Features and Benefits

- Actuation Force as low as 0.2N and sensitivity range to 20N
- Cost Effective
- Ultra Thin
- Robust; up to 10M actuations
- Simple and easy to integrate

Description

Interlink Electronics FSR® 400 series is part of the single zone Force Sensing Resistor® family. Force Sensing Resistors®, or FSRs, are robust polymer thick film (PTF) devices that exhibit a decrease in resistance with increase in force applied to the surface of the sensor. This force sensitivity is optimized for use in human touch control of electronic devices such as automotive electronics, medical systems, industrial, and robotics applications.

The 400 series sensors come in six different models with four different connecting options.

FSR® 400 Short
5mm Circle X 20mm

FSR® 400
5mm Circle X 38mm

FSR® 402 Short
13mm Circle X 25mm

FSR® 402
13mm Circle X 56mm

FSR® 406
38mm Square X 83mm

FSR® 408
10mm X 622mm Strip

Embrace the Power of Sensor Technologies
### Applications

<table>
<thead>
<tr>
<th>Description</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Detect &amp; qualify press</td>
<td>Sense whether a touch is accidental or intended by reading force</td>
</tr>
<tr>
<td>Use force for UI feedback</td>
<td>Detect more or less user force to make a more intuitive interface</td>
</tr>
<tr>
<td>Enhance tool safety</td>
<td>Differentiate a grip from a touch as a safety lock</td>
</tr>
<tr>
<td>Find centroid of force</td>
<td>Use multiple sensors to determine centroid of force</td>
</tr>
<tr>
<td>Detect presence, position, or motion</td>
<td>of a person or patient in a bed chair, or medical device</td>
</tr>
<tr>
<td>Many other force change detection applications</td>
<td></td>
</tr>
</tbody>
</table>

### Device Characteristics

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Actuation Force*</td>
<td>~0.2N min</td>
</tr>
<tr>
<td>Force Sensitivity Range*</td>
<td>~0.2N - 20N</td>
</tr>
<tr>
<td>Force Resolution</td>
<td>Continuous (analog)</td>
</tr>
<tr>
<td>Force Repeatability Single Part</td>
<td>+/- 2%</td>
</tr>
<tr>
<td>Force Repeatability Part to Part</td>
<td>+/- 6% (Single Batch)</td>
</tr>
<tr>
<td>Non-Actuated Resistance</td>
<td>&gt;10 Mohms</td>
</tr>
<tr>
<td>Hysteresis</td>
<td>+10% Average ((R_{av} - R_{av})/R_{av})</td>
</tr>
<tr>
<td>Device Rise Time</td>
<td>&lt; 3 microseconds</td>
</tr>
<tr>
<td>Long Term Drift</td>
<td>&lt; 5% (\log_{10}(\text{time}))</td>
</tr>
<tr>
<td>Operating Temperature Performance</td>
<td></td>
</tr>
<tr>
<td>Cold: -40°C after 1 hour</td>
<td>-5% average resistance change</td>
</tr>
<tr>
<td>Hot: +85°C after 1 hour</td>
<td>-15% average resistance change</td>
</tr>
<tr>
<td>Hot Humid: +85°C 95RH after 1 hour</td>
<td>+10% average resistance change</td>
</tr>
<tr>
<td>Storage Temperature Performance</td>
<td></td>
</tr>
<tr>
<td>Cold: -25°C after 120 hours</td>
<td>-10% average resistance change</td>
</tr>
<tr>
<td>Hot: +85°C after 120 hours</td>
<td>-5% average resistance change</td>
</tr>
<tr>
<td>Hot Humid: +85°C 95RH after 240 hours</td>
<td>+30% average resistance change</td>
</tr>
<tr>
<td>Tap Durability</td>
<td>-10% average resistance change</td>
</tr>
<tr>
<td>Tested to 10 Million actuations, 1kg, 4Hz</td>
<td>-5% average resistance change</td>
</tr>
<tr>
<td>Standing Load Durability</td>
<td>Generates No EM</td>
</tr>
<tr>
<td>2.5kg for 24 hours</td>
<td>Not ESD sensitive</td>
</tr>
<tr>
<td>EMI</td>
<td>All materials UL grade 94 V-1 or better</td>
</tr>
<tr>
<td>ESD</td>
<td>Compliant</td>
</tr>
</tbody>
</table>

Specifications are derived from measurements taken at 1000 grams, and are given as (one standard deviation / mean), unless otherwise noted.

*Typical value. Force dependent on actuation interface, mechanics, and measurement electronics.
**Application Information**

For specific application needs please contact Interlink Electronics support team. An integration guide and Hardware Development Kit (HDK) are also available.

FSR's are two-wire devices with a resistance that depends on applied force. To the right is a force vs. resistance graph that illustrates a typical FSR response characteristic. Please note that the graph values are reference only and actual values are dependent upon actuation system mechanics and sensor geometry.

For a simple force-to-voltage conversion, the FSR device is tied to a measuring resistor in a voltage divider (see figure below) and the output is described by the following equation.

\[ V_{OUT} = \frac{R_M V^+}{R_M + R_{FSR}} \]

In the shown configuration, the output voltage increases with increasing force. If \( R_{FSR} \) and \( R_M \) are swapped, the output swing will decrease with increasing force.

The measuring resistor, \( R_M \), is chosen to maximize the desired force sensitivity range and to limit current. Depending on the impedance requirements of the measuring circuit, the voltage divider could be followed by an op-amp.

A family of force vs. \( V_{OUT} \) curves is shown on the graph below for a standard FSR in a voltage divider configuration with various \( R_M \) resistors. A \( V^+ \) of +5V was used for these examples. Please note that the graph values are for reference only and will vary between different sensors and applications.

Refer to the FSR integration guide for more integration methods and techniques.
FSR® Model 400 Short Tail

**Model 400 Short Tail:**
- Active Area: \( \odot 5.62 \text{mm} \)
- Normal Thickness: 0.30mm
- Switch Travel: 0.05mm

**Available Part Numbers:**
PN: 34-47021 Model 400 Short Tail
  - No contacts or solder tabs
PN: 34-00005 Model 400 Short Tail
  - with female contacts
PN: 34-00006 Model 400 Short Tail
  - with female contacts and Housing
PN: 34-00004 Model 400 Short Tail
  - with solder tabs

**Sensor Mechanical Data**

- \( \varnothing 5.6 \text{ (ACTIVE AREA)} \)
- \( R3.8 \)
- \( T=0.30 \pm 0.03 \)
- \( 0.10 \)

**Exploded View**

Sensor mechanical 3D CAD data can be found on our website at www.interlinkelectronics.com/Support
FSR® Model 400

Sensor Mechanical Data

Model 400:
Active Area: 5.08mm
Nominal Thickness: 0.30mm
Switch Travel: 0.05mm

Available Part Numbers:
PN: 34-00007 Model 400
  - no contacts or solder tabs
PN: 34-00011 Model 400
  - with female contacts
PN: 34-44001 Model 400
  - with female contacts and housing
PN: 30-49649 Model 400
  - with solder tabs

Exploded View

Sensor mechanical 3D CAD data can be found on our website at www.interlinkelectronics.com/Support
**FSR® Model 402**

**Model 402:**
- Active Area: 14.68mm
- Nominal Thickness: 0.46mm
- Switch Travel: 0.15mm

**Available Part Numbers:**
- PN: 44-29103 Model 402 - no contacts or solder tabs
- PN: 34-00012 Model 402 - with female contacts
- PN: 34-00001 Model 402 - with female contacts and housing
- PN: 30-81794 Model 402 - with solder tabs

**Sensor Mechanical Data**

**Exploded View**

Sensor mechanical 3D CAD data can be found on our website at www.interlinkelectronics.com/Support
**Model 402 Short Tail:**
- Active Area: 12.70mm
- Nominal Thickness: 0.46mm
- Switch Travel: 0.15mm

**Available Part Numbers:**
- PN: 34-00016 Model 402 Short Tail - no contacts or solder tabs
- PN: 34-00017 Model 402 Short Tail - with female contacts
- PN: 34-00018 Model 402 Short Tail - with female contacts and housing
- PN: 34-00015 Model 402 Short Tail - with solder tabs

**Sensor Mechanical Data**

**Exploded View**

Sensor mechanical 3D CAD data can be found on our website at www.interlinkelectronics.com/Support
**FSR® Model 406**

**Model 406:**
Active Area: 39.6mm x 39.6mm
Nominal Thickness: 0.46mm
Switch Travel: 0.15mm

**Available Part Numbers:**
- PN: 34-00009 Model 406 - no contacts or solder tabs
- PN: 34-00013 Model 406 - with female contacts
- PN: 34-61152 Model 406 - with female contacts and housing
- PN: 30-73258 Model 406 - with solder tabs

**Sensor Mechanical Data**

**Exploded View**

Sensor mechanical 3D CAD data can be found on our website at www.interlinkelectronics.com/Support
**Model 408:**
- Active Area: 609.6mm x 10.2mm
- Nominal Thickness: 0.41mm
- Switch Travel: 0.15mm

**Available Part Numbers:**
- PN: 34-00010 Model 408 - no contacts or solder tabs
- PN: 34-75319 Model 408 - with female contacts
- PN: 34-23845 Model 408 - with female contacts and housing
- PN: 30-61710 Model 408 - with solder tabs

**Sensor Mechanical Data**

**Exploded View**

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