

One Type Wiping Contact Introduction

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Smiths Interconnect



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Shenzhen ■ □ October 25, 2018



Agenda

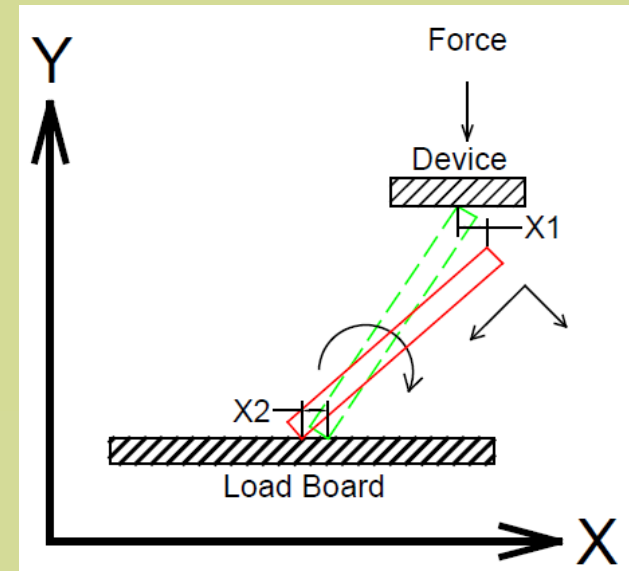
- Wiping Contact Introduction
- One Type Wiping Contact Performance & Test Results
- Summary

What's Wiping Contact

Wiping contact is widely used for lead less peripheral IC packages such as QFN

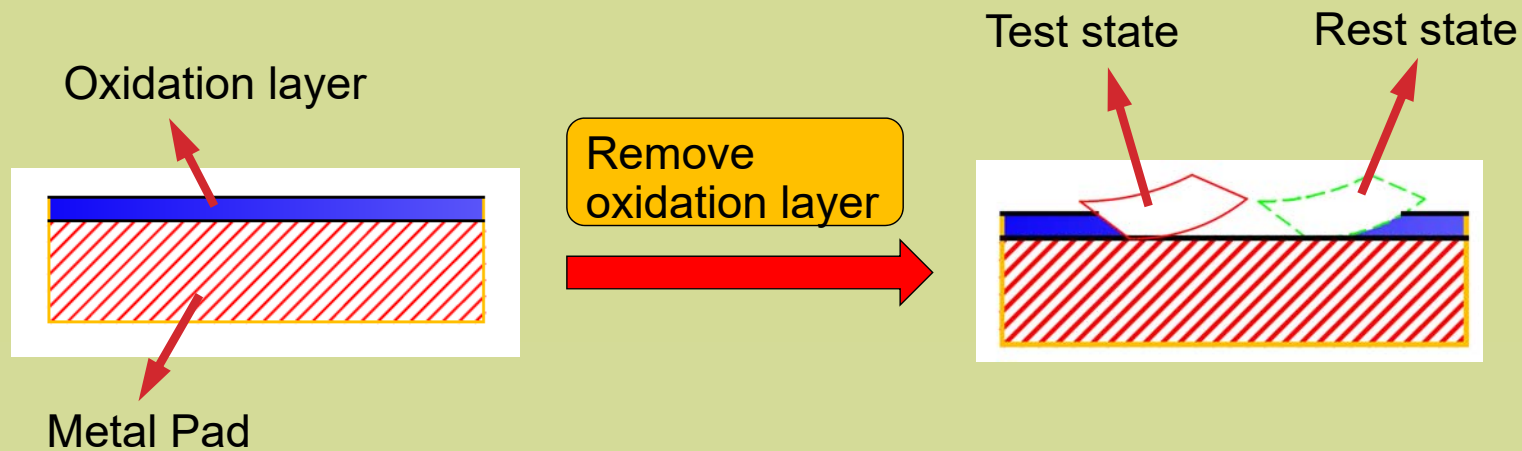
Methodology:

- Force generate Y axis displacement
- Side force at X axis to cause the displacement (X1, X2), wiping the devices and load board pads



Contact Mechanism: Wiping Action

Wiping action can lower the contact resistance by removing surface contaminants



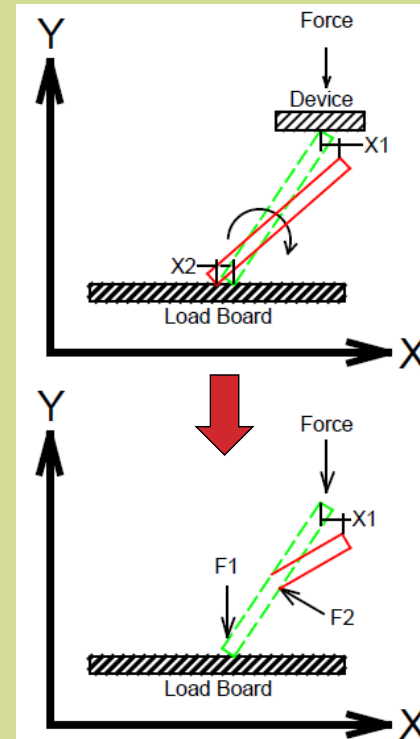
Additional Research Of Wiping Action

Disadvantages:

- Cyclical wiping action wear the PCB pad
- Poor force to generate the wiping action on package pad at X axis

Measures:

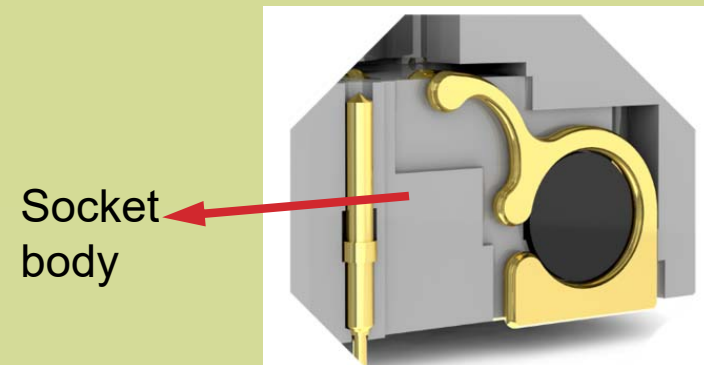
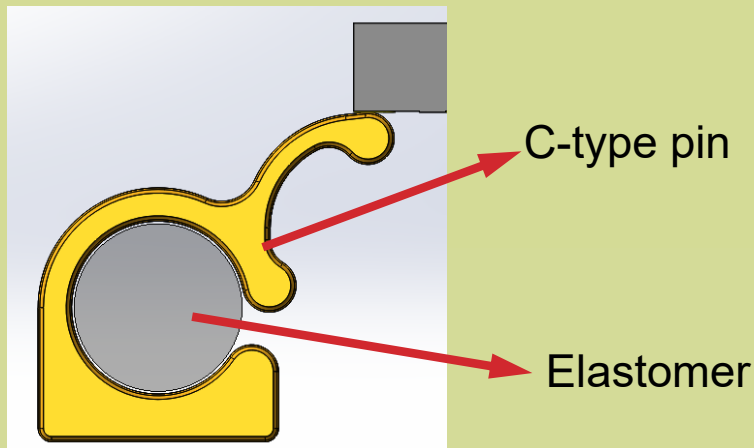
- Apply F1 to prevent wiping action on load board (reduce or remove X2)
- Apply F2 to increase the wiping action on package pad



One Type Wiping Contact Structure

Celsius contact

- Socket Body
- Elastomer: Provide preload & force to protect pin
- 0.5mm Pitch & 0.4mm Pitch

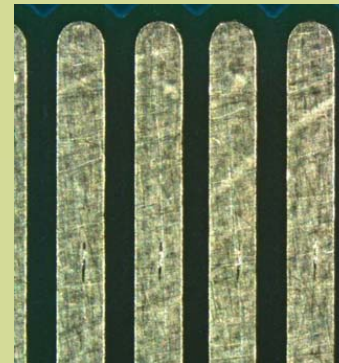
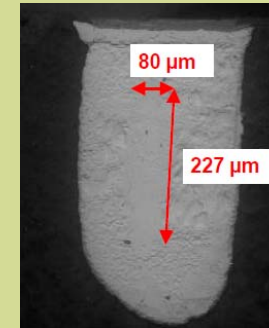
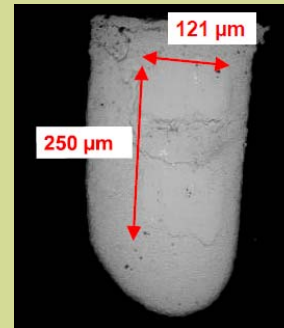


The Performance Of Testing For Celsius Contact

- Mechanical
 - Contact mark
 - Force Vs Deflection
 - Cycle life
 - Ranging temperatures
- Electrical
 - Resistance
 - Current Carrying Capacity
 - RF

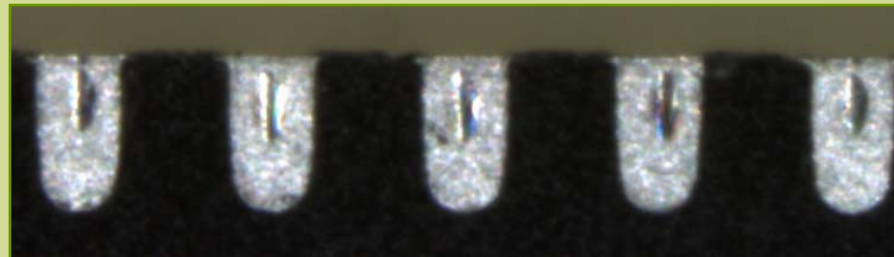
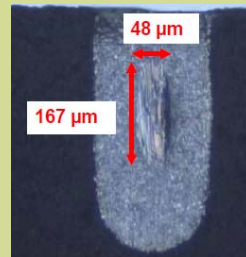
Contact Mark

- Wiping contact mark
 - Consistent scrub
 - Free from board scrub
- PCB mark
 - No clear mark on Au test pads



Contact Mark

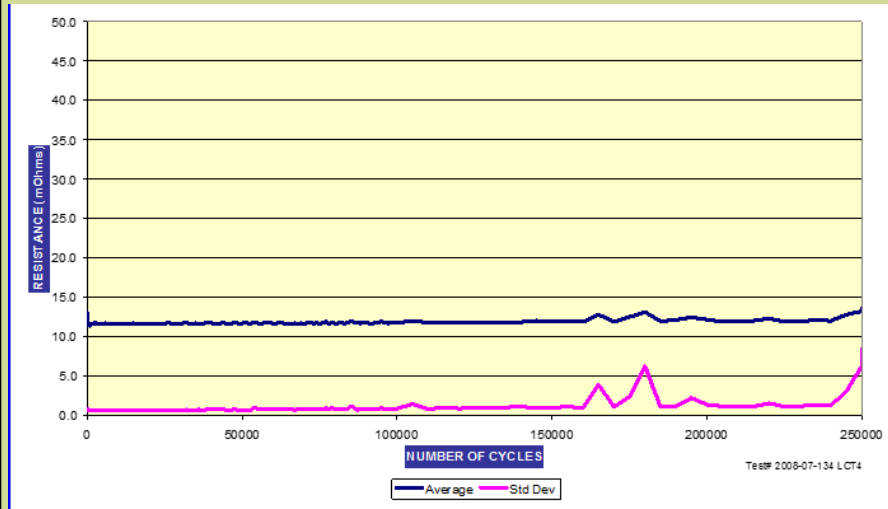
- Wiping contact surface
 - Penetrating ridged head
 - Touchdown accuracy and consistency



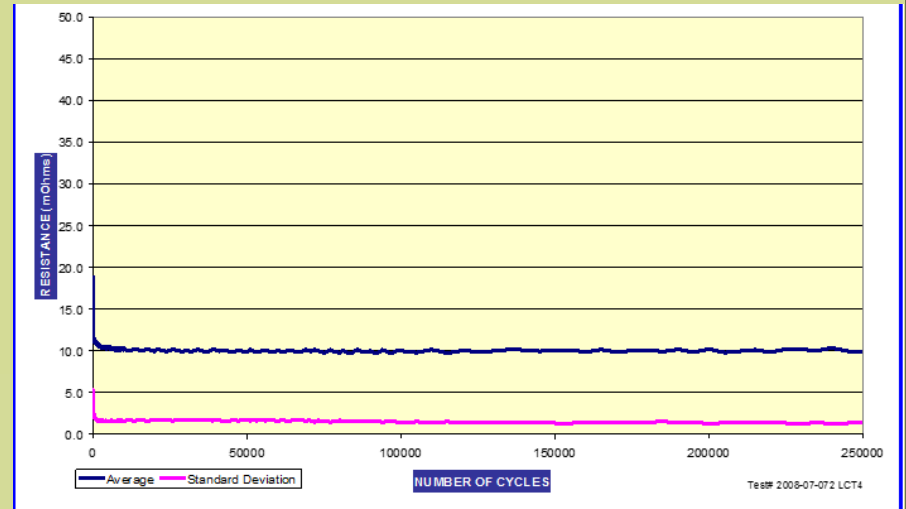
High & Low Temperature (P 0.5mm)

P 0.5mm Wiping pin

- -40°C through 150°C for 250,000 cycles
- Low average contact resistance under 15 milliohms



Test results at 150C



Test results at -40C



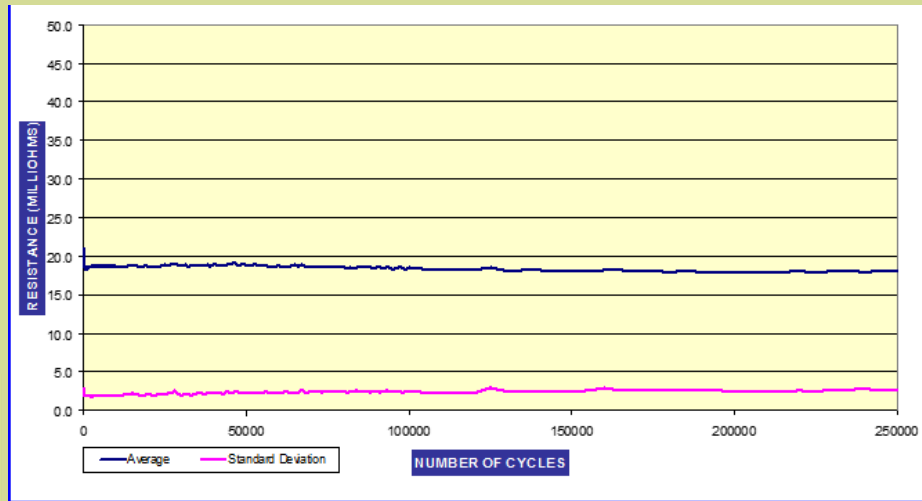
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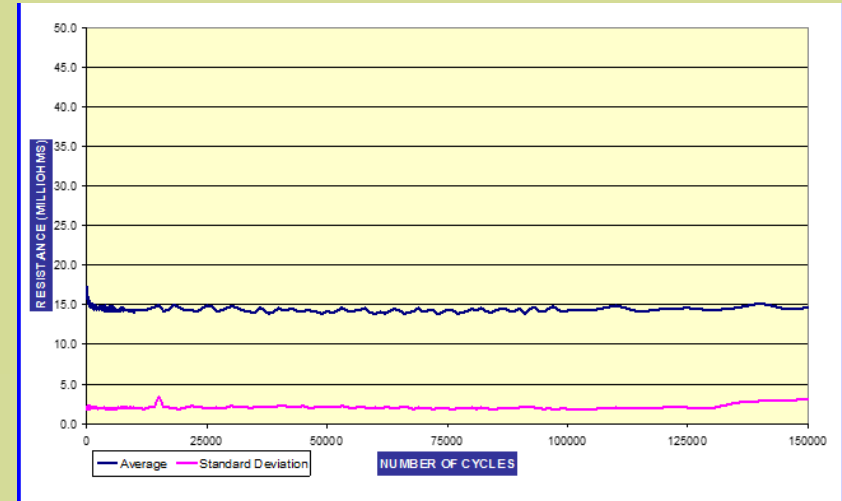
High & Low Temperature (P 0.4mm)

P 0.4mm Wiping pin

- -40°C through 150°C for 150,000 cycles
- Low average contact resistance under 20 milliohms



Test results at 150C



Test results at -40C



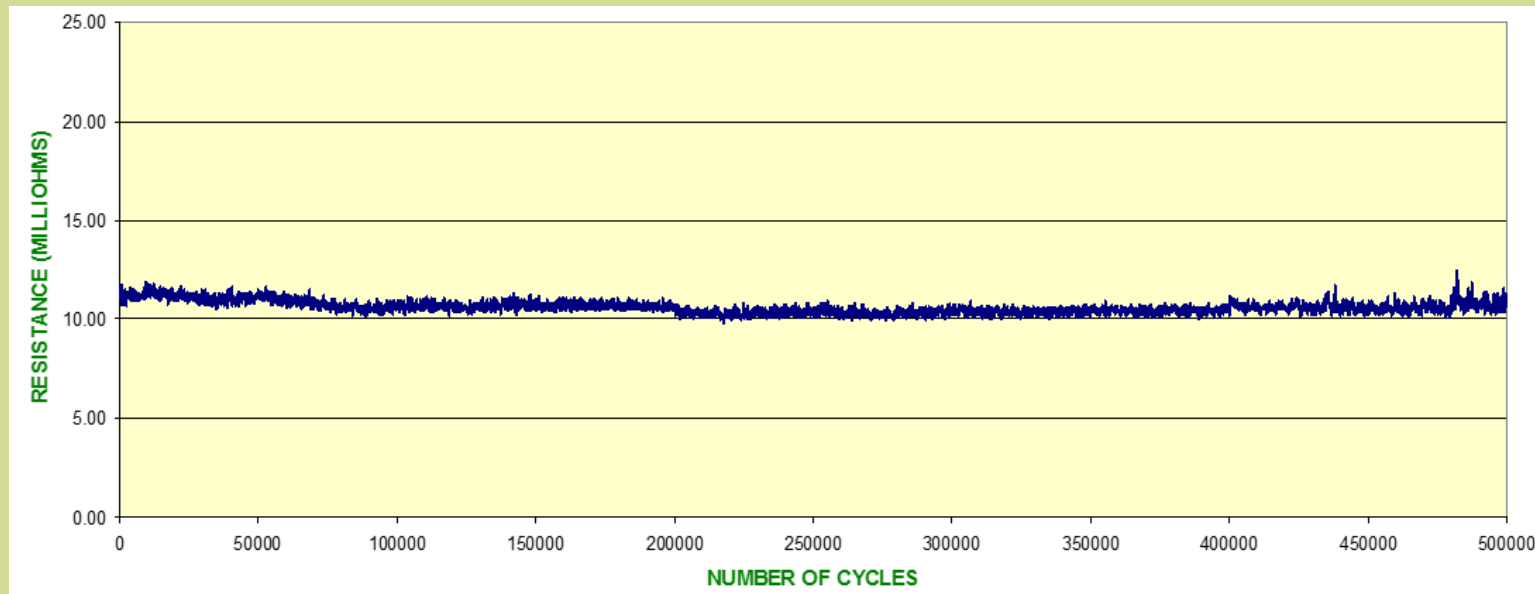
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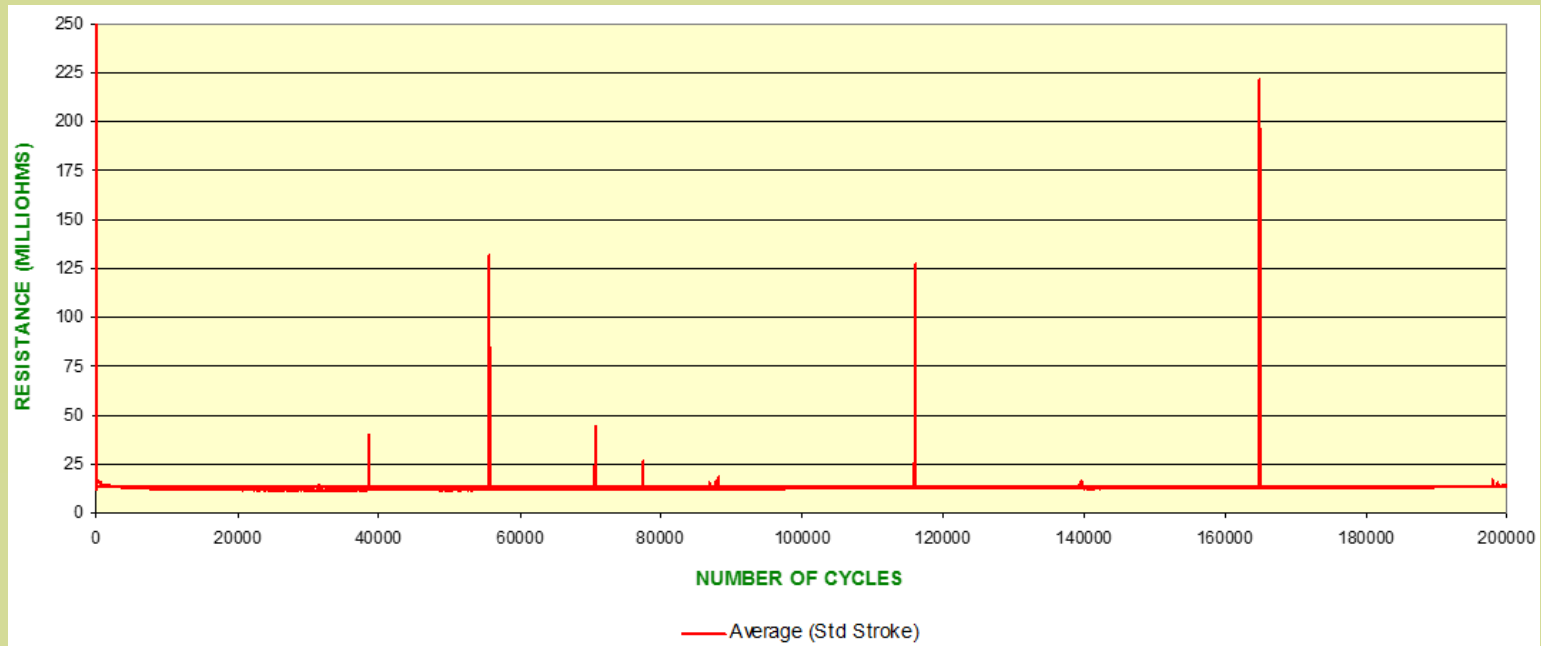
Life Cycle Testing With Matte Sn Pad

- 500K cycles
- Low resistance



Life Cycle Testing With NiPdAu Pad

Test results 200,000 cycles

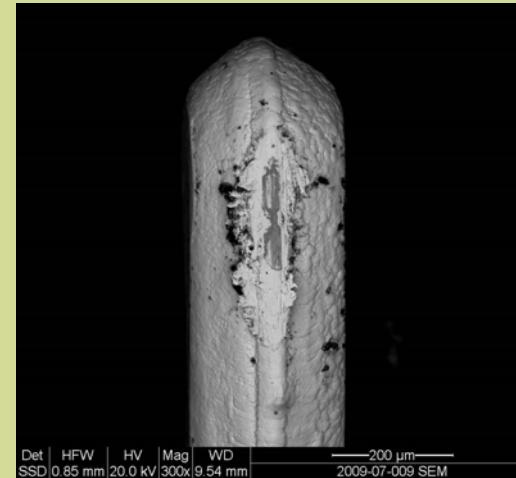


Life Cycle Testing With NiPdAu Pad

Stable performance despite more aggressive wear and hardness



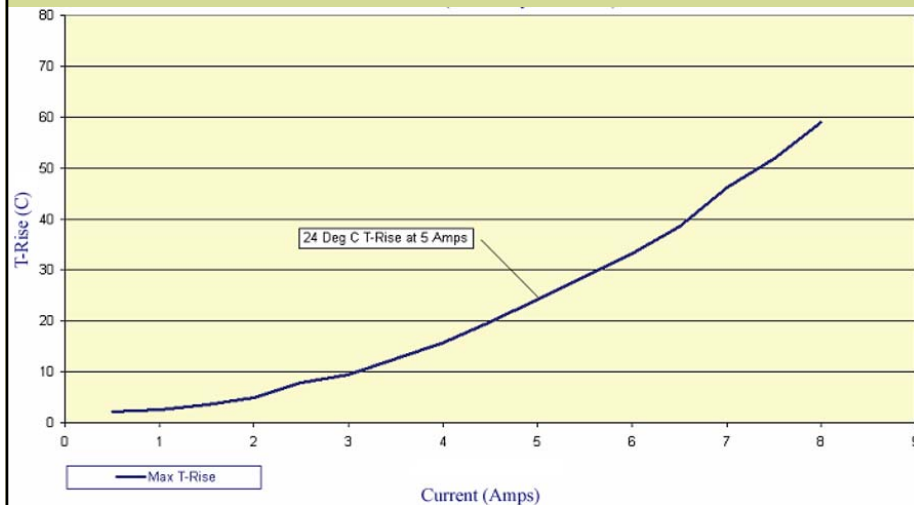
Contact after reduced travel



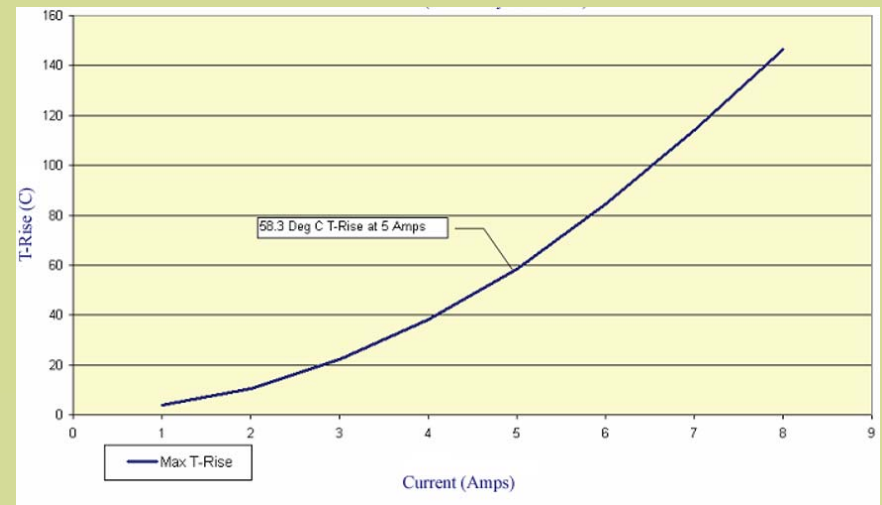
Contact after full travel

Current Carrying Capacity Testing

- Current carrying capacity 8 Amps
- < 60 degree C temp rise at 5 Amps in free air

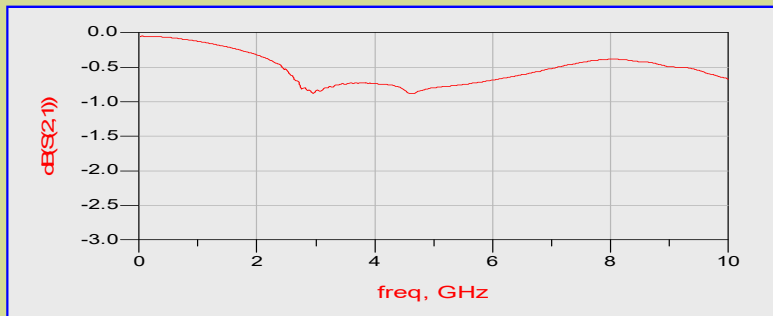


Current test results (P 0.5mm)

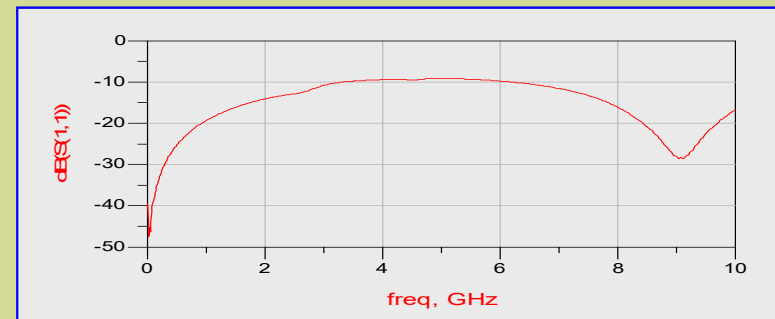
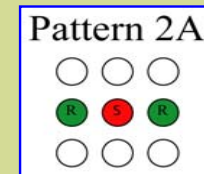


Current test results (P 0.4m)

RF Testing

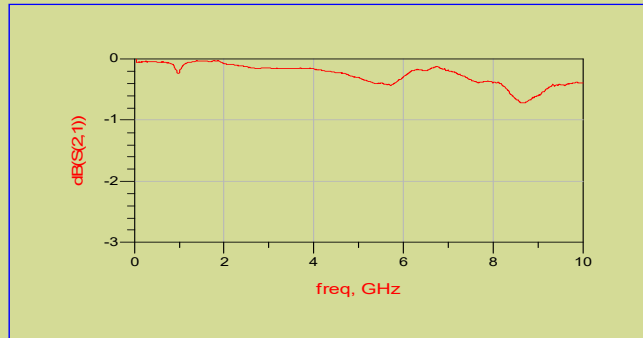


Insertion Loss Single Ended 2A Pattern
(P 0.5mm)
> -1dB at bandwidth 10 GHz

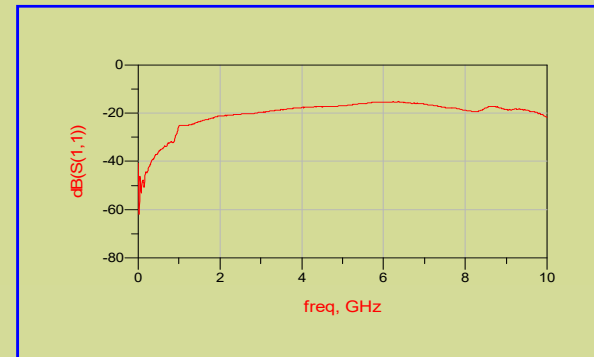
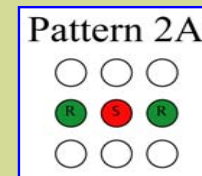


Return Loss Single Ended 2A Pattern
(P 0.5mm)
< -10dB at bandwidth 4 GHz

RF Testing



Insertion Loss Single Ended 2A Pattern
(P 0.4mm)
> -1dB at bandwidth 10 GHz



Return Loss Single Ended 2A Pattern
(P 0.4mm)
< -10dB at bandwidth 10 GHz

Summary

- Consistent contact mark
- Probe-like compression capabilities & larger force
- Insertions: > 500,000 cycles
- Operating temperature: - 40C to 155C
- Resistance < 20 mΩ per contact
- Current carrying capacity: < 80 degree C temp rise at 5 Amps
- Bandwidth of 10GHz at >-1 dB insertion loss

Future Challenges

- Improve the RF performance
- Fine pitch application
- Stable and cheaper socket material to reduce cost

Acknowledgements

I would like to thank my directly manager Jinrong Chen and VP Frank Zhou for their technical supports

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