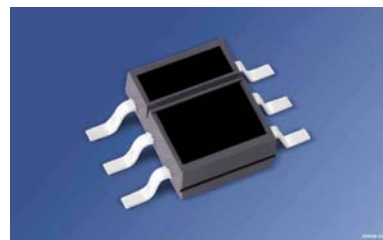


**Reflexlichtschranke**  
**Reflective Interrupter**  
**Lead (Pb) Free Product - RoHS Compliant**

**SFH 9206**



**DRAFT - This design is for reference only.**  
**Subject to change without notice.**

**Wesentliche Merkmale**

- Optimaler Arbeitsabstand 1 mm bis 5 mm
- 940nm Emitter in Kombination mit einem Si-NPN-Fototransistor
- Tageslichtsperrfilter
- Sender und Empfänger galvanisch getrennt
- Vorbehandlung nach JEDEC Level 4

**Anwendungen**

- Positionsmelder
- Endabschalter
- Drehzahlüberwachung
- Bewegungssensor

**Features**

- Optimal operating distance 1 mm to 5 mm
- 940nm emitter in combination with a Silicon NPN phototransistor
- Daylight cut-off filter
- Emitter and detector electrically isolated
- Preconditioning acc. to JEDEC Level 4

**Applications**

- Position detection
- End position switch
- Speed monitoring
- Motion sensor

<b>Typ</b> <b>Type</b>	<b>Bestellnummer</b> <b>Ordering Code</b>	<b><math>I_{CE}</math> [mA]</b> <b>(<math>I_F = 10</math> mA, <math>V_{CE} = 5</math> V, <math>d = 1</math> mm)</b>
SFH 9206	Q65111A3179	0.16 ... 2.0

**Grenzwerte**  
**Maximum Ratings**

Bezeichnung Parameter	Symbol Symbol	Wert Value	Einheit Unit
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**Sender**  
**Emitter**

Sperrspannung Reverse voltage	$V_R$	5	V
Vorwärtsgleichstrom Forward current	$I_F$	50	mA
Verlustleistung Power dissipation	$P_{tot}$	100	mW

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

Dauer-Kollektor-Emitter-Sperrspannung Continuous collector-emitter voltage	$V_{CE}$	16	V
Kollektor-Emitter-Sperrspannung, ( $t \leq 1$ min) Collector-emitter voltage, ( $t \leq 1$ min)	$V_{CE}$	30	
Emitter-Kollektor-Sperrspannung Emitter-collector voltage	$V_{EC}$	7	
Kollektorstrom Collector current	$I_C$	10	mA
Verlustleistung Total power dissipation	$P_{tot}$	100	mW

**Reflexlichtschranke**  
**Light Reflection Switch**

Lagertemperatur Storage temperature range	$T_{stg}$	- 40 ... + 100	°C
Umgebungstemperatur Ambient temperature range	$T_A$	- 40 ... + 100	
Verlustleistung Power dissipation	$P_{tot}$	150	mW
Elektrostatische Entladung Electrostatic discharge	ESD	2	KV
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****Emitter**

Durchlaßspannung Forward voltage $I_F = 50\text{ mA}$	$V_F$	1.55 ( $\leq 1.95$ )	V
Sperrstrom Reverse current	$I_R$	not designed for reverse operation	$\mu\text{A}$
Wärmewiderstand <sup>1)</sup> Thermal resistance <sup>1)</sup>	$R_{thJA}$	300	K/W
Temperaturkoeffizient von $I_e$ bzw. $\Phi_e$ , $I_F = 50\text{ mA}$ Temperature coefficient of $I_e$ or $\Phi_e$ , $I_F = 50\text{ mA}$	$TC_1$	- 0.5	%/K

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

Kapazität Capacitance $V_{CE} = 5\text{ V}, f = 1\text{ MHz}$	$C_{CE}$	5	pF
Kollektor-Emitter-Reststrom Collector-emitter leakage current $V_{CE} = 25\text{ V}$	$I_{CEO}$	1 ( $\leq 200$ )	nA
Fotostrom (Fremdlichtempfindlichkeit) Photocurrent (Ambient Light Sensitivity) $V_{CE} = 5\text{ V}, E_v = 1000\text{ Lx}$ (Standard light A)	$I_P$	1	mA
Wärmewiderstand <sup>1)</sup> Thermal resistance <sup>1)</sup>	$R_{thJA}$	270	K/W
Temperaturkoeffizient von $I_{ce}$ Temperature coefficient of $I_{ce}$	$TC_{I_{ce}}$	+0.7	%/K

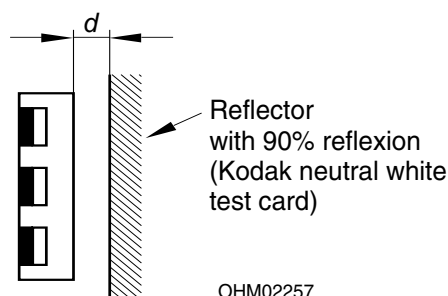
Kennwerte ( $T_A = 25\text{ °C}$ )

Characteristics (cont'd)

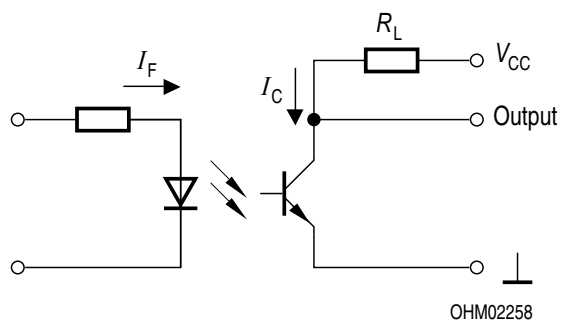
Bezeichnung Parameter	Symbol Symbol	Wert Value	Einheit Unit
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### Reflexlichtschranke Light Reflection Switch

Kollektor-Emitterstrom Collector-emitter current Kodak neutral white test card, 90% Reflexion $I_F = 10\text{ mA}$ ; $V_{CE} = 5\text{ V}$ ; $d = 1\text{ mm}$	$I_{CE\text{ min.}}$ $I_{CE\text{ max}}$	0.16 2.00	mA mA
Kollektor-Emitter-Sättigungsspannung Collector-emitter saturation voltage Kodak neutral white test card, 90% Reflexion $I_F = 10\text{ mA}$ ; $d = 1\text{ mm}$ ; $I_C = 50\text{ }\mu\text{A}$	$V_{CE\text{ sat}}$	0.2 ( $\leq 0.6$ )	V

1) Montage auf PC-Board mit  $> 5\text{ mm}^2$  Padgröße1) Mounting on pcb with  $> 5\text{ mm}^2$  pad size

**Schaltzeiten** ( $T_A = 25\text{ °C}$ ,  $V_{CC} = 5\text{ V}$ ,  $I_C = 100\text{ }\mu\text{A}^1$ ,  $R_L = 1\text{ k}\Omega$ )  
**Switching Times**

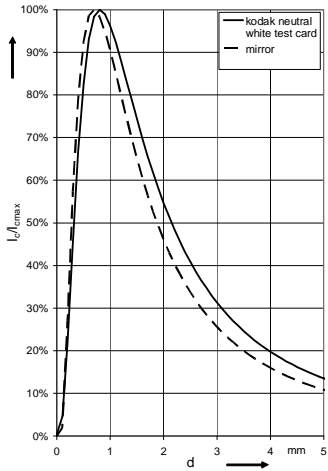


Bezeichnung Parameter	Symbol Symbol	Wert Value	Einheit Unit
Einschaltzeit Turn-on time	$t_{\text{ein}}$ $t_{\text{on}}$	40	$\mu\text{s}$
Anstiegszeit Rise time	$t_r$	30	$\mu\text{s}$
Ausschaltzeit Turn-off time	$t_{\text{aus}}$ $t_{\text{off}}$	45	$\mu\text{s}$
Abfallzeit Fall time	$t_f$	40	$\mu\text{s}$

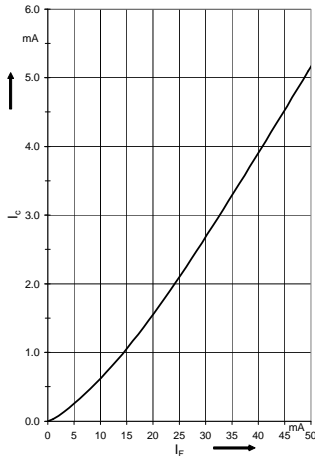
<sup>1)</sup>  $I_C$  eingestellt über den Durchlaßstrom der Sendediode, den Reflexionsgrad und den Abstand des Reflektors vom Bauteil ( $d$ )

<sup>1)</sup>  $I_C$  as a function of the forward current of the emitting diode, the degree of reflection and the distance between reflector and component ( $d$ )

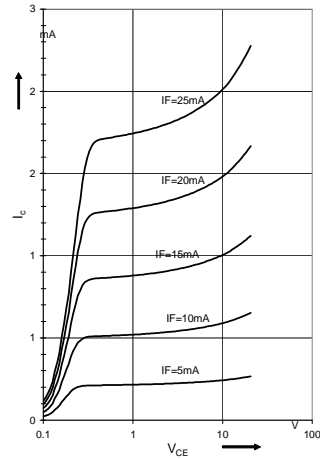
**Collector Current**  
 $T_A = 25\text{ }^\circ\text{C}$   
 $\frac{I_C}{I_{Cmax}} = f(d)$



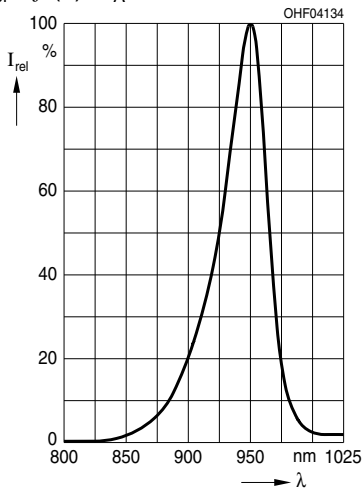
**Collector Current**  $I_C = f(I_F)$ , spacing  $d$  to reflector = 1 mm, 90% reflection  
 $T_A = 25\text{ }^\circ\text{C}$



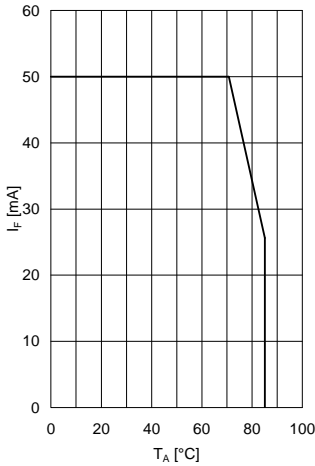
**Output Characteristics (typ.)**  
 $I_C = f(V_{CE})$ , spacing to reflector:  
 $d = 1\text{ mm}$ , 90% reflection,  $T_A = 25\text{ }^\circ\text{C}$



**Relative Spectral Emission**  
 $I_{rel} = f(\lambda)$ ,  $T_A = 25\text{ }^\circ\text{C}$



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



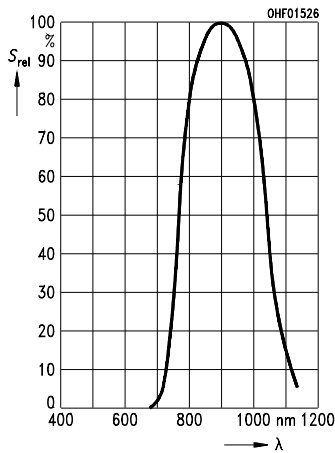
**Perm. Pulse Handling Capability**  
 $I_F = f(t_p)$ , Duty cycle  $D = \text{parameter}$ ,  
 $T_A = 25\text{ }^\circ\text{C}$

TBD

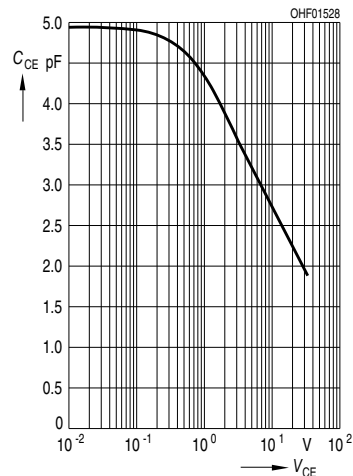
**Perm. Pulse Handling Capability**  
 $I_F = f(t_p)$ , Duty cycle  $D = \text{parameter}$ ,  
 $T_A = 85\text{ }^\circ\text{C}$

TBD

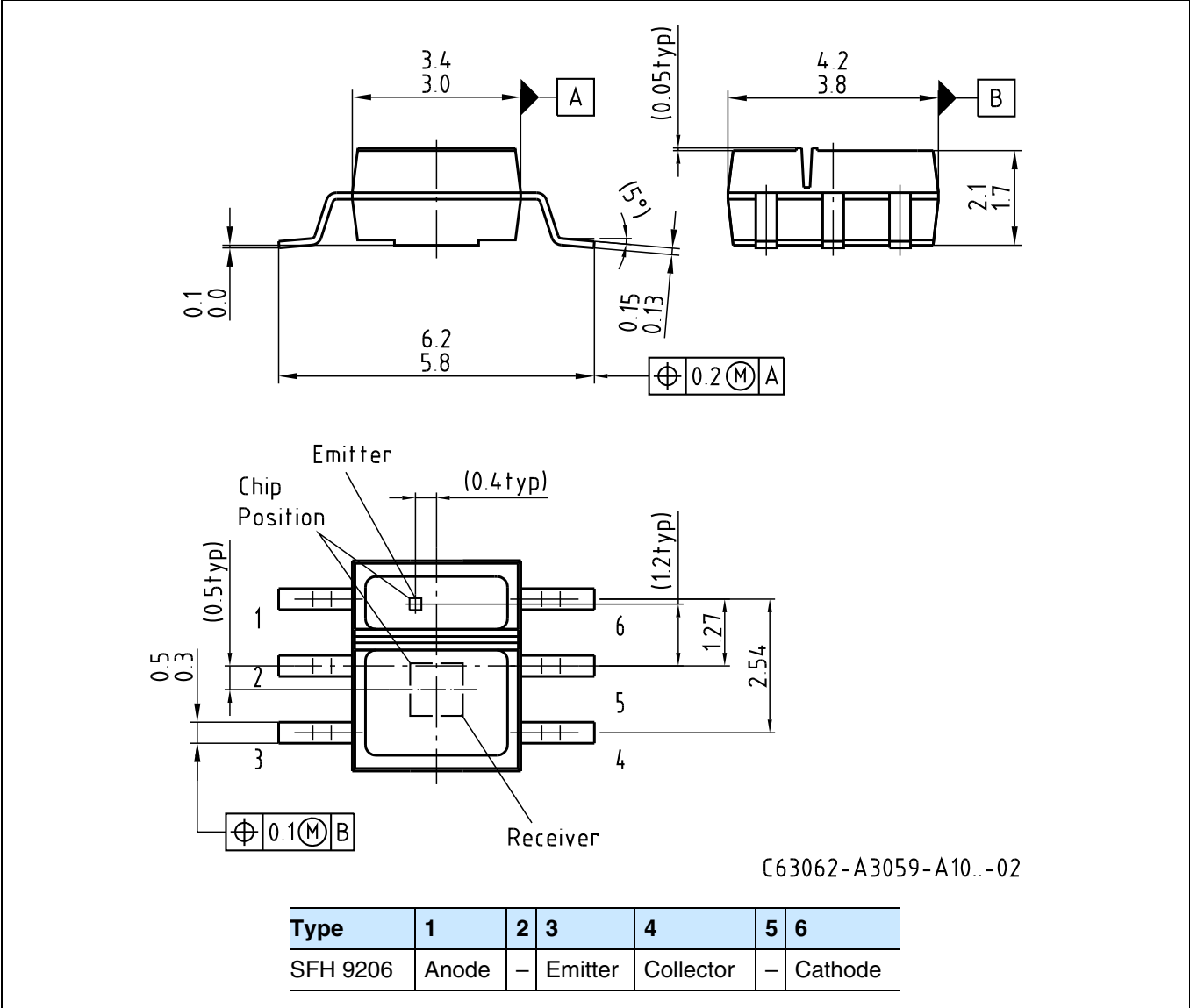
**Relative Spectral Sensitivity**  
 $S_{rel} = f(\lambda)$ ,  $T_A = 25\text{ }^\circ\text{C}$



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



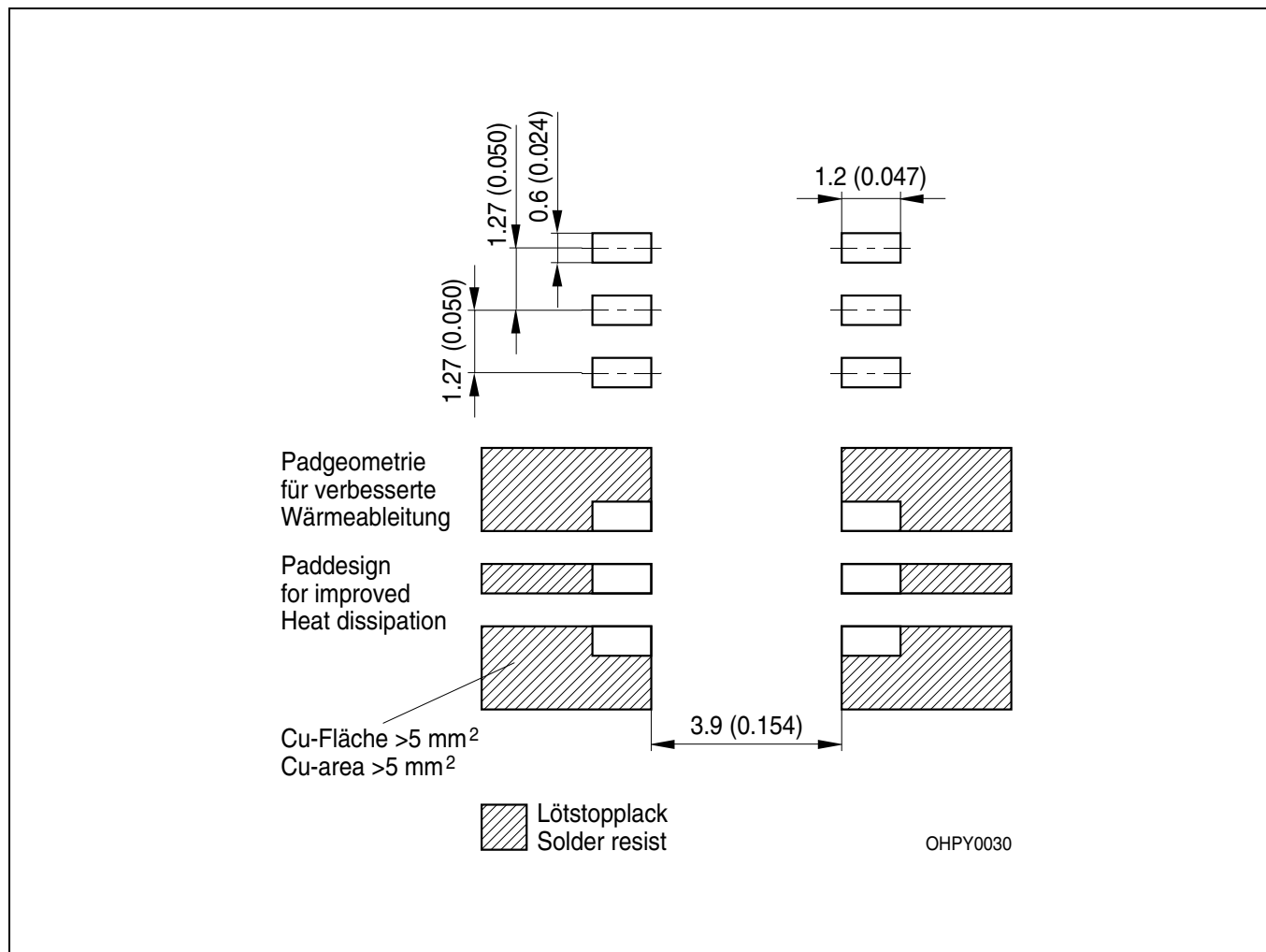
Maßzeichnung  
Package Outlines



Maße in mm / Dimensions in mm.

**Empfohlenes Lötpad design**  
**Recommended Solder Pad**

Reflow Lötén  
 Reflow Soldering

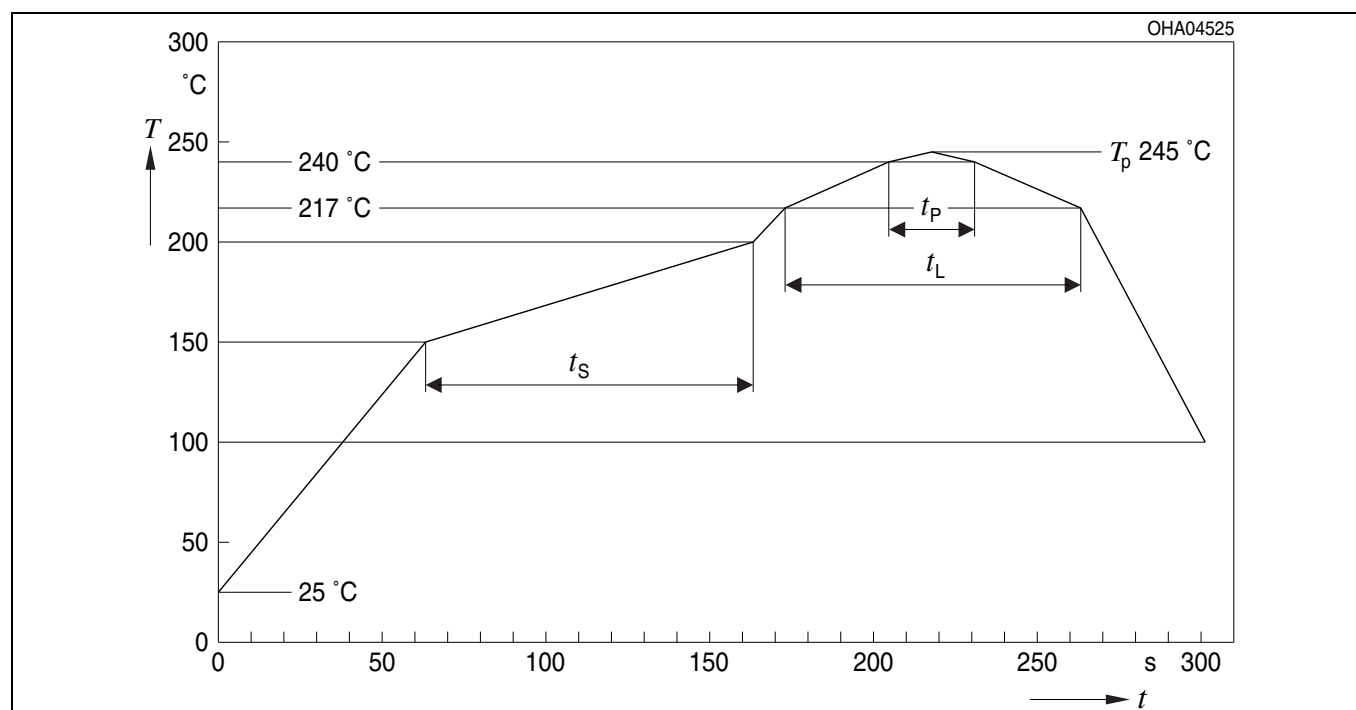


Maße in mm (inch) / Dimensions in mm (inch).



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

Vorbehandlung nach JEDEC Level 4  
 Preconditioning acc. to JEDEC Level 4  
 (nach J-STD-020D.01)  
 (acc. to J-STD-020D.01)



Profileigenschaften Profile Feature	Bleifreier Aufbau / Pb-Free Assembly (SnAgCu)	
	Empfehlung / Recommendation	Grenzwerte / Max. Ratings
Aufheizrate zum Vorwärmen*) / Ramp-up rate to preheat*) 25 °C to 150 °C	2 K / s	3 K / s
Zeit $t_s$ von $T_{Smin}$ bis $T_{Smax}$ / Time $t_s$ from $T_{Smin}$ to $T_{Smax}$ 150 °C to 200 °C	100 s	min. 60 s max. 120 s
Aufheizrate zur Spitzentemperatur*) / Ramp-up rate to peak*) 180 °C to $T_p$	2 K / s	3 K / s
Liquidustemperatur $T_L$ / Liquidus temperature $T_L$	217 °C	
Zeit $t_L$ über $T_L$ / Time $t_L$ above $T_L$	80 s	max. 100 s
Spitzentemperatur $T_p$ / Peak temperature $T_p$	245 °C	max. 260 °C
Verweilzeit $t_p$ innerhalb des spezifizierten Spitzentemperaturbereichs $T_p - 5$ K / Time $t_p$ within the specified peak temperature range $T_p - 5$ K	20 s	min. 10 s max. 30 s
Abkühlrate*) / Ramp-down rate*) $T_p$ to 100 °C	3 K / s	6 K / s maximum
Zeitspanne von 25 °C bis zur Spitzentemperatur / Time from 25 °C to peak temperature		max. 8 min.

Alle Temperaturen beziehen sich auf die Bauteilmittle, jeweils auf der Bauteiloberseite gemessen / All temperatures refer to the center of the package, measured on the top of the package

\* Steigungsberechnung  $\Delta T/\Delta t$ :  $\Delta t$  max. 5 s; erfüllt über den gesamten Temperaturbereich / slope calculation  $\Delta T/\Delta t$ :  $\Delta t$  max. 5 s; fulfillment for the whole T-range

**Gurtung / Polarität und Lage**

siehe Dokument: Short Form Katalog: Gurtung und  
Verpackung - SMT-Bauelemente - Gehäuse:SMT RLS

**Method of Taping / Polarity and Orientation** see document: Short Form Catalog: Tape and Reel -  
SMT-Components - Package: SMT-RLS

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