



Qualification

**501-51061**

Test Report

PRE: Christine Goh

18<sup>th</sup> Oct 11

Rev.H

APP: Justin Goh

DCR No.

D20111018002143\_840997

---

Title: SERIAL ATA (SATA) CONNECTOR, PLUG & RECEPTACLE

**Design Objectives:** 108-51052 Rev G

**Test Request No.:** T06-024, T09-014, T09-066, T11-038

**Test Report No.:** Q07-014, Q09-041, Q11-031, Q11-060

**Date:** 18<sup>th</sup> Oct 2011

**Classification:** Unrestricted

**Prepared by:** Christine Goh

This report remains the property of Tyco Electronics Manufacturing (S) Pte Ltd and cannot be reproduced without the written consent of Tyco Electronics Manufacturing (S) Pte Ltd.

---

Table of Contents		Page
1.	Introduction	3
1.1	Purpose	3
1.2	Scope	3
1.3	Conclusion	3
1.4	Product Description	3
1.5	Test Samples	4
1.6	Qualification Test Sequence	5
2.	Summary of Testing	6
2.1	Examination of Product	6
2.2	Termination Resistance	6
2.3	Mating & Un-mating	8
2.4	Insulation Resistance	8
2.5	Dielectric Withstanding Voltage	9
2.6	Vibration & Physical shock	9
2.7	Solder Ability	9
2.8	Resistance to Soldering Heat	9
2.9	Durability	10
2.10	Mixed Flowing Gas	10
2.11	Current Rating	10
3.	Test Methods	11
3.1	Examination of Product	11
3.2	Insulation Resistance	11
3.3	Dielectric Withstanding Voltage	11
3.4	Contact / Termination Resistance	11
3.5	Durability	11
3.6	Humidity (Steady)	11
3.7	Thermal Shock	11
3.8	Vibration (Random)	11
3.9	Physical Shock	11
3.10	Temperature Life	12
3.11	Mating Force	12
3.12	Un-mating Force	12
3.13	Solder Ability	12
3.14	Resistance to Soldering Heat	12
3.15	Current Rating	12
3.16	Mixed Flowing Gas	12

---

## Qualification Test Report

### 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 Rev G.

#### 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 Rev G.

#### 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 Gold on mating area and Tin on solder area, over Nickel 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 Gold on mating area and Tin on solder area, over Nickel on entire contact.

## 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.
<b>SATA Plug</b>	Serial ATA (SATA) Connector, Plug (15+7+4P)	84998-2, 84998-3, 84955-1, 1735802-1, 1735802-2, 1735855-1, 1735855-2, 1735912-1
	SATA Plug, 15+7P, Straddle Mount	1735750-1, 1735750-2
	SATA Plug, 15+7P, SMT	1735783-3
	SATA Plug, 15+7+4P, Straddle Mount	1735645-1
<b>SATA Receptacle</b>	Serial ATA (SATA) Connector, Receptacle (Backplane)	1735284-1, 1735284-2 & 1735284-3
	SATA Device Receptacle	1735157-2
	A-Free SATA Receptacle	1827334-4

## 1.6 Qualification Test Sequence

Test Item	Test Group						
	1	2	3	4	5	6	7
	Test Sequence (a)						
Examination of Product	1,5	1,9	1,8	1,8	1,7	1,5	1,3
Low Level Contact Resistance	2,4	3,7	2,4, 6		4,6	2,4	
Insulation Resistance				2,6			
Dielectric Withstanding Voltage				3,7			
Current Rating			7				
Solder Ability							2
Soldering Heat Resistivity						3	
Mating Force		2					
Un-mating Force		8					
Durability	3	4(b)			2(b)		
Vibration(Random)		5					
Physical Shock		6					
Reseating (Manually plug/unplug 3 time)			5		5		
Humidity				5			
Temperature Life			3				
Thermal Shock				4			
Mixed Flowing Gas					3		

**NOTE:**

- (a) Numbers indicate sequence in which the tests are performed.
- (b) Preconditioning, 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

For initial termination resistance, all samples meet the requirement of 30 mΩ (maximum) for Standard Plug and Receptacle, and 60 mΩ (maximum) for Standard Plug and A-Free Receptacle. For after test / environmental conditions, all samples meet the requirement of ΔR 15 mΩ (maximum) change from initial.

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
$\Delta R$ (max)	-	0.60	1.06

Test Group (TG)	5 (Mixed Flowing Gas - MFG)			
Sample Condition	Group A		Group B	
	Mated for 14 days		Unmated for 7 days, mated for additional 7 days	
Test Condition	After MFG	After Reseating	After MFG	After Reseating
Sample size	5	5	5	5
No. of measurement	50	50	50	50
Overall average	15.59	15.47	16.95	16.48
Overall minimum	14.25	14.28	14.61	14.26
Overall maximum	17.57	17.67	26.81	28.82
$\Delta R$ (max)	-	1.19	-	2.01

Test Group (TG)	6 (Soldering Heat Resistivity)	
Test Condition	Initial	After Soldering Heat Resistivity
Sample size	5	5
No. of measurement	50	50
Overall average	15.58	15.76
Overall minimum	14.14	14.38
Overall maximum	16.51	17.91
$\Delta R$ (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 7

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

## 2.8 Soldering Heat Resistivity– Test Group 6

No physical damage was observed after reflow.

**2.9 Durability – Test Group 1, 2 & 5**

No physical damage was observed after durability.

**2.10 Mixed Flowing Gas – Test Group 5**

No physical damage was observed after mixed flowing gas.

(For Part number: 84998-2, 1735284-1, -2, 1735645-1)

**2.11 Current Rating – Test Group 3**

Temperature rise meets the requirement of less than 30°C

Sample size	5
No. of measurement	45
Overall average	7.10
Overall minimum	4.85
Overall maximum	10.58

---

### **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  $40\pm 2^{\circ}\text{C}$  for 96 hours. (EIA-364-31, Method II, Condition A)

#### **3.7 Thermal Shock**

Subjected mated connectors to temperature  $-55^{\circ}\text{C}$  to  $+85^{\circ}\text{C}$  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  $85\pm 2^{\circ}\text{C}$  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 solder able portion of contact in molten solder at  $245^{\circ}\text{C}$  for 5 seconds.

**3.14 Resistance to Soldering Heat**

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

**3.15 Current Rating**

With connector mounted on PCB, wire 3 adjacent contacts in parallel for supply and wire 3 adjacent contacts in parallel for return.

Apply 4.5A total DC current to supply contacts and returning through return contacts.

**3.16 Mixed Flowing Gas**

Expose half of samples un-mated for 7 days then mated for 7 additional days and expose other half of samples mated 14 days. (EIA-364-65, Class 2A)