MULTIGIG RT* 3 Connector System

1. INTRODUCTION

1.1 Purpose

Testing was performed on the TE Connectivity* (TE) MULTIGIG RT 3 Connector System to determine its conformance to the requirements of Product Specification 108-2072-3, Rev. B.

1.2 Scope

This report covers the electrical, mechanical, and environmental performance of the MULTIGIG RT 3 Connector System. Testing was performed at the Harrisburg Electrical Components Test Laboratory between November 16, 2018 and January 26, 2019. This documentation is on file and maintained at Harrisburg Electrical Components Test Lab under test file EA20180342T. Additional testing to expand temperature ratings was performed at the Harrisburg Electrical Components Test Laboratory between July 24, 2020 and November 24, 2020.This documentation is on file and maintained at Harrisburg Electrical Components Test Lab under test file EA20200078T.

1.3 Conclusion

The MULTIGIG RT 3 Connector System, listed in paragraph 1.5, conformed to the electrical, mechanical, and environmental performance requirements of 108-2072-3, Rev. B.

1.4 Product Description

The MULTIGIG RT 3 Connector System uses a modular concept and interconnects two printed circuit boards at a right angle. Both daughtercard and backplane connectors attach to the printed circuit boards (PCBs) through compliant pin press-fit contacts. These connectors are designed to enable data rates of up to 25 Gbps.

© 2020 TE Connectivity Ltd. family of companies. All Rights Reserved.

* Trademark

TE Connectivity, TE Connectivity (logo) and TE (logo) are trademarks. Other products, logos, and company names used are the property of their respective owners.

1.5 Test Specimens

The test specimens were representative of normal production lots, and specimens identified in Table 1 and Table 2 with the following part numbers were used for test:

Table 1 – EA20180342T Test Specimens

Test Group	Test Set	Quantity	Part Number	Description
1	1 *(a)*	5 each	2302790-1 Rev 3 2302785-1 Rev 3	Right End Standalone Module, Back Plane Center Module, Daughtercard
	5 *(b)*	5 each	2302790-1 Rev 3 2302785-1 Rev 3	Right End Standalone Module, Back Plane Center Module, Daughtercard
2 *(e)*	2 *(a)*	5 each	2302790-1 Rev 3 2302785-1 Rev 3	Right End Standalone Module, Back Plane Center Module, Daughtercard
	6 *(b)*	5 each	2302790-1 Rev 3 2302785-1 Rev 3	Right End Standalone Module, Back Plane Center Module, Daughtercard
3	3 *(a)*	5 each	2302790-1 Rev 3 2302785-1 Rev 3	Right End Standalone Module, Back Plane Center Module, Daughtercard
	7 *(b)*	5 each	2302790-1 Rev 3 2302785-1 Rev 3	Right End Standalone Module, Back Plane Center Module, Daughtercard
4	4 *(c)*	3 each	2302790-1 Rev 3 2302785-1 Rev 3	Right End Standalone Module, Back Plane Center Module, Daughtercard
	8 *(d)*	3 each	2302790-1 Rev 3 2302785-1 Rev 3	Right End Standalone Module, Back Plane Center Module, Daughtercard

NOTE *(a) Mounted on PCB with immersion tin plated thru hole as follows: Three specimens on PCB 60-1934969-3 Rev B and 60-1934970-3 Rev B for low level contact resistance circuit measurement, and two specimens on PCB 60-1943184-1 Rev A and 60-1943185-1 Rev A for compliant pin resistance measurement.*
(b) Mounted on PCB with electroless nickel immersion gold (ENIG) plated thru hole as follows: Three specimens on PCB 60-1934969-4 Rev B and 60-1934970-4 Rev B for low level contact resistance circuit measurement, and two specimens on PCB 60-1943184-2 Rev A and 60-1943185-2 Rev A for compliant pin resistance measurement.
(c) Mounted on PCB with immersion tin plated thru hole: 60-1934969-3 Rev B and 60-1934970-3 Rev B.
(d) Mounted on PCB with ENIG plated thru hole: 60-1934969-4 Rev B and 60-1934970-4 Rev B.
(e) Thermal shock temperature extremes -55 and 125°C

Table 2 – EA20200078T Test Specimens

Test Group	Qty	Part Number	Description
2 *(a)*	3 *(c)*	2302785-1 Rev A	Right Angle Plug Assembly, 7 Row Center VPX, MULTIGIG RT 3
	3 *(d)*	2302790-1 Rev A	Vertical Receptacle Assembly, Right End, MULTIGIG RT 3
5 *(b)*	3 *(c)*	2302785-1 Rev A	Right Angle Plug Assembly, 7 Row Center VPX, MULTIGIG RT 3
	3 *(d)*	2302790-1 Rev A	Vertical Receptacle Assembly, Right End, MULTIGIG RT 3

NOTE *(a) Thermal Shock Temperature Extremes -65 and 125°C.*
(b) Low Temperature Storage -65 °C.
(c) Mounted on PCB 60-1934969-4 Rev B, with electroless nickel immersion gold (ENIG) plated thru hole.
(d) Mounted on PCB 60-1934970-4 Rev B, with electroless nickel immersion gold (ENIG) plated thru hole.

© 2020 TE Connectivity Ltd. family of companies. All Rights Reserved.

* Trademark

TE Connectivity, TE Connectivity (logo) and TE (logo) are trademarks. Other products, logos, and company names used are the property of their respective owners.

1.6 Qualification Test Sequence

Table 3 – Qualification Test Sequence

Test or Examination	Test Group *(a)*				
	1	**2**	**3**	4	5
	Test Sequence *(b)*				
Initial Examination of Product	1	1	1	1	1
Low Level Contact Resistance (LLCR), Circuit	2,6	3,9	2,7		6
LLCR, Compliant Pin	3,7	4,10	3,8		
Random Vibration			5		
Mechanical Shock			6		
Durability, 500 Cycles		6	4		
Durability, 50 Cycles	4				
Mating Force		2	10		5
Unmating Force		5	9		
Compliant Pin Insertion, Connector				2	4
Compliant Pin Retention, Connector	8	11	11	3	
Temperature Life (125°C)	5				
Thermal Shock (-65 and 125°C)		7			
Humidity/Temperature Cycling		8			
Dielectric Withstanding Voltage					3 *(c)*
Low Temperature Storage (-65°C)					2
Final Examination of Product	9	12	12	4	

NOTE *(a) See Paragraph 1.5.*
(b) Numbers indicate sequence which tests were performed.
(c) Unmated

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 Examination of Product – All 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.

© 2020 TE Connectivity Ltd. family of companies. All Rights Reserved.

* Trademark
TE Connectivity, TE Connectivity (logo) and TE (logo) are trademarks. Other products, logos, and company names used are the property of their respective owners.

2.2 LLCR, Circuit - Groups 1,2,3 and 5

All LLCR measurements taken at 100 milliamperes maximum and 20 millivolts maximum open circuit voltage were less than 80 milliohms initially, had a maximum average change in resistance (ΔR) of less than 5 milliohms after testing, and a maximum individual change in resistance (ΔR) of less than 10 milliohms after testing.

2.3 LLCR, Compliant Pin – Groups 1,2,3

2.3.1 LLCR, Compliant Pin – PCB with Immersion Tin Plated Thru Hole

All compliant pin resistance measurements with immersion tin plated thru holes taken at 100 milliamperes maximum and 20 millivolts maximum open circuit voltage were less than 1 milliohm initially, and had a change in resistance (ΔR) of less than 1 milliohm after testing.

2.3.2 LLCR, Compliant Pin – PCB with ENIG Plated Thru Hole

All compliant pin resistance measurements on ENIG plated thru holes taken at 100 milliamperes maximum and 20 millivolts maximum open circuit voltage were less than 1 milliohm initially, and had a change in resistance (ΔR) of less than 3 milliohms after testing.

2.4 Random Vibration - Group 3

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

2.5 Mechanical Shock - Group 3

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

2.6 Durability, 500 cycles - Group 2,3

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

2.7 Durability, 50 cycles - Group 1

No physical damage occurred to the specimens as a result of mating and unmating the specimens 50 times.

2.8 Mating Force – Groups 2,3 and 5

All mating force measurements were less than 0.75 N per contact.

2.9 Unmating Force – Groups 2,3

All unmating force measurements were greater than 0.15 N per contact.

2.10 Compliant Pin Insertion, Connector – Groups 4 and 5

All connector compliant pin insertion force measurements were less than 22.25 N (5 pounds) per contact.

2.11 Compliant Pin Retention, Connector – Groups 1,2,3 and 4

All connector compliant pin retention force measurements were greater than 1.78 N (0.4 pounds) per contact.

© 2020 TE Connectivity Ltd. family of companies. All Rights Reserved.

* Trademark

TE Connectivity, TE Connectivity (logo) and TE (logo) are trademarks. Other products, logos, and company names used are the property of their respective owners.

2.12 Temperature Life - Group 1

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

2.13 Thermal Shock - Group 2

2.13.1 Thermal Shock (-55 and 125°C)

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

2.13.2 Thermal Shock (-65 and 125°C)

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

2.14 Humidity/Temperature Cycling - Group 2

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

2.15 Dielectric Withstanding Voltage – Group 5

None of the specimens had dielectric breakdown or flashover and none of the specimens had leakage current that exceeded 5 milliamperes.

2.16 Low Temperature Storage – Group 5

None of the specimens showed evidence of physical damage as a result of exposure to low temperature storage for 72 hours at -65°C.

2.17 Final Examination of Product - All Groups

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 Certification of Conformance was issued stating that all specimens in this test package have been produced, inspected, and accepted as conforming to product drawing requirements, and made using the same core manufacturing processes and technologies as production parts. Specimens were visually examined in accordance with EIA-364-18B.

3.2 LLCR, Circuit

Circuit LLCR was conducted in accordance with EIA-364-23C. Signal and ground contact 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.

3.3 LLCR, Compliant Pin

Compliant pin LLCR was conducted in accordance with EIA-364-23C. Daughtercard and backplane compliant pin 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.

© 2020 TE Connectivity Ltd. family of companies. All Rights Reserved.

* Trademark

TE Connectivity, TE Connectivity (logo) and TE (logo) are trademarks. Other products, logos, and company names used are the property of their respective owners.

3.4 Vibration, Random

Random vibration was conducted in accordance with EIA-364-28F, test condition V, test condition letter E. The parameters of this test condition were specified by a random vibration spectrum with excitation frequency bounds of 50 and 2000 Hertz (Hz). The power spectral density (PSD) at 50 Hz was 0.05 G^2/Hz. The spectrum sloped up at 6 dB per octave to a PSD of 0.2 G^2/Hz at 100 Hz. The spectrum was flat at 0.2 G^2/Hz from 100 Hz to 1000 Hz. The spectrum sloped down at 6 dB per octave to a PSD of 0.05 G^2/Hz at the upper bound frequency of 2000 Hz. The root-mean square amplitude of the excitation was 16.91 GRMS. Specimens were subjected to this test for 8 hours in each of the three mutually perpendicular axes, for a total test time of 24 hours per specimen (Figure 1). Three specimens of each set were wired and monitored for discontinuities of 1 microsecond or greater using an energizing current of 100 milliamperes.

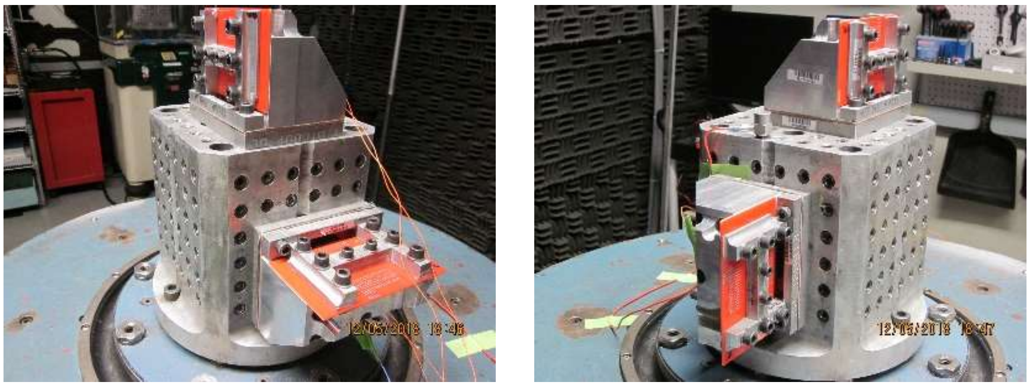

Figure 1 – Vibration and Mechanical Shock

3.5 Mechanical Shock, Sawtooth

Mechanical shock was conducted in accordance with EIA-364-27C, test condition G. Mated specimens were subjected to a mechanical shock test, having a sawtooth waveform of 100 gravity units (g peak) and a duration of 6 milliseconds. Three shocks in each direction were applied along the three mutually perpendicular planes, for a total of 18 shocks (Figure 1). Three specimens of each set were wired and monitored for discontinuities of one microsecond or greater, using a current of 100 milliamperes DC.

3.6 Durability, 500 Cycles

Durability was conducted in accordance with EIA-364-09D. Specimens were mated and unmated 500 times at a maximum rate of 500 cycles per hour (Figure 2).

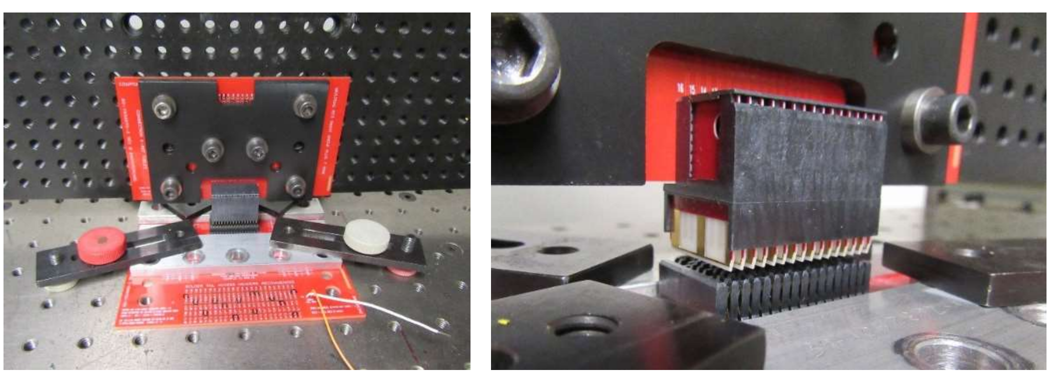

Figure 2 – Durability

© 2020 TE Connectivity Ltd. family of companies. All Rights Reserved.

* Trademark
TE Connectivity, TE Connectivity (logo) and TE (logo) are trademarks. Other products, logos, and company names used are the property of their respective owners.

3.7 Durability, 50 Cycles

Durability was conducted in accordance with EIA-364-09D. Specimens were mated and unmated 50 times at a maximum rate of 500 cycles per hour (Figure 2).

3.8 Mating Force

Mating force was conducted in accordance with EIA-364-13E. The force required to mate connectors was measured using a tensile/compression device with a maximum rate of travel at 0.5 inch/minute and a free floating fixture (Figure 3). The average force per contact was calculated.

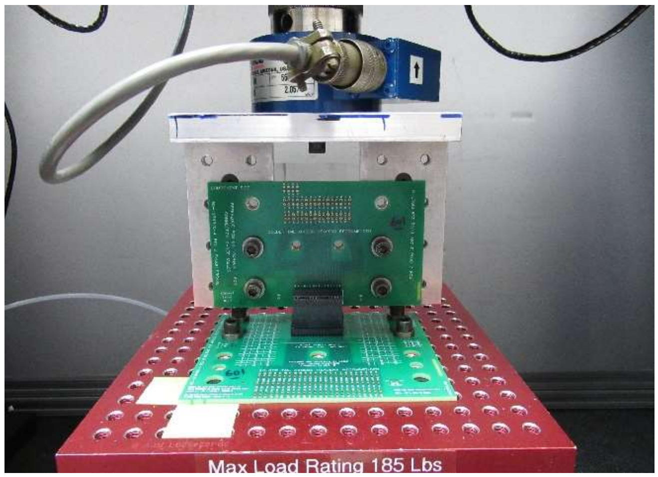

Figure 3 – Mating and Unmating Force

3.9 Unmating Force

Unmating force was conducted in accordance with EIA-364-13E. The force required to unmate connectors was measured using a tensile/compression device with a maximum rate of travel at 0.5 inch/minute and a free floating fixture (Figure 3). The average force per contact was calculated.

3.10 Compliant Pin Insertion, Connector

Connector compliant pin insertion was conducted in accordance with IEC 60352-5, Edition 4.0, with Corrigendum ,1 Paragraph 5.2.2.2. The force required to mount a connector to the PCB using flat rock tooling was measured using a tensile/ compression device with a maximum rate of travel at 0.5 inch/minute. The average force per contact was calculated.

3.11 Compliant Pin Retention, Connector

Connector compliant pin retention was conducted in accordance with IEC 60352-5, Edition 4.0, with Corrigendum ,1 Paragraph 5.2.2.3. The force required to remove unmated backplane and daughtercard connectors from PCB using proper removal tooling was measured using a tensile/ compression device with a maximum rate of travel at 0.5 inch/minute and a free floating fixture. The average force per contact was calculated.

3.12 Temperature Life

Temperature life was conducted in accordance with EIA-364-17C. Mated specimens were exposed to a temperature of 125°C for 1000 hours. After exposure, specimens were unmated, the mating interface cleaned with chloroform, and remated prior to performing final LLCR, circuit.

© 2020 TE Connectivity Ltd. family of companies. All Rights Reserved.

* Trademark

TE Connectivity, TE Connectivity (logo) and TE (logo) are trademarks. Other products, logos, and company names used are the property of their respective owners.

3.13 Thermal Shock

3.13.1 Thermal Shock (-55 and 125°C)

Thermal shock was conducted in accordance with EIA-364-32G, test condition VII, with the exception that 100 cycles were conducted between -55°C and 125°C. 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 five minutes.

3.13.2 Thermal Shock (-65 and 125°C)

Thermal shock was conducted in accordance with EIA-364-32G, Method A, Condition III, Test Duration A-3. Specimens were subjected to 100 cycles of thermal shock with each cycle consisting of 30 minute dwells at -65 and 125°C. The transition between temperatures was less than one minute.

3.14 Humidity/Temperature Cycling

Humidity-temperature cycling was conducted in accordance with EIA-364-31E, method IV. 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.

3.15 Dielectric Withstanding Voltage

Dielectric withstanding voltage was conducted in accordance with EIA-364-20F. Dielectric withstanding voltage was tested between adjacent contacts. A test potential of 500 volts AC was applied between adjacent contacts. This potential was applied at a rate of 500 volts/second and maintained for one minute. Test Group 2 specimens were tested mated and Group 5 specimens were tested unmated.

3.16 Low Temperature Storage

Testing was conducted per Method 502, Procedure I – Storage, of MIL-STD-810H, 31 January 2019. Unmated specimens were subjected to -65°C for 72 hours after achieving stabilization.

3,17 Final Examination of Product

Final examination of product was conducted in accordance with EIA-364-18B. Specimens were evaluated for any signs of damage detrimental to product performance.

MULTIGIG RT is a trademark of TE Connectivity Corporation.

© 2020 TE Connectivity Ltd. family of companies. All Rights Reserved.

* Trademark

TE Connectivity, TE Connectivity (logo) and TE (logo) are trademarks. Other products, logos, and company names used are the property of their respective owners.