

Evaluation board for STUSB1600A USB Type-C™ controller with high voltage protection

Introduction

The STEVAL-CCC002V1 board is designed for STUSB1600A Type-C controller evaluation.

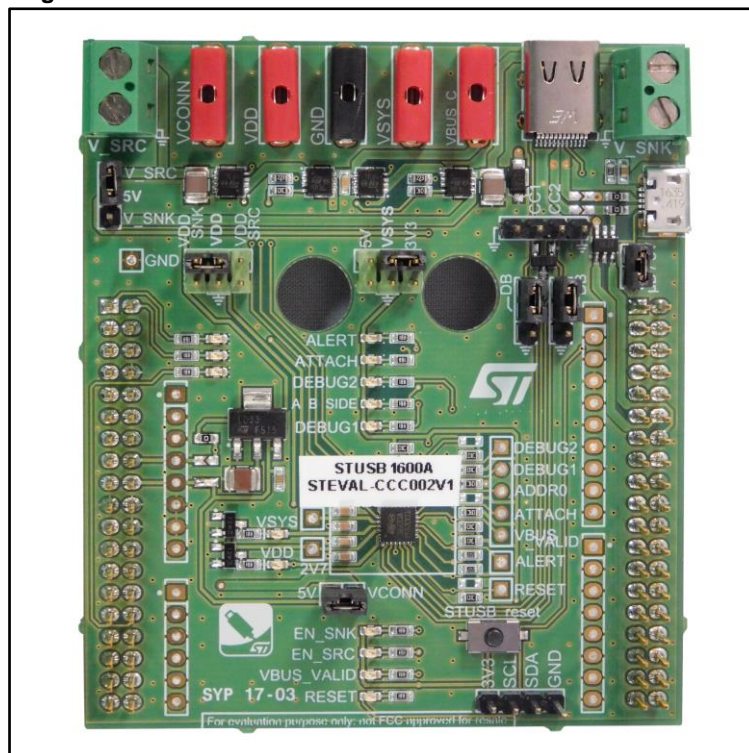
The STEVAL-CCC002V1 board allows the prototyping of a full-featured 5 V USB Type-C port based on the STUSB1600A. The device operates in standalone mode and can be configured in source, sink or dual power role, with or without Dead battery mode.

Both source and sink V_{BUS} power paths are enabled directly by the STUSB1600A according to the port power role configuration and the attached device.

The jumpers are used to simulate different power supply configurations and the various LEDs indicate the operating status of the STUSB1600A and the USB Type-C port.

The STEVAL-CCC002V1 board can also be connected to a standard NUCLEO-F072RB board for configuration and debug purposes.

Figure 1: STEVAL-CCC002V1 evaluation board for STUSB1600A



The USB Type-C port of the STEVAL-CCC002V1 board is pre-configured for 1.5 A USB Type-C current, Dual-role port and Dead battery mode enabled.

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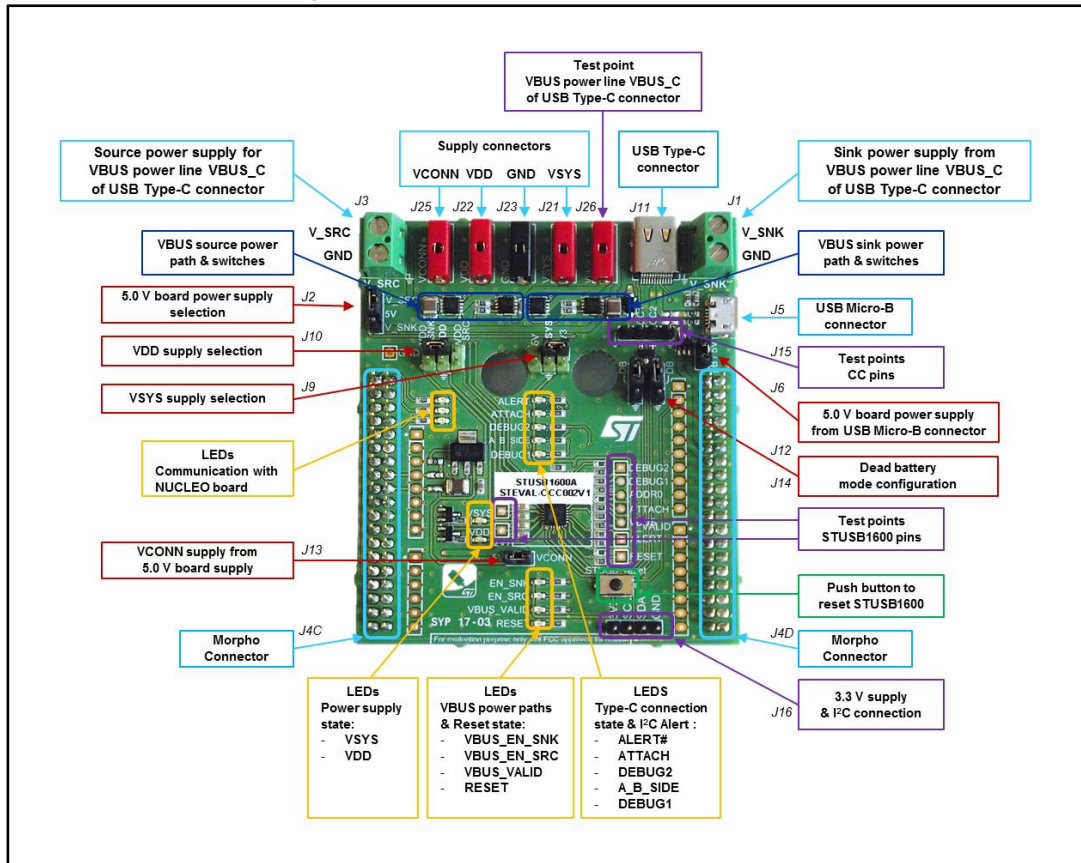
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2 Board description

2.1 Overview

Figure 3: STEVAL-CCC002V1 board overview



Key:

- Blue frame: connectors
- Red frame: jumpers
- Yellow frame: LEDs
- Violet frame: test points
- Dark blue frame: VBUS power paths and switches

2.2 Implementation plan

Figure 4: STEVAL-CCC002V1 component layer - Top view

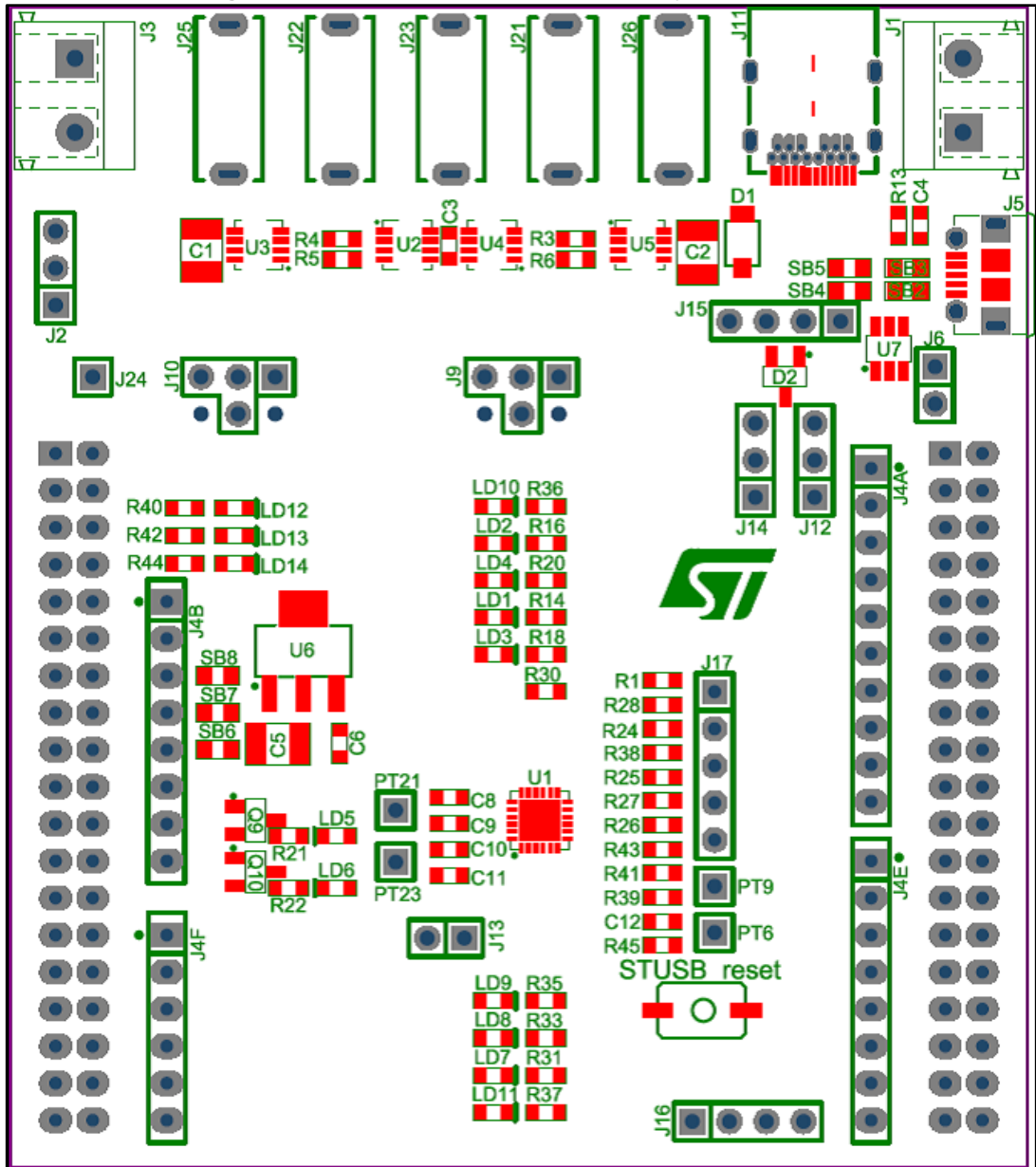
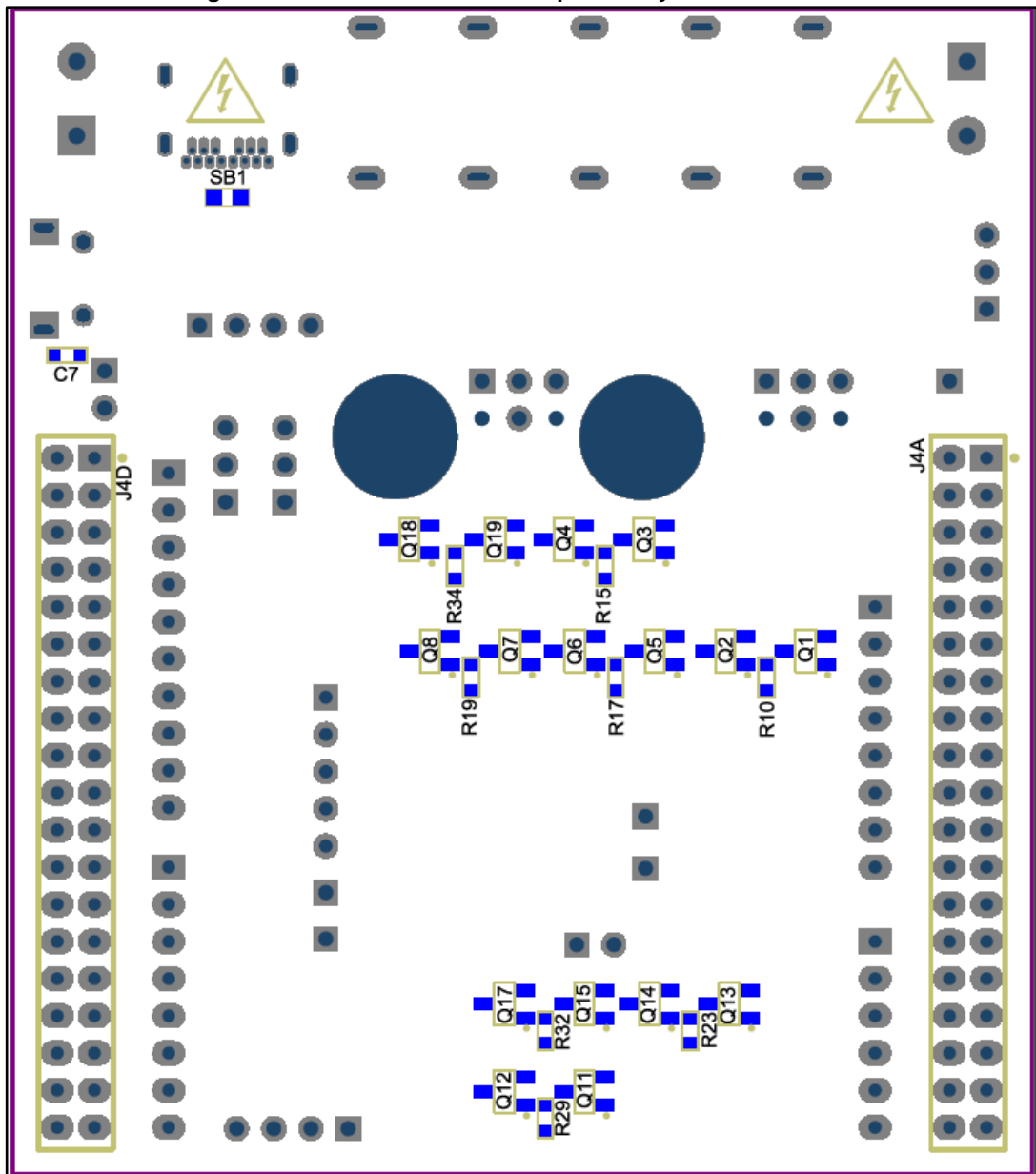


Figure 5: STEVAL-CCC002V1 component layer - Bottom view



2.3 Connectors

Table 1: Connector details

Reference	Naming	Function	Description
J3	V_SRC	Source power supply for VBUS power line	Allows supplying under 5.0 V to the VBUS power line VBUS_C of the USB Type-C connector J11 from an external power supply when the source power path is enabled
J25	VCONN	VCONN power supply	Allows connection of an external power supply to the VCONN power pin of the STUSB1600A
J22	VDD	VDD power supply	Allows connection of an external power supply to the VDD power pin of the STUSB1600A

Reference	Naming	Function	Description
J23	GND	Ground	Allows connection of the ground reference of an external power supply
J21	VSYS	VSYS power supply	Allows connection of an external power supply to the VSYS power pin of the STUSB1600A
J11	n. a.	USB Type-C receptacle	Allows connection of the STEVAL-CCC002V1 board to: Any device with a USB Type-C port using USB Type-C to Type-C cable Any device with a USB Type-A host port using a USB Type-A to USB Type-C cable
J1	V_SNK	Sink power supply from VBUS power line	Allows supplying a system under 5.0 V from the VBUS power line VBUS_C of the USB Type-C connector J11 when the sink power path is enabled
J5	n. a.	USB Micro-B receptacle	Allows connection of the STEVAL-CCC002V1 board to any device with a USB Type-A host port using a USB Type-A to Micro-B cable
J4C / J4D	n. a.	Connection to Nucleo board	Allows plugging the STEVAL-CCC002V1 board to the standard NUCLEO-F072RB board



Connector J1 (V_SNK) must not be connected to an external power supply to avoid evaluation board malfunction.

2.4 Jumpers

Table 2: Jumper descriptions

Reference	Name	Function	Position description
J2	5V	5.0 V board power supply selection	<p>Jumper set to V_SRC:</p> <ul style="list-style-type: none"> An external power supply is connected to J3: 5.0 V board power supply is provided from V_SRC power node of connector J3 No external power supply is connected to J3: V_SRC power node of connector J3 is supplied from 5.0 V board power supply <p>Jumper set to V_SNK: board is supplied from V_SNK power node of connector J1 when VBUS sink power path is enabled</p> <p>Jumper removed: disables board power supply from V_SRC and V_SNK power nodes of connectors J3 and J1 respectively</p>
J9	VSYS	VSYS supply selection	<p>Jumper set to 5V: VSYS pin is supplied from 5.0 V board power supply</p> <p>Jumper set to 3V3: VSYS pin is supplied from 3.3 V board power supply coming from LDO component U6</p> <p>Jumper removed: VSYS pin is supplied from power connector J21 (VSYS)</p> <p>Jumper set to GND: VSYS pin is disabled</p>

Reference	Name	Function	Position description
J10	VDD	VDD supply selection	<p>Jumper set to VDD_SRC: VDD pin is supplied from V_SRC power node of connector J3</p> <p>Jumper set to VDD_SNK: VDD pin is supplied from the VBUS power line VBUS_C of the USB Type-C connector J11</p> <p>Jumper removed: VDD pin is supplied from power connector J22 (VDD)</p> <p>Jumper set to GND: VDD pin is disabled</p>
J6	μB/5V	5.0 V board power supply from VBUS power line of USB Micro-B connector	<p>Jumper set: board is powered from the VBUS power line of the USB Micro-B connector J5</p> <p>Jumper removed: board is powered from the selection of jumper J2</p>
J13	VCONN	VCONN supply from 5.0 V board power supply	<p>Jumper set: VCONN is supplied from 5.0 V board power supply</p> <p>Jumper removed: VCONN is supplied from power connector J25 (VCONN)</p>
J12 / J14	DB	Dead battery mode configuration	<p>Jumpers set to CC1 and CC2, respectively: Dead battery mode enabled</p> <p>Jumpers set to ground: Dead battery mode disabled</p>

2.5 LEDs

Table 3: LED descriptions

Reference	Color	Naming	Description
LD5	Green	VSYS	Lights up when VSYS pin is supplied
LD6	Green	VDD	Lights up when VDD pin is supplied
LD9	Yellow	EN_SNK	Lights up when VBUS_EN_SNK pin is active and VBUS is present on the USB Type-C receptacle J11 Indicates USB Type-C port is operating in sink power role and VBUS sink power path is enabled
LD8	Yellow	EN_SRC	Lights up when VBUS_EN_SRC pin is active Indicates USB Type-C port is operating in source power role and VBUS source power path is enabled
LD7	Green	VBUS_VALID	Lights up when VBUS_VALID pin is active Indicates VBUS is present on the USB Type-C receptacle J11
LD11	Red	RESET	Lights up when a reset is performed through STUSB_reset push button
LD10	Red	ALERT	Lights up when an I ² C alert occurs on ALERT# pin
LD2	Green	ATTACH	Lights up when the ATTACH pin is active Indicates a device is attached to the USB Type-C port and a valid connection is established
LD4	Yellow	DEBUG2	Lights up when DEBUG2 pin is active Indicates a debug accessory device is attached when operating in source power role

Reference	Color	Naming	Description
LD1	Green	A_B_SIDE	Light is off when no connection is established When a connection is established, indicates cable orientation on the USB Type-C receptacle J11: Light off : CC1 pin is attached to CC line Light on : CC2 pin is attached to CC line
LD3	Yellow	DEBUG1	Lights up when DEBUG1 pin is active Indicates a debug accessory device is attached when operating in sink power role
LD12 LD13 LD14	Green	n. a.	Blinks when communication with NUCLEO-F072RB board is active through ST morpho connectors J4C and J4D

2.6 Test points

Table 4: Test points description

Reference	Naming	Description
J26	VBUS_C	VBUS power line of the USB Type-C connector J11
J15	CC2 CC1	STUSB1600A configuration channels pins CC1 and CC2 connected to the USB Type-C connector J11
J16	3V3	3.3V board power supply from LDO component U6
J17	DEBUG2 DEBUG1 ADDR0 ATTACH VBUS_VALID	STUSB1600A input and output pins
PT9	ALERT	STUSB1600A I ² C ALERT# pin
PT6	RESET	STUSB1600A RESET pin
PT21	1V2	STUSB1600A VREG_1V2 pin
PT23	2V7	STUSB1600A VREG_2V7 pin

2.7 Interfaces

Table 5: Interfaces description

Reference	Function	Description
J16	I ² C connection with STUSB1600A	Allows direct communication with the STUSB1600A I ² C interface through SCL and SDA pins.
J5	USB connection with Nucleo board	Allows communication from a PC or laptop with the MCU of the Nucleo board to interact with the I ² C interface of STUSB1600A. A standard NUCLEO-F072RB board must be connected to STEVAL-CCC002V1 board through ST morpho connectors J4C and J4D. The main purpose is to run the STUSB GUI for configuration and monitoring from a PC or laptop.

2.8 Power supplies

2.8.1 Board power supply

The STEVAL-CCC002V1 board can be powered in three ways:

- From VBUS power line of USB Micro-B connector J5 through jumper J6
- From external power supply through connector J3 and jumper J2
- From VBUS power line VBUS_C of USB Type-C connector J11 through VBUS sink power path and jumper J2 (Dead battery mode)

The STEVAL-CCC002V1 board must be supplied under 5.0 V only.

The 5.0 V board power supply is used for:

- Generating a low voltage supply of 3.3 V from LDO component U6
- Powering the STUSB1600A at 5.0 V through the VSYS pin if needed
- Supplying the VCONN pin of STUSB1600A if needed
- Supplying V_SRC power node of connector J3 when no external power supply is connected
- Powering the Nucleo board when connected to ST morpho connectors J4C and J4D

The generated 3.3 V power supply is used for:

- Supplying the network of LEDs
- Supplying the pull-up resistances connected to the open drain outputs of STUSB1600A and I²C interface
- Supplying the STUSB1600A through the VSYS pin if needed
- Resetting the STUSB1600A when the STUSB_reset button is pressed

2.8.2 VBUS power supply

The STEVAL-CCC002V1 board implements a VBUS source power path and a VBUS sink power path connected to the VBUS power line VBUS_C of the USB Type-C receptacle J11.

When the VBUS source power path is enabled by the VBUS_EN_SRC pin of STUSB1600A, the VBUS power line VBUS_C is supplied from V_SRC power node.

The V_SRC power node can be supplied in two ways (see [Section 7: "Power supply configurations"](#)):

- From external power supply through connector J3
- From VBUS power line of USB Micro-B connector J5 through jumpers J6 and J2

When the VBUS sink power path is enabled by the VBUS_EN_SNK pin of STUSB1600A, the VBUS power line VBUS_C is powering V_SNK power node.

2.8.3 STUSB1600A power supply

The STEVAL-CCC002V1 board implements the dual power supply scheme for STUSB1600A through VSYS and VDD pins that can be configured in different ways according to the targeted application (see [Section 7: "Power supply configurations"](#)).

3 Getting started with the default configuration

3.1 System requirements

To start with the STEVAL-CCC002V1 board default configuration, you need:

- a device with a USB Type-A host port (PC, laptop, charger, etc.)
- a device with a USB Type-C port (source, sink or dual role)
- a USB Type-A to Micro-B cable
- a USB Type-C to Type-C cable

3.2 Getting started sequence

- 1 Check jumpers on the STEVAL-CCC002V1 board are set to the default position: J2 to V_SRC, J6 on, J9 to 3V3, J10 to VDD_SNK, J12 to CC1, J14 to CC2, J13 on.
- 2 With this jumper configuration, the STUSB1600A, VBUS and STEVAL-CCC002V1 board are supplied through the VBUS power line of the USB Micro-B connector J5 (see [Section 7: "Power supply configurations"](#)).
- 3 Connect the USB Micro-B receptacle J5 to any device with a USB Type-A host port using a USB Type-A to Micro-B cable to power the board.
- 4 The green LED LD5 (VSY) lights up to indicate the evaluation board and the STUSB1600A are powered.
- 5 Connect the USB Type-C receptacle J11 to any device with a USB Type-C port using a USB Type-C to Type-C cable.
- 6 The green LED LD2 (ATTACH) lights up when the device is attached. The green LED LD1 (A_B_SIDE) lights up if the orientation of the plug is reversed on the USB Type-C receptacle J11.
- 7 If the USB Type-C port is operating as a Source, the yellow LED LD8 (EN_SRC) lights up. If the USB Type-C port is operating as a Sink, the yellow LED LD9 (EN_SNK) lights up.
- 8 The green LED LD7 (VBUS_VALID) lights up to indicate VBUS is available on the Type-C receptacle.

4 Going further with a custom configuration

4.1 System requirements

To customize the default configuration of the STEVAL-CCC002V1 board, you need:

- a PC or Laptop with a USB Type-A host port and STUSB GUI installed (see [Section 5.3: "STUSB GUI installation"](#))
- a standard NUCLEO-F072RB board configured to operate with STEVAL-CCC002V1 board (see [Section 5.4: "Configuring the STM32 Nucleo board"](#))
- a USB Type-A to Micro-B cable
- a USB Type-C to Type-C cable
- a device with a USB Type-C port (source, sink or dual role) to test the configuration

4.2 Configuring the USB Type-C port

- 1 Connect the STEVAL-CCC002V1 board to the NUCLEO-F072RB board (see [Section 5.5: "Connecting the evaluation board to the STM32 Nucleo board"](#)).
- 2 Configure the STUSB1600A with NVM parameters values corresponding to the targeted application (see [Section 5.6: "Configuring the STUSB1600A with STUSB GUI"](#) and [Section 6: "Power mode configuration"](#)).
- 3 Disconnect the STEVAL-CCC002V1 board from the PC or the Laptop by removing the USB Type-A to Micro-B cable from the USB Micro-B receptacle J5.
- 4 Position the jumpers on the STEVAL-CCC002V1 board with respect to the selected power mode (see [Section 6: "Power mode configuration"](#)).
- 5 Configure the different power supplies of the STEVAL-CCC002V1 board according to the targeted application (see [Section 7: "Power supply configurations"](#)).
- 6 Ensure the various warnings related to the jumper positions in [Section 7: "Power supply configurations"](#) have been addressed before providing the power supplies to the STEVAL-CCC002V1 board.
- 7 Power the STEVAL-CCC002V1 board depending on the power supply scheme defined in step 5.
- 8 If the NUCLEO-F072RB board is used for monitoring, the USB Micro-B connector J5 of the STEVAL-CCC002V1 board must be connected to the PC or laptop via the USB Type-A to Micro-B cable.

4.3 Monitoring the USB Type-C port

From the configuration sequence above, open the STUSB GUI to monitor the state of the STUSB1600A when testing the USB Type-C port (see [Section 5.7: "Monitoring the STUSB1600A with STUSB GUI"](#)).

5 Using Nucleo board for STUSB1600A configuration and monitoring

5.1 Overview

The default NVM configuration of the STUSB1600A can be modified to evaluate different operating modes of the USB Type-C port.

A dedicated GUI (GUI_STUSB_Utility_x.x.exe) lets you change the NVM configuration of the STUSB1600A easily. The STUSB GUI interacts with the I²C interface of the STUSB1600A through the standard NUCLEO-F072RB board plugged to the STEVAL-CCC002V1 board. The Nucleo board acts as a USB-to-I²C bridge between the STUSB GUI and the STUSB1600A.

The STUSB GUI can also be used to monitor the state of the STUSB1600A thanks to the I²C status registers.

The STUSB GUI runs on a PC or laptop connected to the STEVAL-CCC002V1 board through the USB Micro-B connector J5.

5.2 System requirements

To use the STUSB GUI, you need:

- a PC or Laptop with a USB Type-A host port
- a standard NUCLEO-F072RB board embedding a STM32F072RB MCU
- a USB Type-A to Mini-B cable
- a USB Type-A to Micro-B cable
- the configuration file for the NUCLEO-F072RB board to operate with STEVAL-CCC002V1 board
- STUSB GUI files

5.3 STUSB GUI installation

The files for Nucleo board configuration and for the STUSB GUI are included in a zip file named GUI_STUSB_Utility_x.x.zip. The zip file can be downloaded from the [STEVAL-CCC002V1 product folder](#) at www.st.com.

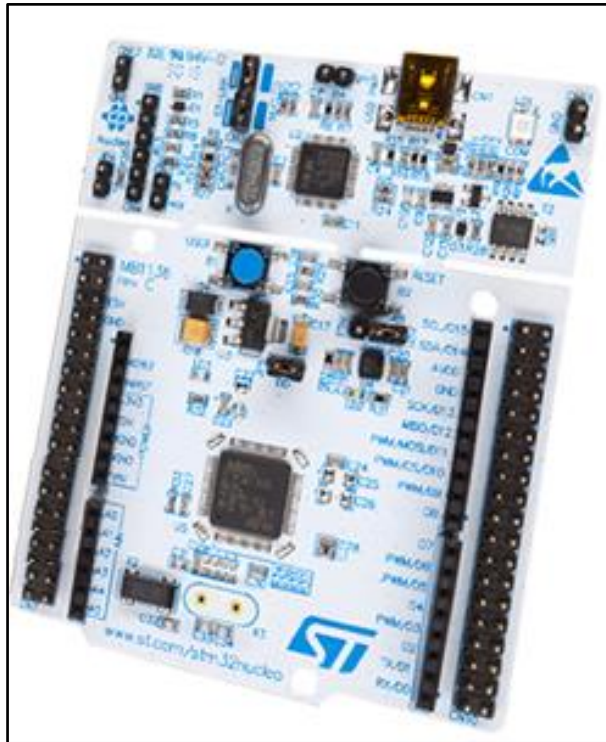
Once downloaded, unzip the file in your working directory to extract the following executable files:

- Configuration file:
 - Nucleo_F072RB_STUSB_NVM_config_x.x.bin
- STUSB GUI files:
 - mfc110u.dll
 - msvcp110.dll
 - msucr110.dll
 - uipinterface.dll
 - GUI_STUSB_Utility_x.x.exe

5.4 Configuring the STM32 Nucleo board

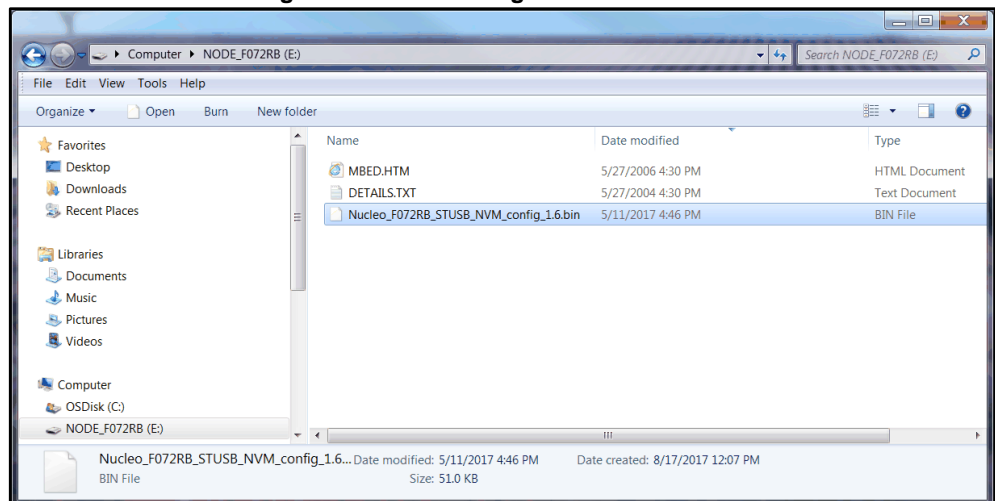
Before running the STUSB GUI, the NUCLEO-F072RB board must be configured to operate with the STEVAL-CCC002V1 board.

Figure 6: Standard NUCLEO-F072RB board



- 1 Connect the USB Mini-B connector CN1 of the NUCLEO-F072RB board to a PC or laptop using a USB Type-A to Mini-B cable.
When connecting for the first time, refer to the “Getting started” section of the insert card provided with the NUCLEO-F072RB package.
- 2 Transfer the configuration file Nucleo_F072RB_STUSB_NVM_config_x.x.bin into the Nucleo board.

Figure 7: Nucleo configuration file transfer



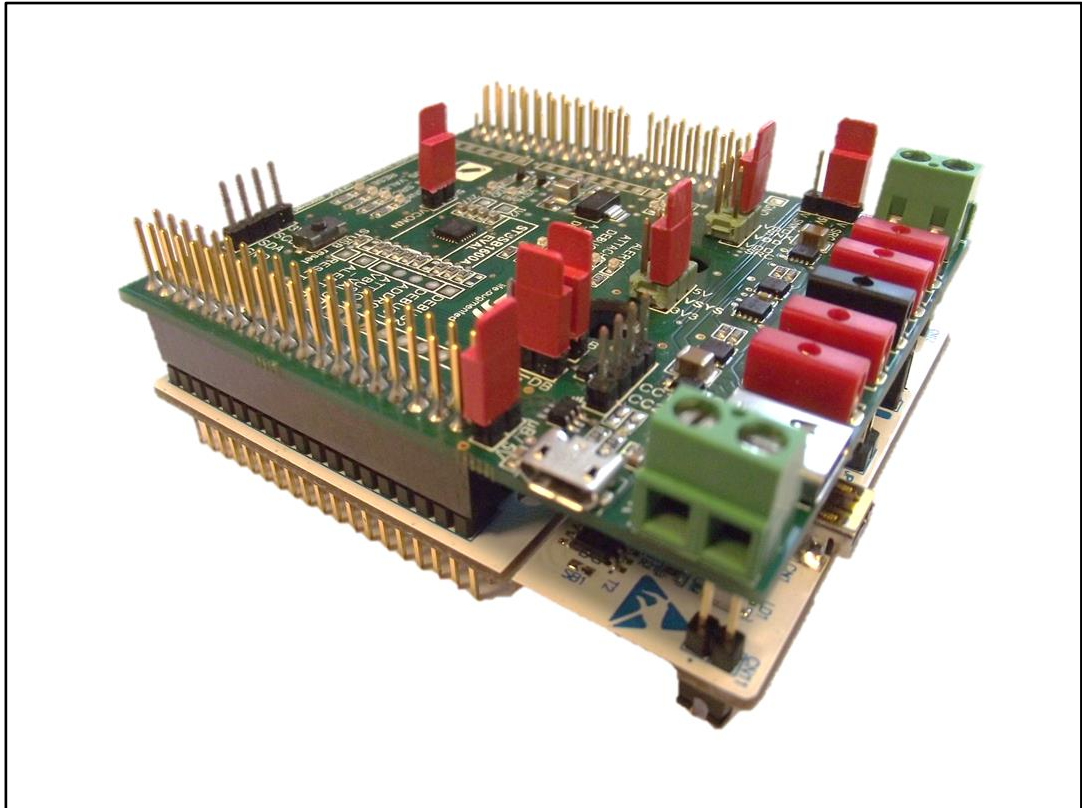
- 3 Press the reset button B2 (black button) on the STM32 Nucleo board.
- 4 The board is now configured to operate with the STEVAL-CCC002V1 board.

- 5 Disconnect the Nucleo board from the PC or the Laptop by removing the USB Type-A to Mini-B cable.

5.5 Connecting the evaluation board to the STM32 Nucleo board

Before running the STUSB GUI, the STEVAL-CCC002V1 board must be connected to the NUCLEO-F072RB board.

Figure 8: NUCLEO-F072RB board assembly with STEVAL-CCC002V1 board



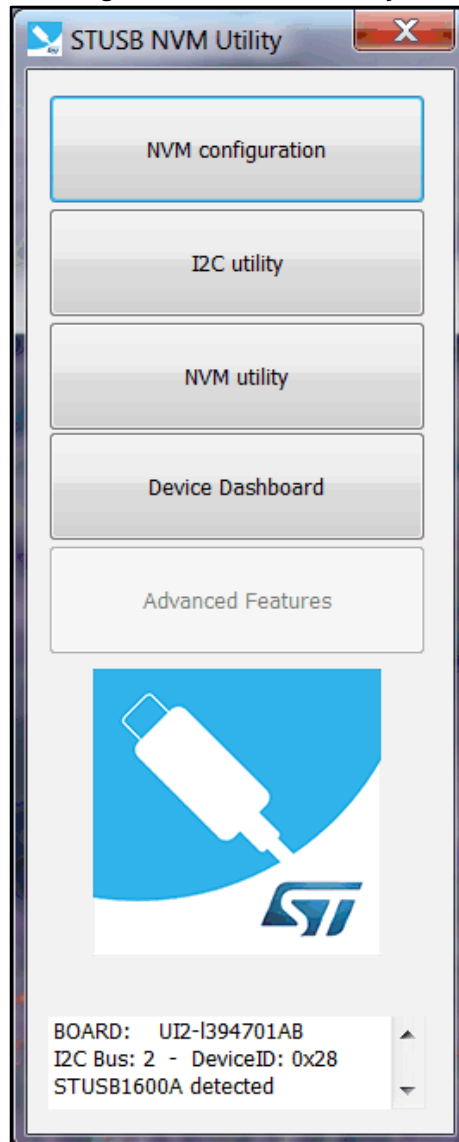
- 1 Plug the STEVAL-CCC002V1 board to the NUCLEO-F072RB board via the ST morpho connectors J4C and J4D as shown in the above figure.
- 2 Ensure the jumpers on the STEVAL-CCC002V1 board are set to the default position: J2 to V_SRC, J6 on, J9 to 3V3, J10 to VDD_SNK, J12 to CC1, J14 to CC2, J13 on (see [Section 3.2: "Getting started sequence"](#)).
- 3 Connect the USB Micro-B connector J5 of the STEVAL-CCC002V1 board to a PC or laptop using a USB Type-A to Micro-B cable.
- 4 The green LED LD5 (VSY) lights up to indicate the evaluation board and the STUSB1600A are powered.
- 5 The red LED LD3 (PWR) on the Nucleo board lights up indicating the board is powered.
- 6 The red LED LD1 (COM) on the Nucleo board and the green LEDs LD12, LD13, LD14 on the evaluation board blink, indicating the two boards are communicating.
- 7 The STUSB GUI can now be opened to interact with the STEVAL-CCC002V1 board through the NUCLEO-F072RB board.

5.6 Configuring the STUSB1600A with STUSB GUI

For further details on the STUSB GUI Utility, visit the ST website on www.st.com.

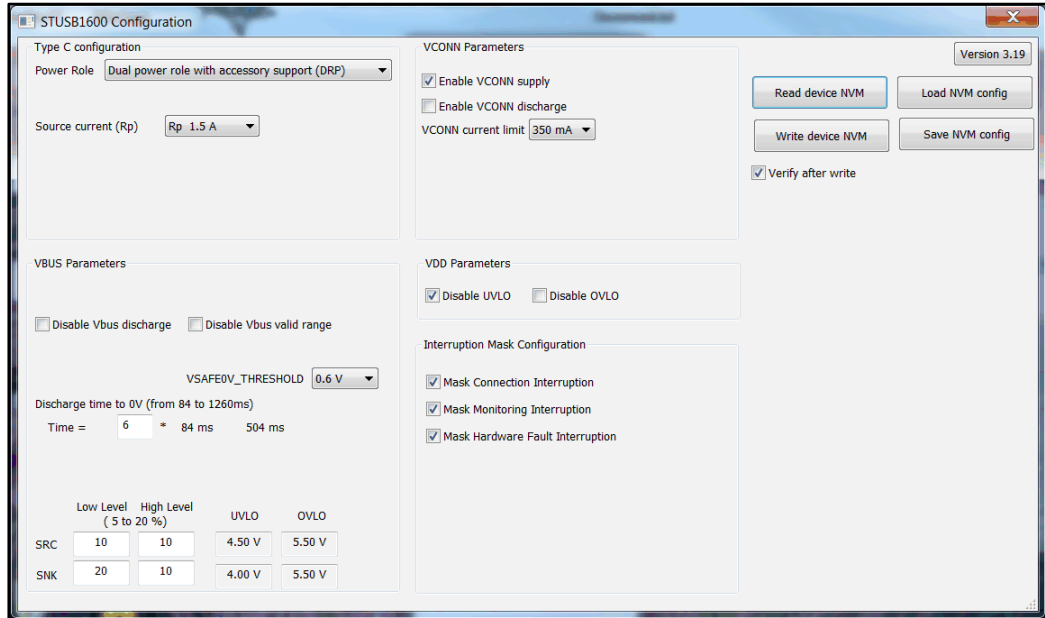
- 1 From your working directory containing the STUSB GUI files, open the STUSB GUI by double clicking on the GUI_STUSB_Utility_x.x.exe file.
- 2 The STUSB GUI window appears.

Figure 9: STUSB NVM utility



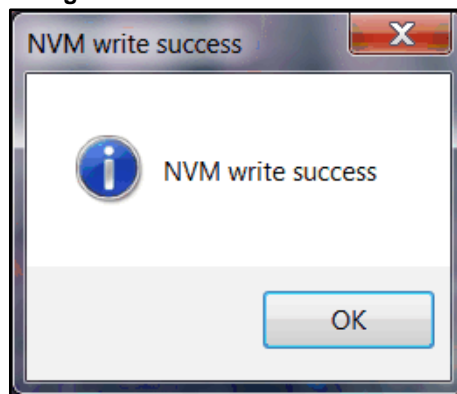
- 3 Click on the “NVM configuration” button to open the configuration window. The window displays the NVM parameters of the STUSB1600A with the default values used at power-up or after a reset. You can change these settings according to your design requirements.

Figure 10: STUSB1600A configuration window



- 4 To program the NVM with the new setting, click on the “Write device NVM” button. Once the write operation has been performed, the window below opens. It informs the NVM is configured with the new set of parameters.

Figure 11: NVM write confirmation

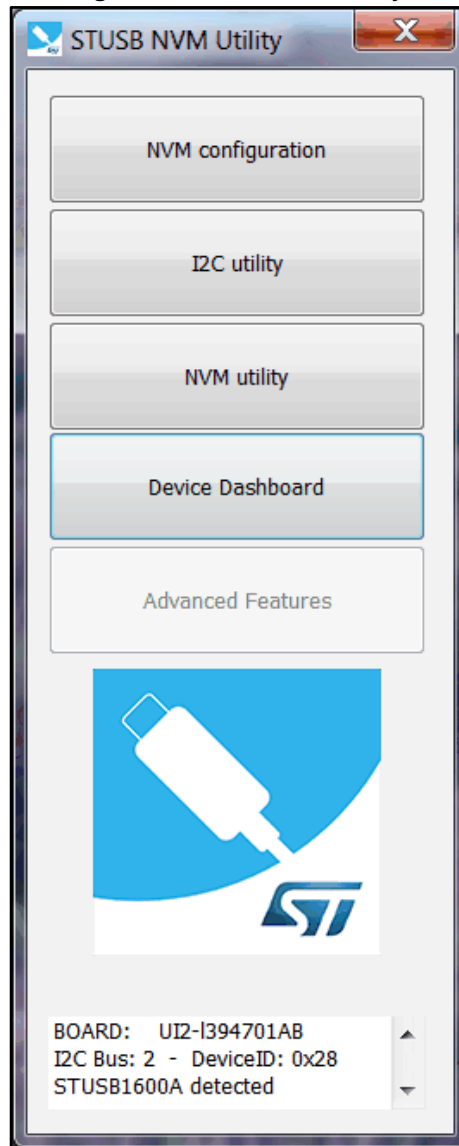


- 5 Click on the “OK” button to close the window.
- 6 Reset the STUSB1600A through the “STUSB_reset” button on the STEVAL-CCC002V1 board to load the new default settings.

5.7 Monitoring the STUSB1600A with STUSB GUI

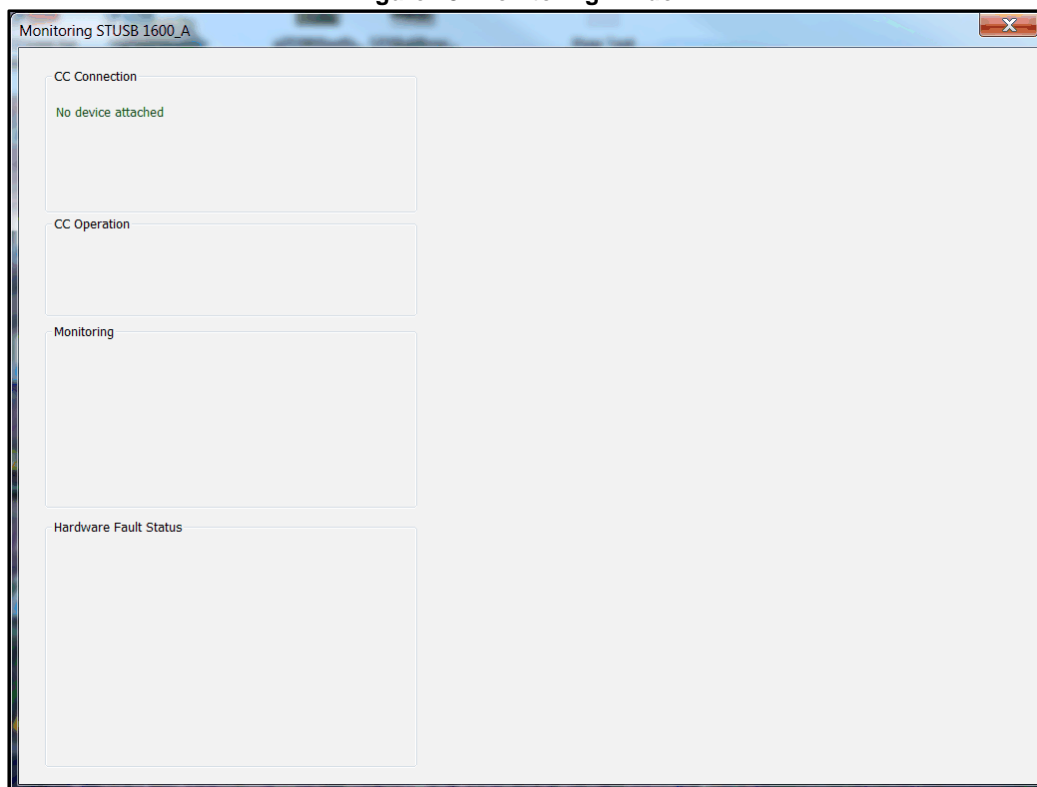
For further details on the STUSB GUI Utility, visit the ST website on www.st.com.

- 1 From your working directory containing the STUSB GUI files, open the STUSB GUI by double clicking on the GUI_STUSB_Utility_x.x.exe file.
The STUSB GUI window appears.

Figure 12: STUSB NVM utility

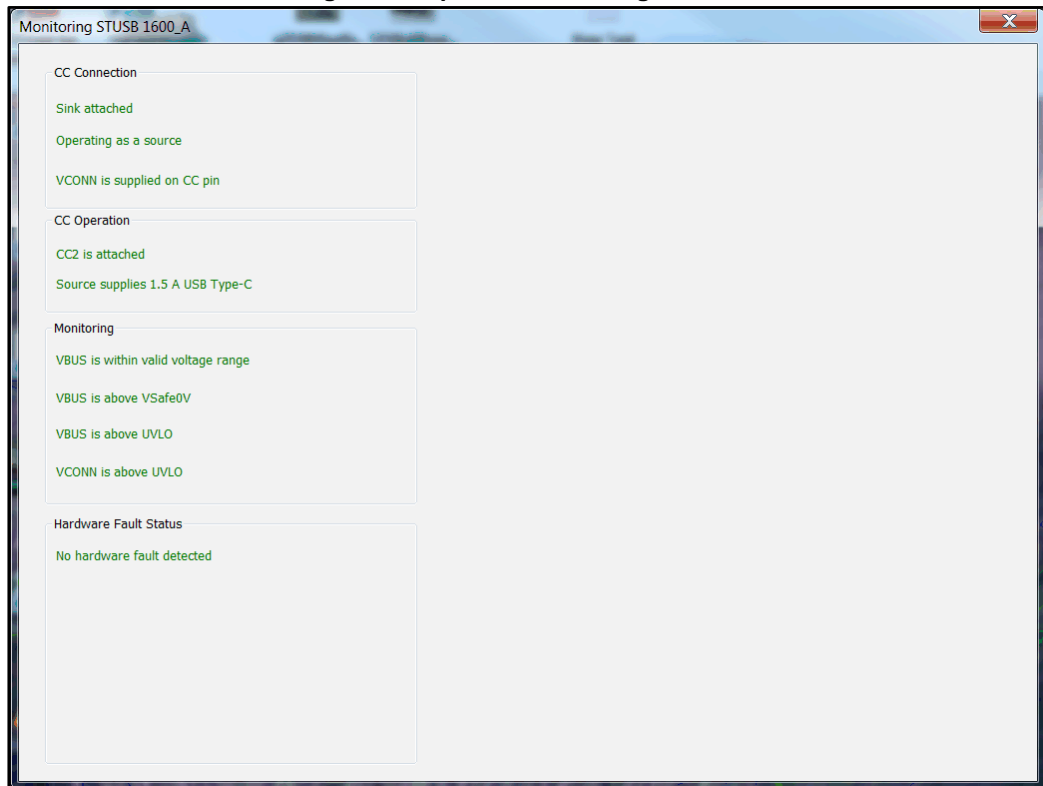
- 2 Click on the “Device Dashboard” button to open the monitoring window.
The monitoring window displays the main information related to the operating status of the STUSB1600A and the USB Type-C port. These information come from the content of the I²C status registers of the STUSB1600A. The monitoring window is updated in real time.

Figure 13: Monitoring window



- 3 If you connect, for instance, a Sink device to the USB Type-C connector J11 of the STEVAL-CCC002V1 board using a USB Type-C to Type-C cable, the content of the monitoring window is updated as follows.

Figure 14: Updated monitoring window



6 Power mode configuration

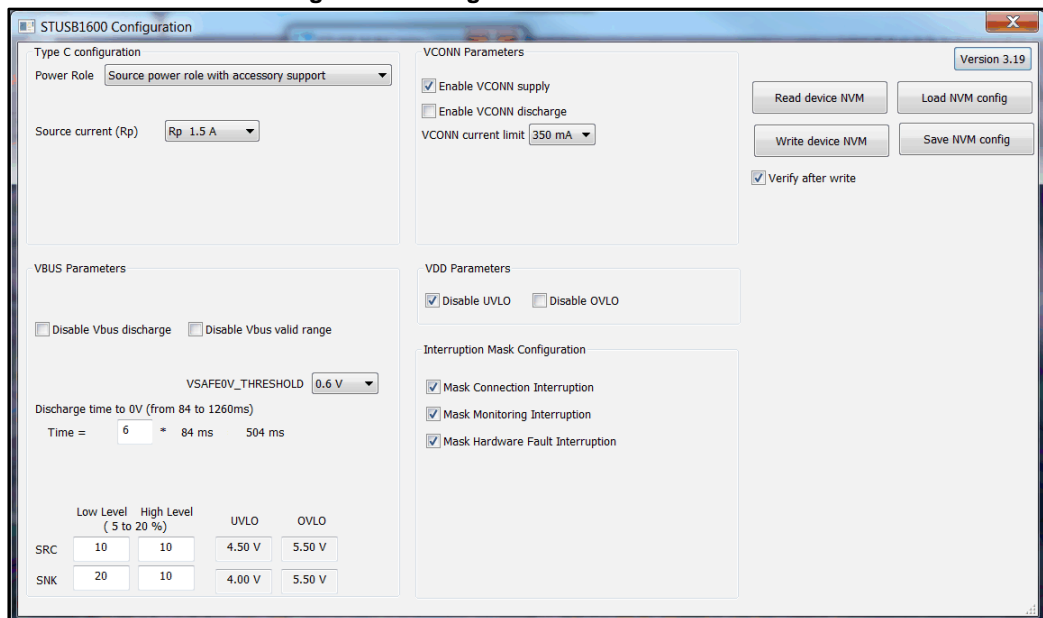
This section presents the basic changes to be performed from the default NVM configuration of the STUSB1600A and the default position of the jumpers on the board to operate with different power modes.

6.1 Source mode

6.1.1 NVM configuration for Source mode

- 1 From the STUSB GUI window, click on the “NVM configuration” button to open the configuration window.
- 2 Set the “Power Role” field to “Source power role with accessory support” as shown in the window below.

Figure 15: configuration for Source mode



- 3 Click on the “Write device NVM” button to program the NVM with the new value of the “Power Role” field.
- 4 Reset the STUSB1600A thanks to the push button “STUSB_reset” on the STEVAL-CCC002V1 board.
The STUSB1600A should now operate in Source mode.

6.1.2 Board configuration for Source mode

Set the jumpers to the following positions:

- J2 to V_SRC (default)
- J6 on (default)
- J9 to 3V3 (default)
- J10 to VDD_SRC
- J12 and J14 to ground (Dead battery mode disabled)
- J13 on (default)

With this jumper configuration, the STUSB1600A, STEVAL-CCC002V1 board and VBUS are powered through the VBUS power line of the USB Micro-B connector J5 (see [Section 7: "Power supply configurations"](#)).

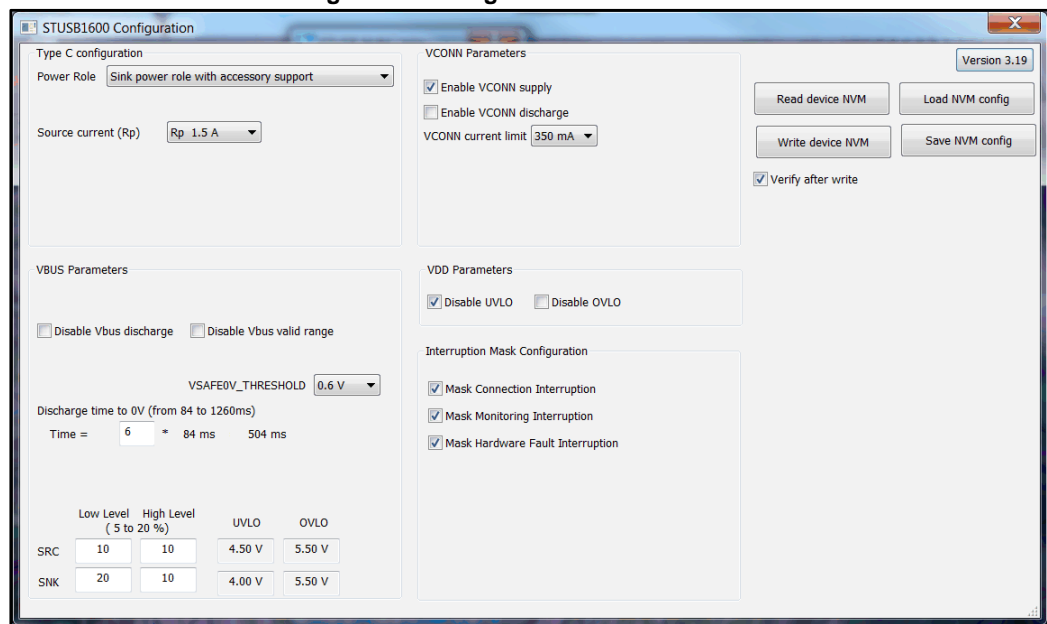
Only VBUS source power path is active.

6.2 Sink mode

6.2.1 NVM configuration for Sink mode

- 1 From the STUSB GUI window, click on the "NVM configuration" button to open the configuration window.
- 2 Set the "Power Role" field either to "Sink power role with accessory support" as shown in the window below, or to "Sink power role without accessory support" depending on the targeted application.

Figure 16: configuration for Sink mode



- 3 Click on the "Write device NVM" button to program the NVM with the new value of "Power Role" field.
- 4 Reset the STUSB1600A thanks to the push button "STUSB_reset" on the STEVAL-CCC002V1 board.
The STUSB1600A should now operate in Sink mode.

6.2.2 Board configuration for Sink mode

Set the jumpers to the following positions:

- J2 to V_SRC (default)
- J6 on (default)
- J9 to 3V3 (default)
- J10 to VDD_SNK (default)
- J12 and J14 to ground (Dead battery mode disabled)
- J13 removed

With this jumper configuration, the STUSB1600A and STEVAL-CCC002V1 board are powered through the VBUS power line of the USB Micro-B connector J5 (see [Section 7: "Power supply configurations"](#)).

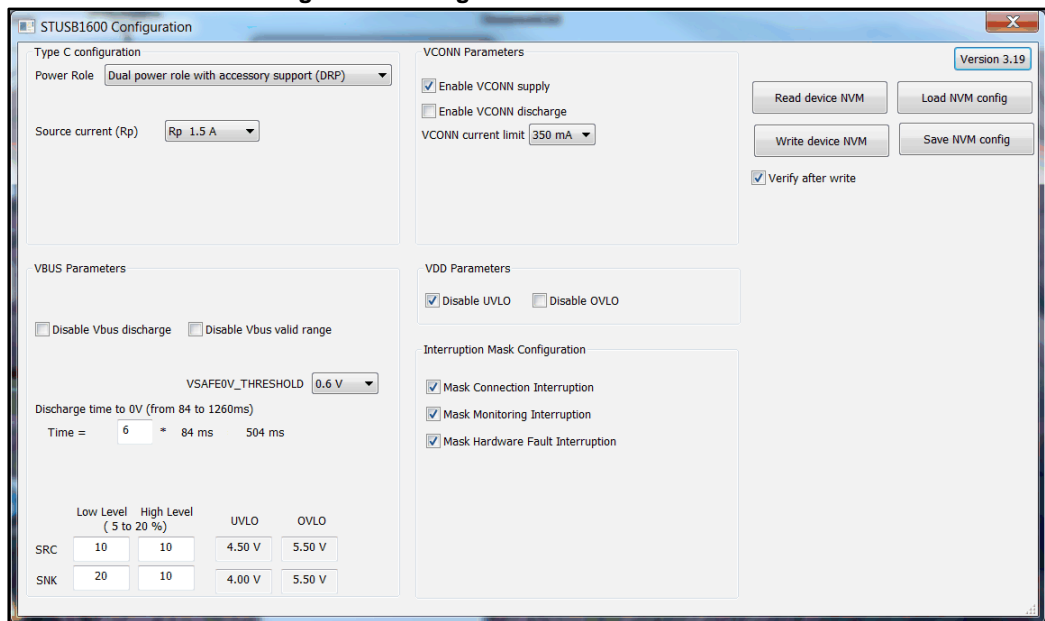
Only VBUS sink power path is active.

6.3 Dual role mode

6.3.1 NVM configuration for Dual role mode

- 1 From the STUSB GUI window, click on the "NVM configuration" button to open the configuration window.
- 2 Set the "Power Role" field either to "Dual power role with accessory support" as shown in the window below, or to "Dual power role with accessory and Try.SRC support", or to "Dual power role with accessory and Try.SNK support" depending on the targeted application.

Figure 17: configuration for Dual role mode



- 3 Click on the "Write device NVM" button to program the NVM with the new value of "Power Role" field.
- 4 Reset the STUSB1600A thanks to the push button "STUSB_reset" on the STEVAL-CCC002V1 board.
The STUSB1600A is now operating in DRP mode.

6.3.2 Board configuration for Dual role mode

Set the jumpers to the following positions:

- J2 to V_SRC (default)
- J6 on (default)
- J9 to 3V3 (default)
- J10 to VDD_SRC
- J12 and J14 to ground (Dead battery mode disabled)
- J13 on (default)

With this jumper configuration, the STUSB1600A, STEVAL-CCC002V1 board and VBUS are powered through the VBUS power line of the USB Micro-B connector J5 (see [Section 7: "Power supply configurations"](#)).

Both VBUS source power path and VBUS sink power path are active.

6.4 Dead battery mode

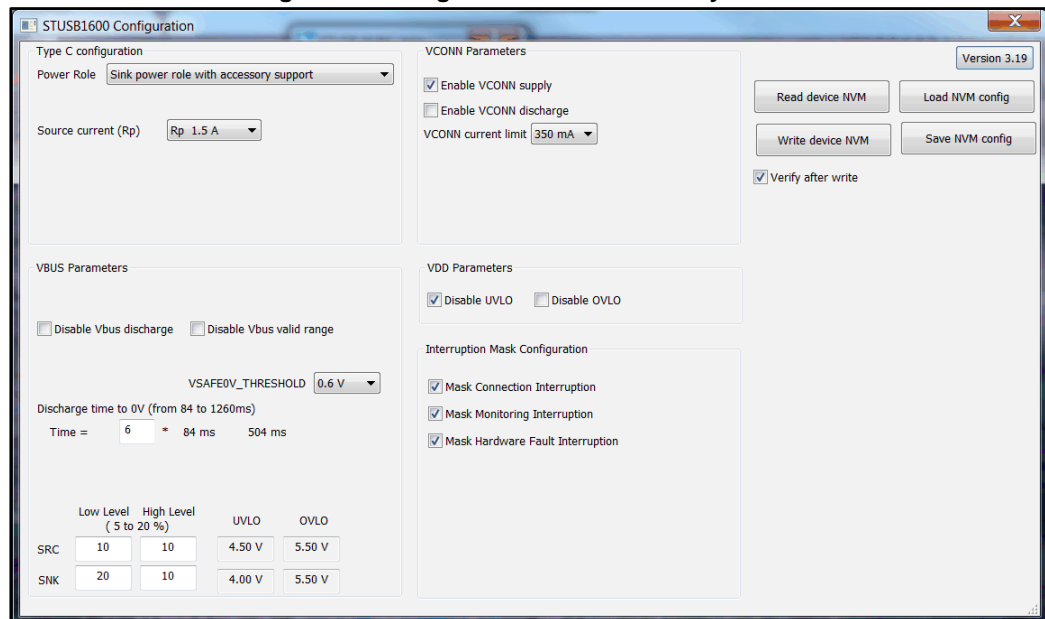
Dead battery mode is only supported with followings power roles:

- Sink power role with accessory support
- Sink power role without accessory support
- Dual power role with accessory support
- Dual power role with accessory and Try.SNK support

6.4.1 NVM configuration for Dead battery mode

- 1 From the STUSB GUI window, click on the "NVM configuration" button to open the configuration window.
- 2 Set the "Power Role" field either to "Sink power role with accessory support" as shown in the window below, or to "Sink power role without accessory support", or to "Dual power role with accessory support", or to "Dual power role with accessory and Try.SNK support" depending on the targeted application.

Figure 18: configuration for Dead battery mode



- 3 Click on the "Write device NVM" button to program the NVM with this new value for "Power Role" field.
- 4 Reset the STUSB1600A thanks to the push button "STUSB_reset" on the STEVAL-CCC002V1 board.
The STUSB1600A should now operate in Sink mode.

6.4.2 Board configuration for Dead battery mode

Set the jumpers to the following positions:

- J2 to V_SNK

- J6 removed
- J9 to 3V3 (default)
- J10 to VDD_SNK (default)
- J12 to CC1 and J14 to CC2 (default) (Dead battery mode enabled)
- J13 on (default)

With this jumper configuration, the STUSB1600A and STEVAL-CCC002V1 board are powered through the VBUS power line VBUS_C of the USB Type-C connector J11 (see [Section 7: "Power supply configurations"](#)).

Only VBUS sink power path is active.

7 Power supply configurations

7.1 Configuration for STUSB1600A power supplies

Table 6: STUSB1600A power supplies

Power pin	Power source	Board configuration
VSY5	From external power supply through connector J21	<ul style="list-style-type: none"> • J9 removed • J21 connected to an external power supply Warning: do not exceed the maximum voltage limit specified in the datasheet of STUSB1600A.
	From 5.0 V board power supply	<ul style="list-style-type: none"> • No external power supply connected to J21 • J9 to 5V
	From 3.3 V board power supply	<ul style="list-style-type: none"> • No external power supply connected to J21 • J9 to 3V3
VDD	From external power supply through connector J22	<ul style="list-style-type: none"> • J10 removed • J22 connected to an external power supply Warning: do not exceed the maximum voltage limit specified in the datasheet of STUSB1600A.
	From V_SRC power node	<ul style="list-style-type: none"> • No external power supply connected to J22 • J10 to VDD_SRC
	From VBUS_C power line of USB Type-C connector J11	<ul style="list-style-type: none"> • No external power supply connected to J22 • J10 to VDD_SNK



Jumper J9 must be removed when an external power supply is connected to VSY5 connector J21 to avoid short-circuit to the ground or to the board power supplies of 5.0 V and 3.3 V.

Jumper J10 must be removed when an external power supply is connected to VDD connector J22 to avoid short-circuit to the ground or to the power nodes V_SRC and VBUS_C.

7.2 Configuration for board power supply and VBUS source power supply

Table 7: Board power supply and VBUS source power supply

#	Board power source	V_SRC power source	Board configuration
1	From VBUS power line of USB Micro-B connector J5	From VBUS power line of USB Micro-B connector J5	<ul style="list-style-type: none"> • No external power supply connected to J3 • J6 on • J2 to V_SRC • J5 connected to the USB Type-A host port of any device delivering 5.0 V on VBUS power line: <ul style="list-style-type: none"> ○ If jumper J9 is set to 5.0 V or 3.3 V, the green LED LD5 (VSYS) lights up. Indicates the board and STUSB1600A are powered. ○ If jumper J10 is set to VDD_SRC, the green LED LD6 (VDD) lights up. Indicates V_SRC and STUSB1600A are powered.
2	From VBUS power line of USB Micro-B connector J5	From external power supply through connector J3	<ul style="list-style-type: none"> • J6 on • J2 removed • J5 connected to the USB Type-A host port of any device delivering 5.0 V on VBUS power line: <ul style="list-style-type: none"> ○ If jumper J9 is set to 5.0 V or 3.3 V, the green LED LD5 (VSYS) lights up. Indicates the board and STUSB1600A are powered. • J3 connected to an external power supply delivering 5.0 V: <ul style="list-style-type: none"> ○ If jumper J10 is set to VDD_SRC, the green LED LD6 (VDD) lights up. Indicates V_SRC and STUSB1600A are powered.
3	From external power supply through connector J3	From external power supply through connector J3	<ul style="list-style-type: none"> • J6 removed • J2 to V_SRC • J3 connected to an external power supply delivering 5.0 V: <ul style="list-style-type: none"> ○ If jumper J9 is set to 5.0 V or 3.3 V, the green LED LD5 (VSYS) lights up. Indicates the board and STUSB1600A are powered. ○ If jumper J10 is set to VDD_SRC, the green LED LD6 (VDD) lights up. Indicates V_SRC and STUSB1600A are powered.
4	From VBUS power line VBUS_C of USB Type-C connector J11	Not applicable	<p>Dead battery mode</p> <ul style="list-style-type: none"> • J6 removed • J2 to V_SNK • J10 to VDD_SNK • J12 to CC1 and J14 to CC2 • J11 connected to the USB Type-C port of any device delivering 5.0 V: <ul style="list-style-type: none"> ○ The green LED LD6 (VDD) lights up. Indicates STUSB1600A is powered. ○ The yellow LED LD9 (EN_SNK) lights up. Indicates V_SNK and board are powered.



#2: Jumper J2 must be removed before connecting the Type-A host port of any device to the USB Micro-B receptacle J5.

#3 and #4: Jumper J6 must be removed in case the USB Micro-B receptacle J5 would be connected to the Type-A host port of a PC or laptop. It avoids short-circuiting the V_SRC or V_SNK power nodes to the VBUS power line of the USB Micro-B connector J5 through the 5.0 V board power path. It prevents damaging the Type-A host port of the connected device.

8 Board information

8.1 Material and dimensions

Table 8: Board material and dimension

Designation	Value
Layers number	2 (Top + Bottom)
Type	Epoxy FR4 standard
Thickness	1.6 mm
Finishing	HAL SN
Class	5
Dimensions	69.65 mm (Width) x 79.55 mm (Height)

8.2 Layout

Figure 19: Board layout - top view

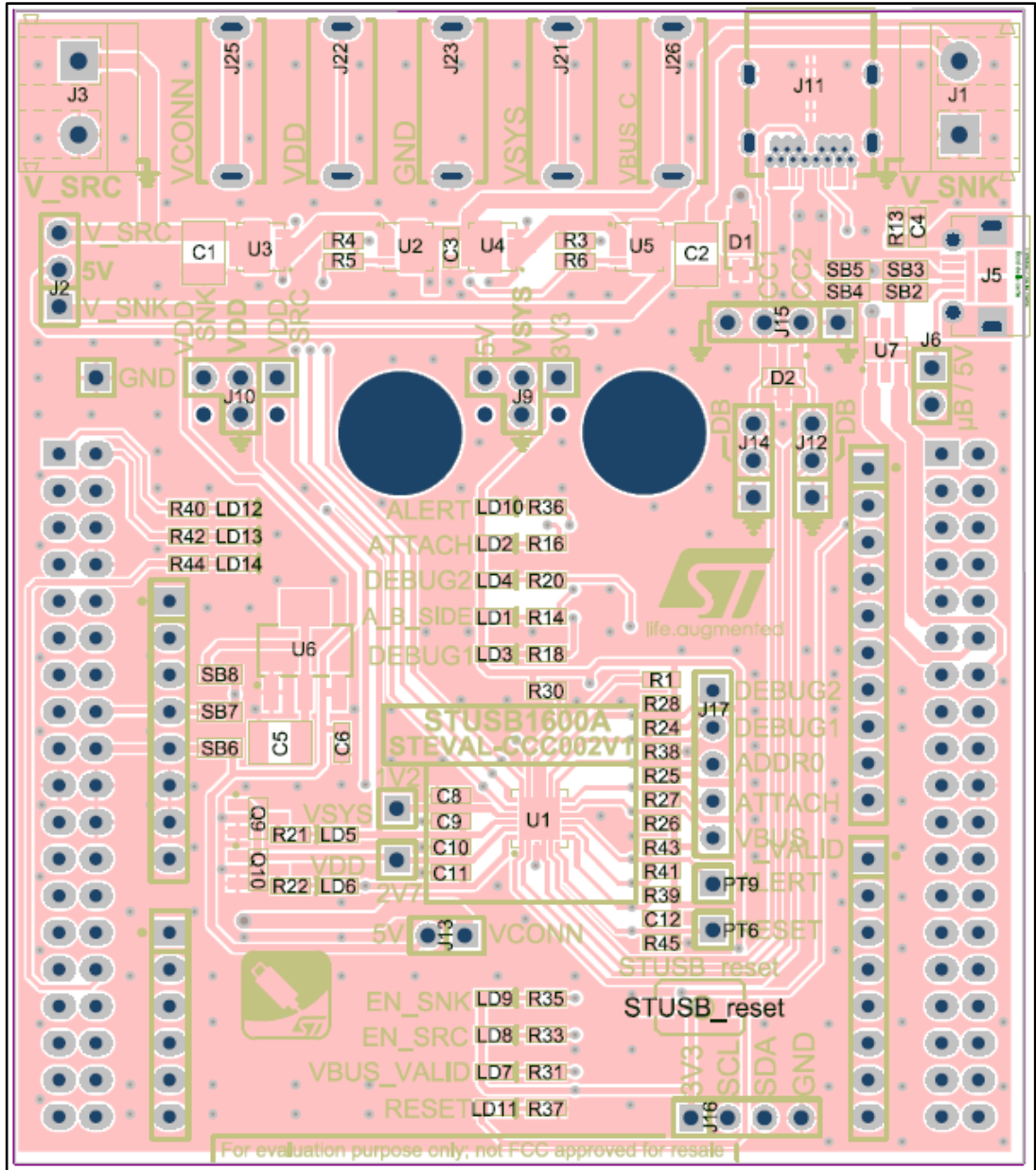
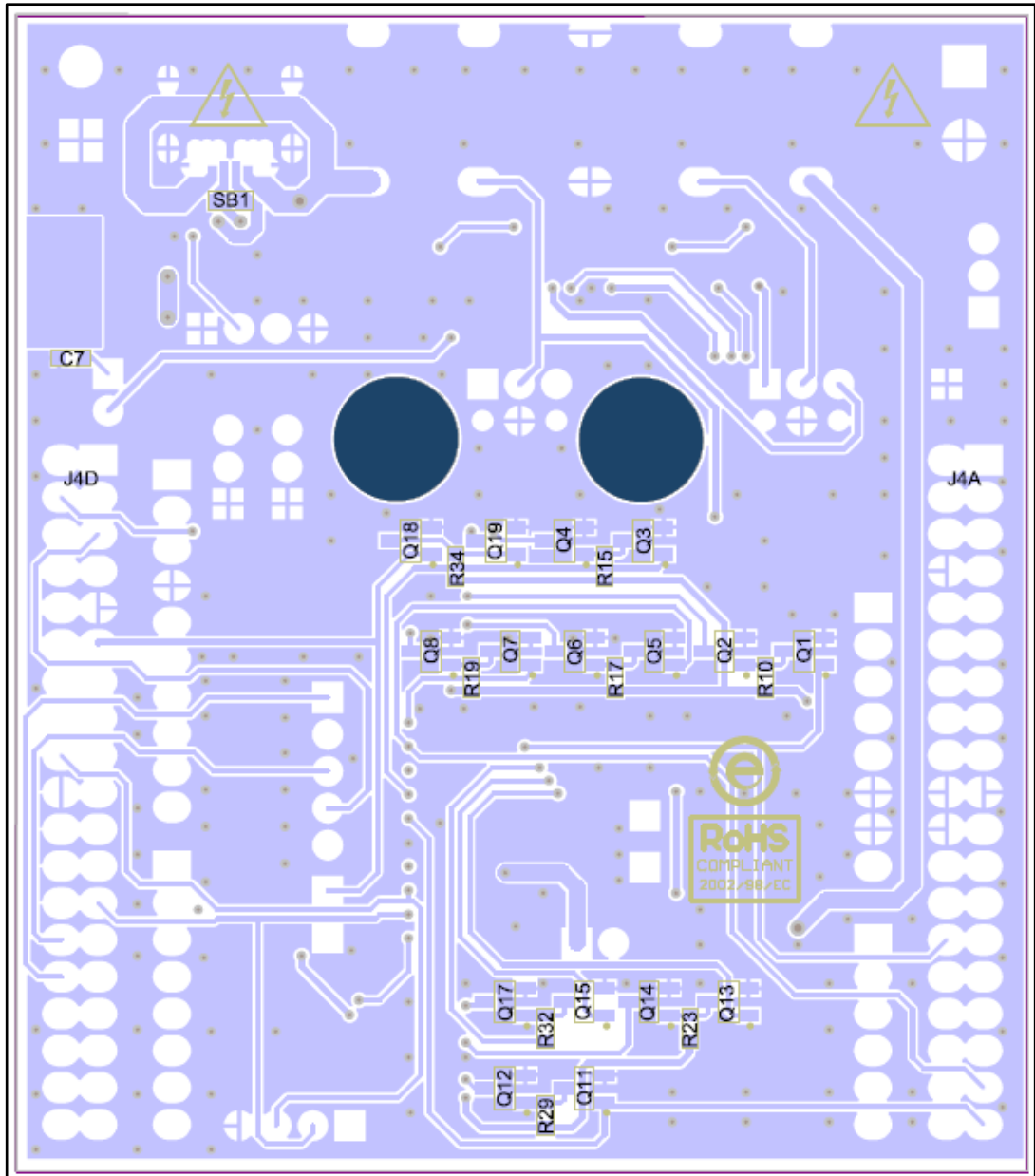


Figure 20: Board layout - bottom view



9 Reference documents

For more information, refer to the following resources on www.st.com

[DS11503: USB Type-C™ controller with high voltage protection](#)

[STEVAL-CCC002V1 Bill of Materials](#)

10 Revision history

Table 9: Document revision history

Date	Version	Changes
23-Oct-2017	1	Initial release.

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