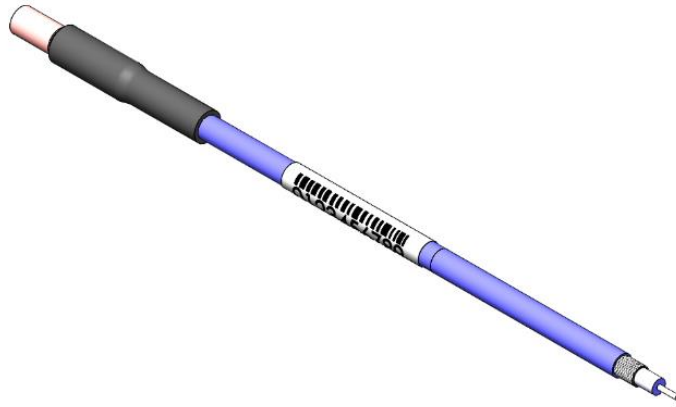




Project Number: Design Qualification Test Report	Tracking Code: 2734746_Report_Rev_1
Requested by: Iris Wang	Date: 5/12/2021
Part #: RF23C-M0SP-303030-0153 /RF23C-M0SJ-303030-0153	
Part description: RF23C-M0SP / RF23C-M0SJ	Tech: Keney Chen
Test Start: 3/25/2021	Test Completed: 4/20/2021



**DESIGN QUALIFICATION TEST REPORT**  
**RF23C-M0SP / RF23C-M0SJ**  
**RF23C-M0SP-303030-0153 /RF23C-M0SJ-303030-0153**

Tracking Code: 2734746_Report_Rev_1	Part #: RF23C-M0SP-303030-0153 /RF23C-M0SJ-303030-0153
Part description: RF23C-M0SP / RF23C-M0SJ	

**REVISION HISTORY**

<b>DATA</b>	<b>REV.NUM.</b>	<b>DESCRIPTION</b>	<b>ENG</b>
5/11/2021	1	Initial Issue	KC

## 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, 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**Group 1

RF23C-MOSP-303030-0153

RF23C-MOSJ-303030-0153

8 Assemblies

<b>Step</b>	<b>Description</b>
1.	Contact Gaps <i>Note: Note: Signal and ground</i>
2.	LLCR <sup>(2)</sup> <i>Note: Note: Signal and ground</i>
3.	Cycles Quantity = 50 Cycles <i>Note: By hand</i>
4.	Contact Gaps <i>Note: Note: Signal and ground</i>
5.	LLCR <sup>(2)</sup> Max Delta = 15 mOhm <i>Note: Note: Signal and ground</i>
6.	Thermal Shock <sup>(3)</sup>
7.	LLCR <sup>(2)</sup> Max Delta = 15 mOhm <i>Note: Note: Signal and ground</i>
8.	Humidity <sup>(1)</sup>
9.	LLCR <sup>(2)</sup> Max Delta = 15 mOhm <i>Note: Note: Signal and ground</i>

- (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) 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-Ground****Group 1**

RF23C-M0SP-303030-0153

RF23C-M0SJ-303030-0153

2 Assemblies

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**Step Description**

1. DWV Breakdown<sup>(1)</sup>

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(1) 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

**Cable Pull**

*Note: Monitor signal and ground for loss of signal.*

**Group 1**

RF23C-M0SP-303030-0153

RF23C-M0SJ-303030-0153

5 Assemblies

0 Degrees

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**Step Description**

1. Cable Pull<sup>(1)</sup>

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(1) Cable Pull = EIA-364-38

Measure and Record Force Required to Failure

Failure = Discontinuity &gt;1 microsecond at 10 ohms

**FLOWCHARTS Continued****Insertion/Withdrawal Force**Group 1

PRFM0-J-SK-005-2E

8 Contacts Minimum

Custom Group

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**Step Description**

1. Insertion Force Test  
*Note: Test pin diameter: .0130 inch  
+.0001/-.0000 inch.  
Insertion depth: .030 inch  
minimum, .045 inch maximum.*
  
  2. Withdrawal Force Test  
*Note: Test pin diameter: .0110 inch  
+.0000/-.0001 inch.  
Insertion depth: .030 inch  
minimum, .045 inch maximum.*
-

**FLOWCHARTS Continued****Mechanical Shock/Random Vibration/LLCR**Group 1

RF23C-M0SP-303030-0153

RF23C-M0SJ-303030-0153

8 Assemblies

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**Step Description**

1. LLCR<sup>(1)</sup>  
*Note: Signal and ground.*
2. Mechanical Shock<sup>(2)</sup>
3. Random Vibration<sup>(3)</sup>
4. LLCR<sup>(1)</sup>  
Max Delta = 15 mOhm  
*Note: Signal and ground.*

---

(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)

**FLOWCHARTS Continued****Mechanical Shock/Random Vibration/Event Detection**Group 1

RF23C-M0SP-303030-0153

RF23C-M0SJ-303030-0153

8 Assemblies

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<b>Step</b>	<b>Description</b>
1.	Nanosecond Event Detection (Mechanical Shock) <sup>(1)</sup>
2.	Nanosecond Event Detection (Random Vibration) <sup>(2)</sup>

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(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)

**ATTRIBUTE DEFINITIONS**

The following is a brief, simplified description of attributes.

**THERMAL SHOCK:**

- 1) EIA-364-32, *Thermal Shock (Temperature Cycling) Test Procedure for Electrical Connectors.*
- 2) Test Condition 1: -55°C to +85°C
- 3) Test Time: ½ hour dwell at each temperature extreme
- 4) Number of Cycles: 100
- 5) All test samples are pre-conditioned at ambient.
- 6) All test samples are exposed to environmental stressing in the mated condition.

**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 G<sup>2</sup> / 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

**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 +1000 mOhms: -----Unstable
  - f. >+1000 mOhms:-----Open Failure

**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 5000 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 dielectric withstanding voltage shall be recorded as 750VAC.

The working voltage shall be recorded as one-third (1/3) of the dielectric withstanding voltage (one-fourth of the breakdown voltage).

**CABLE RETENTION:**

- 1) Pull to destruct(Failure=Discontinuity>1 microsecond at 10ohms).
- 2) Reference document: EIA-364-38 Cable Pull-Out Test Procedure for Electrical Connectors.

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

- **Initial** ----- 23.02 mOhms Max
- **50Cycles**
  - **<= +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
- **T-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
- **Humidity**
  - **<= +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

**LLCR Shock & Vibration Group (16 LLCR test points)**

- **Initial** ----- 22.78 mOhms Max
- **Vibration/ 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

### Result Continued

#### Mechanical Shock & Random Vibration:

- Shock
  - No Damage----- Pass
  - 1 Microseconds ----- Pass
- Vibration
  - No Damage----- Pass
  - 1 Microseconds ----- Pass

#### Cable Pull force

- 0° Pull
  - Min ----- 6.32 lbs
  - Max ----- 8.05 lbs

#### Dielectric Withstanding Voltage minimums, DWV

- Minimums DWV Breakdown
  - Test Voltage ----- 1347 VAC

**DATA SUMMARIES****DIELECTRIC WITHSTANDING VOLTAGE (DWV):**

<b>Voltage Rating Summary</b>	
<b>Minimum</b>	<b>RF23C-M0SP/RF23C-M0SJ</b>
<b>Break Down Voltage</b>	1347
<b>Test Voltage</b>	1010
<b>Working Voltage</b>	337

**Cable Pull Force:  
0° Pull**

	<b>Force (lbs)</b>
Minimum	<b>6.32</b>
Maximum	8.05
Average	7.04

**Insertion/Withdrawal Force:**

<b>Units:Lbs</b>	<b>Insertion force(0.013inch)</b>	<b>Withdrawal Force (0.011inch)</b>
Minimum	0.777	0.179
Maximum	1.041	0.256
Average	0.897	0.210

### 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				
	3/29/2021	3/31/2021	4/6/2021	4/17/2021
Date	3/29/2021	3/31/2021	4/6/2021	4/17/2021
Room Temp (Deg C)	23	23	23	23
Rel Humidity (%)	51	51	51	51
Technician	Keney Chen	Keney Chen	Keney Chen	Keney Chen
<b>mOhm values</b>				
	<b>Actual Initial</b>	<b>Delta 50 Cycles</b>	<b>Delta Therm Shck</b>	<b>Delta Humidity</b>
<b>Pin Type 1: Signal</b>				
Average	22.78	0.17	0.21	0.39
St. Dev.	0.16	0.13	0.21	0.18
Min	22.52	0.02	0.00	0.14
Max	23.02	0.44	0.63	0.61
Summary Count	8	8	8	8
Total Count	8	8	8	8
<b>Pin Type 2: Ground</b>				
Average	9.27	0.28	0.21	0.46
St. Dev.	0.06	0.13	0.12	0.18
Min	9.21	0.04	0.03	0.20
Max	9.41	0.45	0.44	0.82
Summary Count	8	8	8	8
Total Count	8	8	8	8

LLCR Delta Count by Category						
	Stable	Minor	Acceptable	Marginal	Unstable	Open
mOhms	$\leq 5$	$>5 \ \& \ \leq 10$	$>10 \ \& \ \leq 15$	$>15 \ \& \ \leq 50$	$>50 \ \& \ \leq 1000$	$>1000$
<b>50 Cycles</b>	16	0	0	0	0	0
<b>Therm Shck</b>	16	0	0	0	0	0
<b>Humidity</b>	16	0	0	0	0	0

### DATA SUMMARIES Continued

#### LLCR Shock & Vibration 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	4/6/2021	4/12/2021		
Room Temp (Deg C)	23	23		
Rel Humidity (%)	42	41		
Technician	Scott Rollefstad	Scott Rollefstad		
<b>mOhm values</b>	<b>Actual Initial</b>	<b>Delta Shock/Vib</b>	<b>NOT USED</b>	<b>NOT USED</b>
Pin Type: Signal 1				
Average	22.54	0.10		
St. Dev.	0.15	0.08		
Min	22.36	0.00		
Max	22.78	0.22		
Summary Count	8	8		
Total Count	8	8		
Pin Type: GND 1				
Average	8.95	0.19		
St. Dev.	0.15	0.10		
Min	8.7	0.04		
Max	9.23	0.36		
Summary Count	8	8		
Total Count	8	8		

LLCR Delta Count by Category						
	Stable	Minor	Acceptable	Marginal	Unstable	Open
<b>mOhms</b>	<b><math>\leq 5</math></b>	<b><math>&gt;5</math> &amp; <math>\leq 10</math></b>	<b><math>&gt;10</math> &amp; <math>\leq 15</math></b>	<b><math>&gt;15</math> &amp; <math>\leq 50</math></b>	<b><math>&gt;50</math> &amp; <math>\leq 1000</math></b>	<b><math>&gt;1000</math></b>
<b>SHOCK/VIBE</b>	16	0	0	0	0	0

#### Nanosecond Event Detection:

Shock and Vibration Event Detection Summary	
Contacts tested	16
Test Condition	C, 100g's, 6ms, Half-Sine
Shock Events	0
Test Condition	V-B, 7.56 rms g
Vibration Events	0
<b>Total Events</b>	<b>0</b>

**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: 3/4/2021, Next Cal: 3/3/2022**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: 04/16/2021, Next Cal: 04/15/2022

**Equipment #:** DG-HPT-01**Description:** Hipot Safety Tester**Manufacturer:** Vitrek**Model:** V73**Serial #:** 025866**Accuracy:**

... Last Cal: 04/16/2021, Next Cal: 04/15/2022

**Equipment #:** HZ-MO-05**Description:** Micro-ohmmeter**Manufacturer:** Keithley**Model:** 3706**Serial #:** 1285188**Accuracy:** Last Cal: 12/17/2020, Next Cal: 12/16/2021**Equipment #:** HPM-01**Description:** Hipot Megommeter**Manufacturer:** Hipotronics**Model:** H306B-A**Serial #:** M9905004**Accuracy:** 2 % Full Scale Accuracy

... Last Cal: 05/24/2020, Next Cal: 05/24/2021

**Equipment #:** THC-07**Description:** Temperature/Humidity Chamber (Chamber Room)**Manufacturer:** Thermotron**Model:** SM-8-8200**Serial #:** 046375**Accuracy:** See Manual

... Last Cal: 04/13/2021, Next Cal: 04/13/2022

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

... Last Cal: 11/31/2020, Next Cal: 11/31/2021

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

... Last Cal: 07/09/2020, Next Cal: 07/09/2021

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

... Last Cal: 06/04/2020, Next Cal: 06/04/2021