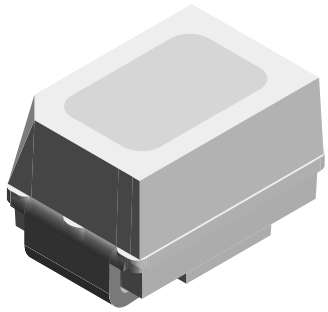
# Power Mini SMD LED



19226

## FEATURES

- SMD LEDs with exceptional brightness
- Luminous intensity categorized
- Compatible with automatic placement equipment
- IR reflow soldering
- 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 packing unit $I_{Vmax.}/I_{Vmin.} \leq 1.6$
- AEC-Q101 qualified
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912

AUTOMOTIVE GRADE

Pb-free

e3

RoHS COMPLIANT

HALOGEN FREE

GREEN (5-2008)

## DESCRIPTION

The new MiniLED series has been designed in a small white SMT package. The feature of the device is the very small package 2.3 mm x 1.3 mm x 1.4 mm. The MiniLED is an obvious solution for small-scale, high-power products that are expected to work reliability in an arduous environment. This is often the case in automotive and industrial application.

## PRODUCT GROUP AND PACKAGE DATA

- Product group: LED
- Package: SMD MiniLED
- Product series: power
- Angle of half intensity: ± 60°

## 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

## 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. | | |
| VLMK23P2R1-GS08 | Red | 56 | - | 140 | 20 | - | 630 | - | 20 | - | 1.9 | 2.6 | 20 | AlInGaP on GaAs |
| VLMK23Q2S1-GS08 | Red | 90 | - | 224 | 20 | - | 630 | - | 20 | - | 1.9 | 2.6 | 20 | AlInGaP on GaAs |
| VLMK23P2S1-GS08 | Red | 56 | - | 224 | 20 | - | 630 | - | 20 | - | 1.9 | 2.6 | 20 | AlInGaP on GaAs |
| VLMK23R1S1-GS08 | Red | 112 | - | 224 | 20 | - | 630 | - | 20 | - | 1.9 | 2.6 | 20 | AlInGaP on GaAs |
| VLMF23Q2S1-GS08 | Soft orange | 90 | - | 224 | 20 | 598 | 605 | 611 | 20 | - | 2 | 2.6 | 20 | AlInGaP on GaAs |
| VLMF23R2T1-GS08 | Soft orange | 140 | - | 355 | 20 | 598 | 605 | 611 | 20 | - | 2 | 2.6 | 20 | AlInGaP on GaAs |
| VLMF23Q2T1-GS08 | Soft orange | 90 | - | 355 | 20 | 598 | 605 | 611 | 20 | - | 2 | 2.6 | 20 | AlInGaP on GaAs |
| VLME23Q2S1-GS08 | Yellow | 90 | - | 224 | 20 | 581 | 588 | 594 | 20 | - | 2 | 2.6 | 20 | AlInGaP on GaAs |
| VLME23R2T1-GS08 | Yellow | 140 | - | 355 | 20 | 581 | 588 | 594 | 20 | - | 2 | 2.6 | 20 | AlInGaP on GaAs |
| VLME23Q2T1-GS08 | Yellow | 90 | - | 355 | 20 | 581 | 588 | 594 | 20 | - | 2 | 2.6 | 20 | AlInGaP on GaAs |

| **ABSOLUTE MAXIMUM RATINGS** ($T_{amb}$ = 25 °C, unless otherwise specified)<br>**VLMK23.., VLMF23.., VLME23..** | | | | |
|---|---|---|---|---|
| **PARAMETER** | **TEST CONDITION** | **SYMBOL** | **VALUE** | **UNIT** |
| Reverse voltage (1) | | $V_R$ | 5 | V |
| DC Forward current | $T_{amb} \leq 80$ °C | $I_F$ | 30 | mA |
| Surge forward current | $t_p \leq 10$ µs | $I_{FSM}$ | 0.1 | A |
| Power dissipation | | $P_V$ | 80 | mW |
| Junction temperature | | $T_j$ | +125 | °C |
| Operating temperature range | | $T_{amb}$ | -40 to +100 | °C |
| Storage temperature range | | $T_{stg}$ | -40 to +100 | °C |
| Thermal resistance junction/ambient | mounted on PC board (pad size > 5 $mm_2$) | $R_{thJA}$ | 580 | K/W |

**Note**

(1) Driving the LED in reverse direction is suitable for a short term application

| **OPTICAL AND ELECTRICAL CHARACTERISTICS** ($T_{amb}$ = 25 °C, unless otherwise specified)<br>**VLMK23.., RED** | | | | | | | |
|---|---|---|---|---|---|---|---|
| **PARAMETER** | **TEST CONDITION** | **PART** | **SYMBOL** | **MIN.** | **TYP.** | **MAX.** | **UNIT** |
| Luminous intensity (1) | $I_F$ = 20 mA | VLMK23P2R1 | $I_V$ | 56 | - | 140 | mcd |
| | | VLMK23Q2S1 | $I_V$ | 90 | - | 224 | mcd |
| | | VLMK23P2S1 | $I_V$ | 56 | - | 224 | mcd |
| | | VLMK23R1S1 | $I_V$ | 112 | - | 224 | mcd |
| Dominant wavelength | $I_F$ = 20 mA | | $\lambda_d$ | - | 630 | - | nm |
| Peak wavelength | $I_F$ = 20 mA | | $\lambda_p$ | - | 643 | - | nm |
| Angle of half intensity | $I_F$ = 20 mA | | $\varphi$ | - | ± 60 | - | deg |
| Forward voltage | $I_F$ = 20 mA | | $V_F$ | - | 1.9 | 2.6 | V |
| Reverse voltage | $I_R$ = 10 µA | | $V_R$ | 5 | - | - | V |
| 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)<br>**VLMF23.., SOFT ORANGE** | | | | | | | |
|---|---|---|---|---|---|---|---|
| **PARAMETER** | **TEST CONDITION** | **PART** | **SYMBOL** | **MIN.** | **TYP.** | **MAX.** | **UNIT** |
| Luminous intensity (1) | $I_F$ = 20 mA | VLMF23Q2S1 | $I_V$ | 90 | - | 224 | mcd |
| | | VLMF23R2T1 | $I_V$ | 140 | - | 355 | mcd |
| | | VLMF23Q2T1 | $I_V$ | 90 | - | 355 | mcd |
| Dominant wavelength | $I_F$ = 20 mA | | $\lambda_d$ | 598 | 605 | 611 | nm |
| Peak wavelength | $I_F$ = 20 mA | | $\lambda_p$ | - | 610 | - | nm |
| Angle of half intensity | $I_F$ = 20 mA | | $\varphi$ | - | ± 60 | - | deg |
| Forward voltage | $I_F$ = 20 mA | | $V_F$ | - | 2 | 2.6 | V |
| Reverse voltage | $I_R$ = 10 µA | | $V_R$ | 5 | - | - | V |
| 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)
## VLME23.., YELLOW

| PARAMETER | TEST CONDITION | PART | SYMBOL | MIN. | TYP. | MAX. | UNIT |
|---|---|---|---|---|---|---|---|
| Luminous intensity (1) | $I_F$ = 20 mA | VLME23Q2S1 | $I_V$ | 90 | - | 224 | mcd |
| | | VLME23R2T1 | $I_V$ | 140 | - | 355 | mcd |
| | | VLME23Q2T1 | $I_V$ | 90 | - | 355 | mcd |
| Dominant wavelength | $I_F$ = 20 mA | | $\lambda_d$ | 581 | 588 | 594 | nm |
| Peak wavelength | $I_F$ = 20 mA | | $\lambda_p$ | - | 590 | - | nm |
| Angle of half intensity | $I_F$ = 20 mA | | φ | - | ± 60 | - | deg |
| Forward voltage | $I_F$ = 20 mA | | $V_F$ | - | 2 | 2.6 | V |
| Reverse voltage | $I_R$ = 10 µA | | $V_R$ | 5 | - | - | V |
| Junction capacitance | $V_R$ = 0 V, f = 1 MHz | | $C_j$ | | 15 | - | pF |

**Note**

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

## LUMINOUS INTENSITY CLASSIFICATION

| GROUP | LIGHT INTENSITY (mcd) | | |
|---|---|---|---|
| STANDARD | OPTIONAL | MIN. | MAX. |
| P | 2 | 56 | 71 |
| Q | 1 | 71 | 90 |
| | 2 | 90 | 112 |
| R | 1 | 112 | 140 |
| | 2 | 140 | 180 |
| S | 1 | 180 | 224 |
| | 2 | 224 | 280 |
| T | 1 | 280 | 355 |

**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.

## COLOR CLASSIFICATION

| GROUP | DOMINANT WAVELENGTH (nm) | | | |
|---|---|---|---|---|
| | SOFT ORANGE | | YELLOW | |
| | MIN. | MAX. | MIN. | MAX. |
| 1 | 598 | 601 | 581 | 584 |
| 2 | 600 | 603 | 583 | 586 |
| 3 | 602 | 605 | 585 | 588 |
| 4 | 604 | 607 | 587 | 590 |
| 5 | 606 | 609 | 589 | 592 |
| 6 | 608 | 611 | 591 | 594 |

**Note**

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

## CROSSING TABLE

| VISHAY | OSRAM |
|---|---|
| VLME23Q2S1 | LYM676Q2S1 |
| VLME23R2T1 | LYM676R2T1 |
| VLME23Q2T1 | LYM676Q2T1 |
| VLMF23Q2S1 | LOM676Q2S1 |
| VLMF23R2T1 | LOM676R2T1 |
| VLMF23Q2T1 | LOM676Q2T1 |
| VLMK23P2R1 | LSM676P2R1 |
| VLMK23Q2S1 | LSM676Q2S1 |
| VLMK23P2S1 | LSM676P2S1 |

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

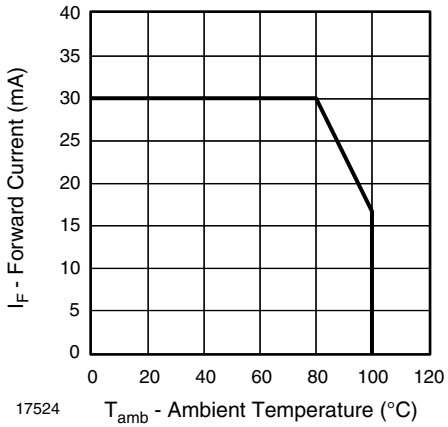



Fig. 1 - Forward Current vs. Ambient Temperature

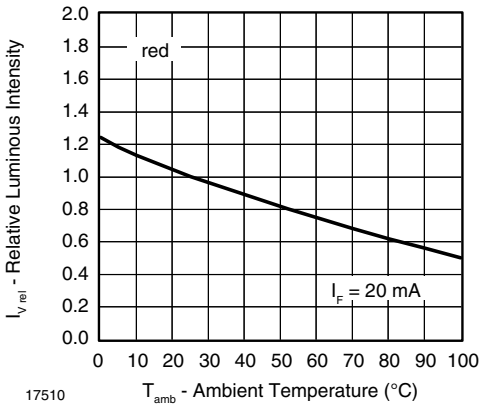



Fig. 4 - Relative Luminous Intensity vs. Ambient Temperature

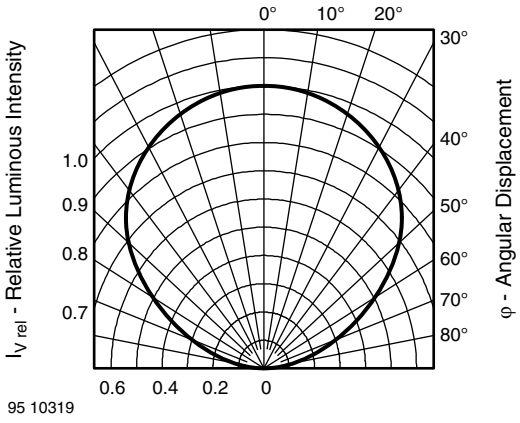



Fig. 2 - Relative Luminous Intensity vs. Angular Displacement

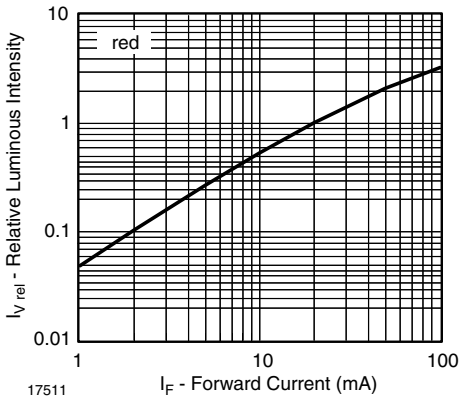



Fig. 5 - Relative Luminous Intensity vs. Forward Current

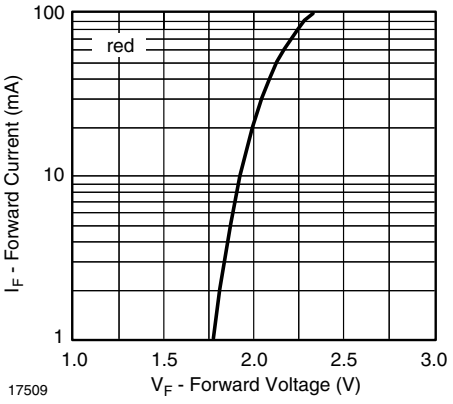



Fig. 3 - Forward Current vs. Forward Voltage

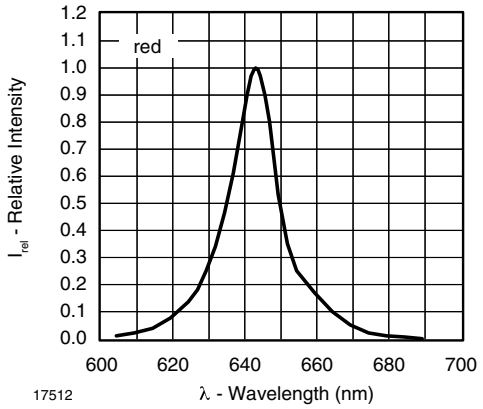



Fig. 6 - Relative Intensity vs. Wavelength

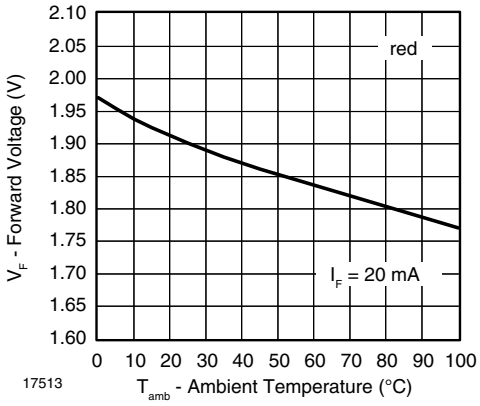



Fig. 7 - Relative Intensity vs. Wavelength

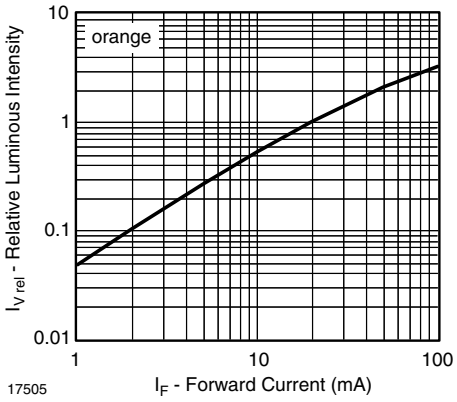



Fig. 10 - Relative Luminous Intensity vs. Forward Current

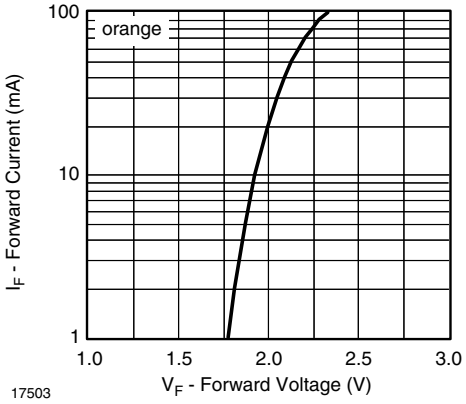



Fig. 8 - Forward Current vs. Forward Voltage

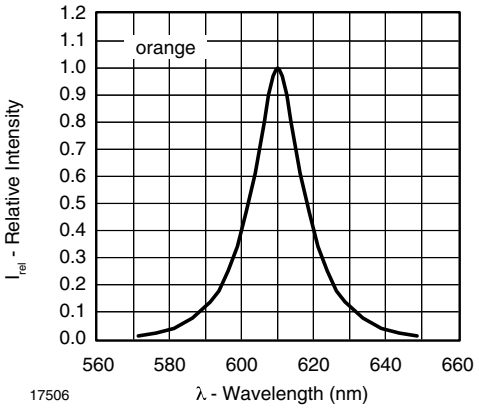



Fig. 11 - Relative Intensity vs. Wavelength

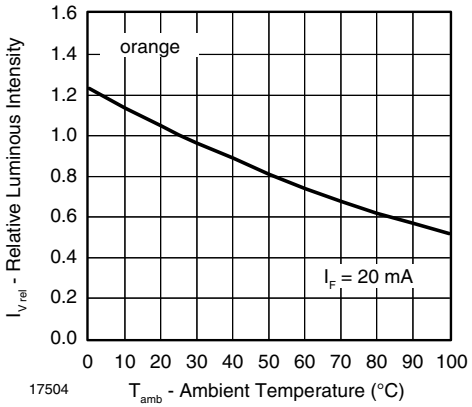



Fig. 9 - Relative Luminous Intensity vs. Ambient Temperature

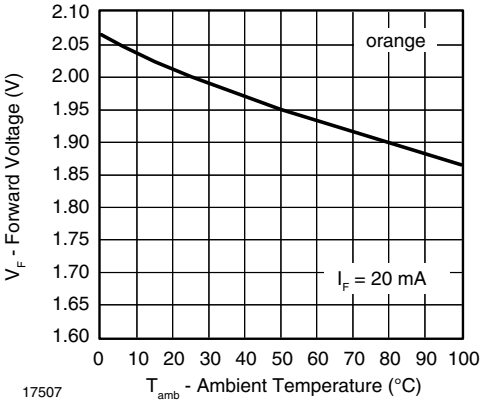



Fig. 12 - Forward Voltage vs. Ambient Temperature

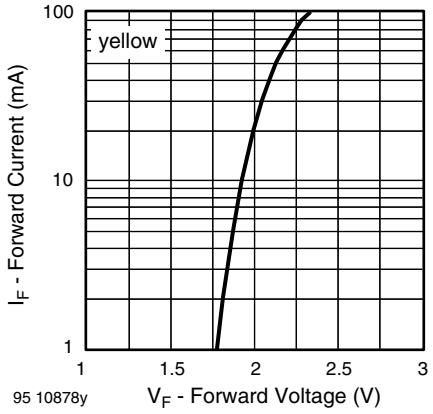



Fig. 13 - Forward Current vs. Forward Voltage

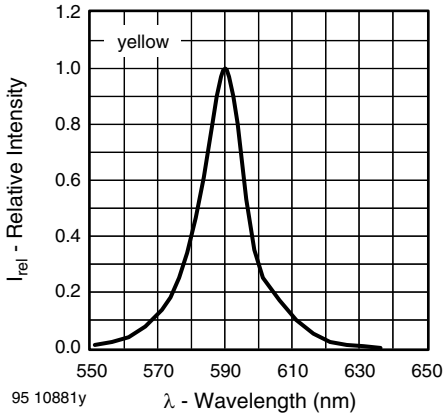



Fig. 16 - Relative Intensity vs. Wavelength

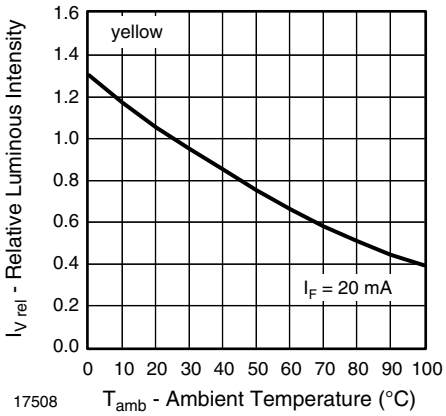



Fig. 14 - Relative Luminous Intensity vs. Ambient Temperature

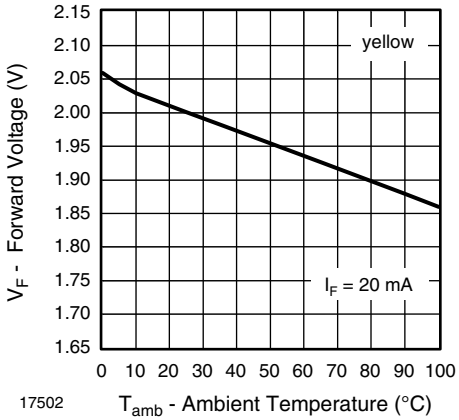



Fig. 17 - Forward Voltage vs. Ambient Temperature

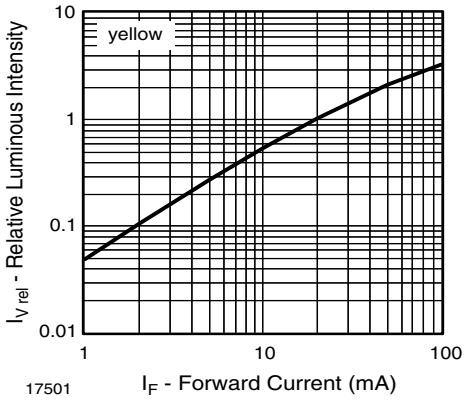
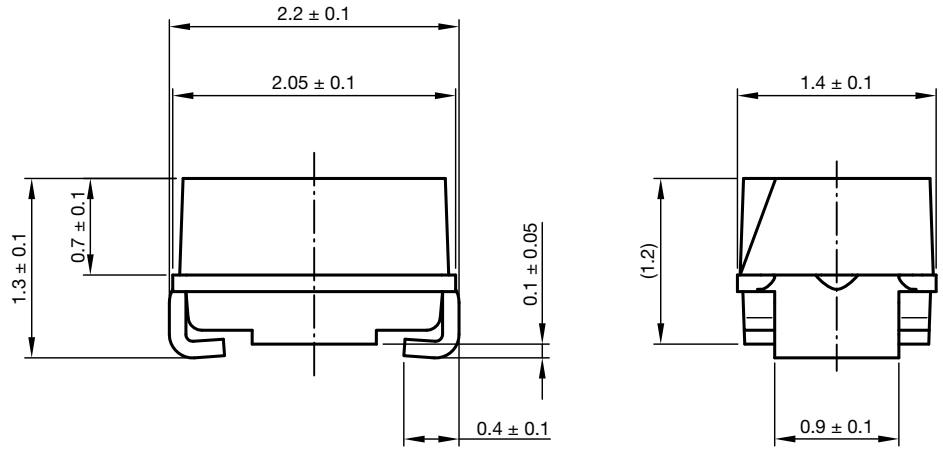
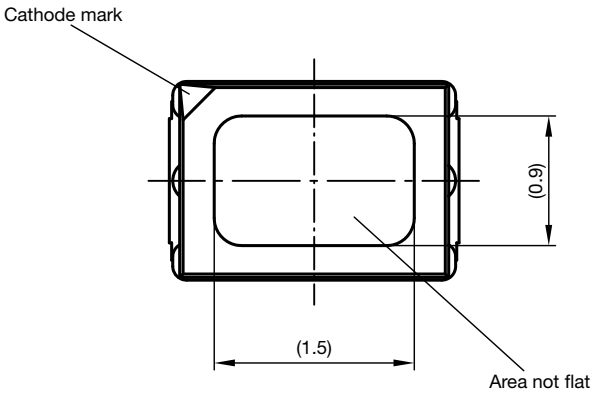


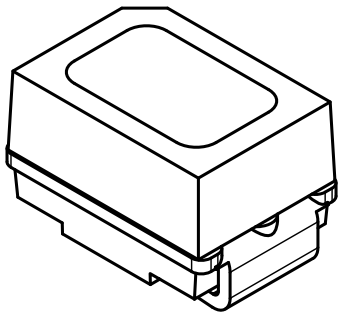

Fig. 15 - Relative Luminous Intensity vs. Forward Current

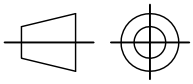
**PACKAGE DIMENSIONS** in millimeters




Not indicated tolerances ± 0.2

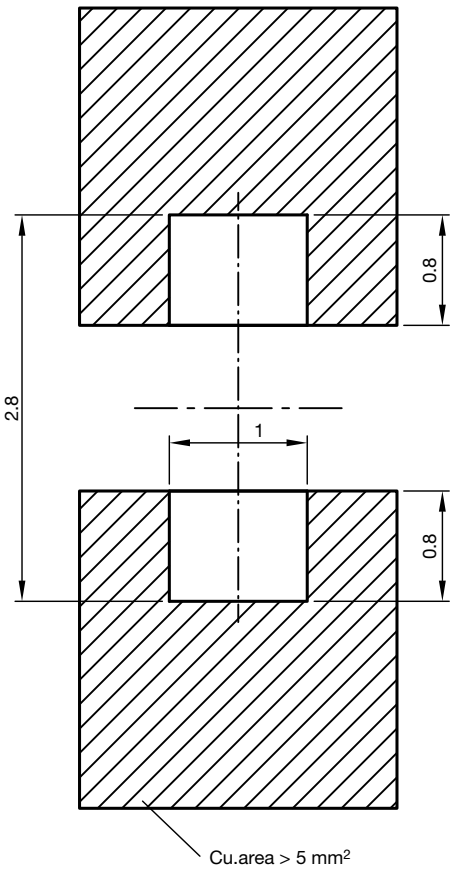




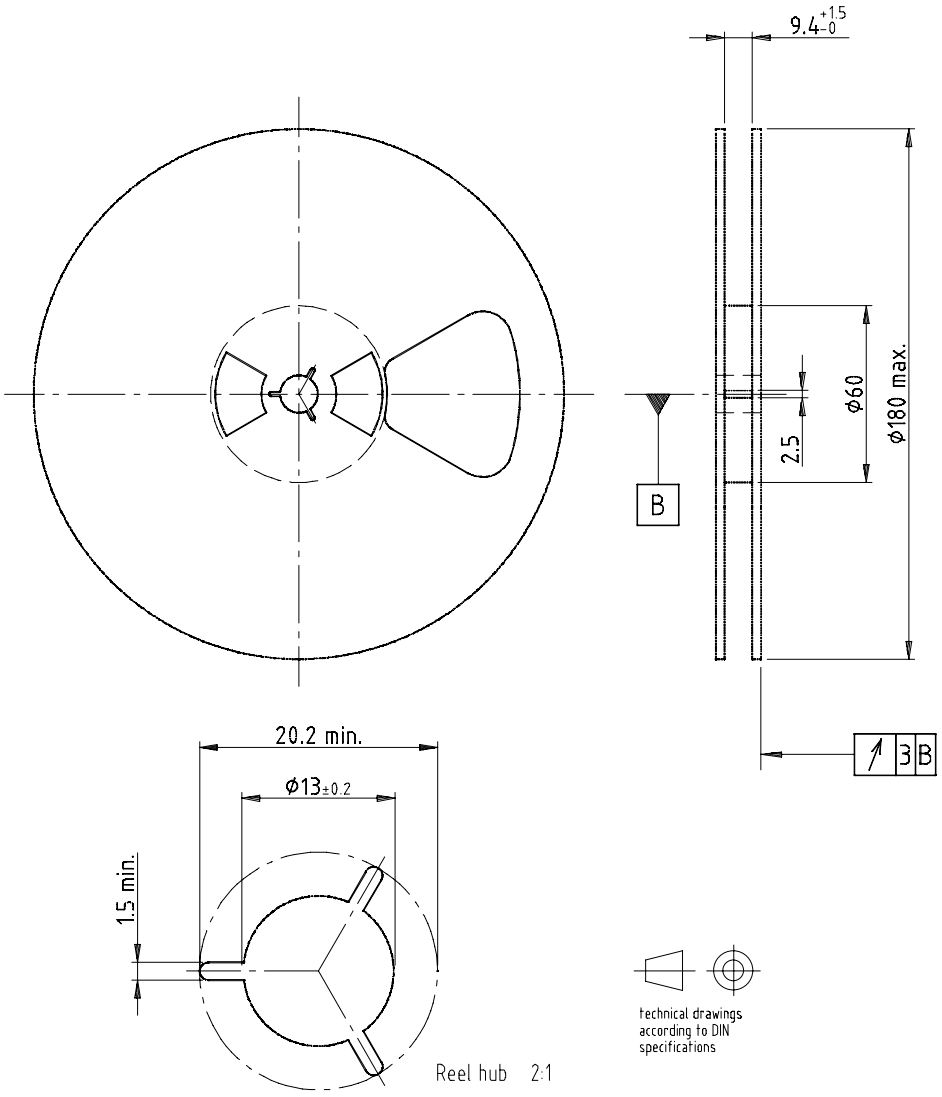
technical drawings
according to DIN
specifications


Proposed pad layout
(for reference only)




Drawing-No.: 6.541-5069.01-4
Issue: 2; 24.11.14

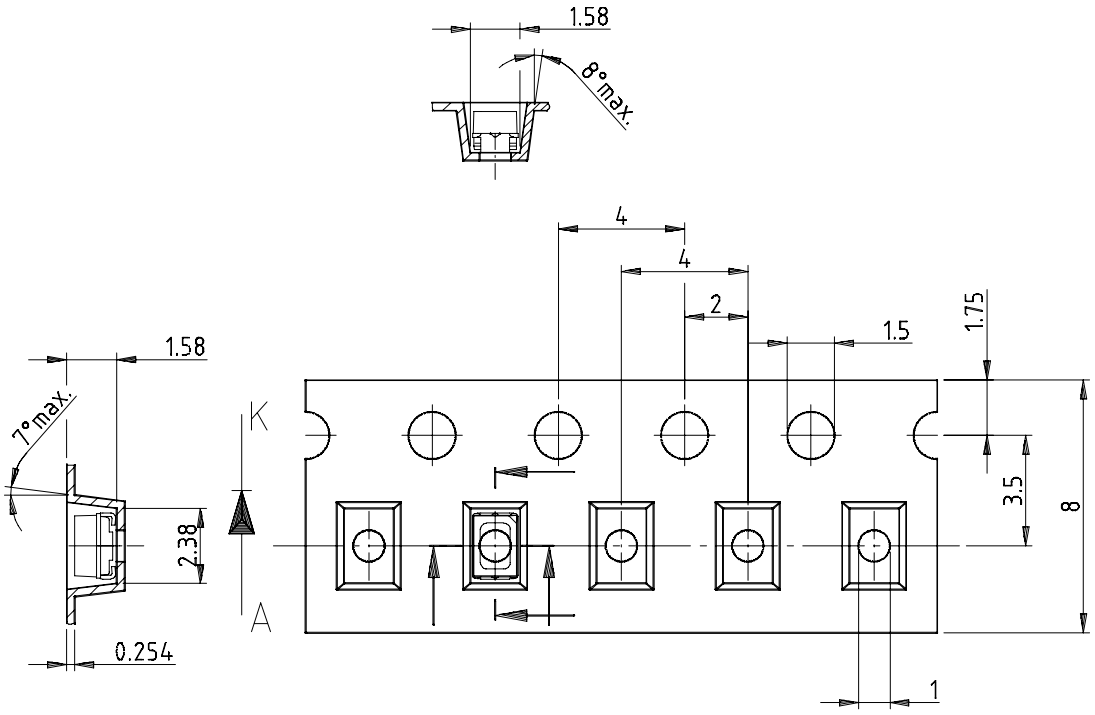
**REEL DIMENSIONS** in millimeters




Drawing-No.: 9.800-5051.V5-4
Issue: 1; 25.07.02

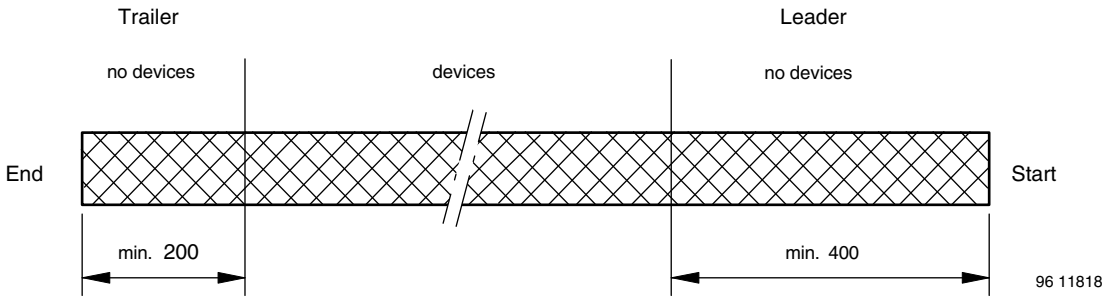
16938

**TAPE DIMENSIONS** in millimeters




Drawing-No.: 9.700-5266.01-4
Issue: 1; 05.06.02
16939

**LEADER AND TRAILER DIMENSIONS** in millimeters




GS08 = 3000 pcs

## COVER TAPE PEEL STRENGTH

According to DIN EN 60286-3

0.1 N to 1.3 N

300 mm/min ± 10 mm/min

165° to 180° peel angle

## LABEL

**Standard bar code labels for finished goods**

The standard bar code labels are product labels and used for identification of goods. The finished goods are packed in final packing area. The standard packing units are labeled with standard bar code labels before transported as finished goods to warehouses. The labels are on each packing unit and contain Vishay Semiconductor GmbH specific data.

| VISHAY SEMICONDUCTOR GMBH STANDARD BAR CODE PRODUCT LABEL (finished goods) | | |
|---|---|---|
| **PLAIN WRITING** | **ABBREVIATION** | **LENGTH** |
| Item-description | - | 18 |
| Item-number | INO | 8 |
| Selection-code | SEL | 3 |
| LOT-/serial-number | BATCH | 10 |
| Data-code | COD | 3 (YWW) |
| Plant-code | PTC | 2 |
| Quantity | QTY | 8 |
| Accepted by: | ACC | - |
| Packed by: | PCK | - |
| Mixed code indicator | MIXED CODE | - |
| Origin | xxxxxxx+ | Company logo |
| **LONG BAR CODE TOP** | **TYPE** | **LENGTH** |
| Item-number | N | 8 |
| Plant-code | N | 2 |
| Sequence-number | X | 3 |
| Quantity | N | 8 |
| Total length | - | 21 |
| **SHORT BAR CODE BOTTOM** | **TYPE** | **LENGTH** |
| Data-code | N | 3 |
| Selection-code | X | 3 |
| Batch-number | X | 10 |
| Filter | - | 1 |
| Total length | - | 17 |

## SOLDERING PROFILE

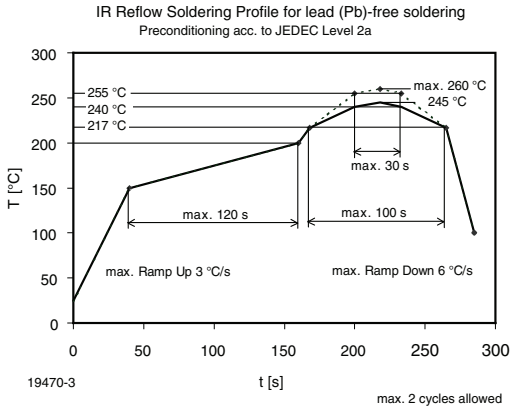
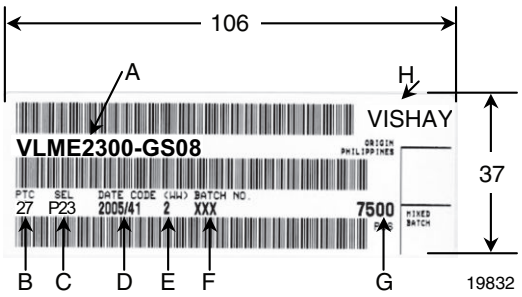



Fig. 18 - Vishay Lead (Pb)-free Reflow Soldering Profile (acc. to J-STD-020)

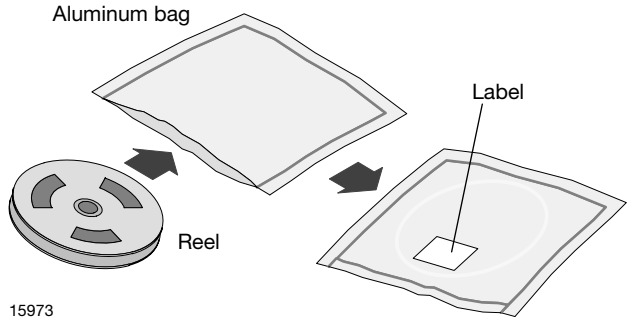
## BAR CODE PRODUCT LABEL (example)




A. Type of component
B. Manufacturing plant
C. SEL - selection code (bin):
e.g.: P2 = code for luminous intensity group
3 = 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:

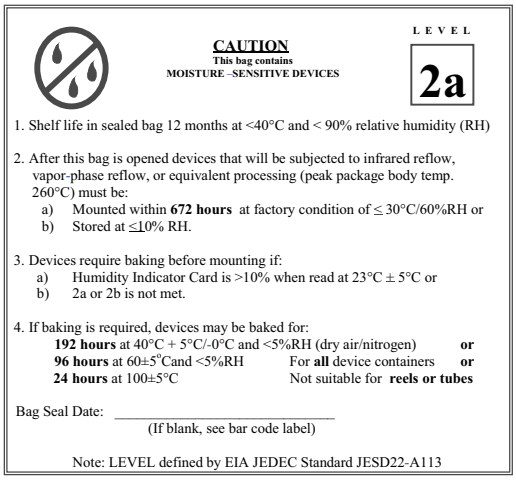
- Storage temperature 10 °C to 30 °C
- Storage humidity ≤ 60 % RH max.

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.




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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# Material Category Policy

**Vishay Intertechnology, Inc. hereby certifies that all its products that are identified as RoHS-Compliant fulfill the definitions and restrictions defined under Directive 2011/65/EU of The European Parliament and of the Council of June 8, 2011 on the restriction of the use of certain hazardous substances in electrical and electronic equipment (EEE) - recast, unless otherwise specified as non-compliant.**

**Please note that some Vishay documentation may still make reference to RoHS Directive 2002/95/EC. We confirm that all the products identified as being compliant to Directive 2002/95/EC conform to Directive 2011/65/EU.**

**Vishay Intertechnology, Inc. hereby certifies that all its products that are identified as Halogen-Free follow Halogen-Free requirements as per JEDEC JS709A standards. Please note that some Vishay documentation may still make reference to the IEC 61249-2-21 definition. We confirm that all the products identified as being compliant to IEC 61249-2-21 conform to JEDEC JS709A standards.**

Общество с ограниченной ответственностью «МосЧип» ИНН 7719860671 / КПП 771901001
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