



RJ45 Jacks with integrated Magnetics

1. SCOPE

1.1. Content

This specification covers the performance, tests and quality requirements for RJ45 Jacks with integrated magnetics for Ethernet applications.

1.2. Qualification

When tests are performed on the subject product line, procedures specified in Paragraph 3.4 shall be used. All inspections shall be performed using the applicable inspection plan and product drawing.

2. APPLICABLE DOCUMENTS AND FORMS

The following documents and forms constitute a part of this specification to the extent specified herein.

2.1. TE Documents

A. Application Specifications

114-94447 Application Specification

B. Test Reports

502-153102 Engineering Report

2.2. Standards

All dimensions in the contact zone of all RJ45 Jacks are according to IEC 60603-7.

IEC 60512-1-100 Connectors for electronic equipment – Tests and measurements – Part 1-100:
General – Applicable publications

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

IEEE 802-3 Local Area Networks: Carrier Sense Multiple Access with Collision Detection
(CSMA/CD) Access Method and Physical Layer Specification

FCC Part 68 Connection of Terminal Equipment to the Telephone, Connector Specifications

Table 1: IEC Modular Plug and Jack Standards

Category	Type	Standard
Category 3	Unshielded Twisted Pair	IEC 60603-7
Category 3	Screened Twisted Pair	IEC 60603-7-1
Category 5e	Unshielded Twisted Pair	IEC 60603-7-2
Category 5e	Screened Twisted Pair	IEC 60603-7-3
Category 6	Unshielded Twisted Pair	IEC 60603-7-4
Category 6	Screened Twisted Pair	IEC 60603-7-5

3. REQUIREMENTS

3.1. Design and Construction

Product shall be of the design, construction, materials 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.

- **Contacts** Copper alloy, overall nickel plating with selective gold plating in the contact area and tin plating on the soldertails.
- **Housing** LCP Black UL94V-0.
- **Shield** Copper Alloy, overall Nickel plating.
- **LED** Epoxy encapsulated diode lens, iron lead frame with Nickel and Tin.
- **Magnetics** Epoxy encapsulated wound cores. Printed circuit board assembly contains Common mode choke cores, isolation transformer cores, auto-transformer (center-tapped inductor) cores, resistors, and capacitors surface-mounted. Wound cores consist of magnet wire winding on a manganese-zinc ferrite toroid.

3.3. Test Requirements and Procedures Summary

Unless otherwise specified, all tests shall be performed at ambient environmental conditions.

TEST DESCRIPTION	REQUIREMENT	PROCEDURE
Visual examination	Meet requirements of product drawing. There shall be no cracks or burrs	comply with IEC 60512-1-1 Test 1a
ELECTRICAL		
LED Test	Meet LED requirements of product drawing.	If applicable: Test all LEDs in both directions
Contact Resistance	8 contacts/specimen, $\leq 30\text{m}\Omega$.	IEC 60512, Test 2a
Insulation Resistance	8 contacts/specimen, DC 500V, Insulation Resistance $\geq 500\text{M}\Omega$	IEC 60512, Test 3a
HI Pot (Isolation voltage)	2250 VDC for 60 s applied as specified in 5.3.2 of IEC 60950-1:1991	Between all contacts on the PHY side to the contacts on the plug side and the contacts of the PHY side to the shield. Comply with IEEE802.3 isolation requirements: IEC 60512 Test 4a
Turn ratio (Chip: cable)	TX = 1:1; RX = 1:1 @100kHz, 100mV	
MECHANICAL		
Insertion and withdrawal forces	Speed: 10 mm/s maximum Insertion and withdrawal: 20 N maximum All types.	IEC 60512, Test 13b Number of cycles:10
Effectiveness of connector locking device	Tensile force: 50 N for 60 s \pm 5 s All types.	IEC 60512, Test 15f
ENVIRONMENTAL		
Thermal shock	No physical evidence of damage	IEC 60512-11-4 Test 11e. Subject unmated to 5 cycles between -40°C for 30 minutes and 85°C for 30 minutes
TRANSMISSION PERFORMANCE		
Insertion Loss	-1.0 dB MAX from 1 MHz to 100 MHz -1.2 dB MAX from 100 MHz to 125 MHz	In accordance with IEC 60512-28-100 For specific application, refer to the relevant IEC specification from Table 1

Return Loss	-18.5 dB MIN from 1 MHz to 30 MHz -16.5 dB MIN from 40 MHz to 60 MHz -13 dB MIN from 60 MHz to 80 MHz -11 dB MIN from 80 MHz to 100 MHz	In accordance with IEC 60512-28-100 For specific application, refer to the relevant IEC specification from Table 1
Near-End Cross-Talk (NEXT)	-30 dB MIN from 1 MHz to 100 MHz	In accordance with IEC 60512-28-100 For specific application, refer to the relevant IEC specification from Table 1
Common- to- Common Mode Attenuation	-30 dB MIN from 1 MHz to 100 MHz	In accordance with IEC 60512-28-100 For specific application, refer to the relevant IEC specification from Table 1
DC Resistance	1.2 Ohms MAX	

SOLDERABILITY

Solderability Test (THR)	Appearance of the specimen shall be inspected with a magnifier of min 10x. The soldered surface shall be covered with a smooth solder coating with no more than small amounts of scattering imperfections such as pin-holes, un-wet or de-wet areas.	Test connector on PCB IEC 60068-2-58 Profile acc. IPC/JEDEC J-STD-020D Preheat temperature: 150+/-10°, Preheat time: 60~120sec Peak temperature: 235 +/-5 °C Peak soldering time: 10+-1sec Number of reflow: 2
Resistance to Soldering Heat (THR)	No physical or evidence of damage. If with LED: LED functionality shall be tested.	Test Connectors loose (not on PCB) IEC 60068-2-58 Profile acc. IPC/JEDEC J-STD-020D Average ramp rate: 3°C/ sec max Preheat temperature:150~200°C Preheat time: 60~120sec Ramp to peak: 3°C/sec max Time over liquid's (217°C): 60~150sec Peak temperature: 250 +/-5 °C Peak soldering time: 30sec Ramp - cool down: 6°C/ sec max Time 25°C to peak: 8 min max Number of reflow: 2
Solderability (DIP)	Appearance of the specimen shall be inspected with a magnifier of min 10x. The soldered surface shall be covered with a smooth solder coating with no more than small amounts of scattering imperfections such as pin-holes, un-wet or de-wet areas.	IEC 60068-2-20, Test Ta Test connector on PCB Solder Temperature: 245+/-5° Immersion Duration: 3+-0.5sec
Resistance to Soldering Heat (DIP)	No physical evidence of damage.	IEC 60068-2-20, Test Tb, method 1a 260 +/-5 °C /10sec

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 Paragraph 3.5.

3.4. Test Sequence of product qualification

TEST OR EXAMINATION	TEST GROUP				
	A	B	C	D	E
Visual examination	1, 8 ^(a)	1, 4, 8	1,7	1, 10	1, 7
LED test			2,6	2, 9	2, 4
Contact Resistance				3, 6	5
Insulation Resistance				4, 7	6
HI Pot (Isolation voltage)		3, 5	5	5, 8	
Turn ratio (Chip: cable)	2				
Insertion and withdrawal forces		2, 6			
Effectiveness of connector locking device		7			
Thermal shock			3		
Insertion Loss	3				
Return Loss	4				
Near-End Cross-Talk (NEXT)	5				
Common-to-Common Mode Attenuation	6				
DC Resistance	7				
Resistance to Soldering Heat (THR)			4 ^(b)		
Solderability test (THR)					3 ^(b)
Resistance to Soldering Heat (DIP)			4 ^(b)		
Solderability test (DIP)					3 ^(b)

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

(b) Half of the specimen each

Classification of test groups:

Group A: Electrical transmission

Group B: Mechanical

Group C: (Solder) Heat resistance

Group D: Electrical

Group E: Solderability

4. QUALITY ASSURANCE PROVISIONS

4.1. Qualification Testing

A. Sample Selection

The samples shall be prepared in accordance with product drawings. They shall be selected at random from current production.

B. Test Sequence

The tests realization must be in accordance with test groups as shown in section 3.5.

C. Number of specimens (if not otherwise specified)

For Test group A, B and D: 3 specimens each

For Test group C and E: 6 specimens each

4.2. Re-Qualification 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.

4.3. Acceptance

Acceptance is based on verification that the product meets the requirements of section 3.4. Failures attributed to equipment, test setup, or operator deficiencies shall not disqualify the product. When product failure occurs, corrective action shall be taken and samples resubmitted for qualification. Testing to confirm corrective action is required before resubmittal.

4.4. Quality Conformance Inspection

The applicable TE 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.

Revision Record

Revision	Remarks	Name	Date
D	Solder tests updated and new tests added, Test groups re-arranged	LET & NM	SEP2023
E	Minor update in the document for clarity	LET & KS	JAN2025