0.64 mm Generation Y Terminal

1. INTRODUCTION

1.1. Purpose

Testing was performed on the Tyco Electronics 0.64 mm Generation Y Terminal to determine its conformance to the requirements of Product Specification 108-2296 Revision A.

1.2. Scope

This report covers the electrical, mechanical, and environmental performance of the 0.64 mm Generation Y Terminal. Testing was performed at the Global Automotive Division Product Reliability Center. The test file numbers for this testing are 20060256ACL, 20060266ACL, 20060267ACL, 20060268ACL, 20060269ACL, 20070030ACS and 20070049ACL. This documentation is on file at and available from the Global Automotive Division Product Reliability Center.

1.3. Conclusion

The 0.64 mm Generation Y Terminal listed in paragraph 1.5., conformed to the electrical, mechanical, and environmental performance requirements of Product Specification 108-2296 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:

Part Number	Description
1-776695-0	0.64 mm USCAR contact
828922-1	Cavity plug, 2.5 mm system
1456574-1	20 to 22 AWG unsealed female contact
1456819-3	2X8 unsealed vertical header assembly
1456841-1	20 to 22 AWG sealed female contact
1456841-2	18 AWG sealed female contact
1456841-3	20 to 22 AWG sealed female contact
1456841-4	18 AWG sealed female contact
1456867-3	2X8 unsealed plug assembly
1732175-1	2 x 5 sealed connector assembly

Figure 1

1.5. Environmental Conditions

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

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

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1.6. Qualification Test Sequence

Test or Examination	Test Group (a)										
	1(b)	2(b)	3(b)	4(b)	5(c)	6(c)	7(c)	8(c)	9(b)	10(b)	11
	Test Sequence (d)										
Visual inspection	1,4	1,3	1,3	1,3	1,9	1,7	1,4				
Connector/terminal cycling					2	2	2				
Terminal-to-terminal engaging force	2										
Terminal-to-terminal disengaging force	3										
Terminal bend resistance		2									
Terminal crush resistance			2								
Robustness to test probe				2							
Dry circuit resistance					3,7	3,5					
Voltage drop					4,8	6					
Maximum current rating					5						
1008 hour current cycling					6						
Thermal shock						4					
Stand alone pressure/vacuum							3				
Field correlated life test								1			
Appearance									1	1	1,3
CCH, CCW, ICH and ICW									2		
Cross-section									3		
Conductor crimp pull-out force										2	
Accelerated environmental test sequence (ENV)											2

NOTE

(a) See paragraph 1.4.
(b) Tests on terminals only.
(c) Tests on terminals in connectors.
(d) Numbers indicate sequence in which tests are performed.

Figure 2

2. SUMMARY OF TESTING

2.1. Visual Inspection

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. Connector/terminal Cycling

No physical damage occurred as a result of manually mating and unmating the specimens 10 times.

2.3. Terminal-to-Terminal Engaging/disengaging Force

All terminal engaging force measurements were less than 3.7 N. All terminal disengaging force measurements were greater than 1.0 N.

2.4. Terminal Bend Resistance

No physical damage occurred as a result of subjecting the terminals to a 4 N load in 3 directions, initial, rotated 90 degrees, and rotated 180 degrees.

2.5. Terminal Crush Resistance

No physical damage occurred as a result of subjecting the top and side of the terminal box to a 70 N load for 2 minutes.

2.6. Robustness to Test Probe

No physical damage occurred as a result of subjecting the front face of the terminal beam to a 30 N load.

2.7. Dry Circuit Resistance

All low level contact resistance measurements, taken at 100 milliamperes maximum and 20 millivolts maximum open circuit voltage were less than 20 milliohms.

2.8. Voltage Drop

All voltage drop measurements were less than 20 milliohms.

2.9. Maximum Current Rating

All specimens had a temperature rise of less than 30˚C above ambient when tested using currents of 8.40 amperes for 22 AWG, 9.50 amperes for 20 AWG and 10.50 amperes for 18 AWG.

2.10. 1008 Hour Current Cycling

All specimens had a temperature rise of less than 55˚C above ambient when tested using the specified current. All voltage drop measurements were less than 20 milliohms.

2.11. Thermal Shock

No evidence of physical damage was visible as a result of exposure to thermal shock. All low level contact resistance and voltage drop measurements were less than 20 milliohms.

2.12. Stand Alone Pressure/vacuum

No evidence of physical damage was visible as a result of exposure to stand alone pressure/vacuum. Pressure/vacuum exceeded 7 psi initially and 4 psi after heat soak. Insulation resistance exceeded 20 milliohms at 500 volts DC.

2.13. Field Correlated Life Test

No evidence of physical damage was visible as a result of exposure to the field correlated life test. All low level contact resistance measurements were less than 20 milliohms before and after testing.

2.14. Appearance

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

2.15. CCH, CCW, ICH and ICW

All measurements were within specifications.

2.16. Cross-section

No evidence of physical damage was visible in cross-sectioned specimens.

2.17. Conductor Crimp Pull-Out Force

All pull-out force measurements were greater than 50 N for 22 AWG, 75 N for 20 AWG and 90 N for 18 AWG.

2.18. Accelerated Environmental Test Sequence (ENV)

No evidence of physical damage was visible as a result of exposure to accelerated environmental test sequence. All low level contact resistance measurements were less than 20 milliohms. Change in resistance was less than 0.84 milliohm for 22 AWG wire; less than 0.66 milliohm for 20 AWG wire; and less than 0.56 milliohm for 18 AWG wire.

3. TEST METHODS

3.1. Visual Inspection

The requestor submitted the crimp inspection forms certifying that all measured crimps met the required print dimensions, and a Certificate of Conformance with the test package certifying that the specimens were produced, inspected and accepted as conforming to product drawing requirements, and manufactured using the same core manufacturing processes and technologies as the production parts. A visual examination of the housing assembly was performed under fluorescence lighting with the naked eye examining for cracks, delaminations, warpage, deformation, discoloration, latching and mating functions. A visual examination of the crimped terminals was performed under fluorescence lighting with the naked eye examining for the correct wire size, wire brush, burrs on the terminal, insulation in wire crimp, insulation tears, and bulging of insulation or penetration of the insulation crimp.

3.2. Connector/terminal Cycling

Specimens were manually mated and unmated 10 times.

3.3. Terminal-to-Terminal Engaging/Disengaging Force

Receptacles held in a chuck attached to the crosshead of an Instron machine were inserted into blades held in a floating vise attached to the base of the Instron machine. After the receptacle was fully inserted it was then disengaged by the crosshead changing from compression to tensile mode which returned the receptacle back to its original starting position. Each specimen was engaged and disengaged 10 times with readings being taken on the 1st and 10th cycle. Test speed was 50 mm per minute in the cycling mode.

3.4. Terminal Bend Resistance

A push pin held in a chuck attached to the crosshead of an Instron machine was used to bend the terminals in the 3 required directions, initial, terminals rotated 90 degrees, and terminals rotated 180 degrees. Terminals were held by a pin vice which in turn was held by an L-vice attached to a flat table on the base of the Instron machine. Test speed was 50 mm per minute in the compression mode.

3.5. Terminal Crush Resistance

A push pin held in a chuck attached to the crosshead of an Instron machine was used to apply a static force of 70 N, a distance of 3 mm from the end of the connector cavity, in any plane perpendicular to the line of engagement. Plugs were held by an L-vice attached to a floating table on the base of the Instron machine. Test speed was 50 mm per minute in the compression mode.

3.6. Robustness to Test Probe

Fully loaded specimens were held in an L-vice attached to a floating table on the base of an Instron machine. A push pin held by a chuck mounted to the crosshead of the Instron machine was used to apply the 30 N force to the front face of the terminal beam. Test speed was 50 mm per minute in the compression mode.

3.7. Dry Circuit Resistance

Specimens were subjected to a 20 millivolt maximum open circuit voltage at 100 milliamperes. Measurements were taken using a 4 wire method. Current was forward and reversed bias for each reading. A voltage and current probe were attached to each end of a bus wire used to connect the specimens. The contacts at the other end of each specimen were hand probed individually. The total resistance included wire, crimp interface, and terminal bulk material. The resistance of a soldered crimp deduct specimen was subtracted from the total resistance leaving only the crimp interface resistance.

3.8. Voltage Drop

Specimens were read for millivolt drop at a current of 1.0 ampere. Measurements were taken after specimens had stabilized at room ambient conditions for 30 minutes, prior to recording resistance values using a four wire measurement technique. Raw data recorded consisted of 3 inches of terminated wire on the 0.64 and 3 inches of soldered wire length on the male blade, the receptacle crimp resistance, the bulk resistance of the receptacle, the mating resistance of the receptacle/blade, and the bulk resistance of the blade. The bulk wire resistance of six (6) inches per each wire size was subtracted from the raw data. Thus the data summary data reported in this report captures the receptacle's crimp resistance, the blade's resistance, and the mating resistance of the receptacle/ blade.

3.9. Maximum Current Rating

Terminated and crimped specimens were arranged in a draft free enclosure in a horizontal attitude a minimum of 2 inches above the bottom of the enclosure, a minimum of 6 inches below the top, and at least 8 inches from the sides. An ambient probe was place 6 inches from the specimens on the same horizontal attitude. Specimens were energized at a current level and allowed to maintain thermal stability. Thermal stabilization was achieved when temperature rise of 3 consecutive readings taken at 5 minute intervals differed at most by 2˚C [3.6˚ F]. Once the specimen was stable at that current level, the current was increased to the next level. This was repeated until a 55˚C temperature rise was reached and the maximum current level noted.

3.10. 1008 Hour Current Cycling

Terminated and crimped specimens were energized by the determined maximum current value less 10%. Current was applied for 45 minutes and then removed for 15 minutes. This was considered to be 1 cycle and was repeated for a total of 1008. Temperature rise readings were taken at 24 hour intervals.

3.11. Thermal Shock

Specimens were subjected to 72 cycles of thermal shock with each cycle consisting of 30 minute dwells at -40 and 125˚C. The transition between temperatures was less than 5 minutes.

3.12. Stand Alone Pressure/vacuum

Mated specimens were immersed in a 5% saltwater solution at 25˚C with ultraviolet dye added to assist in leak detection. Pressure was slowly increased to the proper value (7 psi initial and 4 psi final) and held for 15 seconds, while noting any air bubbles. The proper vacuum (14.2 in/hg initial and 8.1 in/hg final) was applied for 15 seconds.

3.13. Field Correlated Life Test

Specimens were subjected to the following sequence twice.

1. A visual examination performed by the naked eye for evidence of cracks, deformities, etc. that would impair function.

2. Dry circuit resistance. Specimens were attached to a non-conductive wood surface. Data was collected using the PCB card edge adaptor and Dx20, Data Acquisition System utilizing a 4 wire probe method and forward/reverse current biasing. A maximum of 20 millivolts mV at 100 milliamperes full scale was applied for a dry circuit condition. The overall resistance consisted of 6 inches of wire, crimp, female bulk terminal, terminal interface and male header pin. The wire and header pin bulk were subtracted out after testing was completed.

3. Heat age. Specimens were subjected to a temperature of 125˚C for 72 hours.

4. Random vibration. Specimens were subjected to the following vibration profile for 4 hours per plane.

Hz	(g^2/Hz)
10	0.070
20	0.070
40	0.020
350	0.020
550	0.005
700	0.001
750	0.0001
2000	0.0001
RMS g level 3.2 g's	

5. Thermal shock. Specimens were subjected to 72 cycles of thermal shock with each cycle consisting of 30 minute dwells at -40 and 125˚C. The transition between temperatures was less than 5 minutes.

6. Temperature/humidity cycling. Specimens were subjected to the following 24 hour temperature/humidity cycle.

   16 hours at 95 to 98% relative humidity at 65˚C
   2 hours at -40˚C
   2 hours at 85˚C
   4 hours at 25˚C

3.14. Appearance

A visual examination of the housing assembly was performed under fluorescence lighting with the naked eye examining for cracks, delaminations, warpage, deformation, discoloration, latching and mating functions. A visual examination of the crimped terminals was performed under fluorescence lighting with the naked eye examining for the correct wire size, wire brush, burrs on the terminal, insulation in wire crimp, insulation tears, and bulging of insulation or penetration of the insulation crimp.

3.15. CCH, CCW, ICH and ICW

Specimens were measured using calibrated instruments.

3.16. Cross-section

No defects were found.

3.17. Conductor Crimp Pull-Out Force

The force load was applied to each specimen using a tensile/compression device with the rate of travel at 12.7 mm per minute.

3.18. Accelerated Environmental Test Sequence (ENV)

Specimens were subjected to the following sequence.

1. Visual inspection per paragraph 3.1.
2. Dry circuit resistance per paragraph 3.7.
3. Thermal shock per paragraph 3.11.
4. Dry circuit resistance per paragraph 3.7.
5. Temperature/humidity cycling per paragraph 3.13.6.
6. Visual inspection per paragraph 3.1.
7. Dry circuit resistance per paragraph 3.7.