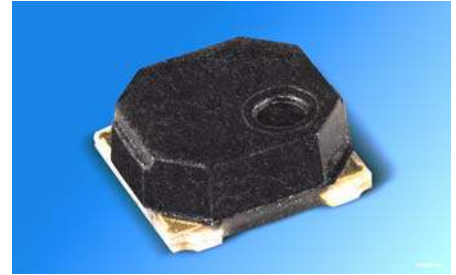


**SMD Kippsensor mit digitalem Ausgang (SFH 7710)**  
**SMD Orientation-Sensor with digital output (SFH 7710)**  
**Lead (Pb) Free Product - RoHS Compliant**

**SFH 7710**



**Wesentliche Merkmale**

- optische Erkennung der Verkippung durch gravitationsabhängige Position einer Stahlkugel
- Niedriger Stromverbrauch
- digitaler Ausgang, open drain
- definierter Schaltwinkelbereich
- sehr kleines SMD Gehäuse
- IC gesteuerter Sensor

**Anwendungen**

- Digitalkameras
- Camcorder
- Mobiltelefone
- Computer Zubehör

**Features**

- optical detection of orientation by gravity dependent position of a steel ball
- Low current consumption
- digital output, open drain
- defined range of switching angle
- very small SMD package
- IC controlled sensor

**Applications**

- Digital cameras
- Camcorders
- Mobile phones
- Computer peripherals

Typ Type	Bestellnummer Ordering Code
SFH 7710	Q65110A4407

**Grenzwerte**  
**Maximum Ratings**

Bezeichnung Parameter	Symbol Symbol	Wert Value	Einheit Unit
Versorgungsspannung Supply voltage	$V_{cc}$	-0.2...6	V
Ausgangsspannung Output voltage	$V_o$	-0.3...4.5	V
Ausgangsstrom Output current	$I_o$	10	mA
Lagertemperatur Storage temperature range	$T_s$	-40...100	°C
Elektrostatische Entladung Electrostatic discharge - human body model (according to: Class I) - machine model (according to: AEC-Q100-003-REV-D, classification M3)	$V_{ESD}$	2 200	kV V
latch up Schutz latch-up protection (according to: EIA/JESD78 Class I)		20	mA

**Empfohlener Arbeitsbereich**  
**Recommended Operating conditions**

Bezeichnung Parameter	Symbol Symbol	Wert Value		Einheit Unit
		Min	Max	
Betriebstemperatur Full operational ambient temperature range	$T_A$	-20	+65	°C
Versorgungsspannung Supply voltage	$V_{cc}$	2.3	3.6	V
Versorgungsspannungsstörungen * (Frequenzbereich: 0...20kHz) Supply voltage noise (frequency range: 0...20kHz)	$dV_{cc pp}$		0.2	V
Ausgangsspannung Output voltage	$V_o$	1.7	3.6	V
Pull-up Widerstand Pull-up resistance	$R_{pull up}$	10	100	kOhm

\* Der Emitter wird mit 10mA gepulst betrieben; das bedeutet, dass jeder Widerstand in Serie zu  $V_{cc}$  einen Spannungsabfall in der Versorgungsleitung verursacht. Daher wird empfohlen, diesen Serienwiderstand kleiner 10 Ohm zu halten. Die minimale Versorgungsspannung ( $V_{cc min}$ ) darf keinesfalls unterschritten werden.

\* The emitter is driven with 10 mA in pulsed mode; this means that any series resistor to  $V_{cc}$  causes a voltage drop on the power line. It is recommended to keep the series resistor below 10 Ohm. The supply voltage may not fall below  $V_{cc min}$

**Kennwerte****Characteristics**

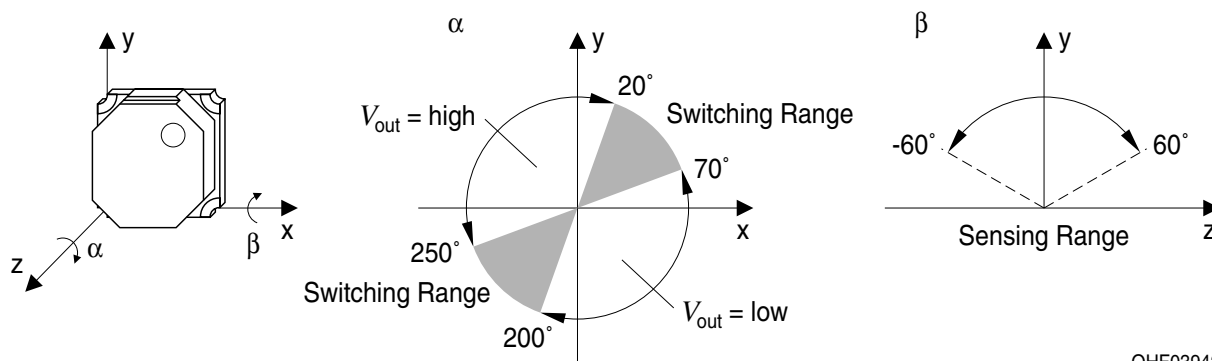
(TA=25°C)

Bezeichnung Parameter	Symbol Symbol	Wert Value			Einheit Unit
		Min.	Typ.	Max.	
Minimale Betriebsspannung für Startphase (siehe Figure 3) Minimum required supply voltage for start-up (see Figure 3)	$V_{cc,start}$	0.8		2.0	V
Länge der Startphase (siehe Figure 3) Start up time (see Figure 3)	$t_{start}$	60		120	ms
Durchschnittlicher Stromaufnahme <sup>1)</sup> mean current consumption <sup>1)</sup>	$I_{mean}$			50	$\mu A$
Spitzenstromaufnahme <sup>2)</sup> peak current consumption <sup>1)</sup>	$I_{peak}$			20	mA
Ausgangsleckstrom „high“ Output leakage current „high“ $V_o = 3,6V$	$I_{OH}$			5	$\mu A$
Ausgangsleckstrom „low“ Output leakage current „low“ $I_{OL} = 10mA$ ( $V_{cc} = 2,3V$ )	$V_{OL}$			0.5	V
Aktualisierung des Ausgangssignals <sup>1)</sup> Refresh of output signal <sup>1)</sup>	$t_{refresh}$		90		ms
Kippwinkel mit Ausgangszustand „low“ (siehe Figure1) Tilt angle with output state „low“ (see Figure 1)	$\alpha_t$	70		200	°
Kippwinkel mit Ausgangszustand „high“ (siehe Figure1) Tilt angle with output state „high“ (see Figure 1)	$\alpha_u$	250		20	°

<sup>1)</sup> gepulster Betrieb: Dauer LED an: ~44 $\mu s$  / Dauer LED aus: ~90ms  
pulsed operation mode: LED on time: ~44 $\mu s$  / LED off time: ~90ms

<sup>2)</sup> gepulster Betrieb: Dauer LED an: ~44 $\mu s$  / Dauer LED aus: ~90ms  
pulsed operation mode: LED on time: ~44 $\mu s$  / LED off time: ~90ms

## Funktionsdiagramm Functional diagram



OHF03942

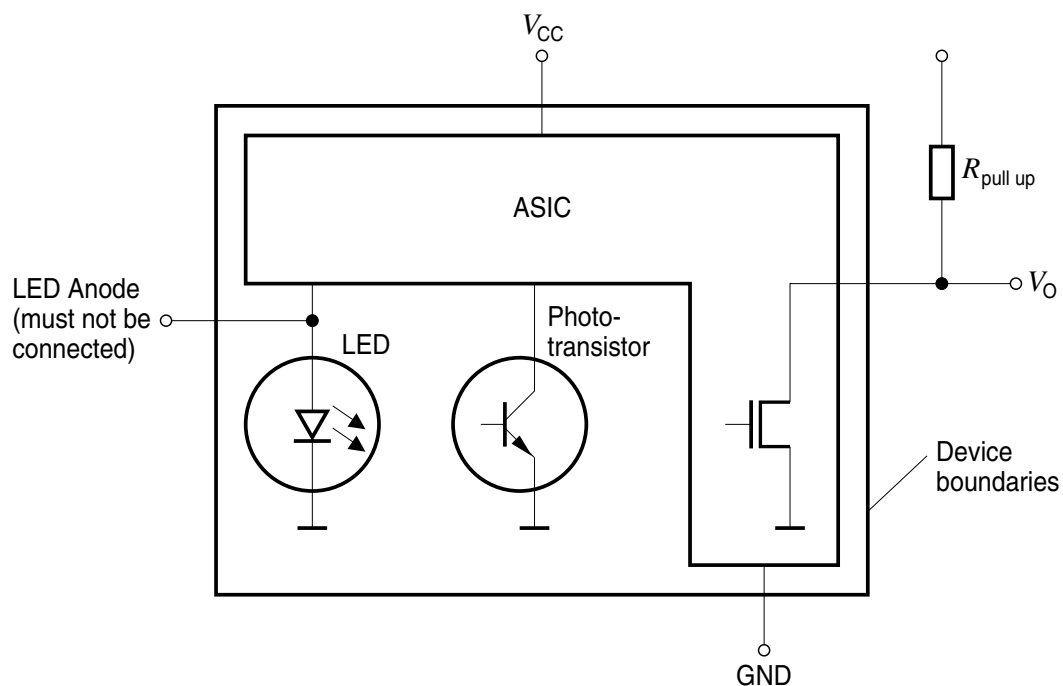
Figure1:

Erfassungscharakteristik / Detecting characteristics

(Unter extremen Bedingungen (hohe Temperatur und/oder hohe relative Feuchte) kann vorübergehend eine grössere Schaltwinkeltoleranz auftreten)

(Under extreme conditions (high temperature and/or high relative humidity) a wider switching angle tolerance can occur temporarily)

**Blockdiagramm**  
**block diagram**



OHF03939

Figure2:

Blockdiagramm (empfohlener Pull-Up-Widerstand  $R_{\text{pull up}} = 10\text{k}\Omega \dots 100\text{k}\Omega$ )

Block diagram (recommended Pull up resistance  $R_{\text{pull up}} = 10\text{k}\Omega \dots 100\text{k}\Omega$ )

## Startverhalten und Ablaufdiagramm

### Start-up behavior and Timing diagramm

Der Ausgang ist immer hochohmig, wenn an  $V_{CC}$  keine Spannung angeschlossen ist. Wenn die Versorgungsspannung  $V_{CC}$ , start erreicht, bleibt der Ausgang für 60ms  $t_{start} < 120ms$  auf „low“. Anschließend findet etwa alle 90ms eine Messung der Orientierung statt und der Ausgang wird entsprechend geschaltet.

The Output is always high ohmic when voltage at  $V_{CC}$  is not connected. When supply voltage reaches  $V_{CC}$ , start the sensor output stays low for 60ms  $t_{start} < 120ms$ . Subsequently approx. every 90ms the orientation is measured and the output is set accordingly.

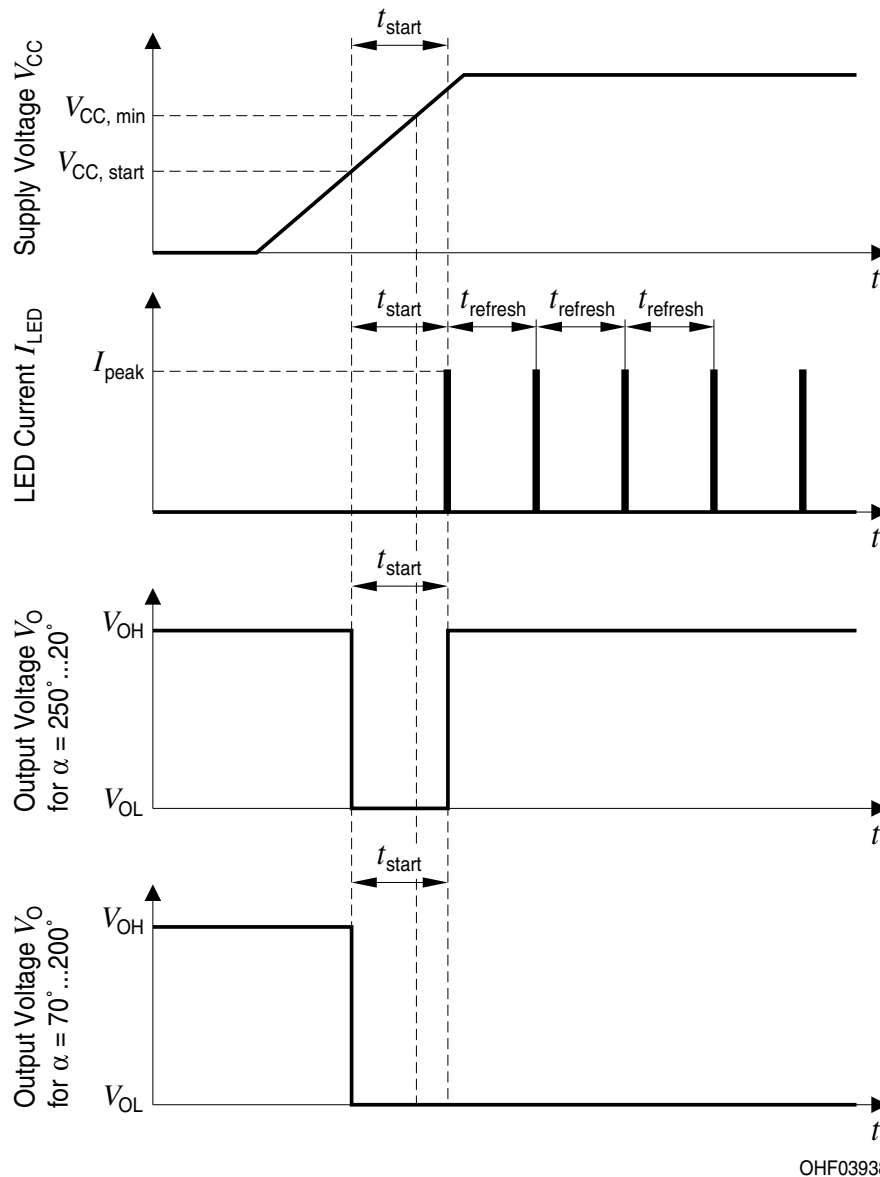
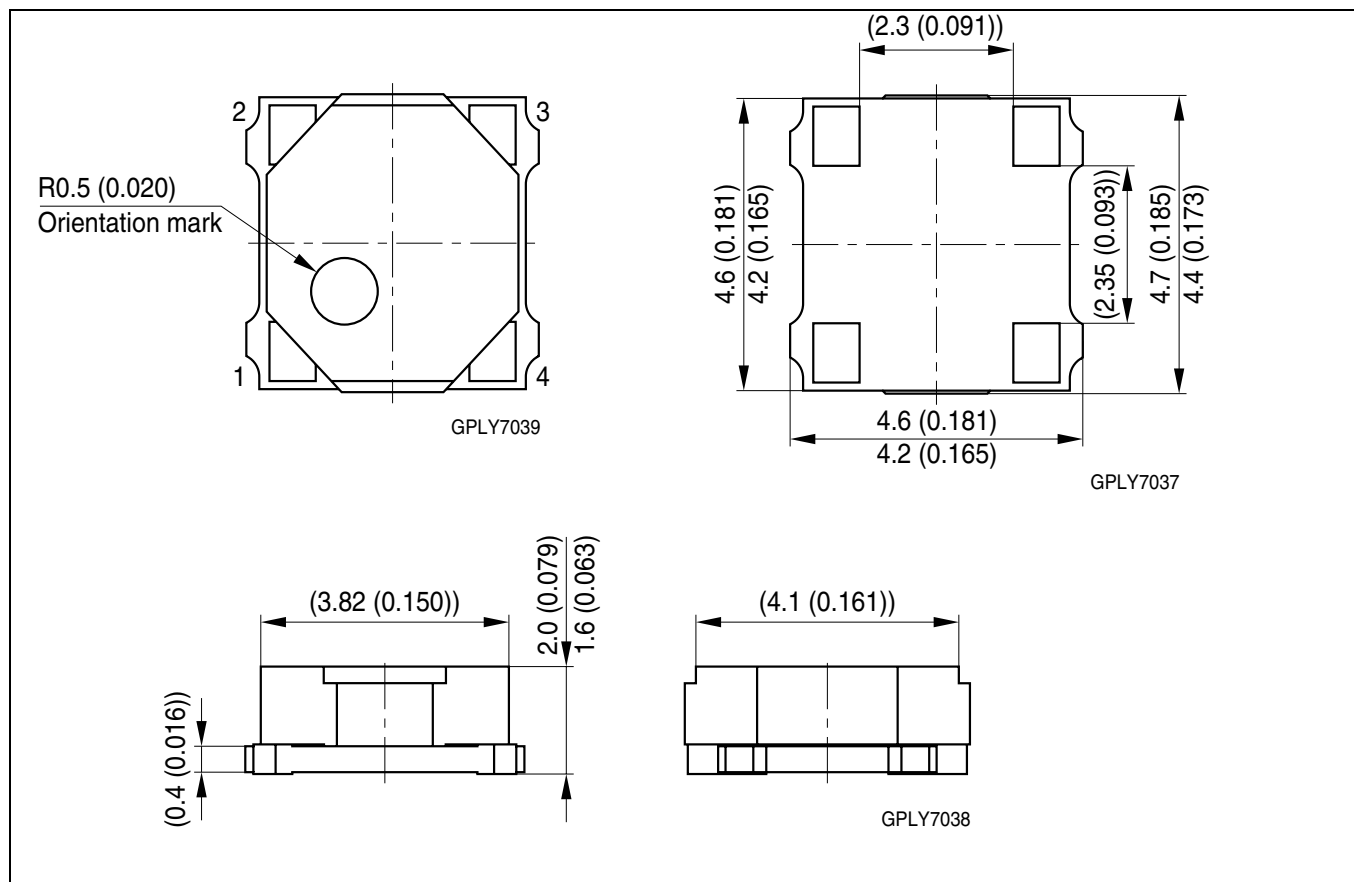


Figure 3:  
Startverhalten und Ablaufdiagramm des Sensors  
Start-up behavior and Timing diagram of sensor

## Maßzeichnung Package Outlines



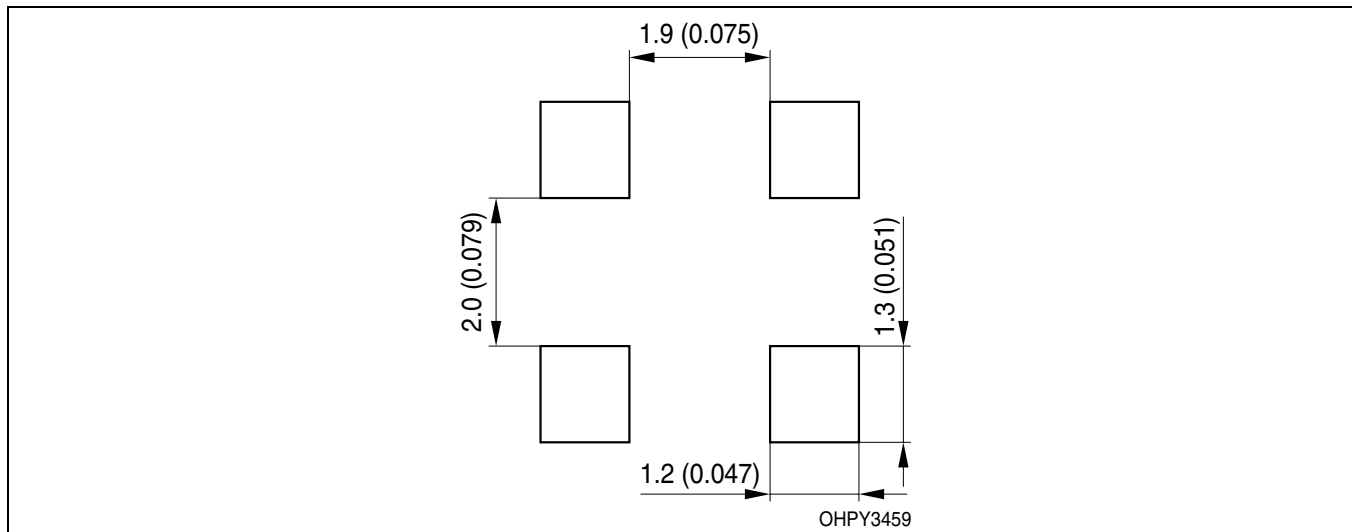
Maße in mm (inch) / Dimensions in mm (inch)

## Anschlußbelegung Pin configuration

Pin #	Description
1	GND
2	Vcc
3	LED Anode (must not be connected)
4	Out

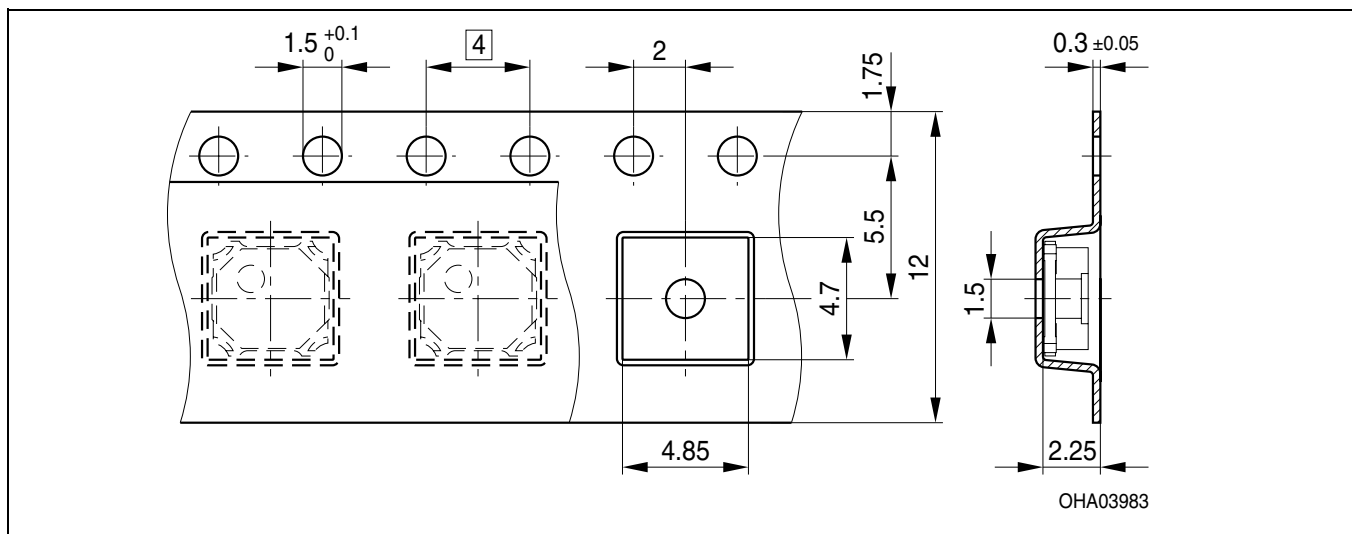


**Empfohlenes Lötpaddesign**  
**Recommended Solderpad Design**



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

**Gurtung und Lage**  
**Method of taping and orientation**



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

## Lötbedingungen Soldering Conditions

Vorbehandlung nach JEDEC Level 4  
Preconditioning acc. to JEDEC Level 4

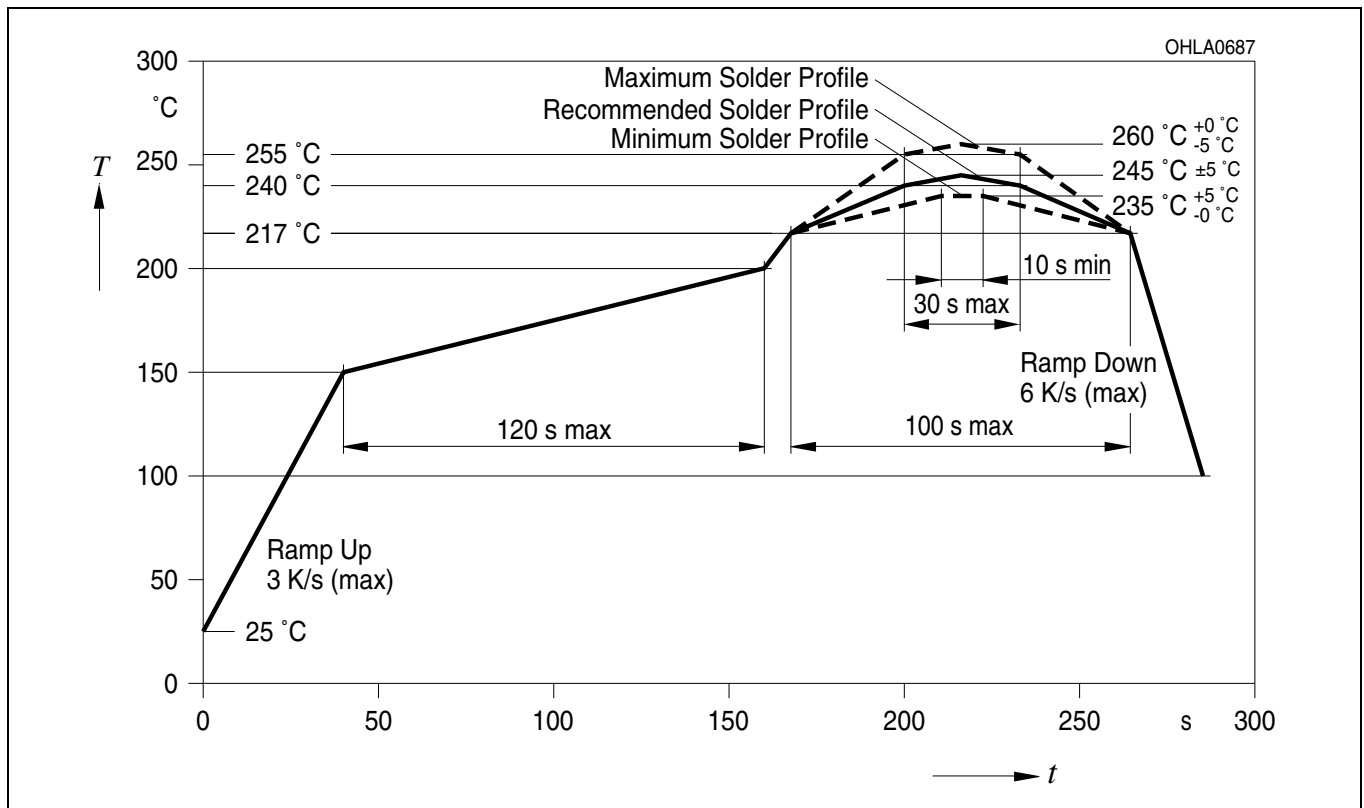


Figure 8: Temperaturprofil für Reflow-Löten (Der Sensor darf nach dem Löten nicht gewaschen werden.)  
Temperature profile for Reflow-soldering (Do not wash the sensor after soldering)

EU RoHS and China RoHS compliant product



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