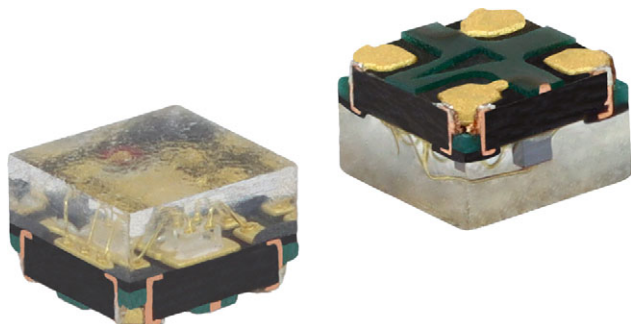


## Multi SMD LED RGB



### DESCRIPTION

The VLMRGB1500... is a high brightness tricolor LED designed primarily for RGB displays and backlights. It is using the popular PCB based 0404 SMD package with 120° emission characteristic. The 4 pin package with common anode allows individual driving of each chip and thus a gapless coverage of a wide color space by additive color mixing. It provides high reliability in a temperature range from -40 °C to +85 °C, using highly suitable blue light stable package materials.

### PRODUCT GROUP AND PACKAGE DATA

- Product group: LED
- Package: SMD 0404, 4 pin
- Product series: RGB
- Angle of half intensity:  $\pm 60^\circ$

### FEATURES

- Utilizing high brightness AlInGaP and InGaN chip technologies
- 4 pin RGB SMD LED package allows individual control the driving current of each chip
- Compact package outline dimensions (L x W x H in mm): 1.0 x 1.0 x 0.65
- Qualified according to JEDEC® moisture sensitivity level 3
- Compatible to IR reflow soldering
- Operation temperature range: -40 °C to +85 °C
- ESD-withstand voltage: up to 2 kV for red and 1 kV for blue and green according to JESD22-A114-B
- Luminous intensities and colors categorized per reel
- Material categorization: for definitions of compliance please see [www.vishay.com/doc?99912](http://www.vishay.com/doc?99912)



### APPLICATIONS

- Telecommunication, office equipment, home appliances, industrial equipment, white goods
- Wide range of accent and decorative lighting
- Displays: full color message and displays video boards
- Keyboard backlighting
- Status indicator
- Signal and symbol illumination

### 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. |                        |            |
| VLMRGB1500-GS08 | Red        | 26                       | -    | 65   | 5                      | 616             | -    | 628  | 5                      | 1.5                 | -    | 2.15 | 5                      | AlInGaP    |
|                 | True green | 122                      | -    | 303  | 5                      | 519             | -    | 537  | 5                      | 2.0                 | -    | 3.2  | 5                      | InGaN      |
|                 | Blue       | 22                       | -    | 66   | 5                      | 464             | -    | 479  | 5                      | 2.0                 | -    | 3.2  | 5                      | InGaN      |

#### Note

- Measurement accuracy:  $\pm 11\%$  for luminous intensity,  $\pm 1$  nm for dominant wavelength,  $\pm 0.1$  V for forward voltage

**ABSOLUTE MAXIMUM RATINGS** ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ , unless otherwise specified)  
**VLMRGB1500, RED**

| PARAMETER   | TEST CONDITION   | SYMBOL     | VALUE      | UNIT               |
|---|--|------------|------------|--------------------|
| Forward current                                     |  | $I_F$      | 25         | mA                 |
| Power dissipation                                   |  | $P_{tot}$  | 62         | mW                 |
| Junction temperature                                |  | $T_j$      | 95         | $^{\circ}\text{C}$ |
| Peak forward current                                | $t_p < 100\text{ }\mu\text{s}$ , duty cycle = 0.1                                      | $I_{FM}$   | 60         | mA                 |
| Thermal resistance junction-to-solder point, 1 chip |  | $R_{thJP}$ | 300        | K/W                |
| Thermal resistance junction-to-ambient, 1 chip      | Mounted on FR4 PC board ( $t = 1.6\text{ mm}$ )<br>with Cu pad size $> 16\text{ mm}^2$ | $R_{thJA}$ | 500        | K/W                |
| Operating temperature                               |  | $T_{amb}$  | -40 to +85 | $^{\circ}\text{C}$ |
| Storage temperature                                 |  | $T_{stg}$  | -40 to +90 | $^{\circ}\text{C}$ |
| ESD voltage   | HBM  | $V_{ESD}$  | 2000       | V                  |

**ABSOLUTE MAXIMUM RATINGS** ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ , unless otherwise specified)  
**VLMRGB1500, TRUE GREEN, BLUE**

| PARAMETER   | TEST CONDITION   | SYMBOL     | VALUE      | UNIT               |
|---|--|------------|------------|--------------------|
| Forward current                                     |  | $I_F$      | 20         | mA                 |
| Power dissipation                                   |  | $P_{tot}$  | 76         | mW                 |
| Junction temperature                                |  | $T_j$      | 95         | $^{\circ}\text{C}$ |
| Peak forward current                                | $t_p < 100\text{ }\mu\text{s}$ , duty cycle = 0.1                                      | $I_{FM}$   | 100        | mA                 |
| Thermal resistance junction-to-solder point, 1 chip |  | $R_{thJP}$ | 300        | K/W                |
| Thermal resistance junction-to-ambient, 1 chip      | Mounted on FR4 PC board ( $t = 1.6\text{ mm}$ )<br>with Cu pad size $> 16\text{ mm}^2$ | $R_{thJA}$ | 500        | K/W                |
| Operating temperature                               |  | $T_{amb}$  | -40 to +85 | $^{\circ}\text{C}$ |
| Storage temperature                                 |  | $T_{stg}$  | -40 to +90 | $^{\circ}\text{C}$ |
| ESD voltage   | HBM  | $V_{ESD}$  | 1000       | V                  |

**OPTICAL AND ELECTRICAL CHARACTERISTICS** ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ , unless otherwise specified)  
**VLMRGB1500, RED, TRUE GREEN, BLUE**

| PARAMETER   | TEST CONDITION        | COLOR      | SYMBOL            | MIN. | TYP. | MAX. | UNIT |
|---|-----------------------|------------|-------------------|------|------|------|------|
| Luminous intensity                                | I <sub>F</sub> = 5 mA | Red        | I <sub>v</sub>    | 26   | -    | 65   | mcd  |
|   |                       | True green |                   | 122  | -    | 303  |      |
|   |                       | Blue       |                   | 22   | -    | 66   |      |
| Dominant wavelength                               |                       | Red        | λ <sub>d</sub>    | 616  | -    | 628  | nm   |
|   |                       | True green |                   | 519  | -    | 537  |      |
|   |                       | Blue       |                   | 464  | -    | 479  |      |
| Peak wavelength                                   |                       | Red        | λ <sub>p</sub>    | -    | 632  | -    | nm   |
|   |                       | True green |                   | -    | 518  | -    |      |
|   |                       | Blue       |                   | -    | 468  | -    |      |
| Spectral half width at 50 % I <sub>rel</sub> max. |                       | Red        | Δλ <sub>0.5</sub> | -    | 12   | -    | nm   |
|   |                       | True green |                   | -    | 27   | -    |      |
|   |                       | Blue       |                   | -    | 20   | -    |      |
| Angle of half intensity                           |                       | Red        | φ                 | -    | ± 60 | -    | °    |
|   |                       | True green |                   |      |      |      |      |
|   |                       | Blue       |                   |      |      |      |      |
| Forward voltage                                   |                       | Red        | V <sub>F</sub>    | 1.5  | -    | 2.15 | V    |
|   |                       | True green |                   | 2.0  | -    | 3.2  |      |
|   |                       | Blue       |                   | 2.0  | -    | 3.2  |      |
| Reverse current <sup>(1)</sup>                    | V <sub>R</sub> = 5 V  | Red        | I <sub>R</sub>    | -    | -    | 10   | μA   |
|   |                       | True green |                   | -    | -    | 10   |      |
|   |                       | Blue       |                   | -    | -    | 10   |      |

**Notes**

- Not designed for operating in reverse direction.  
Measurement accuracy:  $\pm 11\%$  for luminous intensity,  $\pm 1\text{ nm}$  for dominant wavelength,  $\pm 0.1\text{ V}$  for forward voltage
- (1) Not designed for operating in reverse direction; reverse voltage is only applied for testing purpose; only applied for testing purpose



| LUMINOUS INTENSITY (in mcd at 5 mA) |      |      |            |       |      |      |
|-------------------------------------|------|------|------------|-------|------|------|
| BIN CODE                            | RED  |      | TRUE GREEN |       | BLUE |      |
|                                     | MIN. | MAX. | MIN.       | MAX.  | MIN. | MAX. |
| A                                   | 26.0 | 31.0 | 122.0      | 146.0 | 22.0 | 26.5 |
| B                                   | 31.0 | 37.0 | 146.0      | 175.0 | 26.5 | 32.0 |
| C                                   | 37.0 | 45.0 | 175.0      | 210.0 | 32.0 | 38.0 |
| D                                   | 45.0 | 54.0 | 210.0      | 252.0 | 38.0 | 46.0 |
| E                                   | 54.0 | 65.0 | 252.0      | 303.0 | 46.0 | 55.0 |
| F                                   | -    | -    | -          | -     | 55.0 | 66.0 |

**Note**

- Tolerance on each luminous intensity bin is  $\pm 11\%$ .  
The above classification represents the brightness range which includes only a few brightness groups.  
Only one luminous intensity group per color 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.

| DOMINANT WAVELENGTH (in nm at 5 mA) |       |       |            |       |       |       |
|-------------------------------------|-------|-------|------------|-------|-------|-------|
| BIN CODE                            | RED   |       | TRUE GREEN |       | BLUE  |       |
|                                     | MIN.  | MAX.  | MIN.       | MAX.  | MIN.  | MAX.  |
| 1                                   | 616.0 | 619.0 | 519.0      | 522.0 | 464.0 | 467.0 |
| 2                                   | 619.0 | 622.0 | 522.0      | 525.0 | 467.0 | 470.0 |
| 3                                   | 622.0 | 625.0 | 525.0      | 528.0 | 470.0 | 473.0 |
| 4                                   | 625.0 | 628.0 | 528.0      | 531.0 | 473.0 | 476.0 |
| 5                                   | -     | -     | 531.0      | 534.0 | 476.0 | 479.0 |
| 6                                   | -     | -     | 534.0      | 537.0 | -     | -     |

**Note**

- Tolerance for each dominate wavelength bin is  $\pm 1$  nm.  
The above classification represents the wavelength range which includes only a few brightness groups.  
Only one wavelength group per color will be shipped on each reel (there will be no mixing of two groups on each reel).  
In order to ensure availability, single wavelength groups will not be orderable.

**MARKING EXAMPLE FOR SELECTION CODE ON LABEL**

Selection code: BBC/232 (sequence: RGB for both IV and color groups)

- BBC:
  - I<sub>V</sub> group red: B (31 mcd to 37 mcd)
  - I<sub>V</sub> group true green: B (164 mcd to 175 mcd)
  - I<sub>V</sub> group blue: C (32 mcd to 38 mcd)
- 232:
  - LD group red: 2 (619 mcd to 622 nm)
  - LD group true green: 3 (525 mcd to 528 nm)
  - LD group blue: 2 (467 mcd to 470 nm)

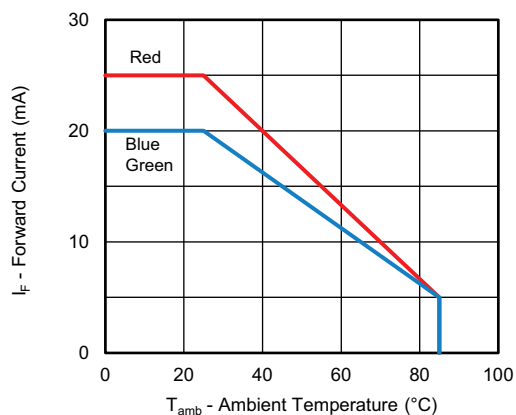
**TYPICAL CHARACTERISTICS** ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ , unless otherwise specified)


Fig. 1 - Forward Current vs. Ambient Temperature

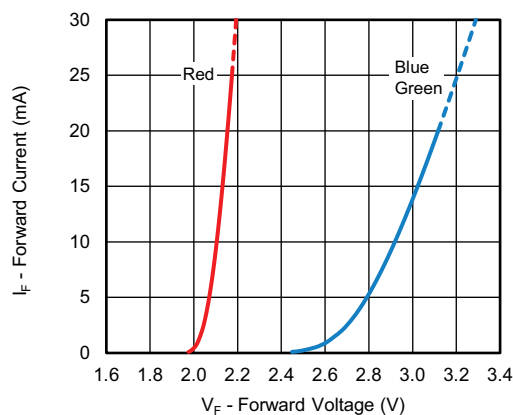


Fig. 4 - Forward Current vs. Forward Voltage

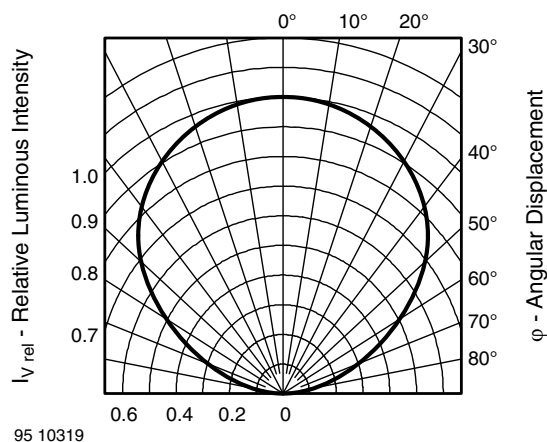


Fig. 2 - Relative Luminous Intensity vs. Angular Displacement

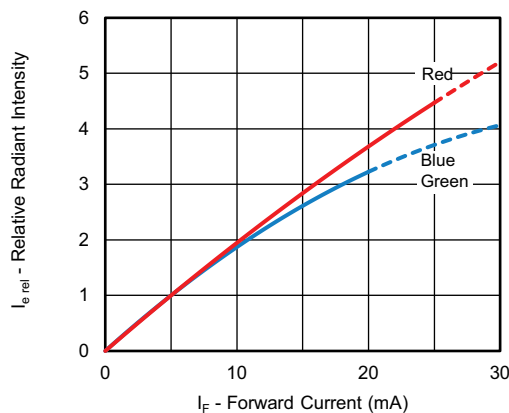


Fig. 5 - Relative Luminous Intensity vs. Forward Current

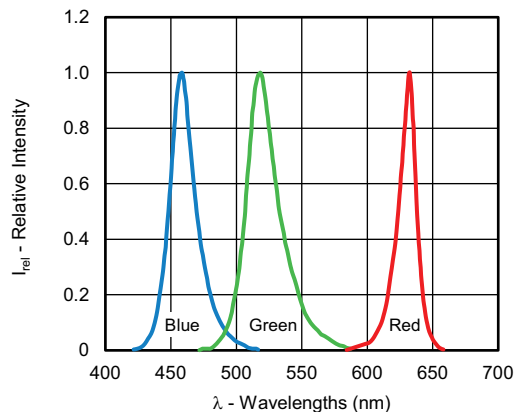
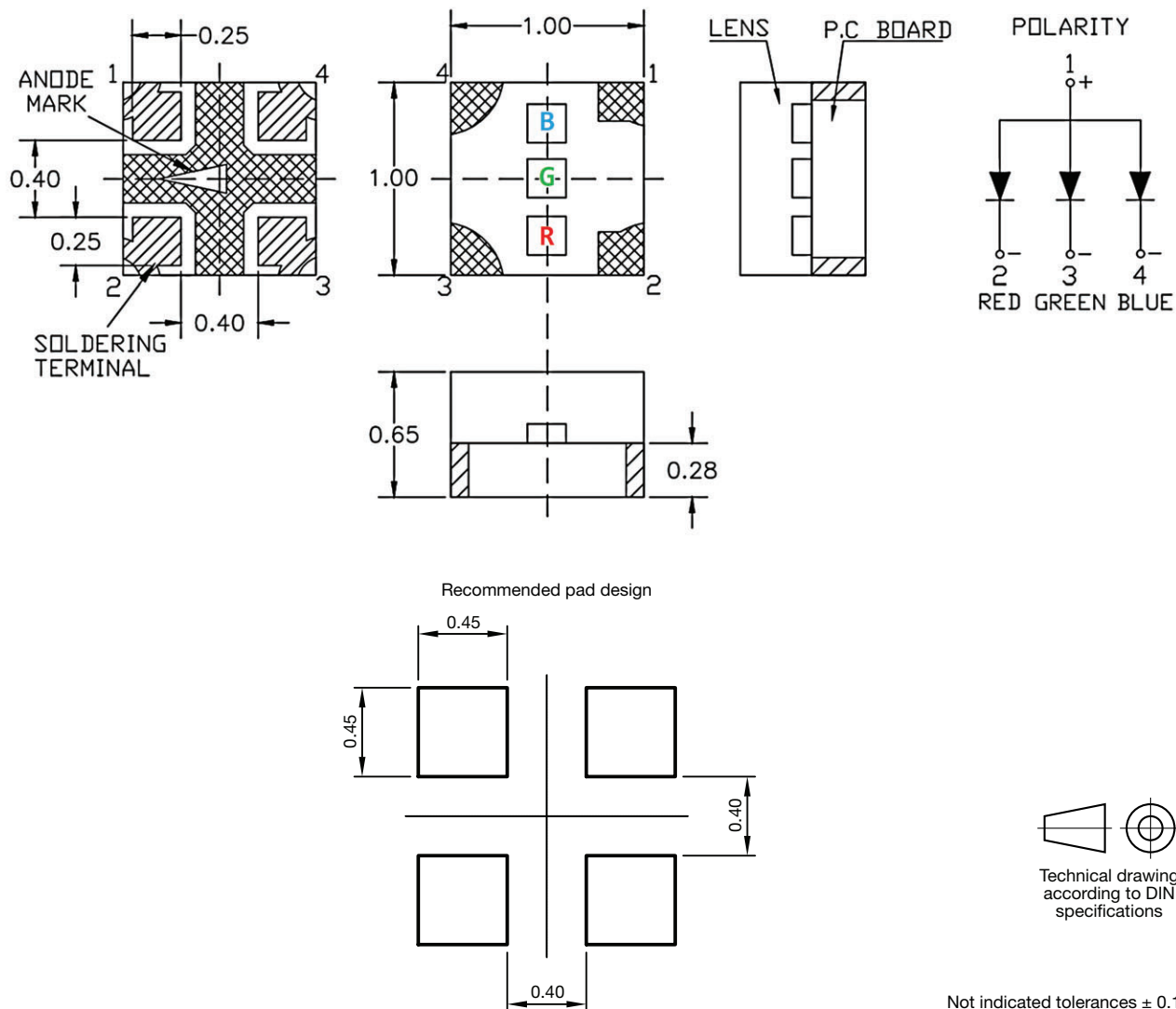
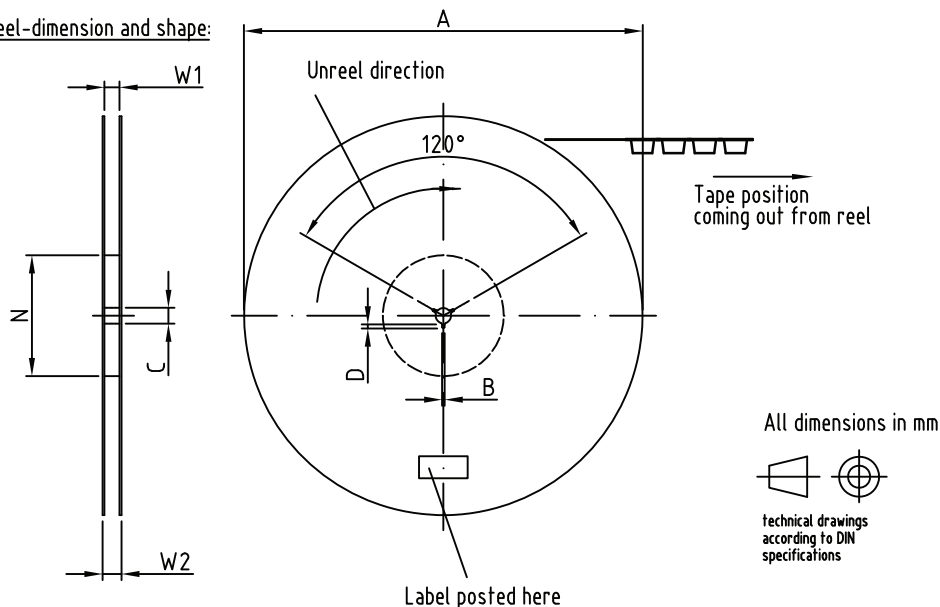


Fig. 3 - Relative Intensity vs. Wavelength

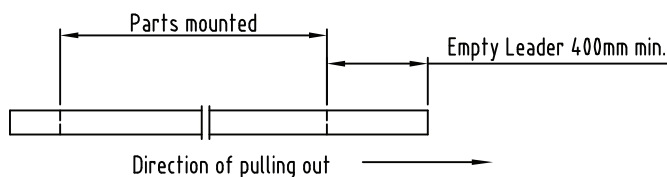
**PACKAGE DIMENSIONS / SOLDERING PADS DIMENSIONS** in millimeters


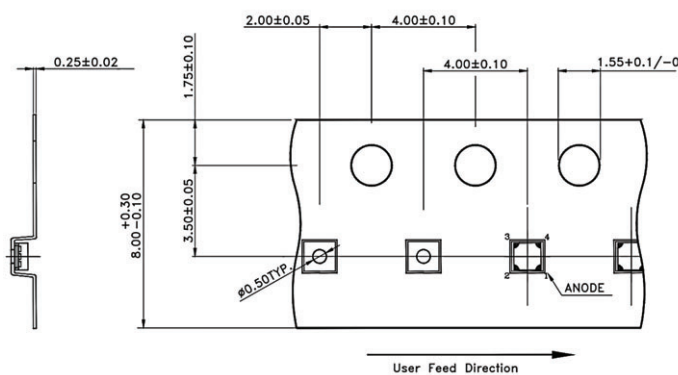
**TAPING DIMENSIONS** in millimeters

Reel-dimension and shape:



Leader and trailer tape:


Drawing-No.: 9.800-5172.01  
Issue: VK; 18.04.24

QTY per reel: 4000 pcs  
MOQ: 20 000 pcs


| REEL DIMENSIONS |   |         |          |         |          |         |        |
|-----------------|---|---------|----------|---------|----------|---------|--------|
| TAPING VERSION  | REEL DIMENSIONS IN mm ACCORDING DRAWING REFERENCE |         |          |         |          |         |        |
|                 | A   | B       | C        | D       | N        | W1      | W2     |
| GS08            | 178 ± 1   | 2 ± 0.5 | 13 ± 0.5 | 4 ± 0.5 | 60 ± 0.2 | 9 ± 0.2 | 12 ± 1 |

## SOLDERING PROFILE

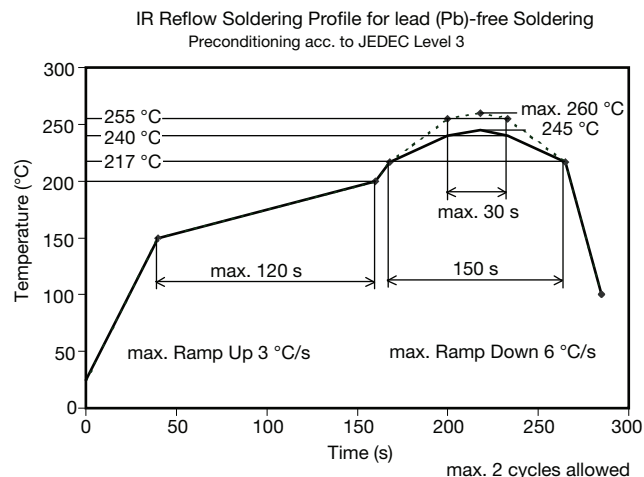


Fig. 6 - Vishay Lead (Pb)-free Reflow Soldering Profile  
According to J-STD-020

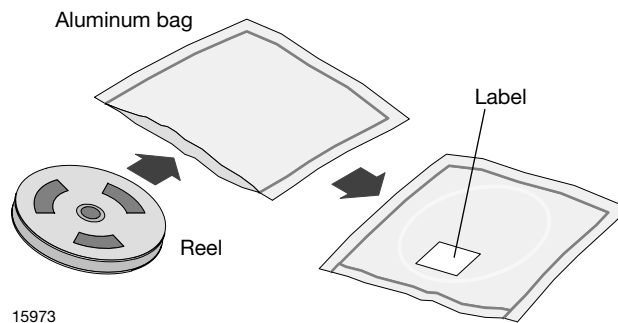
## BAR CODE PRODUCT LABEL (example)



- A. 2D bar code
- B. Vishay part number
- C. Quantity
- D. Selection code (bin): brightness and color groups
- E. Code of manufacturing plant
- F. Termination plating finish
- G. Batch = date code: year / week / plant code
- H. Region code
- I. Internal serial number
- J. Sales location
- K. ESD symbol
- L. Lead (Pb)-free symbol
- M. RoHS symbol, halogen-free symbol
- N. Internal 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.

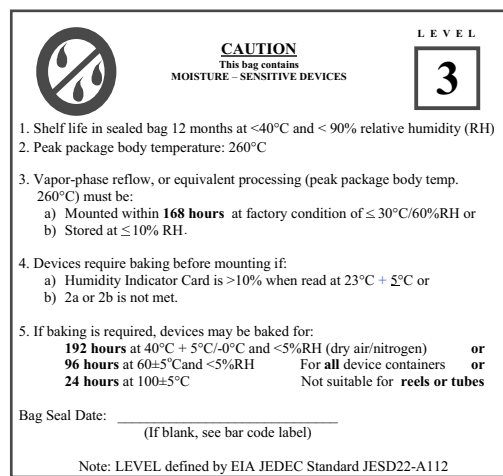
After more than 168 h under these conditions moisture content will be too high for reflow soldering.

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 3 label is included on all aluminum dry bags.



Example of JESD22-A112 level 3 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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