

**Impact 85 Ohm Interconnect Systems**

**1. INTRODUCTION**

**1.1 Purpose**

Testing was performed on TE Connectivity (TE) Impact 85-Ohm Interconnect Systems to determine their conformance to the requirements of Product Specification 108-32044, Rev. B.

**1.2 Scope**

This report covers the environmental, mechanical and electrical performance of the TE Impact 85-Ohm Interconnect Systems family. Testing was performed at the TE Harrisburg Electrical Components Test Laboratory between 03/28/2014 and 01/25/2015 and is on file under test number EA20140177T.

**1.3 Conclusion**

The TE Connectivity 85-Ohm Interconnect System specimens listed in Table 1 of paragraph 1.5 conformed to the electrical, mechanical, and environmental performance requirements of Product Specification 108-32044, Rev. B.

**1.4 Product Description**

The TE Connectivity 85-Ohm Interconnect System consist of modular groupings of broad-edge coupled signals with optional integrated guidance. These connectors are two-piece devices, which connect two printed circuit (pc) boards. The right-angle receptacle connectors (daughter card) and header pin connectors (backplane) are through-hole devices with eye-of-needle (EON) compliant pin terminals.

**1.5 Test Specimens**

The test specimens were representative of normal production lots, and the part numbers listed in Table 1 were used for testing.

**Table 1 – Test Specimens**

Test Set	Test Group	Qty	Part Number	Description
1	1	5	2198058-2, Rev 3	Impact 85 Ohm Header Assembly
1	1	5	2198785-3, Rev 5	Impact 85 Ohm Receptacle Assembly
2	2	5	2198058-2, Rev 3	Impact 85 Ohm Header Assembly
2	2	5	2198785-3, Rev 5	Impact 85 Ohm Receptacle Assembly
3	3	5	2198058-2, Rev 3	Impact 85 Ohm Header Assembly
3	3	5	2198785-3, Rev 5	Impact 85 Ohm Receptacle Assembly
4	4	5	2198058-2, Rev 3	Impact 85 Ohm Header Assembly
4	4	5	2198785-3, Rev 5	Impact 85 Ohm Receptacle Assembly
5	4	5	2198058-2, Rev 3	Impact 85 Ohm Header Assembly
5	4	5	2198785-3, Rev 5	Impact 85 Ohm Receptacle Assembly
6	5	5	2198058-2, Rev 3	Impact 85 Ohm Header Assembly
6	5	5	2198785-3, Rev 5	Impact 85 Ohm Receptacle Assembly
7	6	5	2198058-2, Rev 3	Impact 85 Ohm Header Assembly
7	6	5	2198785-3, Rev 5	Impact 85 Ohm Receptacle Assembly

**NOTES**

- 1) Test Groups 1, 2, 3, 4 and 5 header assemblies were mounted to 60-1824499-2 Rev A (LLCR PCB).
- 2) Test Groups 1, 2, 3, 4 and 5 receptacle assemblies were mounted to 60-1824500-5 Rev A (LLCR PCB).
- 3) Test Group 4 header assemblies were mounted to 60-1824502-3 Rev A (nanosecond discontinuity PCB).
- 4) Test Group 4 receptacle assemblies were mounted to 60-1824503-3 Rev A (nanosecond discontinuity PCB).
- 5) Test Group 6 header and receptacle assemblies were not mounted to PCB's.
- 6) While in the mated condition, fixture P/N 39-469196-1 was mounted to the left and right side of the header and receptacle PCB's in order to provide stability to the interface during normal handling.

**1.6 Qualification Test Sequence**

The test specimens identified in paragraph 1.4 were subjected to the tests outlined in Table 1.

**Table 2 - Test Sequence**

	TEST GROUP (a)					
	1	2	3	4(b)	5	6(c)
	TEST SEQUENCE (d)					
Initial Examination of Product	1	1	1	1	1	1
Low Level Contact Resistance	3,5	3,5	2,5,7,9	2,4,7,9,11	2,4,6,8,10,12,14,16,18	
Insulation Resistance						2,6
Withstanding Voltage						3,7
Sinusoidal Vibration				6		
Mechanical Shock				8		
Durability			3(e),8(e)	3(e),10(e)	5 (f),17 (f)	
Mating Force	2,7	2,7				
Unmating Force	6	6				
Minute Thermal Disturbance					15	
Thermal Shock		4				4
Humidity/Temperature Cycling			6			5
Temperature Life	4				3(g)	
Mixed Flowing Gas					7,9,11,13	
Dust			4	5		
Final Examination of Product	8	8	10	12	19	8

**NOTES**

- (a) Specimens were prepared in accordance with applicable instruction sheets and were selected at random from current production. Test Groups 1,2,3,5 and 6 consisted of 5 specimens each.
- (b) Test Group 4 consisted of 10 specimens because separate specimens were tested for LLCR and nanosecond discontinuity.
- (c) This test group was not mounted on PCB's.
- (d) Numbers indicate sequence in which the tests were performed.
- (e) 100 cycles only.
- (f) 98 cycles only.
- (g) 300 hours only.

**1.7 Environmental Conditions**

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

Temperature: 15°C to 35°C  
 Relative Humidity: 20% to 80%

**2. SUMMARY OF TESTING**

**2.1 Initial Visual Examination of Product – All Groups**

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

**2.2 Low-Level Contact Resistance (LLCR) – Groups 1, 2, 3, 4 and 5**

None of the specimens had a change in resistance ( $\Delta R$ ) of greater than 10 milliohms after testing, as specified in Product Specification 108-32044, Rev. B. See Tables 3 thru 7 for all summary data.

**Table 3 – LLCR, Test Group 1 (milliohms)**

	Initial	After Temp Life
	Actual	Delta
<b>Min</b>	4.95	-0.85
<b>Max</b>	17.58	8.31
<b>Avg</b>	12.76	0.42
<b>Nv/Nr</b>	<b>450/450</b>	<b>450/450</b>

**Table 4 – LLCR, Test Group 2 (milliohms)**

	Initial	After Thermal Shock
	Actual	Delta
<b>Min</b>	5.03	-0.54
<b>Max</b>	17.22	2.51
<b>Avg</b>	12.60	0.36
<b>Nv/Nr</b>	<b>450/450</b>	<b>450/450</b>

**Table 5 – LLCR, Test Group 3 (milliohms)**

	Initial	After Dust	After Hum/Temp Cycling	Final After Durability
	Actual	Delta	Delta	Delta
<b>Min</b>	5.05	-3.03	-2.76	-3.19
<b>Max</b>	17.88	4.29	7.77	7.10
<b>Avg</b>	12.84	-0.25	-0.37	0.44
<b>Nv/Nr</b>	<b>450/450</b>	<b>450/450</b>	<b>450/450</b>	<b>450/450</b>

**Table 6 – LLCR, Test Group 4 (milliohms)**

	Initial	After Durability (100 cycles)	After Vibration	After Mechanical Shock	Final After Durability (100 cycles)
	Actual	Delta	Delta	Delta	Delta
<b>Min</b>	4.72	-1.87	-2.02	-1.95	-2.04
<b>Max</b>	17.76	0.66	0.33	0.37	1.46
<b>Avg</b>	12.83	-0.42	-0.43	-0.40	-0.28
<b>Nv/Nr</b>	<b>450/450</b>	<b>450/450</b>	<b>450/450</b>	<b>450/450</b>	<b>450/450</b>

**Table 7 – LLCR, Test Group 5 (milliohms)**

	Initial	After Temp Life	98 Cycles Durability	5 Days Unmated MFG	10 Days Unmated MFG	5 Days Mated MFG	10 Days Mated MFG	Minute Disturbance	Final
	Actual	Delta	Delta	Delta	Delta	Delta	Delta	Delta	Delta
<b>Min</b>	5.09	-0.92	-3.17	-2.70	-2.98	-2.77	-3.37	-3.19	-3.00
<b>Max</b>	19.05	4.38	6.76	8.58	9.37	8.07	9.92	7.77	2.96
<b>Avg</b>	12.84	0.36	0.21	0.24	0.46	0.82	0.71	0.41	0.37
<b>Nv/Nr</b>	<b>450/450</b>	<b>450/450</b>	<b>450/450</b>	<b>450/450</b>	<b>450/450</b>	<b>450/450</b>	<b>450/450</b>	<b>450/450</b>	<b>450/450</b>

**2.3 Insulation Resistance – Group 6**

All specimens met the requirements as stated in Product Specification 108-32044, Rev. B, as the insulation resistance measurements on all specimens were greater than the 1000 Megohms (1.0E09) minimum specified requirement.

**2.4 Withstanding Voltage – Group 6**

All specimens met the requirements as stated in Product Specification 108-32044 Rev. B, as there was no dielectric breakdown, flashover or leakage current exceeding 5 milliamperes.

**2.5 Sinusoidal Vibration – Group 4**

All test specimens met the requirements as stated in Product Specification 108-32044 Rev. B. No discontinuities of 10 nanoseconds or greater were detected during vibration. Following vibration, no cracks, breaks, or loose parts on the specimens were visible.

**2.6 Mechanical Shock – Group 4**

All test specimens met the requirements as stated in Product Specification 108-32044 Rev. B. No discontinuities of 10 nanoseconds or greater were detected. Following mechanical shock, no cracks, breaks, or loose parts on the specimens were visible.

**2.7 Durability - Groups 3, 4 and 5**

All specimens met the requirements as stated in Product Specification 108-32044 Rev. B. No physical damage occurred to the specimens as a result of mating and unmating the specimens for the specified amount of cycles.

**2.8 Mating Force – Groups 1 and 2**

All specimens in Test Group 1 and Test Group 2 met the mating force requirement of 40 grams maximum, average per contact, as specified in Product Specification 108-32044 Rev. B. See Table 8 and Table 9 for summary results.

**Table 8 - Test Group 1 Mating Force Per Contact (gf)**

	Force per Contact	
	Initial	Final
<b>Min</b>	33.31	19.38
<b>Max</b>	39.33	24.55
<b>Avg</b>	36.05	22.04
<b>N</b>	120	120

**Table 9 - Test Group 2 Mating Force Per Contact (gf)**

	Force per Contact	
	Initial	Final
<b>Min</b>	34.92	18.91
<b>Max</b>	37.94	21.32
<b>Avg</b>	37.15	20.63
<b>N</b>	120	120

## 2.9 Unmating Force - Groups 1 and 2

All specimens in Test Group 1 and Test Group 2 met the unmating force requirement of 8 grams minimum average per contact, as specified in Product Specification 108-32044 Rev. B. See Table 10 and Table 11 for summary results.

**Table 10 – Test Group 1 Unmating Force Per Contact (gf)**

	<b>Unmating Force Per Contact</b>
<b>Min</b>	17.82
<b>Max</b>	21.89
<b>Avg</b>	20.03
<b>N</b>	<b>120</b>

**Table 11 – Test Group 2 Unmating Force Per Contact (gf)**

	<b>Unmating Force Per Contact</b>
<b>Min</b>	17.17
<b>Max</b>	20.50
<b>Avg</b>	19.08
<b>N</b>	<b>120</b>

## 2.10 Minute Thermal Disturbance – Group 5

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

## 2.11 Thermal Shock – Groups 2 and 6

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

## 2.12 Humidity/Temperature Cycling – Groups 3 and 6

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

## 2.13 Temperature Life – Groups 1 and 5

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

## 2.14 Mixed Flowing Gas – Group 5

No evidence of physical damage was visible as a result of exposure to 10 days of unmated and 10 days of mated exposure to Class IIA mixed flowing gas.

## 2.15 Dust - Groups 3 and 4

No evidence of physical damage was visible as a result of exposure to dust contamination.

## 2.16 Final Examination of Product – All Groups

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

#### **3.2 Low Level Contact Resistance (LLCR)**

Low level contact resistance 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. Testing was conducted in accordance with EIA-364-23C and Product Specification 108-32044 Rev. B.

#### **3.3 Insulation Resistance**

A 500 VDC potential was applied to adjacent contacts of the unmated header and receptacle connectors for 2 minutes. After 2 minutes the insulation resistance was recorded. Testing was conducted in accordance with EIA-364-21E and Product Specification 108-32044 Rev. B.

#### **3.4 Withstanding Voltage**

A 500 VAC potential was applied to adjacent contacts of unmated header and receptacle connectors. Voltage was applied at a rate of 500 volts per second and maintained for 1 minute. Testing was conducted in accordance with EIA-364-20D, Condition I, Method B and Product Specification 108-32044 Rev. B.

#### **3.5 Sinusoidal Vibration**

The test specimens were subjected to a sinusoidal vibration test in accordance with EIA-364-28F, Test Condition II as stated in Product Specification 108-32044 Rev. B. The parameters of this test condition are a simple harmonic motion having an amplitude of either 0.06 inch double amplitude (maximum total excursion) or 10 gravity unit (g's peak) whichever is less. The vibration frequency was varied logarithmically between the approximate limits of 10 to 500 Hertz (Hz). The entire frequency range of 10 to 500 Hz and return to 10 Hz was traversed in approximately 15 minutes. This cycle was performed 12 times in all three mutually perpendicular axes (total of 36 times), so that the motion was applied for a total period of approximately nine hours. The test specimens were monitored for discontinuities of 10 nanoseconds or greater using an energizing current of 100 milliamperes. Nanosecond discontinuities were monitored in accordance with EIA-364-87A.

#### **3.6 Mechanical Shock**

The test specimens were subjected to a mechanical shock test in accordance with EIA-364-27C, Test Condition H, as stated in Product Specification 108-32044 Rev. B. The parameters of this test condition are a half-sine waveform with an acceleration amplitude of 30 gravity units (g's peak) and a duration of 11 milliseconds. Three shocks in each direction were applied along the three mutually perpendicular axes of the test specimens, for a total of eighteen shocks. The test specimens were monitored for discontinuities of 10 nanoseconds or greater using an energizing current of 100 milliamperes. Nanosecond discontinuities were monitored in accordance with EIA-364-87A.

#### **3.7 Durability**

The specimens were mated and unmated for the specified amount of cycles at a rate of less than 500 cycles per hour. Testing was conducted in accordance with EIA-364-09C and Product Specification 108-32044 Rev. B. The specimens in Test Groups 3 and 4 were cycled 100 times each, during each of the two steps and the specimens in Test Group 5 were cycled 98 times each, during each of the two steps.

### **3.8 Mating Force**

Testing was conducted in accordance with EIA-364-13E and Product Specification 108-32044 Rev. B. The header and receptacle specimens were mated at 6.35mm per minute until they were fully mated.

### **3.9 Unmating Force**

Testing was conducted in accordance with EIA-364-13E and Product Specification 108-32044 Rev. B. The header and receptacle specimens were unmated at 6.35mm per minute until they were fully unmated.

### **3.10 Minute Thermal Disturbance**

The mated specimens were subjected to 10 cycles between 15°C and 85°C with a dwell until acclimated. The transition between extremes was approximately 10 degrees per minute. Testing was conducted to Product Specification 108-32044 Rev. B, in accordance with EIA-364-110 Test Condition A, Duration A.

### **3.11 Thermal Shock**

The mated specimens were subject to 5 cycles between -55°C and 85°C with 30 minute dwells at the temperature extremes and a 1 minute transition between temperatures. Testing was conducted to Product Specification 108-32044 Rev. B, in accordance with specification EIA-364-32G Test Condition I, Method A, Test Duration A.

### **3.12 Humidity/Temperature Cycling**

The mated specimens were exposed to 500 hours between 25°C and 65°C at 80 to 100% RH. Testing was conducted to Product Specification 108-32044 Rev. B, in accordance with EIA-364-31D Method IV.

### **3.13 Temperature Life**

The Group 1 mated specimens were exposed to a temperature of 85°C for 500 hours and the Group 5 mated specimens were exposed to a temperature of 85°C for 300 hours in an air circulating oven. Testing was conducted to Product Specification 108-32044 Rev. B, in accordance with EIA-364-17C Method A, Test Condition 3, Test Time Condition C for Group 1.

### **3.14 Mixed Flowing Gas**

The specimens were subjected to a 4 gas Class IIA environment in accordance with EIA-364-65B and Product Specification 108-32044 Rev. B. The connectors were subjected to 10 days of un-mated and 10 days of mated exposure for 20 days total. Low level contact resistance measurements were taken every 5 days.

### **3.15 Dust**

The unmated specimens were placed in the dust chamber and exposed to number 1 (benign) dust for 1 hour. Following the exposure, the specimens were allowed to rest in the chamber for an additional hour. After the specimens were removed from the dust chamber they were tapped on the test bench 5 times at a rate of 25.4mm/sec. Testing was conducted to Product Specification 108-32044 Rev. B, in accordance with EIA-364-91A.

### **3.16 Final Examination of Product**

The specimens were visually examined for physical damage which would be detrimental to product performance without magnification.