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## The Latest WLCSP Probe

(An Exercise in Continuous Improvement)

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### Problem:

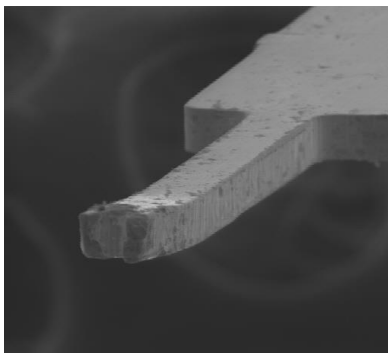
Spring probe contactor in a “Wafer-Level” \* application reported to have bent and broken probes

### Details:

Once bent, probes also damaged contactor housing (body)

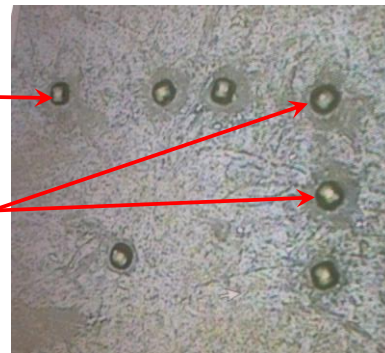
Occurrence random, typically 300 k to 500 k touchdowns

(Probes more typically last 1 M – 2 M touchdowns)



*probes bent and  
tips damaged*

*probe  
oversized  
probe  
holes*



*probe holes enlarged  
and deformed*

### \* Note:

It was later determined that this was not a true wafer-level test application, but a film-frame application

These applications are very similar with one important difference:

Devices on film frames are not as accurately positioned as devices on a wafer



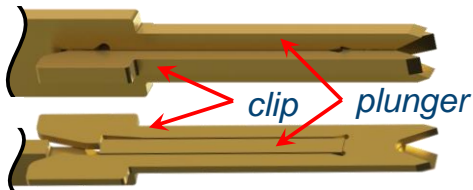
## Objective:

Identify best solution for preventing bending and breaking:

- Identify and establish best mechanical performance operating window
- Ensure best in class electrical performance

## Discovery Process:

- Ran a controlled DOE to achieve quality outputs/results
- Identified and established best performance operating window
- Established optimal strength, force, compliance, resistance, conductivity, and bandwidth

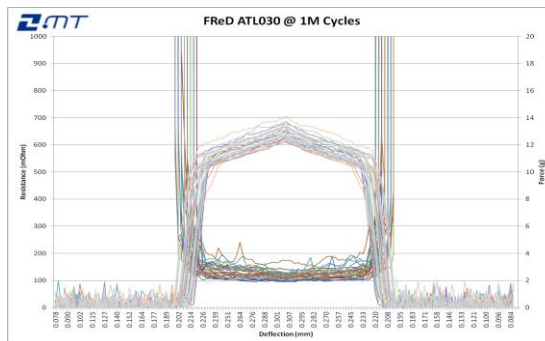
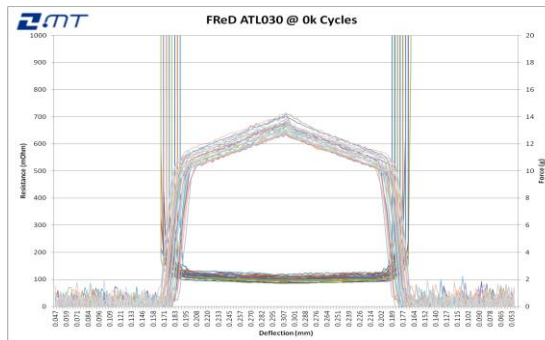
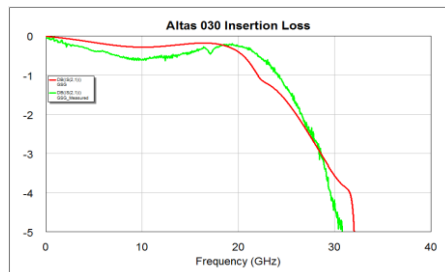
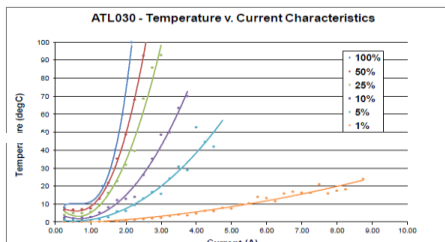


## Solution:

- Reinforced probe tip, made of same material as the plunger
  - Added third piece (clip) to create 3D tip from flat components
  - Developed an extremely precise fabrication capability
- The clip is a patented feature. US patent number 7,862,391

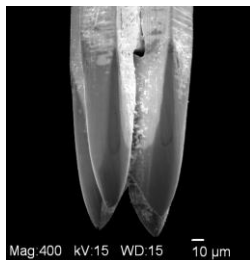
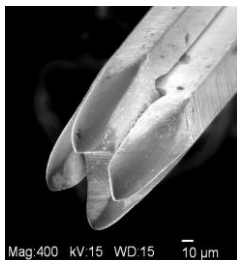
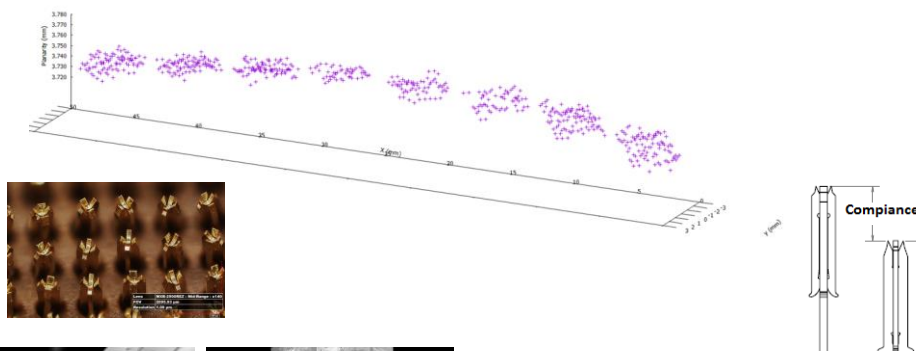
## Validation:

- Laboratory cycle test the enhanced tip to 1 M + cycles
- Test the Current Carrying Capacity (T-Rise method) to confirm no degradation in performance
- Re-measure RF performance
- Test cleaning performance in-situ with abrasive cleaning sheets used by customers



## Validation in WLCSP Customer Applications

- Leveraging probe card metrics including probe tip position, tip size, and tip planarity to ensure a highly reliable and repeatable interconnect
- Maintaining the true fidelity of the originating test signals
- Providing enough compliance to accommodate bump and device irregularities in multisite test applications



## Cleaning

- Tip sharpness and geometries maintained when cleaned with standard cleaning sheets

## Conclusion

- Resolved the issue of bent and broken probes
- Created a probe that works in the most demanding applications
- Improved the force, compliance, planarity, and operating life for increased throughput in test
- Delivered the electrical performance characteristics needed to bring full parametric test to the world of WLCSP testing in the lab and production
- Extended the solution into a variety of applications and sizes

