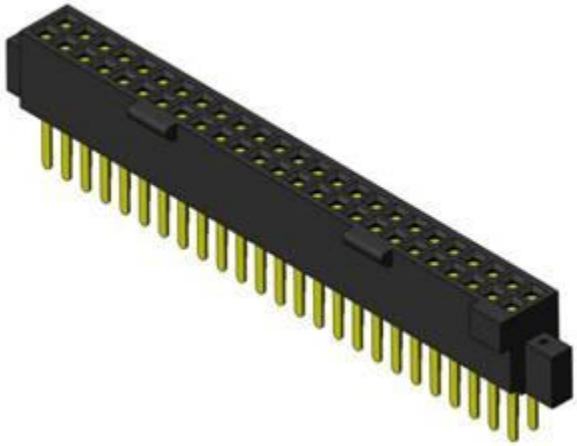
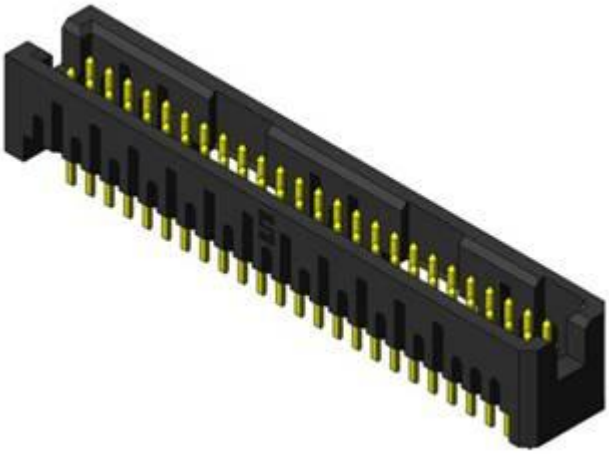
Project Number: Design Qualification Test Report	Tracking Code: 185189_Report_Rev_2		
Requested by: Eric Mings	Date: 11/26/2012	Product Rev: N/A	
Part #: SFML-150-T2-L-D-A\ TFML-150-02-L-D-A SFML-125-T2-L-D-A\ TFML-125-02-L-D-A SFML-105-T2-L-D-A\ TFML-105-02-L-D-A	Lot #: N/A	Tech: Kason He	Eng: Vico Zhao
Part description: SFML\TFML			Qty to test: 24
Test Start: 5/1/2012	Test Completed: 5/19/2012		





DESIGN QUALIFICATION TEST REPORT

SFML\ TFML
SFML-150-T2-L-D-A\ TFML-150-02-L-D-A
SFML-125-T2-L-D-A\ TFML-125-02-L-D-A
SFML-105-T2-L-D-A\ TFML-105-02-L-D-A

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.

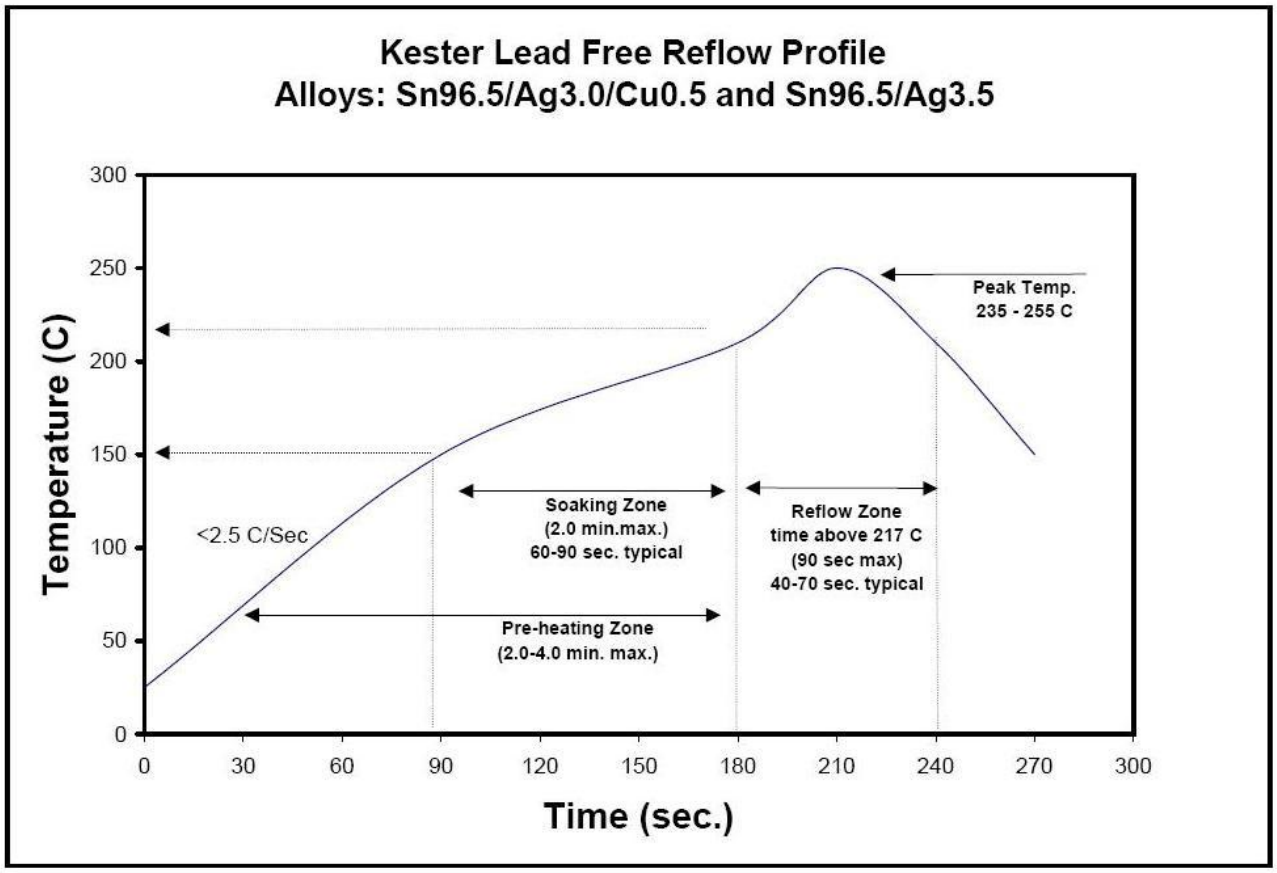
APPLICABLE DOCUMENTS

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

TYPICAL OVEN PROFILE (Soldering Parts to Test Boards)



FLOWCHARTS

Durability/Mating/Unmating/Gaps

TEST STEP	GROUP B1 8 Boards (largest position submitted)	GROUP B2 8 Boards (middle position submitted)	GROUP B3 8 Boards (smallest position submitted)
01	Contact Gaps	Contact Gaps	Contact Gaps
02	LLCR-1	Forces - Mating / Unmating	Forces - Mating / Unmating
03	Forces - Mating / Unmating	25 Cycles	25 Cycles
04	25 Cycles	Forces - Mating / Unmating	Forces - Mating / Unmating
05	Forces - Mating / Unmating	25 Cycles (50 Total)	25 Cycles (50 Total)
06	25 Cycles (50 Total)	Forces - Mating / Unmating	Forces - Mating / Unmating
07	Forces - Mating / Unmating	25 Cycles (75 Total)	25 Cycles (75 Total)
08	25 Cycles (75 Total)	Forces - Mating / Unmating	Forces - Mating / Unmating
09	Forces - Mating / Unmating	25 Cycles (100 Total)	25 Cycles (100 Total)
10	25 Cycles (100 Total)	Forces - Mating / Unmating	Forces - Mating / Unmating
11	Forces - Mating / Unmating		
12	Clean w/Compressed Air		
13	Contact Gaps		
14	LLCR-2		
15	Thermal Shock (Mated and Undisturbed)		
16	LLCR-3		
17	Cyclic Humidity (Mated and Undisturbed)		
18	LLCR-4		
19	Forces - Mating / Unmating		

Thermal Shock = EIA-364-32, Table II, Test Condition I:

-55°C to +85°C 1/2 hour dwell, 100 cycles

Humidity = EIA-364-31, Test Condition B (240 Hours)

and Method III (+25°C to +65°C @ 90% RH to 98% RH)

ambient pre-condition and delete steps 7a and 7b

Mating / Unmating Forces = EIA-364-13

Contact Gaps / Height - No standard method. Usually measured optically.

Gaps to be taken on a minimum of 20% of each part tested

LLCR = EIA-364-23, LLCR

20 mV Max, 100 mA Max

Use Keithley 580 or 3706 in 4 wire dry circuit mode

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.

CONTACT GAPS:

1) Gaps above the surrounding plastic surface were measured before and after stressing the contacts (e.g. thermal aging, mechanical cycling, etc.).
2) Typically, all contacts on the connector are measured.

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 +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

Mating\Unmating Forces

SFML-150-T2-L-D-A\ TFML-150-02-L-D-A

- **Initial**
  - **Mating**
    - **Min ----------16.01 Lbs**
    - **Max----------19.58 Lbs**
  - **Unmating**
    - **Min ----------15.29 Lbs**
    - **Max----------22.02 Lbs**
- **After 25 Cycles**
  - **Mating**
    - **Min ----------15.53 Lbs**
    - **Max----------20.22 Lbs**
  - **Unmating**
    - **Min ----------15.79 Lbs**
    - **Max----------22.57 Lbs**
- **After 50 Cycles**
  - **Mating**
    - **Min ----------16.19 Lbs**
    - **Max----------20.87 Lbs**
  - **Unmating**
    - **Min ----------17.00 Lbs**
    - **Max----------22.97 Lbs**
- **After 75 Cycles**
  - **Mating**
    - **Min ----------17.05 Lbs**
    - **Max----------21.31 Lbs**
  - **Unmating**
    - **Min ----------17.84 Lbs**
    - **Max----------23.36 Lbs**
- **After 100 Cycles**
  - **Mating**
    - **Min ----------17.48 Lbs**
    - **Max----------21.79 Lbs**
  - **Unmating**
    - **Min ----------18.19 Lbs**
    - **Max----------23.73 Lbs**
- **After Humidity**
  - **Mating**
    - **Min ----------11.63 Lbs**
    - **Max----------14.93 Lbs**
  - **Unmating**
    - **Min ----------11.84 Lbs**
    - **Max----------17.17 Lbs**

RESULTS Continued

Mating\Unmating Forces

SFML-125-T2-L-D-A\ TFML-125-02-L-D-A

- **Initial**
  - **Mating**
    - **Min ---------- 9.58 Lbs**
    - **Max----------12.04 Lbs**
  - **Unmating**
    - **Min ----------13.11 Lbs**
    - **Max----------16.94 Lbs**
- **After 25 Cycles**
  - **Mating**
    - **Min ---------- 7.26 Lbs**
    - **Max---------- 8.52 Lbs**
  - **Unmating**
    - **Min ---------- 8.31 Lbs**
    - **Max---------- 9.96 Lbs**
- **After 50 Cycles**
  - **Mating**
    - **Min ---------- 7.55 Lbs**
    - **Max---------- 8.97 Lbs**
  - **Unmating**
    - **Min ---------- 8.34 Lbs**
    - **Max----------10.62 Lbs**
- **After 75 Cycles**
  - **Mating**
    - **Min ---------- 7.63 Lbs**
    - **Max---------- 9.47 Lbs**
  - **Unmating**
    - **Min ---------- 8.57 Lbs**
    - **Max----------11.21 Lbs**
- **After 100 Cycles**
  - **Mating**
    - **Min ---------- 7.89 Lbs**
    - **Max---------- 9.56 Lbs**
  - **Unmating**
    - **Min ---------- 8.70 Lbs**
    - **Max----------11.47 Lbs**

RESULTS Continued

Mating\Unmating Forces

SFML-105-T2-L-D-A\ TFML-105-02-L-D-A

- **Initial**
  - **Mating**
    - **Min ---------- 2.41 Lbs**
    - **Max---------- 3.25 Lbs**
  - **Unmating**
    - **Min ---------- 3.04 Lbs**
    - **Max---------- 4.89 Lbs**
- **After 25 Cycles**
  - **Mating**
    - **Min ---------- 1.84 Lbs**
    - **Max---------- 3.28 Lbs**
  - **Unmating**
    - **Min ---------- 2.02 Lbs**
    - **Max---------- 3.52 Lbs**
- **After 50 Cycles**
  - **Mating**
    - **Min ---------- 1.73 Lbs**
    - **Max---------- 2.17 Lbs**
  - **Unmating**
    - **Min ---------- 2.05 Lbs**
    - **Max---------- 3.19 Lbs**
- **After 75 Cycles**
  - **Mating**
    - **Min ---------- 1.73 Lbs**
    - **Max---------- 2.13 Lbs**
  - **Unmating**
    - **Min ---------- 1.99 Lbs**
    - **Max---------- 2.67 Lbs**
- **After 100 Cycles**
  - **Mating**
    - **Min ---------- 1.60 Lbs**
    - **Max---------- 2.05 Lbs**
  - **Unmating**
    - **Min ---------- 1.84 Lbs**
    - **Max---------- 2.55 Lbs**

RESULTS Continued

LLCR Durability:

- **Initial ---------- 10.12mOhms Max**
- **Durability, 25 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**
  - **<= +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 ---------- 190 Points ---------- Stable**
  - **+5.1 to +10.0 mOhms ----------2 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

Mating\Unmating Force

SFML-150-T2-L-D-A\ TFML-150-02-L-D-A

	Initial				After 25 Cycles			
	Mating		**Unmating**		**Mating**		**Unmating**	
	Newtons	Force (Lbs)	Newtons	Force (Lbs)	Newtons	Force (Lbs)	Newtons	Force (Lbs)
Minimum	71.21	16.01	68.01	15.29	69.08	15.53	70.23	15.79
Maximum	87.09	19.58	97.94	22.02	89.94	20.22	100.39	22.57
Average	79.52	**17.88**	80.51	**18.10**	78.91	**17.74**	82.08	**18.45**
St Dev	5.82	1.31	11.14	2.50	7.43	1.67	11.26	2.53
Count	8	8	8	8	8	8	8	8

	After 50 Cycles				After 75 Cycles			
	Mating		**Unmating**		**Mating**		**Unmating**	
	Newtons	Force (Lbs)	Newtons	Force (Lbs)	Newtons	Force (Lbs)	Newtons	Force (Lbs)
Minimum	72.01	16.19	75.62	17.00	75.84	17.05	79.35	17.84
Maximum	92.83	20.87	102.17	22.97	94.79	21.31	103.91	23.36
Average	83.33	**18.73**	87.30	**19.63**	85.90	**19.31**	91.03	**20.47**
St Dev	7.02	1.58	9.31	2.09	6.52	1.47	8.77	1.97
Count	8	8	8	8	8	8	8	8

	After 100 Cycles				After Humidity			
	Mating		**Unmating**		**Mating**		**Unmating**	
	Newtons	Force (Lbs)	Newtons	Force (Lbs)	Newtons	Force (Lbs)	Newtons	Force (Lbs)
Minimum	77.75	17.48	80.91	18.19	51.73	11.63	52.66	11.84
Maximum	96.92	21.79	105.55	23.73	66.41	14.93	76.37	17.17
Average	88.35	**19.86**	93.57	**21.04**	57.84	**13.00**	63.46	**14.27**
St Dev	6.70	1.51	8.96	2.01	4.38	0.99	7.46	1.68
Count	8	8	8	8	8	8	8	8

DATA SUMMARIES Continued

Mating\Unmating Force

SFML-125-T2-L-D-A\ TFML-125-02-L-D-A

	Initial				After 25 Cycles			
	Mating		**Unmating**		**Mating**		**Unmating**	
	Newtons	Force (Lbs)	Newtons	Force (Lbs)	Newtons	Force (Lbs)	Newtons	Force (Lbs)
Minimum	42.61	9.58	58.31	13.11	32.29	7.26	36.96	8.31
Maximum	53.55	12.04	75.35	16.94	37.90	8.52	44.30	9.96
Average	49.71	**11.18**	68.84	**15.48**	35.75	**8.04**	40.72	**9.15**
St Dev	3.79	0.85	6.54	1.47	1.99	0.45	2.69	0.60
Count	8	8	8	8	8	8	8	8

	After 50 Cycles				After 75 Cycles			
	Mating		**Unmating**		**Mating**		**Unmating**	
	Newtons	Force (Lbs)	Newtons	Force (Lbs)	Newtons	Force (Lbs)	Newtons	Force (Lbs)
Minimum	33.58	7.55	37.10	8.34	33.94	7.63	38.12	8.57
Maximum	39.90	8.97	47.24	10.62	42.12	9.47	49.86	11.21
Average	36.56	**8.22**	41.51	**9.33**	37.86	**8.51**	43.22	**9.72**
St Dev	2.19	0.49	3.35	0.75	2.67	0.60	4.04	0.91
Count	8	8	8	8	8	8	8	8

	After 100 Cycles			
	Mating		**Unmating**	
	Newtons	Force (Lbs)	Newtons	Force (Lbs)
Minimum	35.09	7.89	38.70	8.70
Maximum	42.52	9.56	51.02	11.47
Average	38.76	**8.72**	44.39	**9.98**
St Dev	2.67	0.60	4.47	1.00
Count	8	8	8	8

DATA SUMMARIES Continued

Mating\Unmating Force

SFML-105-T2-L-D-A\ TFML-105-02-L-D-A

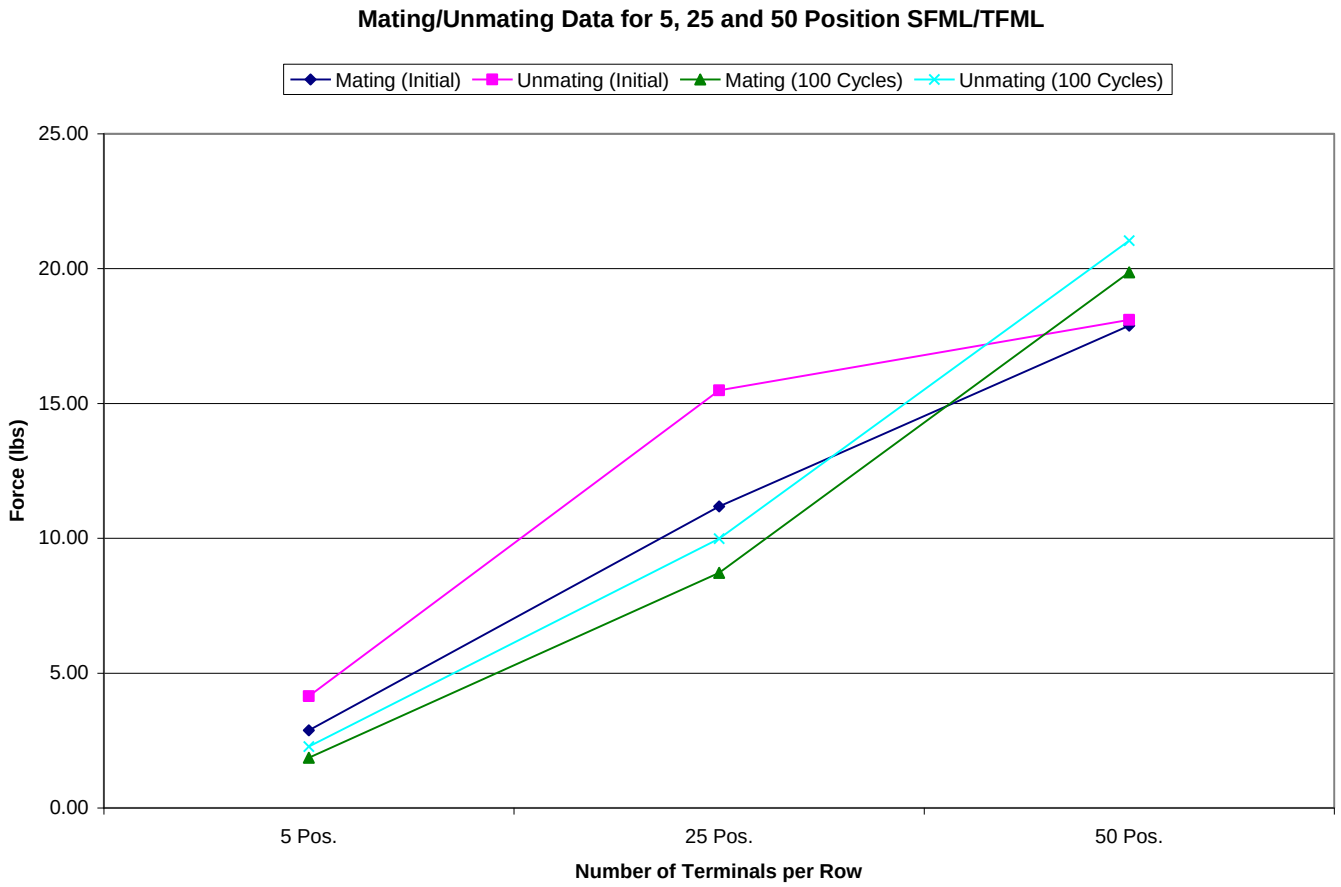
	Initial				After 25 Cycles			
	Mating		**Unmating**		**Mating**		**Unmating**	
	Newtons	Force (Lbs)	Newtons	Force (Lbs)	Newtons	Force (Lbs)	Newtons	Force (Lbs)
Minimum	10.72	2.41	13.52	3.04	8.18	1.84	8.98	2.02
Maximum	14.46	3.25	21.75	4.89	14.59	3.28	15.66	3.52
Average	12.82	**2.88**	18.43	**4.14**	10.62	**2.39**	12.66	**2.85**
St Dev	1.21	0.27	2.61	0.59	1.91	0.43	2.51	0.56
Count	8	8	8	8	8	8	8	8

	After 50 Cycles				After 75 Cycles			
	Mating		**Unmating**		**Mating**		**Unmating**	
	Newtons	Force (Lbs)	Newtons	Force (Lbs)	Newtons	Force (Lbs)	Newtons	Force (Lbs)
Minimum	7.70	1.73	9.12	2.05	7.70	1.73	8.85	1.99
Maximum	9.65	2.17	14.19	3.19	9.47	2.13	11.88	2.67
Average	8.92	**2.01**	11.40	**2.56**	8.72	**1.96**	10.45	**2.35**
St Dev	0.85	0.19	1.63	0.37	0.66	0.15	1.14	0.26
Count	8	8	8	8	8	8	8	8

	After 100 Cycles			
	Mating		**Unmating**	
	Newtons	Force (Lbs)	Newtons	Force (Lbs)
Minimum	7.12	1.60	8.18	1.84
Maximum	9.12	2.05	11.34	2.55
Average	8.27	**1.86**	10.10	**2.27**
St Dev	0.69	0.15	1.22	0.27
Count	8	8	8	8

DATA SUMMARIES Continued

Mating\Unmating



DATA SUMMARIES Continued

LLCR Durability:

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	5/1/2012	5/1/2012	5/8/2012	5/19/2012
Room Temp (Deg C)	23	23	23	22
Rel Humidity (%)	58	58	56	55
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	8.65	0.59	0.62	0.77
St. Dev.	0.48	0.53	0.68	0.99
Min	7.76	0.00	0.00	0.00
Max	10.12	3.11	4.66	6.16
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**
100 Cycles	**192**	**0**	**0**	**0**	**0**	**0**
Therm Shck	**192**	**0**	**0**	**0**	**0**	**0**
Humidity	**190**	**2**	**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: 4/27/2012, Next Cal: 4/26/2013

Equipment #: HZ-THC-01
Description: Humidity transmitter
Manufacturer: Thermtron
Model: HMM30C
Serial #: D0240037
Accuracy: Last Cal: 3/1/2012, Next Cal: 2/28/2013

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: 06/28/2011, Next Cal: 06/27/2012

Equipment #: HZ-MO-05
Description: Micro-ohmmeter
Manufacturer: Keithley
Model: 3706
Serial #: 1285188
Accuracy: Last Cal: 8/18/2011, Next Cal: 8/17/2012

Equipment #: HZ-OGP-01
Description: Video measurement system
Manufacturer: OGP
Model: SMARTSCOPE FLASH 200
Serial #: SVW2003632
Accuracy: Last Cal: 6/9/2012, Next Cal: 6/8/2013