

# SFH 2200 FA A01

**TOPLED®**

Silicon PIN Photodiode



## Applications

- Electronic Equipment
- Gesture Recognition
- Remote Control, Proximity, Ambient Light Sensing

## Features:

- Qualifications: The product qualification test plan is based on the guidelines of AEC-Q101-REV-C, Stress Test Qualification for Automotive Grade Discrete Semiconductors.
- ESD: 2 kV acc. to ANSI/ESDA/JEDEC JS-001 (HBM, Class 2)
- Suitable for reflow soldering
- Especially suitable for applications from 800 nm to 1100 nm
- Small package (WxDxH): 4 mm x 5.1 mm x 0.85mm
- Solder control structure

## Ordering Information

| Type            | Photocurrent                                                                           | Photocurrent<br>typ.                                                              | Ordering Code |
|-----------------|----------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|---------------|
|                 | $E_e = 0.5 \text{ mW/cm}^2; \lambda = 850 \text{ nm};$<br>$V_R = 5 \text{ V}$<br>$I_P$ | $E_e = 0.5 \text{ mW/cm}^2; \lambda = 850 \text{ nm}; V_R = 5 \text{ V}$<br>$I_P$ |               |
| SFH 2200 FA A01 | $\geq 18 \mu\text{A}$                                                                  | 23 $\mu\text{A}$                                                                  | Q65112A0247   |

## Maximum Ratings

$T_A = 25\text{ °C}$

| Parameter                                                              | Symbol    |              | Values           |
|------------------------------------------------------------------------|-----------|--------------|------------------|
| Operating Temperature                                                  | $T_{op}$  | min.<br>max. | -40 °C<br>125 °C |
| Storage temperature                                                    | $T_{stg}$ | min.<br>max. | -40 °C<br>125 °C |
| Reverse voltage                                                        | $V_R$     | max.         | 20 V             |
| Total power dissipation                                                | $P_{tot}$ | max.         | 150 mW           |
| ESD withstand voltage<br>acc. to ANSI/ESDA/JEDEC JS-001 (HBM, Class 2) | $V_{ESD}$ | max.         | 2 kV             |

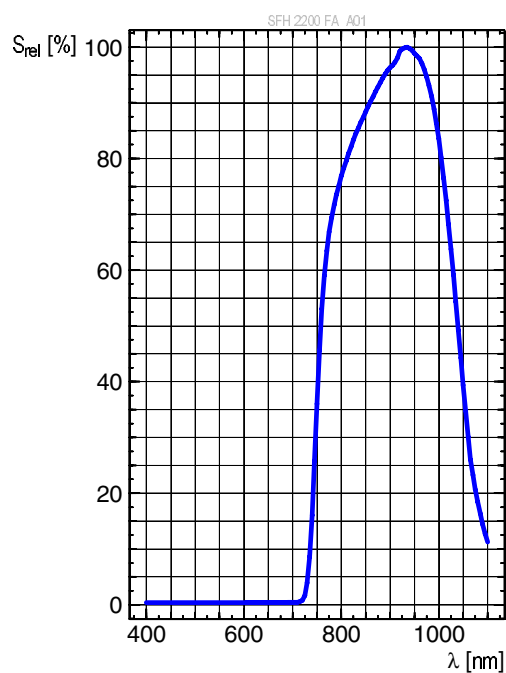
## Characteristics

$T_A = 25\text{ °C}$

| Parameter                                                                                                         | Symbol                   |              | Values                            |
|-------------------------------------------------------------------------------------------------------------------|--------------------------|--------------|-----------------------------------|
| Wavelength of max sensitivity                                                                                     | $\lambda_{S\text{ max}}$ | typ.         | 940 nm                            |
| Spectral range of sensitivity                                                                                     | $\lambda_{10\%}$         | typ.         | 740 ... 1100 nm                   |
| Radiant sensitive area                                                                                            | A                        | typ.         | 7.02 mm <sup>2</sup>              |
| Dimensions of active chip area                                                                                    | L x W                    | typ.         | 2.65 x 2.65 mm x mm               |
| Half angle                                                                                                        | $\varphi$                | typ.         | 60 °                              |
| Dark current<br>$V_R = 10\text{ V}$                                                                               | $I_R$                    | typ.<br>max. | 1 nA<br>25 nA                     |
| Spectral sensitivity of the chip<br>$\lambda = 850\text{ nm}$                                                     | $S_\lambda$              | typ.         | 0.64 A / W                        |
| Quantum yield of the chip<br>$\lambda = 850\text{ nm}$                                                            | $\eta$                   | typ.         | 0.93 Electrons / Photon           |
| Open-circuit voltage<br>$E_e = 0.5\text{ mW/cm}^2$ ; $\lambda = 850\text{ nm}$ ; $V_R = 5\text{ V}$               | $V_O$                    | min.<br>typ. | 0.25 mV<br>0.35 mV                |
| Short-circuit current<br>$E_e = 0.5\text{ mW/cm}^2$ ; $\lambda = 850\text{ nm}$                                   | $I_{sc}$                 | typ.         | 22 $\mu$ A                        |
| Rise time<br>$V_R = 5\text{ V}$ ; $R_L = 50\text{ }\Omega$ ; $\lambda = 850\text{ nm}$ ; $I_p = 800\text{ }\mu$ A | $t_r$                    | typ.         | 0.04 $\mu$ s                      |
| Fall time<br>$V_R = 5\text{ V}$ ; $R_L = 50\text{ }\Omega$ ; $\lambda = 850\text{ nm}$ ; $I_p = 800\text{ }\mu$ A | $t_f$                    | typ.         | 0.04 $\mu$ s                      |
| Forward voltage<br>$I_F = 100\text{ mA}$ ; $E = 0$                                                                | $V_F$                    | typ.         | 1 V                               |
| Capacitance<br>$V_R = 0\text{ V}$ ; $f = 1\text{ MHz}$ ; $E = 0$                                                  | $C_0$                    | typ.         | 60 pF                             |
| Temperature coefficient of voltage                                                                                | $TC_V$                   | typ.         | -2.6 mV / K                       |
| Temperature coefficient of short-circuit current<br>$\lambda = 850\text{ nm}$                                     | $TC_I$                   | typ.         | 0.03 % / K                        |
| Noise equivalent power<br>$V_R = 10\text{ V}$ ; $\lambda = 850\text{ nm}$                                         | NEP                      | typ.         | 0.028 pW / Hz <sup>1/2</sup>      |
| Detection limit<br>$V_R = 10\text{ V}$ ; $\lambda = 850\text{ nm}$                                                | $D^*$                    | typ.         | 9.5e12 cm x Hz <sup>1/2</sup> / W |
| Thermal resistance junction ambient real                                                                          | $R_{thJA}$               | max.         | 280 K / W                         |

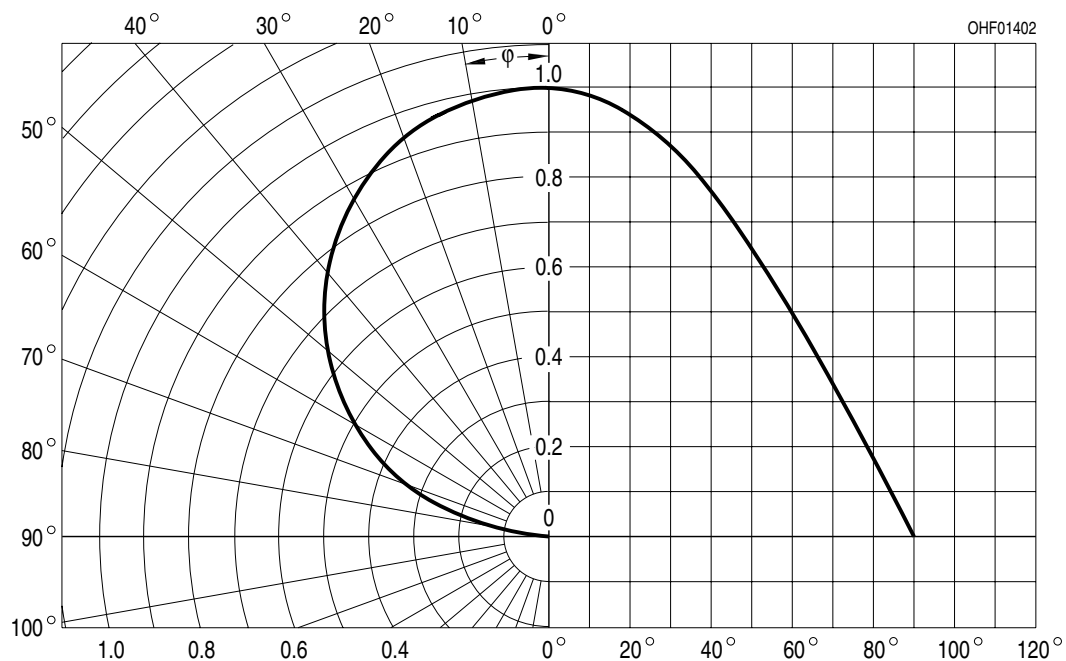
## Relative Spectral Sensitivity <sup>1), 2)</sup>

$$S_{\text{rel}} = f(\lambda)$$



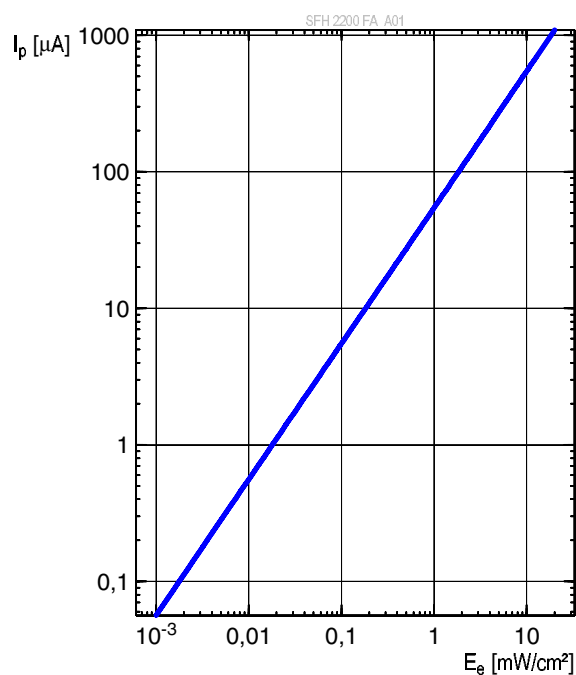
## Directional Characteristics <sup>1), 2)</sup>

$$S_{\text{rel}} = f(\varphi)$$

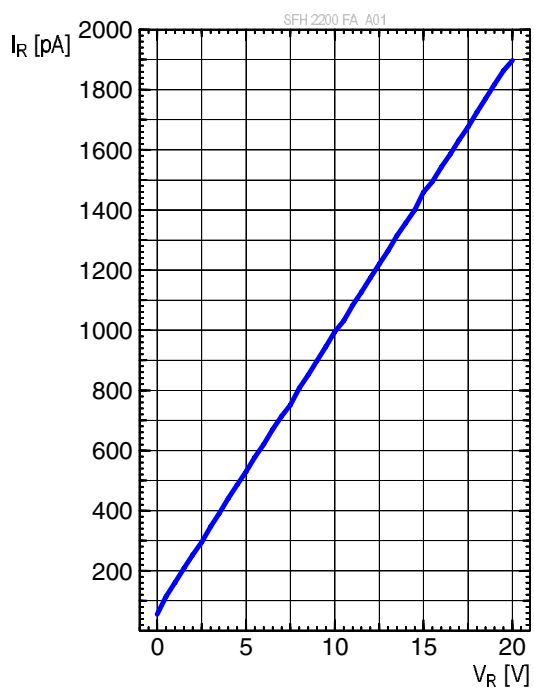


**Photocurrent** <sup>1), 2)</sup>

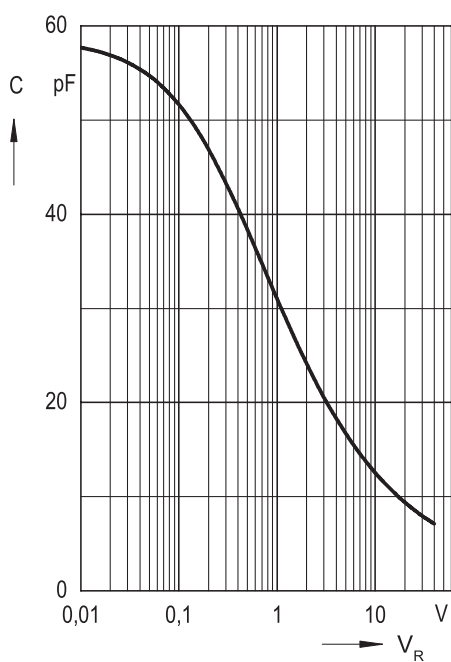
$$I_p = f(E_e); V_R = 5 \text{ V}$$

**Dark Current** <sup>1), 2)</sup>

$$I_R = f(V_R); E = 0$$

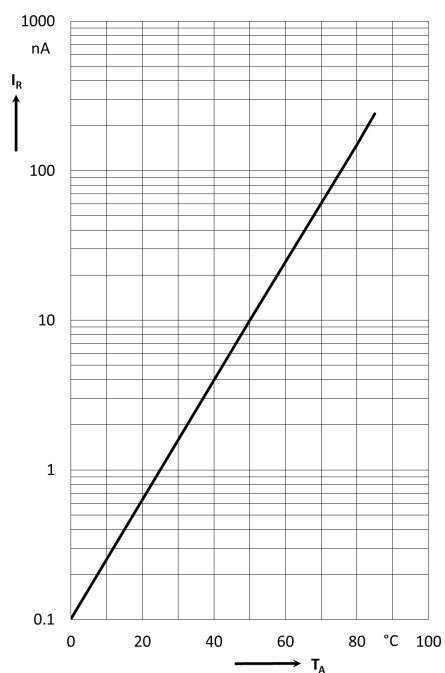
**Capacitance** <sup>1), 2)</sup>

$$C = f(V_R); f = 1 \text{ MHz}; E = 0;$$



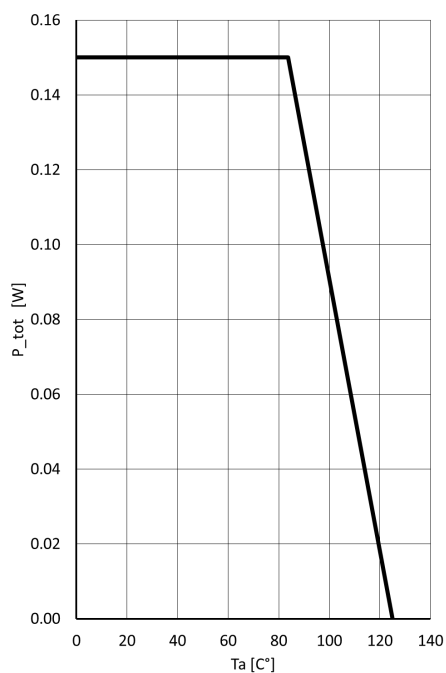
## Dark Current <sup>1)</sup>

$$I_R = f(T_A); E = 0; V_R = 10 \text{ V}$$

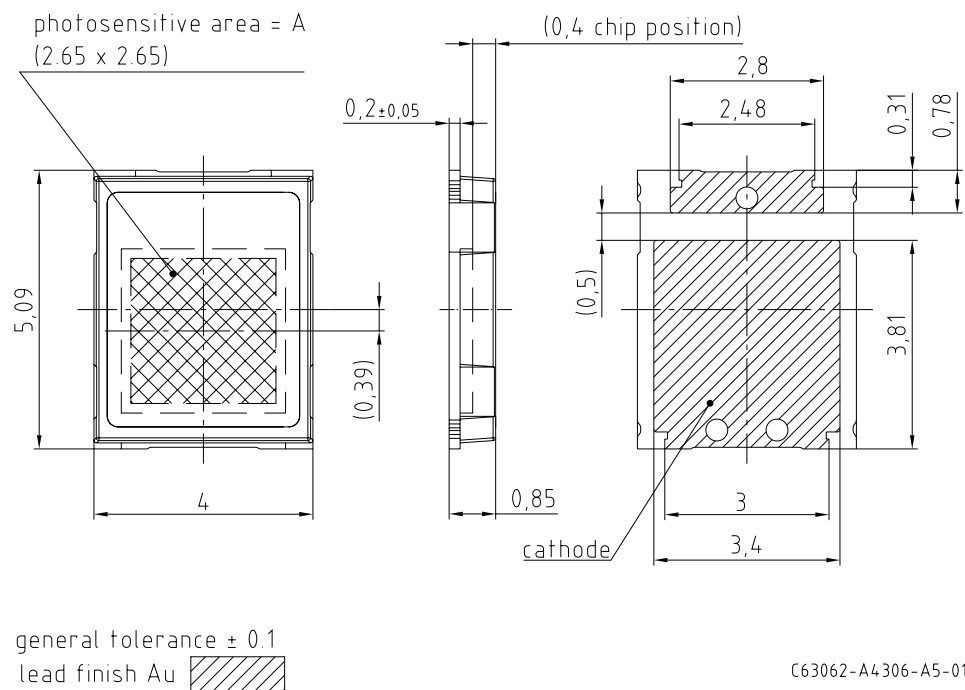


## Power Consumption

$$P_{\text{tot}} = f(T_A); R_{\text{thJA}} = 280 \text{ K / W}$$

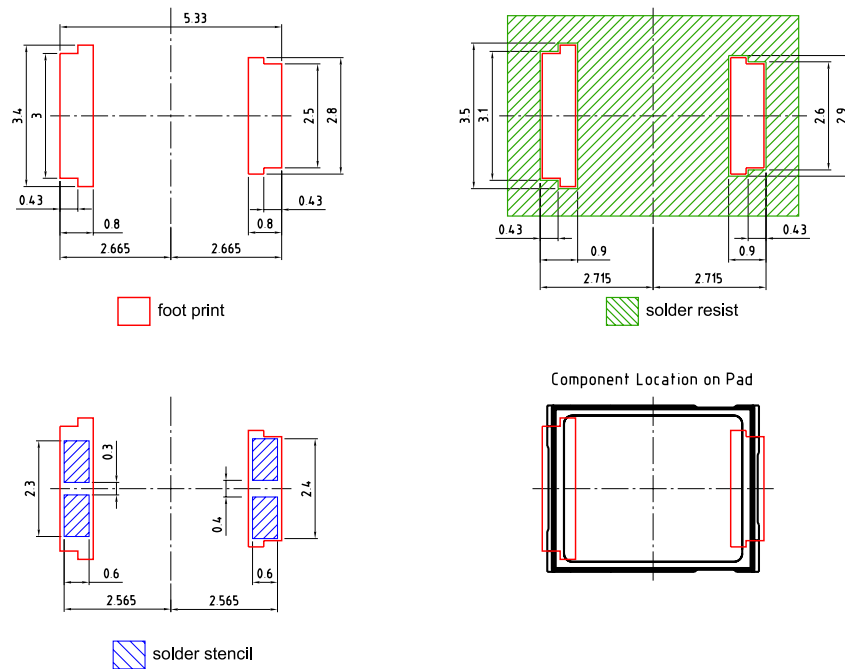


## Dimensional Drawing <sup>3)</sup>



**Approximate Weight:** 46.0 mg

## Recommended Solder Pad <sup>3)</sup>

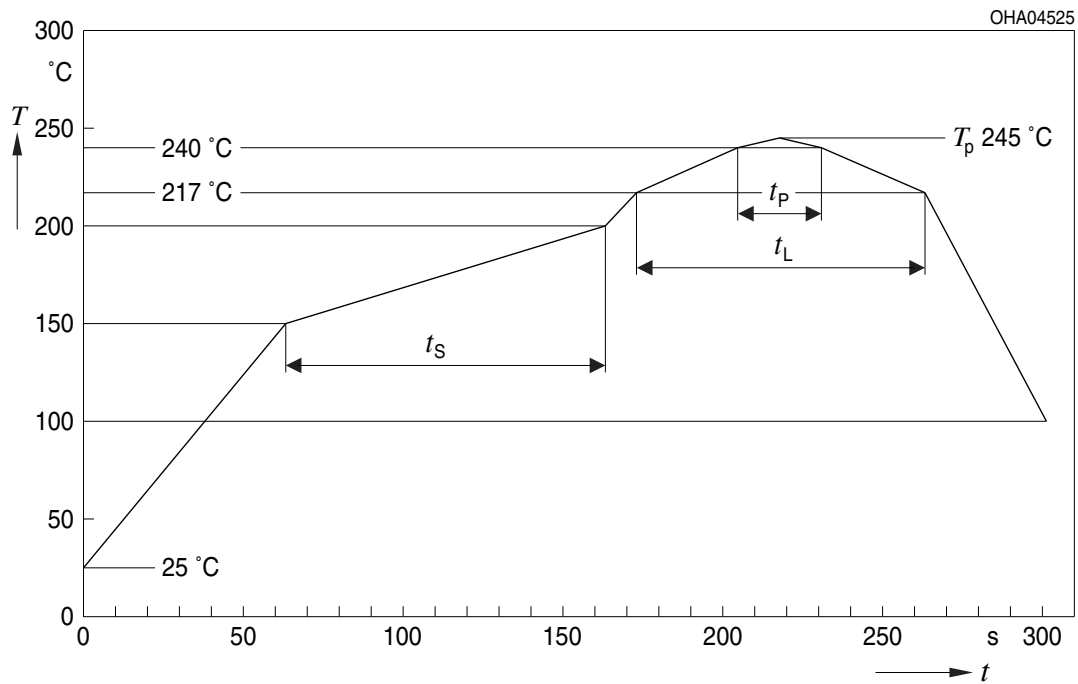


E062 3010 210-01

Handling Indication: The package is casted with silicone. Mechanical stress at the silicone surface of the unit should be avoided. Pickup the device at the plastic frame.

## Reflow Soldering Profile

Product complies to MSL Level 2 acc. to JEDEC J-STD-020E

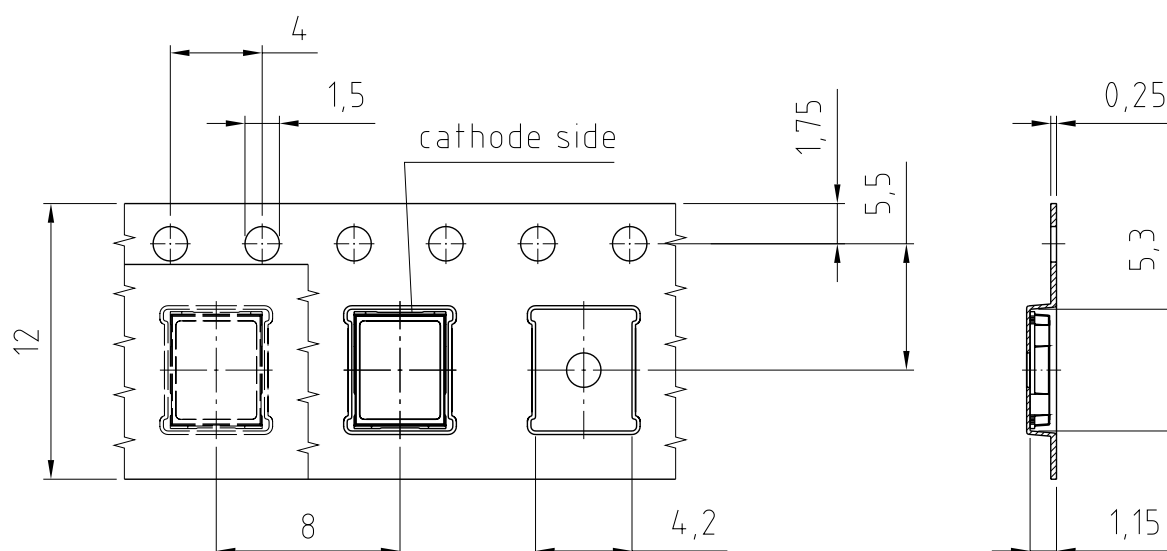


| Profile Feature                                                   | Symbol | Pb-Free (SnAgCu) Assembly |                |         | Unit |
|-------------------------------------------------------------------|--------|---------------------------|----------------|---------|------|
|                                                                   |        | 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<br>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

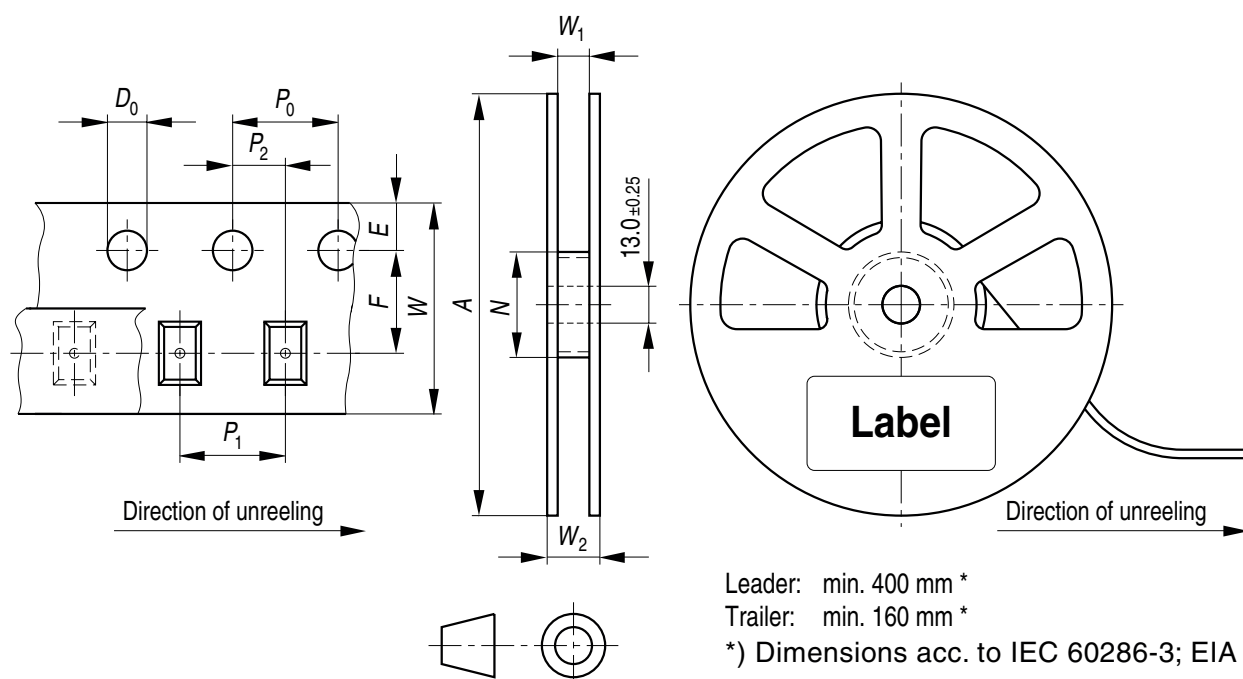
\* slope calculation  $DT/Dt$ :  $Dt$  max. 5 s; fulfillment for the whole T-range

## Taping <sup>3)</sup>



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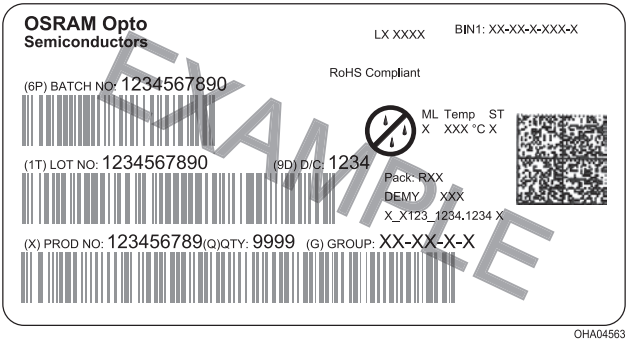
## Tape and Reel <sup>4)</sup>



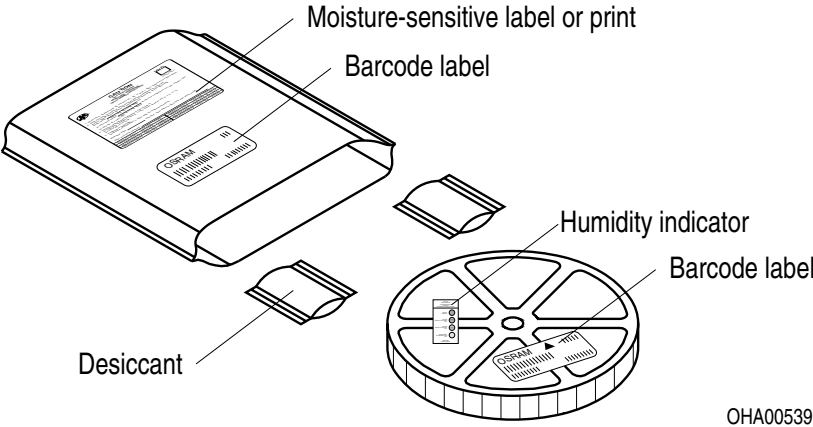
## Reel dimensions [mm]

| A      | W                | N <sub>min</sub> | W <sub>1</sub> | W <sub>2 max</sub> | Pieces per PU |
|--------|------------------|------------------|----------------|--------------------|---------------|
| 180 mm | 12 + 0.3 / - 0.1 | 60               | 12.4 + 2       | 18.4               | 1500          |

Barcode-Product-Label (BPL)

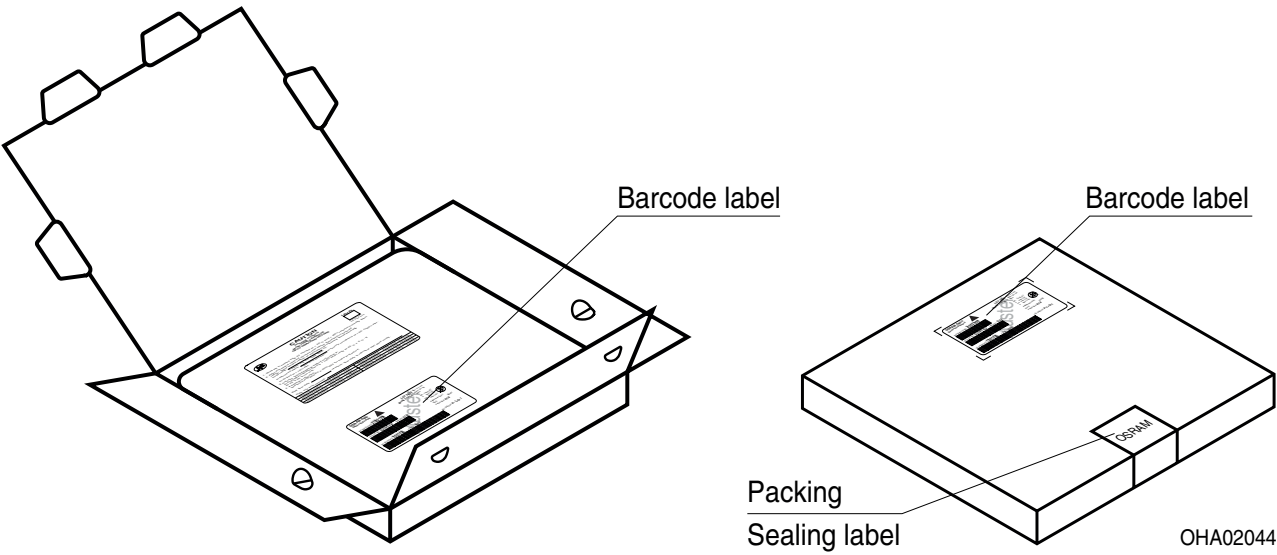


Dry Packing Process and Materials <sup>3)</sup>



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

Transportation Packing and Materials <sup>3)</sup>



Dimensions of transportation box in mm

| Width      | Length     | Height    |
|------------|------------|-----------|
| 195 ± 5 mm | 195 ± 5 mm | 30 ± 5 mm |

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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 falls 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 informations please visit [www.osram-os.com/appnotes](http://www.osram-os.com/appnotes)

## Disclaimer

### Disclaimer

Language english will prevail in case of any discrepancies or deviations between the two language wordings.

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- 1) **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.
- 2) **Testing temperature:**  $T_A = 25^\circ\text{C}$
- 3) **Tolerance of Measure:** Unless otherwise noted in drawing, tolerances are specified with  $\pm 0.1$  and dimensions are specified in mm.
- 4) **Tape and Reel:** All dimensions and tolerances are specified acc. IEC 60286-3 and specified in mm.

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