| | |
|---|---|
| **Reference Product Specifications:** | **108-5390 Rev F1** |
| **Reference Report:** | **Qualification Report 501-5099 Rev D1** |
| | **T04-018 / Q04-041 (Lead free)** |
| | **T07-071 / Q07-069 (Lead free)** |
| **Date:** | **31th Oct 2017** |
| **Classification:** | **Unrestricted** |







* Trademark
| Indicates change

LOC DY

| | *Table of Contents* | *Page* |
|---|---|---|

# Qualification Test Report

## 1. Introduction

### 1.1 Purpose

Testing was performed on FH 0.8mm Pitch Board-To-Board connector, so as to determine its conformance to the requirements of Product Specification 108-5390

### 1.2 Scope

This report covers the electrical, mechanical and environmental performance of, FH 0.8mm Pitch Board-To-Board connector manufactured by TE connectivity

### 1.3 Conclusion

The FH 0.8mm Pitch Board-To-Board connector meets all the electrical, mechanical and environmental requirements of Product Specification 108-5390

### 1.4 Product Description

The FH 0.8mm Pitch Board-To-Board connector, housing material is made of LCP. The contacts are made of Copper alloy for receptacle and Brass for plug. Contacts finish were 0.0002mm min thick Gold plated on contact area only over Nickel under-plate 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:

| Part Number | Description |
|---|---|
| 0-5177983-6 | AMP FH 0.8mm Pitch receptacle, Ht. 5mm |
| 5-517910-6 | AMP FH 0.8mm Pitch receptacle, Ht. 13mm |
| 177877-2 | AMP FH 0.8mm Pitch receptacle, 60P |
| 177983-3 | AMP FH 0.8mm Pitch receptacle, 80P |
| 2-5084968-1 | AMP FH 0.8mm Pitch receptacle, 40P |
| 2-5179230-6 | AMP FH 0.8mm Pitch plug, Ht. 6mm |
| 1735408-1 | AMP FH 0.8mm Pitch plug, 40P |
| 177880-2 | AMP FH 0.8mm Pitch plug, 60P |
| 917434-3 | AMP FH 0.8mm Pitch right angle plug, 80P |
| 7-5179180-1 | AMP FH 0.8mm Pitch receptacle, 40P |

## 1.6 Qualification Test Sequence

| Test items | Test Group | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 |
| | Test Sequence (a) | | | | | | | | | | |
| **Confirmation of product** | 1,9 | 1,9 | 1,5 | 1,5 | 1,5 | 1,5 | 1,5 | 1,5 | 1 | 1,3 | 1,3 |
| **Termination resistance (Low level)** | 2,6 | 2,8 | 2,4 | 2,4 | 2,4 | 2,4 | 2,4 | 2,4 | 2 | | |
| **Dielectric Strength** | 4,8 | | | | | | | | | | |
| **Insulation resistance** | 3,7 | | | | | | | | | | |
| **Vibration (Frequency)** | | | 3 | | | | | | | | |
| **Physical shock** | | | | 3 | | | | | | | |
| **Connector Mating force** | | 3,6 | | | | | | | | | |
| **Connector Un-mating force** | | 4,7 | | | | | | | | | |
| **Durability (Repeatedmate/un-mate)** | | 5 | | | | | | | | | |
| **Reflow soldering heat (SMT type)** | | | | | | | | | 3 | | |
| **Thermal shock** | | | | | 3 | | | | | | |
| **Humidity-Temperature cycling** | 5 | | | | | | | | | | |
| **Salt spray** | | | | | | 3 | | | | | |
| **Industrial Gas ($SO_2$)** | | | | | | | 3 | | | | |
| **Temperature life (Heat aging)** | | | | | | | | 3 | | | |
| **Solder ability** | | | | | | | | | | 2 | |
| **Reflow Soldering Heat (Lead free)** | | | | | | | | | | | 2 |

Notes: - (a) Discontinuities shall not take place in this test group, during test

## 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, 4, 5, 6, 7, 8 & 9

All samples meet the requirement of 30 mΩ (maximum) initial termination resistance. All samples meet the requirement of R 20 mΩ (maximum) final after test / environmental conditions.

**All Termination Resistance Measurement in mΩ**

| Test Group (TG) | 1 (Temperature-Humidity Cycling) | | |
|---|---|---|---|
| Sample ID | Leaded | | |
| Test condition | Initial | After | △R |
| No. of measurement | 300 | 300 | 300 |
| Overall average | 15.42 | 16.27 | 0.85 |
| Overall minimum | 14.16 | 14.75 | -0.39 |
| Overall maximum | 17.13 | 19.30 | 3.88 |
| Overall Stdev | 0.45 | 0.97 | 0.88 |
| Disposition | Pass | - | Pass |

| Test Group (TG) | 2 (Durability) | | |
|---|---|---|---|
| Sample ID | Leaded | | |
| Test condition | Initial | After | △R |
| No. of measurement | 300 | 300 | 300 |
| Overall average | 15.65 | 15.23 | -0.46 |
| Overall minimum | 14.16 | 13.96 | -3.17 |
| Overall maximum | 18.78 | 19.53 | 3.28 |
| Overall Stdev | 0.91 | 0.71 | 0.68 |
| Disposition | Pass | - | Pass |

| Test Group (TG) | 3 (Vibration) | | |
|---|---|---|---|
| Sample ID | Leaded | | |
| Test condition | Initial | After | △R |
| No. of measurement | 300 | 300 | 300 |
| Overall average | 15.89 | 16.15 | 0.26 |
| Overall minimum | 14.54 | 14.72 | -2.54 |
| Overall maximum | 18.64 | 20.32 | 3.55 |
| Overall Stdev | 0.74 | 0.94 | 1.22 |
| Disposition | Pass | - | Pass |

| Test Group (TG) | 3 (Vibration) | |
|---|---|---|
| Sample ID | Lead free | |
| Test condition | Initial | After |
| No. of measurement | 50 | 50 |
| Overall average | 16.51 | 16.34 |
| Overall minimum | 14.05 | 12.79 |
| Overall maximum | 19.61 | 18.84 |
| Overall Stdev | 1.33 | 1.45 |
| △R(Max) | -0.89 | |
| Disposition | - | Pass |

| Test Group (TG) | 4 (Physical shock) | | |
|---|---|---|---|
| Sample ID | Leaded | | |
| Test condition | Initial | After | △R |
| No. of measurement | 300 | 300 | 300 |
| Overall average | 15.72 | 15.69 | -0.03 |
| Overall minimum | 14.24 | 14.44 | -3.22 |
| Overall maximum | 18.56 | 18.31 | 2.61 |
| Overall Stdev | 0.84 | 0.68 | 1.00 |
| Disposition | Pass | - | Pass |

| Test Group (TG) | 4 (Physical shock) | |
|---|---|---|
| Sample ID | Lead free | |
| Test condition | Initial | After |
| No. of measurement | 50 | 50 |
| Overall average | 16.05 | 16.06 |
| Overall minimum | 14.02 | 13.25 |
| Overall maximum | 17.93 | 18.53 |
| Overall Stdev | 1.13 | 1.37 |
| △R(Max) | - | 1.38 |
| Disposition | Pass | Pass |

| Test Group (TG) | 5 (Thermal shock) | | |
|---|---|---|---|
| Sample ID | Leaded | | |
| Test condition | Initial | After | △R |
| No. of measurement | 300 | 300 | 300 |
| Overall average | 15.69 | 16.15 | 0.46 |
| Overall minimum | 14.44 | 14.72 | -1.33 |
| Overall maximum | 18.31 | 20.32 | 3.29 |
| Overall Stdev | 0.68 | 0.94 | 0.64 |
| Disposition | Pass | - | Pass |

| Test Group (TG) | 5 (Thermal shock) | |
|---|---|---|
| Sample ID | Lead free | |
| Test condition | Initial | After(△R) |
| No. of measurement | 320 | 320 |
| Overall average | 18.77 | 0.02 |
| Overall minimum | 16.58 | -2.07 |
| Overall maximum | 20.97 | 5.52 |
| Overall Stdev | 0.67 | 0.58 |
| Disposition | Pass | Pass |

| Test Group (TG) | 6 (Salt spray) | | |
|---|---|---|---|
| Sample ID | Leaded | | |
| Test condition | Initial | After | △R |
| No. of measurement | 300 | 300 | 300 |
| Overall average | 15.51 | 15.11 | -0.40 |
| Overall minimum | 14.47 | 14.09 | -1.85 |
| Overall maximum | 17.70 | 17.26 | 1.01 |
| Overall Stdev | 0.60 | 0.57 | 0.32 |
| Disposition | Pass | - | Pass |

| Test Group (TG) | 7 ($SO_2$ Gas) | | |
|---|---|---|---|
| Sample ID | Leaded | | |
| Test condition | Initial | After | △R |
| No. of measurement | 300 | 300 | 300 |
| Overall average | 15.67 | 16.64 | 0.98 |
| Overall minimum | 14.37 | 14.23 | -1.74 |
| Overall maximum | 17.89 | 19.89 | 3.99 |
| Overall Stdev | 0.69 | 1.29 | 1.10 |
| Disposition | Pass | - | Pass |

| Test Group (TG) | 8 (Temperature life – 96 hours) | | |
|---|---|---|---|
| Sample ID | Leaded | | |
| Test condition | Initial | After | △R |
| No. of measurement | 300 | 300 | 300 |
| Overall average | 15.25 | 16.17 | 0.93 |
| Overall minimum | 13.89 | 14.67 | -2.29 |
| Overall maximum | 17.88 | 17.94 | 3.62 |
| Overall Stdev | 0.51 | 0.79 | 0.82 |
| Disposition | Pass | - | Pass |

| Test Group (TG) | 8 (Temperature life – 250 hours) | |
|---|---|---|
| Sample ID | Leaded | |
| Test condition | Initial | △R |
| No. of measurement | 300 | 300 |
| Overall average | 16.01 | 0.76 |
| Overall minimum | 14.14 | -1.77 |
| Overall maximum | 18.15 | 3.57 |
| Overall Stdev | 0.83 | 0.75 |
| Disposition | - | Pass |

| Test Group (TG) | 8 (Temperature life – 500 hours) | |
|---|---|---|
| Sample ID | Leaded | |
| Test condition | Initial | △R |
| No. of measurement | 300 | 300 |
| Overall average | 16.20 | 0.94 |
| Overall minimum | 13.42 | -4.08 |
| Overall maximum | 20.45 | 5.15 |
| Overall Stdev | 1.25 | 1.09 |
| Disposition | - | Pass |

| Test Group (TG) | 8 (Temperature life – 96 hours) | |
|---|---|---|
| Sample ID | Lead free | |
| Test condition | Initial | After(△R) |
| No. of measurement | 320 | 320 |
| Overall average | 18.92 | 0.48 |
| Overall minimum | 16.65 | -0.98 |
| Overall maximum | 21.27 | 6.91 |
| Overall Stdev | 0.79 | 0.66 |
| Disposition | Pass | Pass |

**2.3 Connector Mating/Un-mating force**
Unit: Kgf

| Test Group (TG) | 2 (Mating force) | |
|---|---|---|
| **Sample ID** | **Leaded** | |
| **Test condition** | **Initial** | **After 100th Cycle** |
| No. of measurement | 5 | 5 |
| Overall average | 1.90 (0.032 per contact) | 1.97 (0.033 per contact) |
| Overall minimum | 1.79 (0.028 per contact) | 1.90 (0.032 per contact) |
| Overall maximum | 2.00 (0.033 per contact) | 2.05 (0.034 per contact) |
| Overall Stdev | 0.090 Max (per contact) | |
| Disposition | Pass | Pass |

| Test Group (TG) | 2 (Un-Mating force) | |
|---|---|---|
| **Sample ID** | **Leaded** | |
| **Test condition** | **Initial** | **After 100th Cycle** |
| No. of measurement | 5 | 5 |
| Overall average | 0.98 (0.016 per contact) | 1.05 (0.018 per contact) |
| Overall minimum | 0.90 (0.015 per contact) | 0.95 (0.016 per contact) |
| Overall maximum | 1.05 (0.018 per contact) | 1.10 (0.018 per contact) |
| Overall Stdev | 0.010 Max (per contact) | |
| Disposition | Pass | Pass |

**2.4 Insulation Resistance – Test Group 1**

All tested samples (both Leaded and Lead free), were measured with resistance readings that exceed 500M , before and after environmental test.

**2.5 Dielectric Withstanding Voltage – Test Group 1**

No dielectric breakdown or flashover or leakage of current greater than 5mA occurred (both Leaded and Lead free samples) when a test voltage of 500 VAC was applied between adjacent terminals of mated/unmated connector assemblies, before and after environmental test.

**2.6 Vibration & Physical Shock - Test Group 3 & 4**

No Sample failed the electrical discontinuity.

**2.7 Solder ability – Test Group 10**

All contact leads showed more than 95% solder coverage with no voids and pins hole observed, for both Leaded and Lead free samples.

**2.8 Reflow Soldering Heat (Lead free) – Test Group 11**

No physical damage was observed after reflow.

**2.9 Reflow Soldering Heat (Leaded) – Test Group 9**

No physical damage was observed after reflow.

## 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

Impressed voltage 500VDC. Test between adjacent circuits of un-mated connectors.
(Spec. 109-5302)

### 3.3 Dielectric Strength

Test between adjacent circuits of mate/un-mated connectors. 500VAC for one minute.
(Spec. 109-5301)

### 3.4 Termination Resistance (Low Level)

Subject mated contacts assembled in housing to open circuit voltage of 20mV maximum, closed circuit current at 10mA maximum. (Spec. 109-5311-1)

### 3.5 Connector Mating/Un-mating force

Measure force required to mate and un-mate connector. Operation speed: 100mm per minute.
(Spec. 109-5206)

### 3.6 Durability (Repeated mate/Un-mate)

Operation speed: 100mm per minute. No. of cycles: 100 cycles. (Spec. 109-5213)
3.7 Vibration (Frequency)
Subject mated connectors to 10-55-10Hz Traverse in 1 minute at 1.52mm amplitude; 2 hours in each of the 3 mutually perpendicular planes. (Spec. 109-5201)

### 3.8 Physical Shock

Accelerated velocity: 50G / Duration: 11ms
Waveform: Saw tooth shock pulse
Number of drops: 18 drops / Velocity change: 11.3 m/s
Spec. 109-5208

**3.9 Resistance to Reflow Soldering Heat (SMT type)**
Spec. 109-201, Condition B

| Step | Leaded | Lead-free |
|---|---|---|
| **Pre-heat** | 100~105°C; 60 sec.min | 100~105°C; 60 sec.min |
| **Heat** | 210°C min.; 30 sec.max | 217°C min.; 60sec. max |
| **Peak temperature** | 260°C max | 240°C max |

**3.10 Solder ability**
Spec. 109-5203

| Step | Leaded | Lead-free |
|---|---|---|
| **Solder Temperature** | 230±2°C | 250±2°C |
| **Immersion duration** | 3±0.5 sec | - |
| **Flux** | Alpha 100 | Sparkle<br>ES-1020 |

**3.11 Thermal Shock**

Subject mated connector assembly to 5 cycles at -40°C for 30 minute, +125°C for 30 minute. (Spec. 109-5103)

**3.12 Humidity-Temperature Cycling**

Subject mated connectors to 25~65°C and 90~95%RH for 10 cycles.
(Spec. 109-5106)

**3.13 Temperature Life (Heat Aging)**

Subject mated connector assemblies to temperature life at 125°C for 4 days.
For Lead free test (Spec. 109-5104)
Subject mated connector assemblies to temperature life at 85°C for 4 days.
For Leaded test (Spec. 109-5104)

**3.14 Salt Spray**

Subject mated connectors to 5±1% salt concentration for 24 hours.

(MIL-STD-202, Method 101 / Spec. 109-5101)

**3.15 Industrial Gas ($SO_2$)**

SO2 Gas: 10ppm

R.H.: 90~95%

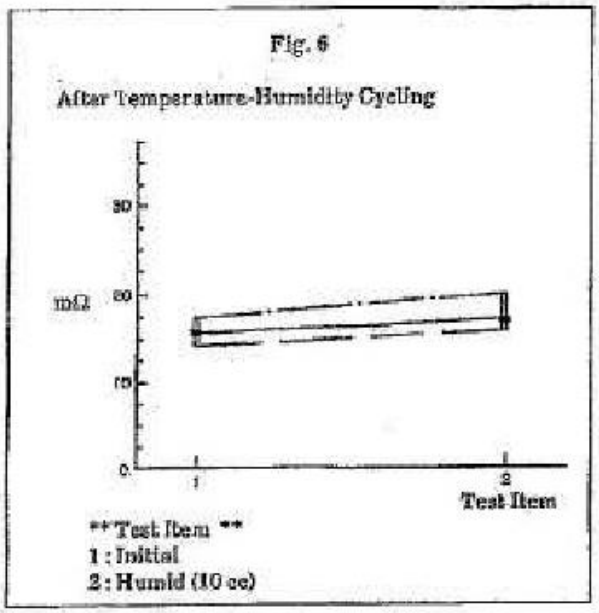
Temperature: Room temperature

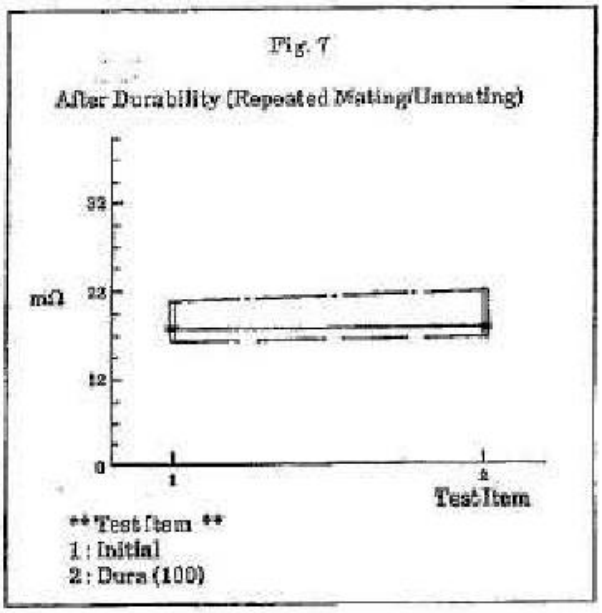
Duration: 24 hours

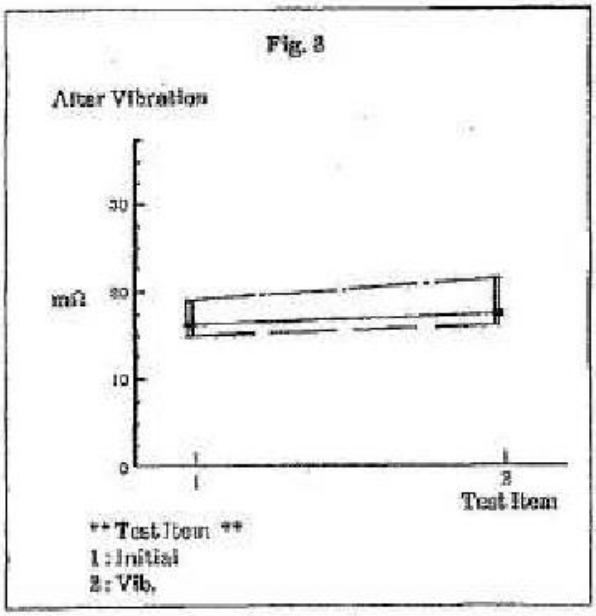
(Spec.109-5107)

APPENDIX

TERMINATION RESISTANCE, LOW LEVEL (FOR LEADED SAMPLES ONLY)



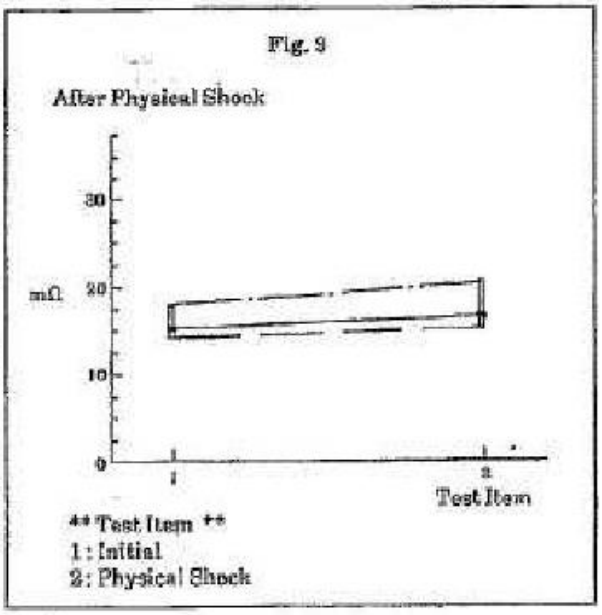
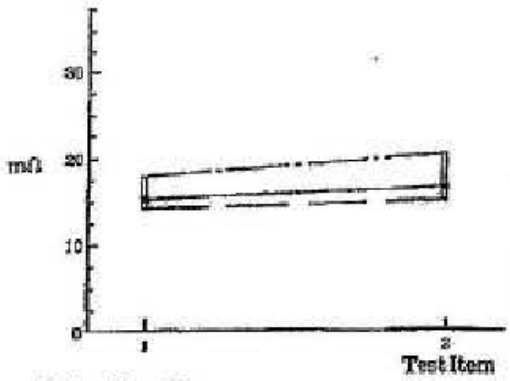



Fig. 10

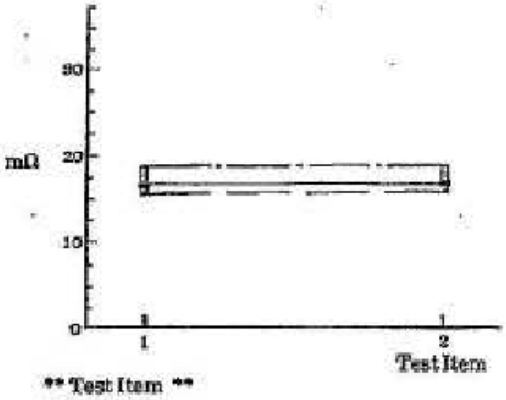
After Physical Shock




** Test Item **
1 : Initial
2 : T.S(5)

Fig. 11

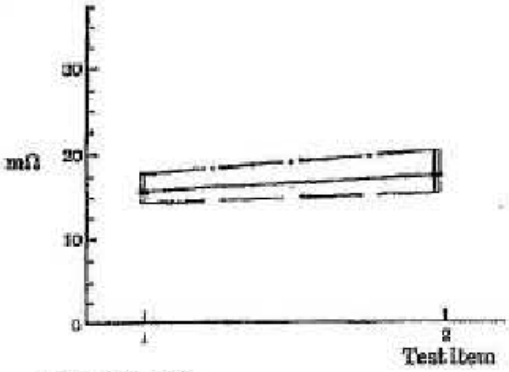
Salt Spray




** Test Item **
1 : Initial
2 : Salt Spray (24h)

Fig. 12

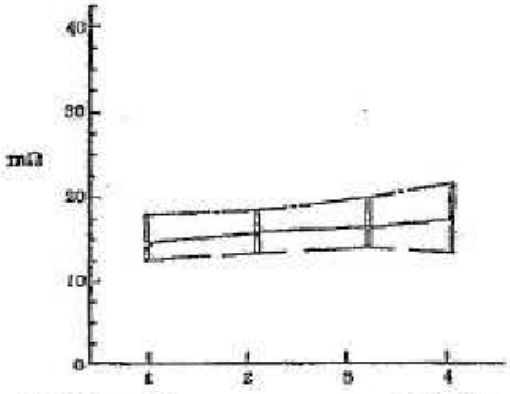
After Sulfurous Acid Gas Exposure




** Test Item **
1 : Initial
2 : $SO_2$ (24h)

Fig. 13

After Temperature Life




** Test Item **

1 : Initial
2 : Heat (96h)
3 : Heat (356h)
4 : Heat (500h)