



## STUSB4531 graphical user interface

### Introduction

- The Nucleo firmware needs to be flashed using the binary files included in the zip file to be operational with the GUI.
- Operating system required: Microsoft Windows.

## 1 Features and description

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### Features

- Access to the STUSB4531 non-volatile memory using I<sup>2</sup>C link
- Read and write any I<sup>2</sup>C register address
- Device dashboard

### Description

The STSW-STUSB020 is a free graphical user interface (GUI) aimed at seamlessly customizing the STUSB4531 device through direct access to the non-volatile-memory (NVM).

The tool allows the NVM to be read, configured, and written without dedicated software skills, thanks to the GUI.

The utility also provides a basic panel to read and write STUSB4531 I<sup>2</sup>C registers regardless of its selected device address.

The software can be used with the evaluation boards of the STUSB4531 device stacked on a NUCLEO-C071RB or NUCLEO-F072RB controller board.

## 2 Hardware configuration

### 2.1 Main elements list

Table 1. Main elements list

Main elements	
<b>NUCLEO-C071RB</b>	STM32 Nucleo-64 development board with ARM Cortex M0+
<b>Or NUCLEO-F072RB</b>	STM32 Nucleo-64 development board with ARM Cortex M0
<b>USB-C Cable</b>	With USB data support
<b>Or Mini-B USB Cable</b>	With USB data support
<b>STSW-STUSB020</b>	STUSB4531 Graphical User Interface
<b>EVAL-SCS007V1</b>	STUSB4531 <a href="#">evaluation board</a>
<b>Or EVAL-SCS006V1</b>	STUSB4531 <a href="#">reference design board</a>
<b>Operating System</b>	Window OS

### 2.2 Nucleo boards

Figure 1. NUCLEO-C071RB

Connect cable here to communicate with GUI

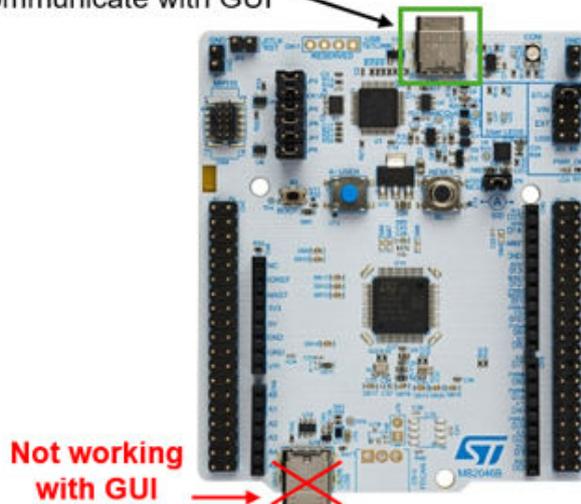
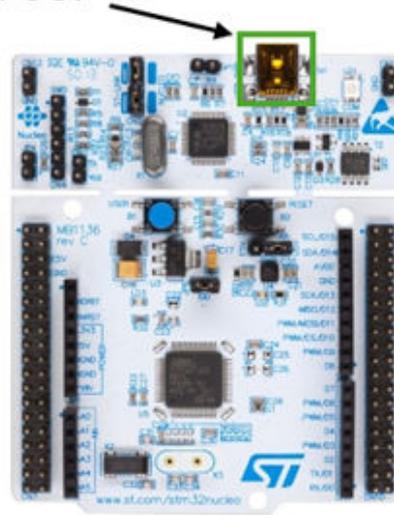


Figure 2. NUCLEO-F072RB

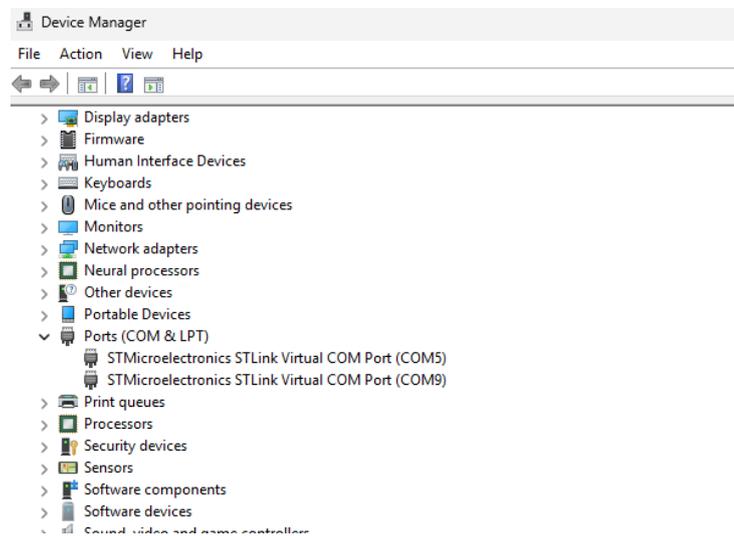
Connect cable here to  
communicate with GUI



*Note:* Please ensure that Nucleo STLink firmware is correctly installed and up-to-date before starting, using <https://www.st.com/en/development-tools/stsw-link007.html>.

STLink installation can be checked in Device Manager:  
“STMicroelectronics STLink Virtual COM Port (COMx)” shall be listed, as mentioned in Figure 3.

Figure 3. STLink correctly installed



## 2.3 STUSB4531 boards

Figure 4. EVAL-SCS007V1

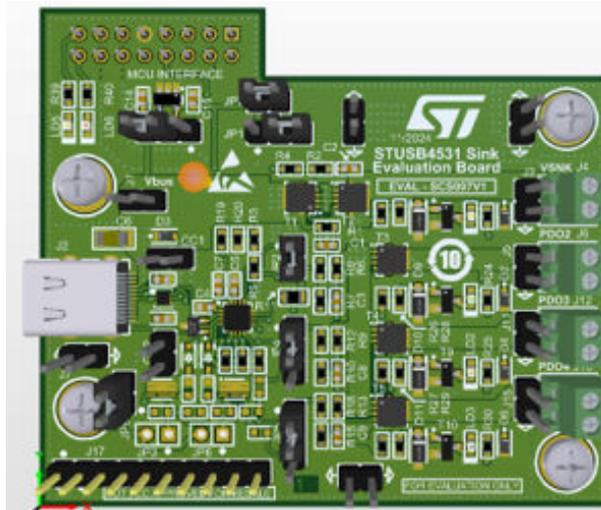
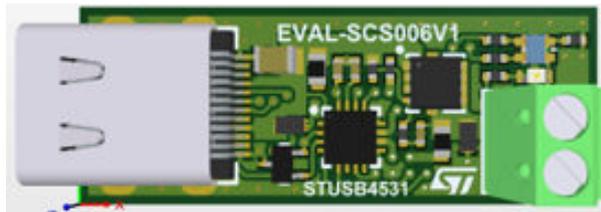


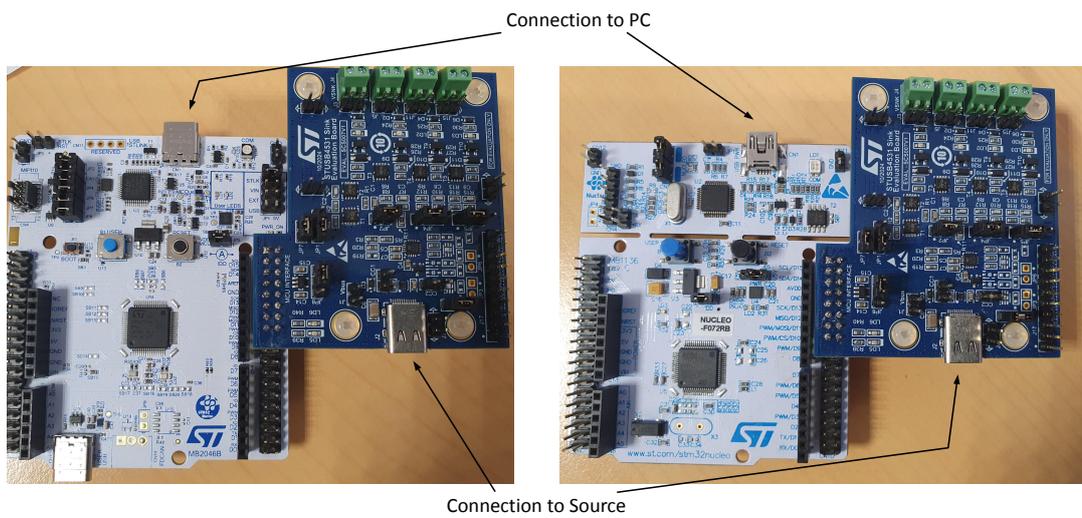
Figure 5. EVAL-SCS006V1



## 2.4 STUSB4531 board connection to Nucleo

The EVAL-SCS007V1 can be directly plugged onto the Nucleo-F072RB or Nucleo-C071RB:

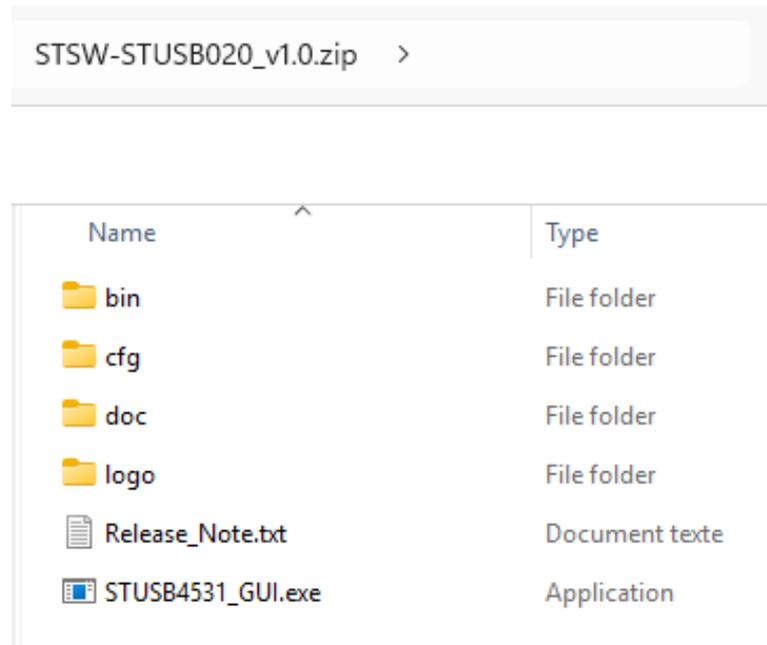
Figure 6. Eval-SCS007V1 connected to Nucleo



### 3 Software package content

The package folder structure is the following:

Figure 7. Package folder structure



The **bin** directory contains binary files necessary to flash Nucleo:

- Nucleo\_C071RB\_STUSB\_UART\_NVM\_config\_C.bin for **NUCLEO-C071RB**
- Nucleo\_F072RB\_STUSB\_UART\_NVM\_config\_F.bin for **NUCLEO-F072RB**

The **cfg** directory contains config files corresponding to the 2 different configs described in the STUSB4531 datasheet:

- Datasheet\_4531\_deadbattery.nvm (P/N: **STUSB4531QTR** and **STUSB4531BJR**)
- Datasheet\_4531\_no\_deadbattery.nvm (P/N: **STUSB4531Q2TR**)

The **doc** directory contains GUI documentations.

The **logo** directory contains the icon and logo used by the GUI.

**STUSB4531\_GUI.exe** is the Windows executable file to launch the GUI.

**Release\_Note.txt** provides information about the GUI version in the current package.

## 4 GUI functionality

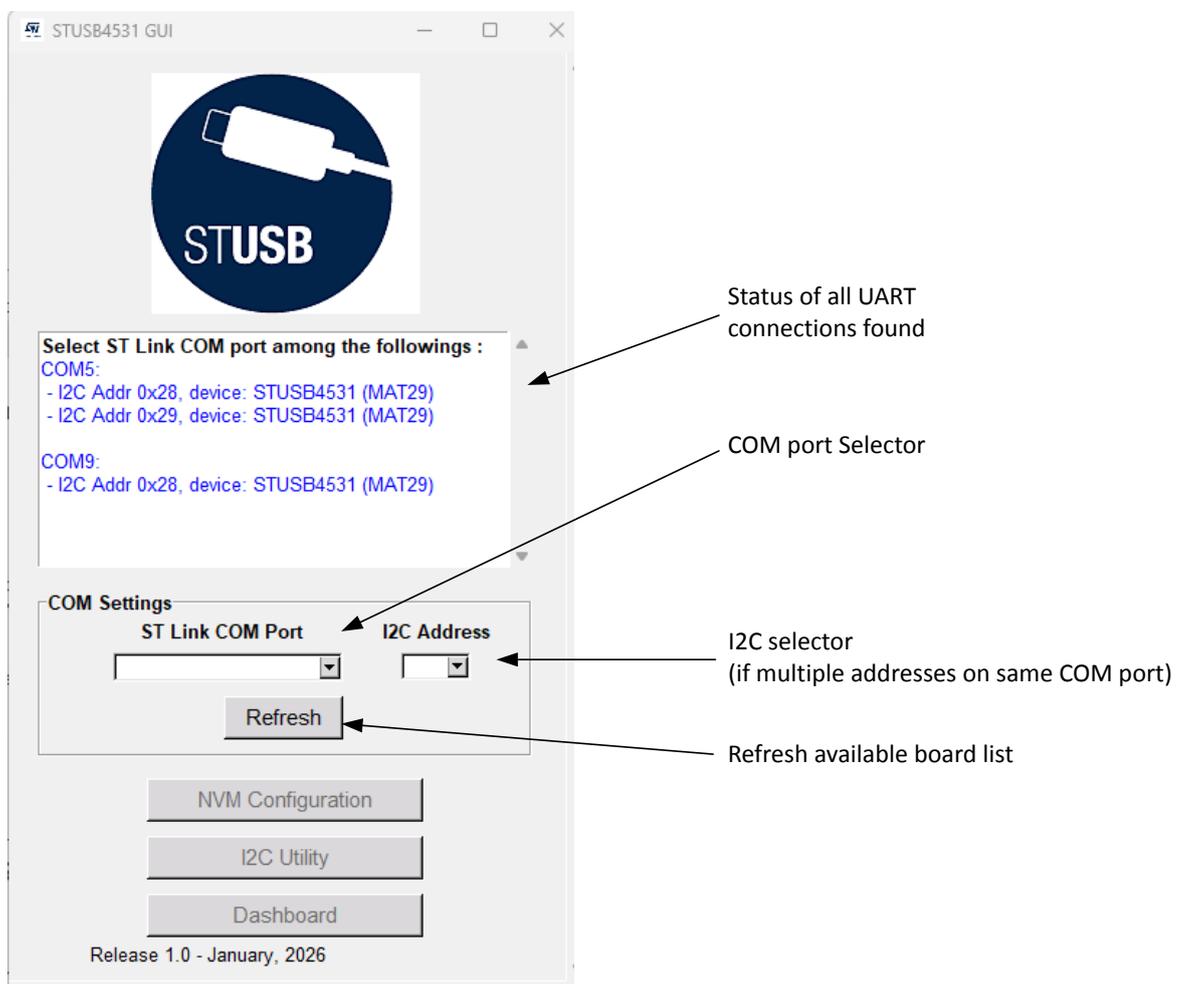
This chapter describes how to use the different functions of the STUSB4531 graphical user interface step by step.

### 4.1 GUI startup

When the GUI opens, it gives the status of all COM ports connected to the Windows PC used.

In the picture below, the GUI has found 2 Nucleo boards (COM5 and COM9) and another COM port, which is either not a Nucleo board or a Nucleo with outdated firmware. Each Nucleo board has a single STUSB4531 device, but uses two different I<sup>2</sup>C addresses.

Figure 8. Main window example after GUI startup



The refresh button can be pressed to refresh the list of available boards, when all secondary windows are closed.

Figure 9. Main menu after COM port selection with 2 boards

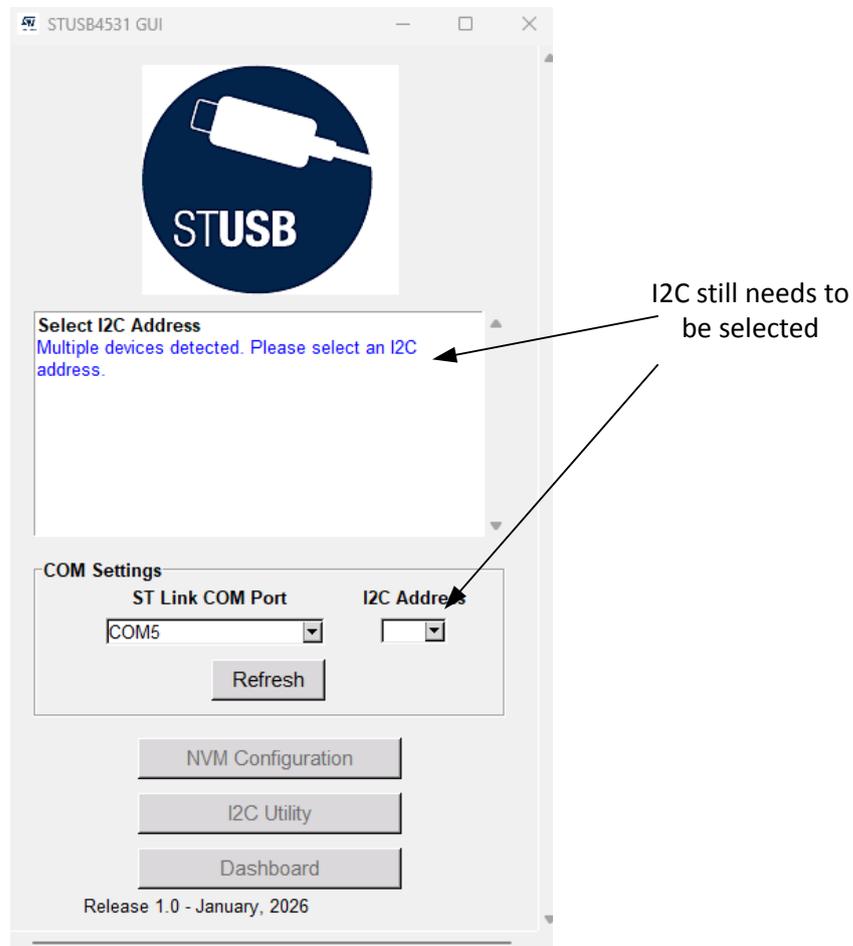
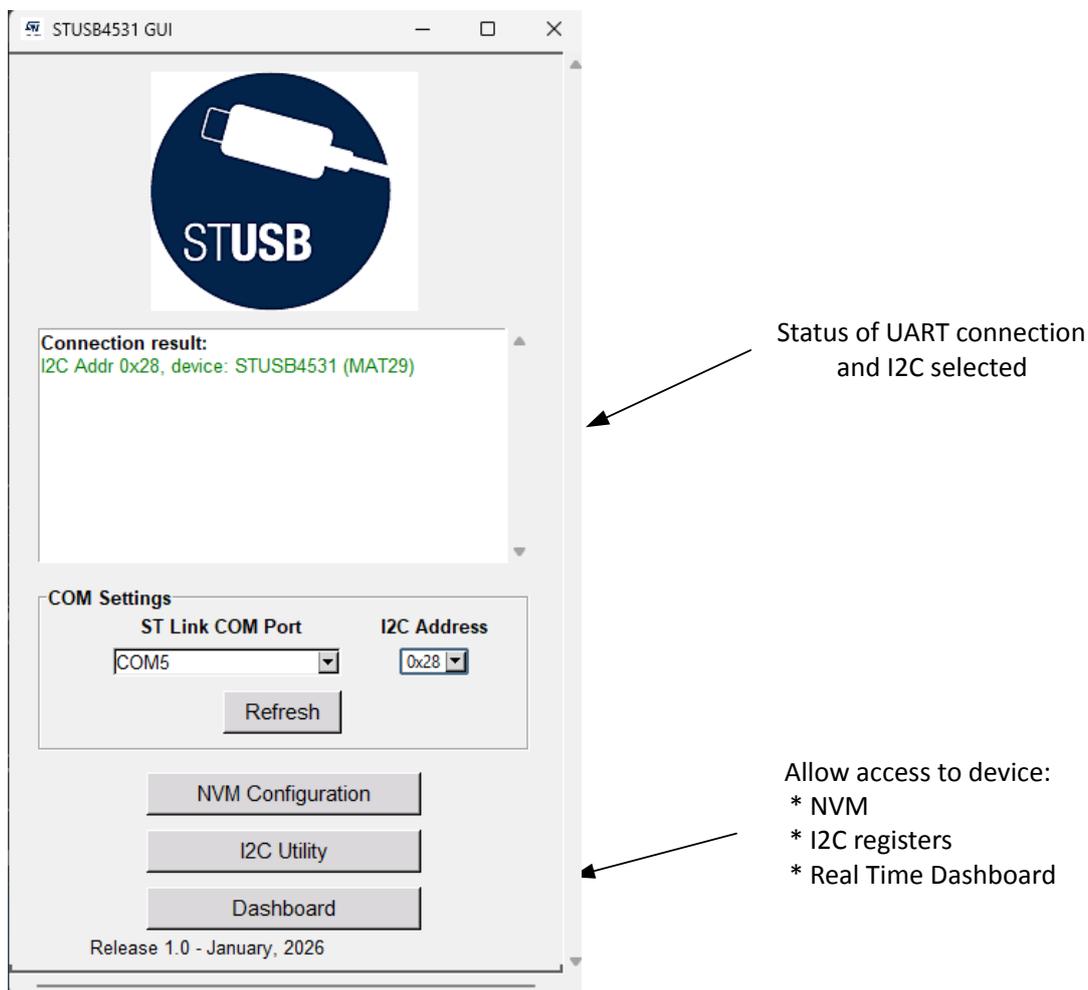


Figure 9 shows the main window when 2 STUSB4531 boards are connected to a single Nucleo board. The I<sup>2</sup>C address remains to be selected.

Figure 10 shows COM5 selected versus the 2 given possibilities with the STUSB4531 shown in Figure 8.

Figure 10. Main window example after COM port selection



Status of UART connection and I2C selected

Allow access to device:  
\* NVM  
\* I2C registers  
\* Real Time Dashboard

After COM port and I<sup>2</sup>C Address selection, the GUI allows the user to access 3 further windows:

- NVM configuration window
- I<sup>2</sup>C utility
- Real Time Dashboard

Note:

*ST Link COM port is locked and cannot be changed if at least one of the 3 windows (NVM Configuration, I<sup>2</sup>C Utility or Dashboard) are open.*

*Those windows need to be closed, since otherwise it is not possible to change the selected ST Link COM port or I<sup>2</sup>C address (when 2 devices are using the same COM port).*

## 4.2 NVM configuration window

### 4.2.1 NVM bitfield configuration

This window provides access to the various bitfields of the NVM memory that define the features or functions of the STUSB4531 device. The system automatically performs an NVM read operation when the window opens, provided that the STUSB4531 device is present and communication is operational. In this case, the data displayed in the GUI are those read from the device.

Figure 11. NVM configuration panel

Sub-sheets of NVM Setup configuration

STUSB4531 NVM Setup configuration window part

STUSB4531 PD3 Sink capability message extrapolation

Allows to import or export NVM files.

Makes a NVM Read or Write on STUSB4531 connected

Generates textual summary of all NVM bit fields

SINK CAPABILITIES content						
	Vmin (V)	Vtyp (V)	Vmax (V)	Iop (A)	UVLO (V)	OVLO (V)
PDO1 :	FIXED	5.0		3.0	2.9	5.78
PDO2 :	FIXED	9.0		3.33	6.93	10.4
PDO3 :	FIXED	15.0		2.0	12.35	17.33
PDO4 :	VARIABLE	9.0	20.0	1.5	6.93	23

Figure 12 shows all windows to access the NVM bit settings, as described in the startup configuration chapter of the STUSB4531 datasheet.

Figure 12. NVM configuration windows

The figure displays four screenshots of the NVM configuration GUI, organized into four quadrants:

- Top Left: Power Configuration**
  - DEVID PDP (W): 30
  - NB FIXED PDO: 3
  - VSEL VAR (V): 12.0
  - SINK FEATURE: FIXED-VARIABLE
  - APDO FILL: 9.0
  - SOURCE: Min
  - EXPECTED PDP (W): DEVICE\_PDP, Shift L
  - VBUS MONITORING: 0.55
  - Voltage (V): 5.0
  - Clamped Current (A): 3.0
  - FIX\_PDO1: 9.0, 3.0
  - FIX\_PDO2: 15.0, 5.0
  - FIX\_PDO3: 9.0, 3.0
  - Min Voltage (V): 9.0, 20.0
  - Max Voltage (V): 20.0, 1.5
  - Max Current (A): 1.5
  - Operational: DEVICE\_PDP, Shift H
  - Max: DEVICE\_PDP
- Top Right: Autorun Algorithm Configuration**
  - ABOVE 5V:
  - MISMATCH 5V:
  - MISMATCH PD:
  - PDO OMA MISMATCH:
  - OPERATING CURRENT:
  - PPS PRIORITY: PPS FIRST
  - PPS VOLTAGE SELECTION: MAX VOLTAGE
- Bottom Left: Application Specific**
  - Power Settings:** BATTERY PRESENT, BATTERY SWAP, HIGHER CAPABILITY, UNCONS POWER
  - Data Settings:** USB COM CAPABLE, DRD CAPABLE, DR SWAP 2 UFP, DR SWAP 2 DFP, VDM SUPPORT
  - Monitoring Control:** VBUS CTRL LOW MASK
  - VCONN:** VCONN EN, VCONN SWAP 2 ON, VCONN SWAP 2 OFF
  - Others:** GPIO CONF: Conf 0, Discharge time to 0V (ms): 630, Discharge time transition (ms): 350
- Bottom Right: Alert Mask**
  - CONNECTION STATUS AL MASK:
  - PD STATUS AL MASK:
  - PRL STATUS AL MASK:
  - MONITORING STATUS MASK:
  - NVM DOWNLOADED AL MASK:
  - CC STATUS AL MASK:
  - ATTACH STATUS AL MASK:
  - TRANSITION WINDOW MASK:
  - TRANSITION END MASK:
  - AMS STOPPED MASK:
  - TX BUFFER READY MASK:

### 4.2.2 Read or flash STUSB4531

Using this graphical user interface, the STUSB4531 nonvolatile memory (NVM) content can be read and modified as required by the application and then written to the device.

Note that the NVM content is loaded into the STUSB4531 during power-up.

Writing the STUSB4531 NVM without performing a power cycle does not change its auto-run behaviour.

Figure 13. NVM read and write access

The screenshot shows the 'STUSB4531 DeviceClass Configuration' window. The 'Dialog Box' at the top indicates a successful read operation: 'Connection Status : COM5, I2C Addr 0x28, device: STUSB4531 (MAT29)' and 'Message : Read device operation complete successfully'. The 'Application Specific' tab is active, displaying 'Power Configuration' settings for various PDOs and VBUS monitoring. On the right, the 'NVM Configuration' panel includes 'Import File' and 'Export File' buttons, and a highlighted 'STUSB4531 Access' section with 'Read NVM' and 'Write NVM' buttons. A 'Copy Summary' button is also present.

**Power Configuration**

Parameter	Value	Voltage (V)	Clamped Current (A)
DEVICE PDP (W)	30		
NB FIXED PDO	3	FIX_PDO1 : 5.0	3.0
VSEL VAR (V)	12.0	FIX_PDO2 : 9.0	3.0
SINK FEATURE	FIXED+VARIABLE	FIX_PDO3 : 15.0	5.0
APDO FILL	9.0	20.0	1.5
SOURCE	Min	Operational	Max
EXPECTED PDP (W)	DEVICE_PDP	DEVICE_PDP	DEVICE_PDP
	Shift L	Shift H	
VBUS MONITORING	0.95	1.10	

**SINK CAPABILITIES content**

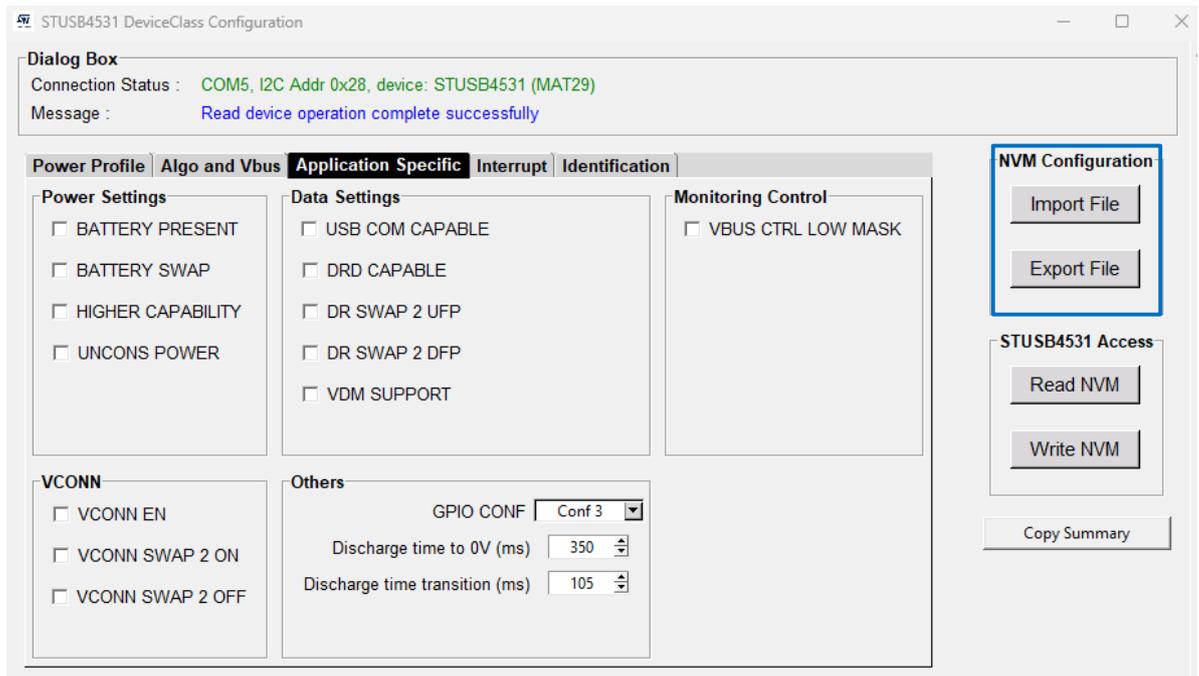
	Vmin (V)	Vtyp (V)	Vmax (V)	Iop (A)	UVLO (V)	OVLO (V)
PDO1 : FIXED		5.0		3.0	2.9	5.78
PDO2 : FIXED		9.0		3.0	6.93	10.4
PDO3 : FIXED		15.0		2.0	12.35	17.33
PDO4 : VARIABLE	9.0		20.0	1.5	6.93	23

### 4.2.3 Import or generate an STUSB4531 NVM file

The graphical user interface can import a nonvolatile memory (NVM) file to provide an overview of the bitfield settings.

Use the “Export” button to generate an NVM file. For example, generate an NVM file to store the STUSB4531 configuration before modifying it, or to use it with the STUSB4531 command-line flasher tool.

Figure 14. NVM import or export file



#### 4.2.4 Working in offline mode

OFFLINE mode can be selected even if the STUSB4531 is listed in the main window as shown in [Figure 15](#).

[Figure 16](#) shows the main window after OFFLINE mode is selected.

When in OFFLINE mode, the NVM configuration panel ([Figure 17](#)) displays configuration mainly based on bit fields set to '0'.

**Figure 15. OFFLINE part of COM port list**

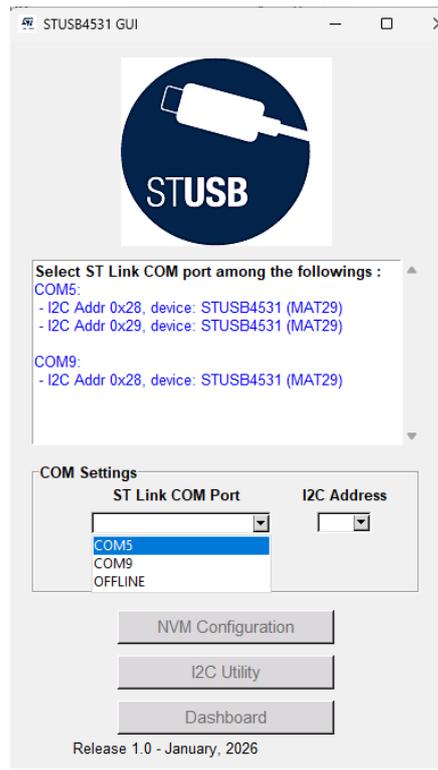


Figure 16. Offline main menu

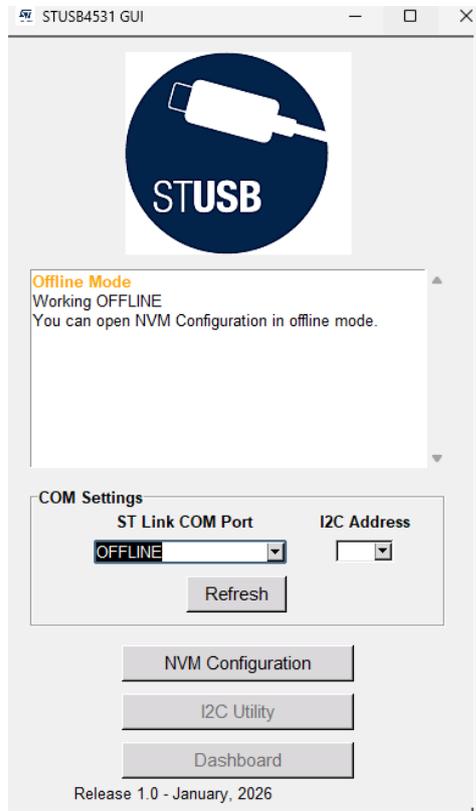
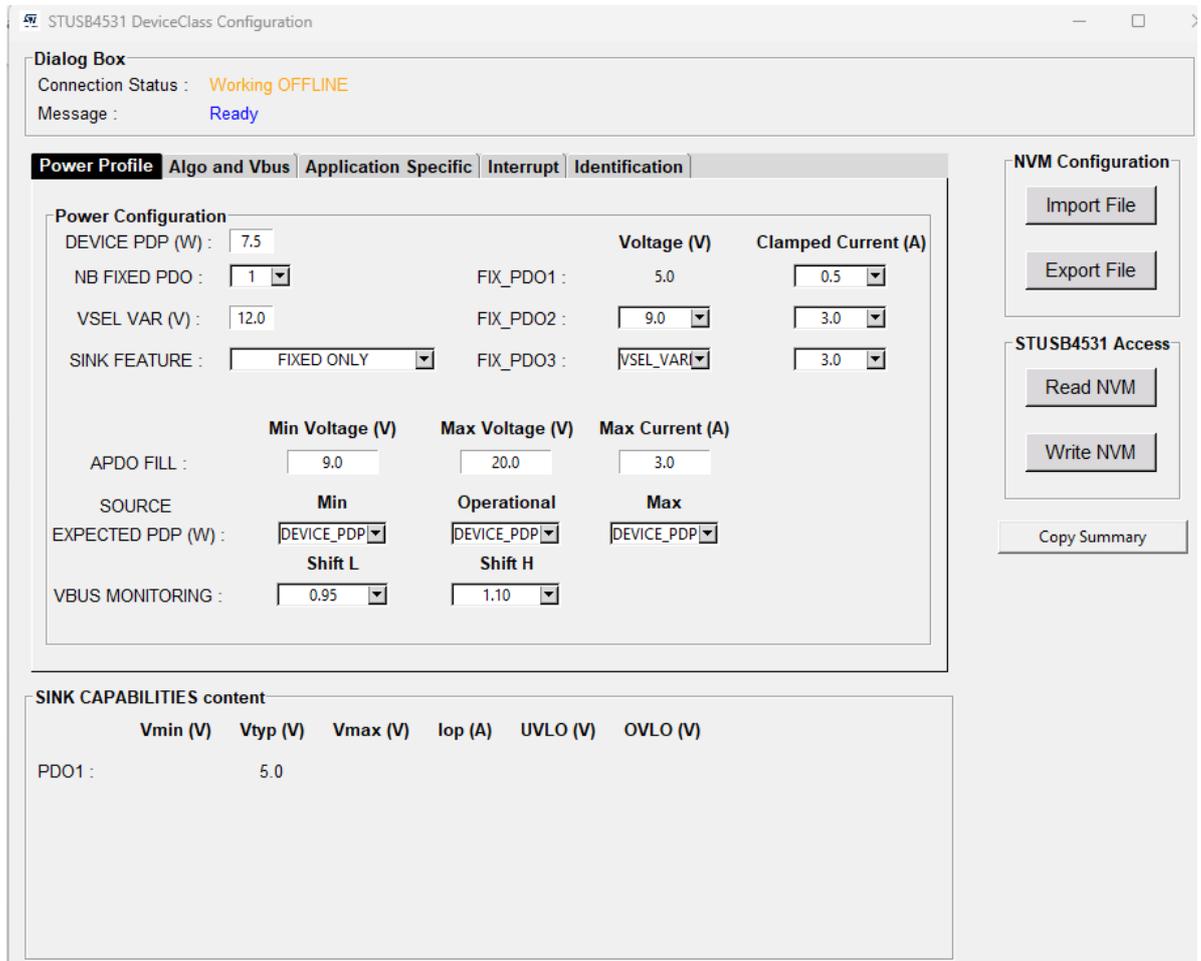


Figure 17. NVM configuration panel in offline mode

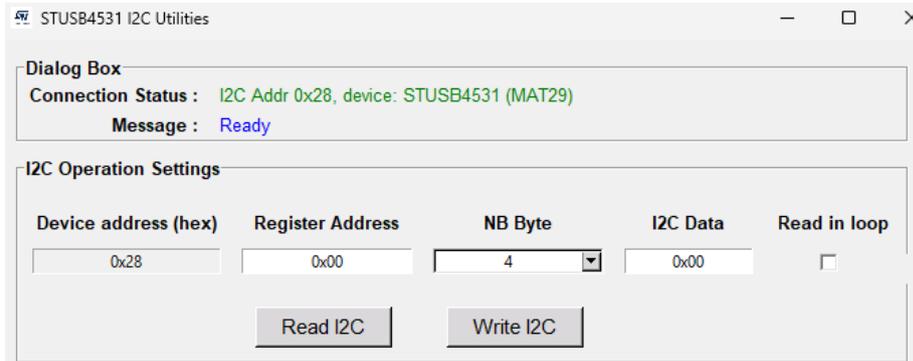


When in offline, the import file button can be pressed to load a datasheet configuration (from ./cfg directory) or any configuration the user has already stored.

### 4.3 I<sup>2</sup>C utilities window

I<sup>2</sup>C utilities enables read and write of any STUSB4531 I<sup>2</sup>C register. Read can be done in 1, 2 or 4 bytes.

Figure 18. I<sup>2</sup>C utilities window



## 4.4 Dashboard window

The dashboard gives an overview of the STUSB4531 real-time connection status. It also provides:

- Source capabilities received to perform the last explicit contract, when connected to Source PD
- Source Type-C power when connected to Source Type-C or legacy USB port using legacy to Type-C cable
- Summary of current sink capabilities and Vbus\_En\_Sink management

Figure 19. STUSB4531 supplied but not connected to source

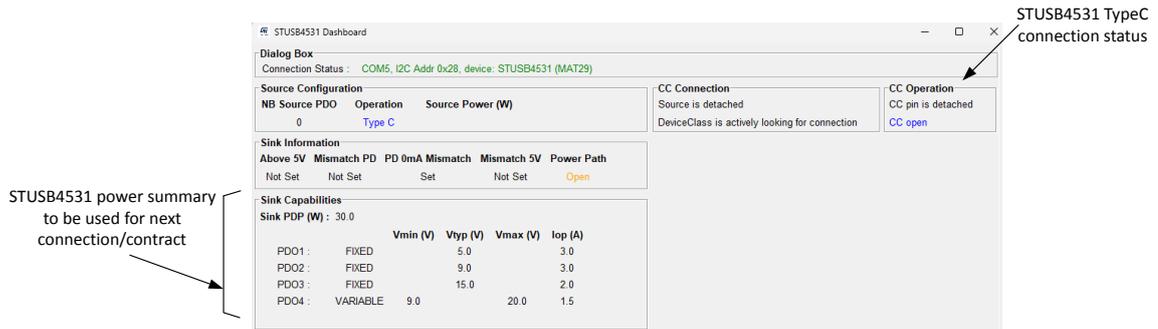


Figure 20. STUSB4531 connected to USBPD source

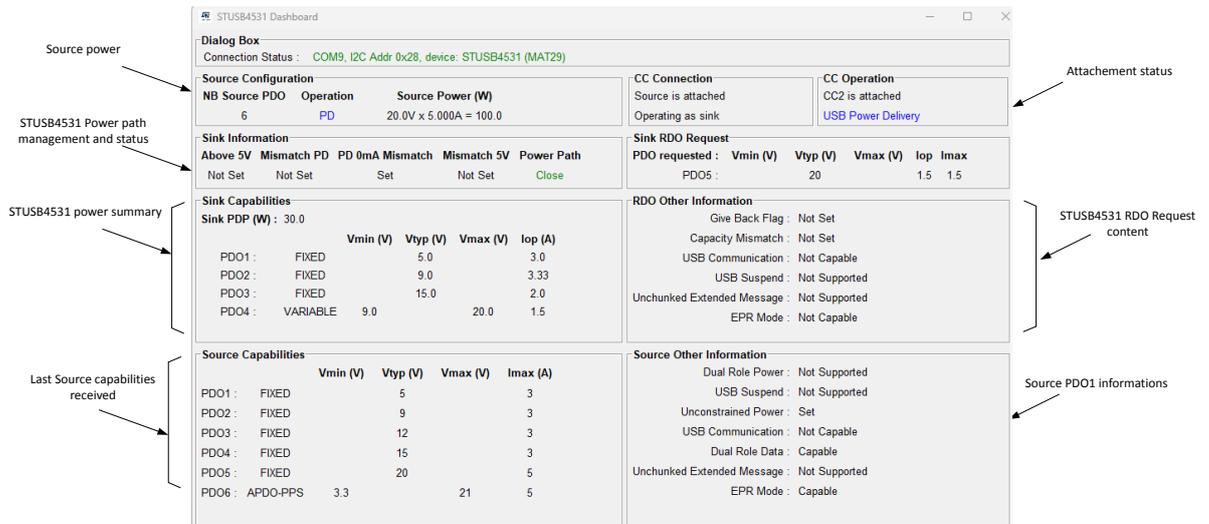


Figure 21. STUSB4531 connected to Type-C or Legacy USB source port



## Revision history

**Table 2. Document revision history**

Date	Version	Changes
17-Feb-2026	1	Initial release.

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