SMART CARD READER WITH EJECTOR MECHANISM

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CONTENT

1. SCOPE

1.1 Content

This specification covers the mechanical, electrical, climatic tests and quality requirements of a Smart Card Connector. This connector has 8 signal and 2 switch contacts, a solenoid cable assembly. All the 10 contacts are SMT soldered to a flex PCB. The card is locked by a mechanism and is released by solenoid activation. The connector will accept ISO 7810-7816 TYPE SMART CARDS.

1.2 Qualification

When tests are performed, the following specified specifications and standards 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, latest edition of the document applies. In the events of conflict between the requirements of this specification and the product drawing, 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 (TE) Documents

A **109-1** General Requirements for Test Specifications

B Customer Drawing

1955562 Smart Card Reader Ejector Assembly

C Application Specification

108-94417 Smart Card Reader With Ejector Mechanism

2.2 General Documents

A IEC 60512
Connectors for electronic equipment – Tests and measurements

B IEC 60068
Environmental testing

C ISO 7810
Identification cards

D ISO 7816
Identification cards with microcircuits

3. REQUIREMENTS

3.1 Design and Construction

The product is designed to interconnect a smart card (according to ISO 7810 and ISO 7816). The connection between the smart card and the connector is accomplished by cantilever contacts. The detection of the card end position is obtained by a blade switch, normally open. To avoid dirt inside the reader a dust cover is located on the front side which is spring loaded. The connector is fixed in the customer's device using 2 side ribs located on the housing of the reader & 2 elongated holes at the rear area to screw the reader. The contacts are soldered with Flex printed circuit board. Contacts C4,C6 and C8 are not connected to the Flex Printed circuit. The FPC is having a pitch of 1 mm.

The card reader has an electromechanical ejector mechanism to eject the card. The ejector mechanism is activated by a solenoid with a cable assembly. The cable assembly of the solenoid has TE connector Terminal PN 794606-1 and Housing PN 794617-2. The card will stay inside the card reader when the power is swithched off.

3.2 Materials

- Plastic parts: Flame retardant glass filled PC UL 94 V0
- Contact Housing: Flame retardent glass filled LCP UL 94 V0
- Signal contacts: Phosphor bronze, gold plated over nickel in contact area, tin over nickel in solder area.
- Switch contacts: Phosphor bronze, gold plated over nickel in contact area, tin over nickel in solder area.
- Flat spring: SS304

3.3 Ratings

- Voltage: DC 5 V ± 10%
- Current consumption: 3 A (at DC 5 V, 20°C)
- Impulse length: 10…30 ms
- Inter pulse period: > 1 sec
- Coil resistance: 1.9 Ω ± 10%
- Coil Inductance: 145 µH ± 20%
- Climatic: Operating temperature: -25℃ to +80° C

  Storage temperature: -40℃ to +85℃

3.4 Performance and Test Description

The product is designed to meet the electrical, mechanical and environmental performance requirements. All Tests, requirements and test groups are listed and explained in the following chapter.

3.5 Requirements and Procedures

TABLE 1: Tests are carried out according to IEC 60512 series

Test Description	Requirement	Procedure
3.5.1 **Visual Examination**	No defect that would impair normal operation	As per IEC 60512-1-1
3.5.2 **Termination Resistance (Data Contacts)**	Measure the overall resistance from test card end to the flexible PCB end & then substract the individual resistances of flex PCB & test card. Data contacts <= 100 mΩ	As per IEC 60512-2 Test 2a Subject mated contacts with Test Card to 20 mV max open circuit at 50 mA max, See figure 1
3.5.3 **Insulation Resistance**	Ri ≥ 1000 MΩ	As per IEC 60512-3 Method A Test between one contact and the other at a voltage 100 V
3.5.4 **Dielectric Withstanding Voltage**	500 V AC; 1 min	As per IEC 60512-4 Method A Test between one contact and the other

3.5.5 **Card Mating Force**	15 N max mating force	As per IEC 60512-7 Test 13b Measure the necessary force to mate the card into the samples at maximum speed of 100 mm/min. Use Test Cards as per Fig.3
3.5.6 **Vibration Endurance With An Additional Temperature Profile (Random)**	No functional damage No discontinuity > 1µs Meet an additional requirements as per test sequence in table 2	As per IEC 60068-2-64 Method 2 F(Hz) PSD (m2/s3) Slope(dB/Oct) 5-10 1.92 0 10-50 10 0 50-66.7 - -24 66.7-100 1,0 0 100-1000 - -3 1000 0.1 0 Crest factor :3 Time: 3 x 16 h (16 H in each main axis) Temperature profile (8 h cycle): +20℃ to -25℃ 1 h -25℃ 1.5 h -25℃ to +80℃ 2.5 h +80℃ 2 h +80℃ to +20℃ 1 h
3.5.7 **Multiple Shocks**	No functional damage No discontinuity > 1µs Meet an additional requirements as per test sequence in table 2	As per IEC 60512-6 Test 6c Subject mated samples to 20G halfsine shock pulses of 11ms duration. 3 shocks in each direction applied along 3 mutually perpendicular planes.
3.5.8 **Shock Cyclic**	No functional damage No discontinuity > 1µs Meet an additional requirements as per test sequence in table 2	As per IEC 60068-2-29 Eb 50G peak value, half sinusoidal peak 11ms, 3 times in each direction Exception: 20G peak value, half sinusoidal peak 11ms, 3 times in each direction of solenoid plunger axis.

3.5.9 **Durability**	After 25,000 cycles: No defect that would impair normal operation Meet an additional requirements as per test sequence in table 2 ▪ Card mating force 15 N max ▪ Solenoid working normal	As per IEC 60512-5 Test 9a Mate and unmate samples for 25000 cycles at room temperature.Smart card to be replaced by a new one every 5000 cycles.Insertion speed 80mm/s max. Ra <= 0.1 µm
3.5.10 **Card Ejection Distance**	Min. 5.5mm for 45°tilt upwards Max. 28mm horizontal position Max. 35mm for 30°tilt downwards	The smart card connector is tilted at an angle +45°and -30°from the horizantal position. The solenoid is activated and card ejection distance is measured from the front end of the reader.
3.5.11 **Rapid Change of Temperature**	No physical damage. Meet an additional requirements as per test sequence in table 2	As per IEC 60512-11-4 Test 11d TA = -40℃ for 30 mins, TB = +85℃ for 30 mins. Transition time <= 10 s. 5 cycles without card.
3.5.12 **Damp Heat, Steady State**	No physical damage. Meet an additional requirements as per test sequence in table 2	As per IEC 60512-11-3 Test 11c 40℃, 95% relative humidity 21 days. Without card
3.5.13 **Climatic Sequence / Damp Heat Cyclic**	No physical damage. Meet an additional requirements as per test sequence in table 2	As per IEC 60512-11-1 Test 11a 25-55℃, 93% relative humidity, 6 cycles of 12+12 hrs, recovery at 25℃, 25-70% humidity, 2hrs. Without card
3.5.14 **Temperature Life**	No physical damage. Meet an additional requirements as per test sequence in table 2	As per IEC 60068-2-1Aa Cold: -25℃ (Storage with card) Duration :120 hrs As per IEC 60068-2-1Ba Hot: +80℃ (Storage with card) Duration :120 hrs

3.5.15 **Temperature Step Test**	Test of card ejection. Meet an additional requirements as per test sequence in table 2	-25℃ to +85℃ in 10℃ steps. Each step for 30 mins.
3.5.16 **Temperature Change**	No physical damage. Meet an additional requirements as per test sequence in table 2	As per IEC 60068-2-14 Nb TA = -40℃ for 4.5 hrs, TB = +85℃ for 4.5 hrs, Transition time is 1.5 hrs. 10 cycles without card.

4. QUALITY ASSURANCE PROVISIONS

4.1 Qualification Testing

The product shall be of the design, construction and physical dimensions of the applicable product drawing.

TABLE 2: Test Groups

Test or Examination	Test Group (a)			
	TG1	TG2	TG3	TG4
	Test Sequence (b) (e) (f)			
Visual Examination	1, 5, 8	1, 6, 9,12, 18	1, 4, 7, 10	1, 9
Ternimation Resistance	2, 6, 9	2, 7, 10, 13, 17	2, 5, 8, 11	2, 8
Insulation Resistance		3, 16		3, 7
Dielectric Withstanding Voltage		4, 15		4, 6
Card Mating Force	3			
Vibration Endurance with Temperature Profile			3 (c) (f)	
Shock Cyclic			6 (c) (f)	
Multiple Shocks			9 (c) (f)	
Durability	7			
Temperature Step Test	4			
Rapid Change of Temperature		5		
Temperature Chnage		8		
Temperature Life		11 (d) (c)		
Climatic Sequence		14		
Damp Heat				5

(a) See § 4.2
(b) Numbers in Table 2 indicates the sequence in which tests are performed
(c) Samples mated to test card – See Fig.3
(d) Precondition of samples with 10 cycles of card insertion & removal
(e) Connector soldered to a test PCB – See Fig.1
(f) Mount the card reader onto a plate while testing – See Fig.2

4.2 Sample Selection

Samples shall be prepared in accordance with applicable instruction sheets. Test group 3 shall consist of a minimum of 5 samples soldered to printed circuit board. Test group 1,2 and 4 shall consist of a minimum of 5 unmounted samples.

4.3 Test Sequence

Qualification inspection shall be verified by testing samples as specified in Table 2.

4.4 Requalification Testing

If changes significantly affecting form, fit or function are made to the product or to the 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.

4.5 Acceptance

Acceptance is based on verification that the product meets the requirements of Table 1. Failures attributed to equipment, test setup or operator deficiencies shall not disqualify the product. When failure occurs corrective actions shall be taken and samples resubmitted for qualification. Testing to confirm corrective actions is required before re-submittal.

4.6 Quality Conformance Inspection

The applicable quality inspection plan will 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.

Fig.1: TERMINATION RESISTANCE MEASUREMENT METHOD

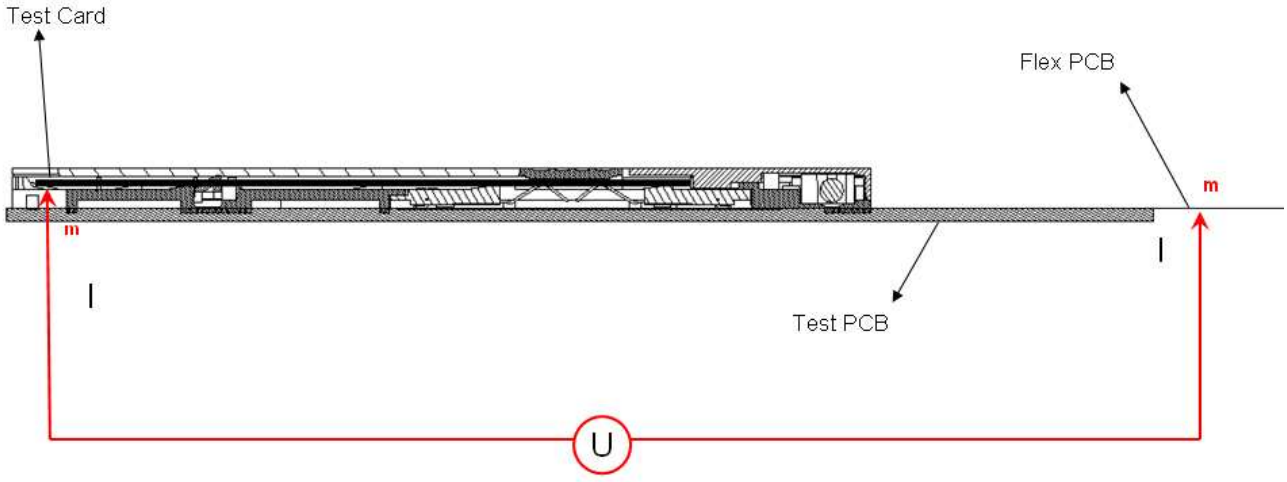


Fig.2: MOUNTING METHOD FOR VIBRATION TEST

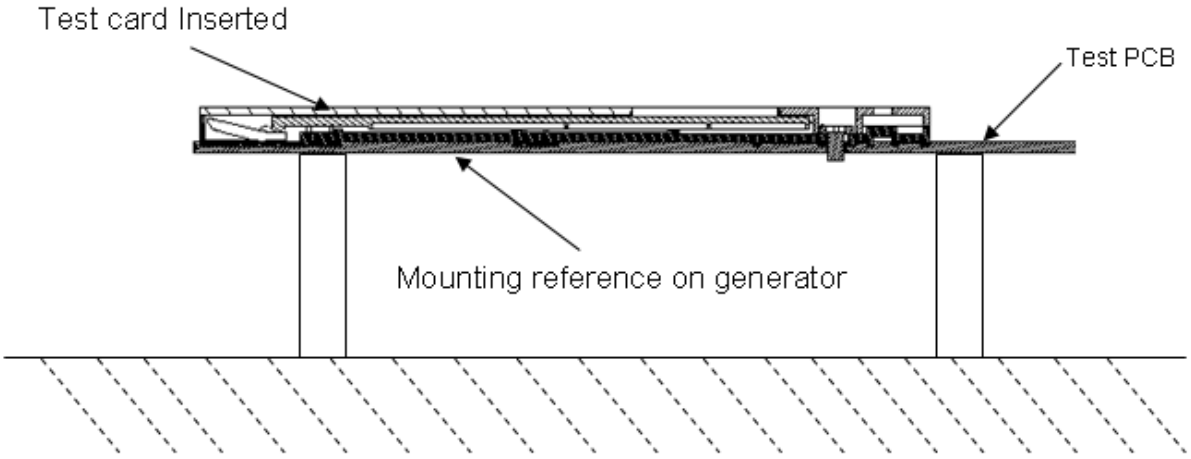
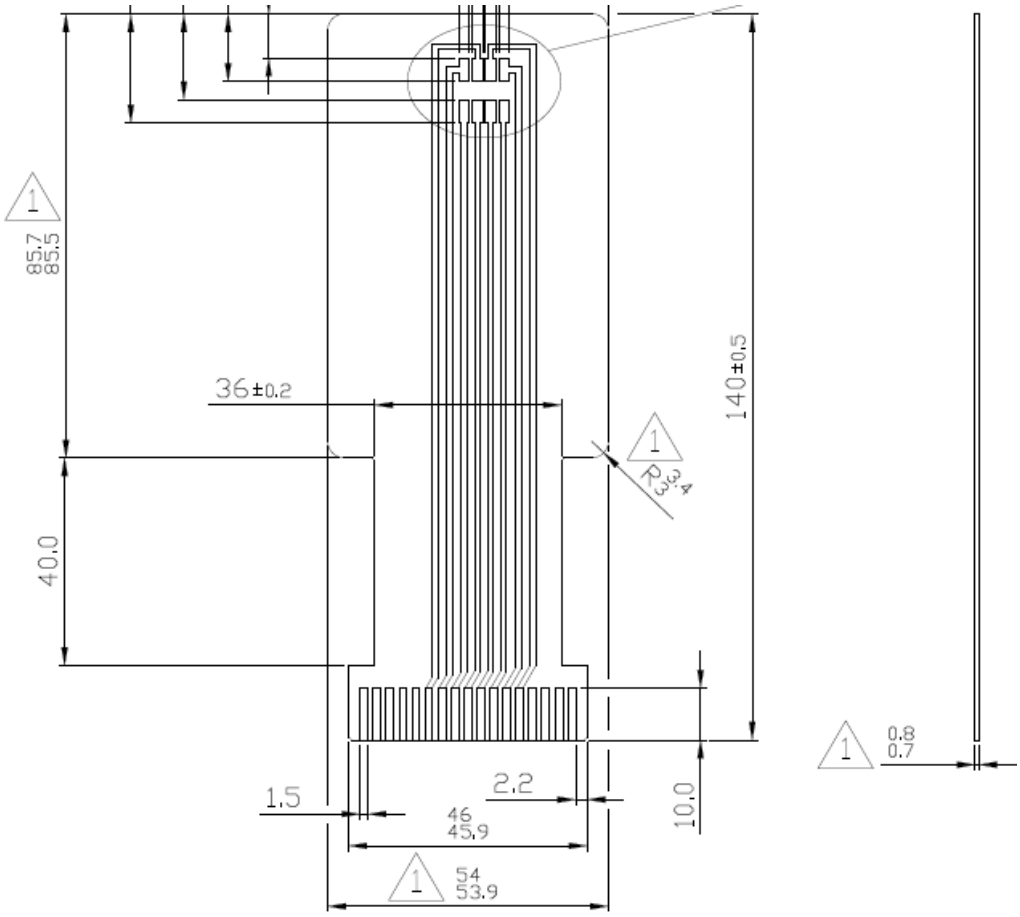


Fig.3: TEST CARD FOR CONTACT RESISTANCE



Material and Finish: FR4, Normal, 0.80mm, 35/0 microns copper,Green Solder mask and ENIG(Nickel 3-4 and GOLD 0.05-0.07microns only) finish.