



1. INTRODUCTION

1.1 Purpose

Testing was performed on Hybrid Power Card Edge Connector (part number 2322260-1) to determine its conformance to requirements of design objective 108-128060, Revision 2.

1.2 Scope

This report covers the electrical, mechanical, and environmental performance of the Hybrid Power Card Edge Connector. Testing was performed at TE Shanghai Testing Laboratory between 16-Jan-2018 and 09-Mar-2018.

1.3 Conclusion

Hybrid Power Card Edge Connector (part number 2322260-1) conformed to the electrical, mechanical, and environmental performance requirements of design objective 108-128060, Revision 2

1.4 Test Specimens

Test specimens were representative of normal production lots. Specimens identified with the following part numbers were used for test:

| Test Group | Quantity | Part Number | Description |
|------------|------------|-------------|----------------------------------|
| #1,2,5,6 | 20 (5 ea.) | 2322260-1 | Hybrid Power Card Edge Connector |
| | 20 (5 ea.) | 2327532-1 | Mating side test PCB |
| | 20 (5 ea.) | 2327556-1 | Mounting side test PCB, |
| #3 | 5 | 2322260-1 | Hybrid Power Card Edge Connector |

* Notes: 2327532-1 is 6layers, 2oz copper on internal layers and 3oz copper on outer layers PCB
2327556-1 is 8layers, 1oz copper on internal layers and 2oz copper on outer layers PCB
Test Group 4 refer to the data from engineering report 502-128064

1.5 Environmental Conditions

Unless otherwise stated, the following environmental conditions prevailed during testing:
Temperature: 15°C to 35°C Relative Humidity 25% to 75%

1.6 Qualification Test Sequence

| Test Description | Test group (a) | | | | | |
|---------------------------------|-------------------|-----|-----|---|-----|-----|
| | 1 | 2 | 3 | 4 | 5 | 6 |
| | Test sequence (b) | | | | | |
| Initial examination of product | 1 | 1 | 1 | 1 | 1 | 1 |
| Low level contact resistance | 3,7 | 2,5 | | | 2,4 | 2,5 |
| Insulation resistance | | | 2,6 | | | |
| Dielectric Withstanding Voltage | | | 3,7 | | | |

| | | | | | | |
|-------------------------------|----|------|---|---|------|---|
| Temperature rise vs current | 9 | 3 | | | 5 | |
| Vibration, sinusoidal | 5 | | | | | |
| Mechanical shock | 6 | | | | | |
| Durability | 4 | | | | | |
| Mating force | 2 | | | | | |
| Un-mating force | 8 | | | | | |
| contact retention force | | | | 2 | | |
| Thermal shock | | | 4 | | | 3 |
| Humidity/temperature cycling. | | | 5 | | | 4 |
| Temperature life | | | | | 3(c) | |
| Mixed flowing gas | | 4(c) | | | | |
| Final examination | 10 | 6 | 8 | 3 | 6 | 6 |

Note

- (a) Numbers indicate sequence in which tests are performed.
(b) Precondition specimens with 10 durability cycles

2. SUMMARY OF TESTING

2.1 Initial examination– All Test Groups

All specimens submitted for testing were representative of normal production lots. A Certificate of Conformance was issued by Product Assurance. Where specified, specimens were visually examined and no evidence of physical damage detrimental to product performance was observed.

2.2 Low Level Contact Resistance- Test Group 1, 2, 5, 6.

| Test Group | | Test Condition | LLCR (mΩ) | | Spec | Jud. |
|------------|----------|----------------|-----------|-------|------------------------|------|
| | | | AVG | MAX | | |
| #1 | Signal | Initial | 7.76 | 9.59 | Signal: 25 mΩ max. | OK |
| | | Final | 7.16 | 8.10 | | OK |
| | AC-Power | Initial | 0.50 | 0.58 | | OK |
| | | Final | 0.46 | 0.55 | | OK |
| | DC-Power | Initial | 0.18 | 0.25 | DC Power: 1 mΩ max. | OK |
| | | Final | 0.19 | 0.27 | | OK |
| #2 | Signal | Initial | 9.33 | 14.40 | AC Power: 5 mΩ max. | OK |
| | | Final | 8.23 | 19.33 | | OK |
| | AC-Power | Initial | 0.56 | 0.68 | | OK |
| | | Final | 0.58 | 0.97 | | OK |
| | | Initial | 0.21 | 0.29 | | OK |
| | | Final | | | | |

| | | | | | |
|----|----------|---------|-------|-------|----|
| | DC-Power | Final | 0.28 | 0.48 | OK |
| #5 | Signal | Initial | 8.48 | 9.63 | OK |
| | | Final | 12.20 | 20.80 | OK |
| | AC-Power | Initial | 0.52 | 0.68 | OK |
| | | Final | 0.81 | 1.31 | OK |
| | DC-Power | Initial | 0.20 | 0.29 | OK |
| | | Final | 0.25 | 0.39 | OK |
| #6 | Signal | Initial | 9.65 | 13.07 | OK |
| | | Final | 9.25 | 17.45 | OK |
| | AC-Power | Initial | 0.57 | 0.65 | OK |
| | | Final | 0.58 | 0.69 | OK |
| | DC-Power | Initial | 0.21 | 0.36 | OK |
| | | Final | 0.23 | 0.39 | OK |

2.3 Insulation resistance– Test Group 3

All insulation resistance measurements between power conductors were greater than 5000 megohms, and all insulation resistance measurements between signal conductors were greater than 500 megohms.

2.4 Dielectric Withstanding Voltage – Test Group 3

No dielectric breakdown or flashover occurred.

2.5 Temperature rise vs current – Test Group 1,2,5

All specimens were soldered on TE mounting test PCB 2327556-1, and mated with TE mating side PCB 2327556-1.

At the max current load (All four DC power contacts charged with 62.5A per contact) the temp rise is within the requirement of $\Delta t_{max} = 30^{\circ}\text{C}$,

| Test Group | Test Condition | T-rise($^{\circ}\text{C}$) | | Spec | Jud. |
|------------|----------------|------------------------------|------|-----------------------------|------|
| | | AVG | MAX | | |
| #1 | Step 9 | 18.9 | 20.6 | 30.0 $^{\circ}\text{C}$ Max | OK |
| #2 | Step 3 | 19.5 | 23.2 | | OK |
| #5 | Step 5 | 20.5 | 22.5 | | OK |

2.6 Vibration, sinusoidal – Test Group 1

No discontinuity greater than 1microsecond were detected; No physical damage.

2.7 Mechanical shock – Test Group 1

No discontinuity greater than 1microsecond were detected; No physical damage.

2.8 Durability – Test Group 1

No physical damage occurred to the specimens as a result of mating and unmating the specimens 200 times.

2.9 Mating force and Unmating force – Test Group 1

Mating force measurements of all specimens which were soldered on mounting PCB were less than 100N, with average 76.64N. and Unmating force measurements of all specimens which were soldered on mounting PCB were more than 10N, with average 35.49N

**A1 version update:*

Mating force measurements of all specimens without mounting PCB were less than 80N, with average 42.25N. and Unmating force measurements of all specimens without mounting PCB were more than 10N and less than 60N.

2.10 Contact retention force – Test Group 4

All retention force measurements for Power contact were more than 20N per contact.
All retention force measurements for Signal contact were more than 5N per contact.

2.11 Thermal shock – Test Group 3, 6

No evidence of physical damage was visible as a result of exposure to thermal shock.

2.12 Humidity-temperature cycling – Test Group 3, 6

No evidence of physical damage was visible as a result of exposure to Humidity-temperature cycling

2.13 Temperature life– Test Group 5

No evidence of physical damage was visible as a result of exposure to 250hours at 115°C temperature life.

2.14 Mixed flowing gas– Test Group 2

No evidence of physical damage was visible as a result of the Class IIA MFG exposure for 20days.

2.15 Final examination of product – All Test Groups

Specimens were visually examined and no evidence of physical damage detrimental to product performance was observed.

3. TEST REQUIREMENTS AND PROCEDURES SUMMARY

| Test Description | Requirement | Procedure |
|------------------------|--|--|
| Visual Examination | Meets requirements of product drawing. | IEC 60512-1-1 Visual and dimensional (C of C) inspection per product drawing. |
| ELECTRICAL | | |
| Termination Resistance | Signal contact: 25 mΩ max. | IEC 60512-2-1. Test 2a |

| | | |
|---------------------------------|---|--|
| (Low Level) | DC Power contact: 1 mΩ max. AC Power contact: 5 mΩ max. | Subject specimens to 100 milliamperes maximum and 20 millivolts maximum open circuit voltage. |
| Insulation resistance | 5000 MΩ minimum between all AC power conductors, 5000 MΩ minimum between all DC power conductors, 500 MΩ minimum between all signal conductors; | IEC 60512-3-1. 500 volts DC. |
| Dielectric Withstanding Voltage | One minute hold with no breakdown or flashover | IEC 60512-4-1. 2000V AC between DC power conductors mutually. 2000V AC between AC power conductors mutually. 1000V AC between signal conductors mutually. |
| Temperature rise vs current | Temperature rise: 30°C max. over ambient temperature | EIA-364-70, Method 1. Stabilize at a single current level until 3 readings at 5 minute intervals are within 1°C See Table 1 |

| MECHANICAL | | |
|-------------------------|--|---|
| Vibration, sinusoidal | No discontinuities of 1 microsecond or longer duration. See Note | EIA-364-28, Test condition I, Subject mated specimens to 10-55-10 Hz Traversed in 1 minutes at 1.52mm amplitude 2 hours each of 3 mutually perpendicular planes; See figure 3 |
| Mechanical shock | No discontinuities of 1 microsecond or longer duration. See Note | EIA-364-27, Test Condition A. Subject mated specimens to 50 G's half-sine shock pulses of 11 milliseconds duration. Three shocks in each direction applied along 3 mutually perpendicular planes, 18 total shocks See Figure 3 |
| Mating force | 100N maximum [tentative value] | IEC 60512-13-1 Maximum rate of 12.5mm per minutes. |
| Un-mating force | 10N min. | IEC 60512-13-1 Maximum rate of 12.5mm per minutes. |
| Durability | 200 operations See Note | IEC 60512-5, Test 9a 10 cycles at a max rate of 10mm per second. 5 second rest in the unmated condition. |
| Contact retention force | 20N min. per power pin [tentative value] 5N min. per signal pin [tentative value] | EIA-364-29 Measure force necessary to remove individual contact from the housing at a maximum rate of 12.7mm per minute |

| | | |
|---------------|---|------------------------------------|
| Solderability | Solderable area shall have a minimum of 95% solder coverage. See Note. | TE Spec. 109-11-11, Test Method A. |
|---------------|---|------------------------------------|

| ENVIRONMENTAL | | |
|-------------------------------|----------|---|
| Thermal shock | See Note | EIA-364-32, Method A, Test condition I, Subject specimens to 5cycles between -40 and 115°C with 30 minute dwells at temperature extremes and 1 minute maximum transition between temperatures |
| Temperature life | See Note | EIA-364-17, Method A, Test condition 4, Test condition C. Subject mated specimens to 115°C for 250 hours |
| Humidity/temperature cycling. | See Note | EIA-364-31, Method III. Subject mated specimens to 10 cycles (10 days) between 25 and 65°C at 90 to 95% RH |
| Mixed flowing gas | See Note | EIA-364-65, Class IIA (4 gas). Subject mated specimens to environmental Class IIA for 20 days (10 days unmated, LLCR, followed by 10 days mated) |

NOTE

Shall meet visual requirements, show no physical damage, and meet requirements of additional tests as specified in the Product Qualification and Requalification Test Sequence