1.0 Objective

This specification defines the performance, test, quality and reliability requirements of the USB3.0 Standard-A Receptacle.

2.0 Scope

This specification is applicable to the termination characteristics of the USB3.0 standard-A receptacles which provides USB3.0 standard-A plug to PCB interconnecting.

3.0 Ratings

3.1 Operating Voltage Rating = $30V_{AC}$ (RMS)

3.2 Operating Current Rating = 1.8A or 0.25A (see section 4.7, section 6.4)

3.3 Operating Temperature Range = -55 ~ 85 (^{o}C)

4.0 Applicable Documents

4.1 FCI drawing 10117835, 10117836

4.2 FCI Product Shelf life-Storage-Solderability GS-20-060

4.3 FCI Package specification GS-14-2157

4.4 Universal Serial Bus 3.0 Specification

4.5 EIA-364: Electrical Connector/Socket Test Procedures Including Environmental Classifications.

4.6 IEC 60512: Connectors for Electronic Equipment – Tests and Measurement

4.7 USB 3.0 Standard-A Receptacle Pin Assignments

Pin Number	Signal Name	Description
1	VBUS	Power
2	D-	USB2.0 differential pair
3	D+	
4	GND	Ground for power return
5	StdA_SSRX-	SuperSpeed receiver differential pair
6	StdA_SSRX+	
7	GND_DRAIN	Ground for signal return
8	StdA_SSTX-	SuperSpeed transmitter differential pair
9	StdA_SSTX+	
Shell	Shield	Connector metal shell

Note: Pins 1 to 4 are referred to as USB 2.0 pins, while pins 5 to 9 are referred to as the SuperSpeed pins.

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 and Plating were described in individual drawings.

5.3 Design and Construction

Connectors shall be of the design, construction and physical dimensions specified on the applicable product drawings.

5.4 Visual

Visual examinations shall be performed using 10X magnification. Parts should be free from blistering, cracks, discoloration, etc.

6.0 Electrical Characteristics

6.1 Contact Resistance, Low Level (LLCR)

The low level contact resistance shall not exceed 30 mΩ (VBUS, GND) and 50 mΩ(others) initially. The low level contact resistance shall also not exceed 10 mΩ increase in resistance (from the initial measurement) after any treatment and/or environmental exposure. Measurements shall be in accordance with EIA-364-23.

The following details shall apply:

a. Test Voltage - 20 milli-volts DC max open circuit.

b. Test Current - Not to exceed 100 milli-amperes.

6.2 Insulation Resistance

The insulation resistance of mated and unmated connectors shall not be less than 100 MΩ initially and after environmental exposure.

Measurements shall be in accordance with EIA-364-21.

The following details shall apply:

a. Test Voltage - 500±10% volts DC.

b. Electrification Time - 2 minutes, unless otherwise specified.

c. Points of Measurement - Between adjacent contacts.

6.3 Dielectric Withstanding Voltage

There shall be no evidence of arc-over, insulation breakdown, or excessive leakage current > 0.5mA amperes when mated and unmated connectors are tested in accordance with EIA-364-20.

The following details shall apply:

a. Test Voltage - 100 volts (AC RMS, 60Hz).

b. Test Duration - 60 seconds.

c. Test Condition - 1 (760 Torr - sea level).

d. Points of Measurement - Between adjacent contacts.

6.4 Temperature rise

The temperature rise above ambient shall not exceed 30°C at any point in the system when all contacts are powered at 1.8 amperes (VBUS & GND) and 0.25 amperes (others).

The following details shall apply:

a. Ambient Conditions –25°C, still air.

6.5 SuperSpeed Electrical Requirement:

The following outline the requirements for SuperSpeed signals.

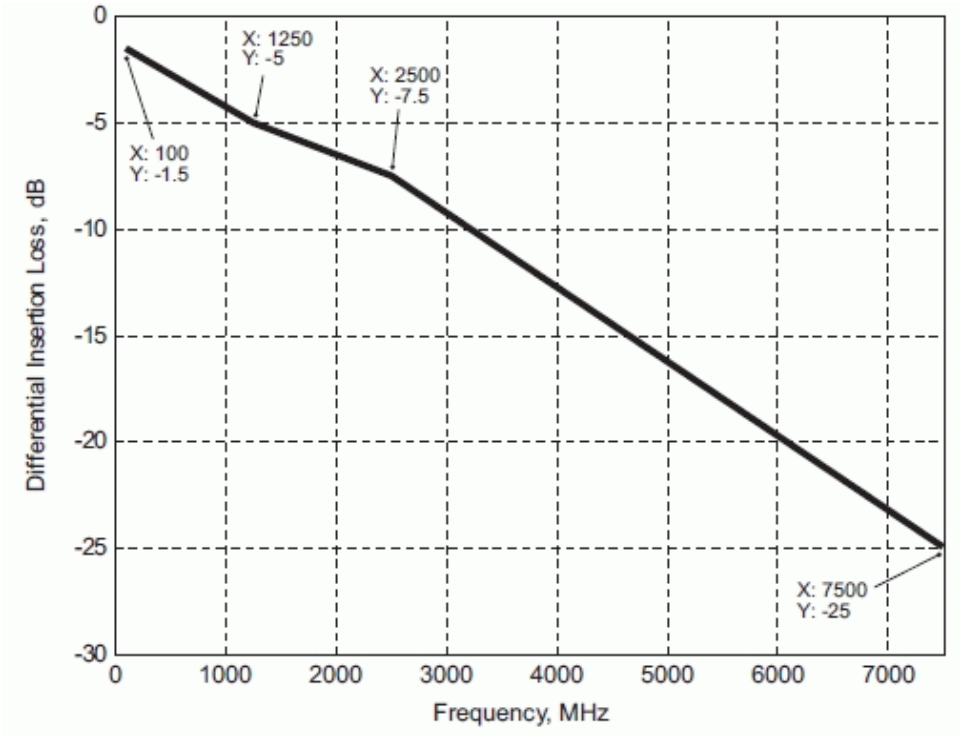
6.5.1 Differential Impedance of mated connector-EIA-364-108

The mated connector impedance shall be within 90Ω±15Ω, as seen from a 50ps (20%-80%) rise time of a differential TDR.

6.5.2 Differential Insertion loss of mated cable assembly – EIA-364-101

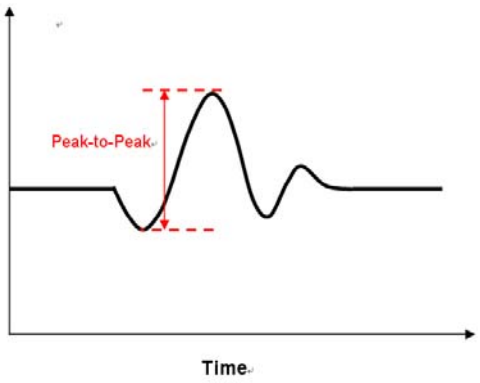
Figure below show differential insertion loss limit, which is normalized with 90Ω differential impedance and defined by following vertices:

(100 MHz, -1.5 dB), (1.25 GHz, -5 dB), (2.5 GHz, -7.5 dB), and (7.5 GHz, -25 dB)



6.5.3 Differential Near-End Crosstalk (DDNEXT) Between SuperSpeed Pairs – EIA-364-90

The DDNEXT shall be measured in time domain with a rise time of 50 ps(20%-80%) entering the connector under test. The mated cable assembly meets the DDNEXT requirement if its peak-to-peak DDNEXT does not exceed 0.9%. (See below Figure for illustration of the peak-to-peak crosstalk):

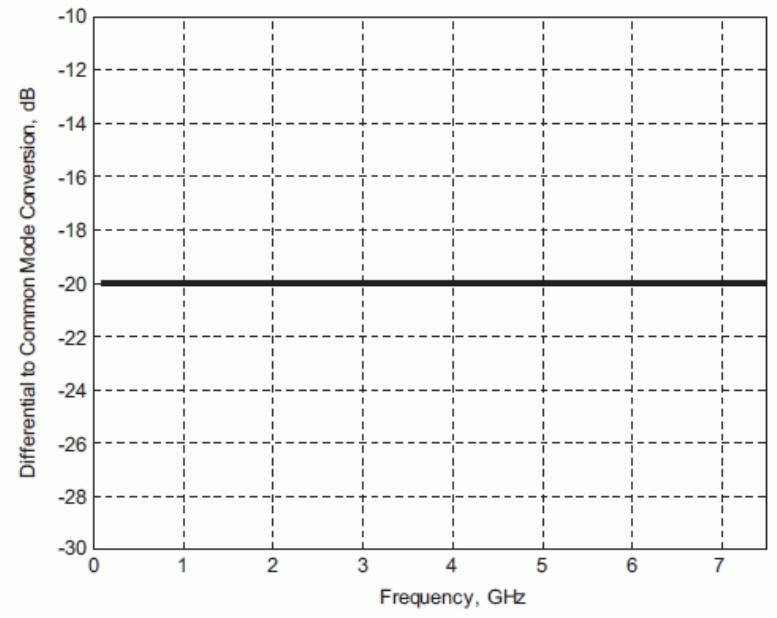


6.5.4 Differential Crosstalk Between D+/D- and SuperSpeed Pairs – EIA-364-90

The DDNEXT and DDFEXT shall be measured in time domain with a rise time of 500 ps (10-90%) entering the connector under test. The mated cable assembly meets the DDNEXT/DDFEXT requirement if its peak-to-peak value does not exceed 2%.

6.5.5 Differential-to-Common-Mode Conversion

Referencing to 90Ω differential impedance, the mated cable assembly Differential-to-Common-Mode requirements is less than or equal to -20 dB across the frequency range 100 MHz to 7.5 GHz shown in below figure.



7.0 Mechanical Characteristics

7.1 Insertion Force

The connector insertion force shall not exceed 35 Newtons.

The following details shall apply:

a. Cross Head Speed – 12.5 mm or inch per minute.

b. Lubrication – non-silicon based lubricant on the latching mechanism to reduce wear is recommended. If used, the lubricant may not affect any other characteristic of the system.

c. Utilize free floating fixtures.

d. Reference – EIA-364-13.

7.2 Extraction Force

The connector extraction force shall not be less than 10 Newotns and 8 Newtons after the specified insertion/extraction or durability cycles.

The following details shall apply:

a. Cross Head Speed – 12.5 mm per minute.

b. Lubrication - non-silicon based lubricant on the latching mechanism to reduce wear is recommended. If used, the lubricant may not affect any other characteristic of the system.

c. Utilize free floating fixtures.

d. Reference – EIA-364-13.

7.3 Durability or Insertion/Extraction Cycles-EIA-364-09

Durability cycle is described in individual customer drawing. The durability test shall be done at a maximum rate of 200 cycles per hour and no physical damage to connector. Non-silicon based lubricant on the latching mechanism to reduce wear is recommended.

7.4 Durability (preconditioning) -EIA-364-09

When used for pre-conditioning treatment, 50 insertion/extraction cycles shall be applied prior to mechanical/environmental exposure.

7.5 Reseating

Manually insert/extract the connector 3 cycles, there shall no evidence of physical damage.

8.0 Environmental Conditions

The connector interface environmental tests shall follow EIA-364-1000, *Environmental Test Methodology for Assessing the Performance of Electrical Connectors and Sockets Used in Business Office Applications*. Since the connector defined has far more than 0.127mm wipe length, Test group 6 in EIA-364-1000.01 is not required.

After exposure to the following environmental conditions in accordance with the specified test procedure and/or details, the product shall show no physical damage and shall meet the electrical and mechanical requirements per paragraphs 6.0 and 7.0 as specified in the Table 1 test sequences. Unless specified otherwise, assemblies shall be mated during exposure.

8.1 Thermal Shock – EIA-364-32, method A, test condition I, test duration A4.

a. Number of Cycles – 10 cycles

b. Transfer Time - 5 minutes, maximum

c. Test step/duration, and temperature range see table.

Step	Temperature(□)	Time(minutes)
1	-55 +0/-3	30 Min
2	25 +10/-5	5 Max
3	85 +3/-0	30 Min
4	25 +10/-5	5 Max

8.2 Cyclic temperature & humidity –EIA-364-31 method III without conditioning, initial measurements, cold shock and vibration..

a. Cycle the connector between 25□ ± 3□ at 80%±3% RH and 65□±3□ at 50%±3%.

b. Ramp times should be 0.5 hour and Dwell times should be 1.0 hours.

c. Dwell times start when the temperature and humidity have stabilized within the specified levels.

d. Duration – 24 cycles.

8.3 Temperature Life –EIA-364-17, method A.

a. Test Temperature – 105□.

b. Test Duration - 120 hours.

(Testing temperature/duration pertaining to 65□ for 5 years per EIA-364-1000)

8.4 Temperature Life (Preconditioning) –EIA-364-17, method A.

a. Test Temperature – 105□.

b. Test Duration - 72 hours.

(Testing temperature/duration pertaining to 65□ for 5 years per EIA-364-1000)

8.5 Vibration (Random) –EIA-364-28.

a. Test Condition VII, test condition letter D.

b. Vibration Amplitude – 3.10 rms G minimum

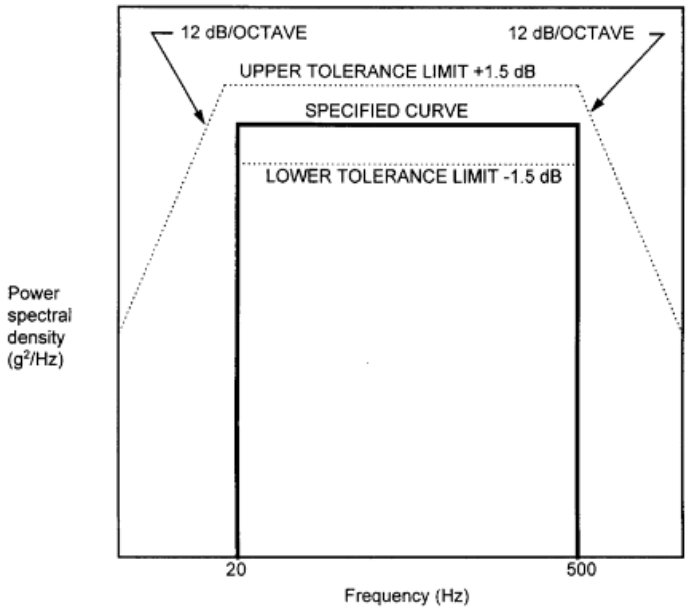
c. Power spectral density – 0.02 g^2/Hz

d. Duration – 15minutes in each of three mutually perpendicular directions.

e. Mounting - Rigidly mount assemblies.

f. No discontinuities greater than 1 microseconds.

g. Random vibration test – curve envelope see figure.



8.6 Mixed Flowing Gas- EIA-364-65.

a. Class – IIA

b. Duration – 168 hours with excepted life ≦ 5years.

c. Unmated for 112 hours duration and mated the remaining 56 hours duration.

8.7 Thermal Disturbance – Cycle the mated connector as,

a. Temperature– Between15±3□ and 85±3□ without humidity control.

b. Ramp should be a minimum of 2□ per minute.

c. Dwell time: 5 minutes, start when the temperature have stabilized.

d. Duration - 10 cycles.

8.8 Thermal Cycling – Cycle the mated connector as,

a. Temperature– Between15±3□ and 85±3□ without humidity control.

b. Ramp should be a minimum of 2□ per minute.

c. Dwell time: 5 minutes, start when the temperature have stabilized.

d. Duration - 500 cycles.

8.9 Solderability – EIA-364-52.

a. Solder temperature- 255 ± 5□

b. Immersion duration – 5 seconds.

c. Minimum solder coverage:95 %

9.0 QUALITY ASSURANCE PROVISIONS

9.1 Equipment Calibration

All test equipment and inspection facilities used in the performance of any test shall be maintained in a calibration system in accordance with ANSI Z-540 and ISO 9000.

9.2 Inspection Conditions

Unless otherwise specified herein, all inspections shall be performed under the following ambient conditions:

a. Temperature: 25 +/- 5 deg C

b. Relative Humidity: 30% to 60%

c. Barometric Pressure: Local ambient

9.3 The sample size is listed for each test in section 9.7 Qualification Test Table.

9.4 Acceptance

9.4.1 Electrical and mechanical requirements placed on test samples as indicated in paragraphs 6.0 and 7.0 shall be established from test data using appropriate statistical techniques or shall otherwise be customer specified, and all samples tested in accordance with this product specification shall meet the stated requirements.

9.4.2 Failures attributed to equipment, test setup, or operator error shall not disqualify the product. If product failure occurs, corrective action shall be taken and samples resubmitted for qualification.

9.5 Qualification Testing

Qualification testing shall be performed on sample units produced with equipment and procedures normally used in production.

9.6 Re-Qualification Testing

If any of the following conditions occur, the responsible product engineer shall initiate requalification testing consisting of all applicable parts of the qualification test matrix.

a. A significant design change is made to the existing product which impacts the product form, fit or function. Examples of significant changes shall include, but not be limited to, changes in the plating material composition or thickness, contact force, contact surface geometry, insulator design, contact base material, or contact lubrication requirements.

b. A significant change is made to the manufacturing process which impacts the product form, fit or function.

c. A significant event occurs during production or end use requiring corrective action to be taken relative to the product design or manufacturing process.

9.7 Qualification Test Table

TEST DESCRIPTION	PARA.	Test Group									
		1	2	3	4	5	6a	6b	7	8	9
		Test Sequence									
Examination of Product	5.4	1 8	1 10	1 8	1 12	1 10	1 5	1 8	1 4	1 3	
Low Level Contact Resistance	6.1	2 5 7	2 5 7 9	2 5 7	2 5 7 9 11	2 5 7 9		2 7			
Insulation Resistance	6.2								2		
Dielectric Withstanding Voltage	6.3						2 4				
Temperature Rise	6.4									2	
Insertion Force	7.1							3			
Extraction Force	7.2							4 6			
Durability	7.3						3	5			
Durability (Preconditioning)	7.4	3	3	3	3	3					
Reseating	7.5	6	8		10	8					
Thermal Shock	8.1		4								
Cyclic Temp & Humidity	8.2		6								
Temperature Life	8.3	4									
Temperature Life (Preconditioning)	8.4			4	4	4					
Vibration	8.5			6							
Mixed Flowing Gas	8.6				6						
Thermal Disturbance	8.7				8						
Thermal Cycling	8.8					6					
Solderability	8.9								3		
SuperSpeed Electrical (SI) Requirement	6.5										1
Sample Size		12	12	12	12	12	5	12	5	5	5

REVISION RECORD

Rev	Page	Description	EC#	Date
1	all	Initial drafting	-	2011-04-26
2	9, 11	Remove 8.10 mechanical shock in page 9, Revise table9.7 (Group 7, 8, 9) in page 11.	-	2011-04-29
3	11	Revise Table 9.7	-	2011-05-03
4	7,8,11	Page 7: Rewrite section 8.2 Page 8: Delete 8.6, description d. Page 11 : Revise table 9.7	-	2011-05-04
5	11	Page 11, Revise Group 9	-	2011-05-06
6	6	Revise Section 7.3 description	-	2011-09-27
A	all	Initial release	-	2012-01-04