

Tipless Silicon Self-Sensing Cantilevers

Silicon piezo-resistive sensing cantilevers

General description

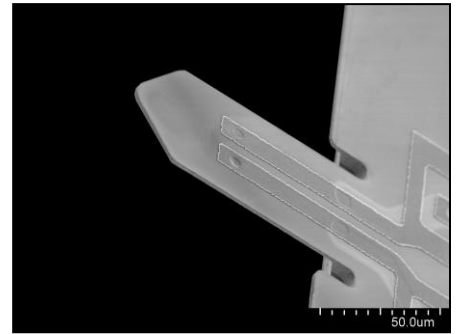
Piezo-Resistive Sensing (PRS) and **Piezo-Resistive Sensing Active (PRSA)** probes are designed for various scanning probe microscopy applications. They are silicon cantilevers with integrated piezo-resistors on-chip for self-sensing and, in the case of PRSA probes, a heater for self-actuating. The piezo-resistors 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 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:

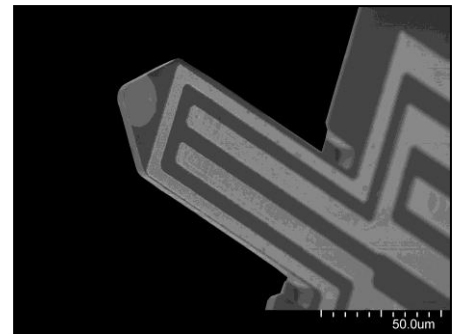
- Integration on a standard AFM scanner and high-speed AFM
- Force or deflection measurements within TEM, SEM, XPS, etc.

What about your application?

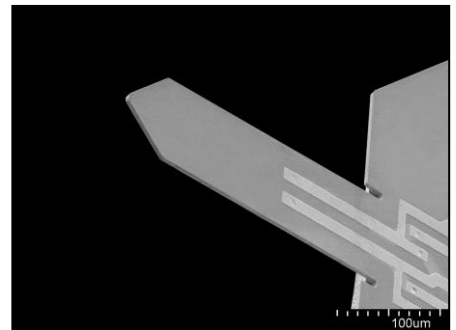
Contact us!



Sample-facing side of a PRS-L100 cantilever with Al tracks of the self-sensing readout



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



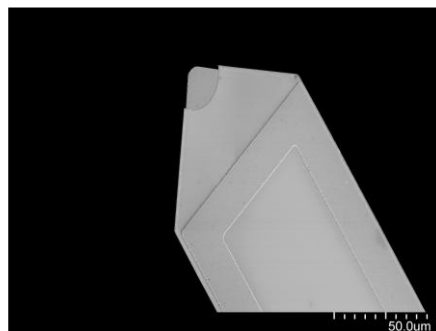
Sample-facing side of a PRS-L300 cantilever with Al tracks of the self-sensing readout



Side view of a PRSA-L300 cantilever



Starter Kit including NanoOne low-noise preamplifier for cantilever readout



Tip area of a PRSA-L450 cantilever with Al tracks for thermal cantilever actuation

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Specifications			
Material	silicon cantilever, boron doped 1k Ohm piezo resistors, aluminium tracks		
Deflection sensing	on chip piezo-resistive bridge		
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-L70-F900-TL-sIPCB PRS-L70-F900-TL-CHP	PRS-L100-F500-TL-sIPCB PRS-L100-F500-TL-CHP	PRSA-L100-F500-TL-sIPCB PRSA-L100-F500-TL-CHP
Resonant frequency (nominal)	500...1300 kHz	200...800 kHz	
Spring constant (calc.)	35... 400 N/m	6... 300 N/m	
sensitivity**	3 $\mu\text{V}/\text{nm}$	1 ... 3 $\mu\text{V}/\text{nm}$	
force sensitivity**	23...400 nN/ μV	2...300 nN/ μV	
Length, width	70 $\pm 5 \mu\text{m}$, 30 $\pm 3 \mu\text{m}$	100 $\pm 5 \mu\text{m}$, 48 $\pm 3 \mu\text{m}$	
Actuator	external shaker	external shaker	external shaker or on-chip heater (11 ± 2 Ohm)
Model*	PRS-L300-F50-TL-sIPCB PRS-L300-F50-TL-CHP	PRS-L300-F80-TL-sIPCB PRS-L300-F80-TL-CHP	PRSA-L300-F80-TL-sIPCB PRSA-L300-F80-TL-CHP
Resonant frequency (nominal)	30...65 kHz	65...95 kHz	
Spring constant (calc.)	2... 15 N/m	15... 56 N/m	
sensitivity**	1... 2 $\mu\text{V}/\text{nm}$	1...2 $\mu\text{V}/\text{nm}$	
force sensitivity**	1... 15 nN/ μV	7... 56 nN/ μV	
Length, width	300 $\pm 5 \mu\text{m}$, 68 $\pm 3 \mu\text{m}$	300 $\pm 5 \mu\text{m}$, 68 $\pm 3 \mu\text{m}$	
Actuator	external shaker	external shaker or on-chip heater (11 ± 2 Ohm)	external shaker or on-chip heater (11 ± 2 Ohm)
Model*	PRS-L460-F30-TL-sIPCB PRS-L460-F30-TL-CHP	PRSA-L460-F30-TL-sIPCB PRSA-L460-F30-TL-CHP	
Resonant frequency (nominal)	15...40 kHz		
Spring constant (calc.)	0.7... 9.3 N/m		
sensitivity**	1...2 $\mu\text{V}/\text{nm}$		
force sensitivity**	0.3...9.3 nN/ μV		
Length, width	460 $\pm 5 \mu\text{m}$, 100 $\pm 3 \mu\text{m}$		
Actuator	external shaker	external shaker or on-chip heater (11 ± 2 Ohm)	

* Electrical characterization is only possible for bonded cantilevers.

** measured without amplification, 2.048 V bridge supply

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