OSFP Single Port and Ganged Cage Assemblies

1. INTRODUCTION

1.1 Purpose

Testing was performed on the TE Connectivity OSFP Single Port and Ganged Cage Assemblies to determine its conformance to the requirements of Product Specification 108-60117 Rev A.

1.2 Scope

This report covers the mechanical, and environmental performance of the TE Connectivity OSFP Single Port and Ganged Cage Assemblies. Testing was performed by the Harrisburg Electrical Components Test Laboratory between April 9, 2018 and April 25, 2018 and also between May 15, 2018 and May 16, 2018. Documentation is on file and maintained at the TE Harrisburg Electrical Components Test Laboratory under EA20180061T and EA20180204T.

1.3 Conclusion

All TE OSFP Single Port and Ganged Cage Assemblies as listed in paragraph 1.5, conformed to the mechanical, and environmental performance requirements of Product Specification 108-60117 Rev A.

1.4 Product Description

Designed to use eight electrical lanes to deliver 400GbE, OSFP is aimed at the upcoming generation of equipment that will operate with 50 Gbps electrical signaling. OSFP integrates thermal management directly into the form factor, eliminating the high thermal resistance between the module and the heat sink. The airflow design allows for cooling the downstream silicon switch or compute chips inside the equipment enclosure.

1.5 Test Specimens

The test specimens were representative of normal production lots, and the following part numbers were used for test:

Table 1 – Test Specimens

Test Group	Test Set	Quantity	Part Number	Description
1	1	5	2317416-1 Rev 2	OSFP 1x1 Cage
		5	2324689-4 Rev 2	OSFP Receptacle
		5	N/A	OSFP Test Plug Module (PCB P/N: 60-1935204-1)
	2	5	2315853-1 Rev 7	OSFP 1x4 Cage
		5	2324689-4 Rev 2	OSFP Receptacle
		5	2332263-1	OSFP Cable
2	3	5	2317416-1 Rev 2	OSFP 1x1 Cage
3	4	5	2317416-1 Rev 2	OSFP 1x1 Cage
4	5	5	2317416-1 Rev 2	OSFP 1x1 Cage
1,2,3,4	1,3,4, 5	3 Each	60-1935203-1 Rev A	OSFP LLCR Test PCB
	2	5		

1.6 Qualification Test Sequence

Table 2 – Qualification Test Sequence

Test or Examination	Test Sets			
	1,2	3	4	5
	Test Groups			
	1	2	3	4
	Test Sequence (a)			
Initial Examination of Product	1	1	1	1
Cage Latch, Axial Retention (c)	6			
Durability (c)	5			
Mating Force	3			
Unmating Force	4			
Cage Compliant Pin Insertion Force	2	2	2	2
Cage Compliant Pin Retention Force		3	4	4
Humidity-Temperature Cycling			3	
Temperature Life				3
Final Examination of Product	7	4	5	5

Note: (a) Numbers indicate sequence which tests were performed.

1.7 Environmental Conditions

Unless otherwise stated, the following environmental conditions prevailed during testing:

Temperature: 15°C to 35°C
Relative Humidity 20% to 80%

2. SUMMARY OF TESTING

2.1 Initial Examination of Product

All specimens submitted for testing were representative of normal production lots. A Certificate of Conformance was issued by Product Assurance. Where specified, specimens were visually examined and no evidence of physical damage detrimental to product performance was observed.

2.2 Cage Latch, Axial Retention – Test Group 1

Refer to Table 3 for cage latch, axial retention force summary data. All recorded forces were above the requirement of 125.0 Newtons [28.09 lbf] minimum for cage latch, axial retention.

Table 3 – Cage Latch, Axial Retention

	Cage Latch Axial Retention	
	Newtons	Newtons
Specimen ID	**Test Set 1**	**Test Set 2**
Minimum	187.47	191.46
Maximum	238.09	252.82
Average	209.16	224.88
Requirement	**125.0 N Min.**	

2.3 Durability

No physical damage detrimental to product performance was visible due to mating and unmating the specimens 100 times.

2.4 Mating Force – Test Group 1

Refer to Table 4 for mating force summary data. All recorded forces were below the requirement of 40.0 Newton maximum for mating force.

Table 4 – Mating Force Data in Newtons

	Mating Force	
	Newtons	Newtons
Specimen ID	**Test Set 1**	**Test Set 2**
Minimum	21.33	20.23
Maximum	23.25	22.14
Average	22.25	21.20
Requirement	**40.0 N Max.**	**40.0 N Max.**

2.5 Unmating Force – Test Group 1

Refer to Table 5 for unmating force summary data. All recorded forces were below the requirement of 30.0 Newton maximum for unmating force.

Table 5 – Unmating Force Data in Newtons

	Unmating Force	
	Newtons	Newtons
Specimen ID	Test Set 1	Test Set 2
Minimum	9.96	10.11
Maximum	16.65	11.41
Average	11.73	10.86
Requirement	30.0 N Max.	30.0 N Max.

2.6 Cage Compliant Pin Insertion Force – All Groups

Refer to Table 6 for cage compliant pin insertion force summary data. All recorded forces were below the requirement of 37.8 Newtons maximum average per pin for cage compliant pin insertion force. The connector force was divided by 24 (1x1 cage) or 48 (1x4 cage) to obtain the average per pin data.

Table 6 – Cage Compliant Pin Insertion Force

1x1 Cage			1x4 Cage		
	Connector Force	Average Per Pin		Connector Force	Average Per Pin
	Newtons	Newtons		Newtons	Newtons
Specimen ID	Test Sets 1,3,4,5	Test Sets 1,3,4,5	Specimen ID	Test Set 2	Test Set 2
Minimum	442.05	18.42	Minimum	1132.95	23.60
Maximum	547.74	22.82	Maximum	1369.88	28.54
Average	495.53	20.65	Average	1257.45	26.20
Requirement	907.2 N Max.	37.8 N Max.	Requirement	1814.4 N Max.	37.8 N Max.

2.7 Cage Compliant Pin Retention Force – Test Groups 2,3,4

Refer to Table 7 for cage compliant pin retention force summary data. All recorded forces were above the requirement of 8.0 Newtons minimum average per pin for cage compliant pin retention force. The connector force was divided by 24 to obtain the average per pin data.

Table 7 – Cage Compliant Pin Retention Force

1x1 Cage		
Specimen ID	Connector Force	Average Per Pin
	Newtons	Newtons
Specimen ID	Test Sets 3,4,5	Test Sets 3,4,5
Minimum	208.31	8.68
Maximum	317.27	13.22
Average	258.28	10.76
Requirement	192.0 N Min.	8.0 N Min.

2.8 Humidity-Temperature Cycling – Test Group 3

No physical damage detrimental to product performance was visible due to humidity/temperature cycling.

2.9 Temperature Life – Test Group 4

No physical damage detrimental to product performance was visible due to temperature life testing.

2.10 Final Examination of Product – All Groups

Specimens were visually examined and no damage detrimental to product performance was visible.

3. TEST METHODS

3.1. Initial Examination of Product

A C of C was issued stating that all specimens in this test package were produced, inspected, and accepted as conforming to product drawing requirements, and were manufactured using the same core manufacturing processes and technologies as production parts.

3.2 Cage Latch, Axial Retention

The PCB was attached to a right angle plate mounted to a free floating x/y and rotational table. The free floating table was attached to the base of the tensile/compression machine. A parallel vise was attached to the moveable crosshead of the tensile/compression machine. The plug module was clamped in the parallel vise and force was applied in an upward direction at a rate of 0.5 in/min until the module was removed from the cage. Refer to Figure 1 for images of the typical test setup. Testing was performed in accordance with EIA-364-98.

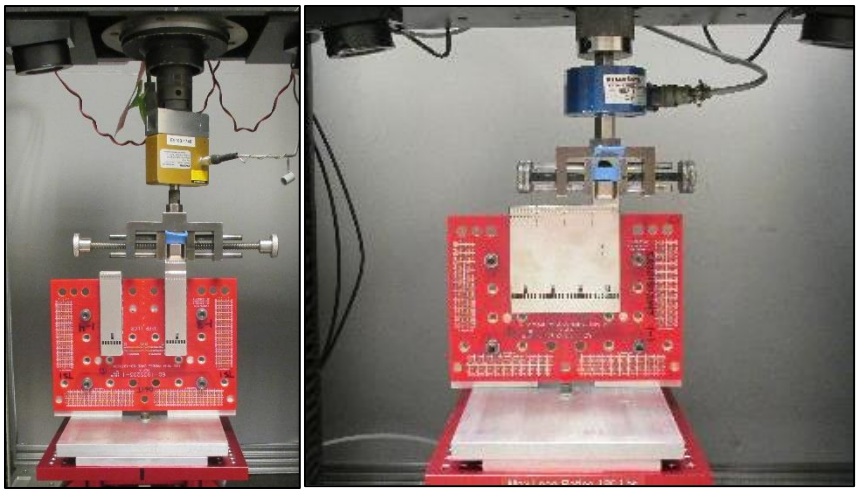

Figure 1 – Typical Cage Latch Axial Retention Test Setup

3.3 Durability

The specimens were mated and unmated 100 times by hand at a rate less than 300 cycles per hour. Testing was performed in accordance with EIA-364-09D.

3.4 Mating Force

The PCB was attached to a right angle plate mounted on a mill table. The mill table was attached to the base of the tensile/compression machine. A probe fixture was held in a drill chuck attached to the moveable crosshead of the tensile/compression machine. The plug module was manually started into the cage. The probe fixture was aligned with the rear of the plug module and force was applied in a downward direction at a rate of 0.5 in/min until the plug module was fully inserted into the cage and the latches engaged. Refer to Figure 2 for images of the typical test setup. Testing was performed in accordance with EIA-364-13E.

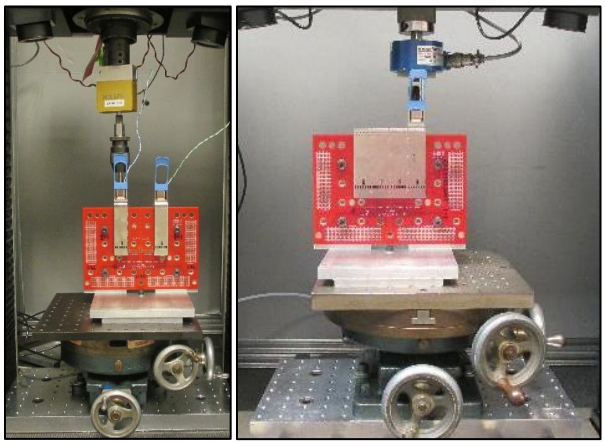

Figure 2 – Mating Force Test Setup

3.5 Unmating Force

The PCB was attached to a right angle plate mounted to a free floating x/y and rotational table. The free floating table was attached to the base of the tensile/compression machine. A parallel vise was attached to the moveable crosshead of the tensile/compression machine. The pull tab of the plug module was clamped in the parallel vise and force was applied in an upward direction at a rate of 0.5 in/min until the module was removed from the cage. Refer to Figure 3 for images of the typical test setup. Testing was performed in accordance with EIA-364-13E.

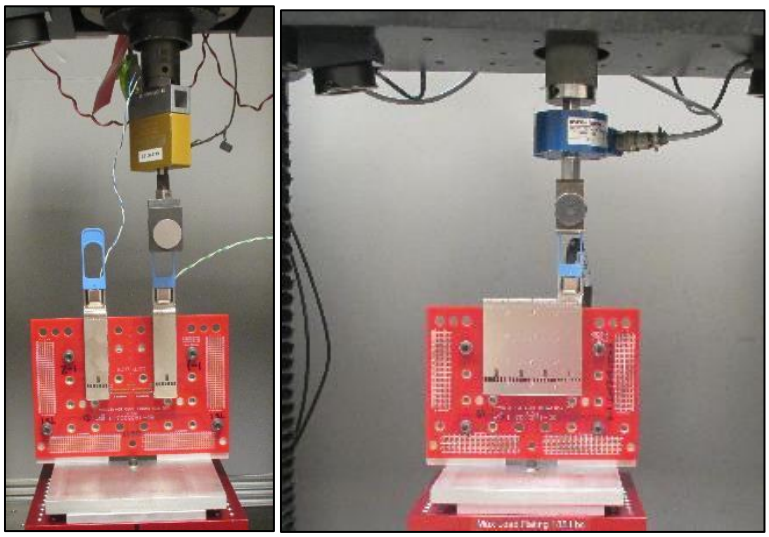

Figure 3 – Typical Unmating Force Test Setup

3.6 Cage Compliant Pin Insertion Force

The PCB was placed on a mill table at the base of the tensile/compression machine. A probe fixture was attached to the moveable crosshead of the tensile/compression machine. The cage specimen was manually placed on the PCB and a plate was placed on top to flat rock the specimens onto the PCB. Force was applied in a downward direction at a rate of 0.5 in/min until the cage was fully inserted onto the PCB. Refer to Figure 4 for images of the typical test setup. Testing was performed in accordance with EIA-364-05B.

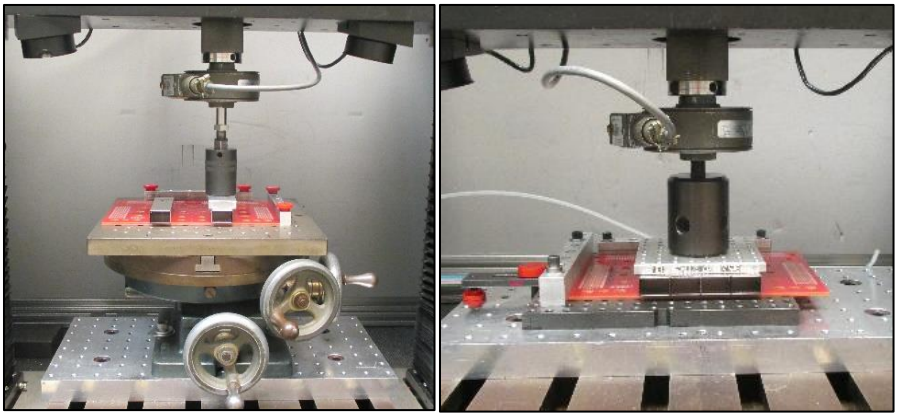

Figure 4 – Typical Compliant Pin Insertion Force Test Setup

3.7 Cage Compliant Pin Retention Force

The PCB was clamped to a mill table at the base of the tensile/compression machine. A drill chuck was attached to a universal joint on the moveable crosshead of the tensile/compression machine. A hole was drilled in the top of the cage to allow a fixture to be inserted and bolted to the top of the cage. The bolt was secured in the drill chuck and force was applied in an upward direction at a rate of 0.5 in/min until the cage was removed from the PCB. Refer to Figure 5 for images of the typical test setup. Testing was performed in accordance with EIA-364-29C.

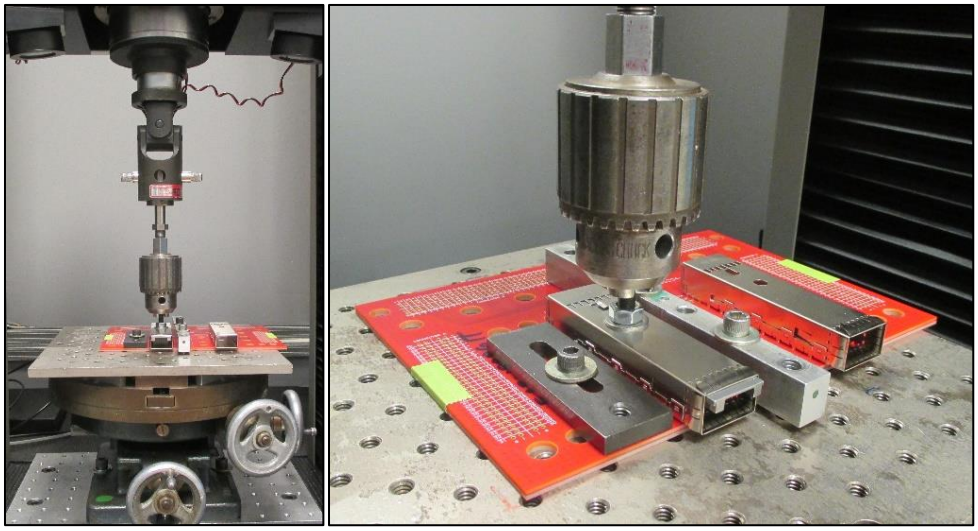

Figure 5 – Typical Compliant Pin Retention Test Setup

3.8 Humidity-Temperature Cycling

The PCB mounted cage specimens were subjected to 24 cycles of temperature/humidity cycling between 25±3°C at 80±3%RH and 65±3°C at 50±3%RH. The ramp time between temperatures was 30 minutes with one hour dwells at temperature extremes. Refer to Figure 6 for an illustration of the typical humidity/temperature profile. Testing was performed in accordance with EIA-364-31E.

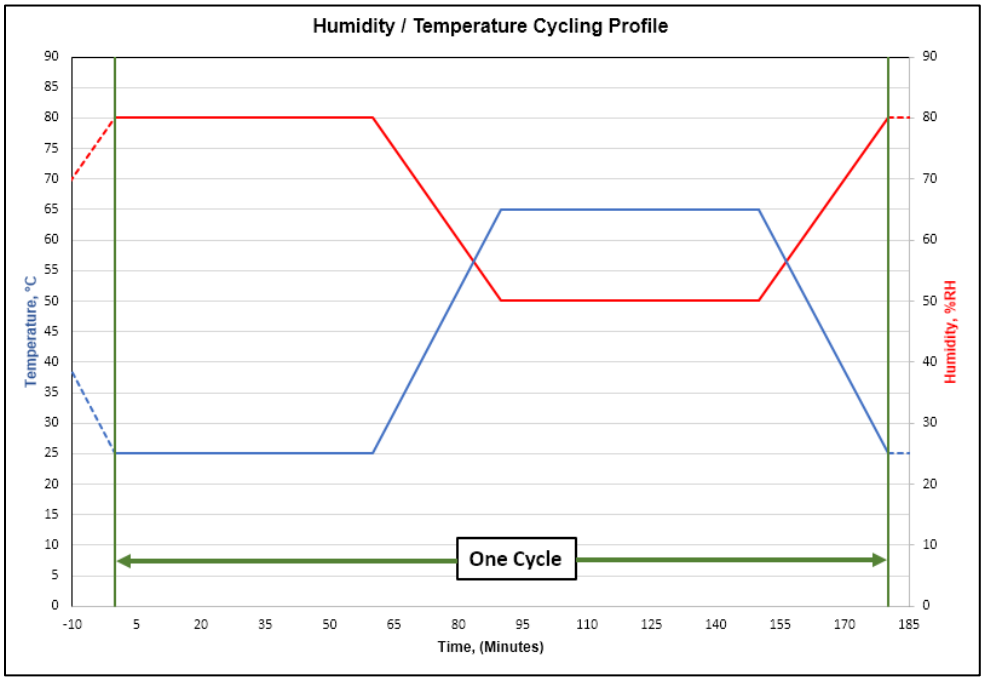

Figure 6 – Typical Humidity/Temperature Cycling Profile

3.9 Temperature Life

The PCB mounted cage specimens were subjected to 240 hours at a temperature of 105°C. Testing was performed in accordance with EIA-364-17C.

3.10 Final Examination of Product

Specimens were visually examined with the unaided eye. Testing was performed in accordance with EIA-364-18B.