# Title: CONNECTOR, SAS PLUG & Receptacle 15+7+7P

| | |
|---|---|
| Product Specification: | 108-51053 Rev G |
| Test Request No.: | T05 - 042<br>T06 – 090 (Test Group 6)<br>T10 - 026<br>T11 – 016 (Test Group 1, 6 & 7) |
| Date: | 24th Oct 2013 |
| Classification: | Unrestricted |
| Prepared by: | Stanley Huang |

| | TableofContents | 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 | 3 |
| 1.6 | Qualification Test Sequence | 4 |
| 2. | Summary of Testing | 5 |
| 2.1 | Examination of Product | 5 |
| 2.2 | Termination Resistance | 5 |
| 2.3 | Insulation Resistance | 7 |
| 2.4 | Dielectric Withstanding Voltage | 7 |
| 2.5 | Vibration & Physical Shock | 7 |
| 2.6 | Mate/Un-mate & Durability | 8 |
| 2.7 | Solder ability | 8 |
| 2.8 | Resistance to Soldering Heat | 8 |
| 2.9 | Temperature Rise | 8 |
| 2.10 | Visual Inspection | 8 |
| 3. | Test Methods | 9 |
| 3.1 | Examination of Product | 9 |
| 3.2 | Insulation Resistance | 9 |
| 3.3 | Dielectric Withstanding Voltage | 9 |
| 3.4 | Contact/Termination Resistance | 9 |
| 3.5 | Durability | 9 |
| 3.6 | Thermal Shock | 9 |
| 3.7 | Vibration (Random) | 9 |
| 3.8 | Physical Shock | 10 |
| 3.9 | Temperature Life | 10 |
| 3.10 | Mating Force | 10 |
| 3.11 | Un-mating Force | 10 |
| 3.12 | Solder ability | 10 |
| 3.13 | Resistance to Solder Heat | 10 |
| 3.14 | Temperature Rise | 10 |
| 3.15 | Mixed Flowing Gas | 10 |
| 3.16 | Reseating | 11 |
| 3.17 | Humidity | 11 |

Qualification Test Report

# 1. Introduction

## 1.1 Purpose

Testing was performed on connector, SAS Plug and Receptacle 15+7+7P, so as to determine its conformance to the requirements of Product Specification 108-51053 Rev F.

## 1.2 Scope

This report covers the electrical, mechanical and environmental performance of SAS Plug and Receptacle 15+7+7P connector manufactured by Tyco Electronics Manufacturing (S) Pte Ltd.

## 1.3 Conclusion

The SAS Plug and Receptacle 15+7+7P connector meets all the electrical, mechanical and environmental requirements of Design Objectives 108-51053 Rev F.

## 1.4 Product Description

The SAS Plug and Receptacle 15+7+7P connector's housing is made of high temperature thermoplastics, glass filled. The contacts are made of Copper Alloy. Contacts were Gold plated at contact area and Nickel under-plate.

## 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 Number |
|---|---|
| SAS Plug, 15+7+7P | 84958-x, 1735078-x, 1735183-x, 1735236-x, 1735099-x, 1735610-x, 1735902-x, 1735911-x, 2229630-x |
| SAS Receptacle, 15+7+7P | 1735104-x, 1735105-x, 1735368-x, 1735164-x, 1735234-x |

1.6 Qualification Test Sequence

| Test Item | Test Group | | | | | | |
|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 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 | | | |
| Temperature Rise | | | 7 | | | | |
| Solderability | | | | | | | 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:
(b) Preconditioning, 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 - TestGroup1,2,3,5& 6

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 Durability |
| Sample size | 5 | 5 |
| No. of measurement | 50 | 50 |
| Overall average | 15.77 | 16.23 |
| Overall minimum | 13.27 | 13.79 |
| Overall maximum | 17.58 | 19.42 |
| Overall Stdev | 0.94 | 1.23 |
| ΔR (Max) | - | 3.88 |

| Test Group (TG) | 2 (Vibration & Physical shock) | |
|---|---|---|
| Test condition | Initial | After Physical shock |
| Sample size | 5 | 5 |
| No. of measurement | 50 | 50 |
| Overall average | 15.76 | 15.73 |
| Overall minimum | 13.57 | 13.58 |
| Overall maximum | 17.70 | 17.78 |
| Overall Stdev | 1.00 | 0.98 |
| ΔR (Max) | - | 1.35 |

| 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 | 15.91 | 16.33 | 15.98 |
| Overall minimum | 13.62 | 14.40 | 13.27 |
| Overall maximum | 19.12 | 19.08 | 17.83 |
| Overall Stdev | 1.38 | 1.16 | 0.87 |
| ΔR (Max) | - | 3.85 | 3.98 |

| Test Group (TG) | 5 (Mixed Flowing Gas) - *7 day Un-mate, 7 days mated* | | |
|---|---|---|---|
| Test condition | initial | After MFG | After Reseating |
| Sample size | 5 | 5 | 5 |
| No. of measurement | 50 | 50 | 50 |
| Overall average | 16.34 | 16.83 | 16.16 |
| Overall minimum | 13.76 | 14.24 | 14.21 |
| Overall maximum | 19.47 | 22.30 | 19.03 |
| Overall Stdev | 1.62 | 1.89 | 1.13 |
| ΔR (Max) | - | 6.95 | 3.16 |

| Test Group (TG) | 5 (Mixed Flowing Gas) – *14 days mated* | | |
|---|---|---|---|
| Test condition | initial | After MFG | After Reseating |
| Sample size | 5 | 5 | 5 |
| No. of measurement | 50 | 50 | 50 |
| Overall average | 16.13 | 16.00 | 15.83 |
| Overall minimum | 14.00 | 14.09 | 14.11 |
| Overall maximum | 19.41 | 18.25 | 17.51 |
| Overall Stdev | 1.19 | 1.06 | 0.89 |
| ΔR (Max) | - | 2.34 | 2.16 |

| 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 | 16.19 | 15.41 |
| Overall minimum | 13.31 | 13.23 |
| Overall maximum | 18.63 | 17.97 |
| Overall Stdev | 1.53 | 1.08 |
| ΔR (Max) | - | 2.20 |

## 2.3 Insulation Resistance – Test Group 4

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

| Test Group (TG) | 4 (Thermal shock & Humidity) | |
|---|---|---|
| Test condition | Initial | After Humidity |
| Sample size | 5 | 5 |
| No. of measurement | 50 | 50 |
| Overall average | 3.94E+14 | 5.71E+13 |
| Overall minimum | 4.17E+13 | 1.11E+12 |
| Overall maximum | 9.09E+14 | 1.14E+14 |

## 2.4 Dielectric Withstanding Voltage – Test Group 4

No dielectric breakdown or flashover or leakage of current greater than 0.5mA occurred when a test voltage of 500 VDC was applied between adjacent contacts of connector.

## 2.5 Vibration & Physical Shock - Test Group 2

No Sample failed the electrical discontinuity

2.6 Mate/Un-mate & Durability Force – Test Group 2

The Mating force meets the requirement of 2.5kgf (Max), for initial & after 500 cycle of durability

The Un-mating force meets the requirement of 0.5kgf (Min), for initial & after 500 cycle of durability.

| Test condition | 1st Cycle | Final |
|---|---|---|
| | Mate | Un-mate |
| Sample size | 5 | 5 |
| No. of measurement | 5 | 5 |
| Overall average | 0.816 | 0.686 |
| Overall minimum | 0.723 | 0.536 |
| Overall maximum | 0.859 | 0.772 |
| Overall Stdev | 0.056 | 0.102 |

2.7 Solderability – Test Group 7

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

2.8 Resistance to Soldering Heat – Test Group 6

No physical damage was observed after resistance to soldering heat.

2.9 Temperature Rise – Test Group 3

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

| Test Group(TG) | 3 |
|---|---|
| Sample size | 5 |
| No of measurements | 45 |
| Average | 9.30 |
| Minimum | 3.60 |
| Maximum | 14.53 |

2.10 Visual Inspection – All Test Groups

No physical damage or loose contacts were observed before and after

Durability, Mechanical & Environmental test.

# 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. Reading was recorded after 1 minute.

As per 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 0.5mA.

As per 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.

As per EIA-364-23

## 3.5 Durability

Subject connector to 500 cycles of repeated mate and Un-mate. With an operation speed of 200 cycle per hour max.

As per EIA-364-09

## 3.6 Thermal Shock

Subjected mated connectors to temperature -55ºC to +85ºC for 10 cycles, each temperature dwell time 30 minutes.

As per EIA-364-32, Condition I

## 3.7 Vibration (Random)

Subject mated connectors for 1 hour in each of 3 mutually perpendicular planes. Frequency of 20 ~ 500Hz with 3.10 g's RMS.

As per EIA-364-28, Condition VII, Letter D.

### 3.8 Physical Shock

Subject mated connector to 50Gs half sine pulses of 11ms duration along the 3 mutually perpendicular planes.

As per EIA-364-27, Condition A

### 3.9 Temperature Life

Subject mated connector to 85°C for 500 hours.

As per EIA 364-17, Method A, Condition III

### 3.10 Mating Force

Mate connector assembly at a rate of 25mm per minute.

As per EIA-364-13

### 3.11 Un-mating Force

Un-mate connector assembly at a rate 25mm per minute.

As per EIA-364-13

### 3.12 Solderability

Immerse solderable portion of contact in molten solder at 245±2°C for 5 seconds.

Tyco 109-11-11

### 3.13 Resistance to Soldering Heat

Test connector EIA-364-56B, Procedure 6, Level #4.

### 3.14 Temperature Rise

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.

### 3.15 Mixed Flowing Gas

Expose ½ of the un-mated samples for 10 days and then mated for 4 additional days. The other ½ of the samples are exposed mated for full 14 days.

As per EIA-364-65, Class 2A.

### 3.16 Reseating

Subject connectors to 3 manual mate/un-mate cycles. No lubrication to be used.

### 3.17 Humidity

Subject mated connector to 96 hours at 40°C with 90~95%RH.

As per EIA-364-31, Method II, Condition A.