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More than You Think: The Beauty of Coaxial Socket

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BiTS Burn-in & Test Strategies Workshop

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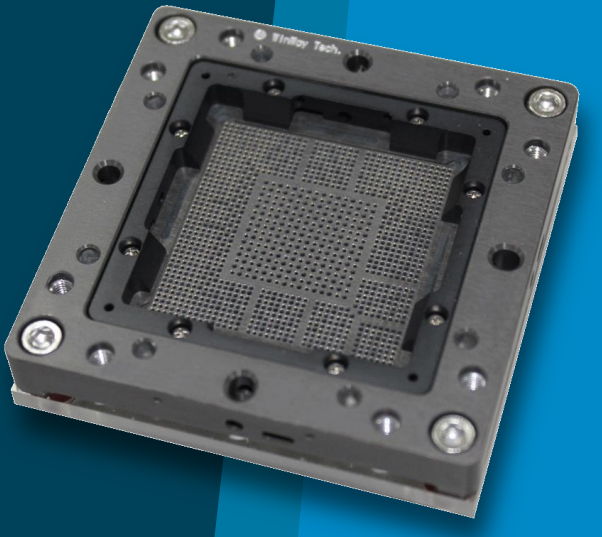
WinWay Technology

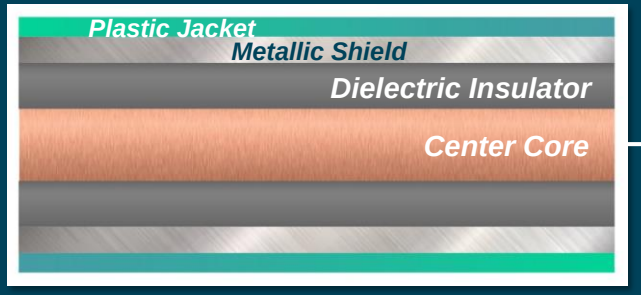
Contents

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

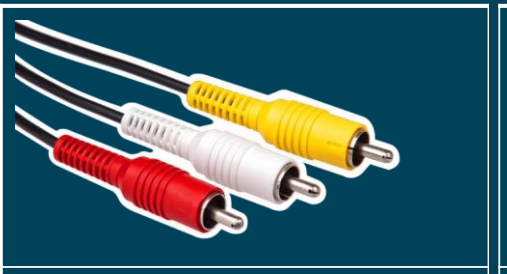


Why Choose Coaxial?

Coaxial Cable



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



RCA Connector

Television Coaxial Cable

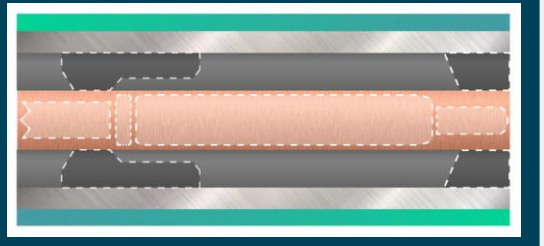
SMA Connector

BNC Connector

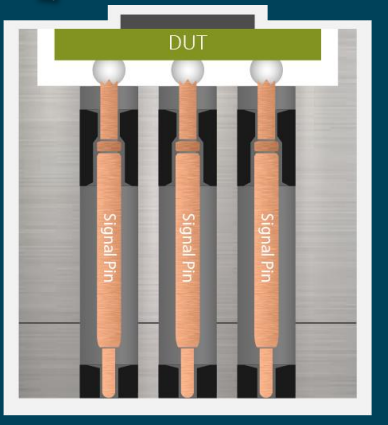
Brownie Coaxial Socket Structure

Through-hole Coaxial Socket Design

Coaxial Cable



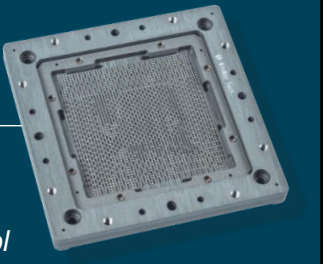
Innovation



"Brownie" Coaxial Socket

**** Patented Product ****

Features

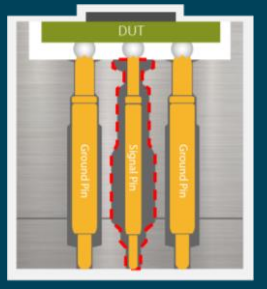


- **Through-hole Design**
  - → *Excellent Impedance Control*
- **Composite Insulation Materials**
  - → *Superior Reliability for Mass Production (>1M)*
- **Fully Metal Shielding** → *Perfect Signal Protection*
- **Surface Insulation** → *Avoid Shorting Risk*
- **Mix Pin Configuration** → *Higher Current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

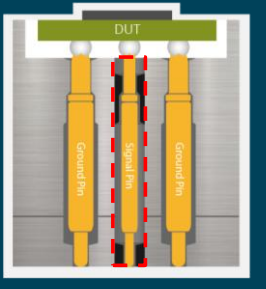
Brownie Coaxial Socket Structure

What is the advantage of through-hole design?

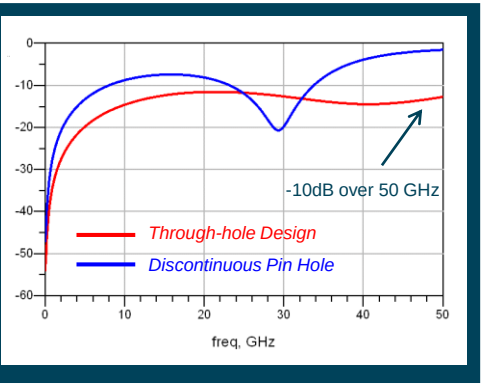
Impedance Continuity



Discontinuous Pin Hole

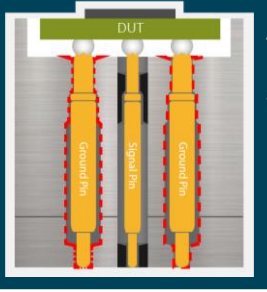


Through-Hole Design

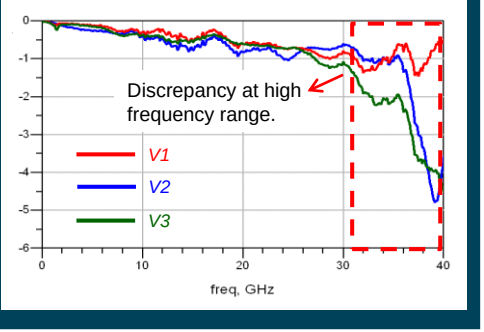


Why should coaxial housing have grounding design?

High Frequency Behavior



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



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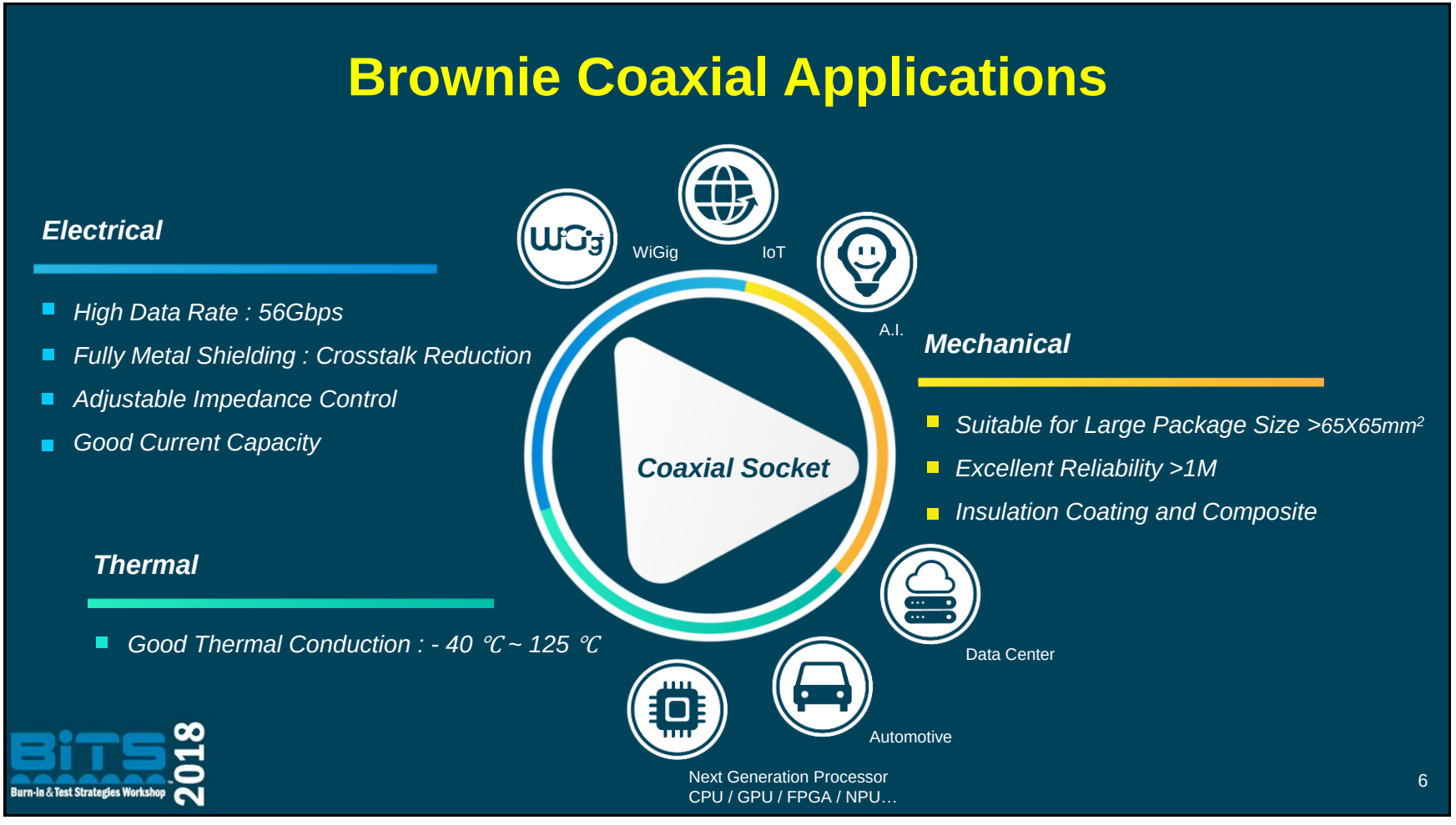
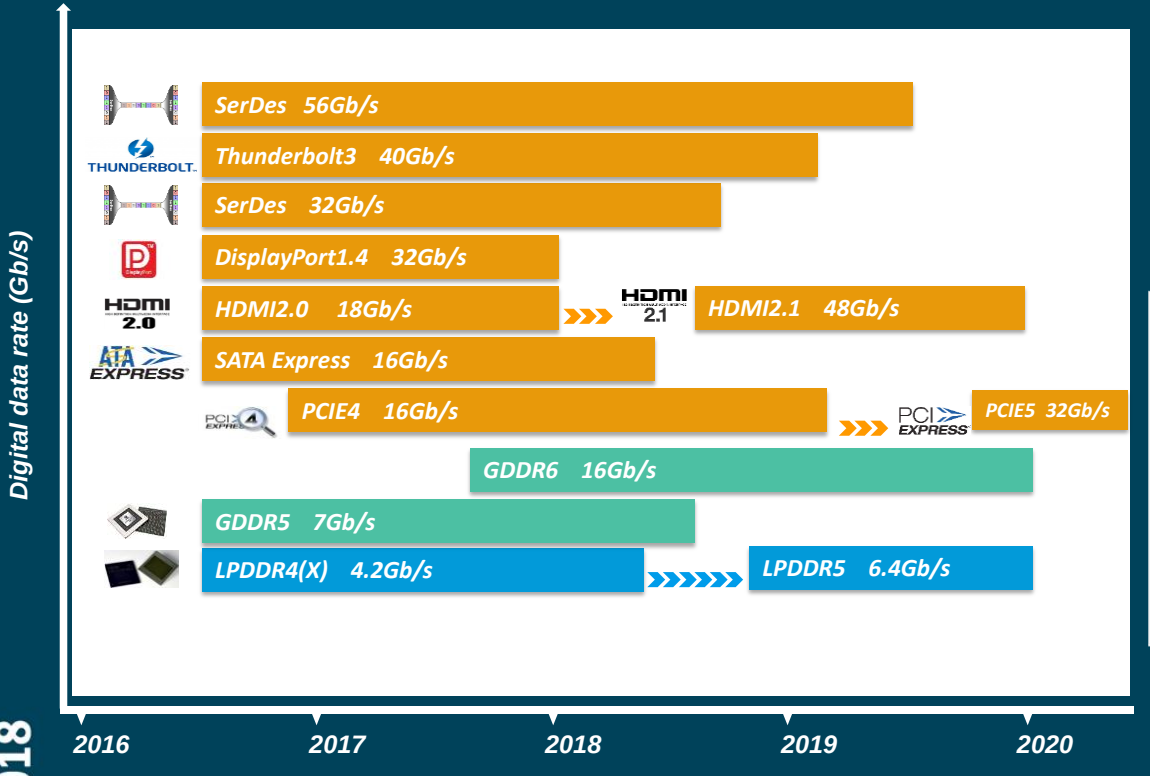
Brownie Coaxial Applications



Brownie Coaxial Applications



"Brownie" Coaxial Socket

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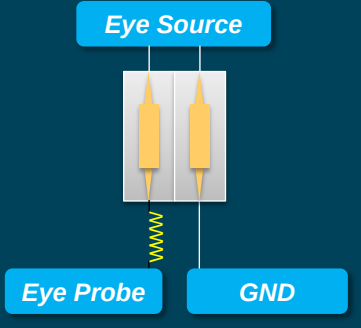
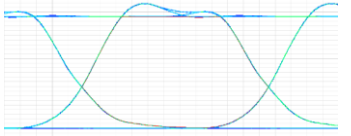
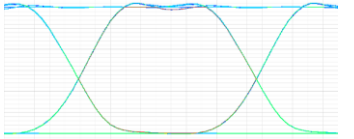
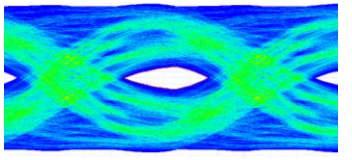
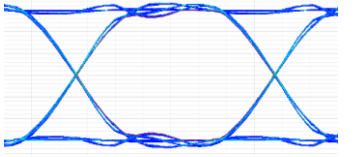
7

The Crosstalk Issue on Testing

8S1G
(Signal to Ground Probes Ratio)



Plastic Socket	*Brownie Coaxial*
 *DDR-4266Mbps IBIS model*	 *DDR-4266Mbps IBIS model*
■ Eye height : 1.09 ■ Eye width : 215.00 ■ Eye Jitter RMS : 3.23	■ Eye height : 1.15 ■ Eye width : 225.89 ■ Eye Jitter RMS : 1.42
 *56Gbps data rate pure eye source*	 *56Gbps data rate pure eye source*
■ Eye height : NA ■ Eye width : 0.41 ■ Eye Jitter RMS : 2.57	■ Eye height : 1.04 ■ Eye width : 17.45 ■ Eye Jitter RMS : 0.07

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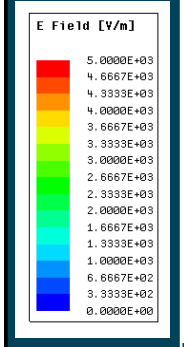
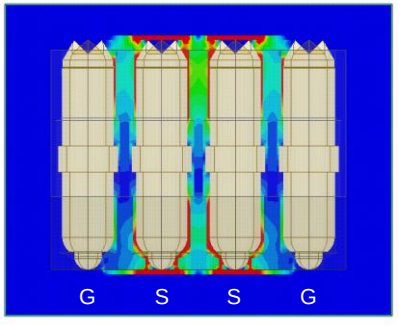
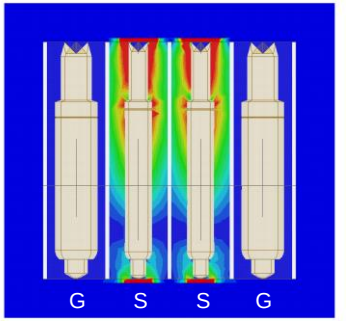
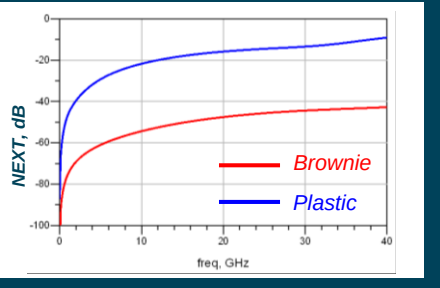
8

The Crosstalk Issue on Testing



Plastic Socket	*Brownie Coaxial*
	
The coupling between signals is very strong and it brings crosstalk issue.	There is no interference between two signals due to fully shielding design.

Example Pin Map Schematic

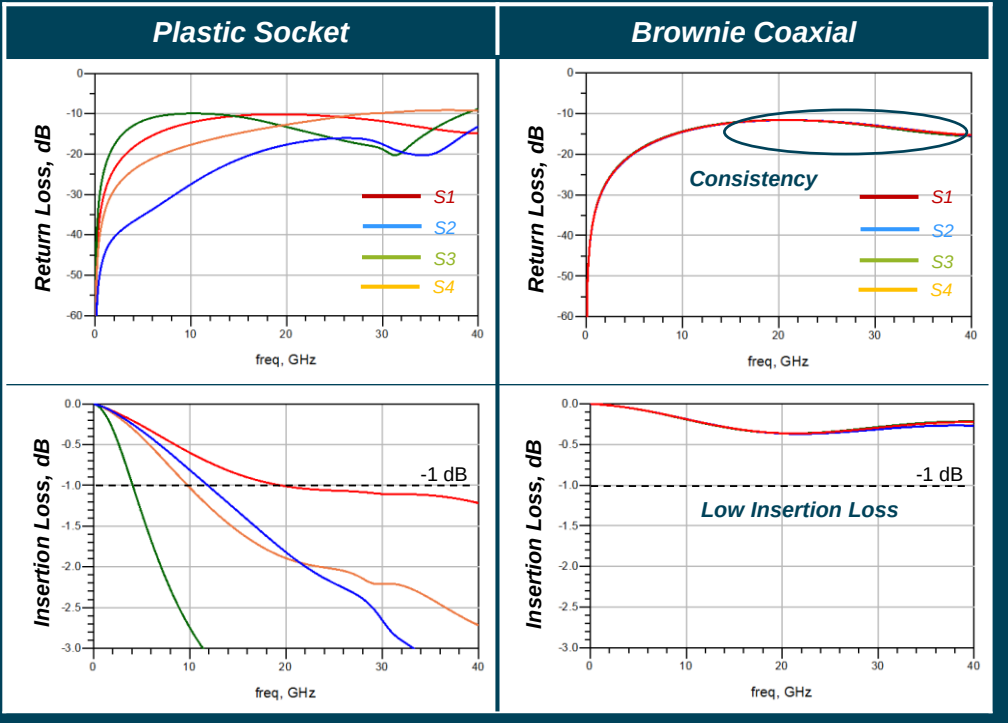


Crosstalk Comparison of GSSG

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.



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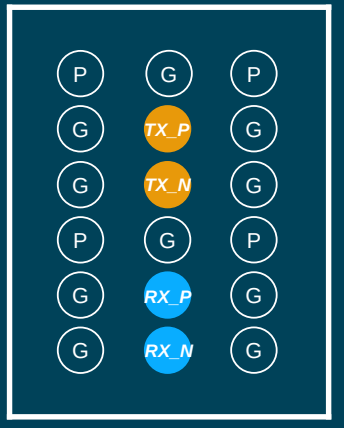
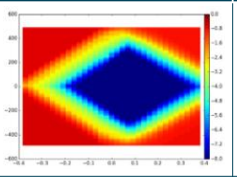
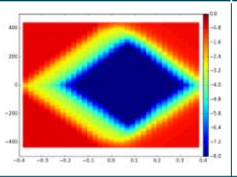
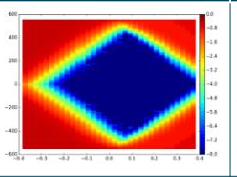
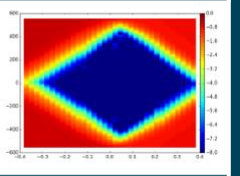
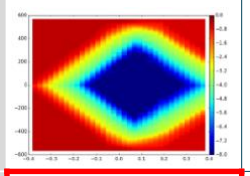
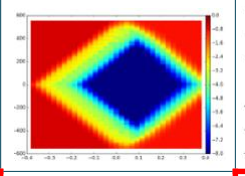
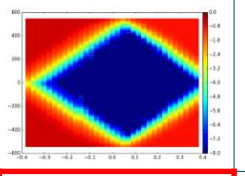
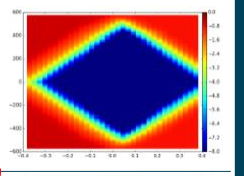
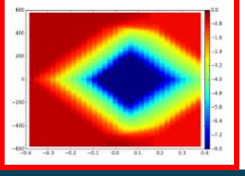
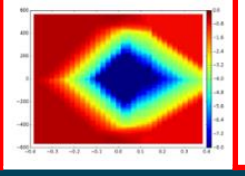
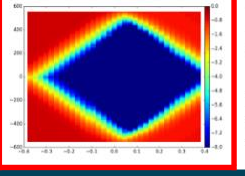
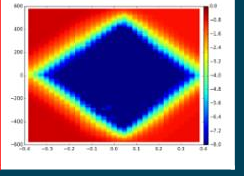
Actual High Speed Test Results



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

Test Solution	*Plastic Socket*		*Brownie Coaxial*	
Test speed (Gb/s)	*TX*	*RX*	*TX*	*RX*
20				
25				
30				

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

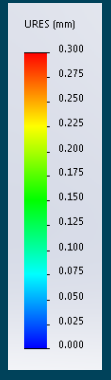
Mechanical Analysis

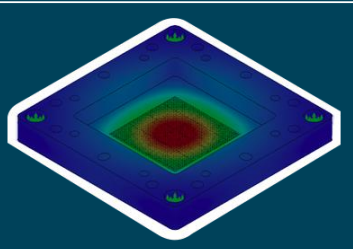
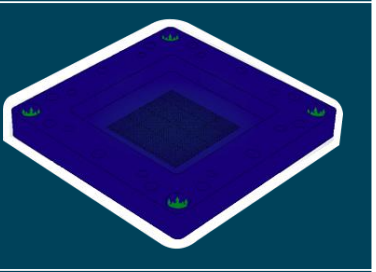
Simulation Condition

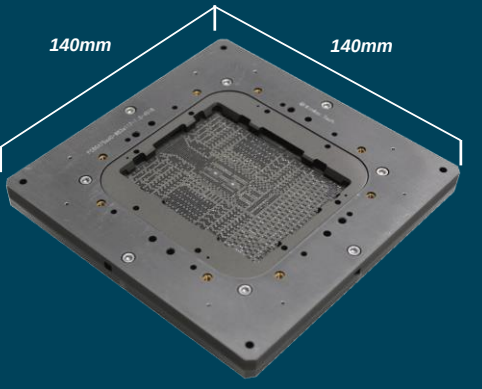
- Mounting Plate
- Total Pre-Load Force : 20Kg
- Pin Counts : ~1,300

Summary

To fulfill the large package application >65*65mm^2, coaxial socket can suppress the housing warpage without losing electrical performance.

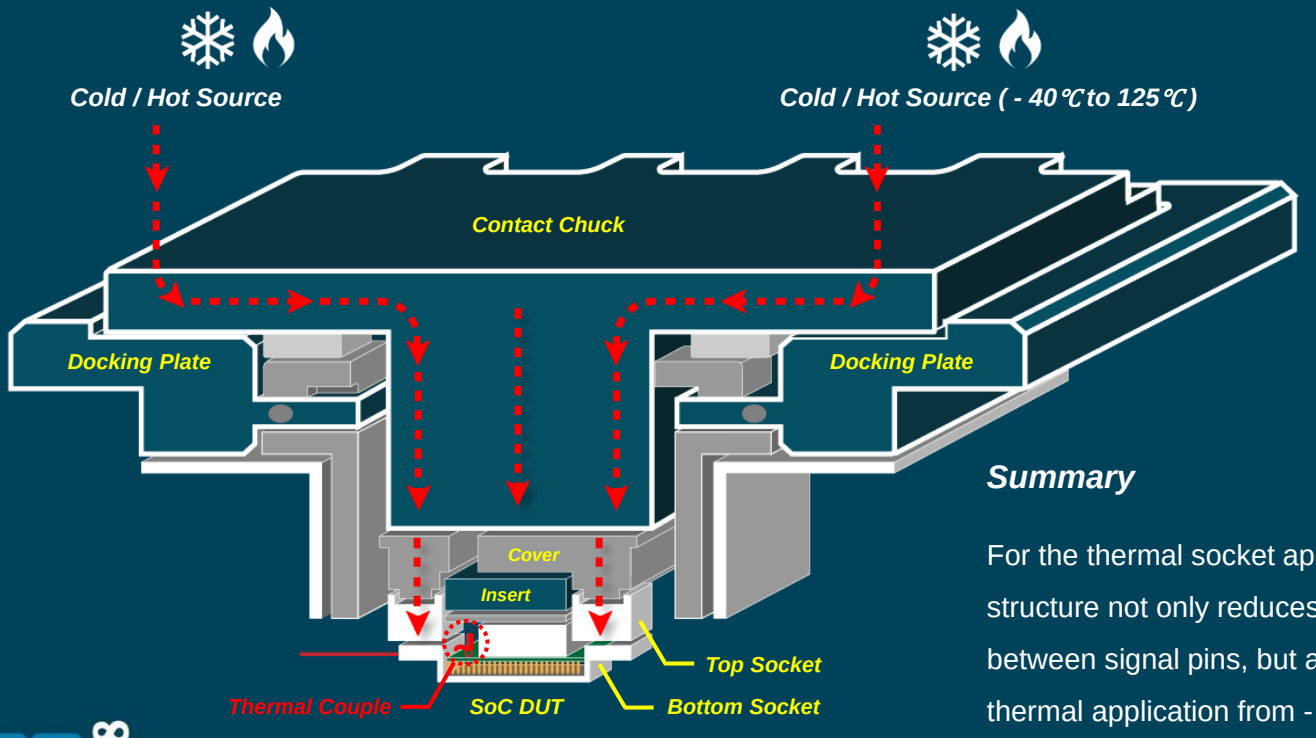


Plastic Socket	*Brownie Coaxial*
	
Center Warpage ~0.3mm	**Center Warpage ~0.018mm**



- **Package Size : 75*60mm^2**
- **Pin Counts : ~4000**
- **Device Pitch : 1.0mm**

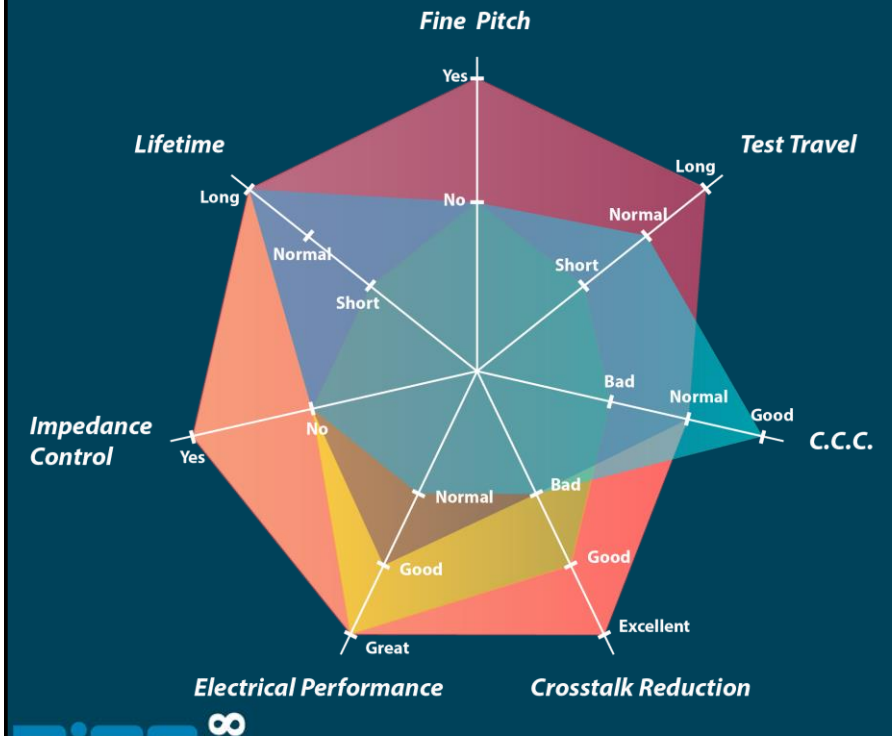
Thermal Socket Application



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 ℃.

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***

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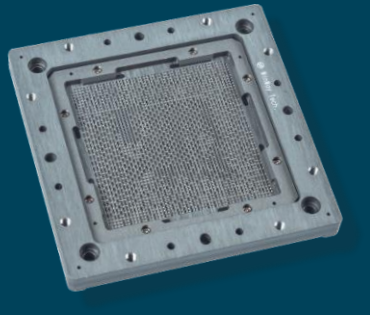
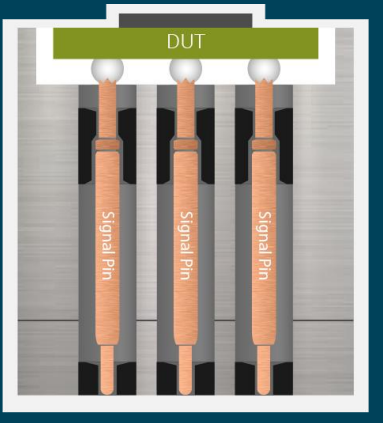
14

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***

More than You Think: The Beauty of Coaxial Socket

15

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.