

**IR-Lumineszenzdiode (850 nm) mit hoher Ausgangsleistung**  
**High Power Infrared Emitter (850 nm)**  
**Lead (Pb) Free Product - RoHS Compliant**

**SFH 4059**



**Wesentliche Merkmale**

- Sehr kleines Gehäuse:  
(LxBxH) 3.2 mm x 1.6mm x 1.85 mm
- Sehr hohe Gesamtleistung

**Anwendungen**

- Miniaturlichtschranken
- Industrieelektronik
- Mobile Geräte
- „Messen/Steuern/Regeln“

**Sicherheitshinweise**

Je nach Betriebsart emittieren diese Bauteile hochkonzentrierte, nicht sichtbare Infrarot-Strahlung, die gefährlich für das menschliche Auge sein kann. Produkte, die diese Bauteile enthalten, müssen gemäß den Sicherheitsrichtlinien der IEC-Normen 60825-1 und 62471 behandelt werden.

**Features**

- Very small package:  
(LxWxH) 3.2 mm x 1.6 mm x 1.85 mm
- High optical total power

**Applications**

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

**Safety Advices**

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.

| <b>Typ</b><br><b>Type</b> | <b>Bestellnummer</b><br><b>Ordering Code</b> | <b>Strahlstärkegruppierung<sup>1)</sup></b> ( $I_F = 70 \text{ mA}$ , $t_p = 20 \text{ ms}$ )<br><b>Radiant Intensity Grouping<sup>1)</sup></b><br>$I_e \text{ (mW/sr)}$ |
|---------------------------|--|--|
| SFH 4059                  | Q65111A0020                                  | $\geq 40$ (typ. 100)   |

<sup>1)</sup> gemessen bei einem Raumwinkel  $\Omega = 0.01 \text{ sr}$  / measured at a solid angle of  $\Omega = 0.01 \text{ sr}$

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

| Bezeichnung<br>Parameter  | Symbol<br>Symbol  | Wert<br>Value | Einheit<br>Unit |
|---|-------------------|---------------|-----------------|
| Betriebs- und Lagertemperatur<br>Operating and storage temperature range  | $T_{op}, T_{stg}$ | - 40 ... + 85 | °C              |
| Sperrspannung<br>Reverse voltage  | $V_R$             | 5             | V               |
| Vorwärtsgleichstrom<br>Forward current  | $I_F$             | 70            | mA              |
| Stoßstrom, $t_p = 10\ \mu\text{s}$ , $D = 0$<br>Surge current   | $I_{FSM}$         | 700           | mA              |
| Verlustleistung<br>Power dissipation  | $P_{tot}$         | 140           | mW              |
| Wärmewiderstand Sperrschicht - Umgebung bei<br>Montage auf FR4 Platine, Padgröße je $5\ \text{mm}^2$<br>Thermal resistance junction - ambient mounted<br>on PC-board (FR4), pads size $5\ \text{mm}^2$ each | $R_{thJA}$        | 540           | K/W             |
| Wärmewiderstand Sperrschicht - Lötstelle bei<br>Montage auf Metallkernplatine<br>Thermal resistance junction - soldering point,<br>mounted on metal core board  | $R_{thJS}$        | 360           | K/W             |

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

| Bezeichnung<br>Parameter  | Symbol<br>Symbol     | Wert<br>Value | Einheit<br>Unit |
|---|----------------------|---------------|-----------------|
| Wellenlänge der Strahlung<br>Wavelength at peak emission<br>$I_F = 70\ \text{mA}$ , $t_p = 10\ \text{ms}$                             | $\lambda_{peak}$     | 860           | nm              |
| Schwerpunkts-Wellenlänge der Strahlung<br>Centroid Wavelength<br>$I_F = 70\ \text{mA}$ , $t_p = 10\ \text{ms}$                        | $\lambda_{centroid}$ | 850           | nm              |
| Spektrale Bandbreite bei 50% von $I_{max}$<br>Spectral bandwidth at 50% of $I_{max}$<br>$I_F = 70\ \text{mA}$ , $t_p = 10\ \text{ms}$ | $\Delta\lambda$      | 42            | nm              |
| Abstrahlwinkel<br>Half angle  | $\varphi$            | $\pm 10$      | Grad<br>deg.    |
| Aktive Chipfläche<br>Active chip area   | $A$                  | 0.04          | $\text{mm}^2$   |

Kennwerte ( $T_A = 25\text{ °C}$ )

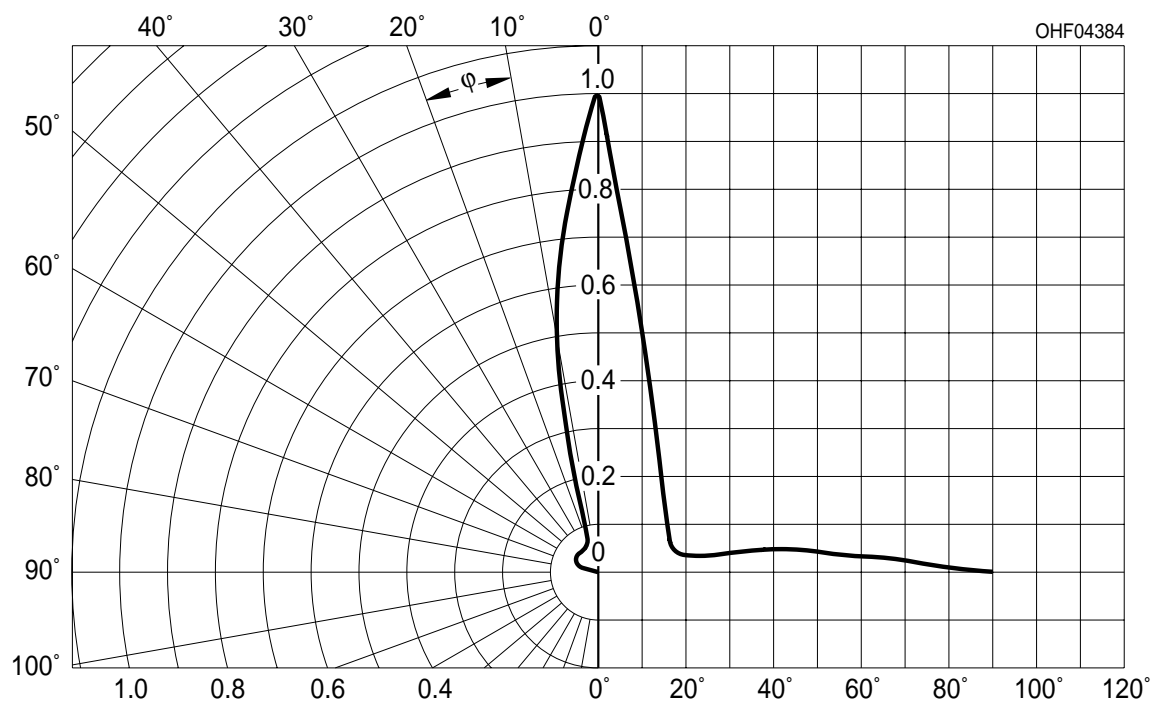
Characteristics (cont'd)

| Bezeichnung<br>Parameter  | Symbol<br>Symbol             | Wert<br>Value                            | Einheit<br>Unit |
|---|------------------------------|--|-----------------|
| Abmessungen der aktiven Chipfläche<br>Dimension of the active chip area   | $L \times B$<br>$L \times W$ | $0.2 \times 0.2$                         | mm <sup>2</sup> |
| Schaltzeiten, $I_e$ von 10% auf 90% und von 90%<br>auf 10%, bei $I_F = 70\text{ mA}$ , $R_L = 50\ \Omega$<br>Switching times, $I_e$ from 10% to 90% and from<br>90% to 10%, $I_F = 70\text{ mA}$ , $R_L = 50\ \Omega$ | $t_r$ , $t_f$                | 12                                       | ns              |
| Durchlassspannung<br>Forward voltage<br>$I_F = 70\text{ mA}$ , $t_p = 20\text{ ms}$   | $V_F$                        | 1.6 (< 2.0)                              | V               |
| Sperrstrom<br>Reverse current   | $I_R$                        | not designed for<br>reverse<br>operation | $\mu\text{A}$   |
| Gesamtstrahlungsfluss<br>Total radiant flux<br>$I_F = 70\text{ mA}$ , $t_p = 20\text{ ms}$  | $\Phi_{e\text{ typ}}$        | 40                                       | mW              |
| Temperaturkoeffizient von $I_e$ bzw. $\Phi_e$ ,<br>$I_F = 70\text{ mA}$<br>Temperature coefficient of $I_e$ or $\Phi_e$ ,<br>$I_F = 70\text{ mA}$   | $TC_I$                       | - 0.5                                    | %/K             |
| Temperaturkoeffizient von $V_F$ , $I_F = 70\text{ mA}$<br>Temperature coefficient of $V_F$ , $I_F = 70\text{ mA}$   | $TC_V$                       | - 0.7                                    | mV/K            |
| Temperaturkoeffizient von $\lambda$ , $I_F = 70\text{ mA}$<br>Temperature coefficient of $\lambda$ , $I_F = 70\text{ mA}$   | $TC_\lambda$                 | + 0.3                                    | nm/K            |

**Strahlstärke  $I_e$  in Achsrichtung<sup>1)</sup>**gemessen bei einem Raumwinkel  $\Omega = 0.01$  sr**Radiant Intensity  $I_e$  in Axial Direction**at a solid angle of  $\Omega = 0.01$  sr

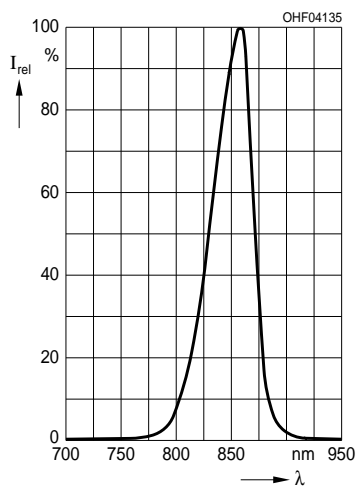
| Bezeichnung<br>Parameter  | Symbol                                     | Werte<br>Values |                |                 | Einheit<br>Unit |
|---|--|-----------------|----------------|-----------------|-----------------|
|   |  | SFH 4059<br>-U  | SFH 4059<br>-V | SFH 4059<br>-AW |                 |
| Strahlstärke<br>Radiant intensity<br>$I_F = 70$ mA, $t_p = 20$ ms       | $I_{e \text{ min}}$<br>$I_{e \text{ max}}$ | 40<br>80        | 63<br>125      | 100<br>200      | mW/sr<br>mW/sr  |
| Strahlstärke<br>Radiant intensity<br>$I_F = 500$ mA, $t_p = 25$ $\mu$ s | $I_{e \text{ typ}}$                        | 350             | 550            | 900             | mW/sr           |

<sup>1)</sup> Nur eine Gruppe in einer Verpackungseinheit (Streuung kleiner 2:1) /  
Only one bin in one packing unit (variation lower 2:1)

**Abstrahlcharakteristik****Radiation Characteristics  $I_{\text{rel}} = f(\varphi)$** 

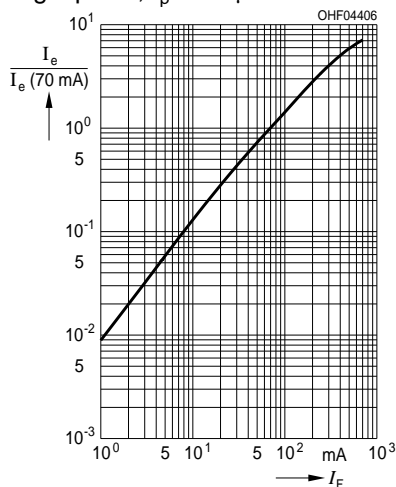
**Relative Spectral Emission**

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



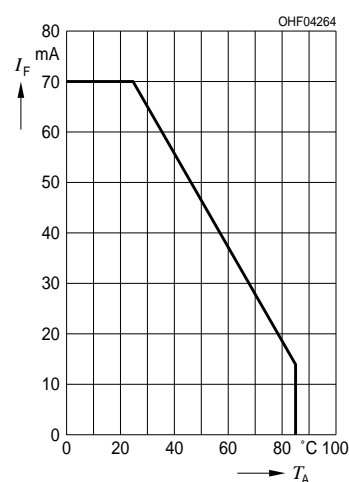
**Radiant Intensity**  $\frac{I_e}{I_e 70 \text{ mA}} = f(I_F)$

Single pulse,  $t_p = 25 \mu\text{s}$



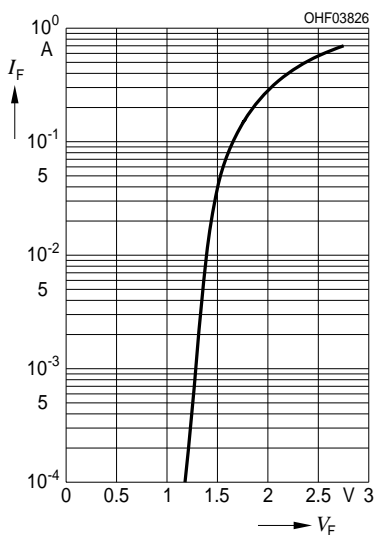
**Max. Permissible Forward Current**

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



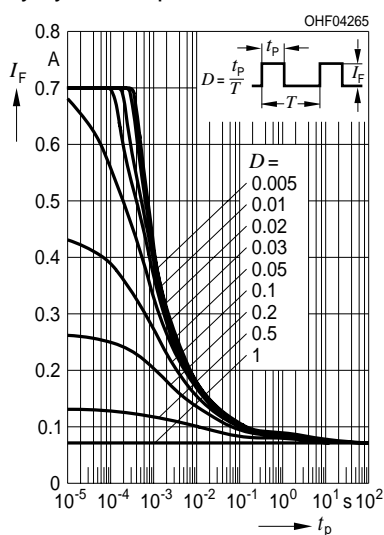
**Forward Current**  $I_F = f(V_F)$

Single pulse,  $t_p = 100 \mu\text{s}$



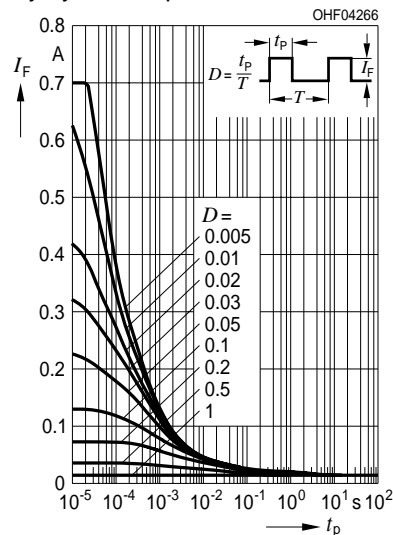
**Permissible Pulse Handling Capability**

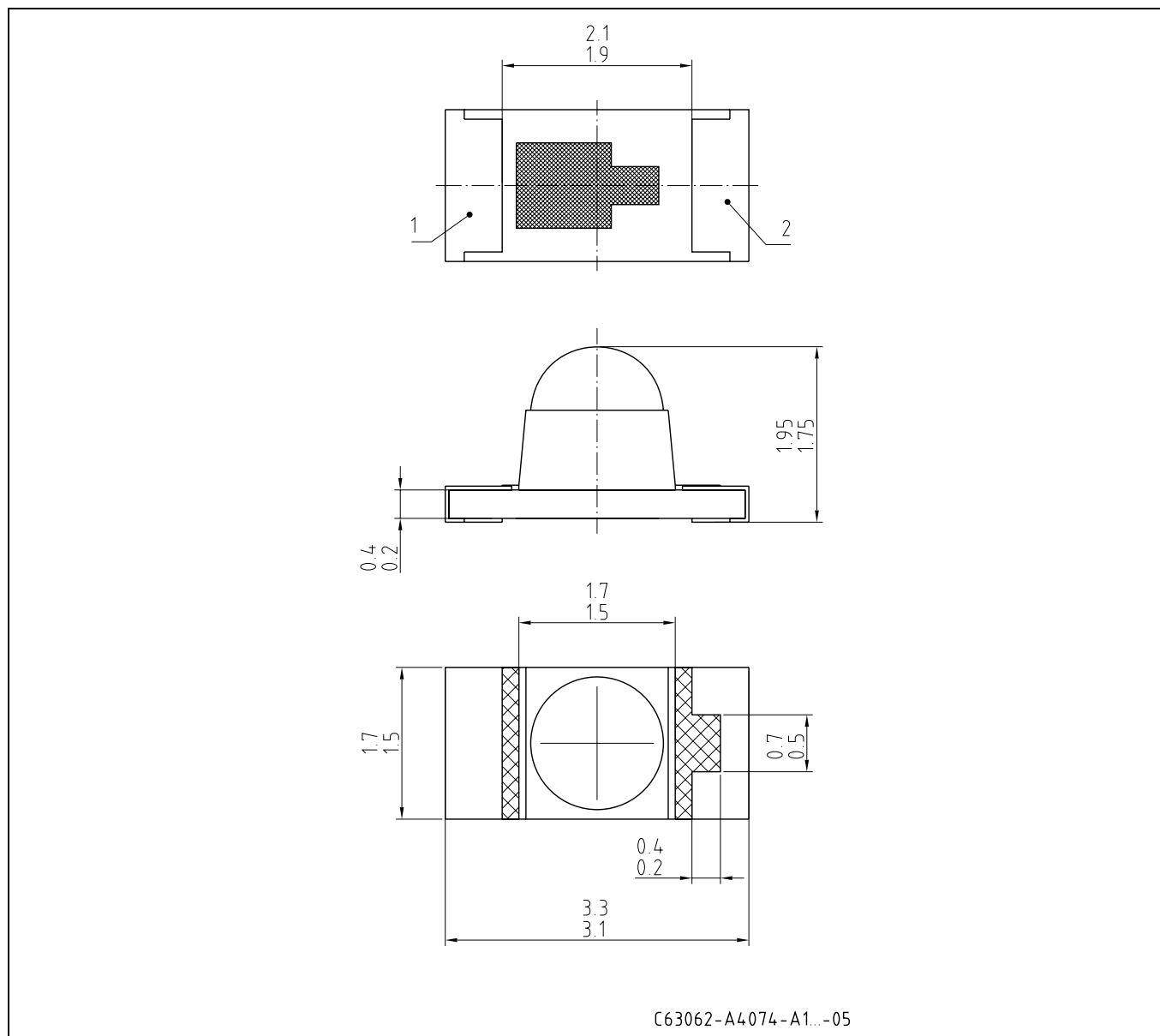
$I_F = f(\tau), T_A = 25 \text{ }^\circ\text{C}$ ,  
duty cycle  $D = \text{parameter}$



**Permissible Pulse Handling Capability**

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



**Maßzeichnung**  
**Package Outlines**


Maße in mm/ Dimensions in mm.

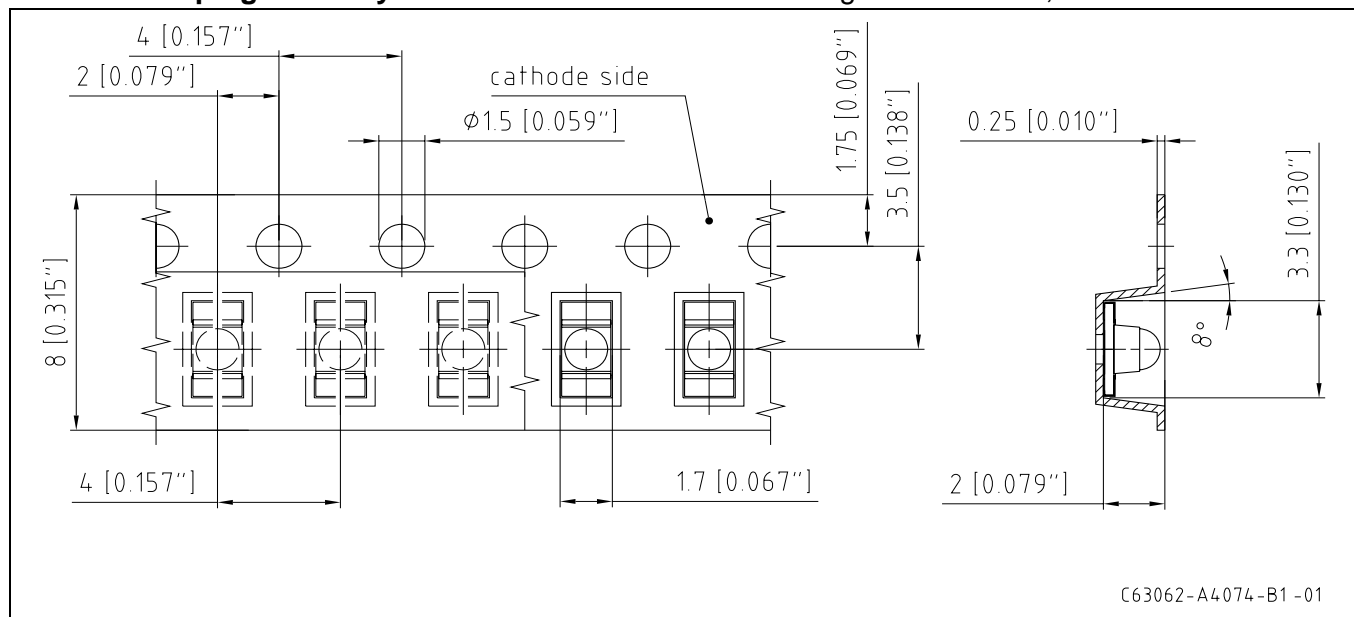
|                                       |  |
|---------------------------------------|--|
| Gehäuse / Package                     | Epoxydharz / Epoxy                               |
| Farbe / Colour                        | Schwarz / black                                  |
| Gehäusemarkierung/<br>Package marking | Pad 1: Kathode / cathode<br>Pad 2: Anode / anode |

**Gurtung / Polarität und Lage**

Verpackungseinheit 2000/Rolle, ø180 mm

**Method of Taping / Polarity and Orientation**

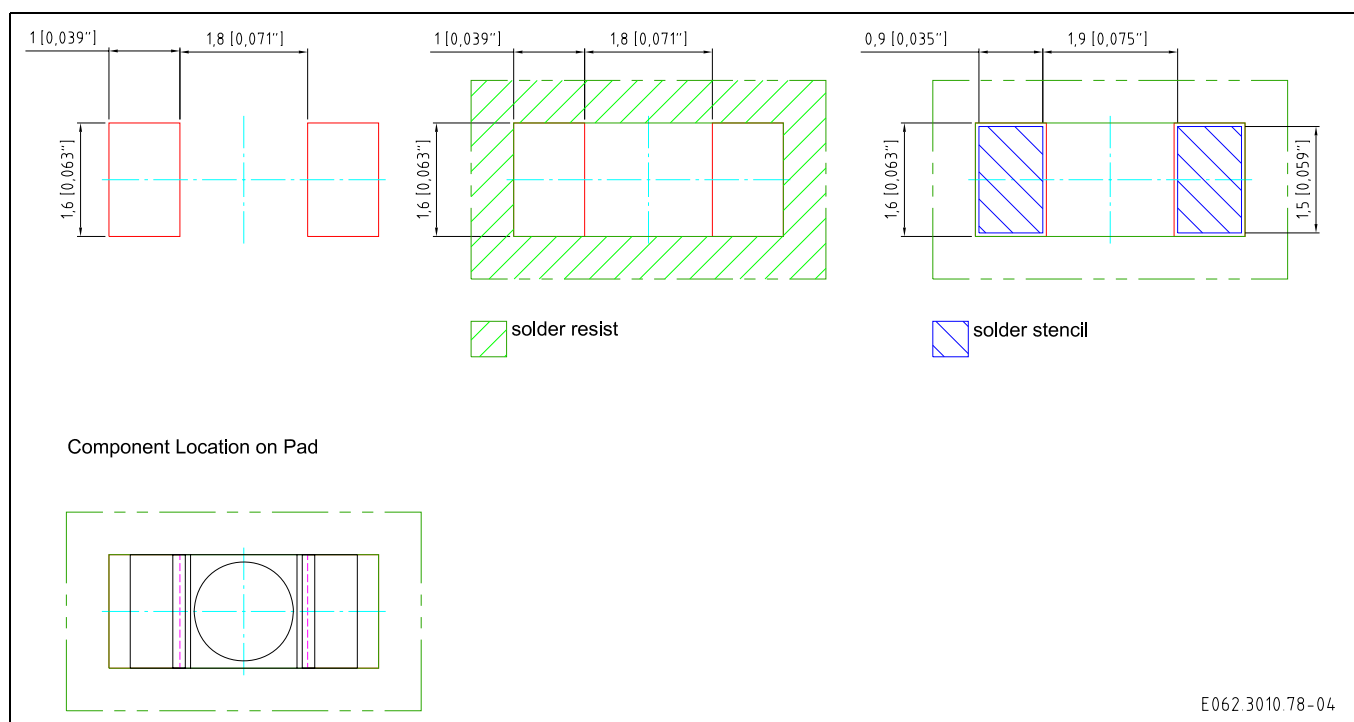
Packing unit 2000/reel, ø180 mm



Maße in mm (inch) / Dimensions in mm (inch).

**Empfohlenes Lötpaddesign  
Recommended Solder Pad**

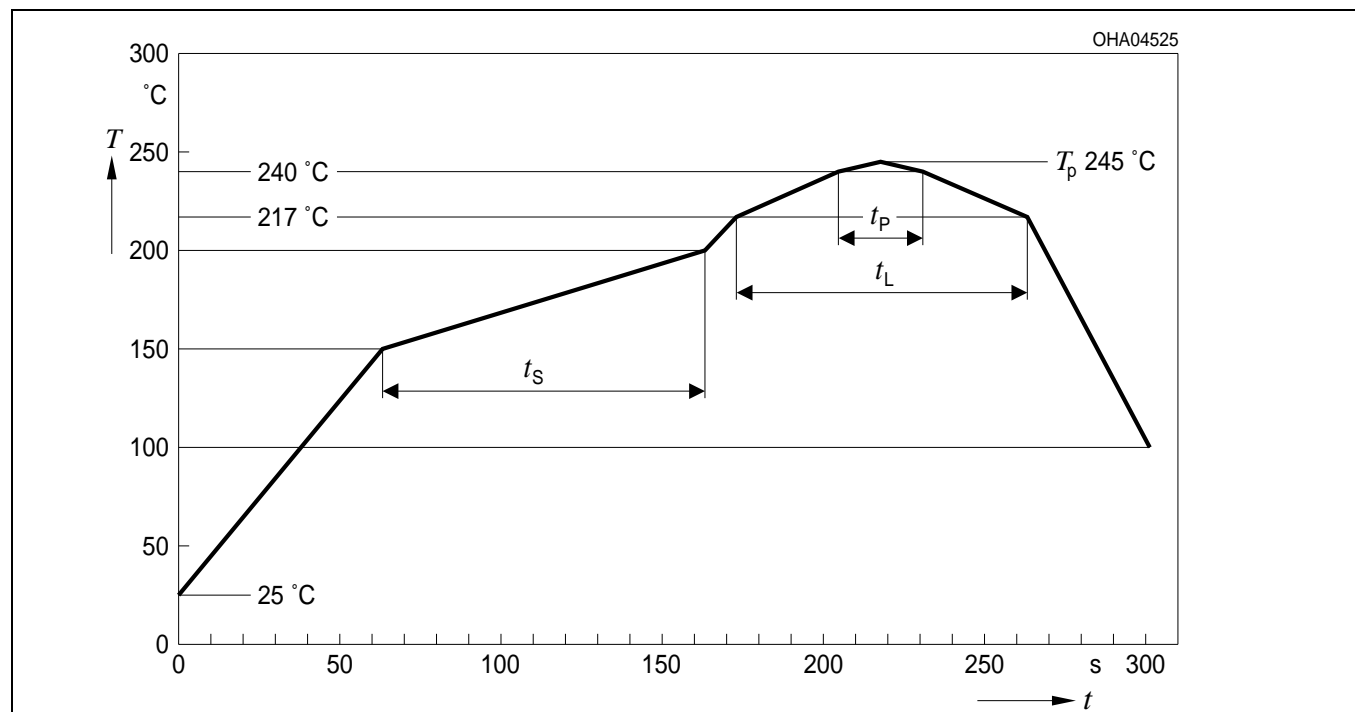
**Reflow Löten  
Reflow Soldering**



Maße in mm / Dimensions in mm (inch).

**Lötbedingungen**  
**Soldering Conditions**  
**Reflow Lötprofil für bleifreies Löten**  
**Reflow Soldering Profile for lead free soldering**

Vorbehandlung nach JEDEC Level 3  
 Preconditioning acc. to JEDEC Level 3  
 (nach J-STD-020-D.01)  
 (acc. to J-STD-020-D.01)



| Pb-Free (SnAgCu) Assembly   |                |                        |
|---|----------------|------------------------|
| Profile Feature   | Recommendation | Max. Ratings           |
| Ramp-up Rate to Preheat*)<br>25°C to 150°C                            | 2°C / sec      | 3°C / sec              |
| Time $t_s$ from $T_{Smin}$ to $T_{Smax}$<br>(150°C to 200°C)          | 100s           | min. 60sec max. 120sec |
| Ramp-up Rate to Peak*)<br>$T_{Smax}$ to $T_p$                         | 2°C / sec      | 3°C / sec              |
| Liquidus Temperature $T_L$  | 217°C          |                        |
| Time $t_L$ above $T_L$  | 80sec          | max. 100sec            |
| Peak Temperature $T_p$  | 245°C          | max. 260°C             |
| Time $t_p$ within 5°C of the specified peak<br>temperature $T_p - 5K$ | 20sec          | min. 10sec max. 30sec  |
| Ramp-down Rate*)<br>$T_p$ to 100°C                                    | 3°C / sec      | 6°C / sec maximum      |
| Time 25°C to Peak temperature   |                | max. 8 min.            |

All temperatures refer to the center of the package, measured on the top of the component

\* slope calculation  $\Delta T/\Delta t$ :  $\Delta t$  max. 5 sec; fulfillment for the whole T-range



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<sup>1</sup> 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 effectiveness of that device or system.

<sup>2</sup> 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 of the user may be endangered.

EU RoHS and China RoHS compliant product



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