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## **Gränssnitt för seriebuss för datakommunikation (USB) – Del 1-2: Gemensamma komponenter – Specifikation för strömförsörjning (USB PD)**

*Universal serial bus interfaces for data and power –  
Part 1-2: Common components –  
USB Power Delivery specification*

Som svensk standard gäller europastandarden EN IEC 62680-1-2:2021. Den svenska standarden innehåller den officiella engelska språkversionen av EN IEC 62680-1-2:2021.

### **Nationellt förord**

Europastandarden EN IEC 62680-1-2:2021

består av:

- **europastandardens ikraftsättningsdokument**, utarbetat inom CENELEC
- **IEC 62680-1-2, Fifth edition, 2021 - Universal serial bus interfaces for data and power - Part 1-2: Common components - USB Power Delivery specification**

utarbetad inom International Electrotechnical Commission, IEC.

Tidigare fastställd svensk standard SS-EN IEC 62680-1-2, utgåva 4, 2020, gäller ej fr o m 2024-04-20.

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ICS 29.220.00; 33.120.00; 35.200.00

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English Version

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Common components - USB Power Delivery specification  
(IEC 62680-1-2:2021)

Interfaces de bus universel en série pour les données et  
l'alimentation électrique - Partie 1-2: Composants communs  
- Spécification de l'alimentation électrique par port USB  
(IEC 62680-1-2:2021)

Schnittstellen des Universellen Seriellen Busses für Daten  
und Energie - Teil 1-2: Gemeinsame Komponenten -  
Festlegung für die USB-Stromversorgung  
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## **European foreword**

The text of document 100/3440/CDV, future edition 5 of IEC 62680-1-2, prepared by IEC/TC 100 "Audio, video and multimedia systems and equipment" was submitted to the IEC-CENELEC parallel vote and approved by CENELEC as EN IEC 62680-1-2:2021.

The following dates are fixed:

- latest date by which the document has to be implemented at national level by publication of an identical national standard or by endorsement (dop) 2022-01-20
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**Universal serial bus interfaces for data and power**  
**Part 1-2: Common components – USB Power Delivery specification**

**Interfaces de bus universel en série pour les données et l'alimentation électrique**  
**Partie 1-2: Composants communs – Spécification de l'alimentation électrique**  
**par port USB**

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ICS 29.220; 33.120; 35.200

ISBN 978-2-8322-9288-4

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## UNIVERSAL SERIAL BUS INTERFACES FOR DATA AND POWER

### Part 1-2: Common components – USB Power Delivery specification

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International Standard IEC 62680-1-2 has been prepared by technical area 18: Multimedia home systems and applications for end-user networks, of IEC technical committee 100: Audio, video and multimedia systems and equipment.

The text of this standard was prepared by the USB Implementers Forum (USB-IF). The structure and editorial rules used in this publication reflect the practice of the organization which submitted it.

The text of this International Standard is based on the following documents:

|              |                  |
|--------------|------------------|
| CDV          | Report on voting |
| 100/3440/CDV | 100/3505/RVC     |

Full information on the voting for the approval of this International Standard can be found in the report on voting indicated in the above table.

This document has been drafted in accordance with the ISO/IEC Directives, Part 2.

The committee has decided that the contents of this document will remain unchanged until the stability date indicated on the IEC website under "<http://webstore.iec.ch>" in the data related to the specific document. At this date, the document will be

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## 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.

This standard is the USB-IF publication Universal Serial Bus Power Delivery Specification Revision 3.0, Version 2.0.

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 Power Delivery Specification

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***Revision:***                ***3.0***  
***Version:***                ***2.0***  
***Release date:***        ***29 August 2019***

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## Revision History

| Revision | Version | Comments                                 | Issue Date       |
|----------|---------|------------------------------------------|------------------|
| 1.0      | 1.0     | Initial release Revision 1.0             | 5 July, 2012     |
| 1.0      | 1.1     | Including errata through 31-October-2012 | 31 October 2012  |
| 1.0      | 1.2     | Including errata through 26-June-2013    | 26 June, 2013    |
| 1.0      | 1.3     | Including errata through 11-March-2014   | 11 March 2014    |
| 2.0      | 1.0     | Initial release Revision 2.0             | 11 August 2014   |
| 2.0      | 1.1     | Including errata through 7-May 2015      | 7 May 2015       |
| 2.0      | 1.2     | Including errata through 25-March-2016   | 25 March 2016    |
| 2.0      | 1.3     | Including errata through 11-January-2017 | 11 January 2017  |
| 3.0      | 1.0     | Initial release Revision 3.0             | 11 December 2015 |
| 3.0      | 1.0a    | Including errata through 25-March-2016   | 25 March 2016    |
| 3.0      | 1.1     | Including errata through 12-January-2016 | 12 January 2017  |
| 3.0      | 1.2     | Including errata through 21-June-2018    | 21 June 2018     |
| 3.0      | 2.0     | Including errata through 29-August-2019  | 29 August 2019   |

## Table of Contents

|                                              |           |
|----------------------------------------------|-----------|
| <b>INTELLECTUAL PROPERTY DISCLAIMER.....</b> | <b>6</b>  |
| <b>Chairs.....</b>                           | <b>7</b>  |
| <b>Editors.....</b>                          | <b>7</b>  |
| <b>Contributors.....</b>                     | <b>7</b>  |
| <b>Revision History .....</b>                | <b>13</b> |
| <b>Table of Contents .....</b>               | <b>14</b> |
| <b>List of Tables .....</b>                  | <b>22</b> |
| <b>List of Figures .....</b>                 | <b>30</b> |
| <b>1. Introduction .....</b>                 | <b>39</b> |
| 1.1 Overview.....                            | 39        |
| 1.2 Purpose.....                             | 40        |
| 1.3 Scope.....                               | 40        |
| 1.4 Conventions.....                         | 41        |
| 1.4.1 Precedence.....                        | 41        |
| 1.4.2 Keywords.....                          | 41        |
| 1.4.3 Numbering.....                         | 42        |
| 1.5 Related Documents.....                   | 42        |
| 1.6 Terms and Abbreviations .....            | 43        |
| 1.7 Parameter Values .....                   | 51        |
| 1.8 Changes from Revision 2.0 .....          | 51        |
| 1.9 Compatibility with Revision 2.0.....     | 51        |
| <b>2. Overview .....</b>                     | <b>52</b> |
| 2.1 Introduction .....                       | 52        |
| 2.2 Section Overview.....                    | 53        |
| 2.3 Compatibility with Revision 2.0.....     | 54        |
| 2.4 USB Power Delivery Capable Devices.....  | 54        |
| 2.5 SOP* Communication.....                  | 55        |
| 2.5.1 Introduction .....                     | 55        |
| 2.5.2 SOP* Collision Avoidance .....         | 55        |
| 2.5.3 SOP Communication .....                | 55        |

|           |                                                                        |           |
|-----------|------------------------------------------------------------------------|-----------|
| 2.5.4     | SOP'/SOP'' Communication with Cable Plugs .....                        | 55        |
| 2.6       | Operational Overview .....                                             | 57        |
| 2.6.1     | Source Operation .....                                                 | 57        |
| 2.6.2     | Sink Operation.....                                                    | 59        |
| 2.6.3     | Cable Plugs.....                                                       | 60        |
| 2.7       | Architectural Overview.....                                            | 61        |
| 2.7.1     | Policy.....                                                            | 64        |
| 2.7.2     | Message Formation and Transmission .....                               | 65        |
| 2.7.3     | Collision Avoidance.....                                               | 65        |
| 2.7.4     | Power supply .....                                                     | 66        |
| 2.7.5     | DFP/UFP .....                                                          | 66        |
| 2.7.6     | Cable and Connectors.....                                              | 67        |
| 2.7.7     | Interactions between Non-PD, BC and PD devices .....                   | 67        |
| 2.7.8     | Power Rules.....                                                       | 67        |
| <b>3.</b> | <b>USB Type-A and USB Type-B Cable Assemblies and Connectors .....</b> | <b>68</b> |
| <b>4.</b> | <b>Electrical Requirements .....</b>                                   | <b>69</b> |
| 4.1       | Interoperability with other USB Specifications .....                   | 69        |
| 4.2       | Dead Battery Detection / Unpowered Port Detection .....                | 69        |
| 4.3       | Cable IR Ground Drop (IR Drop).....                                    | 69        |
| 4.4       | Cable Type Detection.....                                              | 69        |
| <b>5.</b> | <b>Physical Layer .....</b>                                            | <b>70</b> |
| 5.1       | Physical Layer Overview.....                                           | 70        |
| 5.2       | Physical Layer Functions .....                                         | 70        |
| 5.3       | Symbol Encoding.....                                                   | 71        |
| 5.4       | Ordered Sets.....                                                      | 72        |
| 5.5       | Transmitted Bit Ordering .....                                         | 73        |
| 5.6       | Packet Format.....                                                     | 74        |
| 5.6.1     | Packet Framing.....                                                    | 74        |
| 5.6.2     | CRC.....                                                               | 76        |
| 5.6.3     | Packet Detection Errors .....                                          | 78        |
| 5.6.4     | Hard Reset.....                                                        | 78        |
| 5.6.5     | Cable Reset.....                                                       | 79        |
| 5.7       | Collision Avoidance .....                                              | 79        |
| 5.8       | Biphase Mark Coding (BMC) Signaling Scheme.....                        | 80        |
| 5.8.1     | Encoding and signaling.....                                            | 80        |

|           |                                       |           |
|-----------|---------------------------------------|-----------|
| 5.8.2     | Transmit and Receive Masks.....       | 83        |
| 5.8.3     | Transmitter Load Model .....          | 89        |
| 5.8.4     | BMC Common specifications.....        | 90        |
| 5.8.5     | BMC Transmitter Specifications .....  | 91        |
| 5.8.6     | BMC Receiver Specifications .....     | 93        |
| 5.9       | Built in Self-Test (BIST).....        | 97        |
| 5.9.1     | BIST Carrier Mode .....               | 97        |
| 5.9.2     | BIST Test Data.....                   | 97        |
| <b>6.</b> | <b>Protocol Layer .....</b>           | <b>98</b> |
| 6.1       | Overview.....                         | 98        |
| 6.2       | Messages.....                         | 98        |
| 6.2.1     | Message Construction.....             | 98        |
| 6.3       | Control Message.....                  | 108       |
| 6.3.1     | GoodCRC Message.....                  | 109       |
| 6.3.2     | GotoMin Message .....                 | 109       |
| 6.3.3     | Accept Message.....                   | 109       |
| 6.3.4     | Reject Message .....                  | 110       |
| 6.3.5     | Ping Message.....                     | 110       |
| 6.3.6     | PS_RDY Message.....                   | 110       |
| 6.3.7     | Get_Source_Cap Message .....          | 110       |
| 6.3.8     | Get_Sink_Cap Message.....             | 111       |
| 6.3.9     | DR_Swap Message.....                  | 111       |
| 6.3.10    | PR_Swap Message .....                 | 111       |
| 6.3.11    | VCONN_Swap Message .....              | 112       |
| 6.3.12    | Wait Message.....                     | 113       |
| 6.3.13    | Soft Reset Message .....              | 114       |
| 6.3.14    | Data_Reset Message .....              | 114       |
| 6.3.15    | Data_Reset_Complete Message.....      | 115       |
| 6.3.16    | Not_Supported Message.....            | 115       |
| 6.3.17    | Get_Source_Cap_Extended Message ..... | 115       |
| 6.3.18    | Get_Status Message .....              | 115       |
| 6.3.19    | FR_Swap Message .....                 | 115       |
| 6.3.20    | Get_PPS_Status .....                  | 116       |
| 6.3.21    | Get_Country_Codes.....                | 116       |
| 6.3.22    | Get_Sink_Cap_Extended Message .....   | 116       |

|        |                                            |     |
|--------|--------------------------------------------|-----|
| 6.4    | Data Message.....                          | 116 |
| 6.4.1  | Capabilities Message.....                  | 117 |
| 6.4.2  | Request Message.....                       | 126 |
| 6.4.3  | BIST Message.....                          | 131 |
| 6.4.4  | Vendor Defined Message .....               | 133 |
| 6.4.5  | Battery_Status Message.....                | 162 |
| 6.4.6  | Alert Message .....                        | 163 |
| 6.4.7  | Get_Country_Info Message .....             | 165 |
| 6.4.8  | Enter_USB Message.....                     | 165 |
| 6.5    | Extended Message.....                      | 167 |
| 6.5.1  | Source_Capabilities_Extended Message ..... | 168 |
| 6.5.2  | Status Message.....                        | 172 |
| 6.5.3  | Get_Battery_Cap Message .....              | 175 |
| 6.5.4  | Get_Battery_Status Message .....           | 175 |
| 6.5.5  | Battery_Capabilities Message .....         | 176 |
| 6.5.6  | Get_Manufacturer_Info Message.....         | 177 |
| 6.5.7  | Manufacturer_Info Message .....            | 177 |
| 6.5.8  | Security Messages.....                     | 178 |
| 6.5.9  | Firmware Update Messages .....             | 179 |
| 6.5.10 | PPS_Status Message .....                   | 180 |
| 6.5.11 | Country_Codes Message.....                 | 181 |
| 6.5.12 | Country_Info Message.....                  | 182 |
| 6.5.13 | Sink_Capabilities_Extended Message.....    | 182 |
| 6.6    | Timers.....                                | 186 |
| 6.6.1  | CRCReceiveTimer .....                      | 186 |
| 6.6.2  | SenderResponseTimer.....                   | 186 |
| 6.6.3  | Capability Timers.....                     | 186 |
| 6.6.4  | Wait Timers and Times .....                | 187 |
| 6.6.5  | Power Supply Timers .....                  | 188 |
| 6.6.6  | NoResponseTimer .....                      | 189 |
| 6.6.7  | BIST Timers.....                           | 190 |
| 6.6.8  | Power Role Swap Timers.....                | 190 |
| 6.6.9  | Soft Reset Timers .....                    | 190 |
| 6.6.10 | Data Reset Timers.....                     | 191 |
| 6.6.11 | Hard Reset Timers.....                     | 191 |
| 6.6.12 | Structured VDM Timers .....                | 192 |

|        |                                                        |     |
|--------|--------------------------------------------------------|-----|
| 6.6.13 | VCONN Timers.....                                      | 193 |
| 6.6.14 | tCableMessage.....                                     | 193 |
| 6.6.15 | DiscoverIdentityTimer .....                            | 193 |
| 6.6.16 | Collision Avoidance Timers.....                        | 193 |
| 6.6.17 | Fast Role Swap Timers.....                             | 194 |
| 6.6.18 | Chunking Timers.....                                   | 194 |
| 6.6.19 | Programmable Power Supply Timers .....                 | 195 |
| 6.6.20 | tEnterUSB.....                                         | 195 |
| 6.6.21 | Time Values and Timers.....                            | 196 |
| 6.7    | Counters.....                                          | 200 |
| 6.7.1  | MessageID Counter .....                                | 200 |
| 6.7.2  | Retry Counter .....                                    | 200 |
| 6.7.3  | Hard Reset Counter.....                                | 201 |
| 6.7.4  | Capabilities Counter.....                              | 201 |
| 6.7.5  | Discover Identity Counter .....                        | 201 |
| 6.7.6  | VDMBusyCounter.....                                    | 201 |
| 6.7.7  | Counter Values and Counters .....                      | 201 |
| 6.8    | Reset.....                                             | 202 |
| 6.8.1  | Soft Reset and Protocol Error .....                    | 202 |
| 6.8.2  | Data Reset .....                                       | 204 |
| 6.8.3  | Hard Reset.....                                        | 204 |
| 6.8.4  | Cable Reset.....                                       | 205 |
| 6.9    | Collision Avoidance .....                              | 205 |
| 6.10   | Message Discarding.....                                | 205 |
| 6.11   | State behavior.....                                    | 207 |
| 6.11.1 | Introduction to state diagrams used in Chapter 6 ..... | 207 |
| 6.11.2 | State Operation .....                                  | 207 |
| 6.11.3 | List of Protocol Layer States.....                     | 229 |
| 6.12   | Message Applicability.....                             | 231 |
| 6.12.1 | Applicability of Control Messages.....                 | 232 |
| 6.12.2 | Applicability of Data Messages.....                    | 233 |
| 6.12.3 | Applicability of Extended Messages.....                | 234 |
| 6.12.4 | Applicability of Structured VDM Commands.....          | 235 |
| 6.12.5 | Applicability of Reset Signaling.....                  | 236 |
| 6.12.6 | Applicability of Fast Role Swap signal.....            | 236 |
| 6.13   | Value Parameters .....                                 | 237 |

## 7. Power Supply.....238

|        |                                                                  |     |
|--------|------------------------------------------------------------------|-----|
| 7.1    | Source Requirements .....                                        | 238 |
| 7.1.1  | Behavioral Aspects .....                                         | 238 |
| 7.1.2  | Source Bulk Capacitance.....                                     | 238 |
| 7.1.3  | Types of Sources.....                                            | 238 |
| 7.1.4  | Source Transitions.....                                          | 239 |
| 7.1.5  | Response to Hard Resets .....                                    | 246 |
| 7.1.6  | Changing the Output Power Capability.....                        | 247 |
| 7.1.7  | Robust Source Operation.....                                     | 247 |
| 7.1.8  | Output Voltage Tolerance and Range .....                         | 248 |
| 7.1.9  | Charging and Discharging the Bulk Capacitance on $V_{BUS}$ ..... | 249 |
| 7.1.10 | Swap Standby for Sources .....                                   | 249 |
| 7.1.11 | Source Peak Current Operation .....                              | 250 |
| 7.1.12 | Source Capabilities Extended Parameters.....                     | 251 |
| 7.1.13 | Fast Role Swap .....                                             | 253 |
| 7.1.14 | Non-application of $V_{BUS}$ Slew Rate Limits .....              | 254 |
| 7.1.15 | VCONN Power Cycle .....                                          | 255 |
| 7.2    | Sink Requirements.....                                           | 256 |
| 7.2.1  | Behavioral Aspects .....                                         | 256 |
| 7.2.2  | Sink Bulk Capacitance .....                                      | 256 |
| 7.2.3  | Sink Standby.....                                                | 257 |
| 7.2.4  | Suspend Power Consumption.....                                   | 257 |
| 7.2.5  | Zero Negotiated Current.....                                     | 257 |
| 7.2.6  | Transient Load Behavior .....                                    | 257 |
| 7.2.7  | Swap Standby for Sinks .....                                     | 258 |
| 7.2.8  | Sink Peak Current Operation .....                                | 258 |
| 7.2.9  | Robust Sink Operation.....                                       | 258 |
| 7.2.10 | Fast Role Swap .....                                             | 259 |
| 7.3    | Transitions .....                                                | 261 |
| 7.3.1  | Increasing the Current.....                                      | 262 |
| 7.3.2  | Increasing the Voltage.....                                      | 264 |
| 7.3.3  | Increasing the Voltage and Current.....                          | 266 |
| 7.3.4  | Increasing the Voltage and Decreasing the Current.....           | 268 |
| 7.3.5  | Decreasing the Voltage and Increasing the Current.....           | 270 |
| 7.3.6  | Decreasing the Current.....                                      | 272 |

|           |                                                                      |            |
|-----------|----------------------------------------------------------------------|------------|
| 7.3.7     | Decreasing the Voltage .....                                         | 274        |
| 7.3.8     | Decreasing the Voltage and the Current.....                          | 276        |
| 7.3.9     | Sink Requested Power Role Swap.....                                  | 278        |
| 7.3.10    | Source Requested Power Role Swap .....                               | 281        |
| 7.3.11    | GotoMin Current Decrease.....                                        | 284        |
| 7.3.12    | Source Initiated Hard Reset.....                                     | 286        |
| 7.3.13    | Sink Initiated Hard Reset.....                                       | 288        |
| 7.3.14    | No change in Current or Voltage.....                                 | 290        |
| 7.3.15    | Fast Role Swap .....                                                 | 292        |
| 7.3.16    | Increasing the Programmable Power Supply Voltage .....               | 294        |
| 7.3.17    | Decreasing the Programmable Power Supply Voltage.....                | 296        |
| 7.3.18    | Changing the Source PDO or APDO .....                                | 298        |
| 7.3.19    | Increasing the Programmable Power Supply Current .....               | 300        |
| 7.3.20    | Decreasing the Programmable Power Supply Current .....               | 302        |
| 7.3.21    | Same Request Programmable Power Supply.....                          | 304        |
| 7.4       | Electrical Parameters .....                                          | 305        |
| 7.4.1     | Source Electrical Parameters.....                                    | 305        |
| 7.4.2     | Sink Electrical Parameters .....                                     | 309        |
| 7.4.3     | Common Electrical Parameters .....                                   | 310        |
| <b>8.</b> | <b>Device Policy .....</b>                                           | <b>312</b> |
| 8.1       | Overview.....                                                        | 312        |
| 8.2       | Device Policy Manager .....                                          | 312        |
| 8.2.1     | Capabilities .....                                                   | 313        |
| 8.2.2     | System Policy .....                                                  | 313        |
| 8.2.3     | Control of Source/Sink .....                                         | 314        |
| 8.2.4     | Cable Detection.....                                                 | 314        |
| 8.2.5     | Managing Power Requirements.....                                     | 314        |
| 8.2.6     | Use of “Unconstrained Power” bit with Batteries and AC supplies..... | 316        |
| 8.2.7     | Interface to the Policy Engine .....                                 | 318        |
| 8.3       | Policy Engine.....                                                   | 319        |
| 8.3.1     | Introduction .....                                                   | 319        |
| 8.3.2     | Atomic Message Sequence Diagrams.....                                | 319        |
| 8.3.3     | State Diagrams .....                                                 | 479        |
| <b>9.</b> | <b>States and Status Reporting.....</b>                              | <b>567</b> |
| 9.1       | Overview.....                                                        | 567        |

|            |                                                          |            |
|------------|----------------------------------------------------------|------------|
| 9.1.1      | PDUSB Device and Hub Requirements .....                  | 569        |
| 9.1.2      | Mapping to USB Device States .....                       | 569        |
| 9.1.3      | PD Software Stack.....                                   | 572        |
| 9.1.4      | PDUSB Device Enumeration .....                           | 572        |
| 9.2        | PD Specific Descriptors.....                             | 574        |
| 9.2.1      | USB Power Delivery Capability Descriptor .....           | 574        |
| 9.2.2      | Battery Info Capability Descriptor.....                  | 575        |
| 9.2.3      | PD Consumer Port Capability Descriptor .....             | 576        |
| 9.2.4      | PD Provider Port Capability Descriptor .....             | 576        |
| 9.3        | PD Specific Requests and Events .....                    | 578        |
| 9.3.1      | PD Specific Requests.....                                | 578        |
| 9.4        | PDUSB Hub and PDUSB Peripheral Device Requests.....      | 579        |
| 9.4.1      | GetBatteryStatus .....                                   | 579        |
| 9.4.2      | SetPDFeature .....                                       | 580        |
| <b>10.</b> | <b>Power Rules .....</b>                                 | <b>582</b> |
| 10.1       | Introduction .....                                       | 582        |
| 10.2       | Source Power Rules.....                                  | 582        |
| 10.2.1     | Source Power Rule Considerations .....                   | 582        |
| 10.2.2     | Normative Voltages and Currents.....                     | 583        |
| 10.2.3     | Optional Voltages/Currents.....                          | 586        |
| 10.2.4     | Power sharing between ports.....                         | 588        |
| 10.3       | Sink Power Rules.....                                    | 588        |
| 10.3.1     | Sink Power Rule Considerations .....                     | 588        |
| 10.3.2     | Normative Sink Rules .....                               | 588        |
| <b>A.</b>  | <b>CRC calculation .....</b>                             | <b>590</b> |
| A.1        | C code example.....                                      | 590        |
| A.2        | Table showing the full calculation over one Message..... | 592        |
| <b>B.</b>  | <b>PD Message Sequence Examples .....</b>                | <b>593</b> |
| B.1        | External power is supplied downstream .....              | 593        |
| B.2        | External power is supplied upstream.....                 | 597        |
| B.3        | Giving back power .....                                  | 604        |
| <b>C.</b>  | <b>VDM Command Examples.....</b>                         | <b>616</b> |
| C.1        | Discover Identity Example .....                          | 616        |
| C.1.1      | Discover Identity Command request.....                   | 616        |
| C.1.2      | Discover Identity Command response – Active Cable .....  | 616        |

|           |                                                       |            |
|-----------|-------------------------------------------------------|------------|
| C.1.3     | Discover Identity Command response – Hub.....         | 618        |
| C.2       | Discover SVIDs Example .....                          | 619        |
| C.2.1     | Discover SVIDs Command request .....                  | 619        |
| C.2.1     | Discover SVIDs Command response .....                 | 619        |
| C.3       | Discover Modes Example .....                          | 621        |
| C.3.1     | Discover Modes Command request.....                   | 621        |
| C.3.2     | Discover Modes Command response.....                  | 621        |
| C.4       | Enter Mode Example.....                               | 623        |
| C.4.1     | Enter Mode Command request .....                      | 623        |
| C.4.2     | Enter Mode Command response .....                     | 623        |
| C.4.1     | Enter Mode Command request with additional VDO.....   | 624        |
| C.5       | Exit Mode Example .....                               | 625        |
| C.5.1     | Exit Mode Command request.....                        | 625        |
| C.5.2     | Exit Mode Command response.....                       | 625        |
| C.6       | Attention Example .....                               | 627        |
| C.6.1     | Attention Command request.....                        | 627        |
| C.6.2     | Attention Command request with additional VDO .....   | 627        |
| <b>D.</b> | <b>BMC Receiver Design Examples .....</b>             | <b>629</b> |
| D.1       | Finite Difference Scheme .....                        | 629        |
| D.1.1     | Sample Circuitry .....                                | 629        |
| D.1.2     | Theory.....                                           | 629        |
| D.1.3     | Data Recovery.....                                    | 631        |
| D.1.4     | Noise Zone and Detection Zone .....                   | 632        |
| D.2       | Subtraction Scheme.....                               | 632        |
| D.2.1     | Sample Circuitry .....                                | 632        |
| D.2.2     | Output of Each Circuit Block .....                    | 633        |
| D.2.3     | Subtractor Output at Power Source and Power Sink..... | 633        |
| D.2.4     | Noise Zone and Detection Zone .....                   | 634        |
| <b>E.</b> | <b>FRS System Level Example .....</b>                 | <b>635</b> |
| E.1       | Overview.....                                         | 635        |
| E.2       | FRS Initial Setup.....                                | 637        |
| E.3       | FRS Process.....                                      | 639        |

## List of Tables

|                                        |    |
|----------------------------------------|----|
| Table 1-1 Terms and Abbreviations..... | 43 |
|----------------------------------------|----|

|                                                                              |     |
|------------------------------------------------------------------------------|-----|
| Table 5-1 4b5b Symbol Encoding Table .....                                   | 71  |
| Table 5-2 Ordered Sets.....                                                  | 72  |
| Table 5-3 Validation of Ordered Sets .....                                   | 72  |
| Table 5-4 Data Size.....                                                     | 73  |
| Table 5-5 SOP ordered set .....                                              | 74  |
| Table 5-6 SOP' ordered set .....                                             | 75  |
| Table 5-7 SOP'' ordered set.....                                             | 75  |
| Table 5-8 SOP'_Debug ordered set.....                                        | 76  |
| Table 5-9 SOP''_Debug ordered set.....                                       | 76  |
| Table 5-10 CRC-32 Mapping .....                                              | 77  |
| Table 5-11 Hard Reset ordered set.....                                       | 78  |
| Table 5-12 Cable Reset ordered set.....                                      | 79  |
| Table 5-13 Rp values used for Collision Avoidance .....                      | 80  |
| Table 5-14 BMC Tx Mask Definition, X Values.....                             | 84  |
| Table 5-15 BMC Tx Mask Definition, Y Values.....                             | 85  |
| Table 5-16 BMC Rx Mask Definition.....                                       | 89  |
| Table 5-17 BMC Common Normative Requirements .....                           | 91  |
| Table 5-18 BMC Transmitter Normative Requirements .....                      | 91  |
| Table 5-19 BMC Receiver Normative Requirements.....                          | 94  |
| Table 6-1 Message Header.....                                                | 99  |
| Table 6-2 Revision Interoperability during an Explicit Contract.....         | 102 |
| Table 6-3 Extended Message Header .....                                      | 103 |
| Table 6-4 Use of Unchunked Message Supported bit .....                       | 105 |
| Table 6-5 Control Message Types.....                                         | 108 |
| Table 6-6 Data Message Types.....                                            | 116 |
| Table 6-7 Power Data Object.....                                             | 118 |
| Table 6-8 Augmented Power Data Object.....                                   | 118 |
| Table 6-9 Fixed Supply PDO - Source.....                                     | 120 |
| Table 6-10 Fixed Power Source Peak Current Capability.....                   | 122 |
| Table 6-11 Variable Supply (non-Battery) PDO - Source.....                   | 122 |
| Table 6-12 Battery Supply PDO - Source.....                                  | 123 |
| Table 6-13 Programmable Power Supply APDO - Source .....                     | 123 |
| Table 6-14 Fixed Supply PDO - Sink.....                                      | 124 |
| Table 6-15 Variable Supply (non-Battery) PDO - Sink.....                     | 126 |
| Table 6-16 Battery Supply PDO - Sink.....                                    | 126 |
| Table 6-17 Programmable Power Supply APDO - Sink.....                        | 126 |
| Table 6-18 Fixed and Variable Request Data Object.....                       | 127 |
| Table 6-19 Fixed and Variable Request Data Object with GiveBack Support..... | 127 |

|                                                                    |     |
|--------------------------------------------------------------------|-----|
| Table 6-20 Battery Request Data Object .....                       | 127 |
| Table 6-21 Battery Request Data Object with GiveBack Support ..... | 128 |
| Table 6-22 Programmable Request Data Object.....                   | 128 |
| Table 6-23 BIST Data Object .....                                  | 132 |
| Table 6-24 Unstructured VDM Header .....                           | 134 |
| Table 6-25 Structured VDM Header .....                             | 135 |
| Table 6-26 Structured VDM Commands .....                           | 136 |
| Table 6-27 SVID Values.....                                        | 136 |
| Table 6-28 Commands and Responses .....                            | 138 |
| Table 6-29 ID Header VDO .....                                     | 140 |
| Table 6-30 Product Types (UFP) .....                               | 141 |
| Table 6-31 Product Types (Cable Plug) .....                        | 141 |
| Table 6-32 Product Types (DFP) .....                               | 141 |
| Table 6-33 Cert Stat VDO.....                                      | 142 |
| Table 6-34 Product VDO .....                                       | 142 |
| Table 6-35 UFP VDO 1 .....                                         | 143 |
| Table 6-36 UFP VDO 2 .....                                         | 144 |
| Table 6-37 DFP VDO .....                                           | 145 |
| Table 6-38 Passive Cable VDO .....                                 | 146 |
| Table 6-39 Active Cable VDO 1 .....                                | 148 |
| Table 6-40 Active Cable VDO 2 .....                                | 150 |
| Table 6-41 AMA VDO.....                                            | 152 |
| Table 6-42 VPD VDO.....                                            | 153 |
| Table 6-43 Discover SVIDs Responder VDO.....                       | 154 |
| Table 6-44 Battery Status Data Object (BSDO) .....                 | 162 |
| Table 6-45 Alert Data Object .....                                 | 163 |
| Table 6-46 Country Code Data Object .....                          | 165 |
| Table 6-47 Enter_USB Data Object.....                              | 166 |
| Table 6-48 Extended Message Types.....                             | 167 |
| Table 6-49 Source Capabilities Extended Data Block (SCEDB).....    | 168 |
| Table 6-50 SOP Status Data Block (SDB).....                        | 172 |
| Table 6-51 SOP'/SOP'' Status Data Block (SDB).....                 | 175 |
| Table 6-52 Get Battery Cap Data Block (GBCDB) .....                | 175 |
| Table 6-53 Get Battery Status Data Block (GBSDB) .....             | 176 |
| Table 6-54 Battery Capability Data Block (BCDB).....               | 176 |
| Table 6-55 Get Manufacturer Info Data Block (GMIDB).....           | 177 |
| Table 6-56 Manufacturer Info Data Block (MIDB).....                | 178 |
| Table 6-57 PPS Status Data Block (PPSSDB) .....                    | 180 |

|                                                                                            |     |
|--------------------------------------------------------------------------------------------|-----|
| Table 6-58 Country Codes Data Block (CCDB) .....                                           | 181 |
| Table 6-59 Country Info Data Block (CIDB).....                                             | 182 |
| Table 6-60 Sink Capabilities Extended Data Block (SKEDB).....                              | 183 |
| Table 6-61 Time Values .....                                                               | 197 |
| Table 6-62 Timers .....                                                                    | 198 |
| Table 6-63 Counter parameters.....                                                         | 201 |
| Table 6-64 Counters .....                                                                  | 202 |
| Table 6-65 Response to an incoming Message (except VDM) .....                              | 203 |
| Table 6-66 Response to an incoming VDM.....                                                | 204 |
| Table 6-67 Message discarding .....                                                        | 206 |
| Table 6-68 Protocol Layer States.....                                                      | 229 |
| Table 6-69 Applicability of Control Messages.....                                          | 232 |
| Table 6-70 Applicability of Data Messages.....                                             | 233 |
| Table 6-71 Applicability of Extended Messages .....                                        | 234 |
| Table 6-72 Applicability of Structured VDM Commands .....                                  | 235 |
| Table 6-73 Applicability of Reset Signaling .....                                          | 236 |
| Table 6-74 Applicability of Fast Role Swap signal .....                                    | 236 |
| Table 6-75 Value Parameters .....                                                          | 237 |
| Table 7-1 Sequence Description for Increasing the Current.....                             | 263 |
| Table 7-2 Sequence Description for Increasing the Voltage.....                             | 265 |
| Table 7-3 Sequence Diagram for Increasing the Voltage and Current.....                     | 267 |
| Table 7-4 Sequence Description for Increasing the Voltage and Decreasing the Current.....  | 269 |
| Table 7-5 Sequence Description for Decreasing the Voltage and Increasing the Current.....  | 271 |
| Table 7-6 Sequence Description for Decreasing the Current.....                             | 273 |
| Table 7-7 Sequence Description for Decreasing the Voltage .....                            | 275 |
| Table 7-8 Sequence Description for Decreasing the Voltage and the Current.....             | 277 |
| Table 7-9 Sequence Description for a Sink Requested Power Role Swap.....                   | 279 |
| Table 7-10 Sequence Description for a Source Requested Power Role Swap .....               | 282 |
| Table 7-11 Sequence Description for a GotoMin Current Decrease.....                        | 285 |
| Table 7-12 Sequence Description for a Source Initiated Hard Reset.....                     | 287 |
| Table 7-13 Sequence Description for a Sink Initiated Hard Reset.....                       | 289 |
| Table 7-14 Sequence Description for no change in Current or Voltage .....                  | 291 |
| Table 7-15 Sequence Description for Fast Role Swap .....                                   | 292 |
| Table 7-16 Sequence Description for Increasing the Programmable Power Supply Voltage ..... | 294 |
| Table 7-17 Sequence Description for Decreasing the Programmable Power Supply Voltage ..... | 297 |
| Table 7-18 Sequence Description for Changing the Source PDO or APDO .....                  | 298 |
| Table 7-19 Sequence Description for increasing the Current in PPS mode .....               | 301 |
| Table 7-20 Sequence Description for decreasing the Current in PPS mode .....               | 303 |

|                                                                                                         |     |
|---------------------------------------------------------------------------------------------------------|-----|
| Table 7-21 Sequence Description for increasing the Current in PPS mode .....                            | 304 |
| Table 7-22 Source Electrical Parameters.....                                                            | 305 |
| Table 7-23 Sink Electrical Parameters .....                                                             | 309 |
| Table 7-24 Common Source/Sink Electrical Parameters .....                                               | 311 |
| Table 8-1 Basic Message Flow .....                                                                      | 320 |
| Table 8-2 Potential issues in Basic Message Flow .....                                                  | 321 |
| Table 8-3 Basic Message Flow with CRC failure .....                                                     | 322 |
| Table 8-4 Interruptible and Non-interruptible AMS.....                                                  | 324 |
| Table 8-5 Steps for a successful Power Negotiation .....                                                | 326 |
| Table 8-6 Steps for a GotoMin Negotiation .....                                                         | 329 |
| Table 8-7 Steps for a successful Power Negotiation .....                                                | 331 |
| Table 8-8 Steps for a Soft Reset.....                                                                   | 334 |
| Table 8-9 Steps for a DFP Initiated Data Reset where the DFP is the Vconn Source.....                   | 337 |
| Table 8-10 Steps for a DFP Receiving a Data Reset where the DFP is the Vconn Source .....               | 340 |
| Table 8-11 Steps for a DFP Initiated Data Reset where the UFP is the Vconn Source .....                 | 343 |
| Table 8-12 Steps for a DFP Receiving a Data Reset where the UFP is the Vconn Source .....               | 347 |
| Table 8-13 Steps for Source initiated Hard Reset .....                                                  | 351 |
| Table 8-14 Steps for Sink initiated Hard Reset .....                                                    | 354 |
| Table 8-15 Steps for Source initiated Hard Reset – Sink long reset.....                                 | 357 |
| Table 8-16 Steps for a Successful Source Initiated Power Role Swap Sequence.....                        | 360 |
| Table 8-17 Steps for a Successful Sink Initiated Power Role Swap Sequence.....                          | 366 |
| Table 8-18 Steps for a Successful Fast Role Swap Sequence.....                                          | 371 |
| Table 8-19 Steps for Data Role Swap, UFP operating as Sink initiates.....                               | 374 |
| Table 8-20 Steps for Data Role Swap, UFP operating as Source initiates.....                             | 376 |
| Table 8-21 Steps for Data Role Swap, DFP operating as Source initiates.....                             | 378 |
| Table 8-22 Steps for Data Role Swap, DFP operating as Sink initiates.....                               | 380 |
| Table 8-23 Steps for Source to Sink VCONN Source Swap.....                                              | 383 |
| Table 8-24 Steps for Sink to Source VCONN Source Swap.....                                              | 386 |
| Table 8-25 Steps for Source Alert to Sink .....                                                         | 389 |
| Table 8-26 Steps for Sink Alert to Source .....                                                         | 390 |
| Table 8-27 Steps for a Sink getting Source Status Sequence.....                                         | 391 |
| Table 8-28 Steps for a Source getting Sink Status Sequence.....                                         | 393 |
| Table 8-29 Steps for a Sink getting Source PPS status Sequence .....                                    | 395 |
| Table 8-30 Steps for a Sink getting Source Capabilities Sequence .....                                  | 397 |
| Table 8-31 Steps for a Dual-Role Source getting Dual-Role Sink’s capabilities as a Source Sequence..... | 399 |
| Table 8-32 Steps for a Source getting Sink Capabilities Sequence .....                                  | 401 |
| Table 8-33 Steps for a Dual-Role Sink getting Dual-Role Source capabilities as a Sink Sequence .....    | 403 |
| Table 8-34 Steps for a Sink getting Source extended capabilities Sequence .....                         | 405 |

|                                                                                                            |     |
|------------------------------------------------------------------------------------------------------------|-----|
| Table 8-35 Steps for a Dual-Role Source getting Dual-Role Sink extended capabilities Sequence .....        | 407 |
| Table 8-36 Steps for a Sink getting Source Battery capabilities Sequence .....                             | 409 |
| Table 8-37 Steps for a Source getting Sink Battery capabilities Sequence .....                             | 411 |
| Table 8-38 Steps for a Sink getting Source Battery status Sequence .....                                   | 413 |
| Table 8-39 Steps for a Source getting Sink Battery status Sequence .....                                   | 415 |
| Table 8-40 Steps for a Source getting Sink's Port Manufacturer Information Sequence .....                  | 417 |
| Table 8-41 Steps for a Source getting Sink's Port Manufacturer Information Sequence .....                  | 419 |
| Table 8-42 Steps for a Source getting Sink's Battery Manufacturer Information Sequence .....               | 421 |
| Table 8-43 Steps for a Source getting Sink's Battery Manufacturer Information Sequence .....               | 423 |
| Table 8-44 Steps for a VCONN Source getting Sink's Port Manufacturer Information Sequence .....            | 425 |
| Table 8-45 Steps for a Source getting Country Codes Sequence .....                                         | 427 |
| Table 8-46 Steps for a Source getting Sink's Country Codes Sequence .....                                  | 429 |
| Table 8-47 Steps for a VCONN Source getting Sink's Country Codes Sequence .....                            | 431 |
| Table 8-48 Steps for a Source getting Country Information Sequence .....                                   | 433 |
| Table 8-49 Steps for a Source getting Sink's Country Information Sequence .....                            | 435 |
| Table 8-50 Steps for a VCONN Source getting Sink's Country Information Sequence .....                      | 437 |
| Table 8-51 Steps for a Source requesting a security exchange with a Sink Sequence .....                    | 439 |
| Table 8-52 Steps for a Sink requesting a security exchange with a Source Sequence .....                    | 441 |
| Table 8-53 Steps for a Vconn Source requesting a security exchange with a Cable Plug Sequence .....        | 443 |
| Table 8-54 Steps for a Source requesting a firmware update exchange with a Sink Sequence .....             | 445 |
| Table 8-55 Steps for a Sink requesting a firmware update exchange with a Source Sequence .....             | 447 |
| Table 8-56 Steps for a Vconn Source requesting a firmware update exchange with a Cable Plug Sequence ..... | 449 |
| Table 8-57 Steps for DFP to UFP Discover Identity .....                                                    | 451 |
| Table 8-58 Steps for Source Port to Cable Plug Discover Identity .....                                     | 453 |
| Table 8-59 Steps for DFP to Cable Plug Discover Identity .....                                             | 455 |
| Table 8-60 Steps for DFP to UFP Enter Mode .....                                                           | 457 |
| Table 8-61 Steps for DFP to UFP Exit Mode .....                                                            | 459 |
| Table 8-62 Steps for DFP to Cable Plug Enter Mode .....                                                    | 462 |
| Table 8-63 Steps for DFP to Cable Plug Exit Mode .....                                                     | 464 |
| Table 8-64 Steps for UFP to DFP Attention .....                                                            | 466 |
| Table 8-65 Steps for BIST Carrier Mode Test .....                                                          | 468 |
| Table 8-66 Steps for BIST Test Data Test .....                                                             | 470 |
| Table 8-67 Steps for UFP USB4 Mode Entry (Valid) .....                                                     | 472 |
| Table 8-68 Steps for Cable Plug USB4 Mode Entry (Valid) .....                                              | 474 |
| Table 8-69 Steps for UFP USB4 Mode Entry (Invalid) .....                                                   | 476 |
| Table 8-70 Steps for Cable Plug USB4 Mode Entry (Invalid) .....                                            | 478 |
| Table 8-71 Policy Engine States .....                                                                      | 560 |

|                                                                                                      |     |
|------------------------------------------------------------------------------------------------------|-----|
| Table 9-1 USB Power Delivery Type Codes.....                                                         | 574 |
| Table 9-2 USB Power Delivery Capability Descriptor .....                                             | 574 |
| Table 9-3 Battery Info Capability Descriptor .....                                                   | 575 |
| Table 9-4 PD Consumer Port Descriptor .....                                                          | 576 |
| Table 9-5 PD Provider Port Descriptor .....                                                          | 576 |
| Table 9-6 PD Requests.....                                                                           | 578 |
| Table 9-7 PD Request Codes .....                                                                     | 578 |
| Table 9-8 PD Feature Selectors .....                                                                 | 578 |
| Table 9-9 Battery Status Structure .....                                                             | 579 |
| Table 9-10 Battery Wake Mask .....                                                                   | 580 |
| Table 9-11 Charging Policy Encoding.....                                                             | 581 |
| Table 10-1 Considerations for Sources.....                                                           | 582 |
| Table 10-2 Normative Voltages and Minimum Currents .....                                             | 583 |
| Table 10-3 Fixed Supply PDO – Source 5V .....                                                        | 585 |
| Table 10-4 Fixed Supply PDO – Source 9V .....                                                        | 585 |
| Table 10-5 Fixed Supply PDO – Source 15V .....                                                       | 585 |
| Table 10-6 Fixed Supply PDO – Source 20V .....                                                       | 585 |
| Table 10-7 Programmable Power Supply PDOs and APDOs based on the PDP .....                           | 587 |
| Table 10-8 Programmable Power Supply Voltage Ranges.....                                             | 587 |
| Table B-1 External power is supplied downstream.....                                                 | 594 |
| Table B-2 External power is supplied upstream .....                                                  | 597 |
| Table B-3 Giving back power.....                                                                     | 604 |
| Table C-1 Discover Identity Command request from Initiator Example .....                             | 616 |
| Table C-2 Discover Identity Command response from Active Cable Responder Example .....               | 616 |
| Table C-3 Discover Identity Command response from Hub Responder Example .....                        | 618 |
| Table C-4 Discover SVIDs Command request from Initiator Example.....                                 | 619 |
| Table C-5 Discover SVIDs Command response from Responder Example .....                               | 619 |
| Table C-6 Discover Modes Command request from Initiator Example .....                                | 621 |
| Table C-7 Discover Modes Command response from Responder Example.....                                | 621 |
| Table C-8 Enter Mode Command request from Initiator Example .....                                    | 623 |
| Table C-9 Enter Mode Command response from Responder Example .....                                   | 623 |
| Table C-10 Enter Mode Command request from Initiator Example .....                                   | 624 |
| Table C-11 Exit Mode Command request from Initiator Example.....                                     | 625 |
| Table C-12 Exit Mode Command response from Responder Example .....                                   | 625 |
| Table C-13 Attention Command request from Initiator Example.....                                     | 627 |
| Table C-14 Attention Command request from Initiator with additional VDO Example .....                | 627 |
| Table E-1: Sequence Table for setup of a Fast Role Swap (Hub connected to Power Adapter first) ..... | 637 |

|                                                                                                              |     |
|--------------------------------------------------------------------------------------------------------------|-----|
| Table E-2 Sequence Table for setup of a Fast Role Swap (Hub connected to Notebook before Power Adapter)..... | 638 |
| Table E-3 Sequence Table for slow Vbus discharge (it discharges after FR_Swap message is sent) .....         | 640 |
| Table E-4 Vbus discharges quickly after adapter disconnected. ....                                           | 641 |

## List of Figures

|                                                                                                                  |    |
|------------------------------------------------------------------------------------------------------------------|----|
| Figure 2-1 Logical Structure of USB Power Delivery Capable Devices.....                                          | 54 |
| Figure 2-2 Example SOP' Communication between VCONN Source and Cable Plug(s).....                                | 56 |
| Figure 2-3 USB Power Delivery Communications Stack .....                                                         | 62 |
| Figure 2-4 USB Power Delivery Communication Over USB.....                                                        | 62 |
| Figure 2-5 High Level Architecture View.....                                                                     | 64 |
| Figure 5-1 Interpretation of ordered sets.....                                                                   | 72 |
| Figure 5-2 Transmit Order for Various Sizes of Data .....                                                        | 73 |
| Figure 5-3 USB Power Delivery Packet Format .....                                                                | 74 |
| Figure 5-4 CRC 32 generation .....                                                                               | 77 |
| Figure 5-5 Line format of Hard Reset.....                                                                        | 79 |
| Figure 5-6 Line format of Cable Reset.....                                                                       | 79 |
| Figure 5-7 BMC Example.....                                                                                      | 80 |
| Figure 5-8 BMC Transmitter Block Diagram .....                                                                   | 81 |
| Figure 5-9 BMC Receiver Block Diagram .....                                                                      | 81 |
| Figure 5-10 BMC Encoded Start of Preamble.....                                                                   | 81 |
| Figure 5-11 Transmitting or Receiving BMC Encoded Frame Terminated by Zero with High-to-Low Last Transition..... | 82 |
| Figure 5-12 Transmitting or Receiving BMC Encoded Frame Terminated by One with High-to-Low Last Transition.....  | 82 |
| Figure 5-13 Transmitting or Receiving BMC Encoded Frame Terminated by Zero with Low to High Last Transition..... | 83 |
| Figure 5-14 Transmitting or Receiving BMC Encoded Frame Terminated by One with Low to High Last Transition.....  | 83 |
| Figure 5-15 BMC Tx 'ONE' Mask .....                                                                              | 84 |
| Figure 5-16 BMC Tx 'ZERO' Mask.....                                                                              | 84 |
| Figure 5-17 BMC Rx 'ONE' Mask when Sourcing Power .....                                                          | 86 |
| Figure 5-18 BMC Rx 'ZERO' Mask when Sourcing Power.....                                                          | 87 |
| Figure 5-19 BMC Rx 'ONE' Mask when Power neutral.....                                                            | 87 |
| Figure 5-20 BMC Rx 'ZERO' Mask when Power neutral.....                                                           | 88 |
| Figure 5-21 BMC Rx 'ONE' Mask when Sinking Power .....                                                           | 88 |
| Figure 5-22 BMC Rx 'ZERO' Mask when Sinking Power.....                                                           | 89 |
| Figure 5-23 Transmitter Load Model for BMC Tx from a Source.....                                                 | 90 |
| Figure 5-24 Transmitter Load Model for BMC Tx from a Sink .....                                                  | 90 |
| Figure 5-25 Transmitter diagram illustrating zDriver .....                                                       | 92 |
| Figure 5-26 Inter-Frame Gap Timings.....                                                                         | 93 |
| Figure 5-27 Example Multi-Drop Configuration showing two DRPs.....                                               | 95 |
| Figure 5-28 Example Multi-Drop Configuration showing a DFP and UFP .....                                         | 95 |
| Figure 5-29 Test Data Frame.....                                                                                 | 97 |

|                                                                                                                    |     |
|--------------------------------------------------------------------------------------------------------------------|-----|
| Figure 6-1 USB Power Delivery Packet Format including Control Message Payload .....                                | 98  |
| Figure 6-2 USB Power Delivery Packet Format including Data Message Payload .....                                   | 99  |
| Figure 6-3 USB Power Delivery Packet Format including an Extended Message Header and Payload.....                  | 99  |
| Figure 6-4 Example Security_Request sequence Unchunked (Chunked bit = 0) .....                                     | 105 |
| Figure 6-5 Example byte transmission for Security_Request Message of Data Size 7 (Chunked bit is set to 0).....    | 105 |
| Figure 6-6 Example byte transmission for Security_Response Message of Data Size 7 (Chunked bit is set to 0).....   | 106 |
| Figure 6-7 Example Security_Request sequence Chunked (Chunked bit = 1).....                                        | 106 |
| Figure 6-8 Example Security_Request Message of Data Size 7 (Chunked bit set to 1) .....                            | 107 |
| Figure 6-9 Example Chunk 0 of Security_Response Message of Data Size 30 (Chunked bit set to 1).....                | 107 |
| Figure 6-10 Example byte transmission for a Security_Response Message Chunk request (Chunked bit is set to 1)..... | 107 |
| Figure 6-11 Example Chunk 1 of Security_Response Message of Data Size 30 (Chunked bit set to 1) .....              | 108 |
| Figure 6-12 Example Capabilities Message with 2 Power Data Objects .....                                           | 117 |
| Figure 6-13 BIST Message .....                                                                                     | 131 |
| Figure 6-14 Vendor Defined Message.....                                                                            | 134 |
| Figure 6-15 Discover Identity Command response.....                                                                | 139 |
| Figure 6-16 Discover Identity Command response for a DRD .....                                                     | 139 |
| Figure 6-17 Example Discover SVIDs response with 3 SVIDs .....                                                     | 155 |
| Figure 6-18 Example Discover SVIDs response with 4 SVIDs .....                                                     | 155 |
| Figure 6-19 Example Discover SVIDs response with 12 SVIDs followed by an empty response .....                      | 155 |
| Figure 6-20 Example Discover Modes response for a given SVID with 3 Modes .....                                    | 155 |
| Figure 6-21 Successful Enter Mode sequence.....                                                                    | 157 |
| Figure 6-22 Enter Mode sequence Interrupted by Source Capabilities and then Re-run .....                           | 157 |
| Figure 6-23 Unsuccessful Enter Mode sequence due to NAK .....                                                      | 158 |
| Figure 6-24 Exit Mode sequence.....                                                                                | 159 |
| Figure 6-25 Attention Command request/response sequence.....                                                       | 159 |
| Figure 6-26 Command request/response sequence.....                                                                 | 160 |
| Figure 6-27 Enter/Exit Mode Process.....                                                                           | 161 |
| Figure 6-28 Battery_Status Message.....                                                                            | 162 |
| Figure 6-29 Alert Message.....                                                                                     | 163 |
| Figure 6-30 Get_Country_Info Message .....                                                                         | 165 |
| Figure 6-31 Enter_USB Message .....                                                                                | 165 |
| Figure 6-32 Source_Capabilities_Extended Message .....                                                             | 168 |
| Figure 6-33 SOP Status Message .....                                                                               | 172 |
| Figure 6-34 SOP'/SOP'' Status Message.....                                                                         | 174 |
| Figure 6-35 Get_Battery_Cap Message .....                                                                          | 175 |
| Figure 6-36 Get_Battery_Status Message.....                                                                        | 176 |

|                                                                                                                                    |     |
|------------------------------------------------------------------------------------------------------------------------------------|-----|
| Figure 6-37 Battery_Capabilities Message .....                                                                                     | 176 |
| Figure 6-38 Get_Manufacturer_Info Message.....                                                                                     | 177 |
| Figure 6-39 Manufacturer_Info Message .....                                                                                        | 178 |
| Figure 6-40 Security_Request Message .....                                                                                         | 179 |
| Figure 6-41 Security_Response Message.....                                                                                         | 179 |
| Figure 6-42 Firmware_Update_Request Message.....                                                                                   | 179 |
| Figure 6-43 Firmware_Update_Response Message.....                                                                                  | 180 |
| Figure 6-44 PPS_Status Message.....                                                                                                | 180 |
| Figure 6-45 Country_Codes Message .....                                                                                            | 181 |
| Figure 6-46 Country_Info Message .....                                                                                             | 182 |
| Figure 6-47 Sink_Capabilities_Extended Message .....                                                                               | 182 |
| Figure 6-48 Outline of States .....                                                                                                | 207 |
| Figure 6-49 References to states .....                                                                                             | 207 |
| Figure 6-50 Chunking architecture Showing Message and Control Flow .....                                                           | 208 |
| Figure 6-51 Chunked Rx State Diagram.....                                                                                          | 210 |
| Figure 6-52 Chunked Tx State Diagram.....                                                                                          | 213 |
| Figure 6-53 Chunked Message Router State Diagram.....                                                                              | 216 |
| Figure 6-54 Common Protocol Layer Message Transmission State Diagram.....                                                          | 218 |
| Figure 6-55 Source Protocol Layer Message Transmission State Diagram .....                                                         | 221 |
| Figure 6-56 Sink Protocol Layer Message Transmission State Diagram .....                                                           | 222 |
| Figure 6-57 Protocol layer Message reception.....                                                                                  | 224 |
| Figure 6-58 Hard/Cable Reset.....                                                                                                  | 226 |
| Figure 7-1 Placement of Source Bulk Capacitance.....                                                                               | 238 |
| Figure 7-2 Transition Envelope for Positive Voltage Transitions.....                                                               | 239 |
| Figure 7-3 Transition Envelope for Negative Voltage Transitions.....                                                               | 240 |
| Figure 7-4 PPS Positive Voltage Transitions .....                                                                                  | 241 |
| Figure 7-5 PPS Negative Voltage Transitions.....                                                                                   | 242 |
| Figure 7-6 Expected PPS Ripple Relative to an LSB .....                                                                            | 242 |
| Figure 7-7 PPS Programmable Voltage and Current Limit .....                                                                        | 244 |
| Figure 7-8 iPpsCLOperatingDetail .....                                                                                             | 245 |
| Figure 7-9 PPS Programmable Voltage and Current Limit .....                                                                        | 246 |
| Figure 7-10 Source $V_{BUS}$ and $V_{CONN}$ Response to Hard Reset .....                                                           | 247 |
| Figure 7-11 Application of $v_{SrcNew}$ and $v_{SrcValid}$ limits after $t_{SrcReady}$ .....                                       | 249 |
| Figure 7-12 Source Peak Current Overload .....                                                                                     | 250 |
| Figure 7-13 Holdup Time Measurement .....                                                                                          | 252 |
| Figure 7-14 $V_{BUS}$ Power during Fast Role Swap .....                                                                            | 253 |
| Figure 7-15 $V_{BUS}$ detection and timing during Fast Role Swap, initial $V_{BUS}$ (at new source)<br>> $v_{Safe5V}$ (min). ..... | 254 |

|                                                                                                                               |     |
|-------------------------------------------------------------------------------------------------------------------------------|-----|
| Figure 7-16 $V_{BUS}$ detection and timing during Fast Role Swap, initial $V_{BUS}$ (at new source) < $v_{Safe5V}$ (min)..... | 254 |
| Figure 7-17 Data Reset UFP VCONN Power Cycle .....                                                                            | 255 |
| Figure 7-18 Data Reset DFP VCONN Power Cycle .....                                                                            | 256 |
| Figure 7-19 Placement of Sink Bulk Capacitance .....                                                                          | 257 |
| Figure 7-20 Transition Diagram for Increasing the Current.....                                                                | 262 |
| Figure 7-21 Transition Diagram for Increasing the Voltage.....                                                                | 264 |
| Figure 7-22 Transition Diagram for Increasing the Voltage and Current .....                                                   | 266 |
| Figure 7-23 Transition Diagram for Increasing the Voltage and Decreasing the Current.....                                     | 268 |
| Figure 7-24 Transition Diagram for Decreasing the Voltage and Increasing the Current.....                                     | 270 |
| Figure 7-25 Transition Diagram for Decreasing the Current.....                                                                | 272 |
| Figure 7-26 Transition Diagram for Decreasing the Voltage .....                                                               | 274 |
| Figure 7-27 Transition Diagram for Decreasing the Voltage and the Current.....                                                | 276 |
| Figure 7-28 Transition Diagram for a Sink Requested Power Role Swap.....                                                      | 278 |
| Figure 7-29 Transition Diagram for a Source Requested Power Role Swap.....                                                    | 281 |
| Figure 7-30 Transition Diagram for a GotoMin Current Decrease .....                                                           | 284 |
| Figure 7-31 Transition Diagram for a Source Initiated Hard Reset .....                                                        | 286 |
| Figure 7-32 Transition Diagram for a Sink Initiated Hard Reset .....                                                          | 288 |
| Figure 7-33 Transition Diagram for no change in Current or Voltage.....                                                       | 290 |
| Figure 7-34 Transition Diagram for Fast Role Swap .....                                                                       | 292 |
| Figure 7-35 Transition Diagram for Increasing the Programmable Power Supply Voltage .....                                     | 294 |
| Figure 7-36 Transition Diagram for Decreasing the Programmable Power Supply Voltage.....                                      | 296 |
| Figure 7-37 Transition Diagram for Changing the Source PDO or APDO .....                                                      | 298 |
| Figure 7-38 Transition Diagram for increasing the Current in PPS mode .....                                                   | 300 |
| Figure 7-39 Transition Diagram for decreasing the Current in PPS mode .....                                                   | 302 |
| Figure 7-40 Transition Diagram for no change in Current or Voltage in PPS mode.....                                           | 304 |
| Figure 8-1 Example of daisy chained displays.....                                                                             | 317 |
| Figure 8-2 Basic Message Exchange (Successful).....                                                                           | 320 |
| Figure 8-3 Basic Message flow indicating possible errors .....                                                                | 321 |
| Figure 8-4 Basic Message Flow with Bad CRC followed by a Retry.....                                                           | 322 |
| Figure 8-5 Successful Fixed, Variable or Battery Power Negotiation.....                                                       | 326 |
| Figure 8-6 Successful GotoMin operation.....                                                                                  | 329 |
| Figure 8-7 PPS Keep Alive.....                                                                                                | 331 |
| Figure 8-8 Soft Reset .....                                                                                                   | 334 |
| Figure 8-9 DFP Initiated Data Reset where the DFP is the Vconn Source.....                                                    | 336 |
| Figure 8-10 DFP Receives Data Reset where the DFP is the Vconn Source.....                                                    | 339 |
| Figure 8-11 DFP Initiated Data Reset where the UFP is the Vconn Source .....                                                  | 342 |
| Figure 8-12 DFP Receives a Data Reset where the UFP is the Vconn Source .....                                                 | 346 |

|                                                                                  |     |
|----------------------------------------------------------------------------------|-----|
| Figure 8-13 Source initiated Hard Reset.....                                     | 350 |
| Figure 8-14 Sink Initiated Hard Reset.....                                       | 353 |
| Figure 8-15 Source initiated reset - Sink long reset.....                        | 356 |
| Figure 8-16 Successful Power Role Swap Sequence Initiated by the Source.....     | 360 |
| Figure 8-17 Successful Power Role Swap Sequence Initiated by the Sink.....       | 365 |
| Figure 8-18 Successful Fast Role Swap Sequence.....                              | 370 |
| Figure 8-19 Data Role Swap, UFP operating as Sink initiates.....                 | 374 |
| Figure 8-20 Data Role Swap, UFP operating as Source initiates.....               | 376 |
| Figure 8-21 Data Role Swap, DFP operating as Source initiates .....              | 378 |
| Figure 8-22 Data Role Swap, DFP operating as Sink initiates.....                 | 380 |
| Figure 8-23 Source to Sink VCONN Source Swap .....                               | 382 |
| Figure 8-24 Sink to Source VCONN Source Swap .....                               | 385 |
| Figure 8-25 Source Alert to Sink.....                                            | 388 |
| Figure 8-26 Sink Alert to Source.....                                            | 390 |
| Figure 8-27 Sink Gets Source Status.....                                         | 391 |
| Figure 8-28 Source Gets Sink Status.....                                         | 393 |
| Figure 8-29 Sink Gets Source PPS Status .....                                    | 395 |
| Figure 8-30 Sink Gets Source's Capabilities.....                                 | 397 |
| Figure 8-31 Dual-Role Source Gets Dual-Role Sink's Capabilities as a Source..... | 399 |
| Figure 8-32 Source Gets Sink's Capabilities.....                                 | 401 |
| Figure 8-33 Dual-Role Sink Gets Dual-Role Source's Capabilities as a Sink.....   | 403 |
| Figure 8-34 Sink Gets Source's Extended Capabilities.....                        | 405 |
| Figure 8-35 Dual-Role Source Gets Dual-Role Sink's Extended Capabilities .....   | 407 |
| Figure 8-36 Sink Gets Source's Battery Capabilities .....                        | 409 |
| Figure 8-37 Source Gets Sink's Battery Capabilities .....                        | 411 |
| Figure 8-38 Sink Gets Source's Battery Status.....                               | 413 |
| Figure 8-39 Source Gets Sink's Battery Status.....                               | 415 |
| Figure 8-40 Source Gets Sink's Port Manufacturer Information .....               | 417 |
| Figure 8-41 Sink Gets Source's Port Manufacturer Information .....               | 419 |
| Figure 8-42 Source Gets Sink's Battery Manufacturer Information.....             | 421 |
| Figure 8-43 Sink Gets Source's Battery Manufacturer Information.....             | 423 |
| Figure 8-44 VCONN Source Gets Cable Plug's Manufacturer Information .....        | 425 |
| Figure 8-45 Source Gets Sink's Country Codes.....                                | 427 |
| Figure 8-46 Sink Gets Source's Country Codes.....                                | 429 |
| Figure 8-47 VCONN Source Gets Cable Plug's Country Codes.....                    | 431 |
| Figure 8-48 Source Gets Sink's Country Information .....                         | 433 |
| Figure 8-49 Sink Gets Source's Country Information .....                         | 435 |
| Figure 8-50 VCONN Source Gets Cable Plug's Country Information .....             | 437 |

|                                                                                  |     |
|----------------------------------------------------------------------------------|-----|
| Figure 8-51 Source requests security exchange with Sink .....                    | 439 |
| Figure 8-52 Sink requests security exchange with Source .....                    | 441 |
| Figure 8-53 Vconn Source requests security exchange with Cable Plug .....        | 443 |
| Figure 8-54 Source requests firmware update exchange with Sink .....             | 445 |
| Figure 8-55 Sink requests firmware update exchange with Source .....             | 447 |
| Figure 8-56 Vconn Source requests firmware update exchange with Cable Plug ..... | 449 |
| Figure 8-57 DFP to UFP Discover Identity .....                                   | 451 |
| Figure 8-58 Source Port to Cable Plug Discover Identity .....                    | 453 |
| Figure 8-59 DFP to Cable Plug Discover Identity .....                            | 455 |
| Figure 8-60 DFP to UFP Enter Mode .....                                          | 457 |
| Figure 8-61 DFP to UFP Exit Mode .....                                           | 459 |
| Figure 8-62 DFP to Cable Plug Enter Mode .....                                   | 461 |
| Figure 8-63 DFP to Cable Plug Exit Mode .....                                    | 464 |
| Figure 8-64 UFP to DFP Attention .....                                           | 466 |
| Figure 8-65 BIST Carrier Mode Test .....                                         | 467 |
| Figure 8-66 BIST Test Data Test .....                                            | 469 |
| Figure 8-67 UFP Entering USB4 Mode (Valid) .....                                 | 472 |
| Figure 8-68 Cable Plug Entering USB4 Mode (Valid) .....                          | 474 |
| Figure 8-69 UFP Entering USB4 Mode (Invalid) .....                               | 476 |
| Figure 8-70 Cable Plug Entering USB4 Mode (Invalid) .....                        | 478 |
| Figure 8-71 Outline of States .....                                              | 479 |
| Figure 8-72 References to states .....                                           | 480 |
| Figure 8-73 Example of state reference with conditions .....                     | 480 |
| Figure 8-74 Example of state reference with the same entry and exit .....        | 480 |
| Figure 8-75 Source Port Policy Engine State Diagram .....                        | 481 |
| Figure 8-76 Sink Port State Diagram .....                                        | 487 |
| Figure 8-77 Source Port Soft Reset and Protocol Error State Diagram .....        | 492 |
| Figure 8-78 Sink Port Soft Reset and Protocol Error Diagram .....                | 493 |
| Figure 8-79 DFP Data_Reset Message State Diagram .....                           | 495 |
| Figure 8-80 UFP Data_Reset Message State Diagram .....                           | 497 |
| Figure 8-81 Source Port Not Supported Message State Diagram .....                | 499 |
| Figure 8-82 Sink Port Not Supported Message State Diagram .....                  | 500 |
| Figure 8-83 Source Port Ping State Diagram .....                                 | 501 |
| Figure 8-84 Source Port Source Alert State Diagram .....                         | 501 |
| Figure 8-85 Sink Port Source Alert State Diagram .....                           | 502 |
| Figure 8-86 Sink Port Sink Alert State Diagram .....                             | 502 |
| Figure 8-87 Source Port Sink Alert State Diagram .....                           | 502 |
| Figure 8-88 Sink Port Get Source Capabilities Extended State Diagram .....       | 503 |

|                                                                                      |     |
|--------------------------------------------------------------------------------------|-----|
| Figure 8-89 Source Give Source Capabilities Extended State Diagram .....             | 503 |
| Figure 8-90 Sink Port Get Source Status State Diagram.....                           | 504 |
| Figure 8-91 Source Give Source Status State Diagram.....                             | 504 |
| Figure 8-92 Source Port Get Sink Status State Diagram.....                           | 505 |
| Figure 8-93 Sink Give Sink Status State Diagram .....                                | 505 |
| Figure 8-94 Sink Port Get Source PPS Status State Diagram.....                       | 506 |
| Figure 8-95 Source Give Source PPS Status State Diagram.....                         | 506 |
| Figure 8-96 Get Battery Capabilities State Diagram .....                             | 507 |
| Figure 8-97 Give Battery Capabilities State Diagram .....                            | 507 |
| Figure 8-98 Get Battery Status State Diagram .....                                   | 508 |
| Figure 8-99 Give Battery Status State Diagram.....                                   | 508 |
| Figure 8-100 Get Manufacturer Information State Diagram.....                         | 509 |
| Figure 8-101 Give Manufacturer Information State Diagram.....                        | 509 |
| Figure 8-102 Get Country Codes State Diagram .....                                   | 510 |
| Figure 8-103 Give Country Codes State Diagram .....                                  | 511 |
| Figure 8-104 Get Country Information State Diagram.....                              | 511 |
| Figure 8-105 Give Country Information State Diagram .....                            | 512 |
| Figure 8-106 DFP Enter_USB Message State Diagram .....                               | 512 |
| Figure 8-107 UFP Enter_USB Message State Diagram .....                               | 513 |
| Figure 8-108 Send security request State Diagram.....                                | 513 |
| Figure 8-109 Send security response State Diagram.....                               | 514 |
| Figure 8-110 Security response received State Diagram.....                           | 514 |
| Figure 8-111 Send firmware update request State Diagram .....                        | 515 |
| Figure 8-112 Send firmware update response State Diagram .....                       | 515 |
| Figure 8-113 Firmware update response received State Diagram .....                   | 516 |
| Figure 8-114: DFP to UFP Data Role Swap State Diagram .....                          | 517 |
| Figure 8-115: UFP to DFP Data Role Swap State Diagram .....                          | 519 |
| Figure 8-116: Dual-Role Port in Source to Sink Power Role Swap State Diagram .....   | 521 |
| Figure 8-117: Dual-role Port in Sink to Source Power Role Swap State Diagram .....   | 524 |
| Figure 8-118: Dual-Role Port in Source to Sink Fast Role Swap State Diagram.....     | 527 |
| Figure 8-119: Dual-role Port in Sink to Source Fast Role Swap State Diagram .....    | 530 |
| Figure 8-120 Dual-Role (Source) Get Source Capabilities diagram .....                | 532 |
| Figure 8-121 Dual-Role (Source) Give Sink Capabilities diagram .....                 | 533 |
| Figure 8-122 Dual-Role (Sink) Get Sink Capabilities State Diagram .....              | 533 |
| Figure 8-123 Dual-Role (Sink) Give Source Capabilities State Diagram.....            | 534 |
| Figure 8-124 Dual-Role (Source) Get Source Capabilities Extended State Diagram ..... | 534 |
| Figure 8-125 Dual-Role (Source) Give Sink Capabilities diagram .....                 | 535 |
| Figure 8-126 VCONN Swap State Diagram.....                                           | 536 |

|                                                                                                    |     |
|----------------------------------------------------------------------------------------------------|-----|
| Figure 8-127 Initiator to Port VDM Discover Identity State Diagram.....                            | 539 |
| Figure 8-128 Initiator VDM Discover SVIDs State Diagram .....                                      | 540 |
| Figure 8-129 Initiator VDM Discover Modes State Diagram.....                                       | 541 |
| Figure 8-130 Initiator VDM Attention State Diagram .....                                           | 542 |
| Figure 8-131 Responder Structured VDM Discover Identity State Diagram .....                        | 543 |
| Figure 8-132 Responder Structured VDM Discover SVIDs State Diagram.....                            | 544 |
| Figure 8-133 Responder Structured VDM Discover Modes State Diagram .....                           | 545 |
| Figure 8-134 Receiving a Structured VDM Attention State Diagram .....                              | 546 |
| Figure 8-135 DFP VDM Mode Entry State Diagram .....                                                | 546 |
| Figure 8-136 DFP VDM Mode Exit State Diagram.....                                                  | 548 |
| Figure 8-137 UFP Structured VDM Enter Mode State Diagram.....                                      | 549 |
| Figure 8-138 UFP Structured VDM Exit Mode State Diagram .....                                      | 550 |
| Figure 8-139 Cable Ready VDM State Diagram.....                                                    | 551 |
| Figure 8-140 Cable Plug Soft Reset State Diagram .....                                             | 551 |
| Figure 8-141 Cable Plug Hard Reset State Diagram.....                                              | 552 |
| Figure 8-142 VCONN Source Soft Reset or Cable Reset of a Cable Plug or VPD State Diagram .....     | 553 |
| Figure 8-143 Source Startup Structured VDM Discover Identity State Diagram .....                   | 554 |
| Figure 8-144 Cable Plug Structured VDM Enter Mode State Diagram.....                               | 556 |
| Figure 8-145 Cable Plug Structured VDM Exit Mode State Diagram .....                               | 557 |
| Figure 8-146 BIST Carrier Mode State Diagram .....                                                 | 558 |
| Figure 9-1 Example PD Topology.....                                                                | 568 |
| Figure 9-2 Mapping of PD Topology to USB.....                                                      | 569 |
| Figure 9-3 USB Attached to USB Powered State Transition .....                                      | 570 |
| Figure 9-4 Any USB State to USB Attached State Transition (When operating as a Consumer).....      | 571 |
| Figure 9-5 Any USB State to USB Attached State Transition (When operating as a Provider).....      | 571 |
| Figure 9-6 Any USB State to USB Attached State Transition (After a USB Type-C Data Role Swap)..... | 572 |
| Figure 9-7 Software stack on a PD aware OS .....                                                   | 572 |
| Figure 9-8 Enumeration of a PDUSB Device.....                                                      | 573 |
| Figure 10-1 Source Power Rule Illustration.....                                                    | 584 |
| Figure 10-2 Source Power Rule Example.....                                                         | 584 |
| Figure B-1 External Power supplied downstream.....                                                 | 593 |
| Figure B-2 External Power supplied upstream.....                                                   | 597 |
| Figure B-3 Giving Back Power.....                                                                  | 604 |
| Figure D-1 Circuit Block of BMC Finite Difference Receiver .....                                   | 629 |
| Figure D-2 BMC AC and DC noise from VBUS at Power Sink.....                                        | 630 |
| Figure D-3 Sample BMC Signals (a) without [USB 2.0] SE0 Noise (b) with [USB 2.0] SE0 Noise.....    | 630 |
| Figure D-4 Scaled BMC Signal Derivative with 50ns Sampling Rate .....                              | 631 |
| Figure D-5 BMC Signal and Finite Difference Output with Various Time Steps .....                   | 631 |

|                                                                                                             |     |
|-------------------------------------------------------------------------------------------------------------|-----|
| Figure D-6 Output of Finite Difference in dash line and Edge Detector in solid line.....                    | 632 |
| Figure D-7 Noise Zone and Detect Zone of BMC Receiver .....                                                 | 632 |
| Figure D-8 Circuit Block of BMC Subtraction Receiver .....                                                  | 633 |
| Figure D-9 (a) Output of LPF1 and LPF2 (b) Subtraction of LPF1 and LPF2 Output .....                        | 633 |
| Figure D-10 Output of the BMC LPF1 in blue dash curve and the Subtractor in red solid curve.....            | 634 |
| Figure E-1 Example FRS Capable System.....                                                                  | 635 |
| Figure E-2 Slow $V_{BUS}$ Discharge .....                                                                   | 636 |
| Figure E-3 Fast $V_{BUS}$ Discharge.....                                                                    | 637 |
| Figure E-4 Sequence Diagram for slow $V_{BUS}$ discharge (it discharges after FR_Swap message is sent)..... | 640 |

## 1. Introduction

USB has evolved from a data interface capable of supplying limited power to a primary provider of power with a data interface. Today many devices charge or get their power from USB ports contained in laptops, cars, aircraft or even wall sockets. USB has become a ubiquitous power socket for many small devices such as cell phones, MP3 players and other hand-held devices. Users need USB to fulfill their requirements not only in terms of data but also to provide power to, or charge, their devices simply, often without the need to load a driver, in order to carry out “traditional” USB functions.

There are, however, still many devices which either require an additional power connection to the wall, or exceed the USB rated current in order to operate. Increasingly, international regulations require better energy management due to ecological and practical concerns relating to the availability of power. Regulations limit the amount of power available from the wall which has led to a pressing need to optimize power usage. The USB Power Delivery Specification has the potential to minimize waste as it becomes a standard for charging devices that are not satisfied by [\[USBBC 1.2\]](#).

Wider usage of wireless solutions is an attempt to remove data cabling but the need for “tethered” charging remains. In addition, industrial design requirements drive wired connectivity to do much more over the same connector.

USB Power Delivery is designed to enable the maximum functionality of USB by providing more flexible power delivery along with data over a single cable. Its aim is to operate with and build on the existing USB ecosystem; increasing power levels from existing USB standards, for example Battery Charging, enabling new higher power use cases such as USB powered Hard Disk Drives (HDDs) and printers.

With USB Power Delivery the power direction is no longer fixed. This enables the product with the power (Host or Peripheral) to provide the power. For example, a display with a supply from the wall can power, or charge, a laptop. Alternatively, USB power bricks or chargers are able to supply power to laptops and other battery powered devices through their, traditionally power providing, USB ports.

USB Power Delivery enables hubs to become the means to optimize power management across multiple peripherals by allowing each device to take only the power it requires, and to get more power when required for a given application. For example, battery powered devices can get increased charging current and then give it back temporarily when the user’s HDD requires spinning up. **Optionally** the hubs can communicate with the PC to enable even more intelligent and flexible management of power either automatically or with some level of user intervention.

USB Power Delivery allows Low Power cases such as headsets to negotiate for only the power they require. This provides a simple solution that enables USB devices to operate at their optimal power levels.

The Power Delivery Specification, in addition to providing mechanisms to negotiate power also can be used as a side-band channel for standard and vendor defined messaging. Power Delivery enables alternative modes of operation by providing the mechanisms to discover, enter and exit Alternate Modes. The specification also enables discovery of cable capabilities such as supported speeds and current levels.

### 1.1 Overview

This specification defines how USB Devices can negotiate for more current and/or higher or lower voltages over the USB cable (using the USB Type-C® CC wire as the communications channel) than are defined in the [\[USB 2.0\]](#), [\[USB 3.2\]](#), [\[USB Type-C 2.0\]](#) or [\[USBBC 1.2\]](#) specifications. It allows Devices with greater power requirements than can be met with today’s specification to get the power they require to operate from  $V_{BUS}$  and negotiate with external power sources (e.g. Wall Warts). In addition, it allows a Source and Sink to swap power roles such that a Device could supply power to the Host. For example, a display could supply power to a notebook to charge its battery.

The USB Power Delivery Specification is guided by the following principles:

- Works seamlessly with legacy USB Devices
- Compatible with existing spec-compliant USB cables
- Minimizes potential damage from non-compliant cables (e.g. ‘Y’ cables etc.)
- Optimized for low-cost implementations

This specification defines mechanisms to discover, enter and exit Modes defined either by a standard or by a particular vendor. These Modes can be supported either by the Port Partner or by a cable connecting the two Port Partners.

The specification defines mechanisms to discover the capabilities of cables which can communicate using Power Delivery.

This specification adds a mechanism to swap the data roles such that the upstream facing Port becomes the downstream facing Port and vice versa. It also enables a swap of the end supplying  $V_{\text{CONN}}$  to a powered cable.

To facilitate optimum charging, the specification defines two mechanisms a USB Charger can advertise for the Device to use:

1. A list of fixed voltages each with a maximum current. The Device selects a voltage and current from the list. This is the traditional model used by Devices that use internal electronics to manage the charging of their battery including modifying the voltage and current actually supplied to the battery. The side-effect of this model is that the charging circuitry generates heat that may be problematic for small form factor devices.
2. A list of programmable voltage ranges each with a maximum current (PPS). The Device requests a voltage (in 20 mV increments) that is within the advertised range and a maximum current. The USB Charger delivers the requested voltage until the maximum current is reached at which time the USB charger reduces its output voltage so as not to supply more than the requested maximum current. During the high current portion of the charge cycle, the USB Charger can be directly connected (through an appropriate safety device) to the battery. This model is used by Devices that want to minimize the thermal impact of their internal charging circuitry.

## 1.2 Purpose

The USB Power Delivery specification defines a power delivery system covering all elements of a USB system including: Hosts, Devices, Hubs, Chargers and cable assemblies. This specification describes the architecture, protocols, power supply behavior, connectors and cabling necessary for managing power delivery over USB at up to 100W. This specification is intended to be fully compatible and extend the existing USB infrastructure. It is intended that this specification will allow system OEMs, power supply and peripheral developers adequate flexibility for product versatility and market differentiation without losing backwards compatibility.

USB Power Delivery is designed to operate independently of the existing USB bus defined mechanisms used to negotiate power which are:

- [\[USB 2.0\]](#), [\[USB 3.2\]](#) in band requests for high power interfaces.
- [\[USBBC 1.2\]](#) mechanisms for supplying higher power (not mandated by this specification).
- [\[USB Type-C 2.0\]](#) mechanisms for supplying higher power

Initial operating conditions remain the USB Default Operation as defined in [\[USB 2.0\]](#), [\[USB 3.2\]](#), [\[USB Type-C 2.0\]](#) or [\[USBBC 1.2\]](#).

- The DFP sources **vSafe5V** over  $V_{\text{BUS}}$ .
- The UFP consumes power from  $V_{\text{BUS}}$ .

## 1.3 Scope

This specification is intended as an extension to the existing [\[USB 2.0\]](#), [\[USB 3.2\]](#), [\[USB Type-C 2.0\]](#) and [\[USBBC 1.2\]](#) specifications. It addresses only the elements required to implement USB Power Delivery. It is targeted at power supply vendors, manufacturers of [\[USB 2.0\]](#), [\[USB 3.2\]](#), [\[USB Type-C 2.0\]](#) and [\[USBBC 1.2\]](#) Platforms, Devices and cable assemblies.

**Normative** information is provided to allow interoperability of components designed to this specification. Informative information, when provided, illustrates possible design implementation.

## 1.4 Conventions

### 1.4.1 Precedence

If there is a conflict between text, figures, and tables, the precedence **Shall** be tables, figures, and then text.

### 1.4.2 Keywords

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

#### 1.4.2.1 Conditional Normative

**Conditional Normative** is a keyword used to indicate a feature that is mandatory when another related feature has been implemented. Designers are mandated to implement all such requirements, when the dependent features have been implemented, to ensure interoperability with other compliant Devices.

#### 1.4.2.2 Deprecated

**Deprecated** is a keyword used to indicate a feature, supported in previous releases of the specification, which is no longer supported.

#### 1.4.2.3 Discarded

**Discard**, **Discards** and **Discarded** are equivalent keywords indicating that a Packet when received **Shall** be thrown away by the PHY Layer and not passed to the Protocol Layer for processing. No **GoodCRC** Message **Shall** be sent in response to the Packet.

#### 1.4.2.4 Ignored

**Ignore**, **Ignores** and **Ignored** are equivalent keywords indicating Messages or Message fields which, when received, **Shall** result in no special action by the receiver. An **Ignored** Message **Shall** only result in returning a **GoodCRC** Message to acknowledge Message receipt. A Message with an **Ignored** field **Shall** be processed normally except for any actions relating to the **Ignored** field.

#### 1.4.2.5 Invalid

**Invalid** is a keyword when used in relation to a Packet indicates that the Packet's usage or fields fall outside of the defined specification usage. When **Invalid** is used in relation to an Explicit Contract it indicates that a previously established Explicit Contract which can no longer be maintained by the Source. When **Invalid** is used in relation to individual K-codes or K-code sequences indicates that the received Signaling falls outside of the defined specification.

#### 1.4.2.6 May

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

#### 1.4.2.7 May Not

**May Not** is a keyword that is the inverse of **May**. Indicates a choice to not implement a given feature with no implied preference.

#### 1.4.2.8 N/A

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

#### 1.4.2.9 Optional/Optionally/Optional Normative

**Optional**, **Optionally** and **Optional Normative** are equivalent keywords that describe features not mandated by this specification. However, if an **Optional** feature is implemented, the feature **Shall** be implemented as defined by this specification.

#### 1.4.2.10 Reserved

**Reserved** is a keyword indicating reserved bits, bytes, words, fields, and code values that are set-aside for future standardization. Their use and interpretation **May** be specified by future extensions to this specification and **Shall Not** be utilized or adapted by vendor implementation. A **Reserved** bit, byte, word, or field **Shall** be set to zero by the sender and **Shall be Ignored** by the receiver. **Reserved** field values **Shall Not** be sent by the sender and **Shall be Ignored** by the receiver.

#### 1.4.2.11 Shall/Normative

**Shall** and **Normative** are equivalent keywords indicating a mandatory requirement. Designers are mandated to implement all such requirements to ensure interoperability with other compliant Devices.

#### 1.4.2.12 Shall Not

**Shall Not** is a keyword that is the inverse of **Shall** indicating non-compliant operation.

#### 1.4.2.13 Should

**Should** is a keyword indicating flexibility of choice with a preferred alternative; equivalent to the phrase “it is recommended that...”.

#### 1.4.2.14 Should Not

**Should Not** is a keyword is the inverse of **Should**; equivalent to the phrase “it is recommended that implementations do not...”.

#### 1.4.2.15 Valid

**Valid** is a keyword that is the inverse of **Invalid** indicating either a Packet or Signaling that fall within the defined specification or an Explicit Contract that can be maintained by the Source.

### 1.4.3 Numbering

Numbers that are immediately followed by a lowercase “b” (e.g., 01b) are binary values. Numbers that are immediately followed by an uppercase “B” are byte values. Numbers that are immediately followed by a lowercase “h” (e.g., 3Ah) or are preceded by “0x” (e.g. 0xFF00) are hexadecimal values. Numbers not immediately followed by either a “b”, “B”, or “h” are decimal values.

## 1.5 Related Documents

- **[USB 2.0]** – Universal Serial Bus Specification, Revision 2.0, plus ECN and Errata [http://www.usb.org/developers/docs/usb20\\_docs/](http://www.usb.org/developers/docs/usb20_docs/).
- **[USB 3.2]** – Universal Serial Bus 3.2 Specification, Revision 1.0, September 22, 2017. [www.usb.org/developers/docs](http://www.usb.org/developers/docs).
- **[USBTypeCAuthentication 1.0]**, Universal Serial Bus Type-C Authentication Specification, Revision 1.0, March 25, 2016. [www.usb.org/developers/docs](http://www.usb.org/developers/docs).
- **[USBPDFirmwareUpdate 1.0]**, Universal Serial Bus Power Delivery Firmware Update Specification, Revision 1.0, September 15, 2016. <http://www.usb.org/developers/powerdelivery/>
- **[USBBC 1.2]** – Universal Serial Bus Battery Charging Specification, Revision 1.2 plus Errata (referred to in this document as the Battery Charging specification). [www.usb.org/developers/devclass\\_docs#approved](http://www.usb.org/developers/devclass_docs#approved).
- **[USBBridge 1.1]** – Universal Serial Bus Type-C Bridge Specification, Revision 1.1, October 10, 2017. [www.usb.org/developers/docs](http://www.usb.org/developers/docs).
- **[USBTypeCBridge 1.0]** – Universal Serial Bus Type-C Bridge Specification, Revision 1.0, March 25, 2016. [www.usb.org/developers/docs](http://www.usb.org/developers/docs).
- **[USBPD 2.0]** – Universal Serial Bus Power Delivery Specification, Revision 2, Version 1.2, March 25, 2016. [www.usb.org/developers/docs](http://www.usb.org/developers/docs).

- **[USBPDCompliance]** – USB Power Delivery Compliance Plan Revision 1.02, Version 2.0, 8 March 2017 [http://www.usb.org/developers/docs/devclass\\_docs/](http://www.usb.org/developers/docs/devclass_docs/).
- **[USB Type-C 2.0]** – Universal Serial Bus Type-C Cable and Connector Specification, Revision 2.0, TBD August 2019. [www.usb.org/developers/docs](http://www.usb.org/developers/docs).
- **[IEC 60958-1]** IEC 60958-1 Digital Audio Interface Part:1 General Edition 3.0 2008-09 [www.iec.ch](http://www.iec.ch)
- **[IEC 60950-1]** IEC 60950-1:2005 Information technology equipment – Safety – Part 1: General requirements: Amendment 1:2009, Amendment 2:2013
- **[IEC 62368-1]** IEC 62368-1 Audio/Video, information and communication technology equipment – Part 1: Safety requirements
- **[IEC 63002]** Draft CD for IEC 63002 Identification and Communication Interoperability Method for External DC Power Supplies Used with Portable Computing Devices.
- **[ISO 3166]** ISO 3166 international Standard for country codes and codes for their subdivisions. [http://www.iso.org/iso/home/standards/country\\_codes.htm](http://www.iso.org/iso/home/standards/country_codes.htm).
- **[USB4]** – Universal Serial Bus 4 Specification (USB4™), Version 1.0, August 2019. [www.usb.org/developers/docs](http://www.usb.org/developers/docs).
- **[DPTC1.0]** DisplayPort™ Alt Mode on USB Type-C® Standard, Version 1.0b, 03 November 2017. [www.vesa.org](http://www.vesa.org).
- **[TBT3]** see **[USB4]** Chapter 13 for Thunderbolt™ 3 device operation.