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## QSFP Copper Module Direct Attach Cable Assembly and Cage

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### 1. SCOPE

#### 1.1. Content

This specification covers performance, tests and quality requirements for the TE Connectivity (TE) Quad Small Form Factor Pluggable (QSFP) Copper Module Direct Attach Cable Assembly and Cage.

#### 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.

### 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

108-2234: Product Specification (SFF Connector System)

109 Series: Test Specifications as indicated in Figure 1

114-13217: Application Specification (QSFP Thru Bezel Cage Assembly, Heat Sink, EMI/Dust Cover, and Light Pipe)

114-13218: Application Specification (QSFP behind bezel cage assembly, Heat sink, EMI/dust cover, and light pipe)

114-13221: Application Specification (EVERCLEAR connectors and QSFP+ Enhanced EVERCLEAR SMT connectors)

114- (TBD): Application Specification (TBD)

501-60067: Qualification Test Report (QSFP Copper Module Direct Attach Cable Assembly and Cage)

#### 2.2. Industry Document

EIA-364: Electrical Connector/Socket Test Procedures Including Environmental Classifications

#### 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: See Product Specification 108-2234
- Current: See Product Specification 108-2234
- Temperature: -55 to 105°C

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-TBD. | EIA-364-18.<br>Visual and dimensional (C of C) inspection per product drawing.                                                                                                                                   |
| Final examination of product.        | Meets visual requirements.                                                   | EIA-364-18.<br>Visual inspection.                                                                                                                                                                                |
| <b>ELECTRICAL</b>                    |                                                                              |                                                                                                                                                                                                                  |
| Low Level Contact Resistance (LLCR). | $\Delta R$ 10 milliohms maximum for signal and ground contacts.              | EIA-364-23.<br>Subject mated specimens to 100 milliamperes maximum and 20 millivolts maximum open circuit voltage.                                                                                               |
| <b>MECHANICAL</b>                    |                                                                              |                                                                                                                                                                                                                  |
| Random vibration.                    | No discontinuities of 1 microsecond or longer duration.<br>See Note.         | EIA-364-28, Test Condition VII, Condition Letter D.<br>Subject mated specimens to 3.10 G's rms between 20 to 500 Hz.<br>Fifteen minutes in each of 3 mutually perpendicular planes.                              |
| Mechanical shock.                    | No discontinuities of 1 microsecond or longer duration.<br>See Note.         | EIA-364-27, Condition H.<br>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.<br>Manually mate and unmate the QSFP module to the PCB connector interface for 250 cycles with latches enabled.                                                                                       |
| Cable flex.                          | No discontinuities of 1 microsecond or longer duration.<br>See Note.         | EIA-364-41, Test Condition I.<br>Mandrel diameter to be 5 times the maximum cable diameter.                                                                                                                      |

Figure 1 (continued)

|                                                             |                                                                                                                      |                                                                                                                                                                |
|-------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Mating force, QSFP module to PCB connector and QSFP cage.   | 40 N [9 lbf] maximum without heat sink and clip.<br>55 N [12.37 lbf] maximum with heat sink and clip.<br>See Note.   | EIA-364-13.<br>Measure force necessary to mate specimens at a maximum rate of 12.7 mm [.5 in] per minute.                                                      |
| Unmating force, QSFP module to PCB connector and QSFP cage. | 30 N [6.75 lbf] maximum without heat sink and clip.<br>45N [10.12 lbf] maximum with heat sink and clip.<br>See Note. | EIA-364-13.<br>Measure force necessary to unmate specimens at a maximum rate of 12.7 mm [.5 in] per minute with latches disabled.                              |
| Cage latch, axial retention.                                | 125 N [28.1 lbf] minimum.<br>See Note.                                                                               | EIA 364-98.<br>Measure force necessary to remove QSFP module from cage assembly with latches enabled.                                                          |
| Cage compliant pin insertion force.                         | 37.8 N [8.5 lbf] maximum average per pin.<br>See Note.                                                               | TE Spec 109-41.<br>Measure force necessary to push cage into the host board at a maximum rate of 12.7 mm [.5 in] per minute.                                   |
| Cage compliant pin retention force.                         | 9.3 N [2.1 lbf] minimum average per pin.<br>See Note.                                                                | TE Spec 109-30.<br>Measure force necessary to remove cage from the host board at a maximum rate of 12.7 mm [.5 in] per minute.                                 |
| Cable lateral force.                                        | No discontinuities of 1 microsecond or longer duration. Shall remain mated.<br>See Note.                             | EIA-364-38.<br>Apply force of 75 N [16.9 lbf] to the cable module parallel to the test board and perpendicular to the cage in either direction for 10 minutes. |
| Cable longitudinal force.                                   | No discontinuities of 1 microsecond or longer duration. Shall remain mated.<br>See Note.                             | EIA-364-38.<br>Apply force of 75 N [16.9 lbf] to the cable module perpendicular to the test board and downward for 10 minutes.                                 |

ENVIRONMENTAL

|                               |           |                                                                                                                 |
|-------------------------------|-----------|-----------------------------------------------------------------------------------------------------------------|
| Thermal shock.                | See Note. | EIA-364-32, Test Condition VII.<br>Subject mated specimens to 10 cycles between -55 and 105°C.                  |
| Humidity/temperature cycling. | See Note. | EIA-364-31, Method III.<br>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.<br>Subject mated specimens to 105°C for 500 hours.                                        |

Figure 1 (end)

**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*

3.6. Product Qualification and Requalification Test Sequence

| Test or Examination                                          | Test Group (a)    |       |      |   |   |
|--------------------------------------------------------------|-------------------|-------|------|---|---|
|                                                              | 1                 | 2     | 3    | 4 | 5 |
|                                                              | Test Sequence (b) |       |      |   |   |
| Initial examination of product                               | 1                 | 1     | 1    | 1 | 1 |
| LLCR                                                         | 3,5,7,9           | 3,5,7 | 3,5  |   |   |
| Vibration, random                                            | 6                 |       |      |   |   |
| Mechanical shock                                             | 8                 |       |      |   |   |
| Durability                                                   | 4                 |       |      |   |   |
| Cable flex                                                   |                   |       |      | 4 |   |
| Mating force, QSFP module to PCB connector and QSFP cage     | 2                 |       |      |   |   |
| Unmating force, QSFP module from PCB connector and QSFP cage | 10                |       |      |   |   |
| Cage latch, axial retention                                  | 11                |       |      | 5 |   |
| Cage compliant pin insertion force                           |                   | 2     | 2    |   | 2 |
| Cage compliant pin retention force                           |                   | 8     | 6    |   | 3 |
| Cable lateral force                                          |                   |       |      | 2 |   |
| Cable longitudinal force                                     |                   |       |      | 3 |   |
| Thermal shock                                                |                   | 4     |      |   |   |
| Humidity/temperature cycling                                 |                   | 6     |      |   |   |
| Temperature life                                             |                   |       | 4(c) |   |   |
| Final examination of product                                 | 12                | 9     | 7    | 6 | 4 |

Figure 2

**NOTE**

- (a) See paragraph 4.1.A.
- (b) Numbers indicate sequence in which tests are performed.
- (c) Precondition specimens with 10 durability cycles.

#### 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 3 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.