PRODUCT SPECIFICATION PS-7425 Rev. D

ORIGINAL

Title: USB3.0 Product Specification

Part Number: GSB3 Series

Description: USB3.0 A&B Type Plug & Receptacle

Revisions Control

Rev.	ECN Number	Originator	Approval	Issue Date
A	Initial Release	Roger Tsai	Roger Tsai	03/03/2010
B	NE-10101	Aqua Chou	Roger Tsai	07/06/2010
C	NE-13121	Debby Hung	Arron Lin	07/24/2013
D	NE-15174	Debby Hung	Arron Lin	12/16/2015

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Product Specification Origination

Originator:	Date:	Checked by:	Date:	Approved by:	Date:
Debby Hung	12/17/2015	Arron Lin	12/17/2015	Arron Lin	12/17/2015

1.0 GENERAL DESCRIPTION

This specification defines the detail requirements of the standard Universal Serial Bus (USB3.0 A type & B type) board mounted connector.

2.0 APPLICABLE DOCUMENTS (per latest revision on date of order)

UL-STD-94	Tests for Flammability of Plastic Materials for Parts in Devices and Appliances.
EIA-364	Electrical connector/ socket test procedures including environmental classifications.

Standard

USB3.0	USB 3.0, Version 1.0

3.0 REQUIREMENTS

3.1 Design and construction

Product shall be of the design, construction and physical dimensions specified on the applicable product drawing.

3.2 Material and Finish:

Receptacle

A) Shell: Copper Alloy / Cover shell: SPCC
B) Shell finish: Nickel Plated
C) Insulator: High temperature thermoplastic, UL94 Flammability ratings.
D) Contact: Copper Alloy
E) Contact finish:
   Contact area: Gold Plated
   Termination area: Matte Tin Plated
   Under-plated: Nickel Plated

Plug

A) Shell: SPCC
B) Shell finish: Nickel Plated
C) Insulator: High temperature thermoplastic, UL94 Flammability ratings.
D) Contact: Copper Alloy
E) Contact finish:
F) Contact area: Gold Plated
G) Termination area: Tin Plated
H) Under-plated: Nickel Plated

****This product doesn't contain environmental hazardous materials per per Directive 2002/95/EC for RoHS or per SS-00259 for Sony GP or per IEC 61249-2-21 for Halogen Free compliant..**

3.3 Ratings

A) Rate Voltage: 30 VAC (rms)
B) Operating temperature: -55˚C to +85˚C
C) Storage temperature: -55˚C to +85˚C

4.0 PERFORMANCE AND TEST DESCRIPTION

Product is designed to meet electrical, mechanical and environmental performance requirements specified in Table I. Unless otherwise specified, all tests shall be performed at ambient environmental conditions.

Table I - Test Requirements and Procedures Summary

Test	Test procedure	Condition of test specimens	Test criteria
Examination of product	**EIA 364-18** Visual, dimensional and functional compliance.	N/A	Meets requirements of product drawing.
Electrical:			
Low level contact resistance	**EIA-364-23** Current: 100 mA maximum Voltage: 20 mV maximum See Figure3.1.a	Mated	Initial a) 30 mΩ maximum for VBUS and GND b) 50 mΩ maximum for other contacts After test: ΔR=10 milliohms maximum
Insulation resistance	**EIA-364-21** Apply a voltage between adjacent terminals. Voltage: 500 VDC	Unmated	100 MΩ minimum
Dielectric withstanding voltage	**EIA-364-20** Apply a voltage between adjacent terminals. Voltage: 100 VAC (RMS) Duration: 1 minute	Mated	No breakdown Current leakage < 0.5 mA

Contact current rating	**EIA-364-70 Method 2** 1.8A for VBUS & GND(Pin 1 & Pin 4) 0.25A for all other contacts When measure at an ambient of 25℃. With power applied to the contact	Mated	the △T must not exceed +30℃ at any point in the USB connector under test.
Contact capacitance	**EIA-364-30** The object of this test is to detail a standard method to determine the capacitance between conductive elements of a USB 3.0 connector		2 pF maximum unmated, per contact. D+/D- contacts only.
Super Speed Electrical Requirements:			
Mated Connector Impedance (Differential)	**EIA-364-108** It should be measured with a TDR in a differential mold using a 50ps(20-80%)rise time. (Mated connector includes cable termination areas). Super Speed pairs only.	Mated	90Ω±15Ω (85Ω~~105Ω)
Differential Insertion Loss of SS pairs of Mated Cable Assembly	**EIA-364-101** The measured differential insertion loss of a mated cable assembly must not exceed the differential insertion loss limit.	Mated	The differential insertion loss, SDD12, measures the differential signal energy transmitted through the mated cable assembly Figure 5.1.1 show the differential insertion loss limit. which is normalized with 90-Ωdifferential impedance and defined by the following vertices: (100MHz,-1.5dB), (1.25GHz,-5.0dB), (2.5GHz-7.5dB),and (7.5GHz,-25dB).

Near-end crosstalk between Super Speed Pairs	**EIA-364-90** The differential crosstalk measures the unwanted coupling between differential pairs. Since the Tx pair is right next to the Rx pair for super speed.	Mated	The differential crosstalk measure the unwanted coupling Between differential pairs. Since the Tx pair is right next to the Rx pair for Superspeed, only the differential near-end crosstalk (DDNEXT) is specified, as shown in Figure 5.1.2 referencing to a 90-Ω differential impedance, The mated cable assembly meets the DDNEXT requirement if its DDENXT does not exceed the limit shown in Figure 5.1.2; the vertices that defines the DDNEXT limits are:(100MHz,-32dB), (2.5GHz,-32dB), (3GHz;-23dB) and (7.5GHz.-23dB)
Differential Crosstalk Between D+/D- (USB2.0) and SuperSpeed Pairs (USB3.0)	**EIA-364-90** The differential near-end and far-end crosstalk between the D+/D- pairs and the SuperSpeed pairs.	Mated	The differential near-end and far-end crosstalk between the USB2.0 pairs (D+/D-) and the USB3.0 pairs (SSTX+/ SSTX-or SSRX+/ SSRX-) shall be managed not exceed the limits shown in Figure 5.1.3; the vertices that defines the DNETX and DDFEXT limits are: (100MHz,-12dB),(2.5GHz,-21dB),(3.0GHz,-15dB) and (7.5GHz,-15dB). The reference differential impedance shall de 90Ω

Differential-to-Common-Mode Conversion	This is a differential mode to common mode conversion requirement for SS signal pairs	Mated	Since the common mode current is directly responsible for EMI, limiting the differential -to-common- mode conversion. SCD12. will limit EMI generation within the connector and cable assembly. Figure 5.1.4 illustrates the SCD12 requirement; a mated cable assembly passes the SCD12 requirement if its SCD12 is less than or equal to -20dB across the frequency range shown in Figure 5.1.4 -20dB max Up to 7.5GHz
Mechanical:			
Mating force	**EIA-364-13** Rate: 12.5 mm/minute Max.		35N maximum
Un-mating force	**EIA-364-13** Rate: 12.5 mm/minute Max.		10N minimum Initial 8N minimum After test
Durability	**EIA-364-09** Standard-A, standard-B and Powered-B series: *Standard Durability Class:1500 cycles *High Durability Class:5000 cycles Cycles rate of 500 cycles per hour if done automatically and 200 if manual cycle		No evidence of physical damage - Insertion force (35N max.) - Extraction force (8N min.)
Vibration	**EIA-364-28** Test Condition VII. Test Letter D This test procedure tests the connectors to withstand conditions involving vibration. See Figure a.	Mated	No evidence of physical damage

Cable Pull-Out	**EIA-364-38** Test Condition A The object of this test procedure is to detail a standard method for determining the holding effect of a USB 3.0 plug cable clamp without causing any detrimental effects upon the cable or connector components when the cable is subjected to inadvertent axial tensile loads.	Mated	After the application of a steady state axial load of 40 N for one minute. No physical damage or Discontinuity allowed
Cable Flexing (This is for cable assembly)	**EIA-364-41, Condition I** Dimension X=3.7 x cable diameter and 100 cycles in each of two planes.		No physical damage. No discontinuity over 1 ms during flexing.
Environmental:			
Solderability	**EIA-364-52** The object of this test procedure is to detail a uniform test method for determining USB 3.0 connector solderability. The test procedure contained herein utilizes the solder dip technique. It is not intended to test or evaluate solder cup, solder eyelet, other hand-soldered type or SMT type terminations.	Unmated	Solder shall cover a minimum of 95% of the surface being immersed, when soldered at temperature 245℃+/- 5℃ for in immersion duration 5s.
Resistance to soldering heat	**EIA-364-56** Dip connector terminal tails in solder: Solder Duration:10±0.5seconds; **Solder temperature:260±5℃** (refer to FIGURE 3 Recommended IR reflow profile) Peak temperature: 260+0 / -10 ℃ Preheating temperature: **150 – 200 ℃, 60 to 120 sec.** Apply solder iron in solder tail **Temperature: 350±10℃, 3~4 sec.**	Unmated	No physical damage.

Thermal shock	**EIA-364-32,** Test Condition I, 10 Cycles -55℃and +85℃. The object of this test is to determine the resistance of a USB 3.0 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.	Mated	There shall be no evidence of any physical Damage. Test shall be done in sequences defined in EIA 364-1000.01.
Temperature life	**EIA-364-17, Method A** 105℃ without applied voltage for 120 hours. 105℃ without applied Voltage for 72 hours when used as preconditioning in EIA364-1000.01. The object of this test procedure is to detail a standard method to assess the ability of a USB 3.0 connector to withstand temperature.	Mated	There shall be no evidence of any physical Damage. Test shall be done in sequences defined in EIA364-1000.01
Mixed flowing gas (MFG)	**EIA-364-65, Class II A** The object of this test procedure is to produce environmentally related corrosive atmospheres to determine the reaction to plated or un-plated surfaces when exposed to different concentrations of flowing industrial gas mixtures. USB 3.0 connector evaluation samples should be placed in an environmentally controlled 'test chamber' that is monitored by a gas analyzing system for controlled concentrations of the specified gas mixture. Test coupons shall also be used and the weight gain reported	Mated/Unmated	7-days, Options #1A and #1B as specified in EIA 364-1000.01

Cyclic temperature and 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. Number of cycles: 24 cycles	Mated	No evidence of physical damage
Salt Spray	The connector shall be subjected to a fine mist of salt solution at a temperature of 35 ± 2℃ for continuously. Test time : 8h (spcc) 24h (Stainless steel or copper) (salt solution concentration 5 ± 1 % by weight)	Unmated	No evidence of physical damage

5.0 Test sequence

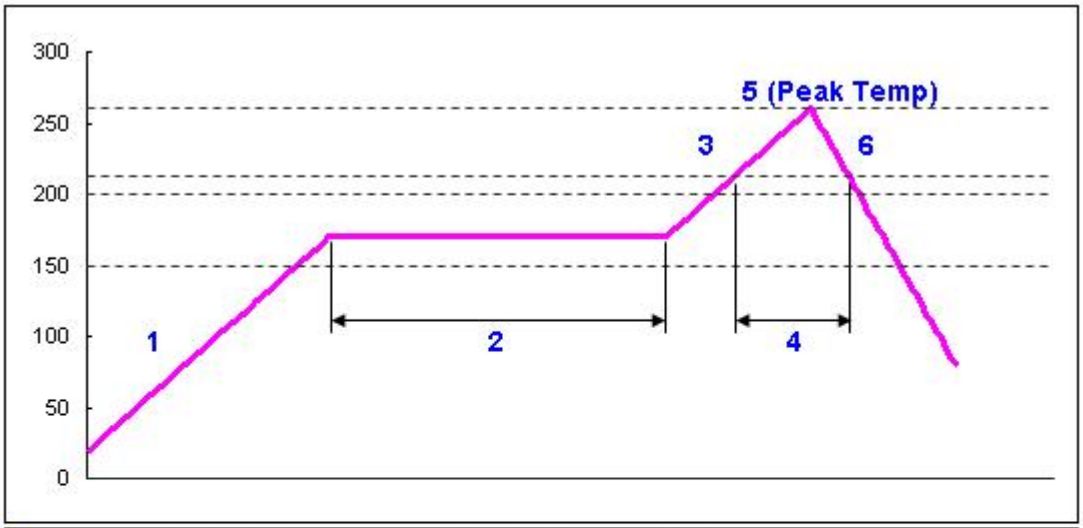
		Test groups									
		1	2	3	4	5	6	7	8	9	10
Examination of product		1,11	1,4	1,3	1,7	1,3,8	1,10	1,6	1,6	1,3	1,3
Insulation resistance			3				3,8				
Dielectric withstanding voltage		2,10					4,9	5			
Low level contact resistance		3,9				4,7			2,5		
Contact current rating										2	
Capacitance							2				
Mating force		4									
Un-mating force		5,8									
Durability		7				6	5		3		
Cable pull-out								2			
Plating thickness						2					
Vibration		6									
Thermal shock							6				
Humidity							7				
Temperature Life			2								
Solderability				2							
Resistance to soldering heat											2
Mixed Flowing Gas (MFG)									4		
Salt spray						5					
Cable Flex								3			
Differential impedance (SS) of Mated Connectors					2						
Differential Insertion Loss (SS) of Mated Cable Assemblies					3						
Differential to Common Mode Conversion(SS) of Mated Cable Assembly					4						
Differential Near-End Crosstalk between SS Pairs					5						
Differential Near-End Crosstalk between SS and D+/D- Pairs					6						
Number of sample	Plug	5 pcs	5 pcs	5 pcs	5 pcs	5 pcs	5 pcs	5 pcs	5 pcs	5 pcs	5 pcs
	Socket	5 pcs	5 pcs	5 pcs	5 pcs	5 pcs	5 pcs	5 pcs	5 pcs	5 pcs	5 pcs

Note:

a.) “Group 7” apply to USB Cable Assembly only.

b.) “Group 8” test by customer’s requirement.

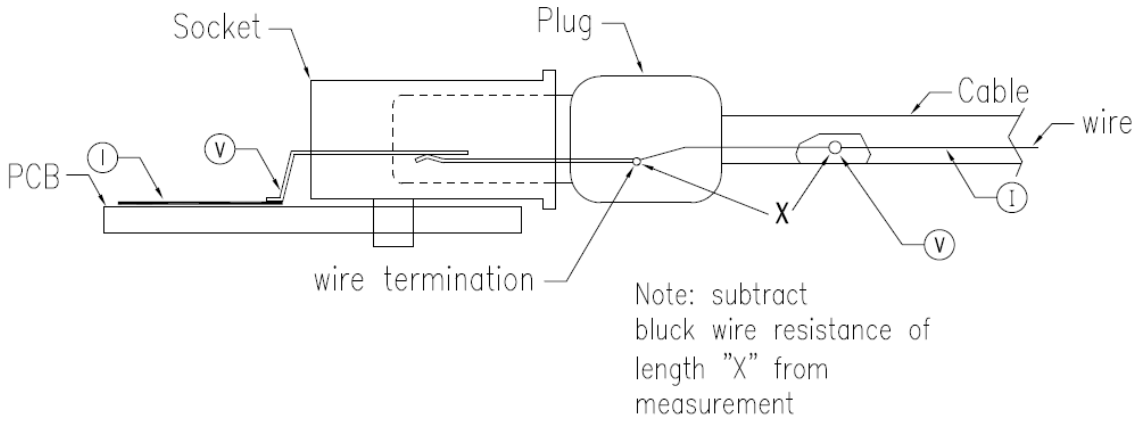
5.1 Recommended IR reflow profile(Lead-free)



1	Average ramp rate	3°C per second max.
2	Pre-heat temp.(minimum)	150°C
	Pre-heat temp.(maximum)	200°C
	Pre-heat time	60 to 120 seconds
3	Ramp to peak	3°C per second max.
4	Time over liquidus(217°C)	60 to 150 seconds
5	Peak temp.	260 +0/-10°C
	Time within 5°C of peak	10 seconds max.
6	Ramp- cool down	6°C per second max.
	Time 25°C to peak	8 minutes max.

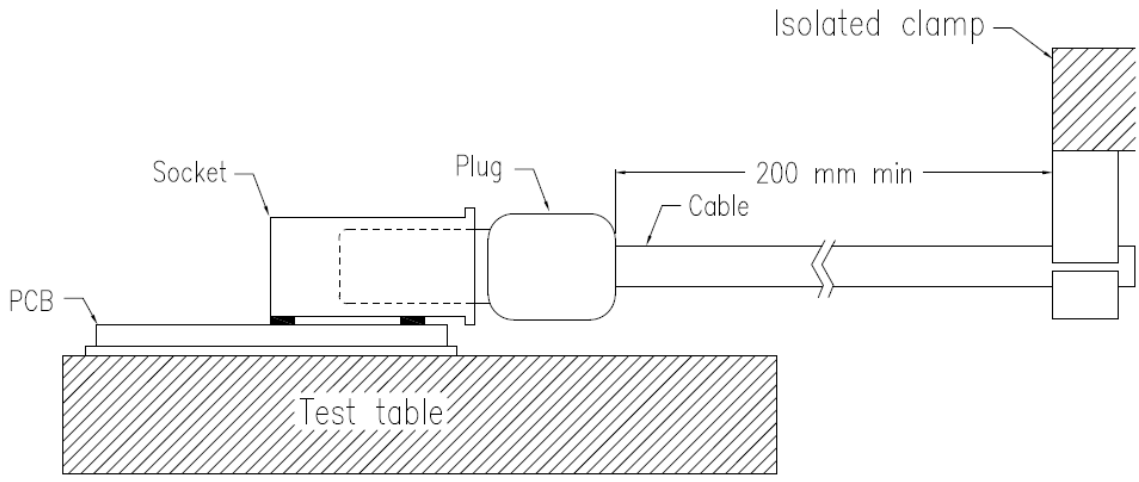
5.2 Sample Selection:

Samples shall be prepared in accordance with applicable manufacturers instructions and shall be selected at random from current productions.



a) contact resistance

Figure5.1.a



a) vibration test

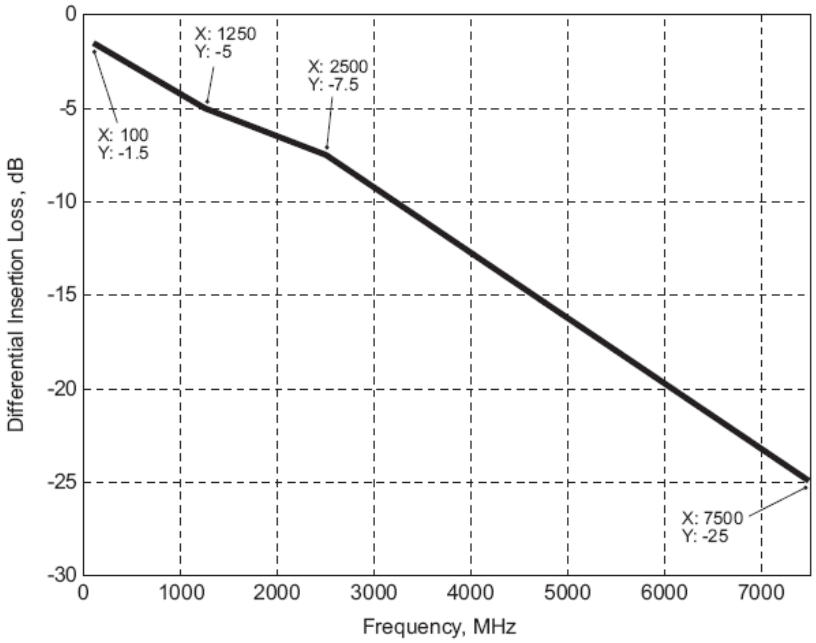


Figure5.1.1

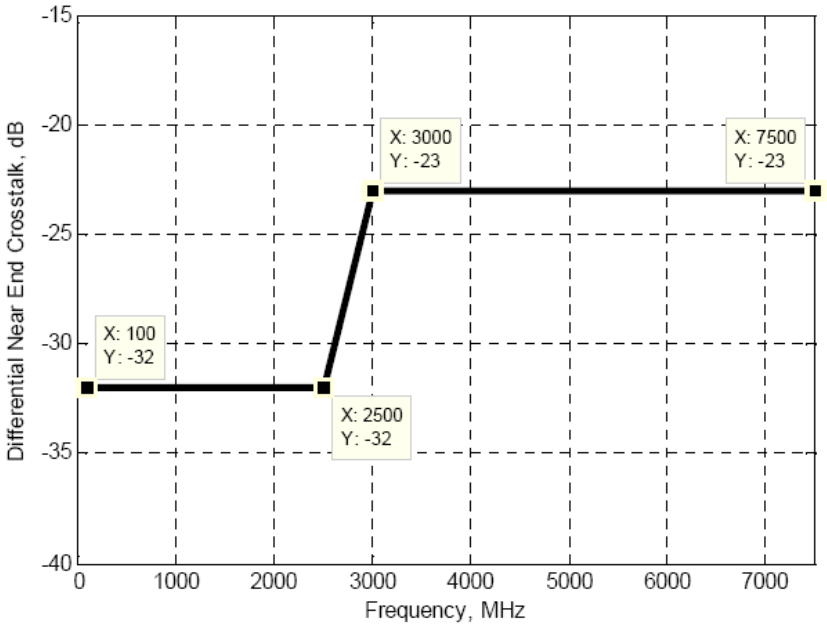


Figure5.1.2

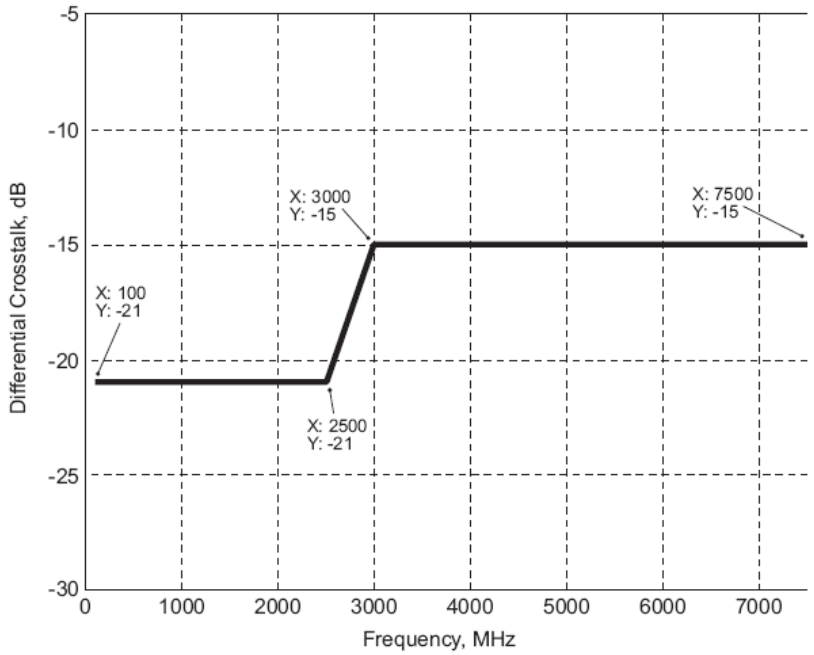


Figure5.1.3

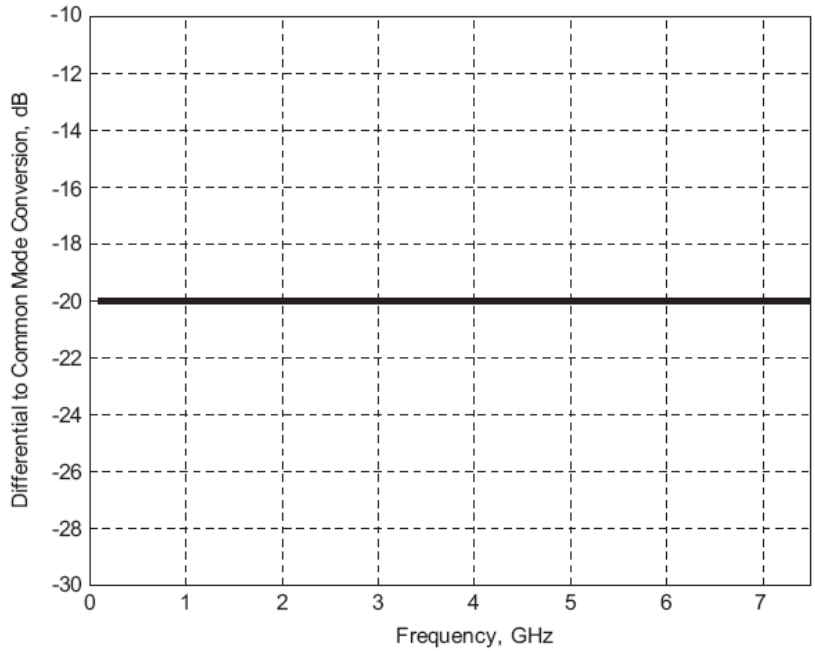


Figure5.1.4

6.0 USB connector termination data:

provide the standardized contact terminating assignments by number and electrical for series “A” and series “B” connectors.

6.1 USB 3.0 standard-A connector Pin Assignments

Pin Number	**Signal Name**	**Description**	**Mating Sequence**
1	VBUS	Power	Second
2	D-	USB2.0 differential pair	Third
3	D+		
4	GND	Ground for power return	Second
5	Std A_SSRX-	SuperSpeed receiver differential pair	Last
6	Std A_SSRX+		
7	GND_DRAIN	Ground for signal return	
8	Std A_SSTX-	SuperSpeed transmitter differential pair	
9	Std A_SSTX+		
Shell	Shield	Connector metal shell	First

Note: Tx and Rx are defined from the host perspective

6.2 USB 3.0 standard-B connector pin Assignments

Pin Number	Signal Name	Description	Mating Sequence
1	VBUS	Power	Second
2	D-	USB2.0 differential pair	Third or beyond
3	D+		
4	GND	Ground for power return	Second
5	Std B_SSTX-	SuperSpeed transmitter differential pair	Third or beyond
6	Std B_SSTX+		
7	GND_DRAIN	Ground for signal return	
8	Std B_SSRX-	SuperSpeed receiver differential pair	
9	Std B_SSRX+		
Shell	Shield	Connector metal shell	First

Note: Tx and Rx are defined from the device perspective