**DATASHEET**

**SQ-MIN-200**

**NANO-POWER TILT AND VIBRATION SENSOR**

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**FEATURES**

- **Simple Interface** - No signal conditioning required
- **Surface Mount** - RoHS & REACH compliant, lead free, Halogen free
- **Made in USA** - fully automated production, 100% testing, worldwide quality and price leader
- **Ultra Miniature Size** – 1.9 mm x 3.6 mm
- **Nano-power** - As little as 50 nA
- **Industrial Rated** - 10 year life, -40° to 85° C

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**FUNCTION**

- Normally closed at rest
- Omnidirectional movement sensing
- Chatters open / closed when tilted or vibrated in any direction regardless of orientation

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**APPLICATIONS**

- Motion triggered wake-up
- GPS tracking, RFID, vehicle electronics
- Security, anti-tamper, anti-theft, alarms

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**DESCRIPTION**

The SQ-MIN-200 series sensor acts like a normally closed switch which chatters open and closed as it is tilted or vibrated. Unlike other rolling-ball sensors, the 200 is truly an omnidirectional movement sensor. It will function regardless of how it is mounted or aligned.

When at rest, it normally settles in a closed state. When in motion, it will produce continuous on/off contact closures. It is sensitive to both tilt (static acceleration) and vibration (dynamic acceleration). The sensor can be easily used to produce a series of CMOS or TTL level logic level or pulse train using a single resistor to limit current. The signal level can be read directly by a digital input. This can be used to interrupt (wake up) a microcontroller or can be counted to estimate the amount and duration of activity. The sensor is fully passive, requires no signal conditioning, and draws as little as 50 nA of continuous current.

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**PATENTS**

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THEORY OF OPERATION

The SQ-MIN-200 series sensor acts like a normally closed switch which chatters open and closed as it is tilted or vibrated. Note that the SQ-MIN-200 is not guaranteed to be closed – occasionally the sensing mechanism may remain open when at rest. The engineer should design his or her software to look for high-to-low and low-to-high edge transitions rather than an open or closed state of the switch.

CHARACTERISTICS

<table>
<thead>
<tr>
<th>PARAMETER</th>
<th>MIN</th>
<th>MAX</th>
<th>CONDITIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shock Survival</td>
<td>5,000</td>
<td>5x, 0.1 ms half-sin, any axis</td>
<td></td>
</tr>
<tr>
<td>Storage Temperature</td>
<td>-40 °C</td>
<td>85 °C</td>
<td></td>
</tr>
<tr>
<td>Supply Voltage Range</td>
<td>0.5 V</td>
<td>12 V</td>
<td></td>
</tr>
<tr>
<td>Current Sink*</td>
<td>50 nA</td>
<td>10 mA</td>
<td></td>
</tr>
</tbody>
</table>

* Current consumption is determined by the resistance of the application circuit and the supply voltage.

DIMENSIONS

PHYSICAL SIZE

- **D**: Length
- **E**: Diameter
- **F**: Terminal Width

<table>
<thead>
<tr>
<th>SYMBOL</th>
<th>DESCRIPTION</th>
<th>MM</th>
<th>TOLERANCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>D</td>
<td>Length</td>
<td>3.60</td>
<td>±0.1</td>
</tr>
<tr>
<td>E</td>
<td>Diameter</td>
<td>1.95</td>
<td>±0.1</td>
</tr>
<tr>
<td>F</td>
<td>Terminal Width</td>
<td>0.40</td>
<td>±0.1</td>
</tr>
</tbody>
</table>

PCB LANDING

- **A**: Pitch
- **B**: Pad Length
- **C**: Pad Width

<table>
<thead>
<tr>
<th>SYMBOL</th>
<th>DESCRIPTION</th>
<th>MM</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Pitch</td>
<td>3.6</td>
</tr>
<tr>
<td>B</td>
<td>Pad Length</td>
<td>1.0</td>
</tr>
<tr>
<td>C</td>
<td>Pad Width</td>
<td>1.5</td>
</tr>
</tbody>
</table>

*Note: Alternative layouts may be used to optimize size or manufacturability*
DATASHEET

SQ-MIN-200
NANO-POWER TILT AND VIBRATION SENSOR

PRODUCT COMPARISON

<table>
<thead>
<tr>
<th>GRADE</th>
<th>ASSEMBLY METHOD</th>
<th>SEALED</th>
<th>WASHABLE</th>
<th>ROHS</th>
<th>OPERATING TEMPERATURE</th>
<th>CYCLES *</th>
<th>SERVICE LIFE (YRS)</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>Reflow Solder: 260° C peak Hand Assembly: 315° C peak, 2-3 seconds on end terminal</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>-40° to +85° C</td>
<td>1 Billion</td>
<td>10</td>
</tr>
<tr>
<td>C</td>
<td>Reflow Solder: 260° C peak Hand Assembly: 315° C peak, 2-3 seconds on end terminal</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>-25° to +70° C</td>
<td>1 Billion</td>
<td>5</td>
</tr>
</tbody>
</table>

*Test conditions: 0.5 gRMS, 5 to 200 Hz flat spectrum

ORDERING GUIDE

<table>
<thead>
<tr>
<th>PART NUMBER</th>
<th>PACKAGING CODE</th>
<th>COMPLETE ORDER NUMBER</th>
</tr>
</thead>
<tbody>
<tr>
<td>SQ-MIN-200-C</td>
<td>TR - Tape on Reel</td>
<td>SQ-MIN-200-CTR</td>
</tr>
<tr>
<td>SQ-MIN-200-I</td>
<td>CT - Cut Tape TR - Tape on Reel</td>
<td>SQ-MIN-200-ICT SQ-MIN-200-ITR</td>
</tr>
</tbody>
</table>
LIMITATIONS AND WARNINGS
This product is not designed for use in life support and/or safety equipment where malfunction of the product can reasonably be expected to result in personal injury or death. Buyer uses this product in such applications at Buyer’s own risk and agrees to defend, indemnify, and hold harmless SignalQuest, LLC from any and all damages, claims, suits, or expenses resulting from such misuse.

TESTING
The performance of each sensor is verified through build-time testing.

SYSTEM INTEGRATION TESTING
Thorough testing should be carried out prior to product release to ensure system integration has not introduced unforeseen problems. The system integrator assumes the ultimate responsibility for the safety of the target application.

NOTICE
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FURTHER INFORMATION
For pricing, deliveries, and ordering information, please contact SignalQuest at (603) 448-6266
For updates on this and other documents, visit our website at www.signalquest.com.

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