X-CUBE-USB-PD

STM32 USB-PD (Power Delivery) software expansion for STM32Cube

Data brief

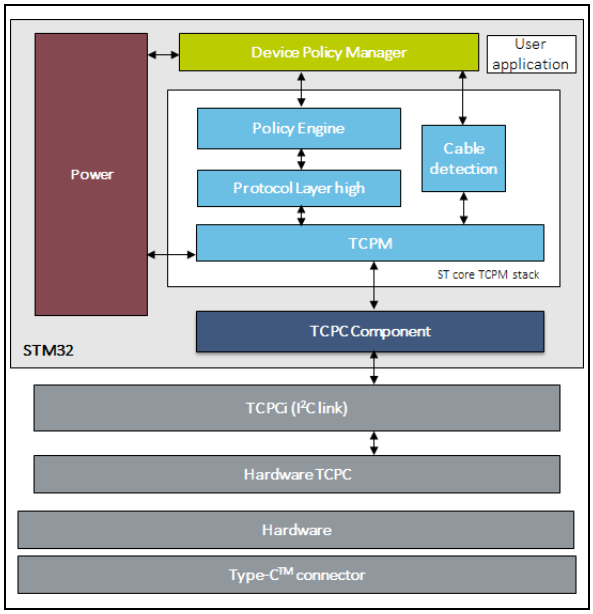
Features

- Compliant with USB Type-C™ 1.3 specification and USB Power Delivery 3.0 standard
- Support to the following USB-PD 3.0 optional features:
  - Programming power supply (PPS), fast role swap (FRS), extended messages
  - Authentication messages and commands via USB-PD protocol
- Compliant with Type-C™ port controller interface (TCPCi) specification
  - Enables the STM32 to act as TCPM (Type-C™ port manager) and to control multi TCPCs (Type-C™ port controllers)
- Dual-role power (DRP) supported
- USB Type-C™ CC logic supported
  - Cable insertion, connector orientation detection and attachment with distant port
- USB-PD messages transmission and reception over selected configuration channel (CC lines)
  - Protocol layer including coding and decoding using BMC and 5b4b coding
- PD communication supported for the two sides of the USB-C™ cable (SOP', SOP'')
- Driver of VCONN and SuperSpeed switches for a flip connector or alternate modes
- BIST mode support: BIST mode to enable platform testing at runtime

Description

The USB Type-C™ is the newest USB connector ecosystem, which addresses the evolving needs of platforms and devices, while retaining the functional benefits of USB.

X-CUBE-USB-PD is a USB-IF certified Expansion Package. It consists of libraries, drivers, sources, APIs and application examples running on any STM32 32-bit microcontrollers acting as USB Type-C™ port managers (TCPMs) and controlling third party Type-C™ port controllers (TCPCs).



An example is provided to help to develop applications based on USB-PD.

The 'Core' of the stack is delivered in a library format, while the 'TCPC Component' part in open-source format offers a high level of flexibility to match the design considerations.

This Expansion Package supports various hardware implementations covering most of the typical USB Type-C™ use-cases at optimized cost.

To discover all the MCU-based solutions for USB Type-C™ and Power Delivery technology, go to the landing page https://www.st.com/content/st_com/en/stm32-usb-c.html.

For further information contact your local STMicroelectronics sales office. www.st.com

System requirements

X-CUBE-USB-PD supports TCPM/TCPC standardized solution and can be implemented on any STM32 32-bit microcontrollers:

- Ideal solution to upgrade legacy design based on any STM32 with USB-C™
- Lowest memory footprint and easy porting within the STM32 32-bit microcontrollers, based on the Arm®(a) Cortex®-M processor
- USB-PD 2.0/3.0+PPS compliant, multi-port
- Tested with TCPC controller from On-SEMI FUSB307B
- Hardware development platform: *USB Type-C™ port manager (TCPM)/port controller (TCPC) evaluation board* (DB3623)

Because of the I^2C maximum bandwidth, each TCPM manages up to three TCPCs on a common I^2C bus.

For more details on all the components of the USB-PD libraries, refer to the user manual *STM32 USB-PD (Power Delivery) software expansion for STM32Cube* (UM2063), the user manual *Managing USB power delivery systems with STM32 microcontrollers* (UM2552), and the application note *USB Type-C™ Power Delivery using STM32xx Series MCUs and STM32xxx Series MPUs* (AN5225).

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What is STM32Cube?

STM32Cube is an STMicroelectronics original initiative to significantly improve designer's productivity by reducing development effort, time and cost. STM32Cube covers the whole STM32 portfolio.

STM32Cube includes:

- A set of user-friendly software development tools to cover project development from the conception to the realization, among which:
  - STM32CubeMX, a graphical software configuration tool that allows the automatic generation of C initialization code using graphical wizards
  - STM32CubeIDE, an all-in-one development tool with peripheral configuration, code generation, code compilation, and debug features
  - STM32CubeProgrammer (STM32CubeProg), a programming tool available in graphical and command-line versions
  - STM32CubeMonitor (STM32CubeMonitor, STM32CubeMonPwr, STM32CubeMonRF, STM32CubeMonUCPD) powerful monitoring tools to fine-tune the behavior and performance of STM32 applications in real-time
- STM32Cube MCU & MPU Packages, comprehensive embedded-software platforms specific to each microcontroller and microprocessor series (such as STM32CubeF0 for the STM32F0 Series), which include:
  - STM32Cube hardware abstraction layer (HAL), ensuring maximized portability across the STM32 portfolio
  - STM32Cube low-layer APIs, ensuring the best performance and footprints with a high degree of user control over the HW
  - A consistent set of middleware components such as RTOS, USB, TCP/IP, and graphics
  - All embedded software utilities with full sets of peripheral and applicative examples
- STM32Cube Expansion Packages, which contain embedded software components that complement the functionalities of the STM32Cube MCU & MPU Packages with:
  - Middleware extensions and applicative layers
  - Examples running on some specific STMicroelectronics development boards

Ordering Information

X-CUBE-USB-PD is available for free download from the *www.st.com* website.

License

X-CUBE-USB-PD is delivered under the *Mix Ultimate Liberty+OSS+3rd-party V1* license.

The software components provided within this package come with different license scheme as shown in *Table 1*.

For more details, refer to the license agreement of each component.

Table 1. Software component license agreements

Software component	Owner	License
Cortex®-M CMSIS	Arm limited	Open source BSD or Apache License 2.0(1)
FreeRTOS™	Amazon Web Services, Inc.	Open source MIT
HAL STM32, TCPC Component, and BSP	STMicroelectronics	Open source BSD
STM32 USB-PD Library	STMicroelectronics	Ultimate Liberty (Binary release)
Project examples	STMicroelectronics	Ultimate Liberty (Source release)

1. The license choice depends on the CMSIS version.

Revision history

Table 2. Document revision history

Date	Revision	Changes
07-Jun-2016	1	Initial release.
24-Nov-2016	2	Updated figure on the cover page (the title of the expansion board). Added *Section: License*.
19-Jan-2017	3	Updated *Description* (new libraries available).
24-Jan-2017	4	Updated *Table 1: Software component license agreements*.
24-May-2018	5	Updated cover page including figure, new *Features*, and simplified *Description*. Added *System requirements*. Updated *Table 1: Software component license agreements*.
10-Apr-2020	6	Removed support to P-NUCLEO-USB001 and P-NUCLEO-USB002. Added *What is STM32Cube?*. Updated *Table 1: Software component license agreements*.

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