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## 20 Position 1.5/2.8mm Hybrid Unsealed Right Angle Header

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### 1. SCOPE

#### 1.1. Content

This specification covers performance, tests and quality requirements for the TE 20 Position 1.5mm/2.8 mm Hybrid Unsealed Right Angle Header.

#### 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 20 Mar 2012 and 26 Nov 2013. The Qualification Test Report number for this testing is 502-32022 and 20130231 ACL. 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 Connectivity Documents

- [109-11](#): Solderability Dip Test
- 502-32022: Engineering Report (Test Report 1.5/2.8mm Hybrid Unsealed Right Angle Header)
- 20130231 ACL: Test Report

#### 2.2. Industry Documents

- USCAR-2, Revision 5: Performance Specification for Automotive Electrical Connector Systems
- JEDEC JESD22-B102 Method 1 for lead-free solder

### 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

- Blade Contacts: brass strip plated with matte tin over nickel under plate.
- Housing: PCT: polycyclohexylenedimethylene terephthalate

#### 3.3. Ratings

- Temperature: -40° to 105°C
- Solderability: 230°C +/- 5C for 3+/-0.5 seconds

3.4. Performance and Test Description

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

3.5. Test Requirements and Procedures Summary

Items	Requirements	Procedures
Appearances		
Confirmation of product.	Product shall conform to the requirements of applicable product drawings and Application Specifications.	Visually, dimensionally and functionally inspected per applicable quality inspection plan.
Handling ergonomics.	No abnormalities in manual mating/un-mating handling.	Manually operated.
Visual inspection.	USCAR-2, Section 5.1.8.4. No defects.	USCAR-2, Section 5.1.8.3.
Electrical Requirements		
Dry circuit resistance. Termination resistance, low level.	USCAR-2, Section 5.3.1.4. 10 milliohms maximum for 1.5 mm Contacts.  5 milliohms maximum for 2.8 mm Contacts.	USCAR-2, Section 5.3.1.3.

**Figure 1 (cont'd)**

Items	Requirements		Procedures
Voltage drop. Termination Resistance (Specified Current)	Test Current (A)	Resistance mV/A (max)	USCAR-2, Section 5.3.2.3.
	4 amps for 1.5mm	10 milliohms maximum for 1.5 mm contacts	
	10 amps for 2.8mm	5 milliohms maximum for 2.8 mm contacts	
Mechanical Requirements			
Connector-connector audible click.	USCAR-2, Section 5.4.7.4. 7 dB minimum above ambient.		USCAR-2, Section 5.4.7.3.
Connector-connector audible click after moisture conditioning.	USCAR-2, Section 5.4.7.4. 5 dB minimum above ambient.		USCAR-2, Section 5.4.7.3.
Connector-connector mating force.	See TE Product Drawing C-2098835		USCAR-25, Table 6.3.
Connector-connector un- mating force, primary lock engaged.	USCAR-2, Section 5.4.2.4. 110 N minimum.		USCAR-2, Section 5.4.2.3.B.
Connector-connector un- mating force, primary lock disengaged.	See TE Product Drawing C-2098835.		USCAR-2, Section 5.4.2.3.B.
Polarization feature effectiveness, mis-mated.	See TE Product Drawing C-2098835.		USCAR-2, Section 5.4.4.3.
Header pin retention, unsoldered.	USCAR-2, Section 5.7.1.4. 50 N minimum		USCAR-2, Section 5.7.1.3.

**Figure 1 (cont'd)**

Items	Requirements	Procedures
Environmental Requirements		
Connector cycling.	USCAR-2, Section 5.1.7.5. No damage.	USCAR-2, Section 5.1.7.4.
Dry circuit resistance.	USCAR-2, Section 5.3.1.4. 10 milliohms maximum for 1.5 mm contacts. 5 milliohms maximum for 2.8 mm contacts.	USCAR-2, Section 5.3.1.3.
Mechanical shock.	USCAR-2, Section 5.1.9.4. No contact pair resistance greater than 7 ohms for 1 microsecond or longer duration.	USCAR-2, Section 5.4.6. 35 G's half-sine shock pulses of 10 milliseconds duration, 10 shocks in each axis.
Vibration.	USCAR-2, Section 5.1.9.4. No contact pair resistance greater than 7 ohms for 1 microsecond or longer duration.	USCAR-2, Section 5.4.6. Profile per Figure 5.4.6.3.E.
Voltage drop.	USCAR-2, Section 5.3.2.4. 10 milliohms maximum for 1.5 mm contacts. 5 milliohms maximum for 2.8 mm contacts.	USCAR-2, Section 5.3.2.3.
Thermal shock.	USCAR-2, Section 5.6.1.4. No damage or failures.	USCAR-2, Section 5.6.1. Class 2.
Temperature/humidity cycling	USCAR-2, Section 5.6.2.4 No damage or failures.	USCAR-2, Section 5.6.2. Class 2.

**Figure 1 (cont'd)**

Items	Requirements	Procedures
High temperature exposure.	USCAR-2, Section 5.6.3.4. No damage or failures.	USCAR-2, Section 5.6.3. Class 2.
<b>ELECTRICAL REQUIREMENTS</b>		
Maximum current carrying capability.	Condition 1 – Energized in circuit pairs: - 14 A for 1.5 mm terminals - 21.59A for 2.8mm terminals  Condition 2 – Circuits 7, 9, 10, 11, 12, 13, 16, and 17 energized simultaneously - 9.5A for 1.5mm terminals - 18.5A for 2.8mm terminals  Condition 1 and Condition 2 -- No evidence of plastic material melting in either condition.	Test report 20130231ACL performed to match application loading with maximum allowable T-rise of 60° C.

**i** **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)**

Test or Examination	Test Sequence (b)							
	1	2	3	4	5	6	7	8
Visual inspection	1,4	1,5	1,3	1,3	1,8	1,7	1,7	1,7
Connector-connector audible click	2							
Connector-connector audible click after moisture conditioning	3							
Connector-connector mating force		2						
Connector-connector un-mating force, primary lock engaged		3						
Connector-connector un-mating force, primary lock disengaged		4						
Polarization feature effectiveness, mis-mated			2					
Header pin retention, unsoldered				2				
Connector cycling					2	2	2	2
Dry circuit resistance					3,6	3,5	3,5	3,5
Mechanical shock					4			
Vibration					5			
Voltage drop					7	6	6	6
Thermal shock						4		
Temperature/humidity cycling							4	
High temperature exposure								4


**NOTE**

(a) See paragraph 4.1.A.

(b) Numbers indicate sequence in which tests are performed.

**Figure 2**

#### 4. QUALITY ASSURANCE PROVISIONS

##### 4.1. Qualification Testing

###### A. Specimen Testing

Samples shall be selected at random from current production. Unless otherwise specified, no sample shall be reused.

###### B. Test Sequence

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

##### 4.2. Test Conditions

Unless otherwise specified, all tests shall be performed under any combination of the following conditions:

- Temperature: 15 to 35°C
- Relative Humidity: 45 to 75%
- Atmospheric Pressure: 86.7 to 107 kPa

## 5. PACKAGING

### 5.1. 36 pcs per PVC Thermoformed Tray

- Tray footprint 340mm x 390mm
- 7 trays per box

### 5.2. Shipping Box @ 252pcs

- Box TE PN: [999713-3](#)
- Box Cube @ 375mm x 400mm x 235mm

### 5.3. Palletization

- 813mm x 762mm x 864mm
- 12 boxes per Palletized load
- 2x2x3
- Full Palletized Qty @ 3,024 pcs
- Load secured with stretch-film securement