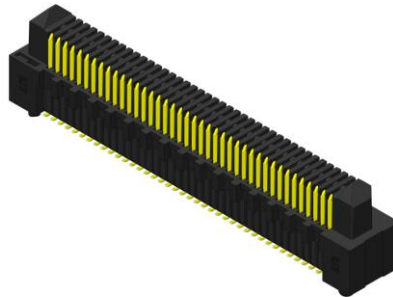
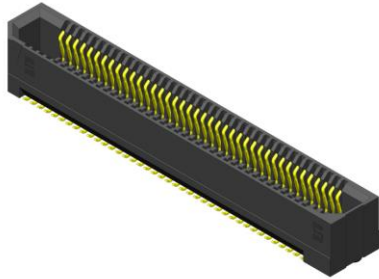




Project Number: Design Qualification Test Report	Tracking Code: 284642_Report_Rev_1
Requested by: Catie Eichhorn	Date: 12/17/2015
Part #: ERF8-040-05.0-L-DV-TR/ERM8-040-05.0-L-DV-TR	Tech: Aaron McKim
Part description: ERF8/ERM8	Qty to test: 105
Test Start: 09/10/2014	Test Completed: 10/05/2014



DESIGN QUALIFICATION TEST REPORT

ERF8/ERM8

ERF8-040-05.0-L-DV-TR/ERM8-040-05.0-L-DV-TR

Tracking Code:284642_Report_Rev_1	Part #: ERF8-040-05.0-L-DV-TR/ERM8-040-05.0-L-DV-TR
Part description: ERF8/ERM8	

REVISION HISTORY

DATA	REV.NUM.	DESCRIPTION	ENG
12/16/2015	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 and DWV/IR 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 and DWV/IR 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) Samtec Test PCBs used: PCB-140229-TST/ PCB-103329-TST/ PCB-103545-TST.

FLOWCHARTS

Gas Tight

Group 1

ERF8-040-05.0-L-DV-TR

ERM8-040-05.0-L-DV-TR

8 Assemblies

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

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

Normal Force

Group 1

ERF8-040-05.0-L-DV-TR

ERM8-040-05.0-L-DV-TR

8 Contacts Minimum

Signal Without Thermals

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

- | | |
|----|---|
| 1. | Contact Gaps |
| 2. | Normal Force ⁽¹⁾
Deflection = 0.0106 "
Expected Force at Max Deflection = 64 g |

Group 2

ERF8-040-05.0-L-DV-TR

ERM8-040-05.0-L-DV-TR

8 Contacts Minimum

Signal With Thermals

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

- | | |
|----|---|
| 1. | Contact Gaps |
| 2. | Thermal Age ⁽²⁾ |
| 3. | Contact Gaps |
| 4. | Normal Force ⁽¹⁾
Deflection = 0.0106 "
Expected Force at Max Deflection = 64 g |

(1) Normal Force = EIA-364-04

(2) Thermal Age = EIA-364-17

Test Condition = 4 (105°C)

Time Condition = B (250 Hours)

FLOWCHARTS Continued**Thermal Aging**Group 1

ERF8-040-05.0-L-DV-TR

ERM8-040-05.0-L-DV-TR

8 Assemblies

Step	Description
1.	Contact Gaps
2.	Mating/Unmating Force ⁽²⁾
3.	LLCR ⁽¹⁾ Max Delta = 15 mOhm
4.	Thermal Age ⁽³⁾
5.	LLCR ⁽¹⁾ Max Delta = 15 mOhm
6.	Mating/Unmating Force ⁽²⁾
7.	Contact Gaps

(1) LLCR = EIA-364-23

Open Circuit Voltage = 20 mV Max

Test Current = 100 mA Max

(2) Mating/Unmating Force = EIA-364-13

(3) Thermal Age = EIA-364-17

Test Condition = 4 (105°C)

Time Condition = B (250 Hours)

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

ERF8-040-05.0-L-DV-TR
ERM8-040-05.0-L-DV-TR
8 Assemblies

Step	Description
1.	Contact Gaps
2.	LLCR ⁽²⁾ Max Delta = 15 mOhm
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⁾

Group 2

ERF8-075-05.0-L-DV-TR
ERM8-075-05.0-L-DV-TR
8 Assemblies

Step	Description
1.	Contact Gaps
2.	Mating/Unmating Force ⁽³⁾
3.	Cycles Quantity = 25 Cycles
4.	Mating/Unmating Force ⁽³⁾

Group 3

ERF8-005-05.0-L-DV-TR
ERM8-005-05.0-L-DV-TR
8 Assemblies

Step	Description
1.	Contact Gaps
2.	Mating/Unmating Force ⁽³⁾
3.	Cycles Quantity = 25 Cycles
4.	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)

FLOWCHARTS Continued**IR/DWV****Pin-to-Pin**

<u>Group 1</u> ERF8-040-05.0-L-DV-TR ERM8-040-05.0-L-DV-TR 2 Assemblies		<u>Group 2</u> ERF8-040-05.0-L-DV-TR 2 Assemblies		<u>Group 3</u> ERM8-040-05.0-L-DV-TR 2 Assemblies		<u>Group 4</u> ERF8-040-05.0-L-DV-TR ERM8-040-05.0-L-DV-TR 2 Assemblies	
Step	Description	Step	Description	Step	Description	Step	Description
1.	DWV Breakdown (2)	1.	DWV Breakdown (2)	1.	DWV Breakdown (2)	1.	IR (4)
						2.	DWV at Test Voltage (1)
						3.	Thermal Shock (5)
						4.	IR (4)
						5.	DWV at Test Voltage (1)
						6.	Humidity (3)
						7.	IR (4)
						8.	DWV at Test Voltage (1)

Row-to-Row

<u>Group 5</u> ERF8-040-05.0-L-DV-TR ERM8-040-05.0-L-DV-TR 2 Assemblies		<u>Group 6</u> ERF8-040-05.0-L-DV-TR 2 Assemblies		<u>Group 7</u> ERM8-040-05.0-L-DV-TR 2 Assemblies		<u>Group 8</u> ERF8-040-05.0-L-DV-TR ERM8-040-05.0-L-DV-TR 2 Assemblies	
Step	Description	Step	Description	Step	Description	Step	Description
1.	DWV Breakdown (2)	1.	DWV Breakdown (2)	1.	DWV Breakdown (2)	1.	IR (4)
						2.	DWV at Test Voltage (1)
						3.	Thermal Shock (5)
						4.	IR (4)
						5.	DWV at Test Voltage (1)
						6.	Humidity (3)
						7.	IR (4)
						8.	DWV at Test Voltage (1)

(1) DWV at Test Voltage = EIA-364-20

Test Condition = 1 (Sea Level)

DWV test voltage is equal to 75% of the lowest breakdown voltage

Test voltage applied for 60 seconds

(2) DWV Breakdown = EIA-364-20

Test Condition = 1 (Sea Level)

DWV test voltage is equal to 75% of the lowest breakdown voltage

Test voltage applied for 60 seconds

(3) 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

(4) IR = EIA-364-21

Test Condition = 500 Vdc, 2 Minutes Max

(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)

FLOWCHARTS Continued**Current Carrying Capacity**Group 1

ERF8-075-05.0-L-DV-TR
ERM8-075-05.0-L-DV-TR
2 Pins Powered
Signal

Step	Description
1.	CCC ⁽¹⁾ Rows = 2 Number of Positions = 1

Group 2

ERF8-075-05.0-L-DV-TR
ERM8-075-05.0-L-DV-TR
4 Pins Powered
Signal

Step	Description
1.	CCC ⁽¹⁾ Rows = 2 Number of Positions = 2

Group 3

ERF8-075-05.0-L-DV-TR
ERM8-075-05.0-L-DV-TR
6 Pins Powered
Signal

Step	Description
1.	CCC ⁽¹⁾ Rows = 2 Number of Positions = 3

Group 4

ERF8-075-05.0-L-DV-TR
ERM8-075-05.0-L-DV-TR
8 Pins Powered
Signal

Step	Description
1.	CCC ⁽¹⁾ Rows = 2 Number of Positions = 4

Group 5

ERF8-075-05.0-L-DV-TR
ERM8-075-05.0-L-DV-TR
150 Pins Powered
Signal

Step	Description
1.	CCC ⁽¹⁾ Rows = 2 Number of Positions = 75

(1) CCC = EIA-364-70

Method 2, Temperature Rise Versus Current Curve

(TIN PLATING) - Tabulate calculated current at RT, 65°C, 75°C and 95°C after derating 20% and based on 105°C

(GOLD PLATING) - Tabulate calculated current at RT, 85°C, 95°C and 115°C after derating 20% and based on 125°C

FLOWCHARTS Continued**Mechanical Shock/Random Vibration/LLCR**Group 1

ERF8-040-05.0-L-DV-TR

ERM8-040-05.0-L-DV-TR

8 Assemblies

Step Description

1. LLCR ⁽¹⁾
Max Delta = 15 mOhm
2. Mechanical Shock ⁽²⁾
3. Random Vibration ⁽³⁾
4. LLCR ⁽¹⁾
Max Delta = 15 mOhm

(1) LLCR = EIA-364-23

Open Circuit Voltage = 20 mV Max

Test Current = 100 mA Max

(2) Mechanical Shock = EIA-364-27

Test Condition = C (100 G Peak, 6 milliseconds, Half Sine)

Number of Shocks = 3 Per Direction, Per Axis, 18 Total

(3) Random Vibration = EIA-364-28

Condition = VB (7.56 gRMS Average, 2 Hours/Axis)

Mechanical Shock/Random Vibration/Event DetectionGroup 1

ERF8-040-05.0-L-DV-TR

ERM8-040-05.0-L-DV-TR

60 Points

Step Description

1. Nanosecond Event Detection
(Mechanical Shock) ⁽¹⁾
2. Nanosecond Event Detection
(Random Vibration) ⁽²⁾

(1) Nanosecond Event Detection (Mechanical Shock)

Use EIA-364-87 for Nanosecond Event Detection:

Test Condition = F (50 nanoseconds at 10 ohms)

Use EIA-364-27 for Mechanical Shock:

Test Condition = C (100 G Peak, 6 milliseconds, Half Sine)

Number of Shocks = 3 Per Direction, Per Axis, 18 Total

(2) Nanosecond Event Detection (Random Vibration)

Use EIA-364-87 for Nanosecond Event Detection:

Test Condition = F (50 nanoseconds at 10 ohms)

Use EIA-364-28 for Random Vibration:

Condition = VB (7.56 gRMS Average, 2 Hours/Axis)

FLOWCHARTS Continued

Extended Life

Group 1 ERF8-040-05.0-S-DV-TR ERM8-040-05.0-S-DV-TR 8 Assemblies 100 Cycles		Group 2 ERF8-040-05.0-S-DV-TR ERM8-040-05.0-S-DV-TR 8 Assemblies 250 Cycles		Group 3 ERF8-040-05.0-S-DV-TR ERM8-040-05.0-S-DV-TR 8 Assemblies 500 Cycles		Group 4 ERF8-040-05.0-S-DV-TR ERM8-040-05.0-S-DV-TR 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) Max Delta = 15 mOhm	2.	LLCR (2) Max Delta = 15 mOhm	2.	LLCR (2) Max Delta = 15 mOhm	2.	LLCR (2) Max Delta = 15 mOhm
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)	5.	Thermal Shock (5)	5.	Thermal Shock (5)	5.	Thermal Shock (5)
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 = 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.

MECHANICAL SHOCK (Specified Pulse):

- 1) Reference document: EIA-364-27, *Mechanical Shock Test Procedure for Electrical Connectors*
- 2) Test Condition C
- 3) Peak Value: 100 G
- 4) Duration: 6 Milliseconds
- 5) Wave Form: Half Sine
- 6) Velocity: 12.3 ft/s
- 7) Number of Shocks: 3 Shocks / Direction, 3 Axis (18 Total)

VIBRATION:

- 1) Reference document: EIA-364-28, *Vibration Test Procedure for Electrical Connectors*
- 2) Test Condition V, Letter B
- 3) Power Spectral Density: 0.04 G² / Hz
- 4) G 'RMS': 7.56
- 5) Frequency: 50 to 2000 Hz
- 6) Duration: 2.0 Hours per axis (3 axis total)

NANOSECOND-EVENT DETECTION:

- 1) Reference document: EIA-364-87, *Nanosecond-Event Detection for Electrical Connectors*
- 2) Prior to test, the samples were characterized to assure the low nanosecond event being monitored will trigger the detector.
- 3) After characterization it was determined the test samples could be monitored for 50 nanosecond events

ATTRIBUTE DEFINITIONS Continued

The following is a brief, simplified description of attributes.

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.

TEMPERATURE RISE (Current Carrying Capacity, CCC):

- 1) EIA-364-70, *Temperature Rise versus Current Test Procedure for Electrical Connectors and Sockets*.
- 2) When current passes through a contact, the temperature of the contact increases as a result of I^2R (resistive) heating.
- 3) The number of contacts being investigated plays a significant part in power dissipation and therefore temperature rise.
- 4) The size of the temperature probe can affect the measured temperature.
- 5) Copper traces on PC boards will contribute to temperature rise:
 - a. Self heating (resistive)
 - b. Reduction in heat sink capacity affecting the heated contacts
- 6) A de-rating curve, usually 20%, is calculated.
- 7) Calculated de-rated currents at four temperature points are reported:
 - a. Ambient
 - b. 85° C
 - c. 95° C
 - d. 115° C
- 8) Typically, neighboring contacts (in close proximity to maximize heat build up) are energized.
- 9) The thermocouple (or temperature measuring probe) will be positioned at a location to sense the maximum temperature in the vicinity of the heat generation area.
- 10) A computer program, *TR 803.exe*, ensures accurate stability for data acquisition.
- 11) Hook-up wire cross section is larger than the cross section of any connector leads/PC board traces, jumpers, etc.
- 12) Hook-up wire length is longer than the minimum specified in the referencing standard.

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

ATTRIBUTE DEFINITIONS Continued

The following is a brief, simplified description of attributes.

GAS TIGHT:

To provide method for evaluating the ability of the contacting surfaces in preventing penetration of harsh vapors which might lead to oxide formation that may degrade the electrical performance of the contact system.

- 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
- 4) Procedure:
 - a. Reference document: EIA-364-36, *Test Procedure for Determination of Gas-Tight Characteristics for Electrical Connectors, Sockets and/or Contact Systems*.
 - b. Test Conditions:
 - i. Class II--- Mated pairs of contacts assembled to their plastic housings.
 - ii. Reagent grade Nitric Acid shall be used of sufficient volume to saturate the test chamber
 - iii. The ratio of the volume of the test chamber to the surface area of the acid shall be 10:1.
 - iv. The chamber shall be saturated with the vapor for at least 15 minutes before samples are added.
 - v. Exposure time, 55 to 65 minutes.
 - vi. The samples shall be no closer to the chamber walls than 1 inches and no closer to the surface of the acid than 3 inches.
 - vii. The samples shall be dried after exposure for a minimum of 1 hour.
 - viii. Drying temperature 50° C
 - ix. The final LLCR shall be conducted within 1 hour after drying.

NORMAL FORCE (FOR CONTACTS TESTED IN THE HOUSING):

- 1) Reference document: EIA-364-04, *Normal Force Test Procedure for Electrical Connectors*.
- 2) The contacts shall be tested in the connector housing.
- 3) If necessary, a "window" shall be made in the connector body to allow a probe to engage and deflect the contact at the same attitude and distance (plus 0.05 mm [0.002"]) as would occur in actual use.
- 4) The connector housing shall be placed in a holding fixture that does not interfere with or otherwise influence the contact force or deflection.
- 5) Said holding fixture shall be mounted on a floating, adjustable, X-Y table on the base of the Dillon TC², computer controlled test stand with a deflection measurement system accuracy of 5.0 μ m (0.0002").
- 6) The nominal deflection rate shall be 5 mm (0.2")/minute.
- 7) Unless otherwise noted a minimum of five contacts shall be tested.
- 8) The force/deflection characteristic to load and unload each contact shall be repeated five times.
- 9) The system shall utilize the TC² software in order to acquire and record the test data.
- 10) The permanent set of each contact shall be measured within the TC² software.
- 11) The acquired data shall be graphed with the deflection data on the X-axis and the force data on the Y-axis and a print out will be stored with the Tracking Code paperwork.

ATTRIBUTE DEFINITIONS Continued

The following is a brief, simplified description of attributes

INSULATION RESISTANCE (IR):

To determine the resistance of insulation materials to leakage of current through or on the surface of these materials when a DC potential is applied.

1) PROCEDURE:

- a. Reference document: EIA-364-21, *Insulation Resistance Test Procedure for Electrical Connectors*.
- b. Test Conditions:
 - i. Between Adjacent Contacts or Signal-to-Ground
 - ii. Electrification Time 2.0 minutes
 - iii. Test Voltage (500 VDC) corresponds to calibration settings for measuring resistances.

2) MEASUREMENTS:

- 3) When the specified test voltage is applied (VDC), the insulation resistance shall not be less than 5000 megohms.

DIELECTRIC WITHSTANDING VOLTAGE (DWV):

To determine if the sockets can operate at its rated voltage and withstand momentary over potentials due to switching, surges, and other similar phenomenon. Separate samples are used to evaluate the effect of environmental stresses so not to influence the readings from arcing that occurs during the measurement process.

1) PROCEDURE:

- a. Reference document: EIA-364-20, *Withstanding Voltage Test Procedure for Electrical Connectors*.
- b. Test Conditions:
 - i. Between Adjacent Contacts or Signal-to-Ground
 - ii. Barometric Test Condition 1
 - iii. Rate of Application 500 V/Sec
 - iv. Test Voltage (VAC) until breakdown occurs

2) MEASUREMENTS/CALCULATIONS

- a. The breakdown voltage shall be measured and recorded.
- b. The dielectric withstanding voltage shall be recorded as 75% of the minimum breakdown voltage.
- c. The working voltage shall be recorded as one-third (1/3) of the dielectric withstanding voltage (one-fourth of the breakdown voltage).

RESULTS

Temperature Rise, CCC at a 20% de-rating

- CCC for a 30°C Temperature Rise-----2.2 A per contact with 2 contacts (2x1) powered
- CCC for a 30°C Temperature Rise-----1.6 A per contact with 4 contacts (2x2) powered
- CCC for a 30°C Temperature Rise-----1.3 A per contact with 6 contacts (2x3) powered
- CCC for a 30°C Temperature Rise-----1.2 A per contact with 8 contacts (2x4) powered
- CCC for a 30°C Temperature Rise-----0.5 A per contact with 150 contacts (2x75) powered

Mating – Unmating Forces

Thermal Aging Group (ERF8-040-05.0-L-DV-TR/ERM8-040-05.0-L-DV-TR)

- Initial
 - Mating
 - Min ----- 5.94 Lbs
 - Max----- 6.60 Lbs
 - Unmating
 - Min ----- 3.05 Lbs
 - Max----- 3.49 Lbs
- After Thermal
 - Mating
 - Min ----- 3.64 Lbs
 - Max----- 4.42 Lbs
 - Unmating
 - Min ----- 2.09 Lbs
 - Max----- 2.56 Lbs

RESULTS Continued**Mating – Unmating Forces****Mating-Unmating Durability Group (ERF8-040-05.0-L-DV-TR/ERM8-040-05.0-L-DV-TR)**

- **Initial**
 - **Mating**
 - **Min**-----4.74 Lbs
 - **Max**-----6.69 Lbs
 - **Unmating**
 - **Min**-----2.25 Lbs
 - **Max**-----3.07 Lbs
- **After 25 Cycles**
 - **Mating**
 - **Min**-----4.80 Lbs
 - **Max**-----7.70 Lbs
 - **Unmating**
 - **Min**-----2.92 Lbs
 - **Max**-----3.83 Lbs
- **Humidity**
 - **Mating**
 - **Min**-----3.48 Lbs
 - **Max**-----4.31 Lbs
 - **Unmating**
 - **Min**-----1.99 Lbs
 - **Max**-----2.46 Lbs

Mating-Unmating Basic (ERF8-075-05.0-L-DV-TR/ERM8-075-05.0-L-DV-TR)

- **Initial**
 - **Mating**
 - **Min**-----10.49 Lbs
 - **Max**-----12.11 Lbs
 - **Unmating**
 - **Min**-----4.40 Lbs
 - **Max**-----5.87 Lbs
- **After 25 Cycles**
 - **Mating**
 - **Min**-----12.64 Lbs
 - **Max**-----14.24 Lbs
 - **Unmating**
 - **Min**-----5.33 Lbs
 - **Max**-----6.86 Lbs

RESULTS Continued**Mating-Unmating Basic (ERF8-005-05.0-L-DV-TR/ERM8-005-05.0-L-DV-TR)**

- **Initial**
 - **Mating**
 - **Min**----- **0.82 Lbs**
 - **Max**----- **1.24 Lbs**
 - **Unmating**
 - **Min**----- **0.34 Lbs**
 - **Max**----- **0.49 Lbs**
 -
- **After 25 Cycles**
 - **Mating**
 - **Min**----- **0.83 Lbs**
 - **Max**----- **1.30 Lbs**
 - **Unmating**
 - **Min**----- **0.40 Lbs**
 - **Max**----- **0.50 Lbs**

Normal Force at 0.0111 inch deflection

- **Initial**
 - **Min**----- **74.60 gf** **Set ---- 0.0016 in**
 - **Max**----- **79.90 gf** **Set ---- 0.0018 in**
- **Thermal**
 - **Min**----- **64.90 gf** **Set ---- 0.0024 in**
 - **Max**----- **71.70 gf** **Set ---- 0.0029 in**

RESULTS Continued**Insulation Resistance minimums, IR****Pin to Pin**

- **Initial**
 - Mated-----45000 Meg Ω ----- Passed
 - Unmated -----45000 Meg Ω ----- Passed
- **Thermal Shock**
 - Mated-----45000 Meg Ω ----- Passed
 - Unmated -----45000 Meg Ω ----- Passed
- **Humidity**
 - Mated-----12600 Meg Ω ----- Passed
 - Unmated -----11300 Meg Ω ----- Passed

Row to Row

- **Initial**
 - Mated-----45000 Meg Ω ----- Passed
 - Unmated -----45000 Meg Ω ----- Passed
- **Thermal Shock**
 - Mated-----45000 Meg Ω ----- Passed
 - Unmated -----45000 Meg Ω ----- Passed
- **Humidity**
 - Mated-----45000 Meg Ω ----- Passed
 - Unmated -----45000 Meg Ω ----- Passed

Dielectric Withstanding Voltage minimums, DWV

- **Minimums**
 - Breakdown Voltage-----900 VAC
 - Test Voltage -----675 VAC
 - Working Voltage -----225 VAC

Pin to Pin

- **Initial DWV** -----Passed
- **Thermal DWV**-----Passed
- **Humidity DWV**-----Passed

Row to Row

- **Initial DWV** -----Passed
- **Thermal DWV**-----Passed
- **Humidity DWV**-----Passed

RESULTS Continued**LLCR Thermal Aging Group (192 LLCR test points)**

- Initial ----- 17.99 mOhms Max
- Thermal
 - <= +5.0 mOhms ----- 191 Points ----- Stable
 - +5.1 to +10.0 mOhms ----- 1 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

LLCR Mating/Unmating Durability Group (192 LLCR test points)

- Initial ----- 21.07 mOhms 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 Shock
 - <= +5.0 mOhms ----- 191 Points ----- Stable
 - +5.1 to +10.0 mOhms ----- 1 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 ----- 191 Points ----- Stable
 - +5.1 to +10.0 mOhms ----- 1 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

LLCR Gas Tight Group (192 LLCR test points)

- Initial ----- 20.49 mOhms Max
- Gas-Tight
 - <= +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

RESULTS Continued**LLCR Shock & Vibration Group (192 LLCR test points)**

- Initial ----- 20.27 mOhms Max
- Shock & Vibration
 - <= +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

Mechanical Shock & Random Vibration:

- Shock
 - No Damage----- Pass
 - 50 Nanoseconds----- Pass
- Vibration
 - No Damage----- Pass
 - 50 Nanoseconds----- Pass

LLCR Extended Life Group (192 LLCR test points)**Group 1 -100 Cycles**

- Initial ----- 20.03 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 ----- 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

RESULTS Continued**Group 2 -250 Cycles**

- **Initial** ----- 19.58 mOhms Max
- **Durability, 250 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 ----- 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

Group 3 -500 Cycles

- **Initial** ----- 20.40 mOhms Max
- **Durability, 500 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 ----- 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

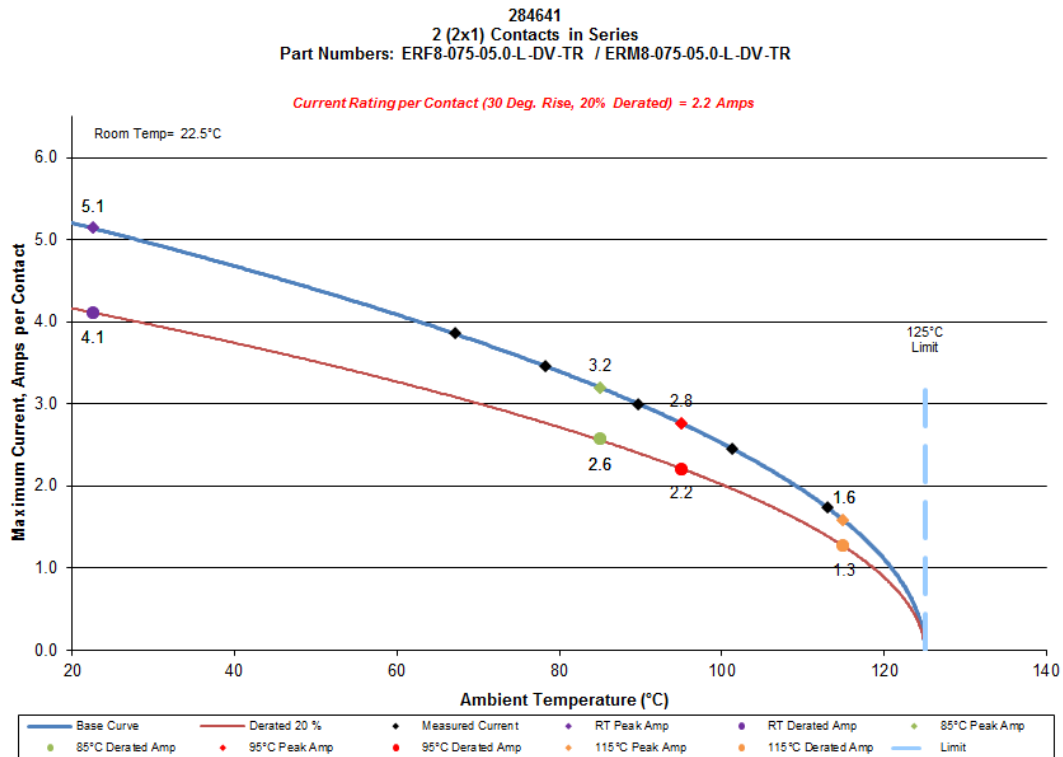
RESULTS Continued**Group 2 -1000 Cycles**

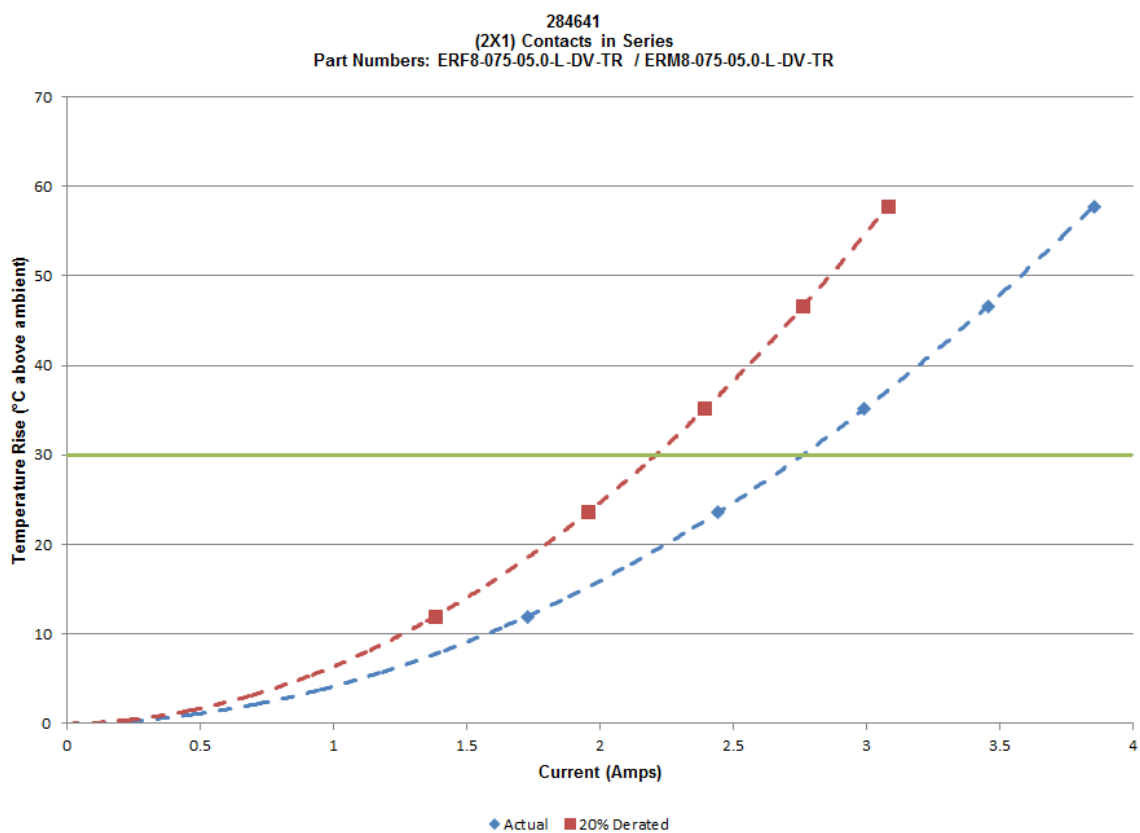
- **Initial** ----- 18.96 mOhms Max
- **Durability, 1000 Cycles**
 - ≤ +5.0 mOhms ----- 192 Points ----- Stable
 - +5.1 to +10.0 mOhms ----- 0 Points ----- Minor
 - +10.1 to +15.0 mOhms ----- 0 Points ----- Acceptable
 - +15.1 to +50.0 mOhms ----- 0 Points ----- Marginal
 - +50.1 to +2000 mOhms ----- 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 ----- 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

DATA SUMMARIES**TEMPERATURE RISE (Current Carrying Capacity, CCC):**

- 1) High quality thermocouples whose temperature slopes track one another were used for temperature monitoring.
- 2) The thermocouples were placed at a location to sense the maximum temperature generated during testing.
- 3) Temperature readings recorded are those for which three successive readings, 15 minutes apart, differ less than 1° C (computer controlled data acquisition).
- 4) Adjacent contacts were powered:

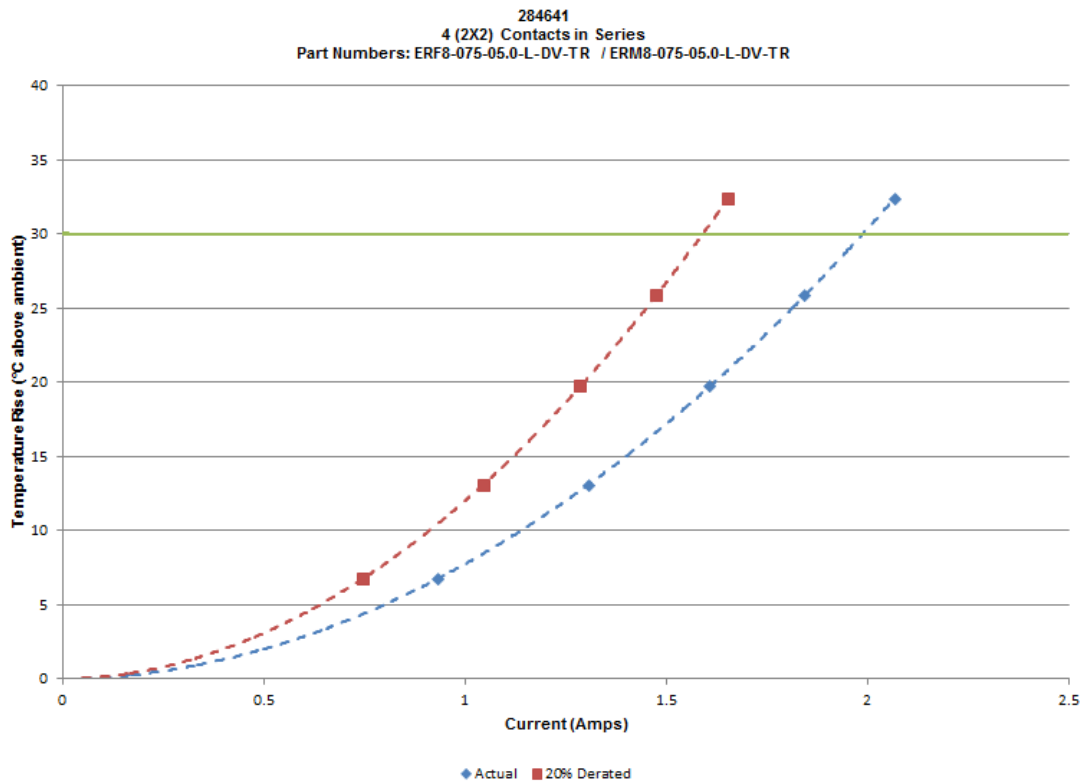
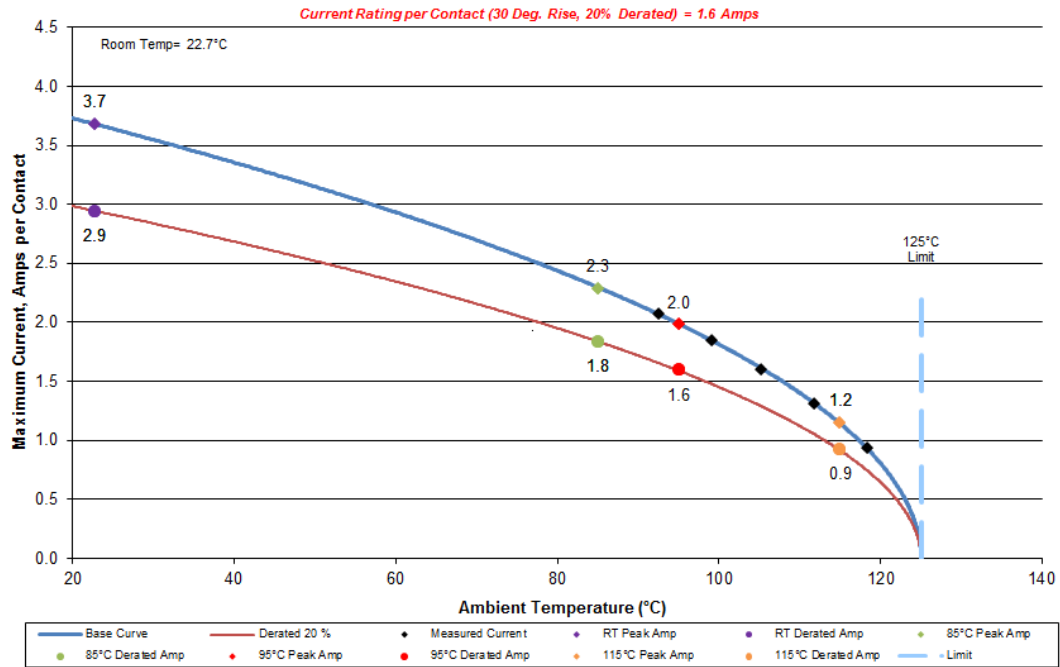
- a. Linear configuration with 2 adjacent conductors/contacts powered



DATA SUMMARIES Continued

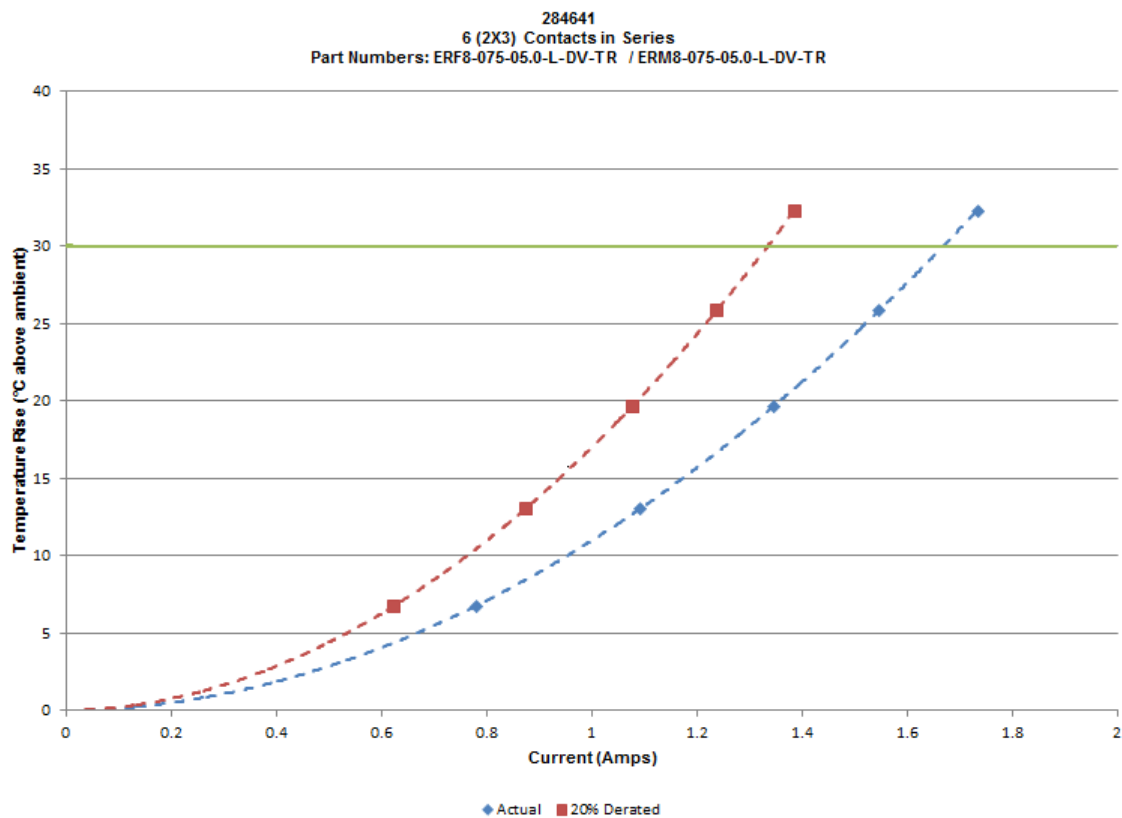
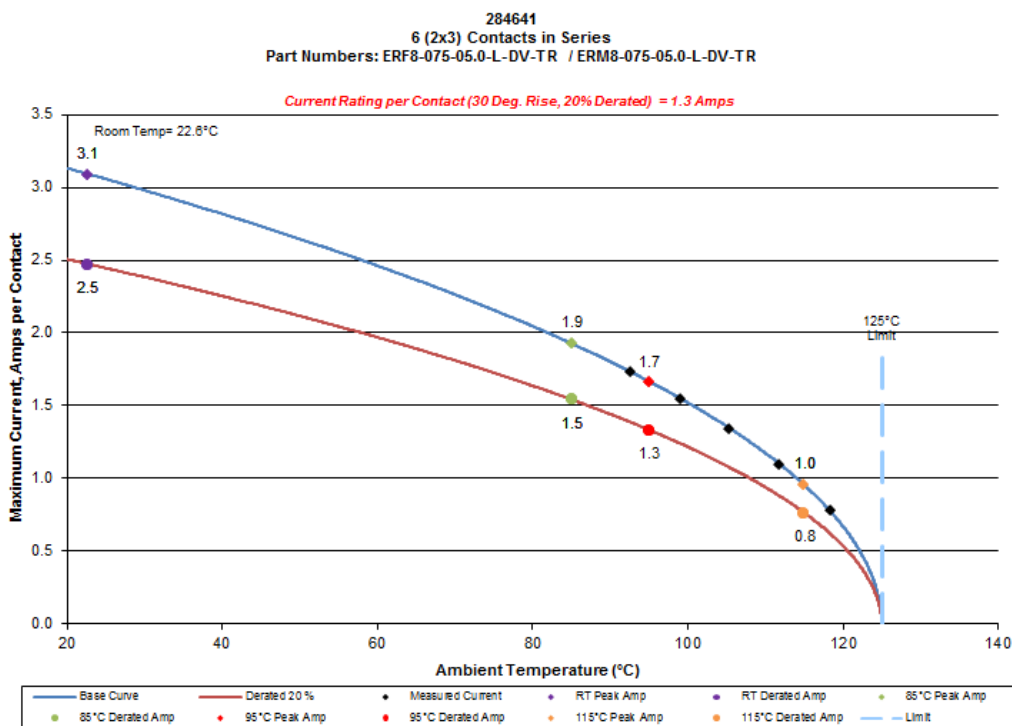
DATA SUMMARIES Continued**b. Linear configuration with 4 adjacent conductors/contacts powered**

284641
4 (2x2) Contacts in Series
Part Numbers: ERF8-075-05.0-L-DV-TR / ERM8-075-05.0-L-DV-TR



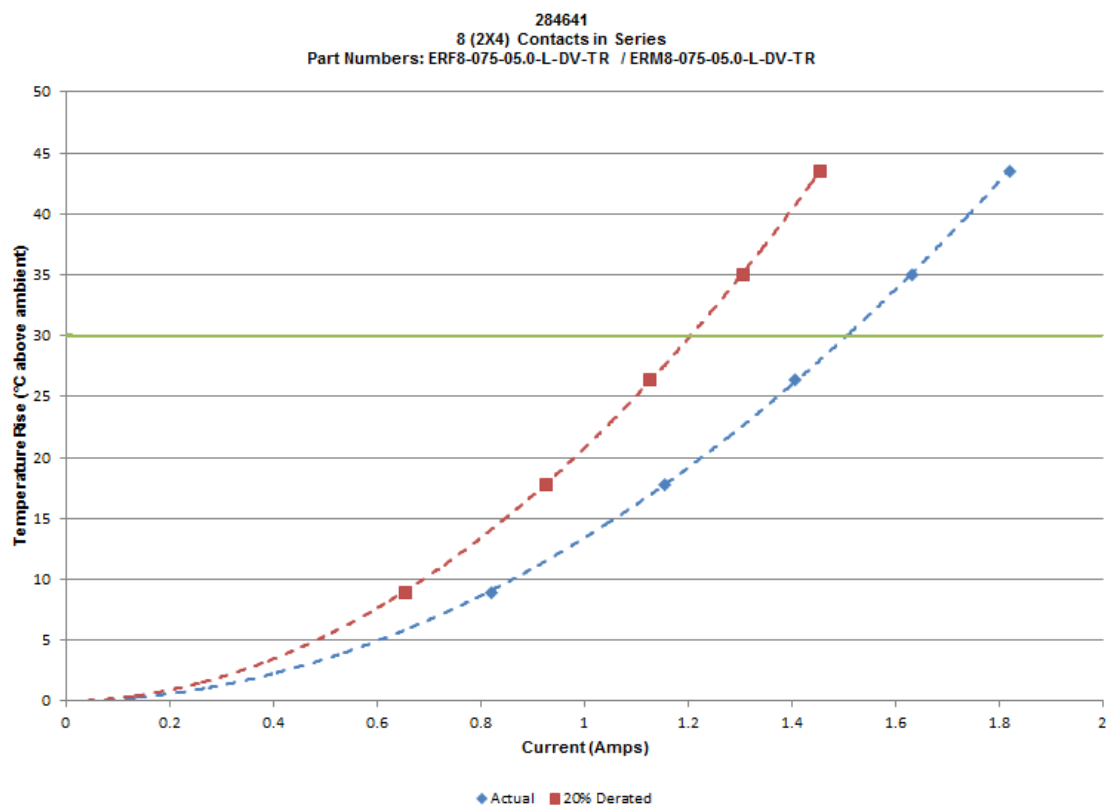
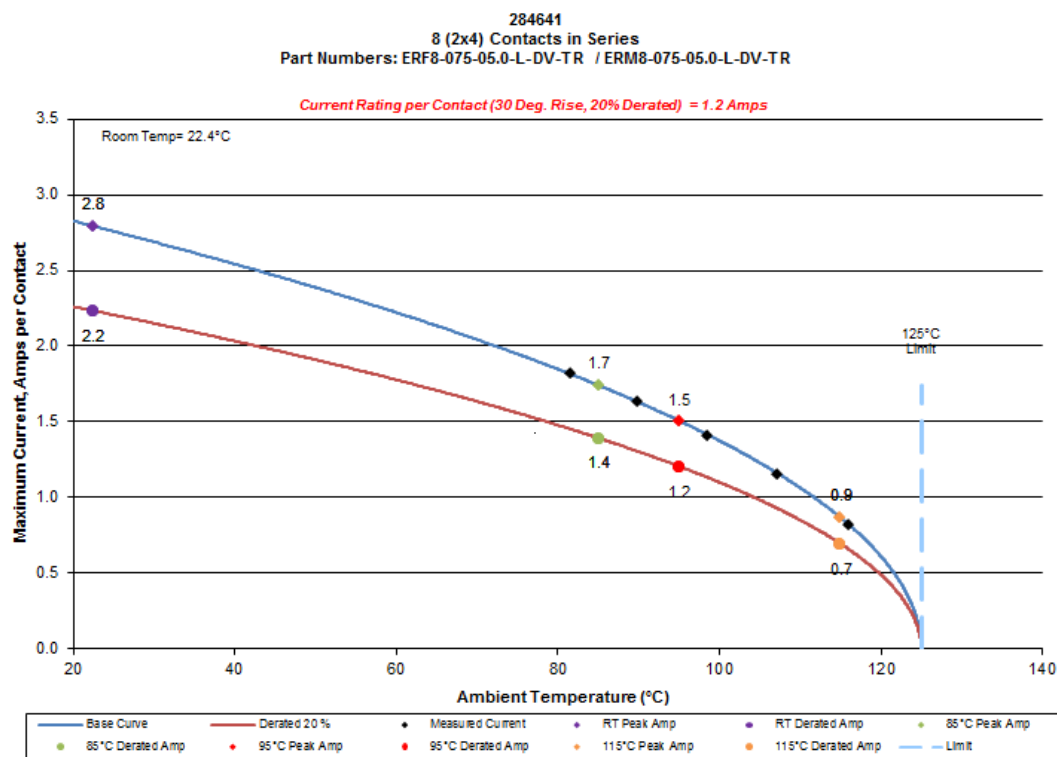
DATA SUMMARIES Continued

c. Linear configuration with 6 adjacent conductors/contacts powered



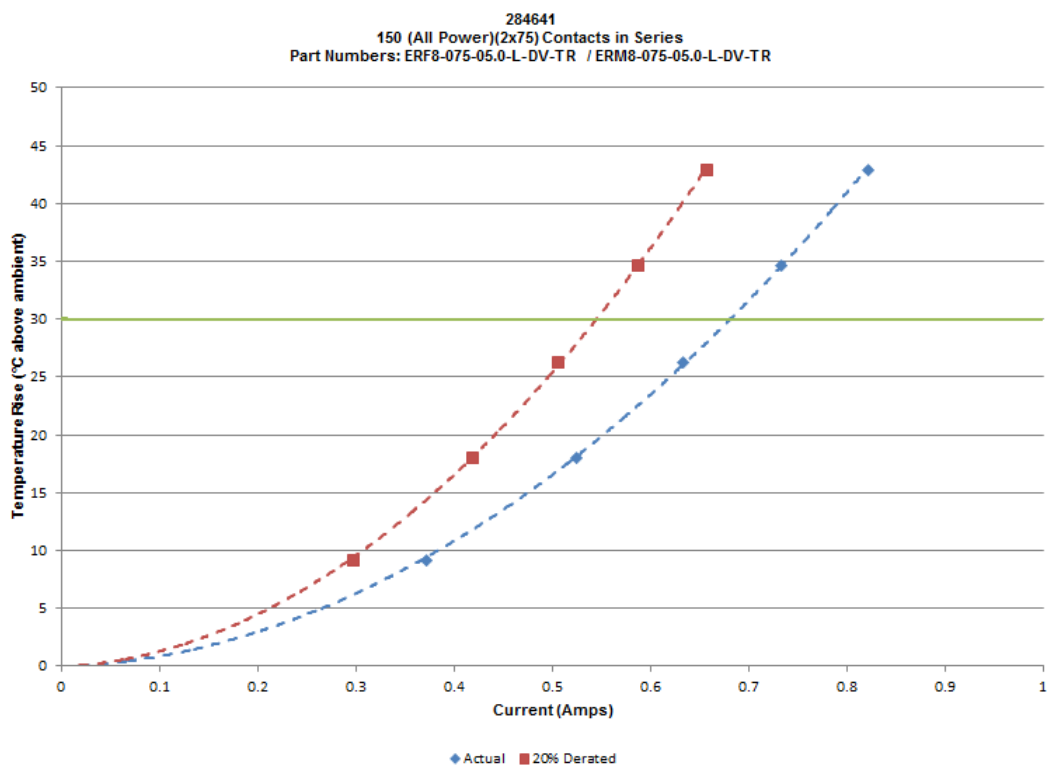
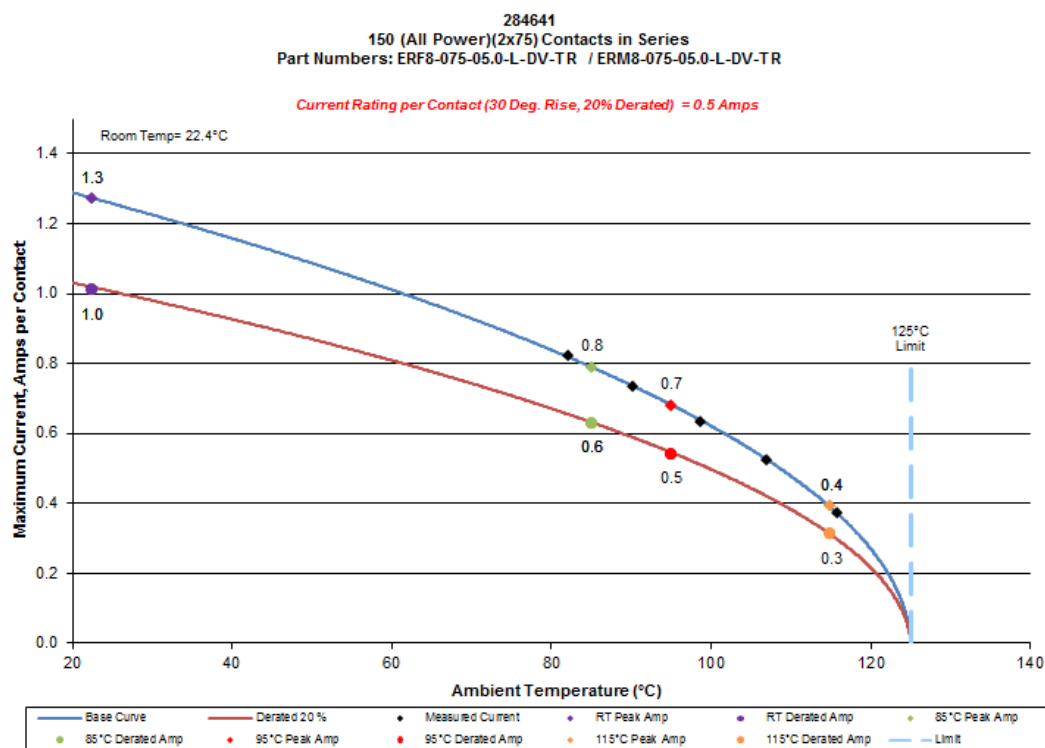
DATA SUMMARIES Continued

d. Linear configuration with 8 adjacent conductors/contacts powered



DATA SUMMARIES Continued

e. Linear configuration with all adjacent conductors/contacts powered



DATA SUMMARIES Continued**MATING-UNMATING FORCE:****Thermal Aging Group (ERF8-040-05.0-L-DV-TR/ERM8-040-05.0-L-DV-TR)**

	Initial				After Thermals			
	Mating		Unmating		Mating		Unmating	
	Newtons	Force (Lbs)	Newtons	Force (Lbs)	Newtons	Force (Lbs)	Newtons	Force (Lbs)
Minimum	26.42	5.94	13.57	3.05	16.19	3.64	9.30	2.09
Maximum	29.36	6.60	15.52	3.49	19.66	4.42	11.39	2.56
Average	28.20	6.34	14.24	3.20	17.93	4.03	9.97	2.24
St Dev	1.06	0.24	0.80	0.18	1.07	0.24	0.65	0.15
Count	8	8	8	8	8	8	8	8

Mating-Unmating Durability Group (ERF8-040-05.0-L-DV-TR/ERM8-040-05.0-L-DV-TR)

	Initial				25 Cycles			
	Mating		Unmating		Mating		Unmating	
	Newtons	Force (Lbs)	Newtons	Force (Lbs)	Newtons	Force (Lbs)	Newtons	Force (Lbs)
Minimum	21.08	4.74	10.01	2.25	21.35	4.80	12.99	2.92
Maximum	29.76	6.69	13.66	3.07	34.29	7.71	17.04	3.83
Average	25.39	5.71	11.68	2.63	26.99	6.07	14.33	3.22
St Dev	2.77	0.62	1.27	0.29	3.82	0.86	1.31	0.29
Count	8	8	8	8	8	8	8	8

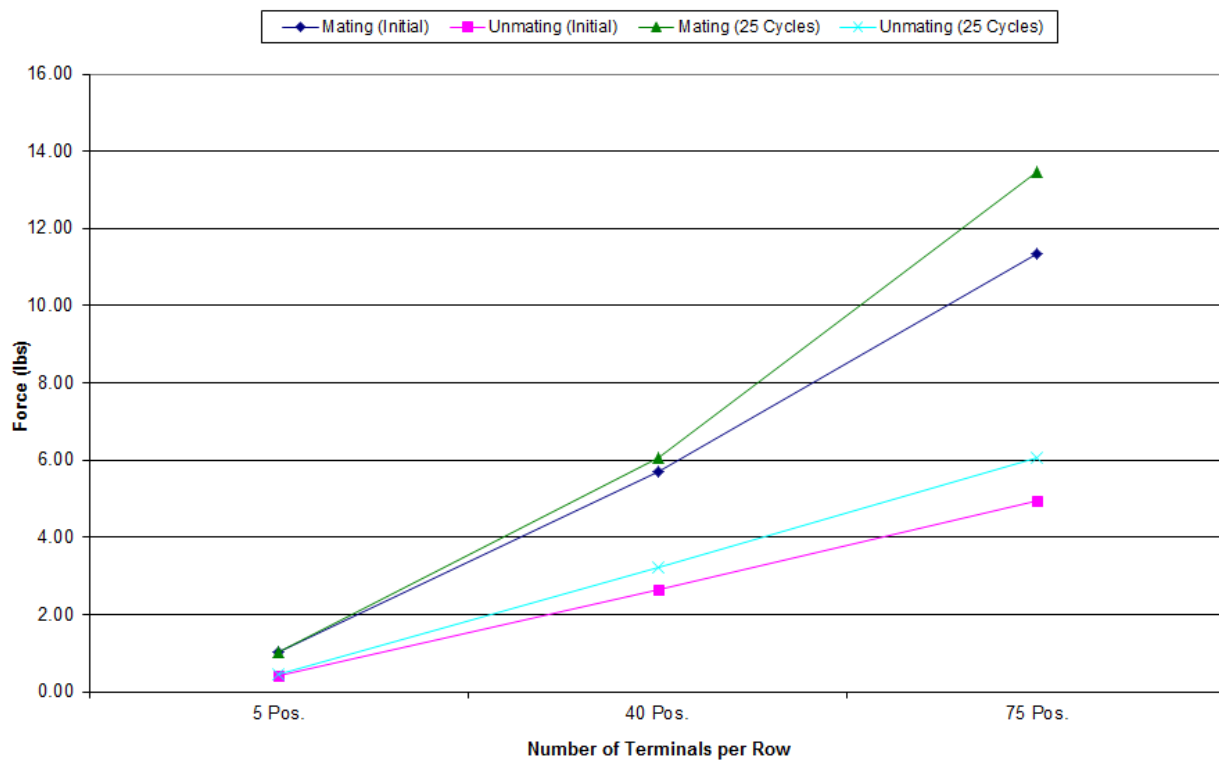
	After Humidity			
	Mating		Unmating	
	Newtons	Force (Lbs)	Newtons	Force (Lbs)
Minimum	15.48	3.48	8.85	1.99
Maximum	19.17	4.31	10.94	2.46
Average	17.65	3.97	9.38	2.11
St Dev	1.33	0.30	0.67	0.15
Count	8	8	8	8

DATA SUMMARIES Continued**Mating-Unmating Basic (ERF8-075-05.0-L-DV-TR/ERM8-075-05.0-L-DV-TR)**

	Initial				25 Cycles			
	Mating		Unmating		Mating		Unmating	
	Newtons	Force (Lbs)	Newtons	Force (Lbs)	Newtons	Force (Lbs)	Newtons	Force (Lbs)
Minimum	46.66	10.49	19.57	4.40	56.22	12.64	23.71	5.33
Maximum	53.87	12.11	26.11	5.87	63.34	14.24	30.51	6.86
Average	50.50	11.35	22.00	4.95	59.91	13.47	26.96	6.06
St Dev	2.13	0.48	1.97	0.44	2.76	0.62	2.14	0.48
Count	8	8	8	8	8	8	8	8

Mating-Unmating Basic (ERF8-005-05.0-L-DV-TR/ERM8-005-05.0-L-DV-TR)

	Initial				25 Cycles			
	Mating		Unmating		Mating		Unmating	
	Newtons	Force (Lbs)	Newtons	Force (Lbs)	Newtons	Force (Lbs)	Newtons	Force (Lbs)
Minimum	3.65	0.82	1.51	0.34	3.69	0.83	1.78	0.40
Maximum	5.52	1.24	2.18	0.49	5.78	1.30	2.22	0.50
Average	4.58	1.03	1.76	0.40	4.61	1.04	1.99	0.45
St Dev	0.80	0.18	0.21	0.05	0.80	0.18	0.15	0.03
Count	8	8	8	8	8	8	8	8

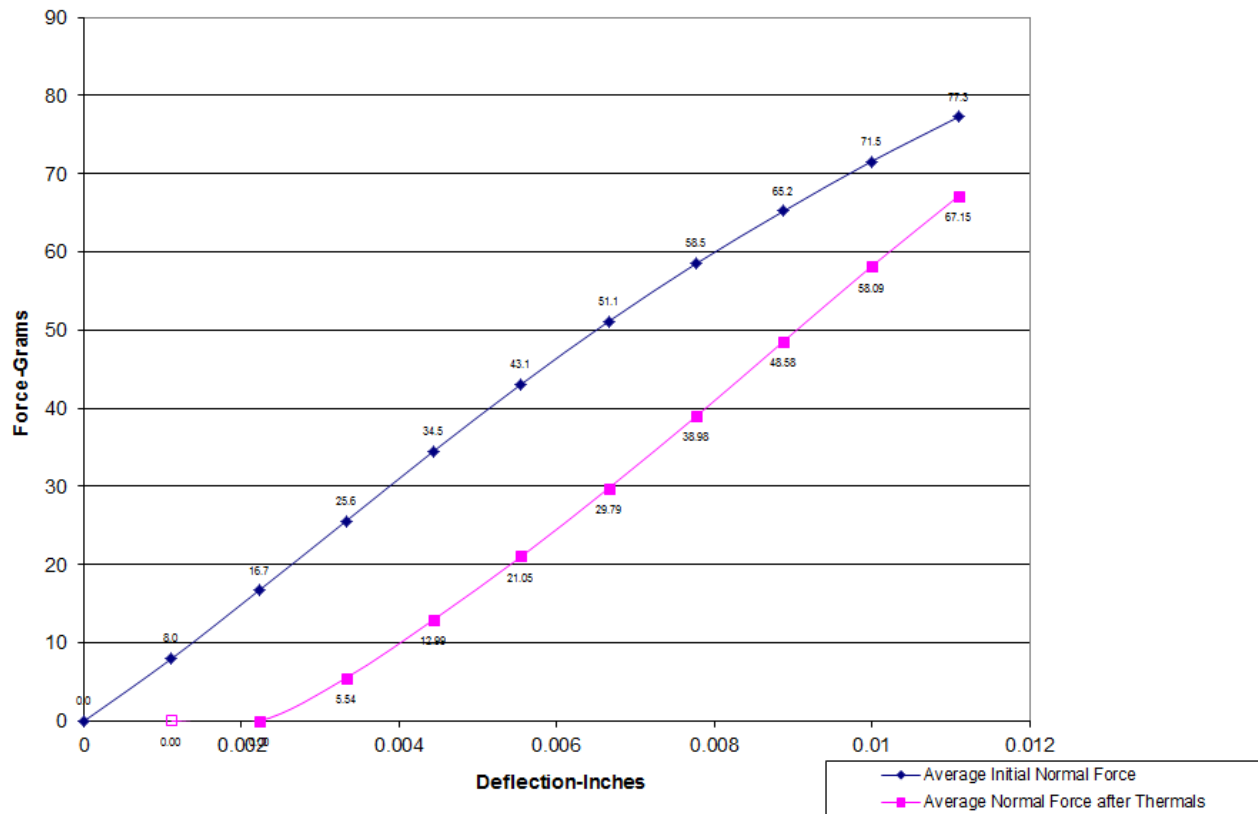
DATA SUMMARIES Continued**Mating\Unmating Force Comparison****Mating/Unmating Data for 5, 40 and 75 Position ERF8/ERM8**

DATA SUMMARIES Continued**NORMAL FORCE (FOR CONTACTS TESTED IN THE HOUSING):**

- 1) Calibrated force gauges are used along with computer controlled positioning equipment.
- 2) For Normal force 8-10 measurements are taken and the averages reported.

Initial	Deflections in inches Forces in Grams										
	<u>0.0011</u>	<u>0.0022</u>	<u>0.0033</u>	<u>0.0044</u>	<u>0.0056</u>	<u>0.0067</u>	<u>0.0078</u>	<u>0.0089</u>	<u>0.0100</u>	<u>0.0111</u>	<i>SET</i>
Averages	7.98	16.70	25.61	34.53	43.09	51.12	58.51	65.23	71.54	77.26	0.0017
Min	7.40	15.80	24.50	33.20	41.50	49.60	56.90	63.30	69.10	74.60	0.0016
Max	8.60	18.40	27.70	36.90	45.00	52.90	60.70	67.50	73.80	79.90	0.0018
St. Dev	0.379	0.745	1.014	1.038	1.102	1.232	1.418	1.602	1.758	2.011	0.0001
Count	12	12	12	12	12	12	12	12	12	12	12

After Thermals	Deflections in inches Forces in Grams										
	<u>0.0011</u>	<u>0.0022</u>	<u>0.0033</u>	<u>0.0044</u>	<u>0.0056</u>	<u>0.0067</u>	<u>0.0078</u>	<u>0.0089</u>	<u>0.0100</u>	<u>0.0111</u>	<i>SET</i>
Averages	0.00	0.00	5.54	12.99	21.05	29.79	38.98	48.58	58.09	67.15	0.0026
Min	0.00	0.00	3.00	9.70	17.30	26.10	35.60	45.60	55.10	64.90	0.0024
Max	0.00	0.00	8.70	17.40	26.60	35.70	45.50	54.90	64.10	71.70	0.0029
St. Dev	0.000	0.000	1.566	2.118	2.527	2.623	2.832	2.685	2.501	2.040	0.0002
Count	12	12	12	12	12	12	12	12	12	12	12

Normal Force - Average Initial vs Average Thermal

DATA SUMMARIES Continued**INSULATION RESISTANCE (IR):**

	Pin to Pin		
	Mated	Unmated	Unmated
Minimum	ERF8/ERM8	ERF8	ERM8
Initial	45000	45000	45000
Thermal	45000	45000	45000
Humidity	12600	11300	45000

	Row to Row		
	Mated	Unmated	Unmated
Minimum	ERF8/ERM8	ERF8	ERM8
Initial	45000	45000	45000
Thermal	45000	45000	45000
Humidity	45000	45000	45000

DIELECTRIC WITHSTANDING VOLTAGE (DWV):

Voltage Rating Summary	
Minimum	ERF8/ERM8
Break Down Voltage	900
Test Voltage	675
Working Voltage	225

Pin to Pin	
Initial Test Voltage	Passed
After Thermal Test Voltage	Passed
After Humidity Test Voltage	Passed

Row to Row	
Initial Test Voltage	Passed
After Thermal Test Voltage	Passed
After Humidity Test Voltage	Passed

DATA SUMMARIES Continued**LLCR Thermal Aging 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	6/5/2014	6/16/2014		
Room Temp (Deg C)	22	22		
Rel Humidity (%)	41	43		
Technician	Aaron McKim	Aaron McKim		
mOhm values	Actual Initial	Delta Thermal	Delta	Delta
Pin Type 1: Signal				
Average	16.38	1.26		
St. Dev.	0.48	0.92		
Min	15.40	0.00		
Max	17.99	8.89		
Summary Count	192	192		
Total Count	192	192		

LLCR Delta Count by Category						
	Stable	Minor	Acceptable	Marginal	Unstable	Open
mOhms	≤ 5	$>5 \text{ \& } \leq 10$	$>10 \text{ \& } \leq 15$	$>15 \text{ \& } \leq 50$	$>50 \text{ \& } \leq 1000$	>1000
Thermal	191	1	0	0	0	0

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. $\leq +5.0$ 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	9/17/2014	9/30/2014	10/6/2014	10/17/2014
Room Temp (Deg C)	22	20	21	21
Rel Humidity (%)	37	48	40	42
Technician	Aaron McKim	Aaron McKim	Tony Wagoner	Aaron McKim
mOhm values	Actual	Delta	Delta Therm Shck	Delta Humidity
	Initial	25 Cycles		
Pin Type 1: Signal				
Average	17.37	0.56	0.94	0.81
St. Dev.	0.72	0.54	0.82	0.70
Min	16.18	0.01	0.01	0.01
Max	21.07	4.01	8.13	5.21
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
25 Cycles	192	0	0	0	0	0
Therm Shck	191	1	0	0	0	0
Humidity	191	1	0	0	0	0

DATA SUMMARIES Continued**LLCR Gas Tight 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	1/29/2014	1/31/2014		
Room Temp (Deg C)	24	23		
Rel Humidity (%)	31	32		
Technician	Aaron McKim	Aaron McKim		
mOhm values	Actual Initial	Delta Acid Vapor	Delta	Delta
Pin Type 1: Signal				
Average	17.84	0.21		
St. Dev.	0.60	0.19		
Min	16.64	0.00		
Max	20.49	1.01		
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
Acid Vapor	192	0	0	0	0	0

DATA SUMMARIES Continued**LLCR Shock & Vibration 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	2/13/2014	2/19/2014		
Room Temp (Deg C)	22	23		
Rel Humidity (%)	34	32		
Technician	Aaron McKim	Aaron McKim		
mOhm values	Actual Initial	Delta Shock-Vib	Delta	Delta
Pin Type 1: Signal				
Average	18.22	1.10		
St. Dev.	0.64	0.57		
Min	17.02	0.01		
Max	20.27	3.36		
Summary Count	192	192		
Total Count	192	192		

LLCR Delta Count by Category						
mOhms	Stable	Minor	Acceptable	Marginal	Unstable	Open
	≤ 5	$>5 \text{ \& } \leq 10$	$>10 \text{ \& } \leq 15$	$>15 \text{ \& } \leq 50$	$>50 \text{ \& } \leq 1000$	>1000
Shock-Vib	192	0	0	0	0	0

Nanosecond Event Detection:

Shock and Vibration Event Detection Summary	
Contacts tested	60
Test Condition	C, 100g's, 6ms, Half-Sine
Shock Events	0
Test Condition	V-B, 7.56 rms g
Vibration Events	0
Total Events	0

DATA SUMMARIES Continued**LLCR Extended Life 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

Group 1-100 cycles

LLCR Measurement Summaries by Pin Type				
Date	6/5/2014	6/6/2014	6/11/2014	6/24/2014
Room Temp (Deg C)	22	22	21	22
Rel Humidity (%)	40	40	45	46
Technician	Aaron McKim	Aaron McKim	Aaron McKim	Aaron McKim
mOhm values	Actual	Delta	Delta Therm Shck	Delta Humidity
	Initial	100 Cycles		
Pin Type 1: Signal				
Average	17.23	0.55	1.05	1.19
St. Dev.	0.61	0.46	0.52	0.66
Min	16.02	0.01	0.01	0.04
Max	20.03	2.13	3.50	4.81
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	$>5 \text{ \& } \leq 10$	$>10 \text{ \& } \leq 15$	$>15 \text{ \& } \leq 50$	$>50 \text{ \& } \leq 1000$	>1000
100 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**Group 2-250 cycles**

LLCR Measurement Summaries by Pin Type				
Date	6/5/2014	6/26/2014	7/7/2014	7/17/2014
Room Temp (Deg C)	22	21	21	22
Rel Humidity (%)	40	42	42	42
Technician	Aaron McKim	Aaron McKim	Aaron McKim	Aaron McKim
mOhm values	Actual Initial	Delta 250 Cycles	Delta Therm Shck	Delta Humidity
Pin Type 1: Signal				
Average	17.08	0.56	1.11	1.29
St. Dev.	0.58	0.55	0.50	0.50
Min	16.14	0.00	0.06	0.02
Max	19.58	3.89	3.46	3.59
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
250 Cycles	192	0	0	0	0	0
Therm Shck	192	0	0	0	0	0
Humidity	192	0	0	0	0	0

Group 3-500 cycles

LLCR Measurement Summaries by Pin Type				
Date	6/5/2014	6/26/2014	7/7/2014	7/17/2014
Room Temp (Deg C)	22	22	21	22
Rel Humidity (%)	40	43	42	42
Technician	Aaron McKim	Aaron McKim	Aaron McKim	Aaron McKim
mOhm values	Actual Initial	Delta 500 Cycles	Delta Therm Shck	Delta Humidity
Pin Type 1: Signal				
Average	17.00	0.52	0.97	1.22
St. Dev.	0.52	0.46	0.46	0.45
Min	16.01	0.00	0.14	0.51
Max	20.40	3.00	3.95	4.32
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
500 Cycles	192	0	0	0	0	0
Therm Shck	192	0	0	0	0	0
Humidity	192	0	0	0	0	0

SUMMARIES Continued**Group 4-1000 cycles**

LLCR Measurement Summaries by Pin Type				
Date	6/5/2014	7/7/2014	7/14/2014	7/25/2014
Room Temp (Deg C)	22	22	22	22
Rel Humidity (%)	40	46	42	38
Technician	Aaron McKim	Aaron McKim	Aaron McKim	Aaron McKim
mOhm values	Actual	Delta	Delta	Delta
	Initial	1000 Cycles	Therm Shck	Humidity
Pin Type 1: Signal				
Average	17.04	0.49	0.76	0.86
St. Dev.	0.58	0.51	0.47	0.53
Min	15.17	0.01	0.00	0.02
Max	18.96	2.98	2.40	3.05
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
Therm Shck	192	0	0	0	0	0
Humidity	192	0	0	0	0	0

EQUIPMENT AND CALIBRATION SCHEDULES

Equipment #: THC-02
Description: Temperature/Humidity Chamber
Manufacturer: Thermotron
Model: SE-1000-6-6
Serial #: 31808
Accuracy: See Manual
... Last Cal: 02/16/2015, Next Cal: 02/16/2016

Equipment #: HPM-01
Description: Hipot Megommeter
Manufacturer: Hipotronics
Model: H306B-A
Serial #: M9905004
Accuracy: 2 % Full Scale Accuracy
... Last Cal: 05/24/2015, Next Cal: 08/24/2016

Equipment #: OV-05
Description: Forced Air Oven, 5 Cu. Ft., 120 V (Chamber Room)
Manufacturer: Sheldon Mfg.
Model: CE5F
Serial #: 02008008
Accuracy: +/- 5 deg. C
... Last Cal: 02/18/2015, Next Cal: 02/18/2016

Equipment #: TSC-01
Description: Vertical Thermal Shock Chamber
Manufacturer: Cincinnatti Sub Zero
Model: VTS-3-6-6-SC/AC
Serial #: 10-VT14993
Accuracy: See Manual
... Last Cal: 05/18/2015, Next Cal: 05/18/2016

Equipment #: MO-04
Description: Multimeter /Data Acquisition System
Manufacturer: Keithley
Model: 2700
Serial #: 0798688
Accuracy: See Manual
... Last Cal: 04/30/2015, Next Cal: 04/30/2016

EQUIPMENT AND CALIBRATION SCHEDULES

Equipment #: TCT-01

Description: Test Stand

Manufacturer: Chatillon

Model: TCD-1000

Serial #: 05 23 00 02

Accuracy: Speed Accuracy: +/-5% of max speed; Displacement: +/- .5% or +/- .005, whichever is greater.

... Last Cal: 08/24/2015, Next Cal: 08/24/2016

Equipment #: PS-01

Description: Power Supply

Manufacturer: Agilent

Model: AT-6032A

Serial #: MY41001186

Accuracy: Last Cal: 06/12/2015, Next Cal: 04/12/2016

Equipment #: MO-03

Description: Multimeter /Data Acquisition System

Manufacturer: Keithley

Model: 2700

Serial #: 0791975

Accuracy: See Manual

... Last Cal: 05/19/2015, Next Cal: 05/19/2016

Equipment #: SVC-01

Description: Shock & Vibration Table

Manufacturer: Data Physics

Model: LE-DSA-10-20K

Serial #: 10037

Accuracy: See Manual

... Last Cal: 11/31/2015, Next Cal: 11/31/2016

Equipment #: ACLM-01

Description: Accelerometer

Manufacturer: PCB Piezotronics

Model: 352C03

Serial #: 115819

Accuracy: See Manual

... Last Cal: 07/09/2015, Next Cal: 07/09/2016

Equipment #: ED-03

Description: Event Detector

Manufacturer: Analysis Tech

Model: 32EHD

Serial #: 1100604

Accuracy: See Manual

... Last Cal: 06/04/2015, Next Cal: 06/04/2016