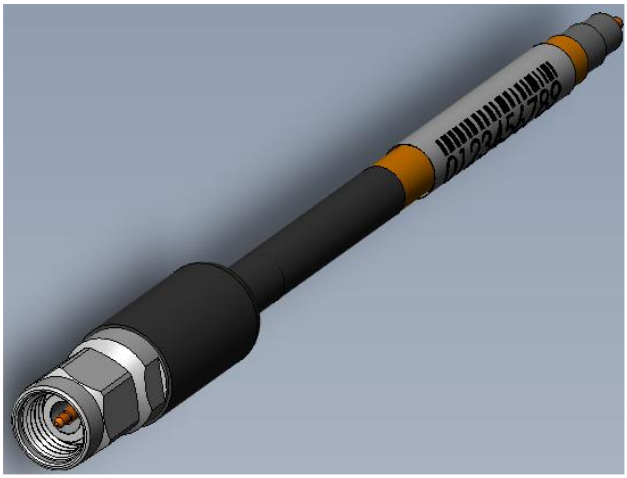
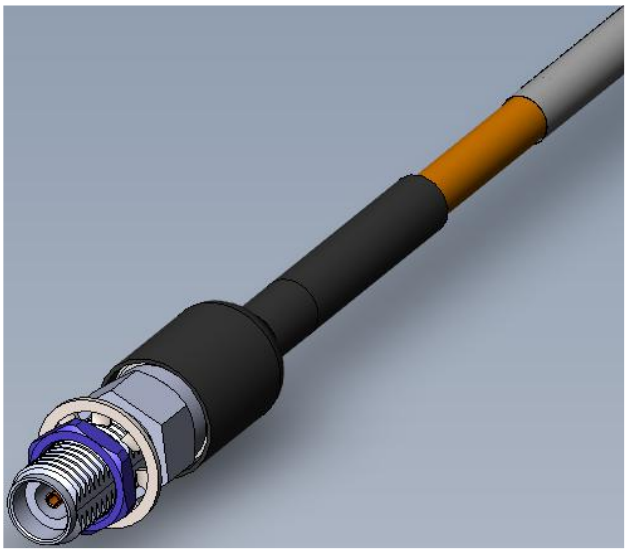
Project Number: Design Qualification Test Report	Tracking Code: CR-1419402_Report_Rev_1
Requested by: Tom Yahav	Date: 5/28/2026
Part #: LL032-01SP-505050-0152/LL043-01BJ-505050-0152	
Part description: LL032/LL043	Tech: Brian Stemle
Test Start: 3/27/2026	Test Completed: 5/8/2026





DESIGN QUALIFICATION TEST REPORT

LL032/LL043
LL032-01SP-505050-0152/LL043-01BJ-505050-0152

REVISION HISTORY

DATA	REV.NUM.	DESCRIPTION	ENG
5/28/2026	**1**	**Initial Issue**	**KH**

CERTIFICATION

All instruments and measuring equipment were calibrated to National Institute for Standards and Technology (NIST) traceable standards according to 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: MIL-PRF-39012.

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) Parts not intended for testing LLCR and DWV/IR are visually inspected and cleaned if necessary.
4) Any additional preparation will be noted in the individual test sequences.

FLOWCHARTS

Mating/Unmating/Durability

Note: The Mating/Unmating/Durability group in this test plan can be qaulified by similarity using the results from the MUD testing done on the LL043-01SP-505050-0152 and LL043-01BJ-505050-0152 qualification test. Reference Tracking Code: CR-1133501_Report_Rev_1 for results

Group 1
LL032-01SP-505050-0152
LL043-01BJ-505050-0152
0 Assemblies

Step	Description
1.	Length & Mass
2.	Interface Gaging MAX. CONTACT DEPTH = 0.008 "
3.	DWV at Test Voltage(1) - Non Standard DWV = 500 VAC
4.	LLCR (2) - Non Standard *Note: Signal and ground.*
5.	Cycles Quantity = 500 Cycles *Note: By hand. Torque each time to 8 in-lbs. Rotate plug coupling nut only. Do not rotate entire assembly. MIL-PRF-39012, Paragraph. 4.6.12*
6.	LLCR (2) - Non Standard Max Delta = 15 mOhm *Note: Signal and ground.*
7.	Interface Gaging MAX. CONTACT DEPTH = 0.008 "

(1) DWV at Test Voltage = Other
Test Condition = 1 (Sea Level) Test voltage applied for 60 seconds
MIL-PRF-39012, Paragraph. 4.6.14 per MIL-STD-202-301

(2) LLCR = Other
Open Circuit Voltage = 20 mV Max
Test Current = 100 mA Max
MIL-PRF-39012, Paragraph 4.6.13 except current to be 100mA nominal and voltage to be 20 mV maximum.

FLOWCHARTS Continued

IR/DWV

Pin-to-Ground

Group 1

LL032-01SP-505050-0152

LL043-01BJ-505050-0152

4 Assemblies

Step	Description
1.	Length & Mass
2.	Interface Gaging MAX. CONTACT DEPTH = 0.008 "
3.	IR (2) - Non Standard
4.	DWV at Test Voltage(1) - Non Standard Test Voltage = 500 VAC
5.	LLCR (3) - Non Standard *Note: Signal and ground.*
6.	Thermal Shock (4) - Non Standard
7.	IR (2) - Non Standard
8.	DWV at Test Voltage(1) - Non Standard Test Voltage = 500 VAC
9.	LLCR (3) - Non Standard Max Delta = 15 mOhm *Note: Signal and ground.*
10.	Interface Gaging MAX. CONTACT DEPTH = 0.008 "

(1) DWV at Test Voltage = Other
Test Condition = 1 (Sea Level) Test voltage applied for 60 seconds
MIL-PRF-39012, Paragraph. 4.6.14 per MIL-STD-202-301

(2) IR = Other
Test Condition = 500V DC, 2 Minutes Max
MIL-PRF-39012, Paragraph 4.6.8 per MIL-STD-202-302

(3) LLCR = Other
Open Circuit Voltage = 20 mV Max
Test Current = 100 mA Max
MIL-PRF-39012, Paragraph 4.6.13 except current to be 100mA nominal and voltage to be 20 mV maximum.

(4) Thermal Shock = Other
Exposure Time at Temperature Extremes = 1/2 Hour
Test Condition = I (-65°C to +125°C)
Test Duration = test condition B except 10 cycles instead of 5.
MIL-PRF-39012, Paragraph. 4.6.17 per MIL-STD-202-107

FLOWCHARTS Continued

Cable Pull

Group 1
LL032-01SP-505050-0152
4 Assemblies
0 Degrees

Step	Description
1.	Cable Retention (2) - Non Standard *Note: Pull-to-destruct.*

Group 2
LL032-01SP-505050-0152
LL043-01BJ-505050-0152
4 Assemblies
0 Degrees

Step	Description
1.	Length & Mass
2.	Interface Gaging MAX. CONTACT DEPTH = 0.008 "
3.	LLCR (3) - Non Standard *Note: Signal and ground.*
4.	Cable Retention (1) - Non Standard *Note: Apply 25 pounds (11.3 kg) for Cable Retention test.*
5.	LLCR (3) - Non Standard *Note: Signal and ground.*
6.	Interface Gaging MAX. CONTACT DEPTH = 0.008 "

(1) Cable Retention = Other
Apply 25 pounds (11.3 kg) for Cable Retention test.
MIL-PRF-39012, Paragraph 4.6.21

(2) Cable Retention = Other
Pull-to-destruct.
MIL-PRF-39012, Paragraph 4.6.21

(3) LLCR = Other
Open Circuit Voltage = 20 mV Max
Test Current = 100 mA Max
MIL-PRF-39012, Paragraph 4.6.13 except current to be 100mA nominal and voltage to be 20 mV maximum.

ATTRIBUTE DEFINITIONS

The following is a brief, simplified description of attributes.

THERMAL SHOCK:

1) MIL-PRF-39012, paragraph. 4.6.17 per MIL-STD-202-107.
2) Test Condition I: -65°C to +125°C
3) Test Time: ½ hour dwell at each temperature extreme
4) Test Duration: test condition B except 10 cycles instead of 5.
5) All test samples are pre-conditioned at ambient.
6) All test samples are exposed to environmental stress in mated conditions.

LLCR:

1) MIL-PRF-39012, Paragraph 4.6.13 except current to be 100 mA nominal and voltage to be 20 mV maximum.
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 of stress
    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 +1000 mOhms: ----------Unstable
    f. >+1000 mOhms:----------Open Failure

CABLE RETENTION:

1) Pull to destruct.
2) MIL-PRF-30192, paragraph. 4.6.21.

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: MIL-PRF-39012, paragraph. 4.6.8 per MIL-STD-202-302.
    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: MIL-PRF-39012, paragraph. 4.6.14 per MIL-STD-202-301.
    b. Test Conditions:
        i. Between Adjacent Contacts or Signal-to-Ground
        ii. Barometric Test Condition 1(Sea Level) Test voltage applied for 60 seconds.
        iii. Rate of Application 500 V/Sec
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).

RESULTS

Cable Pull force

LL032-01SP-505050-0152

- **Min ---------- 95.59 lbs**
- **Max ---------- 100.80 lbs**

Insulation Resistance minimums, IR

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

Dielectric Withstanding Voltage minimums, DWV

- **Minimums**
  - **Test Voltage ---------- 500 VAC**

Mating-Unmating Durability Group

- **Initial DWV ---------- Passed**

IR\DWV Group

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

Interface Gaging

Mating-Unmating Durability Group

Initial

- **Min ---------- 0.00050 in**
- **Max ---------- 0.00250 in**

After 500 cycles

- **Min ---------- 0.00040 in**
- **Max ---------- 0.00230 in**

IR\DWV Group

Initial

- **Min ---------- 0.00050 in**
- **Max ---------- 0.00230 in**

After Thermal Shock

- **Min ---------- 0.00210 in**
- **Max ---------- 0.00020 in**

Cable Pull Group

Initial

- **Min ---------- 0.00130 in**
- **Max ---------- 0.00220 in**

After 25 Ib Retention Force

- **Min ---------- 0.00140 in**
- **Max ---------- 0.00240 in**

RESULTS Continued

LLCR IR/DWV (4 ground and 4 signal LLCR test points)

Signal pin

- **Initial ---------- 8.69 mOhms Max**
- **Thermal Shock**
  - **<= +5.0 mOhms ---------- 4 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**

Ground pin

- **Initial ---------- 7.40 mOhms Max**
- **Thermal Shock**
  - **<= +5.0 mOhms ---------- 4 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 Mate/Unmate Durability (4 ground and 4 signal LLCR test points)

Signal pin

- **Initial ---------- 8.65 mOhms Max**
- **After 500 cycles**
  - **<= +5.0 mOhms ---------- 4 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**

Ground pin

- **Initial ---------- 7.70 mOhms Max**
- **After 500 cycles**
  - **<= +5.0 mOhms ---------- 4 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**

RESULTS Continued

LLCR Cable Pull (4 ground and 4 signal LLCR test points)

Signal pin

- **Initial ---------- 8.67 mOhms Max**
- **After 5Ib Retention Force**
  - **<= +5.0 mOhms ---------- 4 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**

Ground pin

- **Initial ---------- 7.88 mOhms Max**
- **After 5Ib Retention Force**
  - **<= +5.0 mOhms ---------- 4 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

Cable Pull Force:

LL032-01SP-505050-0152

	Force (lbs)
Minimum	95.59
Maximum	100.80
Average	98.49

INSULATION RESISTANCE (IR):

	Pin to Ground
	Mated
Minimum	**LL032/LL043**
Initial	45000
Thermal Shock	45000

DIELECTRIC WITHSTANDING VOLTAGE (DWV):

Voltage Rating Summary	
Minimum	**LL032/LL043**
Test Voltage	500

Mating-Unmating Durability Group

Pin to Ground	
Initial Test Voltage	Pass

IR\DWV Group

Pin to Ground	
Initial Test Voltage	Pass
After Thermal Shock Test Voltage	Pass

DATA SUMMARIES Continued

INTERFACE GAGING

Mating-Unmating Durability Group

Interface Gaging (.003/.000)			
Sample #	Initial	500 Cycles	Delta (Force)
1	0.0024	0.0018	0.0007
2	0.0025	0.0023	0.0002
3	0.0005	0.0004	0.0002
4	0.0014	0.0006	0.0008

IR/DWV Group

Interface Gaging (.003/.000)			
Sample #	Initial	Thermal Shock	Delta (Force)
5	0.0023	0.00210	0.0002
6	0.0009	0.00010	0.0008
7	0.0015	0.00170	0.0002
8	0.0005	0.00020	0.0003

Cable Pull Group

Interface Gaging (.003/.000)			
Sample #	Initial	25lb Ret. Force	Delta (Force)
13	0.0020	0.00240	0.0004
14	0.0013	0.00140	0.0001
15	0.0022	0.00230	0.0001
16	0.0018	0.00200	0.0002

DATA SUMMARIES Continued

LLCR IR/DWV:

1) A total of 4 signals and 4 ground points were measured.
2) MIL-PRF-39012, Paragraph 4.6.13 except current to be 100 mA nominal and voltage to be 20 mV maximum.
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 +1000 mOhms: ----------Unstable
   f. >+1000 mOhms:----------Open Failure

	LLCR Measurement Summaries by Pin Type	
Date	2026/5/6	2026/5/8
Room Temp (Deg C)	22	22
Rel Humidity (%)	39	39
Technician	Brian Stemle	Brian Stemle
mOhm values	Actual **Initial**	**Delta Thermal Shock**
	Pin Type: Signal 1	
Average	8.66	0.07
St. Dev.	0.04	0.04
Min	8.61	0.04
Max	8.69	0.12
Summary Count	4	4
Total Count	4	4
	Pin Type: GND 1	
Average	6.95	0.74
St. Dev.	0.4	0.69
Min	6.58	0.2
Max	7.4	1.63
Summary Count	4	4
Total Count	4	4

LLCR Delta Count by Category						
	Stable	**Minor**	**Acceptable**	**Marginal**	**Unstable**	**Open**
mOhms	**<=5**	**>5 & <=10**	**>10 & <=15**	**>15 & <=50**	**>50 & <=1000**	**>1000**
After Thermal Shock	**8**	**0**	**0**	**0**	**0**	**0**

DATA SUMMARIES Continued

LLCR Mate/Unmate Durability:

1) A total of 4 signals and 4 ground points were measured.
2) MIL-PRF-39012, Paragraph 4.6.13 except current to be 100 mA nominal and voltage to be 20 mV maximum.
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 +1000 mOhms: ----------Unstable
   f. >+1000 mOhms:----------Open Failure

LLCR Measurement Summaries by Pin Type		
Date	2026/3/30	2026/3/30
Room Temp (Deg C)	22	22
Rel Humidity (%)	40	44
Technician	Brian Stemle	Elias Rightnowar
mOhm values	Actual **Initial**	**Delta** **500 CYCLES**
	Pin Type: Signal 1	
Average	8.59	0.05
St. Dev.	0.06	0.05
Min	8.5	0
Max	8.65	0.12
Summary Count	4	4
Total Count	4	4
	Pin Type: GND 1	
Average	7.63	0.28
St. Dev.	0.05	0.05
Min	7.57	0.21
Max	7.7	0.32
Summary Count	4	4
Total Count	4	4

LLCR Delta Count by Category						
	Stable	**Minor**	**Acceptable**	**Marginal**	**Unstable**	**Open**
mOhms	**<=5**	**>5 & <=10**	**>10 & <=15**	**>15 & <=50**	**>50 & <=1000**	**>1000**
500 Cycles	**8**	**0**	**0**	**0**	**0**	**0**

DATA SUMMARIES Continued

LLCR Cable Pull:

1) A total of 4 signals and 4 ground points were measured.
2) MIL-PRF-39012, Paragraph 4.6.13 except current to be 100 mA nominal and voltage to be 20 mV maximum.
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 +1000 mOhms: ----------Unstable
   f. >+1000 mOhms:----------Open Failure

	LLCR Measurement Summaries by Pin Type	
Date	2026/4/16	2026/4/16
Room Temp (Deg C)	22	22
Rel Humidity (%)	50	50
Technician	Brian Stemle	Brian Stemle
mOhm values	Actual **Initial**	**Delta Cable Retention**
	Pin Type: Signal 1	
Average	8.64	0.08
St. Dev.	0.03	0.05
Min	8.61	0.02
Max	8.67	0.13
Summary Count	4	4
Total Count	4	4
	Pin Type: GND 1	
Average	7.49	0.41
St. Dev.	0.31	0.13
Min	7.11	0.28
Max	7.88	0.59
Summary Count	4	4
Total Count	4	4

LLCR Delta Count by Category						
	Stable	**Minor**	**Acceptable**	**Marginal**	**Unstable**	**Open**
mOhms	**<=5**	**>5 & <=10**	**>10 & <=15**	**>15 & <=50**	**>50 & <=1000**	**>1000**
Cable Retention	**8**	**0**	**0**	**0**	**0**	**0**

EQUIPMENT AND CALIBRATION SCHEDULES

Equipment #: MO-01
Description: Micro-Ohmeter
Manufacturer: Keithley
Model: 580
Serial #: 772740
Accuracy: See Manual
… Last Cal: 2/21/2026, Next Cal: 2/21/2027

Equipment #: HPT-01
Description: Hipot Safety Tester
Manufacturer: Vitrek
Model: V73
Serial #: 019808
Accuracy:
… Last Cal: 05/11/2026, Next Cal: 05/11/2027

Equipment #: TSC-01
Description: Vertical Thermal Shock Chamber
Manufacturer: Cincinnatti Sub Zero
Model: VTS-3-6-6-SC/AC
Serial #: 10-VT14993
Accuracy: See Manual
… Last Cal: 06/30/2025, Next Cal: 06/30/2026

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: 05/03/2026, Next Cal: 05/03/2027