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# OSRAM LO Q976.01

# Datasheet

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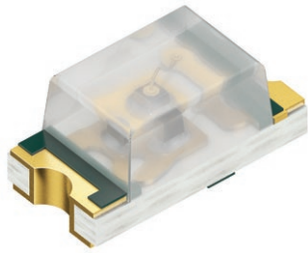


OSRAM

## Chip LED 0603

# LO Q976.01

The Chip LED 0603 is the product of choice for status indication in electronics. The small package size allows compact designs within 7-segment displays and simple backlighting applications in dashboards and switches.



## Applications

- Appliances & Tools
- Display Backlighting
- Factory Automation
- Home & Building Automation
- Projection & Display
- Static Signaling
- Transportation

## Features

- Package: SMT package 0603, clear epoxy
- Chip technology: InGaAlP
- Typ. Radiation: 150°
- Color: $\lambda_{dom}$ = 605 nm (● orange)
- Corrosion Robustness Class: 2B
- ESD: 2 kV acc. to ANSI/ESDA/JEDEC JS-001 (HBM)

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## Ordering Information

| Type | Luminous Intensity [1] $I_F$ = 20 mA $I_v$ | Ordering Code |
|---|---|---|
| LO Q976.01-P2R2-25-1 | 56 ... 180 mcd | Q65113A5256 |

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## Maximum Ratings

| Parameter | Symbol | | Values |
|---|---|---|---|
| Operating Temperature | $T_{op}$ | min.<br>max. | -30 °C<br>85 °C |
| Storage Temperature | $T_{stg}$ | min.<br>max. | -40 °C<br>85 °C |
| Junction Temperature | $T_j$ | max. | 95 °C |
| Forward current<br>$T_A$ = 25 °C | $I_F$ | min.<br>max. | 1 mA<br>30 mA |
| Forward Current pulsed<br>t ≤ 100 µs; D = 0.03 ; $T_s$ = 25 °C | $I_{F\ pulse}$ | max. | 100 mA |
| Surge Current<br>t ≤ 10 µs; D = 0.005 ; $T_A$ = 25 °C | $I_{FS}$ | max. | 100 mA |
| Reverse voltage [2)]<br>$T_A$ = 25 °C | $V_R$ | max. | 10 V |
| ESD withstand voltage<br>acc. to ANSI/ESDA/JEDEC JS-001 (HBM) | $V_{ESD}$ | | 2 kV |

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## Characteristics

$I_F$ = 20 mA; $T_A$ = 25 °C

| Parameter | Symbol | | Values |
|---|---|---|---|
| Peak Wavelength | $\lambda_{peak}$ | typ. | 607 nm |
| Dominant Wavelength [3] | $\lambda_{dom}$ | min. | 600 nm |
| | | typ. | 605 nm |
| | | max. | 612 nm |
| Spectral Bandwidth at 50% $I_{rel,max}$ | $\Delta\lambda$ | typ. | 13 nm |
| Viewing angle at 50% $I_V$ | $2\varphi$ | typ. | 140 ° |
| Forward Voltage [4] | $V_F$ | min. | 1.60 V |
| $I_F$ = 20 mA | | typ. | 2.00 V |
| | | max. | 2.40 V |
| Reverse current [2] | $I_R$ | typ. | 0.01 µA |
| $V_R$ = 10 V | | max. | 10 µA |
| Real thermal resistance junction/solderpoint [5] | $R_{thJS\ real}$ | typ. | 460 K / W |
| | | max. | 550 K / W |

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## Brightness Groups

| Group | Luminous Intensity [1] $I_F$ = 20 mA min. $I_v$ | Luminous Intensity. [1] $I_F$ = 20 mA max. $I_v$ | Luminous Flux [6] $I_F$ = 20 mA typ. $\Phi_V$ |
|---|---|---|---|
| P2 | 56 mcd | 71 mcd | 200 mlm |
| Q1 | 71 mcd | 90 mcd | 260 mlm |
| Q2 | 90 mcd | 112 mcd | 320 mlm |
| R1 | 112 mcd | 140 mcd | 400 mlm |
| R2 | 140 mcd | 180 mcd | 510 mlm |

## Forward Voltage Groups

| Group | Forward Voltage [4] $I_F$ = 20 mA min. $V_F$ | Forward Voltage [4] $I_F$ = 20 mA max. $V_F$ |
|---|---|---|
| A8 | 1.60 V | 2.00 V |
| J8 | 2.00 V | 2.40 V |

## Wavelength Groups

| Group | Dominant Wavelength [3] min. $\lambda_{dom}$ | Dominant Wavelength [3] max. $\lambda_{dom}$ |
|---|---|---|
| 2 | 600 nm | 603 nm |
| 3 | 603 nm | 606 nm |
| 4 | 606 nm | 609 nm |
| 5 | 609 nm | 612 nm |

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## Group Name on Label

**Example: P2-2-A8**

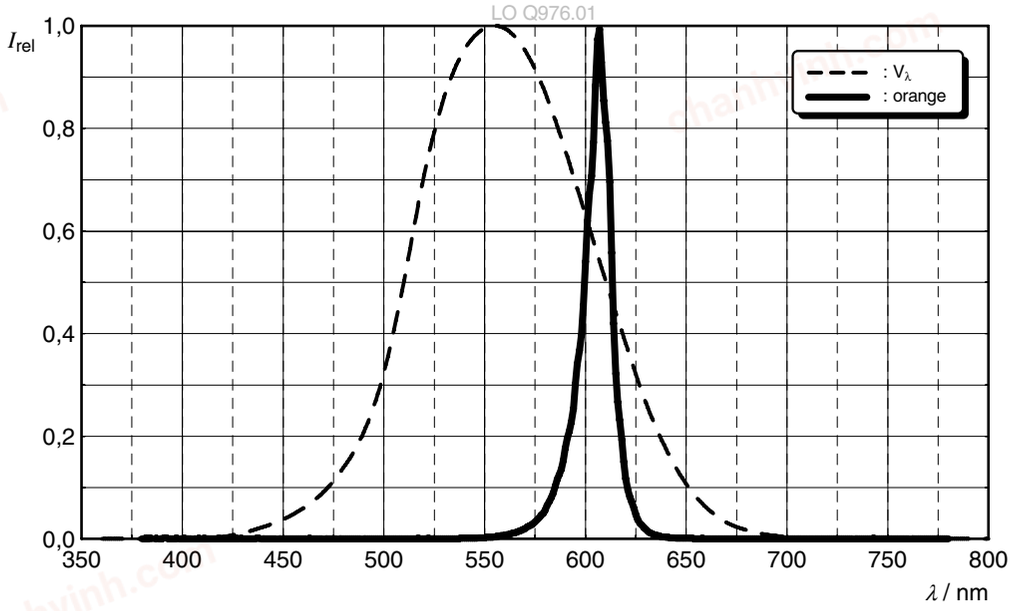
| Brightness | Wavelength | Forward Voltage |
|---|---|---|
| P2 | 2 | A8 |

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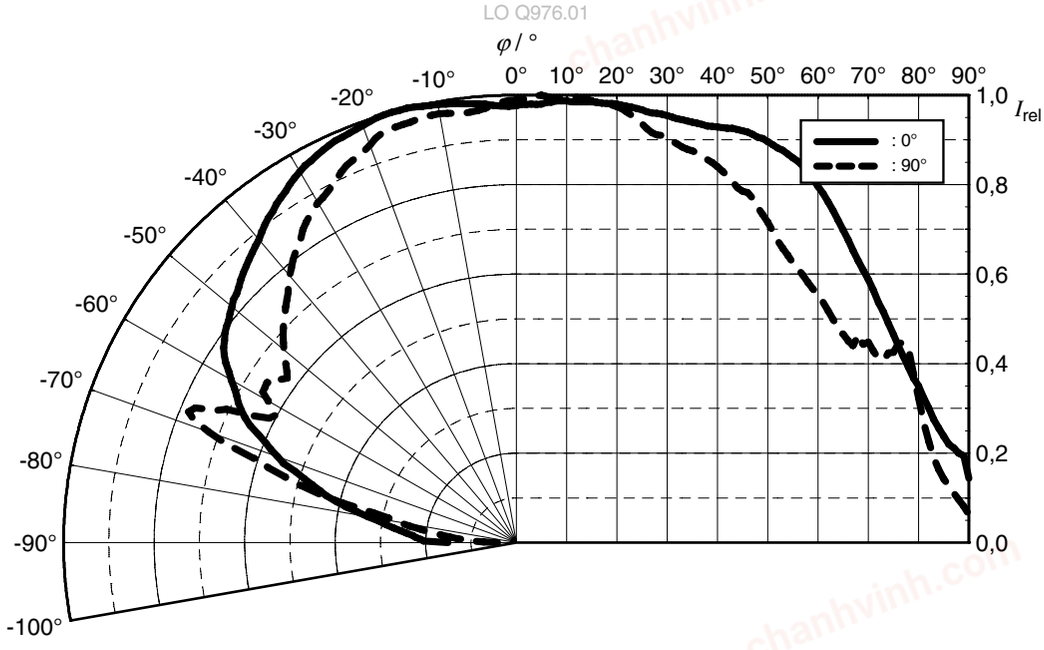
## Relative Spectral Emission [6]

$I_{rel} = f(\lambda)$; $I_F = 20$ mA; $T_A = 25$ °C




## Radiation Characteristics [6]

$I_{rel} = f(\phi)$; $T_A = 25$ °C

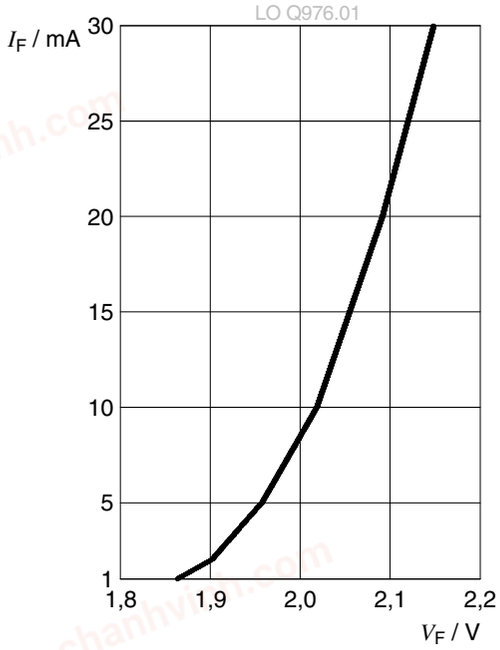


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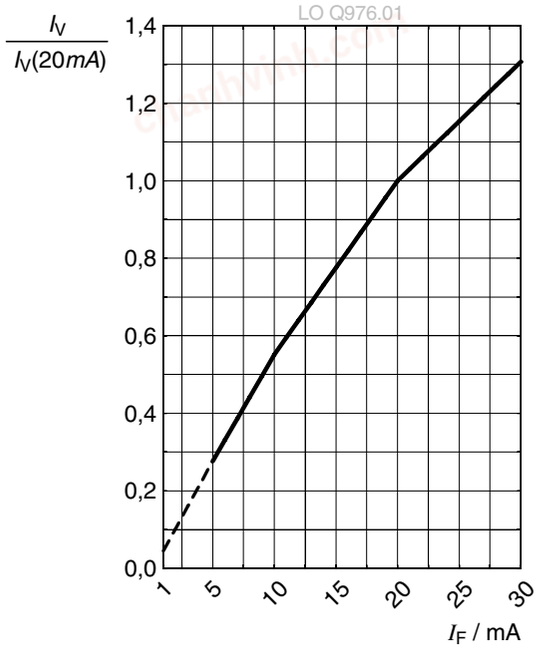
## Forward current [6]

$I_F = f(V_F)$; $T_A = 25$ °C



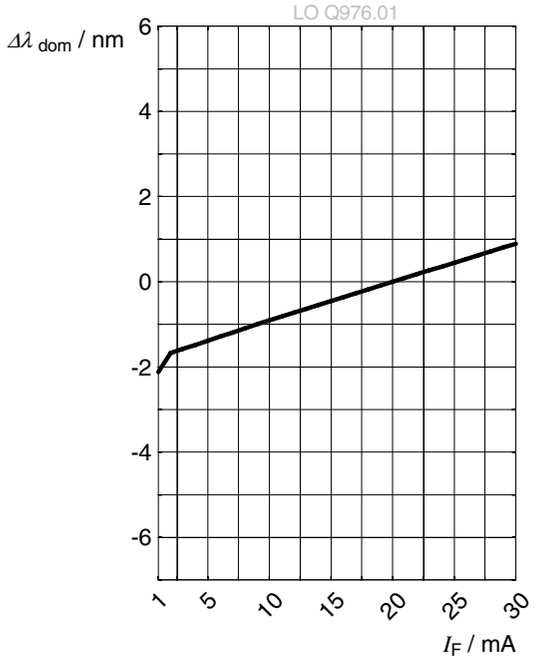

## Relative Luminous Intensity [6], [7]

$I_v/I_v(20\ mA) = f(I_F)$; $T_A = 25$ °C




## Dominant Wavelength [6]

$\Delta\lambda_{dom} = f(I_F)$; $T_A = 25$ °C

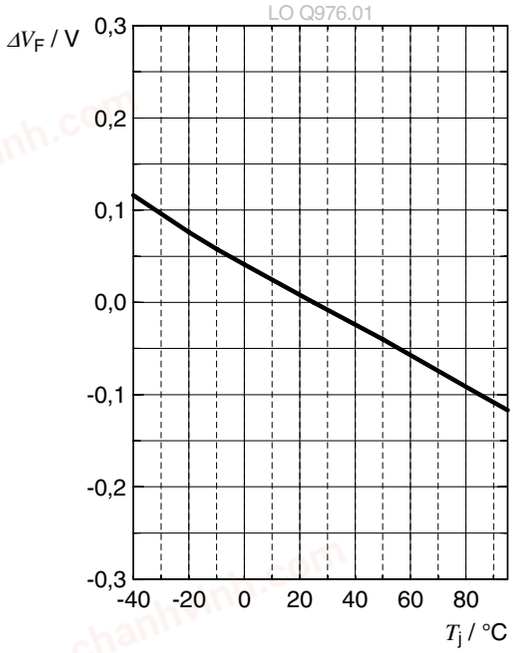


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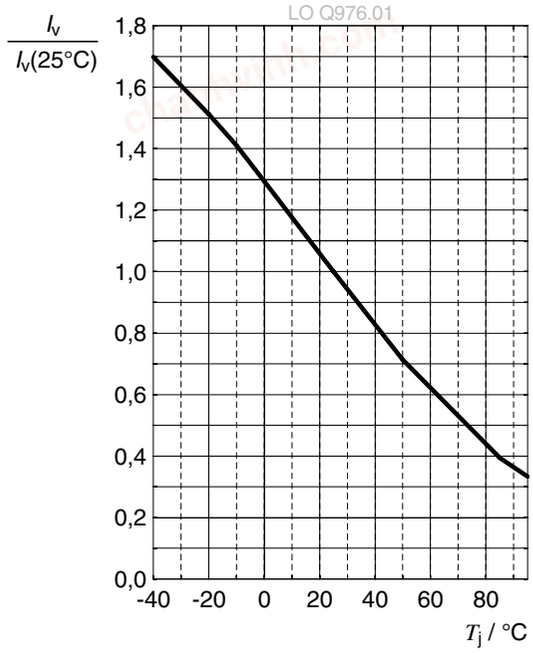
## Forward Voltage [6)]

$\Delta V_F = V_F - V_F(25\ °C) = f(T_j)$; $I_F = 20$ mA



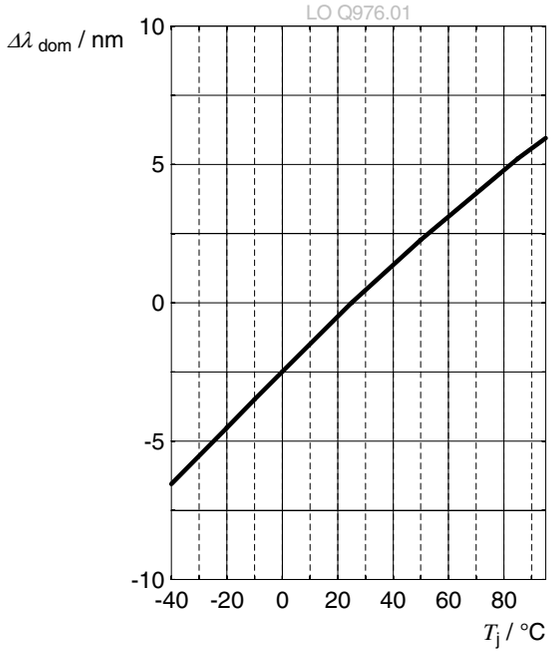

## Relative Luminous Intensity [6)]

$I_v/I_v(25\ °C) = f(T_j)$; $I_F = 20$ mA




## Dominant Wavelength [6)]

$\Delta\lambda_{dom} = \lambda_{dom} - \lambda_{dom}(25\ °C) = f(T_j)$; $I_F = 20$ mA

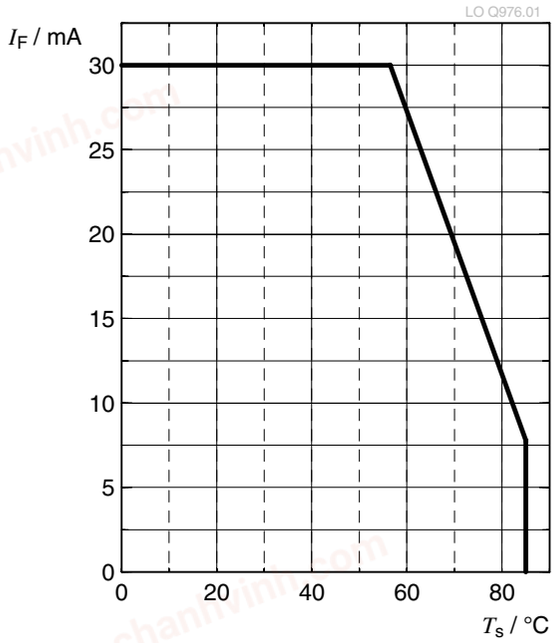


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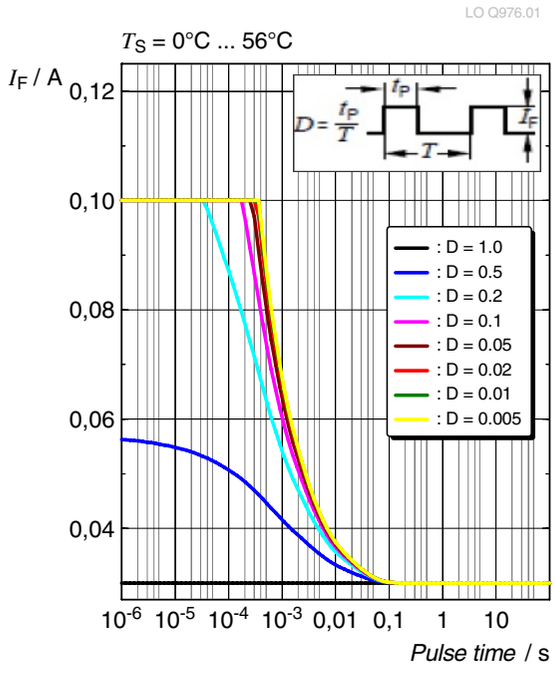
## Max. Permissible Forward Current [5]

$I_F = f(T)$



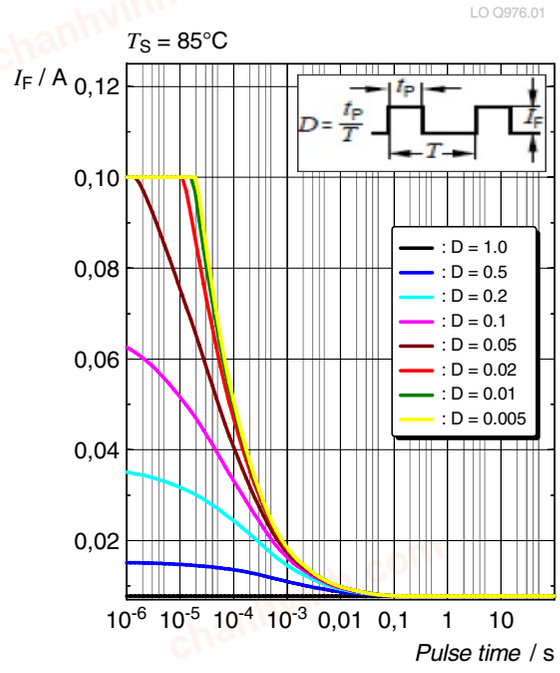

## Permissible Pulse Handling Capability

$I_F = f(t_p)$; D: Duty cycle; $T_A$ = 25 °C




## Permissible Pulse Handling Capability

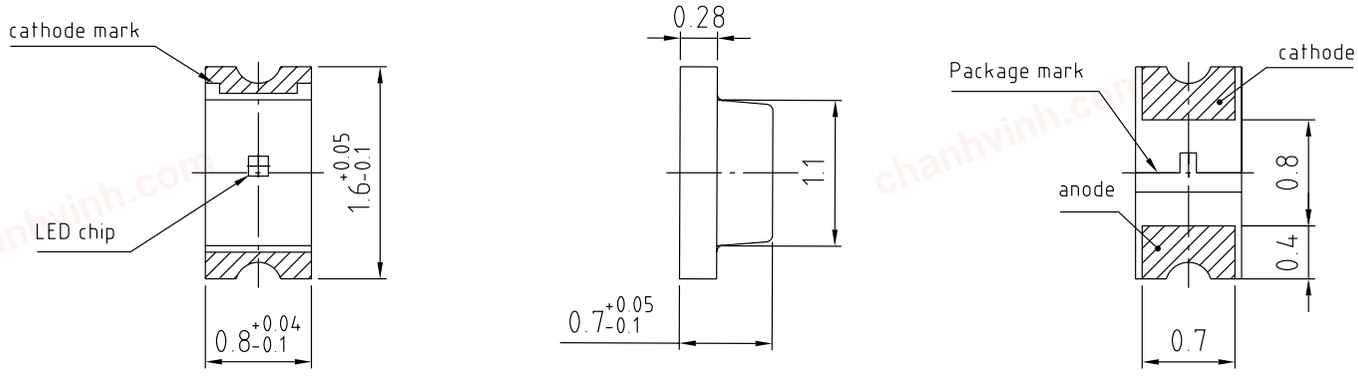
$I_F = f(t_p)$; D: Duty cycle; $T_A$ = 85 °C



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## Dimensional Drawing [8)]




general tolerance ±0.1

C67062-A0462-A2-02

lead finish Ag

## Further Information:

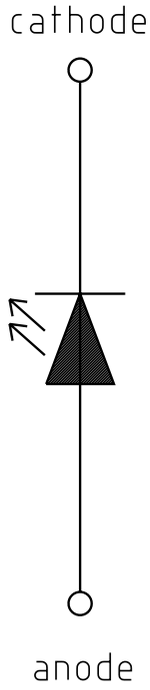
**Approximate Weight:** 1.4 mg

**Corrosion test:** Class: 2B
Test condition: 25°C / 75 % RH / 10 ppm $H_2S$ / 21 days (IEC 60068-2-43)

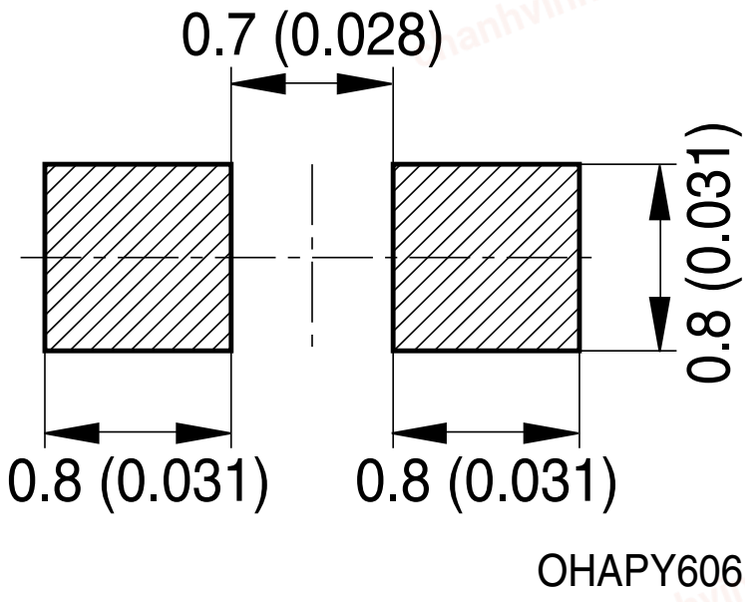
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## Electrical Internal Circuit




## Recommended Solder Pad [8)]



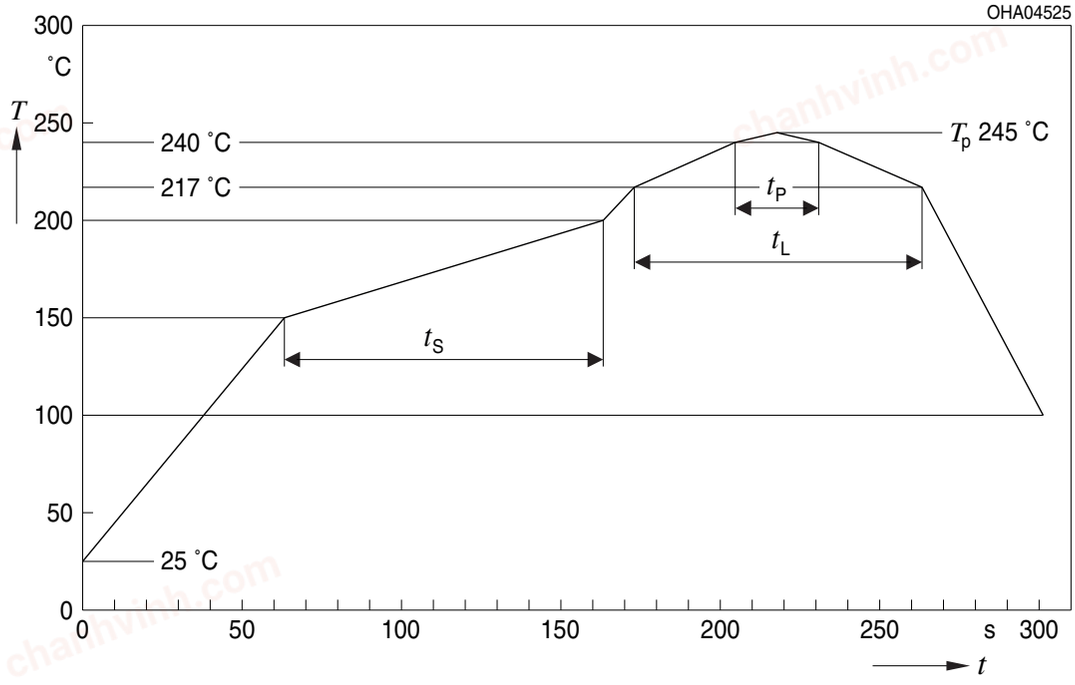

For superior solder joint connectivity results we recommend soldering under standard nitrogen atmosphere. Package not suitable for ultra sonic cleaning.

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## Reflow Soldering Profile

Product complies to MSL Level 3 acc. to JEDEC J-STD-020E



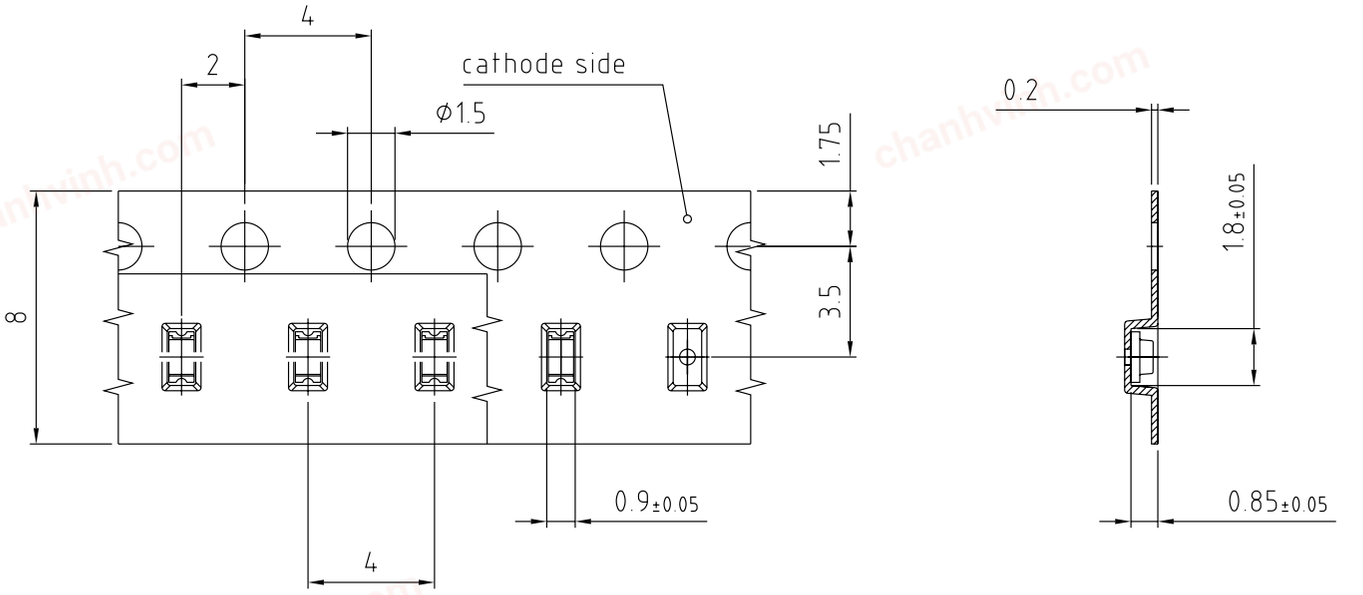

| Profile Feature | Symbol | Pb-Free (SnAgCu) Assembly | | | Unit |
|---|---|---|---|---|---|
| | | Minimum | Recommendation | Maximum | |
| Ramp-up rate to preheat*)<br>25 °C to 150 °C | | | 2 | 3 | K/s |
| Time $t_S$<br>$T_{Smin}$ to $T_{Smax}$ | $t_S$ | 60 | 100 | 120 | s |
| Ramp-up rate to peak*)<br>$T_{Smax}$ to $T_P$ | | | 2 | 3 | K/s |
| Liquidus temperature | $T_L$ | | 217 | | °C |
| Time above liquidus temperature | $t_L$ | | 80 | 100 | s |
| Peak temperature | $T_P$ | | 245 | 260 | °C |
| Time within 5 °C of the specified peak temperature $T_P$ - 5 K | $t_P$ | 10 | 20 | 30 | s |
| Ramp-down rate*<br>$T_P$ to 100 °C | | | 3 | 6 | K/s |
| Time<br>25 °C to $T_P$ | | | | 480 | s |

All temperatures refer to the center of the package, measured on the top of the component
* slope calculation DT/Dt: Dt max. 5 s; fulfillment for the whole T-range

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## Taping [8)]

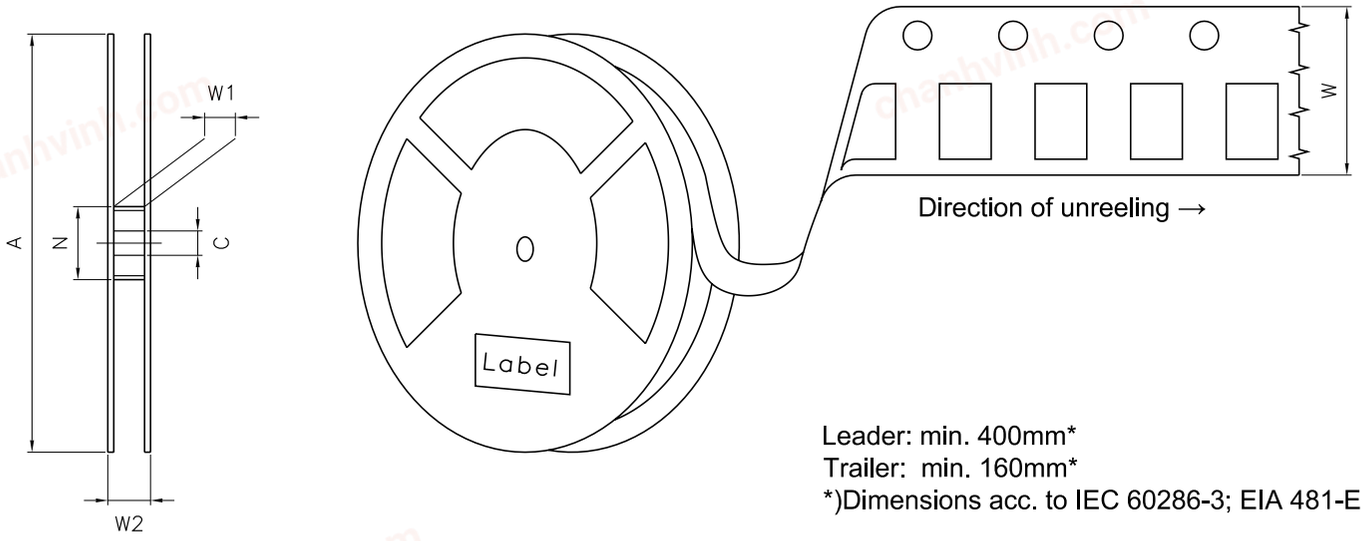



C67062-A0462-B1-02

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## Tape and Reel [9)]




Leader: min. 400mm*
Trailer: min. 160mm*
*)Dimensions acc. to IEC 60286-3; EIA 481-E

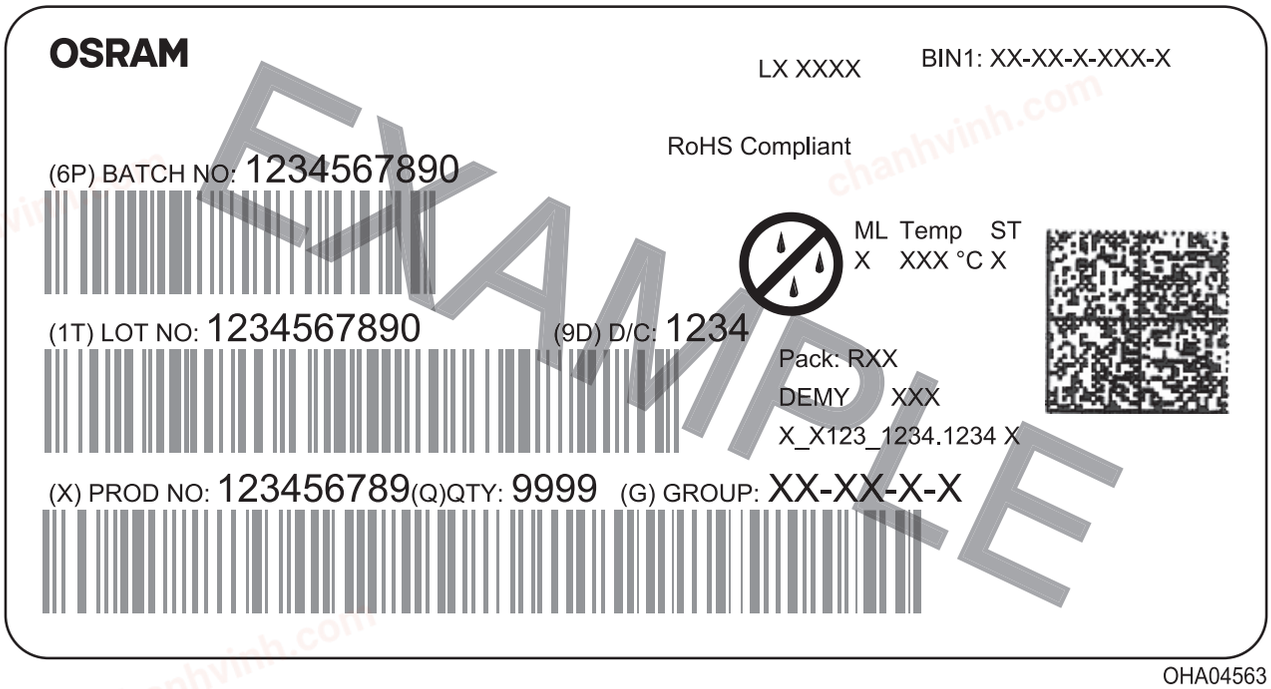
## Reel Dimensions

| A | W | $N_{min}$ | $W_1$ | $W_{2\,max}$ | Pieces per PU |
|---|---|---|---|---|---|
| 180 mm | 8 + 0.3 / - 0.1 mm | 58 mm | 8.4 + 1,5 mm | 14.4 mm | 4000 |

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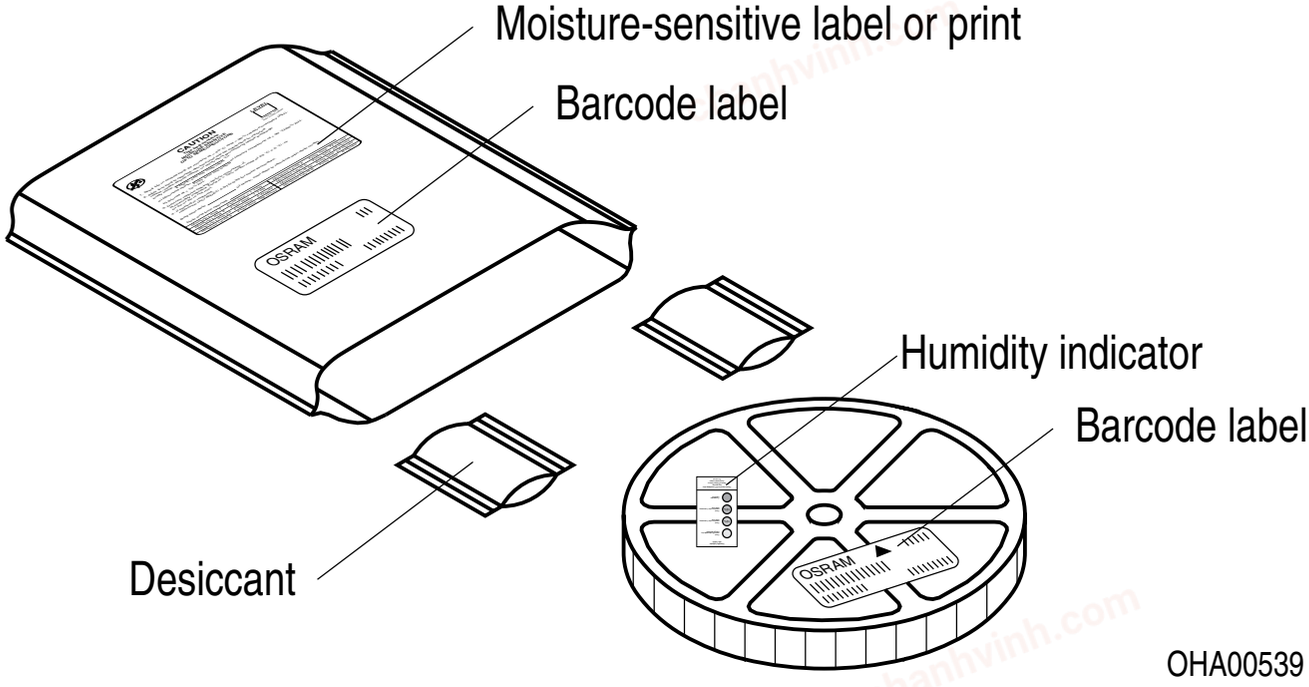


## Barcode-Product-Label (BPL)




OHA04563

## Dry Packing Process and Materials [8)]



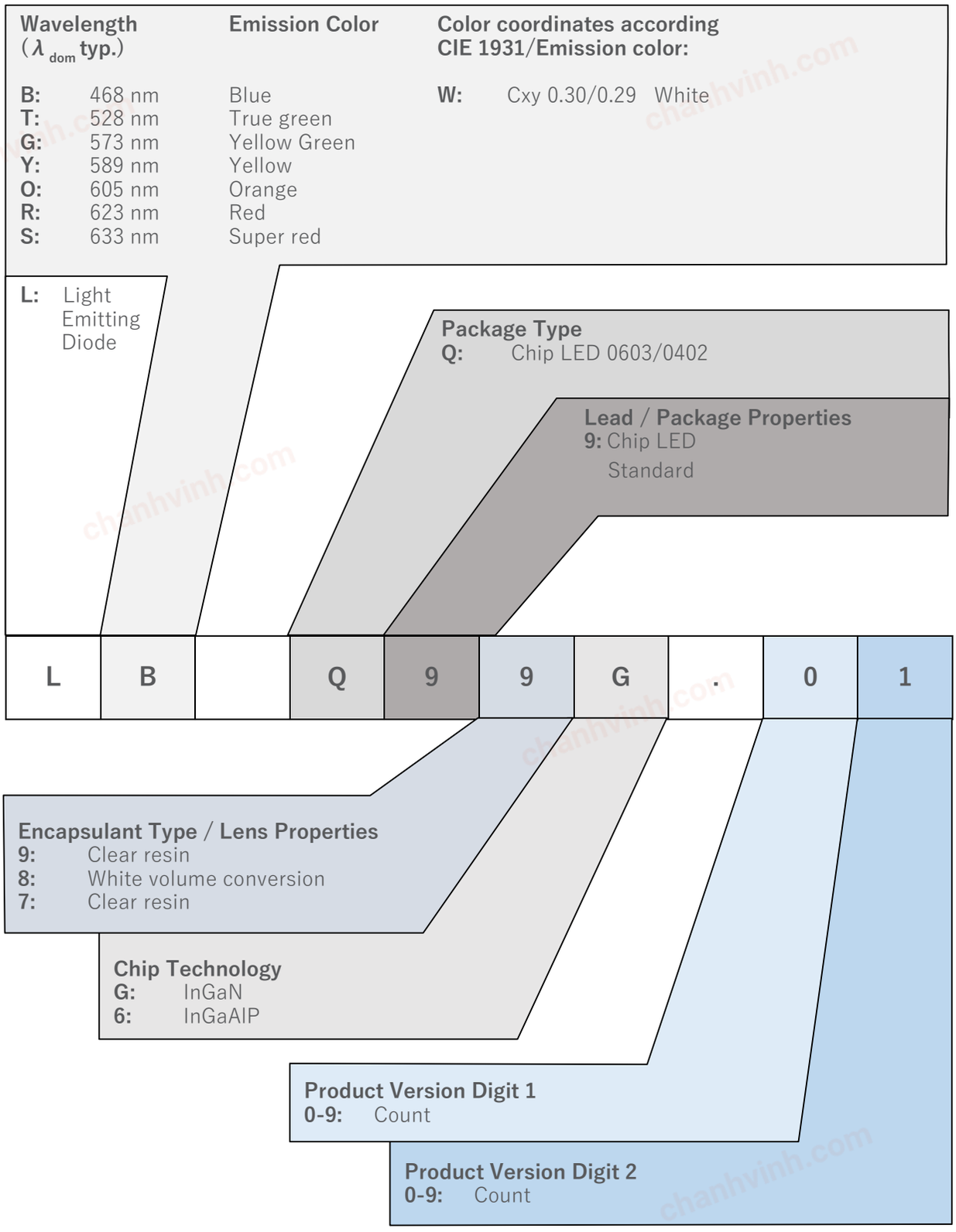

OHA00539

Moisture-sensitive product is packed in a dry bag containing desiccant and a humidity card according JEDEC-STD-033.

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## Type Designation System



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## Notes

The evaluation of eye safety occurs according to the standard IEC 62471:2006 (photo biological safety of lamps and lamp systems). Within the risk grouping system of this IEC standard, the device specified in this data sheet fall into the class **exempt group (exposure time 10000 s)**. Under real circumstances (for exposure time, conditions of the eye pupils, observation distance), it is assumed that no endangerment to the eye exists from these devices. As a matter of principle, however, it should be mentioned that intense light sources have a high secondary exposure potential due to their blinding effect. When looking at bright light sources (e.g. headlights), temporary reduction in visual acuity and afterimages can occur, leading to irritation, annoyance, visual impairment, and even accidents, depending on the situation.

Subcomponents of this device contain, in addition to other substances, metal filled materials including silver. Metal filled materials can be affected by environments that contain traces of aggressive substances. Therefore, we recommend that customers minimize device exposure to aggressive substances during storage, production, and use. Devices that showed visible discoloration when tested using the described tests above did show no performance deviations within failure limits during the stated test duration. Respective failure limits are described in the IEC60810.

For further application related information please visit https://ams-osram.com/support/application-notes

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## Disclaimer

### Attention please!

The information describes the type of component and shall not be considered as assured characteristics.
Terms of delivery and rights to change design reserved. Due to technical requirements components may contain dangerous substances.
For information on the types in question please contact our Sales Organization.
If printed or downloaded, please find the latest version on our website.

### Packing

Please use the recycling operators known to you. We can also help you – get in touch with your nearest sales office. By agreement we will take packing material back, if it is sorted. You must bear the costs of transport. For packing material that is returned to us unsorted or which we are not obliged to accept, we shall have to invoice you for any costs incurred.

### Product and functional safety devices/applications or medical devices/applications

Our components are not developed, constructed or tested for the application as safety relevant component or for the application in medical devices.
Our products are not qualified at module and system level for such application.

In case buyer – or customer supplied by buyer – considers using our components in product safety devices/ applications or medical devices/applications, buyer and/or customer has to inform our local sales partner immediately and we and buyer and /or customer will analyze and coordinate the customer-specific request between us and buyer and/or customer.

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## Glossary

1) **Brightness:** Brightness groups are tested at a current pulse duration of 25 ms and a tolerance of ±11 %.

2) **Reverse Operation:** This product is intended to be operated applying a forward current within the specified range. Applying any continuous reverse bias or forward bias below the voltage range of light emission shall be avoided because it may cause migration which can change the electro-optical characteristics or damage the LED.

3) **Wavelength:** Wavelengths are tested at a current pulse duration of 25 ms and a tolerance of ±1 nm.

4) **Forward Voltage:** Forward voltages are tested at a current pulse duration of 1 ms and a tolerance of ±0.1 V.

5) **Thermal Resistance:** Rth max is based on statistic values (6σ) used for Derating.

6) **Typical Values:** Due to the special conditions of the manufacturing processes of semiconductor devices, the typical data or calculated correlations of technical parameters can only reflect statistical figures. These do not necessarily correspond to the actual parameters of each single product, which could differ from the typical data and calculated correlations or the typical characteristic line. If requested, e.g. because of technical improvements, these typ. data will be changed without any further notice.

7) **Characteristic curve:** In the range where the line of the graph is broken, you must expect higher differences between single devices within one packing unit.

8) **Tolerance of Measure:** Unless otherwise noted in drawing, tolerances are specified with ±0.1 and dimensions are specified in mm.

9) **Tape and Reel:** All dimensions and tolerances are specified acc. IEC 60286-3 and specified in mm.

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## Revision History

| Version | Date | Change |
|---|---|---|
| 1.0 | 2023-08-30 | Initial Version |
| 1.1 | 2023-09-14 | Forward Voltage Groups |

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EU RoHS and China RoHS compliant product
此产品符合欧盟 RoHS 指令的要求；
按照中国的相关法规和标准，
不含有毒有害物质或元素。

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