PRODUCT SPECIFICATION PS-7440 Rev. B

ORIGINAL

Title: USB3.0 Connector Product Specification

Part Number: GSB3 series

Description: A type, Receptacle, Thru hole, PCB mount, G/F

Revisions Control

Rev.	ECN Number	Originator	Approval	Issue Date
A		Sondra Sang	Hank Hsu	10. 12. 2011
B	NE-17063	Sondra Sang	Hank Hsu	04. 14. 2017

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Product Specification Origination

Originator:	Date:	Checked by:	Date:	Approved by:	Date:
Sondra Sang	4/14/2017	Chenny Yeh	4/14/2017	Hank Hsu	4/14/2017

1. Scope

This document defines the detailed requirements for the Amphenol USB3.0 Series A type connector to insure functionality and reliability.

2. Applicable document

2.1	EIA-364 Standard	Test methods for electrical connectors
2.2	UL-STD-94	Tests for flammability of plastic materials for parts in devices and appliances.
2.3	USB3.0 Standard	Universal Serial Bus 3.0 Specification, Revision 1.0

3. Requirement

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

3.2.1 Housing

- High temperature thermoplastic, UL94V-0
- Color: Blue

3.2.2 Contact

- Copper Alloy
- Contact area: Gold flash plating
- Solder area: Gold flash or matte tin plating
- Under-plating: Nickel overall

3.2.3 Shell

- Copper Alloy or Stainless steel
- Solder area: Matte tin plating or Nickel overall
- Under-plating: Nickel overall

3.3 Rating

- Voltage rating: 30 VAC
- Operating temperature: 0°C~ 60°C
- Storage temperature: -20°C~ 85°C
- Ambient humidity: 85% R.H. maximum

4. Performance and testing

4.1 Test requirements and procedures summary

Test	Test procedure	Condition of test specimens	Test criteria
Visual & Dimensional inspection	EIA-364-18 Visual, dimensional and functional inspection.		Must meet the minimum requirements specified by product drawing.
Electrical:			
Low level contact resistance	EIA-364-23b Current: 100 mA maximum Voltage: 20 mV maximum	Mated	Initial: 30 Milliohm maximum for VBUS and GND contacts(Pin 1 & Pin 5) 50 milliohms maximum for all other contacts After test: ΔR=10 milliohms maximum
Insulation resistance	EIA-364-21 Apply a voltage between adjacent terminals. Voltage: 500 VDC	Mated	100 Megohm minimum
Dielectric withstanding voltage	EIA-364-20 Apply a voltage between adjacent terminals. Voltage: 100 VAC Duration: 1 minute	Mated	No breakdown Current leakage < 0.5 mA
Contact capacitance	EIA-364-30 Test between adjacent contact, unmated connector at 1KHz.		2pF maximum per contact. D+/D- contacts only
Propagation delay	EIA-364-103 The purpose of the test is to verify the end-to-end propagation of the D+/D- lines of the cable assembly 16ns maximum for cable assembly attached with one or two Micro connectors and 26ns maximum for a cable assembly attached with no Micro connector.	Mated	200ps rise time. D+/D- lines only.
Propagation delay intra-pair skew	EIA-364-103 The test ensures that the signal on both the D+ and D- lines of cable assembly arrive at the receiver at the same time.	Mated	Test condition: 200ps rise time. D+/D- lines:.100ps maximum.

D+/D- pair attenuation	EIA-634-101 This test ensure the D+/D- pair of a cable assembly can provide adequate signal strength to the receiver in order to maintain a low error rate.	Mated	-0.67dB max. @12 MHz -0.95dB max. @24 MHz -1.35dB max. @48 MHz -1.90dB max. @96 MHz -3.20dB max. @200MHz -5.80dB max. @400MHz
Contact current rating	EIA-364-70 Measure the temperature rise at the rated current. Ambient temperature: 25℃ 1.8A for VBUS & GND(Pin 1 & Pin 5) 0.25A for all other contacts	Mated	ΔT=30℃ maximum
Super Speed Electrical Requirements:			
Mated connection impedance	It should be measured with a TDR in a differential mold using a 50ps(20-80%)rise time.	Mated	90Ω±15Ω (85Ω~~105Ω)
Differential insertion loss of SS pairs	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).
Differential 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 Super Speed, 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

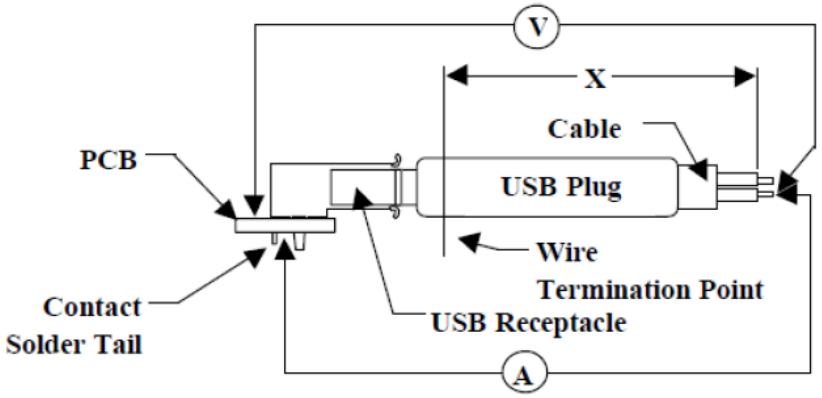
			assembly meets the DDNEXT requirement if its DDENXT does not exceed the limit shown in Figure 5.1.2; the vertices that defines the DDNEXT limits are: (100MHz,-32dB), (2.5GHz,-32dB), (3GHz;-23dB) and (7.5GHz.-23dB)
Differential crosstalk between D+/D- (USB2.0) and Super Speed Pairs (USB3.0)	EIA-364-90 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:			

Insertion force	EIA-364-13 Rate: 12.5 mm/minute		35 N maximum
Extraction force	EIA-364-13 Rate: 12.5 mm/minute		Initial: 10N min After test: 8N min.
Durability (preconditioning)	EIA-364-09 (perform 5 unplug/plug cycles if the application requires up to 25 over the life of the connector or socket; 20 cycles if the application requires 26-200; or, 50 cycles if the application requires 201 or greater)		No evidence of physical damage
Reseating	Manually unplug/plug the connector or socket. Perform 3 such cycles.		No evidence of physical damage
Durability	EIA-364-09 Cycle rate: 200 maximum per hour <Number of cycles> Standard class: 500 minimum		No evidence of physical damage - Insertion force (35N max.) - Extraction force (8N min.)
Vibration	EIA-364-28, Test condition VII, Test letter D 15 minutes in each of 3 mutually perpendicular directions. Overall rms: 3.10 g Electrical load: 100 milliamp maximum	Mated	No evidence of physical damage No discontinuities > 1 microsecond
Mechanical Shock	EIA-364-28, Test condition H 3 shocks in each direction shall be applied along the 3 mutually perpendicular axes of the test specimen(18 shocks). Shock pulse: Half-sine Peak acceleration: 294m/s^2, 30g's Normal duration: 11ms Electrical load: 100 milliamp maximum	Mated	No evidence of physical damage No discontinuities > 1 microsecond
Environmental:			
Temperature life (preconditioning)	EIA-364-17, Test condition 4, Method A Temperature: 105℃ Duration: 72 hours	Mated	No evidence of physical damage

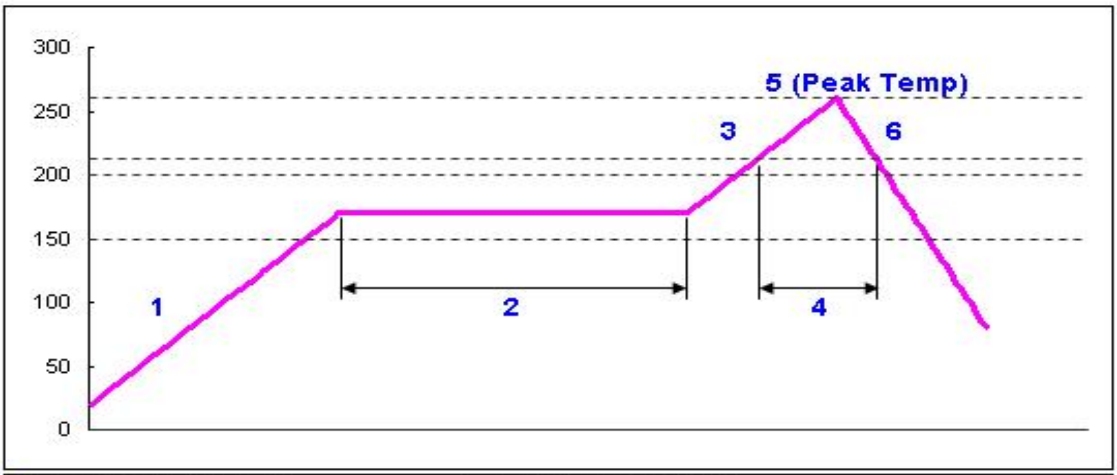
Temperature life	EIA-364-17, Test condition 4, Method A Temperature: 105℃ Duration: 120 hours	Mated	No evidence of physical damage
Cyclic temp and humidity	EIA-364-31, Test condition A, Method III Number of cycles: 24 cycles Duration: 168 hours	Mated	No evidence of physical damage
Thermal shock	EIA-364-32, test condition I Number of cycles: 10 <1 cycle> Step1: -55 +0/-3 ℃ 30 minutes Step2: +25 +10/-5℃ 5 minutes maximum Step3: +85 +3/-0℃ 30 minutes Step4: +25 +10/-5℃ 5 minutes maximum	Mated	No evidence of physical damage
Thermal cycling	EIA-364-110 Cycle the connector or socket 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. Number of cycles: 500 cycles	Mated	No evidence of physical damage
Thermal disturbance	EIA-364-32 Cycle the connector or socket 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. Number of cycles: 10 cycles	Mated	No evidence of physical damage
Solderability	EIA-364-52 The surfaces to be tested shall be immersed in the flux for a minimum of 5 to 10 seconds. Any droplets of flux that may form shall be removed by	Unmated	95% of immersed area must show no volids or pin holes.

	blotting, taking care not to remove the flux coating from the surfaces to be tested. The test samples being tested shall be allowed to dry in ambient air for 5 to 20 seconds prior to solder immersion. The test sample termination shall be immersed to a depth equal to a length from its tip to a location normally not less than 0.5 mm below the connector seating plane. Temperature: 255±5℃ Duration: 5 seconds		
Resistance to soldering heat (Infrared reflow)	EIA-364-29 Average ramp rate: 1~4℃ per second Temperature(board surface): 250 +10℃/-0℃ Duration:30~35 seconds	Unmated	No evidence of physical damage

4.2 Typical contact resistance measurement



4.3 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.

5.0 Test sequence

Test or	Test groups

PRODUCT SPECIFICATION PS-7440 Rev. B

examination	A-1	A-2	A-3	A-5	A-7	B-2	B-3	B-4	B-5
Low level contact resistance	1,4,6	1,4,6,8	1,4,7	1,4,6,8	2,8				
Insulation resistance						2			
Dielectric withstanding voltage					1,9				
Contact current rating									
Contact Capacitance						1			
D+/D- pair attenuation								1	
Propagation delay								2	
Propagation delay intra-pair skew								3	
Mated connection impedance								4	
Differential insertion loss of SS pairs								5	
Differential-to-common-mode conversion								6	
Differential near-end crosstalk between Super Speed Pairs								7	
Differential crosstalk between D+/D- (USB2.0) and Super Speed Pairs (USB3.0)								8	
Insertion force					3,6				
Extraction force					4,7				
Durability (preconditioning)	2	2	2	2					
Reseating	5	7		7					
Durability					5				
Vibration			5						
Mechanical Shock			6						
Temperature life (preconditioning)			3	3					
Temperature life	3								
Cyclic temp and humidity		5							
Thermal shock		3							
Test or examination	Test groups								
	A-1	A-2	A-3	A-5	A-7	B-2	B-3	B-4	B-5

Thermal cycling				5					
Thermal disturbance									
Mixed flowing gas (MFG)									
Solderability							1		
Resistance to soldering heat (Infrared reflow)									
General examination	7	9	8	9	10	3	2		
Critical dimensions									1
Plating thickness									2

Note:

1. Test specimen:
   Test group **A1~A7:** 10 pcs/group
   All other groups: **B-2:** 3 pcs; **B-3:** 5 pcs; **B-4:** 3 pcs; **B-5:** 3 pcs;
2. Test specimen shall be sure to meet the drawing before the testing.