Low Profile CFP 100 Gigabit Pluggable Host Connector and Transceiver Plug Connector System

1. INTRODUCTION

1.1 Purpose

Testing was performed on the TE Connectivity (TE) Low Profile CFP Receptacle Assembly according to Product Specification 108-32089 Rev A.

1.2 Scope

This report covers the electrical, mechanical, and environmental performance of the TE Low Profile CFP Receptacle Assembly. Testing was performed at the TE Harrisburg Electrical Components Test Laboratory from 7-July-2015 to 12-October-2015 and is maintained under EA20150283T.

1.3 Conclusion

The Low Profile CFP Receptacle Assembly listed in paragraph 1.5 met all of the requirements in Product Specification 108-32089 Rev A.

1.4 Product Description

The CFP compliant connector is a high speed pluggable I/O interface supporting 40 and 100 Gb/s ethernet applications. The integrated system provides the mechanical, EMI and thermal performance necessary to meet the demanding requirements of the CFP Multi Source Agreement (MSA) Optical Transceivers and OEM host line cards. Applications include switches and routers for telecom and data center applications and optical transport equipment for long haul, metro, and multiservice provisioning platform applications.

1.5 Test Specimens

The test specimens were representative of normal production lots, and the following part numbers (Table 1) were used for the test:

Table 1 – Test Specimens

Test Group	Qty	Part number	Description
1	4	2274829-1 Rev A 2057629-1 Rev A	Low Profile CFP Receptacle Assembly 100 Gig Connector Assembly Module
2	4	2274829-1 Rev A 2057629-1 Rev A	Low Profile CFP Receptacle Assembly 100 Gig Connector Assembly Module
3	4	2274829-1 Rev A 2057629-1 Rev A	Low Profile CFP Receptacle Assembly 100 Gig Connector Assembly Module
4	4	2274829-1 Rev A 2057629-1 Rev A	Low Profile CFP Receptacle Assembly 100 Gig Connector Assembly Module
5	4	2274829-1 Rev A 2057629-1 Rev A	Low Profile CFP Receptacle Assembly 100 Gig Connector Assembly Module Contacts
1,2,3,5	16	60-1824507-1 Rev A	LLCR Test Board
1,2,3,5	16	60-1042615-1 Rev A	Paddlecard Test Board – Pads “Bussed”

1.6 Qualification Test Sequence

Table 2 - Test Sequence

Test or Examination	Test Group (a)				
	1	2	3	4	5
	Test Sequence (b)				
Initial Visual Examination	1	1	1	1	1
Low Level Contact Resistance	3,5,8	2,4,6,8	2,4,7		2,4(c),6,8
Insulation Resistance				2,6	
Withstanding Voltage				3,7	
Random Vibration	6				
Mechanical Shock	7				
Durability	4				
Insertion Force	2				
Extraction Force	9				
Thermal Shock				4	
Thermal Cycling					5
Humidity / Temperature Cycling		7		5	
Temperature Life		3(c)			
Temperature Life - Preconditioning			3(c)		
Mixed Flowing Gas			5		
Salt Spray					3
Minute Disturbance		5	6		7
Final Visual Examination	10	9	8	8	9

Note: (a) Each test group shall consist of 4 specimens selected at random from current production.
(b) Numbers indicate sequence which tests were performed.
(c) Specimens were preconditioned with 20 cycles of durability.

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 Visual Examination

The specimens were visually examined and no evidence of physical damage detrimental to product performance was observed. A certification of conformance was issued stating that the specimens in the test package were produced, inspected, and accepted as conforming to product drawing requirements and made using the same core manufacturing processes and technologies as production parts.

2.2 Low Level Contact Resistance – Test Groups 1, 2, 3 & 5

All specimens met the maximum 20 milliohm delta requirement. See Tables 3 thru 6 for a summary of results for each test group.

Table 3 – Low Level Contact Resistance Summary in milliohms - Test Group 1

	Initial	After Durability	After Vibe and Shock
	Actual	Delta	Delta
Minimum	18.20	-8.37	-9.12
Maximum	27.35	7.15	2.48
Average	20.50	-1.32	-1.56
Std Dev	1.63	1.53	1.56
N	256	256	256

Table 4 – Low Level Contact Resistance Summary in milliohms - Test Group 2

	Initial	After Temp Life	After Minute Disturbance	After Humidity/ Temp Cycling
	Actual	Delta	Delta	Delta
Minimum	16.19	-2.09	-6.70	-8.01
Maximum	26.09	8.50	9.42	9.72
Average	19.50	1.30	0.80	0.41
Std Dev	1.60	1.89	1.94	2.03
N	256	256	256	256

Table 5 – Low Level Contact Resistance Summary in milliohms - Test Group 3

	Initial	After Temp Life (pre-conditioning)	After MFG
	Actual	Delta	Delta
Minimum	17.41	-4.09	-4.33
Maximum	25.12	9.37	8.55
Average	20.14	0.89	0.45
Std Dev	1.50	1.88	1.82
N	256	256	256

Table 6 – Low Level Contact Resistance Summary in milliohms - Test Group 4

	Initial	After Salt Spray	After Thermal Cycling	After Minute Disturbance
	Actual	Delta	Delta	Delta
Minimum	15.89	-4.52	-3.62	-4.33
Maximum	25.44	19.62	19.85	18.78
Average	19.61	1.05	0.66	1.66
Std Dev	1.32	3.06	2.76	3.65
N	256	256	256	256

2.3 Insulation Resistance

All initial and final insulation resistance readings met the 1000 megohms minimum requirement.

2.4 Withstanding Voltage

Specimens displayed no breakdown or flashover when subjected to 300 VAC for one minute for both initial and final withstanding voltage testing.

2.5 Random Vibration

No discontinuities of one microsecond or greater were detected during vibration. Following vibration, no cracks, breaks or loose parts were visible.

2.6 Mechanical Shock

No discontinuities of one microsecond or greater were detected during mechanical shock. Following mechanical shock, no cracks, breaks or loose parts were visible.

2.7 Durability

No evidence of physical damage detrimental to the operation of the part was observed after mating and unmating the specimens 200 times.

2.8 Insertion Force

All specimens met the maximum insertion force of 70 N.

2.9 Extraction Force

All specimens met the minimum extraction force of 12 N.

2.10 Thermal Shock

No evidence of physical damage was observed as a result of exposure to thermal shock.

2.11 Thermal Cycling

No evidence of physical damage was observed as a result of exposure to thermal cycling.

2.12 Humidity / Temperature Cycling

No evidence of physical damage was observed as a result of exposure to humidity-temperature cycling.

2.13 Temperature Life

No evidence of physical damage was observed as a result of exposure to temperature life.

2.14 Temperature Life – Preconditioning

No evidence of physical damage was observed as a result of exposure to temperature life – preconditioning.

2.15 Mixed Flowing Gas

No evidence of physical damage was observed as a result of exposure to mixed flowing gas.

2.16 Salt Spray

No evidence of physical damage was observed as a result of exposure to salt spray.

2.17 Minute Disturbance

No evidence of physical damage was observed as a result of minute disturbance.

2.18 Final Visual Examination

The specimens were visually examined and no evidence of physical damage detrimental to product performance was observed.

3. TEST METHODS

3.1 Initial Visual Examination

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

3.2 Low Level Contact Resistance

Low level contact resistance measurements at low level current were made using a four terminal measuring technique. The test current was maintained at 100 milliamperes maximum with a 20 millivolt maximum open circuit voltage. Current and voltage were applied to the Low Profile CFP Receptacle Assembly (I+,V+) and to the bussed PCB in the Plug Assembly (I-,V-) utilizing a custom wire harness that was plugged into an automated low level scanning station.

3.3 Insulation Resistance

A test potential of 300 VDC was applied to adjacent contacts on a mated and unmounted specimen for two minutes with insulation resistance measurements recorded immediately after.

3.4 Withstanding Voltage

A test potential of 300 VAC was applied to adjacent contacts on a mated and unmounted specimen. The voltage was held for one minute and the maximum leakage current recorded. The test voltage was increased from zero to 300 VAC at a rate of 300 volts per second.

3.5 Random Vibration

Mated specimens were subjected to a random vibration spectrum with excitation frequency bounds of 20 and 500 Hertz (Hz). The spectrum remains flat at 0.02 G^2/Hz from 20 Hz to the upper bound frequency of 500 Hz. The root-mean square amplitude of the excitation was 3.10 GRMS. The test specimens were subjected to this test for 15 minutes in each of the three mutually perpendicular axes, for a total test time of 45 minutes per test specimen. The test specimens were monitored for discontinuities of 1 microsecond or greater using an energizing current of 100 milliamperes.

3.6 Mechanical Shock

Mated specimens were subjected to a mechanical shock test having a half-sine waveform with an acceleration amplitude of 50 gravity units (g's peak) and a duration of 11 milliseconds. Three shocks in each direction were applied along the three mutually perpendicular axes of the test specimens, for a total of eighteen shocks. The test specimens were monitored for discontinuities of 1 microsecond or greater using an energizing current of 100 milliamperes.

3.7 Durability

Specimens were mated and unmated for 200 cycles at a maximum of 300 cycles per hour by hand.

3.8 Insertion Force

Insertion force was performed with a tensile/compression machine. The board and receptacle were rigidly clamped in two vises set on the base of the tensile/compression machine. The plug was pushed into place with a fixture mounted to the load cell of the tensile/compression crosshead. The crosshead was lowered at a rate of 0.20 inches/min until the specimen was fully mated and the peak force was recorded.

3.9 Extraction Force

Extraction force was performed with a tensile/compression machine. The board and receptacle were rigidly clamped in a vise rigidly attached to the base of the tensile/compression machine (the bezel was removed to assure all retention force was a result of the receptacle and plug only). The transceiver was grasped with a vice mounted to the load cell of the tensile/compression crosshead. The crosshead was raised at a rate of 0.50 inches/min until the specimen was fully unmated and the peak force was recorded.

3.10 Thermal Shock

Mated specimens were subjected to 5 cycles of thermal shock between -55°C and 105°C with 30 minute dwells at temperature extremes and 1 minute transition (or less) between temperatures.

3.11 Thermal Cycling

Mated specimens were subjected to 10 cycles between 15°C and 85°C with 30 minute dwells at temperature extremes and a transition rate of 5°C per minute between temperatures.

3.12 Humidity / Temperature Cycling

Mated specimens were subjected to ten 24-hour cycles between 25°C and 65°C at 90 to 95% relative humidity.

3.13 Temperature Life

Mated specimens were subjected to 105 C for 250 hours.

3.14 Temperature Life – Preconditioning

Mated specimens were subjected to 90°C for 360 hours.

3.15 Mixed Flowing Gas

The specimens were exposed for 20 days total. Two samples were exposed to MFG for 10 days unmated followed by 10 days mated. The remaining two specimens were exposed to MFG for 20 days mated.

Table 10 – MFG Test Parameters

Environment	IIA
Temperature (°C)	30
Relative Humidity (%)	70
Chlorine (Cl_2) Concentration (ppb)	10 $\pm$ 3
Hydrogen Sulfide (H_2S) Concentration (ppb)	10 $\pm$ 3
Nitrogen Dioxide (NO_2) Concentration (ppb)	200 $\pm$ 50
Sulfur Dioxide (SO_2) Concentration (ppb)	100 $\pm$ 20
Exposure Period	20 days

3.16 Salt Spray

Mated specimens were subjected to salt spray for 48 hours at 5% salt.

3.17 Minute Disturbance

Specimens were unmated and mated one time.

3.18 Final Visual Examination

The specimens were visually examined and no evidence of physical damage detrimental to product performance was observed.