Evaluation of MULTIGIG* PWB Wafers from New Vendor

1. INTRODUCTION

1.1 Purpose

Testing was performed on the TE Connectivity (TE) MULTIGIG RT2-R connector using the printed wire board wafer manufactured by a new vendor to determine its conformance to the requirements of Product Specification 108-2072 Rev E with modifications.

1.2 Scope

This report covers the electrical, mechanical, and environmental performance of the TE Connectivity (TE) MULTIGIG RT2-R connector part # 2102771-1. Testing was performed at the Harrisburg Electrical Components Test Laboratory between June 26, 2016 and August 13, 2016. Detailed test data is on file and maintained at the TE Harrisburg Electrical Components Test Laboratory under test number EA20160341T.

1.3 Conclusion

All specimens met the requirements of Product Specification 108-2072 Rev E. when tested to the sequences listed in Table 2 of Paragraph 1.5.

1.4 Test Specimens

The specimens identified with the following part numbers were used for test.

Table 1 – Test Specimens

Test Set	Qty	ID#	Part #	Description	Test Group
1	2	101 102	2102771-1, DC 1624	MULTIGIG Plug	1A
			60-474650-1	TE DC Test Board	
			2102737-1, DC 1307	MULTIGIG Receptacle	
			60-474649-1	TE BP Test Board	
2	2	201 202	2102771-1, DC 1624	MULTIGIG Plug	1B
			2102737-1, DC 1307	MULTIGIG Receptacle	
3	2	301 302	2102771-1, DC 1624	MULTIGIG Plug	2A
			60-474650-1	TE DC Test Board	
			2102737-1, DC 1307	MULTIGIG Receptacle	
			60-474649-1	TE BP Test Board	
4	2	401 402	2102771-1, DC 1624	MULTIGIG Plug	2B
			2102737-1, DC 1307	MULTIGIG Receptacle	
5	2	501 502	2102771-1, DC 1624	MULTIGIG Plug	3
			60-474650-1	TE DC Test Board	
			2102737-1, DC 1307	MULTIGIG Receptacle	
			60-474649-1	TE BP Test Board	

1.5 Test Sequence

Table 2 – Test Sequence

Test or Examination	Test Groups				
	1A	1B	2A	2B	3
	Test Sequence				
Visual Examination	1,10	1,7	1,12	1,8	1,10
Low Level Contact Resistance	3,6,9		3,6,9		2,4,7
Mating Force	2,8		2,11		9
Unmating Force	4,7		4,10		8
Temperature Life	5(a)	4(a)			
Insulation Resistance		2,5		2,6	
Dielectric Withstanding Voltage		3,6		3,7	
Durability			5(b)		3(b)
Vibration					5
Mechanical Shock					6
Thermal Shock			7(c)	4(c)	
Humidity			8	5	

NOTE (a) Perform Temperature Life for 1000Hrs at 125C
(b) Perform 500 Cycles of Durability
(c) Perform Thermal Shock at -55C & 125C for 100 cycles

1.6 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 (All Groups)

Specimens showed no sign of plating defects or connector damage that would be detrimental to connector performance.

2.2 Low Level Contact Resistance (Group 1A, 2A and 3)

Initial LLCR circuit data was less than 80 milliohms. The change in resistance data for all specimens was less than 10 milliohms maximum individual, and 5 milliohms average as specified in Product Specification 108-2072 Rev E. LLCR data is presented in Table 3 thru Table 5.

Table 3 – Low Level Contact Resistance (milliohms)(TG1A)

	Initial	After Temp Life	Final
	Actual	Delta	Delta
Min	26.69	0.02	1.28
Max	52.39	9.75	8.51
Avg.	35.76	4.16	4.24
Std	7.92	2.59	1.73
N	24	24	24

Table 4 – Low Level Contact Resistance (milliohms)(TG2A)

	Initial	After Durability	After Humidity
	Actual	Delta	Delta
Min	27.59	-1.83	-1.30
Max	51.21	2.04	5.95
Avg.	35.73	-0.18	0.93
Std	7.38	0.89	1.42
N	30	30	30

Table 5 – Low Level Contact Resistance (milliohms)(TG3)

	Initial	After Durability	Mechanical Shock
	Actual	Delta	Delta
Min	28.18	-2.12	-1.55
Max	52.12	0.57	0.84
Avg.	36.35	-0.73	-0.47
Std	7.29	0.62	0.52
N	30	30	30

2.3 Mating Force (Group 1A, 2A and 3)

Mating force was less than 2.7 ounces per contact. Mating force is presented in Table 6.

Table 6 – Mating Force (ounces per Contact)

ID#	Initial	After Temp Life
101	1.55	1.54
102	1.40	1.24
ID#	**Initial**	**After Humidity**
301	1.45	1.05
302	1.35	1.11
	After Mechanical Shock	
501	1.35	
502	1.43	

2.4 Unmating Force (Group 1A, 2A and 3)

Unmating force was greater than 0.54 ounces per contact. Unmating force is presented in Table 7.

Table 7 – Unmating Force (ounces per Contact)

ID#	Initial	After Temp Life
101	1.26	0.92
102	1.28	1.19
ID#	**Initial**	**After Humidity**
301	1.15	0.88
302	1.13	1.04
	After Mechanical Shock	
501	1.33	
502	1.25	

2.5 Temperature Life (Group 1B and 1A)

No physical damage occurred to the specimens as a result of subjecting the specimens to 1000 hrs. of temperature life.

2.6 Insulation Resistance (Group 1B and 2B)

All measurements exceeded the minimum requirement of 1,000 Megohms at 100 VDC.

2.7 Dielectric Withstanding Voltage (Group 1B and 2B)

All specimens tested showed no evidence of breakdown or flashover. All leakage currents were less than the specified maximum of 5.0 milliamperes.

2.8 Durability (Group 2A and 3)

No physical damage occurred to the specimens as a result of mating and unmating the specimens 500 times.

2.9 Vibration (Group 3)

No apparent physical damage or discontinuities of one microsecond or greater occurred during testing.

2.10 Mechanical Shock (Group 3)

No apparent physical damage or discontinuities of one microsecond or greater occurred during testing.

2.11 Thermal Shock (Group 2A and 2B)

No physical damage occurred to the specimens as a result of subjecting the specimens to 100 cycles of thermal shock.

2.12 Humidity (Group 2A and 2B)

No physical damage occurred to the specimens as a result of subjecting the specimens to 10 days of humidity.

2.13 Final Visual Examination (Group 1A, 2A and 3)

Specimens showed no sign of plating defects or connector damage that would be detrimental to connector performance.

3. TEST METHODS

3.1 Initial Visual Examination

Visual inspection was conducted per EIA-364-18B in accordance with Product Specification 108-2072 Rev E.

3.2 Low Level Contact Resist

Testing was conducted per EIA-364-23C in accordance with Product Specification 108-2072 Rev E. Specimens were mounted to printed circuit board 60-474649-1 Rev O and 60-474650-1 Rev O. 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. Figure 1 shows the test setup.

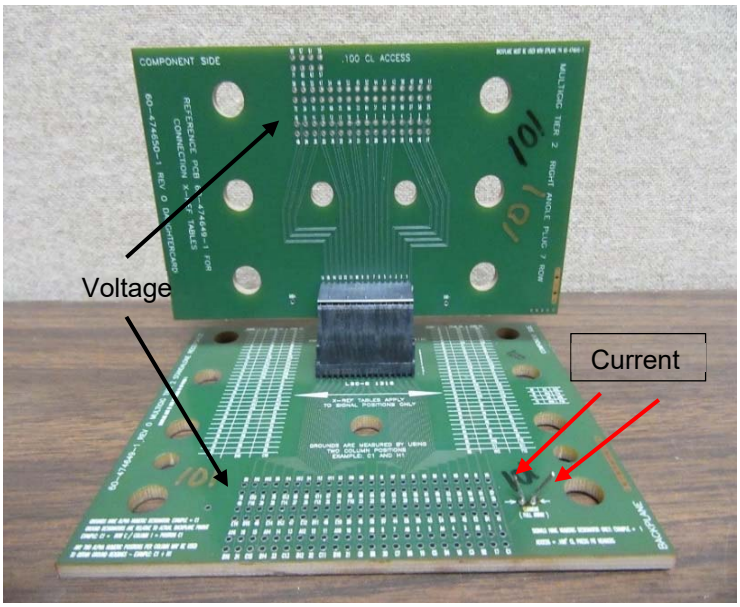

Figure 1 - Low Level Contact Resistance Measurement

3.3 Mating Force

Testing was conducted per EIA-364-13E in accordance with Product Specification 108-2072 Rev E. Backplane connector was attached to a free-floating x/y table mounted to the stationary base of the universal test machine. Right-angle daughter card connector was mounted to an adapter fixture that was attached to load cell and moveable crosshead of test machine. Specimens were manually aligned and then mated at the rate of 0.5 inches per minute. Maximum connector mating force was recorded prior to bottoming of connector. Figure 2 shows the test setup. The fully populated connector contained 144 contacts for calculation of force per contact

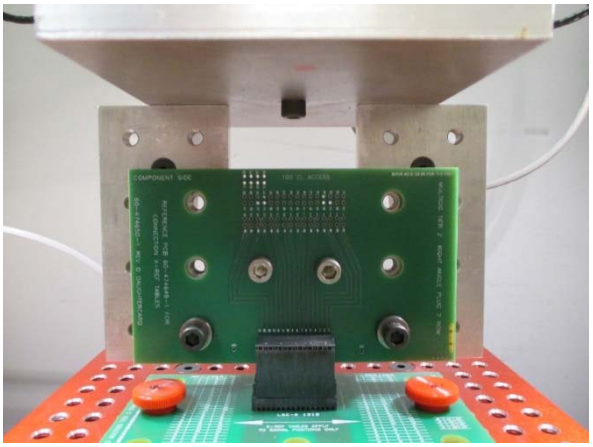

Figure 2 – Mating/Unmating Force

3.4 Unmating Force

Testing was conducted per EIA-364-13E in accordance with Product Specification 108-2072 Rev E. Backplane connector was attached to a free-floating x/y table mounted to the stationary base of the universal test machine. Mated right-angle daughter card connector was aligned with and mounted to an adapter fixture that was attached to load cell and moveable crosshead of test machine. Specimens were then completely unmated at the rate of 0.5 inches per minute. Maximum connector unmating force was recorded. Figure 2 shows the test setup. The fully populated connector contained 144 contacts for calculation of force per contact.

3.5 Temperature Life

Testing was conducted per EIA-364-17C in accordance with Product Specification 108-2072 Rev E. Mated specimens were exposed to a temperature of 125°C for 1000 hours. Two specimens were mounted to printed circuit board 60-474649-1 Rev O1 and 60-474650-1 Rev O1 and two specimens unmounted.

3.6 Insulation resistance

Testing was conducted per EIA-364-21E in accordance with Product Specification 108-2072 Rev E. Insulation resistance was measured between adjacent signal contacts and between ground contacts and signal contacts of the mated specimen. A test potential of 100 volts DC was applied for two minutes. Specimens were measured as shown in Figure 3.

3.7 Dielectric Withstanding Voltage

Testing was conducted per EIA-364-20E, Condition I, in accordance with Product Specification 108-2072 Rev E. Dielectric Withstanding Voltage was measured between adjacent signal contacts and between ground contacts and signal contacts of the mated specimen. A test potential of 500 volts DC was applied for one minute. Specimens were measured as shown in Figure 3.

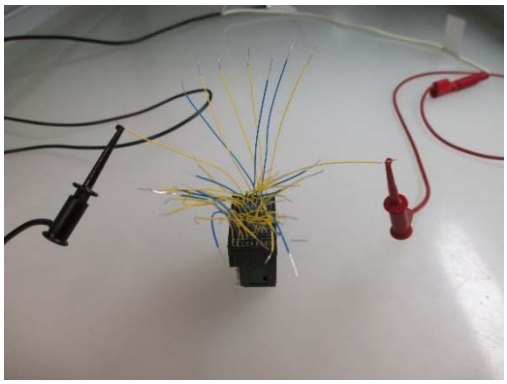

Figure 3 – IR & DWV Measurement

3.8 Durability

Durability was performed according to EIA364-09C in accordance with Product Specification 108-2072 Rev E. The backplane connector was attached to a free-floating x/y table mounted to the moving base of the of the durability machine. The plug connector was attached to the stationary upper plate of the durability machine via a 90 degree fixture. The specimens were mated and unmated 500 times at a maximum cycle rate of 500 cycles per hour. Refer to Figure 4 for the test set-up.

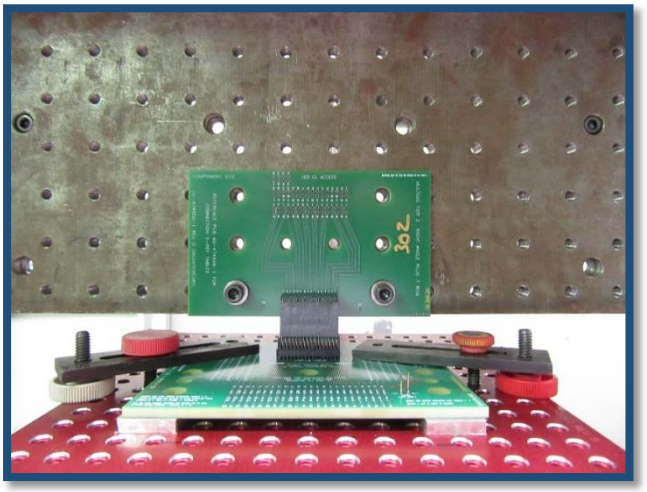

Figure 4 - Durability

3.9 Vibration

The test specimens were subjected to a sinusoidal vibration test per EIA-364-28F, test condition II, in accordance with Product Specification 108-2072 Rev E. The one exception that was applied was that the test time per axis was decreased from the normal three hours to two hours. See Figure 5 and Figure 6 for vibration setup photographs. 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 8 times in all three mutually perpendicular axes (total of 24 times), so that the motion was applied for a total period of approximately six hours. The test specimens were monitored for discontinuities of 1 microsecond or greater using an energizing current of 100 milliamperes.

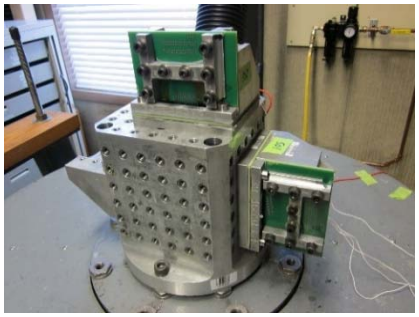

Figure 5 – Vibration Setup

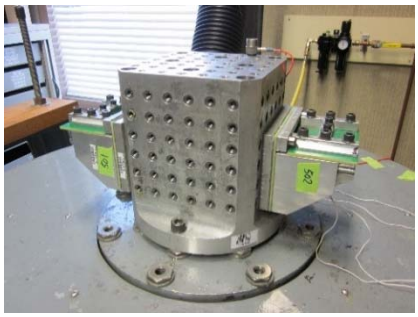

Figure 6 – Vibration Setup

3.10 Mechanical Shock

The test specimens were subjected to a mechanical shock test per EIA-364-27C, test condition H, in accordance with Product Specification 108-2072 Rev E. See Figure 7 thru Figure 9 for shock setup photographs. 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 1 microsecond or greater using an energizing current of 100 milliamperes. Pulse Velocity Change: 74.8 Inches/Second.

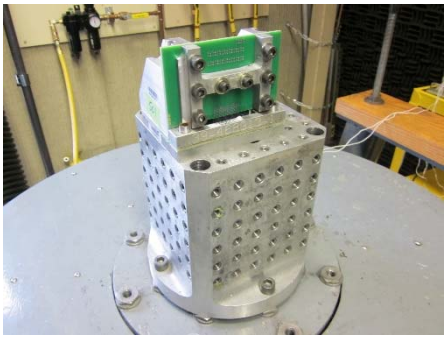

Figure 7 – Shock Setup

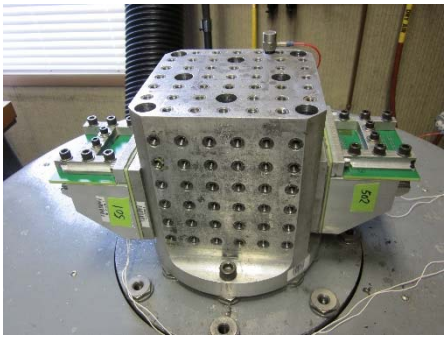

Figure 8 – Shock Setup

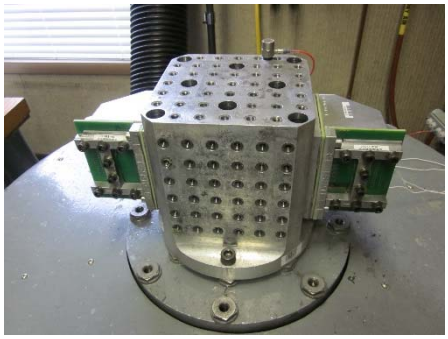

Figure 9 – Shock Setup

3.11 Thermal Shock

Testing was conducted per EIA-364-32G, Condition VII, in accordance with Product Specification 108-2072 Rev E, with the exception that mated specimens were subjected to 100 cycles of thermal shock with each cycle consisting of 30 minute dwells at -55 and 125°C. The transition between temperatures was less than one minute.

3.12 Humidity

Testing was conducted per EIA-364-31D, Method IV (less step 7a), in accordance with Product Specification 108-2072 Rev E. Mated specimens were exposed to 10 cycles of humidity-temperature cycling. Each cycle lasted 24 hours and consisted of cycling the temperature between 25°C and 65°C twice while maintaining high humidity. Refer to Figure 10 for a typical profile.

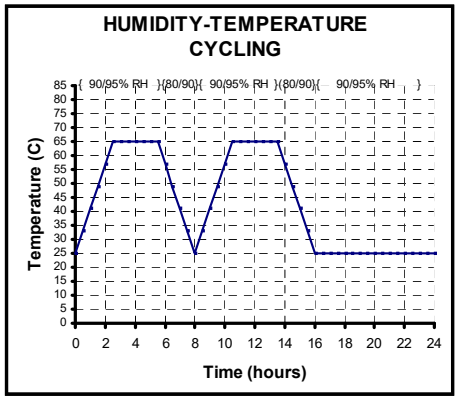

Figure 10 – Typical Humidity-Temperature Cycling Profile

3.13 Final Visual Inspection

Visual inspection was conducted per EIA-364-18B in accordance with Product Specification 108-2072 Rev E.