Project Number: Design Qualification Test Report	Tracking Code: 1178976_Report_Rev_1
Requested by: Michael Menkhaus	Date: 11/20/2018
Part #: FQSFP-DD-01-A-XX.X-X/QSFPO-DD	Tech: Troy Cook
Part description: FQSFP-DD/ QSFPO-DD	Qty to test: 150
Test Start: 08/15/2017	Test Completed: 09/20/2018

Design Qualification Test Report

FQSFP-DD/ QSFPO-DD
FQSFP-DD-01-A-XX.X-X/QSFPO-DD

REVISION HISTORY

DATA	REV.NUM.	DESCRIPTION	ENG
11/7/2018	**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) Samtec Test PCBs used: PCB-108216-TST-XX, PCB-108217-TST-XX, PCB-108218-TST-XX, PCB-108259-TST-XX, PCB-108278-TST-XX, PCB-108280-TST-XX, PCB-108281-TST-XX, PCB-108286-TST-XX, PCB-108300-TST-XX, PCB-108301-TST-XX, PCB-108338-TST-XX, PCB-108339-TST-XX, PCB-109195-TST-XX

FLOWCHARTS

Gas Tight

Group 1

FQSFP-DD-01-A-XX.X-X

QSFPO-DD

8 Assemblies

ENIG .0165" PTH

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

Compliant Pin Only

Group 2

FQSFP-DD-01-A-XX.X-X

QSFPO-DD

30 Contacts Minimum

ENIG .0165" PTH

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

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(1) Gas Tight = EIA-364-36

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

FLOWCHARTS Continued

Normal Force

IM-C-460-34-H

Group 1
FQSFP-DD-01-A-XX.X-X
QSFPO-DD
8 Contacts Minimum
Signal Pair Without Thermals

Step	Description
1.	Contact Gaps
2.	Normal Force (1) Expected Force at Max Deflection = 80 g Deflection = 0.008 "

Group 2
FQSFP-DD-01-A-XX.X-X
QSFPO-DD
8 Contacts Minimum
Signal Pair With Thermals

Step	Description
1.	Contact Gaps
2.	Thermal Age (2)
3.	Contact Gaps
4.	Normal Force (1) Deflection = 0.008 " Expected Force at Max Deflection = 80 g

Group 3
FQSFP-DD-01-A-XX.X-X
QSFPO-DD
8 Contacts Minimum
Ground Without Thermals

Step	Description
1.	Contact Gaps
2.	Normal Force (1) Deflection = 0.008 " Expected Force at Max Deflection = 40 g

Group 4
FQSFP-DD-01-A-XX.X-X
QSFPO-DD
8 Contacts Minimum
Ground With Thermals

Step	Description
1.	Contact Gaps
2.	Thermal Age (2)
3.	Contact Gaps
4.	Normal Force (1) Deflection = 0.008 " Expected Force at Max Deflection = 40 g

IM-C-461-34-H

Group 5
FQSFP-DD-01-A-XX.X-X
QSFPO-DD
8 Contacts Minimum
Signal Pair Without Thermals

Step	Description
1.	Contact Gaps
2.	Normal Force (1) Deflection = 0.008 " Expected Force at Max Deflection = 80 g

Group 6
FQSFP-DD-01-A-XX.X-X
QSFPO-DD
8 Contacts Minimum
Signal Pair With Thermals

Step	Description
1.	Contact Gaps
2.	Thermal Age (2)
3.	Contact Gaps
4.	Normal Force (1) Deflection = 0.008 " Expected Force at Max Deflection = 80 g

Group 7
FQSFP-DD-01-A-XX.X-X
QSFPO-DD
8 Contacts Minimum
Ground Without Thermals

Step	Description
1.	Contact Gaps
2.	Normal Force (1) Deflection = 0.008 " Expected Force at Max Deflection = 40 g

Group 8
FQSFP-DD-01-A-XX.X-X
QSFPO-DD
8 Contacts Minimum
Ground With Thermals

Step	Description
1.	Contact Gaps
2.	Thermal Age (2)
3.	Contact Gaps
4.	Normal Force (1) Deflection = 0.008 " Expected Force at Max Deflection = 40 g

FLOWCHARTS Continued

IM-C-462-L

Group 9 IM-C-462-L 8 Contacts Minimum Without Thermals		Group 10 IM-C-462-L IM-C-460/461 8 Contacts Minimum With Thermals	
Step	**Description**	**Step**	**Description**
1.	Contact Gaps	1.	Contact Gaps
2.	Normal Force (1) Deflection = 0.007 " Expected Force at Max Deflection = 100 g	2.	Thermal Age (2)
		3.	Contact Gaps
		4.	Normal Force (1) Deflection = 0.007 " Expected Force at Max Deflection = 100 g

IM-C-463-L

Group 11 IM-C-463-L 8 Contacts Minimum Without Thermals		Group 12 IM-C-463-L IM-C-460/461 8 Contacts Minimum With Thermals	
Step	**Description**	**Step**	**Description**
1.	Contact Gaps	1.	Contact Gaps
2.	Normal Force (1) Deflection = 0.007 " Expected Force at Max Deflection = 100 g	2.	Thermal Age (2)
		3.	Contact Gaps
		4.	Normal Force (1) Deflection = 0.007 " Expected Force at Max Deflection = 100 g

(1) Normal Force = EIA-364-04

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

FLOWCHARTS Continued

Thermal Aging

Group 1

FQSFP-DD-01-A-XX.X-X

QSFPO-DD

8 Assemblies

ENIG .0165" PTH

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

Compliant Pin Only

Group 2

FQSFP-DD-01-A-XX.X-X

QSFPO-DD

30 Contacts Minimum

ENIG .0165" PTH

Step	Description
1.	LLCR (1)
2.	Thermal Age (3)
3.	LLCR (1) Max Delta = 1 mOhm

(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
FQSFP-DD-01-A-XX.X-X
QSFPO-DD
8 Assemblies
ENIG .0165" PTH

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

FLOWCHARTS Continued

Compliant Pin Only

Group 2

FQSFP-DD-01-A-XX.X-X

QSFPO-DD

30 Contacts Minimum

ENIG .0165" PTH

Step	Description
1.	LLCR (2)
2.	Thermal Shock (4) - Non Standard
3.	LLCR (2) Max Delta ▪ 1 mOhm
4.	Humidity (1)
5.	LLCR (2) Max Delta ▪ 1 mOhm

(1) Humidity = EIA-364-31
Test Condition = B (240 Hours)
Test Method = III (+25°C to +65°C @ 90% RH to 98% RH)
Test Exceptions: ambient pre-condition and delete steps 7a and 7b

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

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

(4) Thermal Shock = Other
Exposure Time at Temperature Extremes =1/2 Hour
Method A, Test Condition = (-25°C to +85°C)
Test Duration = A-3 (100 Cycles)

FLOWCHARTS Continued

IR/DWV

Note: ENIG .0165" PTH

LS Pin-to-LS Pin

Group 1 FQSFP-DD-01-A-XX.X-X QSFPO-DD 2 Assemblies		Group 2 FQSFP-DD-01-A-XX.X-X 2 Assemblies		Group 3 FQSFP-DD-01-A-XX.X-X QSFPO-DD 2 Assemblies	
Step	**Description**	**Step**	**Description**	**Step**	**Description**
1.	DWV Breakdown (2)	1.	DWV Breakdown (2)	1.	IR (4)
				2.	DWV at Test Voltage(1)
				3.	Thermal Shock (5) • Non Standard
				4.	IR (4)
				5.	DWV at Test Voltage(1)
				6.	Humidity (3)
				7.	IR (4)
				8.	DWV at Test Voltage(1)

LS Row-to-LS Row

Group 4 FQSFP-DD-01-A-XX.X-X QSFPO-DD 2 Assemblies		Group 5 FQSFP-DD-01-A-XX.X-X 2 Assemblies		Group 6 FQSFP-DD-01-A-XX.X-X QSFPO-DD 2 Assemblies	
Step	**Description**	**Step**	**Description**	**Step**	**Description**
1.	DWV Breakdown (2)	1.	DWV Breakdown (2)	1.	IR (4)
				2.	DWV at Test Voltage(1)
				3.	Thermal Shock (5) • Non Standard
				4.	IR (4)
				5.	DWV at Test Voltage(1)
				6.	Humidity (3)
				7.	IR (4)
				8.	DWV at Test Voltage(1)

FLOWCHARTS Continued

HS Pin-to-HS Pin

Group 7 FQSFP-DD-01-A-XX.X-X QSFPO-DD 2 Assemblies		Group 8 FQSFP-DD-01-A-XX.X-X 2 Assemblies		Group 9 FQSFP-DD-01-A-XX.X-X QSFPO-DD 2 Assemblies	
Step	**Description**	**Step**	**Description**	**Step**	**Description**
1.	DWV Breakdown (2)	1.	DWV Breakdown (2)	1.	IR (4)
				2.	DWV at Test Voltage(1)
				3.	Thermal Shock (5) - Non Standard
				4.	IR (4)
				5.	DWV at Test Voltage(1)
				6.	Humidity (3)
				7.	IR (4)
				8.	DWV at Test Voltage(1)

HS Row-to-HS Row

Group 10 FQSFP-DD-01-A-XX.X-X QSFPO-DD 2 Assemblies		Group 11 FQSFP-DD-01-A-XX.X-X 2 Assemblies		Group 12 FQSFP-DD-01-A-XX.X-X QSFPO-DD 2 Assemblies	
Step	**Description**	**Step**	**Description**	**Step**	**Description**
1.	DWV Breakdown (2)	1.	DWV Breakdown (2)	1.	IR (4)
				2.	DWV at Test Voltage(1)
				3.	Thermal Shock (5) - Non Standard
				4.	IR (4)
				5.	DWV at Test Voltage(1)
				6.	Humidity (3)
				7.	IR (4)
				8.	DWV at Test Voltage(1)

FLOWCHARTS Continued

HS Pin-to-Ground

Group 13 FQSFP-DD-01-A-XX.X-X QSFPO-DD 2 Assemblies		Group 14 FQSFP-DD-01-A-XX.X-X 2 Assemblies		Group 15 FQSFP-DD-01-A-XX.X-X QSFPO-DD 2 Assemblies	
Step	**Description**	**Step**	**Description**	**Step**	**Description**
1.	DWV Breakdown (2)	1.	DWV Breakdown (2)	1.	IR (4)
				2.	DWV at Test Voltage(1)
				3.	Thermal Shock (5) • Non Standard
				4.	IR (4)
				5.	DWV at Test Voltage(1)
				6.	Humidity (3)
				7.	IR (4)
				8.	DWV at Test Voltage(1)

Ground to Cage Ground

Group 16 FQSFP-DD-01-A-XX.X-X QSFPO-DD 2 Assemblies		Group 17 FQSFP-DD-01-A-XX.X-X 2 Assemblies		Group 18 FQSFP-DD-01-A-XX.X-X QSFPO-DD 2 Assemblies	
Step	**Description**	**Step**	**Description**	**Step**	**Description**
1.	DWV Breakdown (2)	1.	DWV Breakdown (2)	1.	IR (4)
				2.	DWV at Test Voltage(1)
				3.	Thermal Shock (5) • Non Standard
				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 = Other
Exposure Time at Temperature Extremes =1/2 Hour
Method A, Test Condition = (-25°C to +85°C)
Test Duration = A-3 (100 Cycles)
EIA-364-32

FLOWCHARTS Continued

Current Carrying Capacity

Group 1
FQSFP-DD-01-A-XX.X-X
QSFPO-DD
4 Pins Powered
Signal - ENIG .0165" PTH

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

Group 2
FQSFP-DD-01-A-XX.X-X
QSFPO-DD
8 Pins Powered
Signal - ENIG .0165" PTH

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

Group 3
FQSFP-DD-01-A-XX.X-X
QSFPO-DD
12 Pins Powered
Signal - ENIG .0165" PTH

Step	Description
1.	CCC (1) Rows = 4 Number of Positions = 3

Group 4
FQSFP-DD-01-A-XX.X-X
QSFPO-DD
16 Pins Powered
Signal - ENIG .0165" PTH

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

Group 5
FQSFP-DD-01-A-XX.X-X
QSFPO-DD
20 Pins Powered
Signal - ENIG .0165" PTH

Step	Description
1.	CCC (1) Rows = 4 Number of Positions = 5

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

FLOWCHARTS Continued

Mechanical Shock/Random Vibration/LLCR

Group 1
FQSFP-DD-01-A-XX.X-X
QSFPO-DD
8 Assemblies
ENIG .0165" PTH

Step	Description
1.	LLCR (1)
2.	Mechanical Shock (2) - Non Standard
3.	Random Vibration (3)
4.	LLCR (1) Max Delta = 15 mOhm

Compliant Pin Only

Group 2
FQSFP-DD-01-A-XX.X-X
QSFPO-DD
30 Contacts Minimum
ENIG .0165" PTH

Step	Description
1.	LLCR (1)
2.	Mechanical Shock (2) - Non Standard
3.	Random Vibration (3)
4.	LLCR (1) Max Delta = 1 mOhm

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

(2) Mechanical Shock = Other
Test Condition = C (30 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)

FLOWCHARTS Continued

Mechanical Shock/Random Vibration/Event Detection

Group 1
FQSFP-DD-01-A-XX.X-X
QSFPO-DD
60 Points
ENIG .0165" PTH

Step	Description
1.	Nanosecond Event Detection (Mechanical Shock) (1) - Non Standard
2.	Nanosecond Event Detection (Random Vibration) (2)

(1) Nanosecond Event Detection (Mechanical Shock) = Other
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 (30 G Peak, 6 milliseconds, Half Sine)
Number of Shocks = 3 Per Direction, Per Axis, 18 Total

(2) Nanosecond Event Detection (Random Vibration)
Use EIA-364-87 for Nanosecond Event Detection:
Test Condition = F (50 nanoseconds at 10 ohms)
Use EIA-364-28 for Random Vibration:
Condition = VB (7.56 gRMS Average, 2 Hours/Axis)

FLOWCHARTS Continued

Cable Pull

Group 1 FQSFP-DD-01-A-XX.X-X QSFPO-DD 5 Assemblies 0 Degrees		Group 2 FQSFP-DD-01-A-XX.X-X QSFPO-DD 5 Assemblies 90 Degrees	
Step	**Description**	**Step**	**Description**
1.	Cable Pull (1)	1.	Cable Pull (1)

(1) Cable Pull = EIA-364-38
Measure and Record Force Required to Failure
Failure = Discontinuity >1 microsecond at 10 ohms

Cable Flex

Group 1 FQSFP-DD-01-A-XX.X-X QSFPO-DD 8 Assemblies Flat Cable	
Step	**Description**
1.	IR (3)
2.	DWV at Test Voltage (2)
3.	Cable Flex (1)
4.	Visual Inspection
5.	IR (3)
6.	DWV at Test Voltage (2)

(1) Cable Flex = EIA-364-41
Circular Jacket Cable - to be tested 90° each direction (180° total)
Flat Cable - to be tested 70° each direction (140° total)
Monitor continuity during flex testing
Failure = Discontinuity >1 microsecond at 10 ohms

(2) 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

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

FLOWCHARTS Continued

Compliant Pin Buckling

Group 1

FQSFP-DD-01-A-XX.X-X

20 Assemblies

HASL .0125" PTH

Step	Description
1.	Contact Gaps
2.	Measure PTH Diameter
3.	Press Fit Connectors
4.	Visual Connector Inspection *Note: Inspect the connector for buckling. Document findings.*
5.	Cross-Section Connectors *Note: Inspect the connector for buckling. Document findings.* *Note: Cross-section 3 connectors*

FLOWCHARTS Continued

Insertion/Retention/Hole Conditioning

Low Speed Signal

Group 1
FQSFP-DD-01-A-XX.X-X
QSFPO-DD
32 Points
HASL .0125" PTH (LS Sig)

Step	Description
1.	Insertion Force Rate = 2.54 mm/min *Note: Pin 1*
2.	Retention Force Rate = 2.54 mm/min *Note: Pin 1* *Note: EIA 364-29*
3.	Cycles Quantity = 1 Cycles *Note: Pin 2*
4.	Insertion Force Rate = 2.54 mm/min *Note: Pin 3*
5.	Retention Force Rate = 2.54 mm/min *Note: Pin 3* *Note: EIA 364-29*
6.	Hole Integrity *Note: Check for distortion of the PTH according to EIA 364-96*

Group 2
FQSFP-DD-01-A-XX.X-X
QSFPO-DD
32 Points
HASL .0165" PTH (LS Sig)

Step	Description
1.	Insertion Force Rate = 2.54 mm/min *Note: Pin 1*
2.	Retention Force Rate = 2.54 mm/min *Note: Pin 1* *Note: EIA 364-29*
3.	Cycles Quantity = 1 Cycles *Note: Pin 2*
4.	Insertion Force Rate = 2.54 mm/min *Note: Pin 3*
5.	Retention Force Rate = 2.54 mm/min *Note: Pin 3* *Note: EIA 364-29*
6.	Hole Integrity *Note: Check for distortion of the PTH according to EIA 364-96*

Group 3
FQSFP-DD-01-A-XX.X-X
QSFPO-DD
32 Points
ENIG .0165" PTH (LS Sig)

Step	Description
1.	Insertion Force Rate = 2.54 mm/min *Note: Pin 1*
2.	Retention Force Rate = 2.54 mm/min *Note: Pin 1* *Note: EIA 364-29*
3.	Cycles Quantity = 1 Cycles *Note: Pin 2*
4.	Insertion Force Rate = 2.54 mm/min *Note: Pin 3*
5.	Retention Force Rate = 2.54 mm/min *Note: Pin 3* *Note: EIA 364-29*
6.	Hole Integrity *Note: Check for distortion of the PTH according to EIA 364-96*

Group 10
FQSFP-DD-01-A-XX.X-X
QSFPO-DD
32 Points
HASL .0125" PTH (LS Sig)

Step	Description
1.	LLCR (1) *Note: Part 1*
2.	Cycles Quantity = 1 Cycles *Note: Part 2*
3.	LLCR (1) Max Delta = 1 mOhm *Note: Part 3*
4.	Hole Integrity *Note: Check for distortion of the PTH according to EIA 364-96*

Group 11
FQSFP-DD-01-A-XX.X-X
QSFPO-DD
32 Points
HASL .0165" PTH (LS Sig)

Step	Description
1.	LLCR (1) *Note: Part 1*
2.	Cycles Quantity = 1 Cycles *Note: Part 2*
3.	LLCR (1) Max Delta = 1 mOhm *Note: Part 3*
4.	Hole Integrity *Note: Check for distortion of the PTH according to EIA 364-96*

Group 12
FQSFP-DD-01-A-XX.X-X
QSFPO-DD
32 Points
ENIG .0165" PTH (LS Sig)

Step	Description
1.	LLCR (1) *Note: Part 1*
2.	Cycles Quantity = 1 Cycles *Note: Part 2*
3.	LLCR (1) Max Delta = 1 mOhm *Note: Part 3*
4.	Hole Integrity *Note: Check for distortion of the PTH according to EIA 364-96*

FLOWCHARTS Continued

Group 4
FQSFP-DD-01-A-XX.X-X
QSFPO-DD
32 Points
HASL .0125" PTH (Ground)

Step	Description
1.	Insertion Force Rate = 2.54 mm/min *Note: Pin 1*
2.	Retention Force Rate = 2.54 mm/min *Note: Pin 1* *Note: EIA 364-29*
3.	Cycles Quantity = 1 Cycles *Note: Pin 2*
4.	Insertion Force Rate = 2.54 mm/min *Note: Pin 3*
5.	Retention Force Rate = 2.54 mm/min *Note: EIA 364-29* *Note: Pin 3*
6.	Hole Integrity *Note: Check for distortion of the PTH according to EIA 364-96*

Group 5
FQSFP-DD-01-A-XX.X-X
QSFPO-DD
32 Points
HASL .0165" PTH (Ground)

Step	Description
1.	Insertion Force Rate = 2.54 mm/min *Note: Pin 1*
2.	Retention Force Rate = 2.54 mm/min *Note: Pin 1* *Note: EIA 364-29*
3.	Cycles Quantity = 1 Cycles *Note: Pin 2*
4.	Insertion Force Rate = 2.54 mm/min *Note: Pin 3*
5.	Retention Force Rate = 2.54 mm/min *Note: Pin 3* *Note: EIA 364-29*
6.	Hole Integrity *Note: Check for distortion of the PTH according to EIA 364-96*

Group 6
FQSFP-DD-01-A-XX.X-X
QSFPO-DD
32 Points
ENIG .0165" PTH (Ground)

Step	Description
1.	Insertion Force Rate = 2.54 mm/min *Note: Pin 1*
2.	Retention Force Rate = 2.54 mm/min *Note: Pin 1* *Note: EIA 364-29*
3.	Cycles Quantity = 1 Cycles *Note: Pin 2*
4.	Insertion Force Rate = 2.54 mm/min *Note: Pin 3*
5.	Retention Force Rate = 2.54 mm/min *Note: Pin 3* *Note: EIA 364-29*
6.	Hole Integrity *Note: Check for distortion of the PTH according to EIA 364-96*

Group 13
FQSFP-DD-01-A-XX.X-X
QSFPO-DD
32 Points
HASL .0125" PTH (Ground)

Step	Description
1.	LLCR (1) *Note: Part 1*
2.	Cycles Quantity = 1 Cycles *Note: Part 2*
3.	LLCR (1) Max Delta = 1 mOhm *Note: Part 3*
4.	Hole Integrity *Note: Check for distortion of the PTH according to EIA 364-96*

Group 14
FQSFP-DD-01-A-XX.X-X
QSFPO-DD
32 Points
HASL .0165" PTH (Ground)

Step	Description
1.	LLCR (1) *Note: Part 1*
2.	Cycles Quantity = 1 Cycles *Note: Part 2*
3.	LLCR (1) Max Delta = 1 mOhm *Note: Part 3*
4.	Hole Integrity *Note: Check for distortion of the PTH according to EIA 364-96*

Group 15
FQSFP-DD-01-A-XX.X-X
QSFPO-DD
32 Points
ENIG .0165" PTH (Ground)

Step	Description
1.	LLCR (1) *Note: Part 1*
2.	Cycles Quantity = 1 Cycles *Note: Part 2*
3.	LLCR (1) Max Delta = 1 mOhm *Note: Part 3*
4.	Hole Integrity *Note: Check for distortion of the PTH according to EIA 364-96*

FLOWCHARTS Continued

Weld Tab

Group 7 FQSFP-DD-01-A-XX.X-X QSFPO-DD 30 Points HASL .018" PTH (WT)		Group 8 FQSFP-DD-01-A-XX.X-X QSFPO-DD 30 Points HASL .022" PTH (WT)		Group 9 FQSFP-DD-01-A-XX.X-X QSFPO-DD 30 Points ENIG .022" PTH (WT)	
Step	**Description**	**Step**	**Description**	**Step**	**Description**
1.	Insertion Force Rate = 2.54 mm/min *Note: Pin 1*	1.	Insertion Force Rate = 2.54 mm/min *Note: Pin 1*	1.	Insertion Force Rate = 2.54 mm/min *Note: Pin 1*
2.	Retention Force Rate = 2.54 mm/min *Note: Pin 1* *Note: EIA 364-29*	2.	Retention Force Rate = 2.54 mm/min *Note: Pin 1* *Note: EIA 364-29*	2.	Retention Force Rate = 2.54 mm/min *Note: Pin 1* *Note: EIA 364-29*
3.	Cycles Quantity = 1 Cycles *Note: Pin 2*	3.	Cycles Quantity = 1 Cycles *Note: Pin 2*	3.	Cycles Quantity = 1 Cycles *Note: Pin 2*
4.	Insertion Force Rate = 2.54 mm/min *Note: Pin 3*	4.	Insertion Force Rate = 2.54 mm/min *Note: Pin 3*	4.	Insertion Force Rate = 2.54 mm/min *Note: Pin 3*
5.	Retention Force Rate = 2.54 mm/min *Note: Pin 3* *Note: EIA 364-29*	5.	Retention Force Rate = 2.54 mm/min *Note: Pin 3* *Note: EIA 364-29*	5.	Retention Force Rate = 2.54 mm/min *Note: Pin 3* *Note: EIA 364-29*
6.	Hole Integrity *Note: Check for distortion of the PTH according to EIA 364-96*	6.	Hole Integrity *Note: Check for distortion of the PTH according to EIA 364-96*	6.	Hole Integrity *Note: Check for distortion of the PTH according to EIA 364-96*

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

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: -25℃ to +85℃
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 :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: 30 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

MATING/UNMATING:

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

ATTRIBUTE DEFINITIONS Continued

The following is a brief, simplified description of attributes.

NORMAL FORCE (FOR CONTACTS TESTED IN THE HOUSING):

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

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 100 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 Continued

The following is a brief, simplified description of attributes.

TEMPERATURE RISE (Current Carrying Capacity, CCC):

1) EIA-364-70, *Temperature Rise versus Current Test Procedure for Electrical Connectors and Sockets*.
2) When current passes through a contact, the temperature of the contact increases as a result of I^2R (resistive) heating.
3) The number of contacts being investigated plays a significant part in power dissipation and therefore temperature rise.
4) The size of the temperature probe can affect the measured temperature.
5) Copper traces on PC boards will contribute to temperature rise:
    a. Self heating (resistive)
    b. Reduction in heat sink capacity affecting the heated contacts
6) A de-rating curve, usually 20%, is calculated.
7) Calculated de-rated currents at four temperature points are reported:
    c. Ambient
    d. 65^o C
    e. 75^o C
    f. 95^o C
8) Typically, neighboring contacts (in close proximity to maximize heat build up) are energized.
9) The thermocouple (or temperature measuring probe) will be positioned at a location to sense the maximum temperature in the vicinity of the heat generation area.
10) A computer program, *TR 803.exe*, ensures accurate stability for data acquisition.
11) Hook-up wire cross section is larger than the cross section of any connector leads/PC board traces, jumpers, etc.
12) Hook-up wire length is longer than the minimum specified in the referencing standard.

ATTRIBUTE DEFINITIONS Continued

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
4) The following guidelines are used to categorize the changes in LLCR for compliant pin only
    a. <= +0.33 mOhms: ---------- Stable
    b. +0.33 to +0.66 mOhms: ---------- Minor
    c. +0.67 to +1.00 mOhms: ---------- Acceptable
    d. +1.01 to +50.0 mOhms: ---------- Marginal
    e. +50.1 to +1000 mOhms: ---------- Unstable
    f. >+1000 mOhms:---------- Open Failure

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:
    g. Reference document: EIA-364-36, *Test Procedure for Determination of Gas-Tight Characteristics for Electrical Connectors, Sockets and/or Contact Systems*.
    h. 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.

ATTRIBUTE DEFINITIONS Continued

The following is a brief, simplified description of attributes.

5) The following guidelines are used to categorize the changes in LLCR for compliant pin only
   a. <= +0.33 mOhms: ---------- Stable
   b. +0.33 to +0.66 mOhms: ---------- Minor
   c. +0.67 to +1.00 mOhms: ---------- Acceptable
   d. +1.01 to +50.0 mOhms: ---------- Marginal
   e. +50.1 to +1000 mOhms: ---------- Unstable
   f. >+1000 mOhms: ---------- Open Failure

CABLE PULL:

1) Secure cable near center and pull on connector
   a. At 90°, right angle to cable
   b. At 0°, in-line with cable

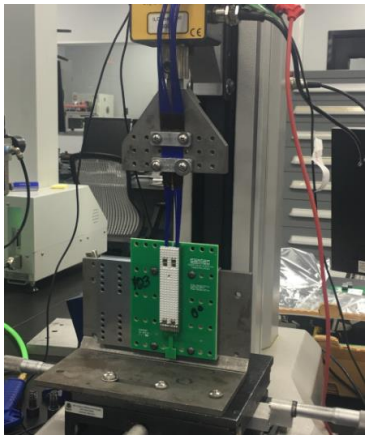


Fig. 1
0° Connector pull, notice the electrical continuity hook-up wires.

CABLE DURABILITY:

1) Oscillate and monitor electrical continuity for open circuit indication.
   a. ± 70° Flex Mode, bend up to 500 cycles. load on cable end.

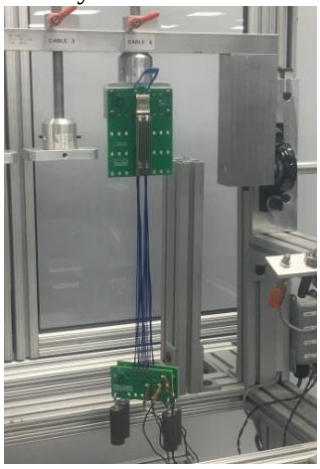


Fig. 2
(Setup picture)

RESULTS

Temperature Rise, CCC at a 20% de-rating

- **CCC for a 30°C Temperature Rise----------2.0 A per contact with 2 contacts (2x1) powered**
- **CCC for a 30°C Temperature Rise----------1.4 A per contact with 4 contacts (2x2) powered**
- **CCC for a 30°C Temperature Rise----------1.2 A per contact with 6 contacts (2x3) powered**
- **CCC for a 30°C Temperature Rise----------1.0 A per contact with 8 contacts (2x4) powered**
- **CCC for a 30°C Temperature Rise----------0.9 A per contact with 10 contacts (2x5) powered**

Mating – Unmating Forces

Thermal aging Group

- **Initial**
  - **Mating**
    - **Min ---------- 6.45 lbs**
    - **Max---------- 9.13 lbs**
  - **Unmating**
    - **Min ---------- 5.38 lbs**
    - **Max---------- 7.74 lbs**
- **After Thermal**
  - **Mating**
    - **Min ---------- 5.16 lbs**
    - **Max---------- 7.08 lbs**
  - **Unmating**
    - **Min ---------- 4.34 lbs**
    - **Max---------- 6.14 lbs**

RESULTS Continued

Mating – Unmating Forces

Mating/Unmating Durability Group

- **Initial**
  - **Mating**
    - **Min ---------- 6.97 lbs**
    - **Max---------- 8.83 lbs**
  - **Unmating**
    - **Min ---------- 4.93 lbs**
    - **Max---------- 7.06 lbs**
- **After 25 Cycles**
  - **Mating**
    - **Min ---------- 7.68 lbs**
    - **Max---------- 9.29 lbs**
  - **Unmating**
    - **Min ---------- 5.54 lbs**
    - **Max---------- 7.64 lbs**
- **After 50 Cycles**
  - **Mating**
    - **Min ---------- 8.00 lbs**
    - **Max---------- 9.31 lbs**
  - **Unmating**
    - **Min ---------- 6.24 lbs**
    - **Max---------- 7.60 lbs**
- **After 75 Cycles**
  - **Mating**
    - **Min ---------- 8.21 lbs**
    - **Max---------- 9.97 lbs**
  - **Unmating**
    - **Min ---------- 5.79 lbs**
    - **Max---------- 8.14 lbs**
- **After 100 Cycles**
  - **Mating**
    - **Min ---------- 8.10 lbs**
    - **Max----------10.20 lbs**
  - **Unmating**
    - **Min ---------- 5.86 lbs**
    - **Max---------- 8.36 lbs**
- **Humidity**
  - **Mating**
    - **Min ---------- 5.34 lbs**
    - **Max---------- 6.17 lbs**
  - **Unmating**
    - **Min ---------- 3.97 lbs**
    - **Max---------- 4.99 lbs**

RESULTS Continued

Normal Force at 0.0080 inch deflection

IM-C-460-34-H

Signal pin

- **Initial**
  - **Min---------- 188.10 gf Set ----- 0.0000 inch**
  - **Max ---------- 268.30 gf Set ----- 0.0001 inch**
- **Thermal**
  - **Min----------64.30 gf Set----- 0.0001 inch**
  - **Max ---------- 171.10 gf Set----- 0.0035 inch**

Ground pin

- **Initial**
  - **Min---------- 118.40 gf Set ----- 0.0000 inch**
  - **Max ---------- 155.60 gf Set ----- 0.0006 inch**
- **Thermal**
  - **Min----------28.90 gf Set----- 0.0015 inch**
  - **Max ----------52.30 gf Set----- 0.0028 inch**

IM-C-461-34-H

Signal pin

- **Initial**
  - **Min---------- 104.30 gf Set ----- 0.0000 inch**
  - **Max ---------- 117.70 gf Set ----- 0.0003 inch**
- **Thermal**
  - **Min----------54.60 gf Set----- 0.0021 inch**
  - **Max ----------76.00 gf Set----- 0.0034 inch**

Ground pin

- **Initial**
  - **Min----------39.90 gf Set ----- 0.0000 inch**
  - **Max ----------42.90 gf Set ----- 0.0003 inch**
- **Thermal**
  - **Min----------24.70 gf Set----- 0.0000 inch**
  - **Max ----------29.60 gf Set----- 0.0000 inch**

Normal Force at 0.0070 inch deflection

IM-C-462-L

- **Initial**
  - **Min---------- 131.40 gf Set ----- 0.0058 inch**
  - **Max ---------- 172.10 gf Set ----- 0.0079 inch**
- **Thermal**
  - **Min----------68.70 gf Set----- 0.0061 inch**
  - **Max ---------- 138.90 gf Set----- 0.0078 inch**

IM-C-463-L

- **Initial**
  - **Min---------- 142.30 gf Set ----- 0.0049 inch**
  - **Max ---------- 163.60 gf Set ----- 0.0061 inch**
- **Thermal**
  - **Min----------84.20 gf Set----- 0.0046 inch**
  - **Max ---------- 138.80 gf Set----- 0.0063 inch**

RESULTS Continued

Cable Pull force

- **0° Pull**
  - **Minimum ----------51.72 lbs**
  - **Maximum----------70.54 lbs**
  - **Average----------60.90 lbs**
- **90° Pull**
  - **Min---------- 4.66 lbs**
  - **Max ---------- 7.33 lbs**
  - **Average---------- 6.18 lbs**

Cable Flex:

Insulation Resistance minimums, IR

Pin to Pin

- **Initial**
  - **Mated----------45000 Meg Ω ---------- Passed**
- **After 500 flex cycles**
  - **Mated----------45000 Meg Ω ---------- Passed**

Pin to Ground

- **Initial**
  - **Mated----------45000 Meg Ω ---------- Passed**
- **After 500 flex cycles**
  - **Mated----------45000 Meg Ω ---------- Passed**

Dielectric Withstanding Voltage minimums, DWV

- **Test Voltage ----------491 VAC**

Pin to Pin

- **Initial DWV ----------Passed**
- **After 500 Flex cycles DWV ----------Passed**

Pin to Ground

- **Initial DWV ----------Passed**
- **After 500 Flex cycles DWV ----------Passed**

RESULTS Continued

Compliant pin Insertion/Retention Forces

Signal Pin- HASL-0.0125"

- **Initial**
  - **Mating**
    - **Min ---------- 1.18 lbs**
    - **Max---------- 1.60 lbs**
  - **Unmating**
    - **Min ---------- 0.08 lbs**
    - **Max---------- 1.33 lbs**
- **After 3 Cycles**
  - **Mating**
    - **Min ---------- 1.16 lbs**
    - **Max---------- 1.48 lbs**
  - **Unmating**
    - **Min ---------- 0.05 lbs**
    - **Max---------- 1.03 lbs**

Signal Pin- HASL-0.0165"

- **Initial**
  - **Mating**
    - **Min ---------- 0.91 lbs**
    - **Max---------- 1.92 lbs**
  - **Unmating**
    - **Min ---------- 0.53 lbs**
    - **Max---------- 1.26 lbs**
- **After 3 Cycles**
  - **Mating**
    - **Min ---------- 0.87 lbs**
    - **Max---------- 1.39 lbs**
  - **Unmating**
    - **Min ---------- 0.46 lbs**
    - **Max---------- 1.12 lbs**

Signal Pin- ENIG-0.0165"

- **Initial**
  - **Mating**
    - **Min ---------- 1.08 lbs**
    - **Max---------- 1.39 lbs**
  - **Unmating**
    - **Min ---------- 0.28 lbs**
    - **Max---------- 0.86 lbs**
- **After 3 Cycles**
  - **Mating**
    - **Min ---------- 1.01 lbs**
    - **Max---------- 1.37 lbs**
  - **Unmating**
    - **Min ---------- 0.23 lbs**
    - **Max---------- 0.80 lbs**

RESULTS Continued

Compliant pin Insertion/Retention Forces

Ground Pin- HASL-0.0125"

- **Initial**
  - **Mating**
    - **Min ---------- 1.46 lbs**
    - **Max---------- 1.50 lbs**
  - **Unmating**
    - **Min ---------- 0.56 lbs**
    - **Max---------- 1.00 lbs**
- **After 3 Cycles**
  - **Mating**
    - **Min ---------- 1.47 lbs**
    - **Max---------- 1.48 lbs**
  - **Unmating**
    - **Min ---------- 0.71 lbs**
    - **Max---------- 1.24 lbs**

Ground Pin- HASL-0.0165"

- **Initial**
  - **Mating**
    - **Min ---------- 1.03 lbs**
    - **Max---------- 1.12 lbs**
  - **Unmating**
    - **Min ---------- 0.99 lbs**
    - **Max---------- 1.01 lbs**
- **After 3 Cycles**
  - **Mating**
    - **Min ---------- 0.93 lbs**
    - **Max---------- 0.97 lbs**
  - **Unmating**
    - **Min ---------- 0.84 lbs**
    - **Max---------- 0.89 lbs**

Ground Pin- ENIG-0.0165"

- **Initial**
  - **Mating**
    - **Min ---------- 1.05 lbs**
    - **Max---------- 1.06 lbs**
  - **Unmating**
    - **Min ---------- 0.64 lbs**
    - **Max---------- 0.75 lbs**
- **After 3 Cycles**
  - **Mating**
    - **Min ---------- 1.02 lbs**
    - **Max---------- 1.02 lbs**
  - **Unmating**
    - **Min ---------- 0.73 lbs**
    - **Max---------- 0.81 lbs**

RESULTS Continued

Compliant pin Insertion/Retention Forces

Retention Pin- HASL-0.018"

- **Initial**
  - **Mating**
    - **Min ---------- 3.02 lbs**
    - **Max---------- 3.64 lbs**
  - **Unmating**
    - **Min ---------- 1.45 lbs**
    - **Max---------- 1.96 lbs**
- **After 3 Cycles**
  - **Mating**
    - **Min ---------- 2.72 lbs**
    - **Max---------- 3.43 lbs**
  - **Unmating**
    - **Min ---------- 1.19 lbs**
    - **Max---------- 2.08 lbs**

Retention Pin- HASL-0.022"

- **Initial**
  - **Mating**
    - **Min ---------- 0.74 lbs**
    - **Max---------- 1.53 lbs**
  - **Unmating**
    - **Min ---------- 0.49 lbs**
    - **Max---------- 1.27 lbs**
- **After 3 Cycles**
  - **Mating**
    - **Min ---------- 0.72 lbs**
    - **Max---------- 1.65 lbs**
  - **Unmating**
    - **Min ---------- 0.60 lbs**
    - **Max---------- 1.22 lbs**

Retention Pin- ENIG-0.022"

- **Initial**
  - **Mating**
    - **Min ---------- 0.44 lbs**
    - **Max---------- 1.90 lbs**
  - **Unmating**
    - **Min ---------- 0.31 lbs**
    - **Max---------- 1.17 lbs**
- **After 3 Cycles**
  - **Mating**
    - **Min ---------- 0.54 lbs**
    - **Max---------- 1.78 lbs**
  - **Unmating**
    - **Min ---------- 0.34 lbs**
    - **Max---------- 1.26 lbs**

RESULTS Continued

LLCR Durability (160 signal, 256 HS signal, 64 ground LLCR test points)

Signal pin:

- **Initial ---------- 23.84 mOhms Max**
- **After 100 cycles**
  - **<= +5.0 mOhms ---------- 160 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 ---------- 160 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 ---------- 156 Points ---------- Stable**
  - **+5.1 to +10.0 mOhms ----------3 Points ---------- Minor**
  - **+10.1 to +15.0 mOhms ----------0 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**

HS Signal pin:

- **Initial ----------334.87 mOhms Max**
- **After 100 cycles**
  - **<= +5.0 mOhms ---------- 256 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 ---------- 256 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 ---------- 256 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 pin:

- **Initial ---------- 106.47 mOhms Max**
- **After 100 cycles**
  - **<= +5.0 mOhms ---------- 52 Points ---------- Stable**
  - **+5.1 to +10.0 mOhms ---------- 10 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 ---------- 0 Points ---------- Unstable**
  - **>+2000 mOhms ---------- 0 Points ---------- Open Failure**
- **After thermal shock**
  - **<= +5.0 mOhms ---------- 52 Points ---------- Stable**
  - **+5.1 to +10.0 mOhms ---------- 7 Points ---------- Minor**
  - **+10.1 to +15.0 mOhms ---------- 5 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 ---------- 30 Points ---------- Stable**
  - **+5.1 to +10.0 mOhms ---------- 15 Points ---------- Minor**
  - **+10.1 to +15.0 mOhms ---------- 12 Points ---------- Acceptable**
  - **+15.1 to +50.0 mOhms ---------- 7 Points ---------- Marginal**
  - **+50.1 to +2000 mOhms ---------- 0 Points ---------- Unstable**
  - **>+2000 mOhms ---------- 0 Points ---------- Open Failure**

LLCR Durability Group (40 Compliant pin LLCR test points)

- **Initial ---------- 0.53 mOhms Max**
- **After thermal shock**
  - **<= +0.33 mOhms ---------- 40 Points ---------- Stable**
  - **+0.34 to +0.66 mOhms ---------- 0 Points ---------- Minor**
  - **+0.67 to +1.00 mOhms ---------- 0 Points ---------- Acceptable**
  - **+1.01 to +50.0 mOhms ---------- 0 Points ---------- Marginal**
  - **+50.1 to +1000 mOhms ---------- 0 Points ---------- Unstable**
  - **>+1000 mOhms ---------- 0 Points ---------- Open Failure**
- **After humidity**
  - **<= +0.33 mOhms ---------- 40 Points ---------- Stable**
  - **+0.34 to +0.66 mOhms ---------- 0 Points ---------- Minor**
  - **+0.67 to +1.00 mOhms ---------- 0 Points ---------- Acceptable**
  - **+1.01 to +50.0 mOhms ---------- 0 Points ---------- Marginal**
  - **+50.1 to +1000 mOhms ---------- 0 Points ---------- Unstable**
  - **>+1000 mOhms ---------- 0 Points ---------- Open Failure**

RESULTS Continued

LLCR Thermal Aging (160 signal, 256 HS signal, 64 ground LLCR test points)

Signal pin:

- **Initial ---------- 23.04 mOhms Max**
- **Thermal Aging**
  - **<= +5.0 mOhms ---------- 148 Points ---------- Stable**
  - **+5.1 to +10.0 mOhms ---------- 11 Points ---------- Minor**
  - **+10.1 to +15.0 mOhms ----------1 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**

HS Signal pin:

- **Initial ----------322.33 mOhms Max**
- **Thermal Aging**
  - **<= +5.0 mOhms ---------- 255 Points ---------- Stable**
  - **+5.1 to +10.0 mOhms ----------1 Points ---------- Minor**
  - **+10.1 to +15.0 mOhms ----------0 Points ---------- Acceptable**
  - **+15.1 to +50.0 mOhms ----------0 Points ---------- Marginal**
  - **+50.1 to +2000 mOhms----------0 Points ---------- Unstable**
  - **>+2000 mOhms----------0 Points ---------- Open Failure**

Ground Pin:

- **Initial ----------177.63 mOhms Max**
- **Thermal Aging**
  - **<= +5.0 mOhms ----------54 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**

LLCR Thermal Aging (40 Compliant pin LLCR test points)

- **Initial ----------0.40 mOhms Max**
- **Thermal Aging**
  - **<= +0.33 mOhms----------40 Points ---------- Stable**
  - **+0.34 to +0.66 mOhms ----------0 Points ---------- Minor**
  - **+0.67 to +1.00 mOhms ----------0 Points ---------- Acceptable**
  - **+1.01 to +50.0 mOhms ----------0 Points ---------- Marginal**
  - **+50.1 to +1000 mOhms----------0 Points ---------- Unstable**
  - **>+1000 mOhms----------0 Points ---------- Open Failure**

RESULTS Continued

LLCR Gas Tight (160 signal, 256 HS signal, 64 ground LLCR test points)

Signal pin:

- **Initial ---------- 31.06 mOhms Max**
- **Gas-Tight**
  - **<= +5.0 mOhms ---------- 159 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**

HS Signal pin:

- **Initial ----------318.26 mOhms Max**
- **Gas-Tight**
  - **<= +5.0 mOhms ---------- 254 Points ---------- Stable**
  - **+5.1 to +10.0 mOhms ----------1 Points ---------- Minor**
  - **+10.1 to +15.0 mOhms ----------1 Points ---------- Acceptable**
  - **+15.1 to +50.0 mOhms ----------0 Points ---------- Marginal**
  - **+50.1 to +2000 mOhms----------0 Points ---------- Unstable**
  - **>+2000 mOhms----------0 Points ---------- Open Failure**

Ground Pin:

- **Initial ----------100.00 mOhms Max**
- **Gas-Tight**
  - **<= +5.0 mOhms ----------63 Points ---------- Stable**
  - **+5.1 to +10.0 mOhms ----------1 Points ---------- Minor**
  - **+10.1 to +15.0 mOhms ----------0 Points ---------- Acceptable**
  - **+15.1 to +50.0 mOhms ----------0 Points ---------- Marginal**
  - **+50.1 to +2000 mOhms----------0 Points ---------- Unstable**
  - **>+2000 mOhms----------0 Points ---------- Open Failure**

LLCR Gas Tight (40 Compliant pin LLCR test points)

- **Initial ----------0.48 mOhms Max**
- **Gas-Tight**
  - **<= +0.33 mOhms----------40 Points ---------- Stable**
  - **+0.34 to +0.66 mOhms ----------0 Points ---------- Minor**
  - **+0.67 to +1.00 mOhms ----------0 Points ---------- Acceptable**
  - **+1.01 to +50.0 mOhms ----------0 Points ---------- Marginal**
  - **+50.1 to +1000 mOhms----------0 Points ---------- Unstable**
  - **>+1000 mOhms----------0 Points ---------- Open Failure**

RESULTS Continued

LLCR Shock Vib (160 signal, 256 HS signal, 64 ground LLCR test points)

Signal pin:

- **Initial ---------- 24.83 mOhms Max**
- **S&V**
  - **<= +5.0 mOhms ---------- 159 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**

HS Signal pin:

- **Initial ----------343.91 mOhms Max**
- **S&V**
  - **<= +5.0 mOhms ---------- 256 Points ---------- Stable**
  - **+5.1 to +10.0 mOhms ----------0 Points ---------- Minor**
  - **+10.1 to +15.0 mOhms ----------0 Points ---------- Acceptable**
  - **+15.1 to +50.0 mOhms ----------0 Points ---------- Marginal**
  - **+50.1 to +2000 mOhms----------0 Points ---------- Unstable**
  - **>+2000 mOhms----------0 Points ---------- Open Failure**

Ground Pin:

- **Initial ----------102.61 mOhms Max**
- **S&V**
  - **<= +5.0 mOhms ----------33 Points ---------- Stable**
  - **+5.1 to +10.0 mOhms ---------- 25 Points ---------- Minor**
  - **+10.1 to +15.0 mOhms ----------4 Points ---------- Acceptable**
  - **+15.1 to +50.0 mOhms ----------0 Points ---------- Marginal**
  - **+50.1 to +2000 mOhms----------2 Points ---------- Unstable**
  - **>+2000 mOhms----------0 Points ---------- Open Failure**

LLCR Shock Vib (40 Compliant pin LLCR test points)

- **Initial ----------0.56 mOhms Max**
- **S&V**
  - **<= +0.33 mOhms----------40 Points ---------- Stable**
  - **+0.34 to +0.66 mOhms ----------0 Points ---------- Minor**
  - **+0.67 to +1.00 mOhms ----------0 Points ---------- Acceptable**
  - **+1.01 to +50.0 mOhms ----------0 Points ---------- Marginal**
  - **+50.1 to +1000 mOhms----------0 Points ---------- Unstable**
  - **>+1000 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

LLCR Insertion and Retention Force (40 signal and 32 ground compliant pin LLCR test points)

Signal Pin- HASL 0.0125" (1 measurement voided due to missing pin)

- **Initial ---------- 0.13 mOhms Max**
- **After 3 cycles**
  - **<= +0.33 mOhms ---------- 39 Points ---------- Stable**
  - **+0.34 to +0.66 mOhms ---------- 0 Points ---------- Minor**
  - **+0.67 to +1.00 mOhms ---------- 0 Points ---------- Acceptable**
  - **+1.01 to +50.0 mOhms ---------- 0 Points ---------- Marginal**
  - **+50.1 to +1000 mOhms ---------- 0 Points ---------- Unstable**
  - **>+1000 mOhms ---------- 0 Points ---------- Open Failure**

Ground Pin- HASL 0.0125" (2 measurements voided due to missing pin)

- **Initial ---------- 0.30 mOhms Max**
- **After 3 cycle**
  - **<= +0.33 mOhms ---------- 30 Points ---------- Stable**
  - **+0.34 to +0.66 mOhms ---------- 0 Points ---------- Minor**
  - **+0.67 to +1.00 mOhms ---------- 0 Points ---------- Acceptable**
  - **+1.01 to +50.0 mOhms ---------- 0 Points ---------- Marginal**
  - **+50.1 to +1000 mOhms ---------- 0 Points ---------- Unstable**
  - **>+1000 mOhms ---------- 0 Points ---------- Open Failure**

Signal Pin- HASL 0.0165"

- **Initial ---------- 0.22 mOhms Max**
- **After 3 cycles**
  - **<= +0.33 mOhms ---------- 40 Points ---------- Stable**
  - **+0.34 to +0.66 mOhms ---------- 0 Points ---------- Minor**
  - **+0.67 to +1.00 mOhms ---------- 0 Points ---------- Acceptable**
  - **+1.01 to +50.0 mOhms ---------- 0 Points ---------- Marginal**
  - **+50.1 to +1000 mOhms ---------- 0 Points ---------- Unstable**
  - **>+1000 mOhms ---------- 0 Points ---------- Open Failure**

Ground Pin- HASL 0.0165"

- **Initial ---------- 0.18 mOhms Max**
- **After 3 cycle**
  - **<= +0.33 mOhms ---------- 32 Points ---------- Stable**
  - **+0.34 to +0.66 mOhms ---------- 0 Points ---------- Minor**
  - **+0.67 to +1.00 mOhms ---------- 0 Points ---------- Acceptable**
  - **+1.01 to +50.0 mOhms ---------- 0 Points ---------- Marginal**
  - **+50.1 to +1000 mOhms ---------- 0 Points ---------- Unstable**
  - **>+1000 mOhms ---------- 0 Points ---------- Open Failure**

Signal Pin- ENIG 0.0165" (1 measurement voided due to bent pin)

- **Initial ---------- 0.29 mOhms Max**
- **After 3 cycles**
  - **<= +0.33 mOhms ---------- 39 Points ---------- Stable**
  - **+0.34 to +0.66 mOhms ---------- 0 Points ---------- Minor**
  - **+0.67 to +1.00 mOhms ---------- 0 Points ---------- Acceptable**
  - **+1.01 to +50.0 mOhms ---------- 0 Points ---------- Marginal**
  - **+50.1 to +1000 mOhms ---------- 0 Points ---------- Unstable**
  - **>+1000 mOhms ---------- 0 Points ---------- Open Failure**

RESULTS Continued

Ground Pin- ENIG 0.0165" (4 measurements voided due to bent pin)

- **Initial ----------0.41 mOhms Max**
- **After 3 cycle**
  - **<= +0.33 mOhms ----------28 Points ---------- Stable**
  - **+0.34 to +0.66 mOhms ----------0 Points ---------- Minor**
  - **+0.67 to +1.00 mOhms ----------0 Points ---------- Acceptable**
  - **+10.01 to +50.0 mOhms ----------0 Points ---------- Marginal**
  - **+50.1 to +1000 mOhms ----------0 Points ---------- Unstable**
  - **>+1000 mOhms ----------0 Points ---------- Open Failure**

RESULTS Continued

Insulation Resistance minimums, IR

LS Pin to LS 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----------645 Meg Ω ---------- Passed**
  - **Unmated ----------549 Meg Ω ---------- Passed**

LS Row to LS 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----------318 Meg Ω ---------- Passed**
  - **Unmated ----------415 Meg Ω ---------- Passed**

HS Pin to HS Pin

- **Initial**
  - **Mated----------15100 Meg Ω ---------- Passed**
  - **Unmated ----------38000 Meg Ω ---------- Passed**
- **Thermal Shock**
  - **Mated---------- 3800 Meg Ω ---------- Passed**
  - **Unmated ----------15100 Meg Ω ---------- Passed**
- **Humidity**
  - **Mated---------- 4600 Meg Ω ---------- Passed**
  - **Unmated ----------12300 Meg Ω ---------- Passed**

HS Row to HS Row

- **Initial**
  - **Mated----------45000 Meg Ω ---------- Passed**
  - **Unmated ----------45000 Meg Ω ---------- Passed**
- **Thermal Shock**
  - **Mated----------43000 Meg Ω ---------- Passed**
  - **Unmated ----------45000 Meg Ω ---------- Passed**
- **Humidity**
  - **Mated----------14500 Meg Ω ---------- Passed**
  - **Unmated ----------45000 Meg Ω ---------- Passed**

HS Pin to Ground

- **Initial**
  - **Mated----------31000 Meg Ω ---------- Passed**
  - **Unmated ----------45000 Meg Ω ---------- Passed**
- **Thermal Shock**
  - **Mated---------- 3000 Meg Ω ---------- Passed**
  - **Unmated ----------45000 Meg Ω ---------- Passed**
- **Humidity**
  - **Mated---------- 1503 Meg Ω ---------- Passed**
  - **Unmated ----------31000 Meg Ω ---------- Passed**

RESULTS Continued

Dielectric Withstanding Voltage minimums, DWV

- **Minimums**
  - **Breakdown Voltage ----------655 VAC**
  - **Test Voltage ----------491 VAC**
  - **Working Voltage ----------160 VAC**

LS Pin to LS Pin

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

LS Row to LS Row

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

HS Pin to HS Pin

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

HS Row to HS Row

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

HS Pin to Ground

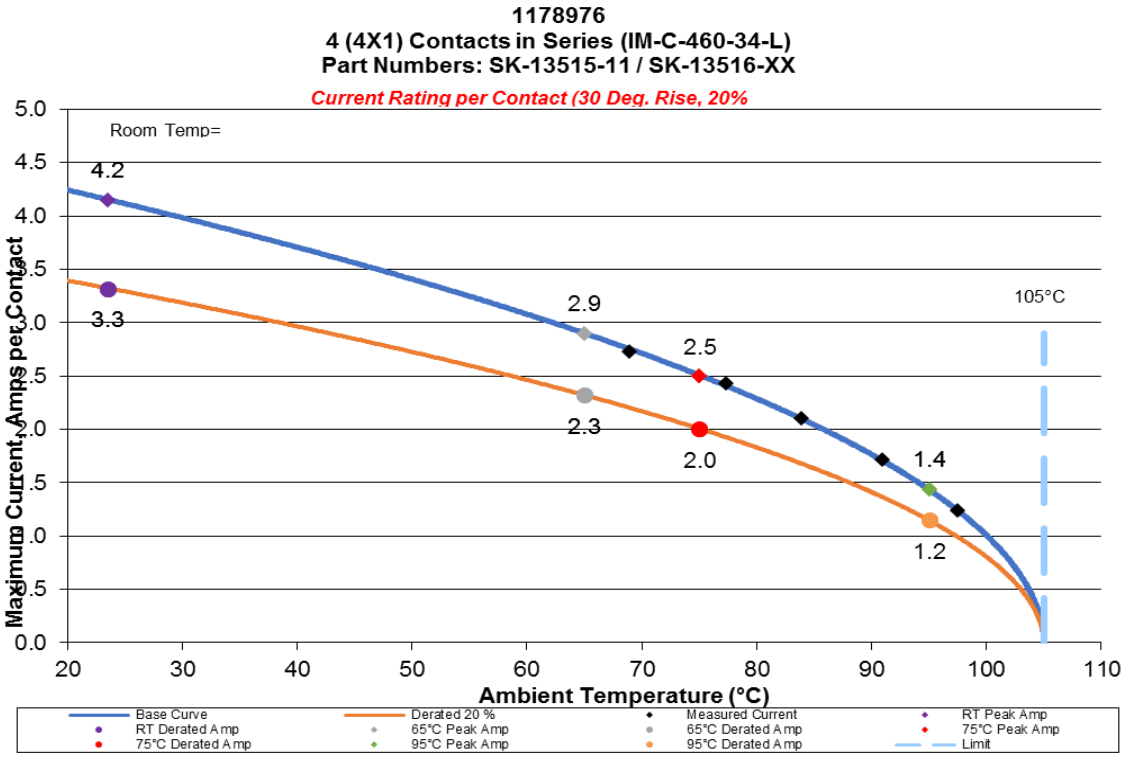
- **Initial DWV ----------Passed**
- **Thermal DWV----------Passed**
- **Humidity DWV----------Passed**

DATA SUMMARIES

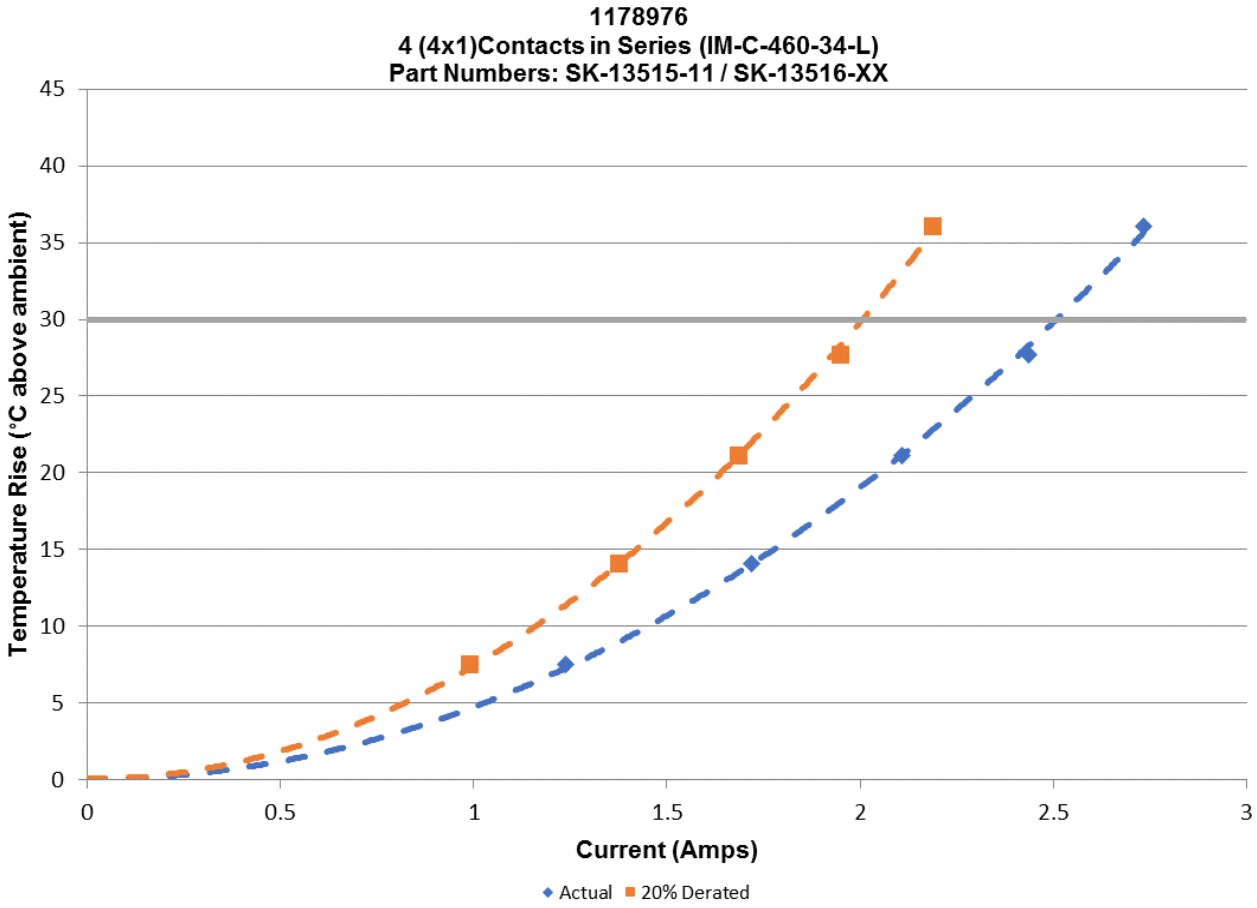
TEMPERATURE RISE (Current Carrying Capacity, CCC):

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 4 adjacent power conductors/contacts powered

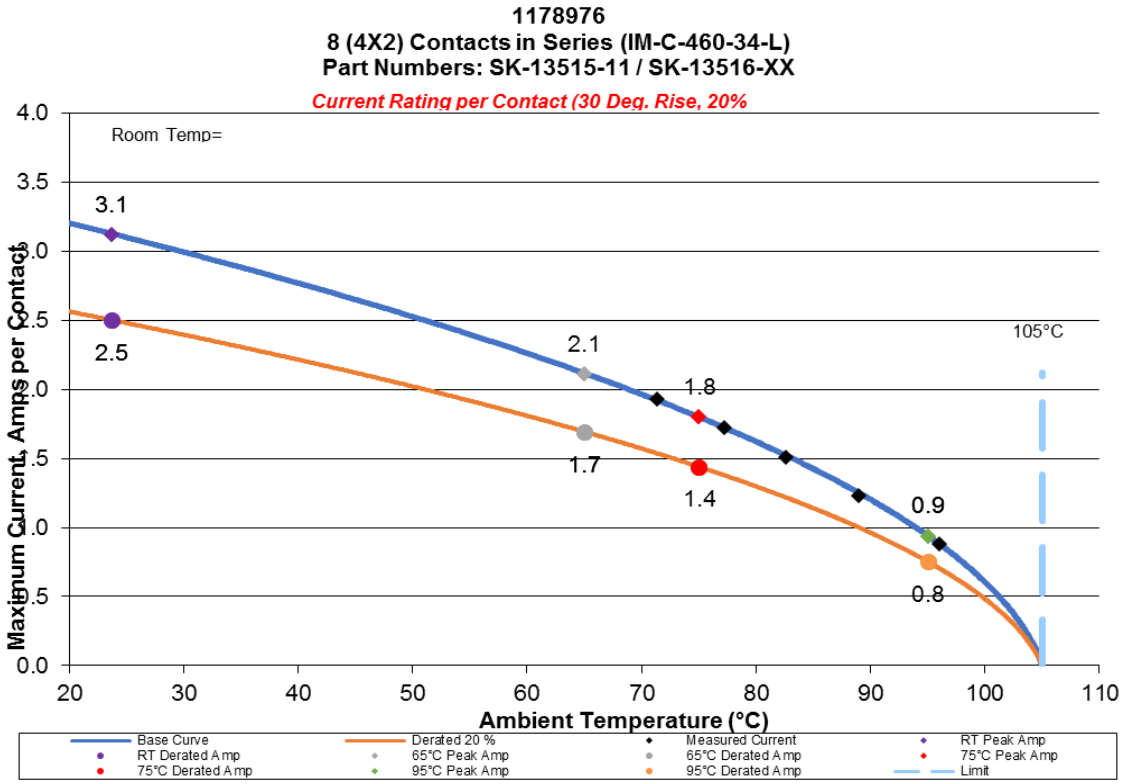


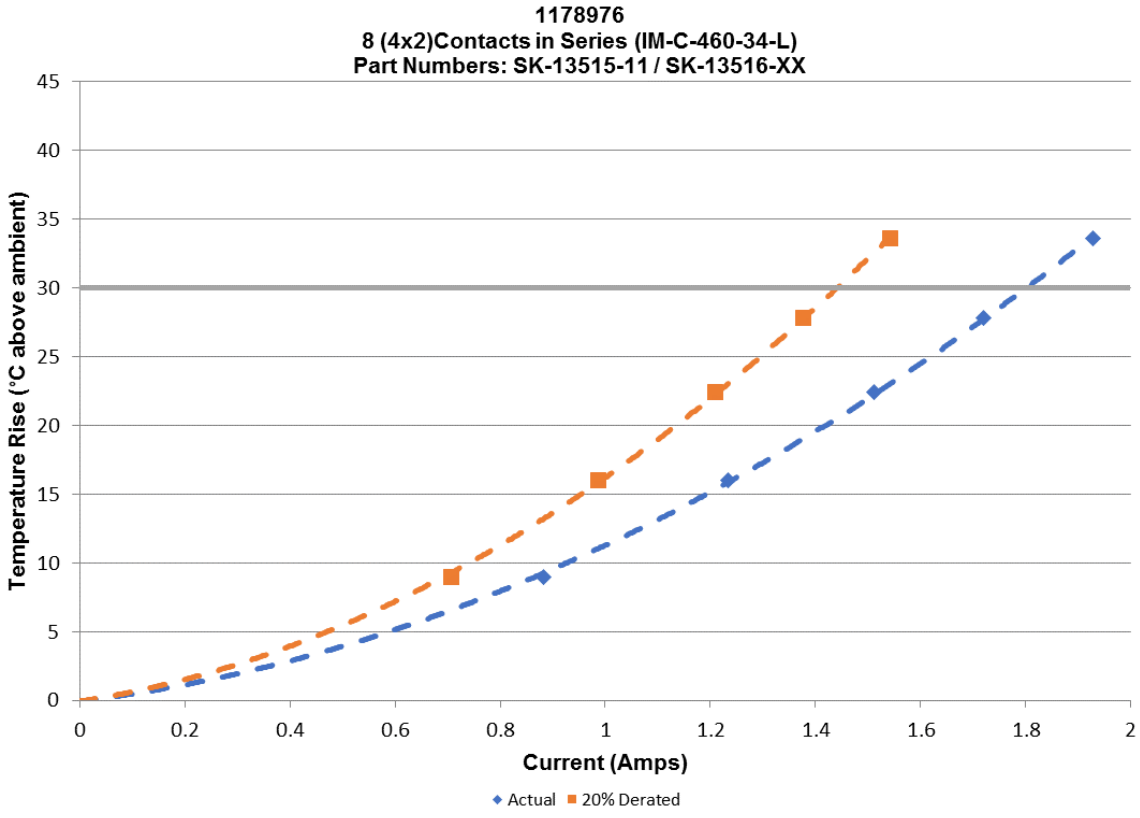
DATA SUMMARIES



DATA SUMMARIES

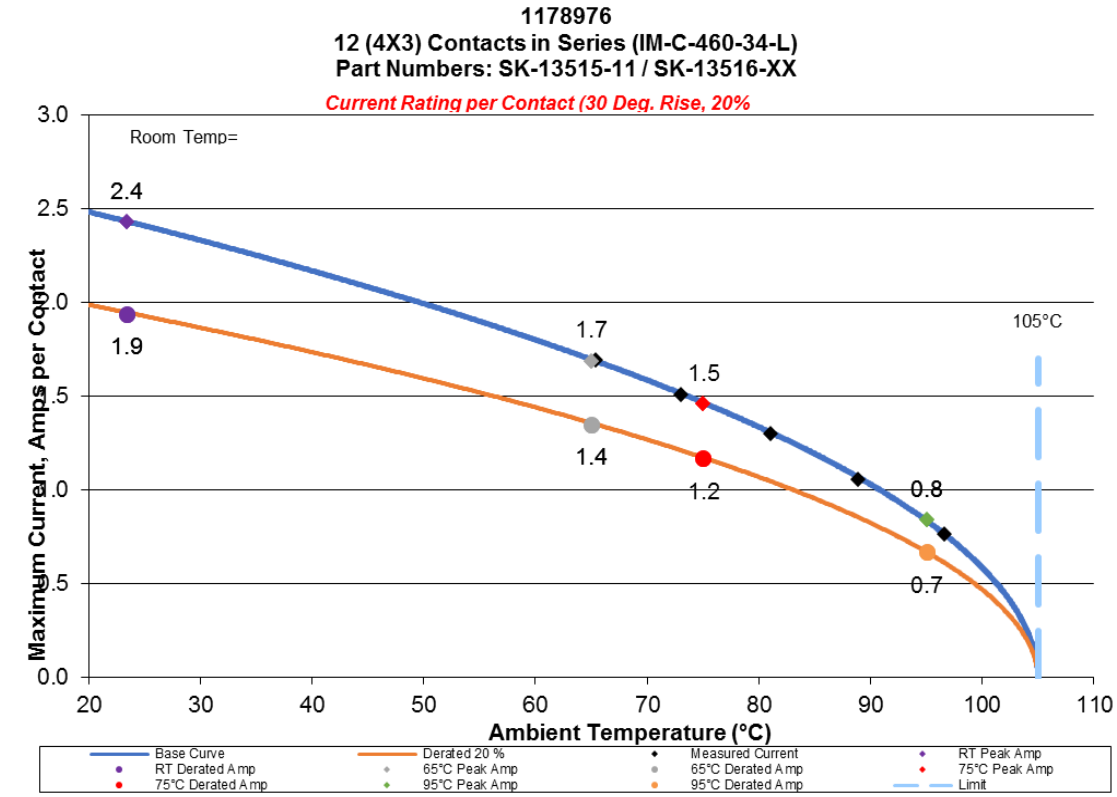
b. Linear configuration with 8 adjacent power conductors/contacts powered

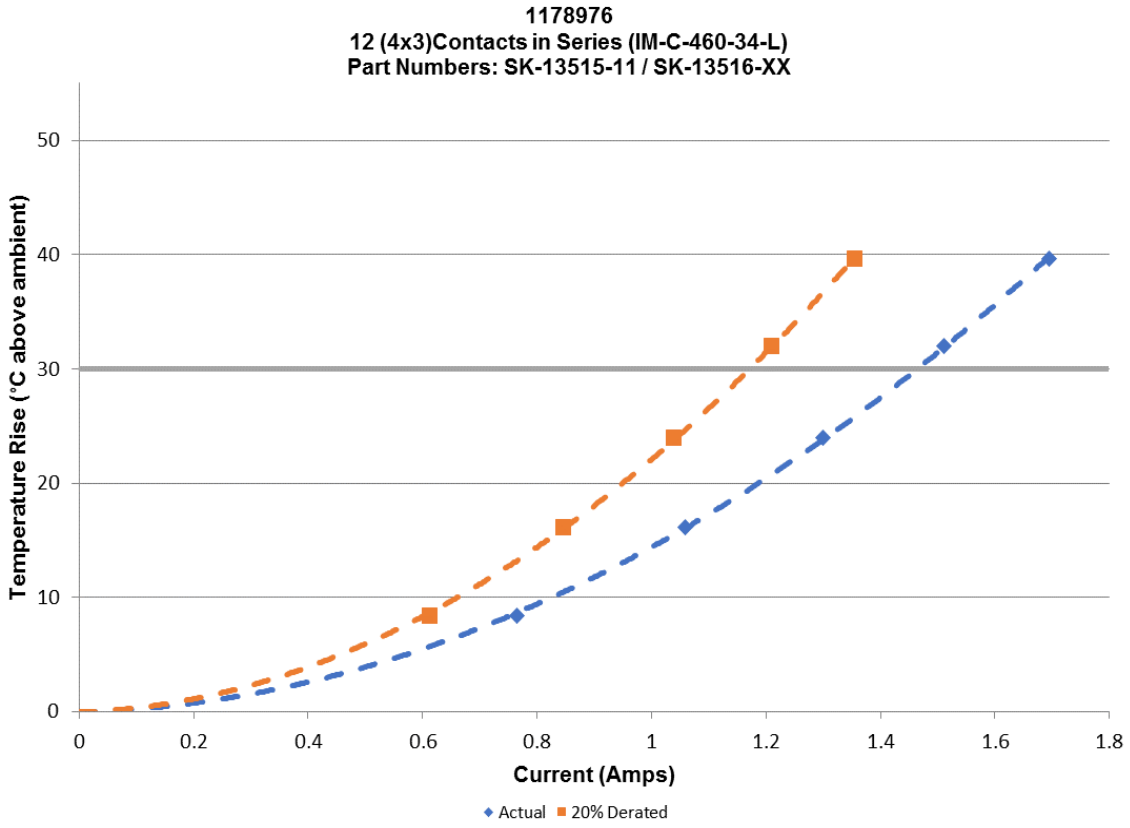




DATA SUMMARIES

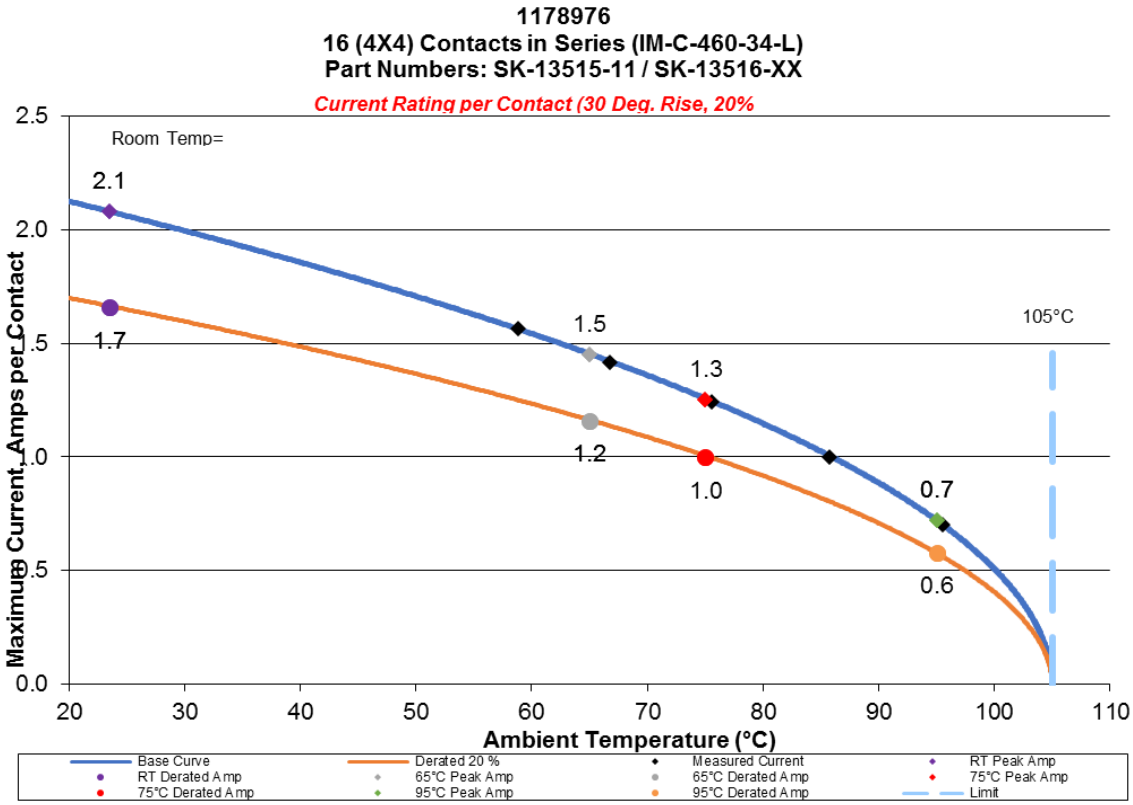
c. Linear configuration with 12 adjacent power conductors/contacts powered

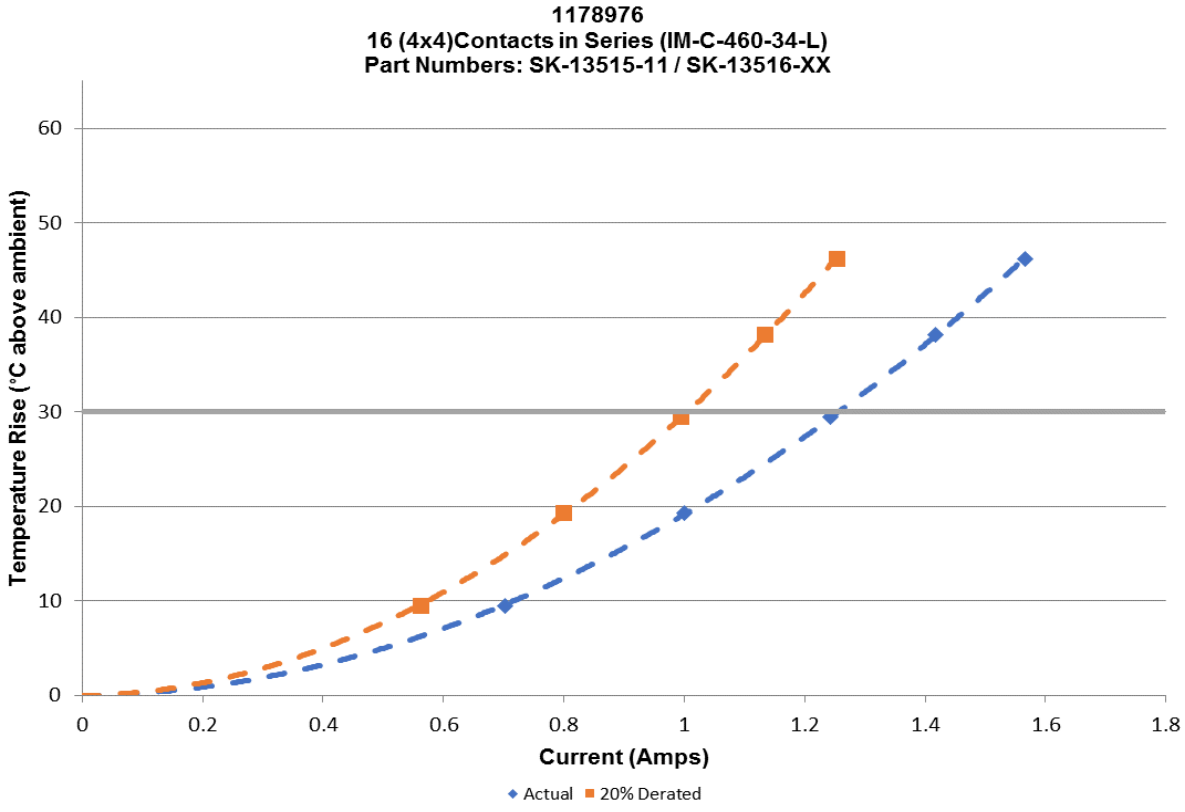




DATA SUMMARIES

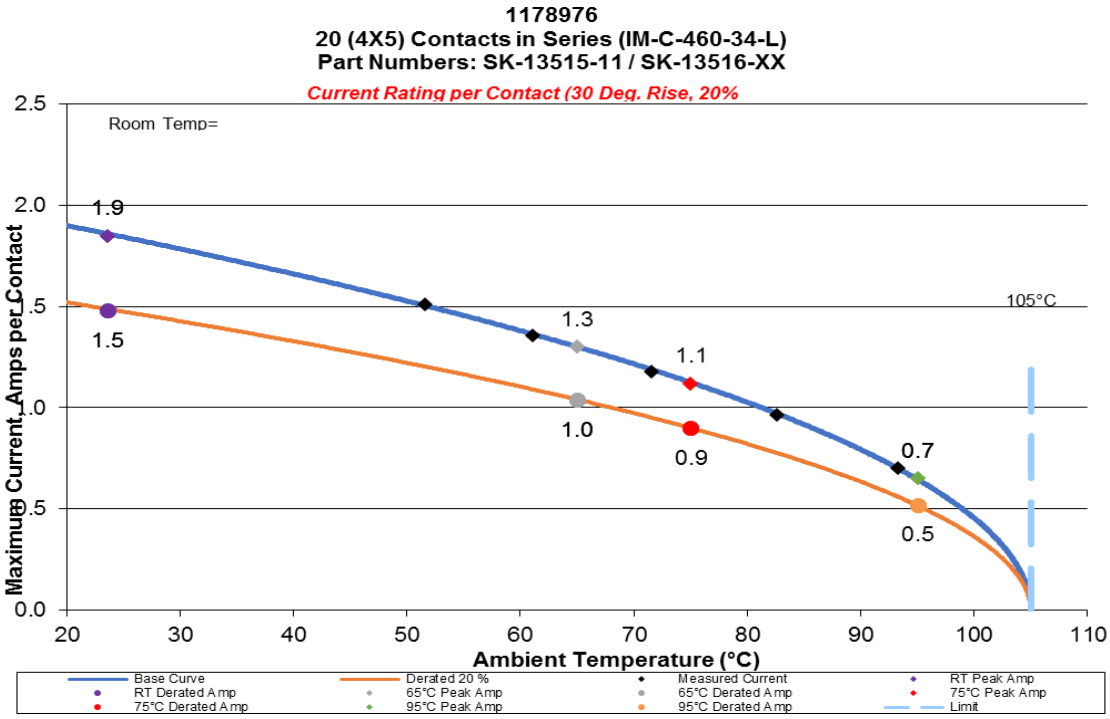
d. Linear configuration with 16 adjacent power conductors/contacts powered

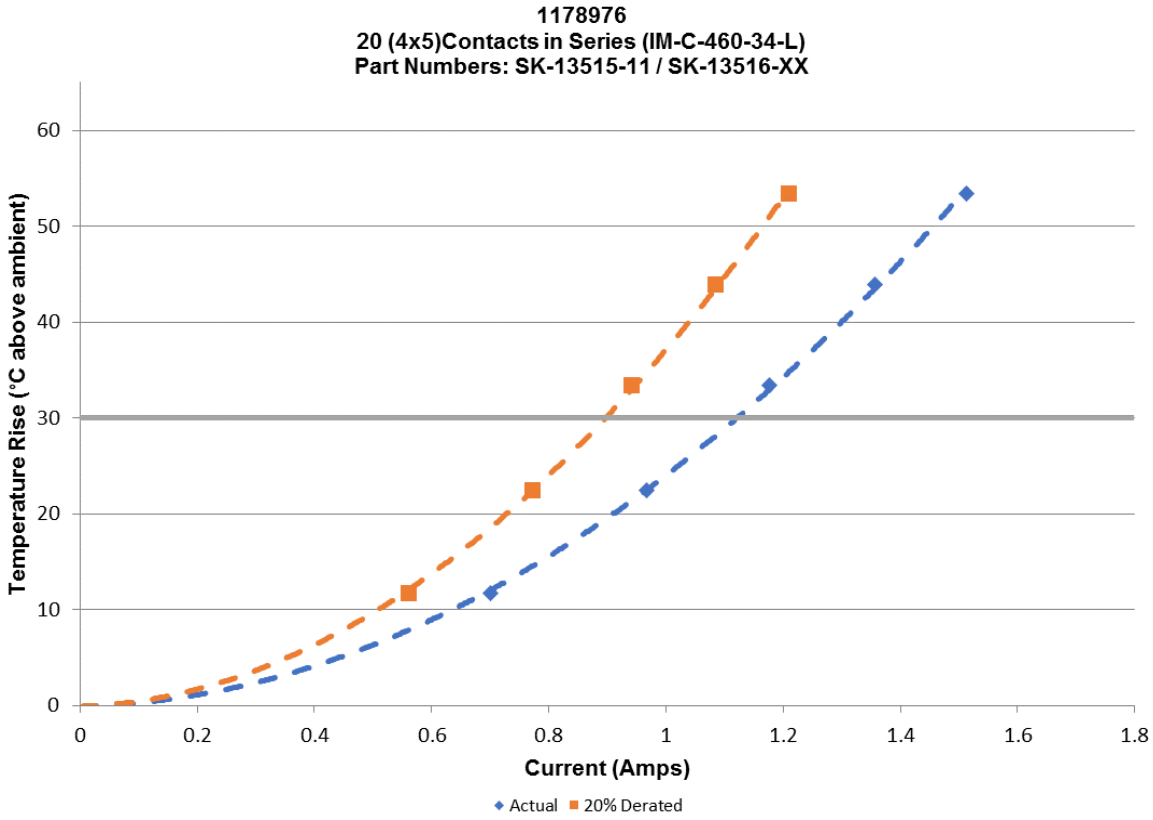




DATA SUMMARIES

e. Linear configuration with 20 adjacent power conductors/contacts powered





DATA SUMMARIES

MATING/UNMATING:

Thermal Aging Group

	Initial				After Thermals			
	Mating		**Unmating**		**Mating**		**Unmating**	
	Newtons	Force (Lbs)	Newtons	Force (Lbs)	Newtons	Force (Lbs)	Newtons	Force (Lbs)
Minimum	28.69	6.45	23.93	5.38	22.97	5.16	19.30	4.34
Maximum	40.61	9.13	34.43	7.74	31.50	7.08	27.31	6.14
Average	34.83	**7.83**	30.03	**6.75**	26.84	**6.03**	23.43	**5.27**
St Dev	3.40	0.76	3.08	0.69	3.34	0.75	2.57	0.58
Count	8	8	8	8	8	8	8	8

Mating/Unmating Durability Group

	Initial				25 Cycles			
	Mating		**Unmating**		**Mating**		**Unmating**	
	Newtons	Force (Lbs)	Newtons	Force (Lbs)	Newtons	Force (Lbs)	Newtons	Force (Lbs)
Minimum	31.00	6.97	21.93	4.93	34.16	7.68	24.64	5.54
Maximum	39.28	8.83	31.40	7.06	41.32	9.29	33.98	7.64
Average	35.44	**7.97**	26.58	**5.98**	38.73	**8.71**	28.92	**6.50**
St Dev	2.86	0.64	3.40	0.76	2.40	0.54	2.65	0.60
Count	9	9	9	9	9	9	9	9
	50 Cycles				75 Cycles			
	Mating		**Unmating**		**Mating**		**Unmating**	
	Newtons	Force (Lbs)	Newtons	Force (Lbs)	Newtons	Force (Lbs)	Newtons	Force (Lbs)
Minimum	35.58	8.00	27.76	6.24	36.52	8.21	25.77	5.79
Maximum	41.41	9.31	33.80	7.60	44.35	9.97	36.21	8.14
Average	39.09	**8.79**	30.18	**6.79**	40.85	**9.18**	31.84	**7.16**
St Dev	1.85	0.42	1.93	0.43	3.04	0.68	3.44	0.77
Count	9	9	9	9	9	9	9	9
	100 Cycles				After Humidity			
	Mating		**Unmating**		**Mating**		**Unmating**	
	Newtons	Force (Lbs)	Newtons	Force (Lbs)	Newtons	Force (Lbs)	Newtons	Force (Lbs)
Minimum	36.03	8.10	26.07	5.86	23.73	5.34	17.65	3.97
Maximum	45.37	10.20	37.19	8.36	27.44	6.17	22.18	4.99
Average	41.71	**9.38**	32.55	**7.32**	25.86	**5.81**	20.15	**4.53**
St Dev	2.84	0.64	3.63	0.81	1.15	0.26	1.44	0.32
Count	9	9	9	9	9	9	9	9

DATA SUMMARIES Continued

NORMAL FORCE (FOR CONTACTS TESTED IN THE HOUSING):

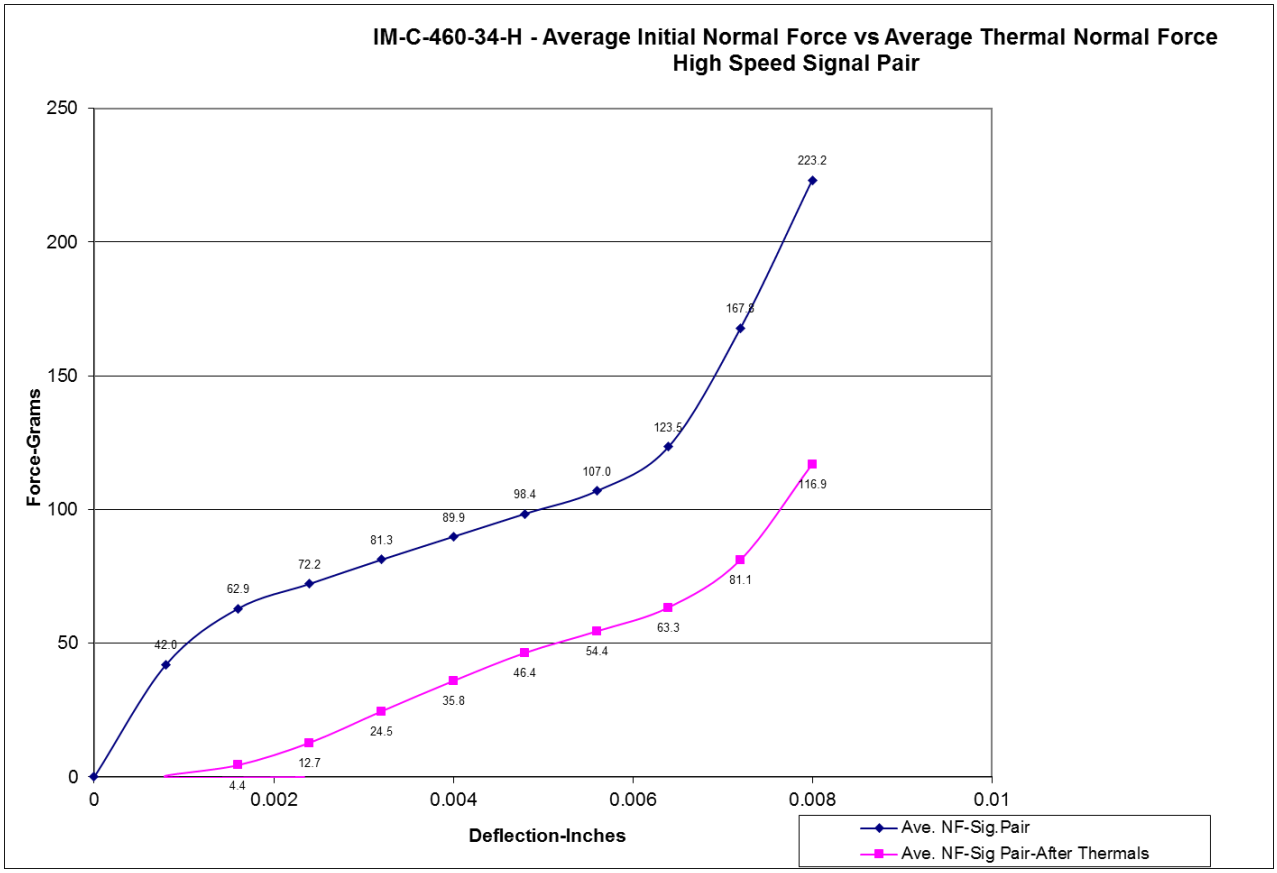
1) Calibrated force gauges are used along with computer controlled positioning equipment.
2) For Normal force 8-10 measurements are taken and the averages reported.

IM-C-460-34-H

Signal pin pair

Initial	Deflections in Inches Forces in Grams										
	0.0008	**0.0016**	**0.0024**	**0.0032**	**0.0040**	**0.0048**	**0.0056**	**0.0064**	**0.0072**	**0.0080**	***SET***
Averages	**42.03**	**62.93**	**72.23**	**81.26**	**89.85**	**98.43**	**106.95**	**123.53**	**167.80**	**223.22**	**0.0000**
Min	22.90	52.70	63.00	72.20	80.40	89.40	97.80	110.40	139.90	188.10	0.0000
Max	57.90	70.20	79.20	88.10	96.10	104.30	113.60	135.70	196.00	268.30	0.0001
St. Dev	11.589	5.794	5.425	5.277	5.014	4.939	5.000	7.540	16.468	25.700	0.0000
Count	12	12	12	12	12	12	12	12	12	12	12

After Thermals	Deflections in Inches Forces in Grams										
	0.0008	**0.0016**	**0.0024**	**0.0032**	**0.0040**	**0.0048**	**0.0056**	**0.0064**	**0.0072**	**0.0080**	***SET***
Averages	**0.00**	**4.37**	**12.74**	**24.48**	**35.84**	**46.35**	**54.42**	**63.32**	**81.09**	**116.86**	**0.0022**
Min	0.00	0.00	-0.40	0.00	14.40	31.40	39.30	47.70	55.40	64.50	0.0010
Max	0.00	18.80	39.90	46.40	54.30	63.50	70.90	80.00	122.10	171.10	0.0035
St. Dev	0.000	7.271	14.920	15.322	13.902	10.773	10.914	11.305	21.885	37.295	0.0008
Count	12	12	12	12	12	12	12	12	12	12	12

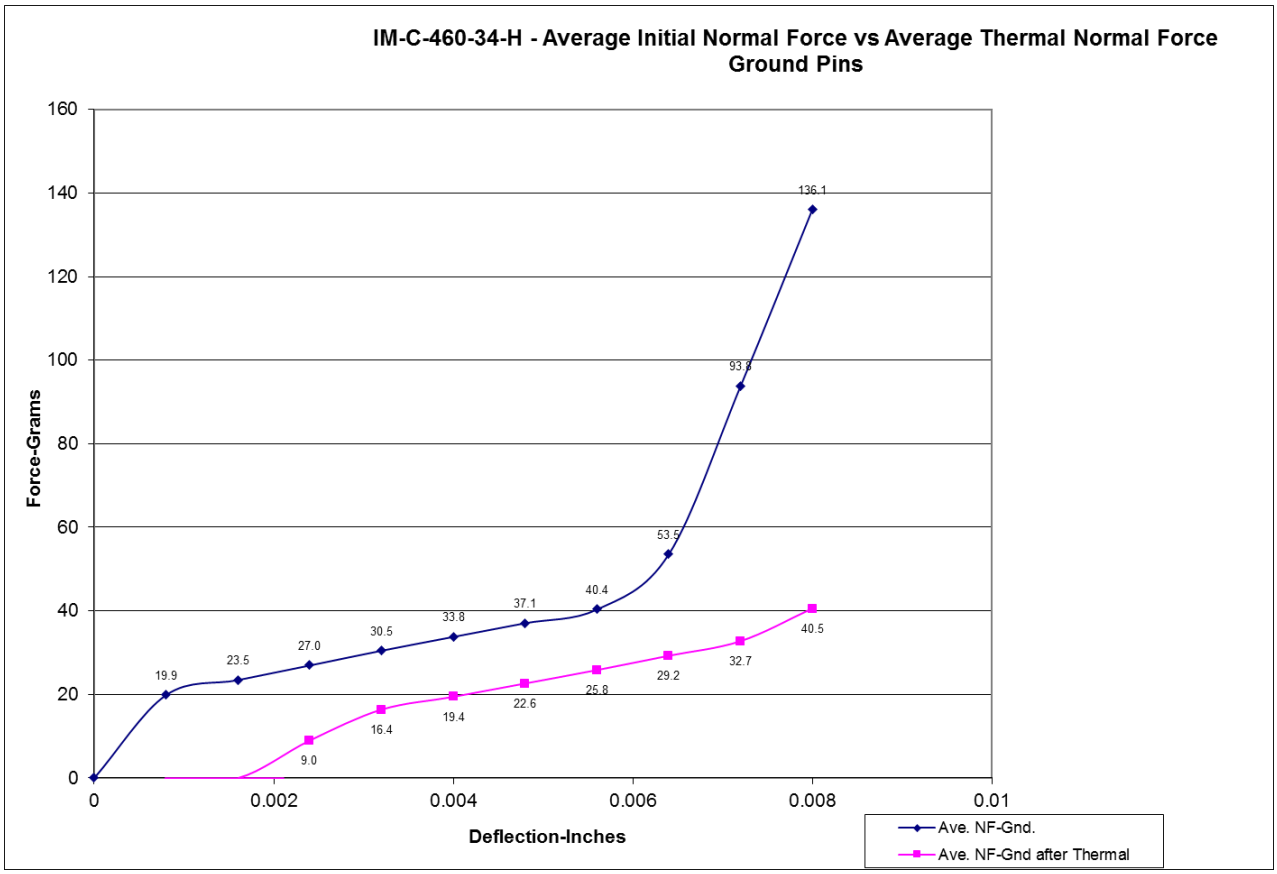


DATA SUMMARIES Continued

Ground pin

Initial	Deflections in Inches Forces in Grams										
	0.0008	**0.0016**	**0.0024**	**0.0032**	**0.0040**	**0.0048**	**0.0056**	**0.0064**	**0.0072**	**0.0080**	***SET***
Averages	**19.88**	**23.47**	**26.97**	**30.51**	**33.81**	**37.09**	**40.36**	**53.53**	**93.79**	**136.08**	**0.0001**
Min	10.00	13.60	17.30	20.70	24.50	28.10	32.00	48.80	80.20	118.40	0.0000
Max	26.20	30.00	33.60	37.00	40.70	44.00	47.60	69.30	110.10	155.60	0.0006
St. Dev	5.340	5.291	5.309	5.227	5.253	5.276	5.266	5.997	7.715	10.600	0.0002
Count	12	12	12	12	12	12	12	12	12	12	12

After Thermals	Deflections in Inches Forces in Grams										
	0.0008	**0.0016**	**0.0024**	**0.0032**	**0.0040**	**0.0048**	**0.0056**	**0.0064**	**0.0072**	**0.0080**	***SET***
Averages	**0.00**	**0.00**	**8.97**	**16.37**	**19.42**	**22.61**	**25.82**	**29.24**	**32.72**	**40.51**	**0.0021**
Min	0.00	0.00	0.00	8.90	11.60	14.90	18.30	22.20	25.30	28.90	0.0015
Max	0.00	0.00	19.30	22.60	25.90	29.50	32.60	36.20	39.50	52.30	0.0028
St. Dev	0.000	0.000	7.723	5.024	5.015	5.007	4.924	4.891	4.814	9.032	0.0004
Count	10	10	10	10	10	10	10	10	10	10	10



DATA SUMMARIES Continued

NORMAL FORCE (FOR CONTACTS TESTED IN THE HOUSING):

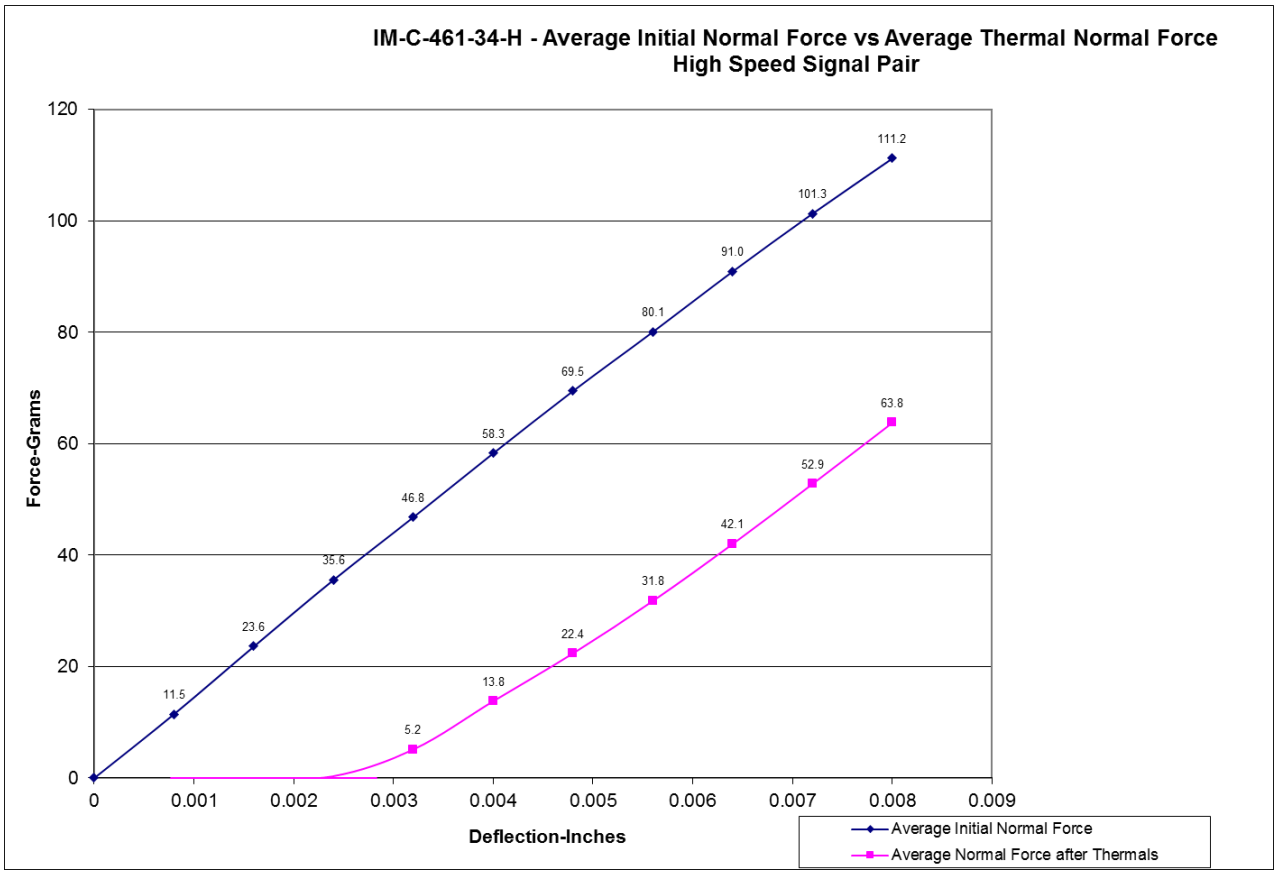
1) Calibrated force gauges are used along with computer controlled positioning equipment.
2) For Normal force 8-10 measurements are taken and the averages reported.

IM-C-461-34-H

Signal pin pair

Initial	Deflections in Inches Forces in Grams										
	0.0008	**0.0016**	**0.0024**	**0.0032**	**0.0040**	**0.0048**	**0.0056**	**0.0064**	**0.0072**	**0.0080**	***SET***
Averages	**11.48**	**23.63**	**35.59**	**46.84**	**58.31**	**69.50**	**80.10**	**90.95**	**101.33**	**111.23**	**0.0002**
Min	9.30	20.90	31.80	41.80	53.10	64.60	75.20	85.70	94.70	104.30	0.0000
Max	16.20	26.90	39.00	50.40	62.20	74.30	85.50	96.80	107.60	117.70	0.0003
St. Dev	1.985	1.950	2.187	2.631	2.954	3.121	3.203	3.342	3.559	3.397	0.0001
Count	12	12	12	12	12	12	12	12	12	12	12

After Thermals	Deflections in inches Forces in Grams										
	0.0008	**0.0016**	**0.0024**	**0.0032**	**0.0040**	**0.0048**	**0.0056**	**0.0064**	**0.0072**	**0.0080**	***SET***
Averages	**0.00**	**0.00**	**0.36**	**5.15**	**13.83**	**22.42**	**31.83**	**42.07**	**52.85**	**63.82**	**0.0028**
Min	0.00	0.00	0.00	0.00	6.70	15.30	23.60	33.50	43.50	54.60	0.0021
Max	0.00	0.00	2.30	11.40	19.90	29.90	40.70	52.50	64.30	76.00	0.0034
St. Dev	0.000	0.000	0.839	3.723	4.053	4.122	4.763	5.129	5.661	5.978	0.0004
Count	12	12	12	12	12	12	12	12	12	12	12

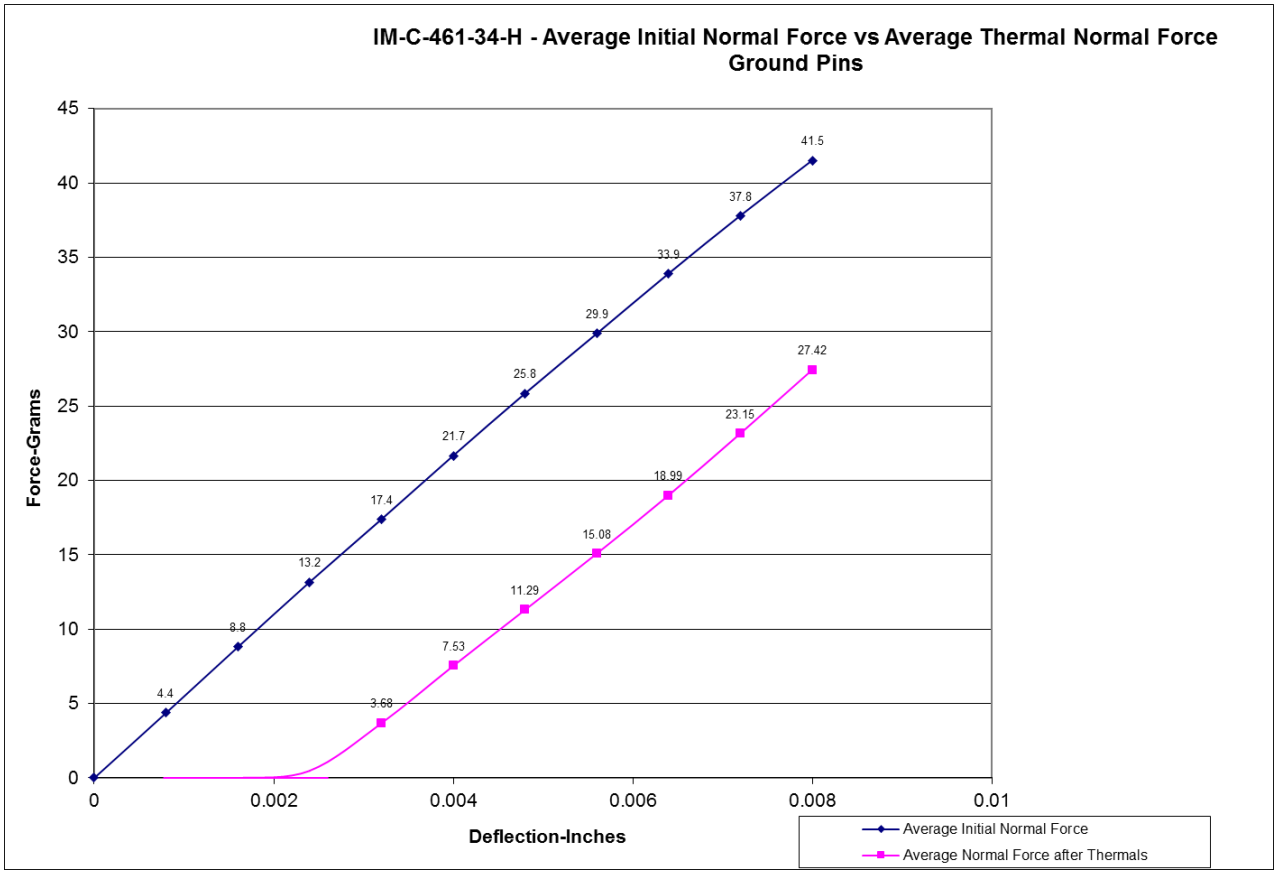


DATA SUMMARIES Continued

Ground pin:

Initial	Deflections in Inches Forces in Grams										
	0.0008	**0.0016**	**0.0024**	**0.0032**	**0.0040**	**0.0048**	**0.0056**	**0.0064**	**0.0072**	**0.0080**	***SET***
Averages	**4.38**	**8.80**	**13.17**	**17.38**	**21.66**	**25.84**	**29.87**	**33.90**	**37.79**	**41.50**	**0.0002**
Min	4.20	8.40	12.80	16.90	21.00	25.10	28.90	32.60	36.50	39.90	0.0000
Max	4.60	9.20	13.70	17.90	22.20	26.30	30.40	34.50	38.50	42.90	0.0003
St. Dev	0.154	0.249	0.299	0.356	0.421	0.417	0.565	0.575	0.601	0.854	0.0001
Count	12	12	12	12	12	12	12	12	12	12	12

After Thermals	Deflections in inches Forces in Grams										
	0.0008	**0.0016**	**0.0024**	**0.0032**	**0.0040**	**0.0048**	**0.0056**	**0.0064**	**0.0072**	**0.0080**	***SET***
Averages	**0.00**	**0.00**	**0.48**	**3.68**	**7.53**	**11.29**	**15.08**	**18.99**	**23.15**	**27.42**	**0.0018**
Min	0.00	0.00	0.00	1.50	5.40	8.90	12.70	16.70	20.70	24.70	-0.0054
Max	0.00	0.00	1.60	6.00	10.00	13.90	17.40	21.40	25.40	29.60	0.0028
St. Dev	0.000	0.000	0.653	1.520	1.478	1.559	1.628	1.631	1.688	1.836	0.0023
Count	12	12	12	12	12	12	12	12	12	12	12



DATA SUMMARIES Continued

NORMAL FORCE (FOR CONTACTS TESTED IN THE HOUSING):

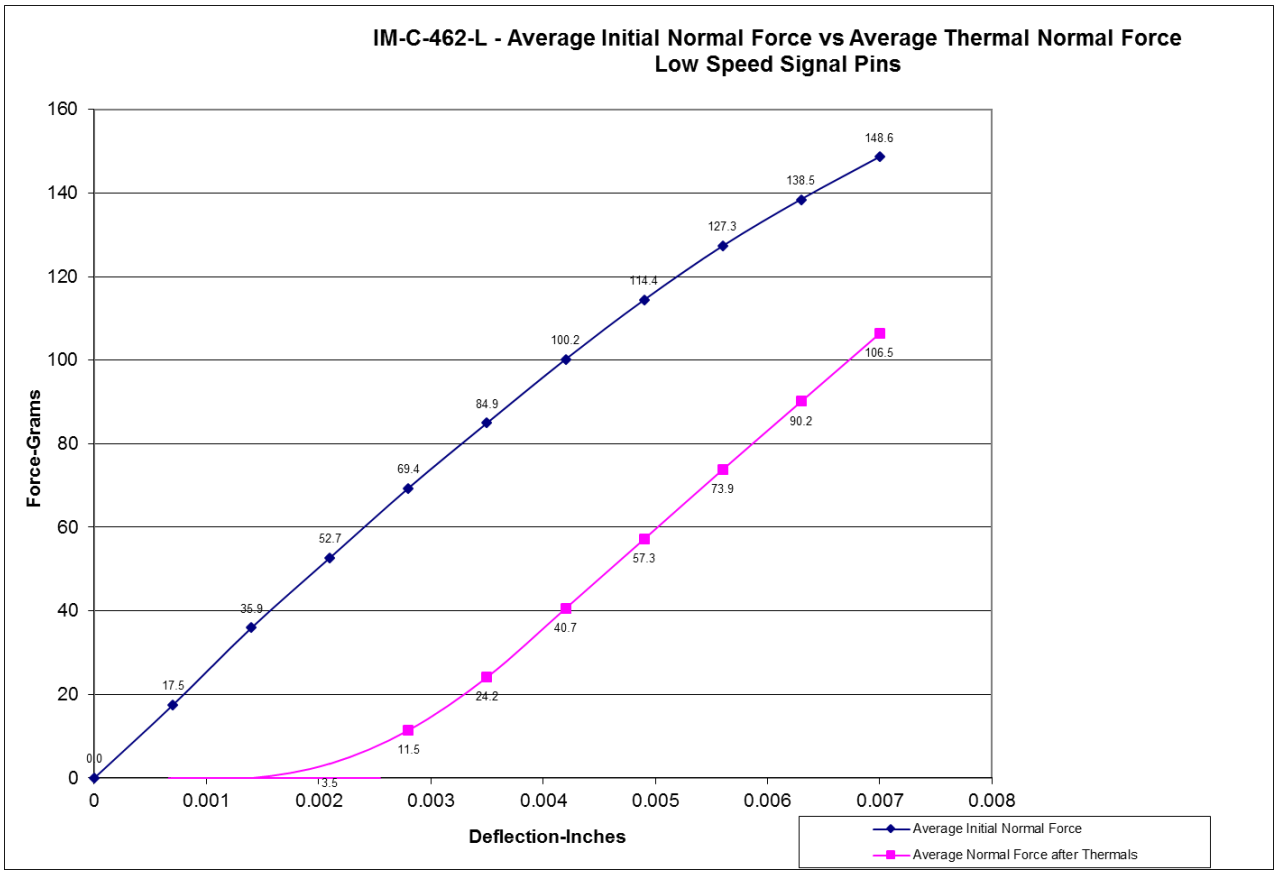
1) Calibrated force gauges are used along with computer controlled positioning equipment.
2) For Normal force 8-10 measurements are taken and the averages reported.

IM-C-462-L

Low speed signal

Initial	Deflections in Inches Forces in Grams										
	0.0007	0.0014	0.0021	0.0028	0.0035	0.0042	0.0049	0.0056	0.0063	0.0070	*SET*
Averages	**17.46**	**35.93**	**52.68**	**69.36**	**84.93**	**100.16**	**114.38**	**127.28**	**138.45**	**148.61**	**0.0068**
Min	15.10	30.30	44.90	59.00	73.10	86.30	99.40	111.00	122.20	131.40	0.0058
Max	21.20	44.30	65.30	85.40	104.50	121.70	137.90	151.80	162.50	172.10	0.0079
St. Dev	2.232	4.649	7.220	9.209	11.041	12.617	13.716	14.471	14.536	14.722	0.0008
Count	8	8	8	8	8	8	8	8	8	8	8

After Thermals	Deflections in inches Forces in Grams										
	0.0007	0.0014	0.0021	0.0028	0.0035	0.0042	0.0049	0.0056	0.0063	0.0070	*SET*
Averages	**0.00**	**0.00**	**3.49**	**11.50**	**24.19**	**40.66**	**57.26**	**73.90**	**90.23**	**106.50**	**0.0068**
Min	0.00	0.00	0.00	0.00	8.10	20.40	33.40	44.60	55.70	68.70	0.0061
Max	0.00	0.00	13.00	31.50	46.20	62.10	83.20	101.20	122.20	138.90	0.0078
St. Dev	0.000	0.000	4.686	12.852	15.105	15.272	17.070	19.605	22.798	23.911	0.0006
Count	8	8	8	8	8	8	8	8	8	8	8



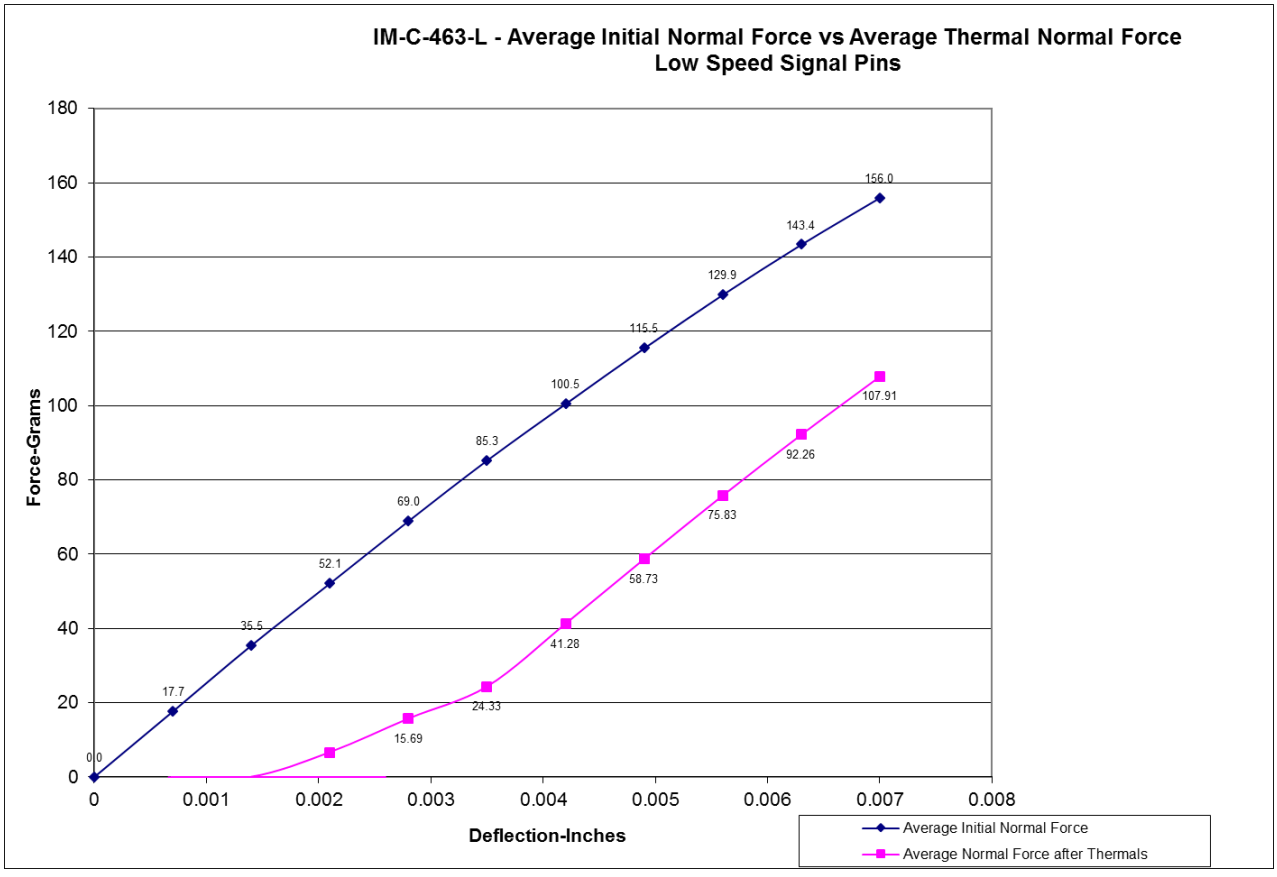
DATA SUMMARIES Continued

IM-C-463-L

Low speed signal

Initial	Deflections in Inches Forces in Grams										
	0.0007	**0.0014**	**0.0021**	**0.0028**	**0.0035**	**0.0042**	**0.0049**	**0.0056**	**0.0063**	**0.0070**	***SET***
Averages	**17.66**	**35.45**	**52.14**	**68.95**	**85.25**	**100.49**	**115.48**	**129.86**	**143.39**	**155.98**	**0.0053**
Min	15.50	32.60	47.50	64.30	78.60	92.20	105.30	118.70	130.80	142.30	0.0049
Max	18.80	37.10	54.80	72.10	89.40	105.40	121.10	137.20	151.40	163.60	0.0061
St. Dev	1.299	1.693	2.669	3.071	4.034	5.166	5.858	6.817	7.724	8.105	0.0004
Count	8	8	8	8	8	8	8	8	8	8	8

After Thermals	Deflections in Inches Forces in Grams										
	0.0007	**0.0014**	**0.0021**	**0.0028**	**0.0035**	**0.0042**	**0.0049**	**0.0056**	**0.0063**	**0.0070**	***SET***
Averages	**0.00**	**0.00**	**6.60**	**15.69**	**24.33**	**41.28**	**58.73**	**75.83**	**92.26**	**107.91**	**0.0057**
Min	0.00	0.00	0.00	0.00	0.00	15.30	34.70	52.30	68.00	84.20	0.0046
Max	0.00	0.00	14.60	33.90	50.90	69.40	86.60	104.40	122.30	138.80	0.0063
St. Dev	0.000	0.000	7.116	16.858	26.089	26.468	25.342	24.522	24.762	24.219	0.0006
Count	8	8	8	8	8	8	8	8	8	8	8



DATA SUMMARIES Continued

Cable Flex:

Insulation Resistance minimums, IR

Pin to Pin	
Mated	
Minimum	
Initial	8400
After 500 Flex Cycles	5300

Pin to Ground	
Mated	
Minimum	
Initial	9,100
After 500 Flex Cycles	16,400

Dielectric Withstanding Voltage minimums, DWV

Voltage Rating Summary	
Minimum	
Break Down Voltage	655
Test Voltage	491
Working Voltage	160

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

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

DATA SUMMARIES Continued

INSULATION RESISTANCE (IR):

	LS Pin to LS Pin		
	Mated	Unmated	Unmated
Minimum	**FQSFP-DD/QSFPO**	**FQSFP-DD**	**QSFPO**
Initial	45000	45000	Not Tested
Thermal	45000	45000	Not Tested
Humidity	645	549	Not Tested

	LS Row to LS Row		
	Mated	Unmated	Unmated
Minimum	**FQSFP-DD/QSFPO**	**FQSFP-DD**	**QSFPO**
Initial	45000	45000	Not Tested
Thermal	45000	45000	Not Tested
Humidity	318	415	Not Tested

	HS Pin to HS Pin		
	Mated	Unmated	Unmated
Minimum	**FQSFP-DD/QSFPO**	**FQSFP-DD**	**QSFPO**
Initial	15100	38000	Not Tested
Thermal	3800	15500	Not Tested
Humidity	4600	12300	Not Tested

	HS Row to HS Row		
	Mated	Unmated	Unmated
Minimum	**FQSFP-DD/QSFPO**	**FQSFP-DD**	**QSFPO**
Initial	45000	45000	Not Tested
Thermal	43000	45000	Not Tested
Humidity	14500	45000	Not Tested

	HS Pin to Ground		
	Mated	Unmated	Unmated
Minimum	**FQSFP-DD/QSFPO**	**FQSFP-DD**	**QSFPO**
Initial	31000	45000	Not Tested
Thermal	3000	45000	Not Tested
Humidity	1503	31000	Not Tested

DATA SUMMARIES Continued

DIELECTRIC WITHSTANDING VOLTAGE (DWV):

Voltage Rating Summary	
Minimum	**FQSFP-DD/QSFPO**
Break Down Voltage	655
Test Voltage	491
Working Voltage	160

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

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

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

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

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

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

DATA SUMMARIES Continued

Compliant Pin Insertion/Retention force:

FQSFP-DD-01-A-XX.X-X/QSFPO-DD

	.0125 LS Signal PTH (HASL)			
	1st CYCLE		3rd CYCLE	
	Insertion Force (lbs.)	Withdrawal Force (lbs.)	Insertion Force (lbs.)	Withdrawal Force (lbs.)
Min. (lbs.)	1.17	0.08	1.13	0.05
Max. (lbs.)	1.60	1.33	1.55	1.07
Ave. (lbs.)	1.31	0.65	1.27	0.65

FQSFP-DD-01-A-XX.X-X/QSFPO-DD

	.0165 LS Signal PTH (HASL)			
	1st CYCLE		3rd CYCLE	
	Insertion Force (lbs.)	Withdrawal Force (lbs.)	Insertion Force (lbs.)	Withdrawal Force (lbs.)
Min. (lbs.)	0.78	0.53	0.67	0.46
Max. (lbs.)	1.92	1.26	1.41	1.12
Ave. (lbs.)	1.06	0.92	1.08	0.87

FQSFP-DD-01-A-XX.X-X/QSFPO-DD

	.0165 LS Signal PTH (ENIG)			
	1st CYCLE		3rd CYCLE	
	Insertion Force (lbs.)	Withdrawal Force (lbs.)	Insertion Force (lbs.)	Withdrawal Force (lbs.)
Min. (lbs.)	0.85	0.28	0.86	0.23
Max. (lbs.)	1.92	0.96	1.53	0.95
Ave. (lbs.)	1.17	0.52	1.12	0.53

DATA SUMMARIES Continued

FQSFP-DD-01-A-XX.X-X/QSFPO-DD

	.0125 Ground PTH (HASL)			
	1st CYCLE		3rd CYCLE	
	Insertion Force (lbs.)	Withdrawal Force (lbs.)	Insertion Force (lbs.)	Withdrawal Force (lbs.)
Min. (lbs.)	1.41	0.28	1.31	0.17
Max. (lbs.)	1.65	1.29	1.89	1.29
Ave. (lbs.)	1.53	0.65	1.49	0.77

FQSFP-DD-01-A-XX.X-X/QSFPO-DD

	.0165 Ground PTH (HASL)			
	1st CYCLE		3rd CYCLE	
	Insertion Force (lbs.)	Withdrawal Force (lbs.)	Insertion Force (lbs.)	Withdrawal Force (lbs.)
Min. (lbs.)	0.78	0.78	0.82	0.61
Max. (lbs.)	1.33	1.06	1.21	1.03
Ave. (lbs.)	1.00	0.92	0.98	0.87

FQSFP-DD-01-A-XX.X-X/QSFPO-DD

	.0165 Ground PTH (ENIG)			
	1st CYCLE		3rd CYCLE	
	Insertion Force (lbs.)	Withdrawal Force (lbs.)	Insertion Force (lbs.)	Withdrawal Force (lbs.)
Min. (lbs.)	0.86	0.45	0.87	0.41
Max. (lbs.)	1.10	0.88	1.04	0.85
Ave. (lbs.)	0.97	0.67	0.95	0.70

DATA SUMMARIES Continued

FQSFP-DD-01-A-XX.X-X/QSFPO-DD

	.018 Signal PTH (HASL)			
	1st CYCLE		3rd CYCLE	
	Insertion Force (lbs.)	Withdrawal Force (lbs.)	Insertion Force (lbs.)	Withdrawal Force (lbs.)
Min. (lbs.)	3.02	1.45	2.72	1.19
Max. (lbs.)	3.64	1.96	3.43	2.08
Ave. (lbs.)	3.31	1.76	3.15	1.72

FQSFP-DD-01-A-XX.X-X/QSFPO-DD

	.022 Ground PTH (HASL)			
	1st CYCLE		3rd CYCLE	
	Insertion Force (lbs.)	Withdrawal Force (lbs.)	Insertion Force (lbs.)	Withdrawal Force (lbs.)
Min. (lbs.)	0.74	0.49	0.72	0.60
Max. (lbs.)	1.53	1.27	1.65	1.22
Ave. (lbs.)	1.05	0.83	1.01	0.81

FQSFP-DD-01-A-XX.X-X/QSFPO-DD

	.022 Ground PTH (ENIG)			
	1st CYCLE		3rd CYCLE	
	Insertion Force (lbs.)	Withdrawal Force (lbs.)	Insertion Force (lbs.)	Withdrawal Force (lbs.)
Min. (lbs.)	0.44	0.31	0.54	0.34
Max. (lbs.)	1.90	1.17	1.78	1.26
Ave. (lbs.)	1.07	0.71	1.11	0.69

DATA SUMMARIES Continued

LLCR Durabiltiy:

1) A total of 480 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	8/28/2018	8/29/2018	9/4/2018	9/17/2018
Room Temp (Deg C)	23	23	23	23
Rel Humidity (%)	43	46	41	49
Technician	Troy Cook	Troy Cook	Troy Cook	Troy Cook
mOhm values	**Actual**	**Increase**	**Increase**	**Increase**
	Initial	**After 100 Cycles**	**After T-Shock**	**After Humidity**
	Pin Type 1: SIGNAL			
Average	17.62	-0.69	-0.92	0.40
St. Dev.	2.05	1.01	1.28	2.35
Min	14.44	-3.86	-6.02	-4.01
Max	23.84	1.90	2.64	19.10
Summary Count	160	160	160	160
Total Count	160	160	160	160
	Pin Type 2: HS SIGNAL			
Average	304.45	-1.08	-0.99	-1.56
St. Dev.	10.67	3.51	3.23	3.46
Min	282.73	-27.33	-24.96	-25.81
Max	334.87	3.41	2.52	4.66
Summary Count	256	256	256	256
Total Count	256	256	256	256
	Pin Type 3: GROUND			
Average	92.70	-0.30	-0.39	5.23
St. Dev.	5.62	5.49	6.75	7.87
Min	78.16	-20.74	-17.24	-13.06
Max	106.47	12.34	14.12	20.03
Summary Count	64	64	64	64
Total Count	64	64	64	64

LLCR Delta Count by Category True Value						
	Stable	**Minor**	**Acceptable**	**Marginal**	**Unstable**	**Open**
mOhms	**<=5**	**>5 & <=10**	**>10 & <=15**	**>15 & <=50**	**>50 & <=1000**	**>1000**
After 100 Cycles	**468**	**10**	**2**	**0**	**0**	**0**
After T-Shock	**468**	**7**	**5**	**0**	**0**	**0**
After Humidity	**442**	**18**	**12**	**8**	**0**	**0**

DATA SUMMARIES Continued

LLCR Durability Group – Compliant Pin

1). A total of 40 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. <= +0.33 mOhms: ---------- Stable
b. +0.34 to +0.66 mOhms: ---------- Minor
c. +0.67 to +1.00 mOhms: ---------- Acceptable
d. +1.01 to +50.0 mOhms: ---------- Marginal
e. +50.1 to +1000 mOhms: ---------- Unstable
f. >+1000 mOhms: ---------- Open Failure

	LLCR Measurement Summaries by Pin Type		
Date	8/28/2018	9/4/2018	9/17/2018
Room Temp (Deg C)	23	23	23
Rel Humidity (%)	43	41	48
Technician	Troy Cook	Troy Cook	Troy Cook
mOhm values	**Actual**	**Delta**	**Delta**
	Initial	**After T-Shock**	**After Humidity**
	Pin Type 1: Signal	**Pin Type 1: Signal**	
Average	0.21	0.14	0.37
St. Dev.	0.07	0.09	0.31
Min	0.09	0.01	0.01
Max	0.53	0.35	1.18
Summary Count	40	40	40
Total Count	40	40	40

LLCR Delta Count by Category						
	Stable	**Minor**	**Acceptable**	**Marginal**	**Unstable**	**Open**
mOhms	**<=5**	**>5 & <=10**	**>10 & <=15**	**>15 & <=50**	**>50 & <=1000**	**>1000**
After T-Shock	**40**	**0**	**0**	**0**	**0**	**0**
After Humidity	**40**	**0**	**0**	**0**	**0**	**0**

DATA SUMMARIES Continued

LLCR Thermal aging

1) A total of 480 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	8/29/2018	9/10/2018
Room Temp (Deg C)	23	23
Rel Humidity (%)	45	40
Technician	Troy Cook	Troy Cook
mOhm values	**Actual**	**Increase**
	Initial	**Thermal Age**
	Pin Type 1: SIGNAL	
Average	17.54	1.84
St. Dev.	2.14	2.16
Min	14.07	-1.71
Max	23.04	12.73
Summary Count	160	160
Total Count	160	160
	Pin Type 2: HS SIGNAL	
Average	298.79	0.00
St. Dev.	11.24	1.48
Min	282.25	-3.73
Max	322.33	8.39
Summary Count	256	256
Total Count	256	256
	Pin Type 3: GROUND	
Average	93.95	-0.83
St. Dev.	11.85	5.20
Min	79.49	-15.64
Max	177.63	8.35
Summary Count	64	64
Total Count	64	64

LLCR Delta Count by Category						
	Stable	**Minor**	**Acceptable**	**Marginal**	**Unstable**	**Open**
mOhms	**<=5**	**>5 & <=10**	**>10 & <=15**	**>15 & <=50**	**>50 & <=1000**	**>1000**
Thermal Age True Value	**457**	**22**	**1**	**0**	**0**	**0**

DATA SUMMARIES Continued

LLCR Thermal Aging Group – Compliant Pin

5). A total of 40 points were measured.
6). EIA-364-23, *Low Level Contact Resistance Test Procedure for Electrical Connectors and Sockets.*
7). A computer program, *LLCR 221.exe*, ensures repeatability for data acquisition.
8). The following guidelines are used to categorize the changes in LLCR as a result from stressing.

g. <= +0.33 mOhms: ---------- Stable
h. +0.34 to +0.66 mOhms: ---------- Minor
i. +0.67 to +1.00 mOhms: ---------- Acceptable
j. +1.01 to +50.0 mOhms: ---------- Marginal
k. +50.1 to +1000 mOhms: ---------- Unstable
l. >+1000 mOhms: ---------- Open Failure

	LLCR Measurement Summaries by Pin Type	
Date	8/29/2018	9/10/2018
Room Temp (Deg C)	23	23
Rel Humidity (%)	46	41
Technician	Troy Cook	Troy Cook
mOhm values	**Actual**	**Delta**
	Initial	**Thermal Age**
	Pin Type 1:	
Average	0.19	0.18
St. Dev.	0.09	0.10
Min	0.01	0.00
Max	0.40	0.33
Summary Count	40	40
Total Count	40	40

LLCR Delta Count by Category						
	Stable	**Minor**	**Acceptable**	**Marginal**	**Unstable**	**Open**
mOhms	**<=5**	**>5 & <=10**	**>10 & <=15**	**>15 & <=50**	**>50 & <=1000**	**>1000**
Thermal Age	**40**	**0**	**0**	**0**	**0**	**0**

DATA SUMMARIES Continued

LLCR GAS TIGHT:

2) A total of 480 points were measured
3) EIA-364-23, *Low Level Contact Resistance Test Procedure for Electrical Connectors and Sockets.*
4) A computer program, *LLCR 221.exe*, ensures repeatability for data acquisition.
5) 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	9/6/2018	9/7/2018
Room Temp (Deg C)	23	23
Rel Humidity (%)	41	43
Technician	Troy Cook	Troy Cook
mOhm values	**Actual**	**Increase**
	Initial	**After Gas Tight**
	Pin Type 1: SIGNAL	
Average	17.55	0.25
St. Dev.	2.40	1.21
Min	13.81	-8.99
Max	31.06	7.58
Summary Count	160	160
Total Count	160	160
	Pin Type 2: HS SIGNAL	
Average	300.16	-0.17
St. Dev.	9.98	1.58
Min	283.48	-4.12
Max	318.26	10.33
Summary Count	256	256
Total Count	256	256
	Pin Type 3: GROUND	
Average	87.29	-2.67
St. Dev.	6.60	3.84
Min	75.26	-11.12
Max	100.00	5.14
Summary Count	64	64
Total Count	64	64

LLCR Delta Count by Category						
	Stable	**Minor**	**Acceptable**	**Marginal**	**Unstable**	**Open**
mOhms	**<=5**	**>5 & <=10**	**>10 & <=15**	**>15 & <=50**	**>50 & <=1000**	**>1000**
After Gas Tight True Value	**476**	**3**	**1**	**0**	**0**	**0**

DATA SUMMARIES Continued

LLCR GAS TIGHT – Compliant Pin

9). A total of 40 points were measured.
10). EIA-364-23, *Low Level Contact Resistance Test Procedure for Electrical Connectors and Sockets.*
11). A computer program, *LLCR 221.exe*, ensures repeatability for data acquisition.
12). The following guidelines are used to categorize the changes in LLCR as a result from stressing.

g. <= +0.33 mOhms: ---------- Stable
h. +0.34 to +0.66 mOhms: ---------- Minor
i. +0.67 to +1.00 mOhms: ---------- Acceptable
j. +1.01 to +50.0 mOhms: ---------- Marginal
k. +50.1 to +1000 mOhms: ---------- Unstable
l. >+1000 mOhms: ---------- Open Failure

	LLCR Measurement Summaries by Pin Type	
Date	9/6/2018	9/7/2018
Room Temp (Deg C)	23	23
Rel Humidity (%)	41	43
Technician	Troy Cook	Troy Cook
mOhm values	**Actual**	**Delta**
	Initial	**Gas Tight**
	Pin Type 1:	
Average	0.23	0.15
St. Dev.	0.11	0.12
Min	0.05	0.01
Max	0.48	0.49
Summary Count	40	40
Total Count	40	40

LLCR Delta Count by Category						
	Stable	**Minor**	**Acceptable**	**Marginal**	**Unstable**	**Open**
mOhms	**<=5**	**>5 & <=10**	**>10 & <=15**	**>15 & <=50**	**>50 & <=1000**	**>1000**
Gas Tight	**40**	**0**	**0**	**0**	**0**	**0**

DATA SUMMARIES Continued

LLCR Shock Vib:

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. <= +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	9/13/2018	9/14/2018
Room Temp (Deg C)	22	23
Rel Humidity (%)	41	43
Technician	Troy Cook	Troy Cook
mOhm values	**Actual**	**Increase**
	Initial	**After Shock&Vibration**
	Pin Type 1: SIGNAL	
Average	17.81	-1.26
St. Dev.	2.40	1.50
Min	12.60	-7.97
Max	24.83	7.26
Summary Count	160	160
Total Count	160	160
	Pin Type 2: HS SIGNAL	
Average	305.46	-4.12
St. Dev.	12.57	6.44
Min	283.48	-37.55
Max	343.91	4.98
Summary Count	256	256
Total Count	256	256
	Pin Type 3: GROUND	
Average	88.43	6.17
St. Dev.	5.89	13.29
Min	73.74	-5.02
Max	102.61	82.99
Summary Count	64	64
Total Count	64	64

LLCR Delta Count by Category						
	Stable	**Minor**	**Acceptable**	**Marginal**	**Unstable**	**Open**
mOhms	**<=5**	**>5 & <=10**	**>10 & <=15**	**>15 & <=50**	**>50 & <=1000**	**>1000**
After Shock & Vibe True Value	**568**	**26**	**4**	**0**	**2**	**0**

DATA SUMMARIES Continued

LLCR Shock Vib – Compliant Pin

13). A total of 40 points were measured.
14). EIA-364-23, *Low Level Contact Resistance Test Procedure for Electrical Connectors and Sockets.*
15). A computer program, *LLCR 221.exe*, ensures repeatability for data acquisition.
16). The following guidelines are used to categorize the changes in LLCR as a result from stressing.

m. <= +0.33 mOhms: ---------- Stable
n. +0.34 to +0.66 mOhms: ---------- Minor
o. +0.67 to +1.00 mOhms: ---------- Acceptable
p. +1.01 to +50.0 mOhms: ---------- Marginal
q. +50.1 to +1000 mOhms: ---------- Unstable
r. >+1000 mOhms: ---------- Open Failure

	LLCR Measurement Summaries by Pin Type	
Date	9/13/2018	9/17/2018
Room Temp (Deg C)	22	22
Rel Humidity (%)	41	41
Technician	Troy Cook	Troy Cook
mOhm values	**Actual**	**Delta**
	Initial	**Shock&Vibration**
	Pin Type 1:	
Average	0.31	0.09
St. Dev.	0.12	0.10
Min	0.13	0.00
Max	0.56	0.35
Summary Count	40	40
Total Count	40	40

LLCR Delta Count by Category						
	Stable	**Minor**	**Acceptable**	**Marginal**	**Unstable**	**Open**
mOhms	**<=5**	**>5 & <=10**	**>10 & <=15**	**>15 & <=50**	**>50 & <=1000**	**>1000**
Shock&Vibration	**40**	**0**	**0**	**0**	**0**	**0**

Shock Vibration Event Detection:

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

DATA SUMMARIES Continued

LLCR Insertion/Retention force:

1) The following guidelines are used to categorize the changes in LLCR for compliant pin only. Total 40 signal and 32 ground points were measured.
   s. <= +0.33 mOhms: ---------- Stable
   t. +0.34 to +0.66 mOhms: ---------- Minor
   u. +0.67 to +1.00 mOhms: ---------- Acceptable
   v. +1.01 to +50.0 mOhms: ---------- Marginal
   w. +50.1 to +1000 mOhms: ---------- Unstable
   x. >+1000 mOhms: ---------- Open Failure

HASL 0.0125" (3 measurements voided as pins were missing from connector)

	LLCR Measurement Summaries by Pin Type	
Date	9/18/2018	9/20/2018
Room Temp (Deg C)	23	23
Rel Humidity (%)	50	48
Technician	Troy Cook	Troy Cook
mOhm values	**Actual**	**Delta**
	Initial	**After 3rd Cycle**
	Pin Type 1: SIGNAL	
Average	0.08	0.06
St. Dev.	0.02	0.03
Min	0.01	0.00
Max	0.13	0.19
Summary Count	40	39
Total Count	40	39
	Pin Type 3: GROUND	
Average	0.08	0.07
St. Dev.	0.08	0.07
Min	0.01	0.00
Max	0.30	0.24
Summary Count	32	30
Total Count	32	30

LLCR Delta Count by Category						
	Stable	**Minor**	**Acceptable**	**Marginal**	**Unstable**	**Open**
mOhms	**<=0.33**	**>0.33 & <=0.66**	**>0.66 & <=1**	**>1 & <=50**	**>50 & <=1000**	**>1000**
After 3rd Cycle	**69**	**0**	**0**	**0**	**0**	**0**

DATA SUMMARIES Continued

HASL 0.0165"

	LLCR Measurement Summaries by Pin Type	
Date	9/18/2018	9/20/2018
Room Temp (Deg C)	23	23
Rel Humidity (%)	49	50
Technician	Troy Cook	Troy Cook
mOhm values	**Actual**	**Delta**
	Initial	**After 3rd Cycle**
	Pin Type 1: SIGNAL	
Average	0.11	0.04
St. Dev.	0.03	0.03
Min	0.06	0.00
Max	0.22	0.17
Summary Count	40	40
Total Count	40	40
	Pin Type 3: GROUND	
Average	0.11	0.05
St. Dev.	0.03	0.03
Min	0.04	0.01
Max	0.18	0.19
Summary Count	32	32
Total Count	32	32

LLCR Delta Count by Category						
	Stable	**Minor**	**Acceptable**	**Marginal**	**Unstable**	**Open**
mOhms	**<=0.33**	**>0.33 & <=0.66**	**>0.66 & <=1**	**>1 & <=50**	**>50 & <=1000**	**>1000**
After 3rd Cycle	**72**	**0**	**0**	**0**	**0**	**0**

DATA SUMMARIES Continued

ENIG 0.0165" (5 measurements voided due to bent pin issue. All 5 on one sample connector)

	LLCR Measurement Summaries by Pin Type	
Date	9/18/2018	9/20/2018
Room Temp (Deg C)	23	23
Rel Humidity (%)	49	49
Technician	Troy Cook	Troy Cook
mOhm values	**Actual**	**Delta**
	Initial	**After 3rd Cycle**
	Pin Type 1: SIGNAL	
Average	0.17	0.06
St. Dev.	0.06	0.04
Min	0.10	0.00
Max	0.29	0.17
Summary Count	40	39
Total Count	40	39
	Pin Type 3: GROUND	
Average	0.22	0.09
St. Dev.	0.10	0.07
Min	0.06	0.01
Max	0.41	0.30
Summary Count	32	28
Total Count	32	28

LLCR Delta Count by Category						
	Stable	**Minor**	**Acceptable**	**Marginal**	**Unstable**	**Open**
mOhms	**<=0.33**	**>0.33 & <=0.66**	**>0.66 & <=1**	**>1 & <=50**	**>50 & <=1000**	**>1000**
After 3rd Cycle	**67**	**0**	**0**	**0**	**0**	**0**

EQUIPMENT AND CALIBRATION SCHEDULES

Equipment #: HPM-01
Description: Hipot Megommeter
Manufacturer: Hipotronics
Model: H306B-A
Serial #: M9905004
Accuracy: 2 % Full Scale Accuracy
… Last Cal: 05/24/2018, Next Cal: 08/24/2019

Equipment #: TCT-06
Description: Test Resources test stand
Manufacturer: Test Resources
Model: 100R250-12
Serial #: 0710016-01
Accuracy: Speed Accuracy: +/- 5% of indicated speed; Displacement: +/- 5 micrometers.
… Last Cal: 05/03/2018, Next Cal: 05/03/2019

Equipment #: MO-04
Description: Multimeter /Data Acquisition System
Manufacturer: Keithley
Model: 2700
Serial #: 0798688
Accuracy: See Manual
… Last Cal: 04/30/2018, Next Cal: 04/30/2019

Equipment #: OV-05
Description: Forced Air Oven, 5 Cu. Ft., 120 V (Chamber Room)
Manufacturer: Sheldon Mfg.
Model: CE5F
Serial #: 02008008
Accuracy: +/- 5 deg. C
… Last Cal: 02/18/2018, Next Cal: 02/18/2019

Equipment #: THC-01
Description: Temperature/Humidity Chamber (Chamber Room)
Manufacturer: Thermotron
Model: SM-8-7800
Serial #: 30676
Accuracy: See Manual
… Last Cal: 10/24/2018, Next Cal: 10/24/2019

Equipment #: TSC-01
Description: Vertical Thermal Shock Chamber
Manufacturer: Cincinnati Sub Zero
Model: VTS-3-6-6-SC/AC
Serial #: 10-VT14993
Accuracy: See Manual
… Last Cal: 06/30/2018, Next Cal: 06/30/2019

EQUIPMENT AND CALIBRATION SCHEDULES

Equipment #: MO-02
Description: Multimeter /Data Acquisition System
Manufacturer: Keithley
Model: 2700
Serial #: 0780546
Accuracy: Last Cal: 6/16/2018, Next Cal: 6/16/2019

Equipment #: PS-01
Description: Power Supply
Manufacturer: Hewlett Packard
Model: 6033A
Serial #: 3329A-07330
Accuracy: Last Cal: 6/12/2018, Next Cal: 6/12/2019

Equipment #: PS-02
Description: Power Supply
Manufacturer: Hewlett Packard
Model: 6033A
Serial #: 2847A-04167
Accuracy: Last Cal: 6/12/2018, Next Cal: 6/12/2019

Equipment #: SVC-01
Description: Shock & Vibration Table
Manufacturer: Data Physics
Model: LE-DSA-10-20K
Serial #: 10037
Accuracy: See Manual
… Last Cal: 11/30/2018, Next Cal: 11/30/2019

Equipment #: ACLM-01
Description: Accelerometer
Manufacturer: PCB Piezotronics
Model: 352C03
Serial #: 115819
Accuracy: See Manual
… Last Cal: 7/9/2018, Next Cal: 7/9/2019

Equipment #: ED-03
Description: Event Detector
Manufacturer: Analysis Tech
Model: 32EHD
Serial #: 1100604
Accuracy: See Manual
… Last Cal: 6/4/2018, Next Cal: 6/4/2019