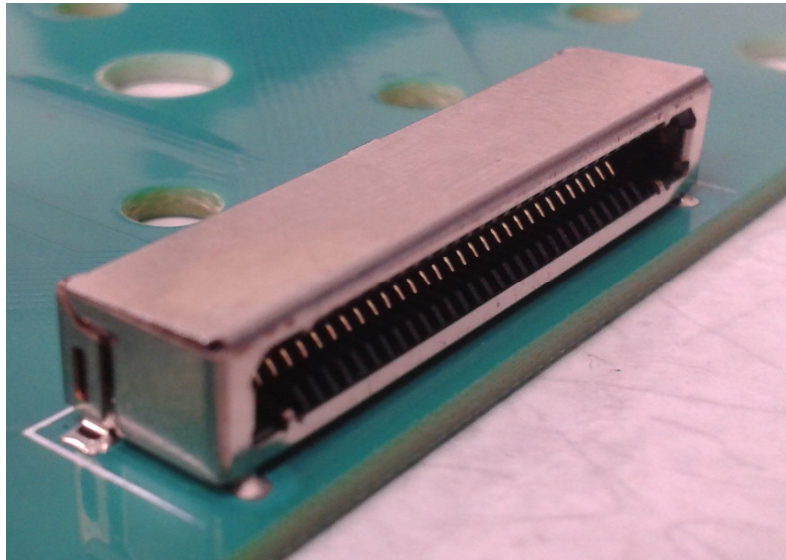




Project Number: Design Qualification Test Report		Tracking Code: 215780_Report_Rev_1	
Requested by: Kevin Meredith		Date: 11/15/2012	Product Rev: 0
Part #:FCF8-30-01-L-12.00-S\FCS8-30-01-L-S-A		Lot #: N/A	Tech: Tony Wagoner Eng: Eric Mings
Part description: FCF8\FCS8			Qty to test: 45
Test Start: 9/15/2012	Test Completed: 10/25/2012		



Design Qualification Test Report

FCF8\FCS8

FCF8-30-01-L-12.00-S\FCS8-30-01-L-S-A

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

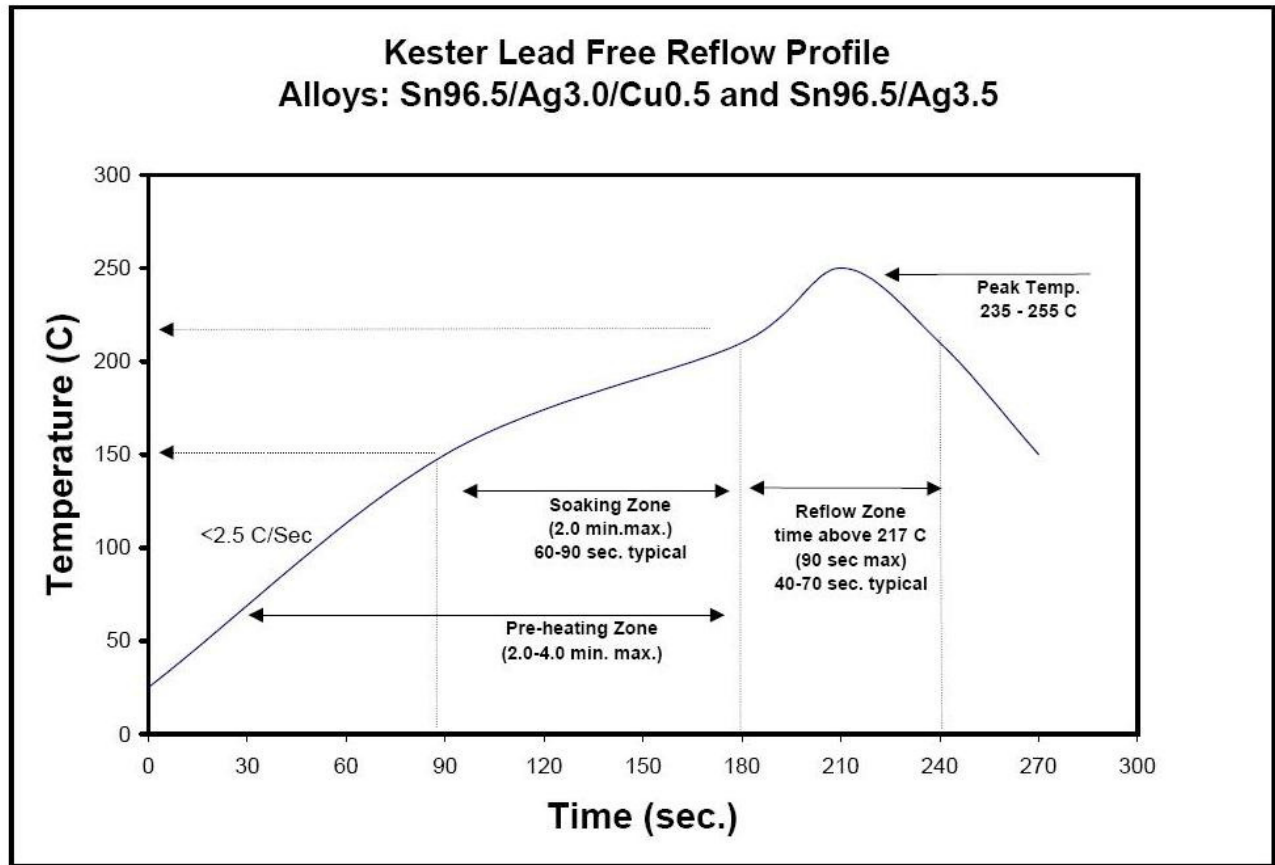
To perform the following tests: Design Qualification Test, Please see test plan.

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) Re-Flow Time/Temp: See accompanying profile.
- 10) Samtec Test PCBs used: PCB-103646-TST-XX\ PCB-103647-TST-XX

TYPICAL OVEN PROFILE (Soldering Parts to Test Boards)

FLOWCHARTS**Gas Tight**

TEST STEP	GROUP A1 192 Points
01	LLCR-1
02	Gas Tight
03	LLCR-2

Gas Tight = EIA-364-36A

LLCR = EIA-364-23, LLCR

20 mV Max, 100 mA Max

Use Keithley 580 or 3706 in 4 wire dry circuit mode

Thermal Aging

TEST STEP	GROUP A1 8 Boards Thermal Aging (Mated)	GROUP A2 8 Boards Thermal Aging (Mated) Latches Removed
01	Contact Gaps	Contact Gaps
02	LLCR-1	Forces - Mating / Unmating
03	Thermal Aging (Mated and Undisturbed)	Thermal Aging (Mated and Undisturbed)
04	LLCR-2	Forces - Mating / Unmating
05	Contact Gaps	Contact Gaps

Thermal Aging = EIA-364-17, Test Condition 4 (105°C)

Time Condition 'B' (250 Hours)

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**Durability/Mating/Unmating/Gaps**

TEST STEP	GROUP A1 8 Boards (largest position submitted)	GROUP A2 8 Boards (largest position submitted) Latches Removed	GROUP A3 8 Boards (middle position submitted) Latches Removed	GROUP A4 8 Boards (smallest position submitted) Latches Removed
01	Contact Gaps	Contact Gaps	Contact Gaps	Contact Gaps
02	LLCR-1	Forces - Mating / Unmating	Forces - Mating / Unmating	Forces - Mating / Unmating
03	25 Cycles	25 Cycles	25 Cycles	25 Cycles
04	Clean w/Compressed Air	Forces - Mating / Unmating	Forces - Mating / Unmating	Forces - Mating / Unmating
05	Contact Gaps	Clean w/Compressed Air		
06	LLCR-2	Contact Gaps		
07	Thermal Shock (Mated and Undisturbed)	Thermal Shock (Mated and Undisturbed)		
08	LLCR-3	Cyclic Humidity (Mated and Undisturbed)		
09	Cyclic Humidity (Mated and Undisturbed)	Forces - Mating / Unmating		
10	LLCR-4			

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 G1 2 Mated Sets Break Down Pin-to-Closest Metallic Hardware	GROUP G2 2 Unmated of Part # Being Tested Break Down Pin-to-Closest Metallic Hardware	GROUP G3 2 Unmated of Mating Part # Break Down Pin-to-Closest Metallic Hardware	GROUP H1 2 Mated Sets Pin-to-Closest Metallic Hardware
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 - Single Row**

TEST STEP	GROUP A1 3 Mated Assemblies 1 Contact Powered	GROUP A2 3 Mated Assemblies 2 Contacts Powered	GROUP A3 3 Mated Assemblies 3 Contacts Powered	GROUP A4 3 Mated Assemblies 4 Contacts Powered	GROUP A5 3 Mated Assemblies All Contacts Powered
01	CCC	CCC	CCC	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

Mechanical Shock / Vibration / LLCR

TEST STEP	GROUP A1 192 Points
01	LLCR-1
02	Shock
03	Vibration
04	LLCR-2

Mechanical Shock = EIA 364-27 Half Sine,

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

Vibration = EIA 364-28, Random Vibration

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

LLCR = EIA-364-23, LLCR

20 mV Max, 100 mA Max

Use Keithley 580 or 3706 in 4 wire dry circuit mode

Shock / Vibration / nanoSecond Event Detection

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

Mechanical Shock = EIA 364-27 Half Sine,

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

Vibration = EIA 364-28, Random Vibration

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

Event detection requirement during Shock / Vibration is 50 nanoseconds minimum

FLOWCHARTS Continued**Connector Pull**

TEST STEP	GROUP A1 5 Pieces 0°	GROUP B1 5 Pieces 90° X-direction	GROUP C1 5 Pieces 90° Y-direction
01	Pull test, Continuity	Pull test, Continuity	Pull test, Continuity

Monitor continuity and pull; record forces when continuity fails

Cable Flex Test

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

DWV to be performed at Test Voltage

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

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

Monitor continuity during flex testing on all groups

Cable Flex Test = EIA-364-41D

Circular Jacket Cable - to be tested 90° each direction (180° total)

EIA-364-41D min flex requirement = 200 cycles

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

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

IR = EIA-364-21

DWV = EIA-364-20, Test Condition 1

ATTRIBUTE DEFINITIONS

The following is a brief, simplified description of attributes.

THERMAL SHOCK:

- 1) EIA-364-32, *Thermal Shock (Temperature Cycling) Test Procedure for Electrical Connectors*.
- 2) Test Condition 1: -55°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

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.

INSULATION RESISTANCE (IR):

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

- 1) PROCEDURE:
 - a. Reference document: EIA-364-21, *Insulation Resistance Test Procedure for Electrical Connectors*.
 - b. Test Conditions:
 - i. Between Adjacent Contacts or Signal-to-Ground
 - ii. Electrification Time 2.0 minutes
 - iii. Test Voltage (500 VDC) corresponds to calibration settings for measuring resistances.
- 2) MEASUREMENTS:
- 3) When the specified test voltage is applied (VDC), the insulation resistance shall not be less than 1000 megohms.

DIELECTRIC WITHSTANDING VOLTAGE (DWV):

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

- 1) PROCEDURE:
 - a. Reference document: EIA-364-20, *Withstanding Voltage Test Procedure for Electrical Connectors*.
 - b. Test Conditions:
 - i. Between Adjacent Contacts or Signal-to-Ground
 - ii. 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)..

ATTRIBUTE DEFINITIONS

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. 80° C
 - c. 95° C
 - d. 115° 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

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.

ATTRIBUTE DEFINITIONS

The following is a brief, simplified description of attributes.

Connector pull test

Pull the cable from the body, measure the test and record the force

Cable Flex test

$\pm 70^\circ$ Flex Mode, bend up to 500 cycles with 4 oz. load on cable end.

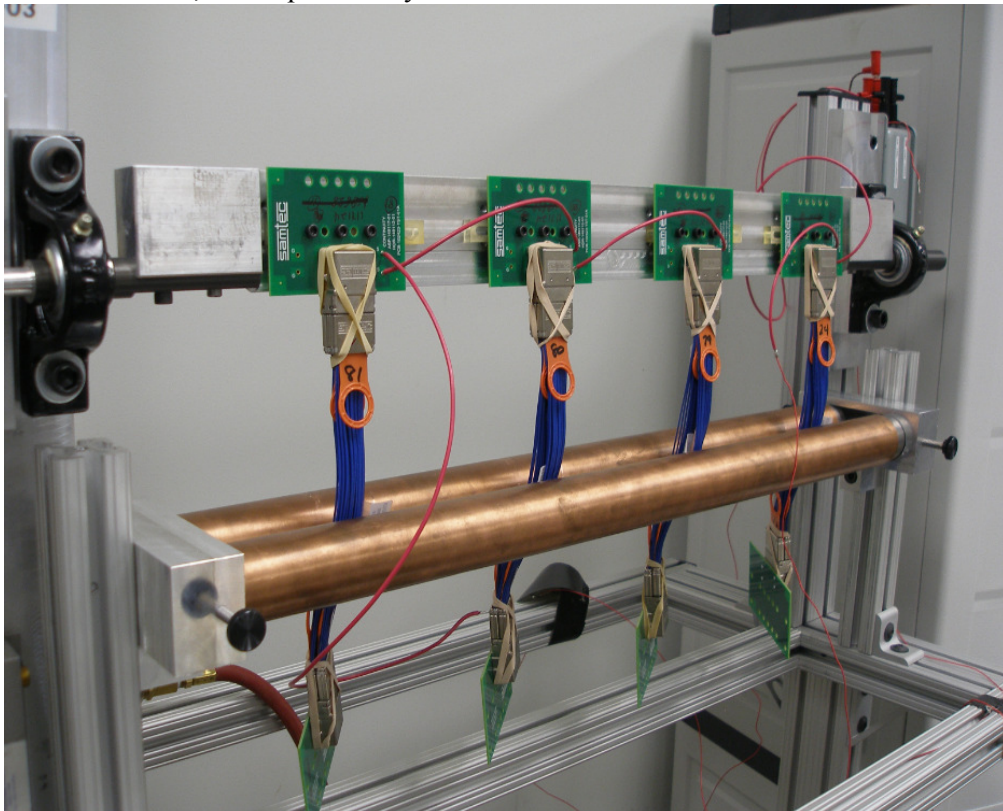


Fig. 1

RESULTS

Temperature Rise, CCC at a 20% de-rating

Contact

- CCC for a 30°C Temperature Rise ----- 1.8 A per contact with 1 adjacent contacts powered
- CCC for a 30°C Temperature Rise ----- 1.5 A per contact with 2 adjacent contacts powered
- CCC for a 30°C Temperature Rise ----- 1.1 A per contact with 3 adjacent contacts powered
- CCC for a 30°C Temperature Rise ----- 1.1 A per contact with 4 adjacent contacts powered
- CCC for a 30°C Temperature Rise ----- 0.4 A per contact with all adjacent contacts powered

Mating /unmating force

Thermal aging - (FCF8-30-01-L-12.00-S\FCS8-30-01-L-S-A)

- Initial
 - Mating
 - Min ----- 3.19 Lbs
 - Max ----- 4.23 Lbs
 - Unmating
 - Min ----- 3.02 Lbs
 - Max ----- 3.93 Lbs
- After thermal aging
 - Mating
 - Min ----- 2.72 Lbs
 - Max ----- 4.44 Lbs
 - Unmating
 - Min ----- 2.29 Lbs
 - Max ----- 3.90 Lbs

Mating&Unmating durability-(FCF8-30-01-L-12.00-S\FCS8-30-01-L-S-A):

- Initial
 - Mating
 - Min ----- 3.27 Lbs
 - Max ----- 4.51 Lbs
 - Unmating
 - Min ----- 2.65 Lbs
 - Max ----- 4.39 Lbs
- After 25 Cycles
 - Mating
 - Min ----- 3.60 Lbs
 - Max ----- 5.38 Lbs
 - Unmating
 - Min ----- 3.51 Lbs
 - Max ----- 5.57 Lbs
- After Humidity
 - Mating
 - Min ----- 1.97 Lbs
 - Max ----- 3.03 Lbs
 - Unmating
 - Min ----- 1.60 Lbs
 - Max ----- 3.44 Lbs

RESULTS Continued**Mating/Unmating basic-(FCF8-20-01-L-12.00-S\FCS8-20-01-L-S-A)**

- **Initial**
 - **Mating**
 - **Min**-----2.43 Lbs
 - **Max**-----3.00 Lbs
 - **Unmating**
 - **Min**-----1.74 Lbs
 - **Max**-----2.36 Lbs
- **After thermal aging**
 - **Mating**
 - **Min**-----2.07 Lbs
 - **Max**-----2.85 Lbs
 - **Unmating**
 - **Min**-----1.64 Lbs
 - **Max**-----2.76 Lbs

Mating/Unmating basic-(FCF8-10-01-L-12.00-S\FCS8-10-01-L-S-A)

- **Initial**
 - **Mating**
 - **Min**-----1.98 Lbs
 - **Max**-----2.61 Lbs
 - **Unmating**
 - **Min**-----2.21 Lbs
 - **Max**-----2.59 Lbs
- **After thermal aging**
 - **Mating**
 - **Min**-----2.18 Lbs
 - **Max**-----3.32 Lbs
 - **Unmating**
 - **Min**-----2.68 Lbs
 - **Max**-----3.97 Lbs

Connector pull force**0° pull**

- **Min**-----10.00 Lbs
- **Max**-----15.50 Lbs

90° X-driection

- **Min**-----3.00 Lbs
- **Max**-----4.00 Lbs

90° Y-driection

- **Min**-----9.50 Lbs
- **Max**-----11.00 Lbs

RESULTS Continued**LLCR Gas Tight (192 pin include 184 signal and 8 ground LLCR test points)****Ground Pin**

- Initial ----- 16.35 mOhms Max
- Gas-Tight
 - ≤ +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

Signal Pin

- Initial ----- 379.02 mOhms Max
- Gas-Tight
 - ≤ +5.0 mOhms ----- 184 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 Thermal Aging (192 pin include 184 signal and 8 ground LLCR test points)**Ground Pin**

- Initial ----- 16.01 mOhms Max
- Thermal Aging
 - ≤ +5.0 mOhms ----- 4 Points ----- Stable
 - +5.1 to +10.0 mOhms ----- 4 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

Signal Pin

- Initial ----- 375.20 mOhms Max
- Thermal Aging
 - ≤ +5.0 mOhms ----- 177 Points ----- Stable
 - +5.1 to +10.0 mOhms ----- 4 Points ----- Minor
 - +10.1 to +15.0 mOhms ----- 2 Points ----- Acceptable
 - +15.1 to +50.0 mOhms ----- 0 Points ----- Marginal
 - +50.1 to +2000 mOhms ----- 1 Points ----- Unstable
 - >+2000 mOhms ----- 0 Points ----- Open Failure

RESULTS Continued**LLCR Durability (192 pin include 184 signal and 8 ground LLCR test points)****Ground Pin**

- **Initial** ----- 14.68 mOhms Max
- **After 25 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 ----- 1 Points ----- Stable
 - +5.1 to +10.0 mOhms ----- 2 Points ----- Minor
 - +10.1 to +15.0 mOhms ----- 4 Points ----- Acceptable
 - +15.1 to +50.0 mOhms ----- 1 Points ----- Marginal
 - +50.1 to +2000 mOhms ----- 0 Points ----- Unstable
 - >+2000 mOhms ----- 0 Points ----- Open Failure
- **After humidity**
 - <= +5.0 mOhms ----- 1 Points ----- Stable
 - +5.1 to +10.0 mOhms ----- 1 Points ----- Minor
 - +10.1 to +15.0 mOhms ----- 5 Points ----- Acceptable
 - +15.1 to +50.0 mOhms ----- 1 Points ----- Marginal
 - +50.1 to +2000 mOhms ----- 0 Points ----- Unstable
 - >+2000 mOhms ----- 0 Points ----- Open Failure

Signal Pin

- **Initial** ----- 374.74 mOhms Max
- **After 100 Cycles**
 - <= +5.0 mOhms ----- 184 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 ----- 184 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 ----- 183 Points ----- Stable
 - +5.1 to +10.0 mOhms ----- 1 Points ----- Minor
 - +10.1 to +15.0 mOhms ----- 0 Points ----- Acceptable
 - +15.1 to +50.0 mOhms ----- 0 Points ----- Marginal
 - +50.1 to +2000 mOhms ----- 0 Points ----- Unstable
 - >+2000 mOhms ----- 0 Points ----- Open Failure

RESULTS Continued**LLCR Shock Vib (192 pin include 184 signal and 8 ground LLCR test points)****Ground Pin**

- **Initial** ----- 21.86 mOhms Max
- **S&V**
 - <= +5.0 mOhms ----- 4 Points ----- Stable
 - +5.1 to +10.0 mOhms ----- 0 Points ----- Minor
 - +10.1 to +15.0 mOhms ----- 2 Points ----- Acceptable
 - +15.1 to +50.0 mOhms ----- 2 Points ----- Marginal
 - +50.1 to +2000 mOhms ----- 0 Points ----- Unstable
 - >+2000 mOhms ----- 0 Points ----- Open Failure

Signal Pin

- **Initial** ----- 764.15 mOhms Max
- **S&V**
 - <= +5.0 mOhms ----- 165 Points ----- Stable
 - +5.1 to +10.0 mOhms ----- 12 Points ----- Minor
 - +10.1 to +15.0 mOhms ----- 2 Points ----- Acceptable
 - +15.1 to +50.0 mOhms ----- 5 Points ----- Marginal
 - +50.1 to +2000 mOhms ----- 0 Points ----- Unstable
 - >+2000 mOhms ----- 0 Points ----- Open Failure

Mechanical Shock & Random Vibration:

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

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

- **Initial**
 - Mated-----100000Meg Ω ----- Pass
 - Unmated -----100000Meg Ω ----- Pass
- **Thermal**
 - Mated-----100000Meg Ω ----- Pass
 - Unmated -----100000Meg Ω ----- Pass
- **Humidity**
 - Mated-----100000Meg Ω ----- Pass
 - Unmated -----100000Meg Ω ----- Pass

Pin to Closest Metallic Hardware

- **Initial**
 - Mated-----100000Meg Ω ----- Pass
 - Unmated -----100000Meg Ω ----- Pass
- **Thermal**
 - Mated-----100000Meg Ω ----- Pass
 - Unmated -----100000Meg Ω ----- Pass
- **Humidity**
 - Mated-----100000Meg Ω ----- Pass
 - Unmated -----100000Meg Ω ----- Pass

Dielectric Withstanding Voltage minimums, DWV

- **Minimums**
 - Breakdown Voltage-----1040VAC
 - Test Voltage -----780VAC
 - Working Voltage -----260VAC

Pin - pin

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

Pin to Closest Metallic Hardware

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

RESULTS Continued

Cable Flex

Insulation Resistance minimums, IR

Pin-Pin

- **Initial**
 - **Mated----- 100000Meg Ω ----- Pass**
- **After flex cycles**
 - **Mated----- 100000Meg Ω ----- Pass**

Pin to Closest Metallic Hardware

- **Initial**
 - **Mated----- 100000Meg Ω ----- Pass**
- **After flex cycles**
 - **Mated----- 100000Meg Ω ----- Pass**

Dielectric Withstanding Voltage minimums, DWV

Pin - pin

- **Initial DWV -----Passed**
- **After flex cycles DWV -----Passed**

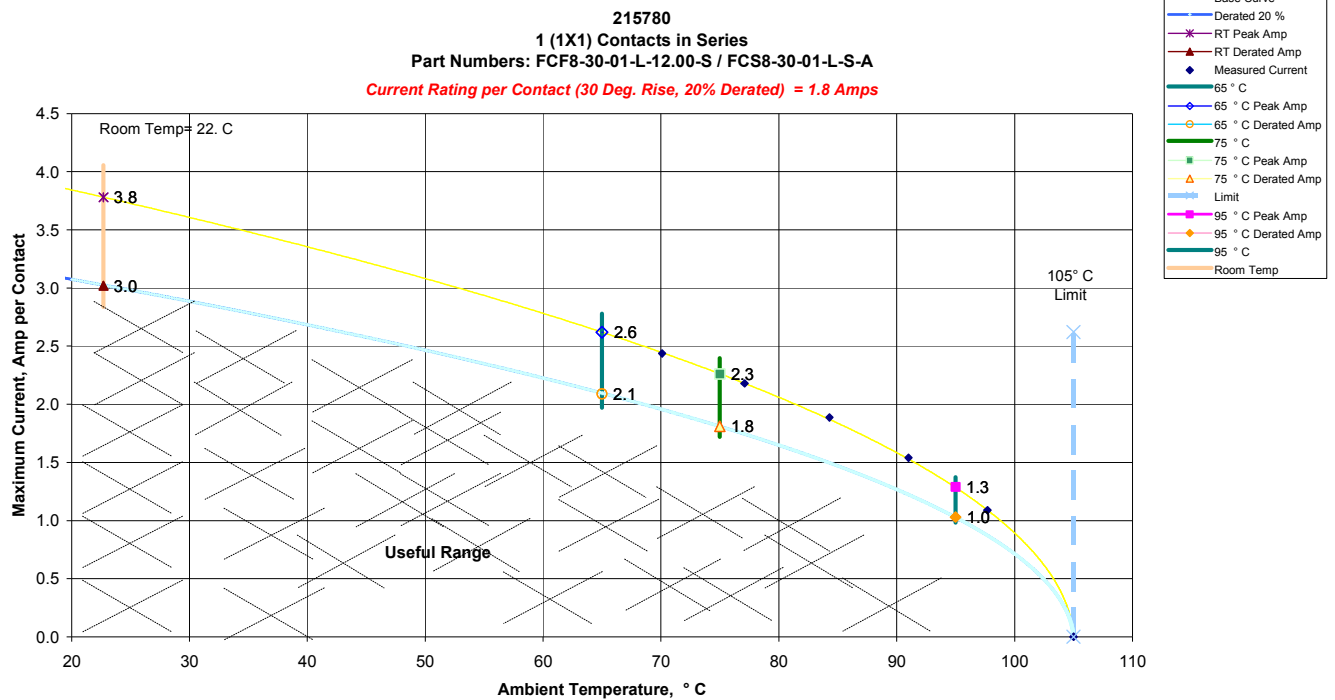
Pin to Closest Metallic Hardware

- **Initial DWV -----Passed**
- **After flex cycles DWV -----Passed**

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

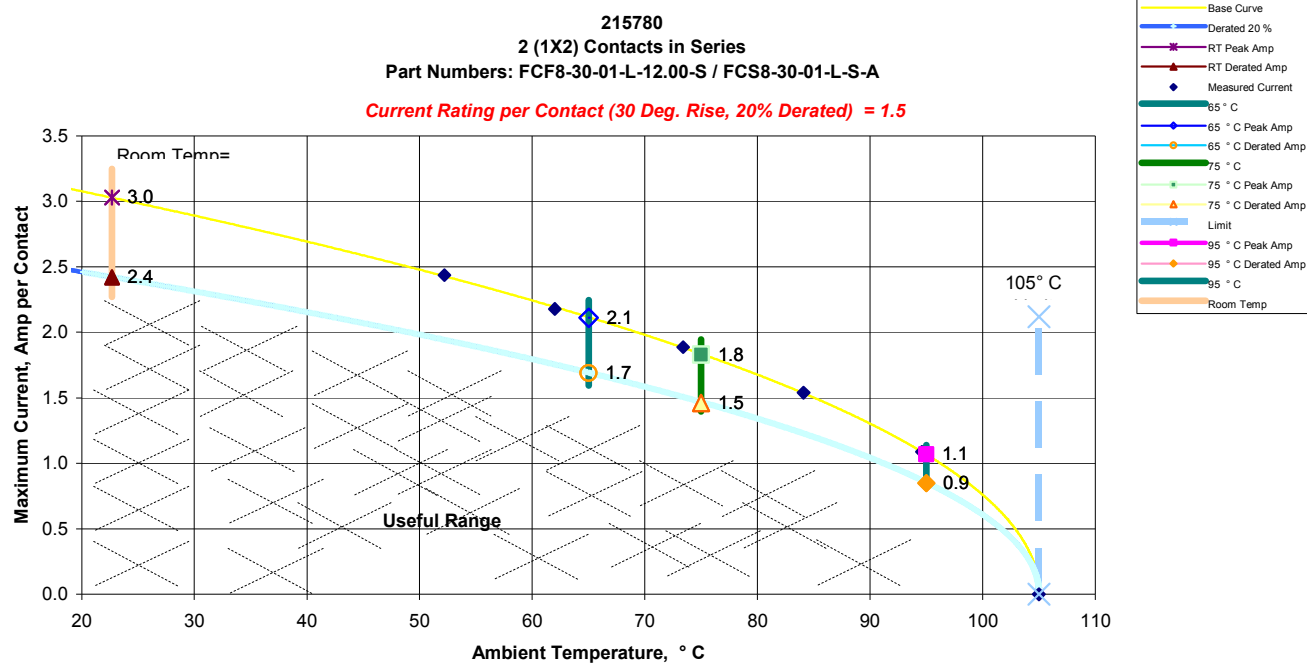
- 1) High quality thermocouples whose temperature slopes track one another were used for temperature monitoring.
- 2) The thermocouples were placed at a location to sense the maximum temperature generated during testing.
- 3) Temperature readings recorded are those for which three successive readings,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

a. Linear configuration with 1 adjacent conductors/contacts powered

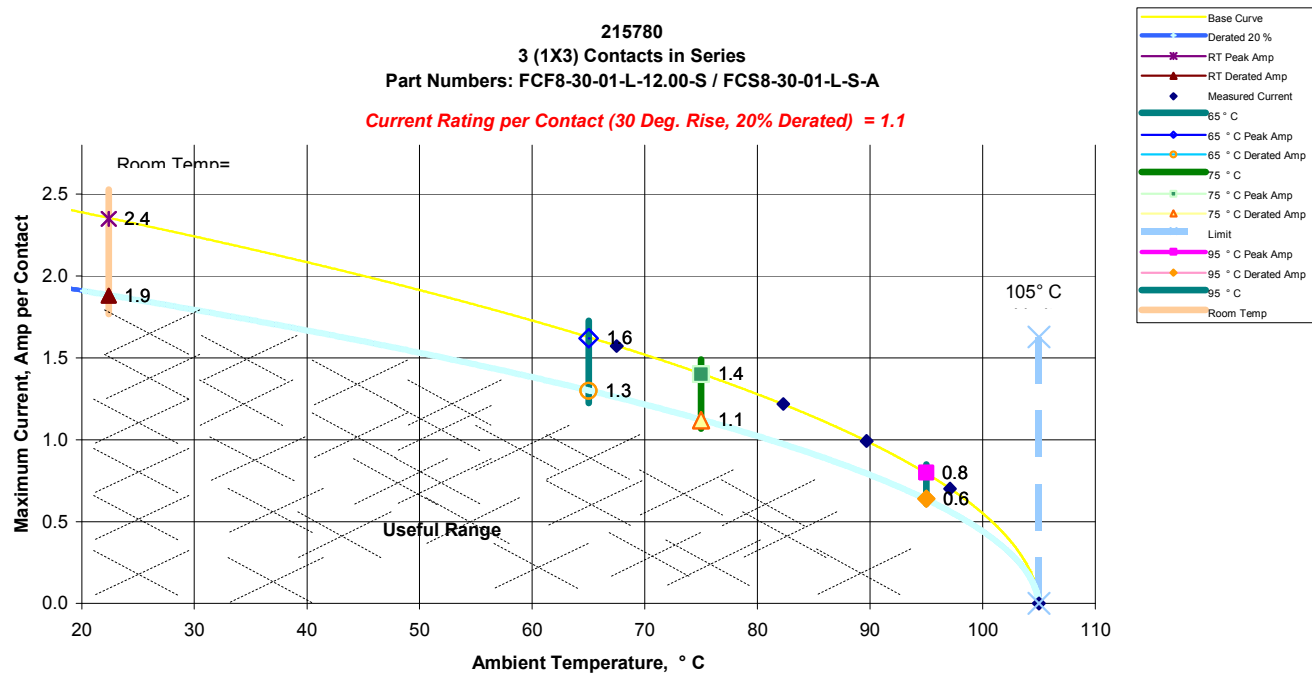


DATA SUMMARIES Continued

b. Linear configuration with 2 adjacent conductors/contacts powered

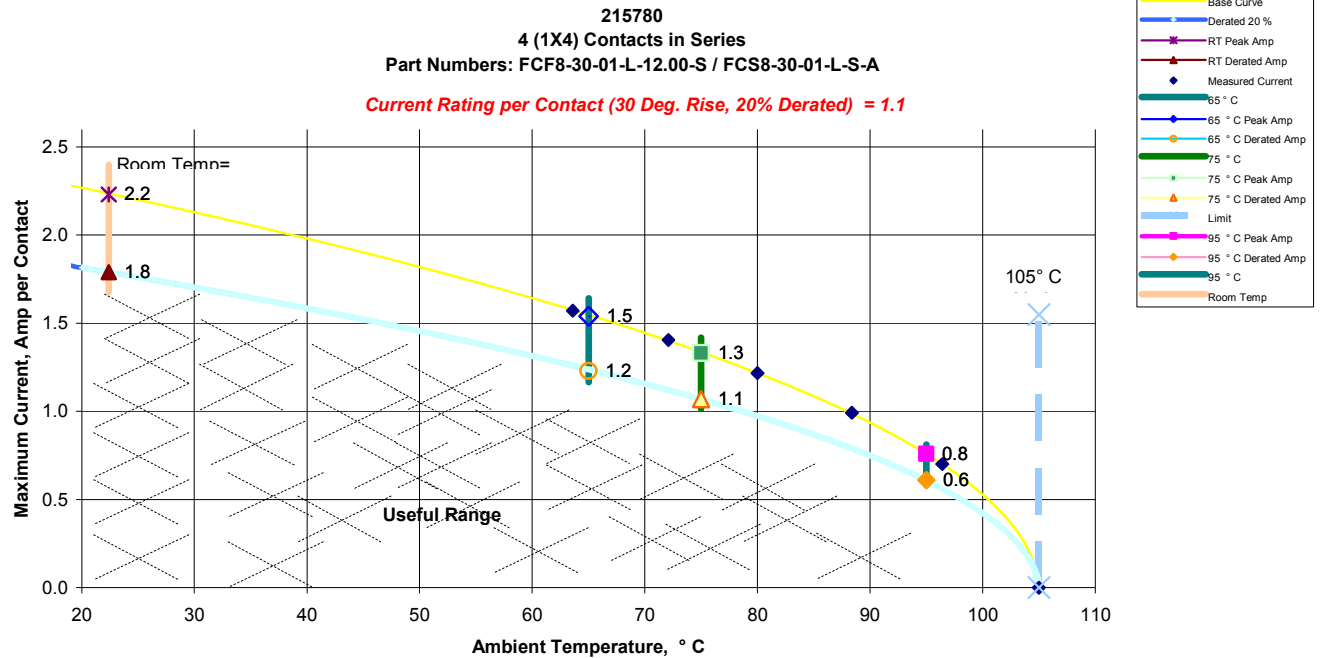


c. Linear configuration with 3 adjacent conductors/contacts powered

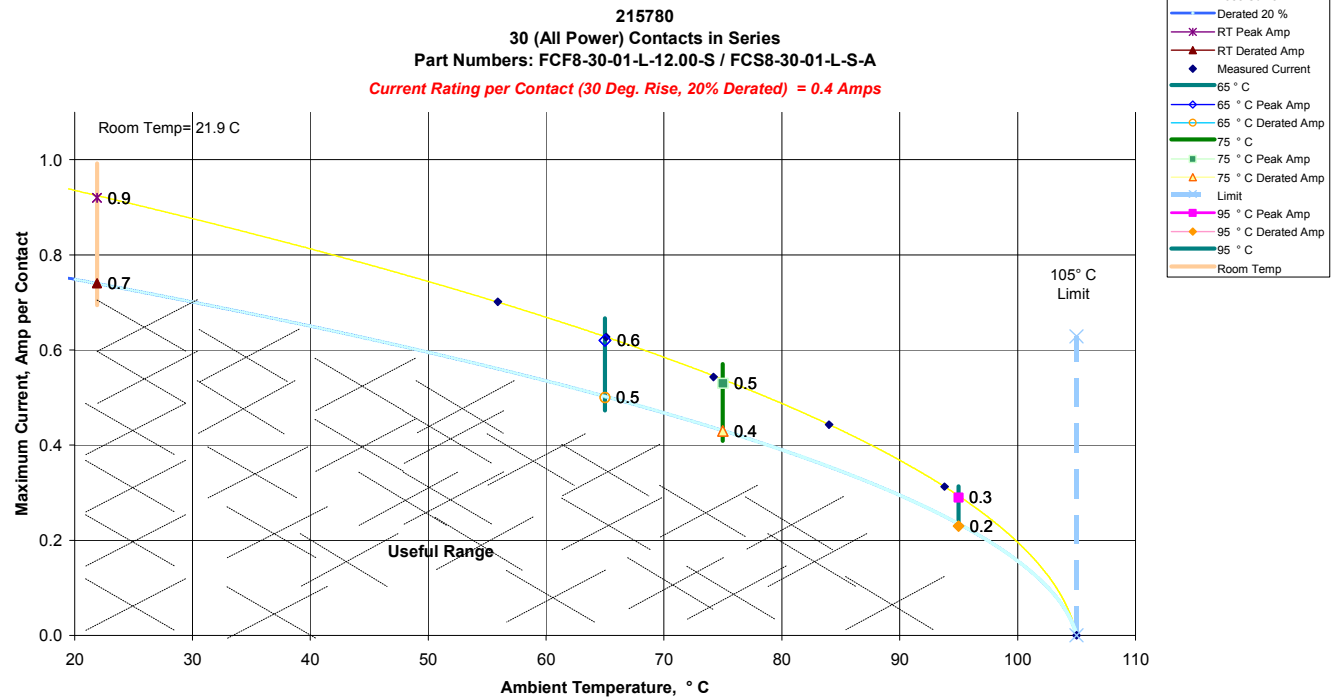


DATA SUMMARIES Continued

d. Linear configuration with 4 adjacent conductors/contacts powered



e. Linear configuration with all adjacent conductors/contacts powered



DATA SUMMARIES**MATING/UNMATING FORCE:****Mating/Unmating durability-(FCF8-30-01-L-12.00-S\FCS8-30-01-L-S-A)**

	Initial				25 Cycles			
	Mating		Unmating		Mating		Unmating	
	Newton	Force (Lbs)	Newton	Force (Lbs)	Newton	Force (Lbs)	Newton	Force (Lbs)
Minimum	14.54	3.27	11.79	2.65	16.01	3.60	15.61	3.51
Maximum	20.06	4.51	19.53	4.39	23.93	5.38	24.78	5.57
Average	17.70	3.98	16.79	3.78	20.92	4.70	21.65	4.87
St Dev	1.66	0.37	2.28	0.51	2.87	0.64	2.81	0.63
Count	8	8	8	8	8	8	8	8
	After Humidity							
	Mating		Unmating					
	Newton	Force (Lbs)	Newton	Force (Lbs)				
Minimum	8.76	1.97	7.12	1.60				
Maximum	13.48	3.03	15.30	3.44				
Average	10.35	2.33	10.23	2.30				
St Dev	1.63	0.37	2.49	0.56				
Count	8	8	8	8				

Mating/Unmating basic-(FCF8-20-01-L-12.00-S\FCS8-20-01-L-S-A)

	Initial				25 Cycles			
	Mating		Unmating		Mating		Unmating	
	Newton	Force (Lbs)	Newton	Force (Lbs)	Newton	Force (Lbs)	Newton	Force (Lbs)
Minimum	10.81	2.43	7.74	1.74	9.21	2.07	7.29	1.64
Maximum	13.34	3.00	10.50	2.36	12.68	2.85	12.28	2.76
Average	11.67	2.62	8.81	1.98	10.96	2.47	9.98	2.24
St Dev	0.85	0.19	0.93	0.21	1.40	0.31	1.75	0.39
Count	8	8	8	8	8	8	8	8

Mating/Unmating basic- (FCF8-10-01-L-12.00-S\FCS8-10-01-L-S-A)

	Initial				25 Cycles			
	Mating		Unmating		Mating		Unmating	
	Newton	Force (Lbs)	Newton	Force (Lbs)	Newton	Force (Lbs)	Newton	Force (Lbs)
Minimum	8.81	1.98	9.83	2.21	9.70	2.18	11.92	2.68
Maximum	11.61	2.61	11.52	2.59	14.77	3.32	17.66	3.97
Average	10.01	2.25	10.77	2.42	12.37	2.78	14.21	3.20
St Dev	0.90	0.20	0.67	0.15	1.69	0.38	1.75	0.39
Count	8	8	8	8	8	8	8	8

DATA SUMMARIES Continued**Thermal aging:**

	Initial				After Thermals			
	Mating		Unmating		Mating		Unmating	
	Newtons	Force (Lbs)	Newtons	Force (Lbs)	Newtons	Force (Lbs)	Newtons	Force (Lbs)
Minimum	14.19	3.19	13.43	3.02	12.10	2.72	10.19	2.29
Maximum	18.82	4.23	17.48	3.93	19.75	4.44	17.35	3.90
Average	16.28	3.66	15.76	3.54	15.93	3.58	13.40	3.01
St Dev	1.44	0.32	1.24	0.28	2.34	0.53	2.62	0.59
Count	8	8	8	8	8	8	8	8

Connector pull force**0° Pull**

	Force (lbs)
Minimum	10.00
Maximum	15.50
Average	12.30

90° X-direction

	Force (lbs)
Minimum	3.00
Maximum	4.00
Average	3.50

90° Y-direction

	Force (lbs)
Minimum	9.50
Maximum	11.00
Average	10.50

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

	Pin to Pin		
	Mated	Unmated	Unmated
Minimum	FCF8/FCS8	FCF8	FCS8
Initial	100000	100000	100000
Thermal	100000	100000	100000
Humidity	100000	100000	100000

	Pin to Closest Metallic Hardware		
	Mated	Unmated	Unmated
Minimum	FCF8/FCS8	FCF8	FCS8
Initial	100000	100000	100000
Thermal	100000	100000	100000
Humidity	100000	100000	100000

DIELECTRIC WITHSTANDING VOLTAGE (DWV):

Voltage Rating Summary	
Minimum	FCF8/FCS8
Break Down Voltage	1040
Test Voltage	780
Working Voltage	260

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

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

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

Pin to Pin	
Mated	
Minimum	
Initial	100000
After 500 Flex Cycles	100000

Pin to Closest Metallic Hardware	
Mated	
Minimum	
Initial	100000
After 500 Flex Cycles	100000

DIELECTRIC WITHSTANDING VOLTAGE (DWV):

Voltage Rating Summary	
Minimum	
Break Down Voltage	1040
Test Voltage	780
Working Voltage	260

Pin to Pin	
Initial Test Voltage	Passed
After 500 Flex Cycles Test Voltage	Passed

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

Shock / Vibration / 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**GAS TIGHT:**

- 1) A total of 192 points were measured
- 2) EIA-364-23, *Low Level Contact Resistance Test Procedure for Electrical Connectors and Sockets*.
- 3) A computer program, *LLCR 221.exe*, ensures repeatability for data acquisition.
- 4) The following guidelines are used to categorize the changes in LLCR as a result from stressing.
 - a. $\leq +5.0$ 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

LLCR Measurement Summaries by Pin Type				
Date	9/6/2012	9/7/2012		
Room Temp (Deg C)	22	22		
Rel Humidity (%)	43	46		
Technician	Catie Eichhorn	Tony Wagoner		
mOhm values	Actual Initial	Delta Acid Vapor	Delta	Delta
Pin Type 1: Signal				
Average	368.15	0.60		
St. Dev.	2.94	0.55		
Min	361.14	0.00		
Max	379.02	3.69		
Summary Count	184	184		
Total Count	184	184		
Pin Type 2: Ground				
Average	13.93	0.82		
St. Dev.	1.72	0.57		
Min	11.09	0.12		
Max	16.35	1.78		
Summary Count	8	8		
Total Count	8	8		

LLCR Delta Count by Category						
mOhms	Stable	Minor	Acceptable	Marginal	Unstable	Open
	≤ 5	>5 & ≤ 10	>10 & ≤ 15	>15 & ≤ 50	>50 & ≤ 1000	>1000
Acid Vapor	192	0	0	0	0	0

DATA SUMMARIES Continued**LLCR thermal aging**

- 1) A total of 192 points were measured
- 2) EIA-364-23, *Low Level Contact Resistance Test Procedure for Electrical Connectors and Sockets*.
- 3) A computer program, *LLCR 221.exe*, ensures repeatability for data acquisition.
- 4) The following guidelines are used to categorize the changes in LLCR as a result from stressing.
 - a. $\leq +5.0$ 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
 - g.

LLCR Measurement Summaries by Pin Type				
Date	9/20/2012	10/2/2012		
Room Temp (Deg C)	22	22		
Rel Humidity (%)	34	42		
Technician	Tony Wagoner	Tony Wagoner		
mOhm values	Actual Initial	Delta Thermal	Delta	Delta
Pin Type 1: Signal				
Average	367.30	2.52		
St. Dev.	3.16	4.74		
Min	360.30	0.00		
Max	375.20	62.18		
Summary Count	184	184		
Total Count	184	184		
Pin Type 2: Ground				
Average	13.56	5.10		
St. Dev.	1.53	1.33		
Min	11.37	3.30		
Max	16.01	7.30		
Summary Count	8	8		
Total Count	8	8		

LLCR Delta Count by Category						
	Stable	Minor	Acceptable	Marginal	Unstable	Open
mOhms	≤ 5	$>5 \text{ \& } \leq 10$	$>10 \text{ \& } \leq 15$	$>15 \text{ \& } \leq 50$	$>50 \text{ \& } \leq 1000$	>1000
Thermal	180	9	2	0	1	0

DATA SUMMARIES Continued**LLCR Durability:**

- 1) A total of 192 points were measured.
- 2) EIA-364-23, *Low Level Contact Resistance Test Procedure for Electrical Connectors and Sockets*.
- 3) A computer program, *LLCR 221.exe*, ensures repeatability for data acquisition.
- 4) The following guidelines are used to categorize the changes in LLCR as a result from stressing.
 - a. $\leq +5.0$ 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	9/20/2012	9/27/2012	10/2/2012	10/12/2012
Room Temp (Deg C)	22	22	21	22
Rel Humidity (%)	34	41	43	54
Technician	Tony Wagoner	Tony Wagoner	Tony Wagoner	Troy Cook
mOhm values	Actual	Delta	Delta Therm Shck	Delta Humidity
	Initial	25 Cycles		
Pin Type 1: Signal				
Average	368.05	0.84	1.17	0.82
St. Dev.	2.79	0.56	0.83	0.76
Min	360.01	0.01	0.00	0.00
Max	374.74	3.08	4.27	5.36
Summary Count	184	184	184	184
Total Count	184	184	184	184
Pin Type 2: Ground				
Average	13.30	1.41	10.87	12.41
St. Dev.	0.91	1.01	4.85	4.80
Min	11.69	0.10	2.78	3.62
Max	14.68	3.13	20.69	20.95
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
25 Cycles	192	0	0	0	0	0
Therm Shck	185	2	4	1	0	0
Humidity	184	2	5	1	0	0

DATA SUMMARIES Continued**Shock Vib LLCR:**

- 1) A total of 192 points were measured
- 2) EIA-364-23, *Low Level Contact Resistance Test Procedure for Electrical Connectors and Sockets*.
- 3) A computer program, *LLCR 221.exe*, ensures repeatability for data acquisition.
- 4) The following guidelines are used to categorize the changes in LLCR as a result from stressing.
 - a. $\leq +5.0$ 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	9/25/2012	9/28/2012		
Room Temp (Deg C)	22	21		
Rel Humidity (%)	39	44		
Technician	Tony Wagoner	Tony Wagoner		
mOhm values	Actual Initial	Delta Shock-Vib	Delta	Delta
Pin Type 1: Signal				
Average	731.37	3.30		
St. Dev.	11.47	4.22		
Min	681.32	0.05		
Max	764.15	30.00		
Summary Count	184	184		
Total Count	184	184		
Pin Type 2: Ground				
Average	18.49	8.83		
St. Dev.	1.67	6.95		
Min	16.85	0.20		
Max	21.86	19.89		
Summary Count	8	8		
Total Count	8	8		

LLCR Delta Count by Category						
	Stable	Minor	Acceptable	Marginal	Unstable	Open
mOhms	≤ 5	$>5 \text{ \& } \leq 10$	$>10 \text{ \& } \leq 15$	$>15 \text{ \& } \leq 50$	$>50 \text{ \& } \leq 1000$	>1000
Shock-Vib	169	12	3	8	0	0

EQUIPMENT AND CALIBRATION SCHEDULES**Equipment #:** MO-03**Description:** Micro-ohmmeter**Manufacturer:** Keithley**Model:** 580**Serial #:** 297288**Accuracy:** Last Cal: 2012-8-06, Next Cal: 2013-8-05**Equipment #:** TCT-01**Description:** Normal force analyzer**Manufacturer:** Mecmesin Multitester**Model:** Mecmesin Multitester 2.5-i**Serial #:** 08-1049-04**Accuracy:** Last Cal: 2012-4-28, Next Cal: 2013-4-27**Equipment #:** OV-01**Description:** Oven**Manufacturer:** Huida**Model:** CS101-1E**Serial #:** CS101-1E-B**Accuracy:** Last Cal: 2011-12-14, Next Cal: 2012-12-13**Equipment #:** THC-01**Description:** Humidity transmitter**Manufacturer:** Thermtron**Model:** HMM30C**Serial #:** D0240037**Accuracy:** Last Cal: 2012-3-3, Next Cal: 2013-3-2**Equipment #:** OGP-01**Description:** Video measurement system**Manufacturer:** OGP**Model:** SMARTSCOPE FLASH 200**Serial #:** SVW2003632**Accuracy:** Last Cal: 2012-6-10, Next Cal: 2013-6-9**Equipment #:** MO-01**Description:** Micro-ohmmeter**Manufacturer:** Keithley**Model:** 2700**Serial #:** 1199807**Accuracy:** Last Cal: 2012-4-28, Next Cal: 2013-4-27

EQUIPMENT AND CALIBRATION SCHEDULES**Equipment #:** PS-01**Description:** Power Supply**Manufacturer:** Agilent**Model:** 6031A**Serial #:** MY41000982**Accuracy:** Last Cal: 2012-4-28, Next Cal: 2013-4-27**Equipment #:** TSC-01**Description:** Thermal Shock transmitter**Manufacturer:** CSZ**Model:** 10-VT14994**Serial #:** VTS-3-6-6-SC/AC**Accuracy:** Last Cal: 2011-11-1, Next Cal: 2012-11-1**Equipment #:** SVC-01**Description:** Shock & Vibration Table**Manufacturer:** Data Physics**Model:** LE-DSA-10-20K**Serial #:** 10037**Accuracy:** See Manual

... Last Cal: 2011-11-31, Next Cal: 2012-11-31

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

... Last Cal: 2012-07-9, Next Cal: 2013-7-9

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

... Last Cal: 2012-06-4, Next Cal: 2013-06-4