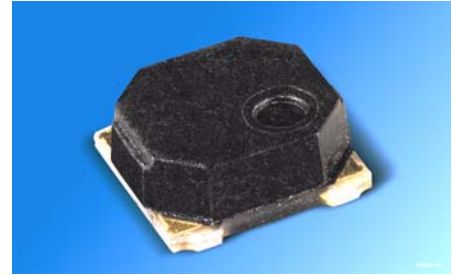


SMD Kippsensor mit digitalem Ausgang (SFH 7710)
SMD Orientation-Sensor with digital output (SFH 7710)
Lead (Pb) Free Product - RoHS Compliant

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**

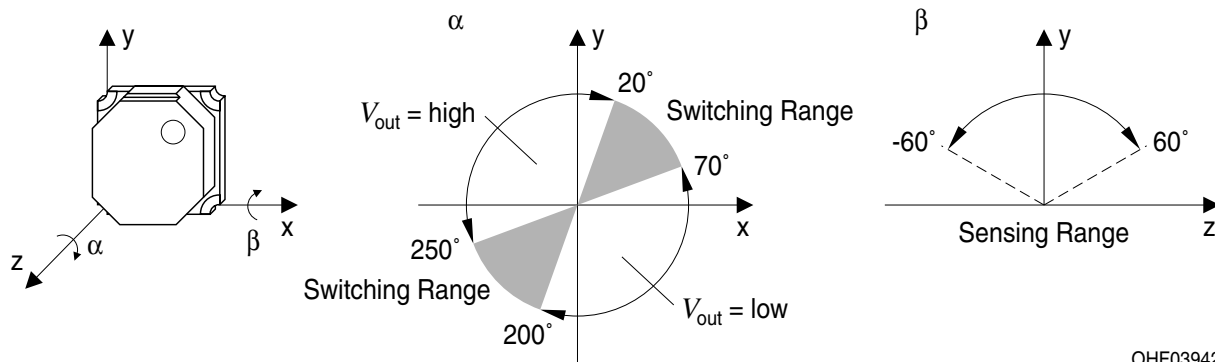
(TA=25°C)

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 ¹⁾ mean current consumption ¹⁾	I_{mean}			50	μ A
Spitzenstromaufnahme ²⁾ peak current consumption ¹⁾	I_{peak}			20	mA
Ausgangsleckstrom „high“ Output leakage current „high“ $V_o = 3,6V$	I_{OH}			5	μ A
Ausgangsleckstrom „low“ Output leakage current „low“ $I_{OL} = 10mA$ ($V_{cc} = 2,3V$)	V_{OL}			0.5	V
Aktualisierung des Ausgangssignals ¹⁾ Refresh of output signal ¹⁾	$t_{refresh}$		90		ms
Kippwinkel mit Ausgangszustand „low“ (siehe Figure1) Tilt angle with output state „low“ (see Figure 1)	α_t	70		200	°
Kippwinkel mit Ausgangszustand „high“ (siehe Figure1) Tilt angle with output state „high“ (see Figure 1)	α_u	250		20	°

1) gepulster Betrieb: Dauer LED an: ~44 μ s / Dauer LED aus: ~90ms
pulsed operation mode: LED on time: ~44 μ s / LED off time: ~90ms

2) gepulster Betrieb: Dauer LED an: ~44 μ s / Dauer LED aus: ~90ms
pulsed operation mode: LED on time: ~44 μ s / LED off time: ~90ms

Funktionsdiagramm Functional diagram



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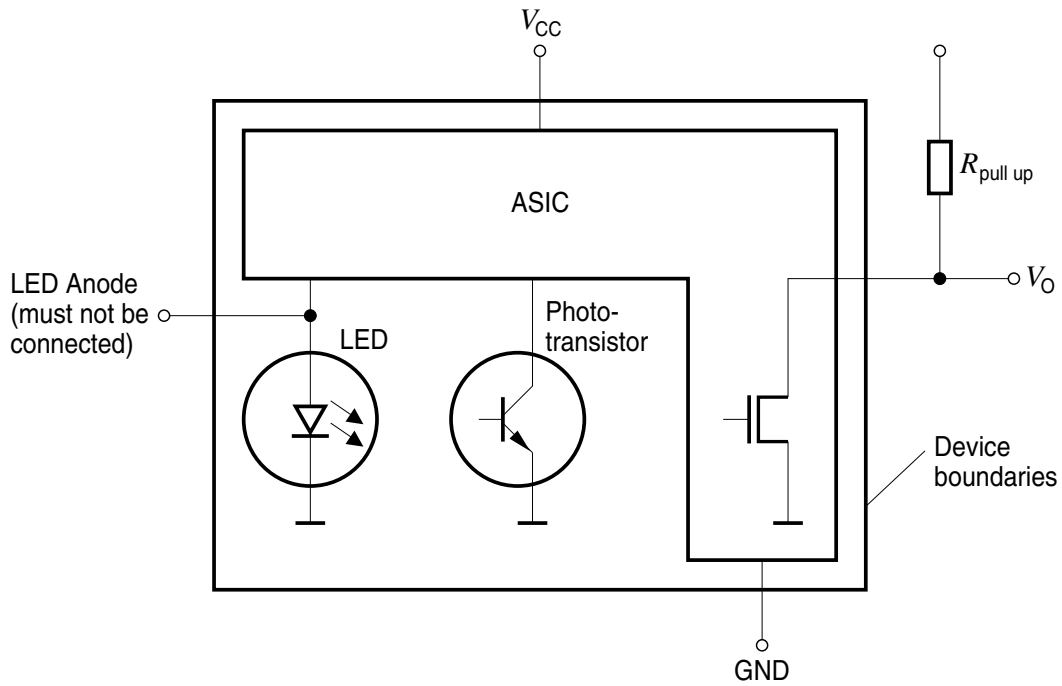
Figure1:

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.

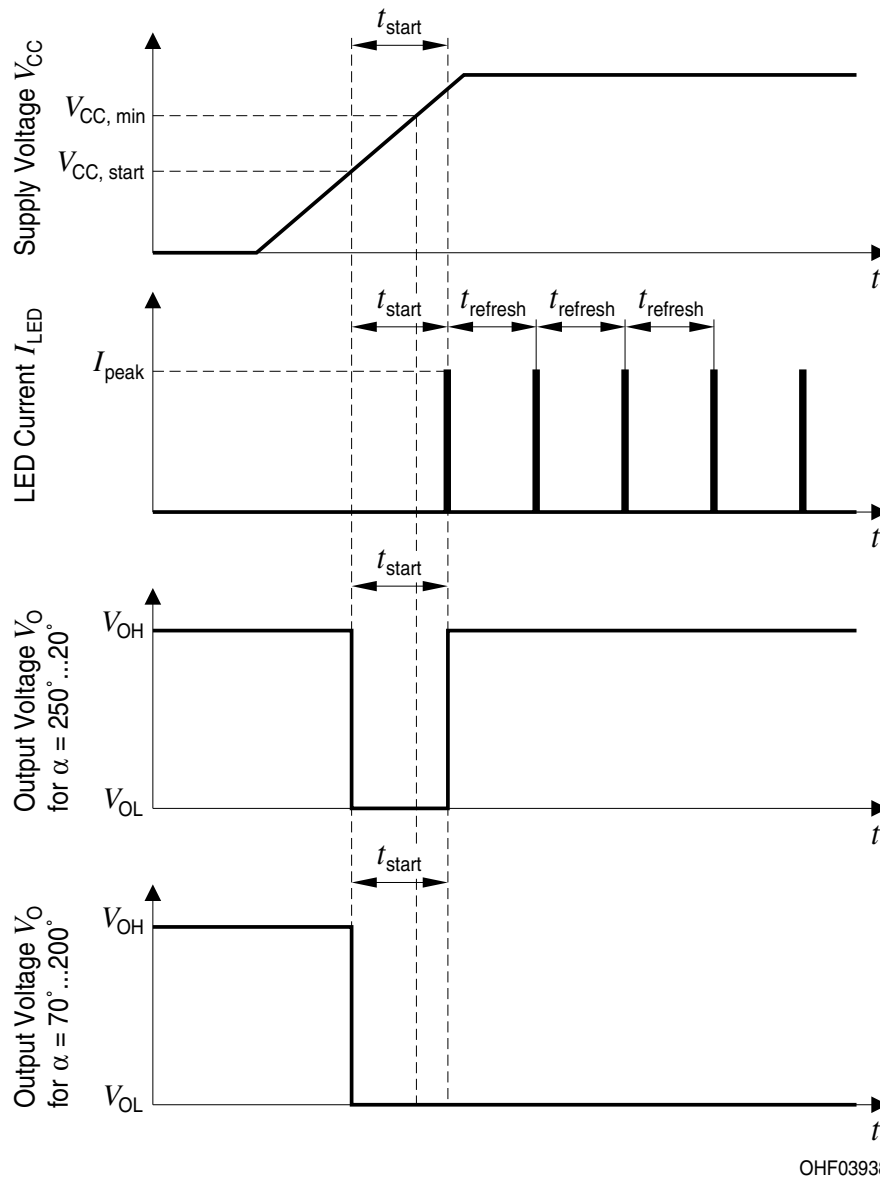
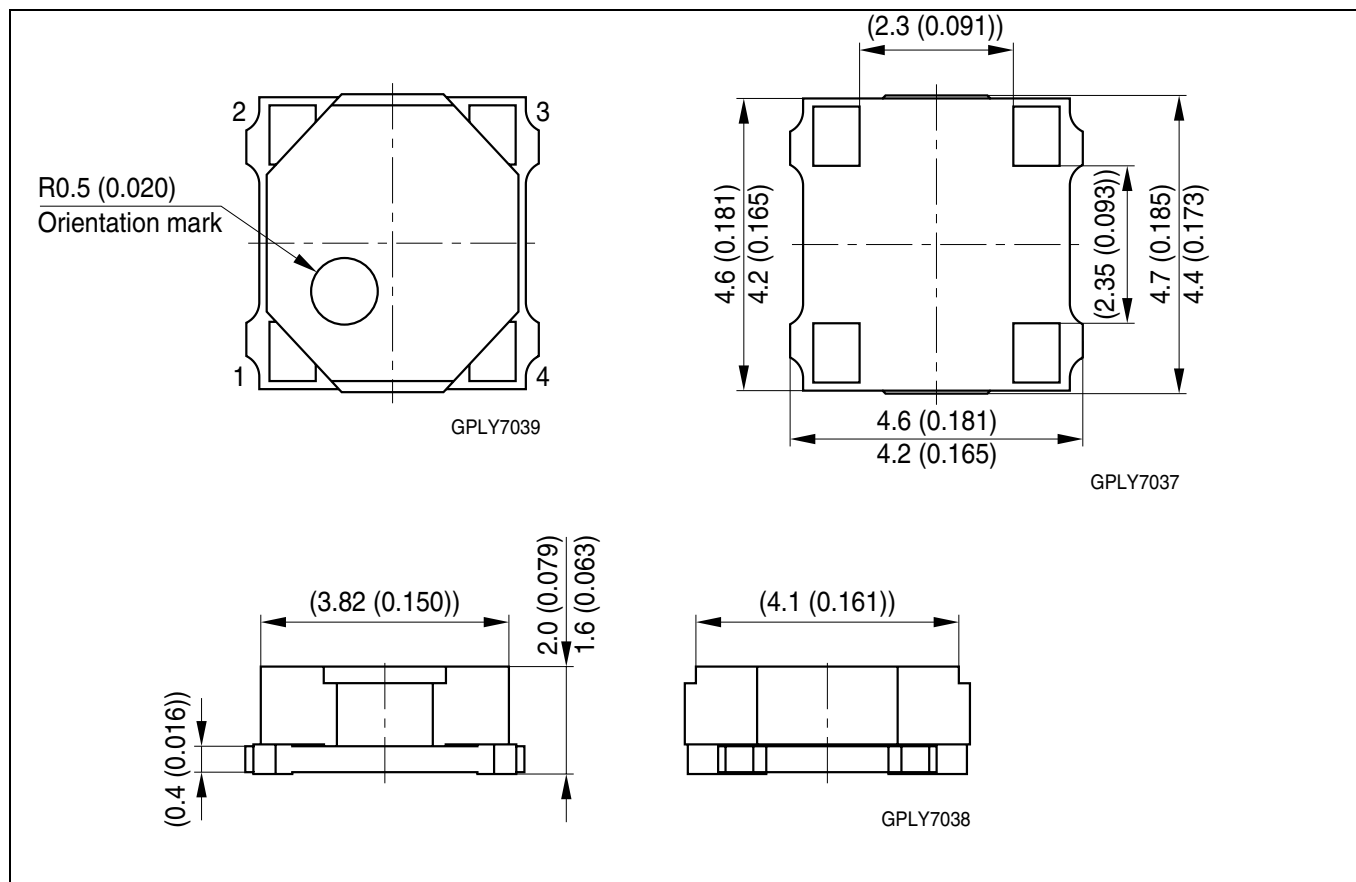


Figure 3:
Startverhalten und Ablaufdiagramm des Sensors
Start-up behavior and Timing diagram of sensor

Maßzeichnung Package Outlines

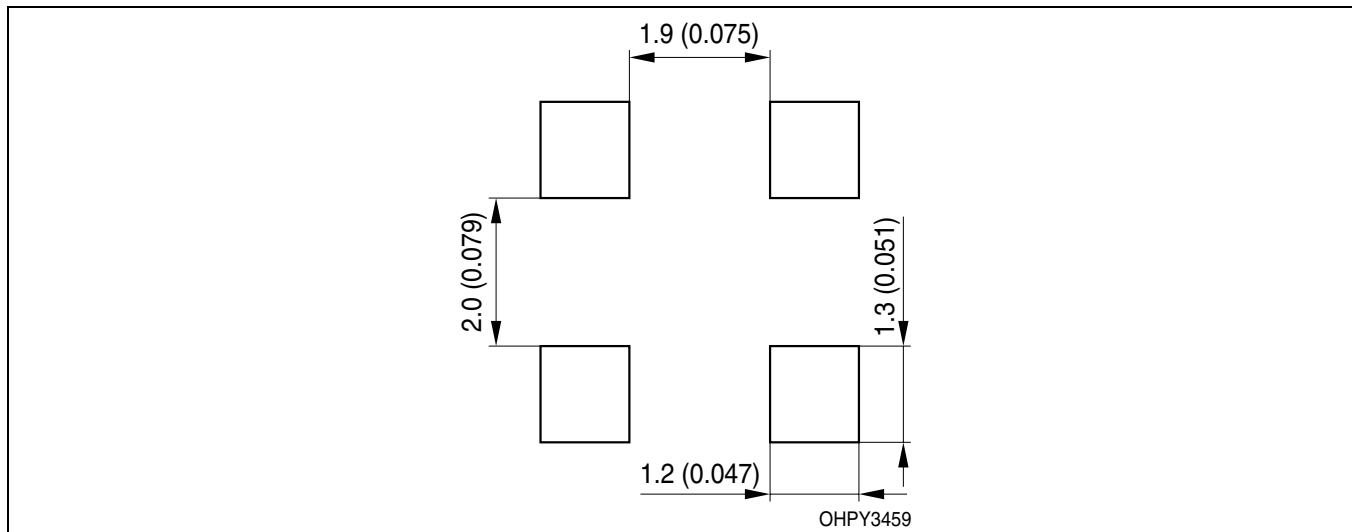


Maße in mm (inch) / Dimensions in mm (inch)

Anschlußbelegung Pin configuration

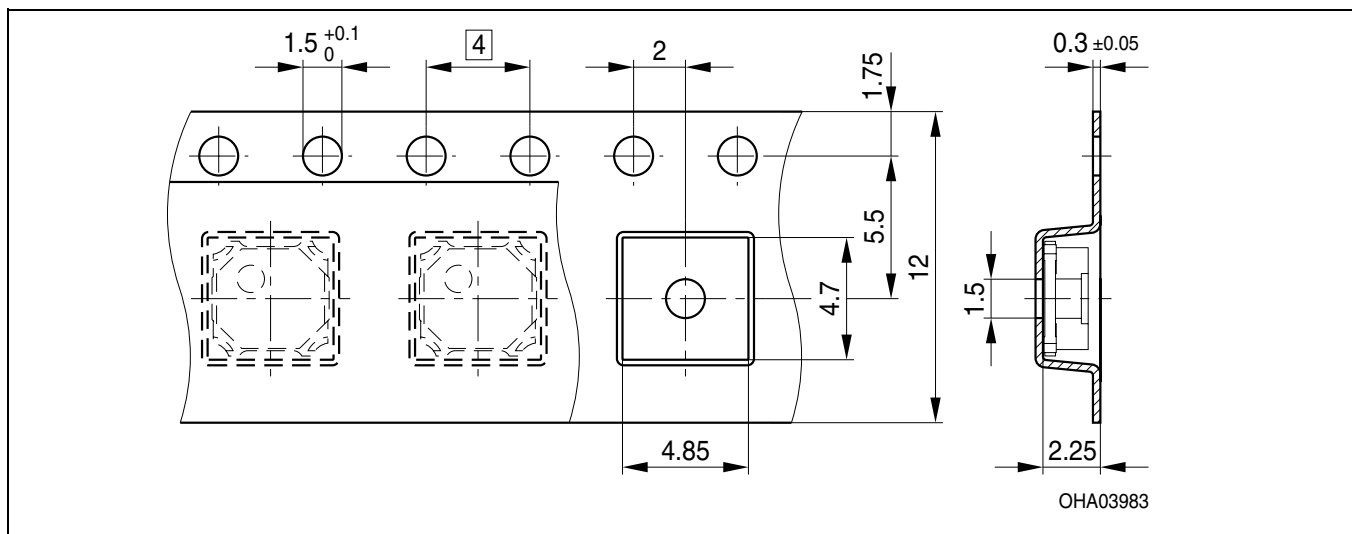
Pin #	Description
1	GND
2	Vcc
3	LED Anode (must not be connected)
4	Out

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

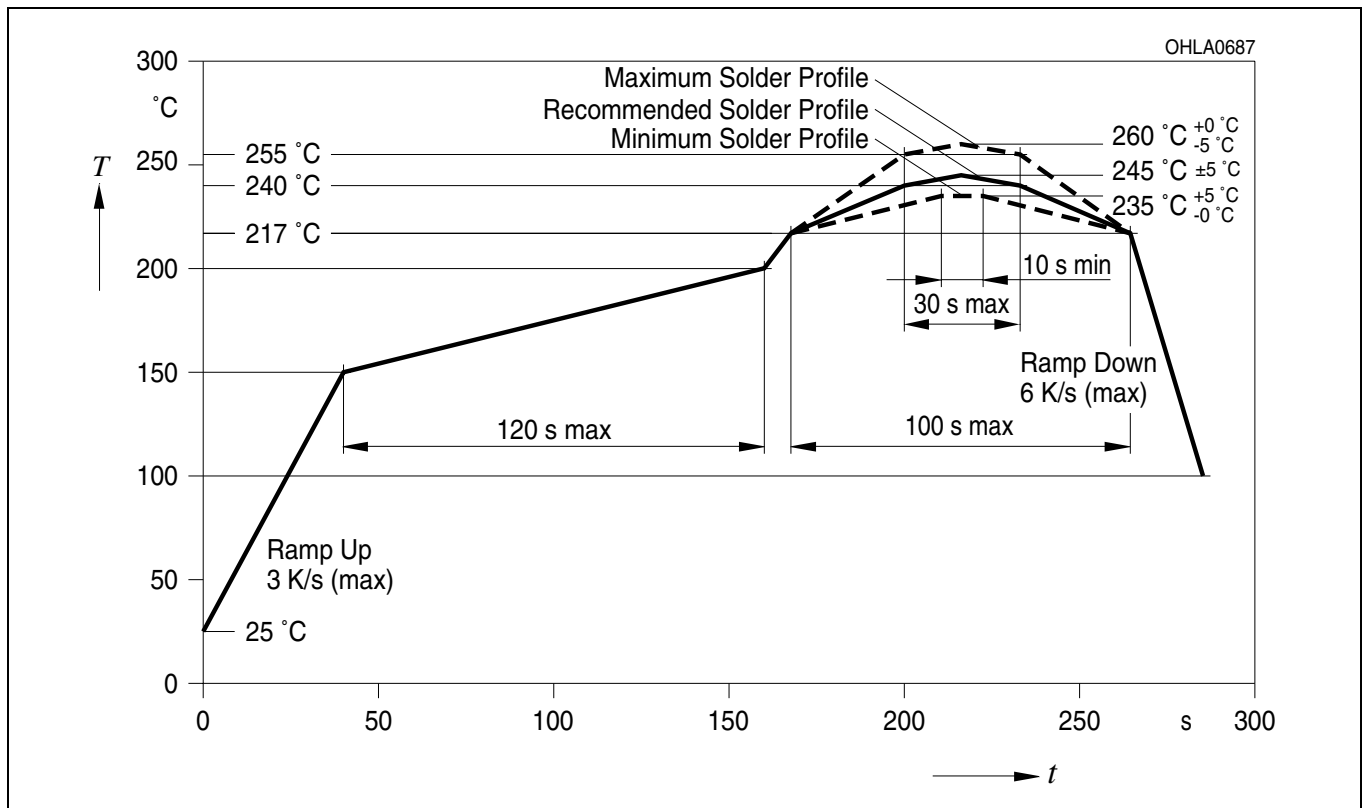


Figure 8: Temperaturprofil für Reflow-Löten (Der Sensor darf nach dem Löten nicht gewaschen werden.)
Temperature profile for Reflow-soldering (Do not wash the sensor after soldering)

EU RoHS and China RoHS compliant product



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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.