Qualification Test Report

501-160299

Product Specification : 108-160251

Date : 29Jun2021

DIST

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A	**Initial Release**	R.M	29Jun 2021

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TITLE

USB 4.0 Receptacle
DUAL ROW SMT

1. Introduction

1.1 Objective

Testing was performed on the USB 4.0 Receptacle and Plug Lead Free Version connectors to determine if it meets the requirements of Product Specification, 108-160251, Rev. A.

1.2 Scope

This report covers the electrical, mechanical and environmental performance requirements of the USB 4.0 Receptacle and Plug Lead Free Version connectors.

1.3 Conclusion

The USB 4.0 Receptacle and Plug Lead Free Version connectors, meets the electrical, mechanical and environmental performance requirements of Product Specification, 108-160251, Rev. A.

1.4 Product Description

The USB 4.0 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	Refer to test result.	2385692-1	Receptacle Assembly

1.6 Environmental Conditions

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

Temperature range: +15℃ to +35℃

Humidity range: 25% to 85% RH

2. Test Method

Test requirement and Procedures summary

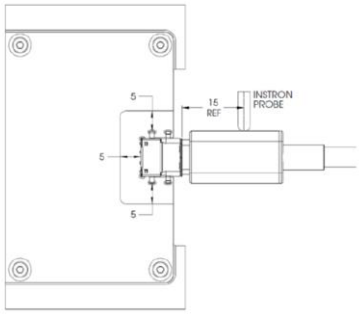
2.1 Examination of product:			
Item	Test Description	Test Methods	Requirement
2.1.1	Examination of product (Outward Appearance Structure)	**EIA-364-18** Shall be confirmed with eyes in accordance with each drawing. Shall be confirmed by using proper measuring instruments.	1).Outward appearance shall be good without such injurious problem 2).Structure shall be meet the design and dimensional requirements of drawing.
2.2 Electrical Performance:			
Item	Test Description	Test Methods	Requirement
2.2.1	Low Level Contact Resistance	**EIA-364-23B** Subject mated contacts assembled in housing to 20mV maximum open circuit at 100 mA maximum The object of this test is to detail a standard method to measure the electrical resistance across a pair of mated contacts such that the insulating films, if present, will not be broken or asperity melting will not occur.	The following requirement apply to the power and signal contacts 1). Initial: 40mΩ Maximum for VBUS, GND and all other contacts. 2). After test: 50 mΩ Maximum

2.2.2	Insulation Resistance	**EIA-364-21** Test between adjacent contacts of mated and unmated connector. This test procedure is used to determine the resistance offered by insulation connector to 500V DC potential current through or on the surface of the members.	100 MΩ Minimum
2.2.3	Dielectric Strength	**EIA-364-20** Test between adjacent contacts of mated and unmated connector assemblies. 100 V AC for one minute at sea level	1).No flashover or insulation breakdown 2).Leakage current: 0.5mA Maximum.
2.2.4	Contact Current Rating	**EIA-364-70 Method 2** When measured at an ambient temperature of 25℃. When the currents are applied to the contacts the temperature rise shall not exceed +△30℃ at any point on the USB 4.0 mated plug and receptacle under test	A current of 5 A shall be applied collectively to VBUS pins (i.e., pins A4, A9, B4, and B9) and 1.25 A shall be applied to the VCONN pin (i.e., B5) as applicable, terminated through the corresponding GND pins (i.e., pins A1, A12, B1, and B12). 0.25A for other contacts

2.3 Mechanical Performance:

Item	Test Description	Test Methods	Requirement
2.3.1	Random Vibration	**EIA-364-28 Test Condition VII Test Letter D**, Subject mated connectors to 3.10 G's rms. Fifteen minutes in each of three mutually perpendicular planes.	1).No discontinuities of 1 μ sec or longer duration 2).Shall meet visual requirement, show no physical damage.

2.3.2	Physical Shock	**EIA-364-27** Subject mated connectors to 30G's half-sine shock pulses of 11ms duration. Three shocks in each direction applied along three mutually perpendicular planes, total 18 shocks.	1).No discontinuities of 1 μ sec or longer duration 2).Shall meet visual requirement, show no physical damage.
2.3.3	Insertion Force	**EIA-364-13** Measure force necessary to mate assemblies at maximum rate of 12.5 mm per minute.	Range: 1 ~ 10,000 Cycles 5N~20N
2.3.4	Extraction Force	**EIA-364-13** Measure force necessary to unmate assemblies at maximum rate of 12.5 mm per minute.	1).Initial 6th cycles of 8~20N (1~5Insertion/Extraction preconditioning cycles) 2).Durability 32th extraction force shall be 33% of the initial reading and with in range 8~20N (6cycles additional 25 insertion/ extraction cycles) 3). After durability 10000 cycles of 6~20N

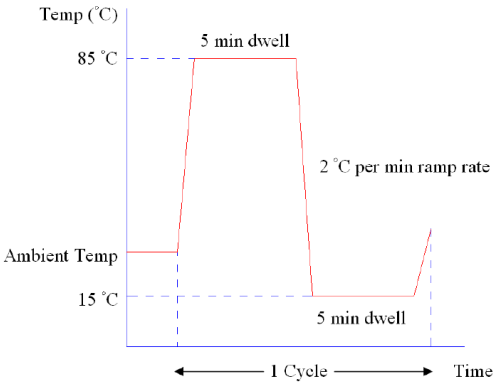
2.3.5	Durability	**EIA-364-09** Automatic equipment: 500± 50 cycles per hour.	1). Shall meet visual requirement, show no physical damage. 2). 10,000 Cycles
2.3.6	Reseating	**EIA-364-09** Automatic equipment: 500± 50 cycles per hour.	1). Shall meet visual requirement, show no physical damage. 2).Manually mating / unmating the connector. Perform 3 such cycles.
2.3.7	4-Axis Continuity Test	1.Test PCB T=1.0 mm 2.Shall be tested for continuity under stress using a test fixture. 3. Force and Moment requirements see the below table. 	1).No discontinuities of 1 μ sec or longer duration 2).Shall meet visual requirement, show no physical damage.

Receptacle configuration with respect to mounting surface	Force at 15 mm from receptacle shell mating edge (N)	Moment with respect to receptacle shell mating edge (Nm)
Right angle	20	0.30
Vertical[1]	8	0.12

Notes:
1. Any configuration of non-conductive shell receptacles shall be tested at the values specified for the vertical receptacle configuration.

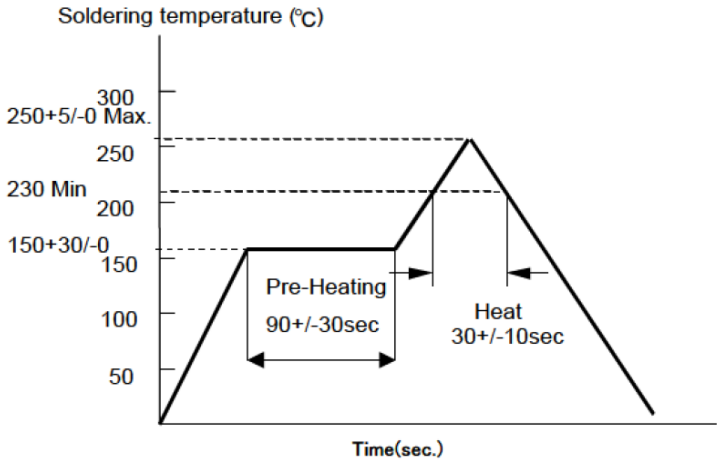
2.4 Environmental Performance:			
Item	Test Description	Test Methods	Requirement
2.4.1	Thermal Shock	**EIA-364-32, Test Condition I,** Subject mated connectors to 10 cycles between –55℃ to +85℃. The object of this test is to determine the resistance of a USB 4.0 connector to exposure at extremes of high and low temperatures and to the shock of alternate exposures to these extremes, simulating the worst case conditions for storage, transportation and application.	1). Shall meet visual requirement, show no physical damage. 2). Shall meet requirements of additional test as specified in TEST SEQUENCE in Section 3.
2.4.2	Cyclic Humidity	**EIA-364-31** Cycle the connector or socket between 25 °C ± 3 °C at 80 % ± 3% RH and 65 °C ± 3 °C at 50 % ± 3% RH. Ramp times should be 0.5 hour and dwell times should be 1.0 hour. Dwell times start when the temperature and humidity have stabilized within the specified levels. Perform 24 such cycles. The object of this test procedure is to detail a standard test method for the evaluation of the designs and materials used in USB 4.0 connectors as the effects of high humidity and heat influences them.	1). Shall meet visual requirement, show no physical damage. 2). Shall meet requirements of additional tests as specified in TEST SEQUENCE in Section 3
2.4.3	Salt Spray	**EIA-364-26** Subject mated connectors to 48 hours at 35℃ ±2℃ with 5%-Salt-solution concentration (for solderable Ni)	1).Shall meet visual requirement, show no physical damage. 2).Shall meet requirements of additional tests as specified in TEST SEQUENCE in Section 3

2.4 Environmental Performance:			
2.4.4	Temperature Life	**EIA-364-17 Test Condition 4 Method A,** 105º C without applied voltage for 120 hours.	1).Shall meet visual requirement, show no physical damage. 2).Shall meet requirements of additional tests as specified in TEST SEQUENCE in Section 3
2.4.5	Temperature Life (Preconditioning)	**EIA-364-17 Test Condition 4 Method A,** 105º C without applied voltage for 72 hours	1).Shall meet visual requirement, show no physical damage. 2).Shall meet requirements of additional tests as specified in TEST SEQUENCE in Section 3
2.4.6	Solderability	**EIA-364-52** Temperature: 255℃+/-5℃ Immersion time: 5+/-0.5 seconds	Solder shall cover a minimum of 95% of the surface being immersed.

2.4.7	Thermal Cycling	**EIA-364-32** Cycle Count: 500 Cycles Temperature High:+85℃± 3℃, uncontrolled humidity Temperature Low: +15℃± 3℃, uncontrolled humidity Ramp Rate: 2℃/min Dwell Time: 5 minutes at High and Low temperatures **Procedure Chart**  	1). Shall meet visual requirement, show no physical damage. 2). Shall meet requirements of additional tests as specified in TEST SEQUENCE in Section 3

Item	Test Description	Test Methods	Requirement
2.4.8	Resistance to Soldering Heat	For REFLOW SOLDERING : EIAJ RCX-0101/102. Pre-heat: 150 ± 10 ℃, 60 ~120 sec Temperature: 255 ± 5 ℃ Immersion duration: 30 ± 1 sec.	No mechanical defect on housing or other parts.

Recommended infrared reflow condition.



3. Qualifications Test Sequence

Test Group (a)		Sample Groups									
Item	Test Description	A	B	C	D	E	F	G	H	I	J
2.1.1	Examination of product	1,10	1,15	1,9	1,13	1,3	1,3	1,5	1,3	1,15	1,3
2.2.1	Low Level Contact Resistance	2,7	2,7,12	2,5,8	2,7,10			2,4		2,10	
2.2.2	Insulation Resistance		3,8,13		3,11					3,11	
2.2.3	Dielectric Strength		4,9,14		4,12					4,12	
2.2.4	Contact Current Rating						2				
2.3.1	Random Vibration			6						8	
2.3.2	Physical Shock									9	
2.3.3	Insertion Force	3,8								5,13	
2.3.4	Extraction Force	4,9								6,14	
2.3.5	Durability									7	
2.3.6	Reseating	6	6,11	4,7	6,9						
2.3.7	4-Axis Continuity Test										2
2.4.1	Thermal Shock		5								
2.4.2	Cyclic Humidity		10								
2.4.3	Salt Spray							3			
2.4.4	Temperature Life	5									
2.4.5	Temperature Life(Preconditioning)			3	5						
2.4.6	Solderability					2					
2.4.7	Thermal Cycling				8						
2.4.8	Resistance to Soldering Heat								2		
Number of Test Samples (Minimum)		5	5	5	5	5	5	5	5	5	5

Note:

a.Samples shall be prepared in accordance with applicable manufacture's instructions and shall be selected at random from current production.

b.The numbers in the table indicate sequence in which tests are performed.

c.All the tests shall be performed in the sequence, indicated by the number in the columns.

d.Each test group shall consist of minimum of five connectors. A minimum of 30 contacts shall be selected and identified. Unless otherwise specified, these contacts shall be used for all measurements.

4 Test Result:

	Test Item	No.	Condition	Test Result			Requirement	Judgment
				Max	Min	Ave		
Group A	Low Level Contact Resistance	5	Initial	29.88	17.28	21.92	<40 mΩ	Pass
	Insertion Force	5	Initial	15.40	13.00	14.34	5N ~ 20 N	Pass
	Extraction Force	5	Initial	15.60	13.50	14.08	8N ~20 N	Pass
	Temperature life	5	Initial	No physical damage occurred			No abnormalities	Pass
	Reseating	5	Initial	No physical damage occurred			No abnormalities	Pass
	Low Level Contact Resistance	5	Final	43.80	18.64	27.18	<50 mΩ	Pass
	Insertion Force	5	Final	16.90	13.80	15.44	5N ~ 20 N	Pass
	Extraction Force	5	Final	19.20	17.40	18.48	6N ~20 N	Pass
Group B	Low Level Contact Resistance	5	Initial	34.01	17.29	22.39	<40 mΩ	Pass
	Insulation Resistance	5	Initial	all test samples > 100MΩ			>100 MΩ	Pass
	Dielectric Strength	5	Initial	No physical damage occurred			No abnormalities	Pass
	Thermal Shock	5	Initial	No physical damage occurred			No abnormalities	Pass
	Reseating	5	Initial	No physical damage occurred			No abnormalities	Pass
	Low Level Contact Resistance	5	Final	37.45	14.23	22.00	<50 mΩ	Pass
	Insulation Resistance	5	Final	all test samples > 100MΩ			>100 MΩ	Pass
	Dielectric Strength	5	Final	No physical damage occurred			No abnormalities	Pass
	Cyclic Humidity	5	Initial	No physical damage occurred			No abnormalities	Pass
	Reseating	5	Final	No physical damage occurred			No abnormalities	Pass
	Low Level Contact Resistance	5	Final	30.71	16.60	21.55	<50 mΩ	Pass
	Insulation Resistance	5	Final	all test samples > 100MΩ			>100 MΩ	Pass
	Dielectric Strength	5	Final	No physical damage occurred			No abnormalities	Pass

Group C	Low Level Contact Resistance	5	Initial	30.51	17.43	22.16	<40 mΩ	Pass
	Temperature life (Preconditioning)	5	Initial	No physical damage occurred			No abnormalities	Pass
	Reseating	5	Initial	No physical damage occurred			No abnormalities	Pass
	Low Level Contact Resistance	5	Final	33.19	18.56	25.17	<50 mΩ	Pass
	Random Vibration	5	Initial	No discontinuities of 1 microsecond or longer duration occurred			No abnormalities	Pass
	Reseating	5	Final	No physical damage occurred			No abnormalities	Pass
	Low Level Contact Resistance	5	Final	30.84	18.29	24.84	<50 mΩ	Pass
Group D	Low Level Contact Resistance	5	Initial	29.84	17.29	22.23	<40 mΩ	Pass
	Insulation Resistance	5	Initial	all test samples > 100MΩ			>100 MΩ	Pass
	Dielectric Strength	5	Initial	No physical damage occurred			No abnormalities	Pass
	Temperature life (Preconditioning)	5	Initial	No physical damage occurred			No abnormalities	Pass
	Reseating	5	Initial	No physical damage occurred			No abnormalities	Pass
	Low Level Contact Resistance	5	Final	30.21	18.45	23.75	<50 mΩ	Pass
	Thermal Cycling	5	Initial	No physical damage occurred			No abnormalities	Pass
	Reseating	5	Final	No physical damage occurred			No abnormalities	Pass
	Low Level Contact Resistance	5	Final	27.78	17.34	22.64	<50 mΩ	Pass
	Insulation Resistance	5	Final	all test samples > 100MΩ			>100 MΩ	Pass
	Dielectric Strength	5	Final	No physical damage occurred			No abnormalities	Pass
Group E	Solderability	5	Initial	Solderable area coverage more than 95%			Solderable area shall have a minimum of 95% solder coverage.	Pass
Group F	Contact Current Rating	5	Initial	all test samples △ T<30℃			△ T<30℃	Pass
Group G	Low Level Contact Resistance	5	Initial	28.48	16.68	21.46	<40 mΩ	Pass
	Salt Spray	5	Initial	No physical damage occurred			No abnormalities	Pass
	Low Level Contact Resistance	5	Final	30.40	16.47	21.29	<50 mΩ	Pass

Group H	Resistance to Soldering Heat	5	Initial	No physical damage occurred			No abnormalities	Pass
Group I	Low Level Contact Resistance	5	Initial	27.84	17.32	22.04	<40 mΩ	Pass
	Insulation Resistance	5	Initial	all test samples > 100MΩ			>100 MΩ	Pass
	Dielectric Strength	5	Initial	No physical damage occurred			No abnormalities	Pass
	Insertion Force	5	Initial	16.60	15.10	15.68	5N ~ 20 N	Pass
	Extraction Force	5	Initial	19.90	16.20	18.74	8N ~20 N	Pass
	Durability	5	Initial	No physical damage occurred			No abnormalities	Pass
	Random Vibration	5	Initial	No discontinuities of 1 microsecond or longer duration occurred			No abnormalities	Pass
	Physical Shock	5	Initial	No discontinuities of 1 microsecond or longer duration occurred			No abnormalities	Pass
	Low Level Contact Resistance	5	Final	28.61	16.60	20.61	<50 mΩ	Pass
	Insulation Resistance	5	Final	all test samples > 100MΩ			>100 MΩ	Pass
	Dielectric Strength	5	Final	No physical damage occurred			No abnormalities	Pass
	Insertion Force	5	Final	11.10	9.70	10.34	5N ~ 20 N	Pass
	Extraction Force	5	Final	11.20	9.60	10.50	6N ~20 N	Pass
Group J	4-Axis Continuity	5	Initial	No discontinuities of 1 microsecond or longer duration occurred			No abnormalities	Pass