STM32U3/U5 Nucleo-64 boards (MB1841)

Introduction

The Nucleo-64 boards based on the MB1841 reference board (NUCLEO-U385RG-Q and NUCLEO-U545RE-Q order codes) provide an affordable and flexible way for users to try out new concepts and build prototypes by choosing from the various combinations of performance and power consumption features, provided by the STM32U3 series and STM32U5 series microcontrollers.

The ARDUINO® Uno V3 connectivity and the ST morpho headers provide easy expansion of the functionality of the STM32 Nucleo open development platform with a wide choice of specialized shields.

The STM32 Nucleo-64 board does not require any separate probe as it integrates the STLINK-V3EC debugger/programmer.

The STM32 Nucleo-64 board comes with the STM32 comprehensive free software libraries and examples available with the STM32CubeU3 and STM32CubeU5 MCU Packages.

Figure 1. NUCLEO-U385RG-Q top view

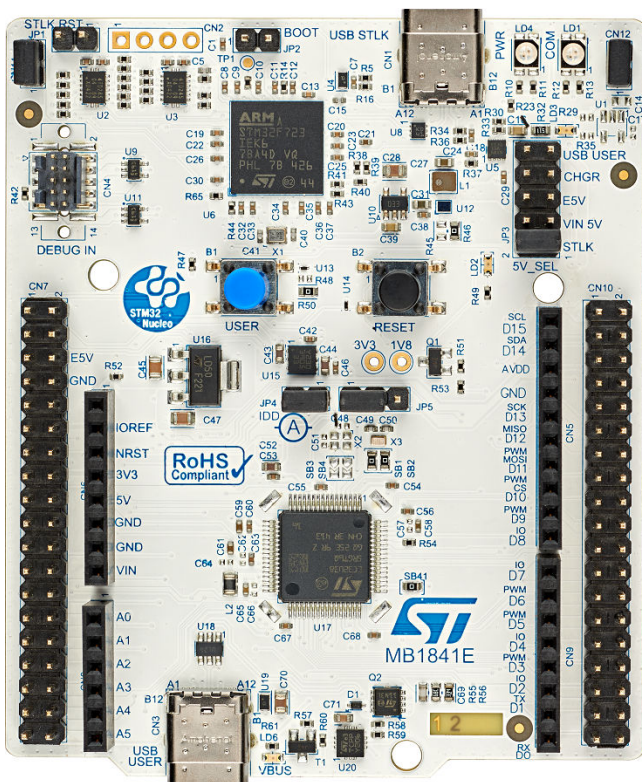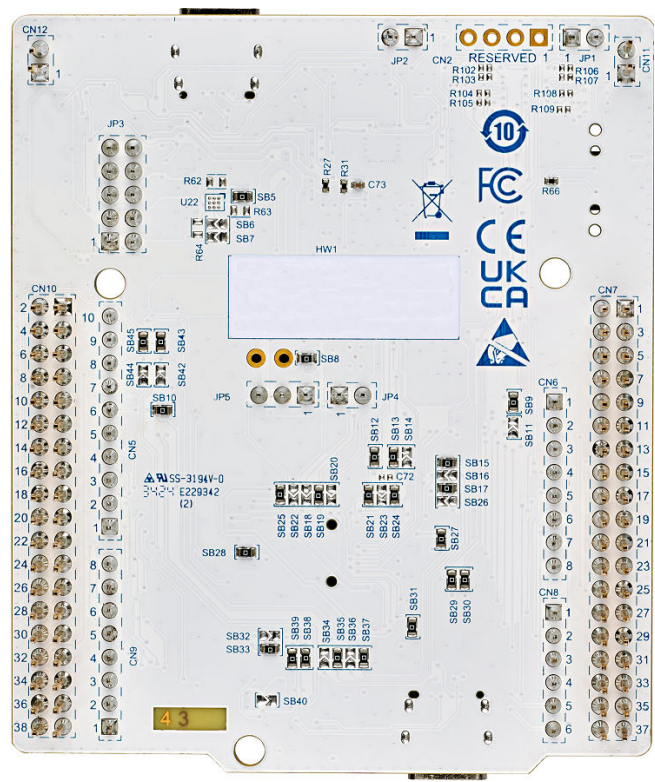**Figure 2. NUCLEO-U385RG-Q bottom view**

Pictures are not contractual.

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For further information, contact your local STMicroelectronics sales office.

www.st.com

1   Features

- STM32 microcontroller in an LQFP 64-pin package
- Internal SMPS[1] to generate V_{core} logic supply, identified by '-Q' suffixed boards
- USB Type-C® sink device FS
- One user LED shared with ARDUINO® Uno V3
- RESET and USER push-buttons
- 32.768 kHz crystal oscillator
- Board connectors:
  – USB Type-C®
  – ARDUINO® Uno V3
  – ST morpho extension pin headers for full access to all STM32 I/Os
- Flexible power-supply options: ST-LINK USB V_{BUS}, user USB connector, or external sources
- On-board STLINK-V3EC debugger/programmer with USB re-enumeration capability: mass storage, Virtual COM port, and debug port
- Comprehensive free software libraries and examples available with the STM32Cube MCU Package
- Support of a wide choice of Integrated Development Environments (IDEs) including IAR Embedded Workbench®, MDK-ARM, and STM32CubeIDE

1. SMPS significantly reduces power consumption in Run mode, by generating a V_{core} logic supply from an internal DC-DC converter.

Note: *Arm is a registered trademark of Arm Limited (or its subsidiaries) in the US and/or elsewhere.*

arm

2 Ordering information

To order the Nucleo-64, refer to Table 1. Additional information is available from the datasheet and reference manual of the target STM32.

Table 1. Ordering information

Order code	Board reference	Target STM32	Differentiating feature
NUCLEO-U385RG-Q	MB1841	STM32U385RGT6Q	Microcontroller featuring 1 Mbyte of flash memory and 256 Kbytes of SRAM
NUCLEO-U545RE-Q		STM32U545RET6Q	Microcontroller featuring 512 Kbytes of flash memory and 274 Kbytes of SRAM

2.1 Codification

The meaning of the codification is explained in Table 1.

Table 2. Codification explanation

NUCLEO-XXYYZT-Q	Description	Example: NUCLEO-U545RE-Q
XX	MCU series in STM32 32-bit Arm Cortex MCUs	STM32U5 series
YY	MCU product line in the series	STM32U535/U545
Z	STM32 package pin count: • R for 64 pins	64 pins
T	STM32 flash memory size: • E for 512 Kbytes	512 Kbytes
-Q	STM32 has an internal SMPS function	SMPS

The order code is mentioned on a sticker placed on the top or bottom side of the board.

3 Development environment

3.1 System requirements

- Multi-OS support: Windows[®] 10, Linux[®] 64-bit, or macOS[®]
- USB Type-A or USB Type-C[®] to USB Type-C[®] cable

Note: *macOS[®] is a trademark of Apple Inc., registered in the U.S. and other countries and regions.*

Linux[®] is a registered trademark of Linus Torvalds.

Windows is a trademark of the Microsoft group of companies.

3.2 Development toolchains

- IAR Systems[®] - IAR Embedded Workbench[®][(1)]
- Keil[®] - MDK-ARM[(1)]
- STMicroelectronics - STM32CubeIDE

1. *On Windows[®] only.*

3.3 Demonstration software

The demonstration software, included in the STM32Cube MCU Package corresponding to the on-board microcontroller, is preloaded in the STM32 flash memory for easy demonstration of the device peripherals in standalone mode. The latest versions of the demonstration source code and associated documentation can be downloaded from *www.st.com*.

3.4 CAD resources

All board design resources, including schematics, CAD databases, manufacturing files, and the bill of materials, are available from the NUCLEO-U385RG-Q and NUCLEO-U545RE-Q product pages at *www.st.com*.

4 Conventions

Table 3 provides the conventions used for the ON and OFF settings in the present document.

Table 3. ON/OFF convention

Convention	Definition
Jumper JPx ON	Jumper fitted
Jumper JPx OFF	Jumper not fitted
Jumper JPx [1-2]	Jumper fitted between pin 1 and pin 2
Solder bridge SBx ON	SBx connections closed by 0 Ω resistor
Solder bridge SBx OFF	SBx connections left open
Resistor Rx ON	Resistor soldered
Resistor Rx OFF	Resistor not soldered
Capacitor Cx ON	Capacitor soldered
Capacitor Cx OFF	Capacitor not soldered

5 Safety recommendations

5.1 Targeted audience

This product targets users with at least basic electronics or embedded software development knowledge such as engineers, technicians, or students. This board is not a toy and is not suited for use by children.

5.2 Handling the board

This product contains a bare printed circuit board and like all products of this type, the user must be careful about the following points:

- The connection pins on the board might be sharp. Be careful when handling the board to avoid hurting yourself
- This board contains static-sensitive devices. To avoid damaging it, handle the board in an ESD-proof environment.
- While powered, do not touch the electric connections on the board with your fingers or anything conductive. The board operates at a voltage level that is not dangerous, but components might be damaged when shorted.
- Do not put any liquid on the board and avoid operating the board close to water or at a high humidity level.
- Do not operate the board if dirty or dusty.

6 Quick start

The STM32 Nucleo-64 boards are low-cost and easy-to-use development kits, to quickly evaluate and start development with an STM32U3 series or STM32U5 series microcontroller in an LQFP 64-pin package. Before installing and using the product, accept the evaluation product license agreement from the www.st.com/epla webpage. For more information on the STM32 Nucleo-64 board and the software example, visit the www.st.com/stm32nucleo webpage.

6.1 Getting started

Follow the sequence below to configure the Nucleo-64 board and launch the demonstration application (refer to Figure 5 and Figure 6 for component location):

1. Check the jumper position on the board (refer to Default board configuration).
2. Connect the Nucleo-64 board to a PC with a USB cable (USB Type-A or USB Type-C® to USB Type-C®) through the USB connector (CN1) to power the board.
3. The 5V_PWR green (LD3), COM (LD1), and PWR (LD4) LEDs light up, and the green LED (LD2) blinks.
4. Press the blue user button (B1).
5. Observe how the blinking of the LED (LD2) changes, according to the clicks on the button (B1).
6. Download the demonstration software and several software examples that help to use the STM32 Nucleo-64 features. These are available on the *www.st.com* website.
7. Develop your application using the available examples.

6.2 Default board configuration

By default, the Nucleo-64 board is configured with VDD_MCU at 3.3 V. It is possible to configure the board with VDD_MCU at 1.8 V. Before switching to 1.8 V, ensure that the extension module and external shield connected to the Nucleo-64 board are 1.8 V compatible.

The default jumper configuration and voltage setting are shown in Table 4.

Table 4. Default jumper configuration

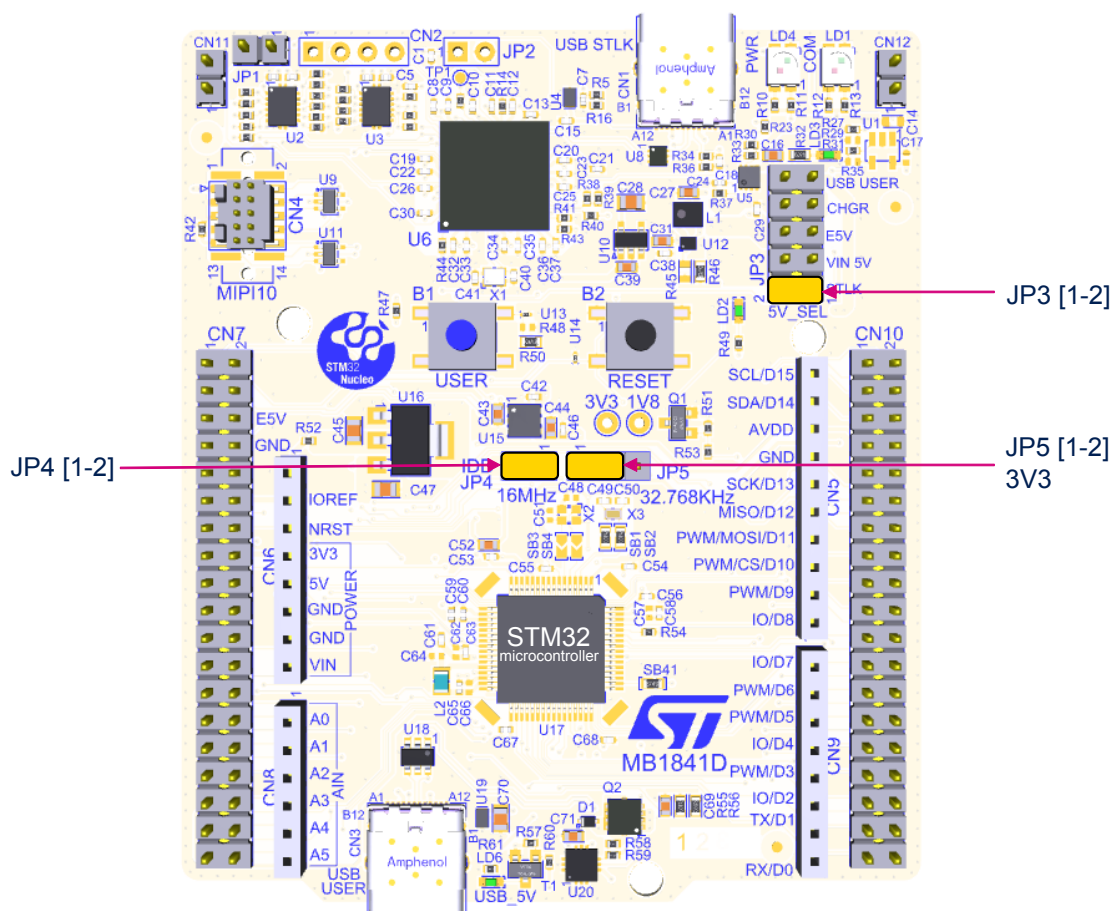| Jumper	Definition	Default position	Comment
JP1	Debugger selection	OFF	STLINK-V3EC is selected as the default debugger.
JP2	STLK_NRST	OFF	STLINK-V3EC MCU is not under Reset mode.
JP3	5V power selection	[1-2]	5V from STLINK-V3EC (STLK)
JP4	IDD measurement	ON	VDD_MCU current measurement
JP5	VDD	[1-2]	VDD voltage selection 3.3 V

Figure 3. Default board configuration

Table 5 explains the different jumper settings and configurations.

Table 5. Jumper configuration

| Jumper	Definition	Setting[1]	Comment
JP1	Debugger selection	[1-2]	An external debugger can be used on the MIPI10 connector (CN4). The level shifter (U2) is in high-Z. STLINK-V3EC no longer drives the embedded STM32.
		OFF	**STLINK-V3EC is selected as the default debugger.**
JP2	STLK_NRST	[1-2]	It can be used to reset the STLINK-V3EC MCU when an external debug probe is used. Thanks to the U2 level shifter and JP1, it is not necessary to put STLINK-V3EC in Reset mode when using an external debug probe.
		OFF	**Normal mode: Onboard STLINK-V3EC debugger used**
JP3	5V power selection[2]	**[1-2]**	**5V source from STLINK-V3EC (CN1)**
		[3-4]	5V source from ARDUINO® VIN 7-12 V from CN6 or CN7
		[5-6]	5V source from external 5V (E5V) from CN6 or CN7
		[7-8]	5V source from ST-LINK in USB charger mode without USB negotiation (CN1)
		[9-10]	5V source from user USB Type-C® (CN3)
		OFF	No 5V power source. Configuration applied when external 3.3 V is used.
JP4	IDD measurement	**ON**	**VDD_MCU = VDD (3.3 or 1.8 V, depending on JP5)**
		OFF	An ammeter is used to measure VDD_MCU power consumption or a 3.3 or 1.8 V external source can be connected on pin 2 (STLINK-PWR tools with STM32CubeMonitor-Power or ULPBench probe as examples)
JP5	VDD	**[1-2]**	**VDD voltage selection is the 3V3 power source.**
		[2-3]	VDD voltage selection is the 1V8 power source
		OFF	No internal VDD power supply (3.3 or 1.8 V external voltage needed on pin 2)

1. *The default configuration is in bold.*
2. *It is recommended to have only one jumper configuration.*

7 Hardware layout and configuration

The STM32 Nucleo-64 board is designed around an STM32U3 or STM32U5 microcontroller in an LQFP 64-pin package. Figure 4 shows the connections between the STM32 and its peripherals (STLINK-V3EC, push-buttons, LEDs, USB, ARDUINO® connectors, and ST morpho headers). Figure 5 and Figure 6 show the location of these features on the STM32 Nucleo-64 board.

The mechanical dimensions of the board are shown in Figure 7.

Figure 4. Hardware block diagram
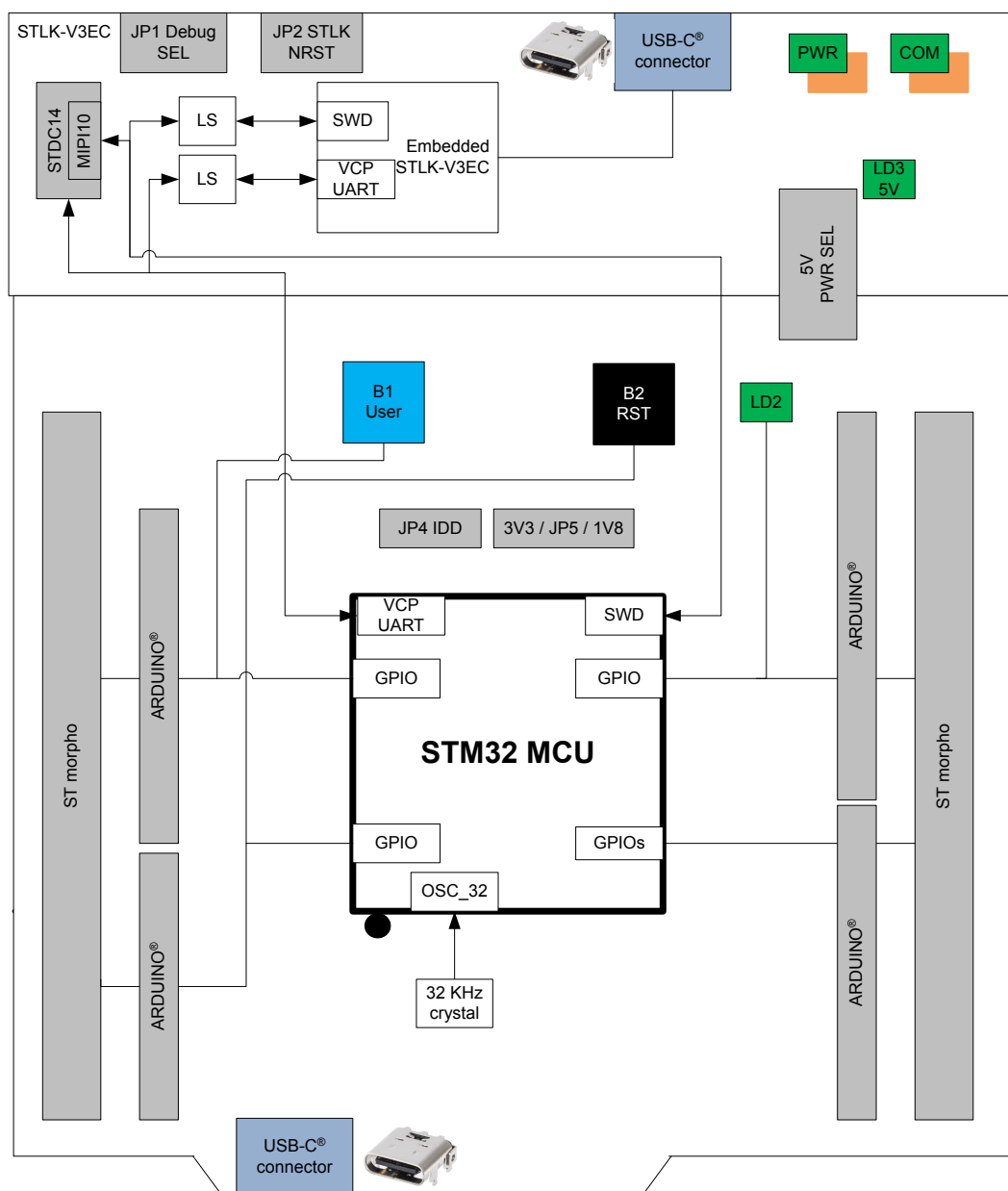
Note:
- *LS: Level shifter*
- *VCP: Virtual COM port*
- *SWD: Serial Wire Debug*

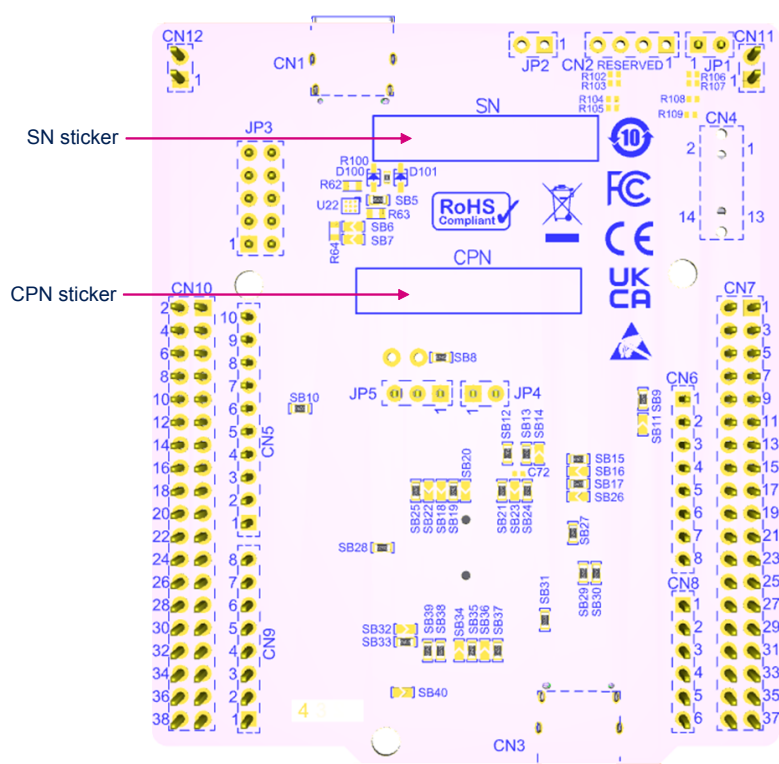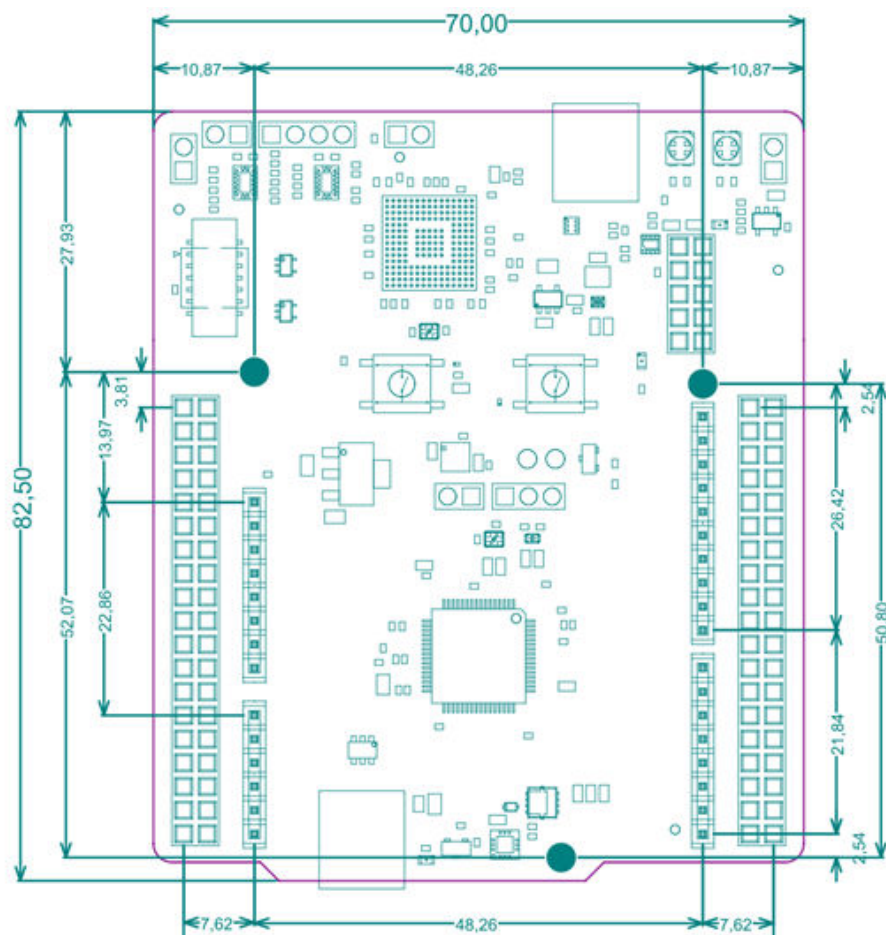## 7.1 Nucleo-64 board layout

Figure 5. Nucleo-64 board top layout
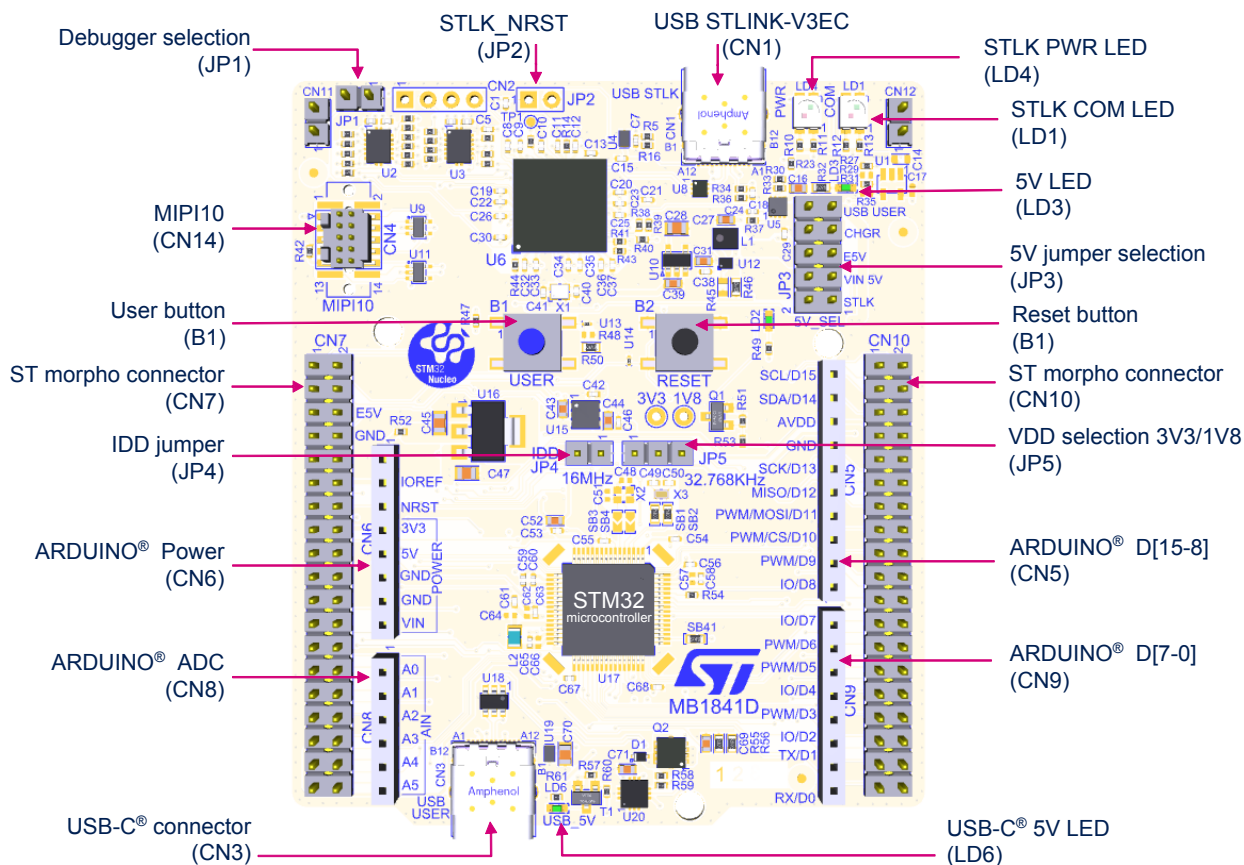
Figure 6. Nucleo-64 board bottom layout

7.2 Mechanical drawing

Figure 7. **Nucleo-64 board mechanical drawing (in millimeters)**

7.3 Embedded STLINK-V3EC

The chapter below gives some information about the implementation of the STLINK-V3EC on this Nucleo-64 board. For detailed information about ST-LINK capabilities, LED management, driver, and firmware for this STLINK-V3EC, refer to the technical note *Overview of ST-LINK derivatives* (TN1235).

For information about the debugging and programming features of STLINK-V3EC, refer to the user manual *STLINK-V3SET debugger/programmer for STM8 and STM32* (UM2448).

7.3.1 Description

There are two different ways to program and debug the onboard STM32 MCU:

- Using the embedded STLINK-V3EC
- Using an external debug tool connected to the STDC14/MIPI10 connector (CN4)

Refer to Table 5 to switch between STLINK-V3EC and STDC14 configurations.

The STLINK-V3EC facility for debugging and flashing is integrated into the STM32 Nucleo-64.

Features supported in STLINK-V3EC:

- 5 V/500 mA power supplied by the USB Type-C® connector (CN1)
- USB 2.0 high-speed-compatible interface
- JTAG and Serial Wire Debug (SWD) with Serial Wire Viewer (SWV)
- Virtual COM port (VCP)
- 1.7 to 3.6 V application voltage
- COM status LED which blinks during communication with the PC
- Power status LED which gives information about STLINK-V3EC target power
- USB-C® overvoltage protection (U5) with current limitation

Two tricolor LEDs (green, orange, and red) provide information about the STLINK-V3EC communication status (LD1) and STLINK-V3EC power status (LD4). For detailed information about these LEDs, refer to the technical note *Overview of ST-LINK derivatives* (TN1235).

Two level shifters are used on VCP and SWD interfaces to offer a debug capability with the MCU powered by a 1.8 V power source. The level shifters are used for signals from the target MCU (1.8/3.3 V) to STLINK-V3EC (3.3 V).

One of the level shifters is enabled with a jumper called debugger selection (JP1) to isolate the output I/Os from STLINK-V3EC when an external debug probe is used.

The configuration of this jumper (JP1) to use an external debug probe is explained in Table 5. Jumper configuration.

7.3.2 Drivers

The driver installation is not mandatory since Windows® 10 allocates an ST-specific name to the ST-LINK COM port in the system device manager.

For detailed information on the ST-LINK USB driver, refer to the technical note *Overview of ST-LINK derivatives* (TN1235).

7.3.3 STLINK-V3EC firmware upgrade

The STLINK-V3EC embeds a firmware upgrade (STSW-LINK007) mechanism through the USB port. The firmware might evolve during the lifetime of the STLINK-V3EC product, to add new functionalities, fix bugs, and support new microcontroller families. Visit the *www.st.com* website before using the STM32 Nucleo-64 board and periodically, to stay updated with the latest firmware version.

For detailed information about firmware upgrades, refer to the technical note *Overview of ST-LINK derivatives* (TN1235).

7.3.4 Using an external debug tool to program and debug the on-board STM32

To support an external debug tool, set the jumper (JP1) to isolate the output I/O from STLINK-V3EC. Then connect the external debug tool through the STDC14/MIPI10 debug connector (CN4).

When using the external debug connector (CN4), it is possible to use the STLINK-V3EC USB connector (CN1) to supply the Nucleo-64 board or select another power supply source as described in Section 7.4: Power supply and power selection.

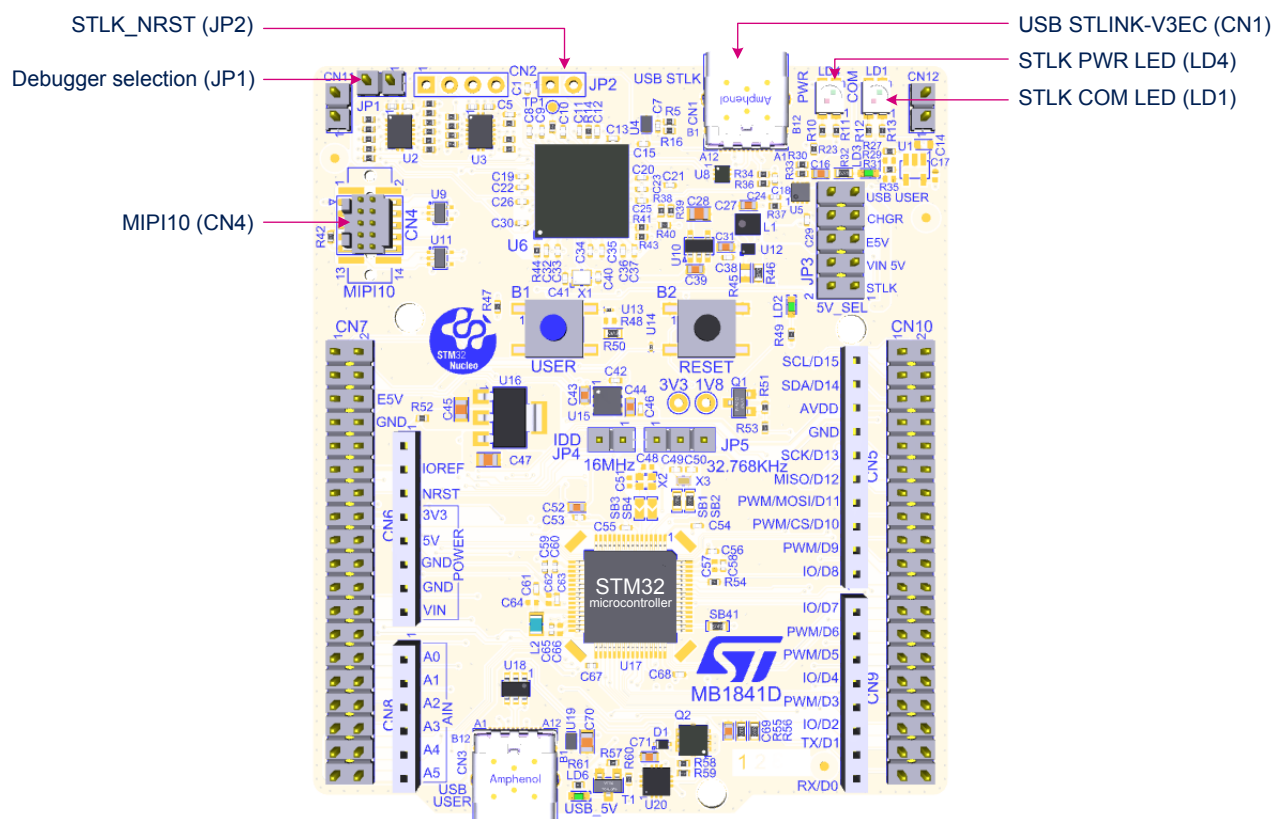**Figure 8. Connecting an external debug tool to program the on-board STM32 microcontroller**

Figure 9 shows the STDC14/MIPI10 connector (CN4).

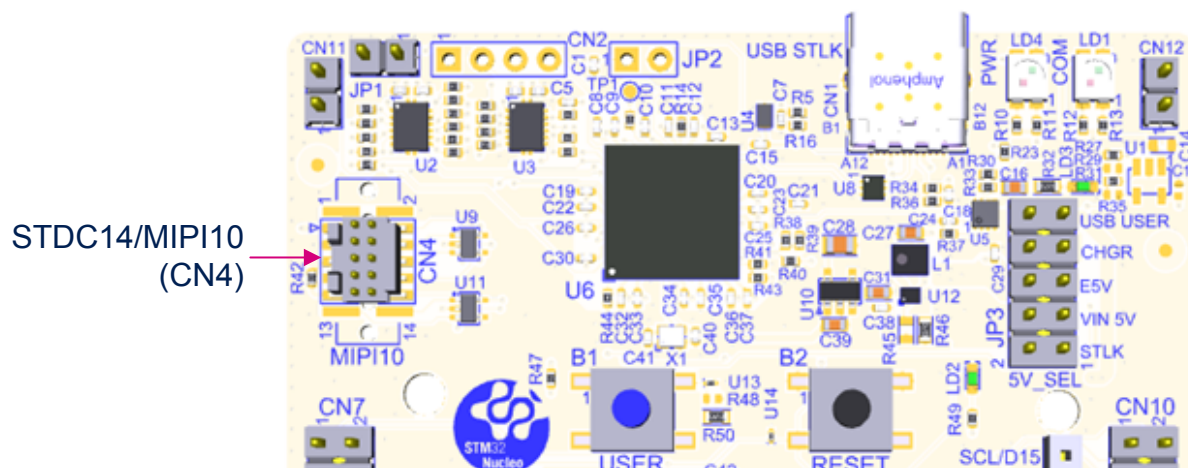**Figure 9. STDC14/MIPI10 debug connector (CN4)**

Table 6. STDC14/MIPI10 debug connector (CN4) pinout describes the STDC14/MIPI10 connector (CN4) pinout.

Table 6. STDC14/MIPI10 debug connector (CN4) pinout

MIPI10 pin	STDC14 pin	CN4	Function
-	1	NC	Reserved[1]
-	2	NC	Reserved[1]
1	3	VDD	Target VDD[2]
2	4	T_SWDIO	Target SWDIO using SWD protocol or target JTMS (T_JTMS) using JTAG protocol
3	5	GND	Ground
4	6	T_SWCLK	Target SWCLK using SWD protocol or target JTCK (T_JTCK) using JTAG protocol
5	7	GND	Ground
6	8	T_SWO	Target SWO using SWD protocol or target JTDO (T_JTDO) using JTAG protocol (SB44 ON)[3]
7	9	NC	T_JRCLK[4]/NC[5]
8	10	T_JTDI	Not used by SWD protocol, target JTDI (T_JTDI) using JTAG protocol
9	11	GNDDetect	GND detection for plug indicator[6]
10	12	T_NRST	Target NRST using SWD protocol or target JTMS (T_JTMS) using JTAG protocol
-	13	T_VCP_RX	Target Rx used for VCP (with UART supporting bootloader)[7]
-	14	T_VCP_TX	Target TX used for VCP (with UART supporting bootloader)[2]

1. *Not connected on the Nucleo-64 board*
2. *Output for the Nucleo-64 board*
3. *SWO is optional and required only for Serial Wire Viewer (SWV) trace.*
4. *Optional loopback of JTCK on the target side*
5. *NC means not required for the SWD connection, or not connected on the Nucleo-64 board*
6. *Tied to GND. The external debugger might use it.*
7. *Input for the Nucleo-64 board*

7.4 Power supply and power selection

7.4.1 External power supply input

It is possible to configure the Nucleo-64 board to use any of the following power sources:

- STLK: 5 V from STLINK-V3EC USB-C® connector (CN1)
- VIN: 7 to 12 V from ARDUINO® (CN6) or ST morpho connector (CN7), with 5 V adaptation from LDO (U16)
- E5V: External 5 V power from ST morpho connector (CN7)
- CHGR: 5 V from STLINK-V3EC USB (CN1) without USB enumeration
- USB_USER: 5 V from user USB Type-C® connector (CN3)
- 3V3 on ARDUINO® (CN6) or ST morpho connector (CN7).

Note: *If VIN, E5V, or 3V3 is used to power a Nucleo-64 board, this power source must comply with the EN 62368-1:2014+A11:2017 standard and be safety extralow voltage (SELV) with limited power capability.*

The power supply capabilities are summarized in Table 7.

Table 7. Power sources capability

| Input power name	Connector pins	Voltage range	Max. current	Limitation
STLK	CN1 JP3[1-2]	4.75 to 5.5 V	500 mA	The maximum current depends on the presence or absence of USB enumeration: • 100 mA without enumeration • 500 mA with enumeration OK.
VIN/VIN_5V	CN6 pin 8 CN7 pin 24 JP3[3-4]	7 to 12 V	800 mA	From 7 to 12 V only and input current capability is linked to input voltage: • 800 mA input current when VIN = 7 V • 450 mA input current when 7 V < VIN < 9 V 250 mA input current when 9 V < VIN < 12 V
E5V	CN7 pin 6 JP3[5-6]	4.75 to 5.5 V	1 A	The maximum current depends on the power source. 1 A maximum is recommended for this Nucleo-64 board.
CHGR	CN1 pin 1 JP3[7-8]	4.75 to 5.5 V	500 mA	The maximum current depends on the used wall charger to power the Nucleo-64 board. No USB enumeration.
USB_USER	CN3 JP3[9-10]	4.75 to 5.5 V	1 A	The maximum current depends on the USB Host used to power the Nucleo-64 board. 1 A maximum is recommended for this Nucleo-64 board.
3V3	CN6 pin 4 CN7 pin 16	3.0 to 3.6 V	-	The maximum current depends on the 3V3 source. The 3V3 can be used when the STLINK-V3EC part of the PCB is not used. SB8 might be OFF to protect LDO (U15).
VDD	JP5 pin 2	1.71 to 3.6 V	-	It is possible to power only the MCU power supply pins by applying a voltage source on JP5 pin 2. In this case, only the MCU is power. External functions like debugging, LED, or expansion connectors are not powered. This option can be used for the MCU power consumption measurement.

STLK is a 5 V DC power with limitations from the STLINK-V3EC USB connector (CN1). In this case, the 5V jumper selection (JP3) must be on pin [1-2] to select the STLK power source on the JP3 connector. This is the default setting. If the USB enumeration succeeds, the STLK power is enabled, by asserting the T_PWR_EN signal from STLINK-V3EC. This pin is connected to the overvoltage protection (U5) with maximum current management.

STLINK-V3EC USB connector (CN1) can power the Nucleo-64 board and its shield. Nevertheless, only the STLINK-V3EC circuit is powered before USB enumeration because the host PC only provides 100 mA to the board at that time. During the USB enumeration, the Nucleo-64 board requests 500 mA power from the host PC.

- If the host can provide the required power, the U5 power switch is enabled, the green LED (LD3) is turned ON, and the Nucleo-64 board and its shield can consume up to 500 mA.

- If the host is not able to provide the requested current, the enumeration fails. The U5 power switch remains OFF and the MCU part including the extension board is not powered. As a consequence, the green LED (LD3) remains OFF. In this case, it is recommended to use an external 5 V power source.

STLK configuration: 5V jumper selection JP3[1-2] must be connected as shown in Figure 10.

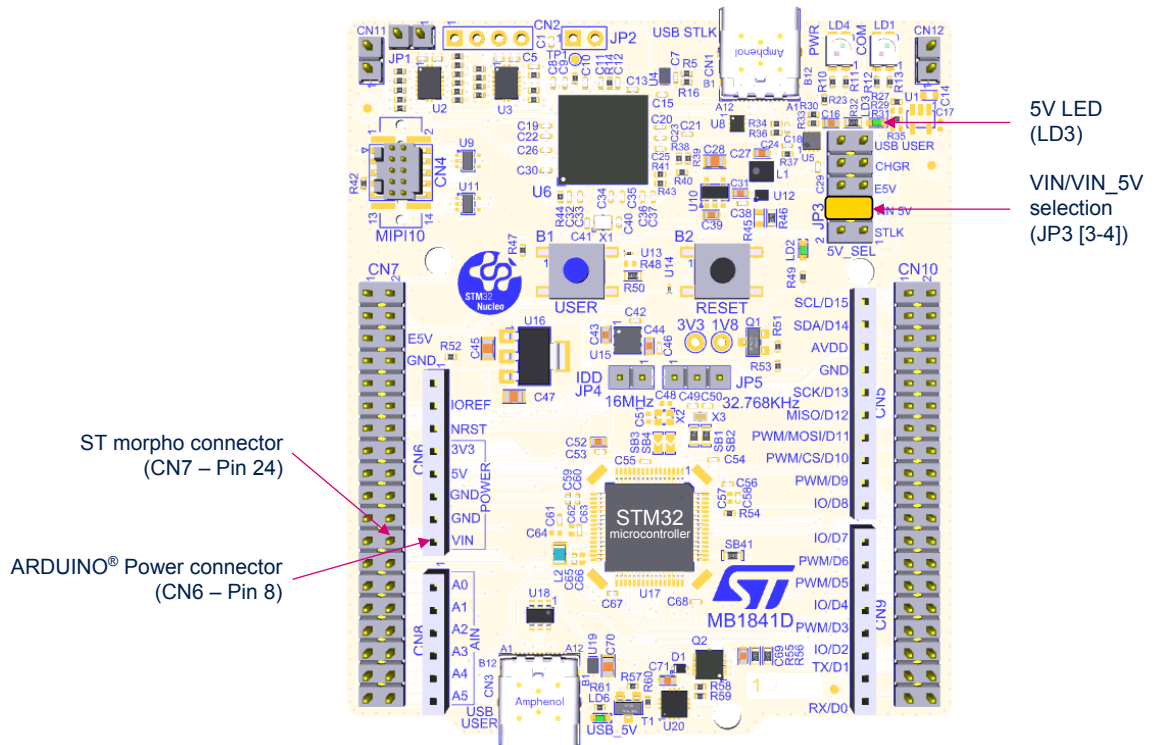**Figure 10. 5V jumper selection JP3[1-2]: STLK power source**
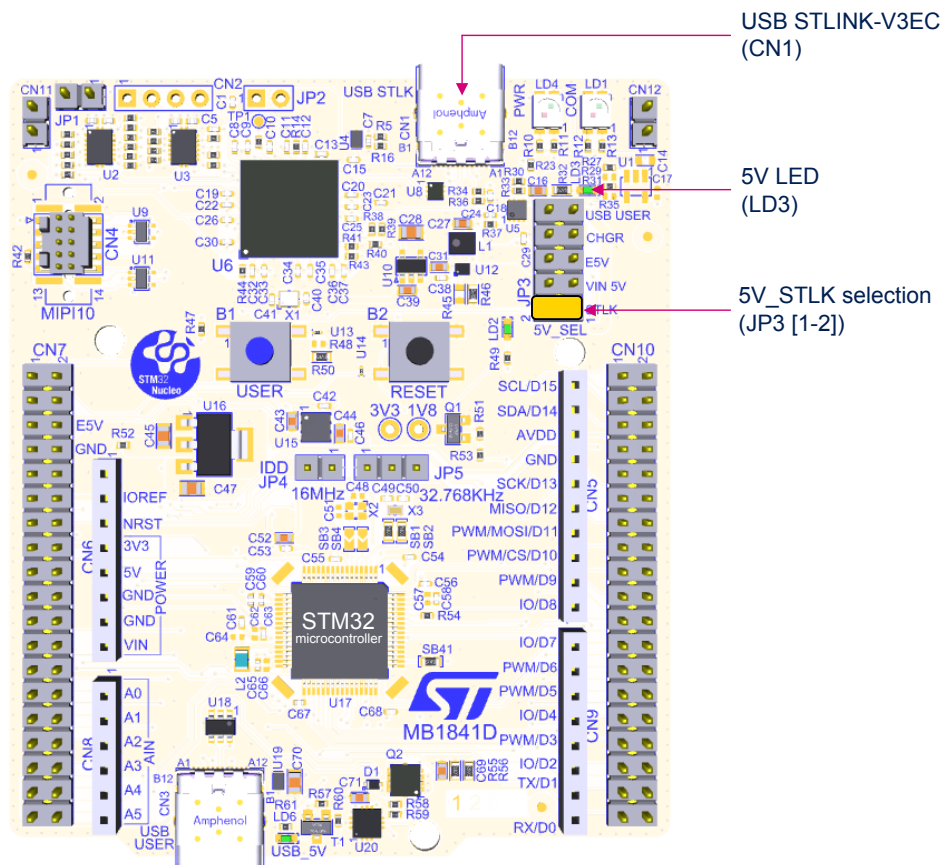
VIN (VIN_5V) is the 7 to 12 V DC power source from the ARDUINO® connector (CN6) pin 8 (VIN), or from the ST morpho connector (CN7) pin 24. The 5V jumper selection (JP3) must be on pin [3-4] to select the VIN_5V power source. In that case, the DC power can come from the ARDUINO® Uno V3 battery shield (compatible with the Adafruit® PowerBoost 500 shield).

An LDO (U16) is used to provide a fixed 5 V from VIN (7-12 V).

VIN_5V configuration: 5V jumper selection (JP3) [3-4] must be connected as shown in Figure 11.

Figure 11. 5V jumper selection JP3[3-4]: VIN_5V power source

E5V is the DC power coming from an external 5 V DC power source from the ST morpho connector (CN7) pin 6. The 5V jumper selection (JP3) must be on pin [5-6] to select the E5V power source on the JP3 connector and must be connected as shown in Figure 12. 5V jumper selection JP3[5-6]: E5V power source.

Figure 12. 5V jumper selection JP3[5-6]: E5V power source
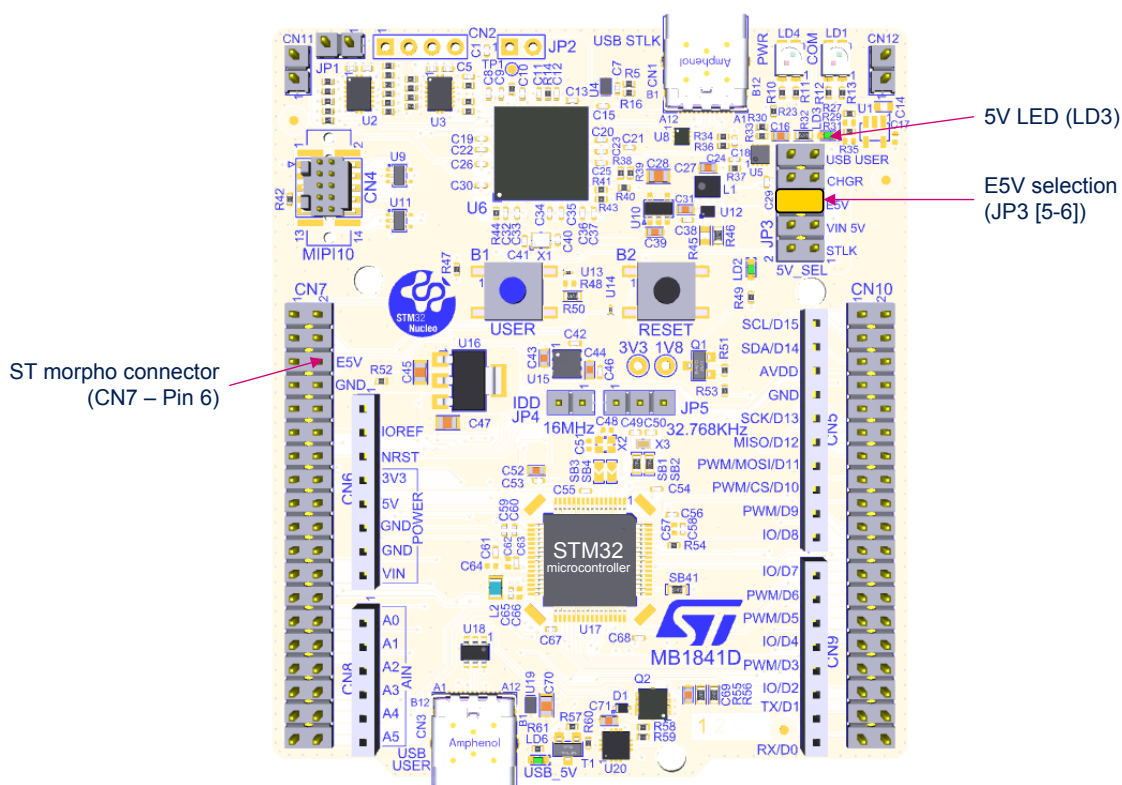
CHGR is when a DC power charger is connected to the USB STLINK-V3EC (CN1). To select the CHGR power source, the 5V jumper selection (JP3) must be on pins [7-8]. If an external USB charger powers the Nucleo-64 board, then the debugging feature through (CN1) is not available. With this configuration, the voltage and current limitations are no longer effective. If a host computer is connected instead of the charger, it is recommended to select the STLK power source.

CHGR configuration: 5V jumper selection JP3[7-8] must be connected as shown in Figure 13.

Figure 13. 5V jumper selection JP3[7-8]: CHGR power source
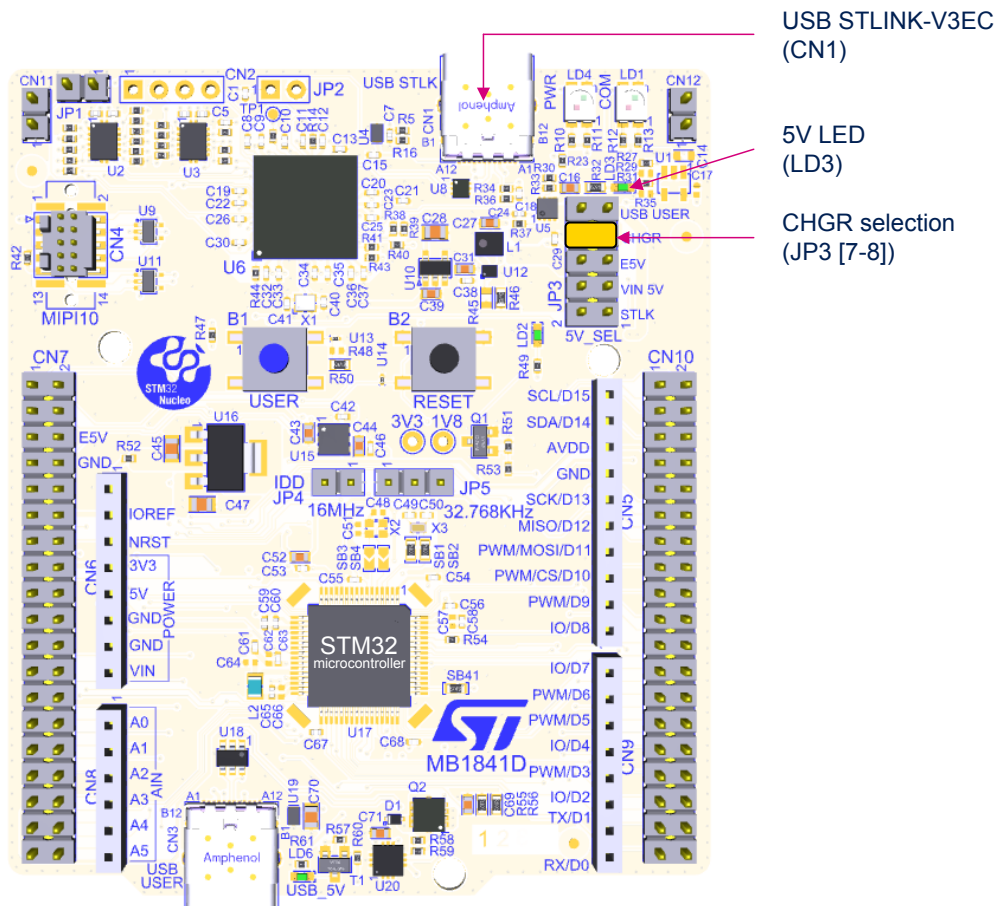
Note: With this JP3 configuration: the USB_PWR protection is bypassed. This configuration is forbidden to power the board with a computer USB port, as the USB_PWR_protection is bypassed. The reason is that if the board consumes more than 500 mA, it can damage the computer.

USB_USER is the DC power source coming from the 5 V of the USB Type-C® connector (CN3). The 5V jumper selection (JP3) must be on pins [9-10] and must be connected as shown in Figure 14.

Figure 14. 5V jumper selection JP3[9-10]: USB USER power source
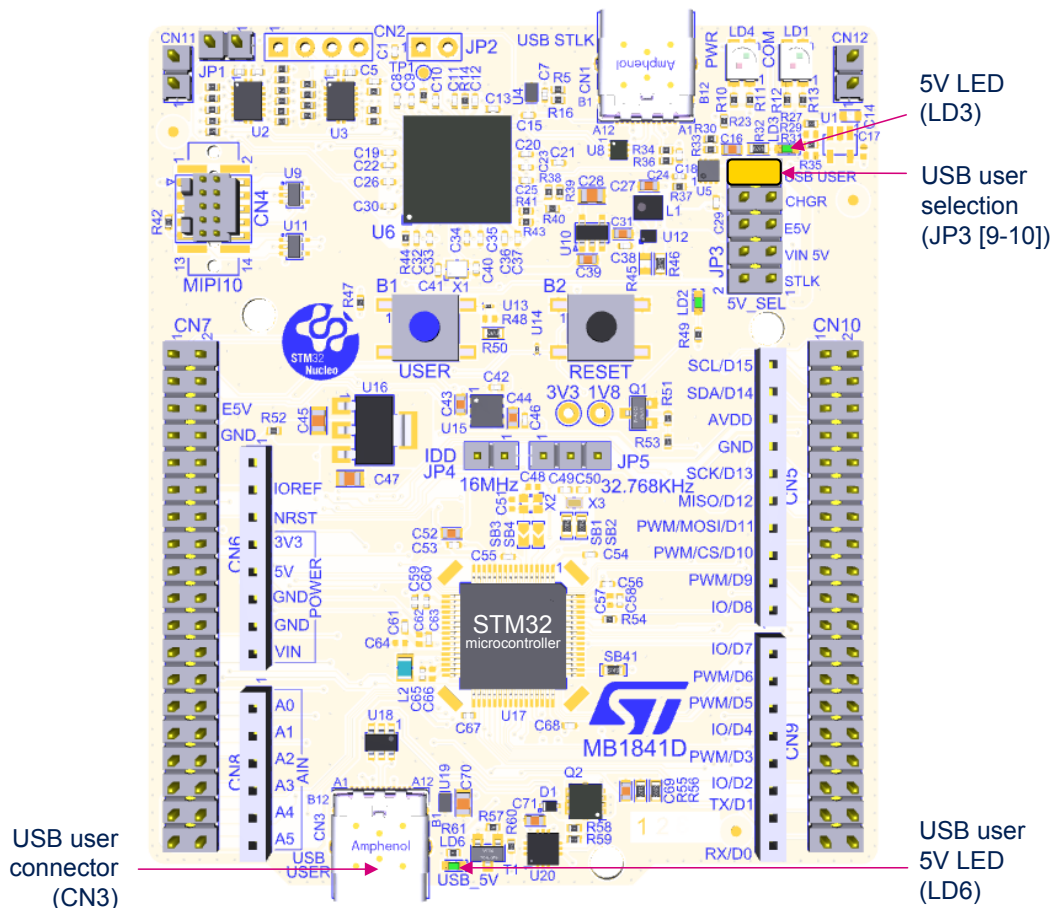
External 3V3 power supply input. In some situations, it is interesting to use an external 3.3 V source on the 3V3 input (CN6 pin 4, CN7 pin 16), for instance in case the 3.3 V is provided by an extension board. When the Nucleo-64 is powered with only a 3.3 V source, STLINK-V3EC is not powered thus programming and debugging are unavailable.

When using the 3V3 input, the STLINK-V3EC part is not supplied

For this configuration, it is recommended to remove SB8 to avoid backward voltage to 5V through U15.

VDD power supply input. In some situations, it is interesting to use an external power source from 1.71 to 3.6 V to power only the MCU power supply pins (JP5 pin 2 or JP4 pin 2). In this configuration, external functions like debug, LED, or expansion connector are not powered. This option can be used to optimize MCU power consumption measurement.

7.4.2 Programing/debugging when the power supply is not from STLINK-V3EC (STLK)

In case the current consumption of the Nucleo-64 and the expansion boards exceeds the allowed current on the ST-LINK USB connector, the external power VIN, E5V, or USB-USER can be used. In such a case, it is still possible to use the embedded ST-LINK for VCP, programming, and debugging.

In this case, the following power sequence procedure must be respected:

1. Set the JP3 jumper according to the 5V selected external power source.
2. Connect the external power source according to JP3.
3. Switch on the external power supply.
4. Check that the 5 V green LED (LD3) is turned ON.
5. Connect the PC to the USB connector (CN1) for programming/debugging.

If this sequence is not respected, V_{BUS} might power the board first from STLINK-V3EC, and the following risk might be encountered:

- If the board needs more than 500 mA, the PC might be damaged or limit the current. Therefore, the board is not powered correctly.
- 500 mA is requested at enumeration. Thus, there is a risk that the request is rejected. Enumeration does not succeed if the PC cannot provide such a current.

Consequently, the board is not powered, and the 5 V green LED (LD3) remains OFF.

7.4.3 Power supply output

- **5V**: Whatever the power source (STLK, VIN_5V, E5V, CHGR, or USB-USER), the 5V generated is present on CN6 pin 5 or CN7 pin 18, and can be used as an output power supply for an ARDUINO® shield or an extension board. In this case, the maximum current of the power source specified in Table 7 needs to be respected.
- **3V3**: The internal 3V3, on CN6 pin 4 or CN7 pin 16, can be used also as a power supply output. The current is limited by the maximum current capability of the U15 regulator (500 mA maximum concerning STM32 Nucleo-64 board with shields consumption).

7.4.4 Internal power supply

The Nucleo-64 boards are designed to support two specific voltage configurations:

- VDD at 3.3 V configuration to reach the Nucleo-64 low-power mode
- VDD at 1.8 V configuration to demonstrate the MCU low-voltage capability

7.4.4.1 3V3

Regardless of the 5V power source, an LDO is used to deliver a fixed 3.3 V power voltage from 5V. The maximum current capability of this source is 500 mA. To select the 3.3 V voltage for the VDD, set the JP5 jumper on [1-2].

A solder bridge (SB8) is used to disconnect the LDO output when an external 3.3 V is applied to the Nucleo-64 board, to avoid backward voltage to 5V through this LDO.

- SB8 ON: U15 LDO output provides a 3.3 V power supply (default configuration).
- SB8 OFF: U15 LDO output does not provide 3.3 V. An external 3.3 V is needed.

7.4.4.2 1V8

An external SMPS can be used for the MCU to work at 1.8 V. The external SMPS capability is 400 mA maximum. Before using the 1.8 V voltage, it is necessary to check that all interfaces connected to the Nucleo-64 board are 1.8 V compatible. To select the 1.8 V for the VDD, connect the VDD jumper (JP5) to the pin [2-3].

In this mode, it is possible to keep some MCU voltage domains on 3.3 V depending on the application use case. The MCU voltage selection is done according to the solder bridge configuration. Refer to Table 8 for solder bridge configuration.

7.4.4.3 JP5 VDD voltage selection 1V8/3V3 power sources

The JP5 jumper selects the VDD voltage:

- Set JP5 on [1-2] to set VDD to 3.3 V.
- Set JP5 on [2-3] to set VDD to 1.8 V.

The consumption on this jumper includes the MCU power pins connected to the VDD_MCU power line and the other features supplied by VDD, such as the level shifter power supply pins for STLINK-V3EC, the user button, the ARDUINO® shield on the IOREF pin, and the power supply pins on the ST morpho connector.

7.4.5 MCU power supply

The default configuration of the MCU power pins is described in Table 8.

Table 8. MCU power configuration

Solder bridge configuration	MCU power supply
JP5[1-2]/JP5[2-3]	VDD selection: Jumper selection for VDD 3V3 or 1V8
JP4[12]/ammeter	IDD: JP4 ON to supply the MCU or connected with an ammeter to do the current measurement.
SB27 ON	SB for VDDSMPS input voltage
SB13 ON	SB for VDDA input voltage
SB33 ON	SB for VDDUSB input voltage (directly on 3V3 because VDDUSB is not compatible with 1V8 configuration)
SB25 ON	SB for VBAT input voltage

Warning: *On this Nucleo-64 board, the power-on sequence implementation for the 1.8 V use case is given as an example and might not follow the recommended power-on sequencing. Refer to the application note Getting started with STM32U5 series MCU hardware development (AN5373) and STM32U5xx product datasheets for power-on sequencing.*

INTERNAL V$_{CORE}$ SMPS power supply

The power figures in Run mode are significantly improved, by generating the V$_{core}$ logic supply from the internal DC-DC converter (this function is only available on '-Q' suffixed boards).

For all general information concerning design recommendations for STM32U3 or STM32U5 with internal SMPS and design guide for ultra-low-power applications with performance, refer to the application note *Getting started with STM32U3 series MCU hardware development* (AN6011) or *Getting started with STM32U5 series MCU hardware development* (AN5373) at the *www.st.com* website.

7.4.6 VDD_MCU IDD measurement

The labeled **IDD** jumper (JP4) measures the consumption of the STM32 microcontroller by removing the jumper and by connecting an ammeter or any other current measurement tool.

- Jumper ON: The STM32 microcontroller is powered (default).
- Jumper OFF: An ammeter or external 3.3 V power source must be connected to power and measure the STM32 microcontroller consumption.

The **IDD** jumper can be used to perform the current consumption for both 3.3 and 1.8 V MCU voltages.

7.5 LEDs

STLINK-V3EC tricolor LEDs (LD1 and LD4)

The tricolor (green, orange, and red) LEDs provide information about STLINK-V3EC communication status (LD1) and power status (LD4). For detailed information about these LEDs, refer to the technical note *Overview of ST-LINK derivatives* (TN1235).

User green LED (LD2)

The user green LED (LD2) is connected to the STM32 I/O PA5 (SB10 ON, default configuration) also used for ARDUINO® D13 function. A transistor is used to drive the LED whatever the MCU 1V8 or 3V3 voltage range is.

5V PWR LED (LD3)

The green LED (LD3) indicates that the Nucleo-64 board is powered by a 5 V source. This source is available on CN6 pin 5 and CN7 pin 18, but also for the LDO and external SMPS input.

USB Type-C® LED (LD6)

The green LED (LD6) shows the presence of 5 V on the USB-USER connector. Refer to Section 7.11: USB Type-C® FS for more details.

7.6 Push-buttons

Two buttons are available on the Nucleo-64 board.

USER button (B1)

The blue button for the user and wake-up functions is connected to PC13 to support the default TAMPER function or to PA0 to support the optional wake-up function of the STM32 microcontroller. When the button is pressed the logic state is HIGH, otherwise, the logic state is LOW.

- To connect the USER button to PC13, SB24 must be ON and SB23 must be OFF. This is the default configuration.
- To connect the USER button to PA0, SB24 must be OFF and SB23 must be ON. This is the optional configuration.

The USER button is implemented using a firmware debounce filter. This helps to reduce the BOM cost by removing the external hardware debounce filter R48 and C72.

Warning: *PC13 I/O used for the USER button must be set in INPUT, pull-down (PD) with debouncing. Never set the PC13 in OUTPUT level LOW to avoid a shortcut when the USER button is pressed.*

RESET button (B2)

The black button connected to NRST is used to reset the STM32 microcontroller. When the button is pressed the logic state is LOW, otherwise, the logic state is HIGH.

The blue and black plastic hats placed on these push-buttons can be removed if necessary when a shield or an application board is plugged into the top of the Nucleo-64 board. This avoids pressure on the buttons and consequently a possible permanent target MCU reset.

7.7 OSC clock sources

Three clock sources are available on the Nucleo-64 board:

- LSE is the 32.768 kHz crystal for the STM32 embedded RTC.
- MCO is the clock from the ST-LINK MCU (8 MHz default value) for the STM32 microcontroller.
- HSE is the 16 MHz oscillator for the STM32 microcontroller. This clock is available depending on the target STM32 series microcontroller used on the Nucleo-64 board.

To help select the crystals and their associated capacitors, refer to the application note *Oscillator design guide for STM8AF/AL/S, STM32 MCUs and MPUs* (AN2867).

7.7.1 LSE: OSC 32 KHz clock supply

There are three ways to configure the pins corresponding to the low-speed clock (LSE):

LSE on-board oscillator X3 crystal (default configuration)

For example, the X3 crystal embedded in the Nucleo-64 has the following characteristics: 32.768 kHz, 9 pF, 20 ppm.

The use of the embedded X3 crystal requires the following solder bridge configuration:

- SB1 and SB2 ON
- SB18 and SB22 OFF

External oscillator connected to PC14 input

From the external oscillator through pin 25 of the ST morpho connector (CN7). The following configuration is needed:

- SB1 and SB2 OFF
- SB18 and SB22 ON, for connection from ST morpho connector CN7 pin 25

LSE not used

PC14 and PC15 are used as GPIOs instead of low-speed clocks. The following configuration is needed:

- SB1 and SB2 OFF
- SB18 and SB22 ON

7.7.2 OSC clock supply

There are four ways to configure the pins corresponding to the external high-speed clock (HSE):

HSE: on-board oscillator X2 crystal (default: not connected)

For example, the X2 crystal embedded in the Nucleo-64 has the following characteristics: 16 MHz, 8 pF, 20 ppm.

The use of the embedded X2 crystal requires the following solder bridge configuration:

- SB19 and SB21 OFF. PH0 and PH1 are not connected to CN7 as I/O.
- SB20 (MCO) OFF
- SB3 and SB4 ON are connected to use the external crystal.

MCO from STLINK-V3EC (default: not connected):

The MCO output of the STLINK-V3EC MCU is used as an input clock. By default, it is fixed at 8 MHz and connected to the PH0 OSC_IN of the STM32 microcontroller. The frequency might be changed during an ST-LINK firmware upgrade (refer to RN0093 for details). The use of this clock source requires the following configuration:

- SB19 OFF and SB21 ON. Only PH1 can be connected to CN7 as I/O.
- SB20 ON: MCO is connected to PH0 and R8 on the STLINK-V3EC side must be connected to provide the MCO from the STLINK-V3EC output. The resistor (R7) and capacitor (C6) can be adapted for the MCO frequency shape. SB20 OFF.
- SB3 and SB4 OFF. The external crystal is disconnected from PH0 and PH1.

External oscillator to PH0 input (default: not connected)

The input clock comes from an external oscillator through PH0, CN17 pin 29. The following configuration is needed:

• SB19 and SB21 ON. PH0 and PH1 are connected to CN7 (PH1 can be used as a GPIO).

• SB20 OFF. MCO is not connected to PH0.

• SB3 and SB4 OFF. The external crystal is disconnected from PH0 and PH1.

HSE not used (default configuration)

PH0 and PH1 are used as GPIOs instead of crystal input. The following configuration is needed:

• SB19 and SB21 ON. PH0 and PH1 are connected to expansion connector CN7 as GPIOs.

• SB20 OFF. MCO is not connected to PH0.

• SB3 and SB4 OFF. The external crystal X2 is disconnected from PH0 and PH1.

7.8 Reset sources

The reset signal NRST of the Nucleo-64 board is active LOW and the reset sources come from:

• The RESET button (B2)

• The embedded STLINK-V3EC (CN1)

• The ARDUINO® connector (CN6 pin 3)

• The ST morpho connector (CN7 pin 14)

7.9 Virtual COM port (VCP)

An STM32 serial interface is connected to the STLINK-V3EC debug interface. The user can choose between a USART or an LPUART interface.

The selection between USART and LPUART is performed by setting related solder bridges.

Refer to the two tables below to set the USART or LPUART connection to the VCP interface.

Table 9. USART1 LPUART1 connection

ST-LINK and ARDUINO® UART configuration	Solder bridge configuration[1]	Feature	
USART1 (PA9/PA10) connected to STLINK-V3EC VCP **and** **LPUART1 (PA2/PA3) connected to ARDUINO® Uno V3 D0/D1**	**SB15, SB17, SB35, and SB37 ON** **SB16, SB26, SB34, and SB36 OFF**	**USART1 (PA9/PA10) connected to STLINK-V3EC VCP**	
		LPUART1 (PA2/PA3) connected to ARDUINO® Uno V3 D0/D1	
LPUART1 (PA2/PA3) connected to STLINK-V3EC VCP and USART1 (PA9/PA10) connected to ARDUINO® Uno V3 D0/D1	SB16, SB26, SB34, and SB36 ON SB15, SB17, SB35, and SB37 OFF	LPUART1 (PA2/PA3) connected to STLINK-V3EC VCP	
		USART1 (PA9/PA10) connected to ARDUINO® Uno V3 D0/D1	

1. *The default configuration is in bold.*

By default:

• The serial communication between the target MCU and ST-LINK MCU is enabled on USART1 because this interface supports Bootloader mode.

• The serial communication between the target MCU and ARDUINO® Uno V3 or ST morpho connector is enabled on LPUART1, not to interfere with the VCP interface.

7.10 Bootloader

The bootloader is located in the system memory, programmed by ST during production. It is used to reprogram the flash memory via USART, I^{2}C, SPI, CAN FD, or USB FS in device mode through the device firmware upgrade (DFU). The bootloader is available on all devices. Refer to the application note *STLINK-V3SET debugger/ programmer for STM8 and STM32* (AN2606) for more details.

The Root Secure Services (RSS) are embedded in a secured system memory area, programmed during ST production. For example, it enables secure firmware installation (SFI), thanks to the RSS extension firmware (RSSe SFI). This feature allows customers to protect the confidentiality of the firmware to be provisioned into the STM32 when production is subcontracted to an untrusted third-party. The RSS is available on all devices, after enabling the TrustZone® through the TZEN option bit.

The bootloader version can be identified by reading the bootloader ID at the `0x0BF99EFE` address.

The I/O PH3_BOOT0 gives external hardware access to the bootloader.

By default, this pin is set to level "0" (pull-down resistor), to boot on the internal flash. It is possible to put this GPIO to level "1" to boot on system flash (bootloader), by connecting a jumper (pitch 2.54 mm) between the ST morpho connector (CN7) pin 7 and pin 5 (VDD).

As mentioned above, USART1 on PA9/PA10 is connected by default because this interface supports Bootloader mode.

7.11 USB Type-C® FS

The Nucleo-64 board supports USB full-speed (FS) communication. The USB connector (CN3) is a USB Type-C® connector.

The Nucleo-64 board supports the USB Type-C® Sink power mode only.

The green USB power LED (LD6) lights up when V_{BUS} is powered by a USB host and the Nucleo-64 board works as a USB device.

7.11.1 USB FS device

With a USB stack inside the STM32, and when a USB host connection to the USB Type-C® connector (CN3) of the STM32 Nucleo-64 is detected, the Nucleo-64 board can be a USB device. Depending on the powering capability of the USB host, the board can be powered by the CN3 V_{BUS} terminal. In the board schematic diagrams, the corresponding power voltage line is called 5V_UCPD. The STM32 Nucleo-64 board supports a 5V USB voltage from 4.75 to 5.5 V. MCU VDD_USB supports the 3V3 voltage only. Section 7.4 provides information on how to use the powering options.

The hardware configuration for the USB FS interface is shown in Table 10.

Table 10. Hardware configuration for the USB interface

I/O	Solder bridge	Setting	Configuration[1]
PA11	SB38	OFF	PA11 used as USB_FS_N differential pair interface No other multiplexing
		ON	**PA11 can be used as a USB data interface and PA11 is also available on the ST morpho connector.** **USB function can be used, but performances can be impacted due to the track length to the expansion connector, causing impedance mismatch.**
PA12	SB41	OFF	PA12 used as USB_FS_P differential pair interface No other multiplexing
		ON	**PA12 can be used as a USB data interface and PA12 is also available on the ST morpho connector.** **USB function can be used, but performances can be impacted due to the track length to the expansion connector, causing impedance mismatch.**

1. The default configuration is shown in bold.

7.11.2 UCPD

The USB Type-C® introduces the USB Power Delivery feature. The STM32 Nucleo-64 implementation for the USB Power Delivery supports the dead battery and the Sink mode with 5 V and 0.5 A (2.5 W).

In addition to the I/O DP/DM directly connected to the USB Type-C® connector, and because only Sink mode with 2.5 W is supported. CC1 and CC2 signals do not need to be connected to the MCU, only one more GPIO is needed for the UCPD feature: VBUS_SENSE connected to an ADC to probe V_{BUS}.

To protect the STM32 Nucleo-64 board from USB overvoltage, a programmable power supply (PPS)-compliant USB Type-C® port protection is used: TCPP01-M12 IEC6100-4-2 level 4-compliant IC.

- Configuration channel: UCPD_CCx and dead battery UCPD_DBn: As the STM32 Nucleo-64 supports only Sink current mode with 5 V and 500 mA (2.5 W), these signals are directly connected to the ground through the ST USB port protection TCPP01-M12.
- Also TCPP01-M12 V_{BUS} OVP is set at 6 V with the resistor bridge on VBUS_CTRL (R59). The resistor is set to 2.4 kΩ to select a 6 V maximum.

For more details about UCPD with the TCPP01-M12 USB Type-C® port protection for sink application, refer to the application note *USB Type-C® Power Delivery using STM32 MCUs and MPUs* (AN5225).

Table 11 describes the hardware configuration for the UCPD feature.

Table 11. Hardware configuration for the UCPD feature

I/O	Solder bridge	Setting	Configuration[1]
PC2	SB31	**ON**	**PC2 used as VBUS_SENSE**
		OFF	PC2 NOT used for UCPD. It can be used on the expansion connector.

1. The default configuration is shown in bold.

7.11.3 USB Type-C® connector

Figure 15 shows the pinout of the USB Type-C® connector (CN3).

Figure 15. USB Type-C® connector (CN3) pinout

A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	A11	A12
GND	TX1+	TX1-	V_{BUS}	CC1	D+	D-	SBU1	V_{BUS}	RX2-	RX2+	GND
GND	RX1+	RX1-	V_{BUS}	SBU2	D-	D+	CC2	V_{BUS}	TX2-	TX2+	GND
B12	B11	B10	B9	B8	B7	B6	B5	B4	B3	B2	B1

Table 12 describes the pinout of the USB Type-C® connector (CN3).

Table 12. USB Type-C® connector (CN3) pinout

STM32 pin	Signal name	Pin name	Pin	Pin	Pin name	Signal name	STM32 pin
-	GND	GND	A1	B12	GND	GND	-
-	-	TX1+	A2	B11	RX1+	-	-
-	-	TX1-	A3	B10	RX1-	-	-
-	VBUS_C/ 5V_UCPD	VBUS	A4	B9	VBUS	VBUS_C/ 5V_UCPD	-
-	UCPD_CC1 on TCPP01	CC1	A5	B8	SBU2	-	-
PA12	USB_FS_P	D+	A6	B7	D-	USB_FS_N	PA11
PA11	USB_FS_N	D-	A7	B6	D+	USB_FS_P	PA12
-	-	SBU1	A8	B5	CC2	UCPD_CC2 on TCPP01	-
-	VBUS_C/ 5V_UCPD	VBUS	A9	B4	VBUS	VBUS_C/ 5V_UCPD	-
-	-	RX2-	A10	B3	TX2-	-	-
-	-	RX2+	A11	B2	TX2+	-	-
-	GND	GND	A12	B1	GND	GND	-

8 Extension connectors

Six extension connectors are implemented on the Nucleo-64 board:

- ARDUINO® Uno V3 connectors (CN5, CN6, CN8, and CN9)
- ST morpho connectors (CN7 and CN10)

8.1 ARDUINO® Uno V3

The CN5, CN6, CN8, and CN9 connectors are female connectors supporting the ARDUINO® Uno V3 standard. Most shields designed for ARDUINO® can fit the Nucleo-64 board.

Caution: *Most of the STM32 microcontroller I/Os are 5V‑tolerant, but a few of them are only 3.6V‑compatible, while ARDUINO® Uno V3 is 5V‑compatible. Refer to the STM32U3 or STM32U3 series data brief and STM32U3xx or STM32U5xx product datasheet for their I/O structure.*

Figure 16. ARDUINO® Uno V3
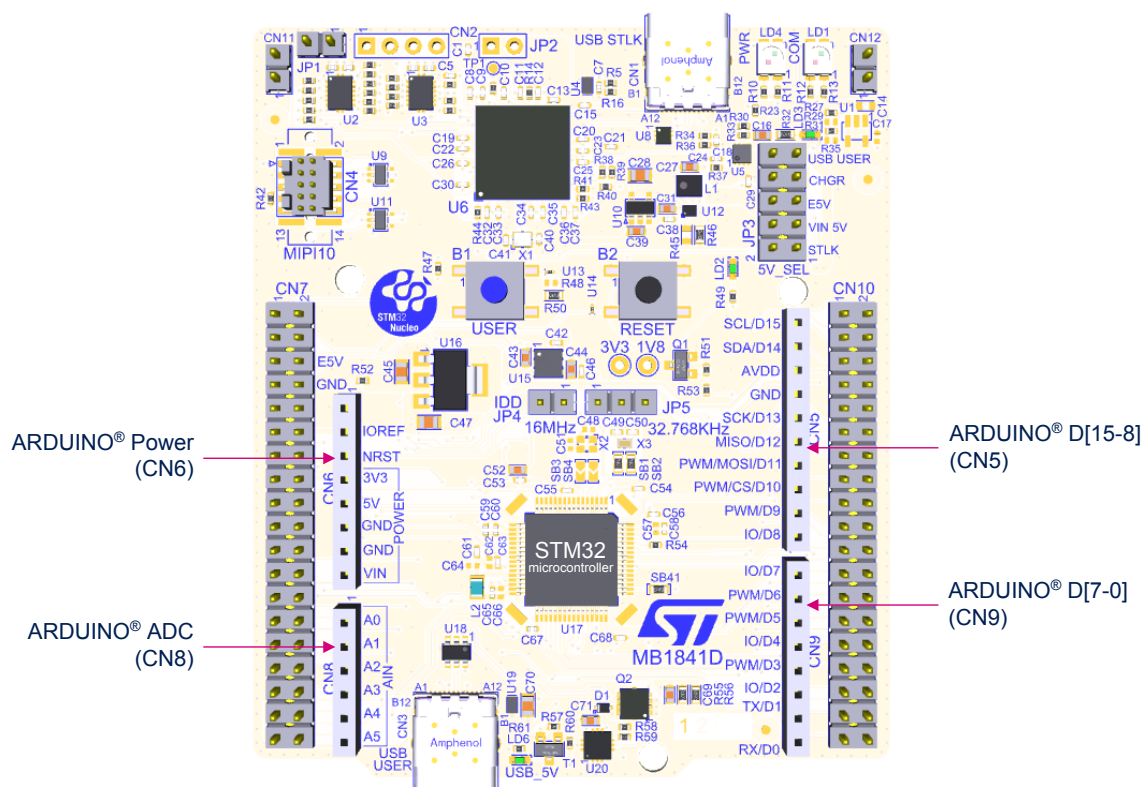
The related pinout for the ARDUINO® connector is listed in Table 13, Table 14, Table 15, and Table 16.

Table 13. **ARDUINO® power connector (CN6) pinout**

Pin	Pin name	Signal name	STM32 pin	MCU function
1	NC	NC	-	RESERVED
2	IOREF	IOREF	-	I/O REF
3	NRST	NRST	NRST	RESET
4	3V3	3V3	-	3V3 input/output
5	5V	5V	-	5V output
6	GND	GND	-	GND
7	GND	GND	-	GND
8	VIN	VIN	-	VIN (7-12 V)

Table 14. **ARDUINO® ADC connector (CN8) pinout**

Pin	Pin name	Signal name	STM32 pin	MCU function
1	A0	ADC	PA0	ADC1_IN5
2	A1	ADC	PA1	ADC1_IN6
3	A2	ADC	PA4	ADC1_IN9
4	A3	ADC	PB0	ADC1_IN15
5	A4	ADC/I²C	PC1	ADC1_IN2/I2C3_SDA
6	A5	ADC/I²C	PC0	ADC1_IN1/I2C3_SCL

Table 15. **ARDUINO® D[7-0] connector (CN9) pinout**

Pin	Pin name	Signal name	STM32 pin	MCU function
1	D7	IO	PA8	I/O
2	D6	PWM	PB10	TIM2_CH3
3	D5	PWM	PB4	TIM3_CH1
4	D4	IO	PB5	I/O
5	D3	PWM	PB3	TIM2_CH2
6	D2	IO	PC8	I/O
7	D1[1]	USART_A_TX	PA2	LPUART1
8	D0[1]	USART_A_RX	PA3	LPUART1

1. The default configuration for the D0/D1 signal is LPUART1 on PA2 and PA3, USART1 on PA9 and PA10 is connected by default on STLINK-V3EC.

In MB1841D, D14/D15 are configured to PB7 and PB6:

Table 16. ARDUINO® D[15-8] connector (CN5) pinout (MB1841D)

Pin	Pin name	Signal name	STM32 pin	MCU function
1	D15	I2C_SCL	PB6	I2C1_SCL/I2C4_SCL
2	D14	I2C_SDA	PB7	I2C1_SDA/I2C4_SDA
3	VREFP	-	-	-
4	GND	-	-	-
5	D13	SPI_SCK	PA5	SPI1_SCK
6	D12	SPI_MISO	PA6	SPI1_MISO
7	D11	SPI_MOSI/PWM	PA7	SPI1_MOSI/TIM3_CH2
8	D10	SPI_NSS/PWM	PC9	SPI_NSS/TIM3_CH4[1]
8	D9	PWM	PC6	TIM3_CH1
10	D8	IO	PC7	-

1. *Due to multiplexing constraints, SPI_NSS is not available as an alternate on this I/O, so this pin is affected with an I/O function to do the chip select.*

In MB1841E, D14/D15 are configured through solder bridges:

Table 17. ARDUINO® D[15-8] connector (CN5) pinout (MB1841E)

Pin	Pin name	Signal name	Solder bridge	STM32 pin	MCU function
1	D15	SCL	SB42 ON SB43 OFF	PB6[1]	I2C1_SCL/I2C4_SCL
			SB42 OFF SB43 ON	PB13[2]	I2C2_SCL/I3C2_SCL
2	D14	SDA	SB44 ON SB45 OFF	PB7[1]	I2C1_SDA/I2C4_SDA
			SB44 OFF SB45 ON	PB14[2]	I2C2_SDA/I3C2_SDA
3	VREFP	-		-	-
4	GND	-		-	-
5	D13	SPI_SCK		PA5	SPI1_SCK
6	D12	SPI_MISO		PA6	SPI1_MISO
7	D11	SPI_MOSI/PWM		PA7	SPI1_MOSI/TIM3_CH2
8	D10	SPI_NSS/PWM		PC9	SPI_NSS/TIM3_CH4[1]
8	D9	PWM		PC6	TIM3_CH1
10	D8	IO		PC7	-

1. *For NUCLEO-U545RE-Q, I^{2}C only.*

2. *For NUCLEO-U385RG-Q, I^{2}C and I3C compatible.*

8.2 ST morpho headers (CN7 and CN10)

The ST morpho connector consists of CN7 and CN10 2.54-pitch male pin headers. They can be used to connect the STM32 Nucleo-64 board to an extension or a prototype/wrapping board placed on top of it. All signals and power pins of the STM32 are available on the ST morpho connector. An oscilloscope, a logic analyzer, or a voltmeter can also probe this connector.

Figure 17. ST morpho connector
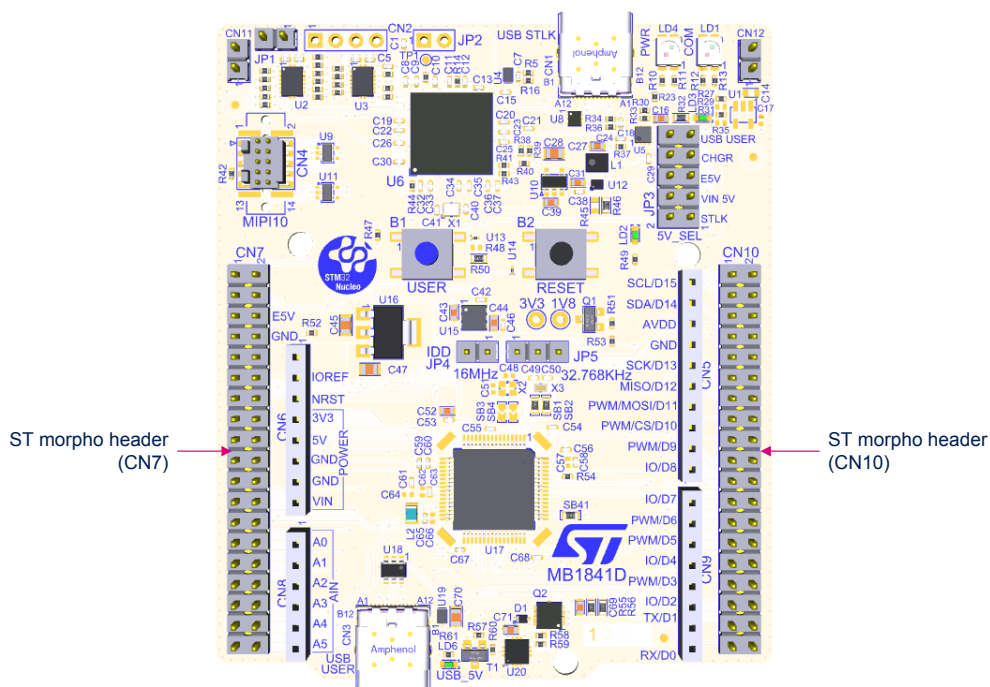
Table 18 shows the pin assignments for the STM32 on the ST morpho connector.

Table 18. ST morpho connector pin assignment

CN7 odd pins		CN7 even pins		CN10 odd pins		CN10 even pins	
Pin number	Pin name	Pin number	Pin name	Pin number	Pin name	Pin number	Pin name
1	PC10	2	PC11	1	-	2	PA9
3	PC12	4	PD2	3[1]	PB6[1]	4	PA10
5	VDD	6	E5V	5[1]	PB7[1]	6	-
7	PH3_BOOT0[2]	8	GND	7	VREFP[3]	8	VBUS_STLK[4]
9	-	10	-	9	GND	10	-
11	-	12	IOREF	11	PA5	12	PA12[5]
13	PA13[6]	14	NRST	13	PA6	14	PA11[5]
15	PA14[6]	16	3V3	15	PA7	16	-
17	PA15	18	5V	17	PC9	18	-
19	GND	20	GND	19	PC6	20	GND
21	-	22	GND	21	PC7	22	PB2
23	PC13	24	VIN	23	PA8	24	PB1
25	PC14	26	-	25	PB10	26	PB15
27	PC15	28	PA0	27	PB4	28	PB14
29	PH0	30	PA1	29	PB5	30	PB13
31	PH1	32	PA4	31	PB3	32	AGND
33	VBAT	34	PB0	33	PC8	34	-
35	PC2	36	PC1	35	PA2[7]	36	PB8
37	PC3	38	PC0	37	PA3[7]	38	-

1. According to the ARDUINO® information, pins 3 and 5 are PB6 and PB7 in MB1841D and configurable in MB1841E.

2. The default state of BOOT0 is 0. It can be set to 1 when a jumper is plugged into the pins 5 (VDD) and 7 (PH3-BOOT0) of CN7.

3. V_{REFP} is also called ADD on Nucleo-64 because it is the same pin in the LQFP64 package. Connected by default to VDD_MCU (SB13 ON). SB13 must be OFF to connect to external VREF from ARDUINO®.

4. VBUS_STLK is the 5V power signal, coming from the STLINK-V3EC USB connector. It rises before the 5V signal of the board.

5. PA11 and PA12 are shared with USB signals connected to a USB Type-C® connector (SB38 and SB39 ON).

6. PA13 and PA14 are shared with SWD signals connected to STLINK-V3EC (SB29 and SB30 ON).

7. The default configuration for pins 35 and 37 is PA2 and PA3. PA9 and PA10 can be connected instead of PA2 and PA3 depending on the solder bridge configuration.

8.3 Solder bridge configuration for the expansion connector

Table 19 details the solder bridges of the STM32 Nucleo-64 board for the expansion connector.

Table 19. Solder bridge configuration

Definition	Bridge	Setting[1][2]	Comment
ARDUINO® IOREF selection	SB9	OFF	IOREF is not connected to the VDD power supply.
		ON	**IOREF is connected to the VDD power supply.**
	SB11	**OFF**	**IOREF is not connected to the 3V3 power supply.**
		ON	IOREF is connected to the 3V3 power supply.
ARDUINO® green LED (LD2)	SB10	OFF	PA5 does not drive the LD2 LED. This configuration can be used in case of a signal issue on SPI-SCK depending on the ARDUINO® shield.
		ON	**PA5 does not drive the LD2 LED and the SPI_SCK.**

1. *The default configuration is in bold.*
2. *All Nucleo-64 products are delivered with solder bridges configured according to the supported target MCU.*
3. *For pins 35 and 37 used in the serial interface selection, refer to Section 7.9: Virtual COM port (VCP).*

9 NUCLEO-U385RG-Q and NUCLEO-U545RE-Q product information

9.1 Product marking

The product and each board composing the product are identified with one or several stickers. The stickers, located on the top or bottom side of each PCB, provide product information:

- Main board featuring the target device: product order code, product identification, serial number, and board reference with revision.

    Single-sticker example:
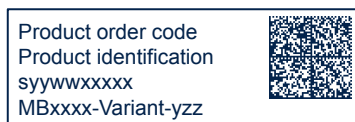
    Dual-sticker example:

- Other boards if any: board reference with revision and serial number.

    Examples:

On the main board sticker, the first line provides the product order code, and the second line the product identification.

On all board stickers, the line formatted as *"MBxxxx-Variant-yzz"* shows the board reference *"MBxxxx"*, the mounting variant *"Variant"* when several exist (optional), the PCB revision *"y"*, and the assembly revision *"zz"*, for example B01. The other line shows the board serial number used for traceability.

Products and parts labeled as *"ES"* or *"E"* are not yet qualified or feature devices that are not yet qualified. STMicroelectronics disclaims any responsibility for consequences arising from their use. Under no circumstances will STMicroelectronics be liable for the customer's use of these engineering samples. Before deciding to use these engineering samples for qualification activities, contact STMicroelectronics' quality department.

"ES" or *"E"* marking examples of location:

- On the targeted STM32 that is soldered on the board (for an illustration of STM32 marking, refer to the STM32 datasheet *Package information* paragraph at the *www.st.com* website).
- Next to the ordering part number of the evaluation tool that is stuck, or silk-screen printed on the board.

Some boards feature a specific STM32 device version, which allows the operation of any bundled commercial stack/library available. This STM32 device shows a *"U"* marking option at the end of the standard part number and is not available for sales.

To use the same commercial stack in their applications, the developers might need to purchase a part number specific to this stack/library. The price of those part numbers includes the stack/library royalties.

9.2 NUCLEO-U385RG-Q and NUCLEO-U545RE-Q product history

Table 20. Product history

Order code	Product identification	Product details	Product change description	Product limitations
NUCLEO-U545RE-Q	NUU545REQ$MR1	MCU: • STM32U545RET6Q silicon revision "A" MCU errata sheet: • *STM32U535xx and STM32U545xx device errata* (ES0587) Board: • MB1841-U545REQ-D01 (main board)	Initial revision	SWDIO: Because of the level shifter to support 1V8 MCU debug, SWDIO frequency is limited to 12 MHz.
	NUU545REQ$MR2	MCU: • STM32U545RET6Q silicon revision "Z" MCU errata sheet: • *STM32U535xx and STM32U545xx device errata* (ES0587) Board: • MB1841-U545REQ-D01 (main board)	STM32U545RET6Q silicon revision Z embedded on NUCLEO-U545RE-Q with the NUU545REQ$MR2 product	SWDIO: Because of the level shifter to support 1V8 MCU debug, SWDIO frequency is limited to 12 MHz.
NUCLEO-U385RG-Q	NUU385RGQ$CR1	MCU: • STM32U385RGT6Q silicon revision "Z" MCU errata sheet: • *STM32U375xx and STM32U385xx device errata* (ES0626) Board: • MB1841-U385RGQ-E01 (main board)	Initial revision	SWDIO: Because of the level shifter to support 1V8 MCU debug, SWDIO frequency is limited to 12 MHz.

9.3 Board revision history

Table 21. Board revision history

Board reference	Board variant and revision	Board change description	Board limitations
MB1841 (main board)	MB1841-U545REQ-D01	Initial revision	No limitation
	MB1841-U385RGQ-E01	To support I^2C/I3C compatible (ARDUINO® D14/D15) for STM32U3 MCU	No limitation

10 Federal Communications Commission (FCC) and ISED Canada Compliance Statements

10.1 FCC Compliance Statement

Part 15.19

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Part 15.21

Any changes or modifications to this equipment not expressly approved by STMicroelectronics may cause harmful interference and void the user's authority to operate this equipment.

Part 15.105

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates uses and can radiate radio frequency energy and, if not installed and used in accordance with the instruction, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception which can be determined by turning the equipment off and on, the user is encouraged to try to correct interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

Note: *Use only shielded cables.*

Responsible Party – U.S. Contact Information:

Francesco Doddo
STMicroelectronics, Inc.
200 Summit Drive | Suite 405 | Burlington, MA 01803
USA
Telephone: +1 781-472-9634

10.2 ISED Compliance Statement

ISED Canada ICES-003 Compliance Label: CAN ICES-3 (B) / NMB-3 (B).

Étiquette de conformité à la NMB-003 d'ISDE Canada : CAN ICES-3 (B) / NMB-3 (B).

11 Product disposal

Disposal of this product: WEEE (Waste Electrical and Electronic Equipment)

(Applicable in Europe)
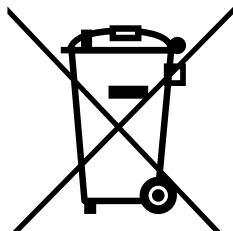
This symbol on the product, accessories, or accompanying documents indicates that the product and its electronic accessories should not be disposed of with household waste at the end of their working life.

To prevent possible harm to the environment and human health from uncontrolled waste disposal, please separate these items from other type of waste and recycle them responsibly to the designated collection point to promote the sustainable reuse of material resources.

Household users:

You should contact either the retailer where you buy the product or your local authority for further details of your nearest designated collection point.

Business users:

You should contact your dealer or supplier for further information.

Revision history

Table 22. Document revision history

Date	Revision	Changes
03-Apr-2023	1	Initial release.
06-Feb-2025	2	Added NUCLEO-U385RG-Q product, and Safety recommendations and Product disposal. Updated top and bottom views in Introduction and MCO clock configurable by software in OSC clock supply.

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IMPORTANT NOTICE – READ CAREFULLY