X-CUBE-USB-PD

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

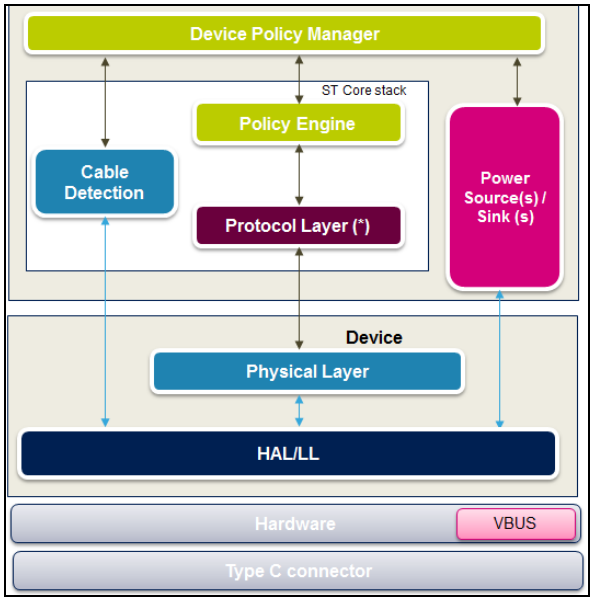
Data brief

Features

- Compliant with USB Type-C™ 1.3 specification and USB Power Delivery 3.0 standard
- Supports 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)
- Provider (source), Consumer (sink) and Dual-Role Power (DRP) roles 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
- Structured VDM (vendor defined messages) support allowing alternate mode extensions implementation
- PD communication supported for the two sides of the USB-C cable (SOP', SOP'')
- Drive VCONN and SuperSpeed switches for flippable 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, it 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 and consists of libraries, drivers, sources, APIs and application examples running on STM32F0 Series microcontrollers acting as USB Power Delivery controllers or USB Type-C port managers (TCPMs). Examples are provided to help to develop applications based on USB-PD (Provider, Consumer, DRP, Dual Port and VDM).

The "Core" of the stack is delivered in library format while the "Device" part, in open source format, offers 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.

System requirements

Various hardware implementation supported:

- Legacy solution: STM32F0 devices with discrete Analog Front End PHY
  - Based on Google reference design
  - USB-PD 2.0 only – 1 port
  - Mainly in captive cable configuration, for example USB Type-C to Display Port adapter
  - Hardware development platform P-NUCLEO-USB001
- STM32F0 with STUSB1602 USB Type-C controller
  - For new design or to upgrade existing design based on STM32F0 devices only
  - USB-PD 2.0/3.0+PPS compliant solution
  - Hardware development platform P-NUCLEO-USB002
- Standardized TCPM/TCPC solution for any STM32F
  - Ideal solution to upgrade legacy design based-on any STM32F0/F4 with USB-C
  - Lowest memory footprint and easy porting within the Cortex-M series
  - USB-PD 2.0/3.0+PPS compliant, multi-port
  - Tested with TCPC controller from On-SEMI FUSB307B
  - Hardware development platform: *STM32F072 MCU Type-Port Manager (TCPM) with ON-SEMI FUSB307B Type-C Port Controller (TCPC) evaluation board (DB3623)*

For more details on all the components of the USB-PD libraries, refer to the *STM32 USB-PD (Power Delivery) software expansion for STM32Cube* user manual (UM2063).

(*) Protocol Layer is different for TCPM when retransmission and GoodCRC is done by TCPC. Therefore, two versions of the stack library are available, including one version dedicated to TCPM.

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®	Open source BSD
FreeRTOS™	FreeRTOS	Modified GNU GPL(1)
HAL STM32 F0 and BSP	STMicroelectronics	Open source BSD
STM32 USB-PD Library	STMicroelectronics	Ultimate Liberty (Binary release)
Project examples	STMicroelectronics	Ultimate Liberty (Source release)

1. The FreeRTOS™ source code is licensed by a modified GNU General Public License, the modification taking the form of an exception. The exception permits the source code of applications that use FreeRTOS™ and are distributed as executables to remain closed source, thus permitting the use of FreeRTOS™ in commercial applications without necessitating that the whole application to be open sourced.

The X-CUBE-USB-PD Expansion Package runs on STM32 32-bit microcontrollers, based on the Arm®(a) Cortex®-M processor.

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Revision history

Table 2. Document revision history

Date	Revision	Changes
07-Jun-2016	1	Initial release.
24-Nov-2016	2	Updated figure in the cover page (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*.

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