Connector, Micro-Strip, Board To Board

1. INTRODUCTION

1.1. Purpose

Testing was performed on AMP* Micro-Strip, Board to Board Connector to determine its conformance to the requirements of AMP Product Specification 108-1272 Rev. O.

1.2. Scope

This report covers the electrical, mechanical, and environmental performance of the Micro-Strip, Board to Board Connector manufactured by the Printed Circuit Board Products Division of the Capital Goods Business Unit.

1.3. Conclusion

The Micro-Strip, Board to Board Connectors, listed in paragraph 1.5., meet the electrical, mechanical, and environmental performance requirements of AMP Product Specification 108-1272 Rev O.

1.4. Product Description

The Micro-strip board to board right angle and vertical connector family is designed to accommodate a variety of printed circuit board thicknesses. The plug assemblies are loaded with .015 inch square male Micro-Strip contacts which mate with receptacle assemblies loaded with female Micro-Strip contacts. The contacts are phosphor bronze or beryllium copper, selective gold over nickel plated. The housings are high temperature thermoplastic, liquid crystal polymer.

1.5. Test Samples

The test samples were randomly selected from normal current production lots, and the following part numbers were used for test:

Test Group	Quantity	Part Nbr	Description
1,3	5 ea.	536254-4	100 Position Receptacle Assembly
1,3	5 ea.	536272-4	100 Position Plug Assembly
1,3	5 ea.	536272-6	140 Position Plug Assembly
1,3	5 ea.	536295-6	140 Position Right Angle Assembly
| 1	5	149012-4	100 Position Plug Assembly
| 1	5	536317-4	100 Position Receptacle Assembly
2	10	536274-4	100 Position Plug Assembly
2	10	536279-4	100 Position Receptacle Assembly
2	10	121496-4	100 Position Receptacle Assembly
2	10	121354-4	100 Position Plug Assembly

* Trademark

| Indicates change

1.6. Qualification Test Sequence

Test or Examination	Test Groups		
	1	2	3
Examination of Product	1,9	1,9	1,8
Termination Resistance, Dry Circuit	3,7	2,7	
Dielectric Withstanding Voltage			3,7
Insulation Resistance			2,6
Temperature Rise vs Current		3,8	
Vibration	5	6	
Physical Shock	6		
Mating Force	2		
Unmating Force	8		
Durability	4		
Thermal Shock			4
Humidity-Temperature Cycling			5
Mixed Flowing Gas		4	
Temperature Life		5	

NOTE *The numbers indicate sequence in which tests were performed.*

2. SUMMARY OF TESTING

2.1. Examination of Product - All Groups

All samples submitted for testing were selected from normal current production lots. They were inspected and accepted by the Product Assurance Department of the Capital Goods Business unit.

2.2. Termination Resistance, Dry Circuit - Groups 1 and 2

All termination resistance measurements, taken at 100 milliamperes DC maximum and 50 millivolts open circuit voltage were less than 20 milliohms for vertical contacts, 25 milliohms for right angle contacts, 40 milliohms for M-bus contacts, and 10 milliohms for ground contacts initially, and a maximum change in resistance (ΔR) of 7.0 milliohms for all signal contacts and a maximum change in resistance (ΔR) of 4.0 milliohms for all ground contacts after testing.

Test Group	Nbr of Samples	Condition	Termination Resistance Min	Max	Mean
		Vertical Signal Contacts			
1	470	Initial	8.60	13.31	9.423
		After Mechanical(ΔR)	-3.76	+2.43	-0.088
2	600	Initial	8.22	13.27	9.100
		After Current Verif.(ΔR)	-2.74	+2.77	+0.118
		Vertical Ground Contacts			
1	25	Initial	1.26	1.73	1.424
		After Mechanical(ΔR)	-0.34	+0.18	-0.037
2	30	Initial	1.25	1.67	1.440
		After Current Verif.(ΔR)	-0.16	+0.63	+0.030
		Right Angle Signal Contacts			
1	175	Initial	11.66	18.15	14.918
		After Mechanical(ΔR)	-3.54	+2.37	-0.061
		Right Angle Ground Contacts			
1	35	Initial	1.41	1.65	1.521
		After Mechanical(ΔR)	-0.03	+0.09	+0.031
		M-Bus Signal Contacts			
2	600	Initial	27.13	31.25	29.040
		After Current Verif.(ΔR)	-1.15	+1.25	-0.003

All values in milliohms

2.3. Dielectric Withstanding Voltage - Group 3

No dielectric breakdown or flashover occurred when a test voltage was applied between adjacent contacts.

2.4. Insulation Resistance - Group 3

All insulation resistance measurements were greater than 5000 megohms.

2.5. Temperature Rise vs Current - Group 2

All samples had a temperature rise of less than 30°C above ambient when tested using a baseline rated current of 10.5 amperes and the correct derating factor value based on the samples wiring configuration.

2.6. Vibration - Groups 1 and 2

No discontinuities of the contacts were detected during vibration (Group 1 only). Following vibration, no cracks, breaks, or loose parts on the connector assemblies were visible.

2.7. Physical Shock - Group 1

No discontinuities of the contacts were detected during physical shock. Following physical shock testing, no cracks, breaks, or loose parts on the connector assemblies were visible.

2.8. Mating Force - Group 1

All mating force measurements were less than 8 pounds per inch of connector (1 inch equals 40 signal contacts and 2 ground contacts).

2.9. Unmating Force - Group 1

All unmating force measurements were greater than 2 pounds per inch of connector (1 inch equals 40 signal contacts and 2 ground contacts).

2.10. Durability - Group 1

No physical damage occurred to the samples as a result of mating and unmating the connector 50 times.

2.11. Thermal Shock - Group 3

No evidence of physical damage to either the contacts or the connector was visible as a result of exposure to thermal shock.

2.12. Humidity-Temperature Cycling - Group 3

No evidence of physical damage to either the contacts or the connector was visible as a result of exposure to humidity-temperature cycling.

2.13. Mixed Flowing Gas - Group 2

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

2.14. Temperature Life - Group 2

No evidence of physical damage to either the contacts or the connector was visible as a result of exposure to an elevated temperature.

3. TEST METHODS

3.1. Examination of Product

Product drawings and inspection plans were used to examine the samples. They were examined visually and functionally.

3.2. Termination Resistance, Low Level

Termination resistance measurements at low level current were made using a 4 terminal measuring technique (Figure 1). The test current was maintained at 100 milliamperes DC with an open circuit voltage of 50 millivolts DC.

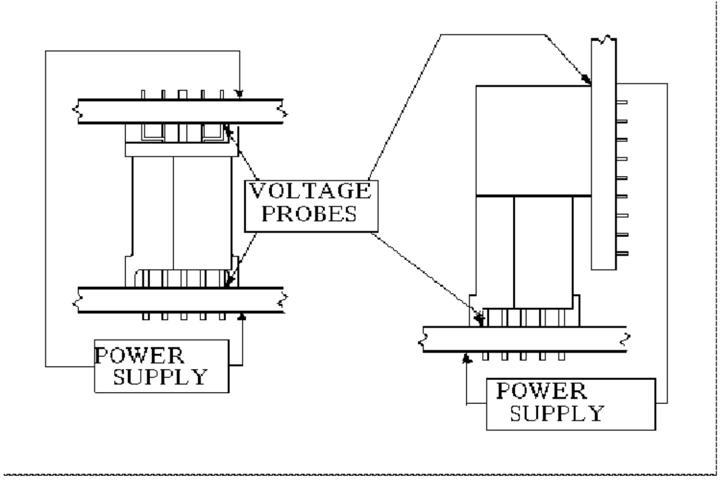

Figure 1
Typical Termination Resistance Measurement Points

3.3. Dielectric Withstanding Voltage

A test potential of 500 volts AC was applied between adjacent signal contacts and between signal contacts and ground contacts. This potential was applied for 1 minute and then returned to zero.

3.4. Insulation Resistance

Insulation resistance was measured between adjacent signal contacts and between signal contacts and ground contacts, using a test voltage of 100 volts DC. This voltage was applied for 1 minute before the resistance was measured.

3.5. Temperature Rise vs Current

Temperature rise curves were produced by measuring individual contact temperatures at 5 different current levels. These measurements were plotted to produce a temperature rise vs current curve. Thermocouples were attached to the 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. Vibration, Random

Mated vertical connectors were subjected to a random vibration test, specified by a random vibration spectrum, with excitation frequency bounds of 50 and 2000 Hz. The power spectral density at 50 Hz was 0.025 G^2/Hz. The spectrum sloped up at 6 dB per octave to a PSD of 0.10 G^2/Hz at 100 Hz. The spectrum was flat at 0.10 G^2/Hz from 100 to 1000 Hz. The spectrum sloped down at 6 dB per octave to the upper bound frequency of 2000 Hz, at which the PSD was 0.025 G^2/Hz. The root-mean square amplitude of the excitation was 11.95 GRMS. The connectors were monitored for discontinuities on 1 microsecond or greater, using a current of 100 milliamperes in the monitoring circuit (Group 1). Samples were energized with a test current producing 18°C temperature rise (Group 2).

Mated M-bus connectors were subjected to a random vibration test, specified by a random vibration spectrum, with excitation frequency bounds of 10 and 500 Hz. The power spectral density at 10 Hz was 0.006 G^2/Hz. The spectrum sloped up at 6 dB per octave to a PSD of 0.10 G^2/Hz at 100 Hz. The spectrum was flat at 0.10 G^2/Hz from 100 to 500 Hz. The root-mean square amplitude of the excitation was 7.01 GRMS. Samples were energized with a test current producing 18°C temperature rise.

3.7. Physical Shock

Mated connectors were subjected to a physical shock test, having a half-sine waveform of 50 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. The connectors were monitored for discontinuities greater than 1 microsecond, using a current of 100 milliamperes in the monitoring circuit.

3.8. Mating Force

The force required to mate individual connectors was measured, using a tensile/compression device with a crosshead rate of travel at 1.0 inch/minute and a free floating fixture. The force per inch of connector was calculated.

3.9. Unmating Force

The force required to unmate individual connectors was measured, using a tensile/compression device with a crosshead rate of travel at 1.0 inch/minute and a free floating fixture. The force per inch of connector was calculated.

3.10. Durability

Connectors were mated and unmated 50 times at a rate not exceeding 600 per hour.

3.11. Thermal Shock

Mated connectors were subjected to 5 cycles of temperature extremes with each cycle consisting of 30 minutes at each temperature. The temperature extremes were -65 and 125°C. The transition between temperatures was less than 1 minute.

3.12. Humidity-Temperature Cycling

Mated connectors were exposed to 10 cycles of humidity-temperature cycling. Each cycle lasted 24 hours and consisted of cycling the temperature between 25 and 65°C twice while the relative humidity was held at 95%.

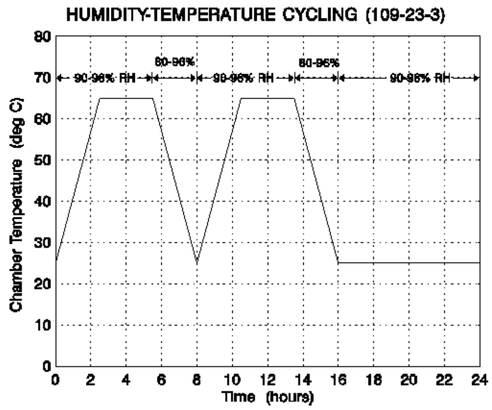

Figure 2
Typical Humidity-Temperature Cycling Profile

3.13. Mixed Flowing Gas, Class III

Mated connectors were exposed for 20 days to a mixed flowing gas Class III exposure. Class III exposure is defined as a temperature of 30°C and a relative humidity of 75% with the pollutants of $C1_2$ at 20 ppb, NO_2 at 200 ppb, and H_2S at 100 ppb.

3.14. Temperature Life

Mated samples were exposed to a temperature of 105°C for 500 hours.

4. VALIDATION

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