STM32 Nucleo-64 boards (MB2046)

Introduction

The STM32 Nucleo-64 boards, based on the MB2046 reference board (NUCLEO-C071RB and NUCLEO-C092RC order codes) provide an affordable and flexible way for users to test new concepts and build prototypes with different combinations of performance, power consumption, and functionality.

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

The STM32 Nucleo-64 boards require no separate probes, as they integrate the STLINK-V2EC debugger/programmer.

The STM32 Nucleo-64 boards come with comprehensive free STM32 software libraries and examples available with the STM32CubeC0 MCU Package.

Figure 1. NUCLEO-C071RB board top view

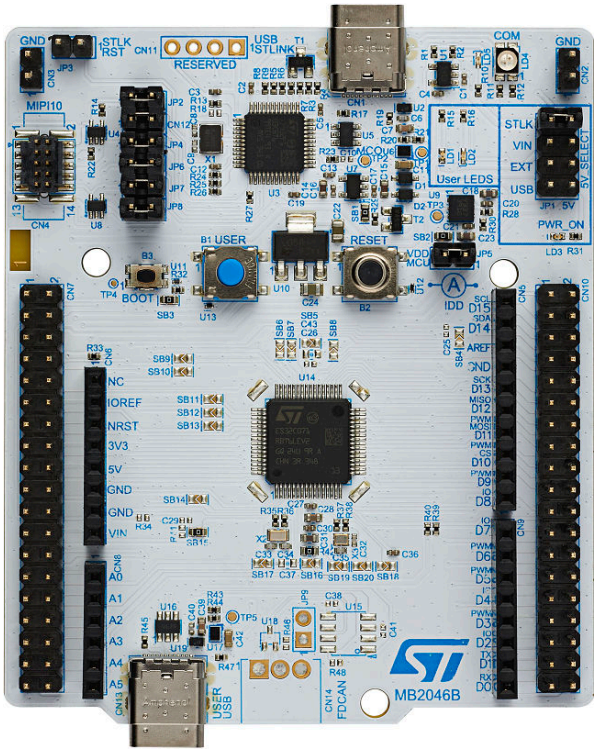
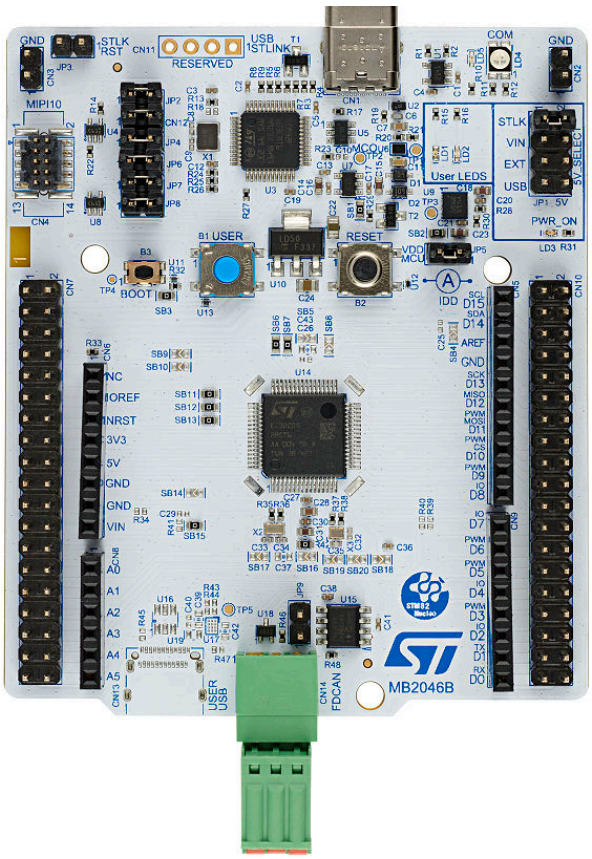


Figure 2. NUCLEO-C092RC board top view



Pictures are not contractual.

1 Features

- STM32 microcontroller based on the Arm® Cortex®-M0+ processor in an LQFP64 package
- Two user LEDs shared with ARDUINO® Uno V3 and ST morpho
- User and reset push-buttons
- User USB Device FS (NUCLEO-C071RB)
- CAN-FD transceiver (NUCLEO-C092RC)
- 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
  - USB Type-C® connector for ST-LINK
  - USB Type-C® user connector (NUCLEO-C071RB)
  - MIPI® debug connector (Arm® Cortex® 10-pin 1.27 mm-pitch debug connector over STDC14/MIPI10 footprint)
- Flexible power-supply options: ST-LINK USB V_{BUS}, user USB FS connector, or external sources
- On-board STLINK-V2EC 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 STM32 Nucleo-64 boards, 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-C071RB	MB2046[1]	STM32C071RBT6
NUCLEO-C092RC		STM32C092RCT6

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-C071RB
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: • R for 64 pins	64 pins
T	STM32 flash memory size: • B for 128 Kbytes • C for 256 Kbytes	128 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 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-C071RB and NUCLEO-C092RC 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 evaluate and start development quickly with the STM32C0 microcontroller.

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 boards and the software example, visit the www.st.com/stm32nucleo webpage.

6.1 Getting started

Follow the sequence below to configure the STM32 Nucleo-64 boards and launch the demonstration application (refer to Figure 4 for component location):

1. Check jumper positions on board (refer to Table 4. Default jumper configuration).
2. To identify correctly all device interfaces from the host PC, install the STLINK-V2EC USB driver available on the www.st.com/stm32nucleo webpage, before connecting to the board.
3. To power the board, connect the STM32 Nucleo-64 boards to a PC with a USB Type-A or USB Type-C® to USB Type-C® through the USB connector (CN1). Once powered on, the PWR green LED (LD3) lights up and the COM LED (LD4) lights up red.
4. Press the blue user button (B1).
5. Observe that the blinking frequency of the LEDs (LD1, LD2) changes, by clicking on the user 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.

Table 4. Default jumper configuration

Jumper	Definition	Default position	Comment
JP5	IDD measurement	ON	STM32 VDD current measurement
JP1	5 V power selection	[1-2]	5 V power supply from ST-LINK USB
JP3	STLK reset	OFF	No STLK reset
JP2, JP4, and JP6 to JP8	SWD interface	ON	On-board STLINK-V2EC debugger

7 Hardware layout and configuration

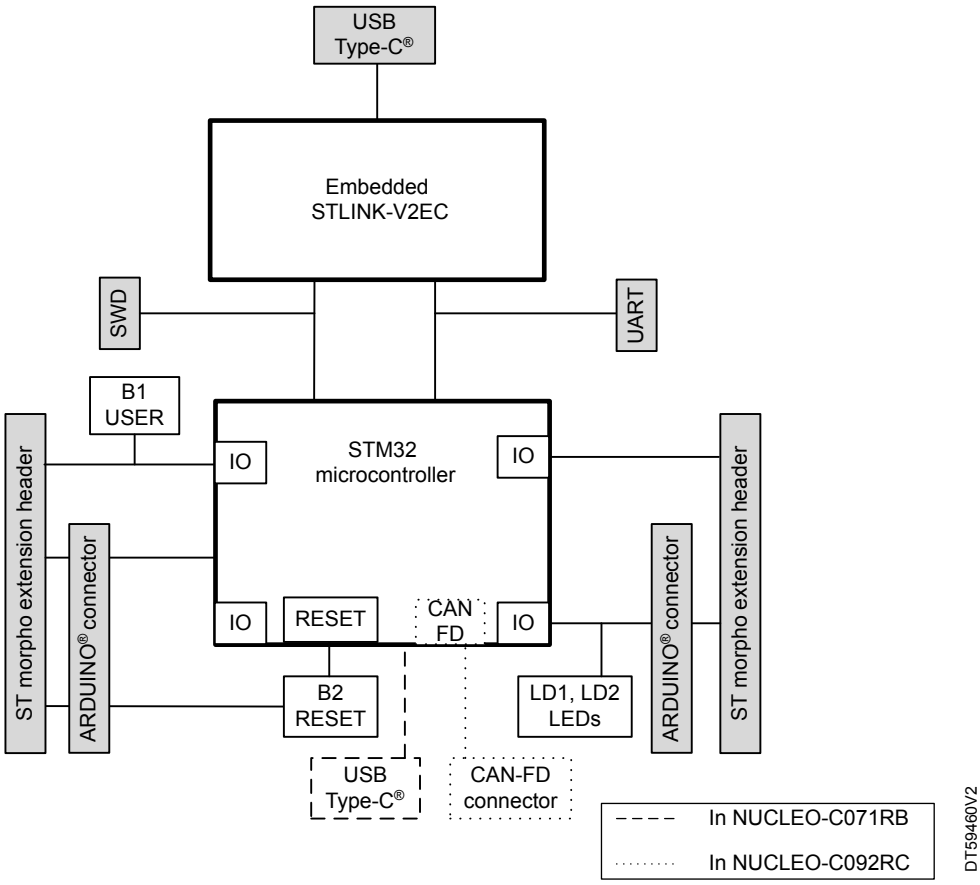
The STM32 Nucleo-64 boards are designed around the STM32C0 microcontroller in an LQFP64 package.

Figure 3 illustrates the connections between the STM32C0 microcontroller and its peripherals, such as STLINK-V2EC, push-buttons, LEDs, USB Type-C® user connector or CAN FD, ARDUINO® Uno V3 connectors, and ST morpho headers.

Figure 4 shows the location of the STM32 Nucleo-64 features.

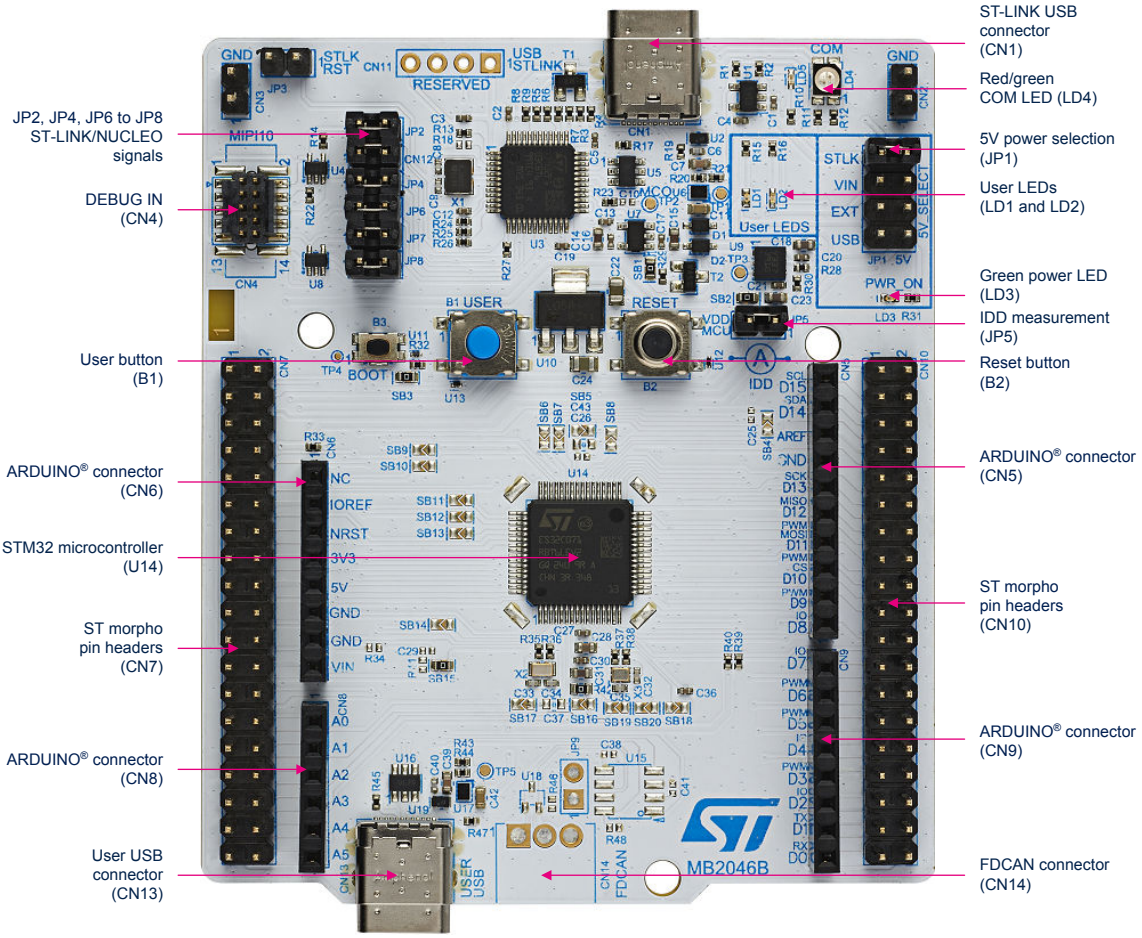
The mechanical dimensions of the board are shown in Figure 5.

Figure 3. Hardware block diagram



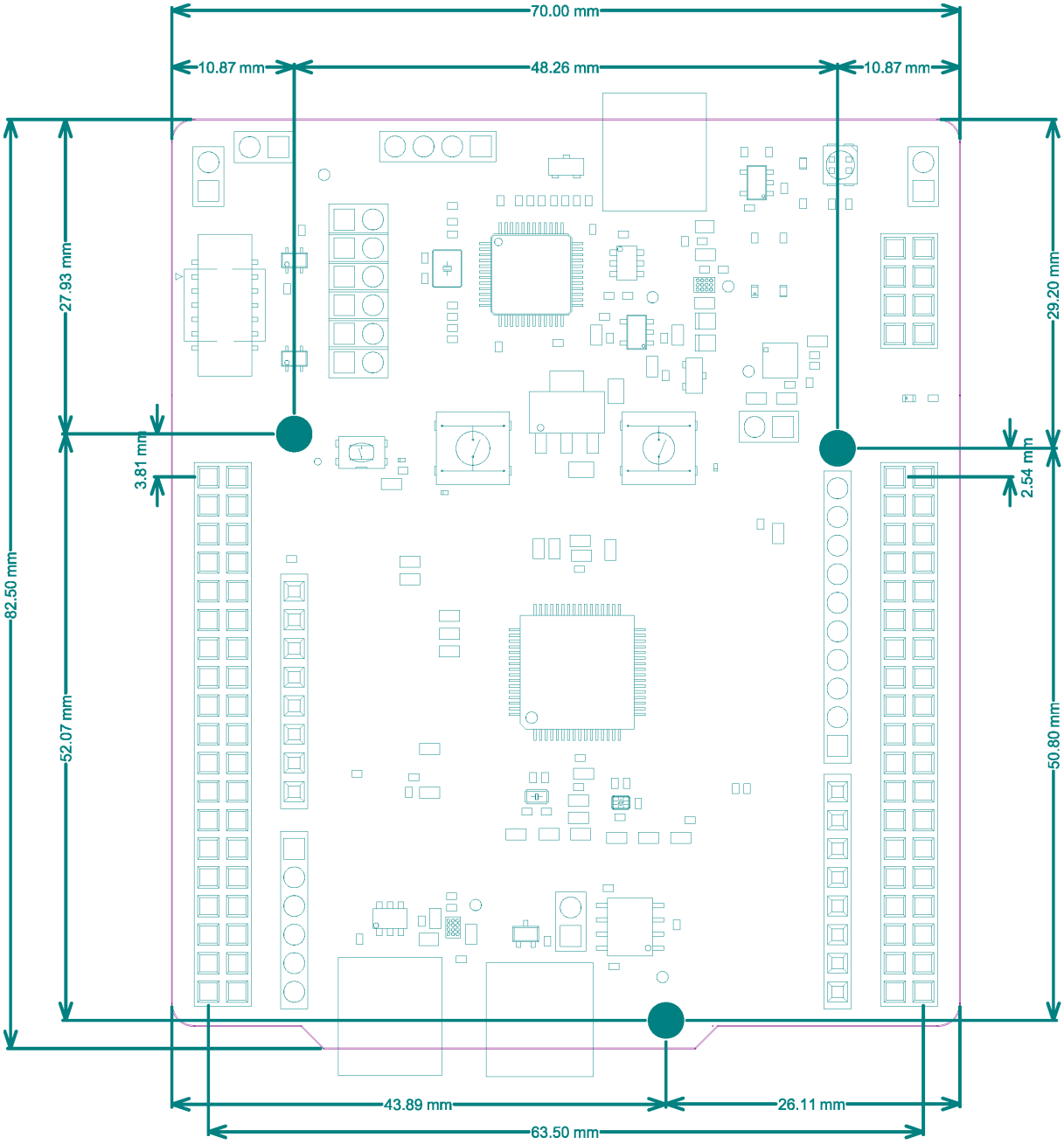
7.1 PCB layout

Figure 4. Top layout



7.2 Mechanical drawing

Figure 5. **Board mechanical drawing (in millimeters)**



7.3 Embedded STLINK-V2EC

The STLINK-V2EC programming and debugging tool is integrated into the STM32 Nucleo-64 boards.

For all general information concerning the debugging and programming features of STLINK-V2EC, refer to the user manual *ST-LINK/V2 in-circuit debugger/programmer for STM8 and STM32* (UM1075) and the technical note *Overview of ST-LINK derivatives* (TN1235).

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

- Using the embedded STLINK-V2EC
- Using an external debug tool connected to the STDC14/MIPI10 connector (CN4)

Refer to Table 10 to switch between STLINK-V2EC and STDC14 configurations.

The STLINK-V2EC facility for debugging and flashing is integrated into the STM32 Nucleo-64.

Features supported in the STLINK-V2EC:

- USB software re-enumeration
- Mass storage interface on USB
- USB power management request for USB power above 100 mA

Known limitation:

- Activating the readout protection on the STM32 target prevents the target application from running afterward. The target readout protection must be kept disabled on STLINK-V2EC boards.

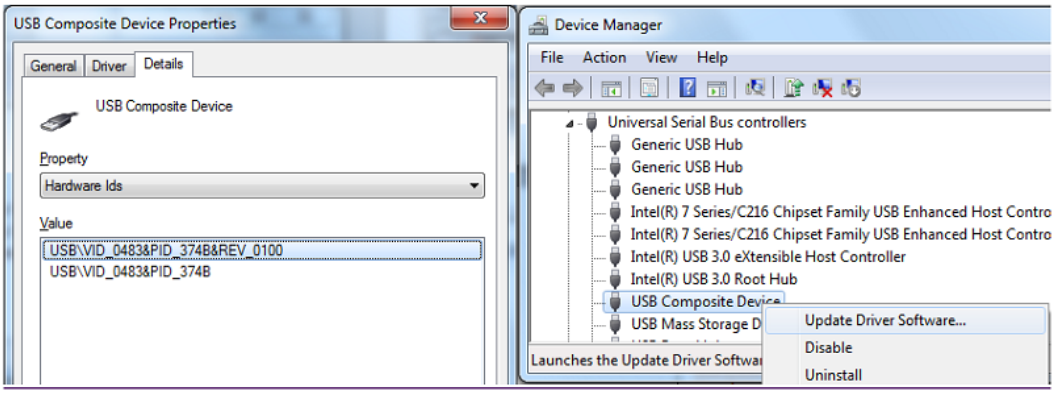
7.3.1 Drivers

Until Windows 10®, STLINK-V2EC requires a dedicated USB driver, available from *www.st.com*.

In case the STM32 Nucleo-64 boards are connected to the PC before the driver is installed, some STM32 Nucleo-64 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



7.3.2 STLINK-V2EC firmware upgrade

STLINK-V2EC embeds a firmware mechanism for the in-place upgrade through the USB port. The firmware might evolve during the lifetime of the STLINK-V2EC 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 STM32 Nucleo-64 boards, then periodically to stay up to date with the latest firmware version.

7.3.3 Programming and debugging the on-board MCU using the MIPI® debug connector

To program the STM32 on board, plug in the MIPI® debug connector (CN4), as shown in Figure 4. The MIPI® debug connector is an Arm® Cortex® 10-pin 1.27 mm-pitch debug connector with STDC14/MIPI10 footprint according to Table 5. STDC14/MIPI10 connector (CN4) (SWD only). It supports STDC14 or MIPI10 standard connectors.

Table 5. STDC14/MIPI10 connector (CN4) (SWD only)

MIPI10 pin	STDC14 pin	CN4	Designation
-	1	N/A	-
-	2	N/A	-
1	3	VDD	Target VDD from the application
2	4	SWDIO	SWD data input/output
3	5	GND	Ground
4	6	SWCLK	SWD clock
5	7	GND	Ground
6	8	SWO	Reserved
7	9	SWCLK	JRCLK
8	10	N/A	-
9	11	GNDDetect	-
10	12	NRST	Reset of target MCU
-	13	VCP_RX	Target Rx used for VCP (with UART supporting bootloader)
-	14	VCP_TX	Target Tx used for VCP (with UART supporting bootloader)

7.4 Power supply and power selection

7.4.1 External power supply input

Several DC power sources can power the STM32 Nucleo-64 boards. It is possible to supply the STM32 Nucleo-64 boards with any of the following sources:

- STLK: 5 V from the STLINK-V2EC USB Type-C® connector
- VIN: 7 to 12 V from the ARDUINO® or ST morpho connector, with 5 V adaptation from LDO
- 5V_EXT: External 5 V power from ST morpho connector
- 5V_USB: 5 V from the USB Type-C® connector
- 3V3 from the ARDUINO® or ST morpho connector

Note: If the VIN, 5V_EXT, or 3V3 DC power source is used to power a Nucleo board, this power must comply 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 6.

Table 6. Power supply capabilities

Input power	Connector pins	Voltage range	Maximum current	Limitation
STLK	CN1 JP1[1-2]	4.75 to 5.5 V	500 mA	The maximum current depends on the presence or absence of the USB enumeration: • 100 mA without enumeration • 500 mA with enumeration
VIN	CN6 pin 8 CN7 pin 24 JP1[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
5V_EXT	CN7 pin 6 JP1[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.
5V_USB	CN13 JP1[7-8]	4.75 to 5.5 V	500 mA	The maximum current depends on the presence or absence of the USB enumeration.
3V3	CN6 pin 4 CN7 pin 16	3.0 to 3.6 V	-	The maximum current depends on the 3V3 source. 3V3 can be used when the STLINK-V2EC part of the PCB is not used. SB2 might be OFF to protect LDO (U9).
VDD	JP5 pin 1	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 1. In this case, only the MCU is powered. External functions like debugging, LED, or expansion connectors are not powered. This option can be used to measure MCU power consumption.

STLK is a 5 V DC power with limitations from the STLINK-V2EC USB connector (CN1). In this case, the 5V jumper selection (JP1) must be on [1-2] to select the STLK power source on the JP1 silkscreen. This is the default setting. If the USB enumeration succeeds, the STLK power is enabled, by asserting the T_PWR_EN signal coming from STLINK-V2EC. 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 boards and their shield can be powered via the STLINK-V2EC connector (CN1). However, only the STLINK-V2EC 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 boards require 500 mA of current from the host PC.

- If the host can provide the required power, the enumeration ends by a *SetConfiguration* command. Then, the power transistor is switched ON and the green LED (LD3) is turned ON. Thus, the STM32 Nucleo-64 boards and their shield request no more than 500 mA current.
- If the host cannot provide the required current, the enumeration fails. Therefore, the power switch stays OFF and the MCU part including the extension board is not powered. As a consequence, the green LED (LD3) stays turned OFF. In this case, it is mandatory to use an external power supply.

VIN is the 7 to 12 V DC power from the ARDUINO® connector (CN6) pin 8, or ST morpho connector (CN7) pin 24. In this case, the JP1 jumper must be on [3-4] to select the VIN power source. In that case, the DC power comes from the ARDUINO® Uno V3 battery shield and is compatible with the Adafruit® PowerBoost 500 shield.

An LDO (U10) provides a fixed 5 V from VIN (7 to 12 V).

5V_EXT 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 (JP1) must be on [5-6] to select the 5V_EXT power source.

5V_USB is a 5 V DC power with limitations from the USB Type-C® connector (CN13). In this case, the 5V jumper selection (JP1) must be on [7-8] to select the USB power source on the JP1 connector.

External 3V3 power supply input. It is sometimes interesting to use an external 3.3 V source on the 3V3 input (CN6 pin 4 or CN7 pin 16). It is the case when an expansion board provides 3.3 V. When the Nucleo-64 is powered with only a 3.3 V source, STLINK-V2EC is not powered thus programming and debugging are unavailable. When using the 3V3 input, the STLINK-V2EC part is not supplied for this configuration. To prevent unintentional feedback of 5 V via component U9, ST recommends removing component SB2 from the circuit.

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 1). 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 Programming/debugging when the power supply is not from STLINK-V2EC (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, 5V_EXT, or 5V_USB 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 JP1 jumper according to the 5 V selected external power source.
2. Connect the external power source according to JP1.
3. Power 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 followed, the STLINK-V2EC V_{BUS} might first supply power to the board, and the following risks might be encountered:

- If the board requires at least 500 mA, this might damage the PC, or the PC might limit the current. Therefore, the board is not powered correctly.
- 500 mA is requested at enumeration: This request is rejectable and the enumeration does not succeed if the PC does not provide such a current. Consequently, the board is not power supplied (LED LD3 remains OFF).

7.4.3 Power supply output

- **5V**: Whatever the power source is (STLK, VIN, 5V_EXT, or 5V_USB), the 5 V generated is present on CN6 pin 5 or CN7 pin 18. It can be 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 6 must 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 U9 regulator (500 mA maximum concerning the STM32 Nucleo-64 boards with shields consumption).

7.4.4 VDD IDD measurement

The IDD-labeled jumper (JP5) is used to measure 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 configuration).
- Jumper OFF: To power and measure the microcontroller consumption, the user must connect an ammeter or an external 3.3 V power supply.

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

7.5 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 8 MHz clock from the STLINK-V2EC MCU for the STM32 microcontroller
- HSE is the 48 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 *Guidelines for oscillator design on STM8AF/AL/S and STM32 MCUs/MPUs* (AN2867).

7.5.1 LSE clock reference

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

LSE on-board oscillator X2 crystal (default configuration)

For example, the X2 crystal embedded in the Nucleo-64 has the following characteristics: 32.768 kHz, 6 pF, 20 ppm.

The use of the embedded X2 crystal requests the following SB configuration:

- SB14 and SB17 OFF
- R35 and R36 ON

External oscillator connected to PC14 input

The use of the external oscillator through pin 25 of the ST morpho connector (CN7) requests the following configuration:

- SB14 ON
- R35 and R36 OFF

LSE not used

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

- SB14 and SB17 ON
- R35 and R36 OFF

7.5.2 HSE clock reference

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

HSE on-board oscillator from X3 crystal (default configuration)

For example, the X3 crystal embedded in the Nucleo-64 has the following characteristics: 48 MHz, 7 pF, 20 ppm.
The use of the embedded X3 crystal requests the following solder bridge configuration:

- SB18 and SB19 OFF
- R37 and R38 ON
- SB20 OFF

MCO from STLINK-V2EC

The MCO output of STLINK-V2EC 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 use of this clock source requests the following configuration:

- SB18 and SB19 OFF
- R37 and R38 OFF
- SB20 ON

External oscillator to PF0 input

The input clock comes from an external oscillator through PF0, CN7 pin 29. The following configuration is needed:

- SB19 ON
- R37 and R38 OFF
- SB20 OFF

HSE not used

PF0 and PF1 are used as GPIOs instead of clocks. The following configuration is needed:

- SB18 and SB19 ON
- R37 and R38 OFF
- SB20 OFF

7.6 Reset sources

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

- The reset push-button (B2)
- The embedded STLINK-V2EC
- The ARDUINO® connector CN6 pin 3
- The ST morpho connector CN7 pin 14

7.7 Virtual COM port (VCP)

An STM32 serial interface is connected to the STLINK-V2EC debug interface. The user can choose the USART2 interface. Refer to Table 7 below to set the USART2 connection to the VCP interface.

Table 7. VCP communication

Pin name	Function	Virtual COM port (default configuration)
PA2	USART2TX	R27 ON
PA3	USART2RX	R26 ON

7.8 LEDs

Five LEDs are available on the STM32 Nucleo-64 boards. The five LEDs are located on the top side of the board.

User LED (LD1, LD2)

The user green LED (LD1) is connected to the STM32 I/O PA5 (SB1 ON, default configuration) also used for the ARDUINO® D13 function. A transistor drives the LED whatever the MCU 1V8 or 3V3 voltage range. And the user blue LED (LD2) is connected to the STM32 I/O PC9.

5 V PWR LED (LD3)

The green LED (LD3) indicates that the Nucleo-64 board is powered by a 5 V source, and this source is available on CN6 pin 5 and CN7 pin 18.

STLINK-V2EC tricolor LED (LD4)

The tricolor (green, orange, and red) LED provides information about STLINK-V2EC communication status (LD4). For detailed information about the LED, refer to the technical note *Overview of ST-LINK derivatives* (TN1235).

VBUS_STLK over current LED (LD5)

The red LED is ON when overcurrent is detected on USB VBUS. The LED gives the information that more than 500 mA is requested on VBUS. In this case, it is recommended to supply the board with 5V_EXT, VIN, or 5V_USB.

7.9 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. When the button is pressed, the logic state is LOW, otherwise, the logic state is HIGH. To connect the user button to PC13, SB15 must be ON.

The user button is implemented using a firmware debounce filter. This helps to reduce the BOM cost by removing the external hardware debounce filter R34, R41, and C29.

Warning: *The PC13 I/O used for the user button must be set in INPUT, pull-up (PU) with debouncing. Never set the PC13 in OUTPUT level HIGH 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.

7.10 USB Type-C® FS port

The STM32 Nucleo-64 boards support USB full-speed (FS) communication. The USB connector (CN13) is a USB Type-C® connector. The USB connector (CN13) can power the board at a 5 V DC voltage with a 500 mA current limitation. The V_{BUS2} voltage is connected to U17 for V_{BUS} overvoltage protection.

The STM32 Nucleo-64 boards support USB Type-C® sink only. When a USB Host connection to the USB Type-C® connector (CN13) of the STM32 Nucleo-64 boards is detected, they start behaving as USB Devices. Depending on the powering capability of the USB Host, the boards can take power from the V_{BUS} terminal of CN13. In the board schematic diagrams, the corresponding power voltage line is called 5V_USB.

Section 7.4.1 provides information on how to use the powering option.

The pin PC0 is used as V_{BUS} sensing detection when the USB Device is bus-powered or self-powered.

The hardware configuration for the USB FS interface is shown in Table 8.

Table 8. USB Type-C® FS GPIO configuration

GPIO	Hardware	Setting(1)	Configuration
PA11	SB7	**OFF**	PA11 is used as the USB_FS_N diff pair interface.
		ON	PA11 is connected in parallel to the extension connector CN10. USB interface can be disturbed.
PA12	SB6	**OFF**	PA12 is used as the USB_FS_P diff pair interface.
		ON	PA12 is connected in parallel to the extension connector CN10. USB interface can be disturbed.

1. *The default configuration is shown in bold.*

7.11 CAN FD

The STM32 Nucleo-64 board supports one CAN FD compliant with ISO-11898-1 version 2.0 parts A and B. The 3-pin header is available as a CAN-FD interface. The screwless push-in connector (HW15) can connect to the CAN-FD connector (CN14) and the flying cable for your application.

Table 9 describes the FDCAN interface and connector pinout CN14.

Table 9. CAN-FD interface and connector (CN14) pinout

Pin	Function	CAN transceiver
1	CANH	CANH
2	CANL	CANL
3	GND	-

7.12 Jumper configuration

The default jumper positions are shown in Table 4. Table 10 describes the other available jumper settings

Table 10. Jumper configuration

Jumper/CN	Function	State[1]	Comment
JP2, JP4, and JP6 to JP8	SWD interface	**ON**	STLINK-V2EC enabled for on-board MCU debugger
		OFF	STLINK-V2EC functions disabled and external debugger from the connector (CN4)
CN2 and CN3	GND	**OFF**	GND probe
CN12		**ON**	
JP1	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 5V_EXT
		[7-8]	5 V from 5V_USB
		OFF	No 5 V power
JP3	STLK reset	ON	STLK reset
		OFF	No STLK reset
JP5	I_{DD} measurement	**ON**	VDD = 3.3 V
		OFF	To connect the external source (ULPBench probe as an example)
JP9	120 Ω resistor selection	ON	The 120 Ω resistor is connected to the CAN network.
		OFF	The 120 Ω is disconnected from the CAN network.

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

7.13 Solder bridge configuration

Table 11 describes the solder bridge configurations and settings.

Table 11. Solder bridge configuration and settings

Definition	Solder bridge	State[1]	Comment
3.3 VLDO output	SB2	**ON**	The U9 LDO output provides 3.3 V.
		OFF	The U9 LDO output does not provide 3.3 V.
PF3/VBAT	SB16	ON	VBAT on STM32 is connected to VDD.
		OFF	PF3/VBAT is connected to the ST morpho connector.
User button	SB15	**ON**	The B1 push-button is connected to PC13.
		OFF	The B1 push-button is not connected to PC13.
User LED	SB1	**ON**	PA5 controls LD1.
		OFF	LD1 is isolated.
SWD signals	SB9/SB10	ON	PA13/PA14 is connected to the ST morpho connector.
		OFF	PA13/PA14 is not connected to the ST morpho connector.
MCO	SB20	ON	MCO from STLK provides 8 MHz CLK to MCU.
		OFF	MCO from STLK floating
HSE CLK selection	SB18/SB19	ON (R37/R38 OFF)	PF0/PF1 works as GPIOs.
		OFF	PF0/PF1 works as HSE pins.
LSE CLK selection	SB14/SB17	ON (R35/R36 OFF)	PC14/PC15 works as GPIOs.
		OFF	PC14/PC15 works as LSE pins.
CAN FD selection	SB11/SB12/SB13	**ON**	PD0/PD1/PD2 works as CAN FD
		OFF	PD0/PD1/PD2 works as GPIOs.

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

8 Connectors

Six extension connectors are implemented on the STM32 Nucleo-64 boards:

- The four ARDUINO® Uno V3 connectors (CN5, CN6, CN8, and CN9)
- The two 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 5 V tolerant, but a few of them are only 3.6 V compatible, while ARDUINO® Uno V3 is 5 V compatible. Refer to the STM32C0 series data brief and STM32xxxx product datasheets for their I/O structure.*

The related pinout for the ARDUINO® connector is listed in Table 12.

Table 12. ARDUINO® connectors on NUCLEO-C071RB and NUCLEO-C092RC

Connector	Pin number	Pin name	MCU pin	Function
CN6	1	-	-	Reserved for test
	2	IOREF	-	I/O reference
	3	NRST	NRST	Reset
	4	3V3	-	3.3 Vinput/output
	5	5V	-	5 Voutput
	6	GND	-	GND
	7	GND	-	GND
	8	VIN	-	7 to 12 V power input
CN8	1	A0	PA0	ADC_IN0
	2	A1	PA1	ADC_IN1
	3	A2	PA4	ADC_IN4
	4	A3	PB0	ADC_IN17
	5	A4	PC4	ADC_IN11
	6	A5	PC5	ADC_IN12
CN5	10	SCL/D15	PB8	I2C1_SCL
	9	SDA/D14	PB9	I2C1_SDA
	8	AREF	-	VREF+
	7	GND	-	GND
	6	SCK/D13	PA5	SPI1_SCK
	5	MISO/D12	PA6	SPI1_MISO
	4	PWM/MOSI/D11	PA7	SPI1_MOSI or TIM3_CH2
	3	PWM/CS/D10	PA15	SPI1_NSS or TIM1_CH1
	2	PWM/D9	PB3	TIM1_CH2
	1	D8	PA9	I/O
CN9	8	D7	PA8	I/O
	7	PWM/D6	PC8	TIM3_CH3
	6	PWM/D5	PB4	TIM3_CH1
	5	D4	PB5	I/O
	4	PWM/D3	PC7	TIM3_CH2
	3	D2	PA10	I/O
	2	TX/D1	PB6	USART1_TX
	1	RX/D0	PB7	USART1_RX

8.2 ST morpho connectors (CN7 and CN10)

The ST morpho connectors are two 2.54 mm pitch male pin headers (CN7 and CN10). They can be used to connect the STM32 Nucleo-64 boards to an expansion or a prototype/wrapping board placed on top of it. All signals and power pins of the STM32 are available on the two ST morpho connectors. A logic analyzer or a voltmeter can also probe this connector.

Table 13 describes the CN7 and CN10 connector pinout.

Table 13. Pin assignments for the STM32 on the ST morpho connectors

CN7				CN10			
Pin name	Pin number	Pin number	Pin name	Pin name	Pin number	Pin number	Pin name
PC10	1	2	PC11	PC3	1	2	PC9
PC12	3	4	PD2	PB8	3	4	PC1
VDD	5	6	5V_EXT	PB9	5	6	PA3
PD4	7	8	GND	VREF(4)	7	8	5V_STLK
PD0	9	10	PD1	GND	9	10	PD6
PD3	11	12	3V3	PA5	11	12	PA12(3)
PA13(1)	13	14	NRST	PA6	13	14	PA11(3)
PA14(1)	15	16	3V3	PA7	15	16	PB12
PC6	17	18	5V	PA15	17	18	PA2
GND	19	20	GND	PB3	19	20	GND
PC2	21	22	GND	PA9	21	22	PC0
PC13	23	24	VIN	PA8	23	24	PB1
PC14(2)	25	26	PD5	PC8	25	26	PB15
PC15(2)	27	28	PA0	PB4	27	28	PB14
PF0(2)	29	30	PA1	PB5	29	30	PB13
PF1(2)	31	32	PA4	PC7	31	32	GND
PF3	33	34	PB0	PA10	33	34	PB10
PB2	35	36	PC4	PB6	35	36	PD8
PB11	37	38	PC5	PB7	37	38	PD9

1. *PA13 and PA14 are shared with SWD signals connected to STLINK-V2EC, it is not recommended to use them as I/O pins.*
2. *Refer to Section 7.5 for details.*
3. *Refer to Section 7.10 for details.*
4. *The ADC input range is 0 <= VIN <= VREF.*

9 STM32 Nucleo-64 boards 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:

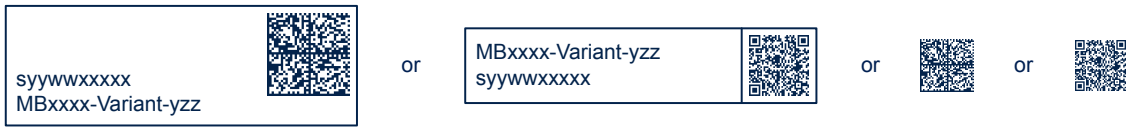
  

  Dual-sticker example:

- 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 STM32 Nucleo-64 boards product history

Table 14. Product history

Order code	Product identification	Product details	Product change description	Product limitations
NUCLEO-C071RB	NUC071RB$KS1	MCU: STM32C071RBT6 silicon revision "A" MCU errata sheet: *STM32C071x8/xB device errata* (ES0618) Board: • MB2046-C071RB-B03 (main board)	Initial revision	No limitation
NUCLEO-C092RC	NUC092RC$KS1	MCU: STM32C092RCT6 silicon revision "A" MCU errata sheet: *STM32C091xx and STM32C092xx device errata* (ES0625) Board: • MB2046-C092RC-B03 (main board)	Initial revision	No limitation

9.3 Board revision history

Table 15. Board revision history

Board reference	Board variant and revision	Board change description	Board limitations
MB2046 (main board)	C071RB-B03	Initial revision	No limitation
	C092RC-B03	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.

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

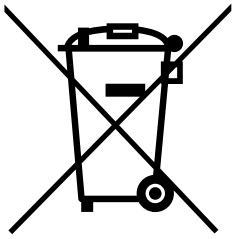
ISED Canada ICES-003 Compliance Label: CAN ICES-3 (B) / NMB-3 (B).

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 16. **Document revision history**

Date	Revision	Changes
09-Aug-2024	1	Initial release.
07-Jan-2025	2	Added NUCLEO-C092RC product and Safety recommendations. Updated Product marking.

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