DONGGUAN MOLEX INTERCONNECT.,LTD

PRODUCT SPECIFICATION

Title: USB Type C to Type C Plug 3.1 cable assy

		TITLE : **USB Type C to Type C Plug 3.1 cable assy**			
A	Initial Release	THIS DOCUMENT CONTAINS INFORMATIOON THAT IS PROPRIETARY TO			
REV.	DESCRIPTION	MOLEX AND SHOULD NOT BE USED WITHOUT WRITTEN PERMISSION			
DOCUMENT NO.		Prepared By : LUCY LI	Date : 15/03/11	Sheet No.	
PS-68798-0001		Checked By : LUCY LI	Date : 15/03/11		
		Approved By : NIE FRED	Date : 15/03/11	1 OF 8	

DONGGUAN MOLEX INTERCONNECT.,LTD

1 Scope

This specification covers the requirements for the Standard Type C cable assembly.

2 Product Description

USB Type C to Type C Plug 3.1 cable assy (Gen1)

USB Type C to Type C Plug 3.1 cable assy (Gen2)

See the sales drawing and the other section of this specification for the necessary.In cases where the specification differs from the drawings, the sales drawings take precedence.

3 Ratings

Voltage

Rated Voltage: 30V DC

Current

Vbus and GND, refer to the sales drawing

Current of 0.25A shall be applied to all the other contacts.

4 Temperature

Operating temperature: -10 °C to +50 °C

Storage temperature: -20 °C to +60 °C

5. Pin assignment

See sales drawing

6. Electrical And Signal Integrity Compliance Requirements

Test Description	Test Condition	Performance Requirement
Low Level Contact Resistance (LLCR)	EIA 364-23 The low level contact resistance (LLCR) measurement is made across the plug and receptacle mated contacts and does not include any internal paddle cards or substrates of the plug or receptacle. The test boards shall be provided with the connectors to be tested. • Measure at 20 mV (max) open circuit at 100 mA.	The following requirements apply to the power and signal contacts: • 40 mΩ (max) initial for VBUS, GND and all other contacts. • 50 mΩ maximum after initial measurement.
Dielectric Withstanding Voltage	Test voltage 100 VAC, 1Min.	No breakdown
Cable Assembly Voltage Drop	The maximum rated VBUS current of the cable assembly shall be used. The measurement includes representative receptacles at both ends of the cable assembly, mounted on test fixtures.	250 mV max for GND and 500 mV max for VBUS.
Insertion Loss Fit at Nyquist Frequencies (ILfitatNq)	Refer to appendix G.3 of Type C connectors and cable assemblies compliance document	For all USB 3.1 Gen2 cable assembly: ≥ −4 dB at 2.5 GHz ≥ −6 dB at 5 GHz ≥ −11 dB at 10 GHz For USB 3.1 Gen-1 cable assembly: ≥−7.0 dB at 2.5 GHz ≥ −12 dB at 5 GHz
Integrated Multi-reflection (IMR)	Refer to appendix G.3 of Type C connectors and cable assemblies compliance document	≤ 0.126 · ILfitatNq^2+3.024 · ILfitatNq – 23.392, in dB. For all SuperSpeed pairs.
Integrated Crosstalk between SuperSpeed Pairs (INEXT and IFEXT)	Refer to appendix G.3 of Type C connectors and cable assemblies compliance document	Integrated near-end crosstalk: INEXT ≤ -40 dB. Integrated far-end crosstalk: IFEXT ≤ -40 dB For all SuperSpeed pairs.
Integrated Crosstalk between SuperSpeed Pairs and D+/D- (IDDXT_1NEXT+FEXT and, IDDXT_2NEXT)	Refer to appendix G.3 of Type C connectors and cable assemblies compliance document	Integrated near-end crosstalk to D+/D-: IDDXT_2NEXT ≤ −33 dB Integrated near-end and far-end crosstalk to D+/D-: IDDXT_1NEXT+FEXT ≤ −34.5 dB For all SuperSpeed pairs.

		TITLE : **USB Type C to Type C Plug 3.1 cable assy**			
A	Initial Release	THIS DOCUMENT CONTAINS INFORMATIOON THAT IS PROPRIETARY TO			
REV.	DESCRIPTION	MOLEX AND SHOULD NOT BE USED WITHOUT WRITTEN PERMISSION			
DOCUMENT NO.		Prepared By : LUCY LI	Date : 15/03/11	Sheet No.	
PS-68798-0001		Checked By : LUCY LI	Date : 15/03/11		
		Approved By : NIE FRED	Date : 15/03/11	3 OF 8	

DONGGUAN MOLEX INTERCONNECT.,LTD

Test Description		Test Procedure		Performance Requirement
Integrated Return Loss (IRL)		Refer to appendix G.3 of Type C connectors and cable assemblies compliance document		≤ 0.046· ILfitatNq^2 + 1.812 · ILfitatNq – 10.784, in dB. For all SuperSpeed pairs.
Differential-to -Common-Mode Conversion (SCD12/SCD21)		Refer to appendix G.3 of Type C connectors and cable assemblies compliance document		≤ -20 dB from 100 MHz to 10 GHz. For all SuperSpeed pairs.
Differential coupling between CC and USB D+/D-		Refer to appendix G.5 of Type C connectors and cable assemblies compliance document		For cable assemblies the limit is defined with the vertices of (0.3 MHz, -60.5 dB), (1 MHz, −50 dB), (10 MHz, −30 dB), (16 MHz, −26 dB) and (100 MHz, −26 dB) on scale of log10(f) .
Differential coupling between VBUS and USB D+/D-		Refer to appendix G.5 of Type C connectors and cable assemblies compliance document		⩽ -40 dB for 0.3 MHz < f ⩽ 30 MHz, and ⩽ 19.12·log10(f/30)-40 (in dB) for 30 MHz< f ⩽ 100 MHz..
Single-ended coupling between SBU_A and CC, SBU_B and CC		Refer to appendix G.5 of Type C connectors and cable assemblies compliance document		The limit is defined with the vertices of (0.3 MHz, -65 dB), (1 MHz, −55 dB), (18 MHz, −30 dB), and (100 MHz, −30 dB) on scale of log10(f).
Single end coupling between CC and D-		Refer to appendix G.5 of Type C connectors and cable assemblies compliance document		For USB Full-Featured Type-C cables, the singled-ended coupling between the CC and D− shall be below the limitsdefined with the vertices of (0.3 MHz, −58 dB), (10 MHz, −27.5 dB), (11.8 MHz, −26 dB) and (100 MHz, −26 dB) in scale of log10(f).
Single- ended coupling between SBU_A and SBU_B		Refer to appendix G.5 of Type C connectors and cable assemblies compliance document		The limit is defined with the vertices of (0.3 MHz, −56.5 dB), (1 MHz, −46 dB), (10 MHz, −26 dB), (11.2 MHz, −25 dB), and (100 MHz, −25 dB) on scale of log10(f).

		TITLE : USB Type C to Type C Plug 3.1 cable assy			
A	Initial Release	THIS DOCUMENT CONTAINS INFORMATIOON THAT IS PROPRIETARY TO			
REV.	DESCRIPTION	MOLEX AND SHOULD NOT BE USED WITHOUT WRITTEN PERMISSION			
DOCUMENT NO.		Prepared By : LUCY LI	Date : 15/03/11	Sheet No.	
PS-68798-0001		Checked By : LUCY LI	Date : 15/03/11		
		Approved By : NIE FRED	Date : 15/03/11	4 OF 8	

Test Description		Test Procedure		Performance Requirement
Differential coupling between SBU_A/SBU_B and USB D+/D−		Refer to appendix G.5 of Type C connectors and cable assemblies compliance document		0.3MHz, -80dB 30MHz, -40dB 100MHz, -40dB
VBUS loop inductance		Refer to appendix G.5 of Type C connectors and cable assemblies compliance document		⩽ 900 nH
VBUS Capacitance		Refer to appendix G.5 of Type C connectors and cable assemblies compliance document		8 nF to 500 nF each side, not including the by-pass capacitor on the test fixture.
Inductance Coupling Factor (k) between VBUS and Other Low Speed Signals (CC, SBU_A, SBU_B, D+, and D-)		Refer to appendix G.5 of Type C connectors and cable assemblies compliance document		⩽ 0.3. The inductance coupling factor is defined as the ratio of mutual inductance to the square root of the product of the loop inductances of the two coupled lines. For example, the coupling factor between VBUS and CC is: k=L_(VBUS_CC)/ √ (L_VBUS L_CC)
D+/D- Pair Differential Impedance		Refer to appendix G.4 of Type C connectors and cable assemblies compliance document Measured with a 400 ps rise time (20%-80%)		75 ohms min and 105 ohms max
D+/D- Pair Propagation Delay		Refer to appendix G.4 of Type C connectors and cable assemblies compliance document Measured with a 400 ps rise time (20%-80%) at 50% voltage crossing.		20 ns max.
D+/D- Pair intra-pair Skew		Refer to appendix G.4 of Type C connectors and cable assemblies compliance document Measured with a 400 ps rise time (20%-80%) at 50% voltage crossing..		100 ps max.
D+/D- Pair Attenuation		Refer to appendix G.4 of Type C connectors and cable assemblies compliance document		≥ −1.02 dB @ 50 MHz ≥ −1.43 dB @ 100 MHz ≥ −2.40 dB @ 200 MHz ≥ −4.35 dB @ 400 MHz

		TITLE : USB Type C to Type C Plug 3.1 cable assy			
A	Initial Release	THIS DOCUMENT CONTAINS INFORMATIOON THAT IS PROPRIETARY TO			
REV.	DESCRIPTION	MOLEX AND SHOULD NOT BE USED WITHOUT WRITTEN PERMISSION			
DOCUMENT NO.		Prepared By : LUCY LI	Date : 15/03/11	Sheet No.	
PS-68798-0001		Checked By : LUCY LI	Date : 15/03/11		
		Approved By : NIE FRED	Date : 15/03/11	5 OF 8	

7. Mechanical Compliance Requirements

Test Description	Test Procedure	Performance Requirement
Cable Flexing	EIA 364-41, Condition I with Dimension X = 3.7 times the cable diameter and 100 cycles in each of two planes 120 degree arc.	No physical damage and discontinuity over 1 microsecond during flexing shall occur to the cable assembly
Cable Pull-Out	EIA 364-38 Test Condition A The cable assembly shall is subjected to a 40N axial load for a minimum of 1 minute while clamping one end of the cable plug.	No visible physical damage and no electrical discontinuity over 1 microsecond to the cable assembly.
Wrenching Strength (Plug-only)	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. Refer to Appendix E of Type C connectors and cable assemblies compliance document	A single plug shall be used for this test. Some mechanical deformation may occur. The plug shall be mated with the continuity test fixture after the test forces have been applied to verify no damage has occurred that causes discontinuity or shorting. The Dielectric Withstanding Voltage test shall be conducted after the continuity test to verify plug compliance. A new plug is required for each of the four test directions. The plug shall disengage from the test fixture or demonstrate mechanical failure (i.e., the force applied during the test procedure peaks and drops off) when a moment of 2.0 Nm is applied to the plug in the up and down directions and a moment 3.5 Nm is applied to the plug in the left and right directions.

4-Axes Continuity		Refer to appendix D of Type C connectors and cable assemblies compliance document. Plug and Receptacle: Subject the mating interface to the moments defined in Appendix D for at least 10 seconds.		No discontinuities greater than 1 microsecond duration in any of the four orientations tested.
Insertion Force		EIA 364-13 The insertion force test shall be done at a maximum rate of 12.5 mm (0.492") per minute.		Within the range from 5 N to 20 N.
Extraction Force		EIA 364-13 The extraction force test shall be done at a maximum rate of 12.5 mm (0.492") per minute.		Within the range of 8 N to 20 N, measured after a preconditioning of five insertion/extraction cycles (i.e., the sixth extraction). After an additional twenty-five insertion/extraction cycles, the extraction force shall be measured again (i.e., the thirty-second extraction) and the extraction force shall be within: a) 33 % of the initial reading, and b) within the range of 8 N to 20 N. The extraction force shall be within the range of 6 N to 20 N after 10,000 insertion/extraction cycles.
Durability or Insertion/Extraction Cycles		EIA 364-09		10,000 cycles minimum. Conductor resistance and dielectric withstanding voltage shall be checked to be within spec after the 10,000 durability cycles

DONGGUAN MOLEX INTERCONNECT.,LTD

8. Environmental Compliance Requirements

Test Description		Test Procedure		Performance Requirement
Temperature Life		EIA 364-17, Method A. 105º C without applied voltage for 120 hours. 105º C without applied voltage for 72 hours when used as preconditioning. The object of this test procedure is to detail a standard method to assess the ability of a USB connector to withstand temperature.		Conductor resistance meets spec before and after the Temperature Life test.
Cyclic Temperature and Humidity		EIA 364-31 The object of this test procedure is to detail a standard test method for the evaluation of the designs and materials used in USB connectors as the effects of high humidity and heat influences them.		Subject samples to between 25℃±3℃ at 80%±3% RH and 65℃±3℃ at 50%±3% RH,Ramp times should be 0.5 hour and dwell times should be 1.0hour.Dwell times start when the temperature and humidity have stabilized within the specified levels.Perform 24 such cycles. Conductor resistance meets spec before and after the Cyclic Temperature and Humidity test.

9. Cable Assembly Shielding Effectiveness Compliance Requirements

Test Description		Test Procedure		Performance Requirement
Cable Shielding Effectiveness		USB Type-C connectors and cable assemblies compliance document		Differential model: ≤ -55 dB for f ≤1.6 GHz ≤ -50 dB for 1.6 GHz ≤ f ≤ 4.0 GHz and 5 GHz ≤ f ≤ 6 GHz Common model: ≤ -40 dB for f ≤ 1.6 GHz ≤ -35 dB for 1.6 GHz ≤ f ≤ 4 GHz and 5 GHz ≤ f ≤ 6 GHz

		TITLE :	**USB Type C to Type C Plug 3.1 cable assy**		
A	Initial Release	THIS DOCUMENT CONTAINS INFORMATIOON THAT IS PROPRIETARY TO			
REV.	DESCRIPTION	MOLEX AND SHOULD NOT BE USED WITHOUT WRITTEN PERMISSION			
DOCUMENT NO.		Prepared By :	LUCY LI	Date : 15/03/11	Sheet No.
PS-68798-0001		Checked By :	LUCY LI	Date : 15/03/11	
		Approved By :	NIE FRED	Date : 15/03/11	8 OF8