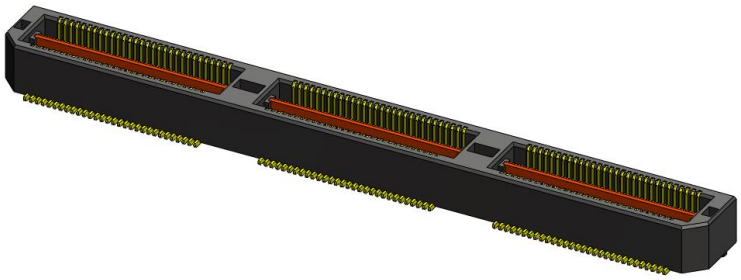
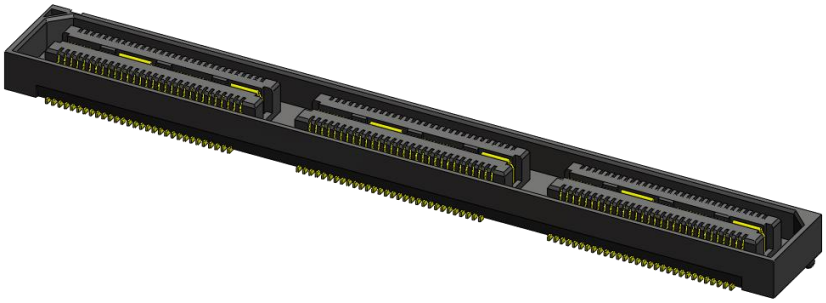
Project Number: Design Qualification Test Report	Tracking Code: 172630_Report_Rev_4
Requested by: Eric Mings	Date: 6/23/2015
Part #: QSH-120-01-L-D-A/QTH-120-01-L-D-A	Tech: Peter Chen
Part description: QSH/QTH	Qty to test: 45
Test Start: 11/28/2011	Test Completed: 1/17/2012





Design Qualification Test Report

QSH/QTH
QSH-120-01-L-D-A/QTH-120-01-L-D-A
QSH-090-01-L-D-A/QTH-090-01-L-D-A
QSH-060-01-L-D-A/QTH-060-01-L-D-A
QSH-030-01-L-D-A/QTH-030-01-L-D-A

REVISION HISTORY

DATA	REV.NUM.	DESCRIPTION	ENG
03/22/2013	**3**	**Updated the cover page**	**PC**
12/30/2013	**4**	**Updated the CCC data**	**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.

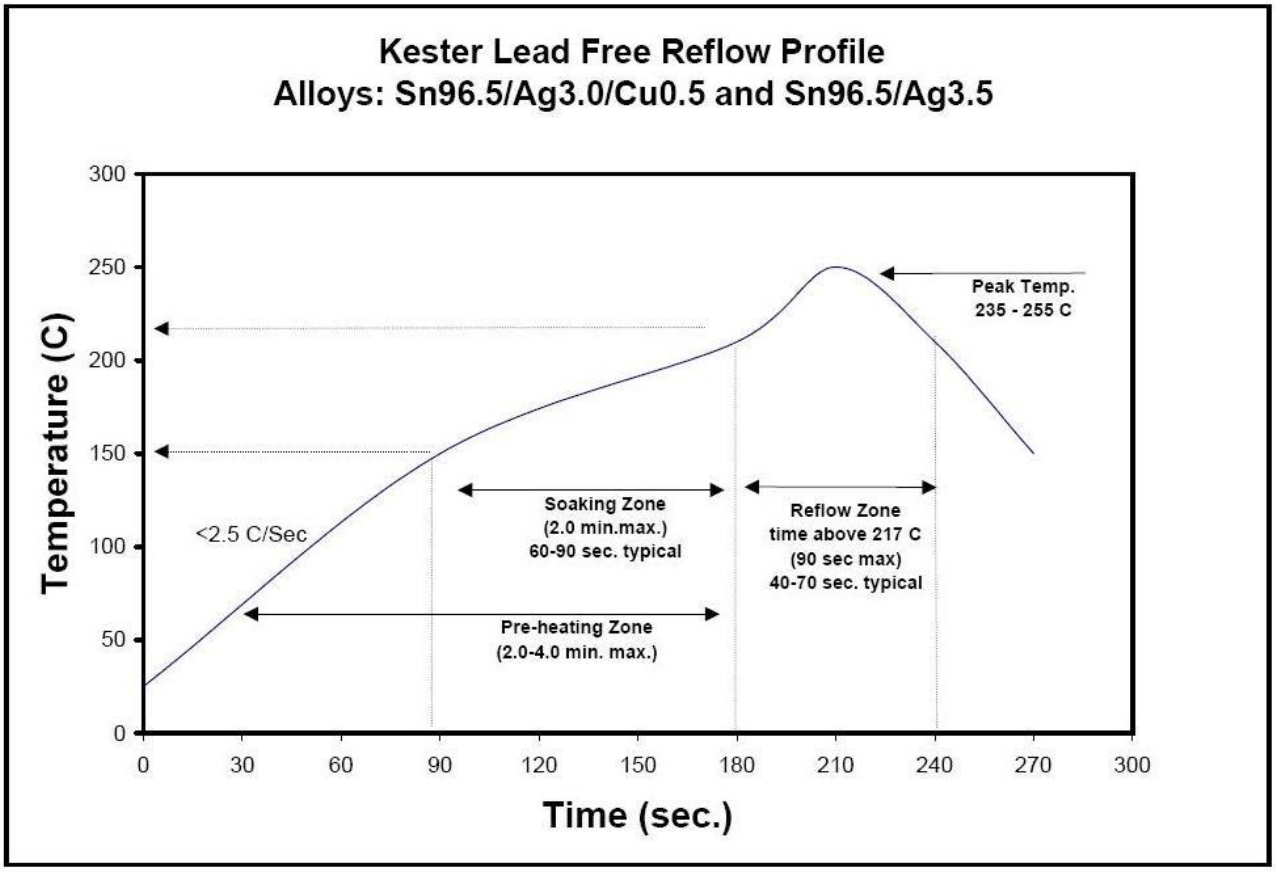
APPLICABLE DOCUMENTS

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-103581-TST-XX

TYPICAL OVEN PROFILE (Soldering Parts to Test Boards)



FLOWCHARTS

Durability/Mating/Unmating/Gaps

TEST STEP	GROUP B1 8 Boards (4 Bank)	GROUP B2 8 Boards (3 Bank)	GROUP B3 8 Boards (2 Bank)	GROUP B4 8 Boards (1 Bank)
01	Contact Gaps	Contact Gaps	Contact Gaps	Contact Gaps
02	LLCR-1	Forces - Mating / Unmating	Forces - Mating / Unmating	Forces - Mating / Unmating
03	Forces - Mating / Unmating	25 Cycles	25 Cycles	25 Cycles
04	25 Cycles	Forces - Mating / Unmating	Forces - Mating / Unmating	Forces - Mating / Unmating
05	Forces - Mating / Unmating	25 Cycles (50 Total)	25 Cycles (50 Total)	25 Cycles (50 Total)
06	25 Cycles (50 Total)	Forces - Mating / Unmating	Forces - Mating / Unmating	Forces - Mating / Unmating
07	Forces - Mating / Unmating	25 Cycles (75 Total)	25 Cycles (75 Total)	25 Cycles (75 Total)
08	25 Cycles (75 Total)	Forces - Mating / Unmating	Forces - Mating / Unmating	Forces - Mating / Unmating
09	Forces - Mating / Unmating	25 Cycles (100 Total)	25 Cycles (100 Total)	25 Cycles (100 Total)
10	25 Cycles (100 Total)	Forces - Mating / Unmating	Forces - Mating / Unmating	Forces - Mating / Unmating
11	Forces - Mating / Unmating			
12	Clean w/Compressed Air			
13	Contact Gaps			
14	LLCR-2			
15	Thermal Shock (Mated and Undisturbed)			
16	LLCR-3			
17	Cyclic Humidity (Mated and Undisturbed)			
18	LLCR-4			
19	Forces - Mating / Unmating			

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

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

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

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

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

Mating / Unmating Forces = EIA-364-13

Contact Gaps / Height - No standard method. Usually measured optically.

Gaps to be taken on a minimum of 20% of each part tested

LLCR = EIA-364-23, LLCR

20 mV Max, 100 mA Max

Use Keithley 580 or 3706 in 4 wire dry circuit mode

FLOWCHARTS Continued

IR & DWV

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

TEST STEP	GROUP E1 2 Mated Sets Break Down Pin-to-Ground	GROUP E2 2 Unmated of Part # Being Tested Break Down Pin-to-Ground	GROUP E3 2 Unmated of Mating Part # Break Down Pin-to-Ground	GROUP F1 2 Mated Sets Pin-to-Ground
01	DWV/Break Down Voltage	DWV/Break Down Voltage	DWV/Break Down Voltage	IR & DWV at test voltage (on both mated sets and on each connector unmated)
02				Thermal Shock (Mated and Undisturbed)
03				IR & DWV at test voltage (on both mated sets and on each connector unmated)
04				Cyclic Humidity (Mated and Undisturbed)
05				IR & DWV at test voltage (on both mated sets and on each connector unmated)

DWV on Group B1 to be performed at Test Voltage

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

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

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

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

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

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

IR = EIA-364-21

DWV = EIA-364-20, Test Condition 1

FLOWCHARTS Continued

Current Carrying Capacity - Ground Planes

TEST STEP	GROUP C1 3 Mated Assemblies 1 Ground Plane Powered	GROUP C2 3 Mated Assemblies 2 Ground Planes Powered	GROUP C3 3 Mated Assemblies 3 Ground Planes Powered
01	CCC	CCC	CCC

TEST STEP	GROUP C4 3 Mated Assemblies 4 Ground Planes Powered	GROUP C5 3 Mated Assemblies All Ground Planes Powered
01	CCC	CCC

Current Carrying Capacity - Double Row

TEST STEP	GROUP B1 3 Mated Assemblies 2 Contacts Powered	GROUP B2 3 Mated Assemblies 4 Contacts Powered	GROUP B3 3 Mated Assemblies 6 Contacts Powered
01	CCC	CCC	CCC

TEST STEP	GROUP B4 3 Mated Assemblies 8 Contacts Powered	GROUP B5 3 Mated Assemblies All Contacts Powered
01	CCC	CCC

(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

CCC, Temp rise = EIA-364-70

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.

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.

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

The following is a brief, simplified description of attributes.

DIELECTRIC WITHSTANDING VOLTAGE (DWV):

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

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

TEMPERATURE RISE (Current Carrying Capacity, CCC):

1) EIA-364-70, *Temperature Rise versus Current Test Procedure for Electrical Connectors and Sockets*.
2) When current passes through a contact, the temperature of the contact increases as a result of I^2R (resistive) heating.
3) The number of contacts being investigated plays a significant part in power dissipation and therefore temperature rise.
4) The size of the temperature probe can affect the measured temperature.
5) Copper traces on PC boards will contribute to temperature rise:
    a. Self heating (resistive)
    b. Reduction in heat sink capacity affecting the heated contacts
6) A de-rating curve, usually 20%, is calculated.
7) Calculated de-rated currents at 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.

ATTRIBUTE DEFINITIONS

The following is a brief, simplified description of attributes.

LLCR:

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

RESULTS

Temperature Rise, CCC at a 20% de-rating

- **CCC for a 30°C Temperature Rise ---------- 2.0 A per contact with 2 adjacent signal contacts powered**
- **CCC for a 30°C Temperature Rise ---------- 1.4 A per contact with 4 adjacent signal contacts powered**
- **CCC for a 30°C Temperature Rise ---------- 1.2 A per contact with 6 adjacent signal contacts powered**
- **CCC for a 30°C Temperature Rise ---------- 1.0 A per contact with 8 adjacent signal contacts powered**
- **CCC for a 30°C Temperature Rise ---------- 0.4 A per contact with all adjacent signal contacts powered**
- **CCC for a 30°C Temperature Rise ---------- 25.0 A per contact with 1 ground contacts powered**
- **CCC for a 30°C Temperature Rise ---------- 23.6 A per contact with 2 adjacent ground contacts powered**
- **CCC for a 30°C Temperature Rise ---------- 22.5 A per contact with 3 adjacent ground contacts powered**
- **CCC for a 30°C Temperature Rise ---------- 21.8 A per contact with 4 adjacent ground contacts powered**

RESULTS Continued

Mating & Unmating force

Mating&Unmating durability (QSH-120-01-L-D-A / QTH-120-01-L-D-A):

- **Initial**
  - **Mating**
    - **Min ----------13.71 Lbs**
    - **Max----------17.60 Lbs**
  - **Unmating**
    - **Min ---------- 8.05 Lbs**
    - **Max----------12.33 Lbs**
- **After 25 Cycles**
  - **Mating**
    - **Min ----------14.86 Lbs**
    - **Max----------18.56 Lbs**
  - **Unmating**
    - **Min ---------- 9.56 Lbs**
    - **Max----------13.29 Lbs**
- **After 50 Cycles**
  - **Mating**
    - **Min ----------15.29 Lbs**
    - **Max----------18.98 Lbs**
  - **Unmating**
    - **Min ----------10.32 Lbs**
    - **Max----------14.02 Lbs**
- **After 75 Cycles**
  - **Mating**
    - **Min ----------16.12 Lbs**
    - **Max----------19.22 Lbs**
  - **Unmating**
    - **Min ----------10.59 Lbs**
    - **Max----------14.25 Lbs**
- **After 100 Cycles**
  - **Mating**
    - **Min ----------16.58 Lbs**
    - **Max----------19.78 Lbs**
  - **Unmating**
    - **Min ----------11.21 Lbs**
    - **Max----------15.02 Lb**
- **After Humidity**
  - **Mating**
    - **Min ---------- 8.64 Lbs**
    - **Max----------13.72 Lbs**
  - **Unmating**
    - **Min ---------- 6.23 Lbs**
    - **Max---------- 8.42 Lbs**

RESULTS Continued

Mating/Unmating basic (QSH-090-01-L-D-A / QTH-090-01-L-D-A):

- **Initial**
  - **Mating**
    - **Min ----------12.82 Lbs**
    - **Max----------16.22 Lbs**
  - **Unmating**
    - **Min ---------- 9.34 Lbs**
    - **Max----------14.17 Lbs**
- **After 25 Cycles**
  - **Mating**
    - **Min ----------14.21 Lbs**
    - **Max----------18.15 Lbs**
  - **Unmating**
    - **Min ----------10.21 Lbs**
    - **Max----------14.64 Lbs**
- **After 50 Cycles**
  - **Mating**
    - **Min ----------14.78 Lbs**
    - **Max----------18.86 Lbs**
  - **Unmating**
    - **Min ----------11.98 Lbs**
    - **Max----------14.89 Lbs**
- **After 75 Cycles**
  - **Mating**
    - **Min ----------15.27 Lbs**
    - **Max----------19.34 Lbs**
  - **Unmating**
    - **Min ----------12.49 Lbs**
    - **Max----------15.21 Lbs**
- **After 100 Cycles**
  - **Mating**
    - **Min ----------16.32 Lbs**
    - **Max----------19.94 Lbs**
  - **Unmating**
    - **Min ----------12.64 Lbs**
    - **Max----------15.79 Lbs**

RESULTS Continued

Mating/Unmating basic (QSH-060-01-L-D-A / QTH-060-01-L-D-A):

- **Initial**
  - **Mating**
    - **Min ---------- 8.15 Lbs**
    - **Max----------10.16 Lbs**
  - **Unmating**
    - **Min ---------- 5.39 Lbs**
    - **Max---------- 8.08 Lbs**
- **After 25 Cycles**
  - **Mating**
    - **Min ---------- 8.59 Lbs**
    - **Max----------10.63 Lbs**
  - **Unmating**
    - **Min ---------- 5.78 Lbs**
    - **Max---------- 8.54 Lbs**
- **After 50 Cycles**
  - **Mating**
    - **Min ---------- 6.31 Lbs**
    - **Max----------10.57 Lbs**
  - **Unmating**
    - **Min ---------- 6.31 Lbs**
    - **Max---------- 9.80 Lbs**
- **After 75 Cycles**
  - **Mating**
    - **Min ---------- 8.85 Lbs**
    - **Max----------10.89 Lbs**
  - **Unmating**
    - **Min ---------- 6.39 Lbs**
    - **Max----------10.06 Lbs**
- **After 100 Cycles**
  - **Mating**
    - **Min ---------- 9.00 Lbs**
    - **Max----------11.24 Lbs**
  - **Unmating**
    - **Min ---------- 6.44 Lbs**
    - **Max----------10.46 Lbs**

RESULTS Continued

Mating/Unmating basic (QSH-030-01-L-D-A / QTH-030-01-L-D-A):

- **Initial**
  - **Mating**
    - **Min ---------- 4.08 Lbs**
    - **Max---------- 4.96 Lbs**
  - **Unmating**
    - **Min ---------- 3.24 Lbs**
    - **Max---------- 4.22 Lbs**
- **After 25 Cycles**
  - **Mating**
    - **Min ---------- 4.67 Lbs**
    - **Max---------- 5.36 Lbs**
  - **Unmating**
    - **Min ---------- 3.64 Lbs**
    - **Max---------- 4.46 Lbs**
- **After 50 Cycles**
  - **Mating**
    - **Min ---------- 5.06 Lbs**
    - **Max---------- 5.72 Lbs**
  - **Unmating**
    - **Min ---------- 4.03 Lbs**
    - **Max---------- 4.44 Lbs**
- **After 75 Cycles**
  - **Mating**
    - **Min ---------- 5.40 Lbs**
    - **Max---------- 6.19 Lbs**
  - **Unmating**
    - **Min ---------- 4.47 Lbs**
    - **Max---------- 4.85 Lbs**
- **After 100 Cycles**
  - **Mating**
    - **Min ---------- 5.67 Lbs**
    - **Max---------- 6.35 Lbs**
  - **Unmating**
    - **Min ---------- 4.64 Lbs**
    - **Max---------- 5.17 Lbs**

RESULTS Continued

LLCR Durability (184 signal pin and 8 ground pin LLCR test points)

Signal pin:

- **Initial ---------- 31.71 mOhms Max**
- **After 100 Cycles**
  - **<= +5.0 mOhms ---------- 177 Points ---------- Stable**
  - **+5.1 to +10.0 mOhms ----------7 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**
- **After thermal shock**
  - **<= +5.0 mOhms ---------- 178 Points ---------- Stable**
  - **+5.1 to +10.0 mOhms ----------6 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**
- **After humidity**
  - **<= +5.0 mOhms ---------- 174 Points ---------- Stable**
  - **+5.1 to +10.0 mOhms ---------- 10 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**
  - **>+2000 mOhms----------0 Points ---------- Open Failure**

Ground pin:

- **Initial ----------3.39 mOhms Max**
- **After 100 Cycles**
  - **<= +5.0 mOhms ---------- 8 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**
- **After thermal shock**
  - **<= +5.0 mOhms ---------- 8 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**
- **After humidity**
  - **<= +5.0 mOhms ---------- 8 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**
  - **>+2000 mOhms----------0 Points ---------- Open Failure**

RESULTS Continued

Insulation Resistance minimums, IR

Pin-Pin

- **Initial**
  - **Mated ---------- 10000Meg Ω ---------- Pass**
  - **Unmated ---------- 10000Meg Ω ---------- Pass**
- **Thermal**
  - **Mated ---------- 10000Meg Ω ---------- Pass**
  - **Unmated ---------- 10000Meg Ω ---------- Pass**
- **Humidity**
  - **Mated ---------- 10000Meg Ω ---------- Pass**
  - **Unmated ---------- 10000Meg Ω ---------- Pass**

Pin-Ground

- **Initial**
  - **Mated ---------- 10000Meg Ω ---------- Pass**
  - **Unmated ---------- 10000Meg Ω ---------- Pass**
- **Thermal**
  - **Mated ---------- 10000Meg Ω ---------- Pass**
  - **Unmated ---------- 10000Meg Ω ---------- Pass**
- **Humidity**
  - **Mated ---------- 10000Meg Ω ---------- Pass**
  - **Unmated ---------- 10000Meg Ω ---------- Pass**

Row-Row

- **Initial**
  - **Mated ---------- 10000Meg Ω ---------- Pass**
  - **Unmated ---------- 10000Meg Ω ---------- Pass**
- **Thermal**
  - **Mated ---------- 10000Meg Ω ---------- Pass**
  - **Unmated ---------- 10000Meg Ω ---------- Pass**
- **Humidity**
  - **Mated ---------- 10000Meg Ω ---------- Pass**
  - **Unmated ---------- 10000Meg Ω ---------- Pass**

Dielectric Withstanding Voltage minimums, DWV

- **Minimums**
  - **Breakdown Voltage ---------- 700VAC**
  - **Test Voltage ---------- 525VAC**
  - **Working Voltage ---------- 175VAC**

Pin - pin

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

Pin - Ground

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

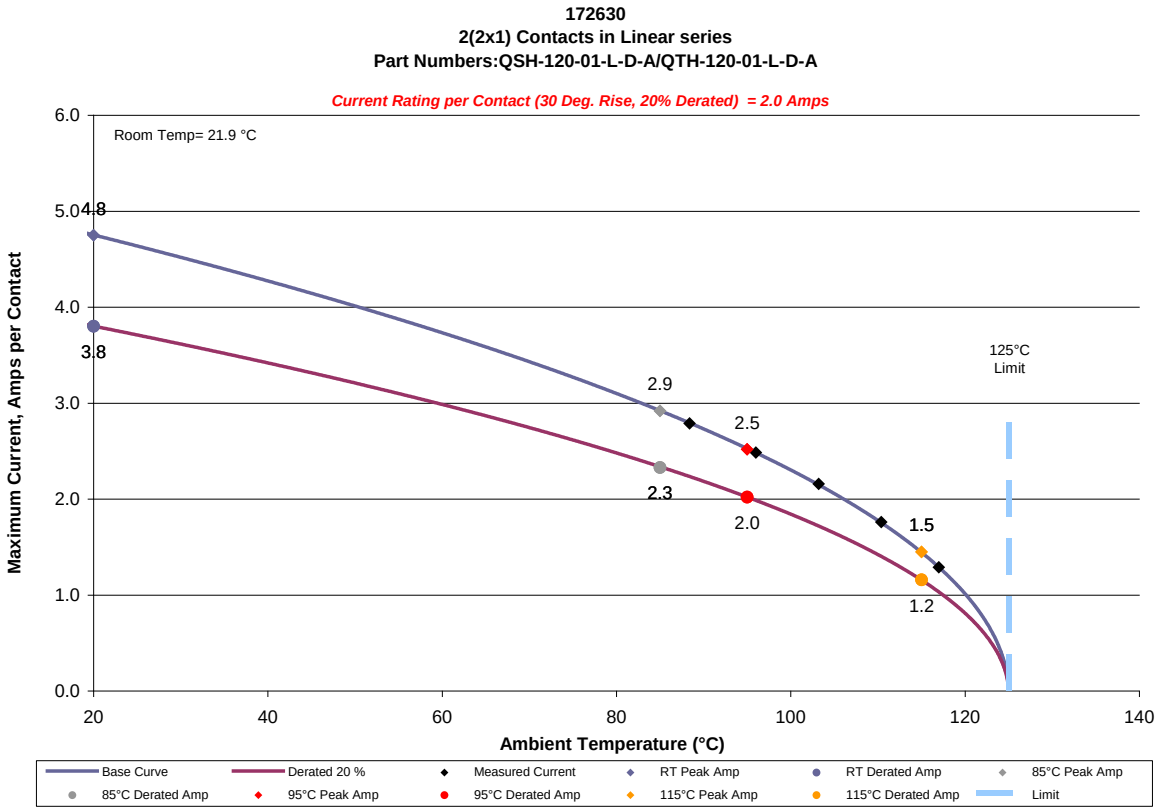
Row-Row

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

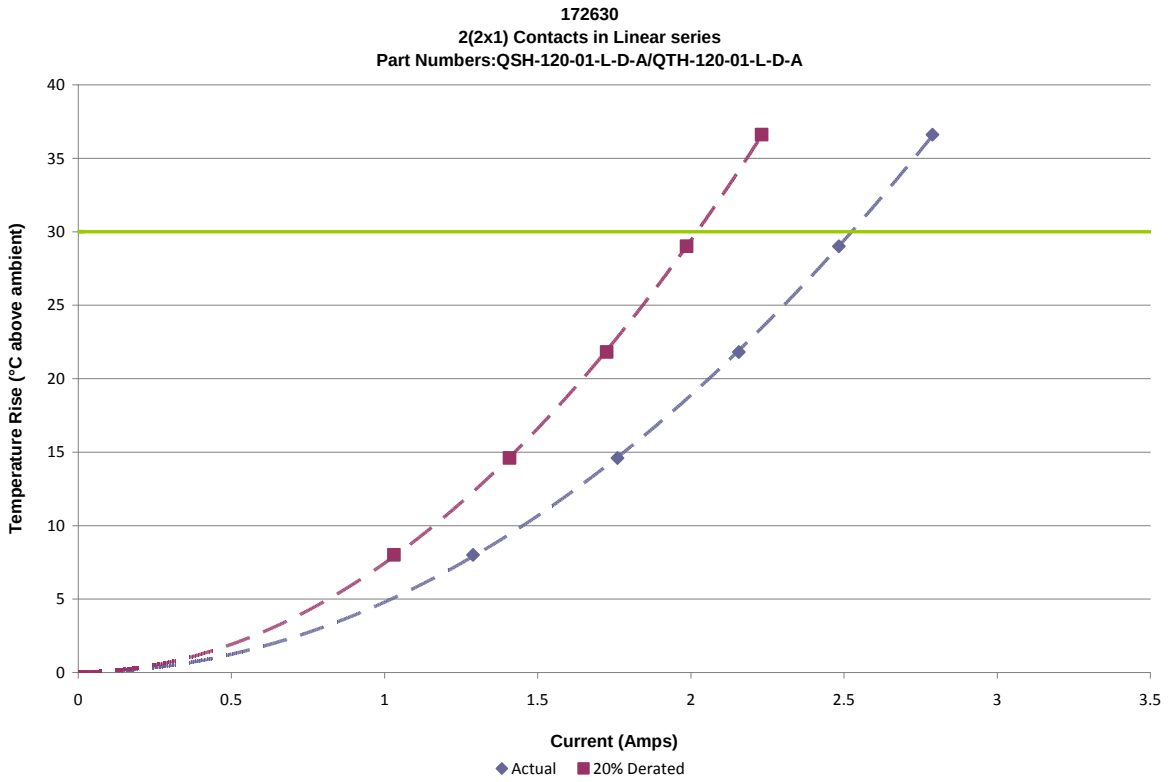
DATA SUMMARIES

TEMPERATURE RISE (Current Carrying Capacity, CCC):

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

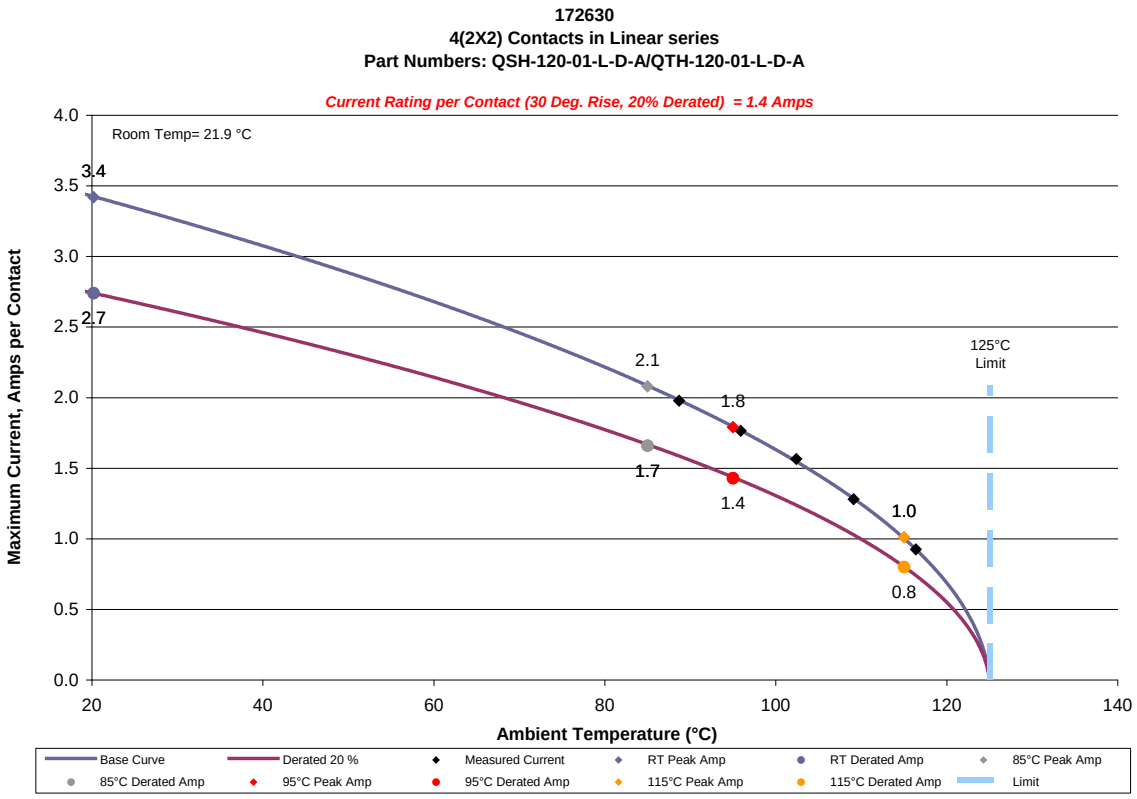


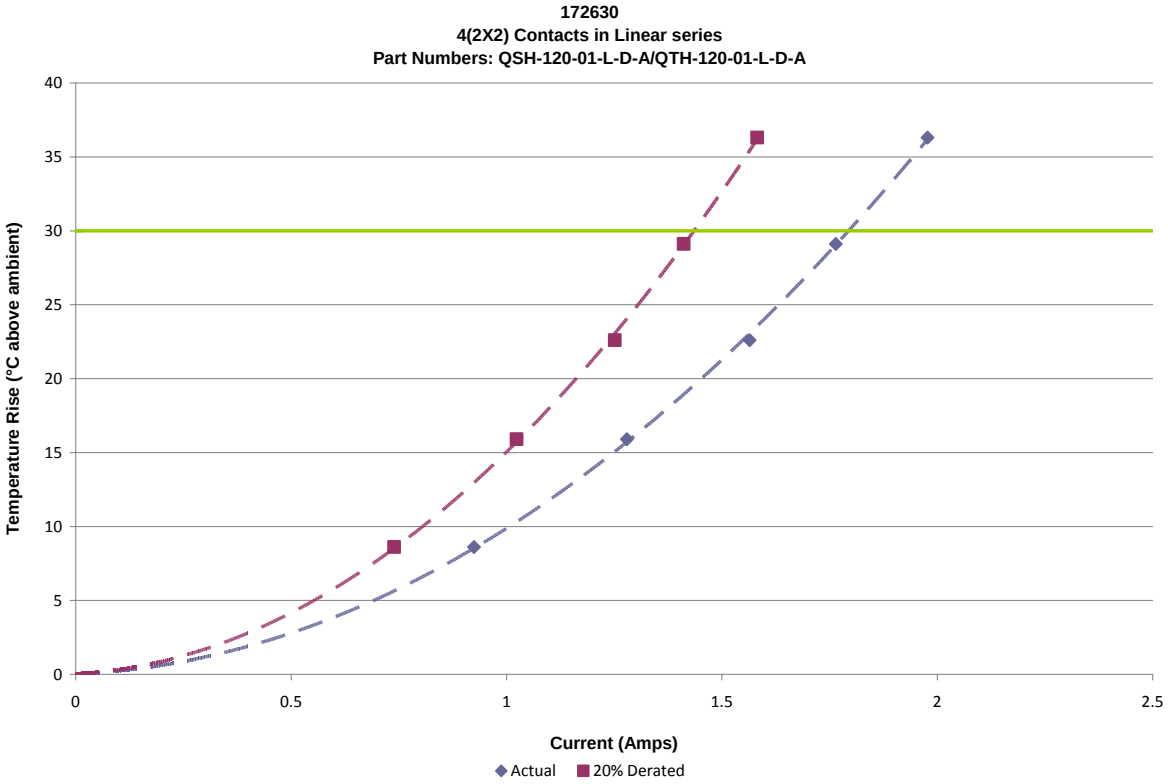
DATA SUMMARIES Continued



DATA SUMMARIES Continued

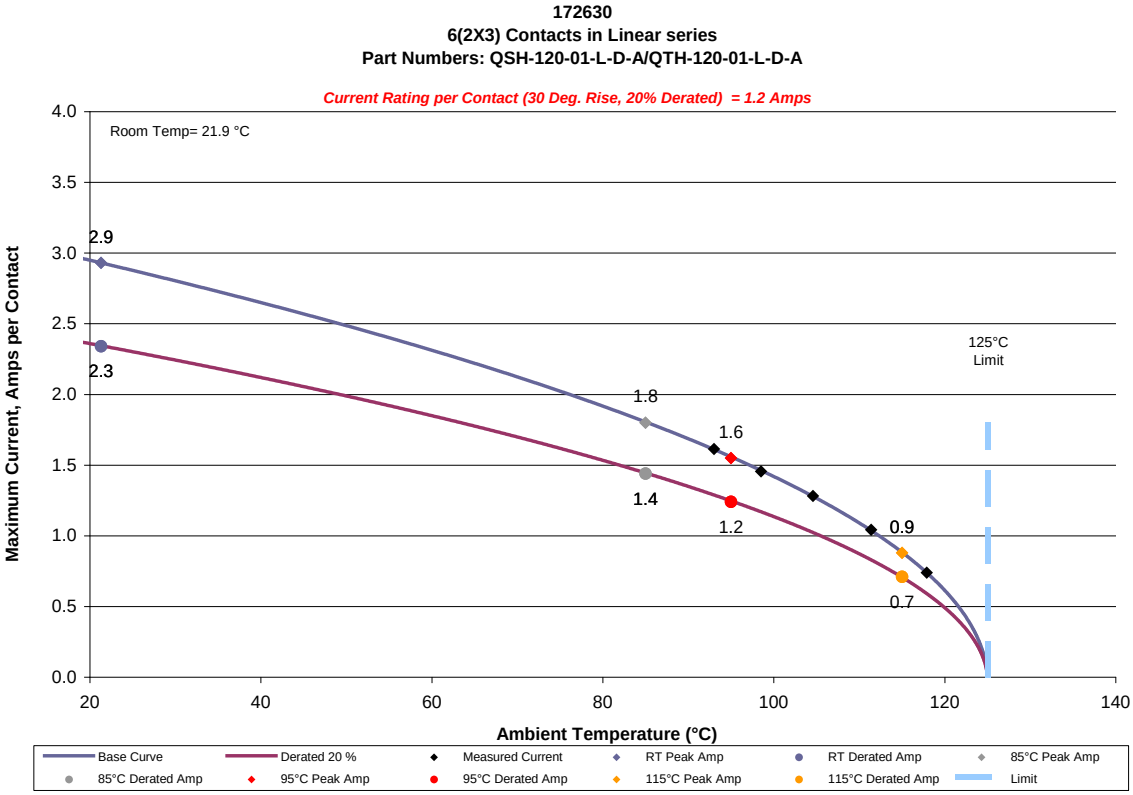
b. Linear configuration with 4 adjacent signal conductors/contacts powered

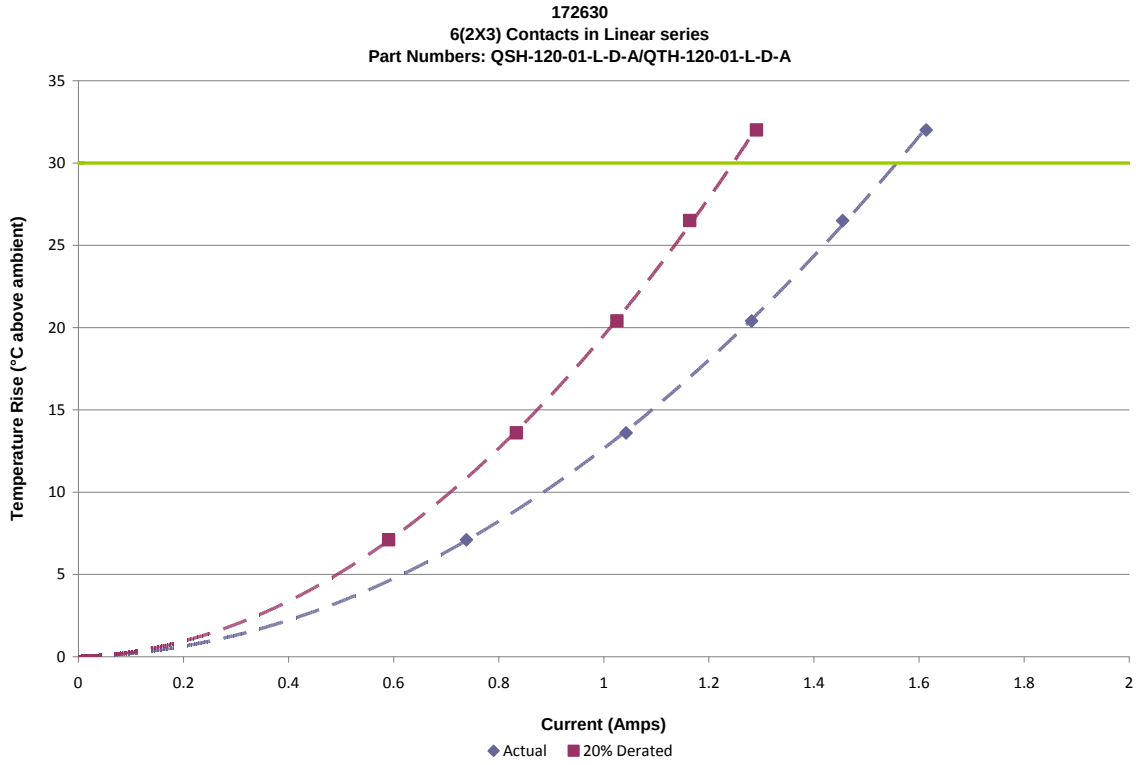




DATA SUMMARIES Continued

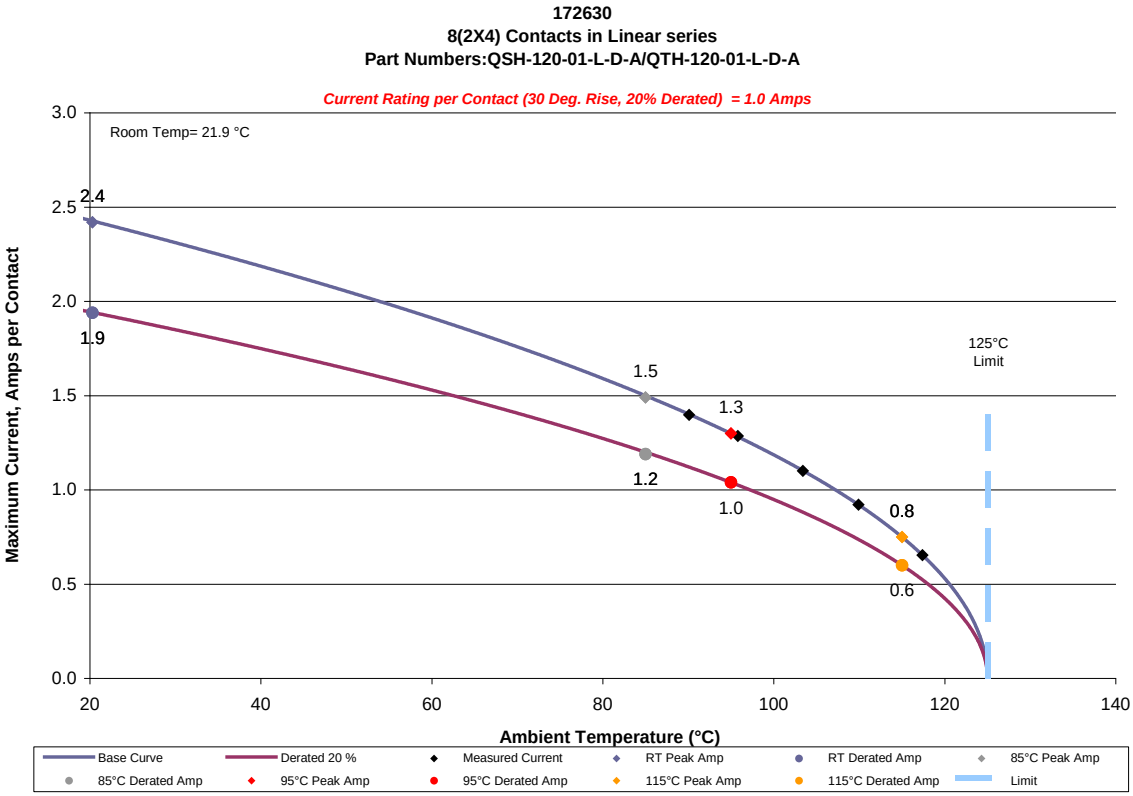
c. Linear configuration with 6 adjacent signal conductors/contacts powered

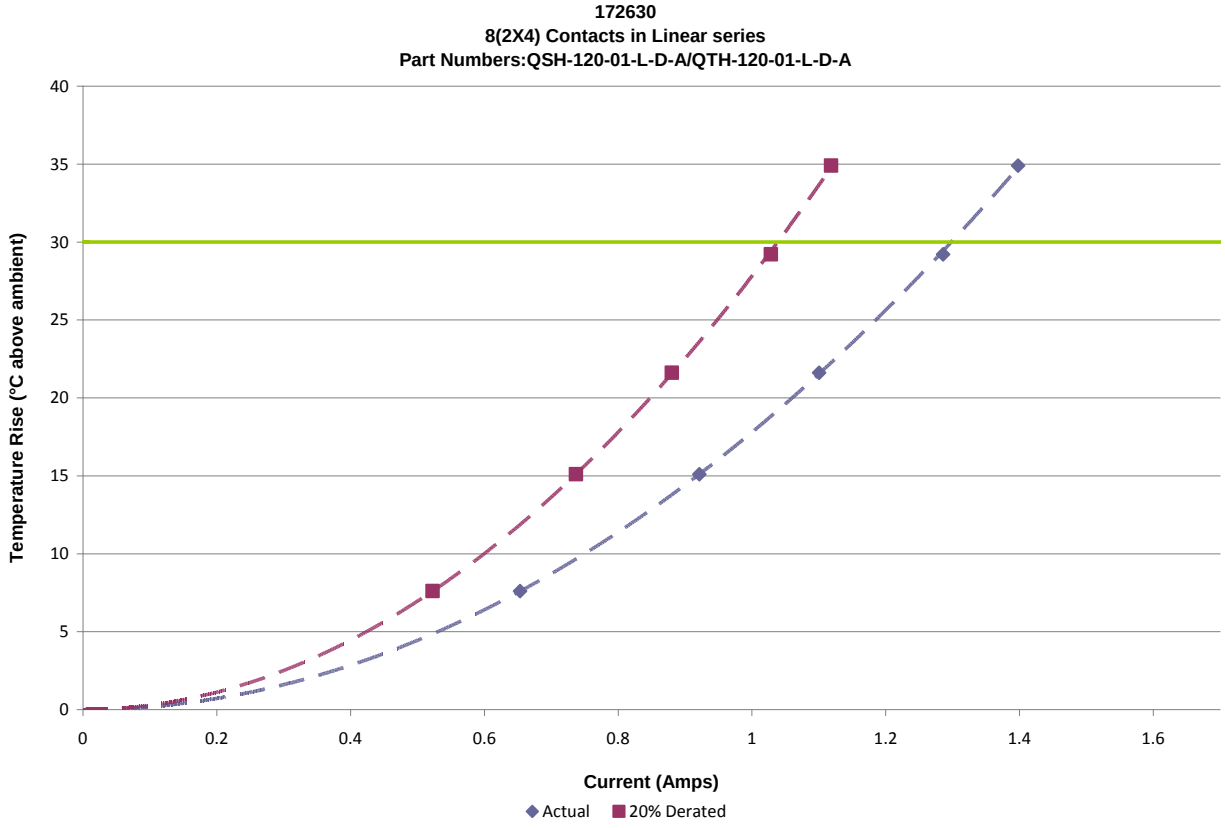




DATA SUMMARIES Continued

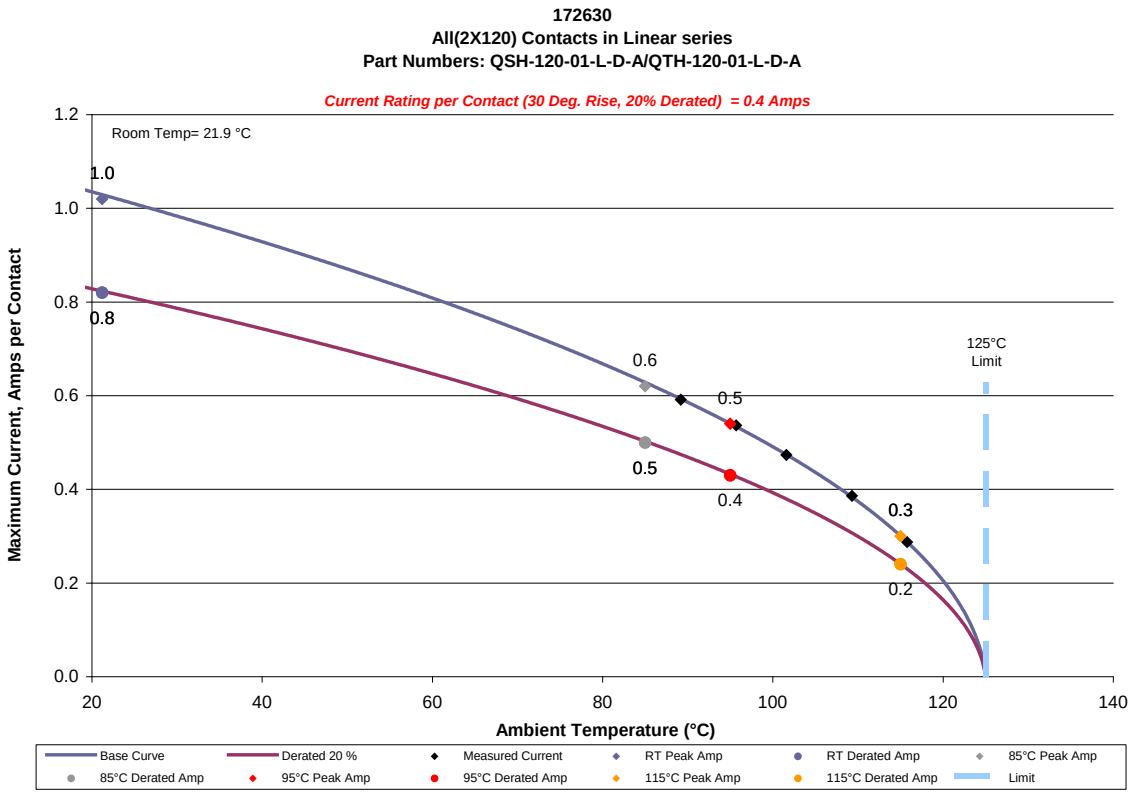
d. Linear configuration with 8 adjacent signal conductors/contacts powered

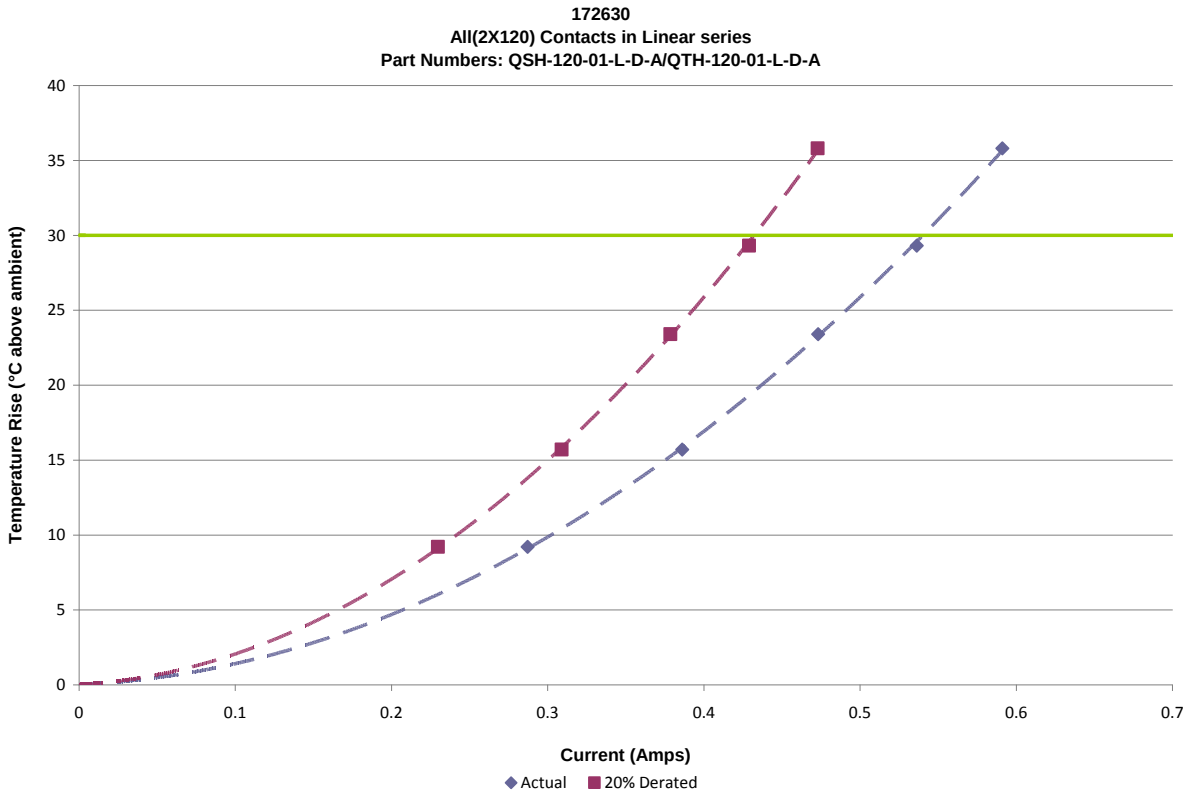




DATA SUMMARIES Continued

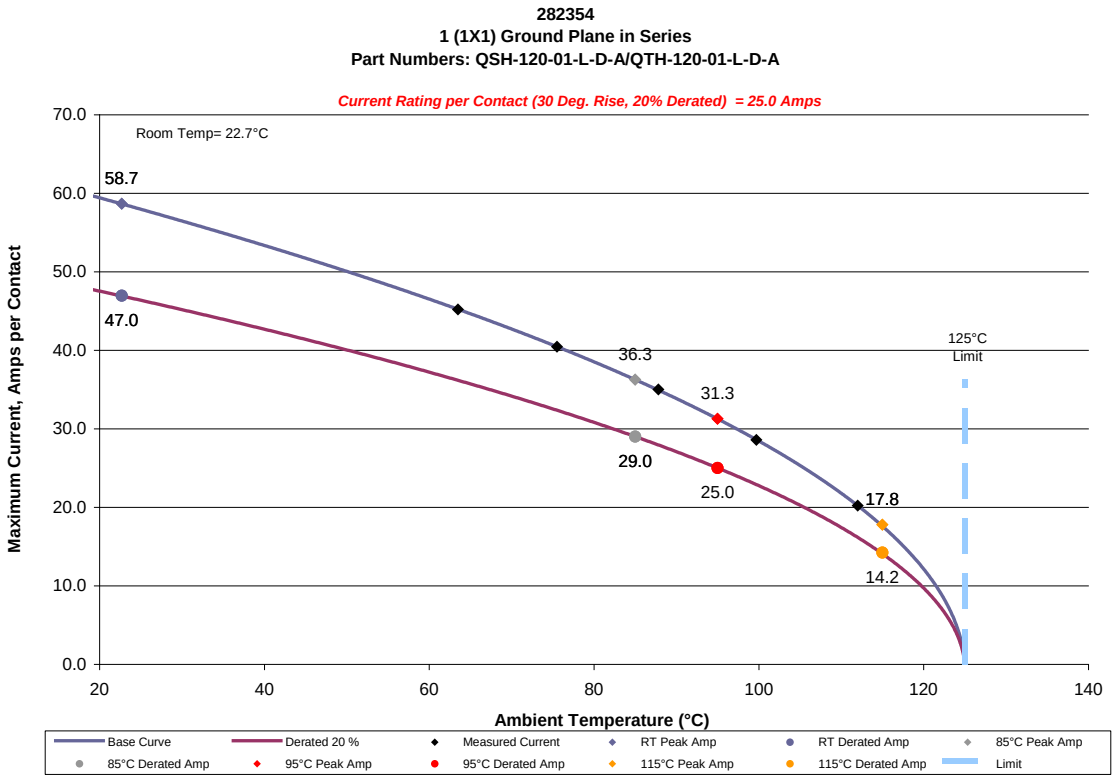
e. Linear configuration with all adjacent signal conductors/contacts powered

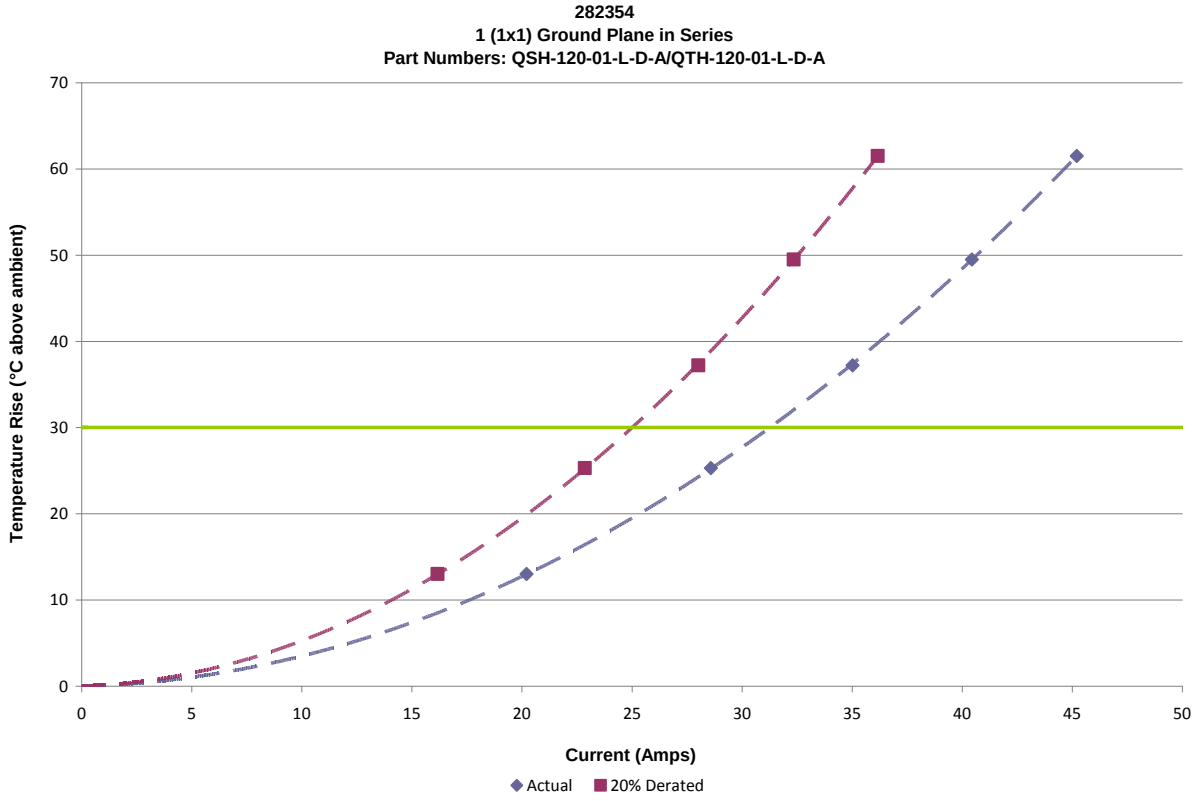




DATA SUMMARIES Continued

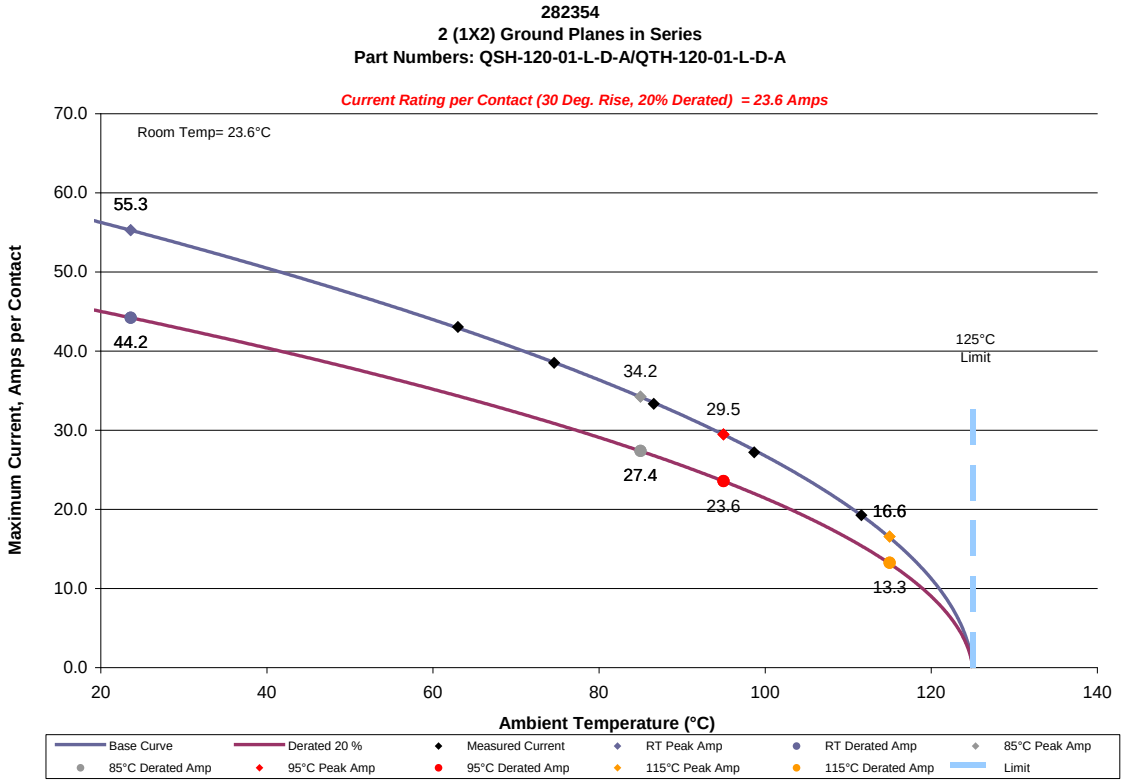
f. Linear configuration with 1 ground conductors/contacts powered

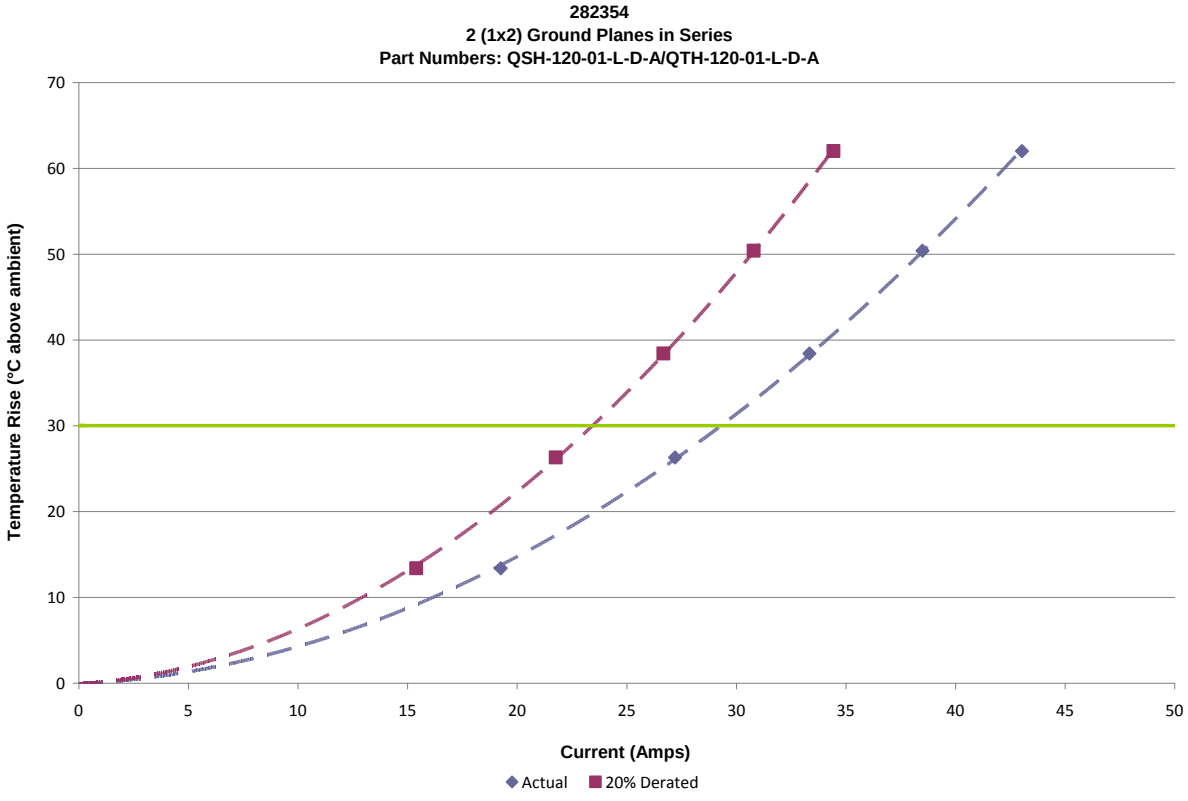




DATA SUMMARIES Continued

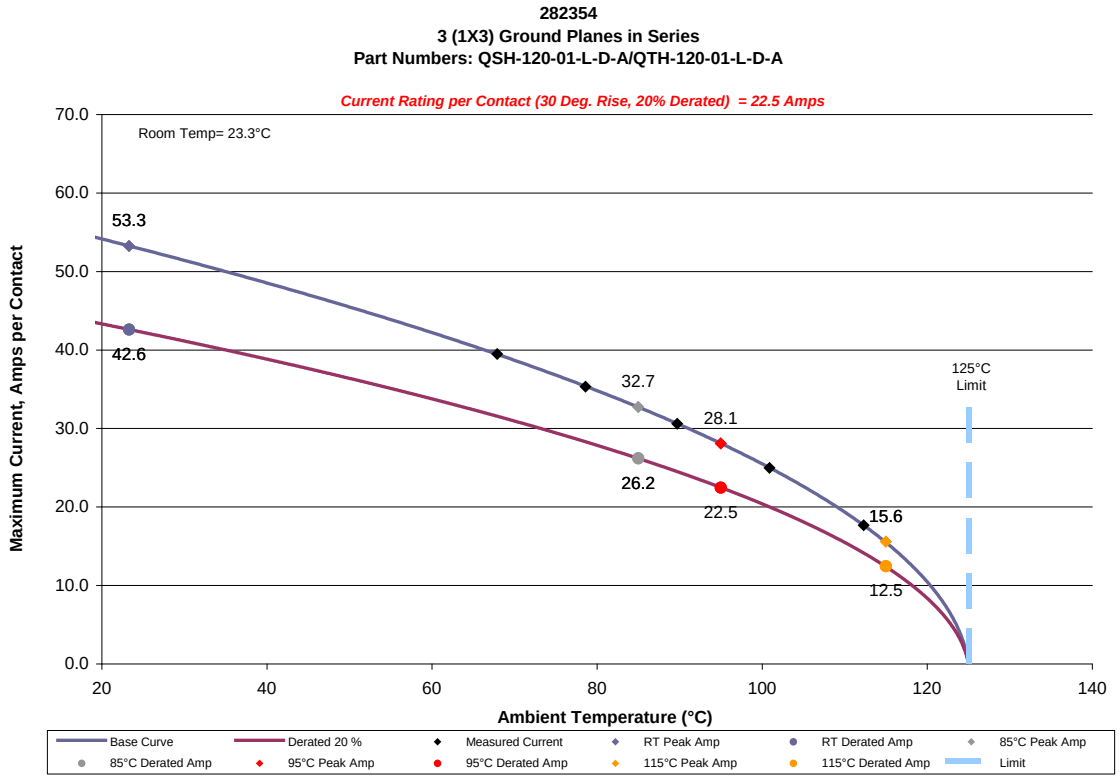
g. Linear configuration with 2 adjacent ground conductors/contacts powered

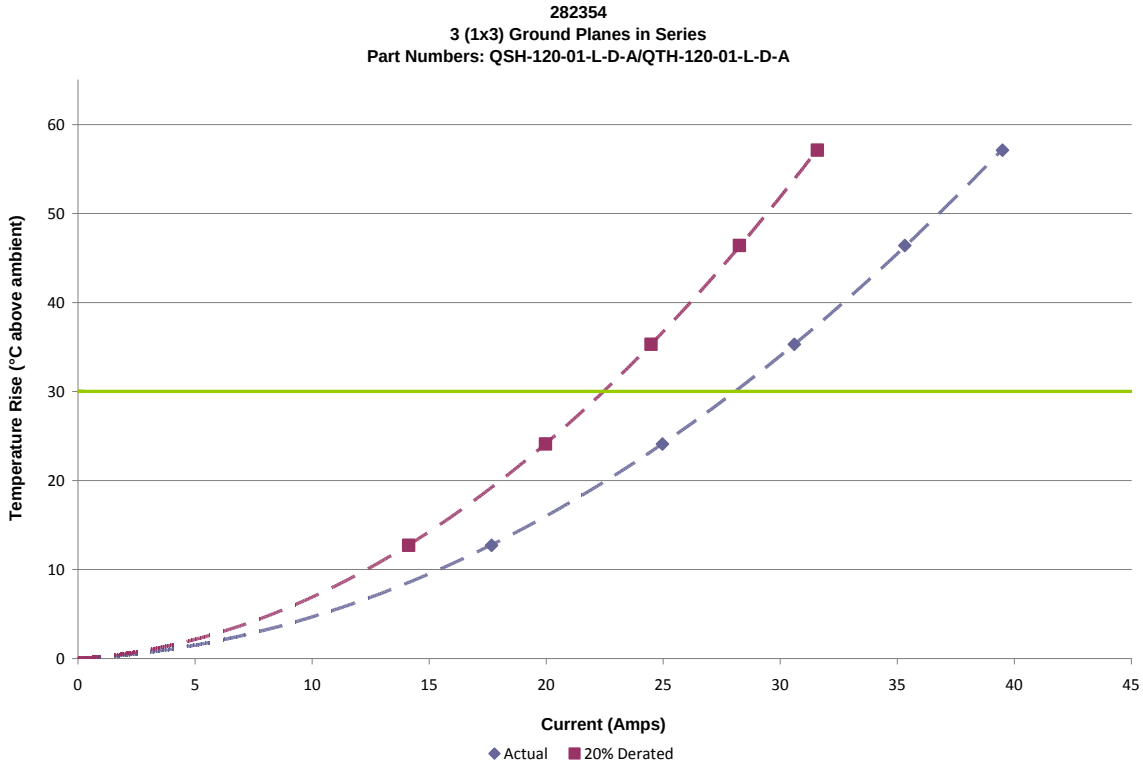




DATA SUMMARIES Continued

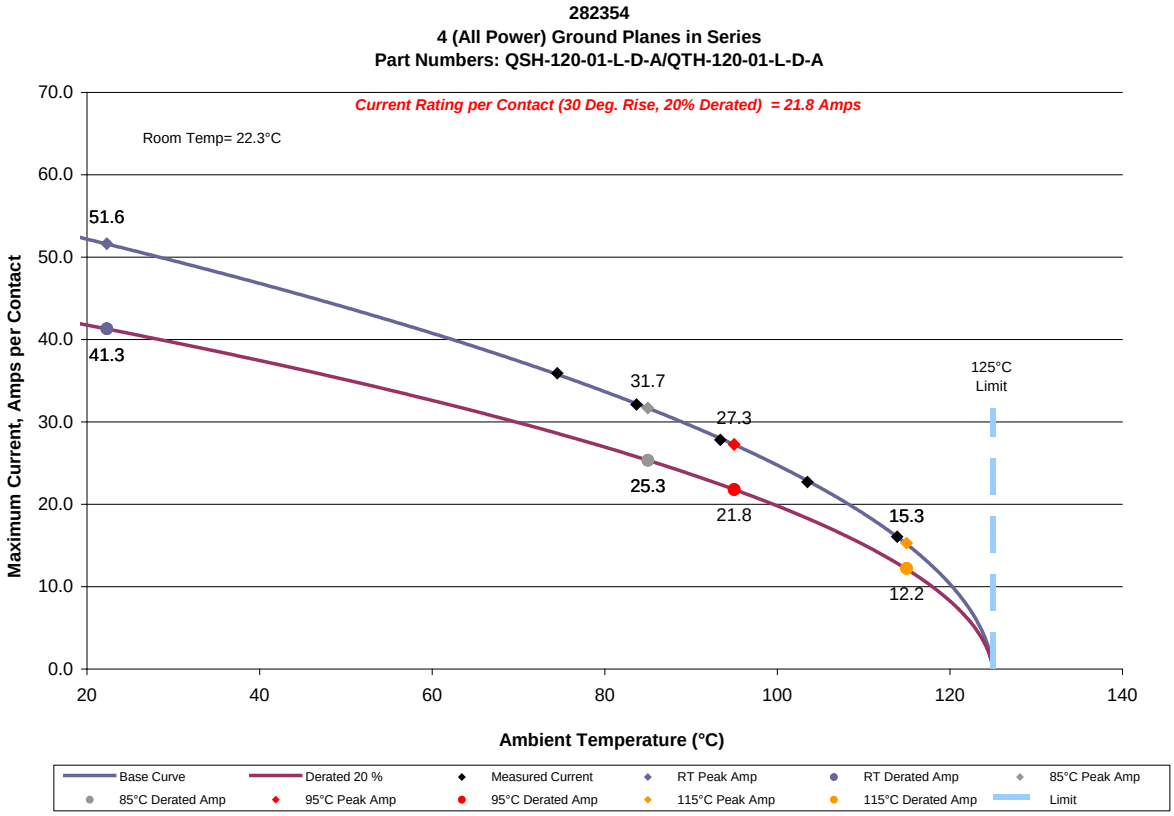
h. Linear configuration with 3 adjacent ground conductors/contacts powered

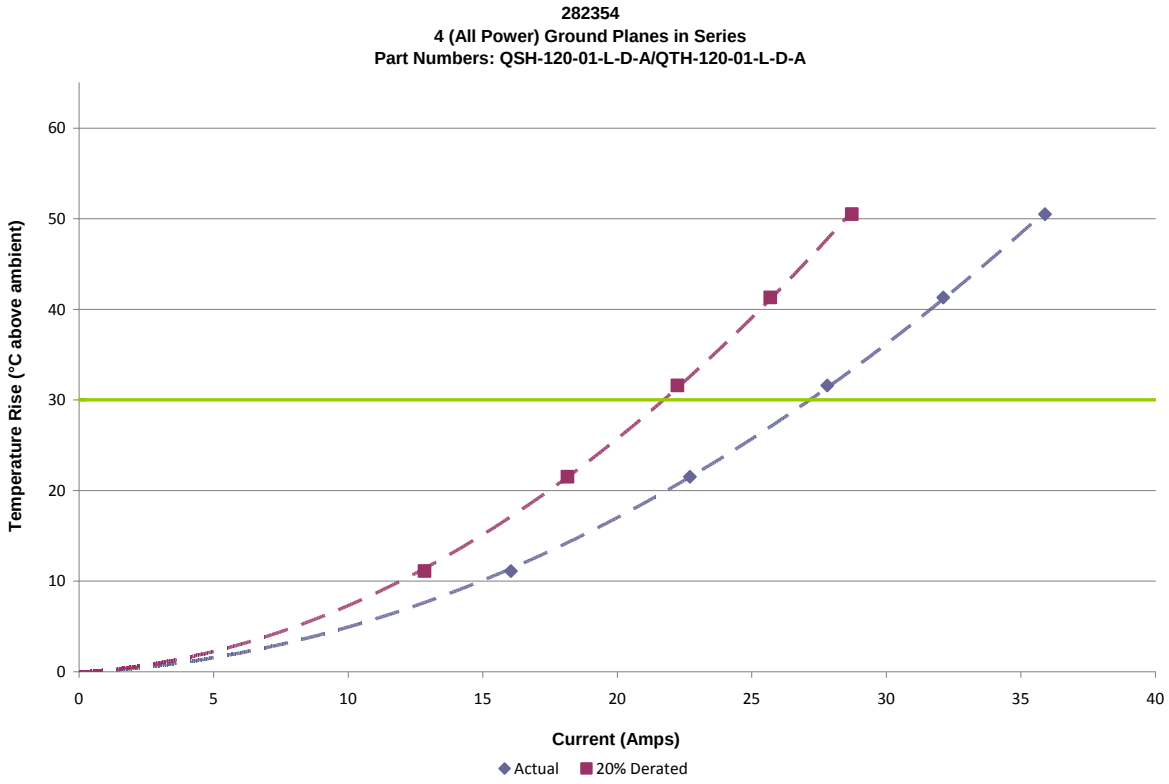




DATA SUMMARIES Continued

i. Linear configuration with 4 adjacent ground conductors/contacts powered





DATA SUMMARIES Continued

MATING/UNMATING FORCE:

Mating/Unmating durability (QSH-120-01-L-D-A / QTH-120-01-L-D-A):

	Initial				After 25 Cycles			
	Mating		**Unmating**		**Mating**		**Unmating**	
	Newtons	Force (Lbs)	Newtons	Force (Lbs)	Newtons	Force (Lbs)	Newtons	Force (Lbs)
Minimum	60.98	13.71	35.81	8.05	66.10	14.86	42.52	9.56
Maximum	78.28	17.60	54.84	12.33	82.33	18.51	59.11	13.29
Average	68.92	**15.49**	46.69	**10.50**	73.03	**16.42**	51.27	**11.53**
St Dev	6.32	1.42	7.20	1.62	5.64	1.27	5.93	1.33
Count	8	8	8	8	8	8	8	8

	After 50 Cycles				After 75 Cycles			
	Mating		**Unmating**		**Mating**		**Unmating**	
	Newtons	Force (Lbs)	Newtons	Force (Lbs)	Newtons	Force (Lbs)	Newtons	Force (Lbs)
Minimum	68.01	15.29	45.90	10.32	71.70	16.12	47.10	10.59
Maximum	84.42	18.98	62.36	14.02	85.49	19.22	63.38	14.25
Average	75.14	**16.89**	53.89	**12.12**	77.28	**17.37**	55.46	**12.47**
St Dev	5.68	1.28	6.11	1.37	4.94	1.11	6.22	1.40
Count	8	8	8	8	8	8	8	8

	After 100 Cycles				After Humidity			
	Mating		**Unmating**		**Mating**		**Unmating**	
	Newtons	Force (Lbs)	Newtons	Force (Lbs)	Newtons	Force (Lbs)	Newtons	Force (Lbs)
Minimum	73.75	16.58	49.86	11.21	38.43	8.64	27.71	6.23
Maximum	87.98	19.78	66.81	15.02	61.03	13.72	37.45	8.42
Average	79.04	**17.77**	57.46	**12.92**	49.60	**11.15**	31.89	**7.17**
St Dev	5.24	1.18	6.48	1.46	6.80	1.53	3.45	0.78
Count	8	8	8	8	8	8	8	8

DATA SUMMARIES Continued

Mating/Unmating basic (QSH-090-01-L-D-A / QTH-090-01-L-D-A):

	Initial				After 25 Cycles			
	Mating		**Unmating**		**Mating**		**Unmating**	
	Newtons	Force (Lbs)	Newtons	Force (Lbs)	Newtons	Force (Lbs)	Newtons	Force (Lbs)
Minimum	57.02	12.82	41.54	9.34	63.21	14.21	45.41	10.21
Maximum	72.15	16.22	63.03	14.17	80.73	18.15	65.12	14.64
Average	64.53	**14.51**	51.98	**11.69**	69.82	**15.70**	56.86	**12.78**
St Dev	5.09	1.14	7.19	1.62	5.16	1.16	6.52	1.47
Count	8	8	8	8	8	8	8	8

	After 50 Cycles				After 75 Cycles			
	Mating		**Unmating**		**Mating**		**Unmating**	
	Newtons	Force (Lbs)	Newtons	Force (Lbs)	Newtons	Force (Lbs)	Newtons	Force (Lbs)
Minimum	65.74	14.78	53.29	11.98	69.70	15.67	55.56	12.49
Maximum	83.89	18.86	66.23	14.89	86.02	19.34	67.65	15.21
Average	72.90	**16.39**	59.38	**13.35**	75.45	**16.96**	61.83	**13.90**
St Dev	5.38	1.21	5.20	1.17	4.91	1.10	4.87	1.09
Count	8	8	8	8	8	8	8	8

	After 100 Cycles			
	Mating		**Unmating**	
	Newtons	Force (Lbs)	Newtons	Force (Lbs)
Minimum	72.59	16.32	56.22	12.64
Maximum	88.69	19.94	70.23	15.79
Average	78.12	**17.56**	64.15	**14.42**
St Dev	4.95	1.11	5.35	1.20
Count	8	8	8	8

DATA SUMMARIES Continued

Mating/Unmating basic (QSH-060-01-L-D-A / QTH-060-01-L-D-A):

	Initial				After 25 Cycles			
	Mating		**Unmating**		**Mating**		**Unmating**	
	Newtons	Force (Lbs)	Newtons	Force (Lbs)	Newtons	Force (Lbs)	Newtons	Force (Lbs)
Minimum	36.25	8.15	23.97	5.39	38.21	8.59	25.71	5.78
Maximum	45.19	10.16	35.94	8.08	47.28	10.63	37.99	8.54
Average	40.52	**9.11**	29.38	**6.61**	42.76	**9.61**	31.99	**7.19**
St Dev	2.90	0.65	3.87	0.87	3.25	0.73	4.30	0.97
Count	8	8	8	8	8	8	8	8

	After 50 Cycles				After 75 Cycles			
	Mating		**Unmating**		**Mating**		**Unmating**	
	Newtons	Force (Lbs)	Newtons	Force (Lbs)	Newtons	Force (Lbs)	Newtons	Force (Lbs)
Minimum	28.07	6.31	28.07	6.31	39.36	8.85	28.42	6.39
Maximum	47.02	10.57	43.59	9.80	48.44	10.89	44.75	10.06
Average	37.34	**8.40**	34.87	**7.84**	45.01	**10.12**	36.53	**8.21**
St Dev	8.20	1.84	6.07	1.37	3.59	0.81	5.98	1.35
Count	8	8	8	8	8	8	8	8

	After 100 Cycles			
	Mating		**Unmating**	
	Newtons	Force (Lbs)	Newtons	Force (Lbs)
Minimum	40.03	9.00	28.65	6.44
Maximum	50.00	11.24	46.53	10.46
Average	46.31	**10.41**	38.25	**8.60**
St Dev	3.94	0.88	6.06	1.36
Count	8	8	8	8

DATA SUMMARIES Continued

Mating/Unmating basic (QSH-030-01-L-D-A / QTH-030-01-L-D-A):

	Initial				After 25 Cycles			
	Mating		**Unmating**		**Mating**		**Unmating**	
	Newtons	Force (Lbs)	Newtons	Force (Lbs)	Newtons	Force (Lbs)	Newtons	Force (Lbs)
Minimum	18.15	4.08	14.41	3.24	20.77	4.67	16.19	3.64
Maximum	22.06	4.96	18.77	4.22	23.84	5.36	19.93	4.48
Average	20.47	**4.60**	16.54	**3.72**	22.15	**4.98**	17.45	**3.92**
St Dev	1.29	0.29	1.32	0.30	1.01	0.23	1.18	0.27
Count	8	8	8	8	8	8	8	8

	After 50 Cycles				After 75 Cycles			
	Mating		**Unmating**		**Mating**		**Unmating**	
	Newtons	Force (Lbs)	Newtons	Force (Lbs)	Newtons	Force (Lbs)	Newtons	Force (Lbs)
Minimum	22.51	5.06	17.93	4.03	24.02	5.40	19.88	4.47
Maximum	25.44	5.72	19.75	4.44	27.53	6.19	21.57	4.85
Average	23.66	**5.32**	18.86	**4.24**	25.36	**5.70**	20.64	**4.64**
St Dev	1.18	0.27	0.72	0.16	1.27	0.29	0.65	0.15
Count	8	8	8	8	8	8	8	8

	After 100 Cycles			
	Mating		**Unmating**	
	Newtons	Force (Lbs)	Newtons	Force (Lbs)
Minimum	25.22	5.67	20.64	4.64
Maximum	28.24	6.35	23.00	5.17
Average	26.76	**6.02**	22.10	**4.97**
St Dev	1.19	0.27	0.80	0.18
Count	8	8	8	8

DATA SUMMARIES Continued

INSULATION RESISTANCE (IR):

	Pin to Pin		
	Mated	Unmated	Unmated
Minimum	QSH/QTH	QSH	QTH
Initial	10000	10000	10000
Thermal	10000	10000	10000
Humidity	10000	10000	10000

	Pin to Ground		
	Mated	Unmated	Unmated
Minimum	QSH/QTH	QSH	QTH
Initial	10000	10000	10000
Thermal	10000	10000	10000
Humidity	10000	10000	10000

	Row to Row		
	Mated	Unmated	Unmated
Minimum	QSH/QTH	QSH	QTH
Initial	10000	10000	10000
Thermal	10000	10000	10000
Humidity	10000	10000	10000

DIELECTRIC WITHSTANDING VOLTAGE (DWV):

Voltage Rating Summary	
Minimum	QSH/QTH
Break Down Voltage	700
Test Voltage	525
Working Voltage	175

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

DATA SUMMARIES Continued

LLCR Durabiltiy:

1) A total of 192 points (184 signal pin and 8 ground pin) 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	12/27/2011	12/29/2011	1/9/2012	1/17/2012
Room Temp (Deg C)	23	23	23	19
Rel Humidity (%)	54	43	43	54
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	25.52	1.65	2.06	1.96
St. Dev.	1.84	1.60	1.49	1.56
Min	22.66	0.01	0.01	0.00
Max	31.71	8.22	7.14	7.44
Summary Count	184	184	184	184
Total Count	184	184	184	184
	Pin Type 2: Ground			
Average	3.15	0.46	0.72	3.53
St. Dev.	0.13	0.09	0.40	0.32
Min	2.99	0.00	0.02	0.00
Max	3.39	0.27	1.11	1.02
Summary Count	8	8	8	8
Total Count	8	8	8	8

LLCR Delta Count by Category						
	Stable	**Minor**	**Acceptable**	**Marginal**	**Unstable**	**Open**
mOhms	**<=5**	**>5 & <=10**	**>10 & <=15**	**>15 & <=50**	**>50 & <=1000**	**>1000**
100 Cycles	**185**	**7**	**0**	**0**	**0**	**0**
Therm Shck	**186**	**6**	**0**	**0**	**0**	**0**
Humidity	**182**	**10**	**0**	**0**	**0**	**0**

EQUIPMENT AND CALIBRATION SCHEDULES

Equipment #: HZ-MO-03
Description: Micro-ohmmeter
Manufacturer: Keithley
Model: 580
Serial #: 297288
Accuracy: Last Cal: 2011-8-06, Next Cal: 2012-8-05

Equipment #: HZ-TCT-01
Description: Normal force analyzer
Manufacturer: Mecmesin Multitester
Model: Mecmesin Multitester 2.5-i
Serial #: 08-1049-04
Accuracy: Last Cal: 2011-4-28, Next Cal: 2012-4-27

Equipment #: HZ-MO-01
Description: Micro-ohmmeter
Manufacturer: Keithley
Model: 2700
Serial #: 1199807
Accuracy: Last Cal: 2011-4-28, Next Cal: 2012-4-27

Equipment #: HZ-PS-01
Description: Power Supply
Manufacturer: Agilent
Model: 6031A
Serial #: MY41000982
Accuracy: Last Cal: 2011-4-28, Next Cal: 2012-4-27

Equipment #: HZ-TSC-01
Description: Thermal Shock transmitter
Manufacturer: Keithley
Model: 10-VT14994
Serial #: VTS-3-6-6-SC/AC
Accuracy: Last Cal: 2011-11-1, Next Cal: 2012-11-1

Equipment #: HZ-HPM-01
Description: IR_DWV Tester
Manufacturer: Keithley
Model: AN9636H
Serial #: 089601091
Accuracy: Last Cal: 2012-3-4, Next Cal: 2013-3-4