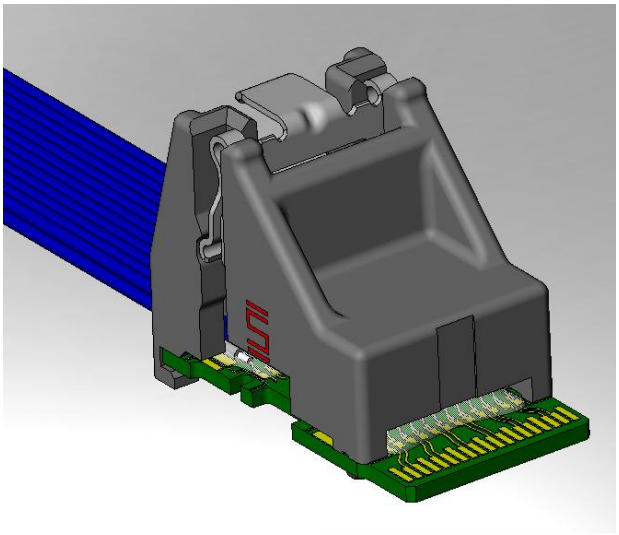
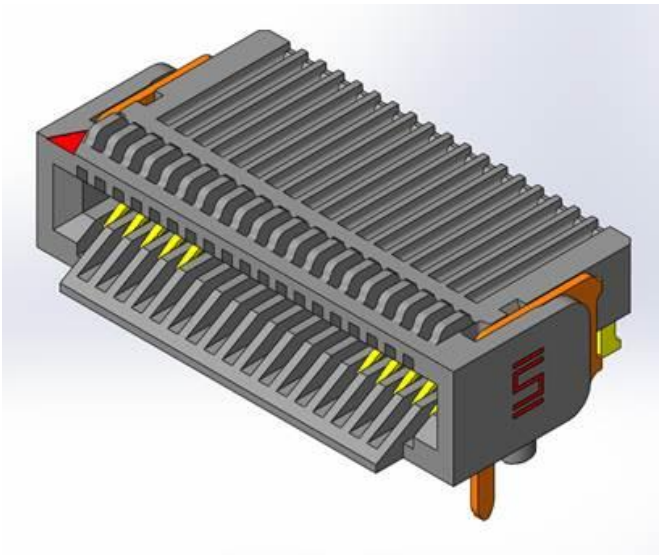
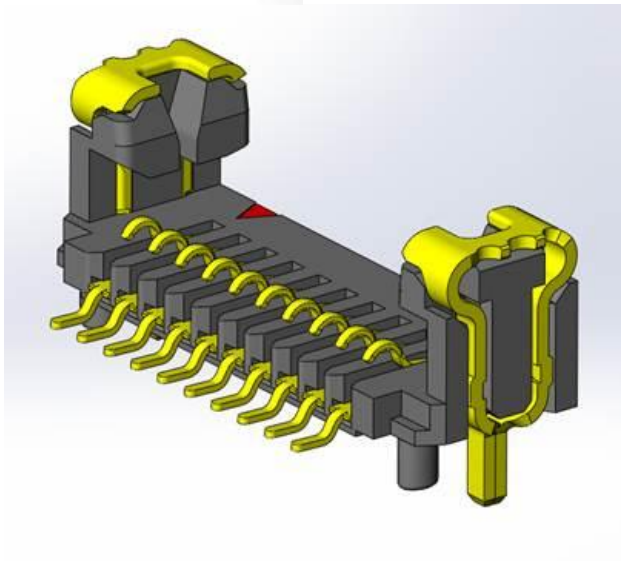
| | |
|---|---|
| Project Number: Design Qualification Test Report | Tracking Code: 261745_Report_Rev_3 |
| Requested by: Eric Korff | Date: 9/16/2014 |
| Part #: ECUE-12-035-C1-FF-01/UEC5-019-1-H-D-RA-1-A &UCC8-010-1-H-S-1-A | Tech: Troy Cook |
| Part description: ECUE/UEC5&UCC8 | Qty to test: 75 |
| Test Start: 8/8/2013 | Test Completed: 9/22/2013 |







# DESIGN QUALIFICATION TEST REPORT

## ECUE/UEC5&UCC8

## ECUE-12-035-C1-FF-01/UEC5-019-1-H-D-RA-1-A &UCC8-010-1-H-S-1-A

## REVISION HISTORY

| DATA | REV.NUM. | DESCRIPTION | ENG |
|---|---|---|---|
| **12/23/2013** | **1** | **Initial Issue** | **PC** |
| **9/10/2014** | **2** | **Update the S&V data** | **KH** |
| **9/15/2014** | **3** | **Update the Part number** | **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.

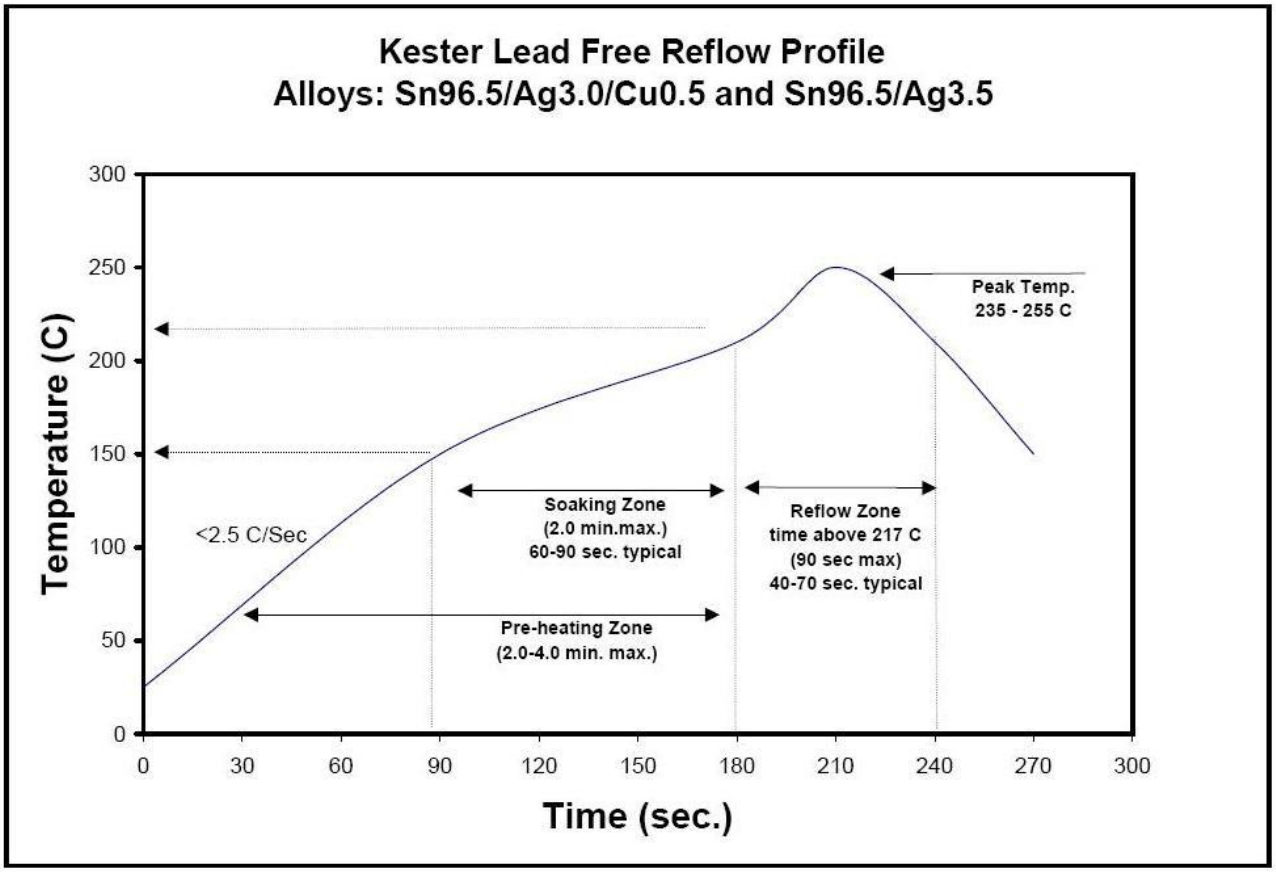
## APPLICABLE DOCUMENTS

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) Solder Information: Lead free
9) Re-Flow Time/Temp: See accompanying profile.
10) Samtec Test PCBs used: PCB-105026-TST-XX, PCB-105023-TST-XX, PCB-105021-TST-XX, PCB-105031-TST-XX.

**TYPICAL OVEN PROFILE (Soldering Parts to Test Boards)**



# FLOWCHARTS

**IR & DWV**

| TEST STEP | GROUP A1<br>2 Mated Sets<br>Break Down<br>0.5mm Pin-to-Pin | GROUP A2<br>2 Unmated of Part # Being Tested<br>Break Down<br>0.5mm Pin-to-Pin | GROUP A3<br>2 Unmated of Mating Part #<br>Break Down<br>0.5mm Pin-to-Pin | GROUP B1<br>2 Mated Sets<br>0.5mm Pin-to-Pin |
|---|---|---|---|---|
| 01 | DWV/Break Down Voltage | DWV/Break Down Voltage | DWV/Break Down Voltage | IR & DWV at test voltage (on both mated sets and on each connector unmated) |
| 02 | | | | Thermal Shock (Mated and Undisturbed) |
| 03 | | | | IR & DWV at test voltage (on both mated sets and on each connector unmated) |
| 04 | | | | Cyclic Humidity (Mated and Undisturbed) |
| 05 | | | | IR & DWV at test voltage (on both mated sets and on each connector unmated) |

| TEST STEP | GROUP A1<br>2 Mated Sets<br>Break Down<br>Row-to-Row | GROUP A2<br>2 Unmated of Part # Being Tested<br>Break Down<br>Row-to-Row | GROUP A3<br>2 Unmated of Mating Part #<br>Break Down<br>Row-to-Row | GROUP B1<br>2 Mated Sets<br>Row-to-Row |
|---|---|---|---|---|
| 01 | DWV/Break Down Voltage | DWV/Break Down Voltage | DWV/Break Down Voltage | IR & DWV at test voltage (on both mated sets and on each connector unmated) |
| 02 | | | | Thermal Shock (Mated and Undisturbed) |
| 03 | | | | IR & DWV at test voltage (on both mated sets and on each connector unmated) |
| 04 | | | | Cyclic Humidity (Mated and Undisturbed) |
| 05 | | | | IR & DWV at test voltage (on both mated sets and on each connector unmated) |

# FLOWCHARTS Continued

| TEST STEP | GROUP G1<br>2 Mated Sets<br>Break Down Pin-to-Closest Metallic Hardware (0.8mm Pin to Latch) | GROUP G2<br>2 Unmated of Part # Being Tested<br>Break Down Pin-to-Closest Metallic Hardware (0.8mm Pin to Latch) | GROUP G3<br>2 Unmated of Mating Part #<br>Break Down Pin-to-Closest Metallic Hardware (0.8mm Pin to Latch) | GROUP H1<br>2 Mated Sets<br>Pin-to-Closest Metallic Hardware (0.8mm Pin to Latch) |
|---|---|---|---|---|
| 01 | DWV/Break Down Voltage | DWV/Break Down Voltage | DWV/Break Down Voltage | IR & DWV at test voltage (on both mated sets and on each connector unmated) |
| 02 | | | | Thermal Shock (Mated and Undisturbed) |
| 03 | | | | IR & DWV at test voltage (on both mated sets and on each connector unmated) |
| 04 | | | | Cyclic Humidity (Mated and Undisturbed) |
| 05 | | | | IR & DWV at test voltage (on both mated sets and on each connector unmated) |

**DWV on Group B1 to be performed at Test Voltage**

**DWV test voltage is equal to 75% of the lowest break down voltage from Groups A1, A2 or A3**

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

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

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

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

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

**IR = EIA-364-21**

**DWV = EIA-364-20, Test Condition 1**

# FLOWCHARTS Continued

## Mechanical Shock / Vibration / LLCR

| TEST STEP | GROUP A1 8 Assemblies |
|---|---|
| 01 | LLCR-1 |
| 02 | Shock |
| 03 | Vibration |
| 04 | LLCR-2 |

**Mechanical Shock = EIA 364-27 Half Sine,**

**100 g's, 6 milliSeconds (Condition "C") each axis**

**Vibration = EIA 364-28, Random Vibration**

**7.56 g RMS, Condition VB --- 2 hours/axis**

**LLCR = EIA-364-23, LLCR**

**20 mV Max, 100 mA Max**

**Use Keithley 580 or 3706 in 4 wire dry circuit mode**

## Shock / Vibration / nanoSecond Event Detection

| TEST STEP | GROUP A1 60 Points |
|---|---|
| 01 | Event Detection, Shock |
| 02 | Event Detection, Vibration |

**Mechanical Shock = EIA 364-27 Half Sine,**

**100 g's, 6 milliSeconds (Condition "C") each axis**

**Vibration = EIA 364-28, Random Vibration**

**7.56 g RMS, Condition VB --- 2 hours/axis**

**Event detection requirement during Shock / Vibration is 50 nanoseconds minimum**

## Current Carrying Capacity - Double Row

| TEST STEP | GROUP B1 3 Mated Assemblies 2 Contacts Powered | GROUP B2 3 Mated Assemblies 4 Contacts Powered | GROUP B3 3 Mated Assemblies 6 Contacts Powered | GROUP B4 3 Mated Assemblies 8 Contacts Powered | GROUP B5 3 Mated Assemblies All Contacts Powered |
|---|---|---|---|---|---|
| 01 | CCC | CCC | CCC | CCC | CCC |

**CCC, Temp rise = EIA-364-70**

# FLOWCHARTS Continued

## Connector Pull

| TEST STEP | GROUP A1 5 Pieces 0° | GROUP B1 5 Pieces 90° |
|---|---|---|
| 01 | Pull test, Continuity | Pull test, Continuity |

**Monitor continuity and pull; record forces when continuity fails**

## Cable Flex Test

| TEST STEP | GROUP B1 8 Cable Assemblies Flat Cable |
|---|---|
| 01 | IR & DWV at test voltage |
| 02 | Flex 500 Cycles |
| 03 | Visual Inspection |
| 04 | IR & DWV at test voltage |

**DWV to be performed at Test Voltage**

**DWV test voltage is equal to 75% of the lowest break down voltage from 'Sequence E'**

*** If 'Sequence E' is not being tested, then separate parts must be broken down to establish the test voltage**

**Monitor continuity during flex testing on all groups**

**Cable Flex Test = EIA-364-41D**

**Flat Cable - to be tested 70°±5° each direction (140°±10° total)**

**EIA-364-41D min flex requirement = 500 cycles**

**IR = EIA-364-21**

**DWV = EIA-364-20, Test Condition 1**

## 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℃ to +85℃
3) Test Time: ½ hour dwell at each temperature extreme
4) Number of Cycles: 100
5) All test samples are pre-conditioned at ambient.
6) All test samples are exposed to environmental stressing in the mated condition.

### HUMIDITY:

1) Reference document: EIA-364-31, *Humidity Test Procedure for Electrical Connectors.*
2) Test Condition B, 240 Hours.
3) Method III, +25° C to + 65° C, 90% to 98% Relative Humidity excluding sub-cycles 7a and 7b.
4) All samples are pre-conditioned at ambient.
5) All test samples are exposed to environmental stressing in the mated condition.

### 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 $G^2$ / Hz
4) G 'RMS': 7.56
5) Frequency: 50 to 2000 Hz
6) Duration: 2.0 Hours per axis (3 axis total)

### NANOSECOND-EVENT DETECTION:

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

## ATTRIBUTE DEFINITIONS Continued

The following is a brief, simplified description of attributes.

### 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 three temperature points are reported:
    a. Ambient
    b. $65^{o}$ C
    c. $75^{o}$ C
    d. $95^{o}$ 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.

### 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

## 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 1000 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).

## ATTRIBUTE DEFINITIONS Continued

The following is a brief, simplified description of attributes.

**CONNECTOR PULL:**

1) Secure cable near center and pull on connector
    a. At 90°, right angle to cable
    b. At 0°, in-line with cable

Fig. 1
0° Connector pull, notice the electrical continuity hook-up wires.

## ATTRIBUTE DEFINITIONS Continued

The following is a brief, simplified description of attributes.

### CABLE DURABILITY:

1) Oscillate and monitor electrical continuity for open circuit indication.
    a. 70°±5 Pendulum Mode.

Fig. 2

## RESULTS

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

- **CCC for a 30°C Temperature Rise----------1.1A per contact with 2 contacts (2x1) powered**
- **CCC for a 30°C Temperature Rise----------0.8A per contact with 4 contacts (2x2) powered**
- **CCC for a 30°C Temperature Rise----------0.7A per contact with 6 contacts (2x3) powered**
- **CCC for a 30°C Temperature Rise----------0.6A per contact with 8 contacts (2x4) powered**
- **CCC for a 30°C Temperature Rise----------0.4A per contact with 24 contacts (2x12) powered**

**Cable Pull force**

- **0˚**
  - **Min ---------- 4.00 Lbs**
  - **Max---------- 7.00 Lbs**
- **90˚**
  - **Min ---------- 5.50 Lbs**
  - **Max---------- 7.50 Lbs**

## RESULTS Continued

### Insulation Resistance minimums, IR

**Pin to Pin**

- **Initial**
  - **Mated ---------- 3600 Meg Ω ---------- Passed**
  - **Unmated ---------- 3250 Meg Ω ---------- Passed**
- **Thermal Shock**
  - **Mated ---------- 45000 Meg Ω ---------- Passed**
  - **Unmated ---------- 45000 Meg Ω ---------- Passed**
- **Humidity**
  - **Mated ---------- 45000 Meg Ω ---------- Passed**
  - **Unmated ---------- 45000 Meg Ω ---------- Passed**

**Row to Row**

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

**Pin to Closest Metallic Hardware**

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

### Dielectric Withstanding Voltage minimums, DWV

- **Minimums**
  - **Breakdown Voltage ---------- 693 VAC**
  - **Test Voltage ---------- 520 VAC**
  - **Working Voltage ---------- 170 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**

## RESULTS Continued

**Cable Flex Test**

### Insulation Resistance minimums, IR

**Pin to Pin**

- **Initial**
  - **Mated ---------- 45000 Meg Ω ---------- Passed**
  - **Unmated ---------- 45000 Meg Ω ---------- Passed**
- **After flex**
  - **Mated ---------- 45000 Meg Ω ---------- Passed**
  - **Unmated ---------- 45000 Meg Ω ---------- Passed**

**Row to Row**

- **Initial**
  - **Mated ---------- 45000 Meg Ω ---------- Passed**
  - **Unmated ---------- 45000 Meg Ω ---------- Passed**
- **After flex**
  - **Mated ---------- 45000 Meg Ω ---------- Passed**
  - **Unmated ---------- 45000 Meg Ω ---------- Passed**

**Pin to Closest Metallic Hardware**

- **Initial**
  - **Mated ---------- 45000 Meg Ω ---------- Passed**
  - **Unmated ---------- 45000 Meg Ω ---------- Passed**
- **After flex**
  - **Mated ---------- 45000 Meg Ω ---------- Passed**
  - **Unmated ---------- 45000 Meg Ω ---------- Passed**

### Dielectric Withstanding Voltage minimums, DWV

- **Minimums**
  - **Breakdown Voltage ---------- 693 VAC**
  - **Test Voltage ---------- 520 VAC**
  - **Working Voltage ---------- 170 VAC**

**Pin to Pin**

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

**Row to Row**

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

**Pin to Closest Metallic Hardware**

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

## RESULTS Continued

### LLCR Shock & Vibration Group (Total 192 pin LLCR test points)

- **Initial ----------888.88 mOhms Max**
- **Shock &Vibration**
  - **<= +5.0 mOhms ---------- 164 Points ---------- Stable**
  - **+5.1 to +10.0 mOhms ---------- 23 Points ---------- Minor**
  - **+10.1 to +15.0 mOhms ----------5 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:

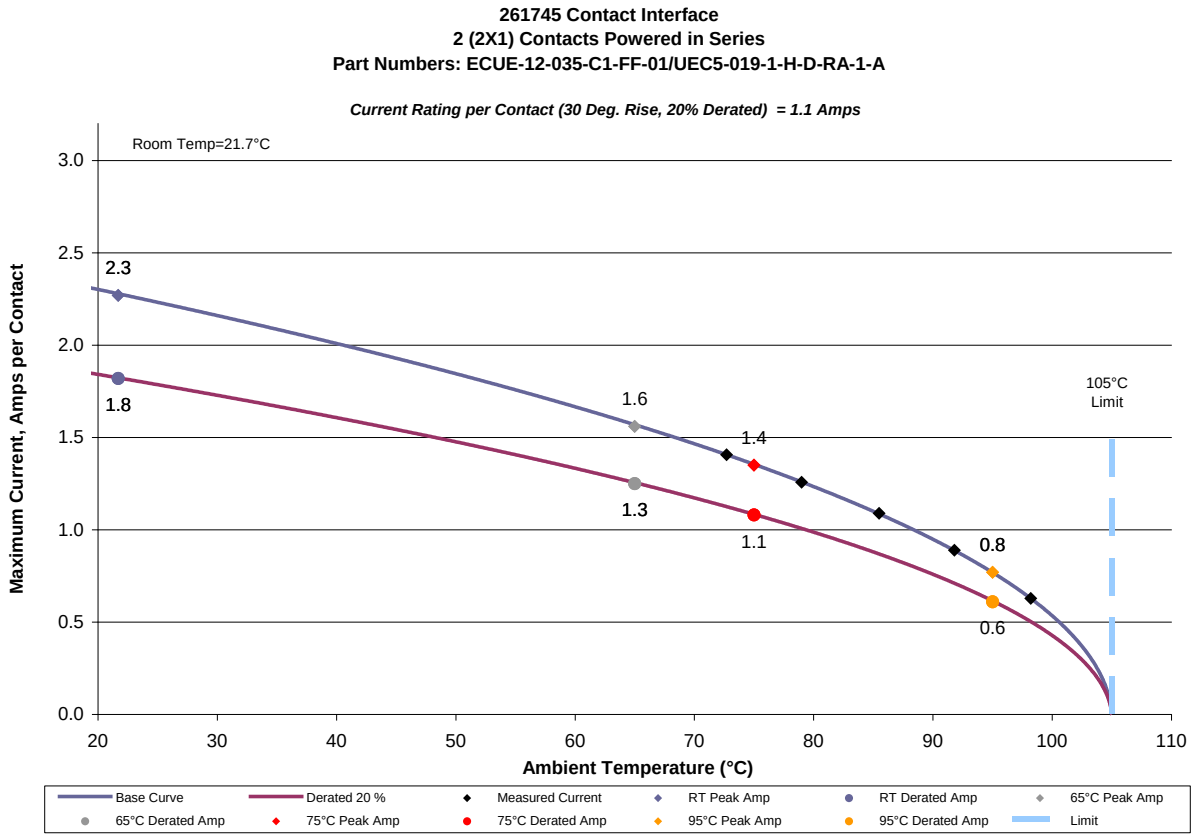
- **Shock**
  - **No Damage---------- ---------- Pass**
  - **50 Nanoseconds---------- ---------- Pass**
- **Vibration**
  - **No Damage---------- ---------- Pass**
  - **50 Nanoseconds---------- ---------- Pass**

# DATA SUMMARIES

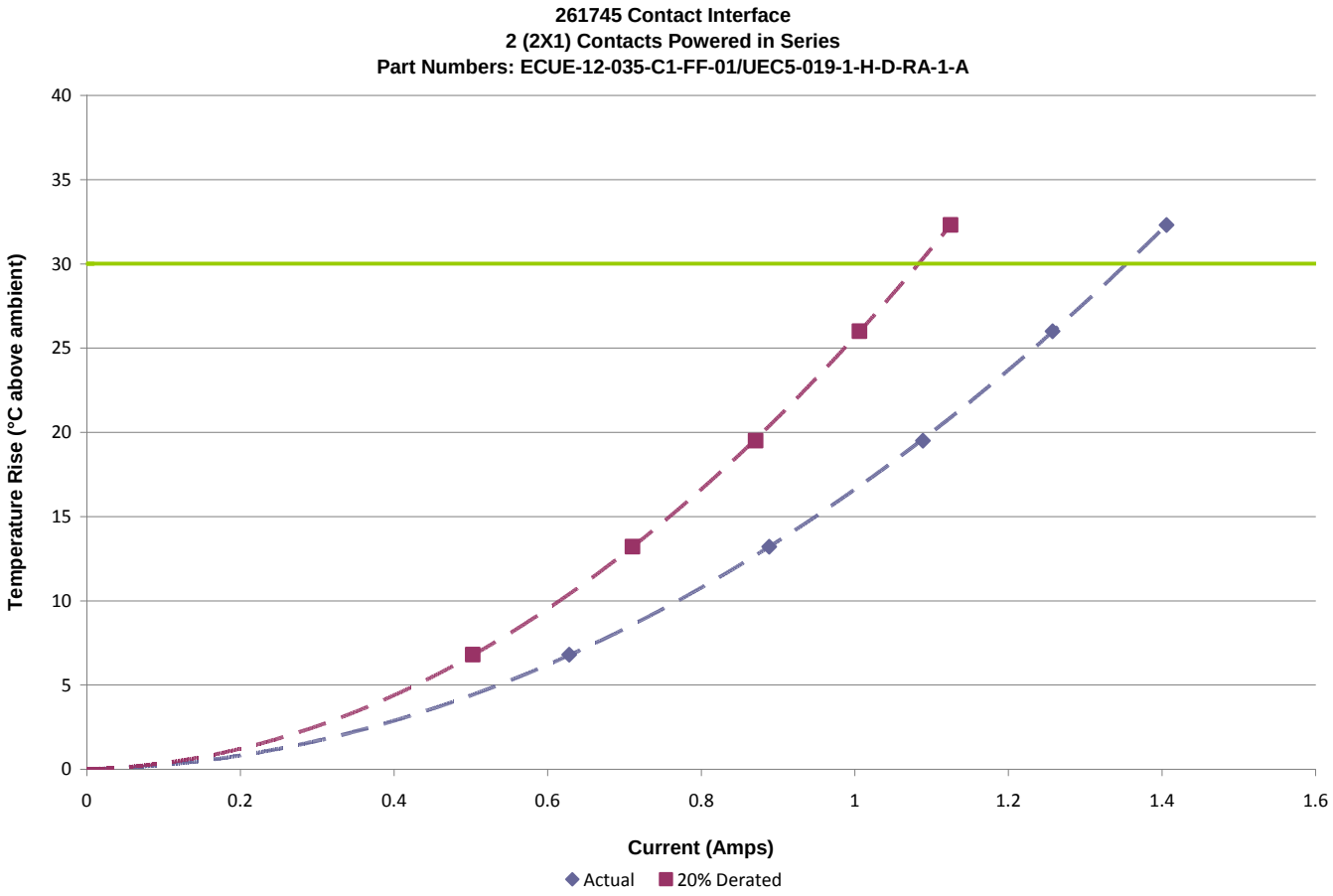
**TEMPERATURE RISE (Current Carrying Capacity, CCC):**

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 2 adjacent conductors/contacts powered

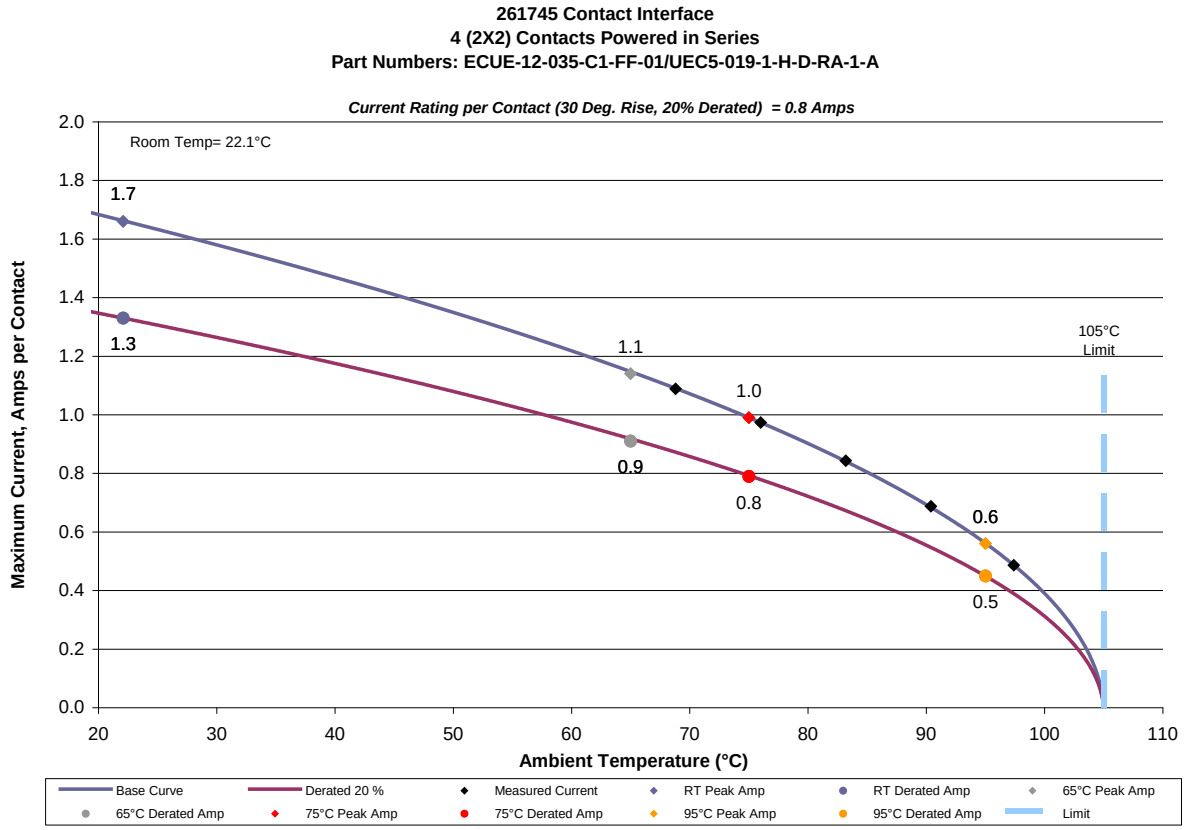


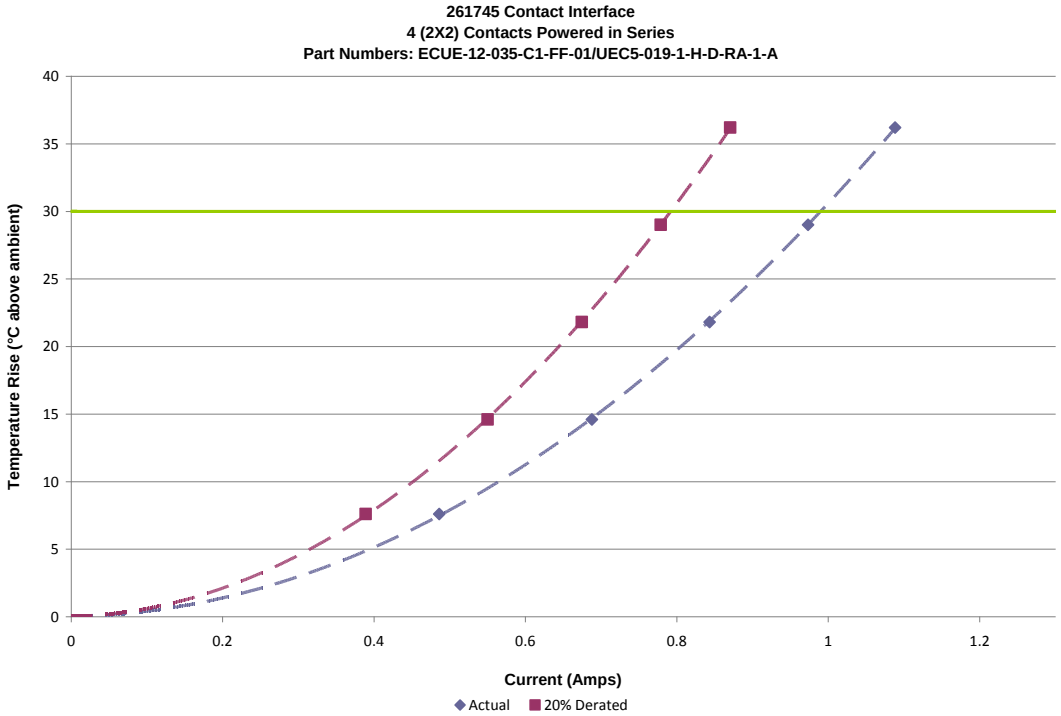
# DATA SUMMARIES Continued



## DATA SUMMARIES Continued

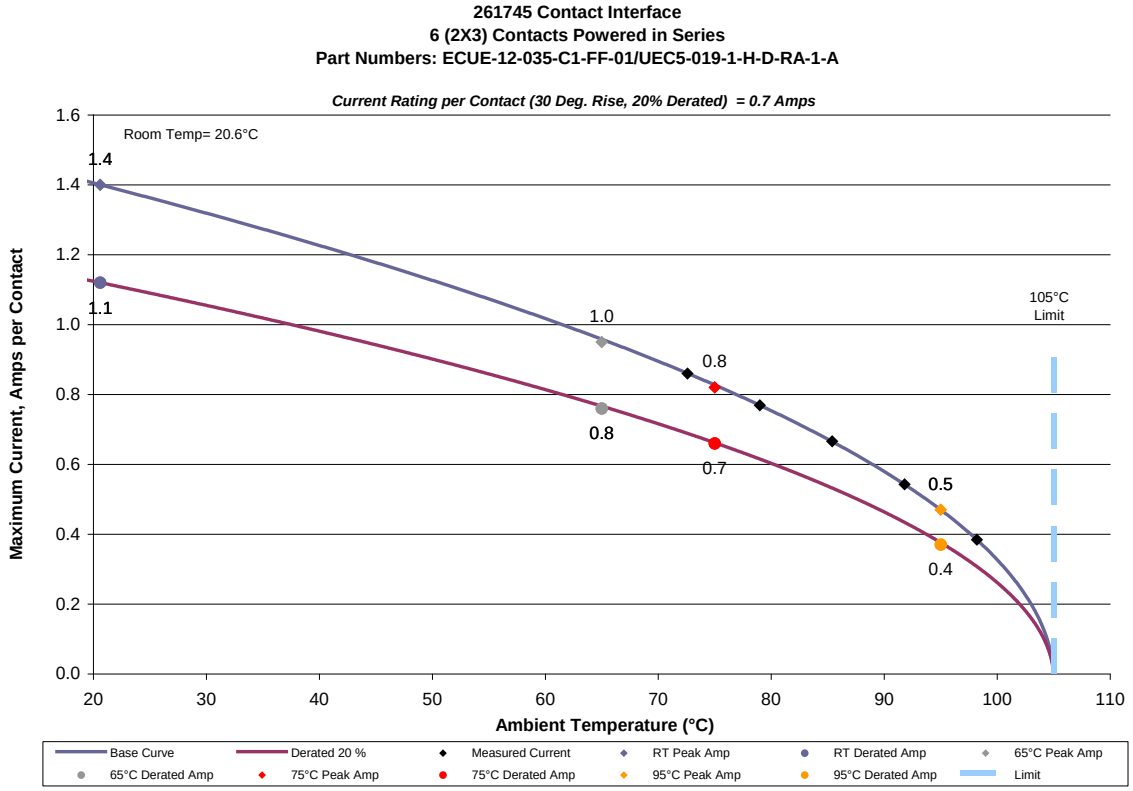
b. Linear configuration with 4 adjacent conductors/contacts powered

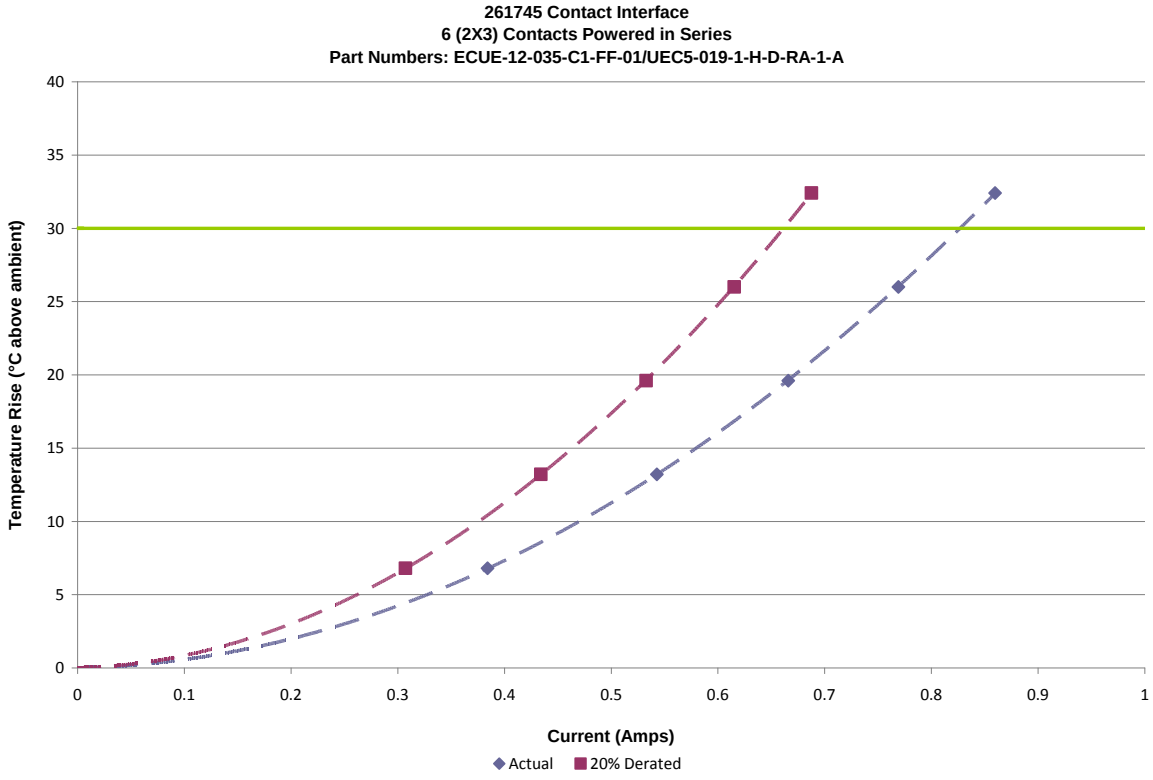


# DATA SUMMARIES Continued

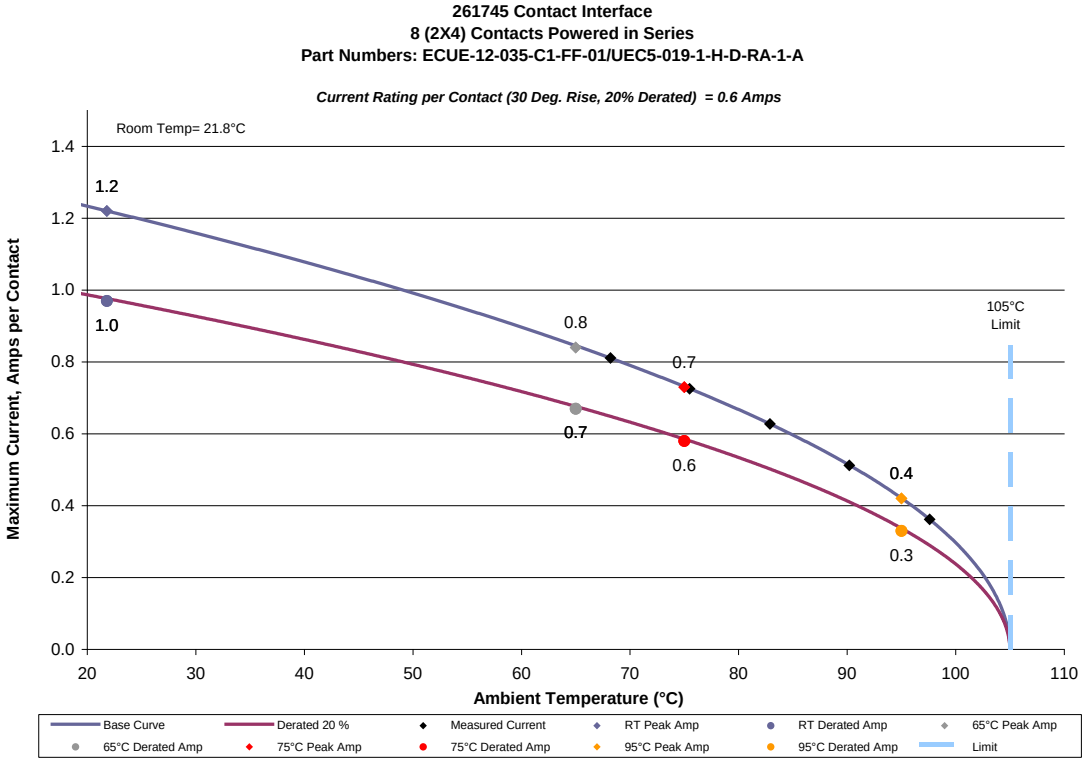
c. Linear configuration with 6 adjacent conductors/contacts powered

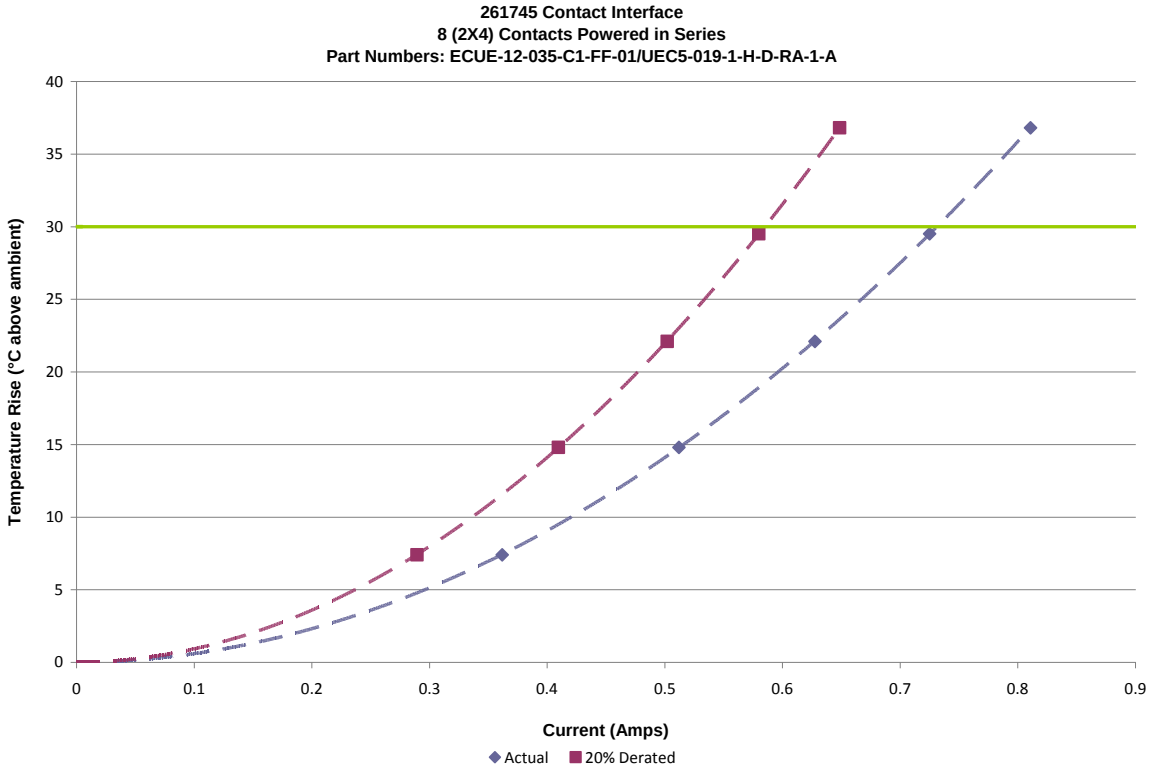


# DATA SUMMARIES Continued

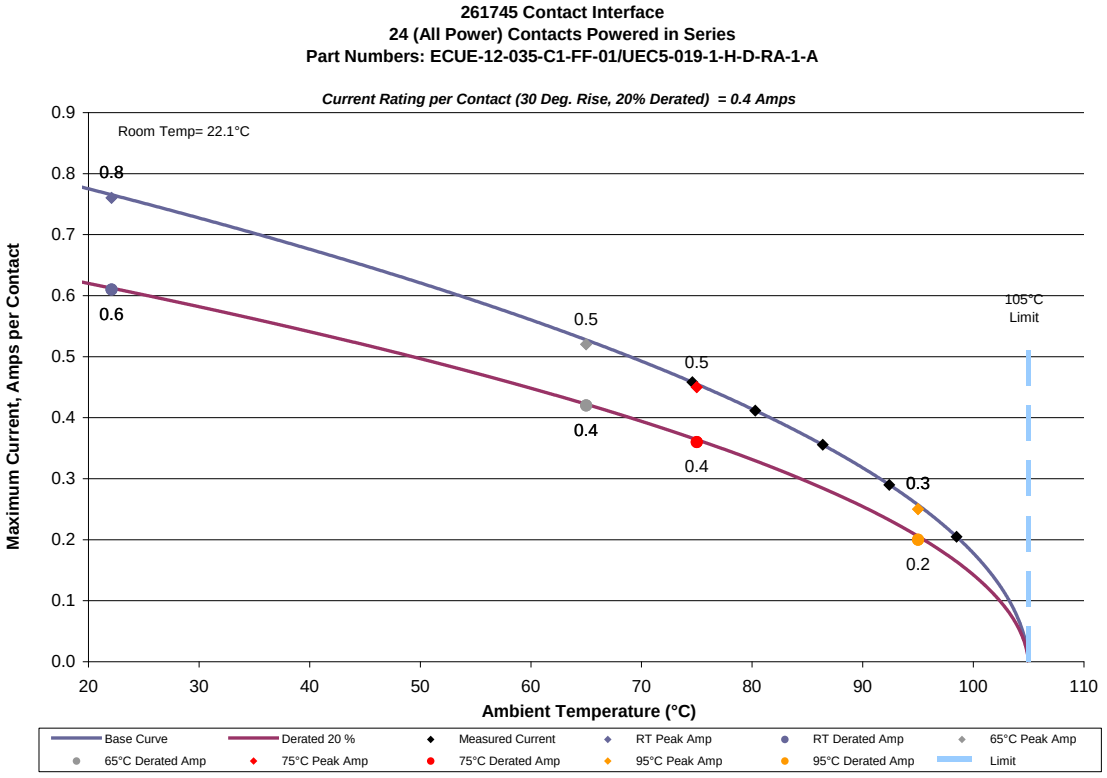
d. Linear configuration with 8 adjacent conductors/contacts powered

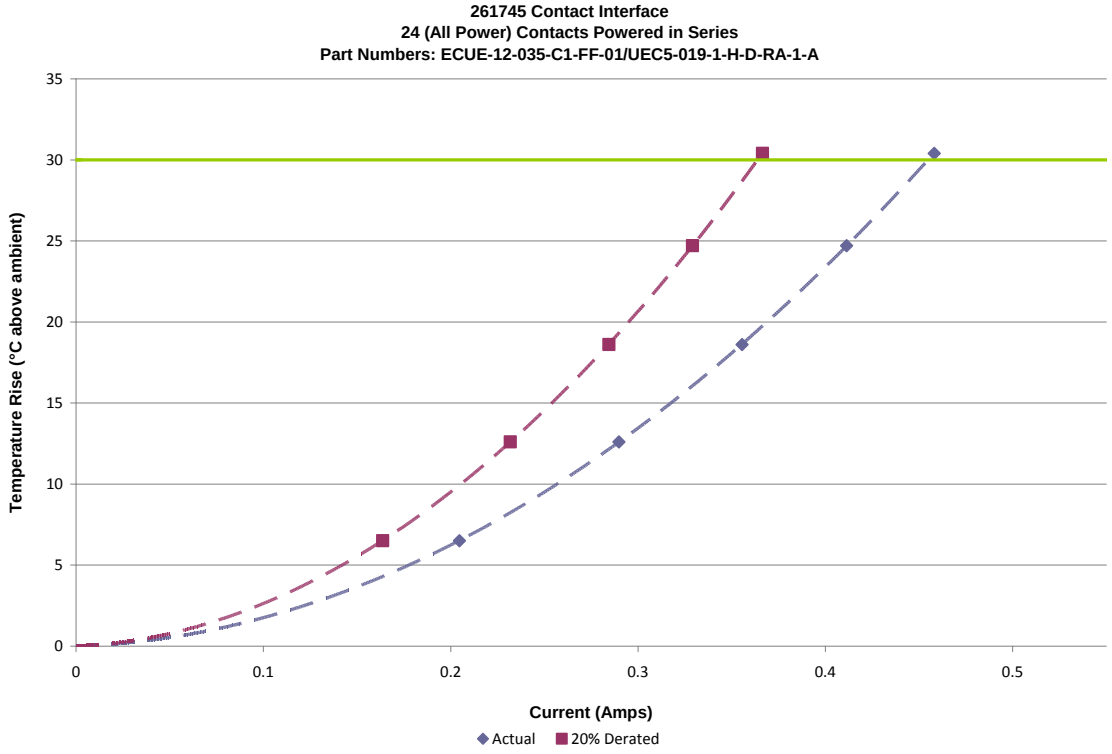


# DATA SUMMARIES Continued

e. Linear configuration with all adjacent conductors/contacts powered



## DATA SUMMARIES Continued

**Cable Pull Force**

- **0˚**

| | Force (lbs) |
|---|---|
| Minimum | **4.00** |
| Maximum | 7.00 |
| Average | 5.40 |

- **90˚**

| | Force (lbs) |
|---|---|
| Minimum | **5.50** |
| Maximum | 7.50 |
| Average | 7.00 |

**INSULATION RESISTANCE (IR):**

| | **Pin to Pin** | | | |
|---|---|---|---|---|
| | Mated | Unmated | Unmated | Unmated |
| Minimum | **ECUE/UEC5/UCC8** | **ECUE** | **UEC5** | **UCC8** |
| **Initial** | 3600 | 3250 | 45000 | 45000 |
| **Thermal** | 45000 | 45000 | 45000 | 45000 |
| **Humidity** | 45000 | 45000 | 45000 | 45000 |

| | **Row to Row** | | | |
|---|---|---|---|---|
| | Mated | Unmated | Unmated | Unmated |
| Minimum | **ECUE/UEC5/UCC8** | **ECUE** | **UEC5** | **UCC8** |
| **Initial** | 34000 | Not Tested | 45000 | Not Tested |
| **Thermal** | 45000 | Not Tested | 45000 | Not Tested |
| **Humidity** | 45000 | Not Tested | 45000 | Not Tested |

| | **Pin to Closest Metallic Hardware** | | | |
|---|---|---|---|---|
| | Mated | Unmated | Unmated | Unmated |
| Minimum | **ECUE/UEC5/UCC8** | **ECUE** | **UEC5** | **UCC8** |
| **Initial** | 45000 | Not Tested | Not Tested | 45000 |
| **Thermal** | 45000 | Not Tested | Not Tested | 45000 |
| **Humidity** | 45000 | Not Tested | Not Tested | 45000 |

## DATA SUMMARIES Continued

### DIELECTRIC WITHSTANDING VOLTAGE (DWV):

| Voltage Rating Summary | |
|---|---|
| **Minimum** | **ECUE/UEC5/UCC8** |
| **Break Down Voltage** | 693 |
| **Test Voltage** | 520 |
| **Working Voltage** | 170 |

| 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

**Cable Flex Test**

| Pin to Pin | |
|---|---|
| Mated | |
| Minimum | |
| **Initial** | 45000 |
| **After 500 Flex Cycles** | 45000 |

| Row to Row | |
|---|---|
| Mated | |
| Minimum | |
| **Initial** | 45000 |
| **After 500 Flex Cycles** | 45000 |

| Pin to Closest Metallic Hardware | |
|---|---|
| Mated | |
| Minimum | |
| **Initial** | 45000 |
| **After 500 Flex Cycles** | 45000 |

| Voltage Rating Summary | |
|---|---|
| **Minimum** | |
| **Break Down Voltage** | 693 |
| **Test Voltage** | 520 |
| **Working Voltage** | 170 |

| Pin to Pin | |
|---|---|
| **Initial Test Voltage** | Passed |
| **After 500 Flex Cycles Test Voltage** | Passed |

| Row to Row | |
|---|---|
| **Initial Test Voltage** | Passed |
| **After 500 Flex Cycles Test Voltage** | Passed |

| Pin to Closest Metallic Hardware | |
|---|---|
| **Initial Test Voltage** | Passed |
| **After 500 Flex Cycles Test Voltage** | Passed |

## DATA SUMMARIES Continued

### LLCR Shock & Vibration Group

1) A total of 192 points were measured.
2) EIA-364-23, *Low Level Contact Resistance Test Procedure for Electrical Connectors and Sockets.*
3) A computer program, *LLCR 221.exe*, ensures repeatability for data acquisition.
4) The following guidelines are used to categorize the changes in LLCR as a result from stressing.
   a. <= +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 | 2014-9-4 | 2014-9-8 | | |
| Room Temp (Deg C) | 21 | 21 | | |
| Rel Humidity (%) | 47 | 43 | | |
| Technician | Aaron McKim | Aaron McKim | | |
| **mOhm values** | **Actual Initial** | **Delta Shock-Vib** | **Delta** | **Delta** |
| | **Pin Type 1: Signal** | | | |
| Average | 876.44 | 3.64 | | |
| St. Dev. | 8.91 | 3.13 | | |
| Min | 812.27 | 0.01 | | |
| Max | 888.88 | 12.14 | | |
| Summary Count | 104 | 104 | | |
| Total Count | 104 | 104 | | |
| | **Pin Type 2:** | | | |
| Average | 14.88 | 0.98 | | |
| St. Dev. | 2.28 | 1.60 | | |
| Min | 10.95 | 0.00 | | |
| Max | 19.44 | 11.59 | | |
| Summary Count | 88 | 88 | | |
| Total Count | 88 | 88 | | |

| ***LLCR Delta Count by Category*** | | | | | | |
|---|---|---|---|---|---|---|
| | **Stable** | **Minor** | **Acceptable** | **Marginal** | **Unstable** | **Open** |
| **mOhms** | **<=5** | **>5 & <=10** | **>10 & <=15** | **>15 & <=50** | **>50 & <=1000** | **>1000** |
| **Shock-Vib** | **164** | **23** | **5** | **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 #:** THC-02
**Description:** Temperature/Humidity Chamber
**Manufacturer:** Thermotron
**Model:** SE-1000-6-6
**Serial #:** 31808
**Accuracy:** See Manual
… Last Cal: 02/16/2013, Next Cal: 02/16/2014

**Equipment #:** HPM-01
**Description:** Hipot Megommeter
**Manufacturer:** Hipotronics
**Model:** H306B-A
**Serial #:** M9905004
**Accuracy:** 2 % Full Scale Accuracy
… Last Cal: 05/24/2013, Next Cal: 08/24/2014

**Equipment #:** TSC-01
**Description:** Vertical Thermal Shock Chamber
**Manufacturer:** Cincinnatti Sub Zero
**Model:** VTS-3-6-6-SC/AC
**Serial #:** 10-VT14993
**Accuracy:** See Manual
… Last Cal: 05/18/2013, Next Cal: 05/18/2014

**Equipment #:** MO-04
**Description:** Multimeter /Data Acquisition System
**Manufacturer:** Keithley
**Model:** 2700
**Serial #:** 0798688
**Accuracy:** See Manual
… Last Cal: 04/30/2013, Next Cal: 04/30/2014

**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 AND CALIBRATION SCHEDULES Continued

Equipment #: PS-01
Description: Power Supply
Manufacturer: Agilent
Model: AT-6032A
Serial #: MY41001186
Accuracy: Last Cal: 06/12/2013, Next Cal: 046/12/2014

Equipment #: SVC-01
Description: Shock & Vibration Table
Manufacturer: Data Physics
Model: LE-DSA-10-20K
Serial #: 10037
Accuracy: See Manual
… Last Cal: 11/31/2013, Next Cal: 11/31/2014

Equipment #: ACLM-01
Description: Accelerometer
Manufacturer: PCB Piezotronics
Model: 352C03
Serial #: 115819
Accuracy: See Manual
… Last Cal: 07/09/2014, Next Cal: 07/09/2015

Equipment #: ED-03
Description: Event Detector
Manufacturer: Analysis Tech
Model: 32EHD
Serial #: 1100604
Accuracy: See Manual
… Last Cal: 06/04/2014, Next Cal: 06/04/2015

**Equipment #:** MO-04
**Description:** Multimeter /Data Acquisition System
**Manufacturer:** Keithley
**Model:** 2700
**Serial #:** 0798688
**Accuracy:** See Manual
… Last Cal: 03/27/2014, Next Cal: 03/27/2015