DATASHEET

Micro Vibration Sensor
MVS0409.02

Revision 2.5
Supersedes data of 2010 Dec. 07

2011 Mar. 22
DESCRIPTION

The micro vibration sensor is used for the detection of slight movements and vibrations 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 vibration sensor controls the operation of movement-sensitive devices. The micro 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 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, that are only switched on when in motion.

FEATURES

- Omnidirectional 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
- 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

<table>
<thead>
<tr>
<th>PARAMETER</th>
<th>SYMBOL</th>
<th>MIN</th>
<th>MAX</th>
<th>UNIT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supply voltage</td>
<td>Vcc</td>
<td>+1.8</td>
<td>+15</td>
<td>Vdc</td>
</tr>
<tr>
<td>Current</td>
<td>Icc</td>
<td>2</td>
<td>-</td>
<td>mA</td>
</tr>
<tr>
<td>R Open</td>
<td>R0</td>
<td>-</td>
<td>&gt; 30</td>
<td>MOhm</td>
</tr>
<tr>
<td>R Closed</td>
<td>Rc</td>
<td>&lt; 100</td>
<td>-</td>
<td>Ohm</td>
</tr>
<tr>
<td>Operating ambient temperature</td>
<td>Tamb</td>
<td>-40</td>
<td>+85</td>
<td>°C</td>
</tr>
</tbody>
</table>

* 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.

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

![Figure 1: Characteristic of the sensor MVS0409.02](image-url)
4. Qualification

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

![Temperature profile diagram](image)

**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

![Package outline diagram]

**DIMENSIONS (mm)**

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Value (mm)</th>
<th>Tolerance</th>
</tr>
</thead>
<tbody>
<tr>
<td>L</td>
<td>2.850</td>
<td>±0.125</td>
</tr>
<tr>
<td>H</td>
<td>1.700</td>
<td>±0.125</td>
</tr>
<tr>
<td>B</td>
<td>2.450</td>
<td>±0.125</td>
</tr>
<tr>
<td>Z</td>
<td>0.675</td>
<td>±0.125</td>
</tr>
<tr>
<td>X*</td>
<td>1.055</td>
<td>±0.125</td>
</tr>
</tbody>
</table>

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

5.2 Footprint

![Recommended footprint diagram]

**DIMENSIONS (mm)**

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Value (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>H</td>
<td>2.80</td>
</tr>
<tr>
<td>B</td>
<td>1.40</td>
</tr>
<tr>
<td>Z</td>
<td>1.00</td>
</tr>
</tbody>
</table>
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)**

<table>
<thead>
<tr>
<th>SYMBOL</th>
<th>MIN (mm)</th>
<th>MAX (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>øA</td>
<td>179.50</td>
<td>180.50</td>
</tr>
<tr>
<td>B</td>
<td>2.00</td>
<td>2.50</td>
</tr>
<tr>
<td>øC</td>
<td>8.40</td>
<td>9.90</td>
</tr>
<tr>
<td>W1</td>
<td>8.40</td>
<td>9.90</td>
</tr>
<tr>
<td>Ao</td>
<td>7.70</td>
<td>8.30</td>
</tr>
<tr>
<td>Bo</td>
<td>3.90</td>
<td>4.10</td>
</tr>
<tr>
<td>Co</td>
<td>3.90</td>
<td>4.10</td>
</tr>
<tr>
<td>Do</td>
<td>1.40</td>
<td>1.60</td>
</tr>
<tr>
<td>Jo</td>
<td>0.80</td>
<td>1.20</td>
</tr>
<tr>
<td>Go</td>
<td>1.74</td>
<td>1.76</td>
</tr>
<tr>
<td>Fo</td>
<td>3.45</td>
<td>3.55</td>
</tr>
<tr>
<td>Eo</td>
<td>3.50</td>
<td>3.70</td>
</tr>
<tr>
<td>Ho</td>
<td>1.90</td>
<td>2.10</td>
</tr>
</tbody>
</table>
6.2 Tray (special-packing)

Figure 7: Tray (drawing not to scale)

Figure 8: Detail view (drawing not to scale)
7. Important Notice

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