STM32 Nucleo-64 boards (MB1717)

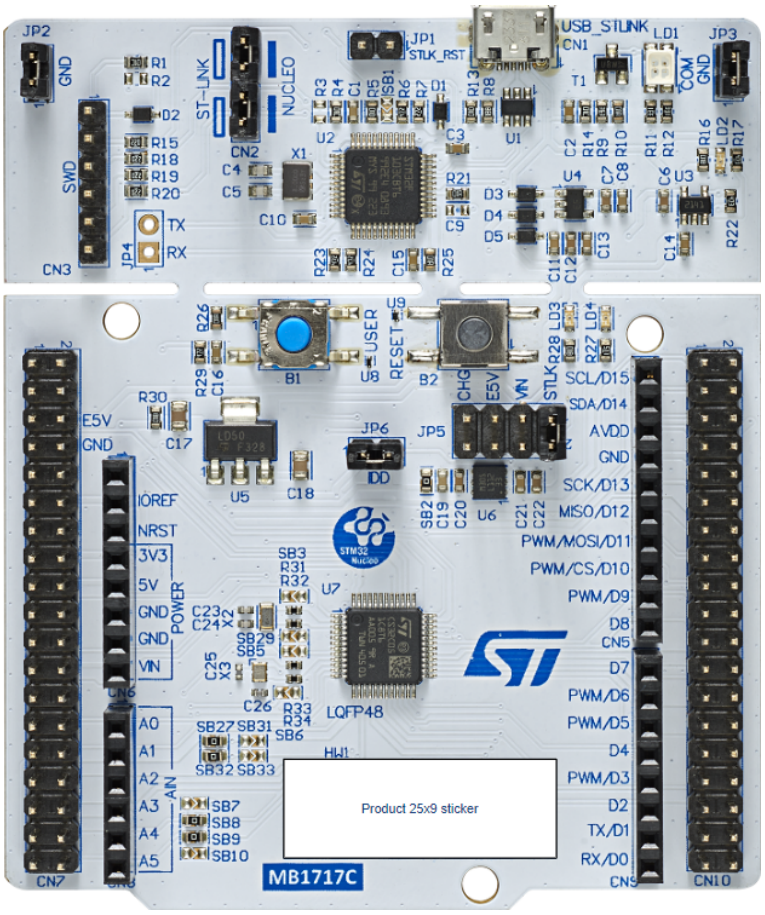
Introduction

The STM32 Nucleo-64 boards, based on the MB1717 reference board (NUCLEO-C031C6 and NUCLEO-C051C8 order codes) provide an affordable and flexible way for users to try out new concepts and build prototypes with various combinations of performance, power consumption, and features.

The ARDUINO® Uno V3 connectivity support and the ST morpho headers provide an easy means of expanding the functionality of the STM32C0 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 ST-LINK/V2-1 debugger/programmer. The STM32 Nucleo-64 board is delivered with comprehensive free STM32 software libraries and examples available with the STM32CubeC0 MCU Package.

Figure 1. Nucleo-64 board top view



Picture is not contractual.

1 Features

- STM32C0x1Cx microcontroller based on the Arm® Cortex®-M0+ processor with 12-Kbyte SRAM, in an LQFP48 package
- User LED shared with ARDUINO®
- User and reset push-buttons
- 32.768 kHz crystal oscillator
- Board connectors:
  - ARDUINO® Uno V3 expansion connector
  - ST morpho extension pin headers for full access to all STM32C0 I/Os
- Flexible power-supply options: ST-LINK USB V_{BUS} or external sources
- On-board ST-LINK/V2-1 debugger/programmer with USB re-enumeration capability: mass storage, Virtual COM port, and debug port
- Comprehensive free software libraries and examples available with the STM32CubeC0 MCU Package
- Support of a wide choice of Integrated Development Environments (IDEs) including IAR Embedded Workbench®, MDK-ARM, and STM32CubeIDE

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

2 Ordering information

To order the Nucleo-64 board, 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 references	Target STM32
NUCLEO-C031C6	MB1717(1)	STM32C031C6T6
NUCLEO-C051C8		STM32C051C8T6

1. *Subsequently called main board in the rest of the documentation.*

2.1 Codification

The meaning of the codification is explained in Table 2.

Table 2. Codification explanation

NUCLEO-XXYYZT	Description	Example: NUCLEO-C031C6
XX	MCU series in STM32 32-bit Arm Cortex MCUs	STM32C0 series
YY	MCU product line in the series	STM32C0x1 product line
Z	STM32 package pin count: • C for 48 pins	48 pins
T	STM32 flash memory size: • 6 for 32 Kbytes • 8 for 64 Kbytes	32 Kbytes

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 Micro-B 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-C031C6 and NUCLEO-C051C8 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 Quick start

This section describes how to start quickly development using the Nucleo-64 board.

To use the product, the user must accept the evaluation product license agreement from the www.st.com/epla webpage.

For more information on the STM32 Nucleo-64 board and demonstration software, visit the www.st.com/stm32nucleo webpage.

5.1 Getting started

Follow the sequence below to configure the STM32 Nucleo-64 board and launch the demonstration application (Refer to Figure 3 for component location):

1. Check jumper positions on board: CN2 ST-LINK [1-2] and [3-4], JP5 PWR [1-2], and JP6 ON.
2. To identify all the device interfaces from the host PC, install the Nucleo USB driver available on the www.st.com/stm32nucleo web page, before connecting the board.
3. To power the board, connect the STM32 Nucleo-64 board to a PC with a USB Type-A or USB Type-C® to Micro-B cable through the CN1 USB connector. Once powered on, the PWR green LED (LD3) lights up and the COM LED (LD1) blinks.
4. Press the B1 blue user button.
5. Observe that the blinking frequency of the green LED (LD4) changes, by clicking the B1 button.
6. The demonstration software and several examples showing how to use the STM32 Nucleo features are available from the Nucleo-64 product location.

6 Hardware layout and configuration

The Nucleo-64 board is designed around the STM32C0x1CxT6 microcontroller in a 48-pin LQFP package.

The hardware block diagram in Figure 2 illustrates the connections between the STM32C0 microcontroller and its peripherals, such as the ARDUINO® Uno V3 connector, ST morpho connector, push-button, and embedded ST-LINK/V2-1).

Figure 3 and Figure 4 help the user to locate these features on the STM32 Nucleo-64 board. The mechanical dimensions of the Nucleo-64 product are shown in Figure 5.

Figure 2. Hardware block diagram

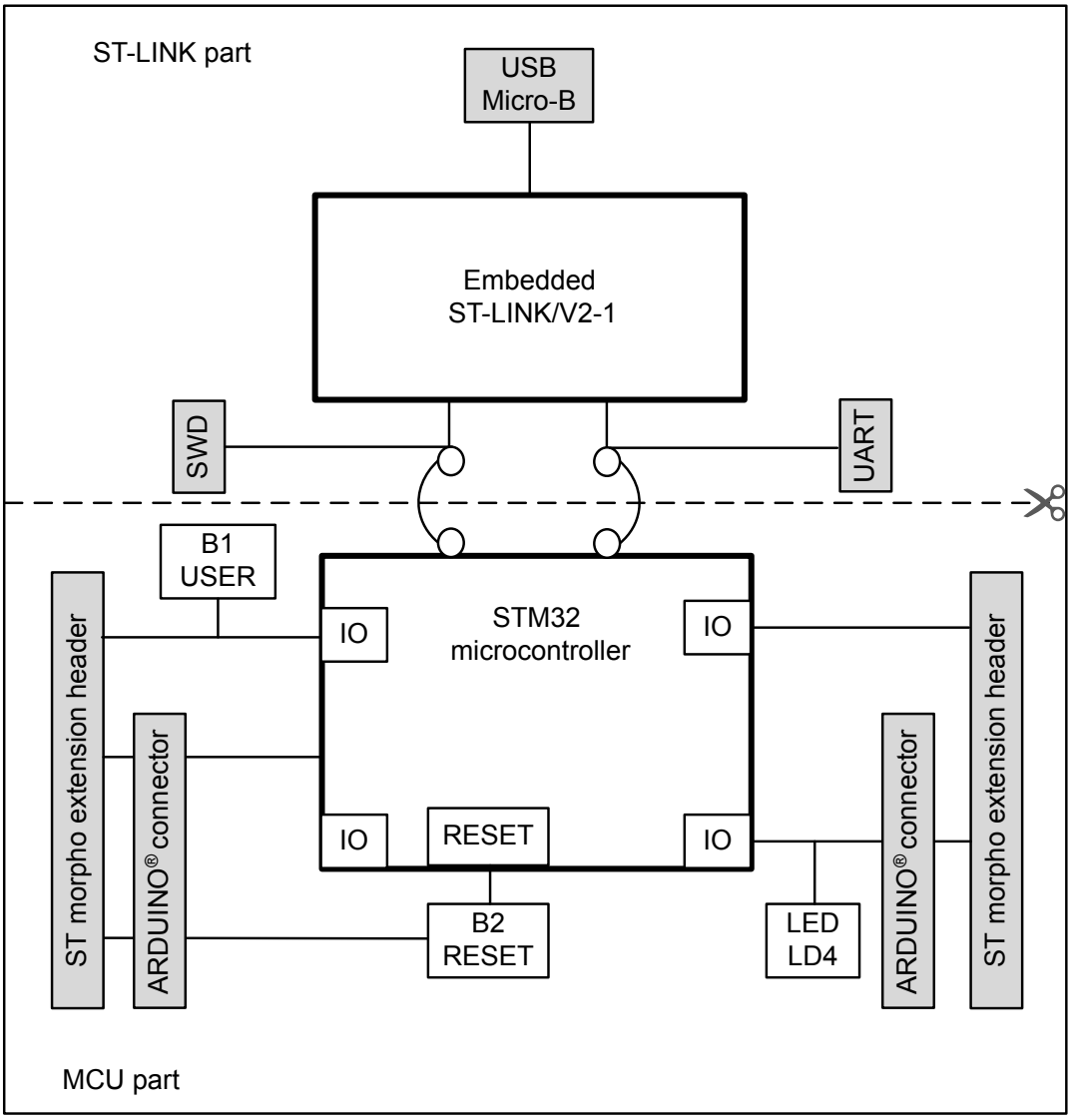


Figure 3. Nucleo-64 PCB top side

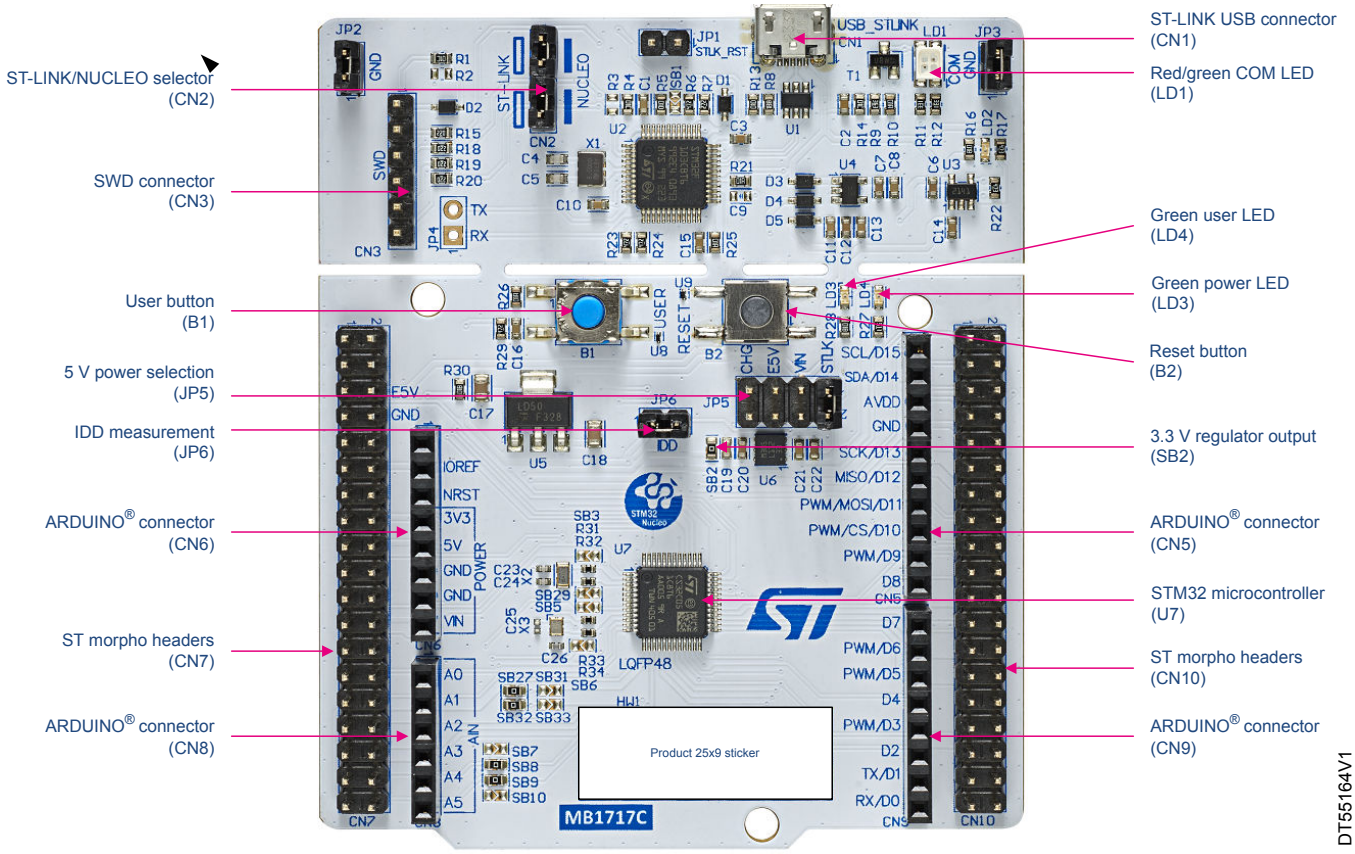
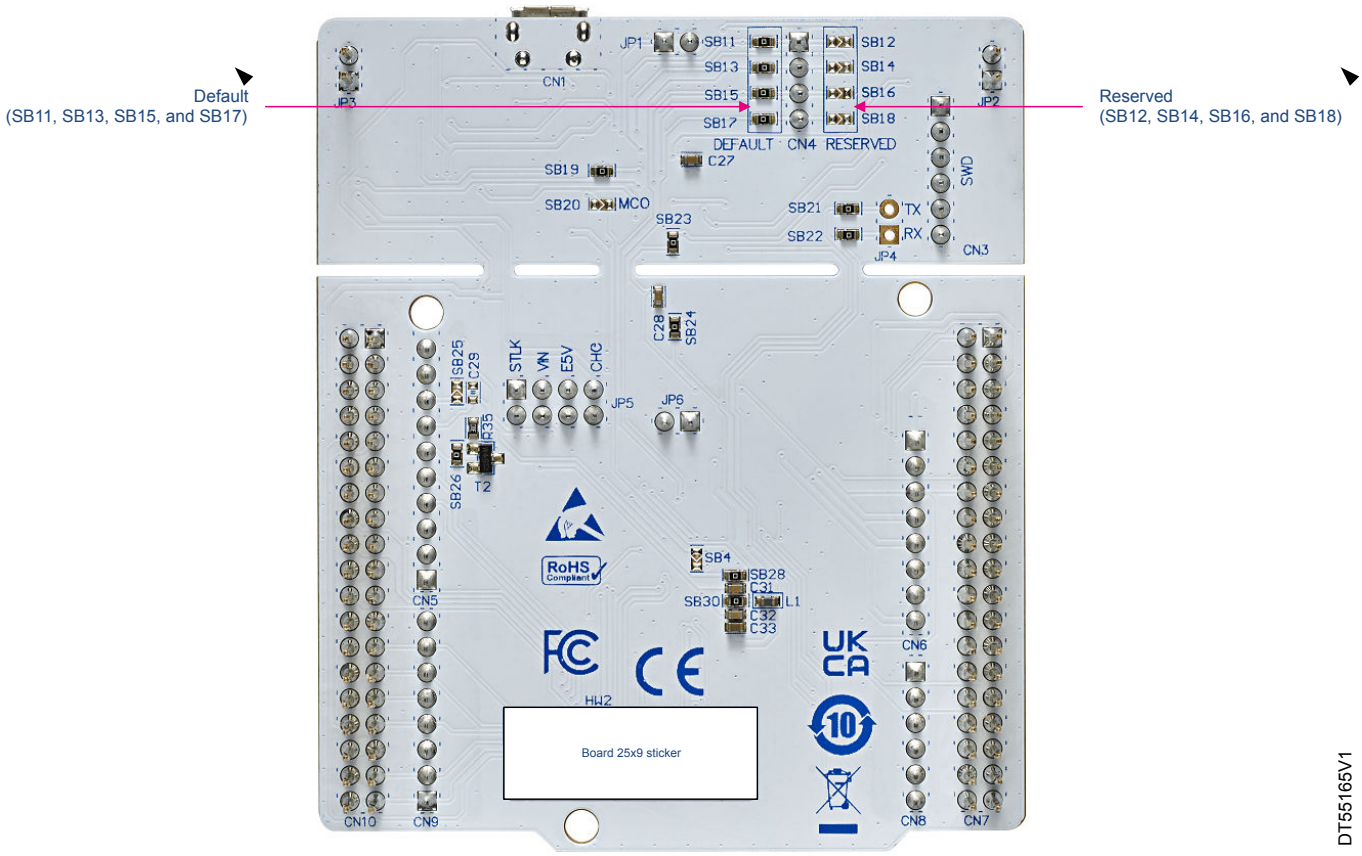
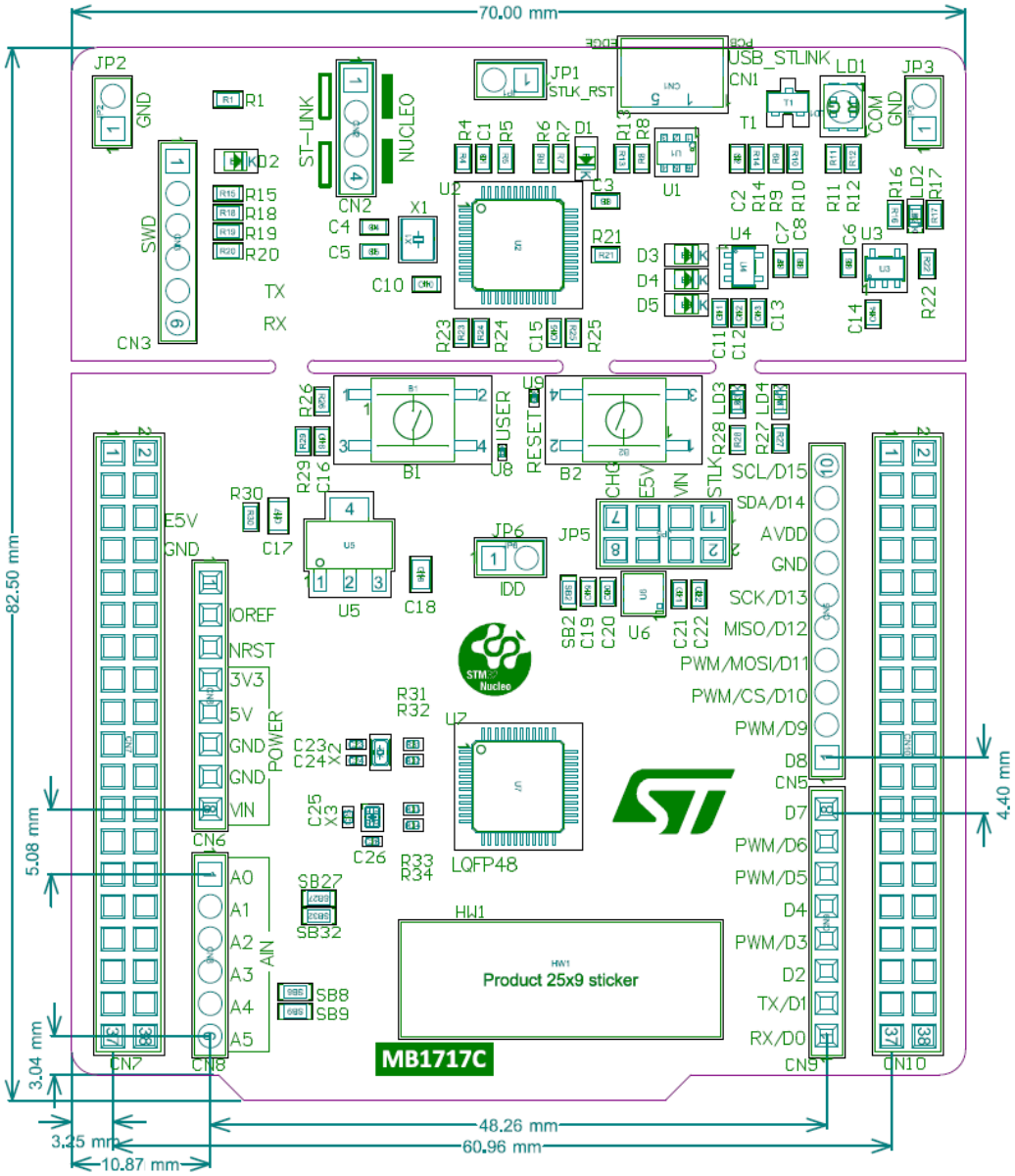


Figure 4. Nucleo-64 PCB bottom side



6.1 STM32 Nucleo-64 board mechanical drawing

Figure 5. **STM32 Nucleo-64 board mechanical dimensions (in millimeters)**



6.2 Default board configuration

Table 4. Default jumper settings

Jumper	Definition	Default position	Comment
CN2	SWD interface	[1-2] [3-4]	On-board ST-LINK/V2-1 debugger
JP5	5 V power selection	[1-2]	5 V from ST-LINK
JP1	STLK reset	OFF	No STLK reset
JP6	IDD measurement	ON	STM32 VDD current measurement

6.3 Cuttable PCB

The STM32 Nucleo-64 board is divided into two parts: the ST-LINK part and the target MCU part. The ST-LINK PCB part is cuttable to reduce the board size. In this case, the remaining target MCU part is only powered by VIN, E5V, and 3.3 V on the CN7 ST morpho connectors or VIN and 3.3 V on the CN6 ARDUINO® connector. Furthermore, it is still possible to use the ST-LINK part to program the main MCU using wires between CN7 and SWD signals available on the ST morpho connectors.

6.4 Embedded ST-LINK/V2-1

The ST-LINK/V2-1 programming and debugging tool is integrated into the Nucleo-64 board.

The additional features supported on the ST-LINK/V2-1 are:

- USB software re-enumeration
- Virtual COM port interface on USB
- Mass storage interface on USB
- Registers read/write interface on USB (Not available on Nucleo)
- USB power management request for more than 100 mA power on USB

The following features are no longer supported on the ST-LINK/V2-1:

- SWIM interface
- Minimum application voltage supported by Nucleo limited to 3 V
- A standalone version does not exist. Only Nucleo and future discovery support V2-1.

For information about debugging and programming features, refer to the user manual *ST-LINK/V2 in-circuit debugger/programmer for STM8 and STM32* (UM1075), which describes in detail all the ST-LINK/V2 and ST-LINK/V2-1 common features.

The embedded ST-LINK/V2-1 is usable in two different ways according to the jumper states (Refer to Table 5):

- Program/debug the on-board STM32,
- Or program/debug an STM32 in an external application board using a cable connected to the SWD connector.

Table 5. ST-LINK jumper configuration

Jumper	Definition	Default position	Comment
CN2	T_SWCLK/T_SWDIO	[1-2] [3-4]	ST-LINK/V2-1 functions enabled for on-board programming (default setting)
		OFF OFF	ST-LINK/V2-1 functions enabled from external connector (SWD supported)

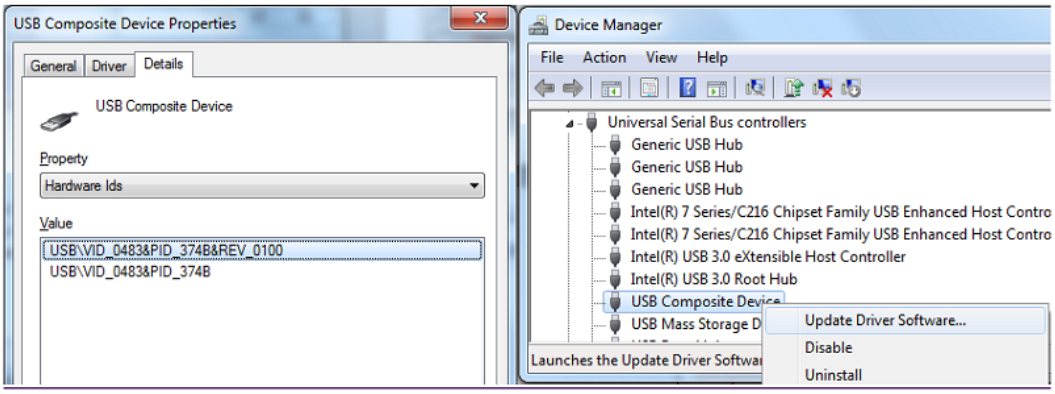
6.4.1 Drivers

ST-LINK/V2-1 requires a dedicated USB driver, which, for Windows 7®, Windows 8® and Windows 10®, is available from *www.st.com*.

In cases where the board is connected to the PC before the driver is installed, some interfaces might be declared as *Unknown* in the PC device manager. In this case, the user must install the dedicated driver files and update the driver of the connected device from the device manager, as shown in Figure 6.

Note: It is preferable to use the USB Composite Device to handle a full recovery.

Figure 6. USB composite device



6.4.2 ST-LINK/V2-1 firmware upgrade

ST-LINK/V2-1 embeds a firmware mechanism for the in-place upgrade through the USB port. As the firmware may evolve during the lifetime of the ST-LINK/V2-1 product (for example new functionalities, bug fixes, support for new microcontroller families), visiting the *www.st.com* website is recommended before starting to use the board, then periodically to stay up to date with the latest firmware version.

6.4.3 Using ST-LINK/V2-1 to program/debug the on-board STM32

To program the on-board STM32, plug in the two jumpers on CN2, as shown in Figure 3. Do not use the CN3 connector as that might disturb communication with the on-board STM32 microcontroller.

6.4.4 Using ST-LINK/V2-1 to program/debug an external STM32 application

It is easy to use ST-LINK/V2-1 to program the STM32 on an external application. Remove the two jumpers from CN2 as shown in Figure 3, and connect the application to the CN3 debug connector according to Table 6.

Note: SB23 must be OFF if CN3 pin 5 is used in the external application.

Table 6. CN3 SWD debug connector

Pin number	Signal name	Designation
1	VDD_TARGET	VDD from the application
2	SWCLK	SWD clock
3	GND	Ground
4	SWDIO	SWD data I/O
5	NRST	Target MCU reset
6	SWO	Reserved

6.5 Power supply and power selection

6.5.1 External power supply input

The STM32 Nucleo-64 board is designed to be powered by several DC power supplies. It is possible to supply the STM32 Nucleo-64 board with any of the following sources:

- 5V_USB_STLK from the ST-LINK USB connector
- VIN (7 to 12 V) from the ARDUINO® or ST morpho connector
- E5V from the ST morpho connector
- 5V_USB_CHG from the ST-LINK USB connector
- 3.3 V from the ARDUINO® or ST morpho connector

Note: If an external 5 V DC power source is used, the Nucleo board must be powered by a power supply unit or by a piece of auxiliary equipment complying with the EN 62368-1:2014+A11:2017 standard and must be safety extralow voltage (SELV) with limited power capability.

The power supply capabilities are shown in Table 7.

Table 7. Power supply capabilities

Input power	Connector pins	Voltage range	Maximum current	Limitation
5V_USB_STLK	CN1 pin 1	4.75 to 5.25 V	500 mA	The maximum current depends on the USB enumeration: • 100 mA without enumeration • 500 mA with good enumeration
VIN	CN6 pin 8 CN7 pin 24	7 to 12 V	800 mA	From 7 to 12 V only and the input current capability is linked to the input voltage: • 800 mA input current when VIN = 7 V • 450 mA input current when 7 V < VIN < 9 V • 300 mA input current when 9 V < VIN < 10 V • Less than 300 mA input current when 10 V < VIN
E5V	CN7 pin 6	4.75 to 5.25 V	500 mA	-
5V_USB_CHG	CN1 pin 1	4.75 to 5.25 V	500 mA	Maximum current depends on the USB wall charger used to power the Nucleo board.
3V3	CN6 pin 4 CN7 pin 16 JP6 pin 1	3.0 to 3.6 V	-	Used when the PCB ST-LINK part is not used or remove SB2 and SB23

5V_ST_LINK is a DC power with limitations from the ST-LINK USB connector (USB type Micro-B connector of ST-LINK/V2-1). In this case, the JP5 jumper must be on pins 1 and 2 to select the STLK power source on the JP5 silkscreen. This is the default setting. If the USB enumeration succeeds, the STLK power is enabled, by asserting the PWR_ENn signal coming from the STM32F103CBT6 ST-LINK microcontroller. This pin is connected to a power switch, which powers the board. This power switch also features a current limitation to protect the PC in case of a short circuit on board, detected with a current higher than 750 mA.

The STM32 Nucleo-64 board and its shield can be supplied by the CN1 ST-LINK USB connector, but only the ST-LINK 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 STM32 Nucleo-64 board requires 500 mA of current from the host PC. If the host can provide the required power, the enumeration ends with a *SetConfiguration* command, and then, the power switch is ON, the LD3 green LED is turned ON, thus the STM32 Nucleo-64 board and its shield request no more than 500 mA current. If the host cannot provide the required current, the enumeration fails. Therefore, the power switch transistor stays OFF and the MCU part including the extension board is not powered. As a consequence, the LD3 green LED stays turned OFF. In this case, it is mandatory to use an external power supply.

USB power: STLK configuration: Jumper JP5 [1-2] (STLK silkscreen) must be connected as shown in Figure 3 and Table 9.

VIN is the 7 to 12 V DC power from CN6 pin 8 named VIN on ARDUINO® connector silkscreen or from pin 24 of CN7 ST morpho connector. In this case, the JP5 jumper must be [3-4] to select the VIN power source on the JP5 silkscreen. In that case, the DC power comes from the power supply through the ARDUINO® Uno V3 battery shield and is compatible with the Adafruit® PowerBoost 500 shield.

VIN configuration: The JP5 jumper [3-4] (VIN silkscreen) must be connected as shown in Figure 3 and Table 9.

E5V is the DC power of an external source (5V DC power from pin 6 of the CN7 ST morpho connector). In this case, the JP5 jumper must be [5-6] to select the E5V power source on the JP5 silkscreen.

E5V configuration: The JP5 jumper [5-6] (E5V silkscreen) must be connected as shown in Figure 3 and Table 9.

5V_USB_CHARGER is the DC power charger connected to the CN1 USB ST-LINK connector. To select the CHG power source on the JP5 silkscreen, the JP5 jumper must be [7-8]. In this case, if the STM32 Nucleo-64 board is powered by an external USB charger the debug is not available. If the PC is connected instead of the charger, the limitation is no longer effective and the PC can be damaged.

CHG configuration: The JP5 jumper [7-8] (CHG silkscreen) must be connected as shown in Figure 3 and Table 9.

6.5.2 External power supply output

- 5V: The 5V present on CN6 pin 5 or CN7 pin 18 is usable as a power supply output for an ARDUINO® shield or an extension board when the STM32 Nucleo-64 board is powered by USB, VIN, or E5V. In this case, the maximum current allowed is shown in Table 7.
- 3.3V: The 3V3 present on CN6 pin 4 or CN7 pin 16 is usable as a power supply output. The current is limited by the maximum current capability of the U6 regulator (LDL112PV33R from STMicroelectronics). In this condition, the maximum consumption of the STM32 Nucleo-64 board and the connected shield current must be lower than 500 mA.

6.6 Programming/debugging when the power supply is not from ST-LINK

VIN or E5V is usable as an external power supply in case the current consumption of the STM32 Nucleo-64 board and its extension boards exceed the allowed current on the USB. In such a condition, it is still possible to use the USB for communication, programming, or debugging only. In this case, it is mandatory to power the board first, using VIN or E5V then to connect the USB cable to the PC. Proceeding this way the enumeration succeeds, thanks to the external power source. The following power sequence procedure must be respected:

- Connect the JP5 jumper [3-4] for VIN or [5-6] for E5V,
- Connect the external power source to VIN or E5V,
- Power on the external power supply 7 V < VIN < 12 V to VIN, or 5 V for E5V,
- Check that the LD3 green LED is turned ON,
- Connect the PC to the CN1 USB connector.

If this sequence is not respected, V_{BUS} might power the board first from ST-LINK, with the following risks:

- If the board needs a current higher than 500 mA, the PC may be damaged or limit the current. As a consequence, the board is not powered correctly.
- 500 mA is requested at the enumeration since SB1 must be OFF. This request is rejectable and the enumeration does not succeed if the PC does not provide such current. Consequently, the board is not power supplied and the LD3 LED remains OFF.

6.7 OSC clock sources

Three clock sources are listed below:

- LSE which is the 32.768 kHz crystal for the STM32 embedded RTC,
- MCO which is the 8 MHz clock from the ST-LINK MCU for the STM32 microcontroller,
- HSE which is the 48 MHz oscillator for the STM32 microcontroller.

6.7.1 LSE clock reference

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

1. LSE on-board X2 crystal (default configuration). Refer to the application note *Guidelines for oscillator design on STM8AF/AL/S and STM32 MCUs/MPUs* (AN2867) for crystal design guide for STM32 microcontrollers.
2. Oscillator from external to PC14 input, from external oscillator through pin 25 of the CN7 connector. The following configuration is needed:
   – SB3 ON
   – R31 and R32 OFF
3. LSE not used. PC14 and PC15 are used as GPIOs instead of low-speed clocks. The following configuration is needed:
   – SB3 and SB4 ON
   – R31 and R32 OFF

6.7.2 HSE clock reference

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

1. HSE not used: PF0 and PF1 are used as GPIOs instead of clocks. The configuration must be:
   – SB5 and SB6 ON
   – SB29 (MCO) OFF
   – R33 and R34 OFF
2. MCO from ST-LINK: The MCO output of ST-LINK is used as an input clock. This frequency cannot be changed. It is fixed at 8 MHz and connected to the PF0-OSC_IN of the STM32 microcontroller. The configuration must be:
   – SB29 ON
   – SB5 and SB6 OFF
   – R33 and R34 OFF
3. HSE on-board oscillator from X3 crystal (default). For typical frequencies, capacitors, and resistors, refer to the STM32 microcontroller datasheet and the application note *Guidelines for oscillator design on STM8AF/AL/S and STM32 MCUs/MPUs* (AN2867) for the oscillator design guide. The X3 crystal has the following characteristics: 48 MHz, 7 pF, and 20 ppm. The configuration must be:
   – SB5 and SB6 OFF
   – R33 and R34 ON
   – C25 and C26 ON with 4.3 pF capacitors
   – SB29 OFF
4. Oscillator from external PF0, from an external oscillator through pin 29 of the CN7 connector. The configuration must be:
   – SB5 ON
   – SB29 OFF
   – R33 and R34 OFF

6.8 Reset sources

The STM32 Nucleo-64 reset signal is active LOW and the reset sources include:

- B2 reset push-button
- Embedded ST-LINK/V2-1
- CN6 ARDUINO® connector pin 3
- CN7 ST morpho connector pin 14

6.9 VCP communication

The two UART interfaces of the STM32 are used for VCP communication:

1. UART2 from PA2/PA3
2. UART1 from PB6/PB7

Table 8. VCP communication

Pin name	Function	Virtual COM port (default configuration)	ST morpho connection
PA2	USART2 Tx	SB27 ON	SB27 OFF
PA3	USART2 Rx	SB32 ON	SB32 OFF
PB6	USART1 Tx	SB31 ON	SB31 OFF
PB7	USART1 Rx	SB33 ON	SB33 OFF

6.10 LEDs

Four LEDs are available on the STM32 Nucleo-64 board. The four LEDs are located on the top side of the board:

1. LD1 COM: LD1 is a bicolored LED. The LD1 default status is red. LD1 turns to green to indicate that communication is in progress between the PC and the ST-LINK/V2-1 as follows:
   - Slow blinking red and OFF: At power-on before USB initialization
   - Fast blinking red and OFF: After the first correct communication between the PC and the ST-LINK/V2-1 (enumeration)
   - Red LED ON: When initialization between the PC and the ST-LINK/V2-1 successfully ends
   - Green LED ON: After successful STM32 communication initialization
   - Blinking red and green: During communication with STM32
   - Green ON: Communication successfully ends.
   - Orange ON: Communication ends with failure.
2. LD2 5V_USB_CHG: This red LED is ON when overcurrent is detected on USB V_{BUS}. The LED indicates that more than 500 mA is requested on V_{BUS}. In this case, it is recommended to supply the board in USB_CHARGER mode or with E5V or VIN.
3. LD3 5V_PWR: This green LED is ON when the STM32 Nucleo-64 board is powered by a 5 V source.
4. LD4 USER: This green LED is a user LED connected to the D13 ARDUINO® signal corresponding to PA5 STM32 I/O. To light the LED, a HIGH logic state must be written in the corresponding GPIO. A transistor is used to drive the LED when the I/O voltage is 1.8 V. LD4 consumption does not impact the VDD STM32 power measurement, since LD4 is isolated from it.

6.11 Push-buttons

Two push-buttons:

1. B1 USER: The user and wake-up button connected to the PC13 I/O pin 3 of the STM32 microcontroller
2. B2 RESET: The push-button connected to NRST is used to reset the STM32 microcontroller.

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

6.12 I_{DD} measurement

The JP6 IDD-labeled jumper allows the consumption of the STM32 microcontroller measurement by removing the jumper and connecting an ammeter:

- Jumper ON: The STM32 microcontroller is powered (default configuration)
- Jumper OFF: An ammeter must be connected to measure the STM32 microcontroller current. If there is no ammeter, the STM32 microcontroller is not powered.

6.13 Jumper configuration

The default jumper positions are shown in Table 4. Table 9 describes the other available jumper settings

Table 9. Jumper configuration

Jumper	Definition	State[1]	Comment
CN2	T_SWCLK T_SWDIO	**[1-2]** **[3-4]**	ST-LINK/V2-1 enable for on-board MCU debugger
		OFF OFF	ST-LINK/V2-1 enable for external MCU debugger
JP2/JP3	GND	ON	GND probe
JP5	5 V power selection	**[1-2]**	5 V from ST-LINK
		[3-4]	5 V from VIN 7 to 12 V
		[5-6]	5 V from E5V
		[7-8]	5 V from USB_CHG
		OFF	No 5 V power
JP1	STLK reset	**OFF**	No STLK reset
		[1-2]	STLK reset
JP6	IDD measurement	**[1-2]**	VDD = 3.3 V
		OFF	To connect the external source (ULPBench probe as an example)

1. *The default jumper state is shown in bold.*

6.14 Solder bridge configuration

Table 10 describes the solder bridge settings.

Table 10. Solder bridge configuration and settings

Solder bridge	Definition	State[1]	Comment
SB11/SB13/SB15/SB17	SWD interface (default)	**ON**	Reserved, do not modify.
SB12/SB14/SB16/SB18	SWD interface (reserved)	OFF	Reserved, do not modify.
SB21/SB22	VCP interface (default)	**ON**	VCP connects ST-LINK and on-board MCU.
	VCP interface (reserved)	OFF	VCP interface used as GPIOs
SB1	Allowed current through CN1 setting	ON	100 mA maximum allowed current through CN1
		OFF	300 mA maximum allowed current through CN1
SB20	MCO	ON	MCO from STLK provides 8 MHz CLK to MCU.
		OFF	MCO from STLK floating

Solder bridge	Definition	State[1]	Comment
SB2	3.3 V LDO output	**ON**	U6 LDO output provides 3.3 V.
		OFF	U6 LDO output does not provide 3.3 V.
SB27/SB31/ SB32/SB33	UART for VCP	SB27/SB32 ON, SB31/SB33 OFF	USART2 from PA2/PA3
		SB27/SB32 OFF, SB31/SB33 ON	USART1 from PB6/PB7
SB30	AVDD	**ON**	VDD provides power to AVDD.
		OFF	VDD does not provide power to AVDD.
SB28	AGND	**ON**	AGND is connected to GND.
		OFF	AGND is not connected to GND.
SB5/SB6	HSE CLK selection	ON (R33/R34 OFF)	PF0 and PF1work as GPIOs.
		OFF	PF0 and PF1work as HSE pins.
SB3/SB4	LSE CLK selection	ON (R31/R32 OFF)	PC14 and PC15 work as GPIOs.
		OFF	PC14 and PC15 work as LSE pins.
SB7/SB8 SB9/SB10	ADC/I^2C	**SB8/SB9 ON SB7/SB10 OFF**	CN8 pins 5 and 6 work as ADC.
		SB8/SB9 OFF SB7/SB10 ON	CN8 PIN5/6 works as I^2C.
SB26	User LED	**ON**	PA5 controls LD4.
		OFF	LD4 is isolated.
SB25	AVDD	ON	AVDD is connected to CN5 pin 8.
		OFF	AVDD is disconnected from CN5 pin 8.

1. *The default solder bridge state is shown in bold.*

7 Connectors

Seven connectors are implemented on the STM32 Nucleo-64 board:

- CN1 ST-LINK USB Micro-B connector
- CN5, CN6, CN8, and CN9 ARDUINO® Uno V3 connector
- CN7 and CN10 ST morpho connectors

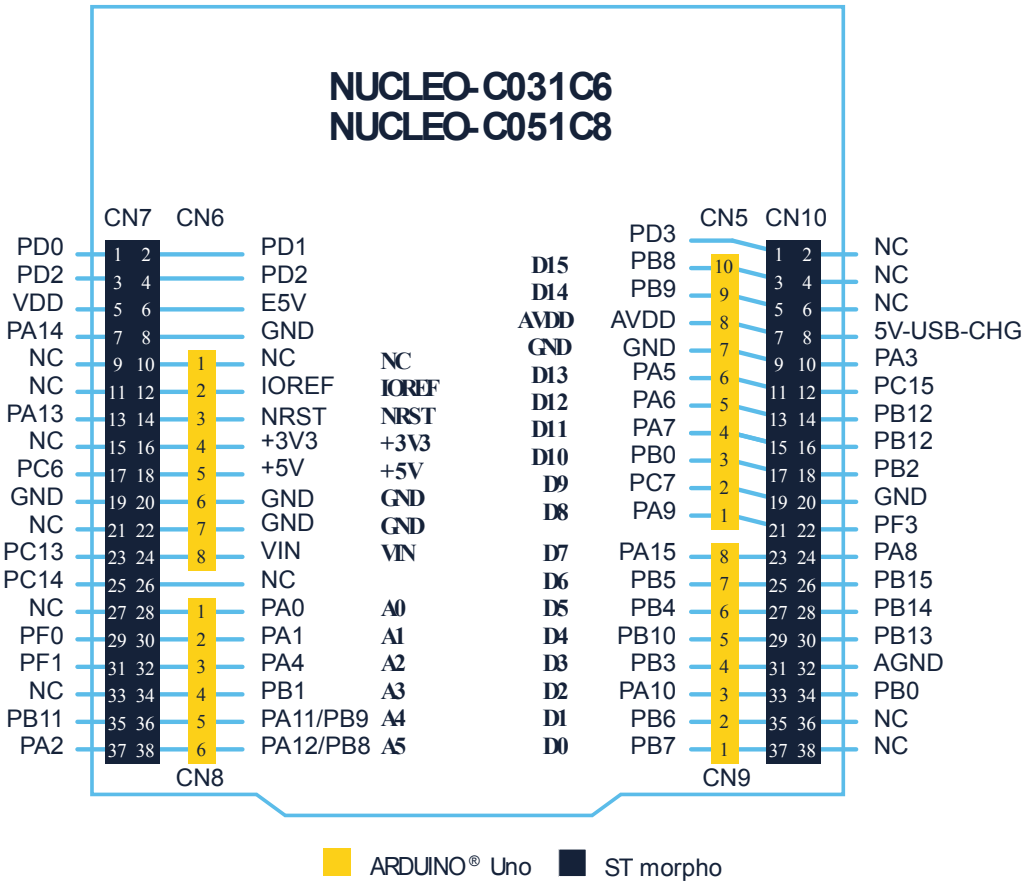
7.1 ARDUINO® Uno V3 connector

The CN5, CN6, CN8, and CN9 ARDUINO® Uno connectors in Figure 3 are female connectors compatible with the ARDUINO® standard. Most shields designed for ARDUINO® fit the STM32 Nucleo-64 board.

The ARDUINO® connectors on the STM32 Nucleo-64 board support the ARDUINO® Uno V3.

The pinout for the ARDUINO® connector is shown in Figure 7 and listed in Table 11.

Figure 7. STM32 Nucleo-64 board ARDUINO® connector pinout



Note: ARDUINO® Uno V3 D0 and D1 signals are connected by default on USART1 (PB6 and PB7 MCU I/Os).

Table 11. **ARDUINO® connector pinout**

Connector	Pin number	Pin name	Signal name	STM32 pin	Function
CN6	1	NC	-	-	Reserved for test
	2	IOREF	-	-	I/O reference
	3	NRST	NRST	NRST	RESET
	4	3V3	-	-	3.3 V input/output
	5	5V	-	-	5 V output
	6	GND	-	-	GND
	7	GND	-	-	GND
	8	VIN	-	-	7 to 12 V power input
CN8	1	A0	ADC	PA0	ARD_A0_IN0
	2	A1	ADC	PA1	ARD_A1_IN1
	3	A2	ADC	PA4	ARD_A2_IN4
	4	A3	ADC	PB1	ARD_A3_IN18
	5	A4	ADC	PB9 orPA11	ARD_A4_IN11 || I2C_1_SCL
	6	A5	ADC	PB8 or PA12	ARD_A5_IN12 || I2C_1_SDA
CN5	10	SCL/D15	ARD_D15	PB8	I2C_1_SCL
	9	SDA/D14	ARD_D14	PB9	I2C_1_SDA
	8	AVDD	VREF+	-	VREF+
	7	GND	-	-	GND
	6	SCK/D13	ARD_D13	PA5	SPI_1_SCK
	5	MISO/D12	ARD_D12	PA6	SPI_1_MISO
	4	PWM/MOSI/D11	ARD_D11	PA7	SPI_1_MOSI || TIM_14_CH1
	3	PWM/CS/D10	ARD_D10	PB0	SPI_1_NSS ||TIM_3_CH3
	2	PWM/D9	ARD_D9	PC7	TIM_3_CH2
	1	D8	ARD_D8	PA9	I/O
CN9	8	D7	ARD_D7	PA15	I/O
	7	PWM/D6	ARD_D6	PB5	TIM_3_CH3
	6	PWM/D5	ARD_D5	PB4	TIM_3_CH1
	5	D4	ARD_D4	PB10	I/O
	4	PWM/D3	ARD_D3	PB3	TIM_1_CH2
	3	D2	ARD_D2	PA10	I/O
	2	TX/D1	ARD_D1	PB6	UART_1_TX
	1	RX/D0	ARD_D0	PB7	UART_1_RX

7.2 CN7 and CN10 ST morpho connectors

The CN7 and CN10 ST morpho connectors are male pin headers accessible on both sides of the STM32 Nucleo-64 board (refer to Figure 3). All STM32 signals and power pins except 1.2 V VDD_CORE are available on the ST morpho connectors. An oscilloscope, logical analyzer, or voltmeter can also probe these connectors.

The related pinout and the MCU assignment for the ST morpho connectors are listed in Figure 7.

8 STM32 Nucleo-64 board I/O assignment

Table 12. **STM32 Nucleo-64 board I/O assignment**

Pin number	Pin name	Main feature/optional feature
1	PC13	BUTTON
2	PC14-OSC32_IN	OSC32_IN
3	PC15-OSC32_OUT	OSC32_OUT
4	PF3	I/O
5	VREF+	-
6	VDD	-
7	VSS	-
8	PF0-OSC_IN	OSC_IN
9	PF1-OSC_OUT	OSC_OUT
10	PF2-NRST	RESET
11	PA0	ARD_A0_ADC_IN0
12	PA1	ARD_A1_ADC_IN1
13	PA2	VCP_USART2_TX
14	PA3	VCP_USART2_RX
15	PA4	ARD_A2_ADC_IN4
16	PA5	ARD_D13_SPI1_SCK
17	PA6	ARD_D12_SPI1_MISO
18	PA7	ARD_D11_SPI1_MOSI || TIM14_CH1
19	PB0	ARD_D10_SPI1_NSS || TIM3_CH3
20	PB1	ARD_A3_ADC_IN18
21	PB2	I/O
22	PB10	ARD_D4
23	PB11	I/O
24	PB12	I/O
25	PB13	I/O
26	PB14	I/O
27	PB15	I/O
28	PA8	I/O
29	PA9	ARD_D8
30	PC6	I/O
31	PC7	ARD_D9 || TIM3_CH2
32	PA10	ARD_D2
33	PA11 [PA9]	ARD_A4_ADC_IN11
34	PA12 [PA10]	ARD_A5_ADC_IN12
35	PA13	SWDIO
36	PA14-BOOT0	SWCLK
37	PA15	ARD_D7
38	PD0	I/O

Pin number	Pin name	Main feature/optional feature
39	PD1	I/O
40	PD2	I/O
41	PD3	I/O
42	PB3	ARD_D3 || TIM1_CH2
43	PB4	ARD_D5 || TIM3_CH1
44	PB5	ARD_D6 || TIM3_CH3
45	PB6	ARD_D1 || VCP_USART1_TX
46	PB7	ARD_D0 || VCP_USART1_RX
47	PB8	ARD_D14_I2C_SDA
48	PB9	ARD_D15_I2C_SCL

9 STM32 Nucleo-64 board information

9.1 Product marking

The stickers located on the top or bottom side of all PCBs provide product information:

- First sticker: product order code and product identification, generally placed on the main board featuring the target device.
  Example:

Product order code Product identification

- Second sticker: board reference with revision and serial number, available on each PCB.
  Example:

MBxxxx-Variant-yzz syywwxxxxx	

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

On the second sticker, the first line has the following format: *"MBxxxx-Variant-yzz"*, where *"MBxxxx"* is the board reference, *"Variant"* (optional) identifies the mounting variant when several exist, *"y"* is the PCB revision, and *"zz"* is the assembly revision, for example B01. The second line shows the board serial number used for traceability.

Parts marked as *"ES"* or *"E"* are not yet qualified and therefore not approved for use in production. ST is not responsible for any consequences resulting from such use. In no event will ST be liable for the customer using any of these engineering samples in production. ST's Quality department must be contacted prior to any decision to use these engineering samples to run a qualification activity.

"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 evaluation tool ordering part number 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-C031C6 product history

Table 13. **Product history**

Order code	Product identification	Product details	Product change description	Product limitations
NUCLEO-C031C6	NUC031C6$KU1	MCU: • STM32C031C6T6 silicon revision "A"	Initial revision	No limitation
		MCU errata sheet: • *STM32C031x4/x6 device errata* (ES0568)		
		Board: • MB1717-C031C6-B01 (main board)		
NUCLEO-C051C8	NUC051C8$KU1	MCU: • STM32C051C8T6 silicon revision "A"	Initial revision	No limitation
		MCU errata sheet: • *STM32C051x6/x8 device errata* (ES0624)		
		Board: • MB1717-C051C8-C02 (main board)		

9.3 Board revision history

Table 14. **Board revision history**

Board reference	Board variant and revision	Board change description	Board limitations
MB1717 (main board)	C031C6-B01	Initial revision	No limitation
	C051C8-C02	Initial revision	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.

To satisfy FCC RF exposure requirements, a separation distance of 20 cm or more should be maintained between the antenna of this device and persons during operation. To ensure compliance, operation at a closer distance than this is not recommended. This transmitter must not be collocated or operating in conjunction with any other antenna or transmitter.

Responsible party (in the USA)

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

10.2 ISED Compliance Statement

This device complies with FCC and ISED Canada RF radiation exposure limits set forth for general population for mobile application (uncontrolled exposure). This device must not be collocated or operating in conjunction with any other antenna or transmitter.

Compliance Statement

Notice: This device complies with ISED Canada licence-exempt RSS standard(s). Operation is subject to the following two conditions: (1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device.

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

Déclaration de conformité

Avis: Le présent appareil est conforme aux CNR d'ISDE Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes : (1) l'appareil ne doit pas produire de brouillage, et (2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

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

11 CE conformity

11.1 Warning

EN 55032 / CISPR32 (2012) Class B product

Warning: this device is compliant with Class B of EN55032 / CISPR32. In a residential environment, this equipment may cause radio interference.

Avertissement : cet équipement est conforme à la Classe B de la EN55032 / CISPR 32. Dans un environnement résidentiel, cet équipement peut créer des interférences radio.

11.2 Simplified CE declaration of conformity

Hereby, STMicroelectronics declares that the radio equipment types NUCLEO-C031C6 and NUCLEO-G071RB comply with the applicable CE requirements stated below:

- EN 55032 (2012) / EN 55024 (2010)
- EN 60950-1 (2006 + A11/2009 + A1/2010 + A12/2011 + A2/2013)

Hereby, STMicroelectronics declares that the radio equipment type NUCLEO-G0B1REB complies with the applicable CE requirements stated below:

- EN 55032 (2012/2015) / EN 55035 (2017)
- EN 60950-1 (2006 + A11/2009 + A1/2010 + A12/2011 + A2/2013) / EN62368-1 (2014 +A1/2017)

The complete declaration of conformity is available upon request from STMicroelectronics.

Revision history

Table 15. **Document revision history**

Date	Revision	Changes
16-Feb-2022	1	Initial release.
08-Nov-2024	2	Added NUCLEO-C051C8 product in the whole document. Updated: • Figure 1 and Figure 3 to Figure 5 with MB1717C version • STM32 Nucleo-64 board information with Product marking, and Product history and Board revision history tables.

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