1. INTRODUCTION

1.1. Purpose

Testing was performed on MINIPAK* HDE Board Mount Power Header Connector to determine its conformance to the requirements of product specification 108-2289.

1.2. Scope

This report covers the electrical, mechanical, and environmental performance of MINIPAK* HDE Board Mount Power Header Connector. Testing was performed at TE Connectivity Shanghai Electrical Test Laboratory. The test file number for this testing is TR-60242-E, this documentation is on file at and available from the TE Connectivity Shanghai Electrical Testing Laboratory.

1.3. Conclusion

The MINIPAK* HDE Board Mount Power Header Connector conformed to the electrical, mechanical, and environmental performance requirements of Product Specification 108-2289.

1.4. Test Specimens

Test specimens were representative of normal production lots, Specimens identified with part 1926273-1 was used for test.

1.5. Environmental Conditions

Unless otherwise stated, the following environmental conditions prevailed during testing:

Temperature: 15°C to 35°C

Relative Humidity: 25% to 75%

1.6. Product Qualification and Requalification Test Sequence

Test or Examination	Test Group (a)				
	1	2	3	4	5
	Test sequence (b)				
Examination of product	1	1	1	1	1
Low level contact resistance		3,7			2,5,7,9
Contact resistance at rated current					11
Insulation resistance			2,6		
Withstanding voltage			3,7		
Temperature rise vs. Current					3(c),10
Random Vibration		5			8
Mechanical shock		6			10
Durability		4			
Mating force		2			
Un-mating force		8			
Compliant pin insertion	2				
Compliant pin retention	3				
Contact retention				2	
Thermal shock			4		
Humidity/temperature cycling			5		
Temperature life					6
Mixed flowing gas					4(d)
Final examination of product	4	9	8	3	12

NOTES
(a) See para 1.4.

(b) Numbers indicate sequence in which tests are performed.
(c) Precondition specimens with 10 durability cycles.
(d) Measure LLCR after 10 days unmated.

Figure 1

2. SUMMARY OF TESTING

2.1. Initial Examination of Product – All Test Groups

All specimens submitted for testing were representative of normal production lots. A Certificate of Conformance (C of C) was issued by Product Assurance. Specimens were visually examined and no evidence of physical damage detrimental to product performance was observed.

2.2. Low Level Contact Resistance – Test Groups 2 and 5

All low level contact resistance measurement, taken at 100 mill amperes maximum and 20 millivolts maximum open circuit voltage were less than 3 milliohms initially and 3 milliohms maximum change after testing.

Test Group	Number of Data points	Condition	LLCR (milliohms)		
			Minimum	Maximum	Average
2	120	Initial	1.04	1.77	1.37
	120	EOL	0.78	1.90	1.32
5	72	Initial	1.13	1.89	1.36
	72	After mixed flowing gas	1.04	2.14	1.38
	72	After temperature life	1.02	2.30	1.51
	72	After random vibration	1.16	1.78	1.40

Figure 2

2.3. Contact Resistance at Rated Current – Test Group 5

Contact resistance measurements for 0.300, 0.250, and 0.200 pitch power contacts were less than the maximum requirement of 0.7 milliohms and low power contacts were less than the maximum requirement of 1.5 milliohms. All data was taken from specimens on 2 ounce copper 2 layer printed circuit boards and 2 ounce copper 10 layer printed circuit boards. Values were measured per individual contacts.

The contact resistance at rated current measurements were less than 2 milliohms after testing.

Test Group	Contact energized	Current (Ampere)	Number of Data points	Contact Resistance (milliohms)		
				Minimum	Maximum	Average
5	1 low row	26	3	1.37	1.42	1.40
	2x6	17	36	1.15	1.99	1.48
	2x12	14	72	1.12	1.99	1.38

Figure 3

2.4. Insulation Resistance – Test Group 3

All insulation resistance measurements were greater than 1000megohms.

2.5. Withstanding Voltage – Test Group 3

No dielectric breakdown or flashover occurred

2.6. Temperature Rise vs Current – Test Group 5

Currents listed in Figure 4 are for a 30°C temperature rise at end of life. All data was taken from specimens on 2 ounce copper 6 layer printed circuit boards.

Number of Contacts Energized	1(Lower row)	2x3	2x4	2x6	2x8	2x10	2x12
Current (amperes)	26	20	18	16	14	13	12

Figure 4

2.7. Random Vibration – Test Group 2 and 5

No discontinuities were detected during vibration testing. Following vibration testing, no cracks, breaks, or loose parts on the specimens were visible.

2.8. Mechanical shock – Test Group 2

No discontinuities were detected during mechanical shock testing. Following mechanical shock testing, no cracks, breaks, or loose parts on the specimens were visible.

2.9. Durability – Test Group 2

No physical damage occurred as a result of mating and unmating the specimens 250 cycles.

2.10. Mating force – Test Group 2

All mating force measurements were less than 1N per contact.

2.11. Unmating force – Test Group 2

All unmating force measurements were more than 0.5N per contact

2.12. Compliant pin insertion – Test Group 1

All compliant pin insertion force measurements were less than 70 N per pin

2.13. Compliant pin retention – Test Group 1

All compliant pin retention measurements were greater than 4.4 N per pin.

2.14. Contact retention – Test Group 4

All power contacts had less than 0.1 mm displacement.

2.15. Thermal shock – Test Group 3

No evidence of physical damage was visible as a result of thermal shock testing

2.16. Humidity/temperature cycling – Test Group 3

No evidence of physical damage was visible as a result of humidity/temperature cycling.

2.17. Temperature Life – Test Group 5

No evidence of physical damage was visible as a result of temperature life testing

2.18. Mixed Flowing Gas – Test Group 5

No evidence of physical damage was visible as a result of exposure to the pollutants of mixed flowing gas.

2.19. Final Examination of Product – All Test Group

Specimens were visually examined and no evidence of physical damage detrimental to product performance was observed.

3. TEST METHODS

3.1. Initial Examination of Product

A C of C was issued stating that all specimens in the test package were produced, inspected, and accepted as conforming to product drawing requirements, and manufactured using the same core manufacturing processes and technologies as production parts.

3.2. Low Level Contact Resistance

LLCR measurements at low level current were made using a four terminal measuring technique. The test current was maintained at 100 milliamperes maximum with a 20 millivolt maximum open circuit voltage. Measurements were taken by applying current through the series wired boards via the plated ring holes. Voltage measurements were taken by applying voltage to each contact's plated via hole.

3.3. Contact Resistance at Rated Current

Specimens were subjected to contact resistance testing in accordance with Design Specification 108-2289 and EIA –364-06. Specimens were energized at the current levels listed in paragraph 2.3 and resistance measurements were recorded.

3.4. Insulation resistance

Insulation resistance was measured between adjacent power contacts of mated specimens. A test voltage of 500 volts DC was applied for 2 minutes before the resistance was measured, in accordance with EIA–364-21C.

3.5. Withstanding voltage

A test potential of 2120 volts DC was applied between the adjacent power contacts of mated specimens. This potential was applied for 1 minute and then returned to zero. In accordance with EIA–364-20B Condition I.

3.6. Temperature Rise vs. Current

Specimens were subjected to temperature rise vs. current test in accordance with EIA-364-70, Method II. Assembly temperature was measured, while energized at the specified current. Thermocouples were attached to the connectors to measure their temperatures. This temperature was when subtracted from the ambient temperature to find the temperature rise. When three readings at five minute intervals were within 1℃, the reading were recorded.

3.7. Random Vibration

Mated specimens were subjected to a random vibration test, specified by a random vibration spectrum with excitation frequency bounds of 20 and 500 Hz. The spectrum remained flat at 0.05 G^2/Hz from 20Hz to upper bound frequency of 500Hz. The root-mean square amplitude of excitation was 4.90 GRMS. The specimens were subjected to this test time of 45 minutes per specimen. Specimens were monitored for discontinuities of microsecond or greater using an energizing current of 100milliamperes. In accordance with EIA–364-28D Condition Ⅶ.

3.8. Mechanical shock

Mated specimens were subjected to a mechanical shock test having s half – sine waveform of 50 gravity units (g peak) and duration of 11 milliseconds. Three shocks in each direction were applied along the 3 mutually perpendicular planes for a total of 18 shocks. Specimens were monitored for discontinuities of one microsecond or greater using a current of 100milliamperes DC. In accordance with EIA–364-27B Method A

3.9. Durability

Specimens were mated and unmated 250 cycles at a maximum rate of 500 cycles per hour. In accordance with EIA–364-09

3.10. Mating force

The force required to mate individual specimens were measured, using a tensile/compression device with free floating fixture and a rate of travel of 25.4 mm per minute. Specimens were subjected to mating force test in accordance with EIA–364-13B.

3.11. Unmating force

The force required to unmate individual specimens were measured, using a tensile/compression device with free floating fixture and a rate of travel of 25.4 mm per minute. Specimens were subjected to unmating force test in accordance with EIA–364-13.

3.12. Compliant pin insertion

The force required to apply the specimens to a PCB was measured using a tensile / compression device with a rate of travel of 25.4 mm per minute. A flat rock technique was used to press the connectors off the PCB.

3.13. Compliant pin retention

The force required to remove a correctly applied specimen from a printed circuit board was measured using a tensile/compression device with a free floating fixture and a rate of travel of 25.4 mm per minute.

3.14. Contact retention

An axial force of 10 N was applied to pin contacts in the unmating direction at an approximate rate of 2.54 mm per minute and held for 5 seconds. An axial force of 5 N was applied to pin contacts in the mating direction at an approximate rate of 2.54 mm per minute and held for 5 seconds. Mating direction is considered the direction that is against the tip of the pin. Unmating direction is considered the direction that is against the back of the contact.

3.15. Thermal shock

Mated specimens were subjected to 5 cycles of thermal shock with each cycle consisting of 30 minute dwells at -40℃ and 105℃. The transition between temperatures was less than 1 minute. In accordance with EIA–364-32C.

3.16. Humidity/temperature cycling

Mated specimens were exposed to 10 cycles of humidity-temperature cycling. Each cycle lasted 24 hours and consisted of cycling the temperature between 25 and 65°C at 80 to 100 %RH. In accordance with EIA-364-31B Method Ⅲ

3.17. Temperature life

Mated specimens were exposed to a temperature of 85℃ for 500 hours (21 days). In accordance with EIA–364-17 Method A Condition 3.

3.18. Mixed Flowing Gas

Subject specimens were exposed for 20 days (10 days unmated, 10 days mated) to a mixed flowing gas Class IIA exposure. Class IIA exposure is defined as a temperature of 30℃ and a relative humidity of 70%RH with the pollutants of Cl_2 at 10 ppb, NO_2 at 200 ppb, H_2S at 10 ppb and SO_2 at 100 ppb. In accordance with EIA–364-65 Class IIA.

3.19. Final Examination of Product

Specimens were visually examined for evidence of physical damage detrimental to product performance.