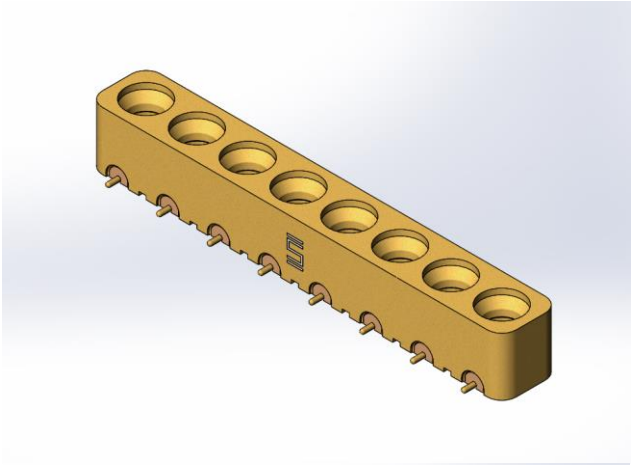
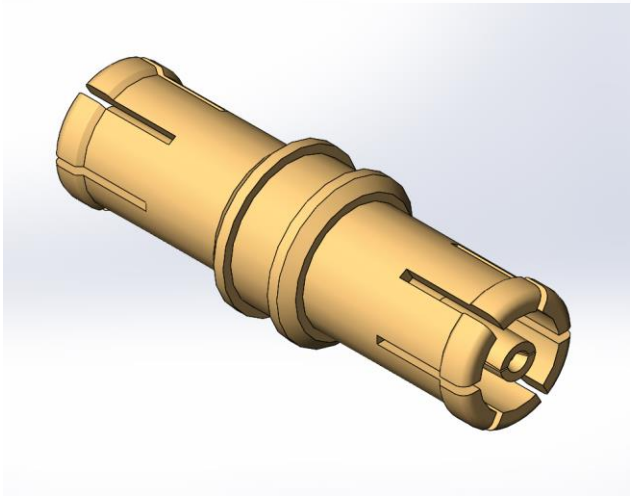
Project Number: Design Qualification Test Report	Tracking Code: CR-708002_Report_Rev_1
Requested by: Brian Luallen	Date: 3/8/2022
Part #: GPPB-PF-1-08-EG-ST-SM-1N/PRFIA-SMPM-J-J-S-2	Tech: Tony Wagoner/Tina Mo
Part description: GPPB / PRFIA	Qty to test: 30
Test Start: 02/01/2021	Test Completed: 03/09/2021





DESIGN QUALIFICATION TEST REPORT

GPPB / PRFIA
GPPB-PF-1-08-EG-ST-SM-1N/PRFIA-SMPM-J-J-S-2

REVISION HISTORY

DATA	REV.NUM.	DESCRIPTION	ENG
3/8/2022	**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: MIL-PRF-39012 and EIA 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 was 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 is 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-111459-TST

FLOWCHARTS

Mechanical Shock/Random Vibration/Event Detection

Group 1
GPPB-PF-1-08-EG-ST-SM-1N
RF047-A-M0SJ-505050-0305
5 Assemblies

Note: CONNECTORS TESTED AFTER SOLDERED TO BOARD

Step	Description
1.	LLCR (1) - Non Standard
2.	Nanosecond Event Detection (Mechanical Shock) (2) - Non Standard
3.	Nanosecond Event Detection (Random Vibration) (3) - Non Standard
4.	LLCR (1) - Non Standard MAX DELTA = 15 mOhm

---

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

(2) Nanosecond Event Detection (Mechanical Shock) = Other
Test condition H per DSCC 10019 (75 g). EXCEPTION: 50 ns max. electrical interruption.
MIL-STD-202-213

(3) Nanosecond Event Detection (Random Vibration) = Other
MIL-STD-202-204
Test condition D per DSCC 10019 (15 minutes min.). EXCEPTION - 50 ns max. electrical interruption.

FLOWCHARTS Continued

Pull/Shear

Note: PULL/SHEAR TO DESTRUCT. RECORD FORCE. 3 PIECES PER TEST, 2 TESTS PER VARIATION.

Group 1
GPPB-PF-1-08-EG-ST-SM-1N
6 Assemblies
1X8 .140P

Step	Description
1.	Connector Pull
2.	Connector Shear

Group 2
GPPB-PF-1-02-EG-ST-SM-1N
6 Assemblies
1X2 .140P

Step	Description
1.	Connector Pull
2.	Connector Shear

Group 3
GPPB-PF-1-04-EG-ST-SM-1N
6 Assemblies
1X4 .140P

Step	Description
1.	Connector Pull
2.	Connector Shear

Group 4
GPPB-PF-1-08-EG-ST-SM-0N
6 Assemblies
1X8 .328P

Step	Description
1.	Connector Pull
2.	Connector Shear

Group 5
GPPB-PF-1-10-EG-ST-SM-1N
6 Assemblies
1X10 .140P

Step	Description
1.	Connector Pull
2.	Connector Shear

Group 6
GPPB-PF-1-06-EG-ST-SM-1N
6 Assemblies
1X6 .140P

Step	Description
1.	Connector Pull
2.	Connector Shear

THERMAL SHOCK/CONTACT RESISTANCE

Group 1
GPPB-PF-1-08-EG-ST-SM-1N
PRFIA-SMPM-J-J-S-2
5 Assemblies

Note: CONNECTORS TESTED AFTER SOLDERED TO BOARD

Step	Description
1.	LLCR (1) - Non Standard
2.	Thermal Shock (2) - Non Standard
3.	LLCR (1) - Non Standard MAX DELTA = 15 mOhm

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

(2) Thermal Shock = Other
MIL-STD-202-107
Test condition B per DSCC 10019. Exception - high temperature to be +165°C. Visual inspection for damage.

ATTRIBUTE DEFINITIONS

The following is a brief, simplified description of attributes.

THERMAL SHOCK:

1) MIL-STD-202-107, *Thermal Shock (Temperature Cycling) Test Procedure for Electrical Connectors.*
2) Test Condition B per DSCC 10019. Exception – high temperature to be +165° C. Visual inspection for damage.
3) All test samples are pre-conditioned at ambient.
4) All test samples are exposed to environmental stressing in the mated condition.

MECHANICAL SHOCK (Specified Pulse):

1) Reference document: MIL-STD-202, *Mechanical Shock Test Procedure for Electrical Connectors*
2) Test Condition: MIL-STD-202, Method 213 Cond. I.

VIBRATION:

1) Reference document: MIL-STD-202, *Vibration Test Procedure for Electrical Connectors*
2) Test Condition: MIL-STD-202-204, Condition D per DSCC 10019.

NANOSECOND-EVENT DETECTION (Mechanical Shock):

1) Reference document: MIL-STD-202-213, *Nanosecond-Event Detection for Electrical Connectors*
2) Test condition H per DSCC 10019(75g).
3) Prior to test, the samples were characterized to assure the low nanosecond event being monitored will trigger the detector.
4) After characterization it was determined the test samples could be monitored for 50 nanosecond events

NANOSECOND-EVENT DETECTION (Random Vibration):

1) Reference document: MIL-STD-202-204, *Nanosecond-Event Detection for Electrical Connectors*
2) Test condition D per DSCC 10019(15 minutes min).
3) Prior to test, the samples were characterized to assure the low nanosecond event being monitored will trigger the detector.
4) 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

PULL/SHEAR

1) PULL/SHEAR TO DESTRUCT. RECORD FORCE.

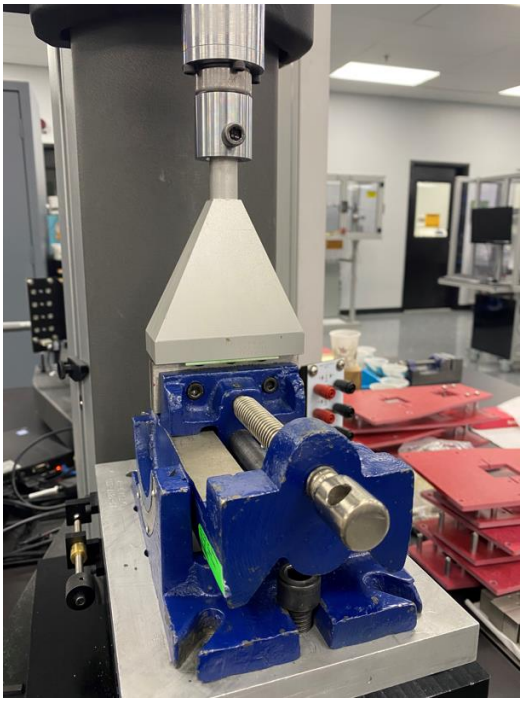


Fig. 1(Pull Force)

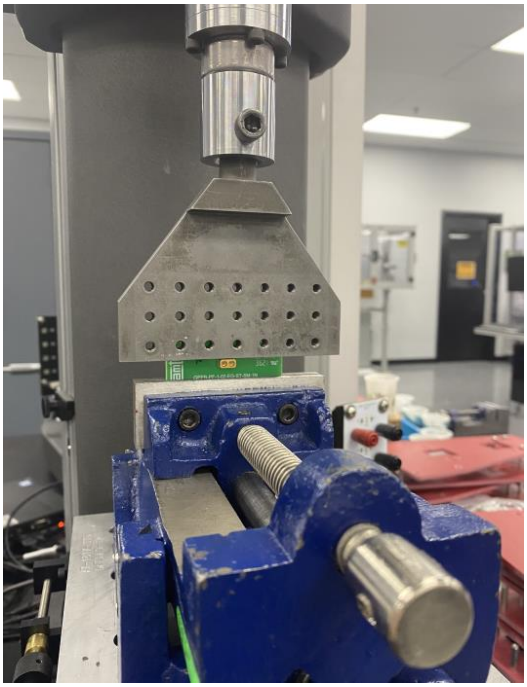


Fig. 2(Shear Force)

RESULTS

Push & Shear Force:

Group 1

Push force

- **Min ---------- 111.83 lbs**
- **Max ---------- 114.86 lbs**

Shear force

- **Min ---------- 208.90 lbs**
- **Max ----------252.30 lbs**

Group 2

Push force

- **Min ----------47.81 lbs**
- **Max ----------76.11 lbs**

Shear force

- **Min ---------- 112.30 lbs**
- **Max ----------129.30 lbs**

Group 3

Push force

- **Min ----------88.58 lbs**
- **Max ---------- 117.96 lbs**

Shear force

- **Min ---------- 147.60 lbs**
- **Max ----------189.50 lbs**

Group 4

Push force

- **Min ----------68.44 lbs**
- **Max ----------82.37 lbs**

Shear force

- **Min ---------- 222.50 lbs**
- **Max ----------241.00 lbs**

Group 5

Push force

- **Min ---------- 119.55 lbs**
- **Max ---------- 152.68 lbs**

Shear force

- **Min ---------- 170.00 lbs**
- **Max ----------205.50 lbs**

Group 6

Push force

- **Min ---------- 102.50 lbs**
- **Max ---------- 193.53 lbs**

Shear force

- **Min ---------- 180.70 lbs**
- **Max ----------199.70 lbs**

RESULTS Continued

LLCR Thermal Shock (5 Signal and 5 Ground LLCR test points)

Signal Pin

- **Initial ---------- 91.70 mOhms Max**

Ground Pin

- **Initial ---------- 30.74 mOhms Max**
- **After Thermal Shock**
  - **<= +5.0 mOhms ---------- 5 Points ---------- Stable**
  - **+5.1 to +10.0 mOhms ---------- 5 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 (5 signal and 5 ground LLCR test points)

Signal Pin

- **Initial ---------- 91.58 mOhms Max**

Ground Pin

- **Initial ---------- 30.40 mOhms Max**
- **Shock &Vibration**
  - **<= +5.0 mOhms ---------- 10 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

Push & Shear Force

Push force

	Force (lbs)					
	Group 1	Group 2	Group 3	Group 4	Group 5	Group 6
Minimum	111.83	47.81	88.58	68.44	119.55	102.50
Maximum	114.86	76.11	117.96	82.37	152.68	193.53
Average	113.53	57.35	101.01	76.84	139.66	143.88

Shear force

	Force (lbs)					
	Group 1	Group 2	Group 3	Group 4	Group 5	Group 6
Minimum	208.90	112.30	147.60	220.50	170.00	180.70
Maximum	252.30	129.20	189.50	241.00	205.50	199.70
Average	233.33	121.13	165.47	233.47	183.83	189.07

DATA SUMMARIES Continued

LLCR Thermal Shock/Contact Resistance:

1) A total of 5 signal and 5 ground 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 +1000 mOhms----------Unstable
   f. >+1000 mOhms:----------Open Failure

	LLCR Measurement Summaries by Pin Type			
Date	2/11/2022	2/16/2022		
Room Temp (Deg C)	22	22		
Rel Humidity (%)	38	39		
Technician	Tony Wagoner	Tony Wagoner		
mOhm values	Actual	**Delta**		
	Initial	**Thermal Shock**		
	Pin Type: Signal 1			
Average	91.15	0.78		
St. Dev.	0.34	0.58		
Min	90.84	0.17		
Max	91.7	1.4		
Summary Count	5	5		
Total Count	5	5		
	Pin Type: GND 1			
Average	30.46	6.92		
St. Dev.	0.21	0.42		
Min	30.25	6.29		
Max	30.74	7.3		
Summary Count	5	5		
Total Count	5	5		

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

DATA SUMMARIES Continued

LLCR Shock &Vibration Group:

1) A total of 5 signal and 5 ground 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 +1000 mOhms----------Unstable
   f. >+1000 mOhms:----------Open Failure

	LLCR Measurement Summaries by Pin Type			
Date	2/14/2022	3/4/2022		
Room Temp (Deg C)	22	22		
Rel Humidity (%)	38	38		
Technician	Tony Wagoner	Tony Wagoner		
mOhm values	Actual	**Delta**		
	Initial	**Shock-Vib**		
	Pin Type: Signal 1			
Average	90.99	0.44		
St. Dev.	0.47	0.28		
Min	90.33	0.19		
Max	91.58	0.9		
Summary Count	5	5		
Total Count	5	5		
	Pin Type: GND 1			
Average	30.51	1.34		
St. Dev.	0.61	0.65		
Min	29.7	0.69		
Max	31.4	2.41		
Summary Count	5	5		
Total Count	5	5		

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

DATA SUMMARIES Continued

Nanosecond Event Detection:

Shock and Vibration Event Detection Summary	
Contacts tested	10
Test Condition	MIL-STD-202-213 CONDITION H
Shock Events	0
Test Condition	MIL-STD-202-204
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: 05/29/2021, Next Cal: 05/29/2022

Equipment #: MO-11
Description: Switch/Multimeter
Manufacturer: Keithley
Model: 3706
Serial #: 120169
Accuracy: See Manual
… Last Cal: 09/11/2021, Next Cal: 09/11/2022

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: 06/30/2021, Next Cal: 06/30/2022

Equipment #: MO-04
Description: Multimeter /Data Acquisition System
Manufacturer: Keithley
Model: 2700
Serial #: 0798688
Accuracy: See Manual
… Last Cal: 09/11/2021, Next Cal: 09/11/2022

Equipment #: PS-02
Description: Power Supply
Manufacturer: Hewlett-Packer
Model: 6033A
Serial #: N/A
Accuracy: See Manual
… Last Cal: NOT CALIBRATED

Equipment #: SVC-01
Description: Shock & Vibration Table
Manufacturer: Data Physics
Model: LE-DSA-10-20K
Serial #: 10037
Accuracy: See Manual
… Last Cal: 04/22/2021, Next Cal: 04/22/2022

EQUIPMENT AND CALIBRATION SCHEDULES

Equipment #: ACLM-01
Description: Accelerometer
Manufacturer: PCB Piezotronics
Model: 352C03
Serial #: 115819
Accuracy: See Manual
… Last Cal: 07/18/2021, Next Cal: 07/18/2022

Equipment #: ED-03
Description: Event Detector
Manufacturer: Analysis Tech
Model: 32EHD
Serial #: 1100604
Accuracy: See Manual
… Last Cal: 10/31/2021, Next Cal: 10/31/2022