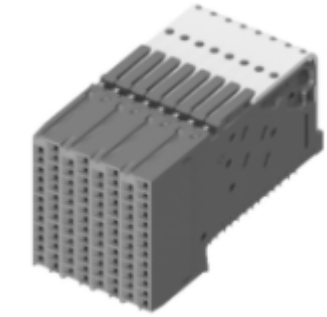
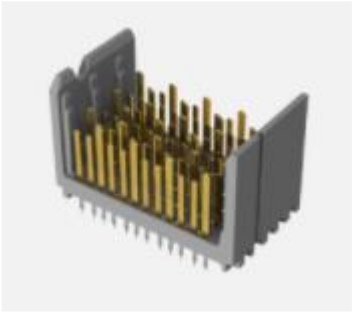
Project Number: Design Qualification Test Report	Tracking Code: 1195204_Report_Rev_3
Requested by: Corey Rose	Date: 3/4/2021
Part #: HDTF-4-08-S-RA-HS-100/HDTM-4-08-1-S-VT-0-1	
Part description: HDTF/HDTM	Tech: Donnie Baldwin
Test Start: 6/30/2017	Test Completed: 8/12/2017





(Actual part not depicted)

DESIGN QUALIFICATION TEST REPORT

HDTF/HDTM
HDTF-4-08-S-RA-HS-100/HDTM-4-08-1-S-VT-0-1

REVISION HISTORY

DATE	REV.NUM.	DESCRIPTION	ENG
1/24/2018	**1**	**Initial Issue**	**KH**
2/19/2018	**2**	**Add IR/DWV data**	**DB**
5/21/2018	**3**	**Normal Force Attribute Definitions updated; Normal Force data updated**	**CR**

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) Parts not intended for testing LLCR and DWV/IR are visually inspected and cleaned if necessary.
4) Any additional preparation will be noted in the individual test sequences.
5) Samtec Test PCBs used: PCB-108294-TST / PCB-108016-TST / PCB-108323-TST
6) Samtec Test Plans used: TP-1569-0 / TP-1634-7
7) Samtec Test Requests used: 1139092 / 1139093 / 1195204 / 1219925 / 1377709

FLOWCHARTS

Gas Tight

Group 1

HDTF-4-08-S-RA-HS-100

HDTM-4-08-1-S-VT-0-1

8 Assemblies

Tin (IMMERSION) .016" PTH

Step	Description
1.	LLCR (2)
2.	Gas Tight (1)
3.	LLCR (2) Max Delta = 15 mOhm

Compliant Pin Only

Group 2

HDTF-4-08-S-RA-HS-100

30 Contacts Minimum

Tin (IMMERSION) .016" PTH

Step	Description
1.	LLCR (2)
2.	Gas Tight (1)
3.	LLCR (2) Max Delta = 1 mOhm

Group 3

HDTM-4-08-1-S-VT-0-1

30 Contacts Minimum

Tin (IMMERSION) .016" PTH

Step	Description
1.	LLCR (2)
2.	Gas Tight (1)
3.	LLCR (2) Max Delta = 1 mOhm

---

(1) Gas Tight = EIA-364-36

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

FLOWCHARTS Continued

Normal Force

Group 1
HDTF-4-08-S-RA-HS-100

8 Contacts Minimum
Signal Without Thermals Wafter A

Step	Description
1.	Normal Force (1) Deflection = 0.0225 " Expected Force at Max Deflection = 100 g

Group 2
HDTF-4-08-S-RA-HS-100

8 Contacts Minimum
Ground Without Thermals Wafer A

Step	Description
1.	Normal Force (1) Deflection = 0.0253 " Expected Force at Max Deflection = 100 g

Group 3
HDTF-4-08-S-RA-HS-100

8 Contacts Minimum
Signal With Thermals Wafer A

Step	Description
1.	Thermal Age (2)
2.	Normal Force (1) Deflection = 0.0225 " Expected Force at Max Deflection = 100 g

Group 4
HDTF-4-08-S-RA-HS-100

8 Contacts Minimum
Ground With Thermals Wafer A

Step	Description
1.	Thermal Age (2)
2.	Normal Force (1) Deflection = 0.0253 " Expected Force at Max Deflection = 100 g

Group 5
HDTF-4-08-S-RA-HS-100

8 Contacts Minimum
Signal Without Thermals Wafer B

Step	Description
1.	Normal Force (1) Deflection = 0.0225 " Expected Force at Max Deflection = 100 g

Group 6
HDTF-4-08-S-RA-HS-100

8 Contacts Minimum
Ground Without Thermals Wafer B

Step	Description
1.	Normal Force (1) Deflection = 0.0253 " Expected Force at Max Deflection = 100 g

Group 7
HDTF-4-08-S-RA-HS-100

8 Contacts Minimum
Signal With Thermals Wafer B

Step	Description
1.	Thermal Age (2)
2.	Normal Force (1) Deflection = 0.0225 " Expected Force at Max Deflection = 100 g

Group 8
HDTF-4-08-S-RA-HS-100

8 Contacts Minimum
Ground With Thermals Wafer B

Step	Description
1.	Thermal Age (2)
2.	Normal Force (1) Deflection = 0.0253 " Expected Force at Max Deflection = 100 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 1
HDTF-4-08-S-RA-HS-100
HDTM-4-08-1-S-VT-0-1
8 Assemblies
Tin (IMMERSION) .016" PTH

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

Compliant Pin Only

Group 2
HDTF-4-08-S-RA-HS-100
30 Contacts Minimum
Tin (IMMERSION) .016" PTH

Step	Description
1.	LLCR (2)
2.	Thermal Shock (4)
3.	LLCR (2) Max Delta = 1 mOhm
4.	Humidity (1)
5.	LLCR (2) Max Delta = 1 mOhm

Group 3
HDTM-4-08-1-S-VT-0-1
30 Contacts Minimum
Tin (IMMERSION) .016" PTH

Step	Description
1.	LLCR (2)
2.	Thermal Shock (4)
3.	LLCR (2) Max Delta = 1 mOhm
4.	Humidity (1)
5.	LLCR (2) Max Delta = 1 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) Mating/Unmating Force = EIA-364-13

(4) Thermal Shock = EIA-364-32
Exposure Time at Temperature Extremes =1/2 Hour
Method A, Test Condition = I (-55°C to +85°C)
Test Duration = A-3 (100 Cycles)

FLOWCHARTS Continued

Current Carrying Capacity

Note: Tin (IMMERSION) .016" SIG PTH, .016" GND PTH

Group 1		Group 2		Group 3	
HDTF-4-08-S-RA-HS-100 HDTM-4-08-1-S-VT-0-1 1 Pins Powered Signal		HDTF-4-08-S-RA-HS-100 HDTM-4-08-1-S-VT-0-1 8 Pins Powered Signal		HDTF-4-08-S-RA-HS-100 HDTM-4-08-1-S-VT-0-1 24 Pins Powered Signal	
Step	**Description**	**Step**	**Description**	**Step**	**Description**
1.	CCC (1) Rows = 1 Number of Positions = 1 *Note: Center of connector location*	1.	CCC (1) Rows = 1 Number of Positions = 8 *Note: All signal pins combined carry supply while all grounds on that wafter carry return*	1.	CCC (1) Rows = 2 Number of Positions = 12 *Note: Center wafer carries supply while adjacent wafer carries return*

(1) CCC = EIA-364-70
Method 2, Temperature Rise Versus Current Curve
(TIN PLATING) - Tabulate calculated current at RT, 65°C, 75°C and 95°C after derating 20% and based on 105°C
(GOLD PLATING) - Tabulate calculated current at RT, 85°C, 95°C and 115°C after derating 20% and based on 125°C

FLOWCHARTS Continued

Thermal Shock/Humidity

Group 1
HDTF-4-08-S-RA-HS-100
HDTM-4-08-1-S-VT-0-1
2 Assemblies
Unmated

Step	Description
1.	Visual Inspection *Note: Check for lifted beams.*
2.	IR (3)
3.	DWV at Test Voltage (1) - Non Standard Test Voltage = 750 VAC
4.	Thermal Shock (4) - Non Standard
5.	IR (3)
6.	DWV at Test Voltage (1) - Non Standard Test Voltage = 750 V
7.	Humidity (2) - Non Standard
8.	IR (3)
9.	DWV at Test Voltage (1) - Non Standard Test Voltage = 750 V

(1) DWV at Test Voltage = Other
Test Condition = 1 (Sea Level)
Voltage applied at a rate of 500 V/sec up to the rated voltage.

(2) Humidity = Other
Test Condition = C (500 Hours)
Test Method = III (+25°C to +65°C @ 90% RH to 98% RH)
EIA-364-31C minimum 50 cycles and minimum 500 hours.

(3) IR = EIA-364-21
Test Condition = 500 Vdc, 2 Minutes Max

(4) Thermal Shock = Other
Exposure Time at Temperature Extremes = 1/2 Hour
Method A, Test Condition = II (-65°C to +105°C)
Test Duration = (5 Cycles)
EIA-364-TP32B

ATTRIBUTE DEFINITIONS

The following is a brief, simplified description of attributes.

THERMAL SHOCK (Mating / Unmating / Durability):

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 SHOCK (Thermal Shock / Humidity):

1) EIA-364-32, *Thermal Shock (Temperature Cycling) Test Procedure for Electrical Connectors.*
2) Test Condition 2: -65°C to +105°C
3) Test Time: ½ hour dwell at each temperature extreme
4) Number of Cycles: 5
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 (Mating / Unmating / Durability):

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.

HUMIDITY (Thermal Shock / Humidity):

1) Reference document: EIA-364-31, *Humidity Test Procedure for Electrical Connectors.*
2) Test Condition C, 500 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.

MATING/UNMATING:

1) Reference document: EIA-364-13, *Mating and Unmating Forces Test Procedure for Electrical Connectors*.
2) The full insertion position was to within 0.003” to 0.004” of the plug bottoming out in the receptacle to prevent damage to the system under test.
3) One of the mating parts is secured to a floating X-Y table to prevent damage during cycling.

ATTRIBUTE DEFINITIONS Continued

The following is a brief, simplified description of attributes

NORMAL FORCE (FOR CONTACTS TESTED OUTSIDE THE HOUSING):

1) Reference document: EIA-364-04, *Normal Force Test Procedure for Electrical Connectors*.
2) The contacts shall be tested in the loose state, *not* inserted in connector housing.
3) The contacts shall be prepared to allow access to the spring member at the same attitude and deflection level as would occur in actual use.
4) In the event that portions of the contact prevent insertion of the test probe and/or deflection of the spring member under evaluation, said material shall be removed leaving the appropriate contact surfaces exposed.
5) In the case of multi-tine contacts, each tine shall be tested independently on separate samples as required.
6) The connector housing shall be simulated, if required, in order to provide an accurate representation of the actual contact system performance.
7) A holding fixture shall be fashioned to allow the contact to be properly deflected.

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 four 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
4) The following guidelines are used to categorize the changes in LLCR for compliant pin only
    a. <= +0.33 mOhms: ---------- Stable
    b. > +0.33 to +0.66 mOhms:---------- Minor
    c. +0.67 to +1 mOhms: ---------- Acceptable
    d. >+1 mOhms: ---------- Unstable

ATTRIBUTE DEFINITIONS Continued

The following is a brief, simplified description of attributes

GAS TIGHT:

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

1) EIA-364-23, *Low Level Contact Resistance Test Procedure for Electrical Connectors and Sockets*.
2) A computer program, *LLCR 221.exe*, ensures repeatability for data acquisition.
3) The following guidelines are used to categorize the changes in LLCR as a result from stressing
    a. <= +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^{o} C
        ix. The final LLCR shall be conducted within 1 hour after drying.
5) The following guidelines are used to categorize the changes in LLCR for compliant pin only
    a. <= +0.33 mOhms: ---------- Stable
    b. > +0.33 to +0.66 mOhms: ---------- Minor
    c. +0.67 to +1 mOhms: ---------- Acceptable
    d. >+1 mOhms:---------- Unstable

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

DIELECTRIC WITHSTANDING VOLTAGE (DWV):

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

1) PROCEDURE:
    a. Reference document: EIA-364-20, *Withstanding Voltage Test Procedure for Electrical Connectors*.
    b. Test Conditions:
        i. Between Adjacent Contacts or Signal-to-Ground
        ii. Barometric Test Condition 1
        iii. Rate of Application 500 V/Sec
        iv. Test Voltage (VAC) until breakdown occurs
2) MEASUREMENTS/CALCULATIONS
    a. The breakdown voltage shall be measured and recorded.
    b. The dielectric withstanding voltage shall be recorded as 75% of the minimum breakdown voltage.
    c. The working voltage shall be recorded as one-third (1/3) of the dielectric withstanding voltage (one-fourth of the breakdown voltage).

RESULTS

Temperature Rise, CCC at a 20% de-rating

- **CCC for a 30°C Temperature Rise----------4.0 A with 1 contacts powered**
- **CCC for a 30°C Temperature Rise----------9.6 A with 8 contacts powered (Signals Carry Supply/Grounds Carry Return)**
- **CCC for a 30°C Temperature Rise----------12.9 A with 24 contacts powered (Center Wafer Carries Supply/ Adjacent Wafer Carries Return)**

Mating/Unmating Forces:

Mating/Unmating Durability Group

- **Initial**
  - **Mating**
    - **Min----------5.29 Lbs**
    - **Max ----------6.28 Lbs**
  - **Unmating**
    - **Min----------3.74 Lbs**
    - **Max ----------4.41 Lbs**
- **After 25 Cycles**
  - **Mating**
    - **Min----------4.86 Lbs**
    - **Max ----------6.01 Lbs**
  - **Unmating**
    - **Min----------3.52 Lbs**
    - **Max ----------4.67 Lbs**
- **After 50 Cycles**
  - **Mating**
    - **Min----------4.64 Lbs**
    - **Max ----------6.41 Lbs**
  - **Unmating**
    - **Min----------3.62 Lbs**
    - **Max ----------4.50 Lbs**
- **After 75 Cycles**
  - **Mating**
    - **Min----------4.91 Lbs**
    - **Max ----------5.90 Lbs**
  - **Unmating**
    - **Min----------3.55 Lbs**
    - **Max ----------4.56 Lbs**
- **After 100 Cycles**
  - **Mating**
    - **Min----------4.92 Lbs**
    - **Max ----------6.02 Lbs**
  - **Unmating**
    - **Min----------3.68 Lbs**
    - **Max ----------4.54 Lbs**
- **After Humidity**
  - **Mating**
    - **Min----------2.51 Lbs**
    - **Max ----------3.04 Lbs**
  - **Unmating**
    - **Min----------2.07 Lbs**
    - **Max ----------2.95 Lbs**

RESULTS Continued

Normal Force at 0.0263 inch deflection for signal pair

"A" wafer

- **Initial**
  - **Min ----------117.90 gf Set ----- 0.0064 in**
  - **Max----------122.60 gf Set ----- 0.0075 in**
- **Thermal**
  - **Min ---------- 85.40 gf Set ------0.0046 in**
  - **Max---------- 98.70 gf Set ----- 0.0065 in**

"B" wafer

- **Initial**
  - **Min ----------127.80 gf Set ----- 0.0061 in**
  - **Max----------130.40 gf Set ----- 0.0069 in**
- **Thermal**
  - **Min ---------- 75.60 gf Set ------0.0034 in**
  - **Max---------- 93.10 gf Set ----- 0.0058 in**

Normal Force at 0.0263 inch deflection for ground pair

"A" wafer

- **Initial**
  - **Min ---------- 89.40 gf Set ----- 0.0048 in**
  - **Max---------- 98.10 gf Set ----- 0.0070 in**
- **Thermal**
  - **Min ---------- 62.30 gf Set ------0.0036 in**
  - **Max---------- 74.80 gf Set ----- 0.0056 in**

"B" wafer

- **Initial**
  - **Min ---------- 89.50 gf Set ----- 0.0044 in**
  - **Max----------101.20 gf Set ----- 0.0063 in**
- **Thermal**
  - **Min ---------- 62.30 gf Set ------0.0026 in**
  - **Max---------- 72.70 gf Set ----- 0.0056 in**

RESULTS Continued

Insulation Resistance minimums, IR

Pin to Pin

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

Pin to Ground

- **Initial**
  - **Unmated---------- 45000 Meg Ω ----------Passed**
- **Thermal Shock**
  - **Unmated---------- 45000 Meg Ω ----------Passed**
- **Humidity**
  - **Unmated----------6600 Meg Ω ----------Passed**

Dielectric Withstanding Voltage minimums, DWV

- **Minimums**
  - **Test Voltage---------- 750 VAC**
  - **Working Voltage---------- 250 VAC**

Pin to Pin

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

Pin to Ground

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

RESULTS Continued

LLCR Gas Tight (128 signal and 64 ground LLCR test points)

Signal pin

- **Initial ----------21.46 mOhms Max**
- **Gas-Tight**
  - **<= +5.0 mOhms ---------- 128 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**

Ground pin

- **Initial ----------17.54 mOhms Max**
- **Gas-Tight**
  - **<= +5.0 mOhms ----------64 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 Compliant pin (15 signal and 15 ground LLCR test points)

HDTF-4-08-S-RA-1 CONTACTS Tin (immersion) 0.016" PTH

Signal pin

- **Initial ---------- 0.39 mOhms Max**
- **Gas-Tight**
  - **<= +0.33 mOhms----------15 Points----------Stable**
  - **+0.34 to +0.66 mOhms ---------- 0 Points----------Minor**
  - **+0.67 to +1 mOhms---------- 0 Points----------Acceptable**
  - **>+1 mOhms---------- 0 Points----------Unstable**

Ground pin

- **Initial ---------- 0.40 mOhms Max**
- **Gas-Tight**
  - **<= +0.33 mOhms----------15 Points----------Stable**
  - **+0.34 to +0.66 mOhms ---------- 0 Points----------Minor**
  - **+0.67 to +1 mOhms---------- 0 Points----------Acceptable**
  - **>+1 mOhms---------- 0 Points----------Unstable**

HDTM-4-08-1-S-VT-0-1 CONTACTS Tin (immersion) 0.016" PTH

Signal pin

- **Initial ---------- 0.09 mOhms Max**
- **Gas-Tight**
  - **<= +0.33 mOhms----------15 Points----------Stable**
  - **+0.34 to +0.66 mOhms ---------- 0 Points----------Minor**
  - **+0.67 to +1 mOhms---------- 0 Points----------Acceptable**
  - **>+1 mOhms---------- 0 Points----------Unstable**

Ground pin

- **Initial ---------- 0.10 mOhms Max**
- **Gas-Tight**
  - **<= +0.33 mOhms----------15 Points----------Stable**
  - **+0.34 to +0.66 mOhms ---------- 0 Points----------Minor**
  - **+0.67 to +1 mOhms---------- 0 Points----------Acceptable**
  - **>+1 mOhms---------- 0 Points----------Unstable**

RESULTS Continued

LLCR Durability (128 signal and 64 ground LLCR test points)

Signal pin

- **Initial ----------21.55 mOhms Max**
- **Durability, 100 Cycles**
  - **<= +5.0 mOhms ---------- 128 Points----------Stable**
  - **+5.1 to +10.0 mOhms ---------- 0 Points----------Minor**
  - **+10.1 to +15.0 mOhms---------- 0 Points----------Acceptable**
  - **+15.1 to +50.0 mOhms---------- 0 Points----------Marginal**
  - **+50.1 to +2000 mOhms ---------- 0 Points----------Unstable**
  - **>+2000 mOhms ---------- 0 Points----------Open Failure**
- **Thermal**
  - **<= +5.0 mOhms ---------- 128 Points----------Stable**
  - **+5.1 to +10.0 mOhms ---------- 0 Points----------Minor**
  - **+10.1 to +15.0 mOhms---------- 0 Points----------Acceptable**
  - **+15.1 to +50.0 mOhms---------- 0 Points----------Marginal**
  - **+50.1 to +2000 mOhms ---------- 0 Points----------Unstable**
  - **>+2000 mOhms ---------- 0 Points----------Open Failure**
- **Humidity**
  - **<= +5.0 mOhms ---------- 127 Points----------Stable**
  - **+5.1 to +10.0 mOhms ---------- 1 Points----------Minor**
  - **+10.1 to +15.0 mOhms---------- 0 Points----------Acceptable**
  - **+15.1 to +50.0 mOhms---------- 0 Points----------Marginal**
  - **+50.1 to +2000 mOhms ---------- 0 Points----------Unstable**
  - **>+2000 mOhms ---------- 0 Points----------Open Failure**

Ground pin

- **Initial ----------17.71 mOhms Max**
- **Durability, 100 Cycles**
  - **<= +5.0 mOhms ----------64 Points----------Stable**
  - **+5.1 to +10.0 mOhms ---------- 0 Points----------Minor**
  - **+10.1 to +15.0 mOhms---------- 0 Points----------Acceptable**
  - **+15.1 to +50.0 mOhms---------- 0 Points----------Marginal**
  - **+50.1 to +2000 mOhms ---------- 0 Points----------Unstable**
  - **>+2000 mOhms ---------- 0 Points----------Open Failure**
- **Thermal**
  - **<= +5.0 mOhms ----------64 Points----------Stable**
  - **+5.1 to +10.0 mOhms ---------- 0 Points----------Minor**
  - **+10.1 to +15.0 mOhms---------- 0 Points----------Acceptable**
  - **+15.1 to +50.0 mOhms---------- 0 Points----------Marginal**
  - **+50.1 to +2000 mOhms ---------- 0 Points----------Unstable**
  - **>+2000 mOhms ---------- 0 Points----------Open Failure**
- **Humidity**
  - **<= +5.0 mOhms ----------63 Points----------Stable**
  - **+5.1 to +10.0 mOhms ---------- 1 Points----------Minor**
  - **+10.1 to +15.0 mOhms---------- 0 Points----------Acceptable**
  - **+15.1 to +50.0 mOhms---------- 0 Points----------Marginal**
  - **+50.1 to +2000 mOhms ---------- 0 Points----------Unstable**
  - **>+2000 mOhms ---------- 0 Points----------Open Failure**

RESULTS Continued

LLCR Durability Compliant pin (15 signal and 15 ground LLCR test points)

HDTF-4-08-S-RA-1 CONTACTS Tin (immersion) 0.016" PTH

Signal pin

- **Initial ---------- 0.38 mOhms Max**
- **Thermal**
  - **<= +0.33 mOhms ---------- 15 Points ---------- Stable**
  - **+0.34 to +0.66 mOhms ---------- 0 Points ---------- Minor**
  - **+0.67 to +1 mOhms ---------- 0 Points ---------- Acceptable**
  - **>+1 mOhms ---------- 0 Points ---------- Unstable**
- **Humidity**
  - **<= +0.33 mOhms ---------- 15 Points ---------- Stable**
  - **+0.34 to +0.66 mOhms ---------- 0 Points ---------- Minor**
  - **+0.67 to +1 mOhms ---------- 0 Points ---------- Acceptable**
  - **>+1 mOhms ---------- 0 Points ---------- Unstable**

Ground pin

- **Initial ---------- 0.44 mOhms Max**
- **Thermal**
  - **<= +0.33 mOhms ---------- 15 Points ---------- Stable**
  - **+0.34 to +0.66 mOhms ---------- 0 Points ---------- Minor**
  - **+0.67 to +1 mOhms ---------- 0 Points ---------- Acceptable**
  - **>+1 mOhms ---------- 0 Points ---------- Unstable**
- **Humidity**
  - **<= +0.33 mOhms ---------- 15 Points ---------- Stable**
  - **+0.34 to +0.66 mOhms ---------- 0 Points ---------- Minor**
  - **+0.67 to +1 mOhms ---------- 0 Points ---------- Acceptable**
  - **>+1 mOhms ---------- 0 Points ---------- Unstable**

HDTM-4-08-1-S-VT-0-1 CONTACTS Tin (immersion) 0.016" PTH

Signal pin

- **Initial ---------- 0.10 mOhms Max**
- **Thermal**
  - **<= +0.33 mOhms ---------- 15 Points ---------- Stable**
  - **+0.34 to +0.66 mOhms ---------- 0 Points ---------- Minor**
  - **+0.67 to +1 mOhms ---------- 0 Points ---------- Acceptable**
  - **>+1 mOhms ---------- 0 Points ---------- Unstable**
- **Humidity**
  - **<= +0.33 mOhms ---------- 15 Points ---------- Stable**
  - **+0.34 to +0.66 mOhms ---------- 0 Points ---------- Minor**
  - **+0.67 to +1 mOhms ---------- 0 Points ---------- Acceptable**
  - **>+1 mOhms ---------- 0 Points ---------- Unstable**

Ground pin

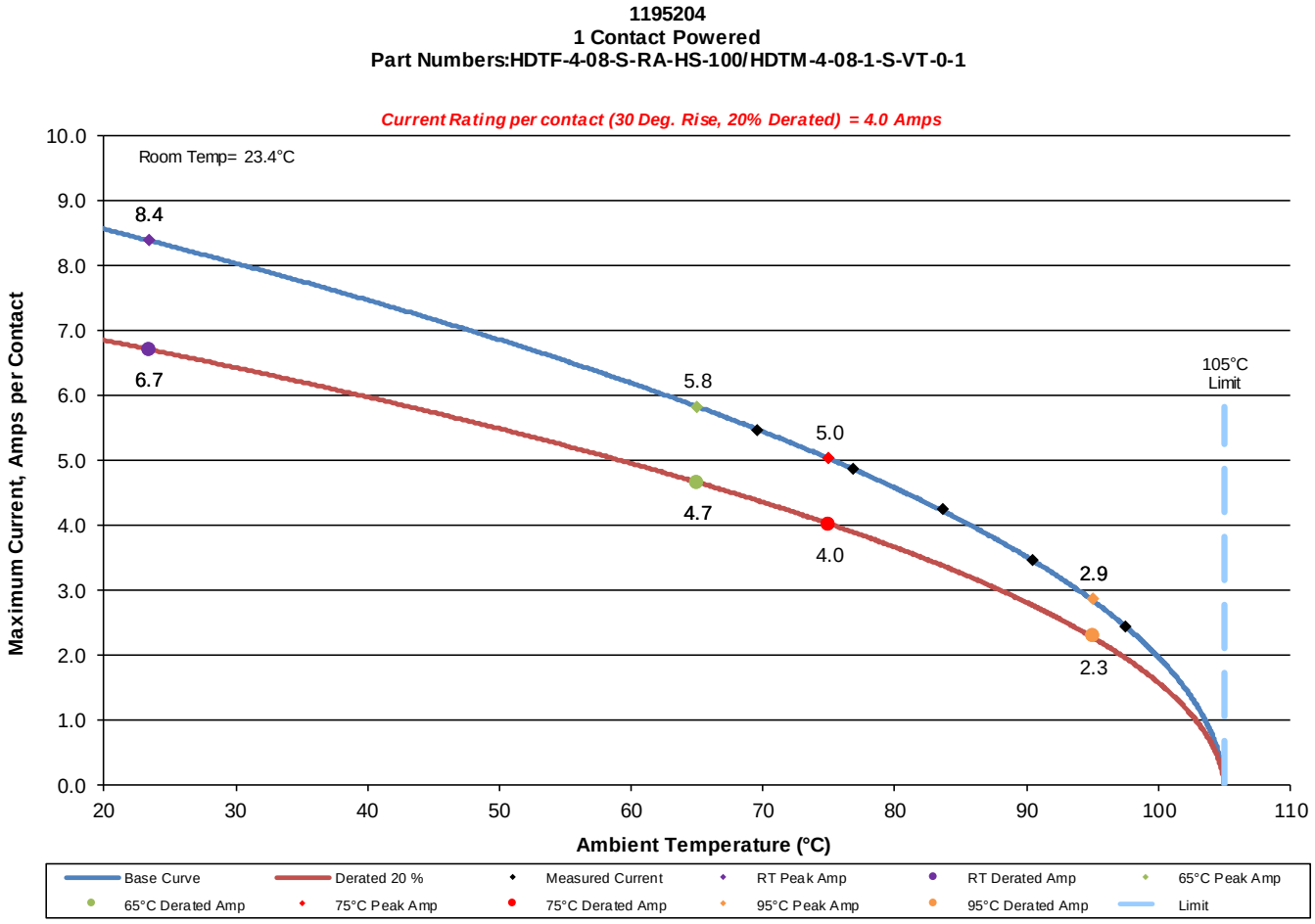
- **Initial ---------- 0.09 mOhms Max**
- **Thermal**
  - **<= +0.33 mOhms ---------- 15 Points ---------- Stable**
  - **+0.34 to +0.66 mOhms ---------- 0 Points ---------- Minor**
  - **+0.67 to +1 mOhms ---------- 0 Points ---------- Acceptable**
  - **>+1 mOhms ---------- 0 Points ---------- Unstable**
- **Humidity**
  - **<= +0.33 mOhms ---------- 15 Points ---------- Stable**
  - **+0.34 to +0.66 mOhms ---------- 0 Points ---------- Minor**
  - **+0.67 to +1 mOhms ---------- 0 Points ---------- Acceptable**
  - **>+1 mOhms ---------- 0 Points ---------- Unstable**

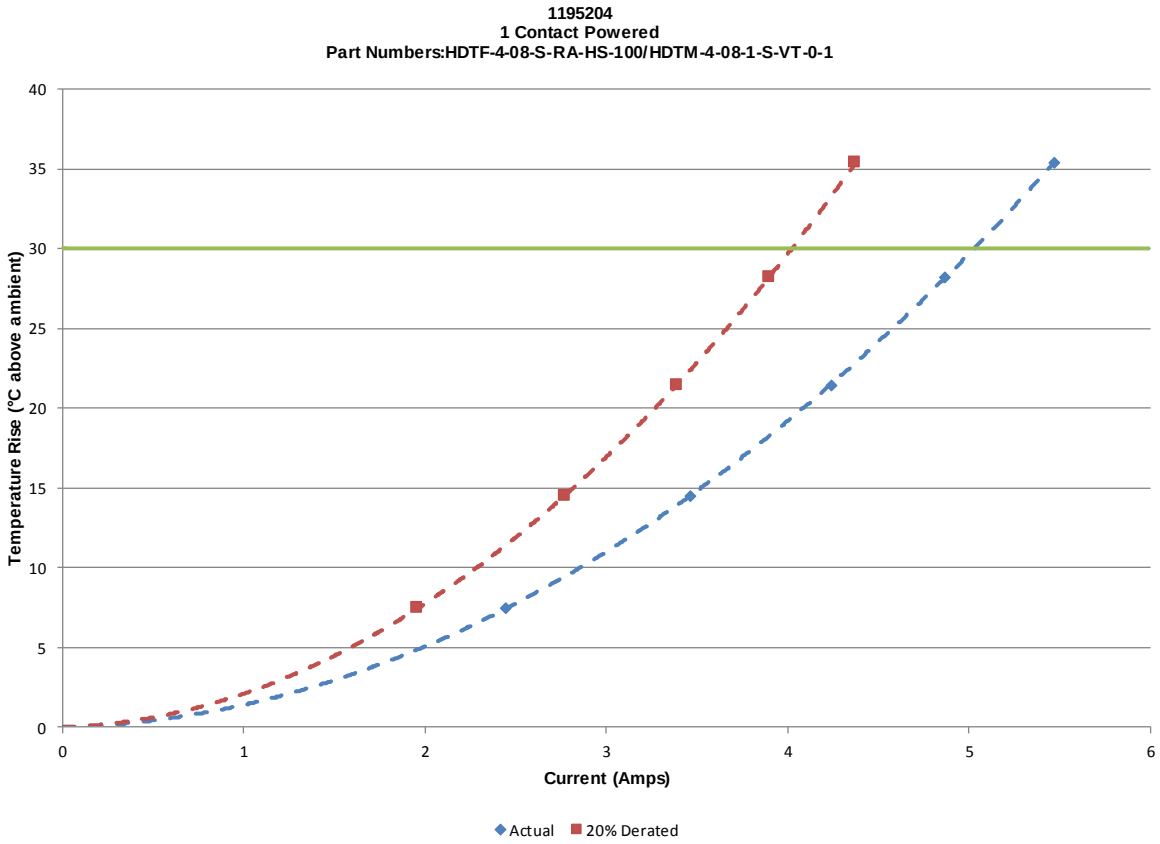
DATA SUMMARIES

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:

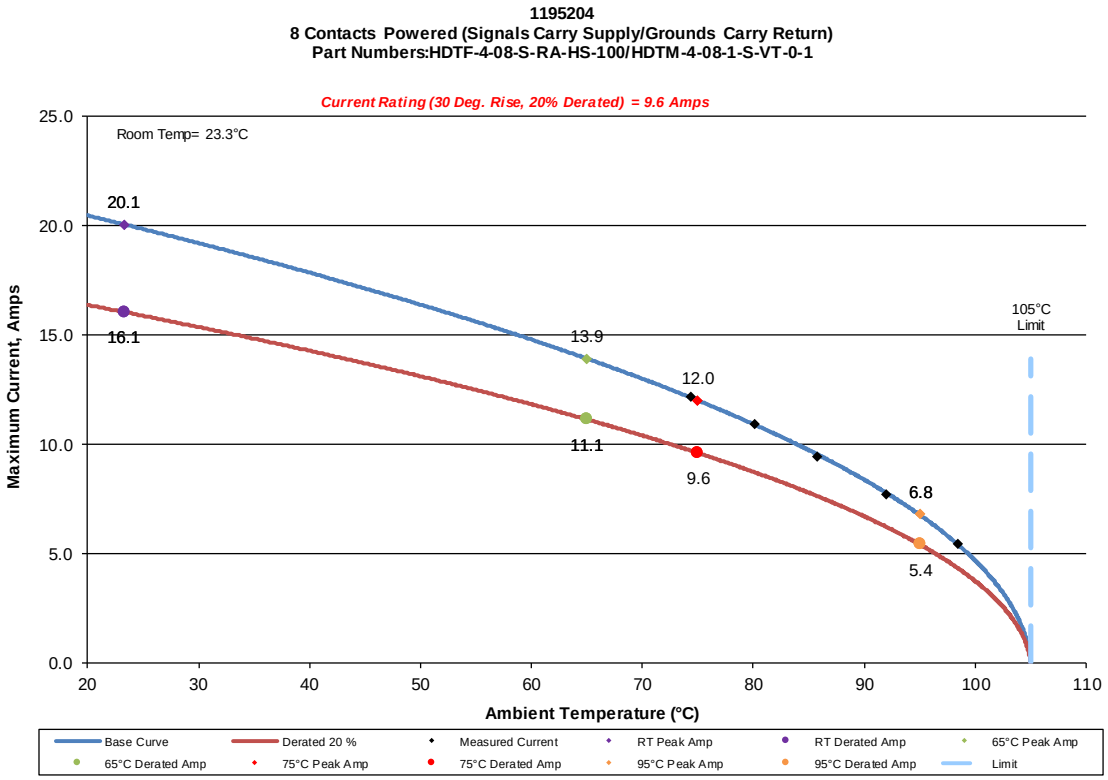
    a. 1 Contact powered

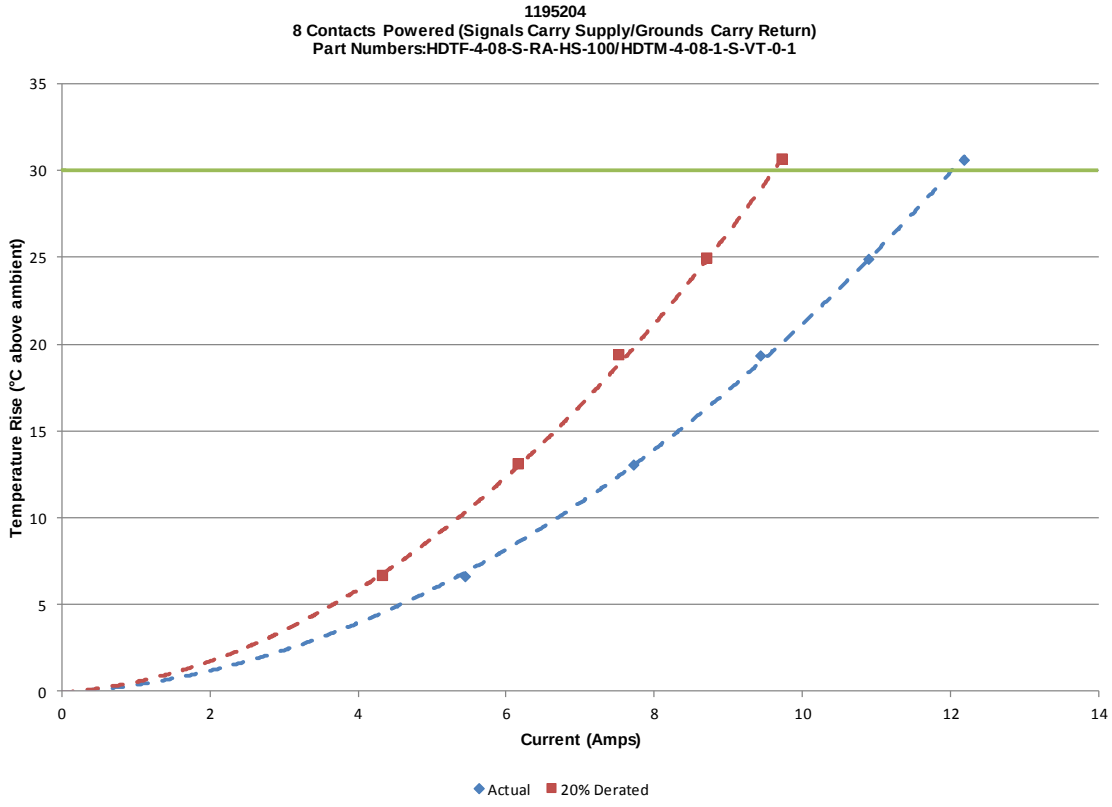



1195204
1 Contact Powered
Part Numbers:HDTF-4-08-S-RA-HS-100/HDTM-4-08-1-S-VT-0-1
Temperature Rise (°C above ambient)
Current (Amps)
0
5
10
15
20
25
30
35
40
0
1
2
3
4
5
6
Actual
20% Derated

DATA SUMMARIES Continued

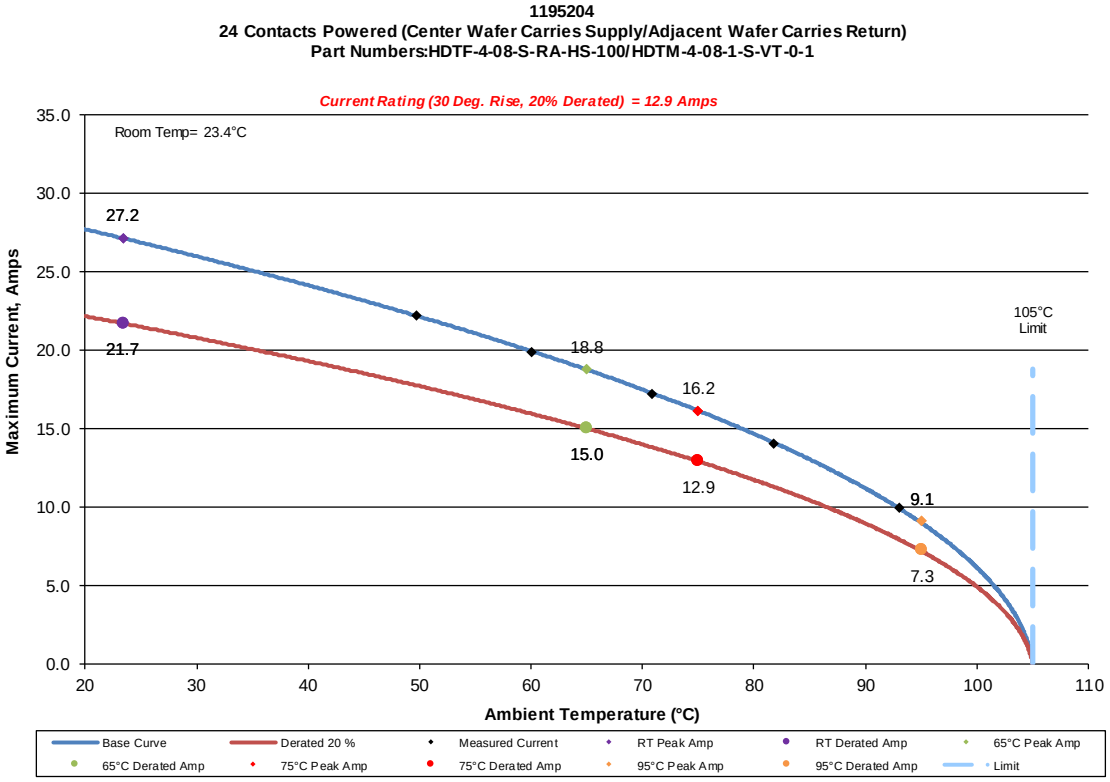
b. 8 Contacts powered (signals carry supply/grounds carry return)

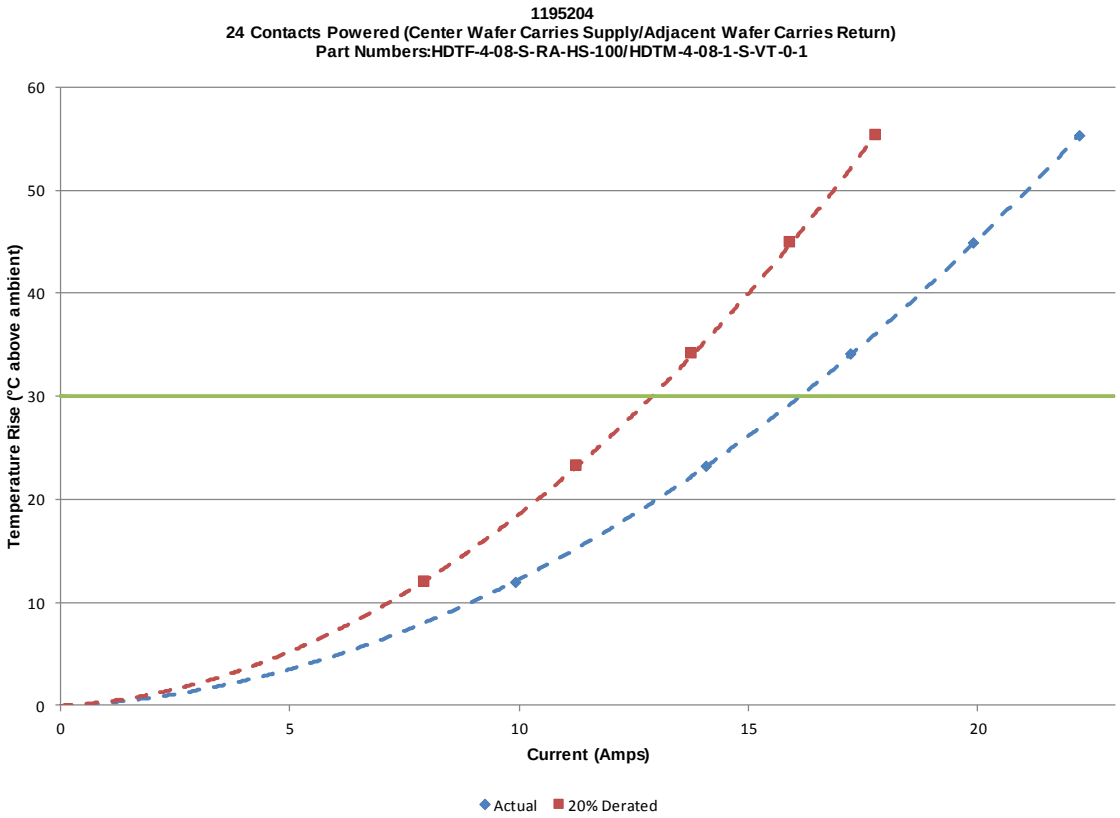




DATA SUMMARIES Continued

c. 24 Contacts powered (Center Wafer Carries Supply/Adjacent Wafer Carries Return)





DATA SUMMARIES Continued

Mating\Unmating Force:

Mating\Unmating Durability Group

	Initial				25 Cycles			
	Mating		**Unmating**		**Mating**		**Unmating**	
	Newtons	Force (Lbs)	Newtons	Force (Lbs)	Newtons	Force (Lbs)	Newtons	Force (Lbs)
Minimum	23.53	5.29	16.64	3.74	21.62	4.86	15.66	3.52
Maximum	27.93	6.28	19.62	4.41	26.73	6.01	20.77	4.67
Average	25.28	**5.68**	18.02	**4.05**	23.84	**5.36**	18.39	**4.13**
St Dev	1.53	0.34	1.21	0.27	1.50	0.34	1.78	0.40
Count	8	8	8	8	8	8	8	8

	50 Cycles				75 Cycles			
	Mating		**Unmating**		**Mating**		**Unmating**	
	Newtons	Force (Lbs)	Newtons	Force (Lbs)	Newtons	Force (Lbs)	Newtons	Force (Lbs)
Minimum	20.64	4.64	16.10	3.62	21.84	4.91	15.79	3.55
Maximum	26.73	6.01	20.02	4.50	26.24	5.90	20.28	4.56
Average	23.65	**5.32**	18.22	**4.10**	23.88	**5.37**	18.10	**4.07**
St Dev	1.90	0.43	1.58	0.36	1.54	0.35	1.52	0.34
Count	8	8	8	8	8	8	8	8

	100 Cycles				After Humidity			
	Mating		**Unmating**		**Mating**		**Unmating**	
	Newtons	Force (Lbs)	Newtons	Force (Lbs)	Newtons	Force (Lbs)	Newtons	Force (Lbs)
Minimum	21.88	4.92	16.37	3.68	11.16	2.51	9.22	2.07
Maximum	26.78	6.02	20.19	4.54	13.54	3.04	13.10	2.95
Average	23.86	**5.37**	18.38	**4.13**	12.79	**2.87**	10.94	**2.46**
St Dev	1.69	0.38	1.54	0.35	0.74	0.17	1.17	0.26
Count	8	8	8	8	8	8	8	8

DATA SUMMARIES Continued

NORMAL FORCE (FOR CONTACTS TESTED OUTSIDE THE HOUSING):

1) Calibrated force gauges are used along with computer controlled positioning equipment.
2) Typically, 8-12 readings are taken and the averages reported.
3) All values are reported for the pair of beams for each position.

Signal pair "A" Wafer Initial

Samtec Wafer A	Deflections in inches Forces in Grams										
	0.0026	**0.0053**	**0.0079**	**0.0105**	**0.0132**	**0.0158**	**0.0184**	**0.0210**	**0.0237**	**0.0263**	***SET***
Averages	**15.16**	**31.22**	**46.18**	**59.91**	**72.43**	**83.70**	**93.94**	**103.28**	**111.85**	**119.71**	**0.0072**
Min	13.40	29.80	45.30	58.70	70.90	82.40	92.70	101.90	110.30	117.90	0.0064
Max	16.00	32.30	47.50	61.60	74.80	86.40	96.80	106.10	115.00	122.60	0.0075
St. Dev	0.754	0.725	0.837	1.000	1.218	1.253	1.276	1.247	1.319	1.252	0.0003
Count	12	12	12	12	12	12	12	12	12	12	12

Signal pair "A" Wafer After Thermals

Samtec Wafer A	Deflections in inches Forces in Grams										
	0.0026	**0.0053**	**0.0079**	**0.0105**	**0.0132**	**0.0158**	**0.0184**	**0.0210**	**0.0237**	**0.0263**	***SET***
Averages	**0.00**	**3.58**	**15.75**	**27.63**	**39.20**	**50.68**	**61.60**	**71.71**	**80.73**	**88.54**	**0.0058**
Min	0.00	0.50	12.90	25.40	37.30	48.60	59.00	69.00	77.60	85.40	0.0046
Max	0.00	7.50	18.20	30.70	43.80	56.90	69.20	80.40	90.30	98.70	0.0065
St. Dev	0.000	2.290	1.770	1.718	2.241	2.868	3.451	3.874	4.199	4.399	0.0006
Count	8	8	8	8	8	8	8	8	8	8	8

Signal pair "B" Wafer Initial

Samtec Wafer B	Deflections in inches Forces in Grams										
	0.0026	**0.0053**	**0.0079**	**0.0105**	**0.0132**	**0.0158**	**0.0184**	**0.0210**	**0.0237**	**0.0263**	***SET***
Averages	**17.04**	**34.33**	**50.42**	**64.68**	**77.60**	**89.60**	**100.73**	**111.03**	**120.53**	**129.05**	**0.0067**
Min	15.40	32.50	48.80	63.10	76.10	88.10	99.10	109.60	119.50	127.80	0.0061
Max	17.90	35.50	51.70	66.00	79.00	90.90	102.30	112.40	122.00	130.40	0.0069
St. Dev	0.742	0.884	0.899	0.805	0.772	0.787	0.852	0.878	0.833	0.757	0.0002
Count	12	12	12	12	12	12	12	12	12	12	12

Signal pair "B" Wafer After Thermals

Samtec Wafer B	Deflections in inches Forces in Grams										
	0.0026	**0.0053**	**0.0079**	**0.0105**	**0.0132**	**0.0158**	**0.0184**	**0.0210**	**0.0237**	**0.0263**	***SET***
Averages	**0.66**	**7.08**	**16.99**	**26.83**	**36.85**	**46.84**	**56.70**	**66.04**	**74.60**	**82.31**	**0.0046**
Min	0.00	0.30	10.80	20.30	29.70	39.60	49.00	58.50	67.20	75.60	0.0034
Max	2.30	14.20	25.50	36.50	47.30	57.80	68.30	77.80	86.20	93.10	0.0058
St. Dev	1.018	5.251	5.509	5.975	6.348	6.461	6.603	6.489	6.279	5.763	0.0009
Count	8	8	8	8	8	8	8	8	8	8	8

DATA SUMMARIES Continued

Ground pair "A" Wafer Initial

Samtec Wafer A	Deflections in inches Forces in Grams										
	0.0029	**0.0058**	**0.0087**	**0.0116**	**0.0146**	**0.0175**	**0.0204**	**0.0233**	**0.0262**	**0.0291**	***SET***
Averages	**11.19**	**22.93**	**34.28**	**44.93**	**54.85**	**63.97**	**72.31**	**80.01**	**87.17**	**93.79**	**0.0062**
Min	8.30	20.50	32.80	43.20	52.40	60.60	68.40	76.00	82.80	89.40	0.0048
Max	12.40	24.50	36.50	47.80	57.90	66.90	75.20	83.30	91.00	98.10	0.0070
St. Dev	1.034	1.089	1.131	1.335	1.608	1.921	2.158	2.275	2.484	2.559	0.0006
Count	12	12	12	12	12	12	12	12	12	12	12

Ground pair "A" Wafer After Thermals

Samtec Wafer A	Deflections in inches Forces in Grams										
	0.0029	**0.0058**	**0.0087**	**0.0116**	**0.0146**	**0.0175**	**0.0204**	**0.0233**	**0.0262**	**0.0291**	***SET***
Averages	**0.03**	**4.73**	**13.46**	**21.93**	**30.33**	**38.75**	**46.84**	**54.90**	**62.53**	**69.59**	**0.0048**
Min	0.00	1.90	9.50	16.90	24.20	31.80	39.50	47.40	55.20	62.30	0.0036
Max	0.20	8.70	17.60	26.20	34.70	43.20	51.40	59.70	67.50	74.80	0.0056
St. Dev	0.071	2.519	2.665	2.879	3.248	3.602	3.763	3.970	4.052	4.091	0.0008
Count	8	8	8	8	8	8	8	8	8	8	8

Ground pair "B" Wafer Initial

Samtec Wafer A	Deflections in inches Forces in Grams										
	0.0029	**0.0058**	**0.0087**	**0.0116**	**0.0146**	**0.0175**	**0.0204**	**0.0233**	**0.0262**	**0.0291**	***SET***
Averages	**11.80**	**23.73**	**35.18**	**45.82**	**55.73**	**64.92**	**73.65**	**81.96**	**89.72**	**96.93**	**0.0056**
Min	10.10	20.60	31.30	41.20	50.70	59.20	67.30	75.00	82.60	89.50	0.0044
Max	12.90	25.50	37.60	48.40	58.50	67.80	77.00	86.10	93.70	101.20	0.0063
St. Dev	0.878	1.713	2.242	2.544	2.790	3.208	3.641	4.024	4.180	4.406	0.0008
Count	12	12	12	12	12	12	12	12	12	12	12

Ground pair "B" Wafer After Thermals

Samtec Wafer A	Deflections in inches Forces in Grams										
	0.0029	**0.0058**	**0.0087**	**0.0116**	**0.0146**	**0.0175**	**0.0204**	**0.0233**	**0.0262**	**0.0291**	***SET***
Averages	**0.36**	**5.35**	**13.74**	**21.85**	**29.88**	**37.91**	**45.71**	**53.49**	**60.89**	**67.74**	**0.0046**
Min	0.00	1.90	9.50	16.90	24.20	31.80	39.50	47.40	55.20	62.30	0.0026
Max	2.70	10.10	17.30	24.70	32.60	41.10	49.50	58.00	65.80	72.70	0.0056
St. Dev	0.947	2.727	2.554	2.537	2.813	3.147	3.301	3.524	3.618	3.611	0.0010
Count	8	8	8	8	8	8	8	8	8	8	8

DATA SUMMARIES Continued

LLCR Durability:

1) A total of 128 signal and 64 ground points were measured.
2) EIA-364-23, *Low Level Contact Resistance Test Procedure for Electrical Connectors and Sockets.*
3) A computer program, *LLCR 221.exe*, ensures repeatability for data acquisition.
4) The following guidelines are used to categorize the changes in LLCR as a result from stressing.
   a. <= +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
5) The following guidelines are used to categorize the changes in LLCR for compliant pin only
   a. <= +0.33 mOhms: ---------- Stable
   b. > +0.33 to +0.66 mOhms: ---------- Minor
   c. +0.67 to +1 mOhms: ---------- Acceptable
   d. >+1 mOhms: ---------- Unstable

LLCR Measurement Summaries by Pin Type				
Date	6/30/2017	7/7/2017	7/14/2017	7/25/2017
Room Temp (Deg C)	22	22	22	23
Rel Humidity (%)	50	49	49	44
Technician	Aaron McKim	Aaron McKim	Aaron McKim	Aaron McKim
mOhm values	**Actual Initial**	**Delta 100 Cycles**	**Delta Therm Shck**	**Delta Humidity**
	Pin Type 1: Signal			
Average	14.63	0.71	0.76	0.79
St. Dev.	3.11	0.40	0.48	0.58
Min	10.51	0.01	0.02	0.04
Max	21.55	1.77	2.62	5.06
Summary Count	128	128	128	128
Total Count	128	128	128	128
	Pin Type 2: Ground			
Average	10.66	0.64	0.54	0.75
St. Dev.	2.30	0.65	0.55	1.16
Min	8.17	0.07	0.00	0.03
Max	17.71	3.60	3.44	8.17
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	**192**	**0**	**0**	**0**	**0**	**0**
Therm Shck	**192**	**0**	**0**	**0**	**0**	**0**
Humidity	**190**	**2**	**0**	**0**	**0**	**0**

DATA SUMMARIES Continued

HDTF-4-08-S-RA-1 Compliant Pin LLCR:

	LLCR Measurement Summaries by Pin Type			
Date	7/6/2017		7/14/2017	7/25/2017
Room Temp (Deg C)	22		23	23
Rel Humidity (%)	49		49	44
Technician	Aaron McKim		Aaron McKim	Aaron McKim
mOhm values	**Actual Initial**	**Delta**	**Delta Therm Shck**	**Delta Humidity**
HDTF	**Pin Type 1: Signal**			
Average	0.35		0.01	0.01
St. Dev.	0.01		0.01	0.01
Min	0.33		0.00	0.00
Max	0.38		0.05	0.03
Summary Count	15		15	15
Total Count	15		15	15
	Pin Type 2: Ground			
Average	0.37		0.02	0.01
St. Dev.	0.03		0.02	0.01
Min	0.33		0.00	0.00
Max	0.44		0.08	0.04
Summary Count	15		15	15
Total Count	15		15	15

LLCR Delta Count by Category				
	Stable	**Minor**	**Acceptable**	**Unstable**
mOhms	**<=.33**	**>.33 & <=.66**	**>.67 & <=1**	**>1**
Therm Shck	**30**	**0**	**0**	**0**
Humidity	**30**	**0**	**0**	**0**

DATA SUMMARIES Continued

HDTM-4-08-1-S-VT-0-1 Compliant Pin LLCR:

	LLCR Measurement Summaries by Pin Type			
Date	7/6/2017		7/14/2017	7/25/2017
Room Temp (Deg C)	22		23	23
Rel Humidity (%)	49		49	44
Technician	Aaron McKim		Aaron McKim	Aaron McKim
mOhm values	**Actual Initial**	**Delta**	**Delta Therm Shck**	**Delta Humidity**
HDTM	**Pin Type 1: Signal**			
Average	0.07		0.02	0.03
St. Dev.	0.02		0.01	0.01
Min	0.03		0.00	0.00
Max	0.10		0.04	0.05
Summary Count	15		15	15
Total Count	15		15	15
	Pin Type 2: Ground			
Average	0.06		0.01	0.02
St. Dev.	0.01		0.01	0.01
Min	0.04		0.00	0.00
Max	0.09		0.04	0.04
Summary Count	15		15	15
Total Count	15		15	15

LLCR Delta Count by Category				
	Stable	**Minor**	**Acceptable**	**Unstable**
mOhms	**<=.33**	**>.33 & <=.66**	**>.67 & <=1**	**>1**
Therm Shck	**30**	**0**	**0**	**0**
Humidity	**30**	**0**	**0**	**0**

DATA SUMMARIES Continued

LLCR Gas Tight:

1) A total of 128 signal and 64 ground points were measured.
2) EIA-364-23, *Low Level Contact Resistance Test Procedure for Electrical Connectors and Sockets.*
3) A computer program, *LLCR 221.exe*, ensures repeatability for data acquisition.
4) The following guidelines are used to categorize the changes in LLCR as a result from stressing.
   a. <= +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
5) The following guidelines are used to categorize the changes in LLCR for compliant pin only
   a. <= +0.33 mOhms: ---------- Stable
   b. > +0.33 to +0.66 mOhms: ---------- Minor
   c. +0.67 to +1 mOhms: ---------- Acceptable
   d. >+1 mOhms: ---------- Unstable

LLCR Measurement Summaries by Pin Type				
Date	8/8/2017	8/12/2017		
Room Temp (Deg C)	23	23		
Rel Humidity (%)	44	46		
Technician	Aaron McKim	Aaron McKim		
mOhm values	**Actual Initial**	**Delta Acid Vapor**	**Delta**	**Delta**
	Pin Type 1: Signal			
Average	14.79	0.43		
St. Dev.	3.15	0.36		
Min	10.58	0.06		
Max	21.46	2.48		
Summary Count	128	128		
Total Count	128	128		
	Pin Type 2: Ground			
Average	10.74	0.30		
St. Dev.	2.41	0.33		
Min	8.05	0.02		
Max	17.54	1.83		
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**

DATA SUMMARIES Continued

HDTF-4-08-S-RA-1 Compliant Pin LLCR:

	LLCR Measurement Summaries by Pin Type			
Date	8/8/2017	8/12/2017		
Room Temp (Deg C)	23	23		
Rel Humidity (%)	45	46		
Technician	Aaron McKim	Aaron McKim		
mOhm values	**Actual Initial**	**Delta Acid Vapor**	**Delta**	**Delta**
HDTF	**Pin Type 1: Signal**			
Average	0.35	0.02		
St. Dev.	0.02	0.01		
Min	0.31	0.00		
Max	0.39	0.04		
Summary Count	15	15		
Total Count	15	15		
	Pin Type 2: Ground			
Average	0.36	0.02		
St. Dev.	0.02	0.02		
Min	0.33	0.00		
Max	0.40	0.06		
Summary Count	15	15		
Total Count	15	15		

LLCR Delta Count by Category				
	Stable	**Minor**	**Acceptable**	**Unstable**
mOhms	**<=.33**	**>.33 & <=.66**	**>.67 & <=1**	**>1**
Acid Vapor	**30**	**0**	**0**	**0**

DATA SUMMARIES Continued

HDTM-4-08-1-S-VT-0-1 Compliant Pin LLCR:

LLCR Measurement Summaries by Pin Type				
Date	8/8/2017	8/12/2017		
Room Temp (Deg C)	23	23		
Rel Humidity (%)	43	46		
Technician	Aaron McKim	Aaron McKim		
mOhm values	**Actual Initial**	**Delta Acid Vapor**	**Delta**	**Delta**
HDTM	**Pin Type 1: Signal**			
Average	0.06	0.01		
St. Dev.	0.01	0.01		
Min	0.03	0.00		
Max	0.09	0.03		
Summary Count	15	15		
Total Count	15	15		
	Pin Type 2: Ground			
Average	0.07	0.01		
St. Dev.	0.02	0.01		
Min	0.04	0.00		
Max	0.10	0.03		
Summary Count	15	15		
Total Count	15	15		

LLCR Delta Count by Category				
	Stable	**Minor**	**Acceptable**	**Unstable**
mOhms	**<=.33**	**>.33 & <=.66**	**>.67 & <=1**	**>1**
Acid Vapor	**30**	**0**	**0**	**0**

DATA SUMMARIES Continued

INSULATION RESISTANCE (IR):

	Pin to Pin
	Unmated
	Minimum
Initial	45000
Thermal	45000
Humidity	45000

	Pin to Ground
	Unmated
	Minimum
Initial	45000
Thermal	45000
Humidity	6600

DIELECTRIC WITHSTANDING VOLTAGE (DWV):

Voltage Rating Summary	
Minimum	
Test Voltage	750
Working Voltage	250

Pin to Pin	
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

EQUIPMENT AND CALIBRATION SCHEDULES

Equipment #: TCT-07
Description: Automated Test Stand
Manufacturer: Chatillon/Lloyd
Model: LF Plus
Serial #: LF1310
Accuracy: See Manual
… Last Cal: 11/14/2017, Next Cal: 11/14/2018

Equipment #: HPT-01
Description: Hipot Safety Tester
Manufacturer: Vitrek
Model: V73
Serial #: 019808
Accuracy:
… Last Cal: 05/15/2017, Next Cal: 05/15/2018

Equipment #: MO-04
Description: Multimeter /Data Acquisition System
Manufacturer: Keithley
Model: 2700
Serial #: 0798688
Accuracy: See Manual
… Last Cal: 09/11/2017, Next Cal: 09/11/2018

Equipment #: PS-02
Description: Power Supply
Manufacturer: Hewlett-Packard
Model: 6033A
Serial #: N/A
Accuracy: See Manual
… Last Cal: NOT CALIBRATED

Equipment #: MO-10
Description: Model 2750 Multimeter/Switch System (Integra Series)
Manufacturer: Keithley
Model: 2750
Serial #: 1215161
Accuracy: See Manual
… Last Cal: 09/11/2017, Next Cal: 09/11/2018

Equipment #: THC-05
Description: Temperature/Humidity Chamber (Chamber Room)
Manufacturer: Thermotron
Model: SM-8-3800
Serial #: 05 23 00 02
Accuracy: See Manual
… Last Cal: 11/14/2017, Next Cal: 11/14/2018

EQUIPMENT AND CALIBRATION SCHEDULES

Equipment #: TSC-01
Description: Vertical Thermal Shock Chamber
Manufacturer: Cincinnati Sub Zero
Model: VTS-3-6-6-SC/AC
Serial #: 10-VT14993
Accuracy: See Manual
… Last Cal: 06/30/2017, Next Cal: 06/30/2018

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