

New Path to Narrow Pitch Burn-In Socket

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Incheon ▪ November 7, 2023



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Introduction

- Device Package Pitch is decreasing
 - 1mm → 0.8mm → 0.65mm → 0.5mm → 0.35mm → 0.3mm → 0.27mm → ?
 - Density is increasing
 - Package size remains about the same
- Small(er) pitch socket solution is required.

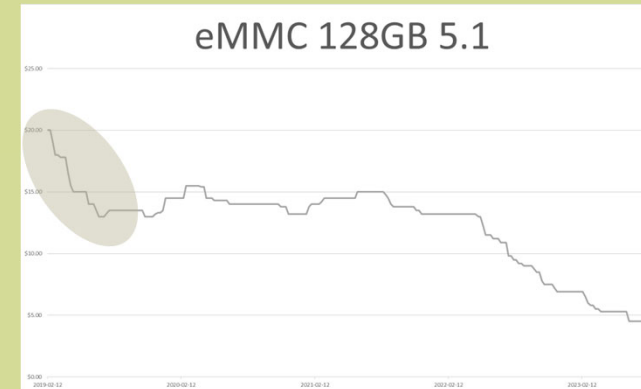
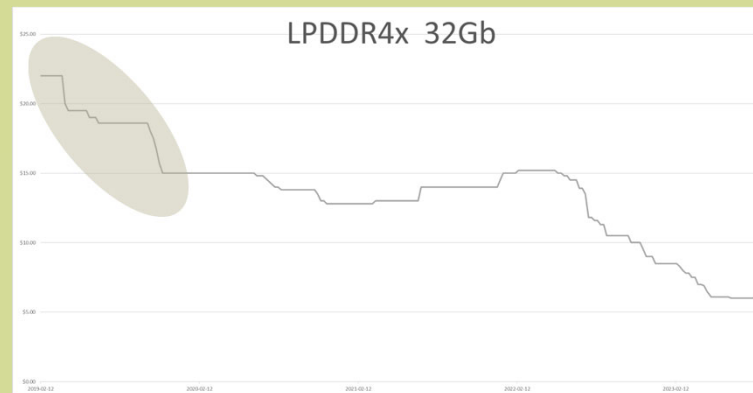


Problem Statement

- Burn-in socket is nearing the pitch limit
- Complex socket manufacturing process
- Long lead time
- High cost
 - due to increased complexity
- Reliability
 - Small pitch increases possibility of assembly defects
 - Solder bridge

Problem Statement

- Lead time: "Time is Money"
 - First to market can command price premium
 - Semiconductor typically become cheaper over time.
 - With quicker supply:
 - Higher price x No. of devices per socket = Additional profit
 - Much higher gain than socket cost
 - Market share advantage

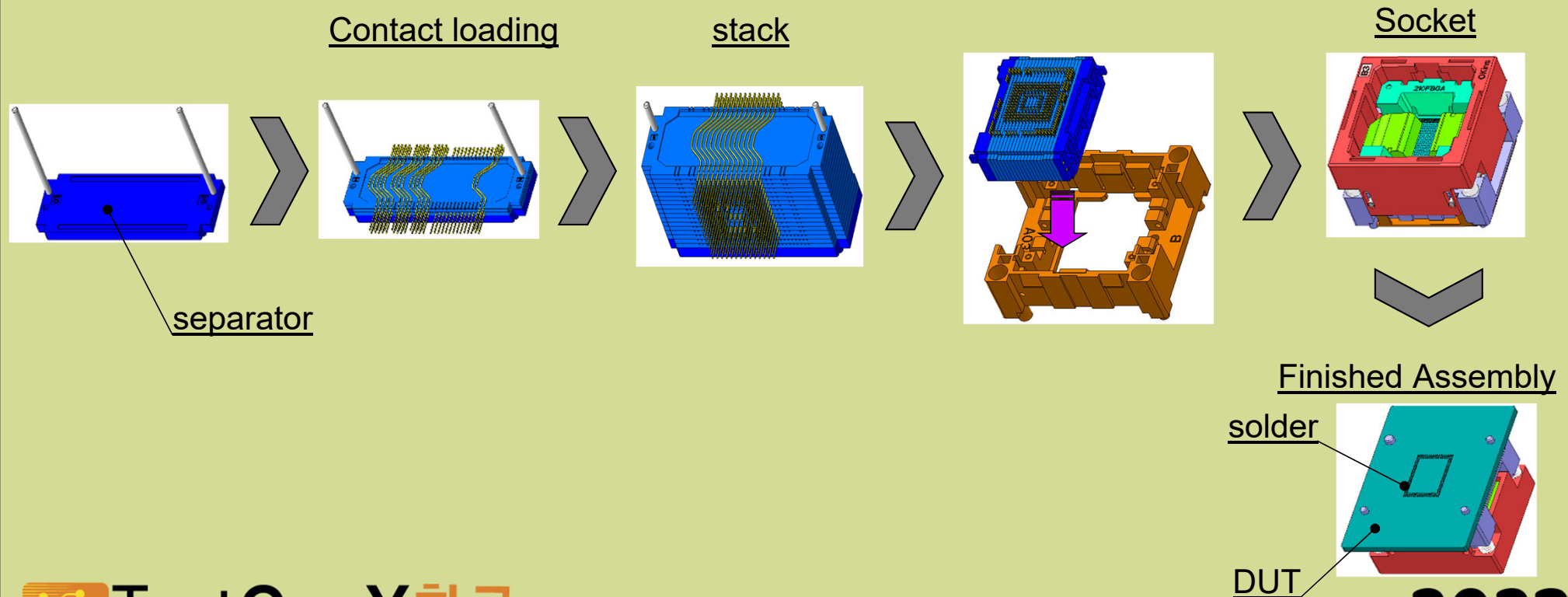


Problem Statement

- Socket Cost Reduction
- Why burn-in socket? (instead of custom machined socket)
 - Cost
 - Lead time
 - Assembly with PCB:
 - small pitch PCB fabrication cost / reliability
 - Assembly
 - Burn-in board density (efficiency)
 - More burn-in socket per burn-in board, due to smaller socket size
- Small pitch roadmap: under 0.27mm
 - Nearing limit of current burn-in socket: cost & reliability
 - Need new technology with roadmap to **0.1mm** pitch

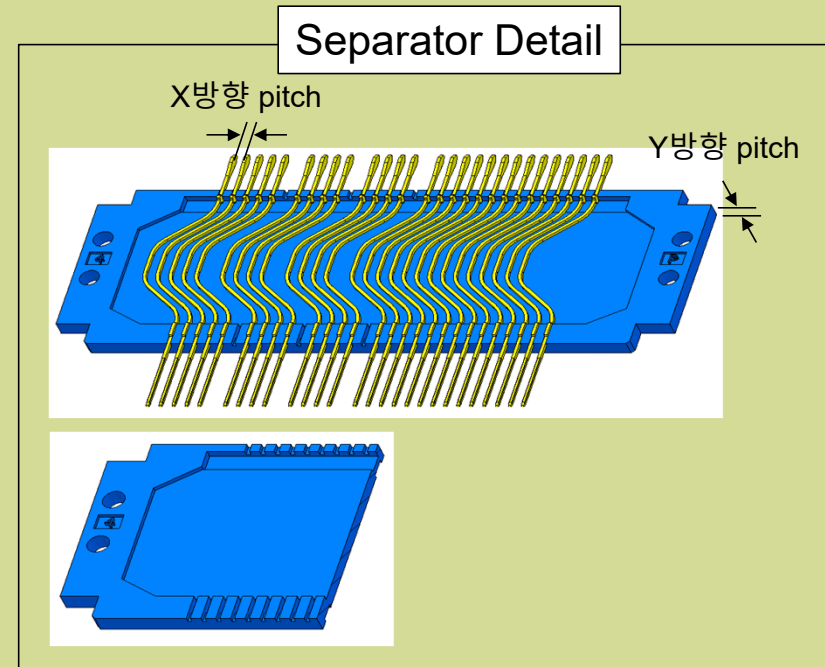
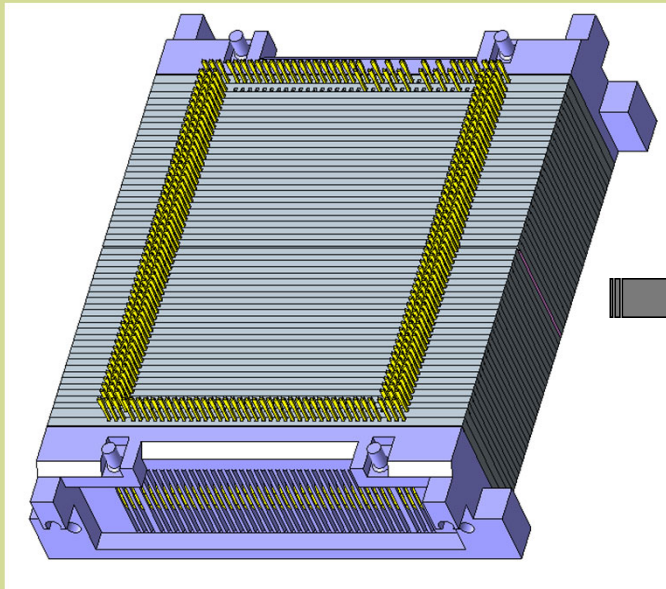
Problem 1 – Complex Build, Complex BOM

- Current Burn-in Socket Manufacturing Process



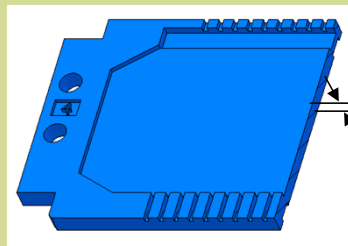
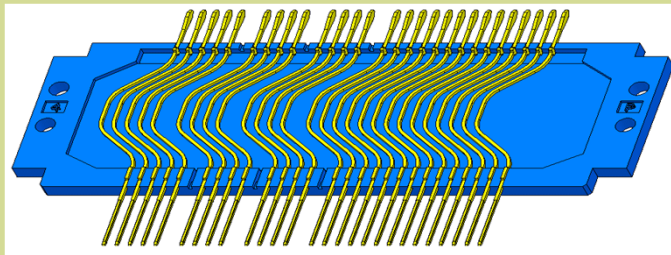
Problem 2 – Multiple Custom Injection Mold Parts

- Multiple new parts required for each X, Y pitch & thickness



Problem 3 – Lack of $< 0.25\text{mm}$ pitch Burn-In socket solution

- $< 0.25\text{mm}$ pitch Burn-in socket is challenging under current burn-in socket technology.



Need $< 0.1\text{mm}$
Separator

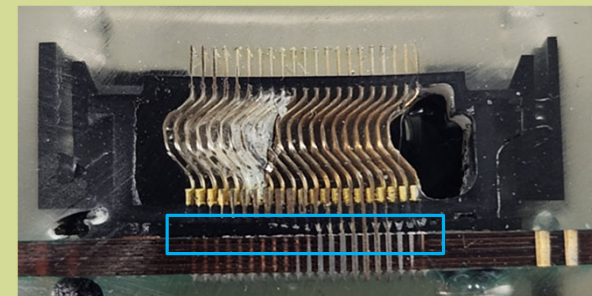
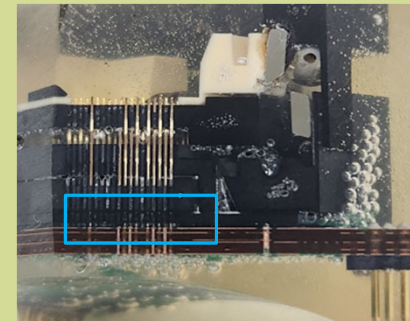
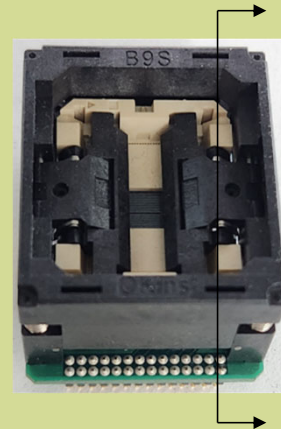
Problem 4 - Assembly

- Current Burn-in Socket: Any soldering (assembly) problem between socket & PCB are not repairable.

DUT Bottom: repairable



Between Socket & DUT: Non-repairable



What if ...

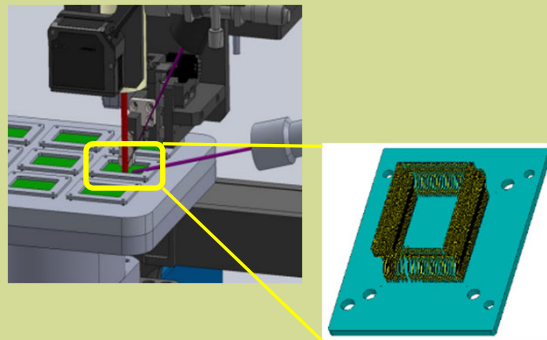
- Instead of
 - Complete Socket
 - Complete PCB
 - Assemble
- Assemble (socket) contacts on PCB first
- Add socket housing last

→ **IF Socket**: Inside First

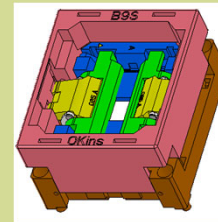
IF Socket – Short lead time, Simple Process

- IF Socket Build Process

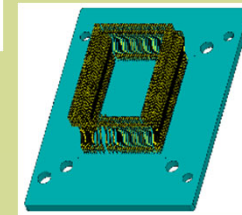
Assemble Contacts on PCB First



Housing

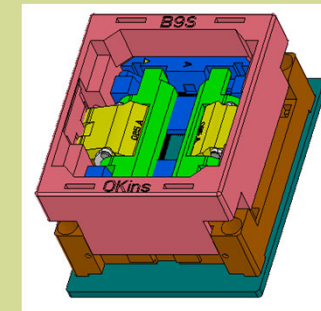


Add Housing



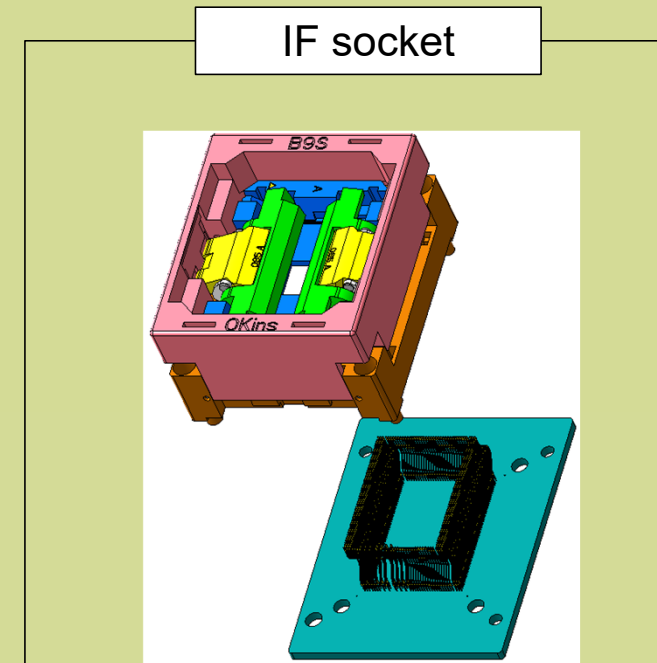
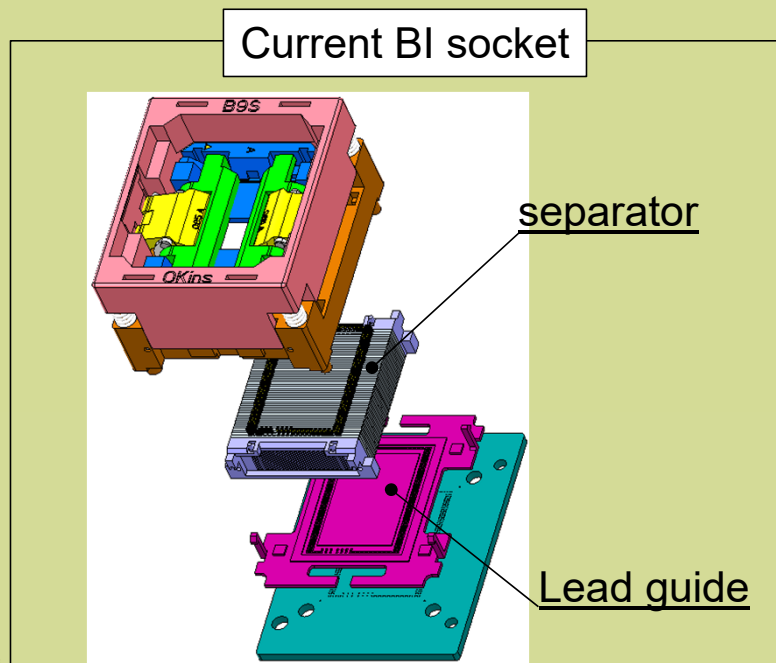
Finished Assembly

(socket + PCB)



IF Socket – Reduced Parts, Reduced Cost

- Eliminating the separator of the current burn-in socket reduce parts & cost

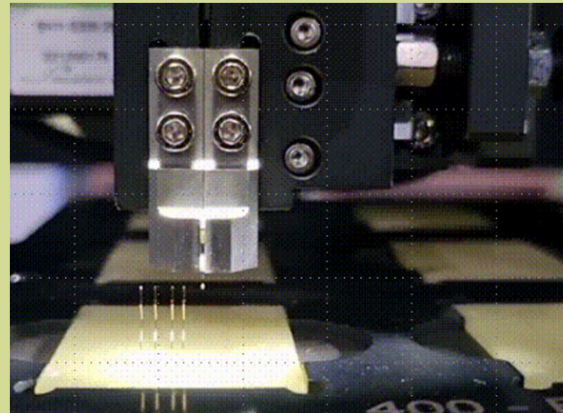


IF Socket – Short Lead Time

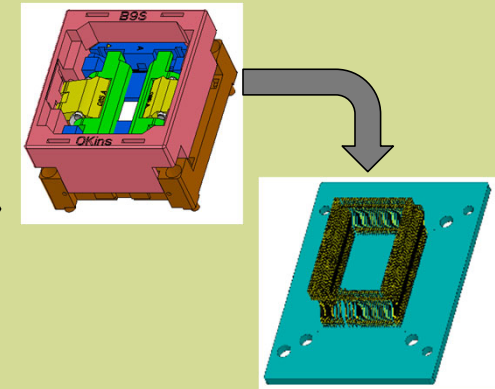
#1 Self Alignment



#2 Contact Bonding



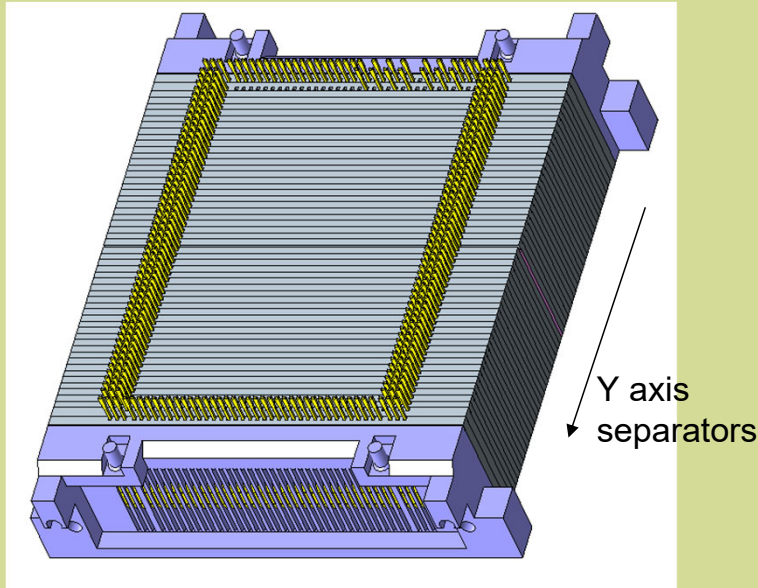
#3 Housing Assembly



1 Day Socket!

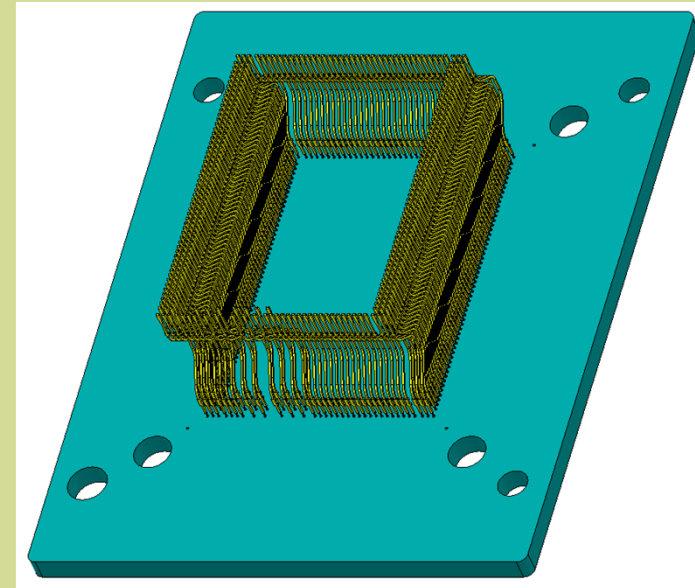
IF Socket – Nimble Pitch Change

Current BI socket



- Current BI socket: Mixed pitch requires multiple injection molds

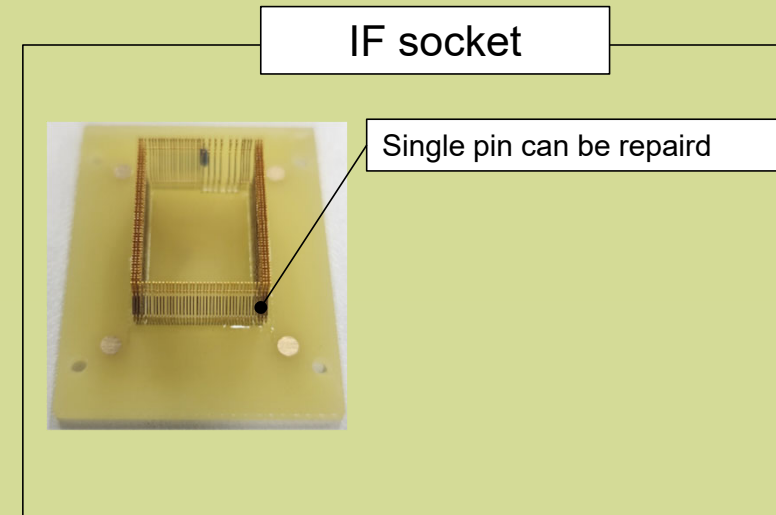
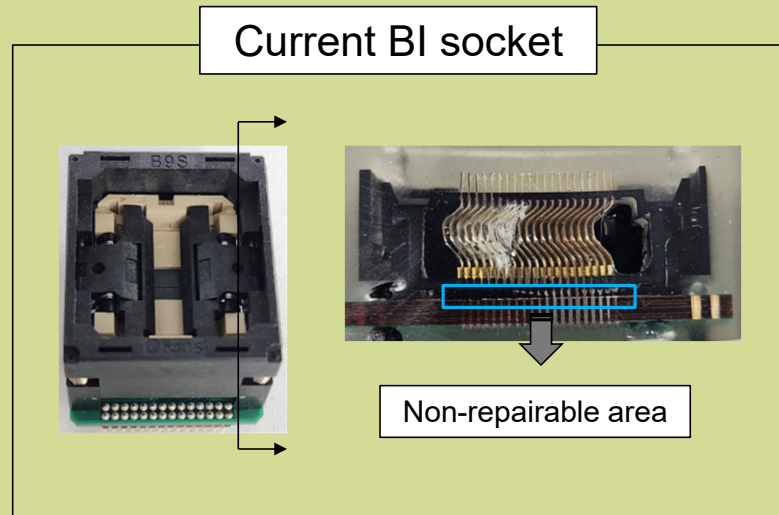
IF socket



- Can build any pitch / pin layout pattern

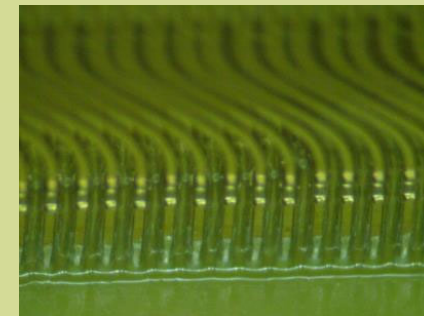
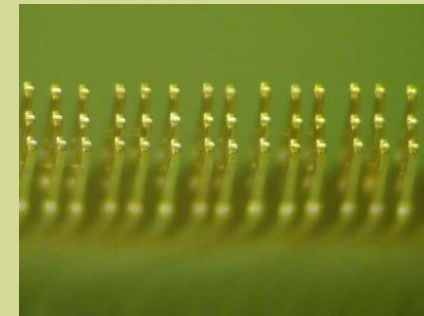
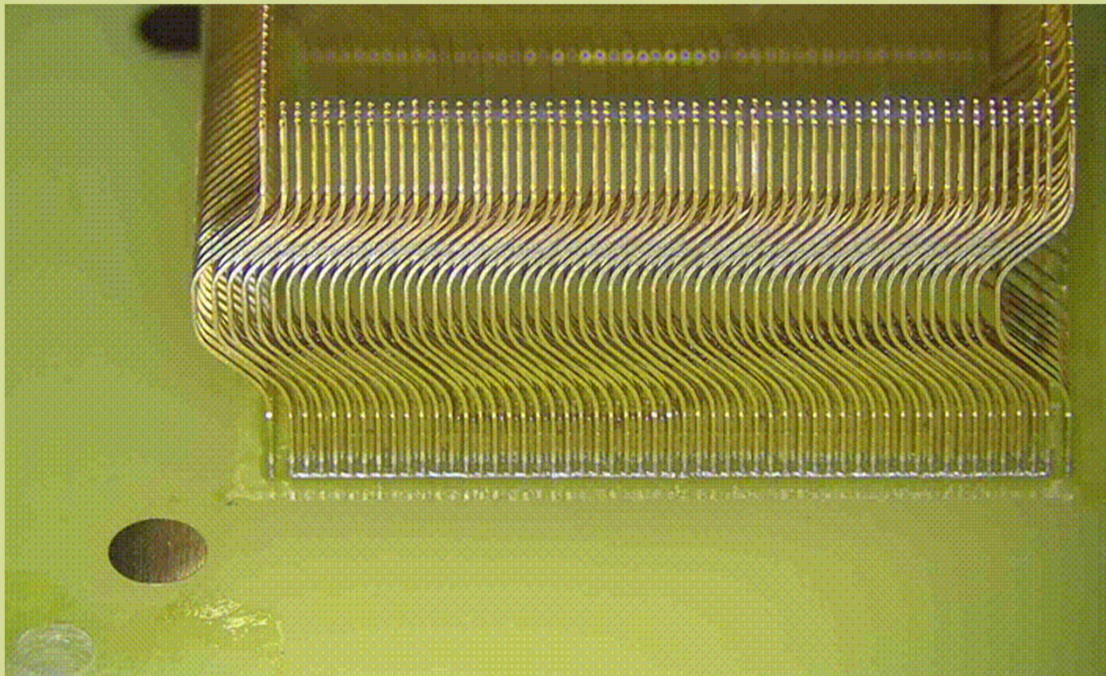
IF Socket – Repairable

- Current burn-in socket will have defects at $< 0.25\text{mm}$ pitch
- IF Socket: Any defect can be repaired at single pin level.



IF Socket Demo -1

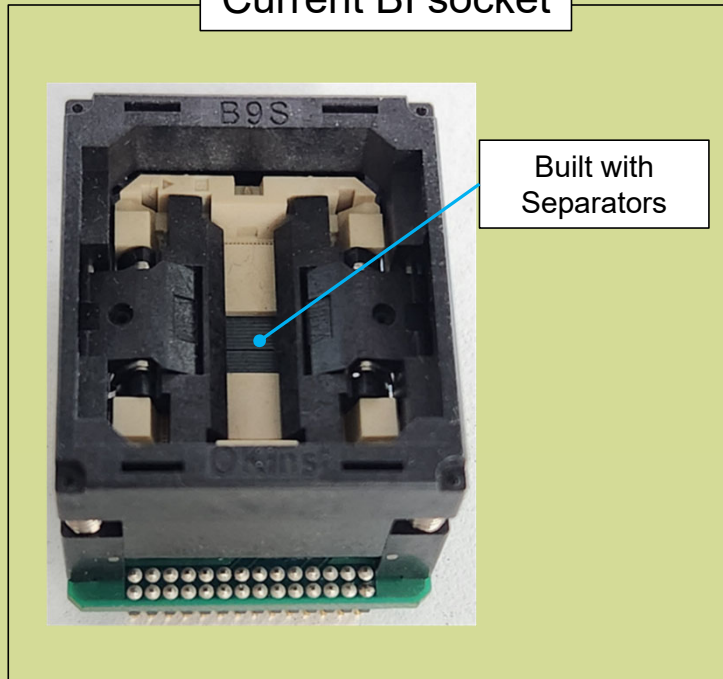
- 0.3mm pitch 400FBGA LPDDR5 Socket



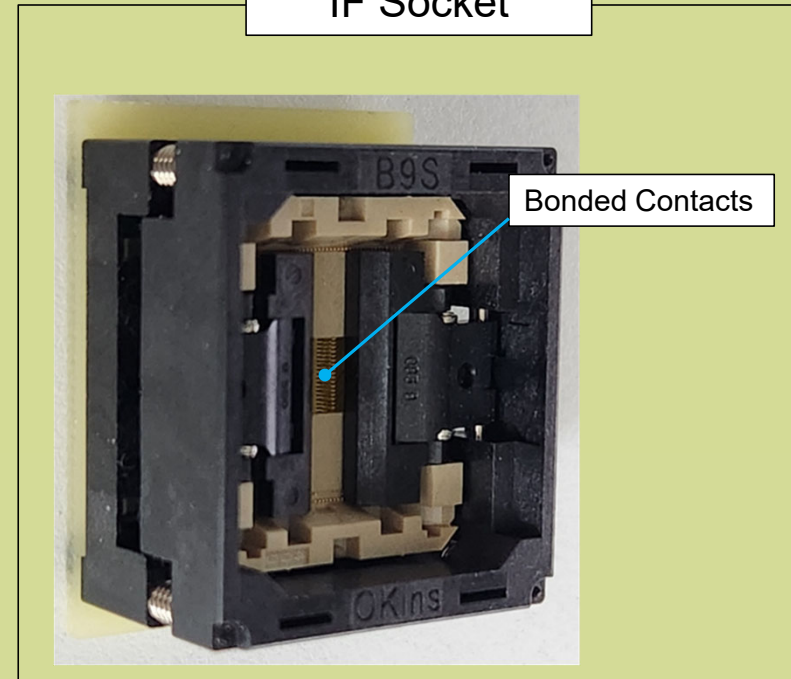
IF Socket Demo -2

- 0.3mm pitch 400FBGA LPDDR5 Socket Comparison

Current BI socket



IF Socket



Conclusion

- New burn-in socket: IF Socket
- Short lead time
 - 1 Day
- Low cost (due to reduced components)
- Reduced NRE
- Path to multiple pin map & small pitch
 - Up to 0.1mm pitch
- Quick inspection of defects:
 - Cold solder, Solder bridge
- Repairable



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2023

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