

Project Number: Design Qualification Test Report	Tracking Code: CR-1023101_Report_Rev_1
Requested by: Tyler Lang	Date: 5/29/2024
Part #: B1SDT-30-28-H-12.0-2/P1M-30-01-S-DV-TR	
Part description: B1SDT/P1M	Tech: Richard Ison
Test Start: 12/20/2023	Test Completed: 1/22/2024



DESIGN QUALIFICATION TEST REPORT
B1SDT/P1M
B1SDT-30-28-H-12.0-2/P1M-30-01-S-DV-TR

Tracking Code: CR-1023101_Report_Rev_1	Part #: B1SDT-30-28-H-12.0-2/P1M-30-01-S-DV-TR
Part description: B1SDT/P1M	

REVISION HISTORY

DATA	REV.NUM.	DESCRIPTION	ENG
2/27/2024	1	Initial test	KH

CERTIFICATION

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

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SCOPE

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

APPLICABLE DOCUMENTS

Standards: EIA Publication 364

TEST SAMPLES AND PREPARATION

- 1) All materials were manufactured in accordance with the applicable product specification.
- 2) All test samples were identified and encoded to maintain traceability throughout the test sequences.
- 3) After soldering, the parts to be used for LLCR and DWV/IR testing were cleaned according to CO-SC-WI-3029.
- 4) Either an automated cleaning procedure or an ultrasonic cleaning procedure may be used.
- 5) The automated procedure is used with aqueous compatible soldering materials.
- 6) Parts not intended for testing LLCR and DWV/IR are visually inspected and cleaned if necessary.
- 7) Any additional preparation will be noted in the individual test sequences.
- 8) Solder Information: Lead Free
- 9) Samtec Test PCBs used: PCB-113447-TST-XX, PCB-113301-TST-XX, PCB-112305-TST-XX.

FLOWCHARTS

Gas Tight

Group 1

B1SDT-30-28-H-06.0

P1M-30-01-S-DV-TR

8 Assemblies

Step	Description
------	-------------

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

(1) Gas Tight = EIA-364-36

(2) LLCR = EIA-364-23

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

FLOWCHARTS Continued**Mating/Unmating/Durability**Group 1

B1SDT-10-28-H-06.0
P1M-10-01-S-DV-TR
8 Assemblies

Note: Removed Contact Gaps

Step	Description
1.	Mating/Unmating Force ⁽³⁾
2.	Cycles Quantity = 25 Cycles
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⁾

Group 2

B1SDT-30-28-H-06.0
P1M-30-01-S-DV-TR
8 Assemblies

Note: Removed Contact Gaps

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

(1) Humidity = EIA-364-31

Test Condition = B (240 Hours)

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

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

(2) LLCR = EIA-364-23

Open Circuit Voltage = 20 mV Max

Test Current = 100 mA Max

(3) Mating/Unmating Force = EIA-364-13**(4) Thermal Shock = EIA-364-32**

Exposure Time at Temperature Extremes = 1/2 Hour

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

Test Duration = A-3 (100 Cycles)

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

<u>Group 1</u>		<u>Group 2</u>		<u>Group 3</u>		<u>Group 4</u>	
B1SDT-30-28-H-06.0 P1M-30-01-S-DV-TR 2 Assemblies		B1SDT-30-28-H-06.0 2 Assemblies		P1M-30-01-S-DV-TR 2 Assemblies		B1SDT-30-28-H-06.0 P1M-30-01-S-DV-TR 2 Assemblies	
Step	Description	Step	Description	Step	Description	Step	Description
1.	DWV Breakdown (2)	1.	DWV Breakdown (2)	1.	DWV Breakdown (2)	1.	IR (4)
						2.	DWV at Test Voltage (1)
						3.	Thermal Shock (5)
						4.	IR (4)
						5.	DWV at Test Voltage (1)
						6.	Humidity (3)
						7.	IR (4)
						8.	DWV at Test Voltage (1)

Row-to-Row

<u>Group 5</u>		<u>Group 6</u>		<u>Group 7</u>		<u>Group 8</u>	
B1SDT-30-28-H-06.0 P1M-30-01-S-DV-TR 2 Assemblies		B1SDT-30-28-H-06.0 2 Assemblies		P1M-30-01-S-DV-TR 2 Assemblies		B1SDT-30-28-H-06.0 P1M-30-01-S-DV-TR 2 Assemblies	
Step	Description	Step	Description	Step	Description	Step	Description
1.	DWV Breakdown (2)	1.	DWV Breakdown (2)	1.	DWV Breakdown (2)	1.	IR (4)
						2.	DWV at Test Voltage (1)
						3.	Thermal Shock (5)
						4.	IR (4)
						5.	DWV at Test Voltage (1)
						6.	Humidity (3)
						7.	IR (4)
						8.	DWV at Test Voltage (1)

- (1) DWV at Test Voltage = EIA-364-20
Test Condition = 1 (Sea Level)
DWV test voltage is equal to 75% of the lowest breakdown voltage
Test voltage applied for 60 seconds
- (2) DWV Breakdown = EIA-364-20
Test Condition = 1 (Sea Level)
DWV test voltage is equal to 75% of the lowest breakdown voltage
Test voltage applied for 60 seconds
- (3) Humidity = EIA-364-31
Test Condition = B (240 Hours)
Test Method = III (+25°C to +65°C @ 90% RH to 98% RH)
Test Exceptions: ambient pre-condition and delete steps 7a and 7b
- (4) IR = EIA-364-21
Test Condition = 500 Vdc, 2 Minutes Max
- (5) Thermal Shock = EIA-364-32
Exposure Time at Temperature Extremes = 1/2 Hour
Method A, Test Condition = I (-55°C to +85°C)
Test Duration = A-3 (100 Cycles)

FLOWCHARTS Continued**Current Carrying Capacity**Group 1

B1SDT-30-28-H-12.0-2
P1M-30-01-S-DV-TR
2 Pins Powered
Signal

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

Group 2

B1SDT-30-28-H-12.0-2
P1M-30-01-S-DV-TR
4 Pins Powered
Signal

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

Group 3

B1SDT-30-28-H-12.0-2
P1M-30-01-S-DV-TR
6 Pins Powered
Signal

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

Group 4

B1SDT-30-28-H-12.0-2
P1M-30-01-S-DV-TR
8 Pins Powered
Signal

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

Group 5

B1SDT-30-28-H-12.0-2
P1M-30-01-S-DV-TR
60 Pins Powered
Signal

Step	Description
1.	CCC ⁽¹⁾ Rows = 2 Number of Positions = 30

(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

B1SDT-30-28-H-12.0

P1M-30-01-S-DV-TR

8 Assemblies

Step Description

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

(1) LLCR = EIA-364-23

Open Circuit Voltage = 20 mV Max

Test Current = 100 mA Max

(2) Mechanical Shock = EIA-364-27

Test Condition = C (100 G Peak, 6 milliseconds, Half Sine)

Number of Shocks = 3 Per Direction, Per Axis, 18 Total

(3) Random Vibration = EIA-364-28

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

Mechanical Shock/Random Vibration/Event DetectionGroup 1

B1SDT-30-28-H-12.0

P1M-30-01-S-DV-TR

60 Points

Step Description

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

(1) Nanosecond Event Detection (Mechanical Shock)

Use EIA-364-87 for Nanosecond Event Detection:

Test Condition = F (50 nanoseconds at 10 ohms)

Use EIA-364-27 for Mechanical Shock:

Test Condition = C (100 G Peak, 6 milliseconds, Half Sine)

Number of Shocks = 3 Per Direction, Per Axis, 18 Total

(2) Nanosecond Event Detection (Random Vibration)

Use EIA-364-87 for Nanosecond Event Detection:

Test Condition = F (50 nanoseconds at 10 ohms)

Use EIA-364-28 for Random Vibration:

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

FLOWCHARTS Continued**Cable Pull**Group 1

B1SDT-30-28-H-12.0-2
 P1M-30-01-S-DV-TR
 5 Assemblies
 0 Degrees

Step	Description
1.	Cable Pull ⁽¹⁾

Group 2

B1SDT-30-28-H-12.0-2
 P1M-30-01-S-DV-TR
 5 Assemblies
 90 Degrees

Step	Description
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 FlexGroup 1

B1SDT-30-28-H-12.0-2
 P1M-30-01-S-DV-TR
 8 Assemblies
 Circular 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⁾
7.	Rotate Cable 90°
8.	Cable Flex ⁽¹⁾
9.	Visual Inspection
10.	IR ⁽³⁾
11.	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

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 I: -55°C to +85°C.
- 3) Test Time: ½ hour dwell at each temperature extreme.
- 4) Number of Cycles: 100
- 5) All test samples are pre-conditioned at ambient.
- 6) All test samples are exposed to environmental stressing in the mated condition.

HUMIDITY:

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

MECHANICAL SHOCK (Specified Pulse):

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

VIBRATION:

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

NANOSECOND-EVENT DETECTION:

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

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.

TEMPERATURE RISE (Current Carrying Capacity, CCC):

- 1) EIA-364-70, *Temperature Rise versus Current Test Procedure for Electrical Connectors and Sockets*.
- 2) When current passes through a contact, the temperature of the contact increases as a result of I^2R (resistive) heating.
- 3) The number of contacts being investigated plays a significant part in power dissipation and therefore temperature rise.
- 4) The size of the temperature probe can affect the measured temperature.
- 5) Copper traces on PC boards will contribute to temperature rise:
 - a. Self-heating (resistive)
 - b. Reduction in heat sink capacity affecting the heated contacts.
- 6) A de-rating curve, usually 20%, is calculated.
- 7) Calculated de-rated currents at four temperature points are reported:
 - a. Ambient
 - b. 85° C
 - c. 95° C
 - d. 115° C
- 8) Typically, neighboring contacts (in close proximity to maximize heat buildup) 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. $\leq +5.0$ mOhms: -----Stable
 - b. $+5.1$ to $+10.0$ mOhms:-----Minor
 - c. $+10.1$ to $+15.0$ mOhms: -----Acceptable
 - d. $+15.1$ to $+50.0$ mOhms: -----Marginal
 - e. $+50.1$ to $+1000$ 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. $\leq +5.0$ mOhms:-----Stable
 - b. $+5.1$ to $+10.0$ mOhms: -----Minor
 - c. $+10.1$ to $+15.0$ mOhms: -----Acceptable
 - d. $+15.1$ to $+50.0$ mOhms: -----Marginal
 - e. $+50.1$ to $+1000$ mOhms:-----Unstable
 - f. $>+1000$ mOhms:-----Open Failure
- 4) Procedure:
 - a. Reference document: EIA-364-36, *Test Procedure for Determination of Gas-Tight Characteristics for Electrical Connectors, Sockets and/or Contact Systems*.
 - b. Test Conditions:
 - i. Class II--- Mated pairs of contacts assembled to their plastic housings.
 - ii. Reagent grade Nitric Acid shall be used of sufficient volume to saturate the test chamber.
 - iii. The ratio of the volume of the test chamber to the surface area of the acid shall be 10:1.
 - iv. The chamber shall be saturated with the vapor for at least 15 minutes before samples are added.
 - v. Exposure time, 55 to 65 minutes.
 - vi. The samples shall be no closer to the chamber walls than 1 inch and no closer to the surface of the acid than 3 inches.
 - vii. The samples shall be dried after exposure for a minimum of 1 hour.
 - viii. Drying temperature 50° C
 - ix. The final LLCR shall be conducted within 1 hour after drying.

ATTRIBUTE DEFINITIONS Continued

The following is a brief, simplified description of attributes.

INSULATION RESISTANCE (IR):

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

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

DIELECTRIC WITHSTANDING VOLTAGE (DWV):

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

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

ATTRIBUTE DEFINITIONS Continued

The following is a brief, simplified description of attributes.

CABLE PULL:

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

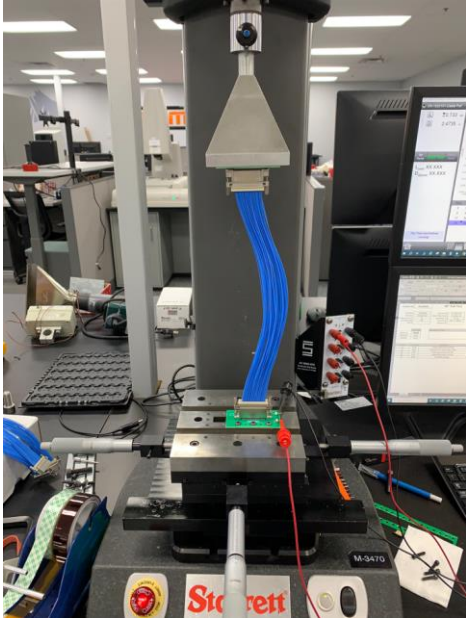


Fig. 1
 0° Connector pull.



Fig. 2
 90° Connector pull.

CABLE Flex:

- 1) Oscillate and monitor electrical continuity for open circuit indication.
 - a. $\pm 70^\circ$ Flex Mode, bend up to 500 cycles. load on 12 oz.

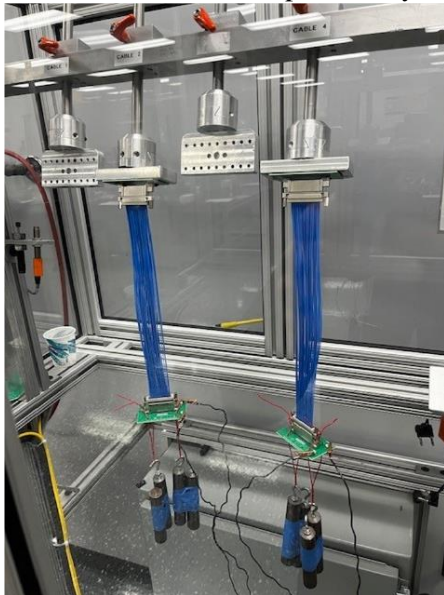


Fig. 3
(Standard setup)



Fig. 4
(Transverse setup)

RESULTS

Temperature Rise, CCC at a 20% de-rating

- CCC for a 30°C Temperature Rise-----3.4 A per contact with 2 contact (2 x 1) powered.
- CCC for a 30°C Temperature Rise-----2.7 A per contact with 4 contacts (2 x 2) powered.
- CCC for a 30°C Temperature Rise-----2.4 A per contact with 6 contacts (2 x 3) powered.
- CCC for a 30°C Temperature Rise-----2.1 A per contact with 8 contacts (2 x 4) powered.
- CCC for a 30°C Temperature Rise-----1.0 A per contact with All contacts (2x30) powered.

Mating – Unmating Forces

Mating/Unmating Durability Group

- **Initial**
 - **Mating**
 - Min -----11.18 lbs
 - Max-----13.54 lbs
 - **Unmating**
 - Min ----- 9.98 lbs
 - Max-----11.68 lbs
- **After 25 Cycles**
 - **Mating**
 - Min -----12.05 lbs
 - Max-----13.43 lbs
 - **Unmating**
 - Min ----- 9.65 lbs
 - Max-----11.80 lbs
- **After 50 Cycles**
 - **Mating**
 - Min -----11.47 lbs
 - Max-----12.74 lbs
 - **Unmating**
 - Min ----- 9.09 lbs
 - Max-----12.51 lbs
- **After 75 Cycles**
 - **Mating**
 - Min -----11.51 lbs
 - Max-----13.22 lbs
 - **Unmating**
 - Min ----- 9.22 lbs
 - Max-----12.90 lbs
- **After 100 Cycles**
 - **Mating**
 - Min -----11.88 lbs
 - Max-----14.25 lbs
 - **Unmating**
 - Min ----- 9.60 lbs
 - Max-----13.60 lbs
- **After Humidity**
 - **Mating**
 - Min -----10.36 lbs
 - Max-----11.51 lbs
 - **Unmating**
 - Min ----- 8.96 lbs
 - Max-----10.63 lbs

RESULTS Continued

Mating/Unmating Basic (B1SDT-10-28-H-06.0/ P1M-10-01-S-DV-TR)

- **Initial**
 - **Mating**
 - **Min** ----- 4.21 lbs
 - **Max** ----- 5.48 lbs
 - **Unmating**
 - **Min** ----- 3.22 lbs
 - **Max** ----- 4.30 lbs
- **After 25 Cycles**
 - **Mating**
 - **Min** ----- 4.09 lbs
 - **Max** ----- 5.80 lbs
 - **Unmating**
 - **Min** ----- 3.64 lbs
 - **Max** ----- 4.93 lbs
- **After 50 Cycles**
 - **Mating**
 - **Min** ----- 4.15 lbs
 - **Max** ----- 5.63 lbs
 - **Unmating**
 - **Min** ----- 3.61 lbs
 - **Max** ----- 4.82 lbs
- **After 75 Cycles**
 - **Mating**
 - **Min** ----- 4.25 lbs
 - **Max** ----- 5.70 lbs
 - **Unmating**
 - **Min** ----- 3.58 lbs
 - **Max** ----- 5.02 lbs
- **After 100 Cycles**
 - **Mating**
 - **Min** ----- 4.37 lbs
 - **Max** ----- 6.22 lbs
 - **Unmating**
 - **Min** ----- 3.67 lbs
 - **Max** ----- 5.21 lbs

Cable Pull force:

- **0° Pull**
 - **Min** ----- 28.62 lbs
 - **Max** ----- 57.71 lbs
- **90° Pull**
 - **Min** ----- 20.05 lbs
 - **Max** ----- 46.68 lbs

RESULTS Continued

Insulation Resistance minimums, IR

Pin to Pin

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

Row to Row

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

Dielectric Withstanding Voltage minimums, DWV

- **Minimums**
 - Breakdown Voltage ----- 1369 VAC
 - Test Voltage ----- 1027 VAC
 - Working Voltage ----- 340 VAC

Pin to Pin

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

Row to Row

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

RESULTS Continued

Cable Flex:

Insulation Resistance minimums, IR

Pin to Pin

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

Rotate Cable 90°

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

Row to Row

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

Rotate Cable 90°

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

Dielectric Withstanding Voltage minimums, DWV

- Breakdown Voltage----- 1369 VAC
- Test Voltage ----- 1027 VAC
- Working Voltage -----340 VAC

Pin to Pin

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

Rotate Cable 90°

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

Row to Row

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

Rotate Cable 90°

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

RESULTS Continued

LLCR Gas Tight (192 LLCR test points)

- **Initial** ----- 38.69 mOhms Max
- **Gas-Tight**
 - <= +5.0 mOhms-----192 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 +1000 mOhms-----0 Points ----- Unstable
 - >+1000 mOhms -----0 Points ----- Open Failure

LLCR Durability (192 LLCR test points)

- **Initial** ----- 38.52 mOhms Max
- **Durability, 100 Cycles**
 - <= +5.0 mOhms-----192 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 +1000 mOhms-----0 Points ----- Unstable
 - >+1000 mOhms -----0 Points ----- Open Failure
- **Thermal**
 - <= +5.0 mOhms-----192 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 +1000 mOhms-----0 Points ----- Unstable
 - >+1000 mOhms -----0 Points ----- Open Failure
- **Humidity**
 - <= +5.0 mOhms-----192 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 +1000 mOhms-----0 Points ----- Unstable
 - >+1000 mOhms -----0 Points ----- Open Failure

LLCR Shock & Vibration (192 LLCR test points)

- **Initial** ----- 70.06 mOhms Max
- **Shock & Vibration**
 - <= +5.0 mOhms-----192 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 +1000 mOhms-----0 Points ----- Unstable
 - >+1000 mOhms -----0 Points ----- Open Failure

Mechanical Shock & Random Vibration:

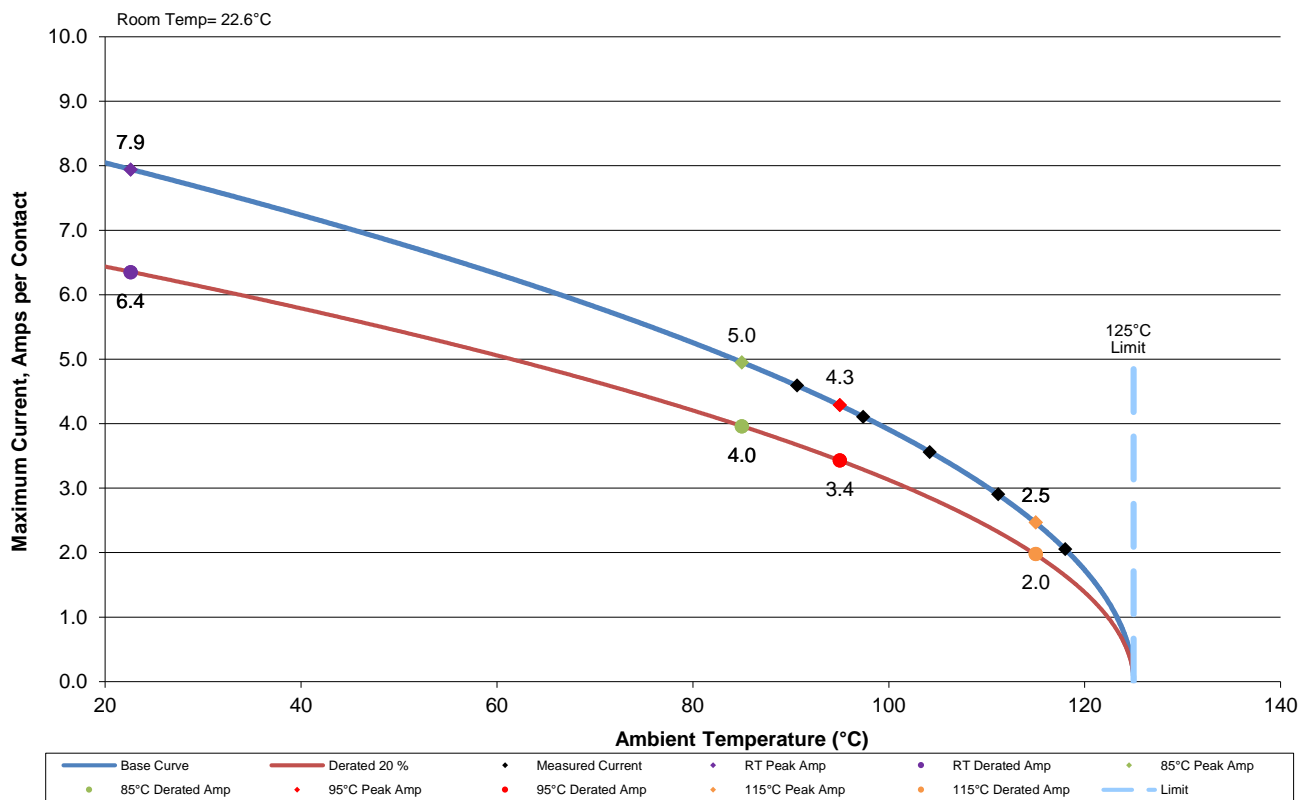
- **Shock**
 - No Damage----- Pass
 - 50 Nanoseconds ----- Pass
- **Vibration**
 - No Damage----- Pass
 - 50 Nanoseconds ----- Pass

DATA SUMMARIES

TEMPERATURE RISE (Current Carrying Capacity, CCC):

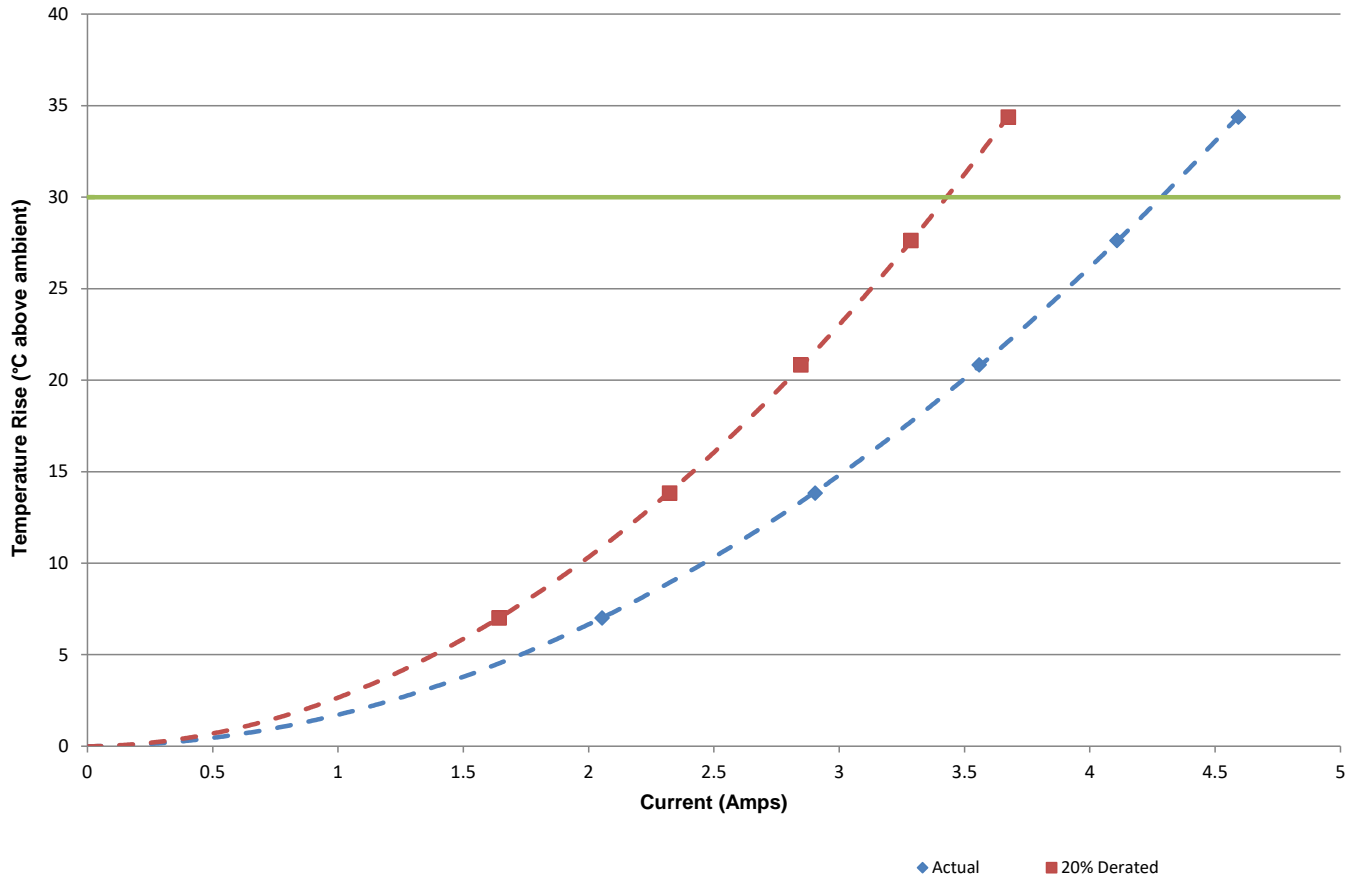
- 1) High quality thermocouples whose temperature slopes track one another were used for temperature monitoring.
- 2) The thermocouples were placed at a location to sense the maximum temperature generated during testing.
- 3) Temperature readings recorded are those for which three successive readings,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

CR-1023101
2(2x1) Contacts in Series
Part Numbers: B1SDT-30-28-H-12.0-2/P1M-30-01-S-DV-TR
Current Rating per Contact (30 Deg. Rise, 20% Derated) = 3.4 Amps



DATA SUMMARIES Continued

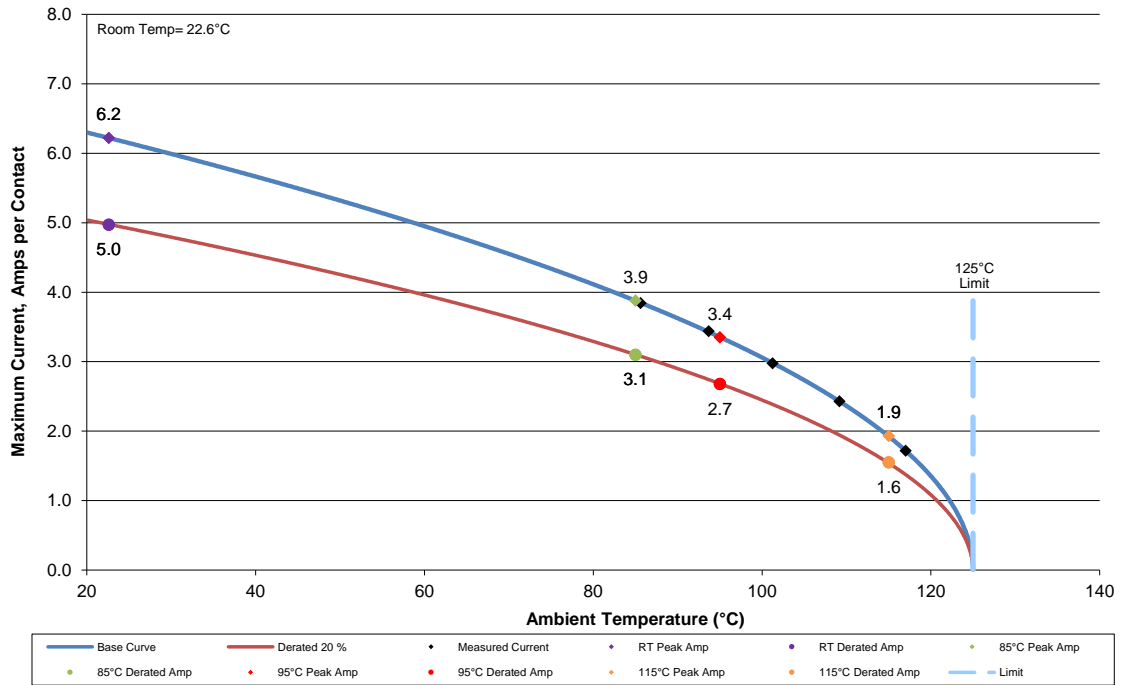
CR-1023101
2(2x1) Contacts in Series
Part Numbers: B1SDT-30-28-H-12.0-2/P1M-30-01-S-DV-TR



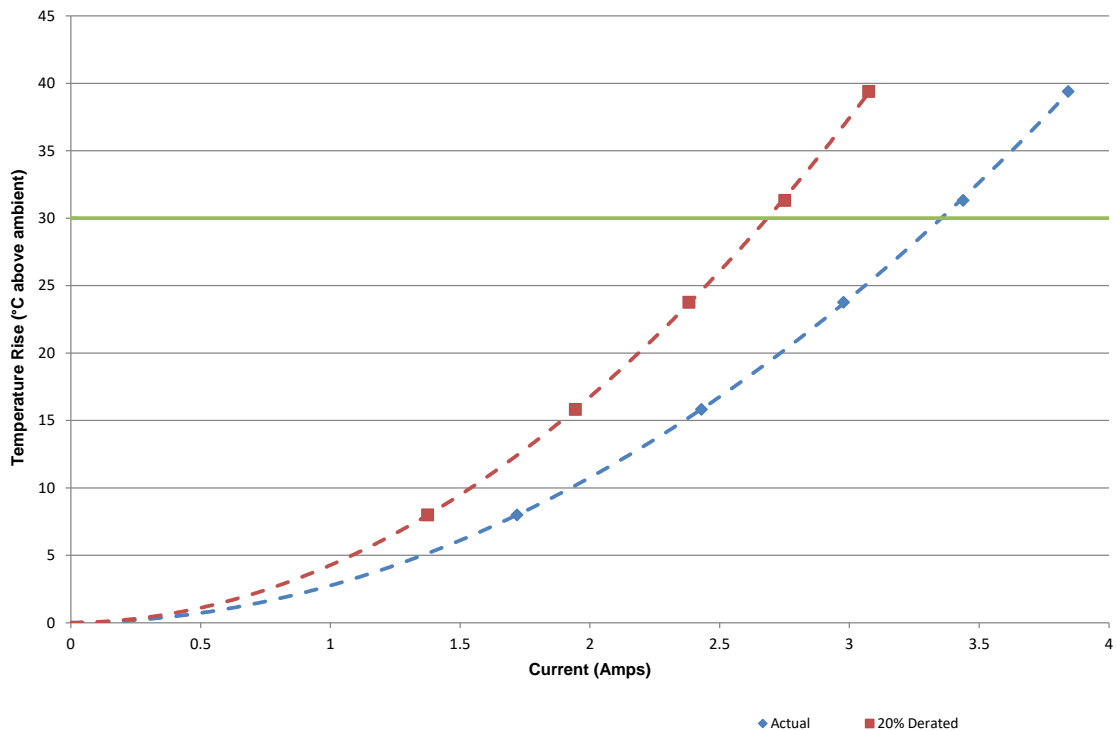
DATA SUMMARIES Continued

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

CR-1023101
 4(2x2) Contacts in Series
 Part Numbers: B1SDT-30-28-H-12.0-2/P1M-30-01-S-DV-TR
 Current Rating per Contact (30 Deg. Rise, 20% Derated) = 2.7 Amps



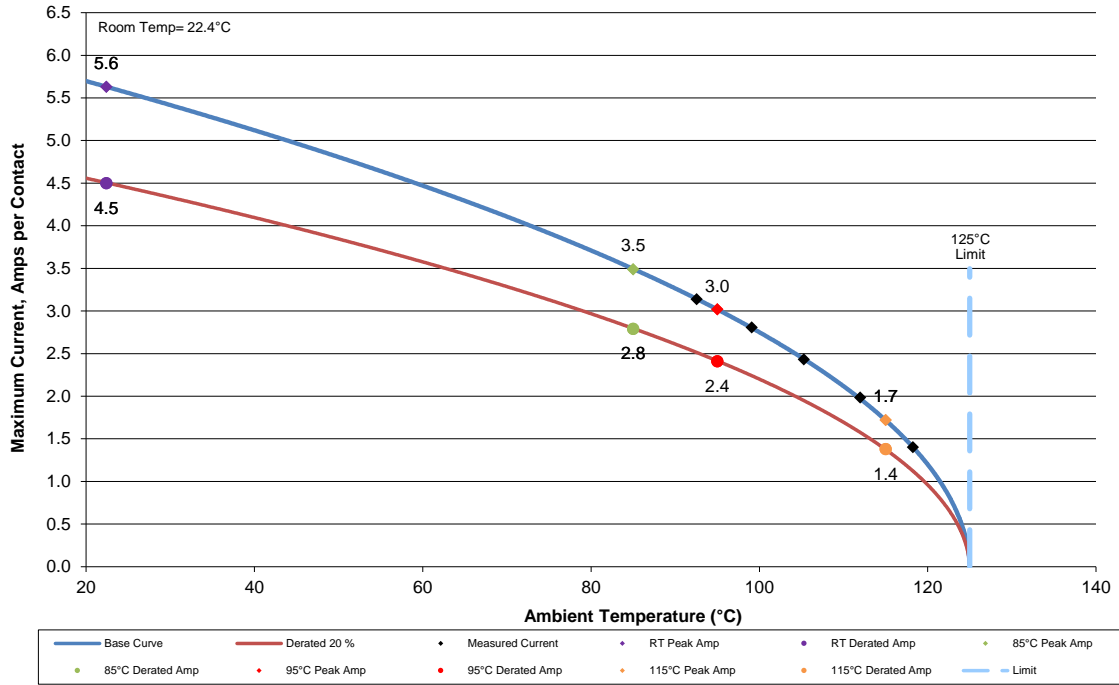
CR-1023101
 4(2x2) Contacts in Series
 Part Numbers: B1SDT-30-28-H-12.0-2/P1M-30-01-S-DV-TR



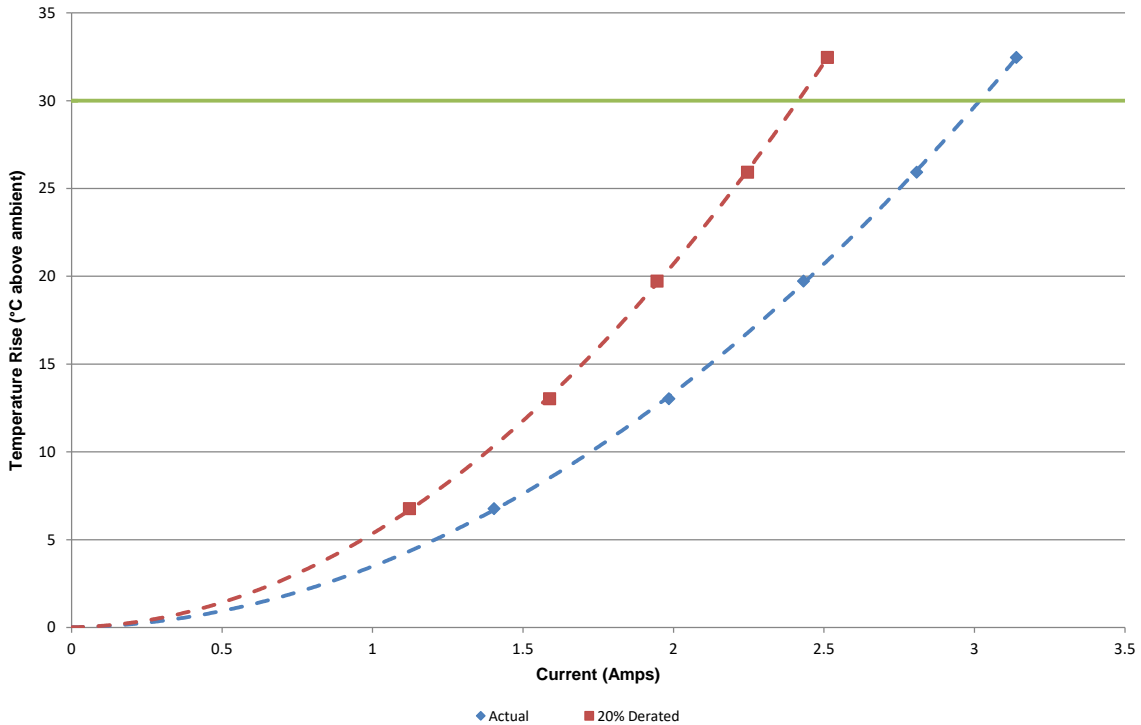
DATA SUMMARIES Continued

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

CR-1023101
 6(2x3) Contacts in Series
 Part Numbers: B1SDT-30-28-H-12.0-2/P1M-30-01-S-DV-TR
 Current Rating per Contact (30 Deg. Rise, 20% Derated) = 2.4 Amps



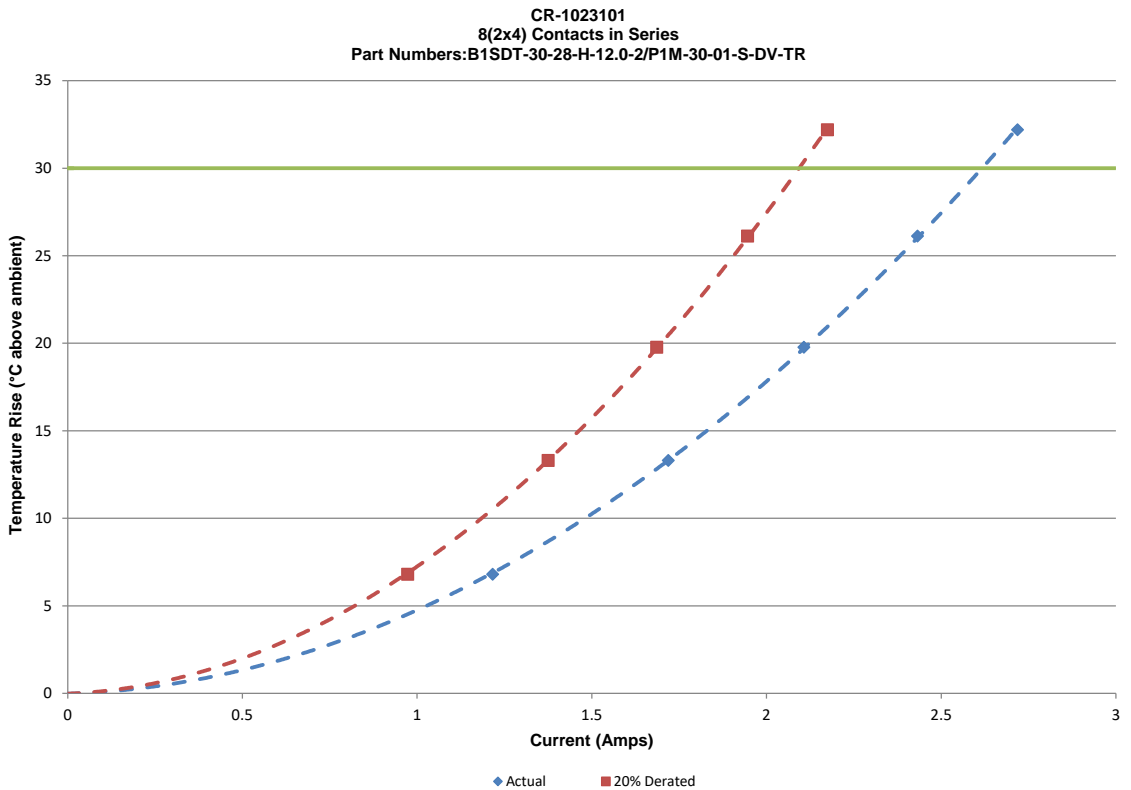
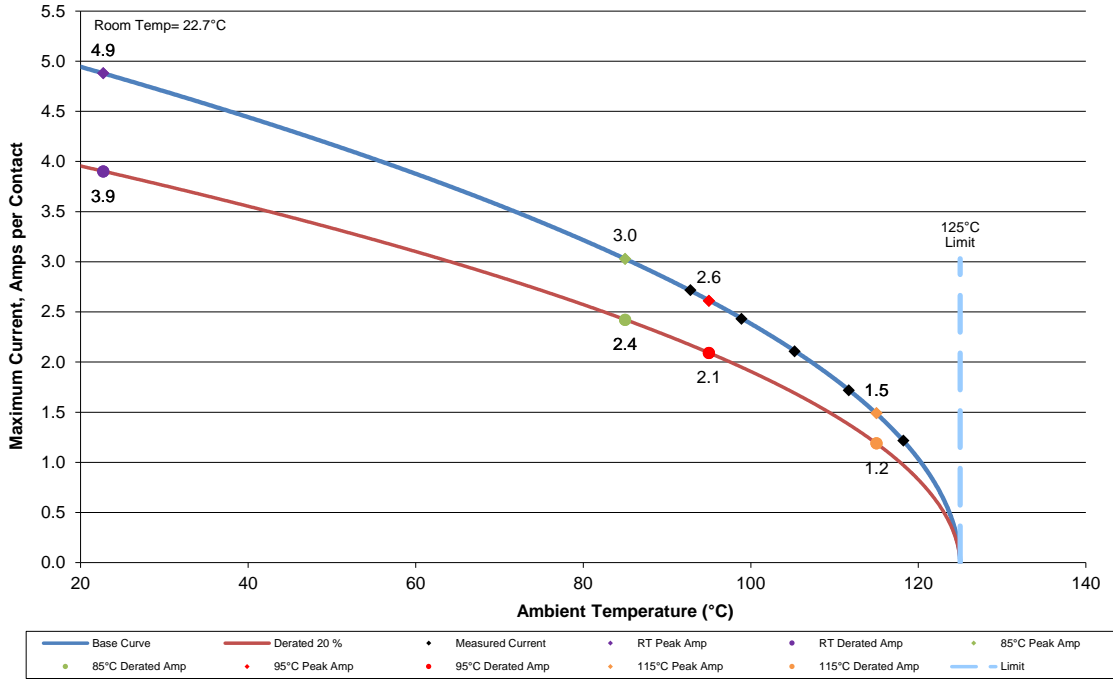
CR-1023101
 6(2x3) Contacts in Series
 Part Numbers: B1SDT-30-28-H-12.0-2/P1M-30-01-S-DV-TR



DATA SUMMARIES Continued

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

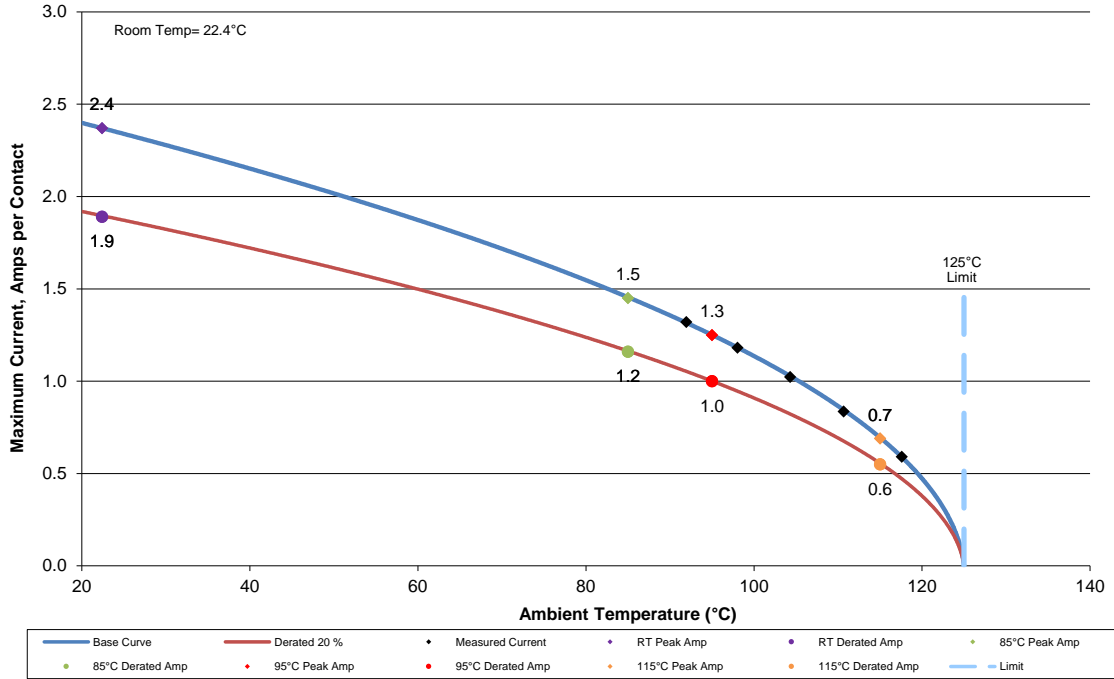
CR-1023101
 8(2x4) Contacts in Series
 Part Numbers: B1SDT-30-28-H-12.0-2/P1M-30-01-S-DV-TR
 Current Rating per Contact (30 Deg. Rise, 20% Derated) = 2.1 Amps



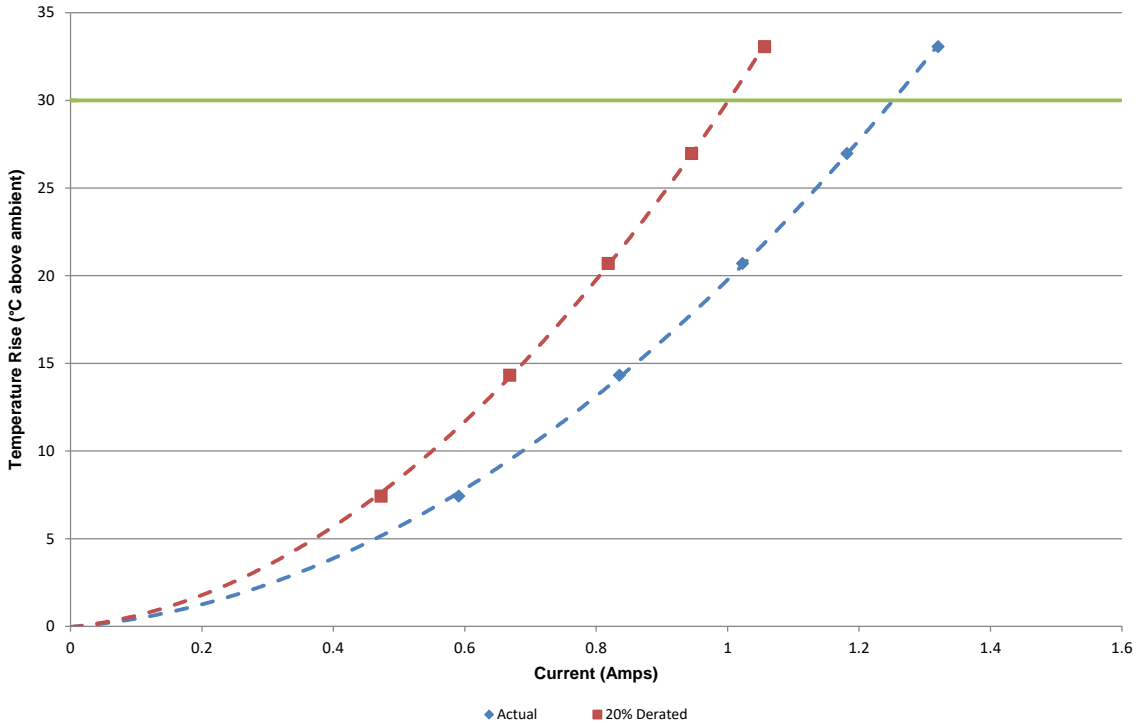
DATA SUMMARIES Continued

e. Linear configuration with All adjacent conductors/contacts powered.

CR-1023101
 60(2x30) Contacts in Series
 Part Numbers: B1SDT-30-28-H-12.0-2/P1M-30-01-S-DV-TR
 Current Rating per Contact (30 Deg. Rise, 20% Derated) = 1.0 Amps



CR-1023101
 60(2x30) Contacts in Series
 Part Numbers: B1SDT-30-28-H-12.0-2/P1M-30-01-S-DV-TR



DATA SUMMARIES Continued**MATING/UNMATING:****Mating/Unmating Durability Group**

	Initial				25 Cycles			
	Mating		Unmating		Mating		Unmating	
	Newton's	Force (Lbs)	Newton's	Force (Lbs)	Newton's	Force (Lbs)	Newton's	Force (Lbs)
Minimum	49.73	11.18	44.39	9.98	53.60	12.05	42.92	9.65
Maximum	60.23	13.54	51.95	11.68	59.74	13.43	52.49	11.80
Average	55.47	12.47	48.85	10.98	56.46	12.69	47.07	10.58
St Dev	3.38	0.76	2.27	0.51	1.99	0.45	3.41	0.77
Count	8	8	8	8	8	8	8	8
	50 Cycles				75 Cycles			
	Mating		Unmating		Mating		Unmating	
	Newton's	Force (Lbs)	Newton's	Force (Lbs)	Newton's	Force (Lbs)	Newton's	Force (Lbs)
Minimum	51.02	11.47	40.43	9.09	51.20	11.51	41.01	9.22
Maximum	56.67	12.74	55.64	12.51	58.80	13.22	57.38	12.90
Average	54.37	12.22	45.89	10.32	55.11	12.39	47.19	10.61
St Dev	1.84	0.41	5.37	1.21	2.56	0.58	5.86	1.32
Count	8	8	8	8	8	8	8	8
	100 Cycles				After Humidity			
	Mating		Unmating		Mating		Unmating	
	Newton's	Force (Lbs)	Newton's	Force (Lbs)	Newton's	Force (Lbs)	Newton's	Force (Lbs)
Minimum	52.84	11.88	42.70	9.60	46.08	10.36	39.85	8.96
Maximum	63.38	14.25	60.49	13.60	51.20	11.51	47.28	10.63
Average	56.89	12.79	49.31	11.09	49.15	11.05	43.14	9.70
St Dev	3.43	0.77	6.39	1.44	1.57	0.35	2.38	0.53
Count	8	8	8	8	8	8	8	8

DATA SUMMARIES Continued

Mating/Unmating Basic (B1SDT-10-28-H-06.0/ P1M-10-01-S-DV-TR)

	Initial				25 Cycles			
	Mating		Unmating		Mating		Unmating	
	Newton	Force (Lbs)	Newton	Force (Lbs)	Newton	Force (Lbs)	Newton	Force (Lbs)
Minimum	18.73	4.21	14.32	3.22	18.19	4.09	16.19	3.64
Maximum	24.38	5.48	19.13	4.30	25.80	5.80	21.93	4.93
Average	20.91	4.70	16.00	3.60	21.08	4.74	18.71	4.21
St Dev	1.96	0.44	1.49	0.34	2.37	0.53	1.70	0.38
Count	8	8	8	8	8	8	8	8
	50 Cycles				75 Cycles			
	Mating		Unmating		Mating		Unmating	
	Newton	Force (Lbs)	Newton	Force (Lbs)	Newton	Force (Lbs)	Newton	Force (Lbs)
Minimum	18.46	4.15	16.06	3.61	18.90	4.25	15.92	3.58
Maximum	25.04	5.63	21.44	4.82	25.35	5.70	22.33	5.02
Average	20.97	4.72	18.58	4.18	21.62	4.86	18.83	4.23
St Dev	1.95	0.44	2.18	0.49	1.93	0.43	2.23	0.50
Count	8	8	8	8	8	8	8	8
	100 Cycles							
	Mating		Unmating					
	Newton	Force (Lbs)	Newton	Force (Lbs)				
Minimum	19.44	4.37	16.32	3.67				
Maximum	27.67	6.22	23.17	5.21				
Average	22.03	4.95	19.02	4.28				
St Dev	2.47	0.56	2.55	0.57				
Count	8	8	8	8				

Cable Pull Force:
0° Pull

	Force (lbs)
Minimum	28.62
Maximum	57.71
Average	37.44

90° Pull

	Force (lbs)
Minimum	20.05
Maximum	46.68
Average	32.33

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

	Pin to Pin		
	Mated	Unmated	Unmated
Minimum	B1SDT-30/P1M-30	B1SDT-30	P1M-30
Initial	45000	45000	45000
Thermal	45000	45000	45000
Humidity	45000	45000	45000

	Row to Row		
	Mated	Unmated	Unmated
Minimum	B1SDT-30/P1M-30	B1SDT-30	P1M-30
Initial	45000	45000	45000
Thermal	45000	45000	45000
Humidity	45000	45000	45000

DIELECTRIC WITHSTANDING VOLTAGE (DWV):

Voltage Rating Summary	
Minimum	B1SDT-30/P1M-30
Break Down Voltage	1369
Test Voltage	1027
Working Voltage	342

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

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

DATA SUMMARIES Continued**Cable Flex:****Insulation Resistance minimums, IR**

Pin to Pin	
Mated	
Minimum	
Initial	45000
After Standard Flex 500 Cycles	45000
After Transverse Flex 500 Cycles	45000
Row to Row	
Mated	
Minimum	
Initial	45000
After Standard Flex 500 Cycles	45000
After Transverse Flex 500 Cycles	45000

Dielectric Withstanding Voltage minimums, DWV

Voltage Rating Summary	
Minimum	B1SDT-30/P1M-30
Break Down Voltage	1369
Test Voltage	1027
Working Voltage	342
Pin to Pin	
Initial Test Voltage	Passed
After Standard Flex 500 Cycles	Passed
After Transverse Flex 500 Cycles	Passed
Row to Row	
Initial Test Voltage	Passed
After Standard Flex 500 Cycles	Passed
After Transverse Flex 500 Cycles	Passed

DATA SUMMARIES Continued

LLCR Durability:

- 1) A total of 192 points were measured.
- 2) EIA-364-23, *Low Level Contact Resistance Test Procedure for Electrical Connectors and Sockets*.
- 3) A computer program, *LLCR 221.exe*, ensures repeatability for data acquisition.
- 4) The following guidelines are used to categorize the changes in LLCR as a result from stressing.
 - a. $\leq +5.0$ mOhms: -----Stable
 - b. $+5.1$ to $+10.0$ mOhms: -----Minor
 - c. $+10.1$ to $+15.0$ mOhms: -----Acceptable
 - d. $+15.1$ to $+50.0$ mOhms: -----Marginal
 - e. $+50.1$ to $+1000$ mOhms: -----Unstable
 - f. $>+1000$ mOhms: -----Open Failure

LLCR Measurement Summaries by Pin Type				
Date	2023/12/20	2023/12/22	2023/12/27	2024/1/9
Room Temp (Deg C)	22	22	22	22
Rel Humidity (%)	37	39	39	40
Technician	Richard Ison	Richard Ison	Richard Ison	Richard Ison
mOhm values				
	Actual Initial	Delta 100 Cycles	Delta Therm Shck	Delta Humidity
Pin Type: Signal 1				
Average	37.12	0.16	0.3	0.4
St. Dev.	0.47	0.11	0.27	0.35
Min	35.82	0	0	0
Max	38.52	0.54	1.65	1.95
Summary Count	192	192	192	192
Total Count	192	192	192	192

LLCR Delta Count by Category						
	Stable	Minor	Acceptable	Marginal	Unstable	Open
mOhms	≤ 5	$>5 \ \& \ \leq 10$	$>10 \ \& \ \leq 15$	$>15 \ \& \ \leq 50$	$>50 \ \& \ \leq 1000$	>1000
100 Cycles	192	0	0	0	0	0
Therm Shck	192	0	0	0	0	0
Humidity	192	0	0	0	0	0

DATA SUMMARIES Continued

LLCR Gas Tight:

- 1) A total of 192 points were measured.
- 2) EIA-364-23, *Low Level Contact Resistance Test Procedure for Electrical Connectors and Sockets*.
- 3) A computer program, *LLCR 221.exe*, ensures repeatability for data acquisition.
- 4) The following guidelines are used to categorize the changes in LLCR as a result from stressing.
 - a. $\leq +5.0$ mOhms: -----Stable
 - b. $+5.1$ to $+10.0$ mOhms: -----Minor
 - c. $+10.1$ to $+15.0$ mOhms: -----Acceptable
 - d. $+15.1$ to $+50.0$ mOhms: -----Marginal
 - e. $+50.1$ to $+1000$ mOhms: -----Unstable
 - f. $>+1000$ mOhms: -----Open Failure

LLCR Measurement Summaries by Pin Type			
Date	2023/12/20	2023/12/28	
Room Temp (Deg C)	22	22	
Rel Humidity (%)	26	40	
Technician	Richard Ison	Richard Ison	
mOhm values	Actual	Delta	
	Initial	Acid Vapor	
Pin Type: Signal 1			
Average	37.02	0.21	
St. Dev.	0.49	0.2	
Min	35.81	0	
Max	38.69	1.66	
Summary Count	192	192	
Total Count	192	192	

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

DATA SUMMARIES Continued

LLCR Shock &Vibration:

- 1). A total of 192 points were measured.
- 2). EIA-364-23, *Low Level Contact Resistance Test Procedure for Electrical Connectors and Sockets.*
- 3). The following guidelines are used to categorize the changes in LLCR as a result from stressing.
 - a. $\leq +5.0$ mOhms: -----Stable
 - b. $+5.1$ to $+10.0$ mOhms: -----Minor
 - c. $+10.1$ to $+15.0$ mOhms: -----Acceptable
 - d. $+15.1$ to $+50.0$ mOhms: -----Marginal
 - e. $+50.1$ to $+1000$ mOhms -----Unstable
 - f. $>+1000$ mOhms:-----Open Failure

LLCR Measurement Summaries by Pin Type			
Date	2024/1/9	2024/1/22	
Room Temp (Deg C)	22	22	
Rel Humidity (%)	40	23	
Technician	Richard Ison	Richard Ison	
mOhm values	Actual	Delta	
	Initial	Shock-Vib	
Pin Type: Signal 1			
Average	67.94	0.28	
St. Dev.	0.72	0.36	
Min	66.37	0	
Max	70.06	3.91	
Summary Count	192	192	
Total Count	192	192	

LLCR Delta Count by Category						
	Stable	Minor	Acceptable	Marginal	Unstable	Open
mOhms	≤ 5	$>5 \ \& \ \leq 10$	$>10 \ \& \ \leq 15$	$>15 \ \& \ \leq 50$	$>50 \ \& \ \leq 1000$	>1000
Shock-Vib	192	0	0	0	0	0

Nanosecond Event Detection:

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

EQUIPMENT AND CALIBRATION SCHEDULES**Equipment #:** TCT-04**Description:** Dillon Quantrol TC21 25-1000 mm/min series test stand**Manufacturer:** Dillon Quantrol**Model:** TC2 I series test stand**Serial #:** 04-1041-04**Accuracy:** Speed Accuracy: +/- 5% of indicated speed; Speed Accuracy: +/- 5% of indicated speed;
... Last Cal: 05/29/2023, Next Cal: 05/29/2024**Equipment #:** MO-11**Description:** Switch/Multimeter**Manufacturer:** Keithley**Model:** 3706**Serial #:** 120169**Accuracy:** See Manual

... Last Cal: 09/11/2023, Next Cal: 09/11/2024

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: 06/30/2023, Next Cal: 06/30/2024

Equipment #: THC-05**Description:** Temperature/Humidity Chamber (Chamber Room)**Manufacturer:** Thermotron**Model:** SM-8-3800**Serial #:** 05 23 00 02**Accuracy:** See Manual

... Last Cal: 11/14/2023, Next Cal: 11/14/2024

Equipment #: HPT-01**Description:** Hipot Safety Tester**Manufacturer:** Vitrek**Model:** V73**Serial #:** 019808**Accuracy:**

... Last Cal: 05/15/2023, Next Cal: 05/15/2024

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

... Last Cal: 09/11/2023, Next Cal: 09/11/2024

EQUIPMENT AND CALIBRATION SCHEDULES**Equipment #:** SVC-01**Description:** Shock & Vibration Table**Manufacturer:** Data Physics**Model:** LE-DSA-10-20K**Serial #:** 10037**Accuracy:** See Manual

... Last Cal: 04/22/2023, Next Cal: 04/22/2024

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

... Last Cal: 07/18/2023, Next Cal: 07/18/2024

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

... Last Cal: 10/31/2023, Next Cal: 10/31/2024