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## **zQSFP+/QSFP28 Connector with Cage**

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### **1. SCOPE**

#### 1.1. Content

This specification defines performance, test and quality requirements for the zQSFP+/QSFP28 connector with cage.

#### 1.2. Qualification

When tests are performed on subject product, procedures specified in this specification shall be used. All inspections shall be performed using applicable inspection plan and product drawing.

### **2. APPLICABLE DOCUMENTS**

#### 2.1. TE Connectivity (TE) Documents

- 108-19437 Signal integrity specification zQSFP+/QSFP28 connector
- 114-32022 Application Specification zQSFP+/QSFP28 connector
- 114-32023 Application Specification zQSFP+/QSFP28 cage
- 501-19183 Qualification Test Report zQSFP+/QSFP28 connector
- 501-60067 Qualification Test Report (QSFP Copper Module Direct Attach Cable Assembly and Cage)

#### 2.2. Industry Documents

- EIA-364 Electrical Connector/Socket Test Procedures Including Environmental Classifications
- EIA-638 Surface Mount Solderability
- SFF-8662 QSFP+ 28 Gbs 4X Connector

#### 2.3. Reference Documents

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

### **3. REQUIREMENTS**

#### 3.1. Design and Construction

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

#### 3.2. Materials and Finish

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

#### 3.3. Ratings

- Working Voltage: 30 VDC maximum per contact
- Current Carrying capacity: 0.5 A maximum per contact and 1.0 A maximum per designated power contact (3 total)
- Operating Temperature: -40 to 85°C

### 3.4. Performance and Test Description

The product is designed to meet electrical, mechanical and environmental performance specified in this paragraph as tested per test sequence specified in Paragraph 3.5. Unless otherwise specified, all tests are performed at ambient environmental conditions and are performed with connectors in fully mated condition.

### 3.5. Test Requirements and Procedures Summary

**Table 1**

<b>Test Description</b>	<b>Requirement</b>	<b>Procedure</b>
Initial examination of product	Meets requirements of product drawing and Application Specification 114-TBD.	EIA-364-18. Visual examination and dimensional (C of C) inspection per product drawing.
Final examination of product	Meets visual requirements.	EIA-364-18. Visual examination.
<b>ELECTRICAL</b>		
Low Level Contact Resistance (LLCR)	15 m $\Omega$ maximum (Initial) DR 10 m $\Omega$ maximum (Final)	EIA-364-23. Max. open voltage 20mV. Max current 10 mA DC. All contacts to be measured. Measuring points shall be as indicated in Figure 1.
Insulation resistance	1000 M $\Omega$ minimum	EIA-364-21. Test voltage 100V DC. Duration: 1 minute. Measure between adjacent contacts.
Withstanding voltage	No breakdown or flashover.	EIA-364-20, Condition I. Test voltage: 300 volts AC at sea level. Duration 1 minute. Test between adjacent contacts, signal to signal and signal to ground
<b>MECHANICAL</b>		
Random vibration	No discontinuity $\geq$ 1 microsecond See Note.	EIA-364-28, Test Condition VII, Test Condition Letter D. Subject mated specimens to 3.10 G RMS between 20 to 500 Hz. Fifteen minutes in each of 3 mutually perpendicular planes.
Mechanical shock	Contact discontinuity 1 microsecond maximum See Note.	EIA-364-27, Test Condition H. Subject mated specimens to 30 Gs 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. Include latching/release function as intended. Operation cycles: 250. Rate: 500 cycles/hour. Speed: 10 mm/s

**Table 1**

Test Description	Requirement	Procedure
Mating force	40 N maximum	EIA-364-13, Method A. Measure force to mate cable plug into zQSFP+ connector including cage.
Unmating force	30 N maximum	EIA-364-13, Method A. Measure force to unmate cable plug from zQSFP+/QSFP28 connector including cage by pulling at latching release feature.
Cage compliant pin insertion force	37.8 N [8.5 lbf] maximum average per pin.	E Spec 109-41. Measure force necessary to push cage into the host board at a maximum rate of 12.7 mm [.50 inch] per minute.
Cage compliant pin retention force	9.3 N [2.1 lbf] minimum average per pin.	TE Spec 109-30. Measure force necessary to remove cage from the host board at a maximum rate of 12.7 mm [.50 inch] per minute.
<b>ENVIRONMENTAL</b>		
Solderability	95% minimum wetting	IPC/ECA J-STD-002 Conditioning: 8 hours ± 15 minutes steam. Preheat: 150° to 180°C / 60-120 seconds Reflow: 230° to 260°C / 30-60 seconds
Resistance to reflow soldering heat	See Note.	TEC-109-201 Method-A, Condition-B. Subject SMD connector to 3x reflow curve 260°C peak.
Thermal shock.	See Note.	EIA-364-32, Method A, Test Condition VII. Subject mated 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 mated 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 Subject mated specimens to 105°C for 240 hours.

**Table 1**

Test Description	Requirement	Procedure
Mixed flowing gas.	See Note.	EIA-364-65, Class IIA (4 gas). Subject board mounted specimens to environmental Class IIA for 14 days. One-half of the specimens (receptacle only) unmated for 7 days followed by 7 days mated. The remaining one-half of the specimens mated for 14 days.
Thermal cycling	See Note.	EIA-364-10, Condition A. Subject mated and board mounted specimens to 10 temperature cycles between 15 ±3°C and 85 ±3°C as measured on the specimen. Ramp times > 2°C per minute with dwell times long enough to ensure contacts reach the temperature extremes (5 minutes minimum). Humidity not controlled.
Dust	See Note.	EIA-364-91 Expose unmated connectors to dust contamination. Dust composition: #1. Flow rate: 300 meters/minute. Exposure time: 1 hour
Minute disturbance	See Note.	Manually unmate and mate the specimen 1 time.

**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 Table 2.*

3.6. Resistance Measurement

Resistance within the mated terminated connectors shall be measured as indicated in Figure 1. It consists of bulk resistance of the contacts, resistance of the connector contact to cable printed circuit board (PCB) transition, and the resistances of the fixed contact connections to cable and PCB. Bulk resistance of circuits outside the connector, such as PCB paths and cable wire outside the terminated section, are not included in the requirement and therefore, shall be measured and documented separately for reference (in case of significant influence).

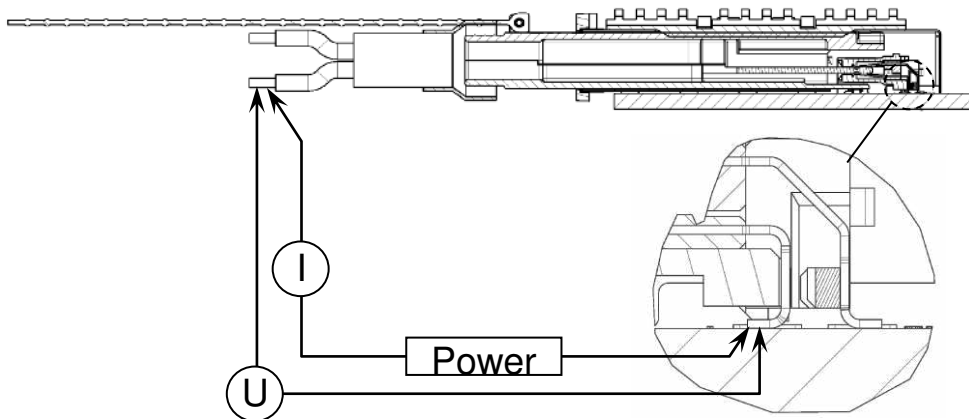


Figure 1

3.7. Test Frames

During vibration and mechanical shock tests, an electrical circuit is checking that no electrical contact interruptions occur that exceed the requirement.

Test-frames shall provide mechanical stability of the connector in relation to its mating parts and shall cover the requirements specified in the TE application specification.

3.8. Product Qualification and Requalification Test Sequence

**Table 2**

Test or Examination	Test Group (a)							
	1	2	3	4	5	6	7	8 (e)
	Test Sequence (b)							
Initial examination of product	1	1	1	1	1	1	1	1
Low Level Contact Resistance	3,7	2,4,6,8	2,4,5,7		2,4,6,8			
Insulation resistance				2,6				
Withstanding voltage				3,7				
Random vibration	5							
Mechanical shock	6							
Durability	4							
Mating force	2							
Unmating force	8							
Connector solderability						2		
Resistance to reflow soldering heat							2	
Thermal shock				4(c)(d)				
Humidity/temperature cycling		7		5				
Temperature life		3(c)(d)						
Mixed flowing gas			3					
Thermal cycling					5			
Dust					3(c)			
Minute disturbance		5	6		7			
Compliant pin insertion force								2
Compliant pin retention force								3
Final examination of product	9	9	8	8	9	3	3	4

- NOTE**
- (a) See Paragraph 4.1.A.
  - (b) Numbers indicate sequence in which tests are performed.
  - (c) Precondition specimens with 20 durability cycles with latches engaged.
  - (d) Mated to blank transceivers (no components added to cable connector PCB).
  - (e) Test results for test group 8 can be found in 501-60067.

4. QUALITY ASSURANCE PROVISIONS

4.1. Qualification testing

A. Sample selection

Samples shall be prepared in accordance with applicable instructions and shall be selected at random from current production. Unless otherwise specified, all test groups shall consist of a minimum of 5 connectors of which all contacts shall be tested.

B. Test sequence

Qualification inspection shall be verified by testing samples as specified in Paragraph 3.5.

4.2. Requalification testing

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

4.3. Acceptance

Acceptance is based upon verification that product meets requirements of Paragraph 3.4. Failures attributed to equipment, test set-up, applied customer components, or operator deficiencies shall not disqualify the product. If product failure occurs, corrective action shall be taken and samples resubmitted for requalification. Testing to confirm corrective action is required before resubmittal.

4.4. Quality conformance inspection

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