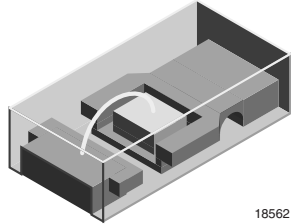




### Standard 0603 SMD LED



#### DESCRIPTION

The new 0603 LED series have been designed in the smallest SMD package. This innovative 0603 LED technology opens the way to

- smaller products of higher performance
- more design in flexibility
- enhanced applications

The 0603 LED is an obvious solution for small-scale, high power products that are expected to work reliably in an arduous environment.

#### PRODUCT GROUP AND PACKAGE DATA

- Product group: LED
- Package: SMD 0603
- Product series: standard
- Angle of half intensity:  $\pm 80^\circ$

#### FEATURES

- Smallest SMD package 0603 with exceptional brightness  
1.6 mm x 0.8 mm x 0.6 mm (L x W x H)
- High reliability lead frame based
- Temperature range - 40 °C to + 100 °C
- Footprint compatible to 0603 chipled
- Wavelength 470 nm (blue), 570 nm (green), 560 nm (pure green), 587 nm (yellow), 606 nm (orange), 633 nm (red)
- AllInGaP and GaN technology
- Viewing angle: extremely wide 160°
- Grouping parameter: luminous intensity, wavelength
- Available in 8 mm tape
- Compatible to IR reflow soldering
- Compliant to RoHS Directive 2002/95/EC and in accordance to WEEE 2002/96/EC
- Preconditioning: acc. to JEDEC level 2
- AEC-Q101 qualified



#### APPLICATIONS

- Backlight keypads
- Navigation systems
- Cellular phone displays
- Displays for industrial control systems
- Automotive features
- Miniaturized color effects
- Traffic displays

PARTS TABLE	
PART	COLOR, LUMINOUS INTENSITY AT I <sub>F</sub> = 20 mA
TLMS1100-GS08	Red, I <sub>V</sub> = 63 mcd (typ.)
TLMO1100-GS08	Orange, I <sub>V</sub> = 80 mcd (typ.)
TLMY1100-GS08	Yellow, I <sub>V</sub> = 80 mcd (typ.)
TLMG1100-GS08	Green, I <sub>V</sub> = 35 mcd (typ.)
TLMP1100-GS08	Pure green, I <sub>V</sub> = 15 mcd (typ.)
TLMB1100-GS08	Blue, I <sub>V</sub> = 5 mcd (typ.)

\*\* Please see document "Vishay Material Category Policy": [www.vishay.com/doc?99902](http://www.vishay.com/doc?99902)

ABSOLUTE MAXIMUM RATINGS <sup>1)</sup> TLMS1100, TLM01100, TLMY1100, TLMG1100, TLMP1100				
PARAMETER	TEST CONDITION	SYMBOL	VALUE	UNIT
Reverse voltage <sup>2)</sup>		$V_R$	12	V
DC Forward current	$T_{amb} \leq 75\text{ }^\circ\text{C}$	$I_F$	30	mA
Surge forward current	$t_p \leq 10\text{ }\mu\text{s}$	$I_{FSM}$	0.5	A
Power dissipation		$P_V$	90	mW
Junction temperature		$T_j$	120	$^\circ\text{C}$
Operating temperature range		$T_{amb}$	- 40 to + 100	$^\circ\text{C}$
Storage temperature range		$T_{stg}$	- 40 to + 100	$^\circ\text{C}$
Soldering temperature	acc. Vishay spec.	$T_{sd}$	260	$^\circ\text{C}$
Thermal resistance junction/ambient	mounted on PC board (pad size > 5 mm <sup>2</sup> )	$R_{thJA}$	480	K/W

Note:

- 1)  $T_{amb} = 25\text{ }^\circ\text{C}$ , unless otherwise specified
- 2) Driving the LED in reverse direction is suitable for short term application

ABSOLUTE MAXIMUM RATINGS <sup>1)</sup> TLMB1100				
PARAMETER	TEST CONDITION	SYMBOL	VALUE	UNIT
Reverse voltage <sup>2)</sup>		$V_R$	5	V
DC Forward current	$T_{amb} \leq 60\text{ }^\circ\text{C}$	$I_F$	15	mA
Surge forward current	$t_p \leq 10\text{ }\mu\text{s}$	$I_{FSM}$	0.1	A
Power dissipation		$P_V$	68	mW
Junction temperature		$T_j$	100	$^\circ\text{C}$
Operating temperature range		$T_{amb}$	- 40 to + 100	$^\circ\text{C}$
Storage temperature range		$T_{stg}$	- 40 to + 100	$^\circ\text{C}$
Soldering temperature	acc. Vishay spec.	$T_{sd}$	260	$^\circ\text{C}$
Thermal resistance junction/ambient	mounted on PC board (pad size > 5 mm <sup>2</sup> )	$R_{thJA}$	480	K/W

Note:

- 1)  $T_{amb} = 25\text{ }^\circ\text{C}$ , unless otherwise specified
- 2) Driving the LED in reverse direction is suitable for short term application

OPTICAL AND ELECTRICAL CHARACTERISTICS <sup>1)</sup> TLMS1100, RED						
PARAMETER	TEST CONDITION	SYMBOL	MIN.	TYP.	MAX.	UNIT
Luminous intensity	$I_F = 20\text{ mA}$	$I_V$	32	63		mcd
Dominant wavelength	$I_F = 20\text{ mA}$	$\lambda_d$	627	633	639	nm
Peak wavelength	$I_F = 20\text{ mA}$	$\lambda_p$		645		nm
Angle of half intensity	$I_F = 20\text{ mA}$	$\varphi$		$\pm 80$		deg
Forward voltage	$I_F = 20\text{ mA}$	$V_F$		2.1	3.0	V
Reverse voltage	$I_R = 10\text{ }\mu\text{A}$	$V_R$	6			V
Junction capacitance	$V_R = 0, f = 1\text{ MHz}$	$C_j$		15		pF

Note:

- 1)  $T_{amb} = 25\text{ }^\circ\text{C}$ , unless otherwise specified



<b>OPTICAL AND ELECTRICAL CHARACTERISTICS <sup>1)</sup> TLMO1100, ORANGE</b>						
PARAMETER	TEST CONDITION	SYMBOL	MIN.	TYP.	MAX.	UNIT
Luminous intensity	$I_F = 20 \text{ mA}$	$I_V$	50	80		mcd
Dominant wavelength	$I_F = 20 \text{ mA}$	$\lambda_d$	600	606	609	nm
Peak wavelength	$I_F = 20 \text{ mA}$	$\lambda_p$		610		nm
Angle of half intensity	$I_F = 20 \text{ mA}$	$\varphi$		$\pm 80$		deg
Forward voltage	$I_F = 20 \text{ mA}$	$V_F$		2.1	3	V
Reverse voltage	$I_R = 10 \mu\text{A}$	$V_R$	6			V
Junction capacitance	$V_R = 0, f = 1 \text{ MHz}$	$C_j$		15		pF

Note:

1)  $T_{amb} = 25 \text{ }^\circ\text{C}$ , unless otherwise specified

<b>OPTICAL AND ELECTRICAL CHARACTERISTICS <sup>1)</sup> TLMY1100, YELLOW</b>						
PARAMETER	TEST CONDITION	SYMBOL	MIN.	TYP.	MAX.	UNIT
Luminous intensity	$I_F = 20 \text{ mA}$	$I_V$	50	80		mcd
Dominant wavelength	$I_F = 20 \text{ mA}$	$\lambda_d$	580	587	595	nm
Peak wavelength	$I_F = 20 \text{ mA}$	$\lambda_p$		591		nm
Angle of half intensity	$I_F = 20 \text{ mA}$	$\varphi$		$\pm 80$		deg
Forward voltage	$I_F = 20 \text{ mA}$	$V_F$		2.1	3	V
Reverse voltage	$I_R = 10 \mu\text{A}$	$V_R$	6			V
Junction capacitance	$V_R = 0, f = 1 \text{ MHz}$	$C_j$		15		pF

Note:

1)  $T_{amb} = 25 \text{ }^\circ\text{C}$ , unless otherwise specified

<b>OPTICAL AND ELECTRICAL CHARACTERISTICS <sup>1)</sup> TLMG1100, GREEN</b>						
PARAMETER	TEST CONDITION	SYMBOL	MIN.	TYP.	MAX.	UNIT
Luminous intensity	$I_F = 20 \text{ mA}$	$I_V$	12.5	35		mcd
Dominant wavelength	$I_F = 20 \text{ mA}$	$\lambda_d$	564	570	575	nm
Peak wavelength	$I_F = 20 \text{ mA}$	$\lambda_p$		572		nm
Angle of half intensity	$I_F = 20 \text{ mA}$	$\varphi$		$\pm 80$		deg
Forward voltage	$I_F = 20 \text{ mA}$	$V_F$		2.1	3.0	V
Reverse voltage	$I_R = 10 \mu\text{A}$	$V_R$	6			V
Junction capacitance	$V_R = 0, f = 1 \text{ MHz}$	$C_j$		15		pF

Note:

1)  $T_{amb} = 25 \text{ }^\circ\text{C}$ , unless otherwise specified

<b>OPTICAL AND ELECTRICAL CHARACTERISTICS <sup>1)</sup> TLMP1100, PURE GREEN</b>						
PARAMETER	TEST CONDITION	SYMBOL	MIN.	TYP.	MAX.	UNIT
Luminous intensity	$I_F = 20 \text{ mA}$	$I_V$	6.3	15		mcd
Dominant wavelength	$I_F = 20 \text{ mA}$	$\lambda_d$	551	558	566	nm
Peak wavelength	$I_F = 20 \text{ mA}$	$\lambda_p$		555		nm
Angle of half intensity	$I_F = 20 \text{ mA}$	$\varphi$		$\pm 80$		deg
Forward voltage	$I_F = 20 \text{ mA}$	$V_F$		2.1	3	V
Reverse voltage	$I_R = 10 \mu\text{A}$	$V_R$	6			V
Junction capacitance	$V_R = 0, f = 1 \text{ MHz}$	$C_j$		15		pF

Note:

1)  $T_{amb} = 25 \text{ }^\circ\text{C}$ , unless otherwise specified



OPTICAL AND ELECTRICAL CHARACTERISTICS <sup>1)</sup> TLMB1100, BLUE						
PARAMETER	TEST CONDITION	SYMBOL	MIN	TYP.	MAX	UNIT
Luminous intensity	$I_F = 10 \text{ mA}$	$I_V$	4	5		mcd
Dominant wavelength	$I_F = 10 \text{ mA}$	$\lambda_d$		466		nm
Peak wavelength	$I_F = 10 \text{ mA}$	$\lambda_p$		428		nm
Angle of half intensity	$I_F = 10 \text{ mA}$	$\varphi$		$\pm 80$		deg
Forward voltage	$I_F = 20 \text{ mA}$	$V_F$		3.9	4.5	V
Reverse voltage	$I_R = 10 \mu\text{A}$	$V_R$	5.0			V

Note:

1)  $T_{amb} = 25 \text{ }^\circ\text{C}$ , unless otherwise specified

COLOR CLASSIFICATION										
GROUP	DOMINANT WAVELENGTH (nm)									
	BLUE		PURE GREEN		GREEN		YELLOW		ORANGE	
	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.
- 1			551	554	564	565				
- 2	460	464	554	557	566	569	580	583	600	603
- 3	464	468	557	560	569	572	583	586	603	606
- 4	468	472	560	563	572	575	586	589	606	609
- 5	472	476	563	566			589	592	609	612
- 6							592	595		

Note:

Wavelengths are tested at a current pulse duration of 25 ms and an accuracy of  $\pm 1 \text{ nm}$

LUMINOUS INTENSITY CLASSIFICATION		
GROUP	LUMINOUS INTENSITY (mcd)	
	MIN.	MAX.
Pa	4	6.3
Pb	5	8
Qa	6.3	10
Qb	8	12.5
Ra	10	16
Rb	12.5	20
Sa	16	25
Sb	20	32
Ta	25	40
Tb	32	50
Ua	40	63
Ub	50	80
Va	63	100
Vb	80	125
Wa	100	160
Wb	125	200

Note:

Luminous intensity is tested at a current pulse duration of 25 ms and an accuracy of  $\pm 11 \%$ .

The above type numbers represent the order groups which include only a few brightness groups. Only one group 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.

In a similar manner for colors where wavelength groups are measured and binned, single wavelength groups will be shipped in any one reel.

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



GROUP NAME ON LABEL		
LUMINOUS INTENSITY GROUP	HALFGROUP	WAVELENGTH
Q	b	4

Note:

One packing unit/tape contains only one classification group of luminous intensity, color and forward voltage.

Only one single classification groups is not available.

The given groups are not order codes, customer specific group combinations require marketing agreement.

No color subgrouping for super red.

**TYPICAL CHARACTERISTICS**

T<sub>amb</sub> = 25 °C, unless otherwise specified

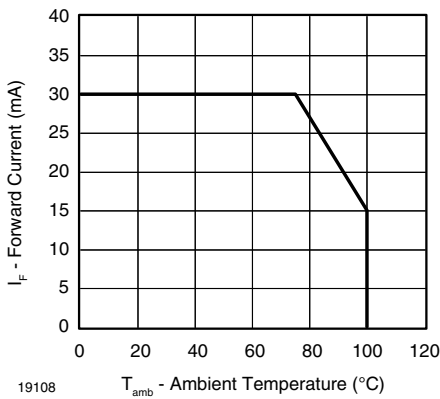


Figure 1. Forward Current vs. Ambient Temperature

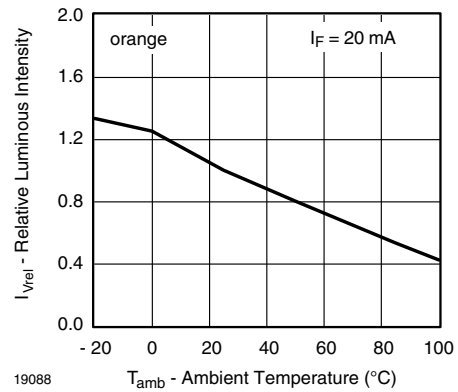


Figure 3. Relative Luminous Intensity vs. Amb. Temperature

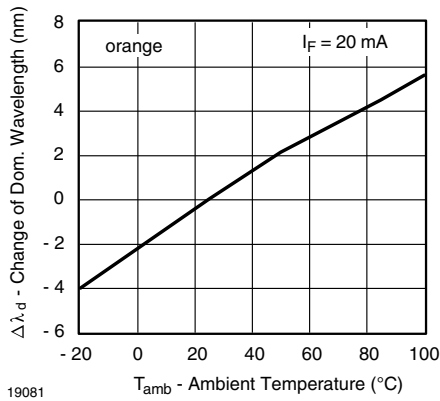


Figure 2. Change of Dominant Wavelength vs. Ambient Temperature

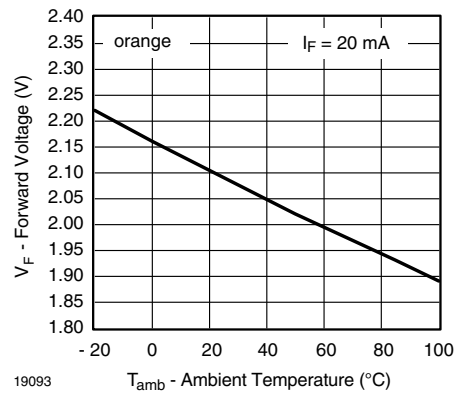


Figure 4. Forward Voltage vs. Ambient Temperature

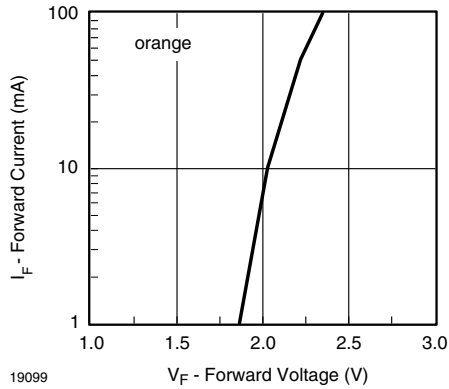


Figure 5. Forward Current vs. Forward Voltage

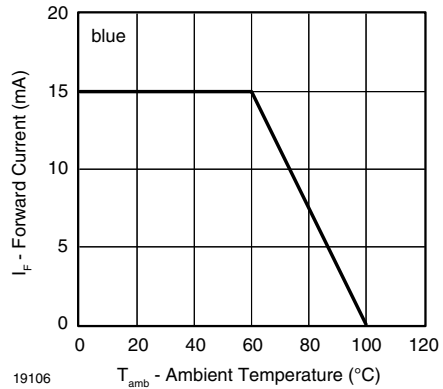


Figure 8. Forward Current vs. Ambient Temperature

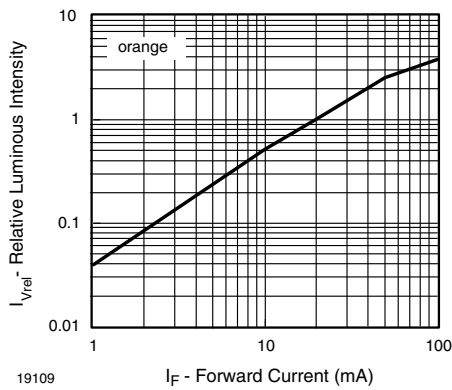


Figure 6. Relative Luminous Intensity vs. Forward Current

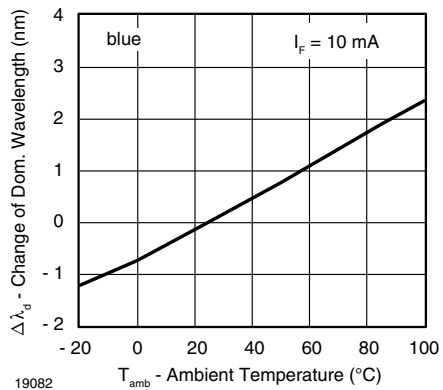


Figure 9. Change of Dominant Wavelength vs. Ambient Temperature

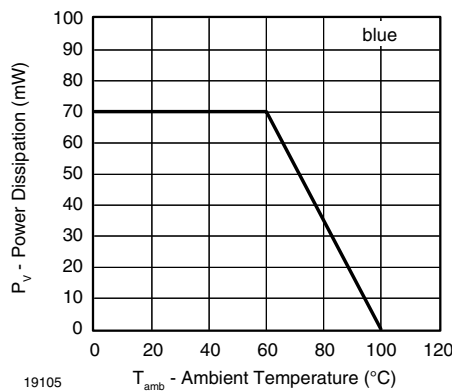


Figure 7. Power Dissipation vs. Ambient Temperature

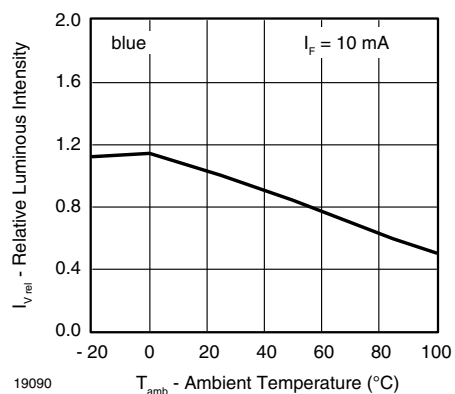


Figure 10. Relative Luminous Intensity vs. Amb. Temperature

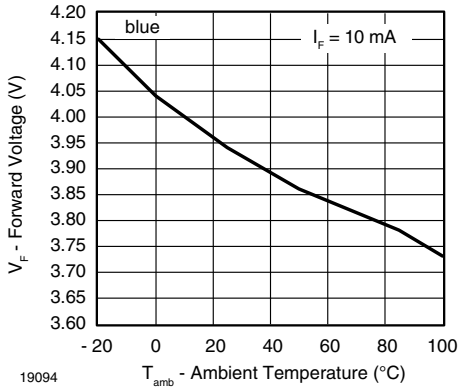


Figure 11. Forward Voltage vs. Ambient Temperature

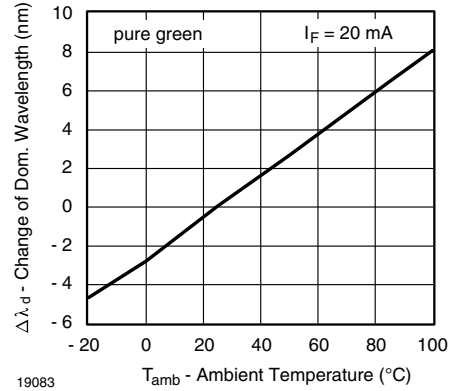


Figure 14. Change of Dominant Wavelength vs. Ambient Temperature

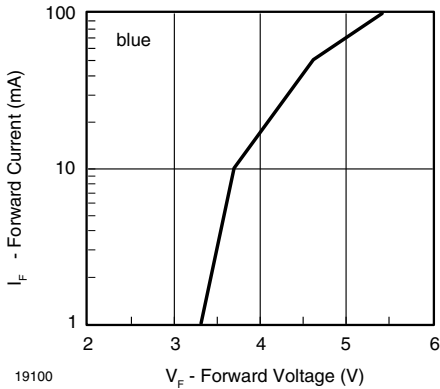


Figure 12. Forward Current vs. Forward Voltage

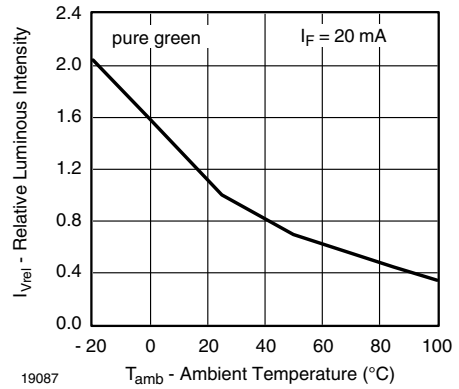


Figure 15. Relative Luminous Intensity vs. Amb. Temperature

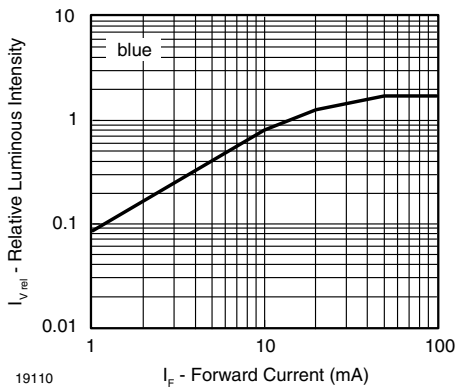


Figure 13. Relative Luminous Intensity vs. Forward Current

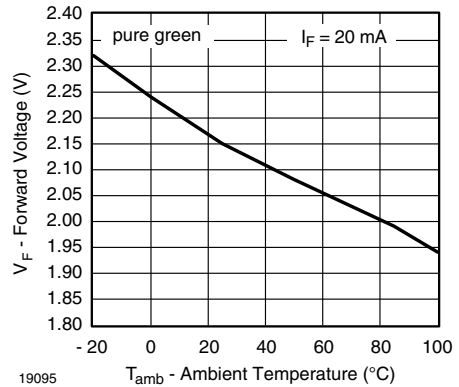


Figure 16. Forward Voltage vs. Ambient Temperature

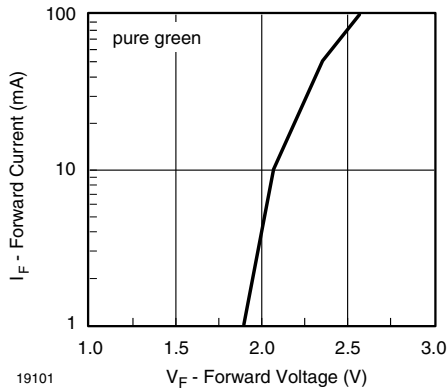


Figure 17. Forward Current vs. Forward Voltage

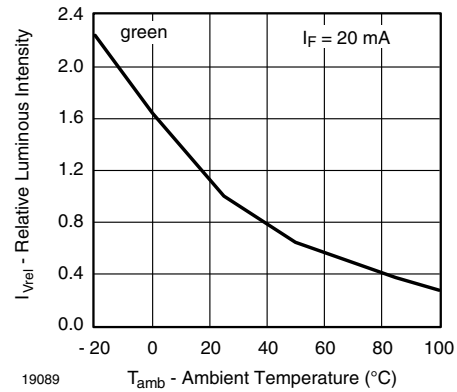


Figure 20. Relative Luminous Intensity vs. Ambient Temperature

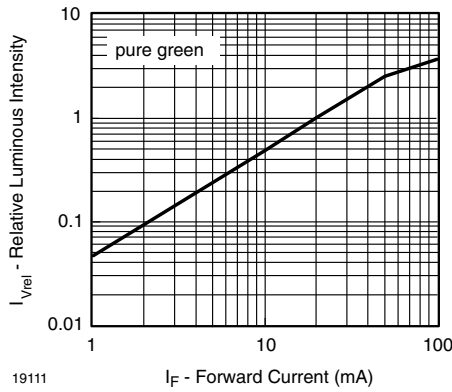


Figure 18. Relative Luminous Intensity vs. Forward Current

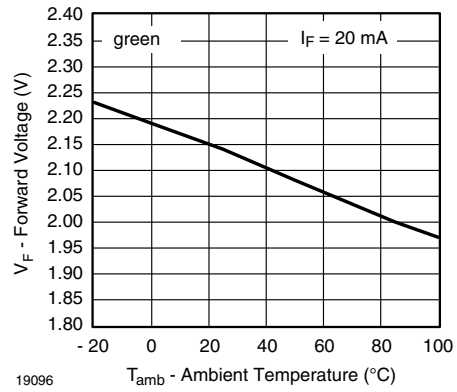


Figure 21. Forward Voltage vs. Ambient Temperature

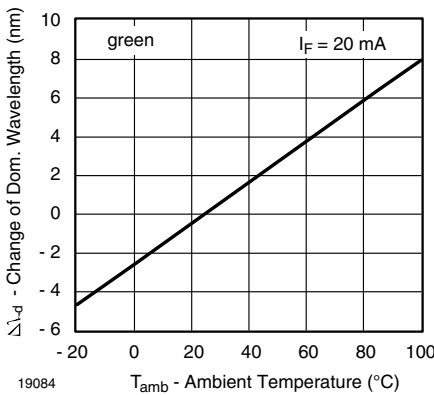


Figure 19. Change of Dominant Wavelength vs. Ambient Temperature

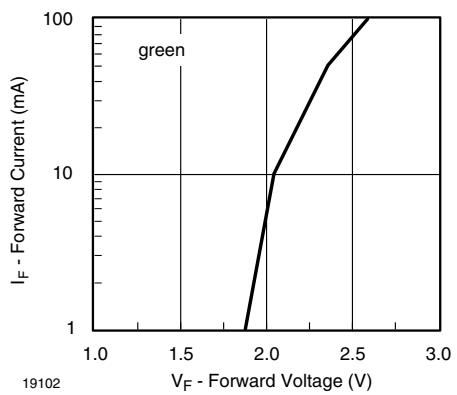


Figure 22. Forward Current vs. Forward Voltage



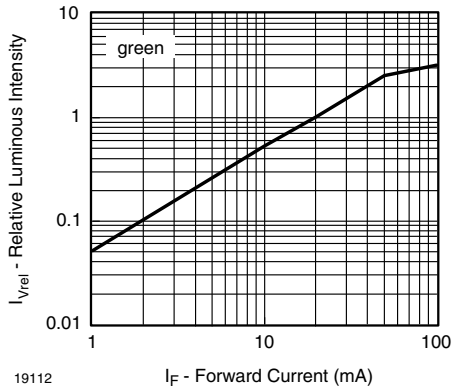


Figure 23. Relative Luminous Intensity vs. Forward Current

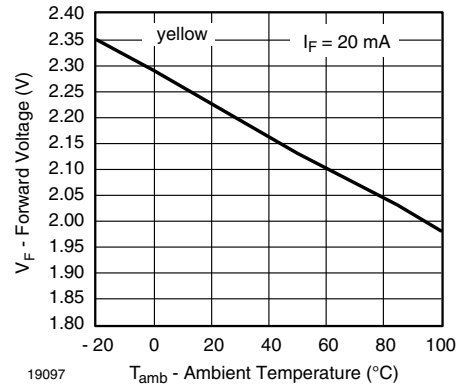


Figure 26. Forward Voltage vs. Ambient Temperature

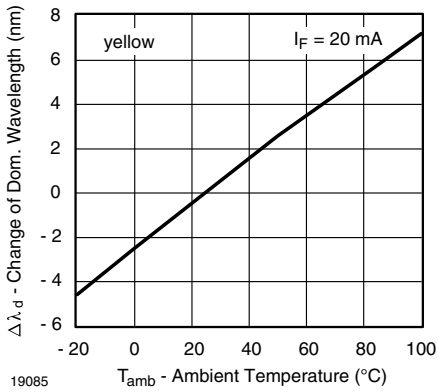


Figure 24. Change of Dominant Wavelength vs. Ambient Temperature

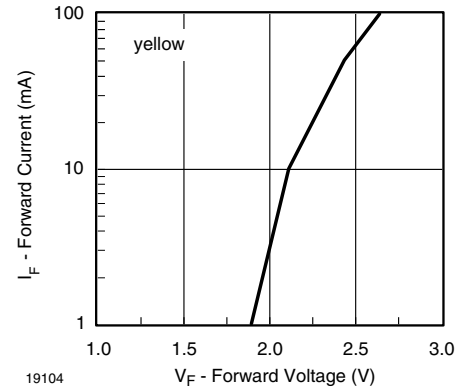


Figure 27. Forward Current vs. Forward Voltage

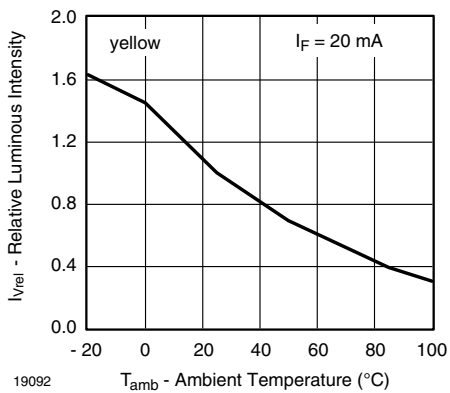


Figure 25. Relative Luminous Intensity vs. Amb. Temperature

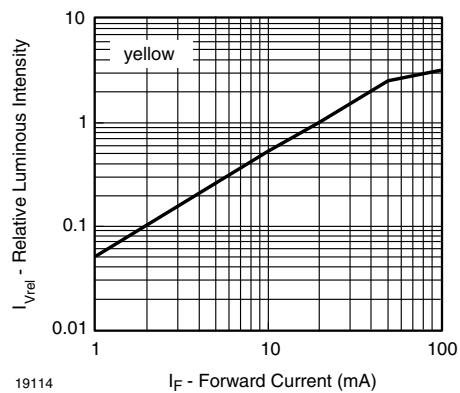


Figure 28. Relative Luminous Intensity vs. Forward Current

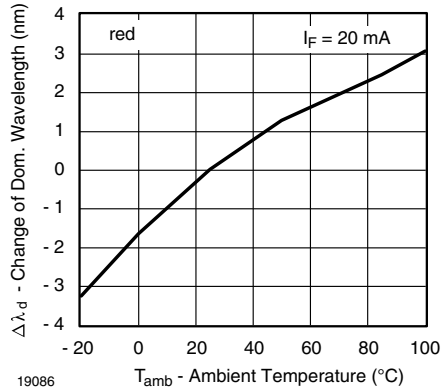


Figure 29. Change of Dominant Wavelength vs. Ambient Temperature

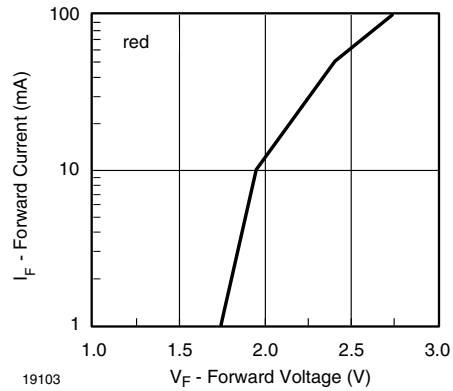


Figure 32. Forward Current vs. Forward Voltage

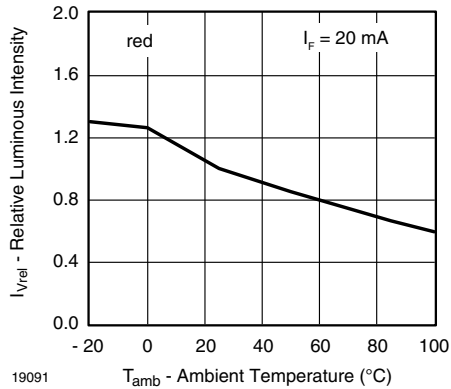


Figure 30. Relative Luminous Intensity vs. Amb. Temperature

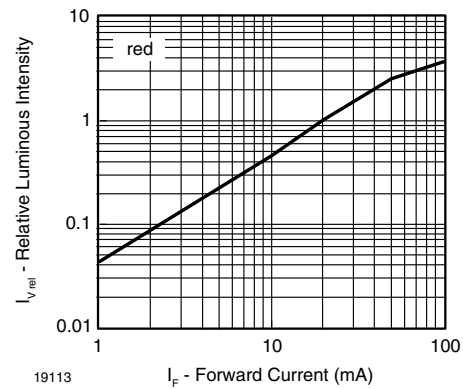


Figure 33. Relative Luminous Intensity vs. Forward Current

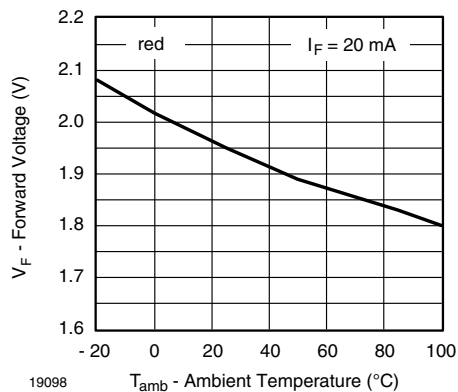
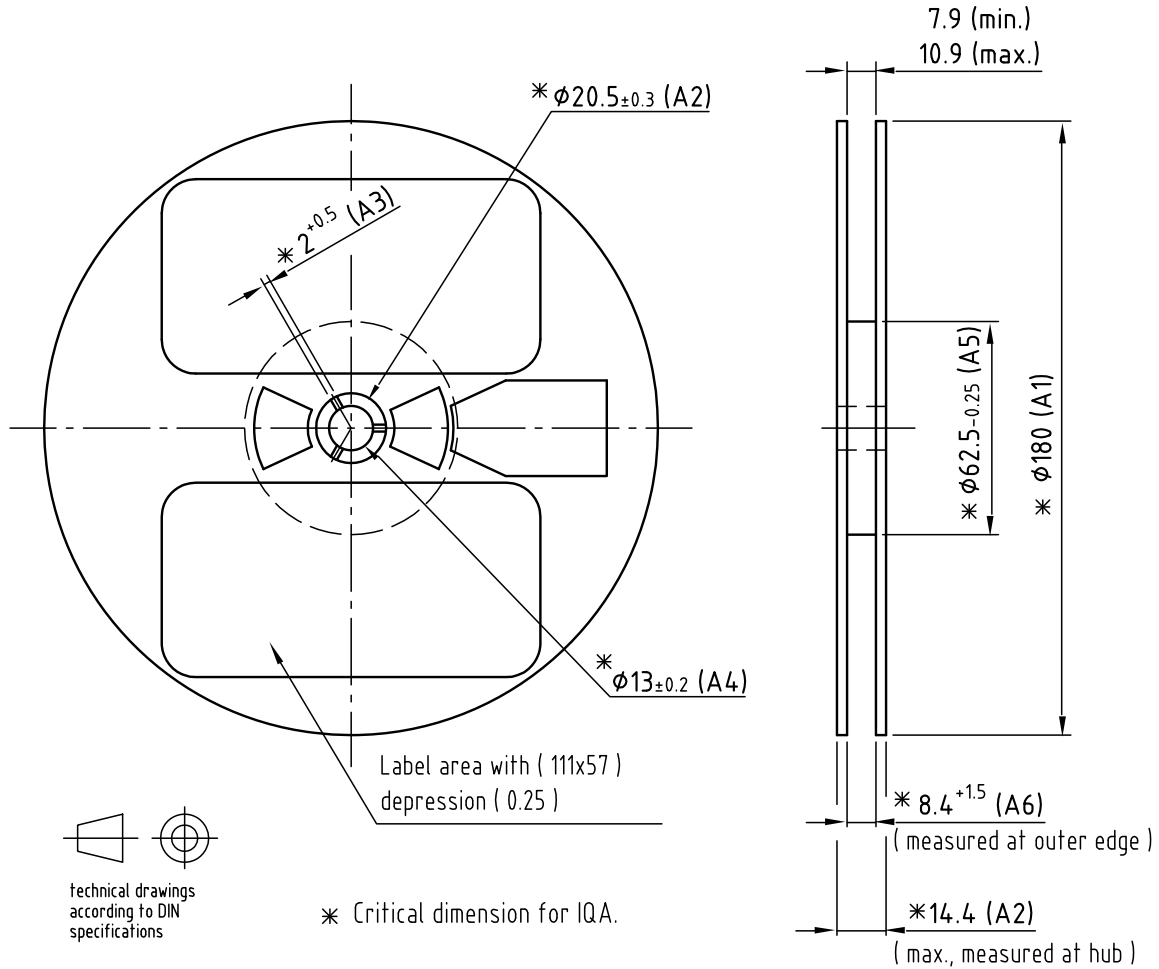


Figure 31. Forward Voltage vs. Ambient Temperature



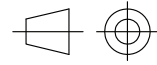
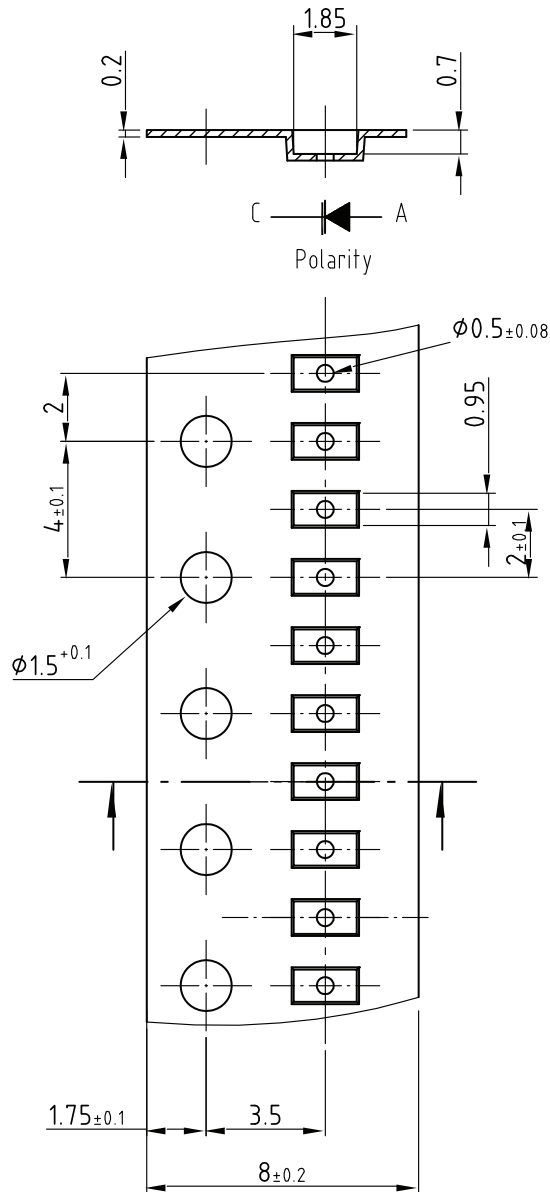
REEL DIMENSIONS in millimeters



Drawing-No.: 9.800-5086.01-4  
 Issue: 1; 29.04.04  
 19043

Not indicated tolerances  $\pm 0.05$   
 Material: black static dissipative

**TAPE DIMENSIONS** in millimeters



Technical drawings according to DIN specifications

Not indicated tolerances  $\pm 0.05$

Material: Conductive black PC

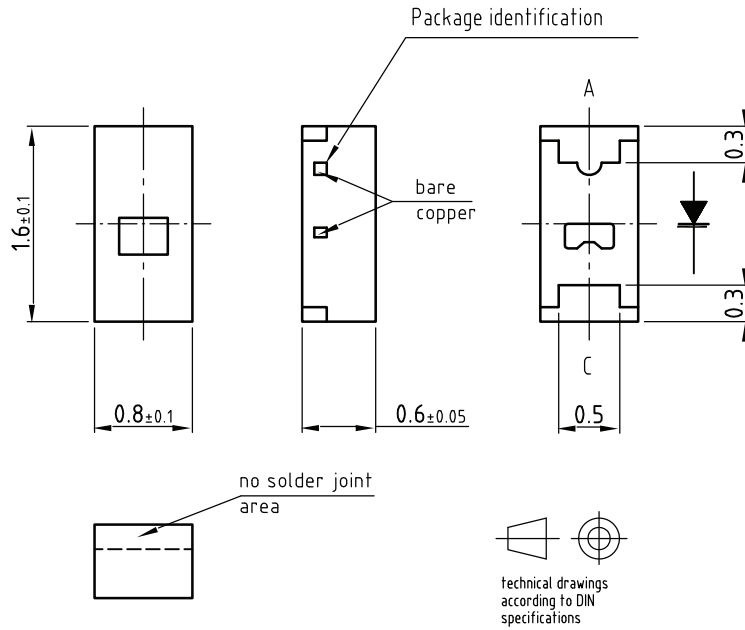
Drawing-No.: 9.700-5290.01-4

Issue: 2; 10.07.06

19044

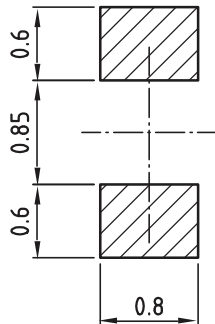


**PACKAGE DIMENSIONS** in millimeters



Not indicated tolerances  $\pm 0.1$

Recommended solder pad



Drawing-No.: 6.541-5056.01-4

Issue: 2; 04.05.05

19426

**SOLDERING PROFILE**

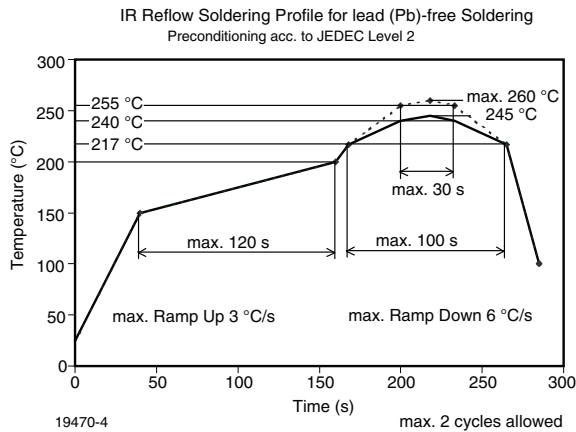
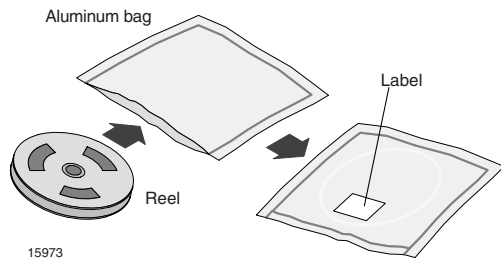


Figure 34. Vishay Lead (Pb)-free Reflow Soldering Profile (acc. to J-STD-020C)

**DRY PACKING**

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



**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 1 year under these conditions moisture content will be too high for reflow soldering.

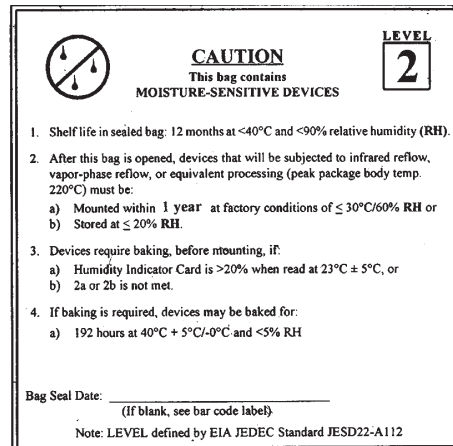
In case of moisture absorption, the devices will recover to the former condition by drying under the following condition:

192 h at 40 °C + 5 °C/- 0 °C and < 5 % RH (dry air/nitrogen) or

96 h at 60 °C + 5 °C and < 5 % RH for all device containers or

24 h at 100 °C + 5 °C not suitable for reel or tubes.

An EIA JEDEC standard JESD22-A112 level 2 label is included on all dry bags.



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Example of JESD22-A112 level 2 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. Electro-static 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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