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More than You Think: The Beauty of Coaxial Socket

Collins Sun, Ryan Chen, Hayden Chen
WinWay Technology Co., Ltd.

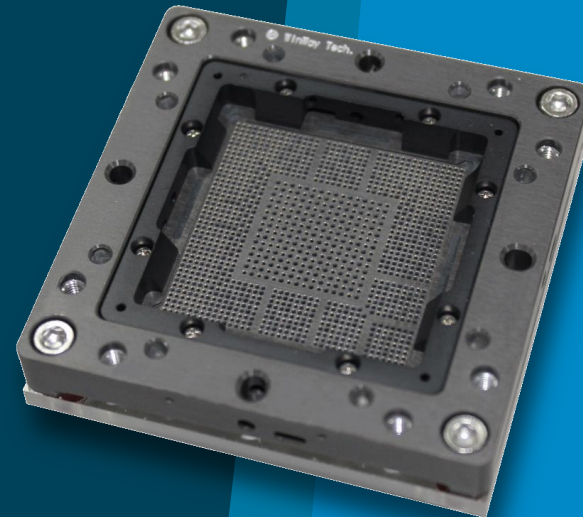


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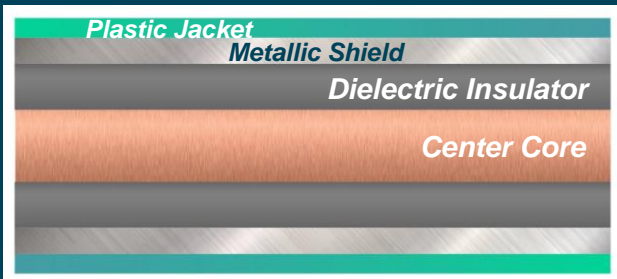
Contents

- Why Choose Coaxial?
- Brownie Coaxial Socket Structure
- Brownie Coaxial Applications
- Summary



Why Choose Coaxial?

Coaxial Cable



- *Superior Signal Protection*
- *Low Transmission Loss*
- *Anti-interference Ability*



RCA Connector



Television Coaxial Cable



SMA Connector

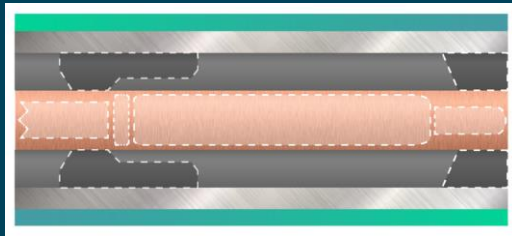


BNC Connector

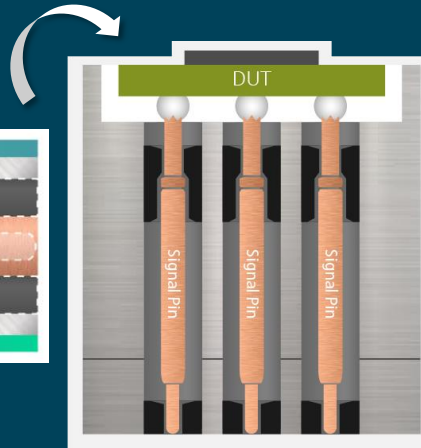
Brownie Coaxial Socket Structure

Through-hole Coaxial Socket Design

Coaxial Cable



Innovation

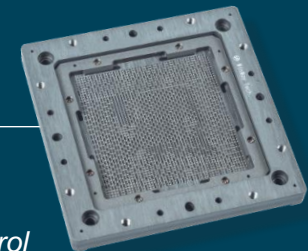


"Brownie" Coaxial Socket

** Patented Product **

Features

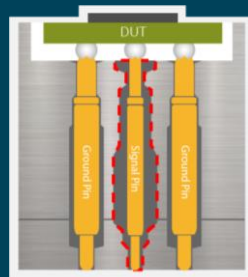
- **Through-hole Design**
→ *Excellent Impedance Control*
- **Composite Insulation Materials**
→ *Superior Reliability for Mass Production (>1M)*
- **Fully Metal Shielding** → *Perfect Signal Protection*
- **Surface Insulation** → *Avoid Shorting Risk*
- **Mix Pin Configuration** → *Higher Current Capacity*



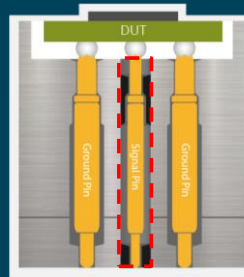
Brownie Coaxial Socket Structure

What is the advantage of through-hole design?

Impedance Continuity

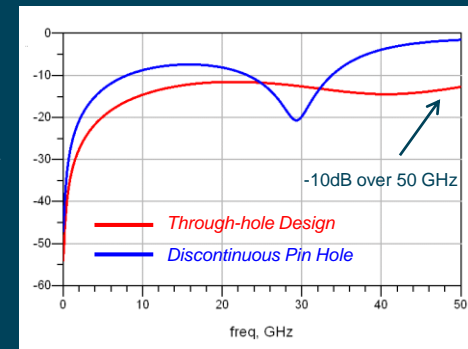


Discontinuous Pin Hole



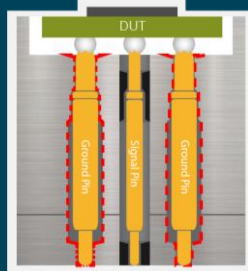
Through-Hole Design

Return Loss, dB



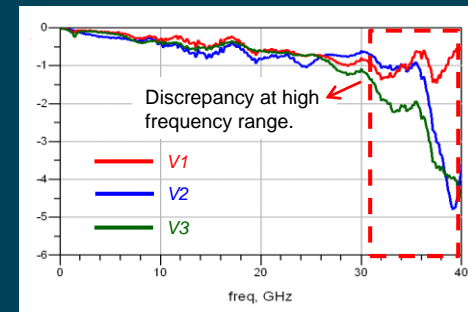
Why should coaxial housing have grounding design?

High Frequency Behavior



Three grounding designs show distinguishable insertion loss behavior at higher frequency >30GHz.

Insertion Loss, dB



Brownie Coaxial Applications

Electrical

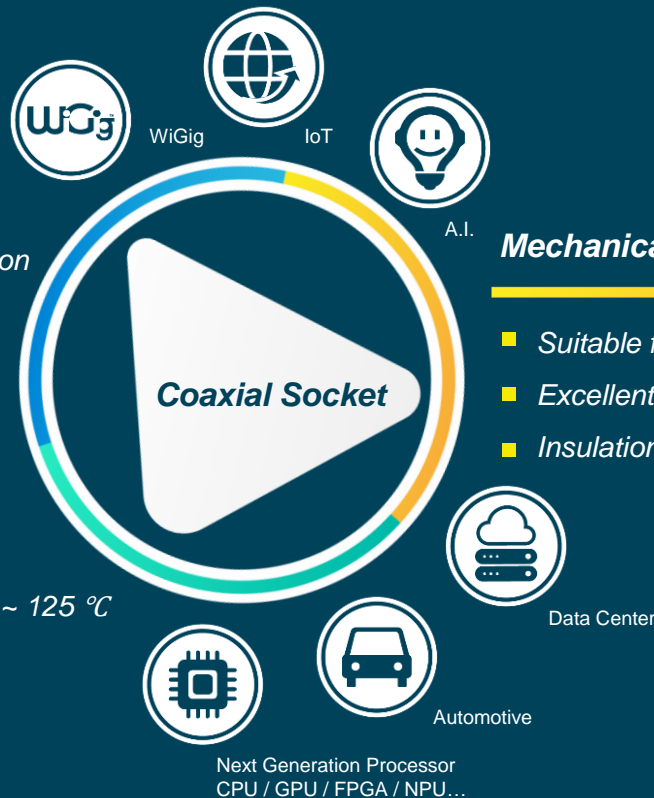
- High Data Rate : 56Gbps
- Fully Metal Shielding : Crosstalk Reduction
- Adjustable Impedance Control
- Good Current Capacity

Thermal

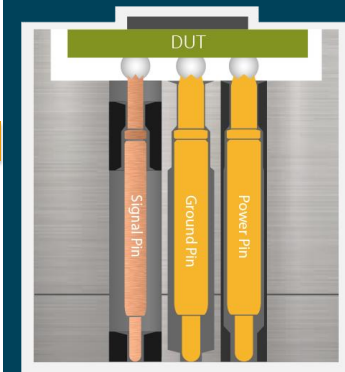
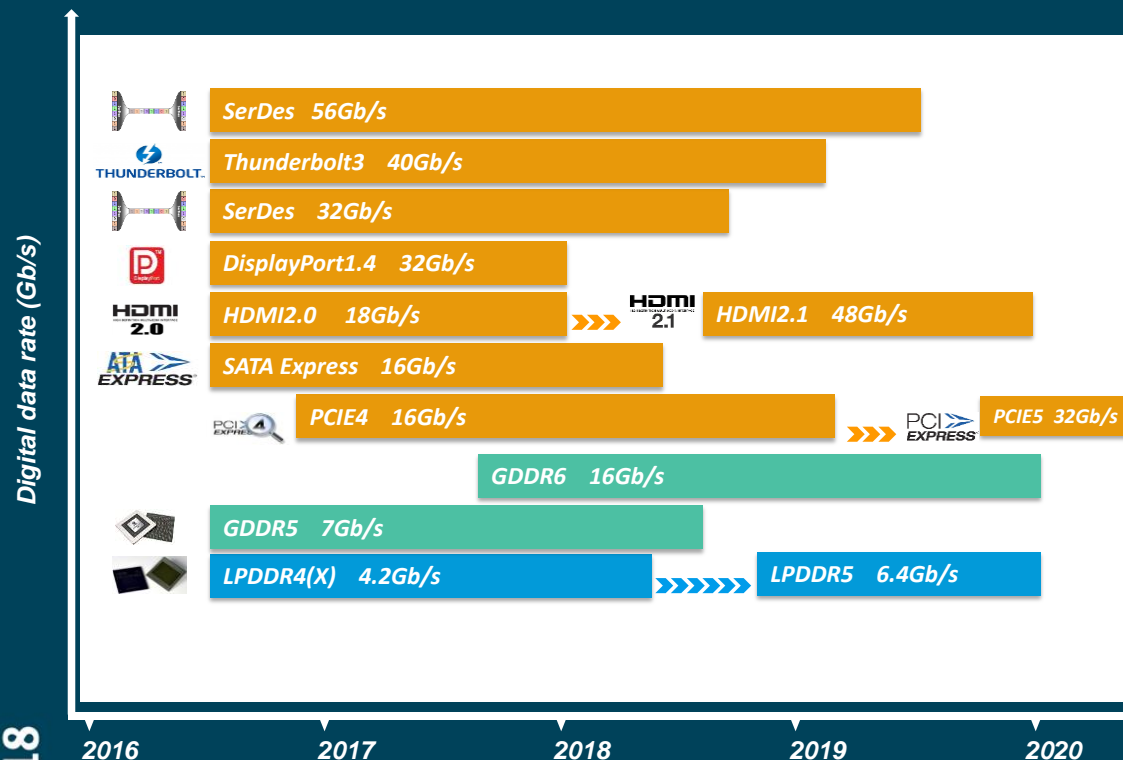
- Good Thermal Conduction : - 40 °C ~ 125 °C

Mechanical

- Suitable for Large Package Size >65X65mm²
- Excellent Reliability >1M
- Insulation Coating and Composite



Brownie Coaxial Applications



"Brownie" Coaxial Socket

The Crosstalk Issue on Testing



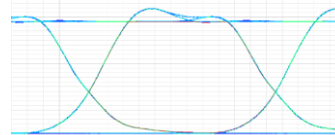
Eye Source



Eye Probe

GND

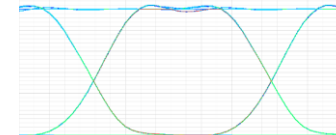
Plastic Socket



DDR-4266Mbps IBIS model

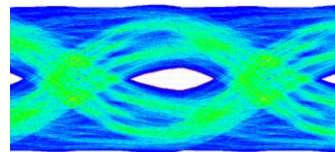
- Eye height : 1.09
- Eye width : 215.00
- Eye Jitter RMS : 3.23

Brownie Coaxial



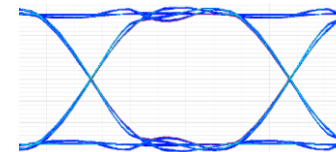
DDR-4266Mbps IBIS model

- Eye height : 1.15
- Eye width : 225.89
- Eye Jitter RMS : 1.42



56Gbps data rate pure eye source

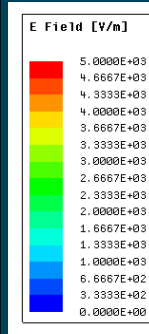
- Eye height : NA
- Eye width : 0.41
- Eye Jitter RMS : 2.57



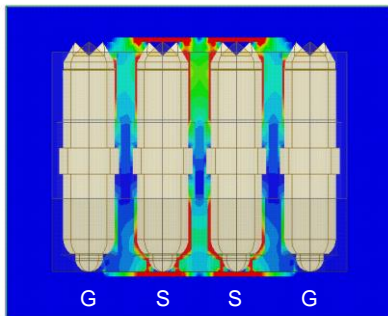
56Gbps data rate pure eye source

- Eye height : 1.04
- Eye width : 17.45
- Eye Jitter RMS : 0.07

The Crosstalk Issue on Testing

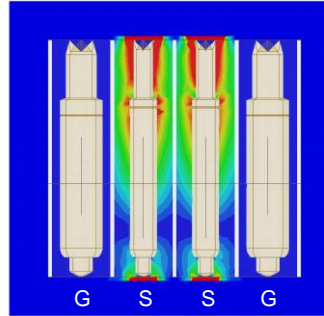


Plastic Socket



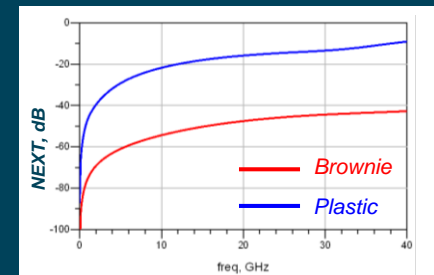
The coupling between signals is very strong and it brings crosstalk issue.

Brownie Coaxial



There is no interference between two signals due to fully shielding design.

Example Pin Map Schematic



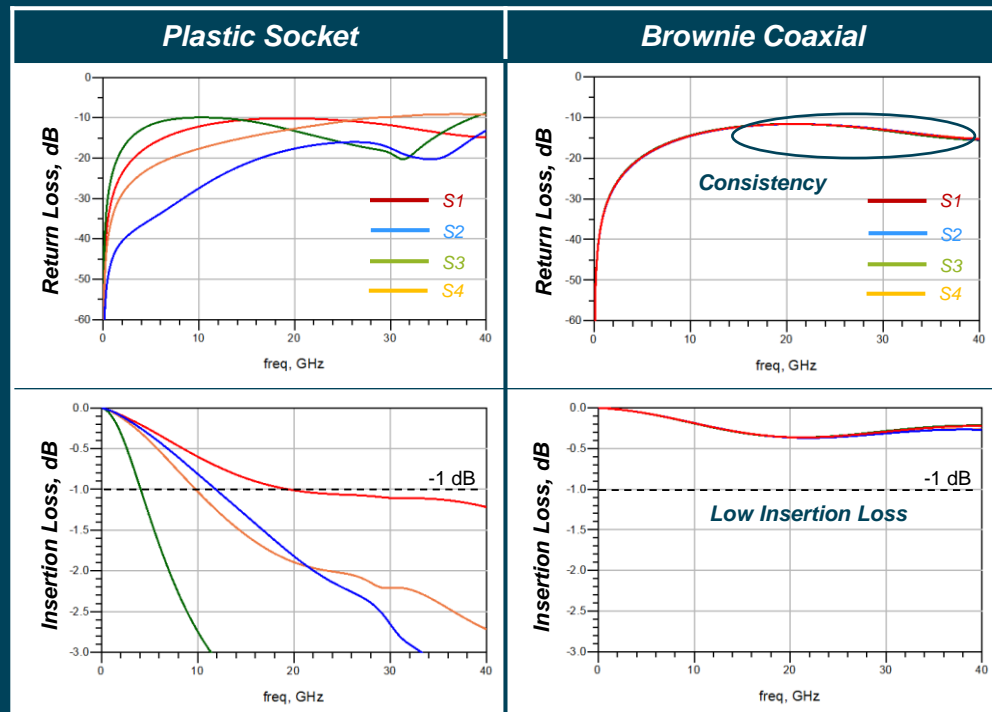
Crosstalk Comparison of GSSG

Perfect Shielding Design

DUT Pin Map Schematic



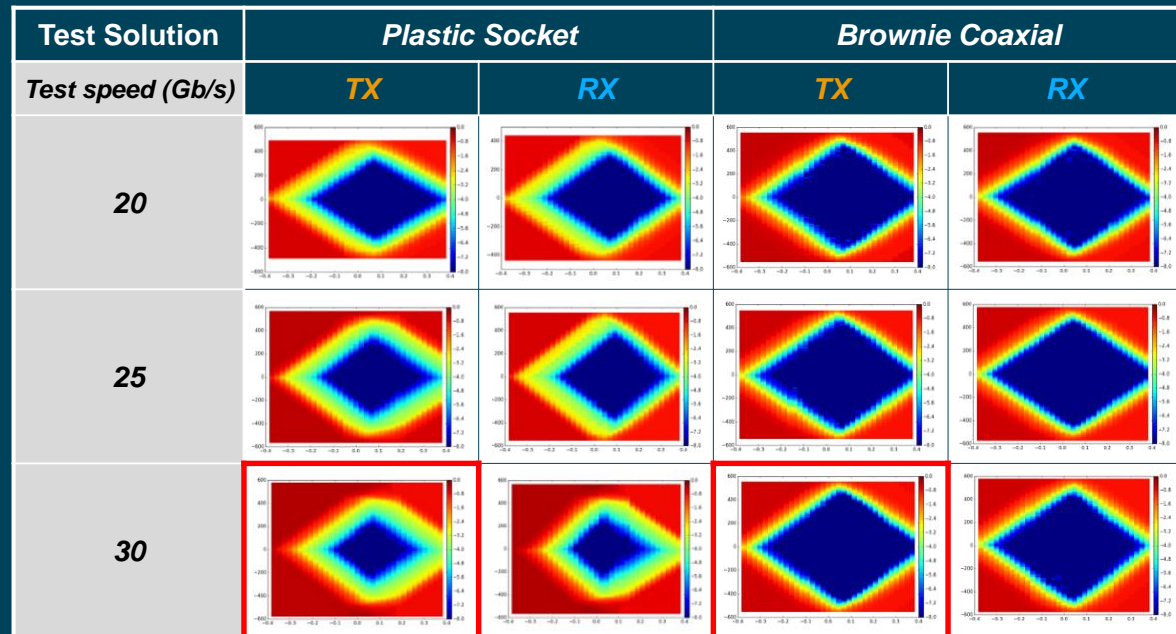
As shown, the performance of plastic socket highly depends on DUT pin map arrangement. In contrast, coaxial socket provides better consistency and impedance matching.



Actual High Speed Test Results



- Device pitch : 1.0mm
- Test requirement : 30Gb/s
- Application : Data Center



In test speed 30Gb/s, the eye height of Brownie coaxial(~1000mV) is twice than plastic socket(~500mV).

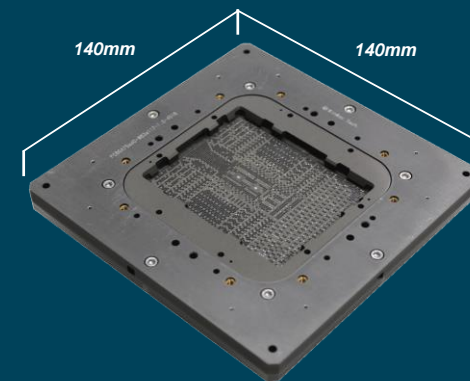
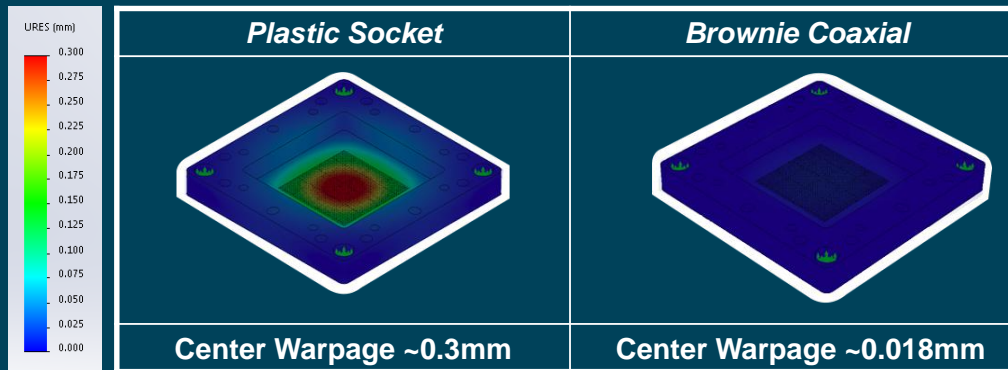
Mechanical Analysis

Simulation Condition

- Mounting Plate
- Total Pre-Load Force : 20Kg
- Pin Counts : ~1,300

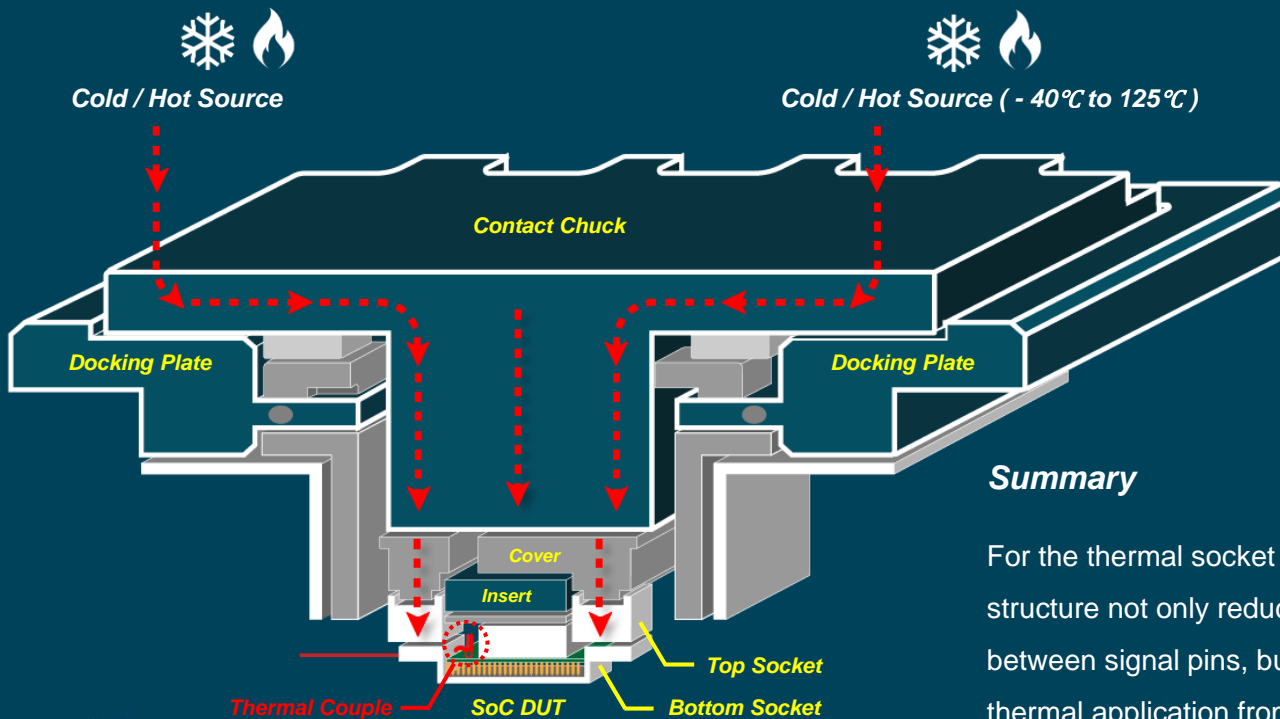
Summary

To fulfill the large package application >65*65mm², coaxial socket can suppress the housing warpage without losing electrical performance.



- Package Size : 75*60mm²
- Pin Counts : ~4000
- Device Pitch : 1.0mm

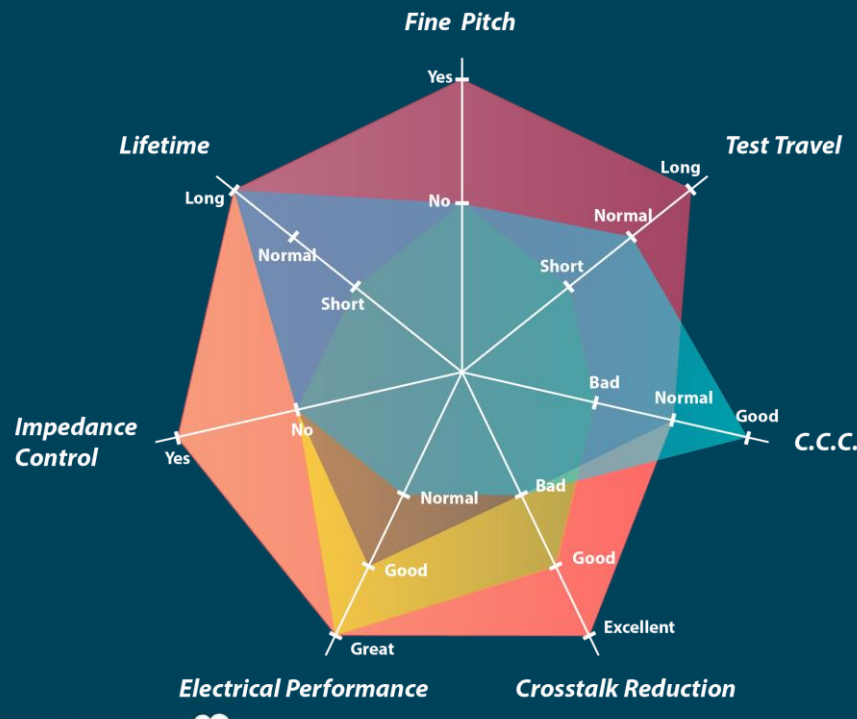
Thermal Socket Application



Summary

For the thermal socket application, coaxial structure not only reduces the crosstalk between signal pins, but also achieves the thermal application from - 40 to 125 °C.

High Speed Solution Comparison



	Pros	Cons
Spring Probe Socket	Good for Production	Poor Thermal Conduction Crosstalk Issue
Rolling Contact	High Current Capacity Short Electrical Length	Shorter Contact Travel
Elastomer	Excellent Electrical Performance	Not Suitable for Production Shorter Contact Travel
Coaxial Socket	Pros	
	1. Adjustable Impedance 2. Excellent Shielding 3. Suit for All Package Types, also Large Package 4. Thermal Application	

■ Spring Probe Socket
■ Rolling Contact
■ Elastomer
■ Coaxial Socket

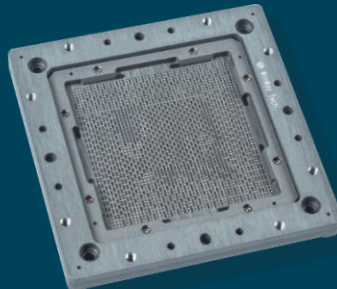
Summary

Final Test

Wafer Test

Pitch(mm)	≥ 0.8	≥ 0.65	≥ 0.5	≥ 0.4	≥ 0.30	≥ 0.2
Design ready	○	○	○	○	○	○
Release	○	○	○	○	△	x
Production	○	○	○	△	△	x

○ : Finished △ : On-going x : TBD



- **Through-hole Design**
- **Composite Insulation Materials with Low Dielectric Loss**
- **Fully Metal Shielding**
- **Surface Insulation**
- **Mix Pin Configuration**

Future Goals

- In order to expand the applicability of Brownie coaxial, **higher bandwidth up to 80GHz**, and **fine pitch solution down to pitch 0.2mm** are also developing for the advance testing requirement in the future.

