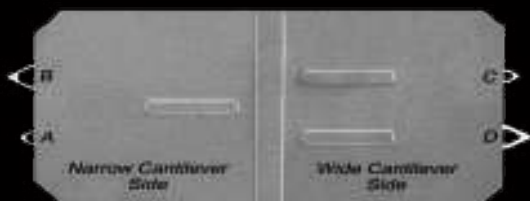
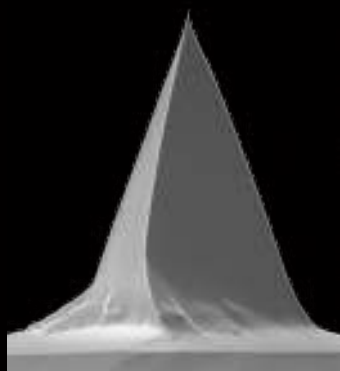
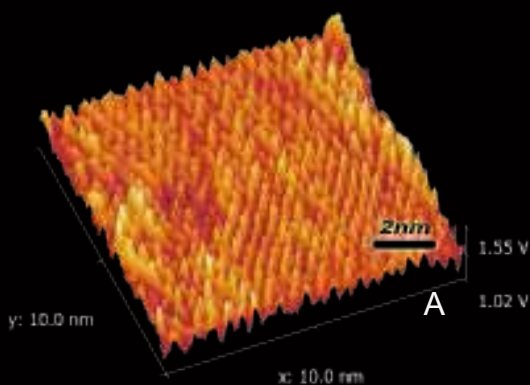
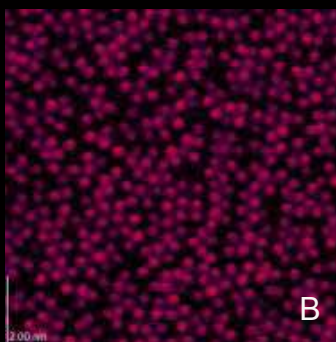


# APPNANO



Hydra-All



## SPM Probes Guide 2012

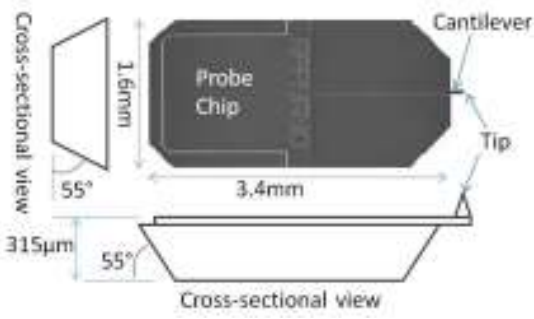
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Cover Images: *Image A*: Courtesy of Donglei Bu, Thomas J. Mullen, and Gang-yu Liu at UC Davis, Department of Chemistry; AFM lateral force image of periodicity of decanethiol self-assembled monolayer (SAM) acquired by Hydra2R50NG.

*Image B*: Courtesy of Gajendra Shekhawat at Northwestern University; Atomic Reconstruction on Selenium Sulphide acquired by HYDRA-ALL-G.

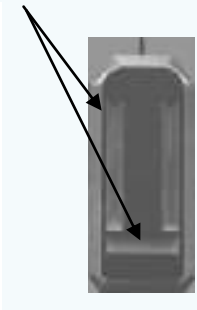
# Probe Chip & Wafer Specifications



**Alignment Grooves** - AppNano Probes are available with and without alignment grooves. The groove locations on our probe chips have been adjusted such that the laser spot falls at the extreme end of the cantilever, irrespective of the length of the cantilever, when used with alignment chips.

Alignment Grooves

**Probe Chip Dimensions** - The dimensions of the probe chip are 3400 µm x 1600 µm x 315 µm (Length x Width x Thickness).



## Terms & Conditions

- **FCA:** Origin
- **Payment:** Prepaid or Net 30 days upon approved credit.
- **Freight Charges:** All freight charges are to be paid by the buyer.
- **Warranty:** Six months after shipping subject to standard storages and handling conditions. Contact AppNano customer support for details.
- **Delivery:** All products are shipped on a best effort basis depending upon availability.
- **Acceptance:** Acceptance of these products is assumed if not returned to AppNano AFM Probes within 30 days of receipt of goods. All prices and specifications are subject to change. Specifications listed are the nominal specifications for each product. For specification ranges please visit our website. If certain specifications are critical to your application, please contact our technical staff to verify specifications prior to purchase. For a complete copy of our Terms & Conditions please contact [info@appnano.com](mailto:info@appnano.com)

## APPNANO Probes Fit All Commercial AFM Systems

Agilent Technologies (Molecular Imaging, Pacific Nanotechnology)
AFM Workshop
Ambios Tech (Quesant)
Asylum Research
Bruker (AXS, SIS, Veeco Instruments, Digital Instruments, Thermo-Microscopes, TopoMetrix)
Hitachi
Jeol
JPK Instruments
Nanosurf
Novascan
NT-MDT
Park Systems
Seiko Instruments
WiTek

# Standard Silicon Probes

**Material** - AppNano silicon probes are manufactured out of prime grade, low resistivity (0.010 to 0.025  $\Omega$ -cm), n-type Antimony doped, single crystal silicon. Well established silicon technology combined with novel micro-fabrication processes are the key ingredients for achieving high quality monolithic probes with unprecedented tip sharpness.

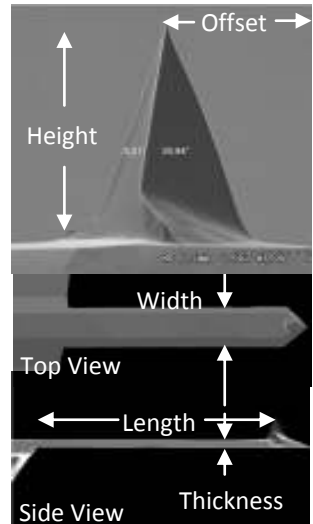
**Tip** - AppNano silicon probe tips are available in tetrahedral and triangular pyramid shape.

**Tetrahedral Tip:**

- Tip height range is 14 to 16  $\mu\text{m}$
- Tip offset range is 15 to 25  $\mu\text{m}$
- Side angle is  $18^\circ$
- Front plane angle is  $31^\circ$  and back plane is  $9^\circ$

**Cantilever** - The length of the cantilever is measured from the chip body to the tip center. The width is the average width of the cantilever.

**Tipless (TL)** - Probes are also available in a tipless configuration where there is no tip at the end. These probes are used for custom applica-



**Tip View Probes:** All ACCESS probes series probes have triangular shaped tips. These tips are at the extreme end of the cantilever.

- Tip height range is 14 to 16  $\mu\text{m}$
- Side angle from front view is  $15^\circ$
- Apex half cone angle is  $11^\circ$

**Coatings** - We also offer tailored specification and specialized metal coatings of tip and cantilever, such as Aluminum, Gold, Platinum, Nickel, and others.



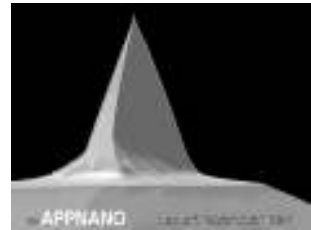
**Probe Packaging** - AppNano Probes are packed and shipped in conducting and ESD safe boxes. Our standard package Sizes are: 5, 10, 20, 50, 200 and full wafer (410+) probes.

**Contact:** Applied NanoStructures, Inc., 1700 Wyatt Dr., Suite 12, Santa Clara, CA 95054, USA, Tel: +1 408-567-0115, Fax: +1 408-516-4917

## Probe Model: ACT Series

**ACT Series Probes** are designed for non-contact, tapping, and close contact mode applications in air and fluid. ACT probes have a high frequency that allows faster scanning. These probes are available with and without Al coating on the reflex side.

Cantilever Parameter	Nominal Value
Spring Constant (N/m)	40
Frequency (kHz)	300
Length ( $\mu\text{m}$ )	125
Width ( $\mu\text{m}$ )	35
Thickness ( $\mu\text{m}$ )	4.5



### Tip Specifications

Material:	Si
Shape:	Pyramidal
Height ( $\mu\text{m}$ ):	14-16
Front Plane:	31°
Back Plane:	9°

Probe Type	Description	Tip ROC
ACT	Standard ACT Probe	6nm (Guaranteed <10nm)
ACTA	Reflex side, Al coated, ACT Probe	
ACTG	Reflex side, Gold coated, ACT Probe	
ACTGG	Both side, Gold coated, ACT Probe	30nm
ACT-TL	Tipless ACT Probe	No tip
ACTA-TL	Reflex side, Al coated, ACT-TL Probe	

### Ordering Information

**Standard Package Size:** 10, 20, 50, 200 and Wafer ( 410+) probes

**Key to Order Part Number:** (Probe Type) - ( Package size)

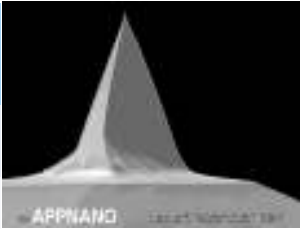
**Example: (i)** Part number to order 10 ACT probes with reflex side Al coating is: **ACTA-10**

**(ii)** Part number to order 50 ACT probes with both side gold coating is: **ACTGG-50**

# Probe Model: ACL Series

**ACL Series Probes** are designed for non-contact, tapping mode, intermittent contact, and/or close contact applications. The long ACL cantilever allows larger laser clearance. These probes are available with and without Al coating on the reflex side.

Long Tapping /  
Non-contact Mode

Cantilever Parameter	Nominal Value	 <p><b>Tip Specifications</b>                      Material: Si                      Shape: Pyramidal                      Height (μm): 14-16                      Front Plane: 31°                      Back Plane: 9°</p>
Spring Constant (N/m)	45	
Frequency (kHz)	190	
Length (μm)	225	
Width (μm)	40	
Thickness (μm)	8.5	

Probe Type	Description	Tip ROC
ACL	Standard ACL Probe	6nm (Guaranteed <10nm)
ACLA	Reflex side, Al coated, ACL Probe	
ACLG	Reflex side, Gold coated, ACL Probe	
ACLGG	Both side, Gold coated, ACLProbe	30nm
ACL-TL	Tipless ACL Probe	No tip
ACLA-TL	Reflex side, Al coated, ACL-TL Probe	

### Ordering Information

**Standard Package Size:** 10, 20, 50, 200 and Wafer ( 410+) probes

**Key to Order Part Number:** (Probe Type) - ( Package size)

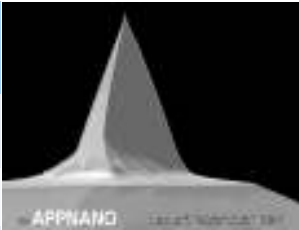
**Example: (i)** Part number to order 10 ACL probes with reflex side Al coating is: **ACLA-10**

**(ii)** Part number to order 50 ACL probes with both side gold coating is: **ACLGG-50**

## Probe Model: ACST Series

**ACST Series Probes** are designed for soft tapping or non-contact mode applications. ACST are moderately soft with a mid-range resonance frequency. These probes are available with and without Al coating on the reflex side.

Soft Tapping / Non  
-contact Mode

Cantilever Parameter	Nominal Value	 <p><b>Tip Specifications</b>  Material: Si  Shape: Pyramidal  Height (μm): 14-16  Front Plane: 31°  Back Plane: 9°</p>
Spring Constant (N/m)	7	
Frequency (kHz)	150	
Length (μm)	150	
Width (μm)	28	
Thickness (μm)	2.5	

Probe Type	Description	Tip ROC
ACST	Standard ACST Probe	6nm (Guaranteed <10nm)
ACSTA	Reflex side, Al coated, ACST Probe	
ACSTG	Reflex side, Gold coated, ACST Probe	
ACSTGG	Both side, Gold coated, ACST Probe	30nm
ACST-TL	Tipless ACST Probe	No tip
ACSTA-TL	Reflex side, Al coated, ACST-TL Probe	

### Ordering Information

**Standard Package Size:** 10, 20, 50, 200 and Wafer ( 410+) probes

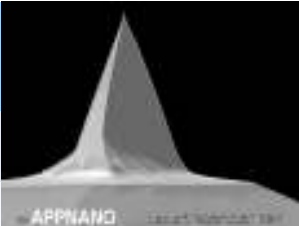
**Key to Order Part Number:** (Probe Type) - ( Package size)

**Example: (i)** Part number to order 10 ACST probes with reflex side Al coating is: **ACSTA-10**

**(ii)** Part number to order 50 ACST probes with both side gold coating is: **ACSTGG-50**

## Probe Model: FORT Series

**FORT Series Probes** are designed for force modulation applications. FORT probes' medium frequency and spring constant makes them ideal for Force Modulation Mode.

Cantilever Parameter	Nominal Value	 <p><b>Tip Specifications</b>            Material: Si            Shape: Pyramidal            Height (μm): 14-16            Front Plane: 31°            Back Plane: 9°</p>
Spring Constant (N/m)	3	
Frequency (kHz)	60	
Length (μm)	225	
Width (μm)	30	
Thickness (μm)	3.0	

Probe Type	Description	Tip ROC
FORT	Standard FORT Probe	6nm (Guaranteed <10nm)
FORTA	Reflex side, Al coated, FORT Probe	
FORTG	Reflex side, Gold coated, FORT Probe	
FORTGG	Both side, Gold coated, FORT Probe	30nm
FORT-TL	Tipless FORT Probe	No tip
FORTA-TL	Reflex side, Al coated, FORT-TL Probe	

### Ordering Information

**Standard Package Size:** 10, 20, 50, 200 and Wafer ( 410+) probes

**Key to Order Part Number:** (Probe Type) - ( Package size)

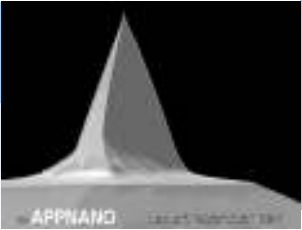
**Example: (i)** Part number to order 10 FORT probes with reflex side Al coating is: **FORTA-10**

**(ii)** Part number to order 50 FORT probes with both side gold coating is: **FORTGG-50**



## Probe Model: SHOCON Series

**SHOCON Series Probes** are designed for contact mode applications with a shorter length, providing better sensitivity without compromising on spring constant requirements.

Cantilever Parameter	Nominal Value		Short Contact Mode Probes	
Spring Constant (N/m)	0.1			
Frequency (kHz)	28			
Length ( $\mu\text{m}$ )	225			<b>Tip Specifications</b> Material: Si Shape: Pyramidal Height ( $\mu\text{m}$ ): 14-16 Front Plane: $31^\circ$ Back Plane: $9^\circ$
Width ( $\mu\text{m}$ )	43			
Thickness ( $\mu\text{m}$ )	1.0			

Probe Type	Description	Tip ROC
SHOCON	Standard SHOCON Probe	6nm (Guaranteed <10nm)
SHOCONA	Reflex side, Al coated, SHOCON Probe	
SHOCONG	Reflex side, Gold coated, SHOCON Probe	
SHOCONGG	Both side, Gold coated, SHOCON Probe	30nm
SHOCON-TL	Tipless SHOCON Probe	No tip
SHOCONA-TL	Reflex side, Al coated, SHOCON-TL Probe	

### Ordering Information

**Standard Package Size:** 10, 20, 50, 200 and Wafer ( 410+) probes

**Key to Order Part Number:** (Probe Type) - ( Package size)

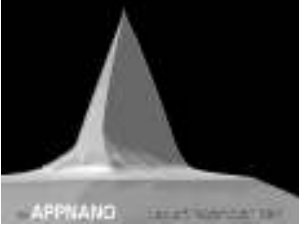
**Example: (i)** Part number to order 10 SHOCON probes with reflex side Al coated is: **SHOCONA-10**

**(ii)** Part number to order 50 SHOCON probes with both side gold coating is: **SHOCONGG-50**

## Probe Model: SICON Series

**SICON Series Probes** are for contact mode applications. These probes have a long, thin cantilever allowing for a low spring constant and improved laser clearance.

Contact Mode Probes

Cantilever Parameter	Nominal Value	 <p><b>Tip Specifications</b>  Material: Si  Shape: Pyramidal  Height (μm): 14-16  Front Plane: 31°  Back Plane: 9°</p>
Spring Constant (N/m)	0.2	
Frequency (kHz)	12	
Length (μm)	450	
Width (μm)	40	
Thickness (μm)	2.5	

Probe Type	Description	Tip ROC
SICON	Standard SICON Probe	6nm (Guaranteed <10nm)
SICONA	Reflex side, Al coated, SICON Probe	
SICONG	Reflex side, Gold coated, SICON Probe	
SICONGG	Both side, Gold coated, SICON Probe	30nm
SICON-TL	Tipless SICON Probe	No tip
SICONA-TL	Reflex side, Al coated, SICON-TL Probe	

### Ordering Information

**Standard Package Size:** 10, 20, 50, 200 and Wafer (410+) probes

**Key to Order Part Number:** (Probe Type) - (Package size)

**Example: (i)** Part number to order 10 SICON probes with reflex side Al coating is: **SICONA-10**

**(ii)** Part number to order 50 SICON probes with both side gold coating is: **SICONGG-50**

## Probe Model: UHF Series

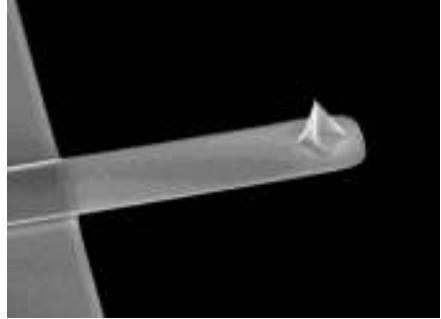
Ultra-High Frequency (UHF) Series Probes are designed for fast and high resolution imaging .

### Tip Specifications

Shape: Pyramidal  
 Height ( $\mu\text{m}$ ): 4-6  
 ROC (nm): 10

### Cantilever Specifications

Material: Si  
 Shape: Rectangular



Parameter	Probe Type	
	UHF-1250	UHFA-250
Frequency (kHz)	1250	1250
Spring Constant (N/m)	12	12
Reflex Side Coating	None	Al
Length ( $\mu\text{m}$ )	25	25
Width ( $\mu\text{m}$ )	10	10
Thickness ( $\mu\text{m}$ )	1.0	1.0

### Ordering Information

UHF-1250	UHFA-1250	Tips
UHF-1250-10	UHFA-1250-10	10
UHF-1250-20	UHFA-1250-20	20
UHF-1250-50	UHFA-1250-50	50
UHF-1250-200	UHFA-1250-200	200
UHF-1250-W	UHFA-1250-W	410+

# Probe Model: Super-Sharp (SS) Series

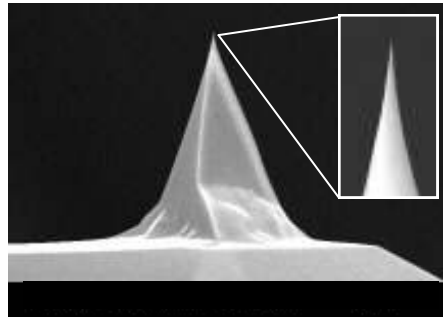
AppNano produces **Super-Sharp (SS) Probes** with a proprietary process, the resulting tips achieve a ultra-small curvature radius (1-2nm). AppNano Super Sharp probes yield enhanced resolution images.

### Tip Specifications

Shape: Pyramidal  
 Height (μm): 14-16  
 ROC (nm): 1-2

### Cantilever Specifications

Material: Si  
 Shape: Rectangular  
 Reflex Coating: None, Al, G



Super-Sharp Probes

## Super-Sharp Probes

Probe Type	Description	Reflex Side Coating Options
ACT-SS	Standard tapping mode super sharp probes	Aluminum (A), Gold (G)
ACL-SS	Long tapping mode super sharp probes	
ACST-SS	Soft tapping mode super sharp probes	
FORT-SS	Force modulation super sharp probes	
SHOCON-SS	Short contact mode super sharp probes	
SICON-SS	Contact mode super sharp probes	

## Ordering Information

**Standard Package Size:** 10, 20, 50, 200 and Wafer ( 410+) probes

**Key to Order Part Number:** (Probe Type) - ( Package size)

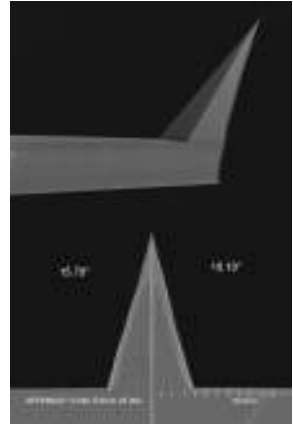
**Example: (i)** Part number to order 10 Super Sharp SICON probes with reflex side Al coating is: **SICONA-SS-10**

**(ii)** Part number to order 50 Super Sharp SICON probes with reflex side gold coating is: **SICONG-SS-50**

## Probe Model: ACCESS-NC

**ACCESS-NC Probes** are sharp silicon probes designed to allow a direct optical view of the AFM tip when imaging. ACCESS-NC is designed for tapping/non-contact mode.

Cantilever Parameter	Nominal Value
Spring Constant (N/m)	45
Frequency (kHz)	300
Length ( $\mu\text{m}$ )	160
Width ( $\mu\text{m}$ )	54
Thickness ( $\mu\text{m}$ )	5
ROC (nm)	<10
Tip Side Coating	None
Reflex Side Coating	None



### Tip Specifications

Material:	Silicon
Height ( $\mu\text{m}$ ):	14-16
Tip Tilt:	17°
Apex Half-Cone Angle:	11°
Front Plane:	15°

ACCESS Tip View  
Probes

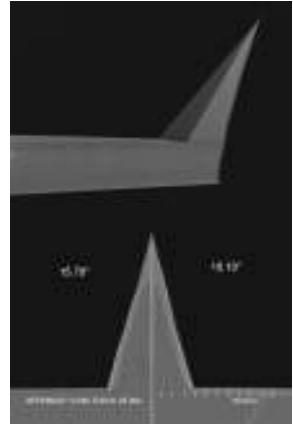
### Ordering Information

ACTA	Probes
ACCESS-NC-10	10
ACCESS-NC-20	20
ACCESS-NC-50	50
ACCESS-NC-200	200
ACCESS-NC-W	410+

## Probe Model: ACCESS-FM

**ACCESS-FM Probes** are sharp silicon probes designed to allow a direct optical view of the AFM tip when imaging. ACCESS-FM are ideal for Force Modulation Mode.

Cantilever Parameter	Nominal Value
Spring Constant (N/m)	3.8
Frequency (kHz)	60
Length ( $\mu\text{m}$ )	245
Width ( $\mu\text{m}$ )	52
Thickness ( $\mu\text{m}$ )	3
ROC (nm)	<10
Tip Side Coating	None
Reflex Side Coating	None



### Tip Specifications

Material :	Silicon
Height ( $\mu\text{m}$ ):	14-16
Tip Tilt:	17°
Apex Half-Cone Angle:	11°
Front Plane:	15°

### Ordering Information

ACTA	Probes
ACCESS-FM-10	10
ACCESS-FM-20	20
ACCESS-FM-50	50
ACCESS-FM-200	200
ACCESS-FM-W	410+

## Conductive ACCESS Probes

**Conductive ACCESS Probes** are silicon probes with conductive coatings (PtIr and Gold) designed to allow a direct optical view of the AFM tip when imaging. **ACCESS-EFM** is coated with PtIr, **ACCESS-FM-GG** is coated with gold. Both probes are ideal for Electrical Force Microscopy.

### Coating Specifications

Reflex Side:	Coated
Tip Side:	Coated
Coating Options:	<b>PtIr or Gold</b>

Cantilever Parameter	Nominal Value
Spring Constant (N/m)	3.8
Frequency (kHz)	60
Length ( $\mu\text{m}$ )	245
Width ( $\mu\text{m}$ )	52
Thickness ( $\mu\text{m}$ )	3
ROC (nm)	30



ACCESS Tip View Probes

### Tip Specifications

Material :	Silicon
Height ( $\mu\text{m}$ ):	14-16
Tip Tilt:	17°
Apex Half-Cone Angle:	11°
Front Plane:	15°

### Ordering Codes

Pt-Ir Coated	Gold Coated	Probes
ACCESS-EFM-10	ACCESS-FM-GG-10	10
ACCESS-EFM-20	ACCESS-FM-GG-20	20
ACCESS-EFM-50	ACCESS-FM-GG-50	50
ACCESS-EFM-200	ACCESS-FM-GG-200	200
ACCESS-EFM-W	ACCESS-FM-GG-W	410+

# Custom MEMS & Nanofabrication

In addition to providing you with our standard catalog of products, Applied NanoStructures enjoys working with customers to develop new probes or devices for advanced applications. Our experienced Research and Development team takes pride in using our knowledge in silicon nanofabrication technology to realize these new ideas.

## Advanced Manufacturing Clean Room Facility

Wet Chemical Processing

Diffusion / Oxidation Processing

Metallization (Al Cr, Ti, Au, Ni, Ag, PtIr and more)

Dry Etching Processing

Physical Vapor Deposition

Photolithography

Optical and Electrical Characterization

Scanning Probe and Scanning Electronic Microscopy Imaging

Process Designing



## R&D, Manufacturing & QA Clean Rooms

Suited for rapid prototyping as well as batch processing.

Complete facility to develop, manufacture, qualify and test MEMS devices.

Continually upgrading the facility with new equipment

## OEM / Custom Nanofabrication

Nano Thermal Analysis Probes

Piezoresistive Cantilevers

Flat Tip Probes

MOSFET Cantilevers

Custom MEMS devices

Please contact us at [info@appnano.com](mailto:info@appnano.com) if you would like to discuss the creation of a custom product.



## Probe Model: Plateau (PTU) Series

**Plateau (PTU) Series Probes** are produced with a flat top and a conical tip. The Plateau Probe provides a well defined contact area.

Cantilever	Description
ACT	40 N/m, 300 kHz, Uncoated
ACTA	40 N/m, 300 kHz, Al reflex
FORT	3 N/m, 60 kHz, Uncoated
FORTA	3 N/m, 60 kHz, Al reflex
SICON	0.2 N/m, 12 kHz, Uncoated
SICONA	0.2 N/m, 12 kHz, Al reflex



### Tip Specifications

Material:	Si
Shape:	Plateau
Radius ( $\mu\text{m}$ ):	1.8
Height ( $\mu\text{m}$ ):	14-16
Front Plane:	2°

### Ordering Information

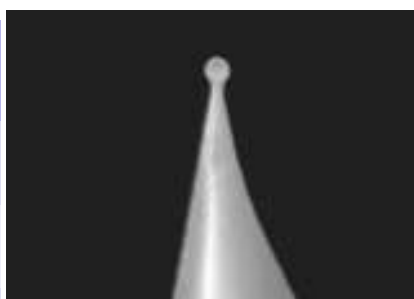
ACT-PTU	ACTA-PTU	FORT-PTU	FORTA-PTU	SICON-PTU	SICONA-PTU	Tips
ACT-PTU-10	ACTA-PTU-10	FORT-PTU-10	FORTA-PTU-10	SICON-PTU-10	SICONA-PTU-10	10
ACT-PTU-20	ACTA-PTU-20	FORT-PTU-20	FORTA-PTU-20	SICON-PTU-20	SICONA-PTU-20	20
ACT-PTU-50	ACTA-PTU-50	FORT-PTU-50	FORTA-PTU-50	SICON-PTU-50	SICONA-PTU-50	50

**Custom Options Available**— Custom gold and platinum coatings available upon request. For details, contact by phone or email.

## Probe Model: Ball Probes

**Ball Probes** are designed for applications that require hard contact with the sample. The tip apex is created using Electron Beam Deposited high density carbon. It is hemispherical in shape and has extremely smooth surface.

Ball Type	Ball Diameter
-B20	10-30 nm
-B35	25-45 nm
-B50	40-60 nm
-B100	90-110 nm
-B150	135-165 nm



### Tip Specifications

Material:	Si/High Density Carbon
Shape:	Ball
Height (μm):	14-16
Front Plane:	31°
Back Plane:	9°

### Ordering Information

Cantilever Model	Probe Type				
	-B20	-B35	-B50	-B100	-B150
FORTA (3 N/m, 65 kHz)	FORTA-B20	FORTA-B35	FORTA-B50	FORTA-B100	FORTA-B150
ACTA (40 N/m, 300 kHz)	ACTA-B20	ACTA-B35	ACTA-B50	ACTA-B100	ACTA-B150
SICONA (0.2 N/m, 12 kHz)	SICONA-B20	SICONA-B35	SICONA-B50	SICONA-B100	SICONA-B150

**Custom Options Available**— Custom gold and platinum coatings available upon request. For details, contact by phone or email.

## Probe Model: COLLOIDAL Probes

**Colloidal Probe** Atomic Force Microscopy requires a tip of known shape to be mounted cleanly on a consistently reproducible cantilever. These probes are known as “**Colloidal Probes**” and are used to study colloidal interactions between two surfaces and to quantify the interactive properties. The tip is formed using a spherical, colloidal particle attached to a tipless cantilever.

### Colloidal Probe Custom Manufacturing Ordering Information

#### Tipless Cantilever Types:

HYDRA, ACT, SICON, ACL,  
SHOCON, FORT

#### Colloidal Particle Options:

Type: Au, BSG, SiO, PS  
 Diameter: A - 5  $\mu\text{m}$  to 9  $\mu\text{m}$   
 B - 10  $\mu\text{m}$  to 14  $\mu\text{m}$   
 C - 15  $\mu\text{m}$  to 19  $\mu\text{m}$   
 D - 20  $\mu\text{m}$  or more

#### Manufacturing:

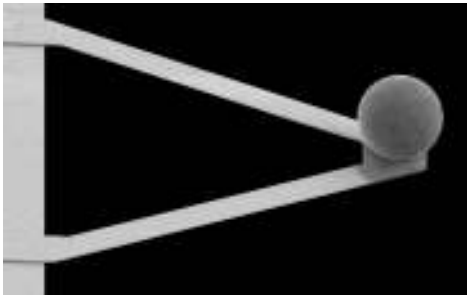
Attach the spheres to the tipless cantilever using high precision 6 axis micro manipulators with 1,000X optics

#### Coating Options:

Reflex Side: A (Al), G (gold)  
 Tip Side : G (gold)



Colloidal Probes



### Model Number Information

#### Type-Size-Coating-Quantity\*

Example: The part # for 5 of the 12  $\mu\text{m}$  diameter glass sphere colloidal probes with gold coating on both sides is -

**SICON-BSG-B-GG-5\***

\* Minimum order is 5 probes per box

## Probe Model: TAP-TALL

The **TAP-TALL** are specially designed 65  $\mu\text{m}$  tall tip probes for profiling high aspect ratio features and deep trenches. Standard probes are only suitable for 10-15  $\mu\text{m}$  features.

### Tip Specifications

Shape: Tetrahedral  
 Height ( $\mu\text{m}$ ): 65  
 ROC\* (nm): >15  
 Coating: Available uncoated or coated with Al

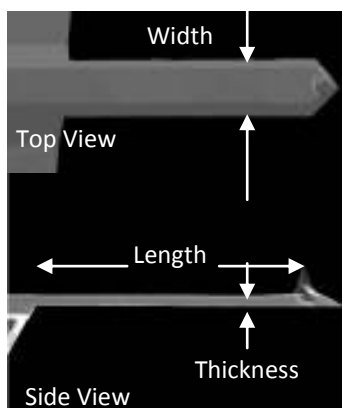
### Cantilever Specifications

Material: Si  
 Shape: Rectangular  
 Reflex Coating: None

\*Nominal specification; guaranteed <30nm



Parameter	Nominal Value
Spring Constant (N/m)	228
Frequency (kHz)	140
Length ( $\mu\text{m}$ )	225
Width ( $\mu\text{m}$ )	120
Thickness ( $\mu\text{m}$ )	8.0



### Ordering Information

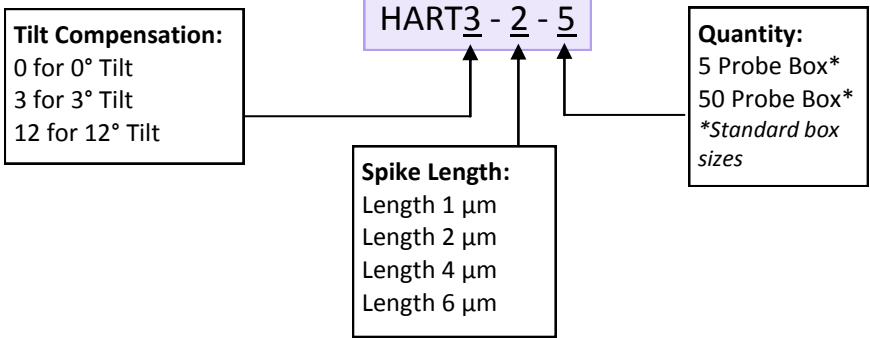
Part Number	Probes
TAP-TALL-10	10
TAP-TALL-20	20
TAP-TALLA-10	10
TAP-TALLA-20	20

# High Aspect Ratio Tilted Probes

AppNano manufactures probes with various spike lengths and widths for trenches and deep features. SPM/AFM instrument manufacturers use different probe chip mounting angles. AppNano provides options to meet all commercial AFM systems. Additionally, we can fabricate HART probes to meet custom dimensions.

## Ordering Information (Standard)

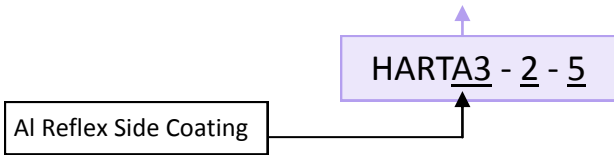
Example Part Number: **HART3-2-5**



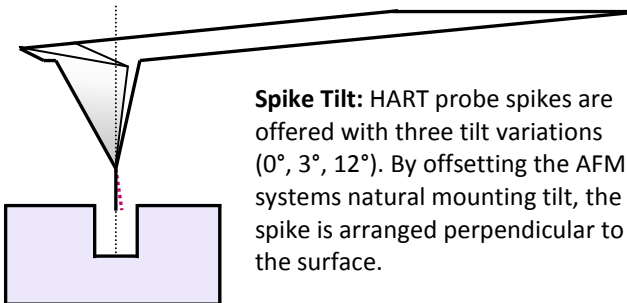
High Aspect Ratio Probes

## Ordering Information (with Reflex Coating)

Example Part Number: **HARTA3-2-5**



## Tilt Compensation

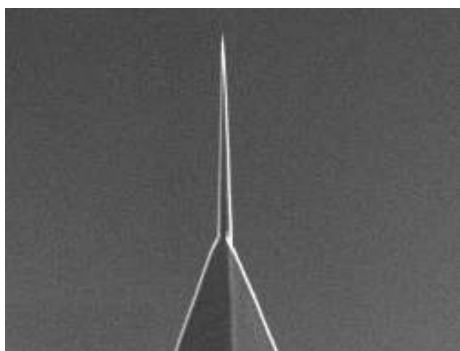


## Probe Model: HART Series

**HART Series Probes** are designed for imaging or depth metrology of shallow features 1, 2, 4 or even 6  $\mu\text{m}$  deep. The spike is tilt compensated to enter trench vertically down. The spike angle is specified at 0, 3, or 12°.

### Spike Properties

- Heavily Doped (0.01—0.025 Ohm-cm) Single Crystal Si
- Focused Ion Beam Milled
- Tip ROC: >20nm



Probe Type	Tilt Compensation	Spike Length ( $\mu\text{m}$ )	Reflex Coating
HART0	0° ( No Tilt)	1,2, 4, 6	None
HARTA0	0° ( No Tilt)	1,2, 4, 6	Yes, Al (50nm)
HART3	3°	1,2,4,6	None
HARTA3	3°	1,2,4,6	Yes, Al (50nm)
HART12	12°	2,4,6	None
HARTA12	12°	2,4,6	Yes, Al (50nm)

Cantilever Parameter	Value	Spike Specifications	
Spring Constant (N/m)	40	Length ( $\mu\text{m}$ )	Width (nm)
Frequency (kHz)	300	1	100
Length ( $\mu\text{m}$ )	125	2	100
Width ( $\mu\text{m}$ )	35	4	200
Thickness ( $\mu\text{m}$ )	4.5	6	400

## Probe Model: Doped Diamond Series

**Doped Diamond (DD) Probes** offers a unique combination of hardness and conducting tip. The tip side of these probes is coated with polycrystalline diamond. The diamond film is doped with boron to make it highly conducting.

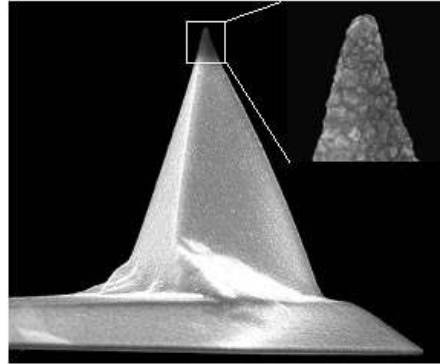
### Tip Specifications

Shape: Pyramidal  
 Height ( $\mu\text{m}$ ): 14-16  
 Aspect Ratio: 1.5-3.0  
 ROC\* (nm): 100-300  
 Coating: 100nm Doped Diamond

\*Nominal specification

### Cantilever Specifications

Material: Si  
 Shape: Rectangular  
 Reflex Coating: Al



Parameter	Probe Type		
	DD-ACTA	DD-FORTA	DD-SICONA
Spring Constant (N/m)	40	3	0.2
Frequency (kHz)	300	60	12
Length ( $\mu\text{m}$ )	125	225	450
Width ( $\mu\text{m}$ )	35	30	40
Thickness ( $\mu\text{m}$ )	4.5	3.0	2.5

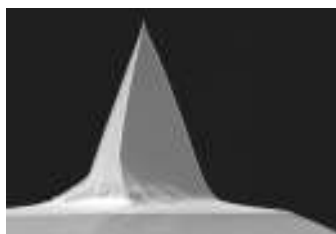
Ordering Information			
NC	FM	EFM	Probes
DD-ACTA-10	DD-FORTA-10	DD-SICONA-10	10
DD-ACTA-20	DD-FORTA-20	DD-SICONA-20	20
DD-ACTA-50	DD-FORTA-50	DD-SICONA-50	50
DD-ACTA-200	DD-FORTA-200	DD-SICONA-200	200
DD-ACTA-W	DD-FORTA-W	DD-SICONA-W	410 +

## Probe Model: ANSCM Series

**ANSCM Series Probes** are coated with PtIr on both sides for EFM applications. **ANSCM-PA** probes are for tapping mode, **ANSCM-PT** probes are for force modulation, and **ANSCM-PC** probes are for contact mode applications. **ANSCM-PA5** probe are designed for CAFM application and have a thicker PtIr coating for enhanced lifetime.

### Applications

Electrical For Microscopy  
 Conducting Atomic Force Microscopy  
 Kelvin Force Microscopy  
 Piezo Force Microscopy  
 Scanning Capacitance Microscopy



Shape: Pyramidal  
 Height ( $\mu\text{m}$ ): 14-16  
 Coating: PtIr

Parameter	Probe Type			
	ANSCM-PA5	ANSCM-PA	ANSCM-PT	ANSCM-PC
Spring Constant (N/m)	40	40	3	0.2
Frequency (kHz)	300	300	60	12
Length ( $\mu\text{m}$ )	125	125	225	450
Width ( $\mu\text{m}$ )	35	35	30	40
Thickness ( $\mu\text{m}$ )	4.5	4.5	3.0	2.5
Tip ROC (nm)	50	30	30	30
Pt/Ir Thickness (nm)	50	25	25	25

### Ordering Information

**Standard Package Size:** 10, 20, 50, 200 and Wafer ( 410+) probes

**Key to Order Part Number:** (Probe type) - ( Package size)

**Example:** (i) Part number to order 10 Force Modulation EFM Probes is:

**ANSCM-PT-10**

(ii) Part number to order 50 contact mode EFM probes: **ANSCM-PC-50**



## Probe Model: MAGT Series

**MAGT Series Probes** are for MFM applications. **MAGT** probes have a medium coercivity and medium moment, **MAGT-LM** probes have low moment and **MAGT-HM** probes have high moment magnetic material coatings.

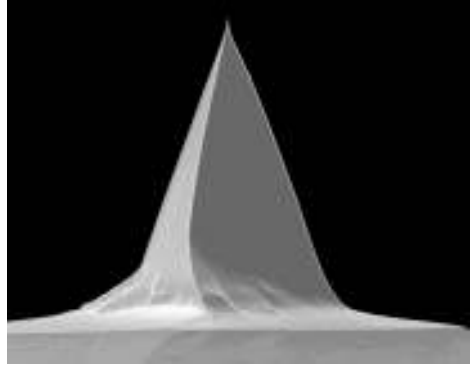
### Tip Specifications

Shape: Pyramidal  
 Height ( $\mu\text{m}$ ): 14-16  
 ROC\* (nm): see below  
 Coating: see below  $\pm 5\text{nm}$

\*Nominal specification

### Cantilever Specifications

Material: Si  
 Shape: Rectangular  
 Reflex Coating: Cr-Co  
 Tip Coating: Cr-Co



Parameter	Value	Type	Specification
	Nominal	MAGT	ROC (nm): 40
Spring Constant (N/m)	3	Coating:	Cr-Co, 50nm
Frequency (kHz)	60	<b>MAGT-LM</b>	ROC (nm): 25
Length ( $\mu\text{m}$ )	225	Coating:	Cr-Co, 15nm
Width ( $\mu\text{m}$ )	30	<b>MAGT-HM</b>	ROC (nm): 75
Thickness ( $\mu\text{m}$ )	3.0	Coating:	Cr-Co, 150nm

Magnetic Coated Probes

### Ordering Information

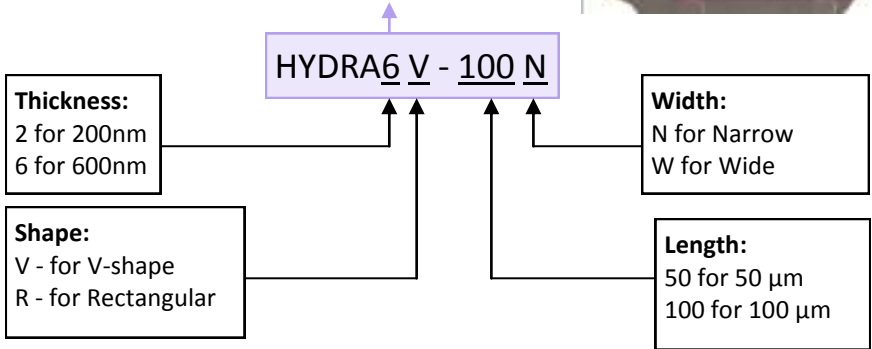
Regular	Low Moment	High Moment	Probes
<b>MAGT-10</b>	<b>MAGT-LM-10</b>	<b>MAGT-HM-10</b>	10
<b>MAGT-20</b>	<b>MAGT-LM-20</b>	<b>MAGT-HM-20</b>	20
<b>MAGT-50</b>	<b>MAGT-LM-50</b>	<b>MAGT-HM-50</b>	50
<b>MAGT-200</b>	<b>MAGT-LM-200</b>	<b>MAGT-HM-200</b>	200
<b>MAGT-W</b>	<b>MAGT-LM-W</b>	<b>MAGT-HM-W</b>	410+

# HYDRA Probe Series

The **HYDRA Series** is a unique series of silicon nitride probes, with proprietary design by AppNano. The probe consists of a silicon chip, silicon nitride cantilever, and silicon tetrahedral tip.

## Ordering Information

Example Part Number: **HYDRA6V-100N**



## Additional Options

**Reflex Coating:**  
G for Gold

Example: **HYDRA6V-100NG**

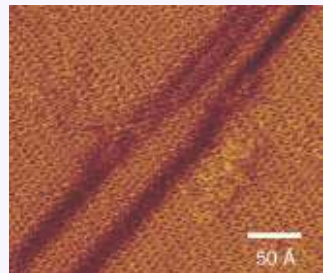
**Tip & Reflex Coating:**  
GG for Gold-Gold

Example: **HYDRA6V-100GG**

**Tipless Option:**  
TL for TipLess

Example: **HYDRA6V-100N-TL**

**HYDRA User Image:** Deflection image of a calcite surface imaged in solution with an AppNano HYDRA6R-200N probe. The light colored 'bumps' are oriented at the crystallographic positions of oxygen atoms protruding from the calcite cleavage plane. Image courtesy of Raymond W. Friddle and James J. De Yoreo at the Molecular



## Probe Model: HYDRA Rectangular Series

The **HYDRA R Series Probes** are rectangular nitride cantilevers with a sharp silicon tip designed for force-distance applications. These probes can also be used for tapping mode and contact mode in air/fluid medium.

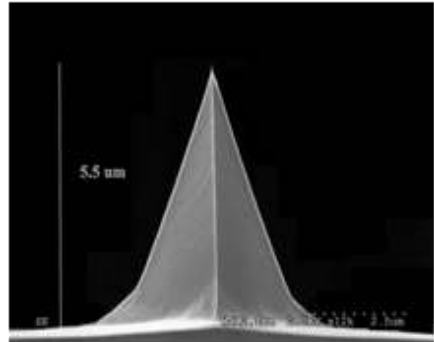
### Tip Specifications

Material: Silicon  
 Shape: Tetrahedral  
 Height ( $\mu\text{m}$ ): 4-6  
 ROC (nm):  $<10^*$   
 Coating: None, G

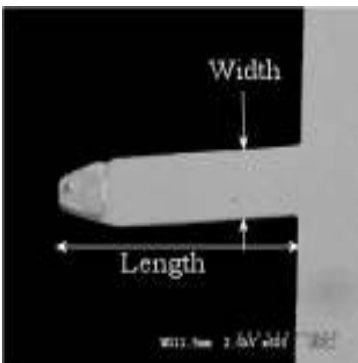
\* Probes with larger tip radius are available upon request.

### Cantilever Specifications

Material: Low Stress Silicon Nitride  
 Shape: Rectangular  
 Options: No Coating, G, GG, TL



Parameter	Value			
	2R-50N	2R-100N	6R-100N	6R-200N
Spring Constant (N/m)	0.084	0.011	0.284	0.035
Frequency (kHz)	77	21	66	17
Length ( $\mu\text{m}$ )	50	100	100	200
Width ( $\mu\text{m}$ )	35	35	35	35
Thickness ( $\mu\text{m}$ )	0.2	0.2	0.6	0.6



Ordering Information	
Example Part Number	No. of Probes
HYDRA2R-50N-10	10
HYDRA2R-50N-20	20
HYDRA2R-50N-50	50
For inquiries regarding larger quantities, please contact our sales group.	

## Probe Model: HYDRA V-Shaped Series

The **HYDRA V Series Probes** are V-shaped nitride cantilevers with a sharp silicon tip for imaging soft samples. These probes can be used for tapping, contact mode in air/liquid and for force-distance mode.

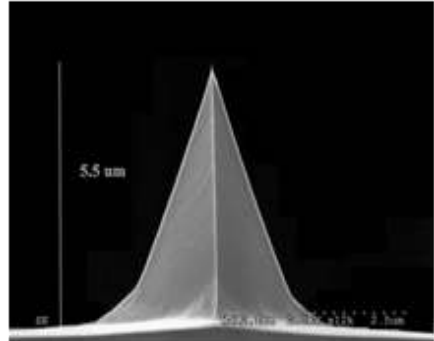
### Tip Specifications

Material: Silicon  
 Shape: Tetrahedral  
 Height ( $\mu\text{m}$ ): 4-6  
 ROC (nm):  $<10^*$   
 Coating: None, G

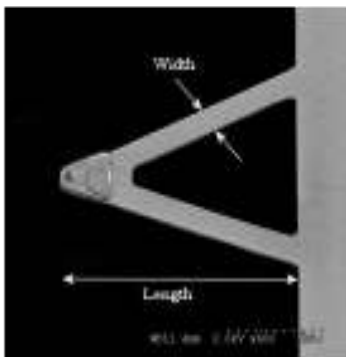
\* Probes with larger tip radius are available upon request.

### Cantilever Specifications

Material: Low Stress Silicon Nitride  
 Shape: V-Shaped  
 Options: No Coating, G, GG, TL



Parameter	Value			
	6V-100N	6V-100W	6V-200N	6V-200W
Spring Constant (N/m)	0.292	0.405	0.045	0.081
Frequency (kHz)	66	67	17	17
Length ( $\mu\text{m}$ )	100	100	200	200
Width ( $\mu\text{m}$ )	18	25	22	40
Thickness ( $\mu\text{m}$ )	0.6	0.6	0.6	0.6



### Ordering Information

Example Part Number	No. of Probes
HYDRA6V-100N-10	10
HYDRA6V-100N-20	20
HYDRA6V-100N-50	50

For inquiries regarding larger quantities, please contact our sales group.

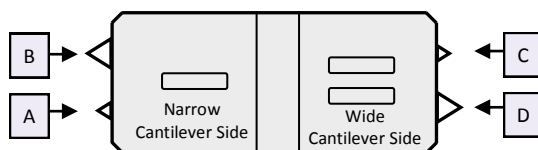
## Probe Model: Hydra-All Series

The **Hydra-All Probe** is a 4-in-1 probe chip with four cantilevers of varying spring constants and lengths. The probe is designed for work with soft materials and can be used to handle various functions.

### Tip Specifications

Material: Silicon  
 Shape: Tetrahedral  
 Height ( $\mu\text{m}$ ): 4-6  
 ROC (nm):  $<10^*$   
 Coating: None, G

\* Probes with larger tip radius are available upon request.



Lever B: HYDRA6V-200N  
 Lever A: HYDRA6V-100N

Lever C: HYDRA6V-100W  
 Lever D: HYDRA6V-200W

Parameter	4 Cantilevers on 1 Chip			
	Lever A: 6V-100N	Lever B: 6V-200N	Lever C: 6V-100W	Lever D: 6V-200W
Spring Constant (N/m)	0.292	0.045	0.405	0.081
Frequency (kHz)	66	17	67	17
Length ( $\mu\text{m}$ )	100	200	100	200
Width ( $\mu\text{m}$ )	18	22	25	40
Thickness ( $\mu\text{m}$ )	0.6	0.6	0.6	0.6
Tip ROC (nm)	30	30	30	30

### Ordering Information

Hydra-All	Hydra-All-G (with gold coating)	Tips
Hydra-All-10	Hydra-All-G-10	10
Hydra-All-20	Hydra-All-G-20	20
Hydra-All-50	Hydra-All-G-50	50

## Probe Model: STM-(W)

AppNano etched STM probes are made from 99.95% tungsten wire (0.25 mm in diameter). The probes are produced by computer controlled electrochemical etching and result in probes with a tip radius of less than

### Ordering Information

Part Number	# of Tips
STM-(W)-10	10
STM-(W)-20	20
STM-(W)-50	50



## Probe Model: STM-(Pt)

AppNano etched STM probes are made from 99.95% platinum wire (0.25 mm diameter). The probes are produced by cutting wire to achieve a tip radius of less than 15nm.

### Ordering Information

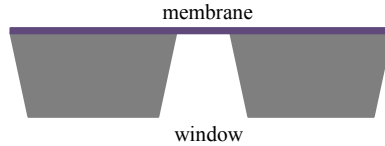
Part Number	# of Tips
STM-(Pt)-10	10
STM-(Pt)-20	20
STM-(Pt)-50	50



AppNano can provide computer controlled, custom etched STM probes made from 99.95% platinum wire. Quotations and details can be requested by email, please contact [sales@appnano.com](mailto:sales@appnano.com).

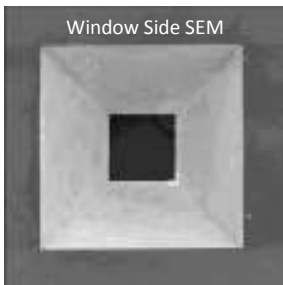
# Membrane Model: SIWD, NIWD, OXWD

Applied NanoStructures' **SIWD Membrane** is made with silicon, **NIWD Membrane** is made with low stress silicon nitride, **OXWD Membrane** is made with silicon oxide which can be coated with various materials according to customer request. Additionally, the size of the chip and window and thickness of the membrane can be varied to fit different applications.



Cross-sectional view

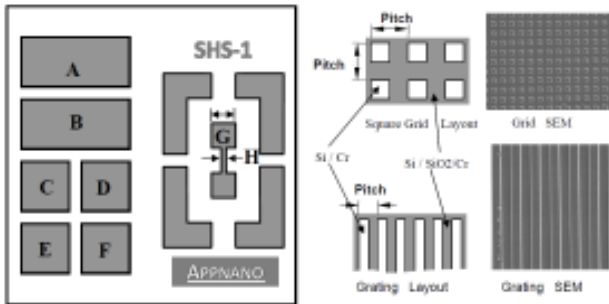
Parameters for Chip	Value for Chip		
	Nominal	Minimum	Maximum
Thickness ( $\mu\text{m}$ )	300	290	310
Width & Length ( $\mu\text{m}$ )	6000 x 6000	6050 x 6050	6050 x 6050
Coatings	Various Coatings Available		
Parameters for Window	Membrane Size		
	WD	WDS	
Thickness (nm)	200	200	
Membrane Size ( $\mu\text{m}$ )	200 x 200	20 x 20	
Window Size ( $\mu\text{m}$ )	600 x 600	600 x 600	



Ordering Information	
Part Number	# of Chips
SIWD-5 / SIWDS-5	5
SIWD-20 / SIWDS-20	20
SIWD-100 / SIWDS-100	100

## Standards Model: SHS-1, SHS-0.1

**Step Height Standards (SHS)** are uniquely designed for X,Y, and Z calibration of scanning probe microscopes and profilometers. Our Step Height Standard features are defined in thermally grown silicon dioxide on silicon substrate. A layer of Cr is deposited to harden the surface. Our step height standards are available in several heights.



Feature	Description	Details
A	Square Grid	3 $\mu\text{m}$ pitch
B	Square Grid	10 $\mu\text{m}$ pitch
C	Grating	3 $\mu\text{m}$ pitch
D	Grating	10 $\mu\text{m}$ pitch
E	Grating	20 $\mu\text{m}$ pitch
F	Grating	50 $\mu\text{m}$ pitch
G	Square Pad	100 $\mu\text{m}$ x 100 $\mu\text{m}$
H	Rectangular Line	1000 $\mu\text{m}$ x 200 $\mu\text{m}$
Ordering Information		
Part Number	# of Chips	Step Height
SHS-1	1	1 $\mu\text{m}$
SHS-0.1	1	100nm

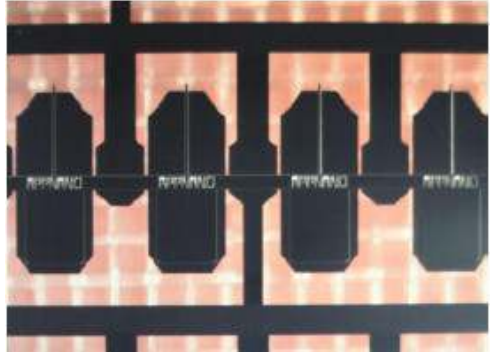


# AppNano Patented Wafer Form

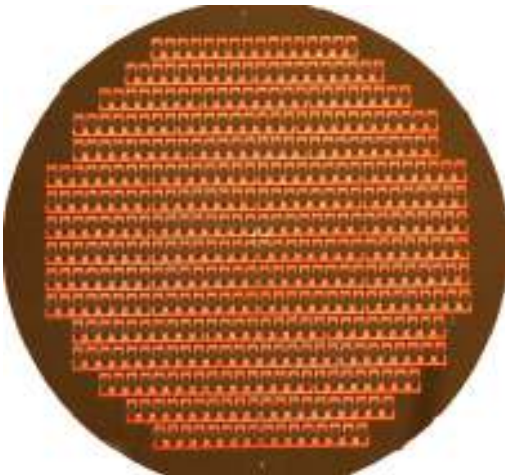


The “old-style” wafer form, offered by most manufacturers, makes the removal of chips difficult and tedious. The use of tweezers is impaired by thick beams leaving little area for tweezers. Additionally horizontal beams tend to be nearly 250  $\mu\text{m}$  thick. Removal of tips requires more force which often causes beams to shatter. Such fragments are a serious problem as they can destroy the tip apex of other probes on the wafer. The traditional wafer form has often been a problem and reduces the benefits of bulk purchasing.

**AppNano developed a patented wafer form with major improvements.** This new form allows for open tweezers access to the bottom half of the AFM probe chip. Open access makes removal easy without damaging the cantilever or tip. Thin 50  $\mu\text{m}$  horizontal silicon beams hold the chip in place while remaining easy to break when force is applied for removal.



**The chip holding beams are strategically positioned.** They allow for maximum access to the probes while utilizing tweezers. The beam placement also maintains a sturdy holding structure for the probes.



## Chart of Probes

Application	Probe Model	Description	Cantilever Length ( $\mu\text{m}$ )	Spring Constant (N/m)	Resonance Frequency (kHz)	Options
<b>High Resolution Imaging</b>	ACT-SS	Tapping Mode, Super Sharp Probe	125	40	300	A, G
	FORT-SS	Force Modulation, Super Sharp Probe	225	3	60	A, G
	SICON-SS	Contact Mode, Super Sharp Probe	450	0.2	12	A, G
<b>Ultra-High Frequency</b>	UHF-1250	Ultra-High Frequency Probes	25	12	1250	A
<b>Plateau Probes</b>	ACT-PTU	High Frequency Plateau Probes	125	40	300	N/A
	FORT-PTU	Medium Frequency Plateau Probes	225	3	60	N/A
	SICON-PTU	Low Frequency Plateau Probes	450	0.2	12	N/A
<b>Ball Probes</b>	ACTA-B50	Tapping Mode, 50nm Ball	125	40	300	B20-B150
	FORTA-B50	Force Modulation Mode, 50nm Ball	225	3	60	B20-B150
	SHOCONA-B50	Contact Mode, 50nm Ball	450	0.2	12	B20-B150
<b>Colloidal Probes</b>	ACTA-BSG-A	ACTA Tipless with BSG Colloidal, Size A	125	40	300	A, B, C, D
	FORTA-BSG-A	FORTA Tipless with BSG Colloidal, Size A	225	3	60	A, B, C, D
	SICONA-BSG-A	SICONA Tipless with BSG Colloidal, Size A	450	0.2	12	A, B, C, D

Option Definitions: A = Aluminum Reflex Coating; C = Custom Tilt & Spike Length; G = Gold Reflex Coating; SS = Super Sharp; TL = Tipless

See backside of catalog for additional probes.

## Chart of Probes

Application	Probe Model	Description	Cantilever Length (μm)	Spring Constant (N/m)	Resonance Frequency (kHz)	Options
<b>Electric Force</b>	ANSCM-PA	High Spring Constant EFM Probe	125	40	300	N/A
	ANSCM-PT	Medium Spring Constant EFM Probe	225	3	60	N/A
<b>Microscopy</b>	ANSCM-PC	Low Spring Constant EFM Probe	450	0.2	12	N/A
<b>Magnetic Force</b>	MAGT-LM	Low Moment MFM Probes	225	3	60	N/A
	MAGT	Medium Moment MFM Probes	225	3	60	N/A
<b>Microscopy</b>	MAGT-HM	High Moment MFM Probes	225	3	60	N/A
<b>Tip View</b>	ACCESS-NC	Non-Contact/Tapping Mode Probes	160	67	300	N/A
	ACCESS-FM	Force Modulation Probes	245	3.8	52	N/A
	ACCESS-EFM	Electric Force Mode Probes	245	3.8	52	Pt-Ir
<b>Doped Diamond</b>	DD-ACTA	Tapping Mode or Hard Contact Mode	125	40	300	N/A
	DD-FORTA	Force Modulation Mode	225	3	60	N/A
	DD-SICONA	Contact Mode Probe	450	0.2	12	N/A
<b>High Aspect Ratio</b>	HART0	No Tilt Compensation, 1, 2, 4 μm spike	125	40	300	A, C
	HART3	3° Tilt Compensation, 1, 2, 4 μm spike	125	40	300	A, C
	HART12	12° Tilt Compensation, 2, 4, 6 μm spike	125	40	300	A, C

Option Definitions: A = Aluminum Reflex Coating; C = Custom Tilt & Spike Length; G = Gold Reflex Coating; SS = Super Sharp; TL = Tipless

See backside of catalogue for additional probes.

## Chart of Probes

Application	Probe Model	Description	Cantilever Length ( $\mu\text{m}$ )	Spring Constant (N/m)	Resonance Frequency (kHz)	Options
<b>Non-Contact / Tapping Mode</b>	ACT	Silicon Tapping Mode Probe	125	40	300	A, TL
	ACL	Long Cantilever Tapping Mode Probe	225	45	190	A, TL
	FORT	Force Modulation Mode Probe	225	3	60	A, TL
	ACST	Silicon Soft Tapping/Contact Mode Probe	150	7	150	A, G, TL
	HYDRA6R-100N	Silicon Nitride Probe, Rectangular Cantilever	100	0.284	66	G, GG, TL
	HYDRA6V-100N	Silicon Nitride Probe, V-Shape, Narrow Cantilever	100	0.292	66	G, GG, TL
	HYDRA6V-100W	Silicon Nitride Probe, V-Shape, Wide Cantilever	100	0.405	67	G, GG, TL
<b>Contact Mode</b>	SICON	Silicon Contact Mode Probe	450	0.2	12	A, G, TL
	SHOCON	Short Cantilever Contact Mode Probe	225	0.10	28	A, G, TL
	HYDRA6R-200N	Silicon Nitride, Rectangular Cantilever	200	0.035	17	G, GG, TL
	HYDRA6V-200N	Silicon Nitride, V-Shape, Narrow Cantilever	200	0.045	17	G, GG, TL
	HYDRA6V-200W	Silicon Nitride, V-Shape, Wide Cantilever	200	0.081	17	G, GG, TL
<b>Force Curve Liquid</b>	HYDRA2R-100N	Nitride Probe, Rectangular Cantilever	100	0.011	21	G, GG, TL
	HYDRA2R-50N	Nitride Probe, Rectangular Cantilever	50	0.084	77	G, GG, TL

Option Definitions: A = Aluminum Reflex Coating; C = Custom Tilt Compensation & Spike Length; G = Gold Reflex Coating; GG = Gold Reflex & Tip Coating; SS = Super Sharp; TL = Tipless

See inside cover for additional probes.



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