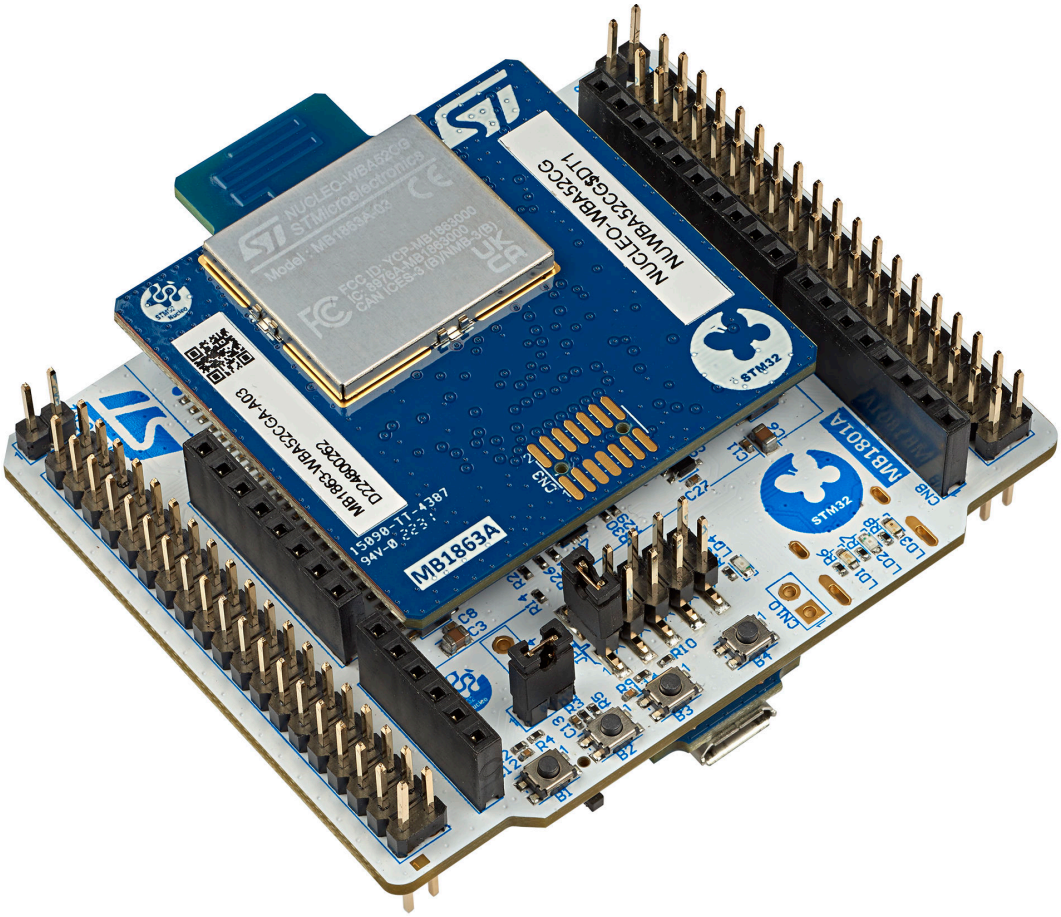
STM32WBA52 Nucleo-64 board (MB1801 and MB1863)

Introduction

NUCLEO-WBA52CG, based on the MB1801 mezzanine board and MB1863 MCU RF board, is a Bluetooth® LE wireless and ultra-low-power board 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 allow the easy expansion of the functionality of the STM32 Nucleo open development platform with a wide choice of specialized shields.

Figure 1. NUCLEO-WBA52CG global view



Picture is not contractual.

1 Features

- Ultra-low-power wireless STM32WBA52CG microcontroller based on the Arm® Cortex®-M33 core, featuring 1 Mbyte of flash memory and 128 Kbytes of SRAM in a UFQFPN48 package
- MCU RF board (MB1863):
  - 2.4 GHz RF transceiver supporting Bluetooth® specification v5.4
  - Arm® Cortex®-M33 CPU with Arm® TrustZone®, MPU, DSP, and FPU
  - Integrated PCB antenna
- Three user LEDs
- Three user and one reset push-buttons
- Board connectors:
  - USB Micro-B
  - ARDUINO® Uno V3 expansion connector
  - ST morpho headers for full access to all STM32 I/Os
- Flexible power-supply options: ST-LINK USB V_{BUS} or external sources
- On-board STLINK-V3MODS debugger/programmer with USB re-enumeration capability: mass storage, Virtual COM port, and debug port
- Comprehensive free software libraries and examples available with the STM32CubeWBA MCU Package
- Support of a wide choice of Integrated Development Environments (IDEs) including IAR Embedded Workbench®, MDK-ARM, and STM32CubeIDE

Note: Arm and TrustZone are registered trademarks of Arm Limited (or its subsidiaries) in the US and/or elsewhere.

arm

2 Ordering information

To order the NUCLEO-WBA52CG board, refer to Table 1. Additional information is available from the datasheet and reference manual of the target microcontroller.

Table 1. List of available products

Order code	Board reference	Target STM32
NUCLEO-WBA52CG	• MB1801(1) • MB1863(2)	STM32WBA52CG

1. *Mezzanine board*
2. *MCU RF board*

2.1 Codification

The meaning of the codification is explained in Table 2.

Table 2. Codification explanation

NUCLEO-XXXYYZT	Description	Example: NUCLEO-WBA52CG
XXX	MCU series in STM32 32-bit Arm Cortex MCUs	STM32WBA series
YY	MCU product line in the series	STM32WBAx2 product line
Z	STM32 package pin count: • C for 48 pins	48 pins
T	STM32 flash memory size: • G for 1 Mbyte	1 Mbyte

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-WBA52CG 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 like 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. Like all products of this type, the user must pay attention to the following points:

- The connection pins on the board might be sharp. Be careful when handling the board to avoid personal damage.
- 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 fingers or anything conductive. The board operates at voltage levels that are not dangerous, but components might be damaged when shorted.
- Do not put liquids on the board, and avoid using it near water or in high humidity.
- Do not operate the board if dirty or dusty.

6 Quick start

This section describes how to start development quickly using NUCLEO-WBA52CG.

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

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

- All socket 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 evaluate quickly and start development with an STM32 microcontroller in a UFQFPN48 package.

6.1 Getting started

Follow the sequence below to configure the STM32WBA52CG board and launch the demonstration application (refer to Figure 3 and Figure 5 for component location):

1. Check jumper positions on board: JP2 ON, JP1 on USB_STLK [1-2].
2. Check that switch SW1 is on the 3V3 power supply.
3. Install ST Bluetooth® LE sensor mobile application on a Bluetooth® LE compatible mobile device from the App Store or Google Play.
4. Connect the Nucleo board to a PC with a USB cable Type-A or USB Type-C® to Micro-B through a USB connector (USB_STLK). Once connected, the green LED (LD4) lights up. Refer to the user manual *STLINK-V3MODS and STLINK-V3MINI debugger/programmer tiny probes for STM32 microcontrollers* (UM2502).
5. Use ST Bluetooth® LE sensor mobile application to detect the STM32WBA P2P server (P2PSRV) and connect it. The smartphone application displays the service and characteristics of the device.
6. Pushing the button (B1) on the board toggles the alarm on the smartphone display. On the smartphone, push the lamp to switch ON/OFF the Nucleo board blue LED (LD1).

7 Hardware layout and configuration

NUCLEO-WBA52CG is designed around the STM32WBA52CG. The design includes a mezzanine board and an MCU RF board. The hardware block diagram in Figure 2 illustrates the connection between STM32WBA52CG and peripherals (ARDUINO® Uno V3 connectors, ST morpho connector, and embedded ST-LINK).

Figure 3 and Figure 5 help users locate these features on the NUCLEO-WBA52CG board. The mechanical dimensions of the NUCLEO-WBA52CG product are shown in Figure 6.

Figure 2. Hardware block diagram

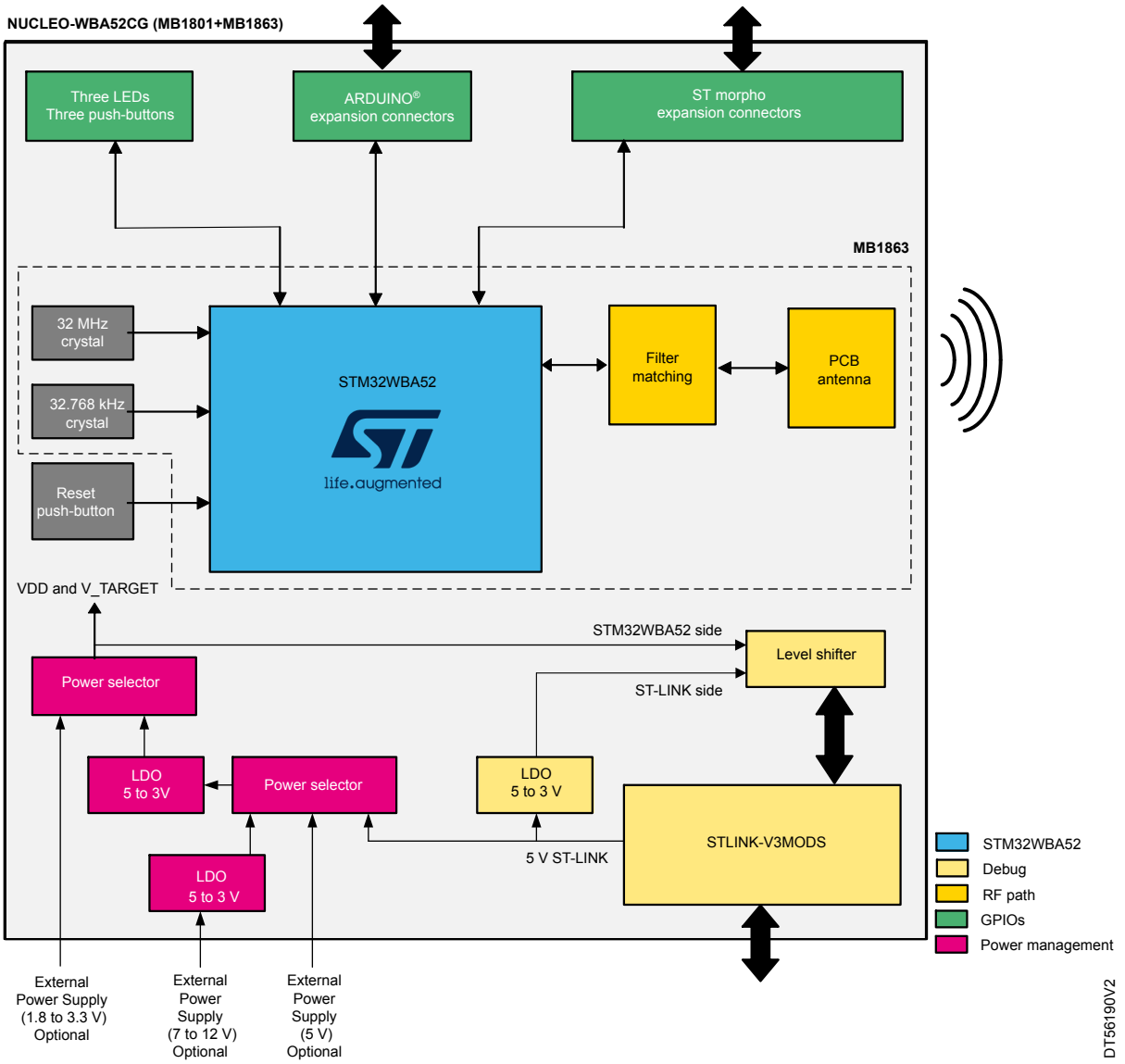


Figure 3. **NUCLEO-WBA52CG PCB top view**

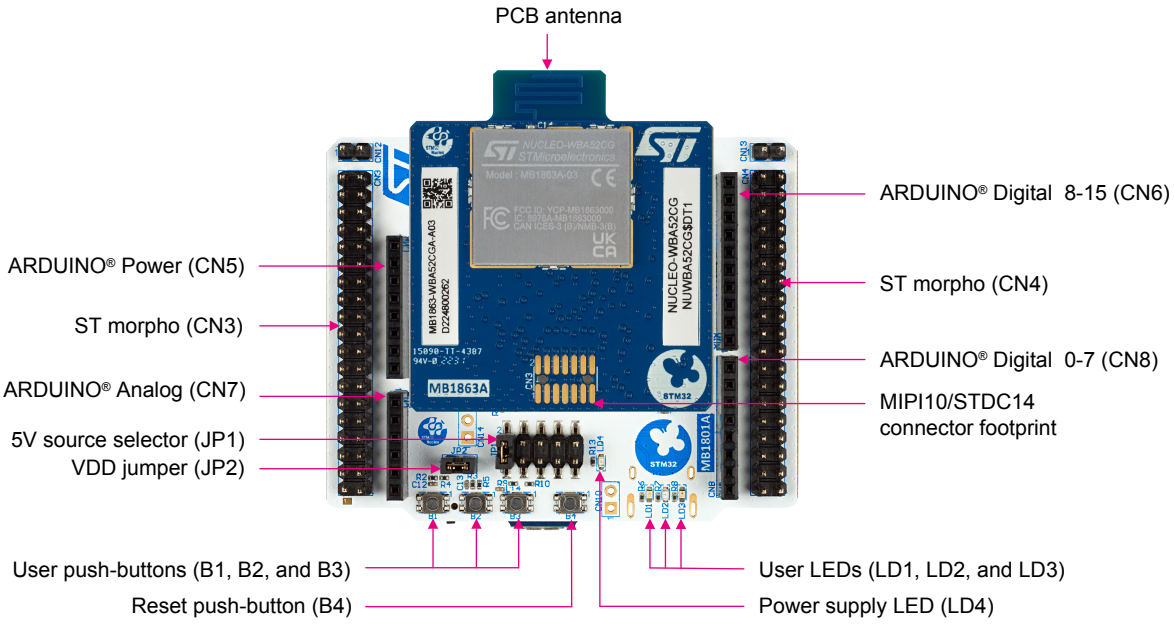


Figure 4. **NUCLEO-WBA52CG PCB details of the MCU RF board**

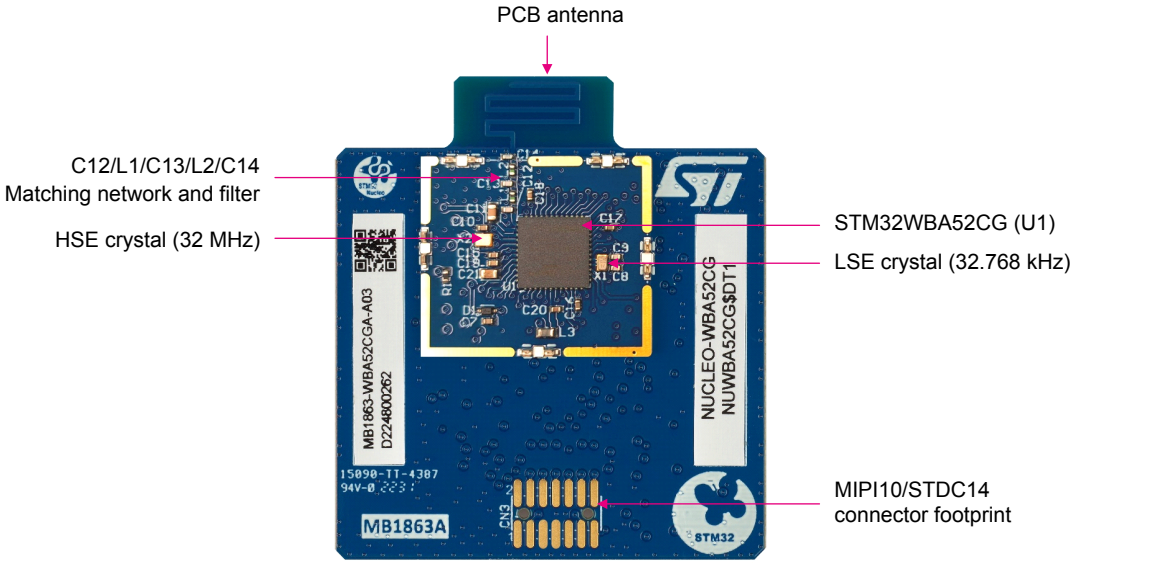
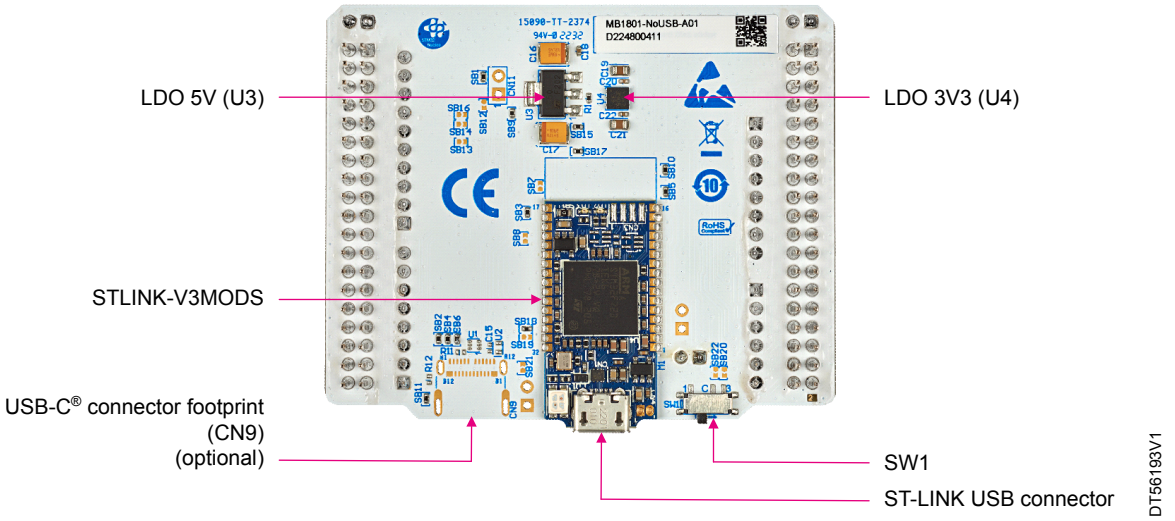
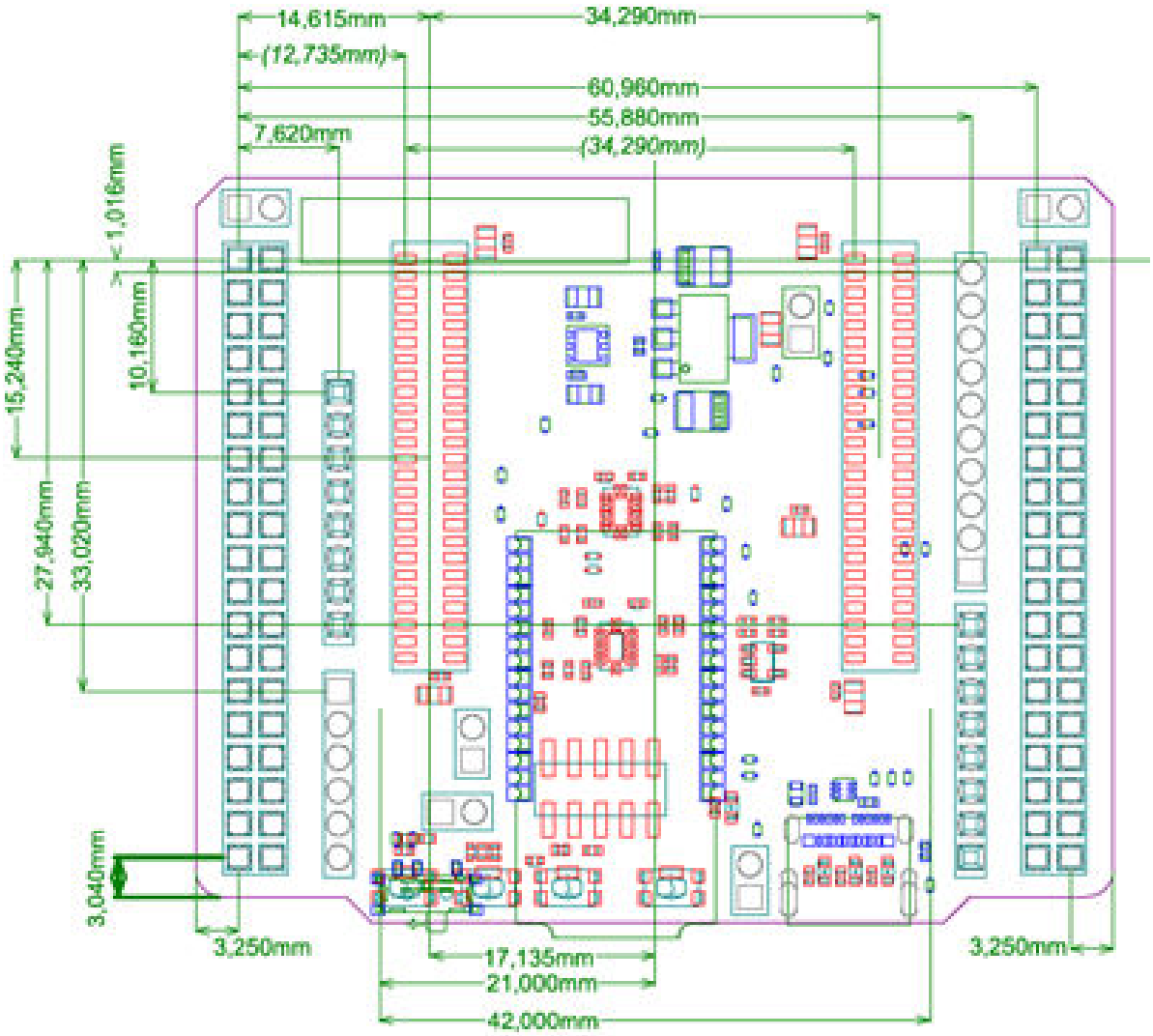


Figure 5. NUCLEO-WBA52CG PCB bottom view



Note: The USB-C® connector footprint (CN9) is not available on the MB1801-NoUSB variant.

Figure 6. **NUCLEO-WBA52CG mechanical dimensions (in millimeters)**

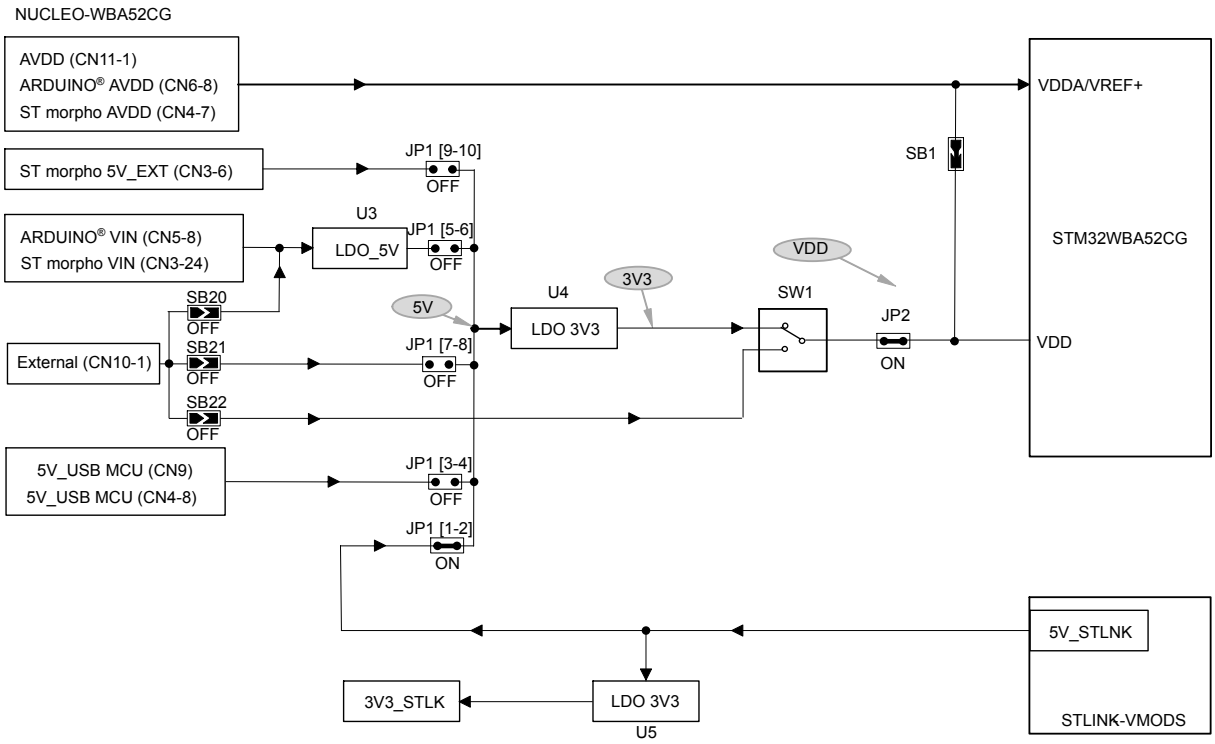


7.1 Power supply

7.1.1 General description

By default, the STM32WBA52CG embedded on this Nucleo board is supplied by 3V3 but the board proposes a lot of possibilities to supply the module. In fact, at first, the 3V3 can come from ST-LINK USB, ARDUINO®, or ST morpho connectors. Moreover, STM32WBA52CG can be supplied by an external source (between 1.8 and 3.3 V). Thanks to level shifters, debugging by embedded STLINK is always possible even if the supply voltage of the target is different than 3V3 (ST-LINK supply). Figure 7 shows the power tree. Moreover, this figure also shows the default state of the jumpers and the solder bridges.

Figure 7. STM32WBA52CG power tree



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

7.1.2 7 to 12 V power supply

A 7 to 12 V DC power source can power NUCLEO-WBA52CG. There are three accesses for this type of level:

- Pin VIN of the ARDUINO® connector (CN5-8). 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
- Pin VIN of the ST morpho connector (CN3-24). It is possible to apply until +12 V on this pin like for the ARDUINO® connection
- External input (CN10). Be careful, in this case, the states of the jumpers and solder bridge are very important. Verify these states in Table 4.

These sources are connected to a linear low-drop voltage regulator (U2). The output of this 5 V regulator is a potential source of the 5V signal. For further details, refer to the next section.

7.1.3 5 V power supply

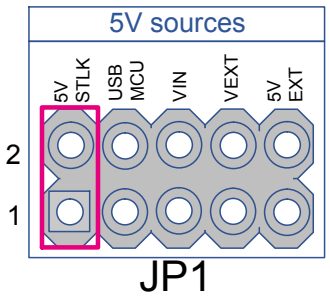
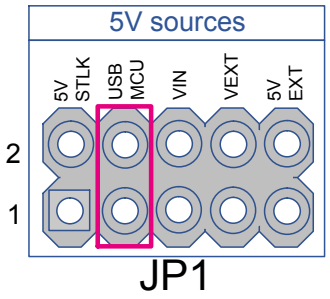
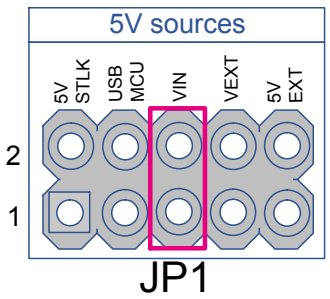
A 5 V DC power source can power NUCLEO-WBA52CG. The 5 V can come from several connectors:

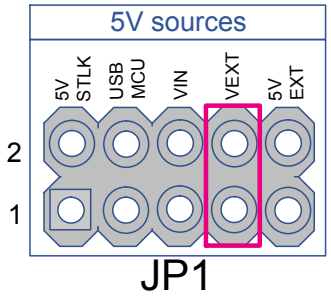
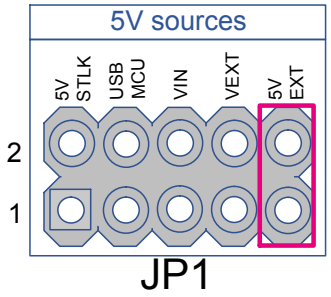
- External input (CN10). Be careful, in this case, the states of the jumpers and solder bridge are very important. Refer to Table 4.
- 5V_EXT from ST morpho connector (CN5-6)
- 7-12 V input through the voltage regulator (U2). Refer to Section 7.1.2: 7 to 12 V power supply.

The jumper (JP1) allows selecting the 5V source. Table 4 shows the configuration to apply the selected source.

Depending on the current needed on 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 NUCLEO-WBA52CG is supplied with the correct power source depending on the current needed.

Table 4. Power supply selector (JP1) description

Jumper/solder bridge	Setting	Configuration
JP1 5V supply source selector		**Default setting** NUCLEO-WBA52CG is supplied through the USB Micro-B receptacle (CN15) (USB_STLNK).
		Not available on variant MB1801-NoUSB.
		NUCLEO-WBA52CG is supplied through the pin 8 of the ARDUINO® connector (CN5) or pin 24 of the ST morpho connector (CN3) or CN10 (refer to the configuration details in the present Power supply section).

Jumper/solder bridge	Setting	Configuration
JP1 5V supply source selector		NUCLEO-WBA52CG is supplied through CN10 (refer to the configuration details in the present Power supply section).
		NUCLEO-WBA52CG is supplied through the pin 6 of the ST morpho connector (CN3).

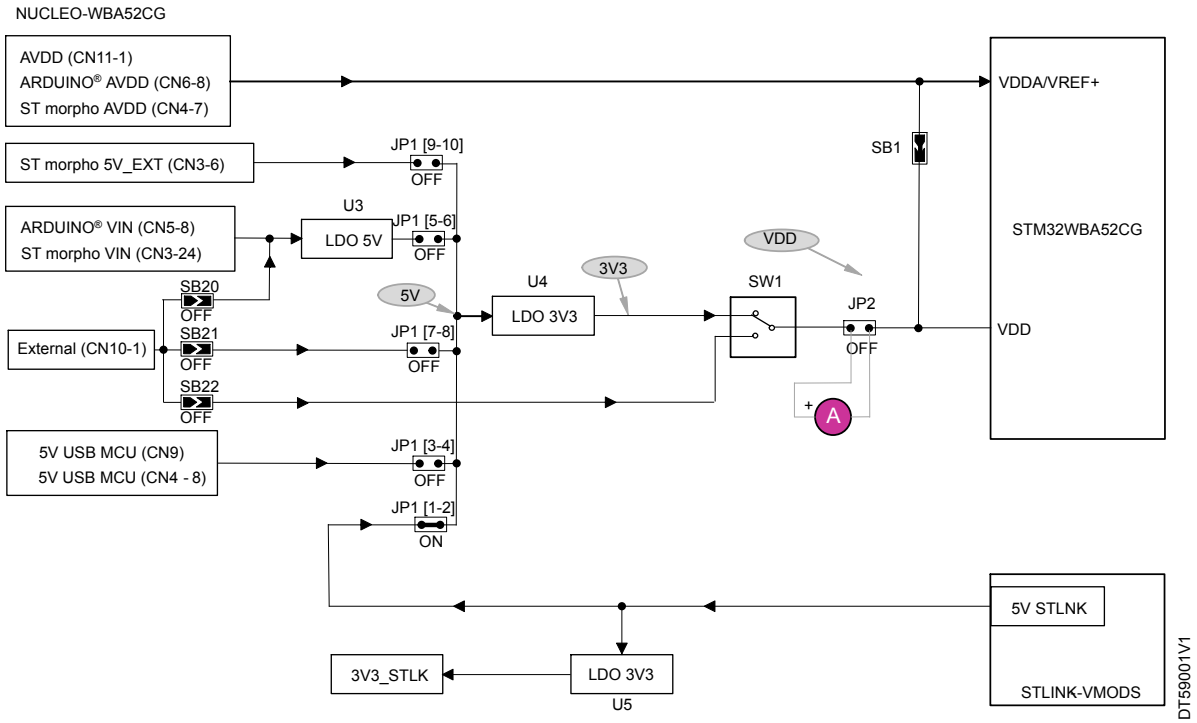
When 5V_USB_STLINK is used, JP1 is set to [1-2]. The sequence is specific. In the beginning, only STLINK-V3MODS is supplied. If the USB enumeration succeeds, the 5V_USB_STLINK power is enabled by asserting the PWR_EN signal from STLINK-V3MODS. This pin is connected to a power switch (TPS2041C) which supplies the rest of the board. This power switch also features a current limitation to protect the PC in case of currents exceeding 300 mA.

7.1.4 Current measurement

As the device has low-power features, it can be interesting to measure the current consumed by NUCLEO-WBA52CG. To do this measurement easily, there are two possibilities:

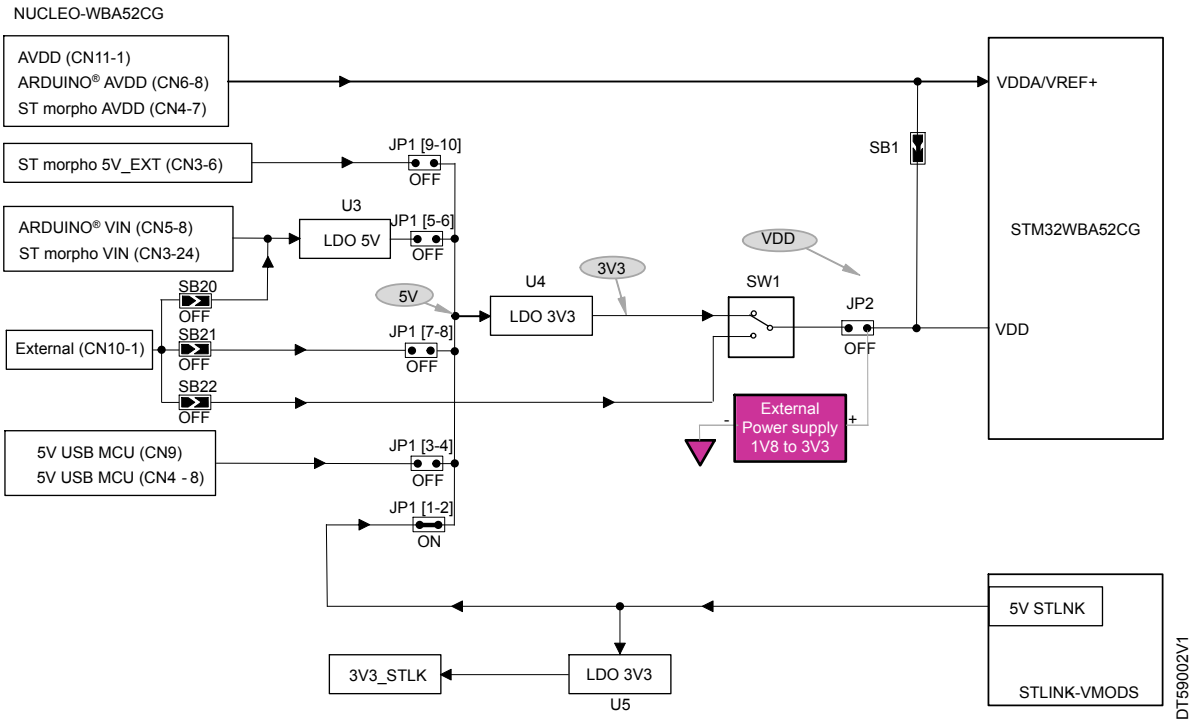
1. Measure the supply current of the SoC using an amperemeter in place of the jumper (JP2). In this case, all supply sources can be used except the AVDD coming from the ARDUINO® connector. Figure 8 shows the configuration.

Figure 8. Current measurement with an ammeter



2. Use an external power supply with current measurement capability. In this case, the jumper (JP2) must be removed and the supply connected to pin 2 of JP2 (refer to Figure 9). The supply voltage should be between 1V8 and 3V3. AVDD input (CN1-8) must not be used during this measurement.

Figure 9. **Current measurement with an external power supply**



7.2 Clock sources

7.2.1 HSE clock references

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

7.2.2 LSE clock references

The accuracy of the low-speed clock (LSE) of the MCU RF board is committed to a 32.768 kHz crystal oscillator.

7.3 Reset sources

The reset signal of NUCLEO-WBA52CG is active LOW. The internal PU forces the RST signal to a high level.

The sources of reset are:

- Reset push-button (B4)
- Embedded STLINK-V3
- ARDUINO® connector (CN5 pin 3), reset from the ARDUINO® board
- ST morpho connector (CN3 pin 14)

7.4 Embedded STLINK-V3

The STLINK-V3 programming and debugging tool is integrated into NUCLEO-WBA52CG.

The features supported on the STLINK-V3 are:

- USB 2.0 high-speed interface
- Probe firmware update through USB
- JTAG communication support up to 21 MHz
- SWD and SWV communication support up to 24 MHz
- 3.0 to 3.6 V application voltage support and 5 V tolerant inputs
- Virtual COM port (VCP) up to 16 Mbps
- Optional drag-and-drop flash memory programming binary files
- Multipath bridge USB to SPI/UART/I^{2}C/CAN/GPIOs

For all general information concerning debugging and programming features common between V3 and V2-1 versions, refer to the user manual *ST-LINK in-circuit debugger/programmer for STM8 and STM32 microcontrollers* (UM0627) at *www.st.com*.

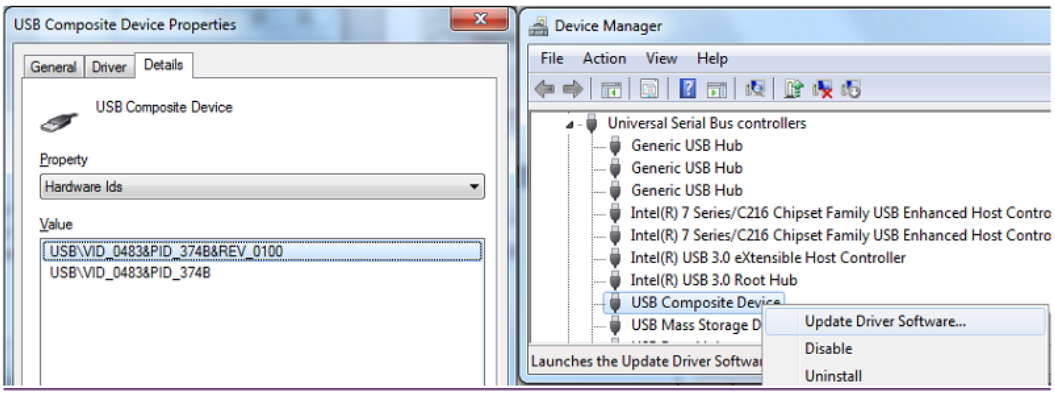
7.4.1 Drivers

STLINK-V3 requires a dedicated USB driver, which, for Windows 7® and Windows 8® is available from *www.st.com*. For Windows 10®, it is not necessary to install the driver. ST-LINK is automatically identified.

In case the NUCLEO-WBA52CG 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 10. USB composite device.

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

Figure 10. USB composite device



7.4.2 STLINK-V3 firmware upgrade

STLINK-V3 embeds a firmware mechanism for the in-place upgrade through the USB port. As the firmware might evolve during the lifetime of the STLINK-V3 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 NUCLEO-WBA52CG board, then periodically to stay up-to-date with the latest firmware version.

7.4.3 STLINK-V3 USB connector (CN15)

The main function of this connector is the access to STLINK-V3 embedded on the NUCLEO-WBA52CG for the debugging as explained above. It allows supplying the board (refer to Section 7.1: Power supply). The connector is a standard USB Micro-B connector.

Table 5. ST-LINK USB Micro-B connector (CN15)

Pin	Pin name	Signal name	Function
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

7.4.4 Virtual COM port USART1

STLINK-V3 offers a USB Virtual COM port bridge. This feature allows access to the USART1 of NUCLEO-WBA52CG by the USB_STLNK connector. By default, this USART1 interface of NUCLEO-WBA52CG is connected to the VCP1 of the STLINK-V3 MCU (STM32F723IE).

An intermediate connection allows the use of this VCP differently. On the CN14 connector, both signals (Tx and Rx) are available, and two solder bridges allow disconnecting the UART coming from the SoC.

Table 6. UART interface pinout description

STM32WBA52CG	CN14	STM32F723
LPUART1 Rx (PA8/pin 45)	Pin 1	STLINK_TX: UART2 Tx (PA2/pin 12)
LPUART1 Tx (PB12/pin 47)	Pin 2	STLINK_RX: UART2 Rx (PA3/pin 13)

7.4.5 Virtual COM port LPUART1

It is possible to replace the mass storage interface with a second Virtual COM port. To do so, the SB7 and SB8 solder bridges must be ON. It is also necessary to do a firmware upgrade through STM32CubeProgrammer (refer to the technical note *Overview of ST-LINK derivatives* (TN1235) at *www.st.com*.

7.4.6 Level shifter

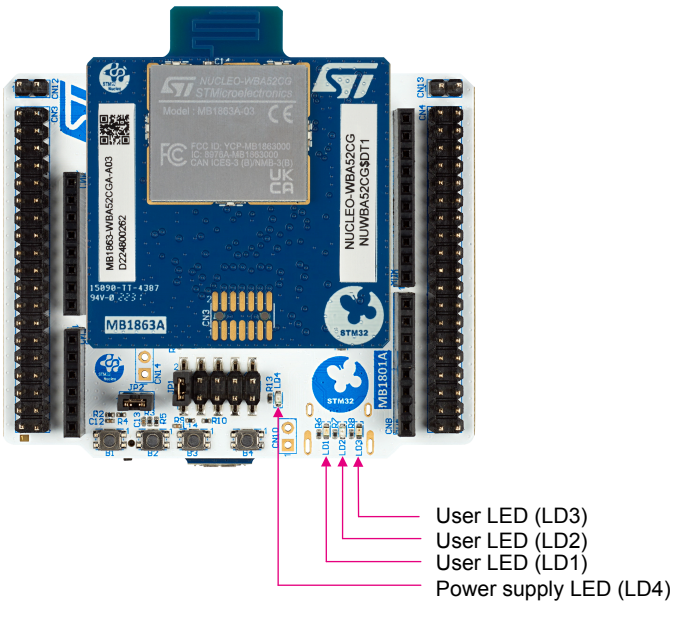
NUCLEO-WBA52CG has a system for supplying STM32WBA52CG with a different voltage than the ST-LINK. The ST-LINK is always supplied by 3V3 sources. By default, the STM32WBA52CG is supplied by the same voltage value as ST-LINK, but it is possible to supply the SoC with another value. It accepts voltage between 1.8 and 3.3 V trust to a specific component (level shifter). This level shifter assures the voltage conversion between ST-LINK and the SoC. It drives SWD and UART signals connected to the VCP on the ST-LINK.

7.5 LEDs

7.5.1 Description

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

Figure 11. LED location



- LD1: This blue LED is available for user application.
- LD2: This green LED is available for user application.
- LD3: This red LED is available for user application.
- LD4: This LED turns green when a 5V source is available. To select the 5V source, refer to Section 7.1.3: 5 V power supply.

LEDs are also available on the ST-LINK on the bottom side of the MB1801 mezzanine board. Refer to the user manual *STLINK-V3MODS and STLINK-V3MINI debugger/programmer tiny probes for STM32 microcontrollers* (UM2502).

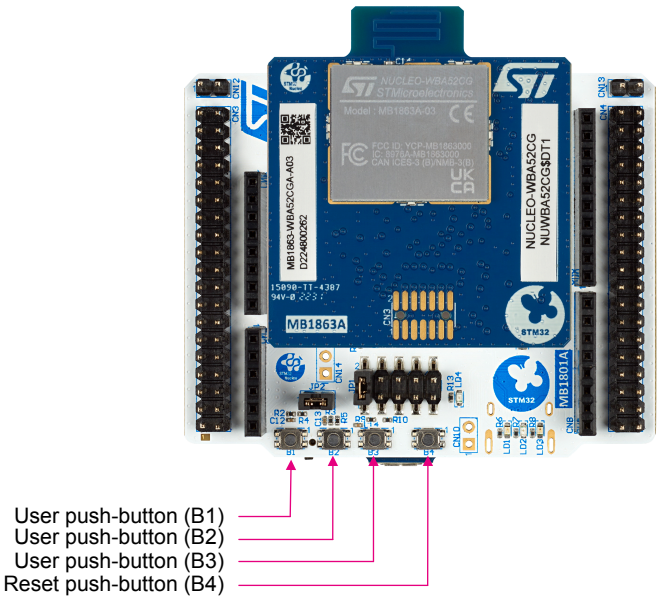
7.6 Push-buttons

7.6.1 Description

NUCLEO-WBA52CG provides two types of buttons:

- USER1 push-button (B1)
- USER2 push-button (B2)
- USER2 push-button (B3)
- Reset push-button (B4), used to reset the Nucleo board.

Figure 12. Push-button location



7.6.2 Reset push-button

B4 is dedicated to the hardware reset of the Nucleo board.

7.6.3 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 with GPIO reading or to wake up the device (only B1).

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

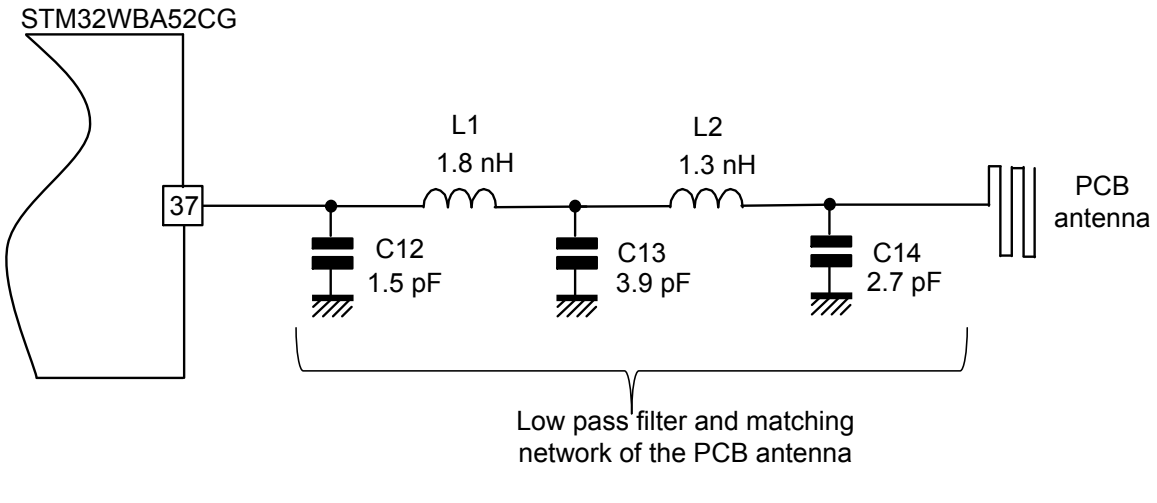
Table 7. I/O configuration for the physical user interface

Name	I/O	Wake-Up available
USER1 pushbutton (B1).	PC13	WKUP1
USER2 pushbutton (B2)	PB6	--
USER3 pushbutton (B3)	PB7	--

7.7 RF I/O stage

The RF output stage is configured by default to use a PCB antenna. The components ahead of the antenna are used for two functions: low-pass filtering of the signal and matching the impedance of the circuit and the antenna.

Figure 13. RF I/O stage



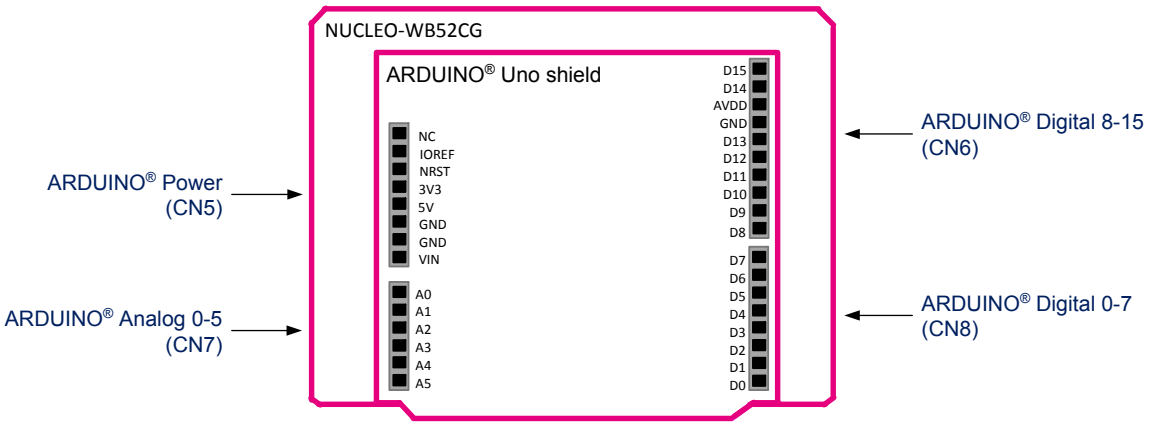
The components C12, L1, C13, L2, and C14 build the output filter and matching network of the PCB antenna.

7.8 ARDUINO® connectors

7.8.1 Description

On the bottom side of the board, there is an ARDUINO® Uno V3 extension socket. It is built around four standard connectors (CN5, CN6, CN7, and CN8). Most shields designed for ARDUINO® can fit with the Discovery kits to offer flexibility in small form factor applications.

Figure 14. ARDUINO® Uno connectors and ARDUINO® shield location



7.8.2 Operating voltage

The ARDUINO® Uno V3 connectors support 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 might damage the Nucleo board.*

Furthermore, if it is necessary to supply the Nucleo board by the ARDUINO® connector, a dedicated pin is available. VIN allows supplying the board directly. To use this feature, refer to Section 7.1.2: 7 to 12 V power supply.

7.8.3 ARDUINO® interface and pinout

Figure 15 shows the position of the ARDUINO® shield when it is plugged into NUCLEO-WBA52CG with the pinout. The pinout shown in Figure 15 corresponds to standard ARDUINO® naming. To see the correspondence with the STM32, refer to Table 8.

Figure 15. ARDUINO® connector pinout

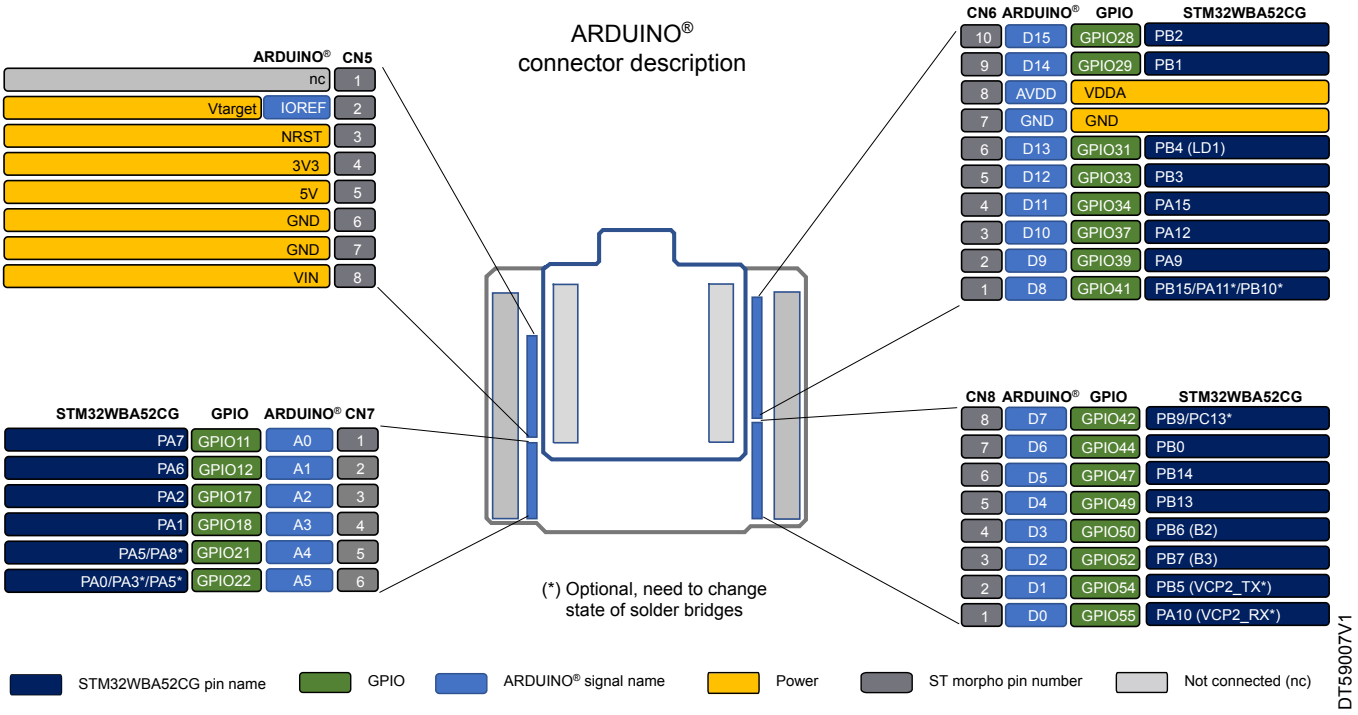


Table 8. Pinout of the ARDUINO® connectors

Connector	Pin number	Signal name	STM32 port	Comment
CN5	1	NC	-	NC (reserved for tests)
	2	3V3 (IOREF)	-	IOREF 3V3
	3	NRST	NRST	NRST
	4	3V3	-	3V3
	5	5V	-	5V
	6	GND	-	GND
	7	GND	-	GND
	8	VIN	-	External supply input (+12 V)
CN7	1	A0	PA7	ADC1_IN9
	2	A1	PA6	ADC1_IN11
	3	A2	PA2	ADC1_IN6
	4	A3	PA1	ADC1_IN5
	5	A4	PA5/PA8(1)	ADC1_IN7
	6	A5	PA0/PA3(1)/PA5(1)	ADC1_IN8
CN8	1	ARD_D0	PA10	LPUART1_RX
	2	ARD_D1	PB5	LPUART1_TX
	3	ARD_D2	PB7	GPIO
	4	ARD_D3	PB6	GPIO
	5	ARD_D4	PB13	GPIO/LPTIM2_IN1
	6	ARD_D5	PB14	GPIO/TIM2_CH4
	7	ARD_D6	PB0	GPIO/TIM1_CH1
	8	ARD_D7	PB9/PC13(1)	GPIO
CN6	1	ARD_D8	PB15/PA11(1)/PB10(1)	GPIO
	2	ARD_D9	PA9	GPIO/TIM2_CH1
	3	ARD_D10	PA12	SPI1_NSS
	4	ARD_D11	PA15	SPI1_MOSI
	5	ARD_D12	PB3	SPI1_MISO
	6	ARD_D13	PB4	SPI1_SCK/TIM2_CH1
	7	GND	-	GND
	8	AVDD	-	VDDA
	9	ARD_D14	PB1	I2C1_SDA
	10	ARD_D15	PB2	I2C1_SCL

1. *Optional need to change the state of solder bridges.*

7.9 ST morpho connectors

7.9.1 ST morpho interface and pinout

The ST morpho connectors (CN3 and CN4) are male pin headers accessible on both sides of the board. All signals and power pins of the MCU are available on the ST morpho connectors. An oscilloscope, logical analyzer, or voltmeter can also probe these connectors.

Figure 16. Pinout of ST morpho connectors

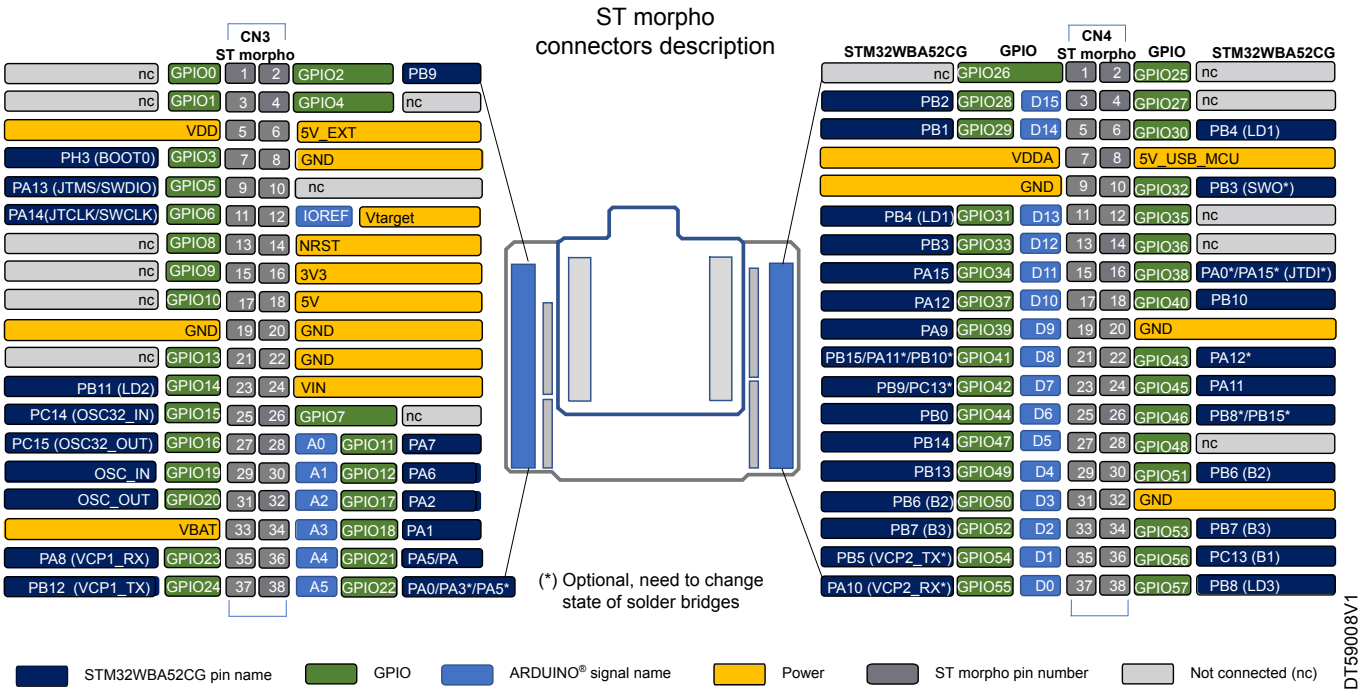


Table 9. Pinout of the ST morpho connectors

CN3				CN4			
Pin number	STM32WBA52CG pin name	Pin number	STM32WBA52CG pin name	Pin number	STM32WBA52CG pin name	Pin number	STM32WBA52CG pin name
1	NC	2	PB9	1	NC	2	NC
3	NC	4	NC	3	PB2	4	NC
5	VDD	6	5V_EXT	5	PB1	6	NC
7	BOOT0	8	GND	7	VDDA	8	5V_USB_MCU
9	PA13	10	NC	9	GND	10	PB3/SWO(1)
11	PA14	12	IOREF	11	PB4	12	NC
13	NC	14	NRST	13	PB3	14	NC
15	NC	16	3V3	15	PA15	16	PA0/PA15(1)/JTDI(1)
17	NC	18	5V	17	PA12	18	PB10
19	GND	20	GND	19	PA9	20	GND
21	NC	22	GND	21	PB15/PA11(1)/ PB10(1)	22	NC/PA12(1)
23	PB11	24	VIN	23	PB9/PC13(1)	24	PA11
25	PC14	26	NC	25	PB0	26	NC/PB8(1)/PB15(1)
27	PC15	28	PA7	27	PB14	28	NC
29	OSC_IN	30	PA6	29	PB13	30	PB6
31	OSC_OUT	32	PA2	31	PB6	32	GND
33	VBAT	34	PA1	33	PB7	34	PB7
35	PA8	36	PA5	35	PB5	36	PC13
37	PB12	38	PA0/PA3(1)/PA5(1)	37	PA10	38	PB8

1. *Optional, need to change the state of solder bridges.*

7.10 MCU RF board interface and pinout

The ST-MCU RF board connectors (CN1 and CN2) are accessible on the top side of the board. They are used to plug the MCU RF board into the mezzanine board.

Figure 17. Pinout of the MCU RF board connectors

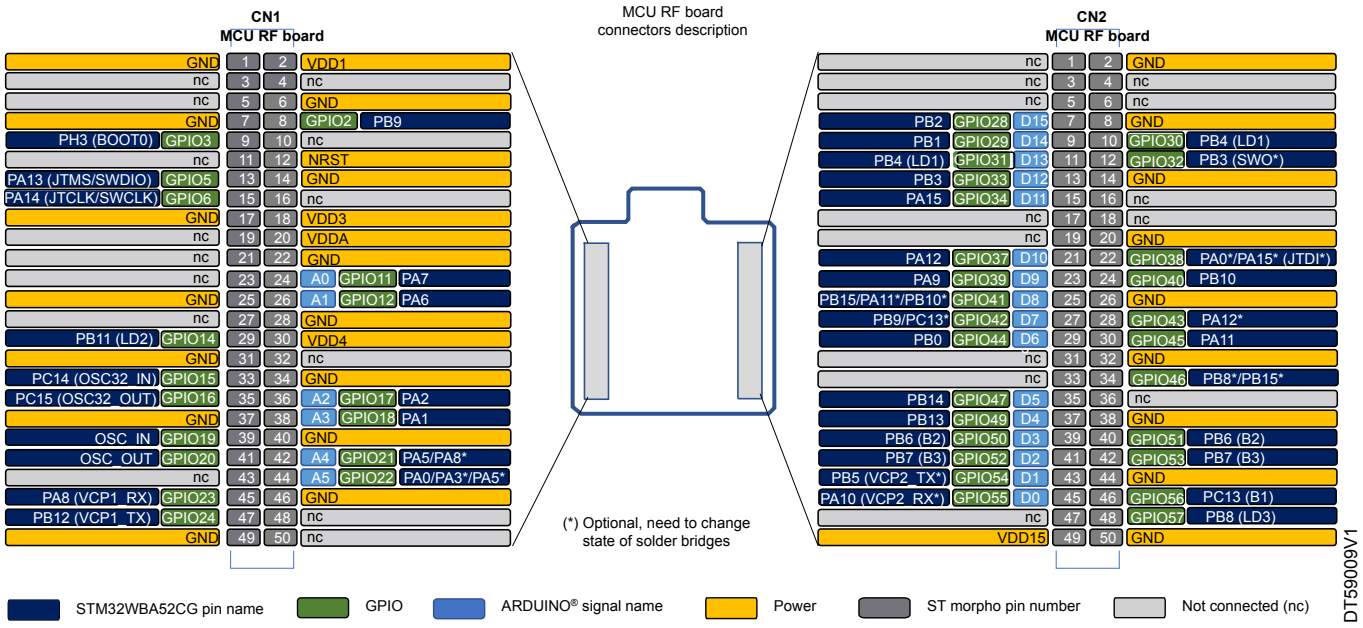


Table 10. Pinout of the MCU RF board connectors

CN1				CN2			
Pin number	STM32WBA52CG pin name	Pin number	STM32WBA52CG pin name	Pin number	STM32WBA52CG pin name	Pin number	STM32WBA52CG pin name
1	GND	2	VDD1	1	NC	2	GND
3	NC	4	NC	3	NC	4	NC
5	NC	6	GND	5	NC	6	NC
7	GND	8	PB9	7	PB2	8	GND
9	BOOT0	10	NC	9	PB1	10	PB4
11	NC	12	NRST	11	PB4	12	PB3/SWO(1)
13	PA13	14	GND	13	PB3	14	GND
15	PA14	16	NC	15	PA15	16	NC
17	GND	18	VDD3	17	NC	18	NC
19	NC	20	VDDA	19	NC	20	GND
21	NC	22	GND	21	PA12	22	PA0/PA15(1)/JTDI(1)
23	NC	24	PA7	23	PA9	24	PB10
25	GND	26	PA6	25	PB15/PA11(1)/ PB10(1)	26	GND
27	NC	28	GND	27	PB9/PC13(1)	28	NC/PA12(1)
29	PB11	30	VDD4	29	PB0	30	PA11
31	GND	32	NC	31	NC	32	GND
33	PC14	34	GND	33	NC	34	NC/PB8(1)/PB15(1)
35	PC15	36	PA2	35	PB14	36	NC
37	GND	38	PA1	37	PB13	38	GND
39	OSC_IN	40	GND	39	PB6	40	PB6
41	OSC_OUT	42	PA5/PA8(1)	41	PB7	42	PB7
43	NC	44	PA0/PA3(1)/PA5(1)	43	PB5	44	GND
45	PA8	46	GND	45	PA10	46	PC13
47	PB12	48	NC	47	NC	48	PB8
49	GND	50	NC	49	VDD15	50	GND

1. *Optional, need to change the state of solder bridges.*

7.11 MIPI10/STDC14 connector pinout

The MIPI10 and STDC14 connectors are compatible as STDC14 is an extension of the MIPI10 connector.

Figure 18. Pinout of the MIPI10/STDC14 connector (CN3 of the MCU RF board)

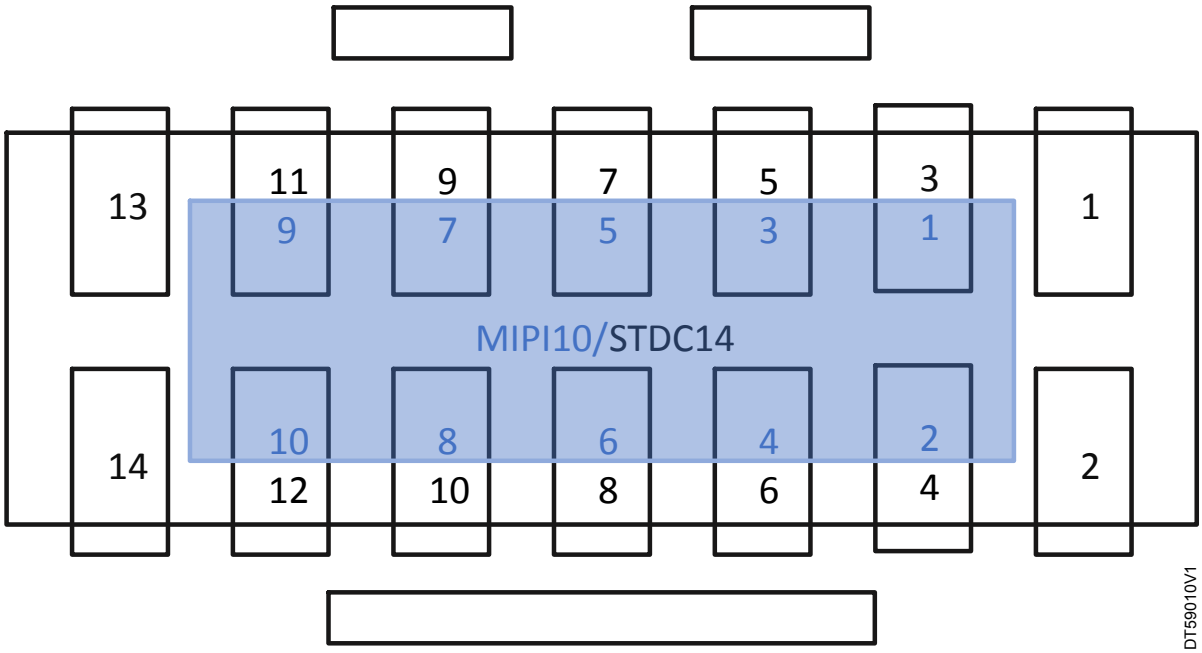


Table 11. Pinout of the MIPI10/STDC14 connector (CN3 of the MCU RF board)

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STDC14 pin #	MIPI10 pin #	Pin description	Type
1	-	Reserved(1)	-
2	-	Reserved(1)	-
3	1	T_VCC(2)	I
4	2	T_JTMS/T_SWDIO	I/O
5	3	GND	S
6	4	T_JCLK/T_SWCLK	O
7	5	GND	S
8	6	T_JTDO/T_SWO(3)	I
9	7	T_JCLK	O
10	8	T_JTDI/NC(4)	O
11	9	GNDDetect	O
12	10	T_NRST	O
13	-	T_VCP_RX	O
14	-	T_VCP_TX	I

1. *Do not connect to the target.*
2. *Input for STLINK-V3.*
3. *Serial Wire Output (SWO) is optional, required only for Serial Wire Viewer (SWV)*
4. *NC means it is not required for the Serial Wire Debug (SWD) connection*

8 NUCLEO-WBA52CG product information

8.1 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:

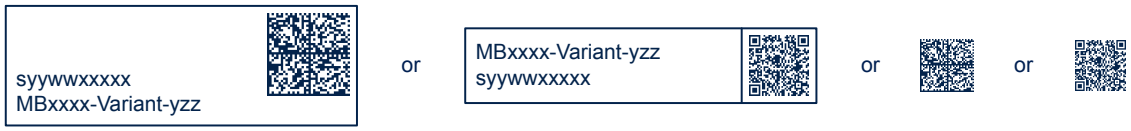
  

  Dual-sticker example:

- 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.

8.2 NUCLEO-WBA52CG product history

Table 12. Product history

Order code	Product identification	Product details	Product change description	Product limitations
NUCLEO-WBA52CG	NUWBA52CG$DT1	MCU: STM32WBA52CGU6 silicon revision "B"	Initial revision	No limitation
		MCU errata sheet: *STM32WBA5x device errata* (ES0592)		
		Boards: • MB1801-NoUSB-A01 (mezzanine board) • MB1863-WBA52CG-A03 (MCU RF board)		
	NUWBA52CG$DT2	MCU: STM32WBA52CGU6 silicon revision "B"	Upgrade of MB1801 and hardware flow control added on VCP2.	No limitation
		MCU errata sheet: *STM32WBA5x device errata* (ES0592)		
		Boards: • MB1801-NoUSB-B01 (mezzanine board) • MB1863-WBA52CG-A03 (MCU RF board)		

8.3 Board revision history

Table 13. Board revision history

Board reference	Board variant and revision	Board change description	Board limitations
MB1801 (mezzanine board)	MB1801-NoUSB-A01	Initial revision	No limitation
	MB1801-NoUSB-B01	Added the VCP2 possibility with hardware flow control (RTS/CTS)	No limitation
MB1863 (MCU RF board)	MB1863-WBA52CG-A03	Initial revision	No limitation

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

9.1 FCC Compliance Statement

Identification of products: NUCLEO-WBA52CG

Contains FCC ID: YCP-MB186300

Warning: *This certification is only valid for an RF output power of +7.5 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 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 – U.S. Contact Information:

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

9.2 ISED Compliance Statement

Identification of products: NUCLEO-WBA52CG
Contains IC ID: 8976A-MB186300

Identification du produit : NUCLEO-WBA52CG
Contient sous-ensemble certifié IC : 8976A-MB186300

Warning: *This certification is only valid for an RF output power of +7.5 dBm (programmed).*

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).

RF exposure statement

This device complies with ISED RF radiation exposure limits set forth for general population. This device must be installed to provide a separation distance of at least 20 cm from all persons and must not be co-located or operating in conjunction with any other antenna or transmitter.

Le présent appareil est conforme aux niveaux limites d’exigences d’exposition RF aux personnes définies par ISDE. L’appareil doit être installé afin d’offrir une distance de séparation d’au moins 20 cm avec les personnes et ne doit pas être installé à proximité ou être utilisé en conjonction avec une autre antenne ou un autre émetteur.

10 UKCA Compliance Statement

SIMPLIFIED UK DECLARATION OF CONFORMITY

Hereby, the manufacturer STMicroelectronics, declares that the radio equipment type "NUCLEO-WBA52CG" is in compliance with the UK Radio Equipment Regulations 2017 (UK S.I. 2017 No. 1206). The full text of the UK Declaration of Conformity is available at the following internet address: *www.st.com*.

11 RED Compliance Statement

Simplified EU declaration of conformity

Hereby, STMicroelectronics declares that the radio equipment type "NUCLEO-WBA52CG" is in compliance with Directive 2014/53/EU.

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

Frequency range used in transmission and maximal radiated power in this range:

- Frequency range: 2400-2483.5 MHz (Bluetooth®)
- Maximal power: 4 mW e.i.r.p

Déclaration de conformité UE simplifiée

STMicroelectronics déclare que l'équipement radioélectrique du type "NUCLEO-WBA52CG" est conforme à la directive 2014/53/UE.

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

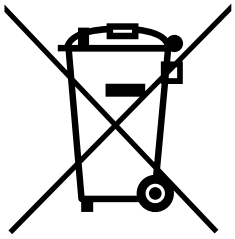
Bande de fréquence utilisée en transmission et puissance maximale rayonnée dans cette bande :

- Bande de fréquence : 2400-2483.5 MHz (Bluetooth®)
- Puissance maximale : 4 mW p.i.r.e

12 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 14. **Document revision history**

Date	Revision	Changes
14-Mar-2023	1	Initial release.
04-Apr-2023	2	Updated: • Two links in *Features* • New product in *Table 12* • New board in *Table 13*
26-Oct-2023	3	Updated *Figure 13*.
16-May-2024	4	Updated FCC Compliance Statement and ISED Compliance Statement. Added UKCA Compliance Statement.
16-Jun-2025	5	Updated: • Document title • Introduction • Section 6.1: Getting started • Figure 3. NUCLEO-WBA52CG PCB top view • Section 7.1.1: General description • Section 7.5.1: Description, including Figure 11. LED location • Section 8.1: Product marking • Section 9.1: FCC Compliance Statement • Section 9.2: ISED Compliance Statement Added: • Section 3.4: EDA resources • Footnotes to Table 11. Pinout of the MIPI10/STDC14 connector (CN3 of the MCU RF board) • Section 12: Product disposal

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