SLIDING SIM CONNECTOR LOW PROFILE

"The product may not perform according to the product specification if precautions have not been taken in the application to provide mechanical stability of the connector in relation to its mating parts".

1 SCOPE .

1.1 Content.

This specification covers performance, test and quality requirements for a Tyco* SIM Connector. The connector is designed to make a connection between a Subscriber Identity Module (SIM) according to ISO 7816-2 and a printed circuit board (PC-Board).

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.

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

2.1 Tyco Documents.

501-19069	Test report of "Sliding SIM Connector Low Profile"
114-19075	Application Specification "Sliding SIM Connector Low Profile"
107-60262	Packaging Objectives "Sliding SIM Connector Low Profile"

2.2 Tyco Drawings

C-6483856	Customer drawing of "Sliding SIM Connector Low Profile"
C-1705615	Customer drawing of "Scalable Sliding SIM Connector"

2.3 Other Documents.

IEC 60512	Basic testing procedures and measuring methods for electromechanical components for electronic equipment.
IEC 60068	Basic environmental testing procedures.
ISO 7816-2	Identification Cards - Integrated Circuits Cards with contacts - dimensions and locations of the contacts
GSM 11.11	IETS Subscriber Identity Module - Interface Specification.

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 Material and Finish:

A.	Contact material:	- copper alloy.
	Plating Mating side:	- post-plated with nickel and selective gold over palladium or palladium/nickel.
	Plating Termination end:	- post-plated with nickel and selective tin.
B.	Clip material:	- stainless steel
	Plating:	- post-plated tin over nickel
C.	Housing material:	- Glassfilled Liquid Crystal Polymer (LCP).

3.3 Ratings:

A.	Voltage:	25 V max.
B.	Current:	1.2 A max./contact
A.	Operating temperature:	-25°C to 75°C.
	Storage temperature:	-40°C to 85°C.
B.	Durability:	5 000 cycles.

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 para. 3.6.
Unless otherwise specified, all tests are performed at ambient environmental conditions per IEC specification 60068-1 clause 5.3. and are performed with connectors in mated conditions.

V I S U A L			
Para	**Test Title**	**Performance / Severity Requirements**	**Procedure**
3.4.1	Examination of product	Meets requirements of product drawing and applicable instructions on customer drawing, and application specification.	Visual, dimensional and functional per applicable inspection plan. In acc. with IEC 60512-1-1 Magnification 10x

M E C H A N I C A L			
Para	**Test Title**	**Performance / Severity Requirements**	**Procedure**
3.4.2	Termination resistance	Max. open voltage 20mV. Max. current 100 mA DC. All contacts to be measured using a GSM 11.11 SIM-card. Measuring points shall be as indicated in figure 1. Requirement: Initial: 50 mΩ max. Final: 100 mΩ max.	In acc. with IEC 60512-2-1 "See also para. 3.5.1."
3.4.3	Insulation resistance	Test voltage $100^{\pm 15}$ V DC or AC Peak. Duration: 1 minute, unmated. Test between adjacent contacts. Requirement: 500 MΩ min.	In acc. with IEC 60512-3-1
3.4.4	Voltage proof	Test voltage: 200 V AC Duration 1 minute, unmated. Test between adjacent contacts. Requirement: no break-down or flash-over	In acc. with IEC 60512-4-1
3.4.5	Current/temperature derating	Current-load shall be increased in steps of 0.2 A up to 1 A. Test shall be conducted for 1, 2, 3,…..up to 6 contacts loaded simultaneously. Requirement: Temperature shall not exceed 70°C in all cases. Curve will be added in para 3.3 after testing.	In acc. with IEC 60512-5-2

MECHANICAL			
Para	**Test Title**	**Performance / Severity Requirements**	**Procedure**
3.4.6	Contact normal force	Normal force shall be measured with point of action as indicated in figure 4. Requirement: 1. 0,20 N min. at 0,34mm distance from housing top. 2. 0,70 N max. at max. deflection.	Normal force test equipment (force / deflection curve for both down and upward motions) See also para. 3.5.4
3.4.7	Mechanical operation	Manually mate and unmate a new standard GSM 11.11 SIM-card with the SIM connector. Operation cycles: 5 000 Rate: 500 cycles/hour. Speed: 10 mm/s	In acc. with IEC 60512-9-1 See also para. 3.5.2
3.4.8	Vibration sinusoidal	10 - 500 Hz sweeping 1 octave/minute displ. 0,75 mm peak. Duration: 1 hour each in 3 directions. Requirements: No physical damage, no discontinuity > 1 μsec.	In acc. with IEC 60512-6-4 See also para. 3.5.2
3.4.9	Vibration fixed frequency	140 Hz 96 hrs in Z-axis only. Acceleration: 16 ms^{-2} Requirements: No physical damage, no discontinuity > 1 μsec.	See also para. 3.5.2
3.4.10	Random vibration	Sweep from 5 - 20 Hz, ASD 0,96 x 10^{-2} g^2/Hz, then -3dB/octave 20-500 Hz. Duration: 16 hours each in 3 directions Requirements: No physical damage, no discontinuity > 1 μsec.	In acc. with IEC 60512-6-5 See also para. 3.5.2
3.4.11	Engaging/separating force	Measure force to mate and unmate a test-gauge (simulating a max. SIM-card) with the SIM connector. Requirements: Mating-force: 2 N max. Unmating-force: > 0 N	In acc. with IEC 60512-13-2 See also para. 3.5.3
3.4.12	Robustness of Card-guide	See figure 5 Card simulating test-gauge shall be inserted in SIM connector. Load of 15N with an insertion depth of 8,15 mm and a load of 3N with an insertion depth of 2mm shall be applied at indicated point of action and direction. Requirements: No functional damage and dim. of gap for Sim card within tolerance 0,94 ± 0,08	See also para. 3.5.5
3.4.13	Shear strength	No shearing at 40N during 10 seconds. See figure 6 for point of action.	See also para. 3.5.6

MECHANICAL *(continued)*			
Para	**Test Title**	**Performance / Severity Requirements**	**Procedure**
3.4.14	Contact lifting strength	Apply lift-force of 5 N min. at point of action indicated in figure 7. Speed: 0.1 mm/s Requirements: No functional damage	See also para. 3.5.7
3.4.15	Contact stress	Apply during 10 seconds, 50 N min. with test-probe in direction and point of action as indicated in figure 8. Speed: 0,1 mm/s Repetitions: 3 times Requirements: No functional damage	See also para. 3.5.8
3.4.16	Physical shock	Subject connector to 100 g half sine shock pulses of 8.5 ms duration. 3 shocks in both directions of 3 mutual perpendicular axes. Requirements: No physical damage, no discontinuity > 1 μsec.	In acc. with IEC 60512-6-3
3.4.17	Bump	Acceleration 25g, half sinewave pulses of 6 ms. 1000 bumps in each direction of 3 mutual perpendicular axes. Requirements: No physical damage, no discontinuity > 1 μsec.	In acc. with IEC 60512-6-2
3.4.18	Contact resistance versus contact normal force	Dry heat at 70°C for 15 minutes. Measure resistance and force for both down and upwards motions Requirements: No termination resistance increment that exceeds the requirement	In acc. with IEC 60512-2-1

ENVIRONMENTAL			
Para	**Test Title**	**Performance / Severity Requirements**	**Procedure**
3.4.19	Rapid change of temperature	-40°/85°C, 0,5 hrs / 0,5 hrs, Number of cycles: 100	In acc. with IEC 60512-11-4
3.4.20	Dry heat	Temperature: 85°C Duration: 500 hrs	In acc. with IEC 60512-11-9
3.4.21	Cold	Temperature -40°C Duration 500 hrs	In acc. with IEC 60512-11-10
3.4.22	Damp/heat steady state	40°C RH 95% 96 hrs	In acc. with IEC 60512-11-3
3.4.23	Solderability (IR/convection)	Solderbath temp.: 215°C Dip duration: 3 sec. Ageing 3: 16 hrs at 155°C (unmated) Requirement: 5% max. dewetting.	In acc. with IEC 60068-2-20 test Ta.
3.4.24	Resistance to soldering heat (IR/convection)	3 cycles of IR soldering heat-curve as specified in figure 7 and 3 cycles of 4 min. at 190°C in hot-air oven. Recover time: 10 min. (unmated). Requirements: No cracks, chips or melting.	In acc. with EIA-JRX-0102-102 § 3.3.4. "See also para. 3.5.9."
3.4.25	Salt mist	Temperature 35 ±2°C, Salt mist: 5 ±1% salt solution Duration: 48 hrs.	In acc. with IEC 60512-11-6
3.4.26	Ageing	Contacts shall be fully deflected and hold that way under 100°C during 30 hours. Force/Deflection curve after 24 hours and final. Requirement: Contact normal force shall be within requirements of para. 3.4.6	
3.4.27	Dust	RH: < 25% - Air-speed: 5 m/s Dust concentration: 5 ± 1.5 gr/m³ 1 cycle: 5 minutes dust exposure 1 insertion/withdrawal with SIM-card Termination resistance measurement Number of cycles: 10 Requirements: Termination resistance shall not exceed final value as specified in para. 3.4.2 UNMATED	In acc. with IEC 60512-11-8 (Dust) Para 3.4.2. Term.Resist.

3.5 Additional testing details.

3.5.1 Termination resistance

Termination resistance shall be measured as indicated in figure 1.
Bulk-resistance of circuits outside the connector, such as SIM-card pads, PC-Board paths and wire for series connection, are not included in the requirement and therefore shall be measured and documented separately for reference (in case of significant influence).

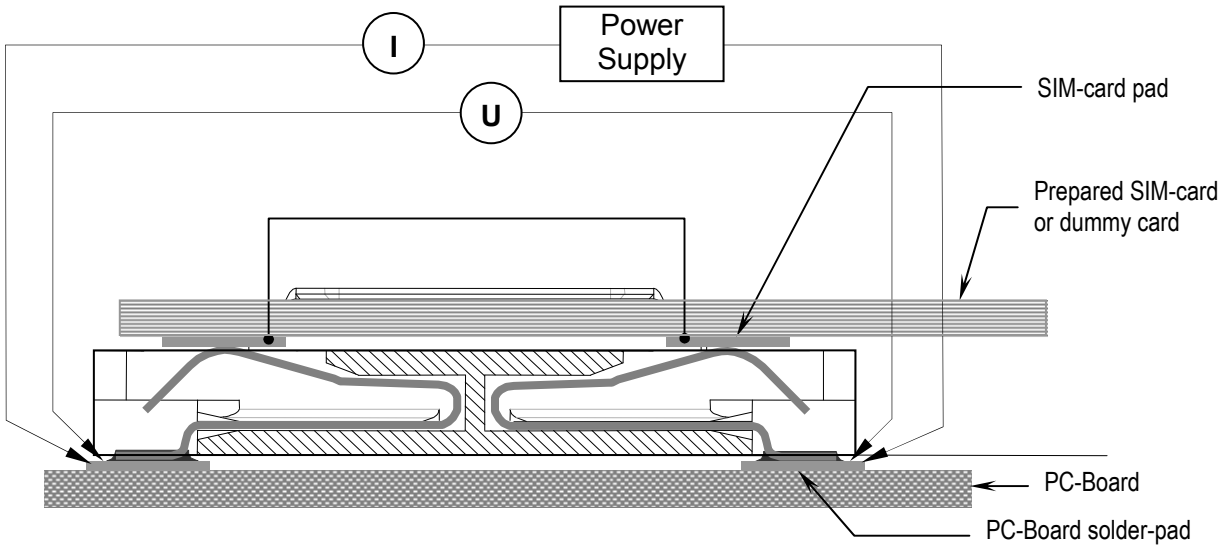

Figure 1.

3.5.2 Testframes

Test-frames shall provide mechanical stability of the connector in relation to its mating parts and shall simulate the actual application as indicated in figure 2.

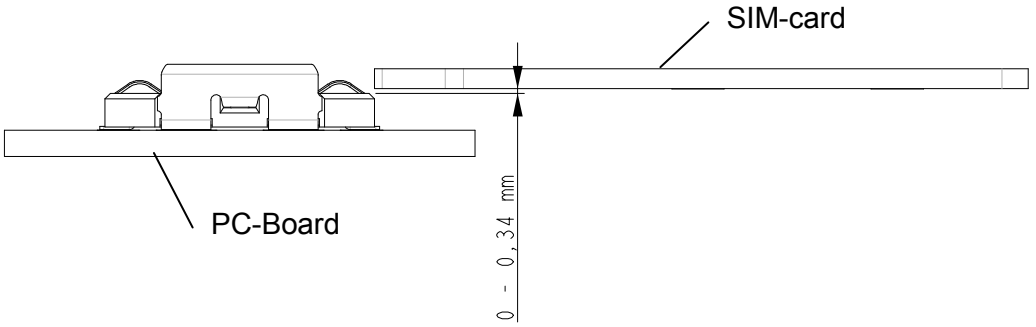

Figure 2.

During Vibration, Physical shock and bump tests, termination resistance is measured continuously to check that no resistance increment occur that exceed the requirement. A special prepared SIM-Card for this shall be inserted in the SIM connector.

3.5.3 SIM-card simulating test gauge

Gauge shall be made of 3 - 5 μ nickel-plated hardened steel with surface roughness of Ra 0.4 μm, shaped at maximum conditions of the GSM 11.11 SIM-card. All edges shall be rounded or chamfered 0.2mm max.

Engaging/separating force measured between 0 and 15 mm. Speed: 30mm/min.

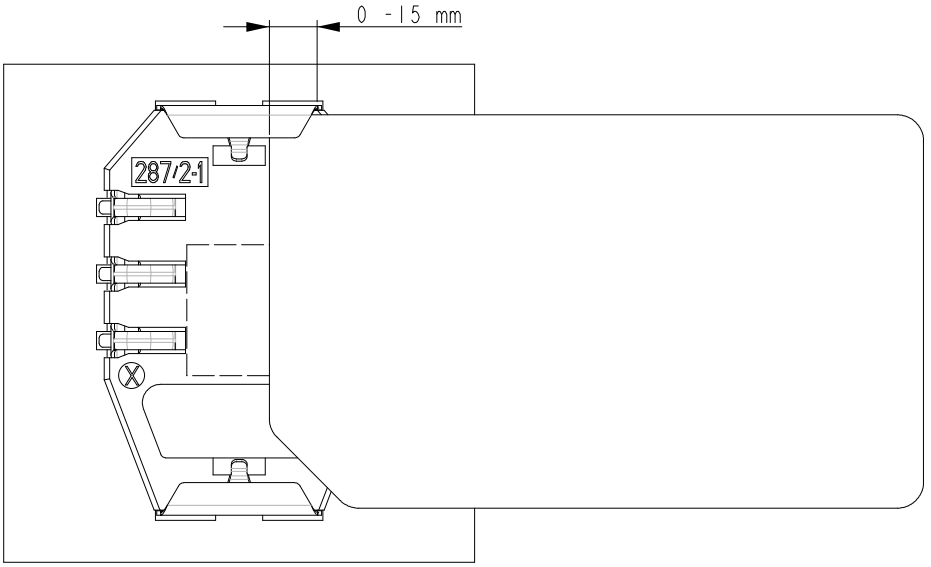

Figure 3

3.5.4 Normal Force

Normal force shall be measured with stroke up to mating face and back.
Force/deflection curve shall display the measuring results.

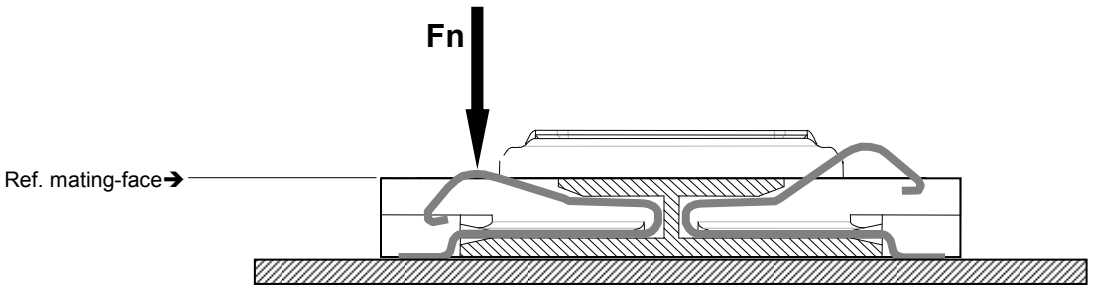

Figure 4

3.5.5 Robustness of guiding

Test shall be applied as indicated in figure 5a and 5b.

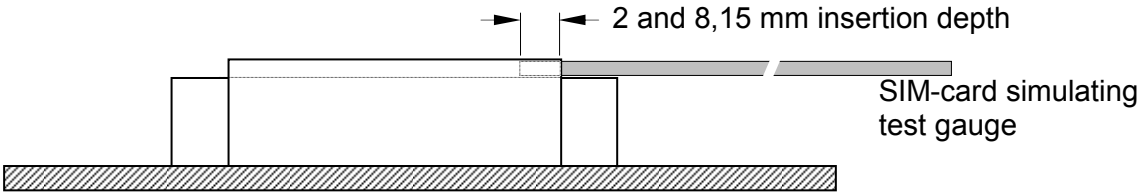

Figure 5a

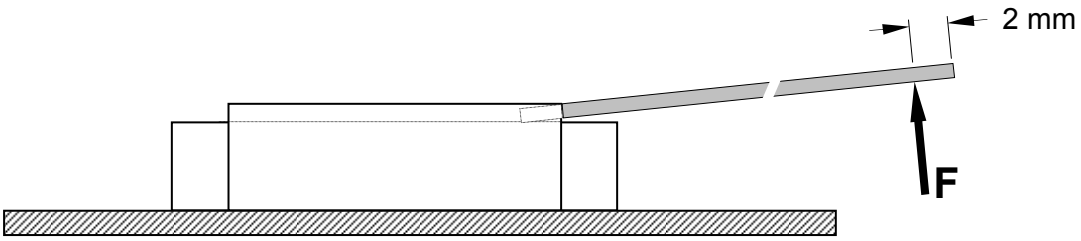

Figure 5b

3.5.6 Shear Force

Specified force shall be applied with point of action and shearing distance as specified in figure 6.

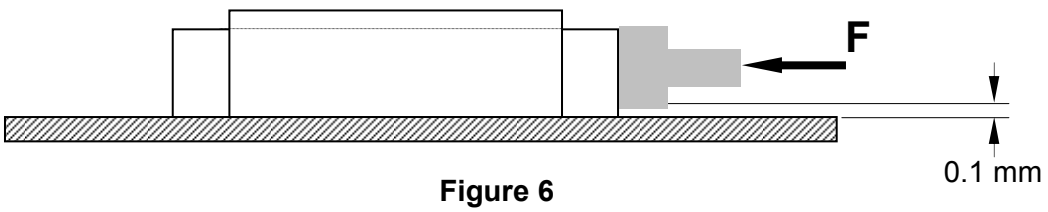

Figure 6

3.5.7 Contact lifting strength

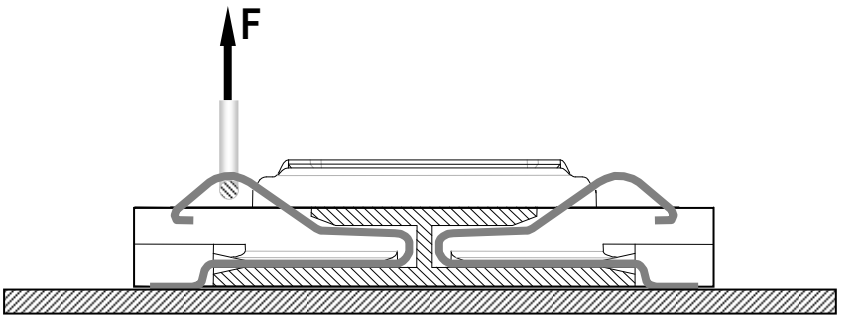

Figure 7

3.5.8 Contact stress

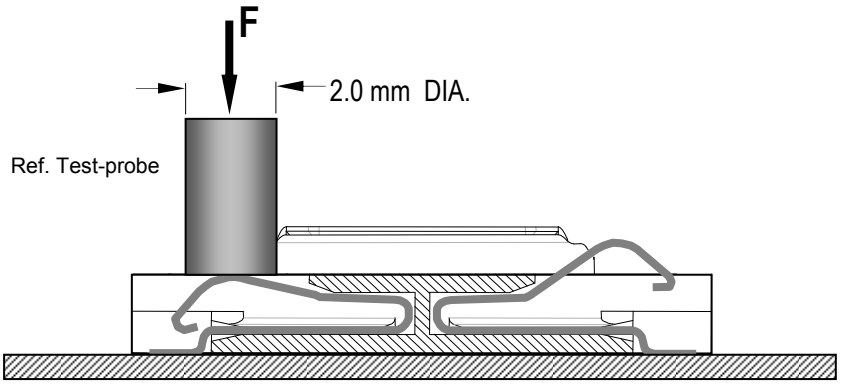

Figure 8

3.5.9 Resistance to soldering heat

Resistance to soldering-heat test shall cover the Forced hot air convection (reflow) heat curve as indicated in figure 9.
ref. IPC/JEDEC J-STD-020B with increased T peak (T_P).
Between exposures, parts shall be allowed to cool down to room temperature, for 5 minutes minimum.

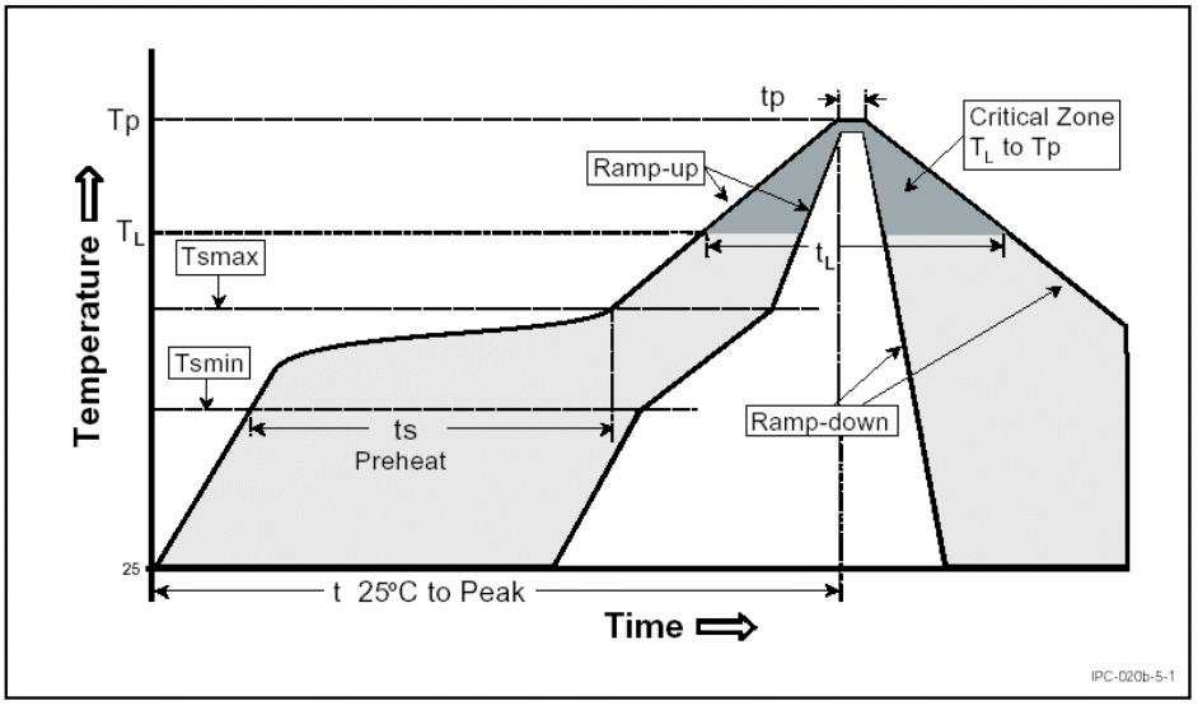

Figure 9. Forced hot air convection (reflow) heat curve.

Profile feature	Pb-Free Assembly Small Body
Average ramp-up rate (T_L to T_P)	3°C /second max.
Preheat - Temperature Min ($T_{S\ min}$) - Temperature Max ($T_{S\ max}$) - Time (min to max) (t_S)	 150°C 200°C 60-180 seconds
$T_{S\ max}$ to T_L - Ramp-up Rate	 3°C /second max.
Preheat - Temperature Min (T_L) - Time (t_L)	 217°C 60-150 seconds
Peak temperature (T_P)	260 +0/-5°C
Time within 5°C of actual Peak Temperature (t_P)	20-40 seconds
Ramp-down Rate	6°C /second max.
Time 25°C to Peak Temperature	8 minutes max.

Note: All temperatures refer to topside of the package, measured on the package body surface.

3.6 Product Qualification and Requalification Test Sequence.

Test or examination	TEST–GROUP (a)										
	1	2	3	4	5	6	7	8	9	10	11
	TEST-SEQUENCE (b)										
Examination of product	1,3, 16	1,3, 16	1,3,9	1,3, 10,18	1,7, 10	1,4	1,4	1,6	1,6	1,3	1,4
Termination resistance	4,15	4,6, 13	4,6,8	4,9, 12,17				3,5	3,5		
Insulation resistance	5,8, 13										
Voltage proof	6,9, 14										
Current / temperature derating			5								
Contact normal force		5,14			3,6						
Mechanical operation		8									
Vibration sinusoidal				5							
Vibration fixed frequency				6							
Random vibration				7							
Engaging separating force		7,15			9						
Robustness of card-guides					8						
Shear strength						3					
Contact lifting strength							3				
Contact stress					5						
Physical shock				11							
Bump				8							
Resistance versus normal force											3
Rapid change of temperature	12	12		13	4						
Dry heat	10	10		14							
Cold	11	11		15							
Damp / heat steady state	7	9		16							
Solderability										2	
Resistance to soldering-heat	2	2	2	2	2	2	2	2	2		2
Salt mist			7								
Ageing								4			
Dust									4		

(a) See para. 4.1.A.
(b) Numbers indicate sequence in which tests are performed.

Sample description	Number of samples in testgroups										
	1	2	3	4	5	6	7	8	9	10	11
SIM Connector on PC-Board	5	5	5		5	5	5	5	5		5
SIM Connector loose piece										5	
SIM Connector with min. Sim card thickness. Card at 0,34 mm distance from housing top				5							

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.
With exception of test-groups 10, connectors in each test-group shall be IR-reflow soldered to a PC-board and shall endure the total number of soldering heat-cycles as required for resistance to soldering heat test.

B. Test sequence

Qualification inspection shall be verified by testing samples as specified in para. 3.6.

4.2 Requalification testing.

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

4.3 Acceptance.

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

4.4 Quality conformance inspection.

Applicable Tyco 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.