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UNIVERSAL SERIAL BUS INTERFACES FOR DATA AND POWER

Part 4-1: Universal Serial Bus 4™ Specification

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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:

Draft	Report on voting
100/3754/CDV	100/3813/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.

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This standard is the USB-IF publication, USB4™ Specification, Version 1.0 with Errata and ECN through May 19, 2021.

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Universal Serial Bus 4 (USB4™) Specification

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Version 1.0 with Errata and ECN through May 19, 2021

May 2021

Release History

Version	Comments	Issue Date
1.0	First release	August 2019
1.0 with Errata and ECN through May 4, 2020	Includes errata and ECN through May 4, 2020 as part of the specification text.	June 2020
1.0 with Errata and ECN through October 15, 2020	Includes errata and ECN through October 15, 2020 as part of the specification text.	October 2020
1.0 with Errata and ECN through May 19, 2021	Includes errata and ECN through May 19, 2021 as part of the specification text.	May 2021

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1 Introduction

1.1 Scope of the Document

The specification is primarily targeted at peripheral developers and platform/adapter developers, but provides valuable information for platform operating system/BIOS/device driver, adapter independent hardware vendors/independent software vendors, and system OEMs. This specification can be used for developing new products and associated software.

1.2 USB Product Compliance

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1.3 Document Organization

Chapters 1 and 2 provide an overview for all readers, while Chapters 3 through 13 contain detailed technical information defining USB4.

1.4 Design Goals

USB 3.1 and USB 3.2 were evolutionary steps to increase bandwidth. The goal for USB4 remains the same with the added goal of helping to converge the USB Type-C® connector ecosystem and minimize end-user confusion. Several key design areas to meet this goal are listed below:

- Offer display, data, and load/store functionality over a single USB Type-C connector.
- Retain compatibility with existing ecosystem of USB and Thunderbolt™ products.
- Define Port Capabilities for predictable and consistent user experience.
- Provide increased host flexibility to configure bandwidth, power management, and other performance-related parameters for system needs.

1.5 Related Documents

Universal Serial Bus 3.2 Specification, Revision 1.0, September 22, 2017 (USB 3.2 Specification)

USB Type-C® Cable and Connector Specification, Release 2.0 (USB Type-C Specification)

USB 3.0 Jitter Budgeting white paper (USB Jitter Paper)

Universal Serial Bus Power Delivery Specification, Release 3.0, Version 2.0, August 2019 (USB PD Specification)

PCI Express® Base Specification, Revision 4, Version 1, September 27, 2017 (PCIe Specification)

VESA DisplayPort™ Standard, Revision 1.2a, May 2012 (DisplayPort 1.2a Specification)

VESA DisplayPort™ Standard, Revision 1.4a, April 19, 2018 (DisplayPort 1.4a Specification)

VESA DisplayPort™ 1.4a PHY Layer Compliance Test Specification, Revision 1.0, 27 July, 2018 (DisplayPort 1.4a PHY CTS)

VESA DisplayPort™ Alt Mode on USB Type-C Standard, Revision 1.0b, November 03, 2017 (DisplayPort Alt Mode Specification)

eXtensible Host Controller Interface for Universal Serial Bus, Revision 1.1 (xHCI Specification)

USB4 Connection Manager (CM) Guide, Revision 1.0, [to be published] – (Connection Manager Guide)

USB4 Re-Timer Specification, [to be published] – (USB4 Re-Timer Specification)

USB4 Device ROM (DROM) Specification, Revision 1.0, [to be published] – (USB4 DROM Specification)

USB4 Inter-Domain Specification, Revision 1.0, [to be published] – (USB4 Inter-Domain Specification)

HDCP on DisplayPort™ Specification, Revision 2.3, January 22, 2019 (HDCP Specification)