Project Number: Extended Life Test Report	Tracking Code: 1014281_Report_Rev_1
Requested by: Mark Shireman	Date: 1/18/2017
Part #: LPAF-30-03.0-S-06-2-K-TR/LPAM-30-01.5-S-06-2-K-TR	
Part description: LPAF/LPAM	Tech: Aaron McKim
Test Start: 11/28/2016	Test Completed: 12/2/2016

(Actual part not depicted)

EXTENDED LIFE TEST REPORT

LPAF/LPAM

LPAF-30-03.0-S-06-2-K-TR/LPAM-30-01.5-S-06-2-K-TR

REVISION HISTORY

DATE	REV.NUM.	DESCRIPTION	ENG
1/18/2017	**1**	**Initial Issue**	**KH**

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 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 are visually inspected and cleaned if necessary.
7) Any additional preparation will be noted in the individual test sequences.
8) Solder Information: Lead Free

FLOWCHARTS

Extended Life

Group 1
LPAF-30-03.0-S-06-2-K-TR
LPAM-30-01.5-S-06-2-K-TR
8 Assemblies
250 Cycles

Step	Description
1.	Plating Thickness Verification (4)
2.	LLCR (2)
3.	Cycles Quantity = 250 Cycles
4.	LLCR (2) Max Delta = 15 mOhm
5.	Photos (3)

Group 2
LPAF-30-03.0-S-06-2-K-TR
LPAM-30-01.5-S-06-2-K-TR
8 Assemblies
500 Cycles

Step	Description
1.	Plating Thickness Verification (4)
2.	LLCR (2)
3.	Cycles Quantity = 500 Cycles
4.	LLCR (2) Max Delta = 15 mOhm
5.	Photos (3)

Group 3
LPAF-30-03.0-S-06-2-K-TR
LPAM-30-01.5-S-06-2-K-TR
8 Assemblies
750 Cycles

Step	Description
1.	Plating Thickness Verification (4)
2.	LLCR (2)
3.	Cycles Quantity = 750 Cycles
4.	LLCR (2) Max Delta = 15 mOhm
5.	Photos (3)

Group 4
LPAF-30-03.0-S-06-2-K-TR
LPAM-30-01.5-S-06-2-K-TR
8 Assemblies
1000 Cycles

Step	Description
1.	Plating Thickness Verification (4)
2.	LLCR (2)
3.	Cycles Quantity = 1000 Cycles
4.	LLCR (2) Max Delta = 15 mOhm
5.	Thermal Shock (5)
6.	LLCR (2) Max Delta = 15 mOhm
7.	Humidity (1)
8.	LLCR (2) Max Delta = 15 mOhm
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 = 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)

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 1: -55℃ to +85℃
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.

MATING/UNMATING:

1) Reference document: EIA-364-13, *Mating and Unmating Forces Test Procedure for Electrical Connectors*.
2) The full insertion position was to within 0.003” to 0.004” of the plug bottoming out in the receptacle to prevent damage to the system under test.
3) One of the mating parts is secured to a floating X-Y table to prevent damage during cycling.

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 +30.0 mOhms: ---------- Acceptable
    d. +30.1 to +50.0 mOhms: ---------- Marginal
    e. +50.1 to +2000 mOhms: ---------- Unstable
    f. >+2000 mOhms:---------- Open Failure

RESULTS

LLCR Durability 250 Cycles (192 LLCR test points)

- **Initial ---------- 5.75 mOhms Max**
- **Durability, 250 Cycles**
  - **<= +5.0 mOhms ---------- 192 Points ---------- Stable**
  - **+5.1 to +10.0 mOhms ---------- 0 Points ---------- Minor**
  - **+10.1 to +30.0 mOhms ---------- 0 Points ---------- Acceptable**
  - **+30.1 to +50.0 mOhms ---------- 0 Points ---------- Marginal**
  - **+50.1 to +2000 mOhms ---------- 0 Points ---------- Unstable**
  - **>+2000 mOhms ---------- 0 Points ---------- Open Failure**

LLCR Durability 500 Cycles (192 LLCR test points)

- **Initial ---------- 5.67 mOhms Max**
- **Durability, 500 Cycles**
  - **<= +5.0 mOhms ---------- 192 Points ---------- Stable**
  - **+5.1 to +10.0 mOhms ---------- 0 Points ---------- Minor**
  - **+10.1 to +30.0 mOhms ---------- 0 Points ---------- Acceptable**
  - **+30.1 to +50.0 mOhms ---------- 0 Points ---------- Marginal**
  - **+50.1 to +2000 mOhms ---------- 0 Points ---------- Unstable**
  - **>+2000 mOhms ---------- 0 Points ---------- Open Failure**

LLCR Durability 750 Cycles (192 LLCR test points)

- **Initial ---------- 5.72 mOhms Max**
- **Durability, 750 Cycles**
  - **<= +5.0 mOhms ---------- 192 Points ---------- Stable**
  - **+5.1 to +10.0 mOhms ---------- 0 Points ---------- Minor**
  - **+10.1 to +30.0 mOhms ---------- 0 Points ---------- Acceptable**
  - **+30.1 to +50.0 mOhms ---------- 0 Points ---------- Marginal**
  - **+50.1 to +2000 mOhms ---------- 0 Points ---------- Unstable**
  - **>+2000 mOhms ---------- 0 Points ---------- Open Failure**

LLCR Durability 1000 Cycles (192 LLCR test points)

- **Initial ---------- 5.68 mOhms Max**
- **Durability, 1000 Cycles**
  - **<= +5.0 mOhms ---------- 192 Points ---------- Stable**
  - **+5.1 to +10.0 mOhms ---------- 0 Points ---------- Minor**
  - **+10.1 to +30.0 mOhms ---------- 0 Points ---------- Acceptable**
  - **+30.1 to +50.0 mOhms ---------- 0 Points ---------- Marginal**
  - **+50.1 to +2000 mOhms ---------- 0 Points ---------- Unstable**
  - **>+2000 mOhms ---------- 0 Points ---------- Open Failure**
- **Thermal**
  - **<= +5.0 mOhms ---------- 192 Points ---------- Stable**
  - **+5.1 to +10.0 mOhms ---------- 0 Points ---------- Minor**
  - **+10.1 to +30.0 mOhms ---------- 0 Points ---------- Acceptable**
  - **+30.1 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 ---------- 192 Points ---------- Stable**
  - **+5.1 to +10.0 mOhms ---------- 0 Points ---------- Minor**
  - **+10.1 to +30.0 mOhms ---------- 0 Points ---------- Acceptable**
  - **+30.1 to +50.0 mOhms ---------- 0 Points ---------- Marginal**
  - **+50.1 to +2000 mOhms ---------- 0 Points ---------- Unstable**
  - **>+2000 mOhms ---------- 0 Points ---------- Open Failure**

DATA SUMMARIES

LLCR Durability 250 Cycles:

1) A total of 192 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	11/28/2016	11/28/2016		
Room Temp (Deg C)	23	23		
Rel Humidity (%)	35	37		
Technician	Aaron McKim	Aaron McKim		
mOhm values	**Actual Initial**	**Delta 250 Cycles**	**Delta**	**Delta**
250 Cycles	**Pin Type 1: Signal**			
Average	5.03	0.13		
St. Dev.	0.30	0.10		
Min	4.23	0.00		
Max	5.75	0.44		
Summary Count	192	192		
Total Count	192	192		

LLCR Delta Count by Category						
	Stable	**Minor**	**Acceptable**	**Marginal**	**Unstable**	**Open**
mOhms	**<=5**	**>5 & <=10**	**>10 & <=15**	**>15 & <=50**	**>50 & <=1000**	**>1000**
250 Cycles	**192**	**0**	**0**	**0**	**0**	**0**

DATA SUMMARIES Continued

LLCR Durability 500 Cycles:

1) A total of 192 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	11/28/2016	11/30/2016		
Room Temp (Deg C)	23	23		
Rel Humidity (%)	35	41		
Technician	Aaron McKim	Aaron McKim		
mOhm values	**Actual Initial**	**Delta 500 Cycles**	**Delta**	**Delta**
500 Cycles	**Pin Type 1: Signal**			
Average	5.05	0.12		
St. Dev.	0.27	0.10		
Min	4.41	0.00		
Max	5.67	0.51		
Summary Count	192	192		
Total Count	192	192		

LLCR Delta Count by Category						
	Stable	**Minor**	**Acceptable**	**Marginal**	**Unstable**	**Open**
mOhms	**<=5**	**>5 & <=10**	**>10 & <=15**	**>15 & <=50**	**>50 & <=1000**	**>1000**
500 Cycles	**192**	**0**	**0**	**0**	**0**	**0**

DATA SUMMARIES Continued

LLCR Durability 750 Cycles:

1) A total of 192 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	11/28/2016	12/1/2016		
Room Temp (Deg C)	23	23		
Rel Humidity (%)	35	33		
Technician	Aaron McKim	Aaron McKim		
mOhm values	**Actual Initial**	**Delta 750 Cycles**	**Delta**	**Delta**
750 Cycles	**Pin Type 1: Signal**			
Average	5.02	0.13		
St. Dev.	0.25	0.10		
Min	4.31	0.00		
Max	5.72	0.51		
Summary Count	192	192		
Total Count	192	192		

LLCR Delta Count by Category						
	Stable	**Minor**	**Acceptable**	**Marginal**	**Unstable**	**Open**
mOhms	**<=5**	**>5 & <=10**	**>10 & <=15**	**>15 & <=50**	**>50 & <=1000**	**>1000**
750 Cycles	**192**	**0**	**0**	**0**	**0**	**0**

DATA SUMMARIES Continued

LLCR Durability 1000 Cycles:

1) A total of 192 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	11/28/2016	12/2/2016	1/3/2017	1/16/2017
Room Temp (Deg C)	23	23	23	23
Rel Humidity (%)	35	34	45	35
Technician	Aaron McKim	Aaron McKim	Aaron McKim	Aaron McKim
mOhm values	**Actual Initial**	**Delta 1000 Cycles**	**Delta Thermal Shock**	**Delta Humidity**
1000 Cycles	**Pin Type 1: Signal**			
Average	5.07	0.13	0.17	0.18
St. Dev.	0.26	0.12	0.13	0.13
Min	4.35	0.00	0.00	0.00
Max	5.68	0.83	0.92	0.91
Summary Count	192	192	192	192
Total Count	192	192	192	192

LLCR Delta Count by Category						
	Stable	**Minor**	**Acceptable**	**Marginal**	**Unstable**	**Open**
mOhms	**<=5**	**>5 & <=10**	**>10 & <=15**	**>15 & <=50**	**>50 & <=1000**	**>1000**
1000 Cycles	**192**	**0**	**0**	**0**	**0**	**0**
Thermal Shock	**192**	**0**	**0**	**0**	**0**	**0**
Humidity	**192**	**0**	**0**	**0**	**0**	**0**

EQUIPMENT AND CALIBRATION SCHEDULES

Equipment #: TCT-04
Description: Dillon Quantrol TC21 25-1000 mm/min series test stand
Manufacturer: Dillon Quantrol
Model: TC2 I series test stand
Serial #: 04-1041-04
Accuracy: Speed Accuracy: +/- 5% of indicated speed; Speed Accuracy: +/- 5% of indicated speed;
… Last Cal: 05/29/2016, Next Cal: 05/29/2017

Equipment #: MO-11
Description: Switch/Multimeter
Manufacturer: Keithley
Model: 3706
Serial #: 120169
Accuracy: See Manual
… Last Cal: 09/11/2016, Next Cal: 09/11/2017

Equipment #: THC-05
Description: Temperature/Humidity Chamber (Chamber Room)
Manufacturer: Thermotron
Model: SM-8-3800
Serial #: 05 23 00 02
Accuracy: See Manual
… Last Cal: 11/30/2016, Next Cal: 05/30/2017

Equipment #: TSC-01
Description: Vertical Thermal Shock Chamber
Manufacturer: Cincinnati Sub Zero
Model: VTS-3-6-6-SC/AC
Serial #: 10-VT14993
Accuracy: See Manual
… Last Cal: 06/30/2016, Next Cal: 06/30/2017