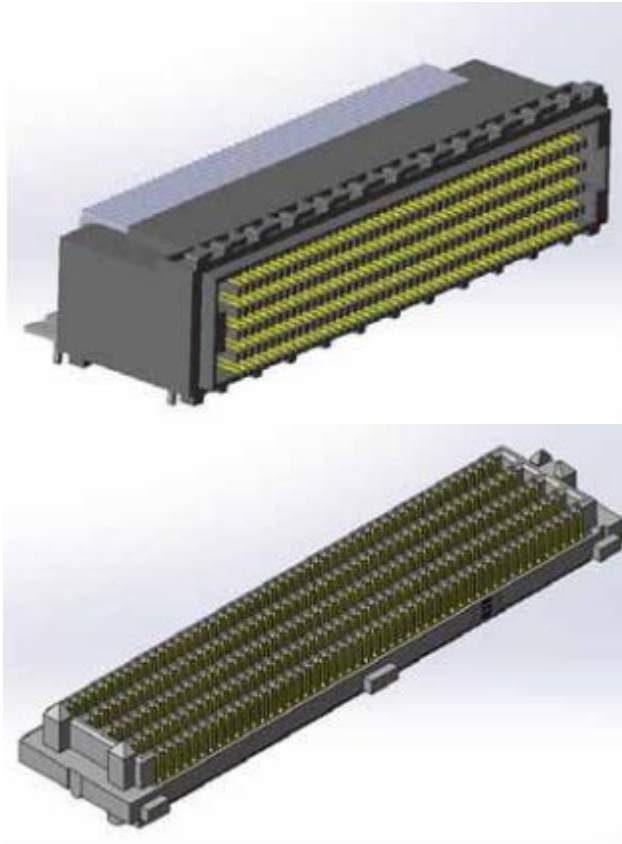




Project Number: Design Qualification Test Report	Tracking Code: 1933773_Report_Rev_1
Requested by: Corey Rose	Date: 5/9/2019
Part #: SEAF8-50-1-S-04-2-RA-GP/SEAM8-50-S02.0-S-04-2-GP	Tech: Peter Chen
Part description: SEAF8/SEAM8	Qty to test: 16
Test Start: 03/15/2019	Test Completed: 04/30/2019



DESIGN QUALIFICATION TEST REPORT

SEAF8/SEAM8

SEAF8-50-1-S-04-2-RA-GP/SEAM8-50-S02.0-S-04-2-GP

REVISION HISTORY

DATA	REV.NUM.	DESCRIPTION	ENG
5/7/2019	1	Initial Issue	PC

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.

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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 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 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-107779-TST.

FLOWCHARTS

Gas Tight

Group 1

SEAF8-50-1-S-04-2-RA-GP

SEAM8-50-S02.0-S-04-2-GP

8 Assemblies

Step	Description
------	-------------

- | | |
|----|---------------------------------|
| 1. | LLCR (2) |
| 2. | Gas Tight (1) |
| 3. | LLCR (2)
Max Delta = 15 mOhm |

(1) Gas Tight = EIA-364-36

(2) LLCR = EIA-364-23

Open Circuit Voltage = 20 mV Max

Test Current = 100 mA Max

FLOWCHARTS Continued**Mating/Unmating/Durability**Group 1

SEAF8-50-1-S-04-2-RA-GP

SEAM8-50-S02.0-S-04-2-GP

8 Assemblies

Step	Description
1.	Contact Gaps
2.	LLCR ⁽²⁾
3.	Mating/Unmating Force ⁽³⁾
4.	Cycles Quantity ■ 25 Cycles
5.	Mating/Unmating Force ⁽³⁾
6.	Contact Gaps
7.	LLCR ⁽²⁾ Max Delta ■ 15 mOhm
8.	Thermal Shock ⁽⁴⁾
9.	LLCR ⁽²⁾ Max Delta ■ 15 mOhm
10.	Humidity ⁽¹⁾
11.	LLCR ⁽²⁾ Max Delta ■ 15 mOhm
12.	Mating/Unmating Force ⁽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) Mating/Unmating Force = EIA-364-13**(4) 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.

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.

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. $\leq +0.33$ mOhms: ----- Stable
 - b. $+0.33$ to $+0.66$ mOhms: ----- Minor
 - c. $+0.67$ to $+1.00$ mOhms: ----- Acceptable
 - d. $+1.01$ to $+50.0$ mOhms: ----- Marginal
 - e. $+50.1$ to $+1000$ mOhms: ----- Unstable
 - f. $>+1000$ mOhms: ----- Open Failure

RESULTS

Mating – Unmating Forces

Mating-Unmating Durability Group

- **Initial**
 - **Mating**
 - **Min** -----12.68 lbs
 - **Max** -----16.10 lbs
 - **Unmating**
 - **Min** ----- 8.03 lbs
 - **Max** -----11.68 lbs
- **After 25 Cycles**
 - **Mating**
 - **Min** -----17.64 lbs
 - **Max** -----19.52 lbs
 - **Unmating**
 - **Min** -----10.94 lbs
 - **Max** -----11.96 lbs
- **Humidity**
 - **Mating**
 - **Min** ----- 9.33 lbs
 - **Max** -----10.02 lbs
 - **Unmating**
 - **Min** ----- 5.23 lbs
 - **Max** ----- 5.64 lbs

RESULTS Continued**LLCR Mating/Unmating Durability Group (192 LLCR test points)**

Row 1

- Initial ----- 23.41 mOhms Max

Row 2

- Initial ----- 28.51 mOhms Max

Row 3

- Initial ----- 30.61 mOhms Max

Row 4

- Initial ----- 33.55 mOhms Max
- Durability, 25 Cycles
 - $\leq +0.33$ mOhms ----- 192 Points ----- Stable
 - $+0.34$ to $+0.66$ mOhms ----- 0 Points ----- Minor
 - $+0.67$ to $+1.00$ mOhms ----- 0 Points ----- Acceptable
 - $+1.01$ to $+50.0$ mOhms ----- 0 Points ----- Marginal
 - $+50.1$ to $+1000$ mOhms ----- 0 Points ----- Unstable
 - $>+1000$ mOhms ----- 0 Points ----- Open Failure
- Thermal Shock
 - $\leq +0.33$ mOhms ----- 192 Points ----- Stable
 - $+0.34$ to $+0.66$ mOhms ----- 0 Points ----- Minor
 - $+0.67$ to $+1.00$ mOhms ----- 0 Points ----- Acceptable
 - $+1.01$ to $+50.0$ mOhms ----- 0 Points ----- Marginal
 - $+50.1$ to $+1000$ mOhms ----- 0 Points ----- Unstable
 - $>+1000$ mOhms ----- 0 Points ----- Open Failure
- Humidity
 - $\leq +0.33$ mOhms ----- 192 Points ----- Stable
 - $+0.34$ to $+0.66$ mOhms ----- 0 Points ----- Minor
 - $+0.67$ to $+1.00$ mOhms ----- 0 Points ----- Acceptable
 - $+1.01$ to $+50.0$ mOhms ----- 0 Points ----- Marginal
 - $+50.1$ to $+1000$ mOhms ----- 0 Points ----- Unstable
 - $>+1000$ mOhms ----- 0 Points ----- Open Failure

LLCR Gas Tight Group (192 LLCR test points)

Row 1

- Initial ----- 24.00 mOhms Max

Row 2

- Initial ----- 28.77 mOhms Max

Row 3

- Initial ----- 31.08 mOhms Max

Row 4

- Initial ----- 33.24 mOhms Max
- Gas-Tight
 - $\leq +0.33$ mOhms ----- 192 Points ----- Stable
 - $+0.34$ to $+0.66$ mOhms ----- 0 Points ----- Minor
 - $+0.67$ to $+1.00$ mOhms ----- 0 Points ----- Acceptable
 - $+1.01$ to $+50.0$ mOhms ----- 0 Points ----- Marginal
 - $+50.1$ to $+1000$ mOhms ----- 0 Points ----- Unstable
 - $>+1000$ mOhms ----- 0 Points ----- Open Failure

DATA SUMMARIES**MATING-UNMATING FORCE:****Mating-Unmating Durability Group**

	Initial				After 25 Cycles			
	Mating		Unmating		Mating		Unmating	
	Newton's	Force (Lbs)	Newton's	Force (Lbs)	Newton's	Force (Lbs)	Newton's	Force (Lbs)
Minimum	56.39	12.68	35.70	8.03	78.44	17.64	48.67	10.94
Maximum	71.60	16.10	51.94	11.68	86.82	19.52	53.19	11.96
Average	65.73	14.78	41.52	9.33	82.71	18.59	50.46	11.34
St Dev	4.68	1.05	5.02	1.13	2.73	0.61	1.38	0.31
Count	8	8	8	8	8	8	8	8
	After Humidity							
	Mating		Unmating					
	Newton's	Force (Lbs)	Newton's	Force (Lbs)				
Minimum	41.48	9.33	23.24	5.23				
Maximum	44.57	10.02	25.09	5.64				
Average	43.19	9.71	23.84	5.36				
St Dev	1.15	0.26	0.60	0.13				
Count	8	8	8	8				

DATA SUMMARIES Continued**LLCR Mating/Unmating Durability 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. $\leq +0.33$ mOhms: ----- Stable
 - b. $+0.34$ to $+0.66$ mOhms: ----- Minor
 - c. $+0.67$ to $+1.00$ mOhms: ----- Acceptable
 - d. $+1.01$ to $+50.0$ mOhms: ----- Marginal
 - e. $+50.1$ to $+1000$ mOhms: ----- Unstable
 - f. $>+1000$ mOhms: ----- Open Failure

LLCR Measurement Summaries by Pin Type				
Date	3/21/2019	4/8/2019	4/15/2019	4/29/2019
Room Temp (Deg C)	22	22	22	23
Rel Humidity (%)	40	46	29	43
Technician	Aaron McKim	Aaron McKim	Aaron McKim	Aaron McKim
mOhm values	Actual Initial	Delta 25 Cycles	Delta Therm Shck	Delta Humidity
Pin Type 1: Row 1				
Average	22.81	0.29	0.45	0.47
St. Dev.	0.31	0.24	0.25	0.26
Min	22.19	0.00	0.07	0.12
Max	23.41	1.00	0.90	1.00
Summary Count	32	32	32	32
Total Count	32	32	32	32
Pin Type 2: Row 2				
Average	27.68	0.68	0.57	0.67
St. Dev.	0.38	0.49	0.34	0.46
Min	26.79	0.07	0.00	0.01
Max	28.51	1.98	1.39	1.57
Summary Count	40	40	40	40
Total Count	40	40	40	40
Pin Type 3: Row 3				
Average	29.80	0.46	0.68	0.68
St. Dev.	0.29	0.24	0.36	0.39
Min	29.22	0.04	0.00	0.03
Max	30.61	1.12	1.61	1.74
Summary Count	56	56	56	56
Total Count	56	56	56	56
Pin Type 4: Row 4				
Average	32.40	0.65	0.48	0.43
St. Dev.	0.37	0.44	0.53	0.43
Min	31.69	0.03	0.02	0.02
Max	33.55	1.80	3.78	2.86
Summary Count	64	64	64	64
Total Count	64	64	64	64

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

DATA SUMMARIES Continued

LLCR Gas Tight Group

- 2) A total of 192 points were measured.
- 3) EIA-364-23, *Low Level Contact Resistance Test Procedure for Electrical Connectors and Sockets*.
- 4) A computer program, *LLCR 221.exe*, ensures repeatability for data acquisition.
- 5) The following guidelines are used to categorize the changes in LLCR as a result from stressing.
 - a. $\leq +0.33$ mOhms: ----- Stable
 - b. $+0.37$ to $+0.66$ mOhms: ----- Minor
 - c. $+0.67$ to $+1.00$ mOhms: ----- Acceptable
 - d. $+1.01$ to $+50.0$ mOhms: ----- Marginal
 - e. $+50.1$ to $+1000$ mOhms: ----- Unstable
 - f. $>+1000$ mOhms: ----- Open Failure

LLCR Measurement Summaries by Pin Type				
Date	3/27/2019	3/27/2019		
Room Temp (Deg C)	22	22		
Rel Humidity (%)	35	35		
Technician	Tony Wagoner	Tony Wagoner		
mOhm values	Actual Initial	Delta Acid Vapor	Delta	Delta
Pin Type 1: Row 1				
Average	22.84	0.34		
St. Dev.	0.46	0.26		
Min	21.65	0.00		
Max	24.00	1.11		
Summary Count	32	32		
Total Count	32	32		
Pin Type 2: Row 2				
Average	27.36	0.64		
St. Dev.	0.45	0.36		
Min	26.60	0.00		
Max	28.77	1.16		
Summary Count	40	40		
Total Count	40	40		
Pin Type 3: Row 3				
Average	29.92	0.58		
St. Dev.	0.38	0.34		
Min	29.37	0.03		
Max	31.08	1.75		
Summary Count	56	56		
Total Count	56	56		
Pin Type 4: Row 4				
Average	32.17	0.53		
St. Dev.	0.56	0.46		
Min	28.97	0.00		
Max	33.24	3.39		
Summary Count	64	64		
Total Count	64	64		

LLCR Delta Count by Category						
	Stable	Minor	Acceptable	Marginal	Unstable	Open
mOhms	<=5	>5 & <=10	>10 & <=15	>15 & <=50	>50 & <=1000	>1000
Acid Vapor	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: 05/29/2018, Next Cal: 05/29/2019**Equipment #:** MO-11**Description:** Switch/Multimeter**Manufacturer:** Keithley**Model:** 3706**Serial #:** 120169**Accuracy:** See Manual

... Last Cal: 09/11/2018, Next Cal: 09/11/2019

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: 05/31/2018, Next Cal: 05/31/2019

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: 06/30/2018, Next Cal: 06/30/2019

EQUIPMENT AND CALIBRATION SCHEDULES**Equipment #:** SVC-01**Description:** Shock & Vibration Table**Manufacturer:** Data Physics**Model:** LE-DSA-10-20K**Serial #:** 10037**Accuracy:** See Manual

... Last Cal: 04/22/2019, Next Cal: 04/22/2020

Equipment #: ACLM-01**Description:** Accelerometer**Manufacturer:** PCB Piezotronics**Model:** 352C03**Serial #:** 115819**Accuracy:** See Manual

... Last Cal: 07/18/2018, Next Cal: 07/18/2019

Equipment #: ED-03**Description:** Event Detector**Manufacturer:** Analysis Tech**Model:** 32EHD**Serial #:** 1100604**Accuracy:** See Manual

... Last Cal: 10/31/2018, Next Cal: 10/31/2019

Equipment #: MO-04**Description:** Multimeter /Data Acquisition System**Manufacturer:** Keithley**Model:** 2700**Serial #:** 0798688**Accuracy:** See Manual

... Last Cal: 09/11/2018, Next Cal: 09/11/2019