

# Silicon NPN Phototransistor in SMT TOPLED®-Package

## Version 1.4

### SFH 320 FA



#### Features:

- **Spectral range of sensitivity:** (typ) 750 ... 1120 nm
- **Package:** TOPLED
- **Special:** High linearity
- P-LCC-2 package
- Available in groups
- Suitable for all soldering methods
- The product qualification test plan is based on the guidelines of AEC-Q101-REV-C, Stress Test Qualification for Automotive Grade Discrete Semiconductors.

#### Applications

- Miniature photointerrupters
- Industrial electronics
- For control and drive circuits

#### Ordering Information

| Type:          | Photocurrent                                                                                           | Ordering Code |
|----------------|--------------------------------------------------------------------------------------------------------|---------------|
|                | $I_{PCE}$ [μA]<br>$\lambda = 950 \text{ nm}$ , $E_e = 0.1 \text{ mW/cm}^2$ ,<br>$V_{CE} = 5 \text{ V}$ |               |
| SFH 320 FA     | 16 ... 80                                                                                              | Q65110A2472   |
| SFH 320 FA-3   | 25 ... 50                                                                                              | Q65110A2470   |
| SFH 320 FA-3/4 | 25 ... 80                                                                                              | Q65110A2475   |
| SFH 320 FA-4   | 40 ... 80                                                                                              | Q65110A1836   |

*Note:* Only one bin within one packing unit (variation less than 2:1)

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

| Parameter                                                         | Symbol            | Values      | Unit |
|-------------------------------------------------------------------|-------------------|-------------|------|
| Operating and storage temperature range                           | $T_{op}; T_{stg}$ | -40 ... 100 | °C   |
| Collector-emitter voltage                                         | $V_{CE}$          | 35          | V    |
| Collector current                                                 | $I_C$             | 15          | mA   |
| Collector surge current<br>( $\tau < 10\text{ }\mu\text{s}$ )     | $I_{CS}$          | 75          | mA   |
| Total Power dissipation                                           | $P_{tot}$         | 165         | mW   |
| ESD withstand voltage<br>(acc. to ANSI/ ESDA/ JEDEC JS-001 - HBM) | $V_{ESD}$         | 2000        | V    |
| Thermal resistance for mounting on pcb                            | $R_{thJA}$        | 450         | K/W  |

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

| Parameter                                                               |             | Symbol                   | Values                | Unit            |
|-------------------------------------------------------------------------|-------------|--------------------------|-----------------------|-----------------|
| Wavelength of max. sensitivity                                          | (typ)       | $\lambda_{S\text{ max}}$ | 980                   | nm              |
| Spectral range of sensitivity                                           | (typ)       | $\lambda_{10\%}$         | (typ) 750<br>... 1120 | nm              |
| Radiant sensitive area<br>( $\varnothing 220\mu\text{m}$ )              | (typ)       | A                        | 0.038                 | mm <sup>2</sup> |
| Dimensions of chip area                                                 | (typ)       | L x W                    | (typ) 0.45 x<br>0.45  | mm x<br>mm      |
| Half angle                                                              | (typ)       | $\varphi$                | $\pm 60$              | °               |
| Capacitance<br>( $V_{CE} = 0\text{ V}$ , $f = 1\text{ MHz}$ , $E = 0$ ) | (typ)       | $C_{CE}$                 | 5                     | pF              |
| Dark current<br>( $V_{CE} = 20\text{ V}$ , $E = 0$ )                    | (typ (max)) | $I_{CE0}$                | 1 ( $\leq 50$ )       | nA              |

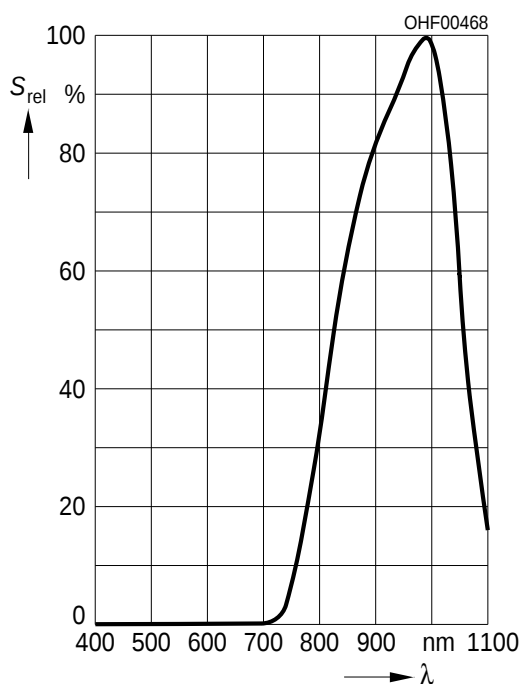
Grouping ( $T_A = 25\text{ °C}$ ,  $\lambda = 950\text{ nm}$ )

| Group | Min Photocurrent<br><br>$E_e = 0.1\text{ mW/cm}^2$ ,<br>$V_{CE} = 5\text{ V}$<br>$I_{PCE, min}\text{ }[\mu\text{A}]$ | Max Photocurrent<br><br>$E_e = 0.1\text{ mW/cm}^2$ ,<br>$V_{CE} = 5\text{ V}$<br>$I_{PCE, max}\text{ }[\mu\text{A}]$ | Rise and fall time<br><br>$I_C = 1\text{ mA}$ , $V_{CC} = 5\text{ V}$ ,<br>$R_L = 1\text{ k}\Omega$<br>$t_r, t_f\text{ }[\mu\text{s}]$ | Collector-emitter<br>saturation<br>voltage<br><br>$I_C = I_{PCEmin} \times 0.3$ , $E_e$<br>$= 0.1\text{ mW/cm}^2$<br>$V_{CEsat}\text{ }[\text{mV}]$ |
|-------|----------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------|
| -2    | 16                                                                                                                   | 32                                                                                                                   | 6                                                                                                                                      | 150                                                                                                                                                 |
| -3    | 25                                                                                                                   | 50                                                                                                                   | 7                                                                                                                                      | 150                                                                                                                                                 |
| -4    | 40                                                                                                                   | 80                                                                                                                   | 8                                                                                                                                      | 150                                                                                                                                                 |

Note.:  $I_{PCEmin}$  is the min. photocurrent of the specified group.

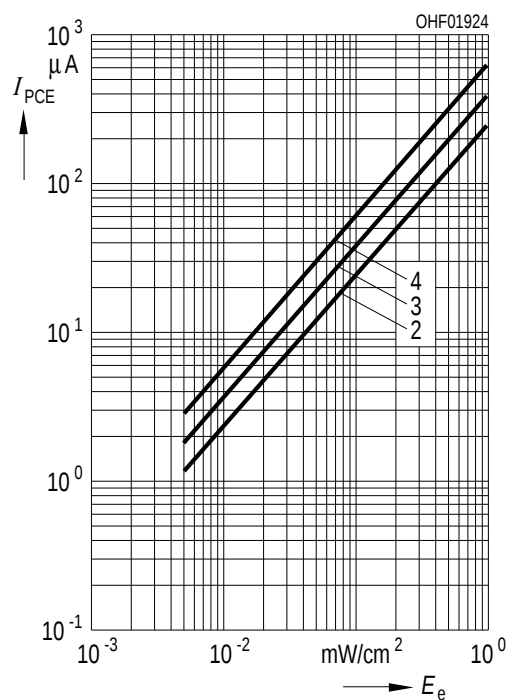
### Relative Spectral Sensitivity <sup>1) page 13</sup>

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



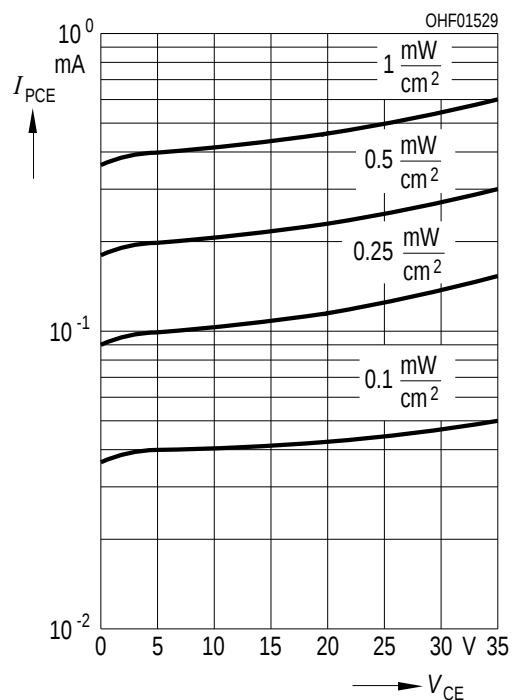
### Photocurrent <sup>1) page 13</sup>

$$I_{PCE} = f(E_e), V_{CE} = 5\text{ V}$$

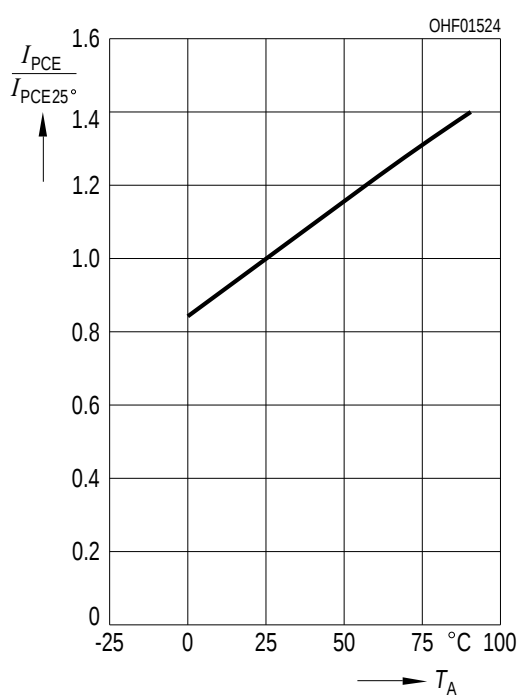


**Photocurrent** <sup>1) page 13</sup>

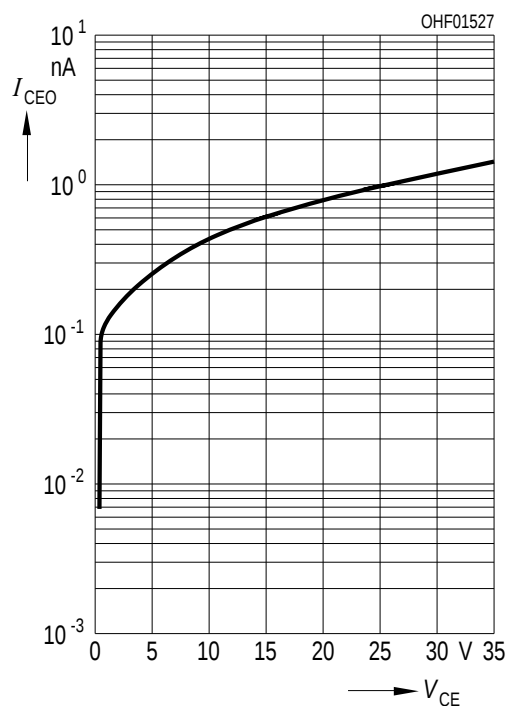
$$I_{PCE} = f(V_{CE}), E_e = \text{Parameter}$$

**Photocurrent** <sup>1) page 13</sup>

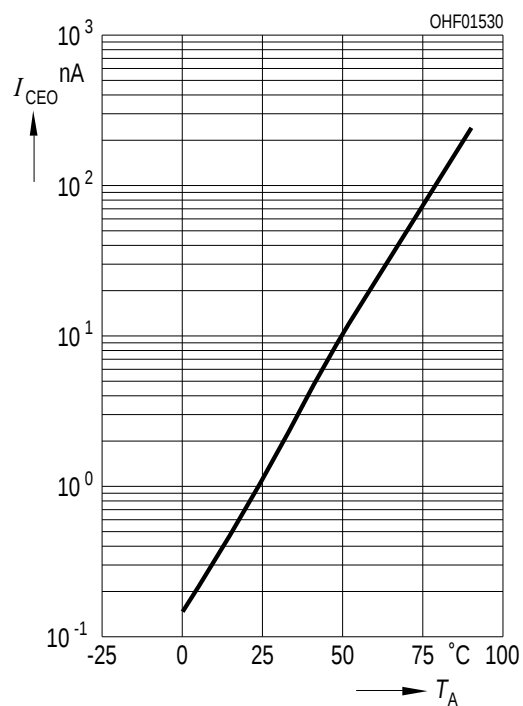
$$I_{PCE} / I_{PCE}(25^\circ\text{C}) = f(T_A), V_{CE} = 5 \text{ V}$$

**Dark Current** <sup>1) page 13</sup>

$$I_{CEO} = f(V_{CE}), E = 0$$

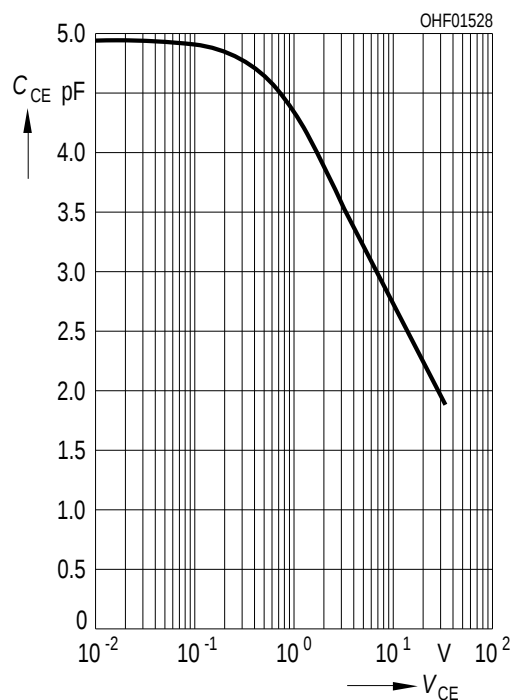
**Dark Current** <sup>1) page 13</sup>

$$I_{CEO} = f(T_A), E = 0$$

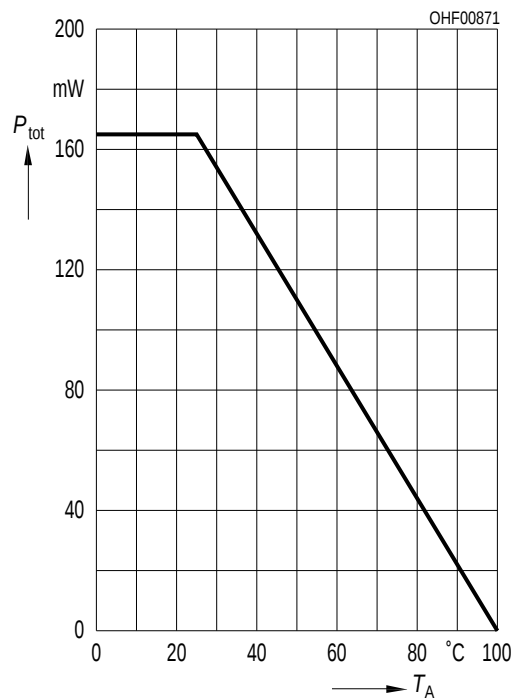


**Collector-Emitter Capacitance** <sup>1) page 13</sup>

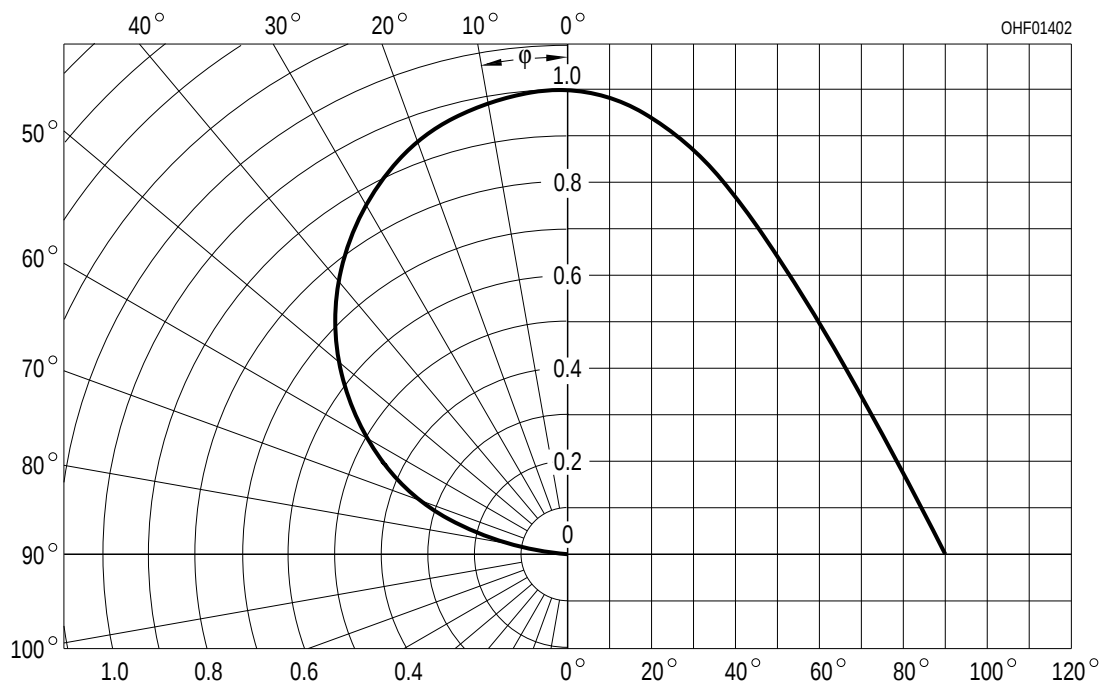
$$C_{CE} = f(V_{CE}), f = 1 \text{ MHz}, E = 0$$

**Power Consumption**

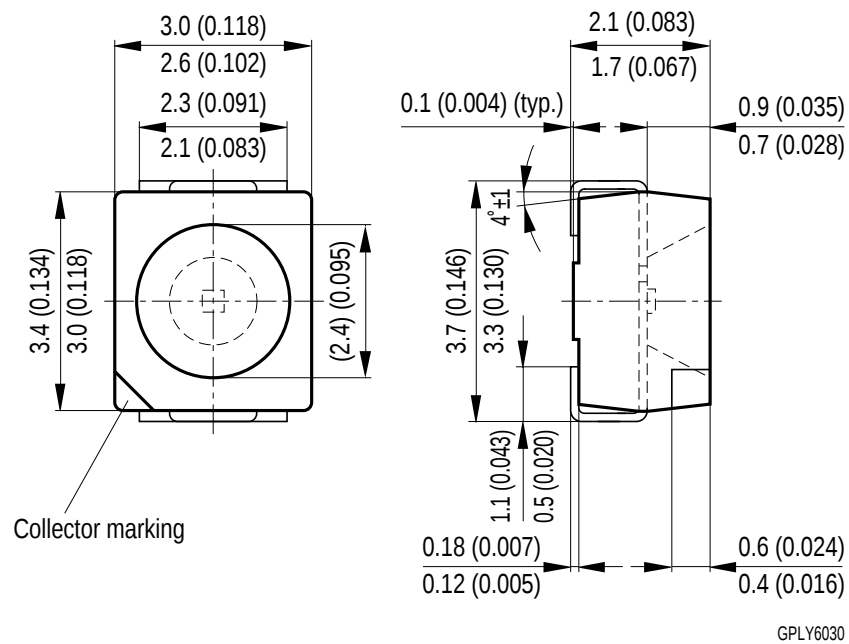
$$P_{tot} = f(T_A), R_{thJA} = 450 \text{ K / W}$$

**Directional Characteristics** <sup>1) page 13</sup>

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



## Package Outline



*Dimensions in mm (inch).*

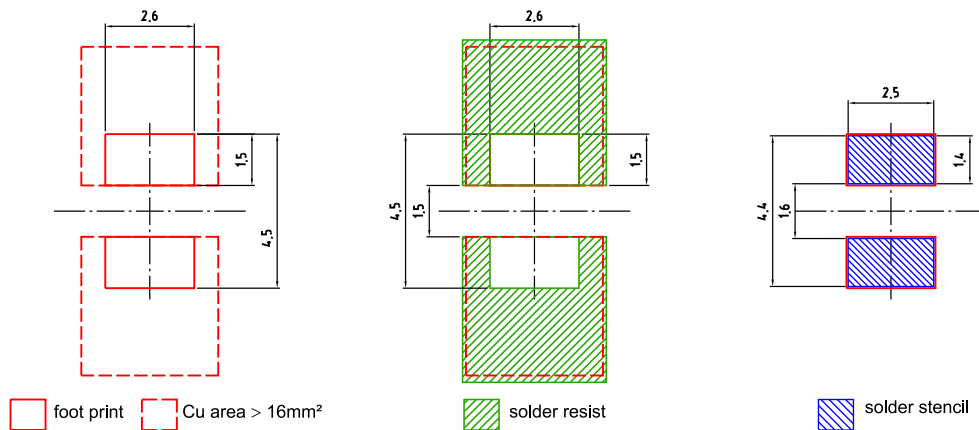
**Package**

TOPLED

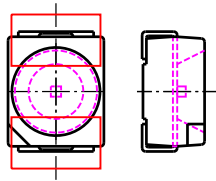
**Approximate Weight:**

35 mg

### Recommended Solder Pad



Component Location on Pad

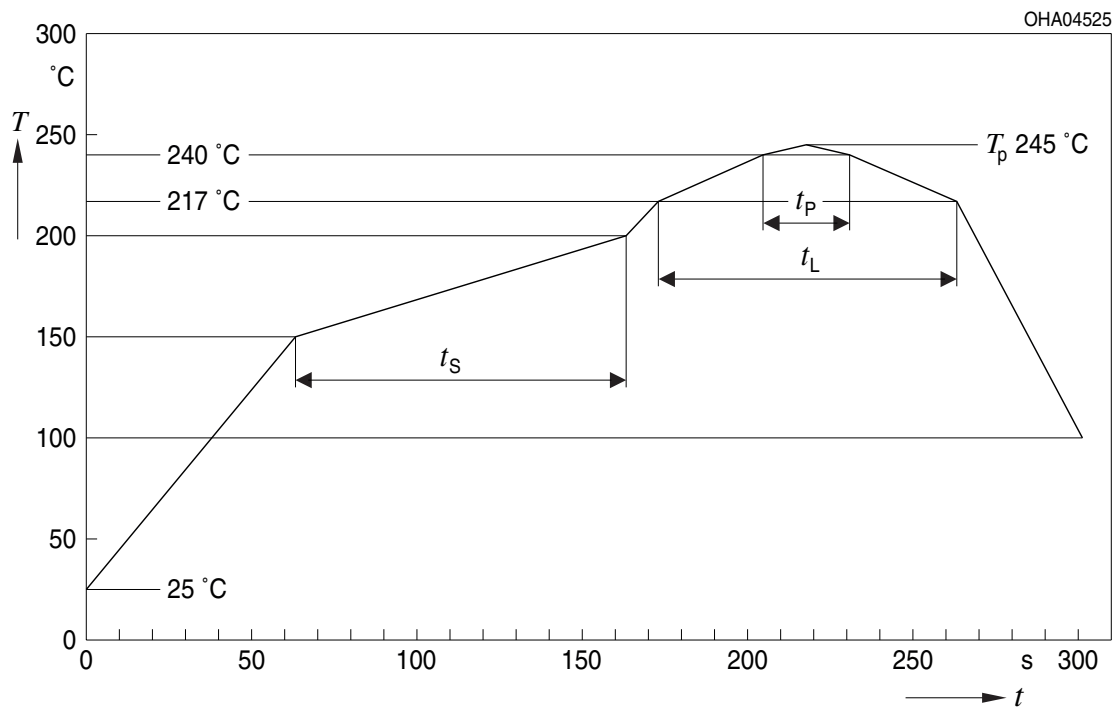


E062 3010.01 -02

Dimensions in mm.

### Reflow Soldering Profile

Product complies to MSL Level 2 acc. to JEDEC J-STD-020D.01



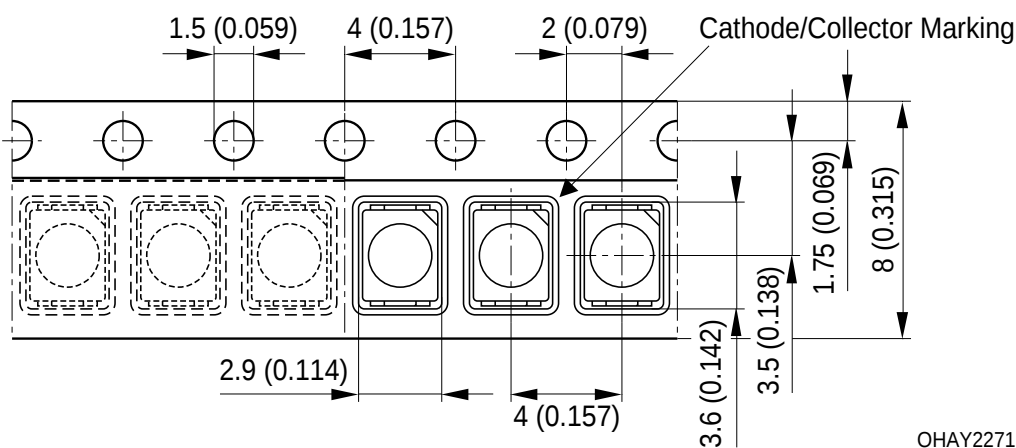
OHA04612

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

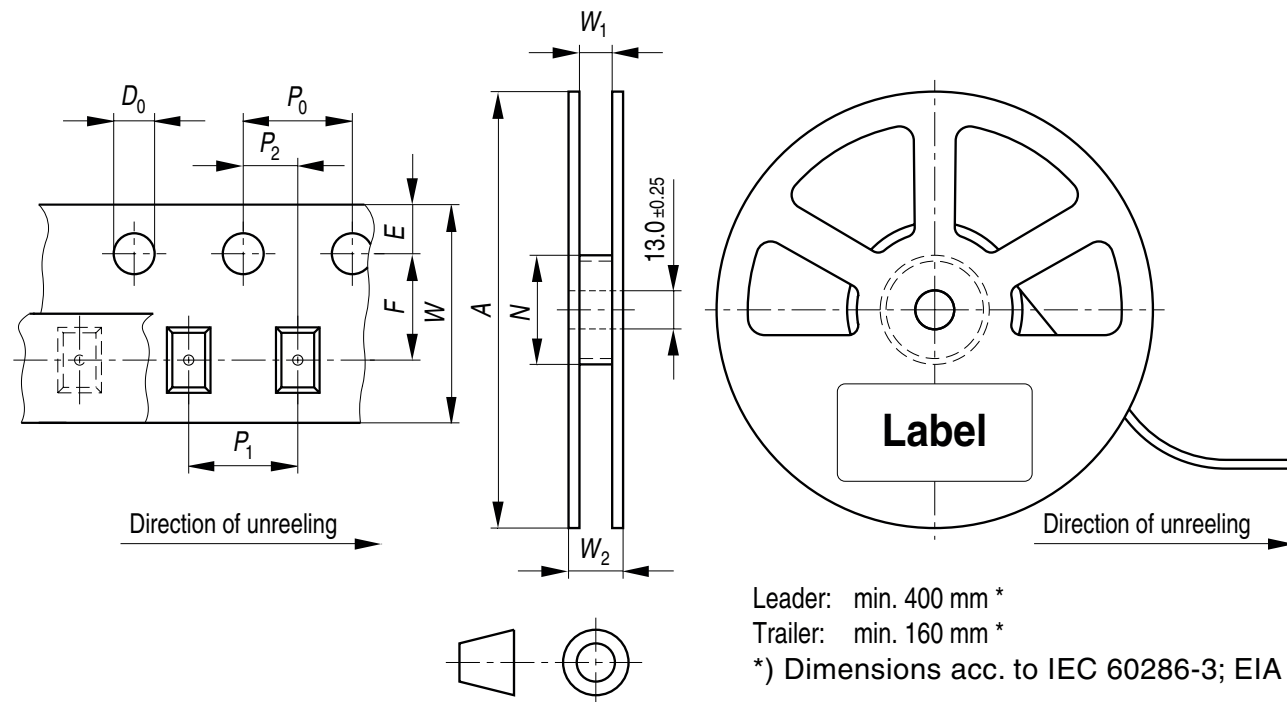


OHAY2271

*Dimensions in mm (inch).*

**Tape and Reel**

8 mm tape with 2000 pcs. on  $\varnothing$  180 mm reel, 8000 pcs. on  $\varnothing$  330 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 |

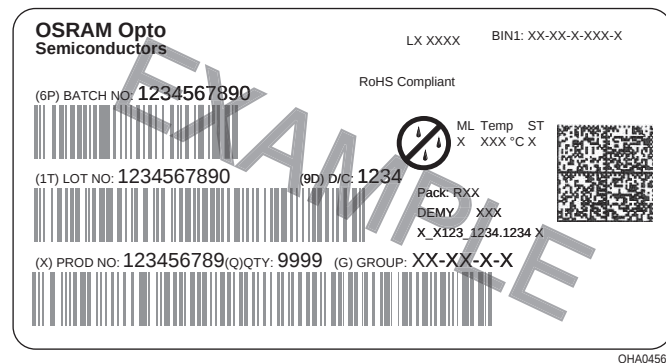
**Reel dimensions [mm]**

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

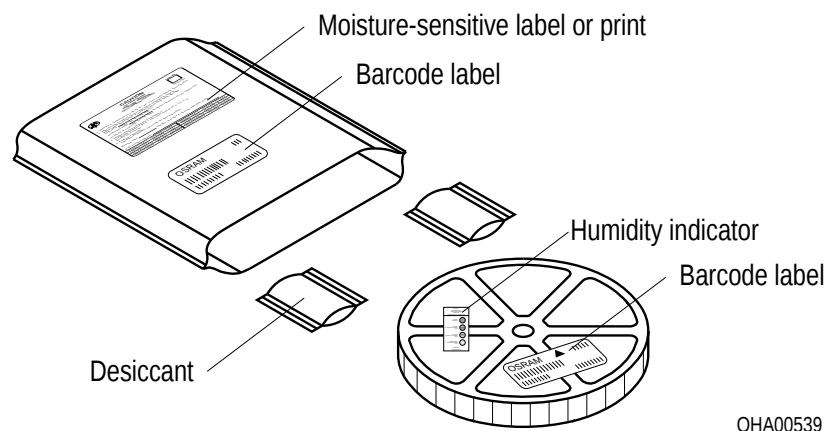
  

| A   | W | N <sub>min</sub> | W <sub>1</sub> | W <sub>2max</sub> |
|-----|---|------------------|----------------|-------------------|
| 330 | 8 | 60               | 8.4 + 2        | 14.4              |

## Barcode-Product-Label (BPL)



## Dry Packing Process and Materials

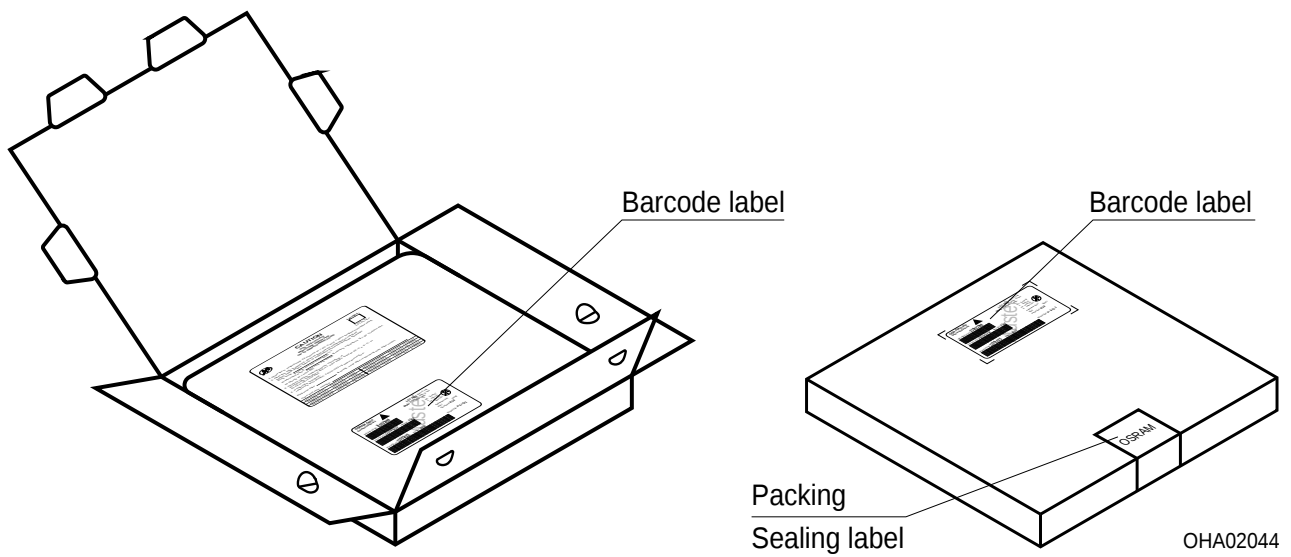


## Note:

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



## Dimensions of transportation box in mm

| Width   | Length  | Height |
|---------|---------|--------|
| 200 ± 5 | 195 ± 5 | 30 ± 5 |
| 352 ± 5 | 352 ± 5 | 33 ± 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.

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 Internet.

**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.

**Components used in life-support devices or systems must be expressly authorized for such purpose!**

Critical components\* may only be used in life-support devices\*\* or systems with the express written approval of OSRAM OS.

\*) A critical component is a component used in a life-support device or system whose failure can reasonably be expected to cause the failure of that life-support device or system, or to affect its safety or the effectiveness of that device or system.

\*\*) 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.

**Published by OSRAM Opto Semiconductors GmbH**  
**Leibnizstraße 4, D-93055 Regensburg**  
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