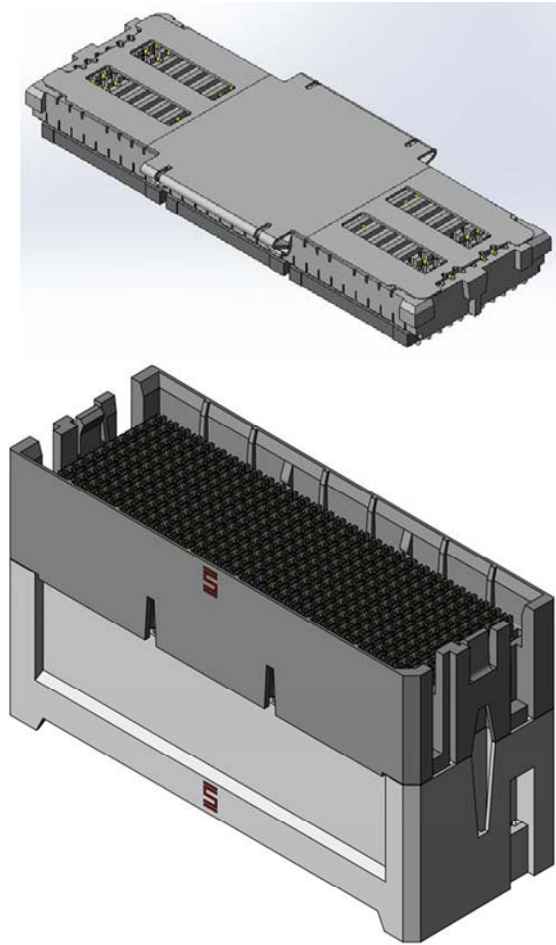




Project Number: Design Qualification Test Report	Tracking Code: 396937_Report_Rev_2
Requested by: Neal Patterson	Date: 6/4/2015
Part #: TPAF-D-H-H-H-0-S-2/TPAR-H-H-H-35-S	
Part description: TPAF/TPAR	Tech: Craig Ryan
Test Start: 10/16/2014	Test Completed: 2/11/2015



(Actual part not depicted)

DESIGN QUALIFICATION TEST REPORT
TPAF/TPAR
TPAF-D-H-H-H-0-S-2/TPAR-H-H-H-35-S

Tracking Code: 396937 Report Rev 2

Part #: TPAF-D-H-H-H-0-S-2/TPAR-H-H-H-35-S

Part description: TPAF/TPAR

REVISION HISTORY

DATE	REV.NUM.	DESCRIPTION	ENG
2/12/2015	1	Initial Issue	KH
6/4/2015	2	Adding the Mating/Unmating basic force data	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.

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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 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) Samtec Test PCBs used: PCB-106574-TST/PCB-106575-TST/PCB-106577-TST

FLOWCHARTS**Gas Tight**Group 1

TPAF-D-H-H-H-0-S-2

TPAR-H-H-H-35-S

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

TPAF-D-H-H-H-0-S-2

TPAR-H-H-H-35-S

8 Contacts Minimum
Signal Without Thermals**Step Description**

1. Contact Gaps
2. Normal Force ⁽¹⁾
Deflection = 0.0134 "
Expected Force at Max Deflection = 78 g

Group 2

TPAF-D-H-H-H-0-S-2

TPAR-H-H-H-35-S

8 Contacts Minimum
Ground Without Thermals**Step Description**

1. Contact Gaps
2. Normal Force ⁽¹⁾
Deflection = 0.0100 "
Expected Force at Max Deflection = 72 g

Group 3

TPAF-D-H-H-H-0-S-2

TPAR-H-H-H-35-S

8 Contacts Minimum
Signal With Thermals**Step Description**

1. Contact Gaps
2. Thermal Age ⁽²⁾
3. Contact Gaps
4. Normal Force ⁽¹⁾
Deflection = 0.0134 "
Expected Force at Max Deflection = 78 g

Group 4

TPAF-D-H-H-H-0-S-2

TPAR-H-H-H-35-S

8 Contacts Minimum
Ground With Thermals**Step Description**

1. Contact Gaps
2. Thermal Age ⁽²⁾
3. Contact Gaps
4. Normal Force ⁽¹⁾
Deflection = 0.0100 "
Expected Force at Max Deflection = 72 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**

TPAF-D-H-H-H-0-S-2

TPAR-H-H-H-35-S

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**

TPAF-D-H-H-H-0-S-2
TPAR-H-H-H-35-S
8 Assemblies
Largest Position

Group 2

TPAF-D-H-H-H-0-S-2
TPAR-H-H-35-S
8 Assemblies
Middle Position

Group 3

TPAF-D-H-0-S-2
TPAR-H-35-S
8 Assemblies
Smallest Position

Step	Description	Step	Description	Step	Description
1.	Contact Gaps	1.	Contact Gaps	1.	Contact Gaps
2.	LLCR ⁽²⁾ Max Delta = 15 mOhm	2.	Mating/Unmating Force ⁽³⁾	2.	Mating/Unmating Force ⁽³⁾
3.	Mating/Unmating Force ⁽³⁾	3.	Cycles Quantity = 25 Cycles	3.	Cycles Quantity = 25 Cycles
4.	Cycles Quantity = 25 Cycles	4.	Mating/Unmating Force ⁽³⁾	4.	Mating/Unmating Force ⁽³⁾
5.	Mating/Unmating Force ⁽³⁾	5.	Cycles Quantity = 25 Cycles	5.	Cycles Quantity = 25 Cycles
6.	Cycles Quantity = 25 Cycles	6.	Mating/Unmating Force ⁽³⁾	6.	Mating/Unmating Force ⁽³⁾
7.	Mating/Unmating Force ⁽³⁾	7.	Cycles Quantity = 25 Cycles	7.	Cycles Quantity = 25 Cycles
8.	Cycles Quantity = 25 Cycles	8.	Mating/Unmating Force ⁽³⁾	8.	Mating/Unmating Force ⁽³⁾
9.	Mating/Unmating Force ⁽³⁾	9.	Cycles Quantity = 25 Cycles	9.	Cycles Quantity = 25 Cycles
10.	Cycles Quantity = 25 Cycles	10.	Mating/Unmating Force ⁽³⁾	10.	Mating/Unmating Force ⁽³⁾
11.	Mating/Unmating Force ⁽³⁾				
12.	Contact Gaps				
13.	LLCR ⁽²⁾ Max Delta = 15 mOhm				
14.	Thermal Shock ⁽⁴⁾				
15.	LLCR ⁽²⁾ Max Delta = 15 mOhm				
16.	Humidity ⁽¹⁾				
17.	LLCR ⁽²⁾ Max Delta = 15 mOhm				
18.	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**

Group 1
TPAF-D-H-H-H-0-S-2
TPAR-H-H-H-35-S
2 Assemblies

Step	Description
1.	DWV Breakdown (2)

Group 2
TPAF-D-H-H-H-0-S-2

2 Assemblies

Step	Description
1.	DWV Breakdown (2)

Group 3

TPAR-H-H-H-35-S
2 Assemblies

Step	Description
1.	DWV Breakdown (2)

Group 4
TPAF-D-H-H-H-0-S-2
TPAR-H-H-H-35-S
2 Assemblies

Step	Description
1.	IR (4)
2.	DWV at Test Voltage (1)
3.	Thermal Shock (5)
4.	IR (4)
5.	DWV at Test Voltage (1)
6.	Humidity (5)
7.	IR (4)
8.	DWV at Test Voltage (1)

Row-to-Row

Group 5
TPAF-D-H-H-H-0-S-2
TPAR-H-H-H-35-S
2 Assemblies

Step	Description
1.	DWV Breakdown (2)

Group 6
TPAF-D-H-H-H-0-S-2

2 Assemblies

Step	Description
1.	DWV Breakdown (2)

Group 7

TPAR-H-H-H-35-S
2 Assemblies

Step	Description
1.	DWV Breakdown (2)

Group 8
TPAF-D-H-H-H-0-S-2
TPAR-H-H-H-35-S
2 Assemblies

Step	Description
1.	IR (4)
2.	DWV at Test Voltage (1)
3.	Thermal Shock (5)
4.	IR (4)
5.	DWV at Test Voltage (1)
6.	Humidity (5)
7.	IR (4)
8.	DWV at Test Voltage (1)

FLOWCHARTS Continued

Pin-to-Ground**Group 9**

TPAF-D-H-H-H-0-S-2
TPAR-H-H-H-35-S
2 Assemblies

Step	Description
1.	DWV Breakdown ₍₂₎

Group 10

TPAF-D-H-H-H-0-S-2
2 Assemblies

Step	Description
1.	DWV Breakdown ₍₂₎

Group 11

TPAR-H-H-H-35-S
2 Assemblies

Step	Description
1.	DWV Breakdown ₍₂₎

Group 12

TPAF-D-H-H-H-0-S-2
TPAR-H-H-H-35-S
2 Assemblies

Step	Description
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

<p><u>Group 1</u> TPAF-D-H-H-H-0-S-2 TPAR-H-H-H-35-S 10 Pins Powered Signal 1 Vertical Row Powered</p> <hr/> <p>Step Description</p> <p>1. CCC⁽¹⁾ Rows = 1 Number of Positions = 10</p>	<p><u>Group 2</u> TPAF-D-H-H-H-0-S-2 TPAR-H-H-H-35-S 20 Pins Powered Signal 2 Adjacent Vertical Rows Powered</p> <hr/> <p>Step Description</p> <p>1. CCC⁽¹⁾ Rows = 2 Number of Positions = 10</p>	<p><u>Group 3</u> TPAF-D-H-H-H-0-S-2 TPAR-H-H-H-35-S 30 Pins Powered Signal 3 Adjacent Vertical Rows Powered</p> <hr/> <p>Step Description</p> <p>1. CCC⁽¹⁾ Rows = 3 Number of Positions = 10</p>	<p><u>Group 4</u> TPAF-D-H-H-H-0-S-2 TPAR-H-H-H-35-S 40 Pins Powered Signal 4 Adjacent Vertical Rows Powered</p> <hr/> <p>Step Description</p> <p>1. CCC⁽¹⁾ Rows = 4 Number of Positions = 10</p>
<p><u>Group 5</u> TPAF-D-H-H-H-0-S-2 TPAR-H-H-H-35-S 300 Pins Powered Signal All Pins Powered</p> <hr/> <p>Step Description</p> <p>1. CCC⁽¹⁾ Rows = 30 Number of Positions = 10</p>	<p><u>Group 6</u> TPAF-D-H-H-H-0-S-2 TPAR-H-H-H-35-S 1 Pins Powered Ground Vertical Row Powered</p> <hr/> <p>Step Description</p> <p>1. CCC⁽¹⁾ Rows = 1 Number of Positions = 1</p>	<p><u>Group 7</u> TPAF-D-H-H-H-0-S-2 TPAR-H-H-H-35-S 2 Pins Powered Ground 2 Adjacent Vertical Rows Powered</p> <hr/> <p>Step Description</p> <p>1. CCC⁽¹⁾ Rows = 2 Number of Positions = 1</p>	<p><u>Group 8</u> TPAF-D-H-H-H-0-S-2 TPAR-H-H-H-35-S 3 Pins Powered Ground 3 Adjacent Vertical Rows Powered</p> <hr/> <p>Step Description</p> <p>1. CCC⁽¹⁾ Rows = 3 Number of Positions = 1</p>
<p><u>Group 9</u> TPAF-D-H-H-H-0-S-2 TPAR-H-H-H-35-S 4 Pins Powered Ground 4 Adjacent Vertical Rows Powered</p> <hr/> <p>Step Description</p> <p>1. CCC⁽¹⁾ Rows = 4 Number of Positions = 1</p>	<p><u>Group 10</u> TPAF-D-H-H-H-0-S-2 TPAR-H-H-H-35-S 30 Pins Powered Ground All Pins Powered</p> <hr/> <p>Step Description</p> <p>1. CCC⁽¹⁾ Rows = 30 Number of Positions = 1</p>	<p><u>Group 11</u> TPAF-D-H-H-H-0-S-2 TPAR-H-H-H-35-S 330 Pins Powered All Powered</p> <hr/> <p>Step Description</p> <p>1. CCC⁽¹⁾ Rows = 30 Number of Positions = 11</p>	

(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

TPAF-D-H-H-H-0-S-2

TPAR-H-H-H-35-S

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

TPAF-D-H-H-H-0-S-2

TPAR-H-H-H-35-S

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)

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

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.

ATTRIBUTE DEFINITIONS Continued

The following is a brief, simplified description of attributes

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 μm (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.

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.

ATTRIBUTE DEFINITIONS Continued

The following is a brief, simplified description of attributes

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

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.

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****Signal Pin**

- CCC for a 30°C Temperature Rise-----0.8 A per contact with 10 contacts (10x1) powered
- CCC for a 30°C Temperature Rise-----0.6 A per contact with 20 contacts (10x2) powered
- CCC for a 30°C Temperature Rise-----0.5 A per contact with 30 contacts (10x3) powered
- CCC for a 30°C Temperature Rise-----0.4 A per contact with 40 contacts (10x4) powered
- CCC for a 30°C Temperature Rise-----0.2 A per contact with 300 contacts (10x30) powered

Ground Pin

- CCC for a 30°C Temperature Rise-----13.1 A per contact with 1 contacts (1x1) powered
- CCC for a 30°C Temperature Rise-----9.6 A per contact with 2 contacts (1x2) powered
- CCC for a 30°C Temperature Rise-----8.3 A per contact with 3 contacts (1x3) powered
- CCC for a 30°C Temperature Rise-----7.3 A per contact with 4 contacts (1x4) powered
- CCC for a 30°C Temperature Rise-----3.9 A per contact with 30 contacts (1x30) powered

Ground pin and Signal pin (signal contacts powered @ 1/2 rated current @ 0.15 AMPS)

- CCC for a 30°C Temperature Rise-----3.2A per contact with 30 ground contacts(1x30) powered

Mating/Unmating Forces:**Thermal Aging Group**

- **Initial**
 - **Mating**
 - **Min** -----16.32 Lbs
 - **Max** -----18.34 Lbs
 - **Unmating**
 - **Min** -----10.93 Lbs
 - **Max** -----12.40 Lbs
- **After Thermal**
 - **Mating**
 - **Min** -----11.77 Lbs
 - **Max** -----14.30 Lbs
 - **Unmating**
 - **Min** ----- 8.24 Lbs
 - **Max** -----10.48 Lbs

RESULTS Continued**Mating/Unmating Forces:****Mating/Unmating Durability Group (TPAF-D-H-H-H-0-S-2/TPAR-H-H-H-35-S)**

- **Initial**
 - **Mating**
 - **Min** -----15.58 Lbs
 - **Max** -----18.42 Lbs
 - **Unmating**
 - **Min** -----10.73 Lbs
 - **Max** -----11.89 Lbs
- **After 25 Cycles**
 - **Mating**
 - **Min** -----16.74 Lbs
 - **Max** -----21.51 Lbs
 - **Unmating**
 - **Min** -----12.50 Lbs
 - **Max** -----14.69 Lbs
- **After 50 Cycles**
 - **Mating**
 - **Min** -----17.20 Lbs
 - **Max** -----22.17 Lbs
 - **Unmating**
 - **Min** -----12.33 Lbs
 - **Max** -----16.52 Lbs
- **After 75 Cycles**
 - **Mating**
 - **Min** -----17.08 Lbs
 - **Max** -----23.11 Lbs
 - **Unmating**
 - **Min** -----14.04 Lbs
 - **Max** -----17.97 Lbs
- **After 100 Cycles**
 - **Mating**
 - **Min** -----18.26 Lbs
 - **Max** -----22.92 Lbs
 - **Unmating**
 - **Min** -----14.28 Lbs
 - **Max** -----18.19 Lbs
- **After Humidity**
 - **Mating**
 - **Min** -----13.07 Lbs
 - **Max** -----15.50 Lbs
 - **Unmating**
 - **Min** -----10.95 Lbs
 - **Max** -----12.96 Lbs

RESULTS Continued**Mating/Unmating Forces:****Mating/Unmating Basic Group (TPAF-D-H-H-0-S-2/TPAR-H-H-35-S)**

- **Initial**
 - **Mating**
 - **Min** -----11.04 Lbs
 - **Max** -----14.04 Lbs
 - **Unmating**
 - **Min** ----- 8.19 Lbs
 - **Max** ----- 8.92 Lbs
- **After 25 Cycles**
 - **Mating**
 - **Min** -----12.06 Lbs
 - **Max** -----15.81 Lbs
 - **Unmating**
 - **Min** ----- 8.88 Lbs
 - **Max** -----10.16 Lbs
- **After 50 Cycles**
 - **Mating**
 - **Min** -----11.48 Lbs
 - **Max** -----14.96 Lbs
 - **Unmating**
 - **Min** ----- 9.60 Lbs
 - **Max** -----10.93 Lbs
- **After 75 Cycles**
 - **Mating**
 - **Min** -----12.54 Lbs
 - **Max** -----14.63 Lbs
 - **Unmating**
 - **Min** -----10.11 Lbs
 - **Max** -----11.15 Lbs
- **After 100 Cycles**
 - **Mating**
 - **Min** -----12.74 Lbs
 - **Max** -----15.39 Lbs
 - **Unmating**
 - **Min** -----10.43 Lbs
 - **Max** -----11.70 Lbs

RESULTS Continued**Mating/Unmating Forces:****Mating/Unmating Basic Group (TPAF-D-H-0-S-2/TPAR-H-35-S)**

- **Initial**
 - **Mating**
 - **Min** ----- 5.88 Lbs
 - **Max** ----- 7.62 Lbs
 - **Unmating**
 - **Min** ----- 3.86 Lbs
 - **Max** ----- 4.60 Lbs
- **After 25 Cycles**
 - **Mating**
 - **Min** ----- 6.06 Lbs
 - **Max** ----- 7.59 Lbs
 - **Unmating**
 - **Min** ----- 4.42 Lbs
 - **Max** ----- 5.27 Lbs
- **After 50 Cycles**
 - **Mating**
 - **Min** ----- 6.16 Lbs
 - **Max** ----- 7.33 Lbs
 - **Unmating**
 - **Min** ----- 4.81 Lbs
 - **Max** ----- 5.92 Lbs
- **After 75 Cycles**
 - **Mating**
 - **Min** ----- 6.24 Lbs
 - **Max** ----- 7.42 Lbs
 - **Unmating**
 - **Min** ----- 5.36 Lbs
 - **Max** ----- 6.42 Lbs
- **After 100 Cycles**
 - **Mating**
 - **Min** ----- 6.49 Lbs
 - **Max** ----- 8.07 Lbs
 - **Unmating**
 - **Min** ----- 5.59 Lbs
 - **Max** ----- 7.17 Lbs

RESULTS Continued**Normal Force at 0.0094 inch deflection****Signal Pin**• **Initial**

○ **Min**-----40.30 gf **Set** ---- 0.0000 in
○ **Max** -----45.10 gf **Set** ---- 0.0002 in

• **Thermal**

○ **Min**----- 25.10 gf **Set**---- 0.0025 in
○ **Max** -----29.00 gf **Set**---- 0.0034 in

Ground Pin• **Initial**

○ **Min**-----43.30 gf **Set** ---- 0.0000 in
○ **Max** -----49.20 gf **Set** ---- 0.0002 in

• **Thermal**

○ **Min**----- 21.80 gf **Set**---- 0.0023 in
○ **Max** -----35.10 gf **Set**---- 0.0035 in

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

- **Initial**
 - Mated -----45000 Meg Ω ----- Passed
 - Unmated -----45000 Meg Ω ----- Passed
- **Thermal**
 - Mated -----45000 Meg Ω ----- Passed
 - Unmated -----45000 Meg Ω ----- Passed
- **Humidity**
 - Mated -----12300 Meg Ω ----- Passed
 - Unmated -----35000 Meg Ω ----- Passed

Row to Row

- **Initial**
 - Mated -----45000 Meg Ω ----- Passed
 - Unmated -----45000 Meg Ω ----- Passed
- **Thermal**
 - Mated -----45000 Meg Ω ----- Passed
 - Unmated -----45000 Meg Ω ----- Passed
- **Humidity**
 - Mated -----15600 Meg Ω ----- Passed
 - Unmated -----45000 Meg Ω ----- Passed

Pin to Ground

- **Initial**
 - Mated -----45000 Meg Ω ----- Passed
 - Unmated -----45000 Meg Ω ----- Passed
- **Thermal**
 - Mated -----45000 Meg Ω ----- Passed
 - Unmated -----45000 Meg Ω ----- Passed
- **Humidity**
 - Mated -----20400 Meg Ω ----- Passed
 - Unmated -----34000 Meg Ω ----- Passed

Dielectric Withstanding Voltage minimums, DWV

- **Minimums**
 - Breakdown Voltage -----667 VAC
 - Test Voltage -----500 VAC
 - Working Voltage -----165 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

Pin to Ground

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

RESULTS Continued**LLCR Gas Tight (128 signal and 48 ground LLCR test points)****Signal pin**

- **Initial** ----- 95.96 mOhms Max
- **Gas-Tight**
 - **<= +5.0 mOhms** ----- 126 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

Ground Pin

- **Initial** ----- 9.68 mOhms Max
- **Gas-Tight**
 - **<= +5.0 mOhms** ----- 48 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

LLCR Thermal Aging (128 signal and 48 ground LLCR test points)**Signal Pin**

- **Initial** ----- 99.95 mOhms Max
- **Thermal Aging**
 - **<= +5.0 mOhms** ----- 125 Points ----- Stable
 - **+5.1 to +10.0 mOhms** ----- 2 Points ----- Minor
 - **+10.1 to +15.0 mOhms** ----- 1 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

Ground Pin

- **Initial** ----- 9.43 mOhms Max
- **Thermal Aging**
 - **<= +5.0 mOhms** ----- 48 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 Durability (128 Signal and 48 Ground LLCR test points)****Signal Pin**

- **Initial** ----- 96.42 mOhms Max
- **Durability, 100 Cycles**
 - **<= +5.0 mOhms** ----- 109 Points ----- Stable
 - **+5.1 to +10.0 mOhms** ----- 19 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** ----- 109 Points ----- Stable
 - **+5.1 to +10.0 mOhms** ----- 18 Points ----- Minor
 - **+10.1 to +15.0 mOhms** ----- 1 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** ----- 107 Points ----- Stable
 - **+5.1 to +10.0 mOhms** ----- 13 Points ----- Minor
 - **+10.1 to +15.0 mOhms** ----- 8 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

Ground Pin

- **Initial** ----- 9.81 mOhms Max
- **Durability, 100 Cycles**
 - **<= +5.0 mOhms** ----- 48 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** ----- 48 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** ----- 48 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 (144 Signal and 48 Ground LLCR test points)****Signal Pin**

- **Initial**-----100.99 mOhms Max
- **Shock &Vibration**
 - **<= +5.0 mOhms**-----139 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

Ground Pin

- **Initial**-----9.36 mOhms Max
- **Shock &Vibration**
 - **<= +5.0 mOhms**-----48 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

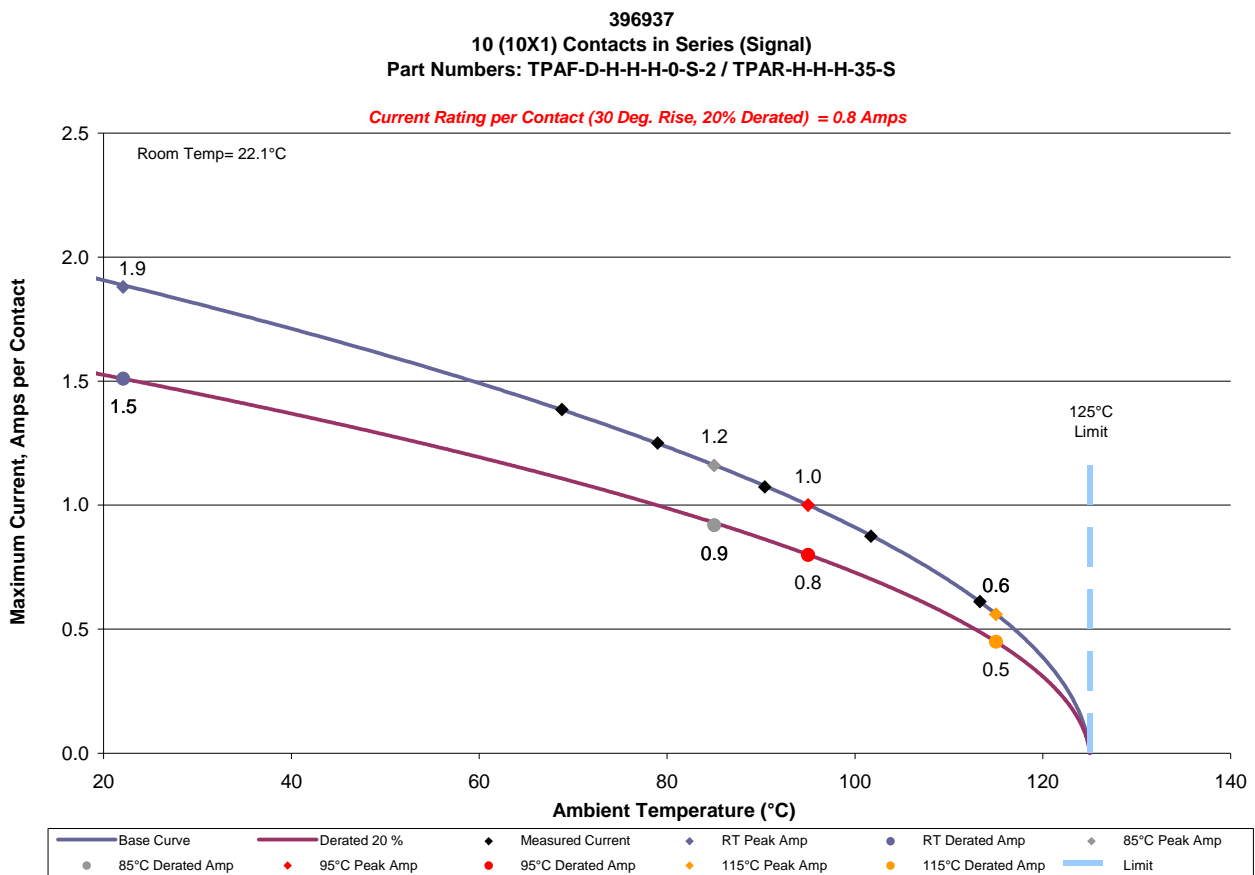
Mechanical Shock & Random Vibration:

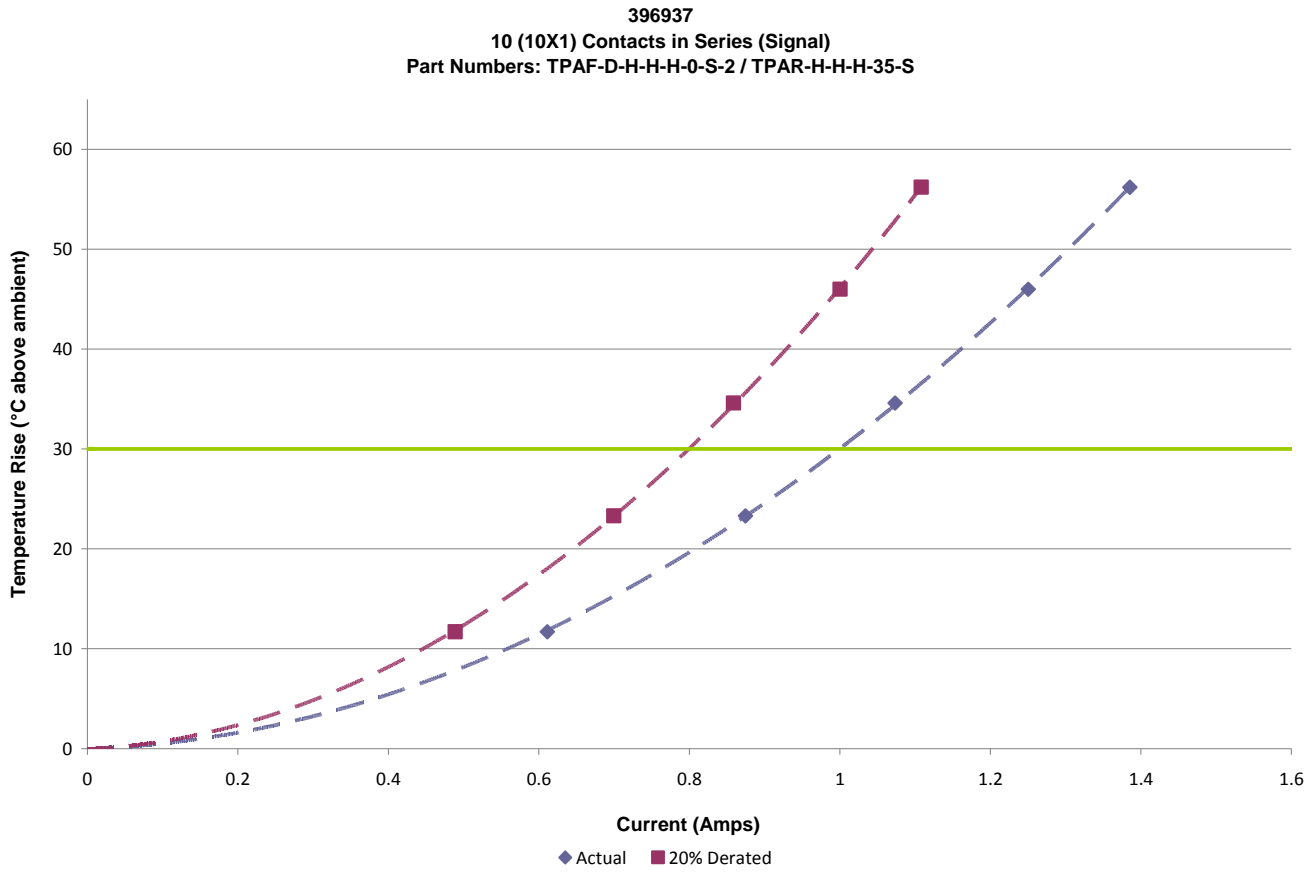
- **Shock**
 - **No Damage**-----Pass
 - **50 Nanoseconds**-----Pass
- **Vibration**
 - **No Damage**-----Pass
 - **50 Nanoseconds**-----Pass

DATA SUMMARIES

TEMPERATURE RISE (Current Carrying Capacity, CCC):

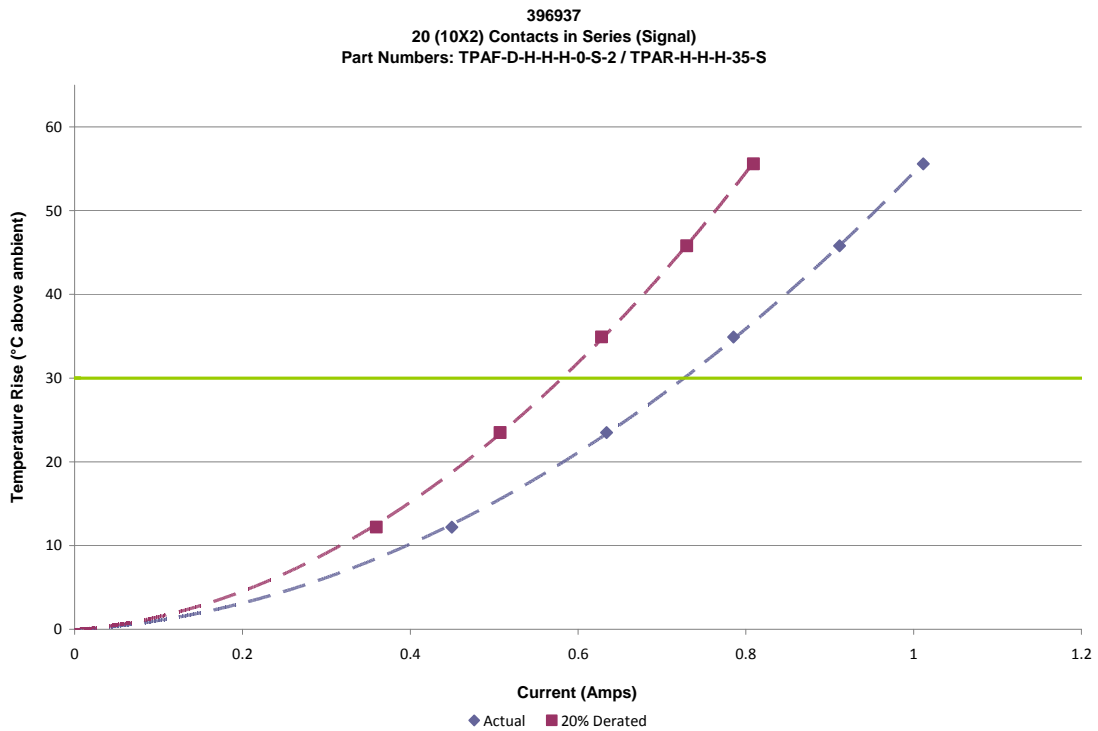
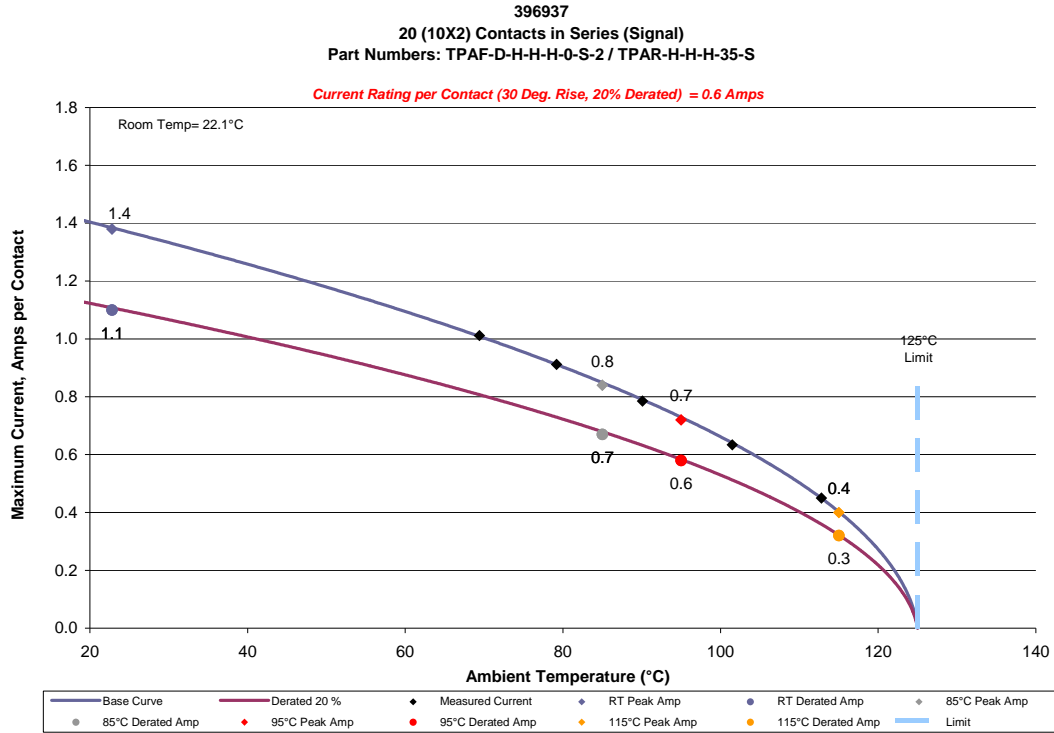
- 1) High quality thermocouples whose temperature slopes track one another were used for temperature monitoring.
- 2) The thermocouples were placed at a location to sense the maximum temperature generated during testing.
- 3) Temperature readings recorded are those for which three successive readings, 15 minutes apart, differ less than 1° C (computer controlled data acquisition).
- 4) Adjacent contacts were powered:
 - a. Linear configuration with 10 adjacent signal conductors/contacts powered





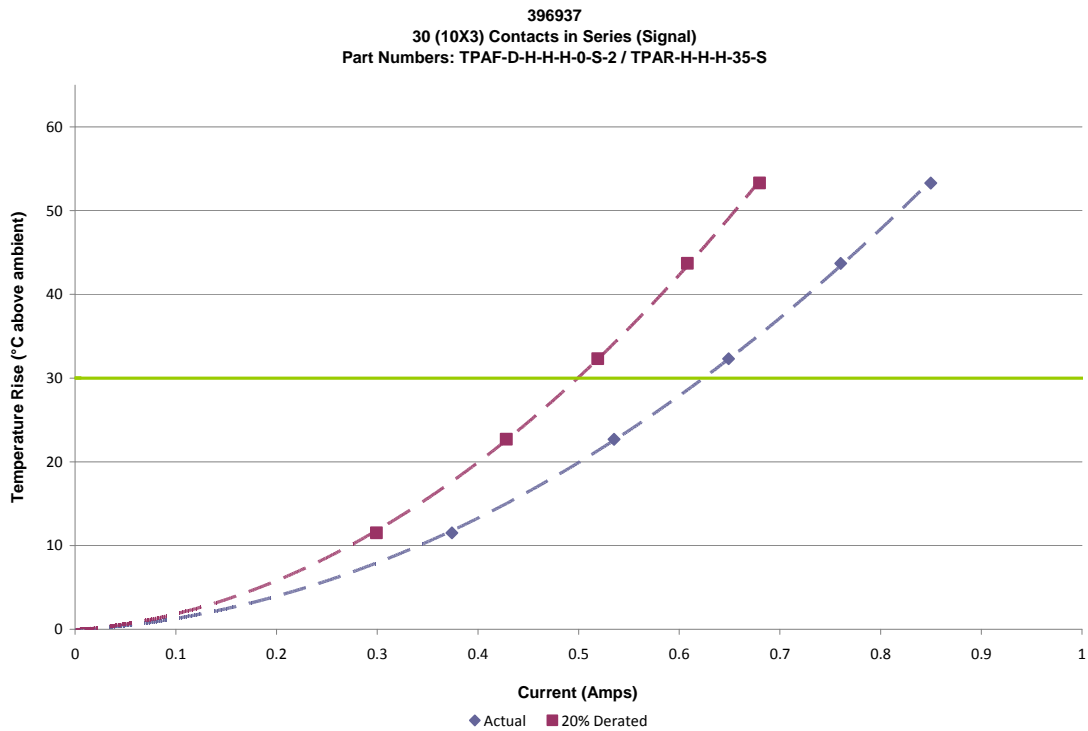
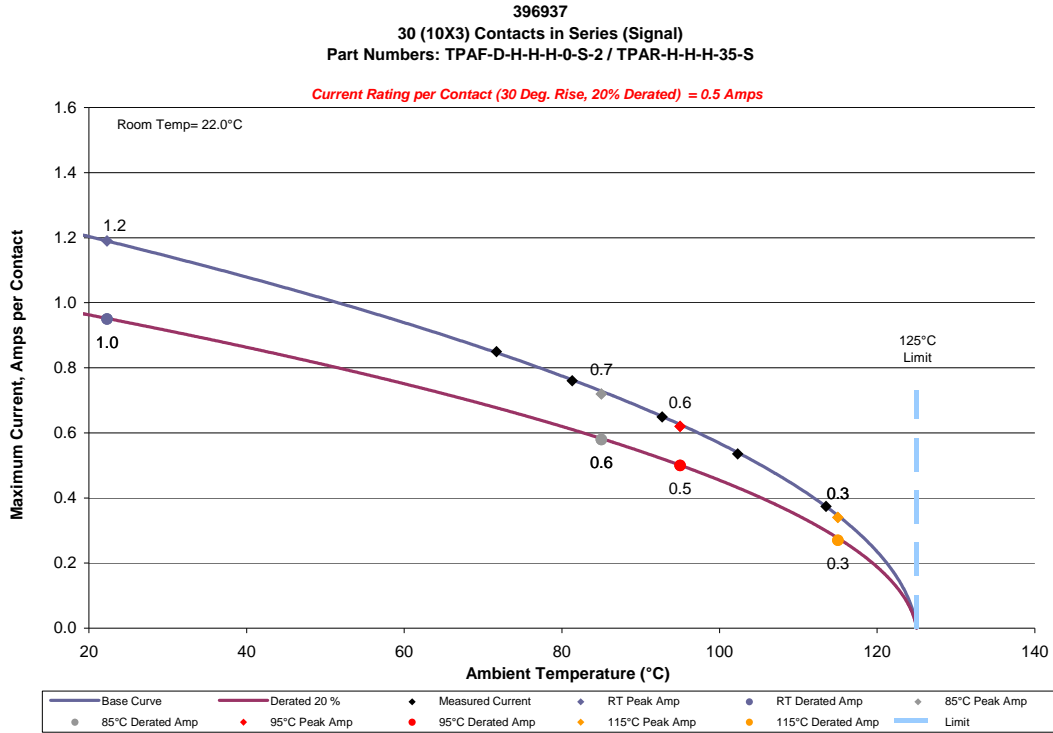
DATA SUMMARIES Continued

b. Linear configuration with 20 adjacent signal conductors/contacts powered



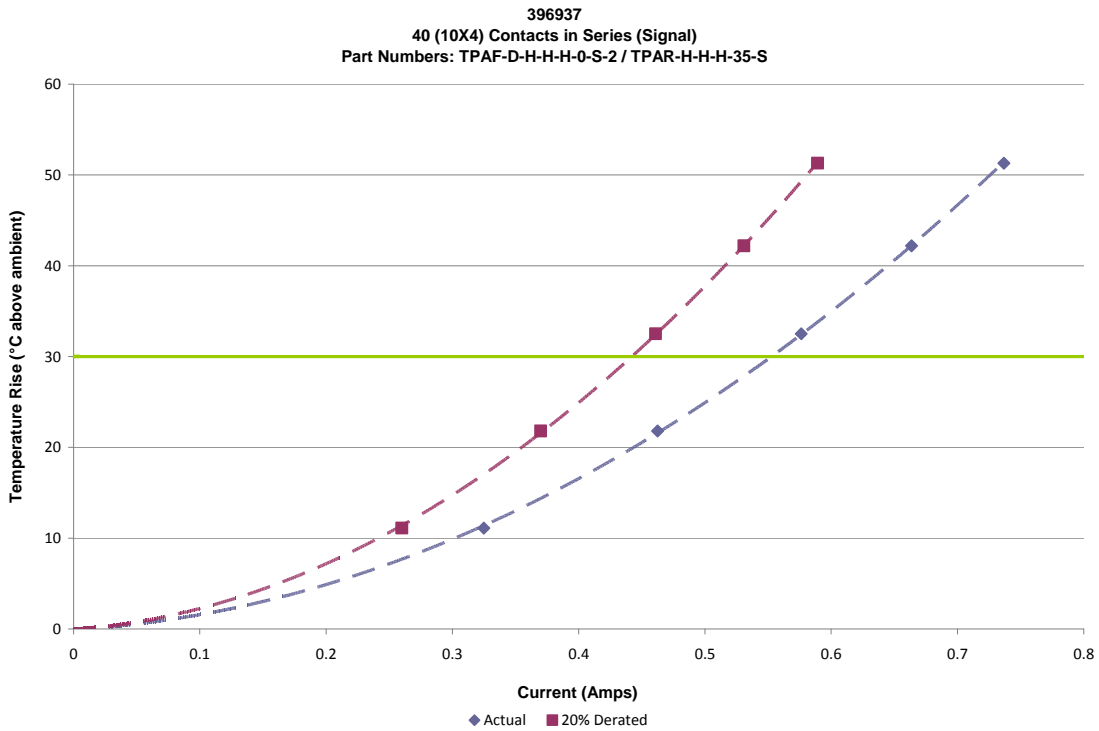
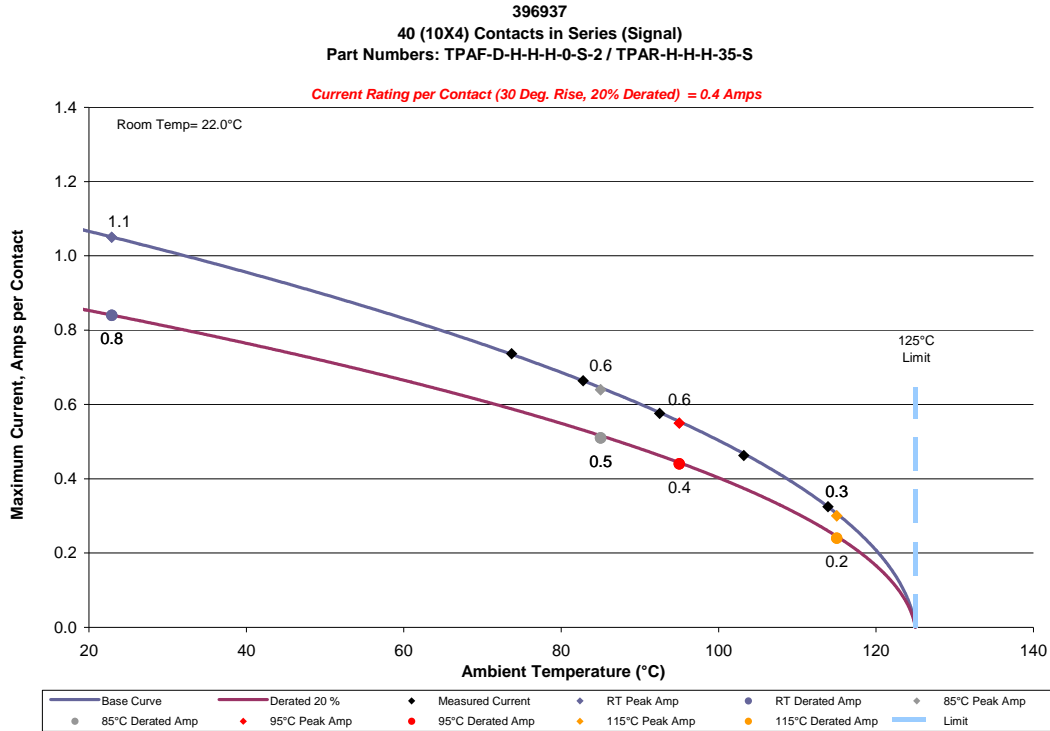
DATA SUMMARIES Continued

c. Linear configuration with 30 adjacent signal conductors/contacts powered



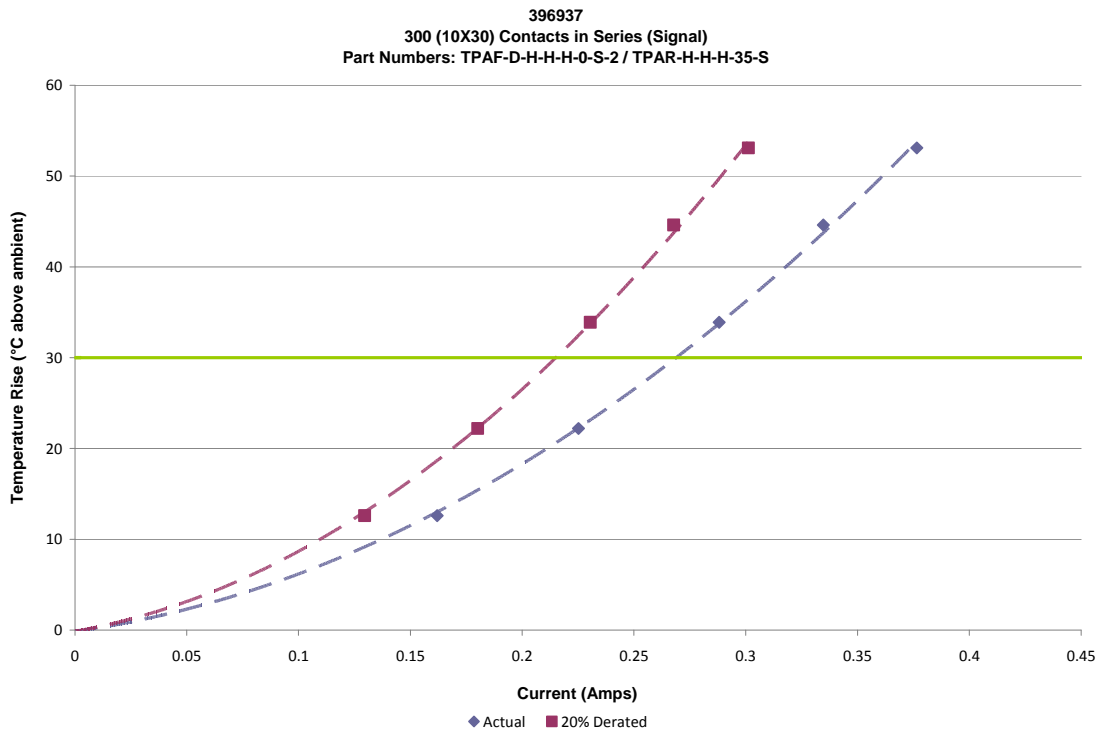
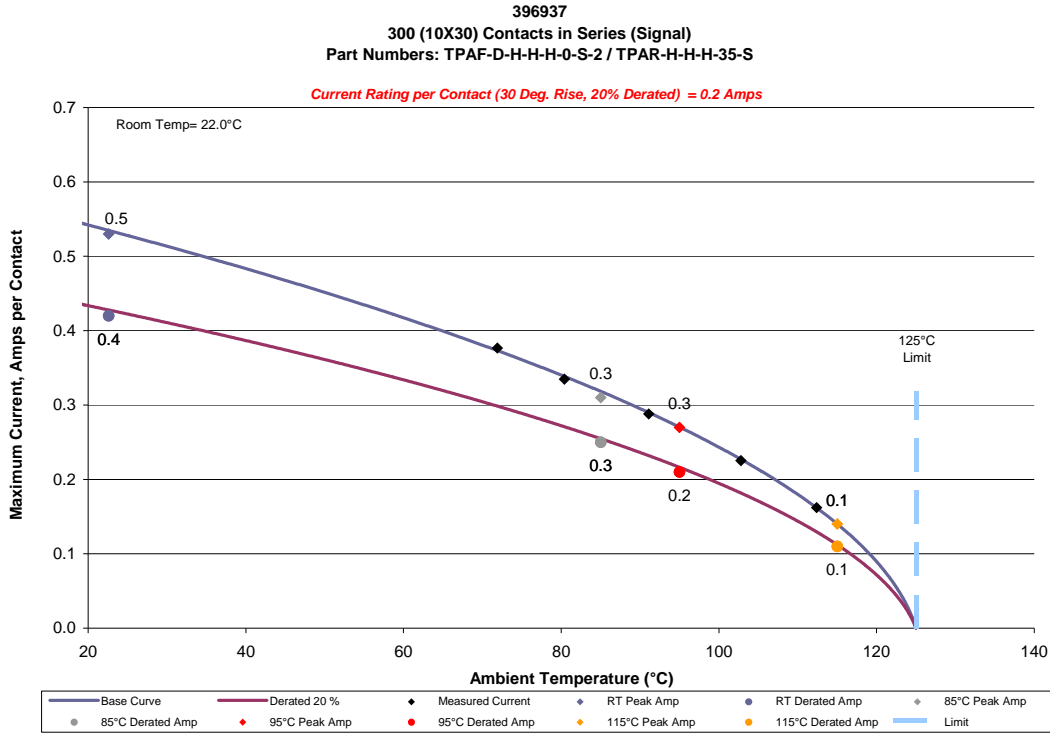
DATA SUMMARIES Continued

d. Linear configuration with 40 adjacent signal conductors/contacts powered



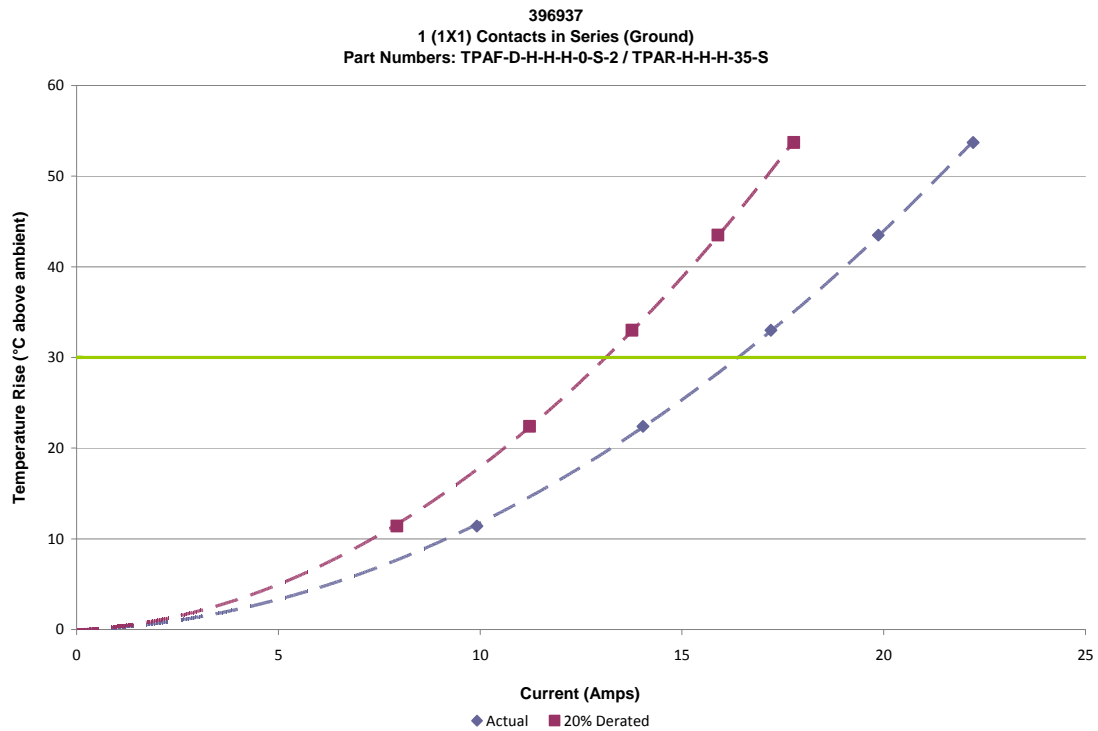
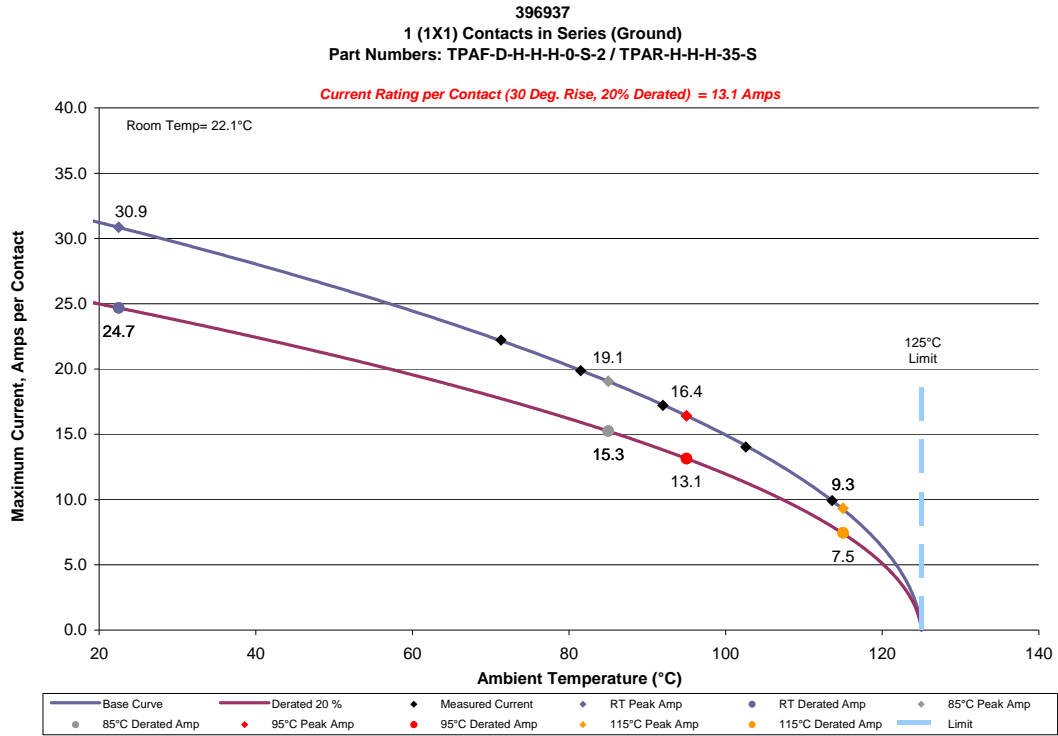
DATA SUMMARIES Continued

e. Linear configuration with all adjacent signal conductors/contacts powered



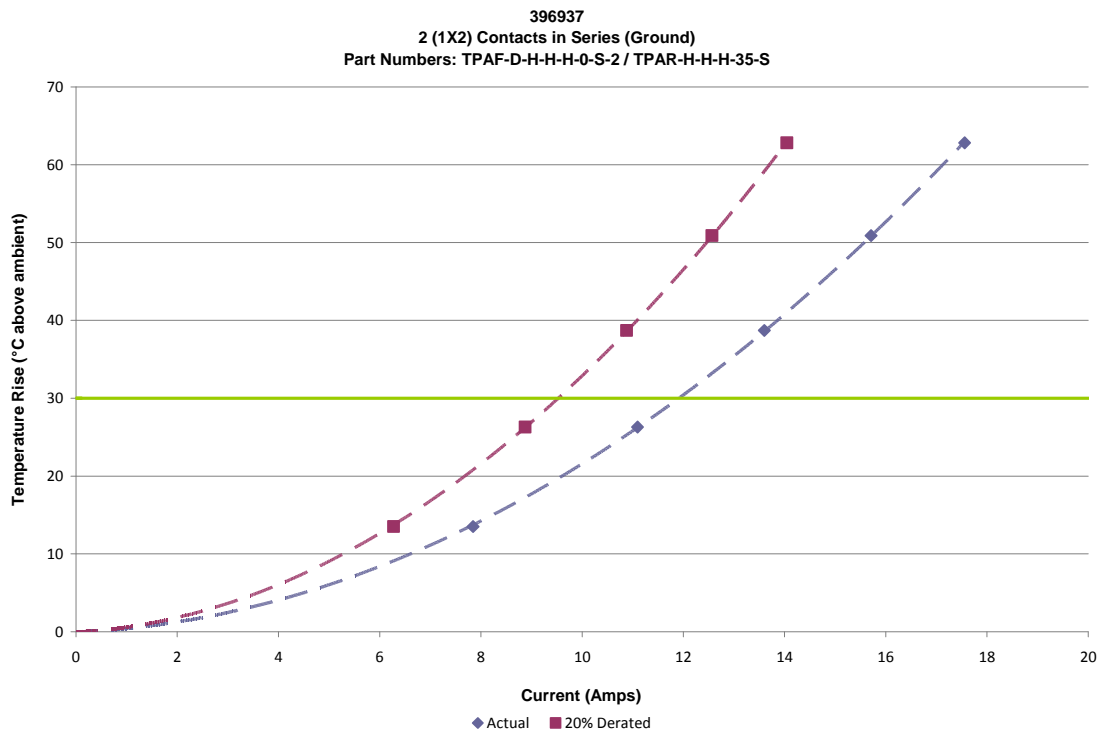
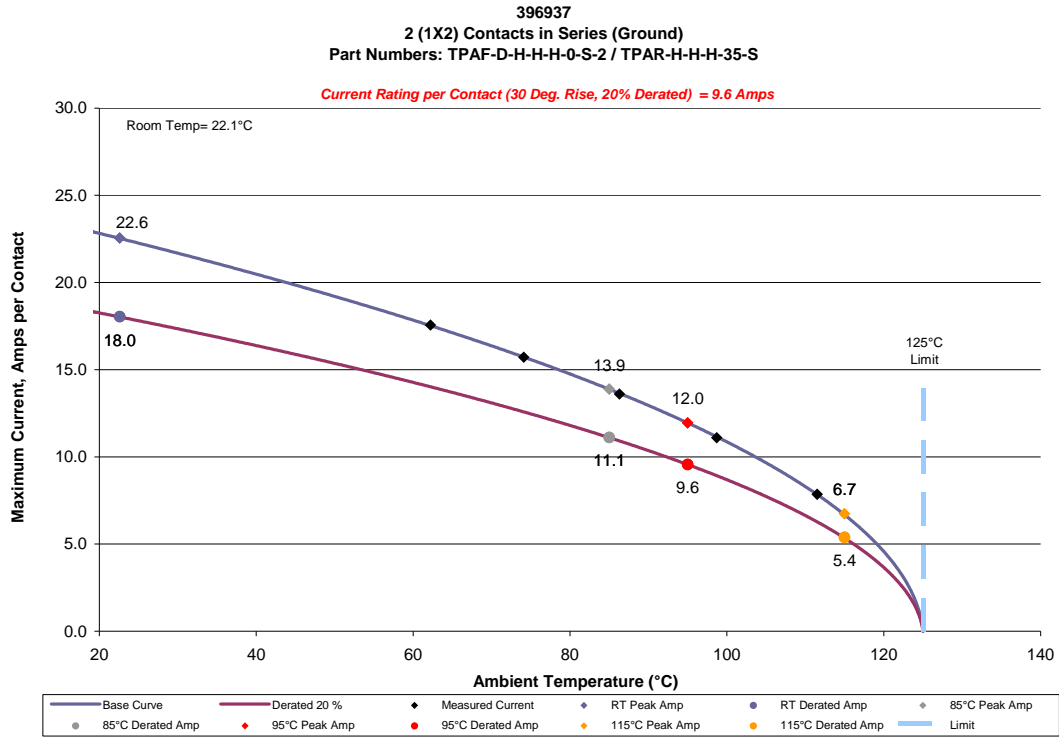
DATA SUMMARIES Continued

f. Linear configuration with 1 adjacent ground conductors/contacts powered



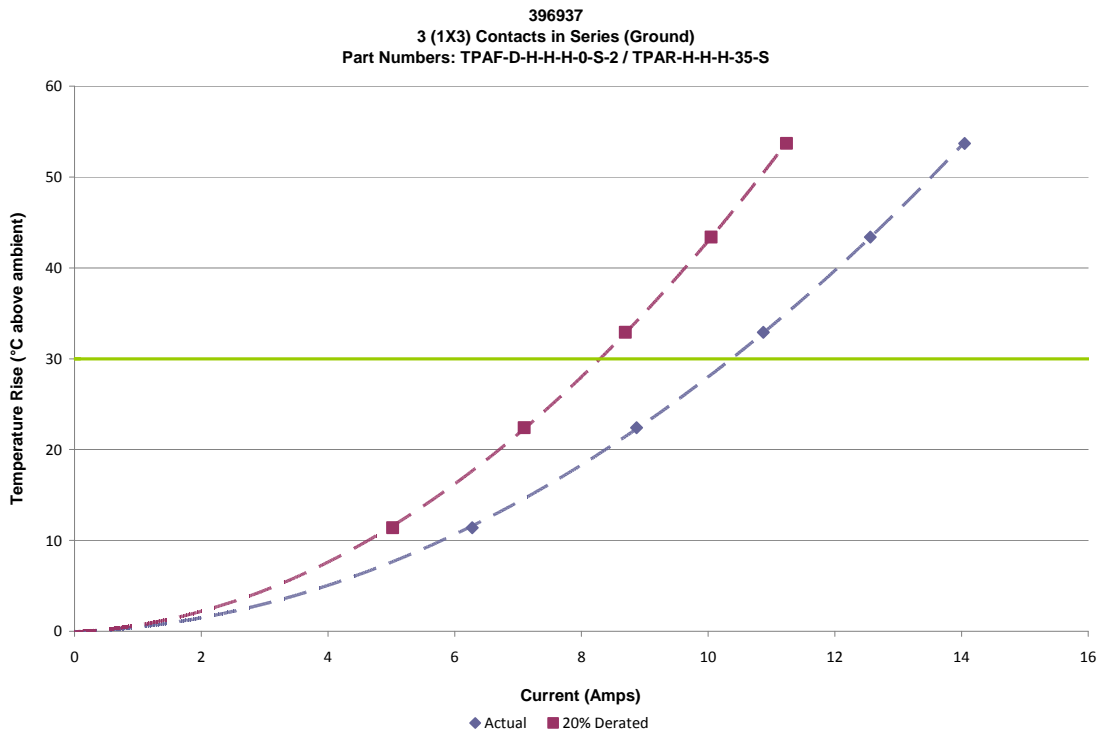
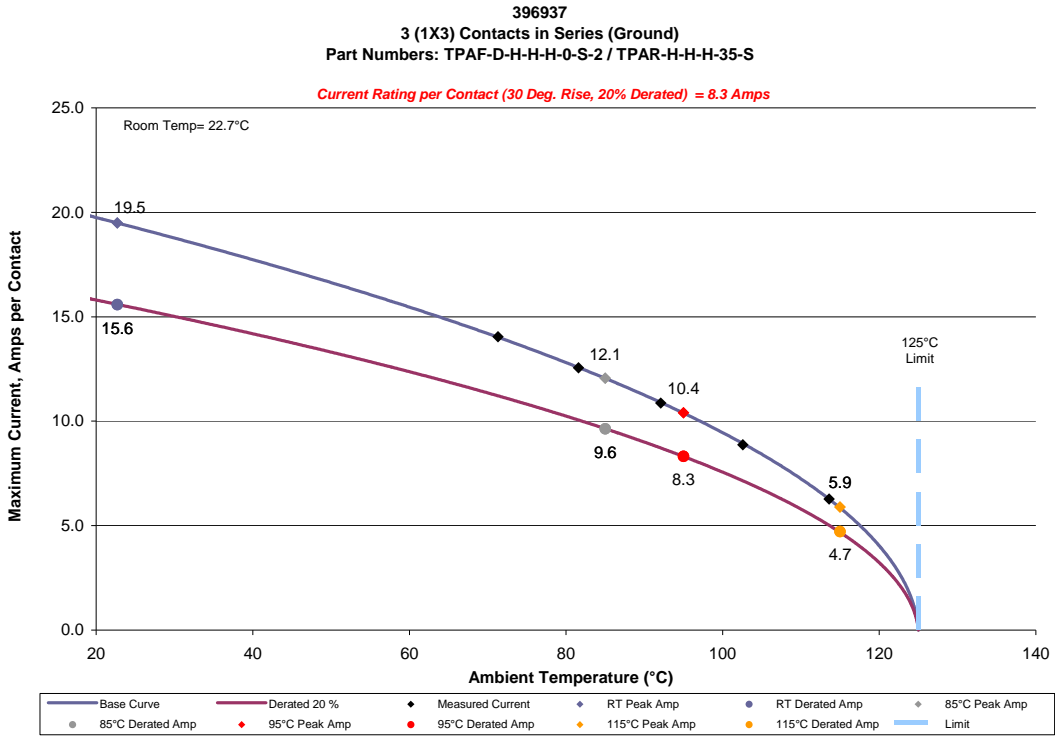
DATA SUMMARIES Continued

g. Linear configuration with 2 adjacent ground conductors/contacts powered



DATA SUMMARIES Continued

h. Linear configuration with 3 adjacent ground conductors/contacts powered

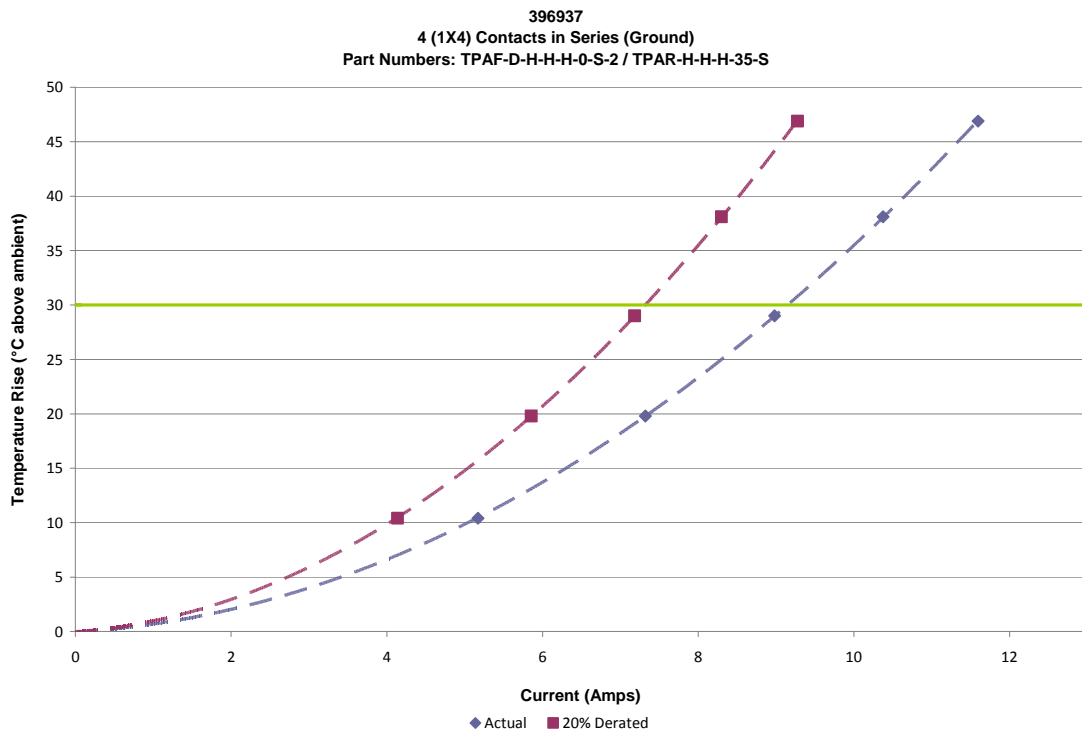
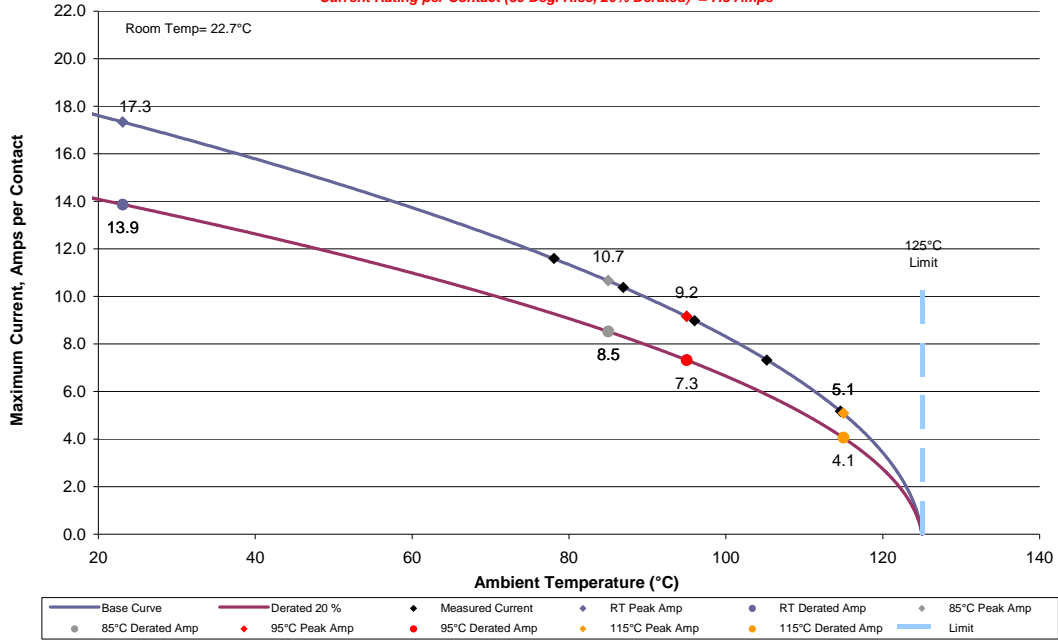


DATA SUMMARIES Continued

i. Linear configuration with 4 adjacent ground conductors/contacts powered

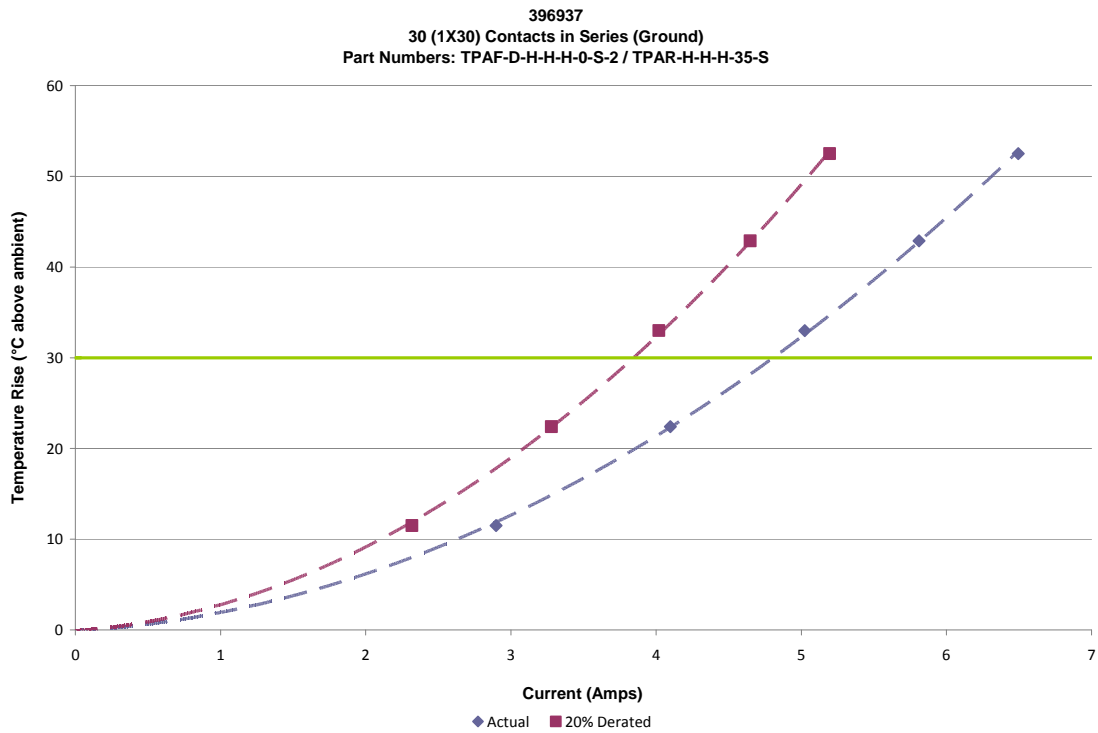
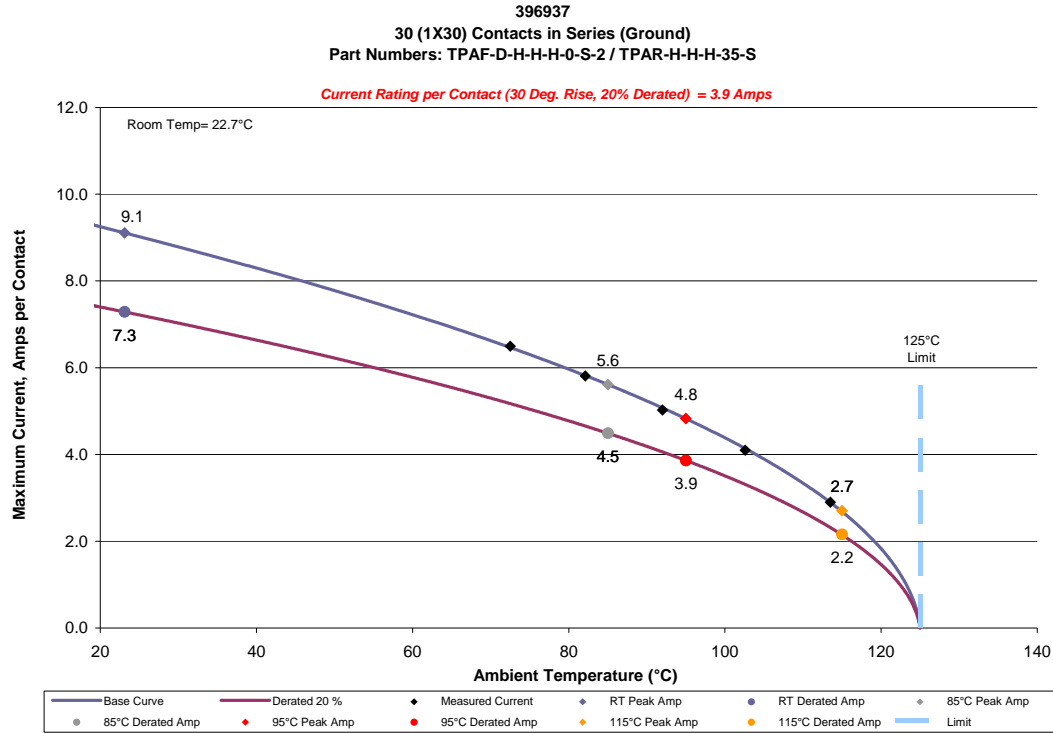
396937
 4 (1X4) Contacts in Series (Ground)
 Part Numbers: TPAF-D-H-H-H-0-S-2 / TPAR-H-H-H-35-S

Current Rating per Contact (30 Deg. Rise, 20% Derated) = 7.3 Amps



DATA SUMMARIES Continued

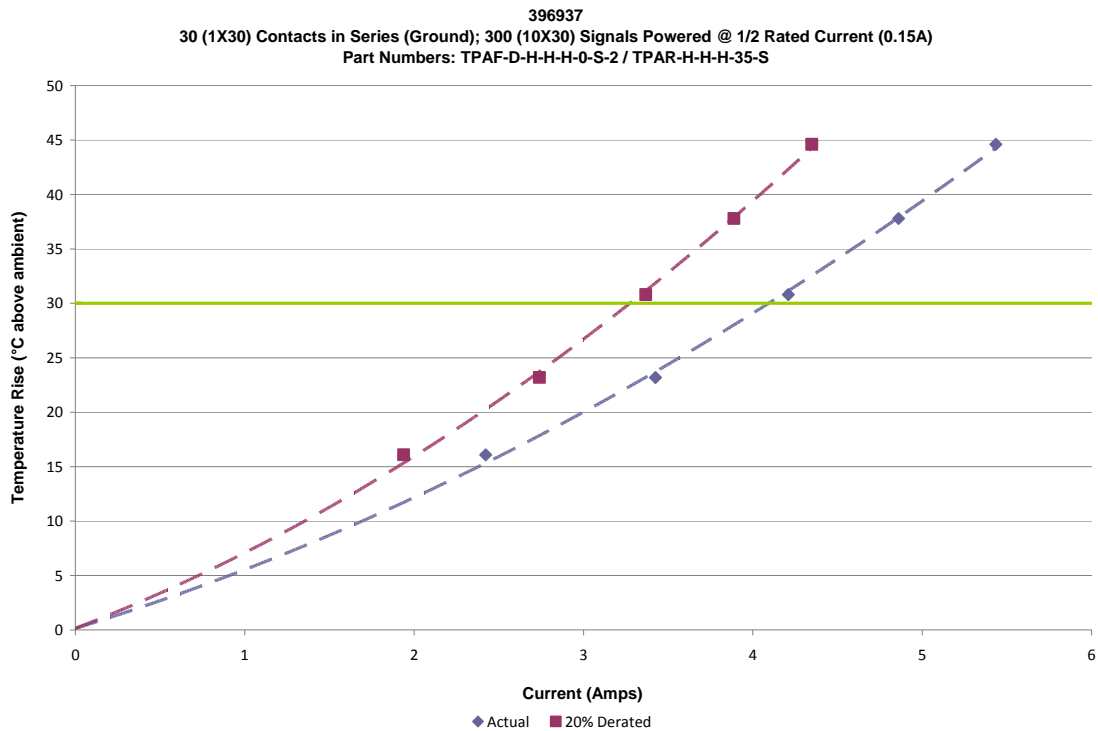
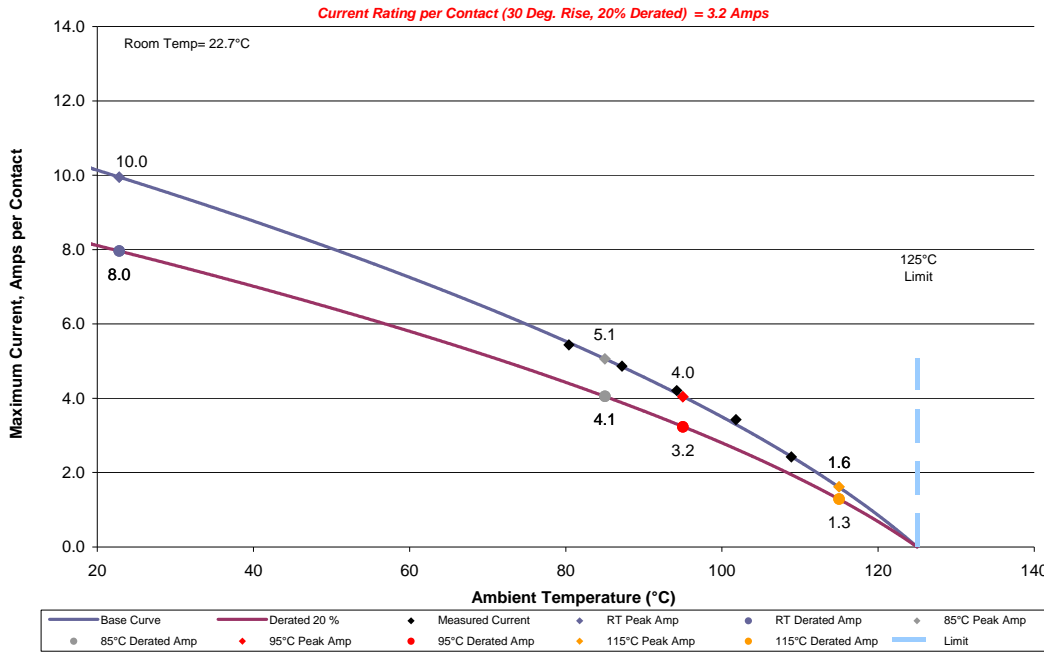
j. Linear configuration with 30 adjacent ground conductors/contacts powered



DATA SUMMARIES Continued

k. Linear configuration with all adjacent signal and ground conductors/contacts powered

396937
 30 (1X30) Contacts in Series (Ground); 300 (10X30) Signals Powered @ 1/2 Rated Current (0.15A)
 Part Numbers: TPAF-D-H-H-H-0-S-2 / TPAR-H-H-H-35-S



DATA SUMMARIES Continued

**Mating\Unmating Force:
Thermal Aging Group**

	Initial				After Thermals			
	Mating		Unmating		Mating		Unmating	
	Newton's	Force (Lbs)	Newton's	Force (Lbs)	Newton's	Force (Lbs)	Newton's	Force (Lbs)
Minimum	72.59	16.32	48.62	10.93	52.35	11.77	36.65	8.24
Maximum	81.58	18.34	55.16	12.40	63.61	14.30	46.62	10.48
Average	76.76	17.26	51.16	11.50	57.61	12.95	41.72	9.38
St Dev	3.48	0.78	2.05	0.46	3.69	0.83	3.35	0.75
Count	8	8	8	8	8	8	8	8

Mating\Unmating Durability Group (TPAF-D-H-H-H-0-S-2/TPAR-H-H-H-35-S)

	Initial				25 Cycles			
	Mating		Unmating		Mating		Unmating	
	Newton's	Force (Lbs)	Newton's	Force (Lbs)	Newton's	Force (Lbs)	Newton's	Force (Lbs)
Minimum	69.30	15.58	47.73	10.73	74.46	16.74	55.60	12.50
Maximum	81.93	18.42	52.89	11.89	95.68	21.51	65.34	14.69
Average	73.86	16.61	51.15	11.50	81.11	18.24	59.97	13.48
St Dev	4.39	0.99	1.72	0.39	7.10	1.60	3.58	0.80
Count	8	8	8	8	8	8	8	8

	50 Cycles				75 Cycles			
	Mating		Unmating		Mating		Unmating	
	Newton's	Force (Lbs)	Newton's	Force (Lbs)	Newton's	Force (Lbs)	Newton's	Force (Lbs)
Minimum	76.51	17.20	54.84	12.33	75.97	17.08	62.45	14.04
Maximum	98.61	22.17	73.48	16.52	102.79	23.11	79.93	17.97
Average	83.67	18.81	65.41	14.71	85.14	19.14	70.14	15.77
St Dev	7.65	1.72	6.11	1.37	8.57	1.93	6.08	1.37
Count	8	8	8	8	8	8	8	8

	100 Cycles				After Humidity			
	Mating		Unmating		Mating		Unmating	
	Newton's	Force (Lbs)	Newton's	Force (Lbs)	Newton's	Force (Lbs)	Newton's	Force (Lbs)
Minimum	81.22	18.26	63.52	14.28	58.14	13.07	48.71	10.95
Maximum	101.95	22.92	80.91	18.19	68.94	15.50	57.65	12.96
Average	87.34	19.64	72.81	16.37	61.60	13.85	51.07	11.48
St Dev	7.39	1.66	6.43	1.45	3.45	0.77	2.83	0.64
Count	8	8	8	8	8	8	8	8

DATA SUMMARIES Continued

Mating\Unmating Force:

Mating\Unmating Basic Group (TPAF-D-H-H-0-S-2/TPAR-H-H-35-S)

	Initial				25 Cycles			
	Mating		Unmating		Mating		Unmating	
	Newtons	Force (Lbs)	Newtons	Force (Lbs)	Newtons	Force (Lbs)	Newtons	Force (Lbs)
Minimum	49.11	11.04	36.43	8.19	53.64	12.06	39.50	8.88
Maximum	62.45	14.04	39.68	8.92	70.32	15.81	45.19	10.16
Average	55.18	12.41	37.44	8.42	59.14	13.30	41.74	9.38
St Dev	4.57	1.03	1.07	0.24	5.57	1.25	1.78	0.40
Count	8	8	8	8	8	8	8	8
	50 Cycles				75 Cycles			
	Mating		Unmating		Mating		Unmating	
	Newtons	Force (Lbs)	Newtons	Force (Lbs)	Newtons	Force (Lbs)	Newtons	Force (Lbs)
Minimum	51.06	11.48	42.70	9.60	55.78	12.54	44.97	10.11
Maximum	66.54	14.96	48.62	10.93	65.07	14.63	49.60	11.15
Average	58.88	13.24	44.59	10.03	60.08	13.51	46.94	10.55
St Dev	4.45	1.00	1.91	0.43	2.94	0.66	1.33	0.30
Count	8	8	8	8	8	8	8	8
	100 Cycles							
	Mating		Unmating					
	Newtons	Force (Lbs)	Newtons	Force (Lbs)				
Minimum	56.67	12.74	46.39	10.43				
Maximum	68.45	15.39	52.04	11.70				
Average	60.68	13.64	48.77	10.96				
St Dev	4.28	0.96	2.08	0.47				
Count	8	8	8	8				

DATA SUMMARIES Continued

Mating\Unmating Force:

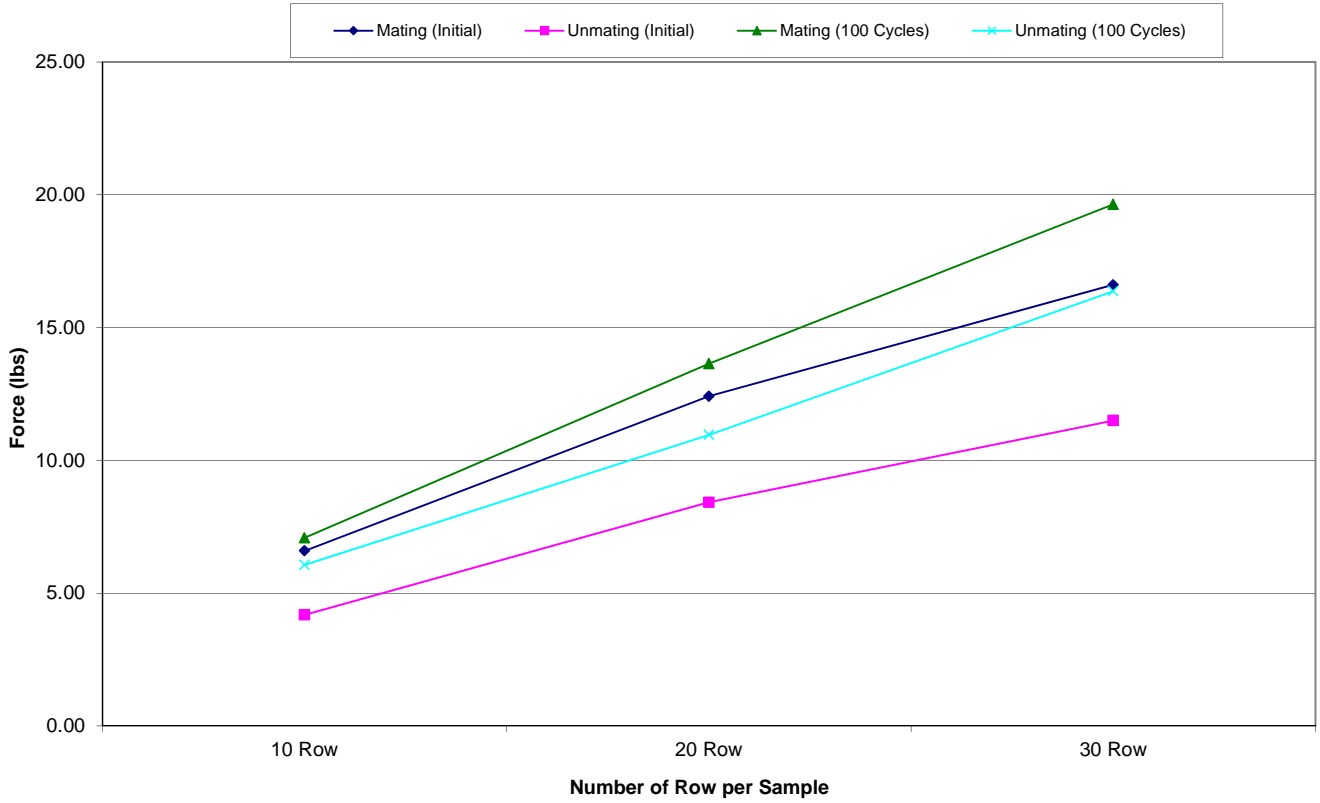
Mating\Unmating Basic Group (TPAF-D-H-0-S-2/TPAR-H-35-S)

	Initial				25 Cycles			
	Mating		Unmating		Mating		Unmating	
	Newton's	Force (Lbs)	Newton's	Force (Lbs)	Newton's	Force (Lbs)	Newton's	Force (Lbs)
Minimum	26.15	5.88	17.17	3.86	26.95	6.06	19.66	4.42
Maximum	33.89	7.62	20.46	4.60	33.76	7.59	23.44	5.27
Average	29.32	6.59	18.57	4.18	29.63	6.66	20.87	4.69
St Dev	2.41	0.54	1.05	0.24	2.27	0.51	1.16	0.26
Count	8	8	8	8	8	8	8	8
	50 Cycles				75 Cycles			
	Mating		Unmating		Mating		Unmating	
	Newton's	Force (Lbs)	Newton's	Force (Lbs)	Newton's	Force (Lbs)	Newton's	Force (Lbs)
Minimum	27.40	6.16	21.39	4.81	27.76	6.24	23.84	5.36
Maximum	32.60	7.33	26.33	5.92	33.00	7.42	28.56	6.42
Average	29.88	6.72	22.88	5.14	30.82	6.93	25.01	5.62
St Dev	1.51	0.34	1.48	0.33	1.57	0.35	1.55	0.35
Count	8	8	8	8	8	8	8	8
	100 Cycles							
	Mating		Unmating					
	Newton's	Force (Lbs)	Newton's	Force (Lbs)				
Minimum	28.87	6.49	24.86	5.59				
Maximum	35.90	8.07	31.89	7.17				
Average	31.47	7.08	26.97	6.06				
St Dev	2.31	0.52	2.26	0.51				
Count	8	8	8	8				

DATA SUMMARIES Continued

Mating\Unmating Force Comparison

Mating/Unmating Data for 10, 20 and 30 Row TPAF/TPAR



DATA SUMMARIES Continued

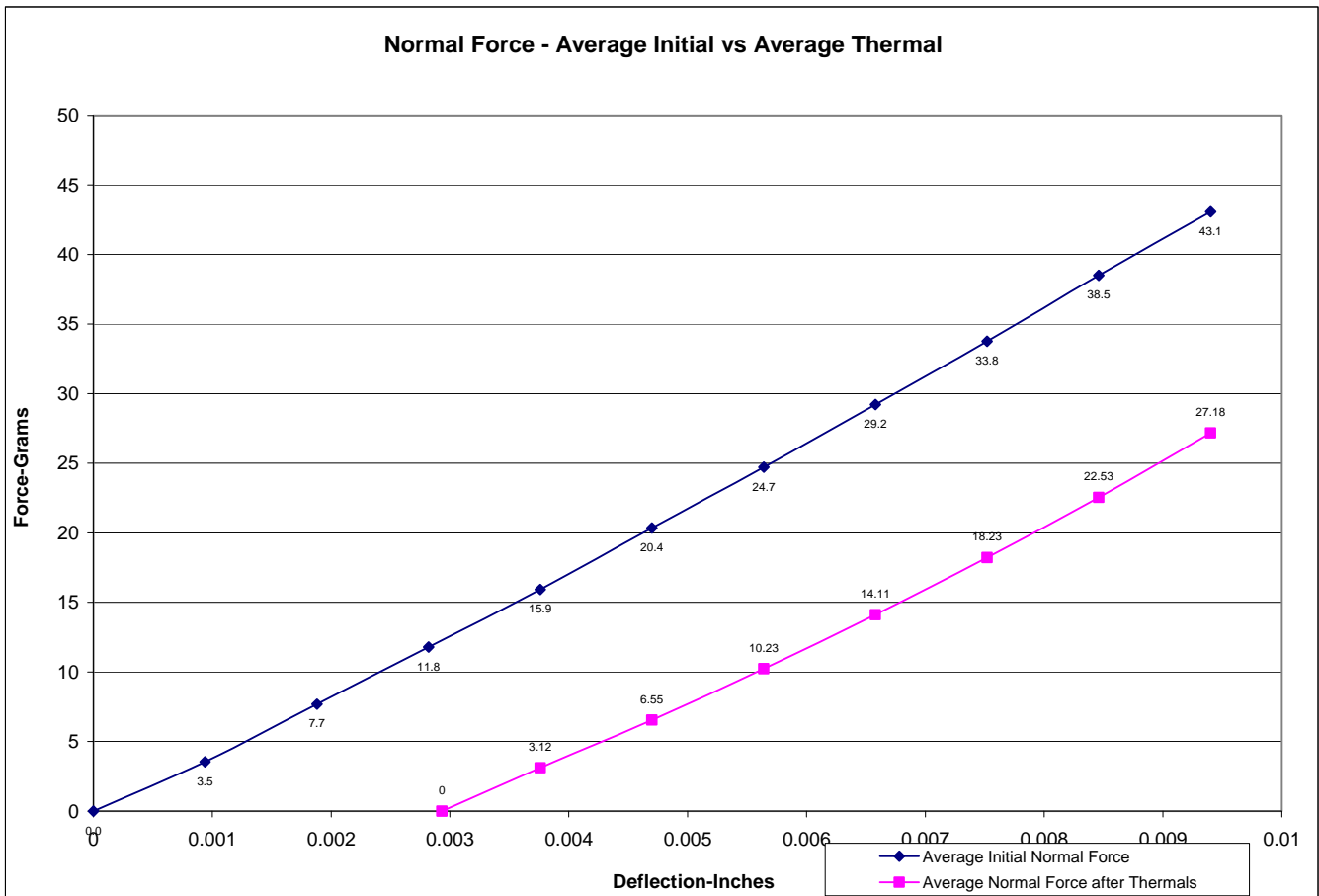
NORMAL FORCE (FOR CONTACTS TESTED IN THE HOUSING):

- 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.

Signal Pin

Initial	Deflections in inches Forces in Grams										
	0.0009	0.0019	0.0028	0.0038	0.0047	0.0056	0.0066	0.0075	0.0085	0.0094	SET
Averages	3.54	7.69	11.79	15.92	20.35	24.71	29.22	33.76	38.49	43.08	0.0001
Min	3.00	6.70	10.30	14.30	18.10	22.50	26.70	31.40	35.80	40.30	0.0000
Max	4.00	8.50	12.90	17.30	22.10	26.40	30.80	35.70	40.60	45.10	0.0002
St. Dev	0.278	0.570	0.742	0.941	1.181	1.272	1.436	1.466	1.699	1.733	0.0001
Count	12	12	12	12	12	12	12	12	12	12	12

After Thermals	Deflections in inches Forces in Grams										
	0.0009	0.0019	0.0028	0.0038	0.0047	0.0056	0.0066	0.0075	0.0085	0.0094	SET
Averages	-0.06	-0.07	0.44	3.12	6.55	10.23	14.11	18.23	22.53	27.18	0.0028
Min	-0.20	-0.20	-0.10	1.50	4.70	8.60	12.50	16.30	20.70	25.10	0.0025
Max	0.00	0.00	1.40	4.30	7.80	11.70	15.50	19.90	24.10	29.00	0.0034
St. Dev	0.067	0.065	0.474	0.927	1.003	1.002	0.955	1.141	1.178	1.354	0.0003
Count	12	12	12	12	12	12	12	12	12	12	12



DATA SUMMARIES Continued

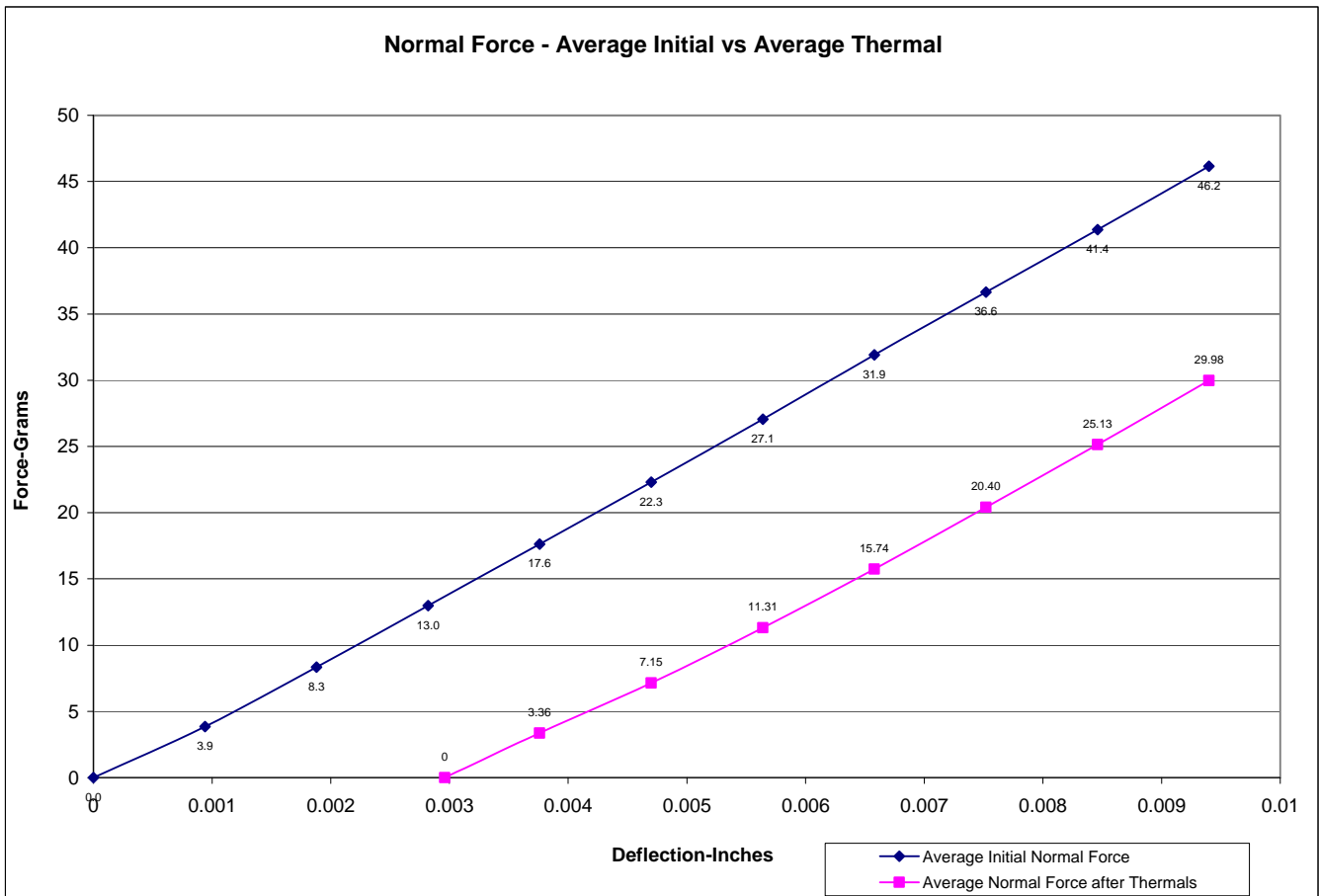
NORMAL FORCE (FOR CONTACTS TESTED IN THE HOUSING):

- 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.

Ground Pin

Initial	Deflections in inches Forces in Grams										
	0.0009	0.0019	0.0028	0.0038	0.0047	0.0056	0.0066	0.0075	0.0085	0.0094	SET
Averages	3.86	8.33	12.99	17.63	22.32	27.06	31.92	36.64	41.37	46.15	0.0001
Min	2.50	6.20	10.80	15.40	19.90	24.30	29.30	34.10	38.70	43.30	0.0000
Max	4.50	9.40	14.20	19.30	24.40	29.50	34.30	39.30	44.00	49.20	0.0002
St. Dev	0.610	0.967	1.088	1.286	1.448	1.619	1.679	1.798	1.816	1.984	0.0001
Count	12	12	12	12	12	12	12	12	12	12	12

After Thermals	Deflections in inches Forces in Grams										
	0.0009	0.0019	0.0028	0.0038	0.0047	0.0056	0.0066	0.0075	0.0085	0.0094	SET
Averages	-0.04	-0.08	0.48	3.36	7.15	11.31	15.74	20.40	25.13	29.98	0.0028
Min	-0.20	-0.30	-0.10	0.90	3.40	5.90	9.50	13.60	17.60	21.80	0.0023
Max	0.00	0.00	2.10	5.70	9.90	14.80	19.70	24.80	30.00	35.10	0.0035
St. Dev	0.067	0.087	0.724	1.427	2.173	2.936	3.320	3.545	3.762	3.970	0.0003
Count	12	12	12	12	12	12	12	12	12	12	12



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

	Pin to Pin		
	Mated	Unmated	Unmated
Minimum	TPAF/TPAR	TPAF	TPAR
Initial	45000	45000	45000
Thermal	45000	45000	45000
Humidity	12300	45000	35000

	Row to Row		
	Mated	Unmated	Unmated
Minimum	TPAF/TPAR	TPAF	TPAR
Initial	45000	45000	45000
Thermal	45000	45000	45000
Humidity	15600	45000	45000

	Pin to Ground		
	Mated	Unmated	Unmated
Minimum	TPAF/TPAR	TPAF	TPAR
Initial	45000	45000	45000
Thermal	45000	45000	45000
Humidity	20400	45000	34000

DIELECTRIC WITHSTANDING VOLTAGE (DWV):

Voltage Rating Summary	
Minimum	TPAF/TPAR
Break Down Voltage	667
Test Voltage	500
Working Voltage	165

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

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

DATA SUMMARIES Continued**LLCR Durability:**

- 1) A total of 128 signal and 48 ground 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	2014/10/21	2014/10/31	2014/11/5	2014/11/25
Room Temp (Deg C)	21	22	20	22
Rel Humidity (%)	36	39	37	28
Technician	Craig Ryan	Craig Ryan	Craig Ryan	Craig Ryan
mOhm values	Actual Initial	Delta 100 Cycles	Delta Therm Shck	Delta Humidity
Pin Type 1: Signal				
Average	86.07	2.52	3.09	3.08
St. Dev.	3.91	2.26	2.13	2.88
Min	73.92	0.02	0.04	0.01
Max	96.42	9.45	10.80	12.10
Summary Count	128	128	128	128
Total Count	128	128	128	128
Pin Type 2: Ground				
Average	8.54	0.21	0.24	0.25
St. Dev.	0.91	0.20	0.18	0.25
Min	5.41	0.01	0.01	0.00
Max	9.81	0.73	0.77	0.88
Summary Count	48	48	48	48
Total Count	48	48	48	48

LLCR Delta Count by Category						
mOhms	Stable	Minor	Acceptable	Marginal	Unstable	Open
	≤ 5	>5 & ≤ 10	>10 & ≤ 15	>15 & ≤ 50	>50 & ≤ 1000	>1000
100 Cycles	157	19	0	0	0	0
Therm Shck	157	18	1	0	0	0
Humidity	155	13	8	0	0	0

DATA SUMMARIES Continued**LLCR Thermal Aging:**

- 1) A total of 128 signal and 48 ground 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	2014/10/22	2014/11/3		
Room Temp (Deg C)	22	21		
Rel Humidity (%)	33	29		
Technician	Craig Ryan	Craig Ryan		
mOhm values	Actual Initial	Delta Thermal	Delta	Delta
Pin Type 1: Signal				
Average	87.42	1.49		
St. Dev.	2.61	1.67		
Min	82.95	0.02		
Max	99.95	14.97		
Summary Count	128	128		
Total Count	128	128		
Pin Type 2: Ground				
Average	8.68	0.20		
St. Dev.	0.49	0.16		
Min	7.56	0.01		
Max	9.43	0.73		
Summary Count	48	48		
Total Count	48	48		

LLCR Delta Count by Category						
mOhms	Stable	Minor	Acceptable	Marginal	Unstable	Open
	≤ 5	>5 & ≤ 10	>10 & ≤ 15	>15 & ≤ 50	>50 & ≤ 1000	>1000
Thermal	173	2	1	0	0	0

DATA SUMMARIES Continued**LLCR Gas Tight:**

- 1) A total of 128 signal and 48 ground 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	2014/10/16	2014/10/16		
Room Temp (Deg C)	21	22		
Rel Humidity (%)	44	45		
Technician	Craig Ryan	Craig Ryan		
mOhm values	Actual Initial	Delta Acid Vapor	Delta	Delta
Pin Type 1: Signal				
Average	86.33	0.77		
St. Dev.	3.65	0.93		
Min	75.21	0.00		
Max	95.96	7.57		
Summary Count	128	128		
Total Count	128	128		
Pin Type 2: Ground				
Average	8.76	0.05		
St. Dev.	0.58	0.04		
Min	6.78	0.00		
Max	9.68	0.17		
Summary Count	48	48		
Total Count	48	48		

LLCR Delta Count by Category						
	Stable	Minor	Acceptable	Marginal	Unstable	Open
mOhms	≤ 5	>5 & ≤ 10	>10 & ≤ 15	>15 & ≤ 50	>50 & ≤ 1000	>1000
Acid Vapor	174	2	0	0	0	0

DATA SUMMARIES Continued**LLCR Shock &Vibration:**

- 1). A total of 144 signal and 48 ground points were measured.
- 2). EIA-364-23, *Low Level Contact Resistance Test Procedure for Electrical Connectors and Sockets*.
- 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

LLCR Measurement Summaries by Pin Type				
Date	2015/2/10	2015/2/11		
Room Temp (Deg C)	23	23		
Rel Humidity (%)	39	40		
Technician	Craig Ryan	Craig Ryan		
mOhm values	Actual Initial	Delta Shock-Vib	Delta	Delta
Pin Type 1: Signal				
Average	89.96	1.95		
St. Dev.	2.95	1.47		
Min	82.87	0.11		
Max	100.99	8.96		
Summary Count	144	144		
Total Count	144	144		
Pin Type 2: Ground				
Average	8.63	0.14		
St. Dev.	0.69	0.16		
Min	4.19	0.00		
Max	9.36	1.01		
Summary Count	48	48		
Total Count	48	48		

LLCR Delta Count by Category						
	Stable	Minor	Acceptable	Marginal	Unstable	Open
mOhms	≤ 5	>5 & ≤ 10	>10 & ≤ 15	>15 & ≤ 50	>50 & ≤ 1000	>1000
Shock-Vib	187	5	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

EQUIPMENT AND CALIBRATION SCHEDULES**Equipment #:** TCT-07**Description:** Automated Test Stand**Manufacturer:** Chatillon/Lloyd**Model:** LF Plus**Serial #:** LF1310**Accuracy:** See Manual

... Last Cal: 11/14/2014, Next Cal: 11/14/2015

Equipment #: HPT-01**Description:** Hipot Safety Tester**Manufacturer:** Vitrek**Model:** V73**Serial #:** 019808**Accuracy:**

... Last Cal: 05/15/2014, Next Cal: 05/15/2015

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

... Last Cal: 09/11/2014, Next Cal: 09/11/2015

Equipment #: PS-02**Description:** Power Supply**Manufacturer:** Hewlett-Packer**Model:** 6033A**Serial #:** N/A**Accuracy:** See Manual

... Last Cal: NOT CALIBRATED

Equipment #: MO-10**Description:** Model 2750 Multimeter/Switch System (Integra Series)**Manufacturer:** Keithley**Model:** 2750**Serial #:** 1215161**Accuracy:** See Manual

... Last Cal: 09/11/2014, Next Cal: 09/11/2015

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: 11/14/2014, Next Cal: 05/31/2015

EQUIPMENT AND CALIBRATION SCHEDULES**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: 06/30/2014, Next Cal: 06/30/2015

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: 02/18/2014, Next Cal: 02/18/2015

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

... Last Cal: 04/22/2014, Next Cal: 04/22/2015

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

... Last Cal: 07/18/2014, Next Cal: 07/18/2015

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

... Last Cal: 10/31/2014, Next Cal: 10/31/2015