INTERLINK ELECTRONICS®
Sensor Technologies

FSR 400 Series Data Sheet

Force Sensing Resistors

Features and Benefits

- Actuation Force as low as 0.1N and sensitivity range to 20N
- Easily customizable to a wide range of sizes
- Cost Effective
- Ultra Thin
- Robust; up to 10M actuations
- Simple and easy to integrate

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Description

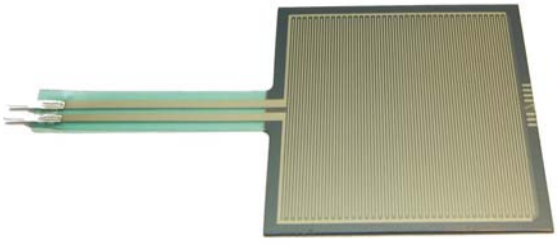
Interlink Electronics FSR™ 400 series is part of the single zone Force Sensing Resistor™ family. Force Sensing Resistors, or FSRs, are robust polymer thick film (PTF) devices that exhibit a decrease in resistance with increase in force applied to the surface of the sensor. This force sensitivity is optimized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

The 400 series sensors come in five different models with three different connecting options.

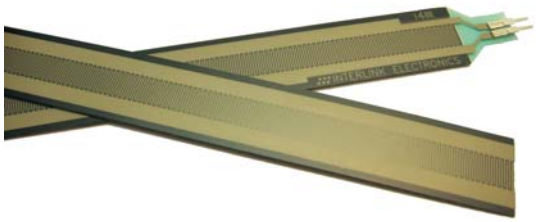
FSR 400 Short
5mm Circle X 20mm

FSR 400
5mm Circle X 38mm

FSR 402
13mm Circle X 56mm



FSR 406
38mm Square X 83mm



FSR 408
10mm X 622mm Strip

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FSR 400 Series Data Sheet

Applications

Detect & qualify press
Sense whether a touch is accidental or intended by reading force

Use force for UI feedback
Detect more or less user force to make a more intuitive interface

Enhance tool safety
Differentiate a grip from a touch as a safety lock

Find centroid of force
Use multiple sensors to determine centroid of force

Detect presence, position, or motion
of a person or patient in a bed chair, or medical device

Detect liquid blockage
Detect tube or pump occlusion or blockage by measuring back pressure

Many other force change detection applications

Device Characteristics

Parameter	Value
Actuation Force*	~0.2N min
Force Sensitivity Range*	~0.2N - 20N
Force Resolution	Continuous (analog)
Force Repeatability Single Part	+/- 2%
Force Repeatability Part to Part	+/- 6%
Non-Actuated Resistance	>10 Mohms
Hysteresis	+10% Average $(R_{F+} - R_{F-})/R_{F+}$
Device Rise Time	< 3 microseconds
Long Term Drift	
1kg load, 35 days	< 5% log10 (time)
Operating Temperature Performance	
Cold: -40C after 1 hour	-5% average resistance change
Hot: +85C after 1 hour	-15% average resistance change
Hot Humid: +85C 95RH after 1 hour	+10% average resistance change
Storage Temperature Performance	
Cold: -25C after 120 hours	-10% average resistance change
Hot: +85C after 120 hours	-5% average resistance change
Hot Humid: +85C 95RH after 240 hours	+30% average resistance change
Tap Durability	
10 Million actuations, 1kg, 4Hz	-10% average resistance change
Standing Load Durability	
2.5kg for 24 hours	-5% average resistance change
EMI	Generates No EMI
ESD	Not ESD sensitive
UL:	All materials UL grade 94 V-1 or better
RoHS:	Compliant

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

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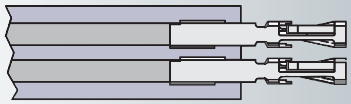
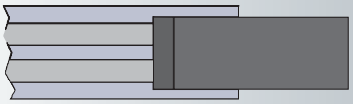
Connector Options

Bare Tail

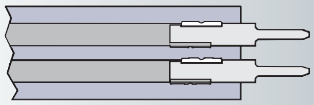
Female Tin Contacts
PN: TE 2-487406-4



Female Tin Contacts
with 2 Pin Housing
PN: TE 2-487406-4
PN: TE 487378-1



Solder Tabs
PN: TE 1-88997-2



Other Available Part Numbers:

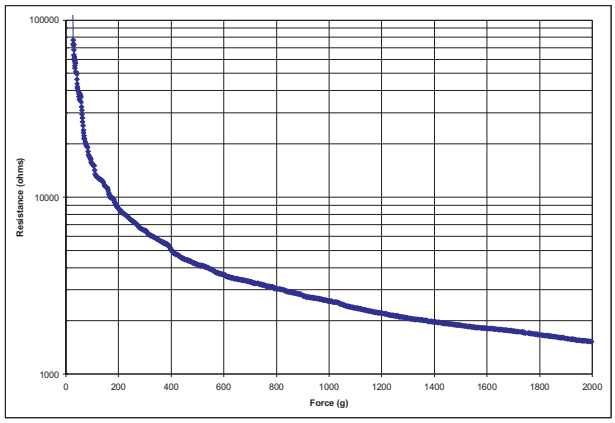
Hardware Development Kit
PN: 54-76247

Demo Assembly with
Single Zone Sensor
PN: 54-00006

Application Information

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

FSRs 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.

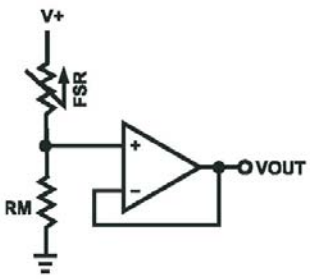
$$V_{OUT} \quad \frac{R_M V}{R_M \quad R_{FSR}}$$

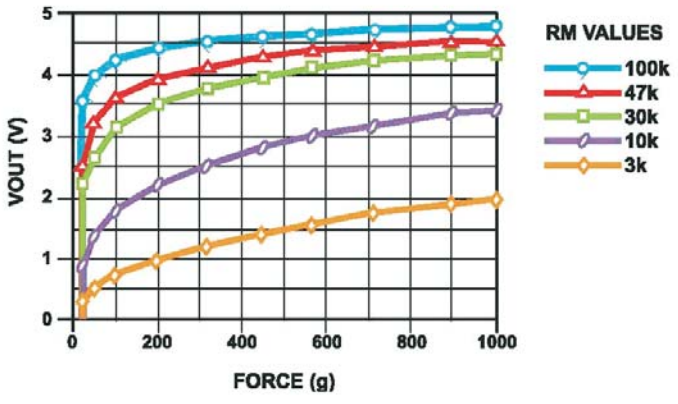
In the shown configuration, the output voltage increases with increasing force. If RFSR and RM are swapped, the output swing will decrease with increasing force.

The measuring resistor, RM, 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. VOUT curves is shown on the graph below for a standard FSR in a voltage divider configuration with various RM 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.





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FSR Model 400 Short Tail

Model 400 Short Tail:

Active Area: Ø 5.6mm
Nominal Thickness: 0.30mm
Switch Travel: 0.05mm

Available Part Numbers:

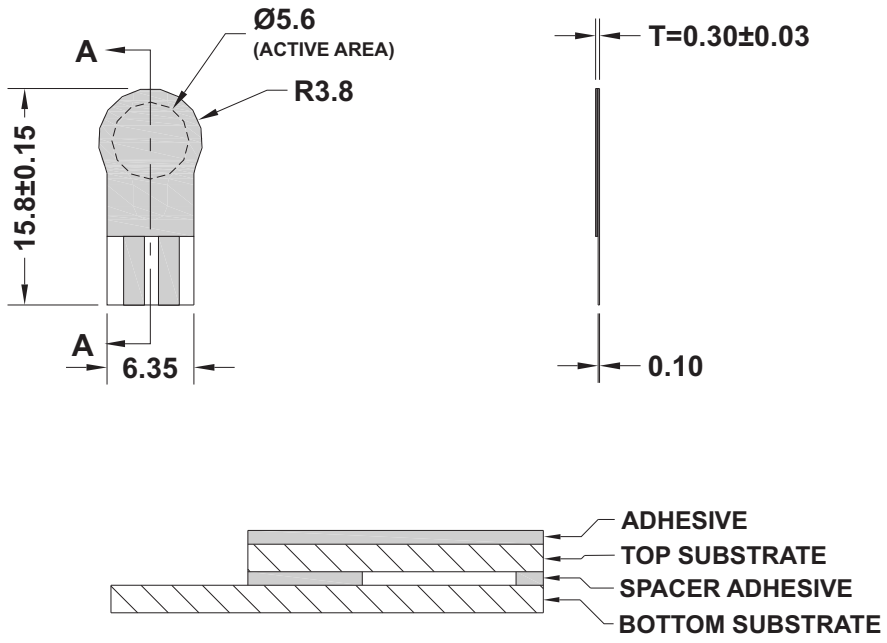
PN: 34-47021 Model 400 Short Tail
- No contacts or solder tabs

PN: 34-00005 Model 400 Short Tail
- with Female Contacts

PN: 34-00006 Model 400 Short Tail
- with Female Contacts & Housing

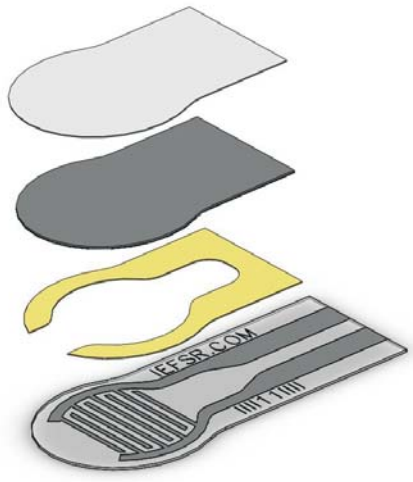
PN: 34-00004 Model 400 Short Tail
- with Solder Tabs

Sensor Mechanical Data



SECTION A-A
LAYER STACK-UP

Exploded View



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

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FSR Model 400

Model 400:

Active Area: ⌀ 0.30mm
Nominal Thickness: 0.35mm
Switch Travel: 0.05mm

Available Part Numbers:

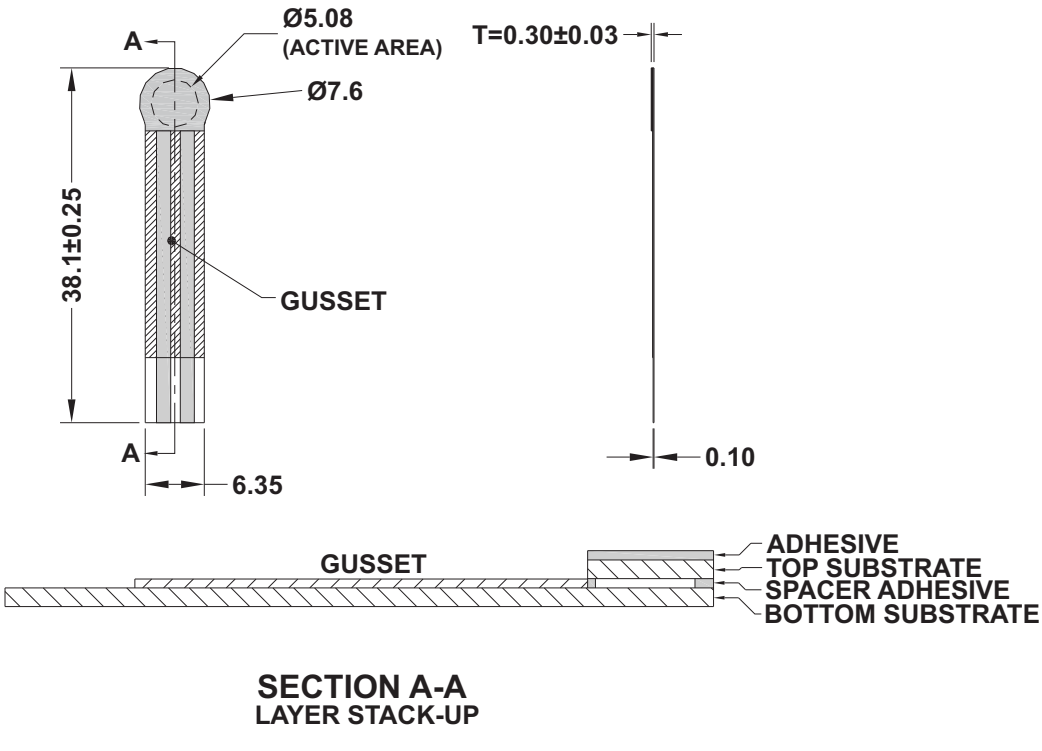
PN: 34-00007 Model 400
- No contacts or solder tabs

PN: 34-00011 Model 400
- with Female Contacts

PN: 34-44001 Model 400
- with Female Contacts & Housing

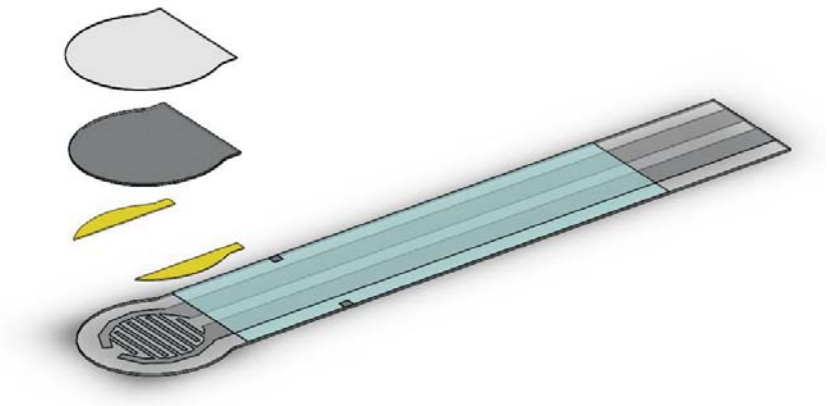
PN: 30-49649 Model 400
- with Solder Tabs

Sensor Mechanical Data



SECTION A-A
LAYER STACK-UP

Exploded View



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FSR Model 402

Model 402:

Active Area: ⌀ 14.68mm
Nominal Thickness: 0.46mm
Switch Travel: 0.15mm

Available Part Numbers:

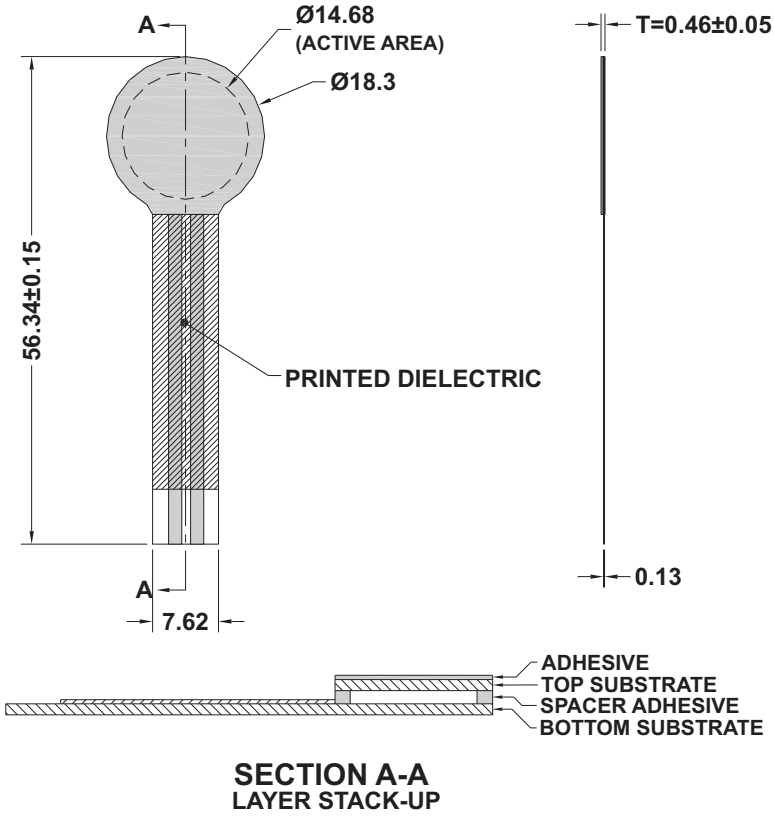
PN: 44-29103 Model 402
- No contacts or solder tabs

PN: 34-00012 Model 402
- with Female Contacts

PN: 34-00001 Model 402
- with Female Contacts & Housing

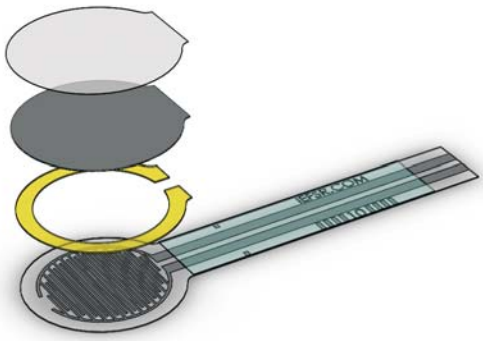
PN: 30-81794 Model 402
- with Solder Tabs

Sensor Mechanical Data



SECTION A-A
LAYER STACK-UP

Exploded View



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FSR Model 406

Model 406:

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

Available Part Numbers:

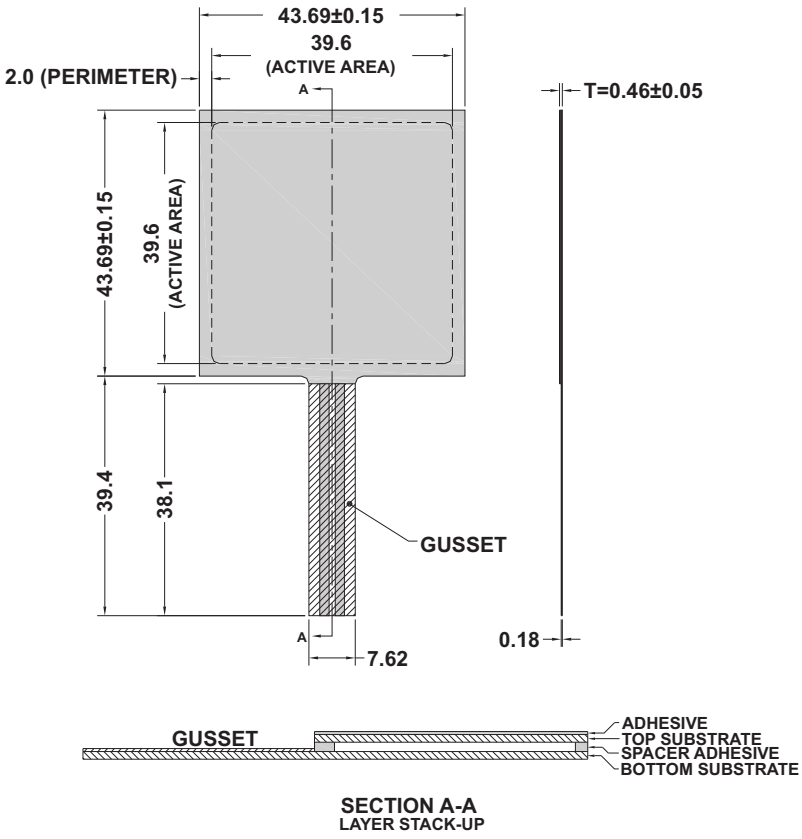
PN: 34-00009 Model 406
- No contacts or solder tabs

PN: 34-00013 Model 406
- with Female Contacts

PN: 34-61152 Model 406
- with Female Contacts & Housing

PN: 30-73258 Model 406
- with Solder Tabs

Sensor Mechanical Data



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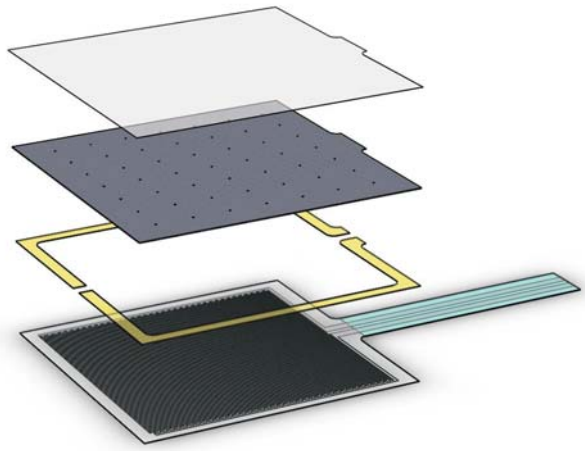

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FSR Model 408

Model 408:

Active Area: 609.6 x 10.2mm
Nominal Thickness: 0.41mm
Switch Travel: 0.15mm

Available Part Numbers:

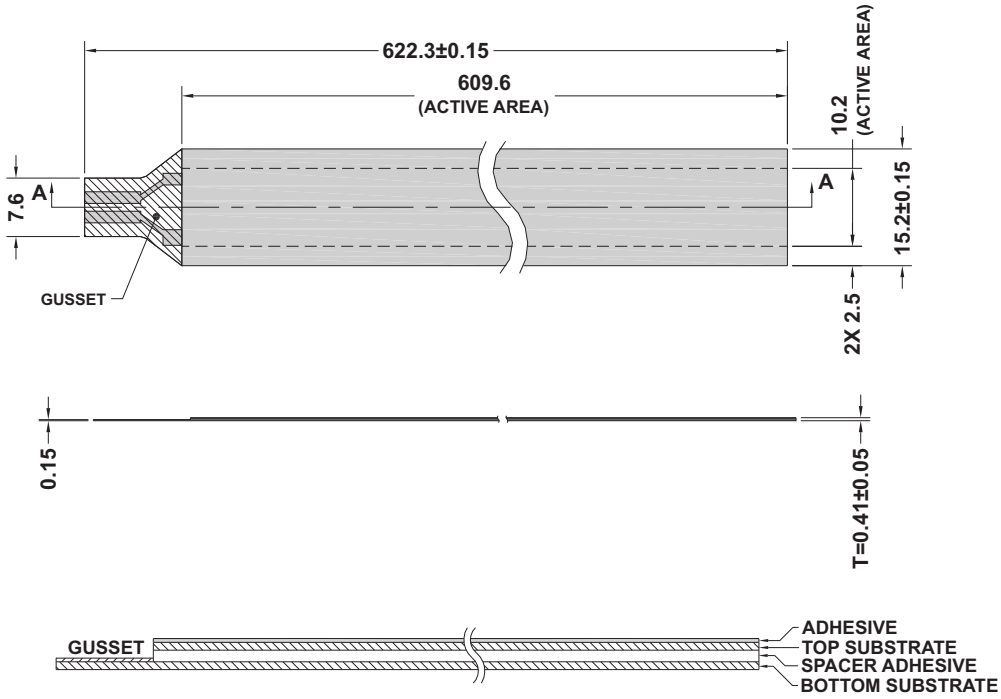
PN: 34-00010 Model 408
- No contacts or solder tabs

PN: 34-75319 Model 408
- with Female Contacts

PN: 34-23845 Model 408
- with Female Contacts & Housing

PN: 30-61710 Model 408
- with Solder Tabs

Sensor Mechanical Data



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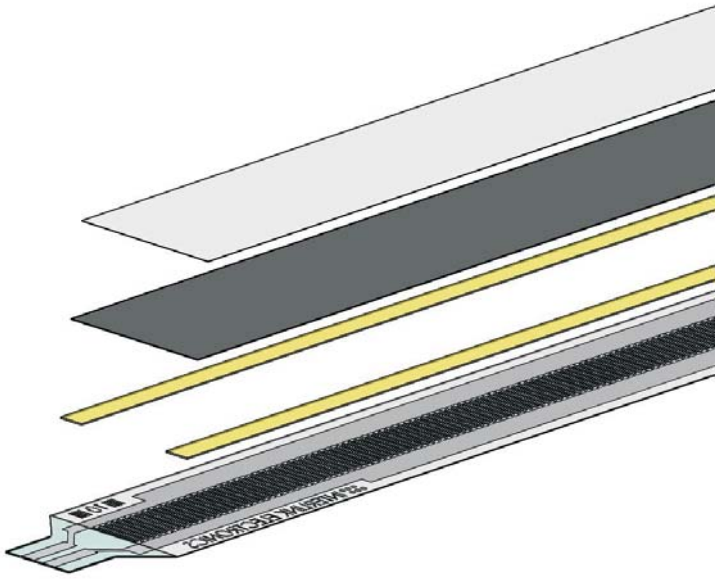

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