AMPMODU* 50/50 Grid Connection System

1. INTRODUCTION

1.1. Purpose

Testing was performed on the AMPMODU* 50/50 Grid Connector System to determine its conformance to the requirements of Product Specification 108-1332 Revision A.

1.2. Scope

This report covers the electrical, mechanical, and environmental performance of the AMPMODU 50/50 Grid Connector System. Testing was performed at the Engineering Assurance Product Test Laboratory between 17Apr95 and 25Sep95, and 06Apr02 and 24Sep02. The test file numbers for this testing are CTL 5424-026-002 and CTL 5345-005 respectively. This documentation is on file at and available from the Engineering Assurance Product Test Laboratory.

1.3. Conclusion

The AMPMODU 50/50 Grid Connector System listed in paragraph 1.5., conformed to the electrical, mechanical, and environmental performance requirements of Product Specification 108-1332 Revision A.

1.4. Product Description

The AMPMODU 50/50 grid connector miniature board-to-board system consists of printed circuit board mounted receptacles and headers on a .050 by .050 inch centerline. Both the receptacles and headers are designed to be soldered to the surface of a printed wiring board having pads with pre-applied solder paste.

1.5. Test Specimens

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

Test Group	Quantity	Part Number	Description
1	5	104652-1	10 position receptacle, beryllium copper per ASTM B194
	5	104652-1	10 position receptacle, copper alloy per ASTM B422-90
	10	104655-1	10 position .250 inch header
	5	1-104652-0	100 position receptacle, beryllium copper per ASTM B194
	5	1-104652-0	100 position receptacle, copper alloy per ASTM B422-90
	10	1-104655-1	100 position .250 inch header
2	8	1-104652-0	100 position receptacle, beryllium copper per ASTM B194
	10	1-104652-0	100 position receptacle, copper alloy per ASTM B422-90
	10	1-104655-1	100 position .250 inch header
	8	1-104693-0	100 position .390 inch header
3	5	1-104655-1	100 position .250 inch header
	5	1-104652-0	100 position receptacle, beryllium copper per ASTM B194
4	5	1-104655-1	100 position .250 inch header
	5	1-104652-0	100 position receptacle, beryllium copper per ASTM B194
	5	1-104652-0	100 position receptacle, copper alloy per ASTM B422-90

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
	Test Sequence (b)			
Examination of product	1,9	1,9	1,8	1,3
Termination resistance	3,7	2,7		
Insulation resistance			2,6	
Dielectric withstanding voltage			3,7	
Temperature rise vs current		3,8		
Vibration	5	6(c)		
Physical shock	6			
Durability	4			
Contact retention				2
Mating force	2			
Unmating force	8			
Thermal shock			4	
Humidity-temperature cycling			5	
Temperature life		5		
Mixed flowing gas, Class III		4(d)		
Mixed flowing gas, Class IIIA		4(d)		

NOTE
(a) See paragraph 1.5.
(b) Numbers indicate sequence in which tests are performed.
(c) Discontinuities shall not be measured. Energize at 18°C level for 100% loadings per Quality Specification 102-950.
(d) Precondition specimens with 10 cycles durability.

Figure 2

2. SUMMARY OF TESTING

2.1. 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. Termination Resistance - Test Groups 1 and 2

All termination resistance measurements, taken at 100 milliamperes maximum and 50 millivolts maximum open circuit voltage were less than 12 milliohms for specimens with .250 inch headers, and 16 milliohms for specimens with .390 inch headers. After testing, the maximum increase in resistance (ΔR) was less than 8 milliohms.

Test Group	Number of Data Points	Condition	Termination Resistance		
			Min	Max	Mean
1 (BeCu)	450	Initial	8.94	11.62	9.616
		After mechanical (ΔR)	-1.38	1.77	0.468
1 (Cu alloy)	60	Initial	4.45	9.52	7.739
		After mechanical (ΔR)	-2.39	3.46	0.265
2 (BeCu)	33	Initial	13.01	13.63	13.305
		After temperature life (ΔR)	-0.18	0.070	-1.017
2 (Cu alloy)	60	Initial	7.30	12.96	9.771
		After temperature life (ΔR)	-1.06	0.68	-0.065

NOTE *All values in milliohms.*

Figure 3

2.3. Insulation Resistance - Test Group 3

All insulation resistance measurements were greater than 5000 megohms.

2.4. Dielectric Withstanding Voltage - Test Group 3

No dielectric breakdown or flashover occurred.

2.5 Temperature Rise vs Current - Test Group 2

All specimens had a temperature rise of less than 30°C above ambient when tested using a baseline rated current of 3.9 amperes AC and the correct derating factor value based on the specimens wiring configuration.

2.6. Vibration, Random - Test Groups 1 and 2

No discontinuities were detected during vibration testing (test group 1 only). Following vibration testing, no cracks, breaks, or loose parts on the specimens were visible.

2.7. Physical Shock, Sawtooth - Test Group 1

No discontinuities were detected during physical shock testing. Following physical 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 manually mating and unmating the specimens 200 times.

2.9. Contact Retention - Test Group 4

No physical damage occurred to either the header or the receptacle, and no contacts dislodged from the housings as a result of applying an axial load of 0.25 pound to the header and 0.40 pound to the receptacle contacts.

2.10. Mating Force - Test Group 1

All mating force measurements were less than 6.4 ounces per contact.

2.11. Unmating Force - Test Group 1

All unmating force measurements were greater than 1 ounce per contact.

2.12. Thermal Shock - Test Group 3

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

2.13. Humidity-temperature Cycling - Test 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.

2.14. Temperature Life - Test Group 2

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

2.15. Mixed Flowing Gas - Test 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.

3. TEST METHODS

3.1. 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. Termination Resistance

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

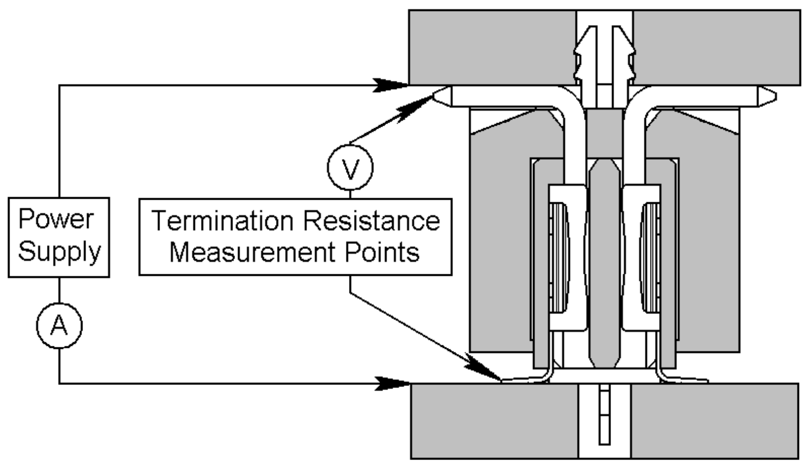

Figure 4
Termination Resistance Measurement Points

3.3. Insulation Resistance

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

3.4. Dielectric Withstanding Voltage

A test potential of 300 volts AC was applied between adjacent contacts. This potential was applied for 1 minute and then returned to zero.

3.5. Temperature Rise vs Current

For beryllium copper specimens, single circuit temperatures were measured, while energized at various current levels. A 30°C upper tolerance level was calculated from these measurements. The temperature was measured using thermography.

For copper alloy specimens, the specimens had a temperature of less than 30°C above ambient when tested using a baseline rated current of 3.9 amperes and the correct derating factor value based on the specimens wiring configuration.

3.6. Vibration, Random

Mated specimens 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 (PSD) at 50 Hz was 0.050 G^2/Hz. The spectrum sloped up at 6 dB per octave to a PSD of 0.20 G^2/Hz at 100 Hz. The spectrum was flat at 0.20 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 0.050 G^2/Hz. The root-mean square amplitude of the excitation was 16.91 GRMS. This was performed for 20 minutes in each of 3 mutually perpendicular planes for a total vibration time of 1 hour. Test Group 1 specimens were monitored for discontinuities. Test Group 2 specimens were energized at the appropriate current level to obtain an 18°C temperature rise.

3.7. Physical Shock, Sawtooth

Mated specimens were subjected to a physical shock test, having a sawtooth waveform of 100 gravity units (g peak) and a duration of 6 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 manually mated and unmated 200 times at a maximum rate of 150 cycles per hour.

3.9. Contact Retention

An axial load was applied to each contact and held for 60 seconds. The force was applied in a direction to cause removal of the contacts from the housing.

3.10. 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 0.5 inch per minute. The force per contact was calculated.

3.11. 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 0.5 inch per minute. The force per contact was calculated.

3.12. Thermal Shock

Mated specimens were subjected to 10 cycles of thermal shock with each cycle consisting of 30 minute dwells at -65 and 105°C. The transition between temperatures was less than 1 minute.

3.13. 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 and 65°C twice while maintaining high humidity (Figure 5).

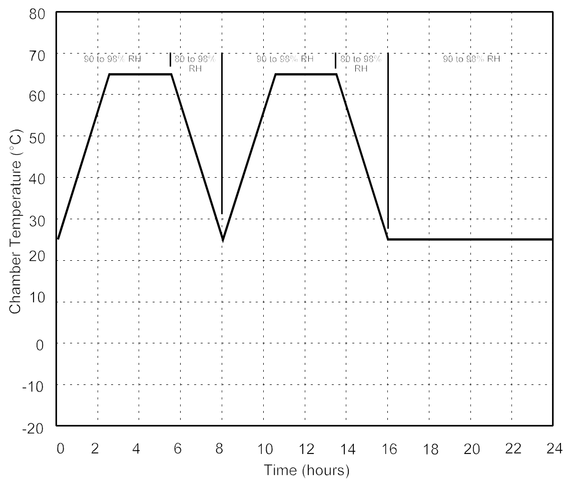

Figure 5
Humidity/Temperature Cycling Profile

3.14. Temperature Life

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

3.15. Mixed Flowing Gas

Mated beryllium copper specimens 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 Cl2 at 20 ppb, NO_2 at 200 ppb, and H_2S at 100 ppb. All specimens were preconditioned with 10 cycles of durability.

Mated copper alloy specimens were exposed for 20 days to a mixed flowing gas Class IIIA exposure. Class IIIA exposure is defined as a temperature of 30°C and a relative humidity of 70% with the pollutants of Cl_2 at 20 ppb, NO_2 at 200 ppb, H_2S at 100 ppb and SO_s at 200 ppb. All specimens were preconditioned with 10 cycles of durability.