SMPM Female Cabled Connectors

1. INTRODUCTION

1.1. Purpose

Testing was performed on the TE Connectivity (TE) Subminiature P Miniature (SMPM) Cabled Female Connectors to determine their conformance to the requirements of Product Specification 108-2326 Revision A.

1.2. Scope

This report covers the electrical, mechanical, and environmental performance of the SMPM Female Cabled Connectors. Testing was performed at the Harrisburg Electrical Components Test Laboratory (HECTL) between 18Sep08 and 02Mar11. The test file numbers for this testing are EA20080535 for test groups 4, 5, 6 and 7 and EA20101067T for test groups 1, 2, 3 and 8. This documentation is on file at and available from HECTL.

1.3. Conclusion

The SMPM Female Cabled Connectors listed in paragraph 1.4., conformed to the electrical, mechanical, and environmental performance requirements of Product Specification 108-2326 Revision A.

1.4. 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	8 each	1757642-1	SMPM straight cable jack terminated to 1.20 mm semi-rigid cable
3	4	1757642-1	SMPM straight cable jack terminated to 1.20 mm semi-rigid cable
5,6	10 each	1757642-1	SMPM straight cable jack
7	5	1757642-1	SMPM straight cable jack
8	8	1757642-1	SMPM straight cable jack terminated to 1.20 mm flexible cable
1,2,8	4 each	1757644-1	SMPM full detent, vertical, PCB, male mating part
4	5	1757644-1	SMPM full detent, vertical, PCB, male mating part
1,2,3,8	4 each	1757253-1	SMPM smooth bore, surface mount, PCB male mating part

NOTE *Full detent specimens part number 1757644-1 were soldered to PCB part number 60-1042540-1. Smooth bore specimens part number 1757253-1 were soldered to PCB part number 60-1042138-2.*

Figure 1

1.5. Environmental Conditions

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

- Temperature: 15 to 35°C
- Relative Humidity: 20 to 80%

| Indicates Change

1.6. Qualification Test Sequence

Test or Examination	Test Group (a)							
	1	2	3	4	5	6	7	8
	Test Sequence (b)							
Initial examination of product	1	1	1	1	1	1	1	1
Low level contact resistance (LLCR)	3,5	2,4	2,4					
Voltage Standing Wave Ratio (VSWR)					2			
Insulation resistance				2,6				
Withstanding voltage				3,7				
Insertion loss						2		
Solderability, dip test							2	
Sinusoidal vibration								2(c)
Mechanical shock								3
Durability	4							
Mating force	2							
Unmating force	6							
Thermal shock				4				
Humidity/temperature cycling				5				
Temperature life		3(c)						
Corrosion			3(c)					
Final examination of product	7	5	5	8	3	3	3	4

NOTE

(a) See paragraph 1.4.
(b) Numbers indicate sequence in which tests are performed.
(c) Precondition specimens with 10 durability cycles.

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, 2 and 3

All LLCR measurements, taken at 100 milliamperes maximum and 20 millivolts maximum open circuit voltage had a change in resistance (ΔR) of less than 2 milliohms after testing.

Test Group	Number of Data Points	Condition	LLCR		
			Min	Max	Mean
Center Contact					
1 (full detent)	4	After mechanical (ΔR)	-1.25	-0.79	-0.97
1 (smooth bore)	4	After mechanical (ΔR)	0.62	0.97	0.84
2 (full detent)	4	After temperature life (ΔR)	-1.21	0.18	-0.55
2 (smooth bore)	4	After temperature life (ΔR)	-0.20	0.07	-0.06
3 (smooth bore)	4	After corrosion (ΔR)	-0.82	-0.58	-0.68
Outer Contact					
1 (full detent)	4	After mechanical (ΔR)	-0.12	0.13	0.00
1 (smooth bore)	4	After mechanical (ΔR)	-0.01	0.38	0.19
2 (full detent)	4	After temperature life (ΔR)	-0.01	0.13	0.04
2 (smooth bore)	4	After temperature life (ΔR)	-0.02	0.02	0.01
3 (smooth bore)	4	After corrosion (ΔR)	0.08	0.06	0.04

NOTE *All values in milliohms.*

Figure 3

2.3. VSWR - Test Group 5

All VSWR measurements were less than 1.2.

2.4. Insulation Resistance - Test Group 4

All insulation resistance measurements were greater than 5000 megohms.

2.5. Withstanding Voltage - Test Group 4

No dielectric breakdown or flashover occurred.

2.6. Insertion Loss - Test Group 6

All insertion loss measurements were less than -0.053 $\sqrt{f}$ (GHz) dB.

2.7. Solderability, Dip Test - Test Group 7

Specimens exhibited a continuous solder coating, free from defects, over a minimum of 95% of the critical surface areas. There was little to no de-wetting, non-wetting, pinholes or other anomalies.

2.8. Sinusoidal Vibration - Test Group 8

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

2.9. Mechanical Shock - Test Group 8

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

2.10. Durability - Test Group 1

No evidence of physical damage was visible as a result of mating and unmating the full detent specimens 100 times, and the smooth bore specimens 500 times.

2.11. Mating Force - Test Group 1

All mating force measurements were less than 40 N for full detent specimens, and less than 22 N for smooth bore specimens.

2.12. Unmating Force - Test Group 1

All unmating force measurements were greater than 7 N for full detent specimens, and greater than 2.3 N for smooth bore specimens.

2.13. Thermal Shock - Test Group 4

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

2.14. Humidity/temperature Cycling - Test Group 4

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

2.15. Temperature Life - Test Group 2

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

2.16. Corrosion - Test Group 3

No evidence of physical damage was visible as a result of exposure to a salt-laden atmosphere.

2.17. 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 of 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 (Figure 4). The test current was maintained at 100 milliamperes maximum with a 20 millivolt maximum open circuit voltage.

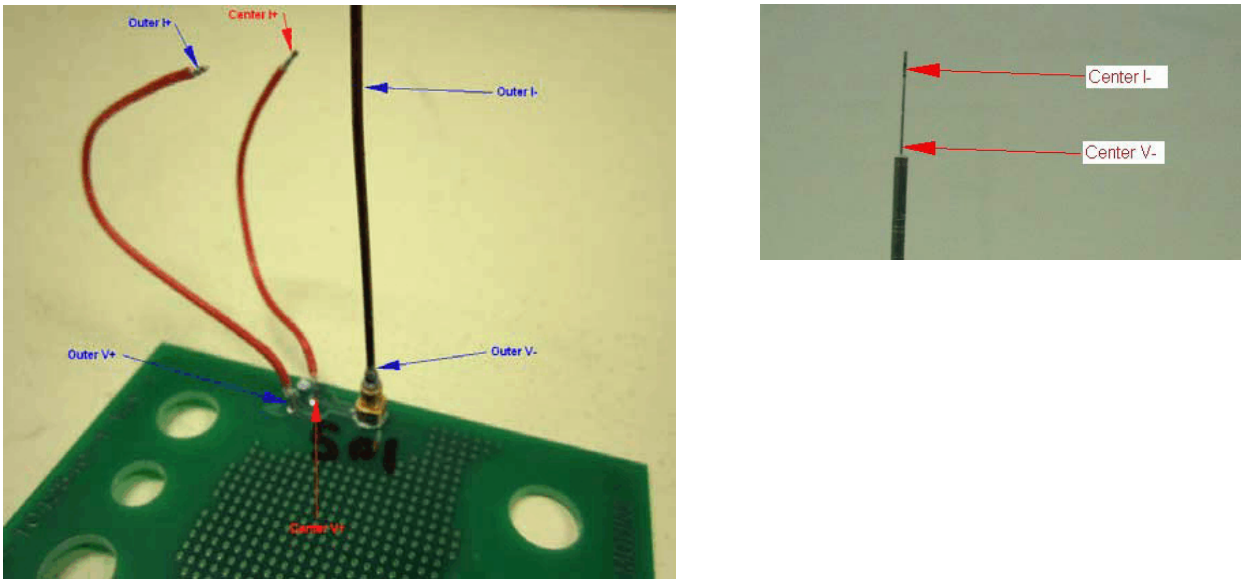

Figure 4
LLCR Measurement Points

3.3. VSWR

Specimens were assembled in accordance with IS 408-10180, 2 per 31 cm, 1.20 mm semi-rigid cable. The near end specimen was connected to the SMPM adapter at port 1 of the network analyzer. The specimen at the far end of the cable was terminated in a 50 ohm load from the cal kit using a Gore SMPM to 2.4 mm adapter. Specimens were tested using an HP-8510C Network Analyzer. A 1 port calibration was performed using the HP 85056A 2.4 mm Calibration kit. The network analyzer was set to collect 401 data points across a frequency range of 0.099751 to 40 GHz. After calibration, the Gore 2.4 mm to SMPM adapter was connected to port 1. The VSWR test was performed with the network analyzer in the S_{11} mode which transmits power from port 1 and receives the reflected signal back into port 1. A gate was applied using the following parameters: Start: -45.62 ps; Stop: 376.4 ps.

3.4. Insulation Resistance

Insulation resistance was measured between the center contact and outer shell of mated specimens. A test voltage of 500 volts DC was applied for 2 minutes before the resistance was measured.

3.5. Withstanding Voltage

A test potential of 325 volts AC was applied between the center contact and outer shell of mated specimens for 1 minute and then returned to zero.

3.6. Insertion Loss

Specimens were assembled in accordance with IS 408-10180. Two specimens were soldered on a length of 8 mm, 1.20 mm semi-rigid cable back to back with no semi-rigid cable visible between the 2 adapters. Insertion loss measurement was taken for both specimens and divided by 2. Specimens were tested using an the HP-8510C Network Analyzer. The 2.4 to 2.4 mm adapter was connected to port 1 of the network analyzer with the 2.4 mm cable attached to test port 2 for the calibration and measurement sequence. The SMPM (full detent) adapter was connected to port 1 of the network analyzer with the SMPM (smooth bore) adapter connected to the end of the cable at port 2 and a thru calibration was performed. After the calibration, the SMPM (smooth bore) adapter was removed from the end of the cable and replaced with a SMPM (full detent) adapter to connect to the specimen. The electrical length of these 2 adapters was be the same, thus adding no additional insertion loss to the final measurements. The network analyzer was set to collect 401 data points across a frequency range of 0.45 to 40.0 GHz using 2% smoothing. The insertion loss test was performed with the network analyzer in the S_{21} mode which transmits power from port 2 and receives the signal into port 1, in a “through” type of measurement.

3.7. Solderability, Dip Test

Specimens were subjected to steam aging for 8 hours prior to solderability testing. Within 72 hours, the specimens were immersed in a mildly-activated flux maintained at room temperature for 5 to 10 seconds and allowed to drain for 5 to 20 seconds. The specimens attached to a dipping machine were immersed at a maximum rate of 1 inch per second into a soldering bath filled with melted 60% tin and 40% lead, controlled at 245 ± 5 °C, until the surface to be evaluated was coated. Specimens were held in the solder bath for 4 to 5 seconds and then removed at a maximum rate of 1 inch per second. Following the solder dip, specimens were subjected to a 5 minute cleaning in isopropyl alcohol and visually examined under 10X magnification.

3.8. Sinusoidal Vibration

Mated specimens were subjected to sinusoidal vibration, having a simple harmonic motion with an amplitude of 1.5 mm peak-to-peak, or 15 G peak (Figure 5). The vibration frequency was varied uniformly between the limits of 10 and 2000 Hz and returned to 10 Hz in 20 minutes. This cycle was performed for 4 hours in each of 3 mutually perpendicular planes. Specimens were monitored for discontinuities of 1 microsecond or greater using a current of 100 milliamperes DC. Specimens were also preconditioned with 10 durability cycles.

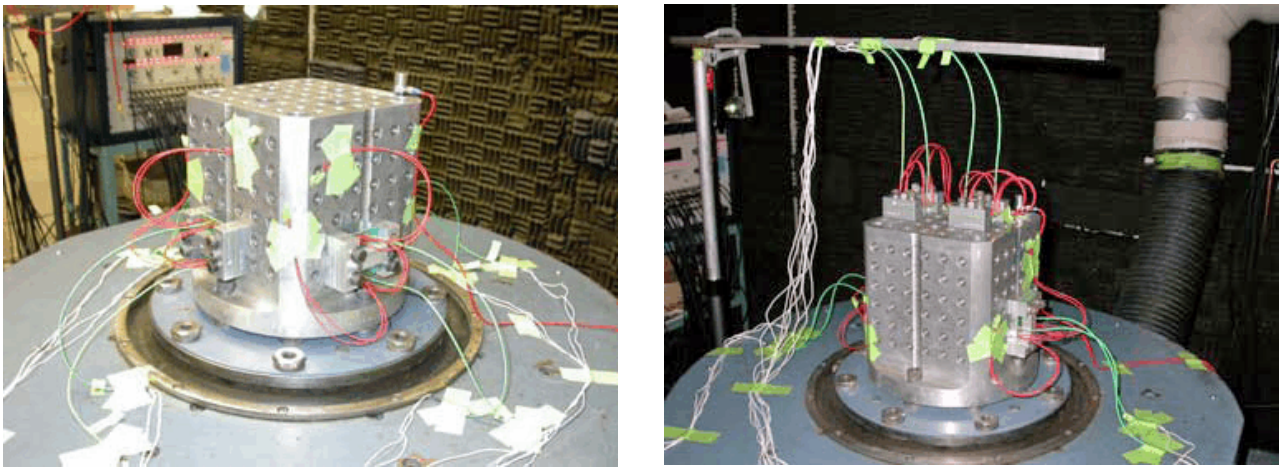

Figure 5
Vibration and Mechanical Shock Mounting Fixture

3.9. Mechanical Shock

Mated specimens were subjected to a mechanical shock test having a sawtooth waveform of 100 gravity units (g peak) and a duration of 6 milliseconds (Figure 5). 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.

3.10. Durability

Full detent specimens were mated and unmated 100 times, and smooth bore specimens 500 times at a maximum rate of 12 cycles per minute.

3.11. 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 5 mm per minute.

3.12. 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 5 mm per minute.

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 125°C with 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 (Figure 6).

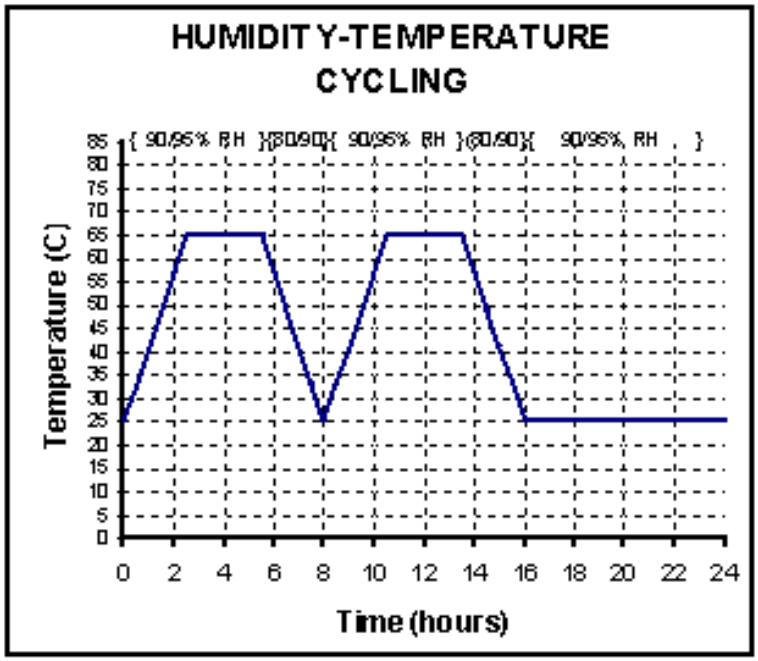

Figure 6
Typical Humidity/Temperature Cycling Profile

3.15. Temperature Life

Mated specimens were exposed to a temperature of 125°C for 250 hours. Specimens were preconditioned with 10 durability cycles.

3.16. Corrosion

Unmated specimens were exposed to 5% concentration salt-laden atmosphere for 48 hours. Specimens were preconditioned with 10 durability cycles.

3.17. Final Examination of Product

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