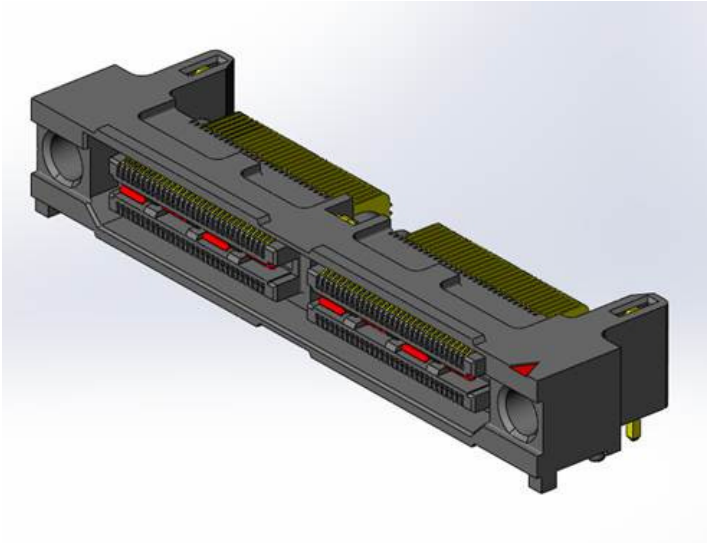
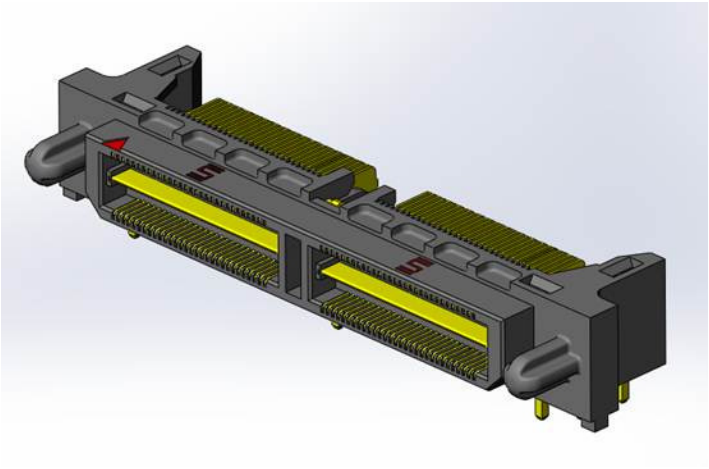
Project Number: Design Qualification Test Report	Tracking Code: 299903_Report_Rev_1
Requested by: Neal Patterson	Date: 3/11/2014
Part #: QSH-060-01-L-D-RA-WT-GP-K/QTH-060-01-L-D-RA-WT-PGP-K	Tech: Troy Cook
Part description: QSH/QTH	Qty to test: 75
Test Start: 01/20/2014	Test Completed: 02/25/2014





DESIGN QUALIFICATION TEST REPORT

QSH/QTH
QSH-060-01-L-D-RA-WT-GP-K/QTH-060-01-L-D-RA-WT-PGP-K

REVISION HISTORY

DATA	REV.NUM.	DESCRIPTION	ENG
03/07/2014	**1**	**Initial Issue**	**PC**

CERTIFICATION

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

SCOPE

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

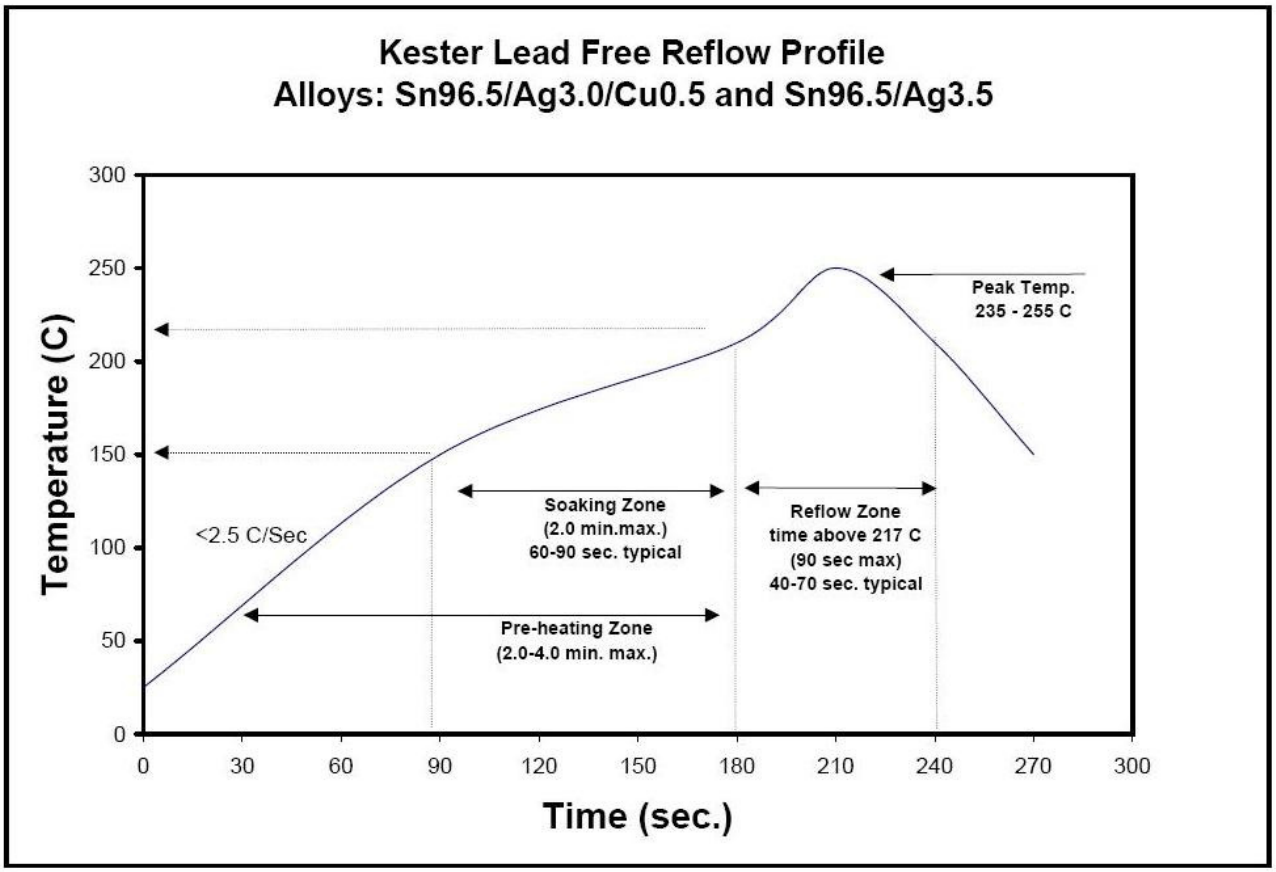
APPLICABLE DOCUMENTS

Standards: EIA Publication 364

TEST SAMPLES AND PREPARATION

1) All materials were manufactured in accordance with the applicable product specification.
2) All test samples were identified and encoded to maintain traceability throughout the test sequences.
3) After soldering, the parts to be used for LLCR and DWV/IR testing were cleaned according to TLWI-0001.
4) Either an automated cleaning procedure or an ultrasonic cleaning procedure may be used.
5) The automated procedure is used with aqueous compatible soldering materials.
6) Parts not intended for testing LLCR and DWV/IR are visually inspected and cleaned if necessary.
7) Any additional preparation will be noted in the individual test sequences.
8) Solder Information: Lead free
9) Re-Flow Time/Temp: See accompanying profile.
10) Samtec Test PCBs used: PCB-106076-TST, PCB-106077-TST, PCB-106078-TST.

TYPICAL OVEN PROFILE (Soldering Parts to Test Boards)



FLOWCHARTS

Gas Tight

Group 1
QSH-060-01-L-D-RA-WT-GP-K
QTH-060-01-L-D-RA-WT-PGP-K
8 Assemblies

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

(1) Gas Tight = EIA-364-36

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

Thermal Aging

Group 1
QSH-060-01-L-D-RA-WT-GP-K
QTH-060-01-L-D-RA-WT-PGP-K
8 Assemblies

Step	Description
1.	Contact Gaps
2.	Mating/Unmating Force (2)
3.	LLCR (1) Max Delta = 15 mOhm
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 QSH-060-01-L-D-RA-WT-GP-K QTH-060-01-L-D-RA-WT-PGP-K 8 Assemblies		Group 2 QSH-090-01-L-D-RA-WT-GP-K QTH-090-01-L-D-RA-WT-PGP-K 8 Assemblies		Group 3 QSH-030-01-L-D-RA-WT-GP-K QTH-030-01-L-D-RA-WT-PGP-K 8 Assemblies	
Step	**Description**	**Step**	**Description**	**Step**	**Description**
1.	Contact Gaps	1.	Contact Gaps	1.	Contact Gaps
2.	LLCR (2) Max Delta = 15 mOhm	2.	Mating/Unmating Force (3)	2.	Mating/Unmating Force (3)
3.	Mating/Unmating Force (3)	3.	Cycles Quantity = 25 Cycles	3.	Cycles Quantity = 25 Cycles
4.	Cycles Quantity = 25 Cycles	4.	Mating/Unmating Force (3)	4.	Mating/Unmating Force (3)
5.	Mating/Unmating Force (3)				
6.	Contact Gaps				
7.	LLCR (2) Max Delta = 15 mOhm				
8.	Thermal Shock (4)				
9.	LLCR (2) Max Delta = 15 mOhm				
10.	Humidity (1)				
11.	LLCR (2) Max Delta = 15 mOhm				
12.	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 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

IR/DWV

Pin-to-Pin

Group 1
QSH-060-01-L-D-RA-WT-GP-K
QTH-060-01-L-D-RA-WT-PGP-K
2 Assemblies

Step	Description
1.	DWV Breakdown (2)

Group 2
QSH-060-01-L-D-RA-WT-GP-K
2 Assemblies

Step	Description
1.	DWV Breakdown (2)

Group 3
QTH-060-01-L-D-RA-WT-PGP-K
2 Assemblies

Step	Description
1.	DWV Breakdown (2)

Group 4
QSH-060-01-L-D-RA-WT-GP-K
QTH-060-01-L-D-RA-WT-PGP-K
2 Assemblies

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

Row-to-Row

Group 5
QSH-060-01-L-D-RA-WT-GP-K
QTH-060-01-L-D-RA-WT-PGP-K
2 Assemblies

Step	Description
1.	DWV Breakdown (2)

Group 6
QSH-060-01-L-D-RA-WT-GP-K
2 Assemblies

Step	Description
1.	DWV Breakdown (2)

Group 7
QTH-060-01-L-D-RA-WT-PGP-K
2 Assemblies

Step	Description
1.	DWV Breakdown (2)

Group 8
QSH-060-01-L-D-RA-WT-GP-K
QTH-060-01-L-D-RA-WT-PGP-K
2 Assemblies

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

FLOWCHARTS Continued

Pin-to-Ground

Group 9 QSH-060-01-L-D-RA-WT-GP-K QTH-060-01-L-D-RA-WT-PGP-K 2 Assemblies		Group 10 QSH-060-01-L-D-RA-WT-GP-K 2 Assemblies		Group 11 QTH-060-01-L-D-RA-WT-PGP-K 2 Assemblies		Group 12 QSH-060-01-L-D-RA-WT-GP-K QTH-060-01-L-D-RA-WT-PGP-K 2 Assemblies	
Step	**Description**	**Step**	**Description**	**Step**	**Description**	**Step**	**Description**
1.	DWV Breakdown (2)	1.	DWV Breakdown (2)	1.	DWV Breakdown (2)	1.	IR (4)
						2.	DWV at Test Voltage (1)
						3.	Thermal Shock (5)
						4.	IR (4)
						5.	DWV at Test Voltage (1)
						6.	Humidity (3)
						7.	IR (4)
						8.	DWV at Test Voltage (1)

Pin-to-Weld Tab

Group 13 QSH-060-01-L-D-RA-WT-GP-K QTH-060-01-L-D-RA-WT-PGP-K 2 Assemblies		Group 14 QSH-060-01-L-D-RA-WT-GP-K 2 Assemblies		Group 15 QTH-060-01-L-D-RA-WT-PGP-K 2 Assemblies		Group 16 QSH-060-01-L-D-RA-WT-GP-K QTH-060-01-L-D-RA-WT-PGP-K 2 Assemblies	
Step	**Description**	**Step**	**Description**	**Step**	**Description**	**Step**	**Description**
1.	DWV Breakdown (2)	1.	DWV Breakdown (2)	1.	DWV Breakdown (2)	1.	IR (4)
						2.	DWV at Test Voltage (1)
						3.	Thermal Shock (5)
						4.	IR (4)
						5.	DWV at Test Voltage (1)
						6.	Humidity (3)
						7.	IR (4)
						8.	DWV at Test Voltage (1)

FLOWCHARTS Continued

Ground-to-Weld Tab

Group 17		Group 18		Group 19		Group 20	
QSH-060-01-L-D-RA-WT-GP-K QTH-060-01-L-D-RA-WT-PGP-K 2 Assemblies		QSH-060-01-L-D-RA-WT-GP-K 2 Assemblies		QTH-060-01-L-D-RA-WT-PGP-K 2 Assemblies		QSH-060-01-L-D-RA-WT-GP-K QTH-060-01-L-D-RA-WT-PGP-K 2 Assemblies	
Step	**Description**	**Step**	**Description**	**Step**	**Description**	**Step**	**Description**
1.	DWV Breakdown (2)	1.	DWV Breakdown (2)	1.	DWV Breakdown (2)	1.	IR (4)
						2.	DWV at Test Voltage (1)
						3.	Thermal Shock (5)
						4.	IR (4)
						5.	DWV at Test Voltage (1)
						6.	Humidity (3)
						7.	IR (4)
						8.	DWV at Test Voltage (1)

(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

Signal

Group 1
QSH-090-01-L-D-RA-WT-GP-K
QTH-090-01-L-D-RA-WT-PGP-K
2 Pins Powered
Signal

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

Group 2
QSH-090-01-L-D-RA-WT-GP-K
QTH-090-01-L-D-RA-WT-PGP-K
4 Pins Powered
Signal

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

Group 3
QSH-090-01-L-D-RA-WT-GP-K
QTH-090-01-L-D-RA-WT-PGP-K
6 Pins Powered
Signal

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

Group 4
QSH-090-01-L-D-RA-WT-GP-K
QTH-090-01-L-D-RA-WT-PGP-K
8 Pins Powered
Signal

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

Group 5
QSH-090-01-L-D-RA-WT-GP-K
QTH-090-01-L-D-RA-WT-PGP-K
180 Pins Powered
Signal

Step	Description
1.	CCC (2) Rows = 2 Number of Positions = 90

Ground

Group 6
QSH-090-01-L-D-RA-WT-GP-K
QTH-090-01-L-D-RA-WT-PGP-K
1 Pins Powered
Ground

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

Group 7
QSH-090-01-L-D-RA-WT-GP-K
QTH-090-01-L-D-RA-WT-PGP-K
2 Pins Powered
Ground

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

Group 8
QSH-090-01-L-D-RA-WT-GP-K
QTH-090-01-L-D-RA-WT-PGP-K
3 Pins Powered
Ground

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

All Power

Group 9
QSH-090-01-L-D-RA-WT-GP-K
QTH-090-01-L-D-RA-WT-PGP-K

All Power

Step	Description
1.	CCC - All Power (1)

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(1) CCC - All Power = 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

(2) 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
QSH-060-01-L-D-RA-WT-GP-K
QTH-060-01-L-D-RA-WT-PGP-K
8 Assemblies

Step	Description
1.	LLCR (1) Max Delta = 15 mOhm
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 Detection

Group 1
QSH-060-01-L-D-RA-WT-GP-K
QTH-060-01-L-D-RA-WT-PGP-K
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)

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.

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.

MECHANICAL SHOCK (Specified Pulse):

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

VIBRATION:

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

NANOSECOND-EVENT DETECTION:

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

ATTRIBUTE DEFINITIONS Continued

The following is a brief, simplified description of attributes.

TEMPERATURE RISE (Current Carrying Capacity, CCC):

1) EIA-364-70, *Temperature Rise versus Current Test Procedure for Electrical Connectors and Sockets*.
2) When current passes through a contact, the temperature of the contact increases as a result of I^2R (resistive) heating.
3) The number of contacts being investigated plays a significant part in power dissipation and therefore temperature rise.
4) The size of the temperature probe can affect the measured temperature.
5) Copper traces on PC boards will contribute to temperature rise:
    a. Self heating (resistive)
    b. Reduction in heat sink capacity affecting the heated contacts
6) A de-rating curve, usually 20%, is calculated.
7) Calculated de-rated currents at three temperature points are reported:
    a. Ambient
    b. 85^{o} C
    c. 95^{o} C
    d. 115^{o} C
8) Typically, neighboring contacts (in close proximity to maximize heat build up) are energized.
9) The thermocouple (or temperature measuring probe) will be positioned at a location to sense the maximum temperature in the vicinity of the heat generation area.
10) A computer program, *TR 803.exe*, ensures accurate stability for data acquisition.
11) Hook-up wire cross section is larger than the cross section of any connector leads/PC board traces, jumpers, etc.
12) Hook-up wire length is longer than the minimum specified in the referencing standard.

LLCR:

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

ATTRIBUTE DEFINITIONS Continued

The following is a brief, simplified description of attributes.

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.

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INSULATION RESISTANCE (IR):

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

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

ATTRIBUTE DEFINITIONS Continued

The following is a brief, simplified description of attributes.

DIELECTRIC WITHSTANDING VOLTAGE (DWV):

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

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

RESULTS

Temperature Rise, CCC at a 20% de-rating

- **CCC for a 30°C Temperature Rise----------2.2A per contact with 2 adjacent signal contacts powered**
- **CCC for a 30°C Temperature Rise----------1.7A per contact with 4 adjacent signal contacts powered**
- **CCC for a 30°C Temperature Rise----------1.3A per contact with 6 adjacent signal contacts powered**
- **CCC for a 30°C Temperature Rise----------1.2A per contact with 8 adjacent signal contacts powered**
- **CCC for a 30°C Temperature Rise----------0.5A per contact with all adjacent signal contacts powered**
- **CCC for a 30°C Temperature Rise----------21.8 A per contact with 1 adjacent ground contacts powered**
- **CCC for a 30°C Temperature Rise----------19.8 A per contact with 2 adjacent ground contacts powered**
- **CCC for a 30°C Temperature Rise----------18.0 A per contact with all adjacent ground contacts powered**
- **CCC for a 30°C Temperature Rise----------15.8 A per contact with all adjacent ground contacts powered and Signal Pins powered at a continuous .3 amps**

Mating – Unmating Forces

Thermal Aging Group （QSH-060-01-L-D-RA-WT-GP-K/QTH-060-01-L-D-RA-WT-PGP-K）

- **Initial**
  - **Mating**
    - **Min ----------14.58 Lbs**
    - **Max----------17.55 Lbs**
  - **Unmating**
    - **Min ---------- 7.01 Lbs**
    - **Max---------- 9.38 Lbs**
- **After Thermal**
  - **Mating**
    - **Min ---------- 8.73 Lbs**
    - **Max----------10.06 Lbs**
  - **Unmating**
    - **Min ---------- 4.75 Lbs**
    - **Max---------- 5.25 Lbs**

Mating-Unmating Durability Group（QSH-060-01-L-D-RA-WT-GP-K/QTH-060-01-L-D-RA-WT-PGP-K）

- **Initial**
  - **Mating**
    - **Min ----------13.44 Lbs**
    - **Max----------14.95 Lbs**
  - **Unmating**
    - **Min ---------- 4.49 Lbs**
    - **Max---------- 8.06 Lbs**
- **After 25 Cycles**
  - **Mating**
    - **Min ----------14.37 Lbs**
    - **Max----------15.82 Lbs**
  - **Unmating**
    - **Min ---------- 2.96 Lbs**
    - **Max---------- 7.96 Lbs**
- **Humidity**
  - **Mating**
    - **Min ---------- 8.69 Lbs**
    - **Max---------- 9.58 Lbs**
  - **Unmating**
    - **Min ---------- 4.08 Lbs**
    - **Max---------- 5.34 Lbs**

RESULTS Continued

Mating – Unmating Forces

Mating-Unmating Basic （QSH-090-01-L-D-RA-WT-GP-K/QTH-090-01-L-D-RA-WT-PGP-K）

- **Initial**
  - **Mating**
    - **Min ----------21.87 Lbs**
    - **Max----------24.69 Lbs**
  - **Unmating**
    - **Min ---------- 7.62 Lbs**
    - **Max----------12.93 Lbs**
- **After 25 Cycles**
  - **Mating**
    - **Min ----------20.86 Lbs**
    - **Max----------24.09 Lbs**
  - **Unmating**
    - **Min ---------- 8.44 Lbs**
    - **Max----------12.86 Lbs**

Mating-Unmating Basic （QSH-030-01-L-D-RA-WT-GP-K/QTH-030-01-L-D-RA-WT-PGP-K）

- **Initial**
  - **Mating**
    - **Min ---------- 6.46 Lbs**
    - **Max---------- 7.52 Lbs**
  - **Unmating**
    - **Min ---------- 3.18 Lbs**
    - **Max---------- 4.70 Lbs**
- **After 25 Cycles**
  - **Mating**
    - **Min ---------- 6.82 Lbs**
    - **Max---------- 7.34 Lbs**
  - **Unmating**
    - **Min ---------- 3.19 Lbs**
    - **Max---------- 4.31 Lbs**

RESULTS Continued

Insulation Resistance minimums, IR

Pin to Pin

- **Initial**
  - **Mated ---------- 45000 Meg Ω ---------- Passed**
  - **Unmated ---------- 45000 Meg Ω ---------- Passed**
- **Thermal Shock**
  - **Mated ---------- 45000 Meg Ω ---------- Passed**
  - **Unmated ---------- 45000 Meg Ω ---------- Passed**
- **Humidity**
  - **Mated ---------- 20300 Meg Ω ---------- Passed**
  - **Unmated ---------- 31000 Meg Ω ---------- Passed**

Row to Row

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

Pin to Ground

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

Pin to Weld Tab

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

Ground to Weld Tab

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

RESULTS Continued

Dielectric Withstanding Voltage minimums, DWV

- **Minimums**
  - **Breakdown Voltage----------895 VAC**
  - **Test Voltage ----------671 VAC**
  - **Working Voltage ----------220 VAC**

Pin to Pin

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

Row to Row

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

Pin to Ground

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

Pin to Weld Tab

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

Ground to Weld Tab

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

RESULTS Continued

LLCR Thermal Aging Group (Total 192 LLCR test points)

Row 1

- **Initial ---------- 30.03 mOhms Max**
- **Thermal**
  - **<= +5.0 mOhms ---------- 72 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**

Row 2

- **Initial ---------- 36.84 mOhms Max**
- **Thermal**
  - **<= +5.0 mOhms ---------- 104 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

- **Initial ---------- 2.88 mOhms Max**
- **Thermal**
  - **<= +5.0 mOhms ---------- 16 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 (192 LLCR test points)

Row 1

- **Initial ---------- 30.76 mOhms Max**
- **Durability, 25 Cycles**
  - **<= +5.0 mOhms ---------- 72 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 ---------- 72 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 ---------- 72 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

Row 2

- **Initial ---------- 36.07 mOhms Max**
- **Durability, 25 Cycles**
  - **<= +5.0 mOhms ---------- 104 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 ---------- 104 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 ---------- 104 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

- **Initial ----------3.01 mOhms Max**
- **Durability, 25 Cycles**
  - **<= +5.0 mOhms ----------16 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 ----------16 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 ----------16 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 Gas Tight Group (192 LLCR test points)

Row 1

- **Initial ---------- 29.88 mOhms Max**
- **Gas-Tight**
  - **<= +5.0 mOhms ---------- 72 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**

Row 2

- **Initial ---------- 35.80 mOhms Max**
- **Gas-Tight**
  - **<= +5.0 mOhms ---------- 104 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

- **Initial ---------- 3.00 mOhms Max**
- **Gas-Tight**
  - **<= +5.0 mOhms ---------- 16 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 Shock & Vibration Group (192 LLCR test points)

Row 1

- **Initial ---------- 30.52 mOhms Max**
- **Shock &Vibration**
  - **<= +5.0 mOhms ---------- 72 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**

Row 2

- **Initial ---------- 36.18 mOhms Max**
- **Shock &Vibration**
  - **<= +5.0 mOhms ---------- 104 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

Ground

- **Initial ----------3.50 mOhms Max**
- **Shock &Vibration**
  - **<= +5.0 mOhms ----------16 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**

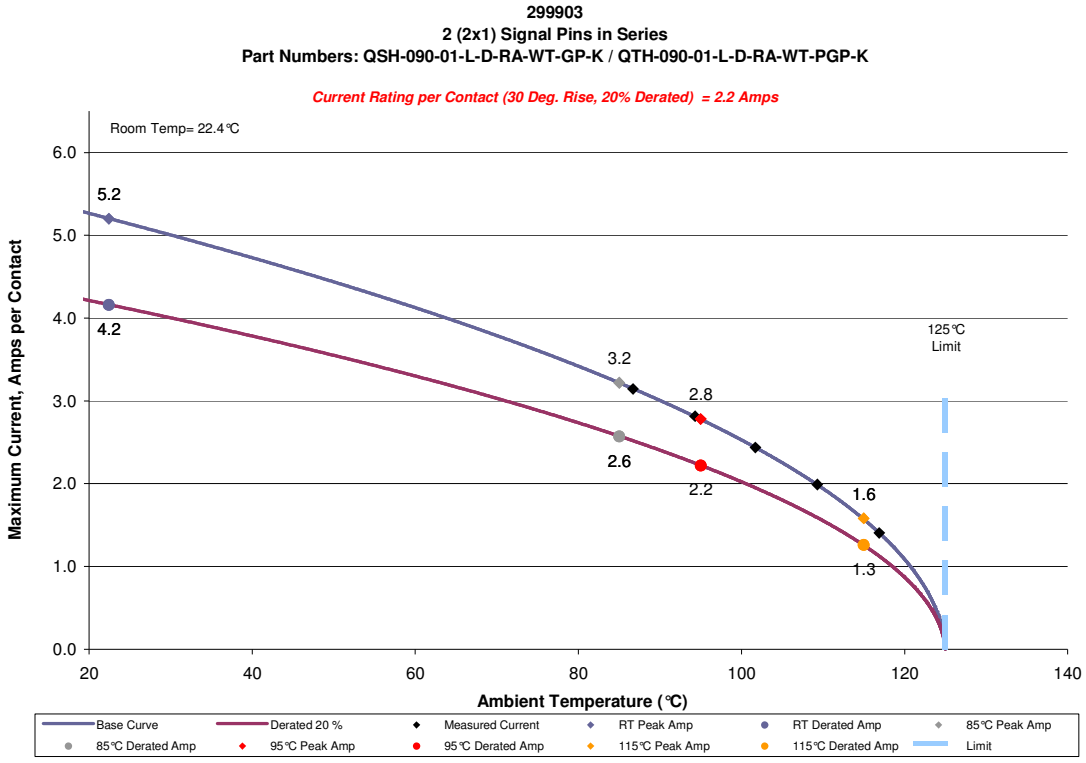
DATA SUMMARIES

TEMPERATURE RISE (Current Carrying Capacity, CCC):

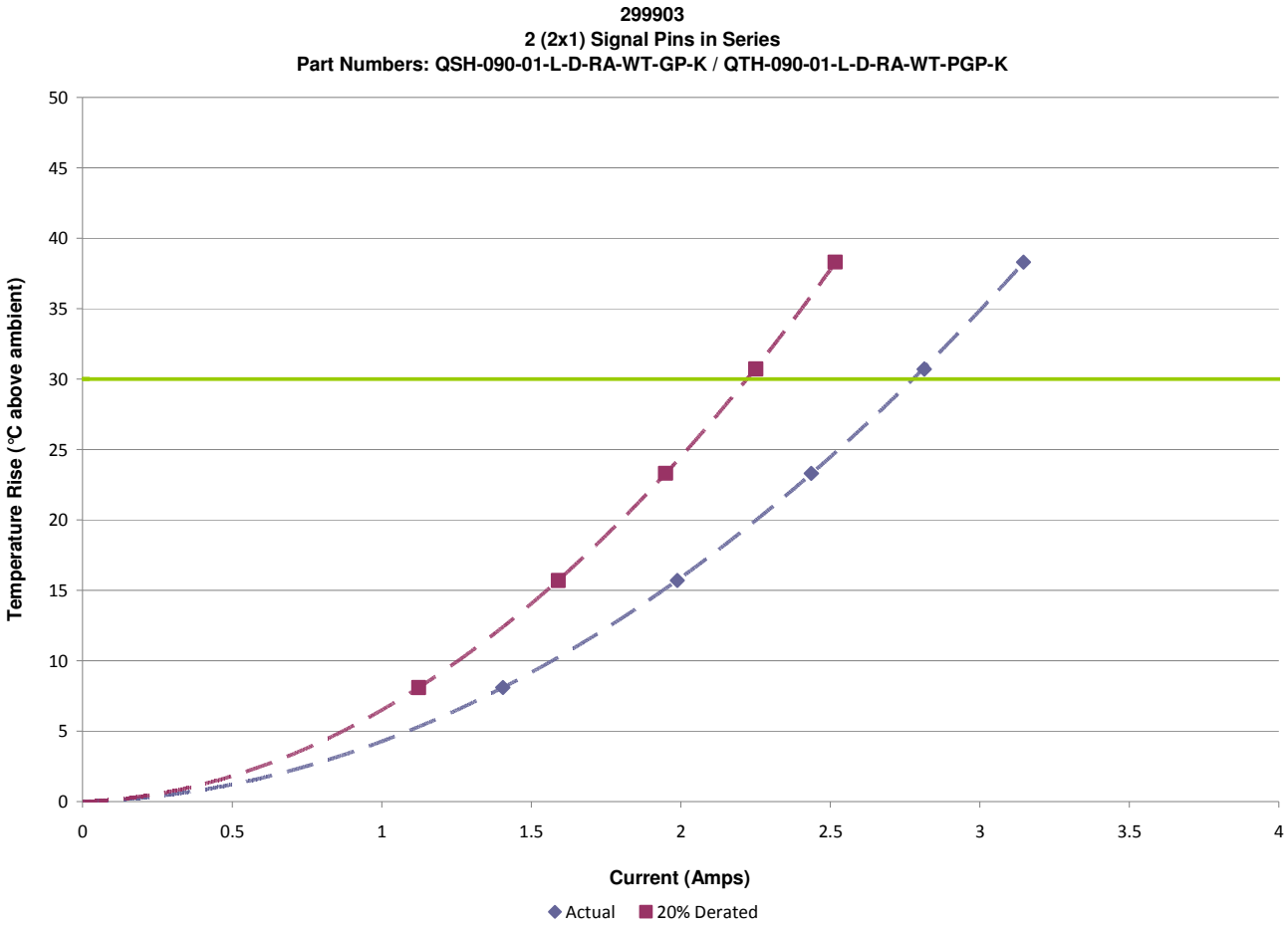
1) High quality thermocouples whose temperature slopes track one another were used for temperature monitoring.
2) The thermocouples were placed at a location to sense the maximum temperature generated during testing.
3) Temperature readings recorded are those for which three successive readings, 15 minutes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

Signal Pin

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

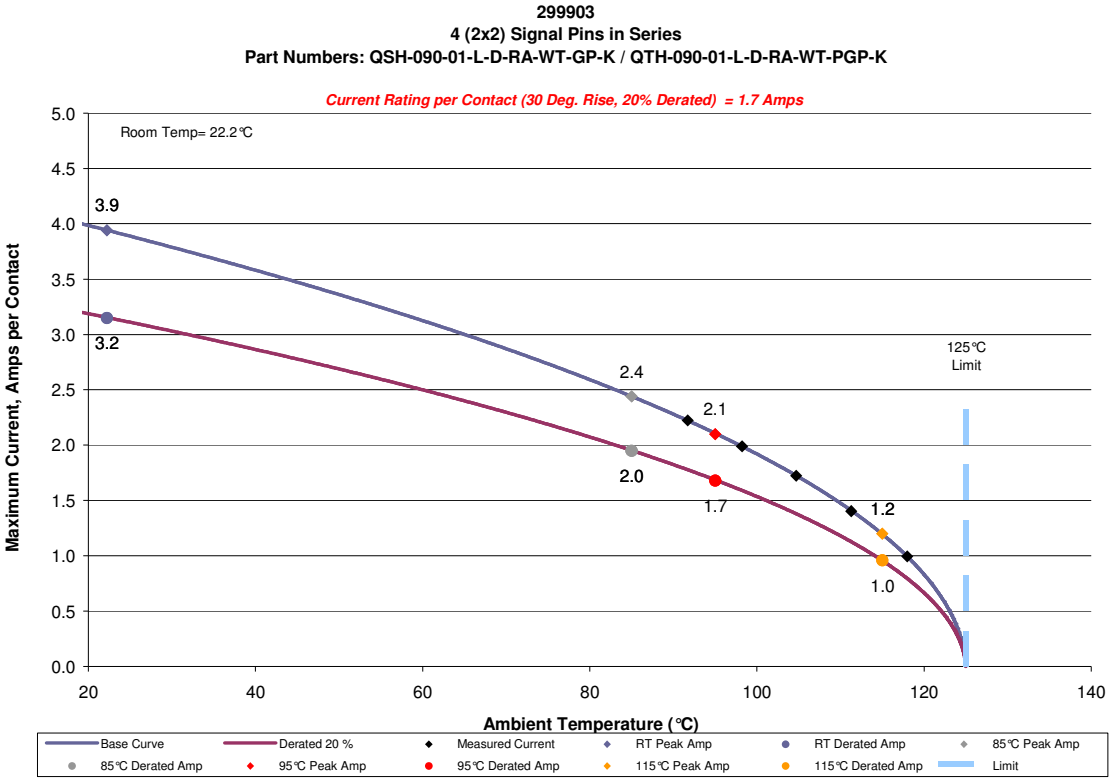


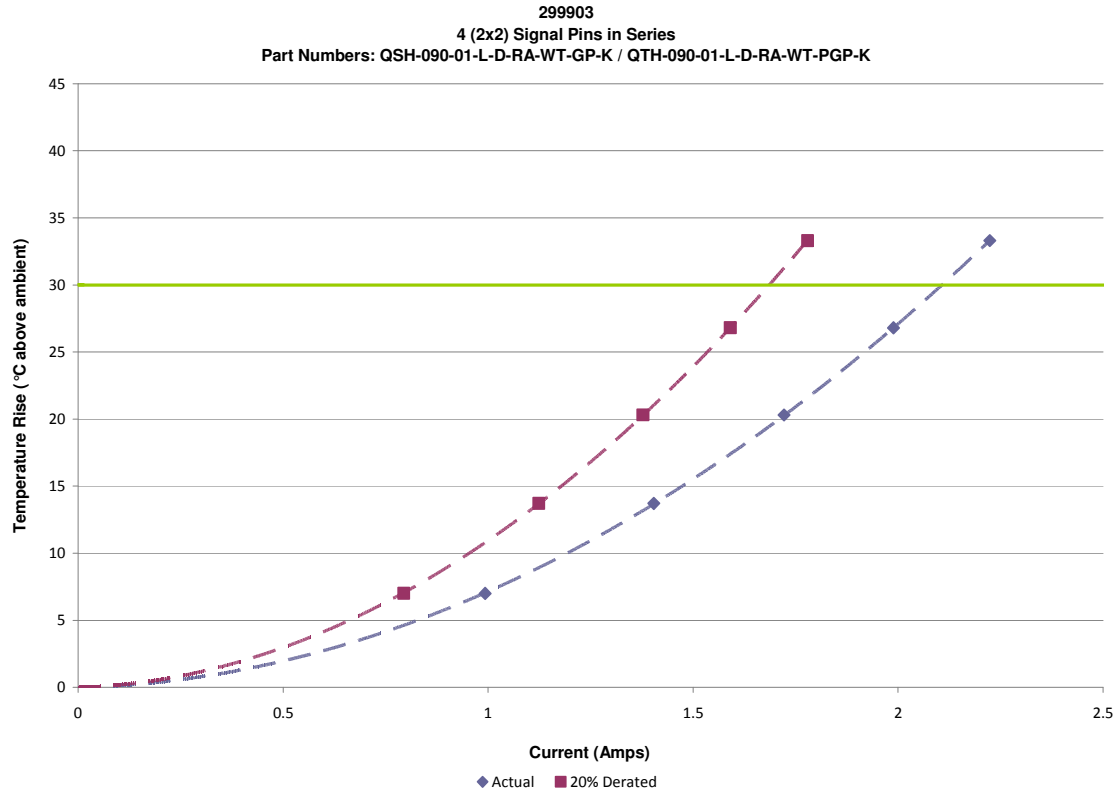
DATA SUMMARIES Continued



DATA SUMMARIES Continued

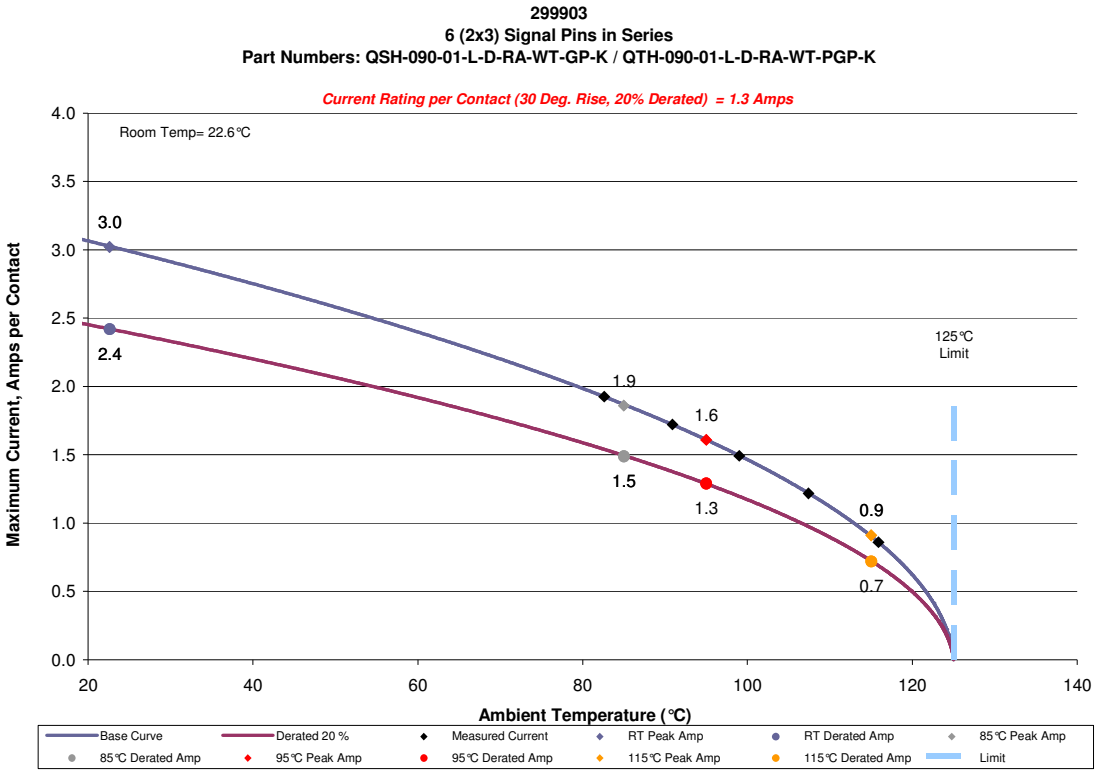
b. Linear configuration with 4 adjacent signal conductors/contacts powered

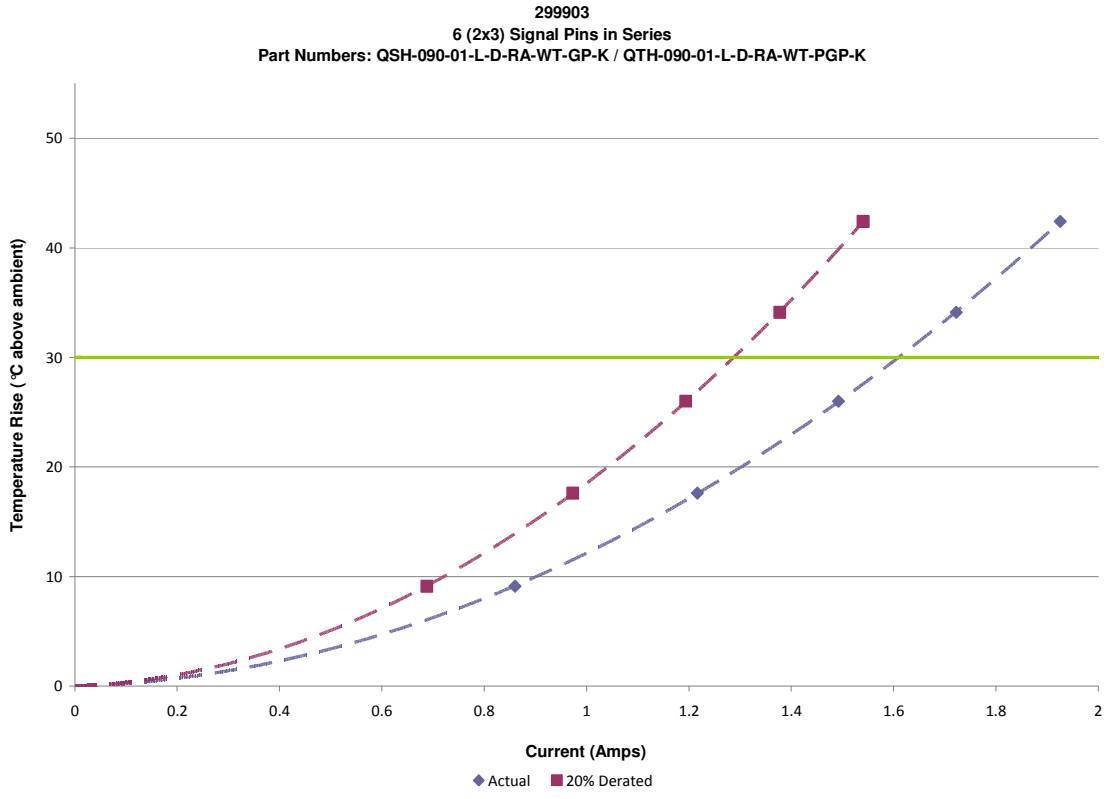




DATA SUMMARIES Continued

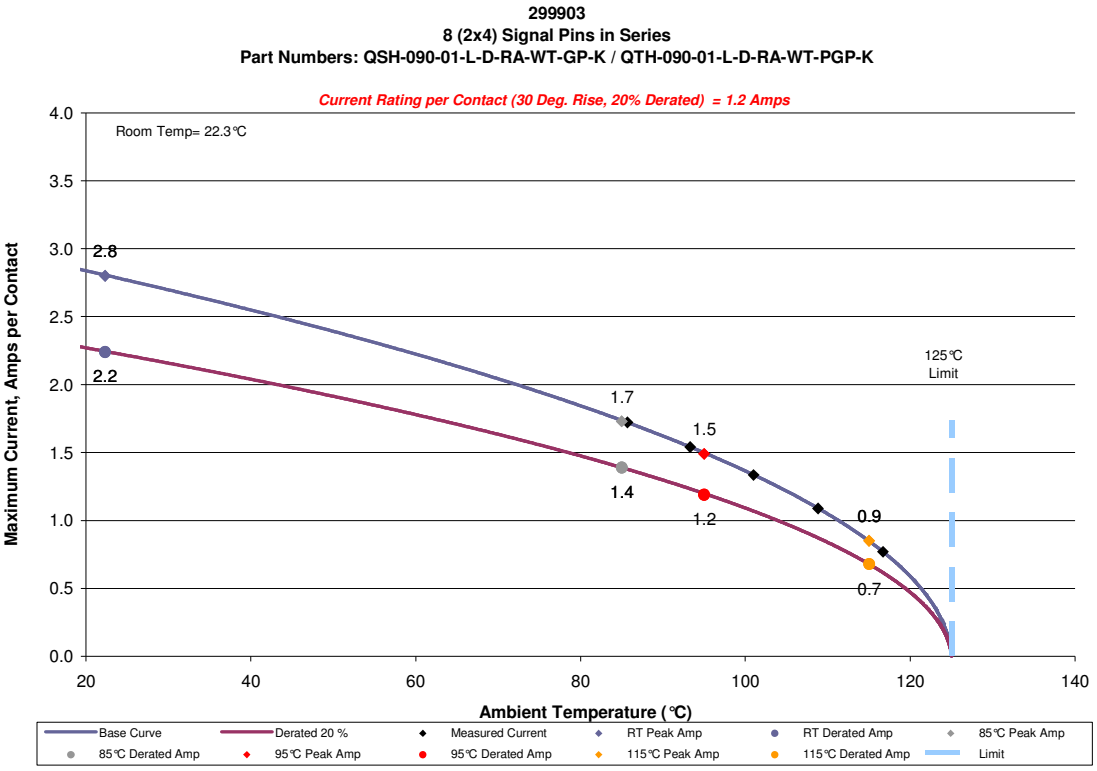
c. Linear configuration with 6 adjacent signal conductors/contacts powered

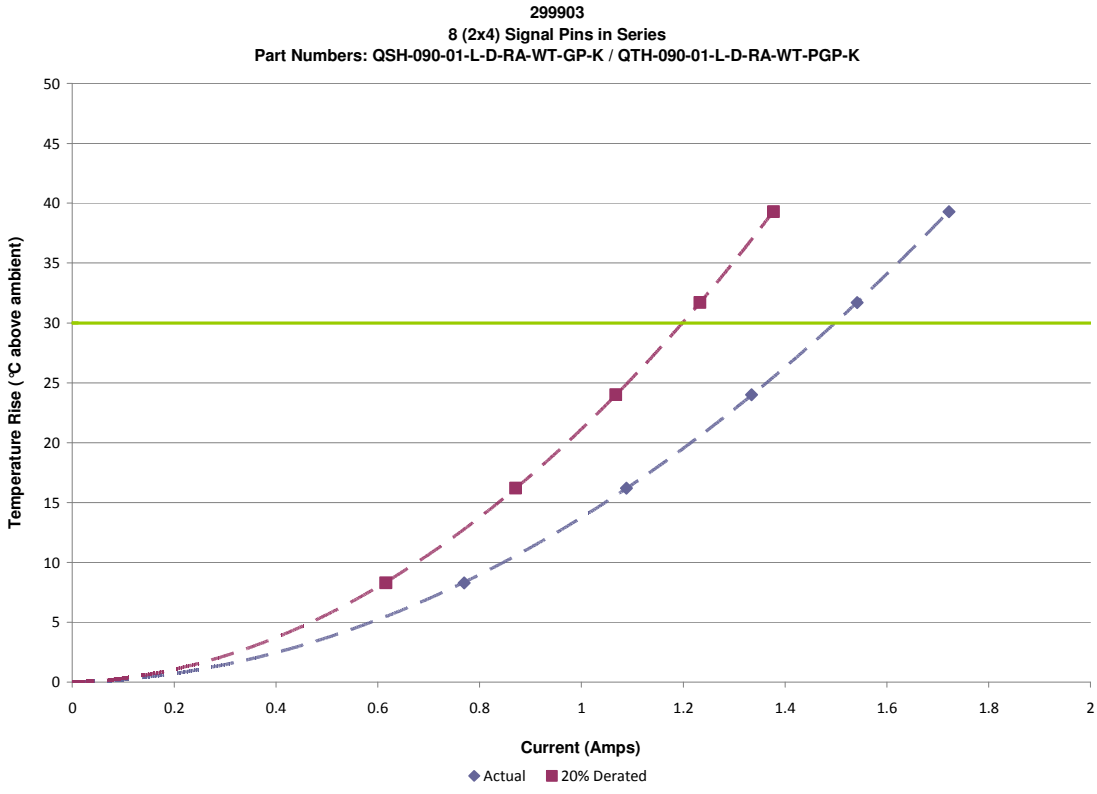




DATA SUMMARIES Continued

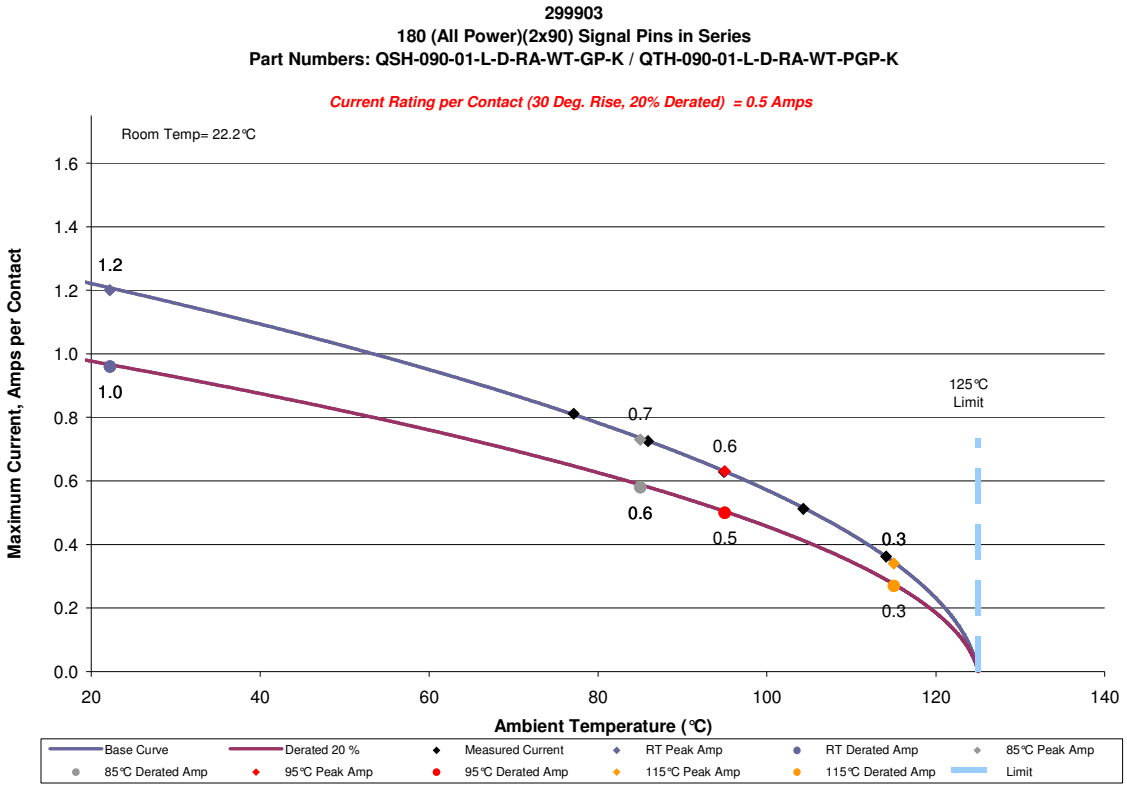
d. Linear configuration with 8 adjacent signal conductors/contacts powered

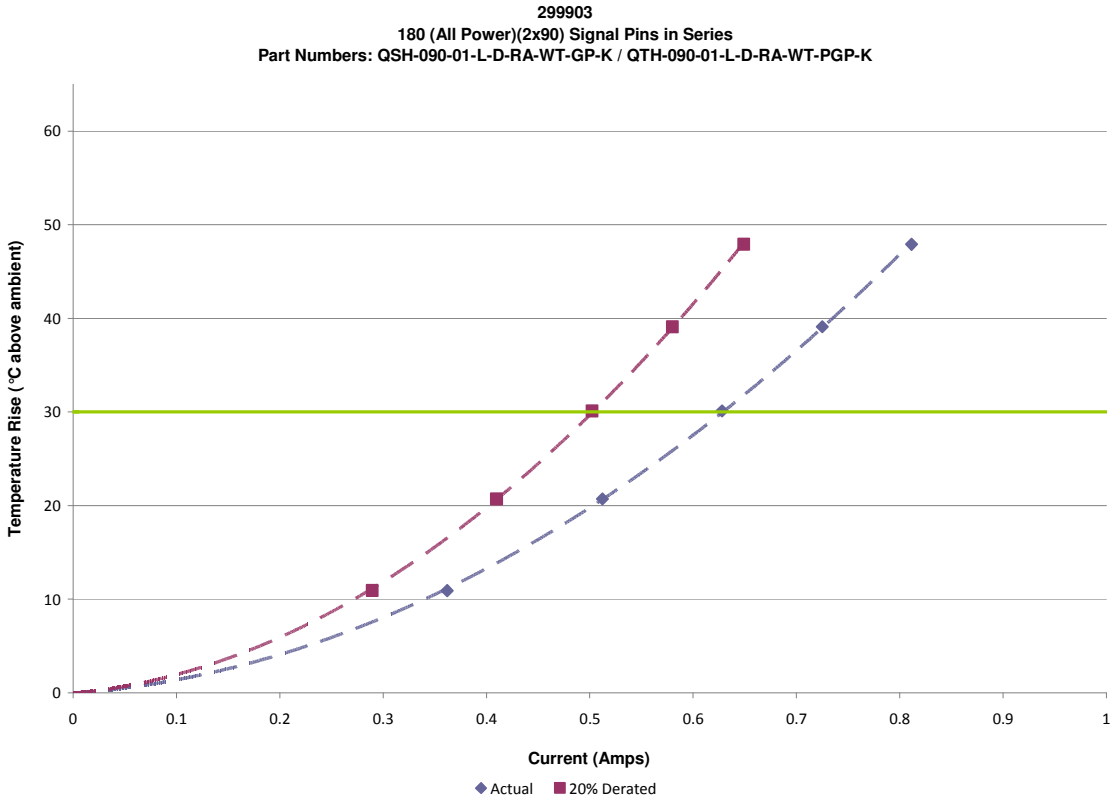




DATA SUMMARIES Continued

e. Linear configuration with all adjacent signal conductors/contacts powered

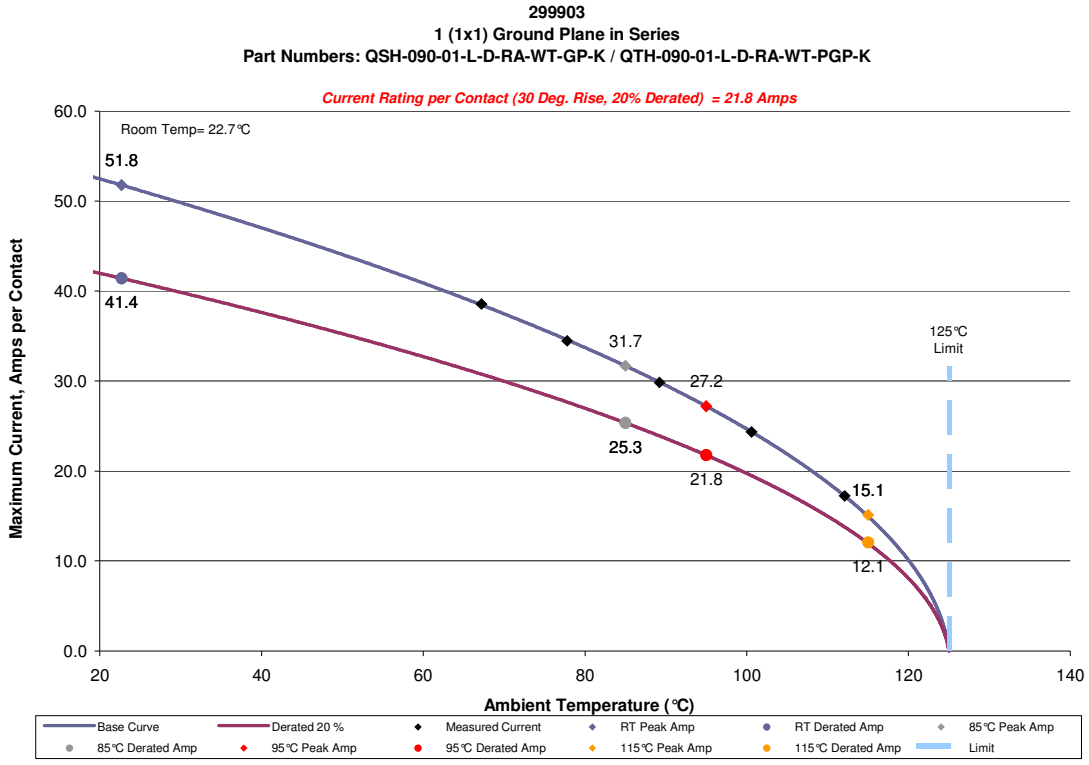


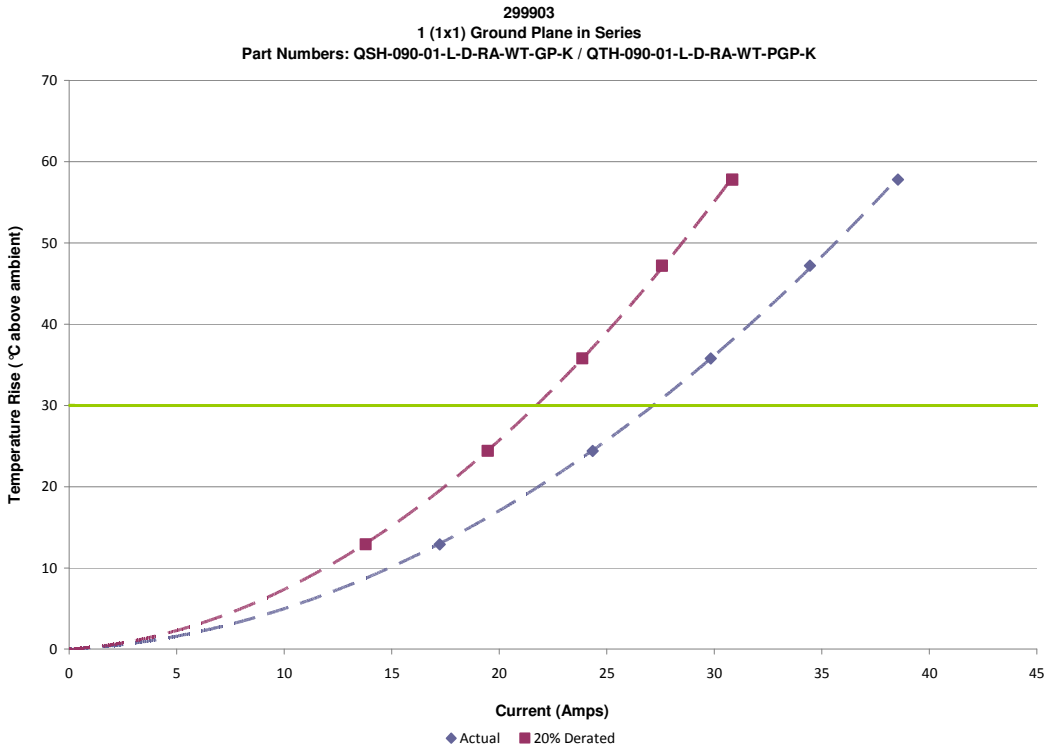


DATA SUMMARIES Continued

Ground pin

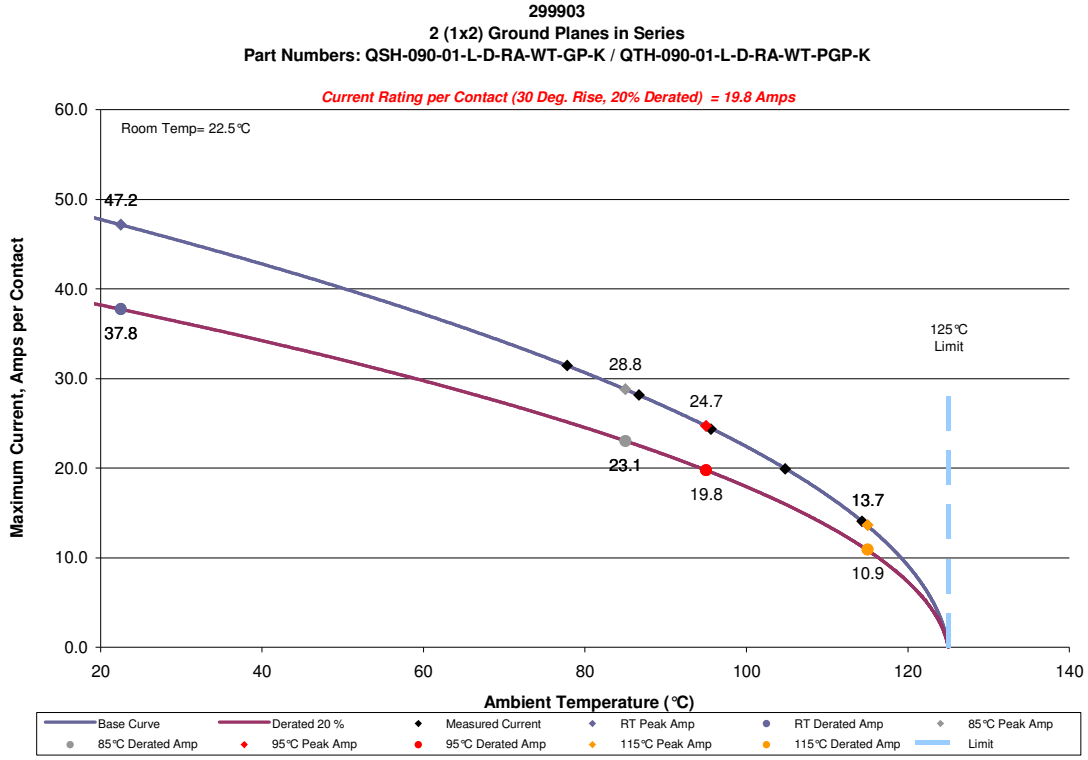
f. Linear configuration with 1 adjacent ground plane powered

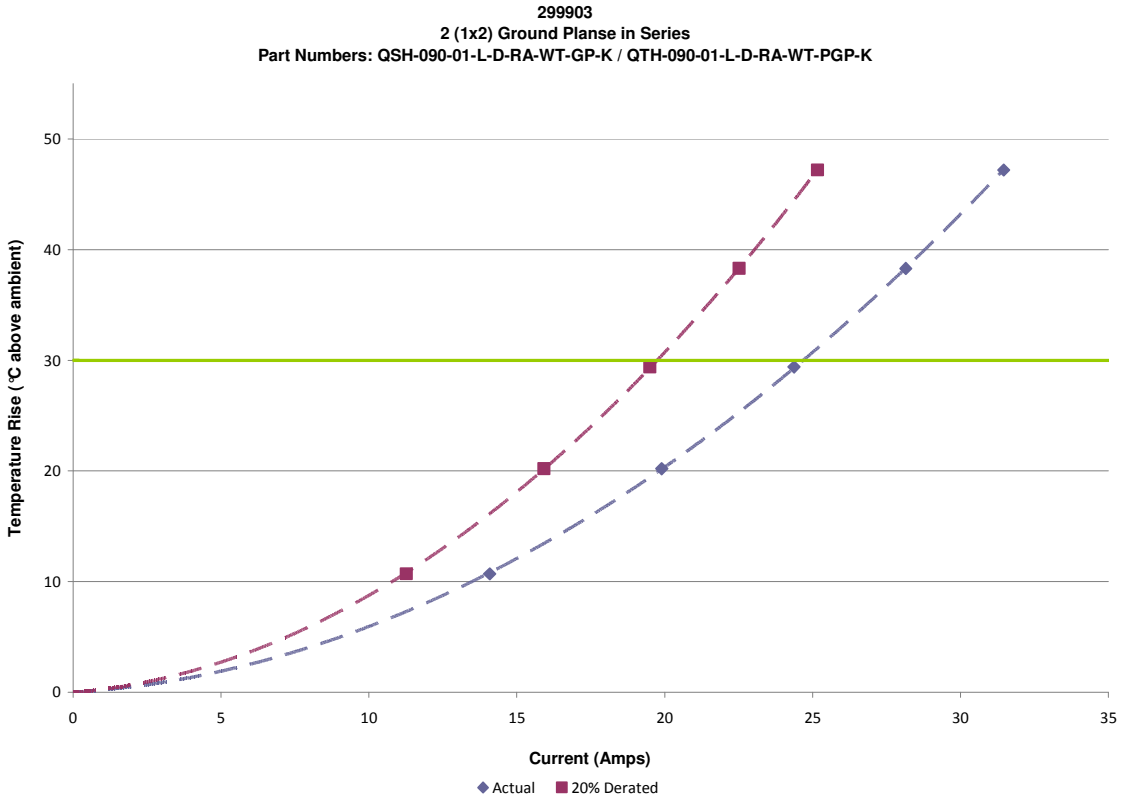




DATA SUMMARIES Continued

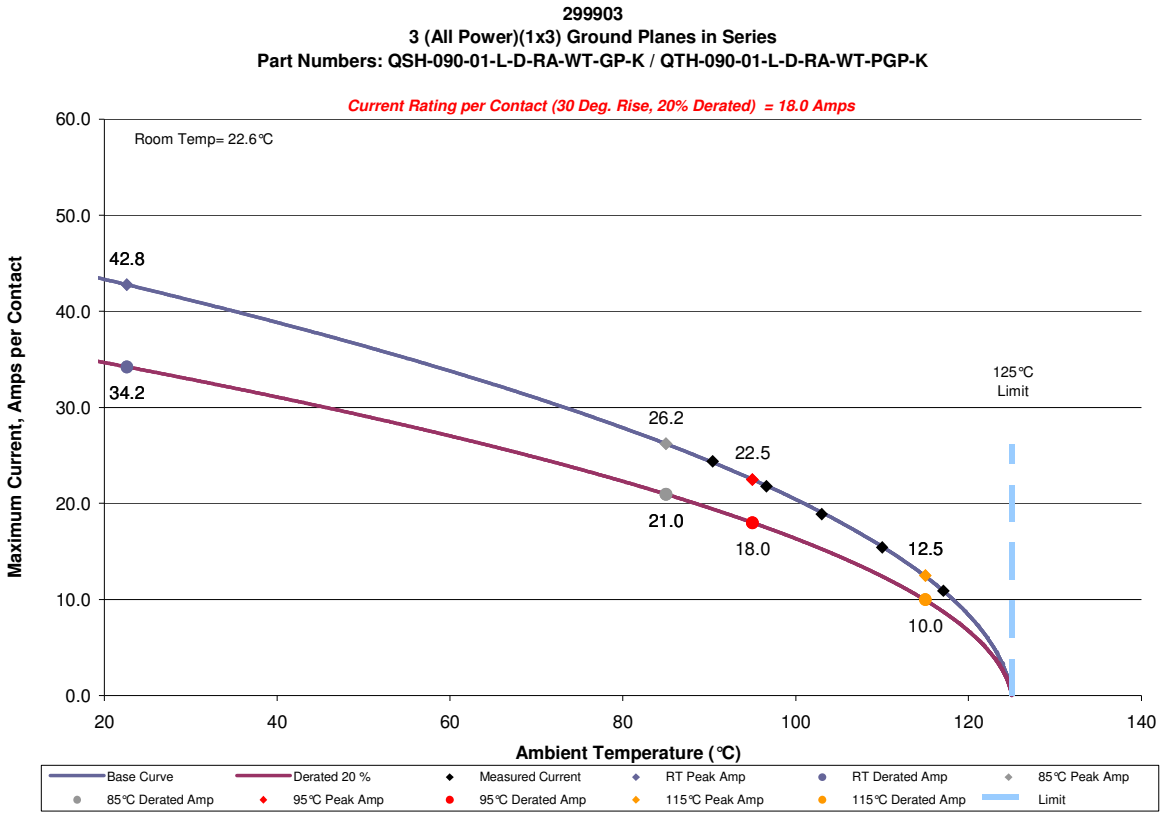
g. Linear configuration with 2 adjacent ground planes powered

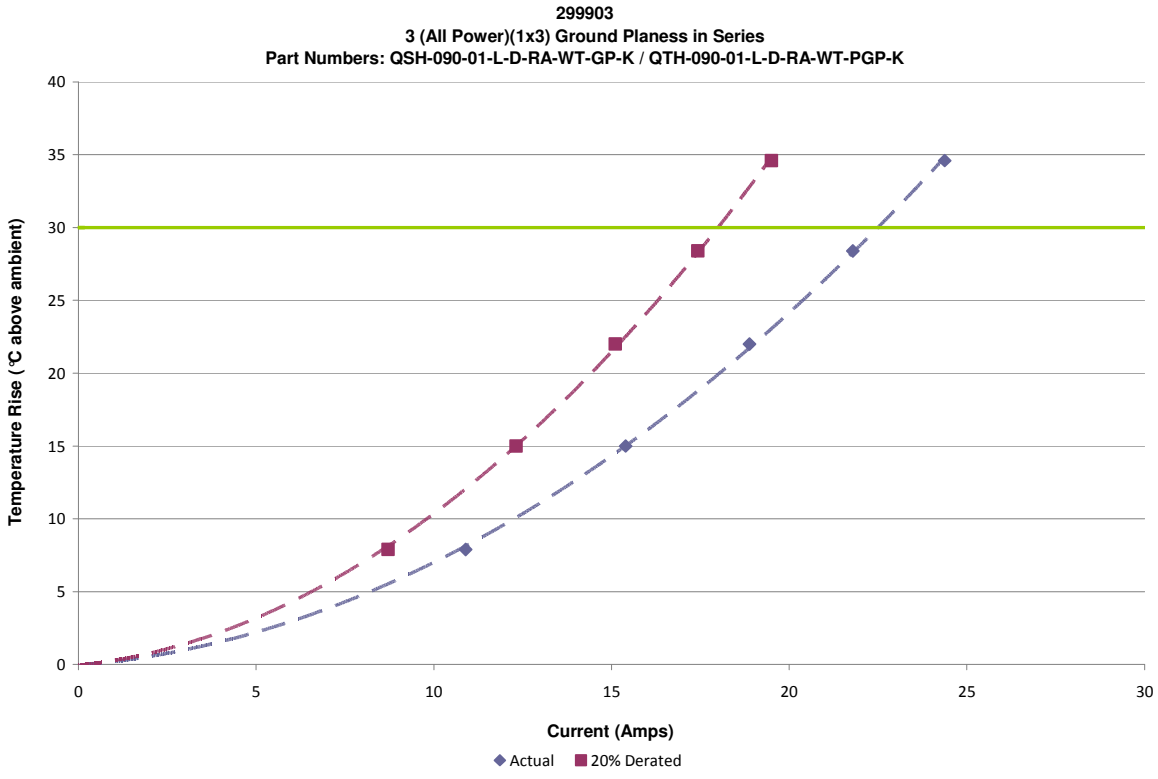




DATA SUMMARIES Continued

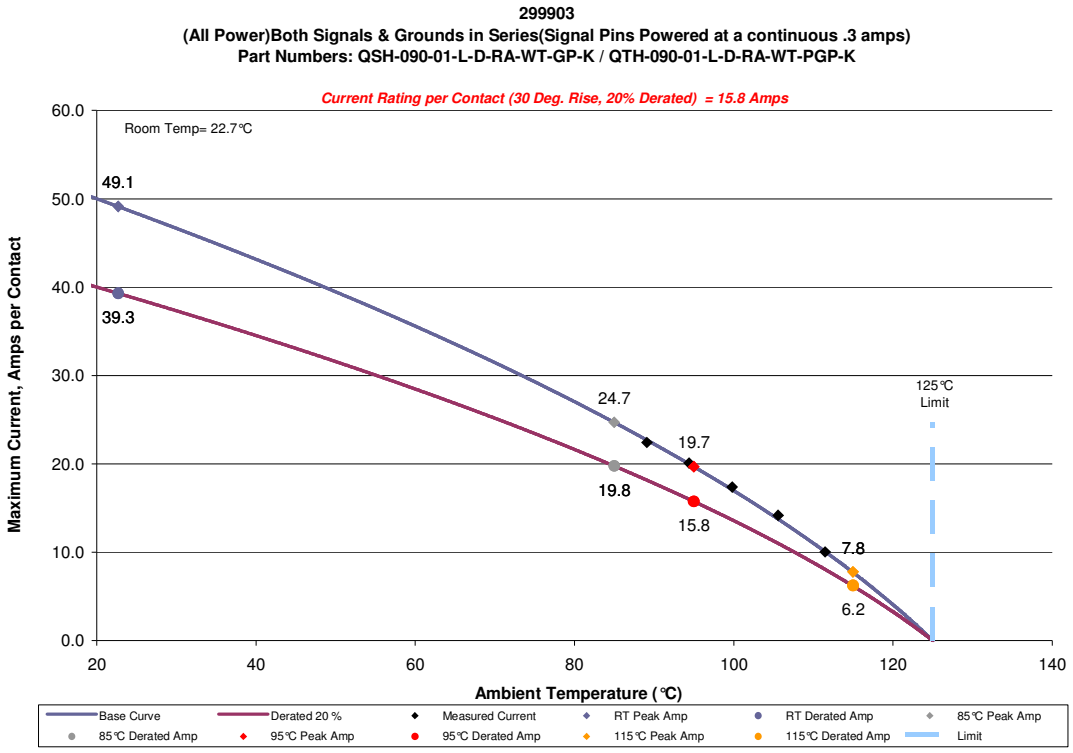
h. Linear configuration with all adjacent ground planes powered

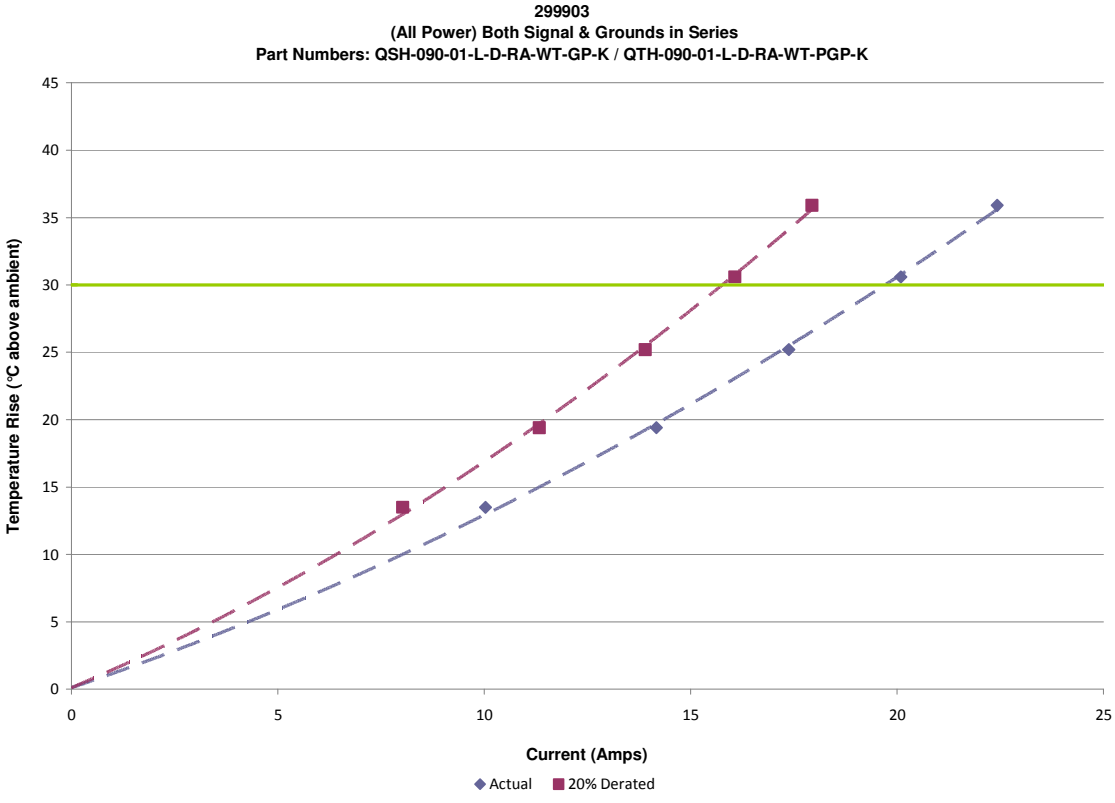




DATA SUMMARIES Continued

i. Linear configuration with all adjacent ground planes powered and signal pins powered at a continuous .3 amps)





DATA SUMMARIES Continued

MATING-UNMATING FORCE:

Thermal Aging Group（QSH-060-01-L-D-RA-WT-GP-K/QTH-060-01-L-D-RA-WT-PGP-K）

	Initial				After Thermals			
	Mating		**Unmating**		**Mating**		**Unmating**	
	Newtons	Force (Lbs)	Newtons	Force (Lbs)	Newtons	Force (Lbs)	Newtons	Force (Lbs)
Minimum	64.85	14.58	31.19	7.01	38.83	8.73	21.13	4.75
Maximum	78.05	17.55	41.72	9.38	44.75	10.06	23.35	5.25
Average	71.03	**15.97**	36.50	**8.21**	41.47	**9.32**	21.98	**4.94**
St Dev	4.38	0.98	3.20	0.72	1.79	0.40	0.75	0.17
Count	8	8	8	8	8	8	8	8

Mating-Unmating Durability Group（QSH-060-01-L-D-RA-WT-GP-K/QTH-060-01-L-D-RA-WT-PGP-K）

	Initial				After 25 Cycles			
	Mating		**Unmating**		**Mating**		**Unmating**	
	Newtons	Force (Lbs)	Newtons	Force (Lbs)	Newtons	Force (Lbs)	Newtons	Force (Lbs)
Minimum	59.78	13.44	19.97	4.49	63.92	14.37	13.17	2.96
Maximum	66.50	14.95	35.85	8.06	70.37	15.82	35.41	7.96
Average	63.70	**14.32**	29.57	**6.65**	67.03	**15.07**	29.55	**6.64**
St Dev	2.59	0.58	4.90	1.10	2.38	0.53	8.07	1.81
Count	8	8	8	8	8	8	8	8

	After Humidity			
	Mating		**Unmating**	
	Newtons	Force (Lbs)	Newtons	Force (Lbs)
Minimum	38.65	8.69	18.15	4.08
Maximum	42.61	9.58	23.75	5.34
Average	39.83	**8.95**	20.94	**4.71**
St Dev	1.25	0.28	1.81	0.41
Count	8	8	8	8

DATA SUMMARIES Continued

Mating-Unmating Basic （QSH-090-01-L-D-RA-WT-GP-K/QTH-090-01-L-D-RA-WT-PGP-K）

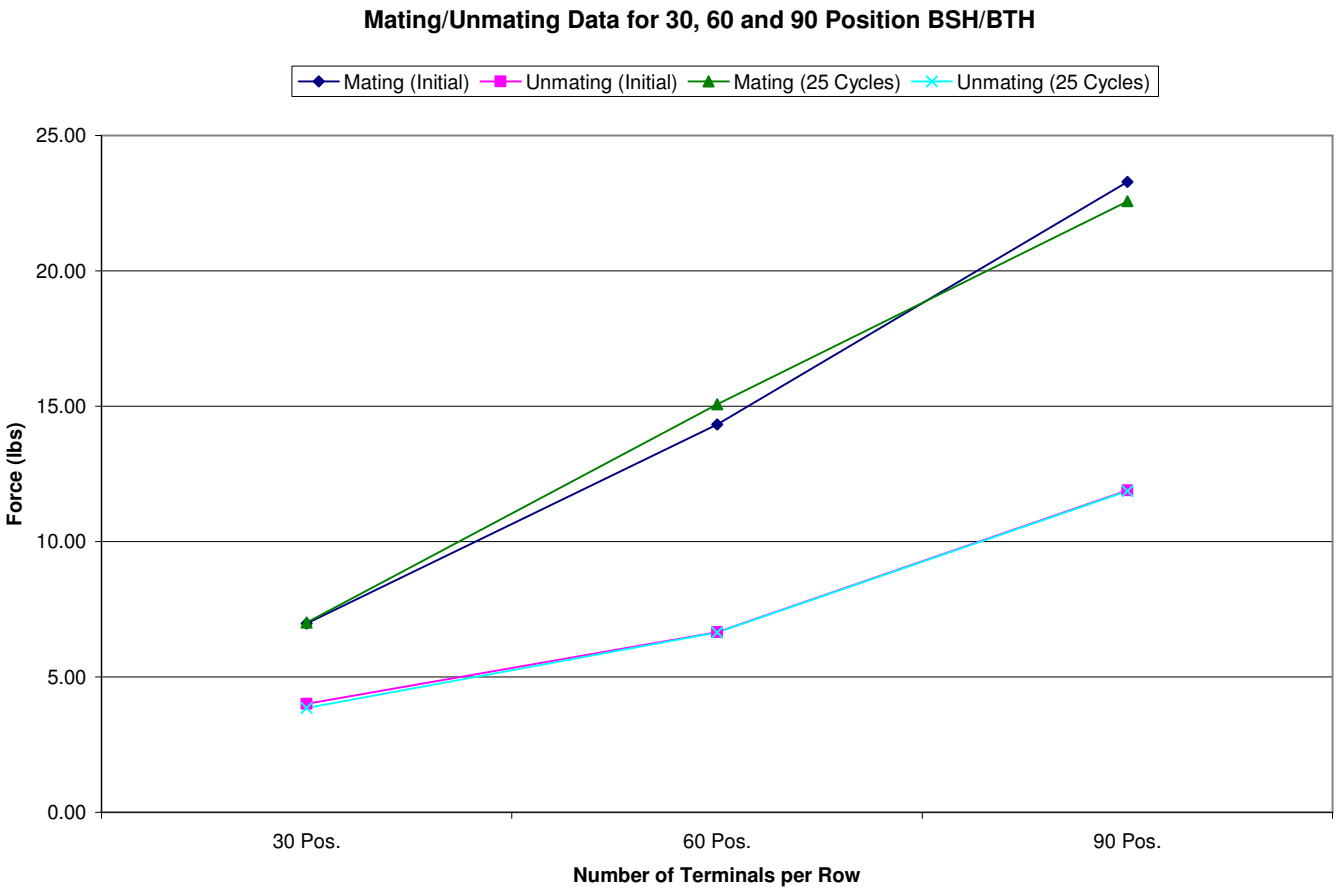
	Initial				After 25 Cycles			
	Mating		**Unmating**		**Mating**		**Unmating**	
	Newtons	Force (Lbs)	Newtons	Force (Lbs)	Newtons	Force (Lbs)	Newtons	Force (Lbs)
Minimum	97.28	21.87	33.89	7.62	92.79	20.86	37.54	8.44
Maximum	109.82	24.69	57.51	12.93	107.15	24.09	57.20	12.86
Average	103.58	**23.29**	52.87	**11.89**	100.42	**22.58**	52.81	**11.87**
St Dev	4.61	1.04	7.74	1.74	5.04	1.13	6.74	1.51
Count	8	8	8	8	8	8	8	8

Mating-Unmating Basic（QSH-030-01-L-D-RA-WT-GP-K/QTH-030-01-L-D-RA-WT-PGP-K）

	Initial				After 25 Cycles			
	Mating		**Unmating**		**Mating**		**Unmating**	
	Newtons	Force (Lbs)	Newtons	Force (Lbs)	Newtons	Force (Lbs)	Newtons	Force (Lbs)
Minimum	28.73	6.46	14.14	3.18	30.34	6.82	14.19	3.19
Maximum	33.45	7.52	20.91	4.70	32.65	7.34	19.17	4.31
Average	31.02	**6.97**	17.84	**4.01**	31.20	**7.01**	17.10	**3.84**
St Dev	1.45	0.32	2.32	0.52	0.79	0.18	1.54	0.35
Count	8	8	8	8	8	8	8	8

DATA SUMMARIES Continued

Mating\Unmating Force Comparison



DATA SUMMARIES Continued

INSULATION RESISTANCE (IR):

	Pin to Pin		
	Mated	Unmated	Unmated
Minimum	**QSH-RA/QTH-RA**	**QSH-RA**	**QTH-RA**
Initial	45000	45000	45000
Thermal	45000	45000	45000
Humidity	20300	31000	45000

	Pin to Ground		
	Mated	Unmated	Unmated
Minimum	**QSH-RA/QTH-RA**	**QSH-RA**	**QTH-RA**
Initial	45000	45000	45000
Thermal	45000	45000	45000
Humidity	45000	45000	45000

	Ground to Closest Metallic Hardware		
	Mated	Unmated	Unmated
Minimum	**QSH-RA/QTH-RA**	**QSH-RA**	**QTH-RA**
Initial	45000	45000	45000
Thermal	45000	45000	45000
Humidity	45000	45000	45000

	Row to Row		
	Mated	Unmated	Unmated
Minimum	**QSH-RA/QTH-RA**	**QSH-RA**	**QTH-RA**
Initial	45000	45000	45000
Thermal	45000	45000	45000
Humidity	45000	45000	45000

	Pin to Closest Metallic Hardware		
	Mated	Unmated	Unmated
Minimum	**QSH-RA/QTH-RA**	**QSH-RA**	**QTH-RA**
Initial	45000	45000	45000
Thermal	45000	45000	45000
Humidity	45000	45000	45000

DATA SUMMARIES Continued

DIELECTRIC WITHSTANDING VOLTAGE (DWV):

Voltage Rating Summary	
Minimum	**QSH-RA/QTH-RA**
Break Down Voltage	895
Test Voltage	671
Working Voltage	220

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

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

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

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

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

DATA SUMMARIES Continued

LLCR Thermal Aging Group

1) A total of 104 points were measured.
2) EIA-364-23, *Low Level Contact Resistance Test Procedure for Electrical Connectors and Sockets.*
3) A computer program, *LLCR 221.exe*, ensures repeatability for data acquisition.
4) The following guidelines are used to categorize the changes in LLCR as a result from stressing.
   a. <= +5.0 mOhms:---------- Stable
   b. +5.1 to +10.0 mOhms:---------- Minor
   c. +10.1 to +15.0 mOhms: ---------- Acceptable
   d. +15.1 to +50.0 mOhms: ---------- Marginal
   e. +50.1 to +2000 mOhms ---------- Unstable
   f. >+2000 mOhms:---------- Open Failure

LLCR Measurement Summaries by Pin Type				
Date	1/30/2014	2/17/2014		
Room Temp (Deg C)	24	22		
Rel Humidity (%)	30	34		
Technician	Troy Cook	Troy Cook		
mOhm values	**Actual Initial**	**Delta Thermal**	**Delta**	**Delta**
	Pin Type 1: Row 1			
Average	29.28	0.38		
St. Dev.	0.31	0.34		
Min	28.65	0.00		
Max	30.03	1.70		
Summary Count	72	72		
Total Count	72	72		
	Pin Type 2: Row 2			
Average	34.95	0.42		
St. Dev.	0.30	0.28		
Min	34.43	0.00		
Max	36.84	1.38		
Summary Count	104	104		
Total Count	104	104		
	Pin Type 3: Ground			
Average	2.47	0.04		
St. Dev.	0.34	0.02		
Min	2.07	0.00		
Max	2.88	0.09		
Summary Count	16	16		
Total Count	16	16		

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

DATA SUMMARIES Continued

LLCR Mating/Unmating Durability Group

1). A total of 104 points were measured.
2). EIA-364-23, *Low Level Contact Resistance Test Procedure for Electrical Connectors and Sockets.*
3). A computer program, *LLCR 221.exe*, ensures repeatability for data acquisition.
4). The following guidelines are used to categorize the changes in LLCR as a result from stressing.
   a. <= +5.0 mOhms: ---------- Stable
   b. +5.1 to +10.0 mOhms: ---------- Minor
   c. +10.1 to +15.0 mOhms: ---------- Acceptable
   d. +15.1 to +50.0 mOhms: ---------- Marginal
   e. +50.1 to +2000 mOhms ---------- Unstable
   f. > +2000 mOhms: ---------- Open Failure

LLCR Measurement Summaries by Pin Type				
Date	1/29/2014	2/5/2014	2/10/2014	2/21/2014
Room Temp (Deg C)	23	23	23	23
Rel Humidity (%)	32	35	33	33
Technician	Troy Cook	Troy Cook	Troy Cook	Troy Cook
mOhm values	**Actual Initial**	**Delta 25 Cycles**	**Delta Therm Shck**	**Delta Humidity**
	Pin Type 1: Row 1			
Average	29.28	0.43	0.44	0.47
St. Dev.	0.40	0.25	0.36	0.41
Min	28.09	0.00	0.01	0.00
Max	30.76	1.04	1.58	2.02
Summary Count	72	72	72	72
Total Count	72	72	72	72
	Pin Type 2: Row 2			
Average	35.04	0.26	0.25	0.30
St. Dev.	0.36	0.21	0.21	0.25
Min	34.25	0.00	0.01	0.01
Max	36.07	0.95	1.13	1.41
Summary Count	104	104	104	104
Total Count	104	104	104	104
	Pin Type 3: Ground			
Average	2.51	0.04	0.04	0.08
St. Dev.	0.37	0.03	0.04	0.05
Min	2.10	0.01	0.00	0.01
Max	3.01	0.12	0.16	0.19
Summary Count	16	16	16	16
Total Count	16	16	16	16

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

DATA SUMMARIES Continued

LLCR Gas Tight Group

1) A total of 104 points were measured.
2) EIA-364-23, *Low Level Contact Resistance Test Procedure for Electrical Connectors and Sockets.*
3) A computer program, *LLCR 221.exe*, ensures repeatability for data acquisition.
4) The following guidelines are used to categorize the changes in LLCR as a result from stressing.
   a. <= +5.0 mOhms: ---------- Stable
   b. +5.1 to +10.0 mOhms: ---------- Minor
   c. +10.1 to +15.0 mOhms: ---------- Acceptable
   d. +15.1 to +50.0 mOhms: ---------- Marginal
   e. +50.1 to +2000 mOhms: ---------- Unstable
   f. >+2000 mOhms: ---------- Open Failure

	LLCR Measurement Summaries by Pin Type			
Date	1/22/2014	1/22/2014		
Room Temp (Deg C)	23	22		
Rel Humidity (%)	31	29		
Technician	Troy Cook	Troy Cook		
mOhm values	**Actual Initial**	**Delta Acid Vapor**	**Delta**	**Delta**
	Pin Type 1: Row 1			
Average	29.11	0.23		
St. Dev.	0.32	0.17		
Min	28.52	0.00		
Max	29.88	0.66		
Summary Count	72	72		
Total Count	72	72		
	Pin Type 2: Row 2			
Average	35.06	0.27		
St. Dev.	0.25	0.19		
Min	34.49	0.00		
Max	35.80	0.97		
Summary Count	104	104		
Total Count	104	104		
	Pin Type 3: Ground			
Average	2.50	0.03		
St. Dev.	0.36	0.03		
Min	2.10	0.00		
Max	3.00	0.12		
Summary Count	16	16		
Total Count	16	16		

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

LLCR Shock & Vibration Group

1) A total of 104 points were measured.
2) EIA-364-23, *Low Level Contact Resistance Test Procedure for Electrical Connectors and Sockets.*
3) A computer program, *LLCR 221.exe*, ensures repeatability for data acquisition.
4) The following guidelines are used to categorize the changes in LLCR as a result from stressing.
   a. <= +5.0 mOhms: ---------- Stable
   b. +5.1 to +10.0 mOhms: ---------- Minor
   c. +10.1 to +15.0 mOhms: ---------- Acceptable
   d. +15.1 to +50.0 mOhms: ---------- Marginal
   e. +50.1 to +2000 mOhms ---------- Unstable
   f. >+2000 mOhms: ---------- Open Failure

LLCR Measurement Summaries by Pin Type				
Date	2/3/2014	2/6/2014		
Room Temp (Deg C)	24	24		
Rel Humidity (%)	30	31		
Technician	Troy Cook	Troy Cook		
mOhm values	**Actual Initial**	**Delta Shock-Vib**	**Delta**	**Delta**
	Pin Type 1: Row 1			
Average	29.40	0.35		
St. Dev.	0.44	0.30		
Min	28.51	0.01		
Max	30.52	1.21		
Summary Count	72	72		
Total Count	72	72		
	Pin Type 2: Row 2			
Average	35.17	0.40		
St. Dev.	0.38	0.31		
Min	34.48	0.01		
Max	36.16	1.28		
Summary Count	104	104		
Total Count	104	104		
	Pin Type 3: Ground			
Average	2.72	0.47		
St. Dev.	0.46	0.36		
Min	1.91	0.01		
Max	3.50	1.04		
Summary Count	16	16		
Total Count	16	16		

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

DATA SUMMARIES Continued

Nanosecond Event Detection:

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

EQUIPMENT AND CALIBRATION SCHEDULES

Equipment #: THC-02
Description: Temperature/Humidity Chamber
Manufacturer: Thermotron
Model: SE-1000-6-6
Serial #: 31808
Accuracy: See Manual
… Last Cal: 02/16/2014, Next Cal: 02/16/2015

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: 02/03/2014, Next Cal: 02/03/2015

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

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

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

EQUIPMENT AND CALIBRATION SCHEDULES Continued

Equipment #: TCT-01
Description: Test Stand
Manufacturer: Chatillon
Model: TCD-1000
Serial #: 05 23 00 02
Accuracy: Speed Accuracy: +/-5% of max speed; Displacement: +/-.5% or +/-.005, whichever is greater.
… Last Cal: 08/24/2013, Next Cal: 08/24/2014

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

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

Equipment #: ACLM-01
Description: Accelerometer
Manufacturer: PCB Piezotronics
Model: 352C03
Serial #: 115819
Accuracy: See Manual
… Last Cal: 07/09/2013, Next Cal: 07/09/2014

Equipment #: ED-03
Description: Event Detector
Manufacturer: Analysis Tech
Model: 32EHD
Serial #: 1100604
Accuracy: See Manual
… Last Cal: 06/04/2013, Next Cal: 06/04/2014

Equipment #: MO-04
Description: Multimeter /Data Acquisition System
Manufacturer: Keithley
Model: 2700
Serial #: 0798688
Accuracy: See Manual
… Last Cal: 03/27/2013, Next Cal: 03/27/2014