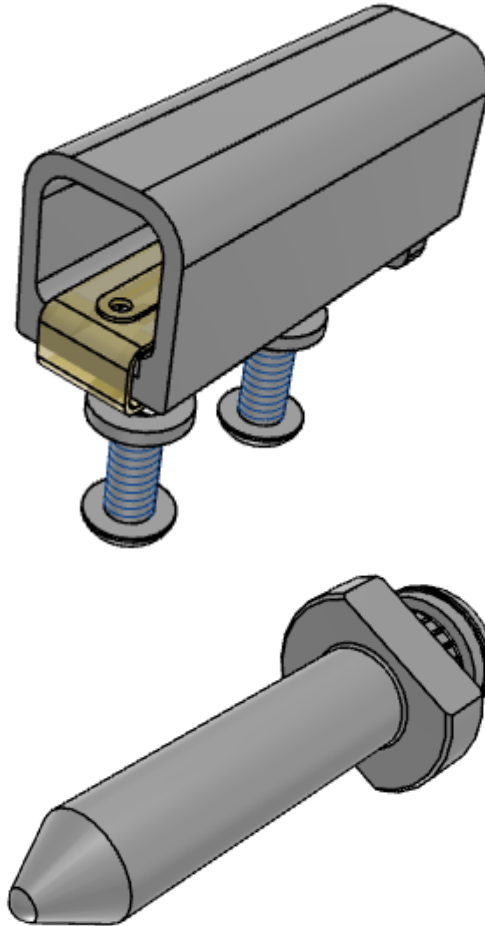




Project Number: Design Qualification Test Report	Tracking Code: CR-1389003_Report_Rev_1
Requested by: Eddie Wang	Date: 7/3/2026
Part #: GPSKM-01-01-1\GPPKM-01-01-1	
Part description: GPSKM\GPPKM	Tech: Peter Chen
Test Start: 2/26/2026	Test Completed: 3/16/2026



DESIGN QUALIFICATION TEST REPORT

GPSKM\GPPKM
GPSKM-01-01-1\GPPKM-01-01-1

Tracking Code: CR-1389003 Report Rev 1	Part #: GPSKM-01-01-1\GPPKM-01-01-1
Part description: GPSKM\GPPKM	

REVISION HISTORY

DATA	REV.NUM.	DESCRIPTION	ENG
7/3/2026	1	Initial Issue	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 customer specified 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 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 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-114000-TST.

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

GPSKM-01-01-1

GPPKM-01-01-1

8 Assemblies

Step	Description
1.	LLCR ⁽¹⁾
2.	Mating/Unmating Force ⁽²⁾
3.	Cycles Quantity = 100 Cycles
4.	LLCR ⁽¹⁾
5.	Mating/Unmating Force ⁽²⁾
6.	Cycles Quantity = 100 Cycles
7.	LLCR ⁽¹⁾
8.	Mating/Unmating Force ⁽²⁾
9.	Cycles Quantity = 100 Cycles
10.	LLCR ⁽¹⁾
11.	Mating/Unmating Force ⁽²⁾
12.	Cycles Quantity = 100 Cycles
13.	LLCR ⁽¹⁾
14.	Mating/Unmating Force ⁽²⁾
15.	Cycles Quantity = 100 Cycles
16.	LLCR ⁽¹⁾
17.	Thermal Shock ⁽³⁾
18.	LLCR ⁽¹⁾

(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 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

GPSKM-01-01-1

GPPKM-01-01-1

1 Pins Powered

Ground

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

(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

ATTRIBUTE DEFINITIONS

The following is a brief, simplified description of attributes.

LLCR:

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

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.

THERMAL SHOCK:

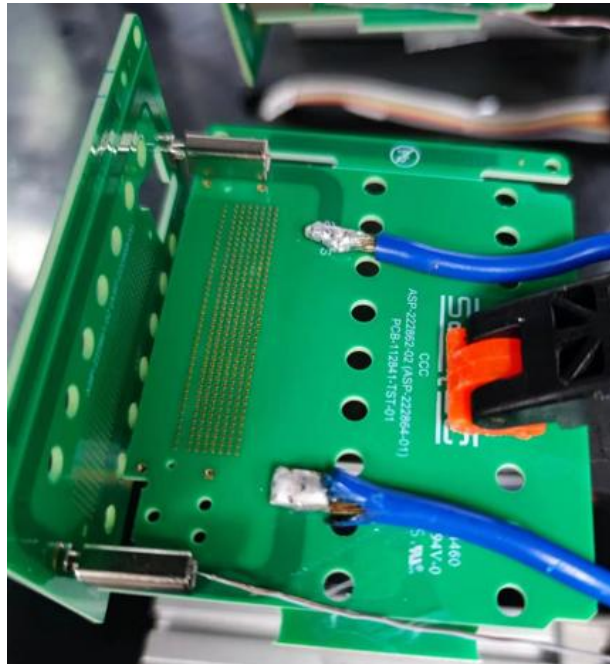
- 1) EIA-364-32, *Thermal Shock (Temperature Cycling) Test Procedure for Electrical Connectors*.
- 2) Test Condition 1: -55°C to $+85^{\circ}\text{C}$
- 3) Test Time: $\frac{1}{2}$ hour dwell at each temperature extreme
- 4) Number of Cycles: 100
- 5) All test samples are pre-conditioned at ambient.
- 6) All test samples are exposed to environmental stress in mated conditions.

ATTRIBUTE DEFINITIONS Continued

The following is a brief, simplified description of attributes.

TEMPERATURE RISE (Current Carrying Capacity, CCC):

- 1) EIA-364-70, *Temperature Rise versus Current Test Procedure for Electrical Connectors and Sockets*.
- 2) When current passes through a contact, the temperature of the contact increases as a result of I^2R (resistive) heating.
- 3) The number of contacts being investigated plays a significant part in power dissipation and therefore temperature rise.
- 4) The size of the temperature probe can affect the measured temperature.
- 5) Copper traces on PC boards will contribute to temperature rise:
 - a. Self-heating (resistive)
 - b. Reduction in heat sink capacity affecting the heated contacts
- 6) A de-rating curve, usually 20%, is calculated.
- 7) Calculated de-rated currents at three temperature points are reported:
 - a. Ambient
 - b. 80° C
 - c. 95° C
 - d. 115° C
- 8) Typically, neighboring contacts (in close proximity to maximize heat build up) are energized.
- 9) The thermocouple (or temperature measuring probe) will be positioned at a location to sense the maximum temperature in the vicinity of the heat generation area.
- 10) A computer program, *TR 803.exe*, ensures accurate stability for data acquisition.
- 11) Hook-up wire cross section is larger than the cross section of any connector leads/PC board traces, jumpers, etc.
- 12) Hook-up wire length is longer than the minimum specified in the referencing standard.



Setup image

RESULTS

Temperature Rise, CCC at a 20% de-rating

- CCC for a 30°C Temperature Rise-----6.6 A per contact with 2 contacts (1 x 2) powered.

Mating-Unmating Force

- Initial
 - Mating
 - Min ----- 0.07 Lbs
 - Max ----- 0.12 Lbs
 - Unmating
 - Min ----- 0.04 Lbs
 - Max ----- 0.08 Lbs
- After 100 Cycles
 - Mating
 - Min ----- 0.09 Lbs
 - Max ----- 0.16 Lbs
 - Unmating
 - Min ----- 0.04 Lbs
 - Max ----- 0.15 Lbs
- After 200 Cycles
 - Mating
 - Min ----- 0.10 Lbs
 - Max ----- 0.16 Lbs
 - Unmating
 - Min ----- 0.05 Lbs
 - Max ----- 0.08 Lbs
- After 300 Cycles
 - Mating
 - Min ----- 0.10 Lbs
 - Max ----- 0.18 Lbs
 - Unmating
 - Min ----- 0.05 Lbs
 - Max ----- 0.09 Lbs
- After 400 Cycles
 - Mating
 - Min ----- 0.12 Lbs
 - Max ----- 0.16 Lbs
 - Unmating
 - Min ----- 0.08 Lbs
 - Max ----- 0.10 Lbs
- After 500 Cycles
 - Mating
 - Min ----- 0.12 Lbs
 - Max ----- 0.17 Lbs
 - Unmating
 - Min ----- 0.06 Lbs
 - Max ----- 0.17 Lbs

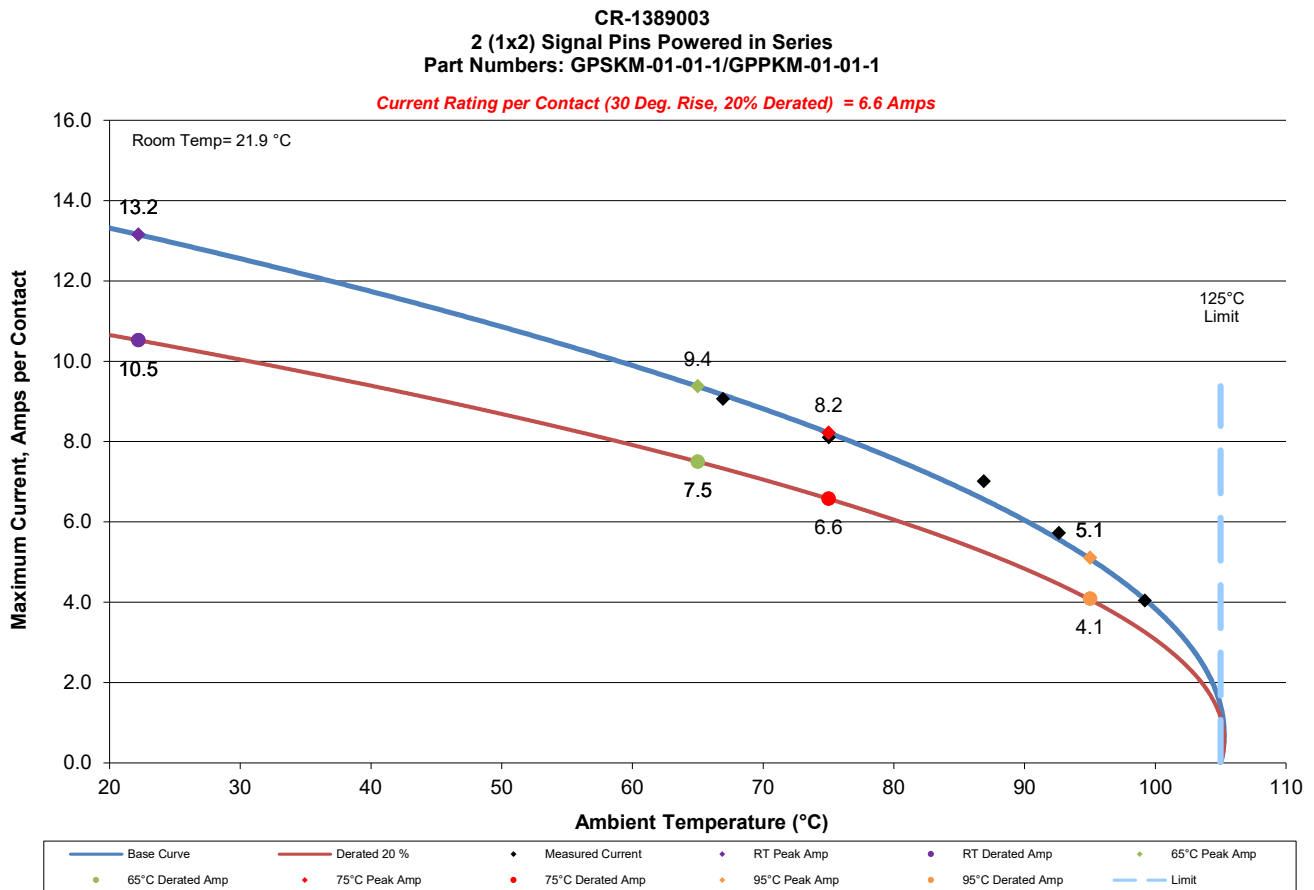
RESULTS Continued**LLCR Mating/Unmating Durability (16 LLCR test points)**

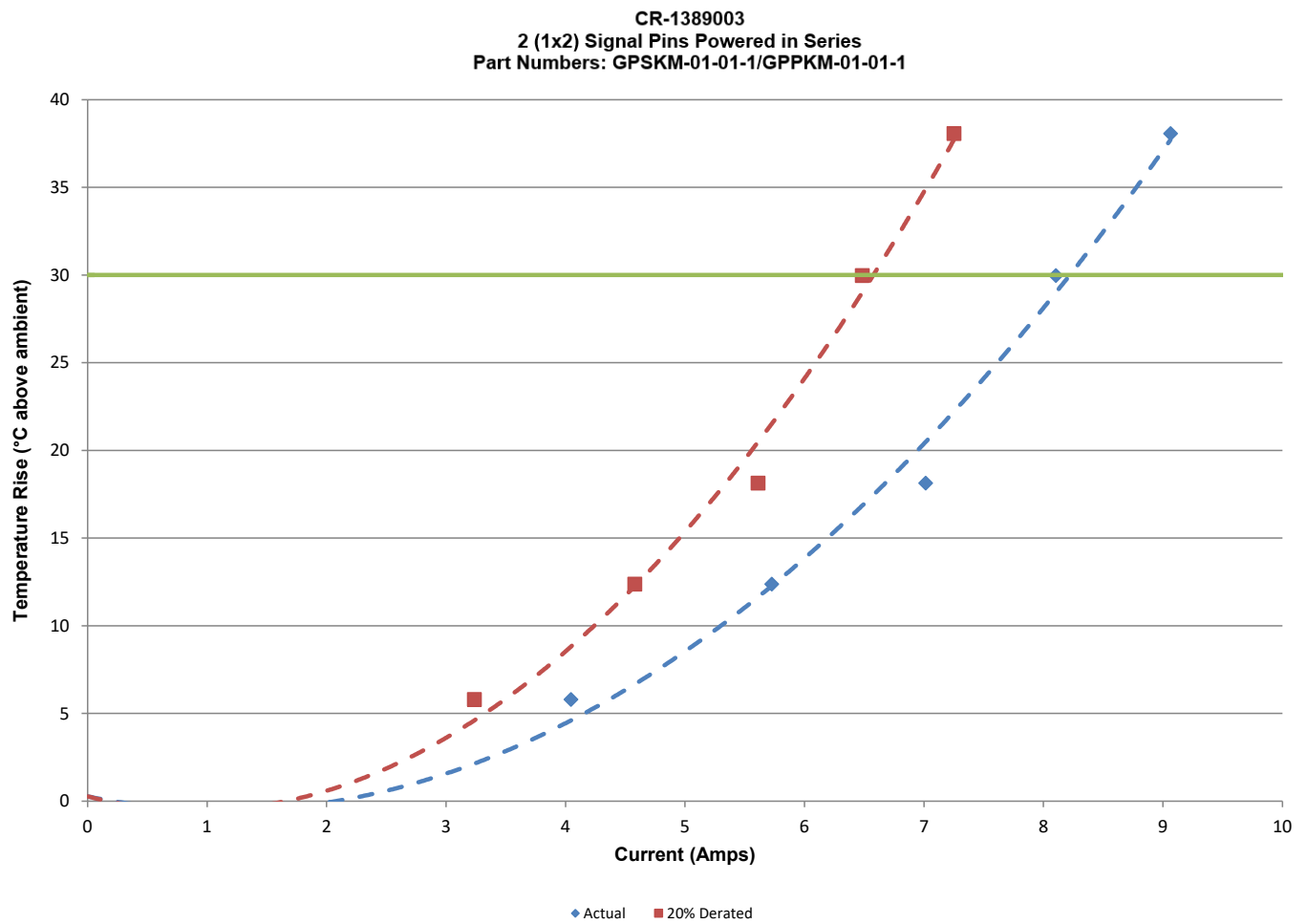
Initial-----7.99 mOhms Max

- **Durability, 100 Cycles**
 - <= +5.0 mOhms-----16 Points-----Stable
 - +5.1 to +10.0 mOhms-----0 Points-----Minor
 - +10.1 to +15.0 mOhms-----0 Points-----Acceptable
 - +15.1 to +50.0 mOhms-----0 Points-----Marginal
 - +50.1 to +1000 mOhms-----0 Points-----Unstable
 - >+1000 mOhms-----0 Points-----Open Failure
- **Durability, 200 Cycles**
 - <= +5.0 mOhms-----16 Points-----Stable
 - +5.1 to +10.0 mOhms-----0 Points-----Minor
 - +10.1 to +15.0 mOhms-----0 Points-----Acceptable
 - +15.1 to +50.0 mOhms-----0 Points-----Marginal
 - +50.1 to +1000 mOhms-----0 Points-----Unstable
 - >+1000 mOhms-----0 Points-----Open Failure
- **Durability, 300 Cycles**
 - <= +5.0 mOhms-----16 Points-----Stable
 - +5.1 to +10.0 mOhms-----0 Points-----Minor
 - +10.1 to +15.0 mOhms-----0 Points-----Acceptable
 - +15.1 to +50.0 mOhms-----0 Points-----Marginal
 - +50.1 to +1000 mOhms-----0 Points-----Unstable
 - >+1000 mOhms-----0 Points-----Open Failure
- **Durability, 400 Cycles**
 - <= +5.0 mOhms-----16 Points-----Stable
 - +5.1 to +10.0 mOhms-----0 Points-----Minor
 - +10.1 to +15.0 mOhms-----0 Points-----Acceptable
 - +15.1 to +50.0 mOhms-----0 Points-----Marginal
 - +50.1 to +1000 mOhms-----0 Points-----Unstable
 - >+1000 mOhms-----0 Points-----Open Failure
- **Durability, 500 Cycles**
 - <= +5.0 mOhms-----16 Points-----Stable
 - +5.1 to +10.0 mOhms-----0 Points-----Minor
 - +10.1 to +15.0 mOhms-----0 Points-----Acceptable
 - +15.1 to +50.0 mOhms-----0 Points-----Marginal
 - +50.1 to +1000 mOhms-----0 Points-----Unstable
 - >+1000 mOhms-----0 Points-----Open Failure
- **Thermal Shock**
 - <= +5.0 mOhms-----16 Points-----Stable
 - +5.1 to +10.0 mOhms-----0 Points-----Minor
 - +10.1 to +15.0 mOhms-----0 Points-----Acceptable
 - +15.1 to +50.0 mOhms-----0 Points-----Marginal
 - +50.1 to +1000 mOhms-----0 Points-----Unstable
 - >+1000 mOhms-----0 Points-----Open Failure

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.



DATA SUMMARIES Continued

DATA SUMMARIES Continued**MATING-UNMATING FORCE:**

	Initial				After 100 Cycles			
	Mating		Unmating		Mating		Unmating	
	Newtons	Force (Lbs)	Newtons	Force (Lbs)	Newtons	Force (Lbs)	Newtons	Force (Lbs)
Minimum	0.31	0.07	0.18	0.04	0.40	0.09	0.18	0.04
Maximum	0.53	0.12	0.36	0.08	0.71	0.16	0.67	0.15
Average	0.41	0.09	0.26	0.06	0.48	0.11	0.35	0.08
St Dev	0.06	0.01	0.06	0.01	0.11	0.03	0.14	0.03
Count	8	8	8	8	8	8	8	8
	After 200 Cycles				After 300 Cycles			
	Mating		Unmating		Mating		Unmating	
	Newtons	Force (Lbs)	Newtons	Force (Lbs)	Newtons	Force (Lbs)	Newtons	Force (Lbs)
Minimum	0.44	0.10	0.22	0.05	0.44	0.10	0.22	0.05
Maximum	0.71	0.16	0.36	0.08	0.80	0.18	0.40	0.09
Average	0.52	0.12	0.30	0.07	0.56	0.13	0.30	0.07
St Dev	0.09	0.02	0.05	0.01	0.11	0.02	0.07	0.01
Count	8	8	8	8	8	8	8	8
	After 400 Cycles				After 500 Cycles			
	Mating		Unmating		Mating		Unmating	
	Newtons	Force (Lbs)	Newtons	Force (Lbs)	Newtons	Force (Lbs)	Newtons	Force (Lbs)
Minimum	0.53	0.12	0.36	0.08	0.53	0.12	0.27	0.06
Maximum	0.71	0.16	0.44	0.10	0.76	0.17	0.76	0.17
Average	0.63	0.14	0.39	0.09	0.63	0.14	0.42	0.10
St Dev	0.07	0.02	0.04	0.01	0.09	0.02	0.15	0.03
Count	8	8	8	8	8	8	8	8

DATA SUMMARIES Continued**LLCR Mating/Unmating Durability Group**

- 1). A total of 16 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	2026/2/26	2026/3/5	2026/3/5	2026/3/5	2026/3/5	2026/3/5	2026/3/16
Room Temp (Deg C)	23	24	24	24	24	24	24
Rel Humidity (%)	51	52	52	52	52	52	52
Technician	Peter Chen	Peter Chen	Peter Chen	Peter Chen	Peter Chen	Peter Chen	Peter Chen
mOhm values	Actual	Delta	Delta	Delta	Delta	Delta	Delta
	Initial	100 Cycles	200 Cycles	300 Cycles	400 Cycles	500 Cycles	Therm Shck
Pin Type: GND							
Average	5.92	0.87	1.00	1.24	0.98	1.44	1.23
St. Dev.	0.90	0.63	0.65	1.02	0.89	1.08	0.97
Min	4.06	0.04	0.09	0.01	0.08	0.10	0.18
Max	7.99	1.94	2.27	3.14	3.57	3.76	3.29
Summary Count	16	16	16	16	16	16	16
Total Count	16	16	16	16	16	16	16

LLCR Delta Count by Category						
	Stable	Minor	Acceptable	Marginal	Unstable	Open
mOhms	≤ 5	$>5 \text{ \& } \leq 10$	$>10 \text{ \& } \leq 15$	$>15 \text{ \& } \leq 50$	$>50 \text{ \& } \leq 1000$	>1000
100 Cycles	16	0	0	0	0	0
200 Cycles	16	0	0	0	0	0
300 Cycles	16	0	0	0	0	0
400 Cycles	16	0	0	0	0	0
500 Cycles	16	0	0	0	0	0
Therm Shck	16	0	0	0	0	0

EQUIPMENT AND CALIBRATION SCHEDULES**Equipment #:** HZ-TCT-01**Description:** Normal force analyzer**Manufacturer:** Mecmesin Multitester**Model:** Mecmesin Multitester 2.5-i**Serial #:** 08-1049-04**Accuracy:** Last Cal: 4/25/2025, Next Cal: 4/24/2026**Equipment #:** HZ-MO-05**Description:** Micro-ohmmeter**Manufacturer:** Keithley**Model:** 3706**Serial #:** 1285188**Accuracy:** Last Cal: 11/14/2025, Next Cal: 11/13/2026**Equipment #:** HZ-TSC-01**Description:** Vertical Thermal Shock Chamber**Manufacturer:** Cincinnatti Sub Zero**Model:** VTS-3-6-6-SC/AC**Serial #:** 10-VT14994**Accuracy:** See Manual

... Last Cal: 06/26/2025, Next Cal: 06/25/2026

Equipment #: HZ-MO-01**Description:** Multimeter /Data Acquisition System**Manufacturer:** Keithley**Model:** 2700**Serial #:** 1199807**Accuracy:** See Manual

... Last Cal: 07/01/2025, Next Cal: 06/30/2026