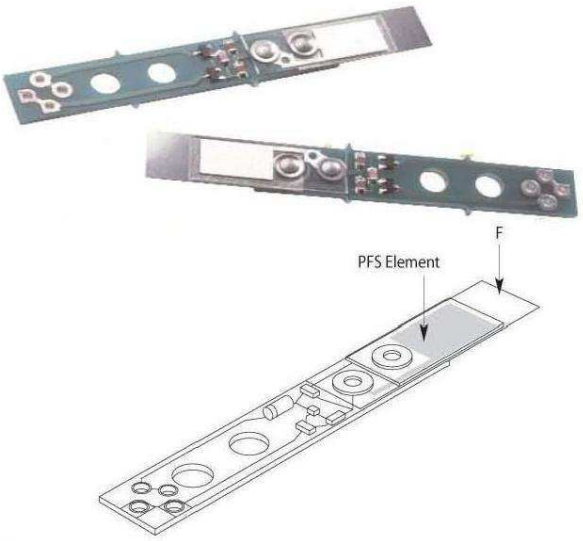
PIEZO FILM SOLID STATE SWITCHES



SPECIFICATIONS

- **Impact and Momentary Switch**
- **Digital Output – contact closure**
- **Robust**
- **Solderable**
- **Piezo Film Technology**

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 available to fit many applications

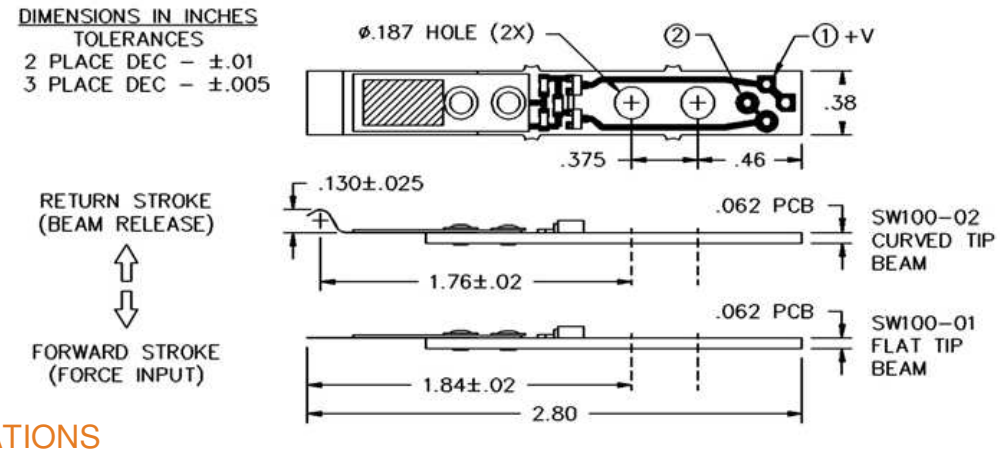
APPLICATIONS

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

The SW100 is an ideal configuration for impact detection and momentary switch applications. A direct contact force on the top of the stainless steel cantilever beam of the SW100 induces strain on the laminated Piezo Film Sensor (PFS) element. With dynamic strain the PFS element generates an output that activates the built-in transistor, closing the 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.

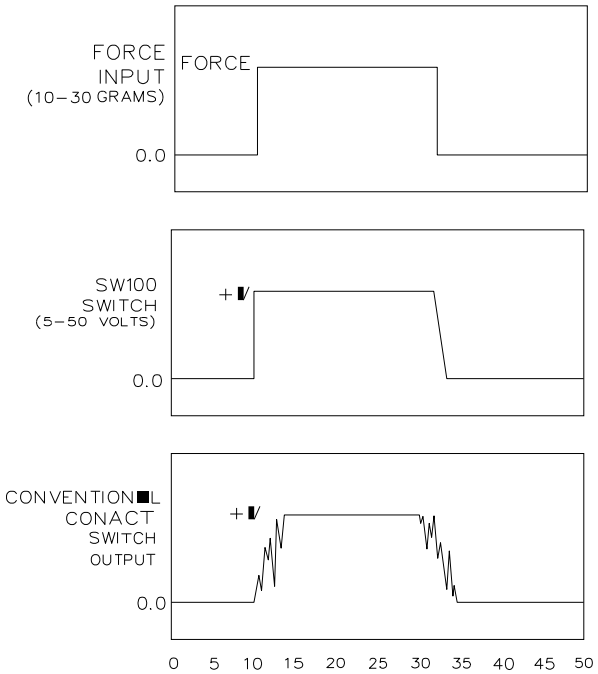
Thus, the SW100 provides a single digital pulse that is ideal for triggering digital circuits and signal processing. The imperviousness, elasticity and reliability of the PFS element, along with the noise rejection characteristics of the circuit, combine to provide the SW100 with features that suit applications demanding consistent, reliable performance throughout tens of millions of switching cycles.

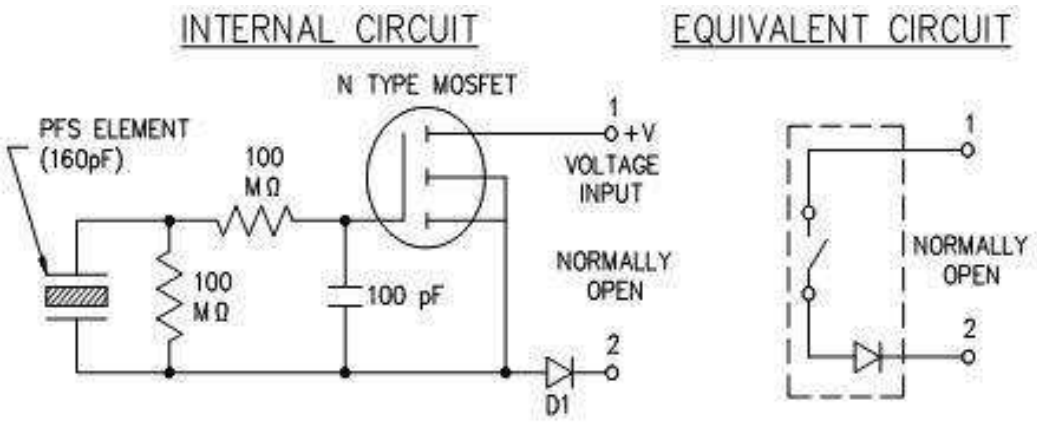
DIMENSIONS



SPECIFICATIONS

Performance Characteristics (T=25°)	**Minimum**	**Typical**	**Maximum**	**Units**
Force Input/Beam Tip Deflection	10/0.03	20/0.06	30/0.09	Gram/In
Frequency of Force Input	5	-	60	Hz
Voltage Input	+5.0	-	+50	Volts
Switch Current	+0.5	-	+70	mA
On Resistance	-	7.5	13.5	Ohms
Life	-	-	>>10MM	Cycles
Environmental Characteristics				
Operating Temperature	5	-	60	°C
Operating Humidity	-	-	90% non-cond.	
Storage Temperature	-40	-	60	°C





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.

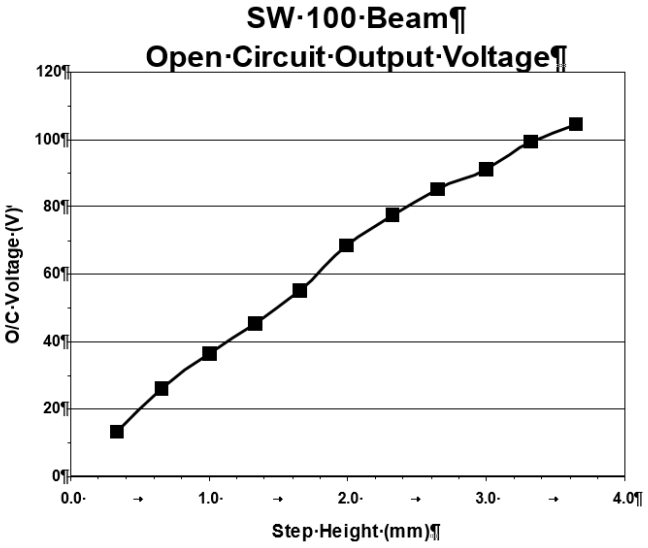
Shim elements of known thickness were withdrawn from underneath the beam tip at various speeds, such that the beam experienced a “step” deflection.

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).

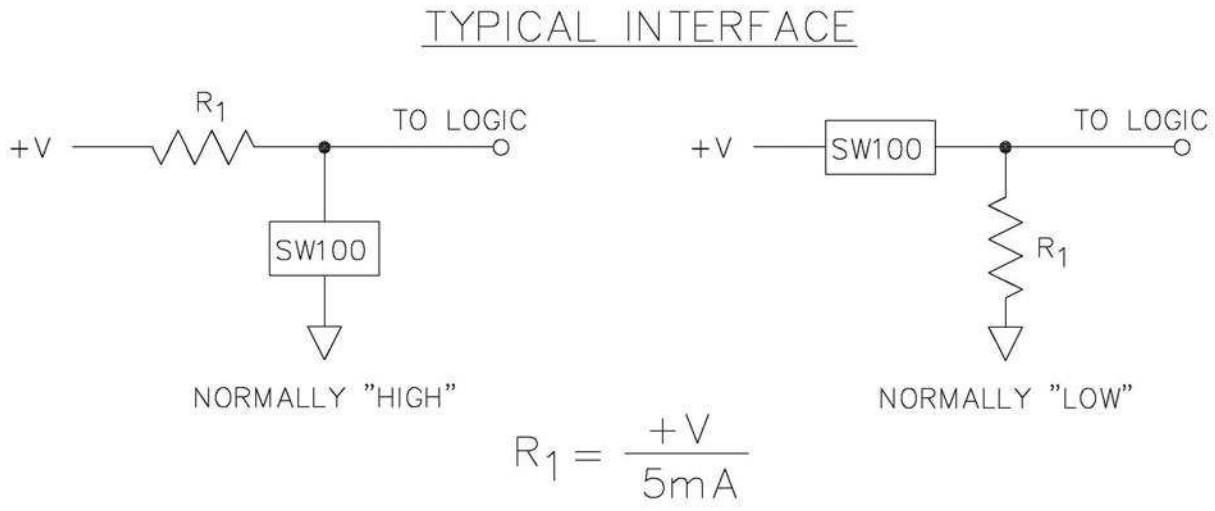
RESULTS

The open-circuit output voltage was found to follow a logarithmic law with step height, of the form: Log10(V) = m.log10(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
3.00	14.8	91.1	92.7
3.32	16.1	99.6	101.5
3.65	16.9	104.5	110.3



TYPICAL INTERFACE



ORDERING INFORMATION

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

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