

# FSR® 400 Series Data Sheet

## 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.

## Force Sensing Resistors®



**FSR® 400 Short**  
5mm Circle X 20mm



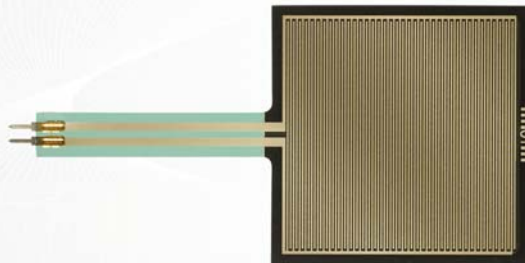
**FSR® 400**  
5mm Circle X 38mm



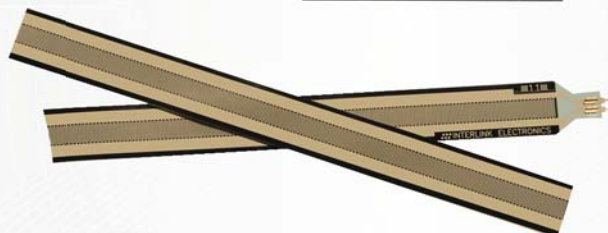
**FSR® 402 Short**  
13mm Circle X 25mm



**FSR® 402**  
13mm Circle X 56mm



**FSR® 406**  
38mm Square X 83mm



**FSR® 408**  
10mm X 622mm Strip



P/N: 94-00027 Rev. D

## 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

Many other force change detection applications

## Device Characteristics

|   |   |
|---|---|
| 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% (Single Batch)                   |
| Non-Actuated Resistance                                     | >10 Mohms                               |
| Hysteresis  | +10% Average $(R_{F+} - R_{F-})/R_{F+}$ |
| Device Rise Time  | < 3 microseconds                        |
| Long Term Drift<br>1kg load, 35 days                        | < 5% $\log_{10}(\text{time})$           |
| Operating Temperature Performance                           |   |
| Cold: -40°C after 1 hour                                    | -5% average resistance change           |
| Hot: +85°C after 1 hour                                     | -15% average resistance change          |
| Hot Humid: +85°C 95RH after 1 hour                          | +10% average resistance change          |
| Storage Temperature Performance                             |   |
| Cold: -25°C after 120 hours                                 | -10% average resistance change          |
| Hot: +85°C after 120 hours                                  | -5% average resistance change           |
| Hot Humid: +85°C 95RH after 240 hours                       | +30% average resistance change          |
| Tap Durability<br>Tested to 10 Million actuations, 1kg, 4Hz | -10% average resistance change          |
| Standing Load Durability<br>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.

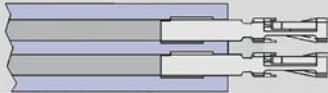
\*Typical value. Force dependent on actuation interface, mechanics, and measurement electronics

## Connector Options

Bare Tail



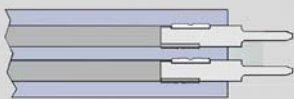
Female Tin Contacts  
PN: TE 2-487406-4



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



Solder Tabs  
PN: TE 1-88997-2



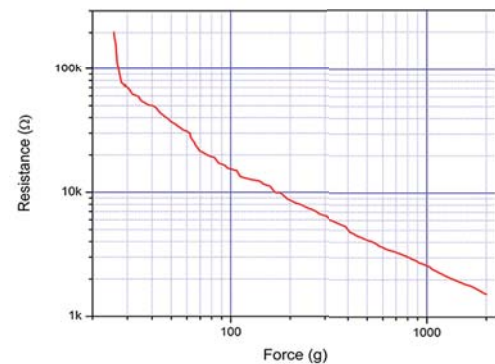
**Other Available Part Numbers:**  
Hardware Development Kit  
PN: 54-76247

## Application Information

Force Sensing Resistors®

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.

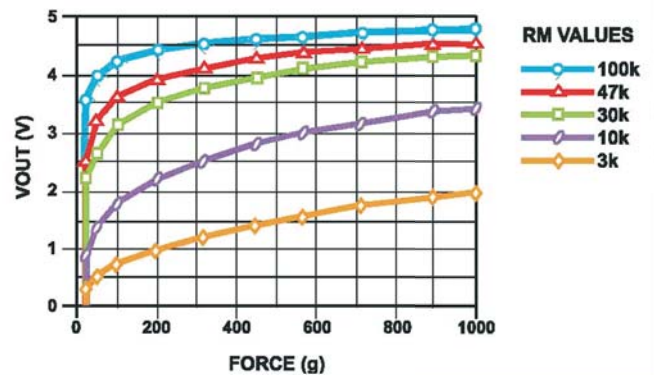
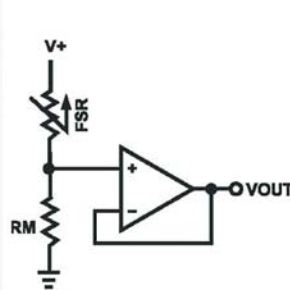
$$V_{OUT} = \frac{R_M V^+}{(R_M + R_{FSR})}$$

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

Force Sensing Resistors®

## Model 400 Short Tail:

Active Area:  $\varnothing 5.62\text{mm}$

Normal Thickness: 0.30mm

Switch Travel: 0.05mm

## Available Part Numbers:

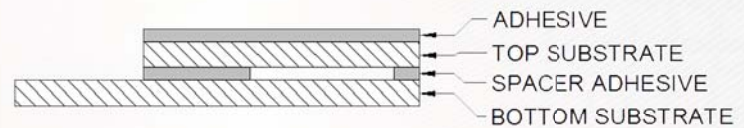
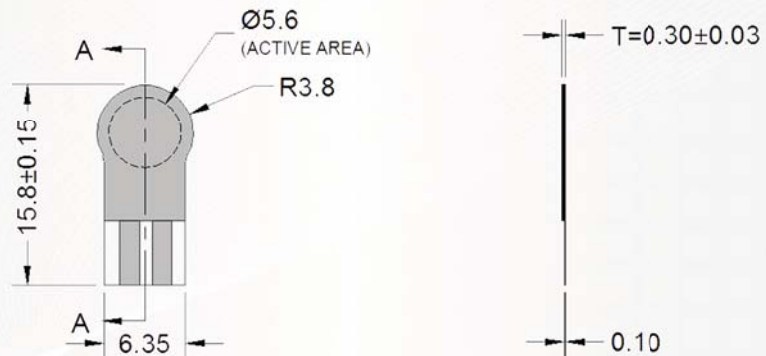
PN: 34-47021 Model 400 Short Tail  
- No contacts or solder tabs

PN: 34-00005 Model 400 Short Tail  
- with female contacts

PN: 34-00006 Model 400 Short Tail  
- with female contacts and Housing

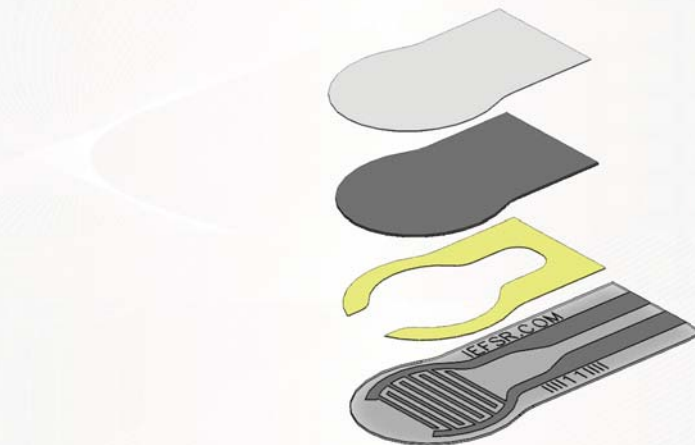
PN: 34-00004 Model 400 Short Tail  
- with solder tabs

## Sensor Mechanical Data



SECTION A-A  
LAYER STACK-UP

## Exploded View



Sensor mechanical 3D CAD data can be found on our website at  
[www.interlinkelectronics.com/Support](http://www.interlinkelectronics.com/Support)

# FSR® Model 400

Force Sensing Resistors®

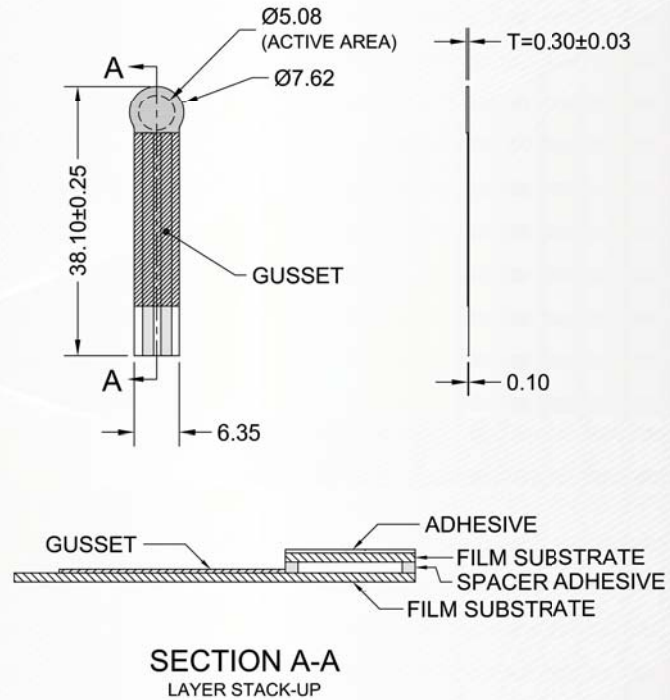
## Model 400:

Active Area:  $\varnothing 5.08\text{mm}$   
Nominal Thickness: 0.30mm  
Switch Travel: 0.05mm

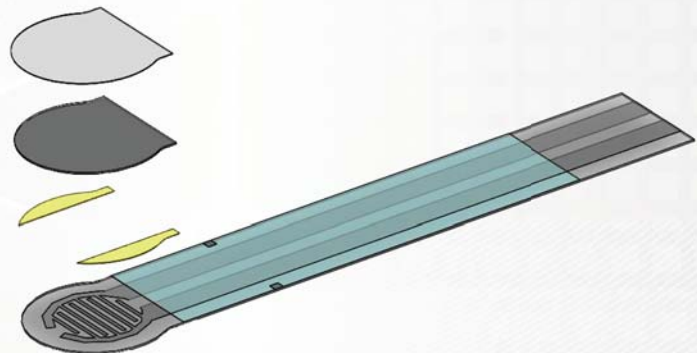
## Available Part Numbers:

- 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

## Sensor Mechanical Data



## Exploded View



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# FSR® Model 402

Force Sensing Resistors®

## Model 402:

Active Area:  $\varnothing$  14.68mm

Nominal Thickness: 0.46mm

Switch Travel: 0.15mm

## Available Part Numbers:

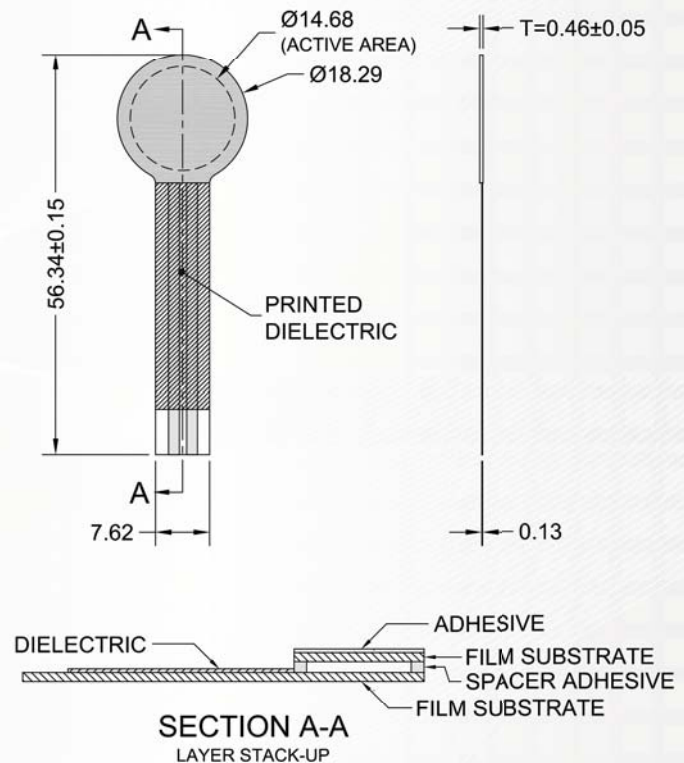
PN: 44-29103 Model 402  
- no contacts or solder tabs

PN: 34-00012 Model 402  
- with female contacts

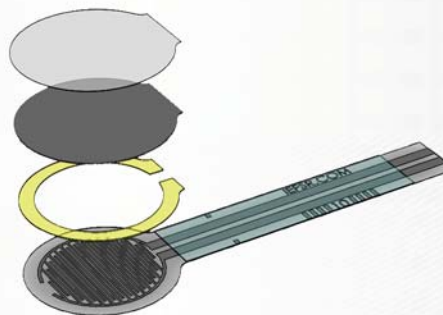
PN: 34-00001 Model 402  
- with female contacts and housing

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](http://www.interlinkelectronics.com/Support)

# FSR® Model 402 Short Tail

Force Sensing Resistors®

## Model 402 Short Tail:

Active Area:  $\varnothing 12.70\text{mm}$

Nominal Thickness: 0.46mm

Switch Travel: 0.15mm

## Available Part Numbers:

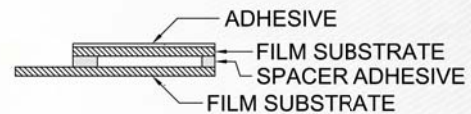
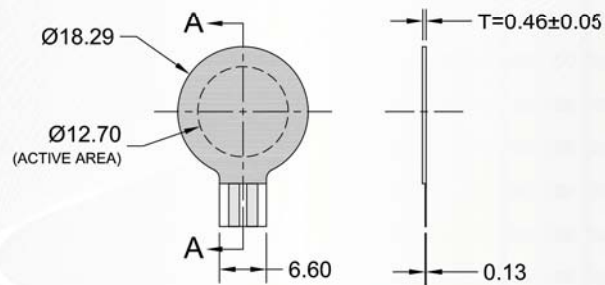
PN: 34-00016 Model 402 Short Tail  
- no contacts or solder tabs

PN: 34-00017 Model 402 Short Tail  
- with female contacts

PN: 34-00018 Model 402 Short Tail  
- with female contacts and housing

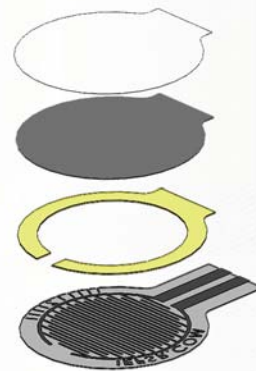
PN: 34-00015 Model 402 Short Tail  
- with solder tabs

## Sensor Mechanical Data



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

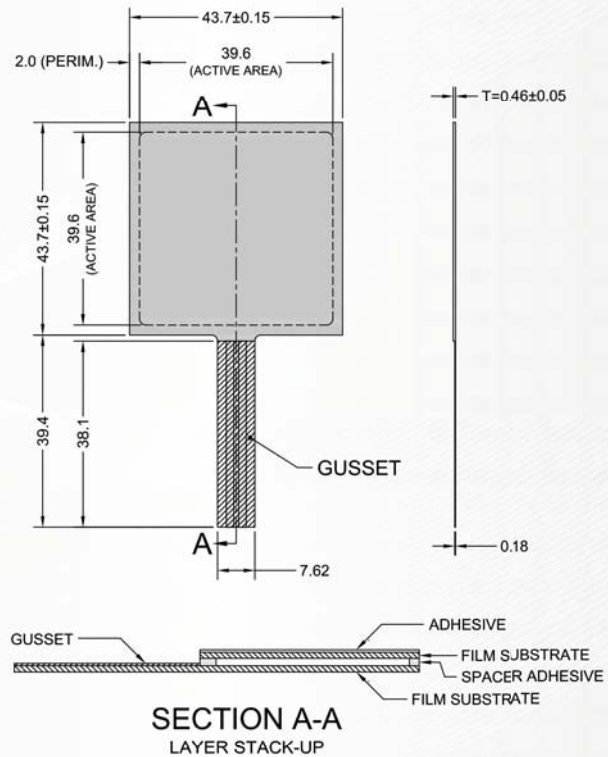
PN: 34-00013 Model 406  
- with female contacts

PN: 34-61152 Model 406  
- with female contacts and housing

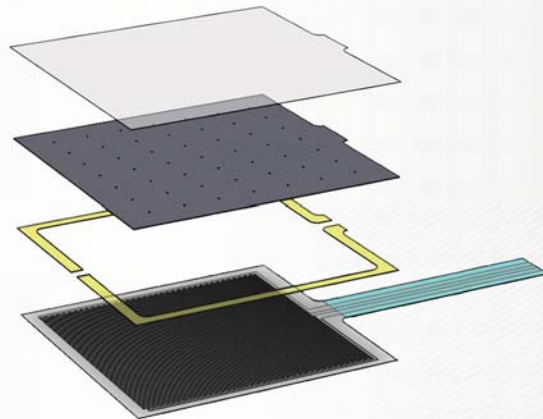
PN: 30-73258 Model 406  
- with solder tabs

Force Sensing Resistors®

## Sensor Mechanical Data



## Exploded View



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# FSR® Model 408

### 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

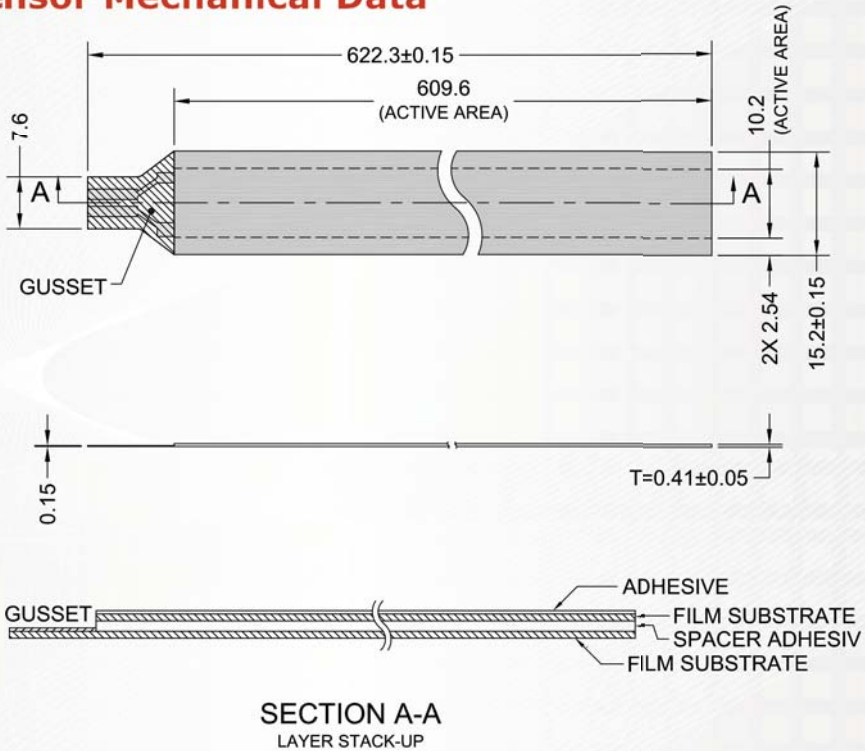
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sales@interlinkelectronics.com

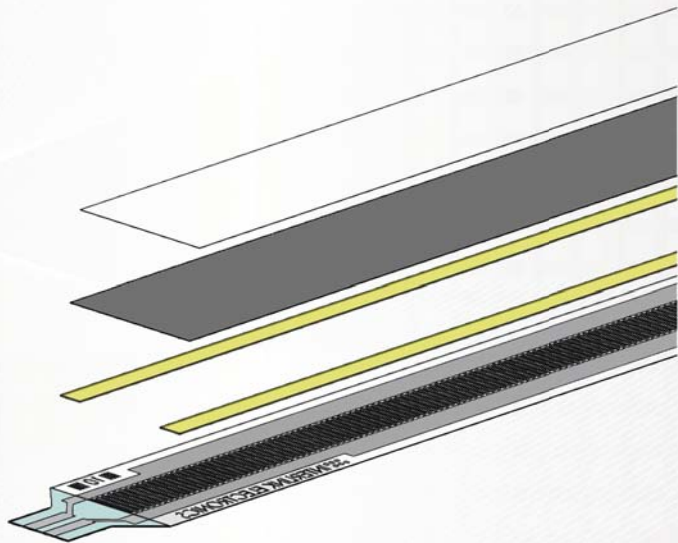
**Japan**  
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Fax: +81-45-263-6501  
www.interlinkelec.co.jp

Force Sensing Resistors®

### Sensor Mechanical Data



### Exploded View



Sensor mechanical 3D CAD data can be found on our website at [www.interlinkelectronics.com/Support](http://www.interlinkelectronics.com/Support)

Компания «Океан Электроники» предлагает заключение долгосрочных отношений при поставках импортных электронных компонентов на взаимовыгодных условиях!

Наши преимущества:

- Поставка оригинальных импортных электронных компонентов напрямую с производств Америки, Европы и Азии, а так же с крупнейших складов мира;
- Широкая линейка поставок активных и пассивных импортных электронных компонентов (более 30 млн. наименований);
- Поставка сложных, дефицитных, либо снятых с производства позиций;
- Оперативные сроки поставки под заказ (от 5 рабочих дней);
- Экспресс доставка в любую точку России;
- Помощь Конструкторского Отдела и консультации квалифицированных инженеров;
- Техническая поддержка проекта, помощь в подборе аналогов, поставка прототипов;
- Поставка электронных компонентов под контролем ВП;
- Система менеджмента качества сертифицирована по Международному стандарту ISO 9001;
- При необходимости вся продукция военного и аэрокосмического назначения проходит испытания и сертификацию в лаборатории (по согласованию с заказчиком);
- Поставка специализированных компонентов военного и аэрокосмического уровня качества (Xilinx, Altera, Analog Devices, Intersil, Interpoint, Microsemi, Actel, Aeroflex, Peregrine, VPT, Syfer, Eurofarad, Texas Instruments, MS Kennedy, Miteq, Cobham, E2V, MA-COM, Hittite, Mini-Circuits, General Dynamics и др.);

Компания «Океан Электроники» является официальным дистрибьютором и эксклюзивным представителем в России одного из крупнейших производителей разъемов военного и аэрокосмического назначения «JONHON», а так же официальным дистрибьютором и эксклюзивным представителем в России производителя высокотехнологичных и надежных решений для передачи СВЧ сигналов «FORSTAR».



## JONHON

«JONHON» (основан в 1970 г.)

Разъемы специального, военного и аэрокосмического назначения:

(Применяются в военной, авиационной, аэрокосмической, морской, железнодорожной, горно- и нефтедобывающей отраслях промышленности)

«FORSTAR» (основан в 1998 г.)

ВЧ соединители, коаксиальные кабели, кабельные сборки и микроволновые компоненты:

(Применяются в телекоммуникациях гражданского и специального назначения, в средствах связи, РЛС, а так же военной, авиационной и аэрокосмической отраслях промышленности).



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