


# Qualification Test Report

501-115002 Rev.A

Product Specification : 108-115001

Date : 2Jun2010

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A	<b>Initial release</b>	F.L	2Jun 2010	Prepared by Francis Lee		 <b>Tyco Electronics</b> - Tyco Electronics Shanghai Ltd		
				Reviewed by Martin Li				
				Approved by Steven Yao		NO 501-115002	REV A	LOC ES
				PAGE 1 of 9	TITLE USB 3.0 Plug & Receptacle			
LTR	REVISION RECORD	DR	DATE					

1. Introduction

1.1 Objective

Testing was performed on the USB Consortium, Plug & Receptacle Lead Free Version connectors to determine if it meets the requirements of Design Objective, 108-115001, Rev. A.

1.2 Scope

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

1.3 Conclusion

The USB Consortium, Plug & Receptacle Lead Free Version connectors listed in paragraph 1.5, meets the electrical, mechanical and environmental performance requirements of Product Specification, 108-115001, Rev. A.

1.4 Product Description

The USB Consortium Plug & Receptacle 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
1,2,3,4,5,6,7,8,9.	5 ea.		Cable Assembly
1,2,3,4,5,6,7,8,9.	5 ea.		Receptacle Assembly

1.6 Environmental Conditions

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

Temperature: 15°C to 35°C

Relative Humidity: 20 to 80%

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## 2. Test Method

### Test requirement and Procedures summary

Para.	Test Items	Requirements	Procedures
2.1	Examination of Product	Meets requirements of product drawing	Visual inspection No physical damage
Electrical Requirements			
2.2	Low level contact resistance	30 mΩ Max initial for VBUS and GND contacts (pin1, pin4, pin7) 50 mΩ Max. initial for all other contacts(pin2, pin3, pin5,pin6,pin8, pin9) Maximum change (delta) of +10m Ω after environmental stresses	EIA 364-23 Subject mated contacts assembled in housing to 20 mV Max. open circuit at 10 mA
2.3	Dielectric withstanding voltage	No creeping discharge nor flashover shall occur.	EIA 364-20 0.1k VAC for 1 minute. Current leakage: 5 mA Max. Test between adjacent contacts of unmated and mated connectors.
2.4	Insulation Resistance	A minimum of 100MΩ insulation resistance	EIA 364-21 Test between adjacent contacts of unmated and mated connectors
2.5	Contact Current Rating	The current is applied to the contacts, the delta temperature shall not exceed +30°C at any point on the USB 3.0 connectors under test, when measured at an ambient temperature of 25°C	EIA 364-70,Method 2 A current of 1.8A shall be applied to VBUS pin and its corresponding GND pin (pin1, pin4, pin7). Additionally, a minimum current of 0.25A shall be applied to all the other contacts (pin2, pin, pin5, pin6, pin8, pin9)
Mechanical Requirements			
2.6	Durability	No physical damage to any part of the Connectors and the cable assembly shall occur.	EIA-364-09 Mate and unmate samples for 1500 cycles at maximum rate of 200 cycles per hour
2.7	Vibration	No electrical discontinuities greater than 1 microsecond shall occur. No evidence of physical damage. See Note	EIA-364-28,test condition VII ,test condition letter D, Subject mated connectors.15 minutes in each of 3 mutually perpendicular planes.
2.8	Physical Shock	No electrical discontinuity greater than 1 microsecond shall occur.	EIA-364-27,test condition H, Except 30 G's subject mated connectors to 30G's half-sine shock pulses of 11 millisecond duration applied along the 3 mutually perpendicular planes, total 18 shocks
2.9	Mating Force	35N maximum	EIA-364-13 ,Method A Measure force necessary to mate samples at maximum rate of 12.5mm a minute.

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Para.	Test Items	Requirements	Procedures
2.10	Unmating Force	10N minimum initial and 8N after the specified mate / unmate or durability cycles	EIA-364-13 ,Method A Measure force necessary to unmate samples at maximum rate of 12.5mm per minute.
2.11	Solder ability	Solderable area shall have minimum of 95% solder coverage	EIA-364-52 Subject surface mount samples to solder ability
2.12	Reseating	No evidence of physical damage	Manually unplug/plug the connector .Perform 3 such cycles
2.13	Cable Flexing	No physical damage or discontinuity over 1 ms	EIA 364-41 ,Condition I during flexing shall occur to the cable assembly with Dimension X=3.7 times the cable diameter and 100 cycles in each of two planes
2.14	Cable Pull-Out	No physical damage to the cable assembly shall occur	EIA 364-38 Condition A Its subjected to a 40N axial load for minimum of 1 minute while clamping one of the cable plug
<b>Environmental Requirements</b>			
2.15	Thermal Shock	30 mΩ Max initial for VBUS and GND contacts (pin1 ,pin4 ,pin7) 50 mΩ Max. initial for all other contacts,(pin2,pin3,pin5,pin6,pin8,pin9) Maximum change (delta) of +10m Ω after environmental stresses	EIA 364-32 Condition I Subject mated samples to 25 cycles between -55 °C and +85°C
2.16	Temperature Life	30 mΩ Max initial for VBUS and GND contacts (pin1 ,pin4 ,pin7) 50 mΩ Max. initial for all other contacts,(pin2,pin3,pin5,pin6,pin8,pin9) Maximum change (delta) of +10m Ω after environmental stresses	EIA 364-17 ,Method A Subject mated samples to temperature life at 105 °C for 120 hours
2.17	Cyclic temperature & humidity	30 mΩ Max initial for VBUS and GND contacts (pin1 ,pin4 ,pin7) 50 mΩ Max. initial for all other contacts,(pin2,pin3,pin5,pin6,pin8,pin9) Maximum change (delta) of +10m Ω after environmental stresses	EIA 364-31 ,Method II Subject samples to between 25°C ±3°C at 80% ±3% RH and 65°C ±3°C at 50% ±3% RH, ramp times should be 0.1 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
2.18	Thermal disturbance	30 mΩ Max initial for VBUS and GND contacts (pin1 ,pin4 ,pin7) 50 mΩ Max. initial for all other contacts,(pin2,pin3,pin5,pin6,pin8,pin9) Maximum change (delta) of +10m Ω after environmental stresses	Cycle samples to between 15°C ±3°C and 85°C ±3°C, as measured on the part ramps should be a minimum of 2°C per minute, And dwell times should insure that the contacts reach the temperature extremes (a minimum of 5 minutes). Humidity is not controlled .perform 10 such cycles.
2.19	Thermal Cycling	30 mΩ Max initial for VBUS and GND contacts (pin1 ,pin4 ,pin7) 50 mΩ Max. initial for all other contacts,(pin2,pin3,pin5,pin6,pin8,pin9) Maximum change (delta) of +10m Ω after environmental stresses	Cycle samples to between 15°C ±3°C and 85°C ±3°C, as measured on the part.ramps should be a minimum of 2°C per minute,. And dwell times should insure that the contacts reach the temperature extremes (a minimum of 5 minutes). Humidity is not controlled .perform 500 such cycles.

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2.20	Mixed flowing gas	30 mΩ Max initial for VBUS and GND contacts (pin1 ,pin4 ,pin7) 50 mΩ Max. initial for all other contacts,(pin2,pin3,pin5,pin6,pin8,pin9) Maximum change (delta) of +10mΩ after environmental stresses	EIA 364-65 ,class IIA Subject samples to environmental, class IIA for 14 days. Final LLCR should be measured after 1 hour from the end of test, Detail request see NOTE
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### 3. Qualifications Test Sequence

Test of Examination	Test Group								
	1	2	3	4	5	6	7	8	9
	Test Sequence								
Examination of Product	1,12	1,10	1,9	1	1,10	1,3	1,7	1,5	1,3
Low level contact resistance	2,7,9	2,5,7,9	2,5,8	2,5,7,9	2,5,7,9		3,5		
Dielectric Withstanding Voltage							2,6		
Insulation Resistance								2	
Contact current rating						2			
Durability	5	3(a)	3(a)	3(a)	3(a)		4		
Vibration			6						
Physical Shock			7						
Mating force	3,10								
Unmating force	4,11								
Solder ability									2
Reseating	8	8		8	8				
Cable flexing								3	
Cable Pull-Out								4	
Thermal Shock		4							
Temperature Life	6		4(b)	4(b)	4(b)				
Cyclic Temperature & Humidity		6							
Thermal Disturbance				8					
Thermal Cychling					6				
Mixed Flowing Gas				6					

(a) Proconditioning 5 cycles

**NOTE**

(b) Proconditioning 105°C for 72 hours

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4 Test Result:

Group	Test Item	N	Condition	Test Result			Requirement	Judgment
				Max	Min	Ave		
1	Examination of Product	5	Initial	No physical damage occurred			No abnormalities	Pass
	LLCR(Pin1,4,7)	5	Initial	12.96	6.94	8.44	<30mΩ	Pass
	LLCR(Pin2,3,5,6,8,9)			13.56	10.11	11.89	<50mΩ	
	Mating Force	5	Final	15.69	12.16	13.77	<35N	Pass
	Unmating Force	5	Final	22.06	19.53	21.14	>10N	Pass
	Durability	5	Final	No physical damage occurred			No abnormalities	Pass
	Temperature Life	5	Final	Pastern come out from the plug			No abnormalities	Pass
	LLCR (ΔR)	5	Final	8.06	-1.58	2.79	<10 mΩ	Pass
	Reseating	5	Final	No physical damage occurred			No abnormalities	Pass
	LLCR (ΔR)	5	Final	9.01	-0.42	4.04	<10 mΩ	Pass
	Mating Force	5	Final	17.51	9.25	12.02	<35N	Pass
	Unmating Force	5	Final	17.03	12.66	14.79	>8N	Pass
	Examination of Product	5	Final	Pastern come out from the plug			No abnormalities	Pass
2	Examination of Product	5	Initial	No physical damage occurred			No abnormalities	Pass
	LLCR(Pin1,4,7)	5	Initial	8.54	5.73	7.40	<30mΩ	Pass
	LLCR(Pin2,3,5,6,8,9)			13.62	9.83	11.51	<50mΩ	
	Durability	5	Final	No physical damage occurred			No abnormalities	Pass
	Thermal Shock	5	Final	No physical damage occurred			No abnormalities	Pass
	LLCR (ΔR)	5	Final	3.97	-3.57	0.13	<10 mΩ	Pass
	Cyclic Temperature Humidity	5	Final	No physical damage occurred			No abnormalities	Pass
	LLCR (ΔR)	5	Final	3.20	-2.73	-0.03	<10 mΩ	Pass

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Group	Test Item	N	Condition	Test Result			Requirement	Judgment
				Max	Min	Ave		
	Reseating	5	Final	No physical damage occurred			No abnormalities --	Pass
	LLCR ( $\Delta R$ )	5	Final	2.79	-2.22	0.01	<10 m $\Omega$	Pass
	Examination of Product	5	Final	No physical damage occurred			No abnormalities	Pass
3	Examination of Product	5	Initial	No physical damage occurred			No abnormalities	Pass
	LLCR(Pin1,4,7)	5	Initial	7.91	5.94	6.74	<30m $\Omega$	Pass
	LLCR(Pin2,3,5,6,8,9)			12.32	9.53	10.85	<50m $\Omega$	
	Durability	5	Final	No physical damage occurred			No abnormalities	Pass
	Temperature Life	5	Final	No physical damage occurred			No abnormalities	Pass
	LLCR ( $\Delta R$ )	5	Final	8.08	-0.51	2.66	<10 m $\Omega$	Pass
	Vibration	5	Final	No discontinuities of 1 microsecond or longer duration occurred			No abnormalities	Pass
	Physical Shock	5	Final	No discontinuities of 1 microsecond or longer duration occurred			No abnormalities	Pass
	LLCR ( $\Delta R$ )	5	Final	6.71	-0.91	2.33	<10 m $\Omega$	Pass
	Examination of Product	5	Final	No physical damage occurred			No abnormalities	Pass
4	Examination of Product	5	Initial	No physical damage occurred			No abnormalities	Pass
	LLCR(Pin1,4,7)	5	Initial	14.79	7.51	8.92	<30m $\Omega$	Pass
	LLCR(Pin2,3,5,6,8,9)			13.48	10.38	12.11	<50m $\Omega$	
	Durability	5	Final	No physical damage occurred-			No abnormalities	Pass

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Group	Test Item	N	Condition	Test Result			Requirement	Judgement
				Max	Min	Ave		
	Temperature Life	5	Final	No physical damage occurred			No abnormalities	Pass
	LLCR ( $\Delta R$ )	5	Final	1.34	-2.97	-0.37	<10 m $\Omega$	Pass
	Mix Flow Gas	5	Final	No physical damage occurred			No abnormalities	Pass
	LLCR ( $\Delta R$ )	5	Final	3.36	-1.23	0.46	<10 m $\Omega$	Pass
	Thermal Disturbance	5	Final	No physical damage occurred			No abnormalities	Pass
	Reseating	5	Final	No physical damage occurred			No abnormalities	Pass
	LLCR ( $\Delta R$ )	5	Final	3.24	-0.84	0.71	<10 m $\Omega$	Pass
	Examination of Product	5	Final	No physical damage occurred			No abnormalities	Pass
5	Examination of Product	5	Initial	No physical damage occurred			No abnormalities	Pass
	LLCR(Pin1,4,7)	5	Initial	9.15	6.41	7.67	<30m $\Omega$	Pass
	LLCR(Pin2,3,5,6,8,9)			12.55	10.15	11.44	<50m $\Omega$	
	Durability	5	Final	No physical damage occurred			No abnormalities	Pass
	Temperature Life	5	Initial	No physical damage occurred			No abnormalities	Pass
	LLCR ( $\Delta R$ )	5	Final	3.33	-1.46	0.91	<10 m $\Omega$	Pass
	Thermal Cycling	5	Final	No physical damage occurred			No abnormalities	Pass
	LLCR ( $\Delta R$ )	5	Final	4.25	-1.36	0.87	<10 m $\Omega$	Pass
	Reseating	5	Final	No physical damage occurred			No abnormalities	Pass
	LLCR ( $\Delta R$ )	5	Final	2.80	-0.16	0.68	<10 m $\Omega$	Pass
	Examination of Product	5	Final	No physical damage occurred			No abnormalities	Pass

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Group	Test Item	N	Condition	Test Result			Requirement	Judgement	
				Max	Min	Ave			
6	Examination of Product	5	Initial	No physical damage occurred			No abnormalities	Pass	
	Contact Current Rating (Pin1,4,7)	5	Final	9.57	4.55	7.00	<30°C	Pass	
	Contact Current Rating (Pin2,3,5,6,8,9)			15.13	10.24	12.92	<30°C		
	Examination of Product	5	Final	No physical damage occurred			No abnormalities	Pass	
7	Examination of Product	5	Initial	No physical damage occurred			No abnormalities	Pass	
	Dielectric Withstanding Voltage (mated)	5	Initial	No physical damage occurred			No abnormalities	Pass	
	Dielectric Withstanding Voltage (unmated)	5	Initial	No physical damage occurred			No abnormalities	Pass	
	LLCR(Pin1,4,7)	5	Initial	10.15	7.43	8.65	<30m Ω	Pass	
	LLCR(Pin2,3,5,6,8,9)			13.55	11.25	12.34	<50m Ω	Pass	
	Durability	5	Final	No physical damage occurred			No abnormalities	Pass	
	LLCR (ΔR)	5	Final	4.25	-1.95	0.78	<10 m Ω	Pass	
	Dielectric Withstanding Voltage (mated)	5	Final	No physical damage occurred			No abnormalities	Pass	
	Dielectric Withstanding Voltage (unmated)	5	Final	No physical damage occurred			No abnormalities	Pass	
	Examination of Product	5	Final	No physical damage occurred			No abnormalities	Pass	
8	Examination of Product	5	Initial	No physical damage occurred			No abnormalities	Pass	
	Insulation Resistance	5	Initial	7.30E+11	4.76E+10	1.77E+11	>100M Ω	Pass	
	Cable Flexing	5	Final	There are discontinuities of 1 microsecond or longer duration occurred			No abnormalities	Pass	
	Cable Pull-out	5	Initial	No performed			No abnormalities	Pass	
	Examination of Product	5	Final	No physical damage occurred			No abnormalities	Pass	
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Group	Test Item	N	Condition	Test Result			Requirement	Judgement
				Max	Min	Ave		
9	Examination of Product	5	Initial	No physical damage occurred			No abnormalities	Pass
	Solderability	5	Initial	There are minimum of 95% solder coverage			No abnormalities	Pass
	Examination of Product	5	Final	No physical damage occurred			No abnormalities	Pass

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