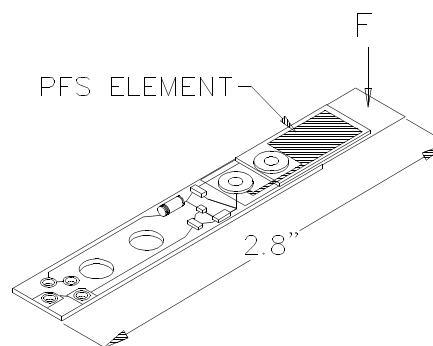


INTRODUCTION

The SW100 is an ideal alternative for impact/vibration detection and momentary switch applications. A direct contact force on the stainless steel cantilever beam of the SW100 induces strain on the laminated Piezo Film Sensor (PFS) element. With this strain, and only while undergoing strain, the PFS element generates an output that activates a built-in, normally-open circuit. Once activated, the circuit resembles the closure of a contact switch, but without the inherent discontinuity that contact points exhibit because of corrosion, pitting and bouncing. Thus the SW100 provides a single digital pulse that is ideal for triggering digital circuits and signal processing. The imperviousness, elasticity and reliability of the PFS element, along with the noise rejection characteristics of the circuit, combine to provide the SW100 with features that suit applications demanding consistent, reliable performance throughout tens of millions of cycles.

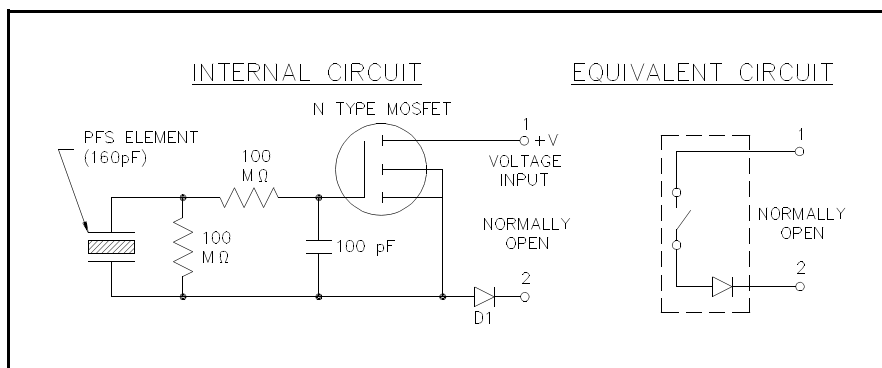
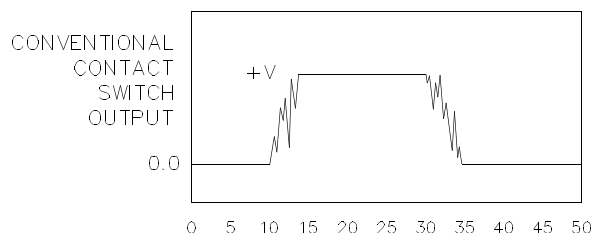
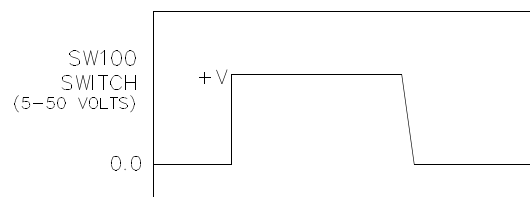
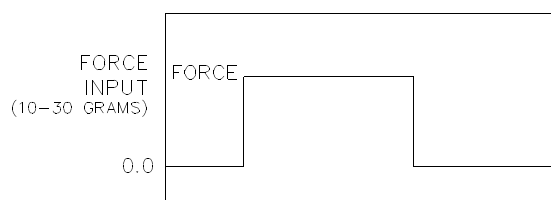


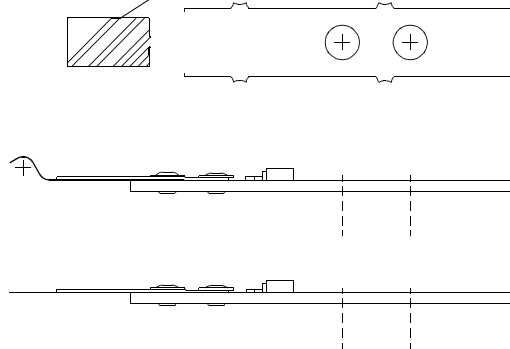
FEATURES

- Digital output
- No adjustments required during installation
- Impervious to moisture, dust and smoke
- Virtually no maintenance required
- Long lifetime, greater than 10 million cycles
- Low profile
- PCB and beam customization to fit application

APPLICATIONS

- Games and toys for impact detection and counting
- Counter of units in assembly line processes
- Counter and switch for automated processes
- Impact detection and counter for machine-dispensed products
- Panel switch
- Foot pedal switch
- Door closure switch
- Toothed Gear Counter





SW100 BEAM CALIBRATION EXPERIMENT

To investigate the open-circuit output voltage developed by the beam element from an SW100-02 (curved beam) switch, all circuit components were removed from the PCB and the device mounted such that the beam tip was resting under slight spring force against a baseplate.

Shim elements of known thickness were withdrawn from underneath the beam tip at various speeds, such that the beam experienced a "step" deflection.

The piezo film element (capacitance nominally 160 pF) was connected to a 4.7 nF load capacitance. The voltage across the combined capacitance (4.86 nF) was observed using a "x100" probe (100 megohm impedance). The resulting electrical time constant was thus 0.486 seconds, meaning that results were almost independent of speed of actuation. The measured peak voltage for various step heights was measured, and scaled to give charge output. This charge output was then used to calculate open-circuit output voltage (by dividing the charge obtained by the source capacitance of 160 pF).

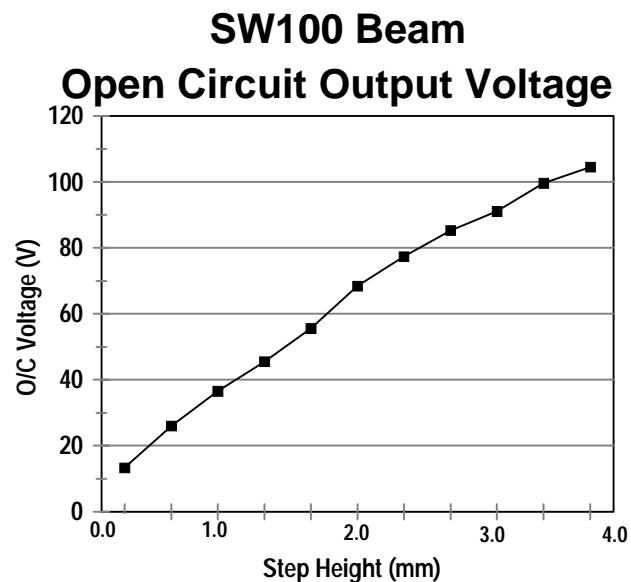
RESULTS

The open-circuit output voltage was found to follow a logarithmic law with step height, of the form:

$$\log_{10}(V) = m \cdot \log_{10}(h) + c$$

where $m = 0.865$, $c = 1.556$, V is in volts, and h in mm. A plot of these results follows.

Step (mm)	Charge (nC)	O/C Volts	Best Fit (V)
0.00			0.1
0.33	2.2	13.3	13.9
0.66	4.2	26.0	25.2
1.00	5.9	36.5	35.8
1.33	7.4	45.5	46.0
1.66	9.0	55.5	55.8
1.99	11.1	68.4	65.3
2.32	12.5	77.4	74.6
2.65	13.8	85.3	83.7
2.99	14.8	91.1	92.7
3.32	16.1	99.6	101.5
3.65	16.9	104.5	110.3



ORDERING INFORMATION

The SW100 switch is currently available in two different beam shaped configurations: (1) Flat and (2) Curved. In addition, the switch is also available in two different triggering modes: (1) Forward (impact) stroke and (2) Return stroke. In the Forward or impact stroke the switch triggers when the force is initially applied to the beam. This makes the signal dependent on the duration of the force. In the return mode, the switch triggers when the beam is returning to its original position after the force has been applied and removed. Since the beam will always return to its original position at a relatively constant rate, the signal provided by the switch is a very consistent duration even for varying duration initial forces.

Description	Beam Tip	Stroke Direction to Trigger Switch	Part #
SW100-01-R	Flat	Reversed	0-1002393-1
SW100-01-F	Flat	Forward	0-1002393-2
SW100-02-R	Curved	Reversed	0-1002132-1
SW100-02-F	Curved	Forward	0-1002132-2

SPECIAL ORDERS

The PCB geometry and shape of the cantilever beam of the SW100 can be modified to meet specific mounting and space requirements. Modifications to the cantilever beam can also be made to detect different ranges of force input.

ADDITIONAL INFORMATION

Measurement Specialties, Inc.
Sensor Products Division