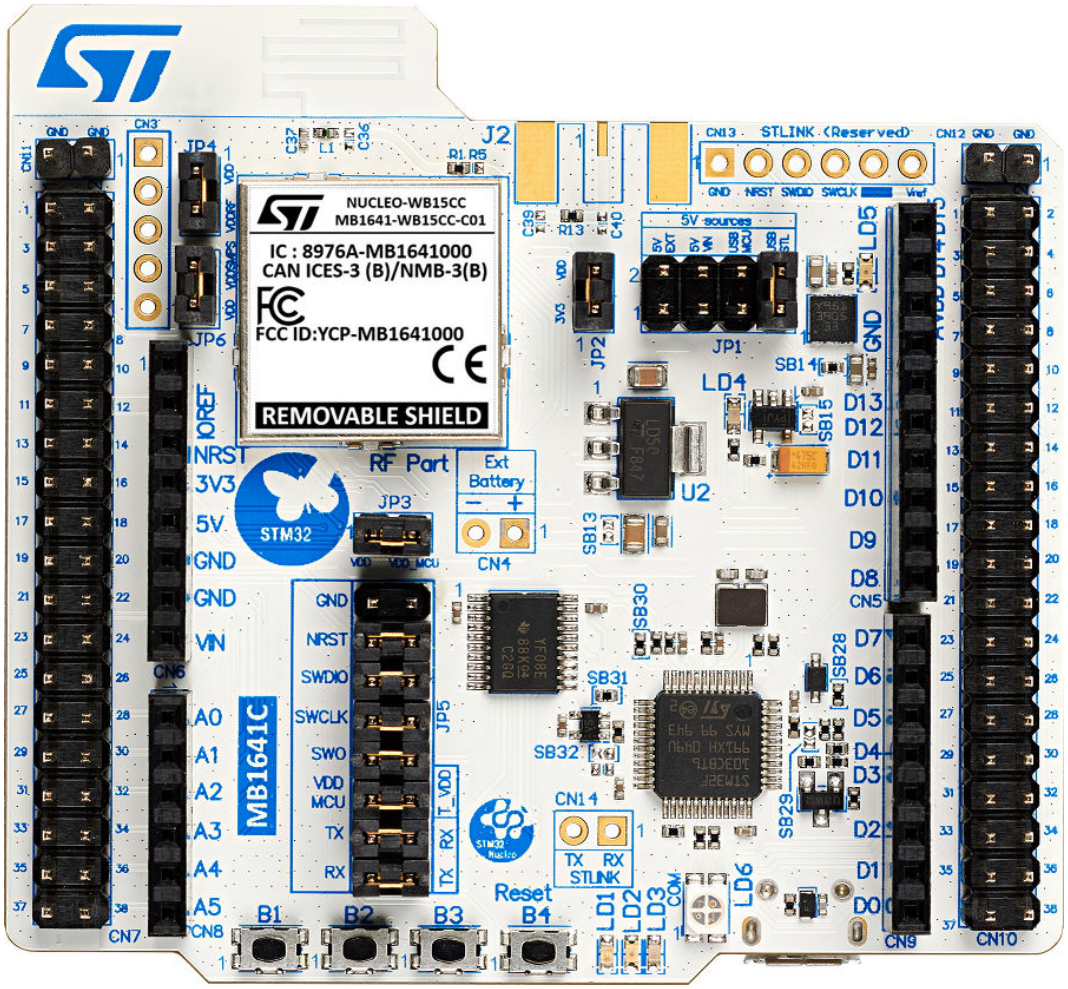
STM32WB Nucleo-64 board (MB1641)

Introduction

The NUCLEO-WB15CC STM32WB Nucleo-64 board based on the MB1641 board is a Bluetooth® LE wireless and ultra-low-power device embedding a powerful and ultra-low-power radio compliant with the Bluetooth® LE SIG specification v5.4.

The ARDUINO® Uno V3 connectivity support and the ST morpho headers provide an easy means of expanding the functionality of the STM32WB Nucleo open development platform with a wide choice of specialized shields.

Figure 1. NUCLEO-WB15CC top view



Picture is not contractual.

1 Features

- STM32WB15CC (320-Kbyte flash memory, 48-Kbyte SRAM, in VFQFPN48 package) ultra-low-power wireless microcontroller featuring:
  - Dual-core 32-bit (Arm® Cortex®-M4 and dedicated M0+ CPU for real-time radio layer)
  - 2.4 GHz RF transceiver supporting Bluetooth® specification v5.4
- Three user LEDs
- One reset and three user push-buttons
- Board connectors:
  - ARDUINO® Uno V3 expansion connector
  - ST morpho extension pin headers for full access to all STM32WB I/Os
- Integrated PCB antenna and SMA connector footprint
- Flexible power-supply options: ST-LINK USB V_{BUS}, USB connector, or external sources
- On-board footprint to mount a CR2032 battery socket
- 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 STM32CubeWB 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-WB15CC 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-WB15CC	MB1641(1)	STM32WB15CC

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-XXRYTZ	Description	Example: NUCLEO-WB15CC
XX	MCU series in STM32 32-bit Arm Cortex MCUs	Wireless Bluetooth® STM32WB Series
Y	Product line in the Series	STM32WBx5 product line
R	Product-specific in the product line: • 1: Die 1, full set of features	STM32WB15 MCU family
T	STM32 package pin count: • C for 48 pins	48-pin package
Z	STM32 Flash memory size: • C for 320 Kbytes	320-Kbyte Flash memory

3 Development environment

3.1 System requirements

- Multi-OS support: Windows® 10 or 11, 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 EDA resources

All board design resources, including schematics, EDA databases, manufacturing files, and the bill of materials, are available from the NUCLEO-WB15CC product page 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 it close to water or at a high humidity level.
- Do not operate the board if it is dirty or dusty.
- The pins of the board are exposed and must not come into contact with a metal surface, as this can produce a short circuit and damage the board.

5.3 Delivery recommendations

Before the first use, inspect the board for any damage that may have occurred during shipment. Ensure that all socketed components are securely fixed in their sockets and that nothing is loose in the plastic bag.

5.4 Power supply

A power supply unit or auxiliary equipment complying with the EN 62368-1:2014+A11:2017 standard (or the one replacing it) and safety extralow voltage (SELV/ES1) with limited power capability (LPS/PS2) must power this equipment.

6 Quick start

This section describes how to quickly start development using NUCLEO-WB15CC.

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 board and demonstration software, visit the www.st.com/stm32nucleo webpage.

Before the first use, make sure that no damage has occurred to the board during shipment:

- All socketed components must be firmly secured in their sockets.
- Nothing must be loose in the board blister.

The Nucleo board is an easy-to-use development kit to quickly evaluate and start development with an STM32 microcontroller in a QFN48 package.

6.1 Getting started

Follow the sequence below to configure the STM32WB Nucleo-64 board and launch the demonstration application (Refer to Section 7 for component location):

1. Check jumper positions on board: JP2, JP3, JP4, and JP6 ON, JP1 (Power source) on USB_STL, all JP5 jumpers ON except for GND.
2. Install the STMicroelectronics Bluetooth® LE sensor mobile application on a Bluetooth® LE compatible mobile device from App Store® or Google Play™.
3. Connect the Nucleo board to a PC with a USB Type-A or USB Type-C® to Micro-B cable through CN15 USB ST-LINK connector. Once powered on, the LD2 green LED blinks for each advertising interval – timeout after one minute.
4. Use the STMicroelectronics Bluetooth® LE sensor mobile application to detect the STM32WB P2P server (P2PSRV1) and connect it. Once connected, the LD2 green LED blinks for each connection interval. The smartphone application displays the device's service and characteristics.
5. Pushing the B1 button on the board toggles the alarm on the smartphone display. Pushing the B2 button changes the connection interval (50 ms, 1 s). The effect is visible directly on the LD2 green LED of the Nucleo board. On the smartphone, push the lamp to switch ON or OFF the Nucleo board LD1 blue LED. For more details, refer to the user manual *STM32CubeWB Nucleo demonstration firmware* (UM2551).
6. The demonstration software and several software examples showing how to use the STM32 Nucleo features are available from the NUCLEO-WB15CC product location.

7 Hardware layout and configuration

7.1 Hardware layout and configuration

The NUCLEO-WB15CC Nucleo-64 board is designed around the STM32WB15CC microcontroller. The hardware block diagram in Figure 2 illustrates the connection between NUCLEO-WB15CC and its peripherals (ARDUINO® Uno V3 connector, ST morpho connector, and embedded ST-LINK).

Figure 3 to Figure 5 help the user to locate these features on the NUCLEO-WB15CC board.

Figure 2. Hardware block diagram

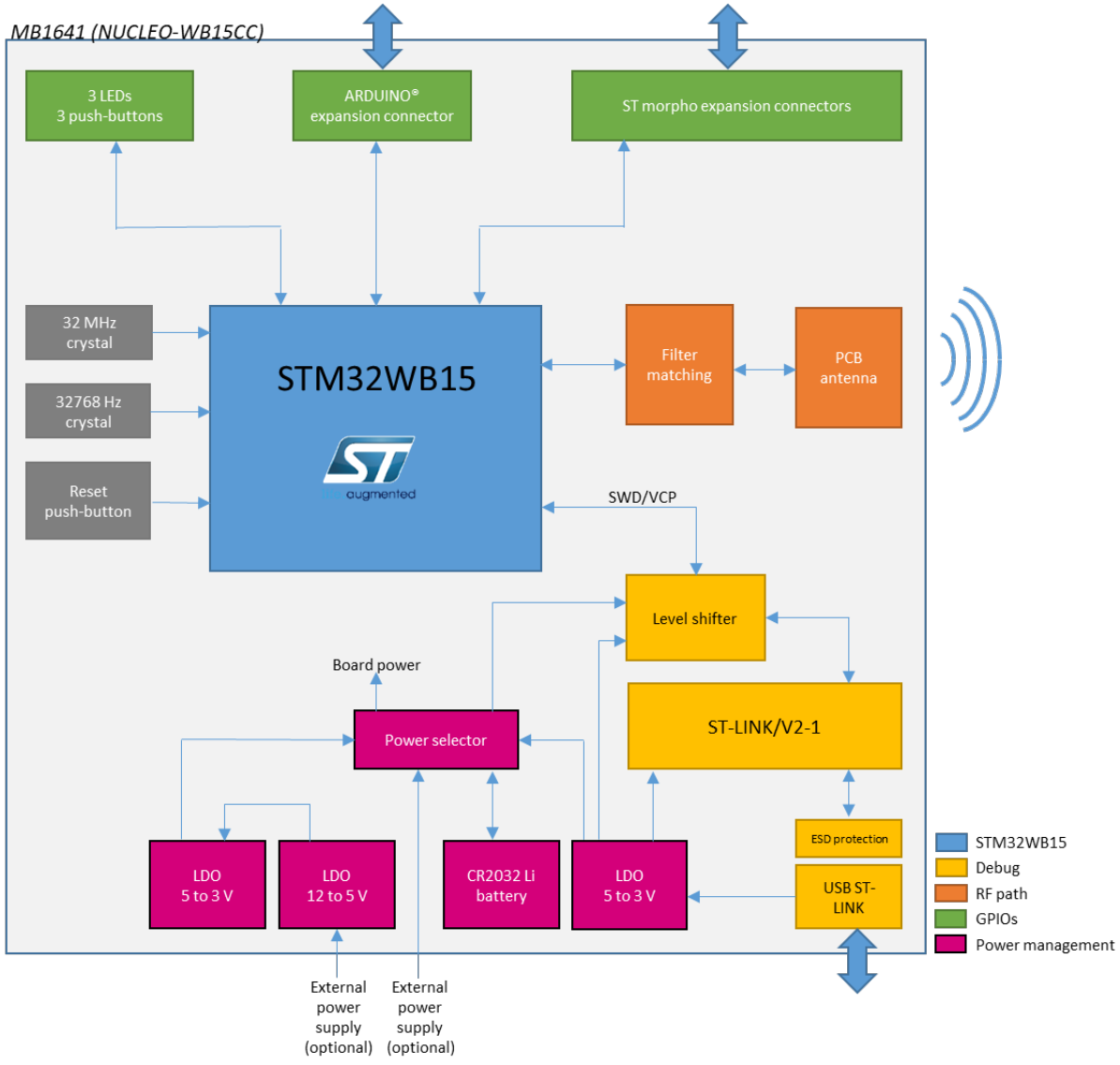


Figure 3. **NUCLEO-WB15CC PCB top side**

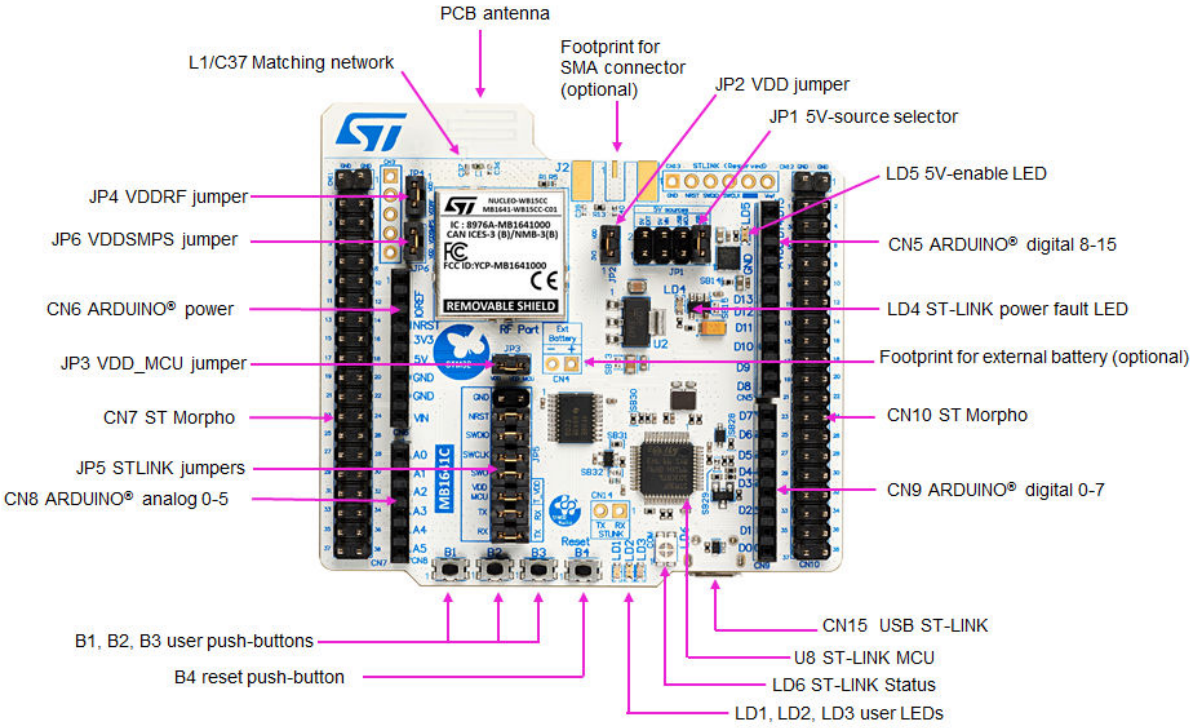


Figure 4. **NUCLEO-WB15CC PCB with details of the main part (SoC and RF)**

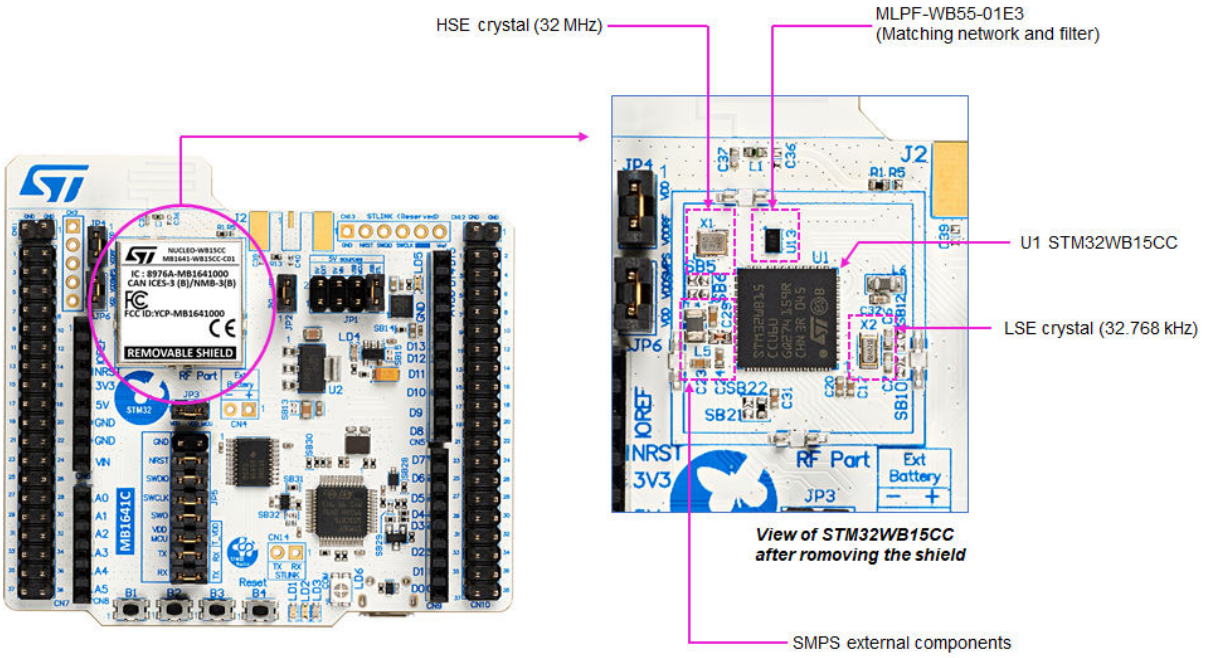
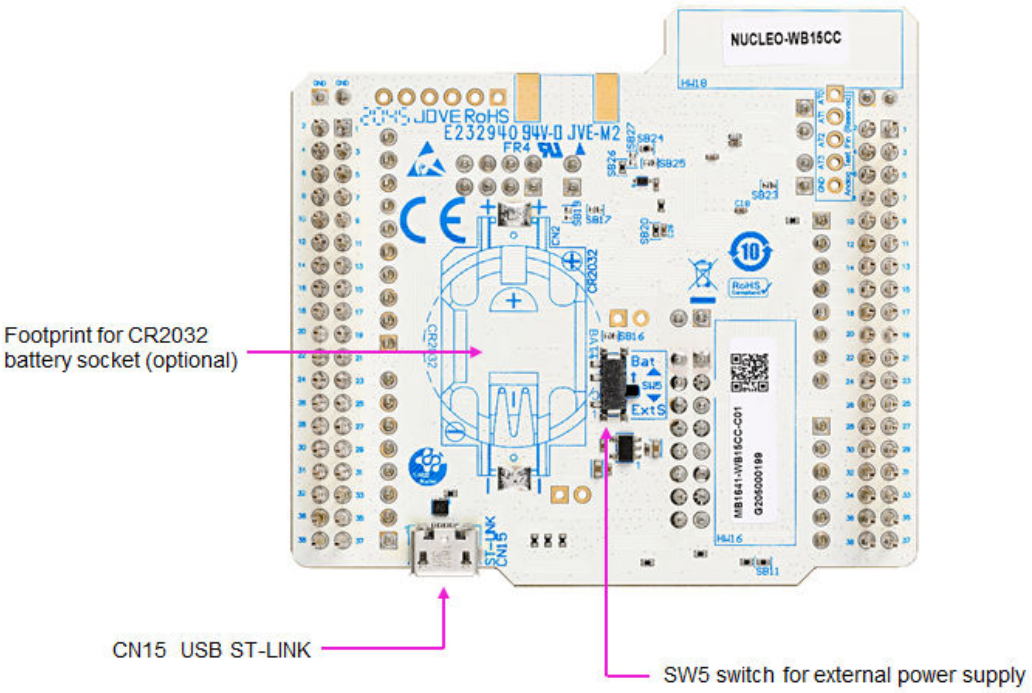
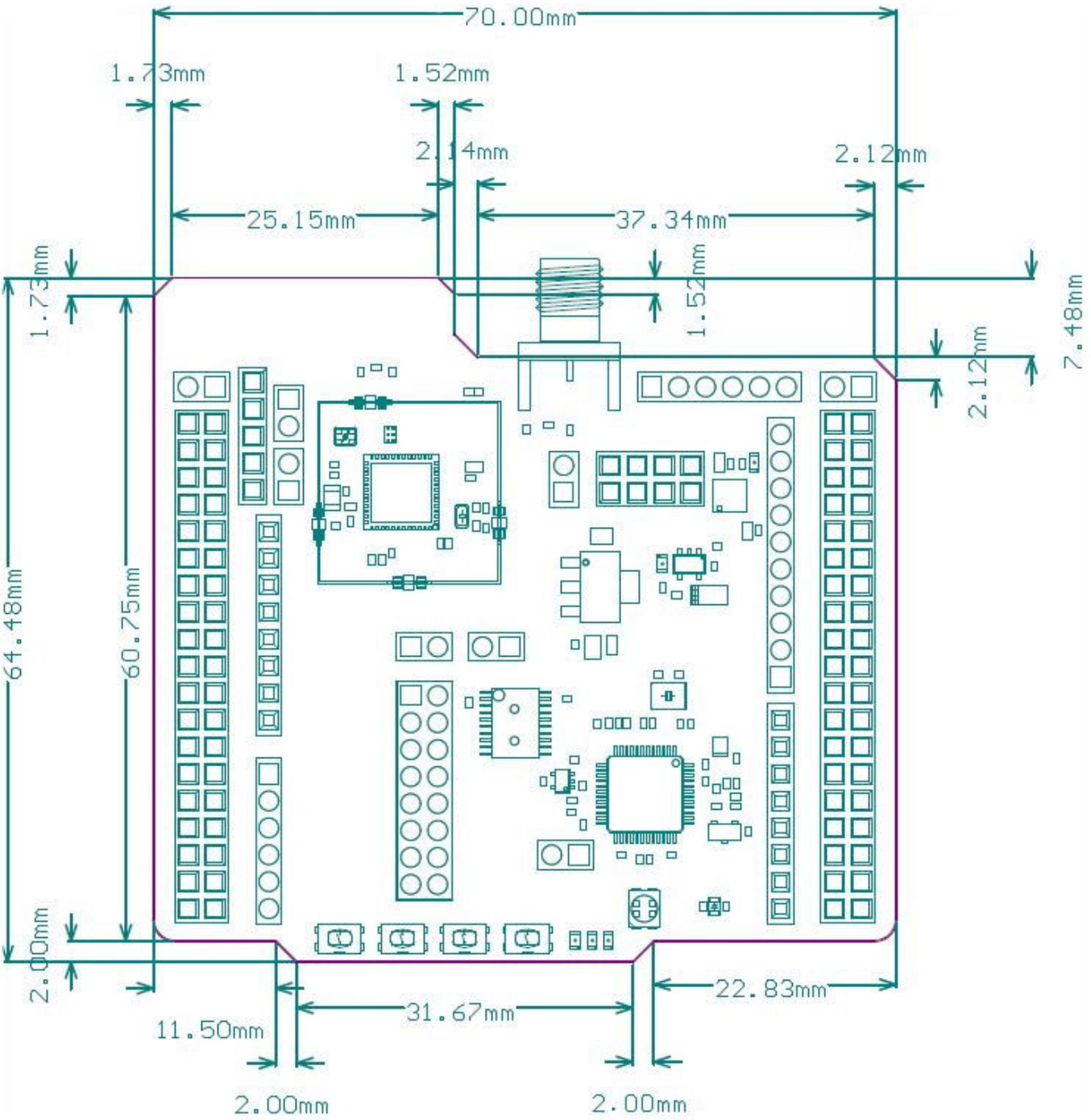


Figure 5. **NUCLEO-WB15CC PCB bottom side**



7.2 Hardware layout

Figure 6. **NUCLEO-WB15CC mechanical dimensions (in millimeters)**



7.3 Embedded ST-LINK/V2-1

The ST-LINK/V2-1 programming and debugging tool is integrated into the NUCLEO-WB15CC Nucleo-64 board. 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 features.

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
- USB power management request for more than 100 mA power on USB (limited to 300 mA for this board)

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

- Application voltage lower than 3 V

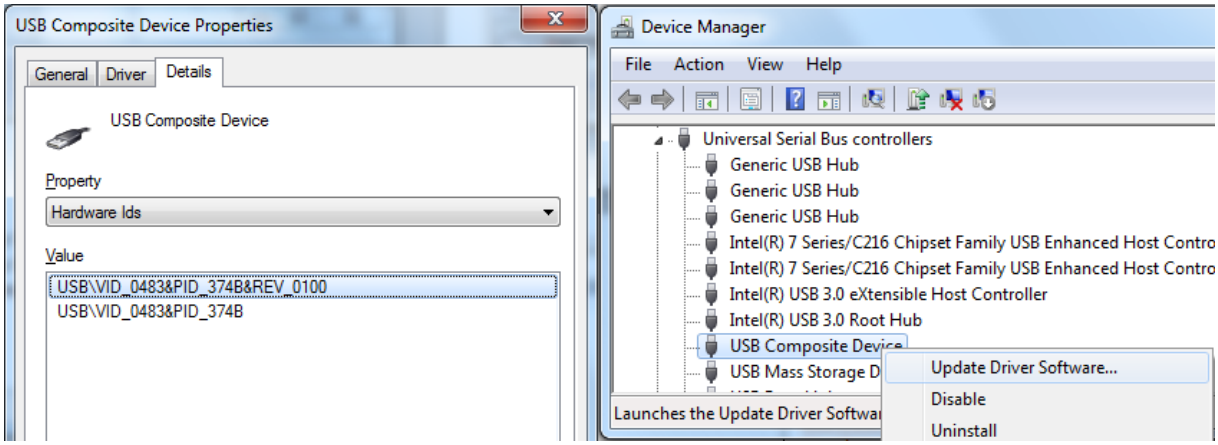
7.3.1 Drivers

The ST-LINK/V2-1 requires a dedicated USB driver, which, for Windows 7®and Windows 8®, is found at *www.st.com*. For Windows 10®, it is not necessary to install the driver, as the ST-LINK is automatically identified.

In case the NUCLEO-WB15CC Nucleo-64 board is connected to the PC before the driver is installed, some board 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 7.

Note: Prefer using the "USB Composite Device" handle for a full recovery.

Figure 7. USB composite device



7.3.2 ST-LINK/V2-1 firmware upgrade

The ST-LINK/V2-1 embeds a firmware upgrade mechanism for the in-place upgrade through the USB port. The firmware might evolve during the lifetime of the ST-LINK/V2-1 product (for example new functionalities, bug fixes, support for new microcontroller families). It is recommended to visit the *www.st.com* website before starting to use the NUCLEO-WB15CC Nucleo-64 board and periodically, to stay up to date with the latest firmware version.

7.3.3 CN15 ST-LINK/V2-1 USB connector

The main function of this connector is the access to ST-LINK/V2-1 embedded on NUCLEO-WB15CC for programming and debugging purposes as explained above. It can supply the board (Refer to Section 7.4: Power supply).

The connector is a standard USB Micro-B connector.

Table 4. USB Micro-B connector CN23 (front view)

Pin number	Pin name	Signal name	Functions
1	VBUS	5V_USB_ST_LINK	VBUS Power
2	DM	USB_STLK_N	DM
3	DP	USB_STLK_P	DP
4	ID	-	-
5	GND	GND	GND

7.3.4 Virtual COM port: USART1

ST-LINK/V2-1 offers a USB Virtual COM port bridge. This feature gives access to the USART1 of the STM32WB15CC by the CN15 USB ST-LINK connector.

By default, this USART1 interface of STM32WB15CC is connected to the UART2 port of the ST-LINK/V2-1 MCU (STM32F103).

This VCP can be used differently with an intermediate connection. On the CN14 connector both TX and RX signals are available and two solder bridges can disconnect the UART coming from SoC.

Table 5. UART interface pinout description

Name	I/O	Wake-up available
USART1 RX (PA10/pin 36)	Pin 1	STLINK_TX: UART2 TX (PA2/pin 12)
USART1 TX (PA9/pin 18)	Pin 2	STLINK_RX: UART2 RX (PA3/pin 13)

7.3.5 Level shifter

NUCLEO-WB15CC has a system to supply STM32WB15CC with a different voltage than ST-LINK. The ST-LINK is always supplied by 3.3 V sources. By default, STM32WB15CC is supplied by the same voltage value as ST-LINK, but it is possible to supply the SoC with another value. It accepts a voltage between 1.8 and 3.3 V trust to a level shifter. This specific component assures the voltage conversion between the ST-LINK and the SoC. It drives SWD and UART signals connected to VCP on ST-LINK.

7.3.6 JP5 multi-function jumper

The JP5 multi-function jumper can connect ST-LINK/V2-1 to STM32WB15CC. It is located between the level shifter and the SoC. It is referenced to the VDD domain (STM32WB15CC supply voltage domain).

Figure 8. Interconnection bloc diagram between STM32WB15CC and ST-LINK/V2-1

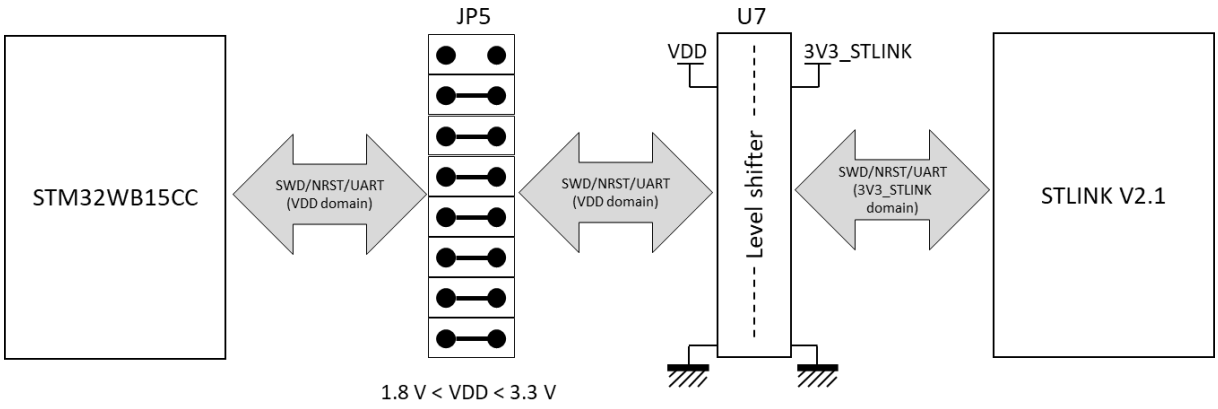


Table 6. Multi-function jumper pinout description

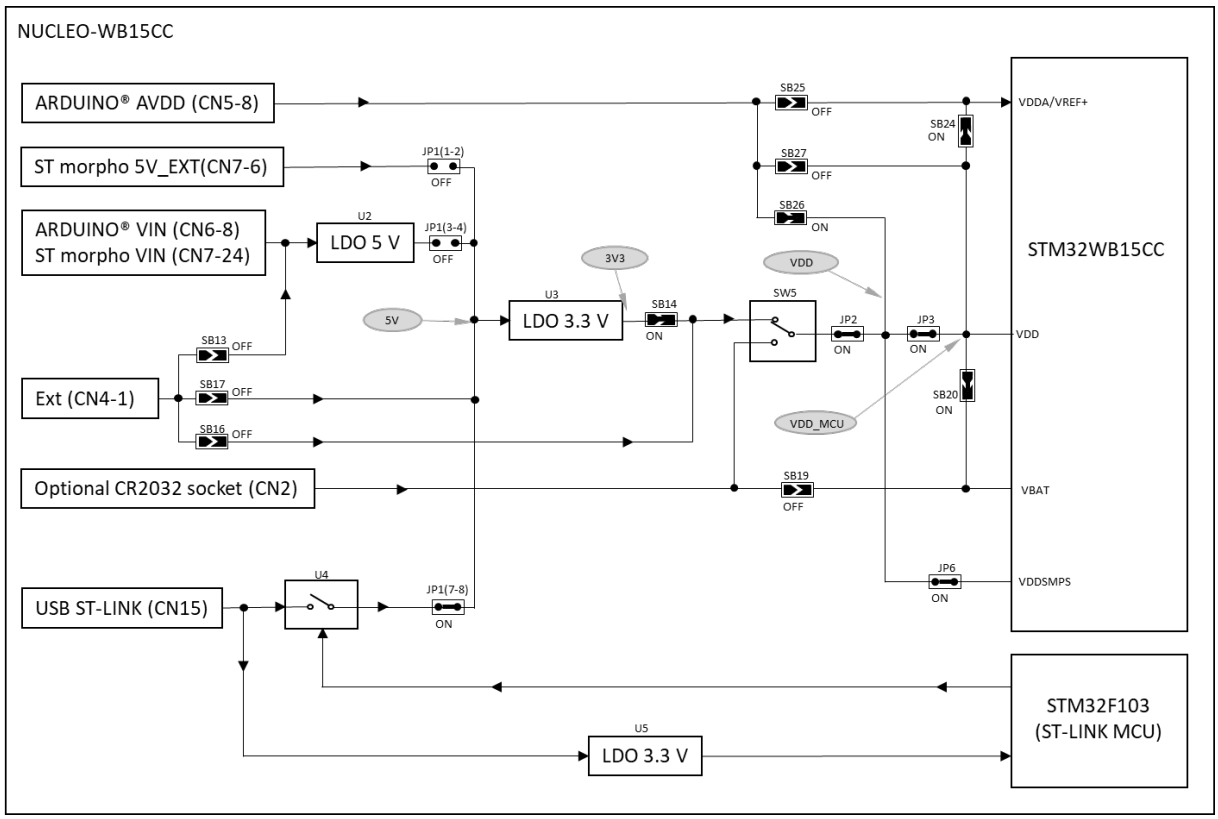
STM32WB15CC	JP5	STM32F103 (ST-LINK)
GND	1-2	GND
NRST (pin 7)	3-4	T_NRST (PB0/pin 18)
SWDIO (PA13/pin 39)	5.6	T_SWDIO (PB12-PB14/pin 25-pin 27)
SWCLK (PA14/pin 41)	7-8	T_SWCLK (PA5-PB13/pin 15-pin 26)
SWO (PB3/pin 43)	9-10	T_SWO (PA10/pin 31)
VDD	11-12	T_VDD
USART1 TX (PA9/pin 18)	13-14	STLINK_RX: UART2 RX (PA3/pin 13)
USART1 RX (PA10/pin 36)	15-16	STLINK_TX: UART2 TX (PA2/pin 12)

7.4 Power supply

7.4.1 General description

By default, the STM32WB15CC microcontroller embedded on this Nucleo board is supplied by 3V3 but the board proposes a lot of possibilities to supply the device. The 3.3 V can first come from the ST-LINK USB, ARDUINO®, or ST morpho connectors. Moreover, the STM32WB15CC can be supplied by an external source, between 1.8 and 3.3 V. Thanks to the level shifter, the debug by embedded ST-LINK is always possible even if the supply voltage of the target is different from 3V3 (ST-LINK supply). Figure 9 shows the power tree. Moreover, this figure also shows the default state of the jumpers and the solder bridges.

Figure 9. NUCLEO-WB15CC power tree



7.4.2 7 to 12 V power supply

NUCLEO-WB15CC can be powered with a 7 to 12 V DC power source. There are three accesses for this type of DC levels:

1. VIN CN6 pin 8 of the ARDUINO® connector. It is possible to apply until +12 V on this pin or use an ARDUINO® shield which can deliver this type of voltage on the VIN pin.
2. VIN CN7 pin 24 of the ST morpho connector. It is possible to apply until +12 V on this pin like for the ARDUINO® connection.
3. CN4 external input. In this case, pay attention to the setting of the jumpers and solder bridges which is very important. Refer to Table 7.

These sources are connected to the U2 linear low drop voltage regulator. The 5 V output of this regulator is a potential source of 5V. Refer to Section 7.4.3for further details.

7.4.3 5 V power supply

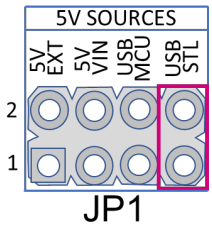
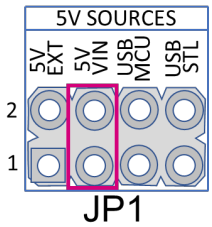
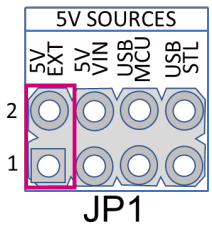
NUCLEO-WB15CC can be powered with a 5 V DC power source. The 5 V can come from several connectors:

1. 5V_USB_STLK connected to CN11 (default configuration for the supply of the board). This connector is dedicated to the access of ST-LINK/V2 and Virtual COM port and therefore can get supply from the host computer. It is also possible to connect a USB charger to this connector. In this case, the ST-LINK and the VCP cannot be accessible.
2. CN4 external input. In this case, pay attention to the setting of the jumpers and solder bridges which is very important. Refer to Section 7.4.2 for more details.
3. 5V_EXT CN7 pin 6 of ST morpho connector.
4. 7-12V input through the U2 voltage regulator. Refer to Section 7.4.2for further details.

The JP1 jumper selects the 5V source. Table 7 shows the configuration versus the selected source.

Depending on the current needed by the devices connected to the USB port, and the board itself, power limitations can prevent the system from working as expected. The user must ensure that the NUCLEO-WB15CC is supplied with the correct power source depending on the current needed.

Table 7. JP1 power supply selector description

Jumper / Solder bridge	Setting	Configuration
JP1 5V supply source selector		**Default setting** **NUCLEO-WB15CC is supplied through the CN15 Micro-B USB receptacle (USB ST-LINK)**
		NUCLEO-WB15CC is supplied through the CN6 pin 8 (ARDUINO®) or CN7 pin 24 (ST morpho) or CN4 (Refer to configuration details in the present power supply section).
		NUCLEO-WB15CC is supplied through CN7 pin 6 directly.

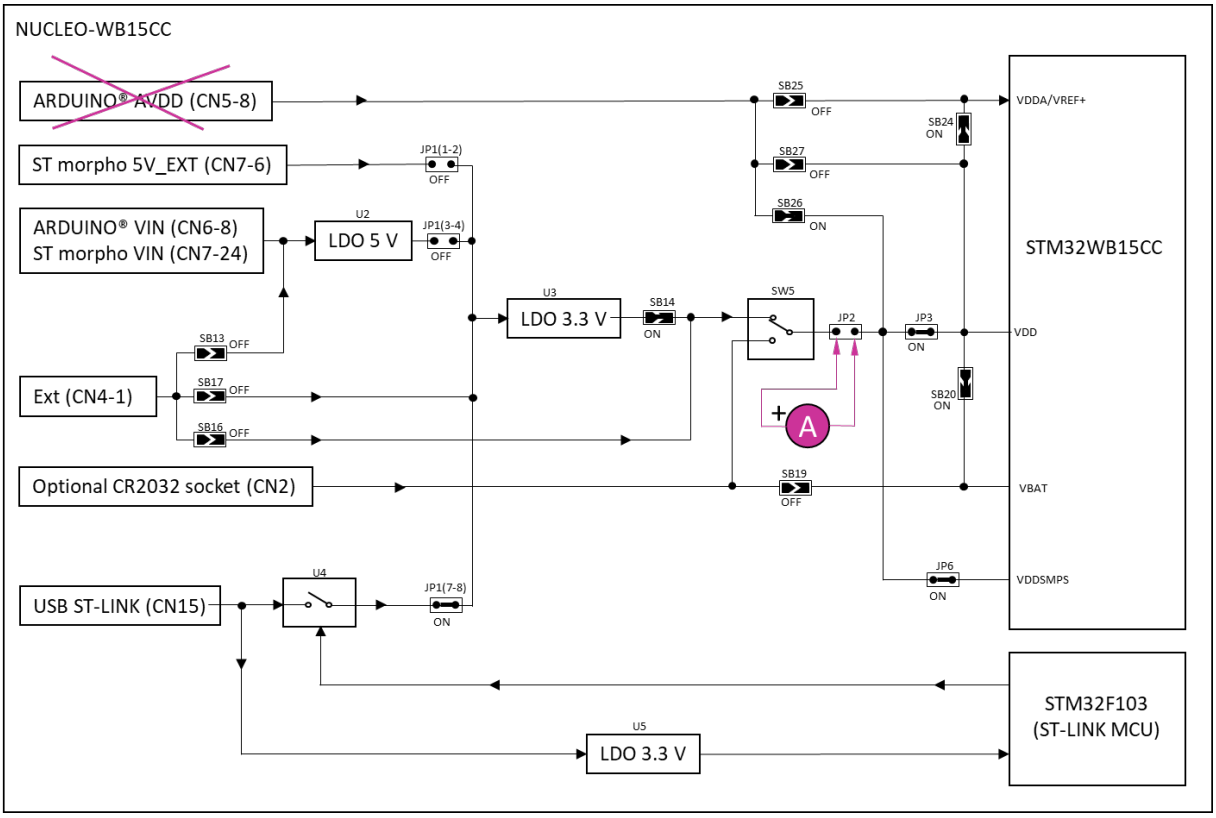
When 5V_USB_STLINK is used, JP1 is set on [7-8]. The sequence is specific. In the beginning, only STM32F103 is supplied. If the USB enumeration succeeds, the 5V_USB_STLNK power is enabled by asserting the PWR_ENn signal from STM32F103CBT6. This pin is connected to a TPS2041C power switch which supplies the rest of the board. This power switch also features a current limitation to protect the host PC in case of currents exceeding 300 mA.

7.4.4 Current measurement

As the device has low power features, it can be interesting to measure the current consumed by NUCLEO-WB15CC. To easily do this measurement, there are two possibilities:

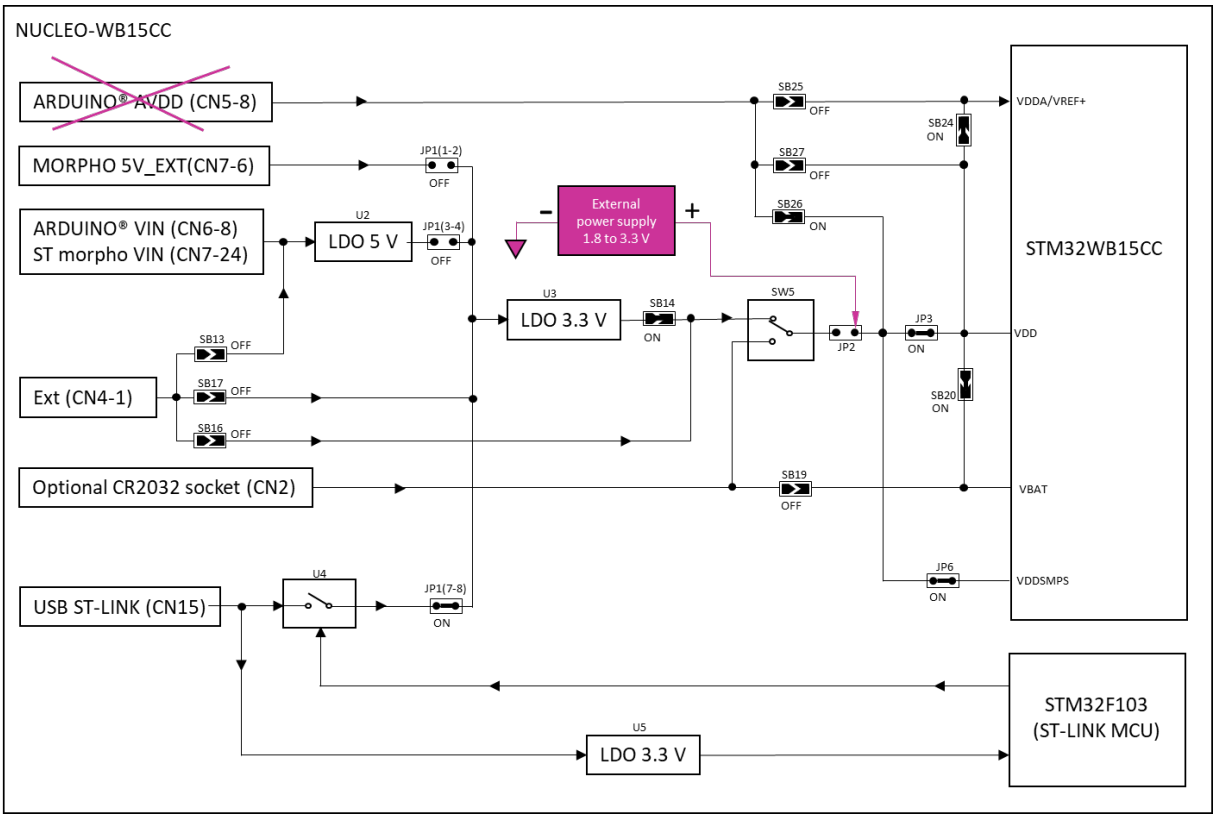
1. Measure the supply current of the SoC using an ammeter in place of the JP1 jumper. In this case, all supply sources can be used except the AVDD coming from the ARDUINO® connector. Figure 10 shows the configuration.

Figure 10. Current measurement with an ammeter



2. Use an external power supply with current measurement capabilities. In this case, the JP2 jumper must be removed, and the supply connected to JP2 pin 2, as shown in Figure 11. The supply voltage must be between 1.8 and 3.3 V. AVDD input (CN1 pin 8) must not be used during this measurement.

Figure 11. Current measurement with an external power supply



7.5 Clock sources

7.5.1 HSE clock reference

The accuracy of the HSE high-speed clock of the SoC is committed to a 32 MHz crystal oscillator. The HSE oscillator is trimmed during board manufacturing.

7.5.2 LSE clock reference

The accuracy of the LSE low-speed clock of the SoC is committed to a 32.768 kHz crystal oscillator.

7.6 Reset sources

The NUCLEO-WB15CC reset signal is active LOW. The internal pull-up resistor forces the RST signal to a high level.

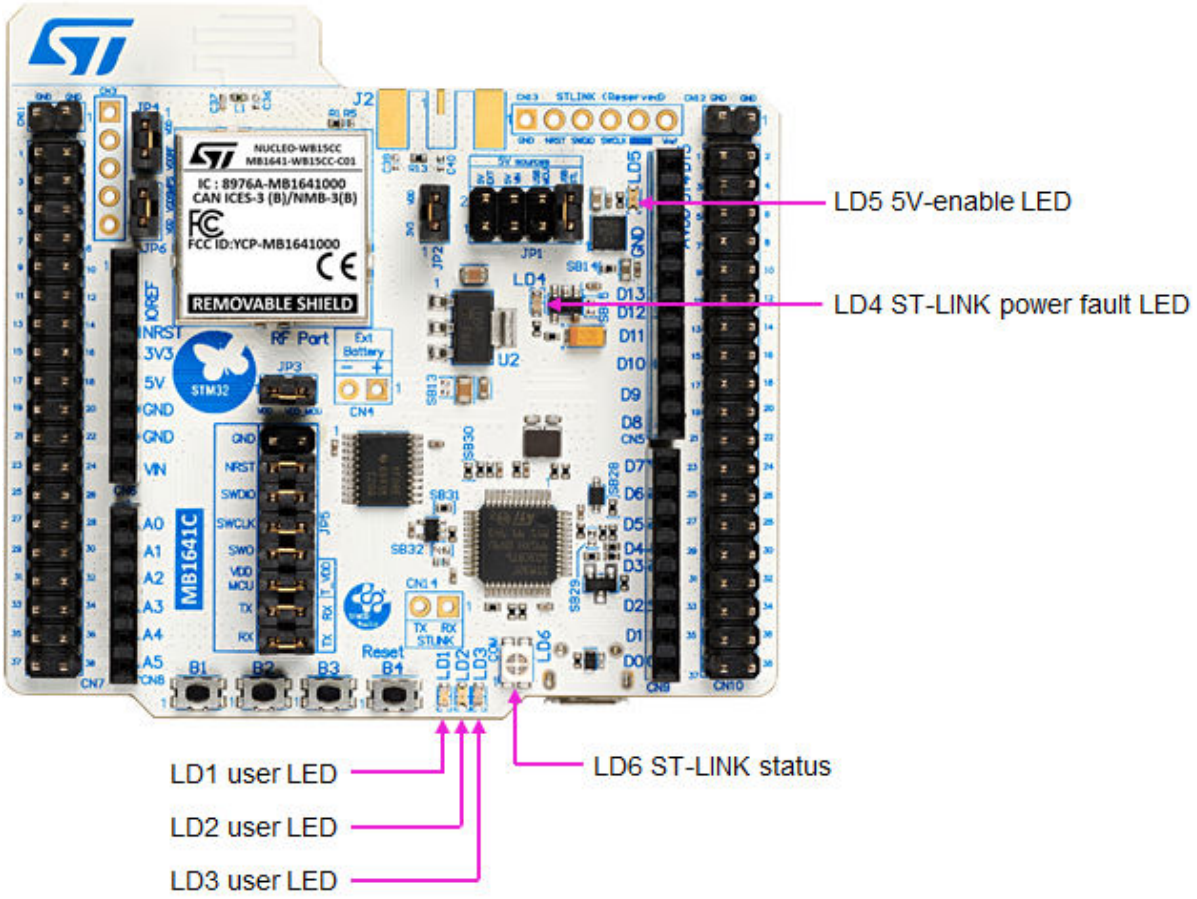
The sources of reset are:

- B4 reset push button
- Embedded ST-LINK/V2-1
- CN2 ARDUINO® connector pin 3 (ARDUINO® board reset).
- CN7 ST morpho connector pin 14

7.7 LEDs

Six LEDs on the top side of the Nucleo board help the user during the application development.

Figure 12. LEDs location



1. *LD1: this blue LED is available for user application.*
2. *LD2: this green LED is available for user application.*
3. *LD3: this red LED is available for user application.*
4. *LD4: this LED turns red to indicate that the current distribution cannot be performed as expected when the board is supplied by USB_STLINK.*
5. *LD5: this LED turns green when the 5V is available. To select the 5 V source, refer to Section 7.4.3for further details.*
6. *LD6 is a bi-color LED, which default status is red. It turns to green to indicate that communication is in progress between the host PC and ST-LINK/V2-1 with the following steps:*
   - *Slow blinking red and OFF: at power-on, before USB initialization*
   - *Fast blinking red and OFF: after the first correct communication between the host PC and ST-LINK/V2-1 (enumeration)*
   - *Red ON: when initialization between the host PC and ST-LINK/V2-1 is successfully finished.*
   - *Green ON: after successful target communication initialization*
   - *Blinking red and green: during communication with the target*
   - *Green ON: communication is successfully finished and OK.*
   - *Orange ON: communication failure.*

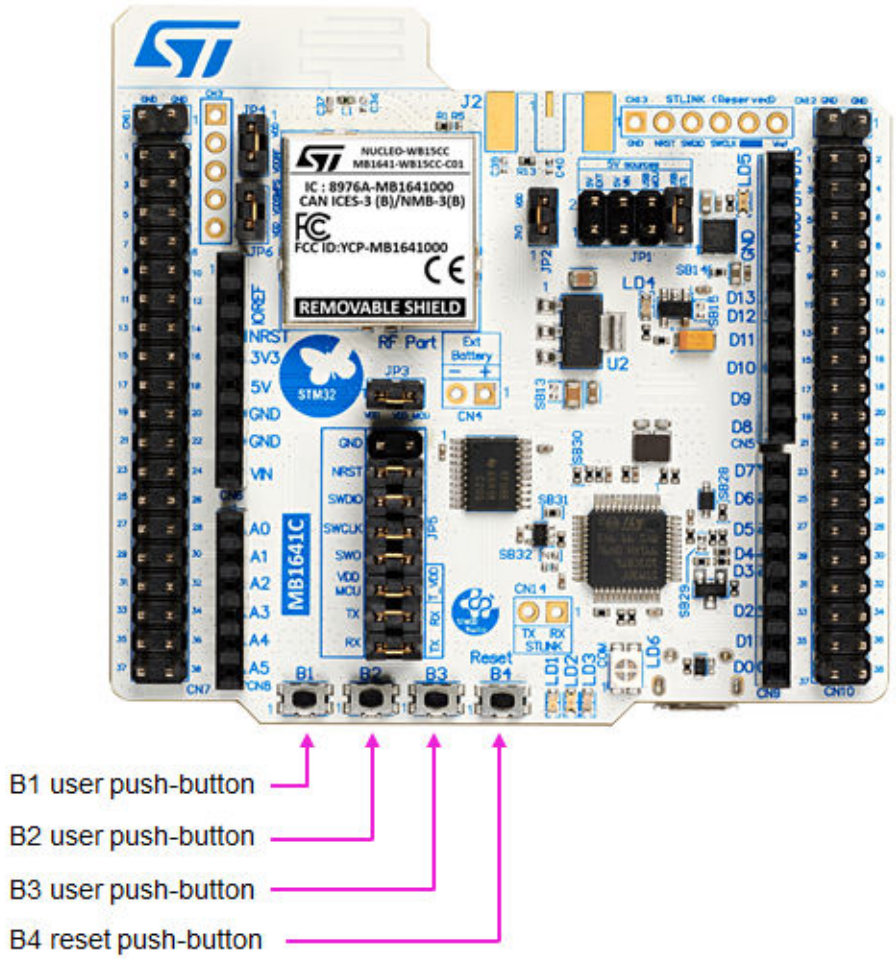
7.8 Push-buttons

7.8.1 Description

NUCLEO-WB15CC provides two types of buttons:

- B1 USER1 pushbutton
- B2 USER2 pushbutton
- B3 USER3 pushbutton
- B4 reset pushbutton to reset the NUCLEO-WB15CC board.

Figure 13. Push-buttons location



7.8.2 Reset push-button

B4 is dedicated to the hardware reset of the NUCLEO-WB15CC board.

7.8.3 User push-buttons

There are three push-buttons available for the user application. They are connected to PA0, PE4, and PA6. It is possible to use them for GPIO reading or to wake up the device (only B1).

Note that PA0 is also connected to ARDUINO® and ST morpho connectors as GPIO, depending on the use case that can generate conflict with B1. In this case, it possible to remove the connection of B1 (SB11 OFF).

Table 8. I/O configuration for the physical user interface

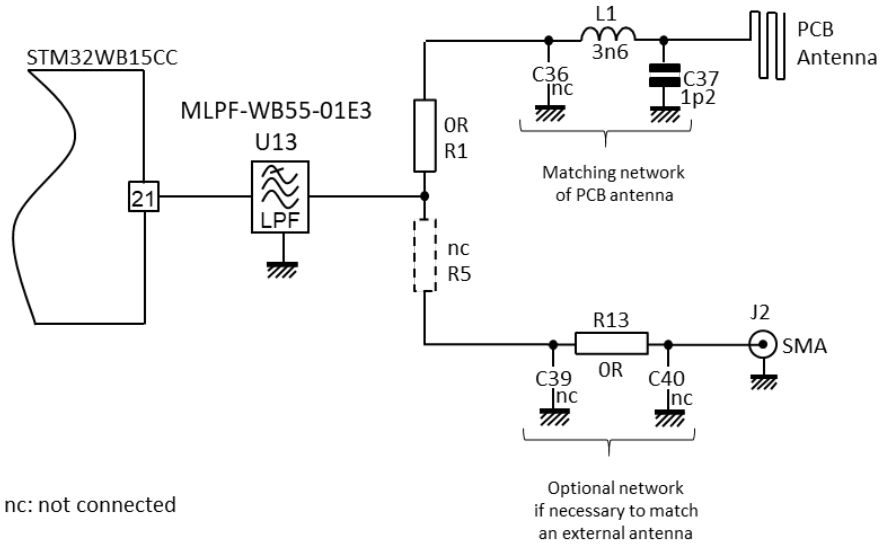
Name	I/O	Wake-up available
B1 USER1 push-button	PA0	WKUP1
B2 USER2 push-button	PE4	-
B3 USER3 push-button	PA6	-

7.9 RF I/O stage

The RF output stage is configured by default to use a PCB antenna. Nevertheless, for laboratory characterization, it is possible to use an SMA connector (not fitted by default).

Figure 14 shows the RF output stage schematic. On the I/O pin, a specific component manufactured by STMicroelectronics allows to match the pin to 50 Ω and embeds a low pass filter which allows satisfying the certification requirements.

Figure 14. RF I/O stage



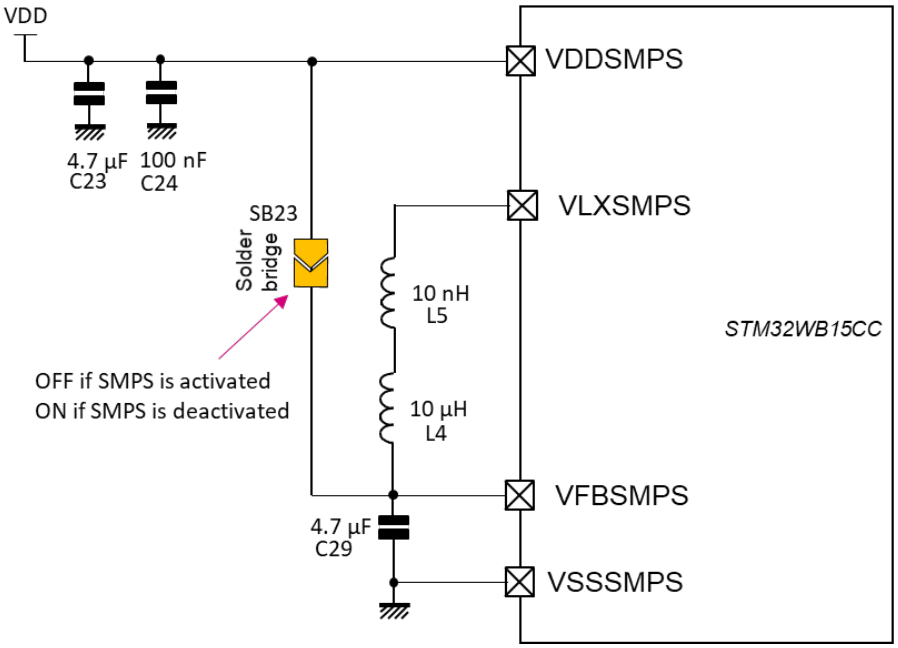
The components C36, L1, and C37 build the matching network of the PCB antenna. The footprint couple R1 and R5 allows switching the direction of the RF I/O. If R1 is ON (default), the PCB antenna is used. If the 0 Ω resistor presents on the R1 footprint is moved on the R5 footprint the SMA direction is used. C39, R13, and C40 are available footprints to build a matching network for an external antenna. By default, the connection to SMA is direct without matching network). R13 is 0 Ω resistor, C39 and C40 are OFF.

7.10 Embedded SMPS

NUCLEO-WB15CC embeds an SMPS to optimize the power consumption. All the details of this part are explained in the datasheet and the reference manual of the NUCLEO-WB15CC. NUCLEO-WB15CC allows the evaluation of the SoC with this SMPS active. All the components necessary for the operation are present.

Moreover, it is possible to bypass the SMPS. For that, it is first necessary to stop the SMPS by firmware (Refer to the SMPS section in the datasheet and user manual). And in a second time, it is possible to bypass the SMPS, for that it is necessary to close SB23.

Figure 15. SMPS part

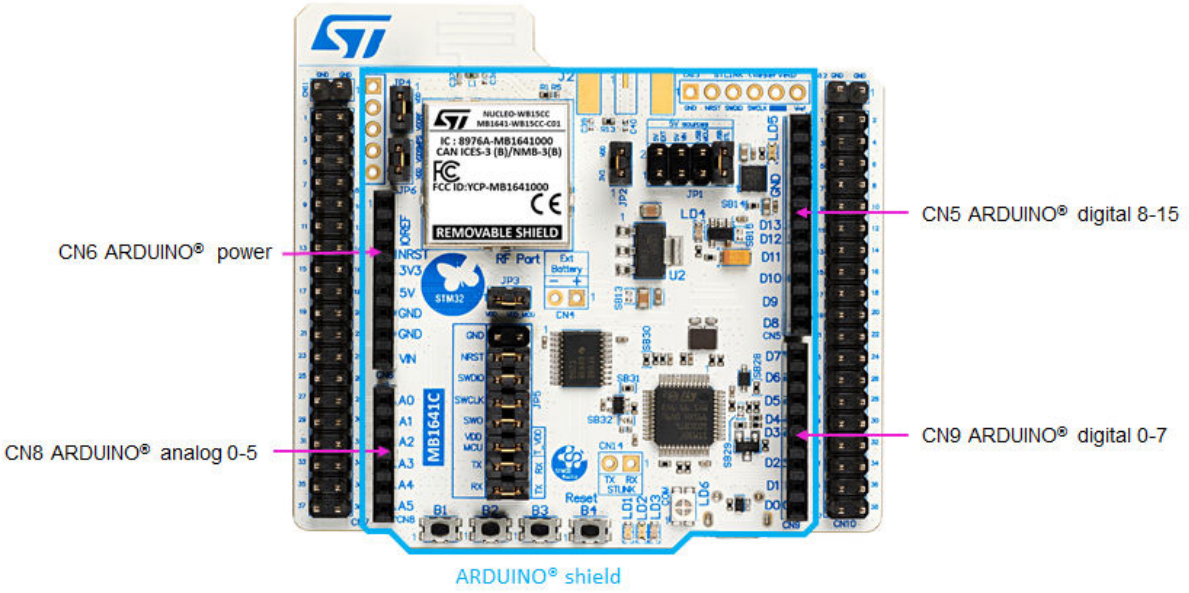


7.11 ARDUINO® connector

7.11.1 Description

On the bottom side of the board, there is an ARDUINO® Uno V3 extension socket. It is built around four standard CN5, CN6, CN8, and CN9 connectors. Most shields designed for ARDUINO® can fit with the development boards to offer flexibility in small form factor applications.

Figure 16. ARDUINO® Uno connectors and ARDUINO®shield location



7.11.2 Operating voltage

The ARDUINO® Uno V3 connector supports 5 V, 3.3 V, and VDD for I/O compatibility.

Caution: *Do not supply 3.3 V or 5 V from the ARDUINO® shield. Supplying 3.3 V or 5 V from the ARDUINO® shield may damage the Nucleo board.*

Furthermore, if it is necessary to supply the Nucleo board by the ARDUINO® connector, a dedicated pin is available. VIN can supply the board directly. Refer to Section 7.4.2for further details.

7.11.3 ARDUINO® interface and pinout

Figure 17 shows the position and pinout of the ARDUINO® shield when it is plugged on NUCLEO-WB15CC. The pinout showed on this figure corresponds to the standard ARDUINO® naming. To see the correspondence with the STM32, refer to Table 9.

Figure 17. ARDUINO® connector location and pinout

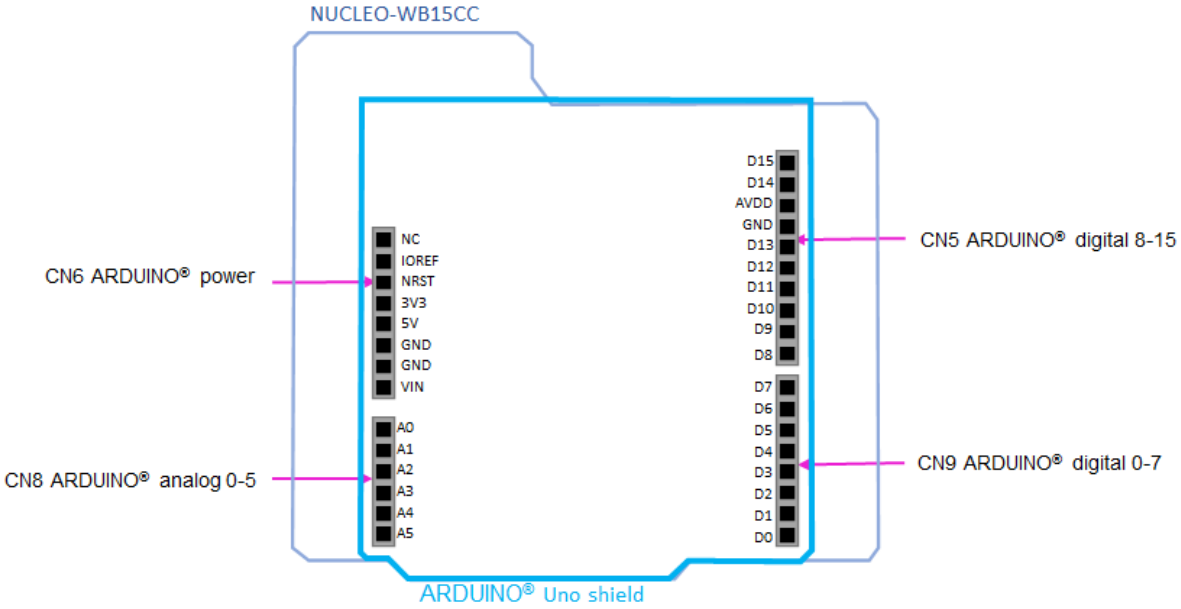


Table 9. **ARDUINO® connector pinout**

Connector	Pin number	Signal name	STM32 pin	Comment
CN6	1	-	-	Not connected (Reserved for the test)
	2	3V3 (IOREF)	-	IOREF 3.3 V
	3	NRST	NRST	NRST
	4	3V3	-	3.3 V
	5	5V	-	5 V
	6	GND	-	GND
	7	GND	-	GND
	8	VIN	-	External Supply Input (+12 V)
CN8	1	A0	PA4	ADC1_IN9
	2	A1	PA6	ADC1_IN11
	3	A2	PA1	ADC1_IN6
	4	A3	PA0	ADC1_IN5
	5	A4	PA2	ADC1_IN7
	6	A5	PA3	ADC1_IN8
CN9	1	ARD_D0	PB7	USART1_RX
	2	ARD_D1	PB6	USART1_TX
	3	ARD_D2	PB0	GPIO
	4	ARD_D3	PA12	GPIO
	5	ARD_D4	PB1	GPIO/LPTIM2_IN1
	6	ARD_D5	PA11	GPIO/TIM2_CH4
	7	ARD_D6	PA8	GPIO/TIM1_CH1
	8	ARD_D7	PE4	GPIO
CN5	1	ARD_D8	PB5	GPIO
	2	ARD_D9	PA15	GPIO/TIM2_CH1
	3	ARD_D10	PB2	SPI1_NSS
	4	ARD_D11	PA7	SPI1_MOSI
	5	ARD_D12	PB4	SPI1_MISO
	6	ARD_D13	PA5	SPI1_SCK/TIM2_CH1
	7	GND	-	GND
	8	AVDD	-	VDDA
	9	ARD_D14	PB9	I2C1_SDA
	10	ARD_D15	PB8	I2C1_SCL

8 NUCLEO-WB15CC I/O assignment

The CN7 and CN10 ST morpho connectors are male pin headers accessible on both sides of the board. All signals and power pins of the MCU are available on these ST morpho connectors. These connectors can also be probed by an oscilloscope, logical analyzer, or voltmeter.

Figure 18. Pinout of ARDUINO® and ST morpho connectors

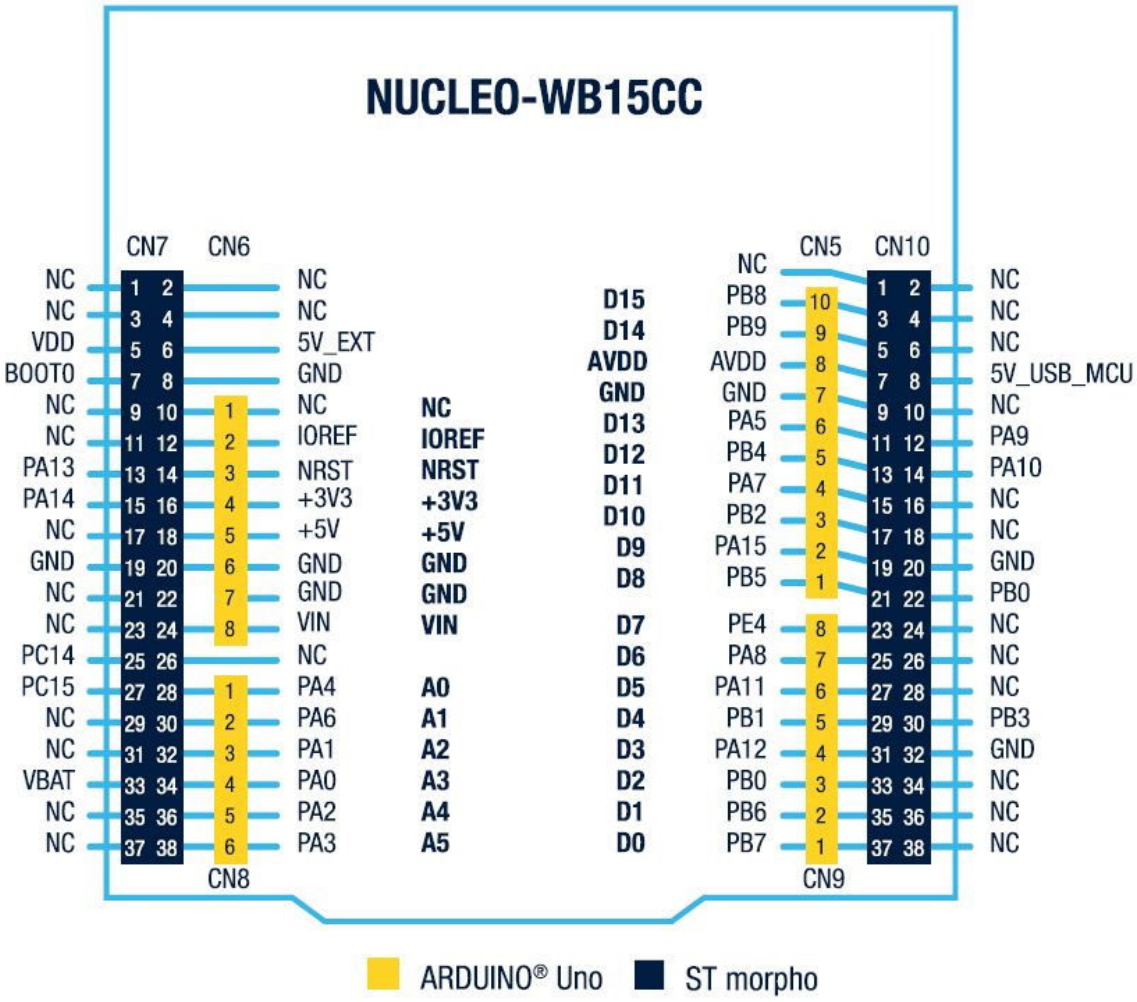


Table 10. **ST morpho connectors pinout**

CN7				CN10			
Pin number	STM32WB15CCpin name	Pin number	STM32WB15CC pin name	Pin number	STM32WB15CC pin name	Pin number	STM32WB15CC pin name
1	-	2	-	1	-	2	-
3	-	4	-	3	PB8	4	-
5	VDD	6	5V_EXT	5	PB9	6	-
7	BOOT0	8	GND	7	AVDD	8	-
9	-	10	5V_INT (with 1 kΩ resistor)	9	GND	10	-
11	-	12	3V3	11	PA5	12	PA9
13	PA13	14	NRST	13	PB4	14	PA10
15	PA14	16	3V3	15	PA7	16	-
17	-	18	5V	17	PB2	18	-
19	GND	20	GND	19	PA15	20	GND
21	-	22	-	21	P5	22	-
23	-	24	VIN	23	PE4	24	-
25	PC14	26	-	25	PA8	26	-
27	PC15	28	PA4	27	PA11	28	-
29	-	30	PA6	29	PB1	30	PB3
31	-	32	PA1	31	PA12	32	GND
33	VBAT	34	PA0	33	PB0	34	-
35	-	36	PA2	35	PB6	36	-
37	-	38	PA3	37	PB7	38	-

9 NUCLEO-WB15CC 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:

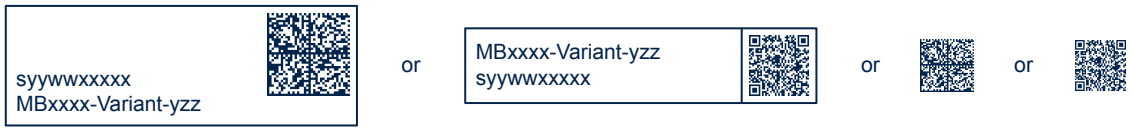
  

  Dual-sticker example:

- 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-WB15CC product history

Order code	Product identification	Product details	Product change description	Product limitations
NUCLEO-WB15CC	NUWB15CC$GU3	MCU: • STM32WB15CCU6U silicon revision "Z"	Initial revision	No limitation
		MCU errata sheet: • STM32WB15CC device errata (ES0557) STM32WB15xx device errata (ES0557)		
		Board: • MB1641-WB15CC-C01		

9.3 Board revision history

Board reference	Board variant and revision	Board change description	Board limitations
MB1641	MB1641-WB15CC-C01	Initial revision	No limitation

10 Compliance statements and conformity declarations

10.1 Federal Communications Commission (FCC) compliance statement

Product identification

- Identification of the product: NUCLEO-WB15CC-C01
  FCC ID: YCP-MB1641001

Warning: *This certification is only valid for an RF output power of 0 dBm (programmed).*

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 instructions, 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 - U.S. Contact Information:

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

10.2 Innovation, Science and Economic Development Canada (ISED) compliance statement

Product identification

- Identification of the product: NUCLEO-WB15CC-C01
  IC: 8976A-MB1641001

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.

This device complies with ISED Canada RF radiation exposure limits set forth for general population for mobile application (uncontrolled exposure).

To satisfy ISED 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.

This product complies with the ICES-003 standard class B of the ISED regulation.

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

Note: Use only shielded cables.

Identification du produit

- Identification du produit : NUCLEO-WB15CC-C01
  IC : 8976A-MB1641001

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.

Cet appareil est conforme aux limites d'exposition aux rayonnements RF d'ISDE Canada établies pour la population générale pour les applications mobiles (exposition non contrôlée).

Pour satisfaire aux exigences d'ISDE en matière d'exposition aux RF, une distance de séparation de 20 cm ou plus doit être maintenue entre l'antenne de cet appareil et les personnes pendant son fonctionnement. Pour garantir la conformité, il n'est pas recommandé de l'utiliser à une distance plus proche que celle-ci. Cet appareil ne doit pas être placé à proximité ou fonctionner en conjonction avec une autre antenne ou un autre émetteur.

Ce produit est conforme à la norme NMB-003 classe B de la ISDE.

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

Note: Utiliser uniquement des câbles blindés.

10.3 UKCA conformity

Simplified UK declaration of conformity

Hereby, the manufacturer STMicroelectronics, declares that the radio equipment type NUCLEO-WB15CC-C01 is in compliance with the UK Radio Equipment Regulations 2017 (UK S.I. 2017 No. 1206) and with the Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment Regulations 2012 (UK SI 2012 No. 3032).

The full text of the UK declaration of conformity is available at the following internet address: *www.st.com*.

Note: Use only shielded cables.

10.4 CE conformity

10.4.1 Simplified EU declaration of conformity

Hereby, STMicroelectronics declares that the radio equipment type NUCLEO-WB15CC-C01 is in compliance with directives 2011/53/EU and 2015/863/EU (RoHS), and 2014/53/EU (RED).

Frequency range used in transmission and maximal radiated power in this range for "CPN1":

- Frequency range: 2400 - 2483.5 MHz (Bluetooth®)
- Maximal power: 4 mW EIRP

The full text of the EU declaration of conformity is available on demand at the following internet address: *www.st.com*.

Note:
- *RoHS: Restriction of hazardous substances*
- *RED: Radio equipment directive*

Note: Use only shielded cables.

10.4.2 Déclaration de conformité UE simplifiée

STMicroelectronics déclare que l'équipement radioélectrique du type NUCLEO-WB15CC-C01 est conforme aux directives 2011/53/UE et 2015/863/UE (LdSD), et à la directive 2014/53/UE (RED).

Plage de fréquences utilisée en transmission et puissance rayonnée maximale dans cette plage pour "CPN1":

- Plage de fréquences: 2400 - 2483,5 MHz (Bluetooth®)
- Puissance maximale: 4 mW p.i.r.e

Le texte complet de la déclaration UE de conformité est disponible sur demande à l'adresse internet suivante : *www.st.com*.

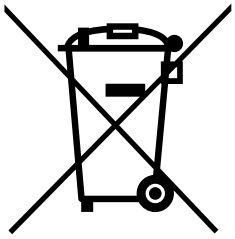
Note:
- *LdSD : directive sur la limitation de l'utilisation des substances dangereuses*
- *RED : directive sur les équipements radio-électriques*

Note: Utiliser uniquement des câbles blindés.

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 must 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, separate these items from other types of waste and recycle them responsibly at a designated collection point to promote the sustainable reuse of material resources.

Household users:

Contact the retailer that you purchased the product from or your local authority for details of your nearest designated collection point.

Business users:

Contact your dealer or supplier for further information.

Revision history

Table 11. **Document revision history**

Date	Version	Changes
12-Jul-2021	1	Initial release.
27-Oct-2025	2	Updated: • Introduction • Section 1: Features • Section 3.1: System requirements • Section 3.2: Development toolchains • Section 5: Safety recommendations • Table 7. JP1 power supply selector description • Section 9: NUCLEO-WB15CC product information • Section 10: Compliance statements and conformity declarations Added: • Section 3.4: EDA resources • Section 11: Product disposal Reorganized Section 7: Hardware layout and configuration.

Contents

List of tables

List of figures

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