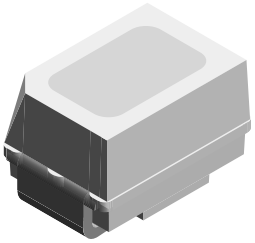
# Standard Mini SMD LED


19226

## FEATURES

- SMD LEDs with exceptional brightness
- Luminous intensity categorized
- Compatible with automatic placement equipment
- EIA and ICE standard package
- 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 packaging unit $I_{Vmax}/I_{Vmin} \leq 2.0$, optional $\leq 1.6$
- Preconditioning acc. to JEDEC level 2a
- Lead (Pb)-free device
- Component in accordance to RoHS 2002/95/EC and WEEE 2002/96/EC

## 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 reliably in an arduous environment. This is often the case in automotive and industrial application of course.

## PRODUCT GROUP AND PACKAGE DATA

- Product group: LED
- Package: SMD MiniLED
- Product series: standard
- 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
- General use

**PARTS TABLE**

| PART | COLOR, LUMINOUS INTENSITY | TECHNOLOGY |
|---|---|---|
| VLMS2100-GS08 | Red, $I_V$ = 7.1 mcd | GaAsP on GaP |
| VLMS21H2K1-GS08 | Red, $I_V$ = (3.55 to 9) mcd | GaAsP on GaP |
| VLMS21J2L1-GS08 | Red, $I_V$ = (5.6 to 14) mcd | GaAsP on GaP |
| VLMS21H2L1-GS08 | Red, $I_V$ = (3.55 to 14) mcd | GaAsP on GaP |
| VLMO2100-GS08 | Soft orange, $I_V$ = 7.1 mcd | GaAsP on GaP |
| VLMO21H2K1-GS08 | Soft orange, $I_V$ = (3.55 to 9) mcd | GaAsP on GaP |
| VLMO21J2L1-GS08 | Soft orange, $I_V$ = (5.6 to 14) mcd | GaAsP on GaP |
| VLMO21H2L1-GS08 | Soft orange, $I_V$ = (3.55 to 14) mcd | GaAsP on GaP |
| VLMY2100-GS08 | Yellow, $I_V$ = 7.1 mcd | GaAsP on GaP |
| VLMY21H2K1-GS08 | Yellow, $I_V$ = (3.55 to 9) mcd | GaAsP on GaP |
| VLMY21J2L1-GS08 | Yellow, $I_V$ = (5.6 to 14) mcd | GaAsP on GaP |
| VLMY21H2L1-GS08 | Yellow, $I_V$ = (3.55 to 14) mcd | GaAsP on GaP |

| ABSOLUTE MAXIMUM RATINGS[1] VLMS21.., VLMO21.., VLMY21.. | | | | |
|---|---|---|---|---|
| **PARAMETER** | **TEST CONDITION** | **SYMBOL** | **VALUE** | **UNIT** |
| Reverse voltage[2] | | $V_R$ | 6 | V |
| DC Forward current | $T_{amb} \leq 60$ °C | $I_F$ | 30 | mA |
| Surge forward current | $t_p \leq 10$ µs | $I_{FSM}$ | 0.5 | A |
| Power dissipation | | $P_V$ | 95 | mW |
| Junction temperature | | $T_j$ | 100 | °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$^2$) | $R_{thJA}$ | 480 | K/W |

Note:
[1] $T_{amb}$ = 25 °C, unless otherwise specified
[2] Driving the LED in reverse direction is suitable for a short term application

| OPTICAL AND ELECTRICAL CHARACTERISTICS[1] VLMS21.., RED | | | | | | | |
|---|---|---|---|---|---|---|---|
| **PARAMETER** | **TEST CONDITION** | **PART** | **SYMBOL** | **MIN** | **TYP.** | **MAX** | **UNIT** |
| Luminous intensity[2] | $I_F$ = 10 mA | VLMS2100 | $I_V$ | 2.8 | 7.1 | | mcd |
| | $I_F$ = 10 mA | VLMS21H2K1 | $I_V$ | 3.55 | | 9 | mcd |
| | $I_F$ = 10 mA | VLMS21J2L1 | $I_V$ | 5.6 | | 14 | mcd |
| | $I_F$ = 10 mA | VLMS21H2L1 | $I_V$ | 3.55 | | 14 | mcd |
| Dominant wavelength | $I_F$ = 10 mA | | $\lambda_d$ | 624 | 628 | 636 | nm |
| Peak wavelength | $I_F$ = 10 mA | | $\lambda_p$ | | 640 | | nm |
| Angle of half intensity | $I_F$ = 10 mA | | $\varphi$ | | ± 60 | | deg |
| Forward voltage | $I_F$ = 20 mA | | $V_F$ | | 2.1 | 3.0 | V |
| Reverse voltage | $I_R$ = 10 µA | | $V_R$ | 6 | 15 | | V |
| Junction capacitance | $V_R$ = 0, f = 1 MHz | | $C_j$ | | 15 | | pF |

Note:
[1] $T_{amb}$ = 25 °C unless otherwise specified
[2] In one Packing Unit $I_{Vmax}/I_{Vmin} \leq 2.0$

| OPTICAL AND ELECTRICAL CHARACTERISTICS[1] VLMO21.., SOFT ORANGE | | | | | | | |
|---|---|---|---|---|---|---|---|
| **PARAMETER** | **TEST CONDITION** | **PART** | **SYMBOL** | **MIN** | **TYP.** | **MAX** | **UNIT** |
| Luminous intensity[2] | $I_F$ = 10 mA | VLMO2100 | $I_V$ | 3.55 | 7.1 | | mcd |
| | $I_F$ = 10 mA | VLMO21H2K1 | $I_V$ | 3.55 | | 9 | mcd |
| | $I_F$ = 10 mA | VLMO21J2L1 | $I_V$ | 5.6 | | 14 | mcd |
| | $I_F$ = 10 mA | VLMO2H2L1 | $I_V$ | 3.55 | | 14 | mcd |
| Dominant wavelength | $I_F$ = 10 mA | | $\lambda_d$ | 598 | 605 | 611 | nm |
| Peak wavelength | $I_F$ = 10 mA | | $\lambda_p$ | | 605 | | nm |
| Angle of half intensity | $I_F$ = 10 mA | | $\varphi$ | | ± 60 | | deg |
| Forward voltage | $I_F$ = 20 mA | | $V_F$ | | 2.1 | 3 | V |
| Reverse voltage | $I_R$ = 10 µA | | $V_R$ | 6 | 15 | | V |
| Junction capacitance | $V_R$ = 0, f = 1 MHz | | $C_j$ | | 15 | | pF |

Note:
[1] $T_{amb}$ = 25 °C unless otherwise specified
[2] In one Packing Unit $I_{Vmax}/I_{Vmin} \leq 2.0$

| OPTICAL AND ELECTRICAL CHARACTERISTICS[1] VLMY21.., YELLOW | | | | | | | |
|---|---|---|---|---|---|---|---|
| **PARAMETER** | **TEST CONDITION** | **PART** | **SYMBOL** | **MIN** | **TYP.** | **MAX** | **UNIT** |
| Luminous intensity[2] | $I_F$ = 10 mA | VLMY2100 | $I_V$ | 3.55 | 7.1 | | mcd |
| | $I_F$ = 10 mA | VLMY21H2K1 | $I_V$ | 3.55 | | 9 | mcd |
| | $I_F$ = 10 mA | VLMY21J2L1 | $I_V$ | 5.6 | | 14 | mcd |
| | $I_F$ = 10 mA | VLMY21H2L1 | $I_V$ | 3.55 | | 14 | mcd |
| Dominant wavelength | $I_F$ = 10 mA | | $\lambda_d$ | 581 | 588 | 594 | nm |
| Peak wavelength | $I_F$ = 10 mA | | $\lambda_p$ | | 585 | | nm |
| Angle of half intensity | $I_F$ = 10 mA | | $\varphi$ | | ± 60 | | deg |
| Forward voltage | $I_F$ = 20 mA | | $V_F$ | | 2.2 | 3 | V |
| Reverse voltage | $I_R$ = 10 µA | | $V_R$ | 6 | 15 | | V |
| Junction capacitance | $V_R$ = 0, f = 1 MHz | | $C_j$ | | 15 | | pF |

Note:
[1] $T_{amb}$ = 25 °C unless otherwise specified
[2] In one Packing Unit $I_{Vmax}/I_{Vmin} \leq 2.0$

| LUMINOUS INTENSITY CLASSIFICATION | | | |
|---|---|---|---|
| **GROUP** | **LIGHT INTENSITY (MCD)** | | |
| **STANDARD** | **OPTIONAL** | **MIN** | **MAX** |
| H | 1 | 2.8 | 3.55 |
| | 2 | 3.55 | 4.5 |
| J | 1 | 4.5 | 5.6 |
| | 2 | 5.6 | 7.1 |
| K | 1 | 7.1 | 9.0 |
| | 2 | 9.0 | 11.2 |
| L | 1 | 11.2 | 14.0 |
| | 2 | 14.0 | 18.0 |
| M | 1 | 18.0 | 22.4 |
| | 2 | 22.4 | 28.0 |
| N | 1 | 28.0 | 35.5 |
| | 2 | 35.5 | 45.0 |

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.

| CROSSING TABLE | |
|---|---|
| **VISHAY** | **OSRAM** |
| VLMS2100 | LSM670 |
| VLMS21H2K1 | LSM670-H2K1 |
| VLMS21J2L1 | LSM670-J2L1 |
| VLMS21H2L1 | LSM670-H2L1 |
| VLMO2100 | LOM670 |
| VLMO21H2K1 | LOM670-H2K1 |
| VLMO21J2L1 | LOM670-J2L1 |
| VLMO2H2L1 | LOM670-H2L1 |
| VLMY2100 | LYM670 |
| VLMY21H2K1 | LYM670-H2K1 |
| VLMY21J2L1 | LYM670-J2L1 |
| VLMY21H2L1 | LYM670-H2L1 |

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

Note:
Wavelengths are tested at a current pulse duration of 25 ms and an accuracy of ± 1 nm.

## TYPICAL CHARACTERISTICS

$T_{amb}$ = 25 °C, unless otherwise specified

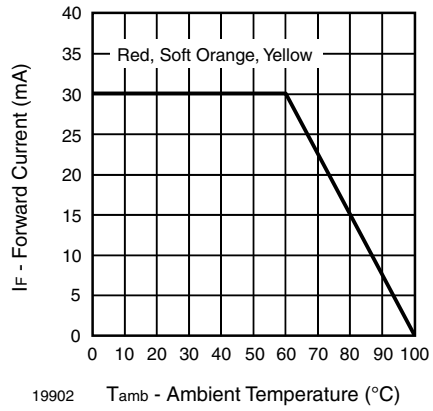



Figure 1. Forward Current vs. Ambient Temperature

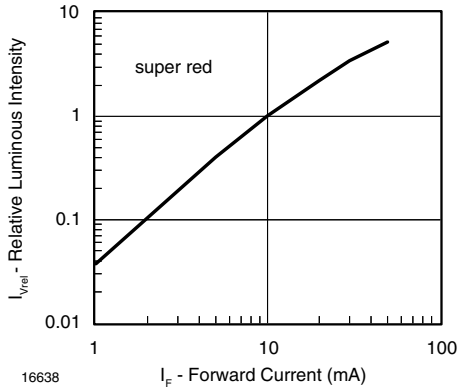



Figure 4. Relative Luminous Intensity vs. Forward Current

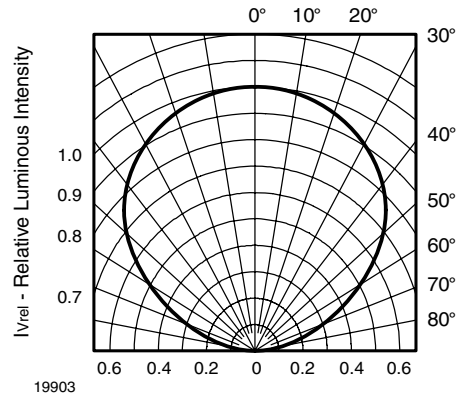



Figure 2. Rel. Luminous Intensity vs. Angular Displacement

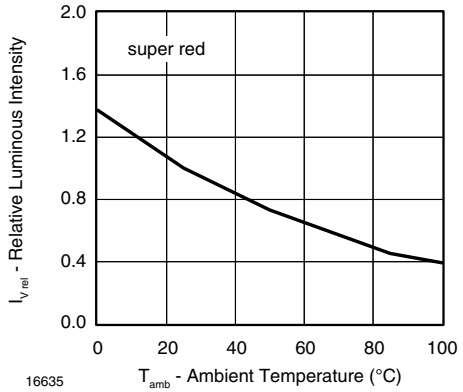



Figure 5. Rel. Luminous Intensity vs. Ambient Temperature

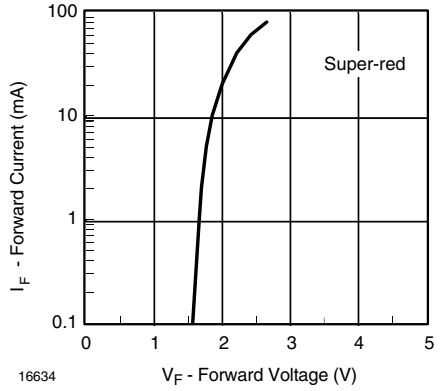



Figure 3. Forward Current vs. Forward Voltage

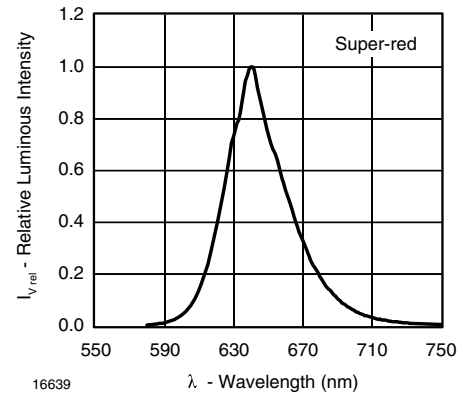



Figure 6. Relative Intensity vs. Wavelength

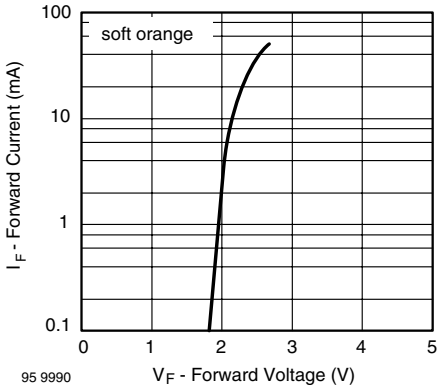



Figure 7. Forward Current vs. Forward Voltage

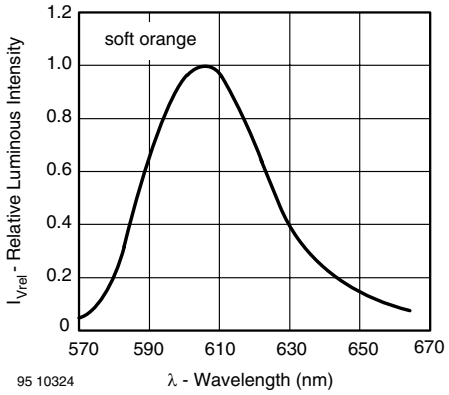



Figure 10. Relative Intensity vs. Wavelength

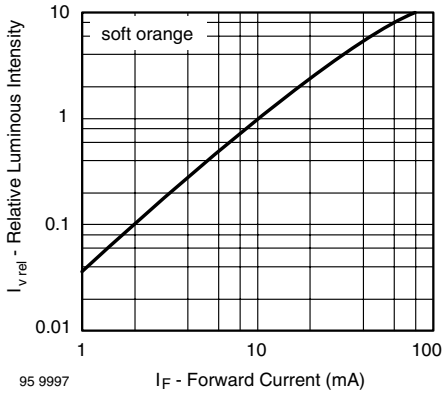



Figure 8. Relative Luminous Intensity vs. Forward Current

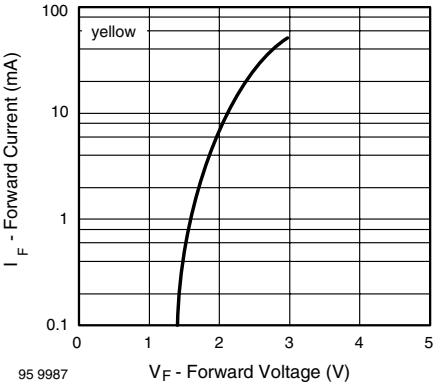



Figure 11. Forward Current vs. Forward Voltage

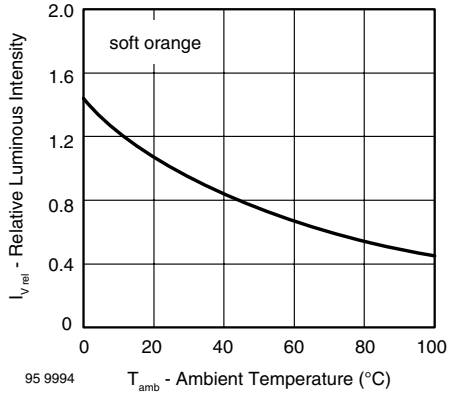



Figure 9. Rel. Luminous Intensity vs. Ambient Temperature

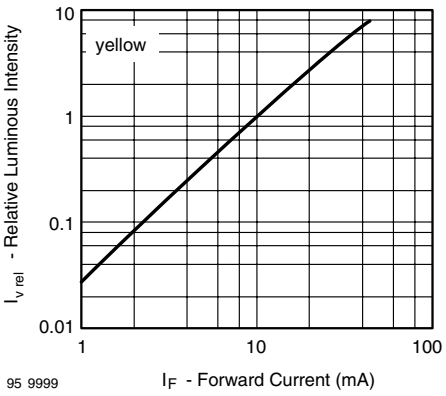



Figure 12. Relative Luminous Intensity vs. Forward Current

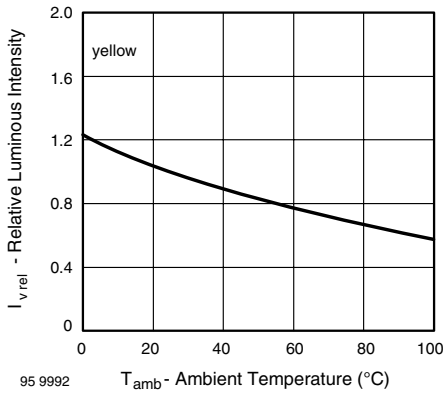



Figure 13. Rel. Luminous Intensity vs. Ambient Temperature

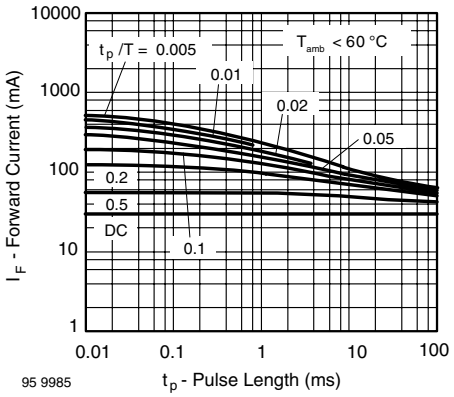



Figure 15. Pulse Forward Current vs. Pulse Duration

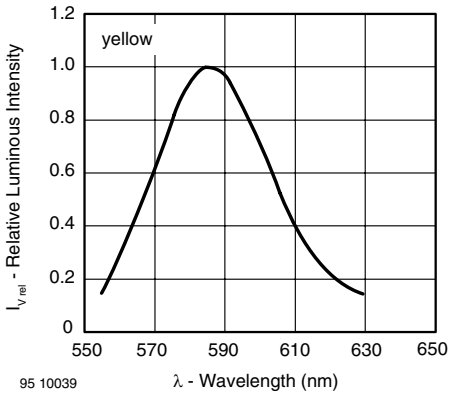



Figure 14. Relative Intensity vs. Wavelength

## SOLDERING PROFILE

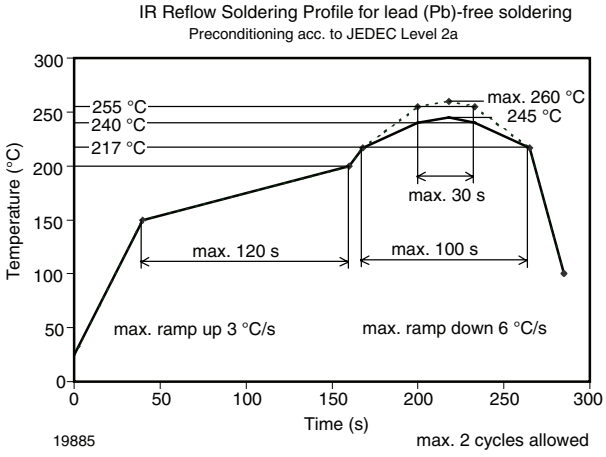
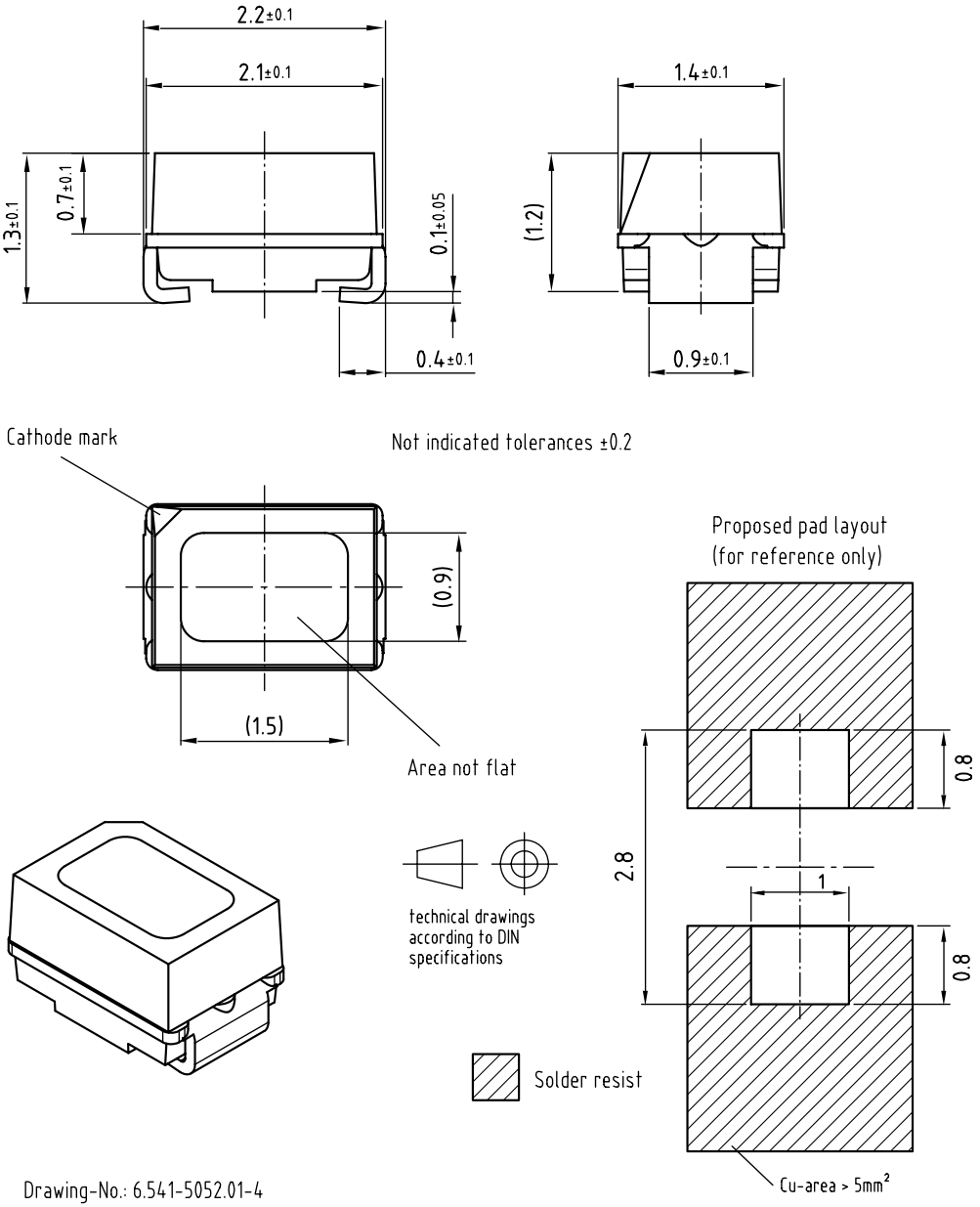
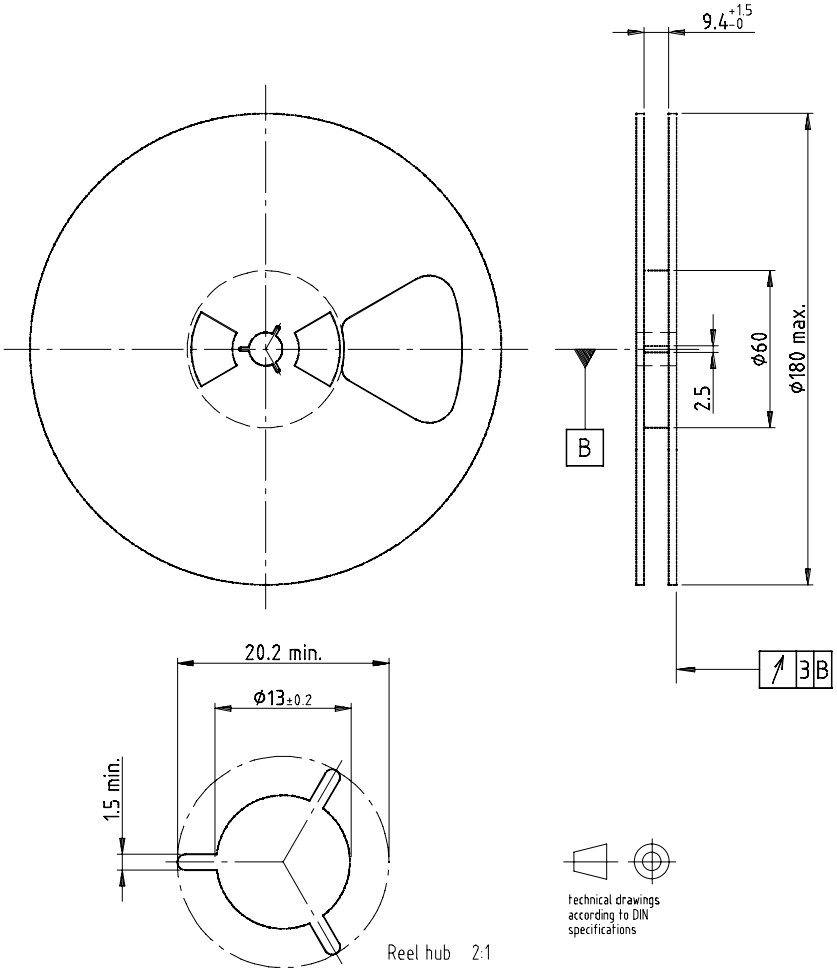



Figure 16. Vishay Leadfree Reflow Soldering Profile
(acc. to J-STD-020B)

**PACKAGE DIMENSIONS** in millimeters



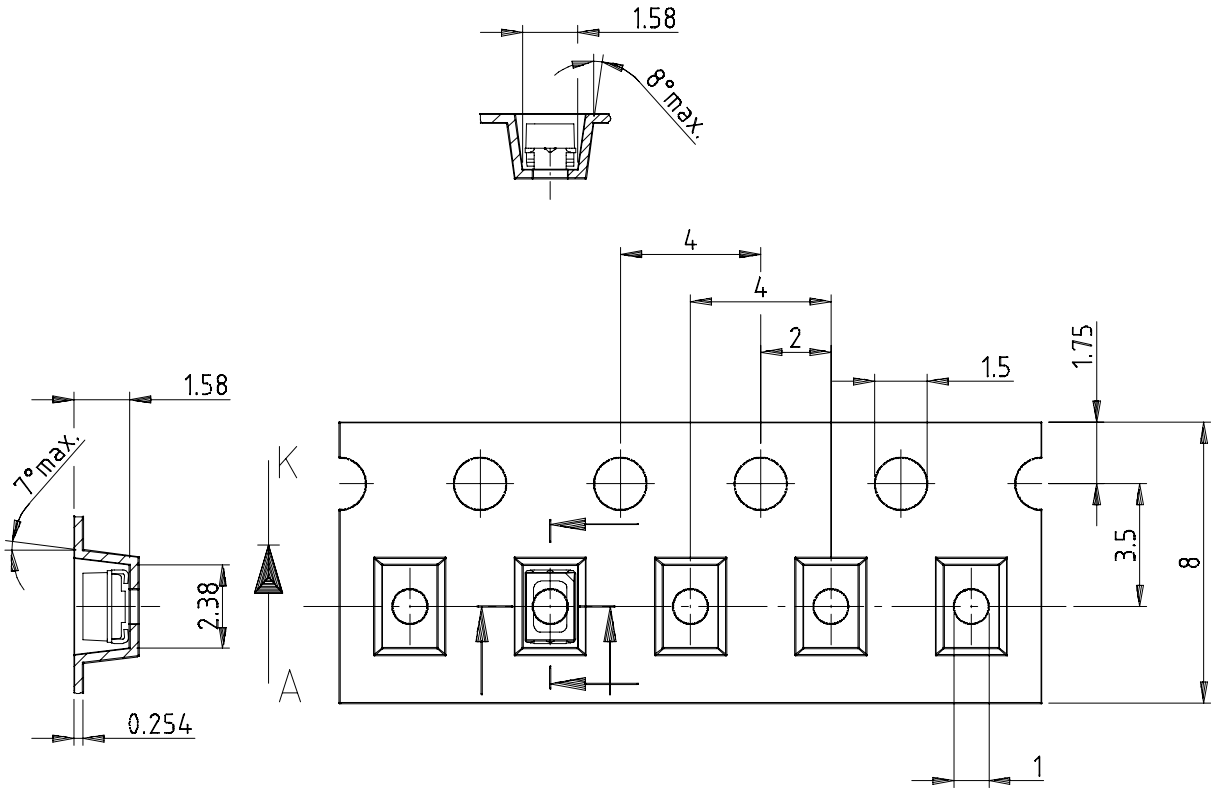
**REEL DIMENSIONS** in millimeters




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

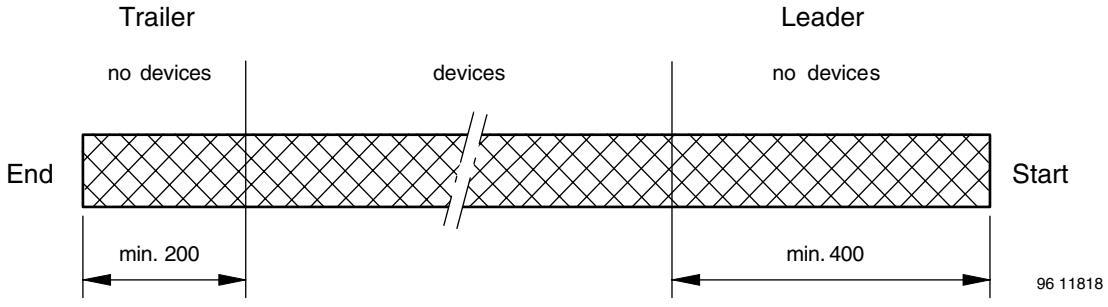
16938

**TAPE DIMENSIONS** in millimeters



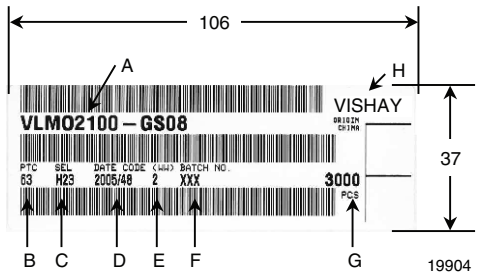

Drawing-No.: 9.700-5266.01-4
Issue: 1; 05.06.02
16939

**LEADER AND TRAILER** Dimensions in millimeters




GS08 = 3000 pcs

## BAR CODE PRODUCT LABEL




A) Type of component
B) Manufacturing plant
C) SEL - Selection code (bin):
   e.g.: H2 = bode for luminous intensity group
   3 = bode for color group
D) Date code year/week
E) Day code (e.g. 2: Tuesday)
F) Batch no.
G) Total quantity
H) Company code

## COVER TAPE PEEL STRENGTH

According to DIN EN 60286-3
0.1 to 1.3 N
300 ± 10 mm/min
165° - 180° peel angle

## LABEL

**Standard bar code labels for finished goods**

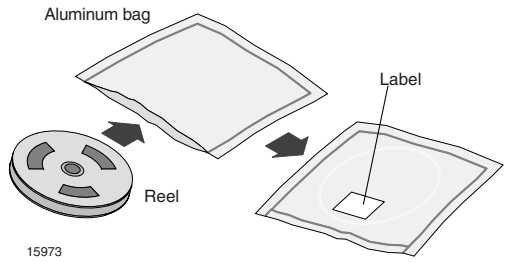
The standard bar code labels are product labels and used for identification of goods. The finished goods are packed in final packing area. The standard packing units are labeled with standard bar code labels before transported as finished goods to warehouses. The labels are on each packing unit and contain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

## VISHAY SEMICONDUCTOR GMBH STANDARD BAR CODE PRODUCT LABEL (FINISHED GOODS)

| PLAIN WRITTING | 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** |
| Selection-code | X | 3 |
| Data-code | N | 3 |
| Batch-number | X | 10 |
| Filter | - | 1 |
| Total length | - | 17 |

## 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.

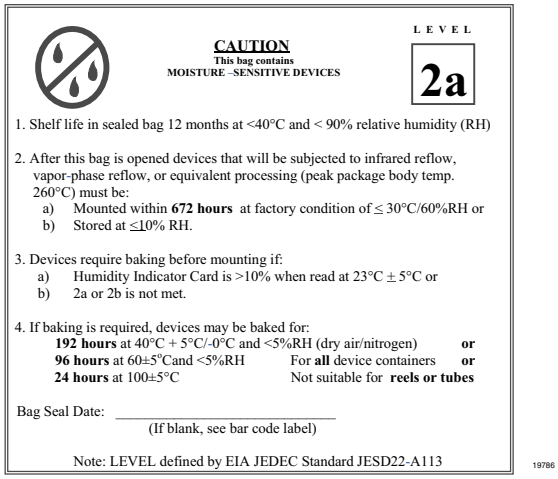
In case of moisture absorption, the devices will recover to the former condition by drying under the following condition:

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. Electro-static 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.

## Ozone Depleting Substances Policy Statement

It is the policy of Vishay Semiconductor GmbH to

1. Meet all present and future national and international statutory requirements.
2. Regularly and continuously improve the performance of our products, processes, distribution and operating systems with respect to their impact on the health and safety of our employees and the public, as well as their impact on the environment.

It is particular concern to control or eliminate releases of those substances into the atmosphere which are known as ozone depleting substances (ODSs).

The Montreal Protocol (1987) and its London Amendments (1990) intend to severely restrict the use of ODSs and forbid their use within the next ten years. Various national and international initiatives are pressing for an earlier ban on these substances.

Vishay Semiconductor GmbH has been able to use its policy of continuous improvements to eliminate the use of ODSs listed in the following documents.

1. Annex A, B and list of transitional substances of the Montreal Protocol and the London Amendments respectively
2. Class I and II ozone depleting substances in the Clean Air Act Amendments of 1990 by the Environmental Protection Agency (EPA) in the USA
3. Council Decision 88/540/EEC and 91/690/EEC Annex A, B and C (transitional substances) respectively.

Vishay Semiconductor GmbH can certify that our semiconductors are not manufactured with ozone depleting substances and do not contain such substances.



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