New Pogo Socket with Replaceable Top Plunger

Yee Sun Kang
TSE Corporation

TestConX한국 Korea

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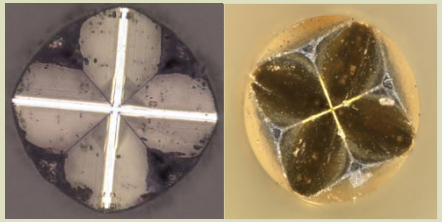
TSE

Contents

- Causes of Pogo Pin's Lifespan Decrease and Replacement Method
- Tango Pin Introduction
- Tango socket Introduction
- Advantage of Tango
- Comparison Pogo Pin and Tango
- Conclusion

Pogo Pin

- Loss of Pin Functionality due to SN(Tin) on the top plunger or damage
- Full replacement is required up to the undamaged components if Top plunger be damaged



→ *Tip Worn out & Sn displacement*

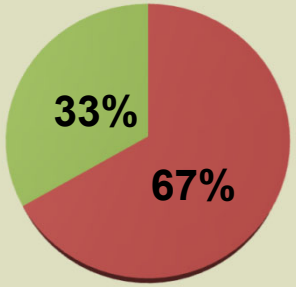
Mechanical Spec

Recommend Operation Stroke : 0.45mm
Operation Full Stroke : 0.60mm
Spring Force : 25gf±20% (@0.45mm)
Life Span : >300,000 (Mechanical)
Operating Temperature : -60°C ~ 220°C

Electrical Characteristic

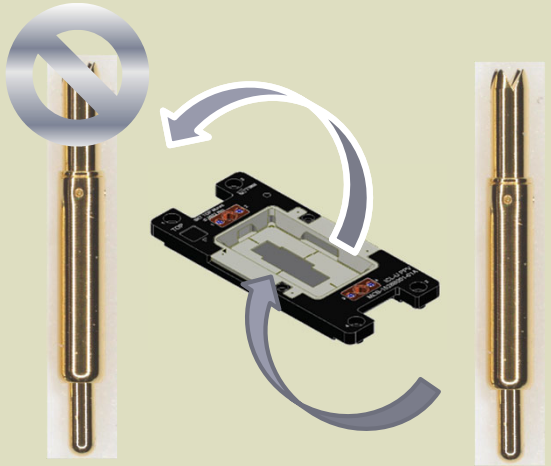
Resistance : <100mΩ (Average)

Force



~20gf
20~25gf
25~30gf
30gf~

→ **100% Spec In**



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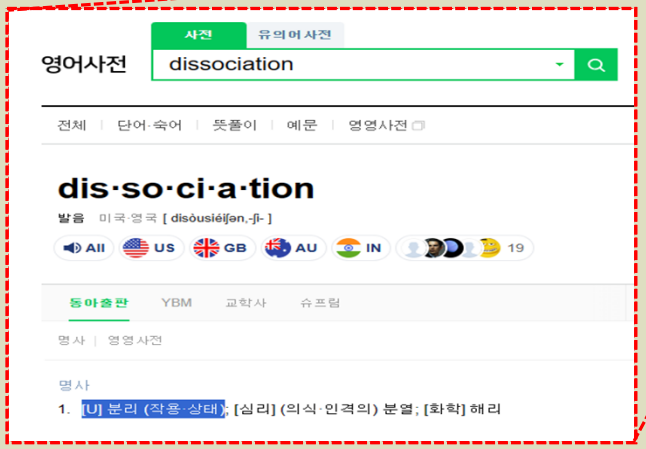
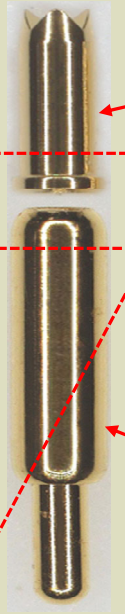
Introduction of Tango

- **What's Tango Socket ? / Why Develop Tango Socket ?**





TANGO

- Contact of separated two parts
- Efficient lifespan, cost, and replacement time
- Outstanding response to Customer Needs

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Tango Pin

- Separated structure of the upper contact part and the lower elastic part
- Able to reuse elastic part

Pogo

Contact Part
Life Span 50k~100k
Sn migration and oxidation

Elastic Part
Life Span 300k~1,500k
due to Au to Au contacts

Tango

Change
every 50k~100k

Reuse
to 300k~1,500k

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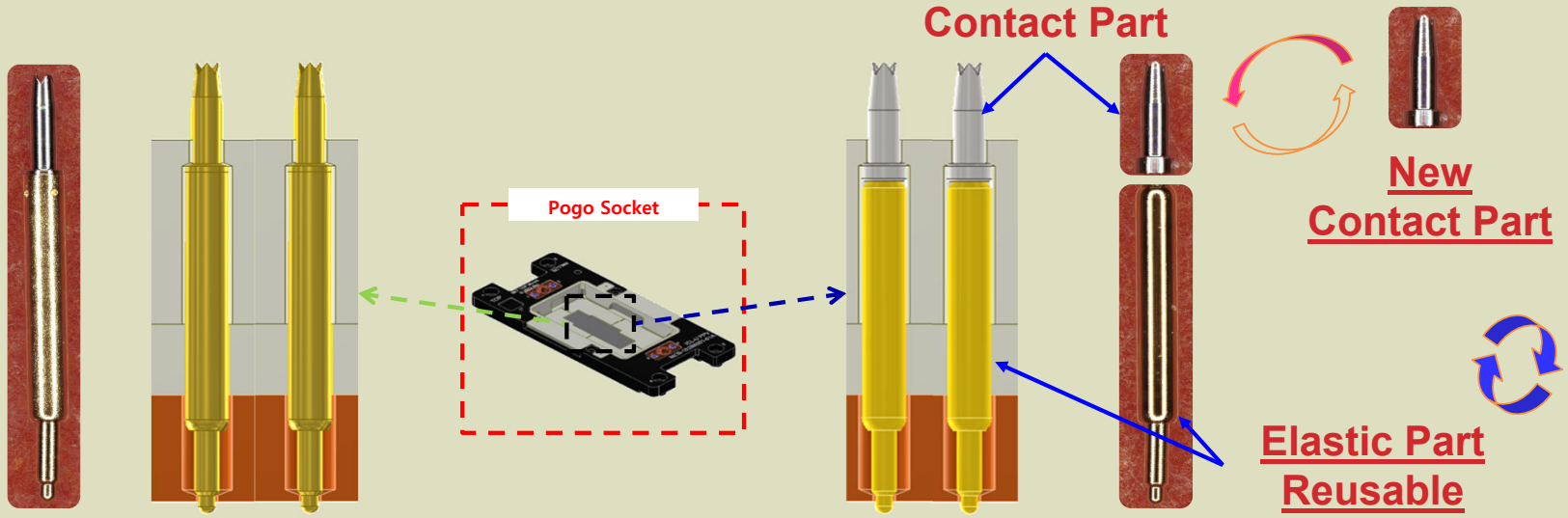
Tango socket

- Able to remove worn out pin and replace contact part only
- By reusing elastic part, reduce manufacturing cost about 30%

Pogo | **Tango**



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Advantage - Cost Reduction

- Pin replacement simulation for every 50K TD@ $1/pin
- 36% cost reduction effect when using Tango

	50K	100K	150K	200K	250K	300K	350K	400K	450K	500K	Total
Pogo($)	1 	1 	1 	1 	1 	1 	1 	1 	1 	1 	$ 10
Tango($)	1 	0.6 	0.6 	0.6 	0.6 	0.6 	0.6 	0.6 	0.6 	0.6 	$ 6.4
Saving Rate(%)	-	40%	40%	40%	40%	40%	40%	40%	40%	40%	36%

Lifespan : Contact Part 50K / Barrel Part 500K

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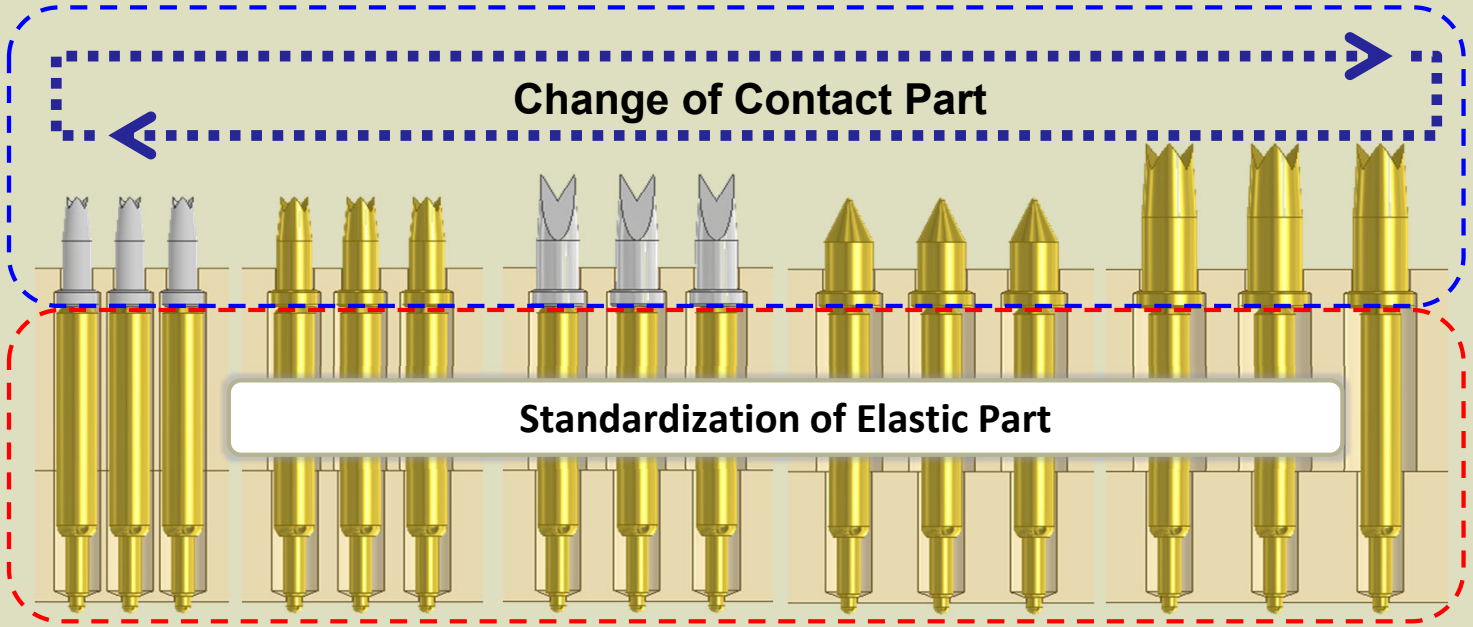
Advantage - Elastic part public

- Able to standardize elastic part
- Able to standardize material and shape of contact part



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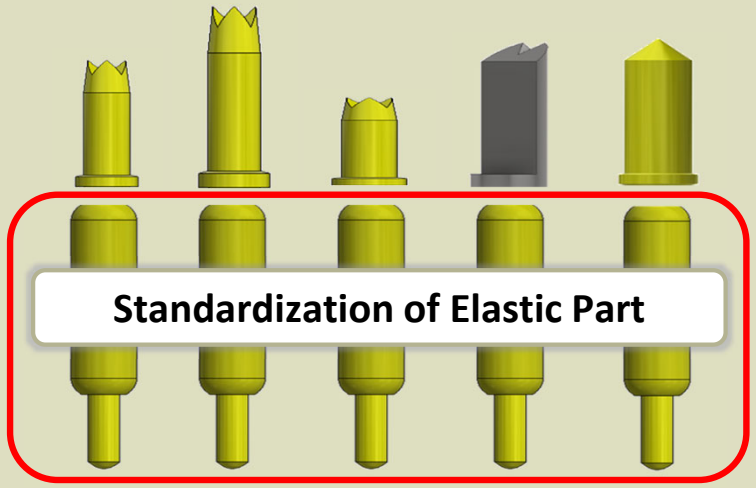
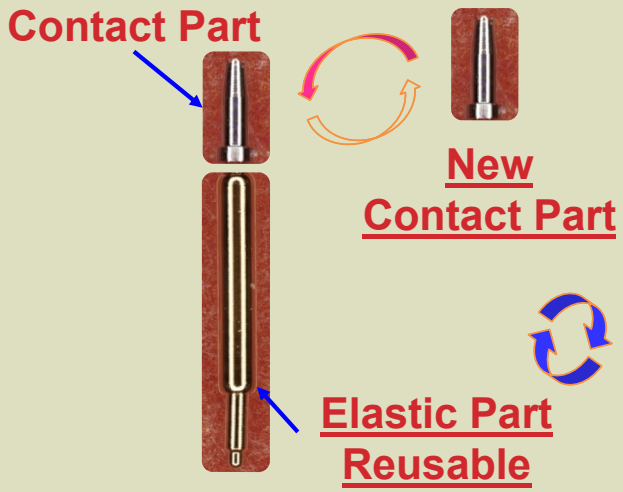
Advantage - Short Delivery Time

- By standardizing and reusing elastic part, able to reduce the Lead time

Pogo Pin : 2.0 weeks

Tango Pin contact part : 1.0 weeks





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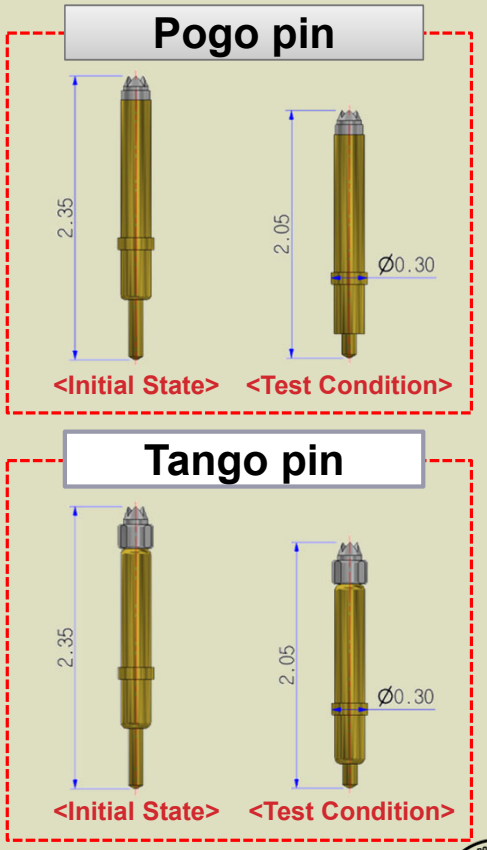
Compare Pogo with Tango

Conditions	Details
Test Temperature	Hot Temp. (100ºC)
Test Housing	12xxBGA_0.35mm Pitch Housing
Touchdown Condition	Dummy Device Contact (Sn ball)
Interval of Dummy Device Replacement	Every 1K
Touchdown Time During Cycling	1 second
Total Number of Cycles	100K



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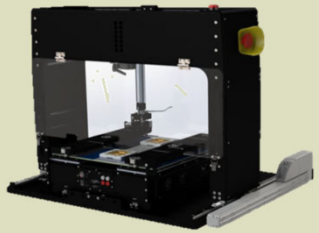
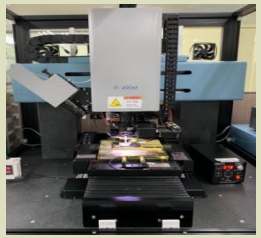
Evaluation Conditions

- **Hardware for Evaluation : MA6 & IT200 & IT490M**
  - **MA6 : Performs repeated touchdown**
  - **MODUS : Measures the Cres of socket**
  - **IT490M : Measures the force and CCC characteristics of socket**

•Maker : TSE
•Model : MA6



•Maker : Modus Test
•Model : MODUS MPT XT



•Maker : TSE
•Model : IT490M

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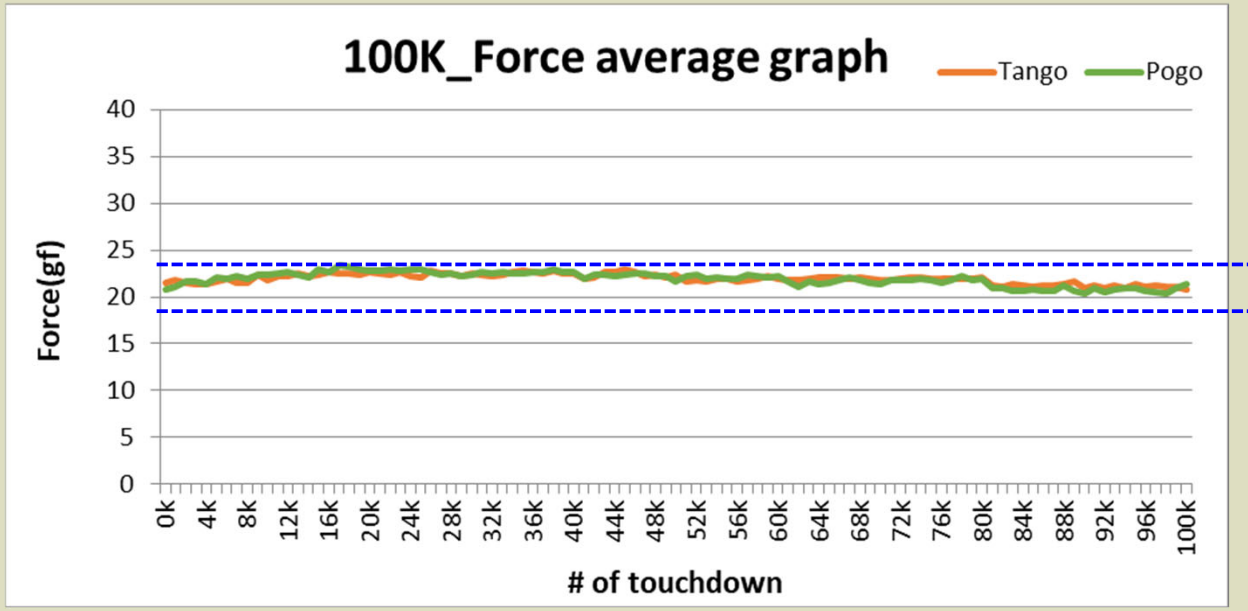
Force Result

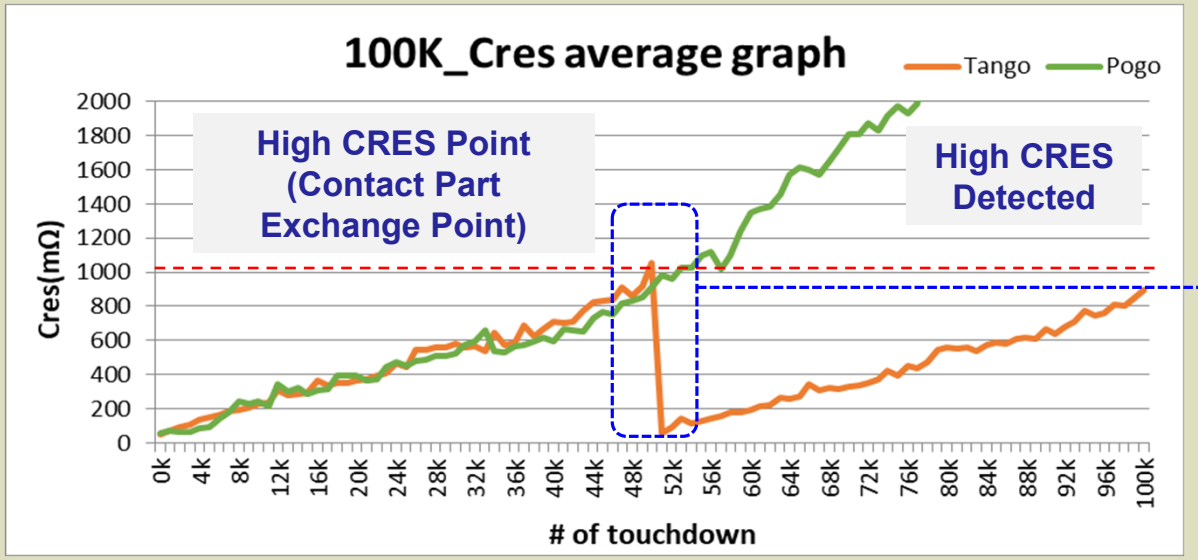
- No significant difference confirmed between Tango pin and Pogo pin.

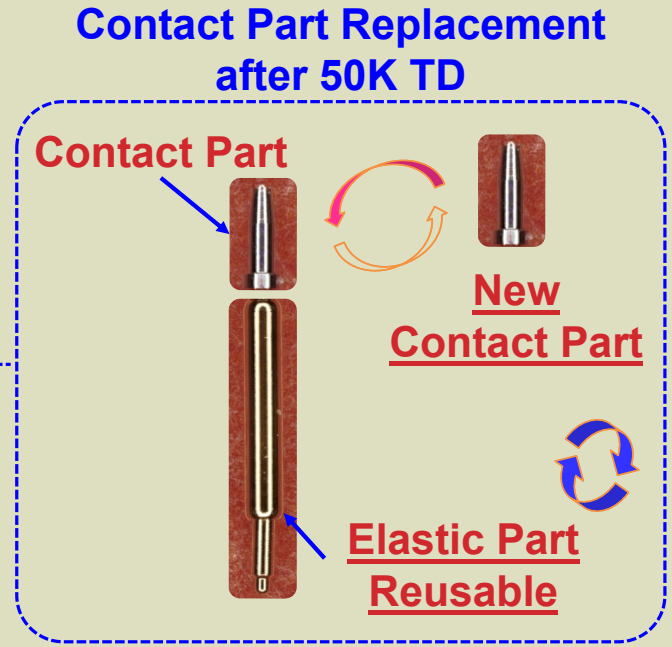


Force Spec. :
21 gf ± 10 %
(18.9 gf ~ 23.1 gf)

Lifespan Result

- Replaced the contact part of Tango pin at 50K TD and confirmed similar CRES results as the initial measurement.





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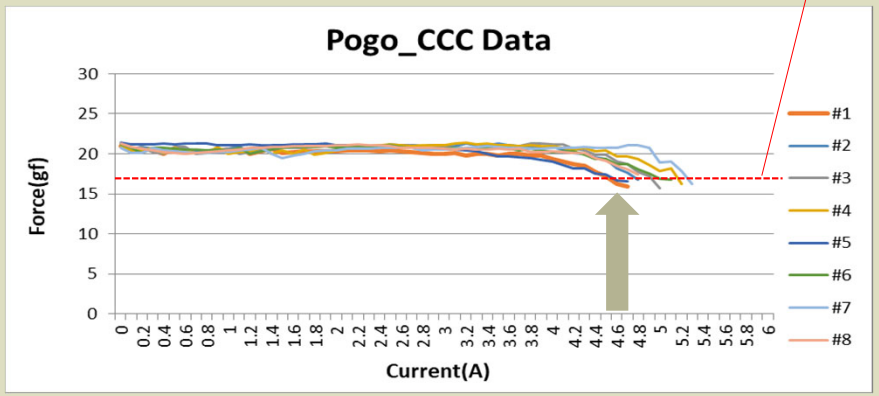
Current Carrying Capacity Result

- C.C.C. confirmed to be similar as average 4.6A for both Tango Pin and Pogo Pin.

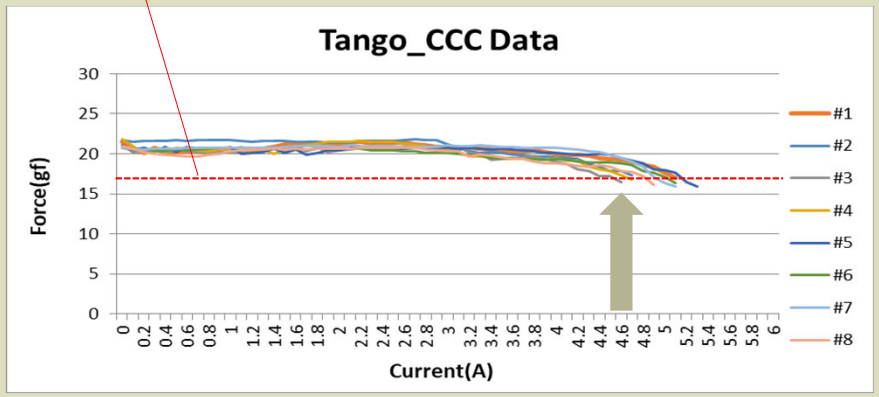
Force spec : 21 gf ± 20 %

Force 20% Reduction Point (16.8 gf)

Pogo



Tango



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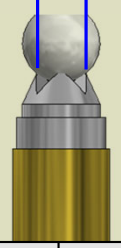
Contact Mark Result

- No significant difference in contact mark confirmed between Tango Pin and Pogo Pin.

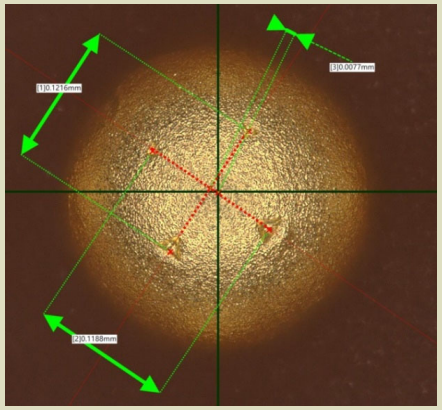
Pogo

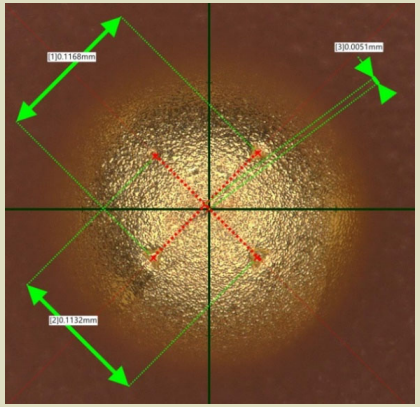
Crown Pitch
Ø 0.12 mm



Crown Pitch	Shifted Amount of Contact
Ø 0.1216 Ø 0.1188	0.0077 mm

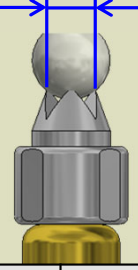
Ball Center Line
Contact Mark Center Line





Tango

Crown Pitch
Ø 0.12 mm



Crown Pitch	Shifted Amount of Contact
Ø 0.1168 Ø 0.1132	0.0051 mm

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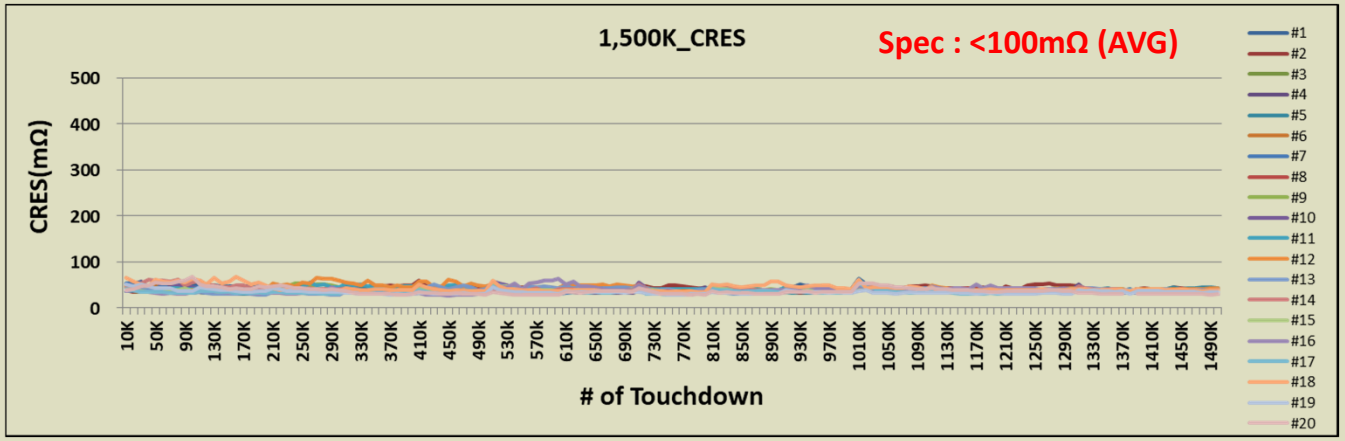
1,500K Tango Life Span

- The Resistance value of Tango for 1,500k is less than 100 mΩ



- Tool : IT-490M [TSE]
- Temp. : Room Temp.
- Measurement Quantity
  : 20 EA per pin type
- resistance measurement
  : Gold Plated

	CRES [mΩ]										
1,500K	#1	#2	#3	#4	#5	#6	#7	#8	#9	#10	AVG
	40.59	42.23	37.04	37.45	38.27	36.56	36.22	37.49	39.35	37.63	38.28
	#11	#12	#13	#14	#15	#16	#17	#18	#19	#20	AVG
	42.09	43.81	38.87	40.24	37.55	38.45	34.62	43.54	34.72	37.10	39.10

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Conclusion

- Confirmed that when Sn transfer or damage occurs on the Top Plunger, only the Top Plunger can be replaced, and the existing Barrel can be reused
- By applying Top plunger separated replacement method, achieved the advantages of cost reduction, shorter lead times through the standardization of the elastic part, reduced maintenance time, and addressing warpage
- Conducted various Field Test with Tango (32QFN, 1298BGA, 64WLCSP…)
- The Tango socket can replace the existing Pogo pin and achieve various advantages

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