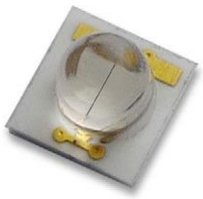
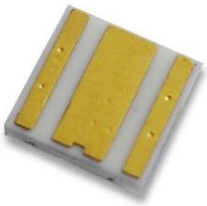
# UV SMD LED with Silicone Lens





## FEATURES

- Ceramic SMT package with silicone lens
- Dimension (L x W x H) in mm: 3.5 x 3.5 x 2.9
- Forward current: up to 700 mA
- Radiant power (typ.): 780 mW at 500 mA, 1037 mW at 700 mA
- Materials:
  - Die: InGaN
  - Resin: silicone (water clear)
  - Leads / terminations finish: gold plated (Au)
- Grouping parameters:
  - Radiant power
  - Peak wavelength
  - Forward voltage
- Reflow soldering method
- MSL2 according to J-STD-020
- Packaging: MOQ = 100 pieces; 12 mm tape with 100 pieces per reel, Ø 180 mm (7")
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912

Pb-free

e4

RoHS COMPLIANT

HALOGEN FREE

GREEN (5-2008)

## DESCRIPTION

VLMU3500-...-060... series is a ceramic based high power UV LED with silicone lens for long life time. The package size is 3.5 mm x 3.5 mm and the radiant power up to 1250 mW at 700 mA in a wavelength range of 380 nm to 410 nm.

## PRODUCT GROUP AND PACKAGE DATA

- Product group: LED
- Package: SMD ceramic high power
- Product series: high power UV LED
- Angle of half intensity: ± 30°
- Lead-finishing: Au

## SAFETY ADVICES

Depending on the mode of operation, these devices emit highly concentrated non visible ultraviolet light which can be hazardous to the human eye. Products which incorporate these devices have to follow the safety precautions given in IEC 62471 “Photobiological Safety of Lamps and Lamp Systems”.

## APPLICATIONS

- Industrial curing
- Photocatalytic purification
- Poster printing curing
- Counterfeit money detector
- Blood detector
- Nail curing
- Teeth curing

**PARTS TABLE**

| PART | COLOR | RADIANT POWER (mW) | | | 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. | | |
| VLMU3500-385-060 | Ultraviolet | 620 | 780 | 940 | 500 | 380 | 385 | 390 | 500 | 2.8 | 3.4 | 4.0 | 500 | InGaN |
| VLMU3500-385-060-L | Ultraviolet | 620 | 780 | 940 | 500 | 380 | 385 | 390 | 500 | 2.8 | 3.4 | 4.0 | 500 | InGaN |
| VLMU3500-395-060 | Ultraviolet | 620 | 780 | 940 | 500 | 390 | 395 | 400 | 500 | 2.8 | 3.4 | 4.0 | 500 | InGaN |
| VLMU3500-395-060-L | Ultraviolet | 620 | 780 | 940 | 500 | 390 | 395 | 400 | 500 | 2.8 | 3.4 | 4.0 | 500 | InGaN |
| VLMU3500-405-060 | Ultraviolet | 620 | 780 | 940 | 500 | 400 | 405 | 410 | 500 | 2.8 | 3.4 | 4.0 | 500 | InGaN |
| VLMU3500-405-060-L | Ultraviolet | 620 | 780 | 940 | 500 | 400 | 405 | 410 | 500 | 2.8 | 3.4 | 4.0 | 500 | InGaN |



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| **ABSOLUTE MAXIMUM RATINGS** ($T_{amb}$ = 25 °C, unless otherwise specified)<br>**VLMU3500-...-060...** | | | | |
|---|---|---|---|---|
| **PARAMETER** | **TEST CONDITION** | **SYMBOL** | **VALUE** | **UNIT** |
| DC forward current | | $I_F$ | 700 | mA |
| Power dissipation | | $P_V$ | 2.8 | W |
| Electrostatic discharge | HBM: MIL-STD-883 C 3B | ESD | 8000 | V |
| Junction temperature | | $T_j$ | +125 | °C |
| Operating temperature range | | $T_{amb}$ | -40 to +85 | °C |
| Storage temperature range | | $T_{stg}$ | -40 to +100 | °C |
| Solder temperature | | $T_{sol}$ | 260 | °C |
| Thermal resistance - junction to solder point | | $R_{thJS}$ | 8 | °C/W |

| **OPTICAL AND ELECTRICAL CHARACTERISTICS** ($T_{amb}$ = 25 °C, unless otherwise specified)<br>**VLMU3500-...-060..., ULTRAVIOLET** | | | | | | | |
|---|---|---|---|---|---|---|---|
| **PARAMETER** | **TEST CONDITION** | **DEVICE TYPE** | **SYMBOL** | **MIN.** | **TYP.** | **MAX.** | **UNIT** |
| Forward voltage | $I_F$ = 500 mA | | $V_F$ | 2.8 | 3.4 | 4 | V |
| Radiant power | $I_F$ = 350 mA | | $\phi_e$ | 445 | 560 | 675 | mW |
| | $I_F$ = 500 mA | | | 620 | 780 | 940 | |
| | $I_F$ = 700 mA | | | 824 | 1037 | 1250 | |
| Radiant intensity | $I_F$ = 350 mA | | $I_e$ | - | 395 | - | mW/sr |
| | $I_F$ = 500 mA | | | - | 550 | - | |
| | $I_F$ = 700 mA | | | - | 730 | - | |
| Peak wavelength | $I_F$ = 500 mA | VLMU3500-385-060... | $\lambda_p$ | 380 | 385 | 390 | nm |
| | | VLMU3500-395-060... | | 390 | 395 | 400 | nm |
| | | VLMU3500-405-060... | | 400 | 405 | 410 | nm |
| Angle of half intensity | $I_F$ = 500 mA | | φ | - | ± 30 | - | ° |
| Reverse current | $V_R$ = 5 V | | $I_R$ | - | - | 10 | µA |

**Note**

- Tolerances: ± 11 % for $\phi_e$, ± 0.1 V for $V_F$, ± 1 nm for $\lambda_p$

| **RADIANT POWER CLASSIFICATION** ($I_F$ = 500 mA) | | | |
|---|---|---|---|
| **GROUP** | **MIN.** | **MAX.** | **UNIT** |
| U062 | 620 | 660 | mW |
| U066 | 660 | 700 | |
| U070 | 700 | 740 | |
| U074 | 740 | 780 | |
| U078 | 780 | 820 | |
| U082 | 820 | 860 | |
| U086 | 860 | 900 | |
| U090 | 900 | 940 | |

| **PEAK WAVELENGTH CLASSIFICATION** ($I_F$ = 500 mA) | | | |
|---|---|---|---|
| **GROUP** | **MIN.** | **MAX.** | **UNIT** |
| Q380 | 380 | 385 | nm |
| Q385 | 385 | 390 | |
| Q390 | 390 | 395 | |
| Q395 | 395 | 400 | |
| Q400 | 400 | 405 | |
| Q405 | 405 | 410 | |



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| FORWARD VOLTAGE CLASSIFICATION ($I_F$ = 500 mA) | | | |
|---|---|---|---|
| **GROUP** | **MIN.** | **MAX.** | **UNIT** |
| V2830 | 2.8 | 3.0 | V |
| V3032 | 3.0 | 3.2 | |
| V3234 | 3.2 | 3.4 | |
| V3436 | 3.4 | 3.6 | |
| V3638 | 3.6 | 3.8 | |
| V3840 | 3.8 | 4.0 | |

**Note**

- In order to ensure availability, single groups for radiant intensity, wavelength, and forward voltage will not be orderable. Only one group for radiant intensity, wavelength, and forward voltage will be shipped in any one reel

## MARKING EXAMPLE FOR SELECTION CODE ON LABEL

Selection code: U074Q385V3436

- U074: $\phi_e$, range 740 mW to 780 mW
- Q385: $\lambda_p$, range 385 nm to 390 nm
- V3436: $V_F$, range 3.4 V to 3.6 V

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

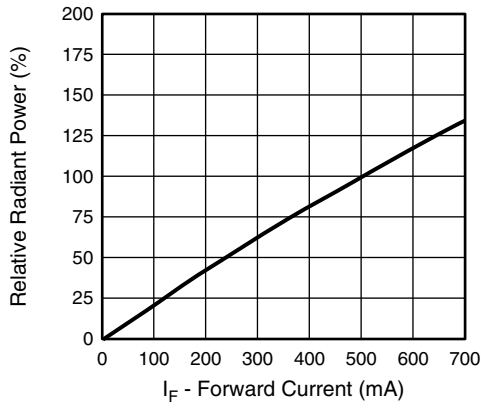


Fig. 1 - Relative Radiant Power vs. Forward Current

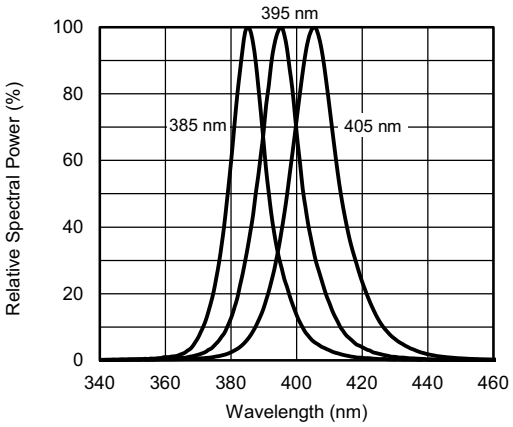


Fig. 3 - Relative Spectral Power vs. Wavelength

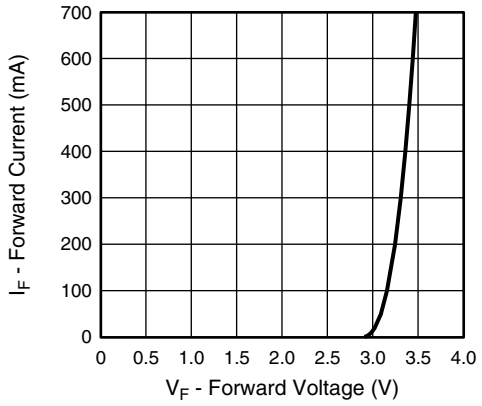


Fig. 2 - Forward Current vs. Forward Voltage

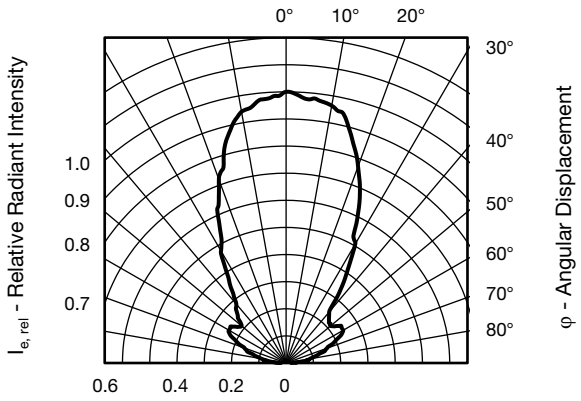


Fig. 4 - Relative Intensity vs. Angular Displacement



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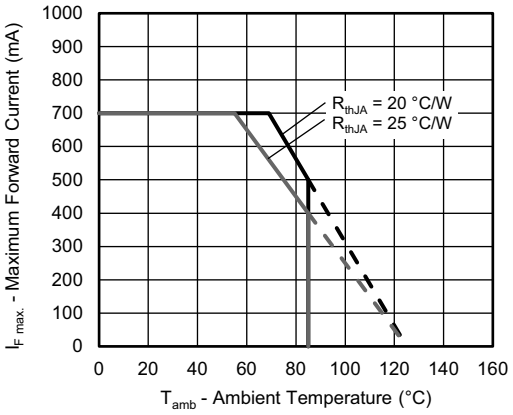


Fig. 5 - Maximum Forward Current vs. Ambient Temperature

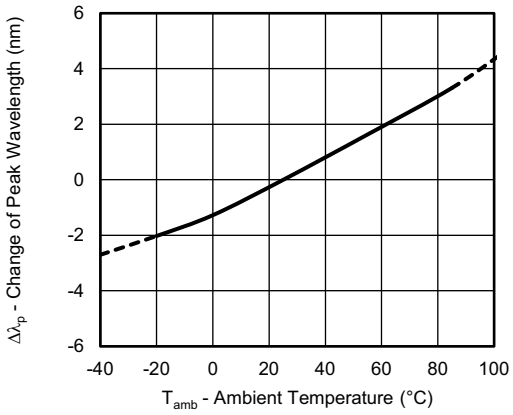


Fig. 7 - Change of Peak Wavelength vs. Ambient Temperature

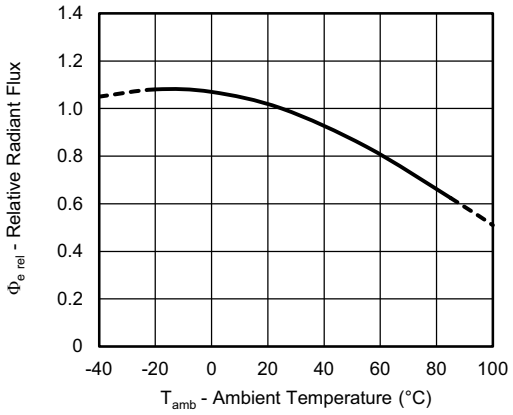


Fig. 6 - Relative Radiant Flux vs. Ambient Temperature

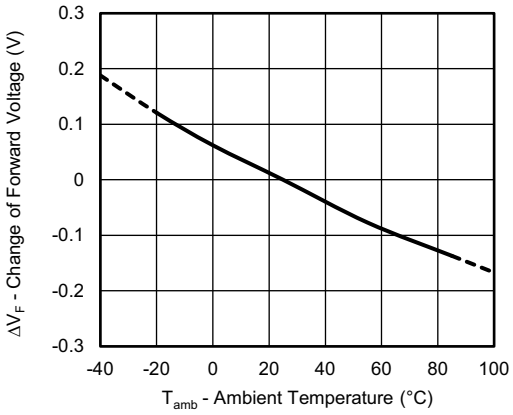


Fig. 8 - Change of Forward Voltage vs. Ambient Temperature


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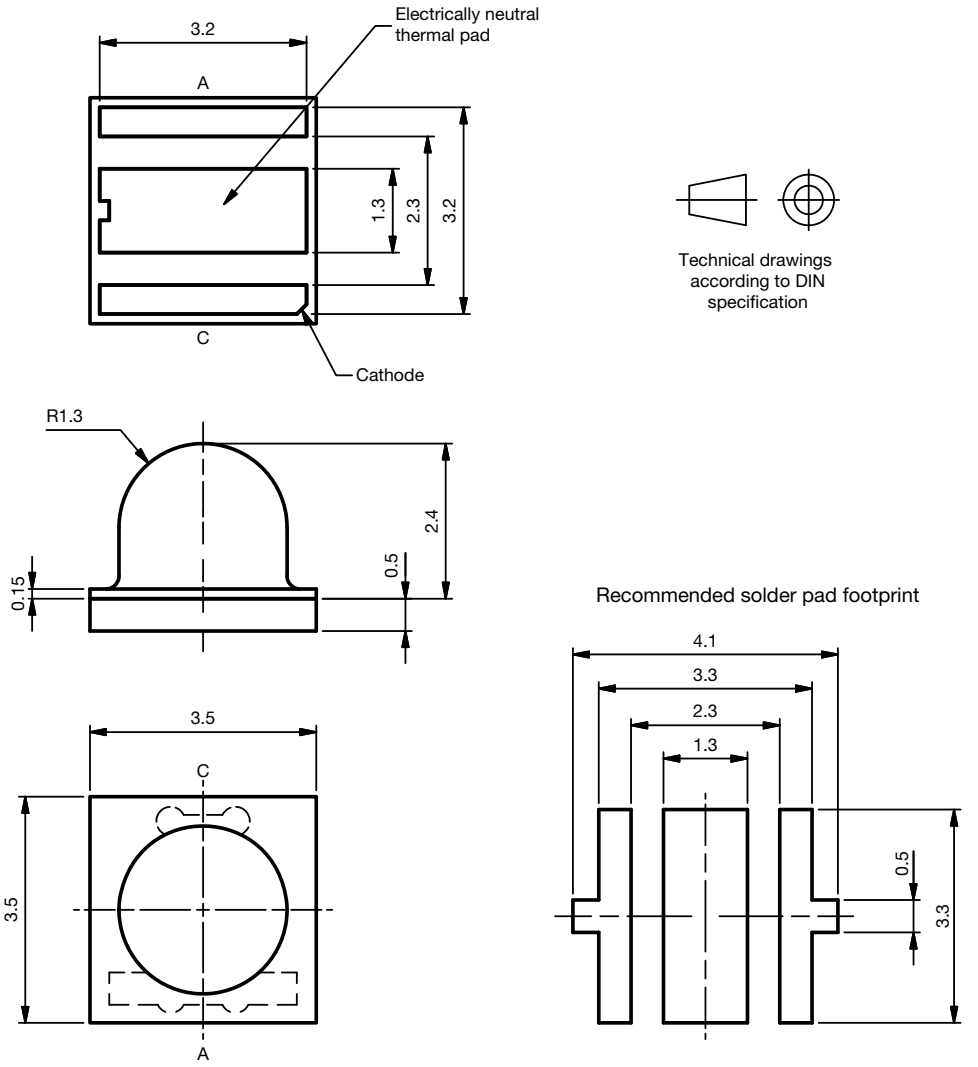
## PACKAGE DIMENSIONS in millimeters




Drawing-No.: 6.541-5108.01-4
Issue: 3VK; 26.11.2019

Not indicated tolerances ± 0.13

## WIRING

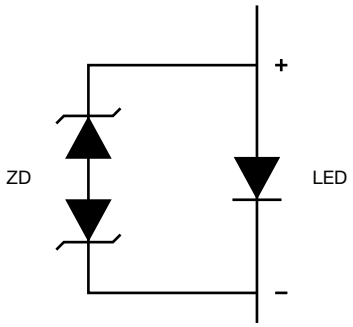



Fig. 9 - Wiring Diagram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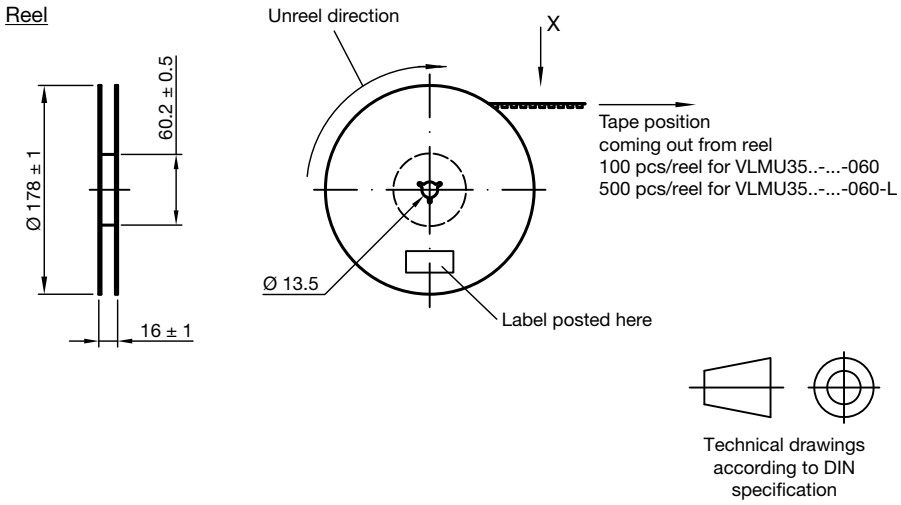
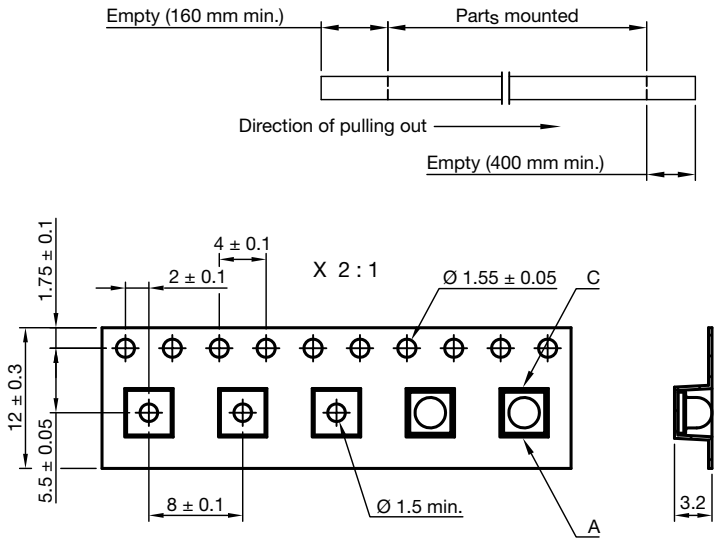
## **TAPE AND REEL DIMENSIONS** in millimeters




Leader and trailer tape:

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## HANDLING RECOMMENDATIONS

In order to achieve excellent lifetime, the package of these UV-LEDs consists of a ceramic substrate in combination with a UV stable silicone as lens material. Compared to standard materials silicone is generally softer and it tends more to attract dust:

- Minimize the level of dirt and dust particles in contact with the LED
- Small amounts of particles on the LEDs, although noticeable from a cosmetic point of view, do not affect the performance in terms of brightness, reliability and quality
- If cleaning is required, a short rinsing with isopropyl alcohol, not longer than 15 seconds, is recommended. Do not use ultrasonic cleaning, it may damage the LED
- Do not apply mechanical stress on the silicone lens
- Avoid any piercing of the silicone lens by sharp objects
- It is recommended to use a suitable pick and place tool for the removal of the LED from blister tape without applying stress to the lens. The recess of the pick-up needle has to be larger than the silicone lens
- For manual handling using tweezers make sure that the LED will be touched carefully at the sidewall of the ceramic substrate, but not at the silicone lens

## SOLDERING PROFILE

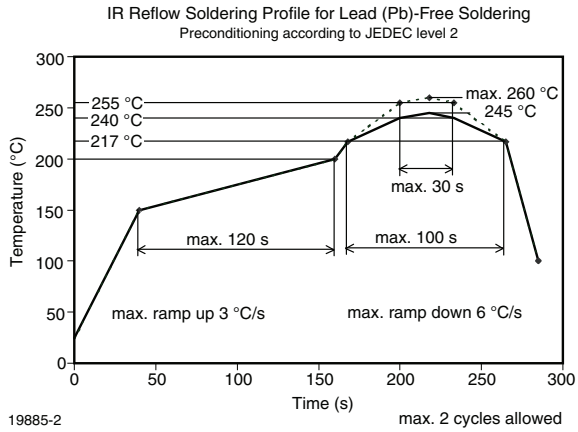
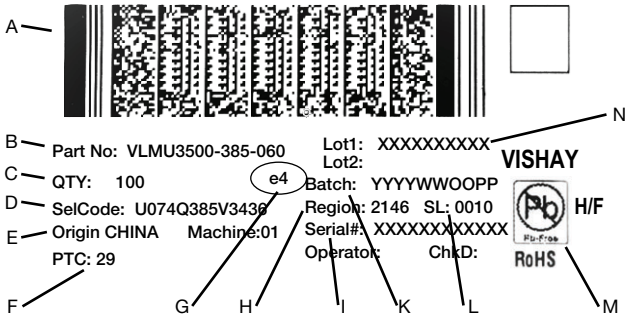



Fig. 10 - Vishay Lead (Pb)-free Reflow Soldering Profile (accord. to J-STD-020C)

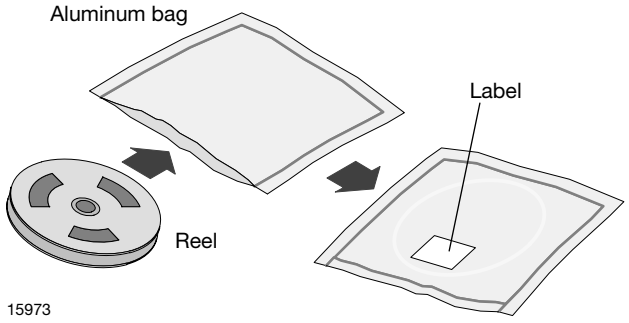
## BAR CODE PRODUCT LABEL (example only)




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: sales 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.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## 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:

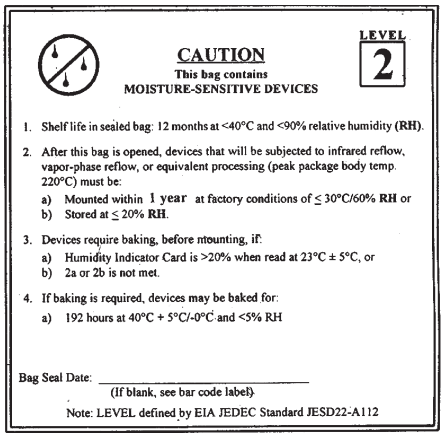
- Storage temperature 10 °C to 30 °C
- Storage humidity ≤ 60 % RH max.

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
24 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.



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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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