

EIGHTEENTH ANNUAL

**BiTS**™

**Burn-in & Test Strategies Workshop**

**March 5 - 8, 2017**

**Hilton Phoenix / Mesa Hotel  
Mesa, Arizona**

**Archive – Session 8**

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## Session 8

Hongjun Yao  
Session Chair

### BiTS Workshop 2017 Schedule

# Solutions Day

Wednesday March 8 - 10:30 am

## Contact Frequency

**" Small Form Factor Cantilever Concepts for High Performance Analog / RF Applications"**

Gerhard Gschwendtberger – Cohu

**"MRC (MEMS Rubber Contact) Socket Bump Particle Structure & Performance Analysis"**

BoHyun Kim, Dave Oh, Justin Yun - TSE Co., Ltd

**"Flat Probe Technology For High Frequency Test"**

Jason Mroczkowski, Nadia Steckler - Xcerra

# Small Form Factor Cantilever Concepts for High Performance Analog/ RF Applications

**Gerhard Gschwendtberger**  
**Cohu**



BiTS Workshop  
March 5 - 8, 2017

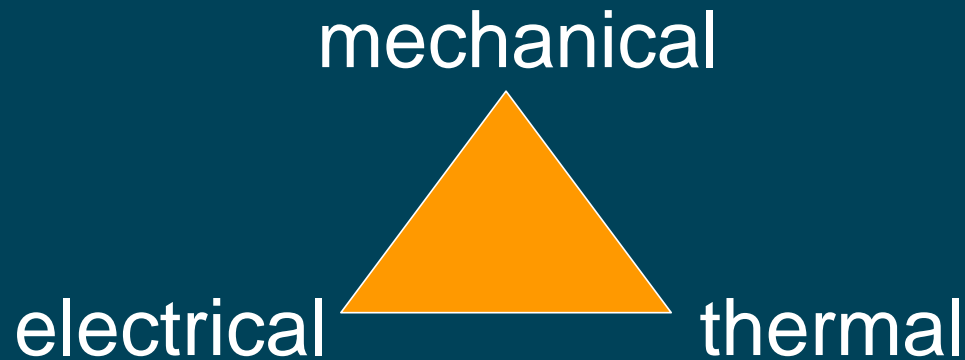


## Content

- Contactor requirements
- New multi-beam cantilever concepts
- RF/Analog & power Kelvin example
- RF/Analog contactor features
- Prototype qualification & specification
- High volume production results
- Summary & outlook

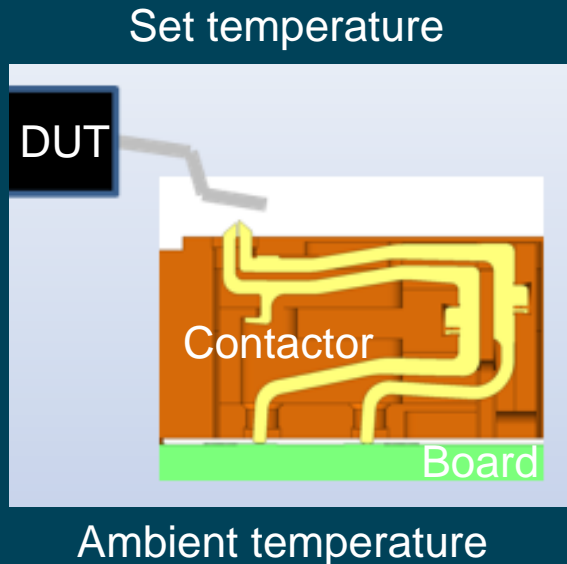
## Contactactor Requirements

Today's contactors have to fulfill more complex requirements in various disciplines.

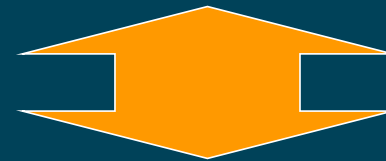


The handling system has significant influence on some of the performance parameters

## Thermal Challenges



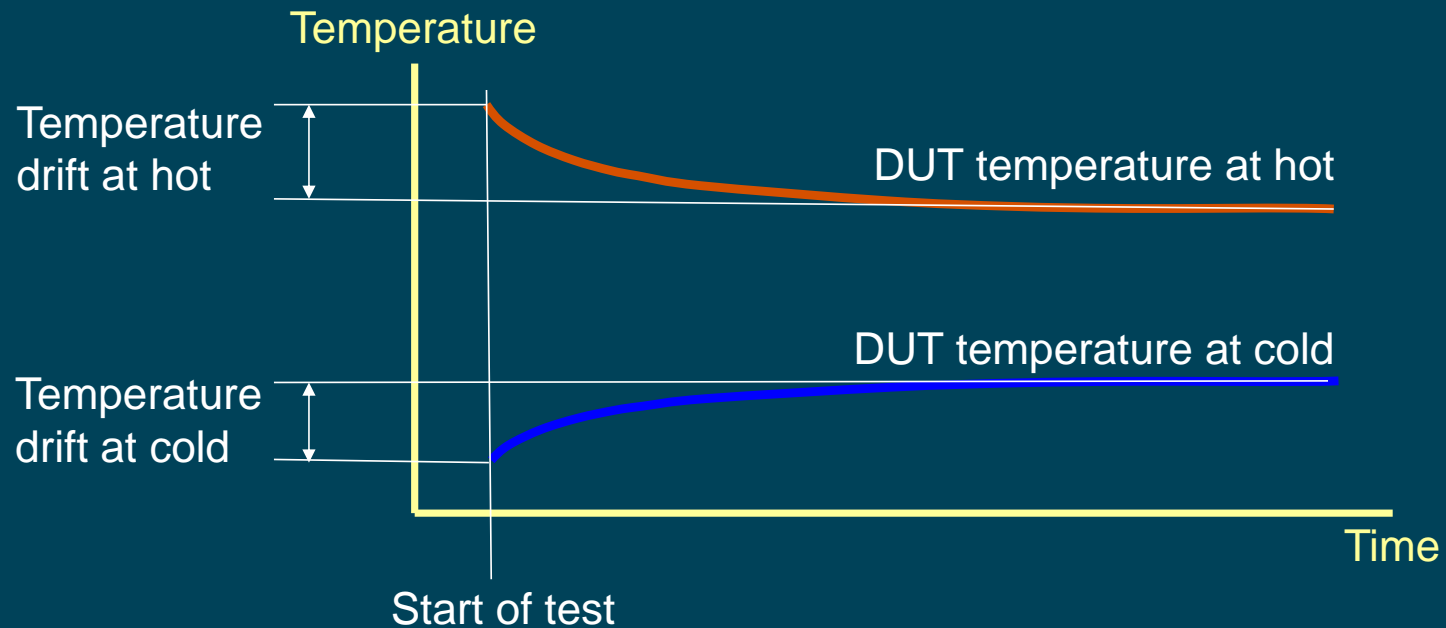
Plunge to board / high performance contactors provide best signal integrity by small contact elements.



Thermal accuracy during test requires large contact surface for thermal conditioning

## Temperature Accuracy During Test

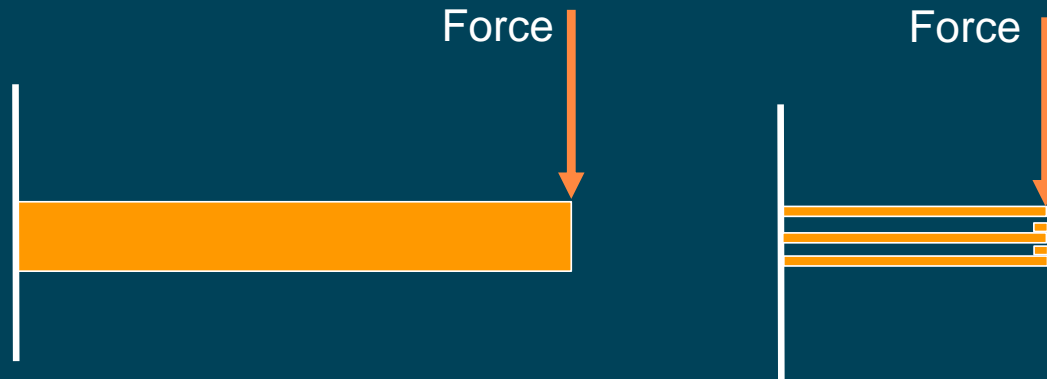
Contactors influence the thermal accuracy of the DUT





# Cantilever Concept Considerations

Multi-beam compared to single-beam concepts

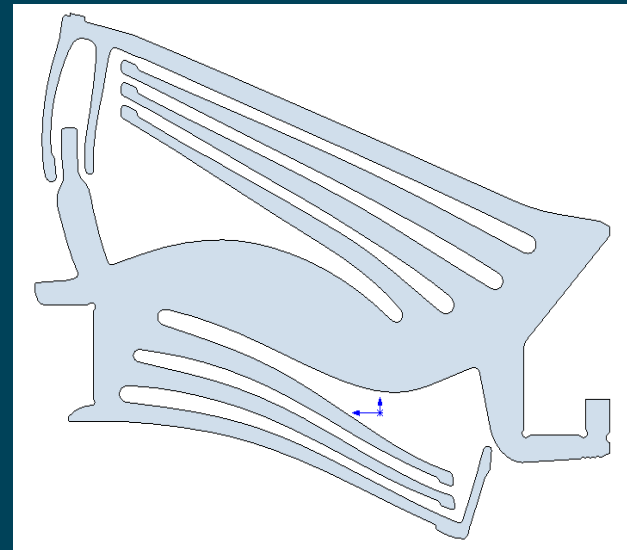


Multi-beam structures allow a smaller formfactor and provide large surface for thermal conditioning

## Multi-Beam Contact Spring Architecture

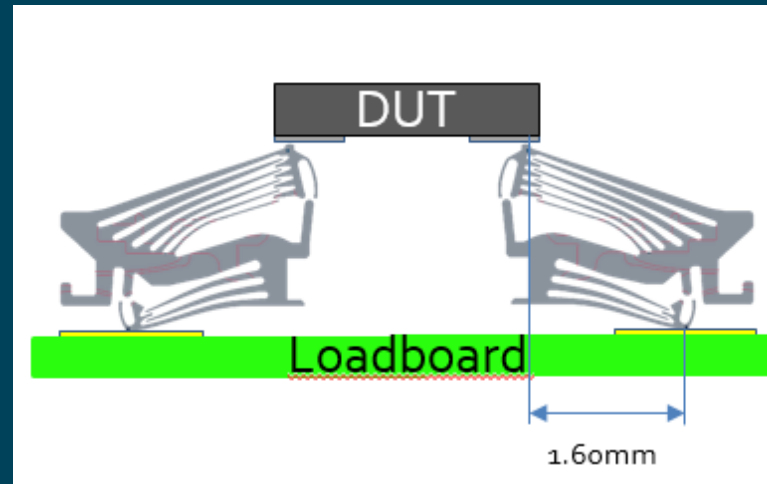


High Power  
Cantilever



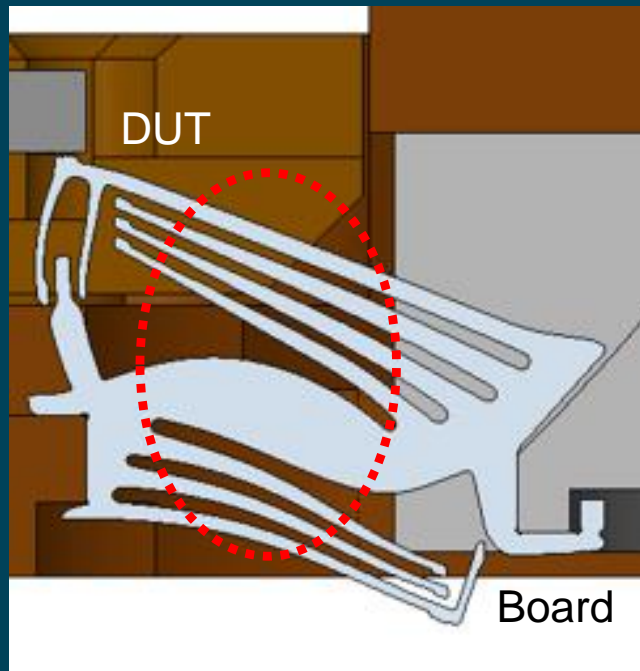
High Performance  
RF/Analog Cantilever

## RF/Analog Cantilever Concept



- Elastomer free multi-beam cantilever
- Scrub against package pad/lead
- Static connection to load board

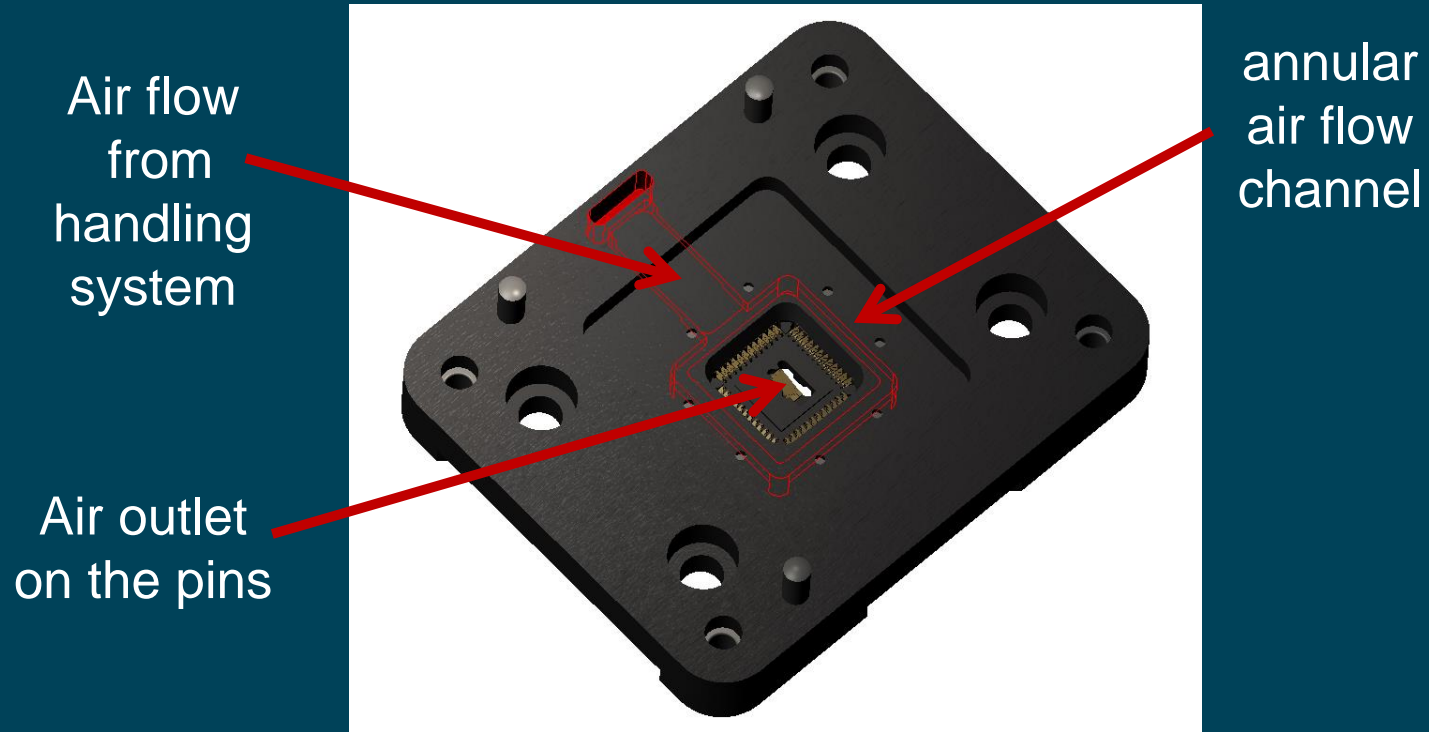
## Contactor Housing Concept



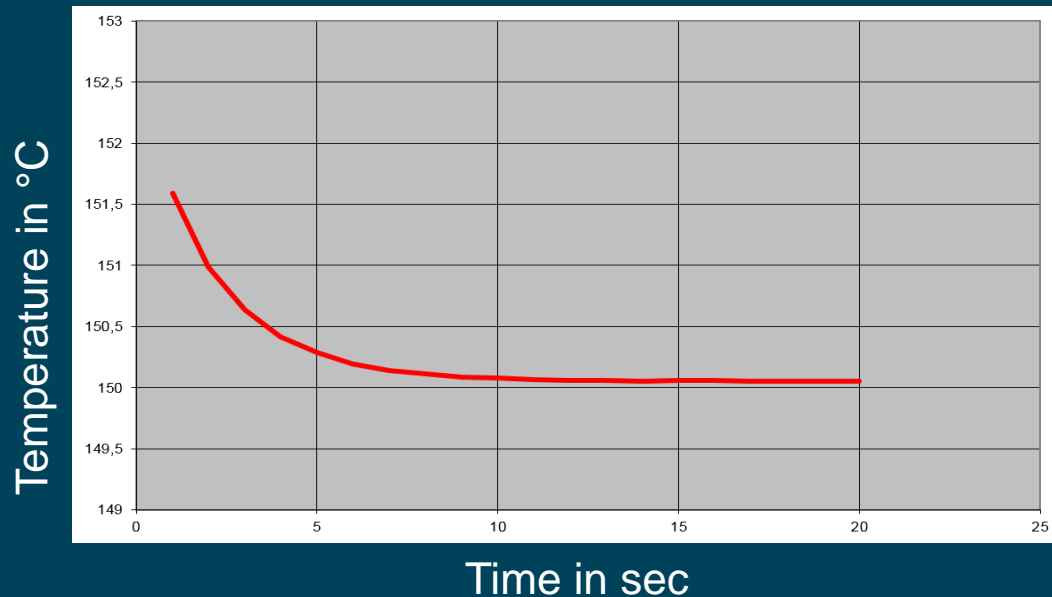
Contact Socket Section

The contact socket design contains air channel features which enable an airstream through the multi-beam structure of the contact spring

## Contactor Housing Thermal Features



## Thermal Drift Measurements



Temperature drift on Coahu handling system with  
150°C set temperature: 1.65°C over 20 sec test-time

## Contactors Specification

### Electrical:

Insertion Loss S21	-1 dB @ 22 GHz	Cres typ.	30mOhm
Return Loss S11	-20 dB @ 12 GHz	CCC	1.2A DC
Crosstalk S41	-20 dB @ 22 GHz		
Self Inductance	0.43nH		

### Mechanical:

#### Compressed Contact

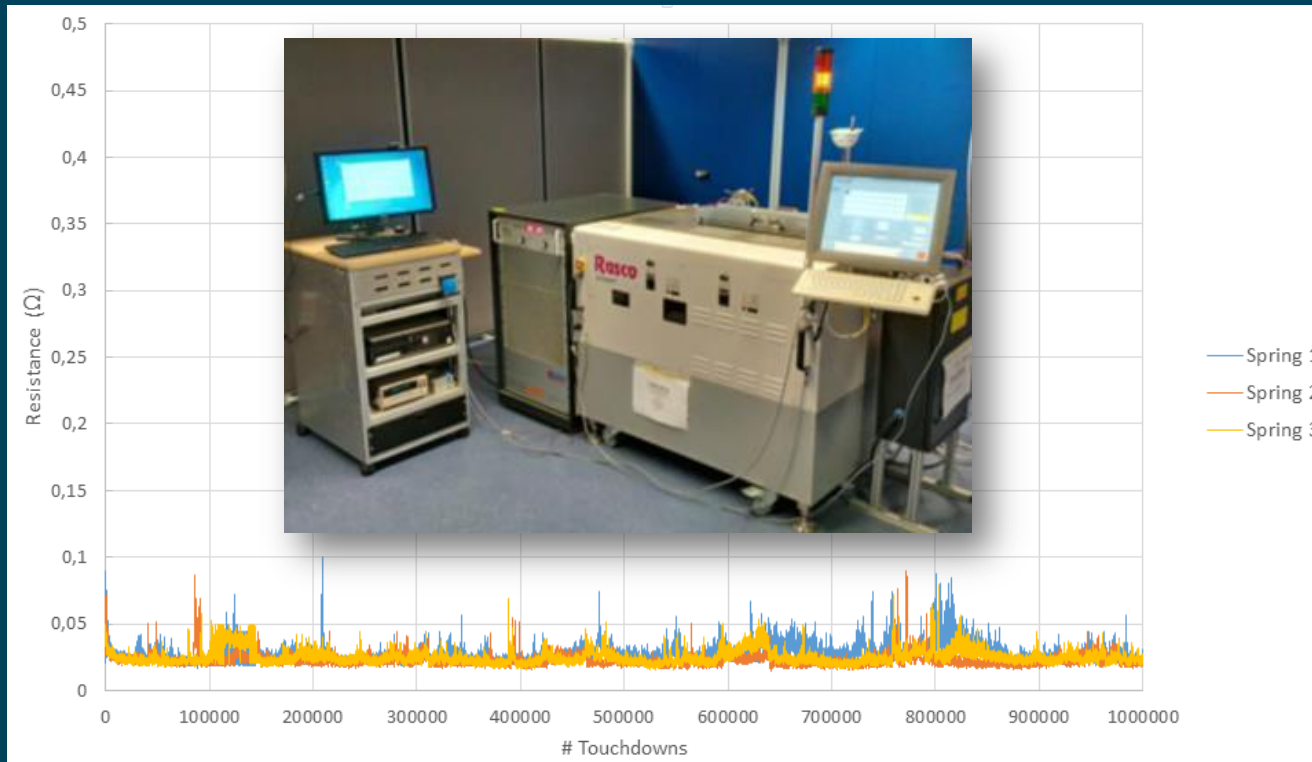
Height:	1.7 mm	Min. Pitch	0.3 mm
Lifetime:	1 M+	Scrub	0.06 mm
Contact Force:	0.4 N		
Deflection:	0.3 mm		

### Thermal:

Temperature Range: -55 °C to 155 °C

## Contact Resistance Qualification

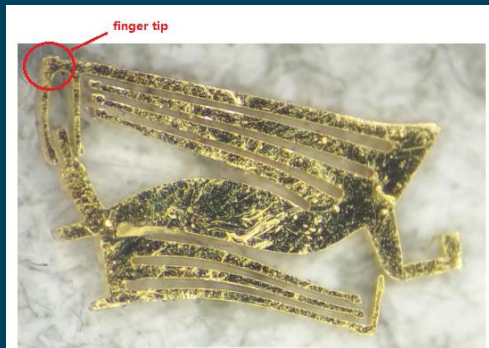
CRes test results on Cohu's strip test handler



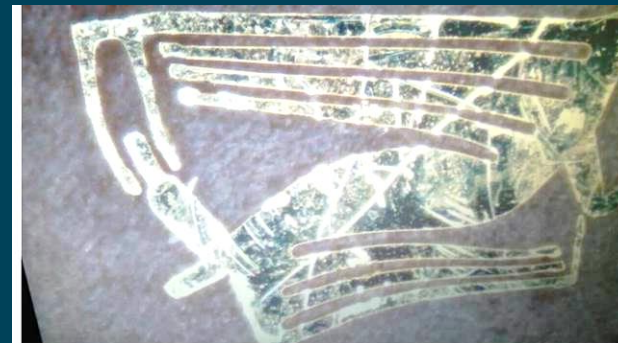


# High Volume Production Results

Setup:	Ismeca Turret System NY20, SOT1232
Lifespan:	1M to 1.5M
Cleaning cycles:	500k to 1M insertions
Yield:	99.5% - 99.8%
End of life reason:	Wear on contact spring tips



New contact spring



Contact spring after 1M

## Summary

Multi-beam cantilever concepts are suitable to enable small form factor plunge-to-board (PTB) contactor solutions in combination with best temperature accuracy behavior.

No elastomers are needed to generate contact force.

Lifespan, yield and cleaning performance have been proven in high volume production environment.

Multi-beam concepts can be applied to various applications from high power Kelvin to RF/Analog solutions.