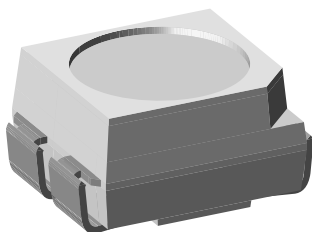


## Bicolor SMD LED



19211

### DESCRIPTION

These devices have been designed to meet the increasing demand for surface mounting technology.

The package of the VLMKG3400 is the PLCC-4.

It consists of a lead frame which is embedded in a white thermoplast. The reflector inside this package is filled up with clear epoxy.

This SMD device consists of a red and green chip. So it is possible to choose the color in one device.

### PRODUCT GROUP AND PACKAGE DATA

- Product group: LED
- Package: SMD PLCC-4
- Product series: bicolor
- Angle of half intensity:  $\pm 60^\circ$

### FEATURES

- SMD LED with exceptional brightness
- Multicolored
- Luminous intensity categorized
- EIA and ICE standard package
- Compatible with automatic placement equipment
- Compatible with IR reflow, vapor phase and wave soldering processes according to CECC 00802 and J-STD-020
- Available in 8 mm tape
- Low profile package
- Non-diffused lens: excellent for coupling to light pipes and backlighting
- Low power consumption
- Luminous intensity ratio in one packaging unit  $I_{Vmax}/I_{Vmin.} \leq 1.6$
- Preconditioning according to JEDEC® level 4
- ESD-withstand voltage: up to 2 kV according to JESD22-A114-B
- Material categorization: for definitions of compliance please see [www.vishay.com/doc?99912](http://www.vishay.com/doc?99912)



**RoHS**  
COMPLIANT  
HALOGEN  
**FREE**  
**GREEN**  
(5-2008)

### APPLICATIONS

- Telecommunication: indicator and backlighting in telephone and fax
- Indicator and backlight in office equipment
- Flat backlight for LCDs, switches, and symbols
- General use

### PARTS TABLE

| PART           | COLOR     | LUMINOUS INTENSITY (mcd) |      |      | at $I_F$ (mA) | WAVELENGTH (nm) |      |      | at $I_F$ (mA) | FORWARD VOLTAGE (V) |      |      | at $I_F$ (mA) | TECHNOLOGY      |
|----------------|-----------|--------------------------|------|------|---------------|-----------------|------|------|---------------|---------------------|------|------|---------------|-----------------|
|                |           | MIN.                     | TYP. | MAX. |               | MIN.            | TYP. | MAX. |               | MIN.                | TYP. | MAX. |               |                 |
| VLMKG3400-GS08 | Super red | 56                       | -    | 140  | 20            | 627             | 633  | 639  | 20            | -                   | 1.9  | 2.6  | 20            | AlInGaP on GaAs |
|                | Green     | 35.5                     | -    | 90   | 20            | 564             | 570  | 575  | 20            | -                   | 2.0  | 2.6  | 20            | AlInGaP on GaAs |
| VLMKG3400-GS18 | Super red | 56                       | -    | 140  | 20            | 627             | 633  | 639  | 20            | -                   | 1.9  | 2.6  | 20            | AlInGaP on GaAs |
|                | Green     | 35.5                     | -    | 90   | 20            | 564             | 570  | 575  | 20            | -                   | 2.0  | 2.6  | 20            | AlInGaP on GaAs |

**ABSOLUTE MAXIMUM RATINGS** ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ , unless otherwise specified)**VLMKG3400**

| PARAMETER                             | TEST CONDITION                                       |                         | SYMBOL     | VALUE                              | UNIT               |
|---------------------------------------|------------------------------------------------------|-------------------------|------------|------------------------------------|--------------------|
| Reverse voltage per diode             |                                                      |                         | $V_R$      | Not designed for reverse operation | V                  |
| DC forward current per diode          | $T_{amb} \leq 80\text{ }^{\circ}\text{C}$            | 1 chip on               | $I_F$      | 30                                 | mA                 |
| Surge forward current per diode       |                                                      |                         | $I_{FSM}$  | 0.1                                | A                  |
| Power dissipation per diode           |                                                      |                         | $P_V$      | 80                                 | mW                 |
| Junction temperature                  |                                                      |                         | $T_j$      | 125                                | $^{\circ}\text{C}$ |
| Operating temperature range           |                                                      |                         | $T_{amb}$  | -40 to +100                        | $^{\circ}\text{C}$ |
| Storage temperature range             |                                                      |                         | $T_{stg}$  | -40 to +100                        | $^{\circ}\text{C}$ |
| Thermal resistance junction / ambient | Mounted on PC board (pad size > 16 mm <sup>2</sup> ) | 1 chip on<br>2 chips on | $R_{thJA}$ | 560<br>780                         | K/W                |

**OPTICAL AND ELECTRICAL CHARACTERISTICS** ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ , unless otherwise specified)**VLMKG3400, SUPER RED**

| PARAMETER               | TEST CONDITION                          | PART      | SYMBOL      | MIN. | TYP.     | MAX. | UNIT          |
|-------------------------|-----------------------------------------|-----------|-------------|------|----------|------|---------------|
| Luminous intensity      | $I_F = 20\text{ mA}$                    | VLMKG3400 | $I_V$       | 56   | -        | 140  | mcd           |
| Dominant wavelength     | $I_F = 20\text{ mA}$                    |           | $\lambda_d$ | 627  | 633      | 639  | nm            |
| Peak wavelength         | $I_F = 20\text{ mA}$                    |           | $\lambda_p$ | -    | 643      | -    | nm            |
| Angle of half intensity | $I_F = 20\text{ mA}$                    |           | $\phi$      | -    | $\pm 60$ | -    | $^{\circ}$    |
| Forward voltage         | $I_F = 20\text{ mA}$                    |           | $V_F$       | -    | 1.9      | 2.6  | V             |
| Reverse current         | $V_R = 5\text{ V}$                      |           | $I_R$       | -    | -        | 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)**VLMKG3400, GREEN**

| PARAMETER               | TEST CONDITION                          | PART      | SYMBOL      | MIN. | TYP.     | MAX. | UNIT          |
|-------------------------|-----------------------------------------|-----------|-------------|------|----------|------|---------------|
| Luminous intensity      | $I_F = 20\text{ mA}$                    | VLMKG3400 | $I_V$       | 35.5 | -        | 90   | 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 | $I_F = 20\text{ mA}$                    |           | $\phi$      | -    | $\pm 60$ | -    | $^{\circ}$    |
| Forward voltage         | $I_F = 20\text{ mA}$                    |           | $V_F$       | -    | 2.0      | 2.6  | V             |
| Reverse current         | $V_R = 5\text{ V}$                      |           | $I_R$       | -    | -        | 10   | $\mu\text{A}$ |
| Junction capacitance    | $V_R = 0\text{ V}$ , $f = 1\text{ MHz}$ |           | $C_j$       | -    | 15       | -    | pF            |

**CROSSING TABLE**

| VISHAY    | OSRAM   |
|-----------|---------|
| VLMKG3400 | LSGT676 |

**LUMINOUS INTENSITY CLASSIFICATION AND GROUP COMBINATIONS, VLMKG3400**

|       |                          | SUPER RED              |                        |                         |                          |
|-------|--------------------------|------------------------|------------------------|-------------------------|--------------------------|
|       |                          | P2<br>56 mcd to 71 mcd | Q1<br>71 mcd to 90 mcd | Q2<br>90 mcd to 112 mcd | R1<br>112 mcd to 140 mcd |
| GREEN | N2<br>35.5 mcd to 45 mcd | VLMKG3400              | VLMKG3400              | VLMKG3400               | VLMKG3400                |
|       | P1<br>45 mcd to 56 mcd   | VLMKG3400              | VLMKG3400              | VLMKG3400               | VLMKG3400                |
|       | P2<br>56 mcd to 71 mcd   | VLMKG3400              | VLMKG3400              | VLMKG3400               | VLMKG3400                |
|       | Q1<br>71 mcd to 90 mcd   | VLMKG3400              | VLMKG3400              | VLMKG3400               | VLMKG3400                |

**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.

**COLOR CLASSIFICATION**

| GROUP | DOMINANT WAVELENGTH (nm) |      |
|-------|--------------------------|------|
|       | GREEN                    |      |
|       | MIN.                     | MAX. |
| 4     | 564                      | 567  |
| 5     | 566                      | 569  |
| 6     | 568                      | 571  |
| 7     | 570                      | 573  |
| 8     | 572                      | 575  |

**Note**

- Wavelengths are tested at a current pulse duration of 25 ms.

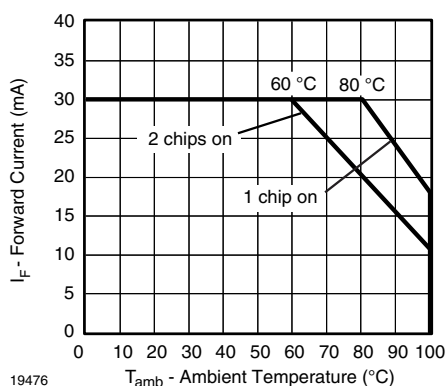
**TYPICAL CHARACTERISTICS** ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ , unless otherwise specified)


Fig. 1 - Forward Current vs. Ambient Temperature

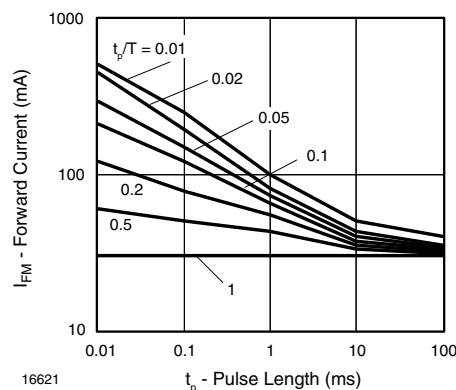


Fig. 2 - Forward Current vs. Pulse Duration

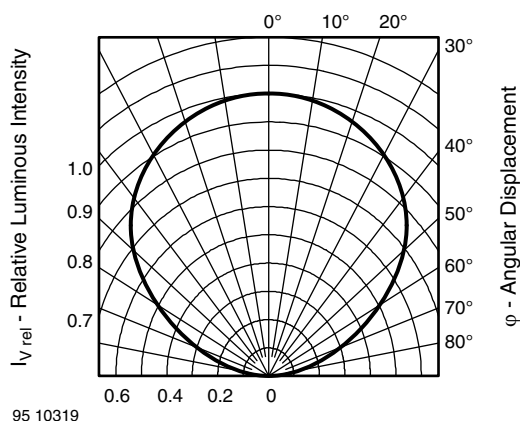


Fig. 3 - Relative Luminous Intensity vs. Angular Displacement

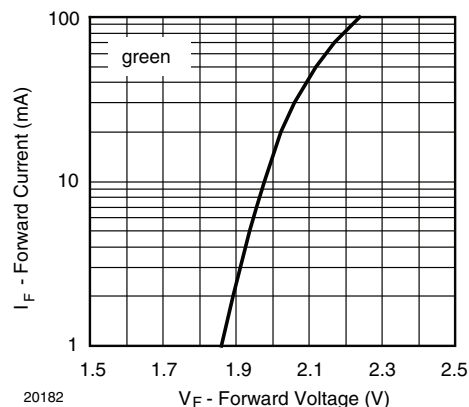


Fig. 6 - Relative Forward Voltage vs. Ambient Temperature

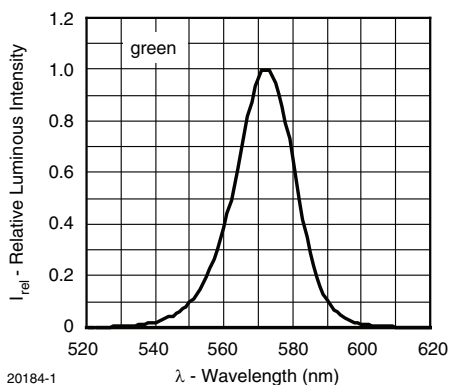


Fig. 4 - Relative Intensity vs. Wavelength

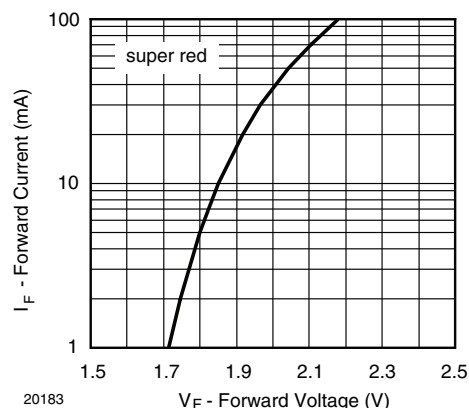


Fig. 7 - Relative Forward Voltage vs. Ambient Temperature

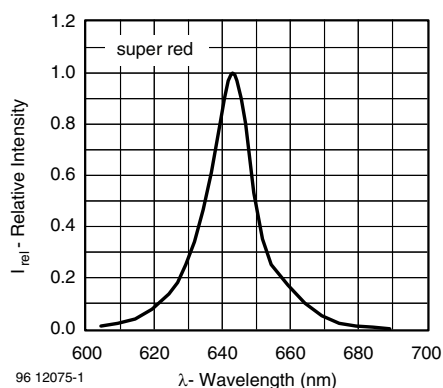


Fig. 5 - Relative Intensity vs. Wavelength

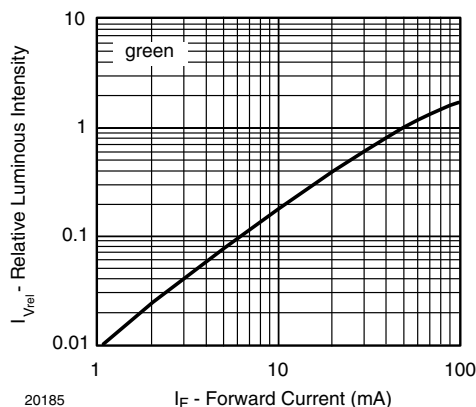


Fig. 8 - Relative Luminous Intensity vs. Forward Current

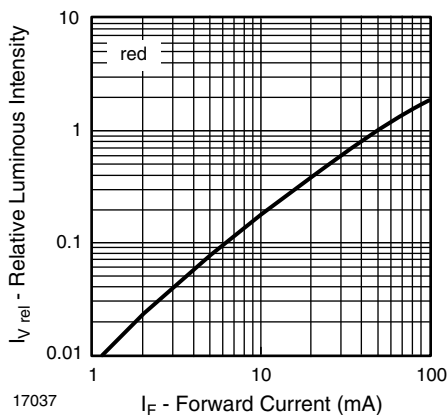


Fig. 9 - Relative Luminous Intensity vs. Forward Current

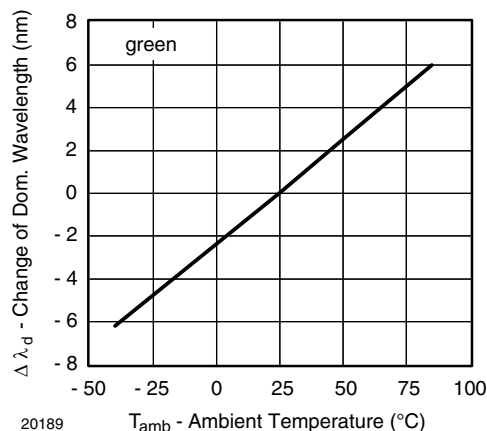


Fig. 12 - Change of Dominant Wavelength vs. Ambient Temperature

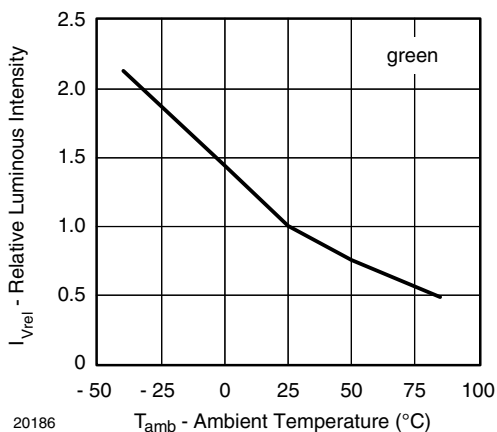


Fig. 10 - Relative Luminous Intensity vs. Ambient Temperature

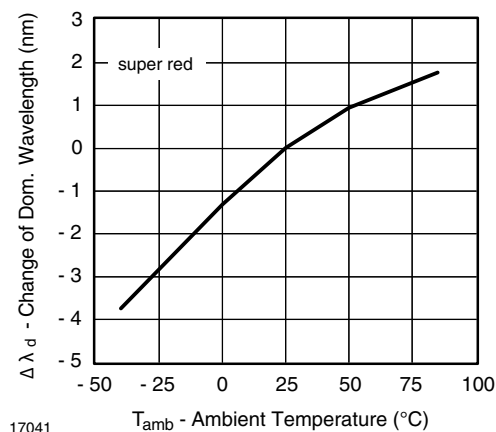


Fig. 13 - Change of Dominant Wavelength vs. Ambient Temperature

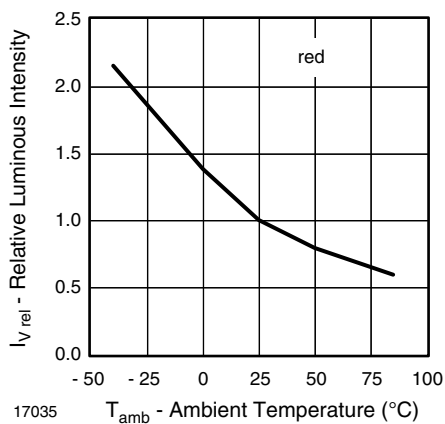


Fig. 11 - Relative Luminous Intensity vs. Ambient Temperature

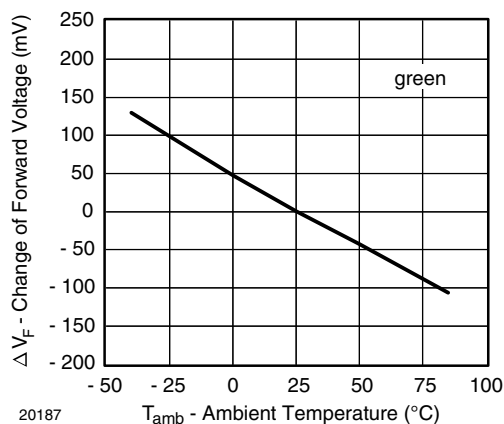


Fig. 14 - Change of Forward Voltage vs. Ambient Temperature

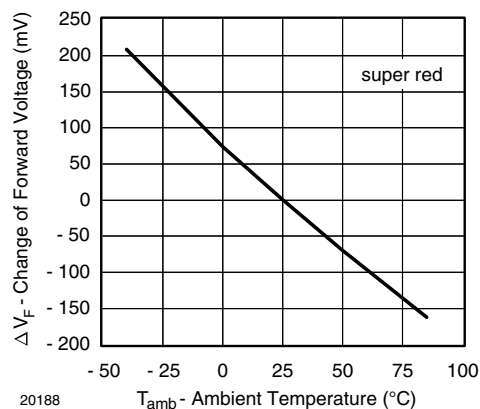
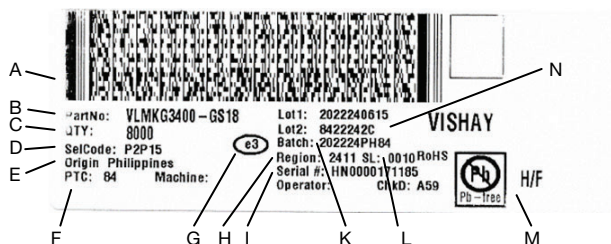


Fig. 15 - Change of Forward Voltage vs. Ambient Temperature

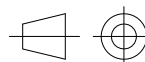
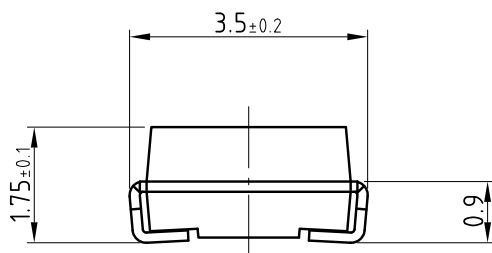
### BAR CODE PRODUCT LABEL (example)



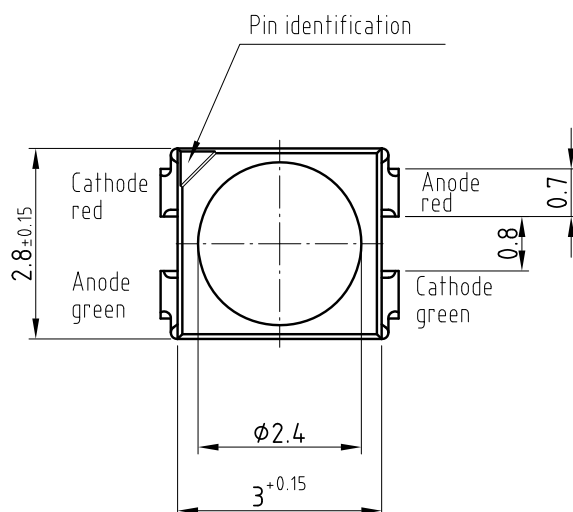
- A. 2D barcode
- B. Part No: Vishay part number
- C. QTY: quantity
- D. SelCode: selection bin code
- E. Country of origin
- F. PTC: production plant code
- G. Termination finish
- H. Region code
- I. Serial#: serial number
- K. Batch number: year, week, country code, plant code
- L. SL: storage location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



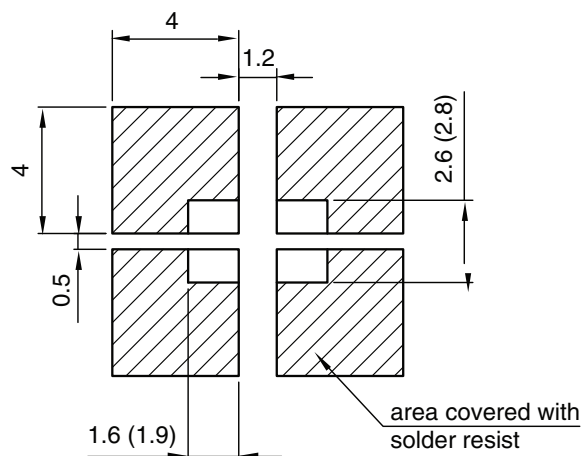
**PACKAGE DIMENSIONS** in millimeters



technical drawings  
according to DIN  
specifications



**Mounting Pad Layout**



Dimensions: IR and Vaporphase  
(Wave Soldering)

Drawing-No.: 6.541-5057.02-4

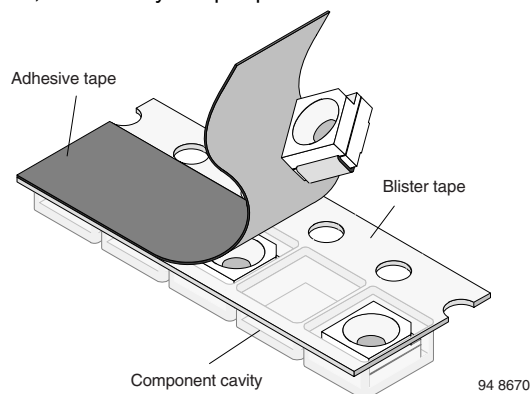
Issue: 2; 30.05.07

20190

## METHOD OF TAPING / POLARITY AND TAPE AND REEL

### SMD LED (VLM.3 - SERIES)

Vishay's LEDs in SMD packages are available in an antistatic 8 mm blister tape (in accordance with DIN IEC 40 (CO) 564) for automatic component insertion. The blister tape is a plastic strip with impressed component cavities, covered by a top tape.



### REEL PACKAGE DIMENSION IN MILLIMETERS FOR SMD LEDs, TAPE OPTION GS18 (= 8000 PCS.) PREFERRED

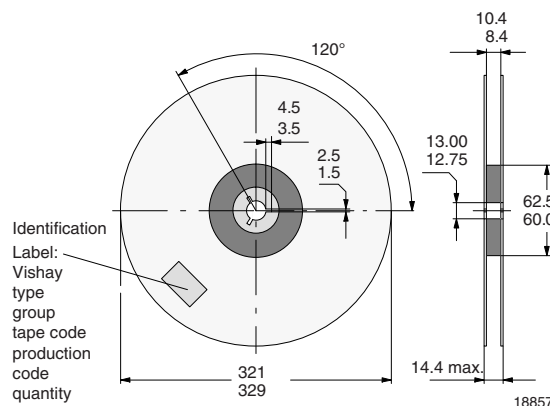


Fig. 18 - Reel Dimensions - GS18

### TAPING OF VLM.3...

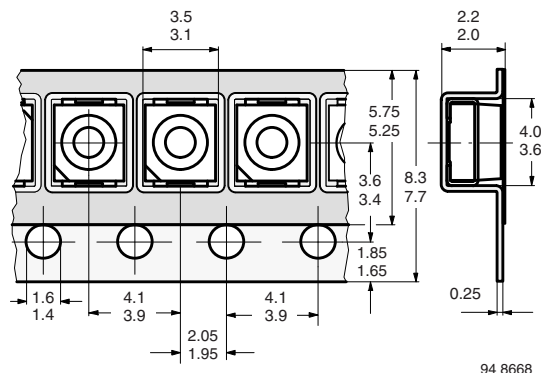


Fig. 16 - Tape Dimensions in mm for PLCC-2

### REEL PACKAGE DIMENSION IN MILLIMETERS FOR SMD LEDs, TAPE OPTION GS08 (= 1500 PCS.)

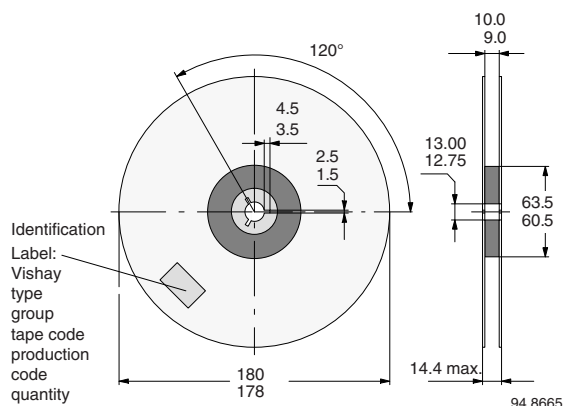


Fig. 17 - Reel Dimensions - GS08

### SOLDERING PROFILE

IR Reflow Soldering Profile for lead (Pb)-free soldering  
Preconditioning acc. to JEDEC level 4

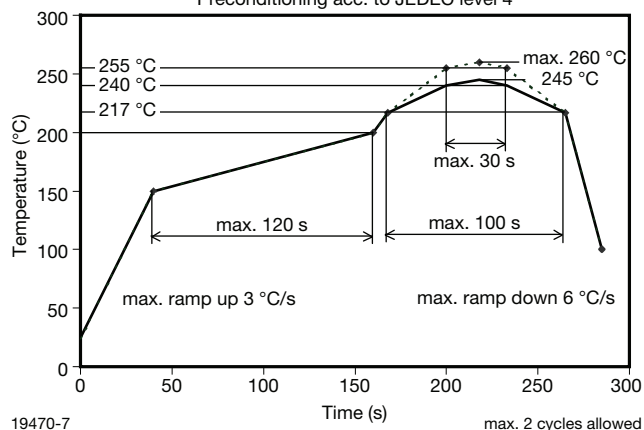
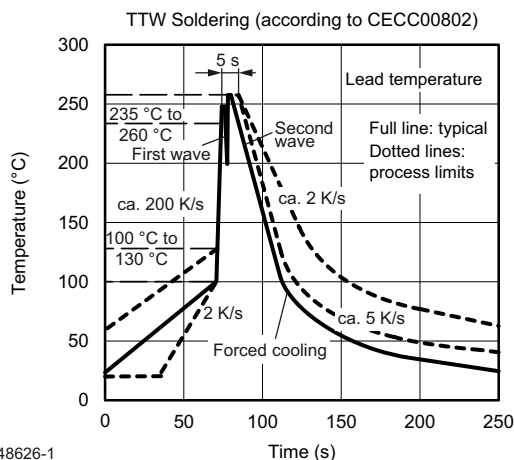


Fig. 19 - Vishay Lead (Pb)-free Reflow Soldering Profile (acc. to J-STD-020)

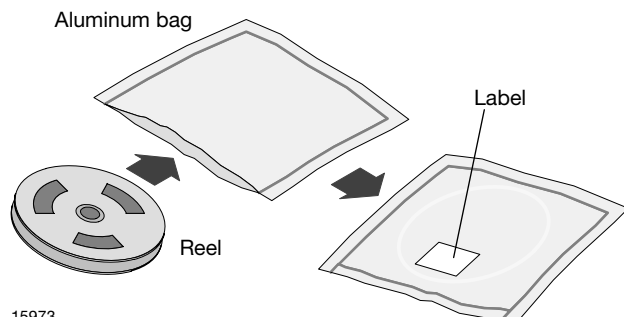


948626-1

Fig. 20 - Double Wave Soldering of Opto Devices (all Packages)

## DRY PACKING

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



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 72 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 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 4 label is included on all dry bags.

|                                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                          |
|-------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------|
|                                                       | <b>CAUTION</b><br>This bag contains<br><b>MOISTURE-SENSITIVE DEVICES</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | <b>LEVEL</b><br><b>4</b> |
|                                                       | <ol style="list-style-type: none"> <li>Shelf life in sealed bag: 12 months at &lt; 40 °C and &lt; 90 % relative humidity (RH)</li> <li>After this bag is opened, devices that will be subjected to infrared reflow, vapor-phase reflow, or equivalent processing (peak package body temp. 260 °C) must be:               <ol style="list-style-type: none"> <li>Mounted within 72 hours at factory condition of &lt; 30 °C / 60 % RH or</li> <li>Stored at ≤ 10 % RH</li> </ol> </li> <li>Devices require baking before mounting if:<br/>Humidity Indicator Card is &gt; 10 % when read at 23 °C ± 5 °C or 2a. or 2b. is not met.</li> <li>If baking is required, devices may be baked for:<br/>192 hours at 40 °C + 5 °C / - 0 °C and &lt; 5 % RH (dry air / nitrogen) or<br/>96 hours at 60 °C ± 5 °C and &lt; 5 % RH for all device containers or<br/>24 hours at 100 °C ± 5 °C not suitable for reels or tubes</li> </ol> |                          |
| Bag Seal Date: _____<br>(If blank, see barcode label) |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                          |
| Note: Level defined by EIA JEDEC Standard JESD22-A113 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                          |

22860

Example of JESD22-A112 level 4 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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