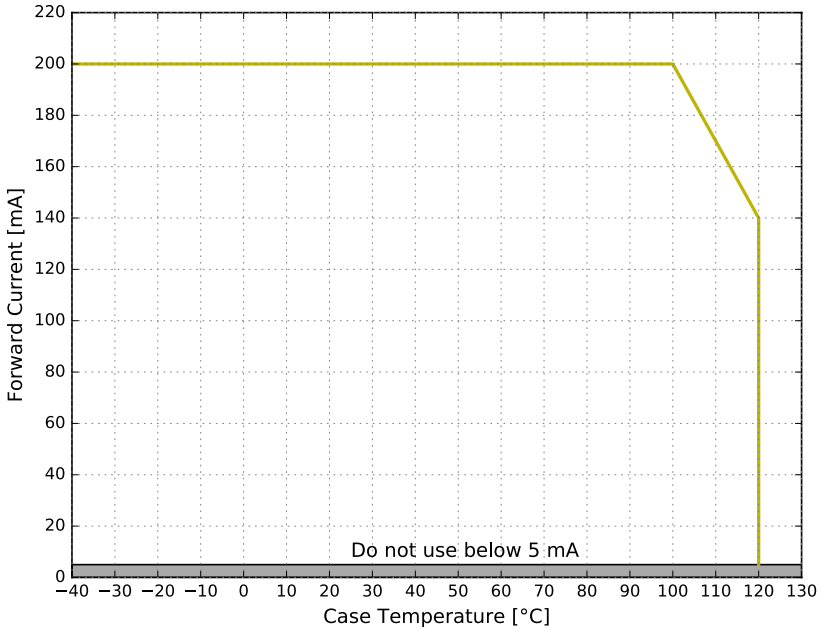

Figure 8. Maximum forward current vs. case temperature for LUXEON Versat 2020 140 AM

Product Bin and Labeling Definitions

Designing with LUXEON Versat 2020 140 AM

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 AM LEDs are labeled using a 3-digit alphanumeric CAT code following the format below:

A B C

Where:

A – designates luminous flux bin (example: J = 15 lumens to 18 lumens)

B – designates color code (example: 0 = 584 nm to 588 nm)

C – designates forward voltage bin (example: A = 2.35 V to 2.50 V)

Therefore, a LUXEON Versat 2020 140 AM with a lumen range of 15 to 18, color code of 0 and a forward voltage of 2.35 to 2.50 has the following CAT code:

J 0 D

Luminous Flux Bins

Table 6 lists the standard luminous flux bins for LUXEON Versat 2020 140 AM 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 6. Luminous flux bin definitions for LUXEON Versat 2020 140 AM, T_c = 25 °C

BIN	LUMINOUS FLUX [1] (lm)	
	MINIMUM	MAXIMUM
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

Notes for Table 6:
1. Lumileds maintains a tolerance of ±10% on luminous flux measurements.

 ©2024 Lumileds Holding B.V. All rights reserved.

Color Codes

Table 7. Color code definitions for LUXEON Versat 2020 140 AM at 20 ms MP, 140 mA, T_c = 25 °C

CODE	DOMINANT WAVELENGTH [1] (nm)	
	MINIMUM	MAXIMUM
0	584	588
1	588	592

Notes for Table 7:
1. Lumileds maintains a tolerance of ±0.5nm on dominant wavelength measurements.

Forward Voltage Bins

Table 8. Forward voltage bin definitions for LUXEON Versat 2020 140 AM at 20 ms MP, 140 mA, T_c = 25 °C

BIN	FORWARD VOLTAGE [1] (V_f)	
	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 ±0.06V on forward voltage measurements.

Mechanical Dimensions

Notes for Figure 9:
1. Drawings are not to scale.
2. All dimensions are in millimeters.

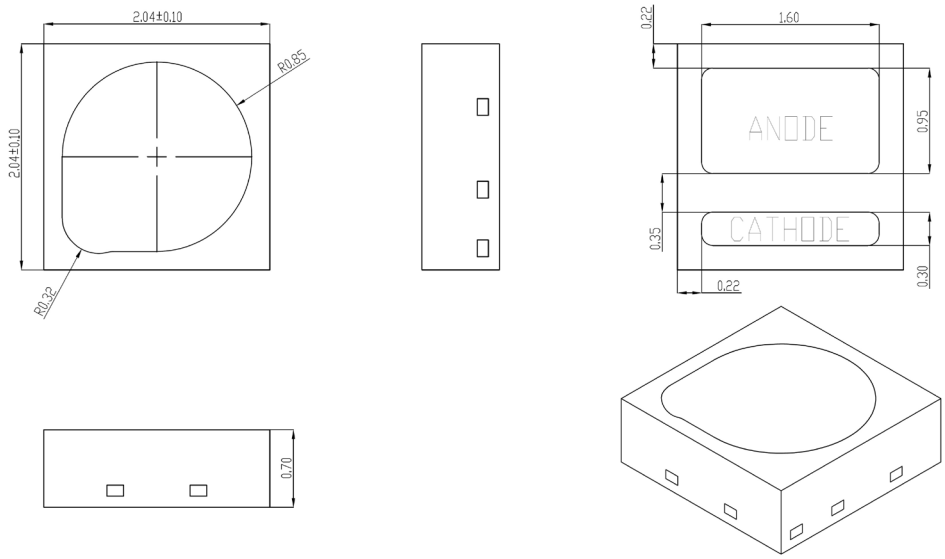

Figure 9. Mechanical dimensions for LUXEON Versat 2020 140 AM

Reflow Soldering Guidelines

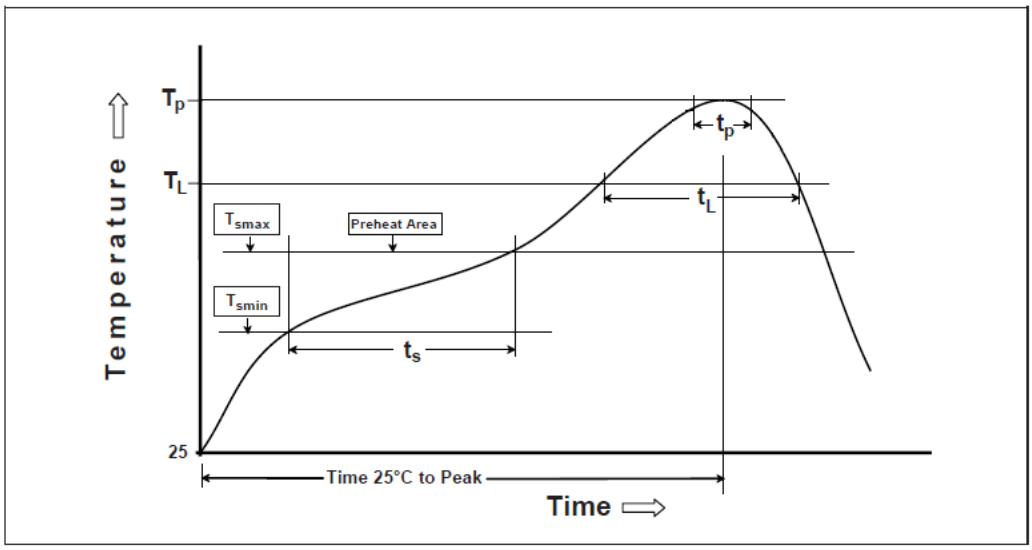

Figure 10. Visualization of the acceptable reflow temperature profile as specified in Table 9

Table 9. Reflow profile characteristics for LUXEON Versat 2020 140 AM.

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
Liquidous 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 Peak 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

Notes for Table 9:
1. All temperatures refer to the application Printed Circuit Board (PCB), measured on the surface adjacent to the package body.

 ©2024 Lumileds Holding B.V. All rights reserved.

Packaging Information

Pocket Tape Dimensions

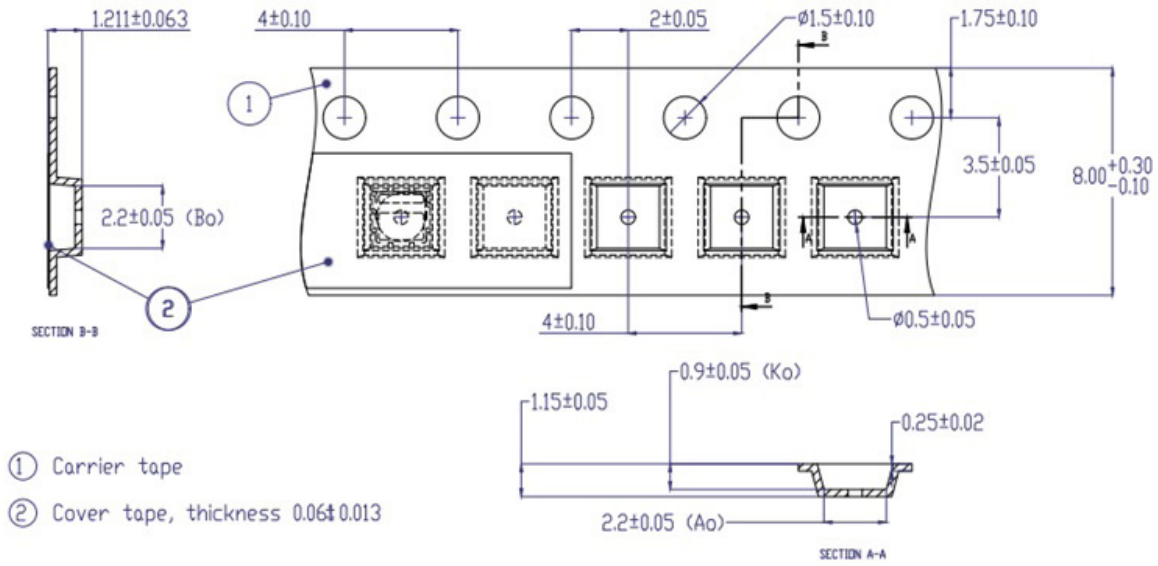

Figure 11. Pocket tape dimensions for LUXEON Versat 2020 140 AM

Notes for Figure 11:
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

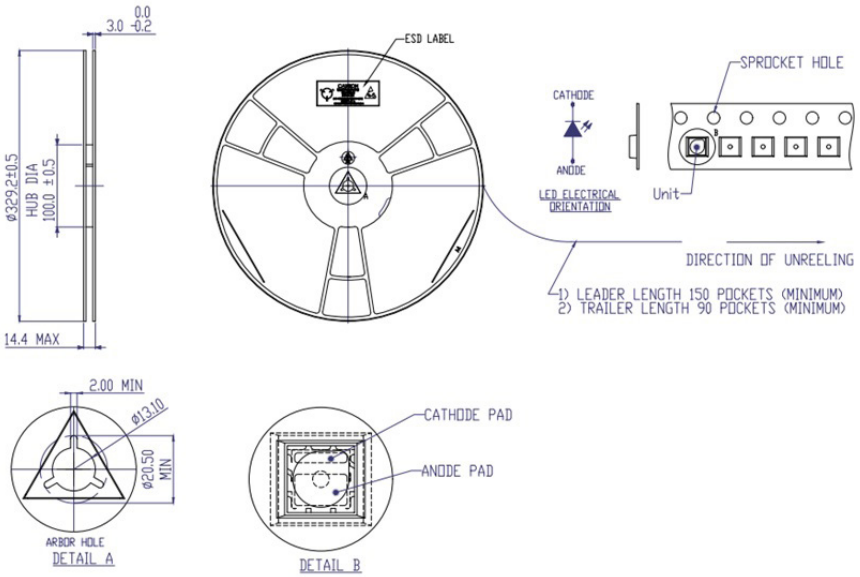

Figure 12. Reel dimensions for LUXEON Versat 2020 140 AM

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

 ©2024 Lumileds Holding B.V. All rights reserved.

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.

©2024 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

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.

DS278 LUXEON Versat 2020 140 AM
Product Datasheet 20240701