

## Force Sensors

### FSS Low Profile Force Sensors

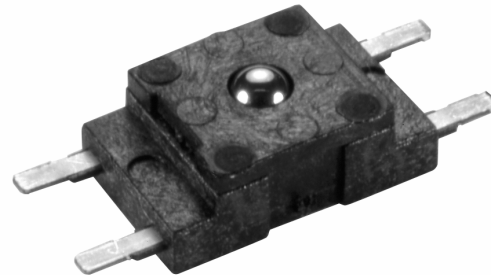
### FS Series

#### FEATURES

- True Surface Mount Technology
- Maximum peak reflow temperature of 260 °C [500 °F]
- Compact, commercial grade package
- Robust performance characteristics
- Adaptable package design
- Precision force sensing
- Reliability rated at 20 million MCTF at 25 °C [77 °F]
- Electrically ratiometric output
- Extremely low deflection (30 microns typ. @ Full Scale)
- High ESD resistance 8 kV
- Available signal conditioning
- Optional terminal configurations

#### TYPICAL APPLICATIONS

- Medical infusion pumps
- Ambulatory noninvasive pump pressure
- Occlusion detection
- Kidney dialysis machines
- Load and compression sensing
- Variable tensions control
- Robotic end-effectors
- Wire bonding equipment



The FS Series sensors provide precise reliable force sensing performance in a compact commercial grade package at a cost effective price. The sensor features a proven sensing technology that uses a specialized piezoresistive micromachined silicon sensing element. The low power, unamplified, uncompensated Wheatstone bridge circuit design provides inherently stable mV outputs over the force range.

Force sensors operate on the principle that the resistance of silicon-implanted piezoresistors will increase when the resistors flex under any applied force. The sensor concentrates force from the applications, through the stainless steel ball, directly to the silicon-sensing element. The amount of resistance changes in proportion to the amount of force being applied. This change in circuit resistance results in a corresponding mV output level change.

The sensor package design incorporates patented modular construction. The use of innovative elastomeric technology and engineered molded plastics result in load excitation capacities of 4.5/5.5 kg over-force. The stainless steel ball provides excellent mechanical stability and is adaptable to a variety of applications. The FSS sensor delivered 20 million operations in Mean Cycles to Failure (MCTF) reliability testing at 50 °C [122 °F]. This test determines the number of possible sensor operations at full scale until failure. Various electric interconnects can accept prewired connectors, printed circuit board mounting, and surface mountings. The unique sensor design also provides a variety of mounting options that include mounting brackets, as well as application specific mounting requirements.

#### **⚠ WARNING**

##### **PERSONAL INJURY**

DO NOT USE these products as safety or emergency stop devices or in any other application where failure of the product could result in personal injury.

**Failure to comply with these instructions could result in death or serious injury.**

#### **⚠ WARNING**

##### **MISUSE OF DOCUMENTATION**

- The information presented in this product sheet is for reference only. Do not use this document as a product installation guide.
- Complete installation, operation, and maintenance information is provided in the instructions supplied with each product.

**Failure to comply with these instructions could result in death or serious injury.**

# Force Sensors

## FSS Low Profile Force Sensors

## FS Series

### PERFORMANCE CHARACTERISTICS @ 5.0 ± 0.01 Vdc Excitation\*, 25 °C [77 °F]

Parameter	Min.	Typical	Max.	Units
Null Offset	-15	0	+15	mV
Operating Force	0	-	1500	grams
Sensitivity.	0.1	0.12	14	mV/gram
Linearity (B.F.S.L.)**	-	± 1.5	-	% span
Repeatability @ 300 g	-	± 10	-	grams
Null Shift				
25 °C to 2 °C [77 °F to 35.6 °F]	-	± 0.5	-	mV
25 °C to 40 °C [77 °F to 104 °F]	-	± 0.5	-	mV
Sensitivity Shift				
25 °C to 50 °C [77 °F to 122 °F]	-	5.5	-	% span
25 °C to 0 °C [77 °F to 32 °F]	-	5.5	-	% span
Input Resistance	4.0 K	5.0 K	6.0 K	Ohms
Output Resistance	4.0 K	5.0 K	6.0 K	Ohms
Overforce	-	-	4,500	grams
ESD (direct contact, terminals and plunger)	8	-	-	kV

\* Non-compensated force sensors, excited by constant current (1.5 mA) instead of voltage, exhibit partial temperature compensation of Span.

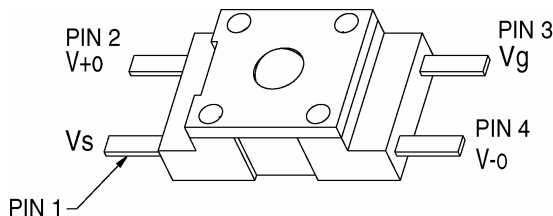
\*\* BFUL: Best Fit Straight Line

### ENVIRONMENTAL SPECIFICATIONS

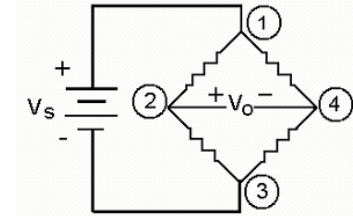
Operating temperature	-40 °C to 85 °C [-40 °F to 185 °F]
Storage temperature	-40 °C to 100 °C [-40 °F to 212 °F]
Shock	Qualification tested to 150 g
Vibration	Qualification tested to 0 to 2 kHz, 20 g sine
MCTF	20 million at 25 °C [77 °F]
Solderability	5 sec at 315 °C [599 °F] per lead
Output ratiometric	Within supply range

Note: All force related specifications are established using dead weight or compliant force.

### SENSOR PINOUT



### EXCITATION SCHEMATIC Excitation 5 Vdc Typ., 12 Vdc Max.



### FS SERIES CIRCUIT

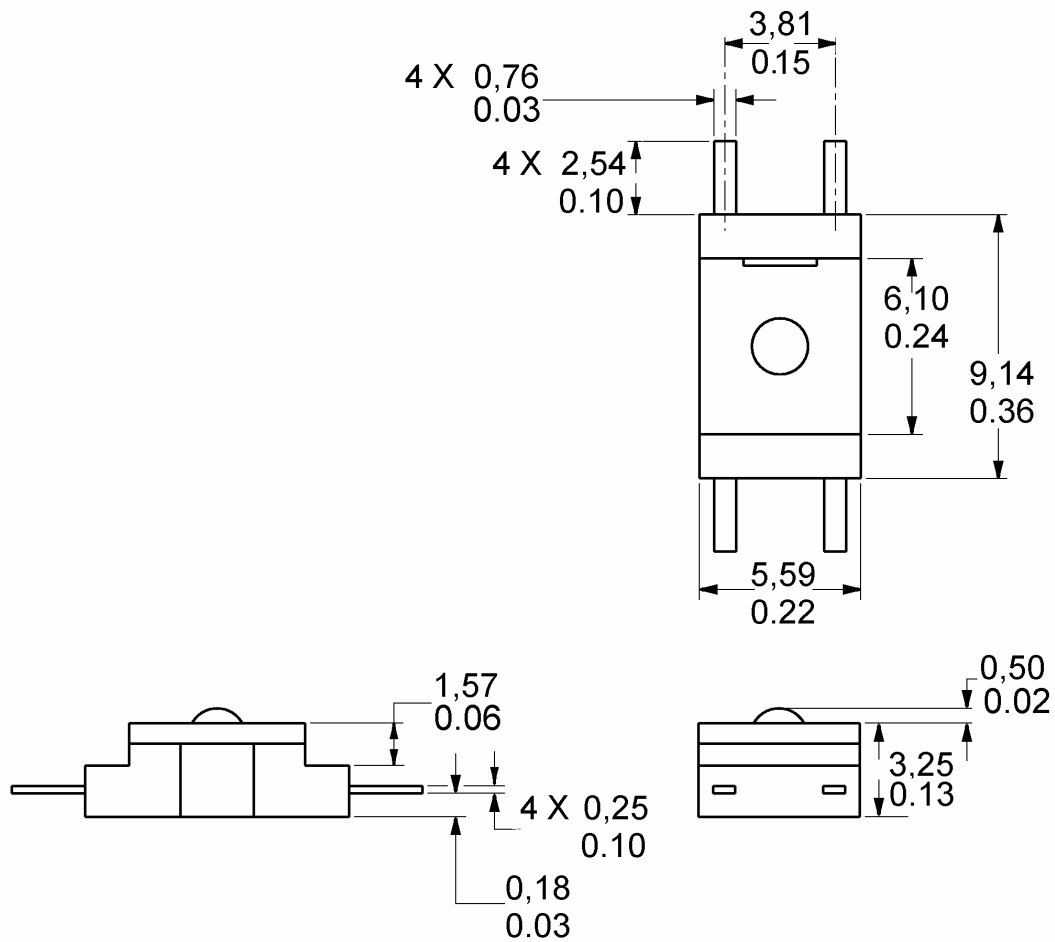
1. Circled numbers refer to sensor terminals (pins).  
Pin 1 = Supply  $V_s$  (+)  
Pin 2 = Output  $V_o$  (+)  
Pin 3 = Ground  $V_g$  (-)  
Pin 4 = Output  $V_o$  (-)
2. The force sensor may be powered by voltage or current. Maximum supply voltage is not to exceed 12 volts. Maximum supply current is not to exceed 1.6 mA. Power is applied across Pin 1 and Pin 3.
3. The sensor output should be measured as a differential voltage across Pin 2 and Pin 4 ( $V_o = V_2 - V_4$ ). The output is ratiometric to the supply voltage. Shifts in supply voltage will cause shifts in output. Neither Pin 2 nor Pin 4 should be tied to ground or voltage supply.

# Force Sensors

## FSS Low Profile Force Sensors

*FS Series*

**MOUNTING DIMENSIONS** (for reference only) mm/in



### DESCRIPTION

Catalog Listing	Packing Style
FSS1500NST	Tube
FSS1500NSB	Bubble Pack
FSS1500NSR	Tape and Reel

# Force Sensors

## FSS Low Profile Force Sensors

*FS Series*

### WARRANTY/REMEDY

Honeywell warrants goods of its manufacture as being free of defective materials and faulty workmanship. Contact your local sales office for warranty information. If warranted goods are returned to Honeywell during the period of coverage, Honeywell will repair or replace without charge those items it finds defective. **The foregoing is Buyer's sole remedy and is in lieu of all other warranties, expressed or implied, including those of merchantability and fitness for a particular purpose.**

Specifications may change without notice. The information we supply is believed to be accurate and reliable as of this printing. However, we assume no responsibility for its use.

While we provide application assistance personally, through our literature and the Honeywell web site, it is up to the customer to determine the suitability of the product in the application.

For application assistance, current specifications, or name of the nearest Authorized Distributor, contact a nearby sales office. Or call:

1-800-537-6945 USA

1-800-737-3360 Canada

1-815-235-6847 International

### FAX

1-815-235-6545 USA

### INTERNET

[www.honeywell.com/sensing](http://www.honeywell.com/sensing)

[info.sc@honeywell.com](mailto:info.sc@honeywell.com)

---

**Honeywell**

### Sensing and Control

Honeywell

11 West Spring Street

Freeport, Illinois 61032

0080809-1-EN ILS0 GLO 803 Printed in USA

Copyright 2003 Honeywell International Inc.

[www.honeywell.com/sensing](http://www.honeywell.com/sensing)