

Digitaler Näherungsdetektor mit integriertem Sender Treiber
Digital proximity detector with integrated emitter driver
Lead (Pb) Free Product - RoHS Compliant

SFH 7743



Wesentliche Merkmale

- Typ. Arbeitsabstand mit externem Sender SFH 4650: 40 mm
- Optohybrid mit Schmitt-Trigger Ausgang, open drain
- Extrem niedriger Stromverbrauch
- Sehr kleines SMD Gehäuse
- Hohe Umgebungslicht Unterdrückung

Anwendungen

- Näherungsdetektor für kurze Entfernungen

Features

- Typ. Working distance with external emitter SFH 4650: 40 mm
- Opto hybrid with Schmitt trigger output, open drain
- Extremely low power consumption
- Very small SMD package
- High ambient light suppression

Applications

- Short range proximity detector

Typ Type	Bestellnummer Ordering Code
SFH 7743	Q65110A8870

Grenzwerte
Maximum Ratings

Bezeichnung Parameter	Symbol Symbol	Wert Value	Einheit Unit
Lagertemperatur Storage temperature	T_{stg}	min: - 40 max: + 85	°C
Versorgungsspannung Supply voltage	V_{dd}	0 - 6	V
Externe Spannung an Pin External voltage at pin Out Prog Test Anode LED	V_{out}	0 - 4.5 0 - 4.5 0 - 4.5 0 - 1.5	V
Sink current durch den Ausgangstransistor Sink current through output transistor (please see figure 1)	I_{sink}	10	mA
Treiberstrom ¹⁾ Driver current (for directly connected LED (figure 1a) or transistor base current (figure 1b) page 6)	I_d	60	mA
Elektrostatische Entladung Electrostatic discharge - Human Body Model (according to: JESD22-A114E; Class2) - Machine Model (according to: JESD22-A115A; Class B)	<i>ESD</i>	2 200	kV V
latch up protection latch up protection (according to: EIA/JESD78 Class 1)		20	mA

¹⁾ Der Treiberstrom I_d ist abhängig von V_{dd} und R_{prog} wie folgt:

The driver current I_d depends on V_{dd} and R_{prog} as in the following formula:

$$I_d = 10\text{mA} + \left(\frac{V_{dd} \times 6}{R_{prog}} \right)$$

Empfohlene Betriebsbedingungen Recommended Operating Conditions

Bezeichnung Parameter	Symbol Symbol	Wert Value			Einheit Unit
		min.	typ.	max.	
Betriebstemperatur Operating temperature	T_{op}	- 20		+ 85	°C
Versorgungsspannung Supply voltage	V_{dd}	2.4		3.6	V
Ausgangsspannung Output voltage (please see figure 1)	DV_{dd}	1.7		3.6	V
Rauschen der Versorgungsspannung ¹⁾ Supply voltage ripple frequency range 0...20kHz	dV_{dd}			200	mV
Pull-up Widerstand Pull-up resistor (please see figure 1)	$R_{pull-up}$	10		1000	k Ω
Abblock Kondensatoren Bypass capacitors (please see figure 1)	C_{bypass} - stabilisation - HF		>1 10 - 100		μ F nF
Max. Umgebungslicht Max. ambient light Normlicht / Standard light A	E_V $V_{dd} < 3V$ $V_{dd} > 3V$		1000 2000		lux

¹⁾ Der externe Sender kann durch den SFH 7743 direkt mit 10mA bis 60mA gepulst betrieben werden; das bedeutet, dass jeder Widerstand in Serie zu V_{dd} einen Spannungsabfall in der Versorgungsleitung verursacht. Es wird empfohlen, diesen Serienwiderstand so klein zu halten, dass max dV_{dd} nicht überschritten und min V_{dd} nicht unterschritten wird. Beim Betrieb des SFH 7743 im Labor ist vom Einsatz geregelter Spannungsversorgungen abzusehen. Durch das Einschalten der IRED wird die Quelle kurzzeitig belastet. Diese Belastung kann zu Spannungsschwankungen der Quelle führen, die wiederum die Funktion des SFH 7743 beeinträchtigen können. Im Normalbetrieb (Akku, Batterie, stabilisierte Netzteile) tritt dieser Effekt nicht auf.

The external emitter can be driven directly with 10 mA to 60 mA in pulsed mode; this means, that any series resistance on the V_{dd} line causes a voltage drop at the power pin. It is recommended to keep the series resistance low, so that max dV_{dd} is not exceeded. When testing the SFH 7743 sensor in the lab, please do not use regulated voltage supplies. The IR emitter pulse is a high, short load for the power supply. This load can influence the stability of the output voltage; this instability will influence the operation of the SFH 7743. This effect does not occur during normal operation of the sensor with batteries, storage batteries, or stabilized voltage supplies.

Kennwerte (Ta = 25°C)

Characteristics

Bezeichnung Parameter	Symbol Symbol	Wert Value			Einheit Unit
		min.	typ.	max.	
Minimale Betriebsspannung für Startphase Minimum required supply voltage for start-up (please see figure 2)	$V_{dd, start}$	0.8		2.0	V
Länge der Startphase Start-up time (please see figure 2)	t_{start}	60	90	120	ms
Mess-Wiederholzeit Measurement refresh time (please see figure 3)	$t_{refresh}$	60	90	120	ms
LED „An“ Zeit LED „ON“ Time (please see figure 3)	t_{pulse}	30	45	60	μs
Schaltswelle „Low“ --> „High“ Switching threshold „Low“ --> „High“	E_e	145			μW/cm ²
Schaltabstand mit externem Sender SFH 4650 Operating distance with external emitter SFH 4650 ($R_{Prog} = 470 \Omega$, $V_{dd} = 3V$, KODAK White Paper R=90%) (please see figure 1a, Option 1)	d		40		mm
Schaltabstand mit externem Sender SFH 4650 Operating distance with external emitter SFH 4650 (SFH 4650 driven with 1A via external transistor, KODAK White Paper R=90%) (please see figure 1b, Option 2)	d		150		mm
Durchschnittliche Stromaufnahme ¹⁾ Mean current consumption ¹⁾ ($R_{Prog} = h$, $V_{dd} = 3V$)	$I_{dd, mean}$		25	50	μA
Maximale Stromaufnahme Maximum current consumption ($R_{Prog} = h$, $V_{dd} = 3V$)	$I_{dd, max}$		10	20	mA
Durchschnittliche Stromaufnahme ¹⁾ Mean current consumption ¹⁾ ($R_{Prog} = 470 \Omega$, $V_{dd} = 3V$)	$I_{dd, mean}$		45	75	μA

Kennwerte ($T_a = 25^\circ\text{C}$)

Characteristics

Bezeichnung Parameter	Symbol Symbol	Wert Value			Einheit Unit
		min.	typ.	max.	
Maximale Stromaufnahme Maximum current consumption ($R_{\text{Prog}} = 470 \Omega$, $V_{\text{dd}} = 3V$)	$I_{\text{dd, max}}$		50	65	mA
Ausgangsleckstrom „high“ Output leakage current „high“ $DV_{\text{dd}} = 2.2V$	$I_{\text{out, H}}$		5	400	nA
Ausgangsspannung „low“ Output voltage „low“ $DV_{\text{dd}} = 2.2V$; $R_{\text{pullup}} = 270 \Omega$	$V_{\text{out, L}}$		0.1	0.5	V
Wellenlänge der max. Fotoempfindlichkeit Wavelength of max. sensitivity	$\lambda_{\text{S, max}}$		880		nm
Spektraler Bereich der Fotoempfindlichkeit $S = 10\%$ von S_{max} Spectral range of sensitivity $S = 10\%$ of S_{max}	λ	730		1080	nm

- 1) gepulster Betrieb: Dauer LED an: $\sim 44\mu\text{s}$ / Dauer LED aus: $\sim 90\text{ms}$
 pulsed operating mode: LED on time: $\sim 44\mu\text{s}$ / LED off time: $\sim 90\text{ms}$

Blockdiagramm (empfohlener Pull-Up-Widerstand $R_{pull\ up} = 10k\Omega \dots 1M\Omega$)

Block diagram (recommended Pull up resistance $R_{pull\ up} = 10k\Omega \dots 1M\Omega$)

Figure 1a Blockdiagramm Option 1
Block diagram option 1

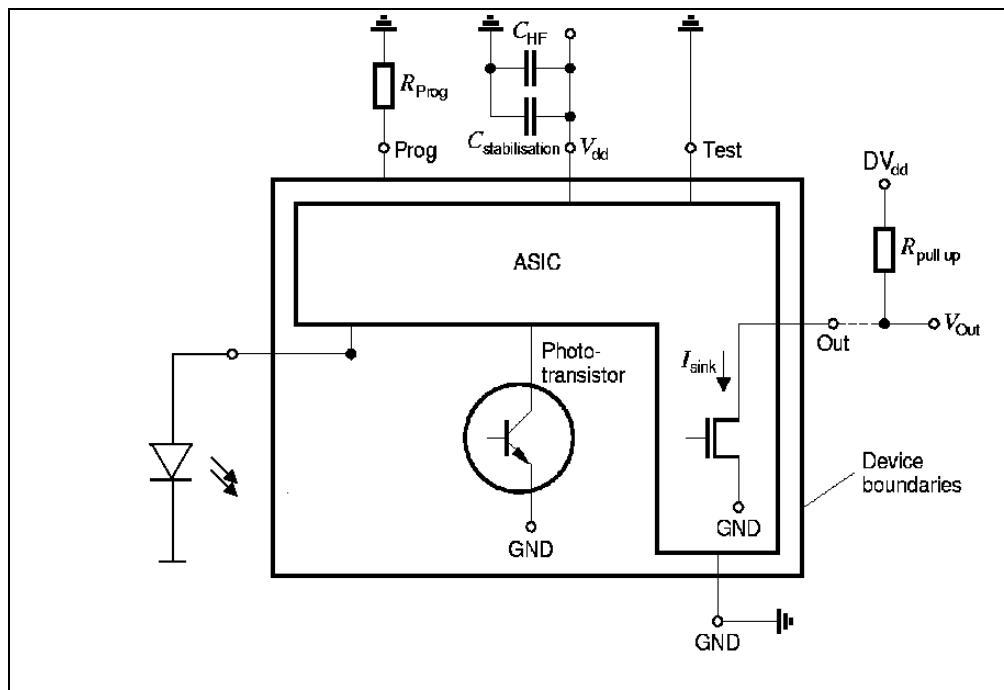
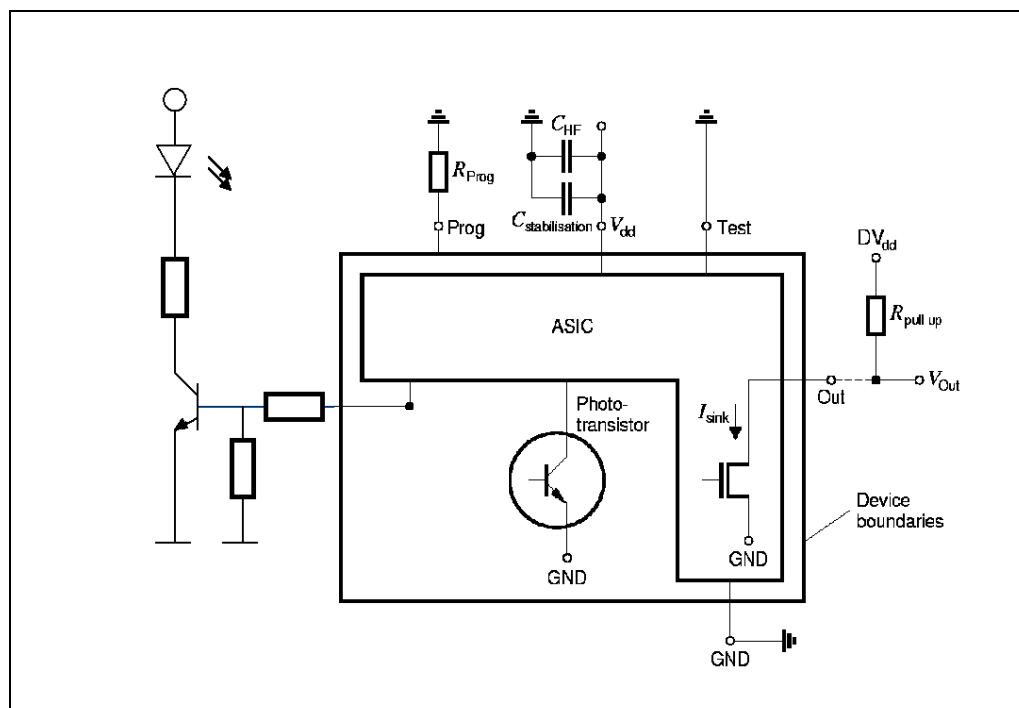
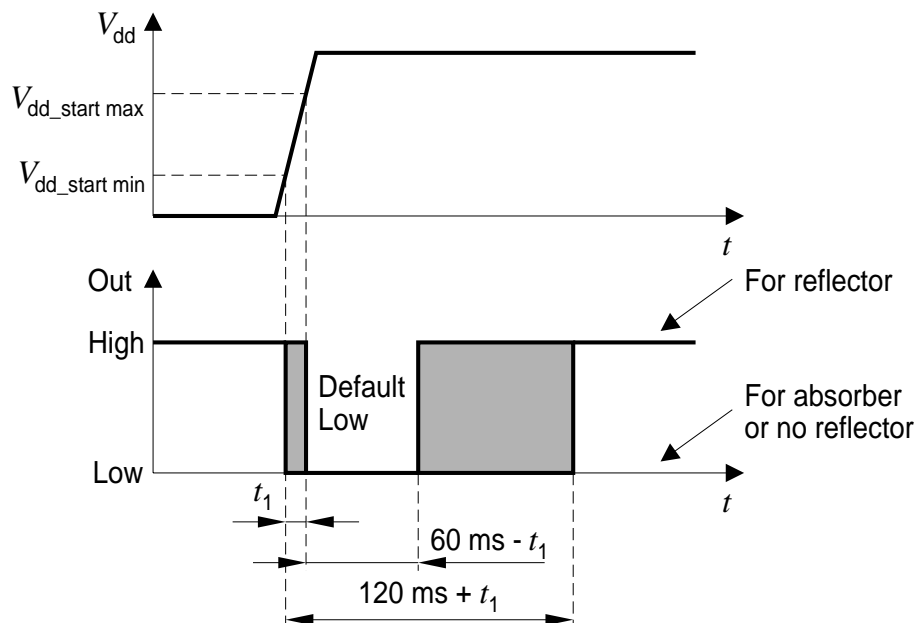



Figure 1b Blockdiagramm Option 2
Block diagram option 2



**Figure 2 Startverhalten
Start-up sequence**



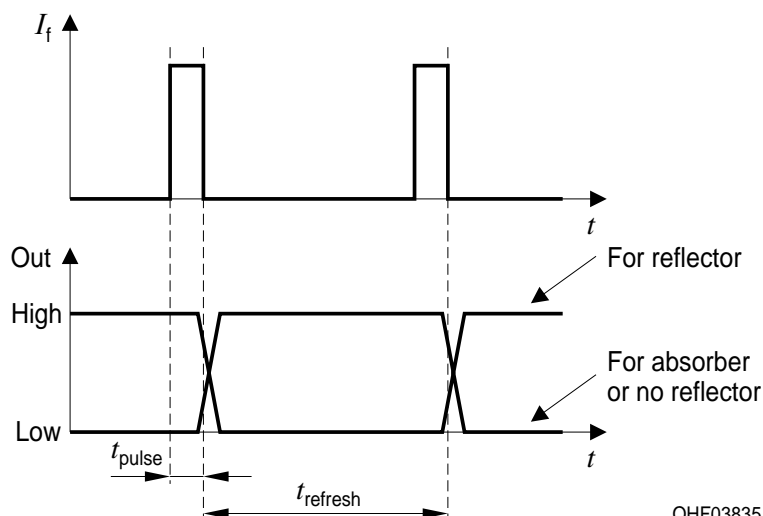
 Undefined high or low output impedance

OHF03836

Der Ausgang ist immer hochohmig, wenn an V_{dd} keine Spannung angeschlossen ist. Wenn die Versorgungsspannung V_{dd_start} erreicht, bleibt der Ausgang für $60\ ms < t_{start} < 120\ ms$ auf „low“. Anschließend findet etwa alle 90ms eine Messung des reflektierten Signals statt und der Ausgang wird entsprechend geschaltet (Figure 3).

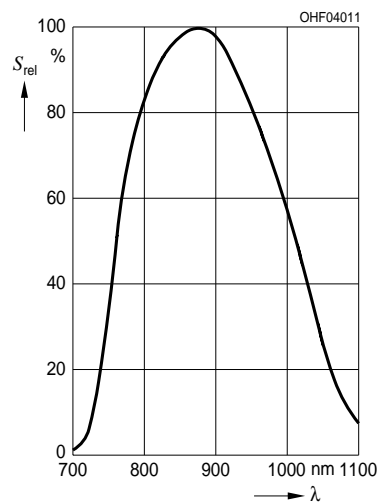
If the supply voltage at V_{dd} is not connected, the output is always high ohmic. When supply voltage reaches V_{dd_start} , the sensor output stays low for $60\ ms < t_{start} < 120\ ms$. Subsequently approx. every 90ms the reflected signal is measured and the output is set accordingly (Figure 3).

Figure 3 Timing diagram

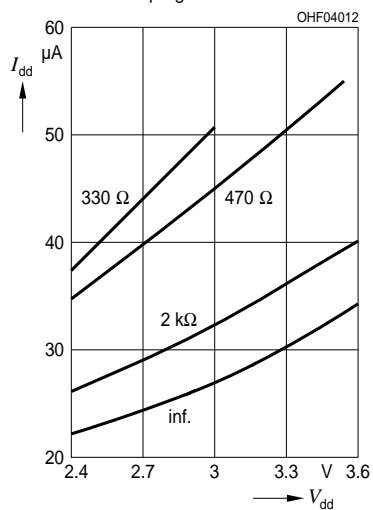


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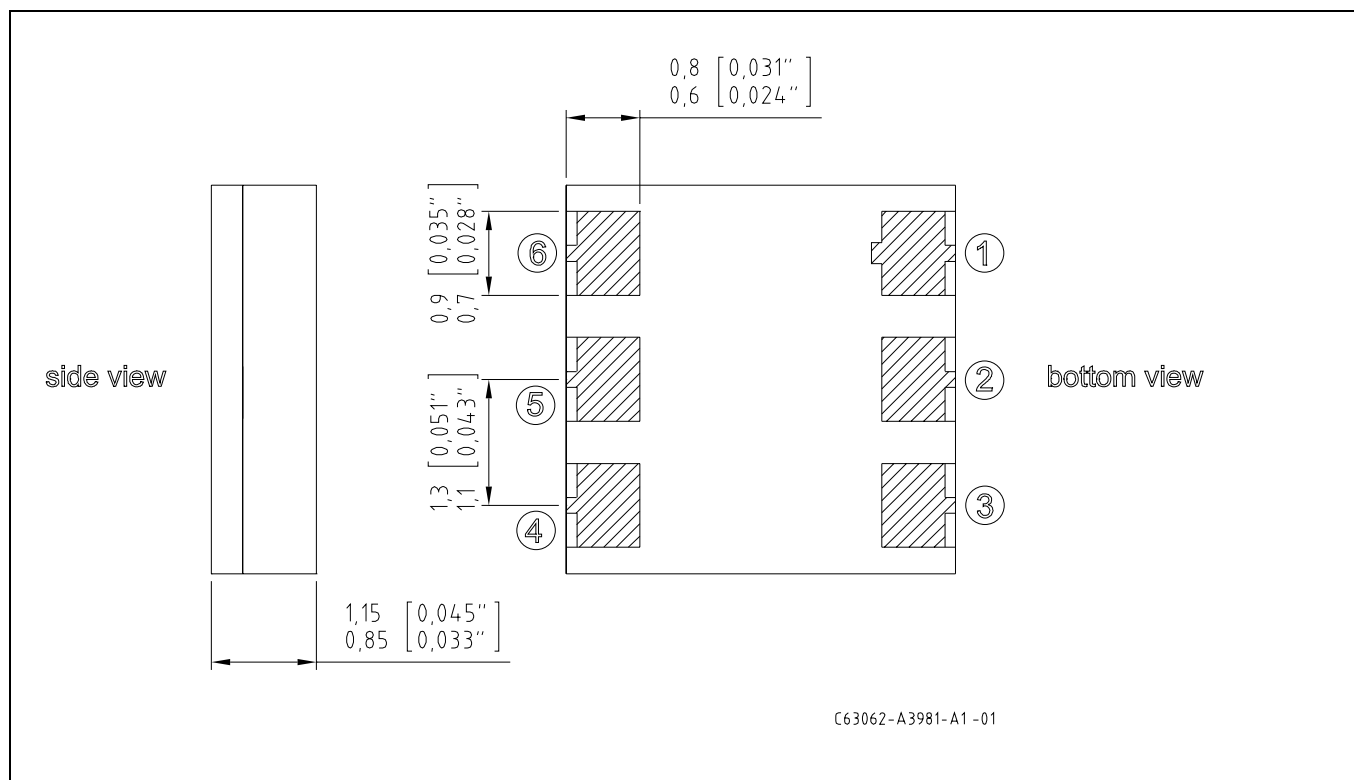
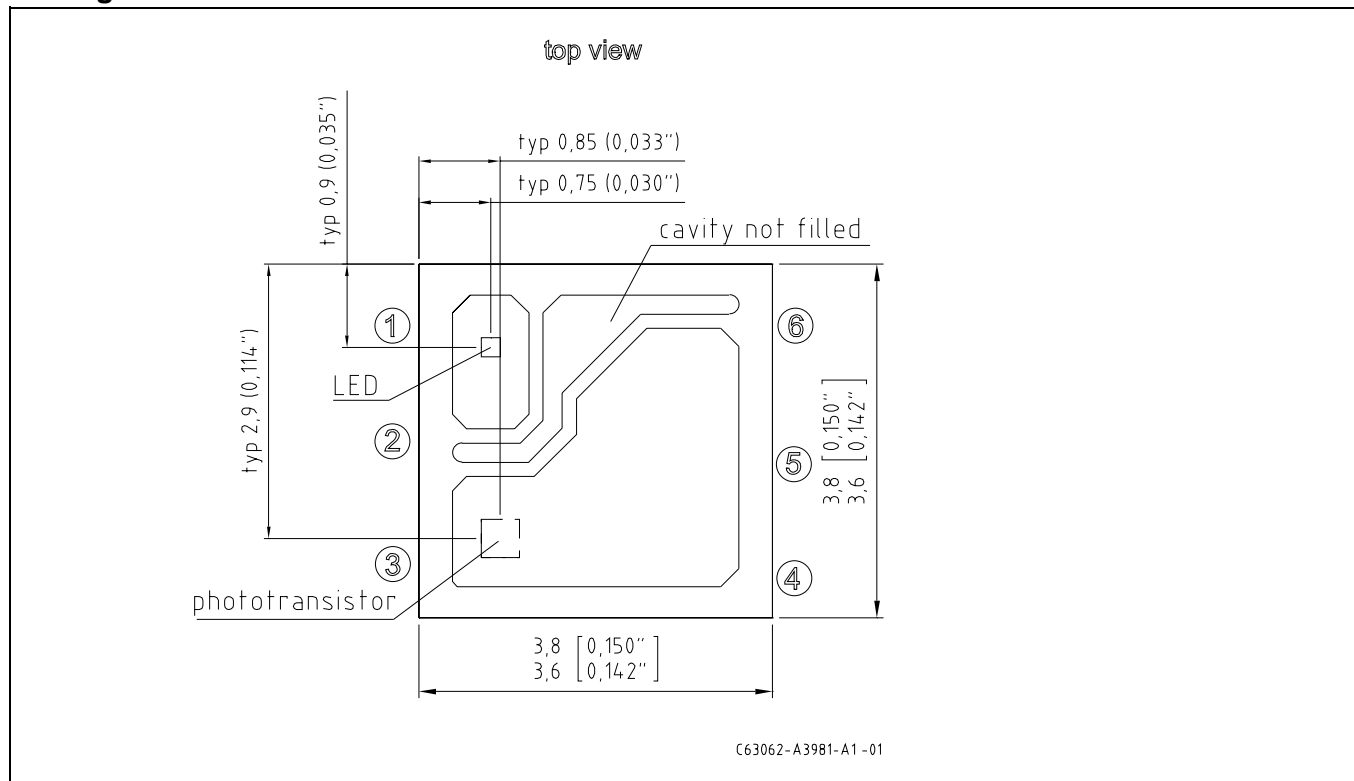
Phototransistor
Relative Spectral Sensitivity
 $S_{rel} = f(\lambda); T_A = 25^\circ\text{C}$



SFH 7743:
Mean current consumption
 $I_{dd} = f(V_{dd}); R_{prog}; T_A = 25^\circ\text{C}$



Maßzeichnung
Package Outlines



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

Anschlußbelegung Pin configuration

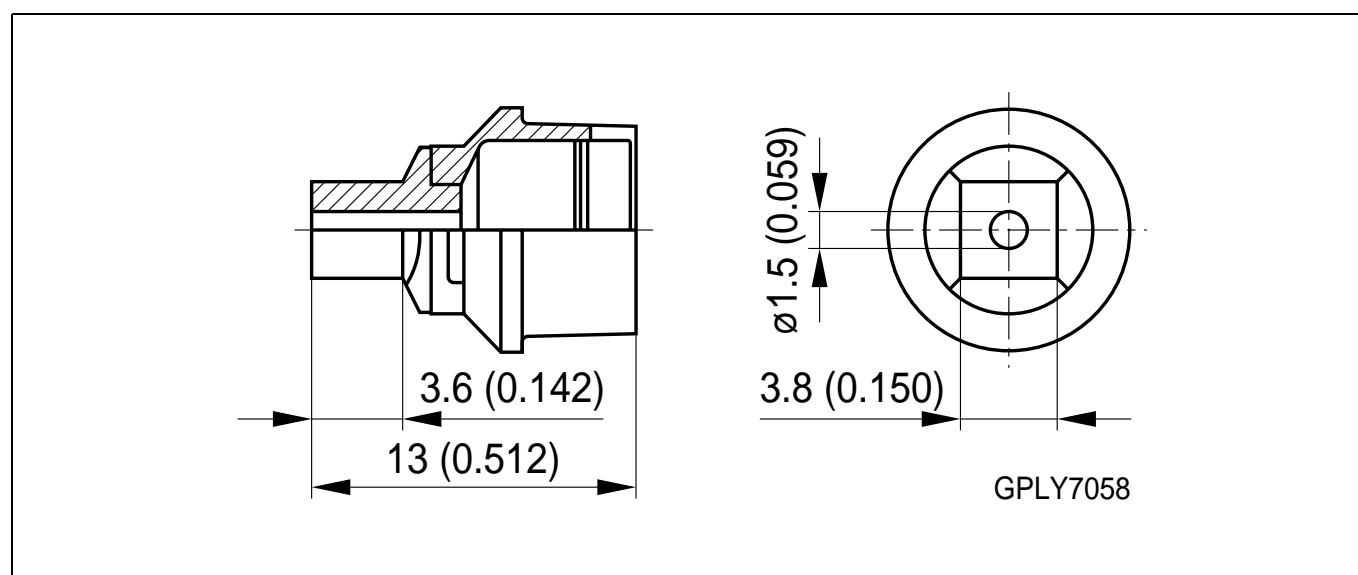
Pin #	Description
1	external LED (anode pin) or I_d for driver circuit
2	GND
3	Out
4	Test (must be connected to GND)
5	V_{dd}
6	Prog

Bauteilaufnahme device pickup

Vakuum Pipette sollte das Bauteil am rechteckigen Außenrahmen fassen.

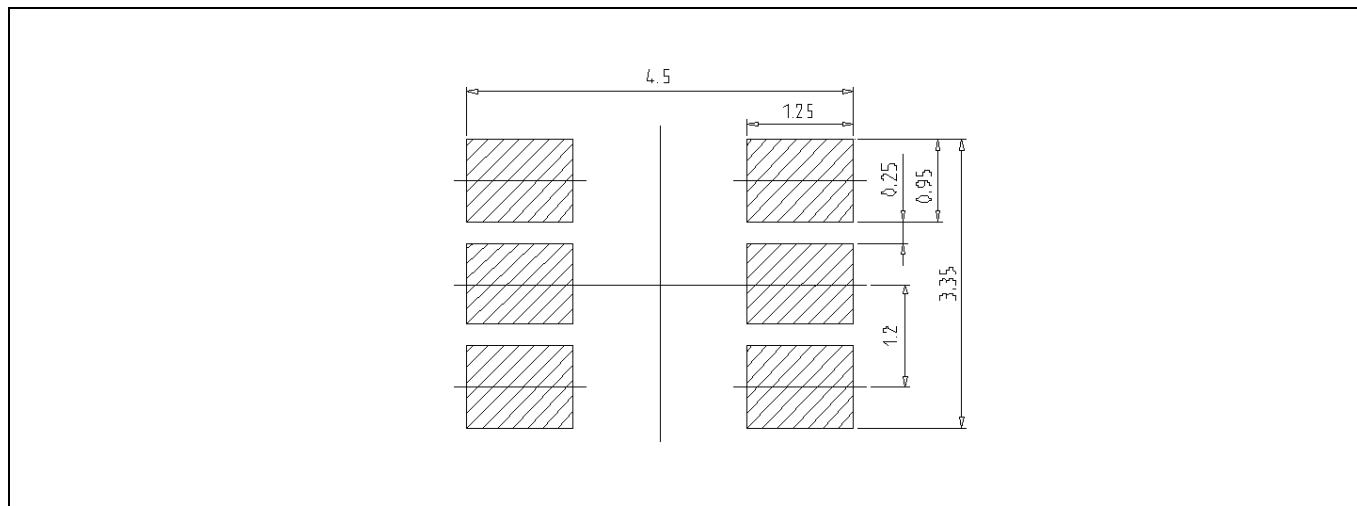
Laminar vacuum pickup nozzle should use the rectangular outer wall of the device for handling.

Empfohlene Pipette Recommended pickup nozzle



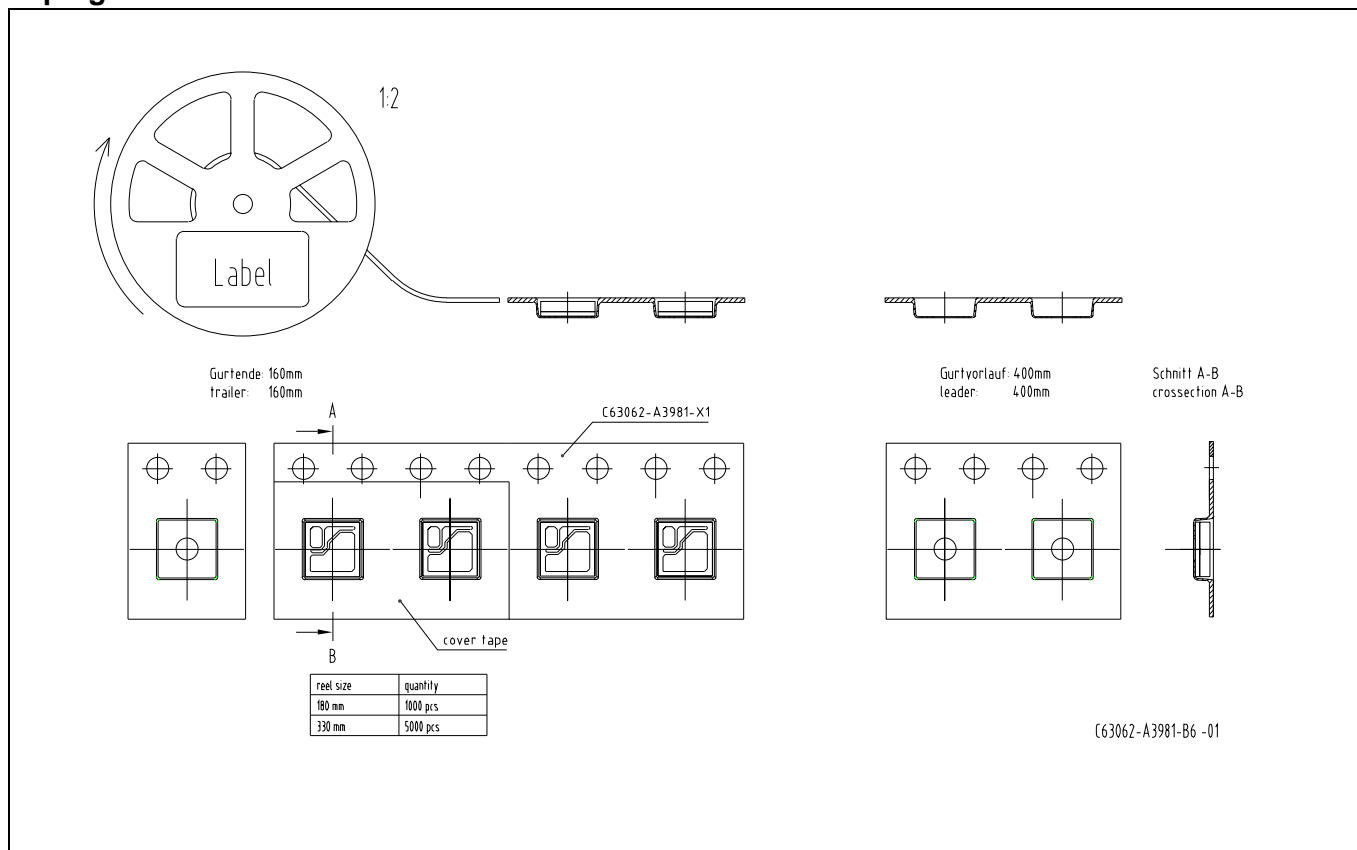
Maße in mm/ Dimensions in mm

Empfohlenes Lötpaddesign
Recommended Solderpad Design

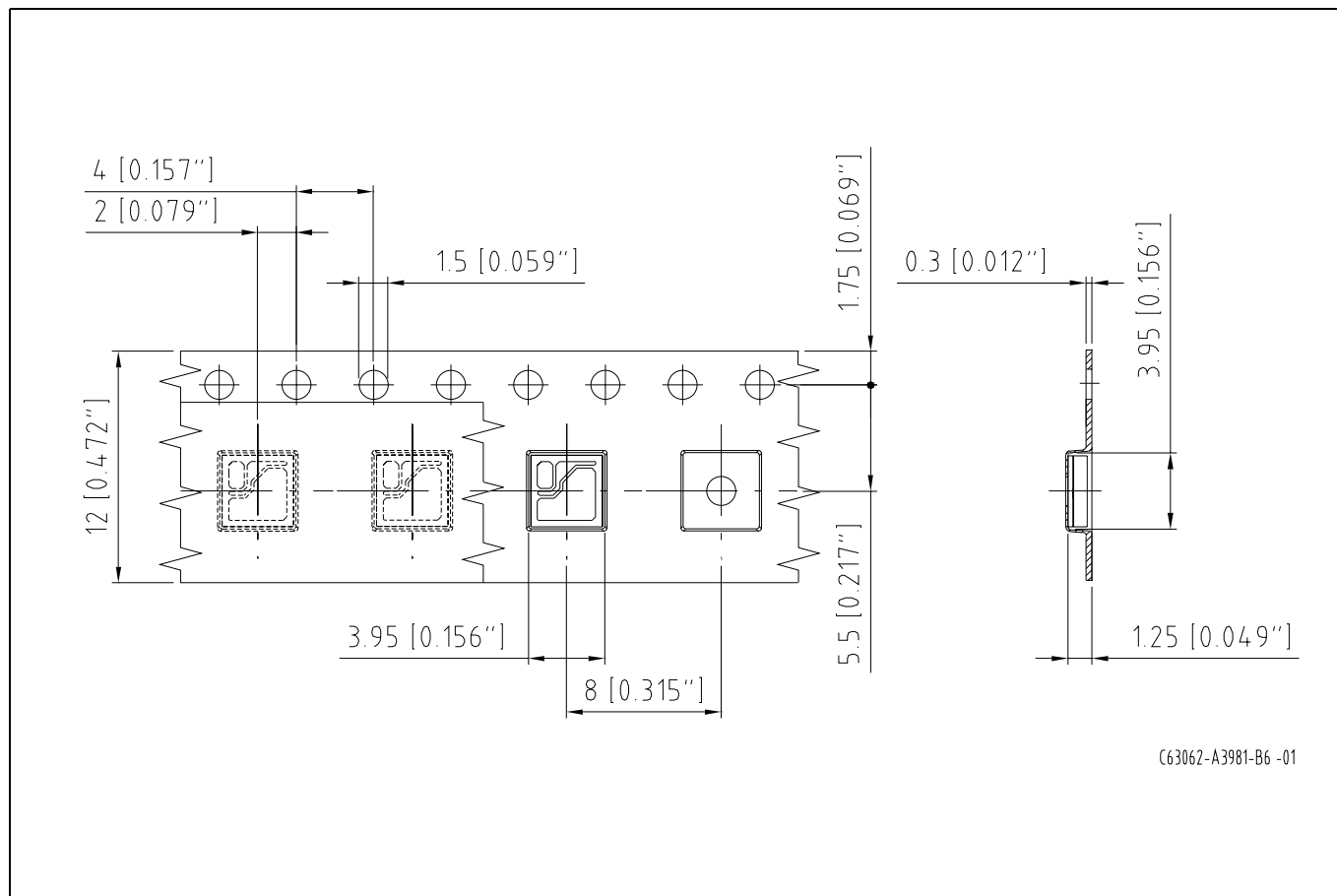


Maße in mm / Dimensions in mm

Gurtverpackung
Taping



Maße in mm / Dimensions in mm

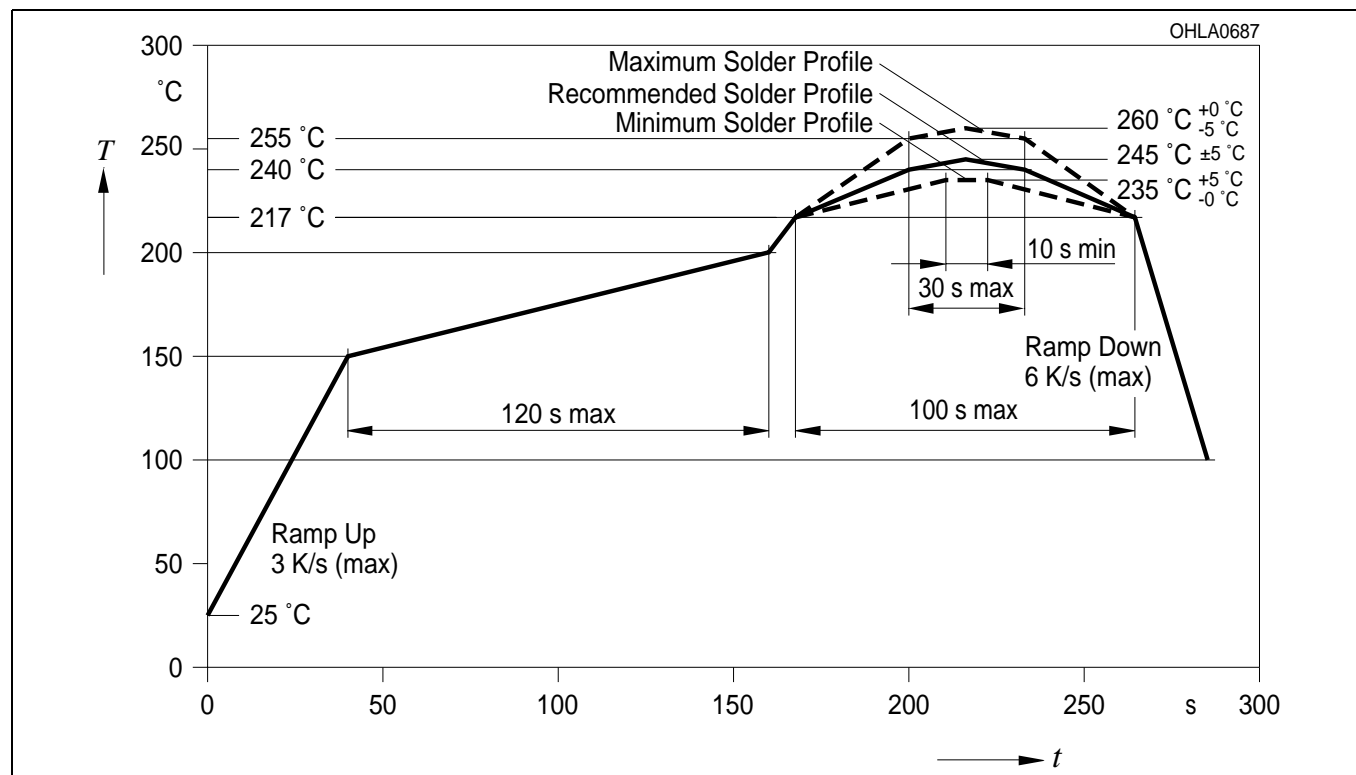


Maße in mm / Dimensions in mm

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-020C)
(acc. to J-STD-020C)



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