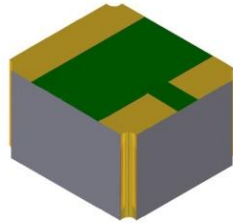


# Micro Tilt and Vibration Sensor

Datasheet

TVS0713.180



TVS0713.180

## FEATURES

- Tilt and vibration sensor
- Halogen free
- Wide supply voltage range: 1.80 V to 15 V
- Low operating current  
(e.g. I<sub>cc</sub> max. 0.2μA at V<sub>cc</sub> 2V and R 10Meg)  
(e.g. I<sub>cc</sub> max. 2.0μA at V<sub>cc</sub> 2V and R 1Meg)
- Noiseless
- R<sub>On</sub> < 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

## 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.

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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 as low as 0.2  $\mu$ A.

(e.g. max.  $I_{CC}$  0.2 $\mu$ A at  $V_{CC}$  2V and R 10Meg)

(e.g. max.  $I_{CC}$  2.0 $\mu$ A at  $V_{CC}$  2V and R 1Meg)

## 2. Soldering Process

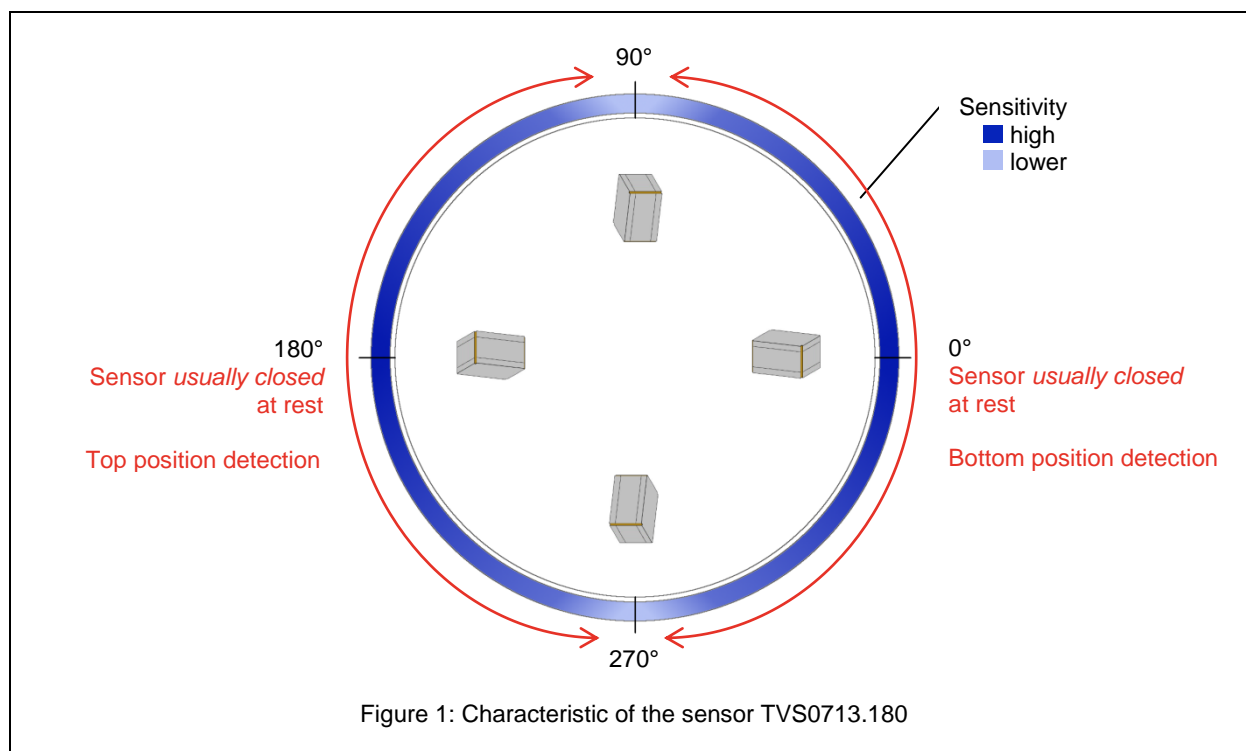
Reflow Soldering Process 260°C, 10 sec

## 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.

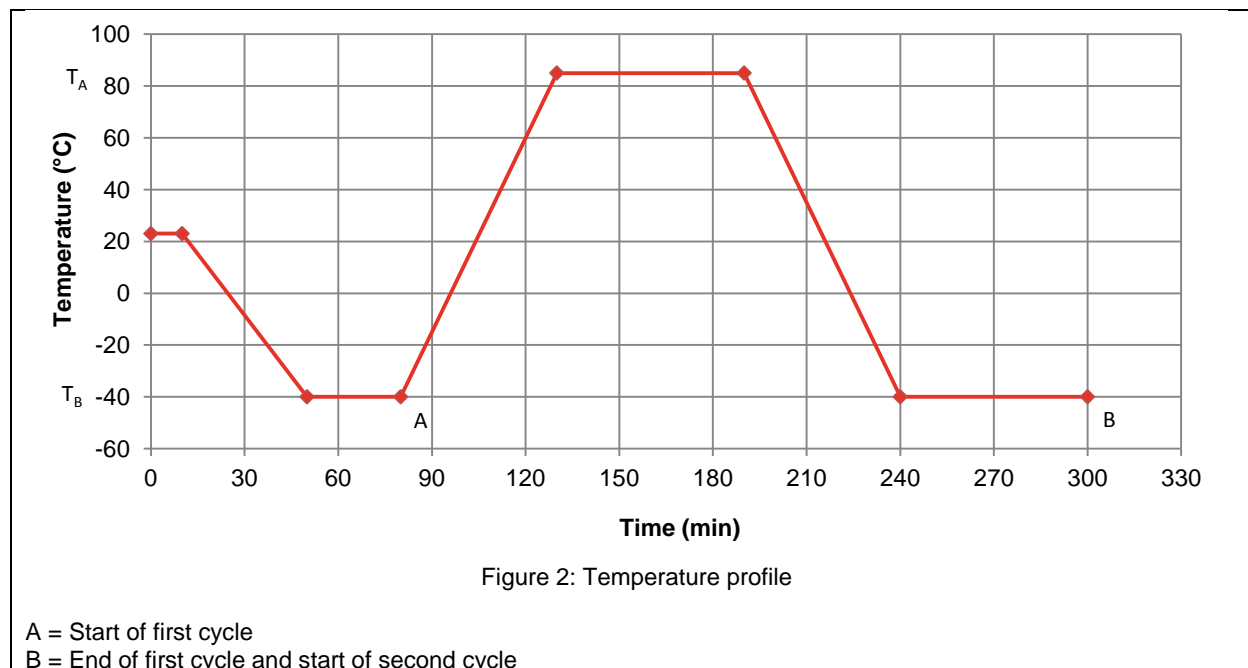
The figure shows the typical characteristics of the sensor in excitation and rest.



## 4. Qualification

### Alternating temperature test

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



### 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

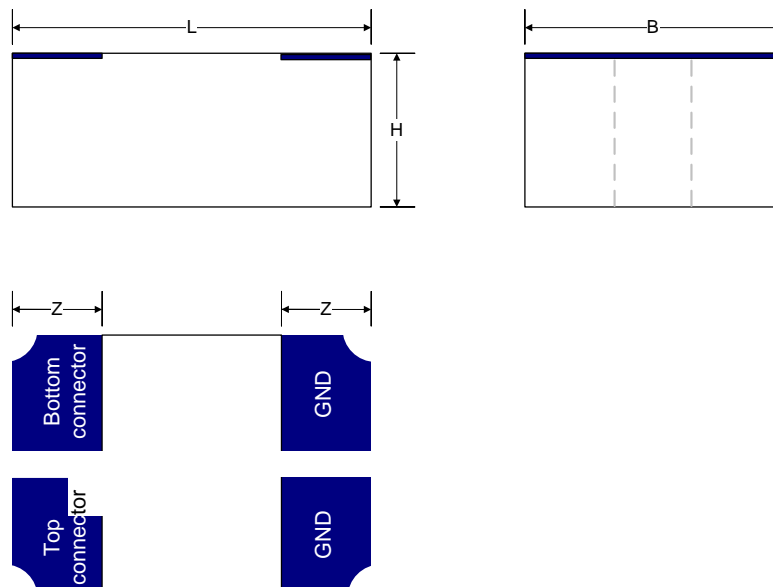


Figure 3: Package outline (drawing not to scale)

#### 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

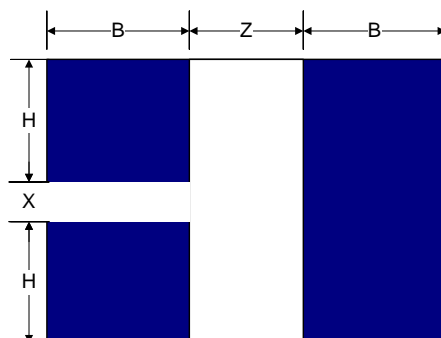


Figure 4: Recommended footprint (drawing not to scale)

#### 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)

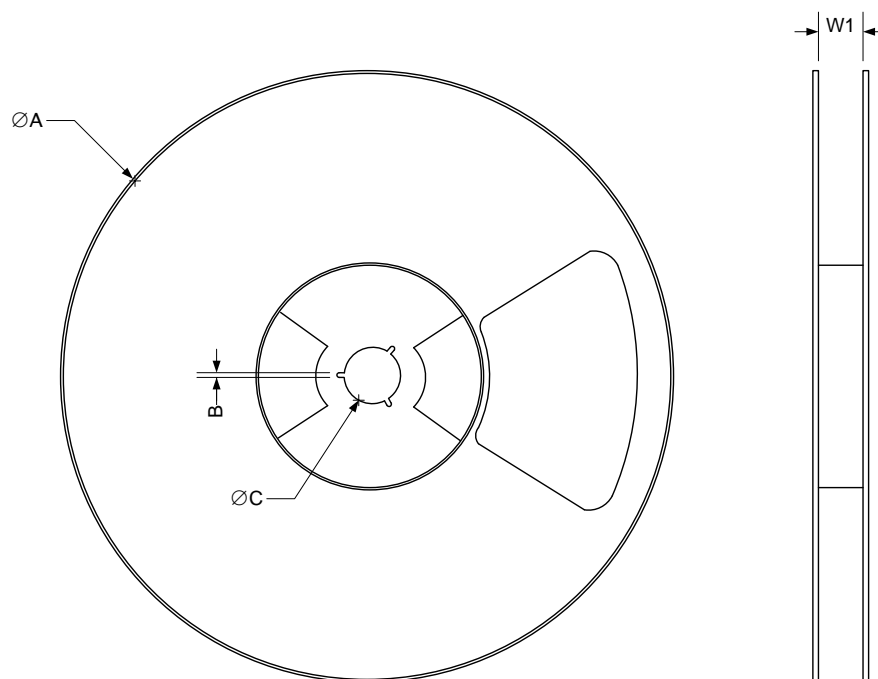


Figure 5: Reel information (drawing not to scale)

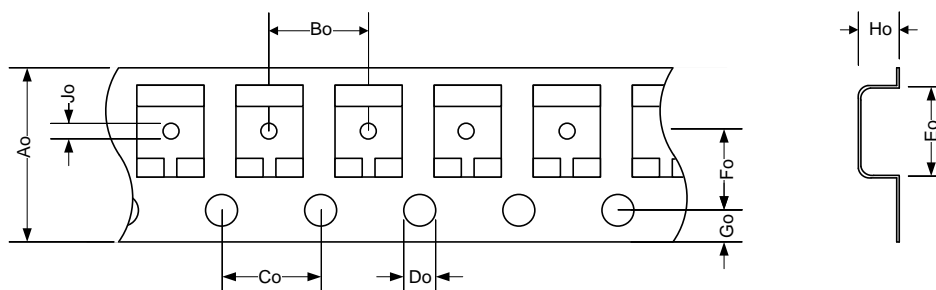


Figure 6: Tape information (drawing not to scale)

#### DIMENSIONS (mm)

Symbol	Min	Max
$\varnothing A$	179.50	180.50
B	2.00	2.50
$\varnothing C$	8.40	9.90
W1	8.40	9.90
$A_0$	7.70	8.30
$B_0$	3.90	4.10
$C_0$	3.90	4.10
$D_0$	1.40	1.60
$J_0$	0.80	1.20
$G_0$	1.74	1.76
$F_0$	3.45	3.55
$E_0$	3.50	3.70
$H_0$	1.90	2.10

## 7. Important Notice

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