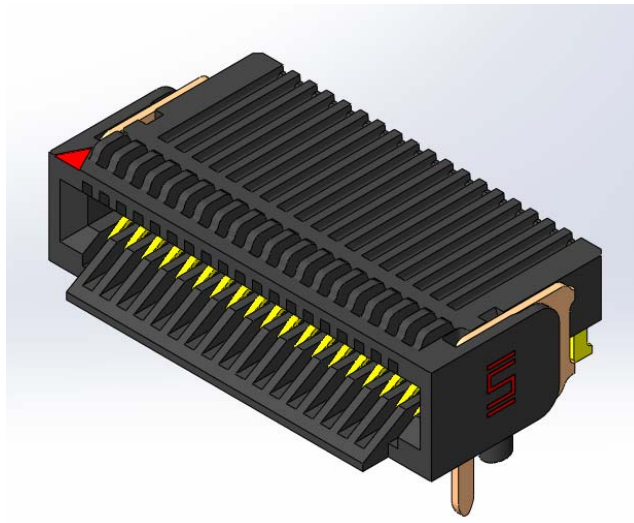




Project Number: Design Qualification Test Report	Tracking Code: 333693_Report_Rev_2
Requested by: Corey Rose	Date: 12/24/2014
Part #: UEC5-019-1-H-D-RA-1-A/Edge Card	Tech: Craig Ryan
Part description: UEC5/CARD	Qty to test: 75
Test Start: 05/20/2014	Test Completed: 06/10/2014



DESIGN QUALIFICATION TEST REPORT

UEC5/CARD
UEC5-019-1-H-D-RA-1-A/Edge Card

Tracking Code: 333693 Report Rev 2	Part #: UEC5-019-1-H-D-RA-1-A/Edge Card
Part description: UEC5/CARD	

REVISION HISTORY

DATA	REV.NUM.	DESCRIPTION	ENG
06/24/2014	1	Initial Issue	PC
12/24/2014	2	Update the flowchart	VZ

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

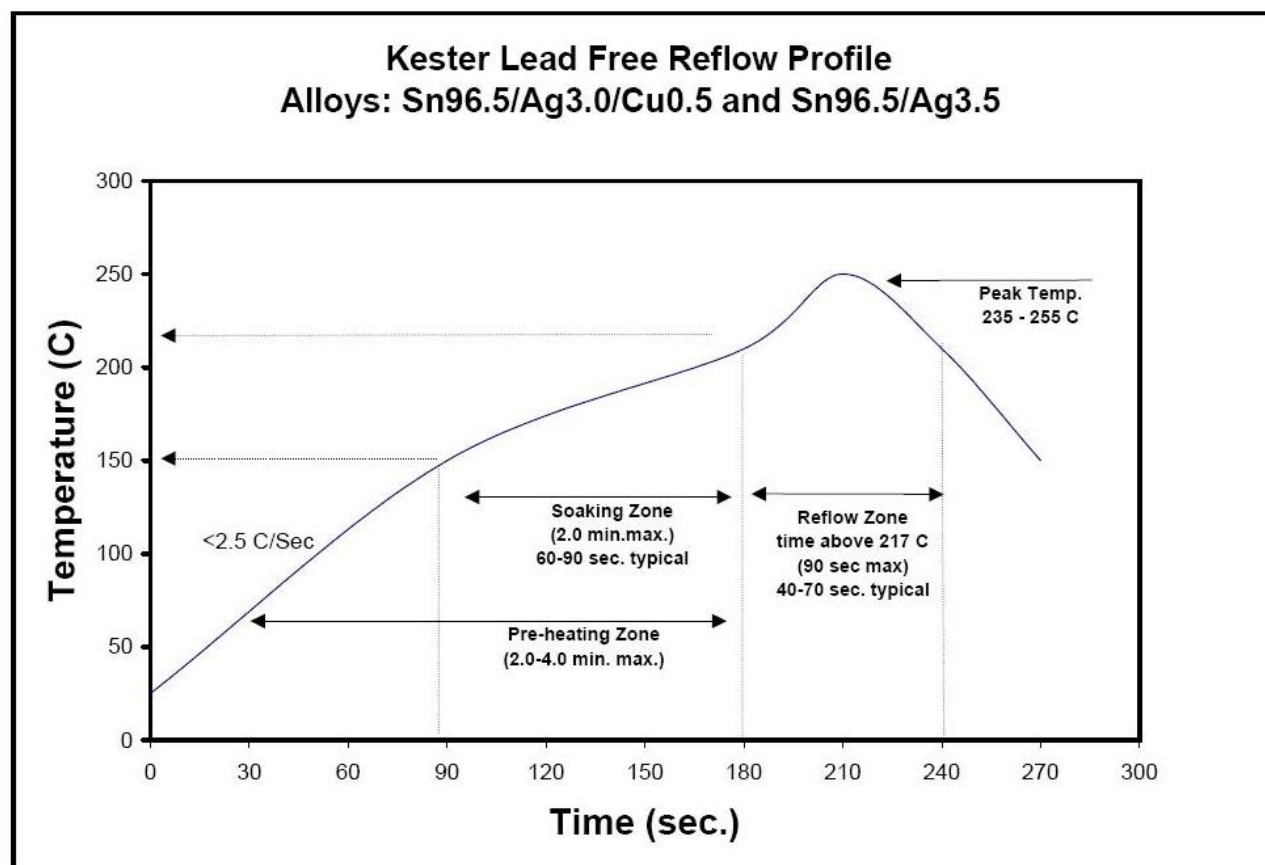
To perform the following tests: Design Qualification test. Please see test plan.

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) Re-Flow Time/Temp: See accompanying profile.
- 10) Samtec Test PCBs used: PCB-106315-TST, PCB-106316-TST, PCB-106317-TST, PCB-106318-TST

TYPICAL OVEN PROFILE (Soldering Parts to Test Boards)

FLOWCHARTS

Gas Tight

Group 1

UEC5-019-1-H-D-RA-1-A

0.0338" EDGE CARD

8 Assemblies

Nominal Mating Card Thickness

Note: Measure and document PCB thickness prior to performing test

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

Note: Mating card thickness: 0.0338±0.0034

Group 1	Group 2	Group 3	Group 4
UEC5-019-1-H-D-RA-1-A	UEC5-019-1-H-D-RA-1-A	UEC5-019-1-H-D-RA-1-A	UEC5-019-1-H-D-RA-1-A
0.0338" EDGE CARD	0.0338" EDGE CARD	0.0338" EDGE CARD	0.0338" EDGE CARD
8 Contacts Minimum	8 Contacts Minimum	8 Contacts Minimum	8 Contacts Minimum
Row 1 Without Thermals	Row 2 Without Thermals	Row 1 With Thermals	Row 2 With Thermals

Step	Description
1.	Contact Gaps
2.	Normal Force ⁽¹⁾ Deflection = 0.0159 " Expected Force at Max Deflection = 50 g

Step	Description
1.	Contact Gaps
2.	Normal Force ⁽¹⁾ Deflection = 0.0159 " Expected Force at Max Deflection = 50 g

Step	Description
1.	Contact Gaps
2.	Thermal Age ⁽²⁾
3.	Contact Gaps
4.	Normal Force ⁽¹⁾ Deflection = 0.0159 " Expected Force at Max Deflection = 50 g

Step	Description
1.	Contact Gaps
2.	Thermal Age ⁽²⁾
3.	Contact Gaps
4.	Normal Force ⁽¹⁾ Deflection = 0.0159 " Expected Force at Max Deflection = 50 g

(1) Normal Force = EIA-364-04

(2) Thermal Age = EIA-364-17

Test Condition = 4 (105°C)

Time Condition = 8 (250 Hours)

FLOWCHARTS Continued**Thermal Aging****Group 1**

UEC5-019-1-H-D-RA-1-A

0.0338" EDGE CARD

8 Assemblies

Nominal Mating Card Thickness

*Note: Measure and document PCB
thickness prior to performing test***Step Description**

1. Contact Gaps
2. LLCR ⁽¹⁾
 Max Delta = 15 mOhm
3. Thermal Age ⁽²⁾
4. LLCR ⁽¹⁾
 Max Delta = 15 mOhm
5. Contact Gaps

(1) LLCR = EIA-364-23

Open Circuit Voltage = 20 mV Max

Test Current = 100 mA Max

(2) Thermal Age = EIA-364-17

Test Condition = 4 (105°C)

Time Condition = B (250 Hours)

FLOWCHARTS Continued

Mating/Unmating/Durability**Group 1**

UEC5-019-1-H-D-RA-1-A

0.0338" EDGE CARD

8 Assemblies

Nominal Mating Card Thickness

Note: Measure and document PCB thickness prior to performing test

Step	Description
1.	Contact Gaps
2.	LLCR ⁽²⁾ Max Delta = 15 mOhm
3.	Cycles Quantity = 25 Cycles
4.	Contact Gaps
5.	LLCR ⁽²⁾ Max Delta = 15 mOhm
6.	Thermal Shock ⁽³⁾
7.	LLCR ⁽²⁾ Max Delta = 15 mOhm
8.	Humidity ⁽¹⁾
9.	LLCR ⁽²⁾ Max Delta = 15 mOhm

Group 2

UEC5-019-1-H-D-RA-1-A

0.0338" EDGE CARD

8 Assemblies

Nominal Mating Card Thickness

Note: Measure and document PCB thickness prior to performing test

Step	Description
1.	Contact Gaps
2.	LLCR ⁽²⁾ Max Delta = 15 mOhm
3.	Cycles Quantity = 100 Cycles
4.	Contact Gaps
5.	LLCR ⁽²⁾ Max Delta = 15 mOhm
6.	Thermal Shock ⁽³⁾
7.	LLCR ⁽²⁾ Max Delta = 15 mOhm
8.	Humidity ⁽¹⁾
9.	LLCR ⁽²⁾ Max Delta = 15 mOhm

(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) 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**

UEC5-019-1-H-D-RA-1-A

0.0338" EDGE CARD

2 Assemblies

Nominal Mating Card Thickness

Step	Description
1.	DWV Breakdown ⁽²⁾

Group 2

UEC5-019-1-H-D-RA-1-A

2 Assemblies

Step	Description
1.	DWV Breakdown ⁽²⁾

Group 3

UEC5-019-1-H-D-RA-1-A

0.0338" EDGE CARD

2 Assemblies

Nominal Mating Card Thickness

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⁾

Row-to-Row**Group 4**

UEC5-019-1-H-D-RA-1-A

0.0338" EDGE CARD

2 Assemblies

Nominal Mating Card Thickness

Step	Description
1.	DWV Breakdown ⁽²⁾

Group 5

UEC5-019-1-H-D-RA-1-A

2 Assemblies

Step	Description
1.	DWV Breakdown ⁽²⁾

Group 6

UEC5-019-1-H-D-RA-1-A

0.0338" EDGE CARD

2 Assemblies

Nominal Mating Card Thickness

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⁾

FLOWCHARTS Continued**Pin-to-Closest Metallic Hardware****Group 7**

UEC5-019-1-H-D-RA-1-A

0.0338" EDGE CARD

2 Assemblies

Nominal Mating Card Thickness

Step Description

1. DWV Breakdown ⁽²⁾

Group 8

UEC5-019-1-H-D-RA-1-A

2 Assemblies

Step Description

1. DWV Breakdown ⁽²⁾

Group 9

UEC5-019-1-H-D-RA-1-A

0.0338" EDGE CARD

2 Assemblies

Nominal Mating Card Thickness

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**Group 1

UEC5-019-1-H-D-RA-1-A
0.0338" EDGE CARD
2 Pins Powered
Signal

Step Description

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

Group 2

UEC5-019-1-H-D-RA-1-A
0.0338" EDGE CARD
4 Pins Powered
Signal

Step Description

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

Group 3

UEC5-019-1-H-D-RA-1-A
0.0338" EDGE CARD
6 Pins Powered
Signal

Step Description

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

Group 4

UEC5-019-1-H-D-RA-1-A
0.0338" EDGE CARD
8 Pins Powered
Signal

Step Description

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

Group 5

UEC5-019-1-H-D-RA-1-A
0.0338" EDGE CARD
38 Pins Powered
Signal

Step Description

1. CCC₍₁₎
Rows = 2
Number of Positions = 19

(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

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.

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

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.

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.

ATTRIBUTE DEFINITIONS Continued

The following is a brief, simplified description of attributes.

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).

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.

RESULTS**Temperature Rise, CCC at a 20% de-rating**

- CCC for a 30°C Temperature Rise-----1.8 A per contact with 2 contacts (2x1) powered
- CCC for a 30°C Temperature Rise-----1.3 A per contact with 4 contacts (2x2) powered
- CCC for a 30°C Temperature Rise-----1.1 A per contact with 6 contacts (2x3) powered
- CCC for a 30°C Temperature Rise-----1.0 A per contact with 8 contacts (2x4) powered
- CCC for a 30°C Temperature Rise-----0.6 A per contact with 38 contacts (2x19) powered

Normal Force**Row 1- 0.0082 inch deflection**

- Initial
 - Min-----50.10 gf Set ---- 0.0001 in
 - Max -----58.50 gf Set ---- 0.0004 in
- Thermal
 - Min-----38.30 gf Set---- 0.0001 in
 - Max -----53.50 gf Set---- 0.0016 in

Row 2- 0.0150 inch deflection

- Initial
 - Min-----44.00 gf Set ---- 0.0006 in
 - Max -----47.80 gf Set ---- 0.0008 in
- Thermal
 - Min-----33.20 gf Set---- 0.0030 in
 - Max -----38.10 gf Set---- 0.0038 in

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

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

Row to Row

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

Pin to Closest Metallic Hardware

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

RESULTS Continued**Dielectric Withstanding Voltage minimums, DWV**

- **Minimums**

- o Breakdown Voltage-----771 VAC
- o Test Voltage-----580 VAC
- o Working Voltage-----190 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 Closest Metallic Hardware

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

LLCR Durability (192 LLCR test points)

- Initial-----17.79 mOhms Max
- Durability, 100 Cycles
 - o <= +5.0 mOhms-----192 Points-----Stable
 - o +5.1 to +10.0 mOhms-----0 Points-----Minor
 - o +10.1 to +15.0 mOhms-----0 Points-----Acceptable
 - o +15.1 to +50.0 mOhms-----0 Points-----Marginal
 - o +50.1 to +2000 mOhms-----0 Points-----Unstable
 - o >+2000 mOhms-----0 Points-----Open Failure
- Thermal
 - o <= +5.0 mOhms-----192 Points-----Stable
 - o +5.1 to +10.0 mOhms-----0 Points-----Minor
 - o +10.1 to +15.0 mOhms-----0 Points-----Acceptable
 - o +15.1 to +50.0 mOhms-----0 Points-----Marginal
 - o +50.1 to +2000 mOhms-----0 Points-----Unstable
 - o >+2000 mOhms-----0 Points-----Open Failure
- Humidity
 - o <= +5.0 mOhms-----192 Points-----Stable
 - o +5.1 to +10.0 mOhms-----0 Points-----Minor
 - o +10.1 to +15.0 mOhms-----0 Points-----Acceptable
 - o +15.1 to +50.0 mOhms-----0 Points-----Marginal
 - o +50.1 to +2000 mOhms-----0 Points-----Unstable
 - o >+2000 mOhms-----0 Points-----Open Failure

LLCR Thermal aging (192 LLCR test points)

- Initial-----17.67 mOhms Max
- Thermal
 - o <= +5.0 mOhms-----192 Points-----Stable
 - o +5.1 to +10.0 mOhms-----0 Points-----Minor
 - o +10.1 to +15.0 mOhms-----0 Points-----Acceptable
 - o +15.1 to +50.0 mOhms-----0 Points-----Marginal
 - o +50.1 to +2000 mOhms-----0 Points-----Unstable
 - o >+2000 mOhms-----0 Points-----Open Failure

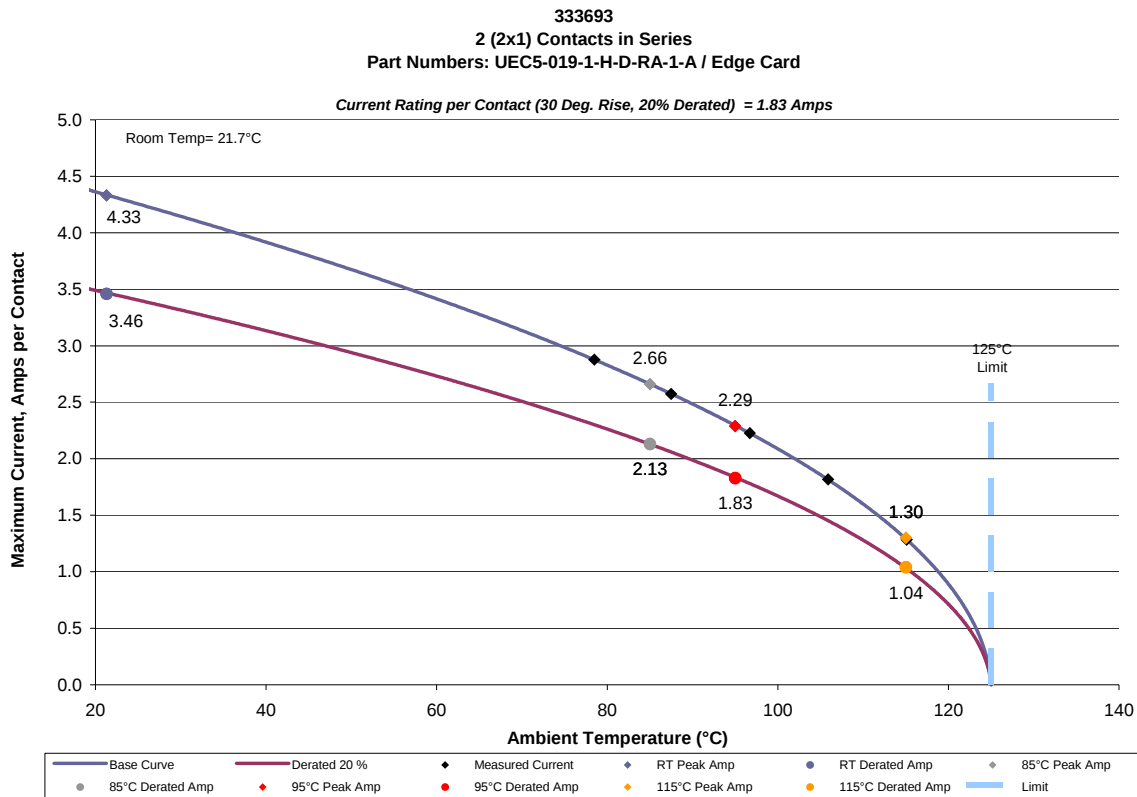
RESULTS Continued

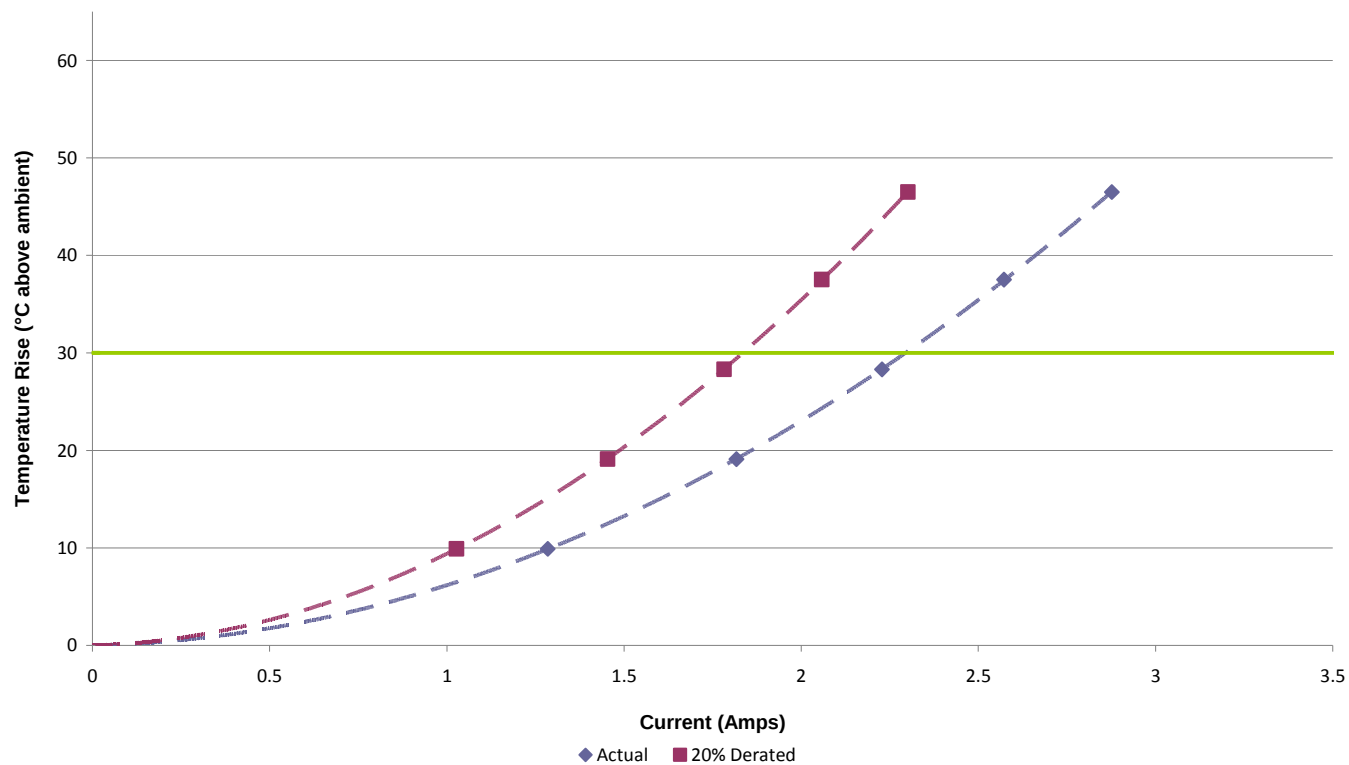
LLCR Gas Tight (192 LLCR test points)

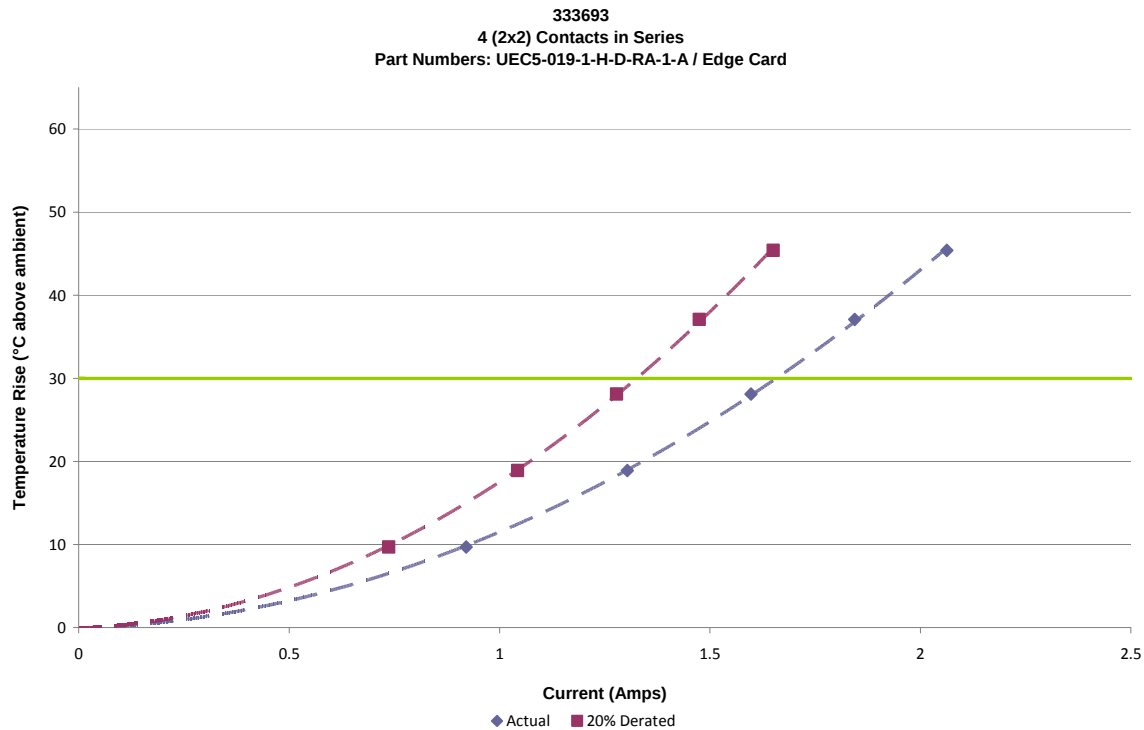
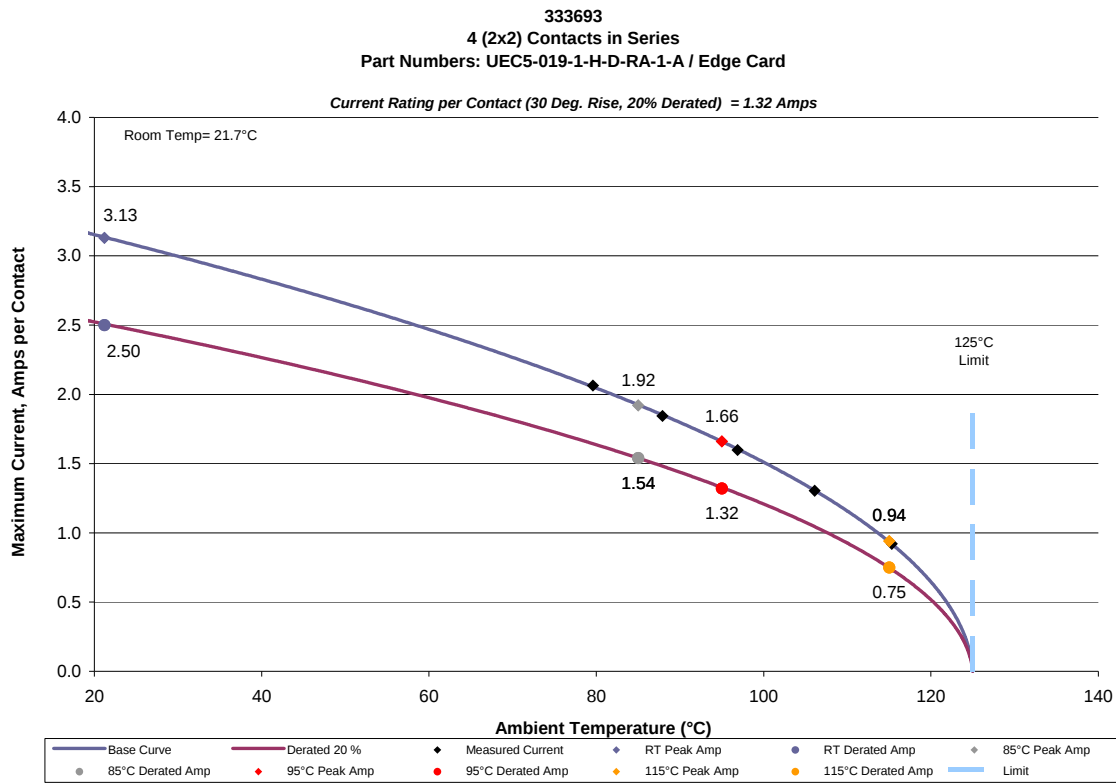
- Initial ----- 16.97 mOhms Max
- Gas-Tight
 - o <= +5.0 mOhms ----- 192 Points ----- Stable
 - o +5.1 to +10.0 mOhms ----- 0 Points ----- Minor
 - o +10.1 to +15.0 mOhms ----- 0 Points ----- Acceptable
 - o +15.1 to +50.0 mOhms ----- 0 Points ----- Marginal
 - o +50.1 to +2000 mOhms ----- 0 Points ----- Unstable
 - o >+2000 mOhms ----- 0 Points ----- Open Failure

DATA SUMMARIES Continued**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

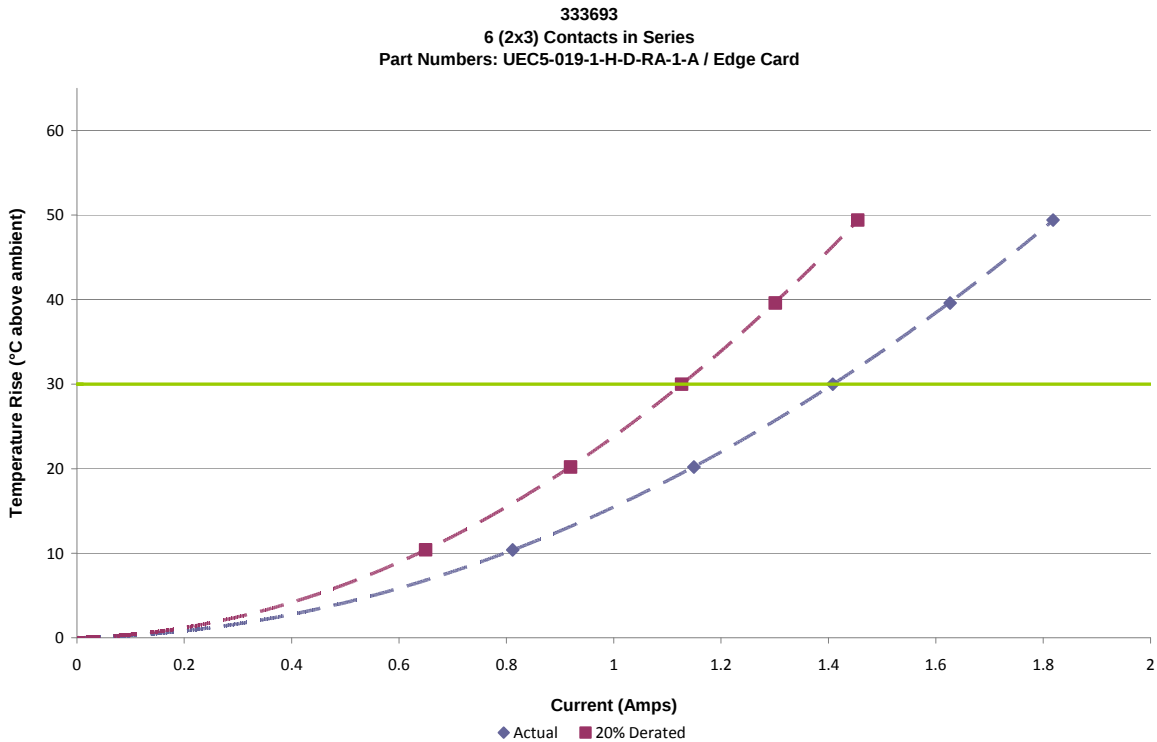
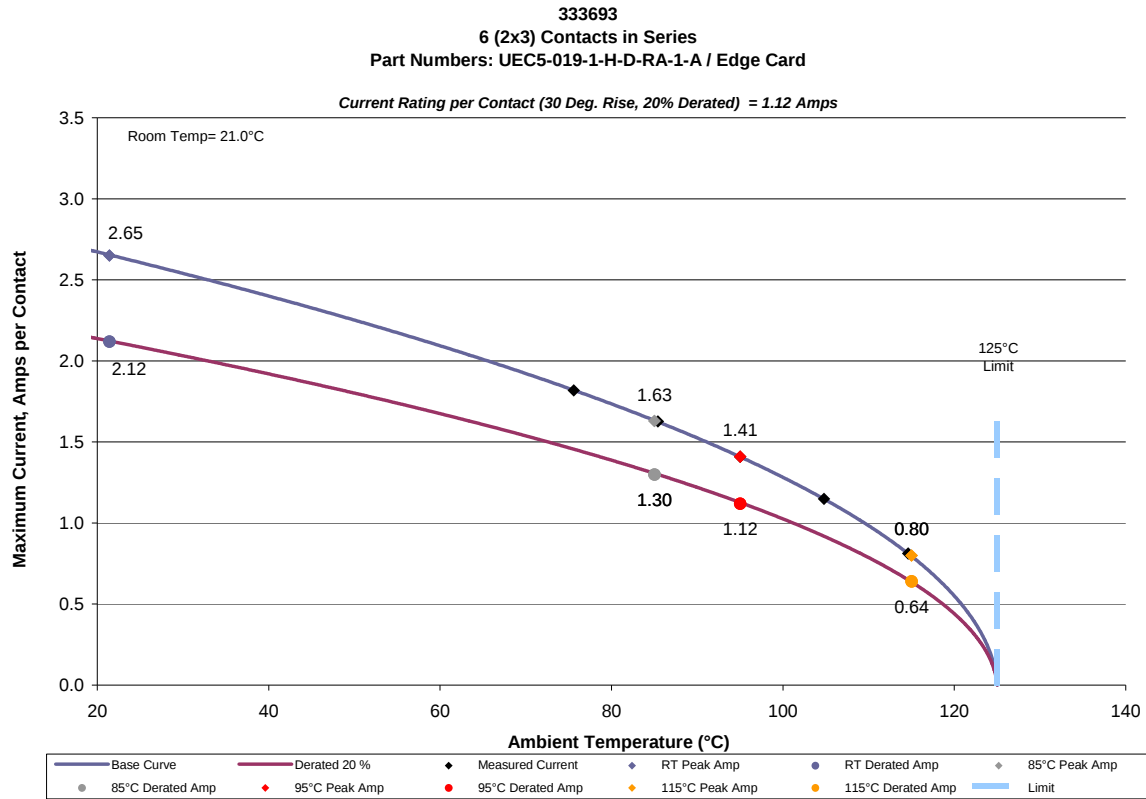


DATA SUMMARIES Continued**333693****2 (2x1) Contacts in Series****Part Numbers: UEC5-019-1-H-D-RA-1-A / Edge Card**

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

DATA SUMMARIES Continued

c. Linear configuration with 6 adjacent conductors/contacts powered



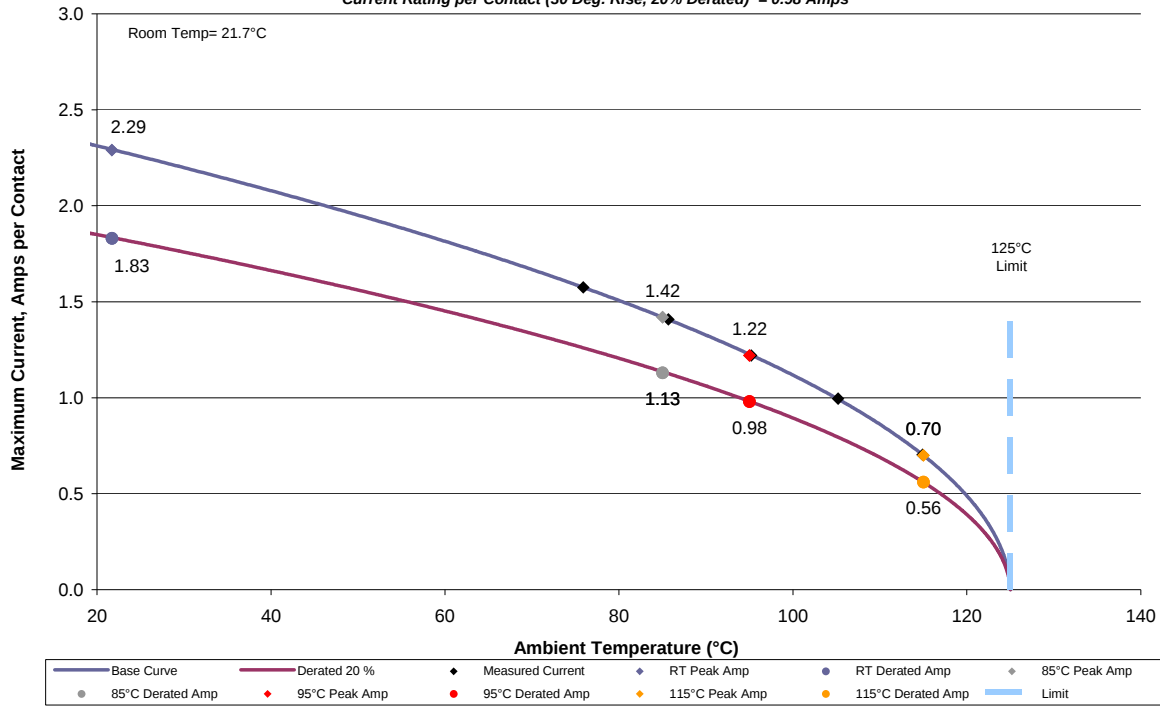
DATA SUMMARIES Continued**d. Linear configuration with 8 adjacent conductors/contacts powered**

333693

8 (2x4) Contacts in Series

Part Numbers: UEC5-019-1-H-D-RA-1-A / Edge Card

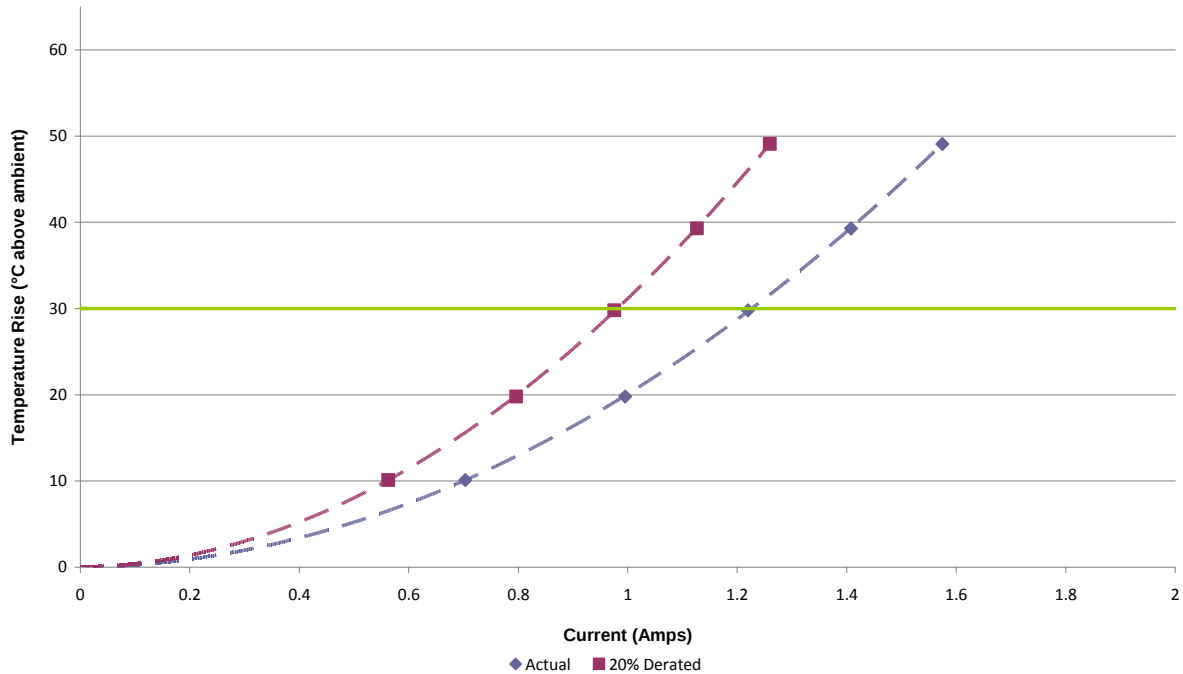
Current Rating per Contact (30 Deg. Rise, 20% Derated) = 0.98 Amps

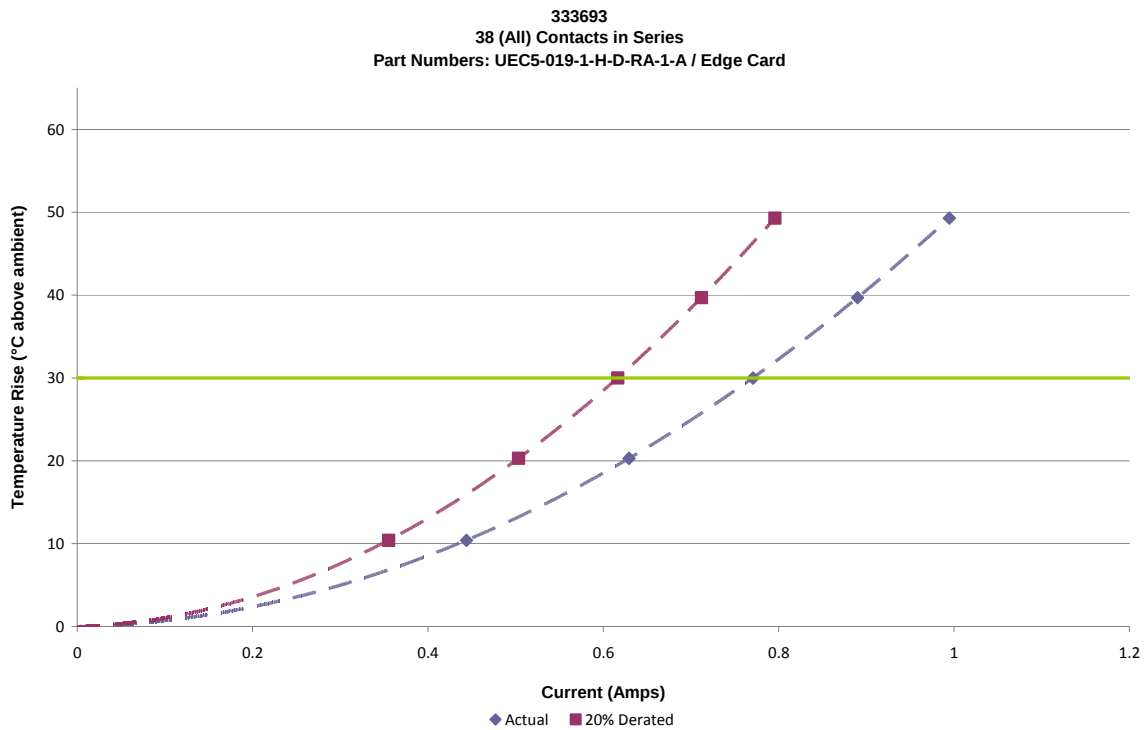
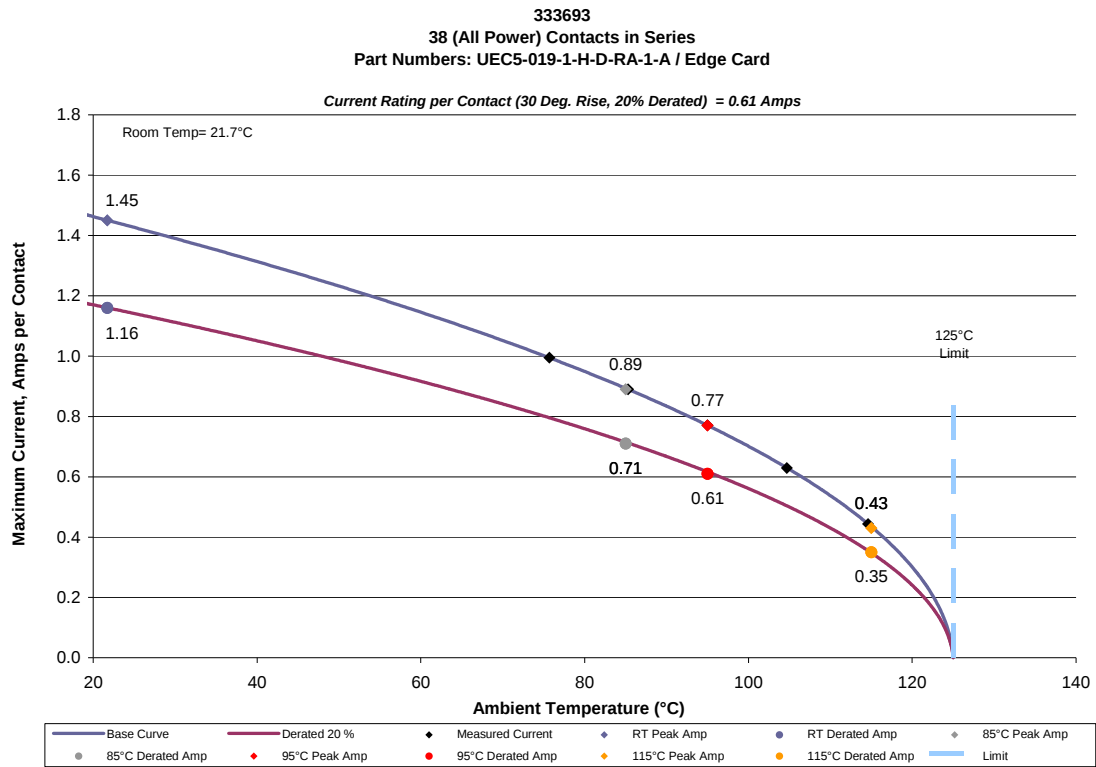


333693

8 (2x4) Contacts in Series

Part Numbers: UEC5-019-1-H-D-RA-1-A / Edge Card



DATA SUMMARIES Continued**e. Linear configuration with all adjacent conductors/contacts powered**

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

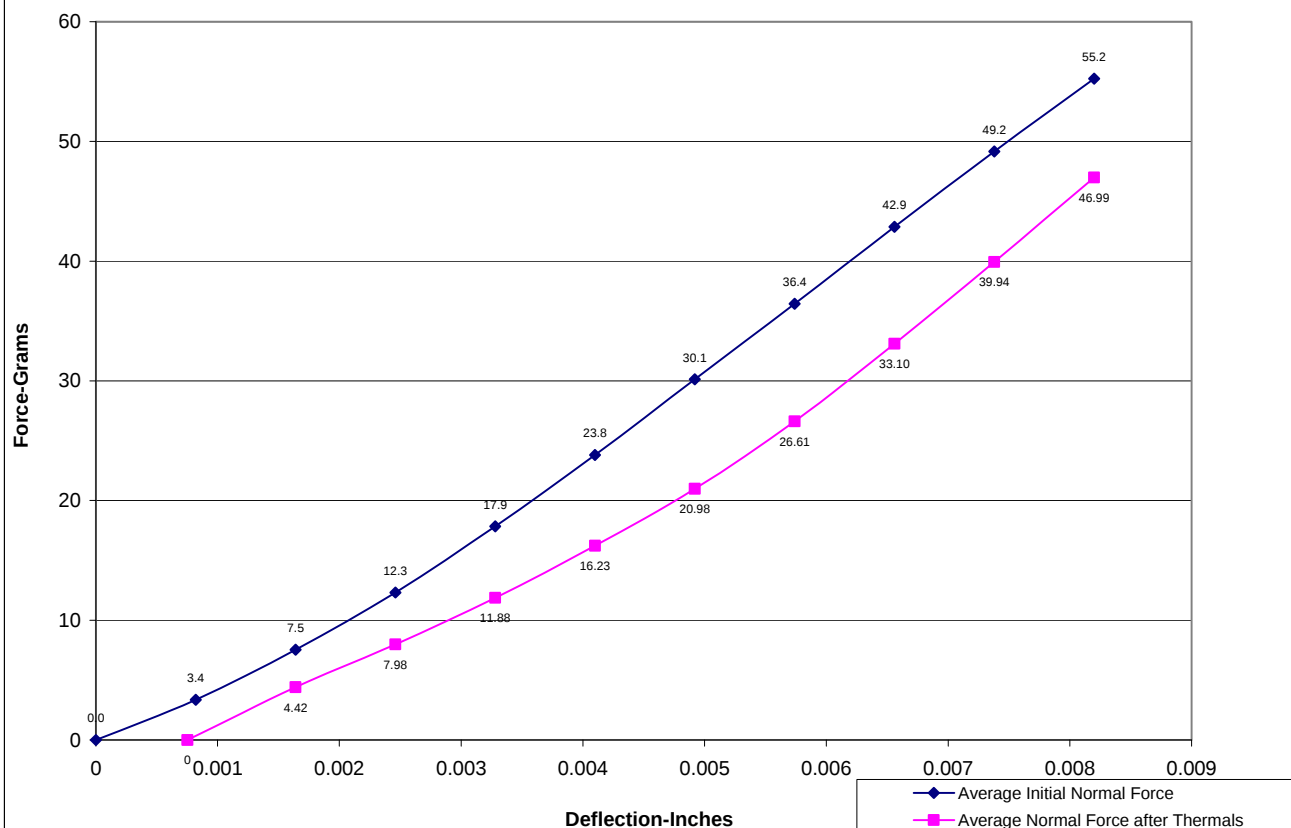
- 1) Calibrated force gauges are used along with computer controlled positioning equipment.
- 2) For Normal force 8-10 measurements are taken and the averages reported.

Row 1

Initial	Deflections in inches Forces in Grams										
	<u>0.0008</u>	<u>0.0016</u>	<u>0.0025</u>	<u>0.0033</u>	<u>0.0041</u>	<u>0.0049</u>	<u>0.0057</u>	<u>0.0066</u>	<u>0.0074</u>	<u>0.0082</u>	<u>SET</u>
Averages	3.35	7.54	12.33	17.85	23.80	30.14	36.43	42.87	49.16	55.23	0.0002
Min	2.70	6.30	10.00	14.10	18.80	24.20	30.60	37.10	44.10	50.10	0.0001
Max	4.40	9.90	15.60	21.60	27.50	33.50	39.70	46.30	52.40	58.50	0.0004
St. Dev	0.585	1.102	1.419	1.859	2.188	2.587	2.659	2.835	2.792	2.807	0.0001
Count	12	12	12	12	12	12	12	12	12	12	12

After Thermals	Deflections in inches Forces in Grams										
	<u>0.0008</u>	<u>0.0016</u>	<u>0.0025</u>	<u>0.0033</u>	<u>0.0041</u>	<u>0.0049</u>	<u>0.0057</u>	<u>0.0066</u>	<u>0.0074</u>	<u>0.0082</u>	<u>SET</u>
Averages	1.29	4.42	7.98	11.88	16.23	20.98	26.61	33.10	39.94	46.99	0.0006
Min	0.00	0.20	3.20	6.30	10.00	14.00	18.80	24.40	31.00	38.30	0.0001
Max	2.50	5.90	10.40	15.20	20.20	26.00	33.00	39.60	46.90	53.50	0.0016
St. Dev	0.852	1.567	1.831	2.214	2.656	3.194	3.712	3.996	4.142	4.001	0.0004
Count	12	12	12	12	12	12	12	12	12	12	12

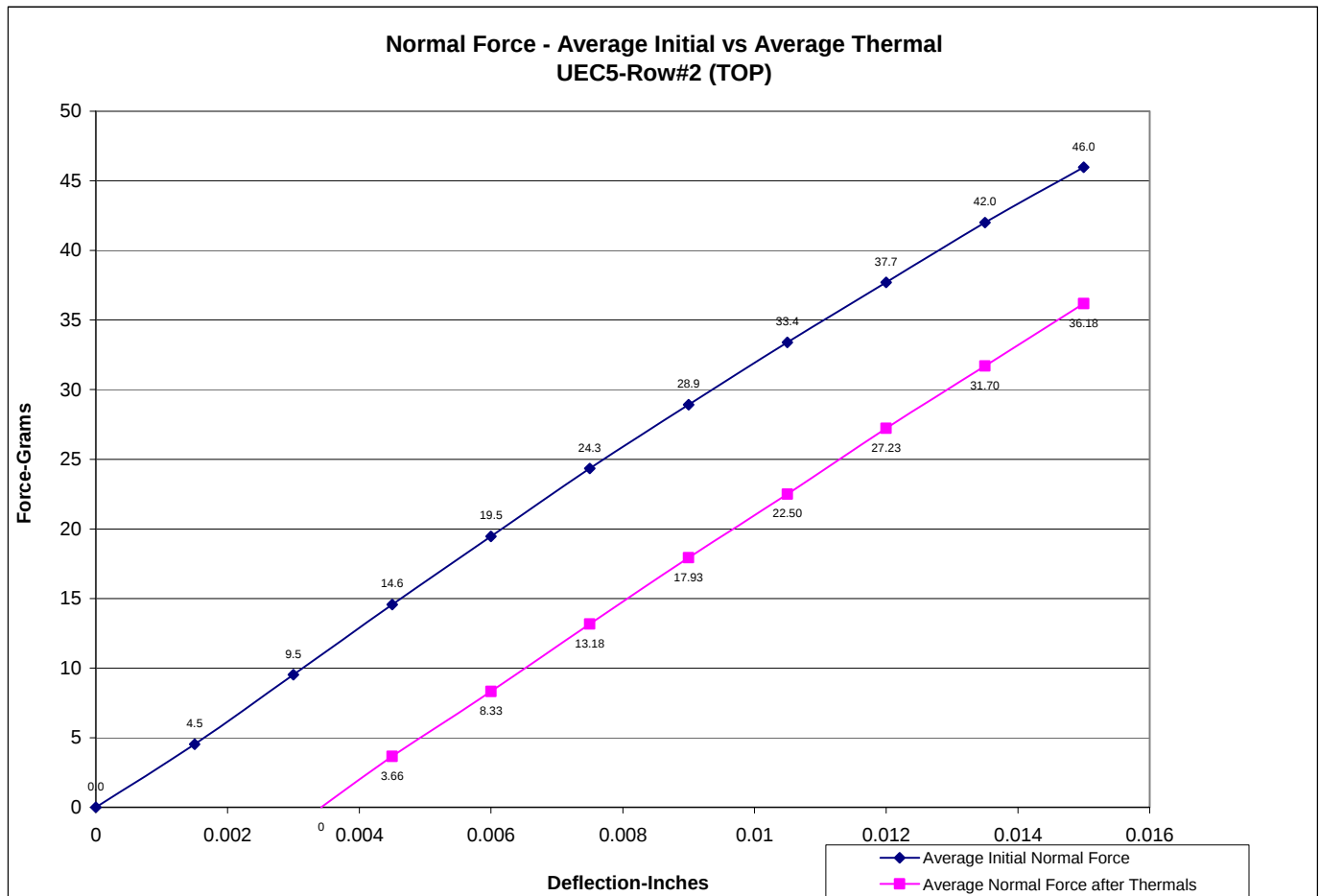
**Normal Force - Average Initial vs Average Thermal
UEC5-Row#1 (Bottom)**



DATA SUMMARIES Continued**Row 2**

Initial	Deflections in inches Forces in Grams										
	<u>0.0015</u>	<u>0.0030</u>	<u>0.0045</u>	<u>0.0060</u>	<u>0.0075</u>	<u>0.0090</u>	<u>0.0105</u>	<u>0.0120</u>	<u>0.0135</u>	<u>0.0150</u>	<i>SET</i>
Averages	4.53	9.53	14.57	19.45	24.33	28.91	33.40	37.71	41.99	45.98	0.0007
Min	4.30	9.10	13.70	18.20	23.20	27.60	31.80	35.80	39.80	44.00	0.0006
Max	5.20	10.70	15.90	20.80	25.90	30.80	35.50	39.90	43.80	47.80	0.0008
St. Dev	0.273	0.502	0.687	0.796	0.838	1.049	1.109	1.204	1.153	1.105	0.0001
Count	12	12	12	12	12	12	12	12	12	12	12

After Thermals	Deflections in inches Forces in Grams										
	<u>0.0015</u>	<u>0.0030</u>	<u>0.0045</u>	<u>0.0060</u>	<u>0.0075</u>	<u>0.0090</u>	<u>0.0105</u>	<u>0.0120</u>	<u>0.0135</u>	<u>0.0150</u>	<i>SET</i>
Averages	0.00	0.00	3.66	8.33	13.18	17.93	22.50	27.23	31.70	36.18	0.0033
Min	0.00	0.00	1.90	6.60	11.40	16.10	20.60	24.60	29.00	33.20	0.0030
Max	0.00	0.00	4.80	9.50	14.60	19.60	24.30	29.20	33.60	38.10	0.0038
St. Dev	0.000	0.000	0.850	0.962	1.084	1.165	1.243	1.356	1.346	1.389	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	UEC5/CARD	UEC5	CARD
Initial	45000	45000	Not Tested
Thermal	45000	45000	Not Tested
Humidity	45000	45000	Not Tested

Row to Row			
	Mated	Unmated	Unmated
Minimum	UEC5/CARD	UEC5	CARD
Initial	45000	45000	Not Tested
Thermal	45000	45000	Not Tested
Humidity	45000	45000	Not Tested

Pin to Closest Metallic Hardware			
	Mated	Unmated	Unmated
Minimum	UEC5/CARD	UEC5	CARD
Initial	45000	45000	Not Tested
Thermal	45000	45000	Not Tested
Humidity	45000	45000	Not Tested

DATA SUMMARIES Continued**DIELECTRIC WITHSTANDING VOLTAGE (DWV):**

Voltage Rating Summary	
Minimum	UEC5/CARD
Break Down Voltage	771
Test Voltage	580
Working Voltage	190

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 Closest Metallic Hardware	
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	5/28/2014	6/9/2014		
Room Temp (Deg C)	22	21		
Rel Humidity (%)	43	44		
Technician	Craig Ryan	Craig Ryan		
mOhm values	Actual Initial	Delta Thermal	Delta	Delta
Pin Type 1: Row 1				
Average	10.83	0.56		
St. Dev.	0.74	0.34		
Min	9.48	0.07		
Max	12.49	1.86		
Summary Count	64	64		
Total Count	64	64		
Pin Type 2: Row 2				
Average	15.92	0.42		
St. Dev.	0.53	0.24		
Min	14.92	0.00		
Max	17.67	1.38		
Summary Count	128	128		
Total Count	128	128		

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	192	0	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	5/23/2014	5/23/2014	5/28/2014	6/9/2014
Room Temp (Deg C)	22	22	22	22
Rel Humidity (%)	35	34	42	40
Technician	Craig Ryan	Craig Ryan	Craig Ryan	Craig Ryan
mOhm values	Actual Initial	Delta 100 Cycles	Delta Therm Shck	Delta Humidity
Pin Type 1: Row 1				
Average	10.52	0.30	0.38	0.44
St. Dev.	0.45	0.22	0.24	0.24
Min	9.64	0.01	0.00	0.03
Max	11.33	0.93	1.00	1.18
Summary Count	64	64	64	64
Total Count	64	64	64	64
Pin Type 2: Row 2				
Average	15.69	0.31	0.42	0.49
St. Dev.	0.48	0.24	0.33	0.34
Min	14.91	0.01	0.01	0.00
Max	17.79	1.61	2.13	2.18
Summary Count	128	128	128	128
Total Count	128	128	128	128

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**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	5/22/2014	5/23/2014		
Room Temp (Deg C)	23	22		
Rel Humidity (%)	40	36		
Technician	Craig Ryan	Craig Ryan		
mOhm values	Actual Initial	Delta Acid Vapor	Delta	Delta
Pin Type 1: Row 1				
Average	10.66	0.11		
St. Dev.	0.49	0.04		
Min	9.68	0.05		
Max	11.83	0.21		
Summary Count	64	64		
Total Count	64	64		
Pin Type 2: Row 2				
Average	15.85	0.10		
St. Dev.	0.51	0.07		
Min	14.92	0.00		
Max	16.97	0.34		
Summary Count	128	128		
Total Count	128	128		

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
Acid Vapor	192	0	0	0	0	0

EQUIPMENT AND CALIBRATION SCHEDULES

Equipment #: THC-06

Description: Temperature/Humidity Chamber (Chamber Room)

Manufacturer: Thermotron

Model: SM-8-8200

Serial #: 38977

Accuracy: See Manual

... Last Cal: 11/12/2013, Next Cal: 11/30/2014

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 #: HPT-01

Description: Hipot Safety Tester

Manufacturer: Vitrek

Model: V73

Serial #: 019808

Accuracy:

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

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 #: MO-11

Description: Switch/Multimeter

Manufacturer: Keithley

Model: 3706

Serial #: 120169

Accuracy: See Manual

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

EQUIPMENT AND CALIBRATION SCHEDULES Continued

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: 08/24/2013, Next Cal: 08/24/2014

Equipment #: PS-01

Description: Power Supply

Manufacturer: Agilent

Model: AT-6032A

Serial #: MY41001186

Accuracy: See Manual

... Last Cal: 06/12/2014, Next Cal: 6/12/2015

Equipment #: MO-03

Description: Multimeter /Data Acquisition System

Manufacturer: Keithley

Model: 2700

Serial #: 0791975

Accuracy: See Manual

... Last Cal: 05/19/2014, Next Cal: 05/19/2015