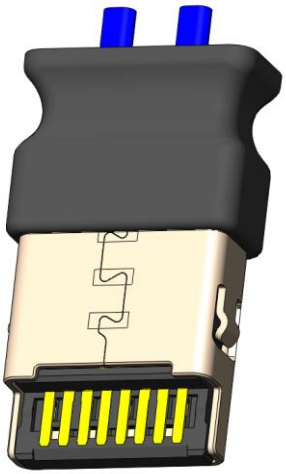
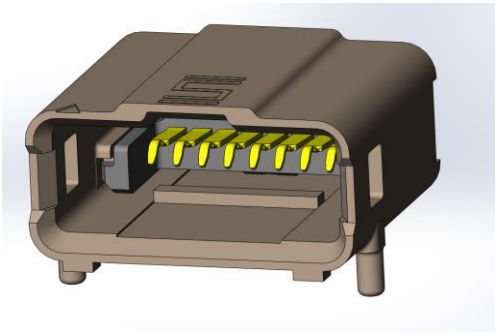
Project Number: Design Qualification Test Report	Tracking Code: CR-868802_ELP-Report_Rev_1
Requested by: Will Luo	Date: 11/30/2023
Part #: ARM6-02-06.0-LU-XX-X-1/AMF6-02-S-RA-XR	
Part description: ARM6/AMF6-RA	Tech: Peter Chen
Test Start: 1/5/2023	Test Completed: 2/25/2023





DESIGN QUALIFICATION TEST REPORT

ARM6/AMF6-RA
ARM6-02-06.0-LU-XX-X-1/AMF6-02-S-RA-XR

REVISION HISTORY

DATA	REV.NUM.	DESCRIPTION	ENG
11/21/2023	**1**	**Initial test**	**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 testing was cleaned according to CO-SC-WI-3029.
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 is 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-112497-TST.

FLOWCHARTS

Extended Life

Group 1 ARM6-02-06.0-LU-XX-X-1 AMF6-02-S-RA-XR 8 Assemblies 100 Cycles		Group 2 ARM6-02-06.0-LU-XX-X-1 AMF6-02-S-RA-XR 8 Assemblies 250 Cycles		Group 3 ARM6-02-06.0-LU-XX-X-1 AMF6-02-S-RA-XR 8 Assemblies 500 Cycles		Group 4 ARM6-02-06.0-LU-XX-X-1 AMF6-02-S-RA-XR 8 Assemblies 1000 Cycles	
Step	**Description**	**Step**	**Description**	**Step**	**Description**	**Step**	**Description**
1.	Plating Thickness Verification (4)	1.	Plating Thickness Verification (4)	1.	Plating Thickness Verification (4)	1.	Plating Thickness Verification (4)
2.	LLCR (2)	2.	LLCR (2)	2.	LLCR (2)	2.	LLCR (2)
3.	Cycles Quantity = 100 Cycles	3.	Cycles Quantity = 250 Cycles	3.	Cycles Quantity = 500 Cycles	3.	Cycles Quantity = 1000 Cycles
4.	LLCR (2) Max Delta = 15 mOhm	4.	LLCR (2) Max Delta = 15 mOhm	4.	LLCR (2) Max Delta = 15 mOhm	4.	LLCR (2) Max Delta = 15 mOhm
5.	Thermal Shock (5) - Non Standard	5.	Thermal Shock (5) - Non Standard	5.	Thermal Shock (5) - Non Standard	5.	Thermal Shock (5) - Non Standard
6.	LLCR (2) Max Delta = 15 mOhm	6.	LLCR (2) Max Delta = 15 mOhm	6.	LLCR (2) Max Delta = 15 mOhm	6.	LLCR (2) Max Delta = 15 mOhm
7.	Humidity (1)	7.	Humidity (1)	7.	Humidity (1)	7.	Humidity (1)
8.	LLCR (2) Max Delta = 15 mOhm	8.	LLCR (2) Max Delta = 15 mOhm	8.	LLCR (2) Max Delta = 15 mOhm	8.	LLCR (2) Max Delta = 15 mOhm
9.	Photos (3)	9.	Photos (3)	9.	Photos (3)	9.	Photos (3)

(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 = Other
Exposure Time at Temperature Extremes =1/2 Hour
Method A, Test Condition = I (-40°C to +85°C)
Test Duration = A-3 (100 Cycles)
EIA-364-32, change Thermal Shock profile from -55°C/85°C to -40°C/85°C, due to temp limit of cable.

ATTRIBUTE DEFINITIONS

The following is a brief, simplified description of attributes.

THERMAL SHOCK:

1) EIA-364-32, *Thermal Shock (Temperature Cycling) Test Procedure for Electrical Connectors.*
2) Test Condition I: -40°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 +1000 mOhms: ----------Unstable
    f. >+1000 mOhms:----------Open Failure

RESULTS

LLCR Extended Life (40 LLCR test points)

100 cycles

Signal pin

- **Initial ---------- 155.92 mOhms Max**

Ground Pin

- **Initial ---------- 37.04 mOhms Max**
- **Durability, 100 Cycles**
  - **<= +5.0 mOhms ---------- 36 Points ---------- Stable**
  - **+5.1 to +10.0 mOhms ---------- 4 Points ---------- Minor**
  - **+10.1 to +15.0 mOhms ---------- 0 Points ---------- Acceptable**
  - **+15.1 to +50.0 mOhms ---------- 0 Points ---------- Marginal**
  - **+50.1 to +1000 mOhms ---------- 0 Points ---------- Unstable**
  - **>+1000 mOhms ---------- 0 Points ---------- Open Failure**
- **Thermal**
  - **<= +5.0 mOhms ---------- 28 Points ---------- Stable**
  - **+5.1 to +10.0 mOhms ---------- 11 Points ---------- Minor**
  - **+10.1 to +15.0 mOhms ---------- 1 Points ---------- Acceptable**
  - **+15.1 to +50.0 mOhms ---------- 0 Points ---------- Marginal**
  - **+50.1 to +1000 mOhms ---------- 0 Points ---------- Unstable**
  - **>+1000 mOhms ---------- 0 Points ---------- Open Failure**
- **Humidity**
  - **<= +5.0 mOhms ---------- 30 Points ---------- Stable**
  - **+5.1 to +10.0 mOhms ---------- 8 Points ---------- Minor**
  - **+10.1 to +15.0 mOhms ---------- 2 Points ---------- Acceptable**
  - **+15.1 to +50.0 mOhms ---------- 0 Points ---------- Marginal**
  - **+50.1 to +1000 mOhms ---------- 0 Points ---------- Unstable**
  - **>+1000 mOhms ---------- 0 Points ---------- Open Failure**

250 cycles

Signal pin

- **Initial ---------- 155.89 mOhms Max**

Ground Pin

- **Initial ---------- 36.49 mOhms Max**
- **Durability, 250 Cycles**
  - **<= +5.0 mOhms ---------- 38 Points ---------- Stable**
  - **+5.1 to +10.0 mOhms ---------- 1 Points ---------- Minor**
  - **+10.1 to +15.0 mOhms ---------- 1 Points ---------- Acceptable**
  - **+15.1 to +50.0 mOhms ---------- 0 Points ---------- Marginal**
  - **+50.1 to +1000 mOhms ---------- 0 Points ---------- Unstable**
  - **>+1000 mOhms ---------- 0 Points ---------- Open Failure**
- **Thermal**
  - **<= +5.0 mOhms ---------- 33 Points ---------- Stable**
  - **+5.1 to +10.0 mOhms ---------- 6 Points ---------- Minor**
  - **+10.1 to +15.0 mOhms ---------- 1 Points ---------- Acceptable**
  - **+15.1 to +50.0 mOhms ---------- 0 Points ---------- Marginal**
  - **+50.1 to +1000 mOhms ---------- 0 Points ---------- Unstable**
  - **>+1000 mOhms ---------- 0 Points ---------- Open Failure**
- **Humidity**
  - **<= +5.0 mOhms ---------- 32 Points ---------- Stable**
  - **+5.1 to +10.0 mOhms ---------- 8 Points ---------- Minor**
  - **+10.1 to +15.0 mOhms ---------- 0 Points ---------- Acceptable**
  - **+15.1 to +50.0 mOhms ---------- 0 Points ---------- Marginal**
  - **+50.1 to +1000 mOhms ---------- 0 Points ---------- Unstable**
  - **>+1000 mOhms ---------- 0 Points ---------- Open Failure**

RESULTS Continued

500 cycles

Signal pin

- **Initial ---------- 156.10 mOhms Max**

Ground Pin

- **Initial ---------- 35.53 mOhms Max**
- **Durability, 500 Cycles**
  - **<= +5.0 mOhms ---------- 40 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 +1000 mOhms ---------- 0 Points ---------- Unstable**
  - **>+1000 mOhms ---------- 0 Points ---------- Open Failure**
- **Thermal**
  - **<= +5.0 mOhms ---------- 29 Points ---------- Stable**
  - **+5.1 to +10.0 mOhms ---------- 7 Points ---------- Minor**
  - **+10.1 to +15.0 mOhms ---------- 4 Points ---------- Acceptable**
  - **+15.1 to +50.0 mOhms ---------- 0 Points ---------- Marginal**
  - **+50.1 to +1000 mOhms ---------- 0 Points ---------- Unstable**
  - **>+1000 mOhms ---------- 0 Points ---------- Open Failure**
- **Humidity**
  - **<= +5.0 mOhms ---------- 37 Points ---------- Stable**
  - **+5.1 to +10.0 mOhms ---------- 3 Points ---------- Minor**
  - **+10.1 to +15.0 mOhms ---------- 0 Points ---------- Acceptable**
  - **+15.1 to +50.0 mOhms ---------- 0 Points ---------- Marginal**
  - **+50.1 to +1000 mOhms ---------- 0 Points ---------- Unstable**
  - **>+1000 mOhms ---------- 0 Points ---------- Open Failure**

1000 cycles

Signal pin

- **Initial ---------- 161.31 mOhms Max**

Ground Pin

- **Initial ---------- 36.18 mOhms Max**
- **Durability, 1000 Cycles**
  - **<= +5.0 mOhms ---------- 40 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 +1000 mOhms ---------- 0 Points ---------- Unstable**
  - **>+1000 mOhms ---------- 0 Points ---------- Open Failure**
- **Thermal**
  - **<= +5.0 mOhms ---------- 36 Points ---------- Stable**
  - **+5.1 to +10.0 mOhms ---------- 2 Points ---------- Minor**
  - **+10.1 to +15.0 mOhms ---------- 2 Points ---------- Acceptable**
  - **+15.1 to +50.0 mOhms ---------- 0 Points ---------- Marginal**
  - **+50.1 to +1000 mOhms ---------- 0 Points ---------- Unstable**
  - **>+1000 mOhms ---------- 0 Points ---------- Open Failure**
- **Humidity**
  - **<= +5.0 mOhms ---------- 26 Points ---------- Stable**
  - **+5.1 to +10.0 mOhms ---------- 13 Points ---------- Minor**
  - **+10.1 to +15.0 mOhms ---------- 1 Points ---------- Acceptable**
  - **+15.1 to +50.0 mOhms ---------- 0 Points ---------- Marginal**
  - **+50.1 to +1000 mOhms ---------- 0 Points ---------- Unstable**
  - **>+1000 mOhms ---------- 0 Points ---------- Open Failure**

DATA SUMMARIES

LLCR Extended Life:

1) A total of 40 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 +1000 mOhms----------Unstable
   f. >+1000 mOhms:----------Open Failure

100 Cycles

LLCR Measurement Summaries by Pin Type				
Date	3/29/2023	4/7/2023	4/19/2023	5/4/2023
Room Temp (Deg C)	23	23	22	23
Rel Humidity (%)	55	55	55	54
Technician	Peter Chen	Peter Chen	Peter Chen	Peter Chen
mOhm values	Actual **Initial**	**Delta Cycles**	**Delta Therm Shck**	**Delta Humidity**
	Pin Type: Signal 1			
Average	149.85	3.01	5.02	3.41
St. Dev.	4.48	2.04	2.58	3.31
Min	137.6	0.05	1.46	0.23
Max	155.92	9.7	14.23	14.75
Summary Count	32	32	32	32
Total Count	32	32	32	32
	Pin Type: GND 1			
Average	34.76	1.1	2.57	4.63
St. Dev.	1.17	0.38	1.34	1.77
Min	33.29	0.68	0.18	2.11
Max	37.04	1.8	3.66	7.54
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**
Cycles	**36**	**4**	**0**	**0**	**0**	**0**
Therm Shck	**28**	**11**	**1**	**0**	**0**	**0**
Humidity	**30**	**8**	**2**	**0**	**0**	**0**

DATA SUMMARIES

250 Cycles

	LLCR Measurement Summaries by Pin Type			
Date	3/29/2023	4/7/2023	4/19/2023	5/4/2023
Room Temp (Deg C)	23	23	23	23
Rel Humidity (%)	55	55	55	52
Technician	Peter Chen	Peter Chen	Peter Chen	Peter Chen
mOhm values	Actual **Initial**	**Delta Cycles**	**Delta Therm Shck**	**Delta Humidity**
	Pin Type: Signal 1			
Average	149.27	2.27	3.72	2.86
St. Dev.	5.14	1.97	1.71	1.94
Min	136.22	0.06	1.33	0.22
Max	155.89	10.6	10.42	9.09
Summary Count	32	32	32	32
Total Count	32	32	32	32
	Pin Type: GND 1			
Average	34.8	1.05	3.52	4.53
St. Dev.	1.21	0.77	1.76	1.94
Min	33.36	0.09	1.9	1.36
Max	36.49	2.14	7.18	6.85
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**
Cycles	**38**	**1**	**1**	**0**	**0**	**0**
Therm Shck	**33**	**6**	**1**	**0**	**0**	**0**
Humidity	**32**	**8**	**0**	**0**	**0**	**0**

DATA SUMMARIES

500 Cycles

	LLCR Measurement Summaries by Pin Type			
Date	4/3/2023	4/7/2023	4/19/2023	5/4/2023
Room Temp (Deg C)	23	23	23	23
Rel Humidity (%)	55	55	55	54
Technician	Peter Chen	Peter Chen	Peter Chen	Peter Chen
mOhm values	Actual **Initial**	**Delta Cycles**	**Delta Therm Shck**	**Delta Humidity**
	Pin Type: Signal 1			
Average	150.12	1.31	4.64	2.53
St. Dev.	4.31	0.95	3.47	2.01
Min	139.68	0.04	1.28	0.05
Max	156.1	3.57	13.91	9.55
Summary Count	32	32	32	32
Total Count	32	32	32	32
	Pin Type: GND 1			
Average	34.02	0.52	2.75	3.05
St. Dev.	1.05	0.29	0.98	1.08
Min	32.82	0.06	1.56	0.8
Max	35.53	0.87	4.14	4.06
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**
Cycles	**40**	**0**	**0**	**0**	**0**	**0**
Therm Shck	**29**	**7**	**4**	**0**	**0**	**0**
Humidity	**37**	**3**	**0**	**0**	**0**	**0**

DATA SUMMARIES

1000 Cycles

	LLCR Measurement Summaries by Pin Type			
Date	4/3/2023	4/20/2023	6/6/2023	6/25/2023
Room Temp (Deg C)	23	23	23	23
Rel Humidity (%)	55	54	54	52
Technician	Peter Chen	Peter Chen	Peter Chen	Peter Chen
mOhm values	Actual **Initial**	**Delta Cycles**	**Delta Therm Shck**	**Delta Humidity**
	Pin Type: Signal 1			
Average	152.6	2.82	2.96	4.06
St. Dev.	3.93	1.45	2.98	2.95
Min	144.4	0.02	0.05	0.06
Max	161.31	4.96	12.2	12.84
Summary Count	32	32	32	32
Total Count	32	32	32	32
	Pin Type: GND 1			
Average	35.01	1	2.54	5.05
St. Dev.	0.86	0.76	1.44	2.23
Min	33.73	0.04	0.06	1.3
Max	36.18	1.98	4.3	9.13
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**
Cycles	**40**	**0**	**0**	**0**	**0**	**0**
Therm Shck	**36**	**2**	**2**	**0**	**0**	**0**
Humidity	**26**	**13**	**1**	**0**	**0**	**0**

EQUIPMENT AND CALIBRATION SCHEDULES

Equipment #: HZ-THC-01
Description: Humidity transmitter
Manufacturer: Thermtron
Model: SM-8-8200
Serial #: 38846
Accuracy: Last Cal: 2/28/2023, Next Cal: 2/27/2024

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: 06/28/2021, Next Cal: 06/27/2022

Equipment #: HZ-MO-01
Description: Micro-ohmmeter
Manufacturer: Keithley
Model: 2700
Serial #: 1199807
Accuracy: Last Cal: 04/28/2022, Next Cal: 04/28/2023

Equipment #: HZ-PS-01
Description: Power Supply
Manufacturer: Agilent
Model: 6031A
Serial #: MY41000982
Accuracy: Last Cal: 04/28/2022, Next Cal: 04/28/2023