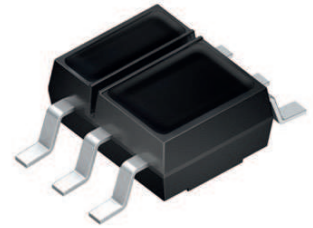


# Reflective Interrupter

## Version 1.5

---

### SFH 9206



#### Features:

- 940nm emitter in combination with a silicon NPN phototransistor
- Optimal operating distance 1 mm to 5 mm
- Daylight cut-off filter
- Emitter and detector electrically isolated
- Soldering Methode: IR Reflow Soldering
- Product complies to MSL Level 4

#### Applications

- Position reporting
- End position switch
- Speed monitoring and regulating
- Motion transmitter

#### Ordering Information

| Type:        | Collector-emitter current<br>$I_{PCE}$ [ $\mu$ A]<br><b>Kodak neutral white testcard with<br/>90% reflection; <math>I_F = 10</math> mA, <math>V_{CE} = 5</math> V,<br/><math>d = 1</math> mm</b> | Ordering Code |
|--------------|--|---------------|
| SFH 9206     | 160 ... 2000   | Q65111A3179   |
| SFH 9206-4   | 160 ... 320  | -             |
| SFH 9206-5/6 | 250 ... 800  | Q65111A3177   |
| SFH 9206-6/7 | 400 ... 1250   | Q65111A3178   |
| SFH 9206-8   | 1000 ... 2000  | -             |

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

| Parameter   | Symbol     | Values | Unit  |
|---|------------|--------|-------|
| <b>Emitter</b>  |            |        |       |
| Reverse voltage   | $V_R$      | 5      | V     |
| Forward current   | $I_F$      | 50     | mA    |
| Surge current<br>( $t_p \leq 10\ \mu\text{s}$ , $D=0$ )     | $I_{FSM}$  | 0.7    | A     |
| Power consumption   | $P_{tot}$  | 100    | mW    |
| Thermal resistance junction - ambient <sup>1) page 14</sup> | $R_{thJA}$ | 495    | K / W |

**Detector**

|   |            |     |       |
|---|------------|-----|-------|
| Collector-emitter voltage                                   | $V_{CE}$   | 16  | V     |
| Collector-emitter voltage<br>( $t \leq 2\ \text{min}$ )     | $V_{CE}$   | 30  | V     |
| Emitter-collector voltage                                   | $V_{EC}$   | 7   | V     |
| Collector current   | $I_C$      | 10  | mA    |
| Total Power dissipation                                     | $P_{tot}$  | 100 | mW    |
| Thermal resistance junction - ambient <sup>1) page 14</sup> | $R_{thJA}$ | 495 | K / W |

**Interrupter**

|   |                      |             |    |
|---|----------------------|-------------|----|
| Operating and storage temperature range | $T_{op}$ ; $T_{stg}$ | -40 ... 100 | °C |
| Ambient temperature range               | $T_A$                | -40 ... 100 | °C |
| Total power dissipation                 | $P_{tot}$            | 150         | mW |
| Electrostatic discharge                 | $V_{ESD}$            | 2           | kV |

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

| Parameter  | Symbol                 | Values                             | Unit          |
|--|------------------------|------------------------------------|---------------|
| <b>Emitter</b>   |                        |                                    |               |
| Peak wavelength<br>( $I_F = 50\ \text{mA}$ , $t_p = 20\ \text{ms}$ ) | (typ) $\lambda_{peak}$ | 950                                | nm            |
| Forward voltage<br>( $I_F = 50\ \text{mA}$ , $t_p = 20\ \text{ms}$ ) | (typ (max)) $V_F$      | 1.45 ( $\leq 1.8$ )                | V             |
| Reverse current<br>( $V_R = 5\ \text{V}$ )                           | $I_R$                  | not designed for reverse operation | $\mu\text{A}$ |

**Detector**

| Parameter  |             | Symbol    | Values          | Unit |
|--|-------------|-----------|-----------------|------|
| Capacitance<br>( $V_{CE} = 0\text{ V}$ , $f = 1\text{ MHz}$ , $E = 0$ )                        | (typ)       | $C_{CE}$  | 5               | pF   |
| Dark current<br>( $V_{CE} = 16\text{ V}$ , $E = 0$ )   | (typ (max)) | $I_{CE0}$ | 1 ( $\leq 50$ ) | nA   |
| Photocurrent (ambient light sensitivity)<br>( $V_{CE} = 5\text{ V}$ , $E_V = 1000\text{ lx}$ ) | (typ)       | $I_{PCE}$ | 1               | mA   |

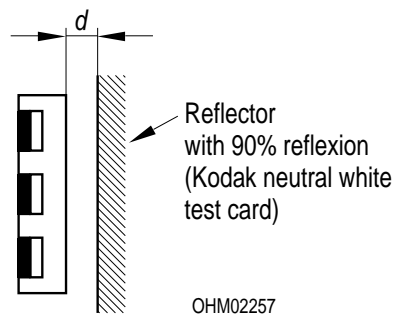
### Interrupter

|   |                         |                                     |                    |   |
|---|-------------------------|-------------------------------------|--------------------|---|
| Collector-emitter current<br>(Kodak neutral white testcard with 90% reflection;<br>$I_F = 10\text{ mA}$ , $V_{CE} = 5\text{ V}$ , $d = 1\text{ mm}$ )                 | (min)<br>(typ)<br>(max) | $I_{PCE}$<br>$I_{PCE}$<br>$I_{PCE}$ | 160<br>600<br>2000 | $\mu\text{A}$<br>$\mu\text{A}$<br>$\mu\text{A}$ |
| Collector-emitter saturation voltage<br>(Kodak neutral white testcard with 90% reflection; $I_F = 10\text{ mA}$ , $I_C = 55\text{ }\mu\text{A}$ , $d = 1\text{ mm}$ ) | (typ (max))             | $V_{CEsat}$                         | 200 ( $< 600$ )    | mV  |

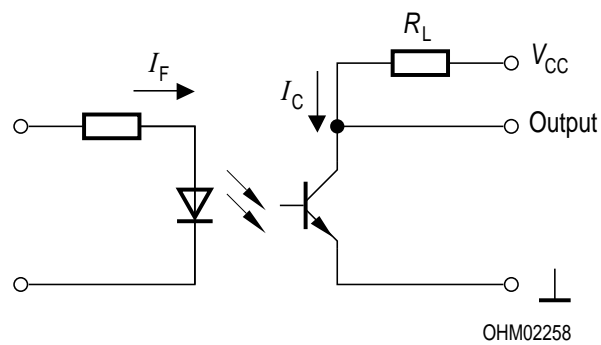
### Switching Times

|  |       |           |    |               |
|--|-------|-----------|----|---------------|
| Turn-on time <sup>2) page 14</sup><br>( $V_{CC} = 5\text{ V}$ , $I_C = 100\text{ }\mu\text{A}$ , $R_L = 1\text{ k}\Omega$ )  | (typ) | $t_{on}$  | 40 | $\mu\text{s}$ |
| Rise time <sup>2) page 14</sup><br>( $V_{CC} = 5\text{ V}$ , $I_C = 100\text{ }\mu\text{A}$ , $R_L = 1\text{ k}\Omega$ )     | (typ) | $t_r$     | 30 | $\mu\text{s}$ |
| Turn-off time <sup>2) page 14</sup><br>( $V_{CC} = 5\text{ V}$ , $I_C = 100\text{ }\mu\text{A}$ , $R_L = 1\text{ k}\Omega$ ) | (typ) | $t_{off}$ | 45 | $\mu\text{s}$ |
| Fall time <sup>2) page 14</sup><br>( $V_{CC} = 5\text{ V}$ , $I_C = 100\text{ }\mu\text{A}$ , $R_L = 1\text{ k}\Omega$ )     | (typ) | $t_f$     | 40 | $\mu\text{s}$ |

## Mechanical test setup

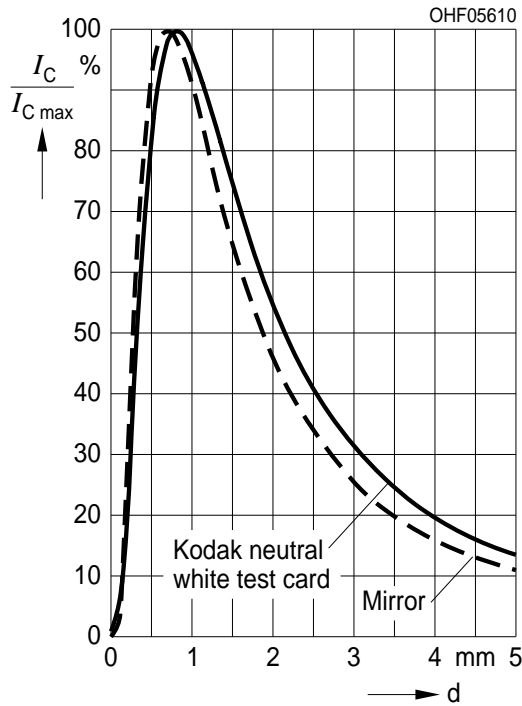


## Test Circuit for Switching and Response Time



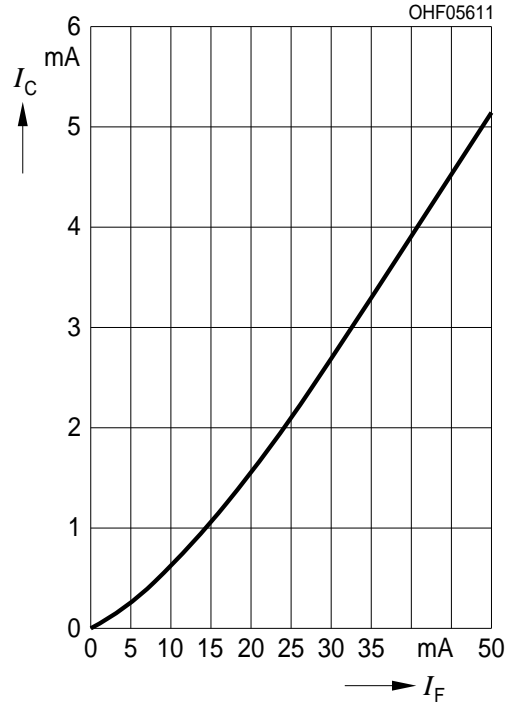
**Collector Current** <sup>3) page 14</sup>

$I_C / I_{Cmax} = f(d), T_A = 25^\circ C$



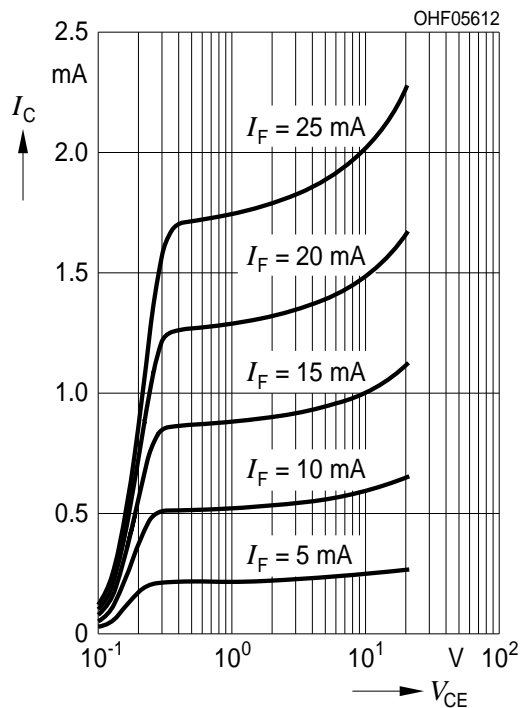
**Collector Current** <sup>3) page 14</sup>

$I_C = f(I_F), d = 1 \text{ mm}, 90\% \text{ reflection}, T_A = 25^\circ C$



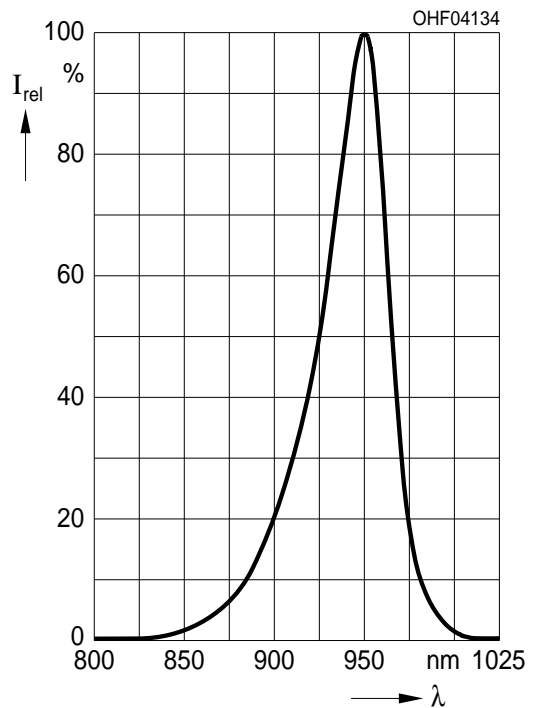
**Photocurrent** <sup>3) page 14</sup>

$I_C = f(V_{CE}), d = 1 \text{ mm}, 90\% \text{ reflection}, T_A = 25^\circ C$



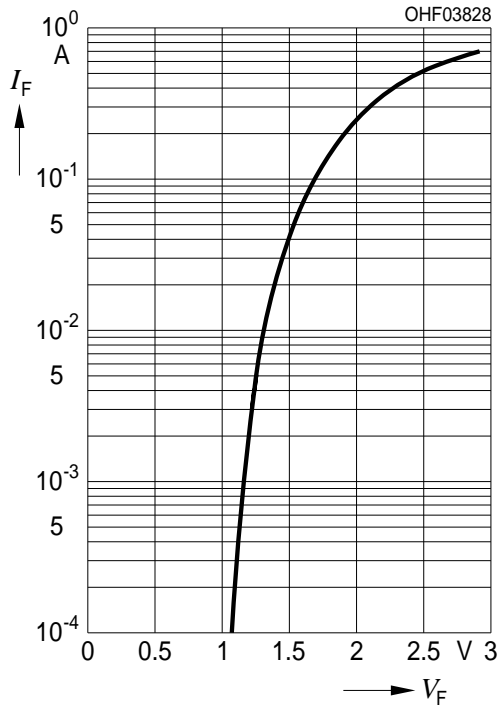
**Relative Spectral Emission** <sup>3) page 14</sup>

(typ)  $I_{rel} = f(\lambda), T_A = 25^\circ C$



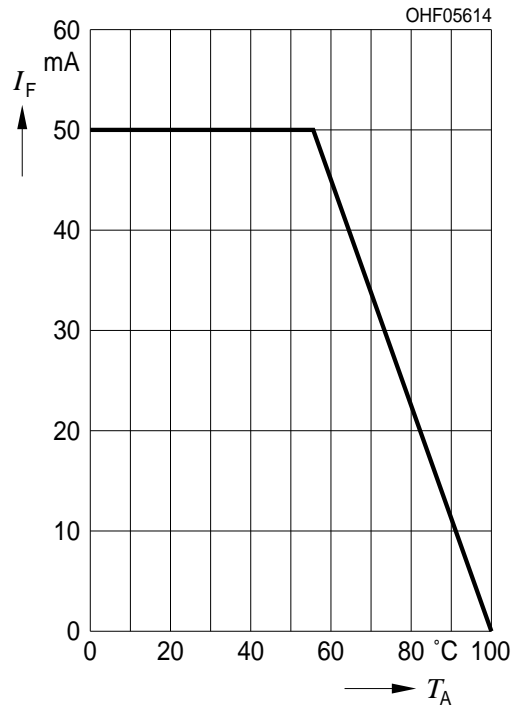
**Forward Current** <sup>3) page 14</sup>

$I_F = f(V_F)$ , single pulse,  $t_p = 100 \mu s$



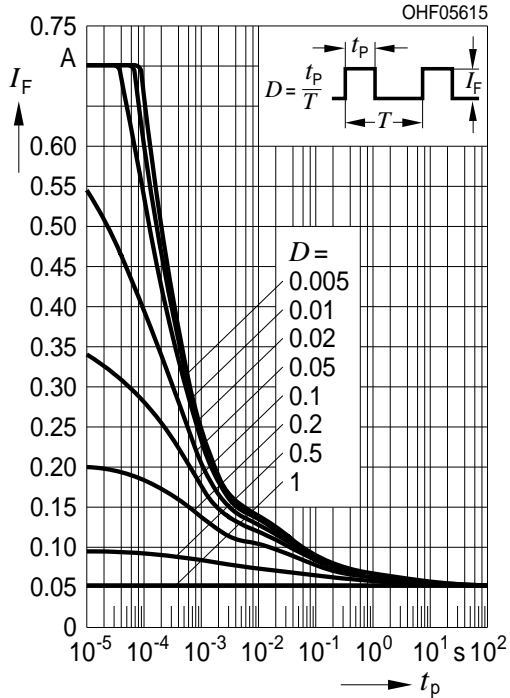
**Max. Permissible Forward Current**

$I_F = f(T_A)$



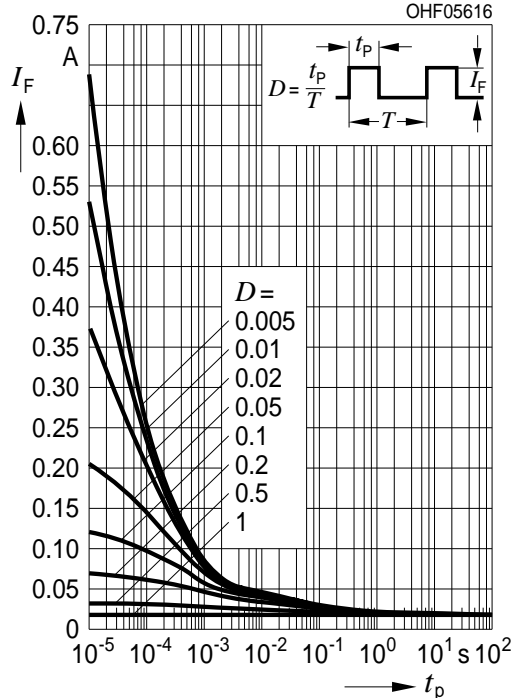
**Permissible Pulse Handling Capability**

$I_F = f(t_p)$ ,  $T_A = 25 \text{ °C}$ , duty cycle  $D = \text{parameter}$



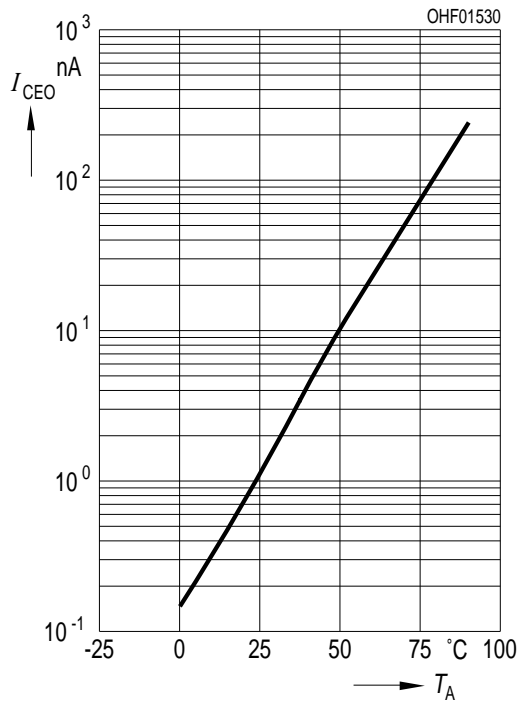
**Permissible Pulse Handling Capability**

$I_F = f(t_p)$ ,  $T_A = 85 \text{ °C}$ , duty cycle  $D = \text{parameter}$



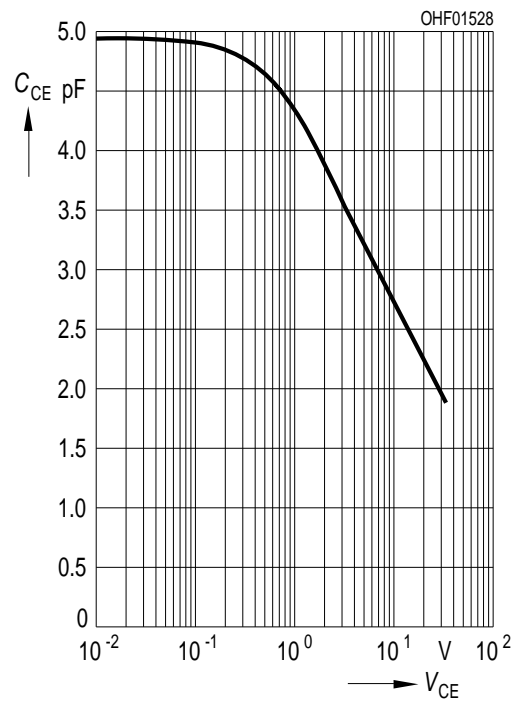
**Dark Current** <sup>3) page 14</sup>

$I_{CEO} = f(T_A), V_{CE} = 20\text{ V}, E = 0$



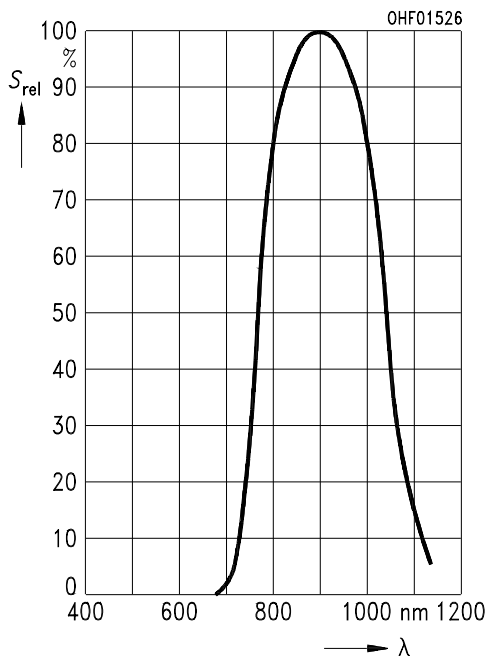
**Collector-Emitter Capacitance** <sup>3) page 14</sup>

$C_{CE} = f(V_{CE}), f = 1\text{ MHz}, E = 0, T_A = 25^\circ\text{C}$



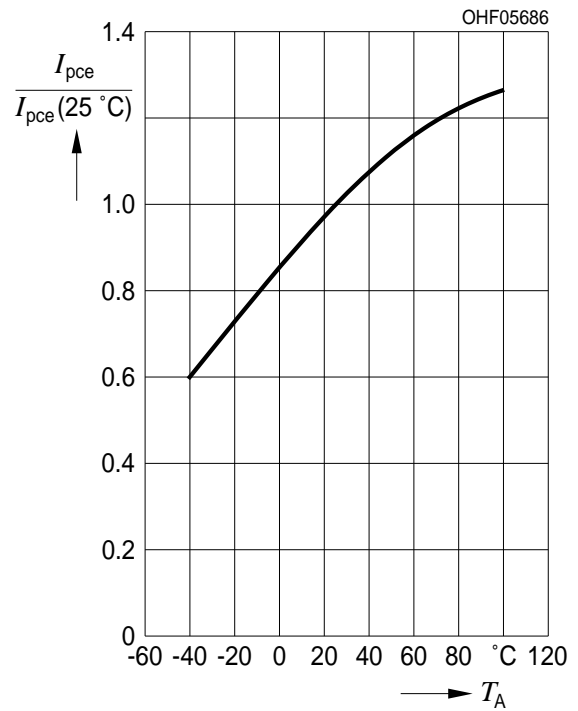
**Relative Spectral Sensitivity** <sup>3) page 14</sup>

$S_{rel} = f(\lambda), T_A = 25^\circ\text{C}$

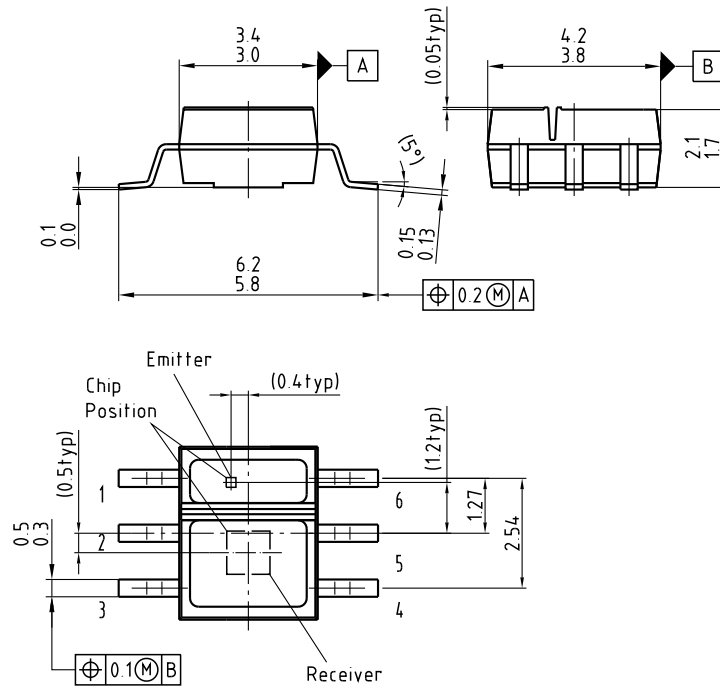


**Photocurrent** <sup>3) page 14</sup>

$I_{PCE} / I_{PCE}(25^\circ\text{C}) = f(T_A), V_{CE} = 5\text{ V}, I_f = 10\text{ mA}$



## Package Outline



C63062-A3059-A11 -01

Dimensions in mm.

## Pinning

| Pin | Description |
|-----|-------------|
| 1   | Anode       |
| 2   | -           |
| 3   | Emitter     |
| 4   | Collector   |
| 5   | -           |
| 6   | Cathode     |

## Package

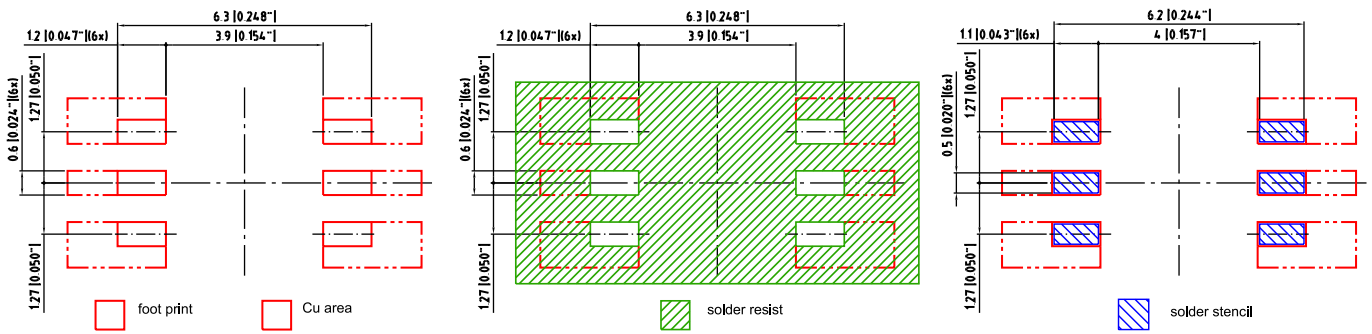
Reflective Interrupter

## Approximate Weight:

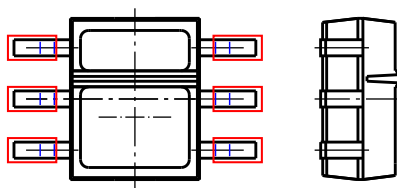
40.0 mg



**Recommended Solder Pad**



Component Location on Pad

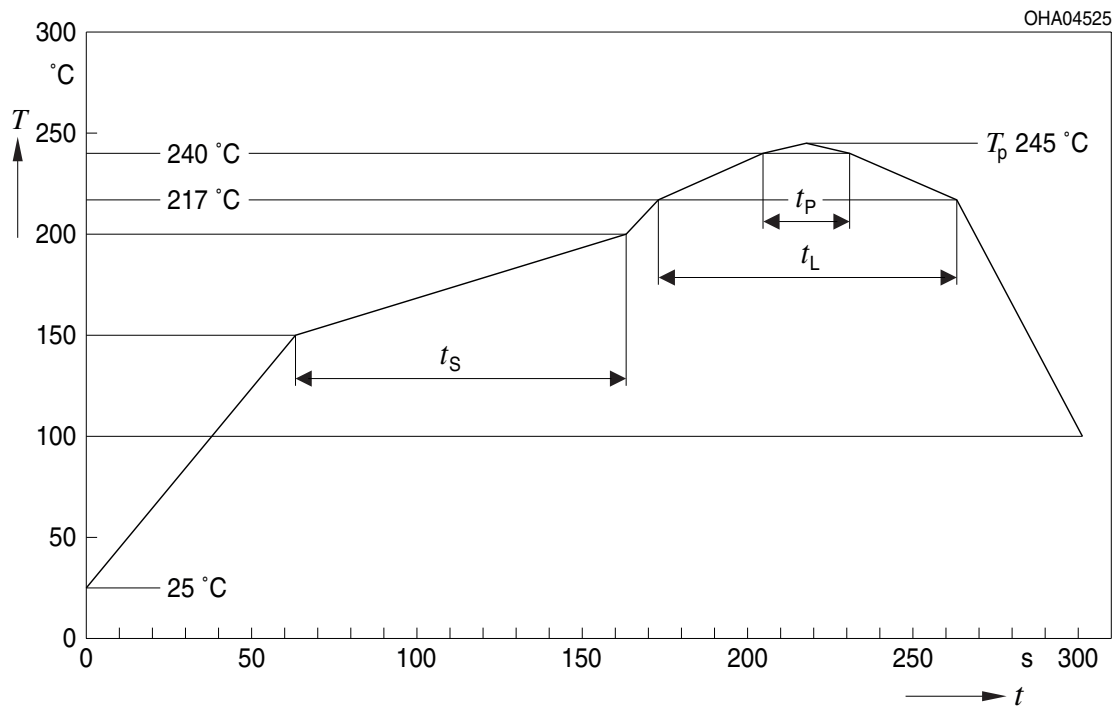


E062.3010.158 -01

*Dimensions in mm (inch).*

**Reflow Soldering Profile**

Product complies to MSL Level 4 acc. to JEDEC J-STD-020D.01



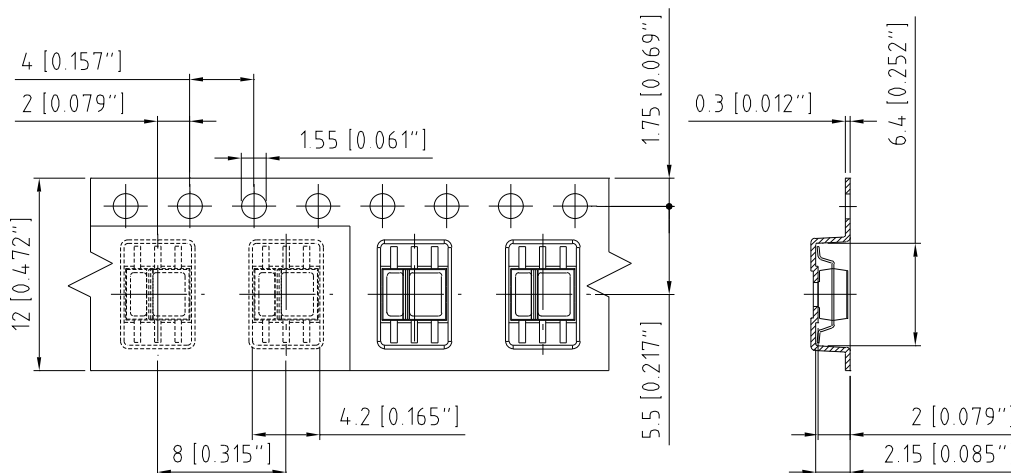
OHA04612

| 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

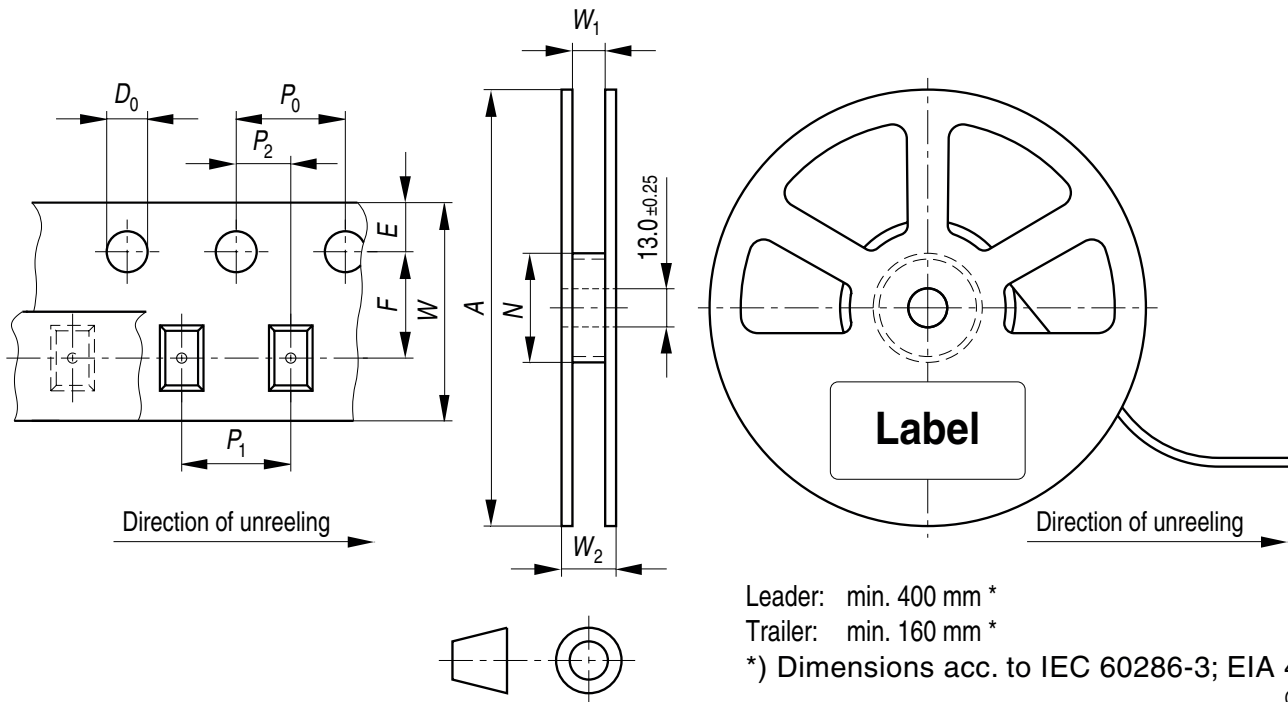


C63062-A3059-B10-03

*Dimensions in mm (inch).*

**Tape and Reel**

12 mm tape with 1000 pcs. on  $\varnothing$  180 mm reel



Leader: min. 400 mm \*

Trailer: min. 160 mm \*

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

OHAY0324

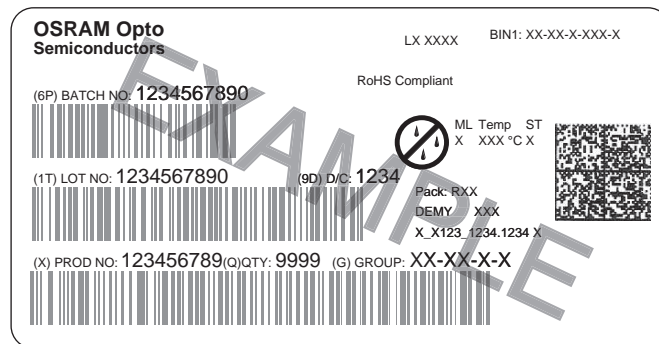
**Tape dimensions [mm]**

| W                | P <sub>0</sub> | P <sub>1</sub>           | P <sub>2</sub> | D <sub>0</sub> | E          | F          |
|------------------|----------------|--------------------------|----------------|----------------|------------|------------|
| 12 + 0.3 / - 0.1 | 4 ± 0.1        | 4 ± 0.1<br>or<br>8 ± 0.1 | 2 ± 0.05       | 1.5 ± 0.1      | 1.75 ± 0.1 | 5.5 ± 0.05 |

**Reel dimensions [mm]**

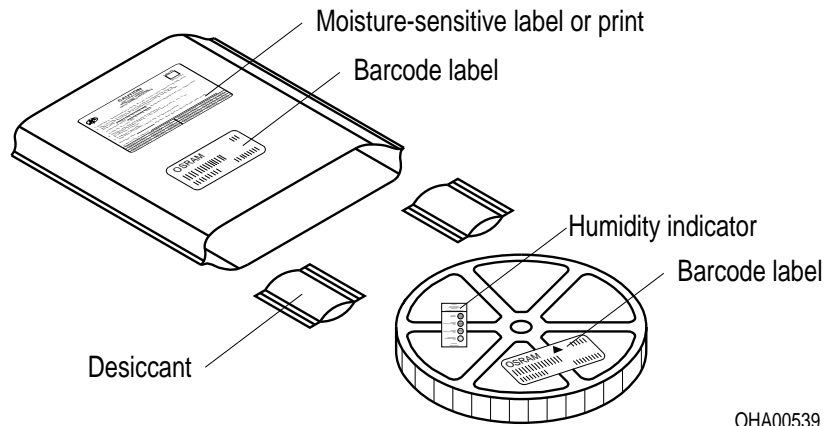
| A   | W  | N <sub>min</sub> | W <sub>1</sub> | W <sub>2max</sub> |
|-----|----|------------------|----------------|-------------------|
| 180 | 12 | 60               | 12.4 + 2       | 18.4              |

**Barcode-Product-Label (BPL)**



OHA04563

**Dry Packing Process and Materials**

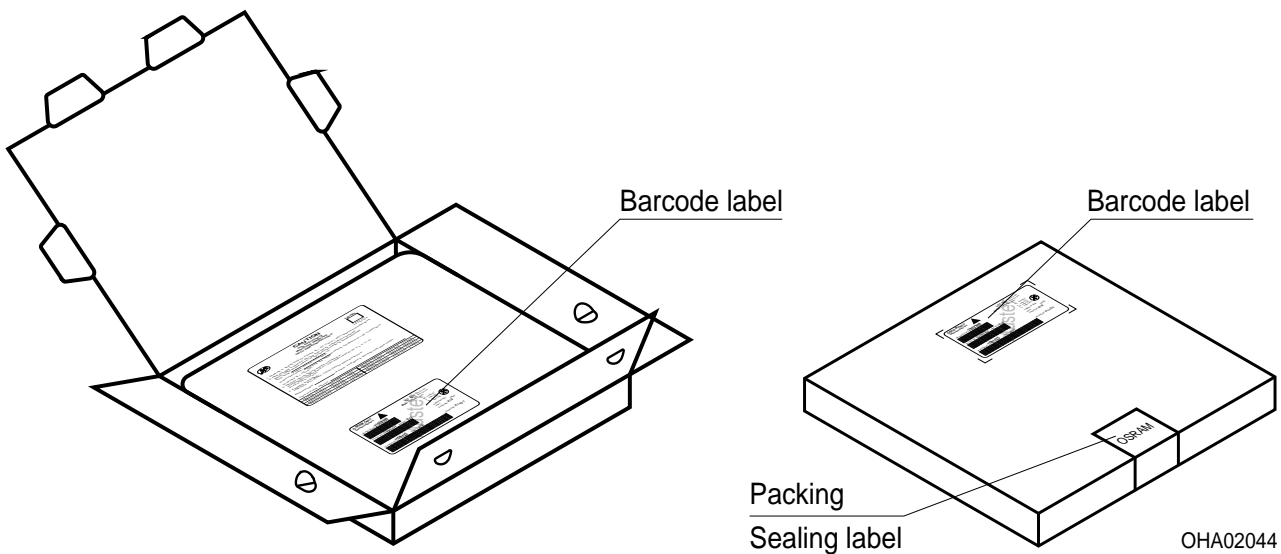


OHA00539

**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 |
|---------|---------|--------|
| 195 ± 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.

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**

- 1) **Thermal resistance:** Mounting on PC-board with  $> 5 \text{ mm}^2$  pad size
- 2)  $I_C$  as a function of the forward current of the emitting diode, the degree of reflection and the distance between reflector and component (d)
- 3) **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**  
**www.osram-os.com © All Rights Reserved.**

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。