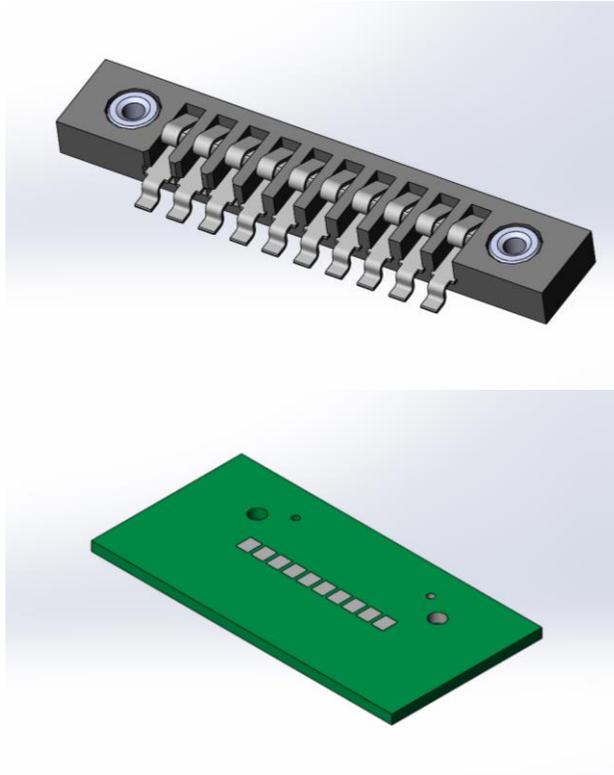




Project Number: Design Qualification Test Report	Tracking Code: 453911_Report_Rev_1
Requested by: Catie Eichhorn	Date: 11/23/2015
Part #: OPP-10-01-T-S-M-AD/EDGE CARD	Tech: Peter Chen
Part description: OPP/EDGE CARD	Qty to test: 105
Test Start: 01/20/2015	Test Completed: 04/20/2015



DESIGN QUALIFICATION TEST REPORT

OPP/EDGE CARD OPP-10-01-T-S-M-AD/EDGE CARD

REVISION HISTORY

DATA	REV.NUM.	DESCRIPTION	ENG
11/19/2015	1	Initial Issue	PC

CERTIFICATION

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

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SCOPE

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

APPLICABLE DOCUMENTS

Standards: EIA Publication 364

TEST SAMPLES AND PREPARATION

- 1) All materials were manufactured in accordance with the applicable product specification.
- 2) All test samples were identified and encoded to maintain traceability throughout the test sequences.
- 3) After soldering, the parts to be used for LLCR and DWV/IR testing were cleaned according to TLWI-0001.
- 4) Either an automated cleaning procedure or an ultrasonic cleaning procedure may be used.
- 5) The automated procedure is used with aqueous compatible soldering materials.
- 6) Parts not intended for testing LLCR and DWV/IR are visually inspected and cleaned if necessary.
- 7) Any additional preparation will be noted in the individual test sequences.
- 8) Solder Information: Lead free
- 9) Samtec Test PCBs used: PCB-106724-TST-XX/ PCB-106725-TST-XX/ PCB-106726-TST-XX.

FLOWCHARTS**Gas Tight**Group 1

OPP-10-01-T-S-M-AD
EDGE CARD
8 Assemblies

Step Description

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

(1) Gas Tight = EIA-364-36

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

Normal ForceGroup 1

OPP-10-01-T-S-M-AD
EDGE CARD
8 Contacts Minimum
Signal Without Thermals

Step Description

1. Contact Gaps
2. Normal Force (1)
Deflection = 0.020 "
Expected Force at Max Deflection = 450
g

Group 2

OPP-10-01-T-S-M-AD
EDGE CARD
8 Contacts Minimum
Signal With Thermals

Step Description

1. Contact Gaps
2. Thermal Age (2)
3. Contact Gaps
4. Normal Force (1)
Deflection = 0.020 "
Expected Force at Max Deflection = 450
g

(1) Normal Force = EIA-364-04

(2) Thermal Age = EIA-364-17
Test Condition = 4 (105°C)
Time Condition = B (250 Hours)

FLOWCHARTS Continued**Thermal Aging**Group 1

OPP-10-01-T-S-M-AD

EDGE CARD

8 Assemblies

Step	Description
1.	Contact Gaps
2.	Mating/Unmating Force ⁽²⁾
3.	LLCR ⁽¹⁾
4.	Thermal Age ⁽³⁾
5.	LLCR ⁽¹⁾ Max Delta = 15 mOhm
6.	Mating/Unmating Force ⁽²⁾
7.	Contact Gaps

(1) LLCR = EIA-364-23

Open Circuit Voltage = 20 mV Max

Test Current = 100 mA Max

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

(3) Thermal Age = EIA-364-17

Test Condition = 4 (105°C)

Time Condition = B (250 Hours)

FLOWCHARTS Continued**Mating/Unmating/Durability**

Group 1
OPP-10-01-T-S-M-AD
EDGE CARD
8 Assemblies

Group 2
OPP-03-01-T-S-M-AD
EDGE CARD
8 Assemblies

Group 3
OPP-07-01-T-S-M-AD
EDGE CARD
8 Assemblies

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)

Step Description

1. Contact Gaps
2. Mating/Unmating Force (3)
3. Cycles
Quantity = 25 Cycles
4. Mating/Unmating Force (3)
5. Cycles
Quantity = 25 Cycles
6. Mating/Unmating Force (3)
7. Cycles
Quantity = 25 Cycles
8. Mating/Unmating Force (3)
9. Cycles
Quantity = 25 Cycles
10. Mating/Unmating Force (3)

Step Description

1. Contact Gaps
2. Mating/Unmating Force (3)
3. Cycles
Quantity = 25 Cycles
4. Mating/Unmating Force (3)
5. Cycles
Quantity = 25 Cycles
6. Mating/Unmating Force (3)
7. Cycles
Quantity = 25 Cycles
8. Mating/Unmating Force (3)
9. Cycles
Quantity = 25 Cycles
10. Mating/Unmating Force (3)

(1) Humidity = EIA-364-31

Test Condition = B (240 Hours)
Test Method = III (+25°C to +65°C @ 90% RH to 98% RH)
Test Exceptions: ambient pre-condition and delete steps 7a ar

(2) LLCR = EIA-364-23

Open Circuit Voltage = 20 mV Max
Test Current = 100 mA Max

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

(4) Thermal Shock = EIA-364-32

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

FLOWCHARTS Continued**IR/DWV****Pin-to-Pin**

Group 1
OPP-10-01-T-S-M-AD
EDGE CARD
2 Assemblies

Group 2
OPP-10-01-T-S-M-AD
2 Assemblies

Group 3
EDGE CARD
2 Assemblies

Group 4
OPP-10-01-T-S-M-AD
EDGE CARD
2 Assemblies

Step	Description
1.	DWV Breakdown (2)

Step	Description
1.	DWV Breakdown (2)

Step	Description
1.	DWV Breakdown (2)

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

(1) DWV at Test Voltage = EIA-364-20

Test Condition = 1 (Sea Level)

DWV test voltage is equal to 75% of the lowest breakdown voltage

Test voltage applied for 60 seconds

(2) DWV Breakdown = EIA-364-20

Test Condition = 1 (Sea Level)

DWV test voltage is equal to 75% of the lowest breakdown voltage

Test voltage applied for 60 seconds

(3) Humidity = EIA-364-31

Test Condition = B (240 Hours)

Test Method = III (+25°C to +65°C @ 90% RH to 98% RH)

Test Exceptions: ambient pre-condition and delete steps 7a and 7b

(4) IR = EIA-364-21

Test Condition = 500 Vdc, 2 Minutes Max

(5) Thermal Shock = EIA-364-32

Exposure Time at Temperature Extremes = 1/2 Hour

Method A, Test Condition = I (-55°C to +85°C)

Test Duration = A-3 (100 Cycles)

FLOWCHARTS Continued**Current Carrying Capacity**

Group 1
OPP-10-01-T-S-M-AD
EDGE CARD
1 Pins Powered
Signal

Step Description

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

Group 2
OPP-10-01-T-S-M-AD
EDGE CARD
2 Pins Powered
Signal

Step Description

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

Group 3
OPP-10-01-T-S-M-AD
EDGE CARD
3 Pins Powered
Signal

Step Description

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

Group 4
OPP-10-01-T-S-M-AD
EDGE CARD
4 Pins Powered
Signal

Step Description

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

Group 5
OPP-10-01-T-S-M-AD
EDGE CARD
10 Pins Powered
Signal

Step Description

1. CCC ⁽¹⁾
Rows = 1
Number of Positions = 10

(1) CCC = EIA-364-70

Method 2, Temperature Rise Versus Current Curve

(TIN PLATING) - Tabulate calculated current at RT, 65°C, 75°C and 95°C after derating 20% and based on 105°C

(GOLD PLATING) - Tabulate calculated current at RT, 85°C, 95°C and 115°C after derating 20% and based on 125°C

FLOWCHARTS Continued**Mechanical Shock/Random Vibration/LLCR**Group 1

OPP-10-01-T-S-M-AD
EDGE CARD
8 Assemblies

Step Description

1. LLCR ⁽¹⁾
2. Mechanical Shock ⁽²⁾
3. Random Vibration ⁽³⁾
4. LLCR ⁽¹⁾
Max Delta = 15 mOhm

(1) LLCR = EIA-364-23

Open Circuit Voltage = 20 mV Max
Test Current = 100 mA Max

(2) Mechanical Shock = EIA-364-27

Test Condition = C (100 G Peak, 6 milliseconds, Half Sine)
Number of Shocks = 3 Per Direction, Per Axis, 18 Total

(3) Random Vibration = EIA-364-28

Condition = VB (7.56 gRMS Average, 2 Hours/Axis)

Mechanical Shock/Random Vibration/Event DetectionGroup 1

OPP-10-01-T-S-M-AD
EDGE CARD
60 Points

Step Description

1. Nanosecond Event Detection
(Mechanical Shock) ⁽¹⁾
2. Nanosecond Event Detection
(Random Vibration) ⁽²⁾

(1) Nanosecond Event Detection (Mechanical Shock)

Use EIA-364-87 for Nanosecond Event Detection:
Test Condition = F (50 nanoseconds at 10 ohms)

Use EIA-364-27 for Mechanical Shock:

Test Condition = C (100 G Peak, 6 milliseconds, Half Sine)
Number of Shocks = 3 Per Direction, Per Axis, 18 Total

(2) Nanosecond Event Detection (Random Vibration)

Use EIA-364-87 for Nanosecond Event Detection:
Test Condition = F (50 nanoseconds at 10 ohms)

Use EIA-364-28 for Random Vibration:

Condition = VB (7.56 gRMS Average, 2 Hours/Axis)

FLOWCHARTS Continued**Extended Life**

Group 1 OPP-10-01-T-S-M-AD EDGE CARD 8 Assemblies 250 Cycles		Group 2 OPP-10-01-T-S-M-AD EDGE CARD 8 Assemblies 500 Cycles		Group 3 OPP-10-01-T-S-M-AD EDGE CARD 8 Assemblies 1000 Cycles		Group 4 OPP-10-01-T-S-M-AD EDGE CARD 8 Assemblies 2500 Cycles	
Step	Description	Step	Description	Step	Description	Step	Description
1.	Plating Thickness Verification (4)	1.	Plating Thickness Verification (4)	1.	Plating Thickness Verification (4)	1.	Plating Thickness Verification (4)
2.	LLCR (2)	2.	LLCR (2)	2.	LLCR (2)	2.	LLCR (2)
3.	Cycles Quantity = 250 Cycles	3.	Cycles Quantity = 500 Cycles	3.	Cycles Quantity = 1000 Cycles	3.	Cycles Quantity = 2500 Cycles
4.	LLCR (2) Max Delta = 15 mOhm	4.	LLCR (2) Max Delta = 15 mOhm	4.	LLCR (2) Max Delta = 15 mOhm	4.	LLCR (2) Max Delta = 15 mOhm
5.	Thermal Shock (5)	5.	Thermal Shock (5)	5.	Thermal Shock (5)	5.	Thermal Shock (5)
6.	LLCR (2) Max Delta = 15 mOhm	6.	LLCR (2) Max Delta = 15 mOhm	6.	LLCR (2) Max Delta = 15 mOhm	6.	LLCR (2) Max Delta = 15 mOhm
7.	Humidity (1)	7.	Humidity (1)	7.	Humidity (1)	7.	Humidity (1)
8.	LLCR (2) Max Delta = 15 mOhm	8.	LLCR (2) Max Delta = 15 mOhm	8.	LLCR (2) Max Delta = 15 mOhm	8.	LLCR (2) Max Delta = 15 mOhm
9.	Photos (3)	9.	Photos (3)	9.	Photos (3)	9.	Photos (3)

- (1) Humidity = EIA-364-31
Test Condition = B (240 Hours)
Test Method = III (+25°C to +65°C @ 90% RH to 98% RH)
Test Exceptions: ambient pre-condition and delete steps 7a and 7b
- (2) LLCR = EIA-364-23
Open Circuit Voltage = 20 mV Max
Test Current = 100 mA Max
- (3) Photos
Attach 2-3 photos of contact area
- (4) Plating Thickness Verification
Measure, verify, and document plating thickness on both male and female (one group only)
Plating thickness to be measured on loose pins used during assembly
- (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)

ATTRIBUTE DEFINITIONS

The following is a brief, simplified description of attributes.

THERMAL SHOCK:

- 1) EIA-364-32, *Thermal Shock (Temperature Cycling) Test Procedure for Electrical Connectors*.
- 2) Test Condition 1: -55°C to +85°C
- 3) Test Time: ½ hour dwell at each temperature extreme
- 4) Number of Cycles: 100
- 5) All test samples are pre-conditioned at ambient.
- 6) All test samples are exposed to environmental stressing in the mated condition.

THERMAL:

- 1) EIA-364-17, *Temperature Life with or without Electrical Load Test Procedure for Electrical Connectors*.
- 2) Test Condition 4 at 105° C
- 3) Test Time Condition B for 250 hours.
- 4) All test samples are pre-conditioned at ambient.
- 5) All test samples are exposed to environmental stressing in the mated condition.

HUMIDITY:

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

MECHANICAL SHOCK (Specified Pulse):

- 1) Reference document: EIA-364-27, *Mechanical Shock Test Procedure for Electrical Connectors*
- 2) Test Condition C
- 3) Peak Value: 100 G
- 4) Duration: 6 Milliseconds
- 5) Wave Form: Half Sine
- 6) Velocity: 12.3 ft/s
- 7) Number of Shocks: 3 Shocks / Direction, 3 Axis (18 Total)

VIBRATION:

- 1) Reference document: EIA-364-28, *Vibration Test Procedure for Electrical Connectors*
- 2) Test Condition V, Letter B
- 3) Power Spectral Density: 0.04 G² / Hz
- 4) G 'RMS': 7.56
- 5) Frequency: 50 to 2000 Hz
- 6) Duration: 2.0 Hours per axis (3 axis total)

NANOSECOND-EVENT DETECTION:

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

ATTRIBUTE DEFINITIONS Continued

The following is a brief, simplified description of attributes.

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.

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° C
 - c. 75° C
 - d. 95° 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. $\leq +5.0$ mOhms:----- Stable
 - b. $+5.1$ to $+10.0$ mOhms:----- Minor
 - c. $+10.1$ to $+15.0$ mOhms:----- Acceptable
 - d. $+15.1$ to $+50.0$ mOhms:----- Marginal
 - e. $+50.1$ to $+2000$ mOhms:----- Unstable
 - f. $>+2000$ mOhms:----- Open Failure

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. $\leq +5.0$ mOhms:----- Stable
 - b. $+5.1$ to $+10.0$ mOhms:----- Minor
 - c. $+10.1$ to $+15.0$ mOhms:----- Acceptable
 - d. $+15.1$ to $+50.0$ mOhms:----- Marginal
 - e. $+50.1$ to $+2000$ mOhms:----- Unstable
 - f. $>+2000$ mOhms:----- Open Failure
- 4) Procedure:
 - a. Reference document: EIA-364-36, *Test Procedure for Determination of Gas-Tight Characteristics for Electrical Connectors, Sockets and/or Contact Systems*.
 - b. Test Conditions:
 - i. Class II--- Mated pairs of contacts assembled to their plastic housings.
 - ii. Reagent grade Nitric Acid shall be used of sufficient volume to saturate the test chamber
 - iii. The ratio of the volume of the test chamber to the surface area of the acid shall be 10:1.
 - iv. The chamber shall be saturated with the vapor for at least 15 minutes before samples are added.
 - v. Exposure time, 55 to 65 minutes.
 - vi. The samples shall be no closer to the chamber walls than 1 inches and no closer to the surface of the acid than 3 inches.
 - vii. The samples shall be dried after exposure for a minimum of 1 hour.
 - viii. Drying temperature 50° C
 - ix. The final LLCR shall be conducted within 1 hour after drying.

NORMAL FORCE (FOR CONTACTS TESTED IN THE HOUSING):

- 1) Reference document: EIA-364-04, *Normal Force Test Procedure for Electrical Connectors*.
- 2) The contacts shall be tested in the connector housing.
- 3) If necessary, a "window" shall be made in the connector body to allow a probe to engage and deflect the contact at the same attitude and distance (plus 0.05 mm [0.002"]) as would occur in actual use.
- 4) The connector housing shall be placed in a holding fixture that does not interfere with or otherwise influence the contact force or deflection.
- 5) Said holding fixture shall be mounted on a floating, adjustable, X-Y table on the base of the Dillon TC², computer controlled test stand with a deflection measurement system accuracy of 5.0 μ m (0.0002").
- 6) The nominal deflection rate shall be 5 mm (0.2")/minute.
- 7) Unless otherwise noted a minimum of five contacts shall be tested.
- 8) The force/deflection characteristic to load and unload each contact shall be repeated five times.
- 9) The system shall utilize the TC² software in order to acquire and record the test data.
- 10) The permanent set of each contact shall be measured within the TC² software.
- 11) The acquired data shall be graphed with the deflection data on the X-axis and the force data on the Y-axis and a print out will be stored with the Tracking Code paperwork.

ATTRIBUTE DEFINITIONS Continued

The following is a brief, simplified description of attributes

INSULATION RESISTANCE (IR):

To determine the resistance of insulation materials to leakage of current through or on the surface of these materials when a DC potential is applied.

- 1) PROCEDURE:
 - a. Reference document: EIA-364-21, *Insulation Resistance Test Procedure for Electrical Connectors*.
 - b. Test Conditions:
 - i. Between Adjacent Contacts or Signal-to-Ground
 - ii. Electrification Time 2.0 minutes
 - iii. Test Voltage (500 VDC) corresponds to calibration settings for measuring resistances.
- 2) MEASUREMENTS:
- 3) When the specified test voltage is applied (VDC), the insulation resistance shall not be less than 5000 megohms.

DIELECTRIC WITHSTANDING VOLTAGE (DWV):

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

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

RESULTS

Temperature Rise, CCC at a 20% de-rating

- CCC for a 30°C Temperature Rise-----9.6 A per contact with 1 contacts (1x1) powered
- CCC for a 30°C Temperature Rise-----7.8 A per contact with 2 contacts (1x2) powered
- CCC for a 30°C Temperature Rise-----6.7 A per contact with 3 contacts (1x3) powered
- CCC for a 30°C Temperature Rise-----6.2 A per contact with 4 contacts (1x4) powered
- CCC for a 30°C Temperature Rise-----4.8 A per contact with 10 contacts (1x10) powered

Mating – Unmating Forces

Thermal Aging Group (OPP-10-01-T-S-M-AD /EDGE CARD)

- Initial
 - Mating
 - Min -----14.98 Lbs
 - Max-----17.62 Lbs
- After Thermal
 - Mating
 - Min -----13.25 Lbs
 - Max-----15.84 Lbs

Mating – Unmating Forces

Mating-Unmating Durability Group (OPP-10-01-T-S-M-AD /EDGE CARD)

- Initial
 - Mating
 - Min -----15.47 Lbs
 - Max-----19.25Lbs
- After 25 Cycles
 - Mating
 - Min -----16.32 Lbs
 - Max-----20.12 Lbs
- After 50 Cycles
 - Mating
 - Min -----16.50 Lbs
 - Max-----21.38 Lbs
- After 75 Cycles
 - Mating
 - Min -----17.42 Lbs
 - Max-----21.55 Lbs
- After 100 Cycles
 - Mating
 - Min -----17.50 Lbs
 - Max-----21.48 Lbs
- Humidity
 - Mating
 - Min -----15.65 Lbs
 - Max-----17.24 Lbs

RESULTS Continued**Mating – Unmating Forces****Mating-Unmating Basic (OPP-07-01-T-S-M-AD /EDGE CARD)**

- **Initial**
 - **Mating**
 - **Min** ----- 8.33 Lbs
 - **Max** -----10.29 Lbs
- **After 25 Cycles**
 - **Mating**
 - **Min** ----- 8.58 Lbs
 - **Max** -----10.81 Lbs
- **After 50 Cycles**
 - **Mating**
 - **Min** ----- 8.62 Lbs
 - **Max** -----10.89 Lbs
- **After 75 Cycles**
 - **Mating**
 - **Min** ----- 8.64 Lbs
 - **Max** -----11.38 Lbs
- **After 100 Cycles**
 - **Mating**
 - **Min** ----- 8.75 Lbs
 - **Max** -----12.39 Lbs

Mating-Unmating Basic (OPP-03-01-T-S-M-AD /EDGE CARD)

- **Initial**
 - **Mating**
 - **Min** ----- 4.38 Lbs
 - **Max** ----- 5.09 Lbs
- **After 25 Cycles**
 - **Mating**
 - **Min** ----- 4.54 Lbs
 - **Max** ----- 5.22 Lbs
- **After 50 Cycles**
 - **Mating**
 - **Min** ----- 4.59 Lbs
 - **Max** ----- 5.30 Lbs
- **After 75 Cycles**
 - **Mating**
 - **Min** ----- 4.64 Lbs
 - **Max** ----- 5.37 Lbs
- **After 100 Cycles**
 - **Mating**
 - **Min** ----- 4.65 Lbs
 - **Max** ----- 5.43 Lbs

Normal Force at 0.0267 inch deflection

- **Initial**
 - **Min** ----- 888.10 gf **Set** ---- 0.0045 in
 - **Max** ----- 973.80 gf **Set** ---- 0.0052 in
- **Thermal**
 - **Min** ----- 778.80 gf **Set** ---- 0.0045 in
 - **Max** ----- 873.60 gf **Set** ---- 0.0062 in

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

- **Initial**
 - Mated-----10000 Meg Ω ----- Passed
 - Unmated -----10000 Meg Ω ----- Passed
- **Thermal Shock**
 - Mated-----10000 Meg Ω ----- Passed
 - Unmated -----10000 Meg Ω ----- Passed
- **Humidity**
 - Mated-----10000 Meg Ω ----- Passed
 - Unmated -----10000 Meg Ω ----- Passed

Dielectric Withstanding Voltage minimums, DWV

- **Minimums**
 - Breakdown Voltage----- 1125 VAC
 - Test Voltage -----845 VAC
 - Working Voltage -----280 VAC

Pin to Pin

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

RESULTS Continued**LLCR Thermal Aging Group (64 LLCR test points)**

- **Initial** -----2.26 mOhms Max
- **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

LLCR Mating/Unmating Durability Group (64 LLCR test points)

- **Initial** -----2.01 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 Shock**
 - <= +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 -----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 Group (64 LLCR test points)

- **Initial** -----2.00 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

RESULTS Continued**LLCR Shock & Vibration Group (64 LLCR test points)**

- **Initial** -----2.01 mOhms Max
- **Shock & Vibration**
 - **<= +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

Mechanical Shock & Random Vibration:

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

LLCR Extended Life Group (64 LLCR test points)**Group 1 -250 Cycles**

- **Initial** -----2.06 mOhms Max
- **Durability, 250 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 Shock**
 - **<= +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** -----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

RESULTS Continued**Group 2 -500 Cycles**

- **Initial** -----2.08 mOhms Max
- **Durability, 500 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 Shock**
 - <= +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 -----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

Group 3 -1000 Cycles

- **Initial** -----2.12 mOhms Max
- **Durability, 1000 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 Shock**
 - <= +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 -----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

RESULTS Continued**Group 4 -2500 Cycles**

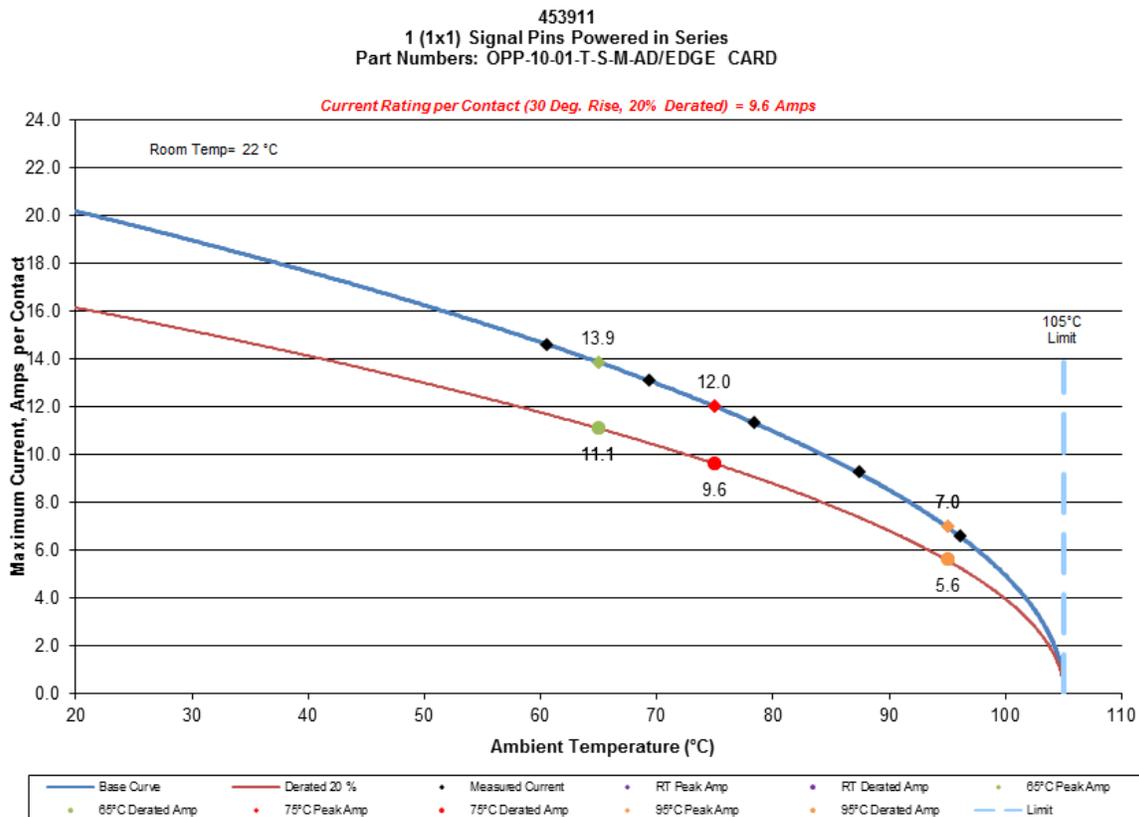
- **Initial** -----2.20 mOhms Max
- **Durability, 2500 Cycles**
 - **<= +5.0 mOhms** -----64 Points ----- Stable
 - **+5.1 to +10.0 mOhms** -----0 Points ----- Minor
 - **+10.1 to +15.0 mOhms** -----0 Points ----- Acceptable
 - **+15.1 to +50.0 mOhms** -----0 Points ----- Marginal
 - **+50.1 to +2000 mOhms** -----0 Points ----- Unstable
 - **>+2000 mOhms** -----0 Points ----- Open Failure
- **Thermal Shock**
 - **<= +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
- **Humidity**
 - **<= +5.0 mOhms** -----49 Points ----- Stable
 - **+5.1 to +10.0 mOhms** -----15 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

DATA SUMMARIES

TEMPERATURE RISE (Current Carrying Capacity, CCC):

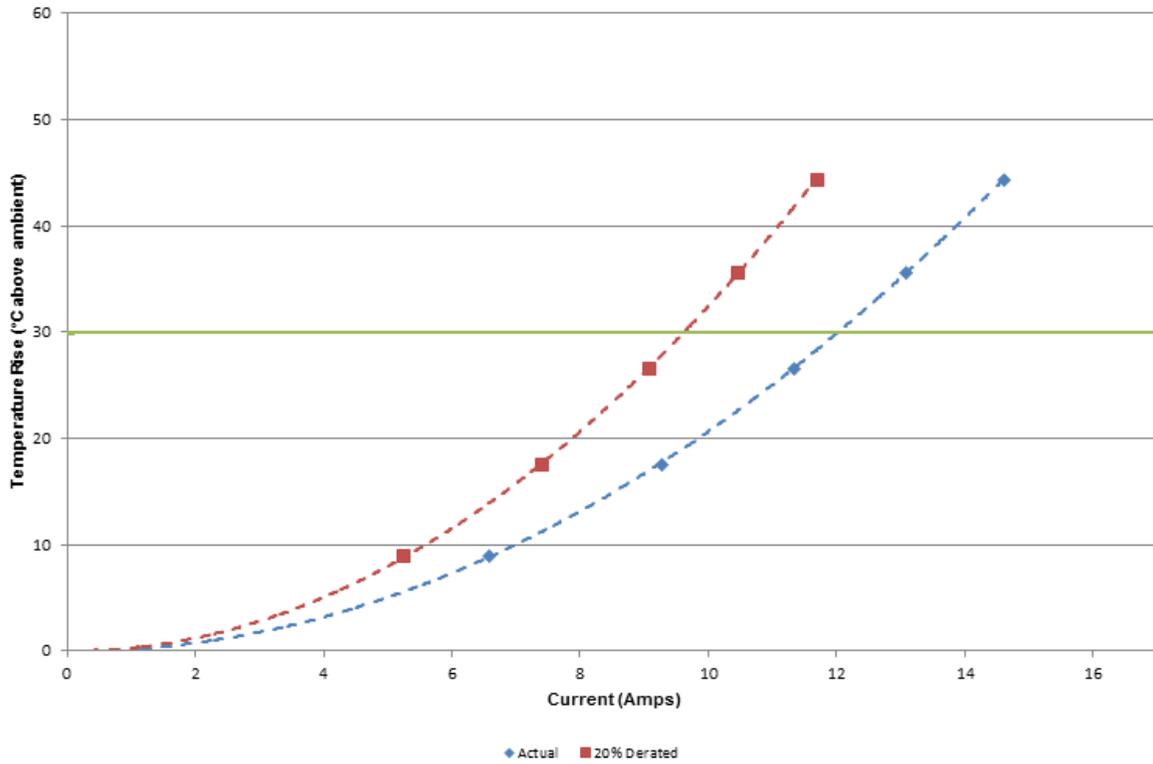
- 1) High quality thermocouples whose temperature slopes track one another were used for temperature monitoring.
- 2) The thermocouples were placed at a location to sense the maximum temperature generated during testing.
- 3) Temperature readings recorded are those for which three successive readings,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

a. Linear configuration with 1 adjacent conductors/contacts powered



DATA SUMMARIES Continued

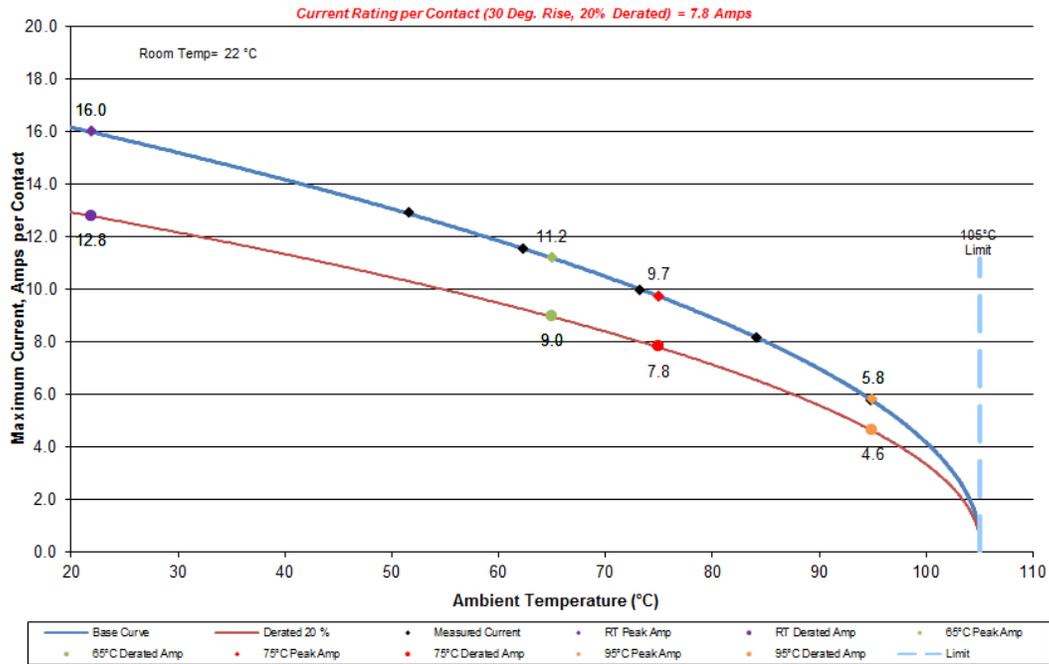
453911
1 (1x1) Signal Pins Powered in Series
Part Numbers: OPP-10-01-T-S-M-AD/EDGE CARD



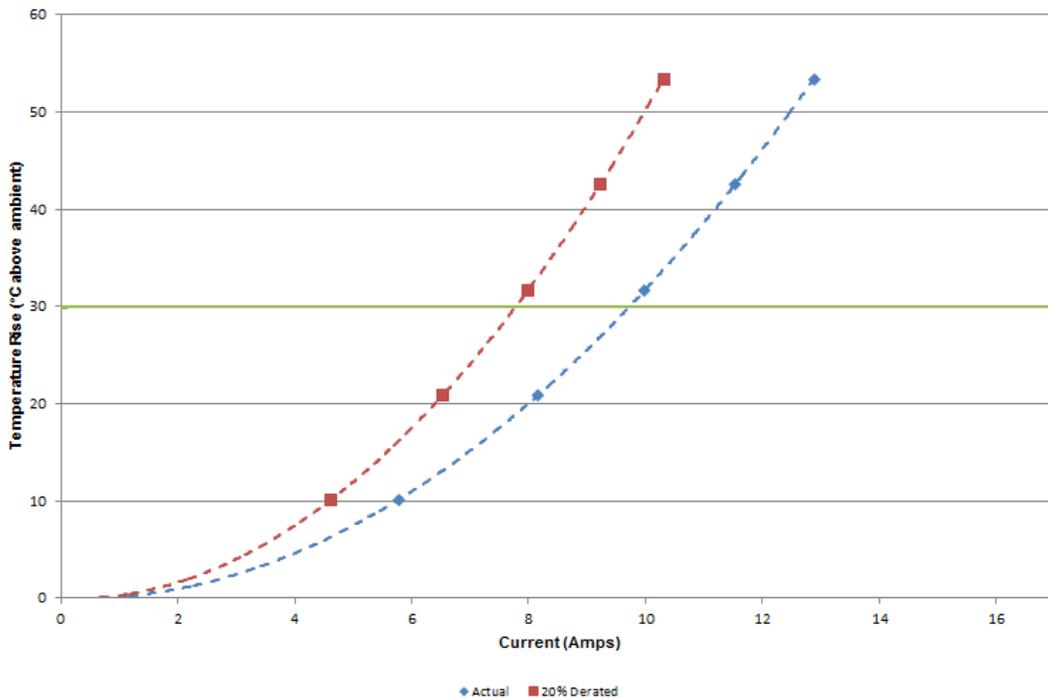
DATA SUMMARIES Continued

b. Linear configuration with 2 adjacent conductors/contacts powered

453911
2 (1x2) Signal Pins Powered in Series
Part Numbers: OPP-10-01-T-S-M-AD/EDGE CARD

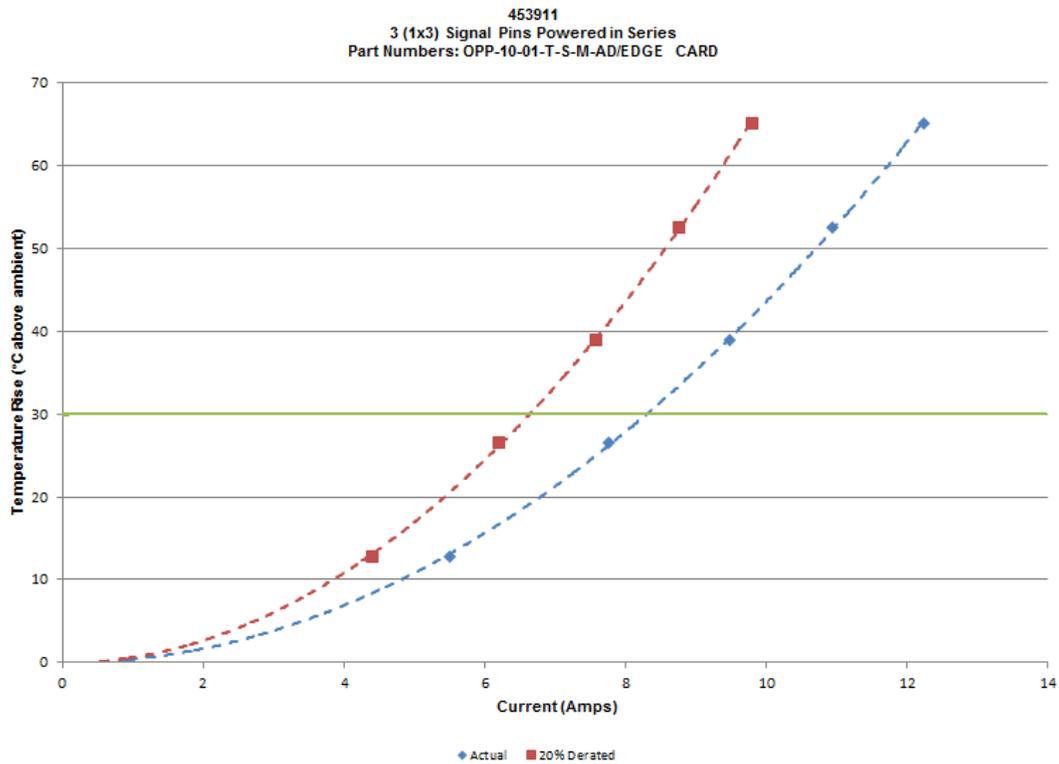
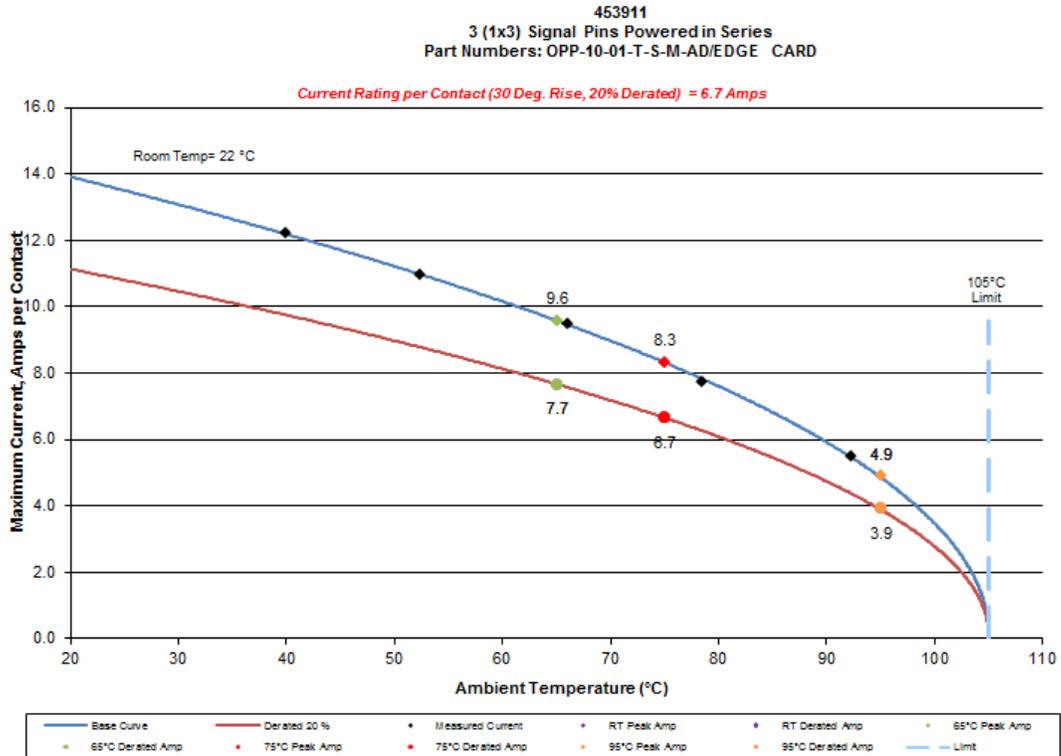


453911
2 (1x2) Signal Pins Powered in Series
Part Numbers: OPP-10-01-T-S-M-AD/EDGE CARD



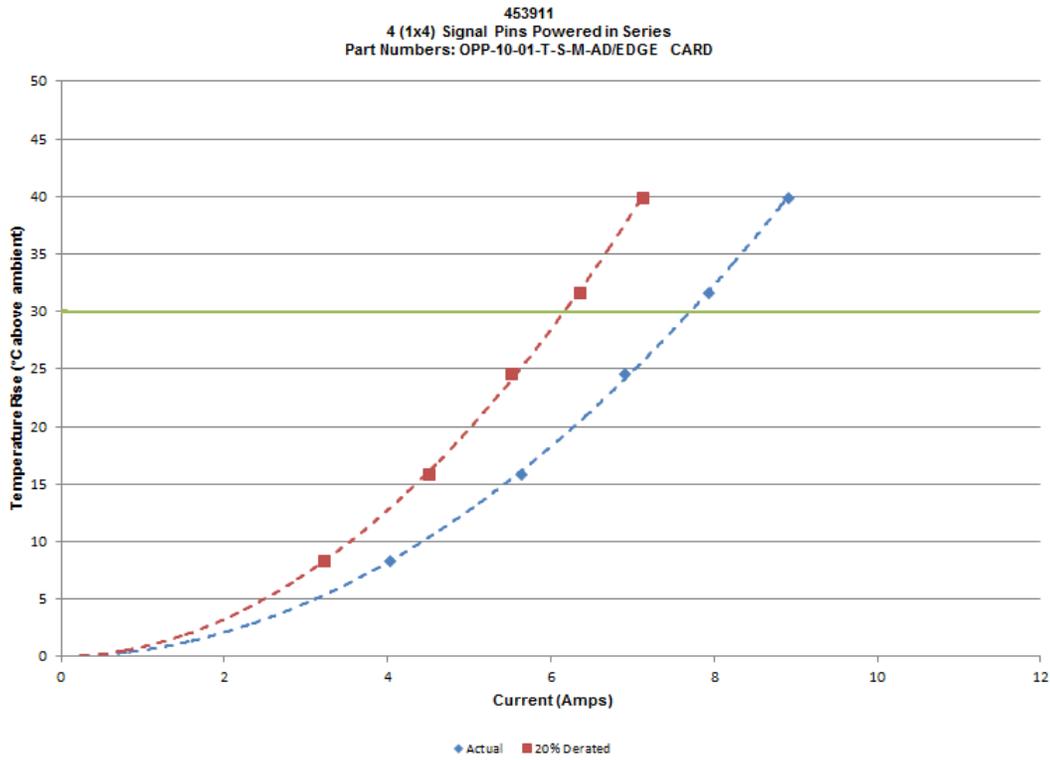
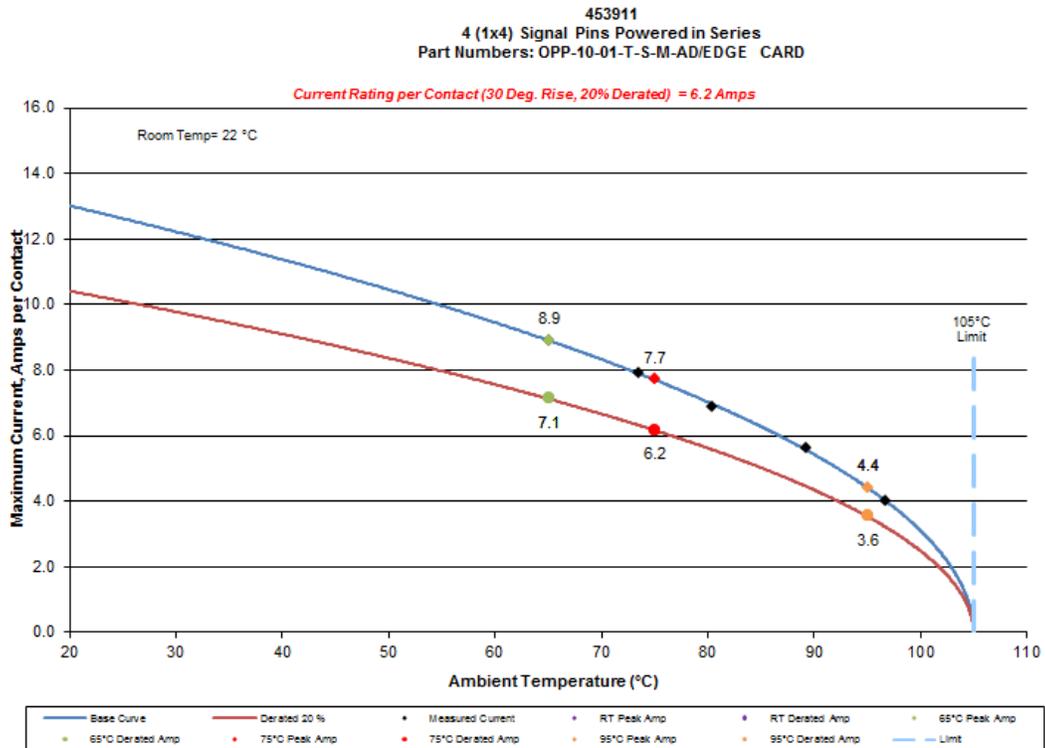
DATA SUMMARIES Continued

c. Linear configuration with 3 adjacent conductors/contacts powered



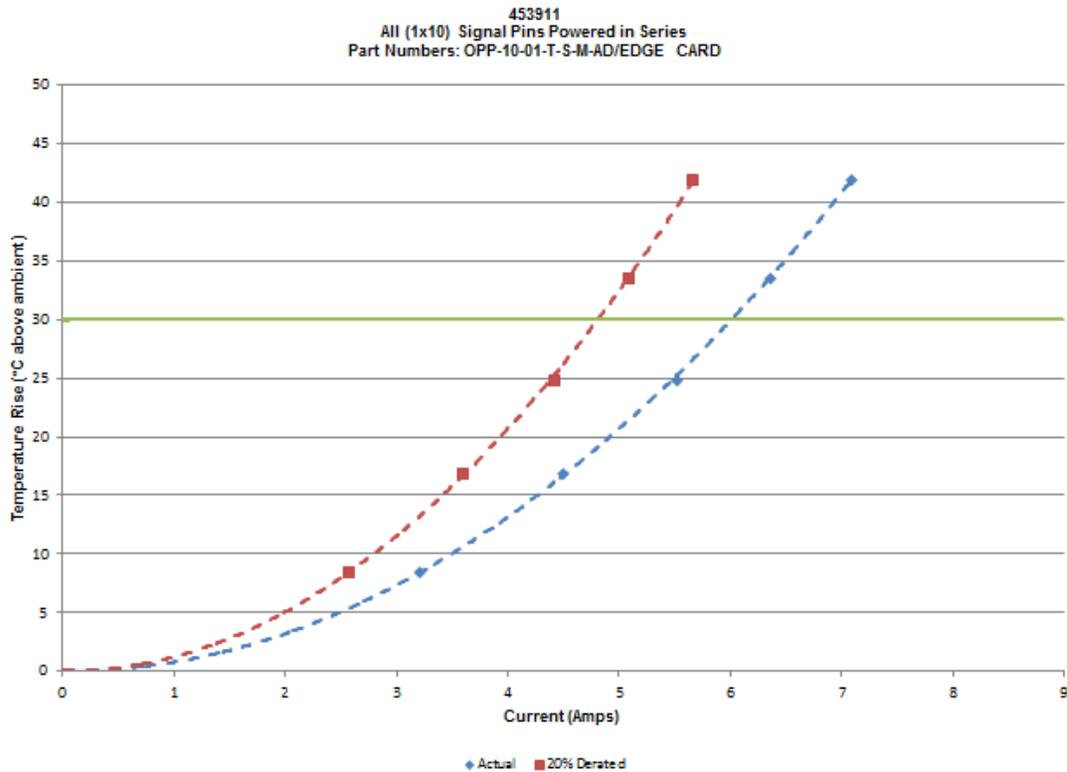
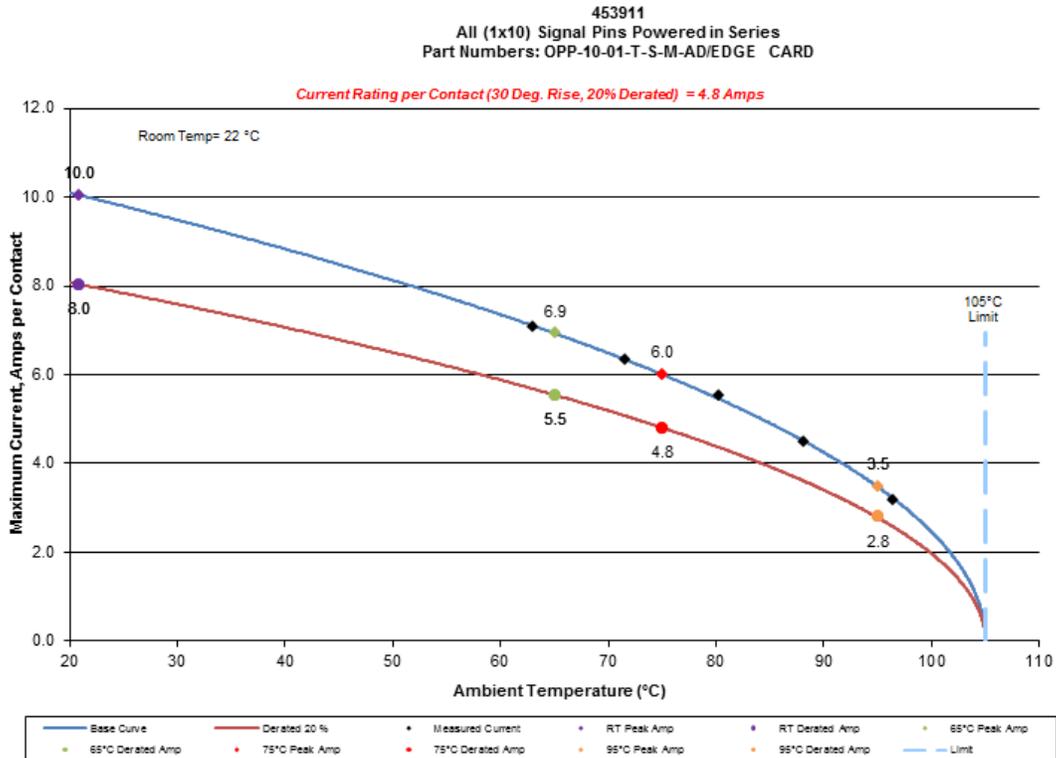
DATA SUMMARIES Continued

d. Linear configuration with 4 adjacent conductors/contacts powered



DATA SUMMARIES Continued

e. Linear configuration with all adjacent conductors/contacts powered



DATA SUMMARIES Continued**MATING-UNMATING FORCE:****Thermal Aging Group (OPP-10-01-T-S-M-AD /EDGE CARD)**

	Initial				After Thermals			
	Mating		Unmating		Mating		Unmating	
	Newton's	Force (Lbs)	Newton's	Force (Lbs)	Newton's	Force (Lbs)	Newton's	Force (Lbs)
Minimum	66.63	14.98	0.00	0.00	58.94	13.25	0.00	0.00
Maximum	78.37	17.62	0.00	0.00	70.46	15.84	0.00	0.00
Average	73.03	16.42	0.00	0.00	66.43	14.94	0.00	0.00
St Dev	3.76	0.84	0.00	0.00	3.37	0.76	0.00	0.00
Count	8	8	8	8	7	7	7	7

Mating-Unmating Durability Group (OPP-10-01-T-S-M-AD /EDGE CARD)

	Initial				After 25 Cycles			
	Mating		Unmating		Mating		Unmating	
	Newton's	Force (Lbs)	Newton's	Force (Lbs)	Newton's	Force (Lbs)	Newton's	Force (Lbs)
Minimum	68.81	15.47	0.00	0.00	72.59	16.32	0.00	0.00
Maximum	85.62	19.25	0.00	0.00	89.49	20.12	0.00	0.00
Average	75.69	17.02	0.00	0.00	79.13	17.79	0.00	0.00
St Dev	5.20	1.17	0.00	0.00	5.52	1.24	0.00	0.00
Count	8	8	8	8	8	8	8	8

	After 50 Cycles				After 75 Cycles			
	Mating		Unmating		Mating		Unmating	
	Newton's	Force (Lbs)	Newton's	Force (Lbs)	Newton's	Force (Lbs)	Newton's	Force (Lbs)
Minimum	73.39	16.50	0.00	0.00	77.48	17.42	0.00	0.00
Maximum	95.10	21.38	0.00	0.00	95.85	21.55	0.00	0.00
Average	81.05	18.22	0.00	0.00	82.43	18.53	0.00	0.00
St Dev	6.88	1.55	0.00	0.00	6.24	1.40	0.00	0.00
Count	8	8	8	8	8	8	8	8

	After 100 Cycles				After Humidity			
	Mating		Unmating		Mating		Unmating	
	Newton's	Force (Lbs)	Newton's	Force (Lbs)	Newton's	Force (Lbs)	Newton's	Force (Lbs)
Minimum	77.84	17.50	0.00	0.00	69.61	15.65	0.00	0.00
Maximum	95.54	21.48	0.00	0.00	76.68	17.24	0.00	0.00
Average	83.50	18.77	0.00	0.00	72.19	16.23	0.00	0.00
St Dev	5.80	1.30	0.00	0.00	2.73	0.61	0.00	0.00
Count	8	8	8	8	8	8	8	8

DATA SUMMARIES Continued**Mating-Unmating Basic (OPP-07-01-T-S-M-AD/EDGE CARD)**

	Initial				After 25 Cycles			
	Mating		Unmating		Mating		Unmating	
	Newton's	Force (Lbs)	Newton's	Force (Lbs)	Newton's	Force (Lbs)	Newton's	Force (Lbs)
Minimum	37.05	8.33	0.00	0.00	38.16	8.58	0.00	0.00
Maximum	45.77	10.29	0.00	0.00	48.08	10.81	0.00	0.00
Average	42.36	9.52	0.00	0.00	43.61	9.81	0.00	0.00
St Dev	3.31	0.74	0.00	0.00	3.56	0.80	0.00	0.00
Count	8	8	8	8	8	8	8	8
	After 50 Cycles				After 75 Cycles			
	Mating		Unmating		Mating		Unmating	
	Newton's	Force (Lbs)	Newton's	Force (Lbs)	Newton's	Force (Lbs)	Newton's	Force (Lbs)
Minimum	38.34	8.62	0.00	0.00	38.43	8.64	0.00	0.00
Maximum	48.44	10.89	0.00	0.00	50.62	11.38	0.00	0.00
Average	44.06	9.91	0.00	0.00	44.72	10.05	0.00	0.00
St Dev	3.68	0.83	0.00	0.00	4.27	0.96	0.00	0.00
Count	8	8	8	8	8	8	8	8
	After 100 Cycles							
	Mating		Unmating					
	Newton's	Force (Lbs)	Newton's	Force (Lbs)				
Minimum	38.92	8.75	0.00	0.00				
Maximum	55.11	12.39	0.00	0.00				
Average	45.60	10.25	0.00	0.00				
St Dev	5.25	1.18	0.00	0.00				
Count	8	8	8	8				

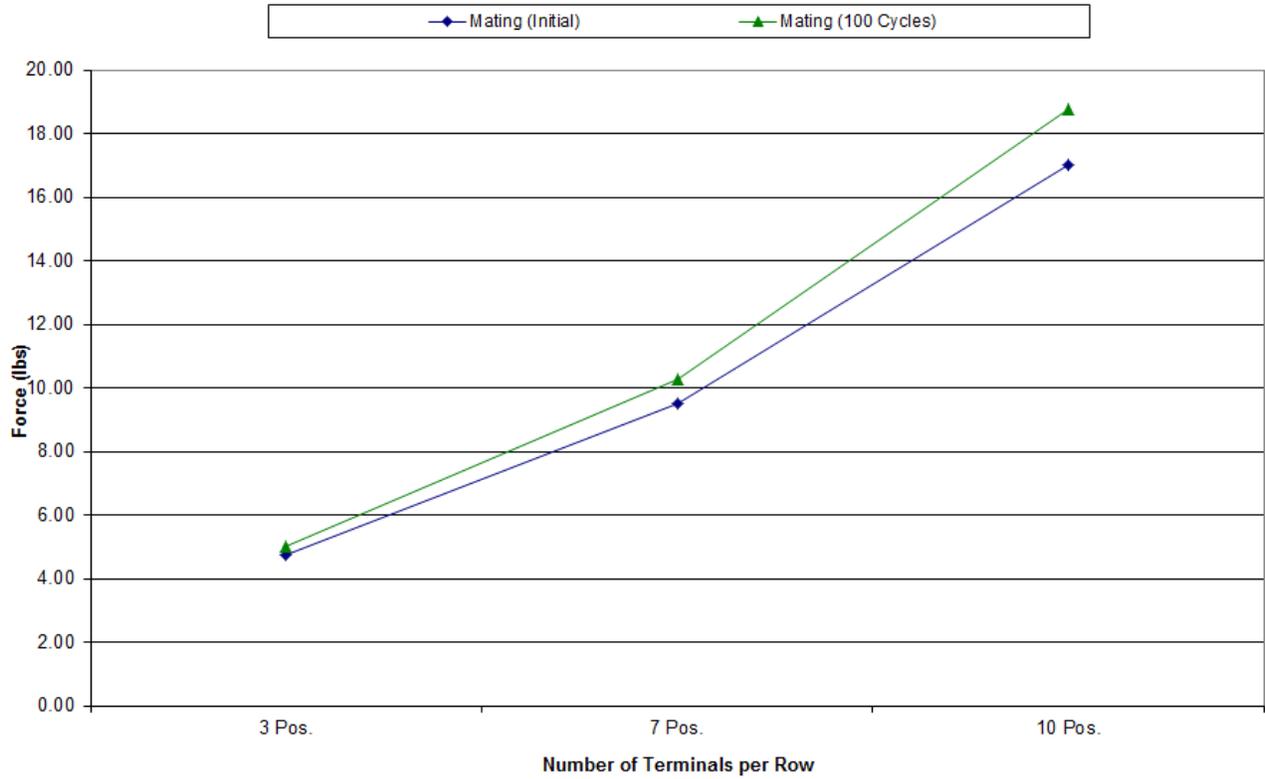
DATA SUMMARIES Continued**Mating-Unmating Basic (OPP-03-01-T-S-M-AD/EDGE CARD)**

	Initial				After 25 Cycles			
	Mating		Unmating		Mating		Unmating	
	Newton's	Force (Lbs)	Newton's	Force (Lbs)	Newton's	Force (Lbs)	Newton's	Force (Lbs)
Minimum	19.48	4.38	0.00	0.00	20.19	4.54	0.00	0.00
Maximum	22.64	5.09	0.00	0.00	23.22	5.22	0.00	0.00
Average	21.01	4.72	0.00	0.00	21.59	4.85	0.00	0.00
St Dev	0.96	0.22	0.00	0.00	1.01	0.23	0.00	0.00
Count	8	8	8	8	8	8	8	8
	After 50 Cycles				After 75 Cycles			
	Mating		Unmating		Mating		Unmating	
	Newton's	Force (Lbs)	Newton's	Force (Lbs)	Newton's	Force (Lbs)	Newton's	Force (Lbs)
Minimum	20.42	4.59	0.00	0.00	20.64	4.64	0.00	0.00
Maximum	23.57	5.30	0.00	0.00	23.89	5.37	0.00	0.00
Average	21.93	4.93	0.00	0.00	22.14	4.98	0.00	0.00
St Dev	1.00	0.22	0.00	0.00	1.05	0.24	0.00	0.00
Count	8	8	8	8	8	8	8	8
	After 100 Cycles							
	Mating		Unmating					
	Newton's	Force (Lbs)	Newton's	Force (Lbs)				
Minimum	20.68	4.65	0.00	0.00				
Maximum	24.15	5.43	0.00	0.00				
Average	22.24	5.00	0.00	0.00				
St Dev	1.10	0.25	0.00	0.00				
Count	8	8	8	8				

DATA SUMMARIES Continued

Mating\Unmating Force Comparison

Mating/Unmating Data for 3, 7 and 10 Position OPP/CARD



DATA SUMMARIES Continued

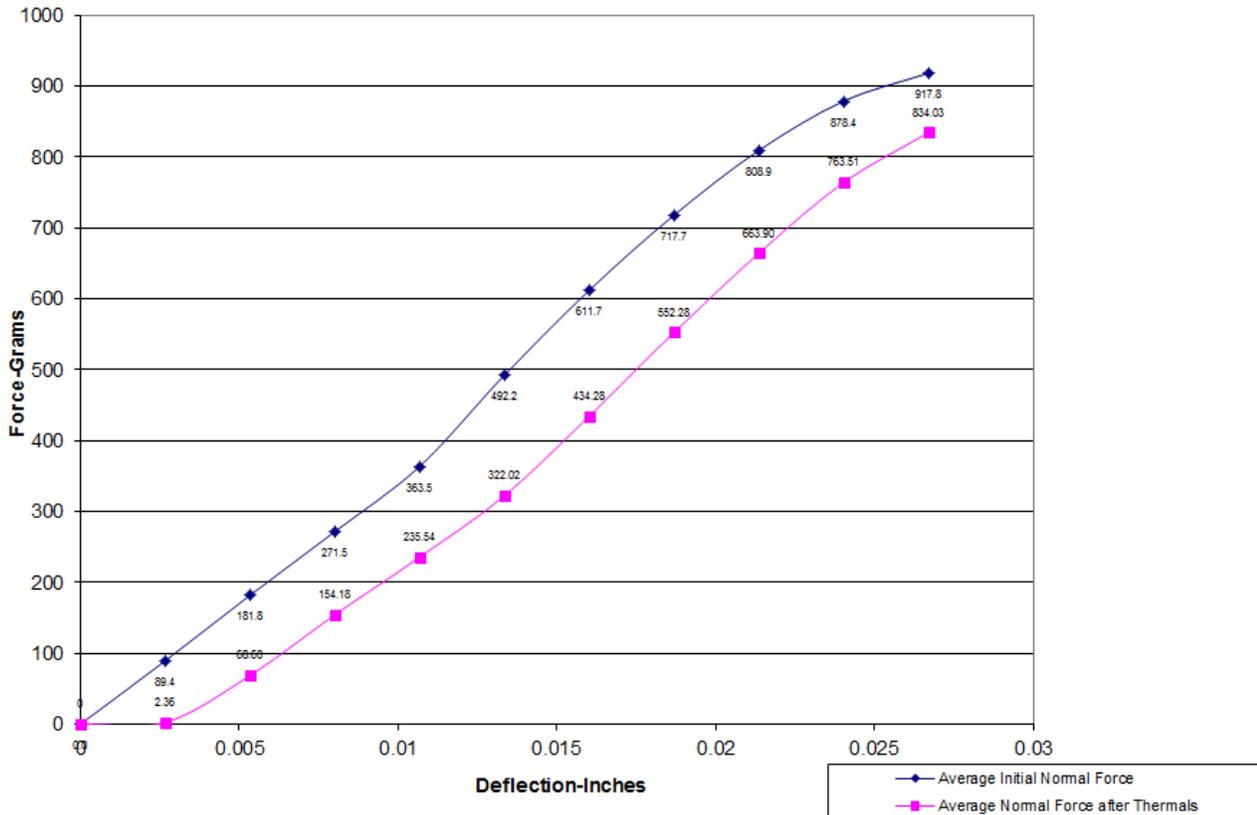
NORMAL FORCE (FOR CONTACTS TESTED IN THE HOUSING):

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

Initial	Deflections in inches Forces in Grams										
	<u>0.0027</u>	<u>0.0053</u>	<u>0.0080</u>	<u>0.0107</u>	<u>0.0134</u>	<u>0.0160</u>	<u>0.0187</u>	<u>0.0214</u>	<u>0.0240</u>	<u>0.0267</u>	<i>SET</i>
Averages	89.41	181.78	271.49	363.48	492.22	611.73	717.71	808.92	878.40	917.82	0.0050
Min	70.70	160.00	262.30	342.00	468.70	579.20	690.60	786.30	845.90	888.10	0.0045
Max	96.70	191.40	283.70	397.40	525.60	668.00	766.80	864.10	934.80	973.80	0.0052
St. Dev	7.234	8.251	7.863	16.202	19.638	23.696	23.964	22.046	26.772	25.060	0.0002
Count	12	12	12	12	12	12	12	12	12	12	12

After Thermals	Deflections in inches Forces in Grams										
	<u>0.0027</u>	<u>0.0053</u>	<u>0.0080</u>	<u>0.0107</u>	<u>0.0134</u>	<u>0.0160</u>	<u>0.0187</u>	<u>0.0214</u>	<u>0.0240</u>	<u>0.0267</u>	<i>SET</i>
Averages	2.36	68.60	154.18	235.54	322.02	434.28	552.28	663.90	763.51	834.03	0.0054
Min	-0.60	1.20	83.80	161.90	240.50	325.30	444.10	562.10	676.10	778.80	0.0045
Max	22.50	110.90	196.00	276.00	371.10	495.00	611.90	718.80	808.00	873.00	0.0062
St. Dev	6.483	31.065	31.860	32.770	36.325	49.949	48.894	45.583	37.205	27.371	0.0005
Count	12	12	12	12	12	12	12	12	12	12	12

Normal Force - Average Initial vs Average Thermal



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

Minimum	Pin to Pin		
	Mated	Unmated	Unmated
	OPP/CARD	OPP	CARD
Initial	10000	10000	10000
Thermal	10000	10000	10000
Humidity	10000	10000	10000

DIELECTRIC WITHSTANDING VOLTAGE (DWV):

Voltage Rating Summary	
Minimum	OPP/CARD
Break Down Voltage	1125
Test Voltage	845
Working Voltage	280

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

DATA SUMMARIES Continued**LLCR Thermal Aging Group**

- 1) A total of 64 points were measured.
- 2) EIA-364-23, *Low Level Contact Resistance Test Procedure for Electrical Connectors and Sockets*.
- 3) A computer program, *LLCR 221.exe*, ensures repeatability for data acquisition.
- 4) The following guidelines are used to categorize the changes in LLCR as a result from stressing.
 - a. $\leq +5.0$ mOhms:----- Stable
 - b. $+5.1$ to $+10.0$ mOhms:----- Minor
 - c. $+10.1$ to $+15.0$ mOhms:----- Acceptable
 - d. $+15.1$ to $+50.0$ mOhms:----- Marginal
 - e. $+50.1$ to $+2000$ mOhms ----- Unstable
 - f. $>+2000$ mOhms:----- Open Failure

LLCR Measurement Summaries by Pin Type				
Date	2/10/2015	3/11/2015		
Room Temp (Deg C)	23	21		
Rel Humidity (%)	46	54		
Technician	Peter Chen	Peter Chen		
mOhm values	Actual Initial	Delta Thermal	Delta	Delta
Pin Type 1: Signal				
Average	1.87	0.20		
St. Dev.	0.12	0.11		
Min	1.70	0.01		
Max	2.26	0.68		
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	64	0	0	0	0	0

DATA SUMMARIES Continued**LLCR Mating/Unmating Durability Group**

- 1). A total of 64 points were measured.
- 2). EIA-364-23, *Low Level Contact Resistance Test Procedure for Electrical Connectors and Sockets*.
- 3). A computer program, *LLCR 221.exe*, ensures repeatability for data acquisition.
- 4). The following guidelines are used to categorize the changes in LLCR as a result from stressing.
 - a. $\leq +5.0$ mOhms: ----- Stable
 - b. $+5.1$ to $+10.0$ mOhms: ----- Minor
 - c. $+10.1$ to $+15.0$ mOhms: ----- Acceptable
 - d. $+15.1$ to $+50.0$ mOhms: ----- Marginal
 - e. $+50.1$ to $+2000$ mOhms ----- Unstable
 - f. $> +2000$ mOhms: ----- Open Failure

LLCR Measurement Summaries by Pin Type				
Date	2/9/2015	2/11/2015	3/5/2015	3/19/2015
Room Temp (Deg C)	21	23	22	21
Rel Humidity (%)	45	47	56	53
Technician	Peter Chen	Peter Chen	Peter Chen	Peter Chen
mOhm values	Actual Initial	Delta 100 Cycles	Delta Therm Shck	Delta Humidity
Pin Type 1: Signal				
Average	1.85	0.25	0.38	0.44
St. Dev.	0.07	0.21	0.44	0.49
Min	1.68	0.00	0.06	0.01
Max	2.01	1.21	3.21	3.40
Summary Count	64	64	64	64
Total Count	64	64	64	64

LLCR Delta Count by Category						
mOhms	Stable	Minor	Acceptable	Marginal	Unstable	Open
	≤ 5	>5 & ≤ 10	>10 & ≤ 15	>15 & ≤ 50	>50 & ≤ 1000	>1000
100 Cycles	64	0	0	0	0	0
Therm Shck	64	0	0	0	0	0
Humidity	64	0	0	0	0	0

DATA SUMMARIES Continued**LLCR Gas Tight Group**

- 1) A total of 64 points were measured.
- 2) EIA-364-23, *Low Level Contact Resistance Test Procedure for Electrical Connectors and Sockets*.
- 3) A computer program, *LLCR 221.exe*, ensures repeatability for data acquisition.
- 4) The following guidelines are used to categorize the changes in LLCR as a result from stressing.
 - a. $\leq +5.0$ mOhms: ----- Stable
 - b. $+5.1$ to $+10.0$ mOhms: ----- Minor
 - c. $+10.1$ to $+15.0$ mOhms: ----- Acceptable
 - d. $+15.1$ to $+50.0$ mOhms: ----- Marginal
 - e. $+50.1$ to $+2000$ mOhms: ----- Unstable
 - f. $>+2000$ mOhms: ----- Open Failure

LLCR Measurement Summaries by Pin Type				
Date	3/3/2015	3/3/2015		
Room Temp (Deg C)	22	23		
Rel Humidity (%)	55	54		
Technician	Peter Chen	Peter Chen		
mOhm values	Actual Initial	Delta Acid Vapor	Delta	Delta
Pin Type 1: Signal				
Average	1.81	0.14		
St. Dev.	0.10	0.10		
Min	1.42	0.00		
Max	2.00	0.41		
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	64	0	0	0	0	0

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

- 1) A total of 64 points were measured.
- 2) EIA-364-23, *Low Level Contact Resistance Test Procedure for Electrical Connectors and Sockets*.
- 3) A computer program, *LLCR 221.exe*, ensures repeatability for data acquisition.
- 4) The following guidelines are used to categorize the changes in LLCR as a result from stressing.
 - a. $\leq +5.0$ mOhms:----- Stable
 - b. $+5.1$ to $+10.0$ mOhms:----- Minor
 - c. $+10.1$ to $+15.0$ mOhms:----- Acceptable
 - d. $+15.1$ to $+50.0$ mOhms:----- Marginal
 - e. $+50.1$ to $+2000$ mOhms ----- Unstable
 - f. $>+2000$ mOhms:----- Open Failure

LLCR Measurement Summaries by Pin Type				
Date	4/28/2015	4/30/2015		
Room Temp (Deg C)	22	22		
Rel Humidity (%)	34	33		
Technician	Troy Cook	Troy Cook		
mOhm values	Actual	Delta	Delta	Delta
	Initial	Shock-Vib		
Pin Type 1: Signal				
Average	1.89	0.03		
St. Dev.	0.05	0.03		
Min	1.78	0.00		
Max	2.01	0.17		
Summary Count	64	64		
Total Count	64	64		

LLCR Delta Count by Category						
mOhms	Stable	Minor	Acceptable	Marginal	Unstable	Open
	≤ 5	$>5 \ \& \ \leq 10$	$>10 \ \& \ \leq 15$	$>15 \ \& \ \leq 50$	$>50 \ \& \ \leq 1000$	>1000
Shock-Vib	64	0	0	0	0	0

Nanosecond Event Detection:

Shock and Vibration Event Detection Summary	
Contacts tested	60
Test Condition	C, 100g's, 6ms, Half-Sine
Shock Events	0
Test Condition	V-B, 7.56 rms g
Vibration Events	0
Total Events	0

DATA SUMMARIES Continued**LLCR Extended Life Group**

- 1). A total of 64 points were measured.
- 2). EIA-364-23, *Low Level Contact Resistance Test Procedure for Electrical Connectors and Sockets*.
- 3). A computer program, *LLCR 221.exe*, ensures repeatability for data acquisition.
- 4). The following guidelines are used to categorize the changes in LLCR as a result from stressing.
 - a. $\leq +5.0$ mOhms: ----- Stable
 - b. $+5.1$ to $+10.0$ mOhms: ----- Minor
 - c. $+10.1$ to $+15.0$ mOhms: ----- Acceptable
 - d. $+15.1$ to $+50.0$ mOhms: ----- Marginal
 - e. $+50.1$ to $+2000$ mOhms ----- Unstable
 - f. $> +2000$ mOhms: ----- Open Failure

Group 1-250 cycles

LLCR Measurement Summaries by Pin Type				
Date	3/18/2015	3/20/2015	3/30/2015	4/13/2015
Room Temp (Deg C)	22	21	23	22
Rel Humidity (%)	52	54	53	54
Technician	Peter Chen	Peter Chen	Peter Chen	Peter Chen
mOhm values	Actual Initial	Delta 250 Cycles	Delta Therm Shck	Delta Humidity
Pin Type 1: Signal				
Average	1.92	0.46	0.66	0.71
St. Dev.	0.09	0.32	0.35	0.39
Min	1.72	0.01	0.11	0.12
Max	2.06	1.32	1.52	1.73
Summary Count	64	64	64	64
Total Count	64	64	64	64

LLCR Delta Count by Category						
mOhms	Stable	Minor	Acceptable	Marginal	Unstable	Open
	≤ 5	>5 & ≤ 10	>10 & ≤ 15	>15 & ≤ 50	>50 & ≤ 1000	>1000
250 Cycles	64	0	0	0	0	0
Therm Shck	64	0	0	0	0	0
Humidity	64	0	0	0	0	0

DATA SUMMARIES Continued**Group 2-500 cycles**

LLCR Measurement Summaries by Pin Type				
Date	3/18/2015	3/20/2015	3/30/2015	4/13/2015
Room Temp (Deg C)	21	22	21	22
Rel Humidity (%)	53	54	54	54
Technician	Peter Chen	Peter Chen	Peter Chen	Peter Chen
mOhm values	Actual Initial	Delta 500 Cycles	Delta Therm Shck	Delta Humidity
Pin Type 1: Signal				
Average	1.92	0.66	0.84	0.86
St. Dev.	0.07	0.41	0.49	0.49
Min	1.78	0.05	0.05	0.06
Max	2.08	2.26	2.02	2.31
Summary Count	64	64	64	64
Total Count	64	64	64	64

LLCR Delta Count by Category						
mOhms	Stable ≤5	Minor >5 & ≤10	Acceptable >10 & ≤15	Marginal >15 & ≤50	Unstable >50 & ≤1000	Open >1000
500 Cycles	64	0	0	0	0	0
Therm Shck	64	0	0	0	0	0
Humidity	64	0	0	0	0	0

Group 3-1000 cycles

LLCR Measurement Summaries by Pin Type				
Date	3/20/2015	3/27/2015	4/8/2015	4/20/2015
Room Temp (Deg C)	22	23	23	23
Rel Humidity (%)	53	54	54	54
Technician	Peter Chen	Peter Chen	Peter Chen	Peter Chen
mOhm values	Actual Initial	Delta 1000 Cycles	Delta Therm Shck	Delta Humidity
Pin Type 1: Signal				
Average	1.91	0.68	1.21	1.71
St. Dev.	0.10	0.49	0.59	1.17
Min	1.73	0.10	0.28	0.32
Max	2.12	2.83	3.16	4.73
Summary Count	64	64	64	64
Total Count	64	64	64	64

LLCR Delta Count by Category						
mOhms	Stable ≤5	Minor >5 & ≤10	Acceptable >10 & ≤15	Marginal >15 & ≤50	Unstable >50 & ≤1000	Open >1000
1000 Cycles	64	0	0	0	0	0
Therm Shck	64	0	0	0	0	0
Humidity	64	0	0	0	0	0

DATA SUMMARIES Continued**Group 4-2500 cycles**

LLCR Measurement Summaries by Pin Type				
Date	3/20/2015	3/27/2015	4/8/2015	4/20/2015
Room Temp (Deg C)	22	23	22	23
Rel Humidity (%)	54	53	54	54
Technician	Peter Chen	Peter Chen	Peter Chen	Peter Chen
mOhm values	Actual Initial	Delta 2500 Cycles	Delta Therm Shck	Delta Humidity
Pin Type 1: Signal				
Average	1.95	0.99	1.13	3.33
St. Dev.	0.09	0.51	0.86	2.43
Min	1.79	0.16	0.26	0.26
Max	2.20	2.32	6.07	9.96
Summary Count	64	64	64	64
Total Count	64	64	64	64

LLCR Delta Count by Category						
mOhms	Stable	Minor	Acceptable	Marginal	Unstable	Open
	<=5	>5 & <=10	>10 & <=15	>15 & <=50	>50 & <=1000	>1000
2500 Cycles	64	0	0	0	0	0
Therm Shck	63	1	0	0	0	0
Humidity	49	15	0	0	0	0

EQUIPMENT AND CALIBRATION SCHEDULES**Equipment #:** HZ-TCT-01**Description:** Normal force analyzer**Manufacturer:** Mecmesin Multitester**Model:** Mecmesin Multitester 2.5-i**Serial #:** 08-1049-04**Accuracy:** Last Cal: 4/26/2015, Next Cal: 4/25/2016**Equipment #:** HZ-OV-01**Description:** Oven**Manufacturer:** Huida**Model:** CS101-1E**Serial #:** CS101-1E-B**Accuracy:** Last Cal: 12/13/2014, Next Cal: 12/12/2015**Equipment #:** HZ-THC-01**Description:** Humidity transmitter**Manufacturer:** Thermtron**Model:** SM-8-8200**Serial #:** 38846**Accuracy:** Last Cal: 2/28/2015, Next Cal: 2/27/2016**Equipment #:** HZ-TSC-01**Description:** Vertical Thermal Shock Chamber**Manufacturer:** Cincinnatti Sub Zero**Model:** VTS-3-6-6-SC/AC**Serial #:** 10-VT14994**Accuracy:** See Manual

... Last Cal: 06/28/2015, Next Cal: 06/27/2016

Equipment #: HZ-HPM-01**Description:** NA9636H**Manufacturer:** Ainuo**Model:** 6031A**Serial #:** 089601091**Accuracy:** Last Cal: 3/7/2015, Next Cal: 3/6/2016**Equipment #:** HZ-MO-05**Description:** Micro-ohmmeter**Manufacturer:** Keithley**Model:** 3706**Serial #:** 1285188**Accuracy:** Last Cal: 11/15/2014, Next Cal: 11/14/2015

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

... Last Cal: 04/30/2015, Next Cal: 04/30/2016

Equipment #: HZ-MO-01**Description:** Micro-ohmmeter**Manufacturer:** Keithley**Model:** 2700**Serial #:** 1199807**Accuracy:** Last Cal: 04/28/2015, Next Cal: 04/28/2016**Equipment #:** HZ-PS-01**Description:** Power Supply**Manufacturer:** Agilent**Model:** 6031A**Serial #:** MY41000982**Accuracy:** Last Cal: 04/28/2015, Next Cal: 04/28/2016**Equipment #:** SVC-01**Description:** Shock & Vibration Table**Manufacturer:** Data Physics**Model:** LE-DSA-10-20K**Serial #:** 10037**Accuracy:** See Manual

... Last Cal: 11/31/2014, Next Cal: 11/31/2015

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

... Last Cal: 07/09/2015, Next Cal: 07/09/2016

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

... Last Cal: 06/04/2015, Next Cal: 06/04/2016