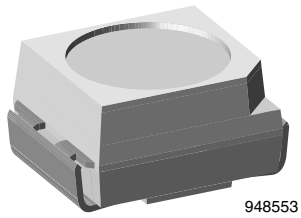
# Standard SMD LED PLCC-2


948553

## FEATURES

- SMD LEDs with exceptional brightness
- Luminous intensity categorized
- Compatible with automatic placement equipment
- EIA and ICE standard package
- Compatible with infrared, vapor phase and wave solder 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 2a
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912

Pb-free
e3
RoHS COMPLIANT
HALOGEN FREE
GREEN (5-2008)

## DESCRIPTION

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

The package of the VLM.310. is the PLCC-2.

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

## PRODUCT GROUP AND PACKAGE DATA

- Product group: LED
- Package: SMD PLCC-2
- Product series: standard
- Angle of half intensity: ± 60°

## APPLICATIONS

- Telecommunication: indicator and backlighting in telephone and fax
- Indicator and backlight for audio and video equipment
- 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. | | |
| VLMH3100-GS08 | Amber | 2.8 | 12 | - | 10 | 612 | 619 | 625 | 10 | - | 2 | 2.8 | 20 | GaAsP on GaP |
| VLMH3100-GS18 | Amber | 2.8 | 12 | - | 10 | 612 | 619 | 625 | 10 | - | 2 | 2.8 | 20 | GaAsP on GaP |
| VLMH3102-GS08 | Amber | 7.1 | 12 | 18 | 10 | 612 | 619 | 625 | 10 | - | 2 | 2.8 | 20 | GaAsP on GaP |
| VLMO3100-GS08 | Soft orange | 2.8 | 8 | - | 10 | 598 | 605 | 611 | 10 | - | 2 | 2.8 | 20 | GaAsP on GaP |
| VLMY3100-GS08 | Yellow | 2.8 | 11 | | 10 | 581 | 588 | 594 | 10 | - | 2.1 | 2.8 | 20 | GaAsP on GaP |
| VLMY3101-GS08 | Yellow | 4.5 | 10 | 11.2 | 10 | 581 | 588 | 594 | 10 | - | 2.1 | 2.8 | 20 | GaAsP on GaP |
| VLMY3102-GS08 | Yellow | 7.1 | 11 | 18 | 10 | 581 | 588 | 594 | 10 | - | 2.1 | 2.8 | 20 | GaAsP on GaP |
| VLMG3100-GS08 | Green | 4.5 | 16 | - | 10 | 562 | 572 | 575 | 10 | - | 2.1 | 2.8 | 20 | GaP on GaP |
| VLMG3100-GS18 | Green | 4.5 | 16 | - | 10 | 562 | 572 | 575 | 10 | - | 2.1 | 2.8 | 20 | GaP on GaP |
| VLMG3102-GS08 | Green | 11.2 | 16 | 18 | 10 | 562 | 572 | 575 | 10 | - | 2.1 | 2.8 | 20 | GaP on GaP |
| VLMG3105-GS08 | Green | 7.1 | 16 | 18 | 10 | 562 | 572 | 575 | 10 | - | 2.1 | 2.8 | 20 | GaP on GaP |


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**ABSOLUTE MAXIMUM RATINGS** ($T_{amb}$ = 25 °C, unless otherwise specified)
**VLMG310., VLMH310., VLMO310., VLMY310.**

| PARAMETER | TEST CONDITION | SYMBOL | VALUE | UNIT |
|---|---|---|---|---|
| Reverse voltage | | $V_R$ | 6 | V |
| DC forward current | $T_{amb} \leq 74$ °C | $I_F$ | 20 | mA |
| Surge forward current | $t_p \leq 10$ µs | $I_{FSM}$ | 0.34 | A |
| Power dissipation | | $P_V$ | 56 | mW |
| Junction temperature | | $T_j$ | 100 | °C |
| Operating temperature range | | $T_{amb}$ | -40 to +100 | °C |
| Storage temperature range | | $T_{stg}$ | -40 to +100 | °C |
| Soldering temperature | t ≤ 5 s | $T_{sd}$ | 260 | °C |
| Thermal resistance junction to ambient | Mounted on PC board (pad size > 16 mm²) | $R_{thJA}$ | 400 | K/W |

**OPTICAL AND ELECTRICAL CHARACTERISTICS** ($T_{amb}$ = 25 °C, unless otherwise specified)
**VLMH310., AMBER**

| PARAMETER | TEST CONDITION | PART | SYMBOL | MIN. | TYP. | MAX. | UNIT |
|---|---|---|---|---|---|---|---|
| Luminous intensity (1) | $I_F$ = 10 mA | VLMH3100 | $I_V$ | 2.8 | 12 | - | mcd |
| | | VLMH3102 | $I_V$ | 7.1 | 12 | 18 | mcd |
| Dominant wavelength | $I_F$ = 10 mA | | $\lambda_d$ | 612 | 619 | 625 | nm |
| Peak wavelength | $I_F$ = 10 mA | | $\lambda_p$ | - | 635 | - | nm |
| Angle of half intensity | $I_F$ = 10 mA | | φ | - | ± 60 | - | ° |
| Forward voltage | $I_F$ = 20 mA | | $V_F$ | - | 2 | 2.8 | V |
| Reverse current | $V_R$ = 6 V | | $I_R$ | - | - | 10 | µA |
| Junction capacitance | $V_R$ = 0 V, f = 1 MHz | | $C_j$ | - | 15 | - | pF |

**Note**
(1) In one packing unit $I_{Vmax.}/I_{Vmin.} \leq 1.6$

**OPTICAL AND ELECTRICAL CHARACTERISTICS** ($T_{amb}$ = 25 °C, unless otherwise specified)
**VLMO310., SOFT ORANGE**

| PARAMETER | TEST CONDITION | PART | SYMBOL | MIN. | TYP. | MAX. | UNIT |
|---|---|---|---|---|---|---|---|
| Luminous intensity (1) | $I_F$ = 10 mA | VLMO3100 | $I_V$ | 2.8 | 8 | - | mcd |
| Dominant wavelength | $I_F$ = 10 mA | | $\lambda_d$ | 598 | 605 | 611 | nm |
| Peak wavelength | $I_F$ = 10 mA | | $\lambda_p$ | - | 605 | - | nm |
| Angle of half intensity | $I_F$ = 10 mA | | φ | - | ± 60 | - | ° |
| Forward voltage | $I_F$ = 20 mA | | $V_F$ | - | 2 | 2.8 | V |
| Reverse current | $V_R$ = 6 V | | $I_R$ | - | - | 10 | µA |
| Junction capacitance | $V_R$ = 0 V, f = 1 MHz | | $C_j$ | - | 15 | - | pF |

**Note**
(1) In one packing unit $I_{Vmax.}/I_{Vmin.} \leq 1.6$


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## OPTICAL AND ELECTRICAL CHARACTERISTICS ($T_{amb}$ = 25 °C, unless otherwise specified)
## VLMY310., YELLOW

| PARAMETER | TEST CONDITION | PART | SYMBOL | MIN. | TYP. | MAX. | UNIT |
|---|---|---|---|---|---|---|---|
| Luminous intensity (1) | $I_F$ = 10 mA | VLMY3100 | $I_V$ | 2.8 | 11 | | mcd |
| | | VLMY3101 | $I_V$ | 4.5 | 10 | 11.2 | mcd |
| | | VLMY3102 | $I_V$ | 7.1 | 11 | 18 | mcd |
| Dominant wavelength | $I_F$ = 10 mA | | $\lambda_d$ | 581 | 588 | 594 | nm |
| Peak wavelength | $I_F$ = 10 mA | | $\lambda_p$ | - | 585 | - | nm |
| Angle of half intensity | $I_F$ = 10 mA | | φ | - | ± 60 | - | ° |
| Forward voltage | $I_F$ = 20 mA | | $V_F$ | - | 2.1 | 2.8 | V |
| Reverse current | $V_R$ = 6 V | | $I_R$ | - | - | 10 | µA |
| Junction capacitance | $V_R$ = 0 V, f = 1 MHz | | $C_j$ | - | 15 | - | pF |

**Note**

(1) In one packing unit $I_{Vmax.}/I_{Vmin.} \leq 1.6$

## OPTICAL AND ELECTRICAL CHARACTERISTICS ($T_{amb}$ = 25 °C, unless otherwise specified)
## VLMG310., GREEN

| PARAMETER | TEST CONDITION | PART | SYMBOL | MIN. | TYP. | MAX. | UNIT |
|---|---|---|---|---|---|---|---|
| Luminous intensity (1) | $I_F$ = 10 mA | VLMG3100 | $I_V$ | 4.5 | 16 | - | mcd |
| | | VLMG3102 | $I_V$ | 11.2 | 16 | 18 | mcd |
| | | VLMG3105 | $I_V$ | 7.1 | 16 | 18 | mcd |
| Dominant wavelength | $I_F$ = 10 mA | | $\lambda_d$ | 562 | 572 | 575 | nm |
| Peak wavelength | $I_F$ = 10 mA | | $\lambda_p$ | - | 565 | - | nm |
| Angle of half intensity | $I_F$ = 10 mA | | φ | - | ± 60 | - | ° |
| Forward voltage | $I_F$ = 20 mA | | $V_F$ | - | 2.1 | 2.8 | V |
| Reverse current | $V_R$ = 6 V | | $I_R$ | - | - | 10 | µA |
| Junction capacitance | $V_R$ = 0 V, f = 1 MHz | | - | - | 15 | - | pF |

**Note**

(1) In one packing unit $I_{Vmax.}/I_{Vmin.} \leq 1.6$

## COLOR CALSSIFICATION

| GROUP | YELLOW | | GREEN | | SOFT ORANGE | |
|---|---|---|---|---|---|---|
| | DOM. WAVELENGTH (nm) | | | | DOM. WAVELENGTH (nm) | |
| | MIN. | MAX. | MIN. | MAX. | MIN. | MAX. |
| 0 | - | - | - | - | - | - |
| 1 | 581 | 584 | - | - | 598 | 601 |
| 2 | 583 | 586 | - | - | 600 | 603 |
| 3 | 585 | 588 | - | - | 602 | 605 |
| 4 | 587 | 590 | 564 | 567 | 604 | 607 |
| 5 | 589 | 592 | 566 | 569 | 606 | 609 |
| 6 | 591 | 594 | 568 | 571 | 608 | 611 |
| 7 | - | - | 570 | 573 | - | - |
| 8 | - | - | 572 | 575 | - | - |

**Note**

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


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| LUMINOUS INTENSITY CLASSIFICATION | | | |
|---|---|---|---|
| GROUP | LIGHT INTENSITY (mcd) | | |
| STANDARD | OPTIONAL | MIN. | MAX. |
| F | 1 | 1.12 | 1.40 |
| | 2 | 1.40 | 1.80 |
| G | 1 | 1.80 | 2.24 |
| | 2 | 2.24 | 2.80 |
| H | 1 | 2.80 | 3.55 |
| | 2 | 3.55 | 4.50 |
| J | 1 | 4.50 | 5.60 |
| | 2 | 5.60 | 7.10 |
| K | 1 | 7.10 | 9.00 |
| | 2 | 9.00 | 11.20 |
| L | 1 | 11.20 | 14.00 |
| | 2 | 14.00 | 18.00 |
| M | 1 | 18.00 | 22.40 |
| | 2 | 22.40 | 28.00 |

**Note**

- Luminous intensity is tested at a current pulse duration of 25 ms and an accuracy of ± 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 on any one reel.
  In order to ensure availability, single wavelength groups will not be orderable

| CROSSING TABLE | | |
|---|---|---|
| VISHAY | OSRAM | STANLEY |
| VLMH3100 | - | - |
| VLMH3101 | - | - |
| VLMH3102 | - | - |
| VLMO3100 | LOT670J1L2 | - |
| VLMO3101 | LOT670J1K2 | - |
| VLMY3100 | LYT670J1L2 | - |
| VLMY3101 | LYT670J1K2 | - |
| VLMY3102 | LYT670K1L2 | - |
| VLMG3100 | LGT670K1M2 | VYBG1104B |
| VLMG3102 | LGT670L1L2 | - |
| VLMG3105 | LGT671K1L2 | - |


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**TYPICAL CHARACTERISTICS** ($T_{amb}$ = 25 °C, unless otherwise specified)

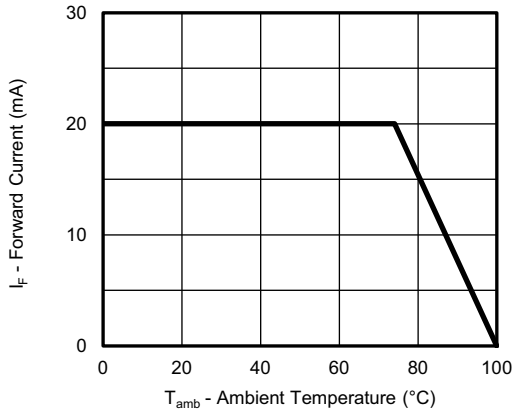



Fig. 1 - Maximum Permissible Forward Current vs. Ambient Temperature

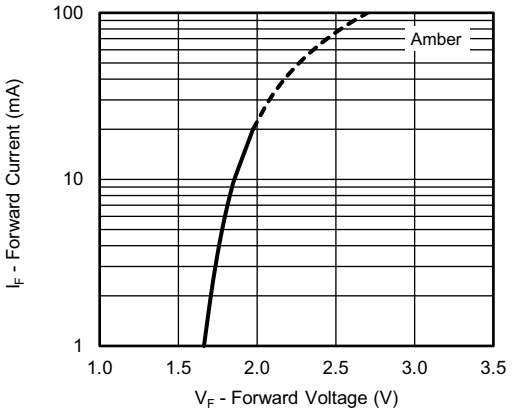



Fig. 4 - Forward Current vs. Forward Voltage

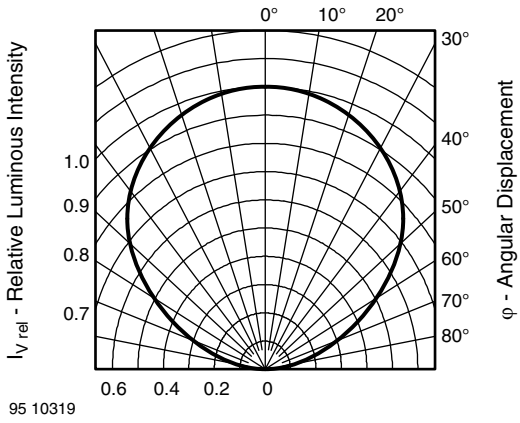



Fig. 2 - Relative Luminous Intensity vs. Angular Displacement

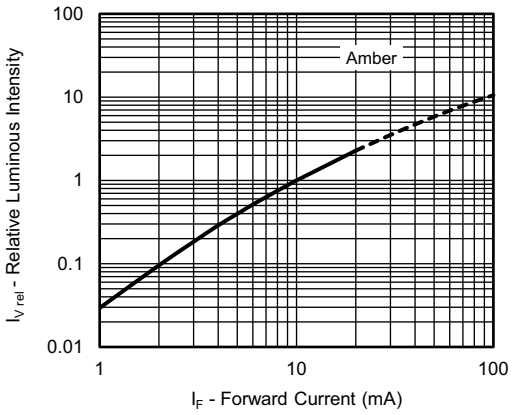



Fig. 5 - Relative Luminous Intensity vs. Forward Current

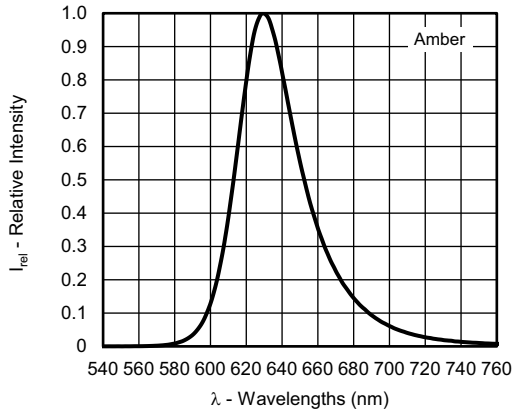



Fig. 3 - Relative Intensity vs. Wavelength

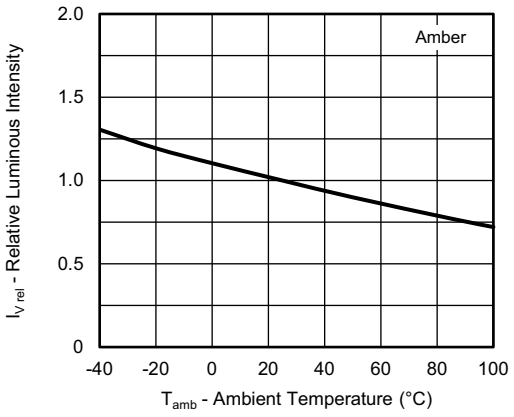



Fig. 6 - Relative Luminous Intensity vs. Ambient Temperature


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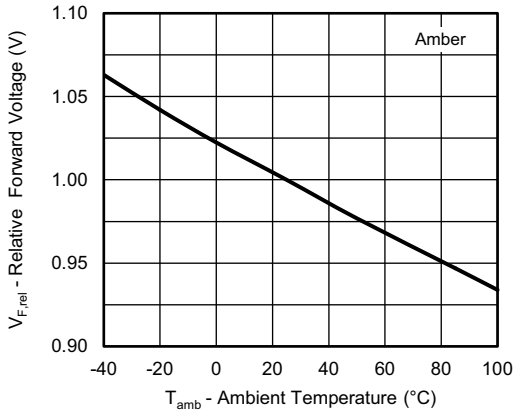



Fig. 7 - Relative Forward Voltage vs. Ambient Temperature

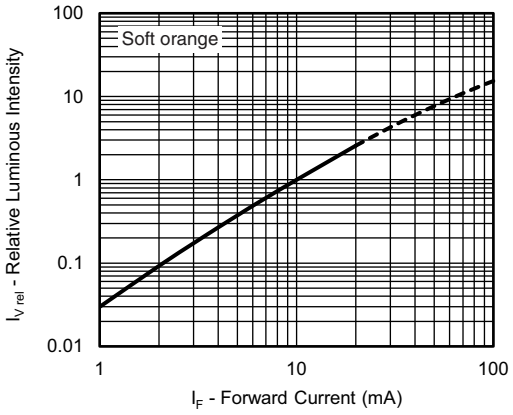



Fig. 10 - Relative Luminous Intensity vs. Forward Current

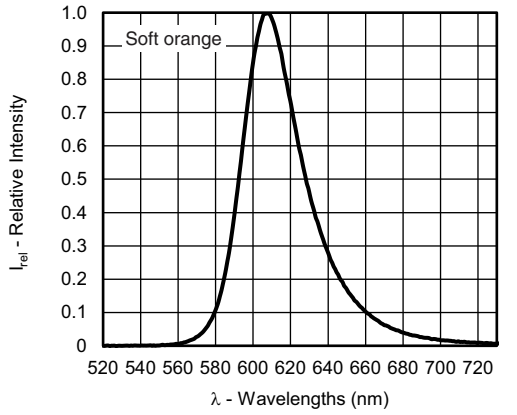



Fig. 8 - Relative Intensity vs. Wavelength

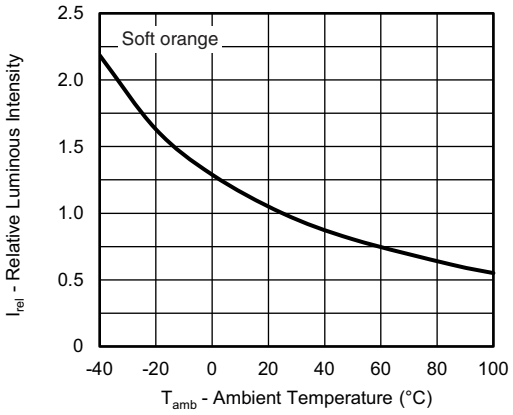



Fig. 11 - Relative Luminous Intensity vs. Ambient Temperature

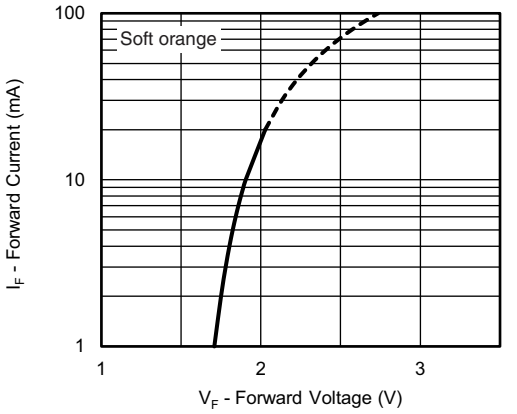



Fig. 9 - Forward Current vs. Forward Voltage

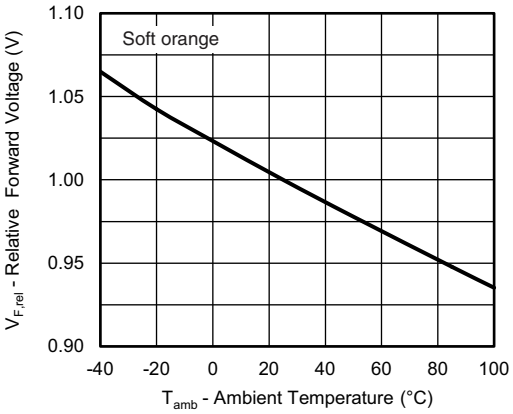



Fig. 12 - Relative Forward Voltage vs. Ambient Temperature


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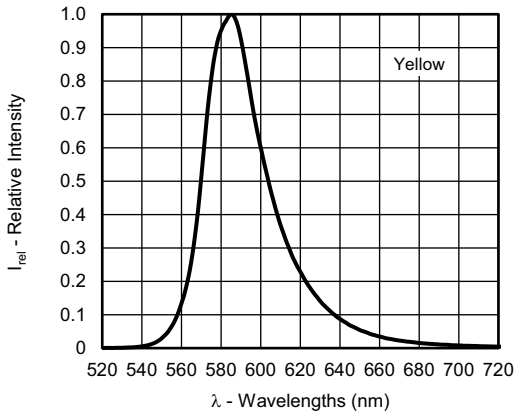



Fig. 13 - Relative Intensity vs. Wavelength

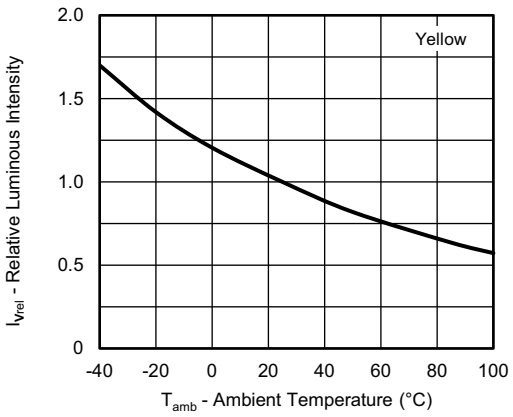



Fig. 16 - Relative Luminous Intensity vs Ambient Temperature

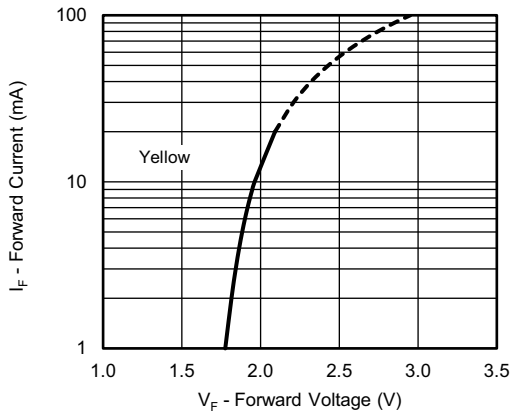



Fig. 14 - Forward Current vs. Forward Voltage

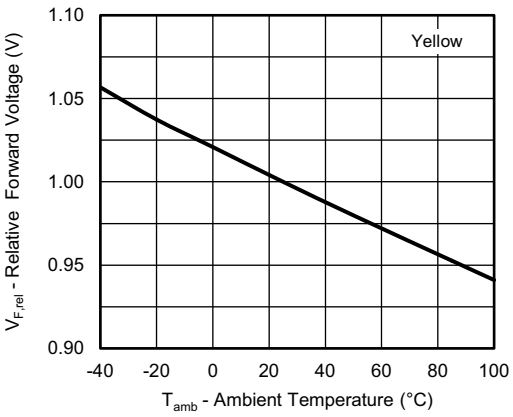



Fig. 17 - Relative Forward Voltage vs. Ambient Temperature

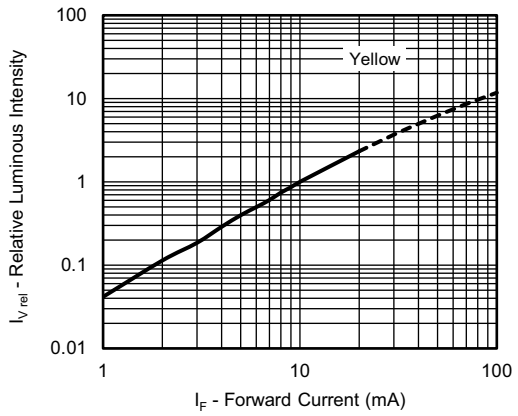



Fig. 15 - Relative Luminous Intensity vs. Forward Current

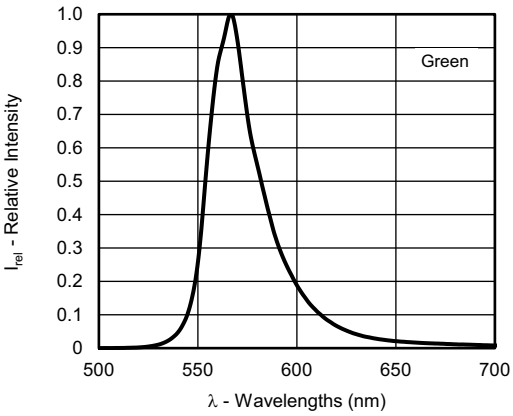



Fig. 18 - Relative Intensity vs. Wavelength


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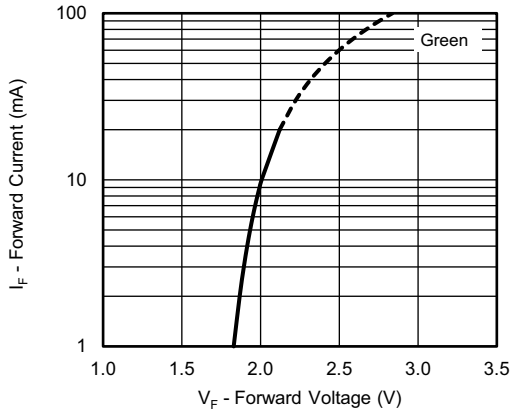



Fig. 19 - Forward Current vs. Forward Voltage

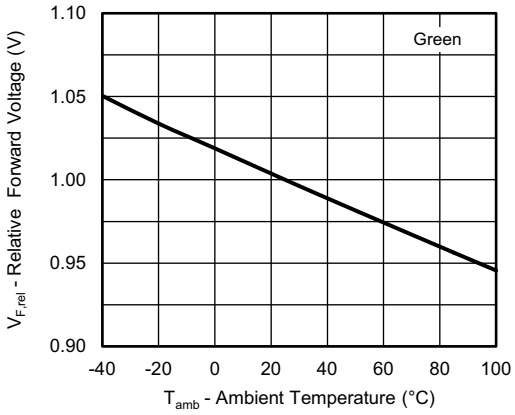



Fig. 22 - Relative Forward Voltage vs. Ambient Temperature

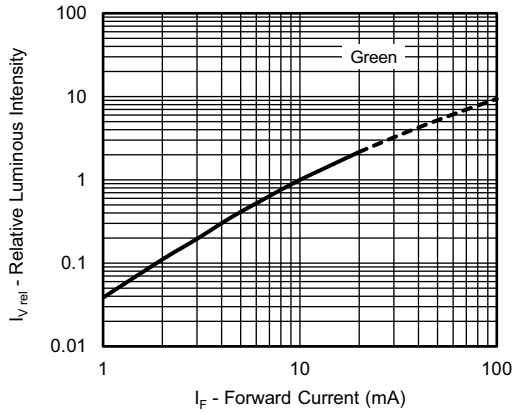



Fig. 20 - Relative Luminous Intensity vs. Forward Current

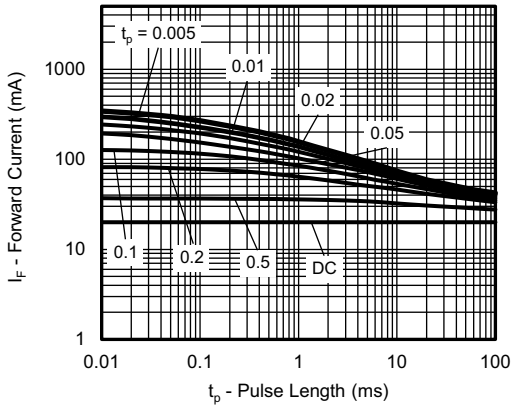



Fig. 23 - Permissible Pulse Forward Current vs. Pulse Duration

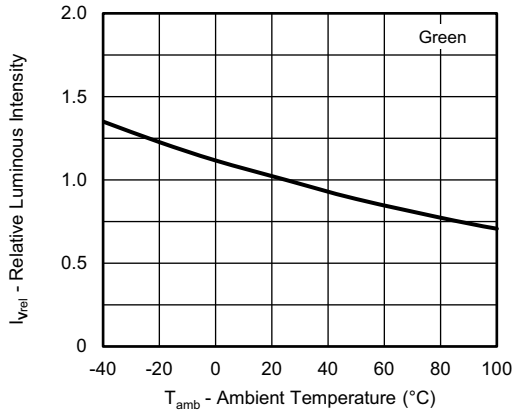
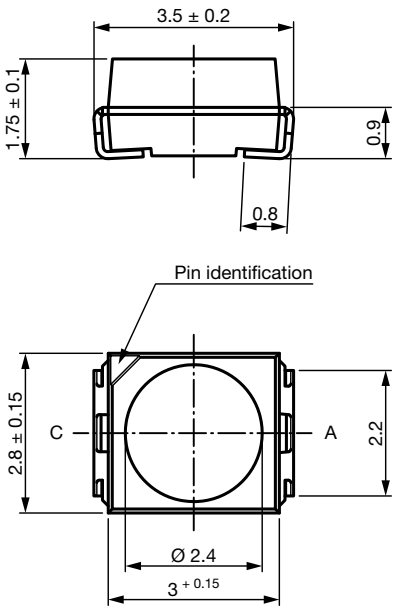



Fig. 21 - Relative Luminous Intensity vs. Ambient Temperature

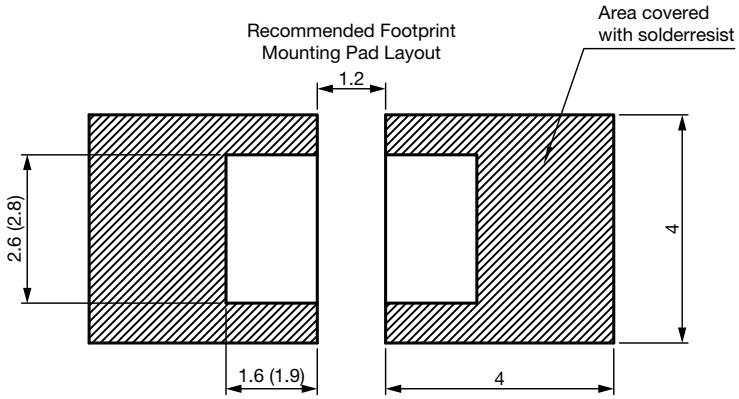

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**PACKAGE DIMENSIONS** in millimeters




technical drawings
according to DIN
specifications

Drawing-No.: 6.541-5067.01-4
Issue: 7; 12.03.14



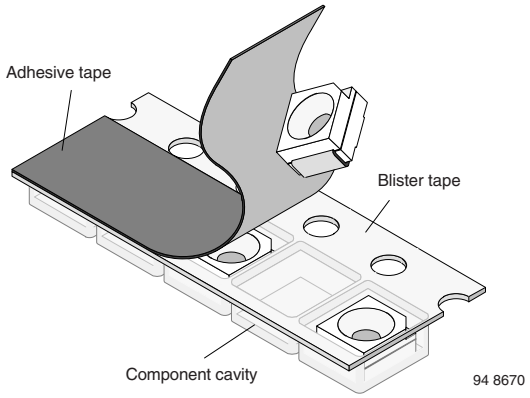


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## METHOD OF TAPING / POLARITY AND TAPE AND REEL

### 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.




### TAPING OF VLM.3...

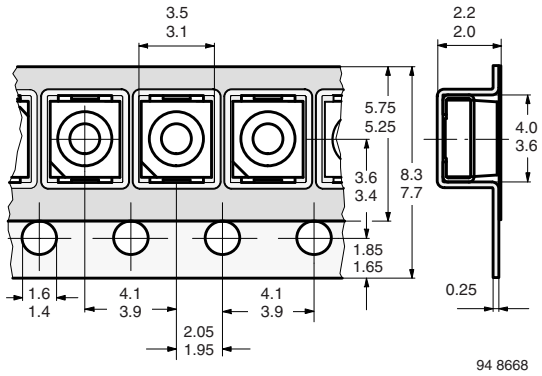



Fig. 24 - Tape Dimensions in mm for PLCC-2

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

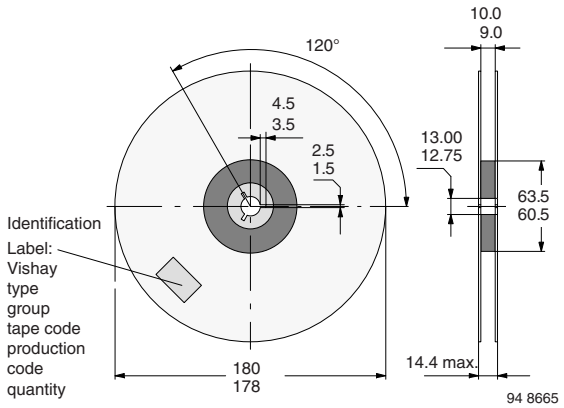



Fig. 25 - Reel Dimensions - GS08

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

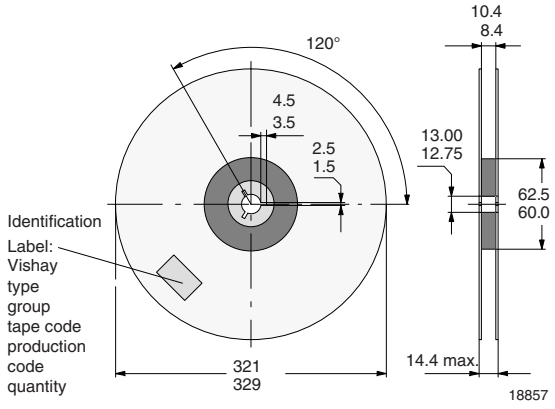



Fig. 26 - Reel Dimensions - GS18

### SOLDERING PROFILE

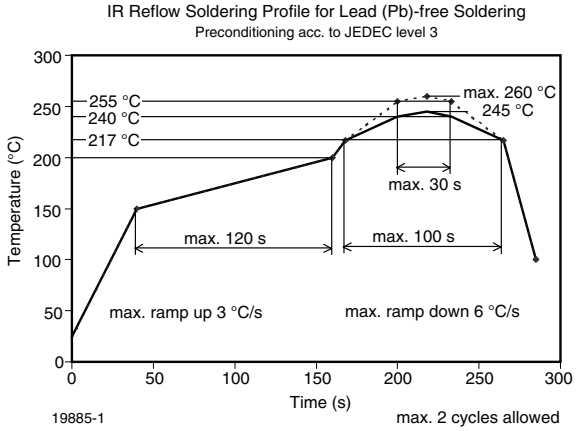



Fig. 27 - Vishay Lead (Pb)-free Reflow Soldering Profile (according to J-STD-020)

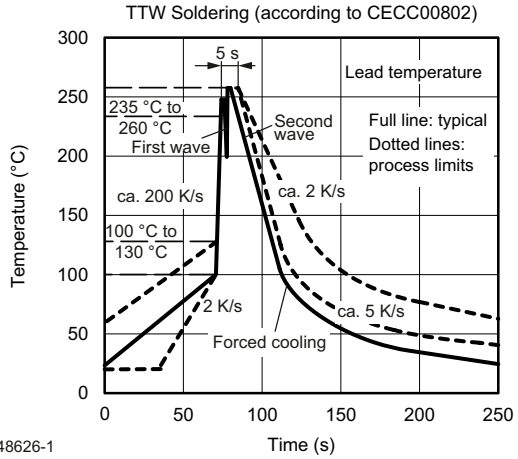
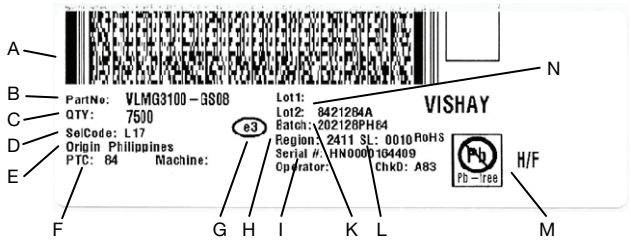



Fig. 28 - Double Wave Soldering of Opto Devices (all packages)


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## 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

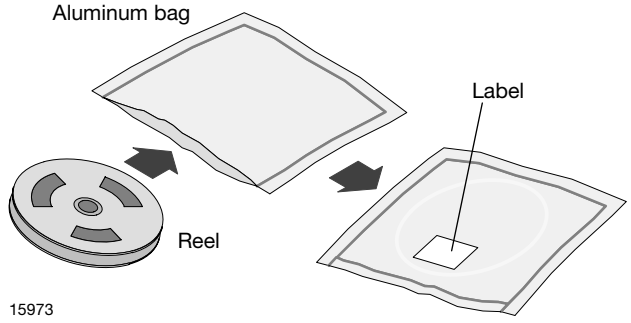
L. SL: storage location

M. Environmental Symbols: RoHS, lead (Pb)-free, halogen free

N. Lot numbers

## 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:

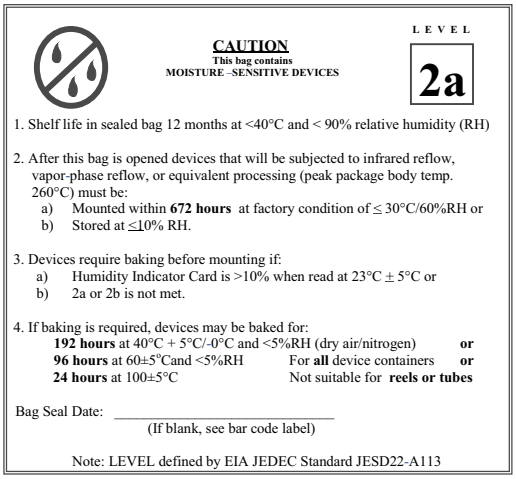
- Storage temperature 10 °C to 30 °C
- Storage humidity ≤ 60 % RH max.

After more than 672 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 2a label is included on all dry bags.




Example of JESD22-A112 level 2a 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 LABEL

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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