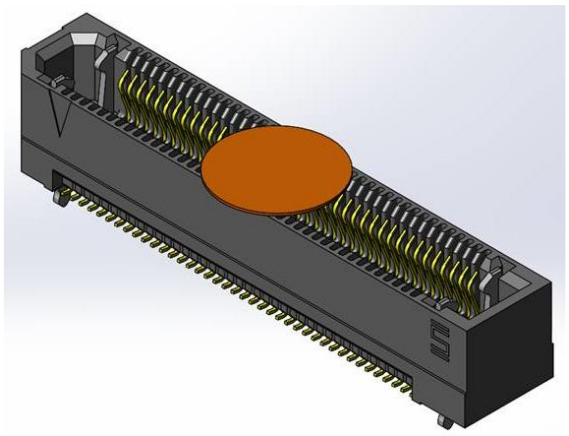
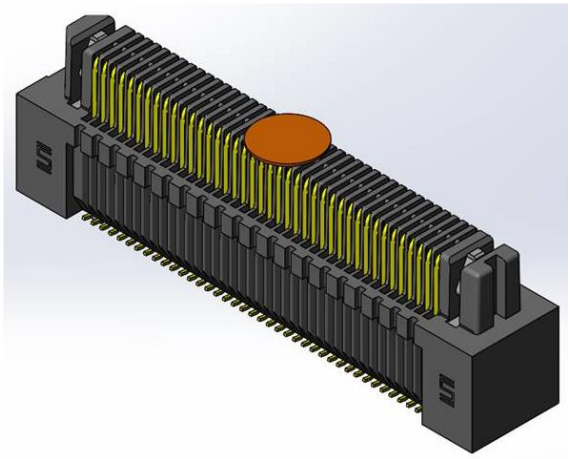
Project Number: Design Qualification Test Report	Tracking Code: 2435282_Report_Rev_2
Requested by: Corey Rose	Date: 8/24/2020
Part #: ERF5-040-05.0-L-DV-L-K-TR/ERM5-040-05.0-L-DV-L-K-TR	
Part description: ERF5/ERM5	Tech: Aaron McKim
Test Start: 6/25/2020	Test Completed: 7/17/2020





DESIGN QUALIFICATION TEST REPORT

ERF5/ERM5

ERF5-040-05.0-L-DV-L-K-TR/ERM5-040-05.0-L-DV-L-K-TR

REVISION HISTORY

DATA	REV.NUM.	DESCRIPTION	ENG
7/21/2020	**1**	**Initial Issue**	**KH**
8/24/2020	**2**	**Add the contact gaps data**	**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: 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-110067-TST

FLOWCHARTS

Mating/Unmating/Durability

Group 1
ERF5-020-05.0-L-DV-L-K-TR
ERM5-020-05.0-L-DV-L-K-TR
8 Assemblies
Latch Test

Step	Description
1.	Contact Gaps *Note: MEASURE WT-123 GAP ONLY*
2.	Mating/Unmating Force (1)
3.	Cycles Quantity = 1 Cycles
4.	Mating/Unmating Force (1)
5.	Cycles Quantity = 4 Cycles
6.	Mating/Unmating Force (1)
7.	Contact Gaps *Note: MEASURE WT-123 GAP ONLY*

Group 2
ERF5-020-05.0-L-DV-K-TR
ERM5-020-05.0-L-DV-K-TR
8 Assemblies
No Latch Test

Step	Description
1.	Mating/Unmating Force (1)
2.	Cycles Quantity = 1 Cycles
3.	Mating/Unmating Force (1)
4.	Cycles Quantity = 4 Cycles
5.	Mating/Unmating Force (1)

Group 3
ERF5-040-05.0-L-DV-L-K-TR
ERM5-040-05.0-L-DV-L-K-TR
8 Assemblies
Latch Test

Step	Description
1.	Contact Gaps *Note: MEASURE WT-123 GAP ONLY*
2.	Mating/Unmating Force (1)
3.	Cycles Quantity = 1 Cycles
4.	Mating/Unmating Force (1)
5.	Cycles Quantity = 4 Cycles
6.	Mating/Unmating Force (1)
7.	Contact Gaps *Note: MEASURE WT-123 GAP ONLY*

Group 4
ERF5-040-05.0-L-DV-K-TR
ERM5-040-05.0-L-DV-K-TR
8 Assemblies
No Latch Test

Step	Description
1.	Mating/Unmating Force (1)
2.	Cycles Quantity = 1 Cycles
3.	Mating/Unmating Force (1)
4.	Cycles Quantity = 4 Cycles
5.	Mating/Unmating Force (1)

(1) Mating/Unmating Force = EIA-364-13

ATTRIBUTE DEFINITIONS

The following is a brief, simplified description of attributes.

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.

CONTACT GAPS:

1) Gaps above the surrounding plastic surface were measured before and after stressing the contacts (e.g. thermal aging, mechanical cycling, etc.).
2) Typically, all contacts on the connector are measured.

RESULTS

Contact Gaps

Group 1 ERF5-020-05.0-L-DV-L-K-TR/ERM5-020-05.0-L-DV-L-K-TR (Latch Test)

- **Initial**
  - **Min ---------- 1.3711 mm**
  - **Max ---------- 1.3847 mm**
- **After 5 Cycles**
  - **Min ---------- 1.4697 mm**
  - **Max ---------- 1.5336 mm**

Group 3 ERF5-040-05.0-L-DV-L-K-TR/ERM5-040-05.0-L-DV-L-K-TR (Latch Test)

- **Initial**
  - **Min ---------- 1.3744 mm**
  - **Max ---------- 1.3855 mm**
- **After 5 Cycles**
  - **Min ---------- 1.4611 mm**
  - **Max ---------- 1.5047 mm**

RESULTS Continued

Mating – Unmating Forces

Group 1 ERF5-020-05.0-L-DV-L-K-TR/ERM5-020-05.0-L-DV-L-K-TR (Latch Test)

- **Initial**
  - **Mating**
    - **Min ---------- 3.96 lbs**
    - **Max---------- 5.51 lbs**
  - **Unmating**
    - **Min ---------- 1.56 lbs**
    - **Max---------- 4.35 lbs**
- **After 1 Cycle**
  - **Mating**
    - **Min ---------- 3.95 lbs**
    - **Max---------- 5.14 lbs**
  - **Unmating**
    - **Min ---------- 1.71 lbs**
    - **Max---------- 4.46 lbs**
- **After 5 Cycles**
  - **Mating**
    - **Min ---------- 3.79 lbs**
    - **Max---------- 5.88 lbs**
  - **Unmating**
    - **Min ---------- 2.36 lbs**
    - **Max---------- 4.97 lbs**

Group 2 ERF5-020-05.0-L-DV-K-TR/ERM5-020-05.0-L-DV-K-TR (No Latch Test)

- **Initial**
  - **Mating**
    - **Min ---------- 1.16 lbs**
    - **Max---------- 1.83 lbs**
  - **Unmating**
    - **Min ---------- 0.73 lbs**
    - **Max---------- 1.57 lbs**
- **After 1 Cycle**
  - **Mating**
    - **Min ---------- 1.21 lbs**
    - **Max---------- 1.80 lbs**
  - **Unmating**
    - **Min ---------- 0.81 lbs**
    - **Max---------- 1.60 lbs**
- **After 5 Cycles**
  - **Mating**
    - **Min ---------- 1.11 lbs**
    - **Max---------- 1.71 lbs**
  - **Unmating**
    - **Min ---------- 0.81 lbs**
    - **Max---------- 1.74 lbs**

RESULTS Continued

Group 3 ERF5-040-05.0-L-DV-L-K-TR/ERM5-040-05.0-L-DV-L-K-TR (Latch Test)

- **Initial**
  - **Mating**
    - **Min ---------- 6.04 lbs**
    - **Max---------- 8.88 lbs**
  - **Unmating**
    - **Min ---------- 2.71 lbs**
    - **Max---------- 5.82 lbs**
- **After 1 Cycle**
  - **Mating**
    - **Min ---------- 5.70 lbs**
    - **Max---------- 8.84 lbs**
  - **Unmating**
    - **Min ---------- 2.72 lbs**
    - **Max---------- 5.97 lbs**
- **After 5 Cycles**
  - **Mating**
    - **Min ---------- 5.55 lbs**
    - **Max---------- 9.89 lbs**
  - **Unmating**
    - **Min ---------- 2.97 lbs**
    - **Max---------- 6.61 lbs**

Group 4 ERF5-040-05.0-L-DV-K-TR/ERM5-040-05.0-L-DV-K-TR (No Latch Test)

- **Initial**
  - **Mating**
    - **Min ---------- 3.85 lbs**
    - **Max---------- 4.91 lbs**
  - **Unmating**
    - **Min ---------- 1.42 lbs**
    - **Max---------- 2.00 lbs**
- **After 1 Cycle**
  - **Mating**
    - **Min ---------- 3.70 lbs**
    - **Max---------- 4.66 lbs**
  - **Unmating**
    - **Min ---------- 1.42 lbs**
    - **Max---------- 1.80 lbs**
- **After 5 Cycles**
  - **Mating**
    - **Min ---------- 3.36 lbs**
    - **Max---------- 4.65 lbs**
  - **Unmating**
    - **Min ---------- 1.36 lbs**
    - **Max---------- 1.85 lbs**

DATA SUMMARIES

CONTACT GAPS:

Group 1 ERF5-020-05.0-L-DV-L-K-TR/ERM5-020-05.0-L-DV-L-K-TR (Latch Test)

Initial

Pin Type 1	
Latch	
Nominal	1.38
Hi Limit	1.43
Lo Limit	1.33
Min	1.3711
Max	1.3847
Avg	1.3808
St. Dev.	0.0038
Count	16
% High	0
% Low	0

After 5 Cycles

Pin Type 1	
Latch	
Nominal	1.38
Hi Limit	1.43
Lo Limit	1.33
Min	1.4697
Max	1.5336
Avg	1.5009
St. Dev.	0.0180
Count	16
% High	100%
% Low	0%

Group 3 ERF5-040-05.0-L-DV-L-K-TR/ERM5-040-05.0-L-DV-L-K-TR (Latch Test)

Initial

Pin Type 1	
Latch	
Nominal	1.38
Hi Limit	1.43
Lo Limit	1.33
Min	1.3744
Max	1.3855
Avg	1.4677
St. Dev.	0.0027
Count	16
% High	0
% Low	0

After 5 Cycles

Pin Type 1	
Latch	
Nominal	1.38
Hi Limit	1.43
Lo Limit	1.33
Min	1.4611
Max	1.5047
Avg	1.4848
St. Dev.	0.0103
Count	16
% High	100%
% Low	0%

DATA SUMMARIES Continued

MATING/UNMATING:

Group 1 ERF5-020-05.0-L-DV-L-K-TR/ERM5-020-05.0-L-DV-L-K-TR (Latch Test)

	Initial				After 1 Cycle			
	Mating		**Unmating**		**Mating**		**Unmating**	
	Newtons	Force (Lbs)	Newtons	Force (Lbs)	Newtons	Force (Lbs)	Newtons	Force (Lbs)
Minimum	17.60	3.96	6.94	1.56	17.59	3.95	7.61	1.71
Maximum	24.52	5.51	19.34	4.35	22.86	5.14	19.84	4.46
Average	20.17	**4.53**	16.66	**3.74**	20.24	**4.55**	17.02	**3.83**
St Dev	2.18	0.49	4.13	0.93	1.82	0.41	4.08	0.92
Count	8	8	8	8	8	8	8	8

	After 5 Cycles			
	Mating		**Unmating**	
	Newtons	Force (Lbs)	Newtons	Force (Lbs)
Minimum	16.86	3.79	10.48	2.36
Maximum	26.15	5.88	22.10	4.97
Average	22.12	**4.97**	18.05	**4.06**
St Dev	2.95	0.66	3.58	0.80
Count	8	8	8	8

Group 2 ERF5-020-05.0-L-DV-K-TR/ERM5-020-05.0-L-DV-K-TR (No Latch Test)

	Initial				1 Cycle			
	Mating		**Unmating**		**Mating**		**Unmating**	
	Newtons	Force (Lbs)	Newtons	Force (Lbs)	Newtons	Force (Lbs)	Newtons	Force (Lbs)
Minimum	5.14	1.16	3.26	0.73	5.38	1.21	3.59	0.81
Maximum	8.12	1.83	6.98	1.57	8.01	1.80	7.11	1.60
Average	6.78	**1.52**	5.04	**1.13**	6.86	**1.54**	4.96	**1.11**
St Dev	0.90	0.20	1.31	0.29	0.75	0.17	1.29	0.29
Count	8	8	8	8	8	8	8	8

	5 Cycles			
	Mating		**Unmating**	
	Newtons	Force (Lbs)	Newtons	Force (Lbs)
Minimum	4.94	1.11	3.59	0.81
Maximum	7.58	1.71	7.73	1.74
Average	6.75	**1.52**	5.12	**1.15**
St Dev	0.78	0.17	1.39	0.31
Count	8	8	8	8

DATA SUMMARIES Continued

Group 3 ERF5-040-05.0-L-DV-L-K-TR/ERM5-040-05.0-L-DV-L-K-TR (Latch Test)

	Initial				1 Cycle			
	Mating		**Unmating**		**Mating**		**Unmating**	
	Newtons	Force (Lbs)	Newtons	Force (Lbs)	Newtons	Force (Lbs)	Newtons	Force (Lbs)
Minimum	26.87	6.04	12.05	2.71	25.34	5.70	12.10	2.72
Maximum	39.50	8.88	25.87	5.82	39.32	8.84	26.55	5.97
Average	30.00	**6.75**	19.47	**4.38**	29.24	**6.57**	19.63	**4.41**
St Dev	4.21	0.95	3.82	0.86	4.57	1.03	4.04	0.91
Count	8	8	8	8	8	8	8	8

	5 Cycles			
	Mating		**Unmating**	
	Newtons	Force (Lbs)	Newtons	Force (Lbs)
Minimum	24.70	5.55	13.20	2.97
Maximum	44.00	9.89	29.41	6.61
Average	29.65	**6.67**	20.66	**4.65**
St Dev	6.21	1.40	4.51	1.01
Count	8	8	8	8

Group 4 ERF5-040-05.0-L-DV-K-TR/ERM5-040-05.0-L-DV-K-TR (No Latch Test)

	Initial				1 Cycle			
	Mating		**Unmating**		**Mating**		**Unmating**	
	Newtons	Force (Lbs)	Newtons	Force (Lbs)	Newtons	Force (Lbs)	Newtons	Force (Lbs)
Minimum	17.11	3.85	6.32	1.42	16.45	3.70	6.33	1.42
Maximum	21.83	4.91	8.90	2.00	20.71	4.66	7.99	1.80
Average	19.92	**4.48**	7.07	**1.59**	19.15	**4.30**	6.95	**1.56**
St Dev	1.64	0.37	0.92	0.21	1.43	0.32	0.62	0.14
Count	8	8	8	8	8	8	8	8

	5 Cycles			
	Mating		**Unmating**	
	Newtons	Force (Lbs)	Newtons	Force (Lbs)
Minimum	14.96	3.36	6.06	1.36
Maximum	20.67	4.65	8.21	1.85
Average	18.31	**4.12**	7.03	**1.58**
St Dev	1.77	0.40	0.71	0.16
Count	8	8	8	8

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: 05/29/2020, Next Cal: 05/29/2021

Equipment #: MV-18
Description: Measurement System
Manufacturer: MicroVu
Model: SL16101047
Serial #: SOL 161
Accuracy: … Last Cal: 04/20/2020, Next Cal: 04/20/2021