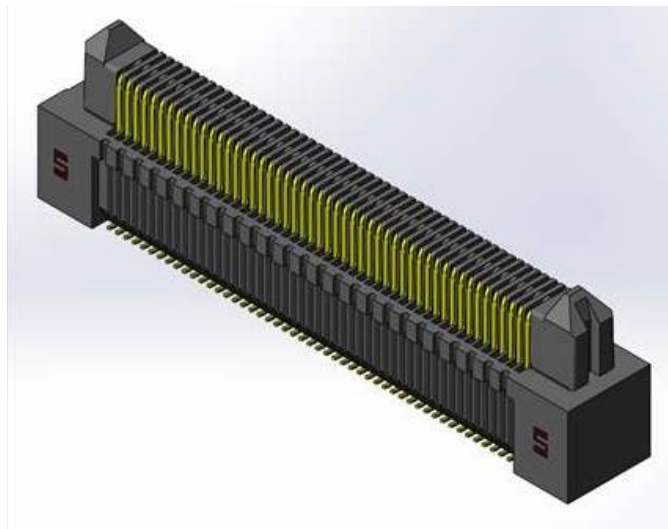
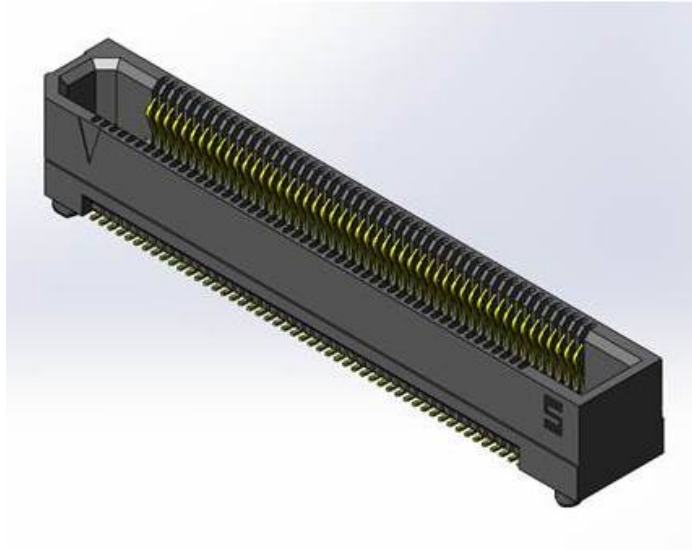




Project Number: Extended Life Cycles Test Report	Tracking Code: 293637_Report_Rev_1
Requested by: Catie Eichhorn	Date: 7/28/2014
Part #: ERF5-050-05.0-S-DV-TR/ERM5-050-05.0-S-DV-TR	
Part description: ERF5/ERM5	Tech: Kason He
Test Start: 3/06/2014	Test Completed: 3/25/2014



EXTENDED LIFE CYCLES TEST REPORT

ERF5/ERM5

ERF5-050-05.0-S-DV-TR/ERM5-050-05.0-S-DV-TR

REVISION HISTORY

DATA	REV.NUM.	DESCRIPTION	ENG
07/25/2014	1	Initial Issue	KH

CERTIFICATION

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

All contents contained herein are the property of Samtec. No portion of this report, in part or in full shall be reproduced without prior written approval of Samtec.

SCOPE

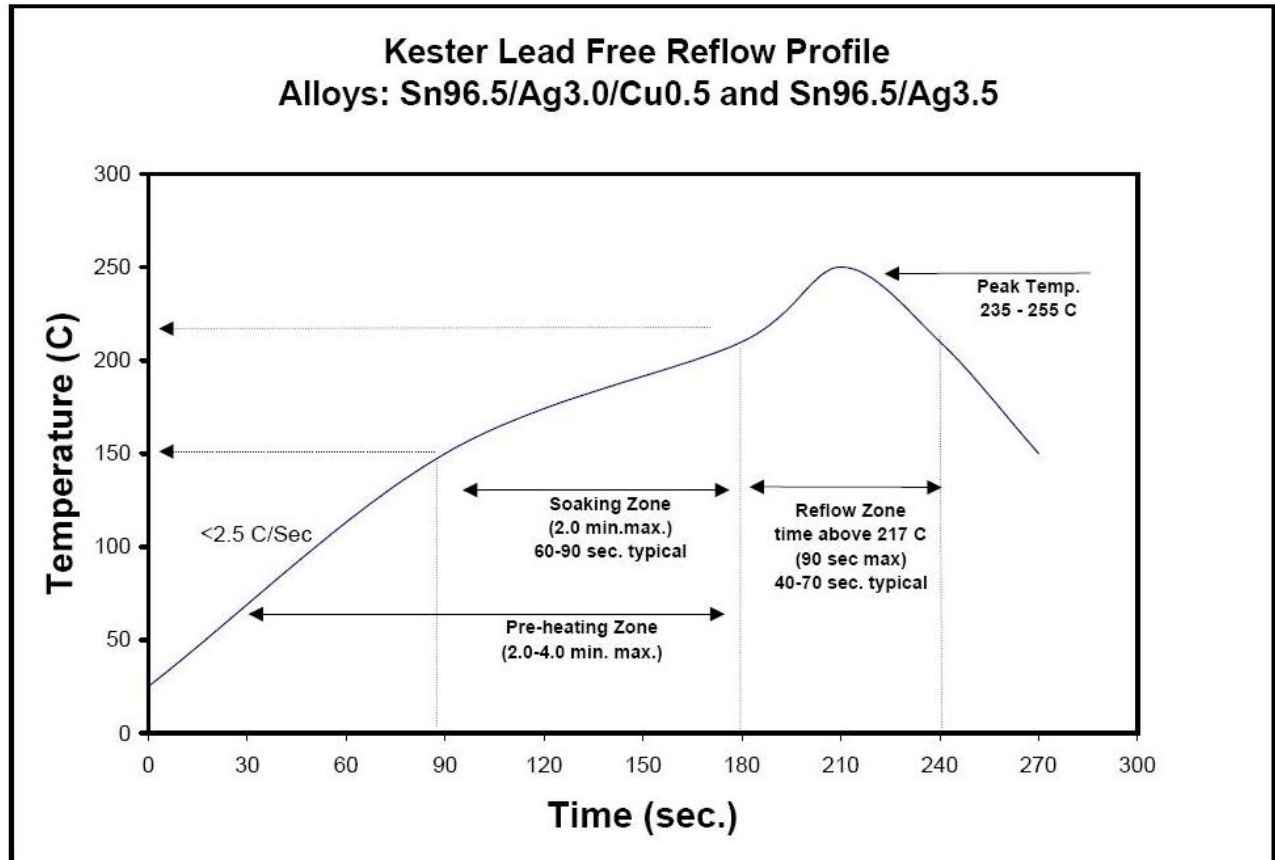
To perform the following tests: Design Qualification test. Please see test plan.

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
- 9) Re-Flow Time/Temp: See accompanying profile.
- 10) Samtec Test PCBs used: PCB-106079-TST

TYPICAL OVEN PROFILE (Soldering Parts to Test Boards)

FLOWCHARTS**Extended Life**Group 1

ERF5-050-05.0-S-DV-TR
ERM5-050-05.0-S-DV-TR
8 Assemblies
100 Cycles

Group 2

ERF5-050-05.0-S-DV-TR
ERM5-050-05.0-S-DV-TR
8 Assemblies
250 Cycles

Step Description

1. Plating Thickness Verification (4)
2. LLCR (2)
Max Delta = 15 mOhm
3. Cycles
Quantity = 100 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)

Step Description

1. Plating Thickness Verification (4)
2. LLCR (2)
Max Delta = 15 mOhm
3. Cycles
Quantity = 250 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°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.

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. $\leq +5.0$ 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

LLCR Mating/Unmating Durability (192 LLCR test points)

100 Cycles Group

- **Initial** ----- 27.44 mOhms Max
- **Durability, 100 Cycles**
 - **<= +5.0 mOhms** ----- 192 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** ----- 192 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
- **Humidity**
 - **<= +5.0 mOhms** ----- 187 Points ----- Stable
 - **+5.1 to +10.0 mOhms** ----- 5 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

250 Cycles Group

- **Initial** ----- 27.92 mOhms Max
- **Durability, 100 Cycles**
 - **<= +5.0 mOhms** ----- 184 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 +2000 mOhms** ----- 0 Points ----- Unstable
 - **>+2000 mOhms** ----- 0 Points ----- Open Failure
- **Thermal Shock**
 - **<= +5.0 mOhms** ----- 187 Points ----- Stable
 - **+5.1 to +10.0 mOhms** ----- 5 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** ----- 174 Points ----- Stable
 - **+5.1 to +10.0 mOhms** ----- 18 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

DATA SUMMARIES**LLCR Mating/Unmating Durability ----100 Cycles Group**

- 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. $\leq +5.0$ 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	3/6/2014	3/6/2014	3/12/2014	3/25/2014
Room Temp (Deg C)	22	22	22	21
Rel Humidity (%)	54	54	54	53
Technician	Kason He	Kason He	Kason He	Kason He
mOhm values	Actual Initial	Delta 100 Cycles	Delta Therm Shck	Delta Humidity
Pin Type 1: Signal				
Average	22.82	1.27	1.13	1.50
St. Dev.	1.11	1.05	0.96	1.34
Min	20.90	0.00	0.01	0.00
Max	27.44	4.53	4.73	6.17
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	$>5 \ \& \ \leq 10$	$>10 \ \& \ \leq 15$	$>15 \ \& \ \leq 50$	$>50 \ \& \ \leq 1000$	>1000
100 Cycles	192	0	0	0	0	0
Therm Shck	192	0	0	0	0	0
Humidity	187	5	0	0	0	0

DATA SUMMARIES Continued**LLCR Mating/Unmating Durability ----250 Cycles Group**

- 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. $\leq +5.0$ 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	3/6/2014	3/7/2014	3/12/2014	3/25/2014
Room Temp (Deg C)	22	22	22	21
Rel Humidity (%)	54	54	54	53
Technician	Kason He	Kason He	Kason He	Kason He
mOhm values	Actual Initial	Delta 250 Cycles	Delta Therm Shck	Delta Humidity
Pin Type 1: Signal				
Average	23.24	1.75	1.65	1.94
St. Dev.	1.48	1.37	1.35	1.85
Min	21.15	0.01	0.03	0.02
Max	27.92	6.21	6.08	9.24
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	$>5 \ \& \ \leq 10$	$>10 \ \& \ \leq 15$	$>15 \ \& \ \leq 50$	$>50 \ \& \ \leq 1000$	>1000
250 Cycles	184	8	0	0	0	0
Therm Shck	187	5	0	0	0	0
Humidity	174	18	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: 4/26/2013, Next Cal: 4/25/2014**Equipment #:** HZ-THC-01**Description:** Humidity transmitter**Manufacturer:** Thermtron**Model:** SM-8-8200**Serial #:** 38846**Accuracy:** Last Cal: 2/27/2014, Next Cal: 2/26/2015**Equipment #:** HZ-MO-05**Description:** Micro-ohmmeter**Manufacturer:** Keithley**Model:** 3706**Serial #:** 1285188**Accuracy:** Last Cal: 11/14/2013, Next Cal: 11/13/2014**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: 06/27/2013, Next Cal: 06/26/2014