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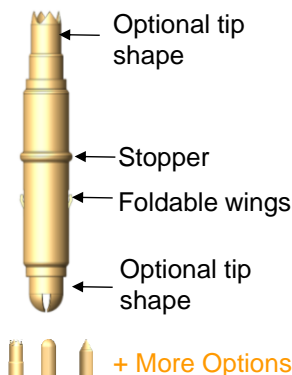
Spring probe with reliable signal path and low cost for high speed/high pin count socket

Samuel Pak / IWIN Co., Ltd

Challenges

- Development of spring probe pins good for extremely high pin count socket.
- Improve reliability and performance of the pins remarkably while traditional spring probes have technical limit to deal with the potential issue of unstable signal path after repeated insertions.
- Socket scale becomes larger in X and Y but thinner in thickness due to spring probe become shorter.
- Working stroke shall be maximized to increase reliability of the socket even though pin length is getting shorter.
- Need solution to reduce manufacturing cost for pins and socket assembly, and cost of quality.

Stamped

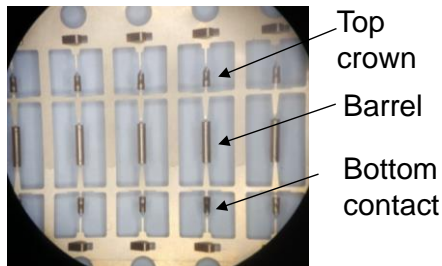
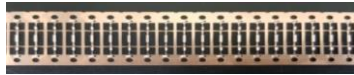


How to settle challenges ?

- Spring probe consists of upper crown, lower crown, and barrel.
- Piece parts made by stamping
- Pin design enables one piece housing good for high pin count socket
- Stable signal path by compressed force between crown and barrel.
- Automation enables pin assembly easier

How to deal with challenges ?

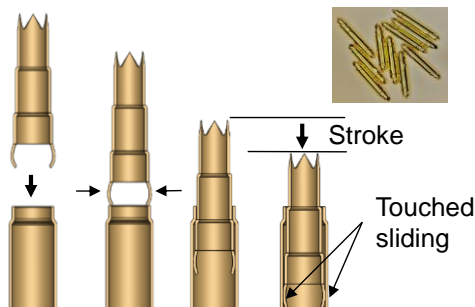
Piece parts made by stamping & parts layout



Parts layout good for auto pin assembly

- Piece parts, upper crown, barrel, and bottom contact are made by stamping process
- Parts layout designed for auto pin assembly
- The strip with parts will be fed into pin assembly machine along with spring

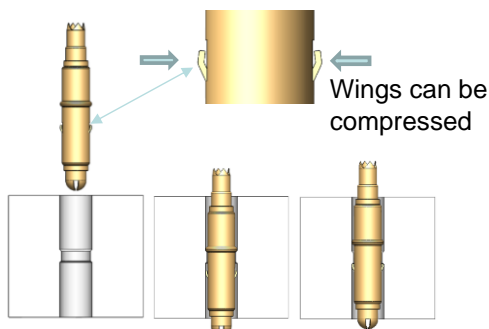
Pin design for reliable signal path



Reliable signal path and performance

- Contact between Top crown and Barrel, Barrel and Bottom contact are reliable by sliding concept
- Safety factor of coil spring can be improved as there is enough space for a coil spring.

Once piece socket design



One piece housing advantages:

- No need two piece housing
- Thickness of housing could be doubled
- Warpage due to thin housing can be prevented
- Less housing cost
- Less socket assembly cost as automation for pin insertion much easier

One piece house
Pin can move in the socket but does not separate.

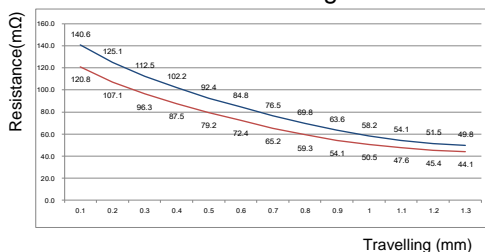
Experimental Run

Pin count : 43,000 pins/socket
Max travelling: 1.3 mm

Pitch: 1.0mm
Spring force: 18 grams/pin

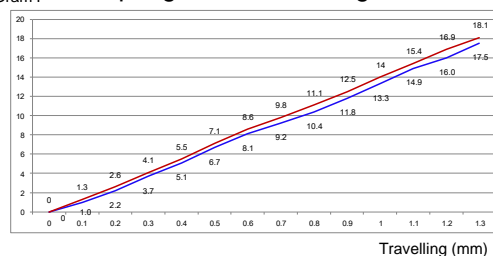
Compressed height: 3.2mm

Cres/Travelling

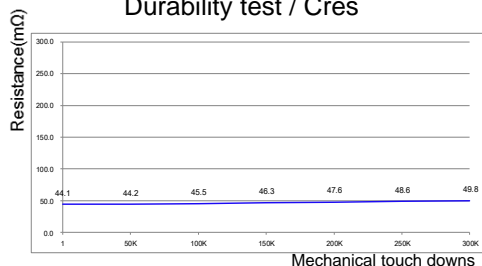


Gram F

Spring Force/Travelling



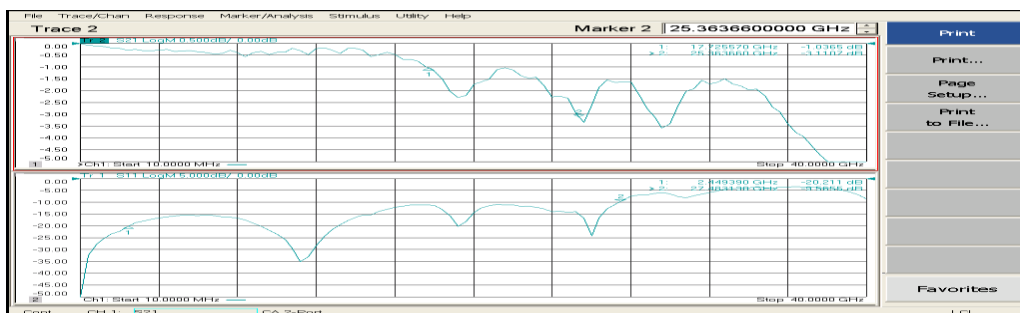
Durability test / Cres



Current Carrying Capacity

Current	Sample 1	Sample 2	Sample 3	Sample 4	Sample 5
1.0A	OK	OK	OK	OK	OK
1.5A	OK	OK	OK	OK	OK
2.0A	OK	OK	OK	OK	OK
2.5A	OK	OK	OK	OK	OK
3.0A	OK	OK	OK	OK	OK
3.5A	OK	OK	OK	OK	OK
4.0A	OK	OK	OK	OK	OK
4.5A	OK	C/F Changed	OK	OK	OK
5.0A	C/F Changed		C/F Changed	C/F Changed	C/F Changed

— Before cycling — After 300K cycles



GSG Insertion Loss: -1dB @ 17 GHz , -3dB @ 25GHz
Return Loss: -20dB @ 2.4 GHz, -10dB @ 27 GHz

Conclusion and Next plan

- High speed parts/minute production by stamping.
- Easier quality management once stamping tool is qualified.
- One tool can have several optional change, crown, length, tip shape.
- Low cost/pin possible for high volume application.
- Lead time for development of new stamping tool shall be reduced.
- Initial tooling cost shall be reduced.
- Need to develop the tool for finer pitch