



# LOTUS

**Intelligent Micro Nano Sensors**

## **AFM TIP**

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**Semicontact/Non-Contact Probes**

**Contact Probes**

**Electrical Probes**

**Magnetic Probes**

## About company:

Lotus Intelligent Micro/ Nano sensors is a knowledge-based company in the field of technology development and manufacture of advanced electronic sensors, relying on Micro-Nano Fabrication technology. Functions and capabilities cover the broad range of customers such as universities and industrial researches.

The company hired specialists in the field of manufacturing of various types of micro-sensors and semiconductors and also developed high-precision equipment, oxidation furnaces, sputtering systems, and other devices that are essential for the manufacturing sensors. This company manufacture MEMS and NEMS sensors, AFM Tip, MEMS accelerometers and gyroscopes, pressure sensors, gas sensors and medical sensors. Infrastructure such as 10000 & 1000 class clean rooms, lithography equipment, deposition, wet and dry etching have enabled the company's specialists to build a variety of sensors and devices which can compete with world-class advancements.

Lotus Intelligent Micro/ Nano sensors with the motto "Sense Your Ideas" strives to tangible your ideas by relying on our specialists.

**LOTUS I M N S C o m p a n y**

## IMNS Silicon-AFM-Probes

IMNS Silicon-AFM-Probes provide the well-known features of the convenient AFM probes such as high application versatility and compatibility with most commercial AFMs with a small reproducible tip radius and a more well-defined tip shape. The typical tip radius of less than 10 nm and the minimized variation in tip shape provide more reproducible images and enhanced resolution.

### General Info:

IMNS Silicon-AFM-probes are manufactured from highly doped, single crystal silicon without any intrinsic mechanical stress. Its low resistivity of 0.002–0.004 ohm/cm avoids electrostatic charging of the probe. The monolithic fabricated probes lead to an absolutely straight cantilever without any bending. Gold backside coating provides the high reflective chemistry stable layer that improves reflectivity 2.5 times in comparison with uncoated probes. The chemical inertness allows application in fluids or electrochemical cells. The tip is pointing into the  $\langle 100 \rangle$  crystal direction.

### Tip Features

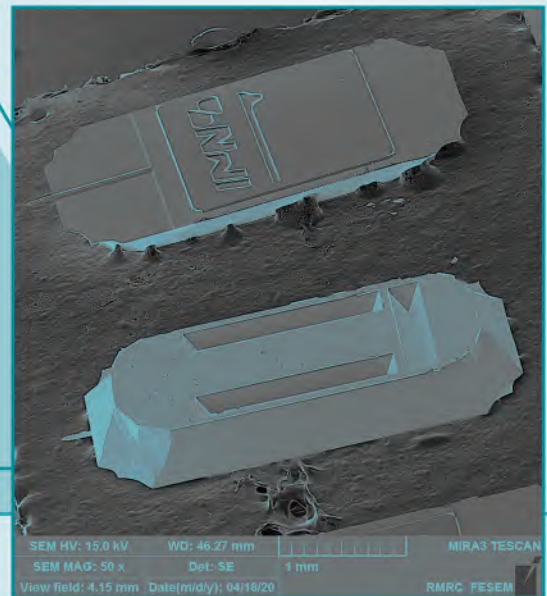
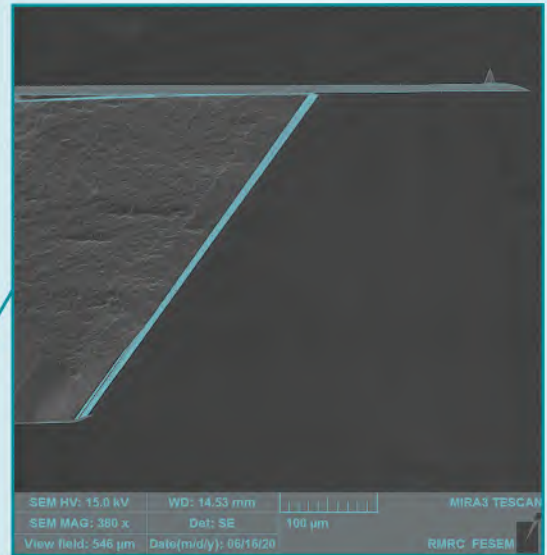
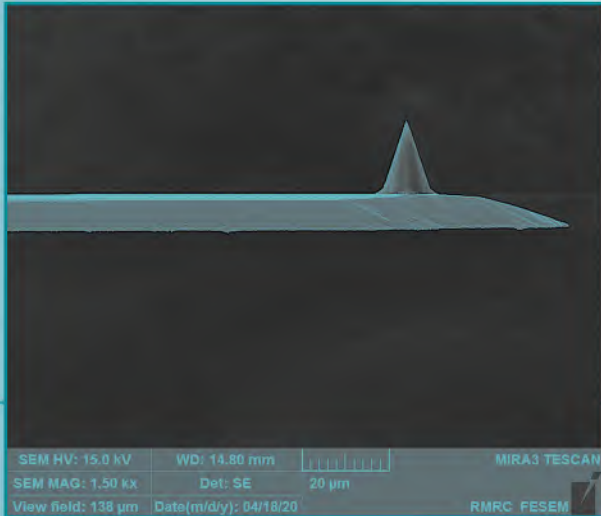
- Total tip shape is tetrahedral
- Tip radius is typically 5–10 nm
- Tip height is 10 – 15  $\mu\text{m}$
- Tip offset: 5 – 20  $\mu\text{m}$

### Cantilever Features

- Backside width is given in probes Specification
- Available for contact, non-contact, Semicontact mode.
- Tip is set on the controlled distance 5–20  $\mu\text{m}$  from the free cantilever end.







# AFM TIP

## Coatings

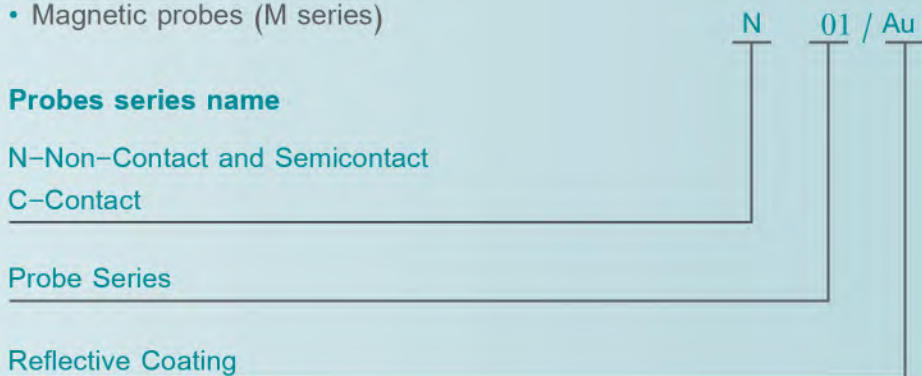
**Au coating on detector side** 70 nm thick layer of gold which enhances the reflectivity of the laser beam by a factor of about 2.5.

**Au coating on both sides** 70 nm thick layer of gold on both sides of the cantilever.

**Magnetic coating** for the visualization of magnetic domains selected Magnetic Probes with different hard and soft magnetic coatings are offered (refer to Magnetic probes).

## Probes Series Name:

- Semiconduct/noncontact probes (N series)
- Contact probes (C series)
- Electrical probes (E series)
- Magnetic probes (M series)



## Semiconduct/NonContact Probes N Series

Substrate Specification	
Material	Single Crystal Silicon
Chip Size	Chip Size 3.4×1.6×0.3
Reflective Side	Cr/Au
Available Coatings	-

Cantilever Specification							
Series	Cantilever length $\pm 10\mu\text{m}$	Cantilever width $\pm 5\mu\text{m}$	Cantilever thickness $\pm 1\mu\text{m}$	Resonance frequency (kHz)			Force Constant(N/m)
				min	typical	max	typical
01	225	45	3.5	60	100	190	7
10	225	45	7	120	200	320	57
30	125	45	3.5	220	300	430	42

## Contact Probes C Series

Substrate Specification	
Material	Single Crystal Silicon
Chip Size	Chip Size 3.4 $\times$ 1.6 $\times$ 0.3 mm
Reflective Side	Cr/Au
Tip Coating	-

Cantilever Specification							
Series	Cantilever length $\pm 10\mu\text{m}$	Cantilever width $\pm 5\mu\text{m}$	Cantilever thickness $\pm 1\mu\text{m}$	Resonance frequency (kHz)			Force Constant(N/m)
				min	typical	max	typical
01	225	45	2	35	55	75	1.2
10	450	45	3.5	17	24	45	0.8
20	450	45	2	8	14	35	0.15



## Electrical Probes E Series

Substrate Specification	
Material	Single Crystal Silicon
Chip Size	Chip Size 3.4×1.6×0.3 mm
Reflective side	Cr/Au
Tip Coating	Cr/Au

Cantilever Specification							
Series	Cantilever length±10µm	Cantilever width±5µm	Cantilever thickness ±1µm	Resonance frequency (kHz)			Force Constant(N/m)
				min	typical	max	typical
01	225	45	3.5	60	100	190	7
10	225	45	7	120	200	320	57
30	125	45	3.5	220	300	430	42

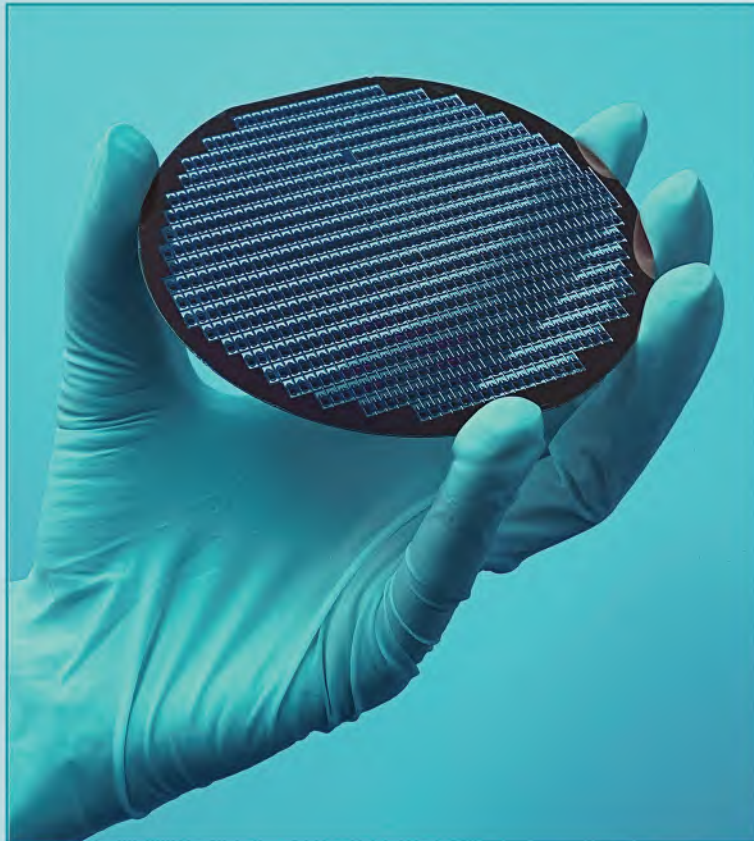
## Magnetic Probes M Series

Substrate Specification	
Material	Single Crystal Silicon
Chip Size	Chip Size 3.4×1.6×0.3 mm
Reflective side	Cr/Au
Tip Coating	Co or Ni/Cr

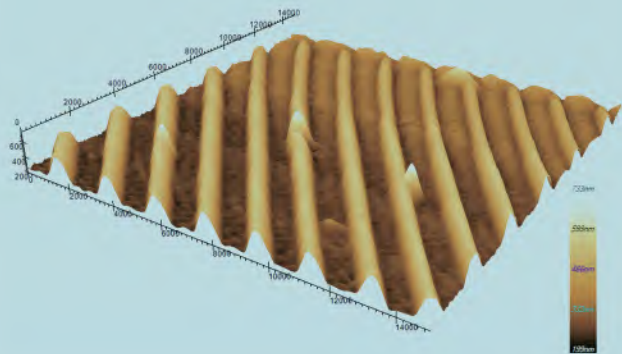
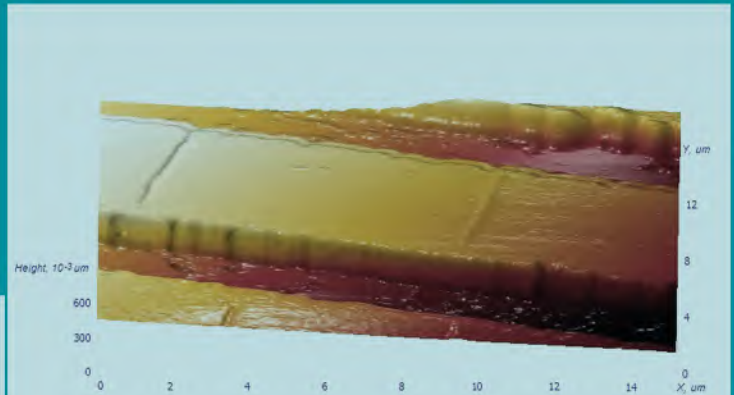
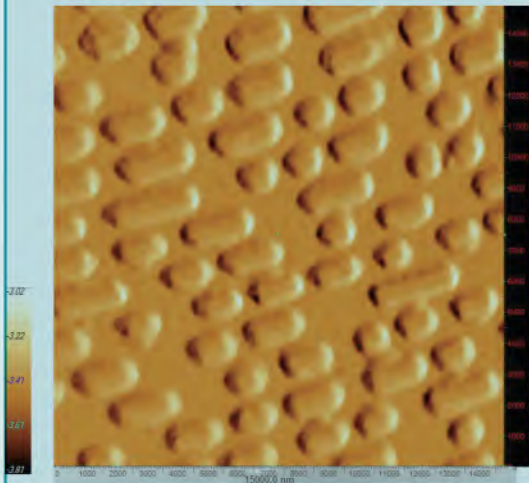


Cantilever Specification							
Series	Cantilever length $\pm 10\mu\text{m}$	Cantilever width $\pm 5\mu\text{m}$	Cantilever thickness $\pm 1\mu\text{m}$	Resonance frequency (kHz)			Force Constant(N/m)
				min	typical	max	typical
01	225	45	3.5	60	100	190	7
10	225	45	7	120	200	320	57
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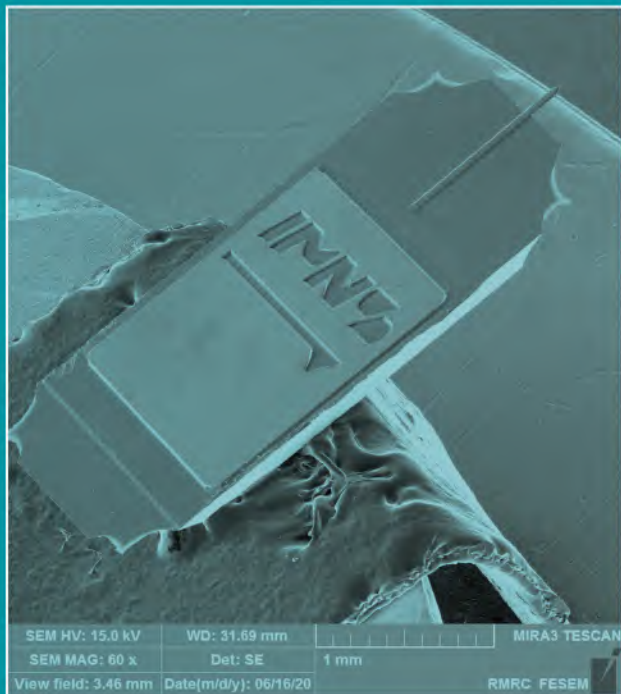
**4-inch**  
**AFM tip**  
**wafer**



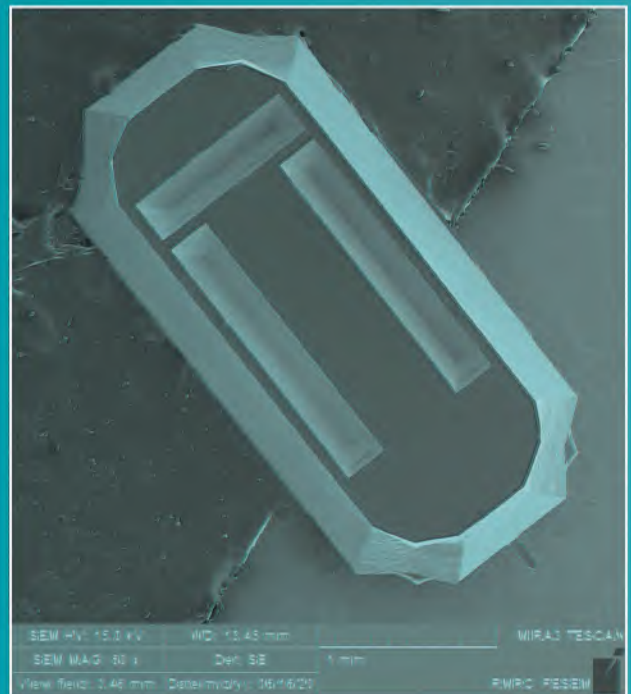
# AFM Tip Scanning Result

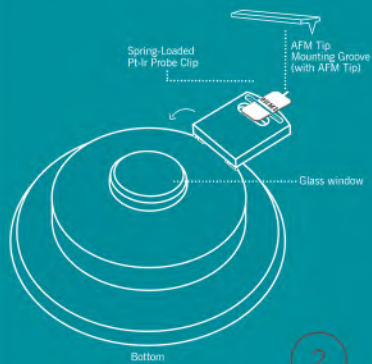


# Top view



# Bottom view

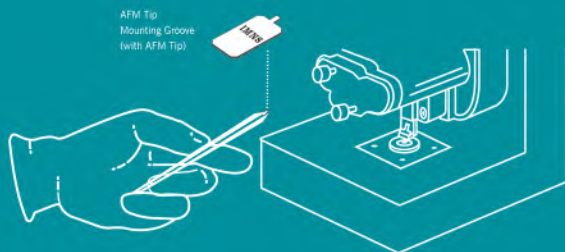




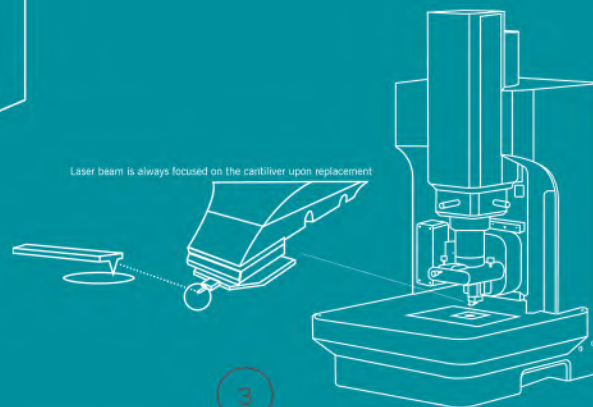
2



4



1



3



# 50 pieces AFM tip package

Atomic force microscopy (AFM) or scanning force microscopy (SFM) is a very-high-resolution type of scanning probe microscopy (SPM), with demonstrated resolution on the order of fractions of a nanometer, more than 1000 times better than the optical diffraction limit.

AFM was developed to overcome a basic drawback with STM – it can only image conducting or semiconducting surfaces.

The AFM has the advantage of imaging almost any type of surface, including polymers, ceramics, composites, glass, and biological samples.



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