DDR2 Press-Fit Tail DIMM Socket

1. INTRODUCTION

1.1. Purpose

Testing was performed on the Tyco Electronics 240 Position Double Data Rate 2 (DDR2) Press-Fit Tail Dual In-line Memory Module (DIMM) Socket part number 1489929-1, Rev. O6, to determine its conformance to the requirements of Product Specification 108-2123, Revision A.

1.2 Scope

This report covers the electrical, mechanical, and environmental performance of the Tyco Electronics 240 Position DDR2 Press-Fit Tail DIMM Socket part number 1489929-1, Rev. O6. Testing was performed at the Engineering Assurance Product Testing Laboratory between 26Jul04 and 12Nov04. The test file number for this testing is CTLB040013-006. This documentation is on file at and available from the Engineering Assurance Product Testing Laboratory.

1.3. Conclusion

The Tyco Electronics 240 Position DDR2 Press-Fit Tail DIMM Socket listed in paragraph 1.5 conformed to the electrical, mechanical, and environmental performance requirements of Product Specification 108-2123, Revision A.

1.4. Product Description

The 240 Position DDR2 Press-Fit Tail DIMM Socket is primarily used in server applications where soldering is not desirable.

1.5. Test Specimens

Test specimens were representative of normal production lots. Specimens identified with the following part numbers were used for test:

- Test Groups 1, 2, 3 and 9:
  (5) each 240 position Press-fit DDR2 connectors, PN 1489929-1, Rev. O6 / Date code: 1 04176
  (5) each Module boards (cards), PN 474475-1, Rev."A"
  (5) each PC boards, PN 474474-1, Rev. "O"
- Test Group 4:
  (6) 240 position DDR2 Press-fit connectors, PN 1489929-1, Rev. O6 / Date code: 1 04176
  (6) Module boards (cards), PN 474475-1, Rev."A"
  (6) PC boards, PN 474474-1, Rev. "O"
- Test Groups 5 and 10:
  (5) each 240 position DDR2 Press-fit connectors, PN 1489929-1, Rev. O6 / Date code: 1 04176
  (2) each PC boards, PN 474439-1, Rev. "A" with a maximum of (3) connectors mounted on each board
- Test Group 6:
  (5) 240 position DDR2 Press-fit connectors, PN 1489929-1, Rev. O6 / Date code: 1 04176
- Test Group 7:
  (4) 240 position DDR2 Press-fit connectors, PN 1489929-1, Rev. O6 / Date code: 1 04176

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1.6. Environmental Conditions

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

- Temperature: 15 to 35˚C
- Relative Humidity: 25 to 75%

1.7. Qualification Test Sequence

Test or Examination	Test Group (a)								
	1	2	3	4	5	6	7	9	10
	Test Sequence (b)								
Initial examination of product	1	1	1	1	1	1	1	1	1
CTF dimensional verification	2	2	2					2	
Low level contact resistance	3,7,9	3,8,10,14	3,5,7,9	2,5,7,9,11					
Insulation resistance		4,11							
Withstanding voltage		5,12							
Current carrying capacity								3	
Mutual inductance between adjacent signals (L12)									
Coupling capacitance between adjacent signals (C12)									
Reseating	8	13		10					
Vibration, random			6						
Mechanical shock			8						
Durability	5(c)	6(c)	4	3(c)					
Mating force					2				
Unmating force					3				
Unmating force per pin pair									3
Contact retention							2		
Plating thickness						2			
Maximum force on connector					4				
Contact backout wipe	4								
Press-fit compliant pin/terminal insertion									2
Press-fit compliant pin/terminal retention									4
Solvent resistance							3		
Thermal shock		7							
Humidity-temperature cycling		9							
Temperature life	6			4(d)					
Thermal disturbance				8					
Mixed flowing gas				6					
Porosity						3			
Final examination of product	10	15	10	12	5	4	4	4	5

NOTE

(a) See paragraph 1.5.
(b) Numbers indicate sequence in which tests are performed.
(c) Durability preconditioning only 5 cycles required same card, all cycles.
(d) Temperature life preconditioning only 120 hours.

Figure 2

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 was issued by Product Assurance. Where specified, specimens were visually examined and no evidence of physical damage detrimental to product performance was observed.

2.2. CTF Dimensional Verification - Test Groups 1, 2, 3 and 9

All specimens measured were within the dimensions specified in Figure 3 of Product Specification 108-2123 Revision A.

2.3. Low Level Contact Resistance - Test Groups 1, 2, 3 and 4

All low level contact resistance measurements taken at 100 milliamperes maximum and 20 millivolts maximum open circuit voltage were less than 30 milliohms initially and had a change in resistance (ΔR) of less than 20 milliohms after testing. See Figure 3. All values are in milliohms.

Condition	Low Level Contact Resistance					
	Min	Max	Mean	Min ΔR	Max ΔR	Mean ΔR
Test Group 1 N=1000						
Initial	10.104	15.326	12.551	-----	-----	-----
After temperature life (240 hours)	10.641	18.337	13.243	-0.506	3.724	0.691
After reseating	10.618	23.209	13.504	-0.250	8.889	0.953
Test Group 2 N=1000						
Initial	10.206	15.301	12.611	-----	-----	-----
After thermal shock	10.404	15.209	12.799	-0.914	1.106	0.187
After humidity-temperature cycling	10.486	15.249	12.828	-0.732	1.133	0.216
After reseating	10.465	15.508	12.940	-0.591	1.924	0.328
Test Group 3 N=1000						
Initial	10.151	15.137	12.600	-----	-----	-----
After 20 durability cycles	10.112	15.180	12.540	-1.206	0.475	-0.059
After vibration	10.039	14.864	12.349	-1.371	0.580	-0.251
After mechanical shock	10.116	16.029	12.376	-1.449	3.486	-0.224
Test Group 4A N=600						
Initial	10.259	15.892	12.544	-----	-----	-----
After temperature life (120 hours)	10.677	17.372	13.222	-0.747	3.074	0.677
After 5 days mated MFG	10.697	15.602	13.094	-0.822	2.452	0.549
After 10 days mated MFG	10.659	16.563	13.040	-0.883	4.052	0.496
After thermal disturbance	10.577	20.111	13.116	-0.891	5.411	0.571
After reseating	10.586	15.779	13.048	-1.132	2.286	0.503
Test Group 4B N=600						
Initial	10.235	15.032	12.544	-----	-----	-----
After temperature life (120 hours)	10.766	16.336	13.338	-1.613	3.263	0.794
After 5 days unmated MFG	10.466	15.856	13.102	-1.522	3.996	0.557
After 5 days mated MFG	10.540	15.686	13.093	-1.143	2.527	0.548
After thermal disturbance	10.831	16.019	13.246	-1.067	2.485	0.701
After reseating	10.509	20.846	13.329	-0.480	6.672	0.784

Figure 3

2.4. Insulation Resistance - Test Group 2

All insulation resistance measurements were greater than 1 megohm..

2.5. Dielectric Withstanding Voltage - Test Group 2

No dielectric breakdown or flashover occurred.

2.6. Current Carrying Capacity - Test Group 9

All specimens had a temperature rise of less than 30˚C above ambient when tested using a current of .5 ampere AC.

2.7. Reseating - Test Groups 1, 2 and 4

No physical damage occurred to as a result of manually mating and unmating the specimens 3 times.

2.8. Random Vibration - Test Group 3

No discontinuities greater than 1 microsecond were detected during vibration testing. Following vibration testing, no cracks, breaks, or loose parts on the specimens were visible.

2.9. Mechanical Shock - Test Group 3

No discontinuities greater than 1 microsecond were detected during mechanical shock testing. Following mechanical shock testing, no cracks, breaks, or loose parts on the specimens were visible.

2.10. Durability - Test Group 3

No physical damage occurred as a result of manually mating and unmating the specimens 20 times.

2.11. Mating Force - Test Group 5

All mating force measurements were less than 155.7 N [35.003 lbf].

2.12. Unmating Force - Test Group 5

All unmating force measurements were less than 38.25 N [8.599 lbf].

2.13. Unmating Force per Pin Pair - Test Group 10

All unmating force per pin pair measurements were greater than 0.14 N [14 gf].

2.14. Contact Retention - Test Group 7

None of the contacts were displaced more than 0.381 mm [.015 in] after applying an axial force of 2.94 N [.661 lbf] for 6 seconds.

2.15. Plating Thickness - Test Group 6

All of the contacts measured exhibited a gold plating thickness greater than 30 microinches.

2.16. Maximum Force on Connector - Test Group 5

There was no blade movement greater than 0.076 mm [.003 in] after applying a 68.1 kg [150 lb] load for 30 seconds.

2.17. Contact Backout Wipe - Test Group 1

None of the specimens exhibited any discontinuities greater than 1 microsecond during testing.

2.18. Press-fit Compliant Pin/terminal Insertion - Test Group 10

All insertion force values were less than 31 N [7 lbf] per pin average.

2.19. Press-fit Compliant Pin/terminal Retention - Test Group 10

No pins were displaced after applying a 13.7 N [3 lbf] axial load.

2.20. Solvent Resistance - Test Group 7

No physical damage occurred to the specimens as a result of solvent resistance testing.

2.21. Thermal Shock - Test Group 2

No evidence of physical damage was visible as a result of exposure to thermal shock.

2.22. Humidity-temperature Cycling - Test Group 2

No evidence of physical damage was visible as a result of exposure to humidity-temperature cycling.

2.23. Temperature Life - Test Group 4

No evidence of physical damage was visible as a result of exposure to temperature life.

2.24. Thermal Disturbance - Test Group 4

No evidence of physical damage was visible as a result of exposure to thermal disturbance.

2.25. Mixed Flowing Gas - Test Group 4

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

2.26. Porosity - Test Group 6

None of the contacts exceeded a maximum pore diameter of 0.051 mm [.002 in].

2.27. Final Examination of Product - All Test Groups

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

3. TEST METHODS

3.1. Examination of Product

A Certification of Conformance was issued stating that all specimens in this 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. CTF Dimensional Verification

Specimens were measured using digital calipers per Figure 3 of Product Specification 108-2123 Revision A.

3.3. Low Level Contact Resistance

Low level contact resistance measurements were made using a 4 terminal measuring technique. The test current was maintained at 100 milliamperes maximum with a 20 millivolt maximum open circuit voltage. Only 200 out of 240 contacts were measured on each specimen.

3.4. Insulation Resistance

Insulation resistance was measured between adjacent inner and outer contact rows of each unmated board mounted specimen. A test voltage of 500 volts DC was applied to for 2 minutes or meter stabilization before the resistance was recorded. A total of 10 inner and 10 outer contacts were measured on each connector.

3.5. Dielectric Withstanding Voltage

A test potential of 500 volts AC was applied between the adjacent inner and outer contact rows of each unmated board mounted specimen. This potential was applied for 1 minute with a rise time of 500 volts per second and then returned to zero. The leakage current was limited to .5 milliampere. The same contacts were measured as in insulation resistance.

3.6. Current Carrying Capacity

Testing consisted of applying a .5 ampere AC current through a group of 10 series wired contacts on each mated assembly. This current was maintained for a minimum of 2 hours prior to taking final temperature measurements. A thermocouple was attached, using thermally conductive epoxy, into each connector housing near the center of the contact group. The ambient temperature was also measured and then subtracted from the measured specimen temperatures to determine the temperature rise.

3.7. Reseating

Testing consisted of subjecting the specimens to 3 cycles of manual durability with the latches enabled.

3.8. Vibration, Random

Mated specimens were subjected to a random vibration test, specified by a random vibration spectrum, with excitation frequency bounds of 5 and 500 Hz. The power spectral density at 5 Hz was 0.01 G^2/Hz. The spectrum sloped up to a PSD of 0.02 G^2/Hz at 20 Hz. The spectrum was flat at 0.02 G^2/Hz from 20 to 500 Hz. The root-mean square amplitude of the excitation was 3.10 GRMS. This was performed for 10 minutes in each of 3 mutually perpendicular planes for a total vibration time of 30 minutes per specimen. In addition, they were monitored for discontinuities of 1 microsecond or greater using a current of 100 milliamperes DC on a minimum of 20 contacts per specimen.

NOTE *Module boards had 35 grams of steel weights attached 25 mm above the mating edge of the cards prior to testing.*

3.9. Mechanical Shock, Trapezoidal

Mated specimens were subjected to a mechanical shock test having a trapezoidal waveform of 50 gravity units (g peak) and a duration of 10 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 1 microsecond or greater using a current of 100 milliamperes DC using the same contacts as before in vibration testing. In addition, module cards remained weighted as before in vibration.

3.10. Durability

Specimens were manually mated and unmated 20 times at a maximum cycling rate of 500 cycles per hour with the latches enabled. The original module card was used for the 1st and 20th cycles while a new separate module card was used for the 2nd through 19th cycles.

3.11. Mating Force

The force required to mate individual specimens was measured using a tensile/compression machine with a free floating "X-Y" table. A 1.37 mm [.054 in] steel blade was then inserted into each connector and the maximum insertion force was recorded. The latches remained enabled during the test. Test speed was 5 mm [.2 in] per minute.

3.12. Unmating Force

The force required to unmate individual specimens using the latches was measured using a tensile/compression machine with a free floating "X-Y' table. After attaching a small wire loop to each latch, the specimen was vertically suspended between a hook attached to the base mounted "X-Y" table and a second hook attached to the crosshead. The crosshead was then energized to activate the latches and extract the 1.37 mm [.054 in] steel blade from each specimen. Test speed was 5 mm [.2 in] per minute.

3.13. Unmating Force per Pin Pair

Unmating force per pin pair testing consisted of fixturing the board mounted and mated specimens with latches removed to the base of the tensile/compression machine with a free floating "X-Y" table. The module card was then attached to a loadcell mounted clamp and extracted from each connector. Test speed was 5 mm [.2 in] per minute.

3.14. Contact Retention

Selected contacts in each housing were initially measured for contact height. An axial load of 2.94 N [.66 lbf] was applied to each contact using a "dead-weight" and held for 6 seconds. This force was applied in a direction that would tend to cause removal of the contacts from the housing. Finally, the same contacts were again measured for contact height to determine if there was any contact movement or displacement. Thirty contacts, 15 inner and 15 outer types, were tested.

3.15 Plating Thickness

Specimen contacts were measured for gold and nickel plating thickness.

3.16 Maximum Force on Connector

A 1.37 mm [.054 in] steel blade was attached to the loadcell of a tensile/compression machine. The crosshead was then slowly (manually) energized to fully mate the blade into the connector. Next, a dial indicator was then placed on the top of the blade and set to zero. The crosshead was manually energized in a downward direction until the force meter indicated that a 68.1 kg [150 lb] axial load was applied to the connector. When the specified load was reached, it was then held for 30 seconds. The dial indicator was observed for any movement of the steel blade and the displacement was recorded.

3.17. Contact Backout Wipe

Mated board mounted specimens were tested for contact backout wipe using a discontinuity monitor set at 1 microsecond. The monitor was connected to the (2) series wired 10-contact sets on each mated specimen and energized while the module card was pulled upward against the closed latches.

3.18. Press-fit Compliant Pin/terminal Insertion

Connectors were pressed onto their respective PC boards using a tensile/compression machine at a maximum speed of 12.7 mm [.5 in] per minute. This force was applied until each connector was fully seated onto its respective board.

3.19. Press-fit Compliant Pin/terminal Retention

Unmated board mounted specimens were inverted and placed on the table of the spring rate machine. A 1.02 mm [.040 in] diameter pin was then attached to the crosshead mounted loadcell and slowly lowered onto the top of each contact tail until a 13.7 N [3 lbf] load was indicated on the force display. After the load was reached, it was maintained for 6 seconds and then removed. The specimens were finally visually inspected to determine if any of the contact tails were displaced. Thirty of both inner and outer contact types were tested throughout the test group.

3.20. Solvent Resistance

Testing consisted of initially placing the unmated unmounted specimens on a scale and recording their respective weights. The specimens were then subjected to immersion in the solvents listed below:

- Specimen 1: Ionox FCR (or equivalent) Temperature: 65.6˚C / Duration - 5 minutes
- Specimen 2: Axarel 32 (or equivalent) Temperature: 60˚C / Duration - 10 minutes
- Specimen 3: B10ACT (or equivalent) Temperature: 71.1˚C / Duration - 10 minutes
- Specimen 4: Synergy CCS (or equivalent) Temperature: 25˚C / Duration - 10 minutes

After removing the specimens from their respective solvents, they were allowed to recover to room ambient for a minimum of 5 minutes and then re-weighed to determine any significant weight gain. Finally, they were visually inspected under 10 magnification to determine any damage or deformation.

3.21. Thermal Shock

Mated board mounted specimens were subjected to 10 cycles of thermal shock with each cycle consisting of the following:

- Low temperature extreme: -55˚C
- High temperature extreme: 85˚C
- Dwell time at both extremes: 30 minutes
- The transition between temperatures was less than 1 minute.

3.22. Humidity-temperature Cycling

Mated board mounted specimens were exposed to 24 cycles of humidity-temperature cycling. Each cycle consisted of the following:

- High temperature extreme: 65˚C at 50% RH
- Low temperature extreme: 25˚C at 80% RH
- Dwell time at each extreme: 1 hour
- Ramp time between extremes: 0.5 hour

3.23. Temperature Life

Mated board mounted specimens were exposed to an environment of dry heat at a temperature of 105˚C for 240 hours.

3.24. Thermal Disturbance

Mated board mounted specimens were subjected to 10 cycles of thermal disturbance. Each cycle was comprised of the following:

- Low temperature extreme: 15˚C
- High temperature extreme: 85˚C
- Ramp time: 2˚C per minute, minimum
- Dwell time at both extremes: 10 minutes
- Relative humidity: Laboratory ambient conditions
- No thermocouples were attached to the boards during the exposure

3.25. Mixed Flowing Gas, Class IIA

Board mounted specimens were exposed to a total of 10 days to a mixed flowing gas Class IIA exposure. Class IIA exposure is defined as a temperature of 30˚C and RH of 70% 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. The specimens were subjected to the testing as described below:

The Group #4 test group was broken down into 2 sub-groups:

- Test Group 4A: 3 specimens: 5 days mated MFG, LLCR/5 days mated MFG, LLCR
- Test Group 4B: 3 specimens: 5 days unmated MFG, LLCR/5 days mated MFG, LLCR

Module cards for Test Group 4B were stored at ambient during the unmated exposure.

The average copper corrosion rate was 15.1µg/cm^2 per day. The requirement for Class IIA is 12-16 µg/cm^2 per day.

3.26. Porosity

Testing consisted of subjecting the individual contacts to a nitric acid environment per EIA-364-53B. Contacts were placed in a desiccator of nitric acid fumes and allowed to remain there for a duration of 75 minutes at 23˚C. After completing the acid exposure, the contacts were removed from the desiccator and dried in an oven set at 125˚C for 10 minutes. After drying, the contacts were removed from the oven and allowed to return to ambient. Finally, the contacts were visually inspected under 10X magnification to determine if the contact developed any corrosion products. Twenty-five inner and 25 outer type contacts were tested throughout the test group.

3.27. Final Examination of Product

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