

*Large Area and Fine Pitch
testing using
Silicon Micro-cantilever*

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1. *Company Introduction*

AMST stands for Advanced Micro Silicon Technology. The main goal of the company is manufacturing and marketing of Micro Electro-Mechanical Systems (MEMS)

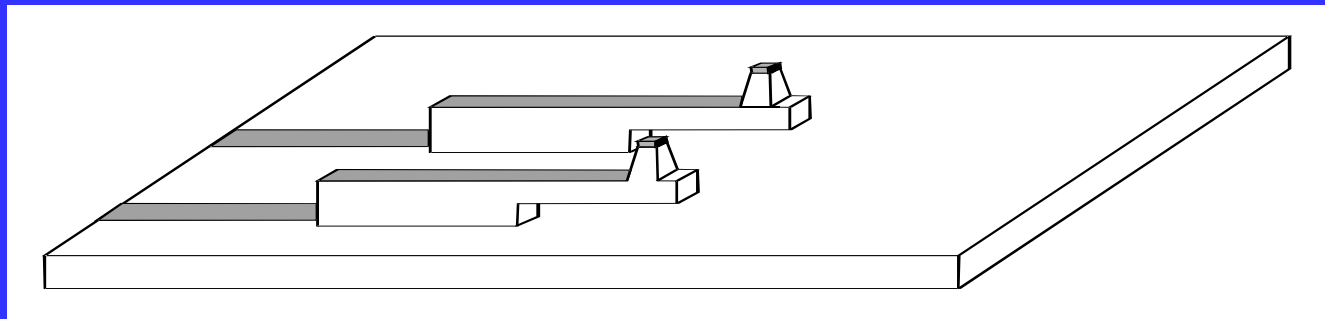
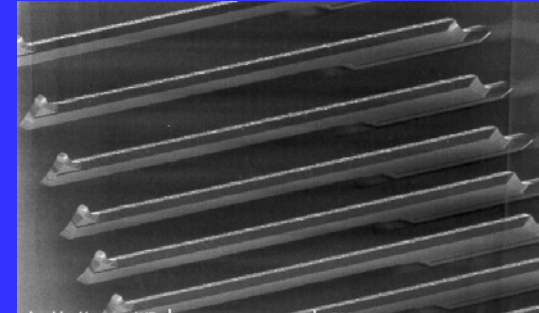


2-1. Purpose of Presentation

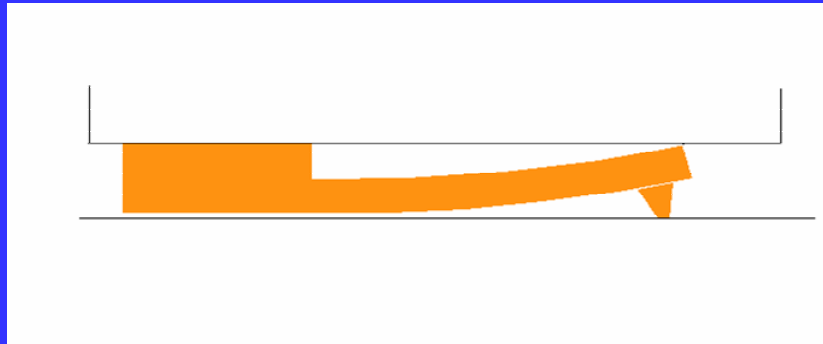
- As a follow up after SWTW 2000 presentation
- Show applicability of simple Micro-cantilever probe for Semiconductor testing
- Introduction of Repairable Large-area testing Probe card

2-2. Introduction to MProbe

- Single Crystal Silicon Cantilever
- Semiconductor fabrication process
- Great design freedom of the cantilever(position, length, width, thickness)

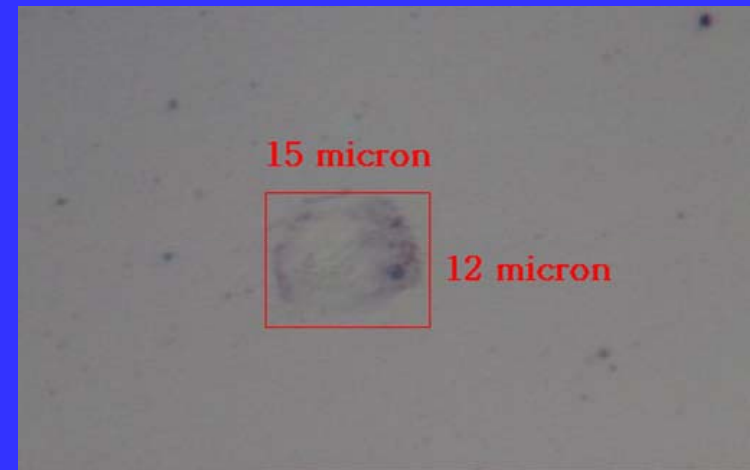


2-3. Probe Movement

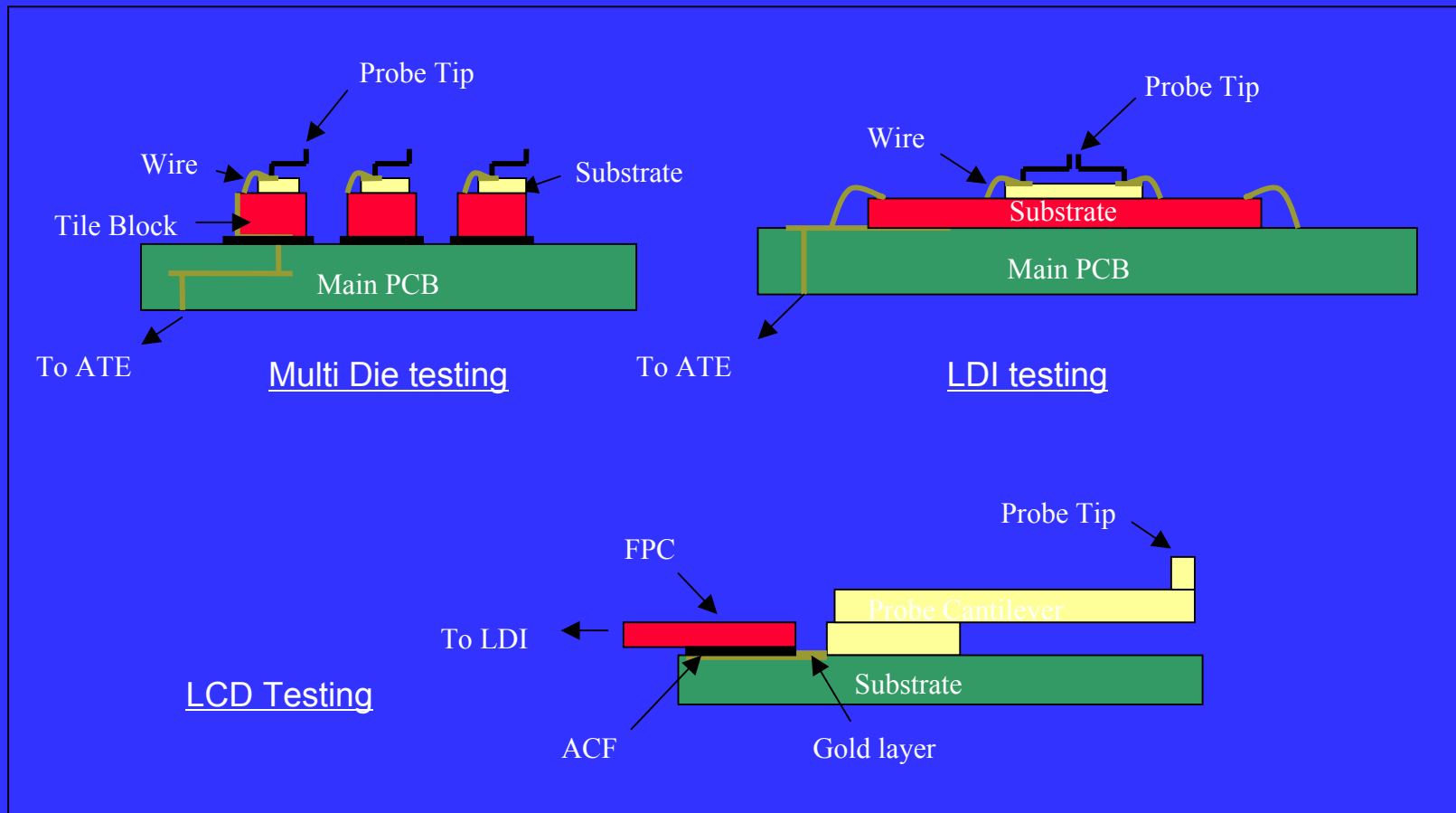


- Overdrive is achieved by bending of cantilever
- Overdrive limit is set by the space between the cantilever and substrate

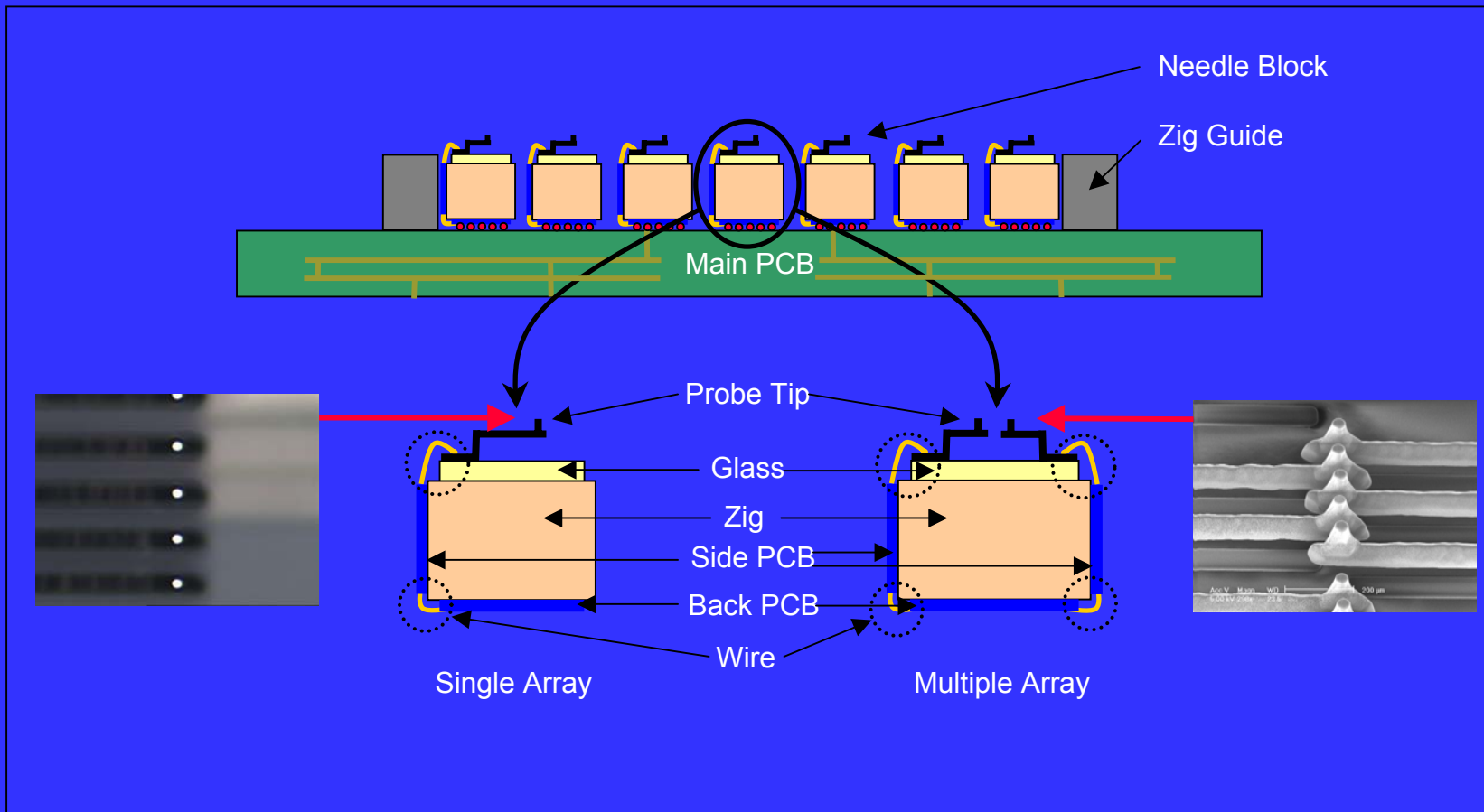
- The Probe mark is made only by the back half of the tip.
- The length of the scrub action is only few microns
- The size of the probe mark is less than 20 micron.



2-4. Wiring Schematics

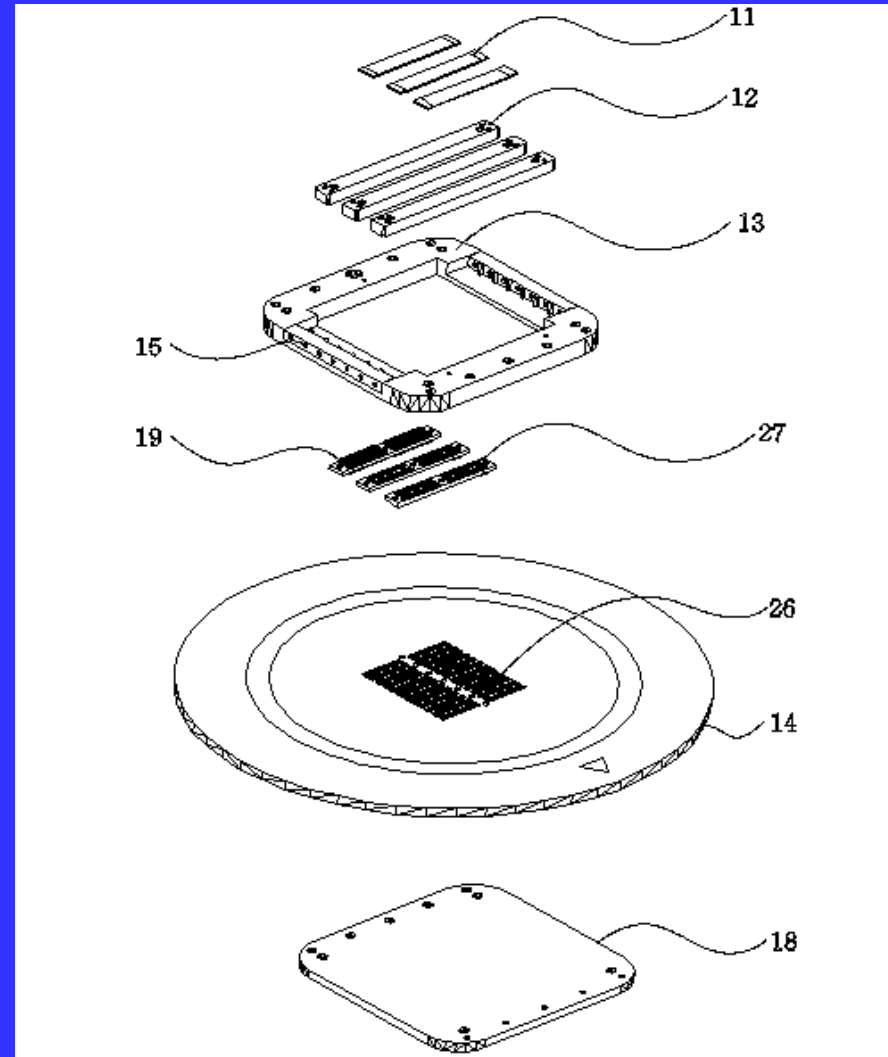


3-1. Large Area Probe card

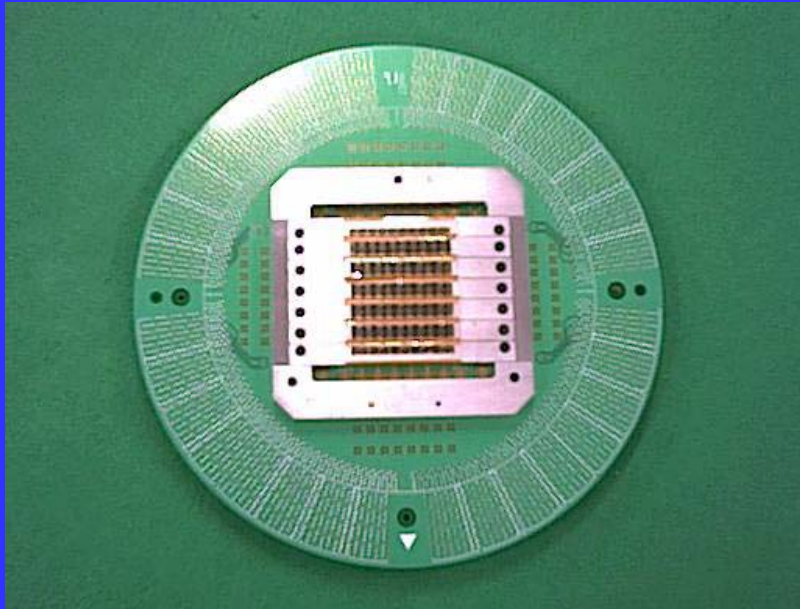


3-2. Assembly

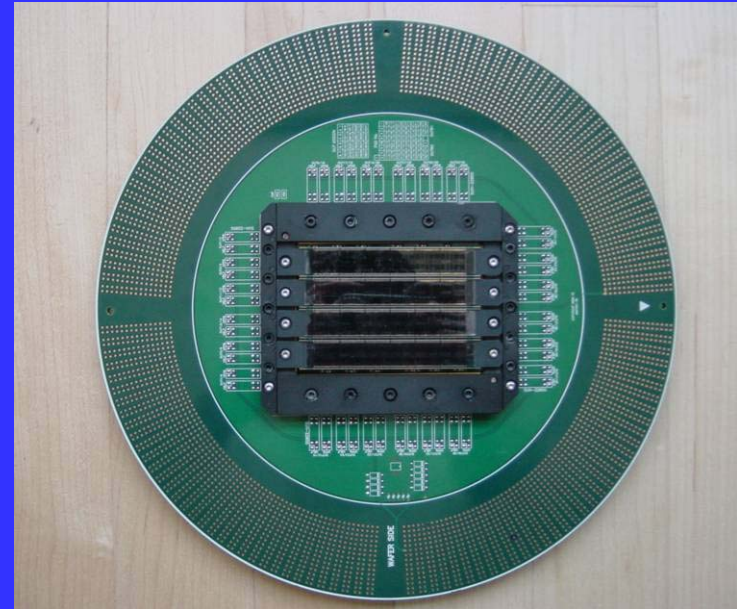
- 11. Needle Tiles
- 12. Support block
- 13. Positioning Block
- 19. Pogo pins
- 27. Pogo pin guide
- 14 . Main PCB
- 18. Backing Plate



3-3. Card Pictures

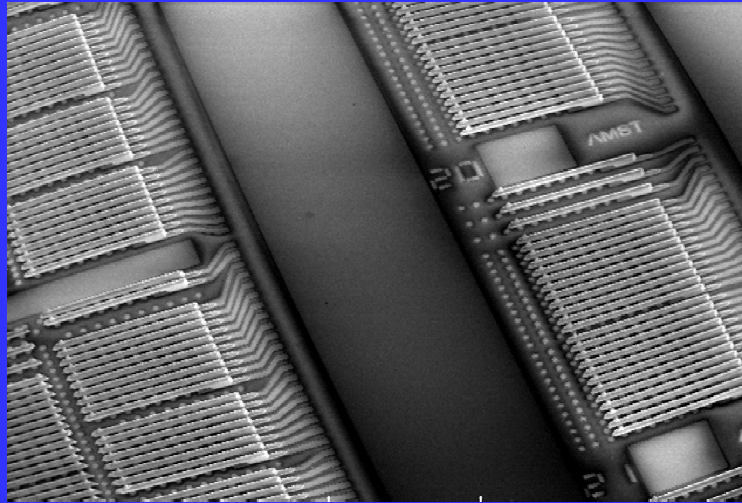


**60 Parallel Tiling Mprobe
(7 tiling blocks)**

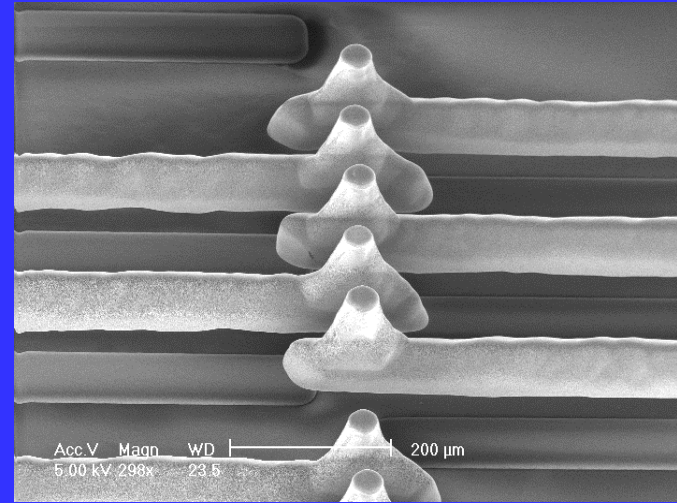


**48 Parallel Tiling Mprobe
(4 tiling blocks)**

3-4. SEM of MProbe

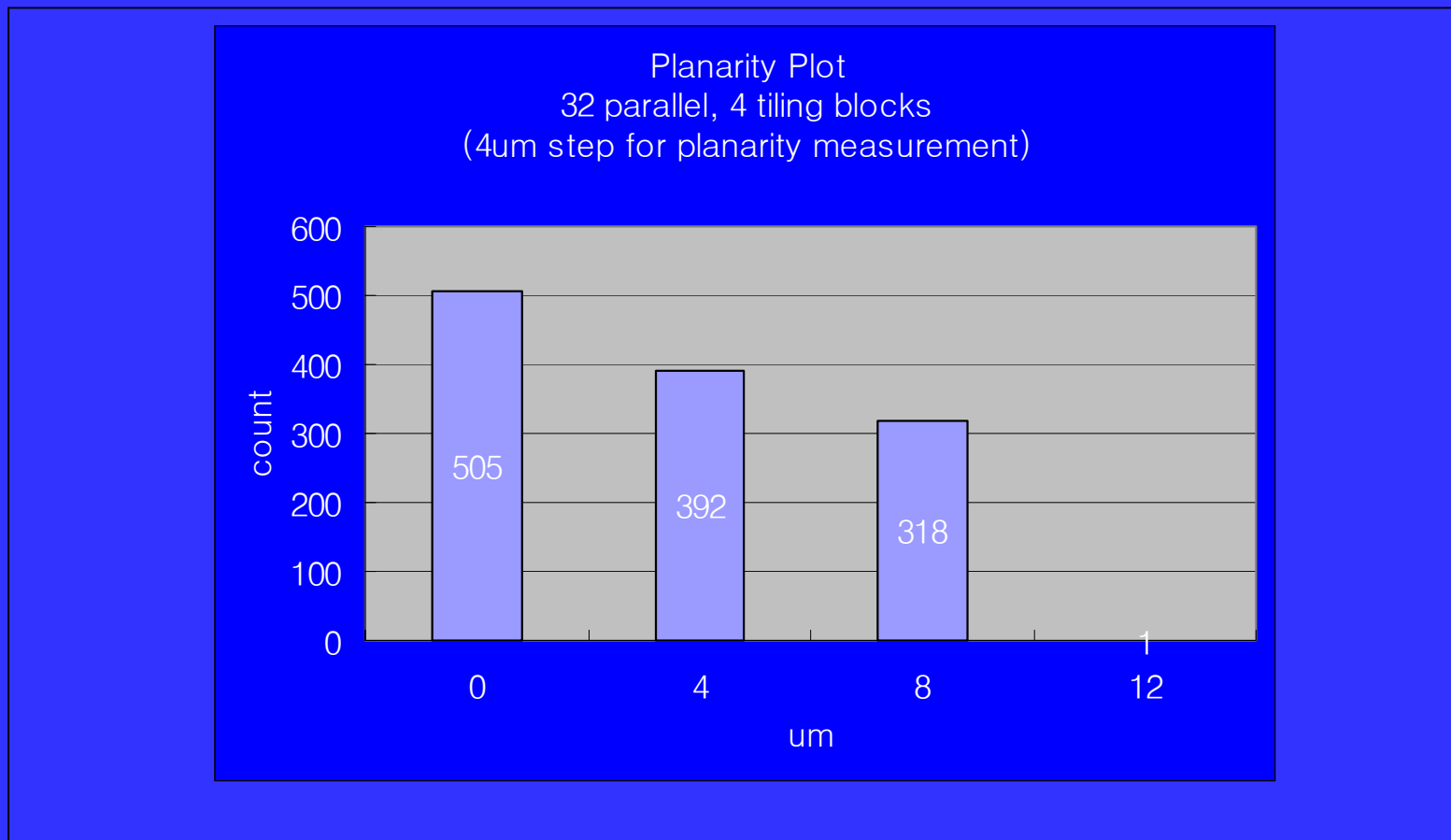


Large Area Array

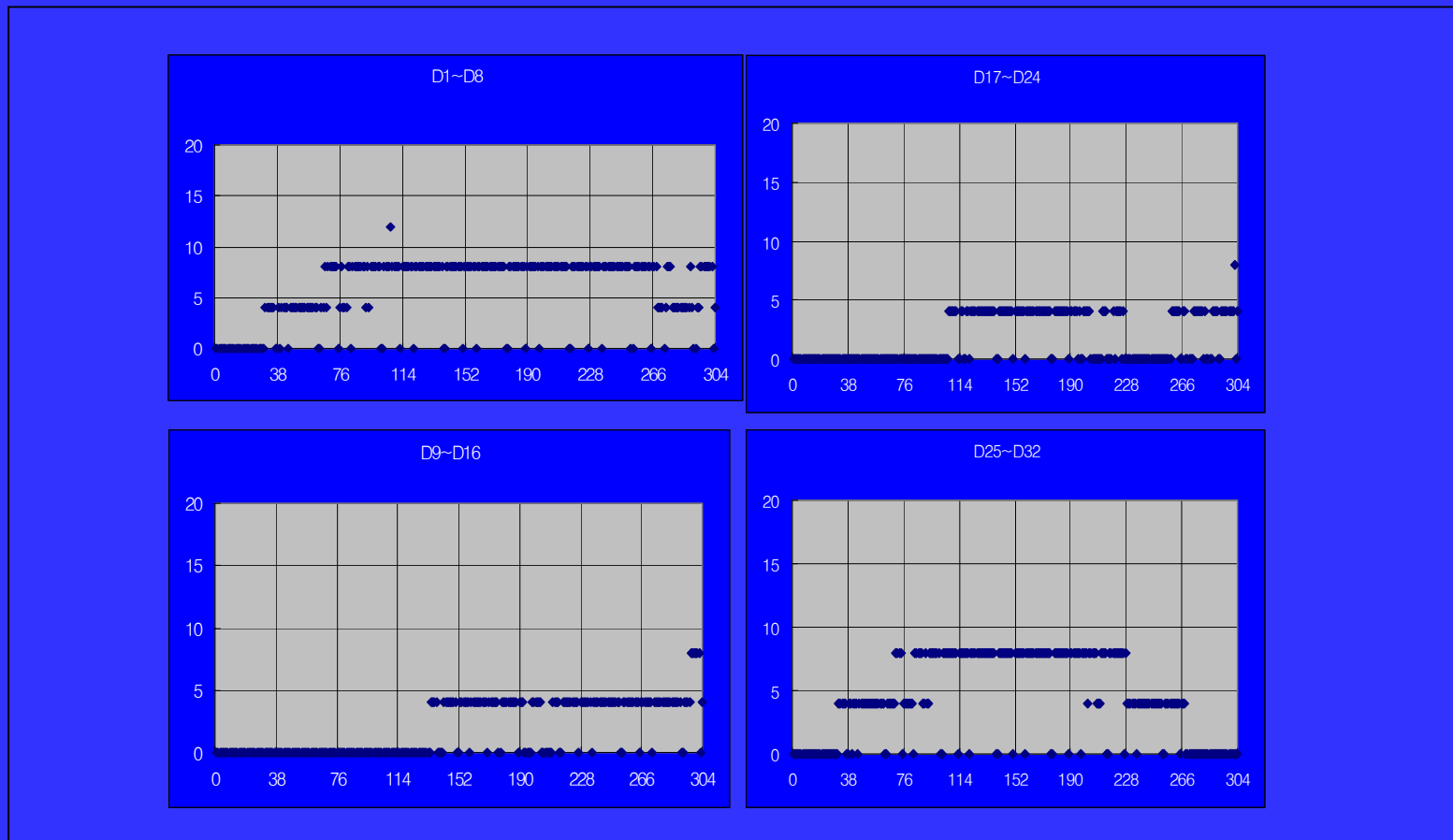


**Enlarged View of the
Probe Tip**

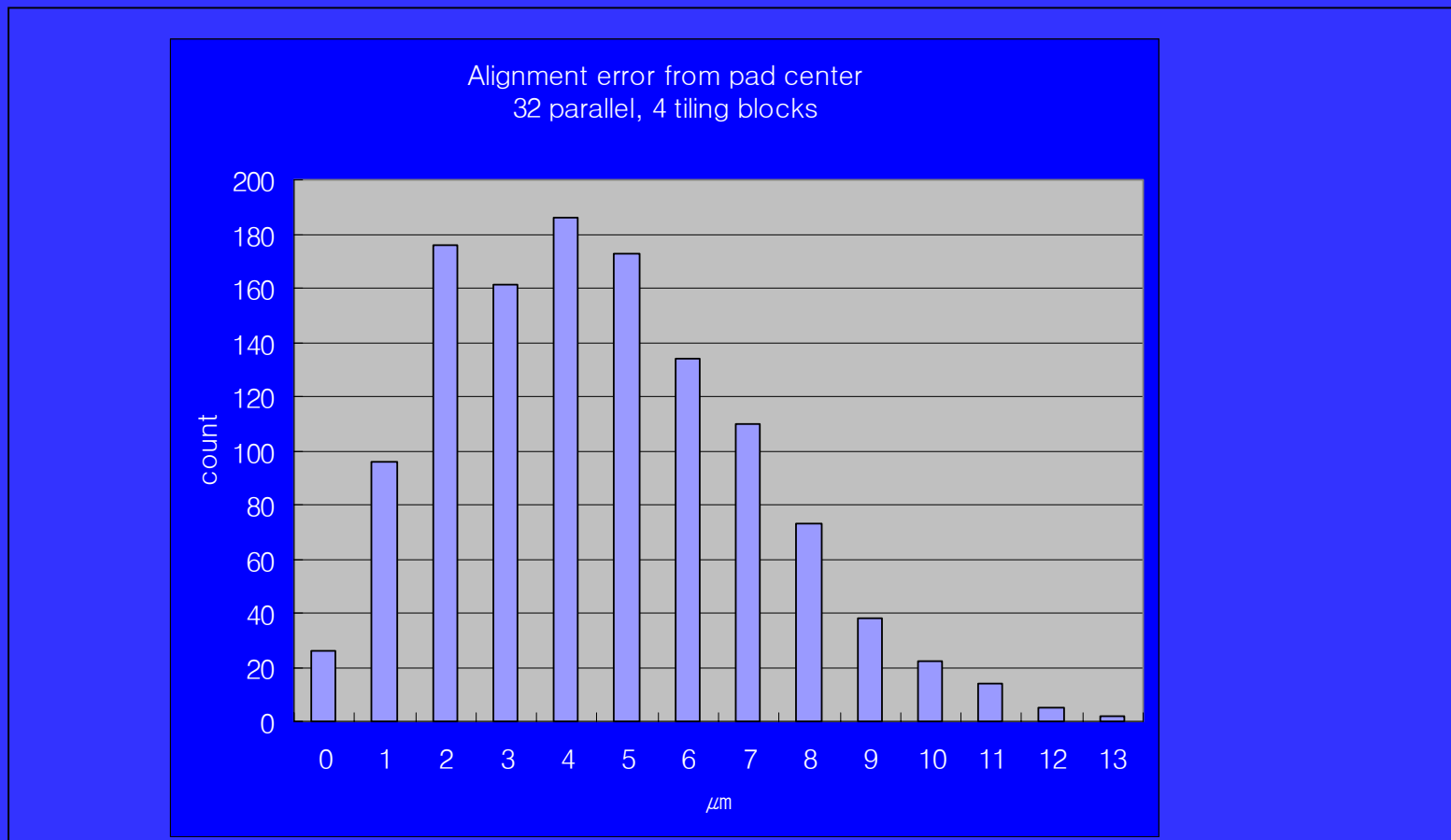
3-5. Tip Planarity (1)



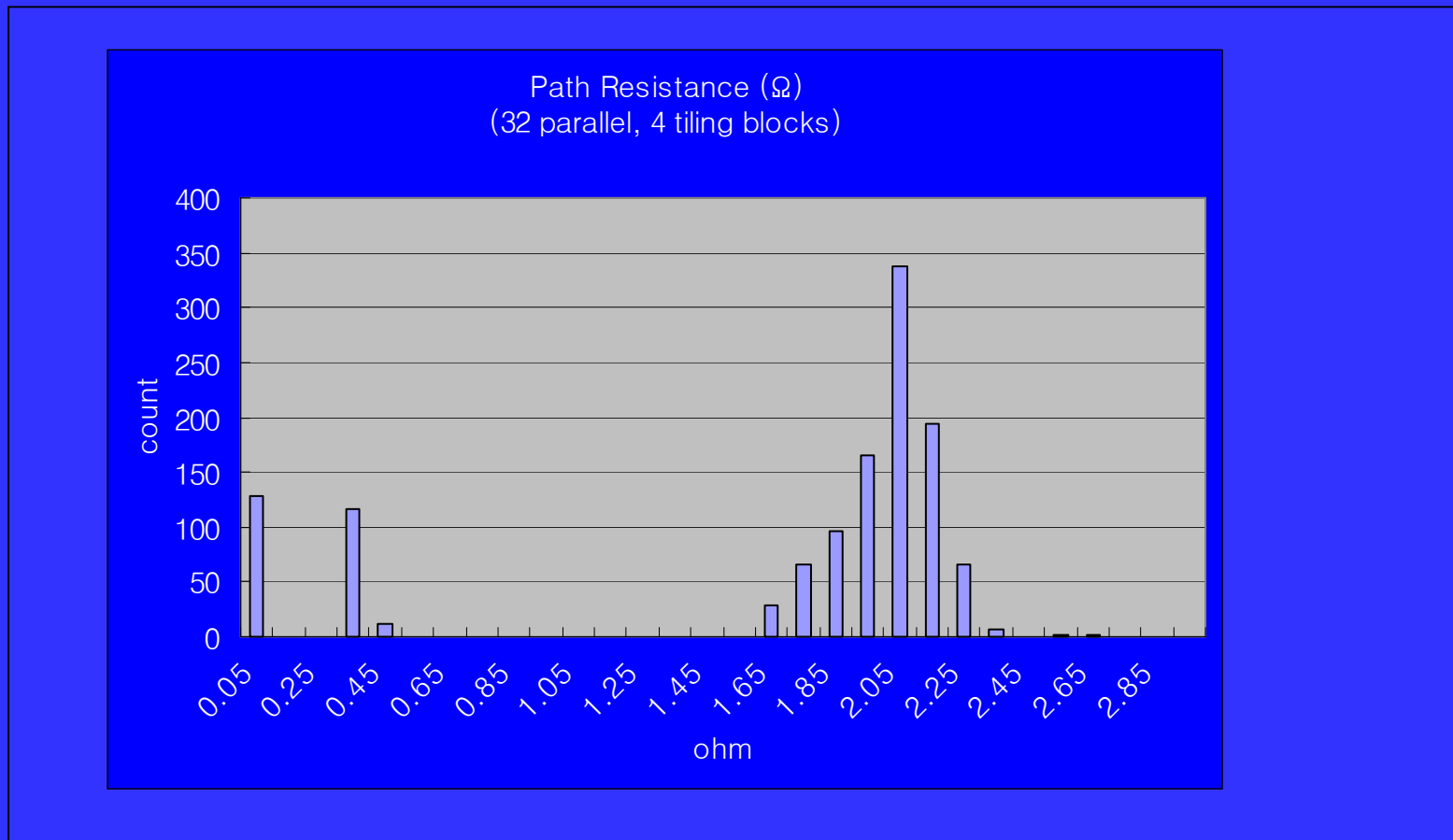
3-6. Tip Planarity (2)



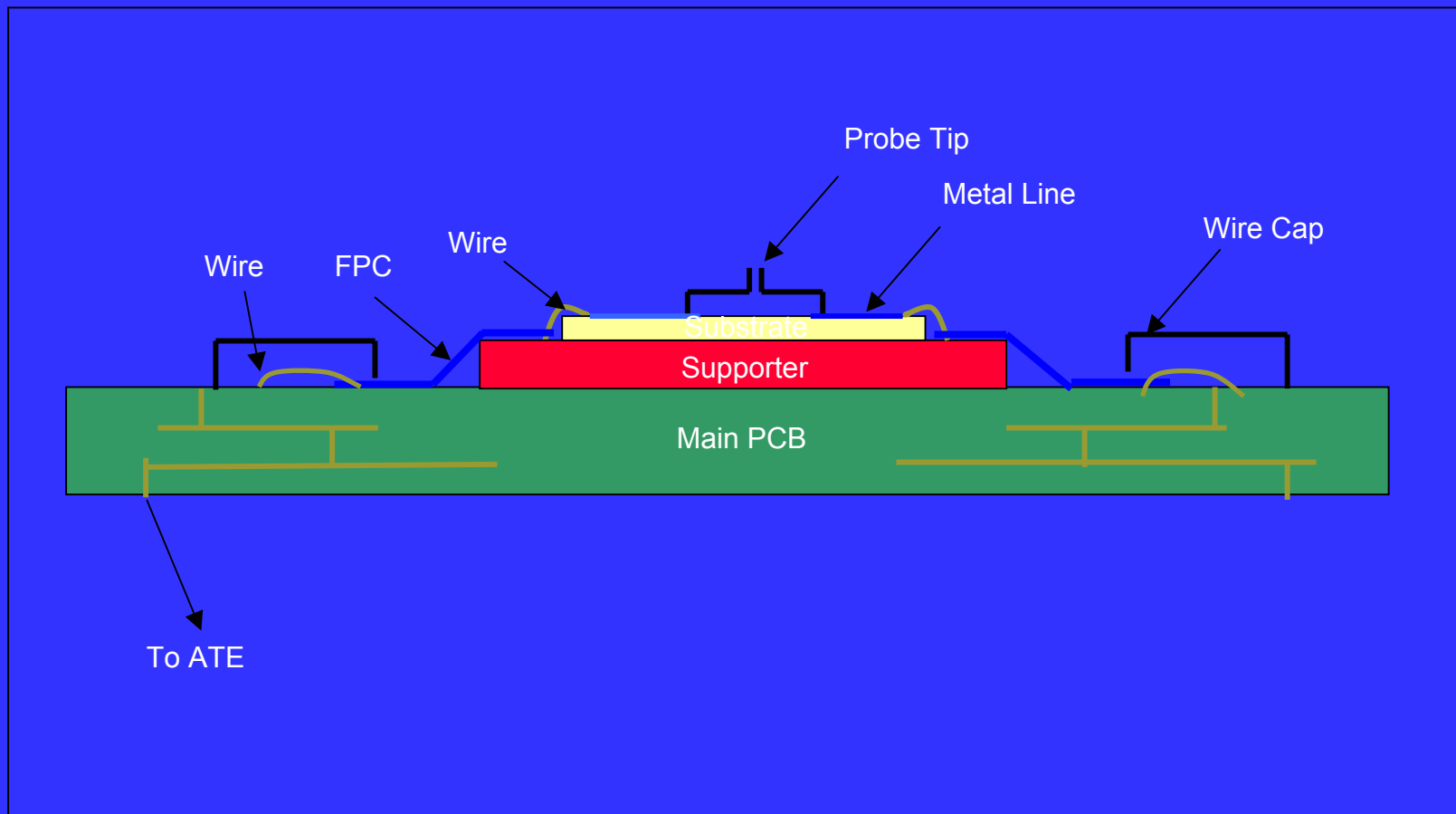
3-7. Pin Position Accuracy



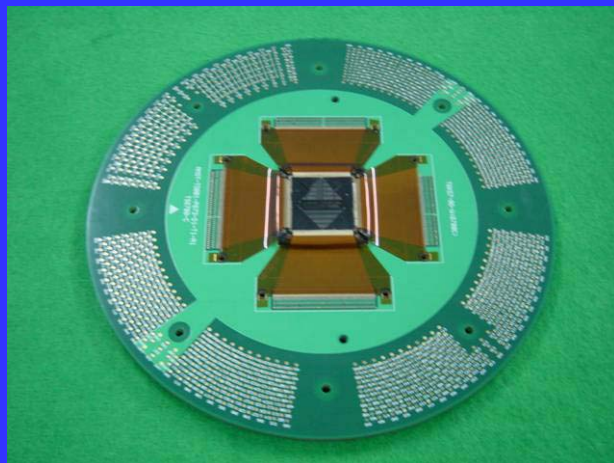
3-8. Contact Resistance



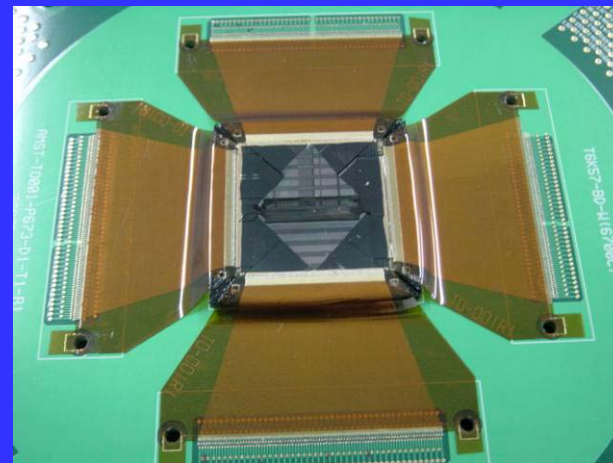
4-1. Fine Pitch Probing -Schematics



4-2. Product Sample Pictures

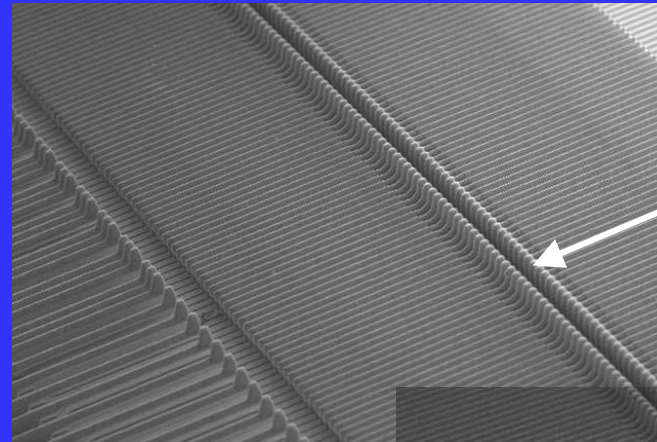


LDI Probe Card

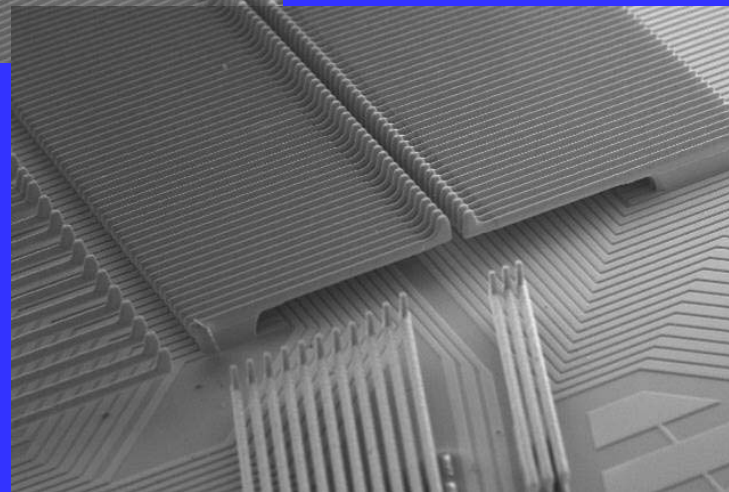


LDI Probe Card Needle

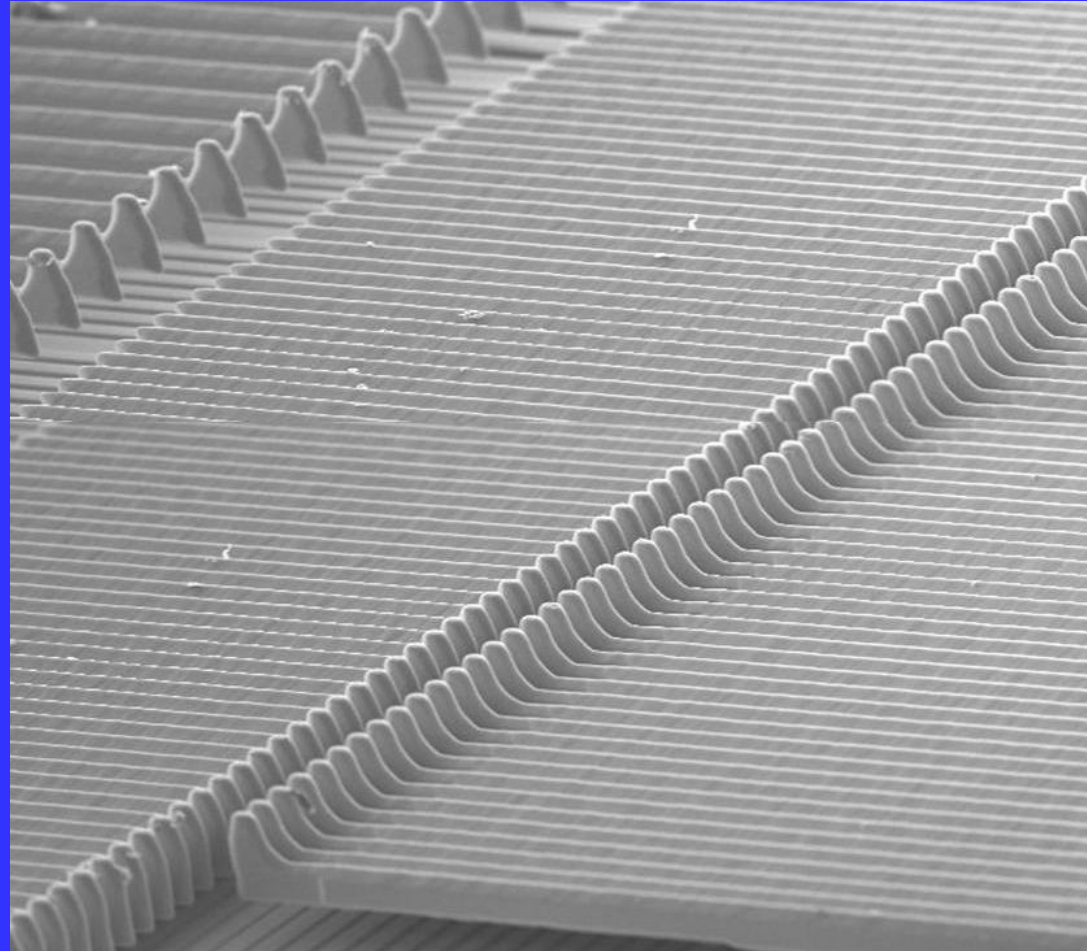
4-3. SEM Pictures (low magnification)



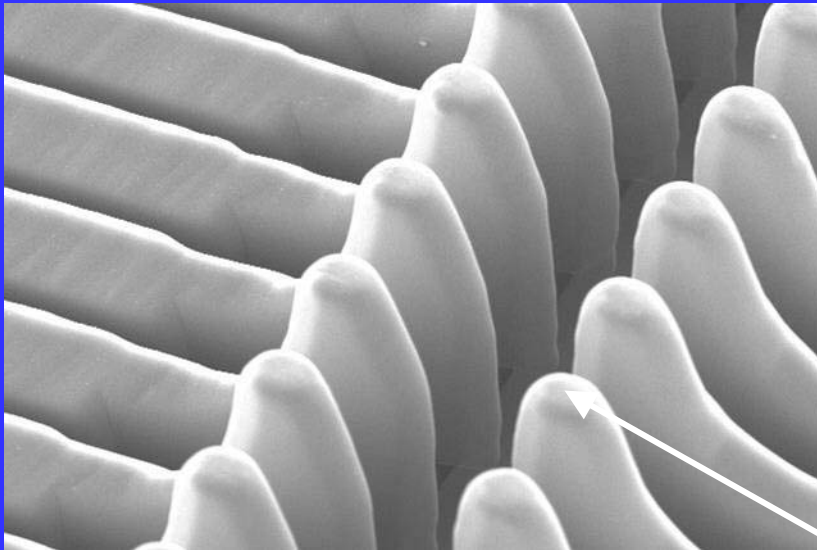
35 um staggered I/O's



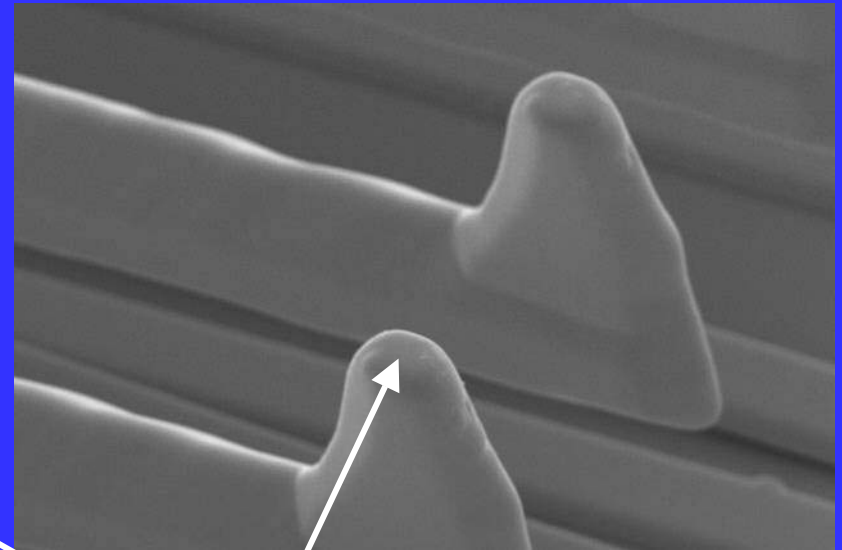
4-4. SEM Picture (medium magnification)



4-5. SEM Picture (high magnification)

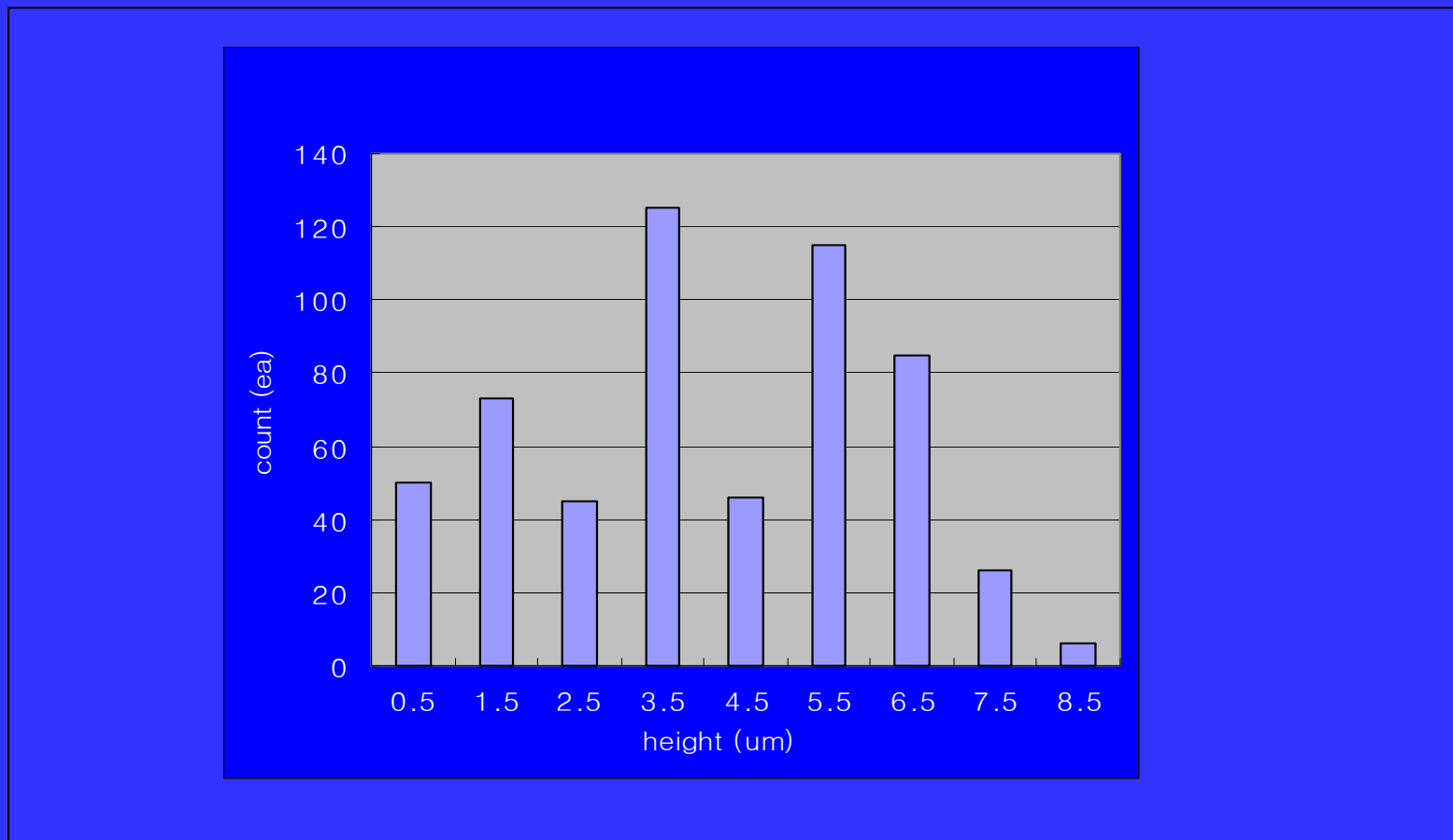


35 um staggered I/O's

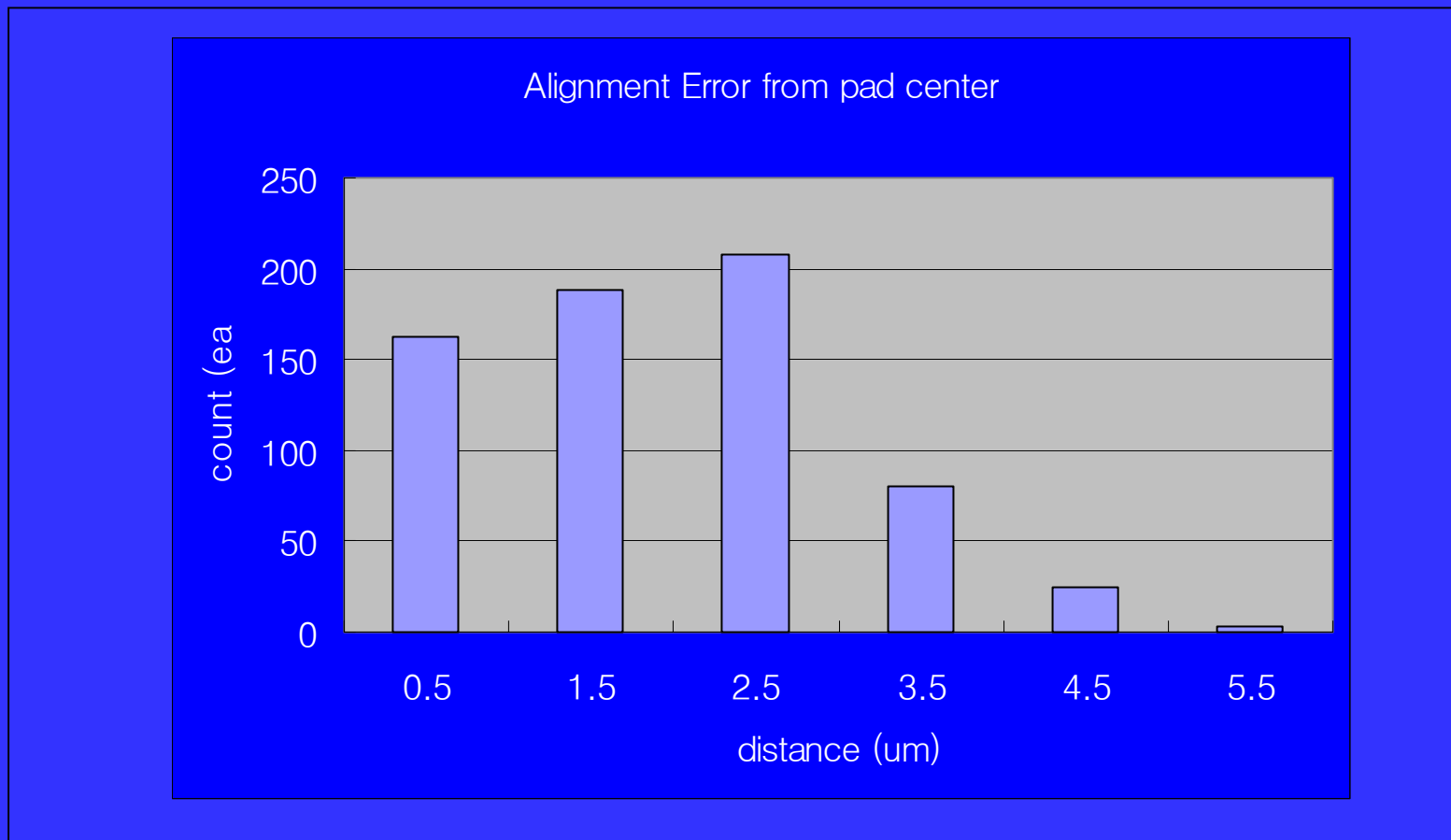


Probing tips

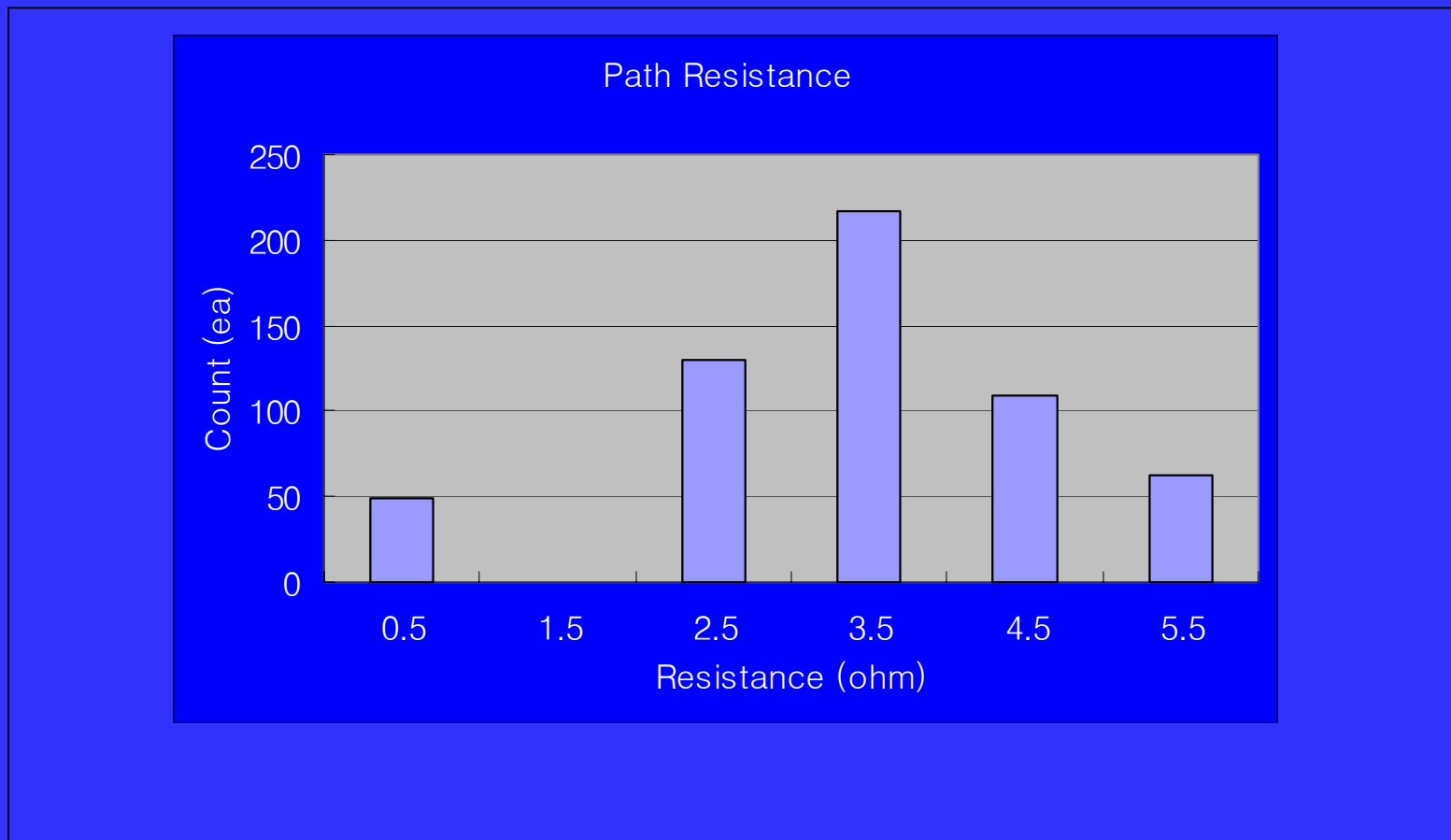
4-6. Planarity



4-7. Pin Position Accuracy



4-8. Path Resistance



5-1. Cleaning (1)

- Gel-Pak Cleaning (ITS PC-1012)
 - 1500 Touchdown on Aluminum Pad
 - 90 micron OD, 10 touchdown



– Before Cleaning



-After Cleaning

5-2. Cleaning (2)

- Gel-Pak Cleaning (ITS PC-1012)
 - 20,000 Touchdown on Aluminum Pad
 - 90 micron OD, 10 touchdown



Before Cleaning



After Cleaning



On Gel-Pak

5-3. Cleaning (Cres change)

- Signal Path : PCB -> I/O Pin -> Aluminum Pad -> Ground Pins -> PCB
- Contact condition : 10 touch down at same location on Aluminum pad
(for example : 500 touchdown =10 touchdown on one location X 50 location)

Touch Down	0	500	1000	1500
Maximum	3.8	3.8	3.9	3.8
Minimum	2	2.5	2.2	2.3
Mean	3.31	3.12	3.14	3.13

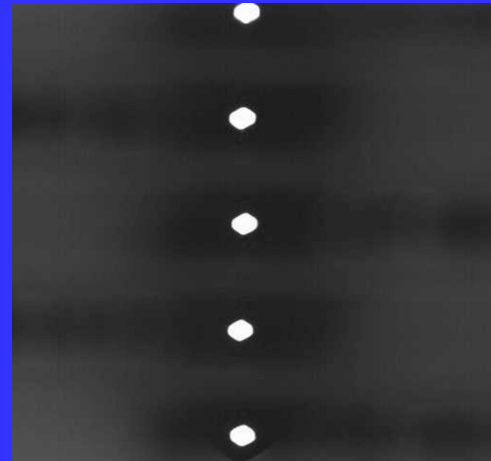
- There is no significant relation between touch down and contact resistance
- Test performed after 20,000 touchdown and cleaning
- Cleaning Cycle not fixed

6. Auto-align

- Bright tip
- Dark surrounding (special treatment to surrounding materials)



Microscope



Prober CCD

- Fiducial align possible
 - Adding alignment marks and making the program to recognize the pin tips from the marks

7-1. Characteristic of Mprobe

- High resilience
- No plastic deformation
- Fine pitch possible
- Accurate pin position
(guaranteed throughout its lifetime)
- Large Area Probing Possible
(Currently Probing Area 90mmX150mm)
(Near future 100mmX200mm)
- Repairable by replacement of defective block
- Small scrub mark(<20 μm)
- Auto Align possible

7-2. Specification

ITEM	Large Area Testing	LCD	LDI
Lifetime (touchdown)	> 200,000	> 150,000	> 150,000
Pin Force(g/mil)	0.8~1.5	0.8~1.5	0.8~1.5
Planarity	$< \pm 10 \mu\text{m}$ (80mmx100mm)	$< \pm 3 \mu\text{m}$	$< \pm 5 \mu\text{m}$
Position Accuracy	$< \pm 10 \mu\text{m}$ (80mmx100mm)	$< \pm 3 \mu\text{m}$	$< \pm 5 \mu\text{m}$
Minimum Pitch	$> 70 \mu\text{m}$	$> 50 \mu\text{m}$	$> 35 \mu\text{m}$
Path Resistance	$< 3 \Omega$	$< 3 \Omega$	$< 5 \Omega$
Leakage Current	$< 10 \text{nA}$ (With PCB)	$< 20 \text{nA}$ (With PCB)	$< 20 \text{nA}$ (With PCB)
Delivery			
First Order	10 week	8 week	10 week
Reorder	4 week	4 week	4 week

Vertical probe card, MProbe

AMST Co., Ltd.

END