

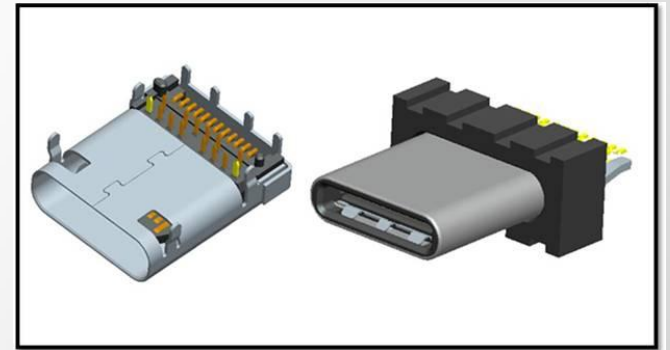


SINGATRON
ENTERPRISE CO., LTD.



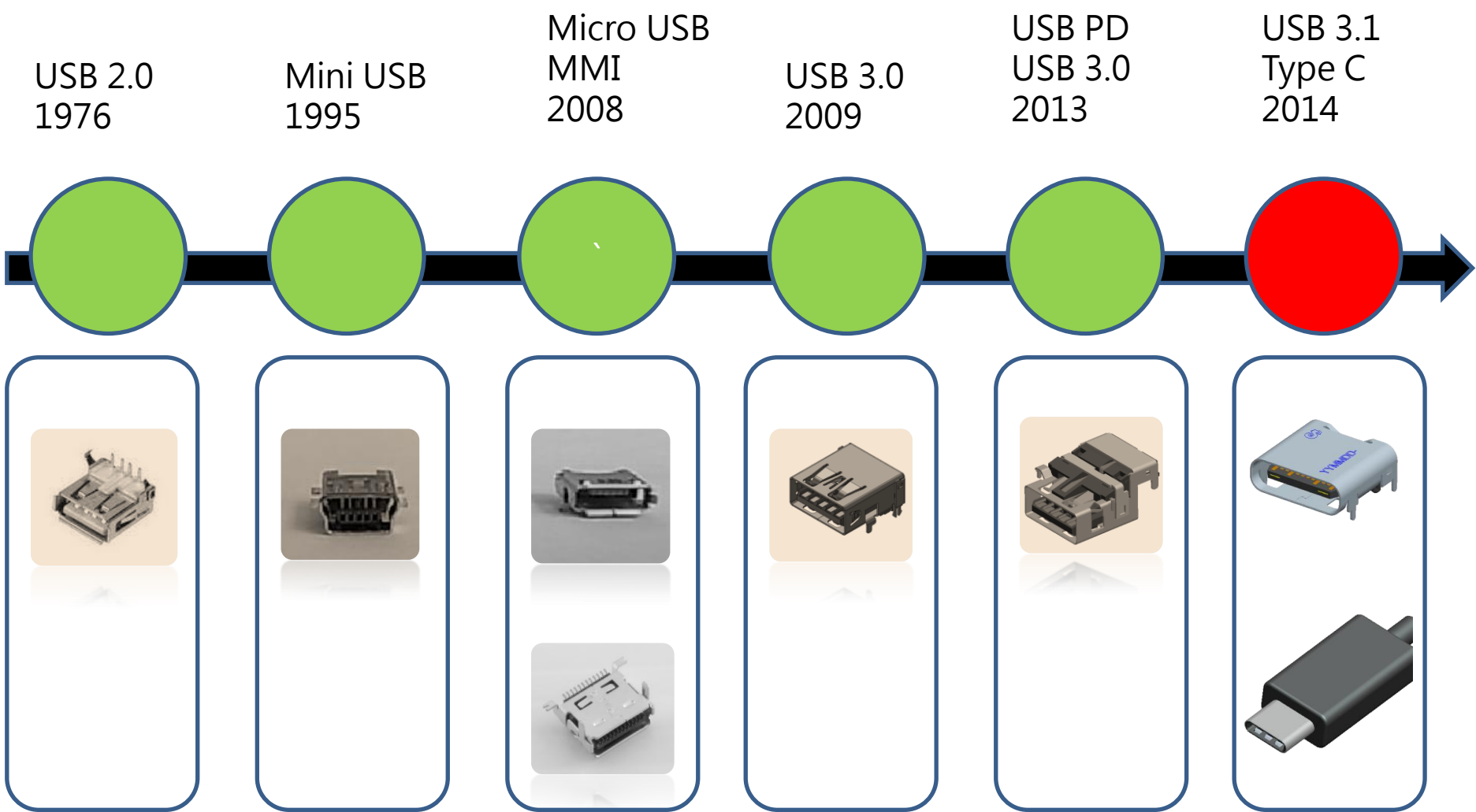
Specialized Connector Manufacturer

USB 3.1 Type C Product Introduction



Dec. 29, 2014

■ Product Roadmap :





Introduction

With the continued success of the USB interface, there exists a need to adapt USB technology to serve newer computing platforms and devices as they trend toward smaller, thinner and lighter form-factors. Many of these newer platforms and devices are reaching a point where existing USB receptacles and plugs are inhibiting innovation, especially given the relatively large size and internal volume constraints of the Standard-A and Standard-B versions of USB connectors. Additionally, as platform usage models have evolved, usability and robustness requirements have advanced and the existing set of USB connectors were not originally designed for some of these newer requirements. This specification is to establish a new USB connector ecosystem that addresses the evolving needs of platforms and devices while retaining all of the functional benefits of USB that form the basis for this most popular of computing device interconnects.

Scope

This specification is intended as a supplement to the existing [USB 2.0](#), [USB 3.1](#) and [USB Power Delivery](#) specifications. It addresses only the elements required to implement and support the USB Type-C receptacles, plugs and cables.

Normative information is provided to allow interoperability of components designed to this specification. Informative information, when provided, may illustrate possible design implementations.

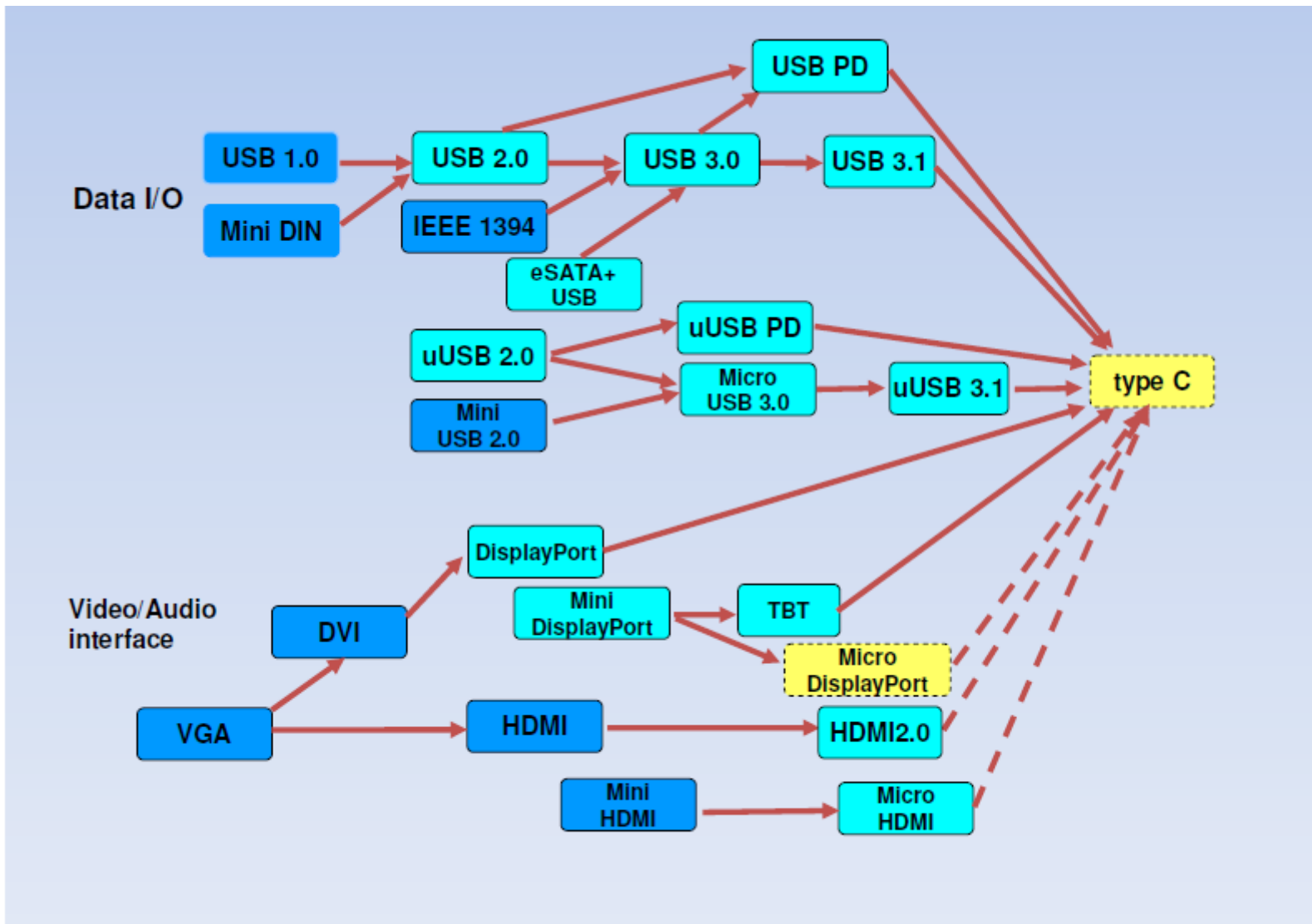




Overview

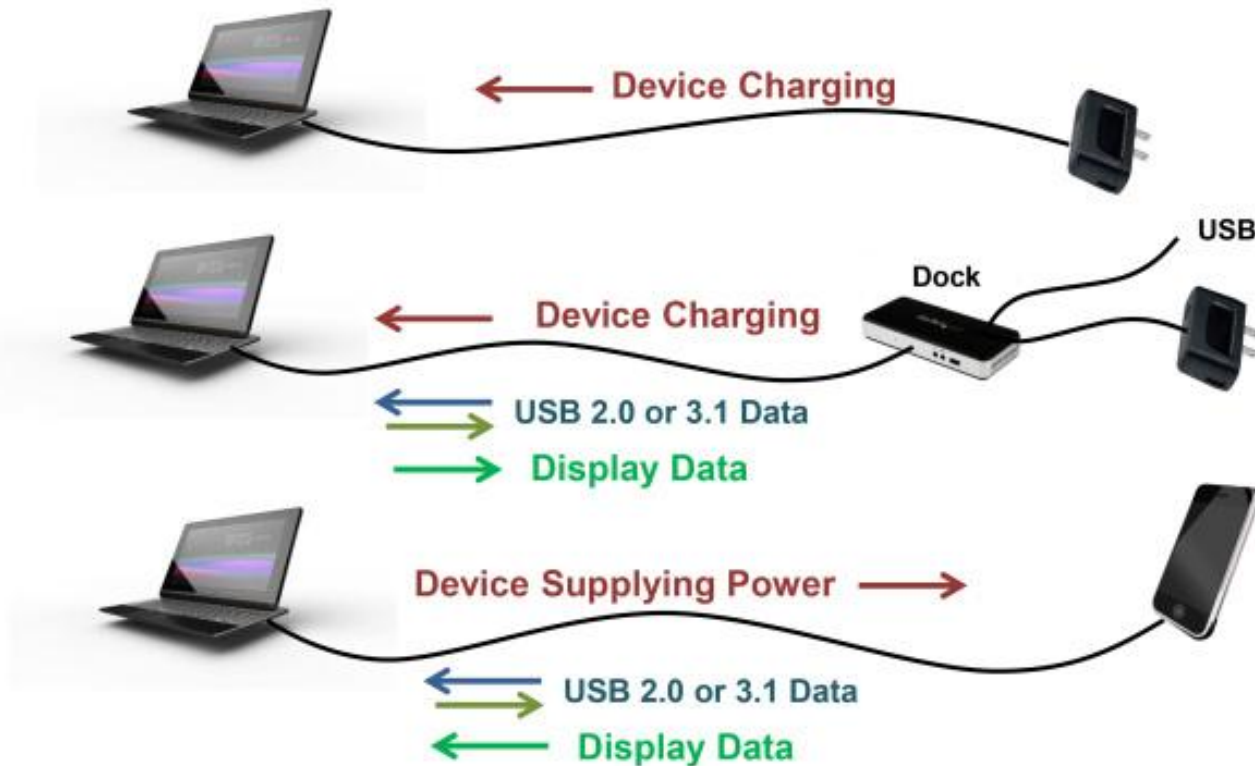
The USB Type-C receptacle, plug and cable provide a smaller, thinner and more robust alternative to existing [USB 3.1](#) interconnect (Standard and Micro USB cables and connectors). This new solution targets use in very thin platforms, ranging from ultra-thin notebook PCs down to smart phones where existing Standard-A and Micro-AB receptacles are deemed too large, difficult to use, or inadequately robust. Some key specific enhancements include:

- The USB Type-C receptacle may be used in very thin platforms as its total system height for the mounted receptacle is under 3 mm
- The USB Type-C plug enhances ease of use by being plug-able in either upside-up or upside-down directions
- The USB Type-C cable enhances ease of use by being plug-able in either direction between host and devices



Example USB Type-C Configurations

- Either end can serve as USB Host, USB-PD Power Consumer, and DisplayPort Video Source (these are orthogonal to each other)



10



Defined

The following USB Type-C receptacles and plugs are defined.

- USB Type-C receptacle for [USB 2.0](#), [USB 3.1](#) and full-featured platforms and devices
- USB Full-Featured Type-C plug
- [USB 2.0](#) Type-C plug

The following USB Type-C cables are defined.

- USB Full-Featured Type-C cable with a USB Full-Featured Type-C plug at both ends for [USB 3.1](#) and full-featured applications
- [USB 2.0](#) Type-C cable with a [USB 2.0](#) Type-C plug at both ends for [USB 2.0](#) applications
- Captive cable with either a USB Full-Featured Type-C plug or [USB 2.0](#) Type-C plug at one end

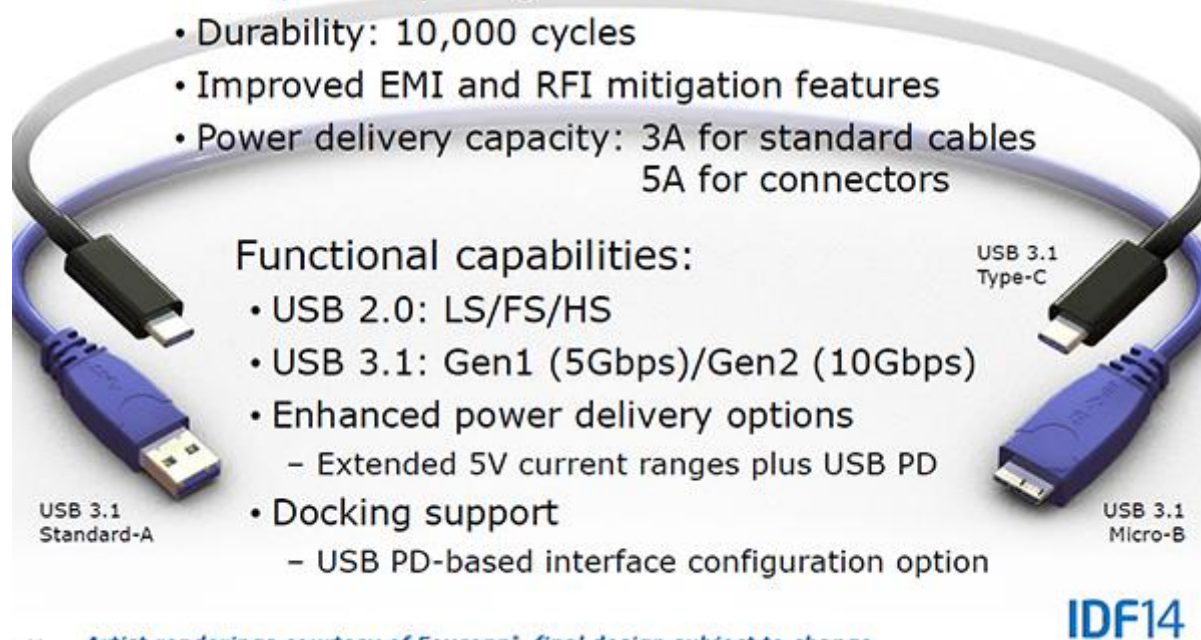
USB Type-C – Additional Characteristics

Mechanical specs (preliminary):

- Receptacle opening: ~8.3mm x ~2.5mm
- Durability: 10,000 cycles
- Improved EMI and RFI mitigation features
- Power delivery capacity: 3A for standard cables
5A for connectors

Functional capabilities:

- USB 2.0: LS/FS/HS
- USB 3.1: Gen1 (5Gbps)/Gen2 (10Gbps)
- Enhanced power delivery options
 - Extended 5V current ranges plus USB PD
- Docking support
 - USB PD-based interface configuration option



11 Artist renderings courtesy of Foxconn*, final design subject to change

The USB Type-C plug can be inserted into a receptacle in either one of two orientations, therefore the CC pins enable a method for detecting plug orientation in order to determine which SuperSpeed USB data signal pairs are functionally connected through the cable. This allows for signal routing, if needed, within a DFP or UFP to be established for a successful connection.



Compliant Connectors

- USB Type-C receptacle
- USB Full-Featured Type-C plug
- USB 2.0 Type-C plug

Compliant 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		



Housing Dielectric Material: Liquid Crystal Polymer

Color: Black

(UL94) rating: V-0

RoHS compliance: Yes

Contact Material:

Base metal alloy designation: COPPER ALLOYS

Base metal yield strength: 66.7 kg/mm² Min.

Contact material thickness: 0.10mm.

Contact surface condition: Forming type or Blanking type Contact

Contact Plating: Note: 0.0254 micro-meter = 1 Micro-inch

Contact surface plating material(s): Au

Contact surface plating thickness: 1~5 or 15 or 30 Micro inch Minimum

Under-plate material: Nickel

Under-plate thickness: 50 Micro inch minimum

Solder tail plating material: matte tin

Solder tail plating thickness: 100 Micro inch minimum matte tin



Contact design:

Contact lead-in: 0~45degree

Nominal contact engagement / wipe (mm) 0.75mm min

Insertion force: 5N~20N.

Withdraw force: 8N~20N.

Durability: Mated 10000 times and still meets electrical and mechanical characteristics in this spec.

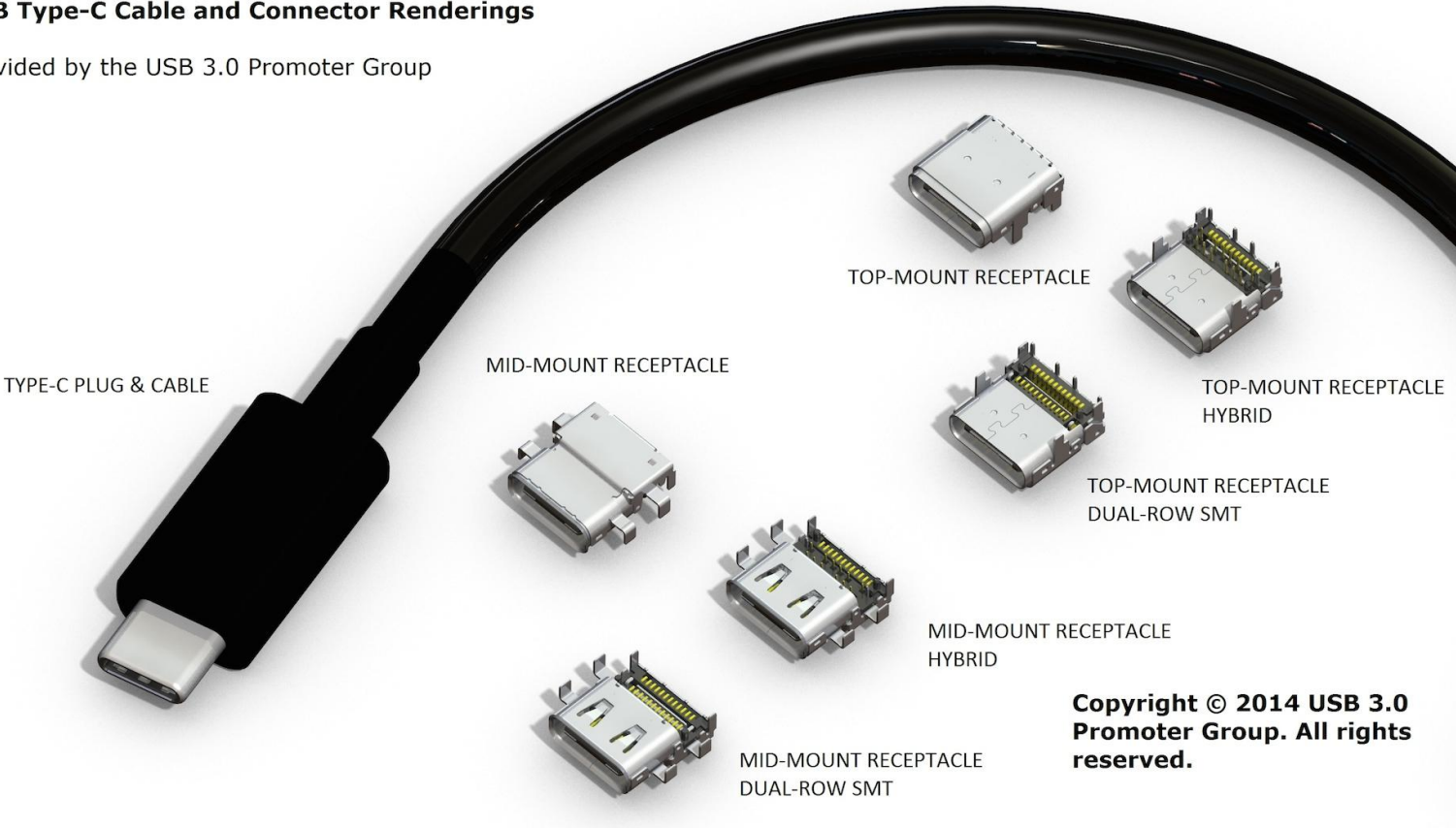
Co-planarity of contact tail: 0.1mm Maximum.

Revision History

Revision	Date	Description
1.0	August 11, 2014	Initial Release

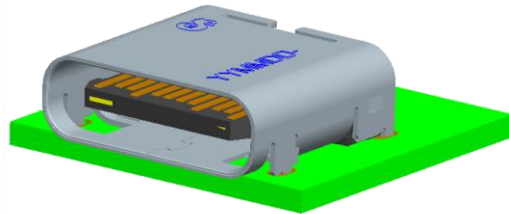
USB Type-C Cable and Connector Renderings

Provided by the USB 3.0 Promoter Group

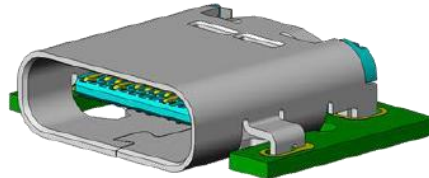
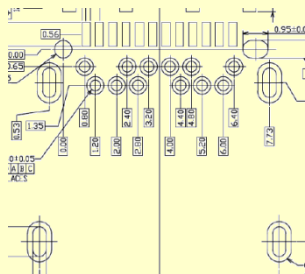
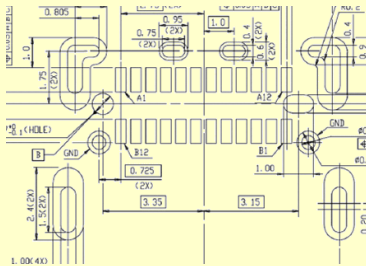


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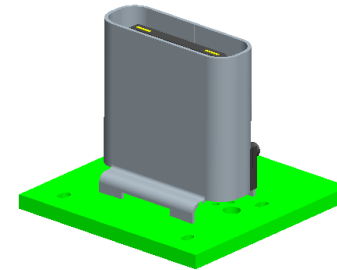
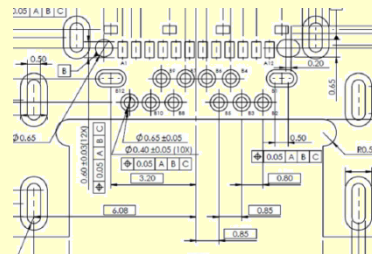
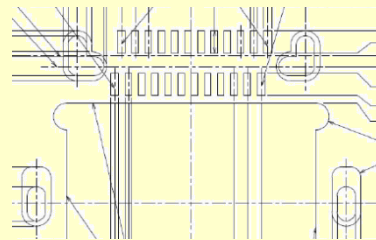
■ USB Type-C receptacle



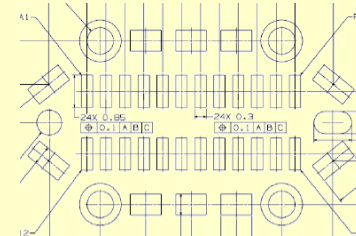
- Top Mount Connector(R/A)
 - Dual-Row SMT Right Angle
 - Hybrid TH and SMT Right Angle



- Mid Mount Connector(R/A)
 - Dual-Row SMT Right Angle
 - Hybrid TH and SMT Right Angle



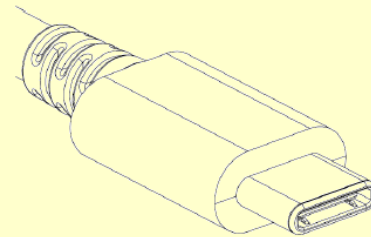
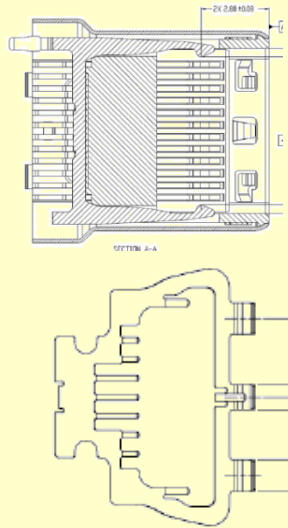
- Vertical Mount Connector
 - Dual-Row SMT Right Angle



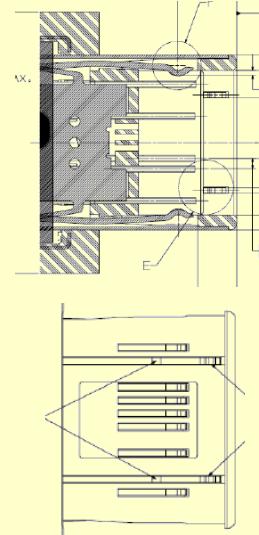
■ USB Type-C Plug



● USB 3.1 Type C



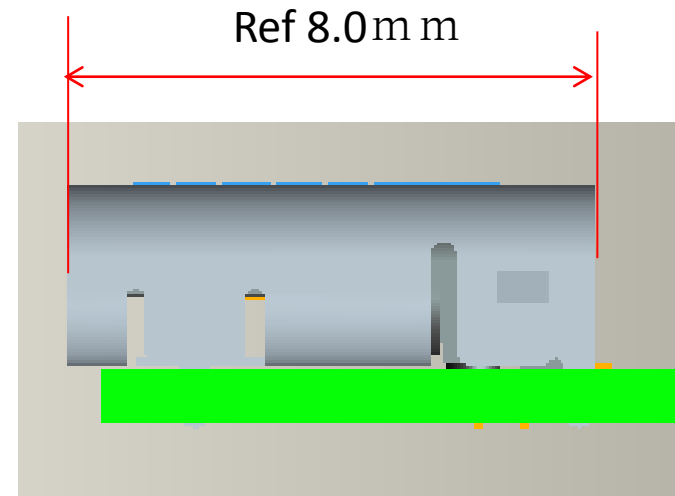
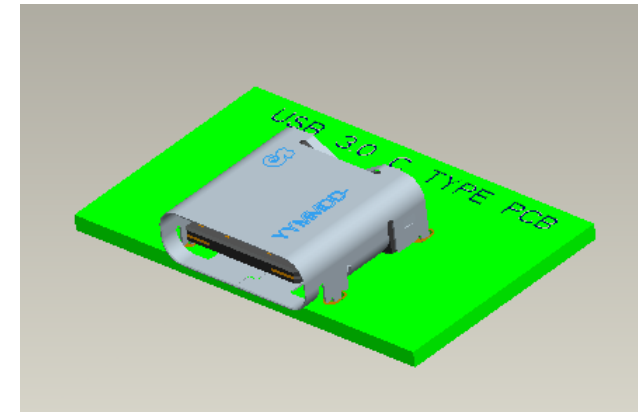
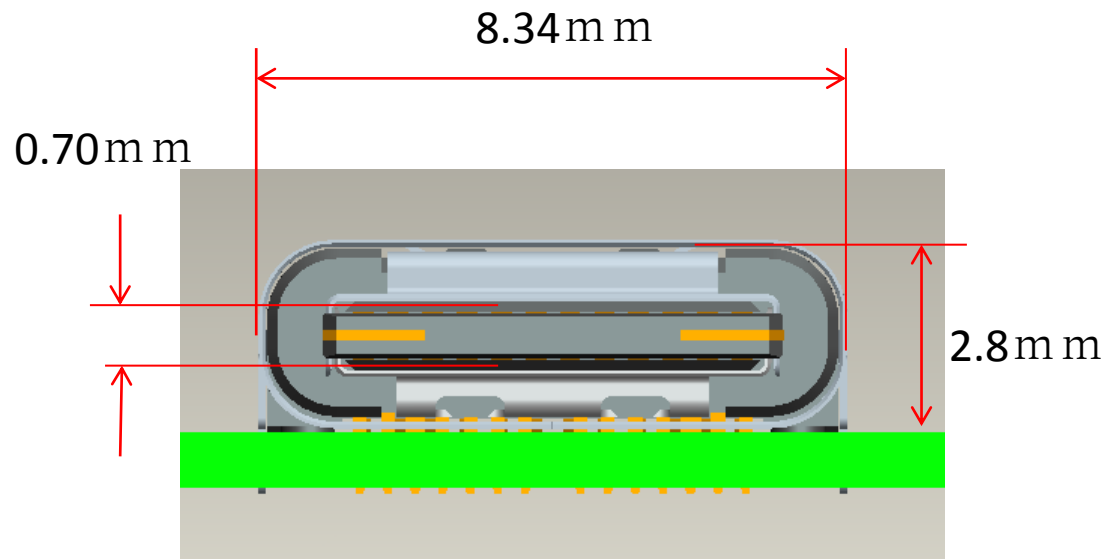
● USB 2.0 Type C



Compliant Connectors – Outside Dimension

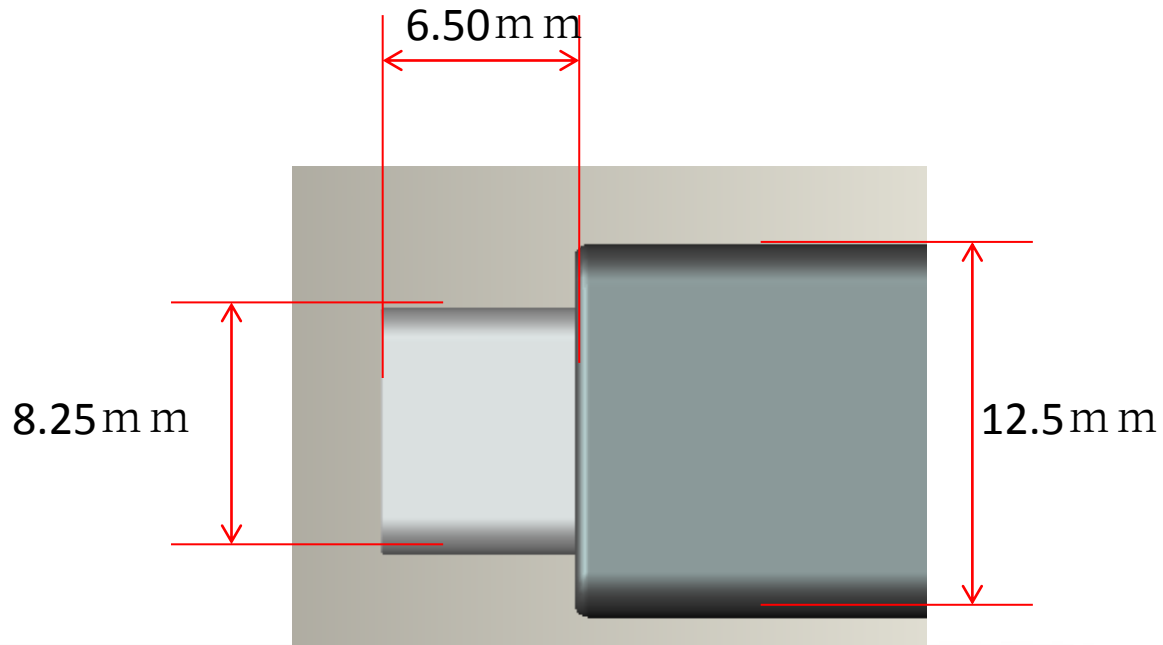
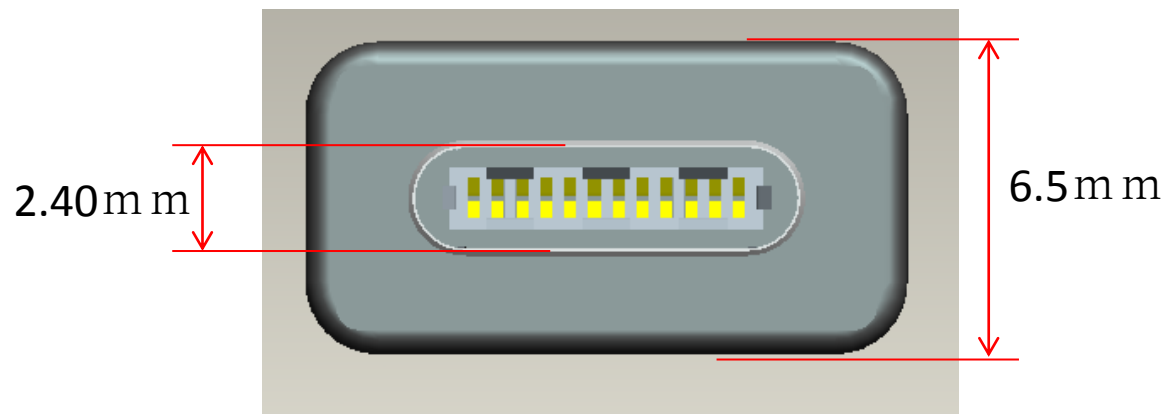
尺寸部分描述说明：

- 母端总高2.80mm
- 母端总长8.0mm
- 母端窗口宽度8.34mm
- 舌片厚度0.70mm

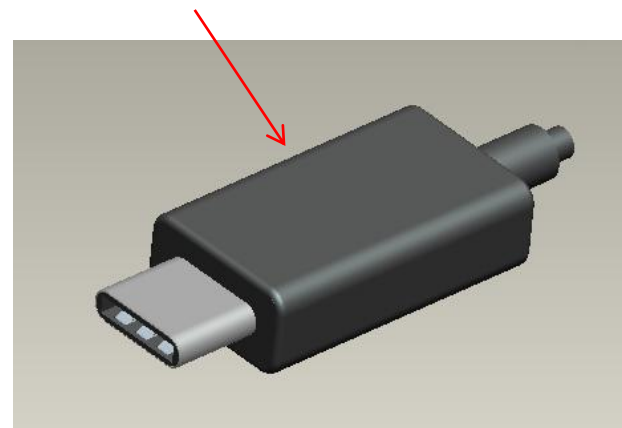


Compliant Connectors – Outside Dimension

□ 公端部分尺寸 (Conn.) :



PLUG护套



PLUG 3D VIEW

尺寸部分描述说明

1. PLUG头部厚度2.40mm
2. PLUG头部宽度8.25mm
3. PLUG头部长度6.50mm
4. PLUG护套长度6.5mm



PIN腳定義:

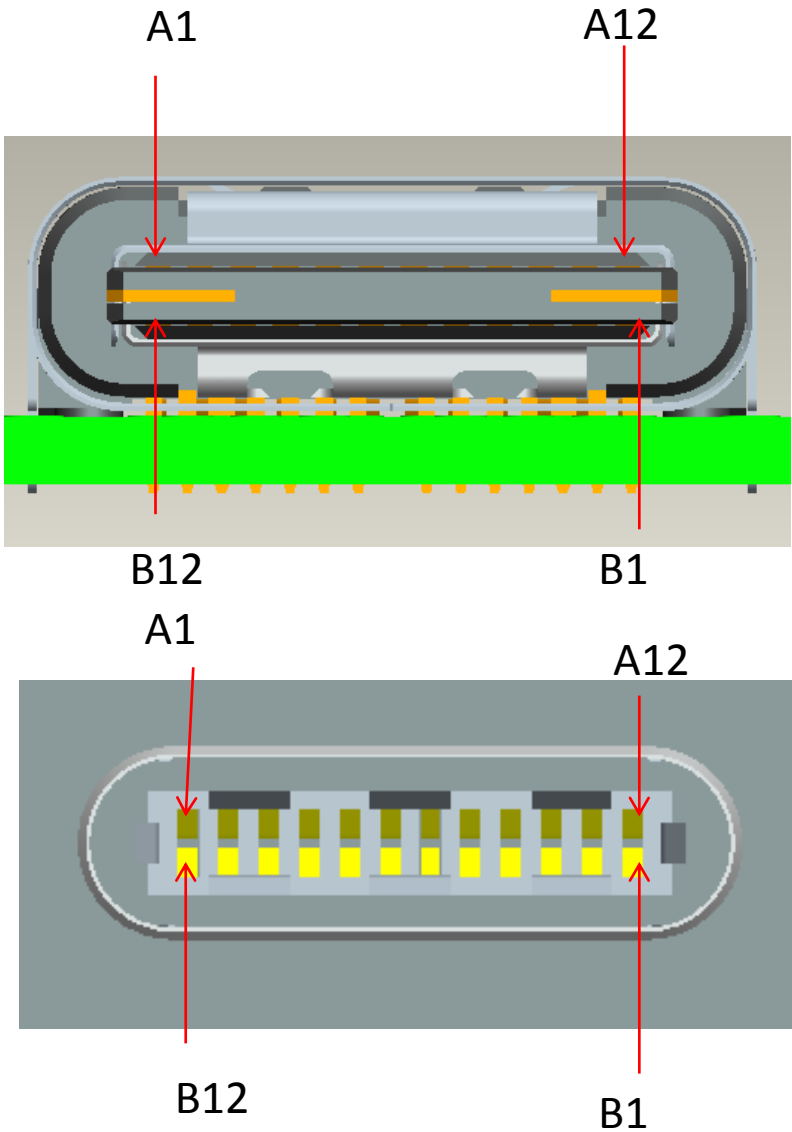
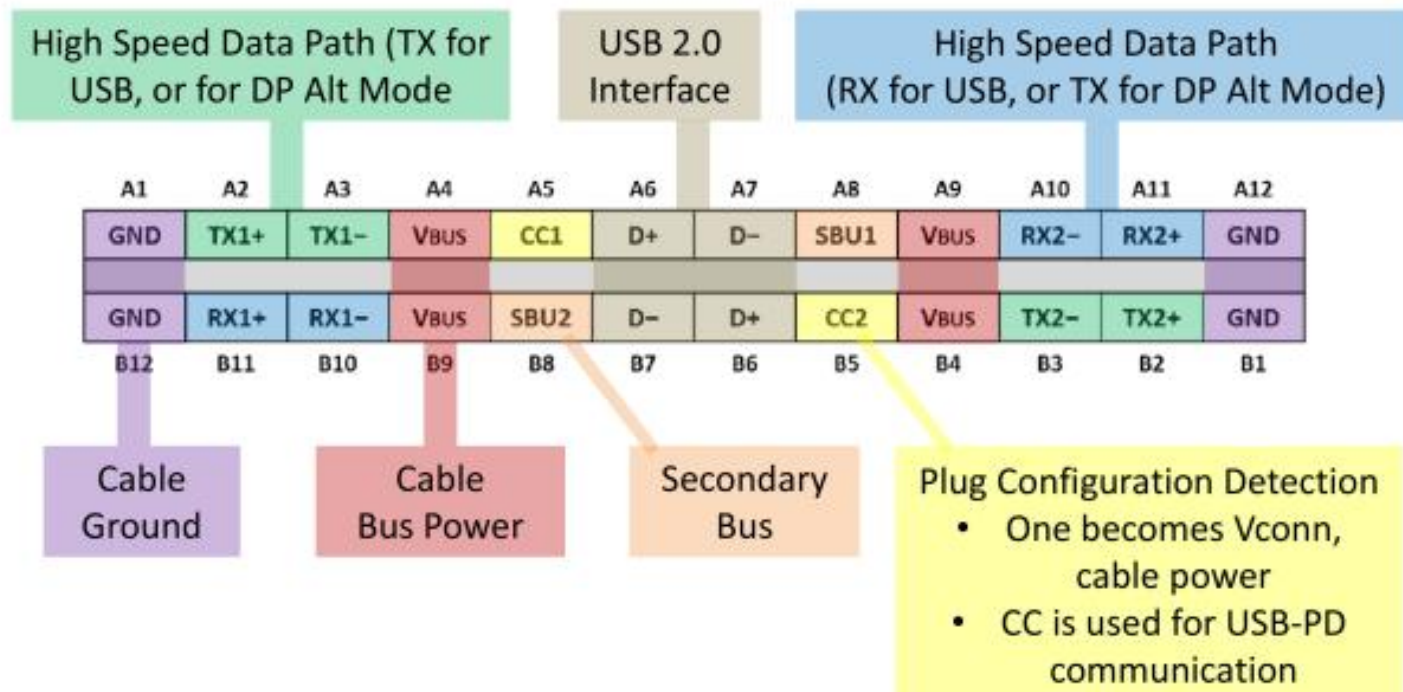


Table 3-1 USB Type-C Receptacle Interface Pin Assignments

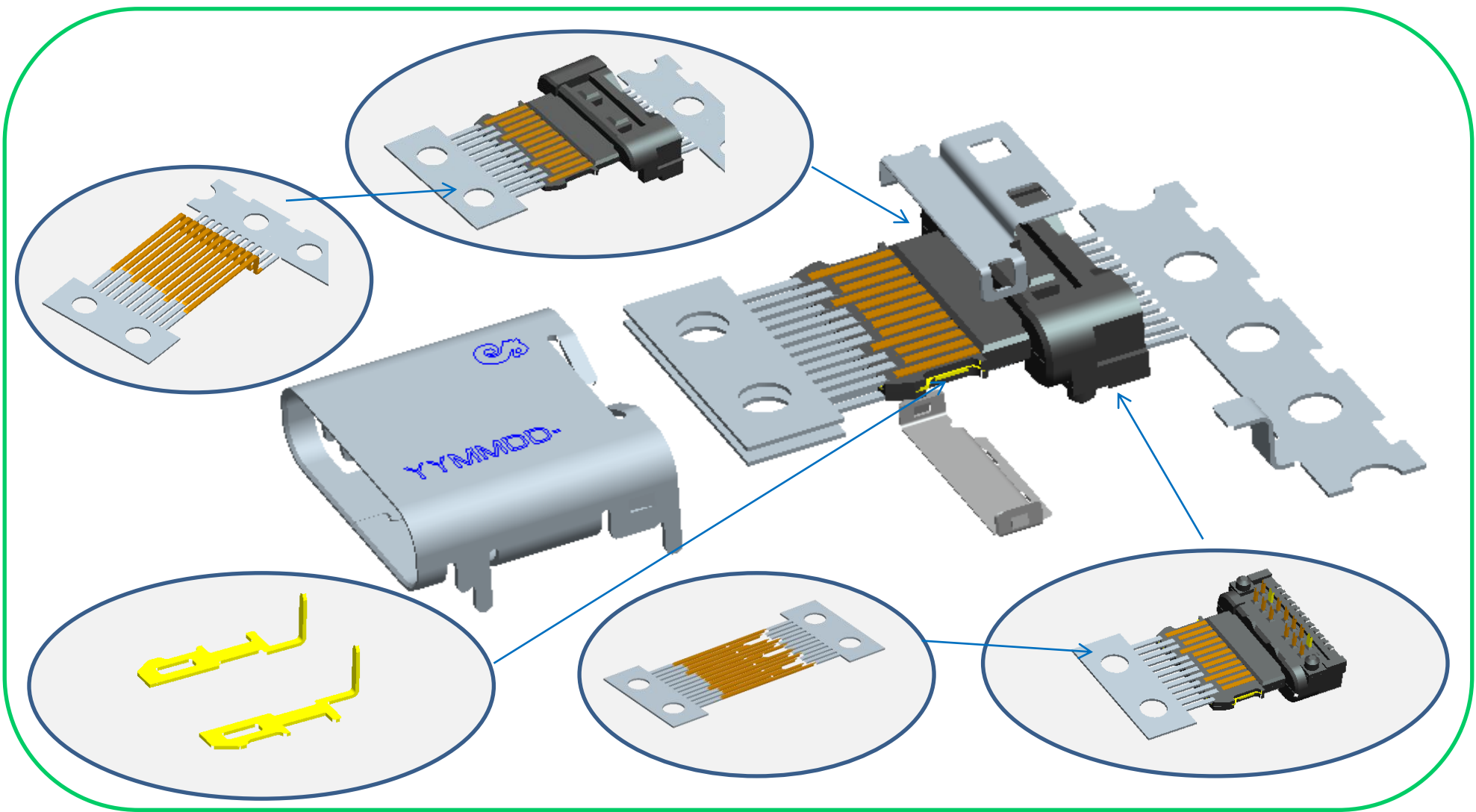
Pin	Signal Name	Description	Mating Sequence	Pin	Signal Name	Description	Mating Sequence
A1	GND	Ground return	First	B12	GND	Ground return	First
A2	SSTXp1	Positive half of first SuperSpeed TX differential pair	Second	B11	SSRXp1	Positive half of first SuperSpeed RX differential pair	Second
A3	SSTXn1	Negative 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	RFU2	Reserved for Future Use (RFU)	Second
A6	Dp1	Positive half of the USB 2.0 differential pair - Position 1	Second	B7	Dn2	Negative half of the USB 2.0 differential pair - Position 2	Second
A7	Dn1	Negative half of the USB 2.0 differential pair - Position 1	Second	B6	Dp2	Positive half of the USB 2.0 differential pair - Position 2	Second
A8	RFU1	Reserved for Future Use (RFU)	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 Receptacle Pins

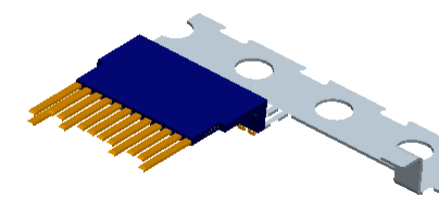
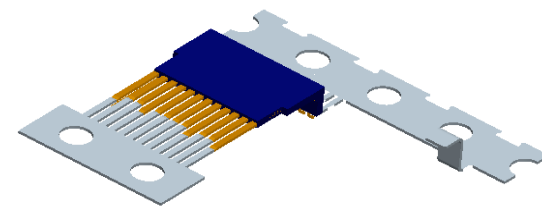
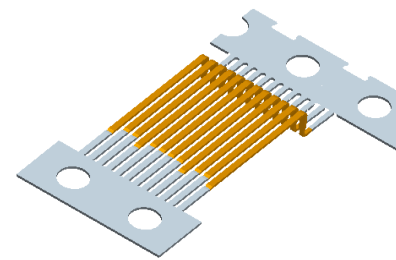
Pins defined for system or device receptacle



■ 爆炸圖/母端：



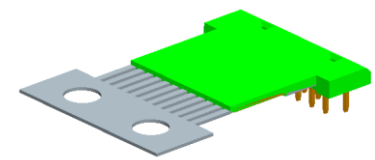
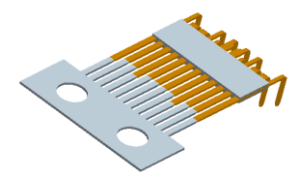
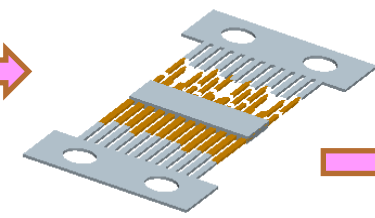
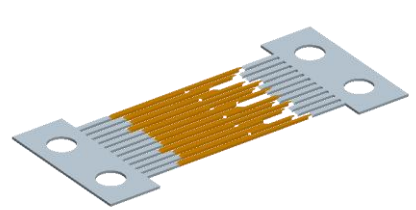
■ 產品組裝制程:



U-Terminal裁切
(4個為一組)

U-Terminal一次I/M

副料帶去除

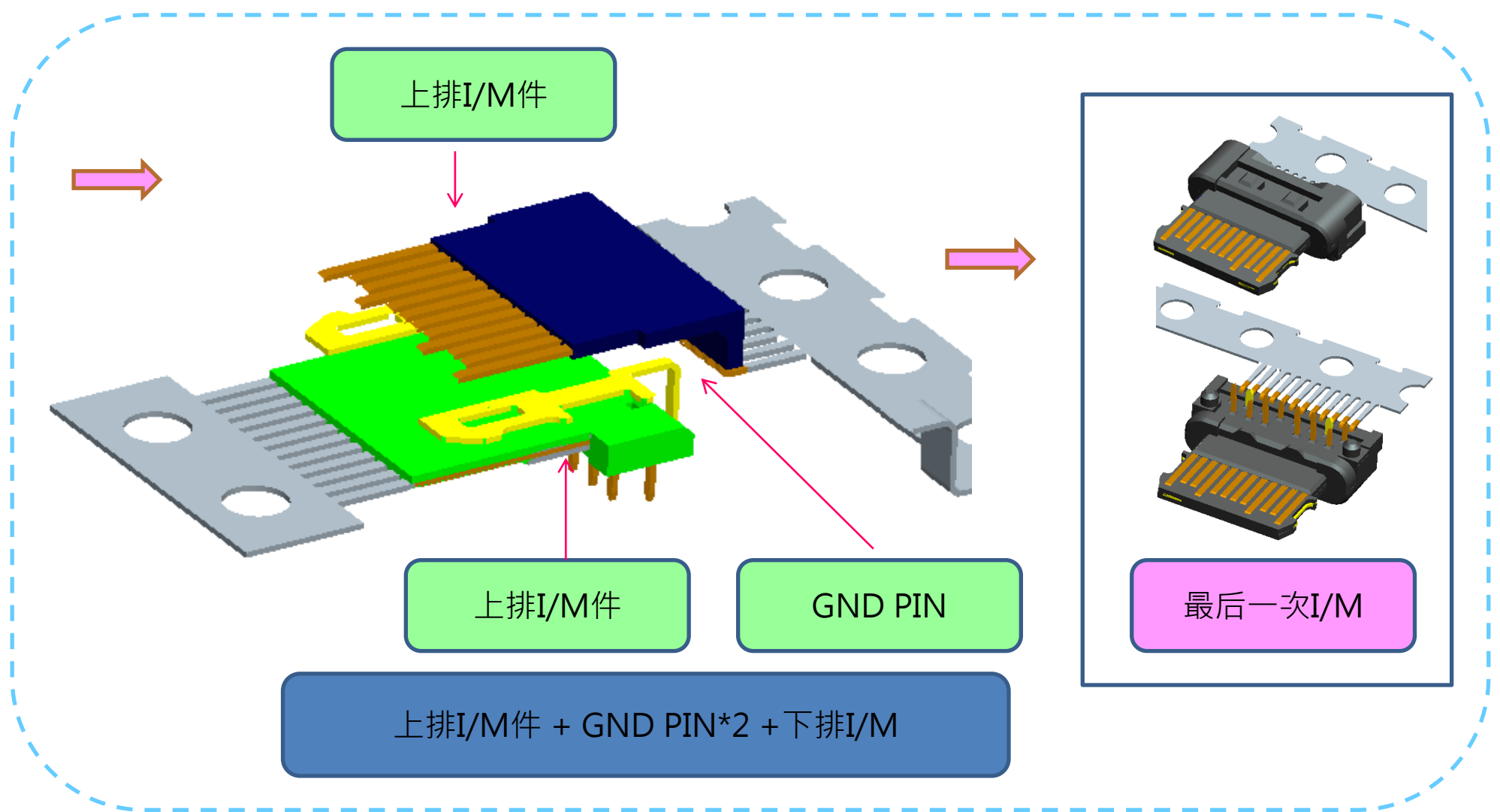


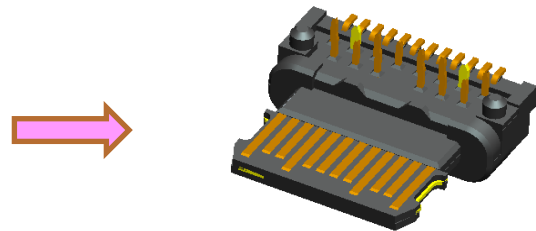
D-Terminal
(連續PIN)

D-Terminal一次I/M
(連續I/M)

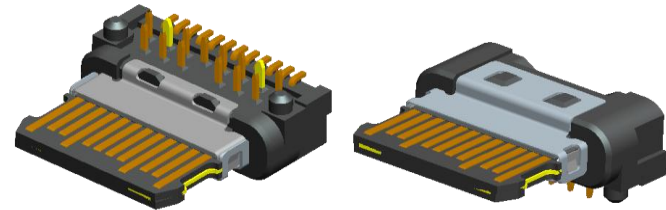
副料帶裁切+
焊腳折彎 (沖
模折彎)

D-Terminal二次I/M

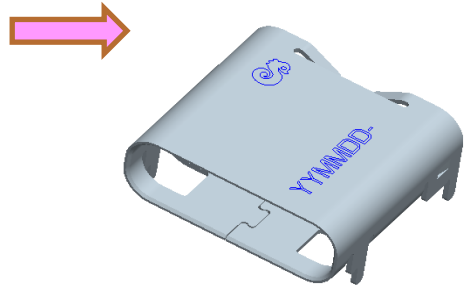




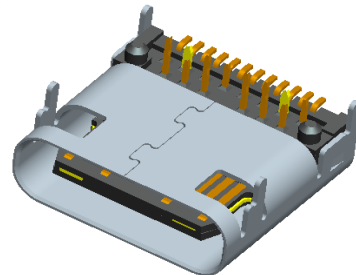
裁SMT腳



裝上下接通地鐵殼
Cover



噴D/C



裝外鐵殼SHELL

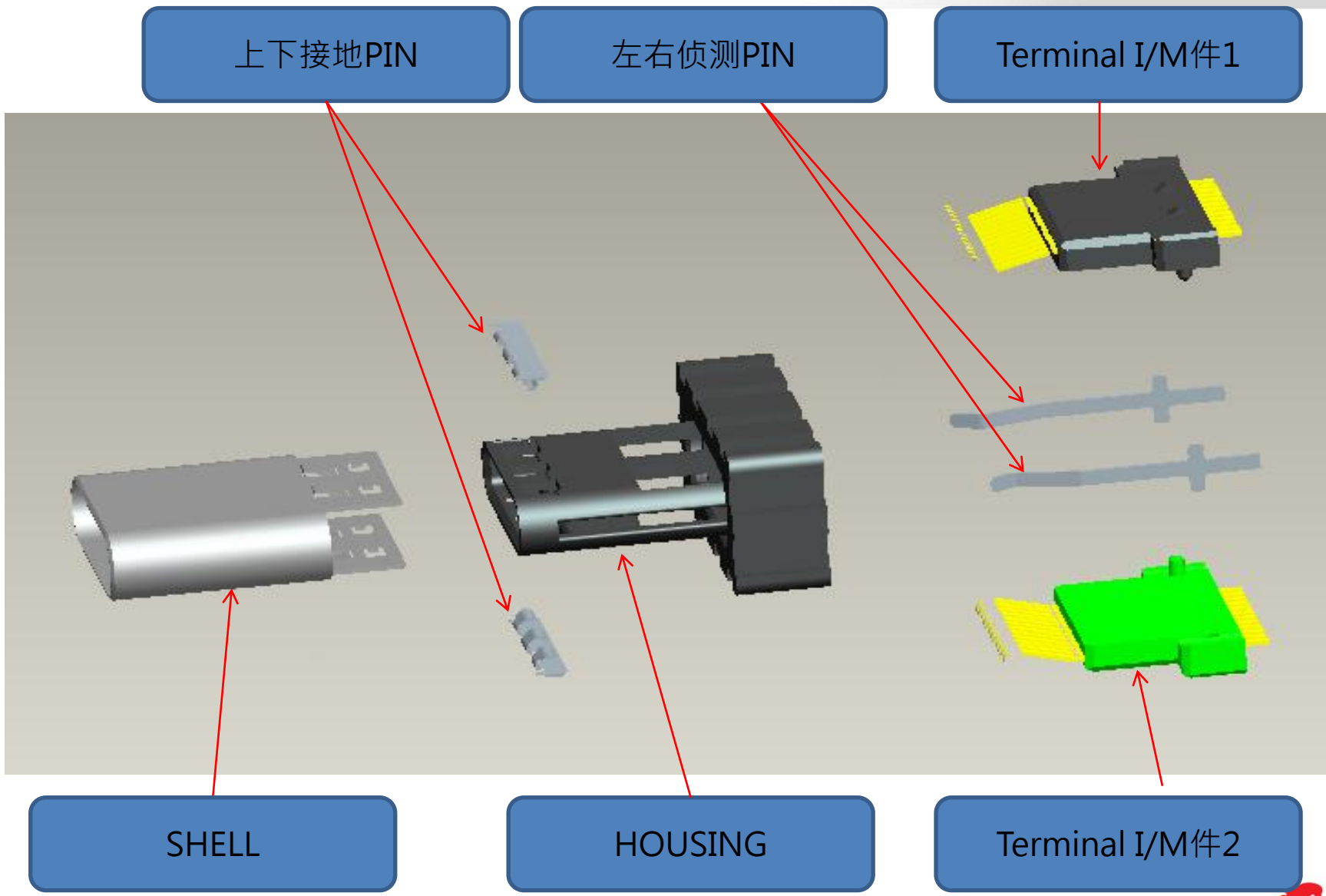
電測 (導通+耐壓)

CCD(舌片+SMT+孔規)

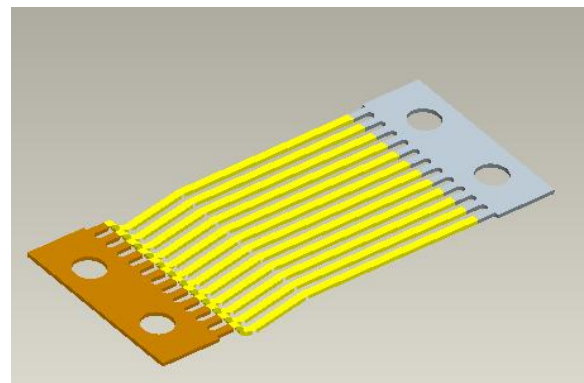
外觀檢查

包裝入庫

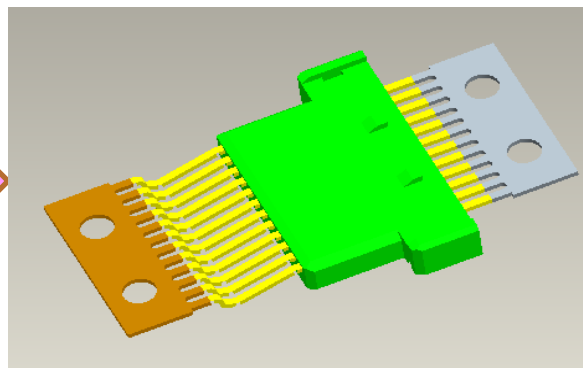
■ 爆炸圖/公端：



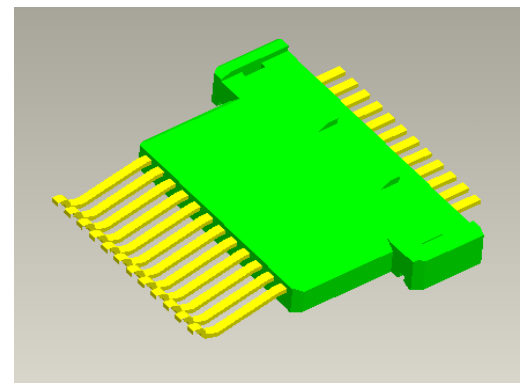
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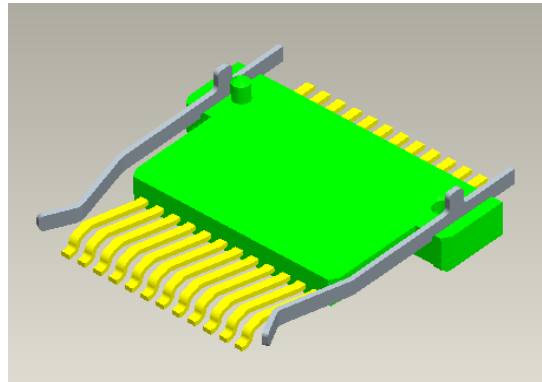
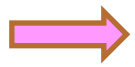
Terminal裁切
(4個為一組)



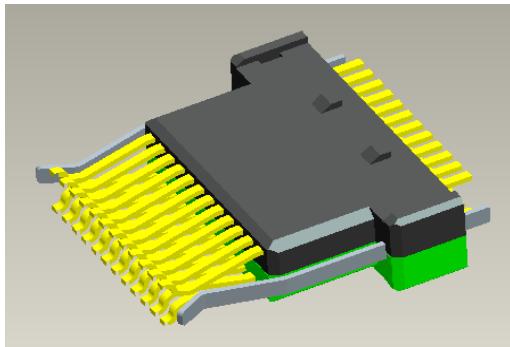
Terminal I/M



料帶裁切+焊腳裁切



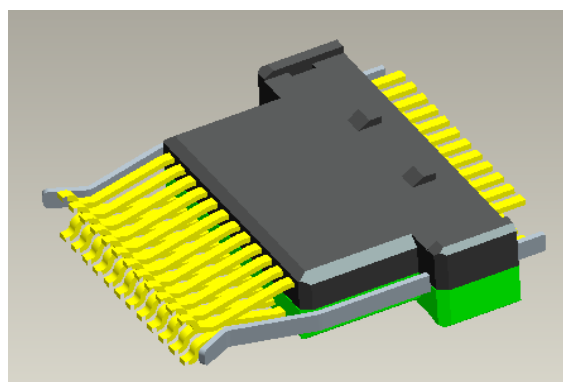
组装侦测端子



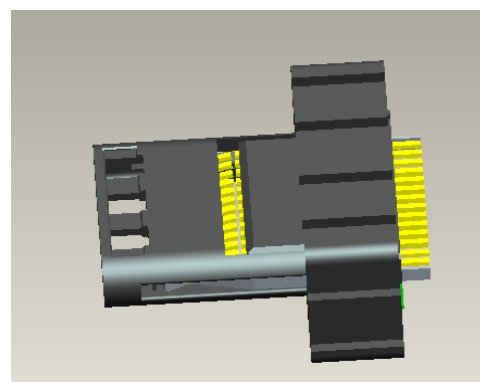
上下MOLDING件扣
和组装(半成品1)

说明:上下MOLDING
结构完全相同.

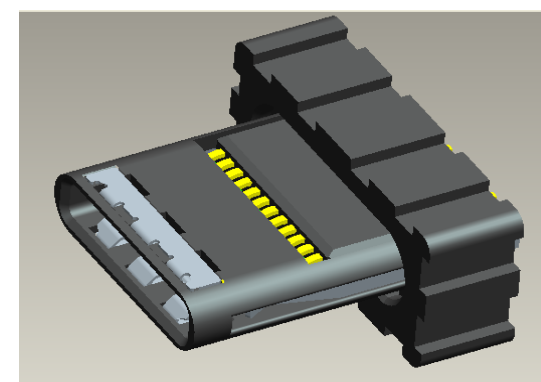
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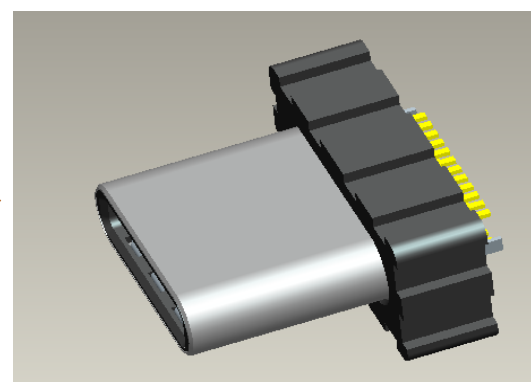
半成品1



半成品1組裝于
HOUSING中



組裝上下接地片



組裝SHLL



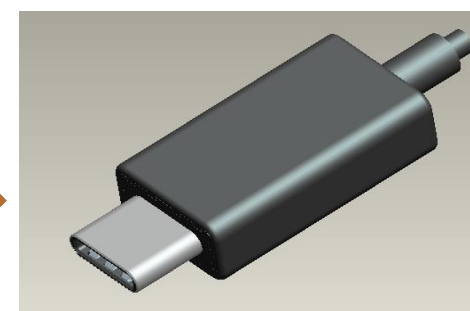
電測 (導通+耐壓)



外觀檢查

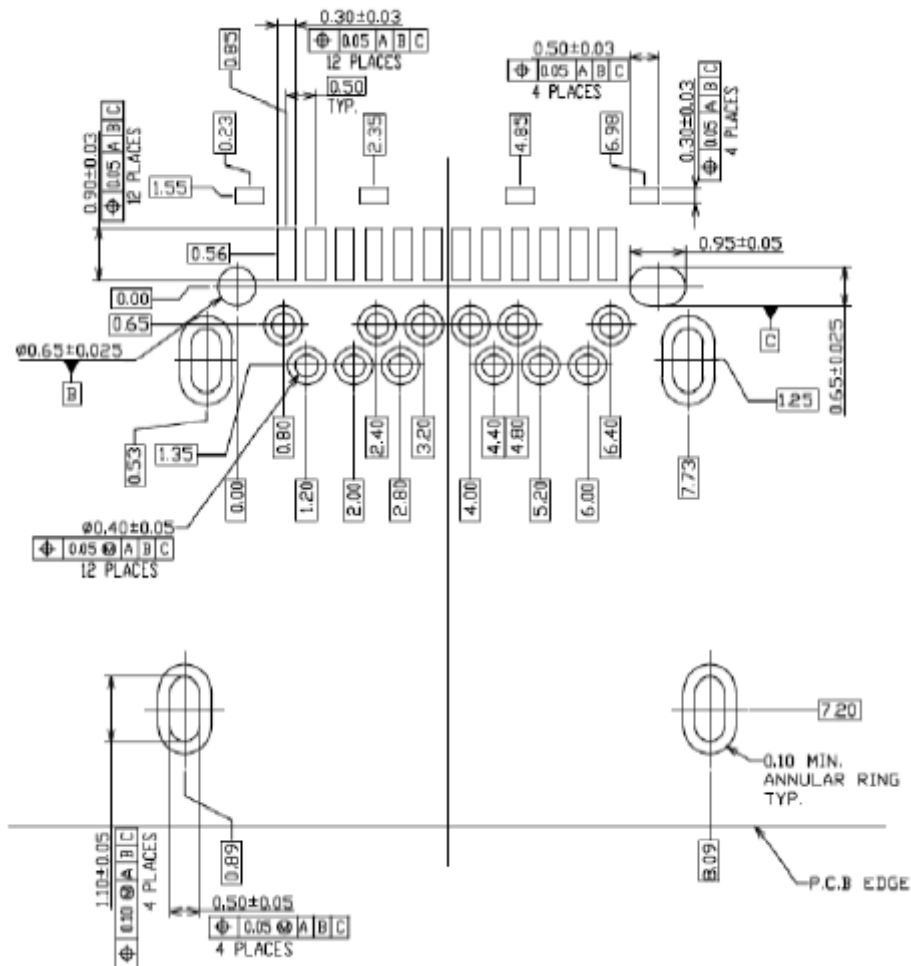


包裝入庫

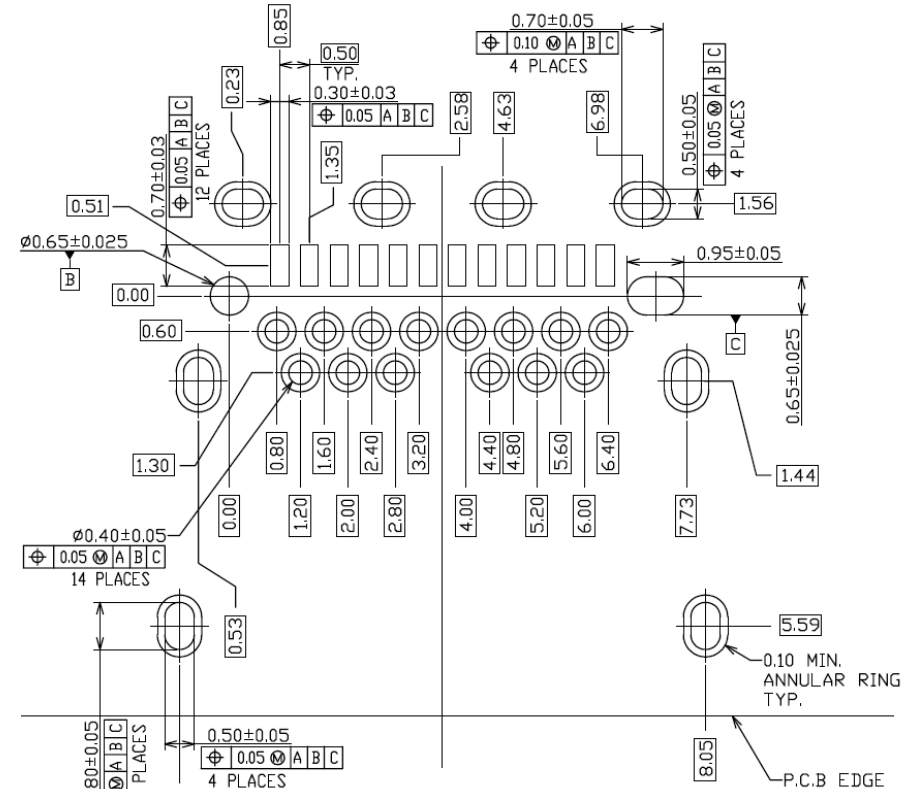


線材焊接后MODING护套

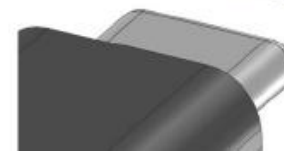
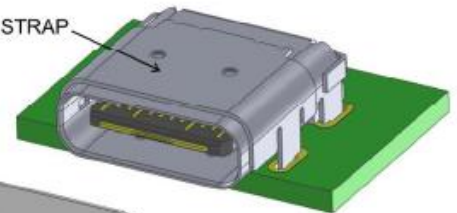
SPEC



Lotes

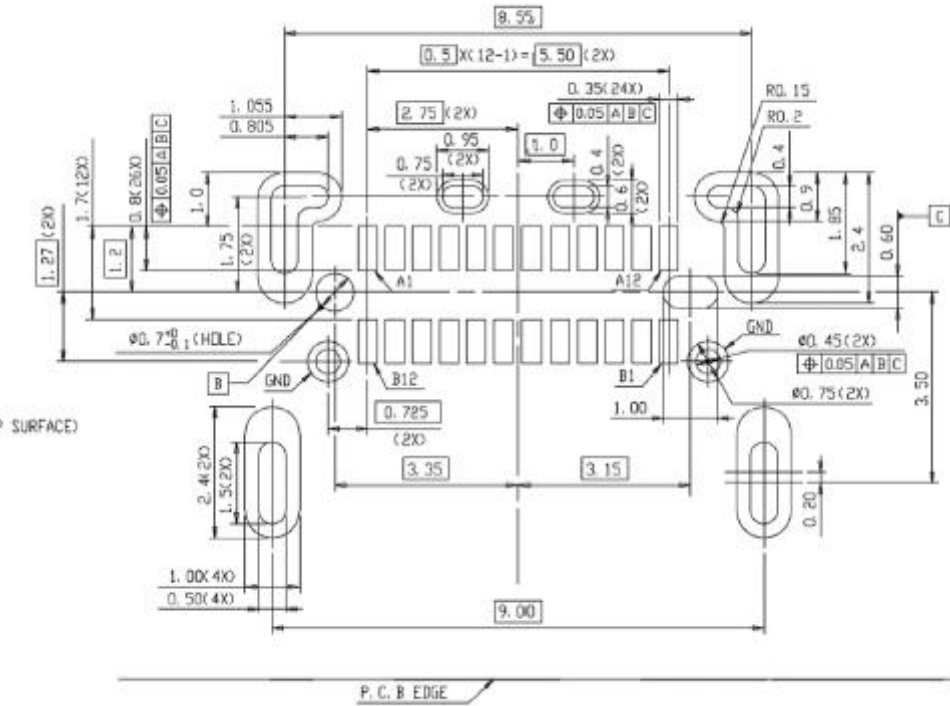


OPTIONAL HOLD DOWN STRAP.

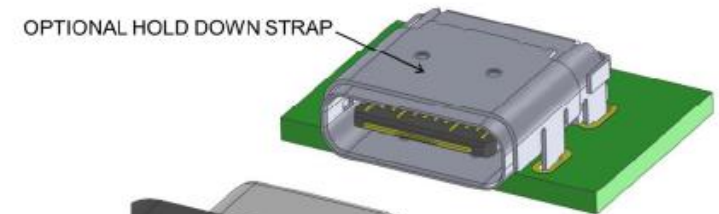


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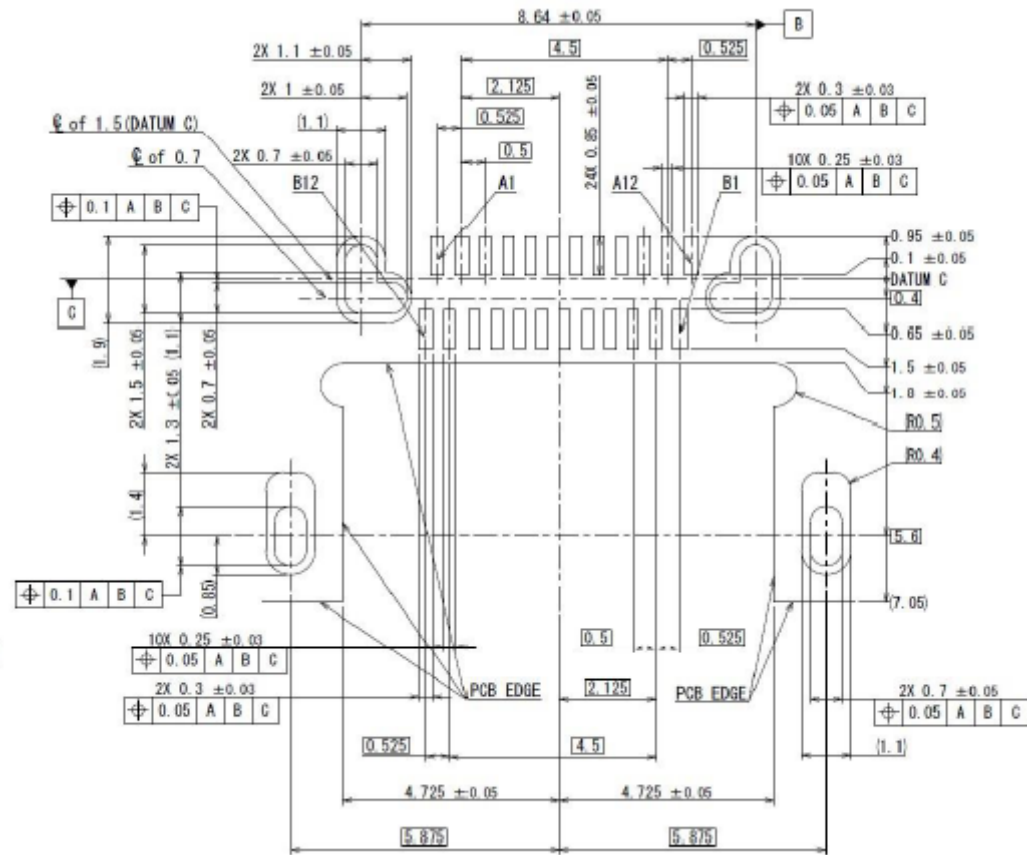
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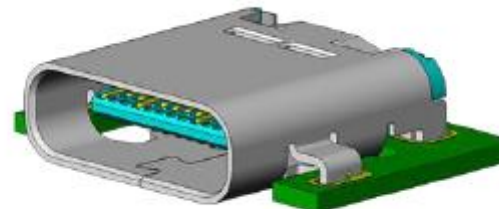
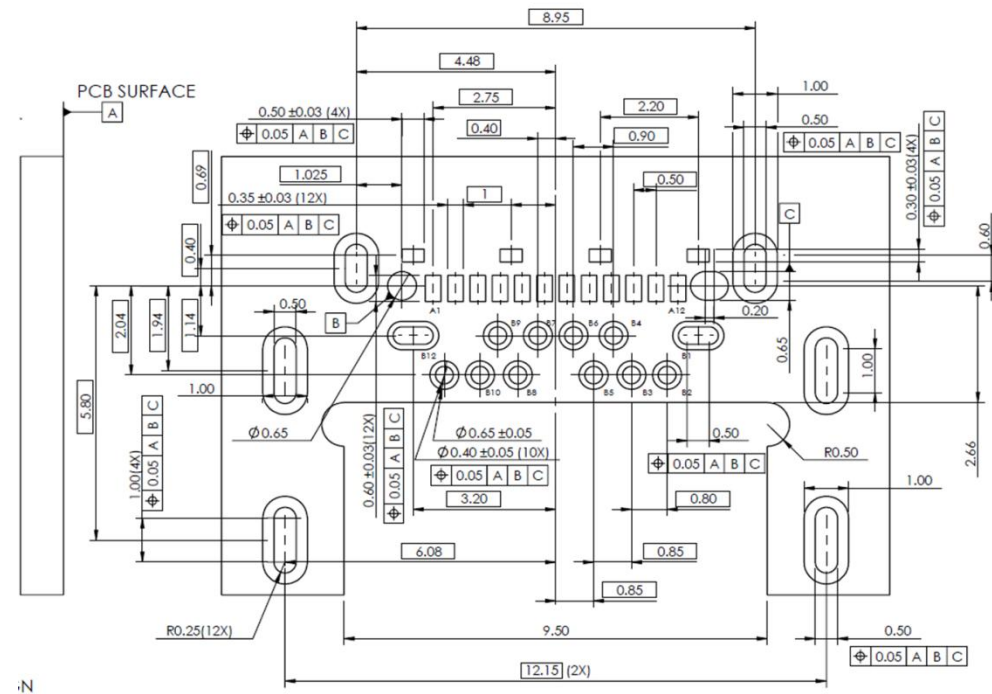
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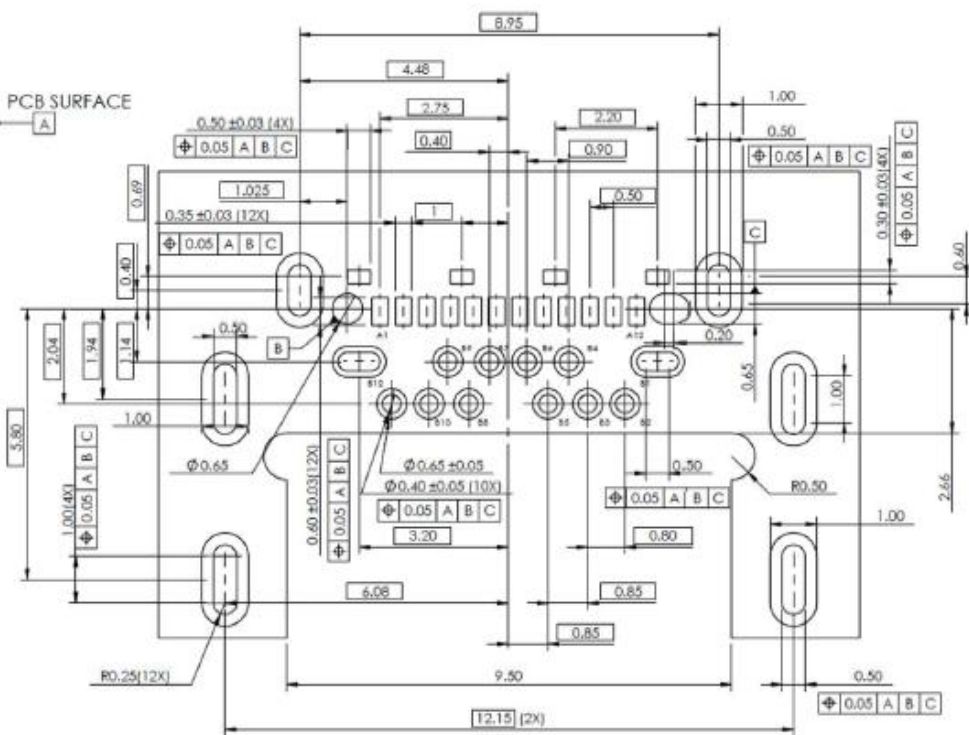
SPEC



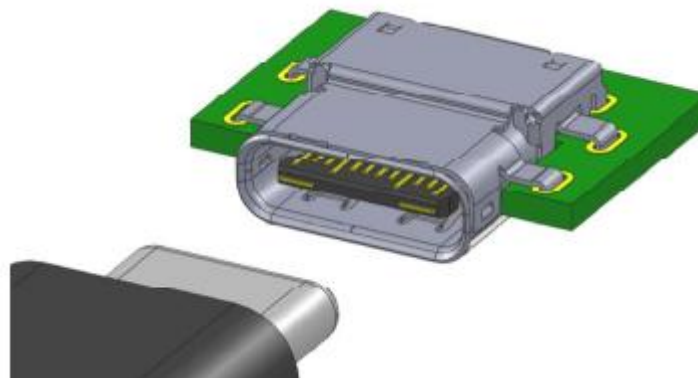
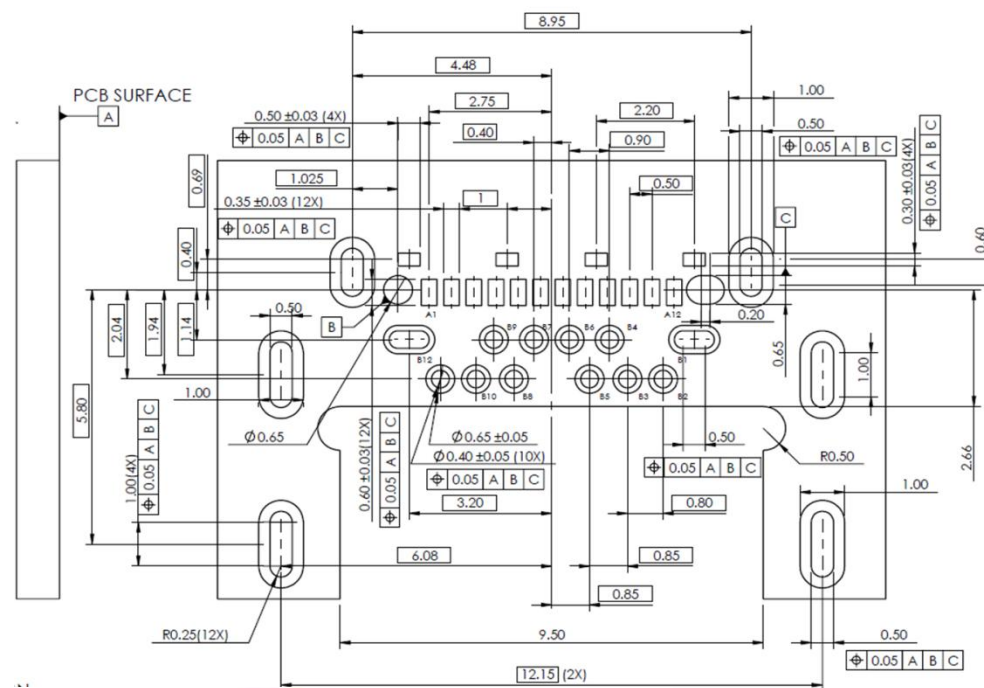
Lotes



SPEC



Lotes



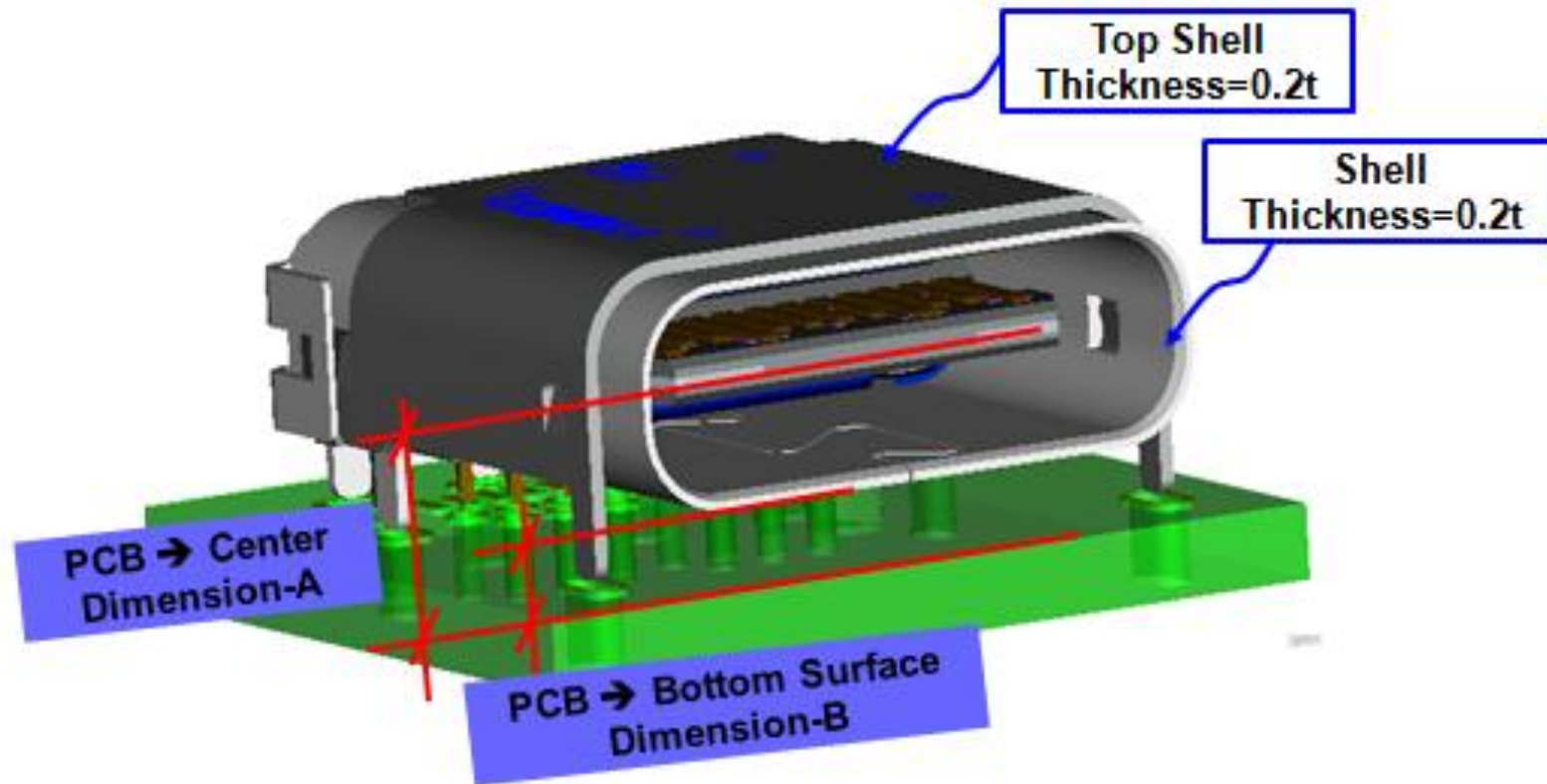
Lotes

This detailed drawing shows the mechanical layout of a PCB. It includes the following features and dimensions:

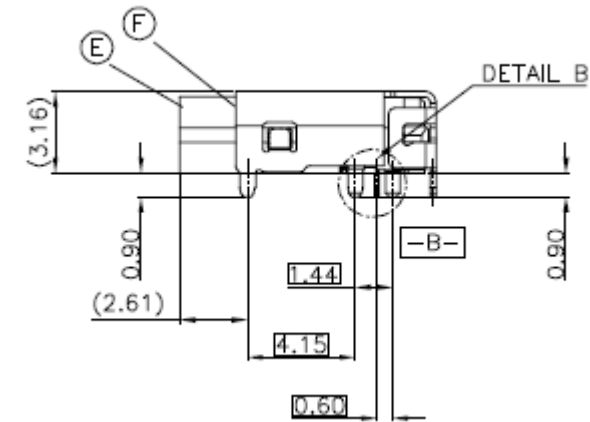
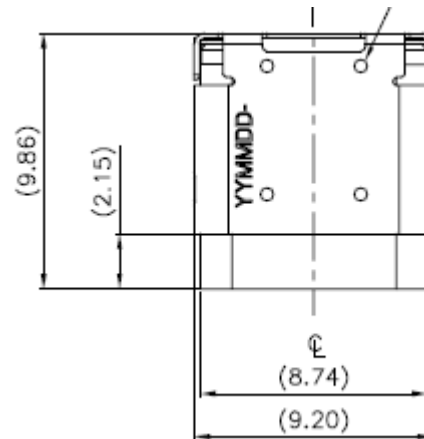
- Top Section:**
 - Overall width: 0.90 ± 0.03
 - Top edge features: $\phi 0.05$ A B C, 12 PLACES; 0.85 ; 0.23 ; 1.55 ; 0.56 .
 - Internal spacing: 0.30 ± 0.03 , 0.05 A B C, 12 PLACES; 0.50 TYP.; 2.35 .
- Bottom Section:**
 - Overall width: 0.95 ± 0.05
 - Bottom edge features: 0.30 ± 0.03 ; $\phi 0.05$ A B C, 4 PLACES; 4.85 ; 6.98 ; 0.30 ± 0.03 ; $\phi 0.05$ A B C, 4 PLACES.
 - Internal spacing: 0.50 ± 0.03 , 0.05 A B C, 4 PLACES.
- Central Features:**
 - Top row of circles: $\phi 0.65 \pm 0.025$ B; 0.00 ; 0.65 ; 0.53 ; 1.35 ; 0.80 ; 1.20 ; 2.00 ; 2.80 ; 3.20 ; 4.00 ; 4.40 ; 4.80 ; 5.20 ; 6.00 ; 6.40 ; 7.73 .
 - Bottom row of circles: $\phi 0.40 \pm 0.05$ A B C, 12 PLACES; 0.05 A B C, 12 PLACES; 0.00 ; 1.20 ; 2.00 ; 2.80 ; 3.20 ; 4.00 ; 4.40 ; 4.80 ; 5.20 ; 6.00 ; 6.40 ; 7.73 .
- Right Section:**
 - Overall width: 0.65 ± 0.025
 - Right edge features: 1.25 ; 7.20 .
 - Internal spacing: 0.10 MIN. ANNULAR RING TYP.
- Bottom Section:**
 - Overall width: 1.10 ± 0.05
 - Bottom edge features: $\phi 0.10$ A B C, 4 PLACES; 0.10 A B C, 4 PLACES; 0.89 ; 0.50 ± 0.05 ; $\phi 0.05$ A B C, 4 PLACES.
 - Internal spacing: 0.30 ± 0.03 , 0.05 A B C, 12 PLACES.
- Other Dimensions:**
 - 0.00 , 0.65 , 0.53 , 1.35 , 0.80 , 1.20 , 2.00 , 2.80 , 3.20 , 4.00 , 4.40 , 4.80 , 5.20 , 6.00 , 6.40 , 7.73 .
 - 0.10 MIN. ANNULAR RING TYP.
 - P.C.B EDGE



■ USB Type-C receptacle dimension



Type



Type





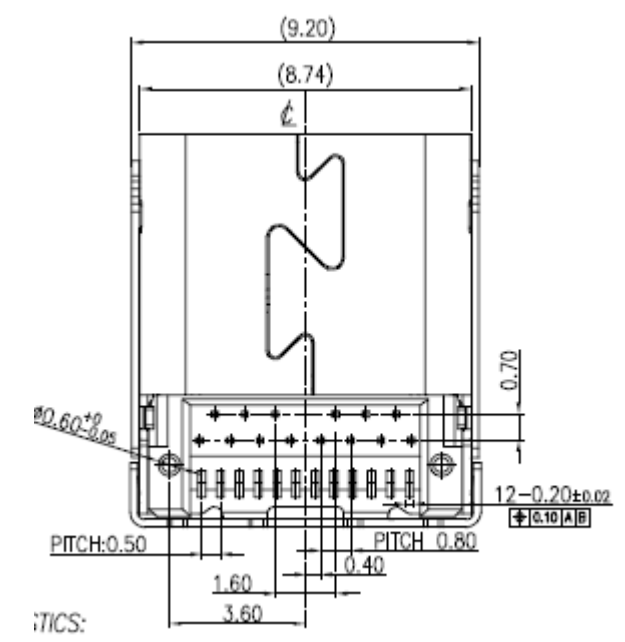
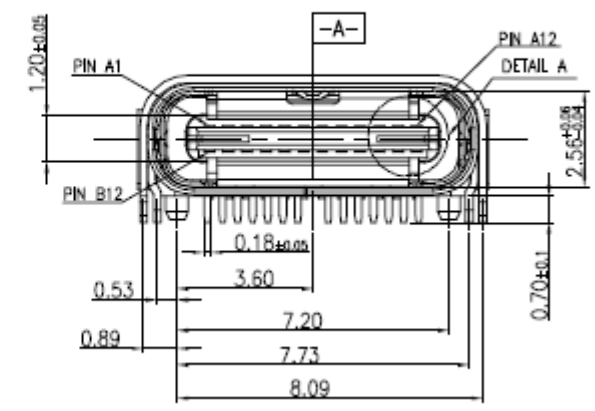
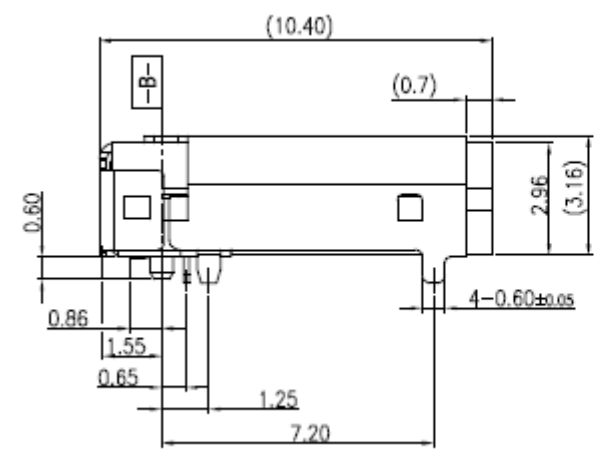
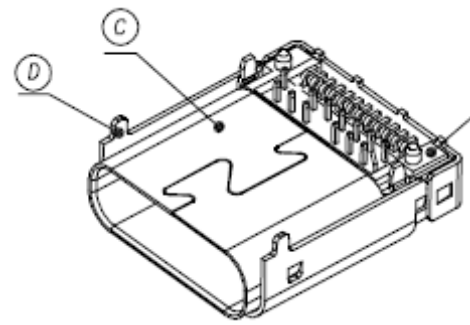
Type





Compliant Connectors – Top Mount Hybrid Type

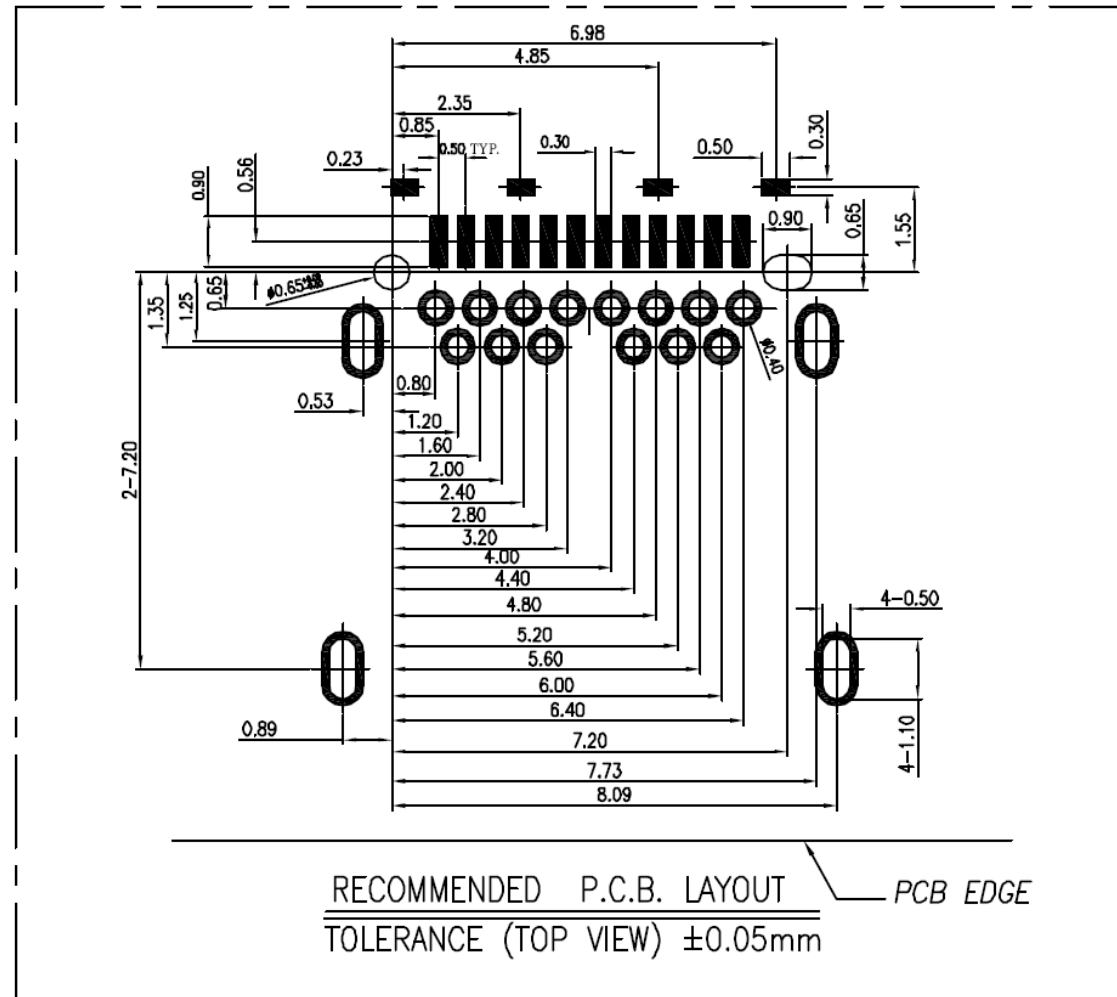
■ (option 2)





Type

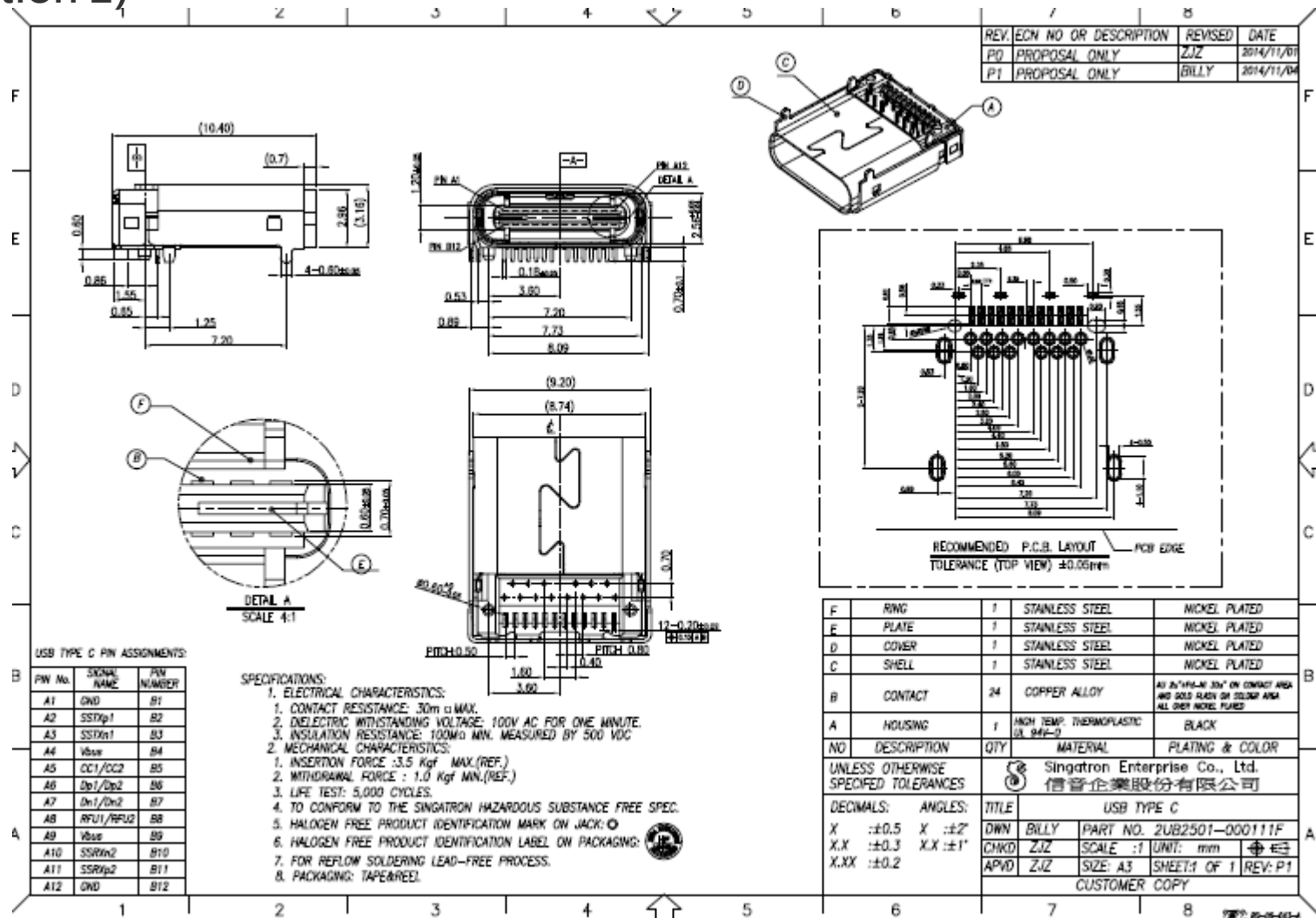
- (option 2) recommend layout

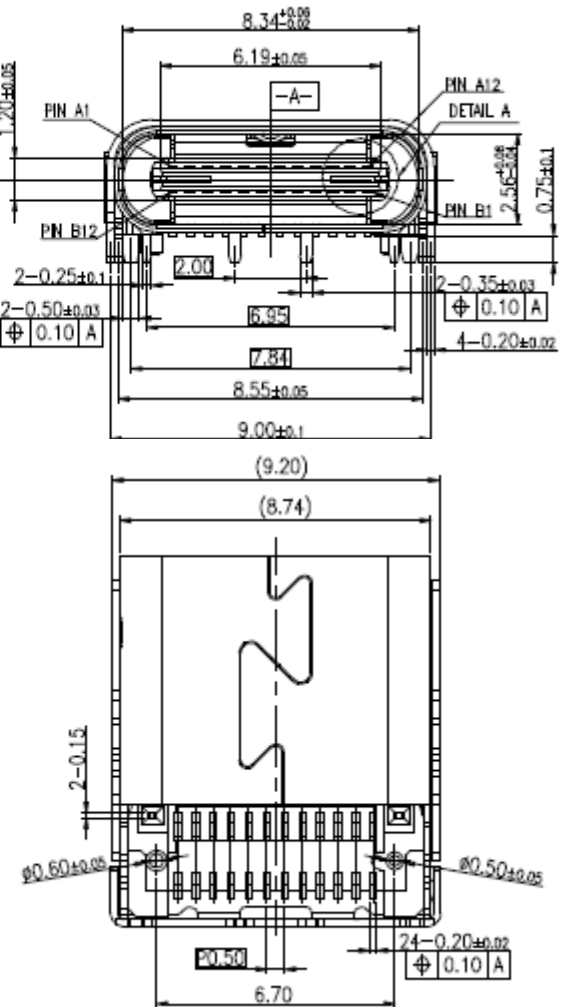
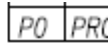




Compliant Connectors – Top Mount Hybrid Type

■ (option 2)

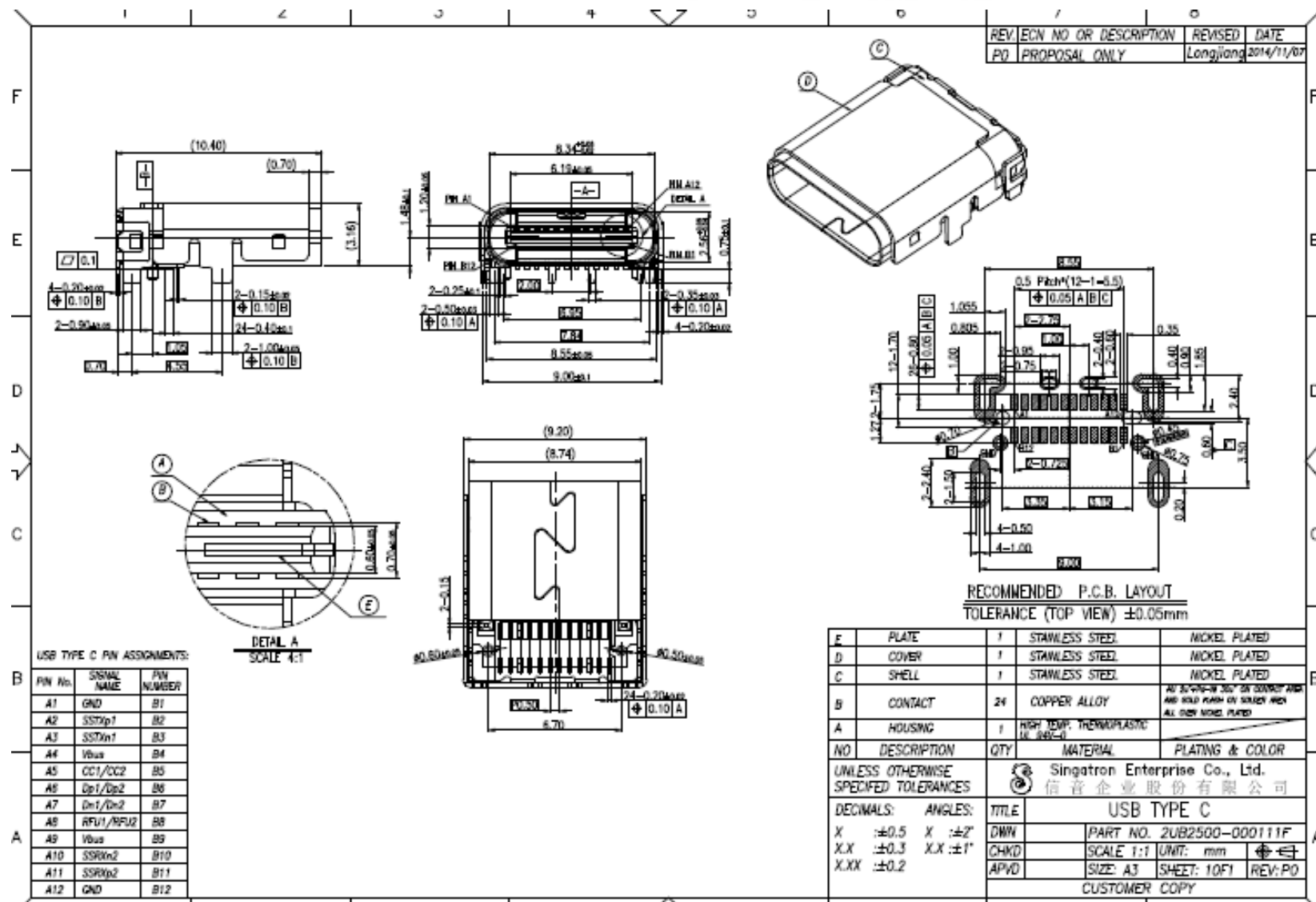




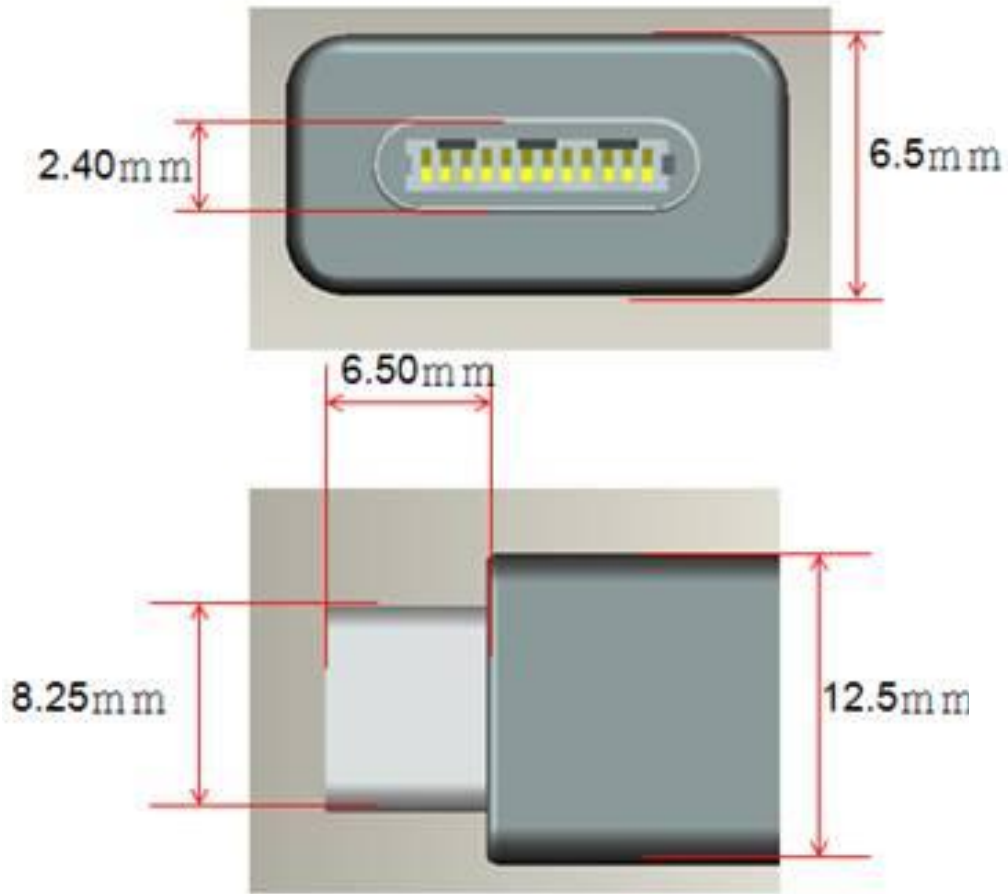


SMT Type

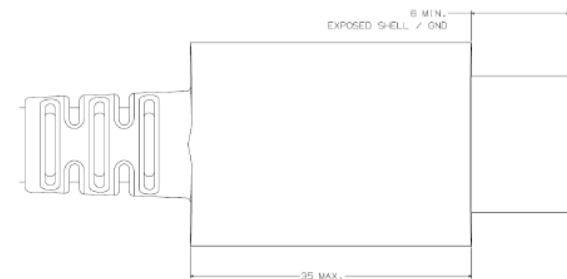
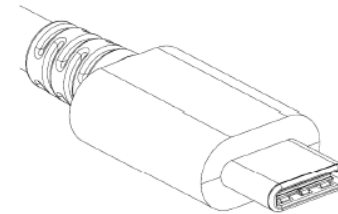


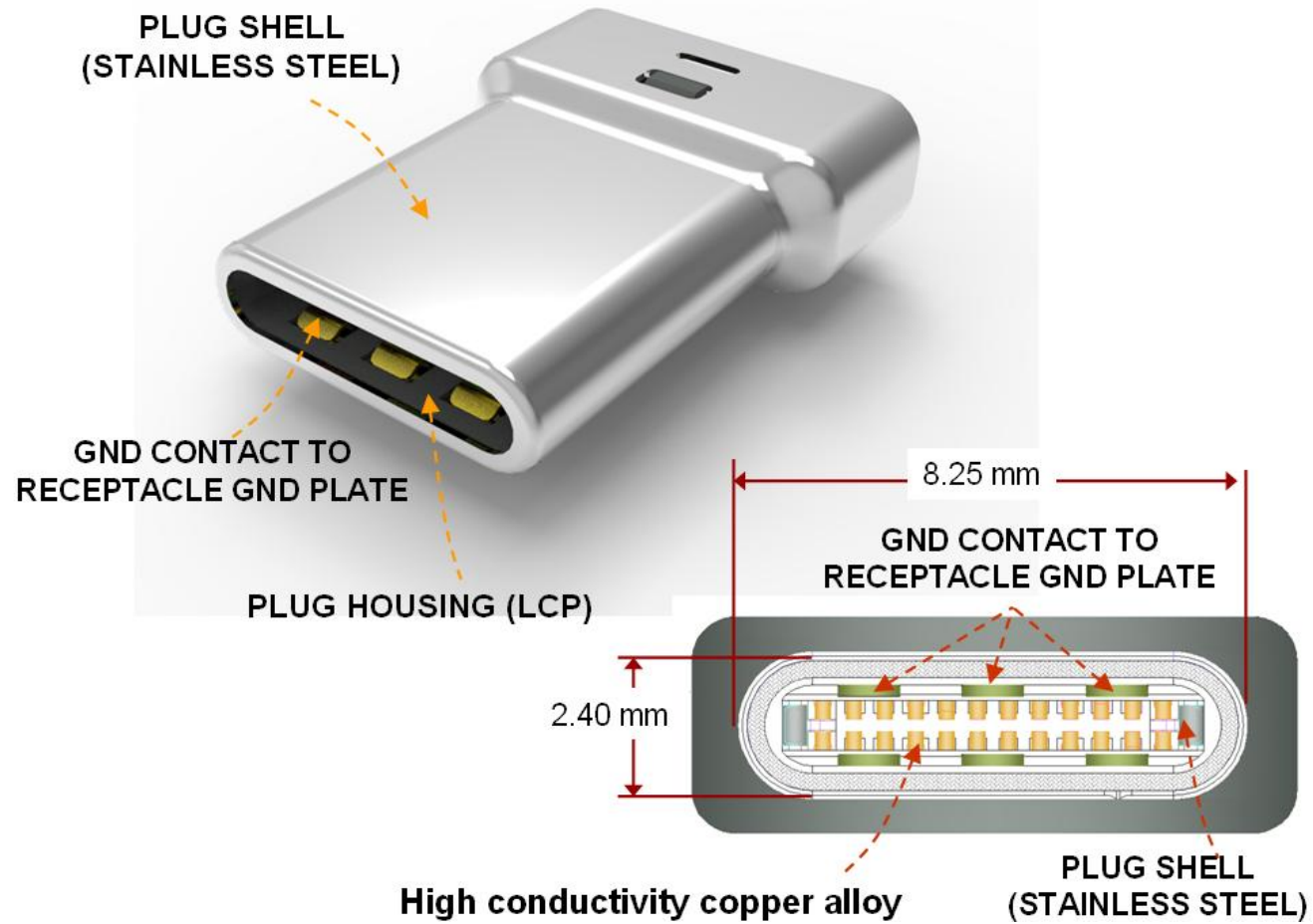


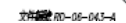
Compliant Connectors - Plug



PLUG 3D VIEW







Compliant Connectors – Cable Assembly

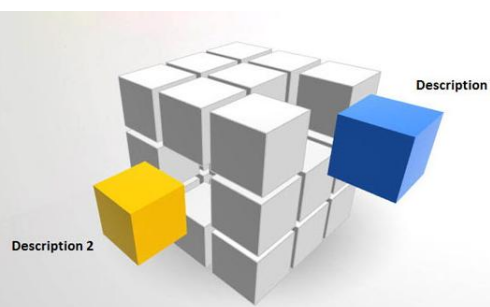


Figure 3-20 USB Full-Featured Type-C Standard Cable Assembly

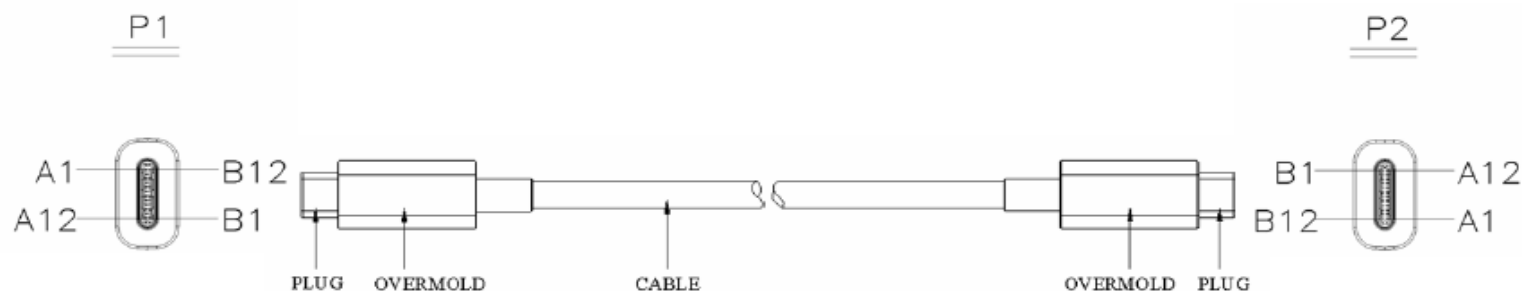


Figure 3-21 USB Type-C to USB 3.1 Standard-A Cable Assembly

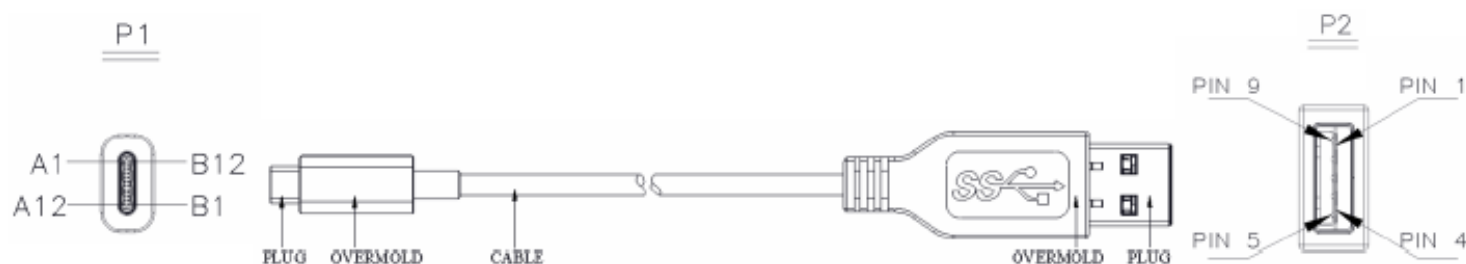
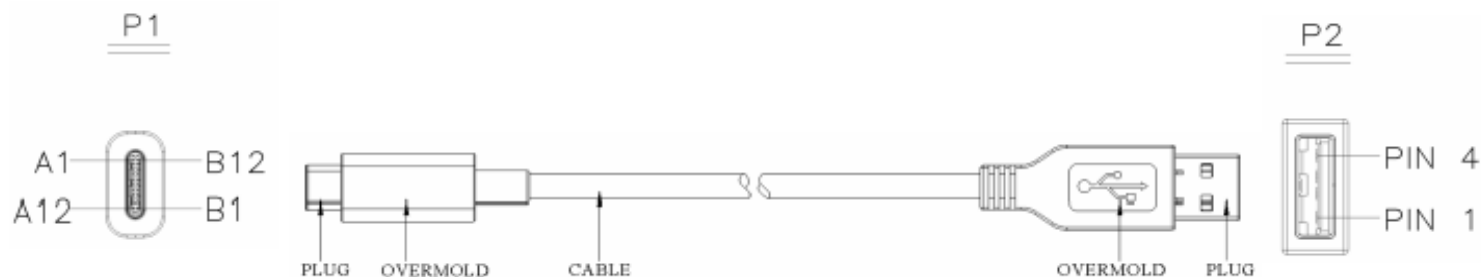
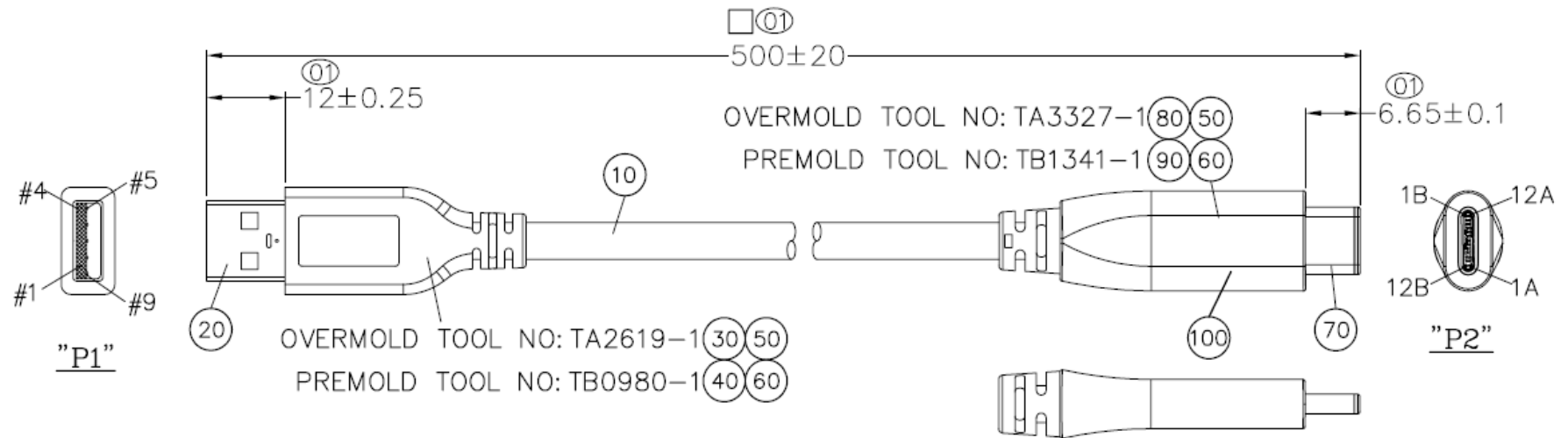
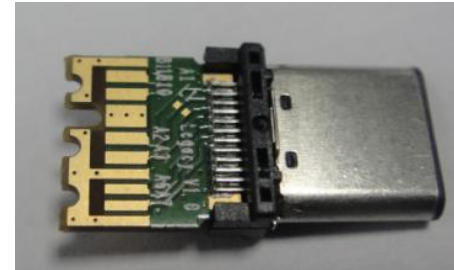


Figure 3-22 USB Type-C to USB 2.0 Standard-A Cable Assembly



Compliant Connectors – Cable Assembly

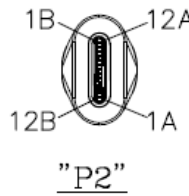
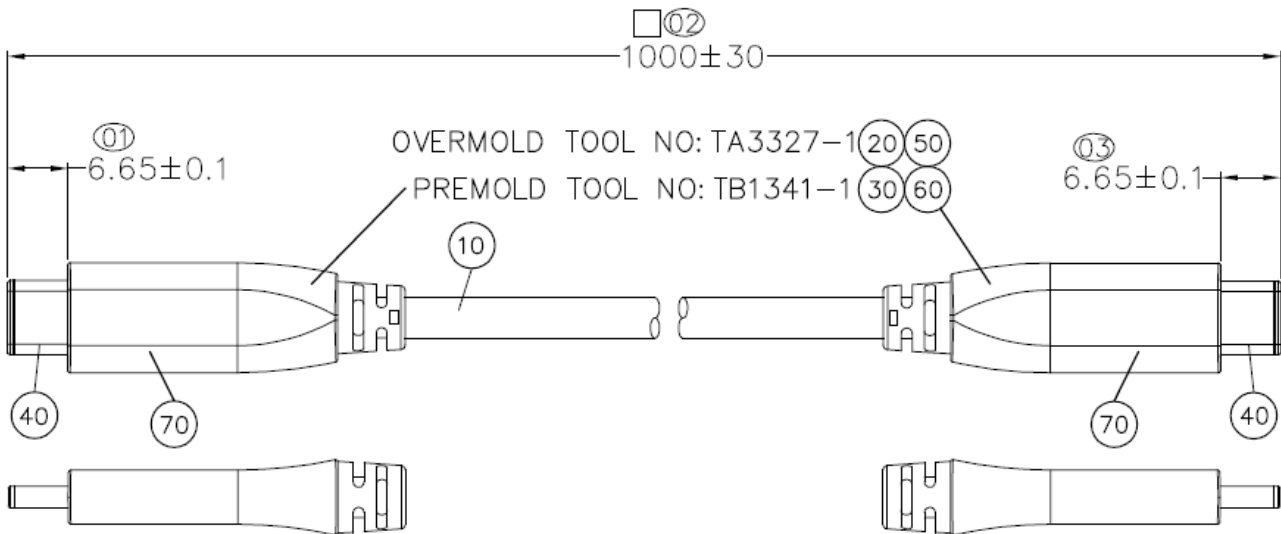
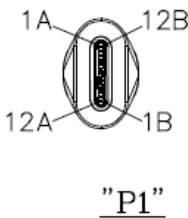
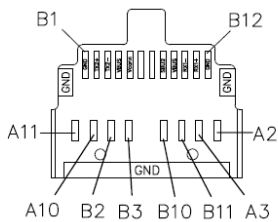
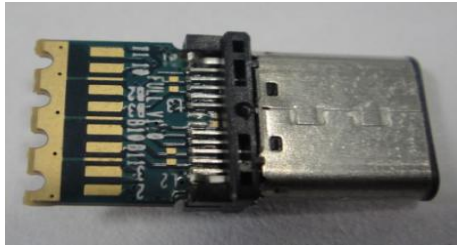
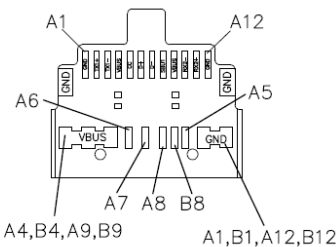
■ (A TO C)



Compliant Connectors – Cable Assembly



■ (C TO C)





Compliant Conn. ~Receptacle

1st Priority: Hybrid Top Mount

2nd Priority: Dual –Row SMT Top Mount

3rd Priority: Mid-Mount Hybrid

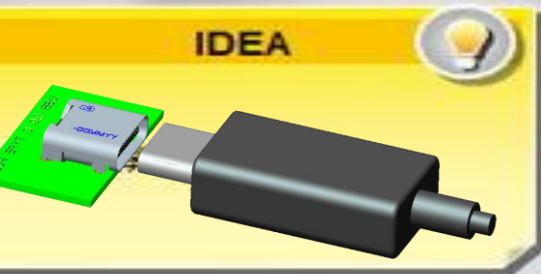
4th Priority: Mid-Mount Dual-Row SMT

5th Priority: Vertical Mount

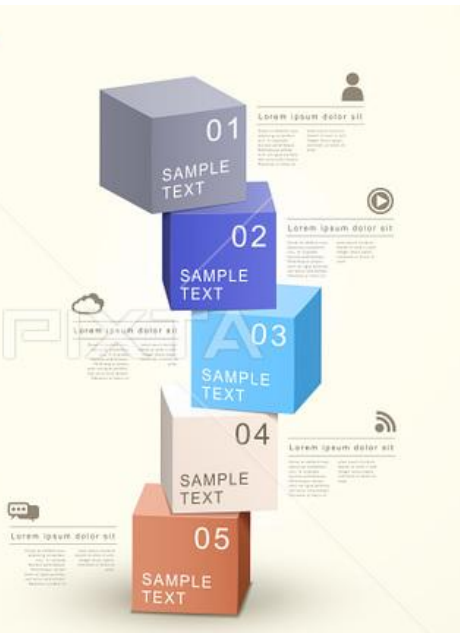
Compliant Conn. ~Plug

1st Priority: USB 3.1 Type

2nd Priority: USB 2.0 Type

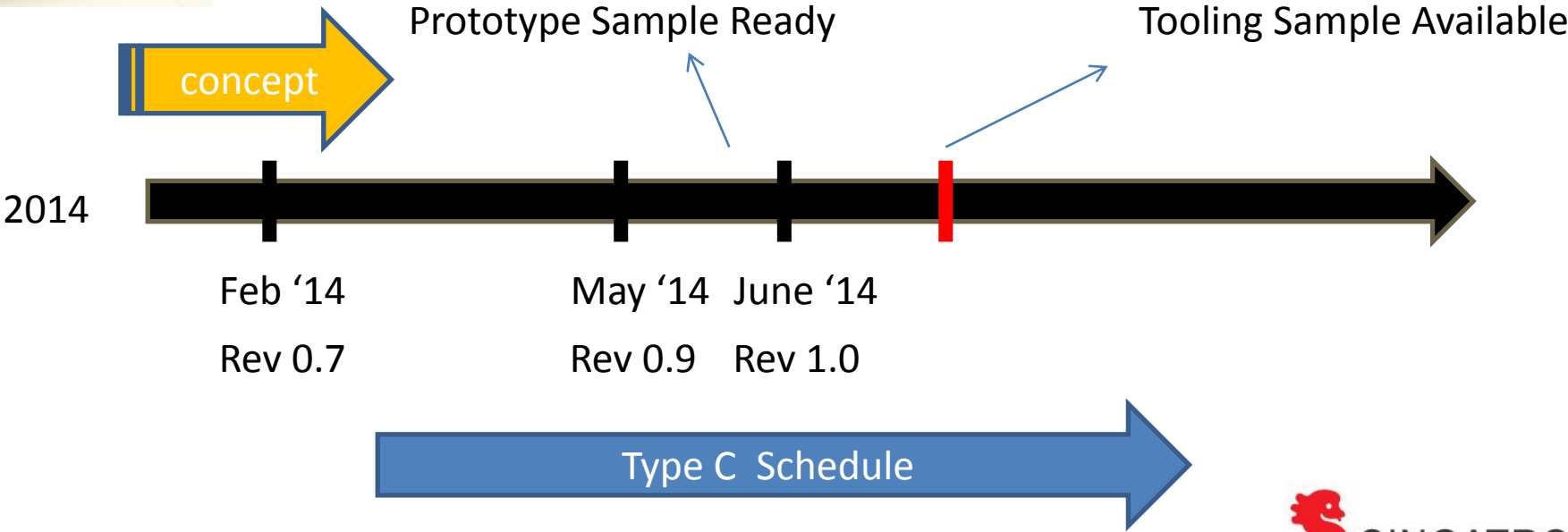


Development Schedule



USB Type C Development Schedule

- | | |
|--|-----------|
| 1. Spec Rev 0.7 for industry & Feedback | Feb 2014 |
| 2. Spec Rev 0.9 for industry & Feedback | May 2014 |
| 3. Singatron prototype sample development | June 2014 |
| 4. Singatron prototype validation finish | July 2014 |
| 5. Spec Rev1.0 Release | Aug 2014 |
| 6. Tooling sample available for the market | Oct. 2014 |



NOKIA

DESIGN

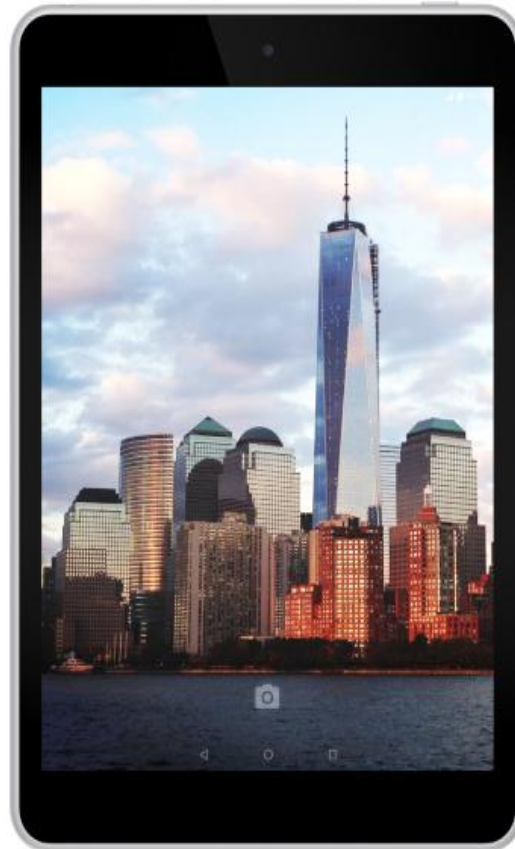
Z LAUNCHER

DETAILS

EN | CN

KEEP ME POSTED

200.7 MM



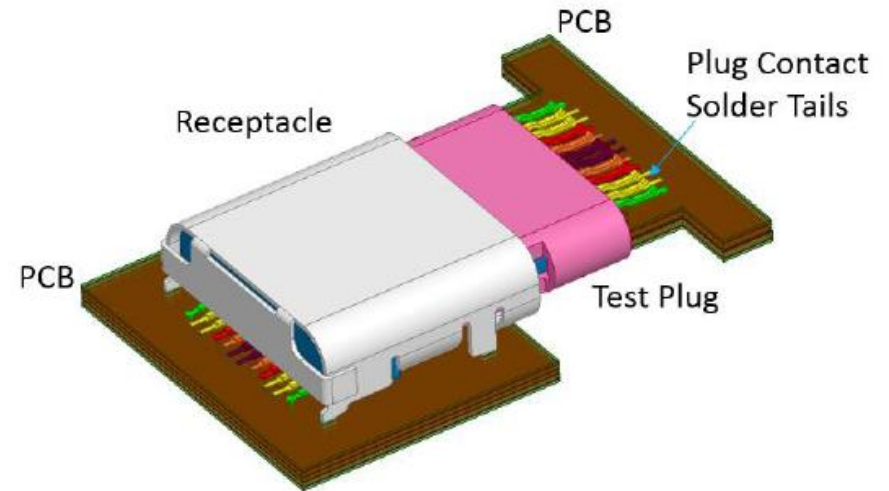
Every detail matters

From the zero air-gap display to its perfect balance, everything has been crafted for thinness and lightness.

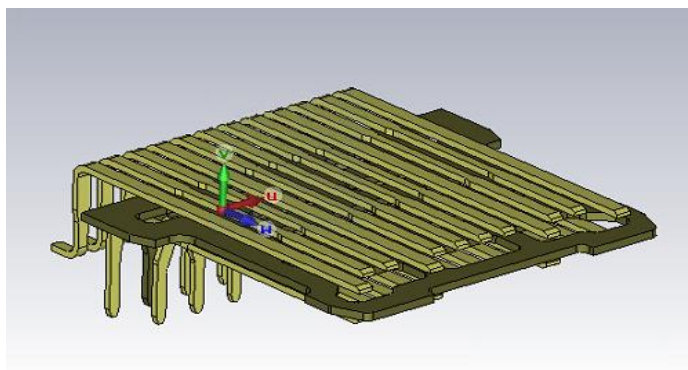
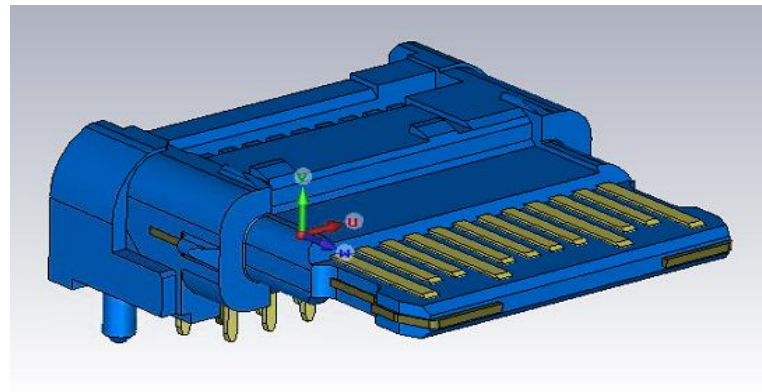
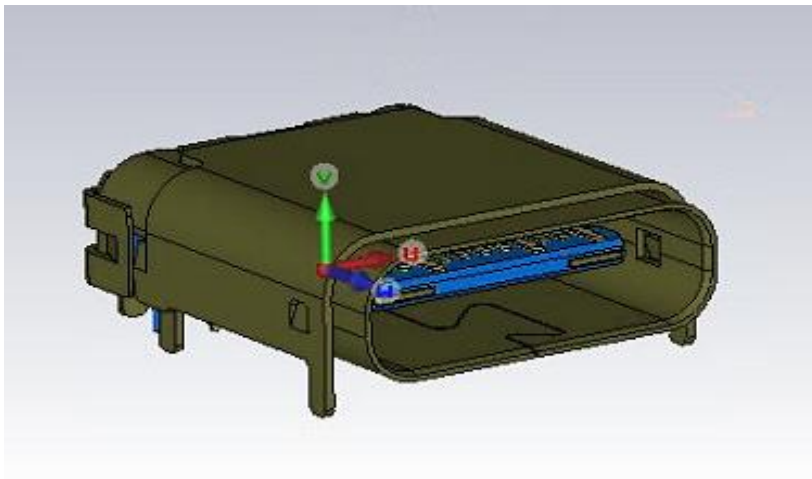


USB Type C Receptacle

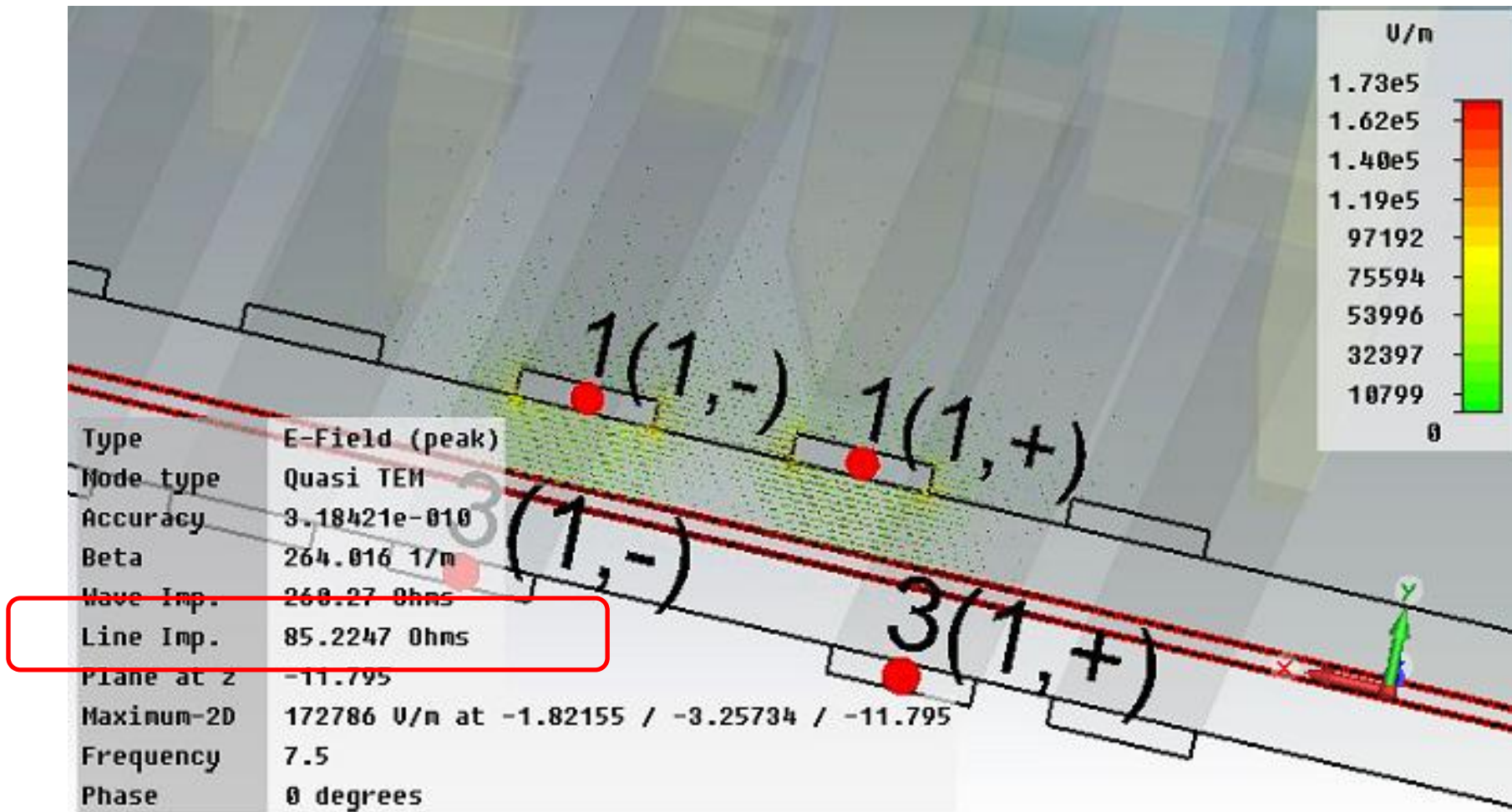
Simulation Analysis Report



Model Structure



PIN Assignment of Port 1



PIN Assignment

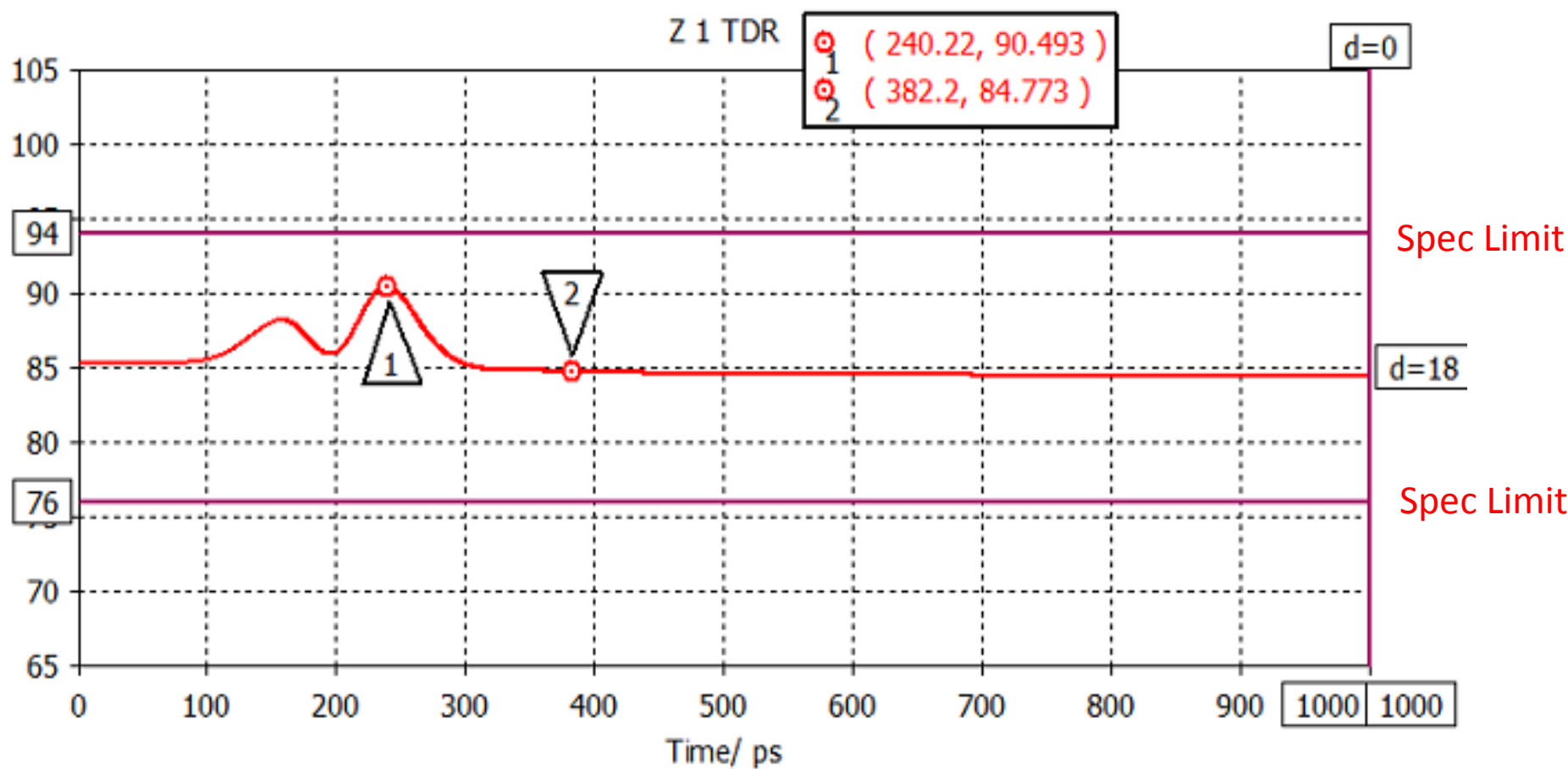


A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	A11	A12
GND	TX1+	TX1-	VBUS	CC1	D+	D-	RFU1	VBUS	RX2-	RX2+	GND
GND	RX1+	RX1-	VBUS	RFU2	D-	D+	CC2	VBUS	TX2-	TX2+	GND
B12	B11	B10	B9	B8	B7	B6	B5	B4	B3	B2	B1

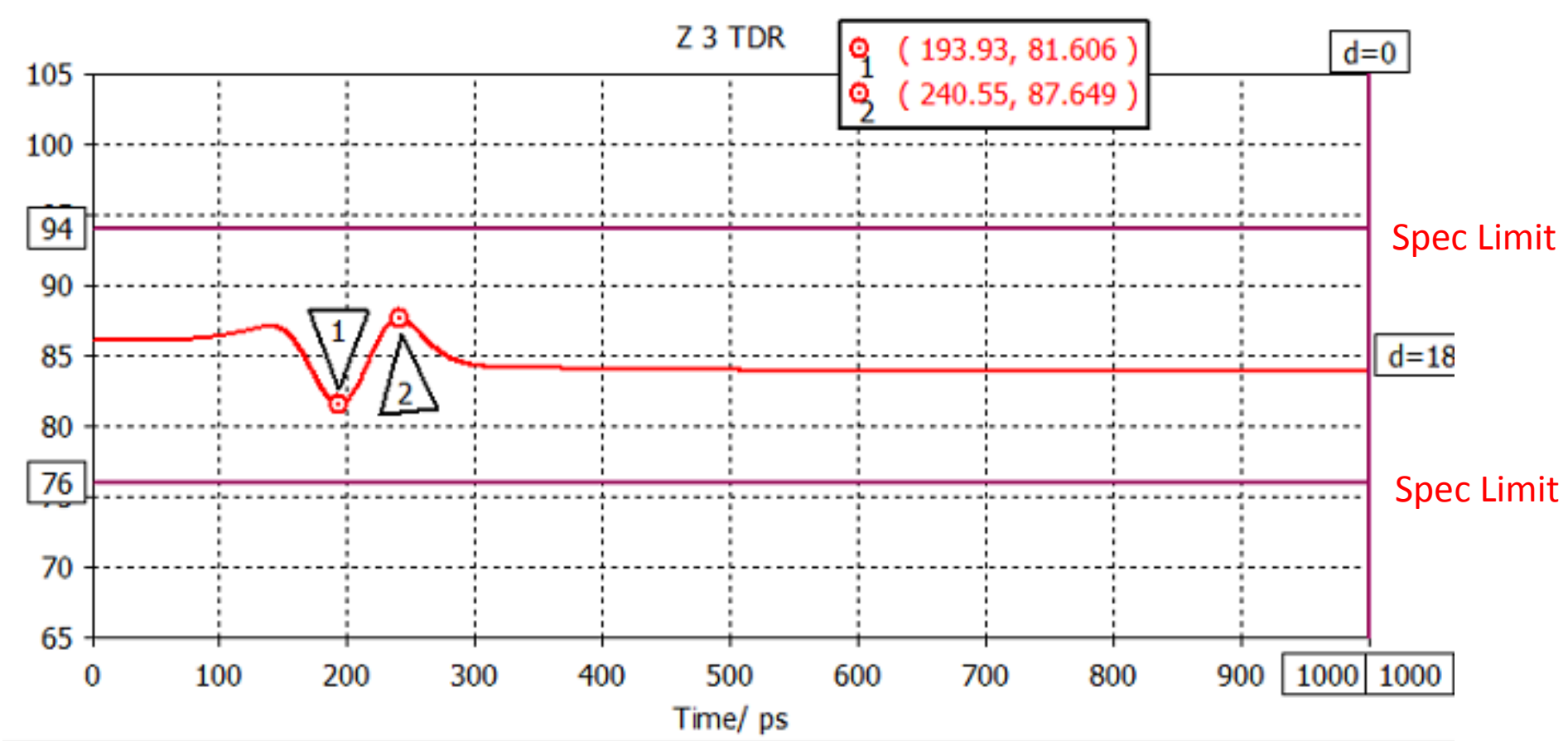
Summary Result

Parameter	Units	Conditions	Result	Remark
Differential Impedance	Ω	$85\Omega \pm 9\Omega$ ($94\Omega \sim 76\Omega$)	Pass	Reference P.6 /P.7
Differential Insertion Loss	dB	100M,-0.25 / 2.5G,-0.35 / 5.0G,-0.45 / 10G,-0.75 / 15G,-1.85	Pass	Reference P.8
Differential Return Loss	db	100M, -20 / 5.0G, -20 / 10G, -13 / 15 G, -6	Pass	Reference P.9
Differential NEXT & FEXT SS pairs	db	100M, -40 / 5.0G, -40 / 10G, -36 / 15G, -30	Pass	Reference P.10
Differential crosstalk / SS Pairs to D+/D-	db	100M, -40 / 5.0G, -40 / 7.5, -36	Pass	Reference P.11
Differential to Common-Mode conversion	db	100M, -30 / 6.0G, -30 / 10G, -25	Pass	Reference P.12

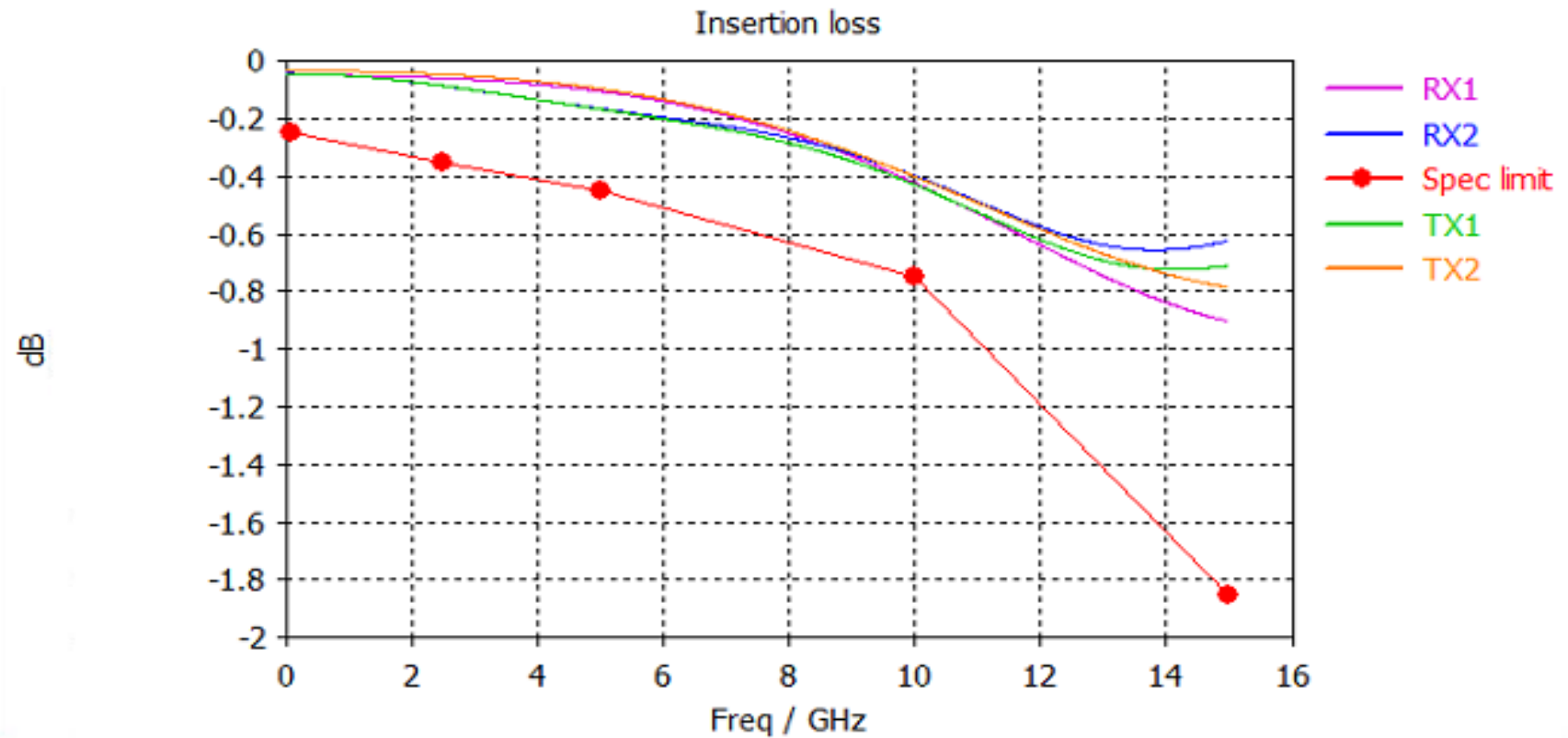
Differential Impedance TX1 Pairs



Differential Impedance RX1 Pairs

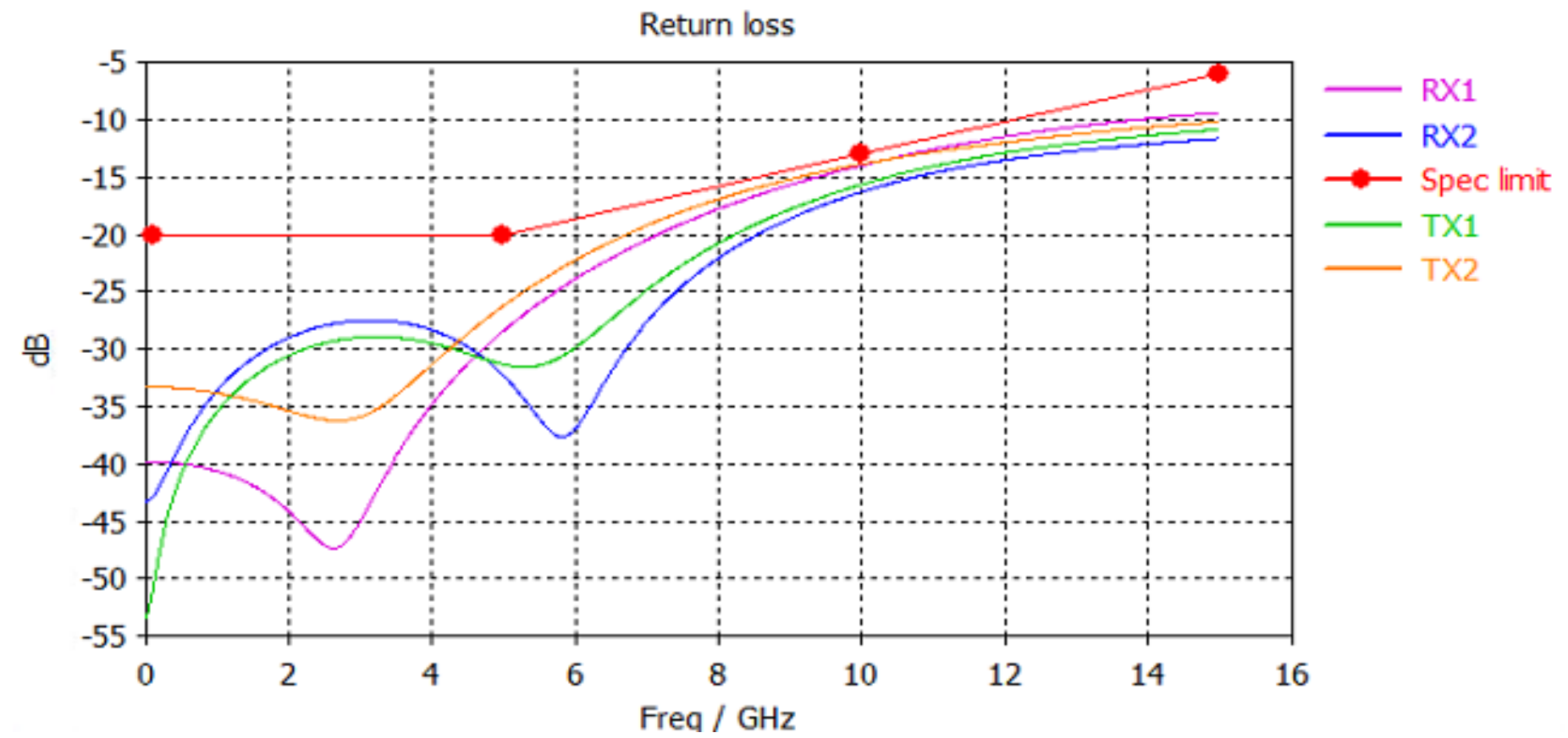


Differential Insertion Loss

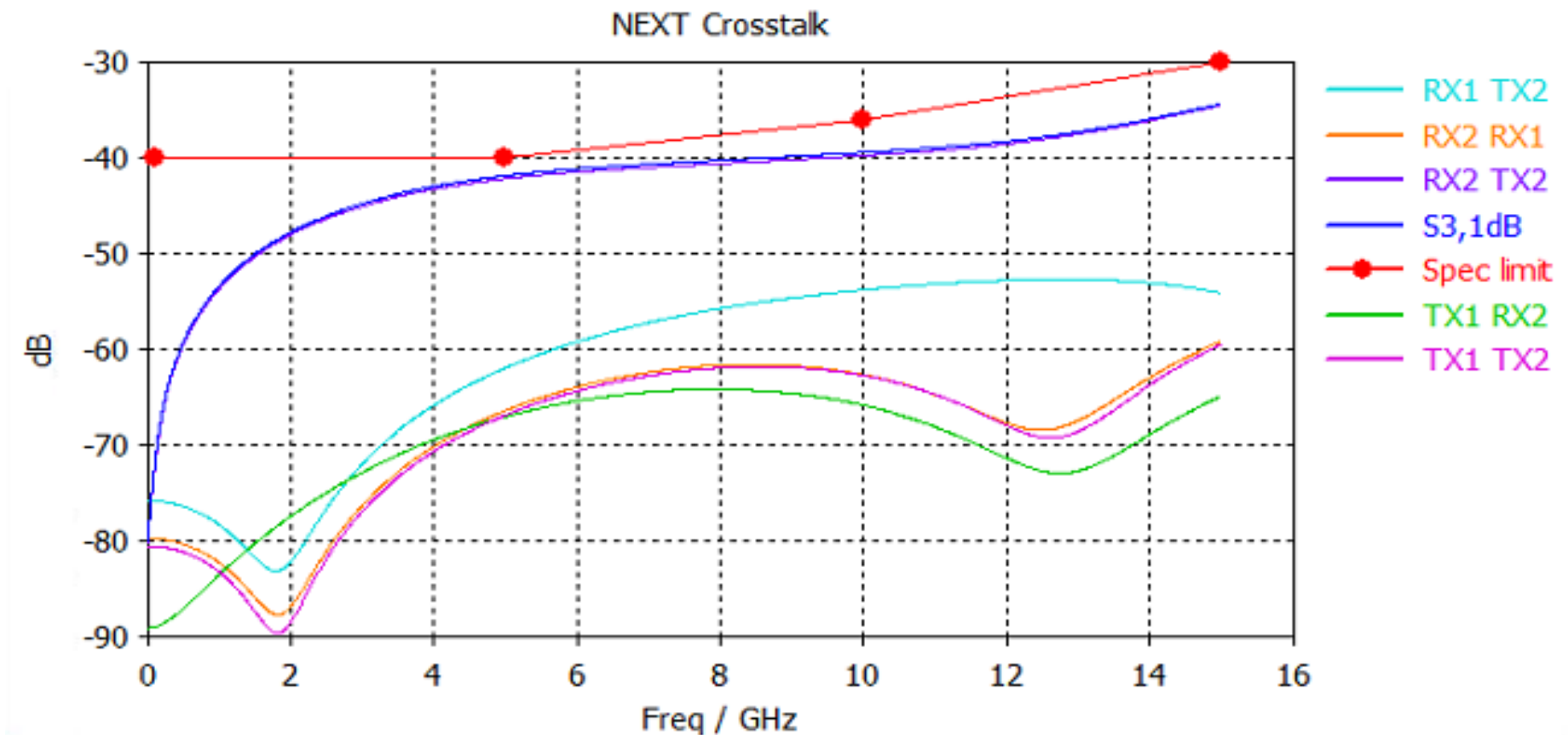




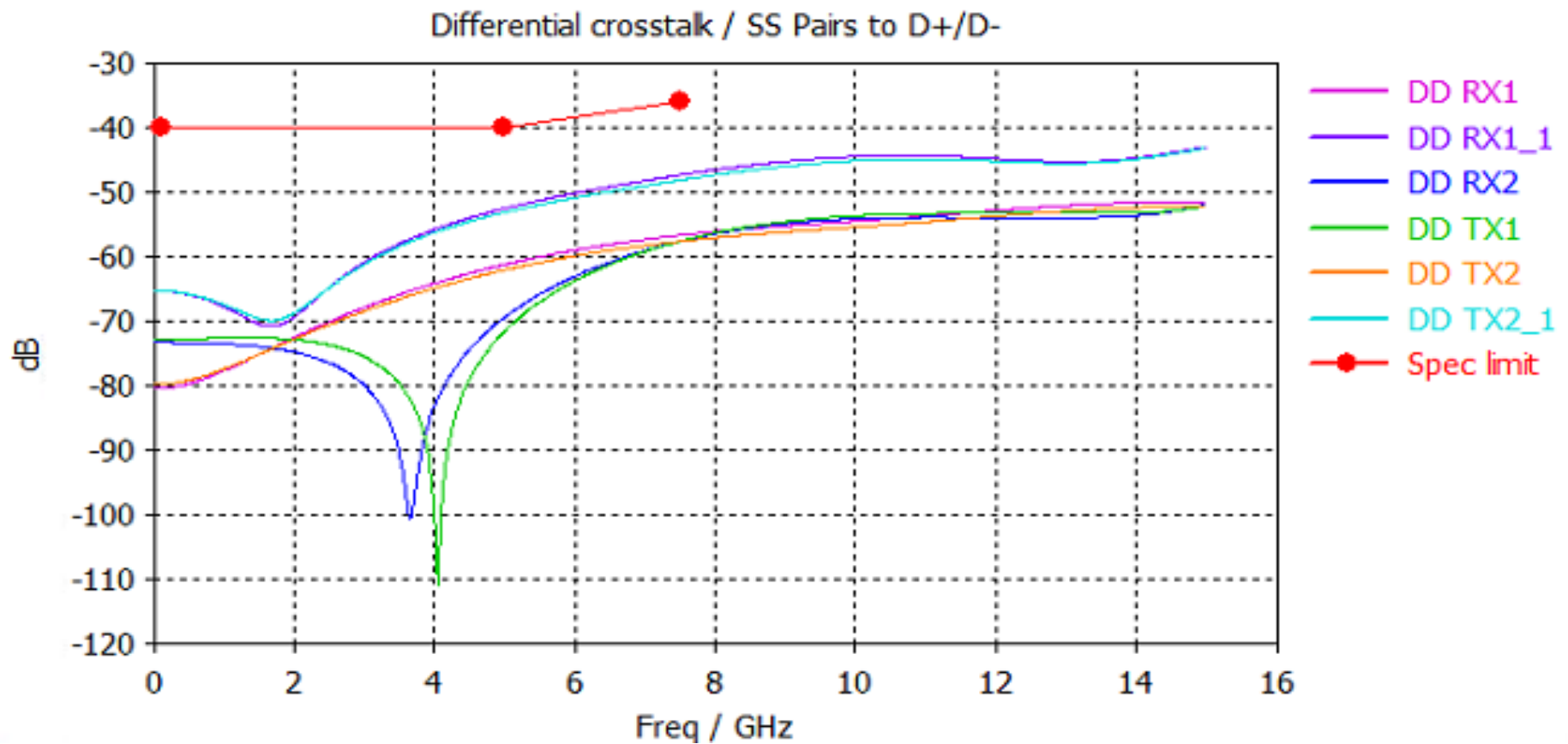
Differential Return Loss



Differential Nest & Fext SS Pairs

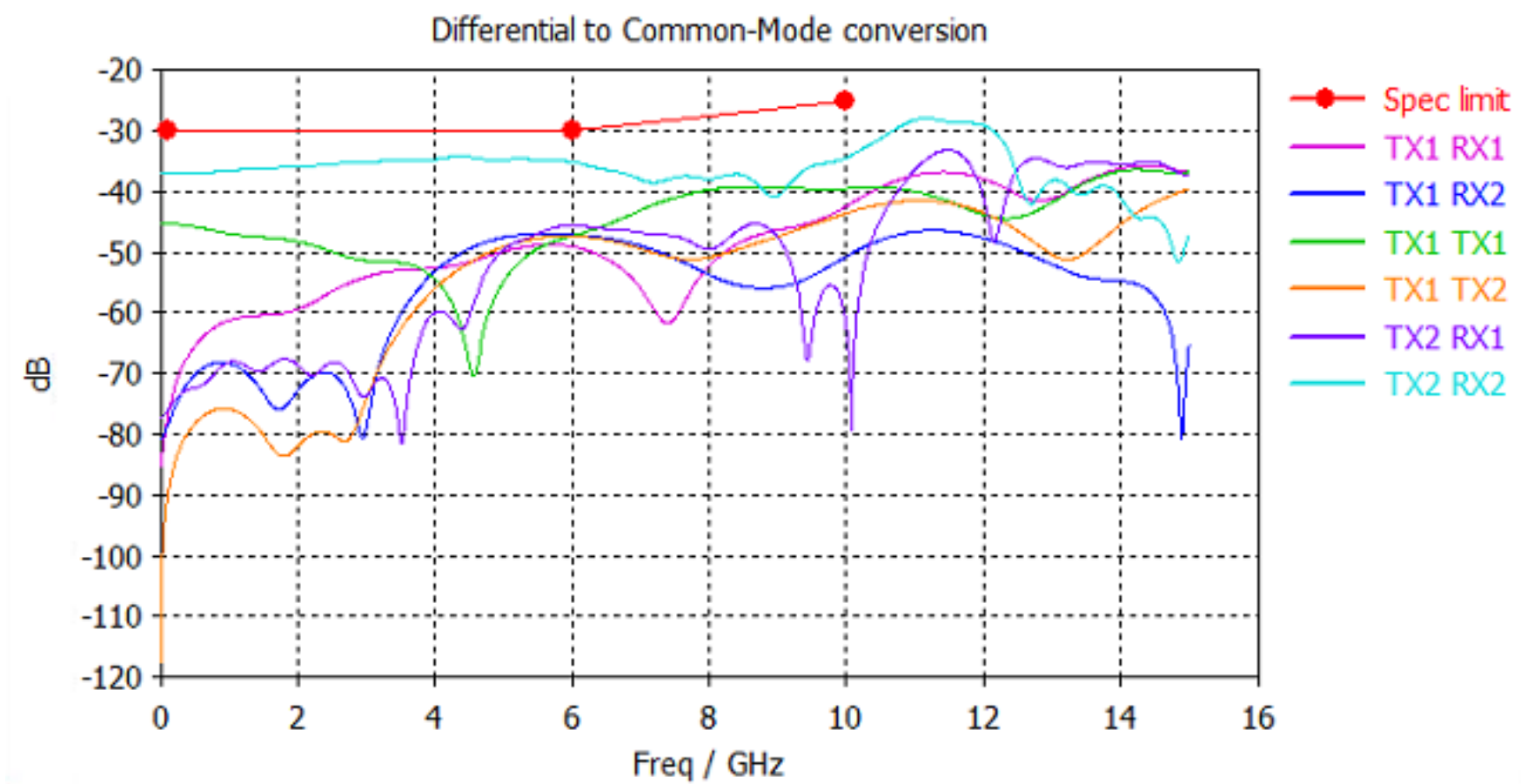


Differential Crosstalk / SS Pairs to D+/D-





Differential to Common-mode Conversion



報告完畢，謝謝！

