Surface Mount Smart Card Connector

1. INTRODUCTION

1.1. Purpose

Testing was performed on the Tyco Electronics Surface Mount Smart Card Connector to determine its conformance to the requirements of Product Specification 108-1742 Revision A.

1.2. Scope

This report covers the electrical, mechanical, and environmental performance of the Surface Mount Smart Card Connector. Testing was performed at the Engineering Assurance Product Test Laboratory between 15Jan01 and 26Mar01. The test file number for this testing is CTLA238-001. This documentation is on file at and available from the Engineering Assurance Product Test Laboratory.

1.3. Conclusion

The Surface Mount Smart Card Connector listed in paragraph 1.5, conformed to the electrical, mechanical, and environmental performance requirements of Product Specification 108-1742 Revision A.

1.4. Product Description

This connector is designed for surface mount technology and is available with 6 or 8 data contacts and 2 switch contacts and accepts ISO 7810-7816 type smart cards. The connector can be supplied without a cover and is also available in a contact module without card control.

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
1,2,3,4,5	5 each	145300-2	Smart Card Connector

Figure 1

1.6. Environmental Conditions

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

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

* Trademark
I Indicates change

LOC B

1.7. Qualification Test Sequence

Test or Examination	Test Groups				
	1	2	3	4	5
	Test Sequence				
Initial examination of product	1	1	1	1	1
Termination resistance	3,7	2,4	2,4		
Insulation resistance				2,6	
Dielectric withstanding voltage				3,7	
Solderability					2
Vibration	5				
Mechanical shock	6				
Durability	4				
Mating force	2				
Unmating force	8				
Thermal shock				4	
Humidity -temperature cycling				5	
Temperature life		3(c)			
Mixed flowing gas			3(c)		
Final examination of product	9	5	5	8	3

NOTE *(a) See paragraph 1.5.*
(b) Numbers indicate sequence in which tests are performed.
(c) Precondition specimens with 10 cycles durability.

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 was issued by Product Assurance. Where specified, specimens were visually examined and no evidence of physical damage detrimental to product performance was observed.

2.2 Termination Resistance - Test Groups 1, 2 and 3

All termination resistance measurements taken at 100 milliamperes maximum and 20 millivolts maximum open circuit voltage were less than 100 milliohms.

Test Group	Number of Data Points	Condition	Termination Resistance		
			Min	Max	Mean
1	40	Initial	9.18	10.64	9.727
		After Mechanical	9.42	11.08	10.007
2	40	Initial	9.02	10.61	9.824
		After Temperature Life	9.42	12.05	10.402
3	40	Initial	9.20	10.76	9.984
		After Mixed Flowing Gas	9.10	12.89	10.130

NOTE *All values in milliohms.*

Figure 3

2.3. Insulation Resistance - Test Group 4

All insulation resistance measurements were greater than 1,000 megohms.

2.4. Dielectric Withstanding Voltage - Test Group 4

No dielectric breakdown or flashover occurred.

2.5. Solderability - Test Group 5

All contact leads had a minimum of 95% solder coverage.

2.6. Vibration - Test Group 1

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 50,000 times.

2.9. Mating Force - Test Group 1

All mating force measurements were less than 10 Newtons.

2.10. Unmating Force - Test Group 1

All unmating force measurements were greater than 1 Newton.

2.11. Thermal Shock - Test Group 4

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

2.12. Humidity-temperature Cycling - Test Group 4

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

2.13. Temperature Life - Test Group 2

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

2.14. Mixed Flowing Gas - Test Group 3

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

2.15. 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. Examination of Product

A Certification of Conformance was issued stating that all specimens in this test package were produced, inspected, and accepted as conforming to product drawing requirements, and 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. The test current was maintained at 100 milliamperes maximum with a 20 millivolt maximum open circuit voltage.

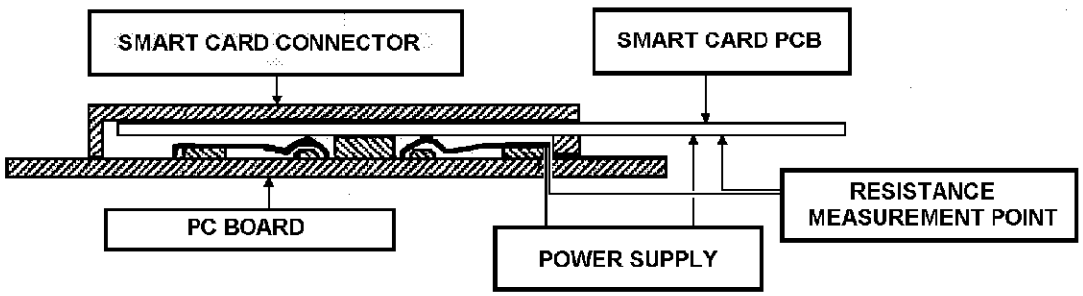

Figure 4

3.3. Insulation Resistance

Insulation resistance was measured between adjacent contacts with the smart card removed. 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 750 volts AC was applied between the adjacent data contacts with the smart card removed. A test potential of 250 volts AC was applied between the switch contacts with the smart card removed. This potential was applied for 1 minute and then returned to zero.

3.5. Solderability

The specimens and ceramic substrates were placed on a conveyor belt which traveled through an infrared oven. The specimens were exposed for 60 seconds to temperatures between 150 and 170°C and for 60 seconds to temperatures between 215 and 230°C. The temperature on the ceramic substrate, at a point close to the specimen, was monitored to enable temperature profiling. After reflow was completed, the specimens were removed from the ceramic substrate and allowed to cool. Any flux residue was removed by immersing the specimens in alcohol in an ultrasonic cleaner for 5 minutes. The specimens were then given a visual examination under a microscope at 10X magnification.

3.6. Vibration, Random

Specimens, mated with printed circuit board cards were subjected to a random vibration test, specified by a random vibration spectrum, with excitation frequency bounds of 20 and 500 Hz. The spectrum remains 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, Half-sine

Specimens, mated with printed circuit board cards were subjected to a mechanical shock test having a half-sine waveform of 10 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 following exception is noted: 4'G shock pulses were applied in the direction of card withdrawal. 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 to PVC smart cards 50,000 times at a rate of 600 cycles per hour. The smart card was replaced every 5,000 cycles.

3.9. Mating Force

The force required to mate individual specimens with PVC smart cards was measured using a tensile/compression device with the rate of travel at 0.5 inch per minute and a free floating fixture.

3.10. Unmating Force

The force required to unmate individual specimens from a PVC smart card was measured using a tensile/compression device with the rate of travel at 0.5 inch per minute and a free floating fixture.

3.11. Thermal Shock

Specimens were subjected to 5 cycles of thermal shock with each cycle consisting of 30 minute dwells at -40 and 90°C. The transition between temperatures was less than 1 minute.

3.12. Humidity-temperature Cycling

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.

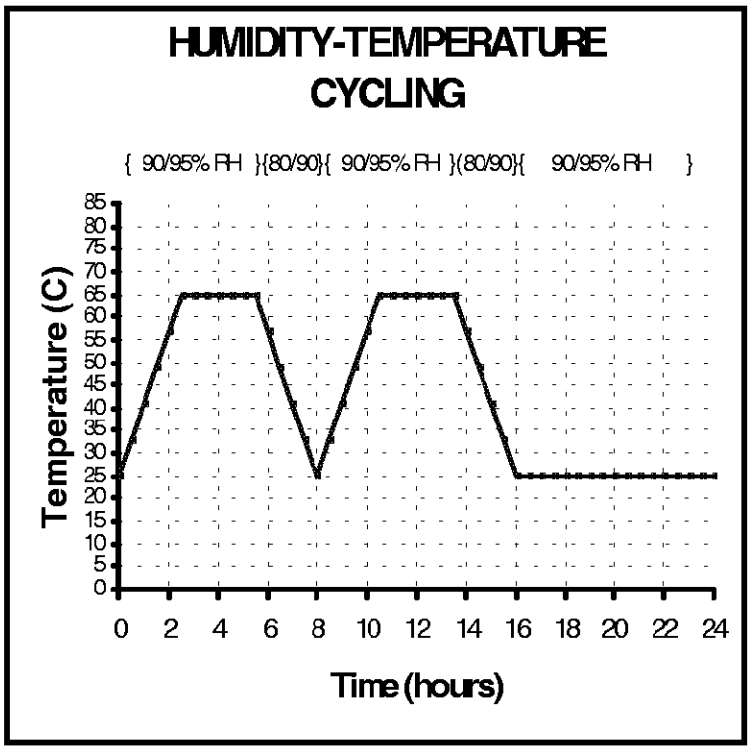

Figure 5
Typical Humidity-Temperature Cycling Profile

3.13. Temperature Life

Specimens were exposed to a temperature of 70°C for 1,000 hours. Specimens were preconditioned with 10 cycles of durability.

3.14. 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°C and a relative humidity of 70% with the pollutants of Cl_2 at 10 ppb, NO_2 at 200 ppb, H_2S at 10 ppb, and SO_2 at 100 ppb. Specimens were preconditioned with 10 cycles of durability.

3.15. Final Examination of Product

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