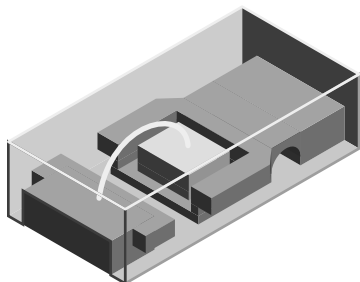




## Standard 0603 SMD LED



### 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 reliability 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  $-40^\circ\text{C}$  to  $+100^\circ\text{C}$
- Footprint compatible to 0603 chipled
- Wavelength 570 nm (green), 561 nm (pure green), 589 nm (yellow), 606 nm (orange), 633 nm (red)
- AlInGaP and GaN technology
- Viewing angle: extremely wide  $160^\circ$
- Grouping parameter: luminous intensity, wavelength
- Available in 8 mm tape
- Compatible to IR reflow soldering
- Preconditioning according to JEDEC® level 2
- AEC-Q101 qualified
- Material categorization: for definitions of compliance please see [www.vishay.com/doc?99912](http://www.vishay.com/doc?99912)

AUTOMOTIVE  
GRADE

RoHS  
COMPLIANT  
HALOGEN  
FREE  
GREEN  
(5-2008)

### 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 (mcd) |      |      | at I <sub>F</sub> (mA) | 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. |                        |            |
| TLMS1100-GS15 | Red        | 32                       | 63   | -    | 20                     | 627             | 633  | 639  | 20                     | 1.8                 | 2.1  | 2.4  | 20                     | AlInGaP    |
| TLMS1101-GS15 | Red        | 50                       | -    | 125  | 20                     | 627             | 633  | 639  | 20                     | 1.8                 | 2.1  | 2.4  | 20                     | AlInGaP    |
| TLMO1100-GS15 | Orange     | 50                       | 80   | -    | 20                     | 600             | 606  | 609  | 20                     | 1.8                 | 2.1  | 2.4  | 20                     | AlInGaP    |
| TLMY1100-GS15 | Yellow     | 50                       | 80   | -    | 20                     | 580             | 589  | 595  | 20                     | 1.8                 | 2.1  | 2.4  | 20                     | AlInGaP    |
| TLMG1100-GS15 | Green      | 12.5                     | 35   | -    | 20                     | 564             | 570  | 575  | 20                     | 1.8                 | 2.1  | 2.4  | 20                     | AlInGaP    |
| TLMP1100-GS15 | Pure green | 6.3                      | 15   | -    | 20                     | 551             | 561  | 566  | 20                     | 1.8                 | 2.1  | 2.4  | 20                     | AlInGaP    |



## ABSOLUTE MAXIMUM RATINGS ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ , unless otherwise specified) TLMS110., TLMO1100, TLMY1100, TLMG1100, TLMP1100

| PARAMETER                              | TEST CONDITION                                      | SYMBOL     | VALUE       | UNIT               |
|----------------------------------------|-----------------------------------------------------|------------|-------------|--------------------|
| Reverse voltage <sup>(1)</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                  | According to Vishay specification                   | $T_{sd}$   | +260        | $^{\circ}\text{C}$ |
| Thermal resistance junction to ambient | Mounted on PC board (pad size > 5 mm <sup>2</sup> ) | $R_{thJA}$ | 480         | K/W                |
| ESD rating                             | HBM                                                 | $V_{ESD}$  | 2000        | V                  |

### Note

<sup>(1)</sup> Driving the LED in reverse direction is suitable for short term application

## OPTICAL AND ELECTRICAL CHARACTERISTICS ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ , unless otherwise specified) TLMS110., RED

| PARAMETER               | TEST CONDITION                          | PART     | SYMBOL      | MIN. | TYP.     | MAX. | UNIT          |
|-------------------------|-----------------------------------------|----------|-------------|------|----------|------|---------------|
| Luminous intensity      | $I_F = 20\text{ mA}$                    | TLMS1100 | $I_V$       | 32   | 63       | -    | mcd           |
|                         |                                         | TLMS1101 |             | 50   | -        | 125  |               |
| 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 | $I_F = 20\text{ mA}$                    |          | $\phi$      | -    | $\pm 80$ | -    | $^{\circ}$    |
| Forward voltage         | $I_F = 20\text{ mA}$                    |          | $V_F$       | 1.8  | 2.1      | 2.4  | V             |
| Reverse current         | $V_R = 6\text{ V}$                      |          | $I_R$       | -    | -        | 10   | $\mu\text{A}$ |
| Junction capacitance    | $V_R = 0\text{ V}$ , $f = 1\text{ MHz}$ |          | $C_j$       | -    | 15       | -    | pF            |

## OPTICAL AND ELECTRICAL CHARACTERISTICS ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ , unless otherwise specified) TLMO1100, ORANGE

| 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 | $I_F = 20\text{ mA}$                    | $\phi$      | -    | $\pm 80$ | -    | $^{\circ}$    |
| Forward voltage         | $I_F = 20\text{ mA}$                    | $V_F$       | 1.8  | 2.1      | 2.4  | V             |
| Reverse current         | $V_R = 6\text{ V}$                      | $I_R$       | -    | -        | 10   | $\mu\text{A}$ |
| Junction capacitance    | $V_R = 0\text{ V}$ , $f = 1\text{ MHz}$ | $C_j$       | -    | 15       | -    | pF            |

## OPTICAL AND ELECTRICAL CHARACTERISTICS ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ , unless otherwise specified) TLMY1100, YELLOW

| 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  | 589      | 595  | nm            |
| Peak wavelength         | $I_F = 20\text{ mA}$                    | $\lambda_p$ | -    | 591      | -    | nm            |
| Angle of half intensity | $I_F = 20\text{ mA}$                    | $\phi$      | -    | $\pm 80$ | -    | $^{\circ}$    |
| Forward voltage         | $I_F = 20\text{ mA}$                    | $V_F$       | 1.8  | 2.1      | 2.4  | V             |
| Reverse current         | $V_R = 6\text{ V}$                      | $I_R$       | -    | -        | 10   | $\mu\text{A}$ |
| Junction capacitance    | $V_R = 0\text{ V}$ , $f = 1\text{ MHz}$ | $C_j$       | -    | 15       | -    | pF            |



## OPTICAL AND ELECTRICAL CHARACTERISTICS ( $T_{amb} = 25^{\circ}\text{C}$ , unless otherwise specified) TLMG1100, GREEN

| 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 | $I_F = 20\text{ mA}$                    | $\phi$      | -    | $\pm 80$ | -    | $^{\circ}$    |
| Forward voltage         | $I_F = 20\text{ mA}$                    | $V_F$       | 1.8  | 2.1      | 2.4  | V             |
| Reverse current         | $V_R = 6\text{ V}$                      | $I_R$       | -    | -        | 10   | $\mu\text{A}$ |
| Junction capacitance    | $V_R = 0\text{ V}$ , $f = 1\text{ MHz}$ | $C_j$       | -    | 15       | -    | pF            |

## OPTICAL AND ELECTRICAL CHARACTERISTICS ( $T_{amb} = 25^{\circ}\text{C}$ , unless otherwise specified) TLMP1100, PURE GREEN

| 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  | 561      | 566  | nm            |
| Peak wavelength         | $I_F = 20\text{ mA}$                    | $\lambda_p$ | -    | 562      | -    | nm            |
| Angle of half intensity | $I_F = 20\text{ mA}$                    | $\phi$      | -    | $\pm 80$ | -    | $^{\circ}$    |
| Forward voltage         | $I_F = 20\text{ mA}$                    | $V_F$       | 1.8  | 2.1      | 2.4  | V             |
| Reverse current         | $V_R = 6\text{ V}$                      | $I_R$       | -    | -        | 10   | $\mu\text{A}$ |
| Junction capacitance    | $V_R = 0\text{ V}$ , $f = 1\text{ MHz}$ | $C_j$       | -    | 15       | -    | pF            |

## LUMINOUS INTENSITY/FLUX CLASSIFICATION

| GROUP | LUMINOUS INTENSITY $I_V$ (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.  
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.



| COLOR CLASSIFICATION |                      |      |       |      |        |      |        |      |
|----------------------|----------------------|------|-------|------|--------|------|--------|------|
| GROUP                | DOM. WAVELENGTH (nm) |      |       |      |        |      |        |      |
|                      | PURE GREEN           |      | GREEN |      | YELLOW |      | ORANGE |      |
|                      | MIN.                 | MAX. | MIN.  | MAX. | MIN.   | MAX. | MIN.   | MAX. |
| 1                    | 551                  | 554  | 564   | 566  | -      | -    | -      | -    |
| 2                    | 554                  | 557  | 566   | 569  | 580    | 583  | 600    | 603  |
| 3                    | 557                  | 560  | 569   | 572  | 583    | 586  | 603    | 606  |
| 4                    | 560                  | 563  | 572   | 575  | 586    | 589  | 606    | 609  |
| 5                    | 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  $\pm 1$  nm

| 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.

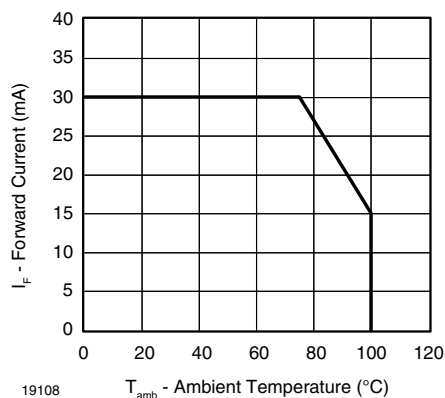
**TYPICAL CHARACTERISTICS** ( $T_{amb} = 25^\circ\text{C}$ , unless otherwise specified)

Fig. 1 - Forward Current vs. Ambient Temperature

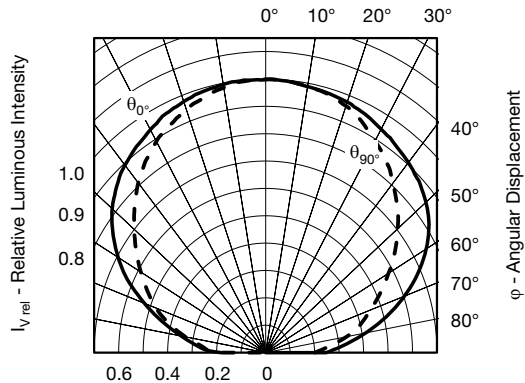


Fig. 2 - Relative Luminous Intensity vs. Angular Displacement

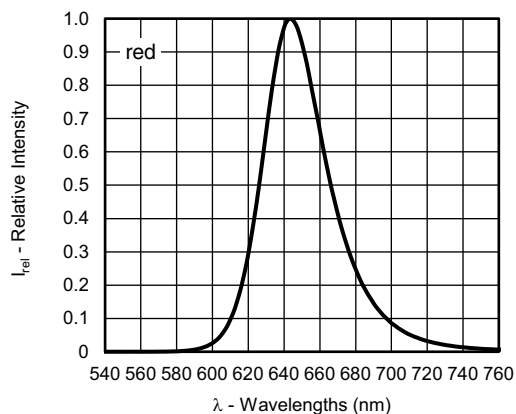


Fig. 3 - Relative Intensity vs. Wavelength

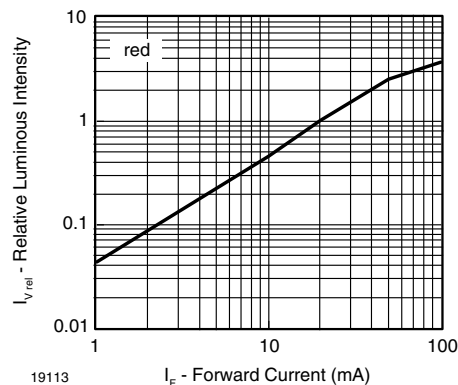


Fig. 6 - Relative Luminous Intensity vs. Forward Current

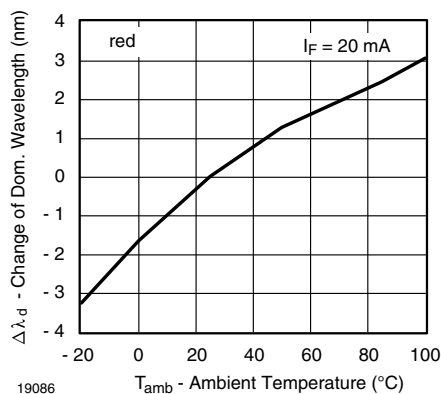


Fig. 4 - Change of Dominant Wavelength vs. Ambient Temperature

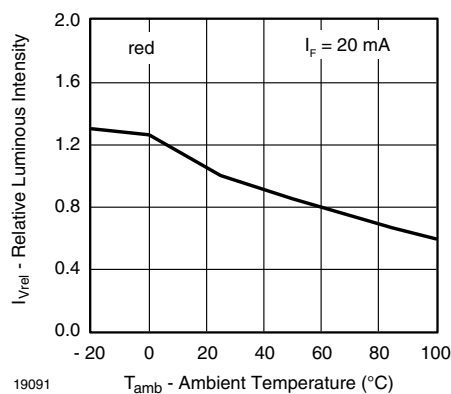


Fig. 7 - Relative Luminous Intensity vs. Ambient Temperature

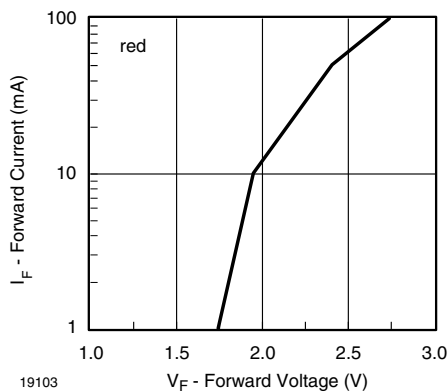


Fig. 5 - Forward Current vs. Forward Voltage

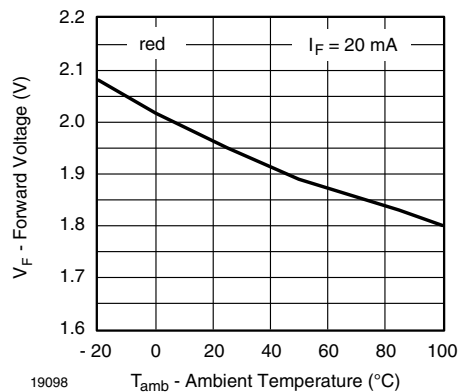


Fig. 8 - Forward Voltage vs. Ambient Temperature

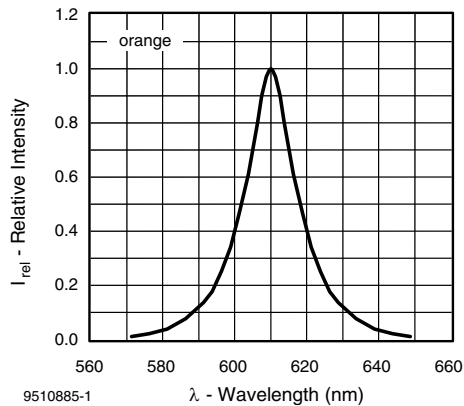


Fig. 9 - Relative Intensity vs. Wavelength

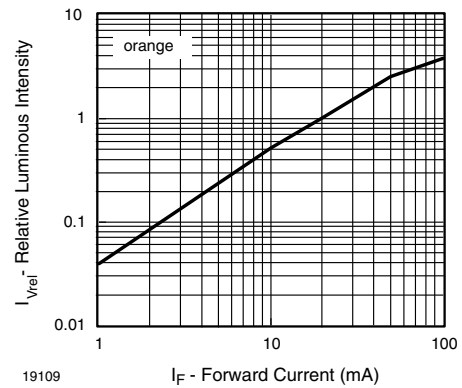


Fig. 12 - Relative Luminous Intensity vs. Forward Current

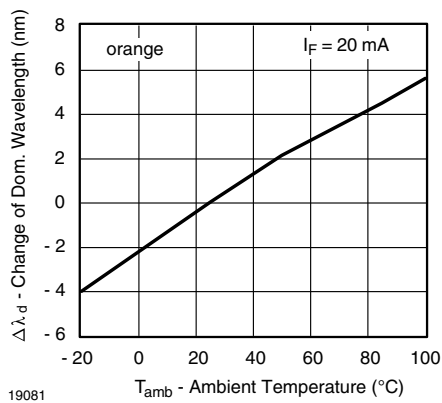


Fig. 10 - Change of Dominant Wavelength vs. Ambient Temperature

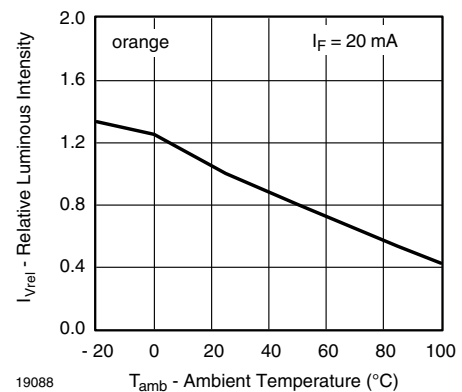


Fig. 13 - Relative Luminous Intensity vs. Ambient Temperature

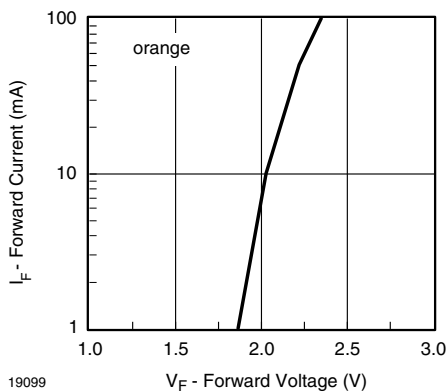


Fig. 11 - Forward Current vs. Forward Voltage

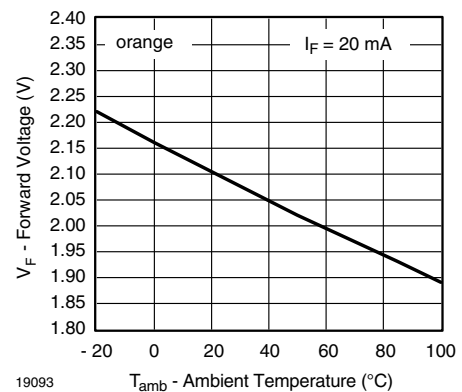


Fig. 14 - Forward Voltage vs. Ambient Temperature

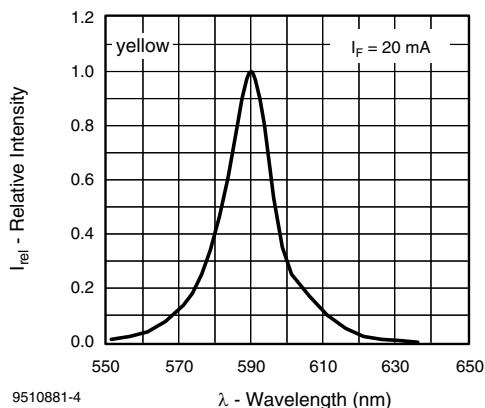


Fig. 15 - Relative Intensity vs. Wavelength

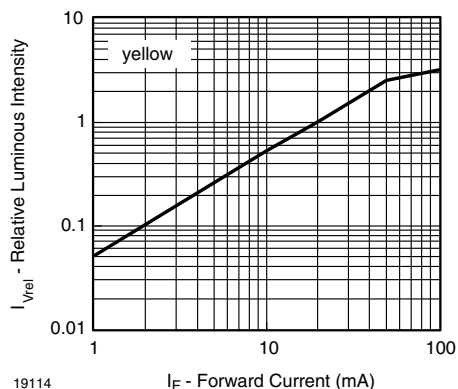


Fig. 18 - Relative Luminous Intensity vs. Forward Current

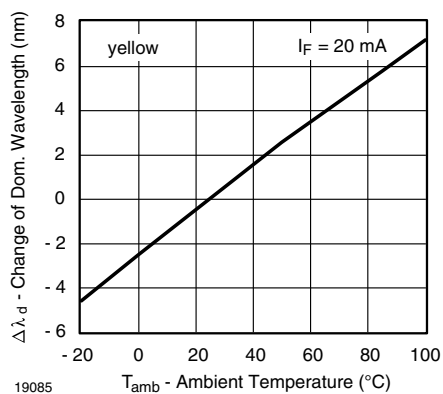


Fig. 16 - Change of Dominant Wavelength vs. Ambient Temperature

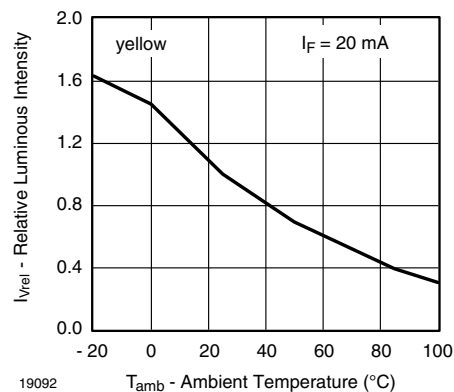


Fig. 19 - Relative Luminous Intensity vs. Ambient Temperature

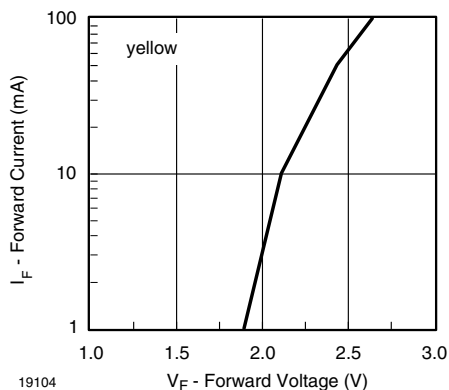


Fig. 17 - Forward Current vs. Forward Voltage

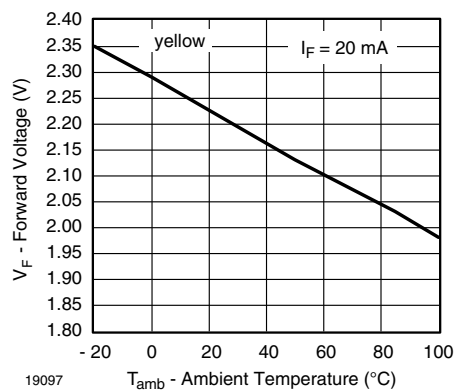


Fig. 20 - Forward Voltage vs. Ambient Temperature

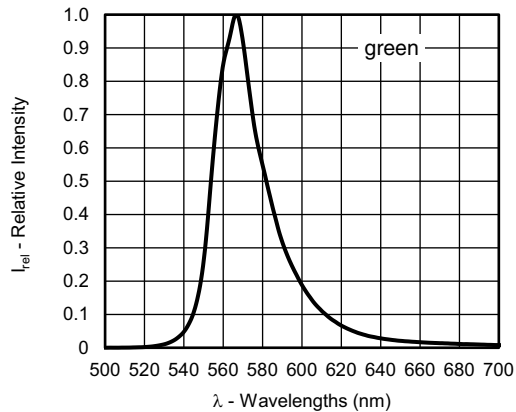


Fig. 21 - Relative Intensity vs. Wavelength

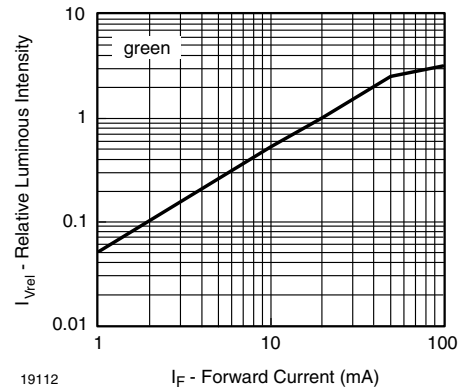


Fig. 24 - Relative Luminous Intensity vs. Forward Current

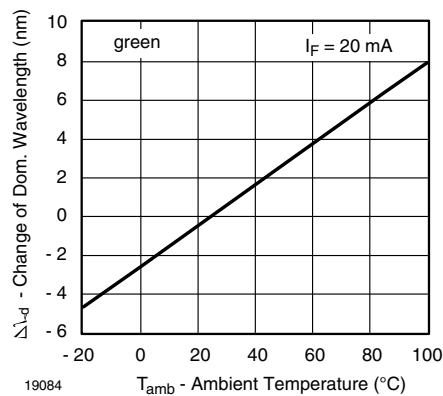


Fig. 22 - Change of Dominant Wavelength vs. Ambient Temperature

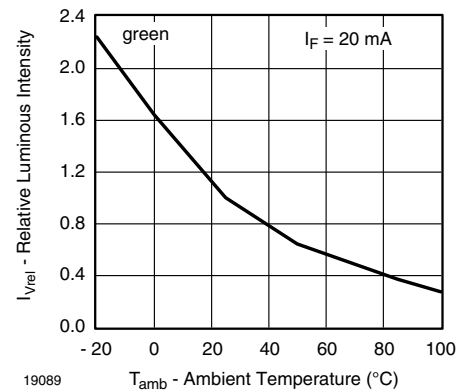


Fig. 25 - Relative Luminous Intensity vs. Ambient Temperature

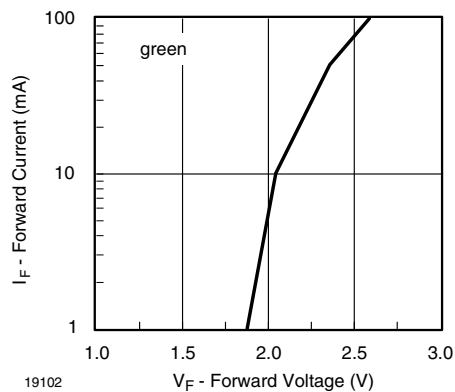


Fig. 23 - Forward Current vs. Forward Voltage

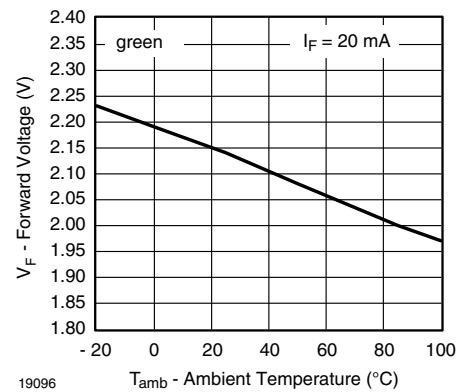
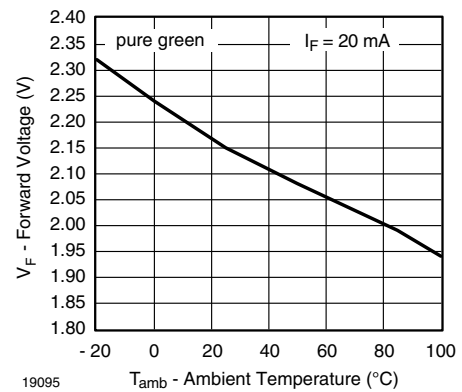
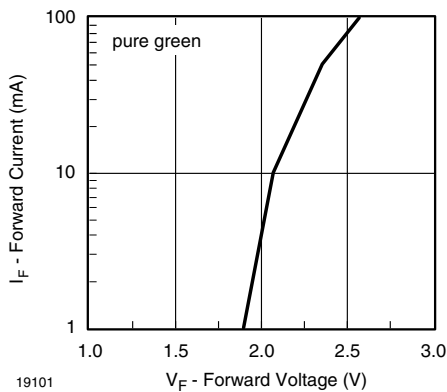
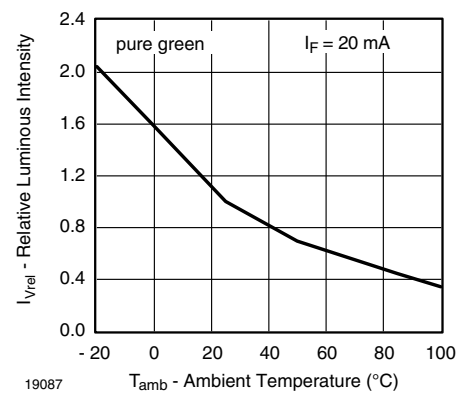
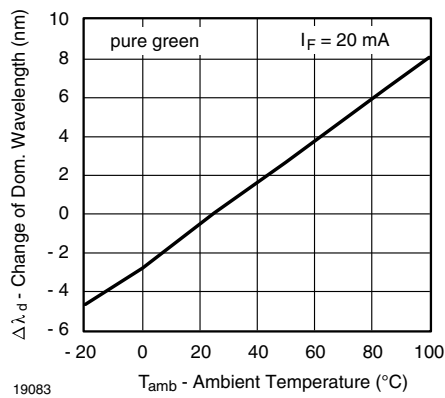
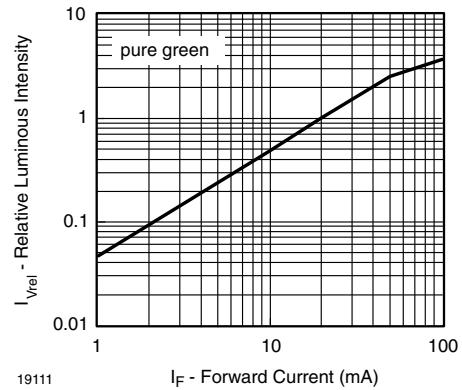
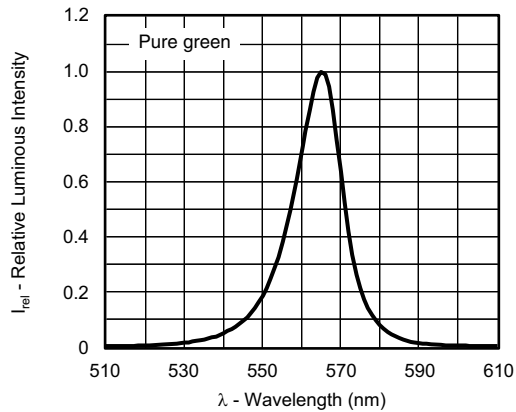
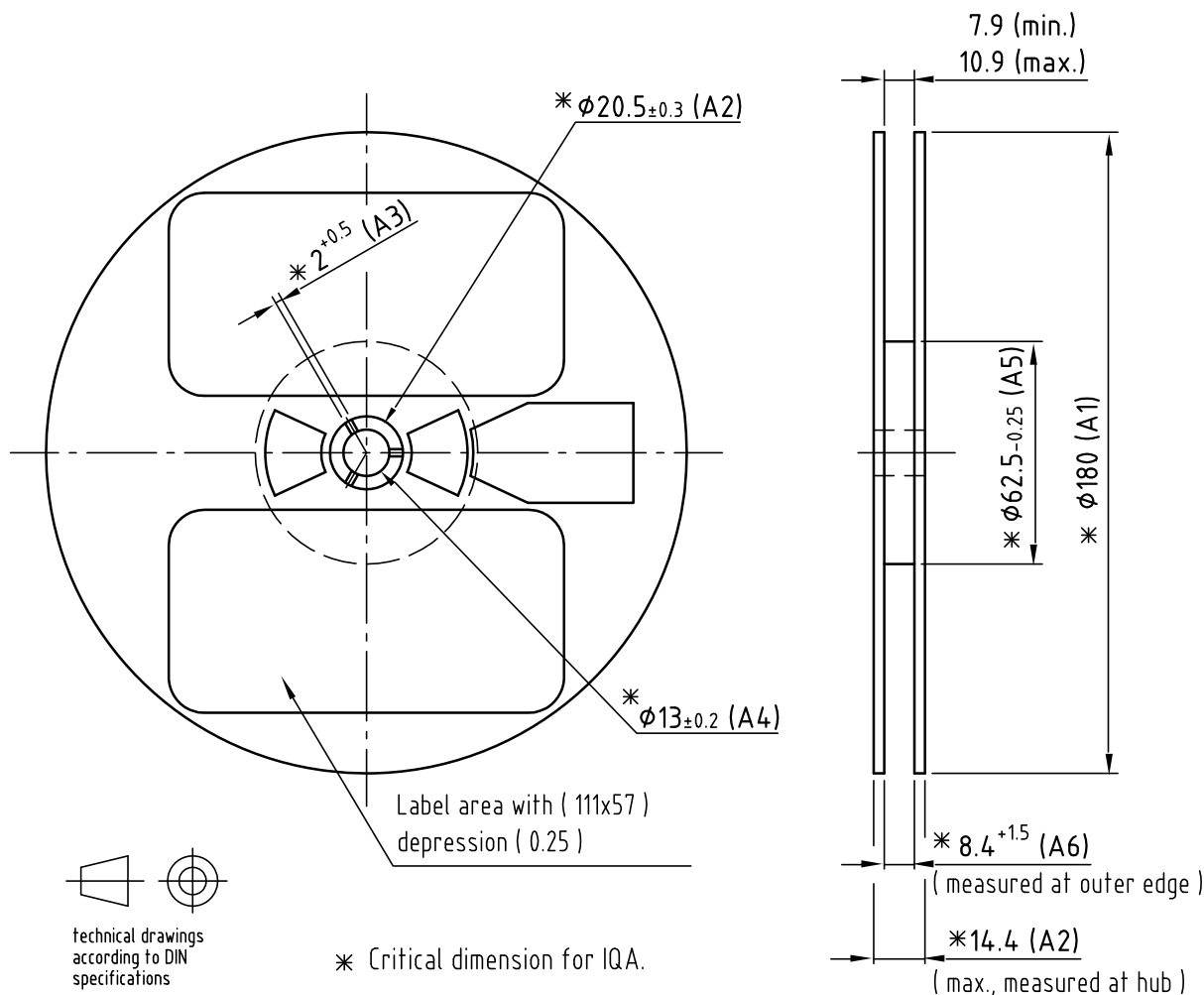


Fig. 26 - Forward Voltage vs. Ambient Temperature





## REEL DIMENSIONS in millimeters



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

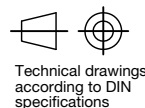
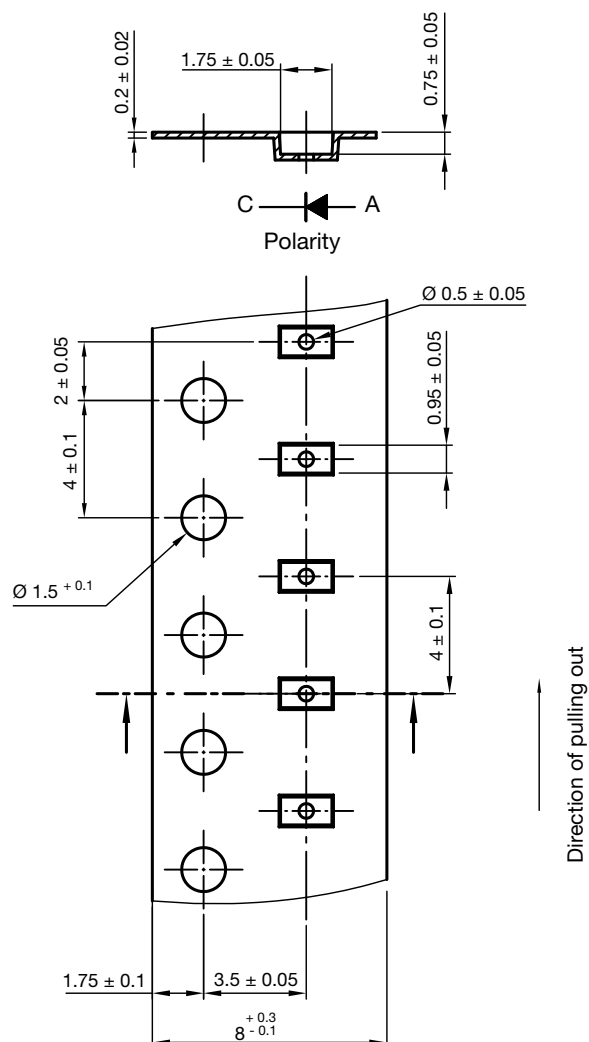
Not indicated tolerances  $\pm 0.05$

Material: black static dissipative

GS15: MOQ = 5000 pcs on one reel  
(MOQ = minimum order quantity)



## TAPE DIMENSIONS in millimeters

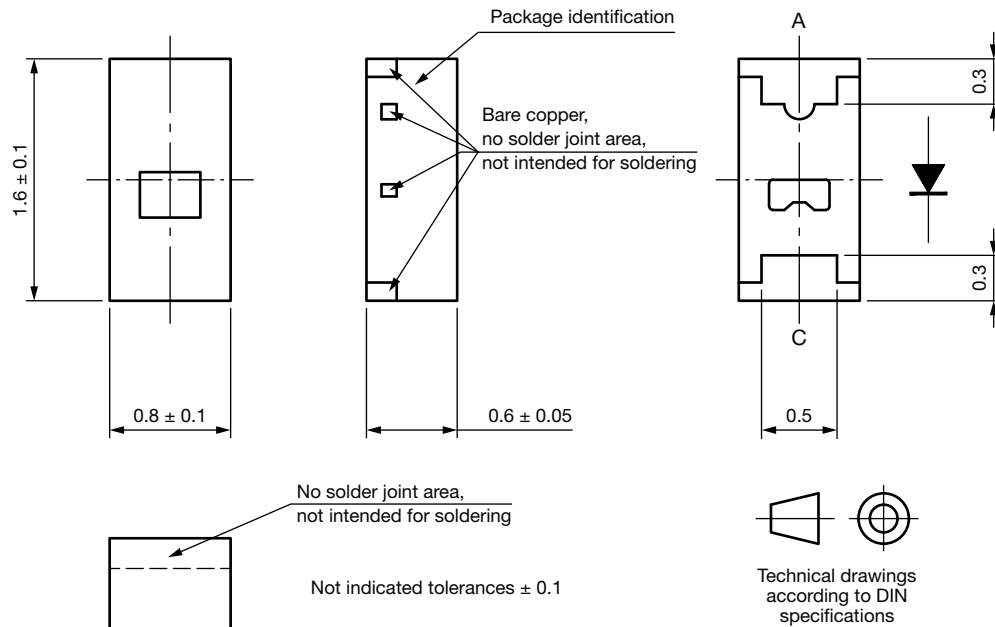


Not indicated tolerances  $\pm 0.05$   
Material: Conductive black PC

Drawing-No.: 9.700-5290.01-4  
Issue: 3; 24.09.13

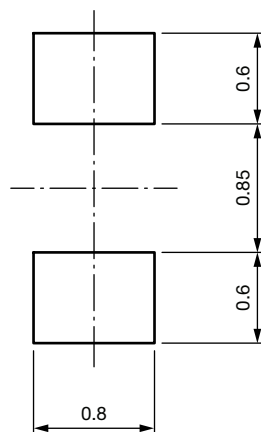


## PACKAGE DIMENSIONS in millimeters

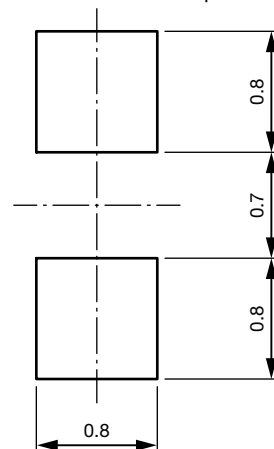


Drawing-No.: 6.541-5056.01-4  
Issue: prelim. 4; 10.05.2023

Recommended solder pad



Alternative solder pad, compatible to other 0603 ChipLEDs



### Note

- Solder joints are only formed on the bottom of the component and solder fillet will not be observable on the sides of the component



## SOLDERING PROFILE

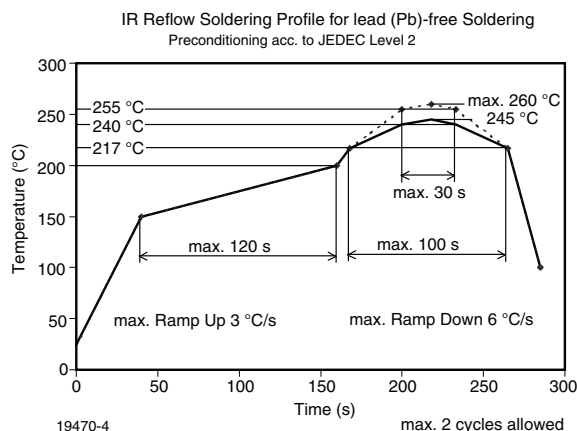
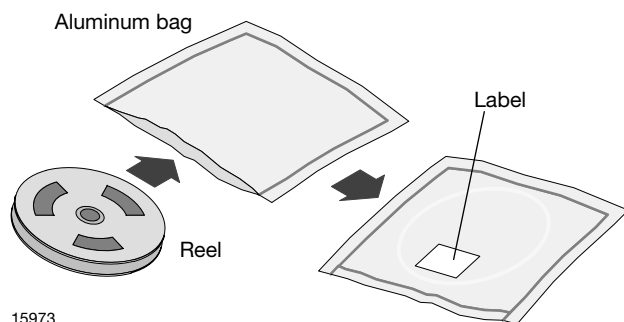


Fig. 33 - Vishay Lead (Pb)-free Reflow Soldering Profile  
(acc. to J-STD-020C)

## DRY PACKING

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



## FINAL PACKING

A cardboard outer box is used for shipping purposes.

## HANDLING REMARK

Since a ChipLED is very tiny and light, it can become more vulnerable to sticking on the cover tape during the assembly process. Therefore it is highly recommended to consider precautionary actions addressing the triboelectric effect as described in the application note: "How to Avoid ChipLEDs Sticking to Cover Tape During Automated Tape-and-Reel Assembly" ([www.vishay.com/doc?84998](http://www.vishay.com/doc?84998)).

## 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:

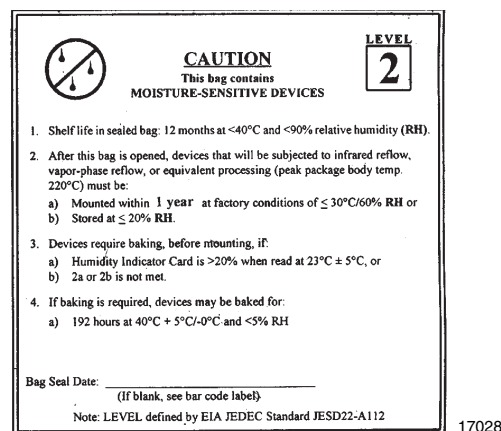
- Storage temperature 10 °C to 30 °C
- Storage humidity ≤ 60 % RH max.

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.



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. 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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