MINIPAK* HDL Board Mount Receptacle or Plug Connector System

1. SCOPE

1.1. Content

This specification covers performance, tests and quality requirements for MINIPAK* HDL Board Mount Receptacle or Plug Connector System.

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 20Apr09. The Qualification Test Report number for this testing is 501-703. 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. Tyco Electronics Documents

- ! 109 Series: Test Specifications as indicated in Figure 1
- ! 501-703: Qualification Test Report (MINIPAK* HDL Board Mount Receptacle or Plug Connector System)
- | ! 502-1259: Engineering Report (MINIPAK* HDL Board Mount Receptacle or Plug Connector)

2.2. Industry Document

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

2.3. Reference Documents

- ! 108-1651: Product Specification (Universal Power Module)
- ! 108-19082: Product Specification (Z-PACK 2 mm HM Connectors)
- ! 109-197: Test Specification (AMP 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 Figure 1
- Current: See Figure 2
- Temperature: -40 to 125˚C

Contact Type	Contact Pitch (mm)	Within Primary Circuits	Primary to Secondary Circuits	Primary to Ground Circuits	Within Secondary Circuits
Signal	2	NR	NR	NR	60 (see Note)
Power	2.75	60 (see Note)	60 (see Note)	60 (see Note)	60 (see Note)
Power	5.50	200	NR	200	200

NOTE *Denotes Safety Extra Low Voltage (SELV) circuits.*

Figure 1
Volts RMS or DC

Signal Contacts (amperes)	
Single Signal Contact	25 Adjacent Signal Contacts
3	1

Current per Power Contact (amperes)						
Number of contacts energized	1	2	4	8	12	24
Steady State - 2.75 mm spacing	26	22	20	17	16	13

NOTE *For low level current or non-energized testing, connectors are applied to test boards with 2, 2 ounce thick copper power planes. Circuit carried on 2 commoned 2 ounce layers. For higher current testing, connectors are applied to test boards with 4, 2 ounce thick copper power planes. Circuit carried on 4 commoned 2 ounce layers. Further current testing results are available in 502-1259. A test system consists of 24 power contacts on 2.75 mm contact pitch and 40 signal contacts on 2.0 mm contact pitch.*

Figure 2
Current Per Contact (amperes) At 30˚C Temperature Rise

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.	EIA-364-18. Visual and dimensional (C of C) inspection per product drawing. Document gold plating thickness at contact interfaces.
Final examination of product.	Meets visual requirements.	EIA-364-18. Visual inspection.
ELECTRICAL		
Low Level Contact Resistance (LLCR), signal and power contacts.	Power contacts: 5 milliohms maximum initial. 5 milliohms maximum change. Signal contacts: 20 milliohms maximum initial. 10 milliohms maximum change.	EIA-364-23. Subject specimens to 100 milliamperes maximum and 20 millivolts maximum open circuit voltage.
Contact resistance at rated current, power contacts.	1.6 milliohms average of the maximum values, end of life.	EIA-364-6. Measure millivolt drop at 17 amperes at 30˚C temperature rise end of life for 2.75 mm centerline, 8 contacts energized. See Figure 2.
Insulation resistance.	1000 megohms minimum for both signal and power contacts.	EIA-364-21. 100 volts DC, 2 minute hold for signal contacts. 500 volts DC, 2 minute hold for power contacts. Test between adjacent contacts of mated specimens.
Withstanding voltage.	One minute hold with no breakdown or flashover.	EIA-364-20, Condition I. 750 volts DC at sea level for signal contacts. 2500 volts DC for power contacts. Test between adjacent contacts of mated specimens and between closest signal and power contacts.

Figure 3 (continued)

Test Description	Requirement	Procedure
Temperature rise vs current, power contacts.	50˚C maximum temperature rise.	EIA-364-70, Method 1. Stabilize at a single current level until 3 readings at 5 minute intervals are within 1˚C. Test with single energized contact and with 2, 4, 8, 12 and 24 adjacent power contacts energized. Record data over a range 20 to 50˚C temperature rise. Document 30˚C temperature rise current.
MECHANICAL		
Random vibration.	No discontinuities of 1 microsecond or longer duration. See Note.	EIA-364-28, Test Condition VII, Condition E. Subject mated specimens to 4.90 G's rms between 20 to 500 Hz. Fifteen minutes in each of 3 mutually perpendicular planes.
Mechanical shock.	No discontinuities of 1 microsecond or longer duration. See Note.	EIA-364-27, Condition A. Subject mated specimens to 50 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. Mate and unmate specimens for 250 cycles at a maximum rate of 500 cycles per hour.
Mating force.	3 N maximum for power contact. Average mating force for signal contacts shall be less than 1.65 N per contact.	EIA-364-13. Measure force necessary to mate specimens at a maximum rate of 12.7 mm per minute.
Unmating force.	0.5 N minimum per power contact. 0.15 N minimum per signal contact.	EIA-364-13. Measure force necessary to unmate specimens at a maximum rate of 12.7 mm per minute.
Compliant pin insertion.	44.5 N maximum per pin.	Tyco Electronics 109-41. Measure force necessary to correctly apply a specimen to a PCB at a maximum rate of 12.7 mm per minute.
Compliant pin retention.	10 N minimum per pin.	Tyco Electronics 109-30-1. Measure force necessary to remove a correctly applied specimen from its PCB at a maximum rate of 12.7 mm per minute.

Figure 3 (continued)

Test Description	Requirement	Procedure
Static load, transverse.	F1 = 100 N F2 = 75 N F3 = 50 N No displacement of connector on PCB likely to impair normal operation. See Note.	Apply specified force in middle of the specimen approximately 6 and 11 mm above the PCB. See Figure 5.
Contact retention.	Signal contacts: 2 N minimum in the mating direction. 9.5 N minimum for pins in the unmating direction. 5 N minimum for receptacles in the unmating direction. Power contacts: 0.1 mm maximum axial displacement. See Note.	Tyco Electronics 109-30-1. Signal contacts: Apply axial force of 2 N to pin and receptacle contacts in the mating direction at a maximum rate of 2.54 mm per minute. Apply axial force of 9.5 N (pin) and 5 N (receptacle) to pin contacts in the unmating direction at a maximum rate of 2.54 mm per minute. Power contacts: Apply axial force of 10 N to pin contacts in the unmating direction at a maximum rate of 2.54 mm per minute and hold for 5 seconds. Apply axial force of 5 N to pin contacts in the mating direction at a maximum rate of 2.54 mm per minute and hold for 5 seconds. Apply axial force of 5 N to receptacle contacts in both the mating (against the tip of the pin) and unmating (against the back of the contact) directions at a maximum rate of 2.54 mm per minute and hold for 5 seconds.
Minute disturbance.	See Note.	Unmate and mate each connector pair a distance of approximately 0.1 mm.
Component heat resistance to wave soldering.	See Note.	Tyco Electronics 109-202, Condition B.
ENVIRONMENTAL		
Thermal shock.	See Note.	EIA-364-32. Subject unmated specimens to 5 cycles between -40 and 125˚C with 30 minute dwells at temperature extremes and less than 1 minute transition between temperatures.
Humidity/temperature cycling.	See Note.	EIA-364-31, Method III. Subject unmated specimens to 10 cycles (10 days) between 25 and 65˚C at 80 to 100% RH.

Figure 3 (continued)

Test Description	Requirement	Procedure
Temperature life.	See Note.	EIA-364-17, Method A, Test Condition 3, Test Time Condition C. Subject mated specimens to 85˚C for 500 hours.
Mixed flowing gas.	See Note.	EIA-364-65, Class IIA (4 gas). Subject specimens to environmental Class IIA for 20 days (10 days unmated followed by 10 days mated).
Dust.	See Note.	EIA-364-91. Subject unmated specimens to dust contamination #1 (benign) for 1 hour at an airflow of 1000 cfm.

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 4.*

Figure 3 (end)

3.6. Product Qualification and Requalification Test Sequence

Test or Examination	Test Group (a)									
	1	2	3	4	5	6(b)	7(c)	8	9	10
	Test Sequence (d)									
Initial examination of product	1	1	1	1	1	1	1	1	1	1
LLCR, signal and power contacts	2,4,6	3,7		2,4				2,4,6		
LLCR, power contacts only					2,4,6,8					
Contact resistance at rated current, power contacts					10					
Insulation resistance			2,6							
Withstanding voltage			3,7							
Temperature rise vs current					3(f),9					
Vibration, random		5			7(e)					
Mechanical shock		6								
Durability		4								
Mating force		2(g)								
Unmating force		8(g)								
Compliant pin insertion							2			
Compliant pin retention							3			
Static load, transverse									2	
Contact retention										2
Minute disturbance	5							5		
Component heat resistance to wave soldering						2				
Thermal shock			4							
Humidity/temperature cycling			5							
Temperature life				3	5					
Mixed flowing gas	3(f)(h)									
Dust								3(f)		
Final examination of product	7	9	8	5	11	3	4	7	3	3

NOTE

(a) See paragraph 4.1.A.
(b) Test on boards.
(c) Insertion only for fully loaded connectors, insertion and retention for loose power plug contacts and loose signal chicklet contacts.
(d) Numbers indicate sequence in which tests are performed.
(e) Energize at current for 18˚C temperature rise.
(f) Precondition specimens with 10 durability cycles.
(g) Power only in housing, signal only in housing, and signal and power in housing.
(h) Measure LLCR after 10 days unmated exposure.

Figure 4

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. Test groups 1, 3, 4, 8 and 10 shall each consist of 5 mated plugs and receptacles. Test group 2 shall consist of 15 mated plugs and receptacles: 5 plugs fully loaded with power and signal contacts; 5 with power contacts only; and 5 with signal contacts only. Test Group 5 shall consist of 3 mated plugs and receptacles. Test Groups 6 and 11 shall each consist of 5 plugs. Test Groups 7 and 9 shall each consist of 5 receptacles.

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.

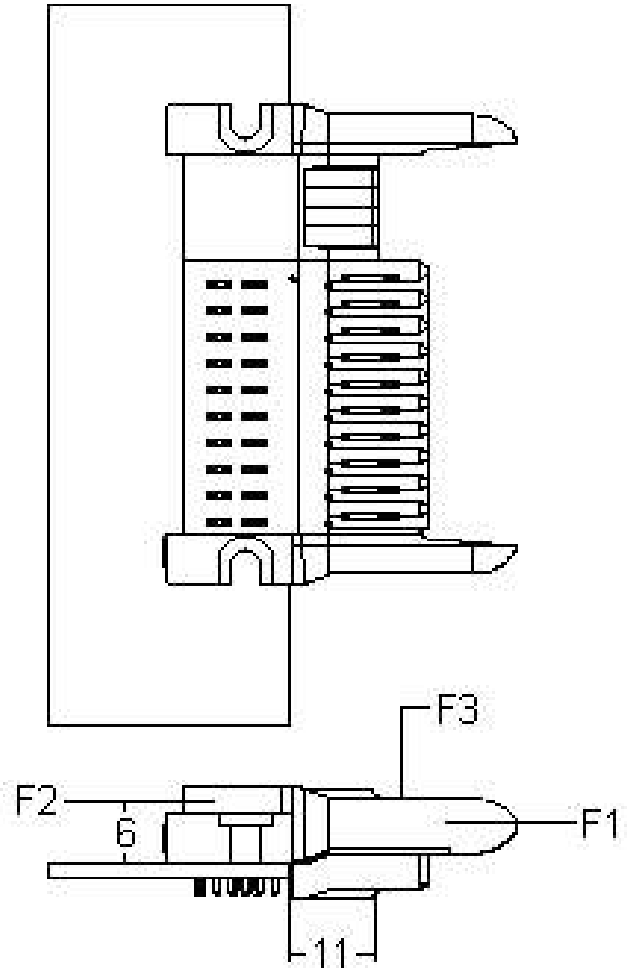

Figure 5
Static Load