STEP-Z* High Speed Mezzanine 1.00 X 0.65 BGA Differential Connector System

1. SCOPE

1.1. Content

This specification covers performance, tests and quality requirements for the STEP-Z* High Speed Mezzanine 1.00 x 0.65 mm Ball Grid Array (BGA) Differential Connector System which provides for interconnection of parallel printed wiring boards in low power applications.

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. Qualification Test Results

| Successful qualification testing on the subject product line was completed on 20Feb06. Additional
| testing was completed on 12Jan07. The Qualification Test Report number for this testing is 501-627. 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

- 109-197: Test Specification (AMP Test Specifications vs EIA and IEC Test Methods)
- 114-13101: Application Specification (STEP-Z* Printed Circuit (PC) Board Connectors)
- 501-627: Qualification Test Report(STEP-Z* High Speed Mezzanine 1.00 X 0.65 mm BGA Differential Connector System

2.2. Industry Standard

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

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.

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3.3. Ratings

- Voltage: 48 volts AC
- Current: 1.0 ampere
- Temperature: 0 to 100˚C

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 per EIA-364.

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.
Final examination of product.	Meets visual requirements.	EIA-364-18. Visual inspection.
	ELECTRICAL	
Low Level Contact Resistance (LLCR).	20 milliohms for 15 mm mated height; 23 milliohms for 18 mm mated height; 24 milliohms for 20 mm mated height; 28 milliohms for 25 mm mated height; 31 milliohms for 28 mm mated height; 32 milliohms for 30 mm mated height; 36 milliohms for 35 mm mated height. 40 milliohms for 40 mm mated height. ΔR 10 milliohms maximum. With a minimum of 500 data points, the following ΔR shall apply: 3% maximum > 5 milliohms; 1% maximum > 10 milliohms; 0% > 50 milliohms.	EIA-364-23. Subject specimens to 100 milliamperes maximum and 20 millivolts maximum open circuit voltage. See Figure 3.
Insulation resistance.	5000 megohms minimum initial. 1000 megohms minimum final.	EIA-364-21. 500 volts DC, 1 minute hold. Test between 10 signal-signal pair and 10 signal-to-adjacent ground contacts of mated specimens.

Figure 1 (continued)

Test Description	Requirement	Procedure
Withstanding voltage.	1 minute hold with no breakdown, flashover, or excessive leakage current >1 milliampere.	EIA-364-20, Condition I. 500 volts DC at sea level. Test between 10 signal-signal pair and 10 signal-to-adjacent ground contacts of mated specimens.
Current rating.	30˚C maximum temperature rise above ambient (25 ± 5˚C) at 1 ampere.	Measure temperature rise on all contacts in 3 adjacent wafers of mated and mounted specimens. Measure temperature rise on all signal contacts in 3 adjacent wafers of mated and mounted specimens. Measure temperature rise on all ground contacts in 3 adjacent wafers of mated and mounted specimens.
	MECHANICAL	
Vibration, sinusoidal.	No discontinuities of 1 microsecond or longer duration. See Note.	EIA-364-28, Test Condition II. Subject mated specimens to 10-500-10 Hz traversed in 15 minutes with 1.5 mm maximum total excursion. Eight hours in each of 3 mutually perpendicular planes.
Mechanical shock.	No discontinuities of 1 microsecond or longer duration. See Note.	EIA-364-27, Method H. Subject mated specimens to 30 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 25 cycles at a maximum rate of 500 cycles per hour. The first 13 cycles shall be performed prior to specific environmental test in the sequence. The remaining 12 cycles shall be performed after environmental test. The test shall be performed with plug and receptacle soldered to board.
Mating/unmating force.	Maximum total mating force: 10 kg for 104 position; 19 kg for 200 position; 28 kg for 296 position. Minimum total unmating force: 2.5 kg for 104 position; 4.8 kg for 200 position; 7.1 kg for 296 position.	EIA-364-13. Measure force necessary to mate and unmate specimens at a rate of 12.7 to 25.4 mm per minute.

Figure 1 (continued)

Test Description	Requirement	Procedure
Disturbed interface.	See Note.	Interface shall be disturbed so that contact surfaces move about 0.10 mm or less.
	ENVIRONMENTAL	
Temperature cycling.	Any measured resistance exceeding 100% increase in total resistance from initial value recorded at hot temperature, shall be considered an open. An open followed by 10 additional opens shall be considered a failure. The time to failure shall be recorded as the first open cycle of the failure sequence. See Note.	Subject specimens to temperature range between 0 and 100 ± 5˚C. Temperature ramp shall be < 20˚C per minute (<10˚C per minute preferred). Dwell at each temperature extreme for a minimum of 15 minutes after printed circuit board reaches temperature. Cycle time shall be approximately 60 minutes (24 test cycles per day). Specimens shall be tested until 63.2% of the specimens (18 connectors) have failed or until 2670 cycles have been completed.
Humidity-temperature cycling.	See Note.	EIA-364-31, Method III. Subject mated specimens to 50 cycles (500 hours) between 25 and 65˚C at 95% RH. Temperature ramp shall be 1 hour per transition with 3 hour minimum dwell at 65˚C.
High 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.
Thermal shock.	No discontinuities of 1 microsecond or longer duration. See Note.	EIA-364-32, Test Condition I. Subject mated specimens to 5 cycles between -55 and 85˚C. Temperature transfer rate shall be < 1 minute with 30 minute dwell at each temperature extreme.

Figure 1 (continued)

Test Description	Requirement	Procedure
Mixed flowing gas.	See Note.	EIA-364-65, Class IIA (4 gas). Subject mated and mounted specimens to environmental Class IIA for 20 days. After initial LLCR and 50% durability cycles, specimens shall be broken into 2 groups of 5. The plugs from the first group and the receptacles from the second group, shall be placed in the chamber unmated for 10 days. After 5 days unmated exposure, mate and recheck LLCR, then unmate and finish initial 10 days. Mate, recheck LLCR and then leave in chamber for 10 days mated. After 5 days mated exposure, recheck LLCR, and then return to chamber for final 5 days mated exposure.
Dust.	See Note.	Subject unmated specimens to dust exposure for 1 hour at a flow rate of 300 cfm. Dust composition shall be #1 Benign. Use 9 grams of dust for each cubic foot of chamber space. Dry dust for 1 hour at 50˚C prior to application to connector. After exposure, let specimens sit for 1 hour in chamber.

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)

3.6. Product Qualification and Requalification Test Sequence

Test or Examination	Test Group (a)						
	1	2	3(b)	4	5	6	7
	Test Sequence (c)						
Initial examination of product	1	1	1	1	1	1	1
Low level contact resistance (LLCR)	2(d),4,6,8,10,12,14,16(e)	2(d),4,6,8,10,12(e)		2(d),4,6,8,10,12(e)	3,5		
Insulation resistance			2,6				
Withstanding voltage			3,7				
Current rating							2
Vibration, sinusoidal				7			
Mechanical shock				9			
Durability	3(d)(f),15(e)(g)	5(d)(f),11(e)(g)		3(d)(f),11(e)(g)			
Mating/unmating force					2,6		
Disturbed interface	13						
Temperature cycling						2	
Humidity-temperature cycling		9	5				
High temperature life					4		
Thermal shock		3	4				
Mixed flowing gas(h)	5,7,9,11						
Dust		7		5			
Final examination of product	17	13	8	13	7	3	3
Specimen quantity	10	8	2	10	5	30	2

NOTE

(a) See paragraph 4.1.A.
(b) Specimens shall be unmated except during insulation resistance and dielectric withstanding measurements.
(c) Numbers indicate sequence in which tests are performed.
(d) Record LLCR after first mating.
(e) Record LLCR prior to last unmating.
(f) First half of the total number of specified cycles.
(g) Second half of the total number of specified cycles.
(h) After initial LLCR and 50% durability cycles, specimens shall be broken into 2 groups of 5. The plugs from the first group and the receptacles from the second group, shall be placed in the chamber unmated for 10 days. After 5 days unmated exposure, mate and recheck LLCR, then unmate and finish initial 10 days. Mate, recheck LLCR and then leave in chamber for 10 days mated. After 5 days mated exposure, recheck LLCR, and then return to chamber for final 5 days mated exposure.

Figure 2

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 per Figure 2. Test group 1 requires 10 connector pairs terminated to LLCR PCB. Test group 2 requires 5 connector pairs terminated to LLCR PCB and a minimum of 3 connector pairs terminated to continuity PCB. Test group 3 requires 3 loose piece connector pairs. Test group 4 requires 5 connector pairs terminated to LLCR PCB and a minimum of 3 connector pairs terminated to continuity PCB. Mated connectors shall be held together with standoffs and fasteners. Test group 5 requires 5 connector pairs terminated to .062 inch minimum thick LLCR PCB. Test group 6 requires 30 connectors terminated to continuity PCB. Mated connectors shall be held together with standoffs and fasteners. Test group 7 requires 2 connector pairs terminated to special serial current test PCB.

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.

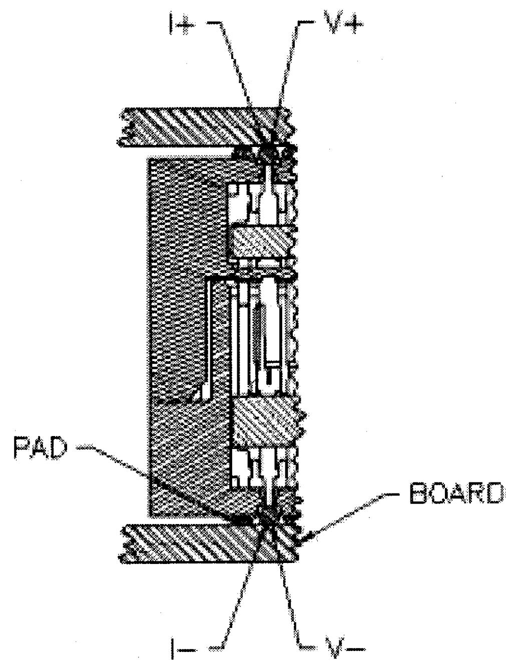

Figure 3
Low Level Contact Resistance Measurement Points