
SIXTEENTH ANNUAL
BiTS
Burn-in & Test Strategies Workshop
March 15 - 18, 2015
Hilton Phoenix / Mesa Hotel
Mesa, Arizona
Archive – Session 7
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Session 7
Valts Treibergs
Session Chair

BiTS Workshop 2015 Schedule

Solutions Day

Wednesday March 18 8:00 am

All That Glitters Is Or Is Not Gold

"One piece spring probes in one piece house socket (The best cost socket solution)"

AJ Park & JD Cho - IWIN Co. Ltd.

"MEMS rubber contact for TEST socket"

Justin Yun & BoHyun Kim - TSE Co., Ltd.

Do You Believe In Leprechauns?

"Marketplace Report"

Ira Feldman - Feldman Engineering Corp.

"A Testing Time for Test Socket Suppliers"

John West - VLSI Research

Copyright Notice

MEMS Rubber Contact for TEST Socket

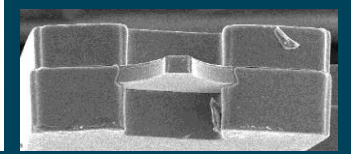
Justin Yun
BoHyun Kim
TSE Co., Ltd.

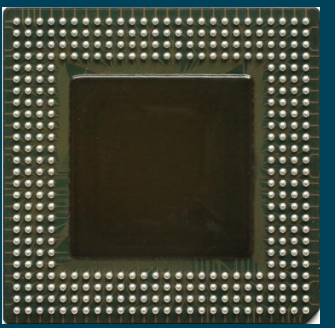
2015 BiTS Workshop
March 15 - 18, 2015

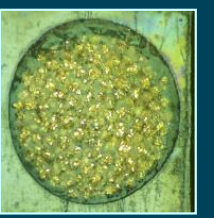
Overview

- Introduction
- Wafer & Final Test Contacts
- MEMS Powder Fab. Process
- PCR vs. MRC Contact Comparison
- Lab & Production Test Results Evaluation
- Conclusion

Wafer Sort & Final Test Contacts



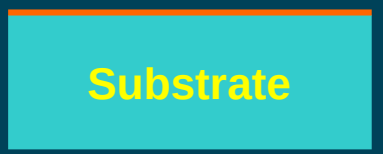




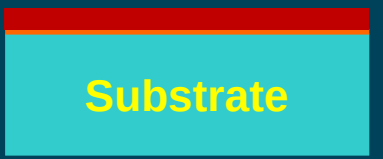
- Al/Cu pad
- Tungsten probe, MEMS Probe (Ni alloy+Rh+Au)
- 50~200um O.D

- SnAgCu ball
- Spring probe(BeCu/SK/Pd) Rubber contact(Ni+Ag+Au)
- 120~500um O.D

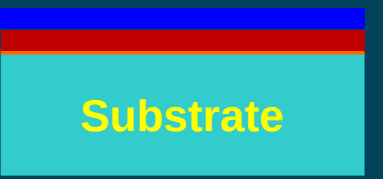
MEMS Powder Fab. Process



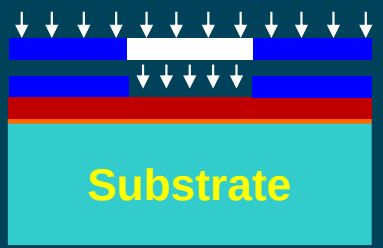
Seed metal sputtering



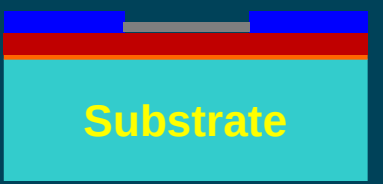
Sacrificial layer electro plating



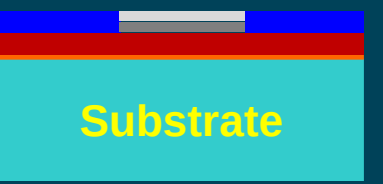
Photoresist spin coating



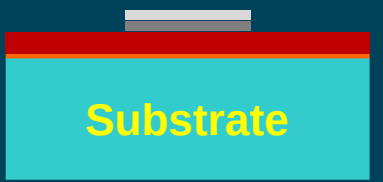
Exposure ► Develop



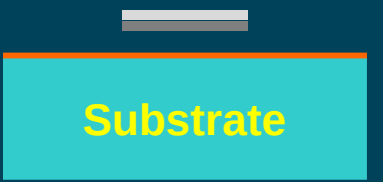
Electro plating(NiCo)



Electro plating(Rh)



PR strip



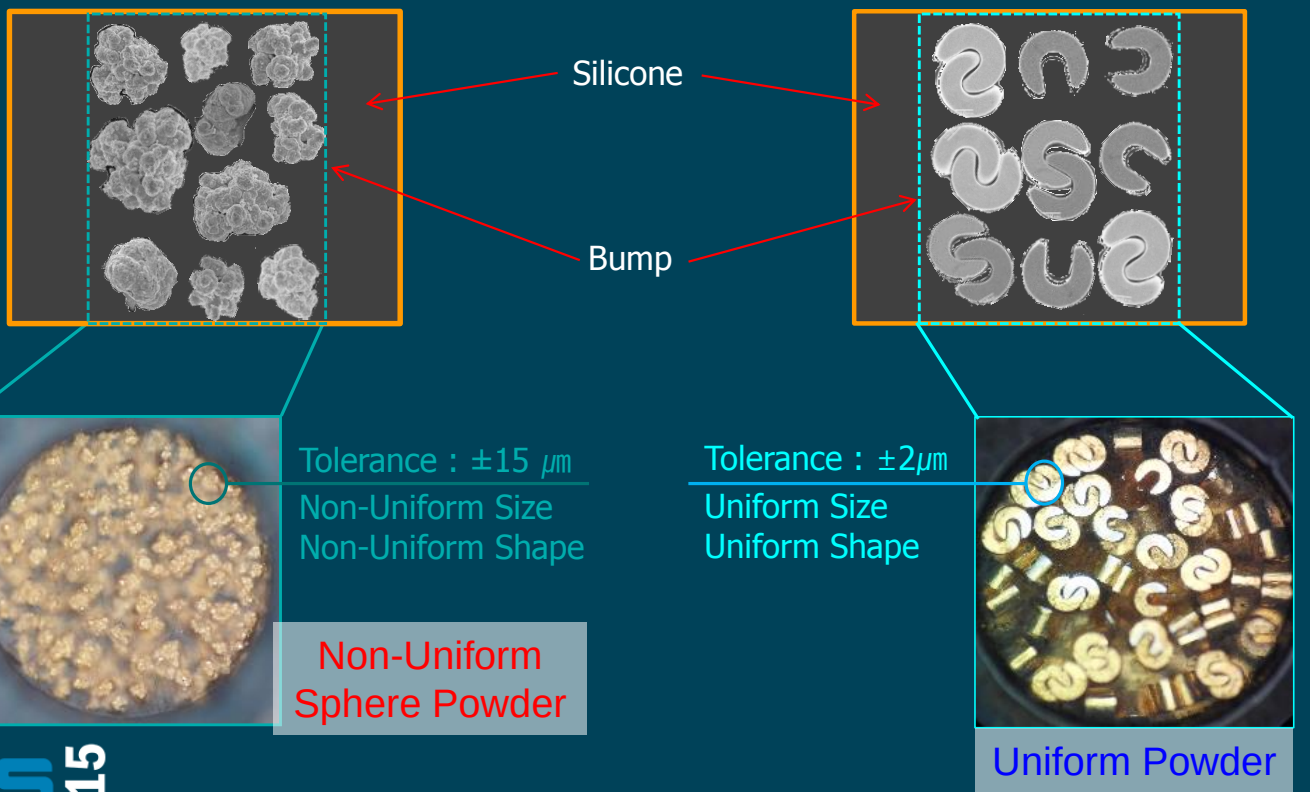
Etching

PCR vs. MRC Comparison

1) Size & Shape of Powder

Conventional PCR powder

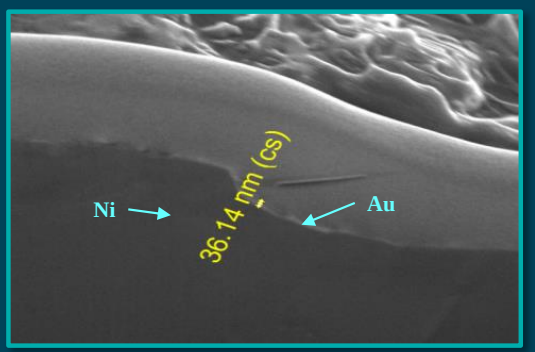
MRC powder



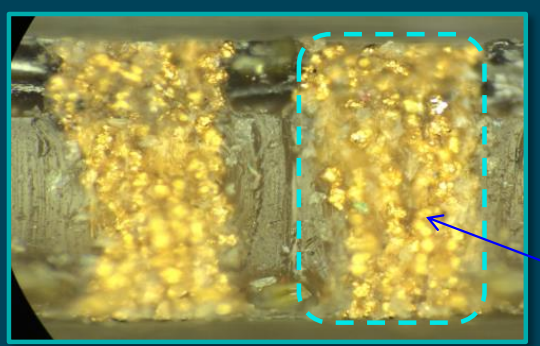
PCR vs. MRC Comparison

2) Plating

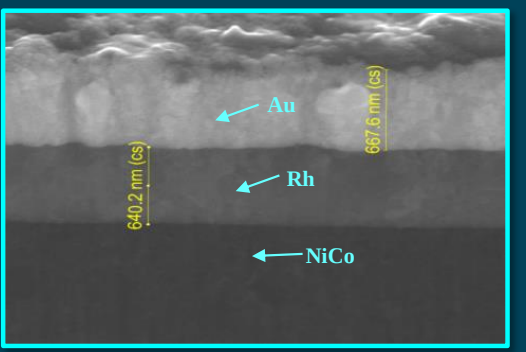
Conventional PCR powder



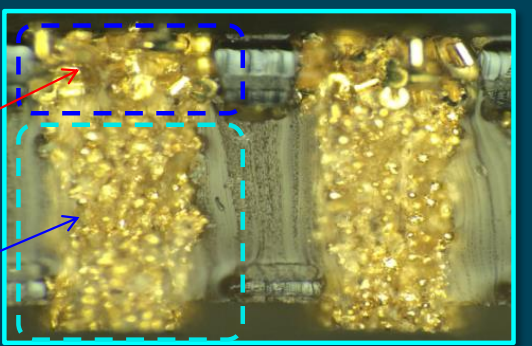
<Au Plating>



MRC powder



<Rh Plating + Au Plating>



MEMS Powder

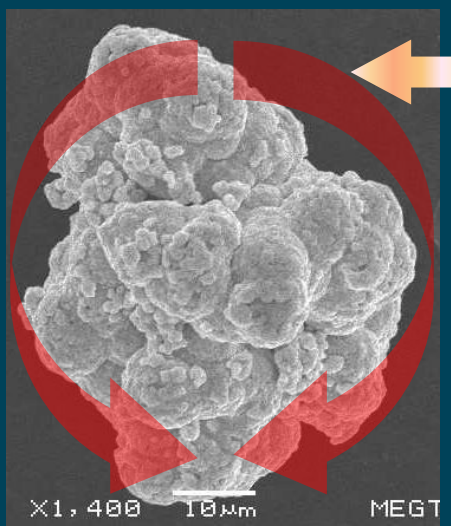
PCR Powder

PCR vs. MRC Comparison

3) Cohesion

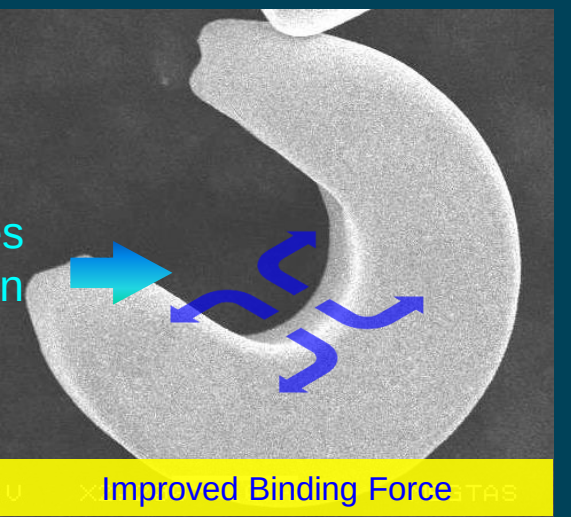
Conventional PCR powder

MRC powder



Silicone Holds Conventional PCR Powder

Silicone Penetrates MRC Powder grip portion

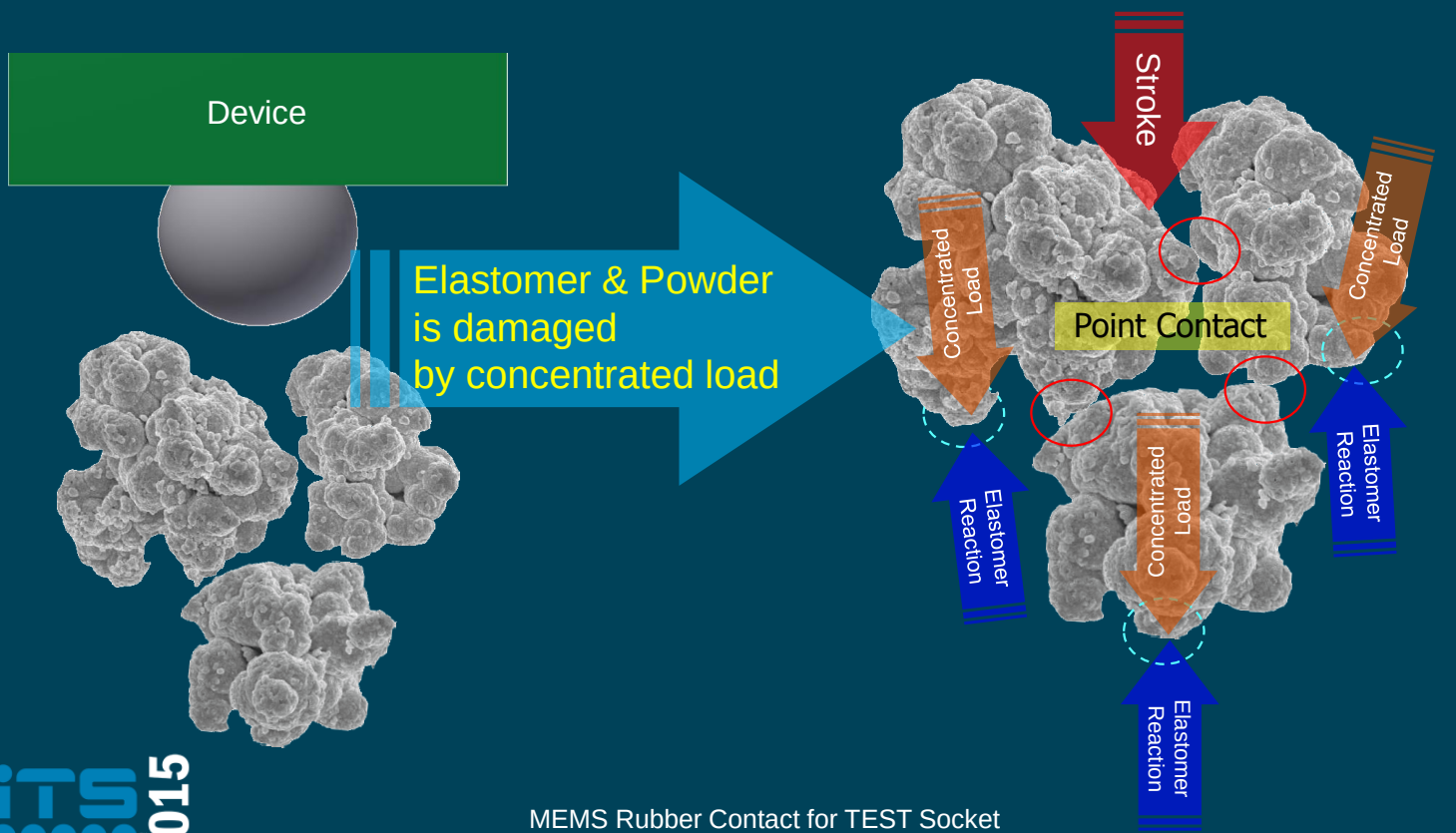


PCR vs. MRC Comparison

4) Contact of Powder (Conventional PCR Powder)

a. Before Device Contact

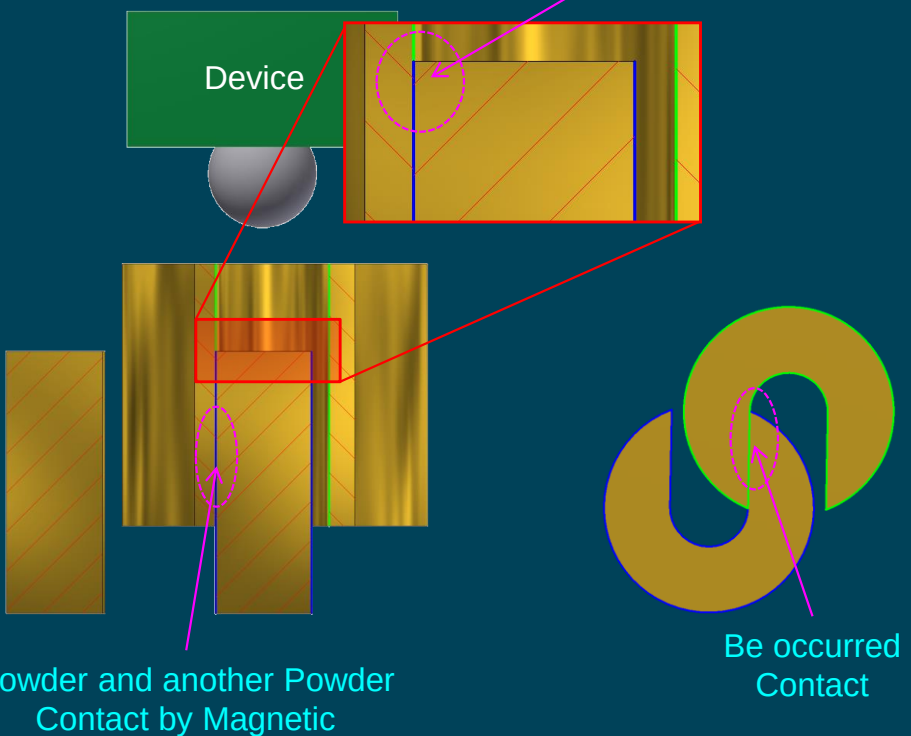
b. After Device Contact



PCR vs. MRC Comparison

5) Contact of Powder (MEMS Powder)

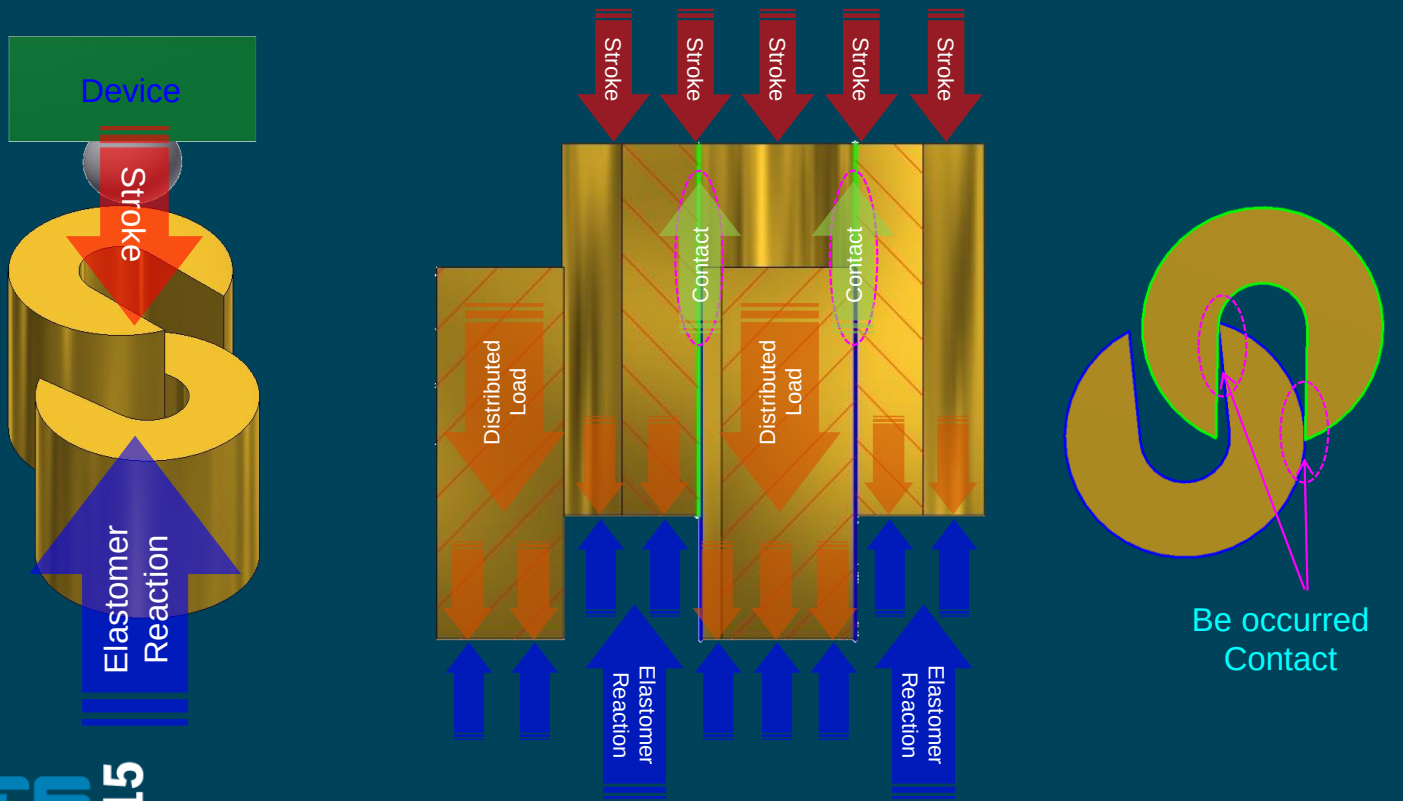
a. Before Device Contact – Docking Powder



PCR vs. MRC Comparison

5) Contact of Powder (MEMS Powder)

b. After Device Contact – Reciprocation of Docking Powder

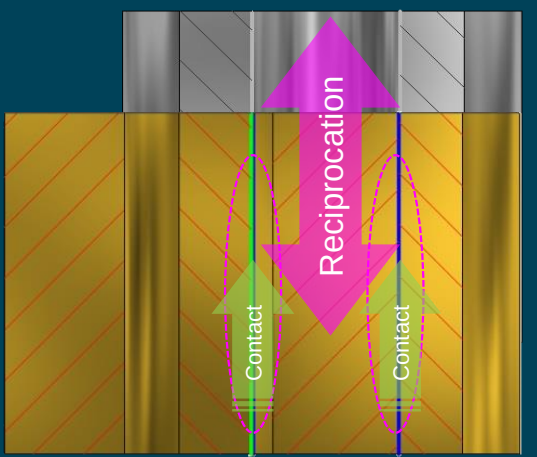


MEMS Rubber Contact for TEST Socket

PCR vs. MRC Comparison

5) Contact of Powder (MEMS Powder)

b. After Device Contact – Reciprocation of Docking Powder

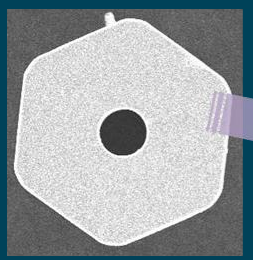


PCR vs. MRC Comparison

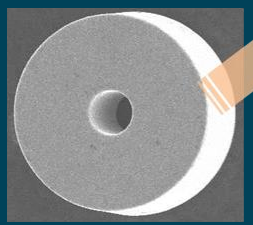
6) Resistance Comparison by Powder Structure

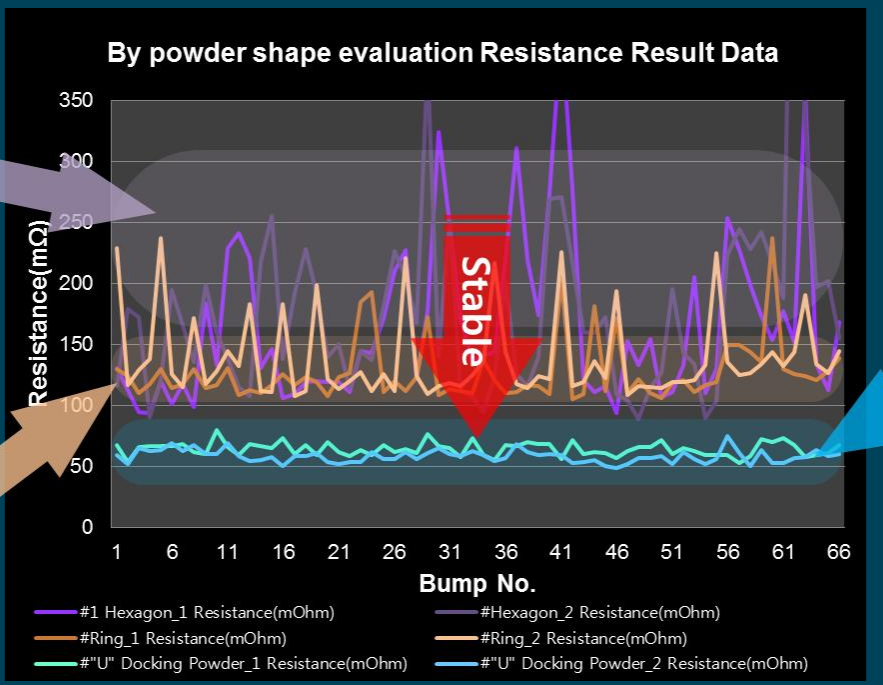
a. Resistance Improvement by Docking Effect

Hexagon Type

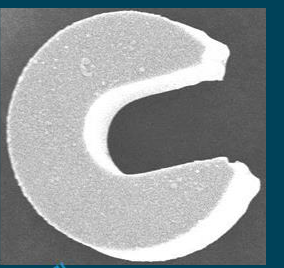


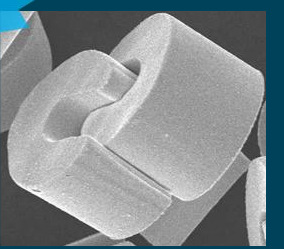
Ring Type





"U" Docking Powder



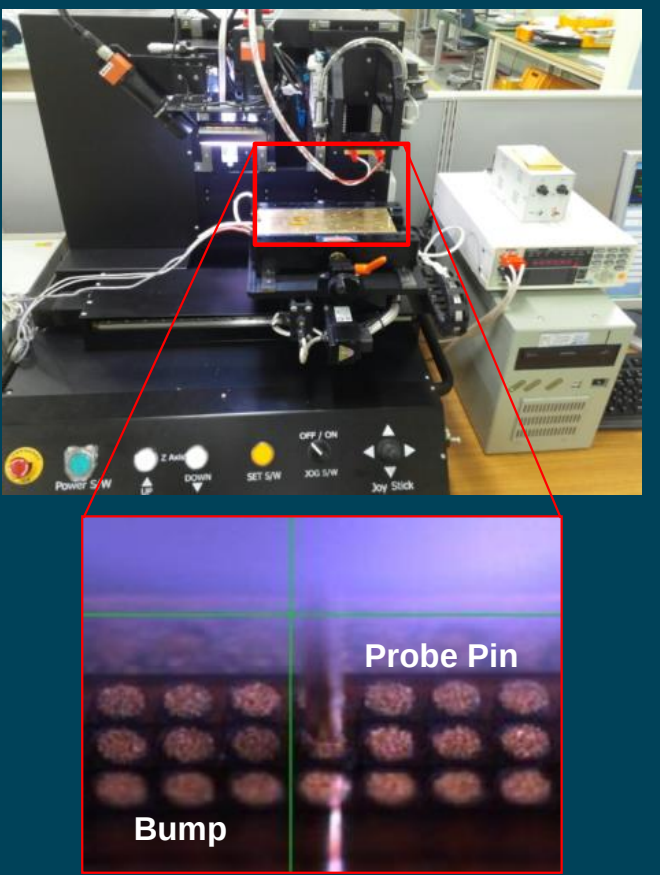


PCR vs. MRC Comparison

7) Contact Lifespan

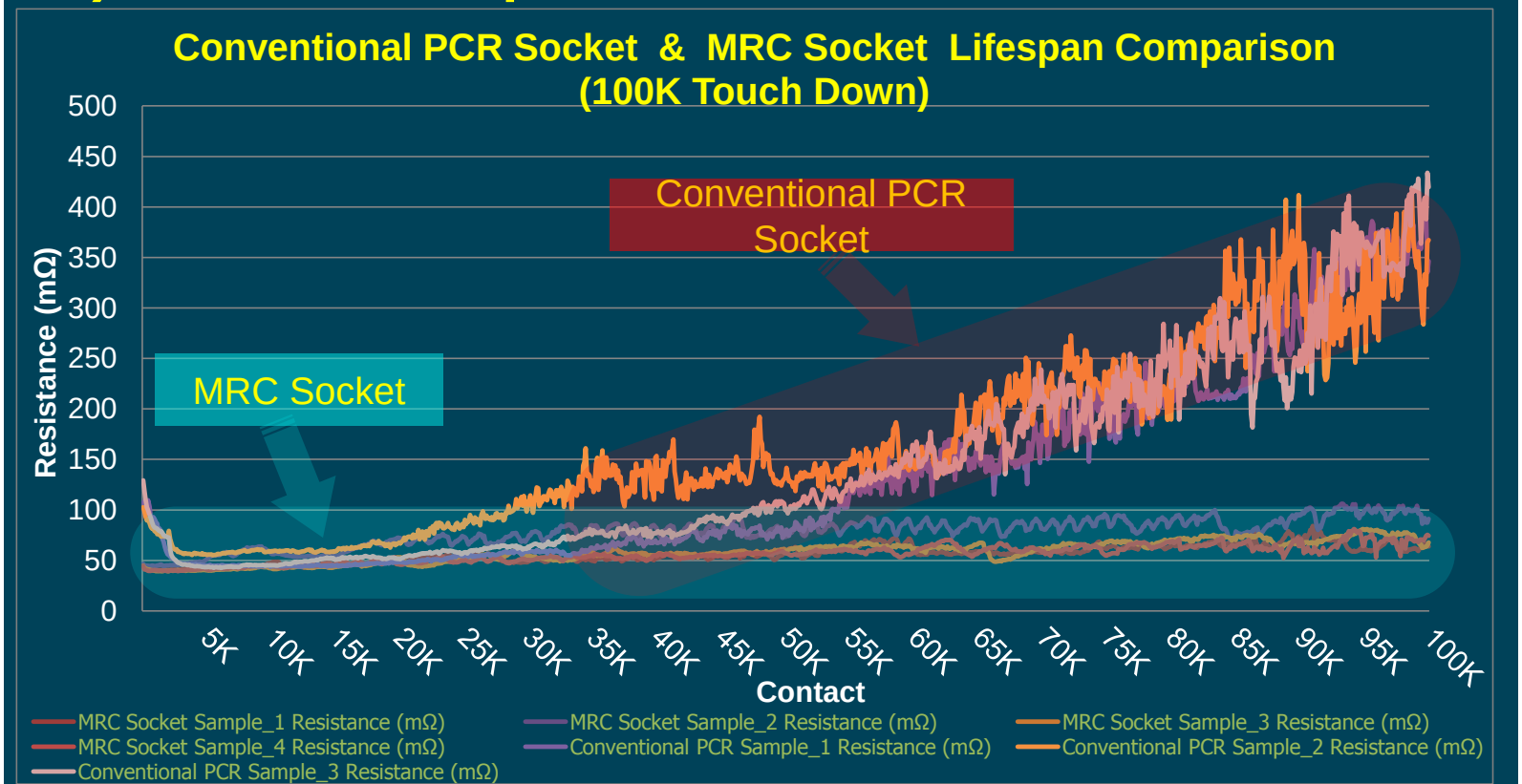
a. Evaluation Condition

- Tester : TSE IT-490
- Temp : 23℃
- Probe Size : ø0.23mm
- Probe Material : BeCu + Plating Au
- Socket : 0.35mm Pitch
- Stroke : 120um
- Lifespan : Touch Down 100K



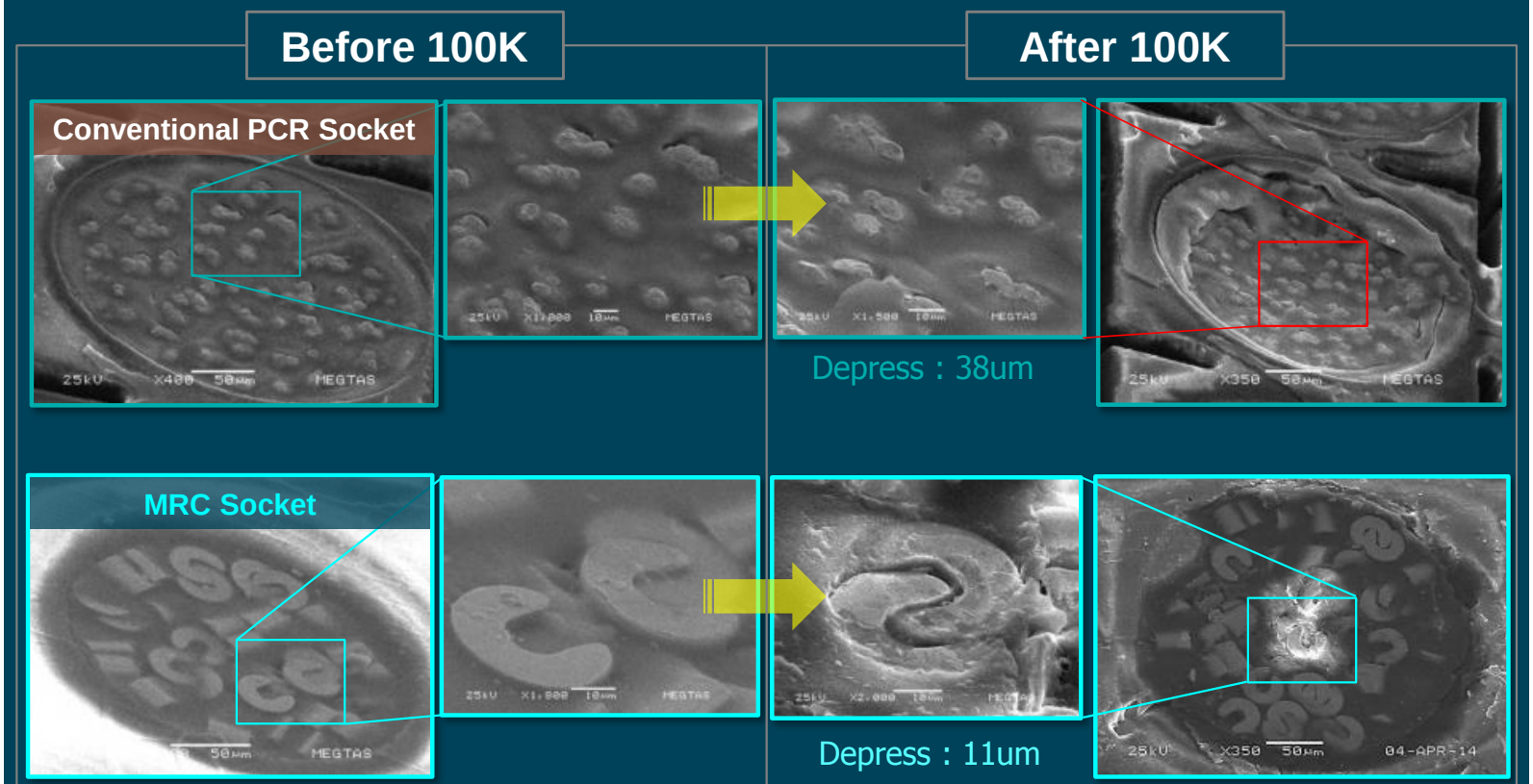
PCR vs. MRC Comparison

8) Contact Lifespan



PCR vs. MRC Comparison

9) Durability



Evaluation

1) Lifespan

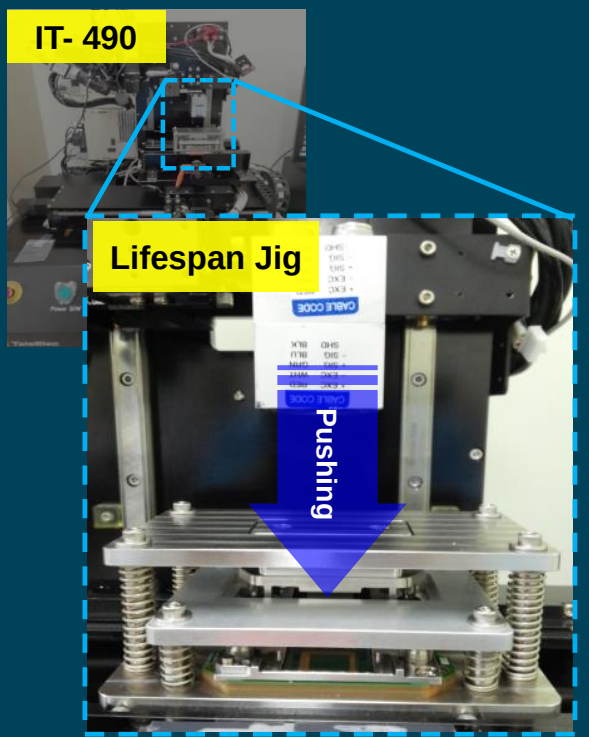
a. Evaluation Condition

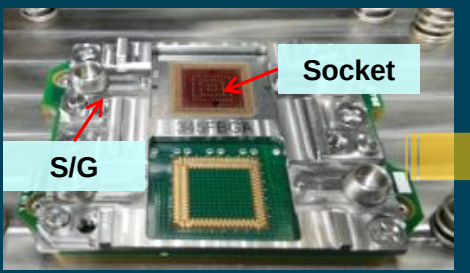
- Tester : TSE IT-490
- Temp : 23℃
- Dummy Device Ball Size : ø0.23mm
- Dummy Device Ball Material : (Pb Free) Sn
- Socket : 0.35mm Pitch
- Stroke : 120um
- Lifespan : Touch Down 100K

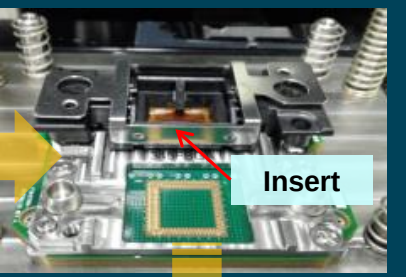
  (Dummy Package was changed whenever after touchdown 10K)

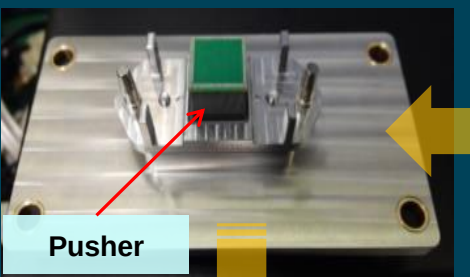
Evaluation

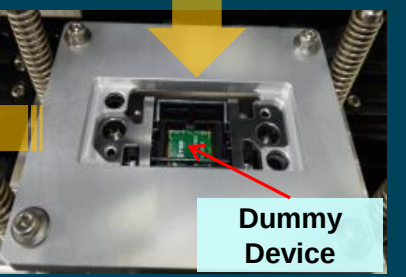
Lifespan Jig

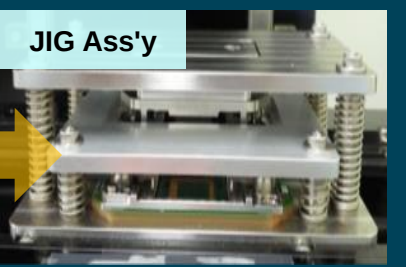












Evaluation

2) Lifespan Results

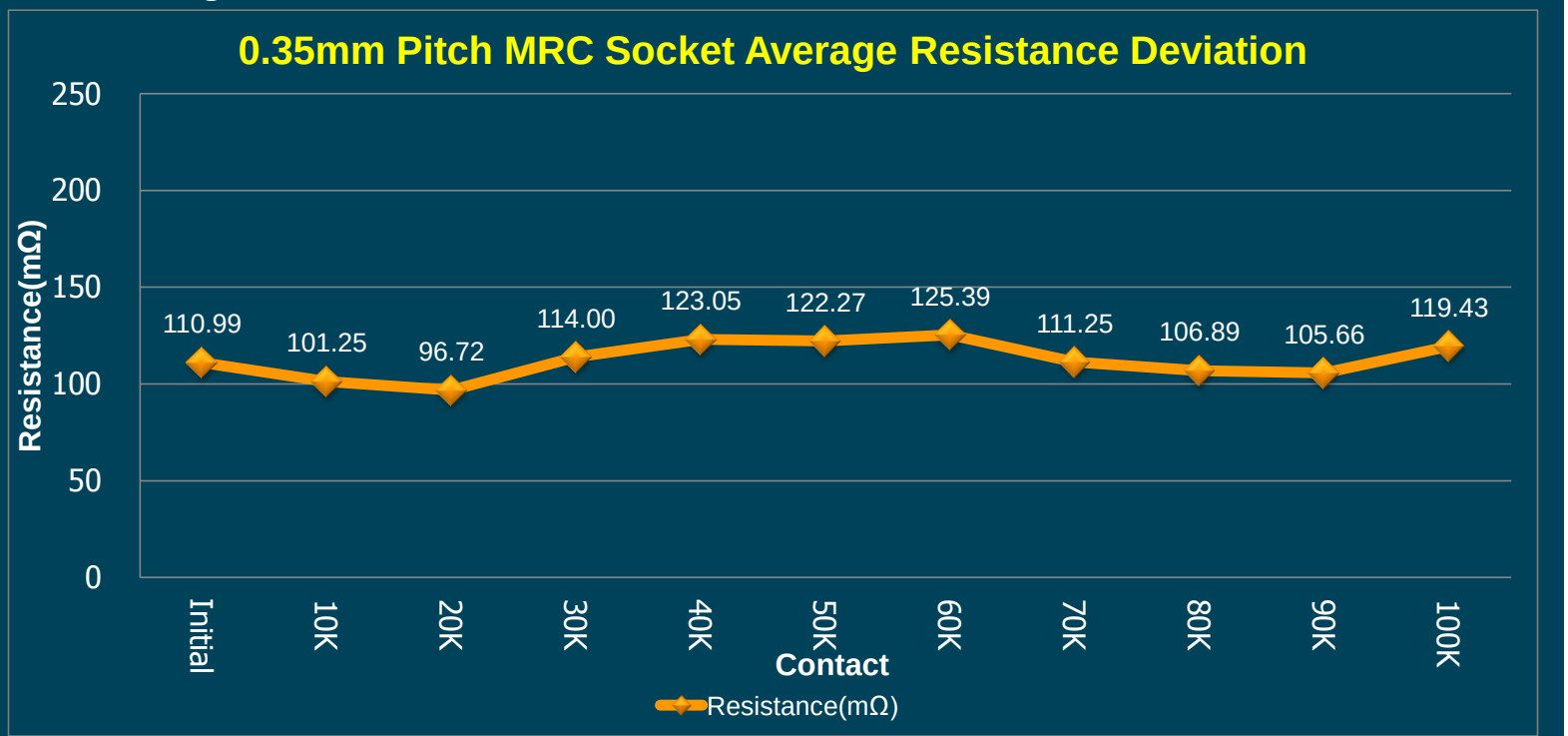
Durability

Depress 11um & AVG Resistance 119.4mΩ

Evaluation

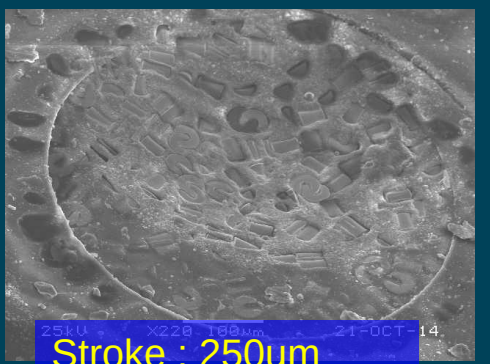
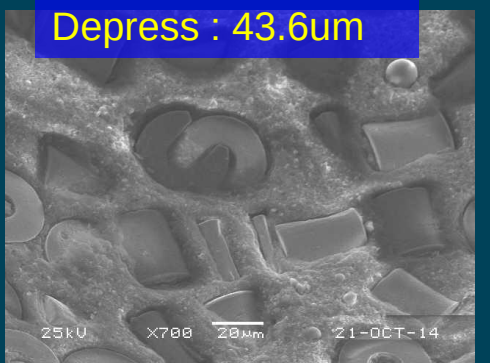
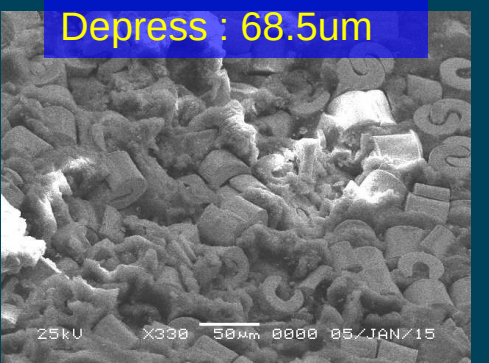
2) Lifespan Results

Average Resistance



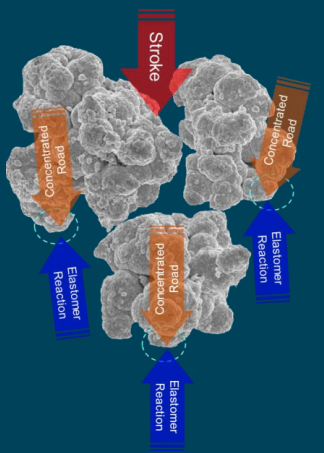
Evaluation

3) Durability at Customer HV Production Site

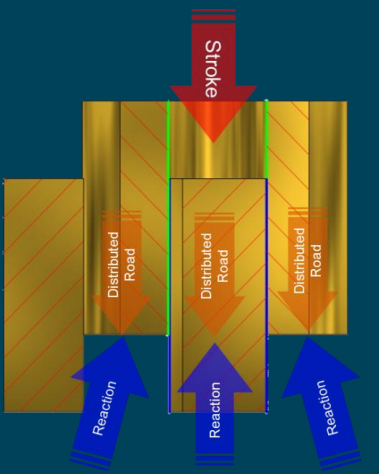
0.35mm Pitch – 40K	0.8mm Pitch – 100K	1.0mm Pitch – 120K
		
Stroke : 120um Depress : 17.3um	Stroke : 250um Depress : 43.6um	Stroke : 350um Depress : 68.5um
		

Conclusion

- Reduced Depression
  - Force distribution on the device & elastomer with uniform shape
  - Prevent damage on powder & elastomer with force distribution
  - Reduced depress by elastomer damage prevention



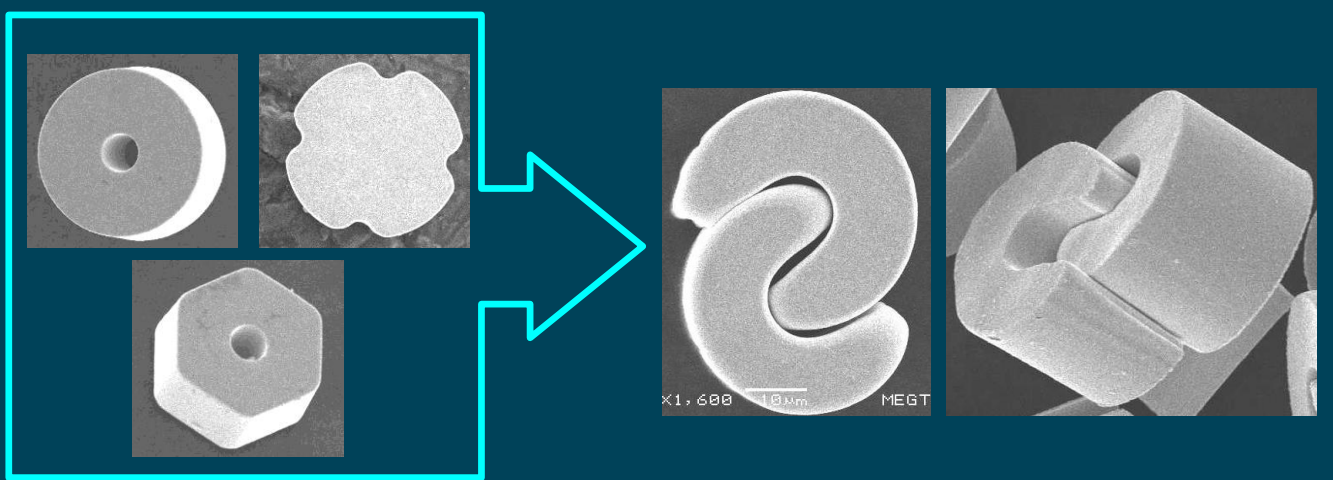
Conventional PCR powder



MRC powder

Conclusion

- Improved Resistance
  - Stable signal path with a powder docking structure
  - Lower contact resistance with stable signal path
  - Resistance Improvement by increasing plating thickness



Conclusion

- Improved Lifespan
  - Secure the stroke even though the contact count increase by reducing depress
  - Resistance reliability and uniformity secured between bumps by docking structure
  - Improved lifespan by stable stroke, bump reliability & uniformity