



# TestConX™

## Archive

DoubleTree by Hilton  
Mesa, Arizona  
March 3-6, 2024

# Next Generation Elastomer Socket and Interposer

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Mesa, Arizona • March 3–6, 2024



# TestConX 2024

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- How Elastomer Works
- Challenges for Elastomer
- Current Elastomer Issues
- Introduction to Next Generation Elastomer
- HFSS Simulation



Next Generation Elastomer Socket and Interposer

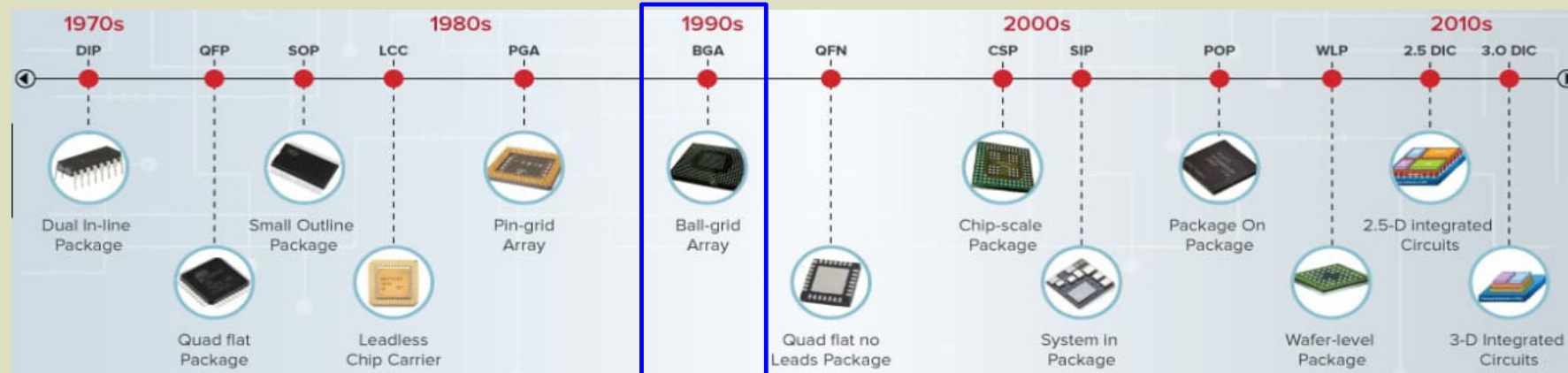
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# TestConX 2024

## Semiconductor IC Technology Trend

- High speed device in the 90's
- Test challenges with CRES, inductance, capacitance etc.
- Elastomer has been widely used since then



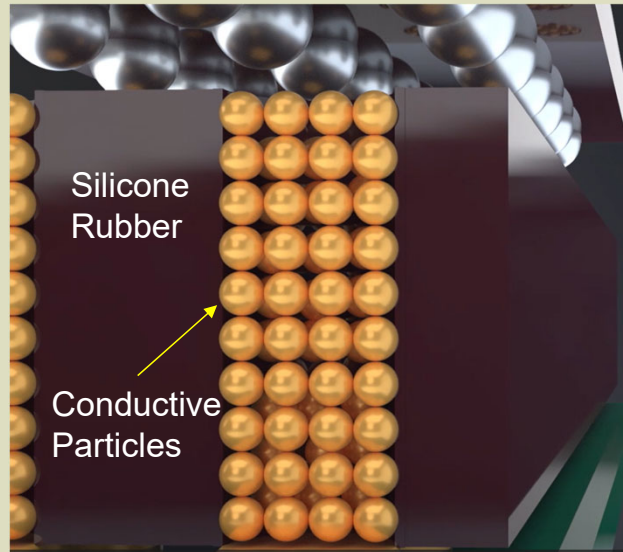
Next Generation Elastomer Socket and Interposer

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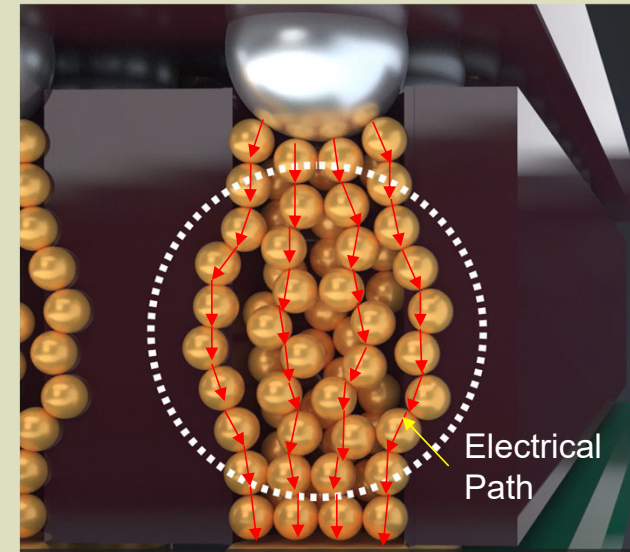


## How Elastomer Works

Before Compression



Compressed



## Challenges for Elastomer

### Technology Challenges

Fast signal transmission

High power

Large number of pins

Package warpage

Small pitch

### Elastomer Challenges

Low inductance, capacitance & CRES

Particle density

Low contact force, Operational stability

Long stroke

Pad size, Position tolerance



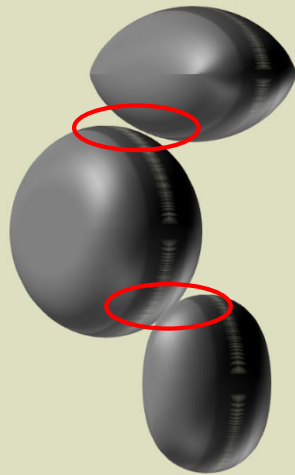
Next Generation Elastomer Socket and Interposer

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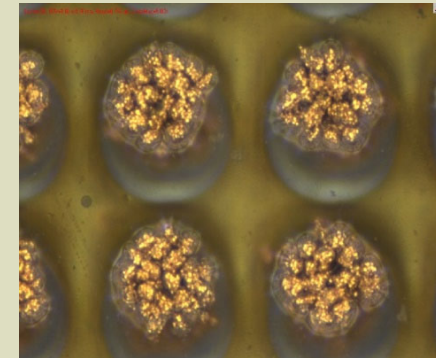
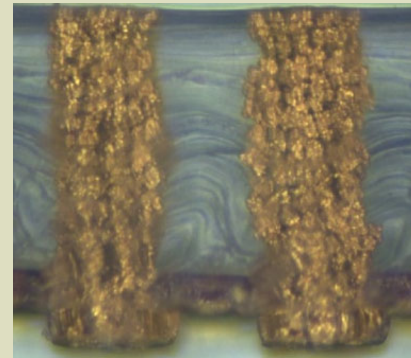
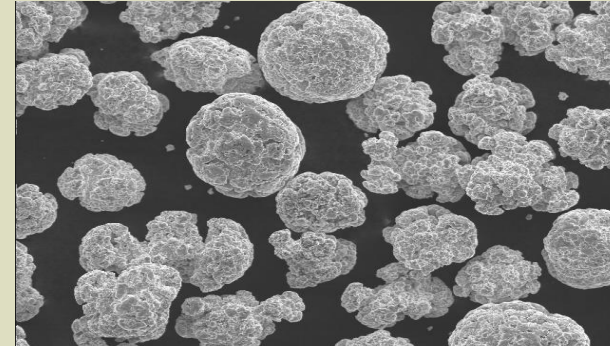


## Current Elastomer Issues

### Particles



- Small Contact Area
- Random Shape
- Different Size
- Rough Surface



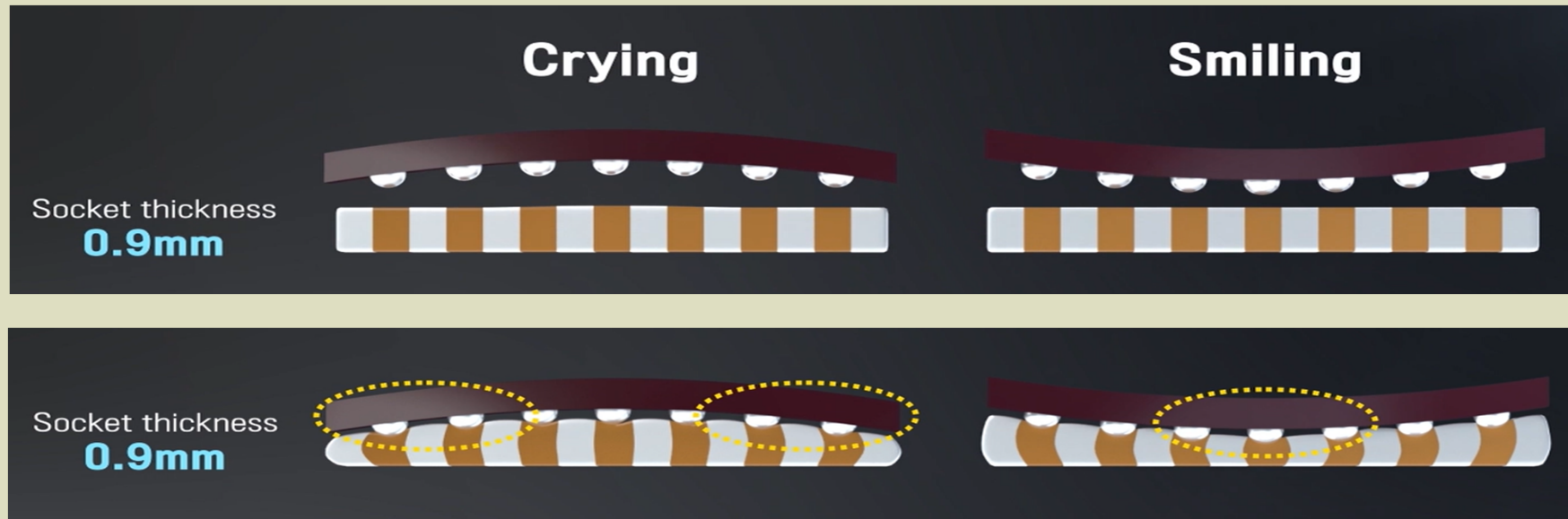
Next Generation Elastomer Socket and Interposer

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## Current Elastomer Issues

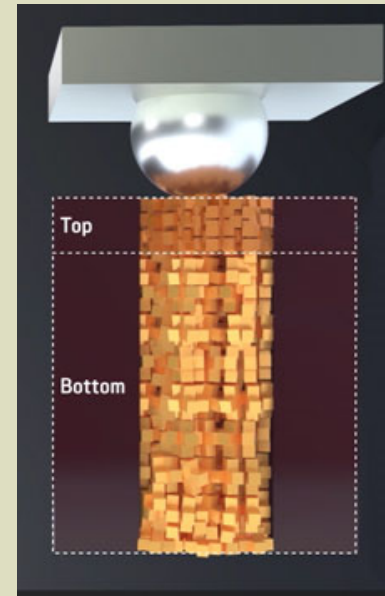
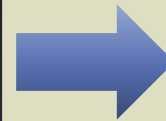
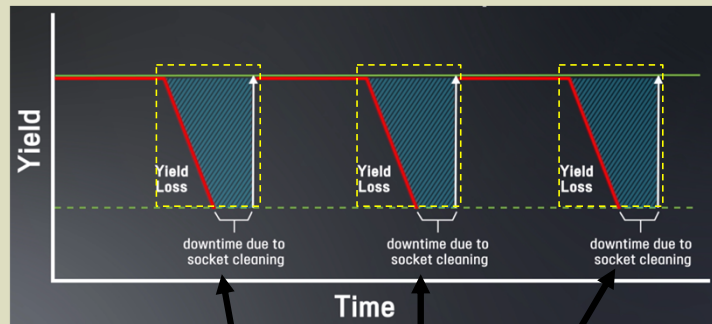
### Package Warpage





## Current Elastomer Issues

### Longevity



- Top Impact Breakage
- High CRES
- Short Stoke
- High Pin Force

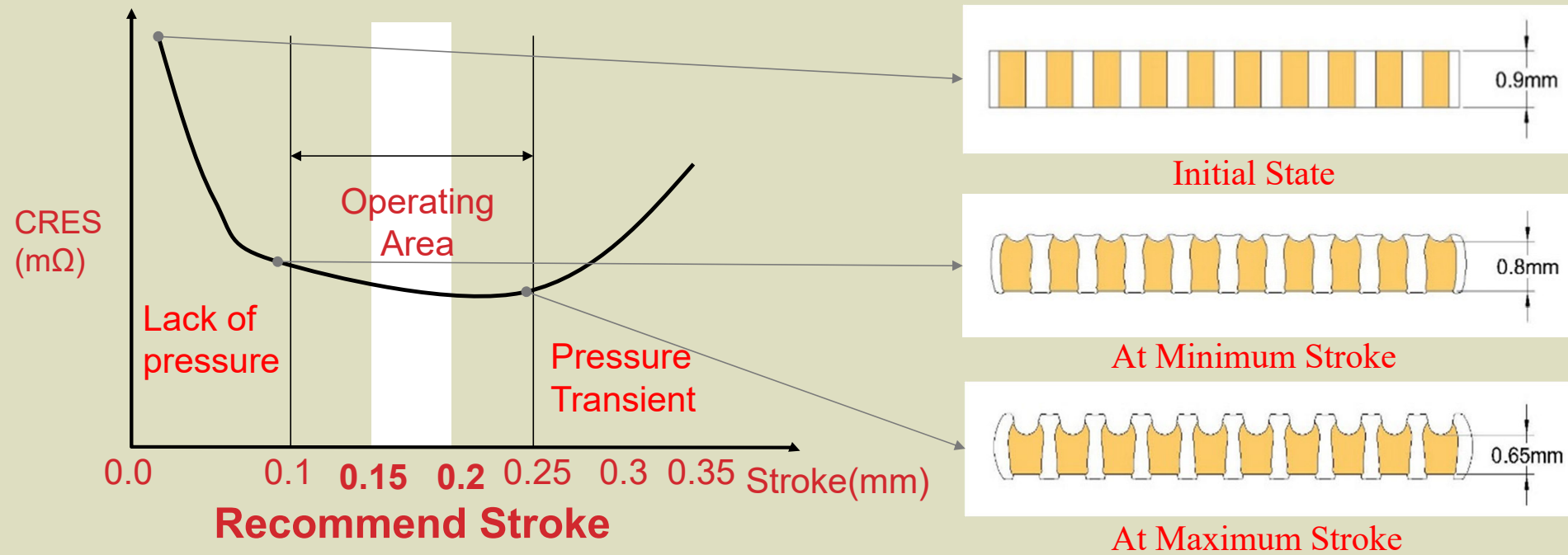


Next Generation Elastomer Socket and Interposer



## Current Elastomer Issues

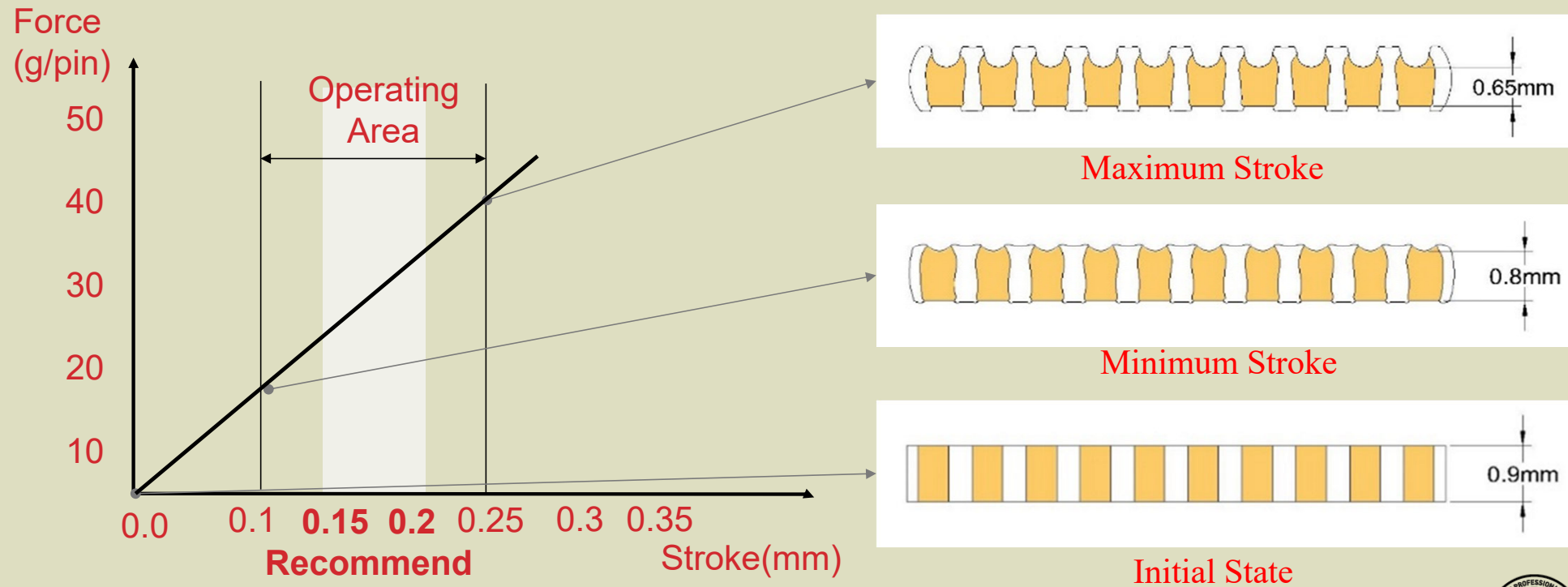
### Short Stroke



Next Generation Elastomer Socket and Interposer



## Current Elastomer Issues High Pin Force



Next Generation Elastomer Socket and Interposer

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## Introduction to Next Generation Elastomer

**Why**

**Next Generation Elastomer?**



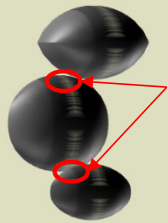
Next Generation Elastomer Socket and Interposer

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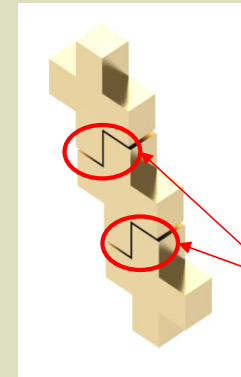
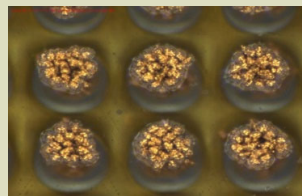
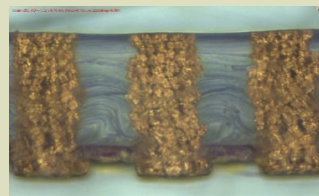
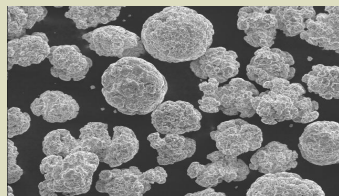


## Introduction to Next Generation Elastomer Particles

### Earlier Generation Particles

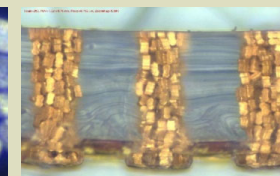
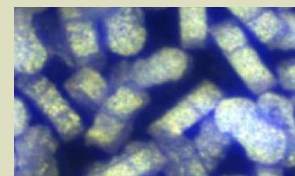
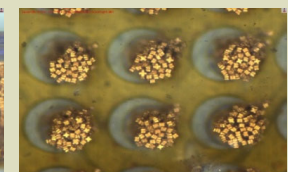
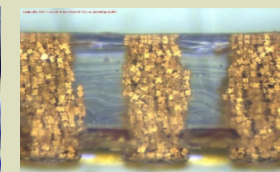
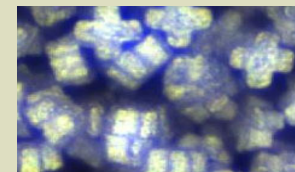


- Random Size & Shape
- Rough Surface
- Small Contact Area
- Higher CRES



### New Generation MEMS Particles

- Uniform Size & Shape
- Smooth Surface
- Larger Contact Area
- Lower CRES



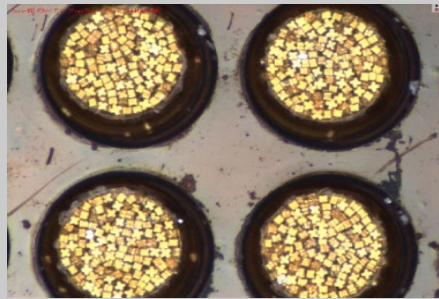
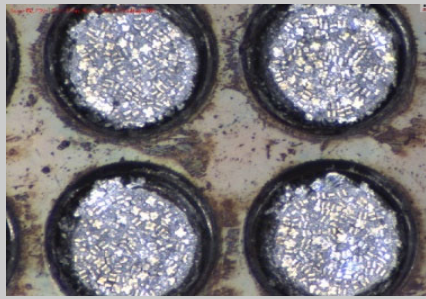
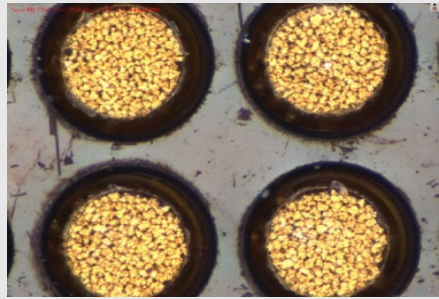
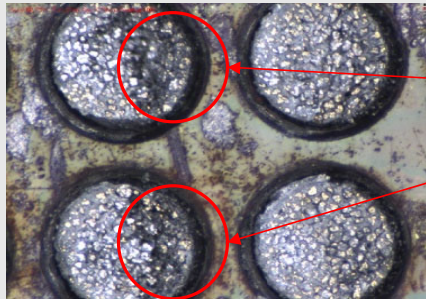
Next Generation Elastomer Socket and Interposer

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## Introduction to Next Generation Elastomer

### Lifespan Test – Top Impact Breakage

	Initial	After 300K Cycles @35g/pin
New Generation Elastomer Pad		
Conventional Pad		

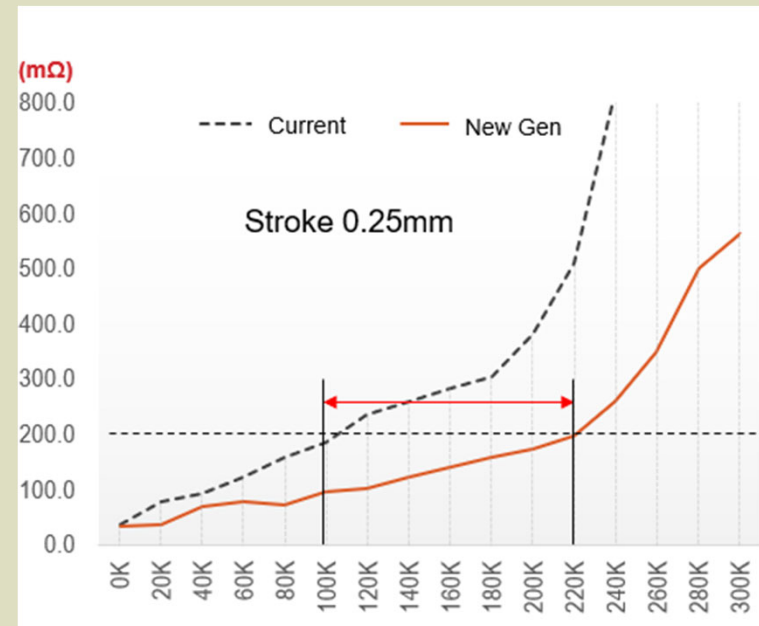
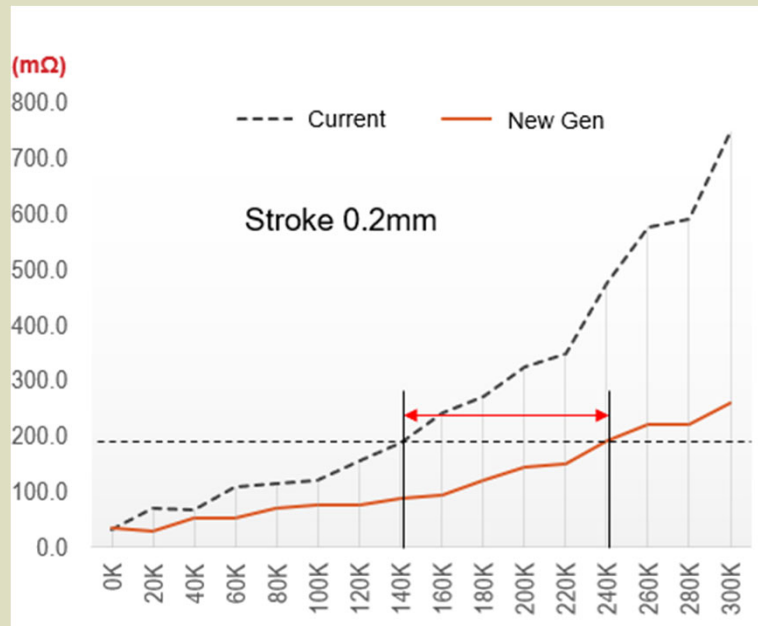
Damaged



## Introduction to Next Generation Elastomer

### Lifespan Test – CRES

Test sample 100BGA-0.8p-0.9t

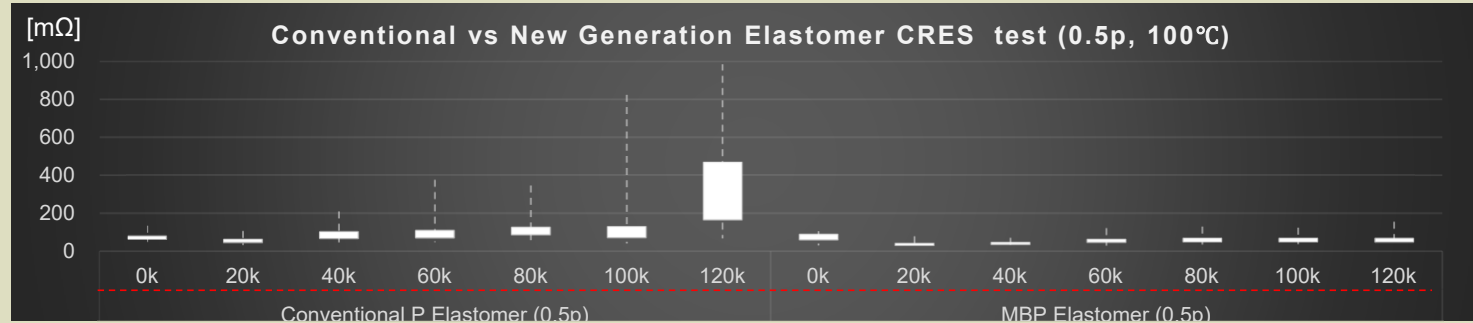


Next Generation Elastomer Socket and Interposer

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## Introduction to Next Generation Elastomer Lifespan Test – CRES



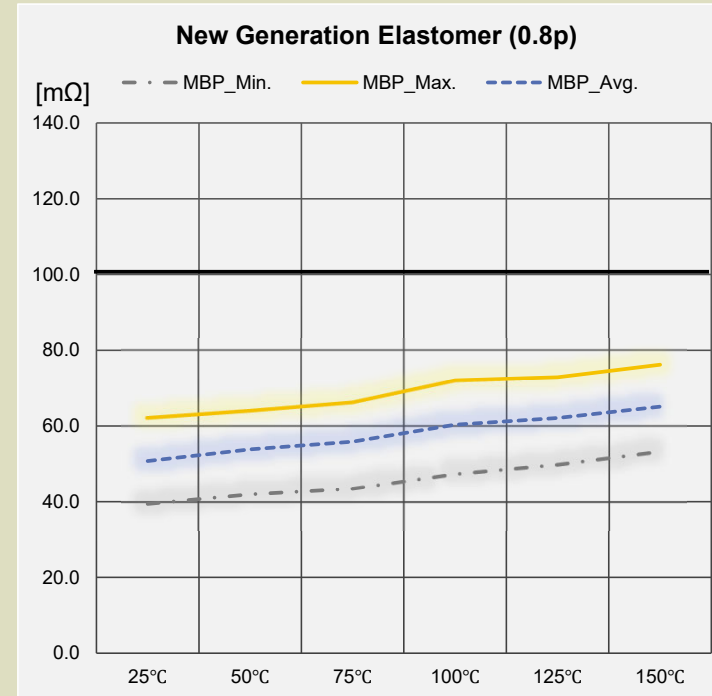
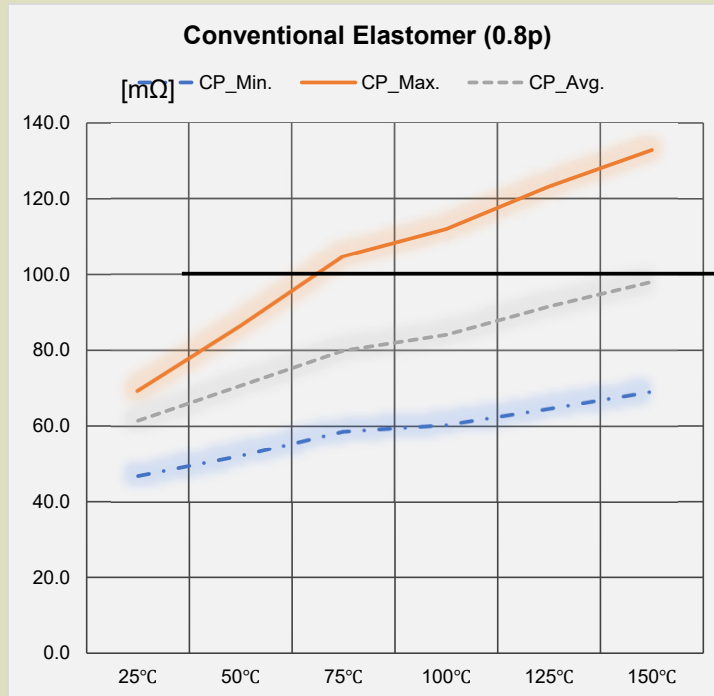
	20K	40K	60K	80K	100K	120K
Conventional						
New Gen						





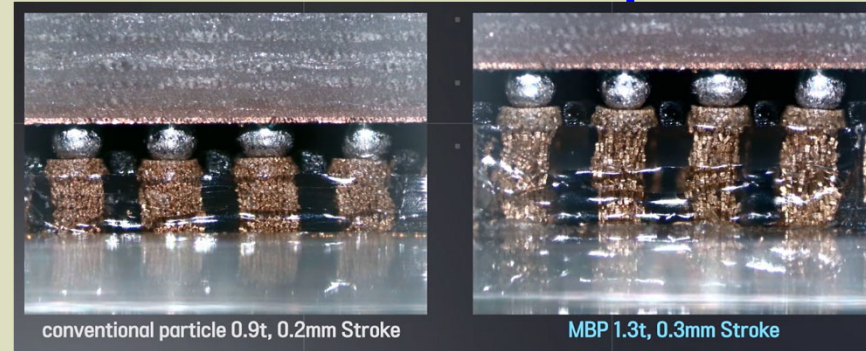
## Introduction to Next Generation Elastomer

### Temperature vs. CRES

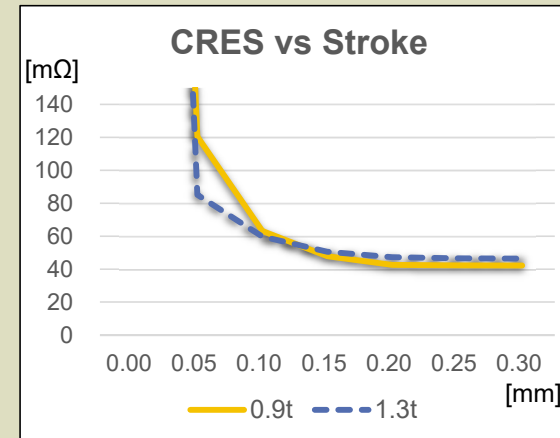
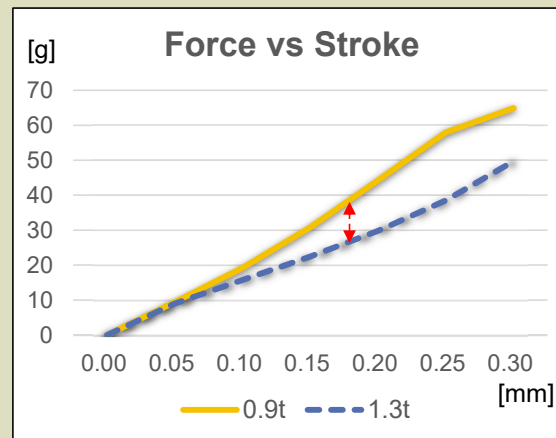


## Introduction to Next Generation Elastomer Thickness Comparison

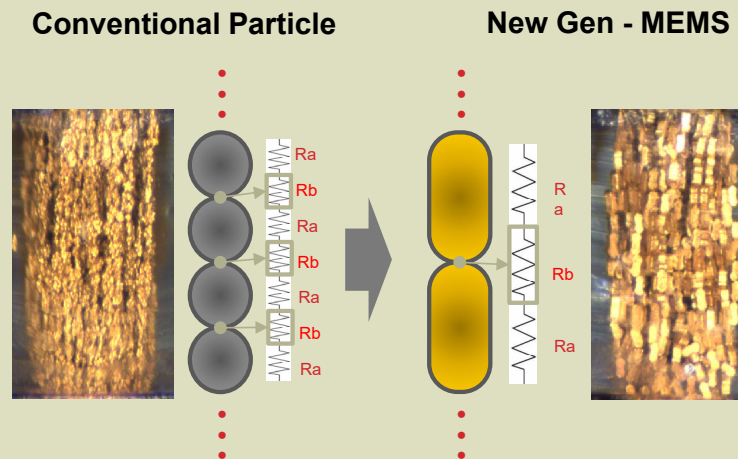
Conventional:  
0.2mm Stroke  
0.9mm Thickness



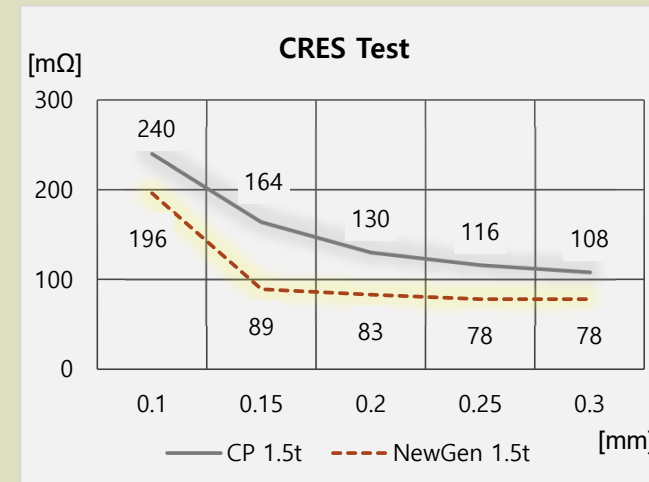
MEMS New Gen:  
0.3mm Stroke  
1.3mm Thickness



## Introduction to Next Generation Elastomer CRES Comparison – 1.5mm Thickness



Lower CRES with a smaller number of contacts



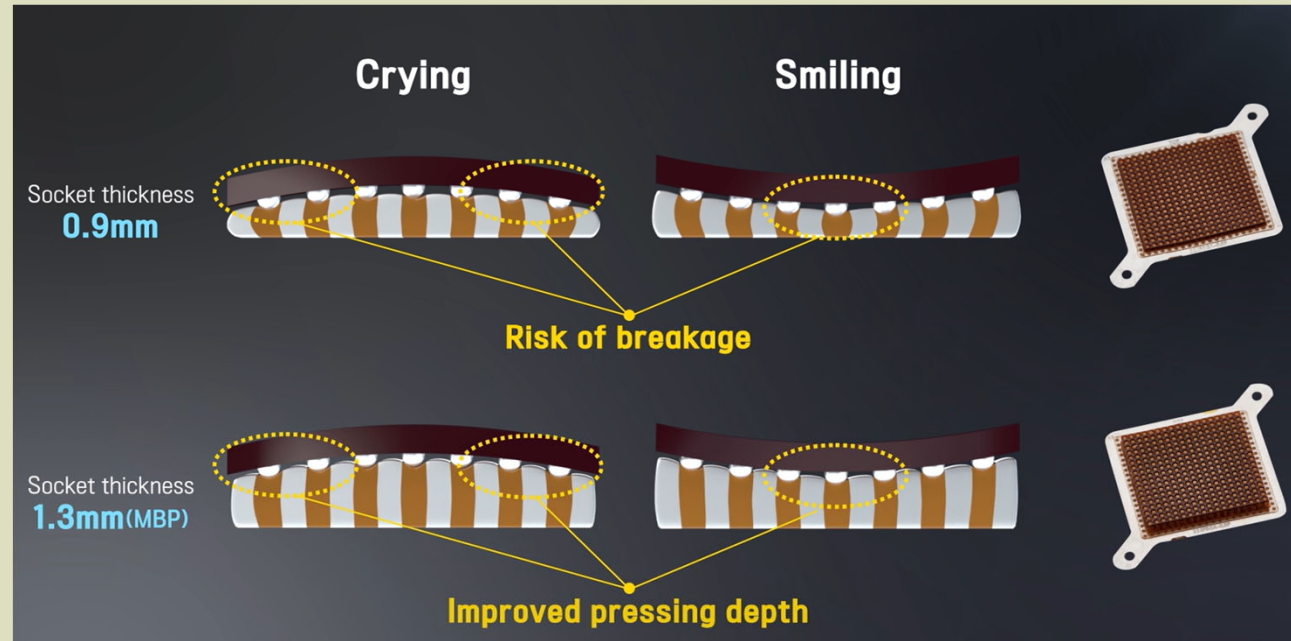
0.8p, CRES @0.2mm → Conv P 130mΩ vs NewGen 83mΩ

36% reduction of CRES

## Introduction to Next Generation Elastomer Warpage Issue Resolved

Conventional  
0.9mm Thickness

New Gen  
1.3mm Thickness  
Longer Stroke



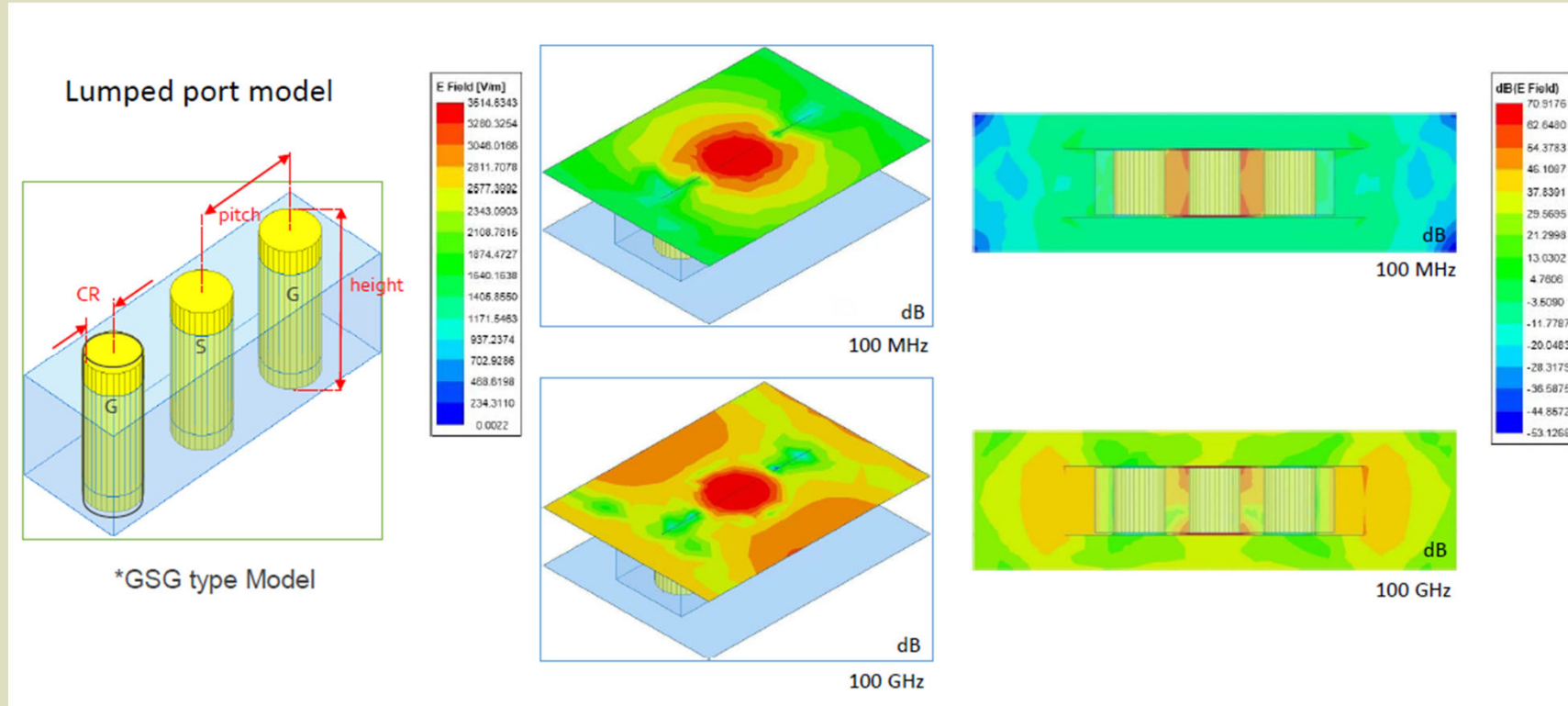
## Introduction to Next Generation Elastomer

### Application

- ATE Manual Test
- ATE Handler Test
- SLT (System Level Test)
- Burn-in
- Interposer

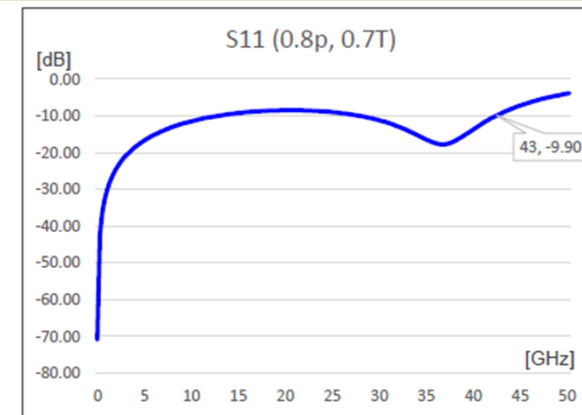
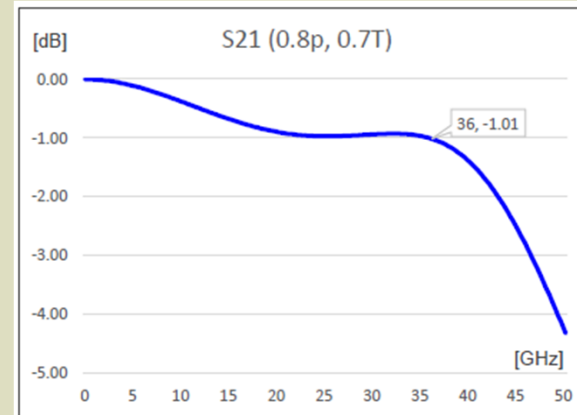


## HFSS Simulation

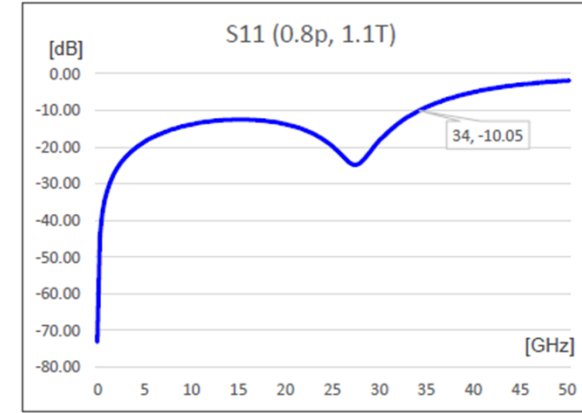
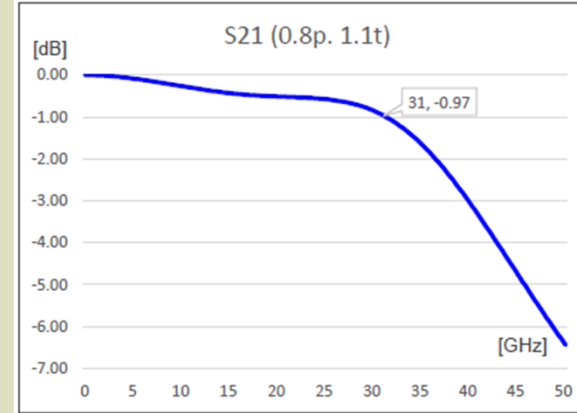


## HFSS Simulation – 0.8mm Pitch

0.7T  
S21: 36GHz @ -1dB  
S11: 43GHz @ -10dB

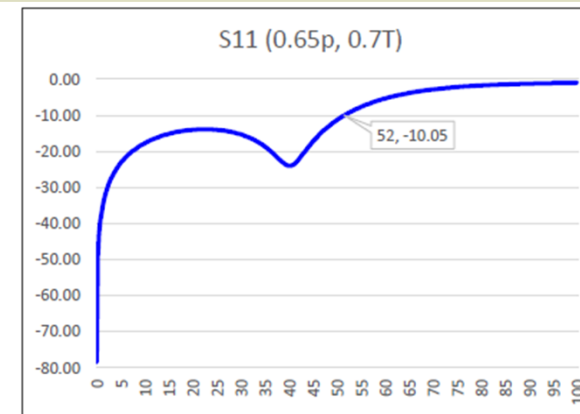
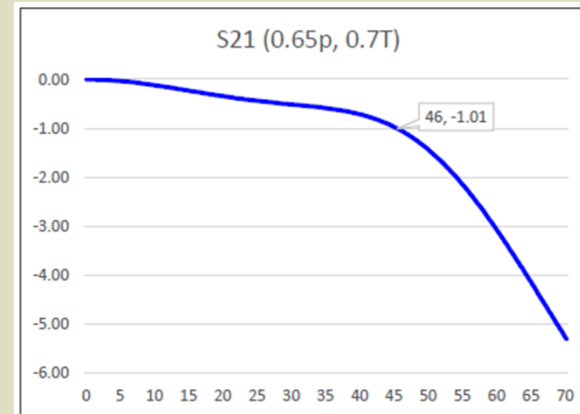


1.1T  
S21: 31GHz @ -1dB  
S11: 34GHz @ -10dB

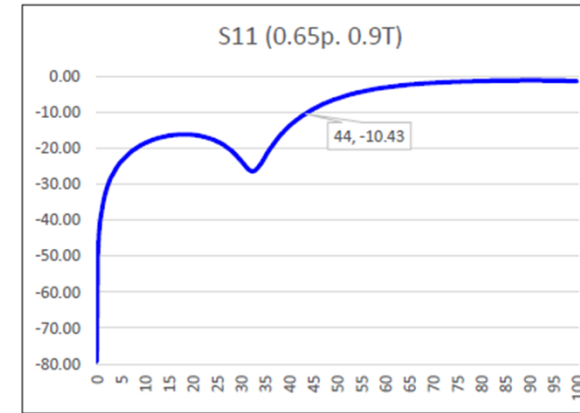
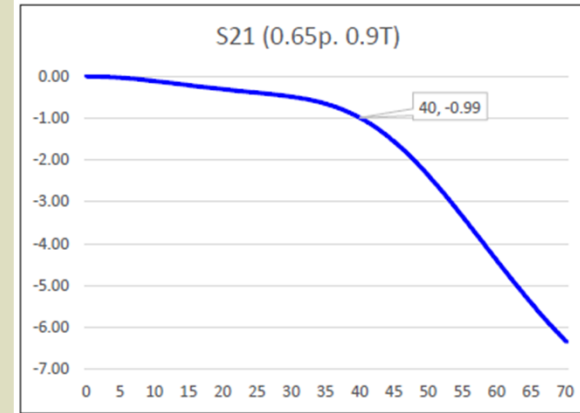


## HFSS Simulation – 0.65mm Pitch

0.7T  
S21: 46GHz @ -1dB  
S11: 52GHz @ -10dB



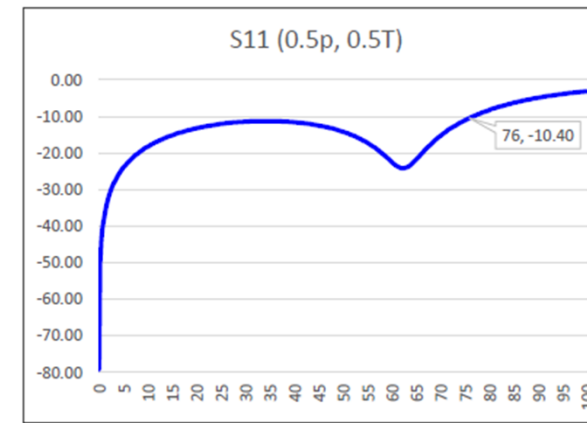
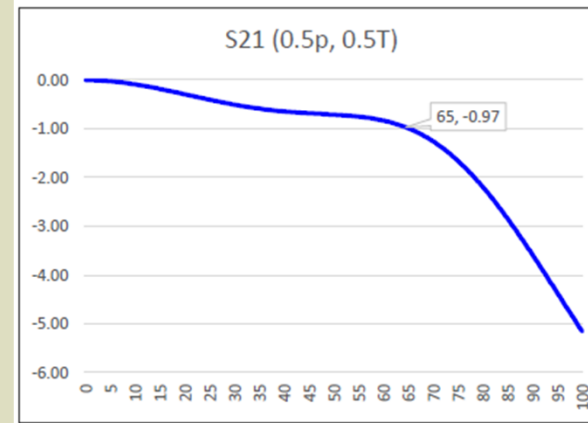
0.9T  
S21: 40GHz @ -1dB  
S11: 44GHz @ -10dB



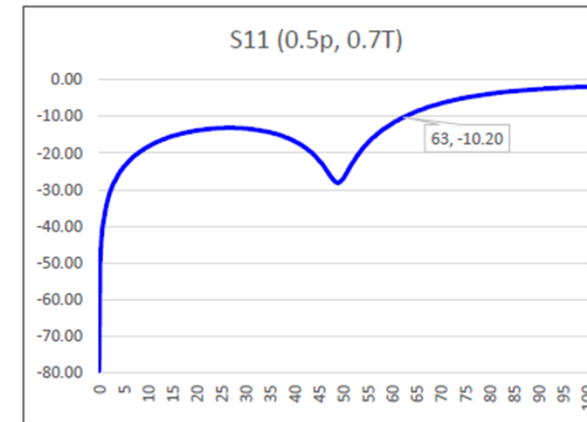
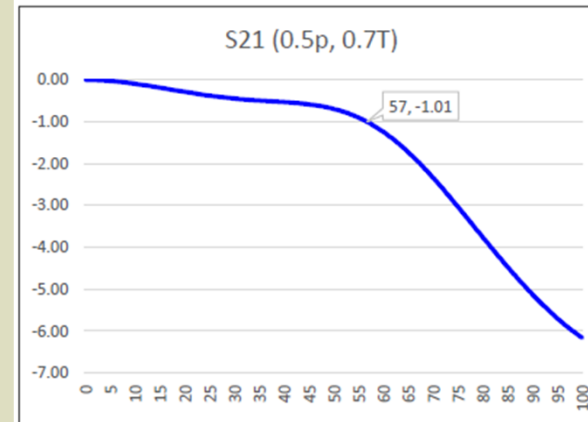


## HFSS Simulation – 0.5mm Pitch

0.5T  
S21: 65GHz @ -1dB  
S11: 76GHz @ -10dB

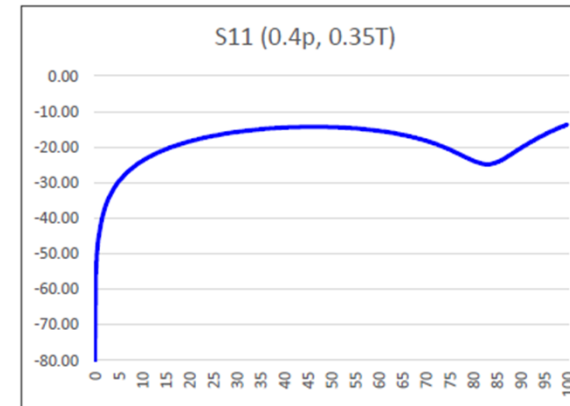
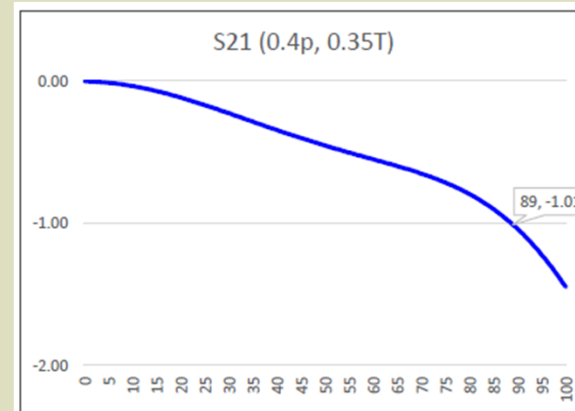


0.7T  
S21: 57GHz @ -1dB  
S11: 63GHz @ -10dB

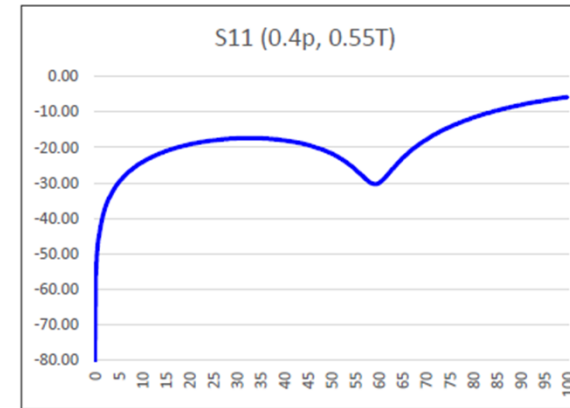
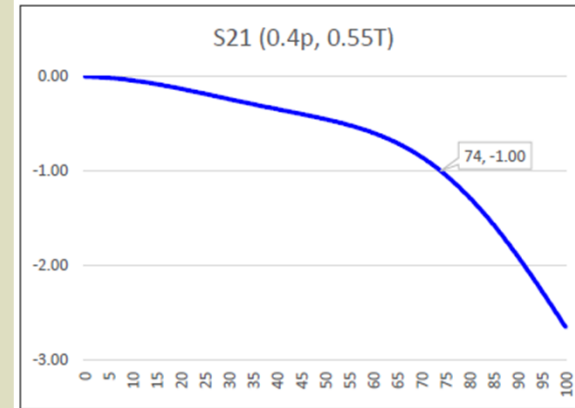


## HFSS Simulation – 0.4mm Pitch

0.35T  
S21: 89GHz @ -1dB  
S11: >100GHz @ -10dB

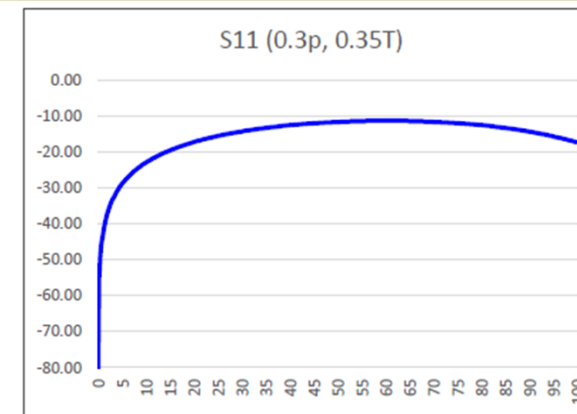
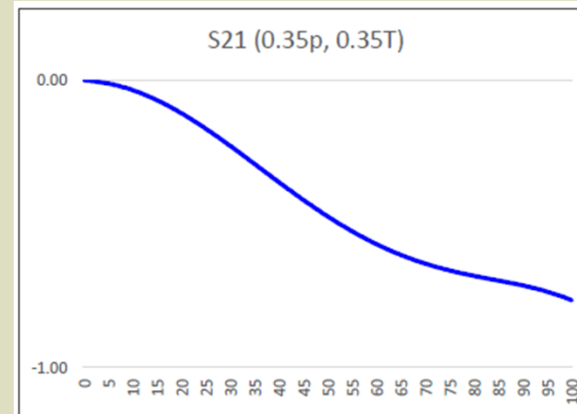


0.55T  
S21: 74GHz @ -1dB  
S11: 80GHz @ -10dB

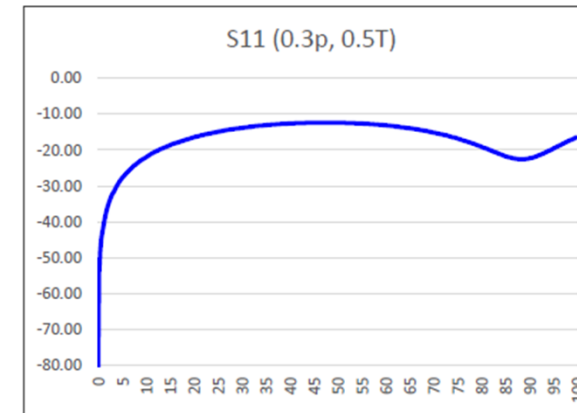
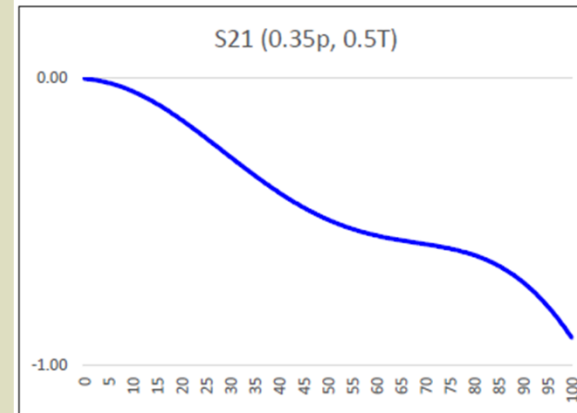


## HFSS Simulation – 0.35 & 0.3mm Pitch

0.35T  
S21: >100GHz @ -1dB  
S11: >100GHz @ -10dB



0.5T  
S21: >100GHz @ -1dB  
S11: >100GHz @ -10dB



## Conclusion

- New Challenges with Elastomer Sockets
- MEMS Particles can resolve many issues
- Yield Improvement
- Test Cost Reduction
- MEMS Elastomer is Today's Solution for Future Packages



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