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Archive

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## Coaxial Probe for RF Solution

**Jay Kim, Scott Shin, Daniel Shin, & Noel Jeong**  
**Leeno Industrial Inc**



## Contents

- Why Impedance Matching?
- Why Use Coaxial?
- Type of Coaxial Sockets
- Coaxial Probe Structure
- Comparison: Conventional Coaxial Vs. Coaxial Probe
- Coaxial Probe Product Line
- Coaxial Probe: RF Characteristics
- Coaxial Probe: Cycling Test / CRES & Spring Force
- Conclusion

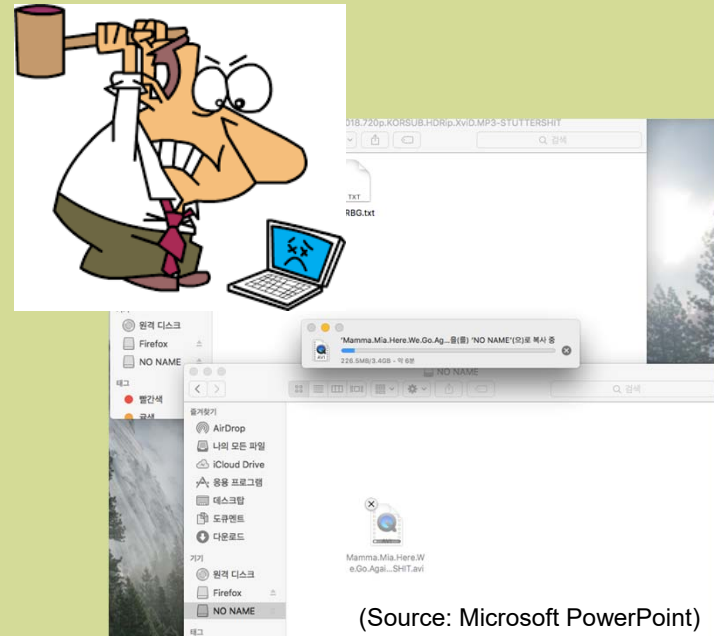


## Why Impedance Matching?



(Source: Film "La Boom")

**No Noise Headphone with Your Partner?**



(Source: Microsoft PowerPoint)

**6 Minutes for JUST 2Gbps?**

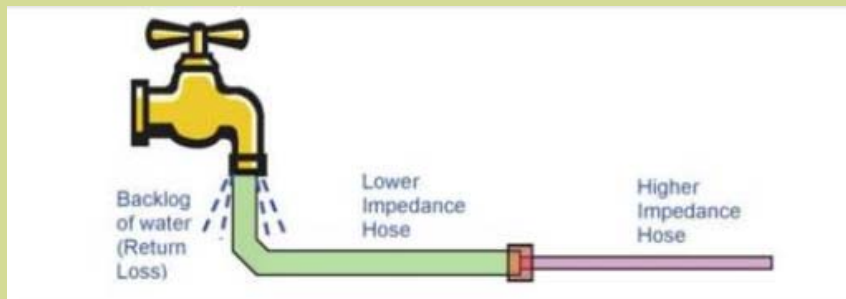


Coaxial Probe for RF Solution

3



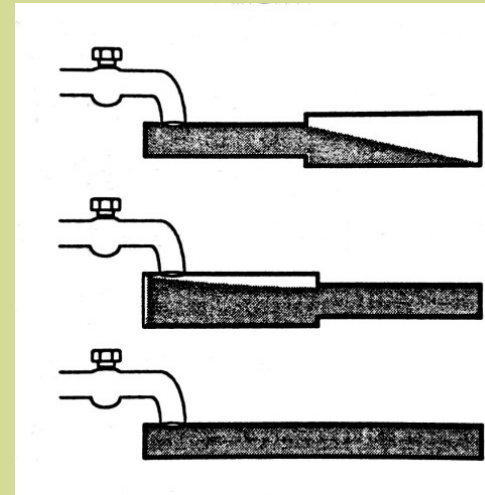
## Why Impedance Matching?



(Source: Toymaker Television)

**Any Impact on the water Source?**

- Water Return
- Lower Pressure

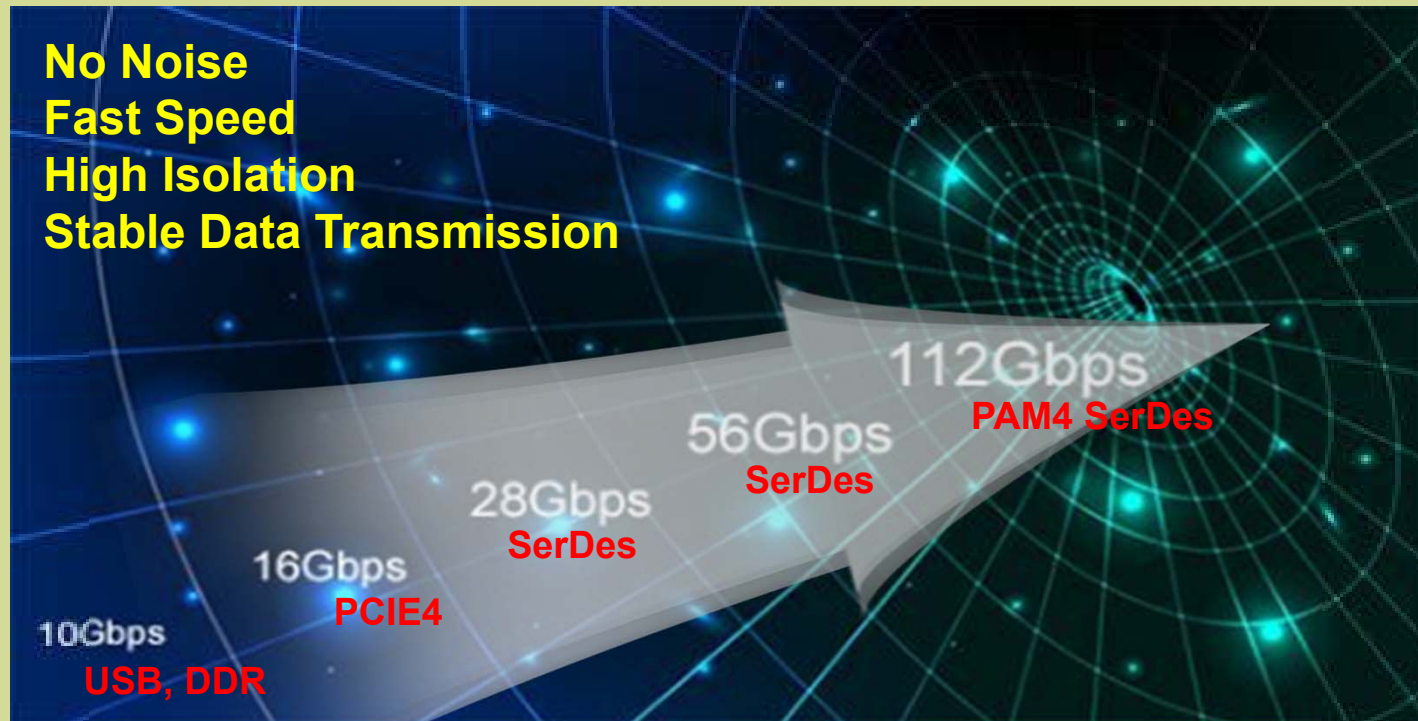


(Source: Toymaker Television)

**What will happen to Water?**

- Different sized Hose?
- Same sized Hose?

## Why Use Coaxial?



(Source: Design-Reuse)



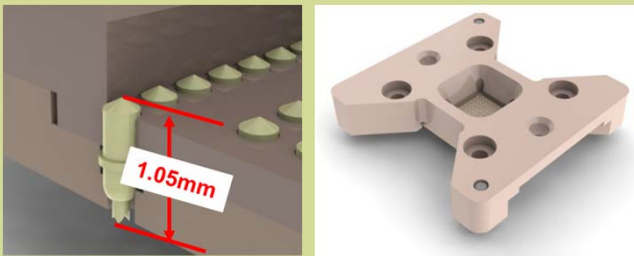
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5



## Why Use Coaxial?

### General Socket



Signal Pass: 1.05mm

Short Probe?

Based on the  
Pin Map

112Gbps  
[PAM4 SerDes]

56Gbps  
[Serdes]

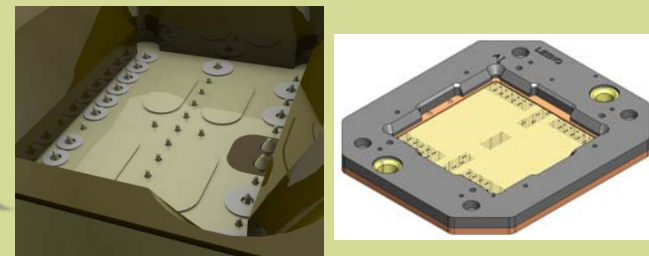
40Gbps  
[Thunderbolt]

28Gbps  
[Serdes]

16Gbps  
[PCIe4]

10Gbps & Below  
[USB, LPDDR..]

### Coaxial Socket



Coaxial Socket?

Meet Impedance  
Characteristics

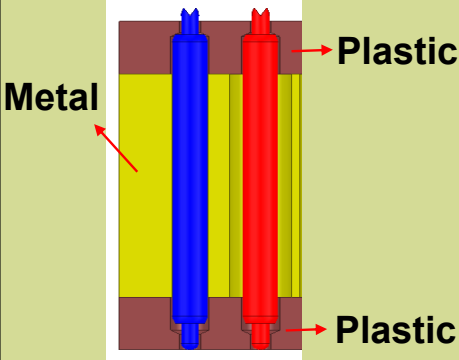
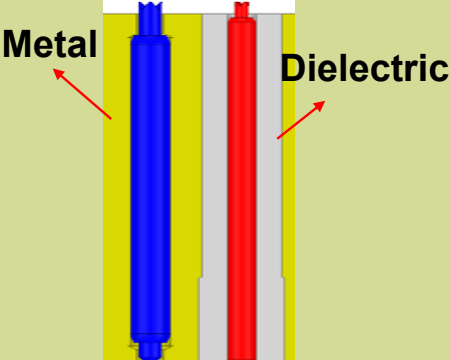
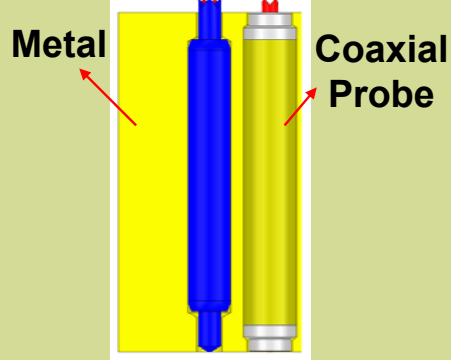


Coaxial Probe for RF Solution

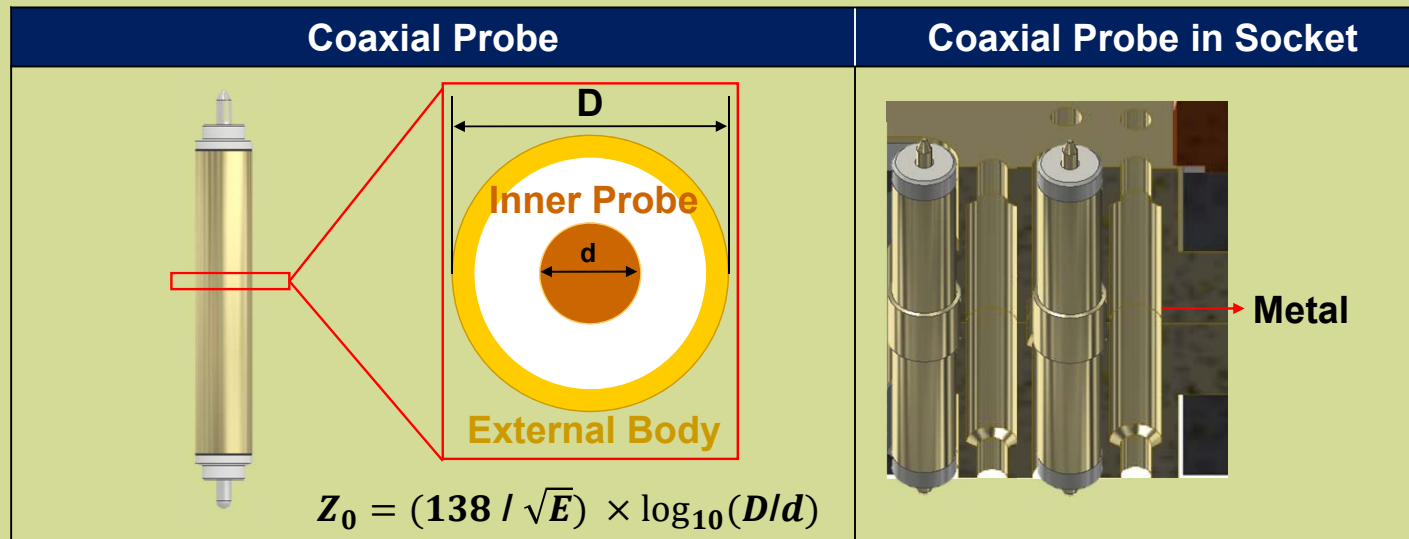
6



## Type of Coaxial Socket

Type	Classic Coaxial	Advanced Coaxial	Coaxial Probe
Structure			
Frequency	20GHz	80GHz	80GHz
Pitch	Min. 0.15 mm	Min. 0.65 mm	Min. 0.25 mm

## Coaxial Probe Structure



### Major Features & Advantages;

- ✓ 50Ω Impedance Matching
- ✓ Fine Pitch(Min. 0.25mm) Application
- ✓ High RF Performance
- ✓ Ease of Maintenance & Assembly
- ✓ Full Metal Shielding

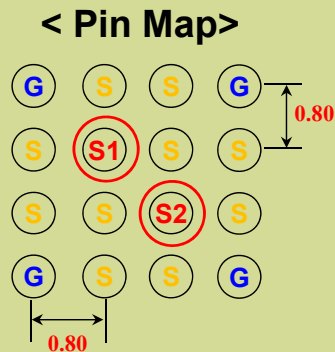


Coaxial Probe for RF Solution

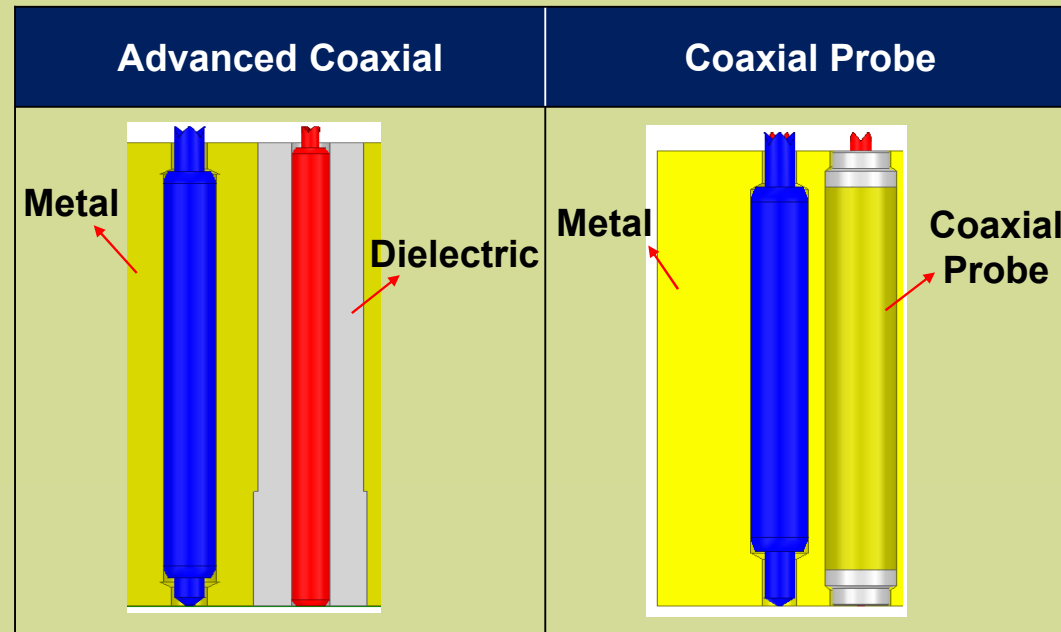
8



## Comparison: Advanced Coaxial Vs. Coaxial Probe

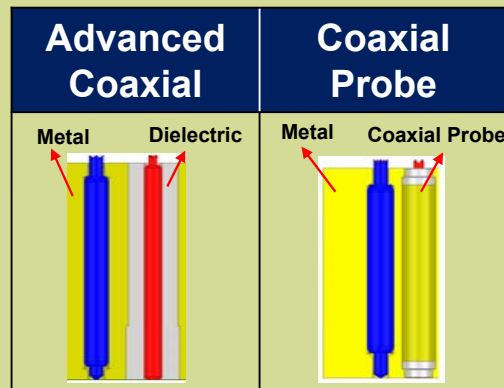
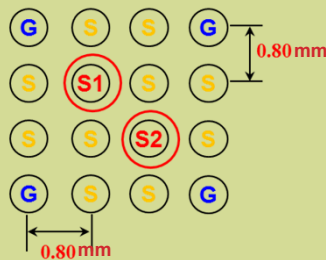


Pitch: Bigger than 0.65mm

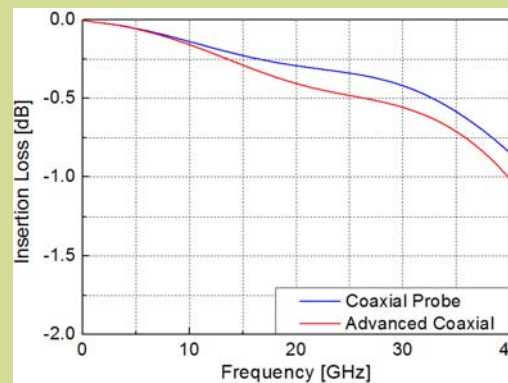


## Comparison: Advanced Coaxial Vs. Coaxial Probe

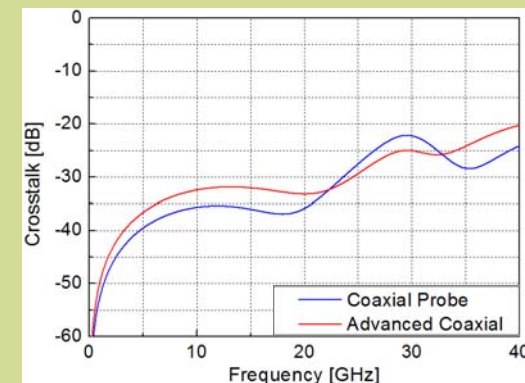
< Pin Map >



<Insertion Loss>

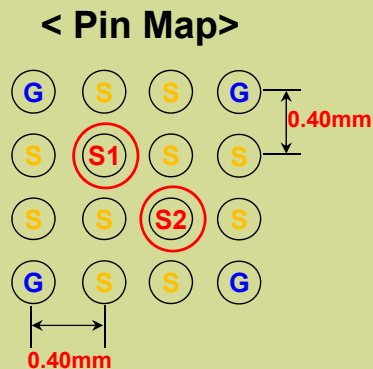


<Crosstalk>

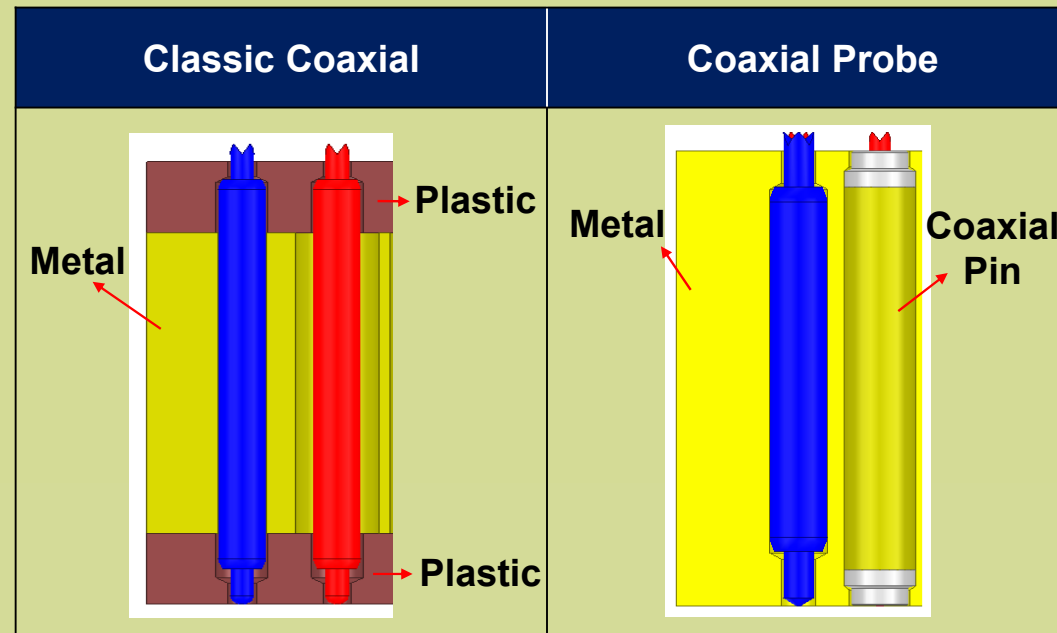


- **Insertion Loss & Cross Talk:**  
No Significant Difference at 0.65mm Pitch  
between Advanced Coaxial & Coaxial Probe Structure.

## Comparison: Classic Coaxial Vs. Coaxial Probe

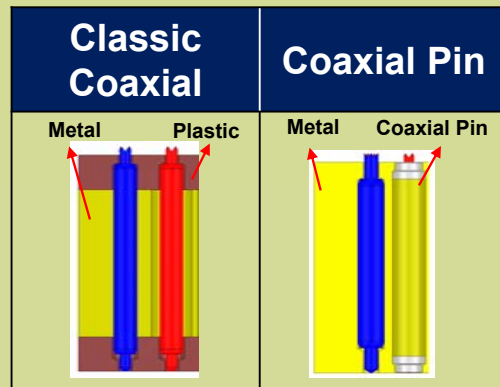
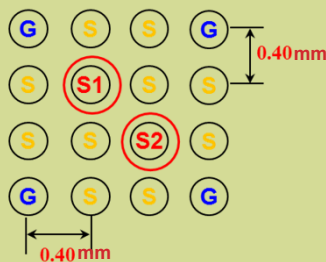


Pitch: Smaller than 0.65mm

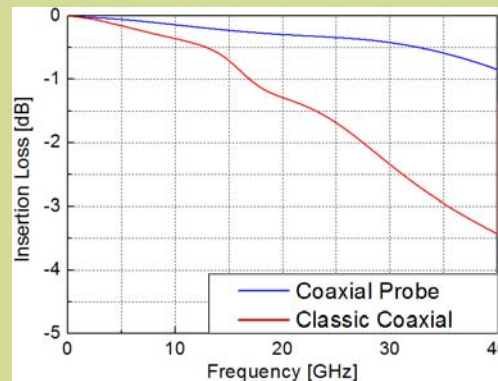


## Comparison: Classic Coaxial Vs. Coaxial Probe

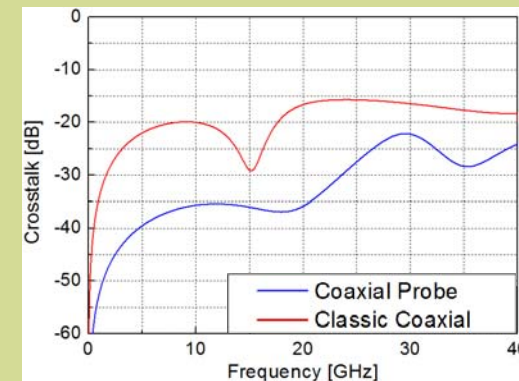
< Pin Map >



<Insertion Loss>



<Crosstalk>

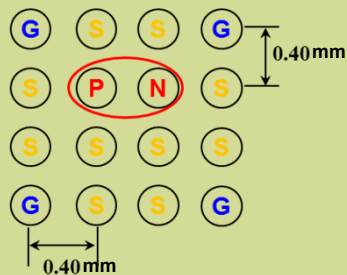


- **Insertion Loss: Less Performance for Classic Coaxial Socket**  
(17GHz @ -1dB → 40GHz @ -1dB)
- **Crosstalk: Better Performance for Coaxial Pins**  
( -10dB ~ -20dB Higher)

Coaxial Probe for RF Solution

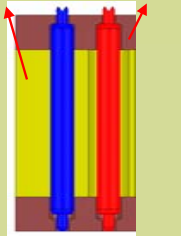
## Comparison: Classic Coaxial Vs. Coaxial Probe

< Pin Map >



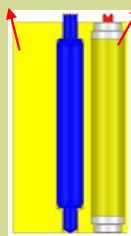
Classic Coaxial

Metal Plastic

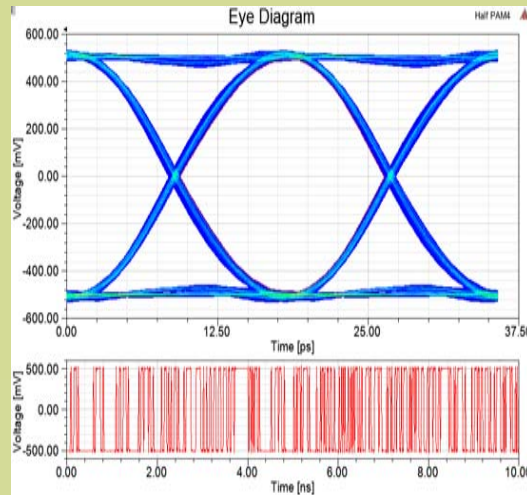


Coaxial Pin

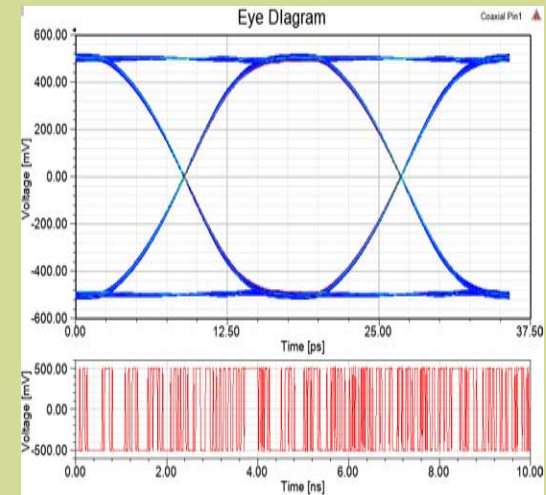
Metal Coaxial Pin



<Classic Coaxial>

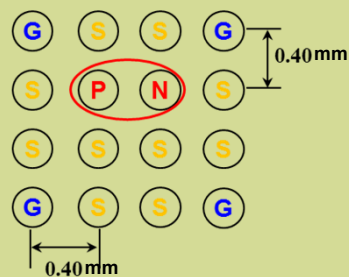


<Coaxial Probe>



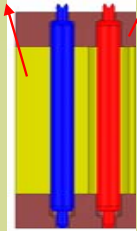
## Comparison: Classic Coaxial Vs. Coaxial Probe

< Pin Map >



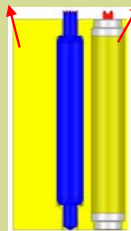
Classic Coaxial

Metal Plastic

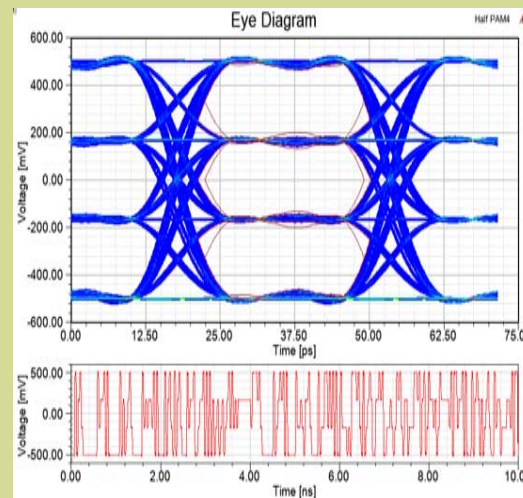


Coaxial Pin

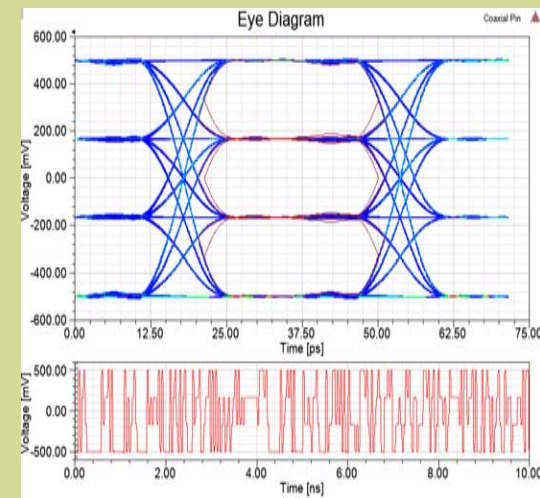
Metal Coaxial Pin



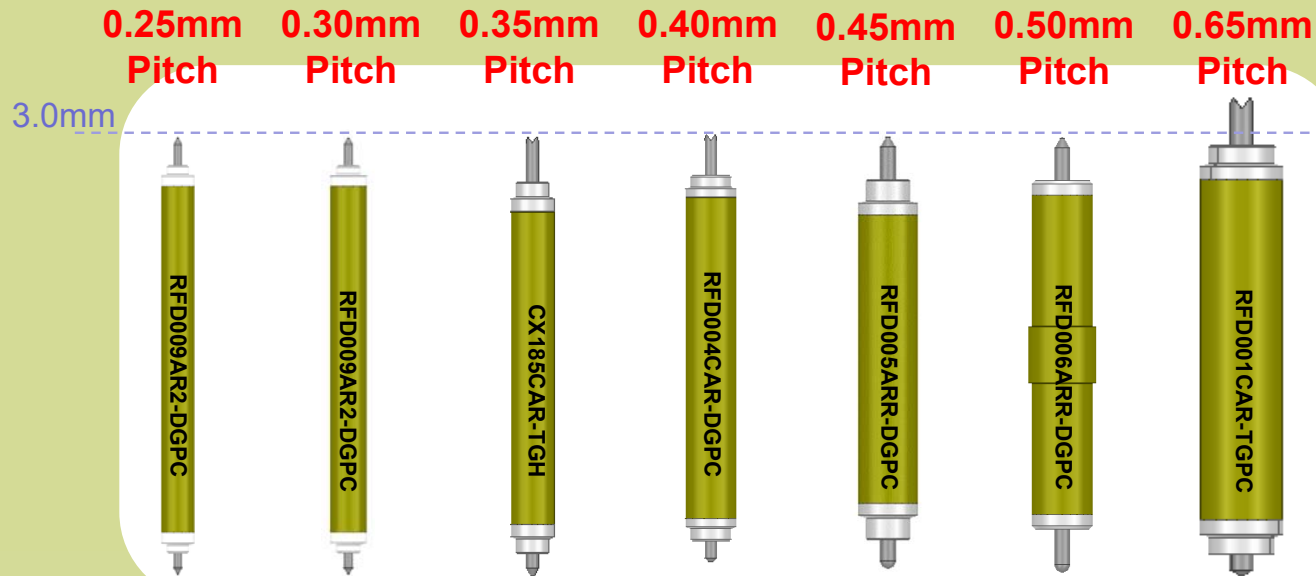
<Classic Coaxial Socket>



<Coaxial Probe>



## Coaxial Probe Product Line



Bandwidth

> 160Gbps (80Ghz)

Impedance

$50\Omega \pm 10\%$



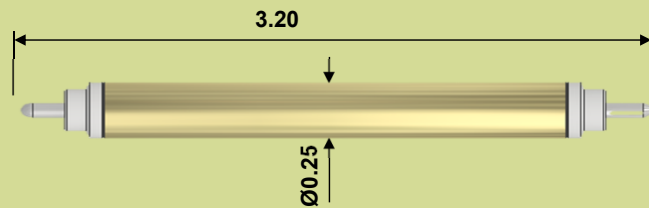
Coaxial Probe for RF Solution

15

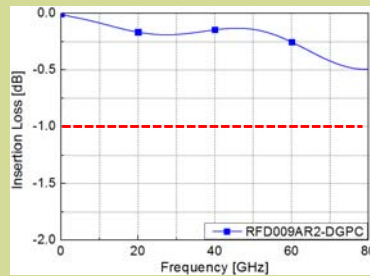


## Coaxial Probe: RF Characteristics

### 0.3mm Pitch Coaxial Pin

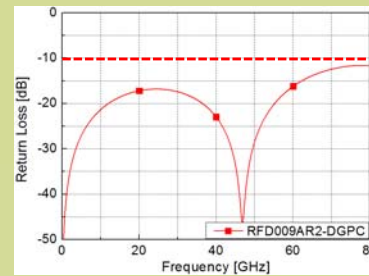


#### Insertion Loss



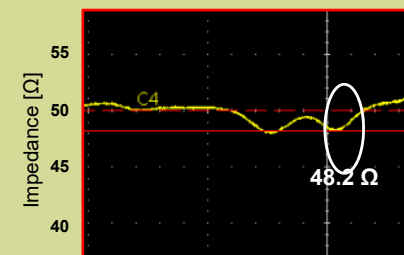
> 160Gbps (80GHz) @ -1 dB

#### Return Loss



> 160 Gbps (80GHz) @ -10dB

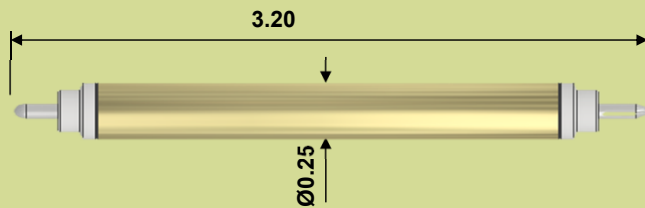
#### Impedance



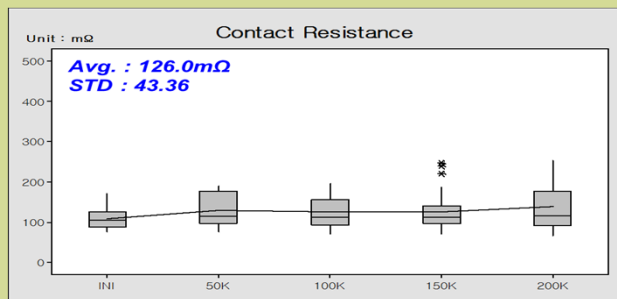
48.2Ω (Min.)

## Coaxial Probe: Cycling Test /CRES & Spring Force

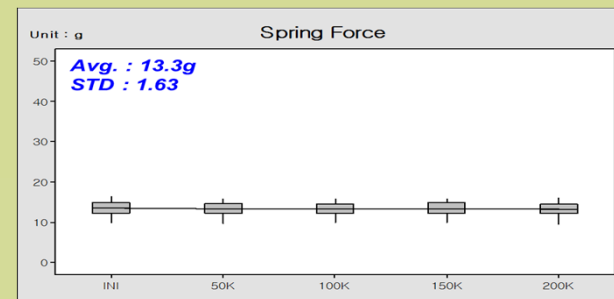
### 0.3mm Pitch Coaxial Probe



- Test Current : 10mA
- Test Temperature : 23 °C
- Test Insertions : 200,000 Insertions
- Test Jig : Silver Plate to Gold Plate



- Contact Resistance : Avg. 126.0mΩ at 0.33mm Recommended Travel
- Standard Deviation : 43.36 mΩ



- Spring Force : Avg. 13.3 g at 0.33mm Recommended Travel
- Standard Deviation : 1.63 g



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17



## Conclusion

### Once Again, Why Coaxial Probe?

- ✓ 50Ω Impedance Matching
- ✓ Fine Pitch (min. 0.25 mm) Application
- ✓ Higher RF Performance
- ✓ Ease of Maintenance & Assembly
- ✓ Full Metal Shielding



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18

