NINETEENTH ANNUAL Burn-in & Test Strategies Workshop

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Short Test Height Solution Using Hybrid Elastomer Contactor

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Present and Feature Market For High Frequency and High Data Rate



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Type of Popular Elastomer Contactor in The Market for High Frequency

Item	Wire Type Elastomer	Metal Particle Type Elastomer			
Contact elements	Gold plated metal wire	Gold plated conductive particle			
Thickness [mm]	0.15 to 0.5	0.2 to 1.4			
Life cycle	>50K (Note 1)	1K to 500K			
Device type	BGA, QFN, QFP (Note 2)	BGA, LGA, QFN, QFP			
Custom design	Not required (Note 3)	Required			
Note 1: Due to metal wire damage Note 2: Due to mechanical limitation Note 3: Standard size available (Ex: 50x50mm)					
Metal wire	Silicone rubber Co	nductive particle pillar			
Wire Type Elast	Wire Type Elastomer Metal Particle Type Elastomer				
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Wire Type Elastomer Contactor Spec Example

Wire Pitch [mm]	Wire Diameter [mm]	Thickness [mm]	Wire Angle [degree]
0.1	0.03	0.2 ~ 2.0	63
0.075	0.03	0.2 ~ 2.0	63
0.05	0.023	0.15 ~ 2.0	63
0.04	0.023	0.15 ~ 2.0	63

- Body
 Silicone Rubber
- Metal Wire Gold plated BeCu or Brass Wire





Wire Type Elastomer Performance for BGA



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Wire Type Elastomer to Hybrid Elastomer



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Hybrid Elastomer Contactor Structure <Hybrid Elastomer: Patent Pending> Metal plunger Polyimide sheet For LGA, For BGA. For BGA, QFN, QFP QFN, QFP QFN, QFP Metal plunger shape example Wire Type Elastomer Metal plunger - Shape: 4-pt crown, 9-pt crown, Conical and etc. - Material: BeCu, SK4, Pd alloy and etc. - Plating: AuCo, PdCo, Rh, multi layer coating and etc. 9 Short Test Height Solution Using Hybrid Elastomer Contactor

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- Metal plunger bottom surface diameter
 - Φ0.24, Φ0.20, Φ0.16, Φ0.10
 - To change RF performance
 - To change compression force



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Wire Type Elastomer (t=0.5mm) RF Performance



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Wire Type Elastomer (t=0.25mm) RF Performance



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Metal Plunger (t=0.4mm) RF Performance



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Hybrid Elastomer (t=0.9mm) RF Performance



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Hybrid Elastomer (t=0.65mm) RF Performance



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RF Performance Summary

٦ Item	Thickness [mm]	Insertion Loss @ -1dB [GHz]		Return Loss @ -10dB [GHz]					
		Ф0.10	Ф0.16	Ф0.20	Ф0.24	Ф0.10	Ф0.16	Ф0.20	Ф0.24
Wire Type Elastomer	0.5	48.8	34.8	27.2	16.3	44.1	25.3	17.7	10.5
	0.25	73.7	66.6	60.8	36.7	70.0	57.3	42.5	23.4
Metal Contactor	0.4	57.5	61.1	62.9	65.5	45.0	51.6	56.4	63.7
Hybrid Elastomer	0.9	48.9	31.6	25.8	17.3	48.1	23.4	18.2	11.6
(Wire Type Elastomer + Metal Contactor)	0.65	62.2	54.4	47.8	35.4	69.5	47.6	38.2	25.8
								(GSG sin	nulation)



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Hybrid Elastomer Cycle Test

- Device simulator: BGA shape (Au plated)
- Contactor height: 0.9mm
- Elastomer thickness: 0.5mm
- Working stroke: 0.1mm
- Metal plunger: BeCu with AuCo plating
- Cycle count: 1 million cycle
- Test item: CRES, compression force, metal plunger condition, wire type elastomer condition



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Cycle Test (Compression Force 0K to 1M Cycle)



- Average compression force 46 gf to 53 gf
- High force
- Wide variation
- Force can control by changing metal plunger bottom surface design

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Cycle Test (Elastomer Condition 100K to 1M Cycle)



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Session 2A Presentation 2

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Cycle Test (Metal Plunger Condition@1M Cycle)





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Hybrid Elastomer Summary

Item	Hybrid Elastomer	Hybrid Elastomer			
Total thickness	0.90mm	0.65mm			
Elastomer thickness	0.50mm	0.25mm			
Working stroke	0.10mm	0.05mm			
Life cycle	>500K	ТВА			
Average CRES	12 to 27mOhm (Note 1)	ТВА			
Average compression force	46 to 53gf (Note 2)	ТВА			
Insertion loss @ -1dB	49GHz	62GHz			
Return loss @ -10dB	48GHz	70GHz			
Loop inductance	0.38nH	0.27nH			
Note 1: 0 to 1M cycle (GSG simulation) Note 2: Compression force can change to 25gf by design					

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Hybrid Elastomer Contactor Sample



0.4mm pitch sample socket



Metal plunger in the polyimide sheet



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