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**Single Port SFP+ Cages, Ganged SFP+ Cages, and SFP+ Copper  
Module Direct Attach Cable Assembly**

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**1. SCOPE**

## 1.1. Content

This specification covers performance, tests and quality requirements for the TE Connectivity (TE) Single Port SFP+ Cages, Ganged SFP+ Cages, and SFP+ Copper Module Direct Attach Cable Assembly.

## 1.2. Qualification

When tests are performed on the subject product line, procedures specified in Figure 1 shall be used. All inspections shall be performed using the applicable inspection plan and product drawing.

## 1.3. Successful qualification testing on the subject product line was completed on 21Sep09. Additional testing was completed on 05Mar10. The Qualification Test Report number for this testing is 501-718. This documentation is on file at and available from Engineering Practices and Standards (EPS).

**2. APPLICABLE DOCUMENTS**

The following documents form a part of this specification to the extent specified herein. Unless otherwise specified, the latest edition of the document applies. In the event of conflict between the requirements of this specification and the product drawing, the product drawing shall take precedence. In the event of conflict between the requirements of this specification and the referenced documents, this specification shall take precedence.

## 2.1. TE Documents

- 114-13120: Application Specification (Small Form-Factor Pluggable (SFP) and SFP+ Surface Mount PT Connectors and Cage Assemblies)
- 501-718: Qualification Test Report (Single Port SFP+ Cages, Ganged SFP+ Cages, and SFP+ Copper Module Direct Attach Cable Assembly)

## 2.2. Industry Documents

- EIA-364: Electrical Connector/Socket Test Procedures Including Environmental Classifications
- JEDEC JESD22-B102D: Solderability

## 2.3. Reference Document

109-197: Test Specification (TE Test Specifications vs EIA and IEC Test Methods)

**3. REQUIREMENTS**

## 3.1. Design and Construction

Product shall be of the design, construction and physical dimensions specified on the applicable product drawing.

## 3.2. Materials

Materials used in the construction of this product shall be as specified on the applicable product drawing.

## 3.3. Ratings

- Voltage: 120 volts AC
- Current: Signal application only
- Temperature: -55 to 105°C for cage assembly

## 3.4. Performance and Test Description

Product is designed to meet the electrical, mechanical and environmental performance requirements specified in Figure 1. Unless otherwise specified, all tests shall be performed at ambient environmental conditions.

## 3.5. Test Requirements and Procedures Summary

Test Description	Requirement	Procedure
Initial examination of product.	Meets requirements of product drawing and Application Specification 114-13120.	EIA-364-18. Visual and dimensional (C of C) inspection per product drawing.
Final examination of product.	Meets visual requirements.	EIA-364-18. Visual inspection.
<b>ELECTRICAL</b>		
Low Level Contact Resistance (LLCR).	35 milliohms maximum initial. $\Delta R$ 10 milliohms maximum. Shield and signal contacts.	EIA-364-23. Subject specimens to 100 milliamperes maximum and 20 millivolts maximum open circuit voltage.
<b>MECHANICAL</b>		
Solderability.	Solderable areas shall have a minimum of 95% coverage.	JEDEC JESD22-B102D, Method 1 for lead-free solder.
Random vibration.	No discontinuities of 1 microsecond or longer duration. See Note.	EIA-364-28, Test Condition VII, Condition Letter D. Subject mated specimens to 3.13 G's rms between 20 to 500 Hz. Fifteen minutes in each of 3 mutually perpendicular planes.
Mechanical shock.	No discontinuities of 1 microsecond or longer duration. See Note.	EIA-364-27, Condition H. Subject mated specimens to 30 G's half-sine shock pulses of 11 milliseconds duration. Three shocks in each direction applied along 3 mutually perpendicular planes, 18 total shocks.
Durability.	See Note.	EIA-364-9. Mate and unmate specimens for 100 cycles at a maximum rate of 500 cycles per hour with cage latch operable.

Figure 1 (continued)

Test Description	Requirement	Procedure
Transceiver insertion force, SFP+ module to PCB connector and SFP+ cage.	34 N [7.64 lbf] maximum without heat sink and clip. 45.37 N [10.2 lbf] maximum with heat sink and clip. See Note.	EIA-364-13. Measure force necessary to insert module into connector and cage at a maximum rate of 12.7 mm [.5 in] per minute.
Transceiver extraction force, SFP+ module from PCB connector and SFP+ cage.	12.5 N [2.8 lbf] maximum without heat sink and clip. 14.36 N [3.23 lbf] maximum with heat sink and clip. See Note.	EIA-364-13. Measure force necessary to extract module from connector and cage at a maximum rate of 12.7 mm [.5 in] per minute.
Cage latch strength.	91.2 N [20.5 lbf] minimum. See Note.	EIA 364-98. Apply specified axial load to latch at a maximum rate of 12.7mm [.5 in] per minute and hold for 1 minute to verify cage latch strength.
Cage press fit insertion force.	44.5 N [10 lbf] maximum for single port cage. 54.3 N [12.2 lbf] maximum for ganged cage. See Note.	EIA-364-5. Measure force necessary to push the cage into the host board at a maximum rate of 12.7 mm [.5 in] per minute.
Cage press fit extraction force.	8.9 N [2.0 lbf] minimum for single port cage. 8.9 N [2.0 lbf] minimum for ganged cage. See Note.	EIA-364-5. Measure force necessary to push the cage out of the host board by applying specified force in a vertical direction at a maximum rate of 12.7 mm [.5 in] per minute.
Rotational cable pull.	33.4 N [7.5 lbf] minimum. See Note.	Load cable module into a cage assembly mounted to a test board, with attached bezel. Apply axial load at a maximum rate of 12.7 mm [.5 in] per minute, rotate cable 40 degrees toward printed circuit board, and then rotate 360 degrees with the load still applied.
Cable retention force.	No discontinuities of 1 microsecond or longer duration. Shall remain mated. See Note.	EIA-364-98. Apply a force of 80 N [18 lbf] in an axial direction and hold for 10 minutes.
Cable side load force.	No discontinuities of 1 microsecond or longer duration. Shall remain mated. See Note.	EIA-364-38. Apply a force of 80 N [18 lbf] to the cable plug in a plane parallel to the bezel and hold for 10 minutes.
Cable longitudinal force.	No discontinuities of 1 microsecond or longer duration. Shall remain mated. See Note.	EIA-364-38. Apply a force of 100 N [22.5 lbf] to the cable plug in a plane perpendicular to the bezel and hold for 10 minutes.

Figure 1 (continued)

Test Description	Requirement	Procedure
<b>ENVIRONMENTAL</b>		
Thermal shock.	See Note.	EIA-364-32, Test Condition VII. Subject specimens to 5 cycles between -55 and 105°C with 30 minute dwells at temperature extremes and 1 minute transition between temperatures.
Humidity/temperature cycling.	See Note.	EIA-364-31, Method III. Subject specimens to 10 cycles (10 days) between 25 and 65°C at 80 to 100% RH.
Temperature life.	See Note.	EIA-364-17, Method A, Test Condition 4. Subject mated specimens to 105°C for 240 hours.
Mixed flowing gas.	See Note.	EIA-364-65, Class IIA (4 gas). Subject mated specimens to Environmental Class IIA for 20 days.

**NOTE**

*Shall meet visual requirements, show no physical damage, and meet requirements of additional tests as specified in the Product Qualification and Requalification Test Sequence shown in Figure 2.*

Figure 1 (end)

3.6. Product Qualification and Requalification Test Sequence

Test or Examination	Test Group (a)						
	1	2	3	4	5	6(b)	7(b)
	Test Sequence (c)						
Initial examination of product	1	1	1	1	1	1	1
LLCR	3,7		3,6	3,5		2,4	
Solderability					2		
Random vibration	5						
Mechanical shock	6						
Durability	4						
Transceiver insertion force	2						
Transceiver extraction force	8						
Cage latch strength	9						
Cage press fit insertion force			2	2			
Cage press fit extraction force			7	6			
Rotational cable pull		2					
Cable retention force							2
Cable side load force							3
Cable longitudinal force							4
Thermal shock			4(d)				
Humidity/temperature cycling			5(d)				
Temperature life				4(d)(e)			
Mixed flowing gas						3(e)	
Final examination of product	10	3	8	7	3	5	5

**NOTE**

- (a) See paragraph 4.1.A.
- (b) Applies to SFP+ direct attach cable assembly product only.
- (c) Numbers indicate sequence in which tests are performed.
- (d) Mated to blank transceivers.
- (e) Precondition specimens with 20 durability cycles.

Figure 2

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#### 4. QUALITY ASSURANCE PROVISIONS

##### 4.1. Qualification Testing

###### A. Specimen Selection

Specimens shall be prepared in accordance with applicable Instruction Sheets and shall be selected at random from current production. Each test group shall consist of a minimum of 5 specimens.

###### B. Test Sequence

Qualification inspection shall be verified by testing specimens as specified in Figure 2.

##### 4.2. Requalification Testing

If changes significantly affecting form, fit or function are made to the product or manufacturing process, product assurance shall coordinate requalification testing, consisting of all or part of the original testing sequence as determined by development/product, quality and reliability engineering.

##### 4.3. Acceptance

Acceptance is based on verification that the product meets the requirements of Figure 1. Failures attributed to equipment, test setup or operator deficiencies shall not disqualify the product. If product failure occurs, corrective action shall be taken and specimens resubmitted for qualification. Testing to confirm corrective action is required before resubmittal.

##### 4.4. Quality Conformance Inspection

The applicable quality inspection plan shall specify the sampling acceptable quality level to be used. Dimensional and functional requirements shall be in accordance with the applicable product drawing and this specification.