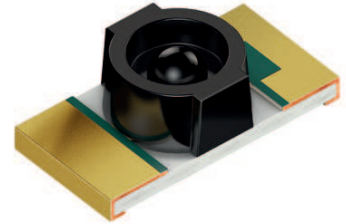


# High Power Infrared Emitter (940 nm) Version 1.3

## SFH 4046



### Features:

- Very small package: (LxWxH) 3.2 mm x 1.6 mm x 1 mm
- High optical total power

### Applications

- Industrial applications
- Miniature photointerrupters
- Mobile devices
- Proximity sensor
- For control and drive circuits

### Notes

Depending on the mode of operation, these devices emit highly concentrated non visible infrared light which can be hazardous to the human eye. Products which incorporate these devices have to follow the safety precautions given in IEC 60825-1 and IEC 62471.

### Ordering Information

| Type:    | Irradiance<br>$E_e$ [mW/cm <sup>2</sup> ]<br>$I_F=70$ mA, $t_p=20$ ms | Radiant intensity<br>$I_{e, typ}$ [mW/sr]<br>$I_F=70$ mA, $t_p=20$ ms | Ordering Code |
|----------|---|---|---------------|
| SFH 4046 | 5 ( $\geq 2.5$ )  | 30  | Q65111A0541   |

Note:  $I_e$  measured with a detector (11.3 mm diameter) in 100 mm distance ( $\Omega = 0.01$  sr) to the device surface

$E_e$  measured in the near field with a detector (7.2 mm diameter) in 20 mm distance ( $\Omega = 0.1$  sr) to the device surface

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

| Parameter  | Symbol            | Values     | Unit  |
|--|-------------------|------------|-------|
| Operation and storage temperature range                                | $T_{op}; T_{stg}$ | -40 ... 85 | °C    |
| Reverse voltage  | $V_R$             | 5          | V     |
| Forward current  | $I_F$             | 70         | mA    |
| Surge current<br>( $t_p \leq 300\ \mu\text{s}$ , $D = 0$ )             | $I_{FSM}$         | 0.7        | A     |
| Power consumption  | $P_{tot}$         | 140        | mW    |
| ESD withstand voltage<br>(acc. to ANSI/ ESDA/ JEDEC JS-001 - HBM)      | $V_{ESD}$         | 2          | kV    |
| Thermal resistance junction - ambient <sup>1) page 13</sup>            | $R_{thJA}$        | 540        | K / W |
| Thermal resistance junction - soldering point<br><sup>2) page 13</sup> | $R_{thJS}$        | 360        | K / W |

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

| Parameter  | Symbol               | Values                             | Unit          |
|--|----------------------|------------------------------------|---------------|
| Peak wavelength<br>( $I_F = 70\text{ mA}$ , $t_p = 20\text{ ms}$ )   | $\lambda_{peak}$     | 950                                | nm            |
| Centroid wavelength<br>( $I_F = 70\text{ mA}$ , $t_p = 20\text{ ms}$ )                                       | $\lambda_{centroid}$ | 940                                | nm            |
| Spectral bandwidth at 50% of $I_{max}$<br>( $I_F = 70\text{ mA}$ , $t_p = 10\text{ ms}$ )                    | $\Delta\lambda$      | 42                                 | nm            |
| Half angle   | $\varphi$            | $\pm 22$                           | °             |
| Dimensions of active chip area   | L x W                | 0.2 x 0.2                          | mm x mm       |
| Rise and fall time of $I_e$ ( 10% and 90% of $I_{e\ max}$ )<br>( $I_F = 70\text{ mA}$ , $R_L = 50\ \Omega$ ) | $t_r, t_f$           | 12                                 | ns            |
| Forward voltage<br>( $I_F = 70\text{ mA}$ , $t_p = 20\text{ ms}$ )   | $V_F$                | 1.6 ( $\leq 2$ )                   | V             |
| Forward voltage<br>( $I_F = 500\text{ mA}$ , $t_p = 100\ \mu\text{s}$ )                                      | $V_F$                | 2.4                                | V             |
| Reverse current<br>( $V_R = 5\text{ V}$ )  | $I_R$                | not designed for reverse operation | $\mu\text{A}$ |
| Total radiant flux<br>( $I_F = 70\text{ mA}$ , $t_p = 20\text{ ms}$ )  | $\Phi_e$             | 40                                 | mW            |
| Radiant intensity<br>( $I_F = 70\text{ mA}$ , $t_p = 20\text{ ms}$ )   | $I_{e, typ}$         | 30                                 | mW/sr         |

| Parameter   |       | Symbol       | Values | Unit   |
|---|-------|--------------|--------|--------|
| Temperature coefficient of $I_e$ or $\Phi_e$<br>( $I_F = 70$ mA, $t_p = 10$ ms) | (typ) | $TC_I$       | -0.5   | % / K  |
| Temperature coefficient of $V_F$<br>( $I_F = 70$ mA, $t_p = 10$ ms)             | (typ) | $TC_V$       | -1.3   | mV / K |
| Temperature coefficient of wavelength<br>( $I_F = 70$ mA, $t_p = 10$ ms)        | (typ) | $TC_\lambda$ | 0.3    | nm / K |

### Grouping ( $T_A = 25$ °C)

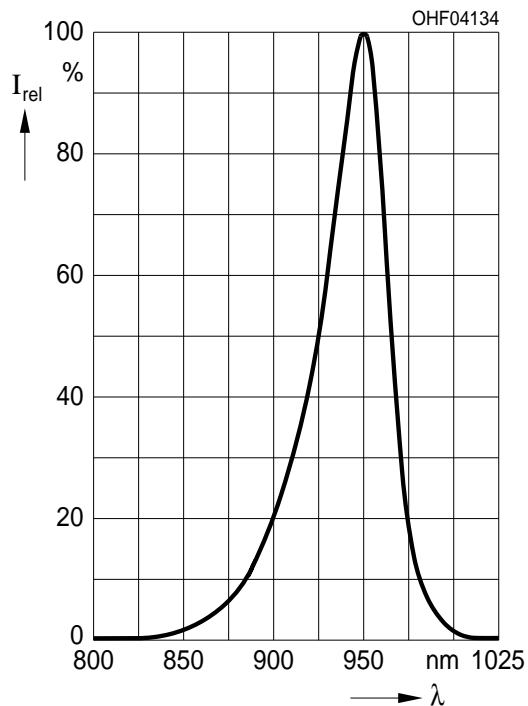
| Parameter   | Min Irradiance  | Max Irradiance  |
|-------------|---|---|
|             | $I_F = 70$ mA, $t_p = 20$ ms<br>$E_{e, \min}$ [mW/cm <sup>2</sup> ] | $I_F = 70$ mA, $t_p = 20$ ms<br>$E_{e, \max}$ [mW/cm <sup>2</sup> ] |
| SFH 4046 -N | 2.5   | 5   |
| SFH 4046 -P | 4   | 8   |
| SFH 4046 -Q | 6.3   | 12.5  |

Note:  $E_e$  measured in the near field with a detector (7.2 mm diameter) in 20 mm distance ( $\Omega = 0.1$  sr) to the device surface

Only one group in one packing unit (variation lower 2:1).

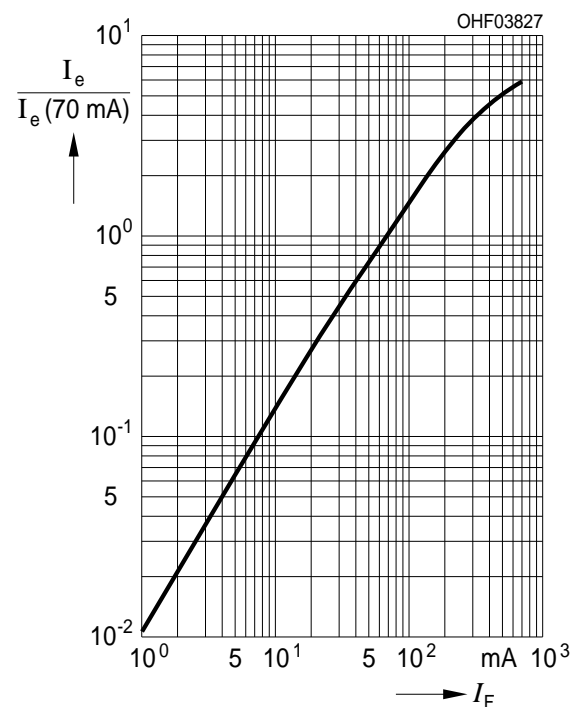
### Relative Spectral Emission <sup>3) page 13</sup>

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



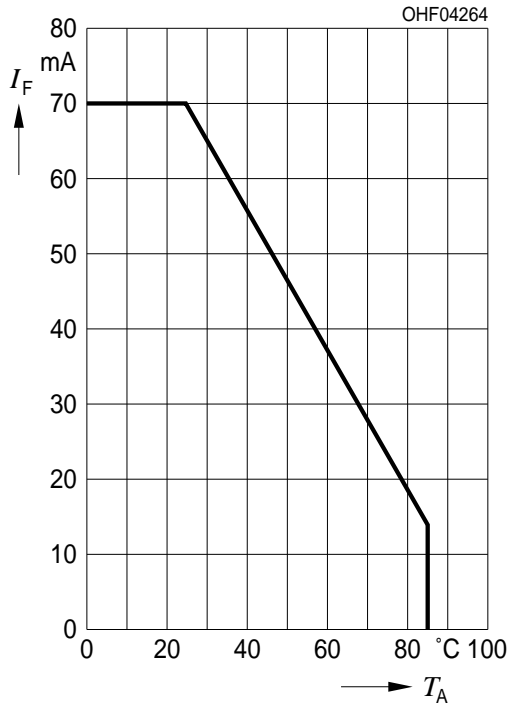
### Irradiance <sup>3) page 13</sup>

$E_e/E_e(70\text{mA}) = f(I_F)$ , Single pulse,  $t_p = 25$   $\mu$ s,  $T_A = 25$  °C



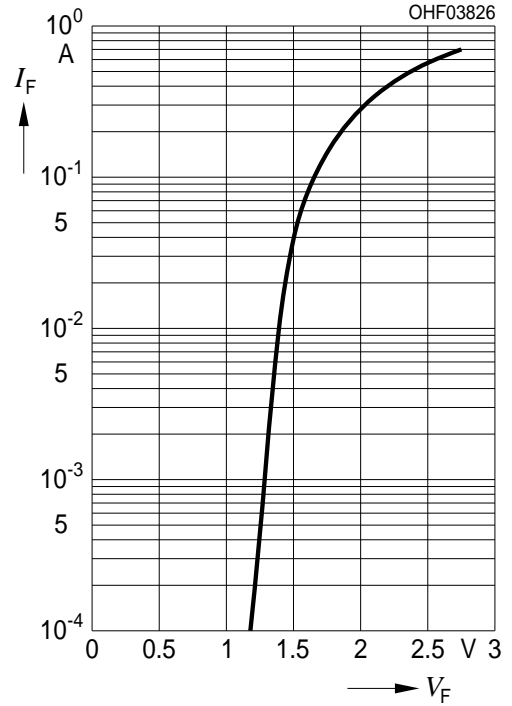
**Max. Permissible Forward Current**

$I_{F, max} = f(T_A), R_{thJA} = 540 \text{ K/W}$



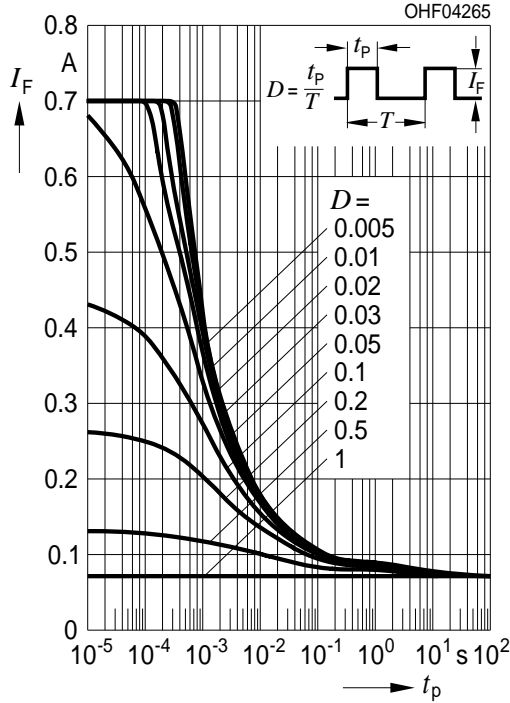
**Forward Current** <sup>3) page 13</sup>

$I_F = f(V_F), \text{ single pulse, } t_p = 100 \mu\text{s}, T_A = 25^\circ\text{C}$



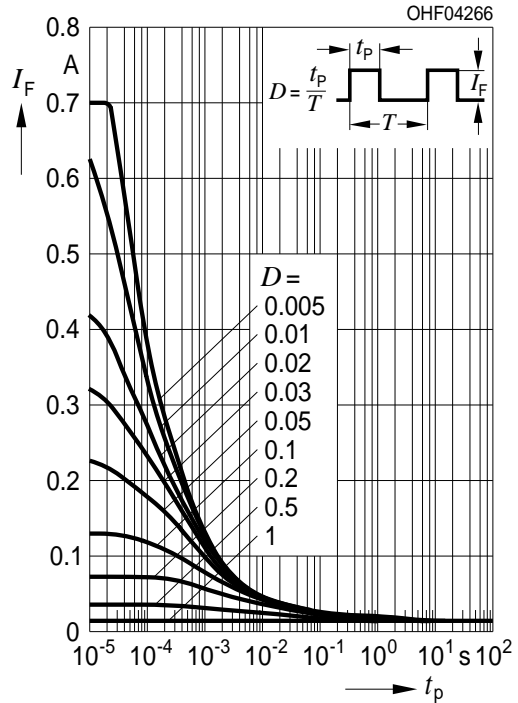
**Permissible Pulse Handling Capability**

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



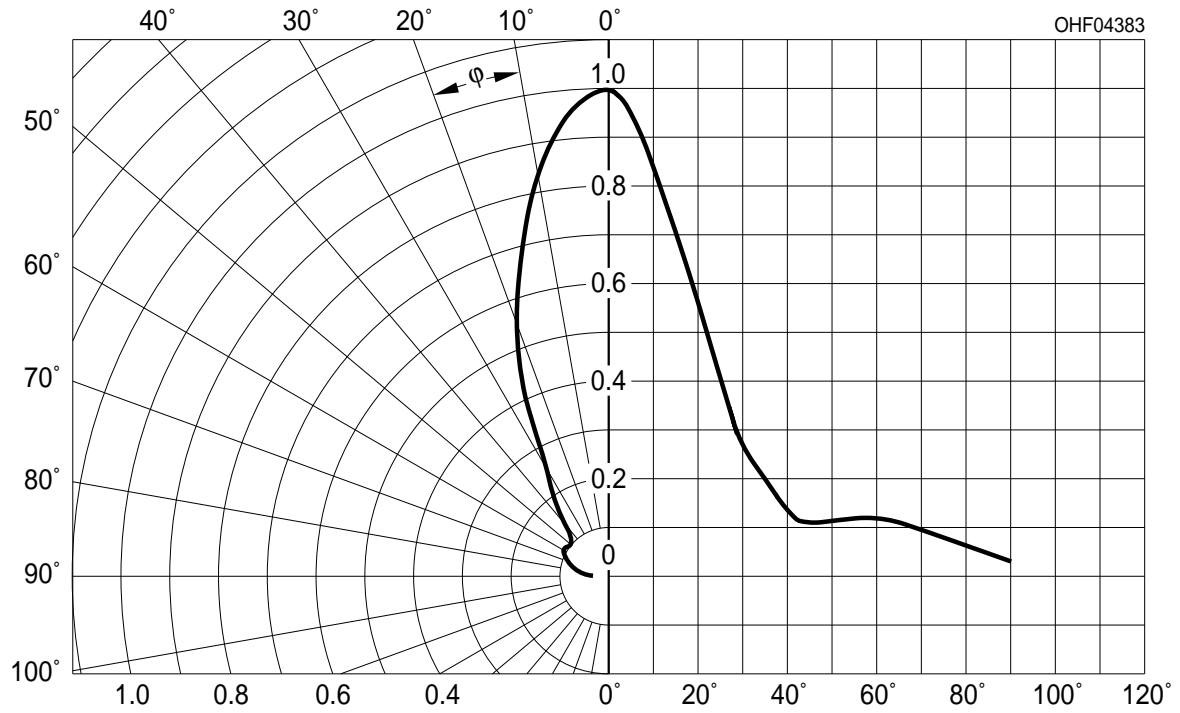
**Permissible Pulse Handling Capability**

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

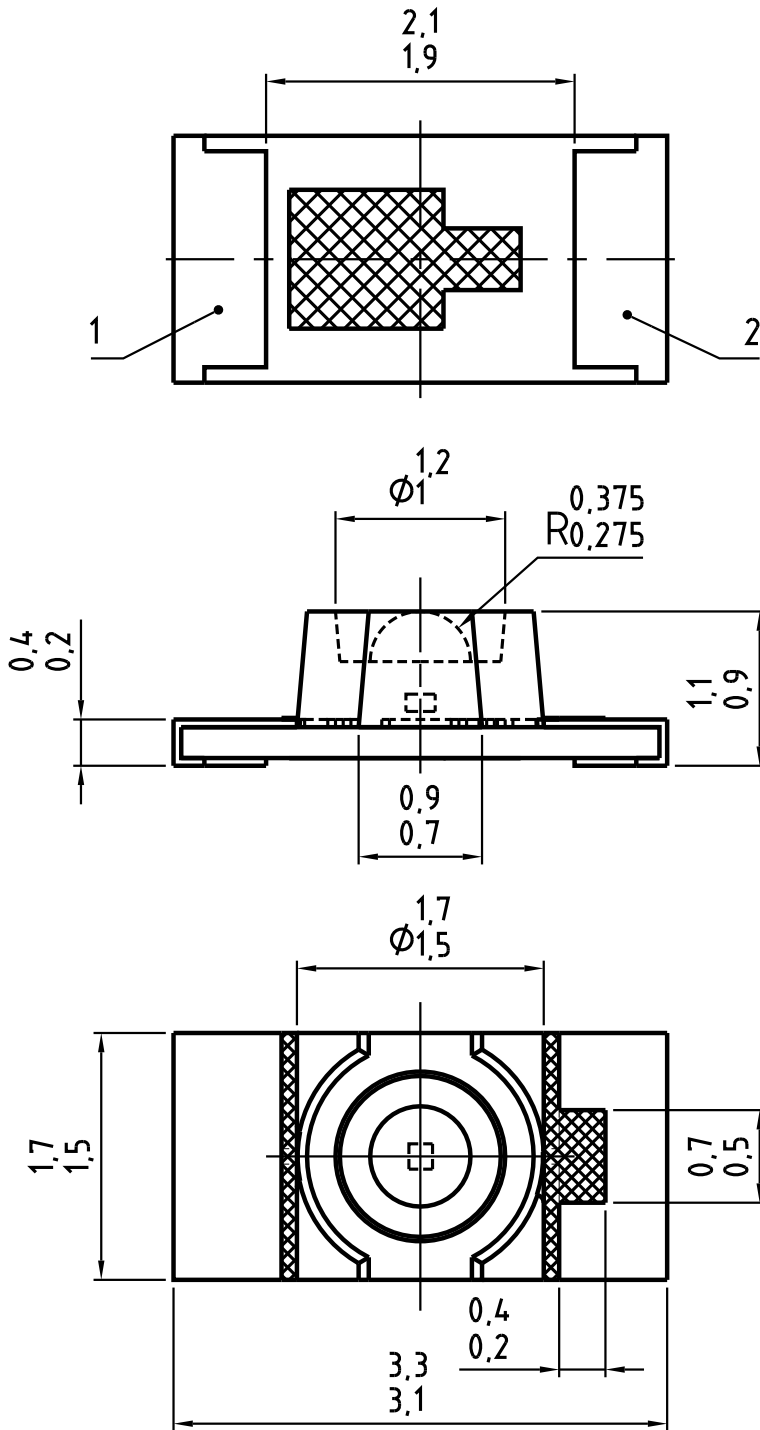


**Radiation Characteristics** <sup>3) page 13</sup>

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



Package Outline



C63062-A4085-A1D...-04

Dimensions in mm.

| Pad | Description |
|-----|-------------|
| 1   | Cathode     |
| 2   | Anode       |

**Package**

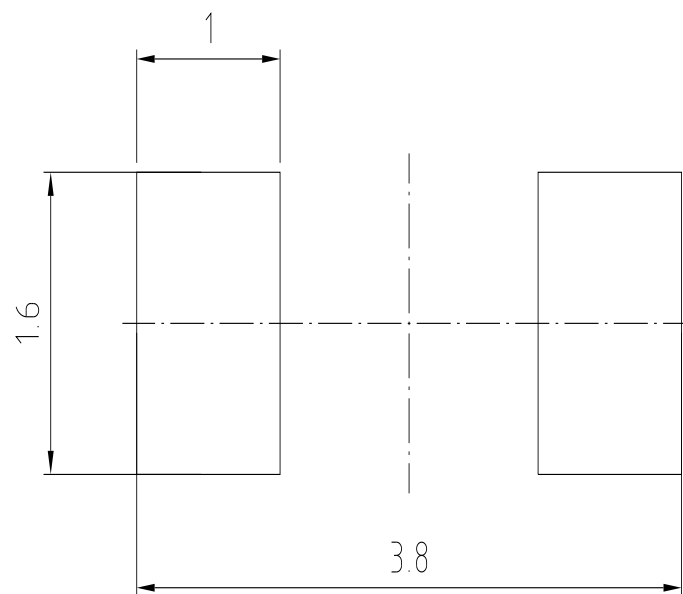
Chiplid

**Approximate Weight:**

5.3 mg

**Note:**

Colour: black

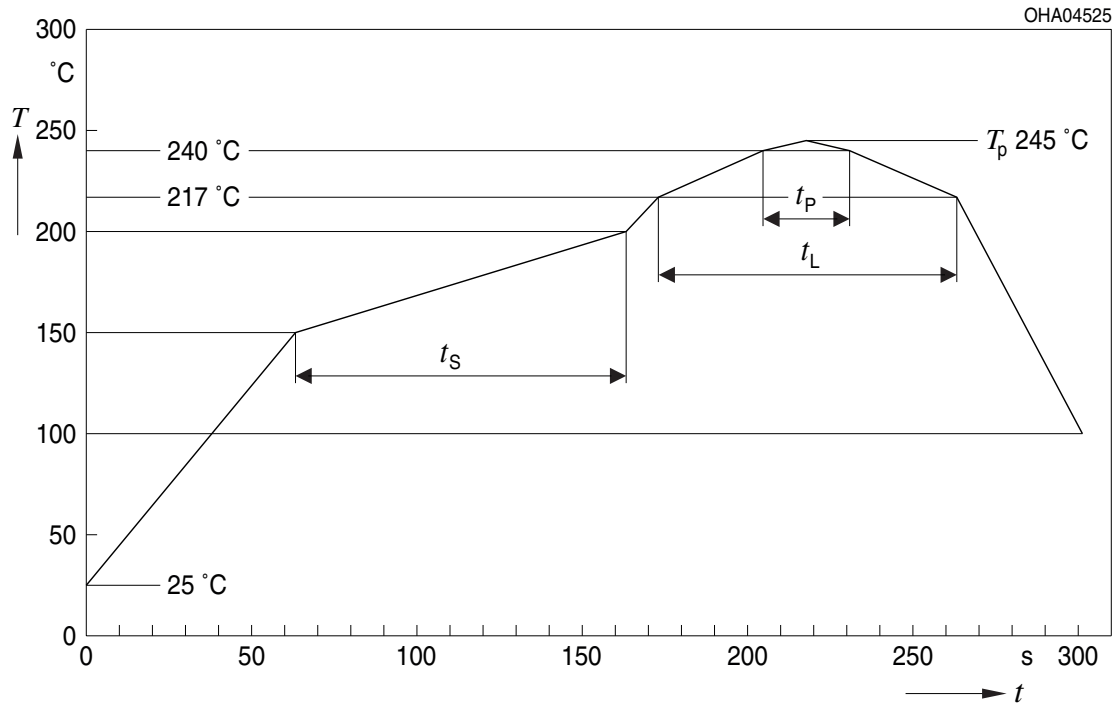
**Recommended Solder Pad**

E062.3010.78-02

Dimensions in mm.

### Reflow Soldering Profile

Product complies to MSL Level 3 acc. to JEDEC J-STD-020D.01



OHA04612

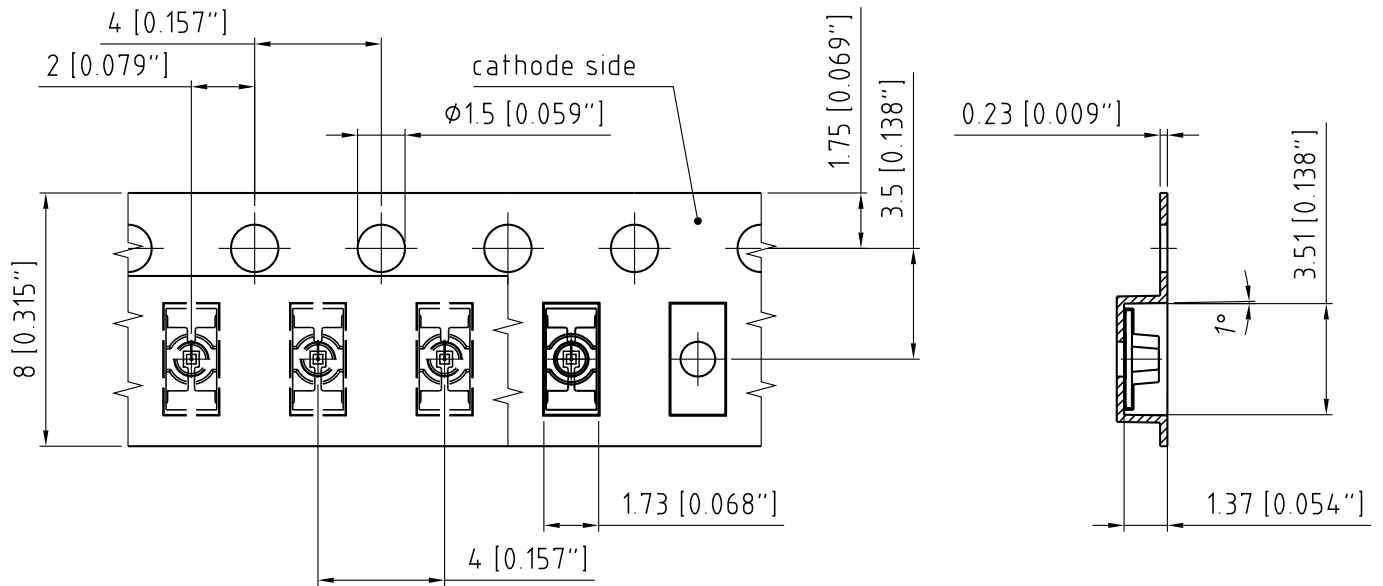
| Profile Feature<br>Profil-Charakteristik                          | Symbol<br>Symbol | Pb-Free (SnAgCu) Assembly |                |         | Unit<br>Einheit |
|---|------------------|---------------------------|----------------|---------|-----------------|
|   |                  | Minimum        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

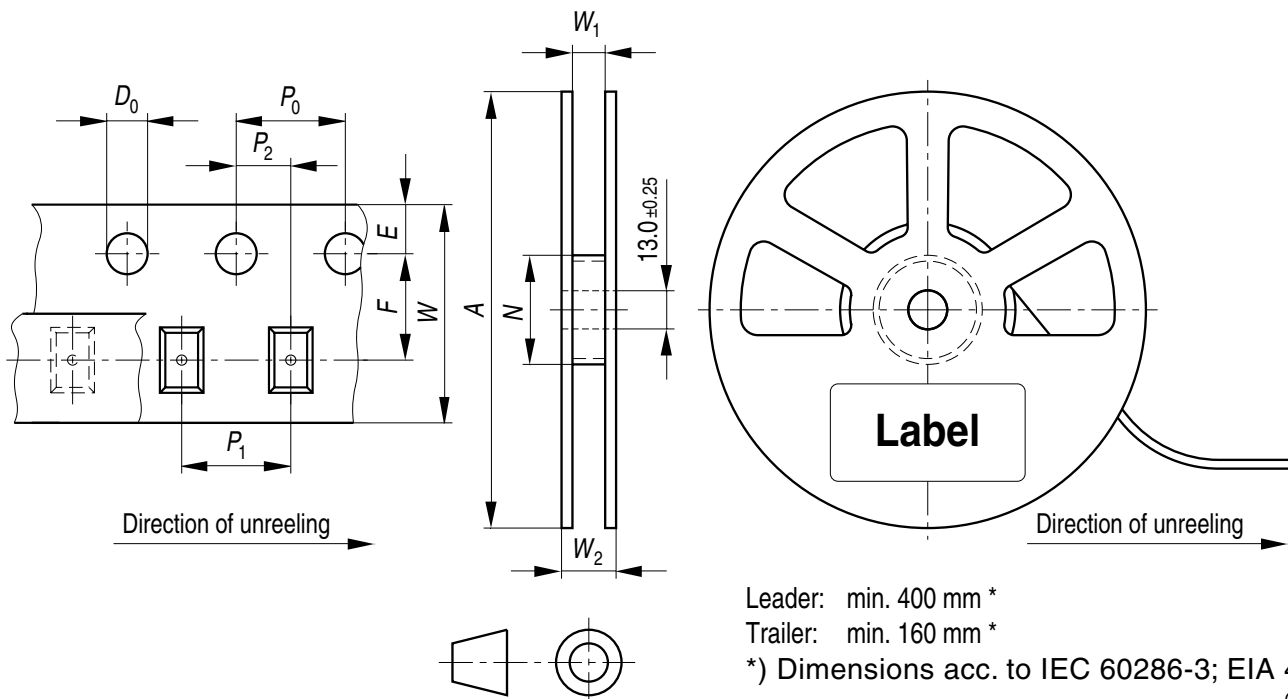


C63062-A4065-B1-03

*Dimensions in mm [inch].*

**Tape and Reel**

8 mm tape with 2000 pcs. on  $\phi$  180 mm reel



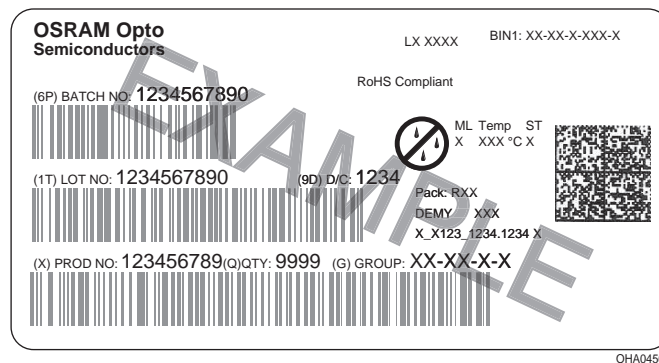
## Tape dimensions [mm]

| 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 |

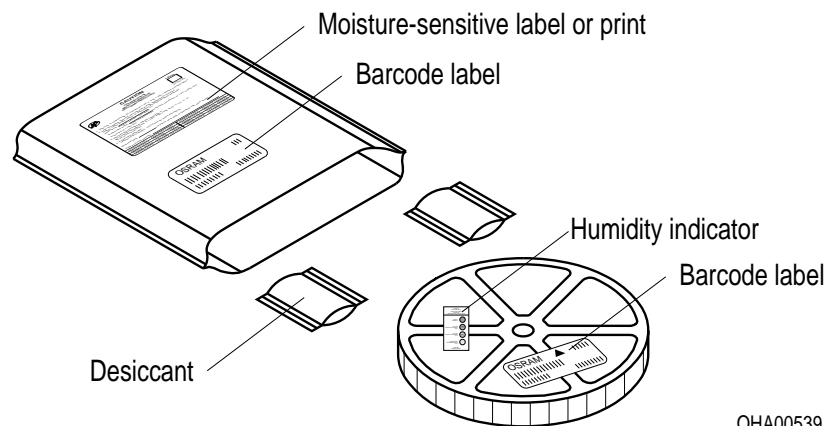
## Reel dimensions [mm]

| 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)



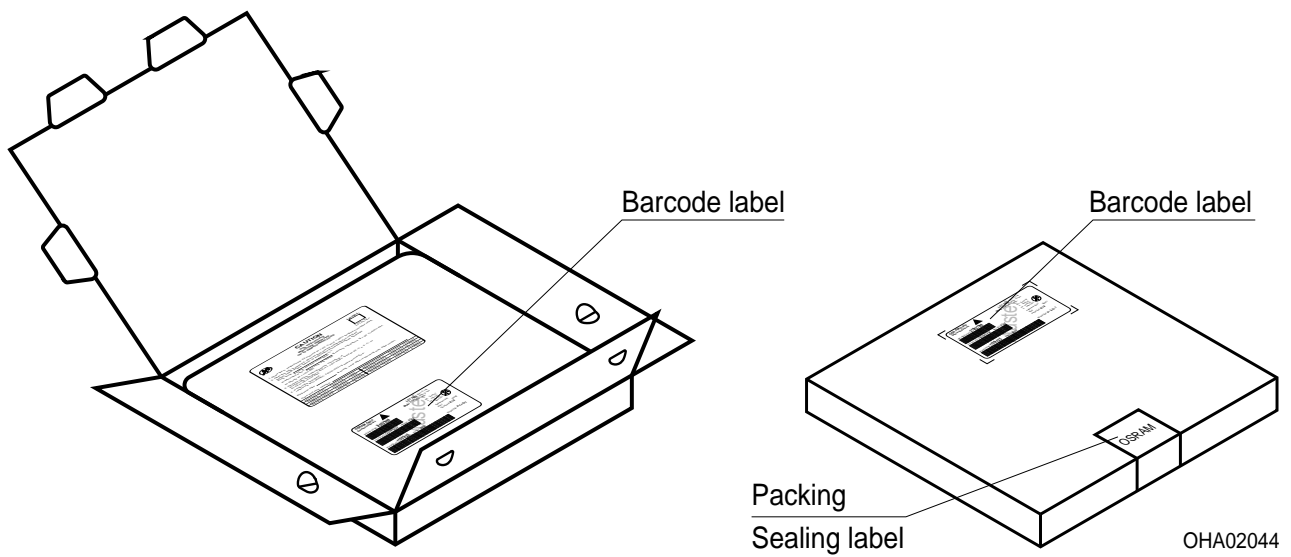
## Dry Packing Process and Materials



## 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



## 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.

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:** junction -ambient, mounted on PC-board (FR4), pads size 5 mm<sup>2</sup> each
- 2) **Thermal resistance:** junction - soldering point, of the device only, mounted on an ideal heatsink (e.g. metal block)
- 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.

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