AMP-DUAC UPC

1. INTRODUCTION

1.1. Purpose

Testing was performed on the AMP* Dual Action (AMP-DUAC) Universal Power Connector (UPC) to determine its conformance to the requirements of Product Specification 108-2248 Revision A.

1.2. Scope

This report covers the electrical, mechanical, and environmental performance of the AMP-DUAC UPC. Testing was performed at the Engineering Assurance Product Testing Laboratory between 12Jul07 and 04Apr08. The test file number for this testing is CTLA203-009. This documentation is on file at and available from the Engineering Assurance Product Testing Laboratory.

1.3. Conclusion

The AMP-DUAC UPC listed in paragraph 1.5., conformed to the electrical, mechanical, and environmental performance requirements of Product Specification 108-2248 Revision A.

1.4. Product Description

This 6 row by variable column count (M) connector system is designed for power applications and uses female crimp-snap contacts in the receptacle connector half, and male crimp-snap contacts in the plug half. Housings are keyed and polarized to prevent inverse mating, improper mating of dissimilar size housings and inverse mating of the plug on a panel.

1.5. Test Specimens

Test specimens were representative of normal production lots. Specimens identified with the following part numbers were used for test:

Part Number	Description
1469910	48 position Positive Lock
1934017	66 position Positive Lock
1934142	48 position plug housing
1934143	66 position plug housing
1934144	48 position receptacle housing
1934145	66 position receptacle housing
1934182	16 AWG receptacle contact
1934183	18 AWG receptacle contact
1934184	16 AWG pin contact
1934185	18 AWG pin contact

Figure 1

* Trademark
| Indicates change

1.6. Environmental Conditions

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

- Temperature: 15 to 35˚C
- Relative Humidity: 25 to 75%

1.7. Qualification Test Sequence

Test or Examination	Test Group (a)				
	1	2	3	4	5
	Test Sequence (b)				
Initial examination of product	1	1	1	1	1
Low Level Contact Resistance (LLCR)	3,7	2,7			2,6
Insulation resistance			2,6		
Withstanding voltage			3,7		
Temperature rise vs current without air flow		3,8			
Temperature rise vs current with air flow					7
Random vibration	5	6			5
Mechanical shock	6				
Durability	4				
Mating force	2				
Unmating force	8				
Latch retention				2	
Contact retention				3	
Thermal shock			4		
Humidity/temperature cycling		4(c)	5(d)		3(c)
Temperature life		5			4
Final examination of product	9	9	8	4	8

NOTE

(a) See paragraph1.5.
(b) Numbers indicate sequence in which tests are performed.
(c) Precondition specimens with 5 durability cycles.
(d) Final measurements shall be taken after the recovery period.

Figure 2

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 (C of C) was issued by Product Assurance. 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 LLCR measurements, taken at 100 milliamperes maximum and 20 millivolts maximum open circuit voltage were less than 25 milliohms.

2.3. Insulation Resistance - Test Group 3

All insulation resistance measurements were greater than 1000 megohms.

2.4. Withstanding Voltage - Test Group 3

No dielectric breakdown or flashover occurred.

2.5 Temperature Rise vs Current, With and Without Air Flow - Test Groups 2 and 5

All specimens had a temperature rise of less than 30˚C above ambient when tested using a baseline rated current specified in Figure 3 and the correct derating factor value based on the specimens wiring configuration.

Density (loading)	Current Rating (amperes)	Loading Array
48 Position UPC		
100%	4.25	Figure 4
Special (75%)	5	Figure 5
66 Position UPC		
100%	4	Figure 6
Special (73%)	4.5	Figure 7
Special (73%) 80 LFM	5.5	Figure 7

NOTE *Figures 4 through 7 are patterns that were specifically tested and proved to produce ≤ 30˚C temperature rise when creating a different load pattern, which utilizes contacts running at > 3 amperes.*

Figure 3

	8	7	6	5	4	3	2	1
A	4.25A	4.25A	4.25A	4.25A	4.25A	4.25A	4.25A	4.25A
B	4.25A	4.25A	4.25A	4.25A	4.25A	4.25A	4.25A	4.25A
C	4.25A	4.25A	4.25A	4.25A	4.25A	4.25A	4.25A	4.25A
D	4.25A	4.25A	4.25A	4.25A	4.25A	4.25A	4.25A	4.25A
E	4.25A	4.25A	4.25A	4.25A	4.25A	4.25A	4.25A	4.25A
F	4.25A	4.25A	4.25A	4.25A	4.25A	4.25A	4.25A	4.25A

Figure 4
48 Position 100 % Loaded

	8	7	6	5	4	3	2	1
A	5 A	5 A	5 A	5 A	5 A	5 A	5 A	5 A
B	5 A	5 A	100 mA	5 A	100 mA	5 A	100 mA	5 A
C	5 A	100 mA	5 A	100 mA	5 A	100 mA	5 A	5 A
D	5 A	5 A	100 mA	5 A	100 mA	5 A	100 mA	5 A
E	5 A	100 mA	5 A	100 mA	5 A	100 mA	5 A	5 A
F	5 A	5 A	5 A	5 A	5 A	5 A	5 A	5 A

Figure 5
48 Position Special Load, 75%

	11	10	9	8	7	6	5	4	3	2	1
A	4A	4A	4A	4A	4A	4A	4A	4A	4A	4A	4A
B	4A	4A	4A	4A	4A	4A	4A	4A	4A	4A	4A
C	4A	4A	4A	4A	4A	4A	4A	4A	4A	4A	4A
D	4A	4A	4A	4A	4A	4A	4A	4A	4A	4A	4A
E	4A	4A	4A	4A	4A	4A	4A	4A	4A	4A	4A
F	4A	4A	4A	4A	4A	4A	4A	4A	4A	4A	4A

Figure 6
66 Position 100% Loaded

	11	10	9	8	7	6	5	4	3	2	1
A	XA	XA	XA	XA	XA	XA	XA	XA	XA	XA	XA
B	XA	XA	100 mA	XA	100 mA	XA	100 mA	XA	100 mA	XA	XA
C	XA	100 mA	XA	100 mA	XA	100 mA	XA	100 mA	XA	100 mA	XA
D	XA	XA	100 mA	XA	100 mA	XA	100 mA	XA	100 mA	XA	XA
E	XA	100 mA	XA	100 mA	XA	100 mA	XA	100 mA	XA	100 mA	XA
F	XA	XA	XA	XA	XA	XA	XA	XA	XA	XA	XA

Note: If 80 LFM of airflow is applied over the connector, it is rated for 5.5 amperes; if no airflow is applied, it is rated for 4.5 amperes.

Figure 7
66 Position Special Load, 73%

2.6. Random Vibration - Test Groups 1, 2 and 5

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

2.7. Mechanical Shock - Test Group 1

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

2.8. Durability - Test Group 1

No physical damage occurred as a result of mating and unmating the specimens 25 times.

2.9. Mating Force - Test Group 1

All single contact maximum average mating force measurements were less than 2.90 N.

2.10. Unmating Force - Test Group 1

All single contact minimum average unmating force measurements were greater than 0.50 N and less than 1.85 N.

2.11. Latch Retention - Test Group 4

All specimens maintained continuity and remained mated when subjected to an axial load of 111 N.

2.12. Contact Retention - Test Group 4

No contacts dislodged from the housing when subjected to a force of 44.5 N for socket contact specimens with PL installed and 22.5 N for pin contact specimens without PL installed.

2.13. Thermal Shock - Test Group 3

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

2.14. Humidity/temperature Cycling - Test Groups 2, 3 and 5

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

2.15. Temperature Life - Test Groups 2 and 5

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

2.16. 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 C o f C 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

LLCR 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. The measurement point was approximately 9.6 mm behind the housing.

3.3. Insulation Resistance

Insulation resistance was measured between adjacent contacts of mated specimens. A test voltage of 500 volts DC was applied for 2 minutes before the resistance was measured.

3.4. Withstanding Voltage

A test potential of 1800 volts AC was applied between adjacent contacts of mated specimens. This potential was applied for 1 minute and then returned to zero.

3.5. Temperature Rise vs Current

Specimens were energized at current levels specified in Figures 4, 5, 6 and 7. Temperature rise curves were produced by measuring individual contact temperatures at the specified current levels. These measurements were plotted to produce a temperature rise vs current curve. Thermocouples were attached to individual contacts to measure their temperatures. The ambient temperature was then subtracted from this measured temperature to find the temperature rise. When the temperature rise of 3 consecutive readings taken at 5 minute intervals did not differ by more than 1˚C, the temperature measurement was recorded.

3.6. Random Vibration

Mated specimens were subjected to a random vibration test, specified by a random vibration spectrum, with excitation frequency bounds of 20 and 500 Hz. The spectrum was flat at 0.02 G^2/Hz from 20 to the upper bound frequency of 500 Hz. The root-mean square amplitude of the excitation was 3.10 GRMS. This was performed for 15 minutes in each of 3 mutually perpendicular planes for a total vibration time of 45 minutes. Specimens were monitored for discontinuities of 1 microsecond or greater using a current of 100 milliamperes DC.

3.7. Mechanical Shock

Mated specimens were subjected to a mechanical shock test having a half-sine waveform of 30 gravity units (g peak) and a duration of 11 milliseconds. 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.

3.8. Durability

Specimens were mated and unmated 25 times at a maximum rate of 500 cycles per hour.

3.9. 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 per minute. The average force per contact was calculated.

3.10. 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 per minute. The average force per contact was calculated.

3.11. Latch Retention

Specimens were series wired and monitored for discontinuities while being subjected to an axial load of 111 N for 6 seconds.

3.12. Contact Retention

Contact retention for socket contact specimens with PL installed was measured by subjecting them to a force of 44.5 N for 6 seconds. Pin contact specimens without PL installed were subjected to a force of 22.5 N for 6 seconds.

3.13. Thermal Shock

Mated specimens were subjected to 5 cycles of thermal shock with each cycle consisting of 30 minute dwells at -55 and 105˚C and 1 minute transition between temperatures.

3.14. Humidity/temperature Cycling

Mated specimens were exposed to 10 humidity/temperature cycles. Each cycle lasted 24 hours and consisted of cycling the temperature between 25 and 65˚C twice while maintaining high humidity. Specimens in Test Group 2 were preconditioned with 5 durability cycles.

3.15. Temperature Life

Mated specimens were exposed to a temperature of 105˚C for 1000 hours.

3.16. Final Examination of Product

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