

Amphenol

COMMUNICATIONS SOLUTIONS

USB Type-C
Connector & Cable Assembly
Product presentation

 **FCi Basics**



FCI Basics: The Amphenol PCB Interconnect Specialist

Industry recognized portfolio combining leading edge technologies and proven solutions

Wire to Board Core	Wire to Board eMobility	Input Output FFC FPC	Backplane	Board to Board
<p>BergStik® Minitek® PV® Dubox® Quickie®</p>	<p>MicroSpace™ MicroSpaceXS™ FlexLock™ MicroSpace™ High Voltage WireLock®</p>	<p>Clincher® SFW®-SfV USB HDMI Modular Jack Universal Contacts USB Cable Assembly</p>	<p>Metral® Millipacs® HPC DIN41612</p>	<p>MezzoStak® BTFW MicroSpeed® Conan® BergStak®</p>

Leading Product Portfolio For Strategic Markets

Automotive
BMS, Lighting ,OBC, ADAS

Industrial
PLC/Controls, ESS, Metering

IT/Datacom
Servers, Storage, AI, Embedded

Consumer
Home Automation, Appliances

Structured To Make Customers Succeed

Value Add Solutions
Tailormade Cable Assemblies

Custom Competence
Design Local; Build Regional

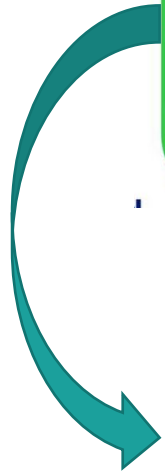
Global Footprint
China; France; India; Mexico; Malaysia

Technology & Innovation
Dedicated Basics Engineering Teams

USB Standard Road map

Revision	Issue Date	Brand Name	Bits/sec	Package Logo	Port & Cable Logo	USB-C® Trident Charging Logo
USB 1.0	Jan 1996	Low Speed Full Speed	1.5 Mbps 12 Mbps			
USB 1.1	Aug 1998	Full Speed With updated	1.5 Mbps 12 Mbps			
USB 2.0	April 2000	High Speed	480 Mbps			
USB 3.0 USB 3.2 Gen 1x1	Nov 12, 2008	SuperSpeed USB 5Gbps	5 Gbps			
USB 3.1 USB 3.2 Gen 2x1	July 26, 2013	SuperSpeed USB 10Gbps	10 Gbps			
USB 3.2 USB 3.2 Gen 2x2	Sep 22, 2017	SuperSpeed USB 20Gbps	20 Gbps			
USB4 USB4 Gen 2x2	Sep 3, 2019	USB4™ 20Gbps	20 Gbps			
USB4 USB4 Gen 3x2	Sep 3, 2019	USB4™ 40Gbps	40 Gbps			

USB 3.x was re-named twice



Original Name	1st time re-name when USB 3.1 (10Gbps) was published	Latest name When USB 3.2 20Gbps was published	Data Speed
USB 3.0	USB 3.1 Gen1	USB 3.2 Gen1	5Gbps
USB 3.1	USB 3.1 Gen2	USB 3.2 Gen2	10Gbps
USB 3.2	USB 3.1 Gen2x2	USB 3.2 Gen2x2	20Gbps

USB Type-C, Value Proposition

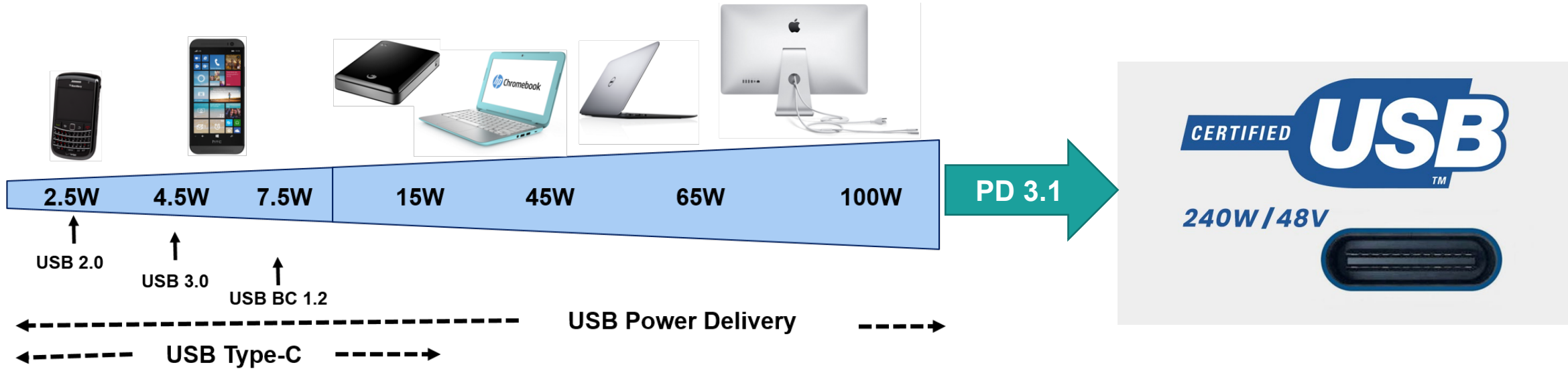
- USB Type-C is the future of the USB interface providing multifunction single cable solution for Data, Power, Audio and Video. It makes reversible plug orientation and cable direction possible.
- FCI Basics USB Type C solution includes right angle, vertical and upright type in surface mount, middle mount, Hybrid (SMT and Through hole) mount type. Slim and elegant design and at the same time robust. Support Super Speed 40Gbps with 10,000 mating cycle.
- USB Type C is backward compatible with USB protocol, supports USB 2.0/3.2 Gen 1/3.2 Gen2 and USB 4, scalable power delivery up to 240W.
- Halogen free and lead free, ROHS compliance



USB Power Delivery Roadmap

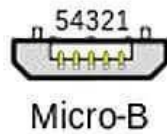
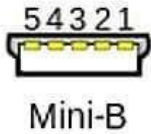
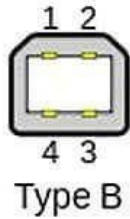
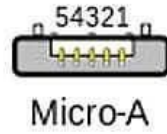
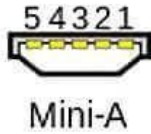
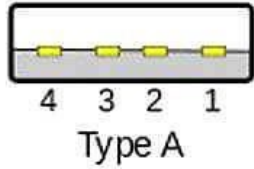
USB has evolved from a data interface capable of supplying limited power to a primary provider of power with a data interface. Today many devices charge or get their power from USB. USB has become a ubiquitous power socket for many small devices such as cell phones, tablets, portable speakers and other hand-held devices. Users need USB to fulfil their requirements not only in terms of data but also to provide power to, or charge, their devices simply, often without the need to load a driver, in order to carry out “traditional” USB functions. The USB Power Delivery (USB PD) Specification enables the maximum functionality of USB by providing more flexible power delivery along with data over a single cable. Its aim is to operate with and build on the existing USB ecosystem.

Rev	PD 2.0	PD 3.0	PD 3.1
Published in	2014	2017	2019
Interface	Type C	Type C	Type C
Max Power	100W	100W	240W



Pinout of typical USB Interfaces

USB 2.0 series



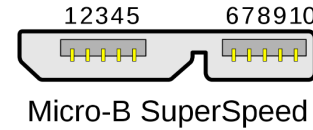
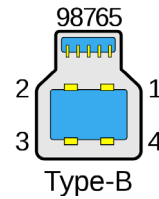
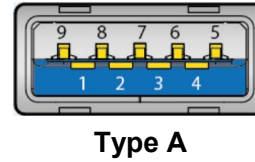
Pin#	Signal name
1	VBUS
2	D-
3	D+
4	GND

Pin#	Signal name
1	GND
2	USB OTG Address bus
3	D+
4	D-
5	VBUS

Red pins were new added for new functions

USB OTG (On The Go) address Bus was added, allows two USB devices to talk to each other without requiring the services of a personal computer, for portable devices using

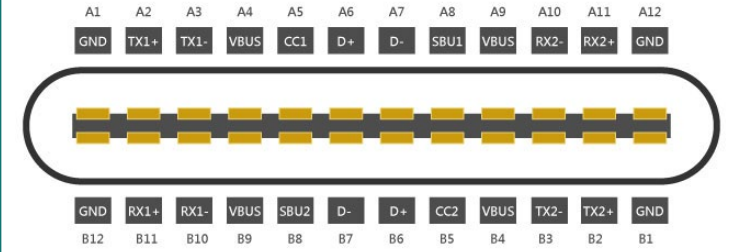
USB 3.x series



Pin#	Signal name
1	VBUS
2	D-
3	D+
4	GND
5	StdA_SSRX-
6	StdA_SSRX+
7	GND_DRAIN
8	StdA_SSTX-
9	StdA_SSTX+

2 pairs differential signal pin were added, to support high speed data transmission up to 5G/10Gbps

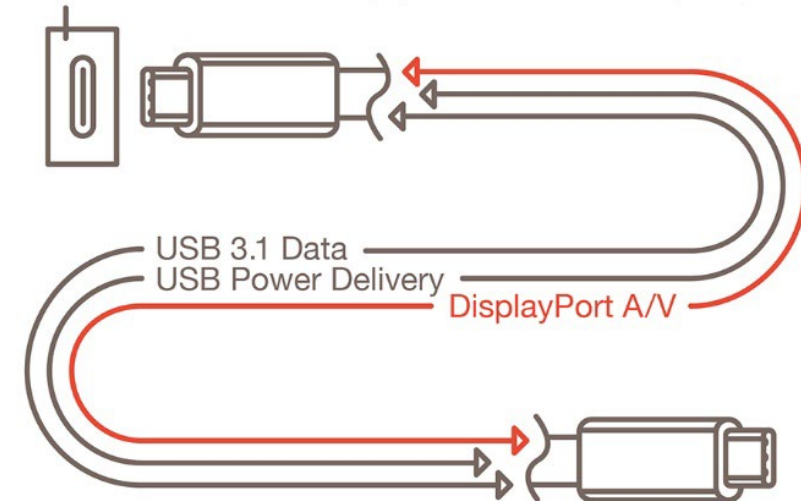
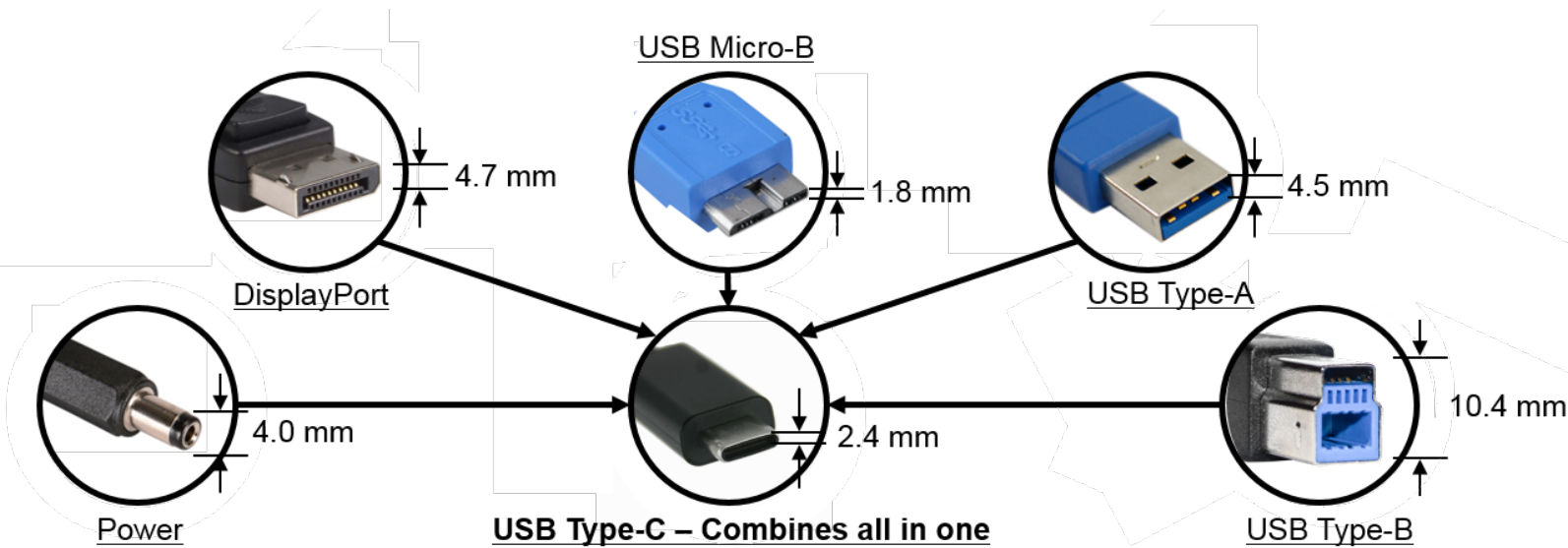
USB Type C



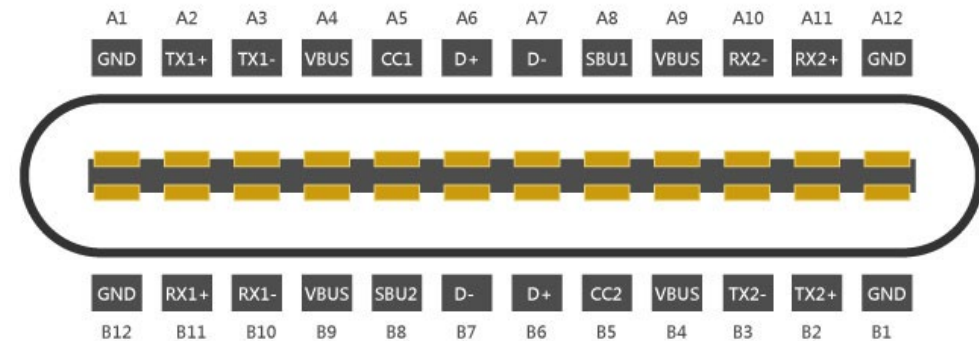
Pin#	Signal name	Pin#	Signal name
A1	GND	B1	GND
A2	TX1+	B2	TX2+
A3	TX1-	B3	TX2-
A4	VBUS	B4	VBUS
A5	CC1	B5	CC2
A6	D+	B6	D+
A7	D-	B7	D-
A8	SBU1	B8	SBU2
A9	VBUS	B9	VBUS
A10	RX2-	B10	RX1-
A11	RX2+	B11	RX1+
A12	GND	B12	GND

2 more pairs differential signal pin was added to support blind mate function, and two SBU pins was added to carry the very important Alternate Modes that allow the Type-C connector to transport other high-speed protocols, such as DisplayPort. They also support the Audio Accessory Mode.

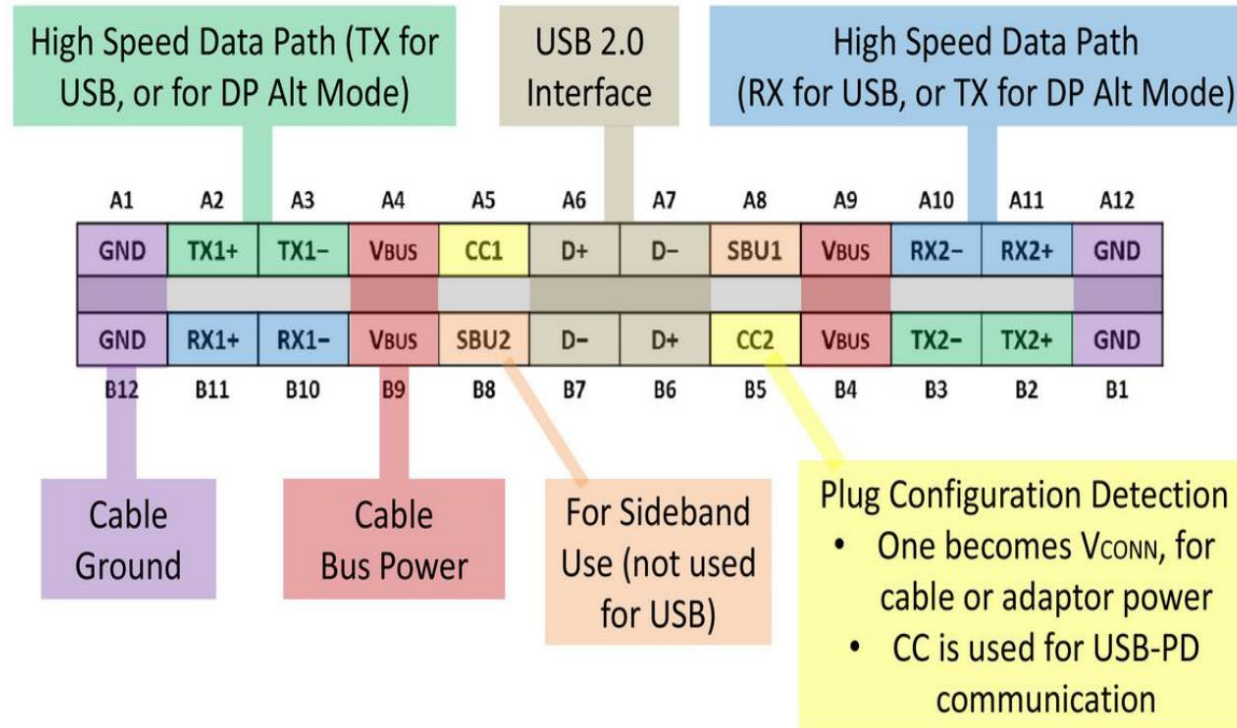
Why Choose Type C



- Blind mate
- Up to 5A current rating, support 240W max power delivery
- Data transmission up to 40Gbps.
- Can be used as charging interface for various electric products via PD protocol
- Enhanced anti-EMI and RFI mitigation performance
- Optional integrated DisplayPort, HDMI, MHL



USB Type C Pinout



1. 24pin type C has full function, can support USB3.2/4 up to 40Gbps
2. If just need to use USB 2.0, then 4 pairs of high speed differential signal pins can be removed (A2/A3/A10/A11/B2/B3/B10/B11), so 16pin type C can only support USB2.0 speed
3. A8 (SBU1) /B8 (SBU2) are also removable if alternate mode is not needed, so 14pin type C is also available and support USB2.0 speed
4. If just need to use USB type C for charging, then just keep A5/A9/A12/B5/B9/B12, SO 6pin version can be used for charging only, no data transmission

USB Type-C Product Overview

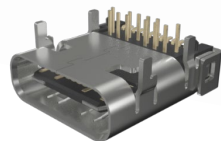
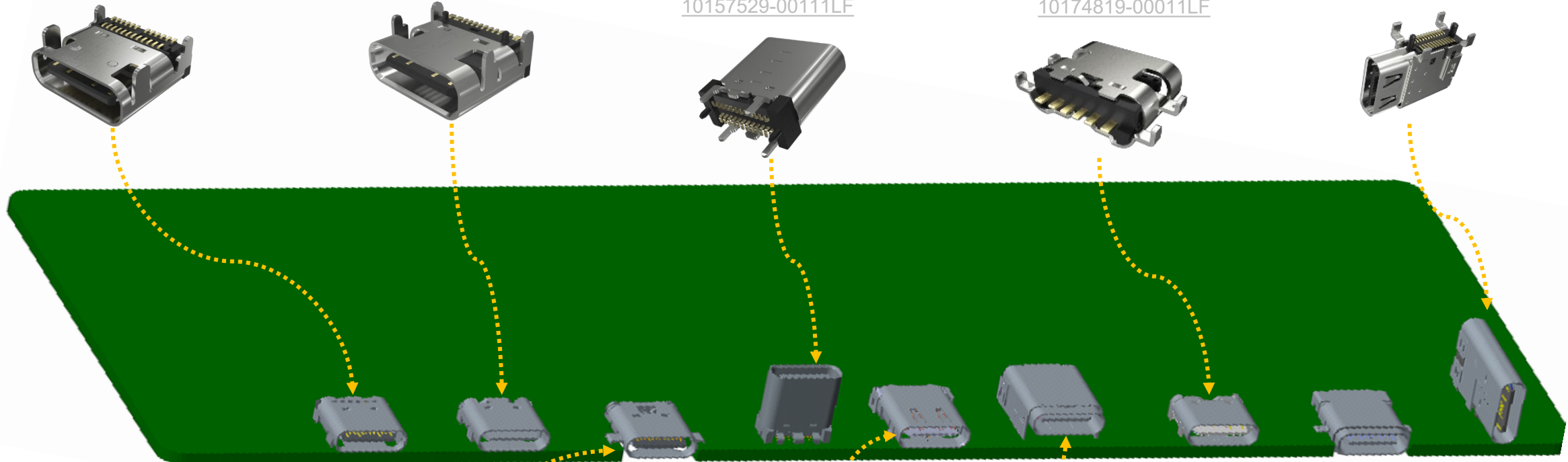
Right Angle Top Mount
Dual row 24pins
[10152803-00011LF](#)

Right Angle Top Mount
Single row 16pins
[10155435-00011LF](#)

Vertical Top Mount
6/16/24pins
Height 6.4 – 10.5mm
[10157529-00111LF](#)

Power Only
6pins
Top/middle mount
[10174819-00011LF](#)

Upright
14/24pins
[10167129-00011LF](#)



USB Cable Assembly
A to C/ C to C
USB2.0/3.2 Gen1/3.2 Gen 2
[10165794-Z0100YBLF](#)

Middle Mount
16/24pins
Sink 0.8/1.0/1.6/2.1mm
[10174570-00A11LF](#)

Hybrid Top Mount
24pins
(12pin SMT + 12Pin through hole)
[10159872-00011LF](#)

High rise
16pins, center height 5.9mm
24pins, center height 3.4mm
[10171167-01111LF](#)

Waterproof
6/16/24pins
IPX5/7/8
[10164986-00011LF](#)

USB Cable Assemblies, Product Overview



Specifications

- Comply to USB Type-C specification
- Compatible with USB 2.0
- TID (Optional)

Electrical Performances

- Low Level Contact Resistance
 - Initial 40mΩ Max
 - After test 50mΩ Max
- Current Rating:
 - 5.0A for VBUS and GND.
 - 1.25A for Vconn and GND.
 - 0.25A for all the others contacts
- Insulation Resistance: >100MΩ
- Dielectric Withstanding Voltage: 500V AC

Materials

- Housing : High temperature thermoplastic
- Shell : Cooper Alloy or Stainless Steel
- Terminal: Cooper Alloy

Mechanical Performance

- Durability: 10,000 cycles
- Insertion Force: 5-20N.
- Withdrawal Force: 8-20N
- Point of contact: 6/14/16/24

Environmental

- Operating Temperature: -40°C to +85°C
- Storage Temperature: -55°C to +85°C
- RoHS compliant
- Lead free, Halogen free

Packaging

- Tape and reel for connectors
- Bag for cable assembly

USB Type-C Features and Benefits

Support 5.0A/100W power delivery and up to 40 Gbps data rates
Enables fast charging and high-speed data transfer

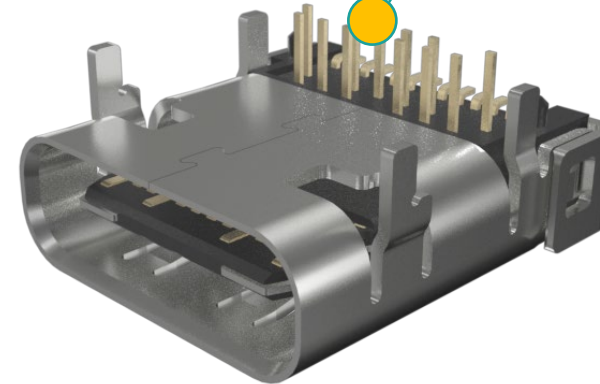
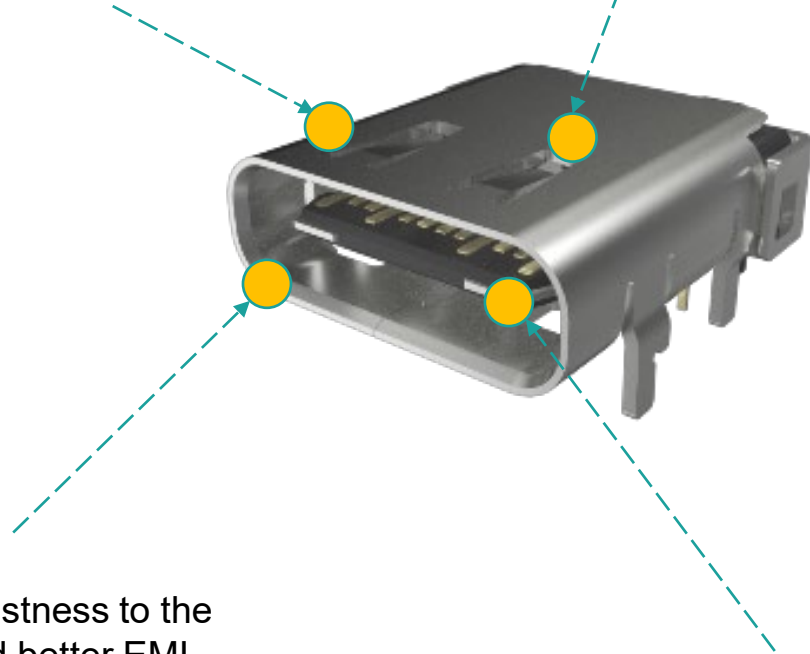
Spring shell friction design
Provides higher un-mating force to ensure stable connection

Soldering pins Hybrid

- Provides higher retention force
- Enables easy inspecting
- Eases supplementary soldering on SMT pins

Metal shell
Provides robustness to the connector and better EMI shielding performance

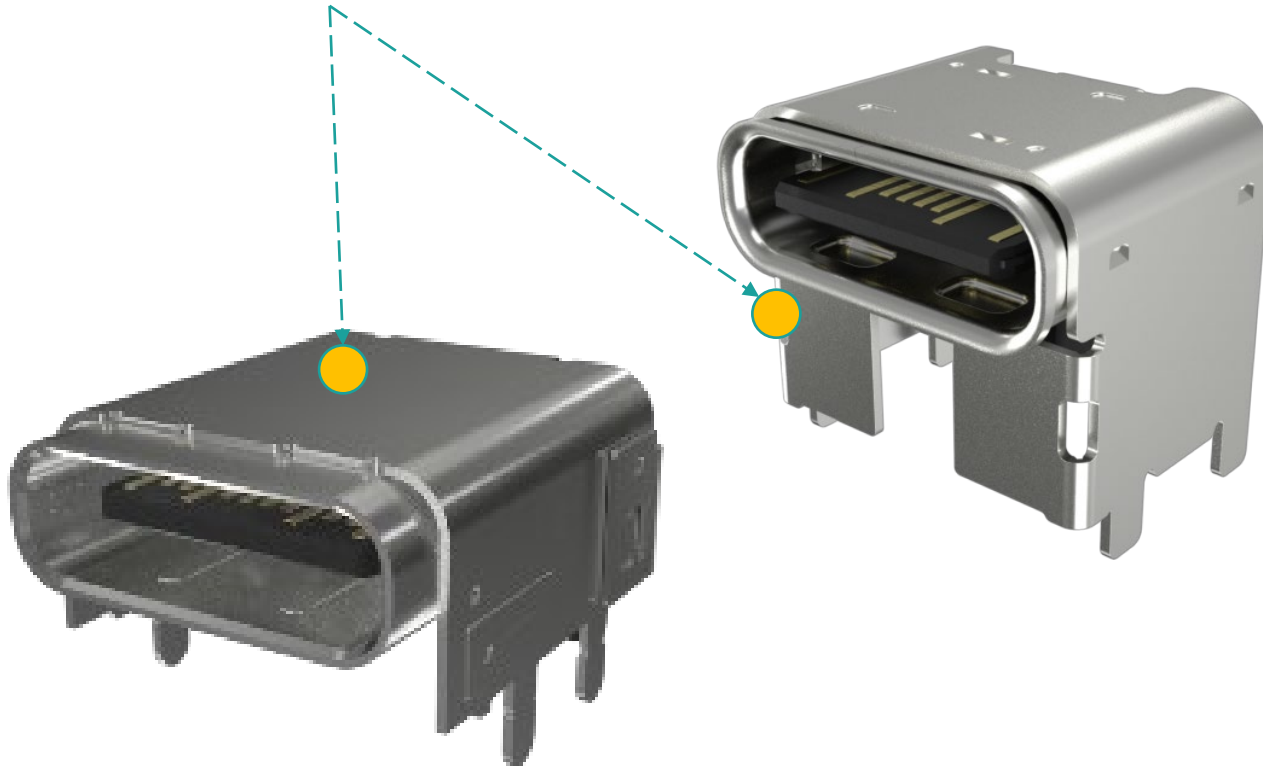
Mid-plate design enhance the tongue strength
Supporting high reliability of 10,000 mating cycles and preventing damage from connector mishandling



USB Type-C Features and Benefits

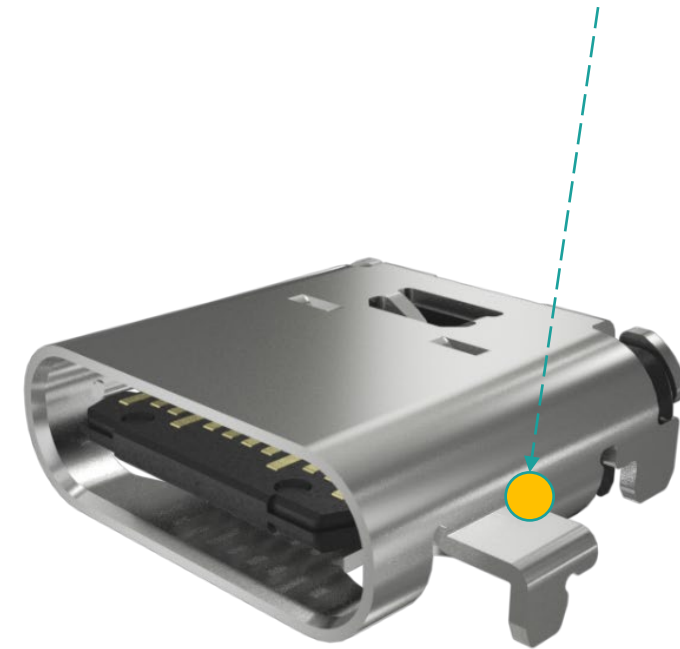
High rise design (Dual shell)

Provides higher center height
3.4/5.9mm (normal type is 1.68mm)
to align with other I/O connectors



Middle mount design

Offers mechanical design flexibility
0.8/1.0/1.6/2.1mm sink available



USB Type-C Features and Benefits

Vertical type

Offers mechanical design flexibility

Flexible height design

Two height options of 9.25&10.4mm to provide customer mechanical design flexibility

Plastic housing holder and shell stopper

Provide robust design to prevent plug over insertion

Upright type

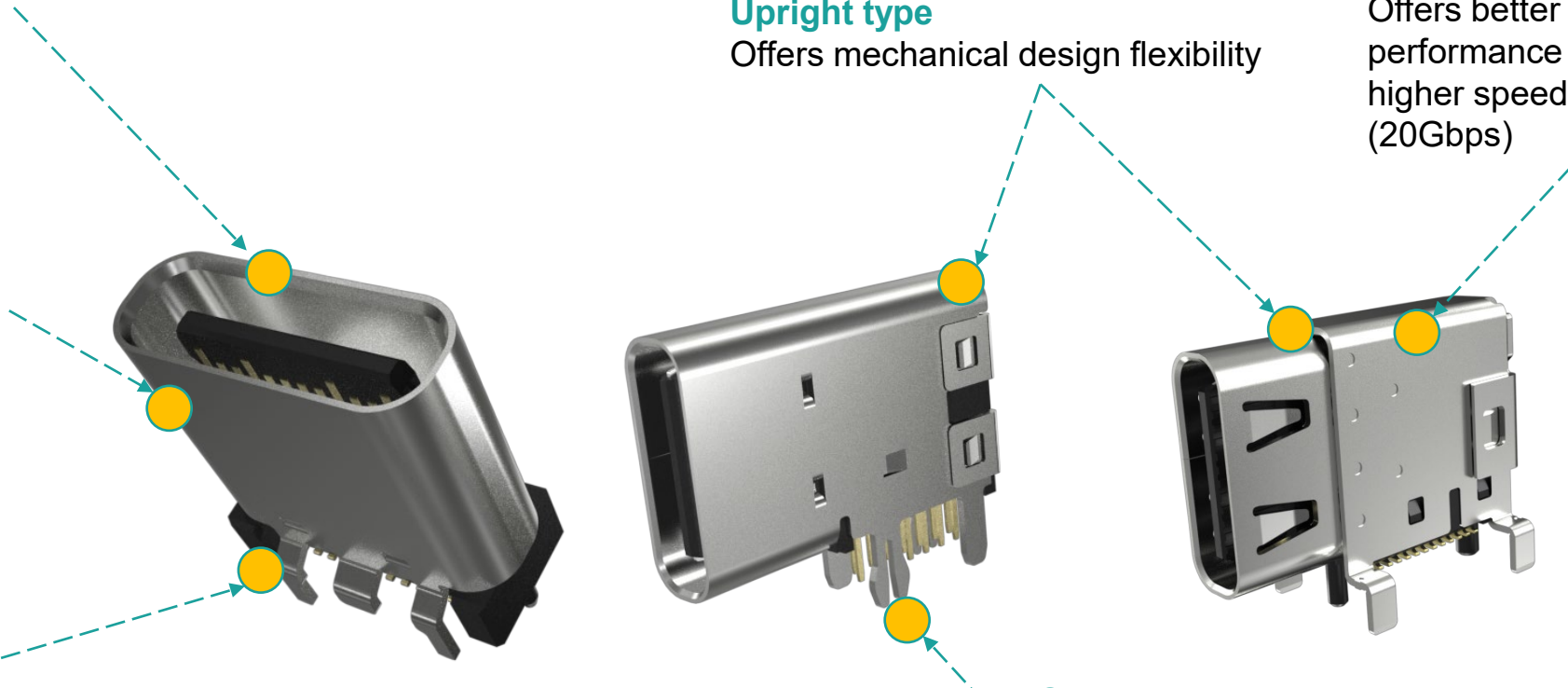
Offers mechanical design flexibility

Double Shell

Offers better EMI performance to support higher speed requirement (20Gbps)

Shell peg hook design

Provides retention force during soldering process to avoid uplift

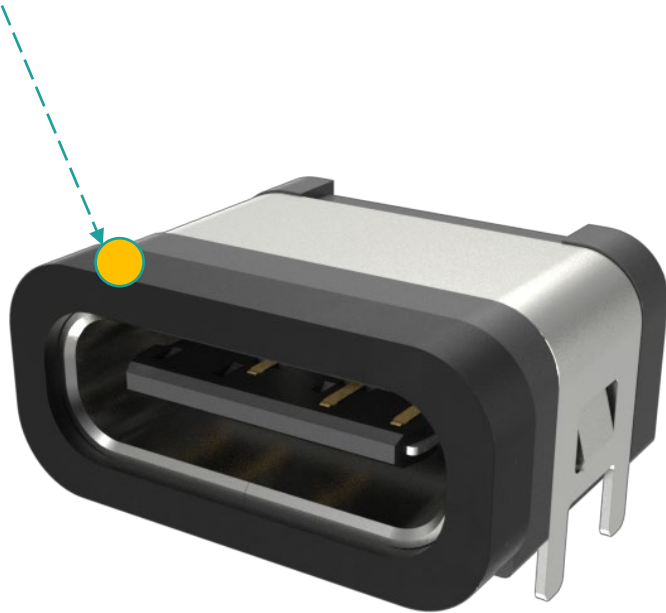


Typical application
Switch, Server

USB Type-C Features and Benefits

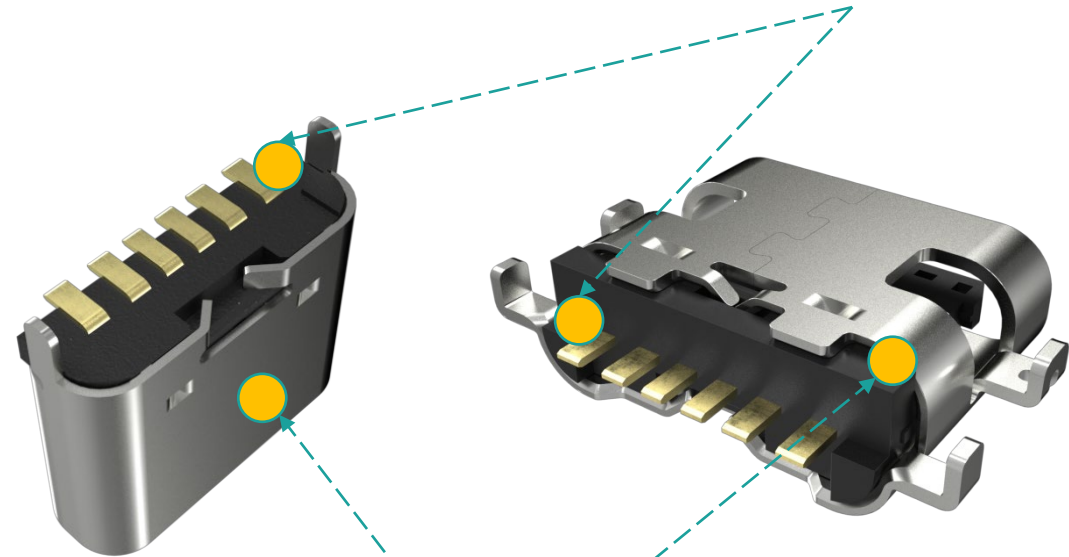
Waterproof Design

Prevent water ingression,
protect electric components



6 Pins for power only

Just keep V-BUS and
GND pins for power
charging only, save cost



Vertical and Right Angle

Offers mechanical design
flexibility

Typical application

E-cig, consumer device

USB Type-C Features and Benefits

Stacked type

Offers mechanical design flexibility
















Through hole pins

Robust design for better mechanical performance



Typical application
Server




USB Type-C connectors - Part Numbers

USB Standard	Pin Count	Data Speed	Orientation	Mount Type	Part Description	PN	Image
Power Only	6	N/A	Right Angle	Top	USB C Receptacle R/A 6P G/F	10164359-00011LF	
	6	N/A	Vertical	Top	USB C Receptacle Vertical 6P G/F 6.5mm height	10173568-00011LF	
	6	N/A	Right Angle	Top	USB C Receptacle R/A 6P G/F IPX5	10165429-00011LF	
	6	N/A	Right Angle	Middle	USB C Receptacle R/A 6P G/F Sink 0.8mm	10174819-00011LF	
USB2.0	16	480M	Right Angle	Top	USB C Receptacle R/A SMT 16P G/F 7.35mm length	10155435-00011LF	
	16	480M	Right Angle	Top	USB C Receptacle R/A SMT 16P G/F 6.5mm length	10171746-00021LF	
	16	480M	Right Angle	Top	USB C Receptacle R/A SMT High rise 16P G/F CH5.9	10171167-01111LF	
	16	480M	Right Angle	Middle	USB C Receptacle R/A SMT 16P G/F Sink 0.8mm	10174570-00A11LF	
	16	480M	Right Angle	Middle	USB C Receptacle R/A SMT 16P G/F Sink 1.0mm	10174570-00B11LF	
	16	480M	Right Angle	Middle	USB C Receptacle R/A SMT 16P G/F Sink 1.6mm	10174570-00C11LF	
	16	480M	Right Angle	Middle	USB C Receptacle R/A SMT 16P G/F Sink 2.1mm	10172013-00011LF	
	16	480M	Vertical	Top	USB C Receptacle Vertical 16P G/F 6.4mm height	10168207-00011LF	
	14	480M	Upright	Top	USB C Receptacle Upright Through Hole 14P G/F	10151348-00011LF	

USB Type-C connectors - Part Numbers

USB Standard	Pin Count	Data Speed	Orientation	Mount Type	Part Description	PN	Image
USB3.2 Gen1	24	10G	Right Angle	Top	USB C Receptacle R/A Hybrid 24P G/F IP67	10164986-00011LF	
USB3.2 Gen2	24	20G	Right Angle	Top	USB C Receptacle R/A SMT 24P G/F CH1.65mm	10163749-00012LF	
	24	20G	Right Angle	Top	USB C Receptacle R/A SMT 24P G/F CH1.68mm	10152803-00011LF	
	24	20G	Right Angle	Top	USB C Receptacle R/A Hybrid 24P G/F	10159872-00011LF	
	24	20G	Right Angle	Top	USB C Receptacle R/A High rise 24P G/F CH3.4mm	10163259-00011LF	
	24	20G	Vertical	Top	USB C Receptacle Vertical 24P G/F	10157529-00111LF	
	24	20G	Upright	Top	USB C Receptacle Upright 24P G/F	10167129-00011LF	
	48	20G	Right Angle	Top	USB C Receptacle Stacked R/A SMT 48P G/F	10174471-00011LF	
USB4	24	40G	Right Angle	Middle	USB C Receptacle R/A SMT 24P G/F Sink	10137064-00011LF	

USB Plug and Cable assemblies - Part Numbers

USB Standard	Data Speed	Length	Color	Part Description	PN	Image	
USB2.0	480M	0.3 m	White	USB Cable Assembly A to C 0.3 m White	10165793-Z0030YWLF	 <p>This is black color, just for reference. If it's white color, the connector and cable are all white</p>	
	480M	0.5 m	White	USB Cable Assembly A to C 0.5 m White	10165793-Z0050YWLF		
	480M	1.0 m	White	USB Cable Assembly A to C 1.0 m White	10165793-Z0100YWLF		
	480M	0.3 m	Black	USB Cable Assembly A to C 0.3 m Black	10165793-Z0030YBLF		
	480M	0.5 m	Black	USB Cable Assembly A to C 0.5 m Black	10165793-Z0050YBLF		
	480M	1.0 m	Black	USB Cable Assembly A to C 1.0 m Black	10165793-Z0100YBLF		
	USB2.0	480M	0.3 m	White	USB Cable Assembly C to C 0.3 m White	10165794-Z0030YWLF	 <p>This is black color, just for reference. If it's white color, the connector and cable are all white</p>
		480M	0.5 m	White	USB Cable Assembly C to C 0.5 m White	10165794-Z0050YWLF	
		480M	1.0 m	White	USB Cable Assembly C to C 1.0 m White	10165794-Z0100YWLF	
		480M	0.3 m	Black	USB Cable Assembly C to C 0.3 m Black	10165794-Z0030YBLF	
480M		0.5 m	Black	USB Cable Assembly C to C 0.5 m Black	10165794-Z0050YBLF		
480M		1.0 m	Black	USB Cable Assembly C to C 1.0 m Black	10165794-Z0100YBLF		
USB3.2 Gen2	20G	0.3 m	Black	USB 240W Cable Assembly C to C 0.3 m Black	10174198-Z0030YYLF		
	20G	0.5 m	Black	USB 240W Cable Assembly C to C 0.5 m Black	10174198-Z0050YYLF		
	20G	1.0 m	Black	USB 240W Cable Assembly C to C 1.0 m Black	10174198-Z0100YYLF		

Data



- Servers
- Laptop
- Desktop

Consumer



- Phone
- Gaming box
- Smart device

Automotive



- Infotainment

Medical



- Ultrasound
- Breathing machine

Industrial



- HMI
- Industry Computer

USB Type C – Additional information

- Samples available (check with sample room Tatabanya : samples.global@amphenol-eu.com)
- Website quick link: [Landing Page](#)

Available on website:

- [Datasheet](#)
- [Product Presentation](#)
- [Product Specification](#)
- [Drawing, 3D model](#)

THANKS