EP 2.5 socket terminal with the different dimple gap function test report

1. INTRODUCTION

1.1. Purpose

Testing was performed on the TE Connectivity (TE) EP 2.5 socket terminal with the different gap to determine its conformance to the requirements of Product Specification 108-2418.

1.2. Scope

This report covers the electrical, mechanical, and environmental performance of TE EP 2.5 Connector system. Testing was performed at the Shanghai Electrical Components Test Laboratory. The test file number for this testing is TP-19-03025-RECORD. This documentation is on file at and available from Shanghai Electrical Components Test Laboratory.

1.3. Conclusion

The specimens from Test Sets 2（0.51~0.52mm dimple gap, 0.53~0.54mm dimple gap and 0.55~0.56mm dimple gap）can’t meet the requirement of having a maximum change in temperature rise vs. current of **more than 30**℃. Other test items conformed to the electrical, mechanical, and environmental performance requirements of 108-2418. Additional results may be found in Section 2.

1.4. Product Description

The EP 2.5 product is a wire-to-board connection consisting of crimp-snap contacts seated in a housing that mates to 0.6 mm diameter post headers on 2.5 mm centerline and is designed to be terminated to 20 to 26 AWG wire.

1.5. Test Specimens

Test Set	Quantity	Part Number	Description
1, 2	10	1744423-1	socket terminal of 0.48~0.50mm dimple gap with 22AWG
	10	1744423-1	socket terminal of 0.51~0.52mm dimple gap with 22AWG
	10	1744423-1	socket terminal of 0.53~0.54mm dimple gap with 22AWG
	10	1744423-1	socket terminal of 0.55~0.56mm dimple gap with 22AWG
	10	1744423-1	socket terminal of 0.44~0.46mm dimple gap(new anvil) with 22AWG
	25	1969442-2	EP 2.5 plug housing with 2P
	25	2132415-2	EP 2.5 header with 2P
3	10	1744423-1	socket terminal of 0.48~0.50mm dimple gap with 22AWG
	10	1744423-1	socket terminal of 0.51~0.52mm dimple gap with 22AWG
	10	1744423-1	socket terminal of 0.53~0.54mm dimple gap with 22AWG
	10	1744423-1	socket terminal of 0.55~0.56mm dimple gap with 22AWG
	10	1744423-1	socket terminal of 0.44~0.46mm dimple gap(new anvil) with 22AWG

Figure 1

1.6. Test Sequence

Test or Examination	Test Groups (a)		
	1	2	3
	Test Sequence (b)		
Initial Examination of Product	1	1	1
LLCR	3,7	2,7	
Temperature rise vs. current		3,8	
Sinusoidal vibration	5	6	
Mechanical shock	6		
Durability	4		
Mating force	2		
Unmating force	8		
Crimp tensile			2
Humidity/temperature cycling		4	
Temperature life		5	
Final examination of product	9		3

NOTE
a) See Paragraph 1.5.
b) Numbers indicate sequence in which tests shall be performed.

Figure 2

1.7. Environmental Conditions

Unless otherwise stated, the following environmental conditions prevailed during testing:

- Temperature: 15°C to 35°C
- Relative Humidity: 20% to 80%

2. SUMMARY OF TESTING

2.1. Initial examination of product – All Test Groups

A Certificate of Conformance stating that all specimens submitted for testing were representative of normal production lots and met the requirements of the application drawing was provided. Where specified, specimens were visually examined, and no evidence of physical damage detrimental to product performance was observed.

2.2. LLCR – Test Groups 1 and 2

All low level contact resistance measurements recorded were less than 10 milliohms initially and 20 milliohms for final. Refer to Figure 3 for the summary data.

Test Group	Number of Data points	Low Level Contact Resistance in milliohms					
		Initial			Final		
		Min	Max	Mean	Min	Max	Mean
1(0.48~0.50mm dimple gap)	10	3.37	3.87	3.60	3.53	6.47	4.86
1(0.51~0.52mm dimple gap)	10	3.41	4.09	3.67	3.72	8.30	5.05
1(0.53~0.54mm dimple gap)	10	3.29	4.16	3.81	3.78	8.99	5.96
1(0.55~0.56mm dimple gap)	10	3.71	4.85	4.08	4.88	9.16	6.60
1(0.44~0.46mm dimple gap, new anvil)	10	3.27	3.99	3.62	3.97	6.69	4.92
2(0.48~0.50mm dimple gap)	10	2.90	3.46	3.19	3.82	4.92	4.30
2(0.51~0.52mm dimple gap)	10	3.08	3.56	3.31	3.82	7.21	5.37
2(0.53~0.54mm dimple gap)	10	3.33	3.72	3.48	3.93	7.01	4.79
2(0.55~0.56mm dimple gap)	10	3.18	3.88	3.41	3.77	6.85	4.94
2(0.44~0.46mm dimple gap, new anvil)	10	2.73	3.48	3.17	3.07	4.33	3.73

Figure 3

2.3. Temperature Rise vs. Current – Test Group 2

some temperature rise vs. current measurements recorded had a temperature rise more than 30°C when energized at a 4.2A as red mark. Refer to Figure 4 for summary data.

Test Group	Number of Data points	Temperature rise vs. current in °C					
		Initial			Final		
		Min	Max	Mean	Min	Max	Mean
2(0.48~0.50mm dimple gap)	10	13.5	17.3	15.6	16.1	24.7	19.7
2(0.51~0.52mm dimple gap)	10	10.7	18.1	15.8	16.0	73.5	33.7
2(0.53~0.54mm dimple gap)	10	15.1	18.9	16.7	17.6	73.9	33.7
2(0.55~0.56mm dimple gap)	10	14.4	18.5	16.4	16.7	72.6	33.9
2(0.44~0.46mm dimple gap, new anvil)	10	13.6	16.5	15.1	15.5	20.7	17.8

Figure 4

2.4. Sinusoidal Vibration – Test Groups 1 and 2

No discontinuities of 1 microsecond or longer duration were detected during random vibration testing.

2.5. Mechanical Shock – Test Groups 1

No discontinuities of 1 microsecond or longer duration were detected during mechanical shock testing.

2.6. Durability – Test Group 1

No evidence of physical damage detrimental to product performance was visible as a result of durability cycling.

2.7. Mating force – Test Group 1

All mating force measurements were less than the maximum requirement of 17.8 N. Refer to Figure 5 for summary data.

Test Group	Number of Data points	Maitng force in N		
		Min	Max	Mean
1(0.48~0.50mm dimple gap)	10	5.90	7.95	6.54
1(0.51~0.52mm dimple gap)	10	4.34	9.97	6.86
1(0.53~0.54mm dimple gap)	10	3.24	4.70	4.10
1(0.55~0.56mm dimple gap)	10	2.21	3.60	3.06
1(0.44~0.46mm dimple gap, new anvil)	10	10.00	14.97	11.97

Figure 5

2.8. Unmating force – Test Group 1

All unmating force measurements were greater than the minimum requirement of 1.8 N. Refer to Figure 6 for summary data.

Test Group	Number of Data points	Unmaitng force in N		
		Min	Max	Mean
1(0.48~0.50mm dimple gap)	10	2.07	3.03	2.57
1(0.51~0.52mm dimple gap)	10	1.91	2.69	2.25
1(0.53~0.54mm dimple gap)	10	1.81	3.53	2.52
1(0.55~0.56mm dimple gap)	10	1.81	2.14	1.94
1(0.44~0.46mm dimple gap, new anvil)	10	2.69	4.26	3.58

Figure 6

2.9. Crimp tensile – Test Group 3

All crimp tensile measurements were greater than the minimum requirement of 49 N for 22 AWG. Refer to Figure 7 for summary data.

Test Group	Number of Data points	Crimp tensile in N		
		Min	Max	Mean
3(0.48~0.50mm dimple gap)	10	58.08	79.75	70.15
3(0.51~0.52mm dimple gap)	10	75.23	83.08	79.55
3(0.53~0.54mm dimple gap)	10	58.38	82.95	71.30
3(0.55~0.56mm dimple gap)	10	57.30	81.22	69.05
3(0.44~0.46mm dimple gap, new anvil)	10	71.42	81.25	78.86

Figure 7

2.10. **Humidity/temperature cycling – Test Group 2**

No evidence of physical damage detrimental to product performance was visible as a result of exposure to a humidity/temperature cycling environment.

2.11. **Temperature life – Test Group 2**

No evidence of physical damage detrimental to product performance was visible as a result of exposure to a temperature life environment.

2.12. **Final examination of product – All Test Groups**

Where specified, specimens were visually examined, and no evidence of physical damage detrimental to product performance was observed.

3. TEST METHODS

3.1. **Initial Examination of Product**

A Certificate of Conformance was issued stating that all specimens in this test package were produced, inspected, and accepted as conforming to product drawing requirements, and were manufactured using the same core manufacturing processes and technologies as production parts.

3.2. **LLCR**

Low level contact resistance measurements were taken using a four wire measuring technique. The test current was maintained at 100 milliamperes maximum with a 20 millivolt maximum open circuit voltage. Measurements were taken according the method identified. Wire bulk was removed from each resistance value.

3.3. **Temperature Rise vs. Current**

Temperature rise vs. current testing was performed by welding a 36 AWG type T thermocouple to the contact in the crimp area. The specimens were energized at 5 progressive current levels and the temperatures were recorded at each level. The ambient temperature was subtracted from each measured temperature reading to find the temperature rise. When the temperature rise of 3 consecutive readings taken at 5 minute intervals didnot differ by more than 1°C, the temperature measurement was recorded. The data was used to produce a temperature rise vs. current curve.

3.4. **Sinusoidal Vibration**

The test specimens were subjected to a simple harmonic motion having an amplitude of 0.06 inch double amplitude (maximum total excursion). The vibration frequency was varied uniformly between the approximate limits of 10 to 55 Hertz (Hz). The entire frequency range of 10 to 55 Hz and return to 10 Hz was traversed in approximately 1 minute. The motion was applied for a period of 2 hours in each of the three mutually perpendicular axes, so the motion was applied for a total period of approximately 6 hours. The test specimens for group 1 were monitored for discontinuities of 1 microsecond or greater using an energizing current of 100 milliamperes.

3.5. Mechanical Shock

The test specimens were subjected to a mechanical shock test with a half-sine waveform with acceleration amplitude of 30 gravity units (g's peak) and duration of 11 milliseconds. Three shocks in each direction were applied along the three mutually perpendicular axes of the test specimens, for a total of eighteen shocks. The test specimens were monitored for discontinuities of 1 microsecond or greater using an energizing current of 100 milliamperes.

3.6. Durability

All Test Group 1 specimens were subjected to 15 cycles of manual durability at a rate not exceeding the maximum rate of 500 cycles per hour.

3.7. Mating force

Mating force testing was performed with a tensile machine a distance of 5.08 mm from point of initial contact. The printed circuit board with the header was secured at the base of the machine to a floating x-y table, and the receptacle was aligned with the header. Force was applied to the back of the receptacle in the downward direction at a rate of 12.7 mm per minute. The maximum force was recorded to fully mate the two halves.

3.8. Unmating force

Unmating force testing was performed with a tensile machine. The mated connector system was secured to the base of the machine, and a fixture attached to the moveable load cell was placed around the receptacle. Force was applied in the upward direction at a rate of 12.7 mm per minute until the specimen was unmated. The maximum force was recorded.

3.9. Crimp tensile

Crimp tensile testing was performed on a tensile machine. The crimp (insulation crimp was de-activated) was secured in a vise at the base of the machine, and the wire was clamped in a set of pneumatic jaws attached to the load cell. Force was applied in the upward direction at a rate of 25.4 mm per minute, until the wire was removed from the crimp. The maximum force was recorded.

3.10. **Humidity/temperature cycling**

The mated test specimens were subjected to 10 cycles of humidity/temperature cycling. Each cycle lasted 24 hours and consisted of cycling the temperature between 25°C and 65°C twice while maintaining high humidity per the humidity/temperature cycling profile illustrated in Figure 8.

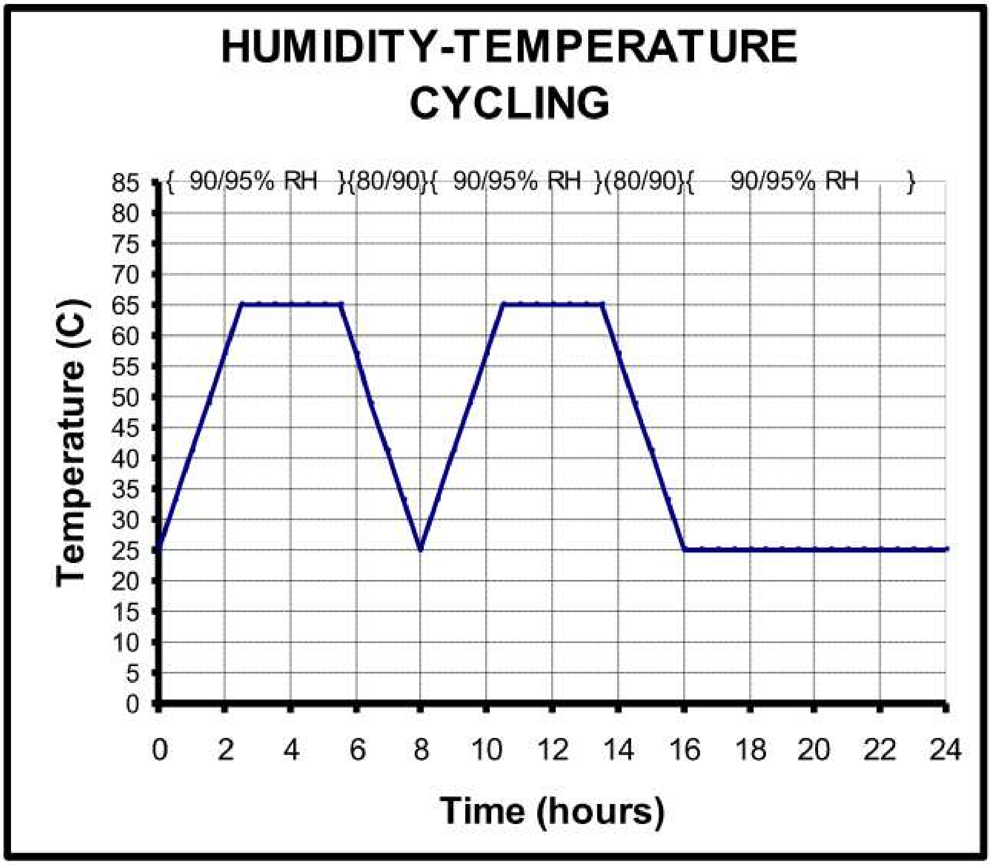

Figure 8 – Humidity Temperature Cycling Profile

3.11. **Temperature life**

The mated test specimens were subjected to 500 hours of temperature life testing in an air circulating oven at a temperature of 105°C.

3.12. **Final examination of product**

Specimens were visually examined for evidence of physical damage detrimental to product performance.