Tel: +86-755-3392 7488 Fax: +86-755-3392 7599
Web: www.szshuoxi.com E-mail: szshuoxi@163.com

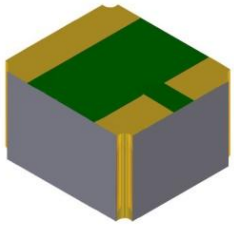
DATASHEET

Micro Tilt and Vibration Sensor

TVS0713.180

Revision 1.1 2014, April 17

Web: www.szshuoxi.com E-mail: szshuoxi@163.com



TVS0713.180

DESCRIPTION

The micro tilt and vibration sensor is used for the detection of slight movements, vibration and orientation or tilt by means of a mobile micro sphere. The ball bridges two contacts reducing the resistance between the two external connection pads from several mega ohms (> 30 MOhm) to below 100 Ohms. The sensor is fully passive, requires no signal conditioning, and operates with currents as low as 0.2 µA.

With the aid of tool-specific evaluation electronics, the micro tilt and vibration sensor controls the operation of movement-sensitive devices. The micro tilt and vibration sensor is utilised for converting many systems to environmentally friendly devices by implementing wake-up and power-down logic to conserve battery power and bringing energy consumption to a minimum, pushing the availability of green technology and green electronics into new areas of design and application.

The sensor is typically used for wake up and power down of battery operated devices depending on motion and/or orientation of the sensor, e.g. applications such as bike computers, remote controls, electronic lock systems, RFID transponders, GPS tracking systems, wireless sensor networks, illuminated dog`s collars, access control systems, data loggers, bicycle lights.

FEATURES

- Tilt and vibration sensor
- Halogen free
- Wide supply voltage range: 1.80 V to 15 V
- Low operating current
  (e.g. Icc max. 0.2µA at Vcc 2V and R 10Meg)
  (e.g. Icc max. 2.0µA at Vcc 2V and R 1Meg)
- Noiseless
- R_{On} < 100 Ω
- Protected against environmental stress
- Automated SMT-mounting
- RoHS compliant, lead free
- Specified from -40 °C to +85 °C
- Size 2.85 mm x 2.45 mm x 1.7 mm
- Reacting point: approx. 50 mg

APPLICATIONS

- Motion detection
- Orientation detection – bottom or top
- System wake up – low power

MATERIAL

Package:	PCB laminate material, halogen free
Inner contact material:	Gold plated
Ball:	Stainless steel, gold plated

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1. Operating Conditions

PARAMETER	SYMBOL	MIN	MAX	UNIT
Supply voltage	V_{CC}	+1.80	+15	Vdc
Current	I_{CC}		2	mA
R Open	R_O	-	> 30	MOhm
R Closed	R_C	< 100	-	Ohm
Operating ambient temperature	T_{amb}	-40	+85	°C

* Current consumption is determined by the resistance of the application circuit and the supply voltage. The sensor is fully passive, requires no signal conditioning, and operates with currents a low as 0.2 µA.
(e.g. max. Icc 0.2µA at Vcc 2V and R 10Meg)
(e.g. max. Icc 2.0µA at Vcc 2V and R 1Meg)

2. Soldering Process

Reflow Soldering Process 260°C, 10 sec

3. Functionality

A mobile, gilded micro sphere is located inside the hollow space of the sensor. When moving, the micro sphere bridges two gilded contacts by switching over from a high resistive to a low resistive state. When the Sensor is at rest, it is **not necessarily closed**. Only in 70% - 99% of time the sensor will be closed when at rest.

Orientation detection for bottom and top, as both are kept separate out.

The figure shows the typical characteristics of the sensor in excitation and rest.

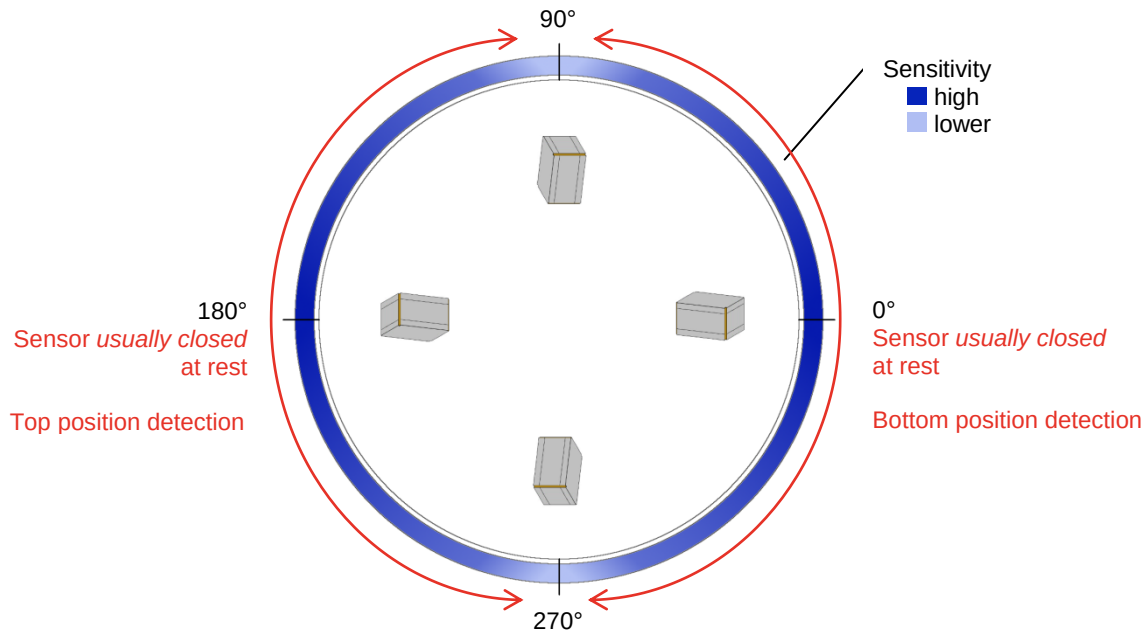

Figure 1: Characteristic of the sensor TVS0713.180

4. Qualification

Alternating temperature test
According DIN EN 60068-2-14 (VDE 0468-2-14):2008-02 Test Na

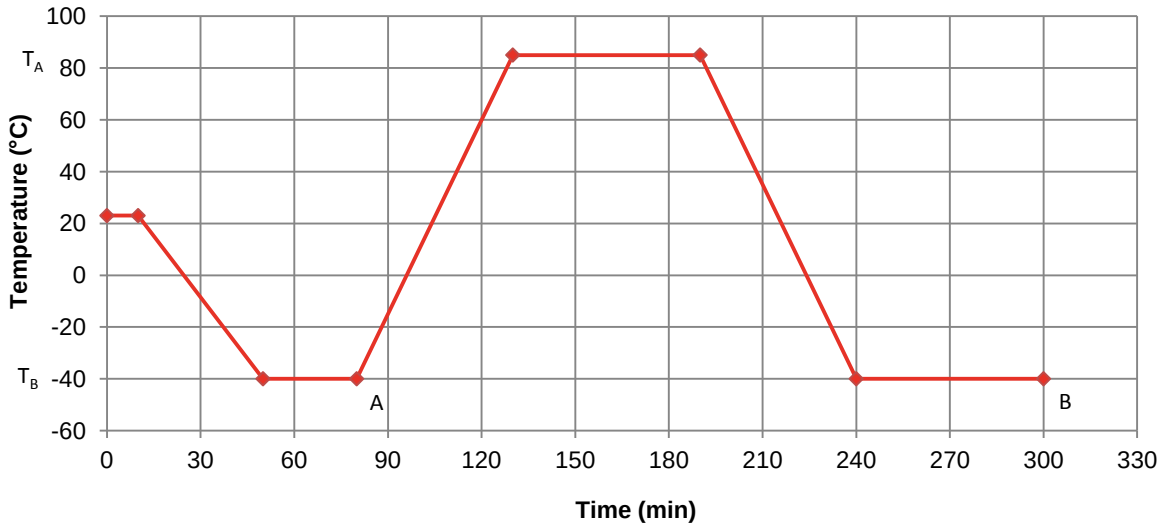

Figure 2: Temperature profile

A = Start of first cycle
B = End of first cycle and start of second cycle

Test parameters

Number of test cycles: 300
High temperature T_A: +85°C; Total time: 300h
Low temperature T_B: -40°C; Total time: 300h
Duration of exposure: 1h
Rate of change between these temperatures: 2.5°C/min
Mechanical excitation of samples: 2 min/hour

Final measurement

No evidence of internal corrosion after the test.
No shape distortion.

Non Operation Half Sine Shock

Test cycle:	Acceleration 25g at 6msec pulse width 1000 cycles pos. 1000cycles neg.; 1Shock/s; 3 axis: X, Y, Z

Non Operational Vibration Test

Test cycle:	Sinus 10 ... 300Hz; Elongation 0.25mm / 0.25g; 5 cycles; 1 axis
Frequency area A:	10 – 22.28Hz, amplitude in A:0.25 mm
Frequency area B:	22.28 - 300Hz, acceleration in B: 0.25g
Sweep speed:	1 Octave/min, Cycles: 10
Time per Sweep:	4.9 min

Non Operational Vibration Test

Test cycle:	Sinus 10 ... 500Hz; Elongation 3.0mm / 1.5g; 5 cycles; 1 axis
Frequency area A:	10 – 15.76Hz, Amplitude in A: 3.0mm
Frequency area B:	15.76 - 500Hz, Acceleration in B: 1.5 g
Sweep speed:	1 Octave/min, Number of sweeps: 10
Time per Sweep:	5.62 min

5. Package mechanical data

5.1 Package outline

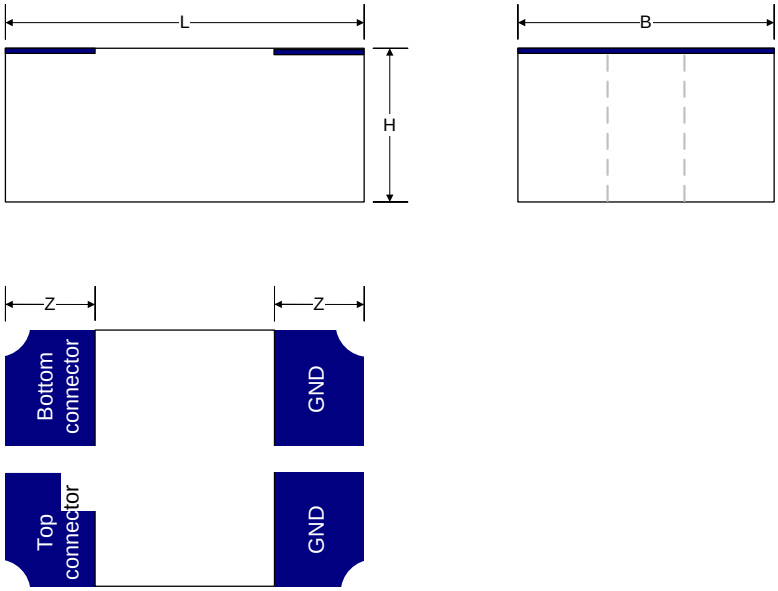

Figure 3: Package outline (drawing not to scale)

DIMENSIONS (mm)

Symbol	Value (mm)	Tolerance
L	2.850	±0.125
H	1.700	±0.125
B	2.450	±0.125
Z	0.675	±0.125

*Depending on the sensor orientation in the SMD belt, the flag can be on the right or left side.

5.2 Footprint

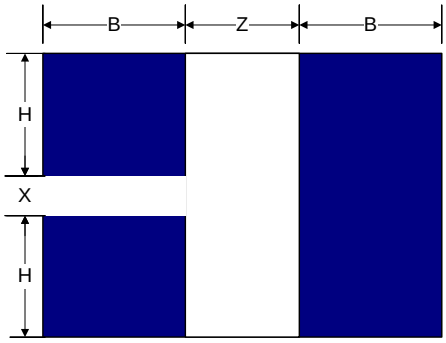

Figure 4: Recommended footprint (drawing not to scale)

DIMENSIONS (mm)

Symbol	Value (mm)
B	1.50
Z	1.00
H	1.50
X	0.50

6. Ordering information

6.1 Tape and reel (standard-packing)

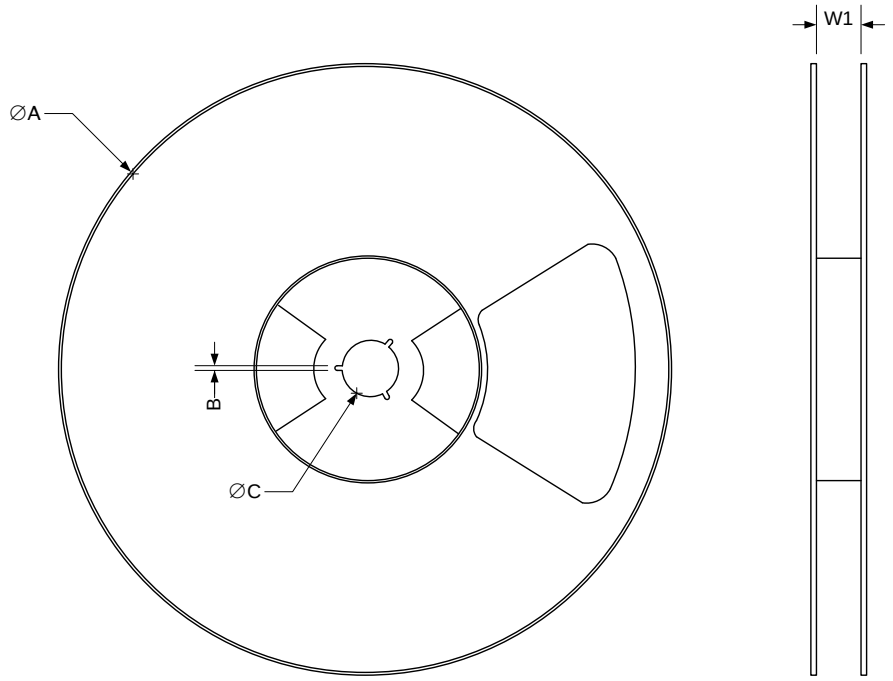

Figure 5: Reel information (drawing not to scale)

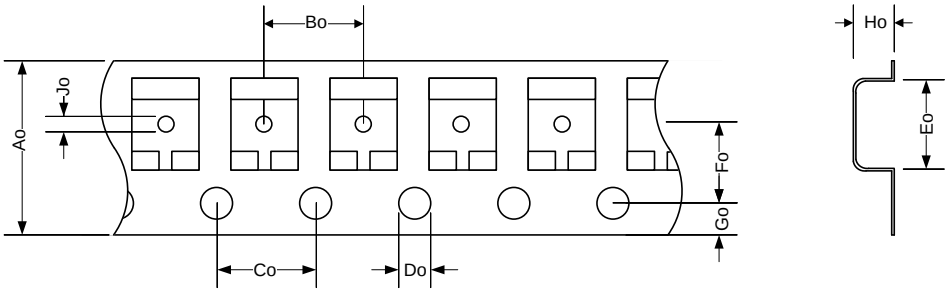

Figure 6: Tape information (drawing not to scale)

DIMENSIONS (mm)

Symbol	Min	Max
∅A	179.50	180.50
B	2.00	2.50
∅C	8.40	9.90
W1	8.40	9.90
Ao	7.70	8.30
Bo	3.90	4.10
Co	3.90	4.10
Do	1.40	1.60
Jo	0.80	1.20
Go	1.74	1.76
Fo	3.45	3.55
Eo	3.50	3.70
Ho	1.90	2.10

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Mailing Address:
Sensolute GmbH
Hermann-von-Helmholtz-Platz 1
76344 Eggenstein-Leopoldshafen, Germany