LUMILEDS

ILLUMINATION

LUXEON 5052 RGBW

RGBW 4-in-1 versatile package

The LUXEON 5052 RGBW is a 4-in-1 package that makes color tuning easier. Each channel is individually addressable, enabling a large color gamut while simplifying the ability of getting just the right color point.

FEATURES AND BENEFITS

- RGBW 4-in-1 module
- 5.0mm x 5.2mm
- Individually control each channel

PRIMARY APPLICATIONS

- Wall Grazer
- Linear
- Wall Wash
- Decorative

c UL us No. E507562

RoHS COMPLIANT

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General Product Information

Product Test Conditions

LUXEON 5052 RGBW LEDs are tested and binned with a 20ms monopulse of 120mA at a junction temperature, T_j, of 25ºC.

Part Number Nomenclature

Part numbers for LUXEON 5052 RGBW follow the convention below:

L 1 M C – **A A A B B C C D D** 0 M P 0

Where:

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

B B – designates CCT (22=2200K, 27=2700K, 30=3000K, 40=4000K, 50=5000K, 65=6500K)

C C – designates CRI (70=70CRI, 80=80CRI, 90=90CRI)

D D – designates footprint (50=5mm x 5mm)

Therefore, the following part number is used for the Red, Green, Blue, 3000K 80CRI LUXEON 5052 RGBW LED:

L 1 M C – **R G B 3 0 8 0 5 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 5052 RGBW is compliant to the European Union directives on the restriction of hazardous substances in electronic equipment, namely the ROHS Directive 2011/65/EU including amendments 2015/863/EU & 2017/2102/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 5052 RGBW at 120mA, T_j=25°C.

COLOR	DOMINANT WAVELENGTH [1] (nm)		LUMINOUS FLUX [2] (lm)		PART NUMBER
	MINIMUM	MAXIMUM	MINIMUM	TYPICAL	
Red	618	625	15	18	L1MC-RGB2290500MP0 L1MC-RGB2780500MP0 L1MC-RGB3080500MP0 L1MC-RGU3080500MP0 L1MC-RGB4080500MP0 L1MC-RGU4080500MP0 L1MC-RGB5080500MP0 L1MC-RGB6570500MP0 L1MC-RGU6570500MP0
Green	520	535	30	38	
Blue	465	480	7	12	
Royal Blue	460	465	6	7.5	
White (2200K, 90CRI)	—	—	36	40	
White (2700K, 80CRI)	—	—	48	52	
White (3000K, 80CRI)	—	—	48	53	
White (4000K, 80CRI)	—	—	53	57	
White (5000K, 80CRI)	—	—	53	57	
White (6500K, 70CRI)	—	—	53	59	

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 5052 RGBW at 120mA, T_j=25°C.

COLOR	PART NUMBER	TYPICAL SPECTRAL HALF-WIDTH [1] (nm)	TYPICAL TEMPERATURE COEFFICIENT OF DOMINANT WAVELENGTH (nm/°C)	TYPICAL TOTAL INCLUDED ANGLE [2]	TYPICAL VIEWING ANGLE [3]
Red	L1MC-RGBxxxx500MP0 L1MC-RGUxxxx500MP0	15.5	0.05	170°	134°
Green		30.0	0.04	170°	130°
Blue		20.0	0.04	165°	120°
Royal Blue		20.0	0.04	165°	120°
White		—	—	160°	120°

Notes for Table 2:
1. Spectral half-width is the spectral bandwidth at 50% of the peak intensity.
2. Total angle at which 90% of total luminous flux is captured.
3. 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 5052 RGBW at 120mA, 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-RGBxxxx500MP0 L1MC-RGUxxxx500MP0	1.80	2.10	2.50	-2.0	20
Green		2.80	3.15	3.30	-2.0	55
Blue		2.80	3.00	3.20	-1.4	25
Royal Blue		2.80	3.00	3.20	-1.4	25
White		2.80	3.00	3.20	-1.4	28

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 5052 RGBW.

PARAMETER	RED	GREEN	BLUE	ROYAL BLUE	WHITE
DC Forward Current (single color light) [1]	250mA	240mA	240mA	240mA	240mA
DC Forward Current (all colors on) [1]	250mA	180mA	240mA	240mA	200mA
Peak Pulsed Forward Current [1, 2]	300mA	300mA	300mA	300mA	240mA
LED Junction Temperature [1] (DC & Pulse)	125°C	125°C	125°C	125°C	125°C
ESD Sensitivity (JEDEC 22A-114)	Class 2				
LED Storage Temperature	-40°C to 100°C				
Soldering Temperature	JEDEC 020c 260°C				
Allowable Reflow Cycles	3				
Reverse Voltage ($V_{reverse}$)	LUXEON 5052 RGBW 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. At 0.01ms pulse on time test with a pulse period of 0.1ms.

Characteristic Curves

Spectral Power Distribution Characteristics

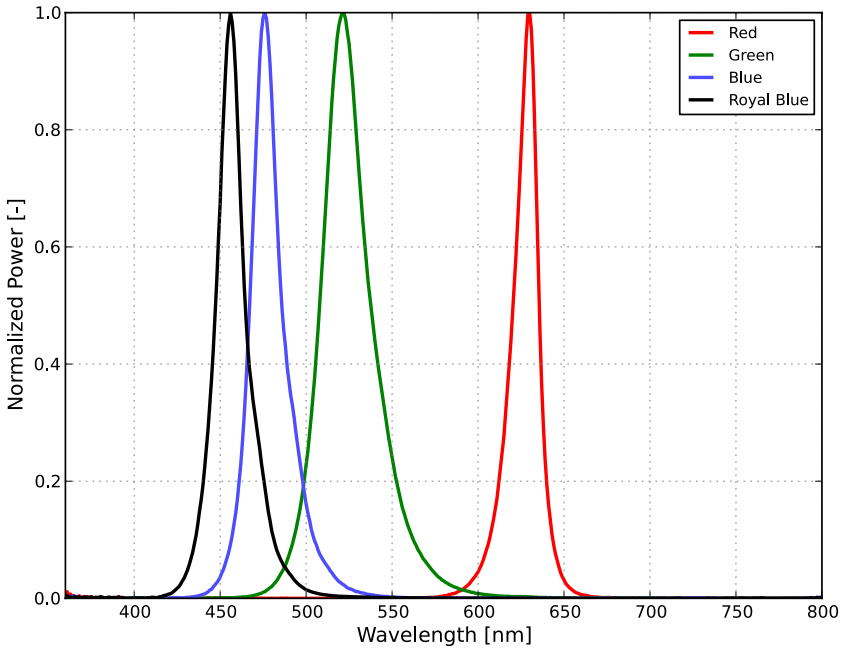


Figure 1a. Typical normalized power vs. wavelength for LUXEON 5052 RGBW Colors at 120mA, T_j=25°C.

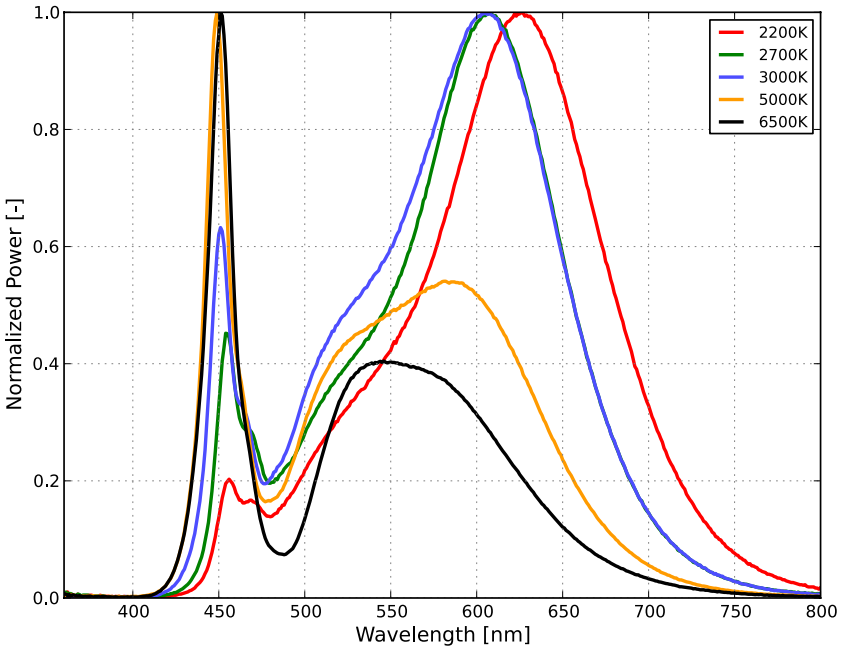


Figure 1b. Typical normalized power vs. wavelength for LUXEON 5052 RGBW White at 120mA, T_j=25°C.

Light Output Characteristics

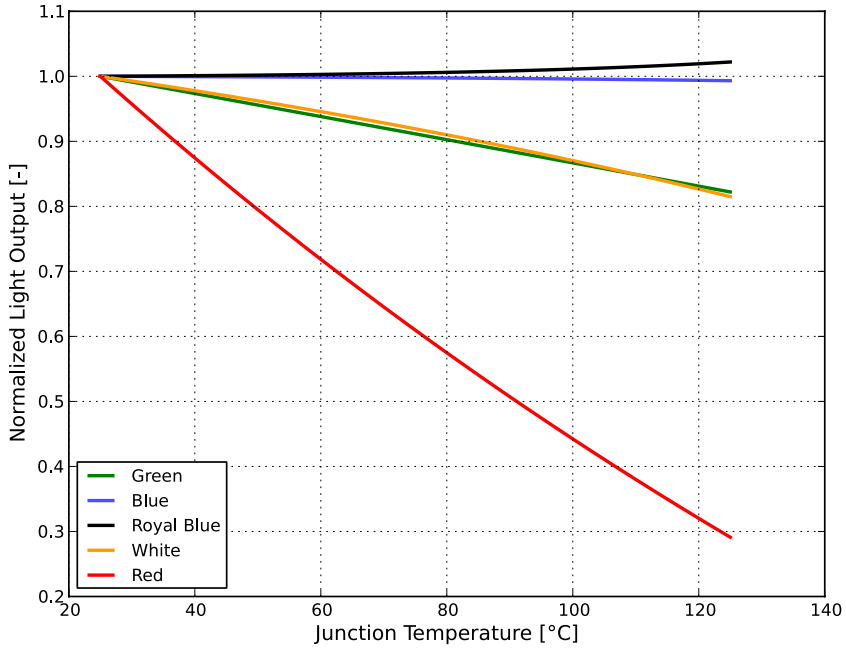


Figure 2. Typical normalized light output vs. junction temperature for LUXEON 5052 RGBW at 25mA.

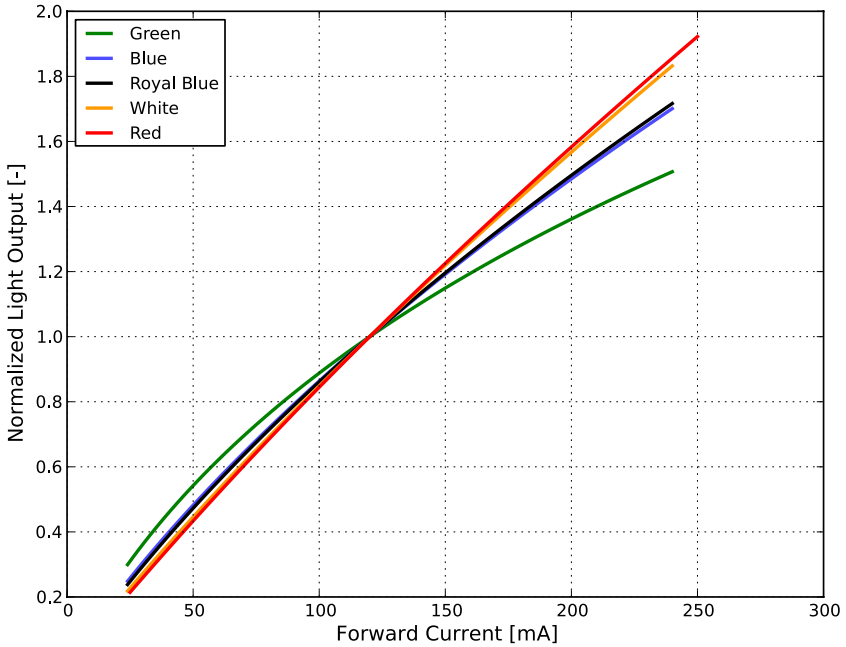


Figure 3. Typical normalized light output vs. forward current for LUXEON 5052 RGBW at T_j=25°C.

Forward Current Characteristics

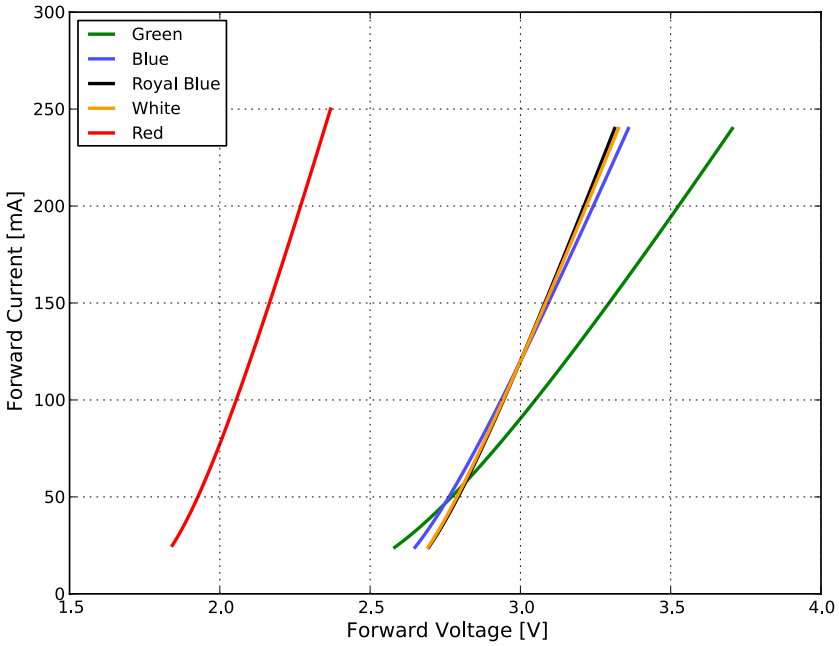


Figure 4. Typical forward current vs. forward voltage for LUXEON 5052 RGBW at T_j=25°C.

Radiation Pattern Characteristics

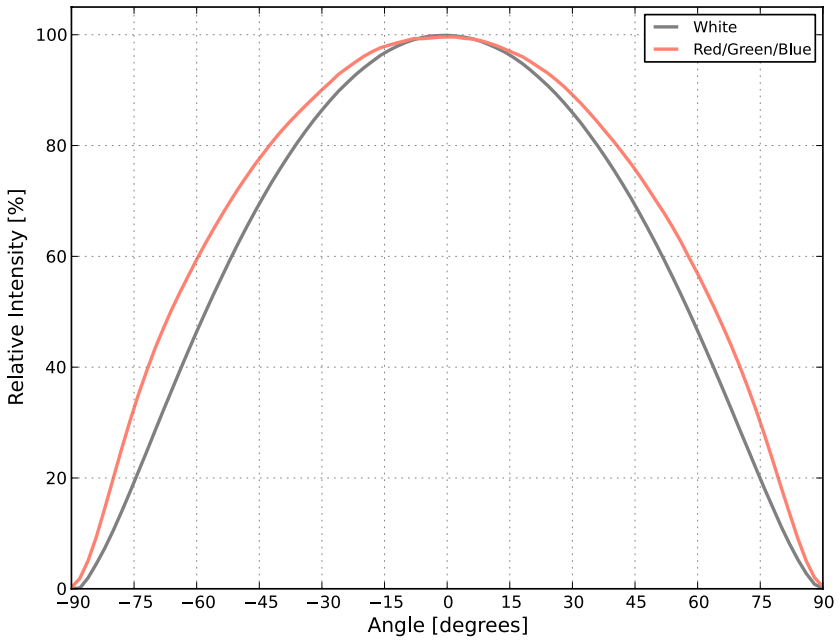


Figure 5a. Typical radiation pattern along x-axis for LUXEON 5052 RGBW at 120mA, T_j=25°C.

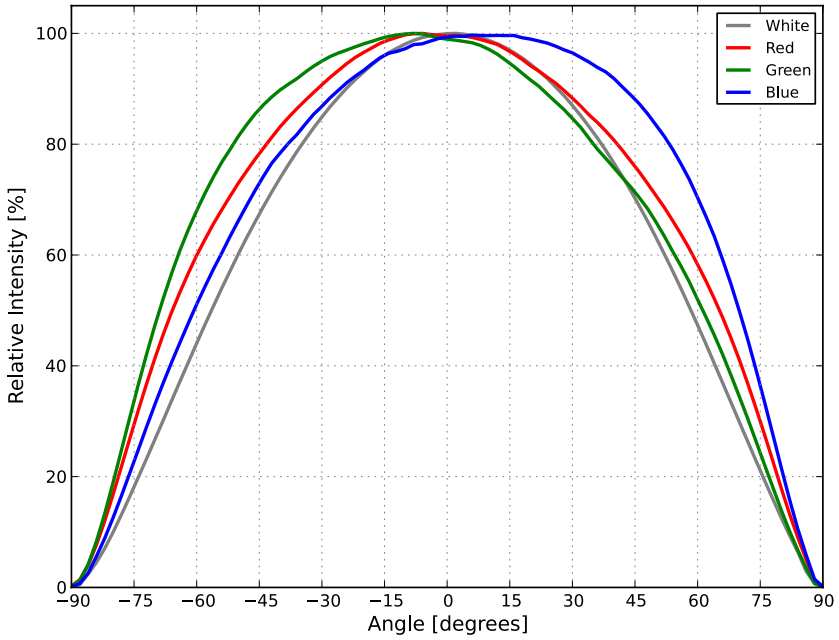


Figure 5b. Typical radiation pattern along y-axis for LUXEON 5052 RGBW at 120mA, T_j=25°C.

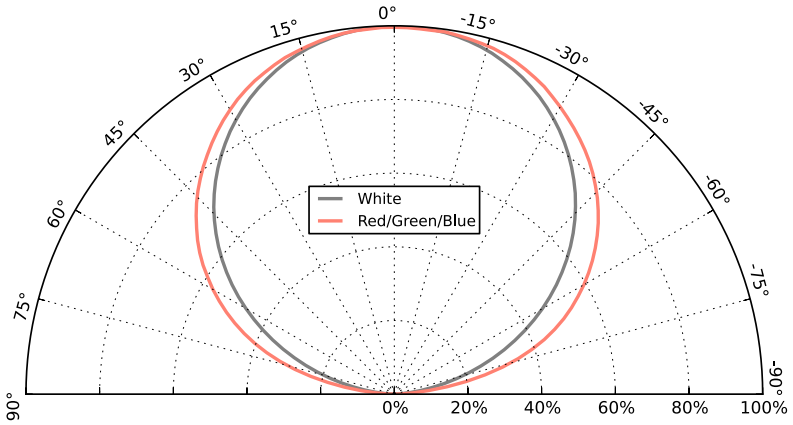


Figure 6a. Typical polar radiation pattern along x-axis for LUXEON 5052 RGBW at 120mA, T_j=25°C.

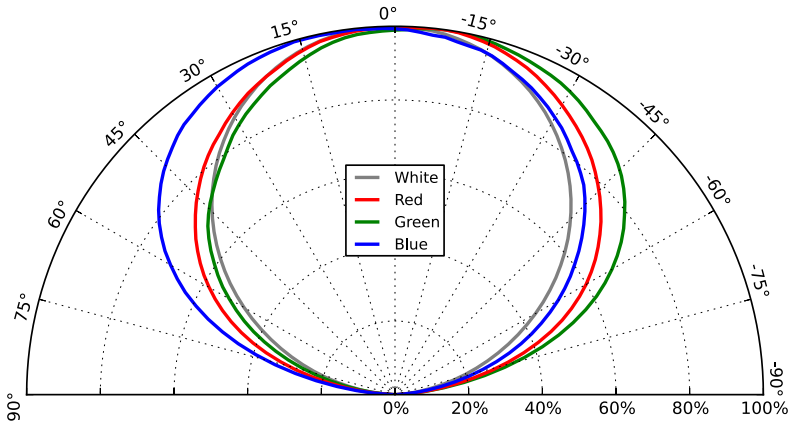


Figure 6b. Typical polar radiation pattern along y-axis for LUXEON 5052 RGBW at 120mA, T_j=25°C.

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

LUXEON 5052 RGBW LEDs are labeled using a 16-digit alphanumeric CAT code following the format below:

A B C – Red

D E F – Green

J K L – Blue / Royal Blue

M N P – White

Where:

A D J M – designates luminous flux bin (example: R=15 to 23 lm, H=35 to 40 lm, C=14 to 21 lm, W=48 to 60 lm)

B E K N – designates color bin for white LED (example: 43=3-step McAdam ellipse); dominant wavelength bin for red, green, and blue LED (example: Red 10=618 to 625nm, Green 20=520 to 525nm, Blue 30=470 to 475nm)

C F L P – designates forward voltage bin (example: A=1.80 to 2.50V, B=2.80 to 3.30V, C=2.80 to 3.20V)

Therefore, a LUXEON 5052 RGBW with the characteristics below has the following CAT codes:

Red – lumen range of 15 to 23 lm, dominant wavelength of 618 to 625nm, and forward voltage range of 1.80 to 2.50V

Green – lumen range of 40 to 45 lm, dominant wavelength of 520 to 525nm, and forward voltage range of 2.80 to 3.30V

Blue – lumen range of 7 to 14 lm, dominant wavelength of 470 to 475nm, and forward voltage range of 2.80 to 3.20V

White – lumen range of 48 to 60 lm, 3-step McAdam ellipse, and forward voltage range of 2.80 to 3.20V

R 1 0 A – Red

J 2 0 B – Green

B 3 0 C – Blue

W 4 3 C – White

Luminous Flux Bins

Table 5 lists the standard luminous flux bins for LUXEON 5052 RGBW LEDs. 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 5052 RGBW.

COLOR	BIN	LUMINOUS FLUX[1] (lm)	
		MINIMUM	MAXIMUM
Red	R	15	23
Green	G	30	35
	H	35	40
	J	40	45
Blue	B	7	14
	C	14	21
Royal Blue	A	6	10
White	V	36	48
	W	48	60
	X	53	65

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

Color Bin Definitions

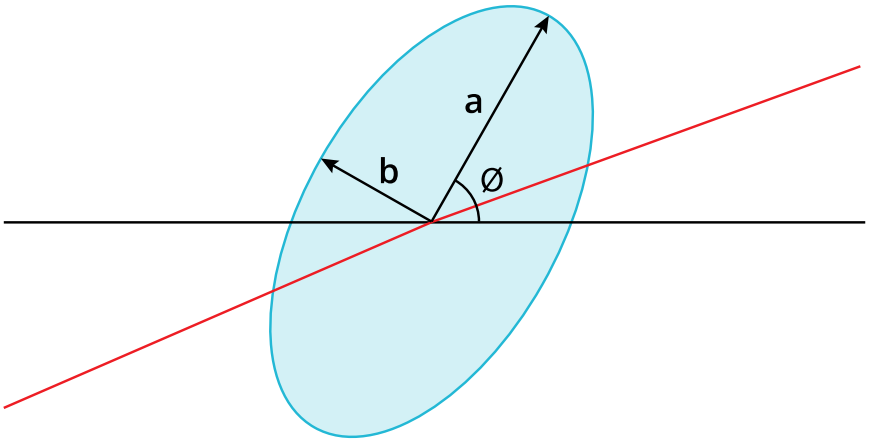


Figure 7. 3- and 5-step MacAdam ellipse illustration for Table 6.

Table 6. 3- and 5-step MacAdam ellipse color bin definitions for LUXEON 5052 RGBW.

NOMINAL CCT	COLOR SPACE	CENTER POINT [1] (cx, cy)	MAJOR AXIS, a	MINOR AXIS, b	ELLIPSE ROTATION ANGLE, θ
2200K	Single 3-step MacAdam ellipse	(0.5018, 0.4153)	0.00860	0.00400	49.27°
	Single 5-step MacAdam ellipse		0.01440	0.00630	
2700K	Single 3-step MacAdam ellipse	(0.4578, 0.4101)	0.00810	0.00420	53.70°
	Single 5-step MacAdam ellipse		0.01350	0.00700	
3000K	Single 3-step MacAdam ellipse	(0.4338, 0.4030)	0.00834	0.00408	53.22°
	Single 5-step MacAdam ellipse		0.01390	0.00680	
4000K	Single 3-step MacAdam ellipse	(0.3818, 0.3797)	0.00939	0.00402	53.72°
	Single 5-step MacAdam ellipse		0.01565	0.00670	
5000K	Single 3-step MacAdam ellipse	(0.3447, 0.3553)	0.00822	0.00354	59.62°
	Single 5-step MacAdam ellipse		0.01370	0.00590	
6500K	Single 3-step MacAdam ellipse	(0.3123, 0.3282)	0.00669	0.00285	58.57°
	Single 5-step MacAdam ellipse		0.01115	0.00475	

Notes for Table 6:
1. Lumileds maintains a tolerance of ±0.005 on x and y coordinates in the CIE 1931 color space.

Table 7. MacAdam ellipse color bin definitions for LUXEON 5052 RGBW.

BIN	SDCM
43	3-step McAdam ellipse
44	5-step McAdam ellipse

Dominant Wavelength Bins

Table 8. Dominant wavelength bins for LUXEON 5052 RGBW at 120mA, T_j=25°C.

COLOR	BIN	DOMINANT WAVELENGTH [1] (nm)	
		MINIMUM	MAXIMUM
Red	10	618	625
Green	20	520	525
	21	525	530
	22	530	535
Blue	3A	465	470
	30	470	475
	31	475	480
Royal Blue	3Z	460	465

Notes for Table 8:
1. Lumileds maintains a tolerance of ±1nm on dominant wavelength measurements.

Forward Voltage Bins

Table 9. Forward voltage bin definitions for LUXEON 5052 RGBW.

BIN	BIN	FORWARD VOLTAGE [1] (V_f)	
		MINIMUM	MAXIMUM
Red	A	1.80	2.50
Green	B	2.80	3.30
Blue	C	2.80	3.20
Royal Blue			
White			

Notes for Table 9:
1. Lumileds maintains a tolerance of ±0.1V on forward voltage measurements.

Mechanical Dimensions

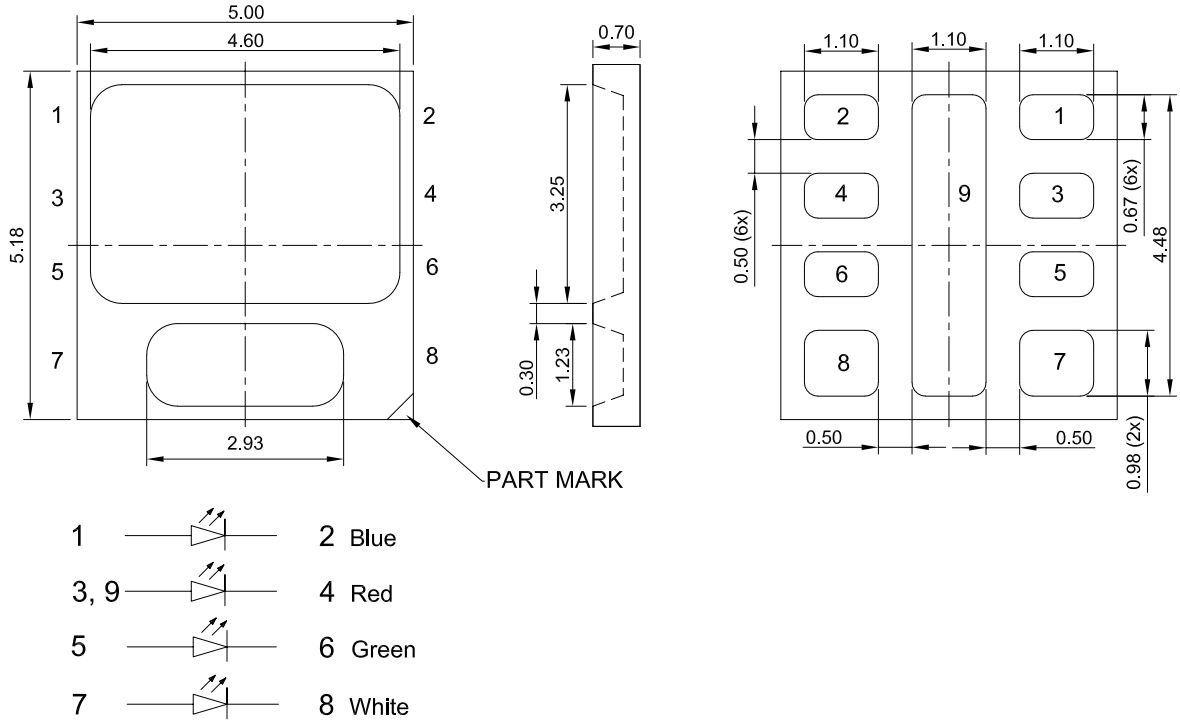


Figure 8. Mechanical dimensions for LUXEON 5052 RGBW.

Notes for Figure 8:
1. Drawings are not to scale.
2. All dimensions are in millimeters.

Reflow Soldering Guidelines

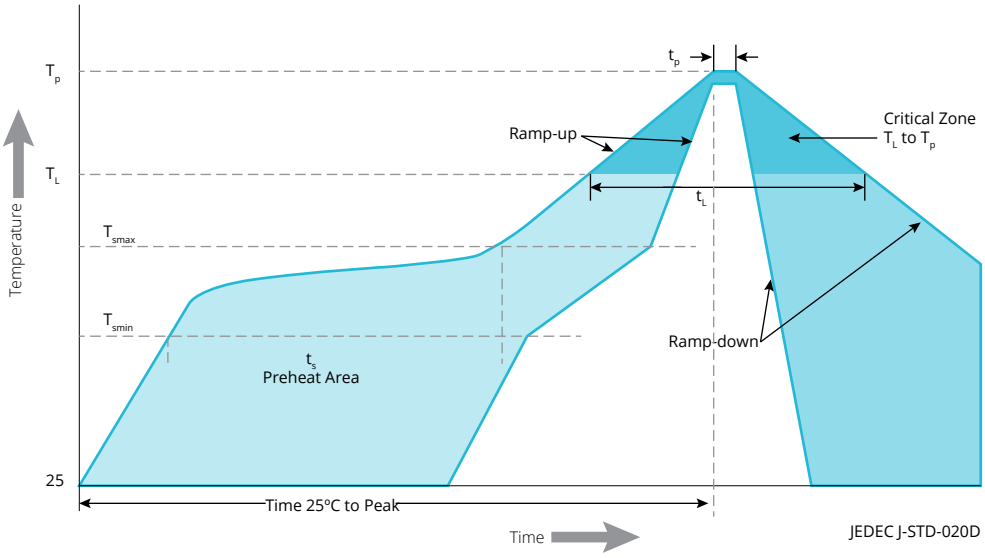


Figure 9. Visualization of the acceptable reflow temperature profile as specified in Table 10.

Table 10. Reflow profile characteristics for LUXEON 5052 RGBW.

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)	3°C / second maximum
Liquidus 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 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 11. Moisture sensitivity levels for LUXEON 5052 RGBW.

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

Solder Pad Design

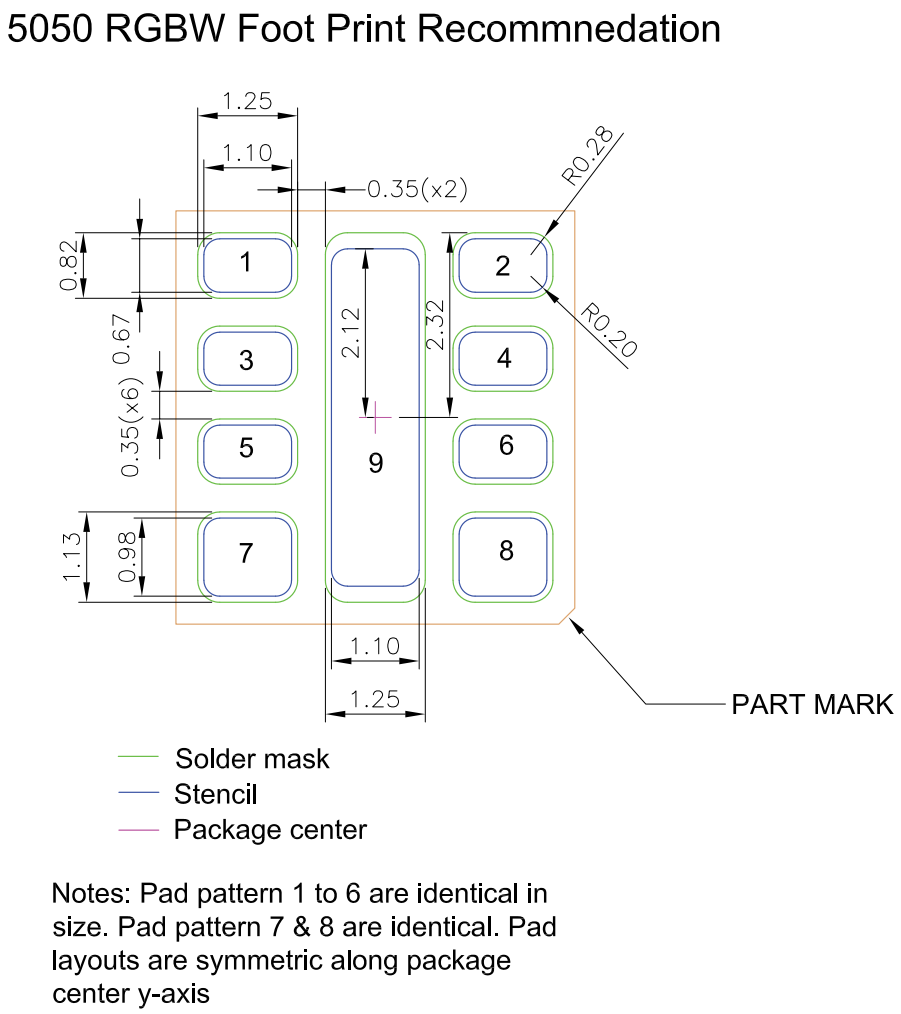
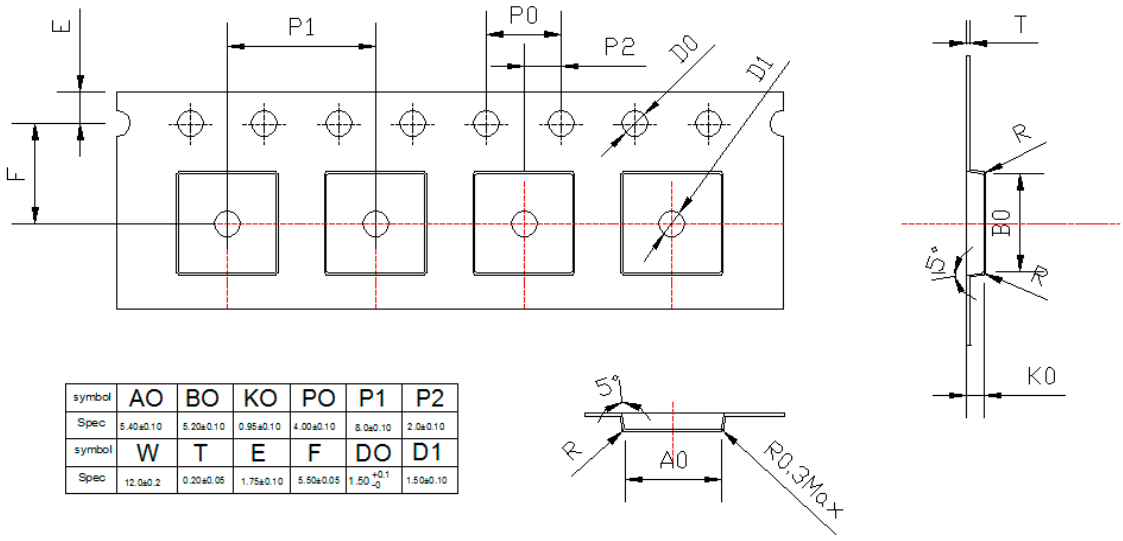


Figure 10. Recommended PCB solder pad layout for LUXEON 5052 RGBW.

Notes for Figure 10:
1. Drawings are not to scale.
2. All dimensions are in millimeters.
3. Pad pattern 1 to 6 are identical in size.
4. Pad pattern 7 and 8 are identical.
5. Pad layouts are symmetric along package center y-axis.

Packaging Information

Pocket Tape Dimensions



symbol	AO	BO	KO	PO	P1	P2
Spec	5.40±0.10	5.20±0.10	0.95±0.10	4.00±0.10	8.0±0.10	2.0±0.10
symbol	W	T	E	F	DO	D1
Spec	12.0±0.2	0.20±0.05	1.75±0.10	5.50±0.05	$1.50^{+0.1}_{-0}$	1.50±0.10

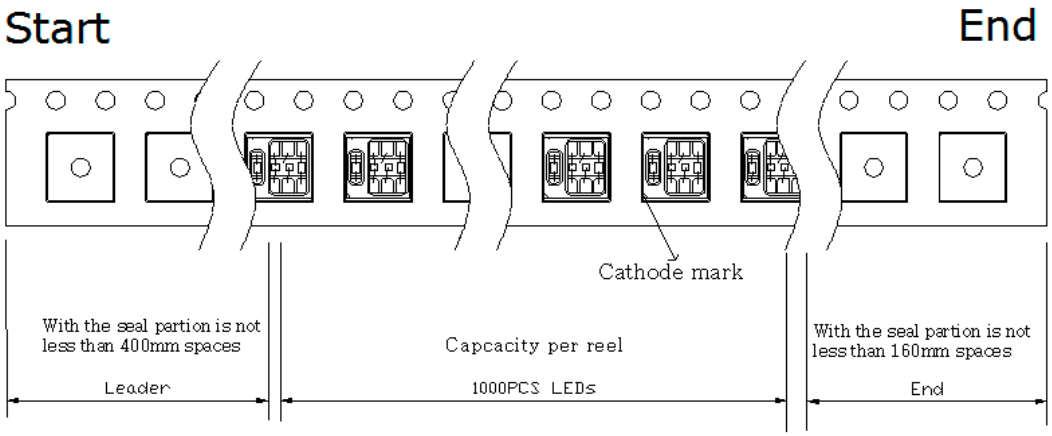
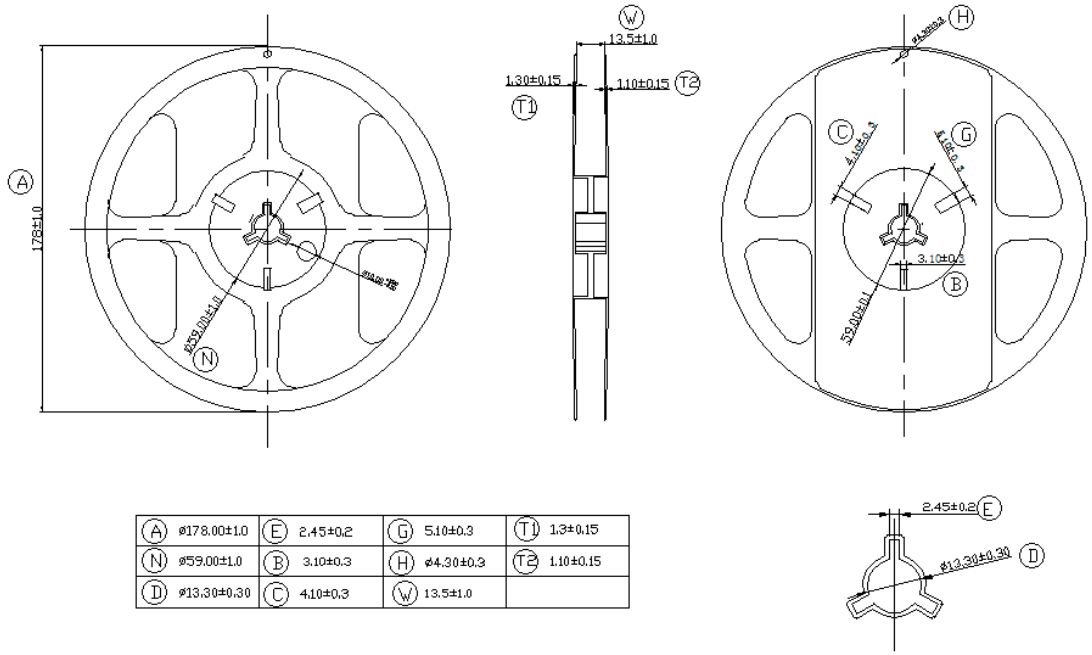


Figure 11 : Pocket Tape dimensions for LUXEON 5052 RGBW.

Notes for Figure 11:
1. Drawings are not to scale.
2. All dimensions are in millimeters.
3. Empty components pockets sealed with top cover tape.

Reel Dimensions



A ø178.00±1.0	E 2.45±0.2	G 5.10±0.3	T1 1.3±0.15
N ø59.00±1.0	B 3.10±0.3	H ø4.30±0.3	T2 1.10±0.15
D ø13.30±0.30	C 4.10±0.3	W 13.5±1.0	

Figure 12 : Reel dimensions for LUXEON 5052 RGBW.

Notes for Figure 12:
1. Drawings are not to scale.
2. All dimensions are in millimeters.
3. Maximum 1,000pcs per reel.

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.