


Qualification Test Report

501- 115122-2 Rev.A

Product Specification : 108-115109-2

Date : 15Oct2015

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				Approved by Hapye.Wu					NO 501-115122-2	REV A	LOC ES
				PAGE 1 of 9	TITLE USB type-C Receptacle						
LTR	REVISION RECORD	DR	DATE								

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 Design Objective, 108-115109-2, Rev. 1.

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 listed in paragraph 1.5, meets the electrical, mechanical and environmental performance requirements of Product Specification, 108-115109-2, Rev. 1.

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 over palladium nickel plating in contact area, tin plating on solder area all over nickel plating. The housing material is thermoplastic UL94V-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-1, A-2,A-3,A-4,A-7, B-1, B-6, C-1 ¹ , C-2 ² .	Refer to test result.	2295018-2 ² 1-2295018-2	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%

¹ Additional test, not part of USB Type C Compliance Requirements

² Additional test, selection item for splash proof product.

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2. Test Method

Test requirement and Procedures summary

Table.1

Test Item	Procedures	Requirements
Electrical		
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 20mV (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.
Continuity	See USB Type C Compliance Document Appendix E.	No discontinuities or shorts allowed.
Dielectric Withstanding Voltage	EIA-364-20, Method B. Applicable to both receptacle and plug. 100VAC (rms) for 1 minute at sea level.	No break down shall occur when voltage is applied between adjacent contacts of unmated and mated connectors
Insulation Resistance	EIA 364-21 Applicable to both receptacle and plug. Apply 500V DC Apply the above specified voltage between adjacent contacts for 2 minute.	>100 MΩ insulation resistance between adjacent contacts of unmated and mated connectors
Current Rating	EIA 364-70, Method 2. See USB Type C Compliancy Document Appendix C. A current of 5.0 A shall be applied collectively to VBUS pins (i.e., pins A4, A9, B4, and B9) and 1.25 A applied to the VCONN pin (i.e., B5 of the plug connector) with the return path through the corresponding GND pins (i.e., pins A1, A12, B1, and B12). A minimum current of 0.25 A shall also be applied individually to all the other contacts. Allow to stabilize. Note: special T-rise test boards design per the guidelines in Appendix C of the USB Type C Compliancy Document are to be used.	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.

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Table.1 (Cont.)

Test Item	Procedures	Requirements
Mechanical		
Critical Dimension Inspection	See USB Type C Compliancy Document Appendix B.	Meet all critical dimension requirements defined in Appendix B.
Insertion Force	EIA-364-13 Maximum rate 12.5mm/min	Between 5N and 20N
Extraction Force	EIA-364-13 Maximum rate 12.5mm/min	Initial: 8 N to 20 N; After test: 6 N to 20 N
Durability	EIA 364-09 10,000 cycles	No evidence of physical damage
Durability (Preconditioning)	EIA 364-09 50 cycles	No evidence of physical damage
Reseating	Manually unplug/plug the connector. Perform 3 such cycles	No evidence of physical damage
4-Axis Continuity Test	See USB Type C Compliancy Document Appendix D for detailed test fixtures and procedures. Plug and Receptacle: Subject the mating interface to the moments defined in USB Type C Compliancy Document Appendix D for at least 10 seconds.	No discontinuities greater than 1 microsecond duration in any of the four orientations tested.

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Table.1 (End)

Test Item	Procedures	Requirements
Environmental		
Temperature Life	EIA-364-17, Method A 105°C, 120hrs	
Temperature Life (Preconditioning)	EIA-364-17, Method A 105°C, 72hrs	
Thermal Shock	EIA-364-32, Method A, Condition I, duration A-4 (-55°-+85°C, 10 cycles)	
Cyclic Temperature and Humidity	EIA-364-31, Method III, w/o optional cold shock and vibration. Exceptions per EIA-364-1000: - Cycle between 25°C/80%RH and 65°C/50%RH. - Ramp 0.5hr, dwell 1hr, dwell starts when conditions are stabilized. - 24 cycles total - Allowable variation $\pm 3^{\circ}\text{C}$ and $\pm 3\% \text{RH}$	
Vibration	EIA-364-28, Condition VII-D, 15min in each of 3 mutually perpendicular directions. Both mating halves should be fixed rigidly. (Power Spectral Density 0.02g ² /Hz, Overall rms 3.10g)	No evidence of physical damages and no discontinuity longer than 1 microsecond.
Mixed Flowing Gas	EIA-364-65, class IIA, 112hrs unmated, 56hrs mated (168hrs total).	
Thermal Disturbance	Cycle the mated connector pair 10 times between 15°C and 85°C. - ramp > 2°C/min - dwell > 5 mins (ensure contacts reach temperature) - Humidity not controlled	
Other		
Solderability	Category 3 Steam Age RMA Class 1 flux immerse in molten solder at a temperature of +255°C \pm 5°C at rate of 25.4 mm \pm 6.35 mm per second. Hold in solder for 5 +0/-0.5 seconds. To include solder pins and mounting pads.	Solderable area shall have a minimum of 95% solder coverage.
Water Ingression (selective for different P/N)	IEC 60529 - IPX4	No water is allowed to enter the enclosure. Use water contact detection paper or color liquid.

NOTE: (1) Shall meet visual requirements, show no physical damage, and meet requirements of additional tests as specified in the Product Qualification and Prequalification Test Sequence shown in table 2.

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3. Qualifications Test Sequence

Table.2

Test	A-1	A-2	A-3	A-4	A-7	B-1	B-6	C-1 ¹	C-2 ²
Low Level Contact Resistance	1,4,6	1,4,6,8	1,4,6	1,4,6,8,10	2,9				
Dielectric Withstanding Voltage					1,10				
Insulation Resistance					11				
Durability					6				
Durability (Preconditioning)	2	2	2	2					
Insertion Force					4,7				
Extraction Force					5,8				
Temperature Life	3			3					
Temperature Life (Preconditioning)			3						
Reseating	5	7		9	3				
Thermal Shock		3							
Cyclic Temperature and Humidity		5							
Vibration			5						
Mixed Flowing Gas				5					
Thermal Disturbance				7					
Current Rating							1		
4-Axis Continuity Test						1			
Solderability								1	
Water Ingression									1

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4 Test Result:

Group	Test Item	No.	Condition	Test Result			Requirement	Judgment
				Max	Min	Ave		
A-1	LLCR	5	Initial	39.47	22.93	29.83	<40 mΩ	Pass
	Durability (50cycles)	5	Initial	No physical damage occurred			No abnormalities	Pass
	Temperature life	5	Initial	No physical damage occurred			No abnormalities	Pass
	LLCR(ΔR)	5	Final	9.57	-9.62	-0.52	<10 mΩ	Pass
	Reseating	5	Final	No physical damage occurred			No abnormalities	Pass
	LLCR(ΔR)	5	Final	8.28	-8.63	-0.48	<10 mΩ	Pass

Group	Test Item	No.	Condition	Test Result			Requirement	Judgment
				Max	Min	Ave		
A-2	LLCR	5	Initial	39.90	22.36	30.08	<40 mΩ	Pass
	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	7.27	-9.75	-2.70	<10 mΩ	Pass
	Temperature and Humidity Cycle	5	Initial	No physical damage occurred			No abnormalities	Pass
	LLCR(ΔR)	5	Final	3.11	-9.78	-2.88	<10 mΩ	Pass
	Reseating	5	Final	No physical damage occurred			No abnormalities	Pass
	LLCR(ΔR)	5	Final	2.52	-9.80	-3.16	<10 mΩ	Pass

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Group	Test Item	No.	Condition	Test Result			Requirement	Judgment
				Max	Min	Ave		
A-3	Durability (50cycles)	5	Initial	No physical damage occurred			No abnormalities	Pass
	Temperature life (precondition)	5	Initial	No physical damage occurred			No abnormalities	Pass
	LLCR	5	Initial	38.91	24.27	32.39	LLCR	5
	Vibration (Random)	5	Final	No physical damage occurred			No abnormalities	Pass
	Sine Vibration	5	Final	No physical damage occurred			No abnormalities	Pass
	LLCR(Δ R)	5	Final	8.96	-5.31	1.02	LLCR(Δ R)	5

Group	Test Item	No.	Condition	Test Result			Requirement	Judgment
				Max	Min	Ave		
A-4	LLCR	5	Initial	39.94	23.42	30.62	<40 m Ω	Pass
	Durability (50cycles)	5	Initial	No physical damage occurred			No abnormalities	Pass
	Temperature life (precondition)	5	Initial	No physical damage occurred			No abnormalities	Pass
	LLCR(Δ R)	5	Final	9.60	-7.58	0.78	<10 m Ω	Pass
	MFG	5	Final	No physical damage occurred			No abnormalities	Pass
	LLCR(Δ R)	5	Final	9.47	-9.84	0.57	<10 m Ω	Pass
	Thermal disturbance	5	Final	No physical damage occurred			No abnormalities	Pass
	LLCR(Δ R)	5	Final	7.45	-6.98	0.05	<10 m Ω	Pass
	Reseating	5	Final	No physical damage occurred			No abnormalities	Pass
	LLCR(Δ R)	5	Final	9.72	-2.19	5.87	<10 m Ω	Pass

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	Test Item	No.	Condition	Test Result			Requirement	Judgment
				Max	Min	Ave		
Group A-7	Dielectric withstanding voltage	5	Initial	No physical damage occurred			No abnormalities	Pass
	LLCR	5	Initial	39.86	22.75	29.97	LLCR	5
	Reseating	5	Final	No physical damage occurred			No abnormalities	Pass
	Mating Force	5	Initial	19.61	10.73	14.64	Mating Force	5
	Un-mating Force	5	Initial	19.98	17.05	19.26	Un-mating Force	5
	Durability (10000cycles)	5	Final	No physical damage occurred			No abnormalities	Pass
	Mating Force	5	Final	16.10	13.96	17.22	Mating Force	5
	Un-mating Force	5	Final	18.22	13.30	16.29	Un-mating Force	5
	LLCR(Δ R)	5	Final	8.20	-3.41	-2.69	LLCR(Δ R)	5
	Dielectric withstanding voltage	5	Final	No physical damage occurred			No abnormalities	Pass
	Insulation resistance	5	Final	714	185	316	Insulation resistance	5

	Test Item	No.	Condition	Test Result			Requirement	Judgment
				Max	Min	Ave		
Group B-1	4-AXIS Continuity Test	5	Initial	No physical damage occurred			No abnormalities	Pass
Group B-2	Current Rating	5	Initial	27.41	20.66	24.78	Δ T 30°C Max.	Pass
Group C-1	Solderability	5	Final	Solderable area coverage more than 95%			Solderable area shall have a minimum of 95% solder coverage.	Pass
Group C-2	Grade of waterproof	5	Final	No water enter the enclosure.			No water is allowed to enter the enclosure.	Pass

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