


# Qualification Test Report

501-115162

Product Specification : 108-115145

Date : 28Nov2018

THIS INFORMATION IS CONFIDENTIAL AND IS DISCLOSED TO YOU ON CONDITION THAT NO FURTHER DISCLOSURE IS MADE BY YOU TO OTHER TEAMP PERSONNEL WITHOUT WRITTEN AUTHORIZATION FROM AMP SHANGHAI LTD

A	Initial Release	W.W	28Nov 2018	Prepared by Winng Wang		TE Connectivity Shanghai Ltd	
				Reviewed by Richard Ma			
				Approved by Simon Li	NO 501-115162	REV A	LOC ES
				PAGE 1 of 13	TITLE USB C Receptacle DUAL ROW SMT ,Vertical Type		
LTR	REVISION RECORD	DR	DATE				

DIST

1. Introduction

1.1 Objective

Testing was performed on the USB Type-C Receptacle and Plug Lead Free Version connectors to determine if it meets the requirements of Product Specification, 108-115145, Rev. A.

1.2 Scope

This report covers the electrical, mechanical and environmental performance requirements of the USB Type-C Receptacle and Plug Lead Free Version connectors.

1.3 Conclusion

The USB Type-C Receptacle and Plug Lead Free Version connectors, meets the electrical, mechanical and environmental performance requirements of Product Specification, 108-115145, Rev. A.

1.4 Product Description

The USB Type-C Lead Free Version connectors are cable mounted plugs and printed circuit mounted receptacles. The contacts are made of a copper alloy with gold plating in contact area, tin plating on solder area all over nickel plating. The housing material is thermoplastic UL 94 V-0 rated.

1.5 Test Samples

The test samples were representative of normal production lots, and samples identified with the following part numbers were used for test:

Test Group	Quantity	Part Number	Description
A B C D E F G H I J K L M N O.	Refer to test result.	2337857-1	Receptacle Assembly

1.6 Environmental Conditions

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

Temperature: 15°C to 35°C

Relative Humidity: 25 to 85%

	<b>TE Connectivity Shanghai Ltd</b>	<b>PAGE</b> 2/13	<b>NO</b> 501-115162	<b>REV</b> A	<b>LOC</b> ES
--	---	---------------------	-------------------------	-----------------	------------------

## 2. Test Method

### Test requirement and Procedures summary

**Table.1**

	Test Item	Procedures	Requirements
	<b>Examination</b>		
1	Visual examination of product	EIA-364-18 Visual, dimensional and functional aspects meet requirements of product drawing and applicable instructions on customer drawing, and application specification.	Meets requirements of product drawing and no defects.

	Test Item	Procedures	Requirements
	<b>Electrical</b>		
2	Low Level Contact Resistance	EIA-364-23 The low level contact resistance (LLCR) measurement is made across the plug and receptacle mated contacts and does not include any internal paddle cards or substrates of the plug or receptacle. Measure at 20 mV (max) open circuit at 100 mA	40 mΩ Max initial for VBUS, GND and all other contacts. Maximum change (delta) of 10 mΩ after environmental stresses.
3	Insulation resistance	EIA-364-21 Applicable to both receptacle and plug. Apply 500V DC. Apply the above specified voltage between adjacent contacts for 1 minute.	>100 MΩ insulation resistance between adjacent contacts of unmated and mated connectors. 100MΩ Min.
4	Dielectric withstanding voltage	EIA-364-20, Method B. Applicable to both receptacle and plug. 100V AC (rms) for 1 minute at sea level.	No break down shall occur when voltage is applied between adjacent contacts of unmated and mated connectors. Leakage of electricity is less than 0.5 mA.
5	Temperature rise	EIA-364-70, Method 1. , Current rating for signal and power Pin, 3 hours, 1. Connection in parallel between 4 pairs VBUS pins and GND pins, each single circuit 1.5 A(DC 9V), 2. Working with single circuit between pair VBUS pins and GND pins, 3 A (DC 9V) Min.	Temperature rise of the outside shell surface of the mated connector pair above the VBUS and GND contacts shall not exceed 30°C above ambient temperature. 30°C Max.

	<b>TE Connectivity Shanghai Ltd</b>	<b>PAGE</b> 3/13	<b>NO</b> 501-115162	<b>REV</b> A	<b>LOC</b> ES
--	---	---------------------	-------------------------	-----------------	------------------

	Test Item	Procedures	Requirements
<b>Mechanical</b>			
6	Durability	EIA-364-09 10,000 cycles Test speed:200 cycles/hour Max.	Meet insertion / extraction force, no evidence of physical damage.
7	Random vibration	EIA-364-28, Condition VII-D, 2 hours in each of 3 mutually perpendicular directions. Both mating halves should be fixed rigidly.  (Power Spectral Density 0.02g <sup>2</sup> /Hz, Overall rms 3.10 g)	No evidence of physical damages and no discontinuity longer than 1 microsecond.
8	Sine vibration	EIA-364-28B  Amplitude: 1.52 mm(0.06 inch);  Frequency: 10 Hz up to 50 Hz in 1 minute, then 55 Hz down to 10 Hz; 2hours in each of 3 mutually perpendicular directions (X、 Y、 Z).	No evidence of physical damages and no discontinuity longer than 1 microsecond.
9	Mechanical shock	EIA-364-27B, half sine, 30 G, duration 11 ms; X, Y,Z,3 times each direction, total 18 times.	No evidence of physical damages and no discontinuity longer than 1 microsecond.
10	Insertion force	EIA-364-13 Maximum rate 12.5mm/min	Between 5 N and 20 N before and after durability.
11	Extraction force	EIA-364-13 Maximum rate 12.5mm/min	Extraction force:  I: no less than 8 N and no more than 20 N before and after 1,000 cycles durability.  II: no less than 6 N and no more than 20 N before and after 10,000 cycles durability.
12	Wrenching strength (Reference)	Apply a force on plug inserted into receptacle at a distance of 15 mm from the edge of the receptacle, five directions (left, right, up, down and insertion directions), speed : 25 mm/min, Refer to Appendix 1 on 108-115145 for test fixture	≥75N; (left, right, up, down ) ≥65N; (insertion direction) 10,000 cycles  No evidence of physical damages.
13	Strength durability	Test force: F3=F4=2kgf Applied to a plug when inserted at a distance of 15 mm from the edge of the receptacle. Apply 15 N force for 3,000 cycles . Speed : 15 times/min. Refer to Appendix 2 on 108-115145 for test fixture.	No evidence of physical damages.
14	360° rotation	Apply additional 800 g weight at a distance of 10 cm from the edge of receptacle,hold 10 seconds separately in degree 90,180, 270 and 360.	No discontinuity during rotation.
15	Tongue strength	Test method: 45° insertion into receptacle,until tongue of receptacle is destroyed.	70 N Min.
16	Slant insertion	Test method: 5-10° insertion into receptacle. 2,500 times per direction. Total four directions [as shown in Appendix 3 on 108-115145].	No mechanical damage. Contact resistance: Δ R =10m Ω Max Scrape damage on surface allowed.
<b>Environmental</b>			

	<b>TE Connectivity Shanghai Ltd</b>	<b>PAGE</b> 4/13	<b>NO</b> 501-115162	<b>REV</b> A	<b>LOC</b> ES
--	---	---------------------	-------------------------	-----------------	------------------

17	Thermal shock	EIA-364-32, Method A, Condition I, duration A-4 (-55°+85°C, 10 cycles) Recovery: 2 hours at ambient atmosphere. -55°C+0/-3°C: 30 minutes, 25°C+/-10°C: 5 minutes Max 85°C+3/-0°C: 30 minutes 25°C+/-10°C: 5 minutes Max	No mechanical damage. Contact resistance: $\Delta R = 10m \Omega$ Max. Insulation resistance >100M $\Omega$
18	Thermal disturbance	EIA-364-32 Cycle the mated connector pair 10 times between 15°C and 85°C. Ramp > 2°C/min Dwell > 5 mins (ensure contacts reach extreme temperature) Humidity not controlled.	No mechanical damage. Contact resistance: $\Delta R = 10m \Omega$ Max. Insulation resistance >100M $\Omega$
19	Thermal cycling	EIA-364-32 Cycle the mated connector pair 500 times between 15°C and 85°C.Ramp > 2°C/min Dwell > 5 mins (ensure contacts reach extreme temperature).Humidity not controlled.	No mechanical damage. Contact resistance: $\Delta R = 10m \Omega$ Max. Insulation resistance >100M $\Omega$
20	Salt spray	EIA-364-26B, temp. 35+/-2°C, 100% RH, Salt NaCl mist 5%.Clean and brush after 48 hours continuous spray on samples, , 35 degree baking within no more than 16 hours.	No mechanical damage. Contact resistance: $\Delta R = 10m \Omega$ Max.
21	Cyclic temperature and humidity	EIA-364-31B, Method IV, 25°C~65°C; 95% RH, total 240 hours S.1 25°C~65°C,90-98%RH, 2.5 hours S.2 65°C, 90-98%RH, 3 hours S.3 65°C~25°C,80-98%RH, 2.5 hours S.4 25°C~65°C,90-98%RH, 2.5 hours S.5 65°C, 90-98%RH, 3 hours S.6 65°C~25°C,80-98%RH, 2.5 hours S.7 25°C, 2 hours, 90-98%RH S.7a -10°C, 3 hours S.7 25°C, 3 hours, 90-98%RH S.1 – S.7 1 cycle 24 hours 10 cycles (240 hours)	No mechanical damage. Contact resistance: $\Delta R = 10m \Omega$ Max. Insulation resistance >100M $\Omega$
22	Temperature life	EIA-364-17A, Method A, condition 4 105°C, 120 hours, mated condition	No mechanical damage. Contact resistance: $\Delta R = 10m \Omega$ Max. Insulation resistance >100M $\Omega$
23	Temperature life (preconditioning)	EIA-364-17A, Method A, condition 4 105°C, 72 hours, mated condition.	No mechanical damage. Contact resistance: $\Delta R = 10m \Omega$ Max. Insulation resistance >100M $\Omega$
24	Mixed flowing gas	EIA-364-65, class IIA, 120 hours unmated, 120 hours mated (240 hours total). RH% 70+/-2, Temp. 30+/-1°C, Cl2: 10+/-3 ppb, NO2: 200+/-50 ppb, H2S: 10+/-5 ppb, SO2: 100+/-20 ppb	No mechanical damage. No change to performance. Contact resistance: $\Delta R = 10m \Omega$ Max.

	<b>TE Connectivity Shanghai Ltd</b>	<b>PAGE</b> 5/13	<b>NO</b> 501-115162	<b>REV</b> A	<b>LOC</b> ES
--	---	---------------------	-------------------------	-----------------	------------------

25	Resistance to soldering heat	EIA-364-56, Reflow cycles: 3 260°C for 30 seconds	No evidence of physical damages
26	Solderability	EIA-364-52, Temperature: 260+/-5°C Immersion time: 5+/-0.5 seconds	Solderable area shall have a minimum of 95% solder coverage.

	<b>TE Connectivity Shanghai Ltd</b>	<b>PAGE</b> <b>6/13</b>	<b>NO</b> 501-115162	<b>REV</b> A	<b>LOC</b> ES
--	---	----------------------------	-------------------------	-----------------	------------------

### 3. Qualifications Test Sequence

Table.2

Item/Test group	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
1	Visual inspection	1, 6	1, 18	1	1	1	1, 7	1, 7	1, 3	1, 6	1	1	1, 3	1, 9	1, 3
2	Contact resistance	2, 5	2, 5, 7, 9	3, 15	4, 7	2, 5, 7, 9	2, 8	2, 4	2, 4		2, 5	2, 5, 7, 9, 11		2, 6	
3	Insulation resistance			17			9	5	5					3, 7	
4	Dielectric withstanding voltage			2, 16			10	6	6					4, 8	
5	Temperature rise	4													
6	Reseating (3X)		8			8					6	10			
	Durability (50X)	3	3		2	3				3	3	3			
	Durability (1000X)			6											
	Durability (10000X)			9											
7	Random vibration			12	5										
8	Sine vibration			13	6										
9	Mechanical shock			14											
10	Insertion force			4, 7, 10			3, 6								
11	Extraction force			5, 8, 11			4, 7								
12	Wrenching strength						5								
13	Strength durability							3							
14	360° rotation								3						
15	Tongue strength									2					
16	Slant insertion													5	
17	Thermal shock		4												
18	Thermal disturbance											8			
19	Thermal cycling					6									
20	Salt spray									4					
21	Cyclic temperature and humidity		6												
22	Temperature life										4				
23	Temperature life (preconditioning)				3	4						4			
24	Mixed flowing gas											6			
25	Resistance to soldering heat												2		
26	Solderability														2
	Sample size (PCS)	5	5	5	5	5	5	5	5	5	5	5	5	5	5

4 Test Result:

	Test Item	No.	Condition	Test Result			Requirement	Judgment
				Max	Min	Ave		
Group A	LLCR	5	Initial	26.41	24.26	25.26	<40 mΩ	Pass
	Durability (preconditioning)	6	Initial	No physical damage occurred			No abnormalities	Pass
	Temperature rise(1.5A/Loop)	4	Initial	28.40	26.70	27.58	ΔT 30°C Max.	Pass
	Temperature rise(3.0A/Single pair)	2	Initial	17.40	14.60	16.10	ΔT 30°C Max.	Pass
	LLCR(ΔR)	5	Final	2.59	-1.72	0.57	<10 mΩ	Pass
	Group B	LLCR	5	Initial	24.73	22.62	23.73	<40 mΩ
Durability (50cycles)		5	Initial	No physical damage occurred			No abnormalities	Pass
Thermal Shock		5	Initial	No physical damage occurred			No abnormalities	Pass
LLCR(ΔR)		5	Final	0.28	-0.23	0.06	<10 mΩ	Pass
Cyclic temperature and humidity		5	Initial	No physical damage occurred			No abnormalities	Pass
LLCR(ΔR)		5	Final	0.08	-0.31	-0.11	<10 mΩ	Pass
Reseating		5	Final	No physical damage occurred			No abnormalities	Pass
LLCR(ΔR)		5	Final	0.05	-0.24	-0.09	<10 mΩ	Pass

	TE Connectivity Shanghai Ltd	PAGE 8/13	NO 501-115162	REV A	LOC ES
--	---------------------------------	--------------	------------------	----------	-----------



Group C	Dielectric withstanding voltage	5	Initial	No physical damage occurred			No abnormalities	Pass
	LLCR	5	Initial	24.72	22.56	23.68	<40 mΩ	Pass
	Insertion force	5	Initial	18.00	17.00	17.22	5N ~ 20 N	Pass
	Extraction force	5	Initial	13.20	11.10	11.88	8N ~20 N	Pass
	Durability (1000cycles)	5	Initial	No physical damage occurred			No abnormalities	Pass
	Insertion force	5	Final	14.70	13.50	14.06	5N ~ 20 N	Pass
	Extraction force	5	Final	12.20	10.30	10.94	8N ~20 N	Pass
	Durability (10000cycles)	5	Final	No physical damage occurred			No abnormalities	Pass
	Insertion force	5	Final	7.00	6.00	6.60	5N ~ 20 N	Pass
	Extraction Force	5	Final	9.10	7.60	8.24	6N ~20 N	Pass
	Random Vibration	5	Initial	No discontinuities of 1 microsecond or longer duration occurred			No abnormalities	Pass
	Sine Vibration	5	Initial	No discontinuities of 1 microsecond or longer duration occurred			No abnormalities	Pass
	Mechanical shock	5	Initial	No discontinuities of 1 microsecond or longer duration occurred			No abnormalities	Pass
	LLCR(ΔR)	5	Final	1.85	-2.10	-0.02	<10 mΩ	Pass
	Dielectric withstanding voltage	5	Final	No physical damage occurred			No abnormalities	Pass
	Insulation resistance	5	Final	3110	2860	4910	>100MΩ	Pass

	TE Connectivity Shanghai Ltd	PAGE 9/13	NO 501-115162	REV A	LOC ES
--	---------------------------------	--------------	------------------	----------	-----------

Group D	Durability (50cycles)	5	Initial	No physical damage occurred			No abnormalities	Pass
	Temperature life (preconditioning)	5	Initial	No physical damage occurred			No abnormalities	Pass
	LLCR	5	Initial	24.70	22.57	23.57	<40 mΩ	Pass
	Vibration (Random)	5	Final	No physical damage occurred			No abnormalities	Pass
	Sine Vibration	5	Final	No physical damage occurred			No abnormalities	Pass
	LLCR(ΔR)	5	Final	2.00	-2.05	0.05	<10 mΩ	Pass
Group E	LLCR	5	Initial	24.74	22.56	23.63	<40 mΩ	Pass
	Durability (50cycles)	5	Initial	No physical damage occurred			No abnormalities	Pass
	Temperature life (preconditioning)	5	Initial	No physical damage occurred			No abnormalities	Pass
	LLCR(ΔR)	5	Final	1.88	-2.03	0.08	<10 mΩ	Pass
	Thermal Cycling	5	Final	No physical damage occurred			No abnormalities	Pass
	LLCR(ΔR)	5	Final	1.79	-2.01	-0.01	<10 mΩ	Pass
	Reseating	5	Final	No physical damage occurred			No abnormalities	Pass
	LLCR(ΔR)	5	Final	1.76	-0.58	0.09	<10 mΩ	Pass

	TE Connectivity Shanghai Ltd	PAGE 10/13	NO 501-115162	REV A	LOC ES
--	---------------------------------	---------------	------------------	----------	-----------

Group F	LLCR	5	Initial	24.64	22.48	23.79	<40 mΩ	Pass
	Insertion force	5	Initial	13.10	10.90	12.54	5N ~ 20 N	Pass
	Extraction force	5	Initial	19.30	18.00	18.46	8N ~20 N	Pass
	Wrenching strength	5	Initial	No physical damage occurred			No abnormalities	Pass
	Insertion force	5	Initial	13.20	11.40	12.46	5N ~ 20 N	Pass
	Extraction force	5	Initial	18.20	17.10	17.68	6N ~20 N	Pass
	LLCR(ΔR)	5	Final	1.94	-2.07	-0.07	<10 mΩ	Pass
	Insulation resistance	5	Final	3350	2230	2883	>100MΩ	Pass
	Dielectric withstanding voltage	5	Final	No physical damage occurred			No abnormalities	Pass
Group G	LLCR	5	Initial	24.71	22.56	23.65	<40 mΩ	Pass
	Strength durability	5	Initial	No physical damage occurred			No abnormalities	Pass
	LLCR(ΔR)	5	Final	2.05	-2.02	0.05	<10 mΩ	Pass
	Insulation resistance	5	Final	2580	1020	2346	>100MΩ	Pass
	Dielectric withstanding voltage	5	Final	No physical damage occurred			No abnormalities	Pass
Group H	LLCR	5	Initial	24.63	22.46	23.63	<40 mΩ	Pass
	360° rotation	5	Initial	No physical damage occurred			No abnormalities	Pass
	LLCR(ΔR)	5	Final	2.03	-1.92	-0.09	<10 mΩ	Pass
	Insulation resistance	5	Final	2480	2140	2295	>100MΩ	Pass
	Dielectric withstanding voltage	5	Final	No physical damage occurred			No abnormalities	Pass

	TE Connectivity Shanghai Ltd	PAGE 11/13	NO 501-115162	REV A	LOC ES
--	---------------------------------	---------------	------------------	----------	-----------

Group I	Tongue strength	5	Initial	No physical damage occurred			No abnormalities	Pass
Group J	LLCR	5	Initial	24.82	22.59	23.73	<40 mΩ	Pass
	Durability (50 cycles)	5	Initial	No physical damage occurred			No abnormalities	Pass
	Salt spray	5	Initial	No physical damage occurred			No abnormalities	Pass
	LLCR(ΔR)	5	Final	7.86	-2.25	0.34	<10 mΩ	Pass
Group K	LLCR	5	Initial	24.72	22.56	23.62	<40 mΩ	Pass
	Durability (50 cycles)	5	Initial	No physical damage occurred			No abnormalities	Pass
	Temperature life	5	Initial	No physical damage occurred			No abnormalities	Pass
	LLCR(ΔR)	5	Final	1.87	-2.00	0.01	<10 mΩ	Pass
	Reseating	5	Final	No physical damage occurred			No abnormalities	Pass
	LLCR(ΔR)	5	Final	2.10	-1.94	-0.09	<10 mΩ	Pass
Group L	LLCR	5	Initial	25.58	21.41	22.64	<40 mΩ	Pass
	Durability (50 cycles)	5	Initial	No physical damage occurred			No abnormalities	Pass
	Temperature life (preconditioning)	5	Initial	No physical damage occurred			No abnormalities	Pass
	LLCR(ΔR)	5	Final	3.95	-5.19	0.23	<10 mΩ	Pass
	Mixed flowing gas	5	Final	No physical damage occurred			No abnormalities	Pass
	LLCR(ΔR)	5	Final	2.52	-8.70	-0.61	<10 mΩ	Pass
	Thermal disturbance	5	Final	No physical damage occurred			No abnormalities	Pass
	LLCR(ΔR)	5	Final	6.58	-4.99	1.31	<10 mΩ	Pass
	Reseating	5	Final	No physical damage occurred			No abnormalities	Pass
	LLCR(ΔR)	5	Final	7.30	-4.91	1.51	<10 mΩ	Pass
Group M	Resistance to soldering heat	5	Initial	No physical damage occurred			No abnormalities	Pass

	TE Connectivity Shanghai Ltd	PAGE 12/13	NO 501-115162	REV A	LOC ES
--	---------------------------------	---------------	------------------	----------	-----------

Group N	LLCR	5	Initial	24.74	22.57	23.62	<40 mΩ	Pass
	Insulation resistance	5	Final	2681	1021	2461	>100MΩ	Pass
	Dielectric withstanding voltage	5	Final	No physical damage occurred			No abnormalities	Pass
	Slant insertion	5	Final	No physical damage occurred			No abnormalities	Pass
	LLCR(ΔR)	5	Final	2.06	-2.10	-0.11	<10 mΩ	Pass
	Insulation resistance	5	Final	2781	1132	2789	>100MΩ	Pass
	Dielectric withstanding voltage	5	Final	No physical damage occurred			No abnormalities	Pass
Group O	Solderability	5	Final	Solderable area coverage more than 95%			Solderable area shall have a minimum of 95% solder coverage.	Pass

	<b>TE Connectivity Shanghai Ltd</b>	<b>PAGE 13/13</b>	<b>NO 501-115162</b>	<b>REV A</b>	<b>LOC ES</b>
--	---	-----------------------	--------------------------	------------------	-------------------