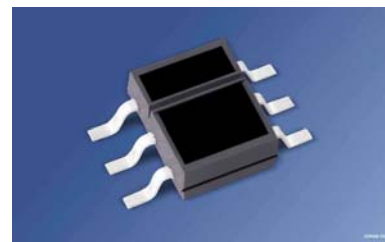


# Reflexlichtschranke mit Schmitt-Trigger Reflective Interrupter with Schmitt-Trigger Lead (Pb) Free Product - RoHS Compliant

SFH 9245



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

## Wesentliche Merkmale

- IR-GaAs-Lumineszenzdiode in Kombination mit einem Schmitt-Trigger IC
- SFH 9245: Output active low
- Tageslichtsperrfilter
- Einschaltstrom: typ. 1 mA
- Sender und Empfänger galvanisch getrennt
- Vorbehandlung nach JEDEC Level 4

## Anwendungen

- Optischer Schalter
- Pulsformer
- Zähler

## Features

- IR-GaAs-emitter in combination with a Schmitt-Trigger IC
- SFH 9245: Output active low
- Daylight cut-off filter
- Threshold current: typ. 1 mA
- Emitter and detector electrically isolated
- Preconditioning acc. to JEDEC Level 4

## Applications

- Optical threshold switch
- Pulseformer
- Counter

Typ Type	Bestellnummer Ordering Code	$I_{F,ON}$ [mA] ( $V_{CC} = 5\text{ V}$ , $d = 1\text{ mm}$ Kodak neutral white test card with 90% reflection)
SFH 9245	Q65111A3174	1 (< 5)

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

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

Sperrspannung Reverse voltage	$V_R$	5	V
Vorwärtsgleichstrom Forward current	$I_F$	50	mA
Stoßstrom ( $t_p \leq 10\ \mu\text{s}$ ) Surge current ( $t_p \leq 10\ \mu\text{s}$ )	$I_{FSM}$	0.7	A
Verlustleistung Power dissipation	$P_{tot}$	100	mW

**Empfänger** (Schmitt-Trigger IC)**Detector** (Schmitt-Trigger IC)

Versorgungsspannung Supply voltage	$V_{CC}$	- 0.5 ... + 20	V
Ausgangsspannung Output voltage	$V_O$	- 0.5 ... + 20	V
Ausgangsstrom Output current ( $T_A = 25\text{ °C}$ )	$I_O$	50	mA
Verlustleistung Power dissipation	$P_{tot}$	175	mW

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

Betriebs- und Lagertemperatur Operating and storage temperature range	$T_{op}, T_{stg}$	- 40 ... + 100	°C
Verlustleistung Power dissipation	$P_{tot}$	150	mW

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

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

Durchlassspannung Forward voltage $I_F = 50\text{ mA}$	$V_F$	1.55 ( $\leq 1.95$ )	V
Sperrstrom Reverse current $V_R = 5\text{ V}$	$I_R$	not designed for reverse operation	$\mu\text{A}$
Wärmewiderstand (Montage auf PC-Board mit > 5 mm <sup>2</sup> Padgröße) Thermal resistance (mounting on pcb with > 5 mm <sup>2</sup> pad size)	$R_{thJA}$	300	K/W

**Empfänger** (Schmitt-Trigger IC) (wenn nicht anders angegeben,  $V_{CC} = 5\text{ V}$ )**Detector** (Schmitt-Trigger IC) (unless otherwise specified,  $V_{CC} = 5\text{ V}$ )

Ausgangsspannung „high“ Output voltage “high” $I_O = 0$	$V_{OH}$	$V_{CC} (> 4.0)$	V
Ausgangsspannung „low“ Output voltage “low” $I_O = 16\text{ mA}$	$V_{OL}$	0.15 (< 0.4)	V
Stromaufnahme Supply current $V_{CC} = 5\text{ V}$ $V_{CC} = 18\text{ V}$	$I_{CC}$	3.3 (< 5) 5.0	mA
Anstiegszeit 10% bis 90% Rise time 10% to 90% $R_L = 280\ \Omega$ , $I_F = 20\text{ mA}$	$t_r$	20	ns
Abfallzeit 90% bis 10% Fall time 90% to 10% $R_L = 280\ \Omega$ , $I_F = 20\text{ mA}$	$t_f$	10	ns
Ausgangsverzögerungszeit Propagation delay time "ON" $R_L = 280\ \Omega$ , $I_F = 20\text{ mA}$	$t_{ON}$	1	$\mu\text{s}$

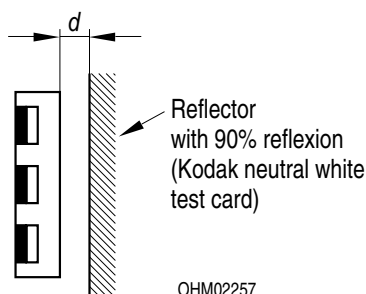
Kennwerte ( $T_A = 25\text{ °C}$ )

Characteristics (cont'd)

Bezeichnung Parameter	Symbol Symbol	Wert Value	Einheit Unit
Ausgangsverzögerungszeit Propagation delay time "OFF" $R_L = 280\ \Omega$ , $I_F = 20\text{ mA}$	$t_{\text{OFF}}$	2	$\mu\text{s}$

### Reflexlichtschranke Light Reflection Switch

Schaltswelle Threshold current, Kodak neutral white test card with 90% reflection $V_{\text{CC}} = 5\text{ V}$ , $d = 1\text{ mm}$	$I_{\text{F, ON}}$	1 (< 5)	mA
Hysterese Hysteresis	$I_{\text{F, OFF}} / I_{\text{F, ON}}$	0.6 (0.5 ... 0.9)	–



### Zulässiger Arbeitsbereich Operating Conditions

Bezeichnung Parameter	Symbol Symbol	Wert Value	Einheit Unit
Versorgungsspannung Supply voltage	$V_{\text{CC}}$	4 ... 18	V
Ausgangsstrom Output current	$I_{\text{O}}$	< 16	mA

Zur Stabilisierung der Versorgung wird ein Stützkondensator (angeschlossen zwischen  $V_{\text{CC}}$  und GND) von typ.  $0.1\ \mu\text{F}$  empfohlen.

A bypass capacitor,  $0.1\ \mu\text{F}$  typical, connected between  $V_{\text{CC}}$  and GND is recommended in order to stabilize power supply line.

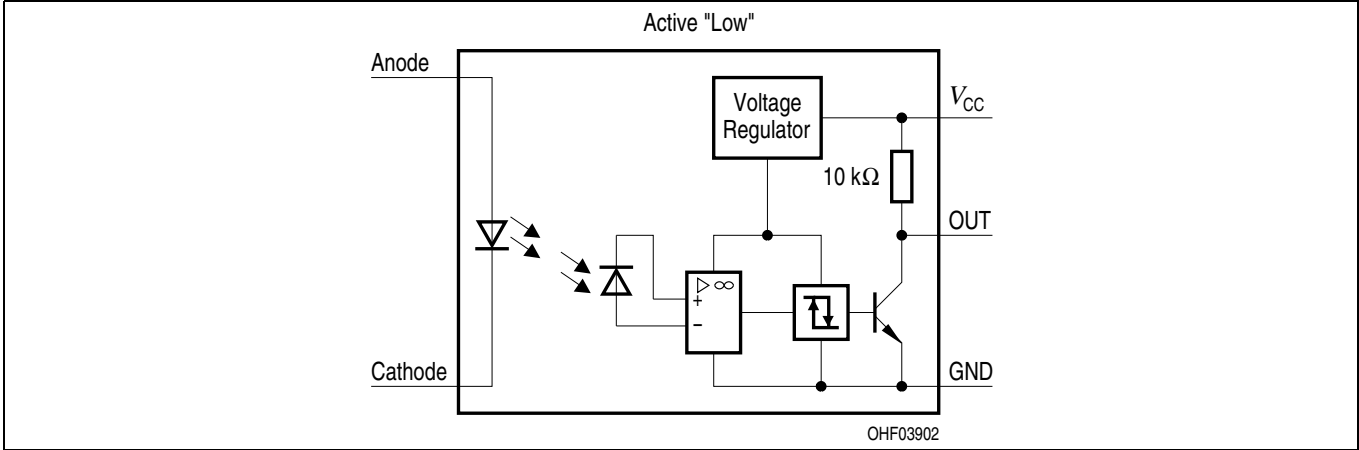


Figure 1 Block Diagram

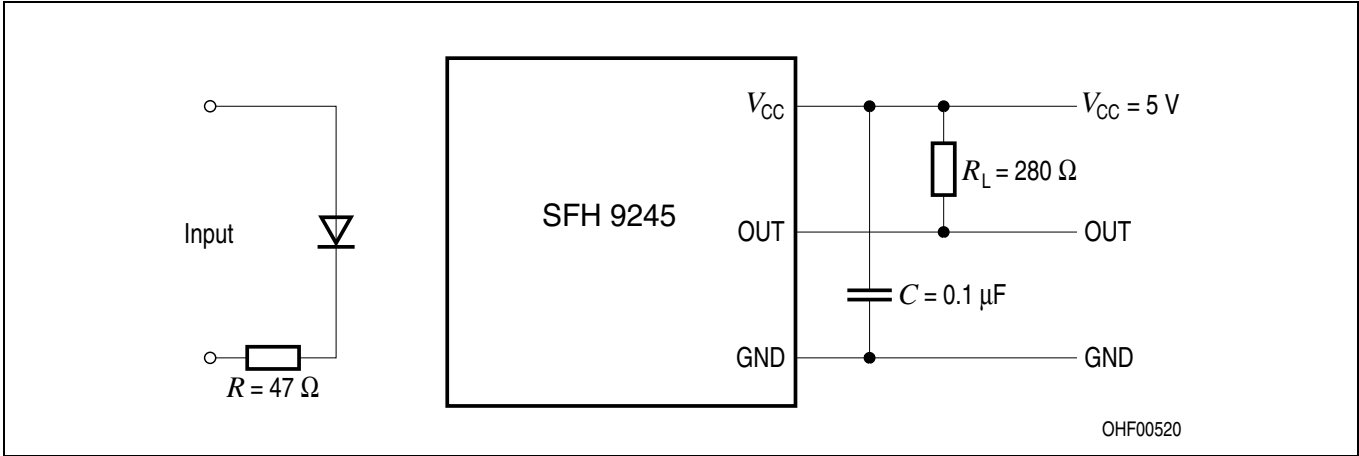


Figure 2 Test Circuit for Switching and Response Time

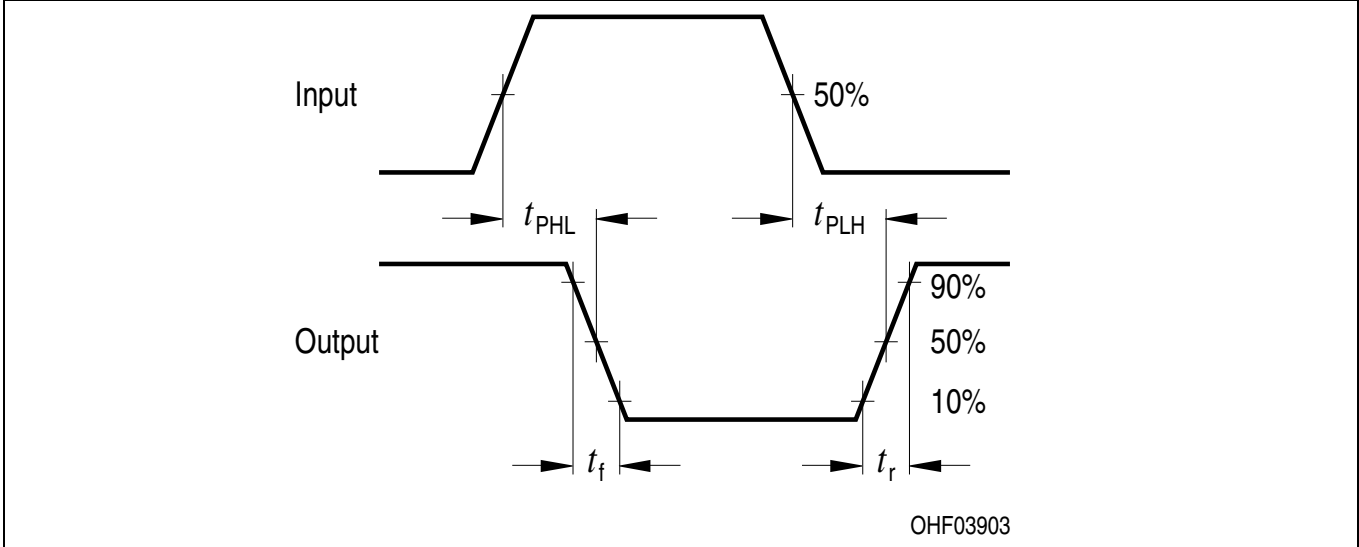
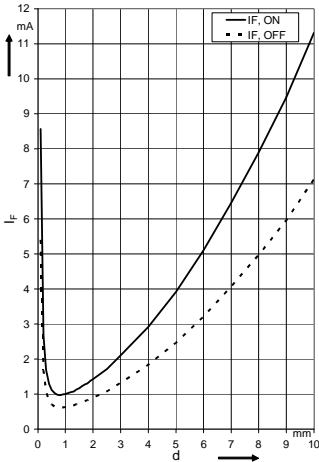


Figure 3 Switching Time Definitions

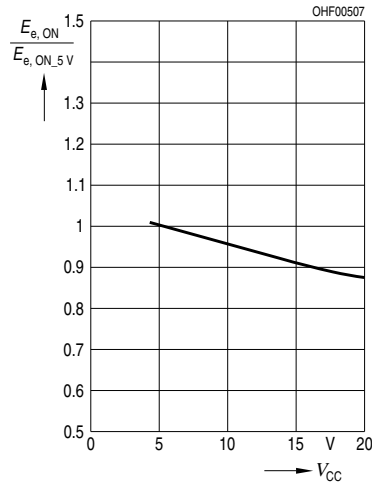
**Threshold Current vs. Distance**

$I_F = f(d)$



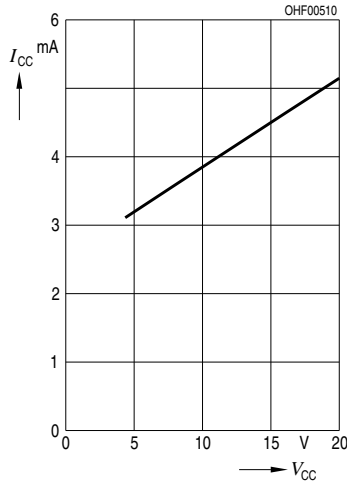
**Relative Threshold**

$E_{e, ON} / E_{e, ON V_{CC} = 5 V} = f(V_{CC})$



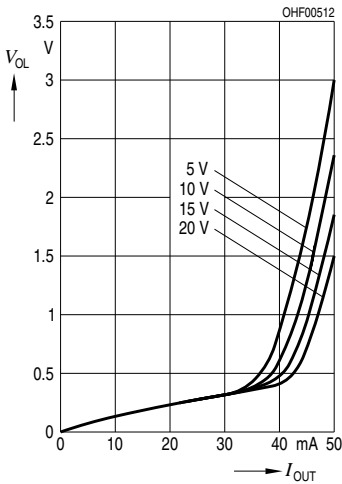
**Supply Current**

$I_{CC} = f(V_{CC})$



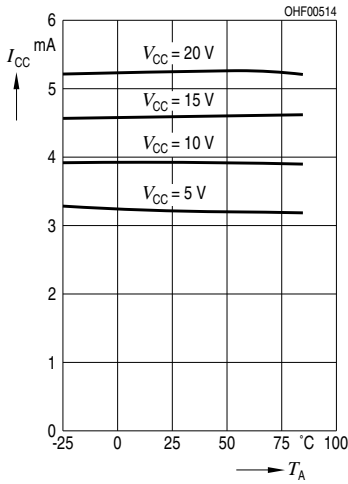
**Output Voltage**

$V_{OL} = f(I_{OUT}, V_{CC})$



**Supply Current vs. Ambient Temperature**

$I_{CC} = f(T_A, V_{CC})$



**Perm. Pulse Handling Capability**

$I_F = f(t_p)$ , Duty cycle  $D$  = parameter,  $T_A = 25\text{ °C}$

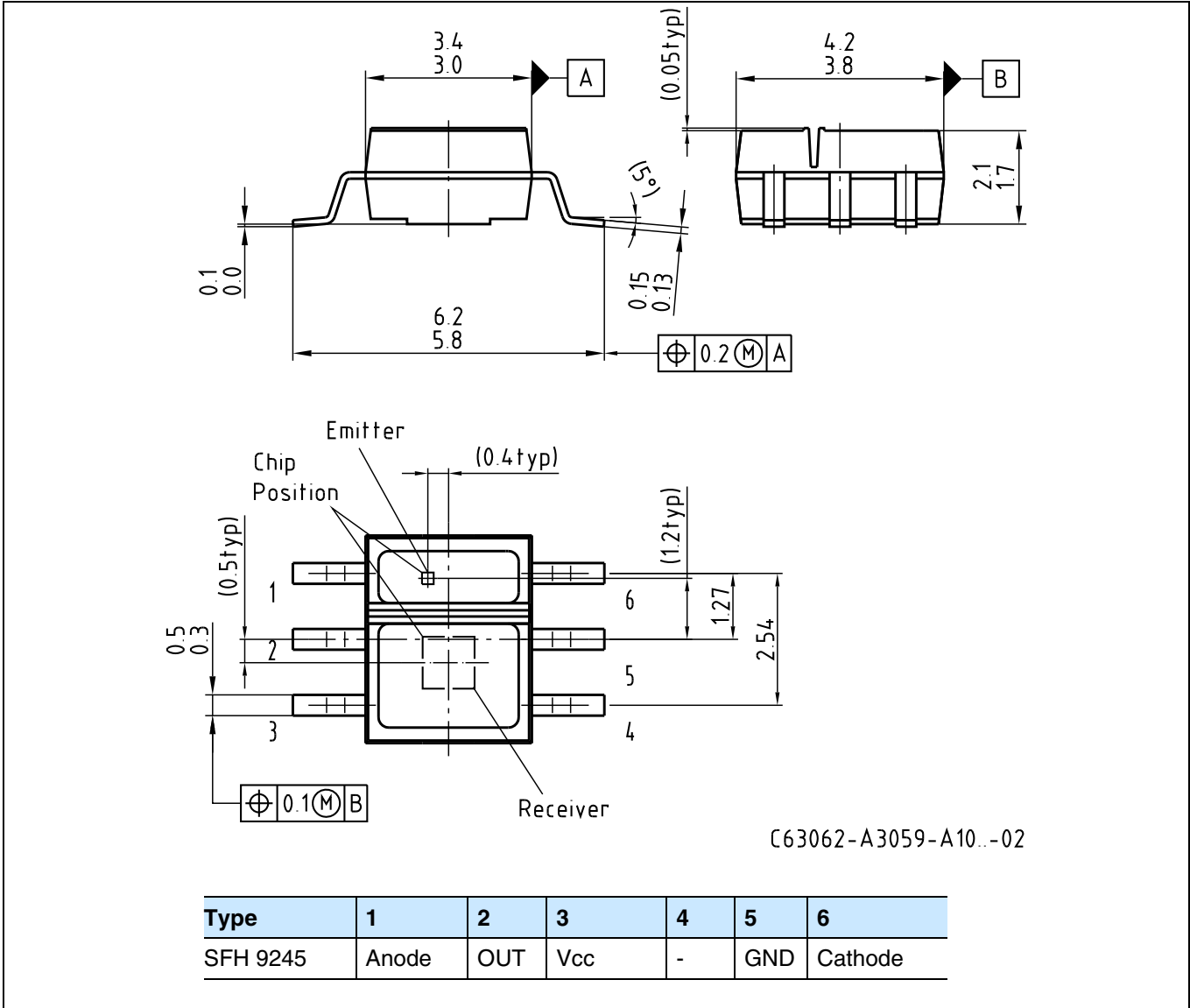
TBD

**Perm. Pulse Handling Capability**

$I_F = f(t_p)$ , Duty cycle  $D$  = parameter,  $T_A = 85\text{ °C}$

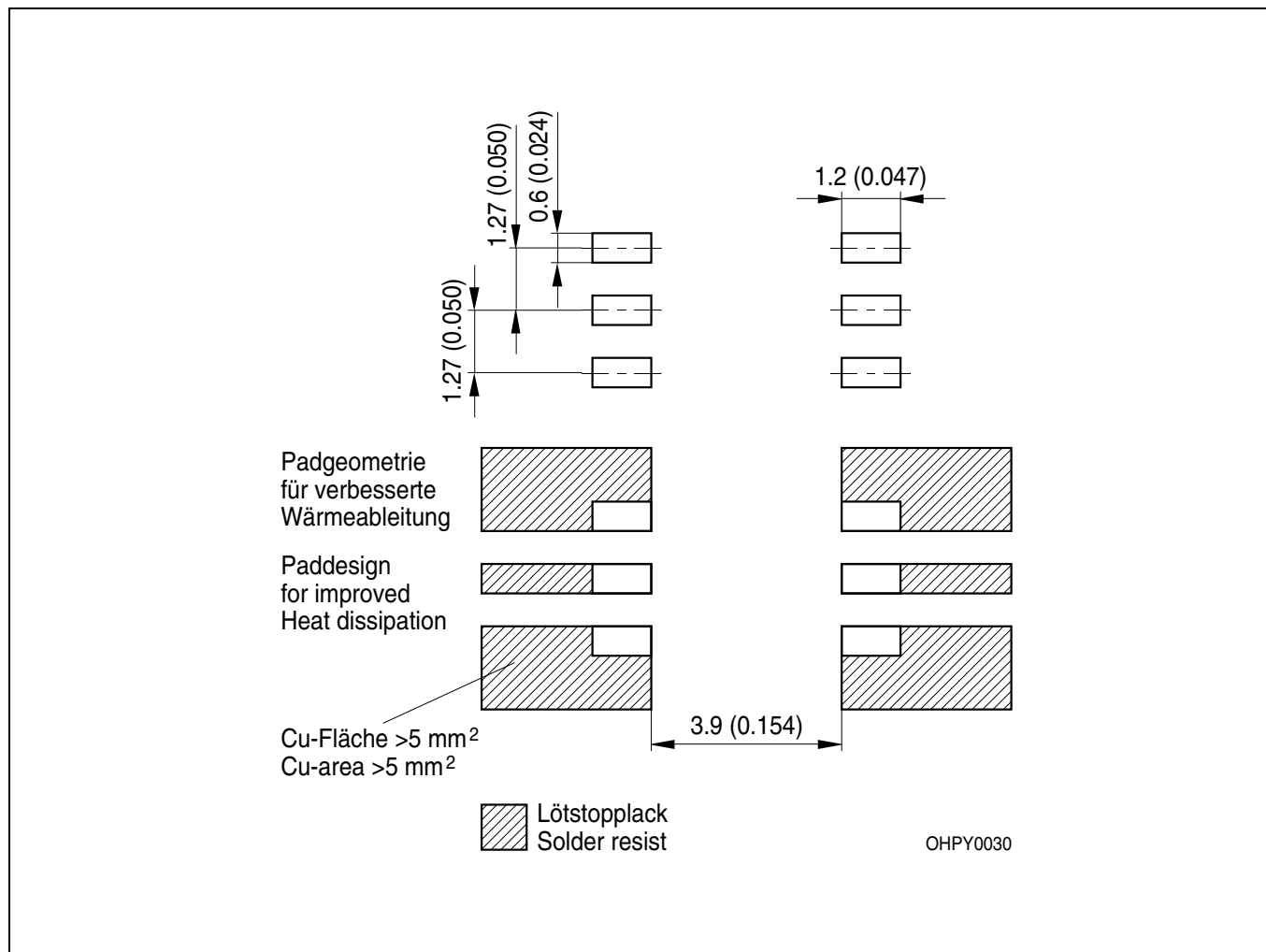
TBD

Maßzeichnung  
Package Outlines



Maße in mm / Dimensions in mm.

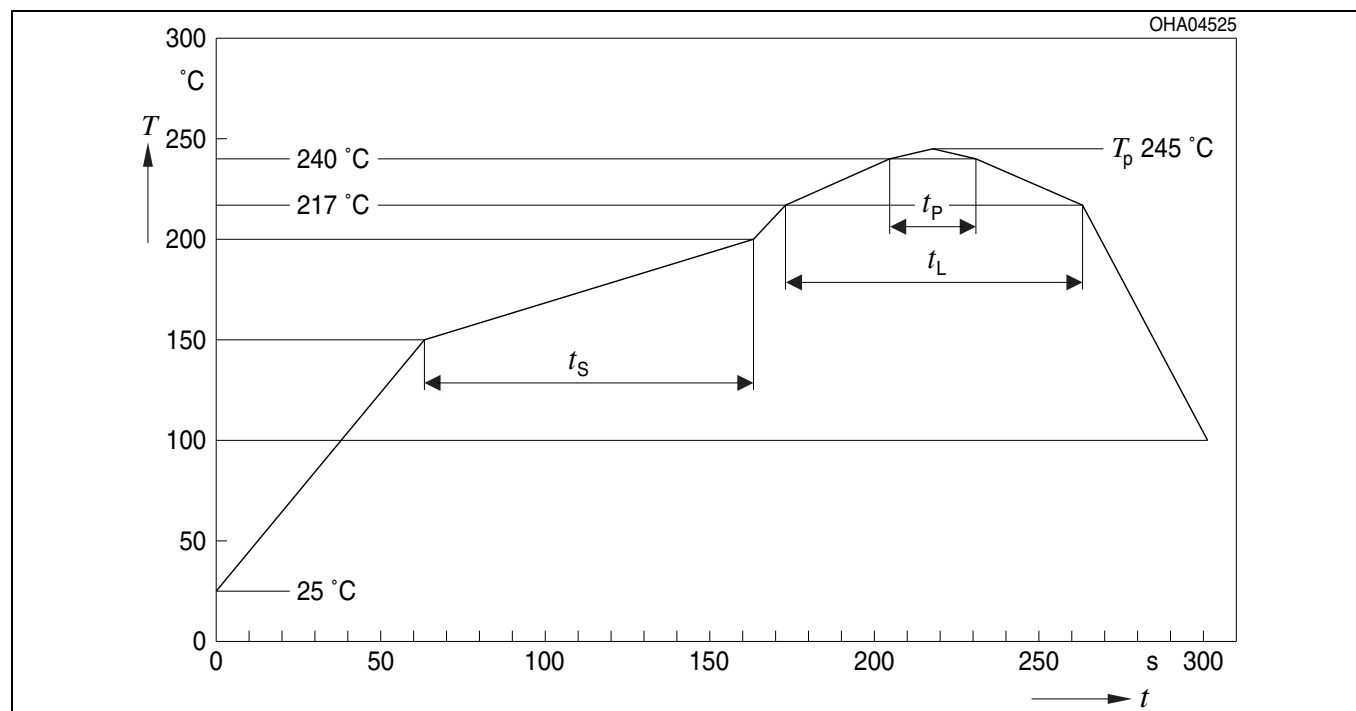
**Empfohlenes Lötpaddesign** Reflow Löten  
**Recommended Solder Pad** Reflow Soldering



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 Bauteilmitte, 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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