


NUMBER GS-12-1336	TYPE PRODUCT SPECIFICATION		
TITLE USB Type C Connectors		PAGE 1 of 10	REVISION A
		AUTHORIZED BY Kenny Tai	DATE 2015-09-25
		CLASSIFICATION UNRESTRICTED	

1.0 Objective

This specification defines the performance, test, quality and reliability requirements of the USB Type C Plug and Receptacle Connectors.

2.0 Scope

This specification is applicable to the termination characteristics of the USB Type C Connector family of products which provides electrical interconnecting between computing platforms and peripheral devices.

3.0 Ratings

- 3.1 Operating Voltage Rating: 100VA C/DC
- 3.2 Operating Current Rating: 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 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.)
- 3.3 Operating Temperature Range: -55°C~ +85°C (*includes the terminal temperature rise when powered*)

4.0 Applicable Documents

- 4.1 FCI Product drawings
- 4.2 EIA-364: Electrical Connector/Socket Test Procedures Including Environmental Classifications
- 4.3 Flammability: UL94V-0 or similar applicable specification
- 4.4 FCI Laboratory Reports

5.0 Requirements

5.1 Qualification


Connectors furnished under this specification shall be capable of meeting the qualification test requirements specified herein.

5.2 Material

The material for each component shall be as specified herein or equivalent.


5.3 Finish

The finish for applicable components shall be as specified herein or equivalent.

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5.4 Design and Construction

Connectors shall be of the design, construction, and physical dimensions specified on the applicable product drawing. There shall be no cracks, burrs, or other physical defects that may impair performance.


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6.0 Test Requirements and Procedures Summary


TEST ITEMS		REQUIREMENT	PROCEDURE
1	Examination of Product	Meet requirements of product drawing. No physical damage.	Visual inspection
ELECTRICAL REQUIREMENTS			
2	Low Level Contact Resistance	1. 40mΩ max. initial for VBUS, GND and all other pins 2. Max. change (delta) of 10mΩ after environmental stresses	EIA-364-23 Subject mated contacts assembled in housing to 20mV max. open circuit at 100mA max. Refer to <u>Fig. 1</u>
3	Dielectric Withstanding Voltage	No creeping discharge nor flashover shall occur	EIA-364-20 Apply 100 VAC for 1 min. between adjacent contacts of unmated and mated connectors.
4	Insulation Resistance	Min. 100 MΩ	EIA-364-21 Test between adjacent contacts of unmated and mated connectors.
5	Temperature Rise	30°C max. under loaded rating current.	EIA-364-70 Contacts are series-wired. Apply test current of loaded rating current to the circuit, and measure the temperature rise by probing on soldered areas of contacts. After the temperature stabilized, deduct ambient temperature from the measured value.
MECHANICAL REQUIREMENTS			
6	Mating Force	5~20N	EIA-364-13 Operation Speed: 12.5 mm/min. Measure the force required to mate connectors.
7	Unmating Force	8~20N for 1~1000 cycles. 6~20N for 1001~10000 cycles.	EIA-364-13 Operation Speed: 12.5 mm/min. Measure the force required to unmate connectors.
8	Durability	No evidence of physical damage	EIA-364-09 Operation Speed: 200 cycles per hour. Durability Cycles: 10000 Cycles

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9	Durability (Preconditioning)	No evidence of physical damage	EIA-364-09 Perform 50 mating/unmating cycles
10	Vibration	Appearance: no damage. Discontinuity: 1 microsecond Max.	EIA-364-28 Condition VII, Test letter D Subject mated connectors to 10-55-10Hz traversed in 1minutes at 1.52mm amplitude. 15 minutes each of 3 mutually perpendicular planes.
11	4-Axes Continuity	No discontinuities greater than 1 microsecond duration in any of the four orientations tested.	Four directions (left, right, up and down) Receptacle: Subject the plug at a distance of 15mm from the mating edge of the rec. shell for at least 10 seconds. Refer to <u>Fig. 2</u> for the force and moment to be applied.
12	Wrenching Strength (Plug only)	No damage shall occur to the plug when a moment of 0.75 Nm is applied (at the front surface of the fixture). The plug shall be mated with a continuity test fixture after the test forces have been applied to verify no damage has occurred that causes discontinuity or shorting.	Perpendicular forces are applied to the plug in four directions (i.e., left, right, up, and down). A metal fixture with opening and tongue representative of a receptacle shall be used.
13	Reseating	No evidence of physical damage	Manually unplug/plug the connector or socket, perform 3 such cycles.
ENVIRONMENTAL REQUIREMENTS			
14	Solderability (Receptacle Only)	The inspected area of each lead must have 95% solder coverage min.	Steam Aging Preconditioning: 1. Intended for non-tin and non-tin-alloy lead finishes at 93+3/-5°C for 1hrs. 2. Intended for tin and tin-alloy lead finishes at 93+3/-5°C for 8hrs. (JESD22-B102, Condition C) Solder pot temperature: 245±5°C, 5sec.

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15	Resistance to Reflow Soldering Heat (Receptacle Only)	No physical damage shall occur. (Lead-Free) (See Note 2)	Pre-soak condition: 85°C/85%RH for 168 hours. Pre Heat: 150~180°C, 90±30 sec. Heat: 230°C Min., 30±10 sec. Peak Temp.: 260+0/-5°C, 20~40sec. Duration: 3 cycles See Fig. 3
16	Thermal Shock	See Note 1	EIA-364-32 Test Condition I Mated Connectors Repeat 10 cycles between -55+/-3°C (30 min.) and +85+/-2°C (30 min.)
17	Thermal Cycling	See Note 1	EIA364-110 Cycle mated connector between 15°C+/-3°C and 85°C+/-3°C. Ramps should be 2°C min. per minute, and dwell time should ensure the contacts reach the temperature extremes (5 minutes min.). Humidity is not controlled. Perform 10 such cycles.
18	Mixed Flowing Gas	See Note 1	EIA-364-65 Subject mated connectors into the chamber. The connectors shall be mounted on appropriate LLCR boards and exposed to: a) Relative Humidity: 70%+/-2% b) Temperature: 30°C+/-1°C c) Duration: 7 days. d) Environmental Class: IIA
19	Humidity	See Note 1	EIA-364-31 Method II Test Condition A Subject mated connectors and perform 24 cycles
20	Temperature Life	See Note 1	EIA-364-17 Method A Mated Connector at 105°C for 120 hours
21	Temperature Life (Precondition)	See Note 1	EIA-364-17 Method A Mated Connector at 105°C for 72 hours

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22	Salt Spray	No detrimental corrosion allowed on contact area and base metal exposed.	EIA-364-26B Subject mated connectors to 35+/-2 °C and 5+/-1% salt solution for 48hours. After test, rinse the sample with water and recondition the room temperature for 1 hour.
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Note 1. Shall meet visual requirements, show no physical damage, and meet requirement of additional tests as specified in the test sequence.


Note 2. Resistance to soldering process is indicated on notes of customer drawing. Select the appropriate test type which drawing notes are matched with.

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7.0 Product Qualification and Test Sequence

Test or Examination	Test Groups										
	A	B	C	D	E	F	G	H	I	J	K
	Test Sequences										
Examination of Product	1,8	1,10	1,8	1,12	1,13	1,3	1,3	1,3	1,3	1,5	1,5
Low Level Contact Resistance	2,5,7	2,5,7,9	2,5,7	2,5,7,9,11	3,10					2,4	2,4
Dielectric Withstanding Voltage					2,11						
Insulation Resistance					12						
Temperature Rise						2					
Mating Force					4						
Un-mating Force					5,7,9						
Durability					6,8 (*)						
Durability (Preconditioning)	3	3	3	3							
Vibration			6								
4-Axes Continuity							2				
Wrenching Strength(Plug only)								2			
Reseating	6	8		10							
Solderability									2		
Resistance to Reflow Soldering Heat										3	
Thermal Shock		4									
Thermal Cycling				8							
Humidity		6									
Mixed Flowing Gas				6							
Temperature Life	4										
Temperature Life (Precondition)			4	4							
Salt Spray											3
Sample Size	3	3	3	3	3	3	3	2	3	3	3

* Sequence 6 for 1000 cycles and 8 for 9000 cycles

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LLCR Measurement

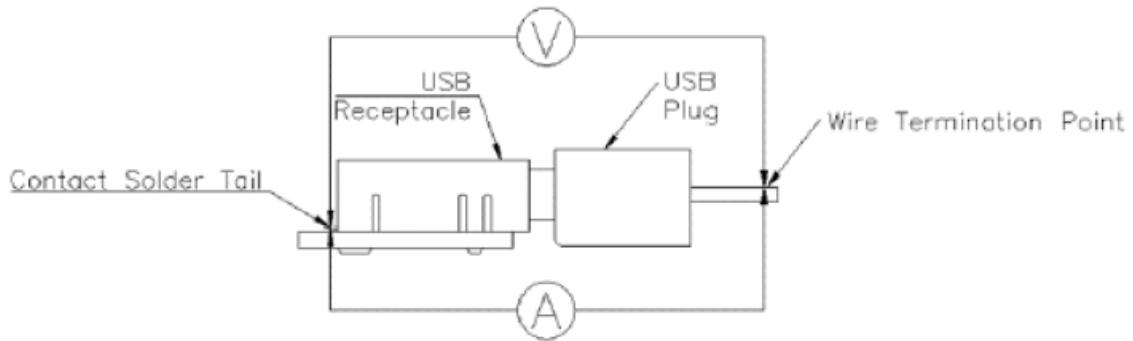


Fig. 1

4-Axes Continuity

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	8	0.12

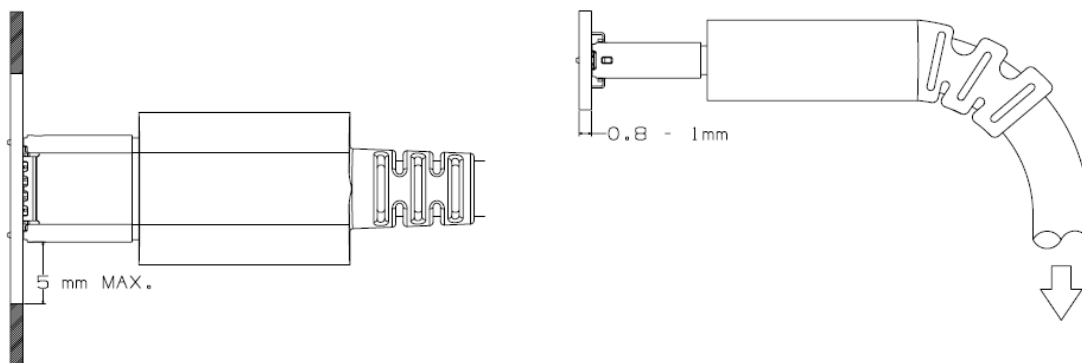



Fig. 2

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Resistance to Reflow Solder Heat

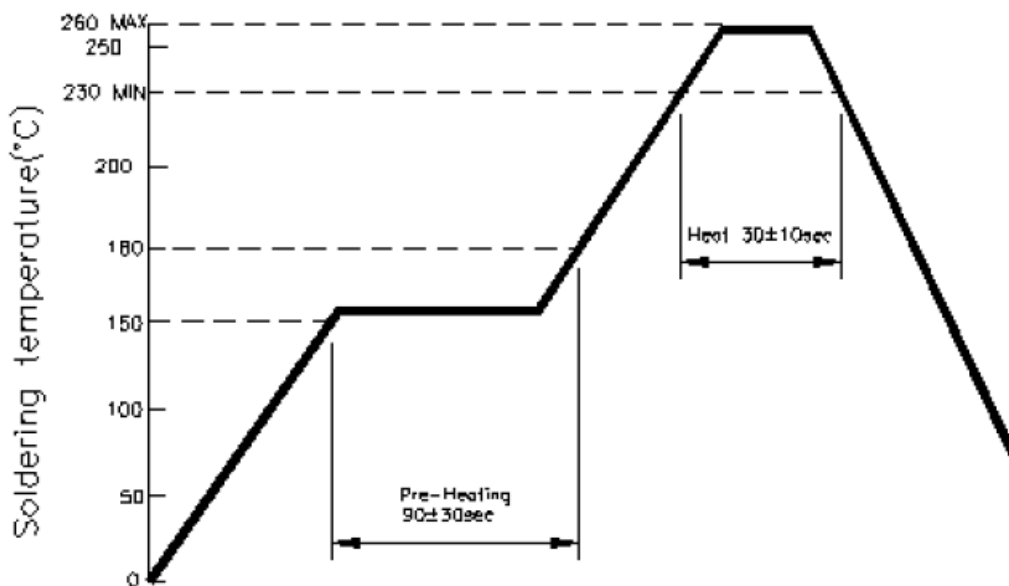



Fig. 3

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