

Self-Sensing Cantilevers with Silicon Tip

Silicon piezo-resistive sensing cantilevers

General description

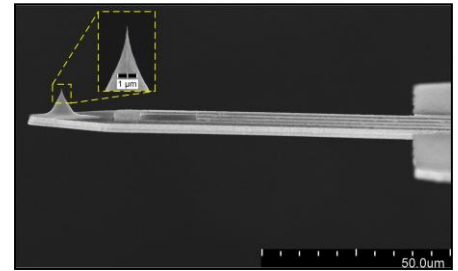
Piezo-Resistive Sensing (PRS) and **Piezo-Resistive Sensing Active (PRSA)** probes are designed for various scanning probe microscopy applications. They are silicon cantilevers with integrated piezo-resistors on-chip for self-sensing and, in the case of PRSA probes, a heater for self-actuating. The piezo-resistors are integrated into a matched Wheatstone bridge for high sensitivity and minimizing environmental thermal drift. By using the self-sensing readout, no laser adjustment is necessary in comparison to conventional optical readout AFM systems. This saves time during a cantilever change. The free space above the cantilever enables new applications and combination of AFM with various instruments. The silicon tips are designed for high-precision with a nominal tip apex radius of <15nm. The cantilevers are available in different lengths and can be shipped either as bare chip (CHP version) or bonded to a small printed circuit board (PCB version) with a small connector for a quick cantilever change. The cantilever PCB can be connected to a low-noise pre-amplifier (e.g. our NanoOne or NanoPro preamplifiers) by using our flexible counter-part PCB.

Applications:

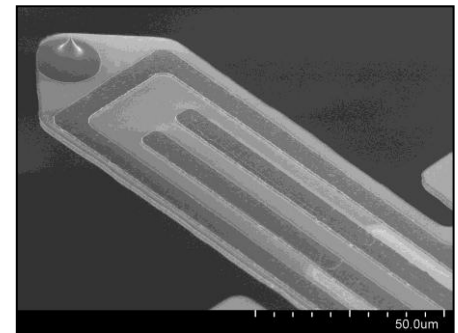
- Integration on a standard AFM scanner and high-speed AFM
- Force or deflection measurements within TEM, SEM, XPS, etc.

What about your application?

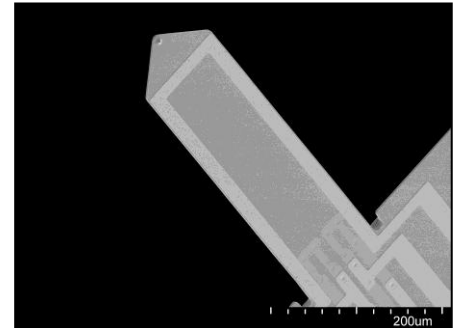
Contact us!



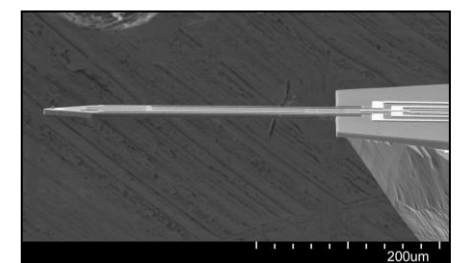
Side view of a PRS-L100 cantilever with zoom onto the silicon tip



Sample-facing side of a PRSA-L100 cantilever with Al tracks of the self-sensing readout and the thermal cantilever actuation



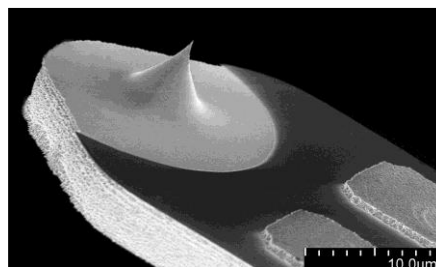
Sample-facing side of a PRSA-L450 cantilever with Al tracks of the self-sensing readout



Side view of a PRSA-L300 cantilever



Starter Kit including NanoOne low-noise preamplifier for cantilever readout



Tip of a PRS-L70 cantilever with Al tracks for thermal cantilever actuation

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Self-Sensing Cantilevers with Silicon Tip

Silicon piezo-resistive sensing cantilevers

Specifications			
Model*	PRS-L70-F900-Si-PCB PRS-L70-F900-Si-CHP		PRS-L100-F500-Si-PCB PRS-L100-F500-Si-CHP PRSA-L100-F500-Si-PCB PRSA-L100-F500-Si-CHP
Tip radius (apex)	<15 nm		
Tip height	4...7 µm		
Tip material	silicon		
Resonant frequency (nominal)	500...1300 kHz	200...800 kHz	
Spring constant (calc.)	35... 400 N/m	6... 400 N/m	
sensitivity**	3 µV/nm	1...3 µV/nm	
force sensitivity**	10...400 nN/µV	2...400 nN/µV	
Length, width	70 ±5 µm, 30 ±3 µm	100 ±5 µm, 48 ±3 µm	
Material	silicon cantilever, boron doped 1k Ohm piezo resistors, aluminium tracks		
Deflection sensing	on chip piezo-resistive bridge		
Actuator	external shaker external shaker or on-chip heater (11 ±2 Ohm)	external shaker	external shaker or on-chip heater (11 ±2 Ohm)
Electrical connections	bonded to small PCB with connector (counter part PCB available) or delivered as bare chip (bonding pads on-chip)		
Chip dimensions (h, w, l)	0.3 / 1.2 / 2.5 mm		

Model*	PRS-L300-F80-Si-PCB PRS-L300-F80-Si-CHP	PRSA-L300-F80-Si-PCB PRSA-L300-F80-Si-CHP	PRS-L460-F30-Si-PCB PRS-L460-F30-Si-CHP	PRSA-L460-F30-Si-PCB PRSA-L460-F30-Si-CHP
Tip radius (apex)	<15 nm			
Tip height	4...7 μm			
Tip material	silicon			
Resonant frequency (nominal)	45...95 kHz		15...40 kHz	
Spring constant (calc.)	2.5... 56 N/m		0.7... 9.3 N/m	
sensitivity**	1...2 μV/nm		1...2 μV/nm	
force sensitivity**	1.5...56 nN/μV		0.3...9.3 nN/μV	
Length, width	300 ±5 μm, 68 ±3 μm		450 ±5 μm,100 ±3 μm	
Material	silicon cantilever, boron doped 1k Ohm piezo resistors, aluminium tracks			
Deflection sensing	on chip piezo-resistive bridge			
Actuator	external shaker	external shaker or on-chip heater (11 ±2 Ohm)	external shaker	external shaker or on-chip heater (11 ±2 Ohm)
Electrical connections	bonded to small PCB with connector (counter part PCB available) or delivered as bare chip (bonding pads on-chip)			
Chip dimensions (h, w, l)	0.3 / 1.2 / 2.5 mm			

* Electrical characterization is only possible for bonded cantilevers.

** measured without amplification, 2.048 V bridge supply

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