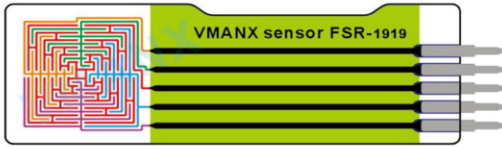
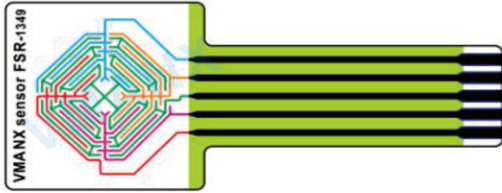


FSR Thin-Film Force Sensor Specification Sheet



1. Product Overview

- The FSR (Force-Sensing Resistor) thin-film pressure sensor utilizes advanced flexible printed electronics technology, designed for high-precision, high-reliability dynamic force detection applications.
- This product combines ultra-thin structure, fast response and long life characteristics.
- Suitable for medical equipment, industrial automation, consumer electronics, robotics, and other fields.
- Demonstrates Vmanx's core technology and process capabilities in the field of flexible sensor manufacturing.



2. Electrical Specifications

Parameter	Specification
Operating Voltage	1.0V - 5.0V DC
Standby Current	<1 μ A (No-load condition)
Resistance Range	10 k Ω - 1 M Ω (Pressure-dependent)
Force Range	0.1N - 20N
Linearity Error	\pm 5% (Full-scale range)
Output Signal	Analog Voltage / Digital (I ² C/SPI)

3. Performance Characteristics

3.1 Precision Metrics

▶ Repeatability	: \pm 2% (multiple pressurizations at the same point)
▶ Hysteresis	: \pm 1.5% (difference between loading and unloading paths)
▶ Temperature Drift	: \pm 0.1%/°C (from -20°C to +70°C)

3.2 Sensitivity

▶ Threshold Sensitivity	: Detects as low as 0.1N
▶ Resolution	: 0.05N (High-precision mode)
▶ Response Time	: <5ms (90% signal stabilization)

3.3 Durability & Lifespan

▶ Mechanical Life	: >10 million cycles (20N load)
▶ Bending Life	: >1 million cycles (Bend radius \geq 5mm)
▶ Environmental Resistance	: IP67-rated (Dustproof & waterproof)

4. Reliability Validation

▶ Temperature range:	-30°C to +85°C (operating); -40°C to +100°C (storage)
▶ Humidity tolerance:	10% - 90% RH (non-condensing)
▶ Shock Resistance	: 50G acceleration, 11ms pulse (compliant with IEC 60068-2-27)
▶ Chemical Stability	: Resistant to alcohol, weak acid/alkali wiping (compliant with medical-grade standards)

5. Applications

5.1 Medical & Healthcare

- ▶ Prosthetic pressure feedback
- ▶ Rehabilitation equipment tactile monitoring
- ▶ Wearable health monitoring devices

5.2 Industrial Automation

- ▶ Robotic gripper force control
- ▶ Assembly line pressure detection
- ▶ Precision electronic component testing

5.3 Consumer Electronics

- ▶ Smart home touch panels
- ▶ Gaming controller force feedback
- ▶ Fitness equipment pressure distribution analysis

5.4 Automotive & Robotics

- ▶ Seat occupancy detection
- ▶ Autonomous driving tactile interaction
- ▶ Collaborative robot safety protection

6. Technical Advantages

6.1 Precision Manufacturing Process

- ▶ Flexible substrate material p
- ▶ Nanoscale printing accuracy : Fully automated screen printing, $\pm 5\mu\text{m}$ tolerance.
- ▶ Multi-layer stack design

6.2 Quality Control System

- ▶ 100% Automated Optical Inspection (AOI)
- ▶ ISO 9001 & IATF 16949 certified
- ▶ EU RoHS, REACH, CE compliant

7. Calibration Guidelines

7.1 Calibration Requirements

Parameter	Specification	
Loading Platform	Flatness error $\leq 0.01\text{mm}$	NIST-traceable calibrat
Force Accuracy	Resolution $\leq 0.01\text{N}$, $\pm 1\%$ FS error	Free standard weight ca
Environment	$23\pm 2^\circ\text{C}$, 45-55%RH	Open SDK for temperat

7.2 Calibration Procedure

- ▶ Three-stage calibration (ISO 376 compliant)

7.3 Key Risk Mitigation

- ▶ **Overload Warning** : >25N pressure causes permanent sensitivity degradation (Calibration limit ≤18N recommended).
- ▶ **Edge Effect** : Active sensing area must be ≥1.5mm from borders.
- ▶ **Dynamic Calibration Compensation** : High-speed applications (>10Hz) require impact force correction (Formula: $F_{cal} = F_{raw} \times (1 + 0.02t)$).

8. Additional Reliability Test Data

Test	Standard	Result
High Temp/Humidity	85°C/85%RH, 1000h	Resistance drift <±3%
Thermal Shock	-40°C↔85°C, 500cycles	No delamination, >98% stability
ESD Protection	IEC 61000-4-2 Level 4	±15kV contact discharge, no damage

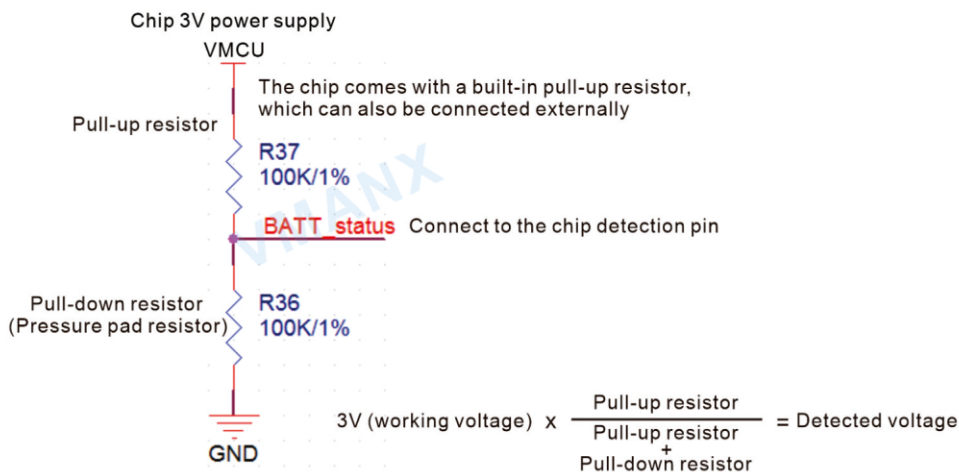
9. Customization Services

- ▶ **Size Customization** : Supports round, rectangular, curved, and irregular shapes.
- ▶ **Interface Options** : I²C, SPI, UART, or custom protocol output.
- ▶ **Sensitivity Tuning** : Optimized force-resistance curve for specific applications.

10. Environmental Commitment

- ▶ **Materials** : Lead-free, halogen-free (EU-compliant).
- ▶ **Packaging** : Biodegradable materials to reduce carbon footprint.

11. Amplifier Schematic



12. Product Cases



RoHS COMPLIANT

