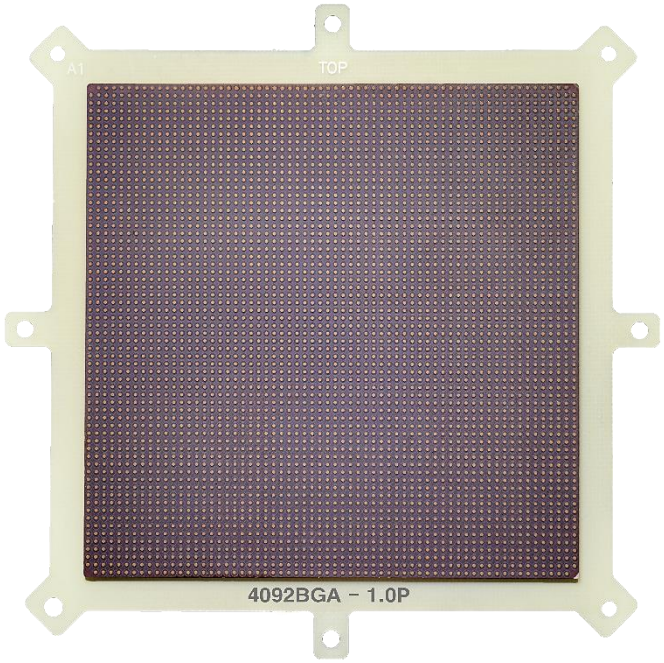
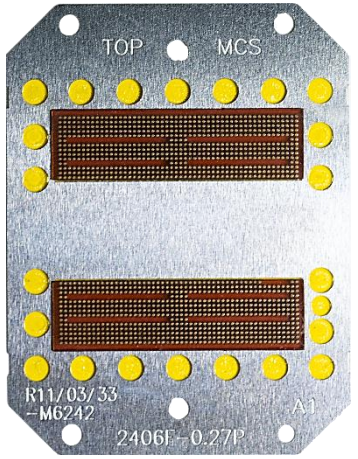
Company Presentation





Leading-edge in Test Socket Technology

The best in test solution technology
Excellence and Distinction in the technology
Products & Services with customer satisfaction

Jan. 2022

MSL Micro Sensing Lab.

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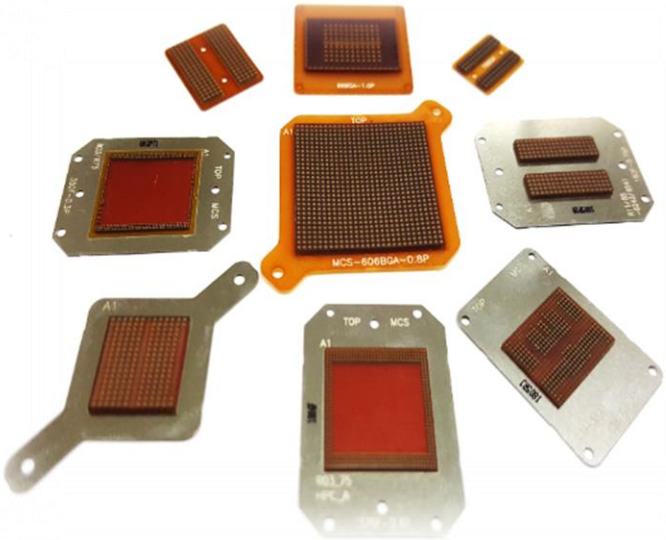
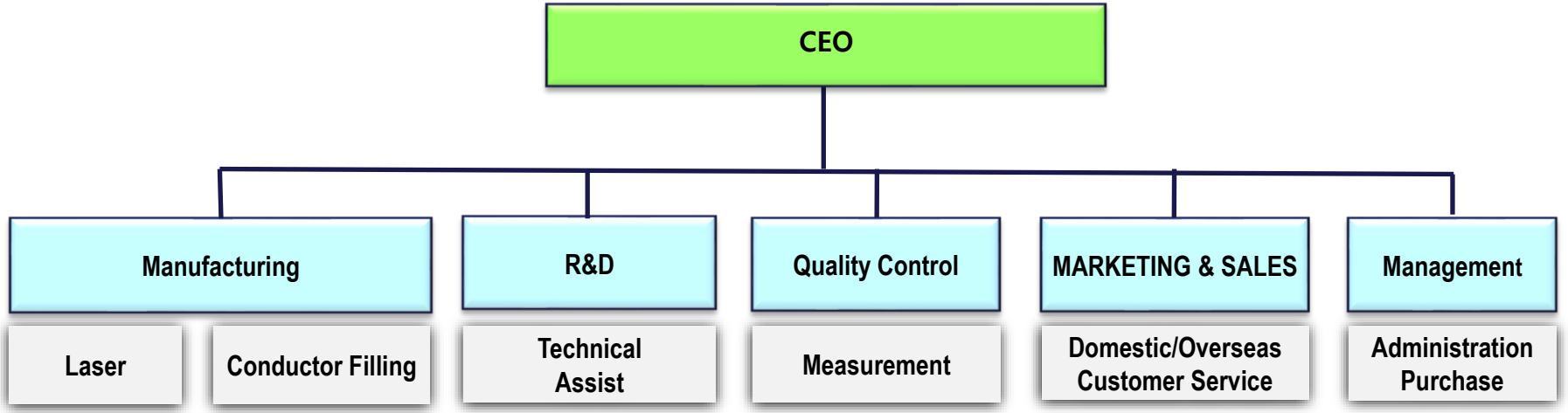


CONTENTS

Micro Sensing Lab.

INTRODUCE

Name	Micro Sensing Lab
Establish	December 2004
President	Oh Seong Kyung
Business	PCR Socket
Employee	30
Address	105-31, Sinsaunjeon-gil, Seongnam-myeon Dongnam-gu, Cheonan-si, Chungnam-do, 31245, Korea
Web	www.mslltd.co.kr



MSL Micro Sensing Lab.

INTRODUCTION

2004. 12	• Establish
2005. 06	• Venture business Certification
2006. 12	• Register factory
2007. 01	• Enterprise Research Certification
2009. 06	• Parts specialized company Certification
2010. 10	• Inno-biz Certification
2011. 12	• Company name changed to Ak-innotech, Inc
2012. 10	• ISO 9001 Certification
2013. 10	• MCS investment shares
2014. 03	• Start providing PCR to Samsung Electronics
2017. 07	• Company name changed to Micro Sensing Lab, Inc
2018. 05	• Completed the development of fine pitch (0.2mm)

INTRODUCTION

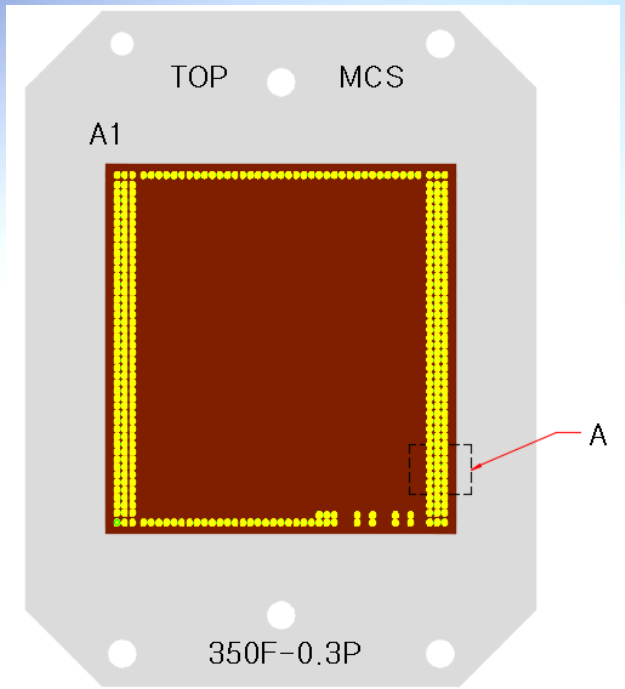
The Certification

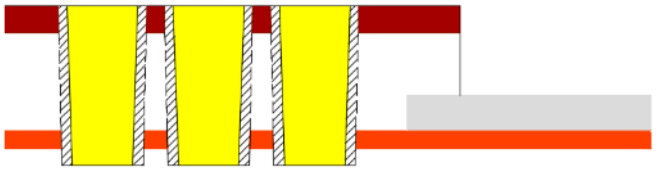
- Venture business Certification
- Enterprise Research Certification
- Parts specialized company Certification
- Inno-biz Certification
- ISO 9001 Certification
- Excellent firm employment in Gwang-Ju city

Micro Sensing Lab.

PRODUCTS _ BGA

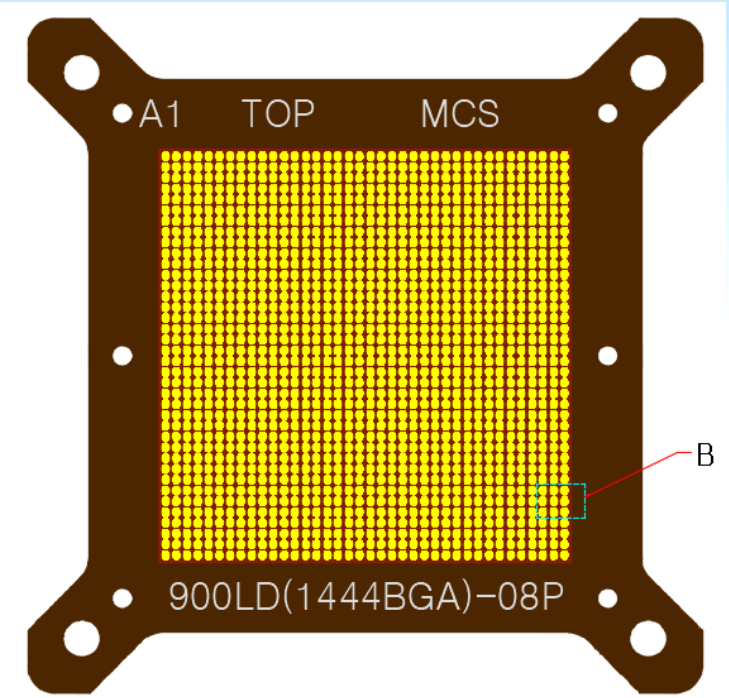
SUS Frame (BGA)

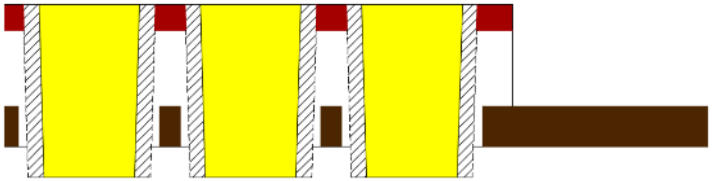




A Cross section Detail

Epoxy Frame (BGA)

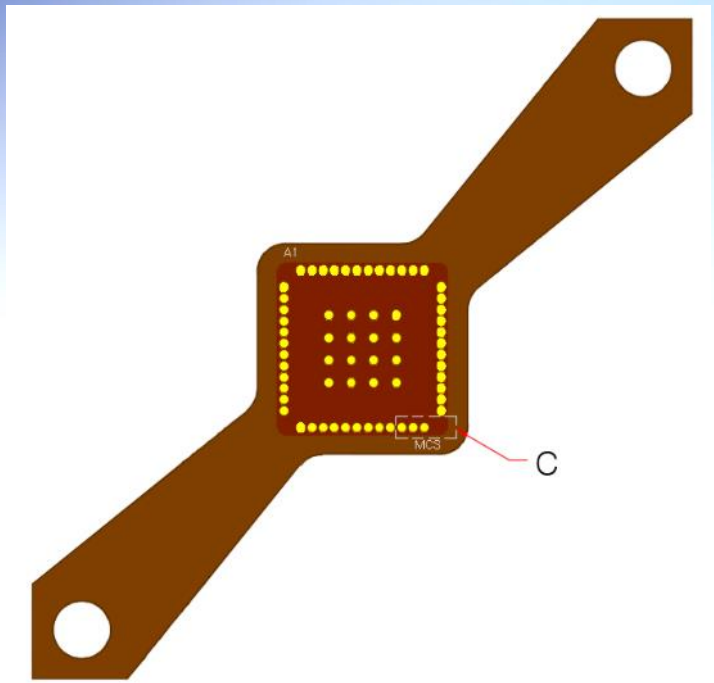




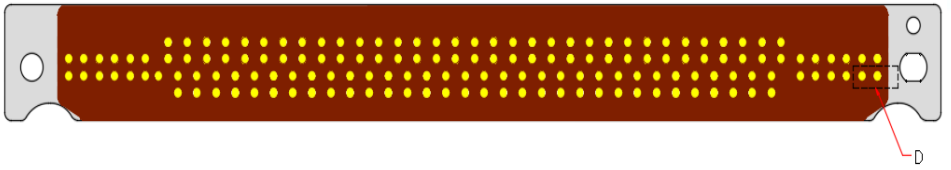
B Cross section Detail

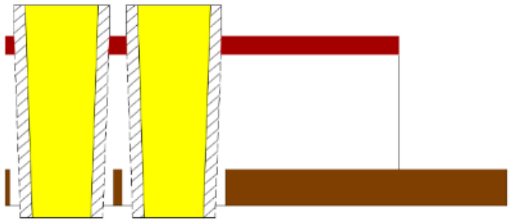
PRODUCTS _ LGA & INTERPOSER

Epoxy Frame (LGA)

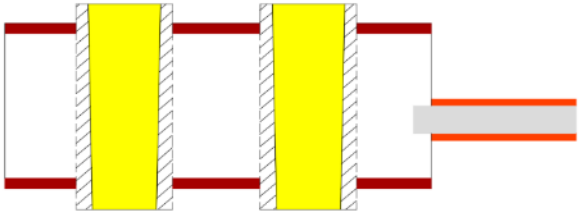


SUS Frame (INTERPOSER)





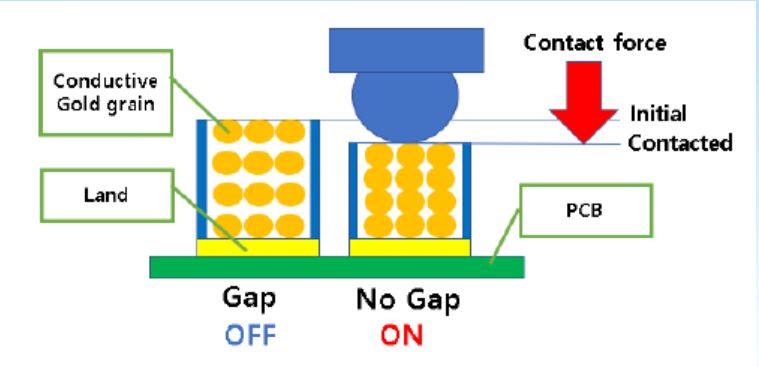
C Cross section Detail

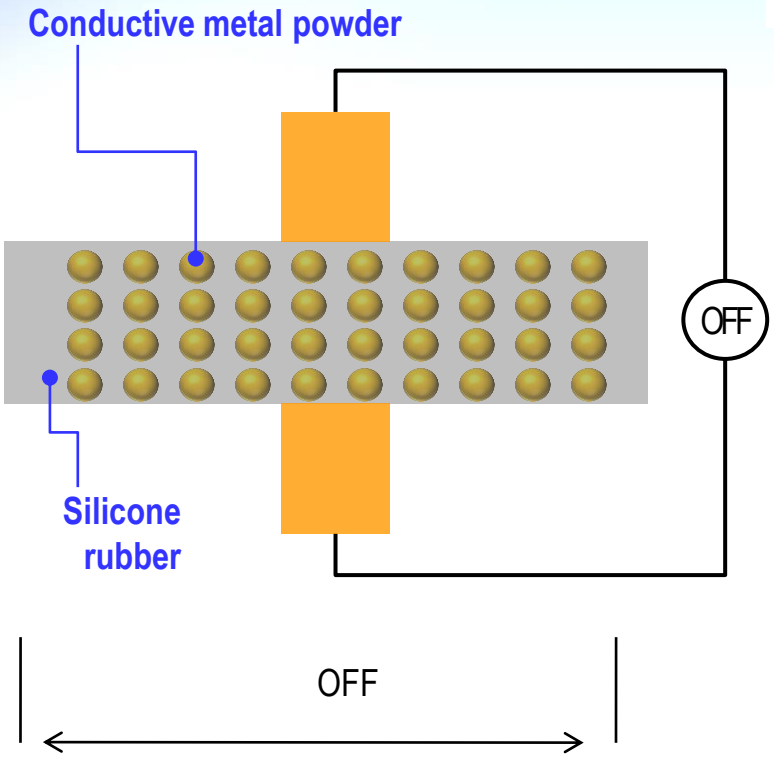


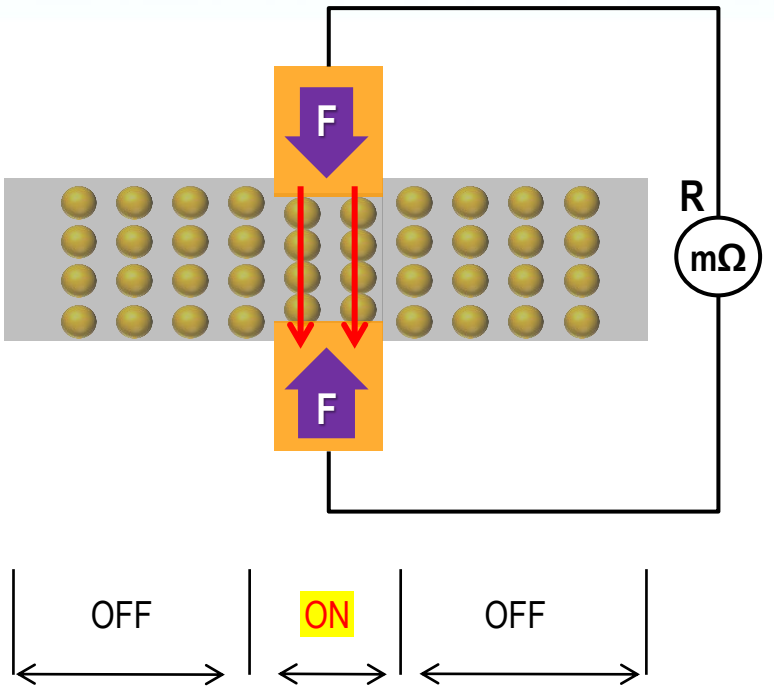
D Cross section Detail

PRODUCTS _ STRUCTURE

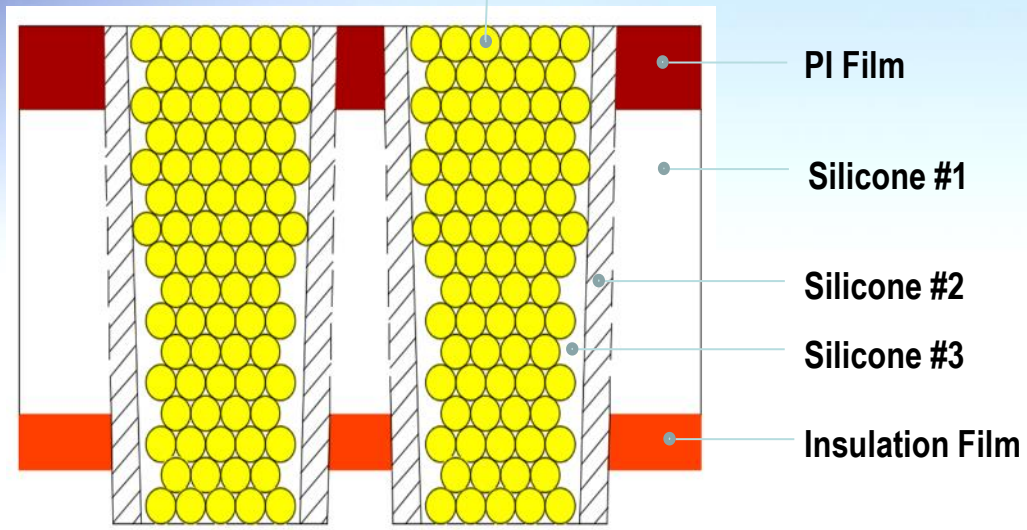
■ Mechanism of Rubber socket



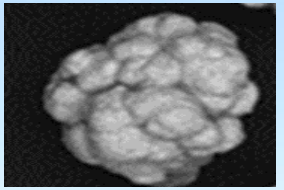


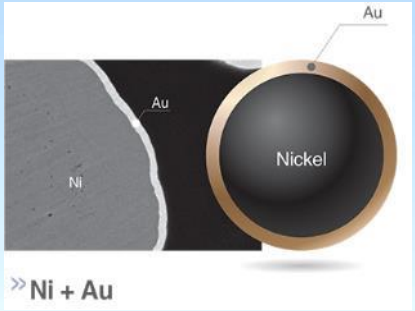


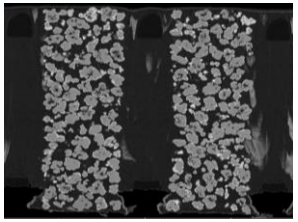
PRODUCTS _ STRUCTURE

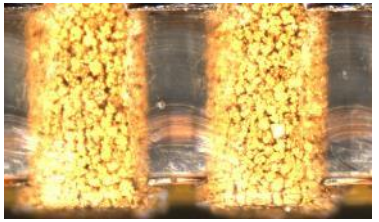


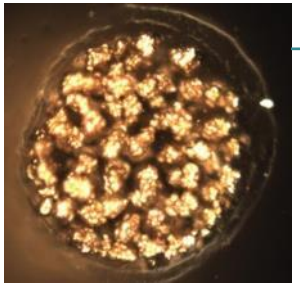
Cross Section Detail



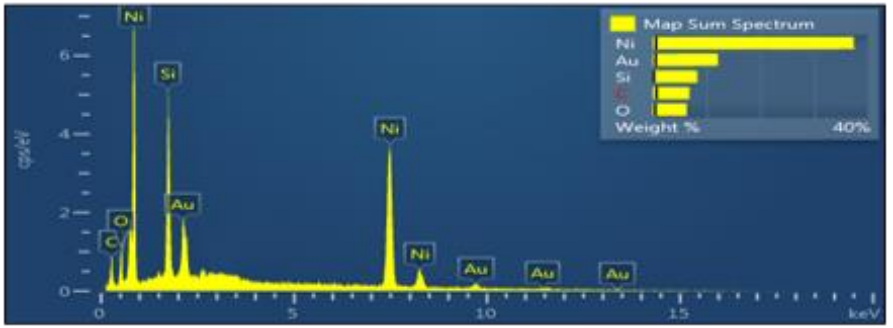








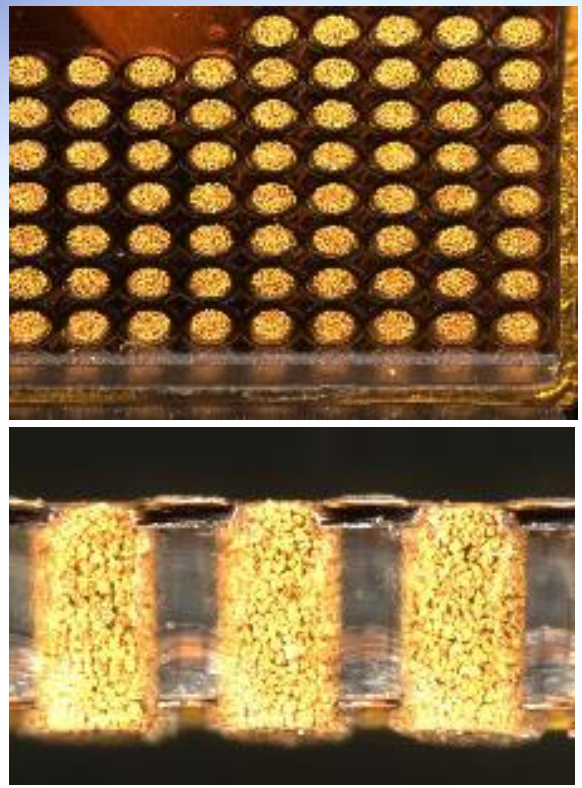
Component Analysis(SEM)



Micro Sensing Lab.

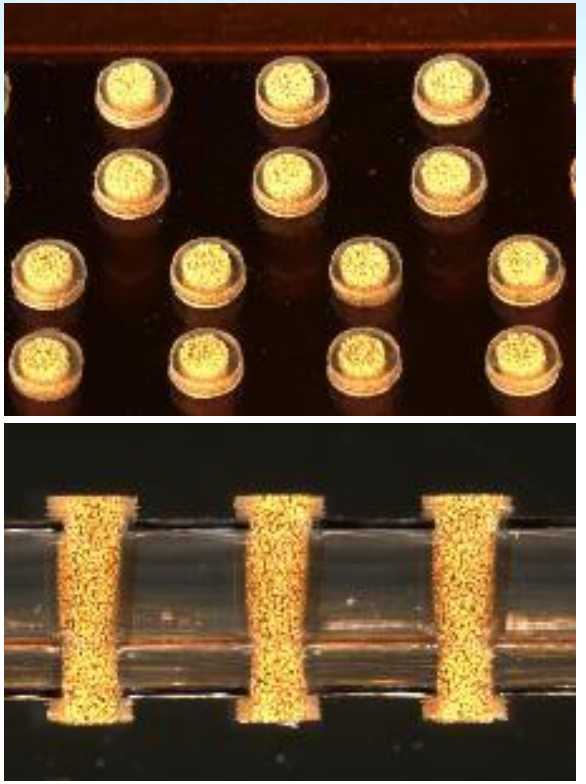
PRODUCTS _ STRUCTURE

[BGA]

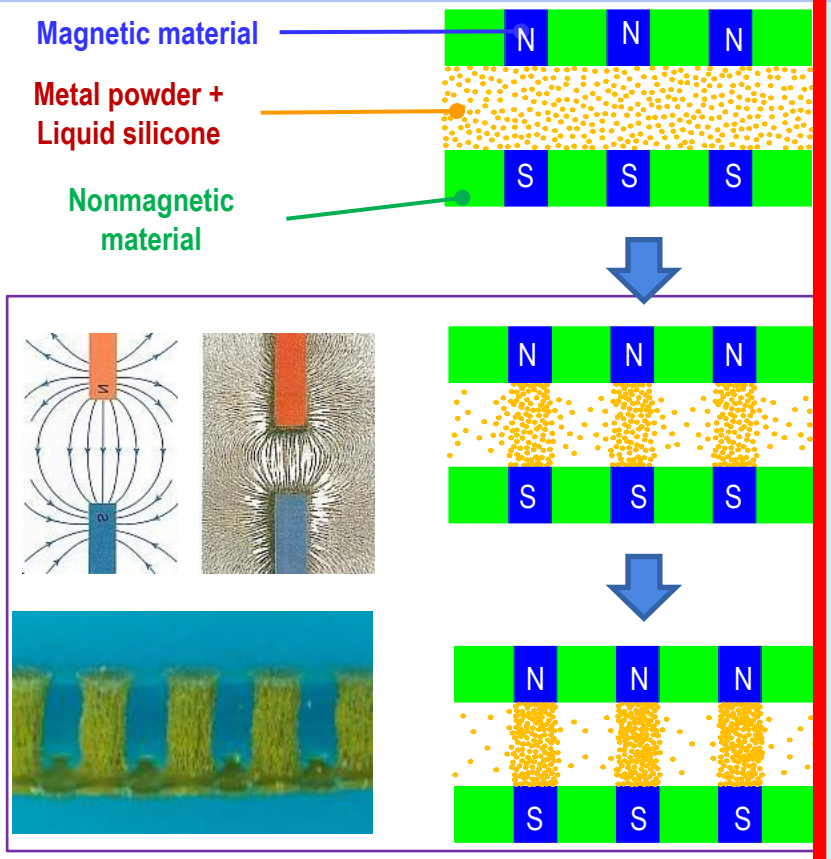
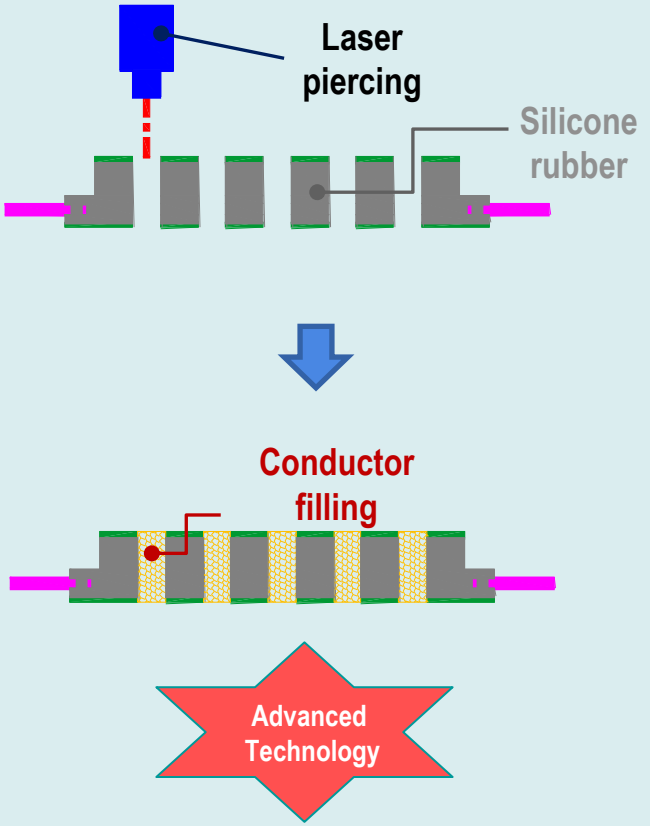


[LGA/QFN]

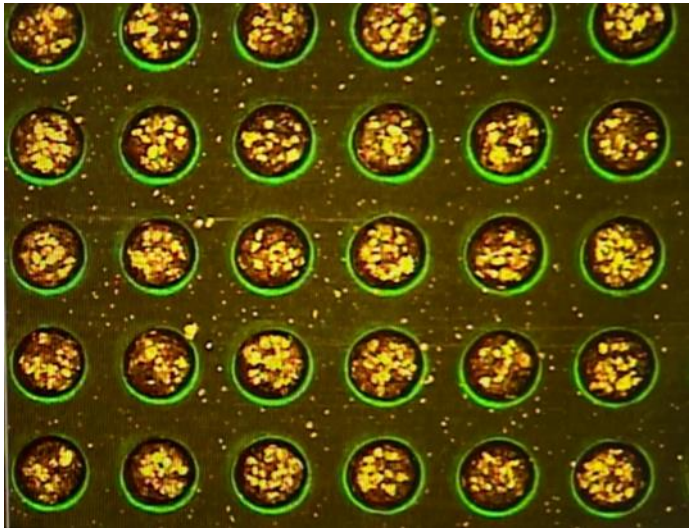
[INTERPOSER]



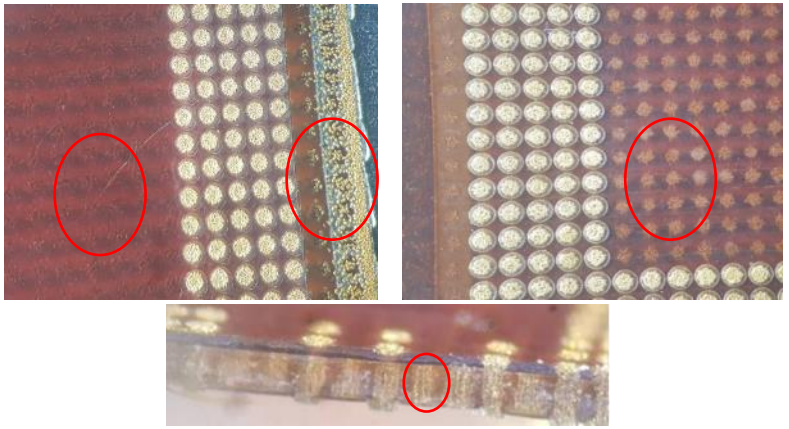
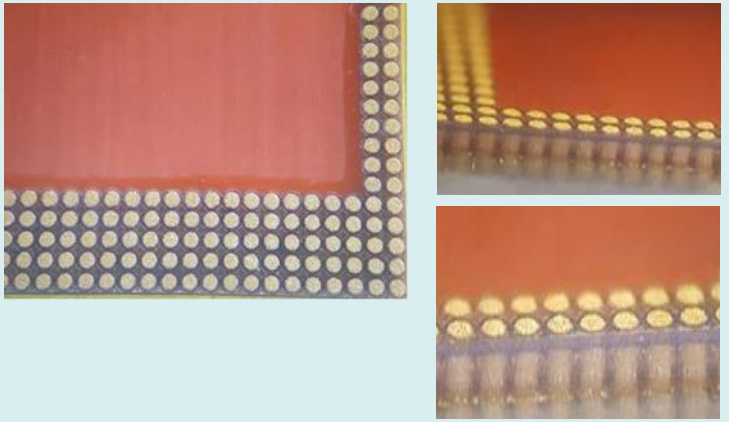
PRODUCTS _ Technology

	Magnetic Field Molding Method [M F M]	Laser Hole Filling Method [L H F]
Theory		
Maker	Competitor	MCS

PRODUCTS _ Technology

	Magnetic Field Molding Method [M F M]	Laser Hole Filling Method [L H F]
Gold Powder	✓ Gold powder residue could be remained among conductive holes by MFM process	✓ No gold powder residue remained through LHF process
	✓ It could induce leakage and poor high frequency performance 	
Maker	Competitor	MCS

PRODUCTS _ Technology

	Magnetic Field Molding Method [M F M]	Laser Hole Filling Method [L H F]
Tooling	✓ Need tooling for each PKG's pitch and ball pattern	✓ Possible to make PCR by laser regardless of PKG's pitch and ball pattern ✓ No tooling is required
Gold Powder	✓ Dummy powder pile at no test pin area ✓ Gold powder loss 	✓ No loss of gold powder ✓ Laser hole drilling and filling gold powder for contact pin only 
Maker	Competitor	MCS

PRODUCTS _ TEFLON™ COATING PROPERTIES

Nonstick

Few solid substances adhere permanently to a Teflon™ coating.
Tacky materials may stick temporarily, but almost all substances release easily

Low coefficient of friction

Teflon™ coatings lower the kinetic coefficient of friction to a range of 0.05 and 0.20, depending on the load, sliding speed, and coating.

Non-wetting

Teflon™ coatings resist water (hydrophobic) and oil (oleophobic).
The low surface energy of the coatings creates cohesive forces strong enough to make water bead up and not spread across the coatings' surfaces.

Heat resistance

Teflon™ coatings can operate continuously at temperatures up to 260 °C (500 °F) and be used for intermittent service up to 316 °C (600 °F), with adequate ventilation, without affecting other properties.

Unique electrical properties

Teflon™ coatings have a high dielectric strength, low dissipation factor, and high surface resistivity over a wide range of frequencies.
Adding fillers to certain coatings facilitates their use as anti-static coatings.

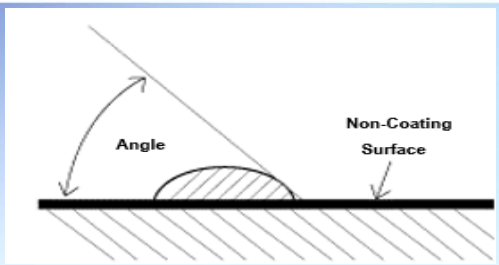
Low temp. durability

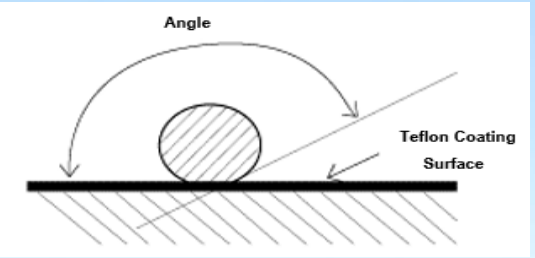
Most Teflon™ coatings retain their physical properties even at extremely low temperatures.
Teflon™ can also be considered for use at temperatures as low as -270°C.

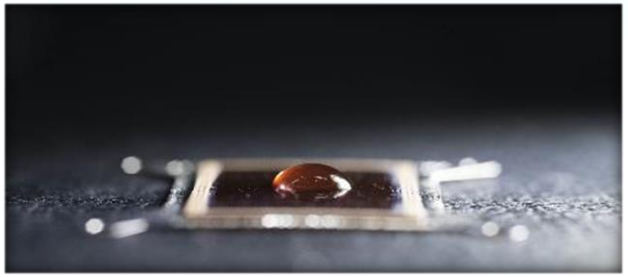
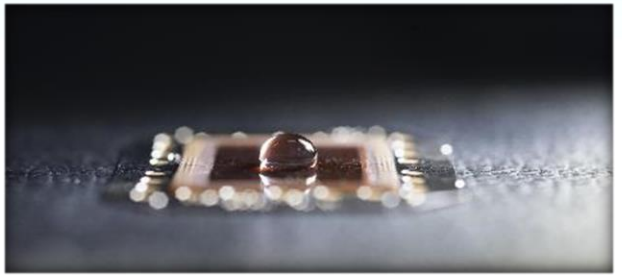
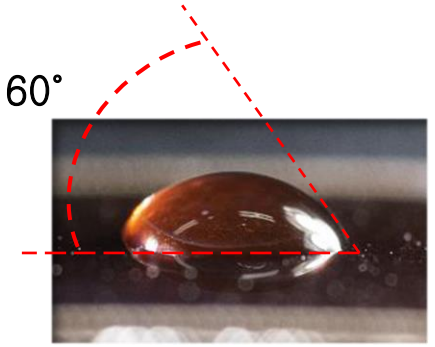
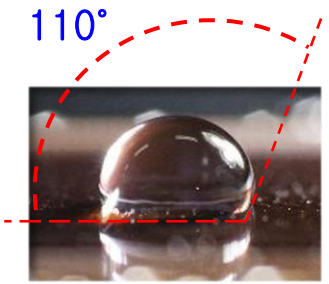
Chemical resistance

Because the low porosity of Teflon™ industrial coatings enables greater permeation resistance, chemical environments tend not to affect them.
The only chemicals that may have a negative effect are molten alkali metals and highly reactive fluorinating agents.

PRODUCTS _ TEFLON™ COATING PROPERTIES

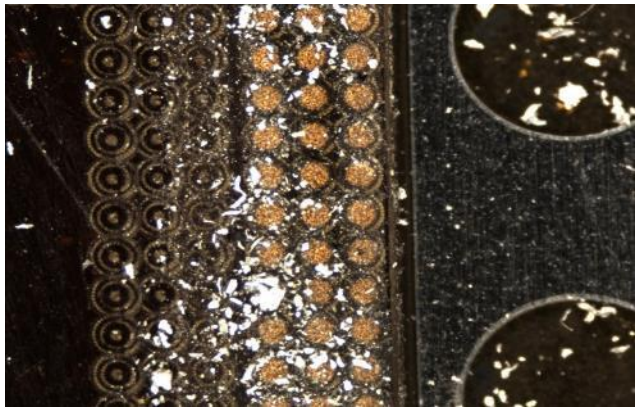
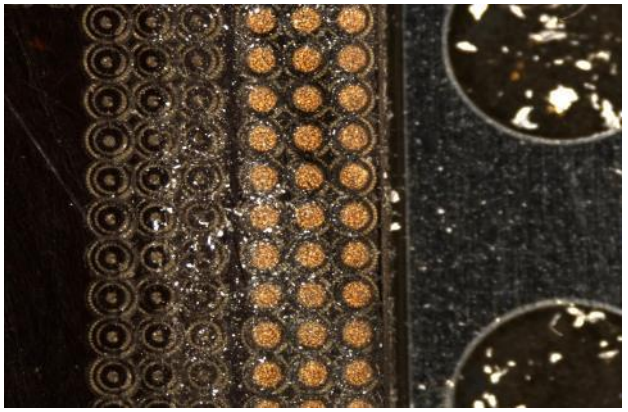
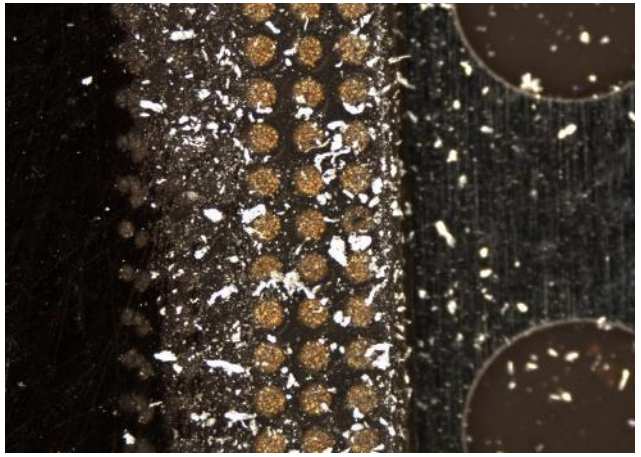




Normal PCR	Teflon Coating PCR
	
	

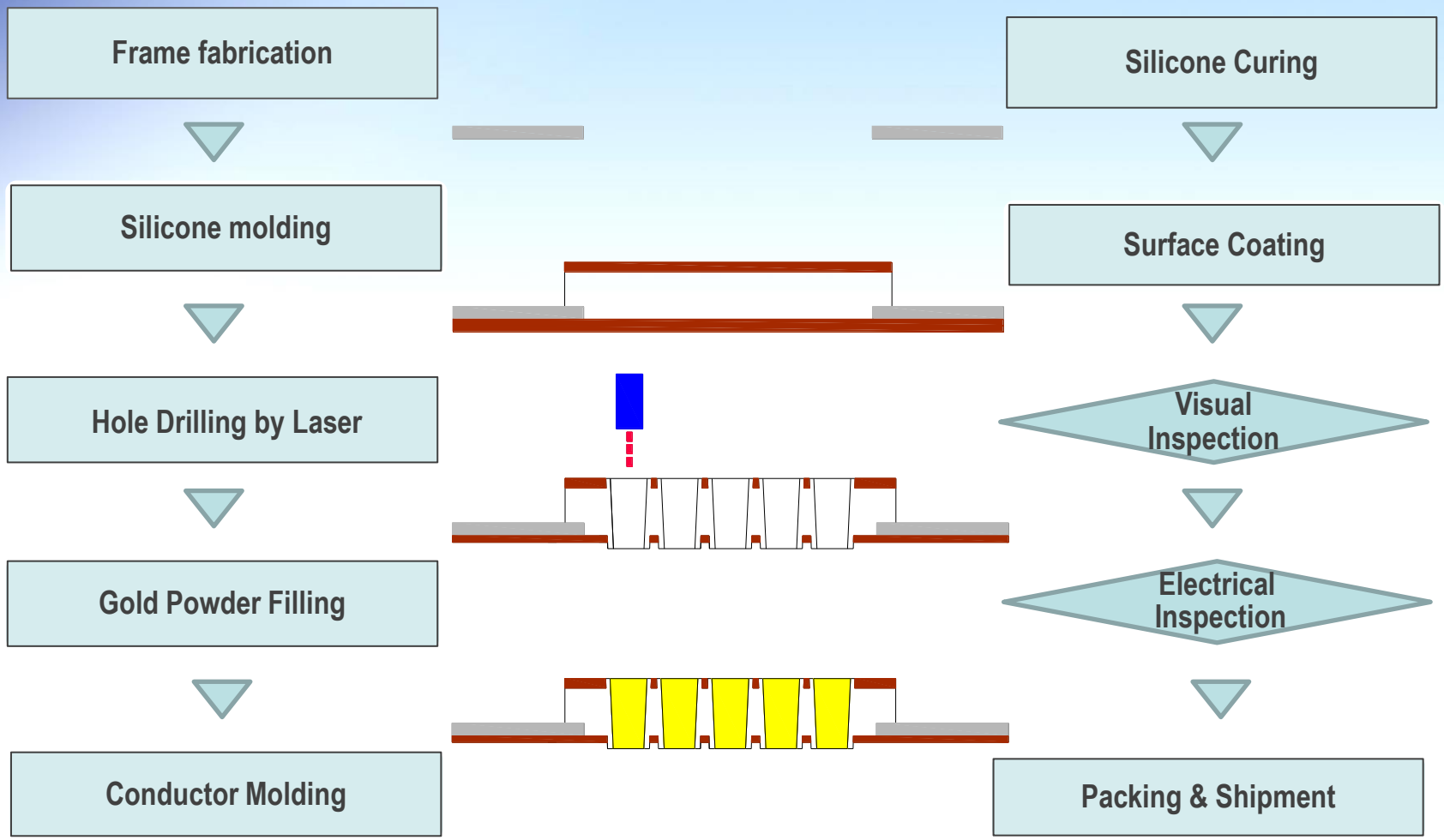
< Comparison of Non-cohesive by Contact Angle >

PRODUCTS _ TEFLON™ COATING PROPERTIES

	Before Cleaning	After Cleaning
Normal PCR		
Teflon Coating PCR		

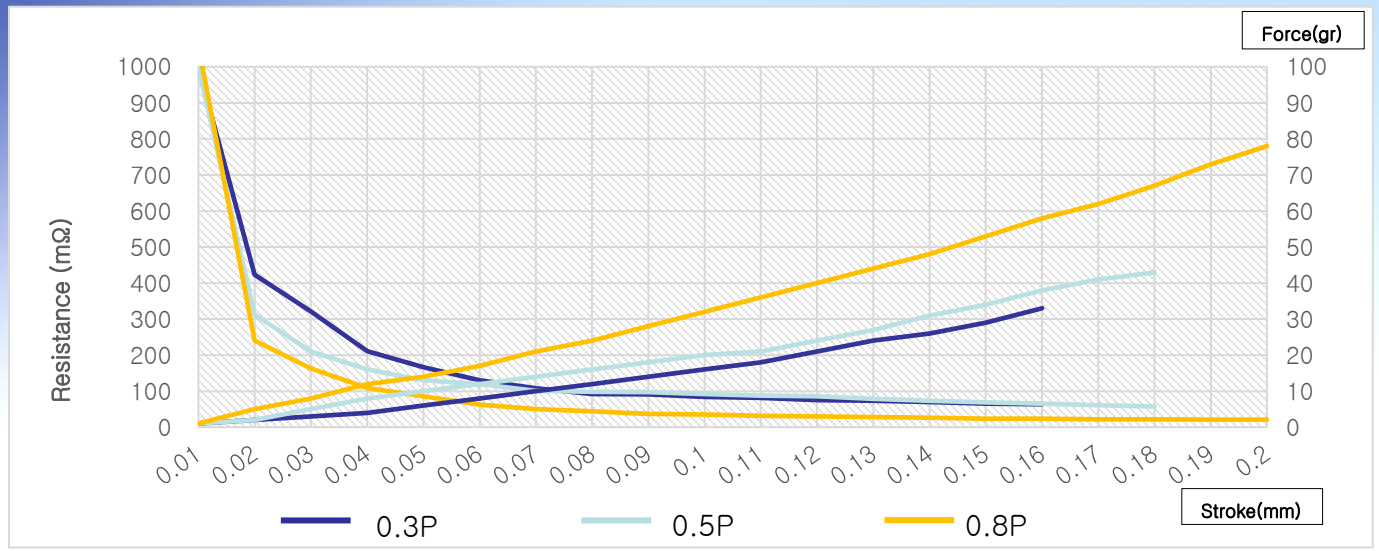
✓ (Test result shows)Teflon coating PCR is more easily cleaned and foreign materials on the top surface of the socket are more easily removed by dry air blowing due to non-sticky socket surface than Normal PCR.

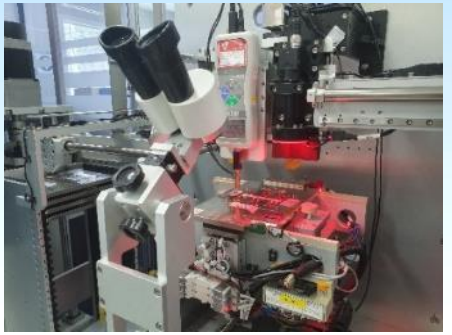
PRODUCTS _ Manufacturing Process



PRODUCTS _ Electric Performance(FSR)

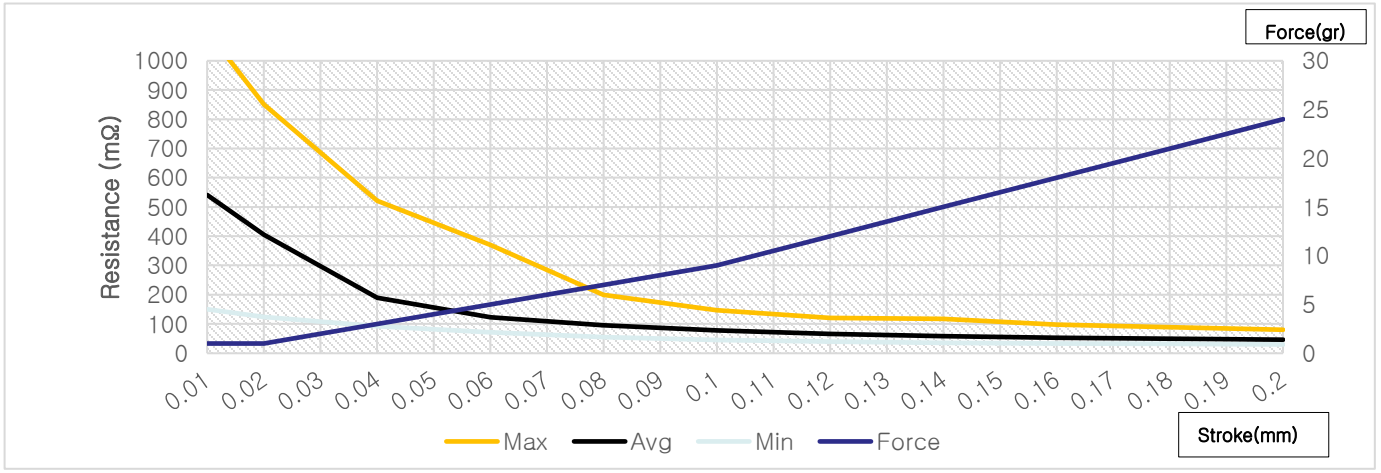
1. 1Pin FSR





Inspection equipment : 1Pin

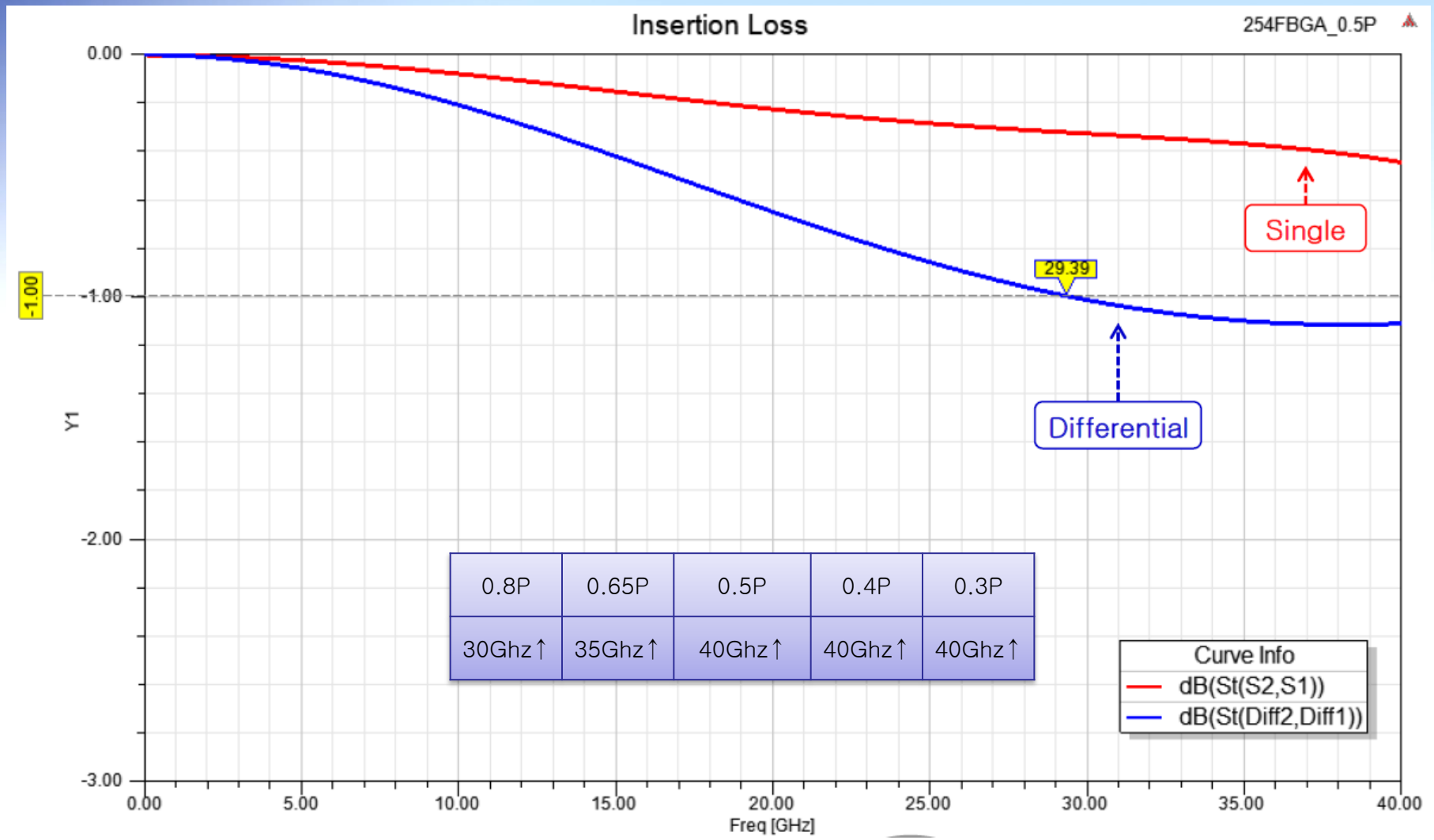
2. Full Pin FSR – 0.3P



Inspection equipment : Full Pin

PRODUCTS _ Electric Performance(SI)

Insertion Loss(S21) – Simulation

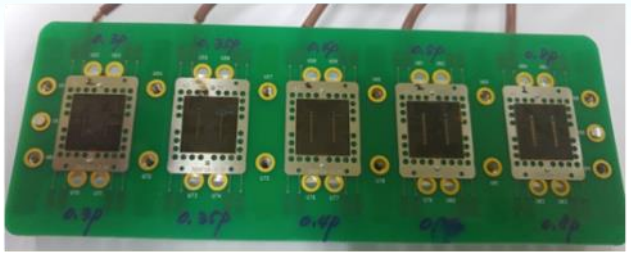


0.8P	0.65P	0.5P	0.4P	0.3P
30Ghz↑	35Ghz↑	40Ghz↑	40Ghz↑	40Ghz↑

Micro Sensing Lab.

PRODUCTS _ Electric Performance(CCC)

1. **Test socket**
   - ➢ Pitch : 0.30mm / 0.35mm / 0.40mm / 0.50mm / 0.80mm
2. **Test method**
   - ➢ Test sample : 3Point measurement for each PCR
   - ➢ Test equipment
     - DC power supply : UP-3020S
     - DC Electronic Load : SL-300

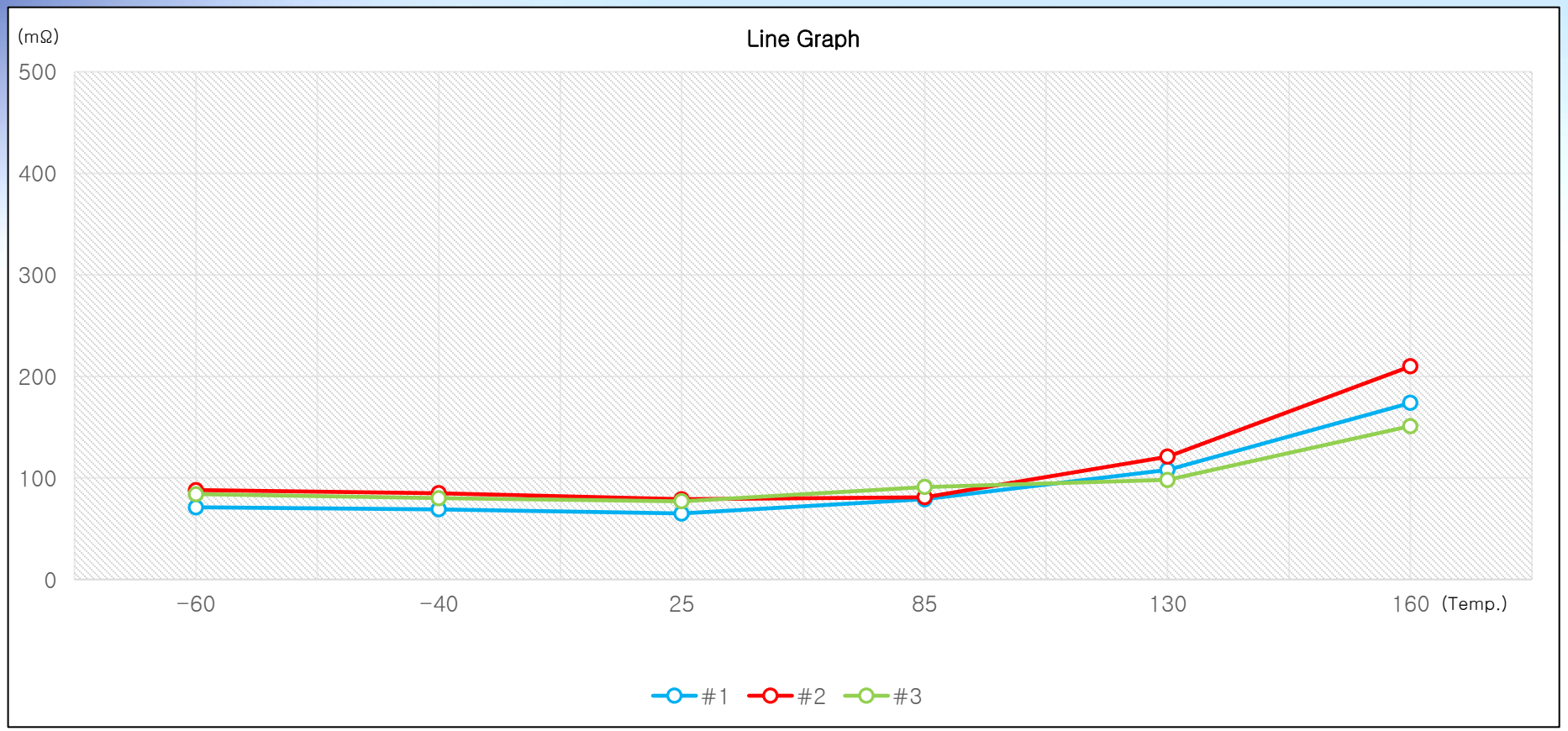


3. **Test result**

Pitch (mm)	0.30	0.35	0.4	0.5	0.8
Socket Height (mm)	0.47	0.5	0.57	0.76	0.92
Stroke(mm)	0.12	0.12	0.12	0.15	0.2
Current (A)	3.2	3.3	4.0	4.3	4.5

PRODUCTS _ Temperature Performance

Products maintain stable resistance both in high temperature and low temperature environment, so they have excellent durability.



* Maintaining Temperature for 30min at each temp

✓ At above 125℃, 30% higher press force is recommended than initial setting force at below 125℃

PRODUCTS _ Features

Outstanding contact stability	• Wide touch with package ball or pad • Low contact resistance(less 100mΩ)
Hi-Frequency	• Very low socket height (Thickness Range 0.35~2.2mm) • Shorten transition time
Hi-Pin Count	• Over 10,000 pins available • Different shape conductors at single socket
Fine Pitch	• 0.2mm pitch socket is qualified • 0.15mm pitch socket(O/S test) is possible • Fine pitch hole shaping by laser drilling technology
Low Cost	• Low cost Rubber socket • Simple architecture
No Ball Damage	• Soft touch on device ball

PRODUCTS _ Features

By using laser processing equipment , fine hole and various types of molding can be done easily and quickly.
The conductor injection technology shows excellent performance both in DC&AC.
Precise and fast process expedite deliveries to customers.

Item			Rubber socket	
			Spec.	Condition
Quality	Contact Resistance		100mΩ ↓	Initial
	Frequency Range(-1.0dB)		30GHz ↑	0.8P=30GHz↑,0.5P=40GHz↑ 0.4P=40GHz↑,0.3P=40GHz↑
	Current Rating		3A ↑	-
	Contact Force		10~50g.f/Pin	-
	Temperature		-55℃ ~ 150℃	-
	Life Span	Ball	10K~200K↑	0.3P~0.8P
		Pad(Land)	100K~500K↑	-
Cost	Unit Price		1/2 (Rubber/POGO)	
Delivery	Shipment		Initial : 3Weeks , Repeat : 3Days~2Weeks	

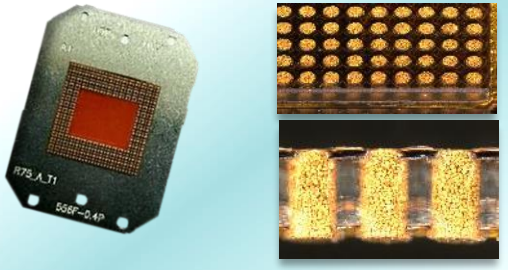
PRODUCTS _ Features

■ PCR vs POGO

Item			Rubber socket(PCR)		Spring probe(POGO)	
			Spec.	Condition	Spec.	Condition
Quality	Contact Resistance		100mΩ ↓	Initial	150mΩ ↓	Initial
	Frequency Range(-1.0dB)		40GHz ↑	0.4P	11GHz	0.4P, L=5.7mm
	Current Rating		3A ↑		1A	
	Contact Force		10~15g.f/Pin		20~30g.f/Pin	
	Temperature		-55 ~ 150℃		-40 ~ 125℃	
	Life Span	Ball	30K	0.4P BGA	50K	0.4P BGA
		Pad(Land)	80K↑		100K	
Cost	Unit Price		X1/2 ~ 2/3		1 ~ 2 USD	
Delivery	Production capability (0.3p 200pin)		1,000EA/1Day/1Machine		?	

PRODUCTS _ Features

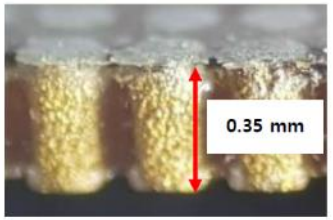
PCR



■ PCR vs POGO

Strong Point

- **Low cost**
  - Laser hole piercing
  - Molding
- **High Frequency**
  - Thin Thickness
  - Many contact point



- **No ball damage**
  - Soft contact
  - No ball mark
- **Wide Temp.**
  - -55℃ ~ 150℃
  - Specialized at low temp.

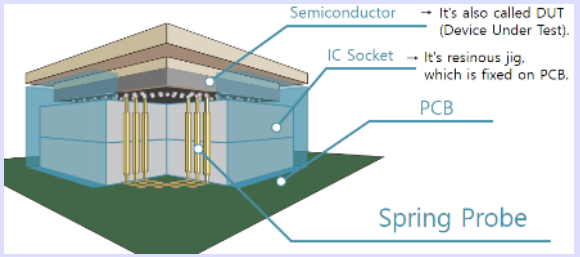
Weak Point

- **Elasticity**
- **Life Span**
  - Silicone

Micro Sensing Lab.

PRODUCTS _ Features

POGO PIN



■ PCR vs POGO

Strong Point

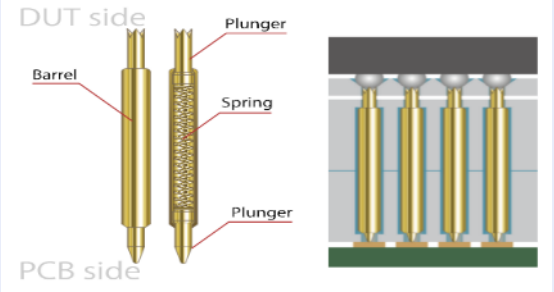
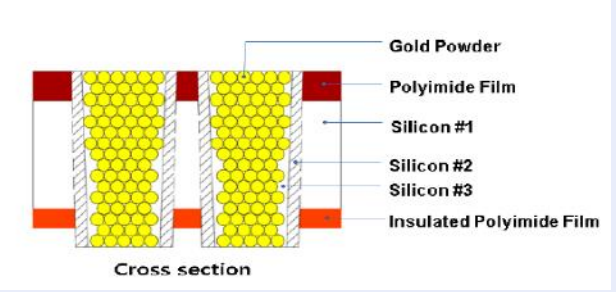
- **Life Span** — Mechanical
- **Elasticity** — Spring

Weak Point

- **Ball damage** — Ball mark
- **Expensive** — Many Parts Machining
- **Signal Path** — Assembly Thickness Limited
- **Temp.** — -40℃ ~ 125℃ Poor performance under -40℃

PRODUCTS _ Features

■ PCR vs POGO

Item	POGO PIN	PCR
Parts	Spring, Barrel, Plunger, Housing	Silicone, Gold Powder, Frame(SUS or FR4)
Contact Point	Plunger(Machining)	Gold Powder(atomizing)
Actuation	Spring	Silicone
Structure		

PRODUCTS _ Features

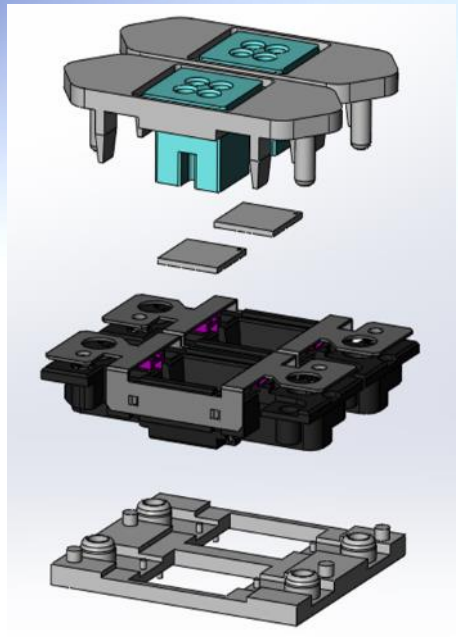
Core tool	Laser piercing machine
Core technology	Laser hole piercing & Conductor filling
Merits	✓ Filling conductor after laser hole fabrication ➔ Expedite delivery ✓ Simplified molding ➔ Low cost

■ Technical competitiveness

Item		MFM(Competitor)	LHF(MSL)
Quality	Fine pitch forming	Difficulty	Easy
	Thickness / (Stroke) control	<	
	Metal powder residue	Remain	None
	Electrical performance	<	
Cost	Tooling cost	>	
	Manufacturing cost	>	
Delivery	Tooling	Long	Short
	Lead time	Long	Short
	Production Capa.(0.3p 200pin)	?	1,000EA / 1Day/1Machine

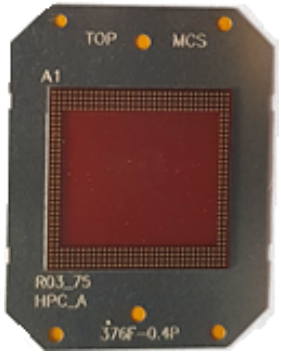
PRODUCTS _ Application

ATE Test Solution

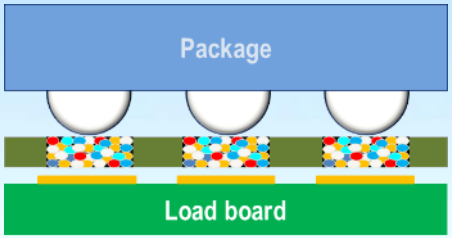


C.O.K

Hi-Fix



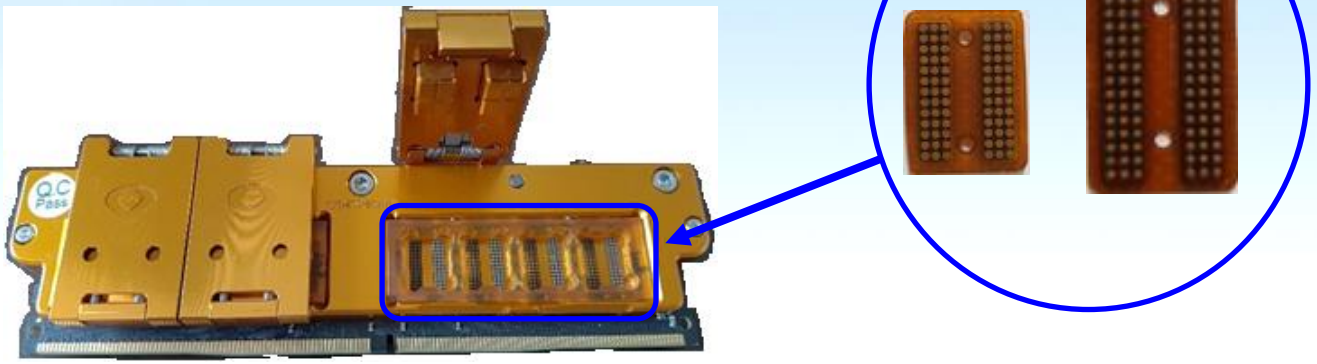
Rubber Socket



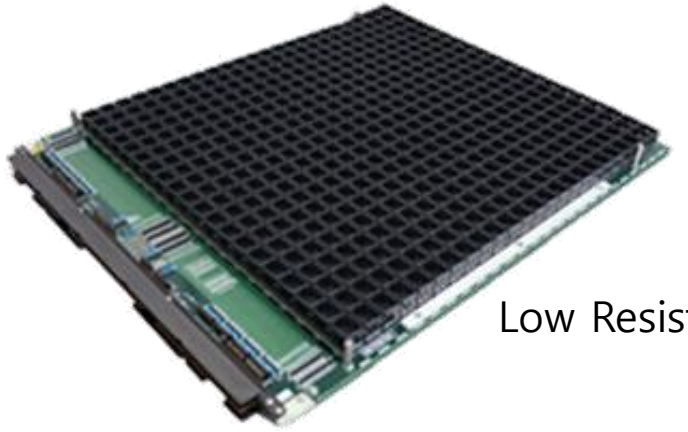
Handler

PRODUCTS _ Application

Manual Test Solution



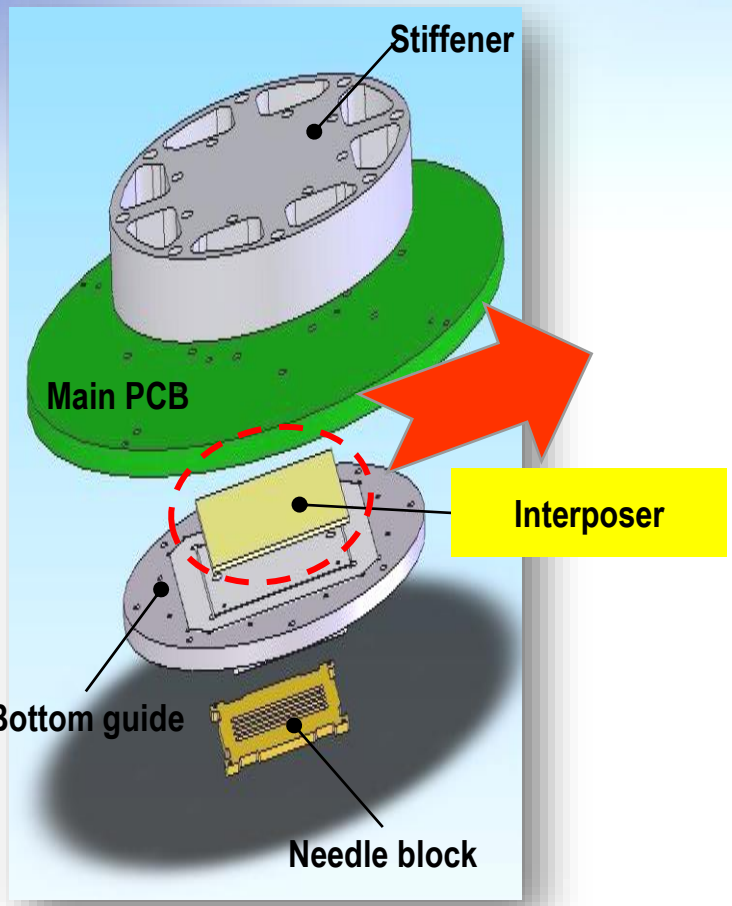
Burn-In Test Solution



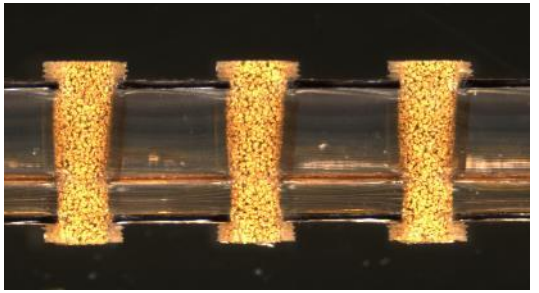
Low Resistance(100mΩ ↓) @125℃

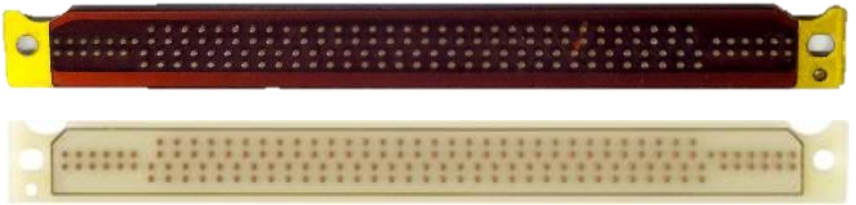
PRODUCTS _ Application

Interposer Solution



- Stabilized contact
- No contact damage
- Wider contact
- Easy replacement
- Customized design

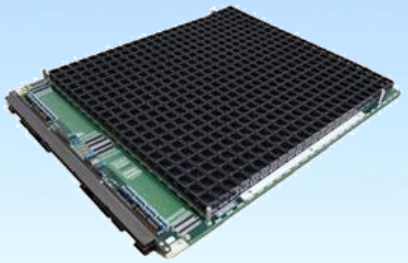




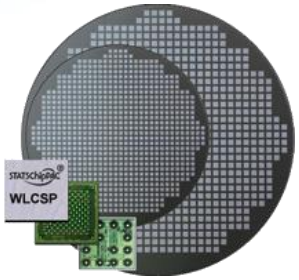
PRODUCTS _ Application

Logic handler test

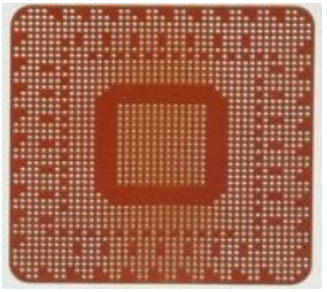
Memory handler test

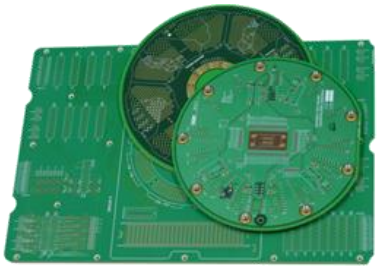


Burn-in test



Fine pitch test





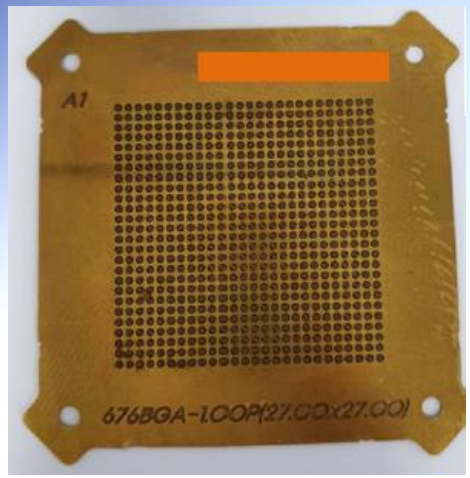
Function test

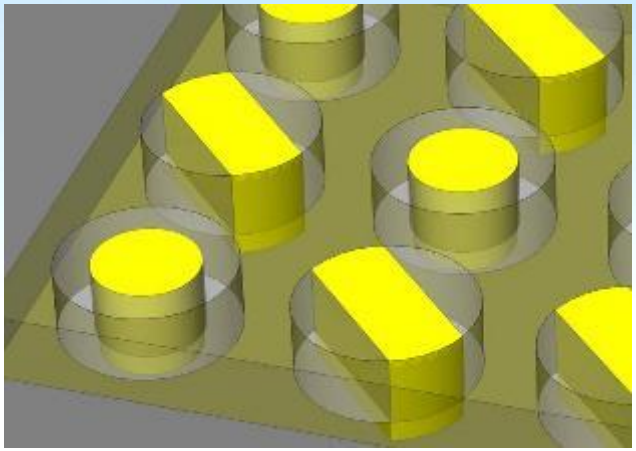
High frequency test

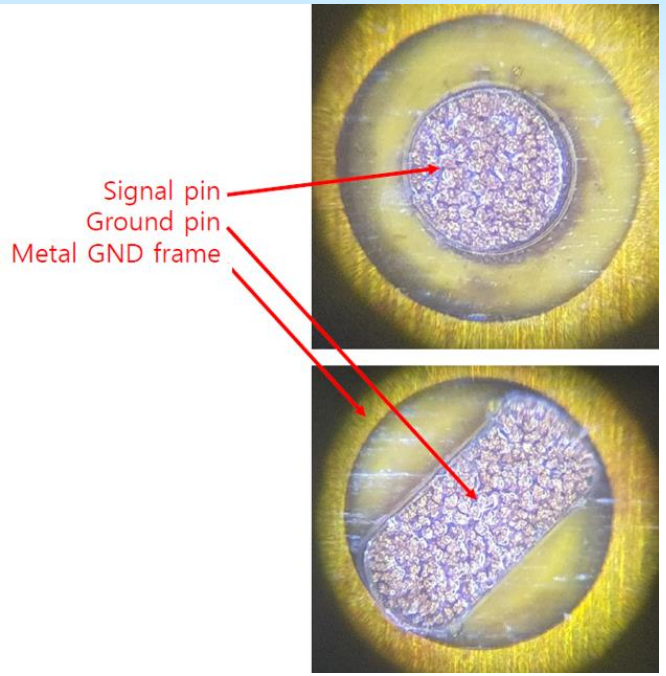
Reliability test

PRODUCTS _ Special PCR

❖ Coaxial Socket





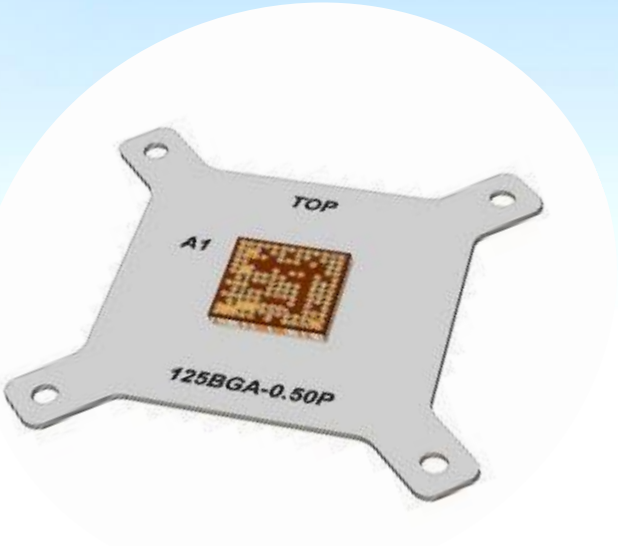


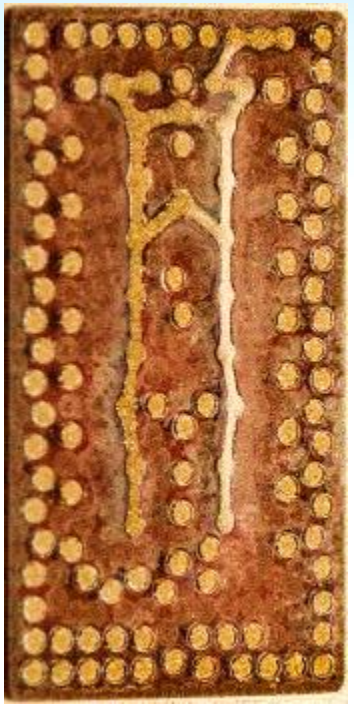
▷ GND pins are shorted with metal frame electrically

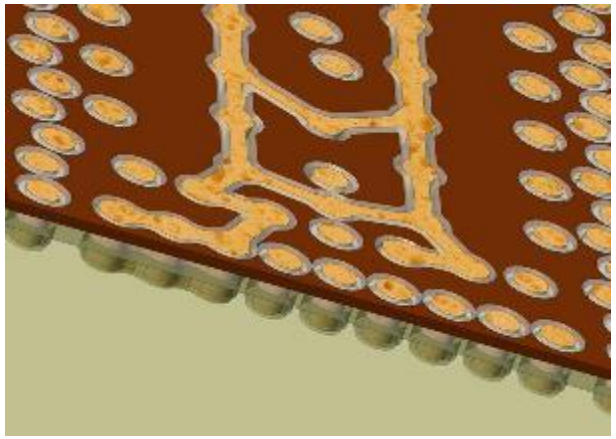
PRODUCTS _ Special PCR

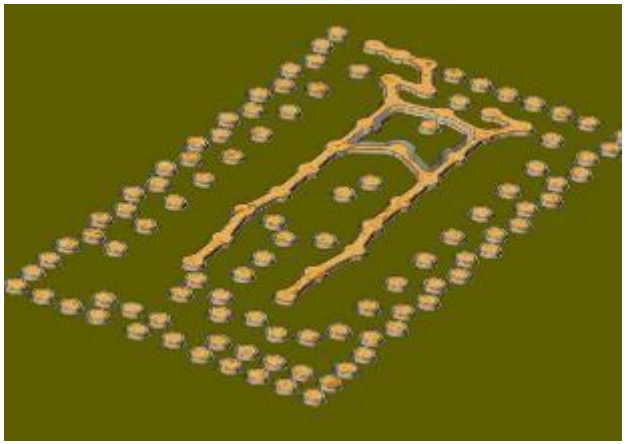
❖ Isolation Socket

Ladar application (60GHz ~ 80GHz)









PRODUCTS _ Special PCR