



SW Test Workshop
Semiconductor Wafer Test Workshop

Multiplexer™

Innovative Vertical Probe Card Structure for High Parallelism Image Sensors

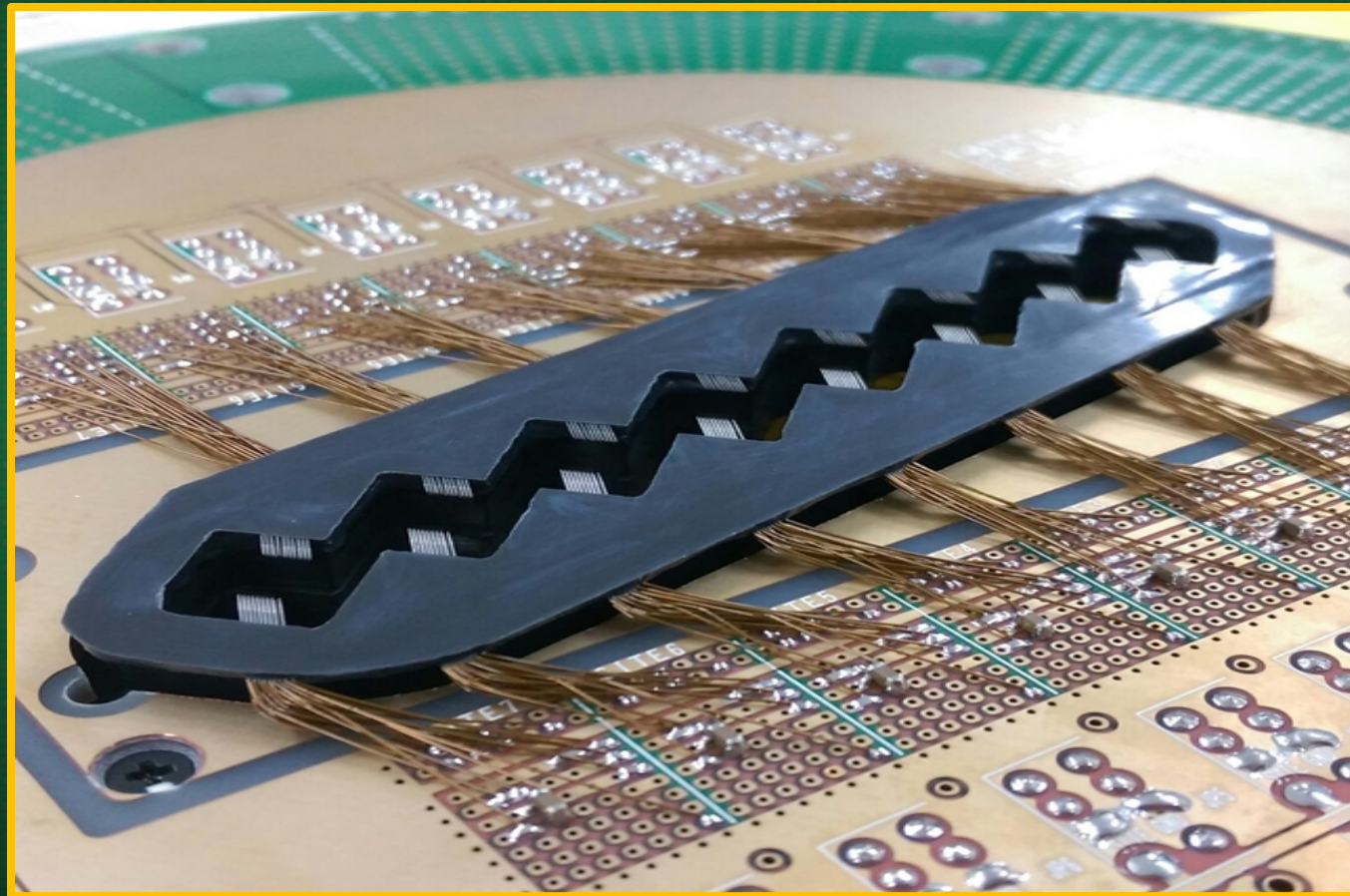


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Legacy Cantilever CIS Probe Card

- 8DUTs (1x8) Diagonal



General Concerns

Cantilever Multi-DUT Probe Card for CIS Sort Testing

1. Multi-DUT

- a. Long probe length – high speed
- b. Uneven probe length across multi-DUT
- c. Skip DUT & Diagonal DUT layout

2. Generates Particles

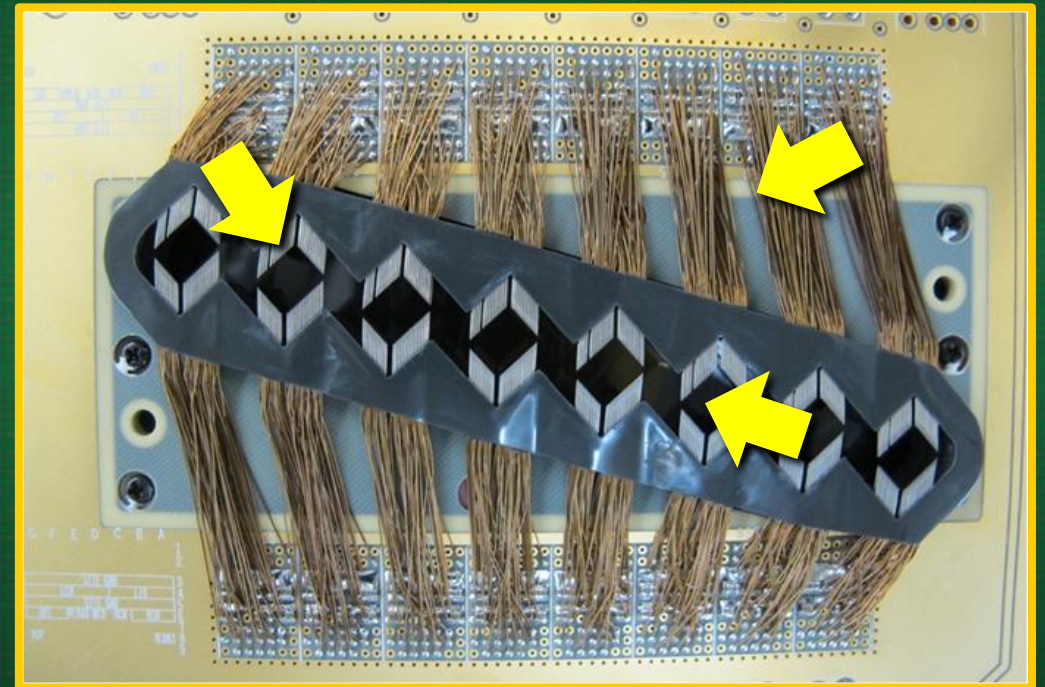
- a. Blocks off the light source
- b. Low contact force – High CRes

3. Window Opening

- a. Reflection from side walls

4. Test Cost & Lead time

- a. Cost of ownership
- b. (Customer delivery request)



Solution - Multiplexer™

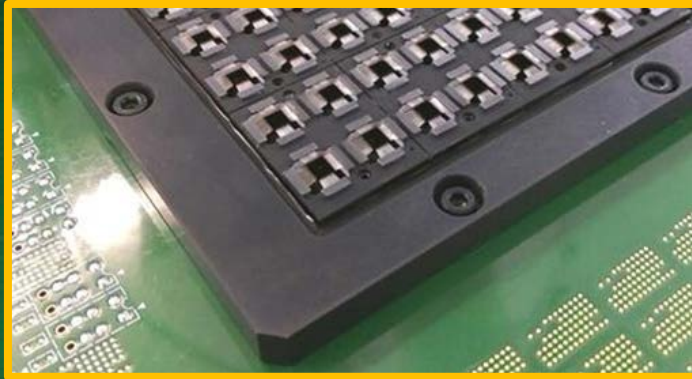
- Multi-DUTs – in Customer Production



Multiplexer™

Multiplexer™

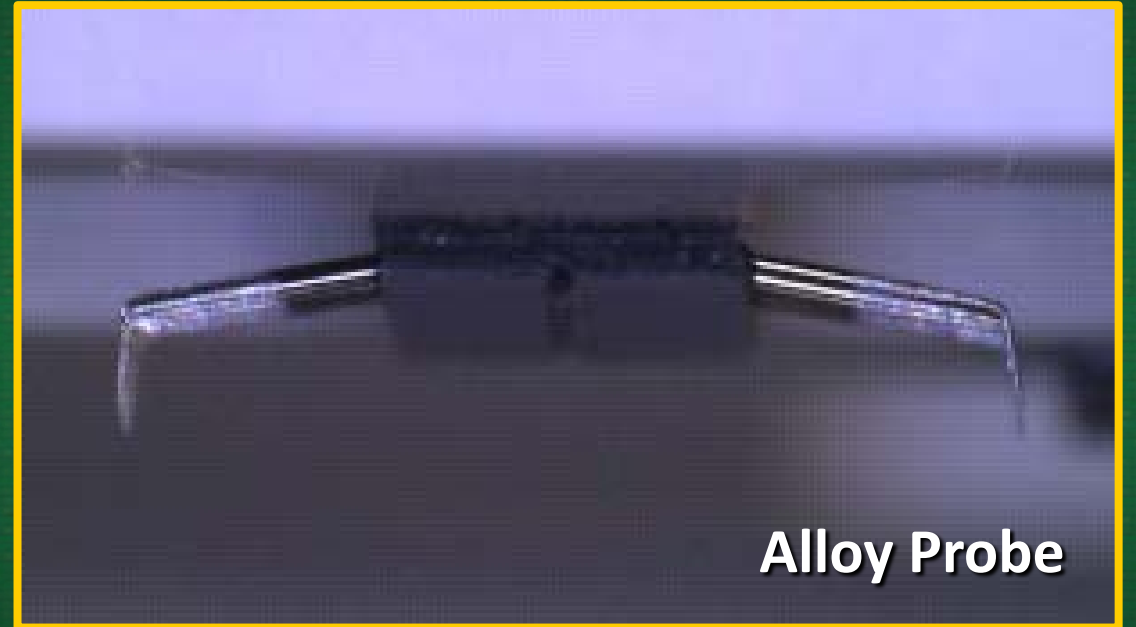
Multi-DUTs



8 multi-DUTs (4 × 2)



STD Spider Design



Alloy Probe

Multiplexer™ Probe Card Solutions

1. High Parallelism

- a. Shorter length probe
- b. Even probe length across multi-DUT
- c. Available matrix DUT layout

2. Reduces Particle Generation

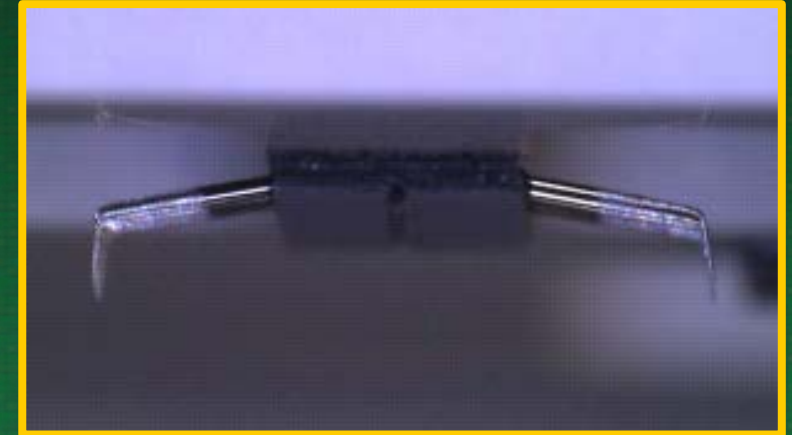
- a. Alloy probe - Lower CF & vertical like small probe scrub
- b. Keeps good Cres

3. Minimizes Reflection

- a. Solution to control reflection

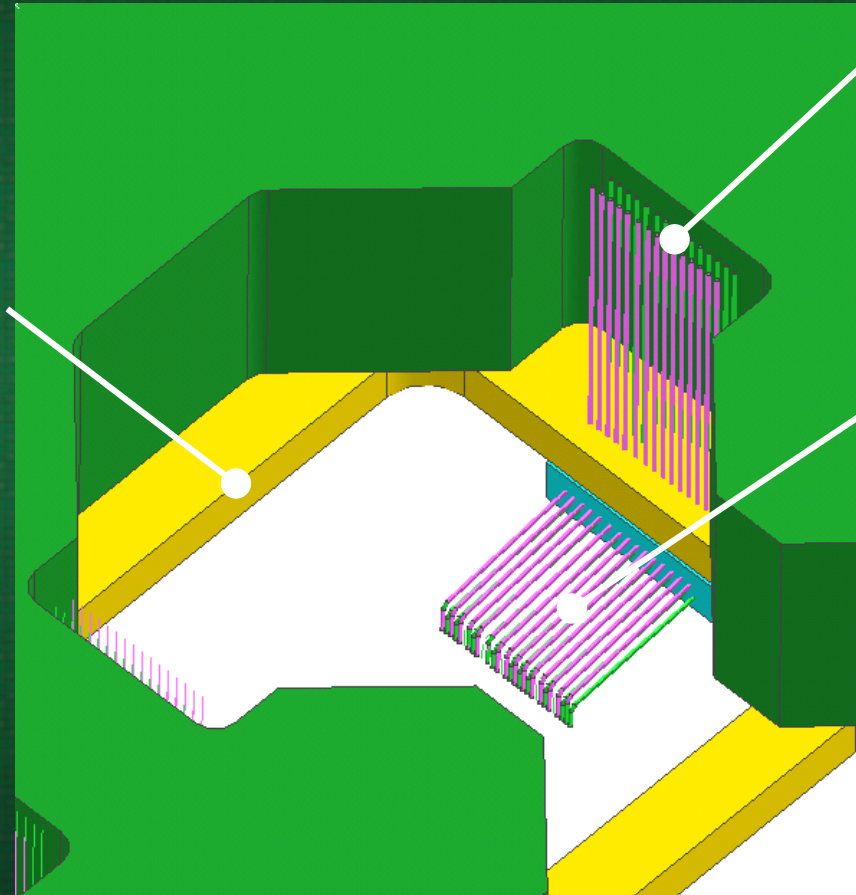
4. Reduces Cost of Ownership (COO)

- a. Reasonable initial/repeat card price
- b. Cantilever delivery lead time



Fundamentals of Multiplexer™ Structure

Multiplexer™ Structure



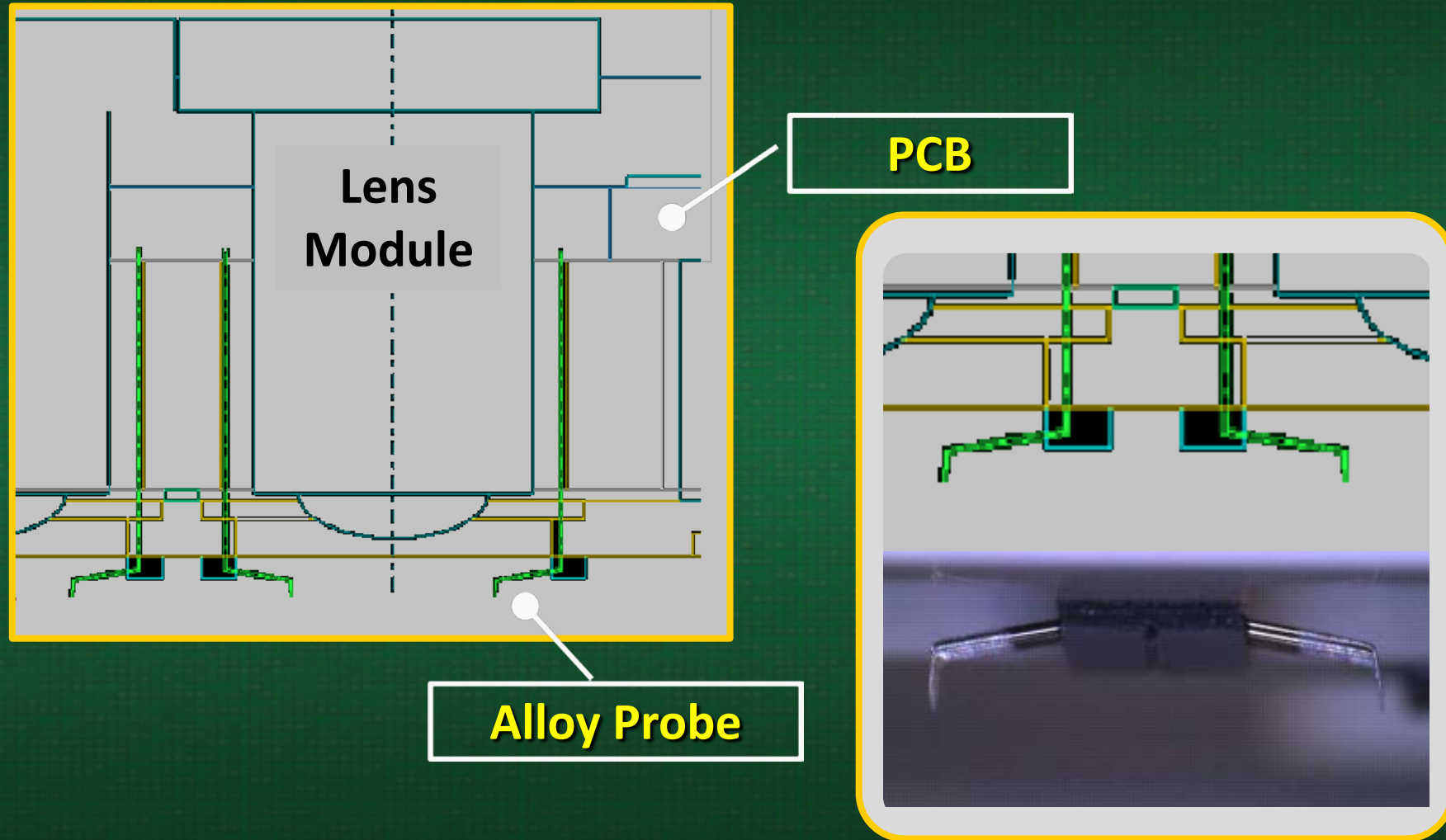
Controlled Reflection

**Shorter & Even
Probe Length**

**Alloy Probe
Low CF
Small Scrub**

- ✓ Matrix DUT layout
- ✓ High Speed Solution
- ✓ Test Cost & Lead Time

Multiplexer™ Structure



AC™ Probe

Fundamentals of Multiplexer™

Alloy Probe

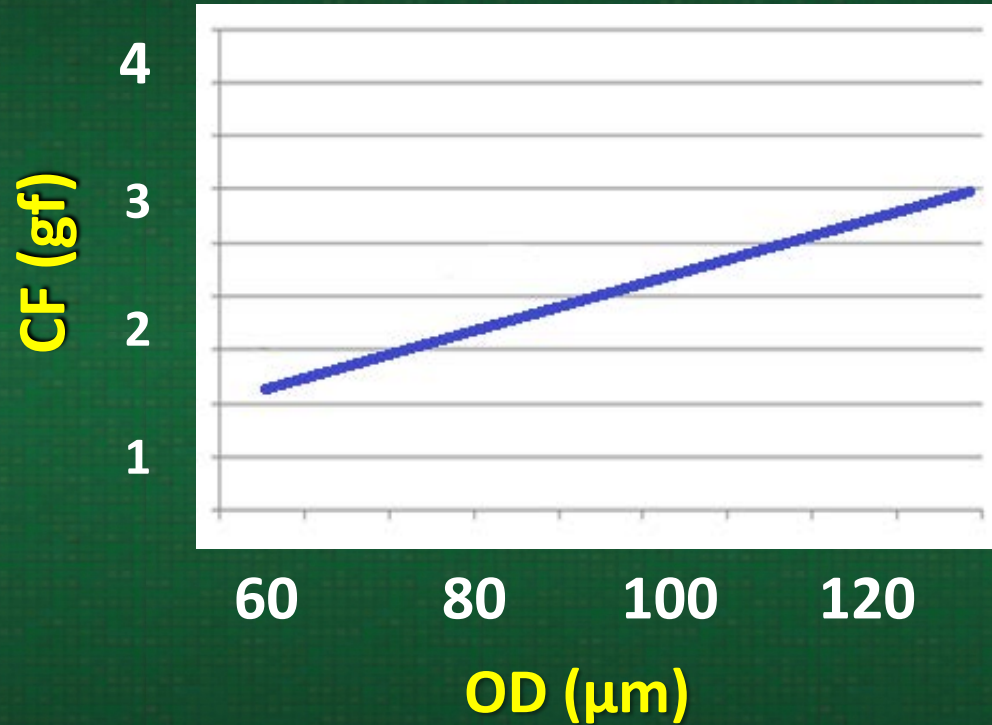
AC™ Probe

Specifications	
Material	AC™ Alloy <i>Anti-oxidation material</i>
O/D	80μm
Probe Force	1.8gf
Alignment	±5μm
Needle Diameter	90μm ~ 150μm
Tip Size	STD 10~15μm flat
Minimum Pitch	70μm ~ 95μm

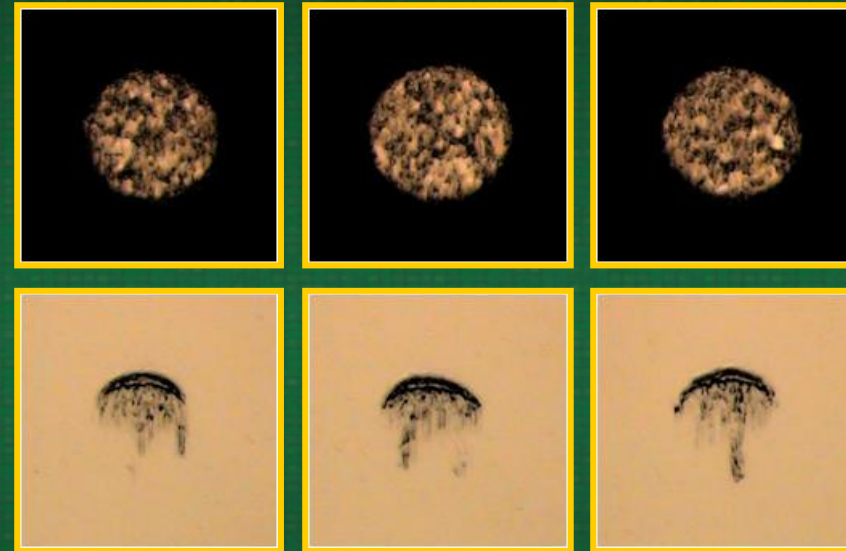
Note: AC™ probe has been released for more than 10 years.

Contact Force & Probe Scrub

Contact Force – OD Plot



Probe Tip & Probe Scrub



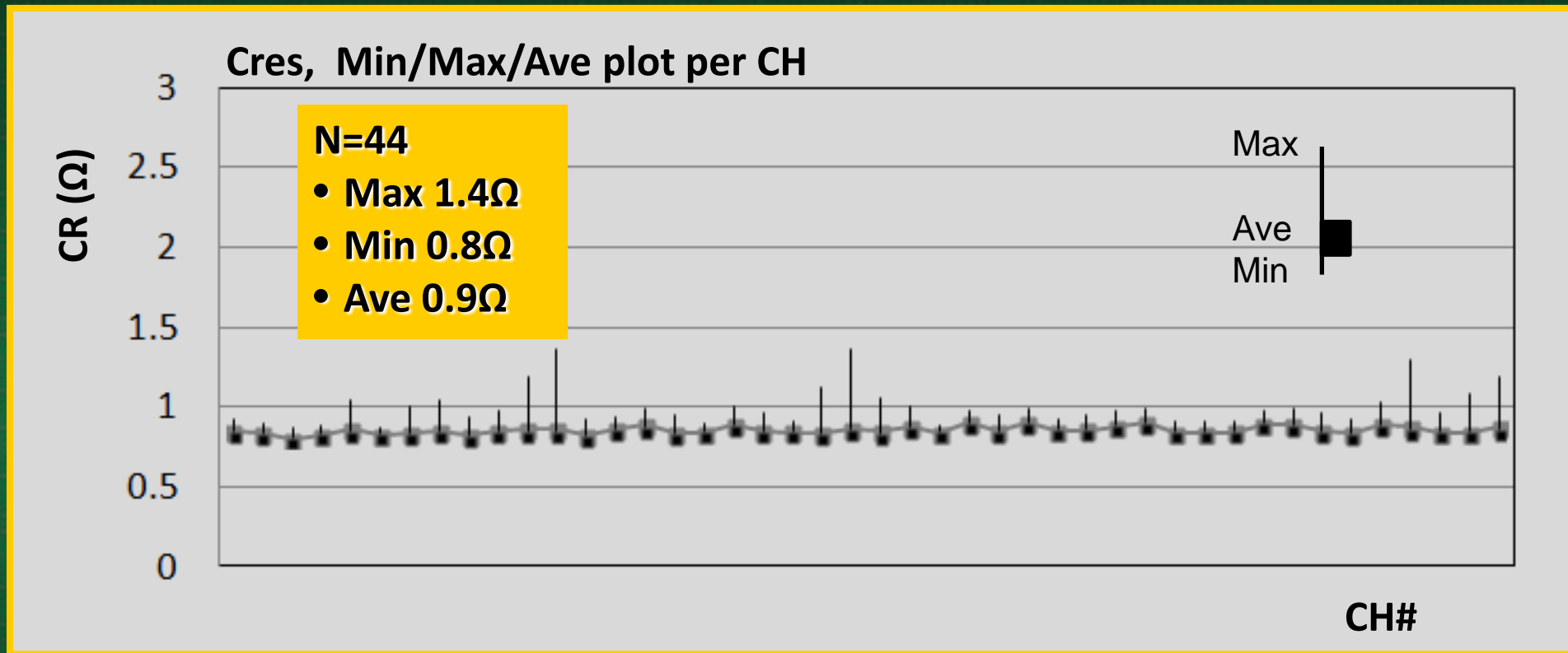
Conditions

Blank AL Wafer 8 Inch (Thickness: $0.8\mu\text{m}$)

Probe Force $1.8\text{gf}/80\mu\text{m OD}$

Temperature: 80°C

CR 2K TD (no cleaning) HT



Conditions

Blank AL Wafer 8 Inch (Thickness: 0.8μm)

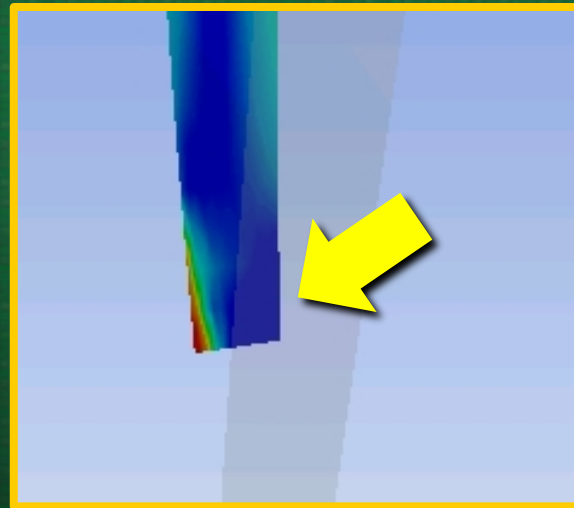
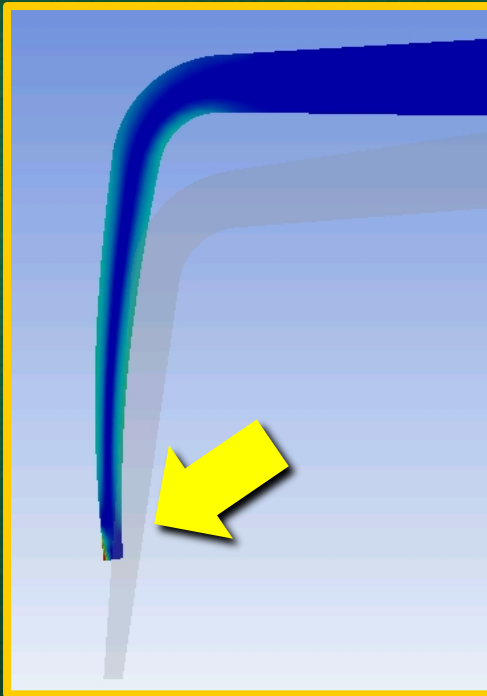
Impressed Current: 10mA

Temperature: 80°C

O/D 80μm ≐1.8gf

Half Moon Probe Scrub

- Tip flexure generates small, half moon probe mark

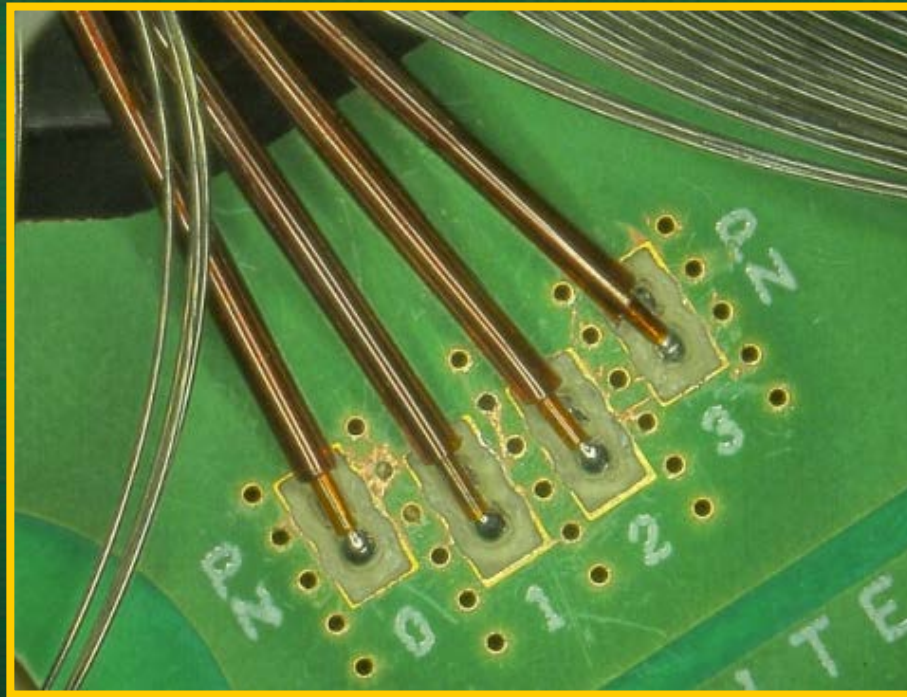


Enlarged Multiplexer™ High Speed Solution

High Speed Solution

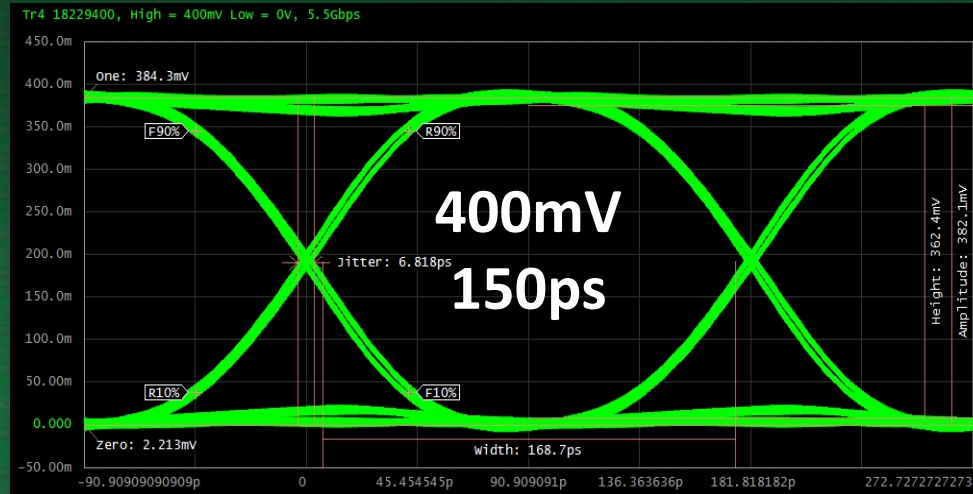
- High speed solution (achieved over 5GHz) – in customer production

Two LVDS Pairs



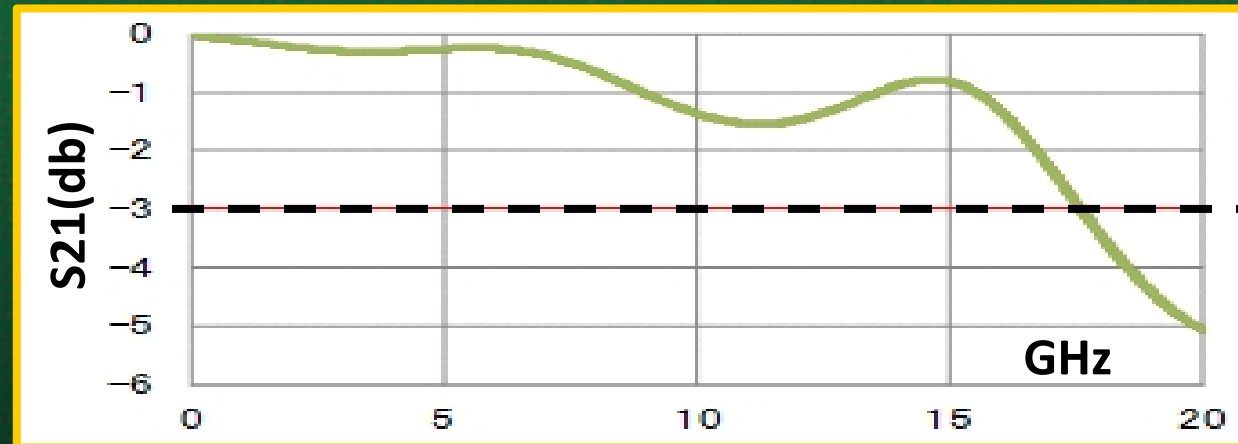
High Speed Solution

EYE pattern



- ## Evaluation Results
- SV TCL Lab
 - Actual Measurement

S21



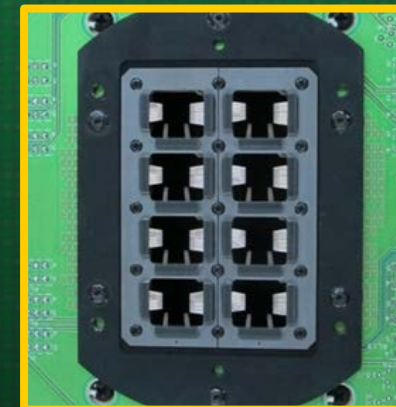
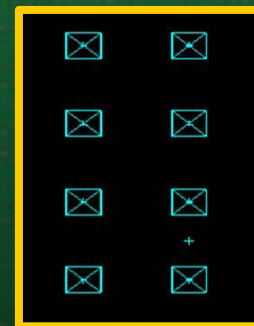
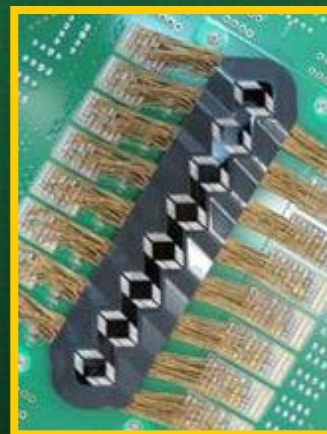
Enlarged Multiplexer™ Multi DUT

Parallelism & TD Efficiency

Customer Conditions

of Chips on 8inch Wafer : 1,927chips

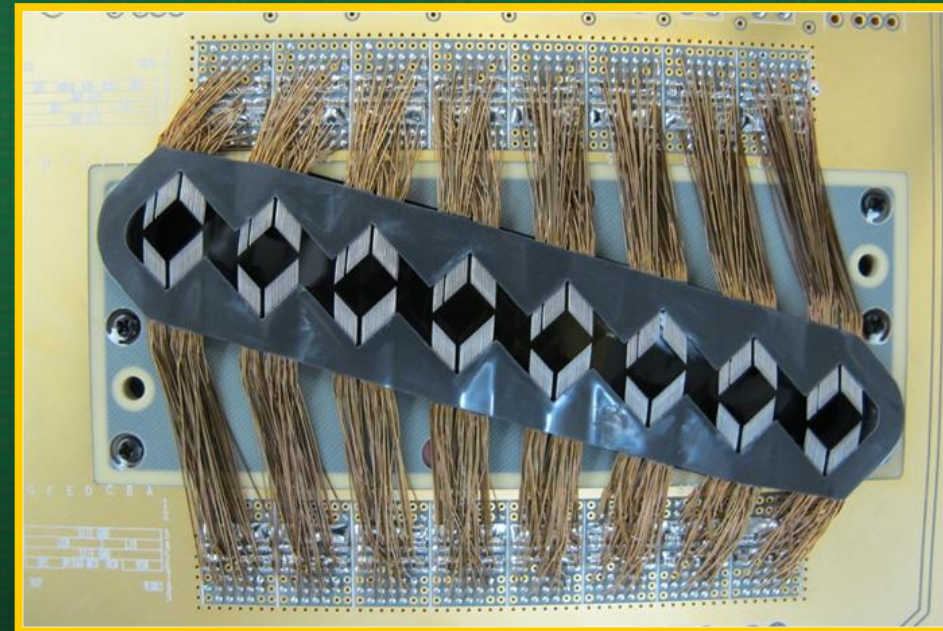
Card & Layout	1x8 Traditional Cantilever	2 × 4 Multiplexer
# of TD/wafer	322	258
# of TD/lot	8,050	6,450
Rate	1	0.8



Conclusion

Multiplexer™ Concept

- Keeps the original beneficial features of cantilever.
Improves electrical performance, small probe scrub & DUT layout feasibility to adapt to the CIS sort test requirement.



Multiplexer™ Specifications

Common Specifications	
Material	AC™ Alloy Anti-oxidation material
O/D	80μm
Probe Force	1.8gf
Alignment	±5μm
Needle Diameter	90μm ~ 150μm
Tip size	STD 10~15um flat
Minimum Pitch	70μm ~ 95μm
Optical Assembly Size	6.5mm ~ 9.5mm
PCB Size - Diameter	200mm ~ 500mm
Planarity	≤10μm
Maximum Temperature	150°C (120°C)

Summary

1. The Multiplexer™ probe card provides an ideal solution for CIS cantilever-type probe card general concerns.
2. Adapts to high speed or multi-DUT requirements.
3. AC™ probe – low contact force, good Cres & small probe scrub.
4. Well-known cantilever style – easy handling for operators.

Thank you