STEVAL-USBPD27S
Quick Start Guide

System Research and Applications

Summary

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STEVAL-USBPD27S Kit

STEVAL-USBPD27S Kit Overview

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What’s inside

STLINK-V3MINI
STLINK-V3 compact in-circuit debugger and programmer for STM32 + programming cable

STEVAL-USBPD27S
Compact 27 W USB Type-C™ power delivery 3.0 with PPS adapter reference design

The STEVAL-USBPD27S works as USB Power Delivery Provider with a single USB Type-C port able to support Programmable Power Supply (PPS) and featuring adaptive synchronous rectification.

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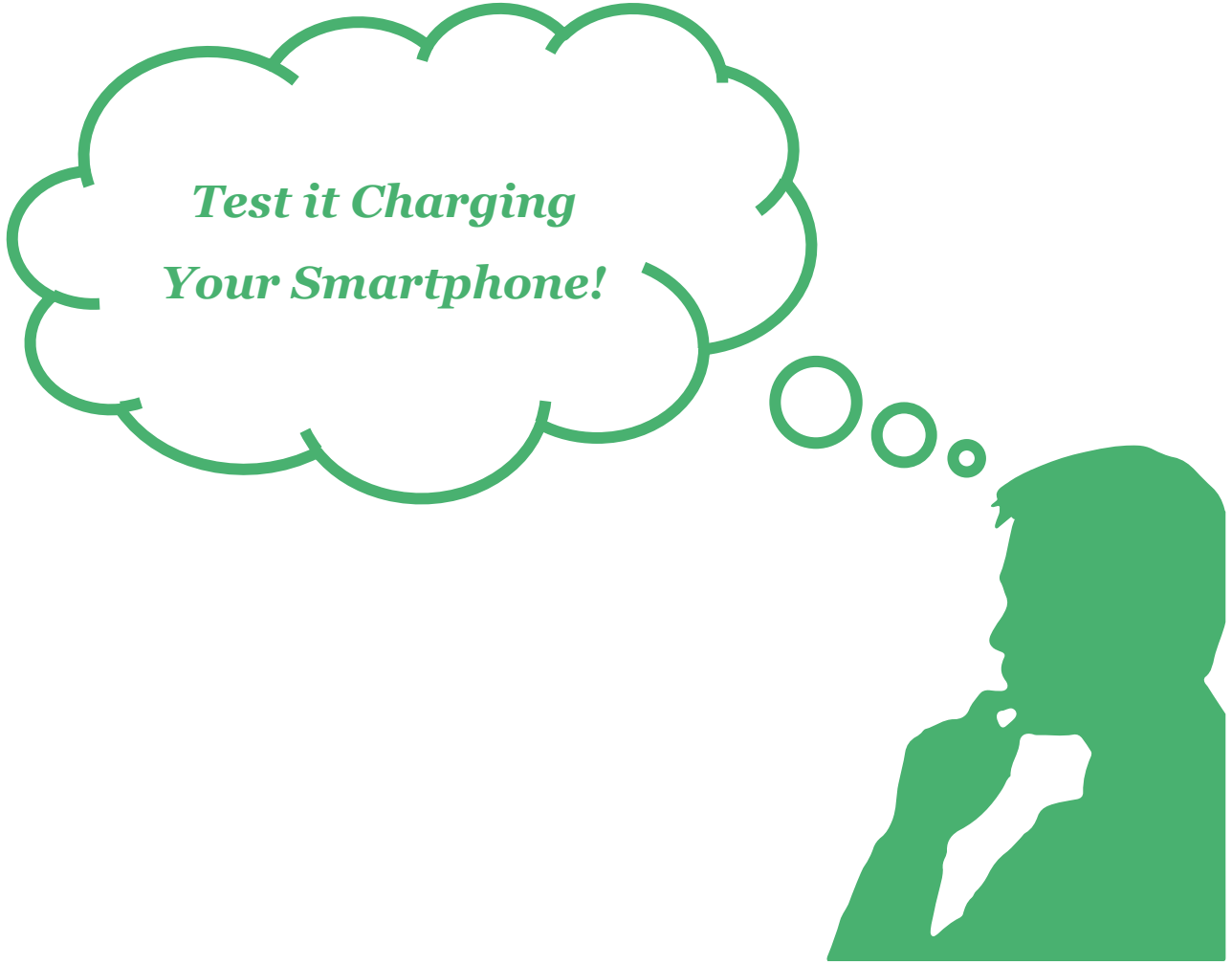
STEVAL-USBPD27S Presentation



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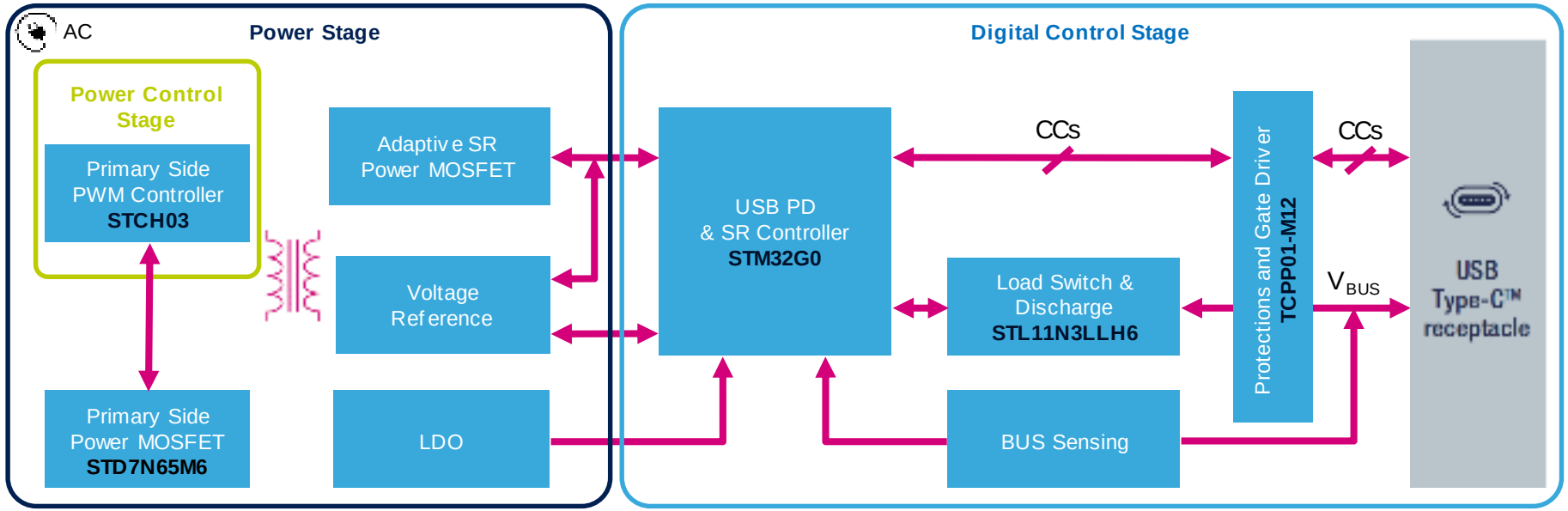
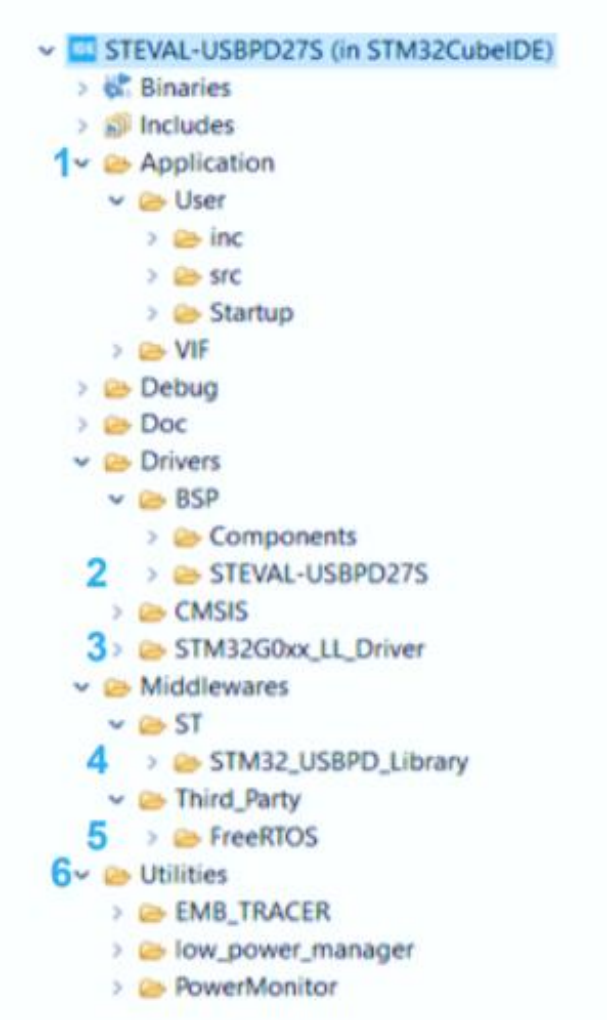
STEVAL-USBPD27S HW Overview

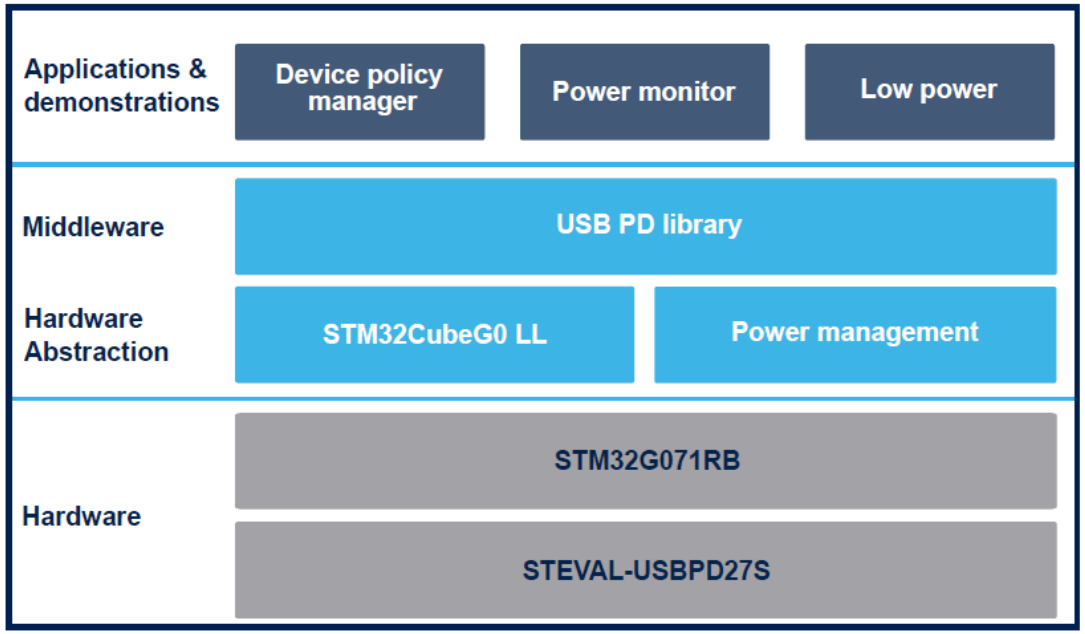


- **Power supply stage** implementing a QR fly-back topology based on the **STD7N65M6** MDmesh™ M6 primary MOSFET,
- **Power control stage** embedding the **STCH03** primary side PWM controller with a 650 V HV start-up cell. It can operate in different modes: QR active mode, valley skipping mode and burst mode to guarantee high efficiency at different input voltage and output load conditions.
- **Digital control stage** based on the **STM32G071KB** Arm Cortex-M0+ MCU that manages the USB Power Delivery stack, controls the USB Type-C connector, enables the V_{BUS} and the V_{CONN} power paths, and runs the adaptive synchronous rectification algorithm. The companion **TCPP01-M12** safely interface the USB-C connector with the MCU, ensuring the highest robustness and protecting against any destructive electrostatic discharge (ESD).

STSW-USBPD27S FW package



1. Application user files
2. BSP and modules
3. Low level drivers
4. USBPD stack library
5. FreeRTOS source code
6. Utilities collection



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Setup & programming the STEVAL-USBPD27S

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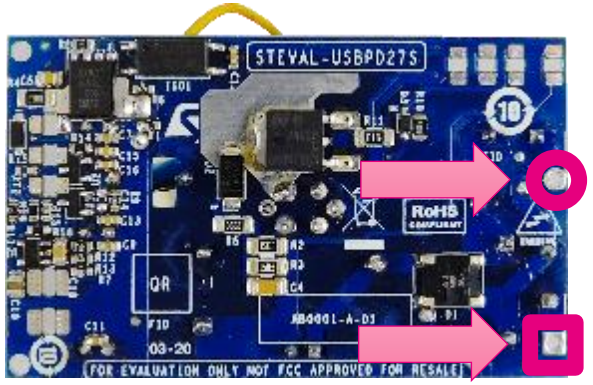
How to Setup the STEVAL-USBPD27S

- Unpack the STEVAL-USBPD27S: *the board is already programmed for you!*

- Connect the board to an AC source through CN1 holes. The board works with universal input mains voltage range: 90 V_{AC} to 264 V_{AC} and line frequency: 45 Hz to 65 Hz.



- Supply the board. *Be careful when supplying!*

- Attach a Sink to the Type-C receptacle

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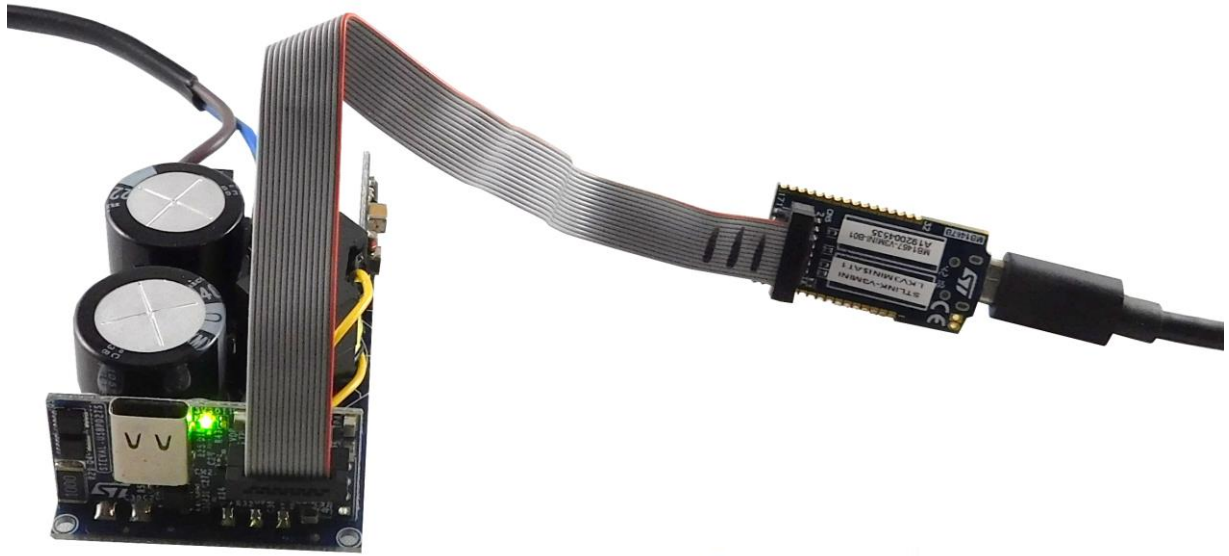
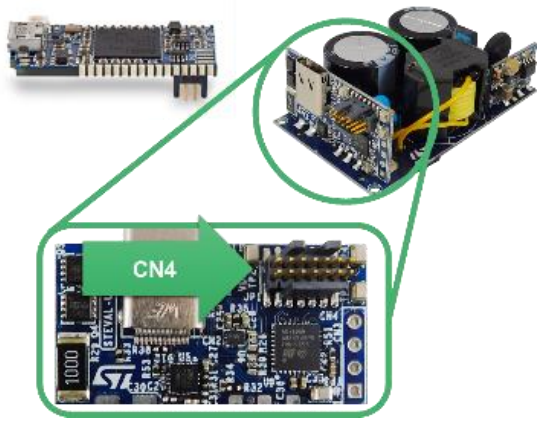
How to Program the STEVAL-USBPD27S

- Connect the STLINK-V3MINI to the STEVAL-USBPD27S CN4 through the provided cable.
- Supply the board. *Be careful when supplying!*
- Program/Debug with the preferred IDE.





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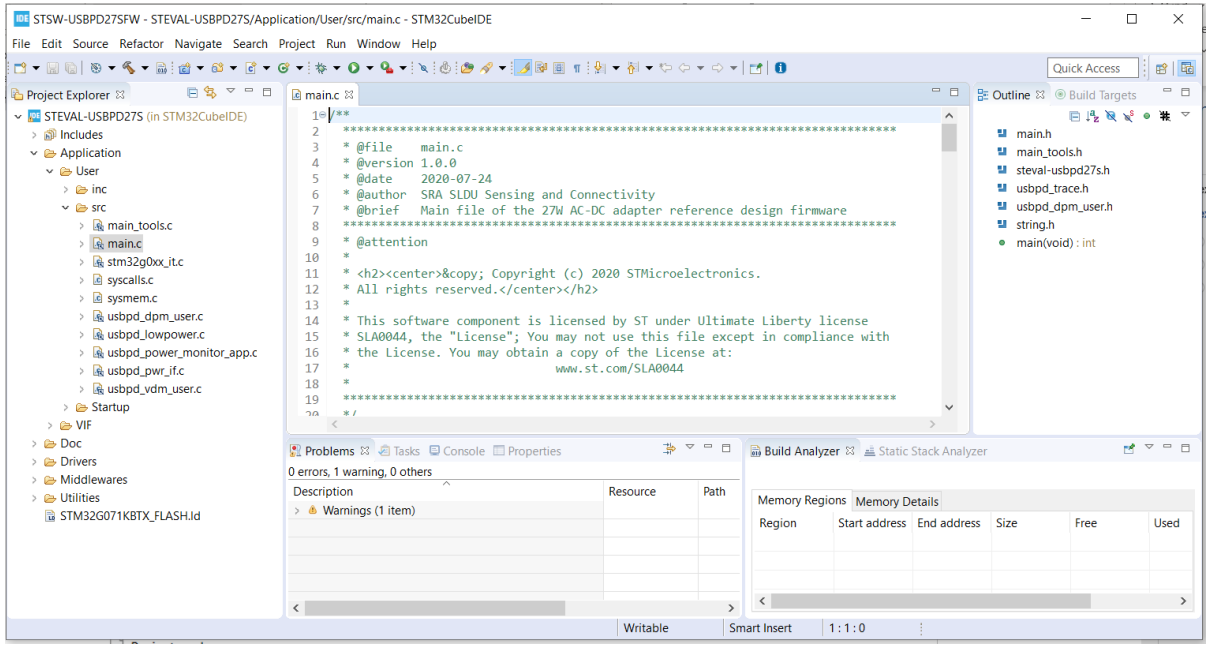
How to debug with STM32CubeIDE



The FW package allows the use of 3 IDE:

- STMicroelectronics STM32CubeIDE
- IAR EWARM
- Keil µVision / MDK-ARM

- STM32CubeIDE is an advanced C/C++ development platform from STMicroelectronics with many useful features
- Open the project, browse the STM32CubeIDE folder and open the available `.project` file
  The path is:
  `$/Firmware/Projects/STEVAL-USBPD27S/Applications/USB_PD/STEVAL-USBPD27S/STM32CubeIDE`
- User can debug/modify the code using the IDE features

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Monitoring and Data Logging

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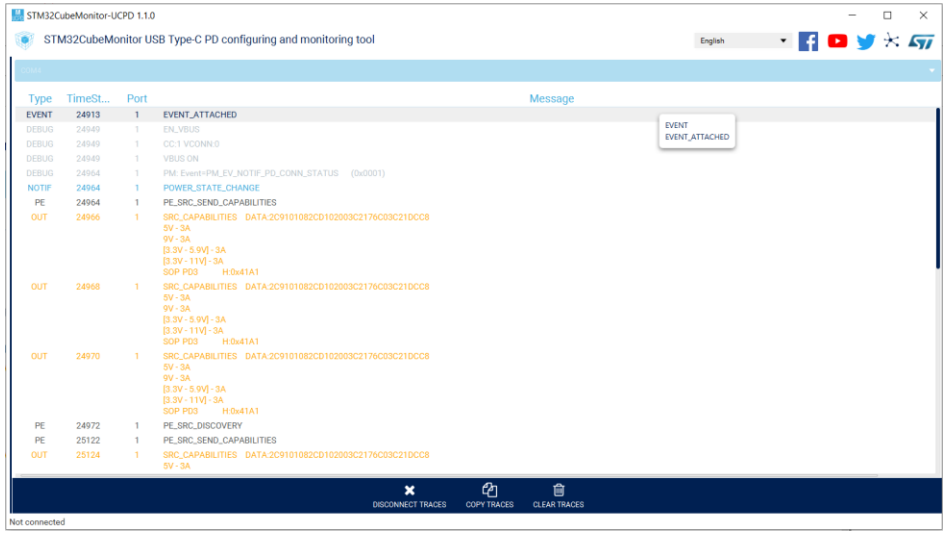
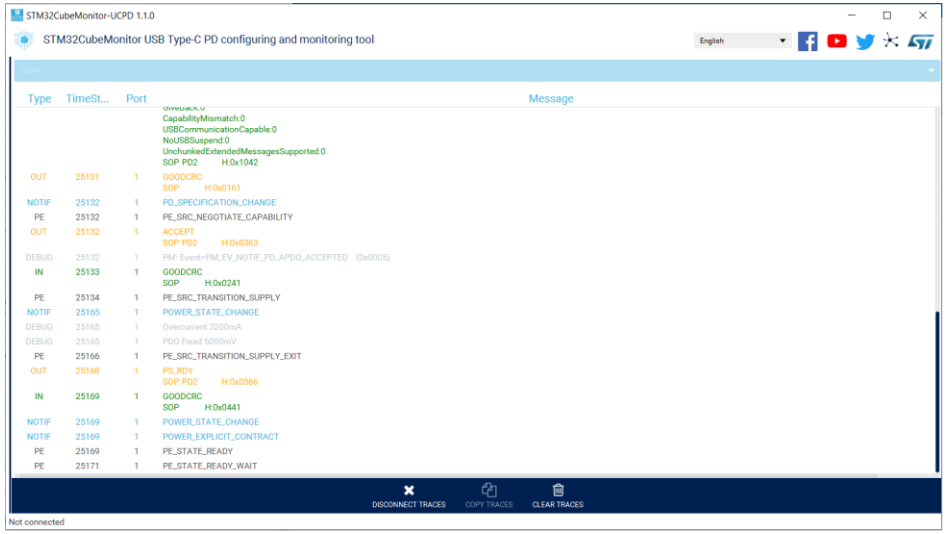
Integrated USBPD Trace

- Useful information on the application behavior can be retrieved using STM32CubeMonitor-UCPD software

- Through the STLINK-V3MINI serial communication channel and by means of the USBPD-Trace utility embedded into the STSW-USBPD27S data are transferred to the STM32CubeMonitor-UCPD GUI





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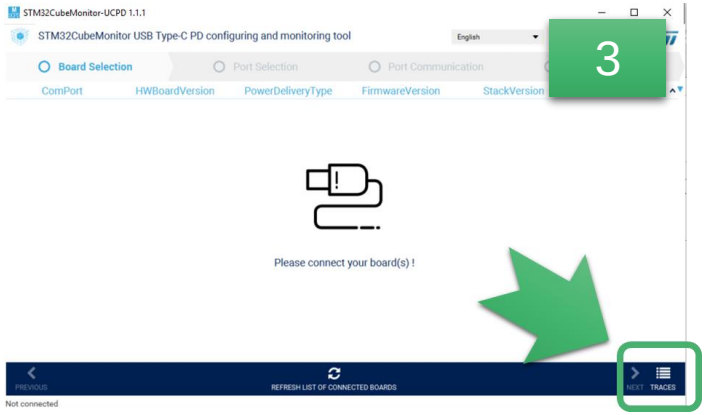
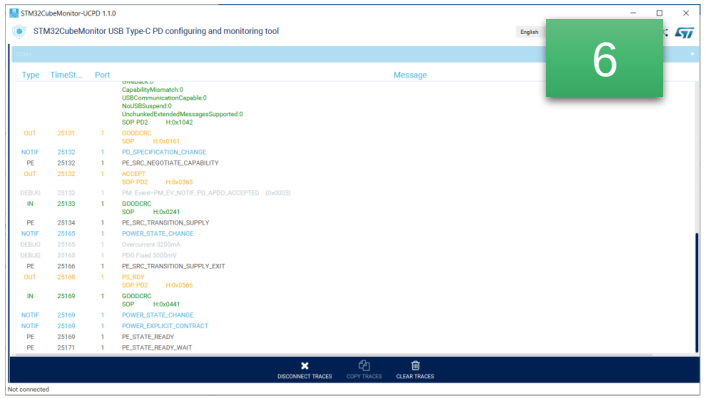
Integrated USBPD Trace: How-To

1. Connect the STLINK-V3MINI to the STEVAL-USBPD27S CN4 connector
2. Run STM32CubeMonitor-UCPD software on your PC
3. Click Traces on the bottom right corner of the GUI
4. Select the COM port offered by the STEVAL-USBPD27S
5. Attach a sink device
6. **You'll get all tracer information**





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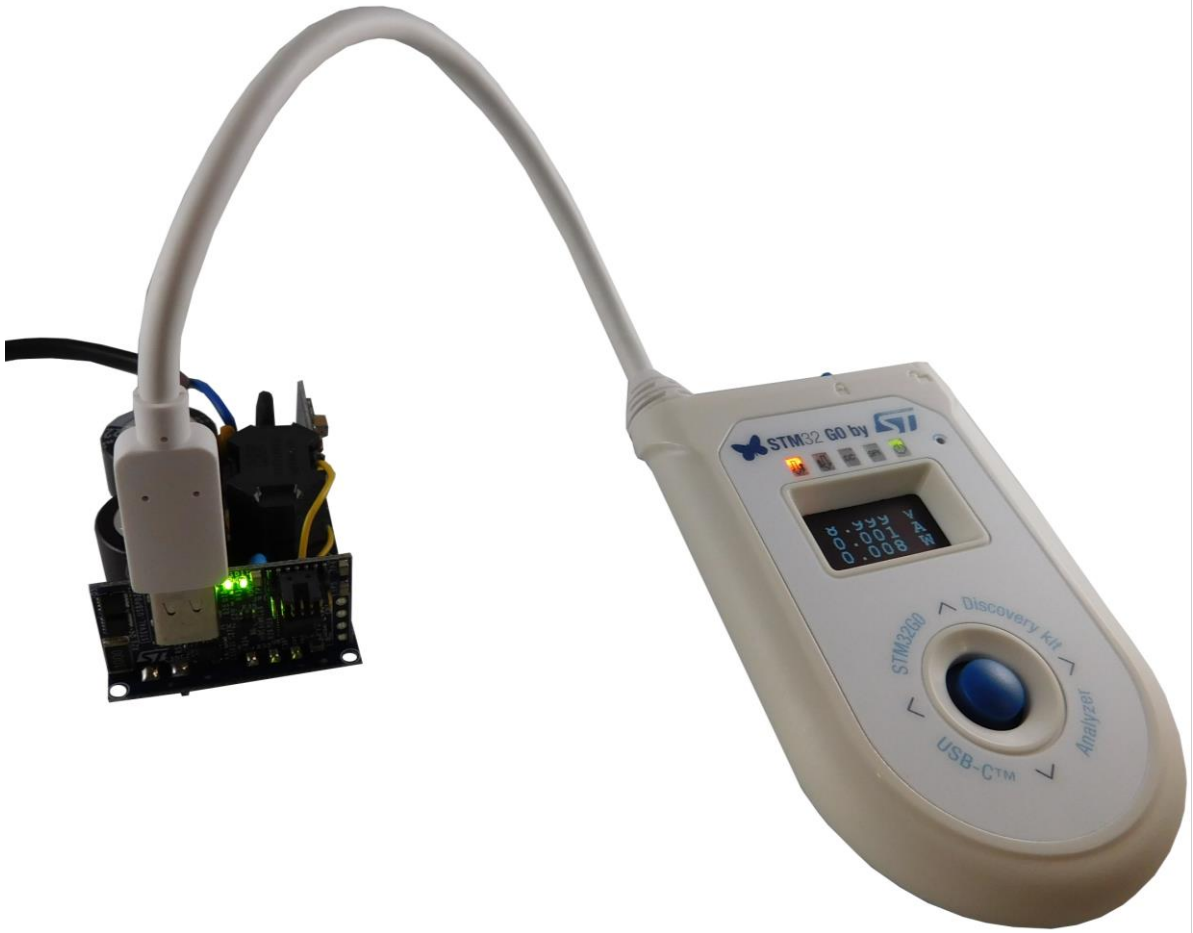
Discover the STEVAL-USBPD27S

How to quickly test the STEVAL-USBPD27S 1/2



- With STM32G071B-DISCO you can easily interact with the STEVAL-USBPD27S
- Basic operations can be performed:
  - Profile requests
  - Control Messages
- The user can check bus parameter in real-time
- STM32G071B-DISCO can also be used:
  - as a sniffer, to monitor a different Sink
  - With STM32CubeMonitor-UCPD to perform advanced testing

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How to quickly test the STEVAL-USBPD27S 2/2

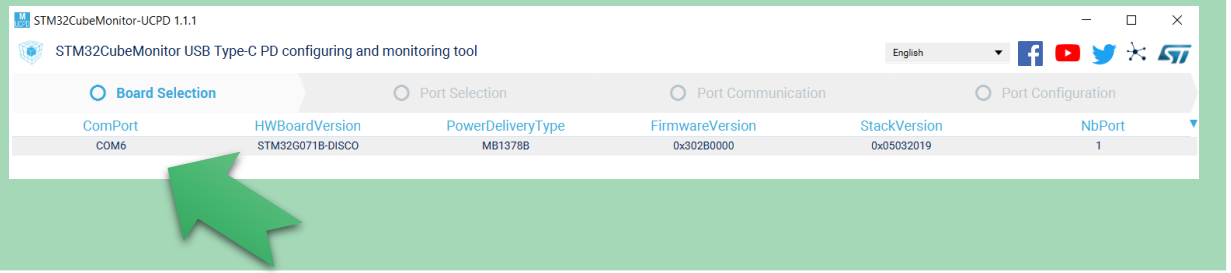
The board will show the “Attach” message on its display

Navigate with the cursor up to the profile menu to select a different profile

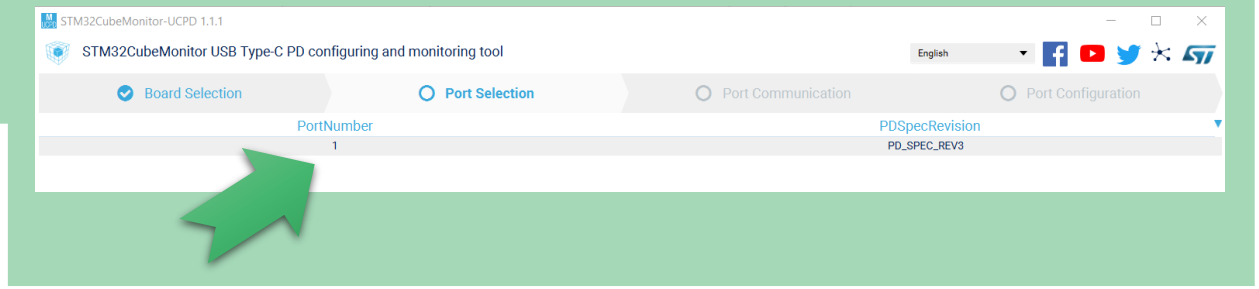
Once a profile is selected, V_{BUS} information is displayed

Advanced testing with STM32CubeMonitor-UCPD 1/3

1. Connect the STM32G071B-DISCO to your PC
2. Run STM32CubeMonitor-UCPD GUI
3. On the ***Board Selection*** pane double-click on STM32G071B-DISCO



4. On the ***Port Selection*** pane double-click on Port Number 1



5. You'll get the GUI to perform requests to STEVAL-USBPD27S and check V_{BUS} values

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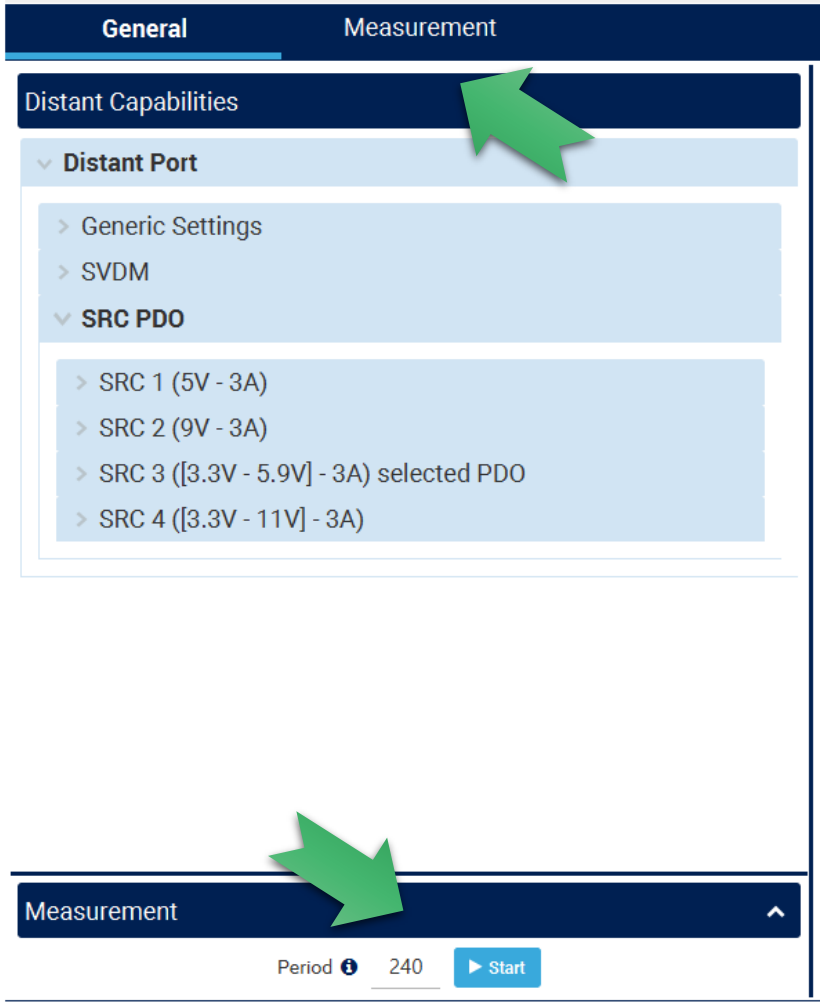
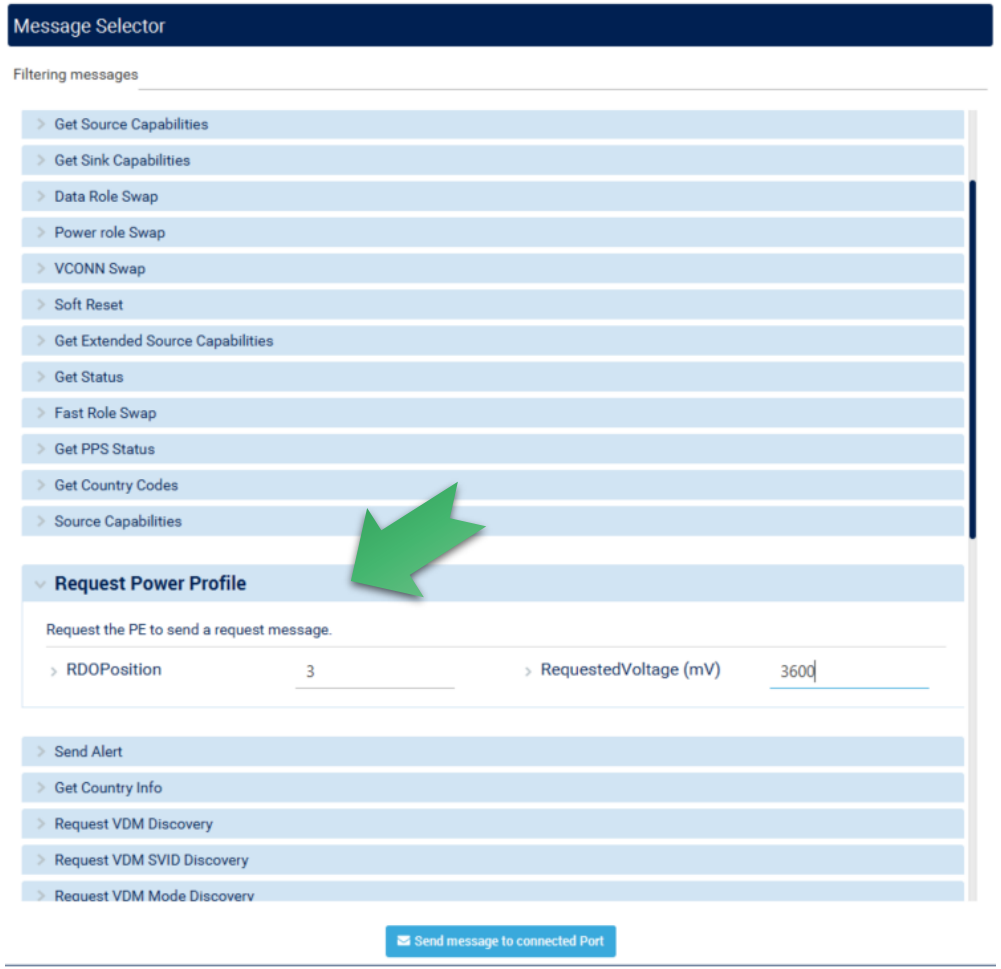
Advanced testing with STM32CubeMonitor-UCPD 2/3

6. Enlarge ***Distant Port*** file to get the information shared by the STEVAL-USBPD27S
7. Set a sampling period (box in the left bottom side of the GUI) and click start to get V_{BUS} samples on the GUI
8. Move to ***Measurement*** tab to get a larger picture of the V_{BUS}



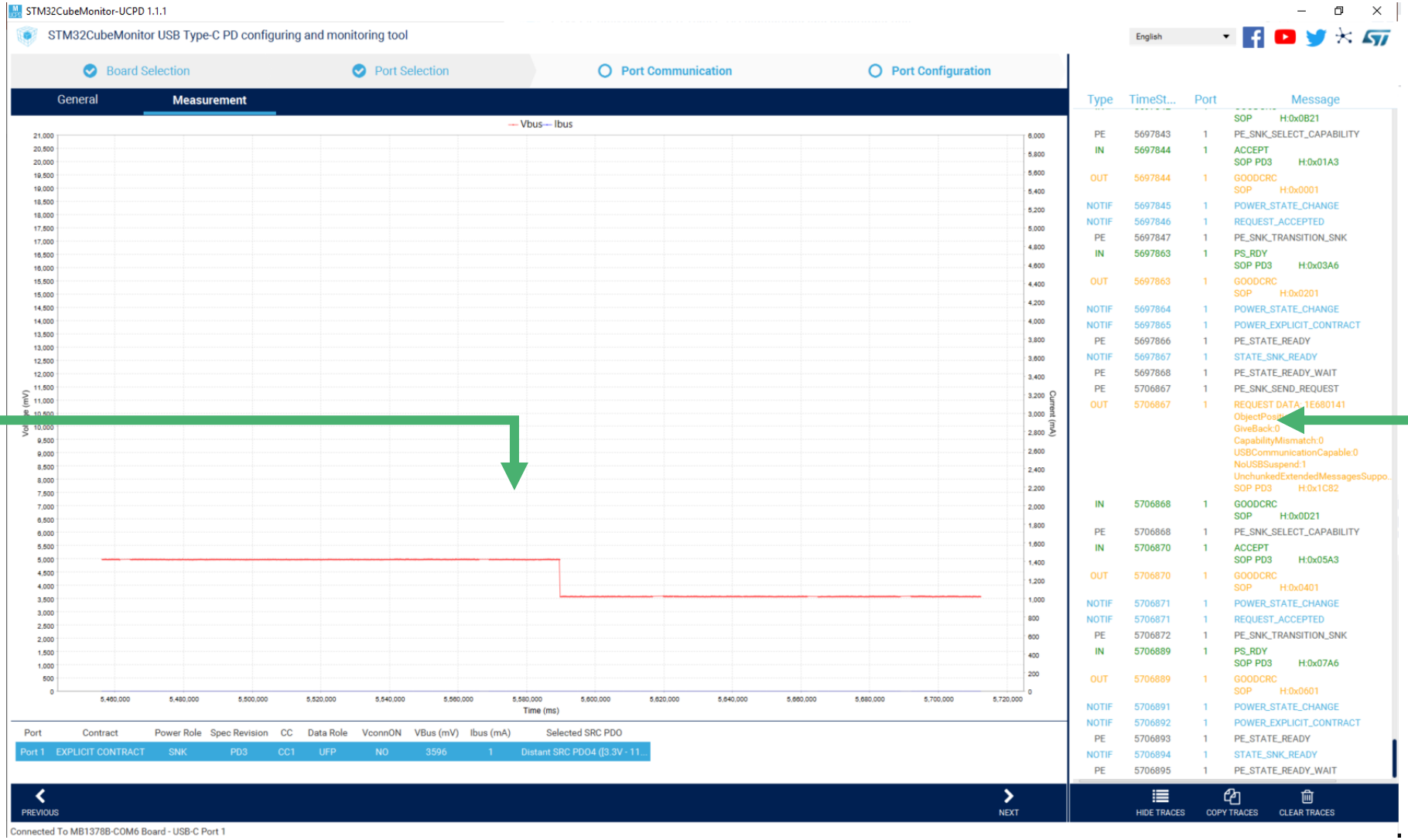
Advanced testing with STM32CubeMonitor-UCPD 3/3

9. Use the ***Message Selector*** pane to interact with the STEVAL-USBPD27S
10. Power profiles can be requested through the specific request box



Example: Profile 4 request with 3.6 Volt

BUS Readings



Traces

Additional Information

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Available Documents

- **STEVAL-USBPD27S Resources**
  - STEVAL-USBPD27S webpage
  - STSW-USBPD27S webpage
  - DB4227: STEVAL-USBPD27S Databrief
  - DB4228: STSW-USBPD27S Databrief
  - UM2733: STEVAL-USBPD27S Hardware User Manual
  - UM2785: STSW-USBPD27SFW Software User Manual
  - AN5563: STEVAL-USBPD27S performance
  - AN5562: V_{BUS} control algorithm compliant with USB Type-C and Power Delivery specifications
  - AN5499: How to implement adaptive synchronous rectification in flyback converters using STM32 MCUs

- **USB-PD Resources**
  - UM2552: Managing USB power delivery systems with STM32 microcontrollers
  - AN5225: USB Type-C™ Power Delivery using STM32xx Series MCUs and STM32xxx Series MPUs
  - TA0357: Overview of USB Type-C and Power Delivery technologies
  - DB3747: STM32CubeMonitor-UCPD software tool for USB Type-C™ Power Delivery port management
- **Programming tools Resources**
  - DB3871: STM32CubeIDE Integrated Development Environment for STM32
  - DB3737: STLINK-V3MINI mini debugger/programmer for STM32
- **STM32G071-Discovery**
  - DB3726: STM32G071B-DISCO STM32G0 Discovery kit for USB Type-C™ and Power Delivery

Thank you

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