

## DIN EN 62680-1-3



ICS 35.200

Einsprüche bis 2017-05-10

**Entwurf**

**Schnittstellen des Universellen Seriellen Busses für Daten und Energie –  
Teil 1-3: Schnittstellen des Universellen Seriellen Busses –  
Gemeinsame Komponenten – Festlegung für USB-Typ-C-Kabel und  
-Steckverbinder  
(IEC 100/2587/CDV:2016);  
Englische Fassung FprEN 62680-1-3:2016**

Universal Serial Bus interfaces for data and power –  
Part 1-3: Universal Serial Bus interfaces –  
common components – Universal Serial Bus Type-C™ Cable and Connector Specification,  
Revision 1.1  
(IEC 100/2587/CDV:2016);  
English version FprEN 62680-1-3:2016

Interfaces de bus universel en série pour les données et l'alimentation électrique –  
Partie 1-3: Interfaces de bus universel en série –  
Composants communs – Spécification des câbles et connecteurs de type C™ de bus  
universel en série  
(IEC 100/2587/CDV:2016);  
Version anglaise FprEN 62680-1-3:2016

**Anwendungswarnvermerk**

Dieser Norm-Entwurf mit Erscheinungsdatum 2017-03-10 wird der Öffentlichkeit zur Prüfung und  
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Weil die beabsichtigte Norm von der vorliegenden Fassung abweichen kann, ist die Anwendung dieses  
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Die Empfänger dieses Norm-Entwurfs werden gebeten, mit ihren Kommentaren jegliche relevanten  
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Gesamtumfang 203 Seiten

DKE Deutsche Kommission Elektrotechnik Elektronik Informationstechnik in DIN und VDE

## Nationales Vorwort

Die Englische Fassung des europäischen Dokuments FprEN 62680-1-3:2016 „Schnittstellen des Universellen Seriellen Busses für Daten und Energie – Teil 1-3: Schnittstellen des Universellen Seriellen Busses – Gemeinsame Komponenten – Festlegung für USB-Typ-C-Kabel und -Steckverbinder“ (Entwurf in der Umfrage) ist unverändert in diesen Norm-Entwurf übernommen worden.

Die Internationale Elektrotechnische Kommission (IEC) und das Europäische Komitee für Elektrotechnische Normung (CENELEC) haben vereinbart, dass ein auf IEC-Ebene erarbeiteter Entwurf für eine Internationale Norm zeitgleich (parallel) bei IEC und CENELEC zur Umfrage (CDV-Stadium) und Abstimmung als FDIS (en: Final Draft International Standard) bzw. Schluss-Entwurf für eine Europäische Norm gestellt wird, um eine Beschleunigung und Straffung der Normungsarbeit zu erreichen. Dem entsprechend ist das internationale Dokument IEC 100/2587/CDV:2016 „Universal Serial Bus interfaces for data and power – Part 1-3: Universal Serial Bus interfaces – common components – Universal Serial Bus Type-C™ Cable and Connector Specification, Revision 1.1“ unverändert in den Entwurf FprEN 62680-1-3:2016 übernommen worden.

Das internationale Dokument wurde vom TC 100 „Audio, video and multimedia systems and equipment“ der Internationalen Elektrotechnischen Kommission (IEC) erarbeitet.

Bei der Abstimmung zu dem Europäischen Schluss-Entwurf bei CENELEC und dem Internationalen Schluss-Entwurf bei IEC [Final Draft International Standard (FDIS)] sind jeweils nur „JA/NEIN“-Entscheidungen möglich, wobei „NEIN“-Entscheidungen fundiert begründet werden müssen. Dokumente, die bei CENELEC als Europäische Norm angenommen und ratifiziert werden, sind unverändert als Deutsche Normen zu übernehmen.

Für dieses Dokument ist das nationale Arbeitsgremium K 742 „Audio-, Video- und Multimediasysteme, -geräte und -komponenten“ der DKE Deutsche Kommission Elektrotechnik Elektronik Informationstechnik in DIN und VDE ([www.dke.de](http://www.dke.de)) zuständig.

Das Präsidium des DIN hat mit Präsidialbeschluss 1/2004 festgelegt, dass DIN-Normen, deren Inhalt sich auf internationale Arbeitsergebnisse der Informationsverarbeitung gründet, unter bestimmten Bedingungen allein in englischer Sprache veröffentlicht werden dürfen. Diese Bedingungen sind für die vorliegende Norm erfüllt.

Da sich die Benutzer der vorliegenden Norm der englischen Sprache als Fachsprache bedienen, wird die Englische Fassung der FprEN 62680-1-3 veröffentlicht. Zu deren Abschnitt 1.2, der den Anwendungsbereich festlegt, und Abschnitt 1.5, der die Abkürzungen und Begriffe festlegt, wurde eine Übersetzung angefertigt und als informativer Nationaler Anhang NA der vorliegenden Norm hinzugefügt. Für die meisten der verwendeten Begriffe existieren keine gebräuchlichen deutschen Benennungen, da sich die deutschen Anwender in der Regel ebenfalls der englischen Benennungen bedienen. Diese Norm steht nicht in unmittelbarem Zusammenhang mit Rechtsvorschriften und ist nicht als Sicherheitsnorm anzusehen.

Es ist vorgesehen, auch bei der entsprechenden zukünftigen Deutschen Norm auf die deutsche Sprachfassung zu verzichten und diese in der englischsprachigen Fassung zu veröffentlichen.

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Das Original-Dokument enthält Bilder in Farbe, die in der Papierversion in einer Graustufen-Darstellung wiedergegeben werden. Elektronische Versionen dieses Dokuments enthalten die Bilder in der originalen Farbdarstellung.

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## Nationaler Anhang NA (informativ)

### Auszugsweise Übersetzung <sup>N1)</sup>

Die deutschen Übersetzungen haben Empfehlungscharakter und können nur die ungefähre Begrifflichkeit in Deutsch wiedergeben. Unter Experten wird empfohlen, ausschließlich die englischen Fachbegriffe zu verwenden, um die Gefahr von Missverständnissen zu reduzieren.

## 1 Einleitung

Mit anhaltendem Erfolg der USB-Schnittstelle ist eine Anpassung der USB-Technologie erforderlich, um neuere Plattformen und Geräte unterstützen zu können, da der Trend zu immer kleineren, dünneren und leichteren Bauformen geht. Viele dieser neueren Plattformen und Geräte erreichen gerade einen Punkt, an dem die bestehenden USB-Buchsen und -Stecker Innovation behindern, insbesondere angesichts der relativ großen Abmessungen und internen Volumenbeschränkungen von USB-Typ-A- und Typ-B-Steckverbindern. Da sich die Verwendungsmodelle für die Plattformen zudem weiterentwickelt haben, sind auch die Anforderungen an die Gebrauchstauglichkeit und Stabilität gestiegen; für einige dieser Anforderungen wurden die bestehenden USB-Steckverbinder ursprünglich jedoch nicht entwickelt. Ziel dieser Spezifikation ist die Aufstellung eines neuen funktionalen Systems von USB-Steckverbindern, das den neuen Anforderungen der Plattformen und Geräte gerecht wird und dabei alle funktionellen Vorteile von USB erhält, welche die Basis von USB als beliebtestem Verbindungstyp zwischen Endgeräten bilden.

### 1.2 Anwendungsbereich

Diese Spezifikation ist als Ergänzung zu den bereits vorhandenen Spezifikationen USB 2.0, USB 3.1 und USB Power Delivery gedacht. Hier sind nur die Elemente zur Implementierung und Unterstützung von USB-Typ-C-Buchsen, -Steckern und -Kabeln beschrieben.

Normative Angaben dienen dazu, die Interoperabilität der entsprechend dieser Spezifikation konstruierten Komponenten zu ermöglichen. Informative Angaben, soweit vorhanden, illustrieren ggf. mögliche Umsetzungen der Konstruktion.

### 1.5 Begriffe und Abkürzungen

| Begriff                                                      | Beschreibung                                                                                                                                                                                                                                                        |
|--------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Zubehörmodus (en: Accessory Mode)                            | eine Rekonfiguration des Steckverbinders je nach Vorliegen von Ra bzw. Ra oder Rd bzw. Rd an CC1 bzw. CC2                                                                                                                                                           |
| aktives Kabel (en: Active Cable)                             | ein elektronisch markiertes Kabel mit Zusatzelektronik zur Aufbereitung der Signale im Datenpfad                                                                                                                                                                    |
| Alternativmodus (en: Alternate Mode)                         | vom Hersteller oder einer Normungsorganisation festgelegte Betriebsart, die mit einer vom USB-IF vergebenen SVID verbunden ist. Beginn und Ende des Alternativmodus werden über strukturierte VDM-Befehle (Enter Mode und Exit Mode) gemäß <i>USB-PD</i> gesteuert. |
| Audioadapter-Zubehörmodus (en: Audio Adapter Accessory Mode) | Der Audioadapter-Zubehörmodus ist durch das Vorliegen von Ra bzw. Ra an CC1 bzw. CC2 definiert. Siehe A.                                                                                                                                                            |
| BFSK                                                         | für die USB-PD-Kommunikation über Vbus verwendete binäre Frequenzumtastung (en: Binary Frequency Shift Keying)                                                                                                                                                      |
| BMC                                                          | für die <i>USB-PD</i> -Kommunikation über die CC-Leitung verwendete Biphas-Mark-Codierung (en: Biphas Mark Coding)                                                                                                                                                  |

<sup>N1)</sup> Nationale Fußnote: Die Nummerierung aus 100/2587/CDV:2016-01-02 wurde beibehalten.

| Begriff                                                         | Beschreibung                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|-----------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| unverlierbares Kabel (en: Captive Cable)                        | ein Kabel, das an einem Ende mit einem USB-Typ-C-Stecker abgeschlossen ist und am anderen Ende über eine herstellerspezifische Anschlussmöglichkeit (festverdrahtet oder herstellerspezifisch ablösbar) verfügt                                                                                                                                                                                                                                                                                                                                                                                                                       |
| CC                                                              | Konfigurationskanal (en: Configuration Channel) zur Auffindung, Konfiguration und Verwaltung von Verbindungen über ein USB-Typ-C-Kabel                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| Debug-Zubehörmodus (en: Debug Accessory Mode)                   | Der Debug-Zubehörmodus ist durch das Vorliegen von Rd bzw. Rd an CC1 bzw. CC2 definiert. Siehe <b>Fehler! Verweisquelle konnte nicht gefunden werden..</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| Standard-Vbus                                                   | in den Spezifikationen <i>USB 2.0</i> und <i>USB 3.1</i> festgelegte Vbus-Spannung. Anmerkung: 5 V hat, soweit verwendet, dieselbe Bedeutung.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| DFP                                                             | abwärtsgerichteter Anschluss (en: Downstream Facing Port), insbesondere in Verbindung mit dem Datenstrom einer USB-Verbindung. Üblicherweise die Anschlüsse an einem Host oder Hub, an welche Geräte angeschlossen werden. Im Anfangszustand die DFP-Quellen Vbus und Vconn, unterstützt auch Daten. Ein nur zum Aufladen dienender DFP-Anschluss belegt nur Vbus.                                                                                                                                                                                                                                                                    |
| Direktanschluss (en: Direct Connect)                            | Der DFP des Host ist direkt – ohne zwischengeschalteten USB-Hub – an den UFP des Geräts angeschlossen, entweder mit oder ohne Kabel (z. B. bei einem USB-Stick).                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| DRP                                                             | Das Akronym DRP wird in dieser Spezifikation für einen USB-Anschluss benutzt, der sowohl als Quelle als auch als Empfänger arbeiten kann. Die Funktion, die der Anschluss bietet, kann entweder auf die Quellen- oder Empfängerfunktion festgelegt sein oder zwischen den beiden Anschlusszuständen wechseln. Wenn der Anschluss anfänglich als Quelle arbeitet, übernimmt er auch die Funktion eines DFP; arbeitet er als Empfänger, übernimmt der Anschluss auch die Funktion eines UFP. Außerdem kann die Funktion des Anschlusses dynamisch geändert werden, um entweder die Stromversorgungs- oder die Datenfunktion umzukehren. |
| DR_Swap                                                         | Data Role Swap gemäß <i>USB-PD</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| elektronisch markiertes Kabel (en: Electronically Marked Cable) | ein USB-Typ-C-Kabel, das <i>USB-PD</i> zum Anzeigen der Kabeleigenschaften verwendet                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| Initiator                                                       | der Anschluss, der eine Vendor Defined Message initiiert. Dies ist unabhängig von der PD-Funktion des Anschlusses (d. h. Stromlieferant, Verbraucher, Stromlieferant/Verbraucher oder Verbraucher/Stromlieferant). In den meisten Fällen ist der Initiator ein Host.                                                                                                                                                                                                                                                                                                                                                                  |
| passives Kabel (en: Passive Cable)                              | ein Kabel ohne Elektronik zur Aufbereitung der Signale im Datenpfad. Ein passives Kabel darf, braucht aber nicht elektronisch markiert zu sein.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| Anschlusspartner (en: Port Partner)                             | bezieht sich auf den Anschluss (Gerät oder Host), mit dem ein Anschluss verbunden ist                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| gespeistes Kabel (en: Powered Cable)                            | ein Kabel mit in den Stecker integrierter Elektronik, das Vconn benötigt, was durch Vorliegen von Ra zwischen Vconn-Pin und Masse angezeigt wird                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| PR_Swap                                                         | Power Role Swap gemäß <i>USB-PD</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| Responder                                                       | der Anschluss, der auf den Initiator einer Vendor Defined Message (VDM) reagiert. Dies ist unabhängig von der PD-Funktion des Anschlusses (d. h. Stromlieferant, Verbraucher, Stromlieferant/Verbraucher oder Verbraucher/Stromlieferant). In den meisten Fällen ist der Responder ein Gerät.                                                                                                                                                                                                                                                                                                                                         |
| SBU                                                             | Seitenbandnutzung (en: Sideband Use).                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| SID                                                             | Eine Norm-ID (Standard ID, SID) ist ein vom USB-IF vergebener eindeutiger 16-Bit-Wert zur Kennzeichnung einer Industrienorm.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| Empfänger (en: Sink)                                            | Anschluss, der Rd auf CC aufschaltet und Strom von Vbus bezieht, in der Regel ein Gerät                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| Quelle                                                          | Anschluss, der Rp auf CC aufschaltet und Strom über Vbus liefert, in der Regel ein Host oder ein Hub-DFP                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |

| Begriff                                                            | Beschreibung                                                                                                                                                                                                                                                                                      |
|--------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| SVID                                                               | allgemeine Verweisung auf eine SID oder VID. Wird von strukturierten VDMs gemäß <i>USB-PD</i> bei der Anforderung von SIDs oder VIDs von einem Gerät verwendet.                                                                                                                                   |
| Typ A                                                              | eine allgemeine Verweisung auf alle USB-A-Stecker und -Buchsen                                                                                                                                                                                                                                    |
| Typ B                                                              | eine allgemeine Verweisung auf alle USB-B-Stecker und -Buchsen                                                                                                                                                                                                                                    |
| USB-Typ-C-Stecker                                                  | ein USB-Stecker, der den mechanischen und elektrischen Anforderungen dieser Spezifikation entspricht                                                                                                                                                                                              |
| Typ-C-Anschluss                                                    | ein zu einer USB-C-Buchse gehöriger USB-Anschluss. Dies beinhaltet die USB-Signalisierung, die CC-Logik, Multiplexer und sonstige zugehörige Logik.                                                                                                                                               |
| Typ-C-Buchse                                                       | eine USB-Buchse, die den mechanischen und elektrischen Anforderungen dieser Spezifikation entspricht                                                                                                                                                                                              |
| UFP                                                                | aufwärtsgerichteter Anschluss (en: Upstream Facing Port), insbesondere in Verbindung mit dem Datenstrom einer USB-Verbindung. Der Anschluss an einem Gerät oder Hub, der mit einem Host oder dem DFP eines Hubs verbunden wird. Im Anfangszustand der UFP-Empfänger Vbus, unterstützt auch Daten. |
| USB-2.0-Typ-C-Kabel                                                | USB-Typ-C-auf-Typ-C-Kabel, das nur den Datenbetrieb gemäß USB 2.0 unterstützt. Dieses Kabel beinhaltet keine USB-3.1- oder SBU-Leitungen.                                                                                                                                                         |
| USB-2.0-Typ-C-Stecker                                              | ein für die Implementierung des USB-2.0-Typ-C-Kabels ausgelegter USB-Typ-C-Stecker                                                                                                                                                                                                                |
| vollwertiges USB-Typ-C-Kabel (en: USB Full-Featured Type-C Cable)  | USB-Typ-C-auf-Typ-C-Kabel, das den Datenbetrieb gemäß USB 2.0 und USB 3.1 unterstützt. Dieses Kabel verfügt über SBU-Leitungen.                                                                                                                                                                   |
| vollwertiger USB-Typ-C-Stecker (en: USB Full-Featured Type-C Plug) | ein für die Implementierung des vollwertigen USB-Typ-C-Kabels ausgelegter USB-Typ-C-Stecker                                                                                                                                                                                                       |
| Vconn-gespeistes Zubehör (en: Vconn-powered accessory)             | ein Zubehörteil, das zum Betrieb im Alternativmodus von Vconn gespeist wird                                                                                                                                                                                                                       |
| Vconn_Swap                                                         | Vconn Swap gemäß <i>USB-PD</i>                                                                                                                                                                                                                                                                    |
| VDM                                                                | Vendor Defined Message gemäß <i>USB-PD</i> -Spezifikation                                                                                                                                                                                                                                         |
| VID                                                                | Eine Hersteller-ID (en: Vendor ID, VID) ist ein vom USB-IF vergebener eindeutiger 16-Bit-Wert zur Kennzeichnung eines Herstellers.                                                                                                                                                                |
| vSafe0V                                                            | Vbus „0 Volt“ gemäß <i>USB-PD</i> -Spezifikation                                                                                                                                                                                                                                                  |
| vSafe5V                                                            | Vbus „5 Volt“ gemäß <i>USB-PD</i> -Spezifikation                                                                                                                                                                                                                                                  |

– Leerseite –

## INTRODUCTION

The IEC 62680 series is based on a series of specifications that were originally developed by the USB Implementers Forum (USB-IF). These specifications were submitted to the IEC under the auspices of a special agreement between the IEC and the USB-IF.

The USB Implementers Forum, Inc.(USB-IF) is a non-profit corporation founded by the group of companies that developed the Universal Serial Bus specification. The USB-IF was formed to provide a support organization and forum for the advancement and adoption of Universal Serial Bus technology. The Forum facilitates the development of high-quality compatible USB peripherals (devices), and promotes the benefits of USB and the quality of products that have passed compliance testing.

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# Universal Serial Bus Type-C Cable and Connector Specification

Revision 1.1  
April 3, 2015

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| Advanced Micro Devices                            | Steve Capezza                                                                                     | Walter Fry                                                                              | Will Harris                                                                                           |
| Agilent Technologies, Inc.                        | James Choate                                                                                      |                                                                                         |                                                                                                       |
| Apple                                             | Mahmoud Amini<br>Sree Anantharaman<br>Paul Baker<br>Jason Chung<br>David Conroy<br>Bill Cornelius | William Ferry<br>Zheng Gao<br>Girault Jones<br>Keong Kam<br>Min Kim<br>Chris Ligtenberg | Nathan Ng<br>James Orr<br>Keith Porthouse<br>Sascha Tietz<br>Colin Whitby-<br>Stevens<br>Dennis Yarak |
| Cypress Semiconductor                             | Mark Fu<br>Rushil Kadakia                                                                         | Anup Nayak<br>Jagadeesan Raj                                                            | Sanjay Sancheti<br>Subu Sankaran                                                                      |
| Dell                                              | Mohammed Hijazi<br>David Meyers                                                                   | Sean O'Neal<br>Ernesto Ramirez                                                          | Thomas Voor                                                                                           |
| DisplayLink (UK) Ltd.                             | Pete Burgers                                                                                      | Richard Petrie                                                                          |                                                                                                       |
| Electronics Testing Center,<br>Taiwan             | Sophia Liu                                                                                        |                                                                                         |                                                                                                       |
| Foxconn                                           | Asroc Chen<br>Allen Cheng<br>Jason Chou<br>Edmond Choy<br>Bob Hall                                | Chien-Ping Kao<br>Ji Li<br>Ann Liu<br>Terry Little<br>Steve Sedio                       | Pei Tsao<br>AJ Yang<br>Yuan Zhang<br>Jessica Zheng<br>Andy Yao                                        |
| Foxlink/Cheng Uei Precision<br>Industry Co., Ltd. | Robert Chen<br>Sunny Chou<br>Carrie Chuang<br>Wen-Chuan Hsu<br>Alex Hsue                          | Armando Lee<br>Dennis Lee<br>Justin Lin<br>Tse Wu Ting                                  | Steve Tsai<br>Wen Yang<br>Wiley Yang<br>Junjie Yu                                                     |
| Google                                            | Joshua Boilard<br>Jim Guerin<br>Jeffrey Hayashida<br>Mark Hayter                                  | Nithya Jagannathan<br>Lawrence Lam<br>Ingrid Lin<br>Adam Rodriguez                      | David Schneider<br>Ken Wu                                                                             |
| Granite River Labs                                | Mike Engbretson                                                                                   | Johnson Tan                                                                             |                                                                                                       |

|                                                            |                                                                                                                                                    |                                                                                                                           |                                                                                                                                 |
|------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------|
| Hewlett Packard<br>(USB 3.0 Promoter<br>company)           | Alan Berkema<br>Robin Castell                                                                                                                      | Michael Krause<br>Jim Mann                                                                                                | Linden McClure<br>Mike Pescetto                                                                                                 |
| Hirose Electric Co., Ltd.                                  | Jeremy Buan<br>William MacKillop                                                                                                                   | Gourgen Oganessyan                                                                                                        | Sid Tono                                                                                                                        |
| Intel Corporation<br>(USB 3.0 Promoter<br>company)         | Dave Ackelson<br>Mike Bell<br>Kuan-Yu Chen<br>Hengju Cheng<br>Bob Dunstan<br>Paul Durley<br>Howard Heck<br>Hao-Han Hsu<br>Abdul (Rahman)<br>Ismail | James Jaussi<br>Luke Johnson<br>Jerzy Kolinski<br>Christine Krause<br>Yun Ling<br>Xiang Li<br>Guobin Liu<br>Steve McGowan | Chee Lim Nge<br>Sridharan<br>Ranganathan<br>Brad Saunders<br>Amit Srivastava<br>Ron Swartz<br>Karthi Vadivelu<br>Rafal Wielicki |
| Japan Aviation Electronics<br>Industry Ltd. (JAE)          | Kenji Hagiwara<br>Masaki Kimura<br>Toshio Masumoto<br>Joe Motojima<br>Ron Muir<br>Tadashi Okubo<br>Kazuhiro Saito                                  | Kimiaki Saito<br>Yuichi Saito<br>Mark Saubert<br>Toshio Shimoyama<br>Tatsuya Shioda<br>Atsuo Tago<br>Masaaki Takaku       | Jussi Takaneva<br>Tomohiko Tamada<br>Kentaro Toda<br>Kouhei Ueda<br>Takakazu Usami<br>Masahide Watanabe<br>Youhei Yokoyama      |
| JPC/Main Super Inc.                                        | Sam Tseng                                                                                                                                          | Ray Yang                                                                                                                  |                                                                                                                                 |
| LeCroy Corporation                                         | Daniel H. Jacobs                                                                                                                                   |                                                                                                                           |                                                                                                                                 |
| Lenovo                                                     | Rob Bowser<br>Tomoki Harada                                                                                                                        | Wei Lie                                                                                                                   | Howard Locker                                                                                                                   |
| Lotes Co., Ltd.                                            | Ariel Delos Reyes<br>Ernest Han<br>Mark Ho                                                                                                         | Regina Liu-Hwang<br>Max Lo<br>Charles Kaun                                                                                | JinYi Tu<br>Jason Yang                                                                                                          |
| LSI Corporation                                            | Dave Thompson                                                                                                                                      |                                                                                                                           |                                                                                                                                 |
| Luxshare-ICT                                               | Josue Castillo<br>Daniel Chen<br>Lisen Chen                                                                                                        | CY Hsu<br>Alan Kinningham<br>John Lin                                                                                     | Stone Lin<br>Pat Young                                                                                                          |
| MegaChips Corporation                                      | Alan Kobayashi                                                                                                                                     |                                                                                                                           |                                                                                                                                 |
| Microchip (SMSC)                                           | Josh Averyt<br>Mark Bohm                                                                                                                           | Donald Perkins                                                                                                            | Mohammed Rahman                                                                                                                 |
| Microsoft Corporation<br>(USB 3.0 Promoter<br>company)     | Randy Aull<br>Fred Bhesania<br>Anthony Chen<br>Marty Evans<br>Vivek Gupta<br>Robbie Harris                                                         | Robert Hollyer<br>Kai Inha<br>Jayson Kastens<br>Andrea Keating<br>Eric Lee                                                | Ivan McCracken<br>Toby Nixon<br>Gene Obie<br>Srivatsan Ravindran<br>David Voth                                                  |
| MQP Electronics Ltd.                                       | Sten Carlsen                                                                                                                                       | Pat Crowe                                                                                                                 |                                                                                                                                 |
| Nokia Corporation                                          | Daniel Gratiot<br>Pekka Leinonen                                                                                                                   | Samuli Makinen<br>Pekka Talmola                                                                                           | Timo Toivola<br>Panu Ylihaavisto                                                                                                |
| NXP Semiconductors                                         | Vijendra Kuroodi                                                                                                                                   | Guru Prasad                                                                                                               |                                                                                                                                 |
| Renesas Electronics Corp.<br>(USB 3.0 Promoter<br>company) | Nobuo Furuya                                                                                                                                       | Philip Leung                                                                                                              | Kiichi Muto                                                                                                                     |

|                                                  |                                                                                                   |                                                                                                                        |                                                                                   |
|--------------------------------------------------|---------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|
| Rohm Co., Ltd.                                   | Mark Aldering<br>Kris Bahar<br>Yusuke Kondo                                                       | Arun Kumar<br>Chris Lin                                                                                                | Takashi Sato<br>Hiroshi Yoshimura                                                 |
| Samsung Electronics Co., Ltd.                    | Soondo Kim<br>Woonki Kim                                                                          | Jagoun Koo<br>Cheolho Lee                                                                                              | Jun Bum Lee                                                                       |
| Seagate                                          | Alvin Cox<br>Tony Priborsky                                                                       | Tom Skaar                                                                                                              | Dan Smith                                                                         |
| STMicroelectronics<br>(USB 3.0 Promoter company) | Nicolas Florenchie<br>Joel Huloux                                                                 | Christophe Lorin<br>Patrizia Milazzo                                                                                   | Federico Musarra<br>Pascal Legrand                                                |
| Tektronics, Inc.                                 | Randy White                                                                                       |                                                                                                                        |                                                                                   |
| Texas Instruments<br>(USB 3.0 Promoter company)  | Jawaid Ahmad<br>Richard Hubbard<br>Scott Jackson<br>Yoon Lee<br>Grant Ley                         | Win Maung<br>Lauren Moore<br>Martin Patoka<br>Brian Quach<br>Wes Ray                                                   | Anwar Sadat<br>Sue Vining<br>Deric Waters                                         |
| Tyco Electronics Corp.<br>(TE Connectivity Ltd.) | Max Chao<br>Robert E. Cid<br>Kengo Ijiri<br>Eiji Ikematsu<br>Joan Leu<br>Clark Li<br>Mike Lockyer | Jim McGrath<br>Takeshi Nakashima<br>Luis A. Navarro<br>Masako Saito<br>Yoshiaki Sakuma<br>Gavin Shih<br>Hiroshi Shirai | Scott Shuey<br>Hidenori Taguchi<br>Bernard Vetten<br>Ryan Yu<br>Sjoerd Zwartkruis |
| VIA Technologies Inc.                            | Terrance Shih                                                                                     | Jay Tseng                                                                                                              | Fong-Jim Wang                                                                     |

481

482 **Pre-Release Draft Industry Reviewing Companies That Provided Feedback**

|                                                 |                                                |                                     |
|-------------------------------------------------|------------------------------------------------|-------------------------------------|
| Aces                                            | Johnson Components & Equipment Co., Ltd.       | Parade Technology                   |
| Allion Labs, Inc.                               | Joinsoon Electronics Mfg. Co. Ltd.             | Pericom                             |
| Analogix Semiconductor                          | JST Mfg. Co., Ltd.                             | Qualcomm                            |
| BizLink International Corp.                     | Korea Electric Terminal                        | Semtech Corporation                 |
| Corning Optical Communications LLC              | Marvell Semiconductor                          | Shenzhen Deren Electronic Co., Ltd. |
| Cypress Semiconductor                           | Motorola Mobility LLC                          | Silicon Image                       |
| Etron Technology Inc.                           | NEC                                            | Simula Technology Corp.             |
| Fairchild Semiconductor                         | Newnex Technology Corp.                        | SMK Corporation                     |
| Fujitsu Ltd.                                    | NXP Semiconductors                             | Sony Corporation                    |
| Industrial Technology Research Institute (ITRI) | PalCONN/PalNova (Palpilot International Corp.) | Sumitomo Electric Industries        |
|                                                 |                                                | Toshiba Corporation                 |

483

484 **Revision History**

| Revision | Date            | Description                                                                                                   |
|----------|-----------------|---------------------------------------------------------------------------------------------------------------|
| 1.0      | August 11, 2014 | Initial Release                                                                                               |
| 1.1      | April 3, 2015   | Reprint release including incorporation of all approved ECNs as of the revision date plus editorial clean-up. |

485

486

487 **1 Introduction**

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

498 **1.1 Purpose**

499 This specification defines the USB Type-C™ receptacles, plug and cables.

500 The USB Type-C Cable and Connector Specification is guided by the following principles:

- 501 • Enable new and exciting host and device form-factors where size, industrial design and  
502 style are important parameters
- 503 • Work seamlessly with existing USB host and device silicon solutions
- 504 • Enhance ease of use for connecting USB devices with a focus on minimizing user  
505 confusion for plug and cable orientation

506 The USB Type-C Cable and Connector Specification defines a new receptacle, plug, cable and  
507 detection mechanisms that are compatible with existing USB interface electrical and functional  
508 specifications. This specification covers the following aspects that are needed to produce and  
509 use this new USB cable/connector solution in newer platforms and devices, and that interoperate  
510 with existing platforms and devices:

- 511 • USB Type-C receptacles, including electro-mechanical definition and performance  
512 requirements
- 513 • USB Type-C plugs and cable assemblies, including electro-mechanical definition and  
514 performance requirements
- 515 • USB Type-C to legacy cable assemblies and adapters
- 516 • USB Type-C-based device detection and interface configuration, including support for legacy  
517 connections
- 518 • USB Power Delivery optimized for the USB Type-C connector

519 The USB Type-C Cable and Connector Specification defines a standardized mechanism that  
520 supports Alternate Modes, such as repurposing the connector for docking-specific applications.

521 **1.2 Scope**

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

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

528 **1.3 Related Documents**

- USB 2.0** *Universal Serial Bus Revision 2.0 Specification*  
This includes the entire document release package.  
<http://www.usb.org/developers/docs>
- USB 3.1** *Universal Serial Bus Revision 3.1 Specification*  
This includes the entire document release package.  
<http://www.usb.org/developers/docs>
- USB PD** *USB Power Delivery Specification, Revision 2.0, August 11, 2014*  
<http://www.usb.org/developers/docs>
- USB BB** *USB Billboard Device Class Specification, Revision 1.0, August 11, 2014*  
<http://www.usb.org/developers/docs>
- USB BC** *Battery Charging Specification, Revision 1.2 (including errata and ECNs through March 15, 2012), March 15, 2012*  
<http://www.usb.org/developers/docs>

529

530 **1.4 Conventions**531 **1.4.1 Precedence**

532 If there is a conflict between text, figures, and tables, the precedence shall be tables, figures, and  
533 then text.

534 **1.4.2 Keywords**

535 The following keywords differentiate between the levels of requirements and options.

536 **1.4.2.1 Informative**

537 Informative is a keyword that describes information with this specification that intends to discuss  
538 and clarify requirements and features as opposed to mandating them.

539 **1.4.2.2 May**

540 May is a keyword that indicates a choice with no implied preference.

541 **1.4.2.3 N/A**

542 N/A is a keyword that indicates that a field or value is not applicable and has no defined value  
543 and shall not be checked or used by the recipient.

544 **1.4.2.4 Normative**

545 Normative is a keyword that describes features that are mandated by this specification.

546 **1.4.2.5 Optional**

547 Optional is a keyword that describes features not mandated by this specification. However, if an  
548 optional feature is implemented, the feature shall be implemented as defined by this specification  
549 (optional normative).

550 **1.4.2.6 Reserved**

551 Reserved is a keyword indicating reserved bits, bytes, words, fields, and code values that are  
552 set-aside for future standardization. Their use and interpretation may be specified by future  
553 extensions to this specification and, unless otherwise stated, shall not be utilized or adapted by  
554 vendor implementation. A reserved bit, byte, word, or field shall be set to zero by the sender and  
555 shall be ignored by the receiver. Reserved field values shall not be sent by the sender and, if  
556 received, shall be ignored by the receiver.

557 **1.4.2.7 Shall**

558 Shall is a keyword indicating a mandatory (normative) requirement. Designers are mandated to  
559 implement all such requirements to ensure interoperability with other compliant Devices.

560 **1.4.2.8 Should**

561 Should is a keyword indicating flexibility of choice with a preferred alternative. Equivalent to the  
562 phrase “it is recommended that”.

563 **1.4.3 Numbering**

564 Numbers that are immediately followed by a lowercase “b” (e.g., 01b) are binary values.  
565 Numbers that are immediately followed by an uppercase “B” are byte values. Numbers that are  
566 immediately followed by a lowercase “h” (e.g., 3Ah) are hexadecimal values. Numbers not  
567 immediately followed by either a “b”, “B”, or “h” are decimal values.

568 **1.5 Terms and Abbreviations**

| Term                         | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Accessory Mode               | A reconfiguration of the connector based on the presence of Rd/Rd or Ra/Ra on CC1/CC2, respectively.                                                                                                                                                                                                                                                                                                                                                                              |
| Active cable                 | An <a href="#">Electronically Marked Cable</a> with additional electronics to condition the data path signals.                                                                                                                                                                                                                                                                                                                                                                    |
| Alternate Mode               | Operation defined by a vendor or standards organization that is associated with a SVID assigned by the USB-IF. Entry and exit into and from an Alternate Mode is controlled by the <a href="#">USB PD</a> Structured VDM Enter Mode and Exit Mode commands.                                                                                                                                                                                                                       |
| Audio Adapter Accessory Mode | The Accessory Mode defined by the presence of Ra/Ra on CC1/CC2, respectively. See Appendix A.                                                                                                                                                                                                                                                                                                                                                                                     |
| BFSK                         | Binary Frequency Shift Keying used for <a href="#">USB PD</a> communication over VBUS.                                                                                                                                                                                                                                                                                                                                                                                            |
| BMC                          | Biphase Mark Coding used for <a href="#">USB PD</a> communication over the CC wire.                                                                                                                                                                                                                                                                                                                                                                                               |
| Captive cable                | A cable that is terminated on one end with a USB Type-C plug and has a vendor-specific connect means (hardwired or custom detachable) on the opposite end.                                                                                                                                                                                                                                                                                                                        |
| CC                           | Configuration Channel (CC) used in the discovery, configuration and management of connections across a USB Type-C cable.                                                                                                                                                                                                                                                                                                                                                          |
| Debug Accessory Mode         | The Accessory Mode defined by the presence of Rd/Rd on CC1/CC2, respectively. See Appendix B.                                                                                                                                                                                                                                                                                                                                                                                     |
| Default VBUS                 | VBUS voltage as defined by the <a href="#">USB 2.0</a> and <a href="#">USB 3.1</a> specifications. Note: where used, 5 V connotes the same meaning.                                                                                                                                                                                                                                                                                                                               |
| 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.                                                                                                                                                                                 |
| Direct connect               | The host's DFP is connected directly with no USB hub in between, either via a cable or without (e.g., thumb drive), to the device's UFP.                                                                                                                                                                                                                                                                                                                                          |
| DRP                          | The acronym used in this specification to refer to a USB port that can operate as either a Source or a Sink. The role that the port offers may be fixed to either a Source or Sink or may alternate between the two port states. Initially when operating as a Source, the port will also take on the role of a DFP and when operating as a Sink, the port will also take on the role of a UFP. The port's role may be changed dynamically either to reverse power or data roles. |
| DR_Swap                      | <a href="#">USB PD</a> Data Role Swap.                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| Electronically Marked Cable  | A USB Type-C cable that uses <a href="#">USB PD</a> to provide the cable's characteristics.                                                                                                                                                                                                                                                                                                                                                                                       |

| Term                           | Description                                                                                                                                                                                                                         |
|--------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Initiator                      | The port initiating a Vendor Defined Message. It is independent of the port's PD role (e.g., Provider, Consumer, Provider/Consumer, or Consumer/Provider). In most cases, the Initiator will be a host.                             |
| Passive cable                  | A cable that does not incorporate any electronics to condition the data path signals. A passive cable may or may not be electronically marked.                                                                                      |
| Port Partner                   | Refers to the port (device or host) a port is attached to.                                                                                                                                                                          |
| Powered cable                  | A cable with electronics in the plug that requires VCONN indicated by the presence of <a href="#">Ra</a> between the VCONN pin and ground.                                                                                          |
| PR_Swap                        | <a href="#">USB PD</a> Power Role Swap.                                                                                                                                                                                             |
| Responder                      | The port responding to the Initiator of a Vendor Defined Message (VDM). It is independent of the port's PD role (e.g., Provider, Consumer, Provider/Consumer, or Consumer/Provider). In most cases, the Responder will be a device. |
| SBU                            | Sideband Use.                                                                                                                                                                                                                       |
| SID                            | A Standard ID (SID) is a unique 16-bit value assigned by the <a href="#">USB-IF</a> to identify an industry standard.                                                                                                               |
| Sink                           | Port asserting Rd on CC and consuming power from VBUS; most commonly a Device.                                                                                                                                                      |
| Source                         | Port asserting Rp on CC and providing power over VBUS; most commonly a Host or Hub DFP.                                                                                                                                             |
| SVID                           | General reference to either a SID or a VID. Used by <a href="#">USB PD</a> Structured VDMs when requesting SIDs and VIDs from a device.                                                                                             |
| Type-A                         | A general reference to all versions of USB "A" plugs and receptacles.                                                                                                                                                               |
| Type-B                         | A general reference to all versions of USB "B" plugs and receptacles.                                                                                                                                                               |
| Type-C Plug                    | A USB plug conforming to the mechanical and electrical requirements in this specification.                                                                                                                                          |
| Type-C Port                    | The USB port associated to a USB Type-C receptacle. This includes the USB signaling, CC logic, multiplexers and other associated logic.                                                                                             |
| Type-C Receptacle              | A USB receptacle conforming to the mechanical and electrical requirements of this specification.                                                                                                                                    |
| 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.     |
| USB 2.0 Type-C Cable           | A USB Type-C to Type-C cable that only supports USB 2.0 data operation. This cable does not include USB 3.1 or SBU wires.                                                                                                           |
| USB 2.0 Type-C Plug            | A USB Type-C plug specifically designed to implement the USB 2.0 Type-C cable.                                                                                                                                                      |
| USB Full-Featured Type-C Cable | A USB Type-C to Type-C cable that supports USB 2.0 and USB 3.1 data operation. This cable includes SBU wires.                                                                                                                       |
| USB Full-Featured Type-C Plug  | A USB Type-C plug specifically designed to implement the USB Full-Featured Type-C cable.                                                                                                                                            |
| VCONN-powered accessory        | An accessory that is powered from VCONN to operate in an Alternate Mode.                                                                                                                                                            |
| VCONN_Swap                     | <a href="#">USB PD</a> VCONN Swap.                                                                                                                                                                                                  |
| VDM                            | Vendor Defined Message as defined by the <a href="#">USB PD</a> specification.                                                                                                                                                      |
| VID                            | A Vendor ID (VID) is a unique 16-bit value assigned by the <a href="#">USB-IF</a> to identify a vendor.                                                                                                                             |
| vSafe0V                        | VBUS "0 volts" as defined by the <a href="#">USB PD</a> specification.                                                                                                                                                              |
| vSafe5V                        | VBUS "5 volts" as defined by the <a href="#">USB PD</a> specification.                                                                                                                                                              |

## 2 Overview

### 2.1 Introduction

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

While the USB Type-C interconnect no longer physically differentiates plugs on a cable by being an A-type or B-type, the USB interface still maintains such a host-to-device logical relationship. Determination of this host-to-device relationship is accomplished through a [Configuration Channel](#) (CC) that is connected through the cable. In addition, the [Configuration Channel](#) is used to set up and manage power and Alternate/Accessory Modes.

Using the [Configuration Channel](#), the USB Type-C interconnect defines a simplified 5 volt VBUS-based power delivery and charging solution that supplements what is already defined in the [USB 3.1 Specification](#). More advanced power delivery and battery charging features over the USB Type-C interconnect are based on the [USB Power Delivery Specification](#). As a product implementation improvement, the USB Type-C interconnect shifts the [USB PD](#) communication protocol from being communicated over VBUS to being delivered across the USB Type-C [Configuration Channel](#).

The USB Type-C receptacle, plug and cable designs are intended to support future USB functional extensions. As such, consideration was given to frequency scaling performance, pin-out arrangement and the configuration mechanisms when developing this solution. The definition of future USB functional extensions is not in the scope of this specification but rather will be provided in future releases of the base USB Specification, i.e., beyond the existing [USB 3.1 Specification](#).

Figure 2-1 illustrates the comprehensive functional signal plan for the USB Type-C receptacle, not all signals shown are required in all platforms or devices. As shown, the receptacle signal list functionally delivers both [USB 2.0](#) (D+ and D-) and [USB 3.1](#) (TX and RX pairs) data buses, USB power (VBUS) and ground (GND), [Configuration Channel](#) signals (CC1 and CC2), and two Sideband Use (SBU) signal pins. Multiple sets of USB data bus signal locations in this layout facilitate being able to functionally map the USB signals independent of plug orientation in the receptacle. For reference, the signal pins are labeled.

Figure 2-1 USB Type-C Receptacle Interface (Front View)

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

Figure 2-2 illustrates the comprehensive functional signal plan for the USB Type-C plug. Only one CC pin is connected through the cable to establish signal orientation and the other CC pin is repurposed as VCONN for powering electronics in the USB Type-C plug. Also, only one set of [USB 2.0](#) D+/D- wires are implemented in a USB Type-C cable. For USB Type-C cables that only intend to support [USB 2.0](#) functionality, the [USB 3.1](#) and SBU signals are not implemented.

**Figure 2-2 USB Full-Featured Type-C Plug Interface (Front View)**

|     |      |      |      |       |    |    |      |      |      |      |     |
|-----|------|------|------|-------|----|----|------|------|------|------|-----|
| A12 | A11  | A10  | A9   | A8    | A7 | A6 | A5   | A4   | A3   | A2   | A1  |
| GND | RX2+ | RX2- | VBUS | SBU1  | D- | D+ | CC   | VBUS | TX1- | TX1+ | GND |
| GND | TX2+ | TX2- | VBUS | VCONN |    |    | SBU2 | VBUS | RX1- | RX1+ | GND |
| B1  | B2   | B3   | B4   | B5    | B6 | B7 | B8   | B9   | B10  | B11  | B12 |

**2.2 USB Type-C Receptacles, Plugs and Cables**

Cables and connectors, including USB Type-C to USB legacy cables and adapters, are explicitly defined within this specification. These are the only connectors and cables that are authorized by the licensing terms of this specification. All licensed cables and connectors are required to comply with the compliance and certification requirements that are developed and maintained by the [USB-IF](#).

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

All of the defined USB Type-C receptacles, plugs and cables support USB charging applications, including support for the optional USB Type-C-specific implementation of the [USB Power Delivery Specification](#) (See Section 4.6.2.4).

All USB Full-Featured Type-C cables are electronically marked. [USB 2.0](#) Type-C cables may be electronically marked. See Section 4.9 for the requirements of Electronically Marked Cables.

The following USB Type-C to USB legacy cables and adapters are defined.

- [USB 3.1](#) Type-C to Legacy Host cable with a USB Full-Featured Type-C plug at one end and a [USB 3.1](#) Standard-A plug at the other end – *this cable supports use of a USB Type-C-based device with a legacy USB host*
- [USB 2.0](#) Type-C to Legacy Host cable with a [USB 2.0](#) Type-C plug at one end and a [USB 2.0](#) Standard-A plug at the other end – *this cable supports use of a USB Type-C-based device with a legacy [USB 2.0](#) host (primarily for mobile charging and sync applications)*

- [USB 3.1](#) Type-C to Legacy Device cable with a USB Full-Featured Type-C plug at one end and a [USB 3.1](#) Standard-B plug at the other end – *this cable supports use of legacy [USB 3.1](#) hubs and devices with a USB Type-C-based host*
- [USB 2.0](#) Type-C to Legacy Device cable with a [USB 2.0](#) Type-C plug at one end and a [USB 2.0](#) Standard-B plug at the other end – *this cable supports use of legacy [USB 2.0](#) hubs and devices with a USB Type-C-based host*
- [USB 2.0](#) Type-C to Legacy Mini Device cable with a [USB 2.0](#) Type-C plug at one end and a [USB 2.0](#) Mini-B plug at the other end – *this cable supports use of legacy devices with a [USB 2.0](#) Type-C-based host*
- [USB 3.1](#) Type-C to Legacy Micro Device cable with a USB Full-Featured Type-C plug at one end and a [USB 3.1](#) Micro-B plug at the other end – *this cable supports use of legacy [USB 3.1](#) hubs and devices with a USB Type-C-based host*
- [USB 2.0](#) Type-C to Legacy Micro Device cable with a [USB 2.0](#) Type-C plug at one end and a [USB 2.0](#) Micro-B plug at the other end – *this cable supports use of legacy [USB 2.0](#) hubs and devices with a USB Type-C-based host*
- [USB 3.1](#) Type-C to Legacy Standard-A adapter with a USB Full-Featured Type-C plug at one end and a [USB 3.1](#) Standard-A receptacle at the other end – *this adapter supports use of a legacy USB “thumb drive” style device or a legacy USB ThinCard device with a [USB 3.1](#) Type-C-based host*
- [USB 2.0](#) Type-C to Legacy Micro-B adapter with a [USB 2.0](#) Type-C plug at one end and a [USB 2.0](#) Micro-B receptacle at the other end – *this adapter supports charging a USB Type-C-based mobile device using a legacy USB Micro-B-based chargers, either captive cable-based or used in conjunction with a legacy [USB 2.0](#) Standard-A to Micro-B cable*

Where implementations of USB Type-C to USB legacy cables are required to support [USB PD](#) BFSK-based communications, they shall do so by incorporating the required [USB PD](#) plug, incorporating the appropriate VBUS to ground decoupling capacitance, ensuring the VBUS wire is impedance controlled as specified in [USB PD](#), and complying with the cable requirements for the legacy connector end of the cable. USB Type-C to USB legacy adapters do not support [USB PD](#) BFSK-based communications.

USB Type-C receptacle to USB legacy adapters are explicitly not defined or allowed. Such adapters would allow many invalid and potentially unsafe cable connections to be constructed by users.

### 2.3 Configuration Process

The USB Type-C receptacle, plug and cable solution incorporates a configuration process to detect a downstream facing port to upstream facing port (DFP-to-UFP) connection for VBUS management and host-to-device connected relationship determination.

The configuration process is used for the following:

- DFP-to-UFP attach/detach detection
- Plug orientation/cable twist detection
- Initial DFP-to-UFP (host-to-device) and power relationships detection
- USB Type-C VBUS current detection and usage
- [USB PD](#) communication
- Discovery and configuration of functional extensions

Two pins on the USB Type-C receptacle, CC1 and CC2, are used for this purpose. Within a standard USB Type-C cable, only a single CC pin position within each plug of the cable is connected through the cable.

### 2.3.1 DFP-to-UFP Attach/Detach Detection

Initially, DFP-to-UFP attach is detected by a host or hub port (DFP) when one of the CC pins at its USB Type-C receptacle senses a specified resistance to GND. Subsequently, DFP-to-UFP detach is detected when the CC pin that was terminated at its USB Type-C receptacle is no longer terminated to GND.

Power is not applied to the USB Type-C host or hub receptacle (VBUS or VCONN) until the DFP detects the presence of an attached device (UFP) port. When a DFP-to-UFP attach is detected, the DFP is expected to enable power to the receptacle and proceed to normal USB operation with the attached device. When a DFP-to-UFP detach is detected, the port sourcing VBUS removes power.

### 2.3.2 Plug Orientation/Cable Twist Detection

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.

### 2.3.3 Initial DFP-to-UFP (host-to-device) and Power Relationships Detection

Unlike existing USB Type-A and Type-B receptacles and plugs, the mechanical characteristics of the USB Type-C receptacle and plug do not inherently establish the relationship of USB host and device ports. The CC pins on the receptacle also serve to establish an initial DFP-to-UFP and power relationships prior to the normal USB enumeration process.

For the purpose of defining how the CC pins are used to establish the initial DFP-to-UFP relationship, the following port behavior modes are defined.

1. Host-only – for this mode, the port exclusively behaves as a DFP
2. Device-only – for this mode, the port exclusively behaves as a UFP
3. Dual-role – for this mode, the port can behave either as a DFP or UFP

The host-only and device-only ports behaviorally map to traditional USB host ports and USB device ports, respectively. When a host-only port is attached to a device-only port, the behavior from the user's perspective follows the traditional USB host-to-device port model. However, the USB Type-C connector solution does not physically prevent host-to-host or device-to-device connections. In this case, the resulting host-to-host or device-to-device connection results in a safe but non-functional situation.

Initially, the DFP sources VBUS and the UFP sinks VBUS. *USB PD* may then be used to independently swap both the data and power roles of the ports.

USB hubs have two types of ports, a single UFP that is connected up to a host or another hub and one or more DFPs for connecting other devices.

A port that supports dual-role operation by being able to shift to the appropriate connected mode when attached to either a host-only or device-only port is a DRP. In the special case of a DRP being attached to another DRP, an initialization protocol across the CC pins is used to establish the initial host-to-device relationship, and in this case, the determination of which is DFP or UFP is random from the user's perspective.

Two methods are defined to allow a USB Type-C DRP to functionally swap data roles, one managed using [USB PD](#) DR\_Swap and the other emulating a disconnect/reconnect sequence (see Figure 4-16). As an alternative to role swapping, a USB Type-C DRP may provide useful functionality by when operating as a host, exposing a CDC/network (preferably TCP/IP) stack or when operating as a device, exposing a CDC/network interface.

#### 2.3.4 USB Type-C Vbus Current Detection and Usage

With the USB Type-C connector solution, a DFP (host or downstream hub port) may implement higher source current over VBUS to enable faster charging of mobile devices or powering devices that require more current than is specified in the [USB 3.1 Specification](#). All USB host and hub ports advertise via the CC pins the level of current that is presently available. The USB device port is required to manage its load to stay within the current level offered by the host or hub, including dynamically scaling back the load if the host or hub port changes its advertisement to a lower level as indicated over the CC pins.

Three current levels at default VBUS are defined by [USB Type-C Current](#):

- Default values as defined by a USB Specification
- 1.5 A
- 3.0 A

The higher [USB Type-C Current](#) levels that can be advertised allows hosts and devices that do not implement [USB PD](#) to take advantage of higher charging current.

#### 2.3.5 USB PD Communication

[USB Power Delivery](#) is a feature on products (hosts, hubs and devices). [USB PD](#) communications is used to:

- Establish power contracts that allow voltage and current outside that defined by the [USB 2.0](#) and [USB 3.1](#) specifications.
- Change the port sourcing VBUS.
- Change the port sourcing VCONN.
- Swap DFP and UFP roles.
- Communicate with cables.

The USB Type-C connector solution provides a new path for [USB PD](#) communications. Rather than superimposing a Binary Frequency Shift Keying (BFSK) on VBUS, the [USB PD](#) Bi-phase Mark Coded (BMC) communications are carried on the CC wire. In USB Type-C to legacy applications, the use of [USB PD](#) BFSK is allowed.

#### 2.3.6 Functional Extensions

Functional extensions (see Chapter 5) are enabled via a communications channel across CC using methods defined by the [USB Power Delivery Specification](#).

### 2.4 VBUS

VBUS provides a path to deliver power between a host and a device, and between a charger and a host/device. A simplified high-current supply capability is defined for hosts and chargers that optionally support current levels beyond the [USB 2.0](#) and [USB 3.1](#) specifications. The [USB Power Delivery Specification](#) is supported.

Table 2-1 summarizes the power supply options available from the perspective of a device with the USB Type-C connector. Not all options will be available to the device from all host or hub

ports – only the first two listed options are mandated by the base USB specifications and form the basis of [USB Type-C Current](#) at the Default USB Power level.

**Table 2-1 Summary of power supply options**

| Mode of Operation                          | Nominal Voltage         | Maximum Current        | Notes                                                            |
|--------------------------------------------|-------------------------|------------------------|------------------------------------------------------------------|
| <a href="#">USB 2.0</a>                    | 5 V                     | 500 mA                 | Default Current, based on definitions in the base specifications |
| <a href="#">USB 3.1</a>                    | 5 V                     | 900 mA                 |                                                                  |
| <a href="#">USB BC 1.2</a>                 | 5 V                     | Up to 1.5 A            | Legacy charging                                                  |
| <a href="#">USB Type-C Current @ 1.5 A</a> | 5 V                     | 1.5 A                  | Supports higher power devices                                    |
| <a href="#">USB Type-C Current @ 3.0 A</a> | 5 V                     | 3 A                    | Supports higher power devices                                    |
| <a href="#">USB PD</a>                     | 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.

## 2.5 VCONN

Once the connection between host and device is established, the CC pin (CC1 or CC2) in the receptacle that is not connected via the CC wire through the standard cable is repurposed to source VCONN to power circuits in the plug needed to implement Electronically Marked Cables (see Section 4.9). Initially, the DFP sources VCONN and the source may be swapped using [USB PD VCONN\\_Swap](#).

Electronically marked cables may use VBUS instead of VCONN as VBUS is available across the cable. VCONN functionally differs from VBUS in that it is isolated from the other end of the cable. VCONN is independent of VBUS and, unlike VBUS which can use [USB PD](#) to support higher voltages, VCONN voltage is fixed at 5 V.

## 2.6 Hubs

USB hubs implemented with USB Type-C receptacles are required to clearly identify the upstream facing port. This requirement is needed because a user can no longer know which port on a hub is the upstream facing port and which ports are the downstream facing ports by the type of receptacles that are exposed, i.e., USB Type-B is the upstream facing port and USB Type-A is a downstream facing port.

## 3 Mechanical

### 3.1 Overview

#### 3.1.1 Compliant Connectors

The USB Type-C™ specification defines the following standard connectors:

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

**3.1.2 Compliant Cable Assemblies**

Table 3-1 summarizes the USB Type-C standard cable assemblies along with the primary differentiating characteristics. The cable lengths listed in the table are informative and represents the practical length based on cable performance requirements. All cables that are either full-featured and/or are rated at more than 3 A current are [Electronically Marked Cables](#).

**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 |
|-------------------------|--------|--------|------------------------------|--------------|----------------|--------------------------|----------------------------------|
| <a href="#">CC2-3</a>   | C      | C      | <a href="#">USB 2.0</a>      | ≤ 4 m        | 3 A            | Supported                | Optional                         |
| <a href="#">CC2-5</a>   |        |        |                              |              | 5 A            |                          | Required                         |
| <a href="#">CC3G1-3</a> | C      | C      | <a href="#">USB 3.1 Gen1</a> | ≤ 2 m        | 3 A            | Supported                | Required                         |
| <a href="#">CC3G1-5</a> |        |        |                              |              | 5 A            |                          |                                  |
| <a href="#">CC3G2-3</a> | C      | C      | <a href="#">USB 3.1 Gen2</a> | ≤ 1 m        | 3 A            | Supported                | Required                         |
| <a href="#">CC3G2-5</a> |        |        |                              |              | 5 A            |                          |                                  |

USB Type-C products are also allowed to have a captive cable. See Section 3.4.3.

**3.1.3 Compliant USB Type-C to Legacy Cable Assemblies**

Table 3-2 summarizes the USB Type-C legacy cable assemblies along with the primary differentiating characteristics. The cable lengths listed in the table are informative and represents the practical length based on cable performance requirements. Cables shall be electronically marked where indicated in Table 3-2. [USB 3.1](#) Type-C legacy cables assemblies that only offer performance up to [USB 3.1](#) Gen1 are not allowed by this specification.

821

**Table 3-2 USB Type-C Legacy Cable Assemblies**

| Cable Ref | Plug 1 <sup>4</sup>                   | Plug 2 <sup>4</sup>                   | USB Version  | Cable Length | Current Rating | USB Type-C Electronically Marked <sup>3</sup> |
|-----------|---------------------------------------|---------------------------------------|--------------|--------------|----------------|-----------------------------------------------|
| AC2-3     | USB 2.0 Standard-A                    | USB 2.0 Type-C <sup>1</sup>           | USB 2.0      | ≤ 4 m        | 3 A            | Optional                                      |
| AC2-5     | USB 2.0 PD Standard-A                 |                                       |              |              | 5 A            | Required                                      |
| AC3G2-3   | USB 3.1 Standard-A                    | USB Full-Featured Type-C <sup>1</sup> | USB 3.1 Gen2 | ≤ 1 m        | 3 A            | Optional                                      |
| AC3G2-5   | USB 3.1 PD Standard-A                 |                                       |              |              | 5 A            | Required                                      |
| CB2-3     | USB 2.0 Type-C <sup>2</sup>           | USB 2.0 Standard-B                    | USB 2.0      | ≤ 4 m        | 3 A            | Optional                                      |
| CB2-5     |                                       | USB 2.0 PD Standard-B                 |              |              | 5 A            | Required                                      |
| CB3G2-3   | USB Full-Featured Type-C <sup>2</sup> | USB 3.1 Standard-B                    | USB 3.1 Gen2 | ≤ 1 m        | 3 A            | Optional                                      |
| CB3G2-5   |                                       | USB 3.1 PD Standard-B                 |              |              | 5 A            | Required                                      |
| CmB2      | USB 2.0 Type-C <sup>2</sup>           | USB 2.0 Mini-B                        | USB 2.0      | ≤ 4 m        | 500 mA         | Optional                                      |
| CμB2-3    | USB 2.0 Type-C <sup>2</sup>           | USB 2.0 PD Micro-B                    | USB 2.0      | ≤ 2 m        | 3 A            | Optional                                      |
| CμB3G2-3  | USB Full-Featured Type-C <sup>2</sup> | USB 3.1 PD Micro-B                    | USB 3.1 Gen2 | ≤ 1 m        | 3 A            | Optional                                      |

**Notes:**

1. USB Type-C plugs associated with the “B” end of a legacy adapter cable 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 cable are required to have Rd termination incorporated into the plug assembly – see Section 4.5.3.2.1.
3. Electronic marking shall only be implemented using **USB PD** BMC.
4. Legacy USB plugs used in the USB Type-C cable assemblies shall comply with the low level contact resistance as specified in **USB PD** 3.6.1 for 3A or 5A cables as appropriate. Legacy USB plugs shall comply with the contact current rating as specified in **USB PD** 3.6.5.1 for 3A current and 3.6.5.2 for 5A current. For USB Type-C to **USB PD**-versions of USB Standard-B and USB Micro-B plugs, **USB PD** passive marking (cPlug) on the ID pin of the B plug is not required.

822

**823 3.1.4 Compliant USB Type-C to Legacy Adapter Assemblies**

824 Table 3-3 summarizes the USB Type-C legacy adapter assemblies along with the primary  
825 differentiating characteristics. The cable lengths listed in the table are informative and  
826 represents the practical length based on cable performance requirements.

827

**Table 3-3 USB Type-C Legacy Adapter Assemblies**

| Adapter Ref | Plug                                  | Receptacle <sup>3</sup> | USB Version  | Cable Length | Current Rating | USB Legacy Receptacle Type | USB Type-C Electronically Marked |
|-------------|---------------------------------------|-------------------------|--------------|--------------|----------------|----------------------------|----------------------------------|
| CμBR2-3     | USB 2.0 Type-C <sup>1</sup>           | USB 2.0 Micro-B         | USB 2.0      | ≤ 0.15 m     | 3 A            | PD Receptacle Not Allowed  | Optional                         |
| CAR3G1-3    | USB Full-Featured Type-C <sup>2</sup> | USB 3.1 Standard-A      | USB 3.1 Gen1 | ≤ 0.15 m     | 3 A            | PD Receptacle Not Allowed  | 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. The **USB PD** version of the USB Micro-B receptacle shall not be implemented.
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. The **USB PD** version of the USB Standard-A receptacle shall not be implemented.
3. Legacy USB receptacles shall to comply with the low level contact resistance as specified in **USB PD** 3.6.1 for 3A. Legacy USB receptacles shall comply with the contact current rating specified in **USB PD** 3.6.5.1 measured for 3A current.

828

**829 3.2 USB Type-C Connector Mating Interfaces**

830 This section defines the connector mating interfaces, including the connector interface drawings,  
831 pin assignments, and descriptions.

**832 3.2.1 Interface Definition**

833 Figure 3-1 and

834 Figure 3-3 show, respectively, the USB Type-C receptacle and USB Full-Featured Type-C plug  
835 interface dimensions.

836 Figure 3-9 shows the [USB 2.0](#) Type-C plug interface dimensions. The dimensions that govern  
837 the mating interoperability are specified. All the REF dimensions are provided for reference only,  
838 not hard requirements.

839 Key features, configuration options, and design areas that need attention:

- 840 1. Figure 3-1 shows a vertical-mount receptacle. Other PCB mounting types such as right-  
841 angle mount and mid-mount are allowed.
- 842 2. A mid-plate is required between the top and bottom signals inside the receptacle tongue  
843 to manage crosstalk in full-featured applications. The mid-plate shall be connected to the  
844 PCB ground with at least two grounding points. A reference design of the mid-plate is  
845 provided in Section 3.2.2.1.
- 846 3. Retention of the cable assembly in the receptacle is achieved by the side-latches in the  
847 plug and features on the sides of the receptacle tongue. Side latches are required for all  
848 plugs except plugs used for docking with no cable attached. Side latches shall be  
849 connected to ground inside the plug. A reference design of the side latches is provided in  
850 Section 3.2.2.2 along with its grounding scheme. Docking applications may not have side  
851 latches, requiring special consideration regarding EMC (Electromagnetic Compatibility).
- 852 4. The EMC shielding springs are required inside the cable plug. The shielding spring shall  
853 be connected to the plug shell. Section 3.2.2.3 shows reference designs of the EMC  
854 spring.
- 855 5. Shorting of any signal or power contact spring to the plug metal shell is not allowed. The  
856 spring in the deflected state should not touch the plug shell. An isolation layer (e.g.,  
857 Kapton tape placed on the plug shell) is recommended to prevent accidental shorting due  
858 to plug shell deformation.
- 859 6. The USB Type-C receptacle shall provide an EMC ground return path through one of the  
860 following options:
  - 861 • Fingers in the receptacle outer shell
  - 862 • Internal EMC pads
  - 863 • Both external fingers in the shell and internal EMC pads

864 If fingers in the receptacle outer shell are used, then the receptacle springs shall contact the  
865 mated plug within the zones defined in

866 Figure 3-2. A minimum of four separate contact points are required. Additional fingers  
867 and points of contact are allowed. See Section 3.2.2.4 for a reference design of  
868 receptacle outer shell fingers.

869 If internal EMC pads are present in the receptacle, then they shall comply with the  
870 requirements defined in Figure 3-1. The shielding pads shall be connected to the  
871 receptacle shell. If no receptacle shell is present, then the receptacle shall provide a  
872 means to connect the shielding pad to ground. See Section 3.2.2.3 for a reference design  
873 of the shielding pad and ground connection.

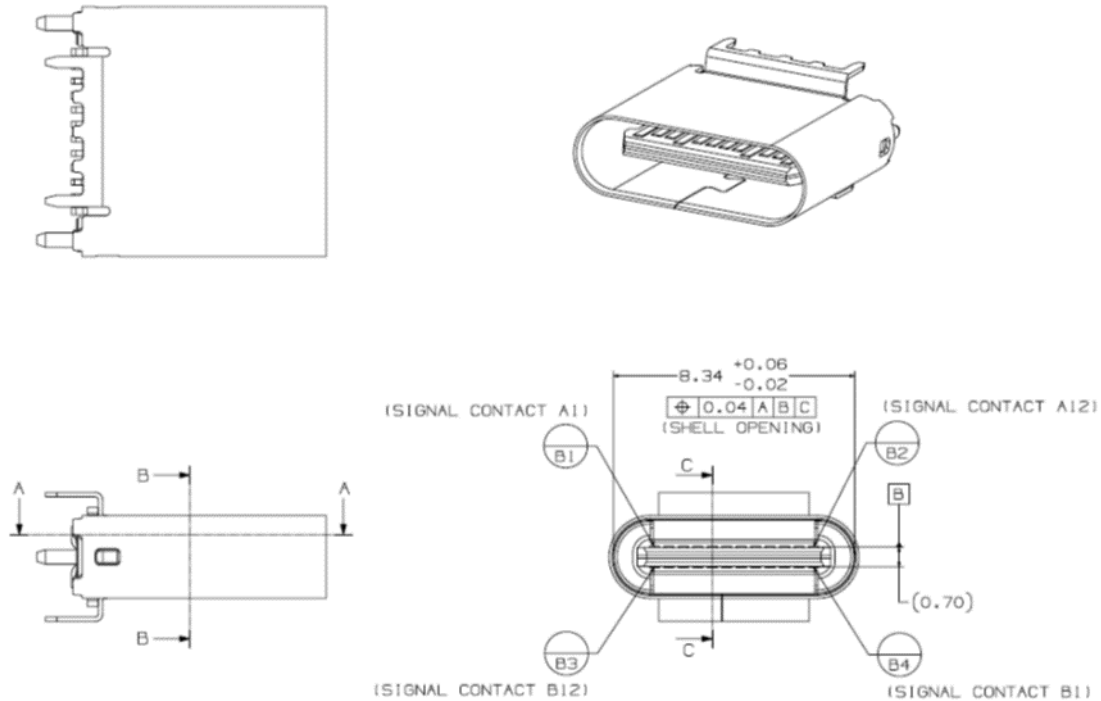
- 874 7. This specification defines the USB Type-C receptacle shell length ( $6.20 \pm 0.02$  mm) as a  
875 reference dimension. The receptacle shell length of 6.2 mm provides proper mechanical  
876 and electrical mating of the plug to the receptacle in addition to providing both the plug  
877 and receptacle a defined configuration to design to for the wrenching and contact mating  
878 requirements. The USB Type-C receptacle at the system level should be implemented  
879 such that the USB Type-C receptacle connector mounted in the associated system  
880 hardware has an effective shell length equal to the reference dimension.

- 881 8. The USB Type-C connector mating interface is defined so that the electrical connection  
882 may be established without the receptacle shell. To prevent excessive misalignment of  
883 the plug when it enters or exits the receptacle, the enclosure should have features to  
884 guide the plug for insertion and withdrawal when a modified receptacle shell is present. If  
885 the USB Type-C receptacle shell is modified from the specified dimension, then the  
886 recommended lead in from the receptacle tongue to the plug point of entry is 1.5 mm  
887 minimum when mounted in the system.
- 888 9. A paddle card (e.g., PCB) may be used in the USB Type-C plug to manage wire  
889 termination and electrical performance. Section 3.2.2.5 includes the guidelines and a  
890 design example for a paddle card.
- 891 10. This specification does not define standard footprints.

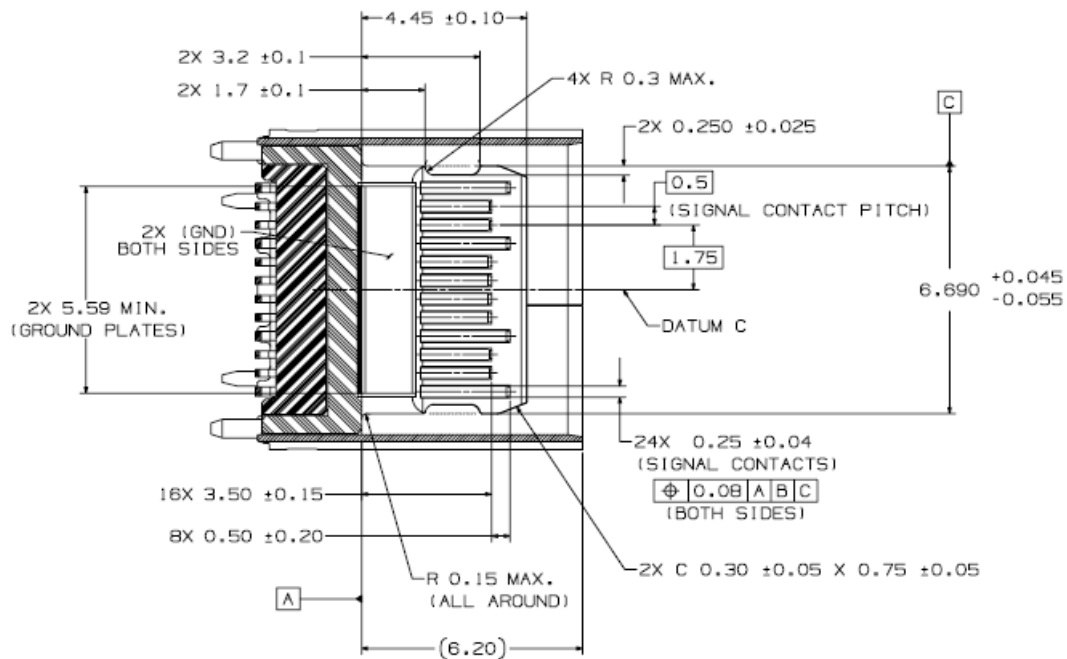
Figure 3-4 shows an example SMT (surface mount) footprint for the vertical receptacle shown in Figure 3-1. Additional reference footprints and mounting configurations are shown in Figure 3-5, Figure 3-6, Figure 3-7, and Figure 3-8.

11. The receptacle shell shall be connected to the PCB ground plane.
12. All VBUS pins shall be connected together in the USB Type-C plug.
13. All Ground return pins shall be connected together in the USB Type-C plug.
14. All VBUS pins shall be connected together at the USB Type-C receptacle when it is in its mounted condition (e.g., all VBUS pins bussed together in the PCB).
15. All Ground return pins shall be connected together at the USB Type-C receptacle when it is in its mounted condition (e.g., all Ground return pins bussed together in the PCB).

**Figure 3-1 USB Type-C Receptacle Interface Dimensions**



907



REFERENCE LENGTH - SEE NOTE 7.

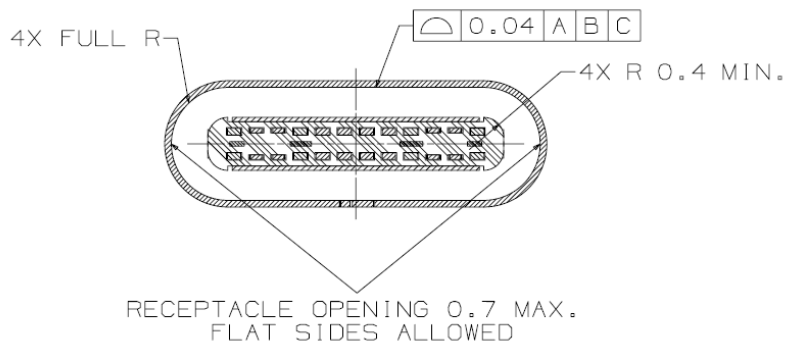
SECTION A-A

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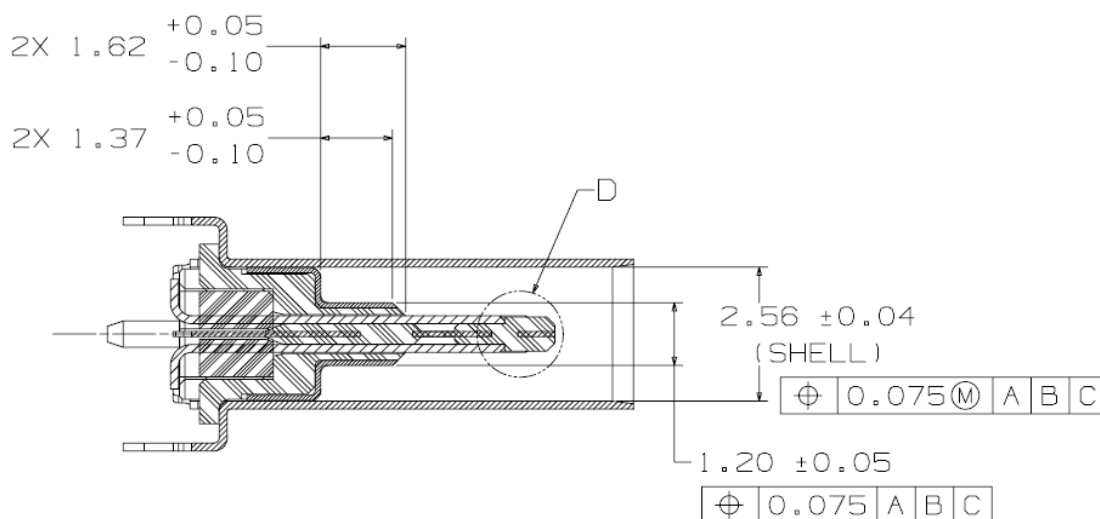
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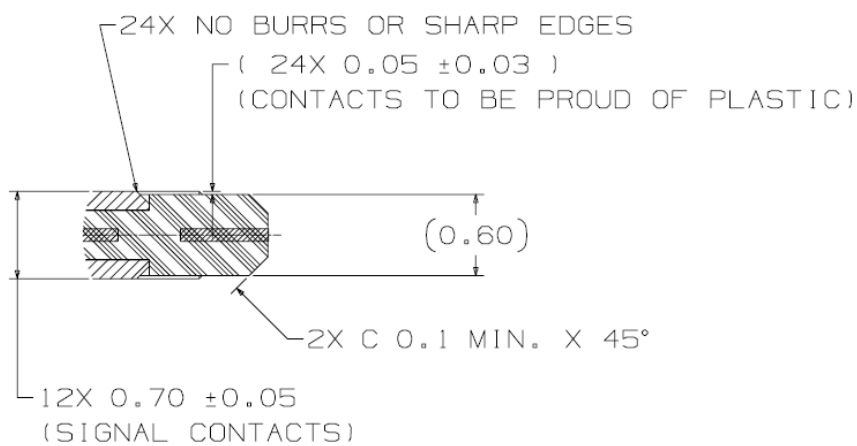
Figure 3-1 USB Type-C Receptacle Interface Dimensions (cont.)



SECTION B-B

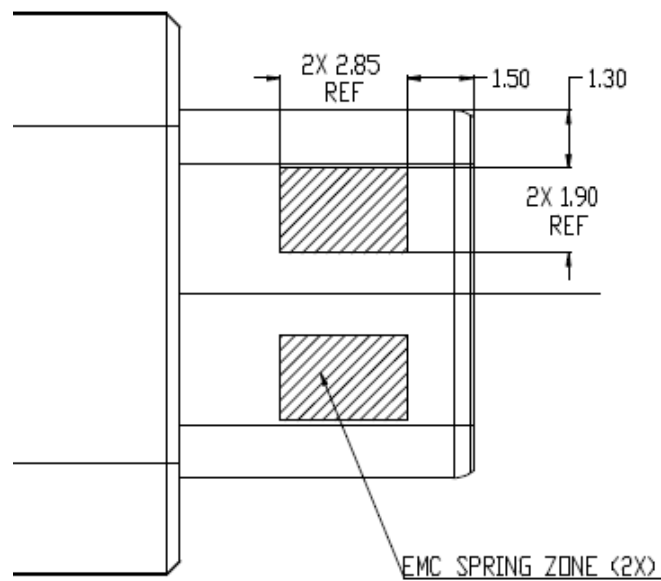
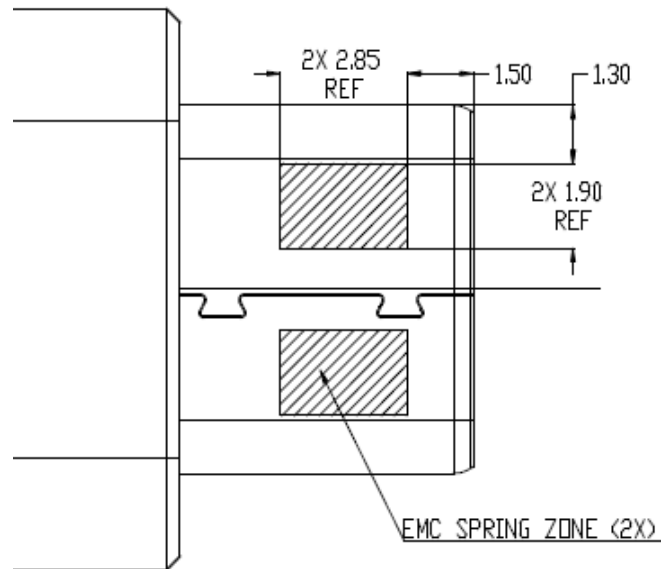


SECTION C-C



DETAIL D

Figure 3-2 Reference Design USB Type-C Plug External EMC Spring Contact Zones

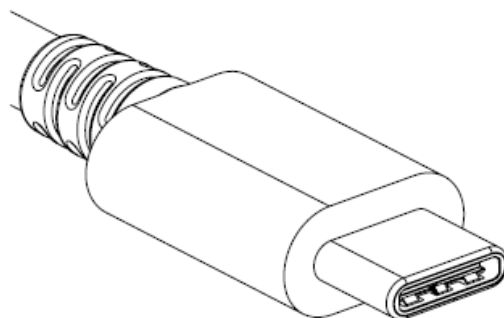
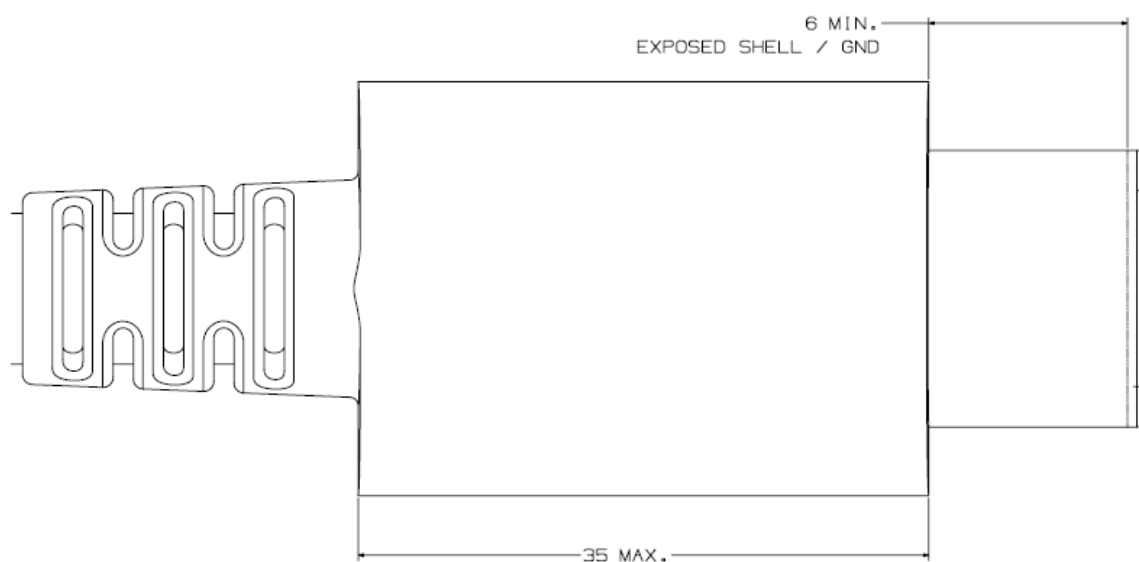
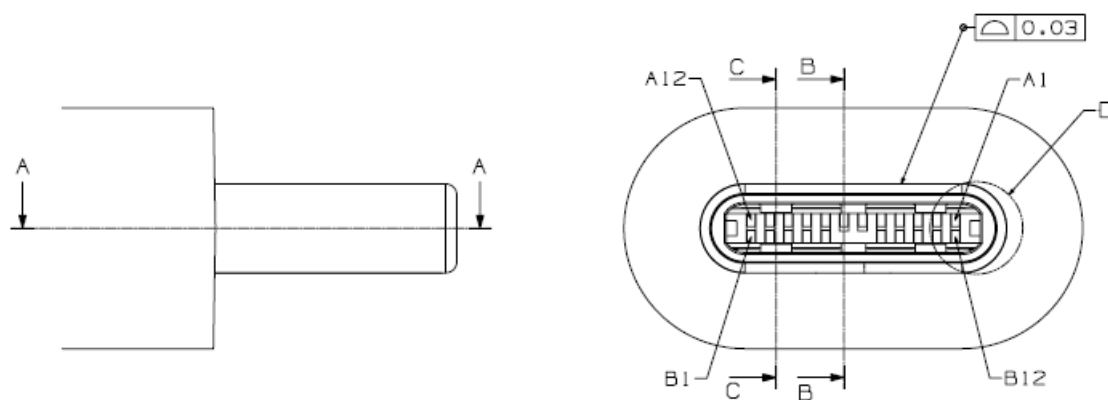


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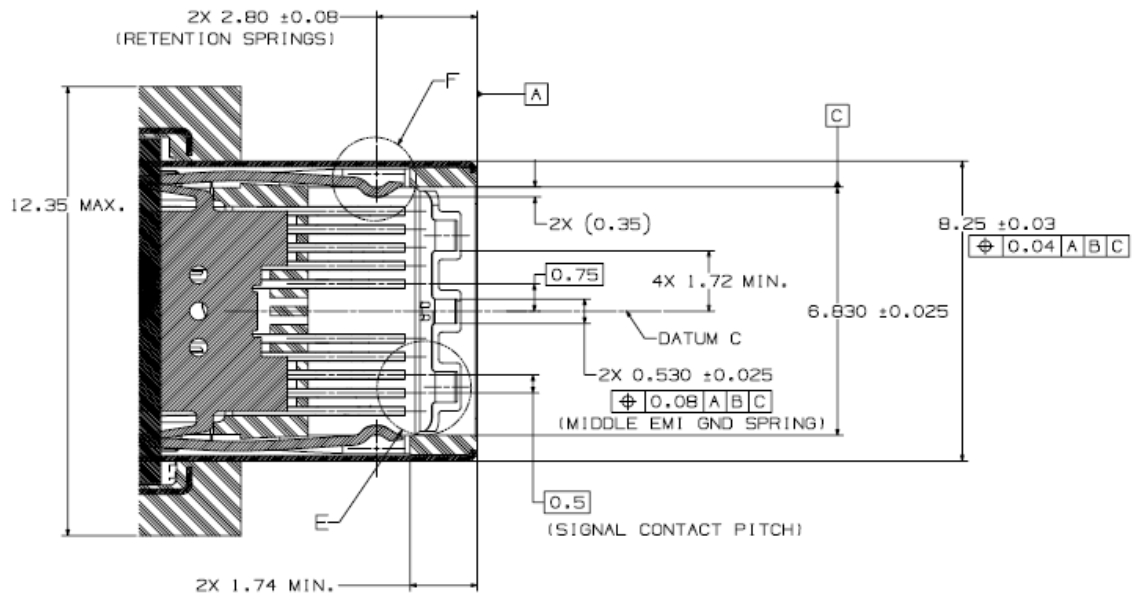
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**Figure 3-3 USB Full-Featured Type-C Plug Interface Dimensions**920  
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923924  
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927928  
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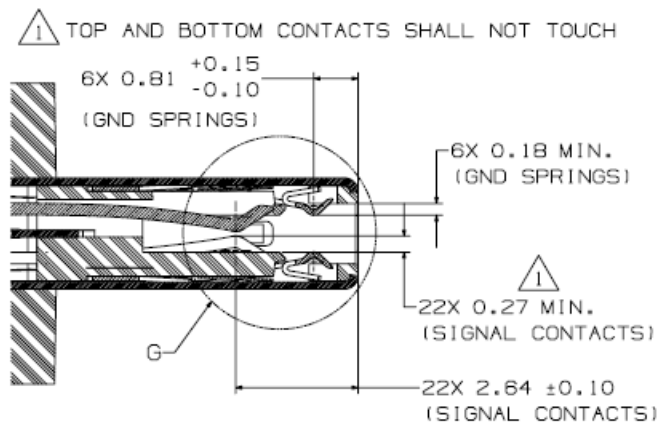
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Figure 3-3 USB Full-Featured Type-C Plug Interface Dimensions, cont.



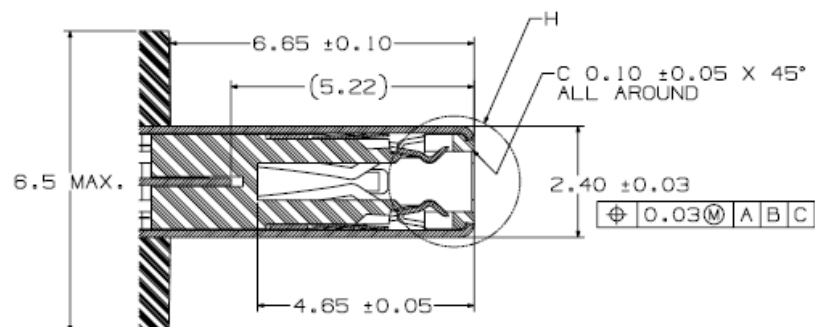
SECTION A-A

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SECTION C-C

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Figure 3-3 USB Full-Featured Type-C Plug Interface Dimensions, cont.

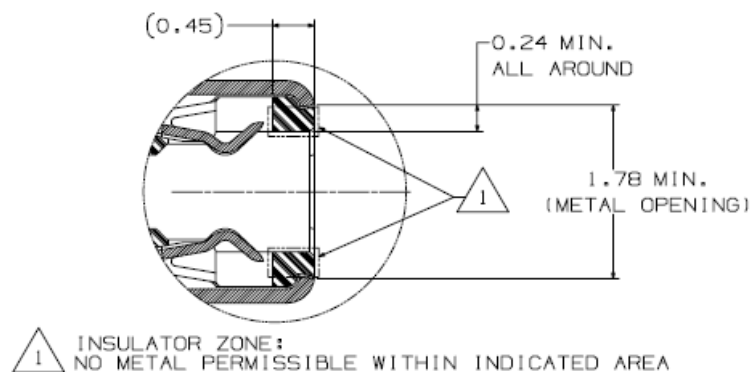
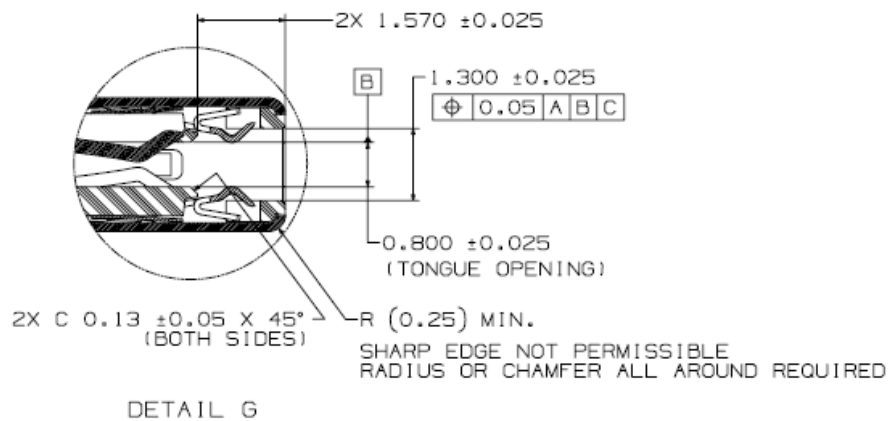
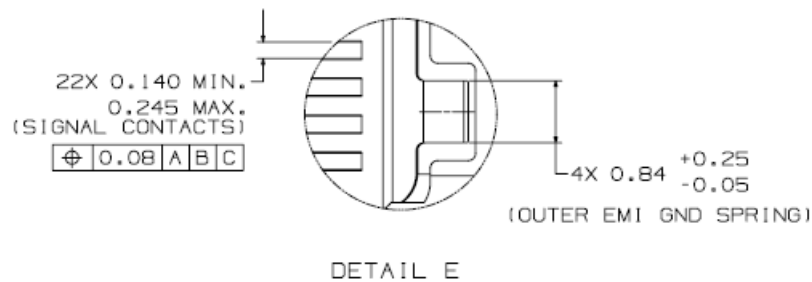
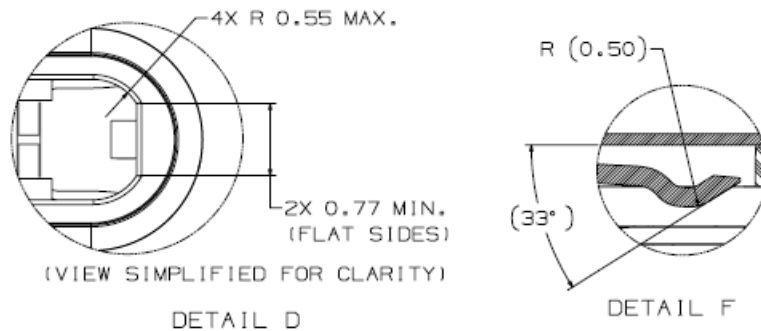
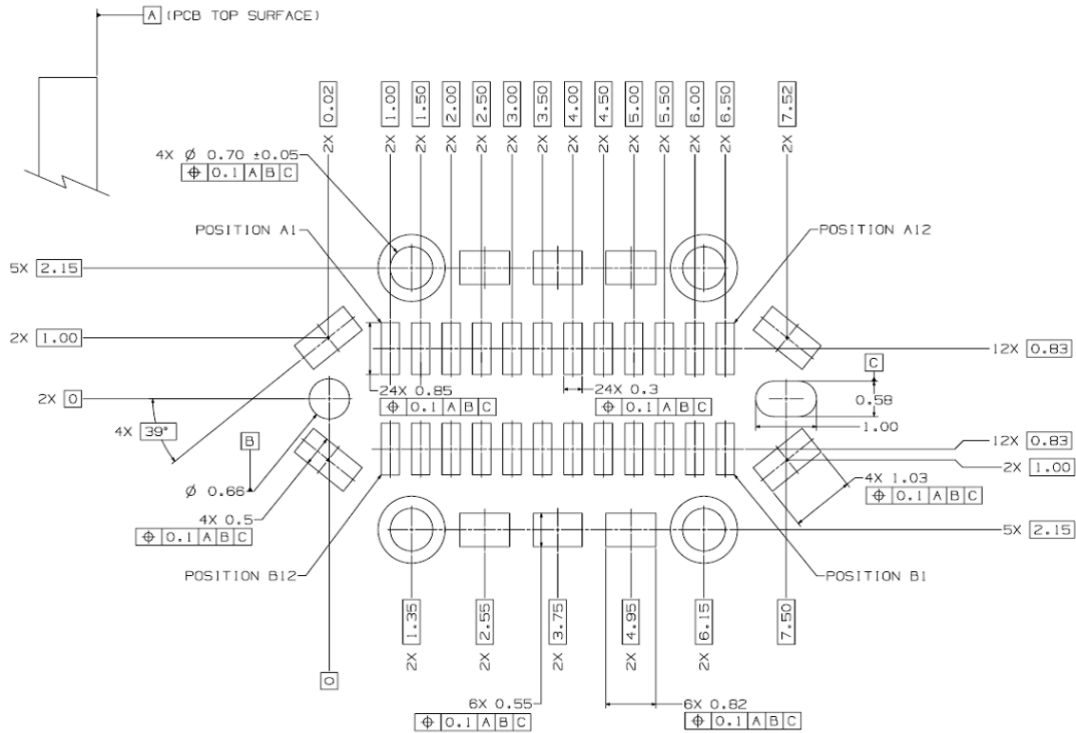
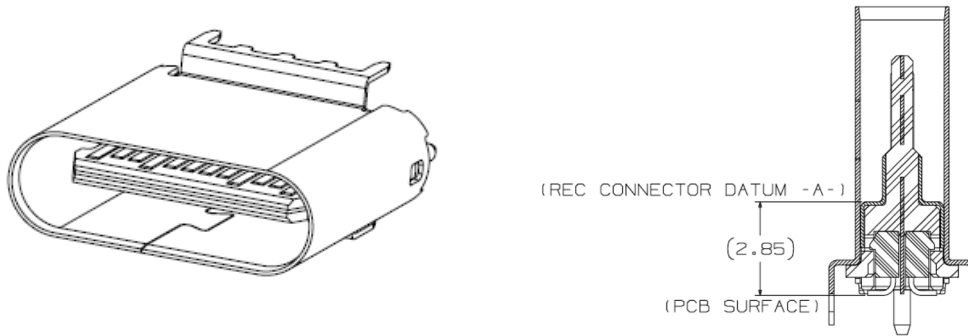


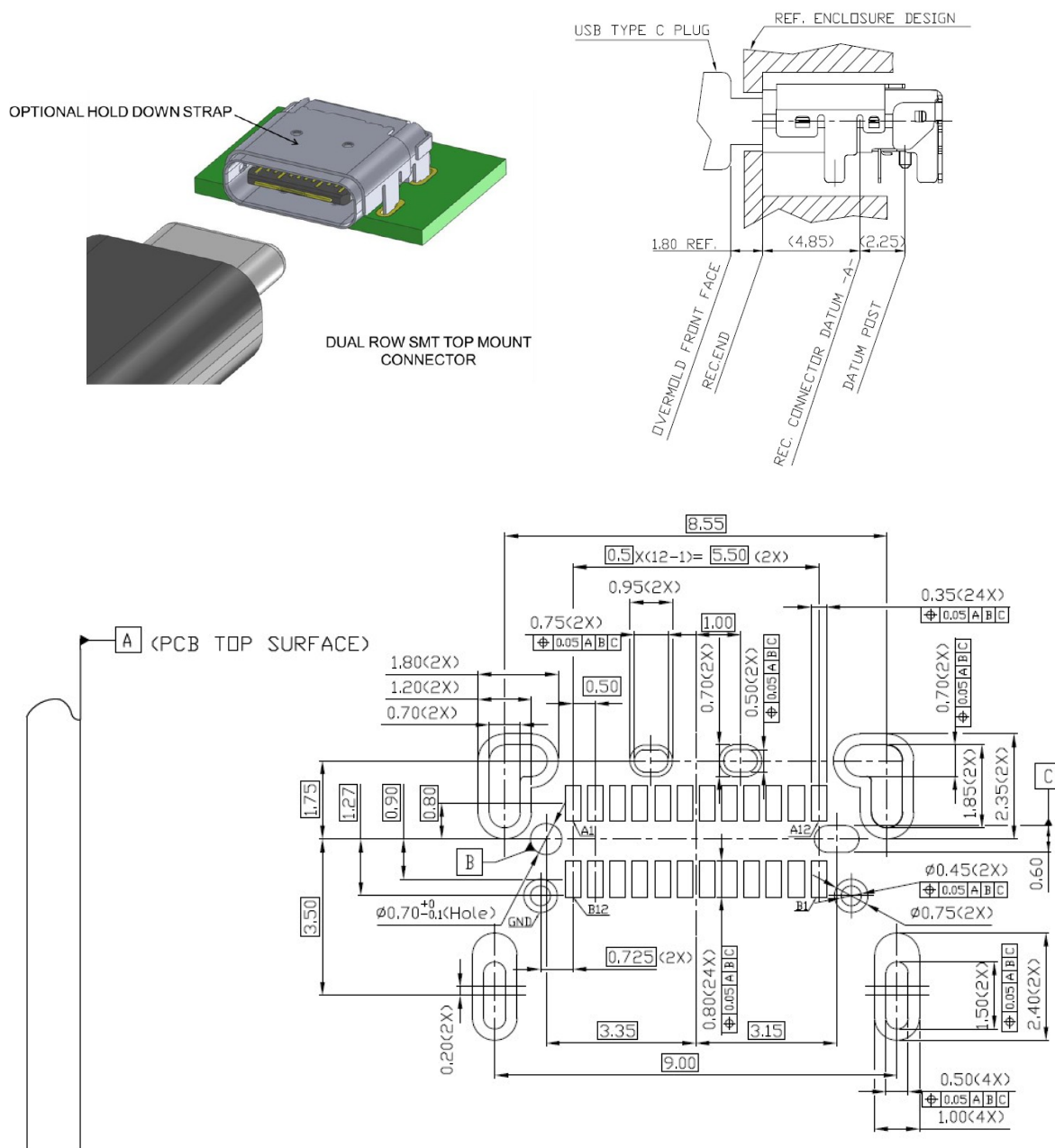
**Figure 3-4 Reference Footprint for a USB Type-C Vertical Mount Receptacle (Informative)**



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947 **Figure 3-5 Reference Footprint for a USB Type-C Dual-Row SMT Right Angle Receptacle**  
948 **(Informative)**

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**Figure 3-6 Reference Footprint for a USB Type-C Hybrid Right-Angle Receptacle (Informative)**

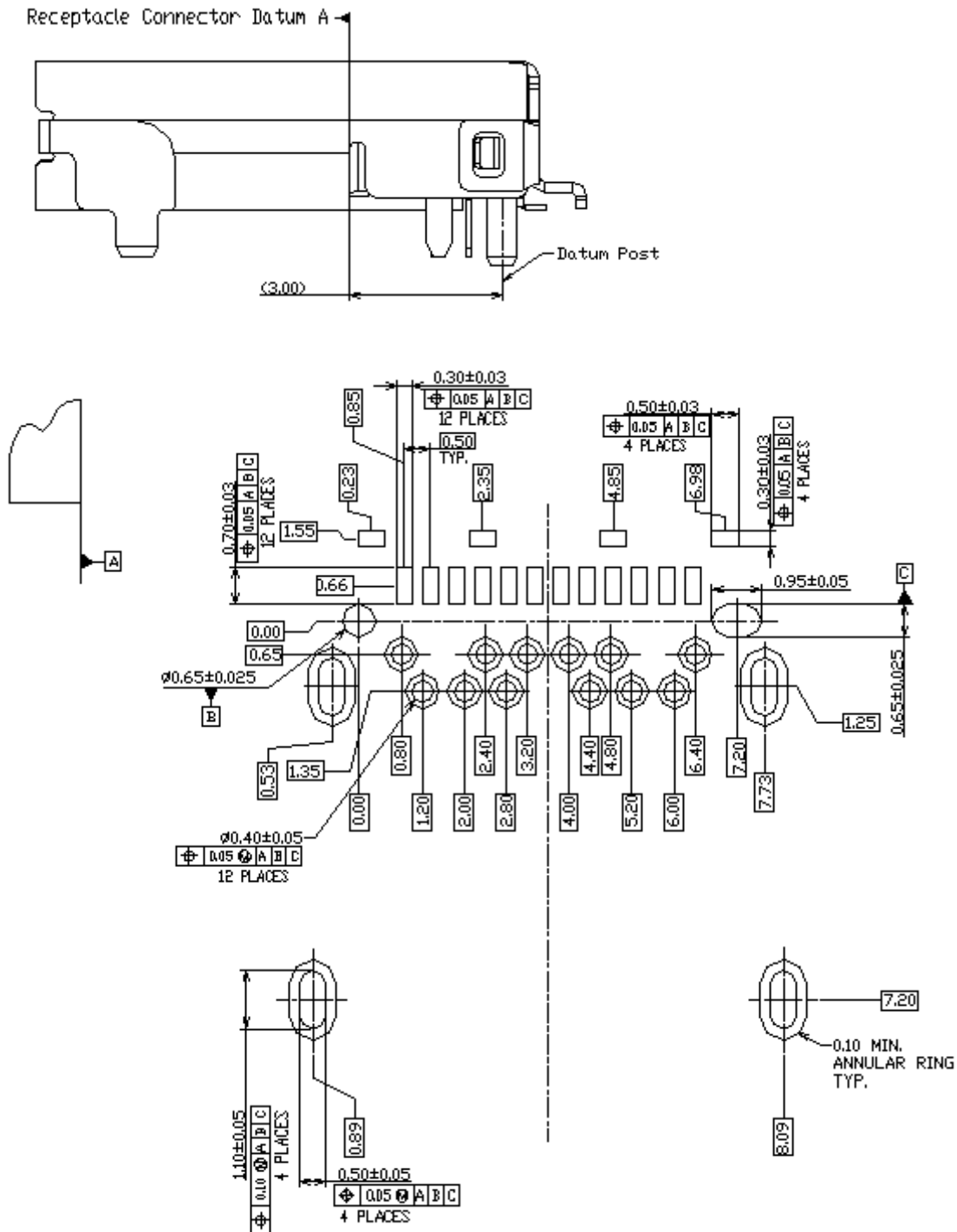
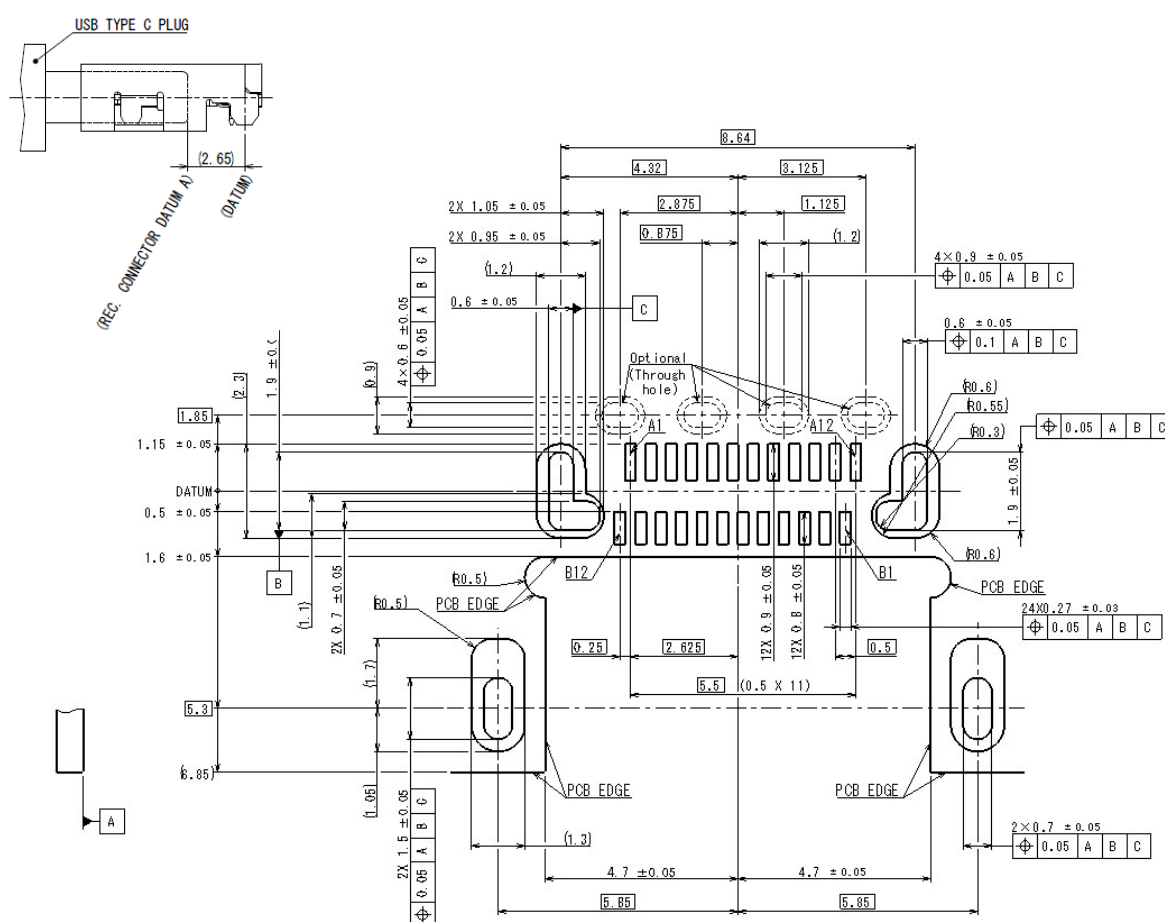
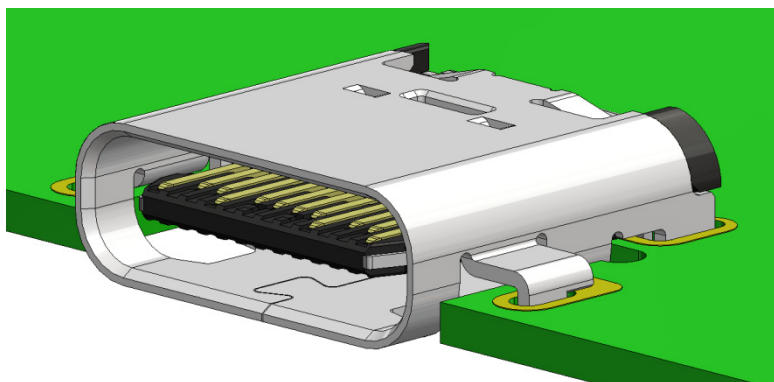
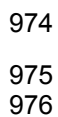


**Figure 3-7 Reference Footprint for a USB Type-C Mid-Mount Dual-Row SMT Receptacle (Informative)**

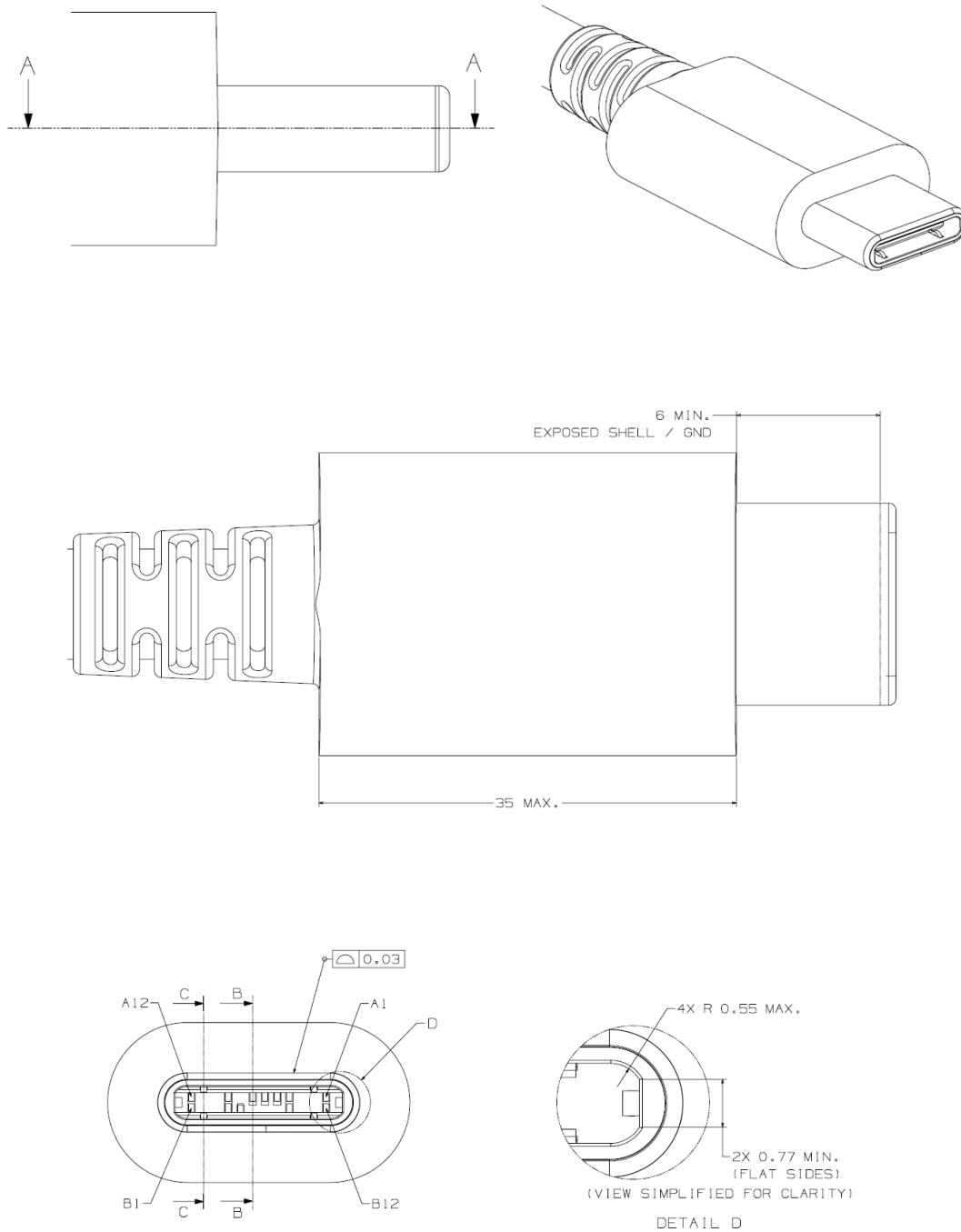


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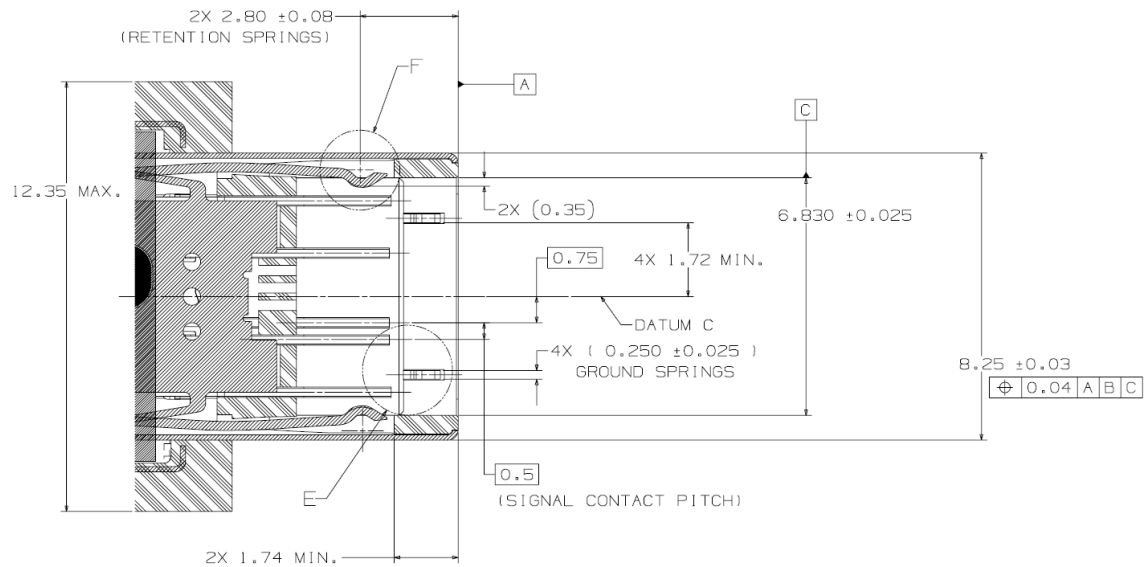


- 977 This specification requires that all contacts be present in the mating interface of the USB Type-C  
978 receptacle connector, but allows the plug to include only the contacts required for *USB PD* and  
979 *USB 2.0* functionality for applications that only support *USB 2.0*. The *USB 2.0* Type-C plug is  
980 shown in Figure 3-9. The following design simplifications may be made when only *USB 2.0* is  
981 supported:  
982
- 983 • Only the contacts necessary to support *USB PD* and *USB 2.0* are required in the plug. All  
984 other pin locations may be unpopulated. See Table 3-5. All contacts are required to be  
985 present in the mating interface of the USB Type-C receptacle connector.
  - 986 • Unlike the USB Full-Featured Type-C plug, the internal EMC springs may be formed from  
987 the same strip as the signal, power, and ground contacts. The internal EMC springs  
988 contact the inner surface of the plug shell and mate with the receptacle EMC pads when  
989 the plug is seated in the receptacle. Alternately, the *USB 2.0* Type-C plug may use the  
990 same EMC spring configuration as defined for the USB Full-Featured Type-C plug. The  
991 *USB 2.0* Type-C plug four EMC spring locations are defined in Figure 3-9. The alternate  
992 configuration using the six spring locations is defined in Figure 3-1. Also refer to the  
993 reference designs in 3.2.2.3 for further clarification.
  - 994 • A paddle card inside the plug may not be necessary if wires are directly attached to the  
995 contact pins.
- 996

Figure 3-9 **USB 2.0** Type-C Plug Interface Dimensions



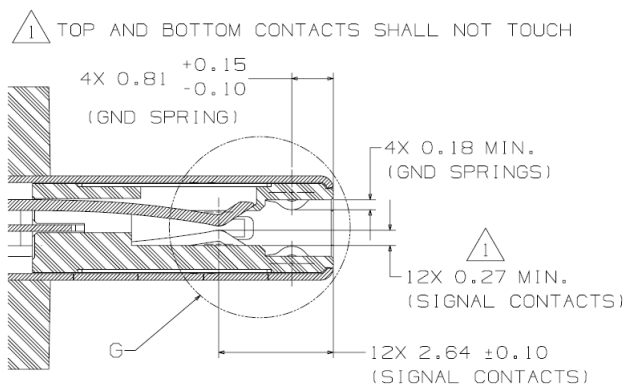
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**Figure 3-9 USB 2.0 Type-C Plug Interface Dimensions, cont.**

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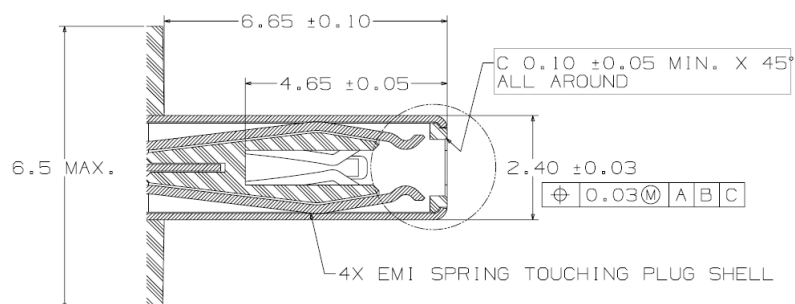
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SECTION B-B

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SECTION C-C

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