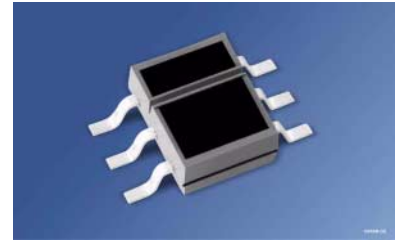


# Reflexlichtschranke mit VCSEL-Sender Reflective Interrupter with VCSEL-Emitter

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## 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

### Anwendungen

- Positionssensor
- Endabschaltung
- Drehzahlüberwachung, -regelung
- Bewegungssensor

### 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

### Applications

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

Typ Type	Bestellnummer Ordering Code	$I_{CE}$ [mA] ( $I_F = 8 \text{ mA}$ , $V_{CE} = 5 \text{ V}$ , $d = 5 \text{ mm}$ ) (see note on <b>page 5</b> )
SFH 9210	Q62702P5262	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 Parameter	Symbol Symbol	Wert Value	Einheit Unit
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**Sender (GaAs-VCSEL-Diode)**
**Emitter (GaAs VCSEL diode)**

Sperrspannung Reverse voltage	$V_R$	3	V
Vorwärtsgleichstrom Forward current	$I_F$	10	mA
Verlustleistung Power dissipation	$P_{tot}$	25	mW

**Empfänger (Si-Fototransistor)**
**Detector (silicon phototransistor)**

Dauer-Kollektor-Emitter-Sperrspannung Continuous collector-emitter voltage	$V_{CE}$	16	V
Kollektor-Emitter-Sperrspannung, ( $t \leq 2$ min) Collector-emitter voltage, ( $t \leq 2$ min)	$V_{CE}$	30	
Emitter-Kollektor-Sperrspannung Emitter-collector voltage	$V_{EC}$	7	
Kollektorstrom Collector current	$I_C$	20	mA
Verlustleistung Total power dissipation	$P_{tot}$	100	mW

**Reflexlichtschranke**
**Reflective Interrupter**

Lagertemperatur Storage temperature range	$T_{stg}$	- 40 ... + 85	°C
Betriebstemperatur Operating temperature range	$T_{OP}$	- 40 ... + 85	
Elektrostatistische Entladung Electrostatic discharge	ESD	400	V
Umweltbedingungen / Environment conditions	3 K3 acc. to EN 60721-3-3 (IEC 721-3-3)		

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

Bezeichnung Parameter	Symbol Symbol	Wert Value	Einheit Unit
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**Sender** (GaAs-VCSEL-Diode)**Emitter** (GaAs-VCSEL diode)

Wellenlänge der Strahlung Wavelength at peak emission $I_F = 8\text{ mA}$ , $t_p = 20\text{ ms}$	$\lambda_{\text{peak}}$	850	nm
Spektrale Bandbreite bei 50% von $I_{\text{max}}$ Spectral bandwidth at 50% of $I_{\text{max}}$ $I_F = 8\text{ mA}$	$\Delta\lambda$	1	nm
Schwellenstrom <sup>1)</sup> Threshold current <sup>1)</sup>	$I_{\text{th}}$	2.6 (<5)	mA
Durchlaßspannung Forward voltage $I_F = 10\text{ mA}$	$V_F$	1.8 ( $\leq 2.3$ )	V
Sperrstrom Reverse current $V_R = 3\text{ V}$	$I_R$	0.01 ( $\leq 1$ )	$\mu\text{A}$
Kapazität Capacitance $V_R = 0\text{ V}$ , $f = 1\text{ MHz}$	$C_O$	25	pF
Wärmewiderstand <sup>2)</sup> Thermal resistance <sup>2)</sup>	$R_{\text{thJA}}$	1200	K/W

**Empfänger** (Si-Fototransistor)**Detector** (silicon phototransistor)

Kapazität Capacitance $V_{\text{CE}} = 5\text{ V}$ , $f = 1\text{ MHz}$	$C_{\text{CE}}$	10	pF
Kollektor-Emitter-Reststrom Collector-emitter leakage current $V_{\text{CE}} = 20\text{ V}$	$I_{\text{CEO}}$	3 ( $\leq 200$ )	nA
Fotostrom (Fremdlichtempfindlichkeit) Photocurrent (outside light density) $V_{\text{CE}} = 5\text{ V}$ , $E_V = 1000\text{ Lx}$	$I_P$	3.5	mA
Wärmewiderstand <sup>2)</sup> Thermal resistance <sup>2)</sup>	$R_{\text{thJA}}$	270	K/W

Kennwerte ( $T_A = 25\text{ °C}$ )

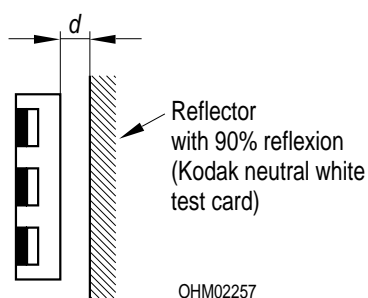
Characteristics (cont'd)

Bezeichnung Parameter	Symbol Symbol	Wert Value	Einheit Unit
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### Reflexlichtschranke Reflective Interrupter

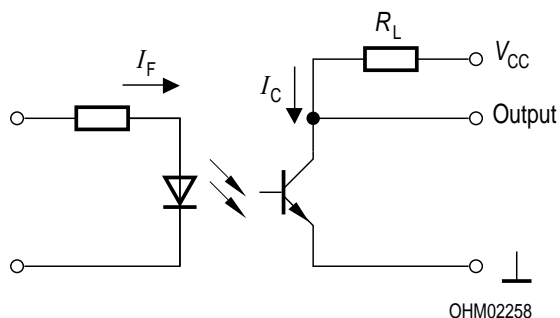
Kollektor-Emitterstrom Collector-emitter current Kodak neutral white test card, 90% Reflexion $I_F = 8\text{ mA}$ ; $V_{CE} = 5\text{ V}$ ; $d = 5\text{ mm}$ (see note on <b>page 5</b> )	$I_{CE}^{3)}$ -1 -2 -3 -4	1 ... 8 1 ... 2 1.6 ... 3.2 2.5 ... 5 4 ... 8	mA
Kollektor-Emitter-Sättigungsspannung Collector-emitter-saturation voltage Kodak neutral white test card, 90% Reflexion $I_F = 8\text{ mA}$ ; $d = 5\text{ mm}$ ; $I_C = 0.3 \times I_{CE\text{ min.}}$ (see note on <b>page 5</b> )	$V_{CE\text{ sat}}$	0.15 ( $\leq 0.6$ )	V

- 1) Der VCSEL emittiert nur bei Flusstströmen größer als  $I_{th}$   
VCSEL only emits at forward currents higher than  $I_{th}$ .
- 2) Montage auf PC-Board mit  $> 5\text{ mm}^2$  Padgröße  
Mounting on pcb with  $> 5\text{ mm}^2$  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 ( $T_A = 25\text{ °C}$ ,  $V_{CC} = 5\text{ V}$ ,  $I_C = 1\text{ mA}^1$ ),  $R_L = 1\text{ k}\Omega$ )

### Switching Times



Bezeichnung Parameter	Symbol Symbol	Wert Value	Einheit Unit
Einschaltzeit Turn-on time	$t_{\text{ein}}$ $t_{\text{on}}$	65	$\mu\text{s}$
Anstiegszeit Rise time	$t_r$	50	$\mu\text{s}$
Ausschaltzeit Turn-off time	$t_{\text{aus}}$ $t_{\text{off}}$	55	$\mu\text{s}$
Abfallzeit Fall time	$t_f$	50	$\mu\text{s}$

<sup>1)</sup>  $I_C$  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 ( $d$ )

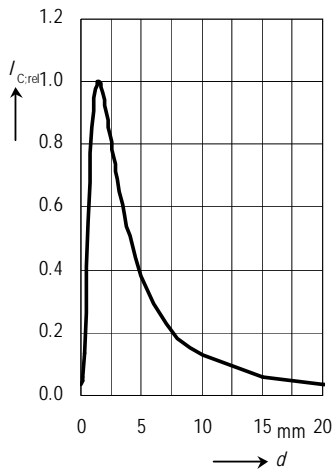
**Anm.:-** Es wird empfohlen die Lichtschranke bei dem spezifizierten Arbeitspunkt von ca. 8mA für den Emitter einzusetzen, weil andere Betriebsströme zu einem größeren Streubereich beim Koppelfaktor führen. Der Abgleich erfolgt über den Arbeitswiderstand am Detektor.

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.

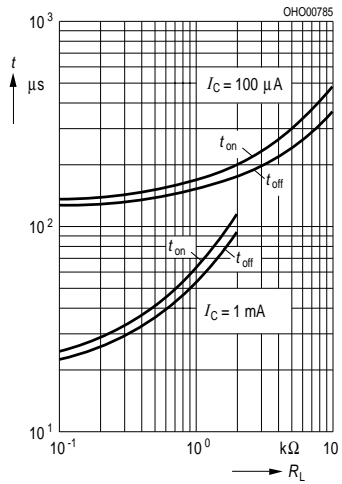
**Note:** It is recommended to use the interrupter at the specified emitter current of about 8mA, as other operating currents lead to a larger coupling factor variation. The tuning is done using the operating resistor on the detector side. It is not recommended to use the interrupter in combination with 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.

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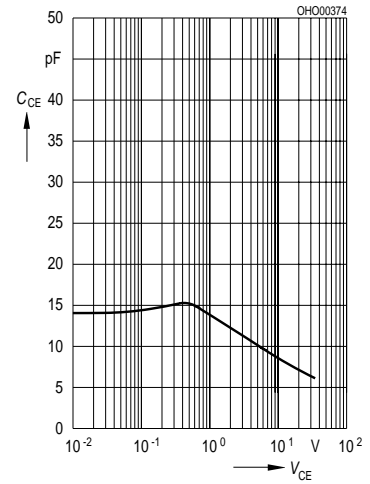
**Collector Current**  $\frac{I_C}{I_{Cmax}} = f(d)$   
Kodak 90%



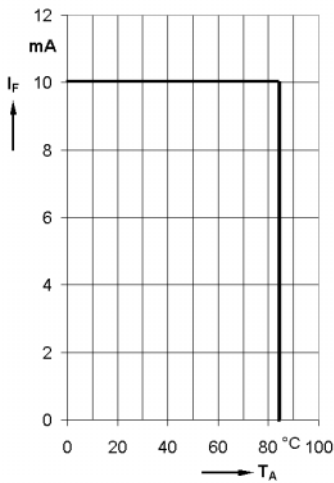
**Switching Characteristics**  $t = f(R_L)$   
 $T_A = 25^\circ\text{C}, I_F = 8\text{ mA}$



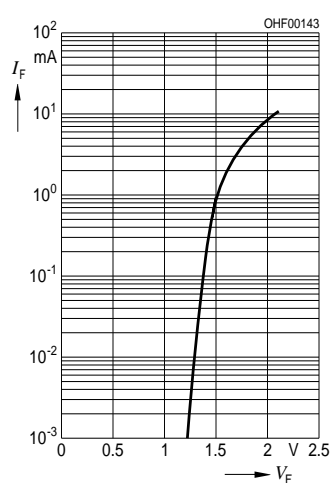
**Transistor Capacitance (typ.)**  
 $C_{CE} = f(V_{CE}), T_A = 25^\circ\text{C}, f = 1\text{ MHz}$



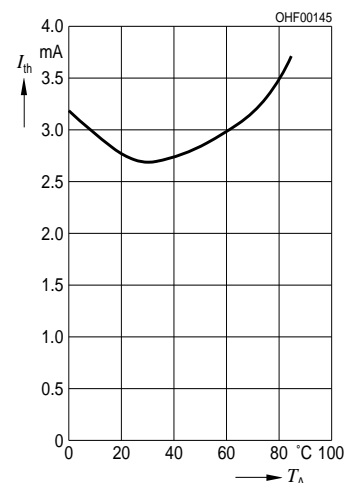
**Max. Permissible Forward Current**  
 $I_F = f(T_A)$



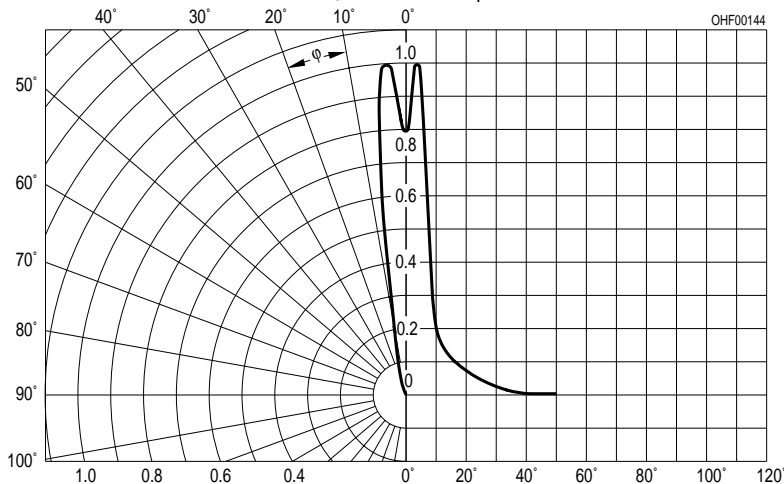
**Forward Current**  
 $I_F = f(V_F)$



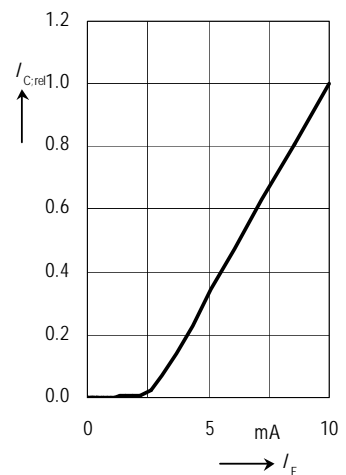
**Threshold Current**  $I_{th} = f(T_A)$



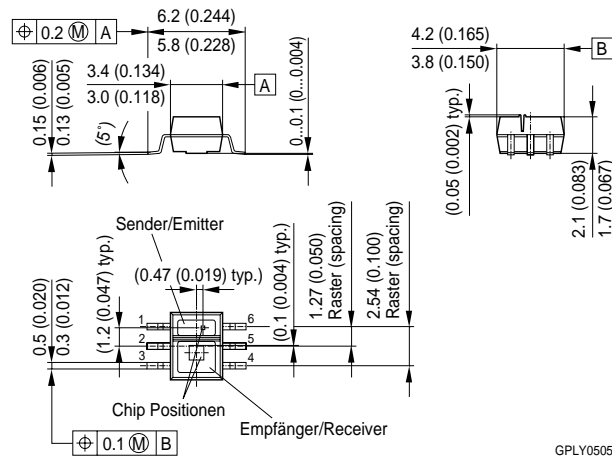
**Radiation characteristics**  $I_{rel} = f(\varphi)$   $I_F = 10\text{ mA}$



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



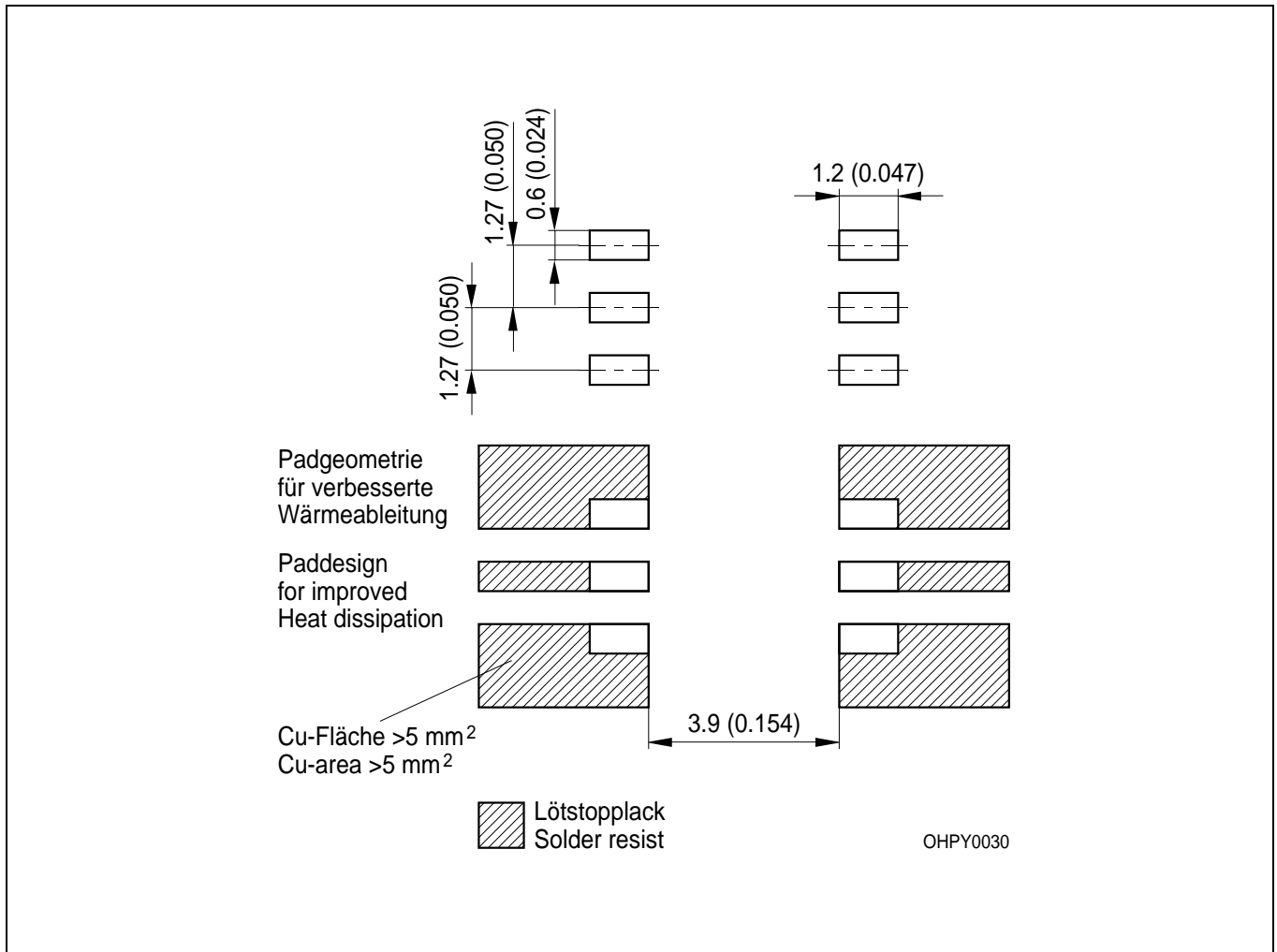
**Maßzeichnung  
Package Outlines**



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 Lötpad design**    IR-Reflow Löten  
**Recommended Solder Pad**    IR Reflow Soldering



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



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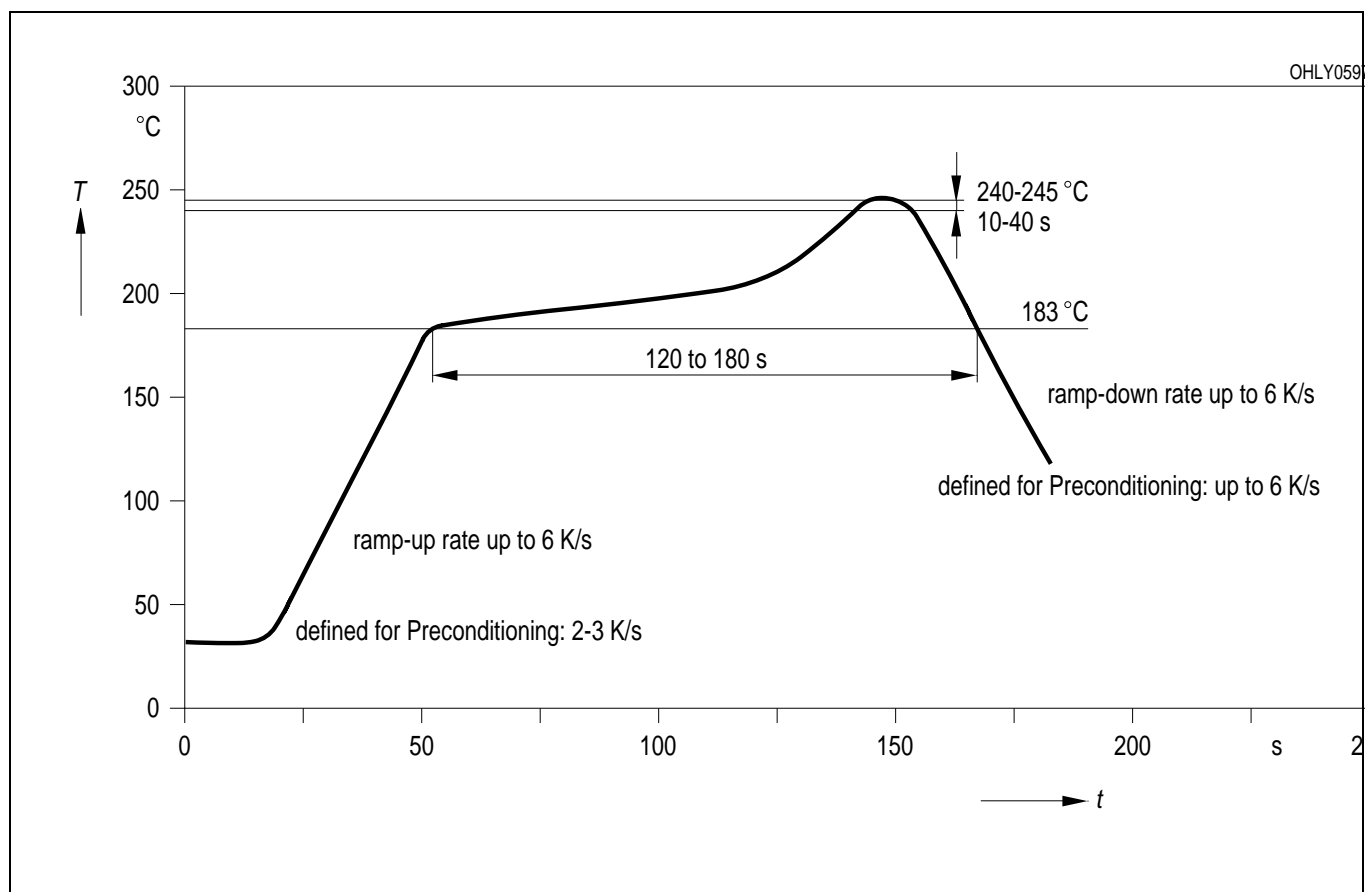
### Löthinweise Soldering Conditions

Bauforn Type	Drypack Level acc. to IPS-stand. 020	Tauch-, Schwallötung Dip, Wave Soldering		Reflowlötung Reflow Soldering		Kolbenlötung Iron Soldering (Iron temp.)
		Peak Temp. (solderbath)	Max. Time in Peak Zone	Peak Temp. (package temp.)	Max. Time in Peak Zone	
SFH 9210	4	n. a.	–	245 °C	10 sec.	n.a.

Bitte Verarbeitungshinweise für SMT-Bauelemente beachten!

Please observe the handling guidelines for SMT devices!

**IR-Reflow Lötprofil** (nach IPC 9501)  
**IR Reflow Soldering Profile** (acc. to IPC 9501)



**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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**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 <sup>1</sup> may only be used in life-support devices or systems <sup>2</sup> with the express written approval of OSRAM OS.

<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.