Qualification Test Specification

Crown Clip Junior Power Qualification Test Specification

1. INTRODUCTION

1.1. Purpose

Testing was performed on the Crown Clip Junior Direct Power Connector System to determine its conformance to the requirements of Product Specification 108-19360-1.

1.2. Scope

This report covers the electrical, mechanical, and environmental performance of the Crown Clip Junior Direct Power Connector System. Testing was performed at the TE Connectivity Shanghai Electrical Component Testing Laboratory between 17 May 2013 and 07 August 2013.

1.3. Conclusion

The Crown Clip Junior Direct Power Connector System conformed to the electrical, mechanical, and environmental performance requirements of Product Specification 108-19360-1 Revision 1.

1.4. Test Specimens

Test specimens were representative of normal production lots. Specimens identified with Crown Clip Junior Power silver plating conn. Drawing: 2178531, Rev.: 1, and C-1982995, Rev.: A. Manufacturer: TE Connectivity China Zhuhai, and 3.0±0.1mm thickness copper bus bar, post-plated with tin over nickel.

1.5. Environmental Conditions

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

- Temperature: 25±10°C
- Relative Humidity: 50±25% RH

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| Indicates Change

1.6. Qualification Test Sequence

Test or Examination	Test Group							
	1	2	3	4	5	6	7	8
	Test sequence							
Initial examination of product	1	1	1	1	1	1	1	1
Low level contact resistance	2,5,7	4,7,9,13	3,6,8,10	2,6,8(a),12	2,5,7,9	2,5,7,9	4,6	
Contact resistance at rated current				10				
Insulation resistance		2,10					2,7	
Withstanding voltage		3,11					3,8	
Temperature rise vs. current				4,9				
Vibration			9					
Mechanical shock			7					
Durability	3(b)	5	4(b)	3(b)	3(b)	3(b)	5	
Mating force			2					
Unmating force			11					
Insertion force								2
Dust						4		
Component heat resistance to soldering								3
Solderability test								4
Thermal shock		6						
Thermal cycling					6			
Thermal disturbance						6		
Humidity-temperature cycling		8						
Temperature life	4		5(c)	5(c)	4(c)			
Mixed flowing gas				7(d)				
Reseating	6	12		11	8	8		
Final examination of product	8	14	12	13	10	10	9	5

NOTE

(a) LLCR shall be measured according to MFG test sequence.
(b) Durability (preconditioning)
(c) Temperature life (preconditioning)
(d) MFG-Class IIA. ½ samples mated 14days; ½ samples unmated 7days, and then mated for final 7days.

Figure 1

2. SUMMARY OF TESTING

2.1. Initial Examination of Product - All Test Groups

All specimens submitted for testing were representative of normal production lots. A Certificate of Conformance was issued by Product Assurance. Specimens were visually examined and no evidence of physical damage detrimental to product performance was observed.

2.2. Low Level Contact Resistance – All Test Groups

All low level contact resistance measurements, taken at 100 milliamperes maximum and 20 millivolts maximum open circuit voltage were less than 0.2 milliohms initially and after testing for power contacts.

Test Group	Test Sequence	Number	Condition	Maximum	Minimum	Average
1	1.2	6	Initial	0.11	0.08	0.10
	1.5	6	After temperature life	0.08	0.05	0.07
	1.7	6	After reseating	0.09	0.05	0.07
2	2.4	6	After withstanding voltage	0.10	0.05	0.08
	2.7	6	After thermal shock	0.09	0.07	0.08
	2.9	6	After humidity temperature cycling	0.09	0.07	0.08
	2.13	6	After reseating	0.09	0.08	0.08
3	3.3	6	Initial	0.06	0.05	0.06
	3.6	6	After temperature life (precondition)	0.08	0.05	0.06
	3.8	6	After mechanical shock	0.12	0.08	0.10
	3.10	6	After vibration	0.08	0.06	0.07
4	4.2	12	Initial	0.11	0.05	0.09
	4.6	12	Before MFG	0.17	0.10	0.14
	4.8	6	After MFG ½ samples 168 hours unmated	0.17	0.12	0.15
		6	After MFG ½ samples 168 hours mated	0.19	0.11	0.14
		6	After MFG ½ samples 336 hours mated	0.19	0.11	0.15
	4.12	12	After reseating	0.18	0.12	0.15
5	5.2	6	Initial	0.08	0.05	0.07
	5.5	6	After temperature life (precondition)	0.09	0.07	0.08
	5.7	6	After thermal cycling	0.09	0.07	0.08
	5.9	6	After reseating	0.09	0.08	0.08
6	6.2	6	Initial	0.07	0.05	0.06
	6.5	6	After dust	0.09	0.06	0.08
	6.7	6	After thermal disturbance	0.09	0.08	0.09
	6.9	6	After reseating	0.09	0.07	0.08
7	7.4	6	Before durability	0.10	0.05	0.08
	7.6	6	After durability	0.09	0.07	0.08

Figure 2

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2.3. Contact Resistance at Rated Current - Test Group 4

All contact resistance at rated current measurements were less than 0.2 milliohm, initial and end of life.

Test Group	Test Sequence	Number	Condition	Maximum	Minimum	Average
4	4.10	12	Contact resistance at rated current	0.16	0.05	0.11

Figure 3

2.4. Insulation Resistance - Test Group 2, 7

All insulation resistance measurements were greater than 5000 megohms.

2.5. Withstanding Voltage - Test Group 2, 7

No dielectric breakdown or flashover occurred.

2.6. Temperature Rise vs Current - Test Group 4

All specimens had a temperature rise of less than 30°C above ambient when tested using a baseline rated current of 160 amperes for Crown Clip Junior Direct Power Connector. Initial and final temperature rise graphs please refer to the below.

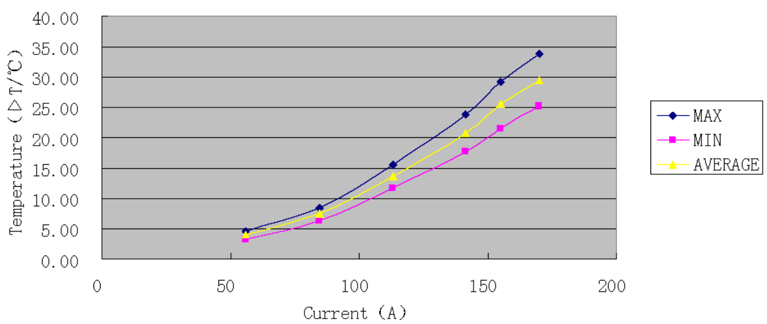

Figure 4 Initial temperature rise vs. current curve

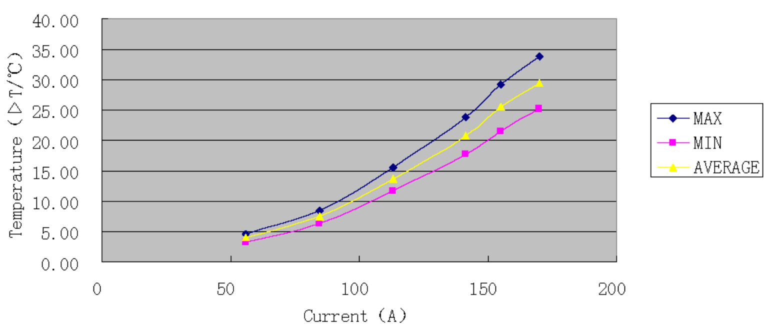

Figure 5 Final temperature rise vs. current curve

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2.7. Vibration - Test Group 3

No discontinuities were detected during vibration testing. Following vibration testing, no cracks, breaks, or loose parts on the specimens were visible.

2.8. Mechanical Shock - Test Group 2

No discontinuities were detected during mechanical shock testing. Following mechanical shock testing, no cracks, breaks, or loose parts on the specimens were visible.

2.9. Durability (preconditioning) - Test Groups 1, 3, 4, 5 and 6

No physical damage occurred as a result of mating and unmating the specimens 5 cycles.

2.10. Durability - Test Groups 2, 7

No physical damage occurred as a result of mating and unmating the specimens 200 cycles.

2.11. Mating Force - Test Group 3

All average mating force measurements were less than 60 N per connector.

2.12. Unmating Force - Test Group 3

All unmating force measurements were more than 12.5 N per connector.

2.13. PCB Insertion Force - Test Group 8

All specimens insertion force measurements were less than 800 N per connector.

2.14. Reseating - Test Group 1, 2, 4, 5 and 6

No physical damage occurred after mating/unmating manually samples for three cycles.

2.15. Component Heat Resistance to Soldering - Test Group 8

No evidence of physical damage was visible as a result of subjecting the specimens to wave soldering.

2.16. Solderability Test - Test Group 8

All solderable areas had a minimum of 95% solder coverage.

2.17. Thermal Shock - Test Group 2

No evidence of physical damage was visible as a result of thermal shock test.

2.18. Thermal Cycling - Test Group 5

No evidence of physical damage was visible as a result of thermal cycling test.

2.19. Thermal Disturbance - Test Group 6

No evidence of physical damage was visible as a result of thermal disturbance test.

2.20. Humidity-temperature Cycling - Test Group 2

No evidence of physical damage was visible as a result of humidity-temperature cycling.

2.21. Temperature Life (preconditioning) - Test Groups 3, 4 and 5

No evidence of physical damage was visible as a result of temperature life test.

2.22. Temperature Life - Test Group 1

No evidence of physical damage was visible as a result of temperature life test.

2.23. Mixed Flowing Gas - Test Group 4

No evidence of physical damage was visible as a result of exposure to the pollutants of mixed flowing gas.

2.24. Dust - Test Group 6

No evidence of physical damage was visible as a result of dust test.

2.25. Final Examination of Product - All Test Groups

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. Low Level Contact Resistance

Low level contact resistance measurements were made using a 4 terminal measuring technique. The test current was maintained at 100 milliamperes maximum with a 20 millivolt maximum open circuit voltage.

3.3. Contact Resistance at Rated Current

Contact resistance measurements at rated current were made using a 4 terminal measuring technique. The test specimens were energized at the rated current in accordance with Design Specification 108-19360-1 and EIA-364-06.

3.4. Insulation Resistance

Insulation resistance was measured between adjacent contacts of mated specimens. A test voltage of 500 volts DC was applied for one minute before the resistance was measured, in accordance with EIA-364-21.

3.5. Withstanding Voltage

A test potential of 1000 volts AC for power contacts was applied between adjacent contacts of mated specimens. This potential was applied for 1 minute and then returned to zero, in accordance with EIA-364-20.

3.6. Temperature Rise vs Current

Temperature rise was measured on 5 unstressed and stressed specimens using infrared imaging. Temperature rise curves were established for specimens with a single circuit energized. All contacts were energized at 5 different current levels. The specimens were allowed to stabilize before the temperature was measured. The specimens were imaged using standard optics after applying an emissivity correction coating (Micatin™ foot powder). The emittance of the emissivity correction factor is 0.93. Raising this emittance value allows for accurate temperature measurements. ThermaCAM™ Researcher 2001 thermal image processing was used for data analysis. The software has a temperature box measurement feature to determine maximum temperature of the contact. This software feature allows a measurement of the area inside the box when placed on an area of interest. The specimens were placed in the stable air environment of a temperature rise enclosure. In accordance with EIA-364-70.

3.7. Vibration

Mated specimens were subjected to a random vibration test, specified by a random vibration spectrum, in accordance with EIA-364-28, condition V, letter C. This was performed for 120 minutes in each of 3 mutually perpendicular planes. Specimens were monitored for discontinuities of 1 microsecond.

3.8. Mechanical Shock

Mated specimens were subjected to a mechanical shock test having a half-sine waveform of 50 gravity units (g peak) and a duration of 11 milliseconds, in accordance with EIA-364-27, condition A. Three shocks in each direction were applied along the 3 mutually perpendicular planes for a total of 18 shocks. Specimens were monitored for discontinuities of 1 microsecond or greater using a current of 100 milliamperes DC.

3.9. Durability (preconditioning)

Specimens were mated and unmated 5 cycles at a maximum rate of 500 cycles per hour.

3.10. Durability

Specimens were mated and unmated 200 cycles at a maximum rate of 500 cycles per hour.

3.11. Mating Force

The force required to mate individual specimens was measured using a tensile/compression device with a free floating fixture and a rate of travel of 12.7 mm [.5 in] per minute.

3.12. Unmating Force

The force required to unmate individual specimens was measured using a tensile/compression device with a free floating fixture and a rate of travel of 12.7 mm [.5 in] per minute.

3.13. Insertion Force

The force required to correctly apply a specimen to a printed circuit board was measured using a tensile/compression device with a free floating fixture and a rate of travel of 12.7 mm [.5 in] per minute.

3.14. Component Heat Resistance to Wave Soldering

All specimens were checked dimensionally before and after exposure to heat. The solderable areas of the specimens were immersed in Kester 145 type ROL0 flux for 5 to 10 seconds. This flux is a non-activated rosin flux having a nominal composition of 25% by weight of water white gum rosin in a solvent of 99% isopropyl alcohol. The specific gravity of the flux was between 0.838 and 0.858. The flux was maintained at room temperature. The specimens were then removed from the flux and the excess was allowed to drain off for 5 to 20 seconds. The specimens were attached to a dipping machine and immersed at a maximum rate of 25.4 mm [1 in] per second into a soldering bath filled with melted lead free solder (96.5% Sn, 3.0% Ag and 0.5% Cu) controlled at 260 ± 5°C [500°F] until the solderable surface was coated. The specimens were held in the solder bath for 3 seconds. The specimens were then removed from the solder bath at a maximum rate of 25.4 mm [1 in] per second and subjected to a 5 minute cleaning in isopropyl alcohol. The specimens were then given a visual examination using 30X magnification.

3.15. Solderability Dip Test

The specimens were immersed at a maximum rate of 25.4 mm [1 in] per second into a soldering bath filled with melted lead free solder (96.5% Sn, 3.0% Ag and 0.5% Cu) controlled at 260 ± 5°C until the solderable area shall be the 95% minimum solder coverage. The specimens were held in the solder bath for 3 seconds. The specimens were then given a visual examination using 30X magnification.
In accordance with EIA-364-52.

3.16. Reseating

Specimens were mated and unmated 3 cycles manually.

3.17. Thermal Shock

Mated specimens were subjected to 25 cycles of thermal shock between -65°C and 105°C, in accordance with EIA-364-32, method A, condition II.

3.18. Thermal Cycling

Mated specimens were subjected to 500 cycles of thermal shock between 15°C and 85°C, in accordance with EIA-364-110, condition A, duration C.

3.19. Thermal Disturbance

Mated specimens were subjected to 10 cycles of thermal shock between 15°C and 85°C, in accordance with EIA-364-110, condition A, duration A.

3.20. Humidity-temperature Cycling

Mated specimens were exposed to 10 cycles of humidity-temperature cycling. Each cycle lasted 24 hours and consisted of cycling the temperature between 25 °C and 65°C while maintaining high humidity, in accordance with EIA-364-31, method III, condition B.

3.21. Temperature Life (preconditioning)

Mated specimens were exposed to a temperature of 105°C for 72 hours in accordance with EIA-364-17, method A; temperature and duration per EIA-364-1000 table 9, 60℃ for 10 years.

3.22. Temperature Life

Mated specimens were exposed to a temperature of 105°C for 1000 hours in accordance with EIA-364-17, method A, condition 4.

3.23. Dust

Unmated specimens were exposed for one hour in accordance with EIA-364-91.

3.24. Mixed Flowing Gas, Class IIA

Specimens were exposed for 14 days to a mixed flowing gas Class IIA exposure. Class IIA exposure is defined as a temperature of 30±1°C and a relative humidity of 70±2% with the pollutants of Cl_2 at 10 ±3 ppb, NO_2 at 200±50 ppb, H_2S at 10±5 ppb and SO_2 at 100±20 ppb, in accordance with EIA-364-65, class IIA. ½ subject samples mated for 336 hours (14days); ½ subject samples unmated 168 hours (7days), and then mated for final 168 hours (7days).

3.25. Final Examination of Product

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