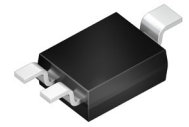


# SFH 2400 FAR

## Smart DIL

Silicon PIN Photodiode



## Applications

- Rain sensors

## Features:

- Package: black epoxy
- 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)
- Especially suitable for applications from 750 nm to 1100 nm
- Short switching time (typ. 5 ns)

## Ordering Information

| Type         | Photocurrent<br>$E_e = 1 \text{ mW/cm}^2; \lambda = 870 \text{ nm}; V_R = 5 \text{ V}$<br>$I_P$ | Photocurrent<br>typ.<br>$E_e = 1 \text{ mW/cm}^2; \lambda = 870 \text{ nm}; V_R = 5 \text{ V}$<br>$I_P$ | Ordering Code |
|--------------|-------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------|---------------|
| SFH 2400 FAR | $\geq 3.6 \mu\text{A}$                                                                          | $6.2 \mu\text{A}$                                                                                       | Q65110A9563   |

## Maximum Ratings

$T_A = 25\text{ °C}$

| Parameter                                                              | Symbol    |              | Values           |
|------------------------------------------------------------------------|-----------|--------------|------------------|
| Operating Temperature                                                  | $T_{op}$  | min.<br>max. | -40 °C<br>100 °C |
| Storage temperature                                                    | $T_{stg}$ | min.<br>max. | -40 °C<br>100 °C |
| Reverse voltage                                                        | $V_R$     | max.         | 20 V             |
| Reverse voltage<br>$t \leq 2\text{ min}$                               | $V_R$     | max.         | 50 V             |
| Total power dissipation                                                | $P_{tot}$ | max.         | 120 mW           |
| ESD withstand voltage<br>acc. to ANSI/ESDA/JEDEC JS-001 (HBM, Class 2) | $V_{ESD}$ |              | 2 kV             |

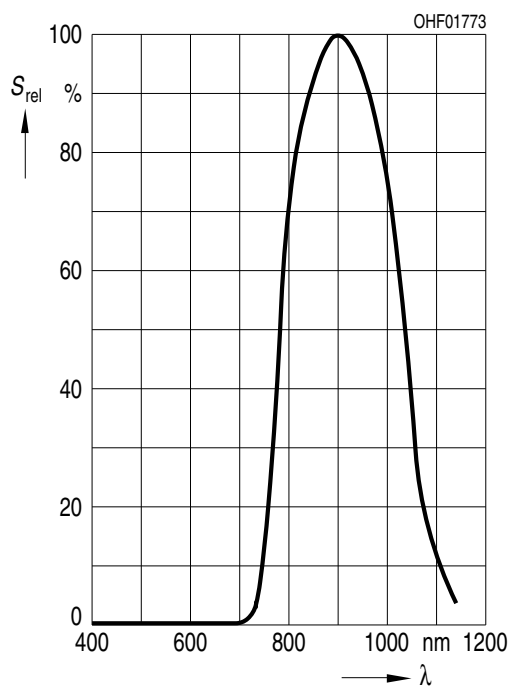
## Characteristics

$T_A = 25\text{ °C}$

| Parameter                                                                     | Symbol                   |      | Values                            |
|-------------------------------------------------------------------------------|--------------------------|------|-----------------------------------|
| Wavelength of max sensitivity                                                 | $\lambda_{S\text{ max}}$ | typ. | 900 nm                            |
| Spectral range of sensitivity                                                 | $\lambda_{10\%}$         | typ. | 750 ... 1100 nm                   |
| Radiant sensitive area                                                        | A                        | typ. | 1.00 mm <sup>2</sup>              |
| Dimensions of active chip area                                                | L x W                    | typ. | 1 x 1 mm x mm                     |
| Half angle                                                                    | $\varphi$                | typ. | 60 °                              |
| Dark current                                                                  | $I_R$                    | typ. | 1 nA                              |
| $V_R = 20\text{ V}$                                                           |                          | max. | 5 nA                              |
| Spectral sensitivity of the chip<br>$\lambda = 870\text{ nm}$                 | $S_\lambda$              | typ. | 0.65 A / W                        |
| Quantum yield of the chip<br>$\lambda = 870\text{ nm}$                        | $\eta$                   | typ. | 0.93 Electrons / Photon           |
| Open-circuit voltage<br>$E_e = 1\text{ mW/cm}^2; \lambda = 870\text{ nm}$     | $V_O$                    | typ. | 320 mV                            |
| Short-circuit current<br>$E_e = 1\text{ mW/cm}^2; \lambda = 870\text{ nm}$    | $I_{sc}$                 | typ. | 6 $\mu$ A                         |
| Rise time<br>$V_R = 20\text{ V}; R_L = 50\ \Omega; \lambda = 850\text{ nm}$   | $t_r$                    | typ. | 0.005 $\mu$ s                     |
| Fall time<br>$V_R = 20\text{ V}; R_L = 50\ \Omega; \lambda = 850\text{ nm}$   | $t_f$                    | typ. | 0.005 $\mu$ s                     |
| Forward voltage<br>$I_F = 80\text{ mA}; E = 0$                                | $V_F$                    | typ. | 1.3 V                             |
| Capacitance<br>$V_R = 0\text{ V}; f = 1\text{ MHz}; E = 0$                    | $C_0$                    | typ. | 11 pF                             |
| Temperature coefficient of voltage                                            | $TC_V$                   | typ. | -2.6 mV / K                       |
| Temperature coefficient of short-circuit current<br>$\lambda = 870\text{ nm}$ | $TC_I$                   | typ. | 0.1 % / K                         |
| Noise equivalent power<br>$V_R = 20\text{ V}; \lambda = 870\text{ nm}$        | NEP                      | typ. | 0.028 pW / Hz <sup>1/2</sup>      |
| Detection limit<br>$V_R = 20\text{ V}; \lambda = 870\text{ nm}$               | $D^*$                    | typ. | 3.6e12 cm x Hz <sup>1/2</sup> / W |
| Thermal resistance junction ambient real                                      | $R_{thJA}$               | max. | 450 K / W                         |

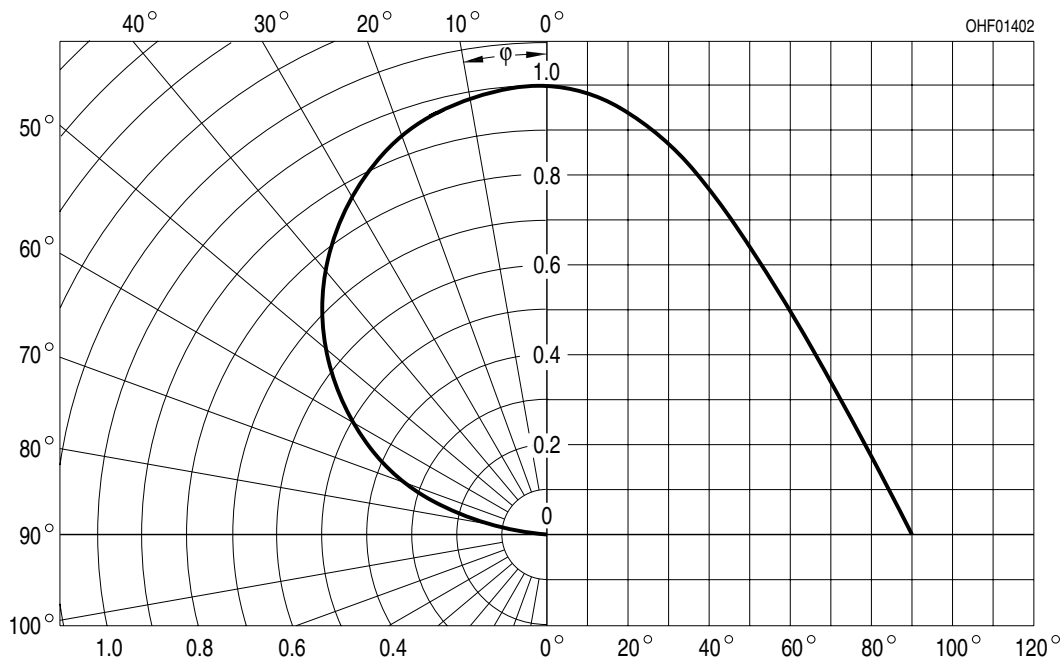
## Relative Spectral Sensitivity <sup>1), 2)</sup>

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



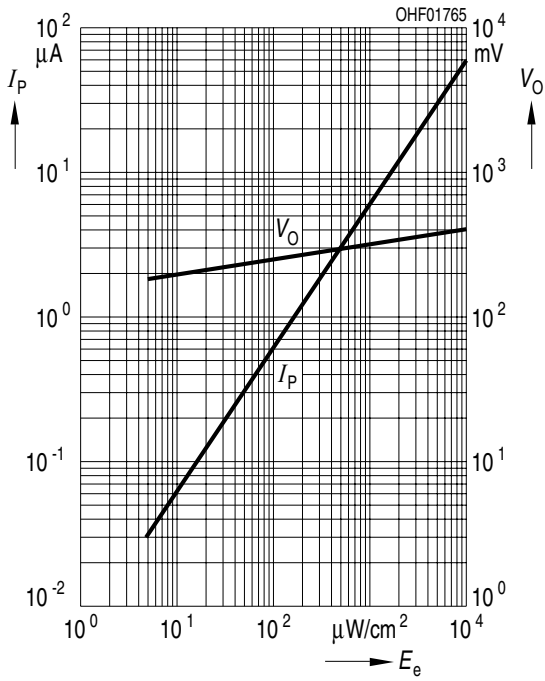
## Directional Characteristics <sup>1), 2)</sup>

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



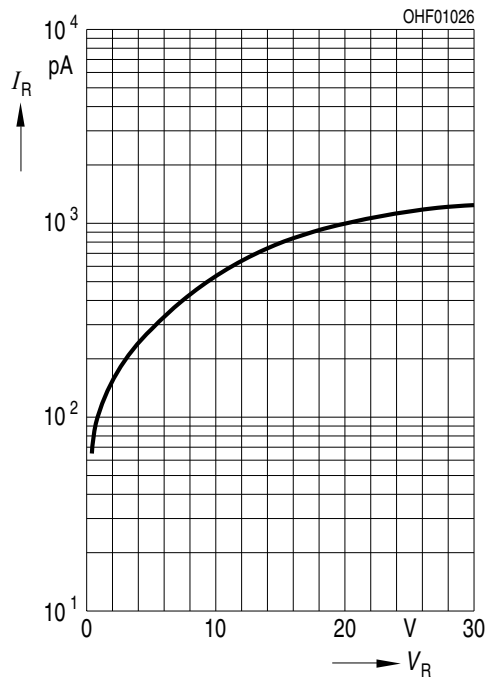
**Photocurrent/Open-Circuit Voltage** <sup>1), 2)</sup>

$I_P (V_R = 5 \text{ V}) / V_O = f(E_e)$



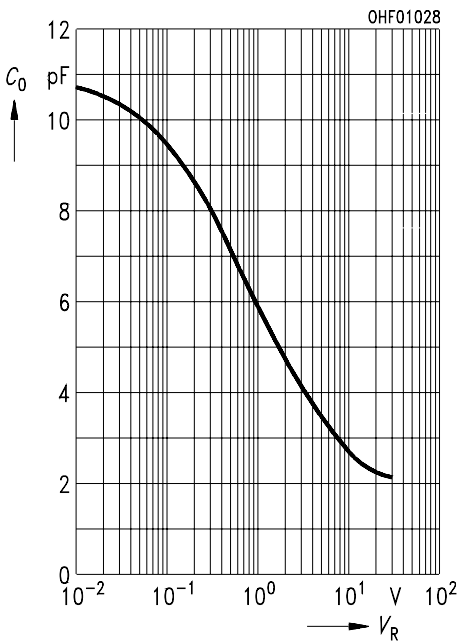
**Dark Current** <sup>1), 2)</sup>

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



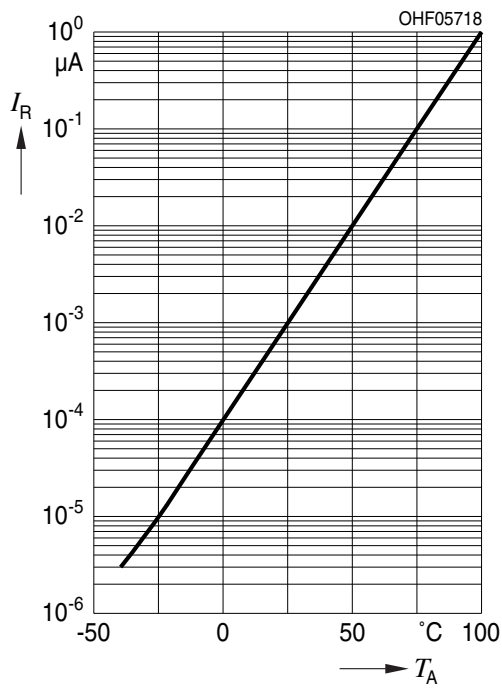
**Capacitance** <sup>1), 2)</sup>

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



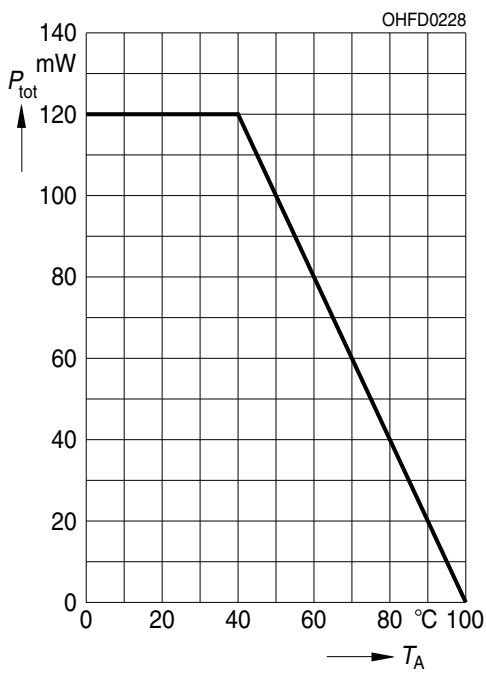
### Dark Current <sup>2)</sup>

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

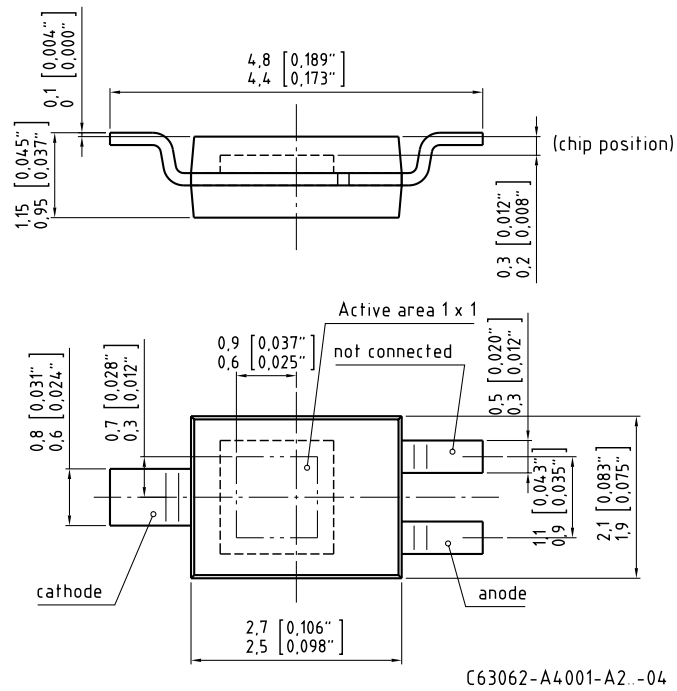


### Power Consumption

$$P_{tot} = f(T_A); R_{thJA} = 450 \text{ K / W}$$



Dimensional Drawing <sup>3)</sup>

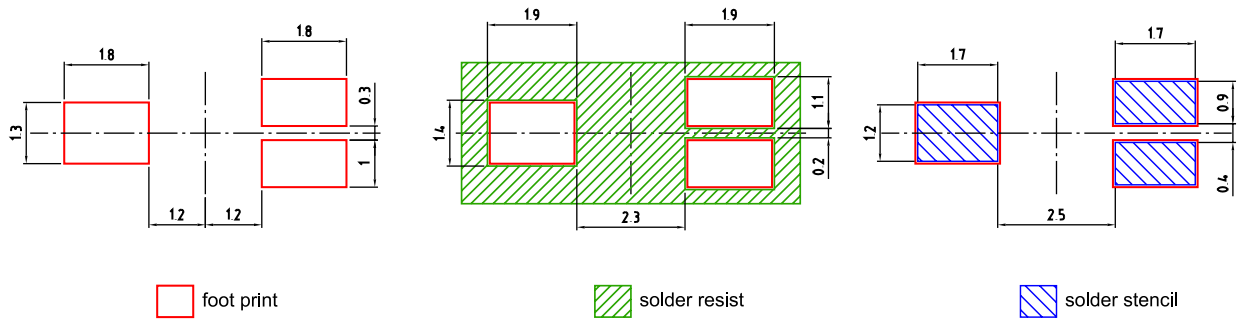


Approximate Weight: 12.0 mg

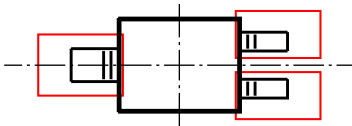
Package marking: Cathode

| Pin | Description |
|-----|-------------|
| 1   | cathode     |
| 2   | n.c.        |
| 3   | anode       |

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



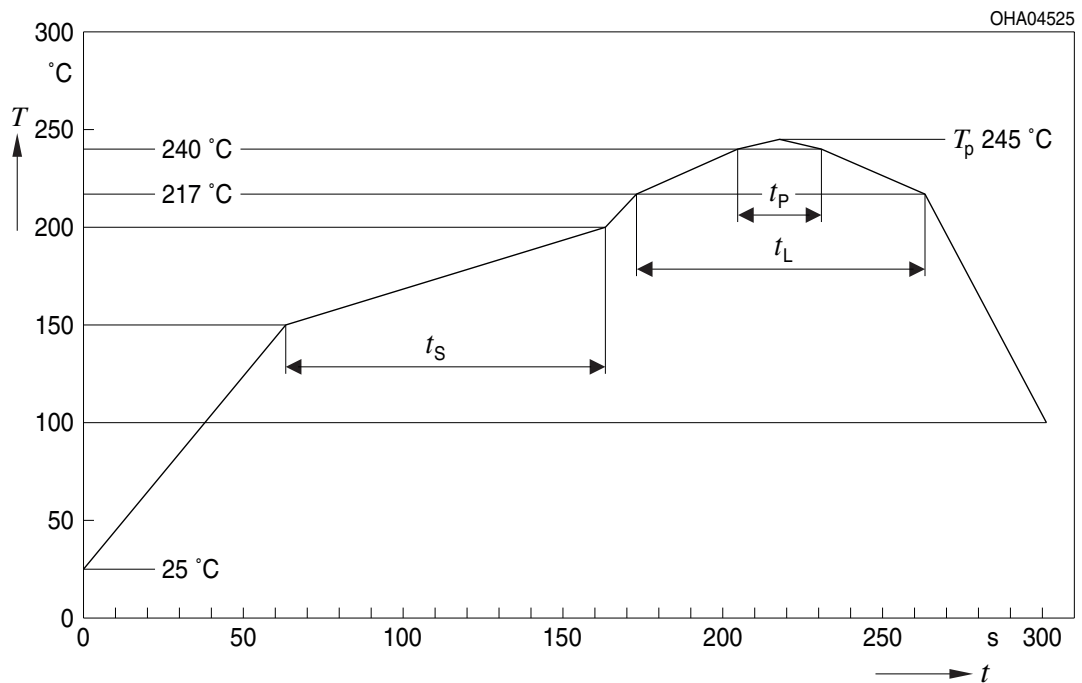
Component Location on Pad



E062.3010.216-01

### Reflow Soldering Profile

Product complies to MSL Level 4 acc. to JEDEC J-STD-020E



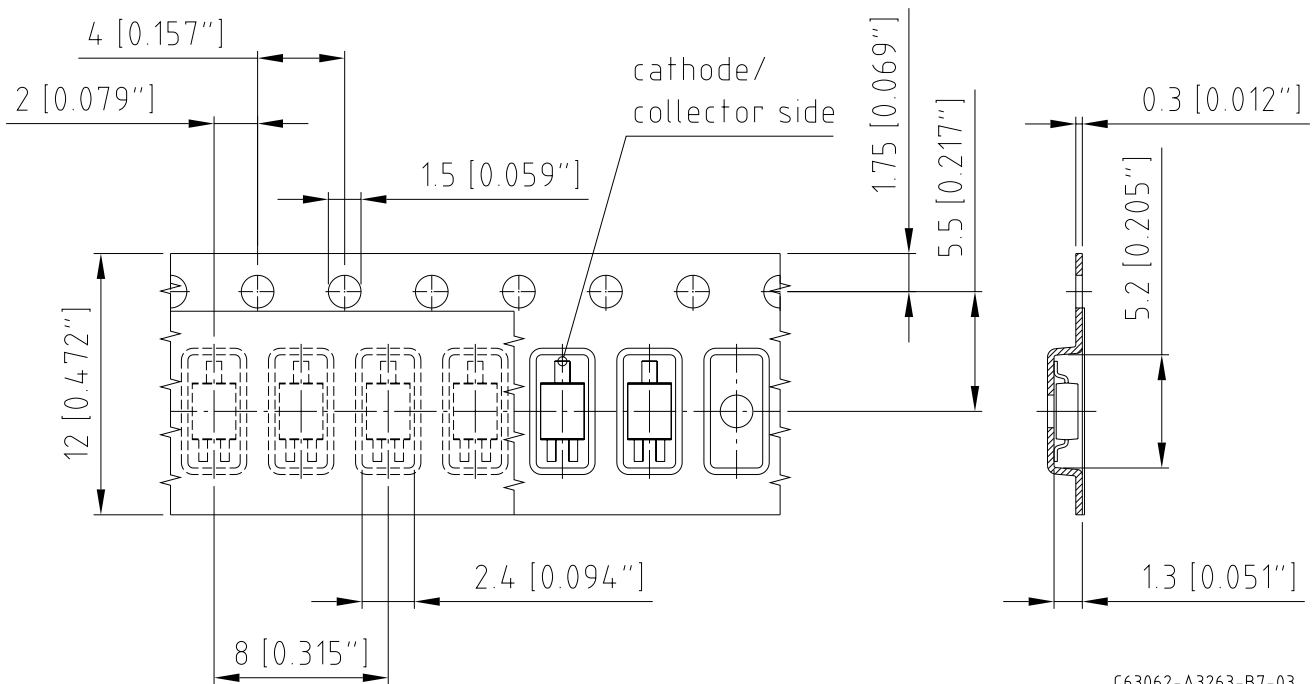


| Profile Feature                                                | Symbol | Pb-Free (SnAgCu) Assembly |                |         | Unit |
|----------------------------------------------------------------|--------|---------------------------|----------------|---------|------|
|                       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

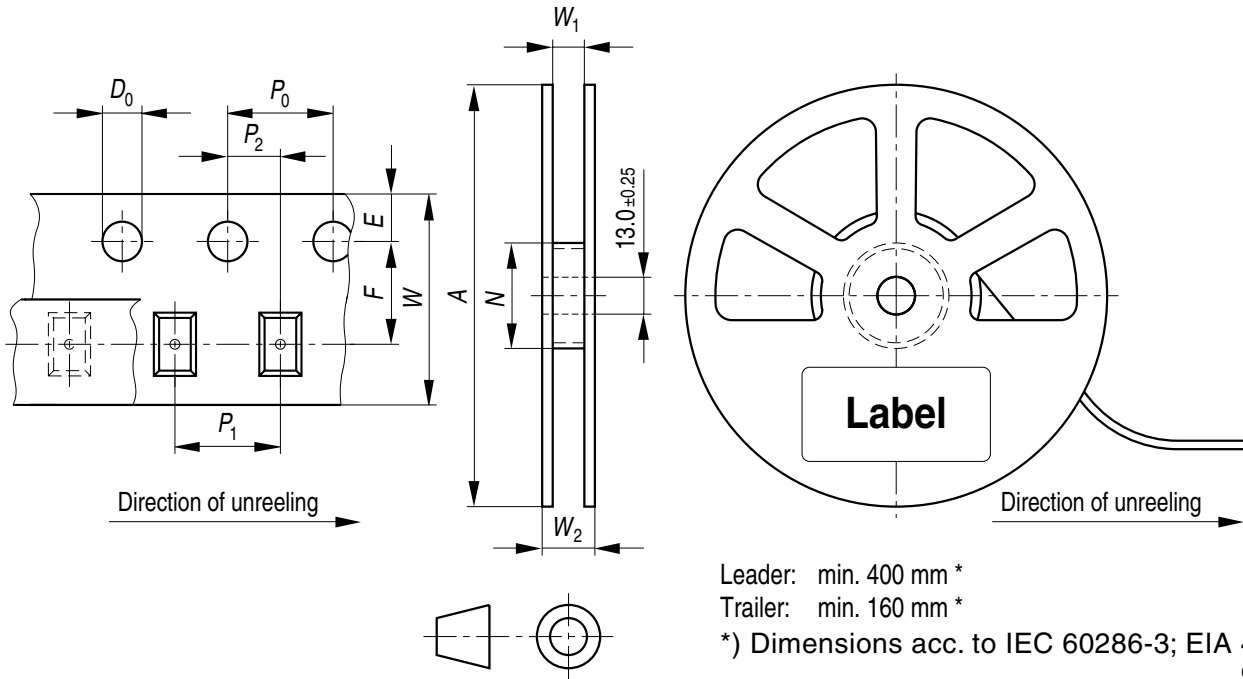
\* slope calculation  $DT/Dt$ :  $Dt$  max. 5 s; fulfillment for the whole T-range

**Taping** <sup>3)</sup>



C63062-A3263-B7-03

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



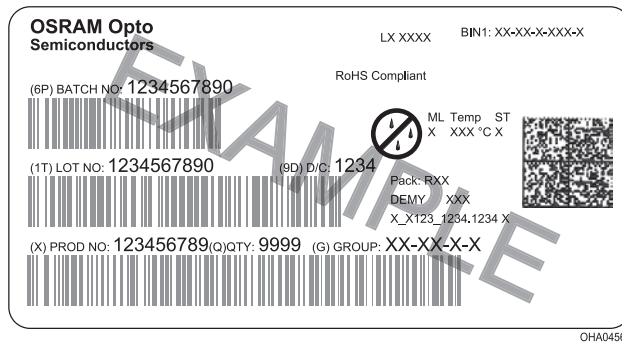
Leader: min. 400 mm \*  
 Trailer: min. 160 mm \*

\*) Dimensions acc. to IEC 60286-3; EIA 481-D  
 OHAY0324

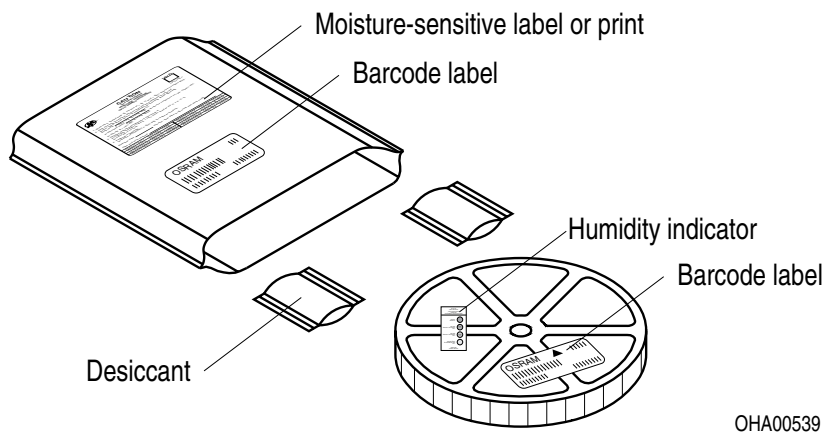
**Reel dimensions [mm]**

| A      | W                | N <sub>min</sub> | W <sub>1</sub> | W <sub>2max</sub> | Pieces per PU |
|--------|------------------|------------------|----------------|-------------------|---------------|
| 180 mm | 12 + 0.3 / - 0.1 | 60               | 12.4 + 2       | 18.4              | 2000          |

## 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 |

## 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 LED 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.

For further application related informations please visit [www.osram-os.com/apnotes](http://www.osram-os.com/apnotes)

## Disclaimer

### Disclaimer

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

### 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 in the OSRAM OS Webside.

### 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 safety devices/applications or medical devices/applications

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## Glossary

- 1) **Testing temperature:**  $T_A = 25^\circ\text{C}$
- 2) **Typical Values:** Due to the special conditions of the manufacturing processes of LED, 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.
- 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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