Alignment Free SATA Receptacle & Plug Connector

Product Specification: **108-78274 Rev B**

Test Request No.: **T09 - 042**

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Classification: **Unrestricted**

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Qualification Test Report

1. Introduction

1.1 Purpose

Testing was performed on Alignment Free SATA connector, so as to determine its conformance to the requirements of Product Specification 108-78274 Rev B.

1.2 Scope

This report covers the electrical, mechanical and environmental performance of, Alignment Free SATA connector manufactured by Tyco Electronics Manufacturing (S) Pte Ltd.

1.3 Conclusion

The Alignment Free SATA connector meets all the electrical, mechanical and environmental requirements of Product Specification 108-78274 Rev B.

1.4 Product Description

The Alignment Free SATA connector, housing material is made of High Temperature Thermoplastics, UL94V-0. The contacts are made of Copper Alloy. Contacts finish were Gold on contact area, Tin Matte plating on solder area and Nickel under-plated all over.

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.	Rev.
Alignment Free SATA Receptacle	1735808-1	3
Alignment Free SATA Plug	1735750-1	A

1.6 Qualification Test Sequence

Test of examination	Test group											
	A	B	C	D	E	F	G	H	I	J	K	L
	Test sequence [a]											
Examination of connector	1,5	1,11	1,3	1,7	1,8	1,6	1,6	1,3	1,3	1,5	1,5	1,7
Termination resistance (Low level)	2,4	2,10		2,4,6		2,5	2,5			2,4	2,4	
Insulation resistance					2,6							2,5
Dielectric withstanding voltage					3,7							3,6
Current rating			2									
Insertion force		3,6										
Removal force		4,7										
Durability	3	5 (b)										
Physical shock		9										
Solderability and flux test								2				
Vibration		8										
Durability of alignment free mechanism											3	
Humidity					5	4						
Temperature life				3								
Reseating (manually unmate/mate three times)				5			4					
Industrial gas							3					
Thermal shock					4	3						
Resistance to soldering heat									2			
Moisture resistance										3		4

NOTE-
(a) Numbers indicate sequence in which tests are performed.
(b) Preconditioning, 50 cycles. The insertion and removal 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 A, B, D, F, G, J & K

All samples meet the requirement of 60 mΩ (maximum) initial Low level contact resistance. All samples meet the requirement of ΔR 25 mΩ (maximum) after test / environmental conditions.

Test Group (TG)	**A (Durability)**	
Test Condition	**Initial**	**After**
Sample size	5	5
No. of measurement	110	110
Overall average	31.78	31.74
Overall minimum	30.43	30.12
Overall maximum	33.65	33.27
Overall Stdev	0.74	0.74
ΔR (max)	-	1.81
Physical Examination	OK	OK

Test Group (TG)	B (Durability, Vibration & Physical Shock)	
Test Condition	**Initial**	**After**
Sample size	5	5
No. of measurement	110	110
Overall average	31.59	31.69
Overall minimum	30.30	29.98
Overall maximum	33.66	34.82
Overall Stdev	0.73	0.85
ΔR (max)	-	2.65
Physical Examination	OK	OK

Test Group (TG)	D (Temperature life)		
Test Condition	**Initial**	**After Temperature life**	**After Reseating**
Sample size	5	5	5
No. of measurement	110	110	110
Overall average	32.11	32.60	32.42
Overall minimum	30.85	30.26	30.74
Overall maximum	33.72	34.80	35.00
Overall Stdev	0.65	0.88	0.88
ΔR (max)	-	2.93	3.07
Physical Examination	OK	OK	OK

Test Group (TG)	F (Thermal Shock & Humidity)	
Test Condition	**Initial**	**After Humidity**
Sample size	5	5
No. of measurement	110	110
Overall average	31.92	32.37
Overall minimum	30.28	30.44
Overall maximum	33.85	38.92
Overall Stdev	0.75	1.18
ΔR (max)	-	5.07
Physical Examination	OK	OK

Test Group (TG)	G (Industrial Gas SO2)	
Test Condition	**Initial**	**After Reseating**
Sample size	5	5
No. of measurement	110	110
Overall average	32.19	32.68
Overall minimum	30.82	30.96
Overall maximum	34.67	35.89
Overall Stdev	0.77	0.91
ΔR (max)	-	4.02
Physical Examination	OK	OK

Test Group (TG)	J (Moisture Resistance)	
Test Condition	**Initial**	**After**
Sample size	5	5
No. of measurement	110	110
Overall average	31.97	32.56
Overall minimum	30.81	30.81
Overall maximum	34.68	35.86
Overall Stdev	0.66	1.06
ΔR (max)	-	3.90
Physical Examination	OK	OK

Test Group (TG)	K (Durability of alignment Free Mechanism)	
Test Condition	**Initial**	**After**
Sample size	5	5
No. of measurement	110	110
Overall average	32.10	32.33
Overall minimum	30.29	30.59
Overall maximum	33.68	34.58
Overall Stdev	0.73	0.88
ΔR (max)	-	2.29
Physical Examination	OK	OK

2.3 Dielectric Withstanding Voltage – Test Group E & L

No dielectric breakdown or flashover or leakage of current greater than 0.5mA occurred when a test voltage of 500 VAC was applied between adjacent contacts of mated and unmated connector before and after environmental tests.

2.4 Insulation Resistance – Test Group E

All insulation resistance readings between adjacent contacts were greater than 1000 MΩ.

Sample ID	**Plug**	**Receptacle**	**Plug & Receptacle**
Sample Condition	**Un-mated**	**Un-mated**	**Mated**
Test condition	**Initial**		
Sample size	5	5	5
No. of measurement	100	100	100
Overall average	2.65E+13	1.40E+14	8.48E+12
Overall minimum	2.33E+12	1.96E+12	1.59E+11
Overall maximum	1.50E+14	1.75E+15	1.46E+13
Physical Examination	OK	OK	OK

Sample ID	**Plug**	**Receptacle**	**Plug & Receptacle**
Sample Condition	**Un-mated**	**Un-mated**	**Mated**
Test condition	**After Thermal shock & Humidity**		
Sample size	5	5	5
No. of measurement	100	100	100
Overall average	3.07E+13	5.51E+13	4.27E+13
Overall minimum	4.79E+11	1.44E+12	1.26E+12
Overall maximum	3.25E+14	7.97E+14	4.09E+14
Physical Examination	OK	OK	OK

2.5 Insulation Resistance – Test Group L

All insulation resistance readings between adjacent contacts were greater than 1000 MΩ.

Sample ID	**Plug**	**Receptacle**	**Plug & Receptacle**
Sample Condition	**Un-mated**	**Un-mated**	**Mated**
Test condition	**Initial**		
Sample size	5	5	5
No. of measurement	100	100	100
Overall average	3.64E+13	8.13E+13	8.18E+13
Overall minimum	1.57E+12	1.26E+11	1.50E+11
Overall maximum	8.91E+14	6.70E+14	5.00E+14
Physical Examination	OK	OK	OK

Sample ID	**Plug**	**Receptacle**	**Plug & Receptacle**
Sample Condition	**Un-mated**	**Un-mated**	**Mated**
Test condition	**After Moisture Resistance**		
Sample size	5	5	5
No. of measurement	100	100	100
Overall average	5.55E+13	3.95E+12	4.07E+12
Overall minimum	6.35E+11	2.27E+11	2.29E+11
Overall maximum	1.04E+15	1.08E+13	7.28E+12
Physical Examination	OK	OK	OK

2.6 Insertion Force – Test Group B

The Insertion force meets the requirement of 2.0kgf (Max), after pre-conditioning of 50 cycles.

Test condition	Initial	After Durability
Sample size	5	5
No. of measurement	5	5
Overall average	0.645	0.651
Overall minimum	0.631	0.622
Overall maximum	0.655	0.669
Overall Stdev	0.009	0.019
Physical Examination	OK	OK

2.7 Removal Force – Test Group B

The Removal force meets the requirement of 0.2Kgf (Min), after pre-conditioning of 50 cycles.

Test condition	Initial	After Durability
Sample size	5	5
No. of measurement	5	5
Overall average	0.633	0.659
Overall minimum	0.604	0.616
Overall maximum	0.650	0.699
Overall Stdev	0.019	0.032
Physical Examination	OK	OK

2.8 Vibration (Random) & Physical Shock - Test Group B

No Sample failed the electrical discontinuity.

2.9 Contact Current Rating (Power Segment) – Test Group C

Temperature rise meets the requirement of less than 30°C.

Units in ºC

Sample size	5
No. of measurement	45
Overall average	14.13
Overall minimum	8.31
Overall maximum	16.94
Overall Stdev	2.73

2.10 Solder ability and Flux Test - Test Group H

All contact leads showed more than 95% solder coverage with no voids and pins hole observed. No Flux was observed at contact point.

2.11 Resistance to Soldering Heat – Test Group I

No physical damage was observed after reflow and manual soldering method.

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 Termination Resistance (Low Level)

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

3.3 Dielectric Withstanding Voltage

A test potential of 500 VAC was applied between adjacent contacts of mated & unmated connector. This potential was held for 1 minute with a current leakage not greater than 0.5mA. (EIA-364-20, Method B)

3.4 Insulation Resistance

Insulation resistance was measured between adjacent contacts of mated & unmated connector, using a test voltage of 500 VDC for 1 minute. (EIA-364-21)

3.5 Current Rating

With connector mounted on PCB, wire contact P1, P2, P8 & P9 in parallel for power. Wire ground pins P4, P5, P6, P10 & P12 in parallel for return. Apply 6A total DC current to the power pins in parallel, returning from the parallel ground pins P4, P5, P6, P10 & P12. Record temperature rise when thermal equilibrium is reached.

3.6 Solder Ability and Flux Test

Flow soldering of temperature 230±5ºC, time of 5±1 sec. (Flux: alpha 100)

3.7 Resistance to Soldering Heat

Manual Soldering

Temperature: 350±10ºC

Time: 3±1 sec

Soldering times: Twice

Reflow Soldering

Reflow times: once

Pre-heat: 150~170ºC (60~120sec)

Heat: 220ºCMin (60sec Max)

Heat Peak: 260ºC Max

3.8 Insertion Force

Measure the force necessary to mate the connector assemblies at a maximum rate of 12.5mm per minute. (EIA-364-13)

3.9 Removal Force

Measure the force necessary to un-mate the connector assemblies at a maximum rate of 12.5mm per minute. (EIA-364-13)

3.10 Durability

Test done at a rate of 200 cycles per hour. (500 Cycles)

(EIA-364-09)

3.11 Vibration (Random)

Subject mated connector assemblies to 5.35 g's RMS, 30 minutes in 3 perpendicular planes. Load 100mA. (EIA-364-28, Condition V, Letter A.)

3.12 Physical Shock

Subject mated connector to following conditions. 3 shocks shall be applied along 3 mutually perpendicular planes. (EIA-364-27, Condition H)

Test pulse: Half-Sine shock

Peak value: 30G

Duration: 11 milliseconds

Total: 18 shocks

3.13 Durability of Alignment Free mechanism

Vertical direction displacement ±0.5mm, 10000 cycles.

3.14 Humidity

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

3.15 Temperature Life

Subject mated connector assemblies to 85°C for 500 hours.

(EIA-364-17, Method A, Condition III)

3.16 Thermal Shock

Subjected mated connector assemblies to temperature -55ºC & +85ºC for 10 cycles.

(EIA-364-32, Condition I)

3.17 Industrial Gas SO2

Subject mated connectors to SO2 gas 10ppm, 25±2ºC, 90~95%RH for 24 hours.

3.18 Moisture Resistance

Subject mated connectors to moisture at 25~65ºC, 90~95%RH for 10 cycles.

(MIL-STD-202 Method 106)