1. Purpose:

This is qualification test report. The purpose of this test is to evaluate the performance of Spring finger.

Testing was performed on below products to determine it compliance with the requirements of product specification 108-115061-1.

2. Scope:

This is test report for Type A 1.6H connector. Testing was performed at TE Connectivity Shanghai Electrical Components Test Laboratory between Oct, 2013 and Dec, 2013.

3. Conclusion:

The product met the electrical, mechanical, and environmental performance requirements of TE product specification 108-115061-1.

4. Test samples:

Samples were taken randomly from current production. The following part numbers were used for test:

Description	Product Part No.
Type A 1.6h Spring Finger	2199248-6

5. Test Requirements and Procedures Summary:

5.1 Examination:

Test Description	Requirement	Procedures
Visual examination of product	Meets requirements of product drawing and applicable instructions on customer drawing, and application specification.	Visual, dimensional and functional per applicable inspection plan. In according with IEC 60512-1-1 Magnification 10x

5.2 Electrical

Test Description	Requirement	Procedures
Low level contact resistance (LLCR)	75mΩ Max (Initial), 100mΩ Max (Final)	Subject mated connector to 20mV Max. open circuit at 100mA. Need to exclude wire resistance from measurement. (see 108-115061-1,Fig.2) Per EIA 364-23
Temperature rise	After tests maximum increase of contact temperature, 30°C max.	Measured at maximum rated current. Per EIA 364-70,Method 2

5.3 Environmental

Test Description	Requirement	Procedures
Damp heat	No change to performance Contact resistance: Max. 50mOhm for Cu alloy / 100mOhm for SST Measure the resistance without opening the mating after test.	Temp 25-55 °C, RH 90-100% for 18 cycles of 24 hours each. The typical cycle in temp 25°C -> 55°C in 3 hours then maintain at 55°C for 9 hours Temp +55°C -> +25°C in 3 hours, maintain at 25°C for 9 hours. Recovery at 25°C. R/H 75% for 2 hours Mated tests: 10 mA (voltage is defined by current and resistance) IEC 60068-2-30 Db
Vibration	No mechanical damage. No change to performance. Discontinuity <1us Max. 50mOhm	Frequency: 10 - 100 Hz: 3 m2/s3 100 - 500 Hz: -3dB/Oct. for: 3 x 60 min (X- Y- and Z-axis) in minimum deflection position. IEC60068-2-64Fh
Shock	No mechanical damage. No change to performance. Discontinuity<1us Max. 50mOhm	Pulse shape half sine, peak acceleration 50 G, pulse 11 ms, 3 shocks in both directions in XYZ axis IEC60068-2-27Ea
Nitric Acid Vapour test	Requirements: see Document ID: DTY11017- EN-2.0.	2 Hours 69±2 % concentration acid Acc. Document ID: DTY11017-EN- 2.0: Guideline for porosity testing of gold coated metallic connector springs – Nitric acid vapour test Blank cutting edges have to be sealed. IEC 600068-2-78
Solderability	Soldering area shall have a minimum of 95% solder coverage.	245±3℃, for 2-3 seconds,
Resistance to reflow soldering heat	No cosmetic damage and shall meet requirement of subsequent test.	Test with reflow profile for soldering heat resistance described in Figure 1 through oven 3 times.
thermal shock	No change to performance Contact resistance: Max. 50mOhm for Cu alloy / 100mOhm for SST Normal Force performance.	-40° /+85° C, transition time 5 minutes max, 25 cycles. Duration time: 30 minutes. Recovery: 2 hours at 25° C, RH 75%. In accordance with IEC 68-2-14-N. (Nokia STR 1H2013, paragraph 3.3)

5.4 Mechanical

Test Description	Requirement	Procedures
Contact force at maximum working height (minimum deflection) low force scalable family	0.2N Min.	Compress spring to max. Working height to PWB surface. Force must be measured from return curve. Spring force-deflection curve described. Have to be fulfilled after 3 reflow cycles.
Contact force at minimum working height (maximum deflection) low force scalable family	1N + 20% Max.	Compress spring to max. Working height to PWB surface. Force must be measured from return curve. Spring force-deflection curve described. Have to be fulfilled after 3 reflow cycles.
Durability (Life cycle) Low Force Scalable Family	No functional damage Contact resistance : 50mΩ Max. Normal force should meet spec	1x max working range + 5000 x 50% working range Mate contact at max.20 matings per minute to 5000 cycles with rigid actuator shaft. Vertical direction deflection to a ½ of working height.
Durability (Spring dynamic test) Low Force Scalable Family	No functional damage Contact resistance : 50mΩ Max. Normal force should meet spec	1x max working range + 10000 x 50% working range Mate contact at max.20 matings per minute to 10000 cycles with rigid actuator shaft. Cycles for Maximum deflection case. Vertical direction deflection to a 1/2 of working height. Max. 20% loss of initial force. No technical function only to check the maximum lifetime.
Peeling Strength	3 N	Test method according STR retention force of contact.（see 108-115061-1, in Figure 4）
Push Strength	10 N Min.	Test method according STR peeling strength force of contact. (see 108-115061-1, in Figure 3）

5.5 Product Qualification Test Sequence

Test group	a	b	c	d	e	f	g	h	i	j	k	m	n
Sample size	5	5	5	5	10	10	10	10	10	10	5	5	5
Visual examination of product	1,7	1,7	1,3	1,7	1,3	1,3	1,3	1,3	1,7	1,7	1,3	1,3	1,7
Low level contact resistance	2,6	2,6		2,6					2,6	2,6			2,6
Temperature rise			2										
Damp heat	4												
Vibration		4											
Shock				4									
Nitric Acid Vapour test					2								
Solderability						2							
Resistance to reflow soldering heat							2						
Contact force	3,5	3,5		3,5				2	3,5	3,5			3,5
Durability (Life cycle)									4				
Durability (Spring dynamic test)										4			
Peeling Strength											2		
Thermal Shock													4
Push Strength												2	

Numbers indicate sequence in which the tests are performed.

6. Test Result

Group	Test Item	N	Condition	Test Result			Requirement	Judgment
				Max	Min	Ave		
a	Examination of Product	5	Initial	No physical damage occurred			No abnormalities	Pass
	LLCR	5	Initial	45.16 mΩ	42.32 mΩ	43.47 mΩ	<75mΩ	Pass
	Contact Force	5	Initial	0.28 N	0.25 N	0.27 N	0.2N Min. at 1.4mm height	Pass
				1.18 N	1.15 N	1.17 N	1.2N Max. at 0.8mm height	Pass
	Damp heat	5	Final	No physical damage occurred			No abnormalities	Pass
	Contact Force	5	Initial	0.24 N	0.22 N	0.23 N	0.2N Min. at 1.4mm height	Pass
				1.15 N	1.10 N	1.12 N	1.2N Max. at 0.8mm height	Pass
	LLCR	5	Final	45.32 mΩ	43.12 mΩ	44.32 mΩ	<100mΩ	Pass
	Examination of Product	5	Final	No physical damage occurred			No abnormalities	Pass
b	Examination of Product	5	Initial	No physical damage occurred			No abnormalities	Pass
	LLCR	5	Initial	44.85 mΩ	43.10 mΩ	44.10 mΩ	<75mΩ	Pass
	Vibration	5	Final	No discontinuities of 1 microsecond or longer duration occurred			No abnormalities	Pass
	LLCR	5	Final	45.96 mΩ	43.72 mΩ	44.52 mΩ	<100mΩ	Pass
	Examination of Product	5	Final	No physical damage occurred			No abnormalities	Pass
c	Examination of Product	5	Initial	No physical damage occurred			No abnormalities	Pass
	Temperature rise	5	Final	22.8°C	19.15°C	21.10°C	30°C max.	Pass
	Examination of Product	5	Final	No physical damage occurred			No abnormalities	Pass
d	Examination of Product	5	Initial	No physical damage occurred			No abnormalities	Pass

	LLCR	5	Initial	45.72 mΩ	44.16 mΩ	45.18 mΩ	<75mΩ	Pass
	Shock	5	Final	No physical damage occurred			No abnormalities	Pass
	LLCR	5	Final	45.78 mΩ	43.91 mΩ	44.65 mΩ	<100mΩ	Pass
	Examination of Product	5	Initial	No physical damage occurred			No abnormalities	Pass
e	Examination of Product	10	Initial	No physical damage occurred			No abnormalities	Pass
	Nitric Acid Vapor Test	10	Final	No physical damage occurred			See Doc.11017- N-2.0.	Pass
	Examination of Product	10	Final	No physical damage occurred			No abnormalities	Pass
f	Examination of Product	10	Initial	No physical damage occurred			No abnormalities	Pass
	Solderability	10	Final	Soldering area have a minimum of 95% solder coverage.			95% solder coverage	Pass
	Examination of Product	10	Final	No physical damage occurred			No abnormalities	Pass
g	Examination of Product	10	Initial	No physical damage occurred			No abnormalities	Pass
	Resistance to reflow soldering heat	10	Final	No physical damage occurred			No abnormalities	Pass
	Examination of Product	10	Final	No physical damage occurred			No abnormalities	Pass
h	Examination of Product	10	Initial	No physical damage occurred			No abnormalities	Pass
	Contact force	10	Initial	0.28N	0.26N	0.27N	0.2N min. at 1.4mm height	Pass
				1.18N	1.15N	1.16N	1.2N max. at 0.8mm height	Pass
	Examination of Product	10	Final	No physical damage occurred			No abnormalities	Pass
i	Examination of Product	10	Initial	No physical damage occurred			No abnormalities	Pass
	LLCR	10	Initial	44.10mΩ	43.25 mΩ	43.82 mΩ	<75mΩ	Pass
	Contact force	10	Initial	0.29N	0.26N	0.27N	0.2N min. at 1.4mm height	Pass

				1.18N	1.15N	1.16N	1.2N max. at 0.8mm height	Pass
	Durability(5000 life cycle)	10	Final	No physical damage occurred			No abnormal ities	Pass
	Contact force	10	Final	0.28N	0.26N	0.27N	0.2N min. at 0.4mm height	Pass
				1.17N	1.14N	1.15N	1.2N max. at 0.8mm height	Pass
	LLCR	10	Final	45.20mΩ	44.75 mΩ	44.92 mΩ	<100 mΩ	Pass
	Examination of Product	10	Final	No physical damage occurred			No abnormal ities	Pass
j	Examination of Product	10	Initial	No physical damage occurred			No abnormal ities	Pass
	LLCR	10	Initial	44.92mΩ	43.15 mΩ	44.58 mΩ	<75mΩ	Pass
	Contact force	10	Initial	0.29 N	0.26 N	0.27 N	0.2N min. at 1.4mm height	Pass
				1.17 N	1.13 N	1.15 N	1.2N max. at 0.8mm height	Pass
	Durability(spring dynamic test)	10	Final	No physical damage occurred			No abnormal ities	Pass
	Contact force	10	Final	0.31 N	0.27 N	0.29 N	0.2N min. at 1.4mm height	Pass
				1.18 N	1.15 N	1.17 N	1.2N max. at 0.8mm height	Pass
	LLCR	10	Final	45.30mΩ	44.04 mΩ	45.12 mΩ	<100mΩ	Pass
	Examination of Product	10	Final	No physical damage occurred			No abnormal ities	Pass
k	Examination of Product	5	Initial	No physical damage occurred			No abnormal ities	Pass
	Peeling Strength	5	Initial	19.5 N	16.2 N	18.3 N	3N Min.	Pass
	Examination of Product	5	Final	No physical damage occurred			No abnormal ities	Pass
m	Examination of Product	5	Initial	No physical damage occurred			No abnormal ities	Pass
	Push Strength	5	Initial	85.2 N	76.3 N	78.5 N	10N Min.	Pass

	Examination of Product	5	Final	No physical damage occurred			No abnormal	Pass
n	Examination of Product	5	Initial	No physical damage occurred			No abnormal ities	Pass
	LLCR	5	Initial	44.10 mΩ	42.08 mΩ	43.78 mΩ	<75mΩ	Pass
	Contact Force	5	Initial	0.28 N	0.25 N	0.26 N	0.2N min. at 1.4mm height	Pass
				1.17 N	1.15 N	1.16 N	1.2N max. at 0.8mm height	Pass
	Thermal Shock	5	Final	No physical damage occurred			No abnormal ities	Pass
	Contact Force	5	Final	0.23 N	0.22 N	0.22 N	0.2N min. at 1.4mm height	Pass
				1.16 N	1.12 N	1.13 N	1.2N max. at 0.8mm height	Pass
	LLCR	5	Final	44.26 mΩ	43.15 mΩ	43.68 mΩ	<100mΩ	Pass
	Examination of Product	5	Final	No physical damage occurred			No abnormal	Pass

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