一 C 各表：USB Type-C 接口的那些事

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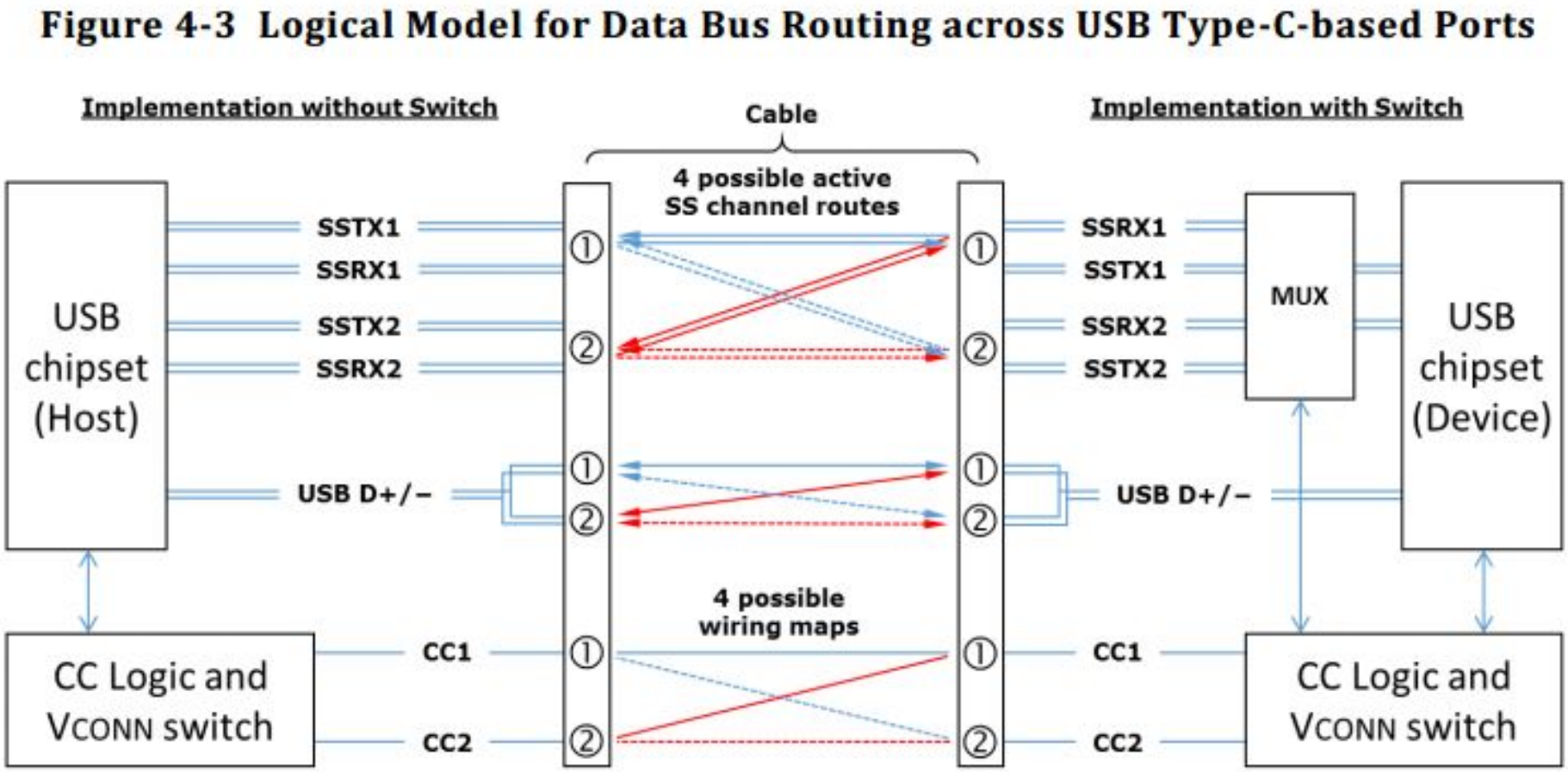
Tunight
Week 18, 2019

根据你所听到的内容，回答下列问题

- USB Type-C 有哪些令人激动的新特性？
- Type-C (USB PD) 可提供多达 _____W 的供电功率
- Type-C (USB 3.1) 可实现高达 ____bps 的数据传输
- Type-C 如何取代电脑上的图像输出接口？
- Type-C 上数据和供电的主从关系是绑定的吗？
- 最初的 USB 接口是 __ 年设计的

USB Type-C 连接器

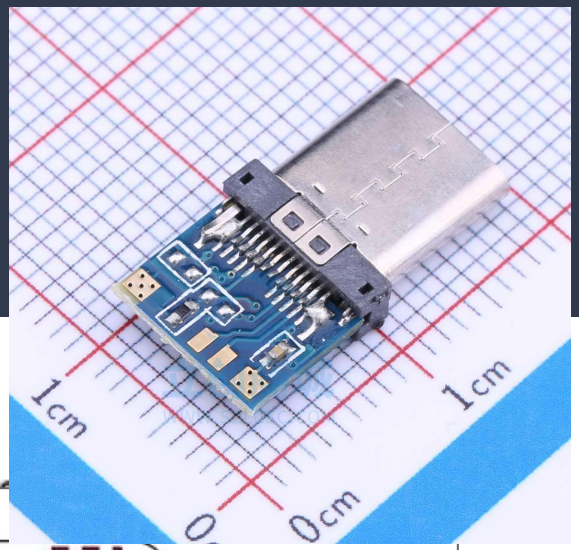
USB Type-C 数据信号连接关系



神秘的 CC 信号线 —— 概念

- **DFP**: Downstream Facing Port, specifically associated with the flow of data in a USB connection. Typically the ports on a host or the ports on a hub to which devices are connected. In its initial state, the DFP sources VBUS and VCONN, and supports data. A charge-only DFP port only sources VBUS.
- **UFP**: Upstream Facing Port, specifically associated with the flow of data in a USB connection. The port on a device or a hub that connects to a host or the DFP of a hub. In its initial state, the UFP sinks VBUS and supports data.
- **DRD**: Dual-Role-Data, the acronym used in this specification to refer to a USB port that can operate as either a DFP (Host) or UFP (Device). The role that the port initially takes is determined by the port's power role at attach. A Source port takes on the data role of a DFP and a Sink port takes on the data role of a UFP. The port's data role may be changed dynamically using USB PD Data Role Swap.

神秘的 CC 信号线 —— 典型连接



DFP monitors for connection

Type-C 线缆 —— C ↔ A

Figure 3-24 USB Type-C to USB 3.1 Standard-A Cable Assembly

Table 3-12 defines the wire connections for the USB Type-C to *USB 3.1* Standard-A cable assembly.

Table 3-12 USB Type-C to *USB 3.1* Standard-A Cable Assembly Wiring

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	See Note 2			
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	Outer shield	Shield	Shell	Shield

Note 2: Pin A5 (CC) of the USB Type-C plug shall be connected to VBUS through a resistor Rp (56 kΩ ± 5%).

Type-C 线缆 —— C ↔ B

Figure 3-26 USB Type-C to *USB 3.1* Standard-B Cable Assembly

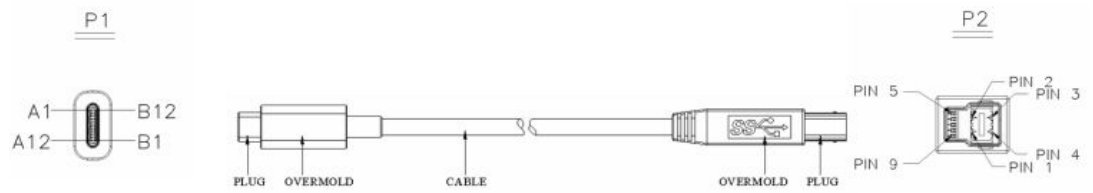


Table 3-14 defines the wire connections for the USB Type-C to *USB 3.1* Standard-B cable assembly.

Table 3-14 USB Type-C to *USB 3.1* Standard-B Cable Assembly Wiring

USB Type-C Plug		Wire		USB 3.1 Standard-B 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	See Note 1			
B5	VCONN				
A6	Dp1	3	UTP_Dp	3	D+
A7	Dn1	4	UTP_Dn	2	D–
A2	SSTXp1	5	SDPp1	9	StdB_SSRX+
A3	SSTXn1	6	SDPn1	8	StdB_SSRX–
B11	SSRXp1	8	SDPp2	6	StdB_SSTX+
B10	SSRXn1	9	SDPn2	5	StdB_SSTX–
Shell	Shield	Outer Shield	Shield	Shell	Shield

Note 1: Pin A5 (CC) of the USB Type-C plug shall be connected to GND through a resistor Rd (5.1 kΩ ± 20%).

Type-C 线缆 —— C ↔ Micro B

Figure 3-30 USB Type-C to *USB 2.0* Micro-B Cable Assembly

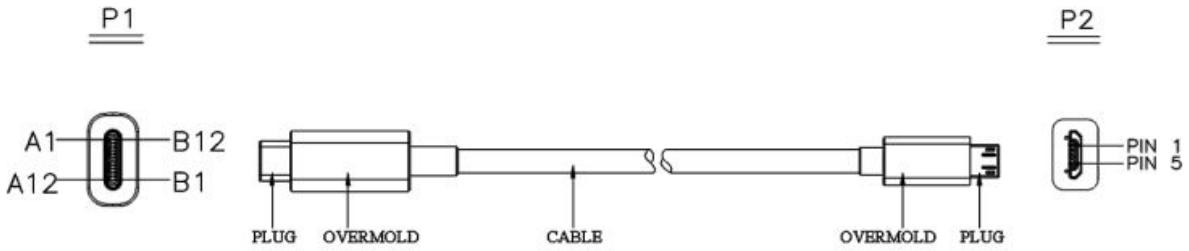


Table 3-18 defines the wire connections for the USB Type-C to *USB 2.0* Micro-B cable assembly.

Table 3-18 USB Type-C to *USB 2.0* Micro-B Cable Assembly Wiring

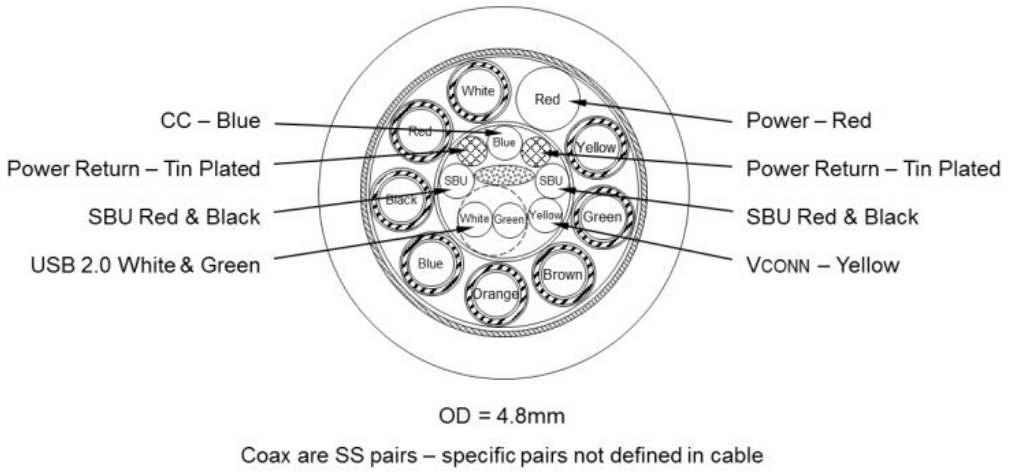
USB Type-C Plug		Wire		USB 2.0 Micro-B plug	
Pin	**Signal Name**	**Wire Number**	**Signal Name**	**Pin**	**Signal Name**
A1, B1, A12, B12	GND	1	GND_PWRrt1	5	GND
A4, B4, A9, B9	VBUS	2	PWR_VBUS1	1	VBUS
A5	CC	See Note 1			
B5	VCONN				
A6	Dp1	3	UTP_Dp	3	D+
A7	Dn1	4	UTP_Dn	2	D-
				4	ID
Shell	Shield	Outer shield	Shield	Shell	Shield

Note 1: Pin A5 (CC) of the USB Type-C plug shall be connected to GND through a resistor Rd (5.1 kΩ ± 20%).

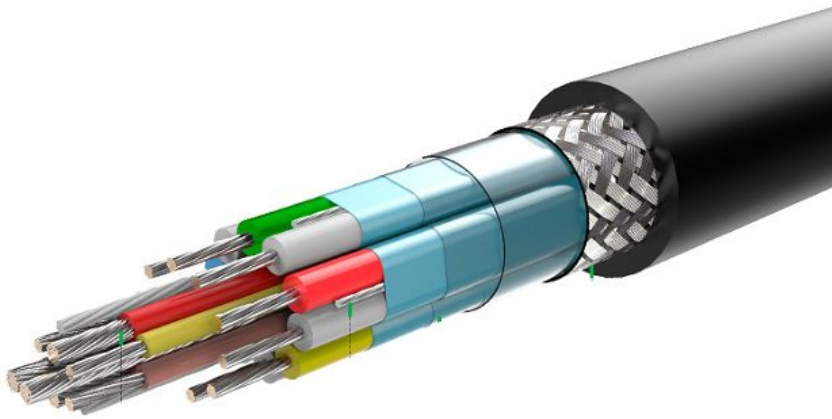
Type-C 线缆 —— C ↔ C

数据信号	No Data	1*HS	1*HS+2*SS
SS速率 (per lane)	5Gbps		10Gbps
信号处理	被动线缆		主动线缆
最大电流	3A		5A

Figure 3-21 Illustration of a USB Full-Featured Type-C Cable Cross Section, a Coaxial Wire Example with VCONN



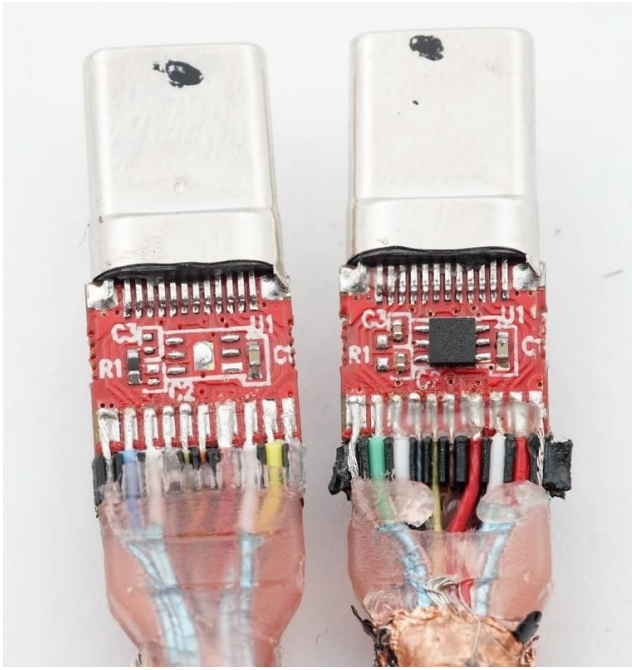
线缆带 E-Marker 芯片

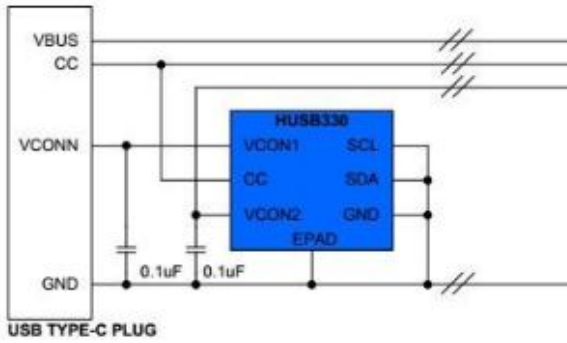


Type-C 线缆 —— Full-Featured Type-C

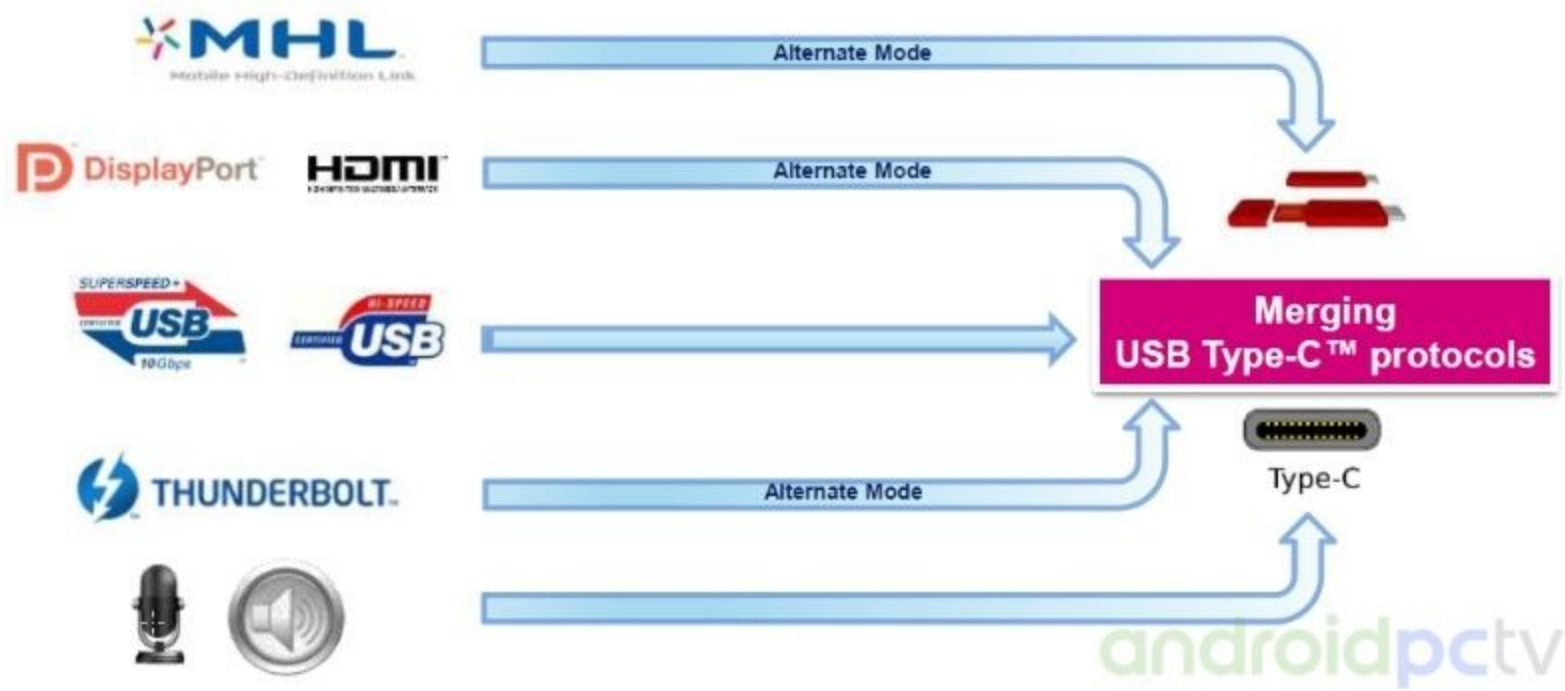
Table 3-10 USB Full-Featured Type-C Standard Cable Assembly Wiring

USB Type-C Plug #1		Wire		USB Type-C Plug #2	
Pin	Signal Name	Wire Number	Signal Name	Pin	Signal Name
A1, B1, A12, B12	GND	1 [16]	GND_PWRrt1 [GND_PWRrt2]	A1, B1, A12, B12	GND
A4, B4, A9, B9	VBUS	2 [17]	PWR_VBUS1 [PWR_VBUS2]	A4, B4, A9, B9	VBUS
A5	CC	3	CC	A5	CC
B5	VCONN	18	PWR_VCONN (See Section 4.9)	B5	VCONN
A6	Dp1	4	UTP_Dp	A6	Dp1
A7	Dn1	5	UTP_Dn	A7	Dn1
A2	SSTXp1	6	SDPp1	B11	SSRXp1
A3	SSTXn1	7	SDPn1	B10	SSRXn1
B11	SSRXp1	8	SDPp2	A2	SSTXp1
B10	SSRXn1	9	SDPn2	A3	SSTXn1
B2	SSTXp2	10	SDPp3	A11	SSRXp2
B3	SSTXn2	11	SDPn3	A10	SSRXn2
A11	SSRXp2	12	SDPp4	B2	SSTXp2
A10	SSRXn2	13	SDPn4	B3	SSTXn2
A8	SBU1	14	SBU_A	B8	SBU2
B8	SBU2	15	SBU_B	A8	SBU1
Shell	Shield	Outer shield	Shield	Shell	Shield

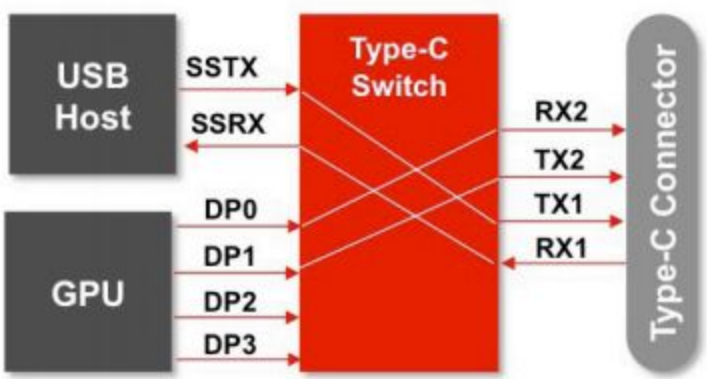




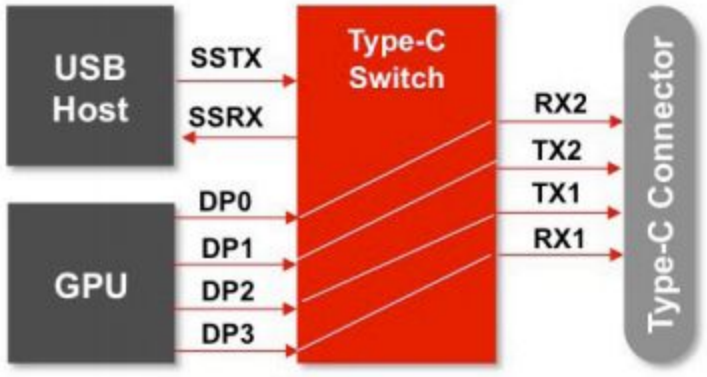
Type-C Alternate Mode



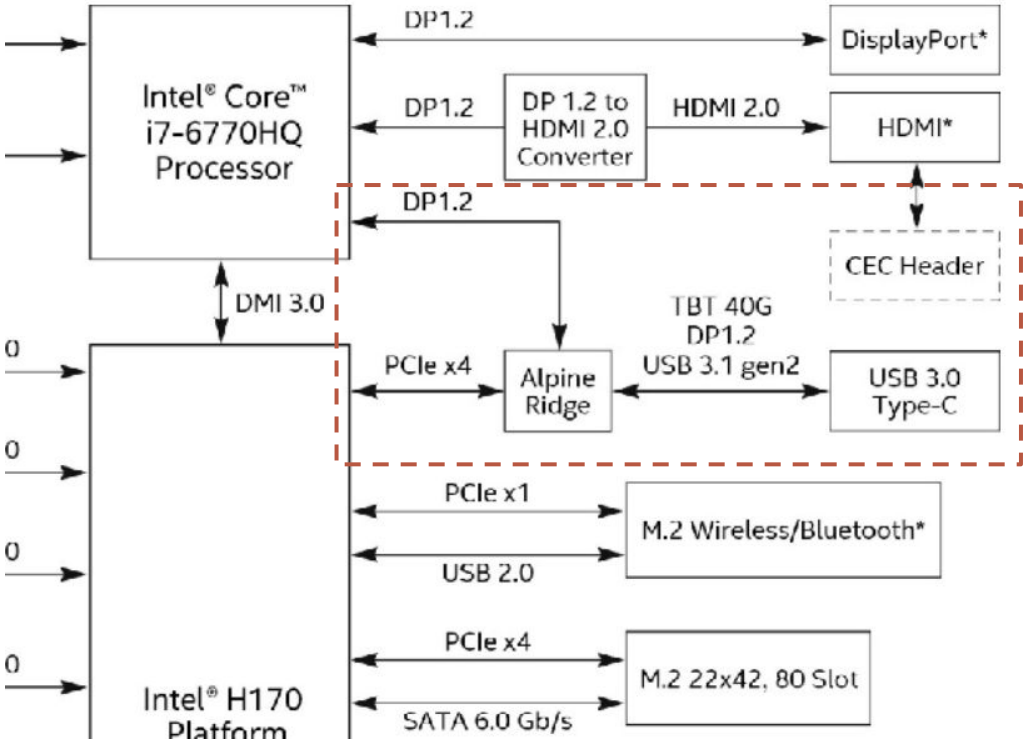
Type-C Alternate Mode —— 以 DP 为例



1-Port USB + 2-Lane DP



4-Lane DP

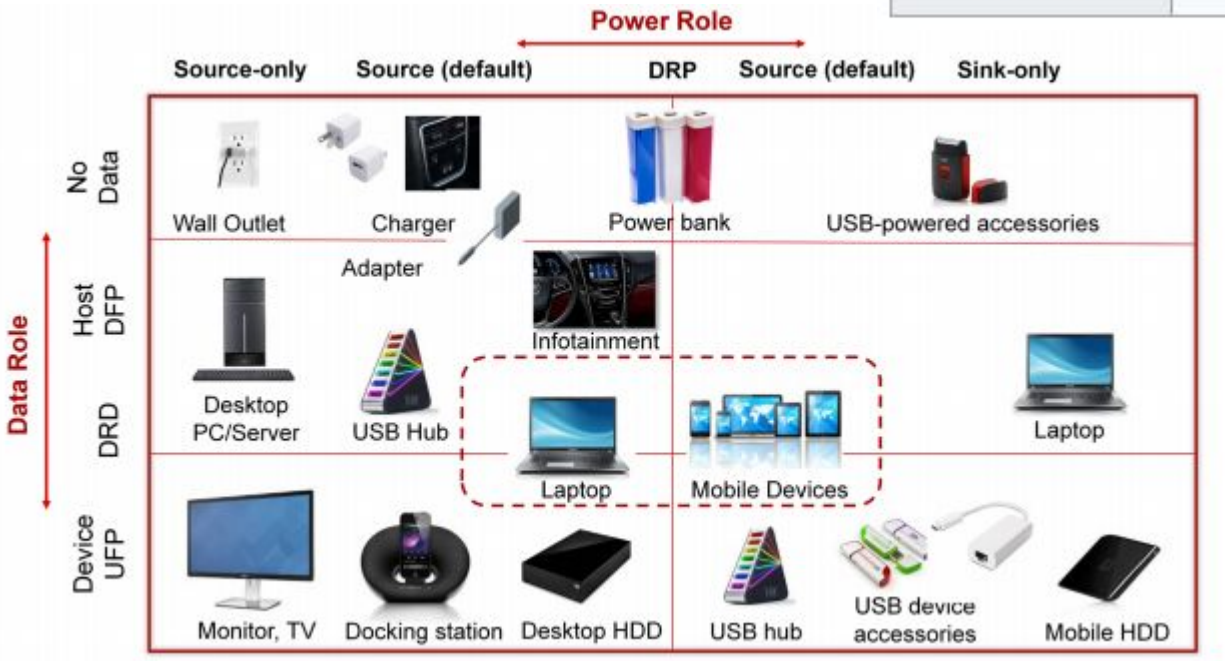


USB Power Delivery

更大的供电功率和
灵活的电压配置

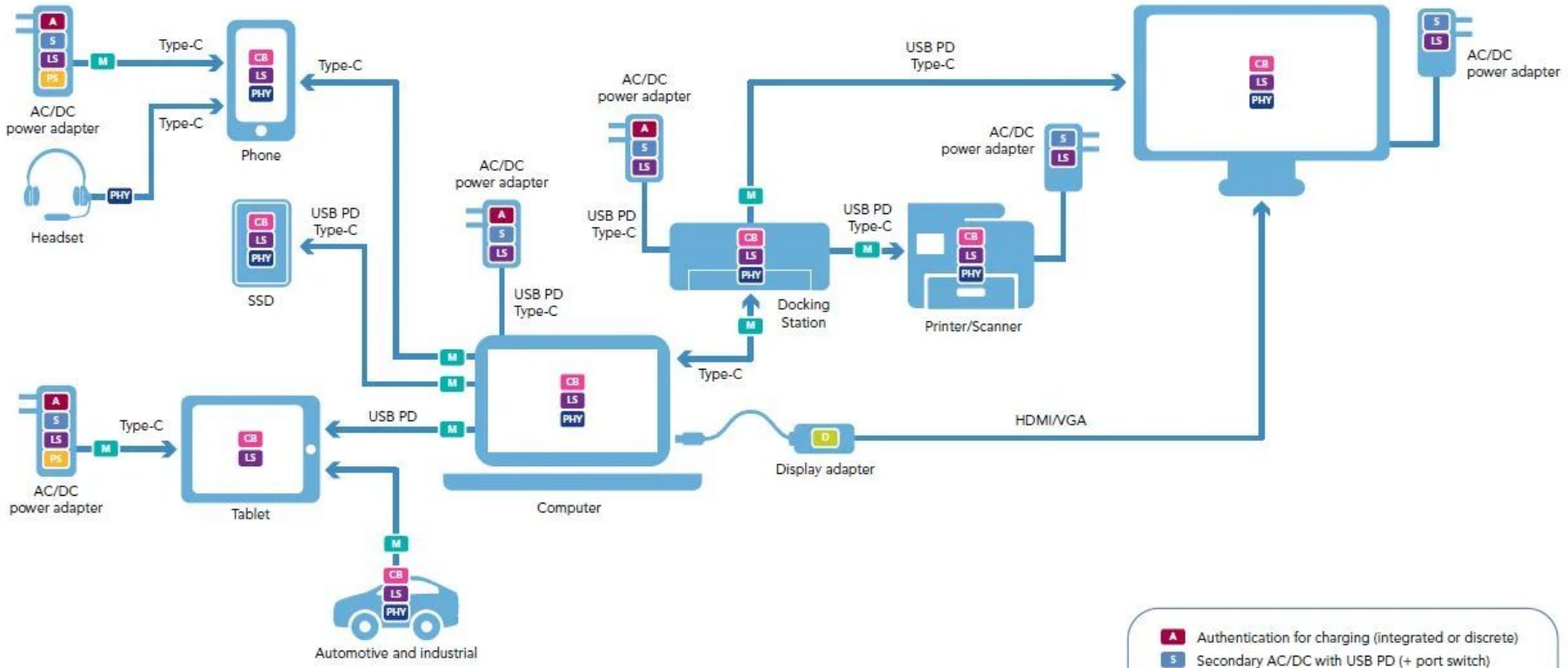
USB PD rev. 2.0/3.0 source power rules[55][56]

Source output power (W)	Current, at: (A)			
	+5 V	+9 V	+15 V	+20 V
0.5–15	0.1–3.0	N/A	N/A	N/A
15–27	3.0 (15 W)	1.67–3.0		
27–45		3.0 (27 W)	1.8–3.0	
45–60			3.0 (45 W)	2.25–3.0
60–100				3.0–5.0

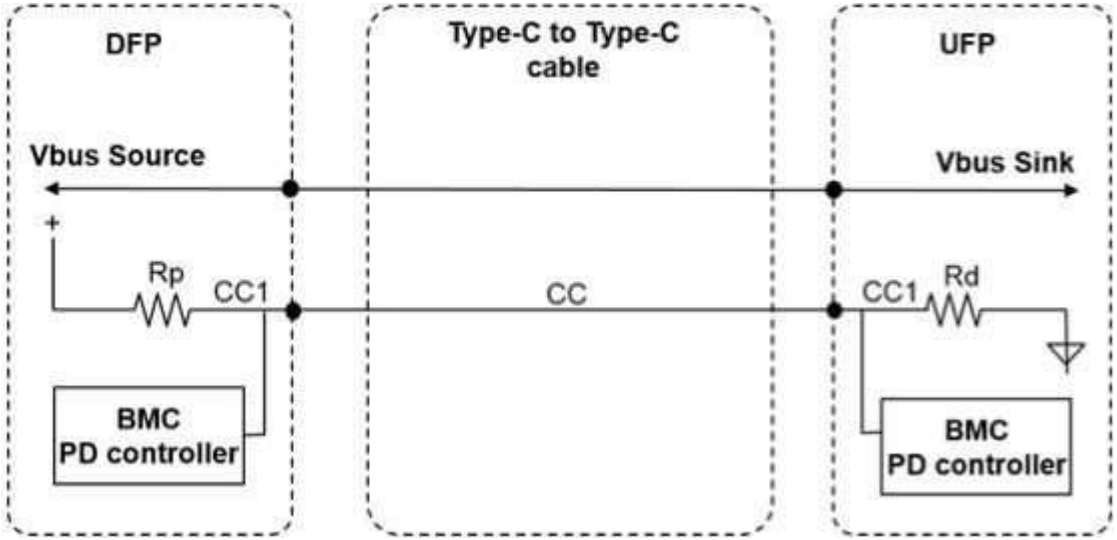


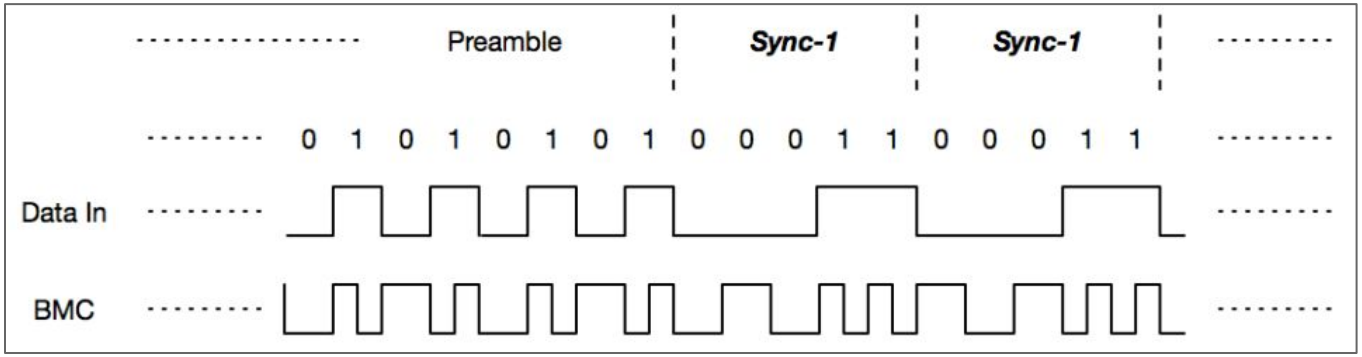
电源角色与数据角色
相互独立，更复杂的
供电拓扑

USB Type-C ecosystem and solutions



USB Power Delivery – 物理层





Biphase Mark Coding (BMC)

USB Power Delivery – 协议层

Figure 6-2 illustrates a Data Message as part of a Packet showing the parts are provided by the Protocol and PHY Layers.

Figure 6-2 USB Power Delivery Packet Format including Data Message Payload

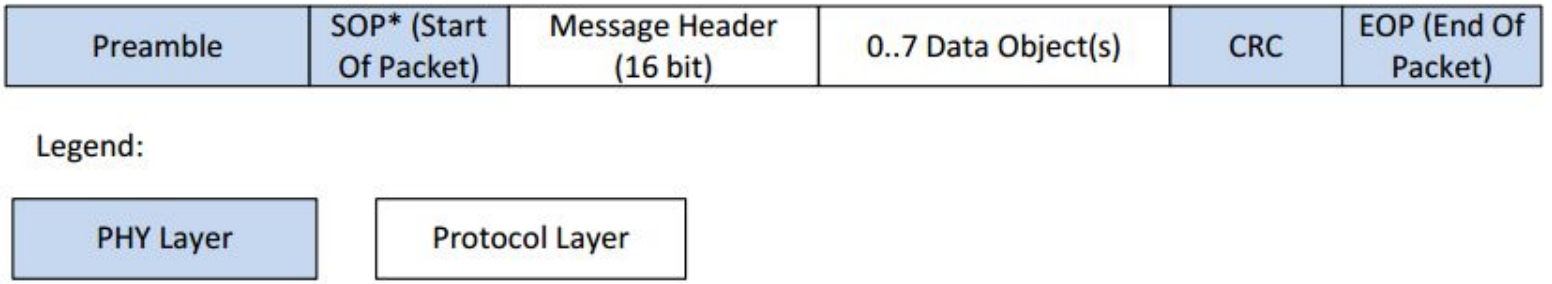
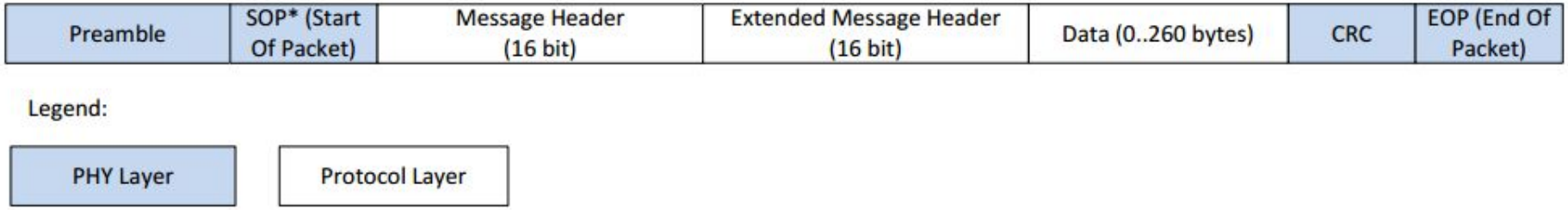


Figure 6-3 illustrates an Extended Message as part of a Packet showing the parts are provided by the Protocol and PHY Layers.

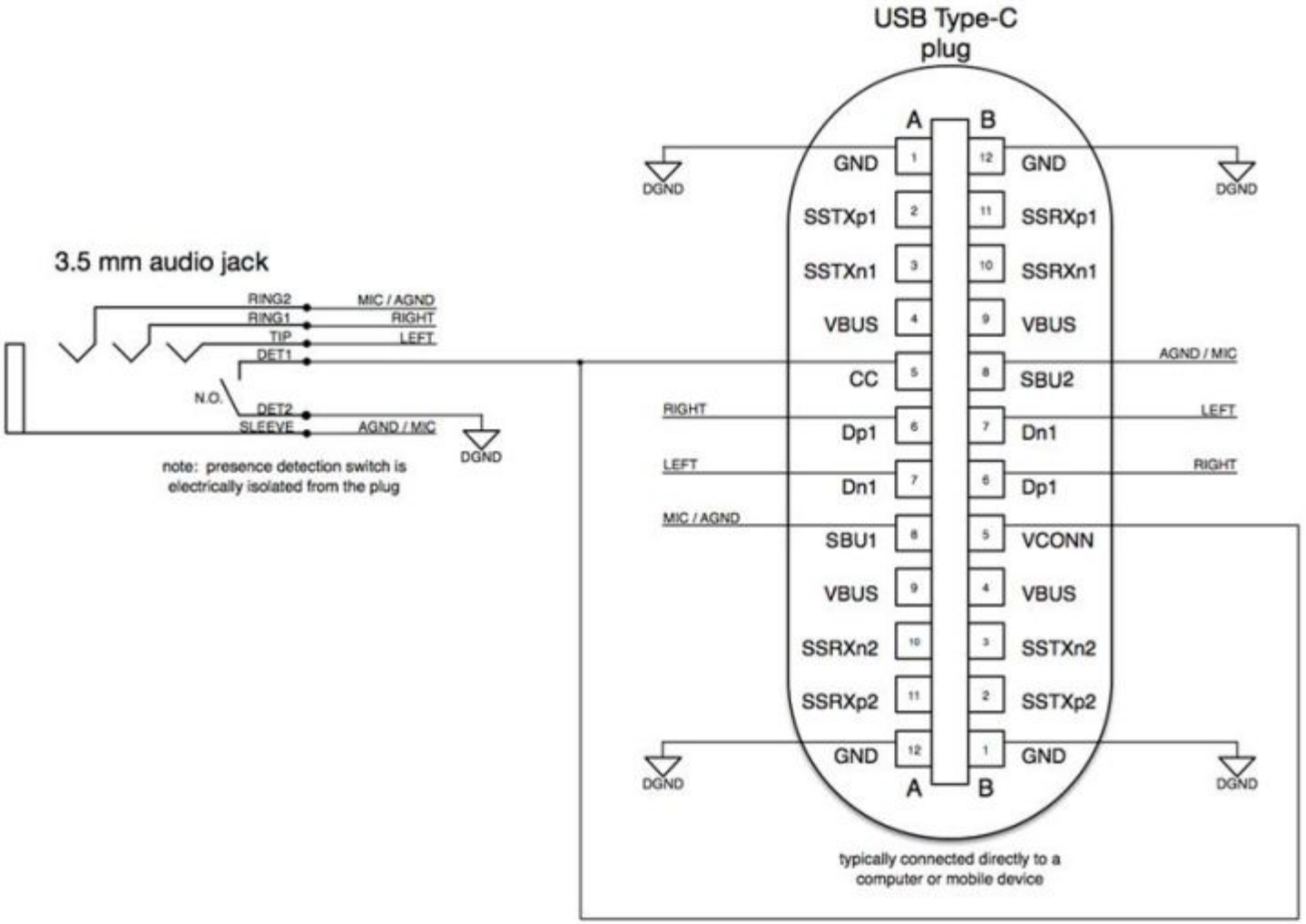
Figure 6-3 USB Power Delivery Packet Format including an Extended Message Header and Payload



USB Power Delivery – 协议层

Table 6-6 Data Message Types

Bits 4...0	Type	Sent by	Description	Valid Start of Packet
0 0000	***Reserved***		All values not explicitly defined are ***Reserved*** and ***Shall Not*** be used.	
0 0001	*Source_Capabilities*	Source or Dual-Role Power	See Section 6.4.1.2	SOP only
0 0010	*Request*	Sink only	See Section 6.4.2	SOP only
0 0011	*BIST*	Tester, Source or Sink	See Section 6.4.3	SOP*
0 0100	*Sink_Capabilities*	Sink or Dual-Role Power	See Section 6.4.1.3	SOP only
0 0101	*Battery_Status*	Source or Sink	See Section 6.4.5	SOP only
0 0110	*Alert*	Source or Sink	See Section 6.4.6	SOP only
0 0111	*Get_Country_Info*	Source or Sink	See Section 6.4.7	SOP only
0 1000 -0 1110	***Reserved***		All values not explicitly defined are ***Reserved*** and ***Shall Not*** be used.	
0 1111	*Vendor_Defined*	Source, Sink or Cable Plug	See Section 6.4.4	SOP*
1 0000-1 1111	***Reserved***		All values not explicitly defined are ***Reserved*** and ***Shall Not*** be used.	



Audio Adapter Accessory Mode