Project Number: Design Qualification Test Report	Tracking Code: 1799257_Report_Rev_1
Requested by: Michael Menkhaus	Date: 6/23/2021
Part #: QSFPC-DD-1-1-S-F	Tech: Peter Chen
Part description: QFSPC	Qty to test: 20
Test Start: 04/07/2019	Test Completed: 04/18/2019

DESIGN QUALIFICATION TEST REPORT

QFSPC
QSFPC-DD-1-1-S-F

REVISION HISTORY

DATA	REV.NUM.	DESCRIPTION	ENG
04/29/2019	**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: 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) Either an automated cleaning procedure or an ultrasonic cleaning procedure may be used.
4) The automated procedure is used with aqueous compatible soldering materials.
5) Any additional preparation will be noted in the individual test sequences.
6) Solder Information: Lead free
7) Samtec Test PCBs used: PCB-108580-TST/ PCB-108581-TST.

FLOWCHARTS

Normal Force

Group 1
QSFPC-DD-1-1-S-F

8 Contacts Minimum
NF On Top/Bottom EMI Fingers

Step	Description
1.	Contact Gaps *Note: Measure feature 341 on SH106-X-X-X-XX-F print. This can be measured in the assembled state.*
2.	Normal Force (1) Expected Force at Max Deflection = 700 g Deflection = 0.020 "

Group 2
QSFPC-DD-1-1-S-F

8 Contacts Minimum
NF On Side/Side EMI Fingers

Step	Description
1.	Contact Gaps *Note: Measure feature 250 on SH106-X-X-X-XX-F print. This can be measured in the assembled state.*
2.	Normal Force (1) Expected Force at Max Deflection = 700 g Deflection = 0.020 "

Group 3
QSFPC-DD-1-1-S-F

8 Contacts Minimum
NF On Heat Sink Clips

Step	Description
1.	Normal Force (1) Expected Force at Max Deflection = 700 g Deflection = 0.020 " *Note: Pull up on heat sink attach fingers to determine the NF.*

Group 4
QSFPC-DD-1-1-S-F

8 Contacts Minimum
NF On Cage Bottom

Step	Description
1.	Normal Force (1) Deflection = 0.045 " Expected Force at Max Deflection = 700 g *Note: Push down on the bottom of the cage tabs to determine the normal force.*

(1) Normal Force = EIA-364-04

Compliant Pin Buckling

Note: Use Starrett press in the test lab for all pressing into boards.

Group 1
QSFPC-DD-1-1-S-F

20 Assemblies
HASL 0.039" PTH

Step	Description
1.	Measure PTH Diameter *Note: Measure PTH diameters on 1 piece of HASL 0.039" PCB.*
2.	Press Connectors *Note: Press 20 pieces of QSFPC-1-1-S-F into HASL 0.039" PCBs using Starrett press in the test lab and SK-14068-02-01.*
3.	Visual Inspection *Note: Check cage straightness and press fit pin collapsing.*
4.	Cross Section Connectors *Note: Cross section 1 connector and take pictures of each press fit pin in the PTH.*

Group 2
QSFPC-DD-1-1-S-F

20 Assemblies
HASL 0.043" PTH

Step	Description
1.	Measure PTH Diameter *Note: Measure PTH diameters on 1 piece of HASL 0.043" PCB.*
2.	Press Connectors *Note: Press 20 pieces of QSFPC-1-1-S-F into HASL 0.043" PCBs using Starrett press in the test lab and SK-14068-02-01.*
3.	Visual Inspection *Note: Check cage straightness and press fit pin collapsing.*
4.	Cross Section Connectors *Note: Cross section 1 connector and take pictures of each press fit pin in the PTH.*

FLOWCHARTS Continued

Insertion/Retention/Hole Conditioning

Group 1 QSFPC-DD-1-1-S-F 30 Contacts Minimum HASL 0.039" PTH *Note: Use Starrett press for each insertion/extraction.*		Group 2 QSFPC-DD-1-1-S-F 30 Contacts Minimum HASL 0.043" PTH *Note: Use Starrett press for each insertion/extraction.*		Group 3 QSFPC-DD-1-1-S-F 30 Contacts Minimum ENIG 0.039" PTH *Note: Use Starrett press for each insertion/extraction.*		Group 4 QSFPC-DD-1-1-S-F 30 Contacts Minimum ENIG 0.043" PTH *Note: Use Starrett press for each insertion/extraction.*	
Step	**Description**	**Step**	**Description**	**Step**	**Description**	**Step**	**Description**
1.	Insertion Force *Note: Measure insertion force for 1 pin into 0.039" HASL PTH.* *Note: Pin 1*	1.	Insertion Force *Note: Measure insertion force for 1 pin into 0.043" HASL PTH.* *Note: Pin 1*	1.	Insertion Force *Note: Measure insertion force for 1 pin into 0.039" ENIG PTH.* *Note: Pin 1*	1.	Insertion Force *Note: Measure insertion force for 1 pin into 0.043" ENIG PTH.* *Note: Pin 1*
2.	Retention Force *Note: Measure extraction force for 1 pin out of 0.039" HASL PTH.* *Note: Pin 1* *Note: EIA-364-29*	2.	Retention Force *Note: Measure extraction force for 1 pin out of 0.043" HASL PTH.* *Note: Pin 1* *Note: EIA-364-29*	2.	Retention Force *Note: EIA-364-29* *Note: Measure extraction force for 1 pin out of 0.039" ENIG PTH.* *Note: Pin 1*	2.	Retention Force *Note: Measure extraction force for 1 pin out of 0.043" ENIG PTH.* *Note: Pin 1* *Note: EIA-364-29*
3.	Cycles Quantity = 1 Cycles *Note: Pin 2*	3.	Cycles Quantity = 1 Cycles *Note: Pin 2*	3.	Cycles Quantity = 1 Cycles *Note: Pin 2*	3.	Cycles Quantity = 1 Cycles *Note: Pin 2*
4.	Insertion Force *Note: Measure insertion force for 1 pin into 0.039" HASL PTH.* *Note: Pin 3*	4.	Insertion Force *Note: Measure insertion force for 1 pin into 0.043" HASL PTH.* *Note: Pin 3*	4.	Insertion Force *Note: Measure insertion force for 1 pin into 0.039" ENIG PTH.* *Note: Pin 3*	4.	Insertion Force *Note: Measure insertion force for 1 pin into 0.043" ENIG PTH.* *Note: Pin 3*
5.	Retention Force *Note: Measure extraction force for 1 pin out of 0.039" HASL PTH.* *Note: Pin 3* *Note: EIA-364-29*	5.	Retention Force *Note: Measure extraction force for 1 pin out of 0.043" HASL PTH.* *Note: Pin 3* *Note: EIA-364-29*	5.	Retention Force *Note: Measure extraction force for 1 pin out of 0.039" ENIG PTH.* *Note: Pin 3* *Note: EIA-364-29*	5.	Retention Force *Note: Measure extraction force for 1 pin out of 0.043" ENIG PTH.* *Note: Pin 3* *Note: EIA-364-29*
6.	Hole Integrity *Note: Check for distortion of the PTH according to EIA-364-96*	6.	Hole Integrity *Note: Check for distortion of the PTH according to EIA-364-96*	6.	Hole Integrity *Note: Check for distortion of the PTH according to EIA-364-96*	6.	Hole Integrity *Note: Check for distortion of the PTH according to EIA-364-96*

ATTRIBUTE DEFINITIONS

The following is a brief, simplified description of attributes.

NORMAL FORCE (FOR CONTACTS TESTED OUTSIDE THE HOUSING):

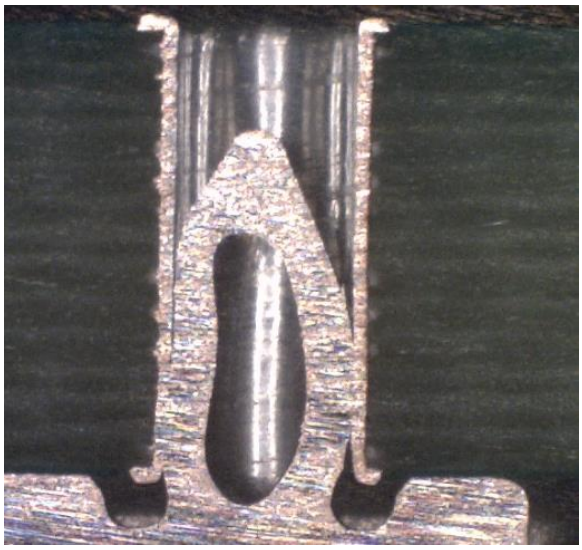
1) Reference document: EIA-364-04, *Normal Force Test Procedure for Electrical Connectors*.
2) The contacts shall be tested in the loose state, *not* inserted in connector housing.
3) The contacts shall be prepared to allow access to the spring member at the same attitude and deflection level as would occur in actual use.
4) In the event that portions of the contact prevent insertion of the test probe and/or deflection of the spring member under evaluation, said material shall be removed leaving the appropriate contact surfaces exposed.
5) In the case of multi-tine contacts, each tine shall be tested independently on separate samples as required.
6) The connector housing shall be simulated, if required, in order to provide an accurate representation of the actual contact system performance.
7) A holding fixture shall be fashioned to allow the contact to be properly deflected.
8) Said holding fixture shall be mounted on a floating, adjustable, X-Y table on the base of the Dillon TC^2, computer controlled test stand with a deflection measurement system accuracy of 5 µm (0.0002”).
9) The probe shall be attached to a Dillon P/N 49761-0105, 5 N (1.1 Lb) load cell providing an accuracy of ± 0.2%.
10) The nominal deflection rate shall be 5 mm (0.2”)/minute.
11) Unless otherwise noted a minimum of five contacts shall be tested.
12) The force/deflection characteristic to load and unload each contact shall be repeated five times.
13) The system shall utilize the TC^2 software in order to acquire and record the test data.
14) The permanent set of each contact shall be measured within the TC^2 software.
15) The acquired data shall be graphed with the deflection data on the X-axis and the force data on the Y-axis and a printout will be stored with the Tracking Code paperwork.

ATTRIBUTE DEFINITIONS

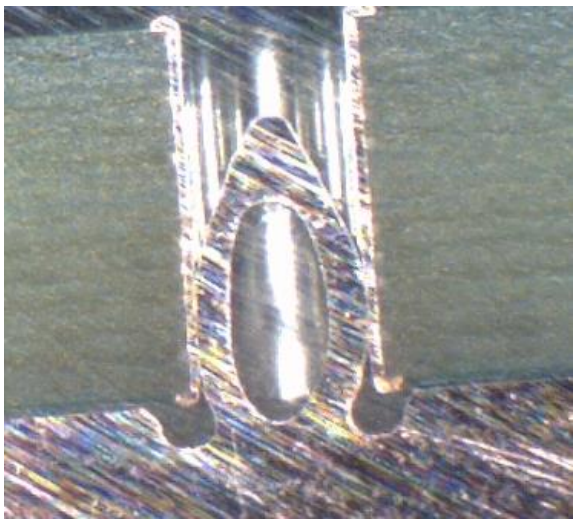
The following is a brief, simplified description of attributes.

Compliant Pin Buckling Picture

HASL-0.039"



HASL-0.043"



RESULTS

Normal Force

On Top/Bottom EMI Fingers-0.020 inch deflection

- **Initial**
  - **Min ---------- 372.30 gf Set ----- 0.0032 mm**
  - **Max ---------- 443.10 gf Set ----- 0.0089 mm**

On Side/Side EMI Fingers-0.020 inch deflection

- **Initial**
  - **Min ---------- 582.60 gf Set ----- 0.0026 mm**
  - **Max ---------- 702.80 gf Set ----- 0.0082 mm**

On Heat Sink Clips-0.020 inch deflection

- **Initial**
  - **Min ---------- 431.30 gf Set ----- 0.0000 mm**
  - **Max ---------- 480.10 gf Set ----- 0.0009 mm**

On Cage Bottom-0.045 inch deflection

- **Initial**
  - **Min ---------- 846.90 gf Set ----- 0.0019 mm**
  - **Max ----------1059.60 gf Set ----- 0.0040 mm**

Compliant Pin Insertion/Retention Force

HASL-0.039"

- **Initial**
  - **Mating**
    - **Min ---------- 4.57 Lbs**
    - **Max---------- 6.67 Lbs**
  - **Unmating**
    - **Min ---------- 1.67 Lbs**
    - **Max---------- 2.74 Lbs**
- **After 3 Cycles**
  - **Mating**
    - **Min ---------- 3.83 Lbs**
    - **Max---------- 5.66 Lbs**
  - **Unmating**
    - **Min ---------- 1.16 Lbs**
    - **Max---------- 1.56 Lbs**

HASL-0.043"

- **Initial**
  - **Mating**
    - **Min ---------- 3.42 Lbs**
    - **Max---------- 5.14 Lbs**
  - **Unmating**
    - **Min ---------- 1.14 Lbs**
    - **Max---------- 1.92 Lbs**
- **After 3 Cycles**
  - **Mating**
    - **Min ---------- 2.68 Lbs**
    - **Max---------- 5.54 Lbs**
  - **Unmating**
    - **Min ---------- 0.95 Lbs**
    - **Max---------- 2.06 Lbs**

RESULTS Continued

ENIG-0.039"

- **Initial**
  - **Mating**
    - **Min ---------- 3.54 Lbs**
    - **Max---------- 8.00 Lbs**
  - **Unmating**
    - **Min ---------- 1.08 Lbs**
    - **Max---------- 1.64 Lbs**
- **After 3 Cycles**
  - **Mating**
    - **Min ---------- 3.24 Lbs**
    - **Max---------- 4.71 Lbs**
  - **Unmating**
    - **Min ---------- 0.79 Lbs**
    - **Max---------- 1.31 Lbs**

ENIG-0.043"

- **Initial**
  - **Mating**
    - **Min ---------- 2.46 Lbs**
    - **Max---------- 3.26 Lbs**
  - **Unmating**
    - **Min ---------- 0.86 Lbs**
    - **Max---------- 1.41 Lbs**
- **After 3 Cycles**
  - **Mating**
    - **Min ---------- 2.18 Lbs**
    - **Max---------- 3.50 Lbs**
  - **Unmating**
    - **Min ---------- 0.49 Lbs**
    - **Max---------- 1.06 Lbs**

DATA SUMMARIES

NORMAL FORCE (FOR CONTACTS TESTED OUT THE HOUSING):

1) Calibrated force gauges are used along with computer controlled positioning equipment.
2) For Normal force 8-10 measurements are taken and the averages reported.

On Top/Bottom EMI Fingers

Initial	Deflections in inches Forces in Grams										
	0.0020	**0.0040**	**0.0060**	**0.0080**	**0.0100**	**0.0120**	**0.0140**	**0.0160**	**0.0180**	**0.0200**	***SET***
Averages	26.14	58.66	93.61	134.76	186.58	240.34	289.20	343.13	384.24	416.48	0.0045
Min	22.10	50.40	83.30	121.70	166.00	203.60	239.40	283.60	326.50	372.30	0.0032
Max	30.10	70.80	108.90	159.30	216.30	271.00	323.40	380.40	422.20	443.10	0.0089
St. Dev	2.499	6.935	9.005	12.773	15.969	20.550	26.774	31.676	29.146	21.503	0.0021
Count	8	8	8	8	8	8	8	8	8	8	8

On Side/Side EMI Fingers

Initial	Deflections in inches Forces in Grams										
	0.0020	**0.0040**	**0.0060**	**0.0080**	**0.0100**	**0.0120**	**0.0140**	**0.0160**	**0.0180**	**0.0200**	***SET***
Averages	21.53	79.34	162.64	263.18	358.71	442.35	511.59	573.50	622.99	655.51	0.0047
Min	3.30	12.60	60.30	126.40	208.90	299.00	378.70	456.20	520.00	582.60	0.0026
Max	39.30	132.10	264.50	370.30	459.90	531.30	594.40	642.70	683.10	702.80	0.0082
St. Dev	12.019	44.882	71.136	74.915	74.748	69.184	63.139	54.148	47.025	36.497	0.0018
Count	8	8	8	8	8	8	8	8	8	8	8

On Heat Sink Clips

Initial	Deflections in inches Forces in Grams										
	0.0020	**0.0040**	**0.0060**	**0.0080**	**0.0100**	**0.0120**	**0.0140**	**0.0160**	**0.0180**	**0.0200**	***SET***
Averages	89.63	158.83	191.81	230.38	268.54	306.86	341.53	379.29	414.68	449.31	0.0004
Min	77.50	144.90	182.50	219.00	255.20	290.10	323.10	361.40	396.80	431.30	0.0000
Max	108.40	202.50	208.70	250.40	292.90	334.20	371.20	409.70	444.00	480.10	0.0009
St. Dev	9.390	18.977	8.155	10.175	12.189	14.143	15.419	15.451	15.154	15.289	0.0003
Count	8	8	8	8	8	8	8	8	8	8	8

On Cage Bottom

Initial	Deflections in inches Forces in Grams										
	0.0045	**0.0090**	**0.0135**	**0.0180**	**0.0225**	**0.0270**	**0.0315**	**0.0360**	**0.0405**	**0.0450**	***SET***
Averages	80.10	162.06	249.82	342.31	436.81	532.43	628.22	723.21	818.52	917.35	0.0031
Min	61.80	134.60	210.80	296.60	386.60	481.40	580.50	672.90	763.50	846.90	0.0019
Max	94.30	185.40	282.70	379.50	475.20	573.30	668.10	760.70	871.40	1059.60	0.0040
St. Dev	11.224	19.311	25.328	29.114	30.809	31.846	31.648	32.875	38.144	58.476	0.0007
Count	10	10	10	10	10	10	10	10	10	10	10

DATA SUMMARIES Continued

Compliant Pin Insertion/Retention force:

HASL 0.039" PTH

Cycle 1		Cycle 3	
Insertion Force Summary		**Insertion Force Summary**	
Minimum	4.57	Minimum	3.83
Maximum	6.67	Maximum	5.66
Average	5.79	Average	4.85
St. Dev.	0.49	St. Dev.	0.44
Cycle 1		**Cycle 3**	
Retention Force Summary		**Retention Force Summary**	
Minimum	1.67	Minimum	1.16
Maximum	2.74	Maximum	1.56
Average	1.93	Average	1.37
St. Dev.	0.24	St. Dev.	0.10

HASL 0.043" PTH

Cycle 1		Cycle 3	
Insertion Force Summary		**Insertion Force Summary**	
Minimum	3.42	Minimum	2.68
Maximum	5.14	Maximum	5.54
Average	4.13	Average	3.50
St. Dev.	0.50	St. Dev.	0.67
Cycle 1		**Cycle 3**	
Retention Force Summary		**Retention Force Summary**	
Minimum	1.14	Minimum	0.95
Maximum	1.92	Maximum	2.06
Average	1.37	Average	1.25
St. Dev.	0.21	St. Dev.	0.23

DATA SUMMARIES Continued

ENIG 0.039" PTH

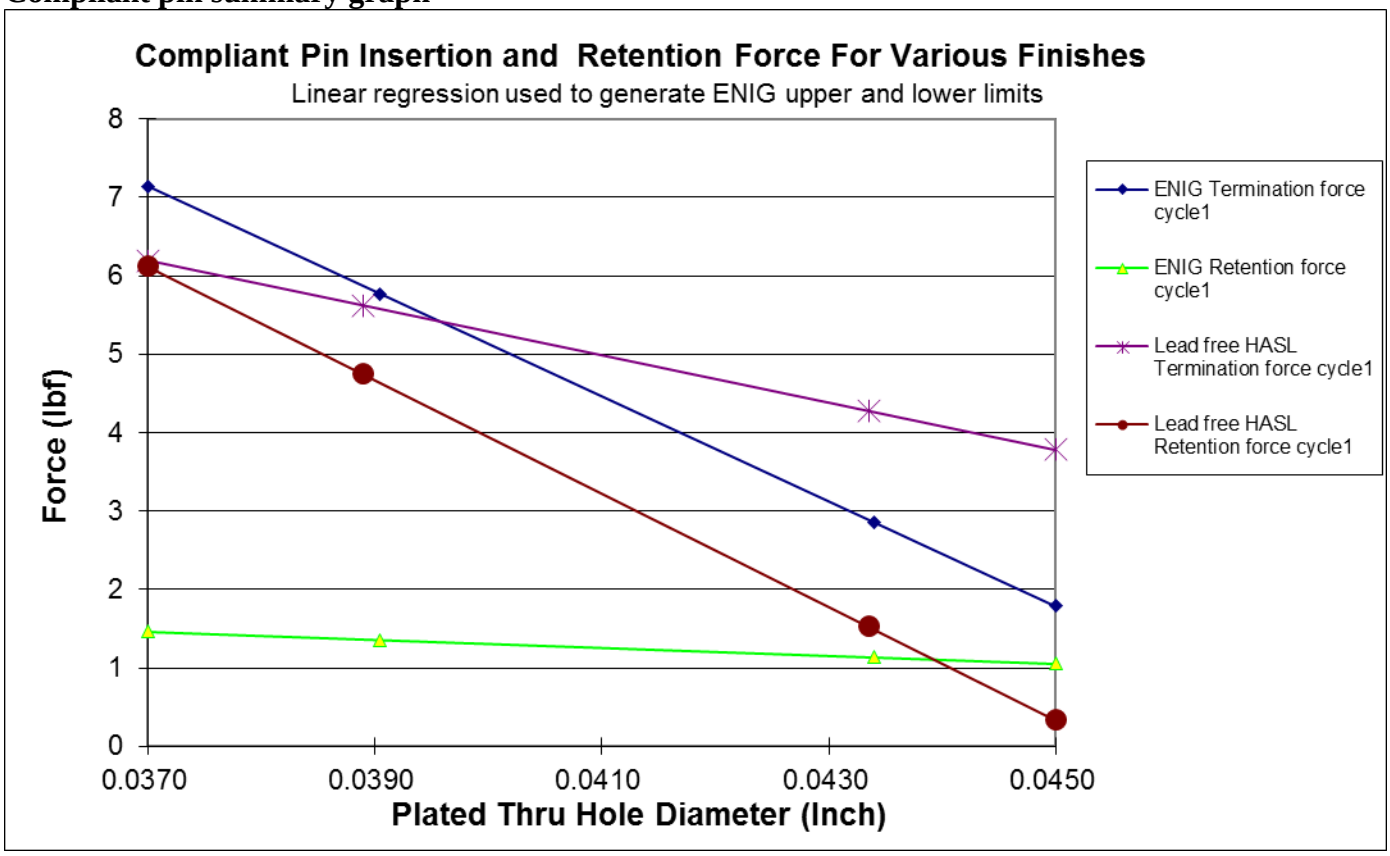
Cycle 1		Cycle 3	
Insertion Force Summary		**Insertion Force Summary**	
Minimum	3.54	Minimum	3.24
Maximum	8.00	Maximum	4.71
Average	4.53	Average	3.91
St. Dev.	0.74	St. Dev.	0.44
Cycle 1		**Cycle 3**	
Retention Force Summary		**Retention Force Summary**	
Minimum	1.08	Minimum	0.79
Maximum	1.64	Maximum	1.31
Average	1.26	Average	1.08
St. Dev.	0.15	St. Dev.	0.12

ENIG 0.043" PTH

Cycle 1		Cycle 3	
Insertion Force Summary		**Insertion Force Summary**	
Minimum	2.46	Minimum	2.18
Maximum	3.26	Maximum	3.50
Average	2.79	Average	2.61
St. Dev.	0.23	St. Dev.	0.35
Cycle 1		**Cycle 3**	
Retention Force Summary		**Retention Force Summary**	
Minimum	0.86	Minimum	0.49
Maximum	1.41	Maximum	1.06
Average	1.13	Average	0.79
St. Dev.	0.13	St. Dev.	0.17

DATA SUMMARIES Continued

Compliant pin summary graph



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: 2019-4-28, Next Cal: 2020-4-27