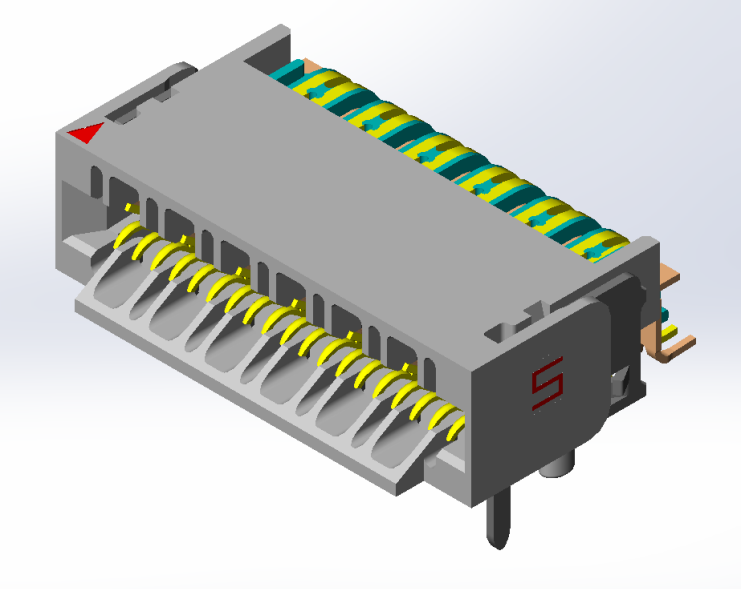
Project Number: Design Qualification Test Report	Tracking Code: 1128974_Report_Rev_1
Requested by: Corey Rose	Date: 10/11/2017
Part #: UEC5-019-2-H-D-RA-1/Edge Card	Tech: Troy Cook
Part description: UEC5/Card	Qty to test: 60
Test Start: 05/10/2017	Test Completed: 06/25/2017



Design Qualification Test Report

UEC5/Card
UEC5-019-2-H-D-RA-1/Edge Card

REVISION HISTORY

DATA	REV.NUM.	DESCRIPTION	ENG
7/18/2017	**1**	**Initial Issue**	**PC**

CERTIFICATION

All instruments and measuring equipment were calibrated to National Institute for Standards and Technology (NIST) traceable standards according to IS0 10012-l and ANSI/NCSL 2540-1, as applicable.

SCOPE

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

APPLICABLE DOCUMENTS

Standards: EIA Publication 364

TEST SAMPLES AND PREPARATION

1) All materials were manufactured in accordance with the applicable product specification.
2) All test samples were identified and encoded to maintain traceability throughout the test sequences.
3) After soldering, the parts to be used for LLCR 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) Samtec Test PCBs used: PCB-108083-TST-XX, PCB-107922-TST-XX.

FLOWCHARTS

Gas Tight

Group 1
UEC5-019-2-H-D-RA-1
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

Thermal Aging

Group 1
UEC5-019-2-H-D-RA-1
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

Normal Force

Note: Mating card thickness: 0.0338±0.0034

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

Step	Description
1.	Contact Gaps
2.	Normal Force (1) Deflection = 0.0100 " Expected Force at Max Deflection = 50 g

Group 2
UEC5-019-2-H-D-RA-1
0.0338" EDGE CARD
8 Contacts Minimum
Row 2 Signals Without Thermals

Step	Description
1.	Contact Gaps
2.	Normal Force (1) Expected Force at Max Deflection = 77 g Deflection = 0.0233 "

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

Step	Description
1.	Contact Gaps
2.	Normal Force (1) Deflection = 0.0233 " Expected Force at Max Deflection = 84 g

Group 4
UEC5-019-2-H-D-RA-1
0.0338" EDGE CARD
8 Contacts Minimum
Row 1 With Thermals
Note: Measure and document PCB thickness prior to performing test

Step	Description
1.	Contact Gaps
2.	Thermal Age (2)
3.	Contact Gaps
4.	Normal Force (1) Deflection = 0.0100 " Expected Force at Max Deflection = 50 g

Group 5
UEC5-019-2-H-D-RA-1
0.0338" EDGE CARD
8 Contacts Minimum
Row 2 Signals With Thermals
Note: Measure and document PCB thickness prior to performing test

Step	Description
1.	Contact Gaps
2.	Thermal Age (2)
3.	Contact Gaps
4.	Normal Force (1) Expected Force at Max Deflection = 77 g Deflection = 0.0233 "

Group 6
UEC5-019-2-H-D-RA-1
0.0338" EDGE CARD
8 Contacts Minimum
Row 2 Ground With Thermals
Note: Measure and document PCB thickness prior to performing test

Step	Description
1.	Contact Gaps
2.	Thermal Age (2)
3.	Contact Gaps
4.	Normal Force (1) Deflection = 0.0233 " Expected Force at Max Deflection = 84 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\

Mating/Unmating/Durability

Group 2
UEC5-019-2-H-D-RA-1
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 (3) Max Delta = 15 mOhm
3.	Cycles Quantity = 100 Cycles
4.	Contact Gaps
5.	LLCR (3) Max Delta = 15 mOhm
6.	Thermal Shock (5)
7.	LLCR (3) Max Delta = 15 mOhm
8.	Humidity (1)
9.	LLCR (3) Max Delta = 15 mOhm

Group 4
UEC5-019-2-H-D-RA-1
0.0338" EDGE CARD
8 Assemblies
Nominal Mating Card Thickness
Note: Measure and document PCB thickness prior to performing test
Note: Removed the UCC8 connector from the board for this testing sequence.

Step	Description
1.	Contact Gaps
2.	Mating/Unmating Force (4)
3.	Cycles Quantity = 100 Cycles
4.	Mating/Unmating Force (4)
5.	Contact Gaps
6.	Thermal Shock (5)
7.	Humidity (1)
8.	Mating/Unmating Force (4)

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(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) LLCR = EIA-364-23
Open Circuit Voltage = 20 mV Max
Test Current = 100 mA Max

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

(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

IR/DWV

Pin-to-Pin

Group 1
UEC5-019-2-H-D-RA-1
0.0338" EDGE CARD
2 Assemblies
Nominal Mating Card Thickness

Step	Description
1.	DWV Breakdown (2)

Group 2
UEC5-019-2-H-D-RA-1
0.0338" EDGE CARD
2 Assemblies

Step	Description
1.	DWV Breakdown (2)

Group 3
UEC5-019-2-H-D-RA-1
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
UEC5-019-2-H-D-RA-1
0.0338" EDGE CARD
2 Assemblies
Nominal Mating Card Thickness

Step	Description
1.	DWV Breakdown (2)

Group 5
UEC5-019-2-H-D-RA-1
0.0338" EDGE CARD
2 Assemblies

Step	Description
1.	DWV Breakdown (2)

Group 6
UEC5-019-2-H-D-RA-1
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		Group 8		Group 9	
UEC5-019-2-H-D-RA-1		UEC5-019-2-H-D-RA-1		UEC5-019-2-H-D-RA-1	
0.0338" EDGE CARD		0.0338" EDGE CARD		0.0338" EDGE CARD	
2 Assemblies		2 Assemblies		2 Assemblies	
Nominal Mating Card Thickness				Nominal Mating Card Thickness	
Step	**Description**	**Step**	**Description**	**Step**	**Description**
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)

Pin-to-Ground

Group 10		Group 11		Group 12	
UEC5-019-2-H-D-RA-1		UEC5-019-2-H-D-RA-1		UEC5-019-2-H-D-RA-1	
0.0338" EDGE CARD		0.0338" EDGE CARD		0.0338" EDGE CARD	
2 Assemblies		2 Assemblies		2 Assemblies	
Nominal Mating Card Thickness				Nominal Mating Card Thickness	
Step	**Description**	**Step**	**Description**	**Step**	**Description**
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)

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(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 = Other
Exposure Time at Temperature Extremes = 1/2 Hour
Method A, Test Condition = (-55°C to +70°C)
Test Duration = A-3 (100 Cycles)
EIA-364-32

FLOWCHARTS Continued

Current Carrying Capacity

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

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

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

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

Group 3
UEC5-019-2-H-D-RA-1
0.0338" EDGE CARD
6 Pins Powered
Signal

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

Group 4
UEC5-019-2-H-D-RA-1
0.0338" EDGE CARD
8 Pins Powered
Signal

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

Group 5
UEC5-019-2-H-D-RA-1
0.0338" EDGE CARD
24 Pins Powered
Signal

Step	Description
1.	CCC (1) Rows = 2 Number of Positions = 12

Group 6
UEC5-019-2-H-D-RA-1
0.0338" EDGE CARD
2 Pins Powered
Ground
Note: Each row of ground positions are combined

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

Group 7
UEC5-019-2-H-D-RA-1
0.0338" EDGE CARD
2 Pins Powered
All Power - Ground
Note: Each row of ground positions are combined

Step	Description
1.	CCC (1) Rows = 2 Number of Positions = 1 *Note: Signals to be run at 1/2 Rated Current*

(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 : -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 : 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.

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.

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

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. Rate of Application 500 V/Sec
        iii. 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).

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:
    c. Ambient
    d. 85^{o} C
    e. 95^{o} C
    f. 115^{o} 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

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. <= +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. <= +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:
    g. Reference document: EIA-364-36, *Test Procedure for Determination of Gas-Tight Characteristics for Electrical Connectors, Sockets and/or Contact Systems*.
    h. 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^{o} C
        ix. The final LLCR shall be conducted within 1 hour after drying.

RESULTS

Temperature Rise, CCC at a 20% de-rating

Signal Pin

- **CCC for a 30°C Temperature Rise----------1.8 A per contact with 2 contact (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----------0.9 A per contact with 8 contacts (2x4) powered**
- **CCC for a 30°C Temperature Rise----------0.7 A per contact with 24 contacts (2x12) powered**

Ground Pin

- **CCC for a 30°C Temperature Rise----------4.4 A per Contact with 24 contact (2x12) Grounds Powered**
- **CCC for a 30°C Temperature Rise----------4.3 A per bank with 24 contact (2x12) Grounds Powered / All Signal Pins powered at ½ rated current (0.35 Amp)**

MATING/UNMATING FORCE:

Mating/Unmating durability

- **Initial**
  - **Mating**
    - **Min ---------- 1.49 Lbs**
    - **Max---------- 2.05 Lbs**
  - **Unmating**
    - **Min ---------- 0.56 Lbs**
    - **Max---------- 0.66 Lbs**
- **After 25 Cycles**
  - **Mating**
    - **Min ---------- 1.60 Lbs**
    - **Max---------- 2.11 Lbs**
  - **Unmating**
    - **Min ---------- 0.70 Lbs**
    - **Max---------- 0.84 Lbs**
- **After 50 Cycles**
  - **Mating**
    - **Min ---------- 1.64 Lbs**
    - **Max---------- 2.06 Lbs**
  - **Unmating**
    - **Min ---------- 0.76 Lbs**
    - **Max---------- 0.86 Lbs**
- **After 75 Cycles**
  - **Mating**
    - **Min ---------- 1.61 Lbs**
    - **Max---------- 2.09 Lbs**
  - **Unmating**
    - **Min ---------- 0.77 Lbs**
    - **Max---------- 0.90 Lbs**
- **After 100 Cycles**
  - **Mating**
    - **Min ---------- 1.61 Lbs**
    - **Max---------- 2.11 Lbs**
  - **Unmating**
    - **Min ---------- 0.82 Lbs**
    - **Max---------- 0.91 Lbs**
- **After humidity**
  - **Mating**
    - **Min ---------- 0.84 Lbs**
    - **Max---------- 1.14 Lbs**
  - **Unmating**
    - **Min ---------- 0.43 Lbs**
    - **Max---------- 0.68 Lbs**

RESULTS Continued

Normal force

Row1-Signal pin at 0.007 Inch deflection

- **Initial**
  - **Min----------64.10 gf Set ----- 0.0000 Inch**
  - **Max ----------78.10 gf Set ----- 0.0002 Inch**
- **Thermal**
  - **Min----------23.80 gf**
  - **Max ----------38.40 gf**

Row1-Ground pin at 0.007 Inch deflection

- **Initial**
  - **Min----------34.70 gf Set ----- 0.0000 Inch**
  - **Max ----------39.80 gf Set ----- 0.0002 Inch**
- **Thermal**
  - **Min----------15.60 gf**
  - **Max ----------20.40 gf**

Row2-Signal pin at 0.0175 Inch deflection

- **Initial**
  - **Min---------- 100.00 gf Set ----- 0.0006 Inch**
  - **Max ---------- 113.80 gf Set ----- 0.0010 Inch**
- **Thermal**
  - **Min----------99.50 gf**
  - **Max ---------- 117.00 gf**

Row2-Ground pin at 0.0175 Inch deflection

- **Initial**
  - **Min----------59.30 gf Set ----- 0.0009 Inch**
  - **Max ----------72.20 gf Set ----- 0.0016 Inch**
- **Thermal**
  - **Min----------56.20 gf**
  - **Max ----------68.70 gf**

RESULTS Continued

LLCR Durability (192 pin LLCR test points)

Signal pin:

- **Initial ---------- 29.75 mOhms Max**

Ground Pin:

- **Initial ---------- 22.93 mOhms Max**
- **Durability, 100 Cycles**
  - **<= +5.0 mOhms ---------- 190 Points ---------- Stable**
  - **+5.1 to +10.0 mOhms ----------1 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**
- **Thermal Shock**
  - **<= +5.0 mOhms ---------- 190 Points ---------- Stable**
  - **+5.1 to +10.0 mOhms ----------1 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 ---------- 190 Points ---------- Stable**
  - **+5.1 to +10.0 mOhms ----------1 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**

LLCR Thermal Aging (192 pin LLCR test points)

Signal pin:

- **Initial ---------- 25.01 mOhms Max**

Ground Pin:

- **Initial ---------- 22.95 mOhms Max**
- **Thermal Aging**
  - **<= +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**

LLCR Gas Tight (192 pin LLCR test points)

Signal pin:

- **Initial ---------- 23.13 mOhms Max**

Ground Pin:

- **Initial ---------- 21.76 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 Failue**

RESULTS Continued

Insulation Resistance minimums, IR

Pin- Pin

- **Initial**
  - **Mated----------45000 Meg Ω ---------- Pass**
- **Thermal**
  - **Mated----------45000 Meg Ω ---------- Pass**
- **Humidity**
  - **Mated----------10500 Meg Ω ---------- Pass**

Pin-Ground

- **Initial**
  - **Mated----------45000 Meg Ω ---------- Pass**
- **Thermal**
  - **Mated----------45000 Meg Ω ---------- Pass**
- **Humidity**
  - **Mated----------21600 Meg Ω ---------- Pass**

Row-Row

- **Initial**
  - **Mated----------45000 Meg Ω ---------- Pass**
- **Thermal**
  - **Mated----------45000 Meg Ω ---------- Pass**
- **Humidity**
  - **Mated----------45000 Meg Ω ---------- Pass**

Pin to Closest Metallic Hardware

- **Initial**
  - **Mated----------45000 Meg Ω ---------- Pass**
- **Thermal**
  - **Mated----------45000 Meg Ω ---------- Pass**
- **Humidity**
  - **Mated----------45000 Meg Ω ---------- Pass**

Dielectric Withstanding Voltage minimums, DWV

- **Minimums**
  - **Breakdown Voltage----------612 VAC**
  - **Test Voltage ----------455 VAC**
  - **Working Voltage ----------150 VAC**

Pin - Pin

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

Pin-Ground

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

Row-Row

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

Pin-Closest Metallic Hardware

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

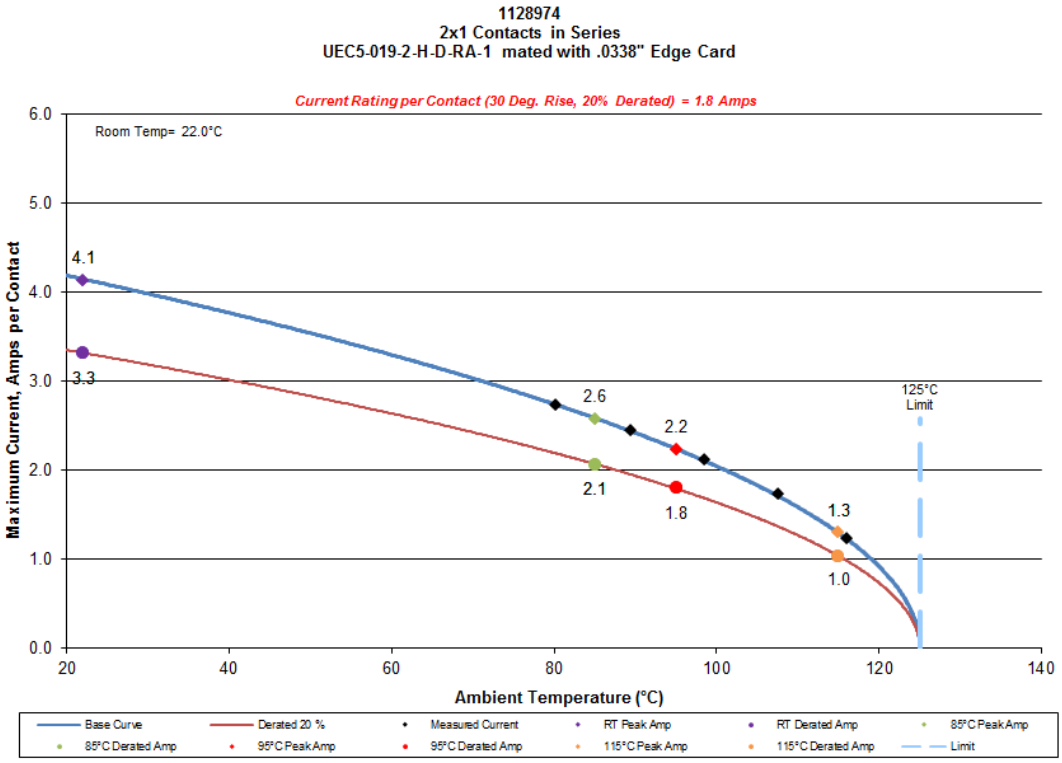
DATA SUMMARIES

TEMPERATURE RISE (Current Carrying Capacity, CCC):

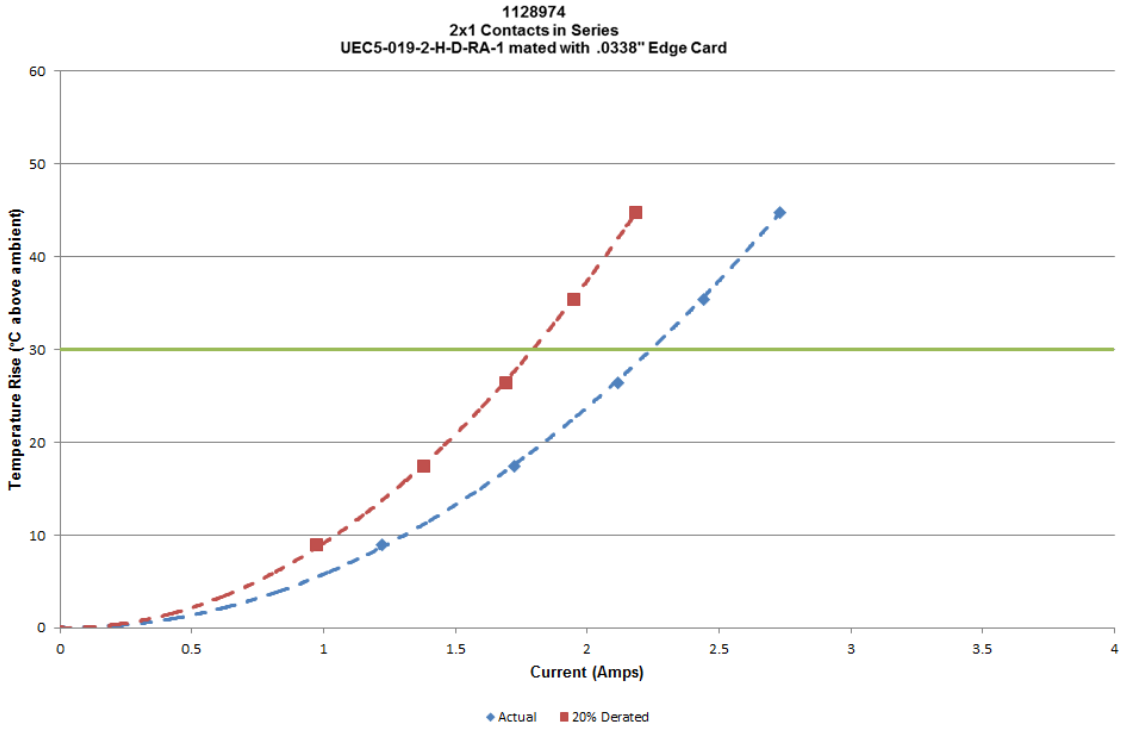
1) High quality thermocouples whose temperature slopes track one another were used for temperature monitoring.
2) The thermocouples were placed at a location to sense the maximum temperature generated during testing.
3) Temperature readings recorded are those for which three successive readings, 15 minutes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

Signal Pin:

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

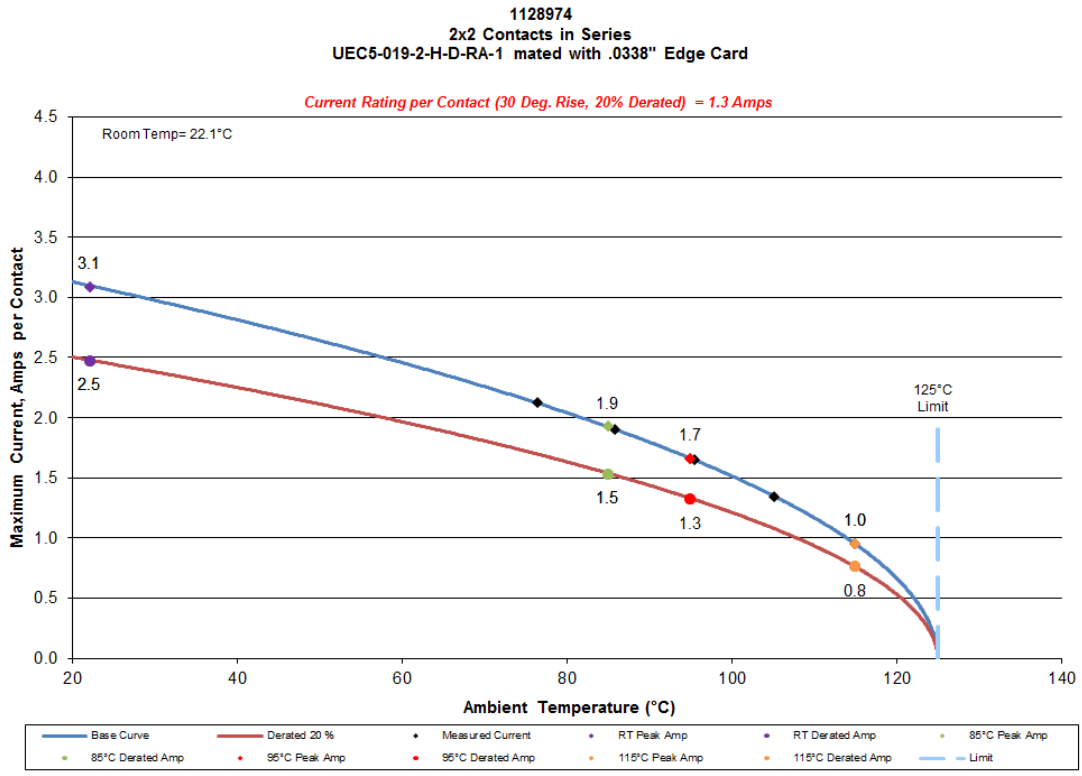


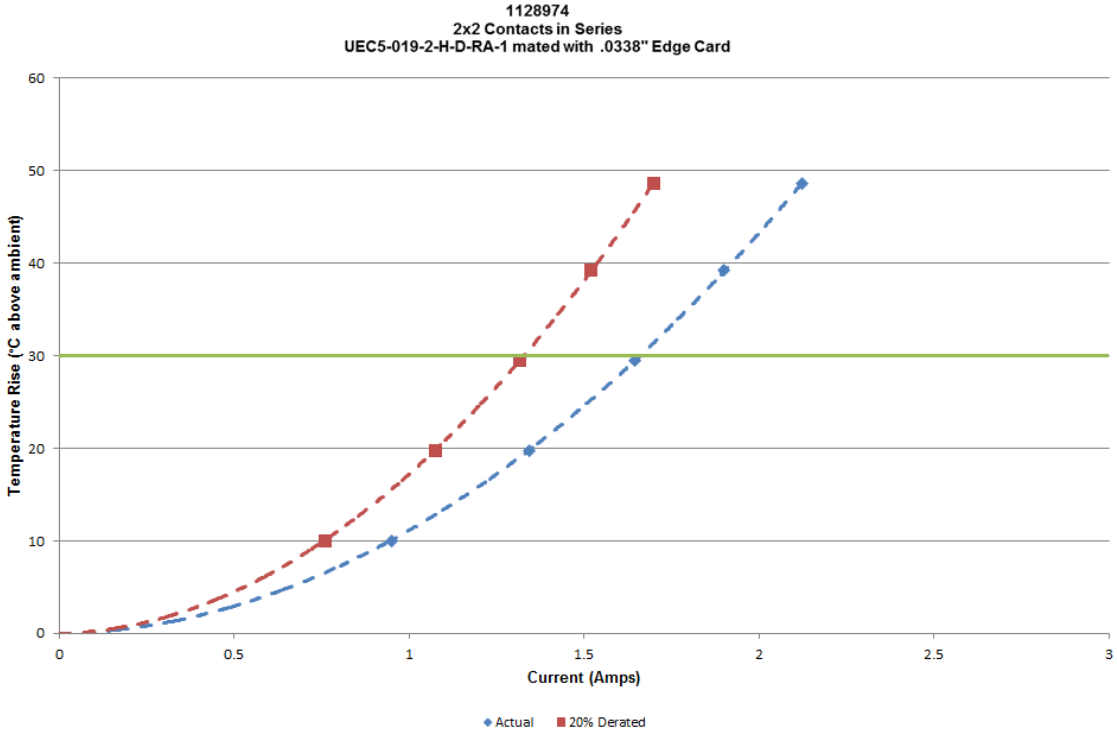
DATA SUMMARIES



DATA SUMMARIES

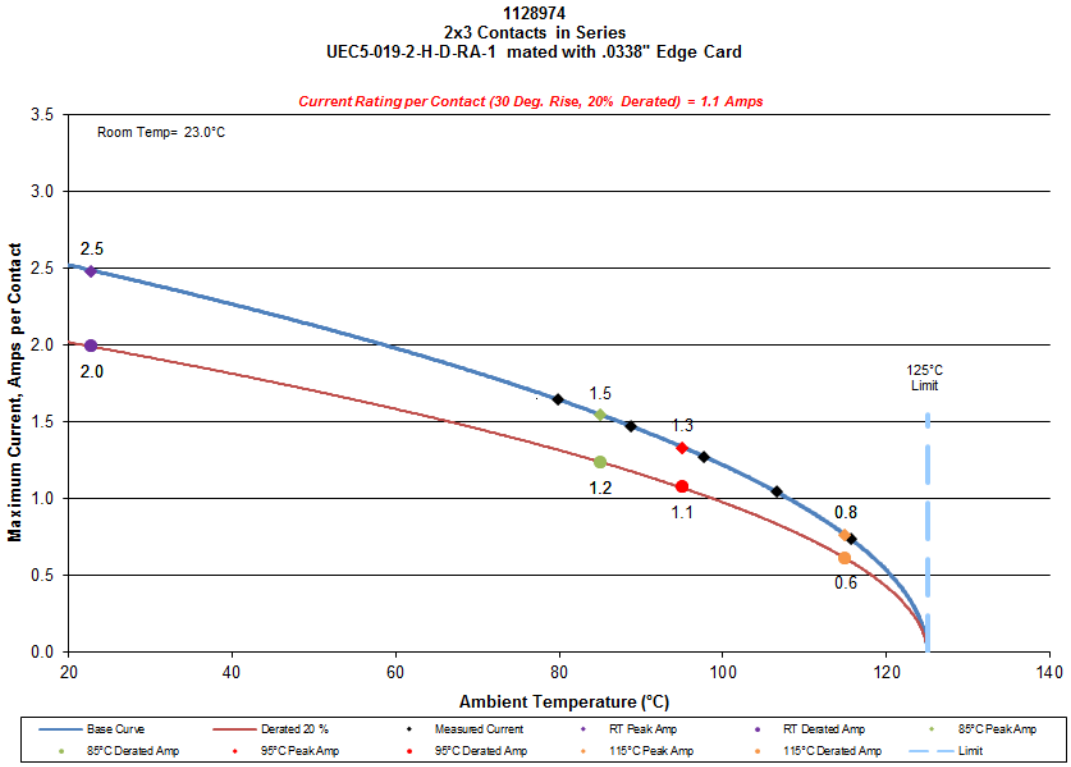
b. Linear configuration with 4 adjacent power conductors/contacts powered

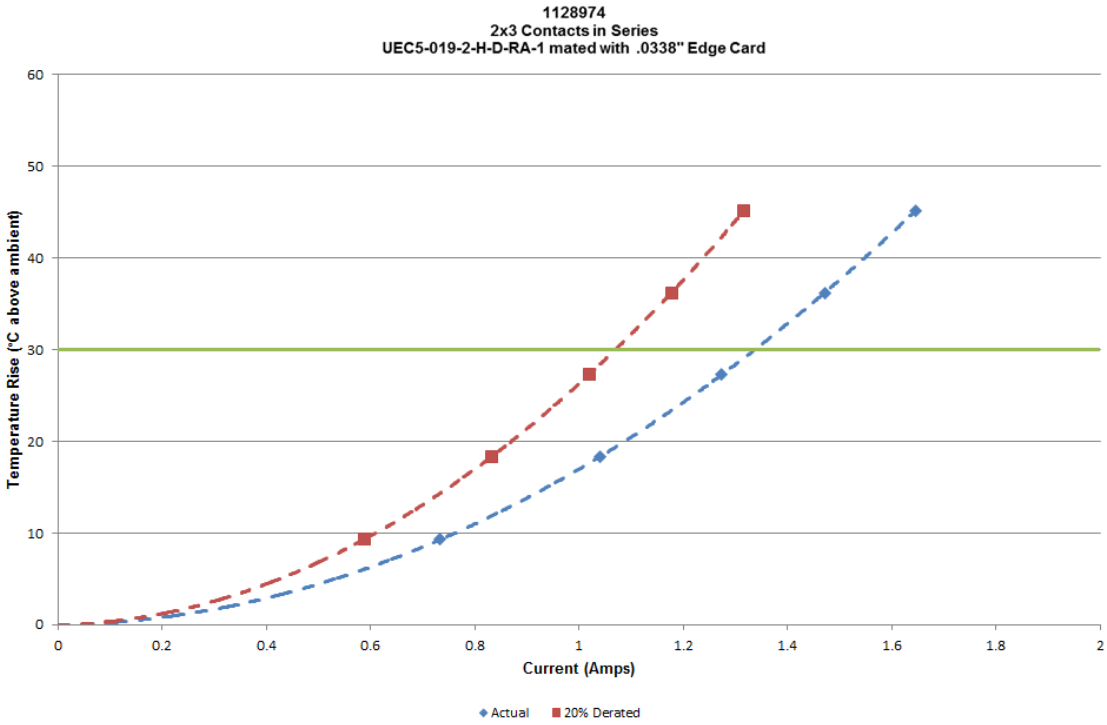




DATA SUMMARIES

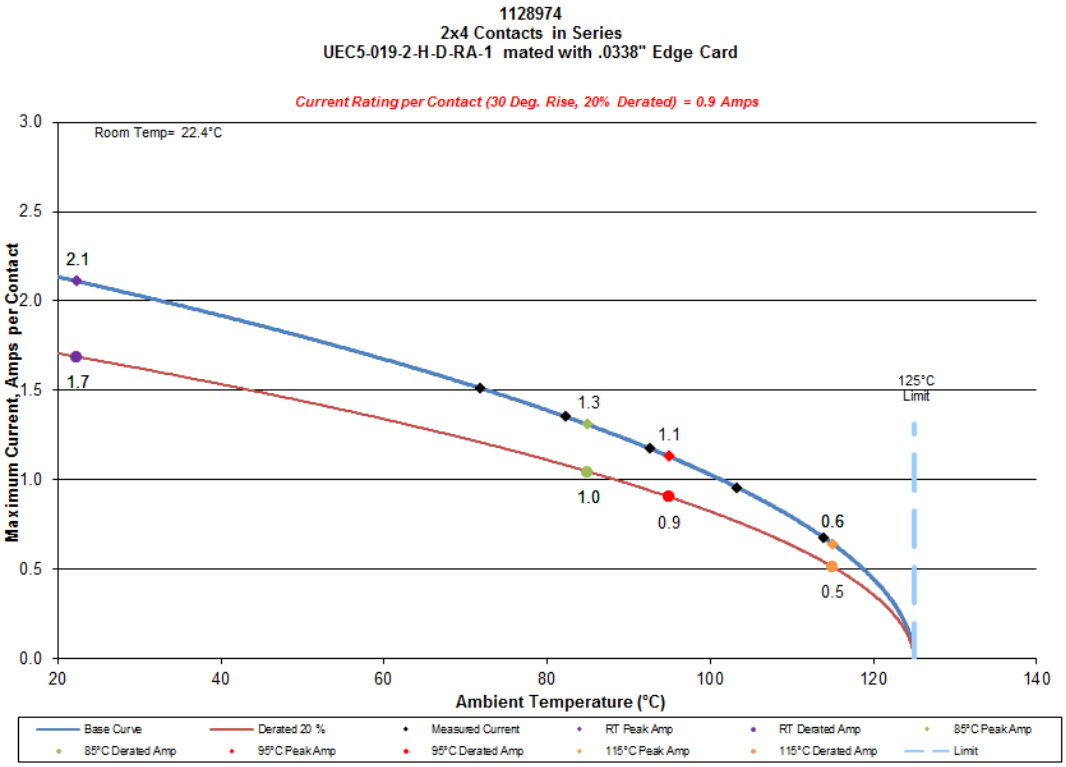
c. Linear configuration with 6 adjacent power conductors/contacts powered

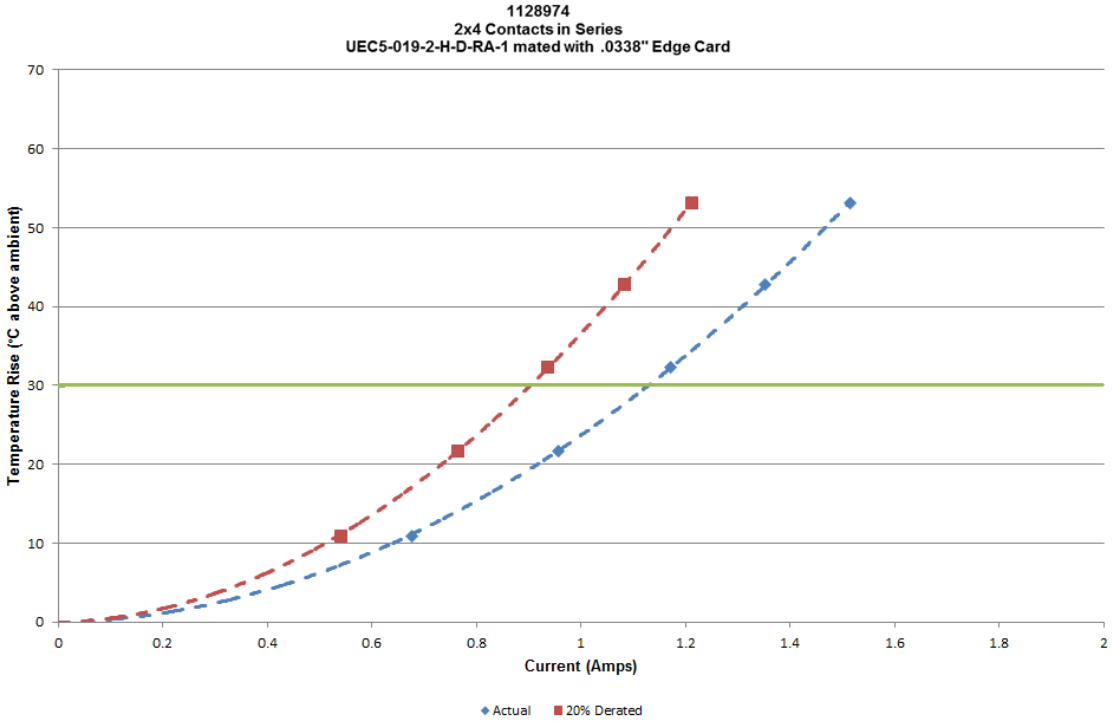




DATA SUMMARIES

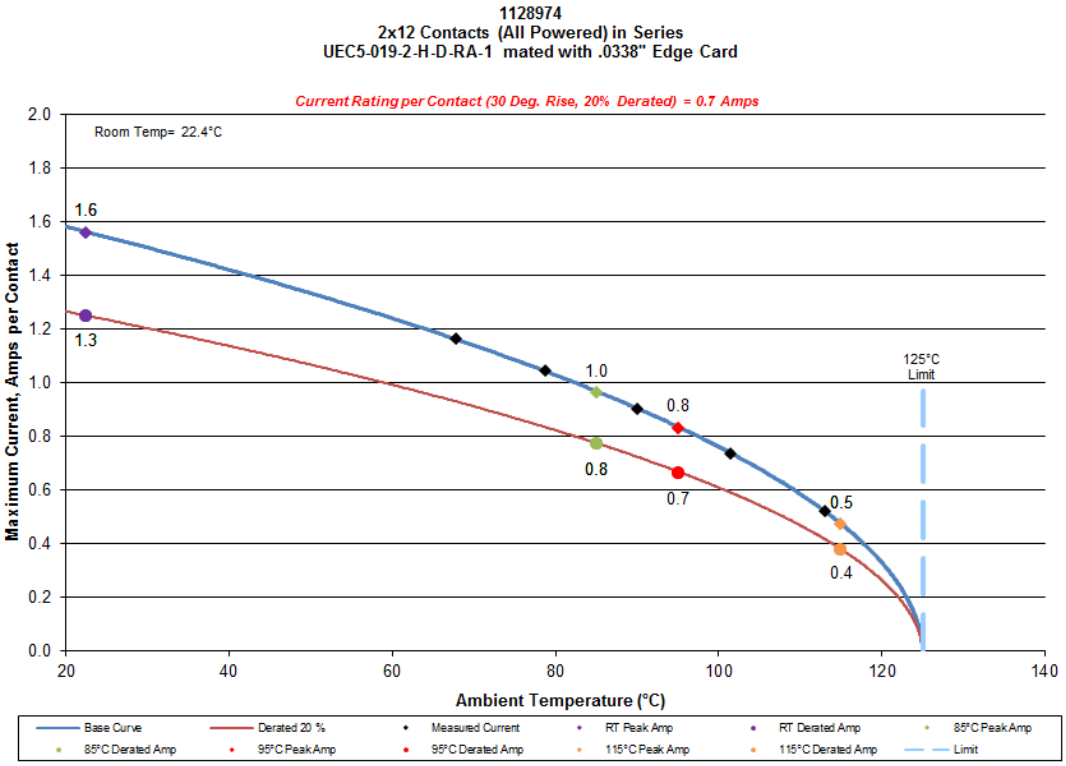
d. Linear configuration with 8 adjacent power conductors/contacts powered

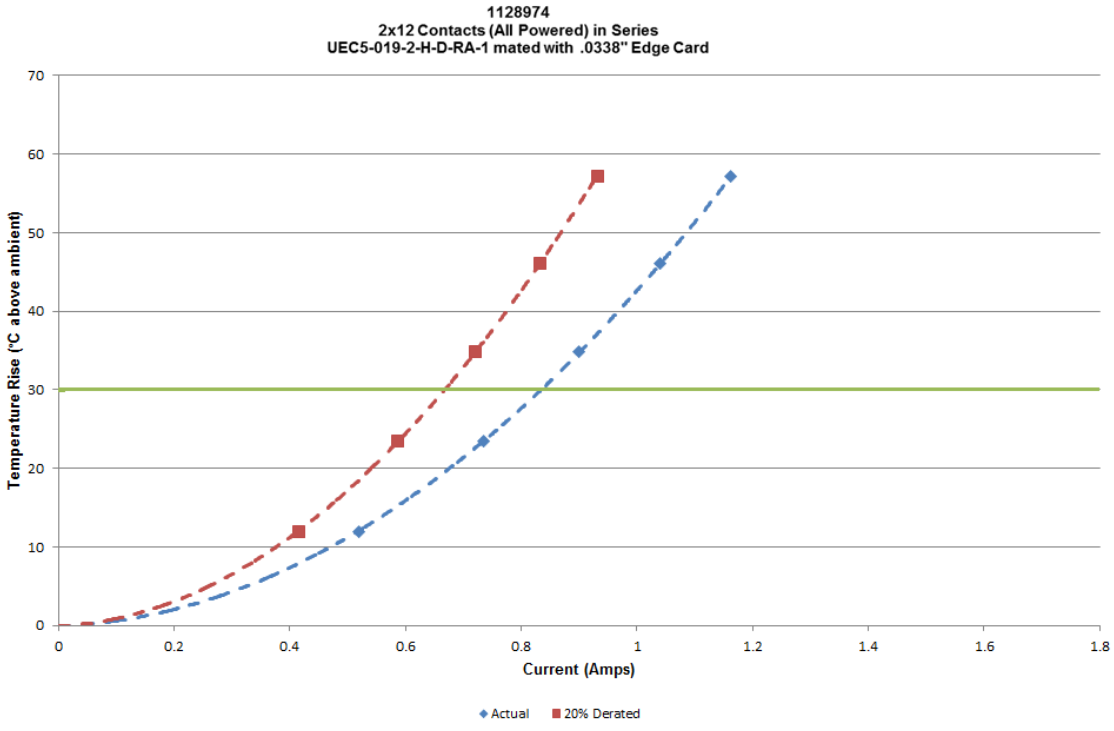




DATA SUMMARIES

e. Linear configuration with 24 adjacent power conductors/contacts powered

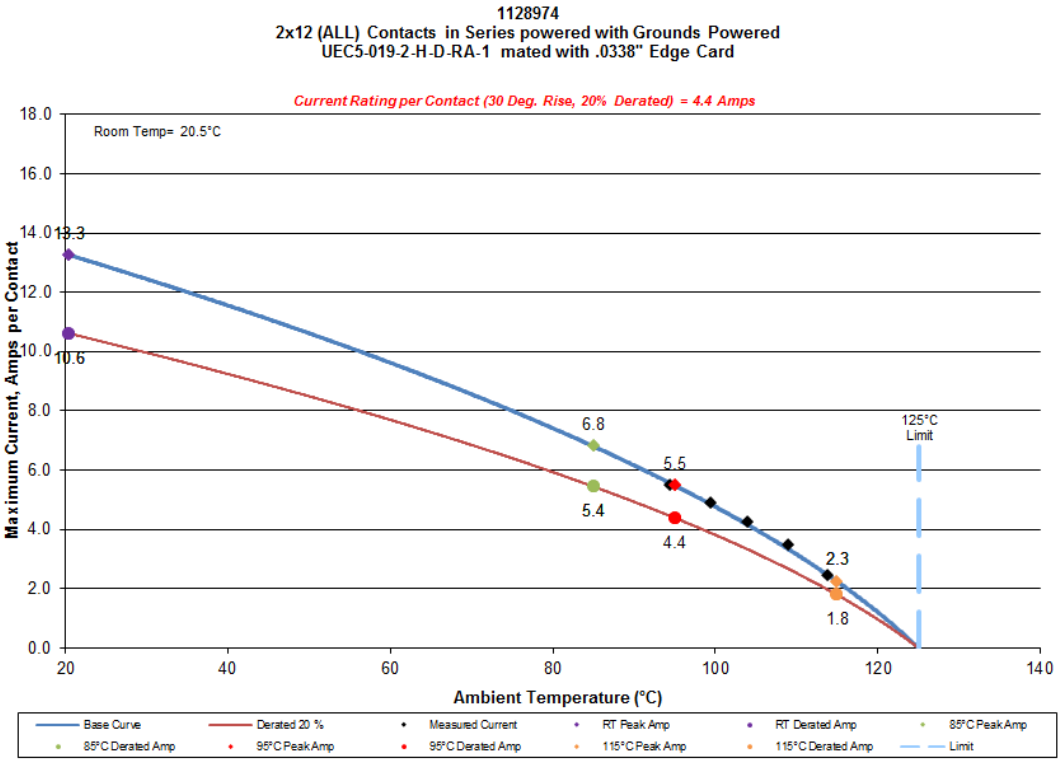


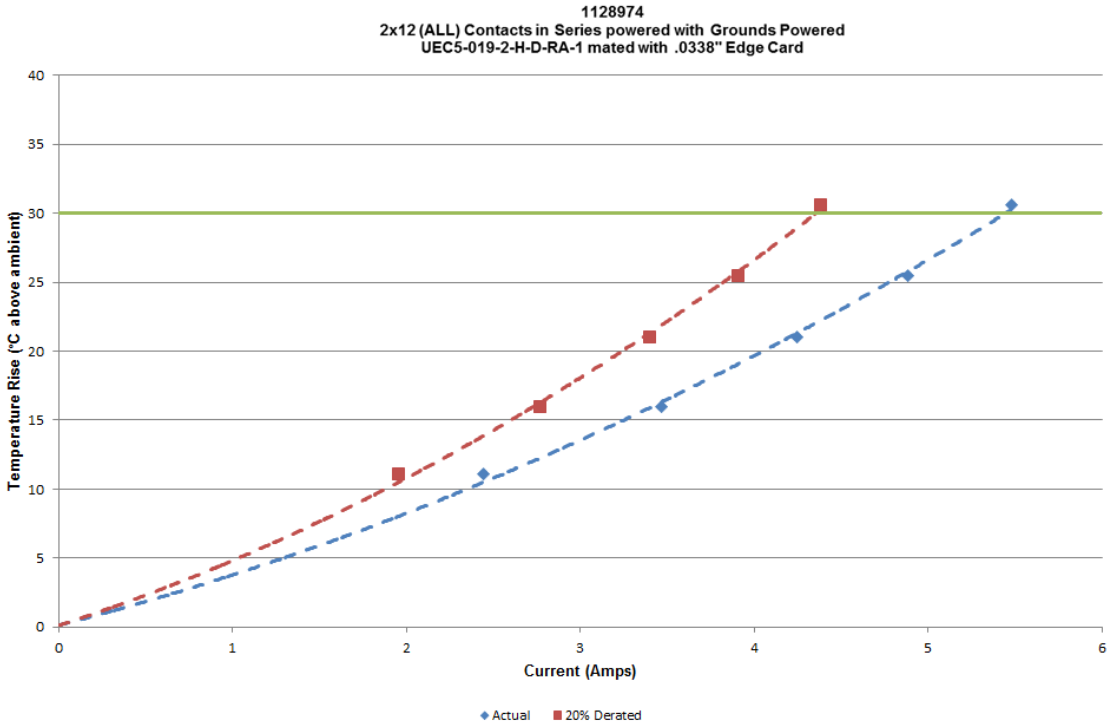


DATA SUMMARIES

Ground Pin

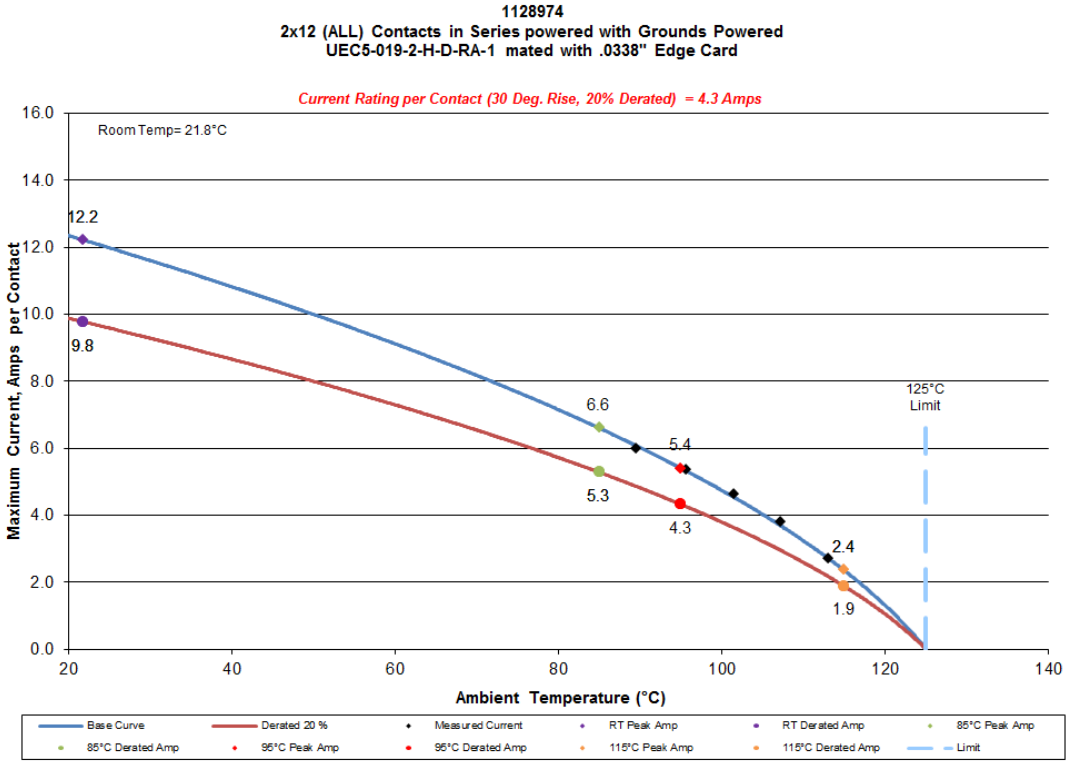
a. Linear configuration with 24 adjacent power conductors/contacts powered

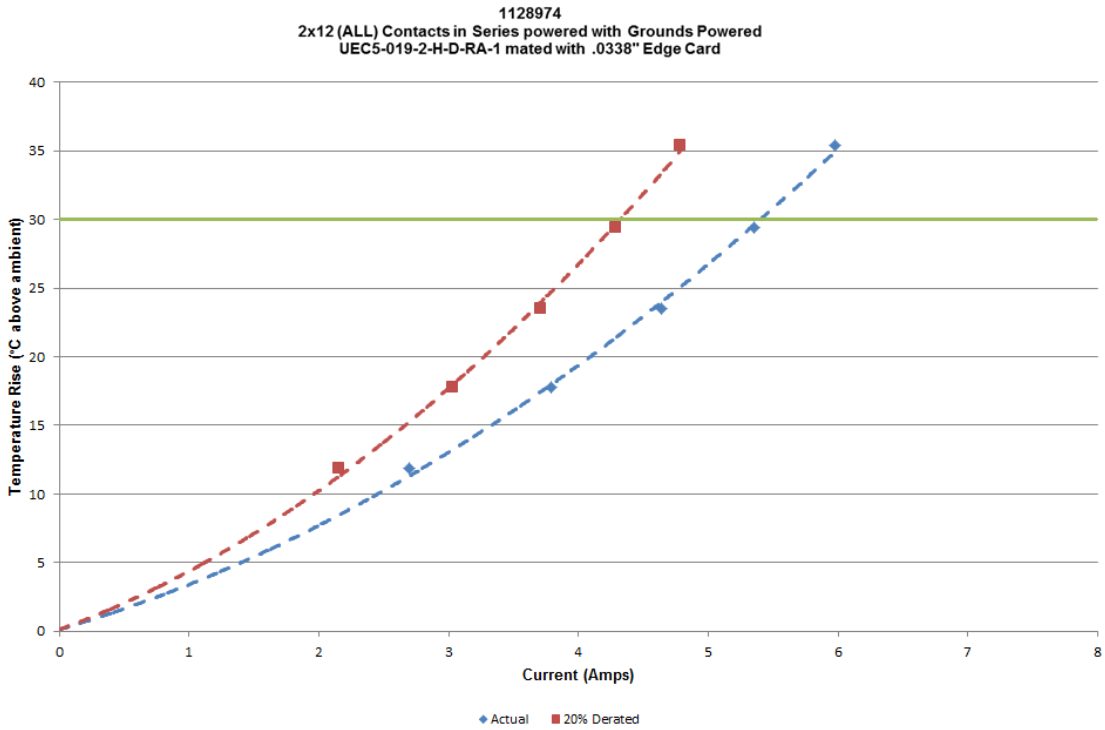




DATA SUMMARIES

b. Linear configuration with 24 adjacent power conductors/contacts powered





DATA SUMMARIES Continued

MATING/UNMATING FORCE:

Mating/Unmating durability

	Initial				After 25 Cycles			
	Mating		**Unmating**		**Mating**		**Unmating**	
	Newtons	Force (Lbs)	Newtons	Force (Lbs)	Newtons	Force (Lbs)	Newtons	Force (Lbs)
Minimum	6.65	1.49	2.48	0.56	7.12	1.60	3.13	0.70
Maximum	9.13	2.05	2.95	0.66	9.38	2.11	3.71	0.84
Average	7.42	**1.67**	2.73	**0.61**	8.57	**1.93**	3.40	**0.77**
St Dev	0.87	0.20	0.14	0.03	0.70	0.16	0.22	0.05
Count	8	8	8	8	8	8	8	8

	After 50 Cycles				After 75 Cycles			
	Mating		**Unmating**		**Mating**		**Unmating**	
	Newtons	Force (Lbs)	Newtons	Force (Lbs)	Newtons	Force (Lbs)	Newtons	Force (Lbs)
Minimum	7.31	1.64	3.38	0.76	7.17	1.61	3.43	0.77
Maximum	9.14	2.06	3.80	0.86	9.30	2.09	3.99	0.90
Average	8.54	**1.92**	3.58	**0.80**	8.55	**1.92**	3.71	**0.83**
St Dev	0.56	0.13	0.16	0.04	0.62	0.14	0.19	0.04
Count	8	8	8	8	8	8	8	8

	After 100 Cycles				After Humidity			
	Mating		**Unmating**		**Mating**		**Unmating**	
	Newtons	Force (Lbs)	Newtons	Force (Lbs)	Newtons	Force (Lbs)	Newtons	Force (Lbs)
Minimum	7.17	1.61	3.63	0.82	3.71	0.84	1.91	0.43
Maximum	9.38	2.11	4.06	0.91	5.07	1.14	3.01	0.68
Average	8.48	**1.91**	3.86	**0.87**	4.39	**0.99**	2.45	**0.55**
St Dev	0.65	0.15	0.15	0.03	0.44	0.10	0.40	0.09
Count	8	8	8	8	8	8	8	8

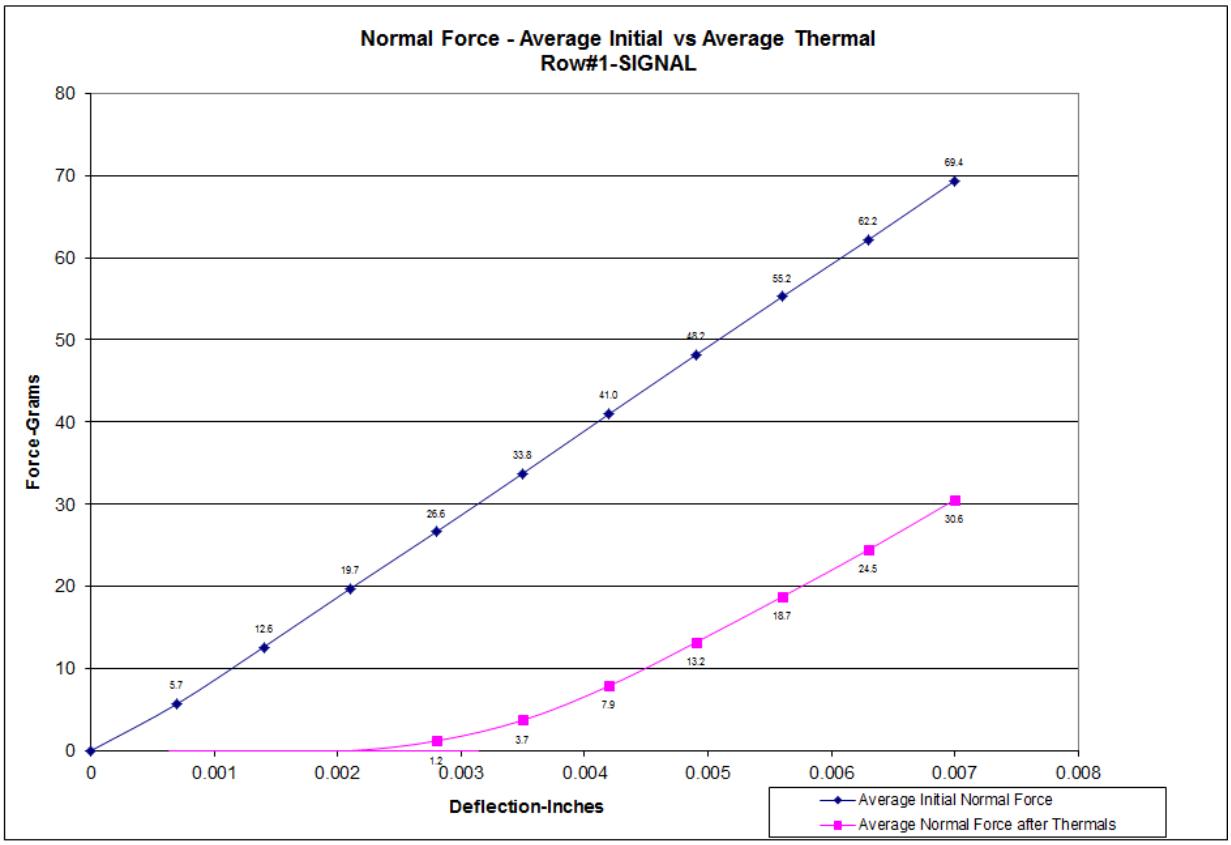
DATA SUMMARIES Continued

Normal force

Row 1-Signal pin

Initial-Signal-Row#1	Deflections in inches Forces in Grams										
	0.0007	**0.0014**	**0.0021**	**0.0028**	**0.0035**	**0.0042**	**0.0049**	**0.0056**	**0.0063**	**0.0070**	***SET***
Averages	**5.72**	**12.62**	**19.71**	**26.65**	**33.76**	**41.00**	**48.15**	**55.25**	**62.19**	**69.37**	**0.0001**
Min	4.40	10.30	17.50	24.00	31.00	37.90	44.50	50.60	57.20	64.10	0.0000
Max	6.70	14.10	22.30	30.20	38.30	46.60	53.80	62.30	69.60	78.10	0.0002
St. Dev	0.767	1.273	1.599	2.077	2.532	3.064	3.543	4.159	4.556	5.017	0.0001
Count	11	11	11	11	11	11	11	11	11	11	11

After Thermals	Deflections in inches Forces in Grams										
	0.0007	**0.0014**	**0.0021**	**0.0028**	**0.0035**	**0.0042**	**0.0049**	**0.0056**	**0.0063**	**0.0070**	***SET***
Averages	0.00	0.00	0.00	1.20	3.72	7.90	13.18	18.74	24.46	30.56	0.0029
Min	0.00	0.00	0.00	0.00	0.00	2.90	7.70	13.20	18.50	23.80	0.0023
Max	0.00	0.00	0.00	3.50	8.50	12.90	18.60	24.30	30.90	38.40	0.0036
St. Dev	0.000	0.000	0.000	1.681	4.100	4.523	4.557	4.968	5.536	6.321	0.0006
Count	5	5	5	5	5	5	5	5	5	5	5

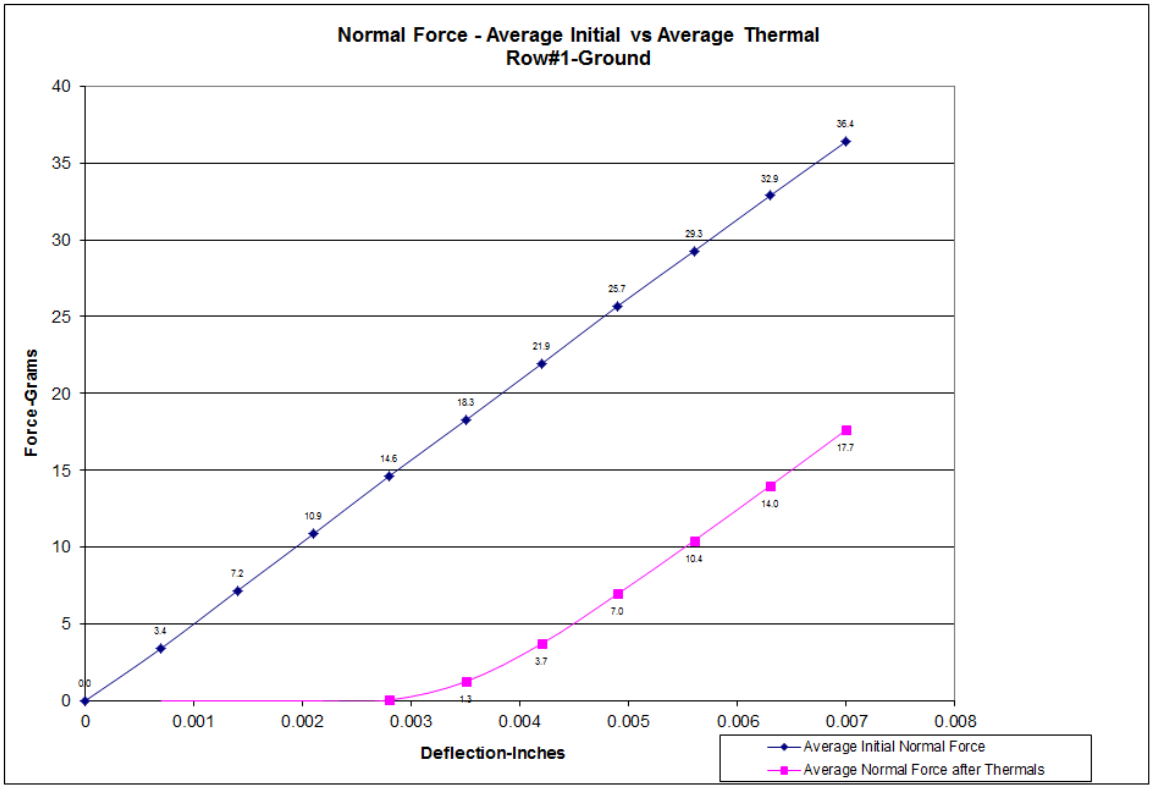


DATA SUMMARIES Continued

Row 1-Ground pin

Initial-Ground-Row#1	Deflections in inches Forces in Grams										
	0.0007	**0.0014**	**0.0021**	**0.0028**	**0.0035**	**0.0042**	**0.0049**	**0.0056**	**0.0063**	**0.0070**	***SET***
Averages	3.42	7.16	10.86	14.65	18.26	21.95	25.71	29.27	32.88	36.41	0.0001
Min	2.80	6.40	9.70	13.40	17.00	20.30	24.10	27.80	31.10	34.70	0.0000
Max	4.00	8.10	11.60	15.80	20.10	24.30	28.30	31.90	36.00	39.80	0.0002
St. Dev	0.400	0.512	0.552	0.722	0.838	1.106	1.193	1.221	1.369	1.456	0.0001
Count	11	11	11	11	11	11	11	11	11	11	11

After Thermals	Deflections in inches Forces in Grams										
	0.0007	**0.0014**	**0.0021**	**0.0028**	**0.0035**	**0.0042**	**0.0049**	**0.0056**	**0.0063**	**0.0070**	***SET***
Averages	0.00	0.00	0.00	0.05	1.25	3.73	6.98	10.43	14.00	17.65	0.0033
Min	0.00	0.00	0.00	0.00	0.00	1.20	4.50	8.20	11.60	15.60	0.0027
Max	0.00	0.00	0.00	0.20	2.90	6.10	9.40	12.80	16.60	20.40	0.0039
St. Dev	0.000	0.000	0.000	0.100	1.392	2.162	2.193	2.034	2.173	2.105	0.0005
Count	4	4	4	4	4	4	4	4	4	4	4

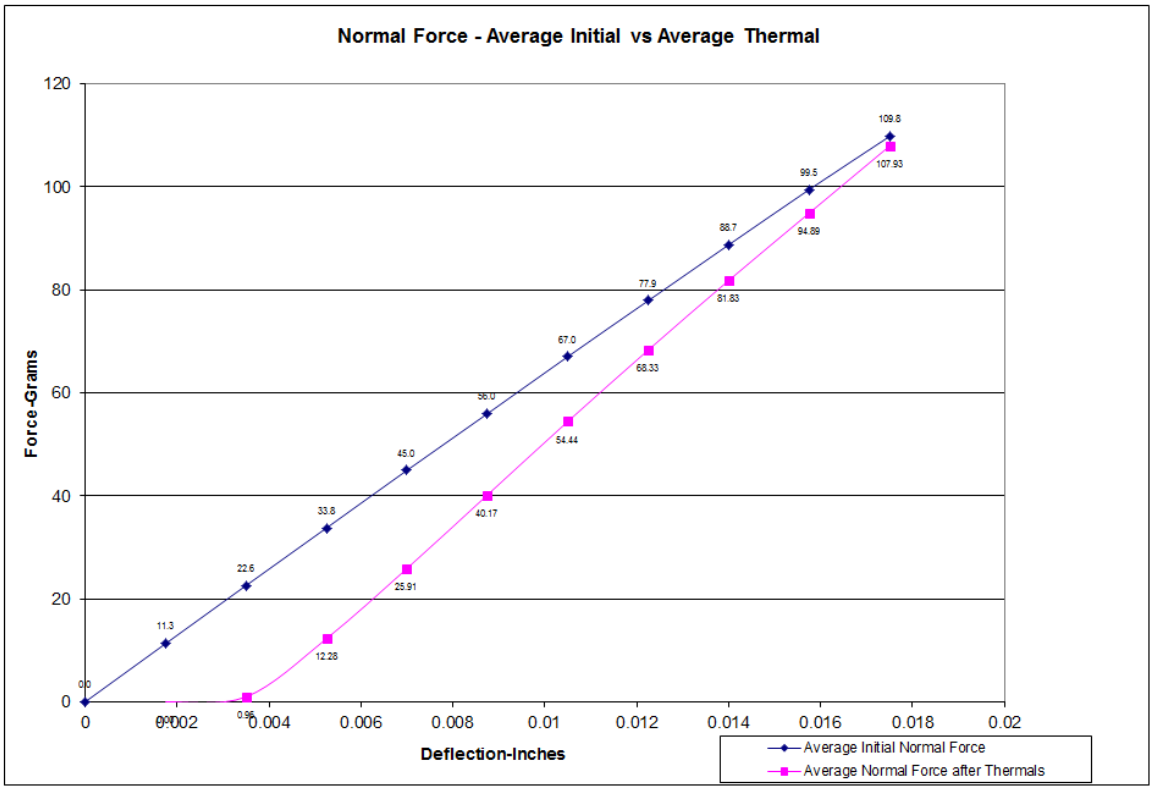


DATA SUMMARIES Continued

Row 2-Signal pin

Initial-Signal-Row#2	Deflections in inches Forces in Grams										
	0.0018	**0.0035**	**0.0053**	**0.0070**	**0.0088**	**0.0105**	**0.0123**	**0.0140**	**0.0158**	**0.0175**	***SET***
Averages	11.32	22.59	33.76	44.96	55.95	67.04	77.91	88.74	99.47	109.80	0.0008
Min	8.80	19.20	29.40	40.60	51.40	61.70	71.90	81.60	91.10	100.00	0.0006
Max	12.20	24.30	36.00	47.30	59.10	70.20	81.60	92.60	103.20	113.80	0.0010
St. Dev	1.139	1.693	2.236	2.418	2.654	2.954	3.220	3.549	3.750	4.190	0.0001
Count	12	12	12	12	12	12	12	12	12	12	12

After Thermals	Deflections in inches Forces in Grams										
	0.0018	**0.0035**	**0.0053**	**0.0070**	**0.0088**	**0.0105**	**0.0123**	**0.0140**	**0.0158**	**0.0175**	***SET***
Averages	0.00	0.96	12.28	25.91	40.17	54.44	68.33	81.83	94.89	107.93	0.0038
Min	0.00	0.00	6.90	20.50	34.20	47.60	61.10	74.00	87.30	99.50	0.0030
Max	0.00	5.90	19.20	31.90	47.20	61.40	75.80	90.20	103.90	117.00	0.0045
St. Dev	0.000	1.902	3.600	3.776	4.045	4.277	4.445	4.904	5.204	5.359	0.0004
Count	12	12	12	12	12	12	12	12	12	12	12

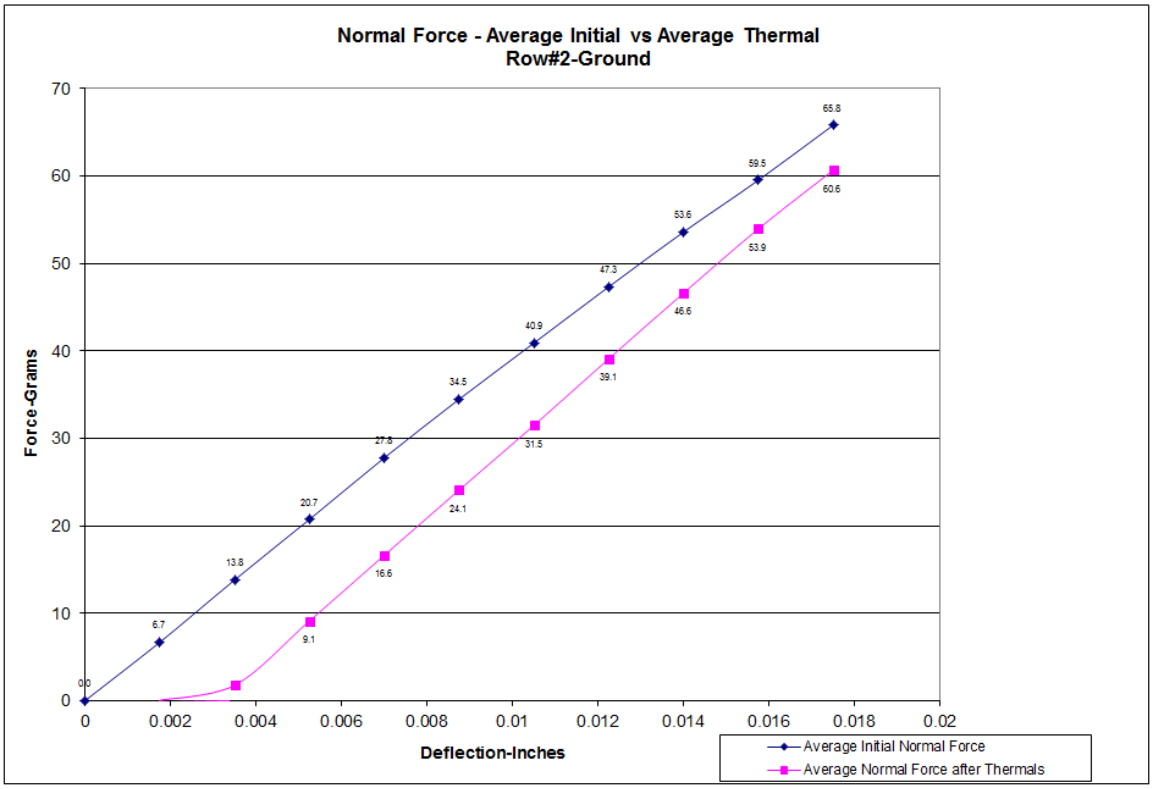


DATA SUMMARIES Continued

Row 2-Ground pin

Initial-Ground-Row#2	Deflections in inches Forces in Grams										
	0.0018	**0.0035**	**0.0053**	**0.0070**	**0.0088**	**0.0105**	**0.0123**	**0.0140**	**0.0158**	**0.0175**	***SET***
Averages	6.68	13.81	20.73	27.76	34.46	40.88	47.31	53.58	59.50	65.78	0.0012
Min	3.30	10.80	17.10	24.70	31.50	36.50	43.30	48.90	54.20	59.30	0.0009
Max	8.00	15.30	22.60	29.80	36.50	43.30	50.00	56.60	62.90	72.20	0.0016
St. Dev	1.337	1.373	1.619	1.566	1.734	2.230	2.414	2.533	2.726	4.037	0.0002
Count	12	12	12	12	12	12	12	12	12	12	12

After Thermals	Deflections in inches Forces in Grams										
	0.0018	**0.0035**	**0.0053**	**0.0070**	**0.0088**	**0.0105**	**0.0123**	**0.0140**	**0.0158**	**0.0175**	***SET***
Averages	0.00	1.76	9.11	16.63	24.08	31.47	39.07	46.59	53.93	60.64	0.0034
Min	0.00	0.00	5.90	13.30	20.60	27.90	35.30	42.40	49.30	56.20	0.0028
Max	0.00	6.00	13.80	21.50	29.20	36.70	45.00	53.10	63.30	68.70	0.0040
St. Dev	0.000	1.851	2.237	2.324	2.450	2.529	2.712	3.011	3.859	3.585	0.0004
Count	10	10	10	10	10	10	10	10	10	10	10



DATA SUMMARIES Continued

INSULATION RESISTANCE (IR):

	Pin to Pin		
	Mated	Unmated	Unmated
Minimum	**UEC5/Edge Card**	**UEC5**	**Edge Card**
Initial	45000	45000	Not Tested
Thermal	45000	45000	Not Tested
Humidity	10500	16500	Not Tested

	Pin to Ground		
	Mated	Unmated	Unmated
Minimum	**UEC5/Edge Card**	**UEC5**	**Edge Card**
Initial	45000	45000	Not Tested
Thermal	45000	45000	Not Tested
Humidity	21600	45000	Not Tested

	Row to Row		
	Mated	Unmated	Unmated
Minimum	**UEC5/Edge Card**	**UEC5**	**Edge 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/Edge Card**	**UEC5**	**Edge 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/Edge Card**
Break Down Voltage	612
Test Voltage	455
Working Voltage	150

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

Pin to Closest Metallic Hardware	
Initial Test Voltage	Passed
After Thermal Test Voltage	Passed
After Humidity Test Voltage	Passed

DATA SUMMARIES Continued

LLCR Durabiltiy:

1) A total of 192 points were measured.
2) EIA-364-23, *Low Level Contact Resistance Test Procedure for Electrical Connectors and Sockets.*
3) A computer program, *LLCR 221.exe*, ensures repeatability for data acquisition.
4) The following guidelines are used to categorize the changes in LLCR as a result from stressing.
   a. <= +5.0 mOhms:---------- Stable
   b. +5.1 to +10.0 mOhms:---------- Minor
   c. +10.1 to +15.0 mOhms: ---------- Acceptable
   d. +15.1 to +50.0 mOhms: ---------- Marginal
   e. +50.1 to +2000 mOhms ---------- Unstable
   f. >+2000 mOhms:---------- Open Failure

LLCR Measurement Summaries by Pin Type				
Date	2017/5/18	2017/6/2	2017/6/12	2017/6/23
Room Temp (Deg C)	21	23	22	22
Rel Humidity (%)	41	40	45	50
Technician	Troy Cook	Troy Cook	Troy Cook	Troy Cook
mOhm values	**Actual Initial**	**Delta 100 Cycles**	**Delta Therm Shck**	**Delta Humidity**
	Pin Type 1: Signal			
Average	20.54	0.90	1.24	1.29
St. Dev.	2.03	1.30	1.36	1.38
Min	16.11	0.01	0.01	0.00
Max	29.75	11.13	11.24	11.31
Summary Count	128	128	128	128
Total Count	128	128	128	128
	Pin Type 2: Ground			
Average	15.40	0.79	1.26	1.32
St. Dev.	4.99	0.71	0.90	0.91
Min	8.50	0.01	0.03	0.04
Max	22.93	2.95	3.96	3.99
Summary Count	64	64	64	64
Total Count	64	64	64	64

LLCR Delta Count by Category						
	Stable	**Minor**	**Acceptable**	**Marginal**	**Unstable**	**Open**
mOhms	**<=5**	**>5 & <=10**	**>10 & <=15**	**>15 & <=50**	**>50 & <=1000**	**>1000**
100 Cycles	**190**	**1**	**1**	**0**	**0**	**0**
Therm Shck	**190**	**1**	**1**	**0**	**0**	**0**
Humidity	**190**	**1**	**1**	**0**	**0**	**0**

DATA SUMMARIES Continued

LLCR thermal aging

1) A total of 192 points were measured
2) EIA-364-23, *Low Level Contact Resistance Test Procedure for Electrical Connectors and Sockets.*
3) A computer program, *LLCR 221.exe*, ensures repeatability for data acquisition.
4) The following guidelines are used to categorize the changes in LLCR as a result from stressing.
   a. <= +5.0 mOhms:---------- Stable
   b. +5.1 to +10.0 mOhms:---------- Minor
   c. +10.1 to +15.0 mOhms: ---------- Acceptable
   d. +15.1 to +50.0 mOhms: ---------- Marginal
   e. +50.1 to +2000 mOhms ---------- Unstable
   f. >+2000 mOhms:---------- Open Failure

LLCR Measurement Summaries by Pin Type				
Date	2017/5/18	2017/5/30		
Room Temp (Deg C)	22	22		
Rel Humidity (%)	41	43		
Technician	Troy Cook	Troy Cook		
mOhm values	**Actual Initial**	**Delta Thermal**	**Delta**	**Delta**
	Pin Type 1: Signal			
Average	20.95	1.11		
St. Dev.	1.85	0.70		
Min	16.70	0.03		
Max	25.01	4.36		
Summary Count	128	128		
Total Count	128	128		
	Pin Type 2: Ground			
Average	15.66	1.14		
St. Dev.	4.76	0.55		
Min	8.95	0.05		
Max	22.95	2.27		
Summary Count	64	64		
Total Count	64	64		

LLCR Delta Count by Category						
	Stable	**Minor**	**Acceptable**	**Marginal**	**Unstable**	**Open**
mOhms	**<=5**	**>5 & <=10**	**>10 & <=15**	**>15 & <=50**	**>50 & <=1000**	**>1000**
Thermal	**192**	**0**	**0**	**0**	**0**	**0**

DATA SUMMARIES Continued

LLCR GAS TIGHT:

1) A total of 128 points were measured
2) EIA-364-23, *Low Level Contact Resistance Test Procedure for Electrical Connectors and Sockets.*
3) A computer program, *LLCR 221.exe*, ensures repeatability for data acquisition.
4) The following guidelines are used to categorize the changes in LLCR as a result from stressing.
   a. <= +5.0 mOhms:---------- Stable
   b. +5.1 to +10.0 mOhms:---------- Minor
   c. +10.1 to +15.0 mOhms: ---------- Acceptable
   d. +15.1 to +50.0 mOhms: ---------- Marginal
   e. +50.1 to +2000 mOhms: ---------- Unstable
   f. >+2000 mOhms:---------- Open Failure

LLCR Measurement Summaries by Pin Type				
Date	2017/5/18	2017/5/19		
Room Temp (Deg C)	22	22		
Rel Humidity (%)	41	48		
Technician	Troy Cook	Troy Cook		
mOhm values	**Actual Initial**	**Delta Acid Vapor**	**Delta**	**Delta**
	Pin Type 1: Signal			
Average	20.15	0.27		
St. Dev.	1.72	0.21		
Min	16.13	0.01		
Max	23.13	0.99		
Summary Count	128	128		
Total Count	128	128		
	Pin Type 2: Ground			
Average	15.04	0.33		
St. Dev.	4.69	0.29		
Min	9.12	0.02		
Max	21.76	1.29		
Summary Count	64	64		
Total Count	64	64		

LLCR Delta Count by Category						
	Stable	**Minor**	**Acceptable**	**Marginal**	**Unstable**	**Open**
mOhms	**<=5**	**>5 & <=10**	**>10 & <=15**	**>15 & <=50**	**>50 & <=1000**	**>1000**
Acid Vapor	**192**	**0**	**0**	**0**	**0**	**0**

EQUIPMENT AND CALIBRATION SCHEDULES

Equipment #: HPM-01
Description: Hipot Megommeter
Manufacturer: Hipotronics
Model: H306B-A
Serial #: M9905004
Accuracy: 2 % Full Scale Accuracy
… Last Cal: 05/24/2017, Next Cal: 08/24/2018

Equipment #: TCT-06
Description: Test Resources test stand
Manufacturer: Test Resources
Model: 100R250-12
Serial #: 0710016-01
Accuracy: Speed Accuracy: +/- 5% of indicated speed; Displacement: +/- 5 micrometers.
… Last Cal: 05/03/2017, Next Cal: 05/03/2018

Equipment #: MO-04
Description: Multimeter /Data Acquisition System
Manufacturer: Keithley
Model: 2700
Serial #: 0798688
Accuracy: See Manual
… Last Cal: 04/30/2017, Next Cal: 04/30/2018

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: 02/18/2017, Next Cal: 02/18/2018

Equipment #: THC-01
Description: Temperature/Humidity Chamber (Chamber Room)
Manufacturer: Thermotron
Model: SM-8-7800
Serial #: 30676
Accuracy: See Manual
… Last Cal: 10/24/2016, Next Cal: 10/24/2017

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: 06/30/2017, Next Cal: 06/30/2018

EQUIPMENT AND CALIBRATION SCHEDULES

Equipment #: MO-02
Description: Multimeter /Data Acquisition System
Manufacturer: Keithley
Model: 2700
Serial #: 0780546
Accuracy: Last Cal: 06/16/2017, Next Cal: 06/16/2018

Equipment #: PS-01
Description: Power Supply
Manufacturer: Hewlett Packard
Model: 6033A
Serial #: 3329A-07330
Accuracy: Not calibrated