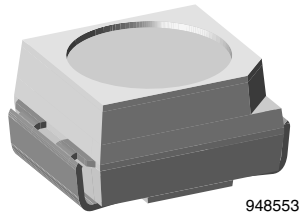


## Standard SMD LED PLCC-2



948553

### DESCRIPTION

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

The package of the VLMG31-series 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:  $\pm 60^\circ$

### FEATURES

- SMD LEDs with exceptional brightness
- Luminous intensity categorized
- EIA and ICE standard package
- Available in 8 mm tape
- Low power consumption
- Low profile package
- Compatible with IR reflow, vapor phase and wave solder processes according to CECC 00802 and J-STD-020
- Compatible with automatic placement equipment
- Non-diffused lens: excellent for coupling to light pipes and backlighting
- Luminous intensity ratio in one packaging unit  $I_{Vmax}/I_{Vmin} \leq 1.6$
- Preconditioning according to JEDEC® level 2a
- ESD-withstand voltage: up to 2 kV according to JESD22-A114-B
- 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

- Automotive: backlighting in dashboards and switches
- 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 <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. |                        |            |
| VLMG31K1L2-GS08 | Green | 7.1                      | 12   | 18   | 10                     | 562             | 572  | 575  | 10                     | -                   | 2.2  | 2.8  | 20                     | GaP on GaP |
| VLMG31K1L2-GS18 | Green | 7.1                      | 12   | 18   | 10                     | 562             | 572  | 575  | 10                     | -                   | 2.2  | 2.8  | 20                     | GaP on GaP |
| VLMG31K1M2-GS08 | Green | 7.1                      | 12   | 28   | 10                     | 562             | 572  | 575  | 10                     | -                   | 2.2  | 2.8  | 20                     | GaP on GaP |
| VLMG31K1M2-GS18 | Green | 7.1                      | 12   | 28   | 10                     | 562             | 572  | 575  | 10                     | -                   | 2.2  | 2.8  | 20                     | GaP on GaP |
| VLMG31L1M2-GS08 | Green | 11.2                     | 13.7 | 28   | 10                     | 562             | 572  | 575  | 10                     | -                   | 2.2  | 2.8  | 20                     | GaP on GaP |
| VLMG31L1M2-GS18 | Green | 11.2                     | 13.7 | 28   | 10                     | 562             | 572  | 575  | 10                     | -                   | 2.2  | 2.8  | 20                     | GaP on GaP |



| <b>ABSOLUTE MAXIMUM RATINGS</b> ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ , unless otherwise specified) |                                                      |            |             |                    |
|--------------------------------------------------------------------------------------------------------|------------------------------------------------------|------------|-------------|--------------------|
| <b>VLMG31..</b>                                                                                        |                                                      |            |             |                    |
| PARAMETER                                                                                              | TEST CONDITION                                       | SYMBOL     | VALUE       | UNIT               |
| Reverse voltage <sup>(1)</sup>                                                                         |                                                      | $V_R$      | 6           | V                  |
| DC forward current                                                                                     | $T_{amb} \leq 60\text{ }^{\circ}\text{C}$            | $I_F$      | 30          | mA                 |
| Surge forward current                                                                                  | $t_p \leq 10\text{ }\mu\text{s}$                     | $I_{FSM}$  | 0.5         | A                  |
| Power dissipation                                                                                      |                                                      | $P_V$      | 100         | 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 | $^{\circ}\text{C}$ |
| Thermal resistance junction / ambient                                                                  | Mounted on PC board (pad size > 16 mm <sup>2</sup> ) | $R_{thJA}$ | 400         | K/W                |

**Note**

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

| <b>OPTICAL AND ELECTRICAL CHARACTERISTICS</b> ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ , unless otherwise specified) |                                         |            |             |      |          |      |      |
|----------------------------------------------------------------------------------------------------------------------|-----------------------------------------|------------|-------------|------|----------|------|------|
| <b>VLMG31.., GREEN</b>                                                                                               |                                         |            |             |      |          |      |      |
| PARAMETER                                                                                                            | TEST CONDITION                          | PART       | SYMBOL      | MIN. | TYP.     | MAX. | UNIT |
| Luminous intensity <sup>(1)</sup>                                                                                    | $I_F = 10\text{ mA}$                    | VLMG31K1L2 | $I_V$       | 7.1  | 12       | 18   | mcd  |
|                                                                                                                      |                                         | VLMG31K1M2 | $I_V$       | 7.1  | 12       | 28   | mcd  |
|                                                                                                                      |                                         | VLMG31L1M2 | $I_V$       | 11.2 | 13.7     | 28   | mcd  |
| Dominant wavelength                                                                                                  | $I_F = 10\text{ mA}$                    |            | $\lambda_d$ | 562  | 572      | 575  | nm   |
| Peak wavelength                                                                                                      | $I_F = 10\text{ mA}$                    |            | $\lambda_p$ | -    | 565      | -    | nm   |
| Angle of half intensity                                                                                              | $I_F = 10\text{ mA}$                    |            | $\phi$      | -    | $\pm 60$ | -    | deg  |
| Forward voltage                                                                                                      | $I_F = 20\text{ mA}$                    |            | $V_F$       | -    | 2.2      | 2.8  | V    |
| Reverse voltage                                                                                                      | $I_R = 10\text{ }\mu\text{A}$           |            | $V_R$       | 6    | 15       | -    | V    |
| Junction capacitance                                                                                                 | $V_R = 0\text{ V}$ , $f = 1\text{ MHz}$ |            | $C_j$       | -    | 15       | -    | pF   |

**Note**

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

| <b>LUMINOUS INTENSITY CLASSIFICATION</b> |                       |      |      |
|------------------------------------------|-----------------------|------|------|
| GROUP                                    | LIGHT INTENSITY (mcd) |      |      |
|                                          | OPTIONAL              | MIN. | MAX. |
| K                                        | 1                     | 7.1  | 9    |
|                                          | 2                     | 9    | 11.2 |
| L                                        | 1                     | 11.2 | 14.0 |
|                                          | 2                     | 14.0 | 18.0 |
| M                                        | 1                     | 18.0 | 22.4 |
|                                          | 2                     | 22.4 | 28.0 |

**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 on any one reel. In order to ensure availability, single wavelength groups will not be orderable.

| <b>COLOR CLASSIFICATION</b> |                      |      |
|-----------------------------|----------------------|------|
| GROUP                       | GREEN                |      |
|                             | DOM. WAVELENGTH (nm) |      |
|                             | MIN.                 | MAX. |
| 3                           | 562                  | 565  |
| 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.

| <b>CROSSING TABLE</b> |             |
|-----------------------|-------------|
| VISHAY                | OSRAM       |
| VLMG31K1L2            | LGT670-K1L2 |
| VLMG31K1M2            | LGT670-K1M2 |
| VLMG31L1M2            | LGT670-L1M2 |

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

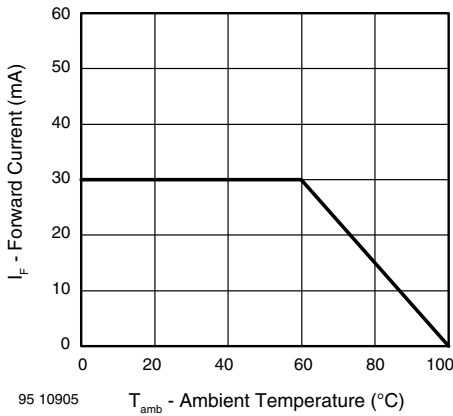


Fig. 1 - Forward Current vs. Ambient Temperature

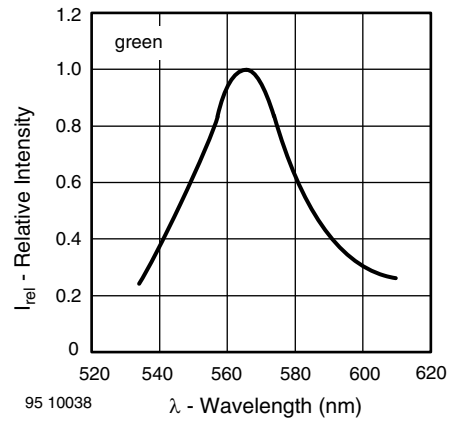


Fig. 4 - Relative Intensity vs. Wavelength

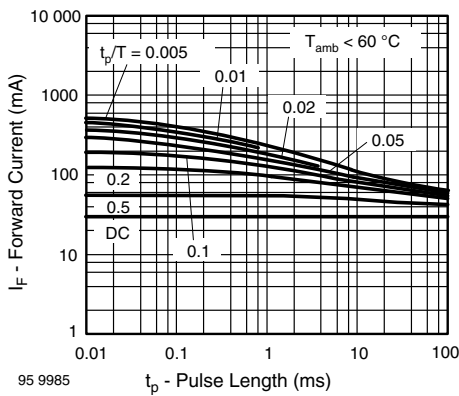


Fig. 2 - Pulse Forward Current vs. Pulse Duration

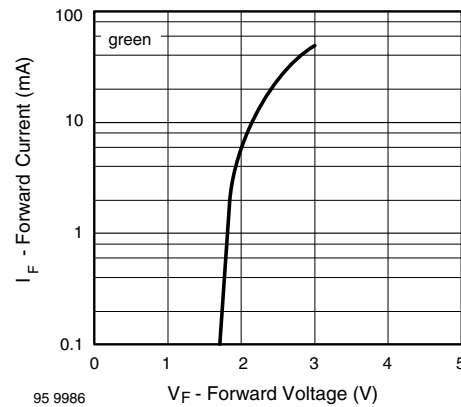


Fig. 5 - Forward Current vs. Forward Voltage

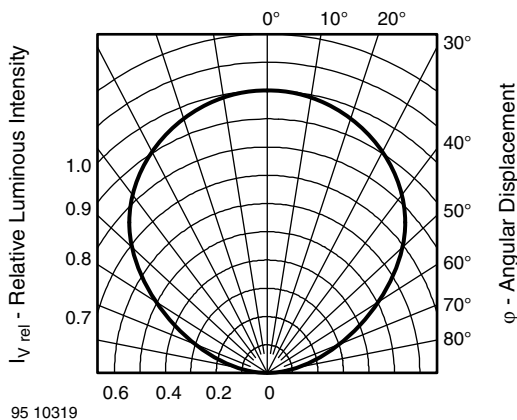


Fig. 3 - Relative Luminous Intensity vs. Angular Displacement

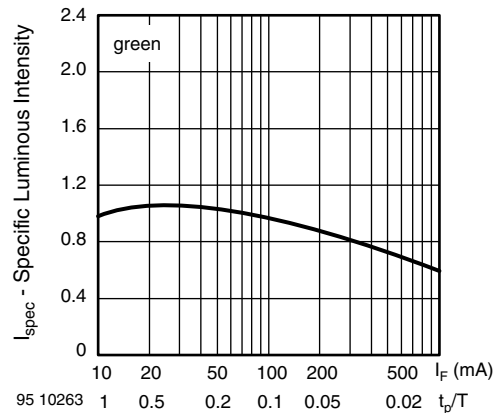


Fig. 6 - Specific Luminous Intensity vs. Forward Current

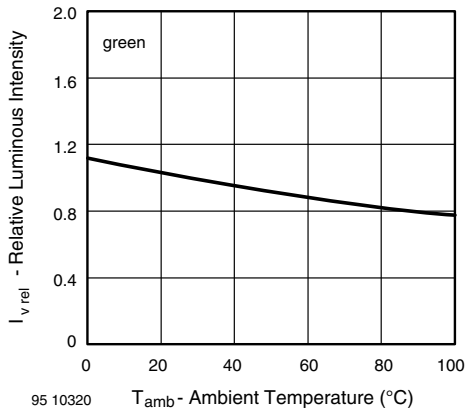
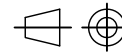
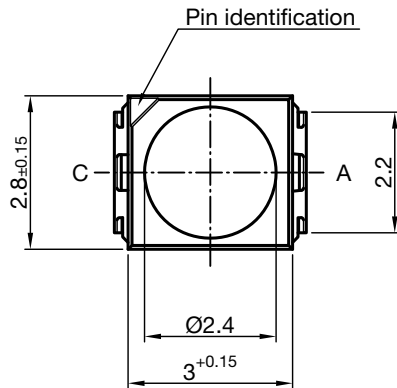
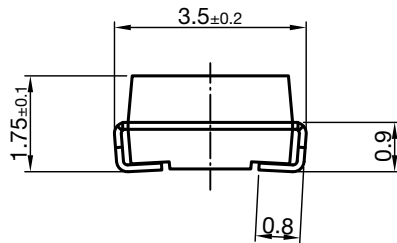


Fig. 7 - Relative Luminous Intensity vs. Ambient Temperature

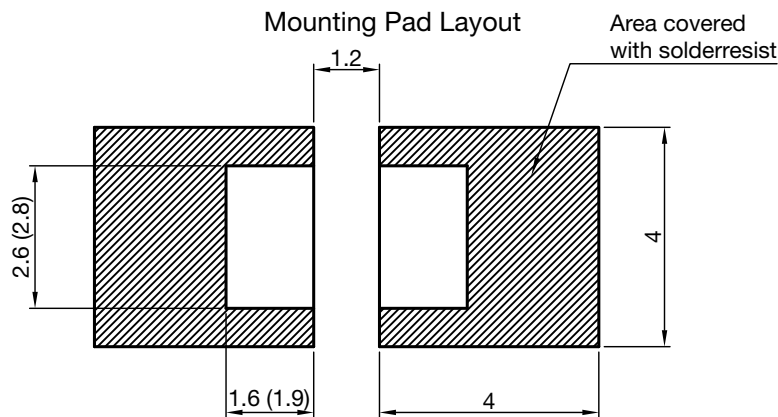
**PACKAGE DIMENSIONS** in millimeters



Technical drawings according to DIN specifications

Dimensions in mm

Drawing-No.: 6.541-5067.01-4  
Issue: 6; 23.09.13

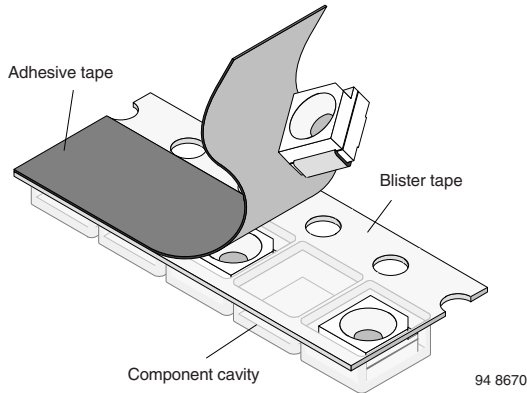


Dimensions: Reflow and vapor phase (wave soldering)

**METHOD OF TAPING / POLARITY AND TAPE AND REEL**

**SMD LED (VLM3-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**

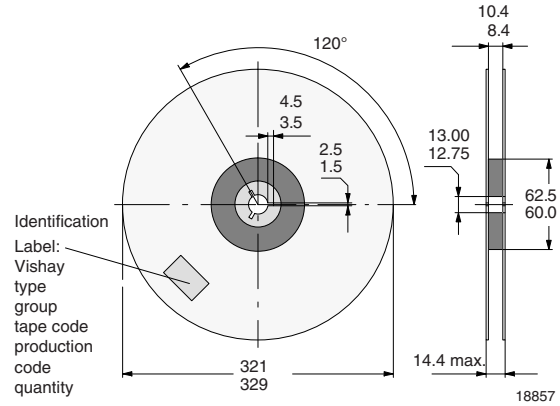


Fig. 10 - Reel Dimensions - GS18

**TAPING OF VLM.3..**

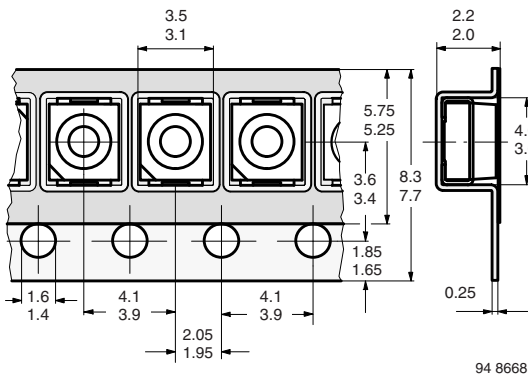


Fig. 8 - Tape Dimensions in mm for PLCC-2

**SOLDERING PROFILE**

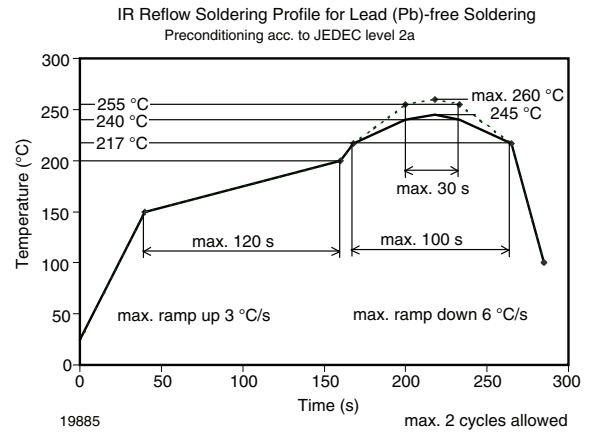


Fig. 11 - Vishay Lead (Pb)-free Reflow Soldering Profile (acc. to J-STD-020)

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

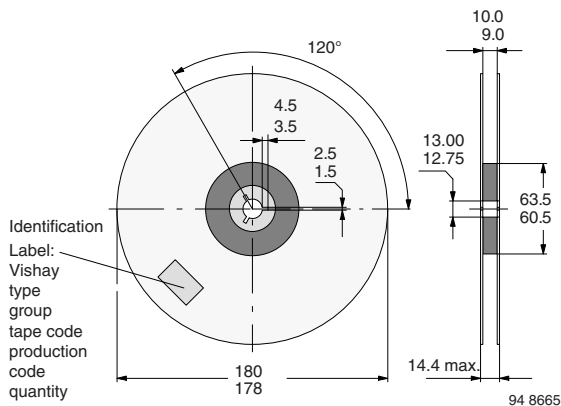


Fig. 9 - Reel Dimensions - GS08

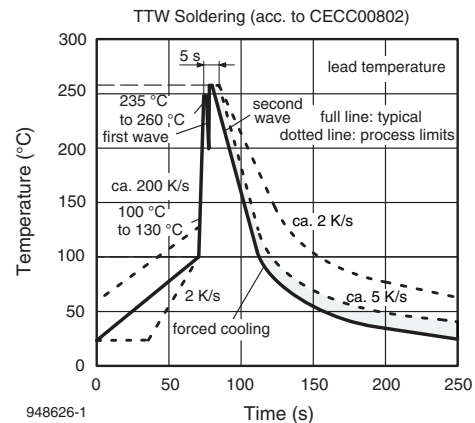
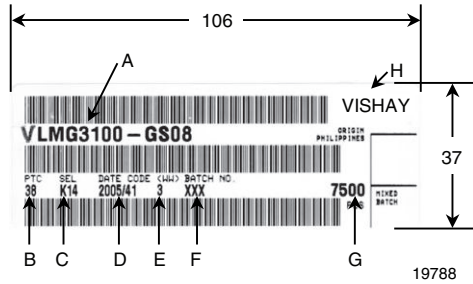


Fig. 12 - Double Wave Soldering of Opto Devices (all Packages)

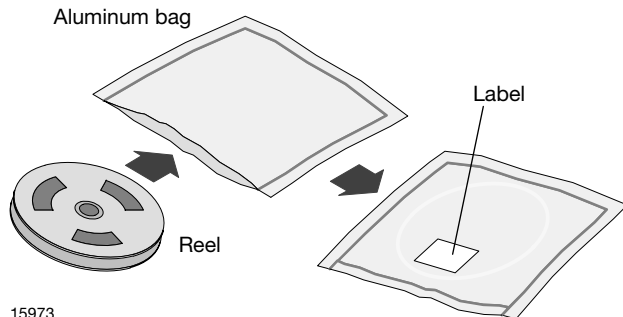
**BAR CODE PRODUCT LABEL** (example)



- A. Type of component
- B. Manufacturing plant
- C. SEL - selection code (bin):  
e.g.: K1= code for luminous intensity group  
4 = code for color group
- D. Date code year / week
- E. Day code (e.g. 2: Tuesday)
- F. Batch no.
- G. Total quantity
- H. Company code

**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.

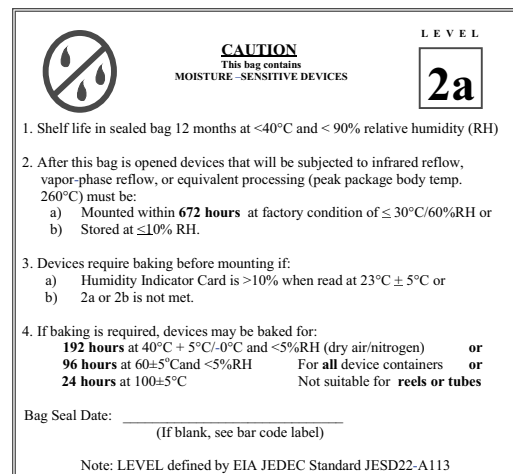


Fig. 13 - Example of JESD22-A112 level 2a label

**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 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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