Inverted Poke-In Through Board Connector

1. INTRODUCTION

1.1 Purpose

Testing was performed on the TE Connectivity (TE) Inverted Poke-In Through Board Connector to determine its conformance to the requirements of Product Specification 108-32040 Rev B.

1.2 Scope

This report covers the electrical, mechanical, and environmental performance of the TE Inverted Poke-In Through Board Connector. Testing was performed at the TE Harrisburg Electrical Components Test Laboratory (HECTL) between February 19, 2014 and April 21, 2014 and October 2, 2013 and November 26, 2013. The test files for the testing are EA201400066T and EA20130511T.

1.3 Conclusion

All part numbers listed in paragraph 1.5 conformed to the electrical, mechanical and environmental performance requirements on Product Specification 108-32040 Rev B.

1.4 Product Description

The 2213189-x Inverted Poke-In Through Board Connector is a platform product that shares the same PCB footprint with the 2213188-x Inverted Card Edge Connector. In both cases, power can be routed to the LEDs on a printed circuit (pc) board thru the pc board via these connector families. The Card Edge version allows the mating of a LED driver pc board perpendicular to the LED pc board. The Poke-In version allows discrete wires ranging from 26 AWG to 18 AWG to poke into the bottom of the connector. The low-profile flat top design minimizes interference of the light cone from the adjacent LEDs, and provides a convenient pick up location for automated pick-and-place machinery. The connectors share a common pc board footprint and are packaged in tape and reel per EIA-481.

1.5 Test Specimens

The test specimens were representative of normal production lots, and the following part numbers were used for testing.

Table 1 – Test Specimens

Test Group	Quantity	Part Number	Description
1	8	2213189-1 Rev 7	Inverted Poke In with 18 AWG Stranded Wire
1	8	2213189-1 Rev 7	Inverted Poke In with 18 AWG PreBond Wire
1	8	2213189-1 Rev 7	Inverted Poke In with 18 AWG Solid Wire
1	8	2213189-1 Rev 7	Inverted Poke In with 20 AWG PreBond Wire
1	8	2213189-1 Rev 7	Inverted Poke In with 20 AWG Solid Wire
1	8	2213189-1 Rev 7	Inverted Poke In with 22 AWG Solid Wire
1	8	2213189-2 Rev 7	Inverted Poke In with 24 AWG Solid
1	8	2213189-2 Rev 7	Inverted Poke In with 26 AWG Solid
2	5	2213189-1 Rev 7	Inverted Poke In (not loaded)
3	15	2213189-1 Rev 7	Inverted Poke In with 22 AWG Solid Wire
3	15	2213189-1 Rev 7	Inverted Poke In with 18 AWG Stranded Wire
3	15	2213189-2 Rev 7	Inverted Poke In with 26 AWG Solid Wire
4	15	2213189-1 Rev 7	Inverted Poke In with 22 AWG Solid Wire
4	15	2213189-1 Rev 7	Inverted Poke In with 18 AWG Stranded Wire
4	15	2213189-2 Rev 7	Inverted Poke In with 26 AWG Solid Wire
5	8	2213189-1 Rev 7	Inverted Poke In with 18 AWG Stranded Wire

Table 1 – Test Specimens, continued

5	8	2213189-1 Rev 7	Inverted Poke In with 18 AWG Solid Wire
5	8	2213189-1 Rev 7	Inverted Poke In with 20 AWG Solid Wire
5	8	2213189-1 Rev 7	Inverted Poke In with 22 AWG Solid Wire
5	8	2213189-2 Rev 7	Inverted Poke in with 24 AWG Solid Wire
5	8	2213189-2 Rev 7	Inverted Poke In with 26 AWG Solid Wire
5	8	2213189-1 Rev 7	Inverted Poke In with 18 AWG Prebond Wire
5	8	2213189-1 Rev 7	Inverted Poke In with 20 AWG Prebond Wire

1.6 Qualification Test Sequence

Table 2 - Test Sequence

Test or Examination	Test Group				
	1	2	3	4	5
	Test Sequence (a)				
Initial Examination of Product	1	1	1	1	1
LLCR	3,6		2,7		
Insulation Resistance				2,6	
Withstanding Voltage				3,7	
Temperature Rise vs. Current			3,8		
Solderability		2			
Random Vibration	4		6(b)		
Mechanical Shock	5				
Wire Insertion Force	2				
Wire Retention Force					2
Thermal Shock				4	
Humidity/Temperature Cycling			4	5	
Temperature Life			5		
Final Examination of Product	7		9	8	3

Note:

(a) Numbers indicate sequence in which tests are performed.

(b) Discontinuities shall not be monitored. Energize at 18°C level for 100% loadings per quality specification 102-950.

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 Test Groups

A Certificate of Conformance stating that all specimens submitted for testing were representative of normal production lots and met the requirements of the applicable product drawing provided. Where specified, specimens were visually examined and no evidence of physical damage detrimental to product performance was observed.

2.2 LLCR – Test Groups 1 and 3

All low level contact resistance measurements were below the 10 milliohm requirement initially and below the 20 milliohm requirement for final measurements. Summary data for Test Groups 1 and 3 are listed in Tables 1, 2 and 3 below.

Table 3 – Test Group 1 LLCR Summary Data

Low Level Contact Resistance (mΩ)								
	18 AWG Stranded		18 AWG PreBond		18 AWG Solid		20 AWG PreBond	
	Initial	Final	Initial	Final	Initial	Final	Initial	Final
Minimum	2.93	3.32	2.61	2.76	1.36	2.73	2.55	2.74
Maximum	3.23	5.14	2.98	3.93	3.13	3.28	4.00	4.06
Mean	3.07	4.15	2.74	3.11	2.69	2.96	2.96	3.15
Std. Dev.	0.09	0.67	0.10	0.32	0.52	0.14	0.42	0.38
N	16	16	16	16	16	16	16	16
EWL Bulk	4.48	4.48	4.37	4.37	4.74	4.74	6.69	6.69
Maximum Requirement	**10**	**20**	**10**	**20**	**10**	**20**	**10**	**20**

Table 4 – Test Group 1 LLCR Summary Data, continued

Low Level Contact Resistance (mΩ)								
	20 AWG Solid		22 AWG Solid		24 AWG Solid		26 AWG Solid	
	Initial	Final	Initial	Final	Initial	Final	Initial	Final
Minimum	2.55	2.54	2.65	2.62	2.21	2.55	1.88	2.14
Maximum	3.12	3.95	3.36	4.27	2.90	3.48	3.16	5.47
Mean	2.78	3.01	2.87	3.24	2.64	2.89	2.48	3.12
Std. Dev.	0.15	0.35	0.22	0.43	0.20	0.29	0.37	0.94
N	16	16	16	16	16	16	16	16
EWL Bulk	7.69	7.69	12.83	12.83	19.25	19.25	30.42	30.42
Maximum Requirement	**10**	**20**	**10**	**20**	**10**	**20**	**10**	**20**

Table 5 – Test Group 3 LLCR Summary Data

Low Level Contact Resistance (mΩ)						
	22 AWG Solid		18 AWG Stranded		26 AWG Solid	
	Initial	Final	Initial	Final	Initial	Final
Minimum	2.79	3.03	2.10	3.31	1.72	1.98
Maximum	3.47	8.30	3.25	4.97	2.95	12.92
Mean	3.08	4.56	2.77	3.97	2.20	3.78
Std. Dev.	0.16	1.40	0.23	0.50	0.30	2.01
N	30	30	30	30	30	30
EWL Bulk	11.59	11.59	4.48	4.48	28.91	28.91
Maximum Requirement	**10**	**20**	**10**	**20**	**10**	**20**

2.3 Insulation Resistance – Test Group 4

All initial insulation resistance readings met the minimum requirement of 1000 megohms and all final readings met the minimum requirement of 500 megohms.

2.4 Withstanding Voltage – Test Group 4

All specimens met the requirement of no dielectric breakdown or flashover during a one minute hold at 1800 VAC.

2.5 Temperature Rise vs Current – Test Group 3

All specimens had an initial and final temperature rise of less than 30°C above ambient when tested using a baseline rated current of 3 amperes for specimens with 18 and 22 AWG wire and 2 amperes for specimens with 26 AWG wire.

2.6 Solderability – Test Group 2

All specimens met the requirement of a minimum of 95% solder coverage.

2.7 Random Vibration – Test Groups 1 and 3

The Test Group 1 specimens showed no apparent physical damage or discontinuities of one microsecond or greater occurred during testing.

The Test Group 3 specimens maintained the required current flow and exhibited no apparent physical damage during testing.

2.8 Mechanical Shock – Test Group 1

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

2.9 Wire Insertion Force – Test Group 1

All wire insertion force measurements met the maximum requirements for insertion force listed in Table 6 below.

Table 6 - Wire Insertion Force Requirements

Wire Size – Style	Requirement
26 AWG – Solid	8 N Max
24 AWG – Solid	8 N Max
22-18 AWG – Solid	15.6 N Max
20-18 AWG – Prebond	29.0 N Max
18 AWG – Stranded	29.0 N Max

2.10 Wire Retention Force – Test Group 5

All wire retention force measurements met the minimum requirements for retention force listed in Table 7 below.

Table 7 – Wire Retention Force Requirements

Wire Size - Style	Requirement
26 -24 AWG – Solid	8 N Min
22-18 AWG – Solid	27 N Min
20-18 AWG – Prebond	21 N Min
18 AWG – Stranded	8 N Min

2.11 Thermal Shock – Test Group 4

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

2.12 Humidity/Temperature Cycling – Test Groups 3 and 4

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

2.13 Temperature Life – Test Group 3

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

2.14 Final Examination of Product – All Test Groups

All test Groups 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. Specimens were visually examined with the unaided eye for signs of damage in accordance with EIA-364-18B.

3.2 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. Measurements were taken from the end of the wire to the board. Wire bulk was removed from the measurement.

3.3 Insulation Resistance

Insulation resistance was measured between adjacent contacts of specimens. A test voltage of 500 volts DC was applied for two minutes before the resistance was measured. All specimens were tested in accordance with test specification EIA-364-21D.

3.4 Withstanding Voltage

A test potential of 1800 volts AC was applied between the adjacent contacts of specimens at sea level. This potential was applied for one minute and then returned to zero. All specimens were tested in accordance with test specification EIA-364-20D test condition I.

3.5 Temperature Rise vs Current

The specimens were series wired and powered at 3.0 Amps DC for specimens with 22 and 18 AWG wires and 2.0 Amps DC for specimens with 26 AWG wires. Measurements were taken after temperature stabilization - three consecutive readings taken at 5 minute intervals with less than one degree of change. Thermography was the method used to record the temperatures. Testing was conducted in accordance with EIA-364-70C, Method 1.

3.6 Solderability

A solder paste with a composition of 96% Sn, 3% Ag, and 0.5% Cu., Visc./KCPS 1000 ±10%, with a mesh of –325 +500 was then placed onto a stencil with pad geometry, opening, and thickness that was appropriate for the specimens being tested. The stencil was supplied with the specimens. The solder paste was printed onto a 4 x 6 inch ceramic substrate. The screen was removed and the specimens were placed onto the solder paste print under appropriate magnification. Care was taken to ensure that the specimens were not contaminated in any way and were tested in the "as received" condition. The specimens and ceramic substrates were placed on a conveyor belt through an infrared oven. The specimens were exposed to 60-120 seconds between the temperatures of 150°C and 180°C and to 30-60 seconds between the temperatures of 230°C and 250°C as specified in J-STD-002. The temperature on the ceramic substrate, at a point close to the specimen, was monitored to enable temperature profiling. All specimens were examined using a microscope for solder wetting. Specimens with a pitch >0.5 mm were examined at 10X, and specimens with a pitch of 0.5 mm or less were examined at 30X as applicable.

3.7 Random Vibration

The test specimens were subjected to a random vibration test in accordance with specification EIA-364-28F, test condition VII, test condition letter D. The parameters of this test condition are specified by a random vibration spectrum with excitation frequency bounds of 20 and 500 Hertz (Hz). The spectrum remains flat at 0.02 G^2/Hz from 20 Hz to the upper bound frequency of 500 Hz. The root-mean square amplitude of the excitation was 3.10 GRMS. The test specimens were subjected to this test for 15 minutes in each of the three mutually perpendicular axes, for a total test time of 45 minutes per test specimen. Test Group 1 specimens were monitored for discontinuities of 1 microsecond or greater using an energizing current of 100 milliamperes. Test Group 3 specimens (22 AWG Solid, 18 AWG Stranded, 26 AWG Solid) were energized with a dc current of 5.2, 6.1 and 4.1 amperes respectively during testing.

3.8 Mechanical Shock

The test specimens were subjected to a mechanical shock test in accordance with specification EIA-364-27C, test condition "H". 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.

3.9 Wire Insertion Force

Wire insertion force testing was conducted per EIA-364-13E, Method A. A drill chuck assembly was placed on the load cell and the wire conductor was placed up through the chuck assembly and secured. The housing was fastened to a floating XY table on the bottom plate of the tensile machine. The wire was then lowered into the housing at a rate of 0.5 inches per minute (12.7 mm per minute). A photo of the test setup for wire insertion is shown in Figure 1.

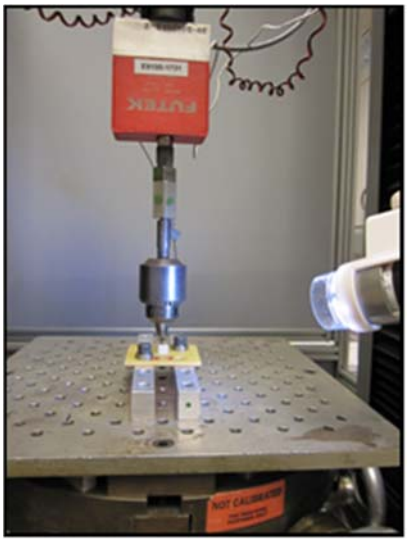

Figure 1 - Wire Insertion Test Setup

3.10 Wire Retention Force

Wire retention force testing was conducted per EIA-364-13E, Method A. The housing was fastened to a floating XY table on the bottom plate of the compression/tensile machine. Air jaws were attached to the load cell of the compression/tensile machine and the wire conductor was secured. The crosshead of the tensile machine was raised at a rate of 0.5 inches per minute (12.7 mm per minute). A photo of the test setup for wire retention is shown in Figure 2.

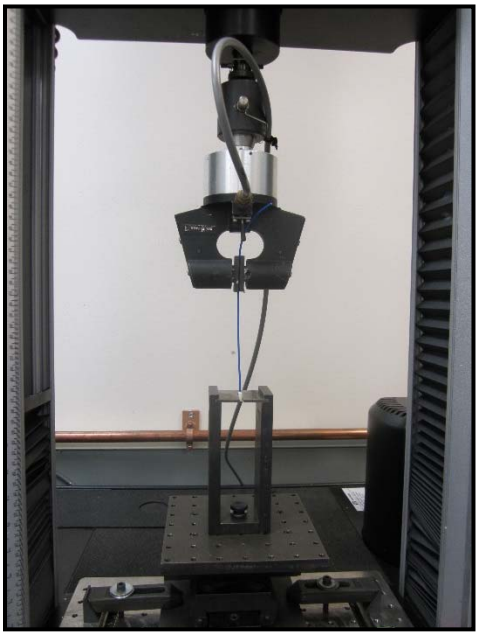

Figure 2 - Wire Retention Test Setup

3.11 Thermal Shock

Specimens were subjected to 5 cycles of thermal shock with each cycle consisting of 30 minute dwells at -40 and 130°C. The transition between temperatures was less than one minute. All specimens were tested in accordance with test specification EIA-364-32E Method A, Test Condition I with the exception of the temperatures.

3.12 Humidity/Temperature Cycling

Specimens were subjected to 10 cycles (10 days) of humidity temperature cycling between 25 and 65°C at 80 to 100% RH with a -10°C cold shock. All specimens were tested in accordance with test specification EIA-364-31 Method IV.

3.13 Temperature Life

Mated specimens were exposed to a temperature of 130°C for 500 hours. Testing was conducted in accordance with EIA-364-17, Test Time Condition C.

3.14 Final Examination of Product

Specimens were visually examined with the unaided eye for signs of physical damage in accordance with EIA-364-18B.