QUALIFICATION TEST REPORT

ON

Serial ATA (SATA) Connector
Plug (15+7+4P) & Receptacle (Backplane)

501-51064 REV. A

Design Objectives:	**108-51052-1 Rev A**
Test Request No.:	**T06 - 023**
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Classification:	**Unrestricted**
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1. Introduction

1.1 Purpose

Testing was performed on Serial ATA (SATA) plug and receptacle connectors, so as to determine its conformance to the requirements of Design Objectives 108-51052-1 Rev A.

1.2 Scope

This report covers the electrical, mechanical and environmental performance of, Serial ATA (SATA) plug & receptacle connector manufactured by Tyco Electronics Manufacturing (S) Pte Ltd.

1.3 Conclusion

The Serial ATA (SATA) plug & receptacle connector meets all the electrical, mechanical and environmental requirements of Design Objectives 108-51052-1 Rev A.

1.4 Product Description

The Serial ATA (SATA) plug connector, housing material is made of high temperature thermoplastics, glass filled, UL94V-0. The contacts are made of Brass. Contacts finish were 0.76µm min. Au on mating area and 1.91µm min. Sn on solder area, over 1.27 ~ 2.54µm Ni on entire contact.

The Serial ATA (SATA) receptacle connector, housing material is made of high temperature thermoplastics, glass filled, UL94V-0. The contacts are made of phosphor bronze. Contacts finish were Au over nickel and Tin over nickel.

1.5 Test Samples

The test samples used for the qualification were randomly selected from production and the conditions of the parts used for each test were summarized in the table below:

Description	Part No.
Serial ATA (SATA) Connector, Plug (15+7+4P)	84998-2
Serial ATA (SATA) Connector, Receptacle (Backplane)	1735284-1, -2, -3 & -4

1.6 Qualification Test Sequence

Test	Test Group							
	1	2	3	4	5	6	7	8
	Test Sequence (a)							
Examination of product	1,5	1,9	1,8	1,8	1,5	1,5	1,4	1,3
Low level Contact resistance	2,4	3,7	2,4,6		2,4	2,4	3	
Insulation Resistance				2,6				
Dielectric withstanding voltage				3,7				
Current rating			7					
Solder ability								2
Soldering Heat resistivity							2	
Mating force		2						
Un-mating force		8						
Durability	3	4(b)						
Vibration (Random)		5						
Physical shock		6						
Reseating (manually plug/unplug 3 time)			5					
Humidity				5				
Temperature life			3					
Thermal shock				4				
Salt spray					3			
Industrial Gas (SO2)						3		

Note:

(a) Numbers indicated sequence in which the tests are performed.

(b) Pre-conditioning, 20 cycles for the 50 durability cycle requirement, 50 cycles for the 500 durability cycle requirement. The mating and un-mating cycle is at the maximum rate of 200 cycles per hour.

2. Summary of Testing

2.1 Examination of Product – All Groups

All samples were visually inspected under the scope and found to be free from any physical damages such as cracks, change of colour, corrosion etc.

2.2 Termination Resistance - Test Group 1, 2, 3, 5, 6 & 7

All samples meet the requirement of 30 mΩ (maximum) initial termination resistance. All samples meet the requirement of ΔR 15 mΩ (maximum) after test / environmental conditions.

All Termination Resistance Measurement in mΩ

Test Group (TG)	**1 (Durability)**	
Test Condition	**Initial**	**After**
Sample size	5	5
No. of measurement	50	50
Overall average	15.42	15.35
Overall minimum	14.29	14.37
Overall maximum	17.88	17.31
ΔR (max)	-	0.62

Test Group (TG)	**2 (Vibration & Physical Shock)**	
Test Condition	**Initial**	**After Physical Shock**
Sample size	5	5
No. of measurement	50	50
Overall average	15.45	15.51
Overall minimum	12.86	14.49
Overall maximum	17.54	16.93
ΔR (max)	-	2.47

Test Group (TG)	3 (Temperature Life)		
Test Condition	**Initial**	**After Temperature Life**	**After Reseating**
Sample size	5	5	5
No. of measurement	50	50	50
Overall average	15.32	15.32	15.26
Overall minimum	13.69	13.64	13.61
Overall maximum	17.18	17.51	17.39
ΔR (max)	-	0.60	1.06

Test Group (TG)	5 (Salt Spray)	
Test Condition	**Initial**	**After Salt Spray**
Sample size	5	5
No. of measurement	50	50
Overall average	14.97	17.55
Overall minimum	13.85	15.16
Overall maximum	16.77	27.91
ΔR (max)	-	12.80

Test Group (TG)	6 (Industrial Gas SO2)	
Test Condition	**Initial**	**After SO2**
Sample size	5	5
No. of measurement	50	50
Overall average	15.45	16.36
Overall minimum	12.86	14.26
Overall maximum	17.54	21.47
ΔR (max)	-	5.56

Test Group (TG)	7 (Solder Heat Resistivity)	
Test Condition	**Initial**	**After Solder heat resistivity**
Sample size	5	5
No. of measurement	50	50
Overall average	15.38	15.76
Overall minimum	14.14	14.38
Overall maximum	16.51	17.91
ΔR (max)	-	2.49

2.3 Mating & Un-mating – Test Group 2

The mating force meets the requirement of 2.0kgf (Max).

The un-mating force meets the requirement of 0.40kgf (Min) after 500 cycle of durability.

All force measurements in Kgf.

Test Group (TG)	2	
Test Condition	**1st Cycle Mating**	**Final Cycle Un-mating**
Sample size	5	5
Number of measurement	5	5
Average	0.833	0.754
Minimum	0.794	0.634
Maximum	0.878	0.889

2.4 Insulation Resistance – Test Group 4

All insulation resistance readings between adjacent contacts were greater than 1000MΩ (initial & final).

Test Group (TG)	**4 (Thermal Shock & Humidity)**	
Sample Condition	**Mated**	
Test Condition	**Initial**	**After Humidity**
Sample size	5	5
Number of measurement	50	50
Average	6.248E+13	1.323E+14
Minimum	2.192E+13	1.470E+13
Maximum	9.561E+13	5.154E+14

Test Group (TG)	**4 (Thermal Shock & Humidity)**	
Sample ID	**SATA Backplane Receptacle**	
Sample Condition	**Un-mated**	
Test Condition	**Initial**	**After Humidity**
Sample size	5	5
Number of measurement	50	50
Average	5.188E+13	1.047E+14
Minimum	3.359E+13	1.345E+13
Maximum	9.998E+13	4.786E+14

Test Group (TG)	**4 (Thermal Shock & Humidity)**	
Sample ID	**SATA Plug**	
Sample Condition	**Un-mated**	
Test Condition	**Initial**	**After Humidity**
Sample size	5	5
Number of measurement	50	50
Average	6.995E+13	6.739E+13
Minimum	2.575E+13	1.663E+13
Maximum	9.999E+13	2.008E+14

2.5 Dielectric Withstanding Voltage – Test Group 4

No dielectric breakdown or flashover or leakage of current greater than 5mA occurred when a test voltage of 500 VAC was applied between adjacent contacts of mated and unmated connector assemblies.

2.6 Vibration & Physical Shock - Test Group 2

No Sample failed the electrical discontinuity.

2.7 Solder Ability – Test Group 8

All contact leads showed more than 95% solder coverage with no voids and pins hole observed.

2.8 Soldering Heat Resistivity– Test Group 7

No physical damage was observed after reflow.

2.9 Durability – Test Group 1 & 2

No physical damage was observed after durability.

2.10 Industrial Gas SO2 – Test Group 6

No physical damage was observed after mixed flowing gas.

2.11 Salt Spray – Test Group 5

No physical damage was observed after salt spray.

2.12 Current Rating – Test Group 3

Temperature rise meets the requirement of less than 30°C

Sample size	5
No. of measurement	20
Overall average	11.52
Overall minimum	10.36
Overall maximum	12.74

3 Test Methods

3.1 Examination of Products

Samples were physically examined under the microscope before and after each test conditions for any physical damage or abnormalities on housing and contacts.

3.2 Insulation Resistance

Insulation resistance was measured between adjacent contacts of connector, using a test voltage of 500 VDC. Record reading after 1 minute. (EIA-364-21)

3.3 Dielectric Withstanding Voltage

A test potential of 500 Vdc was applied between adjacent contacts of connector. This potential was held for 1 minute with a current leakage not greater than 5mA. (EIA-364-20, Method B)

3.4 Contact/Termination Resistance

Measurements shall be made on mated connector, at a voltage of 20mv max open circuit at a current of 100mA. (EIA-364-23)

3.5 Durability

Subject connector to 500 cycles of repeated mate and un-mate, with an operation speed of 200 cycles per hour. (EIA-364-09)

3.6 Humidity (Steady)

Subject mated connectors to relative humidity of 90~95%RH, temperature of 40±2°C for 96 hours. (EIA-364-31, Method II, Condition A)

3.7 Thermal Shock

Subjected mated connectors to temperature -55ºC to +85ºC for 10 cycles, each temperature dwell time 30 minutes. (EIA-364-32, Condition I)

3.8 Vibration (Random)

Subject mated connectors for 30 minutes in each of 3 mutually perpendicular planes. Frequency of 50 ~ 2000Hz with 5.35 g's RMS. (EIA-364-28, Condition V, Letter A)

3.9 Physical Shock

Subject mated connector to 50Gs half sine pulses of 11ms duration along the 3 mutually perpendicular planes. (EIA-364-27, Condition H)

3.10 Temperature Life

Subject mated connector to 85±2°C for 500 hours. (EIA-364-17, Method A, Condition III)

3.11 Mating Force

Mate connector assembly at a rate of 12.5mm per minute.

3.12 Un-mating Force

Un-mate connector assembly at a rate 12.5mm per minute.

3.13 Solder Ability

Immerse solderable portion of contact in molten solder at 245°C for 5 seconds.

3.14 Resistance to Soldering Heat

Test connector per EIA-364-56B, procedure 6, level 4.

3.15 Current Rating

Wire contact P1, P2, P8 & P9 in parallel for power. Wire contact P4, P5, P6, P10 & P12 in parallel for return.

Apply 6A total DC current to parallel contacts P1, P2, P8 & P9 and return from parallel contact P4, P5, P10 & P12.

3.16 Industrial Gas SO2

Subject mated samples to 25ppm of SO2 gas, 96%RH, 25°C for 24 hours per AMP 109-5107.

3.17 Salt spray

Subject mated samples to 5% salt concentration for 24 hours per AMP 109-5101.