LUMILEDS

ILLUMINATION

LUXEON 3528 RGB

Flexible and versatile 3-in-1 package

LUXEON 3258 is the perfect RGB package for indoor, architectural, and decorative applications. Its very compact, low profile package – only 1.75mm – can manage up to 0.5W of power and has an IPX8 water resistant rating. Each of the three color channels can be individually addressed and controlled. It pairs perfectly with LUXEON 2835 Architectural white LEDs for additional color changing options.

FEATURES AND BENEFITS

- RGB 3-in-1 package
- Compact size - just 3.5mm x 2.8mm x 1.75mm is perfect for linear, flexible, and shaped applications
- Individually control each channel
- IPX8 water resistant rating

PRIMARY APPLICATIONS

- Wall Grazer
- Linear
- Wall Wash
- Landscape Lighting
- Decorative

c UL us No. E507562

RoHS COMPLIANT

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General Product Information

Product Test Conditions

LUXEON 3528 RGB LEDs are tested and binned with a 20ms monopulse of 20mA at a junction temperature, T_j, of 25ºC.

Part Number Nomenclature

The part number for the LUXEON 3528 RGB follows the convention below::

L 1 M C – **A A A** 0 0 2 8 0 0 0 M P 0

Where:

A A A – designates color (R=Red, G=Green, B=Blue)

Therefore, the following part number is used for the Red, Green, Blue LUXEON 3528 RGB LED:

L 1 M C – **R G B** 0 0 2 8 0 0 0 M P 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 3528 RGB 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 3528 RGB at 20mA, T_j=25°C.

COLOR	DOMINANT WAVELENGTH [1] (nm)		LUMINOUS FLUX [2] (lm)		PART NUMBER
	MINIMUM	MAXIMUM	MINIMUM	TYPICAL	
Red	619	625	2.7	3.4	L1MC-RGB0028000MP0
Green	520	530	7.0	9.0	
Blue	465	475	1.5	1.9	

Notes for Table 1:
1. Lumileds maintains a tolerance of ±1nm on dominant wavelength measurements.
2. Lumileds maintains a tolerance of ±7.5% on luminous flux measurements.

Optical Characteristics

Table 2. Optical characteristics for LUXEON 3528 RGB at 20mA, T_j=25°C.

COLOR	PART NUMBER	TYPICAL SPECTRAL HALF-WIDTH [1] (nm)	TYPICAL TEMPERATURE COEFFICIENT OF DOMINANT OR PEAK WAVELENGTH (nm/°C)	TYPICAL VIEWING ANGLE [2]
L1MC-RGB0028000MP0	L1MC-RGB0028000MP0	15	0.04	120°
Green		25	0.04	120°
Blue		18	0.04	120°

Notes for Table 2:
1. Spectral half-width is the spectral bandwidth at 50% of the peak intensity.
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. Electrical and thermal characteristics for LUXEON 3528 RGB at 20mA, T_j=25°C.

COLOR	PART NUMBER	FORWARD VOLTAGE [1] (V_f)			TYPICAL TEMPERATURE COEFFICIENT OF FORWARD VOLTAGE [2] (mV/°C)	TYPICAL THERMAL RESISTANCE—JUNCTION TO SOLDER PAD (°C/W)
		MINIMUM	TYPICAL	MAXIMUM		
Red	L1MC-RGB0028000MP0	1.90	2.03	2.50	-1.6	110
Green		2.60	2.73	3.10	-2.4	170
Blue		2.70	2.81	3.30	-2.6	130

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 3528 RGB.

PARAMETER	RED	GREEN AND BLUE
DC Forward Current [1, 2]	60mA	60mA
DC Forward Current [1, 3]	30mA	30mA
Peak Pulsed Forward Current [1, 4]	200mA	100mA
LED Junction Temperature [1] (DC & Pulse)	115°C	125°C
ESD Sensitivity (ANSI/ESDA/JEDEC JS-001-2012)	Class 2	
LED Storage Temperature	-40°C to 85°C	
Soldering Temperature	JEDEC 020c 250°C	
Allowable Reflow Cycles	3	
Reverse Voltage ($V_{reverse}$)	LUXEON 3528 RGB LEDs are not designed to be driven in reverse bias	

Notes for Table 4:
1. Proper current derating must be observed to maintain the junction temperature below the maximum allowable junction temperature.
2. Single-color light.
3. All-color light.
4. At 0.01ms pulse on time test with a pulse period of 0.1ms.

Characteristic Curves

Spectral Power Distribution Characteristics

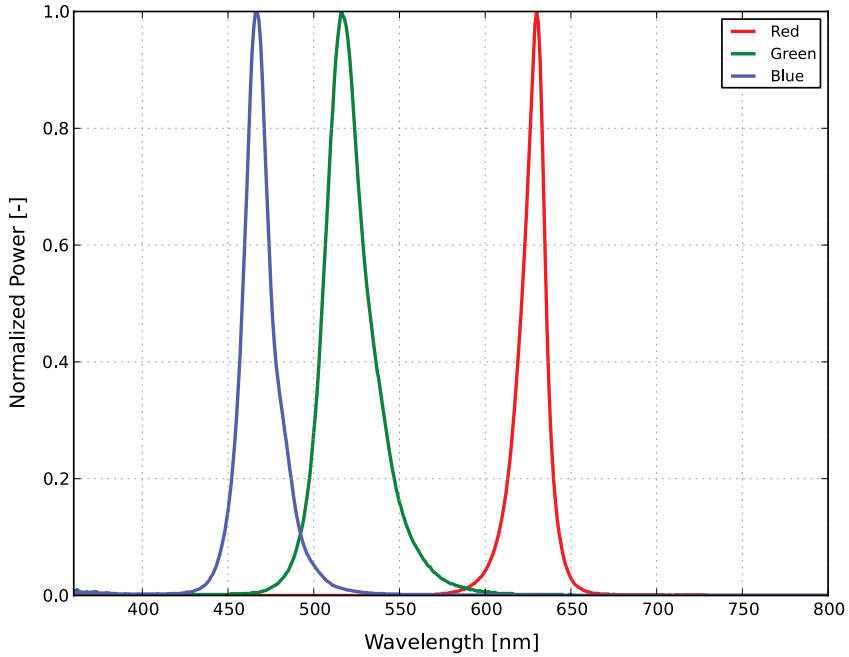


Figure 1. Typical normalized power vs. wavelength for LUXEON 3528 RGB at 20mA, T_j=25°C.

Light Output Characteristics

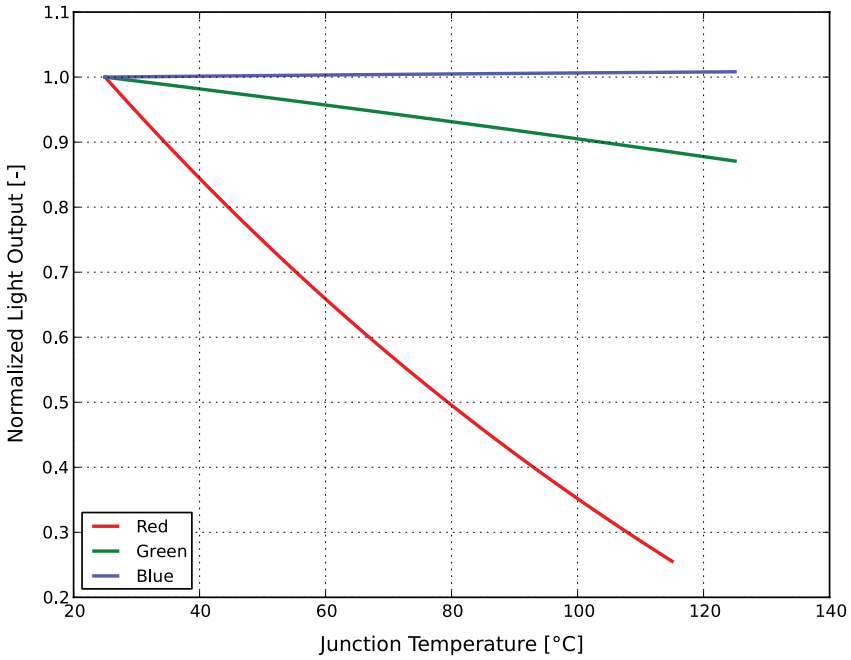


Figure 2. Typical normalized light output vs. junction temperature for LUXEON 3528 RGB at 20mA.

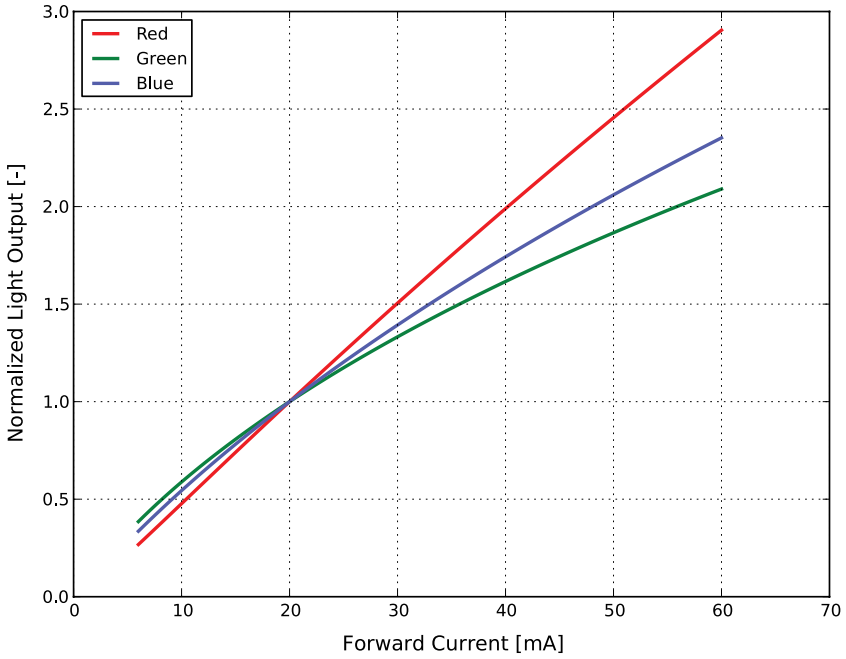


Figure 3. Typical normalized light output vs. forward current for LUXEON 3528 RGB at T_j=25°C.

Forward Current Characteristics

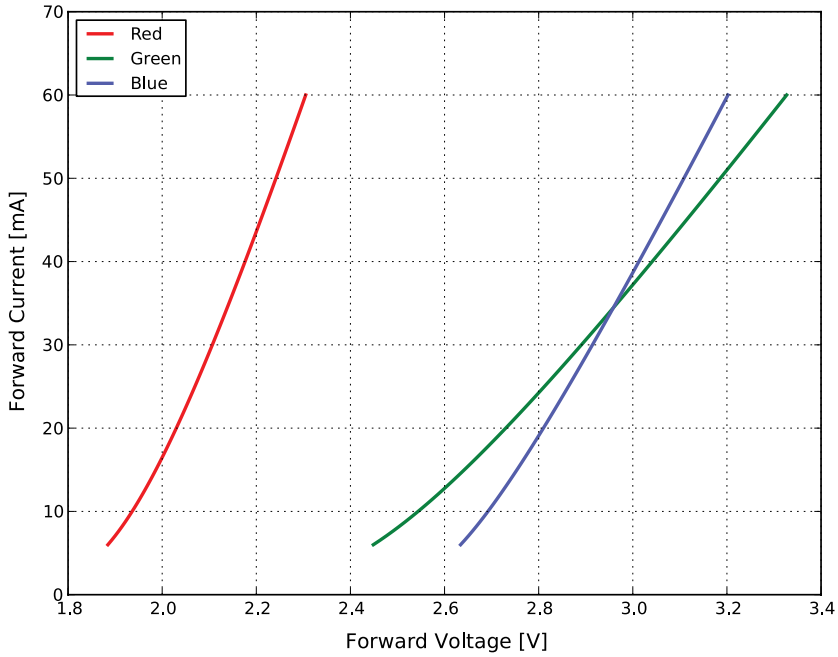
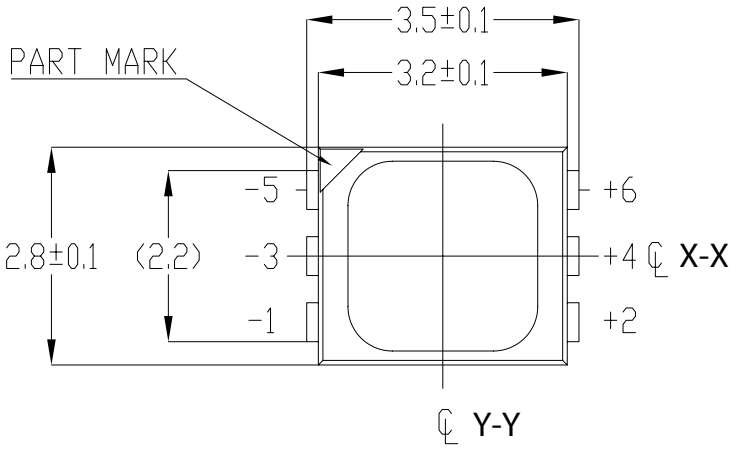


Figure 4. Typical forward current vs. forward voltage for LUXEON 3528 RGB at T_j=25°C.

Radiation Pattern Characteristics



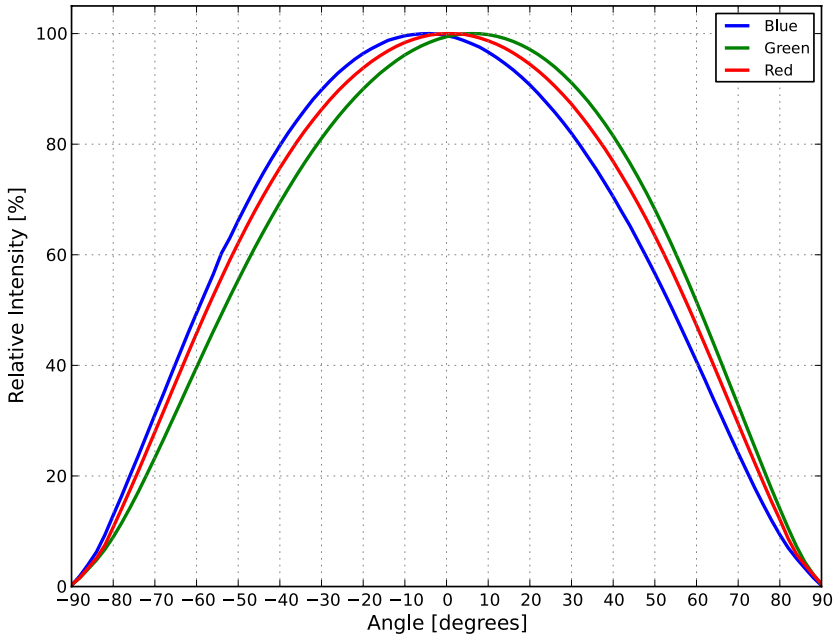


Figure 5a. Typical radiation pattern (Y-Y) for LUXEON 3528 RGB at 20mA, T_j=25°C.

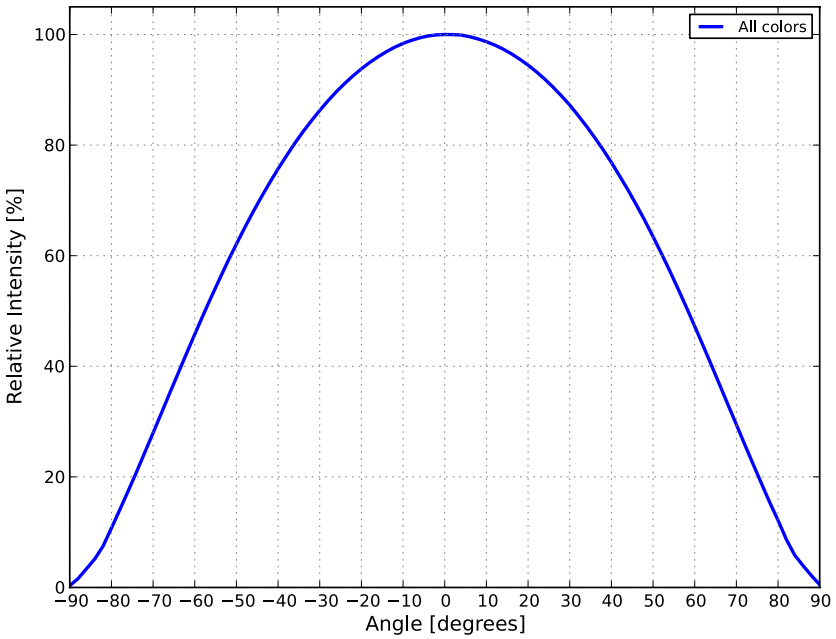


Figure 5b. Typical radiation pattern (X-X) for LUXEON 3528 RGB at 20mA, T_j=25°C.

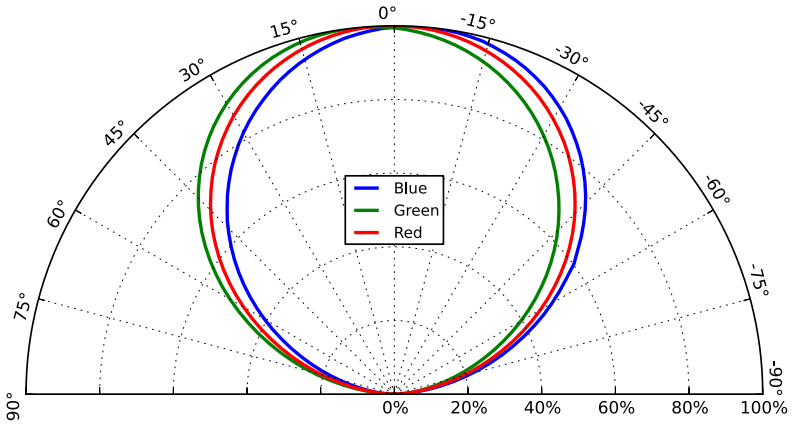


Figure 6a. Typical polar radiation pattern (Y-Y) for LUXEON 3528 RGB at 20mA, T_j=25°C.

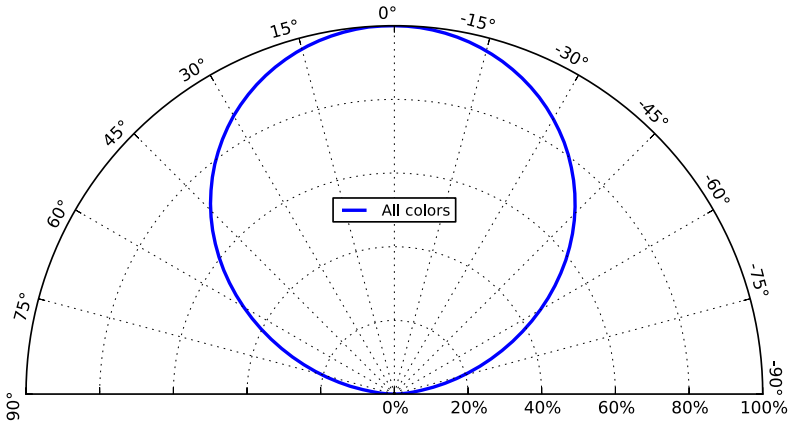


Figure 6b. Typical polar radiation pattern (X-X) for LUXEON 3528 RGB at 20mA, T_j=25°C.

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, intensity, radiometric power, color point, peak wavelength, dominant wavelength and forward voltage.

LUXEON 3528 RGB LEDs are labeled using a 12-digit alphanumeric CAT code following the format below:

A B C D – Red

E F G H – Green

J K L M – Blue

Where:

A E J – designates luminous flux for the red, green and blue LED (example: F=2.7 to 3 lm, P=7.0 to 8.0 lm)

BC FG KL – designates color, dominant wavelength bin (example: Red 10=619 to 625nm, Green 20=520 to 525nm, Blue 31=465 to 470nm)

D H M – designates forward voltage bin (example: A=1.9 to 2.5V, B=2.6 to 3.1V)

Therefore, a LUXEON 3528 RGB LED with a red luminous flux of 2.7 to 3 lm / color 619 to 625nm / forward voltage of 1.9 to 2.5V; green luminous flux of 7.0 to 8.0 lm / color 525 to 530nm / forward voltage of 2.6 to 3.1V; blue luminous flux of 1.9 to 2.3 lm / color 465 to 470nm and forward voltage of 2.7 to 3.3V has the following CAT Code:

F 1 0 A – Red

P 2 1 B – Green

B 3 1 C – Blue

Luminous Flux Bins

Table 5 lists the standard luminous flux bins for LUXEON 3528 RGB LEDs. Although several bins are outlined, product availability in a particular bin varies by production run and by product performance.

Table 5. Intensity bin definitions for LUXEON 3528 RGB.

COLOR	BIN	LUMINOUS FLUX [1] (lm)	
		MINIMUM	MAXIMUM
Red	F	2.7	3.0
	G	3.0	3.3
	H	3.3	3.6
Green	P	7.0	8.0
	Q	8.0	9.0
	R	9.0	10.0
Blue	A	1.5	1.9
	B	1.9	2.3
	C	2.3	2.7

Notes for Table 5:
1. Lumileds maintains a tolerance of ±7.5% on luminous flux measurements.

Dominant Wavelength Bins

Table 6. Dominant wavelength bins for LUXEON 3528 RGB at 20mA, T_j=25°C.

COLOR	PART NUMBER	BIN	DOMINANT WAVELENGTH [1] (nm)	
			MINIMUM	MAXIMUM
Red	L1MC-RGB0028000MP0	10	619	625
Green		20	520	525
		21	525	530
Blue		31	465	470
		32	470	475

Notes for Table 6:
1. Lumileds maintains a tolerance of ±1nm on dominant wavelength measurements.

Forward Voltage Bins

Table 7. Forward voltage bin definitions for LUXEON 3528 RGB.

COLOR	BIN	FORWARD VOLTAGE [1] (V_f)	
		MINIMUM	MAXIMUM
Red	A	1.90	2.50
Green	B	2.60	3.10
Blue	C	2.70	3.30

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

Mechanical Dimensions

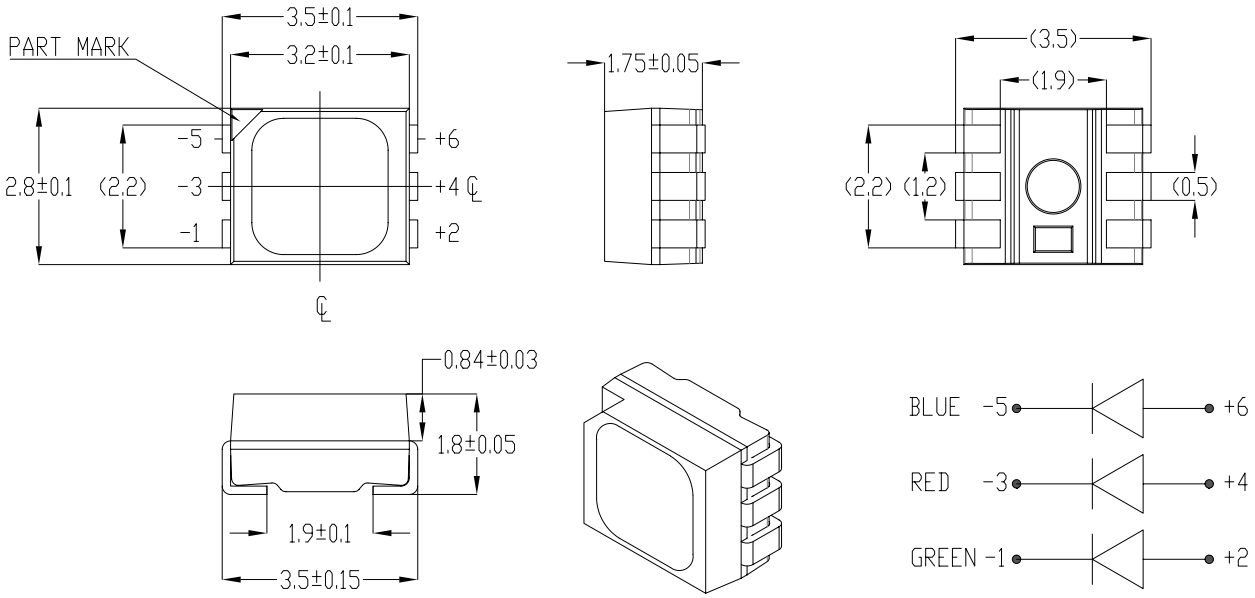


Figure 7. Mechanical dimensions for LUXEON 3528 RGB.

Notes for Figure 7:
1. Drawings are not to scale.
2. All dimensions are in millimeters.

Reflow Soldering Guidelines

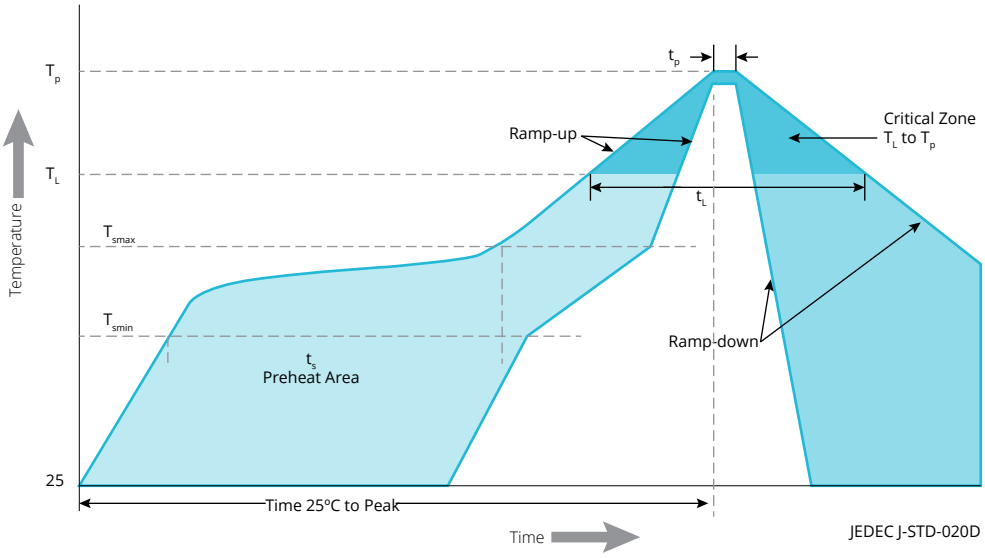


Figure 8. Visualization of the acceptable reflow temperature profile as specified in Table 8.

Table 8. Reflow profile characteristics for LUXEON 3528 RGB.

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_L to T_p)	4°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)	250°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

JEDEC Moisture Sensitivity

Table 9. Moisture sensitivity levels for LUXEON 3528 RGB.

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

Waterproof Test

Table 10. Waterproof test for LUXEON 3528 RGB. [1]

STANDARD	CONDITIONS	TIME
IEC 60529:2001	IPX8 immersing in 1m water	168 Hours

Notes for Table 10:
1. Waterproof test is conducted on the component level by assembling the module on a PCB, isolating the electrical path by silicone. It is recommended to test the product in the application and insulate for moisture.

Solder Pad Design

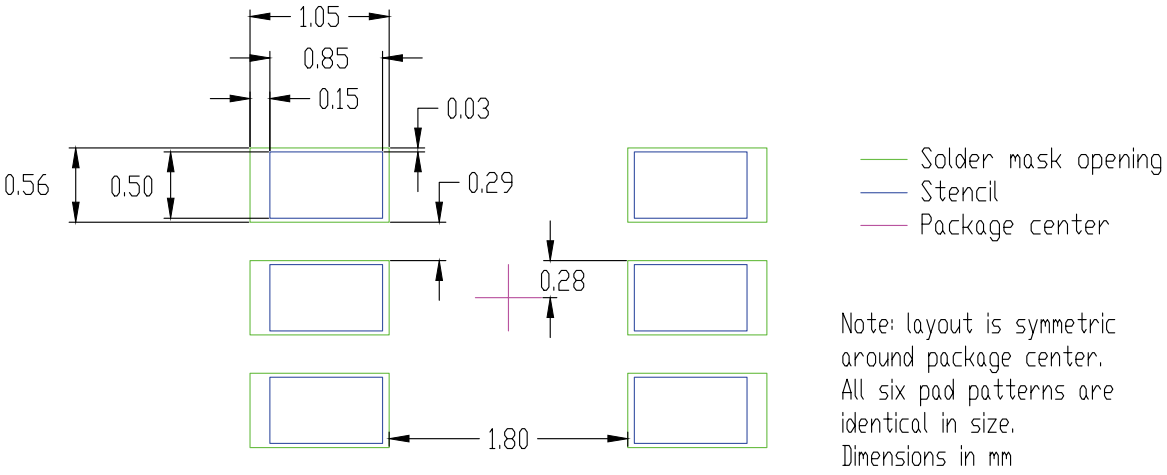
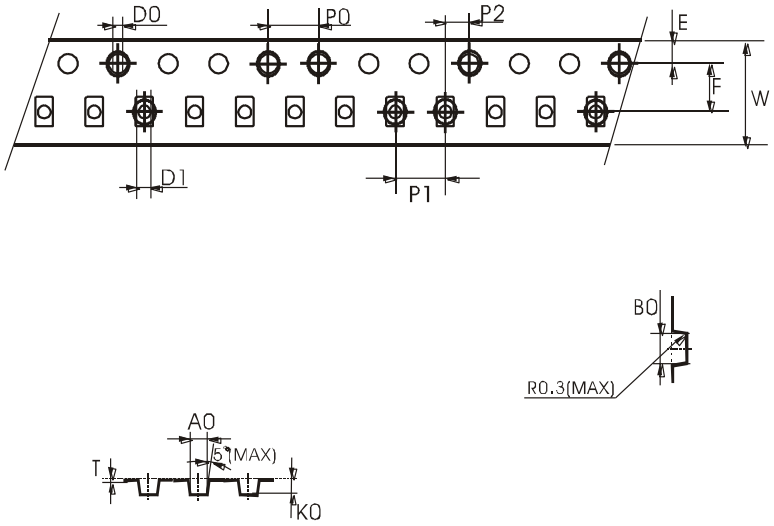


Figure 9. Recommended PCB solder pad layout for LUXEON 3528 RGB.

Notes for Figure 9:
1. Drawings are not to scale.
2. All dimensions are in millimeters.
3. Layout is symmetric around package center.
4. All six pads patterns are identical in size.

Packaging Information

Pocket Tape Dimensions

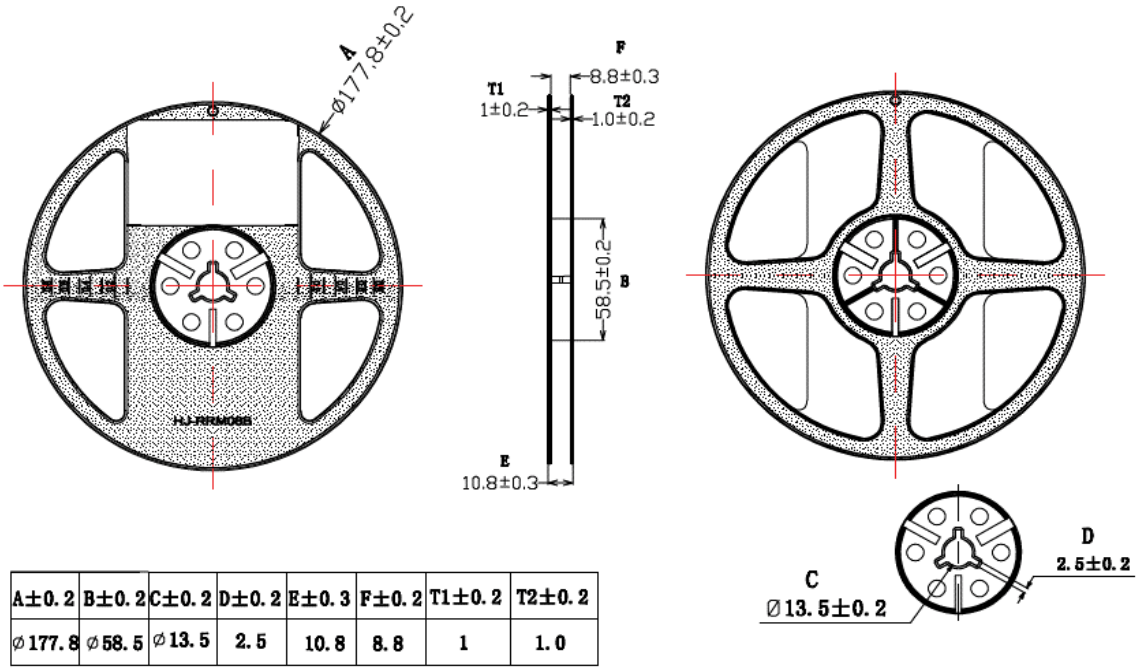


SYMBOL	SPEC
A0	3.10±0.1
B0	3.80±0.1
K0	2.10±0.1
P0	4.00±0.1
P1	4.00±0.1
P2	2.00±0.1
T	0.20±0.05
E	1.75±0.1
F	3.50±0.1
D0	1.50+0.1
D1	1.00+0.1
W	8.00±0.1

Figure 10. Pocket Tape dimensions for LUXEON 3528 RGB.

Notes for Figure 10:
1. Drawings are not to scale.
2. All dimensions are in millimeters.
3. Empty components pockets sealed with top cover tape.

Reel Dimensions



A±0.2	B±0.2	C±0.2	D±0.2	E±0.3	F±0.2	T1±0.2	T2±0.2
ø177.8	ø58.5	ø13.5	2.5	10.8	8.8	1	1.0

Figure 11. Reel dimensions for LUXEON 3528 RGB.

Notes for Figure 11:
1. Drawings are not to scale.
2. All dimensions are in millimeters.
3. Empty component pockets sealed with top cover tape.
4. Maximum 2,000 pieces per reel.
5. The maximum number of consecutive missing LEDs is two.
6. In accordance with EIA-481-1-B specification.

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.

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Product Datasheet 20220321