
Press-fit Power Cable Verification Test Specification

1. INTRODUCTION

1.1. Purpose

Testing was performed on the Press-fit Power cable to determine its conformance to the requirements of Product Specification 108-128013 and customer special request during their audit in TE.

1.2. Scope

This report covers the electrical, mechanical of Press-fit Power cable. Testing was performed at the TE Connectivity Shanghai Testing Laboratory between 7 Nov 2014 and 14 Nov 2014.

1.3. Conclusion

The Press-fit Power cable conformed to the electrical, mechanical performance requirements of Product Specification 108-128013 Revision 04.

1.4. Test Specimens

Press fit cable assembly PN: 2159562-1.

PCB board spec: thickness 2.16mm, 4 layers, 1st layer GTL 0.5oz, 2nd layer GP2S 1oz,
3rd layer GP3S 1oz, 4th layer GBL 0.5oz.

MBXLE gold plating conn, Part Number: 1-1892933-1.

Press-fit conn with Tin plating.

8AWG Red wire PN: 1760457-5, 8AWG black wire: 1760457-4.

1.5. Environmental Conditions

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

- Temperature: $25 \pm 10^{\circ}\text{C}$
- Relative Humidity: $50 \pm 25\% \text{ RH}$

1.6. Test Sequence:

NO.	Test Item	Test sequence (a)					Notes	
		Test Group 1	Test Group 2	Test Group 3	Test Group 4	Test Group 5		
1	Examination of Product	1,6	1,4	1,4	1,3	1,6		
2	Contact resistance Press-fit side	2,4						
3	Temperature rise vs current.	3						[20A----To measure contact resistance and Temp rise] [40A----To measure contact resistance and Temp rise] Go current step 0A- 20A-25A-30A-35A-40A, recording the temprature (Reach each steps take 3 readings, each reading should be within 1 degrees C).
4	Press-fit Connector insertion force to PCB		2	2				
	Press-fit Connector insertion force to PCB max force 700N,3000N,12000N test to see failure mode				2			
5	Press-fit Connector Removal force with PCB Unlocked Screw		3					
6	Press-fit Connector Removal force with PCB locked Screw with press-fit housing			3				
8	Straight tensile to failure.					4 For MBXLE	-	
9	Angled tensile to failure.	5 For press-fit				-	5 For MBXLE	
10	Insulation resistance.					2		
11	Withstanding voltage.					3		
	Test sample qty	4pcs	3 pcs	3 pcs	3 pcs	3 pcs	3 pcs	

Note: (a) Numbers indicate sequence in which tests are performed.

2. SUMMARY OF TESTING

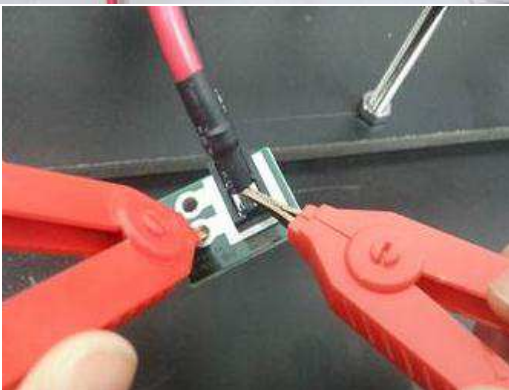
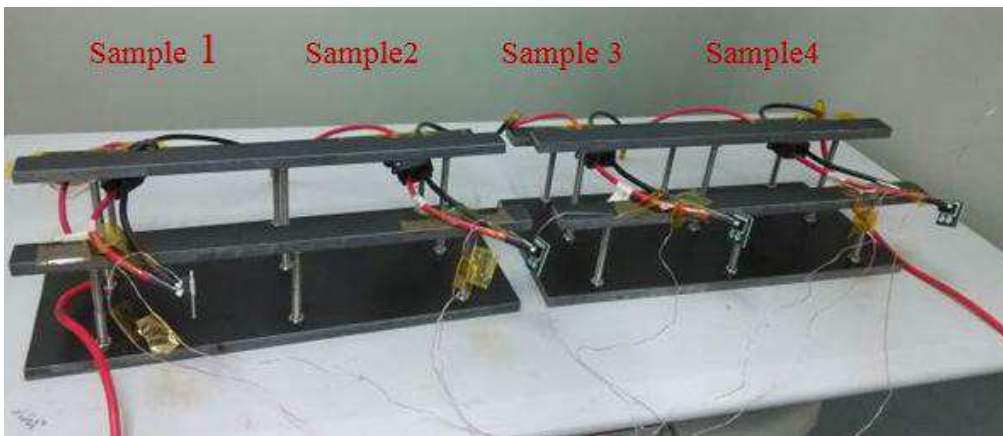
2.1. Initial Examination of Product - All Test Groups

Specimens were visually examined and no evidence of physical damage detrimental to product performance was observed.



2.2. Contact resistance Press-fit side---Initial.

a) Test pictures.

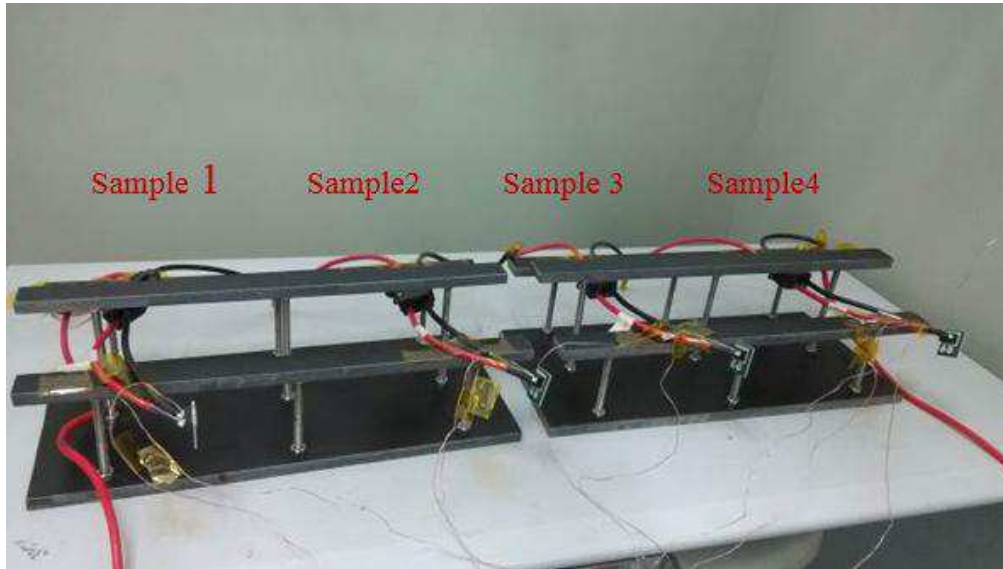


- b) Test results.
Meet specification 1.0mΩ maximum.

Pin	#1	#2	#3	#4	#1	#2	#3	#4
	20A current				40 current			
Red	0.112	0.11	0.11	0.112	0.117	0.116	0.123	0.115
Black	0.126	0.119	0.124	0.123	0.132	0.125	0.131	0.129
Max	0.126				0.132			
Min	0.11				0.115			
Ave	0.117				0.124			

2.3. Temperature rise vs current.

- a) Test pictures.
The temperature detected points as below:

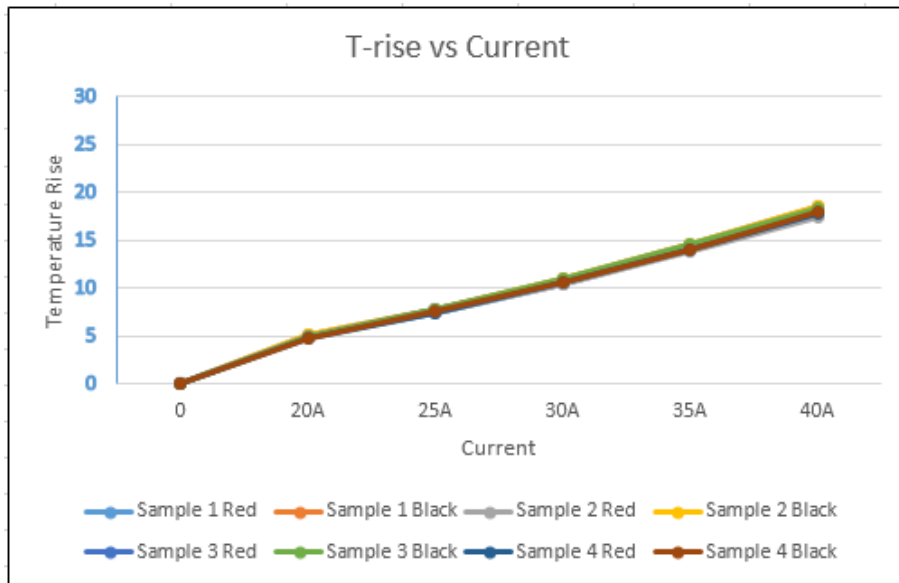


The detected location:



b) Test results: meet specification 30°C maximum temperature rise at 40A current.

	Sample 1		Sample 2		Sample 3		Sample 4	
ΔT (°C)	Red	Black	Red	Black	Red	Black	Red	Black
20A	4.90	5.11	4.89	5.07	5.05	5.04	4.85	4.86
25A	7.50	7.88	7.50	7.82	7.74	7.84	7.51	7.58
30A	10.49	10.96	10.53	10.98	10.79	10.96	10.57	10.56
35A	13.94	14.61	13.77	14.52	14.16	14.53	14.00	14.00
40A	17.65	18.64	17.49	18.52	17.98	18.39	17.76	17.99



2.4. Contact resistance after Temperature rise.

- a) Test pictures, same test picture as item 2.2.
- b) Test results: Meet specification 1.0mΩ maximum.

Pin	#1	#2	#3	#4	#1	#2	#3	#4
	20A current				40 current			
Red	0.115	0.111	0.12	0.116	0.117	0.116	0.124	0.119
Black	0.129	0.132	0.132	0.128	0.134	0.138	0.139	0.133
Max	0.132				0.139			
Min	0.111				0.116			
Ave	0.123				0.128			

2.5. Angled (45 degree) tensile to failure----Press fit side after temperature rise.

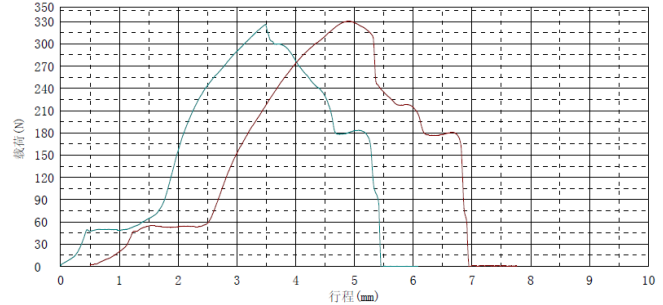
a) Test pictures.



b) Test results. Meet spec: 136 N (30 lbf) minimum.

Sample	Data Unit: N	Notes
1	326.47	Locked screw on PCB
2	330.81	
3	240.63	Unlocked screw on PCB
4	240.25	

單位	N
1 - 1	326.469
1 - 2	330.813



2.6. Press-fit Connector insertion force to PCB.

a) Test pictures.

Before insertion:

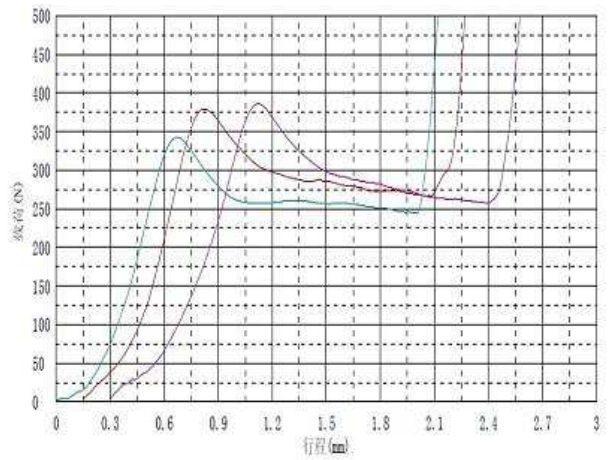
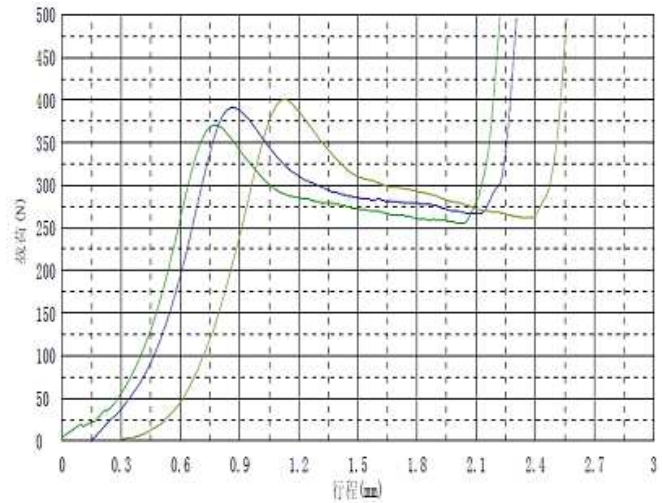


After insertion:



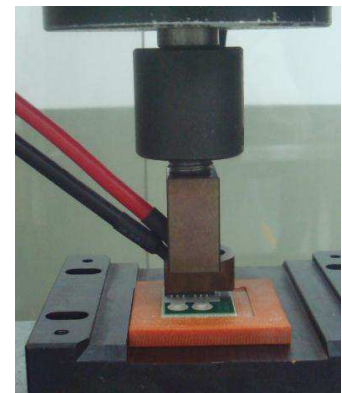
b) Test results, meet specification 700 N maximum.

Sample	Data Unit: N
# 1	342.93
# 2	379.28
# 3	386.40
# 4	370.96
# 5	391.12
# 6	401.00
Max.	401.00
Min.	342.93
Ave.	378.62



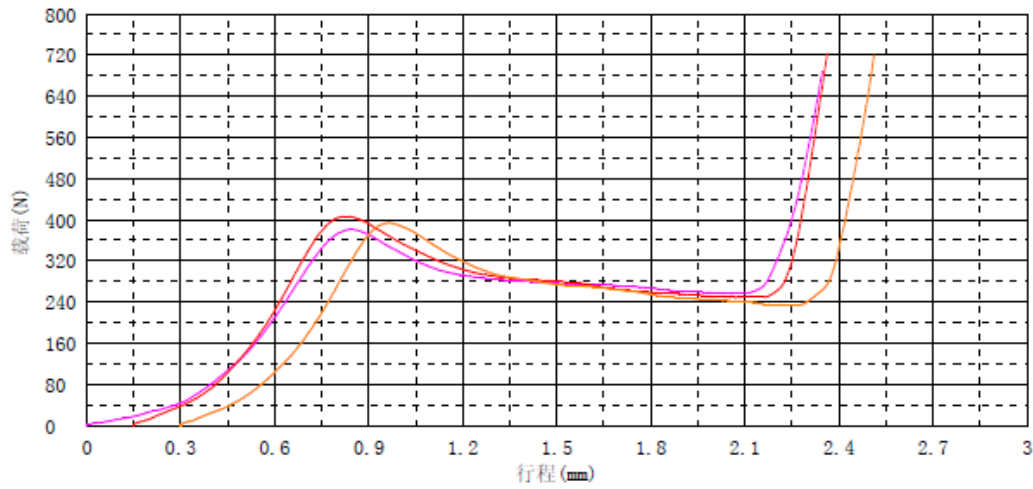
2.7. Press-fit Connector insertion force to PCB---Test max force 700N; 3000N;12000N to see failure mode.

a) Test pictures.
Before insertion:

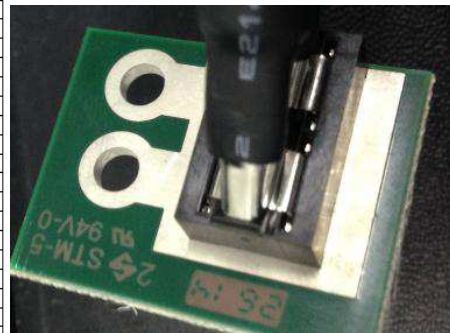
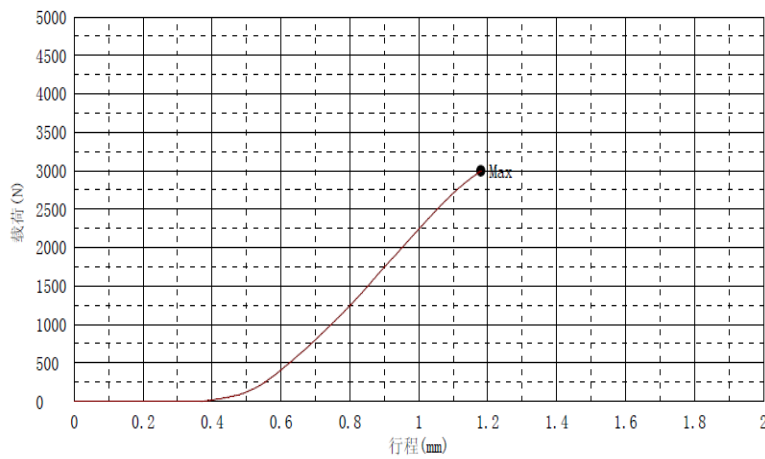


b) Test results.

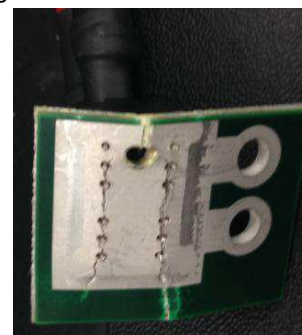
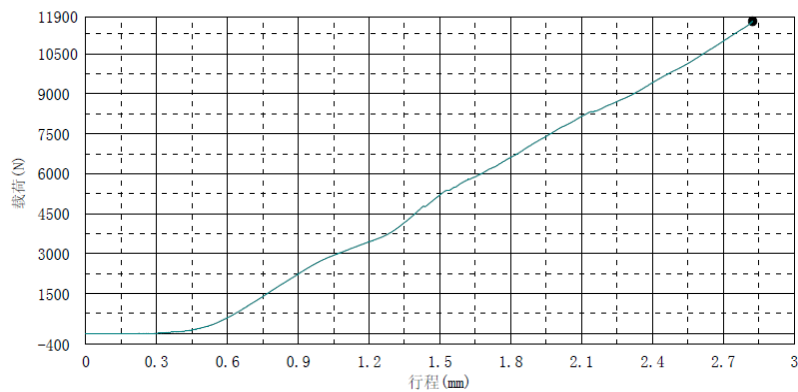
3 pcs after insertion 700N force, no damage. force curve as below.



Enlarge the force to 3000N to test 1 pcs, no damage. force curve as below.



Enlarge the force to 12000N to test 1 pcs, PCB damage. force curve as below.

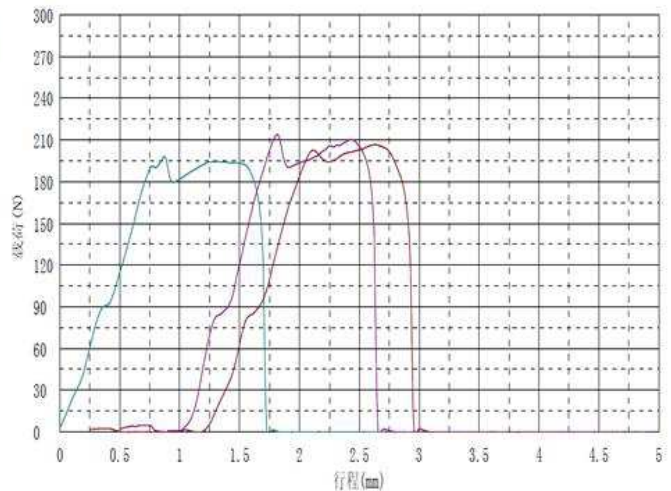


2.8. Press-fit Connector Removal force with PCB unlocked Screw.

a) Test pictures.

Before Removal

After Removal: the conn been pulled out.



b) Test results. Meet specification 80N minimum.

Sample	Data Unit: N
1	198.34
2	207.00
3	214.03
Max.	214.03
Min.	198.34
Ave.	206.46

2.9. Press-fit Connector Removal force with PCB locked Screw.

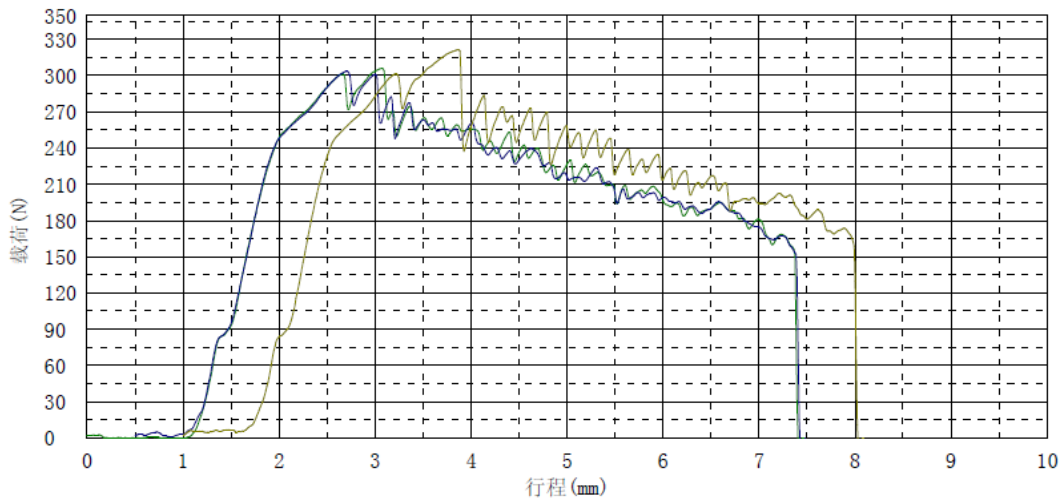
a) Test pictures.



b) Test results: Meet specification 160N minimum.

The force curve as below, after the force more than 303N, the conn still not been pulled out from PCB. But the removal tooling slide from press-fit housing.

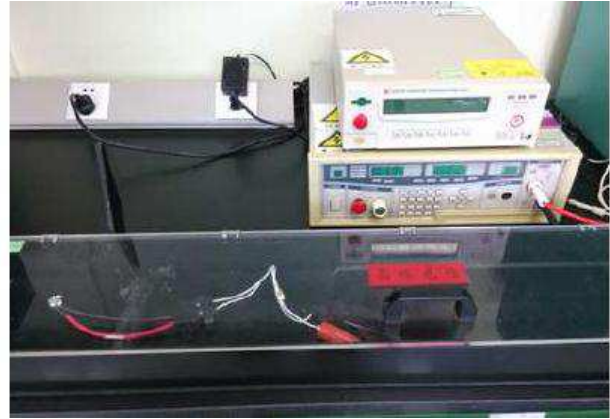
单位	N
1 - 4	306.063
1 - 5	303.688
1 - 6	321.594



The reason for the removal tooling slide from press-fit housing. Since the size of removal tooling is limited by the room of customer's PCB. It was designed only for removal press-fit conn without lock screw. Removal force is much higher after screw locked, so the removal tooling slide.

2.10. Insulation resistance & withstanding voltage.

a) Test pictures.

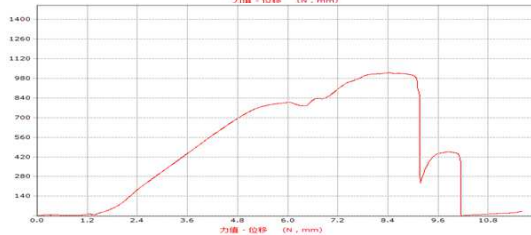
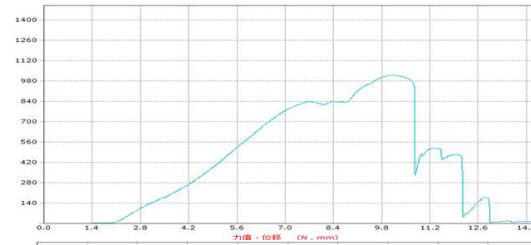


b) Test results:

6 pcs samples meet the spec insulation resistance 1000 megohms minimum and withstanding voltage 1 minutes no breakdown and flashover.

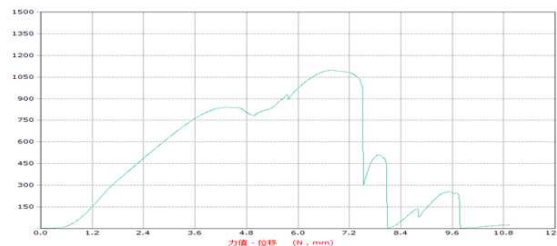
2.11. Straight tensile to failure after Insulation resistance & withstanding voltage.

a) Test pictures.



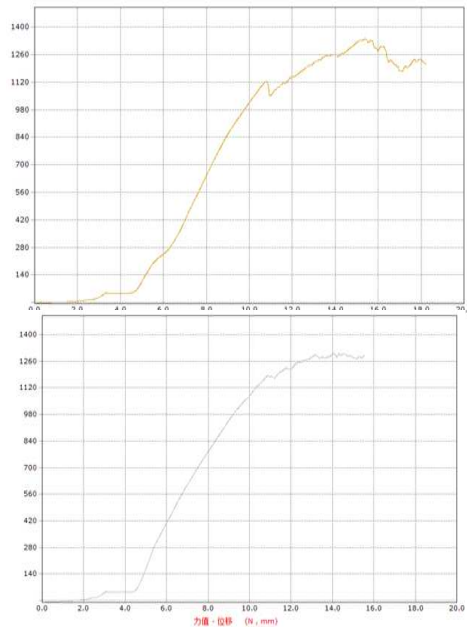
b) Test results. Meet spec: 136 N (30 lbf) minimum.

Sample	Data Unit: N
1	1020.85
2	1020.43
3	1097.18
Max.	1097.18
Min.	1020.43
Ave.	1046.15



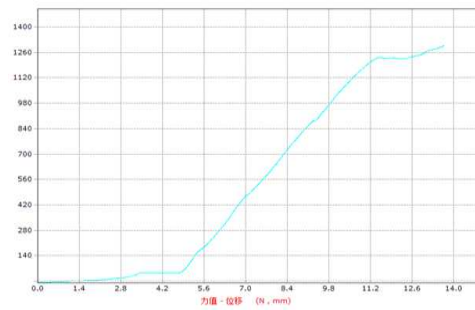
2.12. Angled tensile to failure after Insulation resistance & withstanding voltage.

a) Test pictures.



b) Test results. Meet spec: 136 N (30 lbf) minimum.

Sample	Data Unit: N
1	1339.24
2	1301.39
3	1297.44
Max.	1339.24
Min.	1297.44
Ave.	1312.69



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. Contact Resistance.

Resistance should be measured after the clip has reached thermal equilibrium, after carrying Rated load at 25°C ambient temperature.

3.3. Temperature rise vs current

Temperature rise were established for specimens with a single circuit energized, current up to 40A. Test the temperature in 20A-25A-30A-35A-40A increments. The temperature is measures after the stabilization period. Stabilize at a single current level until 3 readings at 5 minute intervals are within 1°C. The specimens were placed in the stable air environment of a temperature rise enclosure. In accordance with EIA-364-70C.

3.4. Insertion force.

Measure force when insert connector to printed circuit board at speed max 12.7mm/min.

3.5. Removal force.

Measure force when removal connector from printed circuit board at speed max 12.7mm/min.

3.6. Straight tensile to failure.

Pull the contacts out of housing and record the force profile, pull test speed max12.7mm/min.

3.7. Angle tensile to failure.

45 angle to pull the contacts out of housing and record the force profile, pull test speed max 12.7mm/min.

3.8. Insulation resistance.

Measure the adjacent contacts specimens under 500 volts DC, 2minutes hold 1000 megohms minimum.

3.9. Withstanding voltage.

Measure the adjacent contacts specimens under 500 volts DC at sea level, 1 minute hold no breakdown or flashover.

3.10. Final Examination of Product

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