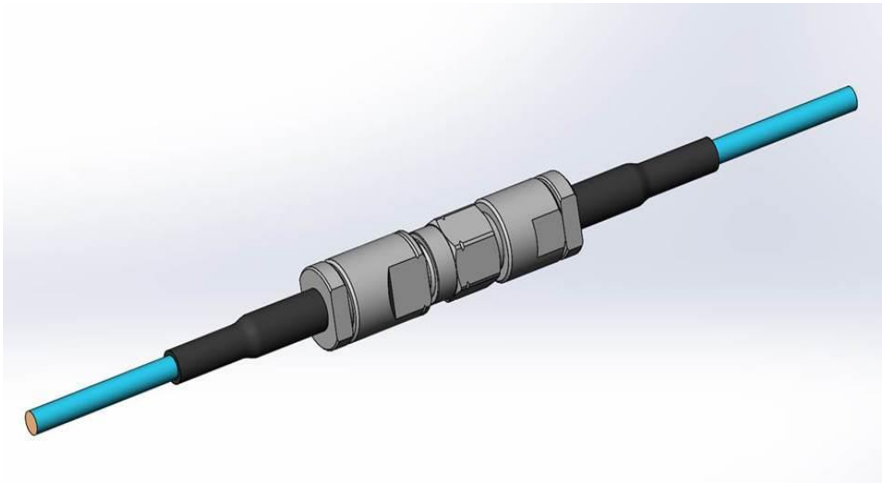
Project Number: Design Qualification Test Report	Tracking Code: 1325587_Report_Rev_2
Requested by: Alvin Wang	Date: 3/1/2018
Part #: RF23S-35SPP-505050-0153/RF23S-35SJP-505050-0153	Tech: Peter Chen
Part description: RF23S-35SPP/RF23S-35SJP	Qty to test: 32
Test Start: 10/29/2017	Test Completed: 12/05/2017



DESIGN QUALIFICATION TEST REPORT

RF23S-35SPP/RF23S-35SJP
RF23S-35SPP-505050-0153/RF23S-35SJP-505050-0153

REVISION HISTORY

DATA	REV.NUM.	DESCRIPTION	ENG
12/19/2017	**1**	**Initial Issue**	**PC**
03/01/2018	**2**	**Updated the test plan**	**PC**

CERTIFICATION

All instruments and measuring equipment were calibrated to National Institute for Standards and Technology (NIST) traceable standards according to IS0 10012-l and ANSI/NCSL 2540-1, as applicable.

SCOPE

To perform the following tests: Design Qualification test. Please see test plan.

APPLICABLE DOCUMENTS

Standards: EIA Publication 364

TEST SAMPLES AND PREPARATION

1) All materials were manufactured in accordance with the applicable product specification.
2) All test samples were identified and encoded to maintain traceability throughout the test sequences.
3) After soldering, the parts to be used for LLCR and DWV/IR testing were cleaned according to TLWI-0001.
4) Either an automated cleaning procedure or an ultrasonic cleaning procedure may be used.
5) The automated procedure is used with aqueous compatible soldering materials.
6) Parts not intended for testing LLCR and DWV/IR are visually inspected and cleaned if necessary.
7) Any additional preparation will be noted in the individual test sequences.
8) Solder Information: Lead free
9) Samtec Test PCBs used: PCB-103219-TST-01.

FLOWCHARTS

Thermal Aging

Group 1

RF23S-35SPP-505050-0153

RF23S-35SJP-505050-0153

8 Assemblies

Step	Description
1.	Contact Gaps *Note: Signal.*
2.	LLCR (1) *Note: Signal and ground.*
3.	Thermal Age (2)
4.	LLCR (1) Max Delta = 15 mOhm *Note: Signal and ground.*
5.	Contact Gaps *Note: Signal.*

(1) LLCR = EIA-364-23
Open Circuit Voltage = 20 mV Max
Test Current = 100 mA Max

(2) Thermal Age = EIA-364-17
Test Condition = 4 (105°C)
Time Condition = B (250 Hours)

FLOWCHARTS Continued

Mating/Unmating/Durability

Group 1

RF23S-35SPP-505050-0153

RF23S-35SJP-505050-0153

8 Assemblies

Step	Description
1.	Contact Gaps *Note: Signal.*
2.	LLCR (2) *Note: Signal and ground.*
3.	Cycles Quantity = 500 Cycles *Note: By hand;* *Rotate plug coupling nut only. Do not rotate entire assembly;* *Torque each time to 8 in-lbs.*
4.	Contact Gaps *Note: Signal.*
5.	LLCR (2) Max Delta = 15 mOhm *Note: Signal and ground.*
6.	Thermal Shock (3)
7.	LLCR (2) Max Delta = 15 mOhm *Note: Signal and ground.*
8.	Humidity (1)
9.	LLCR (2) Max Delta = 15 mOhm *Note: Signal and ground.*

(1) Humidity = EIA-364-31
Test Condition = B (240 Hours)
Test Method = III (+25°C to +65°C @ 90% RH to 98% RH)
Test Exceptions: ambient pre-condition and delete steps 7a and 7b

(2) LLCR = EIA-364-23
Open Circuit Voltage = 20 mV Max
Test Current = 100 mA Max

(3) Photos
Attach 2-3 photos of contact area

(4) Plating Thickness Verification
Measure, verify, and document plating thickness on both male and female (one group only)
Plating thickness to be measured on loose pins used during assembly

(5) Thermal Shock = EIA-364-32
Exposure Time at Temperature Extremes = 1/2 Hour
Method A, Test Condition = I (-55°C to +85°C)
Test Duration = A-3 (100 Cycles)

FLOWCHARTS Continued

IR/DWV

Pin-to-Ground

Group 1 RF23S-35SPP-505050-0153 RF23S-35SJP-505050-0153 2 Assemblies		Group 2 RF23S-35SPP-505050-0153 2 Assemblies		Group 3 RF23S-35SJP-505050-0153 2 Assemblies		Group 4 RF23S-35SPP-505050-0153 RF23S-35SJP-505050-0153 2 Assemblies	
Step	**Description**	**Step**	**Description**	**Step**	**Description**	**Step**	**Description**
1.	DWV Breakdown (2)	1.	DWV Breakdown (2)	1.	DWV Breakdown (2)	1.	IR (4)
						2.	DWV at Test Voltage (1)
						3.	Thermal Shock (5)
						4.	IR (4)
						5.	DWV at Test Voltage (1)
						6.	Humidity (3)
						7.	IR (4)
						8.	DWV at Test Voltage (1)

(1) DWV at Test Voltage = EIA-364-20
Test Condition = 1 (Sea Level)
DWV test voltage is equal to 75% of the lowest breakdown voltage
Test voltage applied for 60 seconds

(2) DWV Breakdown = EIA-364-20
Test Condition = 1 (Sea Level)
DWV test voltage is equal to 75% of the lowest breakdown voltage
Test voltage applied for 60 seconds

(3) Humidity = EIA-364-31
Test Condition = B (240 Hours)
Test Method = III (+25°C to +65°C @ 90% RH to 98% RH)
Test Exceptions: ambient pre-condition and delete steps 7a and 7b

(4) IR = EIA-364-21
Test Condition = 500 Vdc, 2 Minutes Max

(5) Thermal Shock = EIA-364-32
Exposure Time at Temperature Extremes = 1/2 Hour
Method A, Test Condition = I (-55°C to +85°C)
Test Duration = A-3 (100 Cycles)

FLOWCHARTS Continued

Insertion/Withdrawal

Group 1

350-J-C-H-ST-CS3C-SKT

8 Contacts Minimum

Insertion/Withdrawal

Step	Description
1.	Insertion Force Mating Pin = 0.940mm +.002/-.0000 IEEE Spec = VERIFY PER IEEE-287 (2007) PARAGRAPH 4.2.5 *Note: REFERENCE PRINT SPEC: MAXIMUM ALLOWABLE INSERTION FORCE: 5.6N (19.8OZF)*
2.	Withdrawal Force Mating Pin = 0.902mm +.0000/-.002 IEEE Spec = VERIFY PER IEEE-287 (2007) PARAGRAPH 4.2.5 *Note: REFERENCE PRINT SPEC: MINIMUM ALLOWABLE WITHDRAWAL FORCE: 0.55N (1.9OZF)*

ATTRIBUTE DEFINITIONS

The following is a brief, simplified description of attributes.

THERMAL:

1) EIA-364-17, *Temperature Life with or without Electrical Load Test Procedure for Electrical Connectors.*
2) Test Condition 4 at 105° C.
3) Test Time Condition B for 250 hours.
4) All test samples are pre-conditioned at ambient.
5) All test samples are exposed to environmental stressing in the mated condition.

THERMAL SHOCK:

1) EIA-364-32, *Thermal Shock (Temperature Cycling) Test Procedure for Electrical Connectors.*
2) Test Condition 1: -55°C to +85°C
3) Test Time: ½ hour dwell at each temperature extreme
4) Number of Cycles: 100
5) All test samples are pre-conditioned at ambient.
6) All test samples are exposed to environmental stressing in the mated condition.

HUMIDITY:

1) Reference document: EIA-364-31, *Humidity Test Procedure for Electrical Connectors.*
2) Test Condition B, 240 Hours.
3) Method III, +25° C to + 65° C, 90% to 98% Relative Humidity excluding sub-cycles 7a and 7b.
4) All samples are pre-conditioned at ambient.
5) All test samples are exposed to environmental stressing in the mated condition.

LLCR:

1) EIA-364-23, *Low Level Contact Resistance Test Procedure for Electrical Connectors and Sockets*.
2) A computer program, *LLCR 221.exe*, ensures repeatability for data acquisition.
3) The following guidelines are used to categorize the changes in LLCR as a result from stressing
    a. <= +5.0 mOhms:---------- Stable
    b. +5.1 to +10.0 mOhms:---------- Minor
    c. +10.1 to +15.0 mOhms: ---------- Acceptable
    d. +15.1 to +50.0 mOhms: ---------- Marginal
    e. +50.1 to +2000 mOhms: ---------- Unstable
    f. >+2000 mOhms:---------- Open Failure

RESULTS

Insertion/Withdrawal Force:

- **Insertion**
  - **Min ---------- 0.44 Lbs**
  - **Max---------- 0.59 Lbs**
- **Withdrawal**
  - **Min ---------- 0.20 Lbs**
  - **Max---------- 0.27 Lbs**

LLCR Thermal Aging (Total 16 pin LLCR test points)

Signal pin:

- **Initial ---------- 21.23 mOhms Max**

Ground Pin:

- **Initial ---------- 15.76 mOhms Max**
- **Thermal**
  - **<= +5.0 mOhms ----------16 Points ---------- Stable**
  - **+5.1 to +10.0 mOhms ----------0 Points ---------- Minor**
  - **+10.1 to +15.0 mOhms ----------0 Points ---------- Acceptable**
  - **+15.1 to +50.0 mOhms ----------0 Points ---------- Marginal**
  - **+50.1 to +2000 mOhms----------0 Points ---------- Unstable**
  - **>+2000 mOhms----------0 Points ---------- Open Failure**

LLCR Durability (Total 16 pin LLCR test points)

Signal pin:

- **Initial ---------- 21.71 mOhms Max**

Ground Pin:

- **Initial ---------- 15.34 mOhms Max**
- **Durability, 500 Cycles**
  - **<= +5.0 mOhms ----------16 Points ---------- Stable**
  - **+5.1 to +10.0 mOhms ----------0 Points ---------- Minor**
  - **+10.1 to +15.0 mOhms ----------0 Points ---------- Acceptable**
  - **+15.1 to +50.0 mOhms ----------0 Points ---------- Marginal**
  - **+50.1 to +2000 mOhms----------0 Points ---------- Unstable**
  - **>+2000 mOhms----------0 Points ---------- Open Failure**
- **Thermal Shock**
  - **<= +5.0 mOhms ----------15 Points ---------- Stable**
  - **+5.1 to +10.0 mOhms ----------1 Points ---------- Minor**
  - **+10.1 to +15.0 mOhms ----------0 Points ---------- Acceptable**
  - **+15.1 to +50.0 mOhms ----------0 Points ---------- Marginal**
  - **+50.1 to +2000 mOhms----------0 Points ---------- Unstable**
  - **>+2000 mOhms----------0 Points ---------- Open Failure**
- **Humidity**
  - **<= +5.0 mOhms ----------15 Points ---------- Stable**
  - **+5.1 to +10.0 mOhms ----------1 Points ---------- Minor**
  - **+10.1 to +15.0 mOhms ----------0 Points ---------- Acceptable**
  - **+15.1 to +50.0 mOhms ----------0 Points ---------- Marginal**
  - **+50.1 to +2000 mOhms----------0 Points ---------- Unstable**
  - **>+2000 mOhms----------0 Points ---------- Open Failure**

RESULTS Continued

Insulation Resistance minimums, IR

Pin- Ground

- **Initial**
  - **Mated----------10000 Meg Ω ---------- Pass**
- **Thermal**
  - **Mated----------10000 Meg Ω ---------- Pass**
- **Humidity**
  - **Mated----------10000 Meg Ω ---------- Pass**

Dielectric Withstanding Voltage minimums, DWV

- **Minimums**
  - **Breakdown Voltage---------- 1500 VAC**
  - **Test Voltage ---------- 1125 VAC**
  - **Working Voltage ----------375 VAC**

Pin - Ground

- **Initial DWV ----------Passed**
- **Thermal DWV----------Passed**
- **Humidity DWV----------Passed**

DATA SUMMARIES

Insertion/Withdrawal Force:

	Initial			
	Mating		**Unmating**	
	Newtons	Force (Lbs)	Newtons	Force (Lbs)
Minimum	1.96	0.44	0.89	0.20
Maximum	2.62	0.59	1.20	0.27
Average	2.36	**0.53**	1.04	**0.23**
St Dev	0.23	0.05	0.11	0.03
Count	8	8	8	8

INSULATION RESISTANCE (IR):

	Pin to Ground		
	Mated	Unmated	Unmated
Minimum	**35SPP/35SJP**	**35SPP**	**35SJP**
Initial	10000	10000	10000
Thermal	10000	10000	10000
Humidity	10000	10000	10000

DIELECTRIC WITHSTANDING VOLTAGE (DWV):

Voltage Rating Summary	
Minimum	**35SPP/35SJP**
Break Down Voltage	1500
Test Voltage	1125
Working Voltage	375

Pin to Ground	
Initial Test Voltage	Passed
After Thermal Test Voltage	Passed
After Humidity Test Voltage	Passed

DATA SUMMARIES

LLCR Thermal Aging

1). A total of 16 points were measured.
2). EIA-364-23, *Low Level Contact Resistance Test Procedure for Electrical Connectors and Sockets.*
3). A computer program, *LLCR 221.exe*, ensures repeatability for data acquisition.
4). The following guidelines are used to categorize the changes in LLCR as a result from stressing.
   a. <= +5.0 mOhms:----------Stable
   b. +5.1 to +10.0 mOhms: ----------Minor
   c. +10.1 to +15.0 mOhms: ----------Acceptable
   d. +15.1 to +50.0 mOhms: ----------Marginal
   e. +50.1 to +2000 mOhms ----------Unstable
   f. > +2000 mOhms:----------Open Failure

LLCR Measurement Summaries by Pin Type				
Date	2017/10/29	2017/11/13		
Room Temp (Deg C)	23	24		
Rel Humidity (%)	56	56		
Technician	Peter Chen	Peter Chen		
mOhm values	**Actual Initial**	**Delta Thermal**	**Delta**	**Delta**
	Pin Type 1: Signal			
Average	20.88	0.72		
St. Dev.	0.15	0.79		
Min	20.74	0.00		
Max	21.23	1.93		
Summary Count	8	8		
Total Count	8	8		
	Pin Type 2: Ground			
Average	14.49	3.86		
St. Dev.	1.01	0.86		
Min	12.68	2.07		
Max	15.76	4.64		
Summary Count	8	8		
Total Count	8	8		

LLCR Delta Count by Category						
	Stable	**Minor**	**Acceptable**	**Marginal**	**Unstable**	**Open**
mOhms	**<=5**	**>5 & <=10**	**>10 & <=15**	**>15 & <=50**	**>50 & <=1000**	**>1000**
Thermal	**16**	**0**	**0**	**0**	**0**	**0**

DATA SUMMARIES Continued

LLCR Durability

1). A total of 16 points were measured.
2). EIA-364-23, *Low Level Contact Resistance Test Procedure for Electrical Connectors and Sockets.*
3). A computer program, *LLCR 221.exe*, ensures repeatability for data acquisition.
4). The following guidelines are used to categorize the changes in LLCR as a result from stressing.
   a. <= +5.0 mOhms: ---------- Stable
   b. +5.1 to +10.0 mOhms: ---------- Minor
   c. +10.1 to +15.0 mOhms: ---------- Acceptable
   d. +15.1 to +50.0 mOhms: ---------- Marginal
   e. +50.1 to +2000 mOhms ---------- Unstable
   f. > +2000 mOhms: ---------- Open Failure

LLCR Measurement Summaries by Pin Type				
Date	2017/10/29	2017/11/2	2017/11/22	2017/12/5
Room Temp (Deg C)	23	23	23	23
Rel Humidity (%)	56	56	56	56
Technician	Peter Chen	Peter Chen	Peter Chen	Peter Chen
mOhm values	**Actual Initial**	**Delta 500 Cycles**	**Delta Therm Shck**	**Delta Humidity**
	Pin Type 1: Signal			
Average	21.08	0.26	0.77	0.62
St. Dev.	0.26	0.25	0.24	0.30
Min	20.84	0.03	0.51	0.13
Max	21.71	0.83	1.25	1.04
Summary Count	8	8	8	8
Total Count	8	8	8	8
	Pin Type 2: Ground			
Average	14.10	2.70	2.91	3.61
St. Dev.	0.85	1.05	1.79	1.54
Min	13.12	1.51	0.37	1.16
Max	15.34	4.53	5.87	6.19
Summary Count	8	8	8	8
Total Count	8	8	8	8

LLCR Delta Count by Category						
	Stable	**Minor**	**Acceptable**	**Marginal**	**Unstable**	**Open**
mOhms	**<=5**	**>5 & <=10**	**>10 & <=15**	**>15 & <=50**	**>50 & <=1000**	**>1000**
500 Cycles	**16**	**0**	**0**	**0**	**0**	**0**
Therm Shck	**15**	**1**	**0**	**0**	**0**	**0**
Humidity	**15**	**1**	**0**	**0**	**0**	**0**

EQUIPMENT AND CALIBRATION SCHEDULES

Equipment #: HZ-TCT-01
Description: Normal force analyzer
Manufacturer: Mecmesin Multitester
Model: Mecmesin Multitester 2.5-i
Serial #: 08-1049-04
Accuracy: Last Cal: 4/26/2017, Next Cal: 4/25/2018

Equipment #: HZ-OV-01
Description: Oven
Manufacturer: Huida
Model: CS101-1E
Serial #: CS101-1E-B
Accuracy: Last Cal: 12/13/2017, Next Cal: 12/12/2018

Equipment #: HZ-THC-01
Description: Humidity transmitter
Manufacturer: Thermtron
Model: SM-8-8200
Serial #: 38846
Accuracy: Last Cal: 2/28/2017, Next Cal: 2/27/2018

Equipment #: HZ-TSC-01
Description: Vertical Thermal Shock Chamber
Manufacturer: Cincinnatti Sub Zero
Model: VTS-3-6-6-SC/AC
Serial #: 10-VT14994
Accuracy: See Manual
… Last Cal: 06/28/2017, Next Cal: 06/27/2018

Equipment #: HZ-MO-05
Description: Micro-ohmmeter
Manufacturer: Keithley
Model: 3706
Serial #: 1285188
Accuracy: Last Cal: 11/15/2017, Next Cal: 11/14/2018

Equipment #: HZ-HPM-01
Description: NA9636H
Manufacturer: Ainuo
Model: 6031A
Serial #: 089601091
Accuracy: Last Cal: 3/7/2017, Next Cal: 3/6/2018