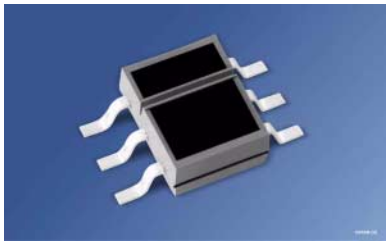
# Reflexlichtschranke mit VCSEL-Sender
# Reflective Interrupter with VCSEL-Emitter
## Lead (Pb) Free Product - RoHS Compliant

## SFH 9210



### Wesentliche Merkmale

- Großer Arbeitsabstand (2-10mm)
- IR-GaAs-VCSEL (Vertical Cavity Surface Emitting Laser)in Kombination mit einem Si-NPN-Fototransistor
- Enge Strahlverteilung des Senders
- Tageslichtsperrfilter

### Features

- Long operating distance (2-10mm)
- IR-GaAs-VCSEL (Vertical Cavity Surface Emitting Laser) in combination with a Silicon NPN phototransistor
- Narrow beam characteristics of the emitter
- Daylight cut-off filter

### Anwendungen

- Positionssensor
- Endabschaltung
- Drehzahlüberwachung, -regelung
- Bewegungssensor

### Applications

- Position sensor
- End position switch
- Speed monitoring and regulating
- Motion sensor

| **Typ**<br>**Type** | **Bestellnummer**<br>**Ordering Code** | $I_{CE}$ **[mA]**<br>**($I_F$ = 8 mA, $V_{CE}$ = 5 V, d = 5 mm)**<br>(see note on **page 5**) |
|---|---|---|
| SFH 9210 | Q65110A2713 | 1 .... 8 |

**Beim Betrieb dieses Bauteils sind die Sicherheitsvorschriften für die Laserklasse 1M nach IEC 60825-1 Am. 2 zu beachten.**

**Operating this device the safety instructions for laser class 1M according to IEC 60825-1 Am. 2 have to be observed.**

**ATTENTION - Observe Precautions For Handling - Electrostatic Sensitive Device**

**Grenzwerte**
**Maximum Ratings**

| **Bezeichnung**<br>**Parameter** | **Symbol**<br>**Symbol** | **Wert**<br>**Value** | **Einheit**<br>**Unit** |
|---|---|---|---|
| **Sender** (GaAs-VCSEL-Diode)<br>**Emitter** (GaAs VCSEL diode) | | | |
| Sperrspannung<br>Reverse voltage | $V_R$ | 3 | V |
| Vorwärtsgleichstrom<br>Forward current | $I_F$ | 10 | mA |
| Verlustleistung<br>Power dissipation | $P_{tot}$ | 25 | mW |
| **Empfänger** (Si-Fototransistor)<br>**Detector** (silicon phototransistor) | | | |
| Dauer-Kollektor-Emitter-Sperrspannung<br>Continuous collector-emitter voltage | $V_{CE}$ | 16 | V |
| Kollektor-Emitter-Sperrspannung, ($t \leq 2$ min)<br>Collector-emitter voltage, ($t \leq 2$ min) | $V_{CE}$ | 30 | |
| Emitter-Kollektor-Sperrspannung<br>Emitter-collector voltage | $V_{EC}$ | 7 | |
| Kollektorstrom<br>Collector current | $I_C$ | 20 | mA |
| Verlustleistung<br>Total power dissipation | $P_{tot}$ | 100 | mW |
| **Reflexlichtschranke**<br>**Reflective Interrupter** | | | |
| Lagertemperatur<br>Storage temperature range | $T_{stg}$ | - 40 … + 85 | °C |
| Betriebstemperatur<br>Operating temperature range | $T_{OP}$ | - 40 … + 85 | |
| Elektrostatische Entladung<br>Electrostatic discharge | ESD | 400 | V |
| Umweltbedingungen / Environment conditions | 3 K3 acc. to EN 60721-3-3 (IEC 721-3-3) | | |

**Kennwerte** ($T_A$ = 25 °C)
**Characteristics**

| **Bezeichnung**<br>**Parameter** | **Symbol**<br>**Symbol** | **Wert**<br>**Value** | **Einheit**<br>**Unit** |
|---|---|---|---|
| **Sender** (GaAs-VCSEL-Diode)<br>**Emitter** (GaAs-VCSEL diode) | | | |
| Wellenlänge der Strahlung<br>Wavelength at peak emission<br>$I_F$ = 8 mA, $t_p$ = 20 ms | $\lambda_{peak}$ | 850 | nm |
| Spektrale Bandbreite bei 50% von $I_{max}$<br>Spectral bandwidth at 50% of $I_{max}$<br>$I_F$ = 8 mA | $\Delta\lambda$ | 1 | nm |
| Schwellenstrom[1)]<br>Threshold current[1)] | $I_{th}$ | 2.6 (<5) | mA |
| Durchlaβspannung<br>Forward voltage<br>$I_F$ = 10 mA | $V_F$ | 1.8 (≤ 2.3) | V |
| Sperrstrom<br>Reverse current<br>$V_R$ = 3 V | $I_R$ | 0.01 (≤ 1) | µA |
| Kapazität<br>Capacitance<br>$V_R$ = 0 V, $f$ = 1 MHz | $C_O$ | 25 | pF |
| Wärmewiderstand[2)]<br>Thermal resistance[2)] | $R_{thJA}$ | 1200 | K/W |
| **Empfänger** (Si-Fototransistor)<br>**Detector** (silicon phototransistor) | | | |
| Kapazität<br>Capacitance<br>$V_{CE}$ = 5 V, $f$ = 1 MHz | $C_{CE}$ | 10 | pF |
| Kollektor-Emitter-Reststrom<br>Collector-emitter leakage current<br>$V_{CE}$ = 20 V | $I_{CEO}$ | 3 (≤ 200) | nA |
| Fotostrom (Fremdlichtempfindlichkeit)<br>Photocurrent (outside light density)<br>$V_{CE}$ = 5 V, $E_V$ = 1000 Lx | $I_P$ | 3.5 | mA |
| Wärmewiderstand[2)]<br>Thermal resistance[2)] | $R_{thJA}$ | 270 | K/W |

**Kennwerte** ($T_A$ = 25 °C)
**Characteristics** (cont'd)

| **Bezeichnung**<br>**Parameter** | **Symbol**<br>**Symbol** | **Wert**<br>**Value** | **Einheit**<br>**Unit** |
|---|---|---|---|
| **Reflexlichtschranke**<br>**Reflective Interrupter** | | | |
| Kollektor-Emitterstrom<br>Collector-emitter current<br>Kodak neutral white test card, 90% Reflexion<br>$I_F$ = 8 mA; $V_{CE}$ = 5 V; $d$ = 5 mm<br>(see note on **page 5**) | $I_{CE}$ [3)]<br><br>-1<br>-2<br>-3<br>-4 | 1 ... 8<br><br>1 ... 2<br>1.6 ... 3.2<br>2.5 ... 5<br>4 ... 8 | mA |
| Kollektor-Emitter-Sättigungsspannung<br>Collector-emitter-saturation voltage<br>Kodak neutral white test card, 90% Reflexion<br>$I_F$ = 8 mA; $d$ = 5 mm; $I_C$ = 0.3 x $I_{CE\ min.}$<br>(see note on **page 5**) | $V_{CE\ sat}$ | 0.15 (≤ 0.6) | V |

1) Der VCSEL emittiert nur bei Flussströmen größer als $I_{th}$

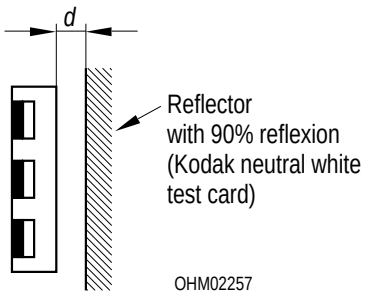
VCSEL only emits at forward currents higher than $I_{th}$

2) Montage auf PC-Board mit > 5 mm² Padgröβe

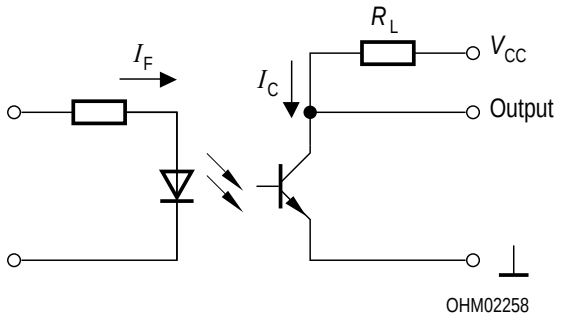
Mounting on pcb with > 5 mm² pad size

3) Nur eine Gruppe innerhalb einer Verpackungseinheit. Bezug von Einzelgruppen ist nicht möglich.

Only single group within one packing unit. Single bins can not be ordered.



**Schaltzeiten** ($T_A$ = 25 °C, $V_{CC}$ = 5 V, $I_C$ = 1 mA[1)], $R_L$ = 1 kΩ)
**Switching Times**




| Bezeichnung<br>Parameter | Symbol<br>Symbol | Wert<br>Value | Einheit<br>Unit |
|---|---|---|---|
| Einschaltzeit<br>Turn-on time | $t_{ein}$<br>$t_{on}$ | 65 | µs |
| Anstiegzeit<br>Rise time | $t_r$ | 50 | µs |
| Ausschaltzeit<br>Turn-off time | $t_{aus}$<br>$t_{off}$ | 55 | µs |
| Abfallzeit<br>Fall time | $t_f$ | 50 | µs |

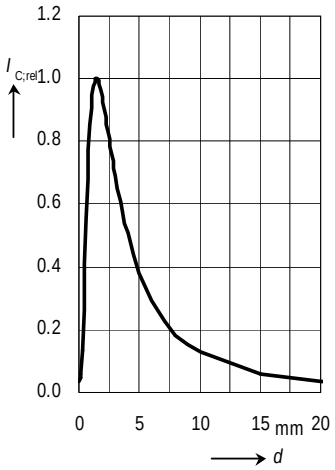
1) $I_C$ eingestellt über den Durchlassstrom der Sendediode, den Reflexionsgrad und den Abstand des Reflektors vom Bauteil ($d$)

$I_C$ as a function of the forward current of the emitting diode, the degree of reflection and the distance between reflector and component ($d$)

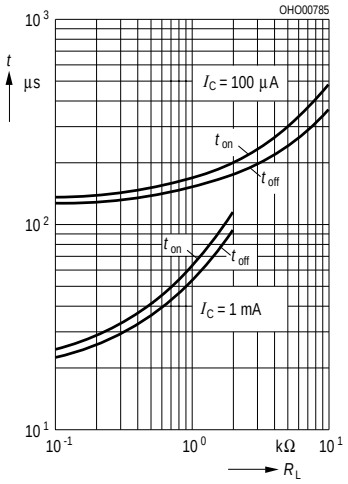
*Anm.:- Es wird empfohlen die Lichtschranke bei dem spezifizierten Arbeitpunkt von ca. 8mA für den Emitter einzusetzten, weil andere Betriebsströme zu einem größeren Streubereich beim Koppelfaktor führen. Der Abgleich erfolgt über den Arbeitswiderstand am Detektor.*
*Von einem Einsatz der Lichtschranke mit glänzenden oder gar spiegelnden Oberflächen wird abgeraten. Die Abstrahlcharakteristik des Senders ändert sich sowohl über die Temperatur als auch mit dem Flußstrom stärker als bei Standardemittern und führt somit ebenfalls zur Erhöhung des Streubereichs beim Koppelfaktor. Bei diffuser Streuung ist dieser Einfluß jedoch gering, und kann für die meisten Anwendungen vernachlässigt werden.*

*Note: It is recomended to use the interrupter at the specified emitter current of about 8mA, as other operating currents lead to a larger coupling factor variation. The tuning is done using the operating resistor on the detector side.*
*It is not recomended to use the interrupter in combination with shiny or mirror like surfaces. Changes in temperatures and operating current are having a bigger influence on the radiation characteristic as it is the case for standard emitters. This means a higher variance of the coupling factor. For diffuse surfaces the mentioned influence is low, and can be neglected for most of the applications.*

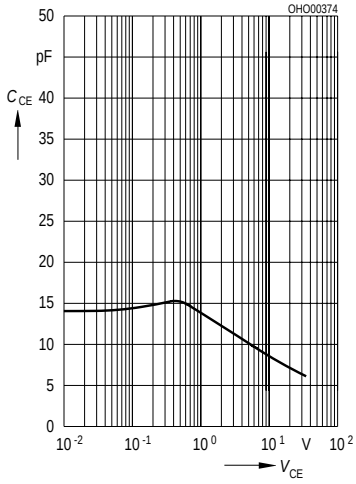
**Collector Current** $\frac{I_C}{I_{Cmax}} = f(d)$
Kodak 90%



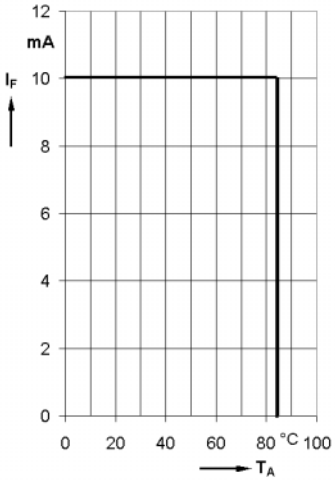

**Switching Characteristics** $t = f(R_L)$
$T_A$ = 25 °C, $I_F$ = 8 mA



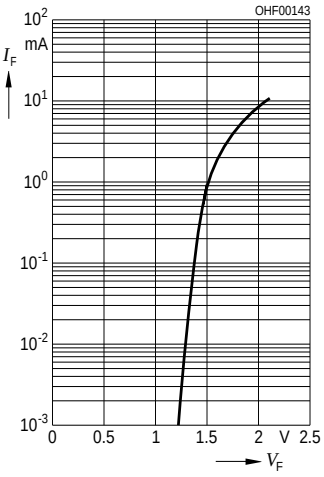

**Transistor Capacitance (typ.)**
$C_{CE} = f(V_{CE})$, $T_A$ = 25 °C, $f$ = 1 MHz



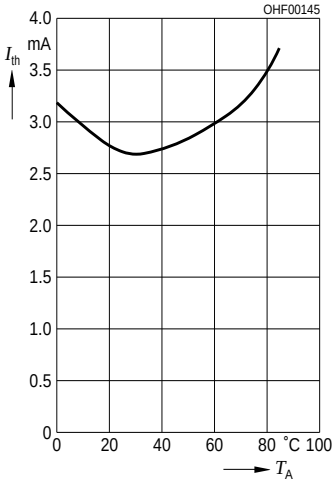

**Max. Permissible Forward Current**
$I_F = f(T_A)$




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

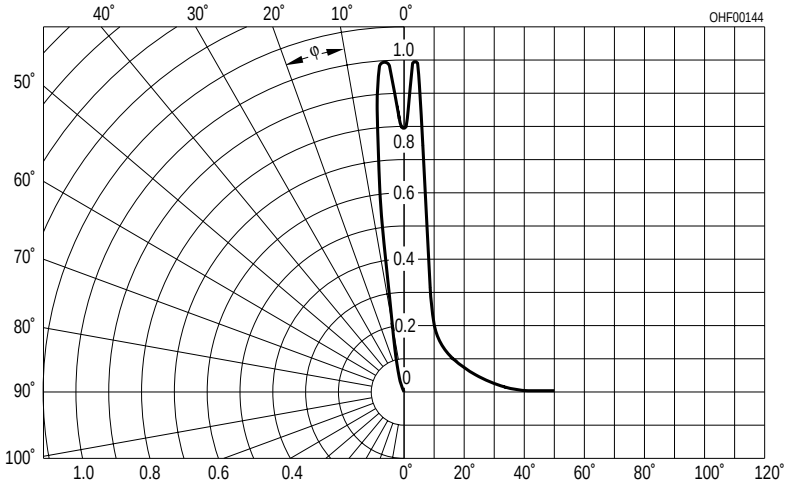



**Threshold Current** $I_{th} = f(T_A)$

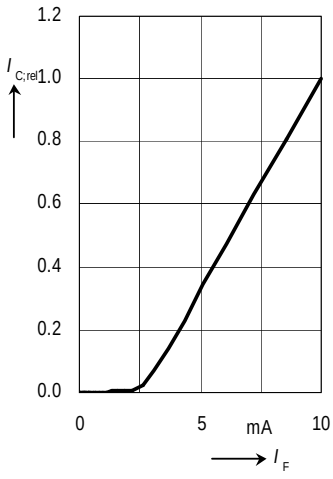



**Radiation characteristics** $I_{rel} = f(\varphi)$

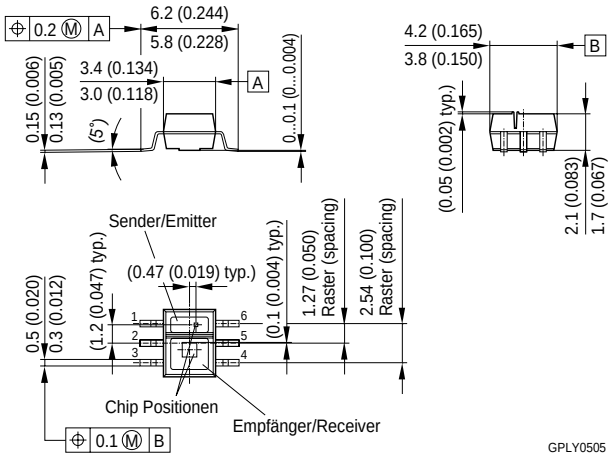
$I_F$ =10mA




**Collector Current** $I_C = f(I_F)$,
d = 5 mm, Kodak 90%



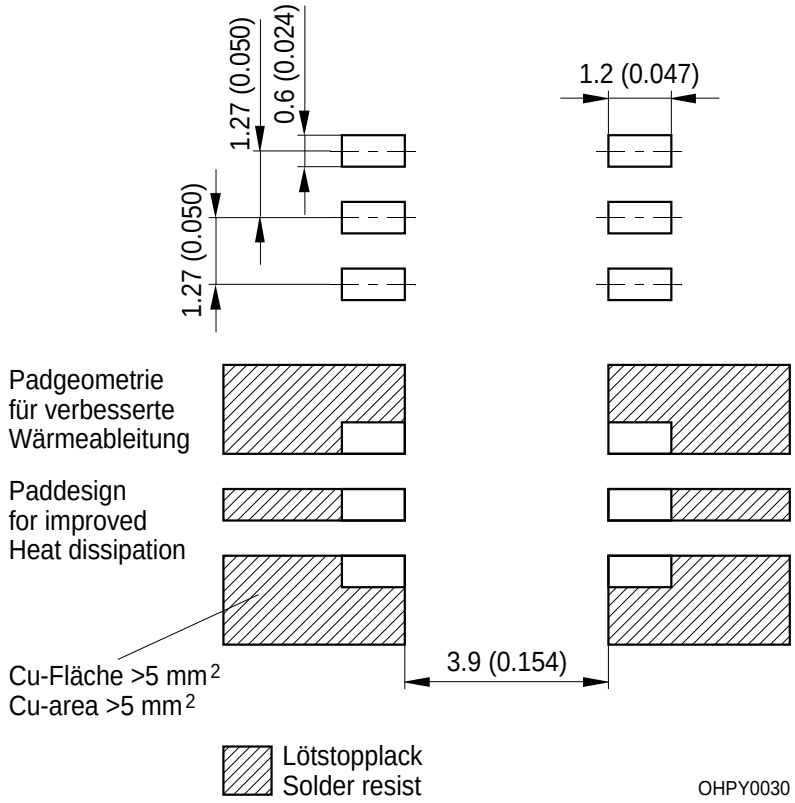
## Maßzeichnung
## Package Outlines




| Type | 1 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|---|
| SFH 9210 | Anode | – | Emitter | Collector | – | Cathode |

Maße werden wie folgt angegeben: mm (inch) / Dimensions are specified as follows: mm (inch).

**Empfohlenes Lötpaddesign** IR-Reflow Löten
**Recommended Solder Pad** IR Reflow Soldering




Maße werden wie folgt angegeben: mm (inch) / Dimensions are specified as follows: mm (inch).

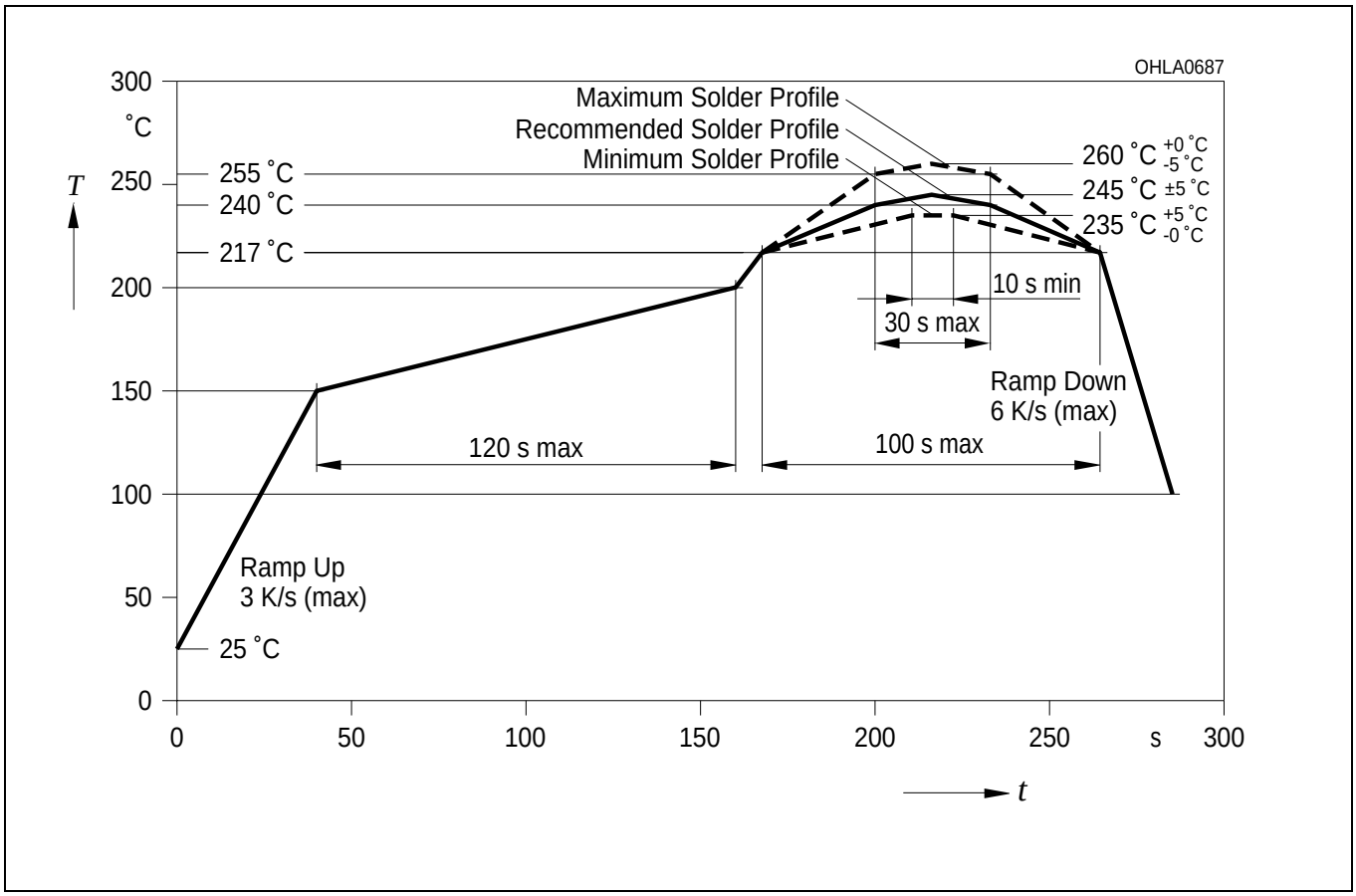
**Löthinweise**
**Soldering Conditions**

| Bauform Type | Drypack Level acc. to IPS-stand. 020 | Tauch-, Schwalllötung Dip, Wave Soldering | | Reflowlötung Reflow Soldering | | Kolbenlötung Iron Soldering |
|---|---|---|---|---|---|---|
| | | Peak Temp. (solderbath) | Max. Time in Peak Zone | Peak Temp. (package temp.) | Max. Time in Peak Zone | (Iron temp.) |
| SFH 9210 | 4 | n. a. | – | 260 °C | 20 sec. | n.a. |

Bitte Verarbeitungshinweise für SMT-Bauelemente beachten!
Please observe the handling guidelines for SMT devices!

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

Vorbehandlung nach JEDEC Level 4
Preconditioning acc. to JEDEC Level 4
(nach J-STD-020B)
(acc. to J-STD-020B)



| | |
|---|---|
| **Gurtung / Polarität und Lage** | siehe Dokument: Short Form Katalog: Gurtung und Verpackung - SMT-Bauelemente - Gehäuse:SMT RLS |
| **Methode of Taping / Polarity and Orientation** | see document: Short Form Catalog: Tape and Reel - SMT-Components - Package: SMT-RLS |

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The information describes the type of component and shall not be considered as assured characteristics.
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**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 [1] , may only be used in life-support devices or systems [2] with the express written approval of OSRAM OS.

[1] A critical component is a component usedin 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.

[2] 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