



Cobb Technology

USB 3.1 & USB C Technical Data



➤ USB 3.1 Technical Data

➤ Type C Technical Data

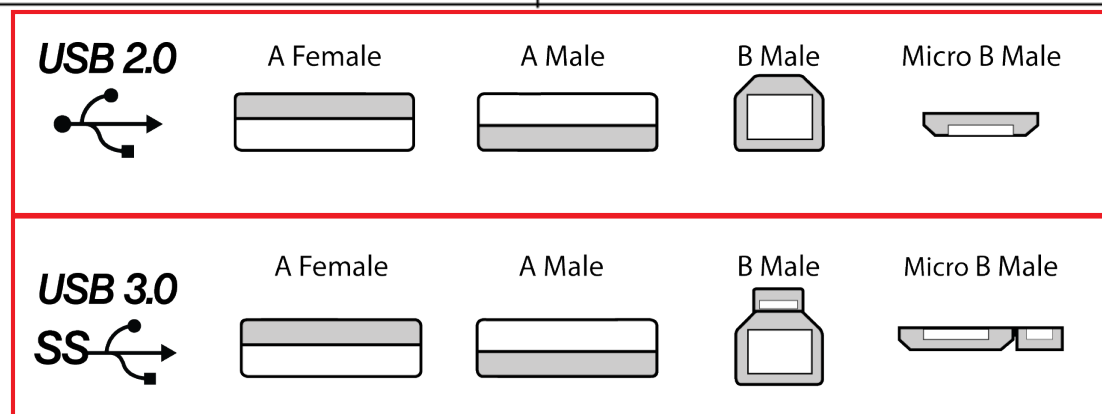
➤ USB Comparison

USB Ver.	General	Speed	Bandwidth	Current (A)	Voltage
1.0	Low-Speed	1.5 Mbps	183.1 KB/s	500mA/100mA	4.75~5.25V
1.1	High-Speed	12 Mbps	1.43 MB/s	500mA/100mA	4.75~5.25V
2.0	Full-Speed	480 Mbps	57.22 MB/s	500mA/100mA	4.75~5.25V
3.0	Super-Speed	5 Gbps	596.05 MB/s	900mA/150mA	4.75~5.25V
3.1	Super-Speed+	10Gbps	1.1 GB/s	3A/5A	5V/12V/20V

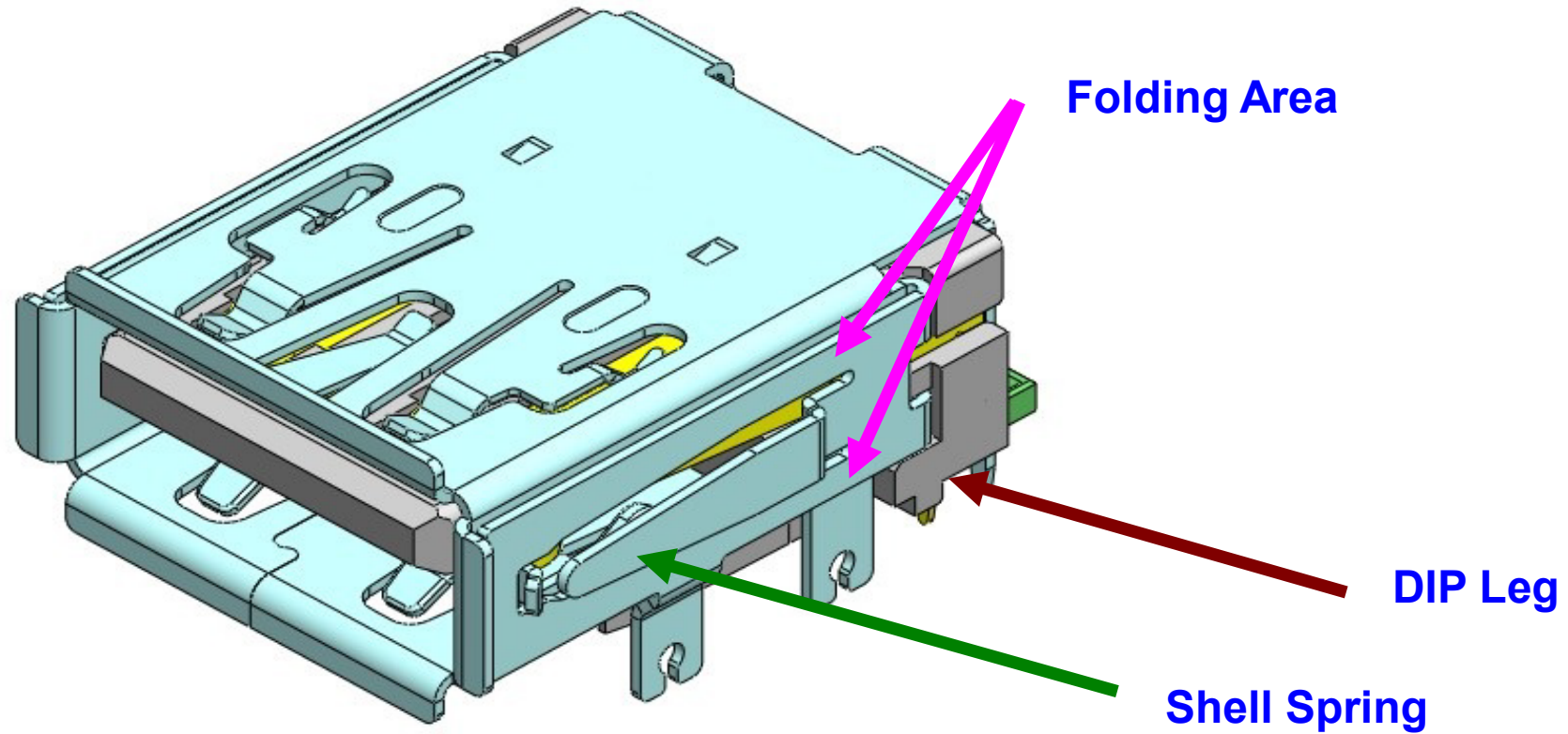
➤ USB Specification List

Table 5-1. Plugs Accepted By Receptacles

Receptacle (Standard or PD)	Plugs Accepted (Standard or PD)
USB 2.0 Standard-A	USB 2.0 Standard-A or USB 3.1 Standard-A
USB 3.1 Standard-A	USB 3.1 Standard-A or USB 2.0 Standard-A
USB 2.0 Standard-B	USB 2.0 Standard-B
USB 3.1 Standard-B	USB 3.1 Standard-B or USB 2.0 Standard-B
USB 2.0 Micro-B	USB 2.0 Micro-B
USB 3.1 Micro-B	USB 3.1 Micro-B or USB 2.0 Micro-B
USB 2.0 Micro-AB	USB 2.0 Micro-B or USB 2.0 Micro-A
USB 3.1 Micro-AB	USB 3.1 Micro-B, USB 3.1 Micro-A, USB 2.0 Micro-B, or USB 2.0 Micro-A

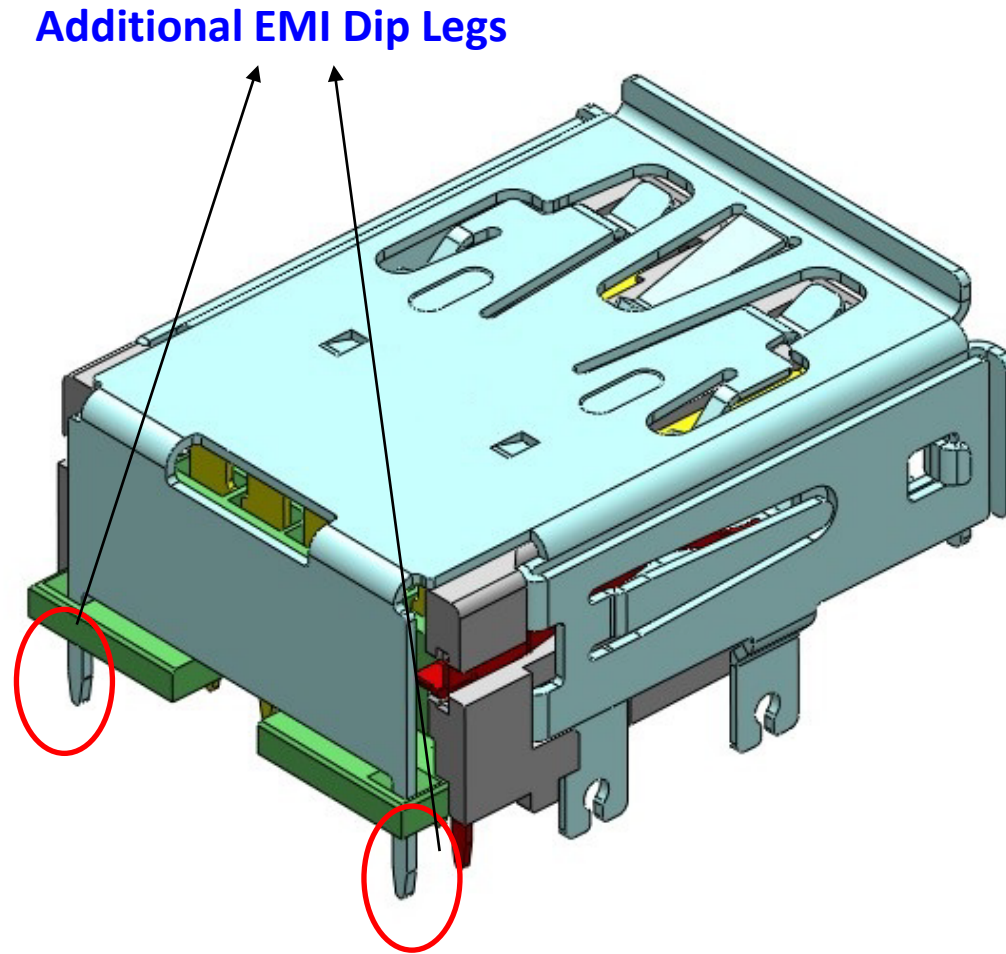


➤ USB 3.1 Design



Patented Design

➤ USB 3.1 Design



➤ USB 3.1 Association Definition

5.6.1.2.1 Mated Connector Impedance for Gen 2 Speed

The recommended mated connector impedance is needed to maintain signal integrity. The differential impedance of a mated connector should be $90\ \Omega \pm 10\ \Omega$ as seen from a 40 ps (20%-80%) risetime of a differential TDR. The impedance profile of a mated connector should fall within the limits shown in Figure 5-21. The impedance profile of the mated connector is defined from the receptacle footprints through the plug cable termination area. In a case where the plug is directly attached to a device PCB, the mated connector impedance profile includes the path from the receptacle footprints to the plug footprints.

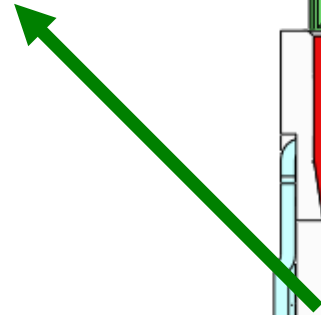
The normative cable assembly requirements are specified in Section 5.6.1.3.2.

Receptacle: $90\ \Omega \pm 10\ \Omega$

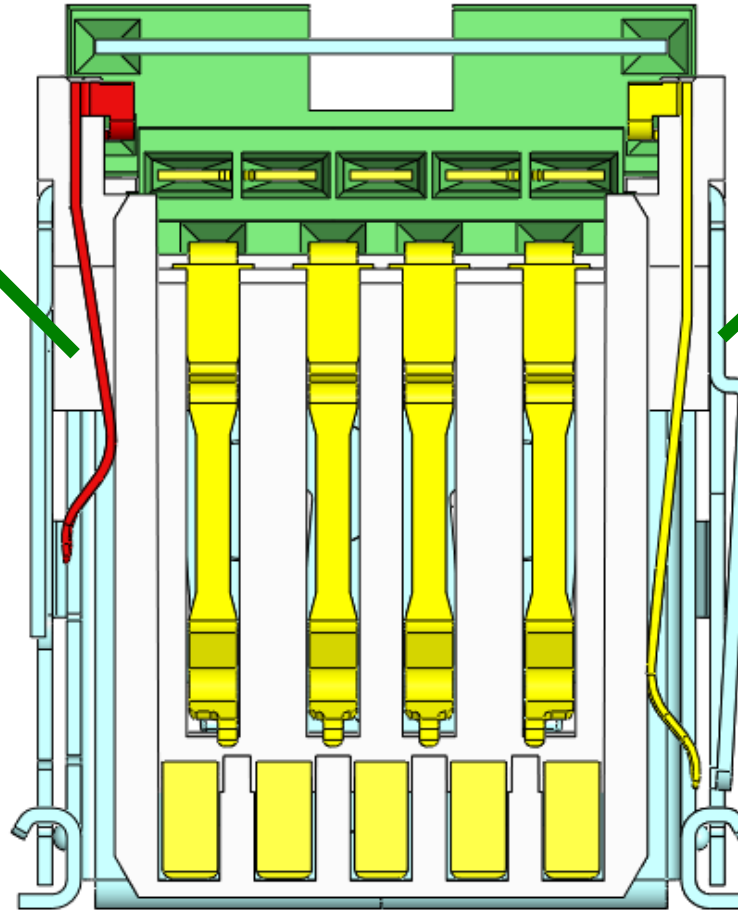
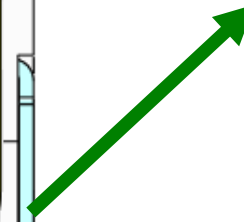
Plug: $90\ \Omega \pm 15\ \Omega$

➤ USB 3.1 (PD) Design

Power Detect Pin



Insertion Detect Pin



➤ USB 3.1(PD) Pin Assignment

Pin Number ¹	Signal Name	Description	Mating Sequence
1	V _{BUS}	Power	Third
2	D-	Differential pair as defined in <i>[USB2.0]</i>	Fourth
3	D+		
4	GND	Ground for power return	Third
10 ²	PD DETECT 1	Contact in PD receptacle to detect a PD plug	Last
11 ²	PD DETECT 2	Contact in PD receptacle to detect a PD plug	Last
12 ³ ,13	INSERTION DETECT	Receptacle only. Detects insertion of a plug into the receptacle. Optional except for cold socket applications.	Second
Shell	Shield	Connector metal shell	First
<p>Note 1: Pin numbers not included in this table do not have contacts present. Pin numbering is consistent with location across multiple USB connector types.</p> <p>Note 2: Implementation of PD DETECT shall include:</p> <ul style="list-style-type: none"> a) either pin 10 or pin 11. b) both pin 10 and pin 11. <p>Note 3: Pin 12, if present, shall be connected to Shield.</p>			

➤ USB 3.1(PD)

3.6.1 Low Level Contact Resistance (EIA 364-23B)

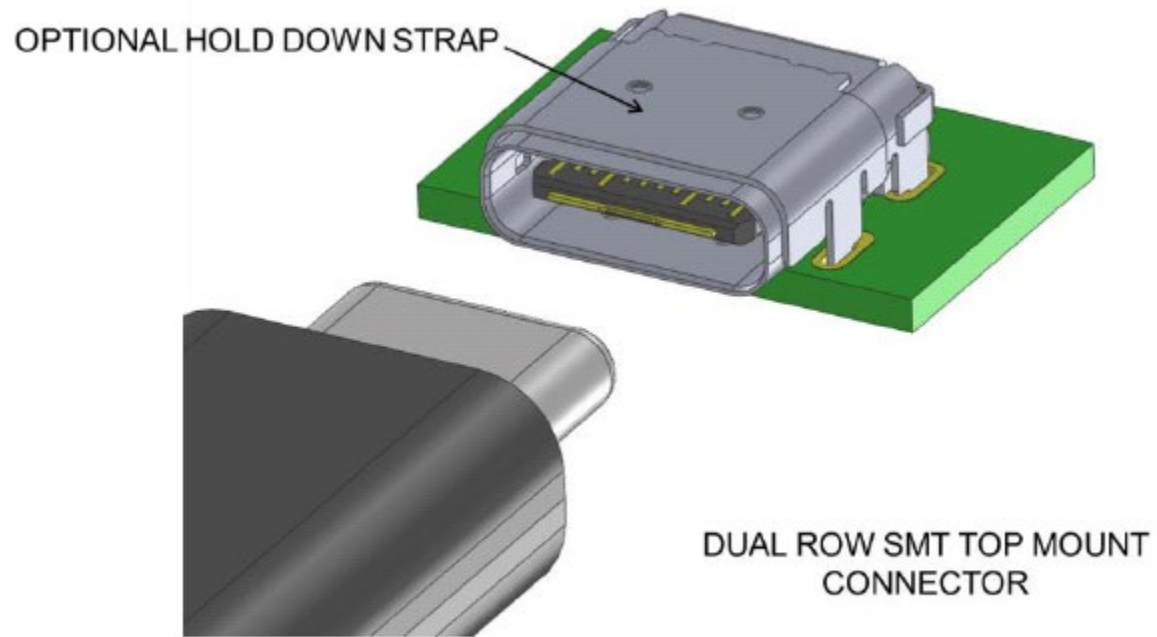
The following requirement applies to the power contacts of a 3A PD cable assembly:

- 20m Ω (Max) initial for V_{BUS} and GND contacts.
- Maximum change (delta) of +10m Ω after environmental stresses.
- Measure at 20mV (Max) open circuit at 100mA.

The following requirement applies to the power contacts of a 5A PD cable assembly:

- 20m Ω (Max) initial for V_{BUS} and GND contacts.
- Maximum change (delta) of +10m Ω after environmental stresses.
- Measure at 20mV (Max) open circuit at 100mA.

➤ USB Type C



➤ USB Type C - SPEC

Table 2-1 Summary of power supply options

Mode of Operation	Nominal Voltage	Maximum Current	Notes
USB 2.0	5 V	500 mA	Default Current, based on definitions in the base specifications
USB 3.1	5 V	900 mA	
USB BC 1.2	5 V	Up to 1.5 A	Legacy charging
USB Type-C Current @ 1.5 A	5 V	1.5 A	Supports higher power devices
USB Type-C Current @ 3.0 A	5 V	3 A	Supports higher power devices
USB PD	Configurable up to 20 V	Configurable up to 5 A	Directional control and power level management

The USB Type-C receptacle is specified for current capability of 5 A whereas standard USB Type-C cable assemblies are rated for 3 A. The higher rating of the receptacle enables systems to deliver more power over directly attached docking solutions or using appropriately designed chargers with captive cables when implementing [USB PD](#). Also, USB Type-C cable assemblies designed for [USB PD](#) and appropriately identified via electronic marking are allowed to support up to 5 A.

➤ USB Type C - SPEC

Table 3-1 USB Type-C Standard Cable Assemblies

Cable Ref	Plug 1	Plug 2	USB Version	Cable Length	Current Rating	USB Power Delivery (BMC)	USB Type-C Electronically Marked
CC2-3	C	C	USB 2.0	≤ 4 m	3 A	Supported	Optional
CC2-5					5 A		Required
CC3G1-3	C	C	USB 3.1 Gen1	≤ 2 m	3 A	Supported	Required
CC3G1-5					5 A		
CC3G2-3	C	C	USB 3.1 Gen2	≤ 1 m	3 A	Supported	Required
CC3G2-5					5 A		

Gen 1: 5 Gps.....USB 3.0 Gen 2: 10 Gps.....USB 3.1

Table 4-10 DFP CC Termination (Rp) Requirements

DFP Advertisement	Current Source to 1.7 - 5.5 V	Resistor pull-up to 4.75 - 5.5 V	Resistor pull-up to 3.3 V ± 5%
Default USB Power	80 μA ± 20%	56 kΩ ± 20%	36 kΩ ± 20%
1.5 A @ 5 V	180 μA ± 8%	22 kΩ ± 5%	12 kΩ ± 5%
3.0 A @ 5 V	330 μA ± 8%	10 kΩ ± 5%	4.7 kΩ ± 5%

➤ USB Type C - SPEC

Table 3-2 USB Type-C Legacy Cable Assemblies

Cable Ref	Plug 1	Plug 2	USB Version	Cable Length	Current Rating	USB Power Delivery (BFSK) ¹	USB Type-C Electronically Marked
AC2-1.5	A	C ²	USB 2.0	≤ 4 m	1.5 A	Optional	N/A
AC2-5					5 A	Supported	Required
AC3G2-1.5	A	C ²	USB 3.1 Gen2	≤ 1 m	1.5 A	Optional	N/A
AC3G2-5					5 A	Supported	Required
CB2-1.5	C ³	B	USB 2.0	≤ 4 m	1.5 A	Optional	Optional
CB2-5					5 A	Supported	Required
CB3G2-1.5	C ³	B	USB 3.1 Gen2	≤ 1 m	1.5 A	Optional	Required
CB3G2-5					5 A	Supported	
CmB2	C ³	Mini-B	USB 2.0	≤ 4 m	500 mA	N/A	N/A
CμB2-1.5	C ³	Micro-B	USB 2.0	≤ 2 m	1.5 A	Optional	Optional
CμB2-3					3 A	Supported	
CμB3G2-1.5	C ³	Micro-B	USB 3.1 Gen2	≤ 1 m	1.5 A	Optional	Required
CμB3G2-3					3 A	Supported	

➤ USB Type C - SPEC

Table 3-3 USB Type-C Legacy Adapter Assemblies

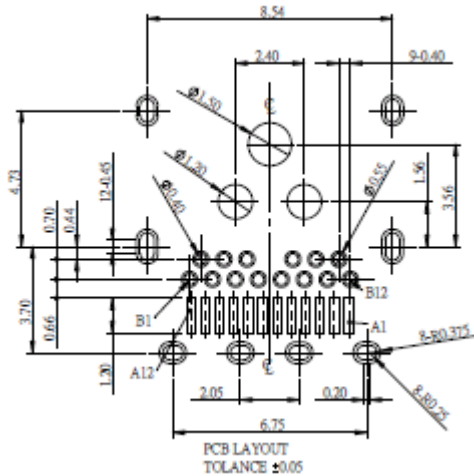
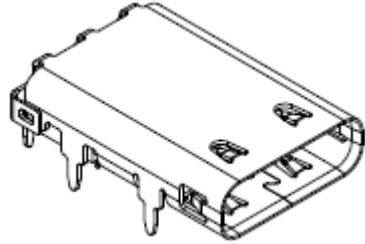
Adapter Ref	Plug	Receptacle	USB Version	Cable Length	Current Rating	USB Power Delivery (BFSK)	USB Type-C Electronically Marked
CμBR2-1.5	C ¹	Micro-B	USB 2.0	≤ 0.15 m	1.5 A	N/A	N/A
CAR3G1-1.5	C ²	A	USB 3.1 Gen1	≤ 0.15 m	1.5 A	N/A	Optional

Notes:

1. USB Type-C plugs associated with the “B” end of a legacy adapter are required to have Rp termination incorporated into the plug assembly – see Section 4.5.3.2.2.
2. USB Type-C plugs associated with the “A” end of a legacy adapter are required to have Rd termination incorporated into the plug assembly – see Section 4.5.3.2.1.

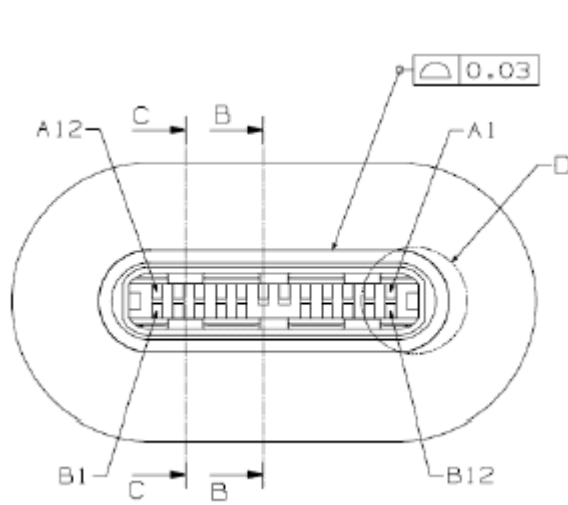
➤ USB Type C

Table 3-4 USB Type-C Receptacle Interface Pin Assignments

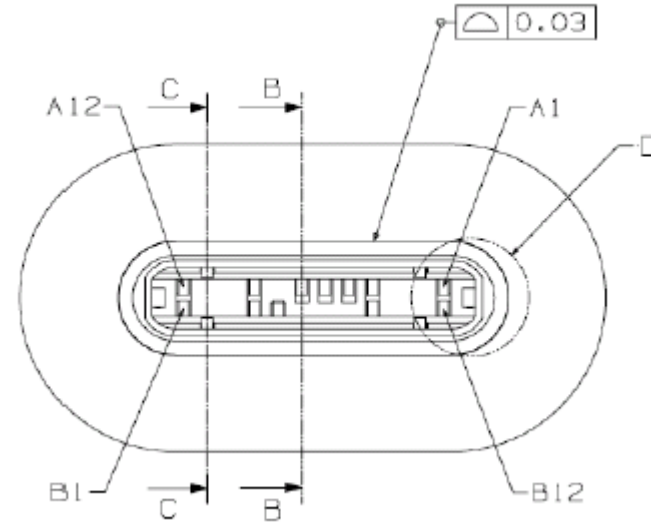


Pin	Signal Name	Description	Mating Sequence	Pin	Signal Name	Description	Mating Sequence
A1	GND	Ground return	First	B12	GND	Ground return	First
A2	SSTXp1	Positive half of first SuperSpeed TX differential pair	Second	B11	SSRXp1	Positive half of first SuperSpeed RX differential pair	Second
A3	SSTXn1	Negative half of first SuperSpeed TX differential pair	Second	B10	SSRXn1	Negative half of first SuperSpeed RX differential pair	Second
A4	VBUS	Bus Power	First	B9	VBUS	Bus Power	First
A5	CC1	Configuration Channel	Second	B8	SBU2	Sideband Use (SBU)	Second
A6	Dp1	Positive half of the <u>USB 2.0</u> differential pair - Position 1	Second	B7	Dn2	Negative half of the <u>USB 2.0</u> differential pair - Position 2	Second
A7	Dn1	Negative half of the <u>USB 2.0</u> differential pair - Position 1	Second	B6	Dp2	Positive half of the <u>USB 2.0</u> differential pair - Position 2	Second
A8	SBU1	Sideband Use (SBU)	Second	B5	CC2	Configuration Channel	Second
A9	VBUS	Bus Power	First	B4	VBUS	Bus Power	First
A10	SSRXn2	Negative half of second SuperSpeed RX differential pair	Second	B3	SSTXn2	Negative half of second SuperSpeed TX differential pair	Second
A11	SSRXp2	Positive half of second SuperSpeed RX differential pair	Second	B2	SSTXp2	Positive half of second SuperSpeed TX differential pair	Second
A12	GND	Ground return	First	B1	GND	Ground return	First

➤ USB Type C



Full-Featured C Type
(22 pins)



2.0 C Type
(12 pins)

➤ USB Type C

Table 3-12 USB Type-C to [USB 3.1](#) Standard-A Cable Assembly Wiring

USB 3.1 C Type to USB 3.1 Plug Micro B Type
USB 3.1 C Type to USB 3.1 Plug A Type
USB 3.1 C Type to USB 3.1 Plug B Type
USB 2.0 C Type to USB 2.0 Plug Micro B Type
USB 2.0 C Type to USB 2.0 Plug A Type
USB 2.0 C Type to USB 2.0 Plug B Type
N/A
USB 2.0 C Type to USB 2.0 Plug Mini B Type

USB Type-C Plug		Wire		USB 3.1 Standard-A plug	
Pin	Signal Name	Wire Number	Signal Name	Pin	Signal Name
A1, B1, A12, B12	GND	1 7, 10	GND_PWRrt1 SDP1_Drain, SDP2_Drain	4 7	GND GND_DRAIN
A4, B4, A9, B9	VBUS	2	PWR_VBus1	1	VBUS
A5	CC				
B5	VCONN				
A6	Dp1	3	UTP_Dp	3	D+
A7	Dn1	4	UTP_Dn	2	D-
A2	SSTXp1	5	SDPp1	6	StdA_SSRX+
A3	SSTXn1	6	SDPn1	5	StdA_SSRX-
B11	SSRXp1	8	SDPp2	9	StdA_SSTX+
B10	SSRXn1	9	SDPn2	8	StdA_SSTX-
Shell	Shield	Braid	Shield	Shell	Shield

Definition by Association:

USB 2.0 pin assignment

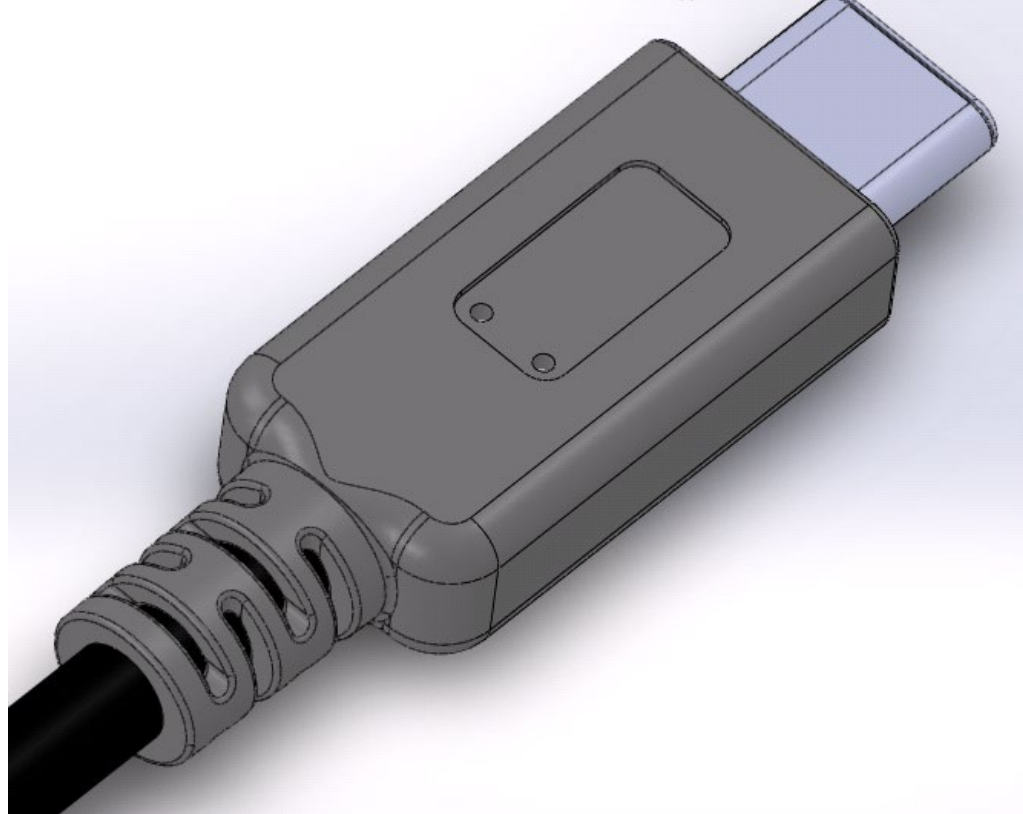
➤ USB Type C Receptacle

Drawing to follow

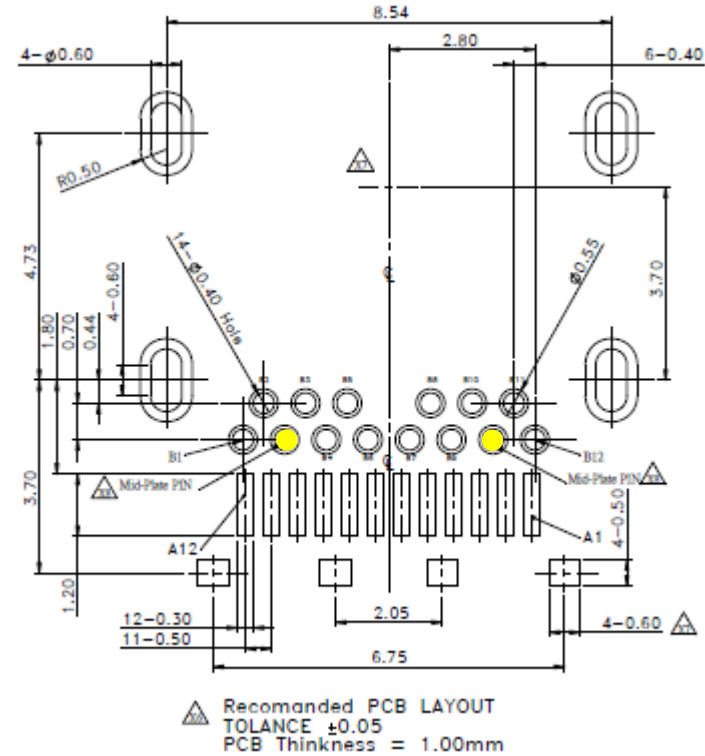
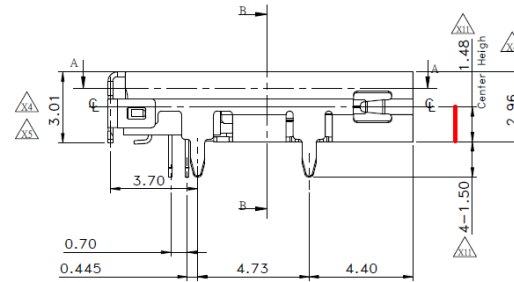
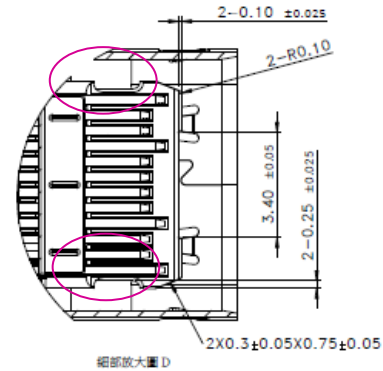
➤ USB Type C Plug

Add Drawing

➤ USB Type C Cable



➤ USB Type C




1) 24 Pins (12 Pin at each side).

2) Structure to lock with latch at cable side.

3) Center Height 1.48 mm.

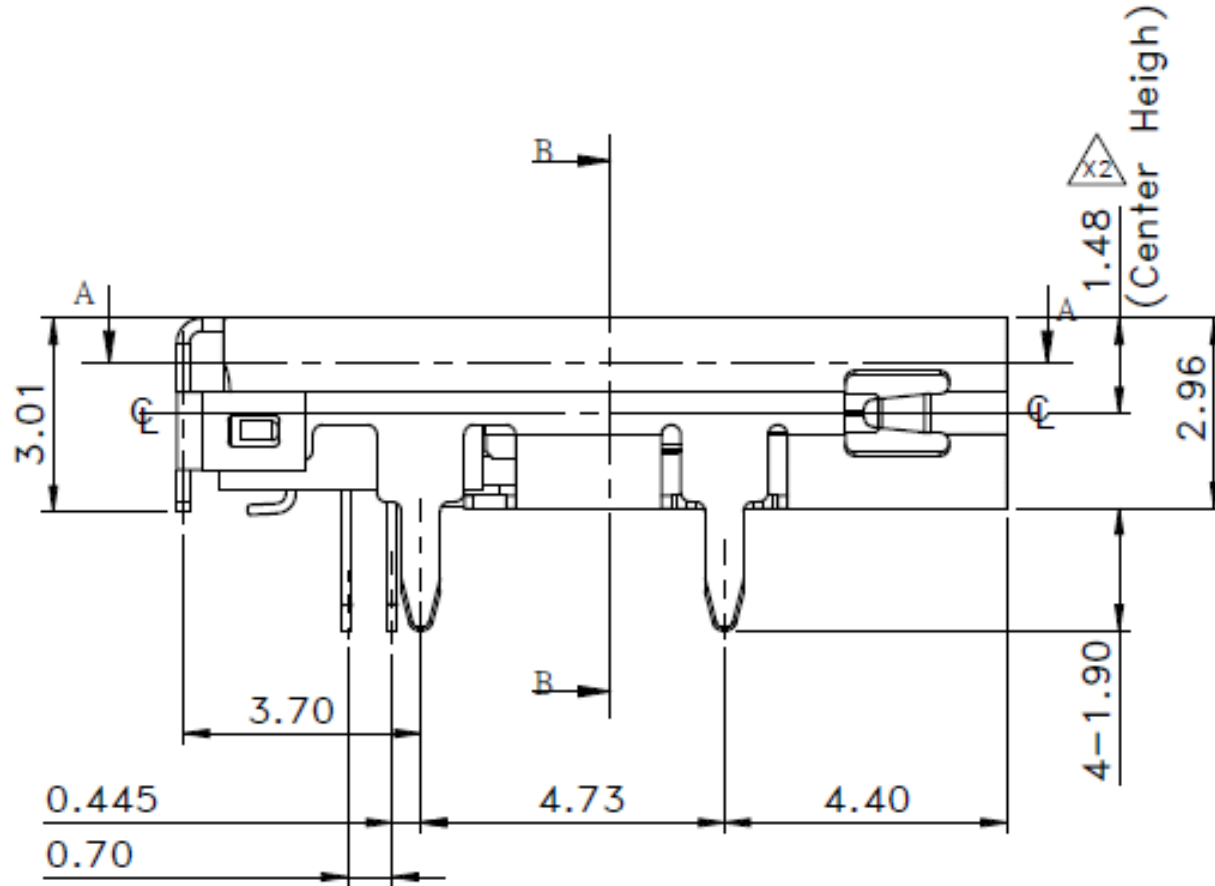
4) Mid-Mount Pin (Ground).

➤ USB Type C

 USB TYPE -C Pin Assignments

Pin Number	Signal Name	Pin Number	Signal Name
A1	GND	B12	GND
A2	SSTXp1	B11	SSTXp1
A3	SSTXn1	B10	SSTXn1
A4	V _{BUS}	B9	V _{BUS}
A5	CC1	B8	SBU2
A6	Dp1	B7	Dn2
A7	Dn1	B6	Dp2
A8	SBU1	B5	CC2
A9	V _{BUS}	B4	V _{BUS}
A10	SSTXn2	B3	SSTXn2
A11	SSTXp2	B2	SSTXp2
A12	GND	B1	GND

➤ USB Type C



1) In order to accommodate a 1.6 mm thick PCB, the Length of the contacts and shell is 1.9 mm.

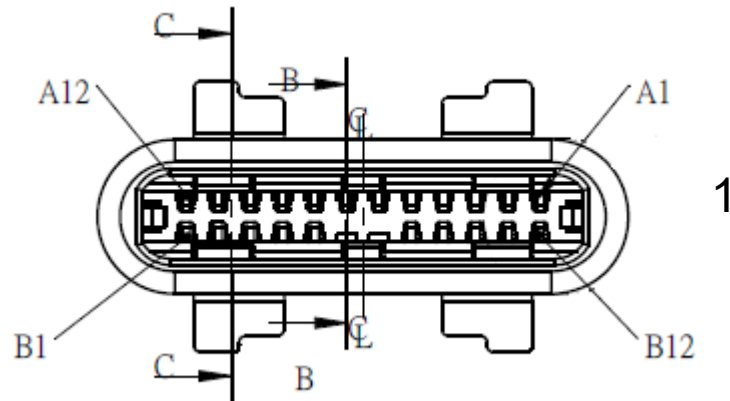
➤ USB Type C

1) 22 Pins - 12 pins on the top side and 10 pins on the bottom.

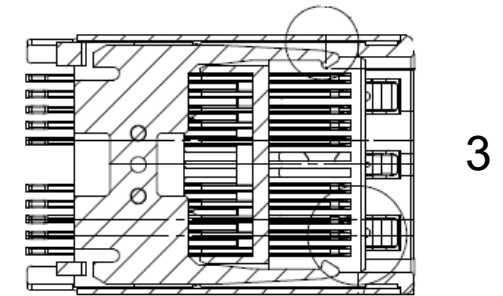
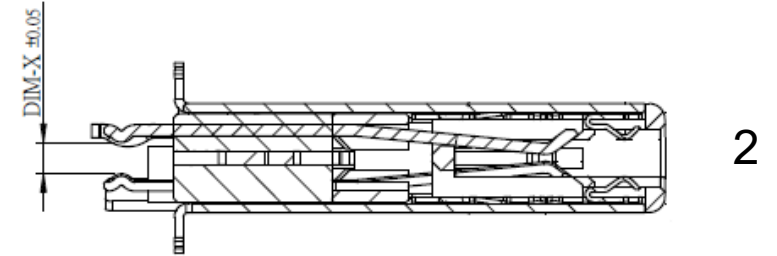
2) Options for cable assembly (0.8 mm) or Flash Drive (pen driver) (0.4 mm).

3) Latch.


- Full feature plug (24 pins) for Alt Mode to transmit 4 channel.



	STANDARD	PEN DRIVER
DIM-X	Δ_{X3} 0.70mm	Δ_{X3} 0.25mm



➤ USB Type C

 USB TYPE -C Plug Pin Assignments




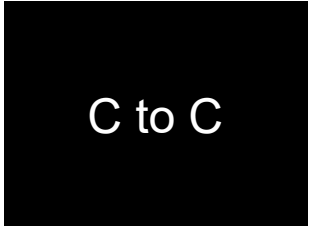
On the PCB side, signal is detected from the cable due to resistance at the CC pin from the cable.

Pin Number	Signal Name	Pin Number	Signal Name
A1	GND	B12	GND
A2	SSTXp1	B11	SSTXp1
A3	SSTXn1	B10	SSTXn1
A4	V _{bus}	B9	V _{bus}
A5	CC1	B8	SBU2
A6	Dp1	B7	NA
A7	Dn1	B6	NA
A8	SBU1	B5	CC2
A9	V _{bus}	B4	V _{bus}
A10	SSTXn2	B3	SSTXn2
A11	SSTXp2	B2	SSTXp2
A12	GND	B1	GND

A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	A11	A12
GND	TX1+	TX1-	V _{BUS}	CC1	D+	D-	SBU1	V _{BUS}	RX2-	RX2+	GND
GND	RX1+	RX1-	V _{BUS}	SBU2	D-	D+	CC2	V _{BUS}	TX2-	TX2+	GND
B12	B11	B10	B9	B8	B7	B6	B5	B4	B3	B2	B1


USB 3.1 Gen 2

Length

C-3.1A	C-3.1B	C- 3.1micro B	C-C 3.1
			
1 M	1 M	0.5 M	TBD





USB 3.1 Gen 1


Length

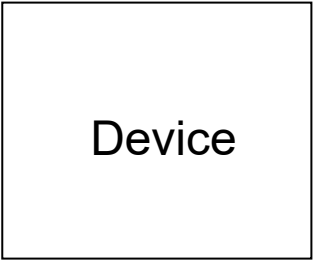
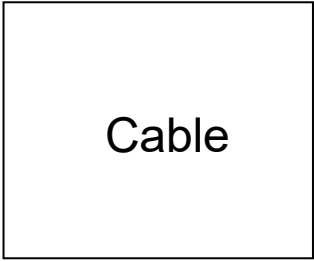
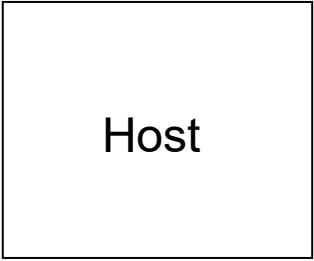
	C-3.0 AF
5 cm	

USB 2.0

Length

C-2.0A	C-2.0B	C- 2.0microB	C- 2.0 miniB
			
1 M	1 M	1 M	1 M

	C- C 2.0
1 M	



Resistance



Host

Cable

Adapter



PD





- 1) USB Dual Type Reader (ID-B) (ID-C)
- 2) USB Type C Legacy Adapter (ID-A) (ID-B)



- 1) USB Type C to USB 2.0 micro BF
- 2) USB Type C to VGA/HDMI/DVI
- 3) USB Type C to DisplayPort
- 4) USB Type C to 1G Lan
- 5) USB Type C to D-Sub 9 Pin
- 6) USB Type C to D-Sub 25 Pin
- 7) USB Type C to Audio
- 8) USB Type C to Audio + Charging
- 9) USB Type C to SATA



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