

## Multi SMD LED RGB



### LINKS TO ADDITIONAL RESOURCES



### DESCRIPTION

The VLMRGB6122... is a high brightness tricolor LED designed primarily for RGB displays and ambient lighting. It is using the popular 6 pin PLCC6 SMD package with 120° emission characteristic. The 6 pin package with separate anodes and cathodes per color allows individual driving of each chip also in serial circuits and thus a gapless coverage of a wide color space by additive color mixing. It provides high reliability in a temperature range from -40 °C to +110 °C, using highly suitable blue light stable package materials.

### PRODUCT GROUP AND PACKAGE DATA

- Product group: LED
- Package: SMD PLCC-6
- Product series: RGB
- Angle of half intensity:  $\pm 60^\circ$

### FEATURES

- Utilizing high brightness AlInGaP and InGaN chip technologies
- 6 pin RGB SMD LED package allows individual control of the driving current of each chip
- Compact package outline dimensions (L x W x H in mm): 3.5 x 2.8 x 1.4
- AEC-Q102 qualified
- Corrosion robustness class: B1
- Qualified according to JEDEC® moisture sensitivity level 3
- Compatible to IR reflow soldering
- Operation temperature range: -40 °C to +110 °C
- ESD-withstand voltage: up to 2 kV for red and 8 kV for blue and green according to JESD22-A114-B
- Luminous intensity, color and forward voltage categorized per reel
- Material categorization: for definitions of compliance please see [www.vishay.com/doc?99912](http://www.vishay.com/doc?99912)

### APPLICATIONS

- Automotive interior lighting
- Ambient lighting
- Switch illumination
- Telecommunication, office equipment, home appliances, industrial equipment, white goods
- Wide range of accent and decorative lighting
- Displays: full color message and displays video boards
- Status indicator
- Signal and symbol illumination



PARTS TABLE														
PART	COLOR	LUMINOUS INTENSITY (mcd)			at I <sub>F</sub> (mA)	DOMINANT WAVELENGTH (nm)			at I <sub>F</sub> (mA)	FORWARD VOLTAGE (V)			at I <sub>F</sub> (mA)	TECHNOLOGY
		MIN.	TYP.	MAX.		MIN.	TYP.	MAX.		MIN.	TYP.	MAX.		
VLMRGB6122-B00-08	Red	710	900	1400	20	618	623	630	20	1.75	1.95	2.75	20	AllInGaP
	Green	1800	2200	2800	20	520	527	535	20	2.5	2.75	3.5	20	InGaN
	Blue	280	320	450	20	450	455	462	20	2.5	3.0	3.5	20	InGaN

#### Note

- Measurement accuracy:  $\pm 8\%$  for luminous intensity,  $\pm 1$  nm for dominant wavelength,  $\pm 0.05$  V for forward voltage



<b>ABSOLUTE MAXIMUM RATINGS</b> ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ , unless otherwise specified) <b>VLMRGB6122.., RED, GREEN, BLUE</b>						
PARAMETER	TEST CONDITION	SYMBOL	VALUE			UNIT
			RED	GREEN	BLUE	
Forward current		$I_F$	50	30	30	mA
Reverse voltage		$V_R$	Not designed for reverse operation			V
Power dissipation		$P_{tot}$	137	105	105	mW
Junction temperature		$T_j$	125			$^{\circ}\text{C}$
Peak forward current	AllInGaP red: $t_p = 10\text{ }\mu\text{s}$ , $t_p/T = 0.05$ ; InGaN green, blue: $t_p = 100\text{ }\mu\text{s}$ , $t_p/T = 0.1$	$I_{FM}$	300	250	250	mA
Thermal resistance junction to solder point		$R_{thJS}$	160	130	130	K/W
Operating temperature		$T_{amb}$	-40 to +110			$^{\circ}\text{C}$
Storage temperature		$T_{stg}$	-40 to +110			$^{\circ}\text{C}$
ESD voltage	HBM	$V_{ESD}$	2000	8000	8000	V
Soldering temperature	Reflow	$T_{stg}$	260			$^{\circ}\text{C}$

<b>OPTICAL AND ELECTRICAL CHARACTERISTICS</b> ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ , unless otherwise specified) <b>VLMRGB6122.., RED, GREEN, BLUE</b>							
PARAMETER	TEST CONDITION	COLOR	SYMBOL	MIN.	TYP.	MAX.	UNIT
Luminous intensity	$I_F = 20\text{ mA}$	Red	$I_v$	710	900	1400	mcd
		Green		1800	2200	2800	
		Blue		280	320	450	
Color coordinates x, y acc. to CIE 1931		Red	x, y	-	0.6951, 0.3047	-	
		Green		-	0.1446, 0.7456	-	
		Blue		-	0.1525, 0.0250	-	
Dominant wavelength		Red	$\lambda_d$	618	623	630	nm
		Green		520	527	535	
		Blue		450	455	462	
Peak wavelength		Red	$\lambda_p$	-	630	-	nm
		Green		-	521	-	
		Blue		-	451	-	
Spectral half width at 50 % $I_{rel}$ max.	Red	$\Delta\lambda_{0.5}$	-	18	-	nm	
	Green		-	33	-		
	Blue		-	19	-		
Angle of half intensity	Red	$\phi$	-	120	-	$^{\circ}$	
	Green		-	120	-		
	Blue		-	120	-		
Forward voltage	Red	$V_F$	1.75	1.95	2.75	V	
	Green		2.5	2.75	3.5		
	Blue		2.5	3.0	3.5		

**Notes**

- Measurement accuracy:  $\pm 8\%$  for luminous intensity,  $\pm 1\text{ nm}$  for dominant wavelength,  $\pm 0.05\text{ V}$  for forward voltage



LUMINOUS INTENSITY CLASSIFICATION at 20 mA			
COLOR	GROUP	LUMINOUS INTENSITY (mcd)	
		MIN.	MAX.
RED	V1	710	900
	V2	900	1120
	AA	1120	1400
GREEN	BA	1800	2240
	BB	2240	2800
BLUE	T1	280	355
	T2	355	450

Note

- Tolerance on each luminous intensity bin is  $\pm 8\%$ .  
The above classification represents the brightness range which includes only a few brightness groups.  
Only one luminous intensity group per color will be shipped on each reel (there will be no mixing of two groups on each reel).  
In order to ensure availability, single brightness groups will not be orderable.

DOMINANT WAVELENGTH CLASSIFICATION at 20 mA								
COLOR	GROUP	DOMINANT WAVELENGTH (nm)		CORRESPONDING CIE 1931 COLOR COORDINATES				
		MIN.	MAX.	COORD.	1	2	3	4
RED	R1	618	622	x	0.6837	0.6918	0.6954	0.6873
				y	0.3128	0.3048	0.3045	0.3126
	R2	622	626	x	0.6918	0.6985	0.7022	0.6954
				y	0.3048	0.2981	0.2977	0.3045
	R3	626	630	x	0.6985	0.7042	0.7079	0.7022
				y	0.2981	0.2924	0.2920	0.2977
GREEN	G1	520	525	x	0.1391	0.1624	0.1448	0.1183
				y	0.7087	0.7178	0.7572	0.7487
	G2	525	530	x	0.1624	0.1882	0.1737	0.1448
				y	0.7178	0.7172	0.7557	0.7572
	G3	530	535	x	0.1882	0.2143	0.2035	0.1737
				y	0.7172	0.7133	0.7476	0.7557
BLUE	B1	450	454	x	0.1598	0.1562	0.1522	0.1566
				y	0.0234	0.0285	0.0216	0.0177
	B2	454	458	x	0.1562	0.1521	0.1476	0.1522
				y	0.0285	0.0351	0.0277	0.0216
	B3	458	462	x	0.1521	0.1476	0.1422	0.1476
				y	0.0351	0.0437	0.0353	0.0277

Note

- Tolerance of dominant wavelength is:  $\pm 1$  nm.  
The above classification represents the color range which includes only a few color groups.  
Only one color group per color will be shipped on each reel (there will be no mixing of two groups on each reel).  
In order to ensure availability, single color groups will not be orderable.

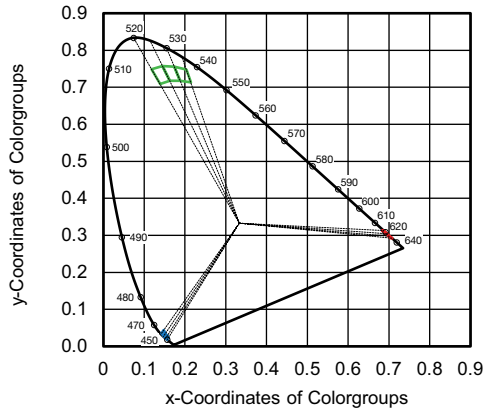


Fig. 1 - CIE 1931 Color Coordinates - RGB

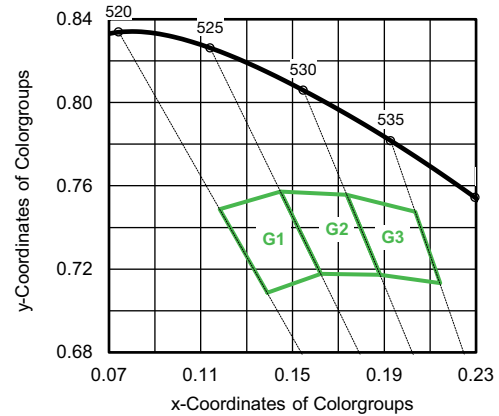


Fig. 3 - CIE 1931 Color Coordinates - Green

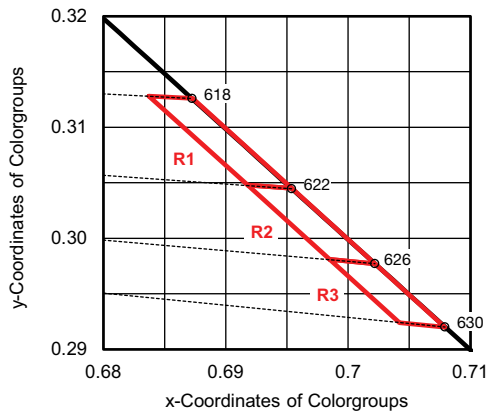


Fig. 2 - CIE 1931 Color Coordinates - Red

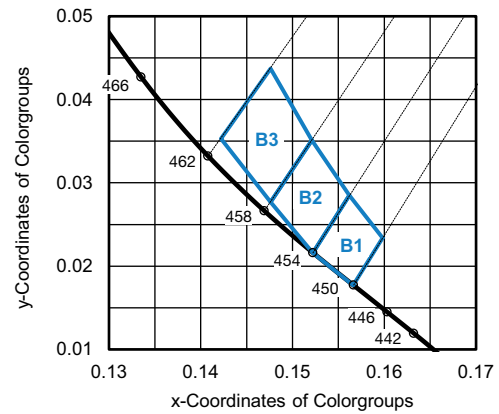


Fig. 4 - CIE 1931 Color Coordinates - Blue

FORWARD VOLTAGE CLASSIFICATION at 20 mA		
GROUP	FORWARD VOLTAGE (V)	
	MIN.	MAX.
D	1.75	2.00
E	2.00	2.25
F	2.25	2.50
G	2.50	2.75
H	2.75	3.00
J	3.00	3.25
K	3.25	3.50

Tolerance of forward voltage is:  $\pm 0.05$  V.

The above classification represents the forward voltage range which includes only a few forward voltage groups.

Only one forward voltage group per color will be shipped on each reel (there will be no mixing of two groups on each reel).

In order to ensure availability, single forward voltage groups will not be orderable.

**MARKING EXAMPLE FOR SELECTION CODE ON LABEL**

V2R2DBAG2GT1B2J (sequence: each 5 characters for red, green, blue for  $I_V$ ,  $\lambda_d$  and  $V_F$  group combination)

- Red:V2R2D→ V2: 900 mcd to 1120 mcd, R2: 622 nm to 626 nm, D: 1.75 V to 2.00 V
- Green:BAG2G→ BA: 1800 mcd to 2240 mcd, G2: 525 nm to 530 nm, G: 2.50 V to 2.75 V
- Blue:T1B2J→ T1: 280 mcd to 355 mcd, B2: 454 nm to 458 nm, J: 3.00 V to 3.25 V

**TYPICAL CHARACTERISTICS** ( $T_{amb} = 25\text{ }^\circ\text{C}$ , unless otherwise specified)

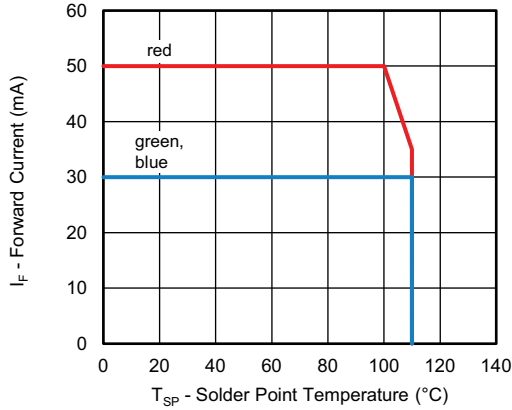


Fig. 5 - Forward Current vs. Solder Point Temperature

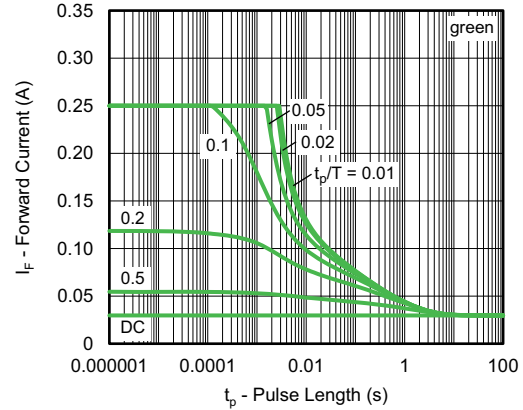


Fig. 7 - Pulse Forward Current vs. Pulse Duration (VLMRGB6122-B00-08, green)

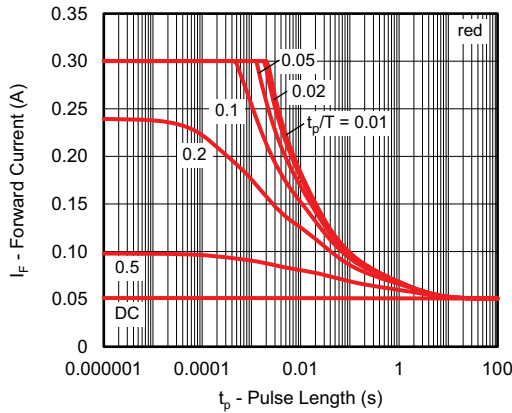


Fig. 6 - Pulse Forward Current vs. Pulse Duration (VLMRGB6122-B00-08, red)

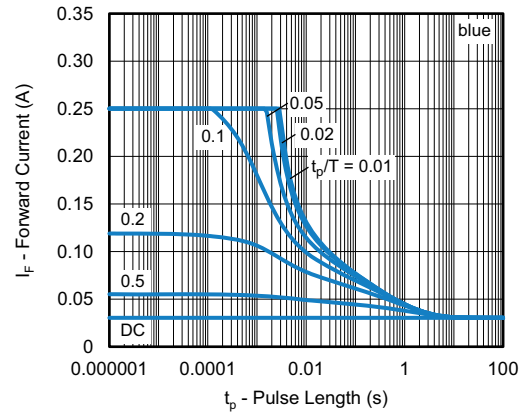


Fig. 8 - Pulse Forward Current vs. Pulse Duration (VLMRGB6122-B00-08, blue)

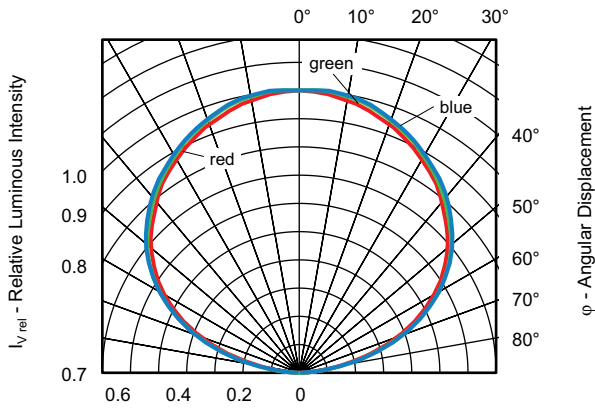


Fig. 9 - Relative Luminous Intensity vs. Angular Displacement

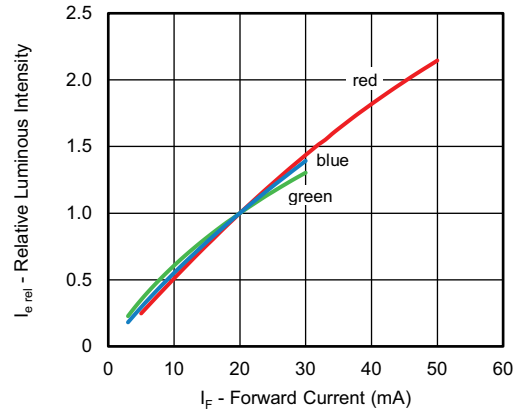


Fig. 12 - Relative Luminous Intensity vs. Forward Current

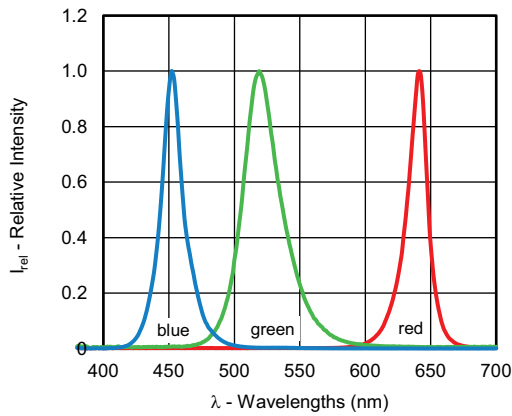


Fig. 10 - Relative Intensity vs. Wavelength

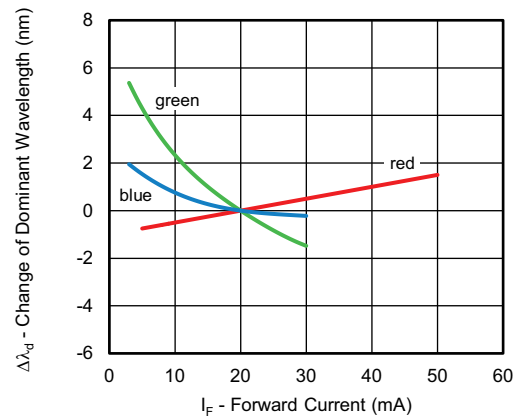


Fig. 13 - Change of Dominant Wavelength vs. Forward Current

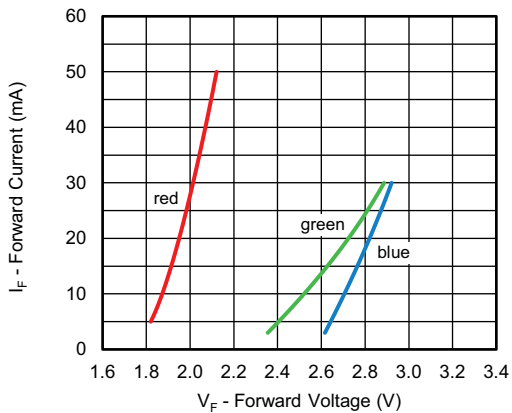


Fig. 11 - Forward Current vs. Forward Voltage

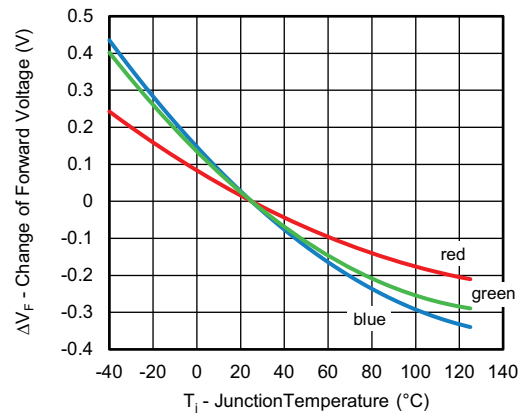


Fig. 14 - Change of Forward Voltage vs. Junction Temperature

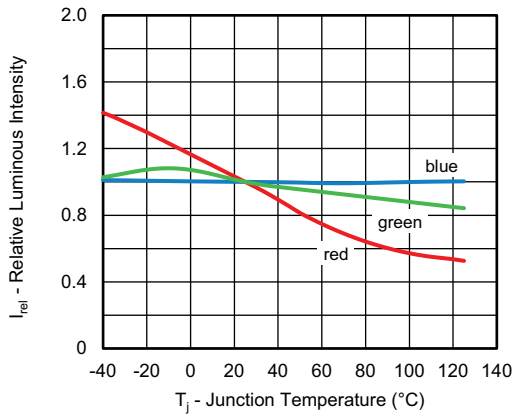


Fig. 15 - Relative Luminous Intensity vs. Junction Temperature

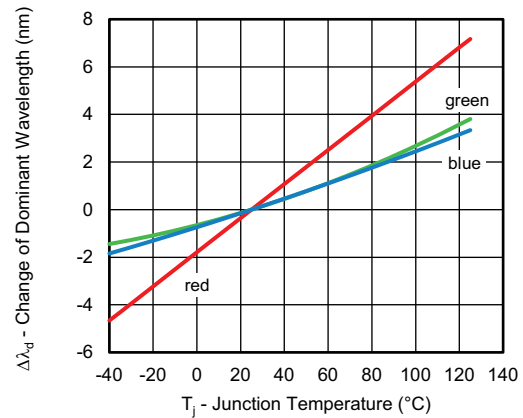
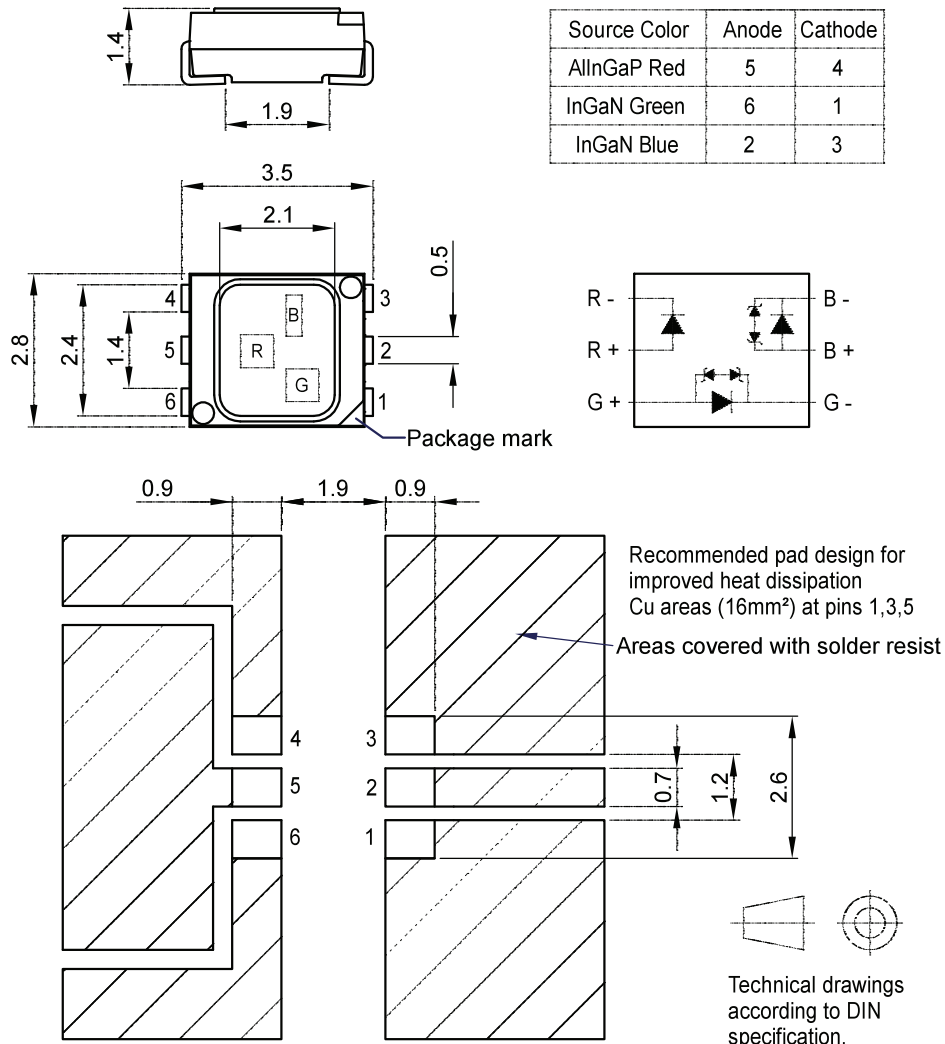


Fig. 16 - Change of Dominant Wavelength vs. Junction Temperature

**PACKAGE DIMENSIONS / SOLDERING PADS DIMENSIONS** in millimeters



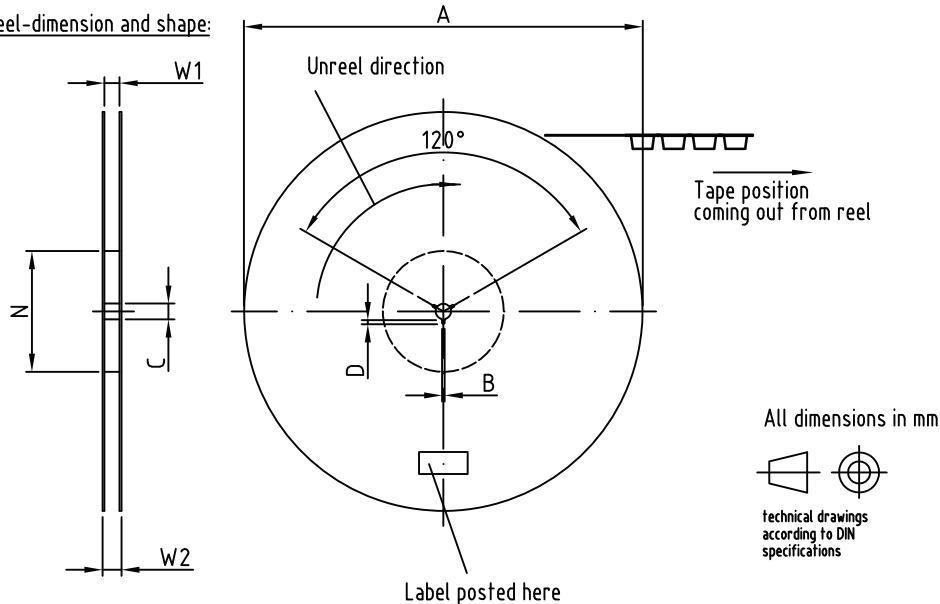
Source Color	Anode	Cathode
AllInGaP Red	5	4
InGaN Green	6	1
InGaN Blue	2	3

Drawing-No.:  
Issue: P1;

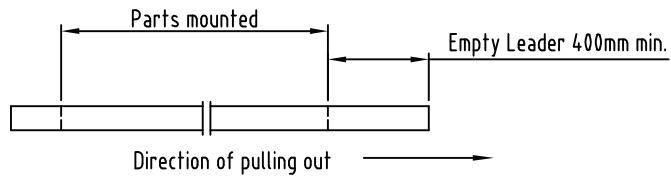
Not indicated tolerances ± 0.1

**TAPING DIMENSIONS** in millimeters

Reel-dimension and shape:

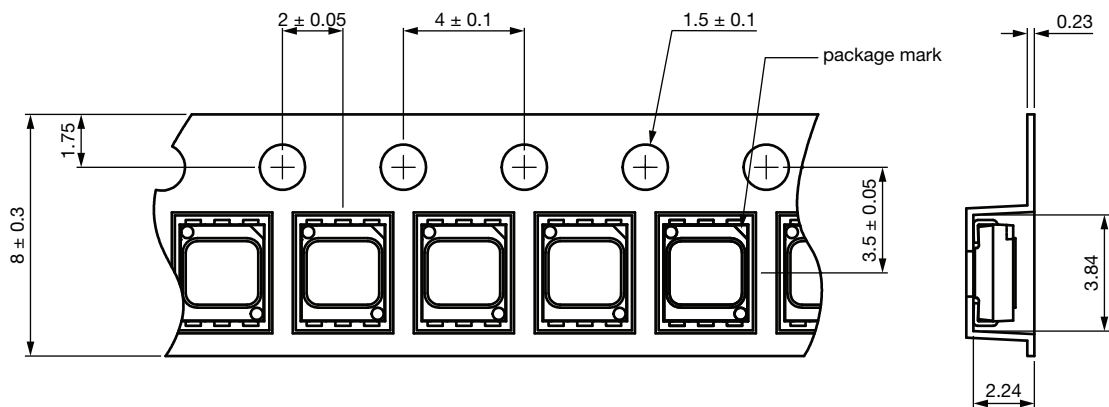


Leader and trailer tape:


 Drawing-No.: 9.800-5172.01  
 Issue: VK; 18.04.24

QTY per reel: 2000 pcs

REEL DIMENSIONS							
TAPING VERSION	REEL DIMENSIONS IN mm ACCORDING DRAWING REFERENCE						
	A	B	C	D	N	W1	W2
GS08	178 ± 1	2.2 ± 0.5	13 ± 0.5	4 ± 0.5	60 ± 1	9 ± 1	12 ± 1





**SOLDERING PROFILE**

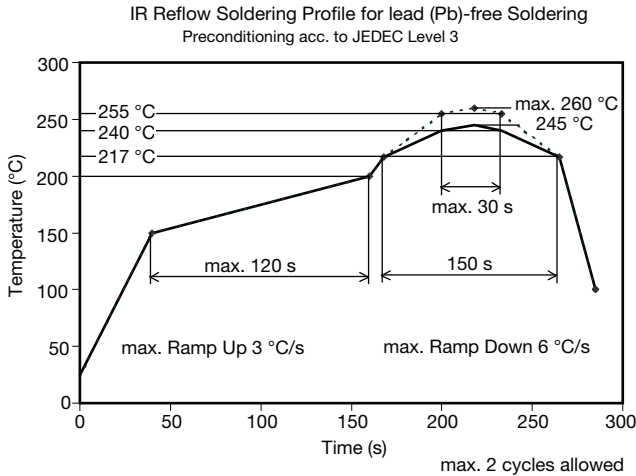
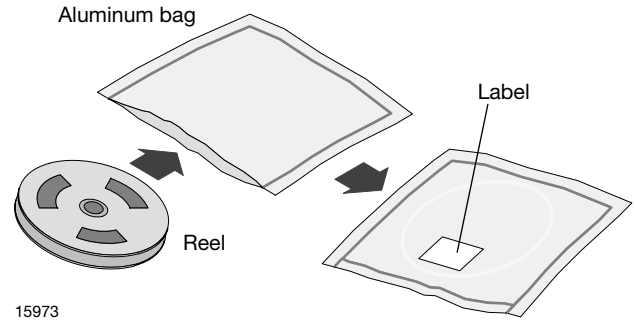


Fig. 17 - Vishay Lead (Pb)-free Reflow Soldering Profile According to J-STD-020



15973

**FINAL PACKING**

The sealed reel is packed into a cardboard box. A secondary cardboard box is used for shipping purposes.

**RECOMMENDED METHOD OF STORAGE**

Dry box storage is recommended as soon as the aluminum bag has been opened to prevent moisture absorption. The following conditions should be observed, if dry boxes are not available:

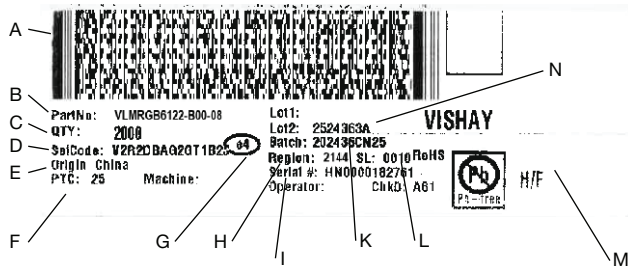
- Storage temperature 10 °C to 30 °C
- Storage humidity ≤ 60 % RH max.

After more than 168 h under these conditions moisture content will be too high for reflow soldering.

In case of moisture absorption, the devices will recover to the former condition by drying under the condition given in J-STD-033.

A JEDEC J-STD-033 level 3 label is included on all aluminum dry bags.

**BAR CODE PRODUCT LABEL (example)**



- A. 2D bar code
- B. Part No: Vishay part number
- C. QTY: quantity
- D. SelCode: selection bin code
- E. Country of origin
- F. PTC: production plant code
- G. Termination finish
- H. Region code
- I. Serial#: serial number
- K. Batch Number: year, week, country code, plant code
- L. SL: storage location
- M. Environmental Symbols: RoHS, lead (Pb)-free, halogen-free
- N. Lot numbers

**DRY PACKING**

The reel is packed in an anti-humidity bag to protect the devices from absorbing moisture during transportation and storage.

**CAUTION**  
This bag contains  
MOISTURE-SENSITIVE DEVICES

LEVEL (MSL)

3

1. Calculated shelf life in sealed bag: 12 months at <40°C and < 90% relative humidity (RH)
2. Peak package body temperature: 260°C
3. After bag is opened, devices that will be subjected to reflow solder or other high temperature process must be
  - a) Mounted within **168 h** of factory conditions ≤ 30°C/60%RH, or
  - b) Stored per J-STD-033.
4. Devices require bake before mounting, if:
  - a) Humidity Indicator Card reads >10% for level 2a - 5a devices or >60% for level 2 devices when read at 23 ± 5 °C
  - b) 3a or 3b are not met
5. If baking is required, refer to IPC/JEDEC J-STD-033 for bake procedure

Bag Seal Date: \_\_\_\_\_  
If blank, see adjacent bar code label

Note: Level (MSL) and body temperature defined by IPC/JEDEC J-STD-020

Example of JEDEC J-STD-033 level 3 label



**ESD PRECAUTION**

Proper storage and handling procedures should be followed to prevent ESD damage to the devices especially when they are removed from the antistatic shielding bag. Electrostatic sensitive devices warning labels are on the packaging.

**VISHAY SEMICONDUCTORS STANDARD BAR CODE LABELS**

The Vishay Semiconductors standard bar code labels are printed at final packing areas. The labels are on each packing unit and contain Vishay Semiconductors specific data.



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