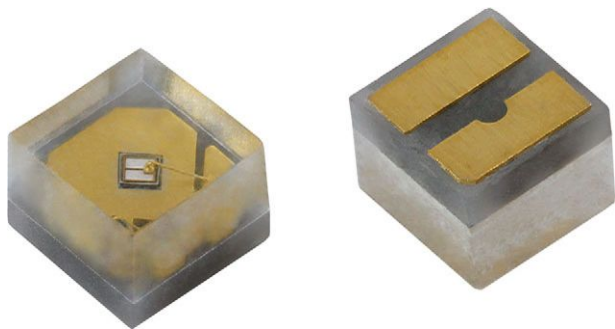


## UV SMD LED with Silicone Lens



### DESCRIPTION

VLMU1610-365-135 is a ceramic based mid power UV LED with silicone lens for long life time. The package size is 1.6 mm x 1.6 mm and the radiant power up to 26 mW at 20 mA in a wavelength range of 362.5 nm to 370 nm.

### PRODUCT GROUP AND PACKAGE DATA

- Product group: LED
- Package: SMD ceramic mid power
- Product series: mid power UV LED
- Angle of half intensity:  $\pm 67.5^\circ$
- 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".

### FEATURES

- Ceramic SMT package with silicone lens
- Dimension (L x W x H) in mm: 1.6 x 1.6 x 1.4
- Forward current: up to 60 mA<sub>DC</sub>
- Radiant power (typ.): 23 mW at 20 mA, 63 mW at 60 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
- MSL 3 according to J-STD-020
- Packaging: MOQ = 6000 pieces; 12 mm tape with 1500 pieces per reel, Ø 180 mm (7")
- Material categorization: for definitions of compliance please see [www.vishay.com/doc?99912](http://www.vishay.com/doc?99912)



### 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 <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. |                        |            |
| VLMU1610-365-135 | Ultraviolet | 14                 | 23   | 26   | 20                     | 362.5           | 367  | 370  | 20                     | 2.8                 | 3.5  | 4.0  | 20                     | InGaN      |

### ABSOLUTE MAXIMUM RATINGS (T<sub>amb</sub> = 25 °C, unless otherwise specified)

#### VLMU1610-365-135

| PARAMETER                   | TEST CONDITION                                 | SYMBOL           | VALUE                              | UNIT |
|-----------------------------|------------------------------------------------|------------------|------------------------------------|------|
| DC forward current          |                                                | I <sub>F</sub>   | 60                                 | mA   |
| Pulse forward current       | t <sub>p</sub> = 2 ms, t <sub>p</sub> /T = 0.1 | I <sub>FP</sub>  | 300                                | mA   |
| Power dissipation           |                                                | P <sub>V</sub>   | 240                                | mW   |
| Reverse voltage             |                                                |                  | Not designed for reverse operation |      |
| Electrostatic discharge     | HBM: MIL-STD-883 C 3B                          | ESD              | 2000                               | V    |
| Junction temperature        |                                                | T <sub>j</sub>   | +90                                | °C   |
| Operating temperature range |                                                | T <sub>amb</sub> | -40 to +85                         | °C   |
| Storage temperature range   |                                                | T <sub>stg</sub> | -40 to +90                         | °C   |
| Solder temperature          |                                                | T <sub>sol</sub> | 260                                | °C   |

**OPTICAL AND ELECTRICAL CHARACTERISTICS** ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ , unless otherwise specified)  
**VLMU1610-365-135, ULTRAVIOLET**

| PARAMETER                             | TEST CONDITION                | SYMBOL       | MIN.  | TYP.       | MAX. | UNIT             |
|---------------------------------------|-------------------------------|--------------|-------|------------|------|------------------|
| Forward voltage                       | $I_F = 20\text{ mA}$          | $V_F$        | 2.8   | 3.5        | 4.0  | V                |
| Radiant power                         | $I_F = 20\text{ mA}$          | $\phi_e$     | 14    | 23         | 26   | mW               |
|                                       | $I_F = 60\text{ mA}$          |              | -     | 63         | -    |                  |
| Ratio: radiant intensity/radiant flux | $I_F = 20\text{ mA}$          | $I_e/\phi_e$ | -     | 0.2        | -    | $\text{sr}^{-1}$ |
| Peak wavelength                       | $I_F = 20\text{ mA}$          | $\lambda_p$  | 362.5 | 367        | 370  | nm               |
| Angle of half intensity               | $I_F = 20\text{ mA}$          | $\phi$       | -     | $\pm 67.5$ | -    | deg              |
| Reverse voltage <sup>(1)</sup>        | $I_R = 10\text{ }\mu\text{A}$ | $V_R$        | -     | -          | 1.2  | V                |
| Thermal resistance junction to case   |                               | $R_{thJC}$   | -     | 53         | -    | K/W              |

**Notes**

- Tolerances:  $\pm 11\%$  for  $\phi_e$ ,  $\pm 0.1\text{ V}$  for  $V_F$ ,  $\pm 3\text{ nm}$  for  $\lambda_p$
- <sup>(1)</sup> Reverse current is applied for reverse voltage test only (function test of Zener diode). The device is not designed for reverse operation. Operating the LED under reverse current condition for long time might result in damage or failure of the component

**RADIANT POWER CLASSIFICATION** ( $I_F = 20\text{ mA}$ )

| GROUP | MIN. | MAX. | UNIT |
|-------|------|------|------|
| R3    | 14   | 16   | mW   |
| R4    | 16   | 18   |      |
| R5    | 18   | 20   |      |
| R6    | 20   | 22   |      |
| R7    | 22   | 24   |      |
| R8    | 24   | 26   |      |

**PEAK WAVELENGTH CLASSIFICATION** ( $I_F = 20\text{ mA}$ )

| GROUP | MIN.  | MAX.  | UNIT |
|-------|-------|-------|------|
| P3M2  | 362.5 | 365   | nm   |
| P3N1  | 365   | 367.5 |      |
| P3N2  | 367.5 | 370   |      |

**FORWARD VOLTAGE CLASSIFICATION** ( $I_F = 20\text{ mA}$ )

| GROUP | MIN. | MAX. | UNIT |
|-------|------|------|------|
| V1    | 2.8  | 3.2  | V    |
| V2    | 3.2  | 3.6  |      |
| V3    | 3.6  | 4.0  |      |

**Note**

- The optical and electrical specification table shows the parameter ranges, comprising only a few classification groups. 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: R5-P3N1-V2

- R5 range: 18 mW to 20 mW
- P3N1 range: 365 nm to 367.5 nm
- V2 range: 3.2 V to 3.6 V

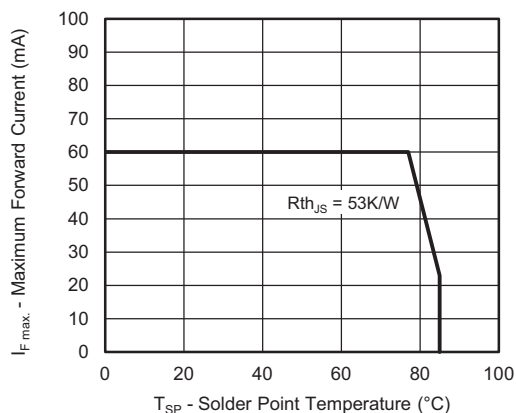
**TYPICAL CHARACTERISTICS** ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ , unless otherwise specified)


Fig. 1 - Maximum Forward Current vs. Solder Point Temperature

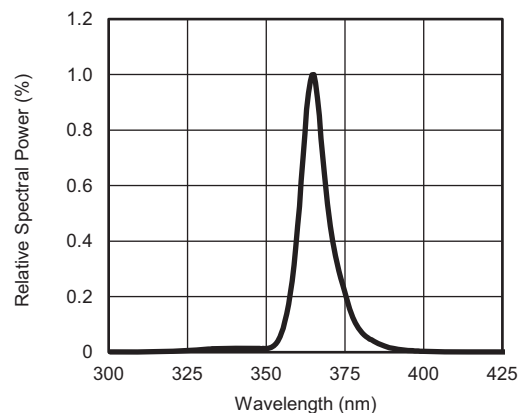


Fig. 4 - Relative Spectral Power vs. Wavelength

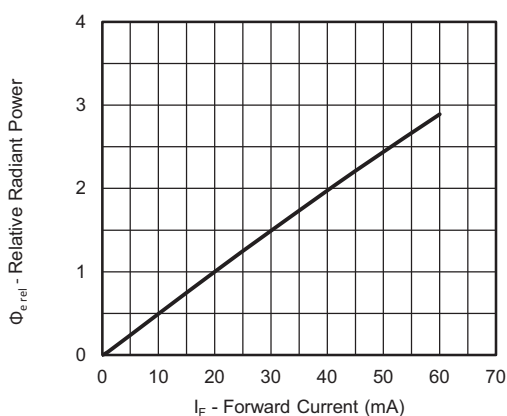


Fig. 2 - Relative Radiant Power vs. Forward Current

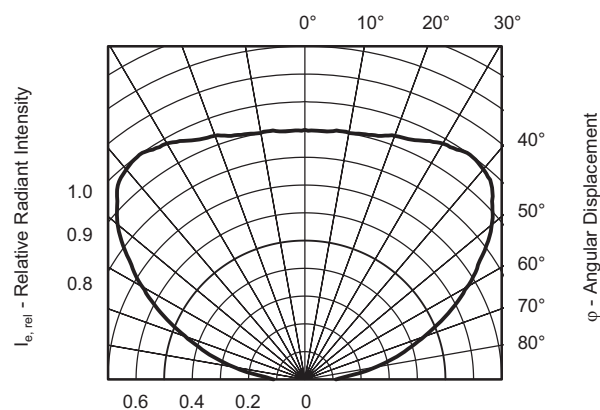


Fig. 5 - Relative Radiant Intensity vs. Angular Displacement

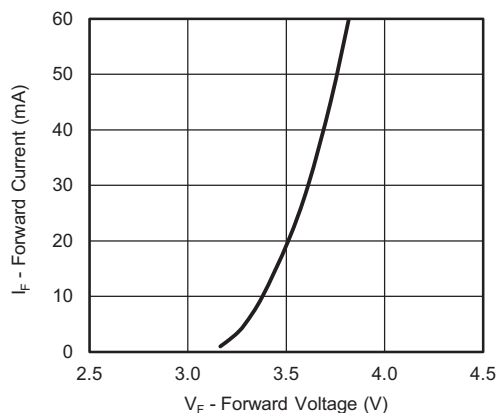


Fig. 3 - Forward Current vs. Forward Voltage

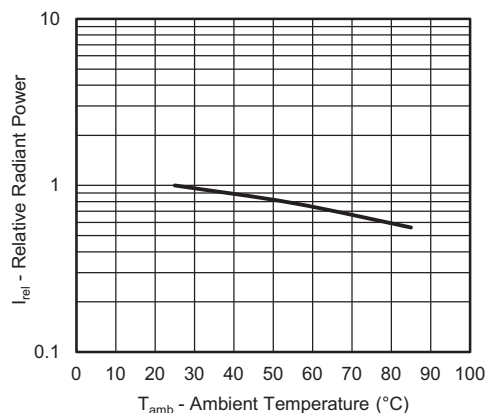
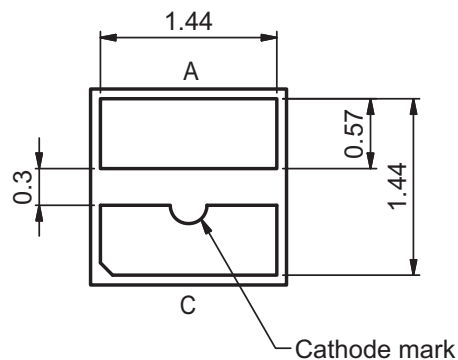
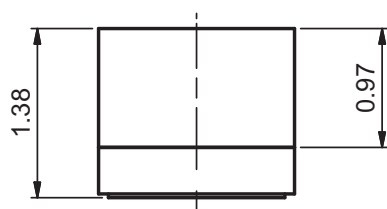
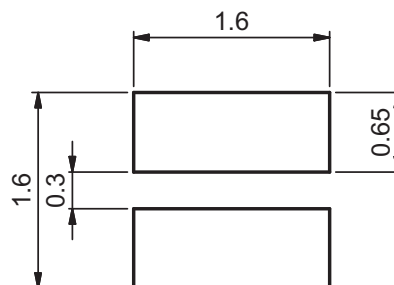
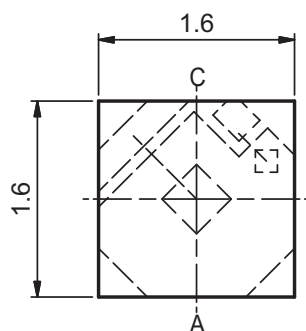


Fig. 6 - Relative Radiant Power vs. Ambient Temperature

**PACKAGE DIMENSIONS** in millimeters

Not indicated tolerances  $\pm 0.1$ 


Recommended solder pad footprint



Drawing-No.: 6.541-5113.01-4  
Issue: prel; 27.04.16

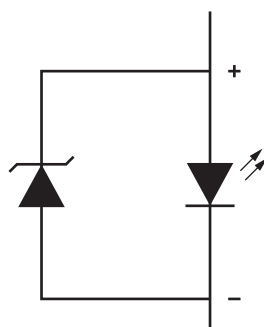
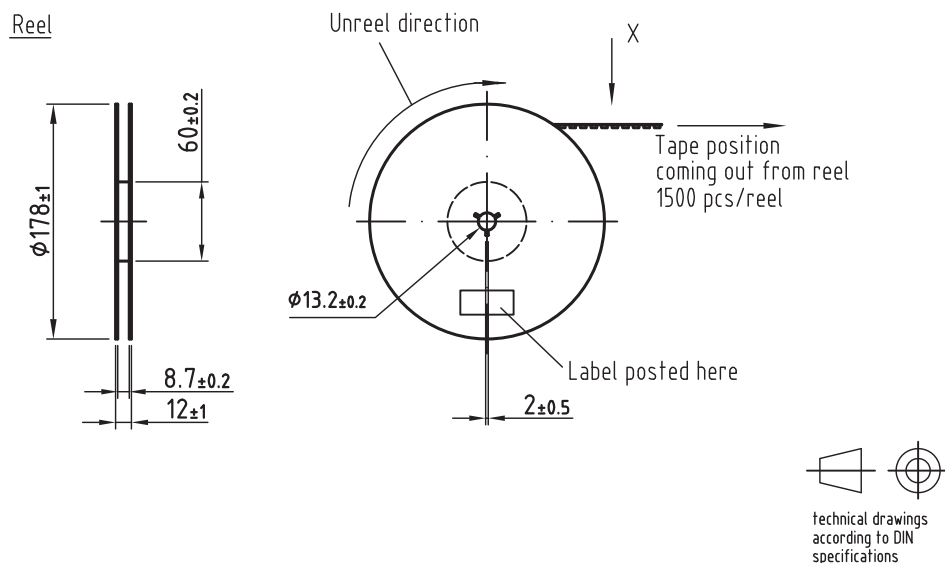
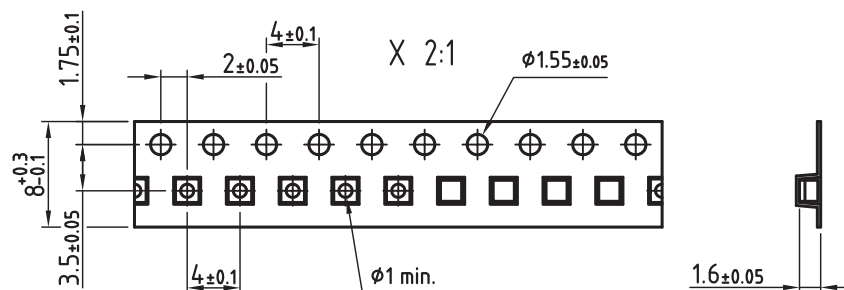
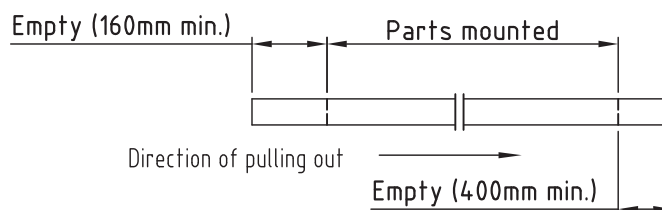
**WIRING**


Fig. 7 - Wiring Diagram

**TAPE AND REEL DIMENSIONS** in millimeters


Leader and trailer tape:



Reel dimensions and tape

Drawing-No.: 9.800-514.1.01-4  
Issue: prel; 27.04.16

MOQ: 6000 pieces (4 reels each with 1500 pieces)

## SOLDERING PROFILE

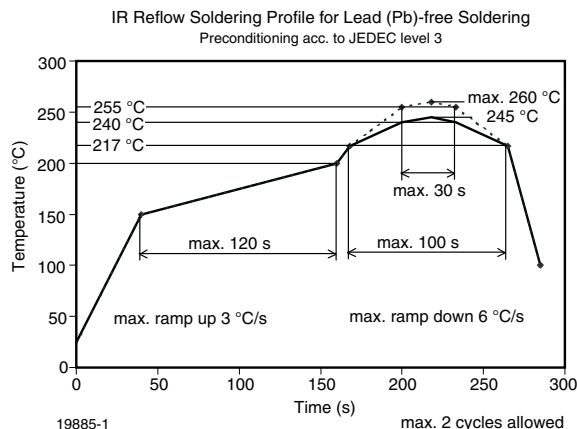
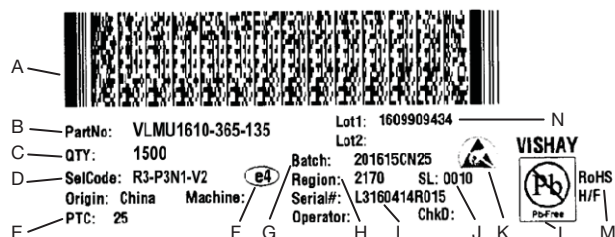


Fig. 8 - Vishay Lead (Pb)-free Reflow Soldering Profile  
(according to J-STD-020C)

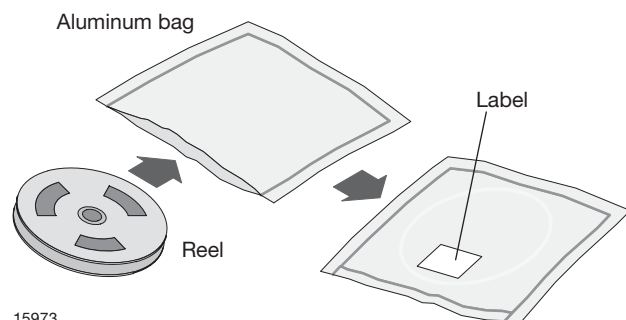
## BAR CODE PRODUCT LABEL (example only)



- A. 2D bar code
- B. Vishay part number
- C. Quantity
- D. Selection code (bin):  $P_e$ ,  $\lambda_p$ , and  $V_F$  group
- 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 number

## 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  $\leq 60\%$  RH max.

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

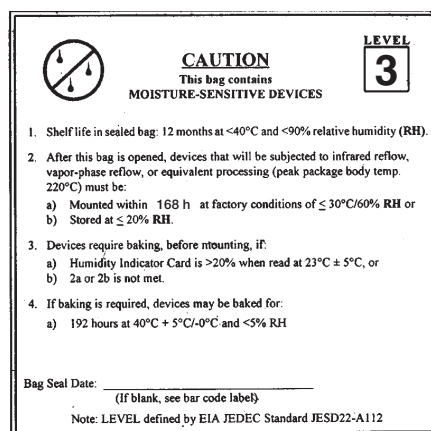
In case of moisture absorption, the devices will recover to the former condition by drying under the following condition:

192 h at 40 °C + 5 °C / - 0 °C and  $< 5\%$  RH (dry air / nitrogen) or

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 3 label is included on all 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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