

# Ambient Light Sensor

## Version 1.1

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### SFH 5701 A01



#### Features:

- Analog output current is proportional to Ambient Light Intensity
- Spectral response close to human eye sensitivity
- Integrated dark current suppression
- Built in thermal compensation
- Linear response over 6 decades of illumination range
- The product qualification test plan is referenced to the guidelines of AEC-Q102 (Failure mechanism based stress test qualification for discrete optoelectronic semiconductors in automotive applications.)

#### Applications

- Sunlight sensor / head lamp control
- Control of display backlighting
- Mobile devices
- Home automation/ smart speakers
- Smart TV
- Industrial displays
- Smart lighting control

#### Ordering Information

| Type:        | Output current                                                              | Ordering Code |
|--------------|-----------------------------------------------------------------------------|---------------|
|              | $I_{OUT}$ [μA]<br>$V_{DD} = 5\text{ V}$ , $E_V = 100\text{ lx}$ (white LED) |               |
| SFH 5701 A01 | typ. 135                                                                    | Q65112A5751   |

*Note:* Only one bin within one packing unit, see characteristics.

**Maximum Ratings** ( $T_A = 25\text{ °C}$ )

| Parameter                                                                                          | Symbol      | Values      | Unit |
|----------------------------------------------------------------------------------------------------|-------------|-------------|------|
| Operation temperature range                                                                        | $T_{op}$    | -40 ... 100 | °C   |
| Storage temperature range                                                                          | $T_{stg}$   | -40 ... 100 | °C   |
| Supply voltage<br>(for definition of voltage polarity refer to Appnote AN132)                      | $V_{ddmax}$ | 6           | V    |
| Supply current<br>(internally limited; for definition of voltage polarity refer to Appnote AN132)) | $I_{ddmax}$ | 15          | mA   |
| Forward voltage<br>(for definition of voltage polarity refer to Appnote AN132)                     | $V_F$       | 0.56        | V    |
| Forward current<br>(for definition of voltage polarity refer to Appnote AN132)                     | $I_F$       | 0.5         | mA   |
| ESD withstand voltage<br>(acc. to ANSI/ ESDA/ JEDEC JS-001 - HBM)                                  | $V_{ESD}$   | 2000        | V    |
| ESD withstand voltage<br>(acc. to ANSI/ ESDA/ JEDEC JS-002 - CDM)                                  | $V_{ESD}$   | 750         | V    |
| ESD withstand voltage<br>(acc. to ANSI/ ESDA/ JESD22-A115-MM)                                      | $V_{ESD}$   | 400         | V    |

**Operating Conditions**

| Parameter                                                                                        | Symbol   | Values |     |     | Unit |
|--------------------------------------------------------------------------------------------------|----------|--------|-----|-----|------|
|                                                                                                  |          | min    | typ | max |      |
| Supply voltage<br>(for the choice of $R_{LOAD}$ refer to Appnote AN132)                          | $V_{dd}$ | 1.45   |     | 5.5 | V    |
| Supply current<br>( $V_{DD} = 5\text{ V}$ , for the choice of $R_{LOAD}$ refer to Appnote AN132) | $I_{dd}$ | 0.01   |     | 10k | μA   |
| Illuminance range                                                                                | $E_V$    | 0.01   |     | 10k | lx   |

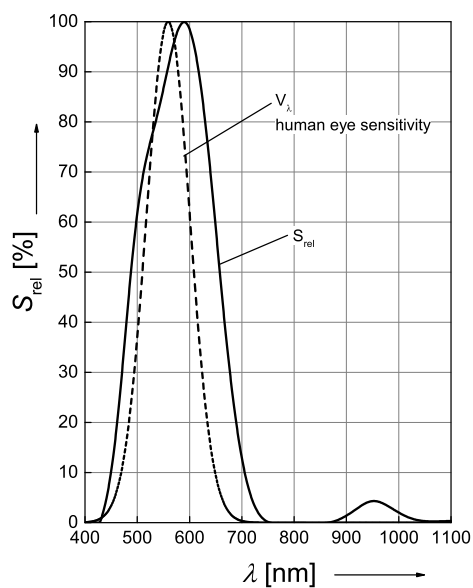
**Characteristics** ( $T_A = 25\text{ °C}$ )

| Parameter                                                                            | Symbol                   | Values | Unit   |
|--------------------------------------------------------------------------------------|--------------------------|--------|--------|
| Spectral sensitivity<br>( $V_{DD} = 5\text{ V}$ , $E_V = 100\text{ lx}$ , white LED) | S                        | 1      | μA/ lx |
| Wavelength of max. sensitivity                                                       | $\lambda_{S\text{ max}}$ | 600    | nm     |
| Spectral range of sensitivity                                                        | $\lambda_{10\%}$ (min)   | 450    | nm     |
|                                                                                      | $\lambda_{10\%}$ (max)   | 705    | nm     |

| Parameter                                                                                                                                    |                | Symbol                             | Values      | Unit       |
|----------------------------------------------------------------------------------------------------------------------------------------------|----------------|------------------------------------|-------------|------------|
| Dimensions of radiant sensitive area                                                                                                         | (typ)          | L x W                              | 0.33 x 0.33 | mm x mm    |
| Half angle                                                                                                                                   | (typ)          | $\varphi$                          | $\pm 60$    | °          |
| Output impedance                                                                                                                             | (typ)          | $Z_{OUT}$                          | 10          | M $\Omega$ |
| Forward voltage<br>( $I_F = 200 \mu A$ , $E = 0$ )                                                                                           | (typ)          | $V_F$                              | 0.52        | V          |
| Supply current<br>( $V_{DD} = 5 V$ , $E_V = 100 \text{ lx}$ (white LED))                                                                     | (typ)          | $I_{dd}$                           | 135         | $\mu A$    |
| Output dark current<br>( $V_{DD} = 5 V$ , $E_V = 0 \text{ lx}$ )                                                                             | (typ)<br>(max) | $I_{OUT\_dark}$<br>$I_{OUT\_dark}$ | 3.4<br>50   | nA<br>nA   |
| Rise time<br>( $R_{LOAD} = 33 \text{ k}\Omega$ , $E_V = 100 \text{ lx}$ ,<br>for different testing conditions refer to the Appnote<br>AN132) | (typ)          | $t_r$                              | 14          | ms         |
| Temperature coefficient                                                                                                                      | (typ)          | $T_{C\ IOUT}$                      | -0.07       | %/ K       |

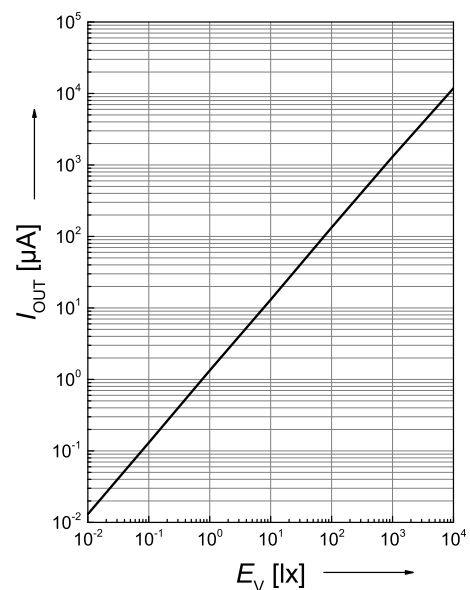
### Relative Spectral Sensitivity <sup>1) page 12</sup>

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



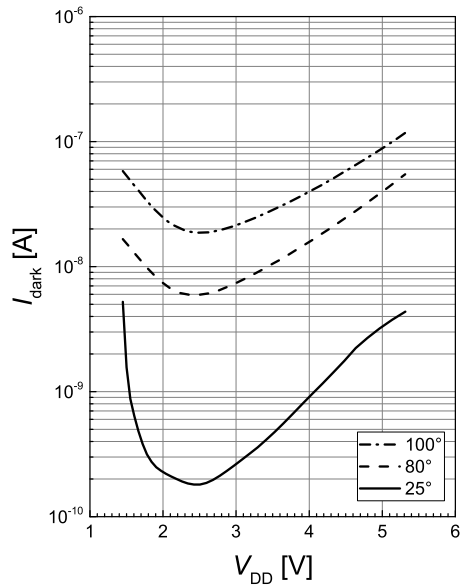
### Output Current <sup>1) page 12</sup>

$I_{OUT} = f(E_V)$ ; white LED;  $V_{DD} = 5 V$

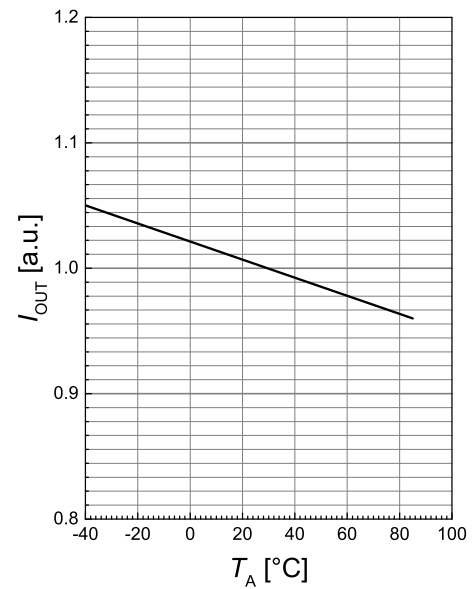


**Dark Current** <sup>1) page 12</sup>

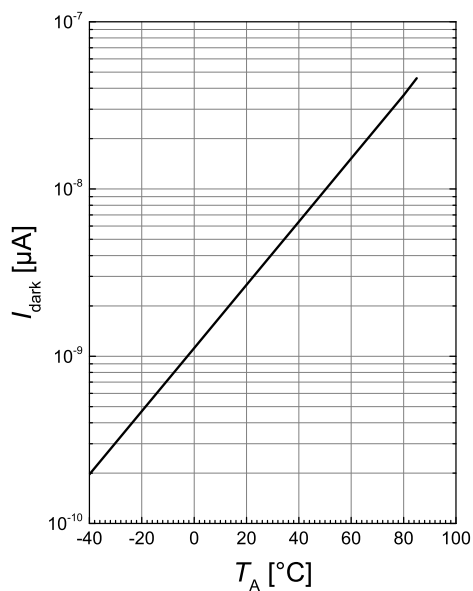
$$I_{\text{dark}} = f(V_{\text{DD}})$$

**Output Current** <sup>1) page 12</sup>

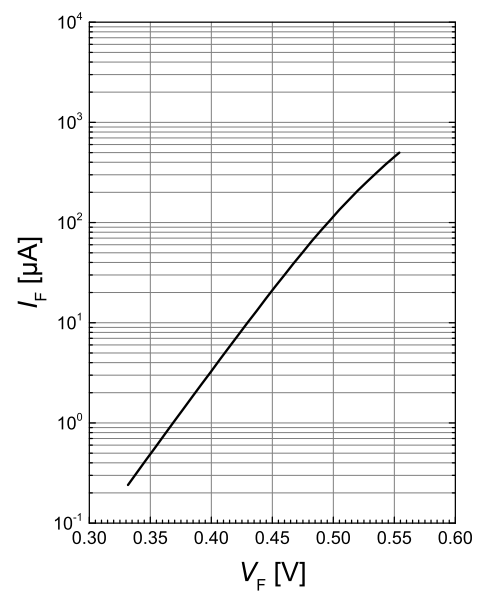
$$I_{\text{OUT}}(T) / I_{\text{OUT}}(25^\circ\text{C}) = f(T_A); E_v = 100\text{lx}; \text{white LED}; V_{\text{DD}} = 5\text{ V}$$

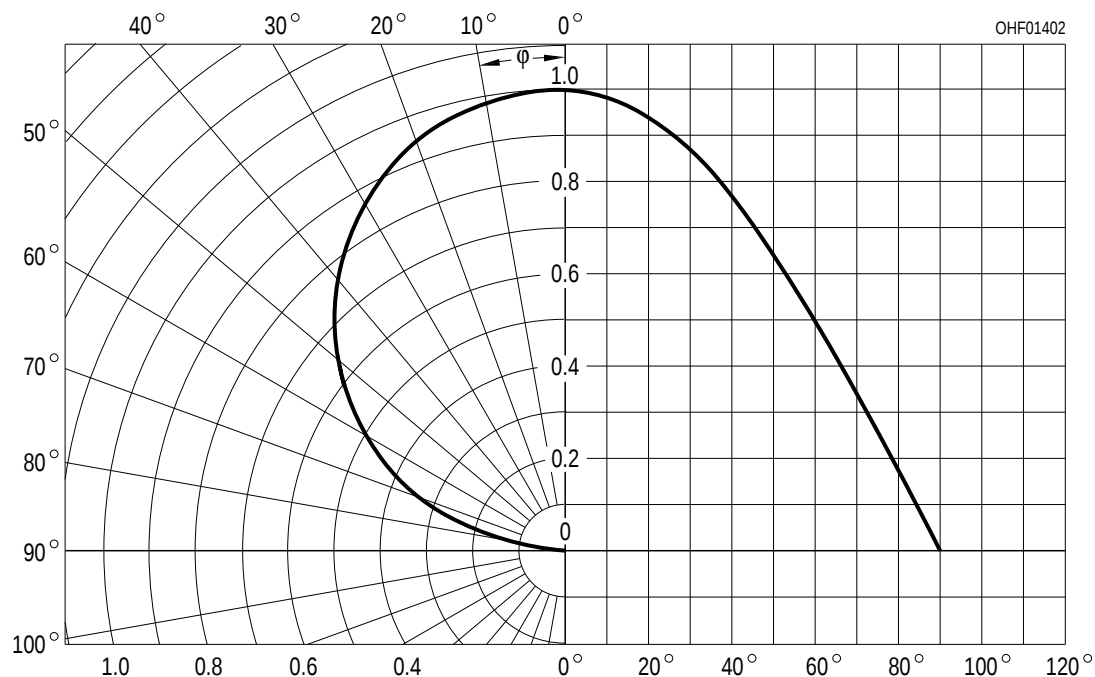
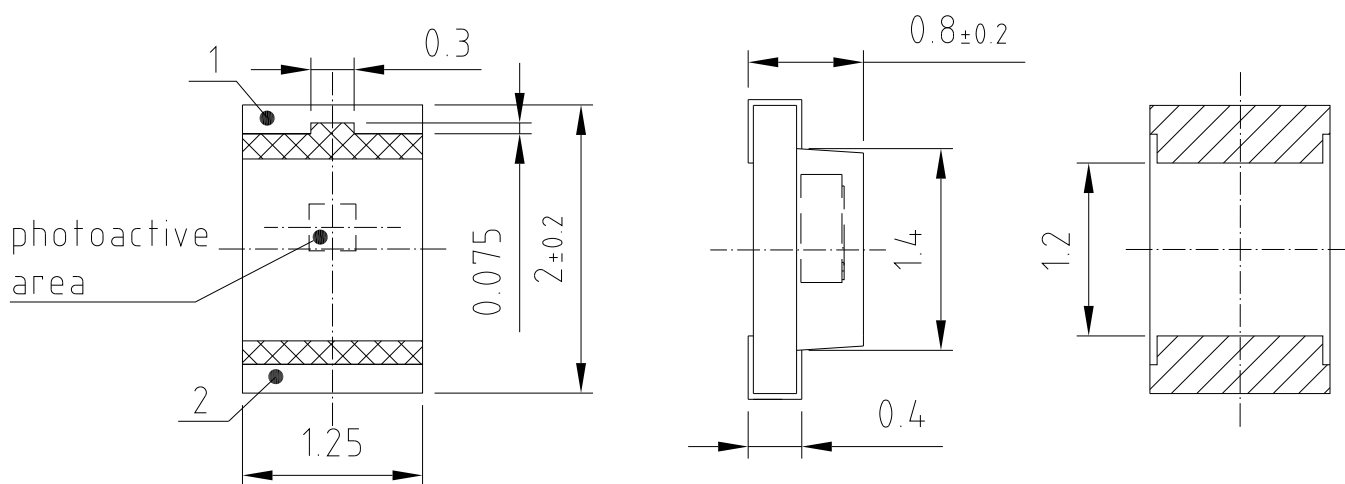
**Dark Current** <sup>1) page 12</sup>

$$I_{\text{dark}} = f(T_A); V_F = 5\text{ V}$$

**Forward Current** <sup>1) page 12</sup>

$$I_F = f(V_F); E = 0$$



**Directional Characteristics (Horizontal)** <sup>1) page 12</sup>Photodiode  $S_{rel} = f(\phi)$ **Package Outline**general tolerance  $\pm 0.1$ 

lead finish Au

C67062-A0260-A1KA-01

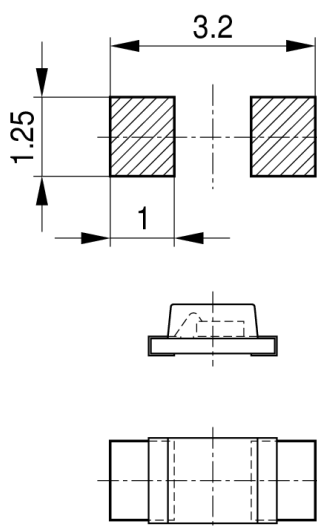
Dimensions in mm.

**Pinning**

| Pin | Description   |
|-----|---------------|
| 1   | anode (OUT)   |
| 2   | cathode (VDD) |

**Approximate Weight:**

3.8 mg

**Recommended Solder Pad**

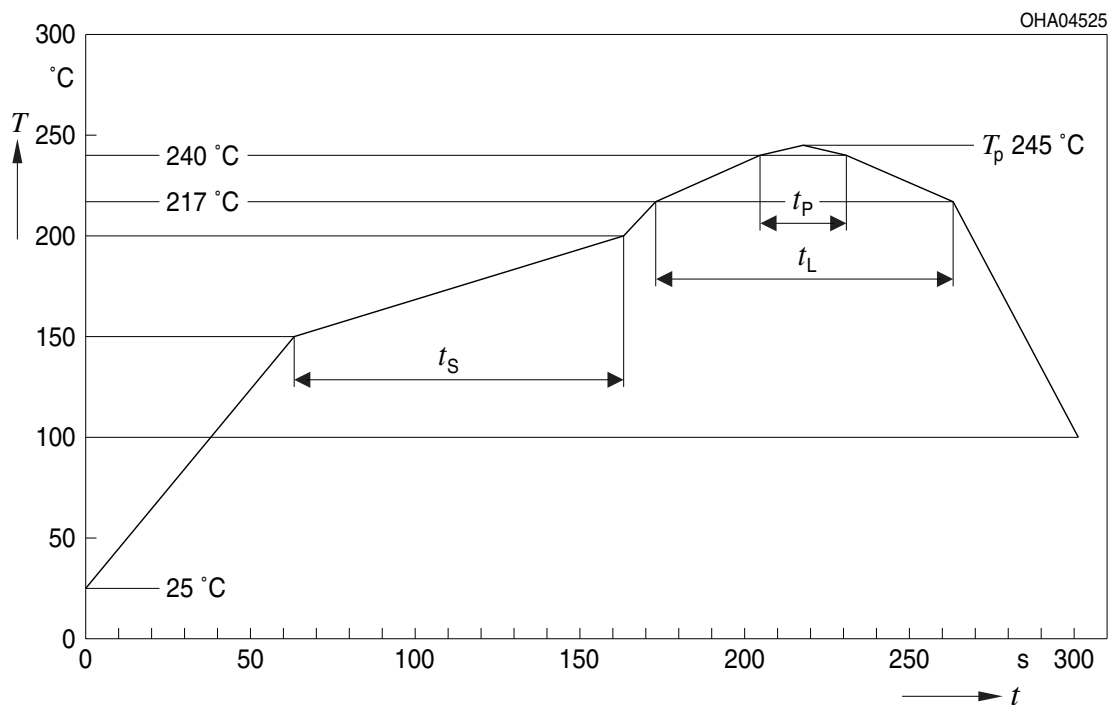
Component location on pad

OHFP2578

Dimensions in mm.

### Reflow Soldering Profile

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



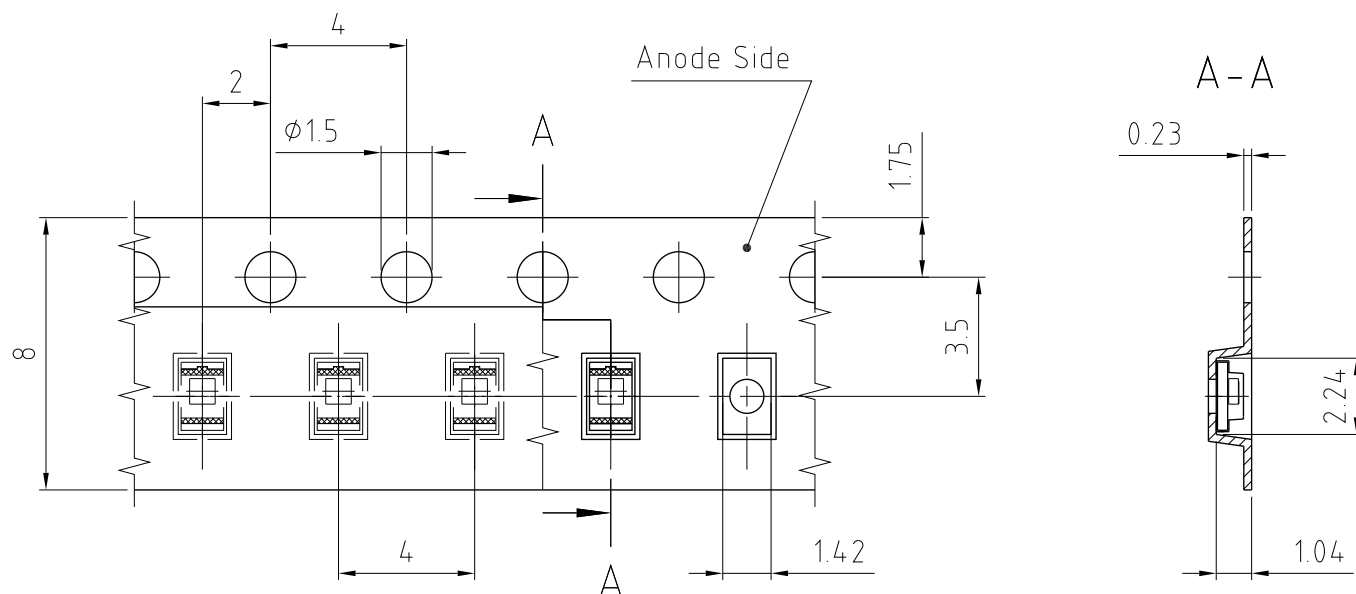
OHA04612

| Profil-Charakteristik<br>Profile Feature                                 | Symbol<br>Symbol | Pb-Free (SnAgCu) Assembly |                |         | Einheit<br>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 $T_p - 5\text{ K}$ | $t_p$            | 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

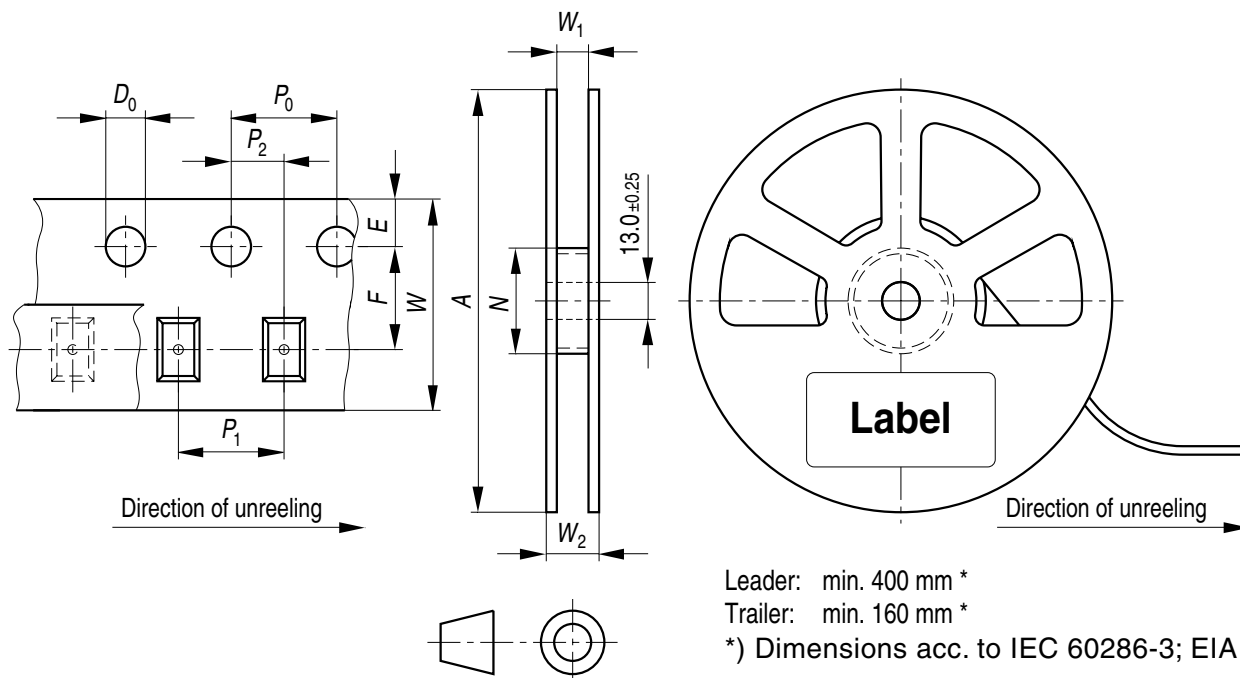
## Taping



C67062-A0260-B1-03

Dimensions in mm.

## Tape and Reel

8 mm tape with 3000 pcs. on  $\varnothing$  180 mm reel

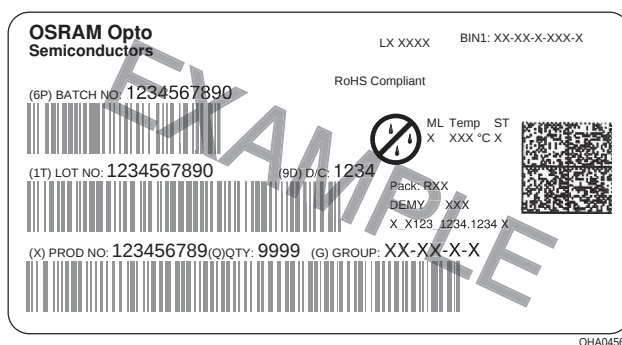
## Tape dimensions [mm]

| W              | P <sub>0</sub> | P <sub>1</sub>            | P <sub>2</sub> | D <sub>0</sub> | E          | F          |
|----------------|----------------|---------------------------|----------------|----------------|------------|------------|
| 8 + 0.3 / -0.1 | 4 ± 0.1        | 2 ± 0.05<br>or<br>4 ± 0.1 | 2 ± 0.05       | 1.5 ± 0.1      | 1.75 ± 0.1 | 3.5 ± 0.05 |

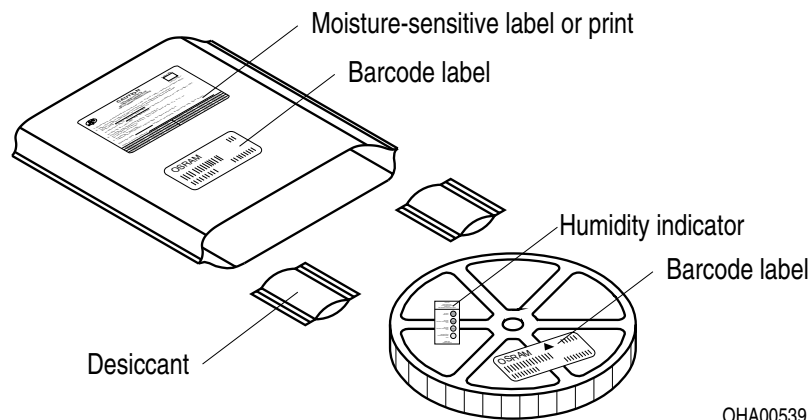
## Reel dimensions [mm]

| A   | W | N <sub>min</sub> | W <sub>1</sub> | W <sub>2max</sub> |
|-----|---|------------------|----------------|-------------------|
| 180 | 8 | 60               | 8.4 + 2        | 14.4              |

## Barcode-Product-Label (BPL)



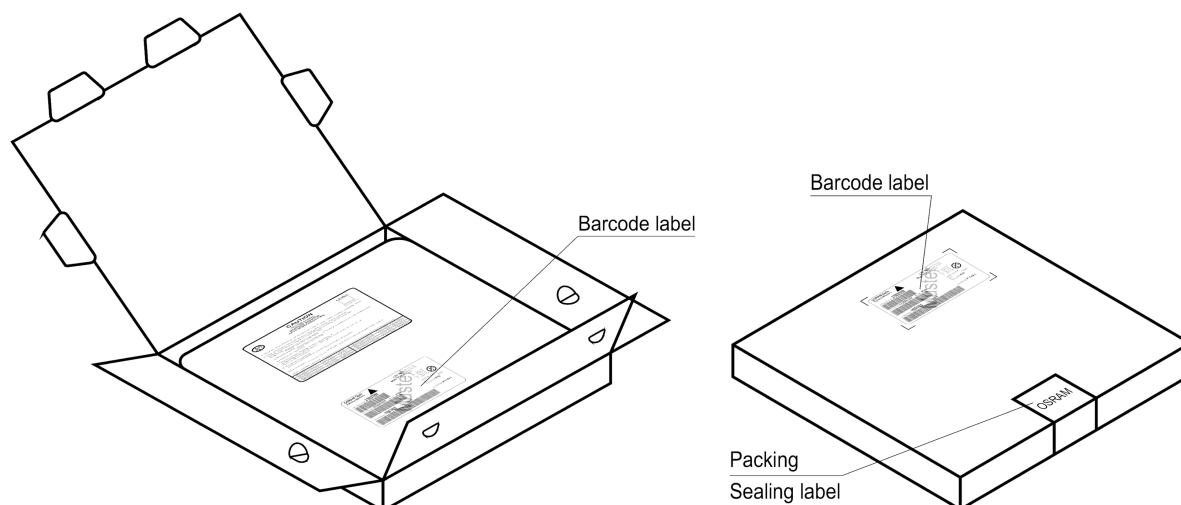
## Dry Packing Process and Materials



## Note:

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

Regarding dry pack you will find further information in the internet. Here you will also find the normative references like JEDEC.

**Transportation Packing and Materials**

OHA02044

**Dimensions of transportation box in mm**

| Width   | Length  | Height |
|---------|---------|--------|
| 200 ± 5 | 195 ± 5 | 30 ± 5 |

**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.

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For information on the types in question please contact our Sales Organization. If printed or downloaded, please find the latest version in the Internet.

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\*\*) Life support devices or systems are intended (a) to be implanted in the human body, or (b) to support and/or maintain and sustain human life. If they fail, it is reasonable to assume that the health and the life of the user may be endangered.

## Glossary

- <sup>1)</sup> **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.

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