STM32WL3 Nucleo-64 boards (MB2029+MB1801)

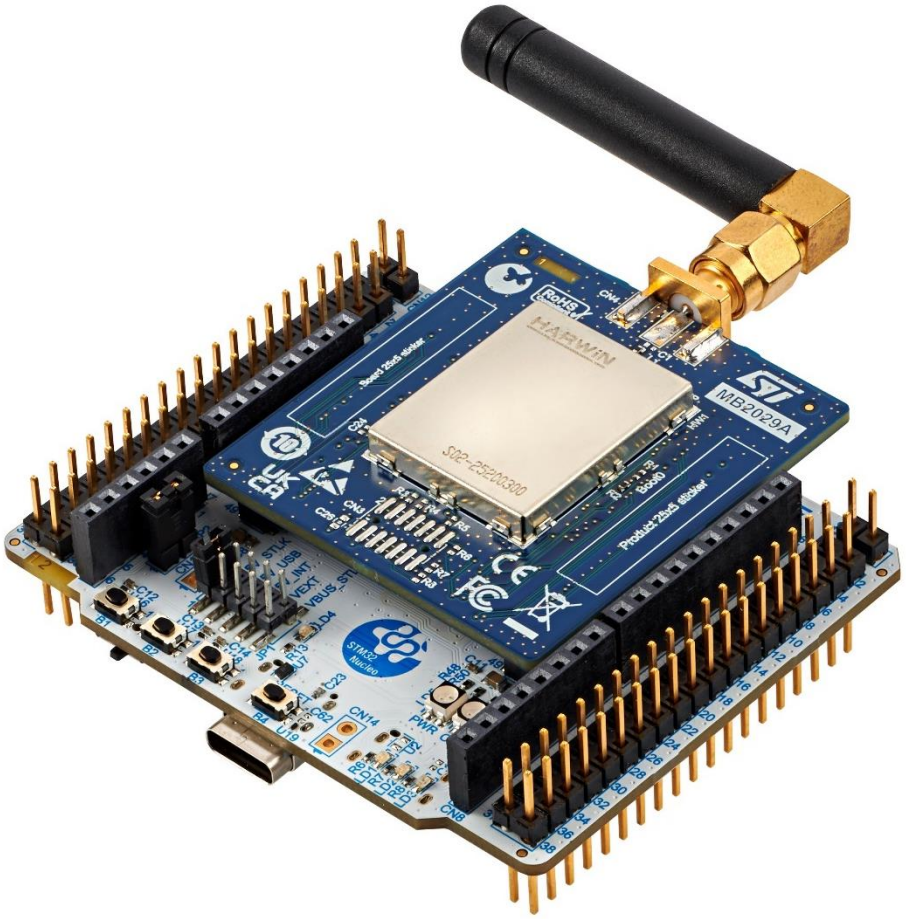
Introduction

NUCLEO-WL33CCx are Nucleo-64 RF board embedding an STM32WL33CCV6 Sub-GHz application processor.
This high performance and low power application processor can operate in 433, 868 and 915 MHz bands.

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.

Nucleo-WL33CC comes with a dedicated software package, HAL library and examples available on STM32Cube package.
The board is declined in two product variants with dedicated front-end tuned for specific frequency band.

Figure 1 : NUCLEO-WL33CC overview



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1 Features

- Ultra-low-power wireless STM32WL33CCV6 microcontroller based on the Arm® Cortex®-M0+ core, featuring 256 Kbytes of flash memory and 32 Kbytes of SRAM in a VFQFPN48 package
- MCU RF board (MB2029):
  - Ultra low power MCU
  - Sub-Ghz transceiver working on 412-479MHz and 862-928MHz frequency bands. Featuring modulation: OOK, ASK, 2(G)FSK 4(G)FSK, D-BPSK, DSSS. Compatible with standardized protocols as Sigfox, Mioty, W-MBus, ... Low power autonomous wake-up receiver
  - SMA Stubby Antenna
- Three user LEDs
- Three user and one reset push-buttons
- Board connectors:
  - USB-C
  - ARDUINO® Uno V3 expansion connector
  - ST morpho headers with full access to all STM32 I/Os
- Flexible power-supply options: ST-LINK USB or external sources
- On-board STLINK-V3EC debugger/programmer with USB re-enumeration capability: Virtual COM port and debug port
- Comprehensive free software libraries and examples available with the STM32CubeWL33 MCU Package
- Dedicated RF tool to control and test radio transceiver.
- Support of a wide choice of Integrated Development Environments (IDEs) including IAR Embedded Workbench®, MDK-ARM, and STM32CubeIDEw

arm

2 Ordering information

To order the NUCLEO-WL33CCx 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	Specificity
NUCLEO-WL33CC1	• MB1801D(1) • MB2029-Highband-Bxx (2)	Nucleo-64 based on STM32WL33CCV6 Front-end optimized for High band (862-928MHz) at 16dBm
NUCLEO-WL33CC2	• MB1801D(1) • MB2029-Lowband-Bxx(2)	Nucleo-64 based on STM32WWL33CCV6 Front-end optimized for Low band (412-479MHz) at 16dBm

1. *Mezzanine board*
2. *MCU RF board, xx stands for BOM revision*

2.1 Codification

The meaning of the codification is explained in Table 2.

Table 2 : Codification explanation

NUCLEO-WL33CCX	Description	Example: NUCLEO-WL33CC1
WL	MCU series in STM32 32-bit Arm Cortex MCUs	STM32WL series
33	MCU product line in the series	STM32WL33 product line
C	STM32 package pin count: • C for 48 pins	48 pins
C	STM32 flash memory size: • C for 256Kbytes flash	256 Kbytes flash
X	Frequency band optimized front-end: 1- High band 862-928MHz 2- Low band 412-479MHz	High frequency band

3 Development environment

3.1 System requirements

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

Note: macOS® is a trademark of Apple Inc., registered in the U.S. and other countries and regions.
Linux® is a registered trademark of Linus Torvalds.
Windows is a trademark of the Microsoft group of companies.

3.2 Development toolchains

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

1. *On Windows® only.*

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 and as with 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, please 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 voltage levels that are not dangerous, but components could 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

This section describes how to start development quickly using NUCLEO-WL33CC.

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 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 evaluate quickly and start development with an STM32 microcontroller in a VFQFPN48 package.

6.1 Getting started

Follow the sequence below to configure the NUCLEO-WL33CC board and launch the demonstration application. The demo application is a CLI to configure and start radio emission from the STM32WL3 GUI Software (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 (blue arrow - default).
3. Download and install the STM32WL3 GUI on a PC
4. Connect the Nucleo to the PC using a USB cable Type-A or Type C to Type C. Green leds (LD4 -5V and LD5 -STlink power) and red led (LD6, COM) lights up

For more information about ST-link PWR and COM leds, refer to the technical note *Overview of ST- LINK derivatives* (TN1235)

5. Use the STM32WL3 GUI to configure radio parameters, start radio emission or reception. For further details, see the dedicated User manual for STM32WL33 SW tools: *Getting started with STM32 SW package for STM32WL3 series.*

7 Hardware layout and configuration

NUCLEO-WL33CC is designed around the STM32WL33CCV6. The design includes a mezzanine board and an MCU RF board. The hardware block diagram in Figure 2 illustrates the connection between STM32WL33CCV6, peripherals (ARDUINO® Uno V3 connectors, ST morpho connector, and embedded ST-LINK) and RF front-end.

Figure 3 and Figure 5 help users locate these features on the board. The mechanical dimensions of the NUCLEO-WL33CC product are shown in Figure 6.

Figure 2 : Hardware block diagram

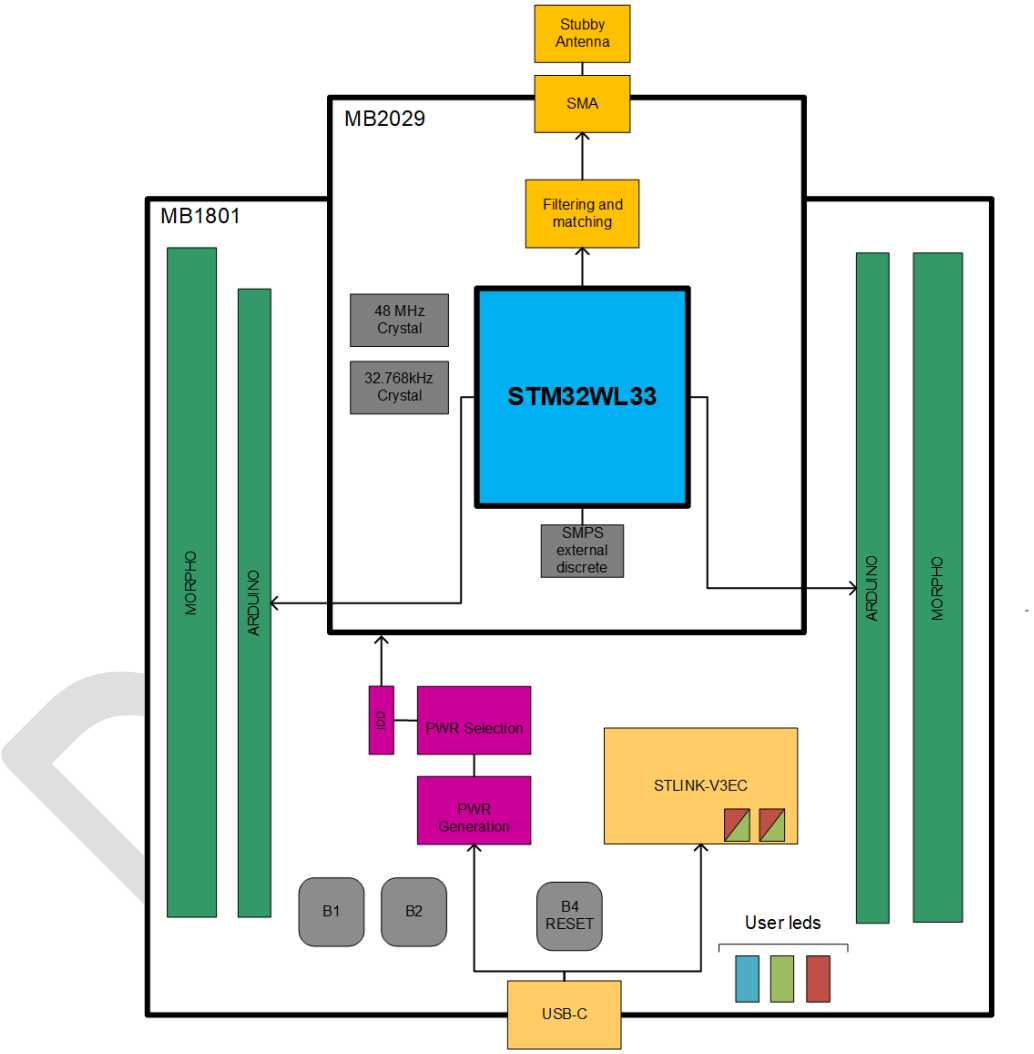


Figure 3 : NUCLEO-WL33CC PCB top view

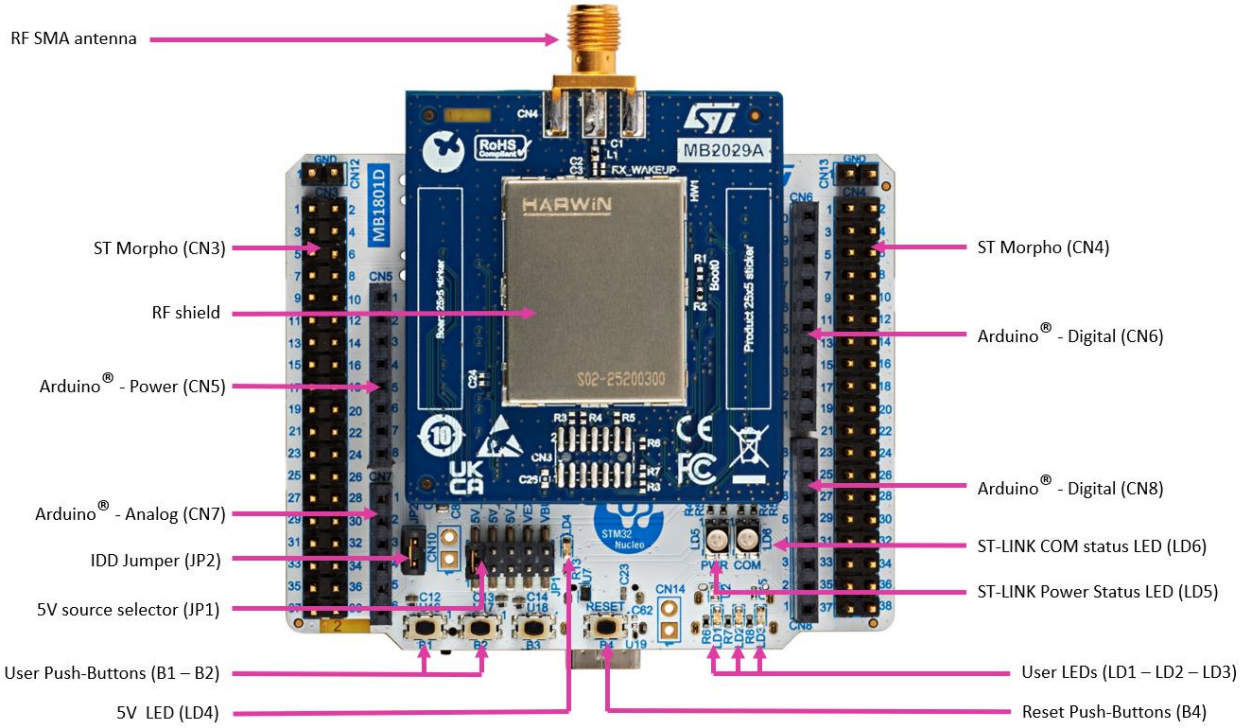


Figure 4 : NUCLEO-WL33CC PCB details of the MCU RF board MB2029

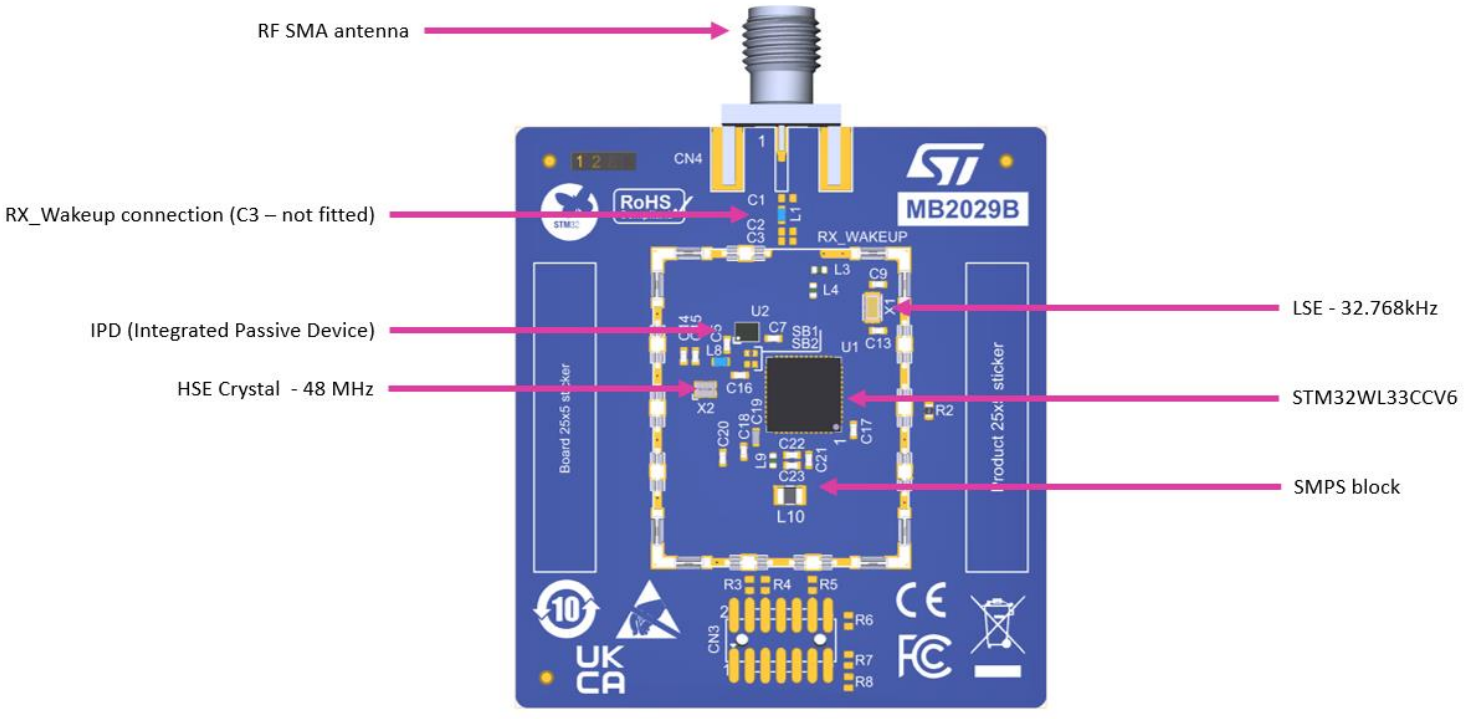


Figure 5 : NUCLEO-WL33CC PCB bottom view

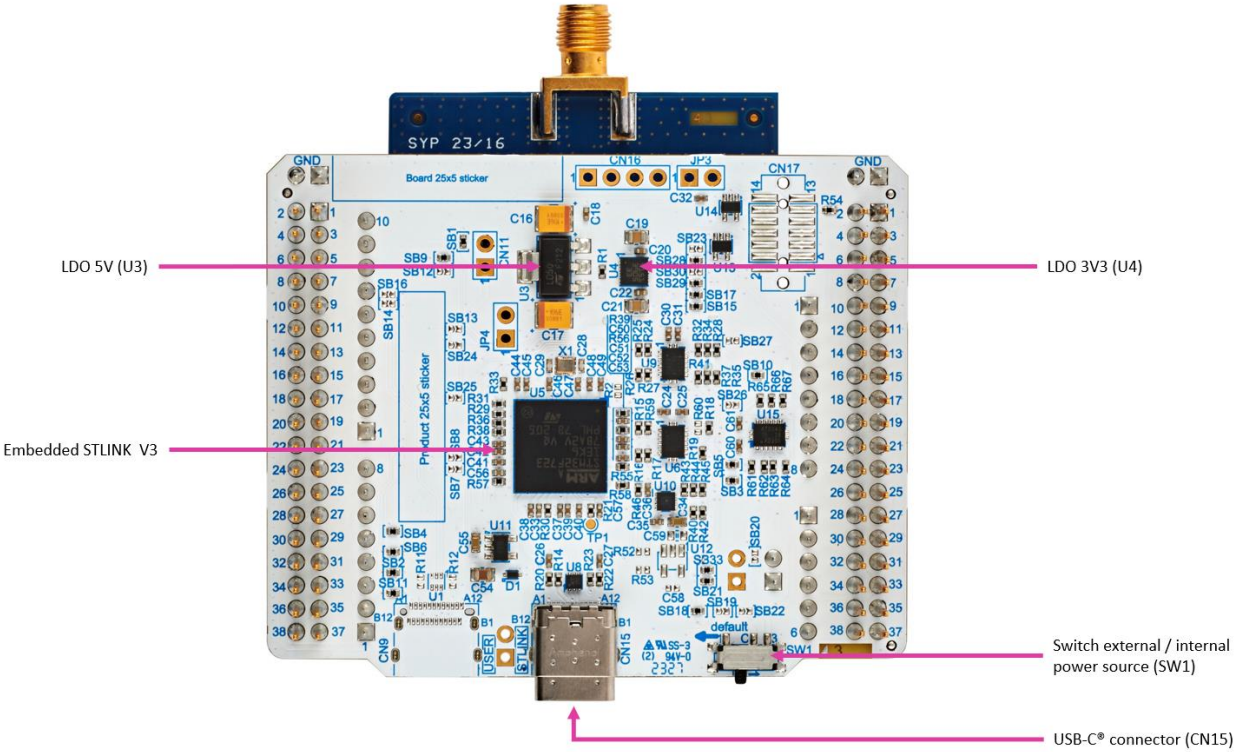
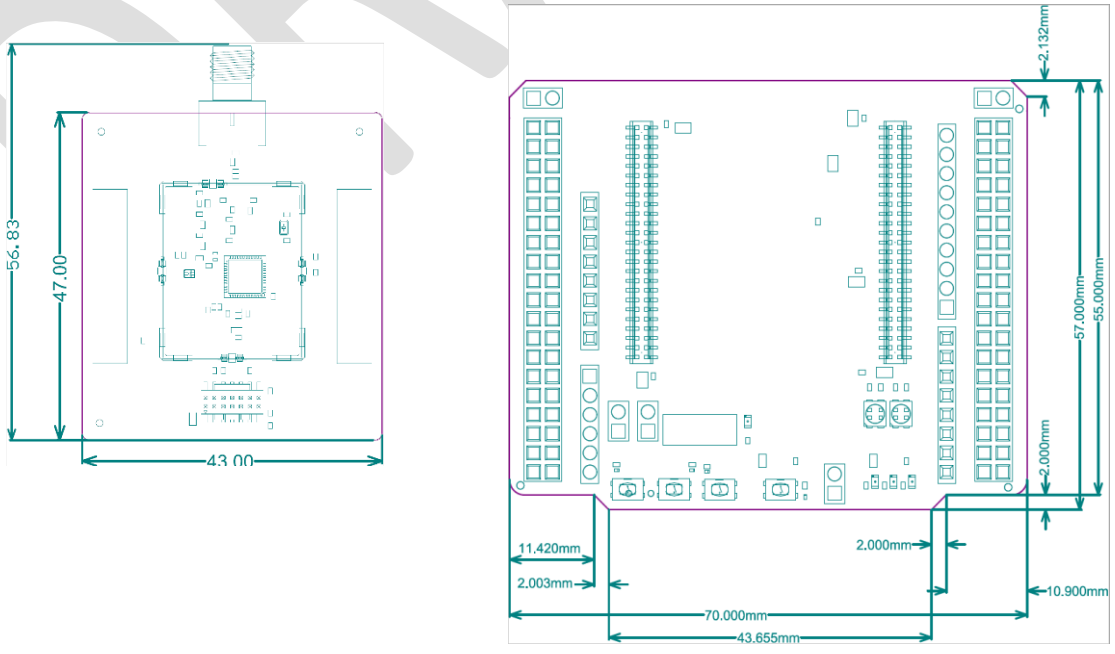


Figure 6 : NUCLEO-WL33CC mechanical dimensions (in millimeters)

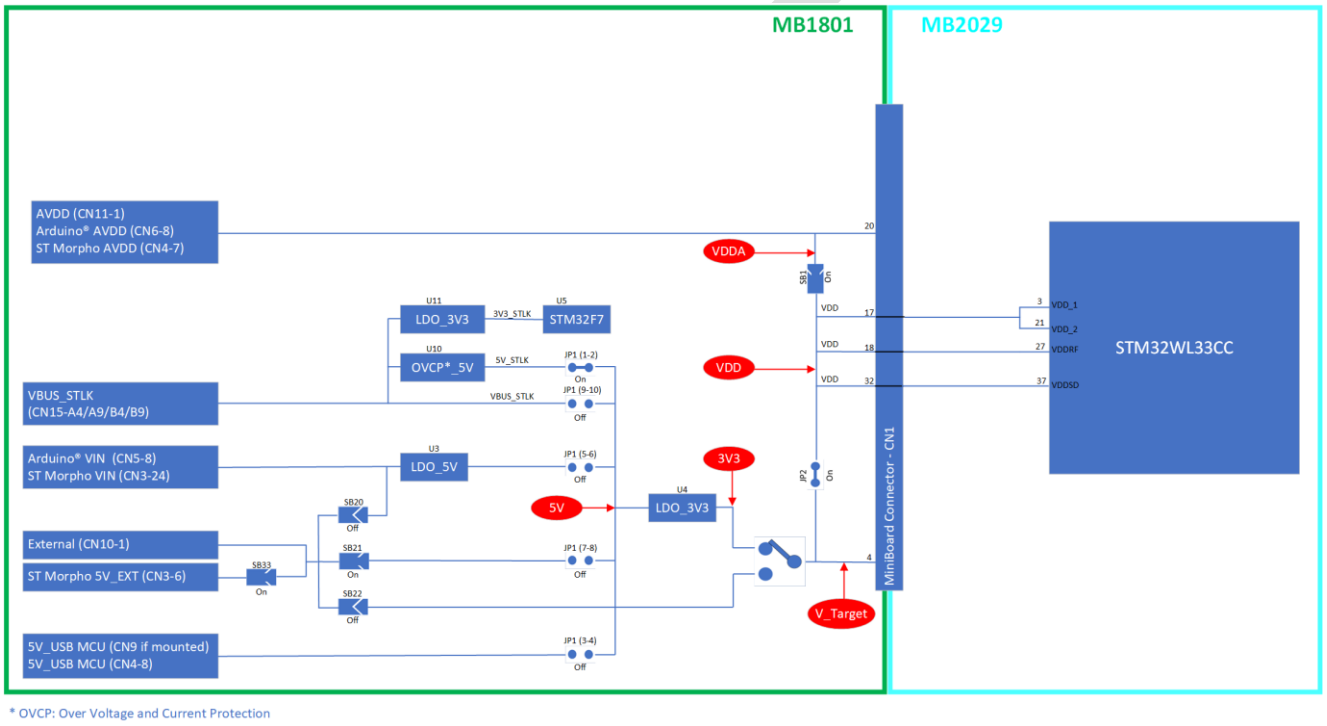


7.1 Power supply

7.1.1 General description

By default, the STM32WL33 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, STM32WL33 can be supplied by an external source (between 1.7 to 3.6 V). Thanks to level shifters, the debug 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. This figure also shows the default state of the jumpers and the solder bridges.

Figure 7 : NUCLEO-WL33CC power tree



7.1.2 7 to 12 V power supply

A 7 to 12 V DC power source can power NUCLEO-WL33CC. There are three connectors available for this configuration:

- Pin VIN of the ARDUINO® connector (CN5-8). It is possible to apply up to +12 V on this pin or use an ARDUINO® shield which can deliver this type of voltage.
- Pin VIN of the ST morpho connector (CN3-24). It is possible to apply up to +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 11. SB20 should be fitted.

These sources are connected to a linear low-drop voltage regulator (U3). The output of this regulator is a potential source of the 5V signal (refer to details in the next section).

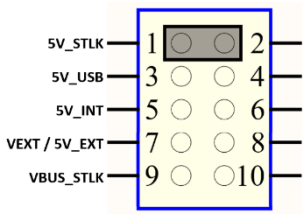
7.1.3 5 V power supply

Different 5V DC power sources can power the NUCLEO-WL33CC. The 5V can come from several connectors:

- 5V from USB-C CN15 with or without overvoltage and current protection
- External Source on CN10. Be careful, in this case, the states of the jumpers and solder bridge are very important. Refer to Table 4. SB21 should be fitted.
- 5V_EXT from ST morpho connector (CN5-6)
- 7-12 V input through the voltage regulator (U3), with the VIN Arduino CN5 pin

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-WL33 is supplied with the correct power source depending on the current needed.

Table 4 : Power supply selector (JP1) description

Jumper/solder bridge	Setting	Configuration
	Jumper fitted 1-2	**Default setting** NUCLEO-WL33CC is supplied through the USB Type-C receptacle CN15 (USB_STLNK), with overvoltage and overcurrent protection.
	Jumper fitted 3-4	Not available on NUCLEO-WL33CC
	Jumper fitted 5-6	NUCLEO-WL33CC 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 fitted 7-8	NUCLEO-WL33CC is supplied through CN10 or through the pin 6 of the ST morpho connector (CN3 – 5V_EXT). (Refer to the configuration details in the present Power supply section).
	Jumper fitted 9-10	NUCLEO-WL33CC is supplied through the USB Type-C receptacle CN15 (USB_STLNK), **without the** overvoltage and overcurrent protection.

7.1.4 Current measurement

As the device has got low power features, it can be interesting to measure the current consumed by NUCLEO-WL33CC. To do this measurement easily, the board is offering an IDD jumper JP2.

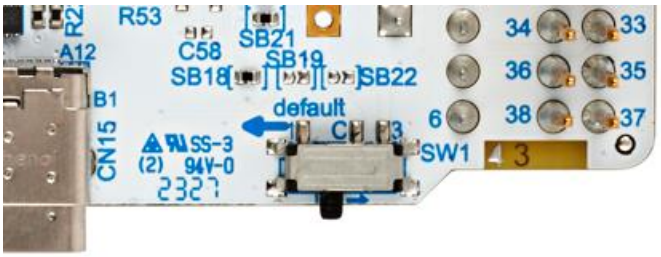
Unfit JP2 and insert an ammeter at this place. This will measure only the STM32WL33 current consumption.

7.1.5 SW1 switch

SW1 is a two positions switch used to select if the STM32WL33 is supplied by onboard 3V3V LDO or directly an external power source.

Position 1-2: It is **the default position**. Voltage source is U4 LDO providing 3.3 V.

Figure 8 : SW1 switch location



Position 3-2 : External sources may be applied on VEXT on CN10, Morpho 5VEXT or Arduino Vin. External applied voltages should be in the range of STM32WL33 supply : 1.7 to 3.6V

See solder bridges configuration of SB21, SB22 and SB23 given your use case.

7.2 Clock sources

7.2.1 HSE clock references

The high-speed clock (HSE) of the MCU RF is 48 MHz crystal unit. Internal capacitor bank of STM32WL33 can be used to trim this frequency.

7.2.2 LSE clock references

The low-speed clock (LSE) of the MCU RF board is a 32.768 kHz crystal unit.

7.3 Reset sources

The reset signal of NUCLEO-WL33CC 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)
- ST morpho connector (CN3 pin 14)

7.4 Boot0

The STM32WL33 has a pre-programmed bootloader supporting UART protocol with automatic baud rate detection. The main features of the embedded bootloader are:

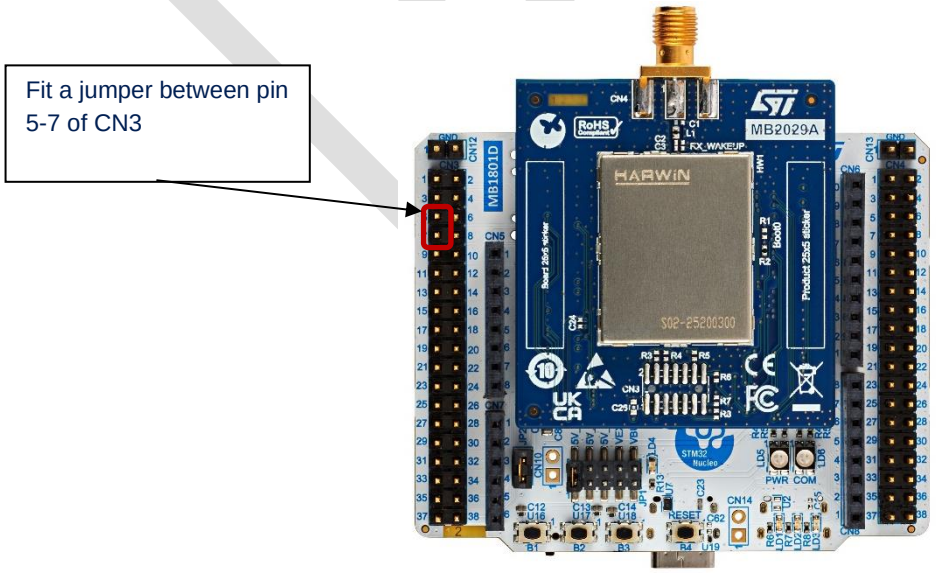
· Auto baud rate detection up to 1 Mbps
· Flash mass erase, section erase
· Flash programming
· Flash readout protection enable/disable

The pre-programmed bootloader is an application, which is stored in the internal ROM at manufacturing time by STMicroelectronics. This application allows upgrading the device Flash with a user application using a serial communication channel (UART).
The bootloader is activated by forcing PA10 high during hardware reset, otherwise, application in Flash is launched.

There are two possibilities on the Nucleo-WL33CC to force PA10 high:

- soldering an SB resistor on R1 footprint of the MCU RF board. Note that this is not ideal, as the STM32WL33 will not boot on internal flash until the SB is not removed.
- Inserting a jumper between pin 5-7 of the Morpho CN3 connector, as shown in Figure 9

Figure 9 : Boot0 jumper location on Morpho CN3



7.5 Embedded STLINK-V3EC

The chapter below gives some information about the implementation of STLINK-V3EC.
For more details on STLINK-V3EC such as LEDs management, drivers, and firmware, refer to the technical note Overview of ST-LINK derivatives (TN1235).
For information about debugging and programming features of STLINK-V3EC, refer to the user manual STLINKV3SET debugger/programmer for STM8 and STM32 (UM2448).

7.5.1 Description

There are two different ways to program and debug the onboard STM32 MCU:
- Using the embedded STLINK-V3EC programming and debugging tool on the NUCLEO-WL33CC board.
- Using an external debug tool connected to CN17 MIPI10 connector on the MB1801 board.

The STLINK-V3EC facility for debugging and flashing is integrated into the NUCLEO-WL33CC board.

Supported features in STLINK-V3EC:
• 5 V/500 mA power supply capability through the USB Type-C® connector (CN15)
• USB 2.0 high-speed-compatible interface
• JTAG and Serial Wire Debug (SWD) with Serial Wire Viewer (SWV)
• Virtual COM port (VCP)
• 1.7 to 3.6 V application voltage
• COM status LED which blinks during communication with the PC
• Power status LED giving information about STLINK-V3EC target power.
• Over-voltage protection with current limitation

Two tricolor LEDs (green, orange, and red) provide information about STLINK-V3EC communication status (LD6) and STLINK-V3EC power status (LD5).

7.5.2 Drivers

The installation of drivers is not mandatory from Windows 10® but allocates an ST specific name to the ST-LINK COM port in the system device manager.
For detailed information on the ST-LINK USB drivers, refer to the technical note “Overview of ST-LINK derivatives” (TN1235).

7.5.3 STLINK-V3EC 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-V3EC 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-WL33CC board, then periodically to stay up-to-date with the latest firmware version.

7.5.4 Using an external debug tool to program and debug the STM32WL33

Before connecting any external debug tool to the STDC14 debug connector (CN17), the SWD and VCP signals from STLINK-V3EC must be isolated. For this, fit the jumper on JP4. It disables the U9 level shifter and isolates SWD and VCP signals from STLINK-V3EC. The configuration of the JP4 is explained in Table 5.

Once the jumper is fitted on JP4, an external debug tool can be connected to the STDC14 debug connector (CN17).

Table 5 : JP4 configuration

Jumper	Definition	Setting	Comment
JP4	Debugger selection	ON [1-2]	An external debugger connected to the STDC14 connector (CN17) can be used. The level shifter (U9) is in high impedance (HZ).
		OFF	The embedded STLINK-V3EC is selected (default configuration)

Note: The STDC14 connector supports 1V8 or 3V3 for target reference voltage. When using the external debug connector (CN17), STLINK-V3EC can be used to supply the board through CN15 USB Type-C® connector.

7.5.5 STLINK-V3EC USB connector (CN15)

The main function of this connector is the access to STLINK-V3 embedded on the NUCLEO-WL33CC for the debugging as explained above. It allows supplying the board (refer to Section 7.1 Power supply). The connector is a standard USB Type C connector.

7.5.6 Level shifter

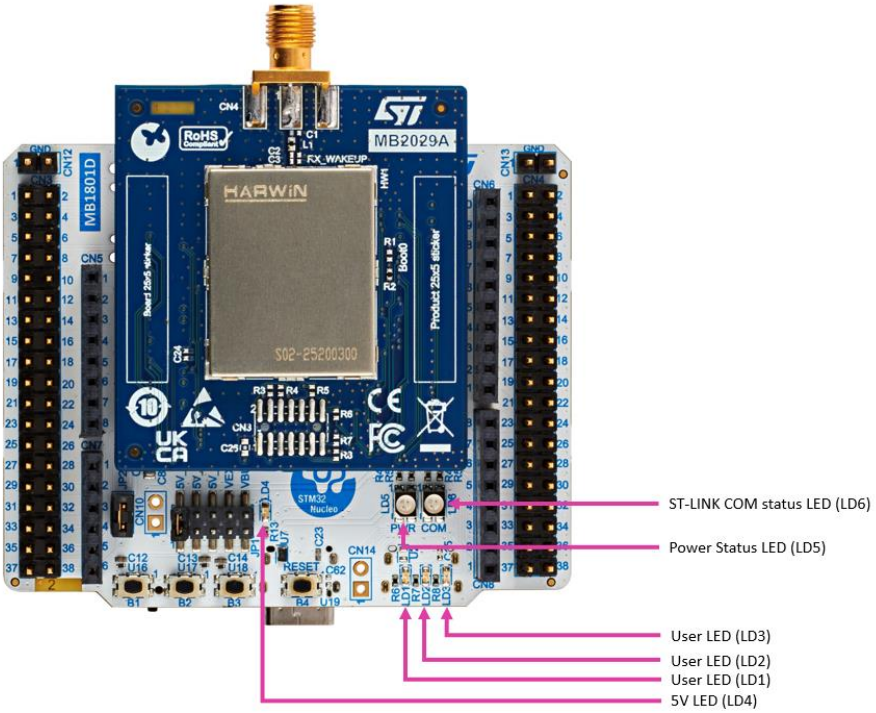
NUCLEO-WL33CC has a system for supplying STM32WL33 with a different voltage than the ST-LINK. The ST-LINK is always supplied by a 3V3 sources with a dedicated LDO. When using a different target voltage, level shifters are used to avoid conflict. This level shifter assures the voltage conversion between ST-LINK and the SoC. It drives SWD and UART signals connected to the ST-LINK.

7.6 LEDs

7.6.1 Description

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

Figure 10 : LEDs location



- LD1: This blue LED is available for user application. It is connected to PA14 of STM32WL33.
- LD2: This green LED is available for user application. It is connected to PB4 of STM32WL33.
- LD3: This red LED is available for user application. It is connected to PB5 of STM32WL33.
- LD4: This LED turns green when a 5V source is available (to select the 5V source, refer to Section 7.1.3 5V power supply).

LD5 and LD6 are ST-link power status and communication LEDs. For more information about ST-link PWR and COM leds, refer to the technical note *Overview of ST- LINK derivatives* (TN1235)

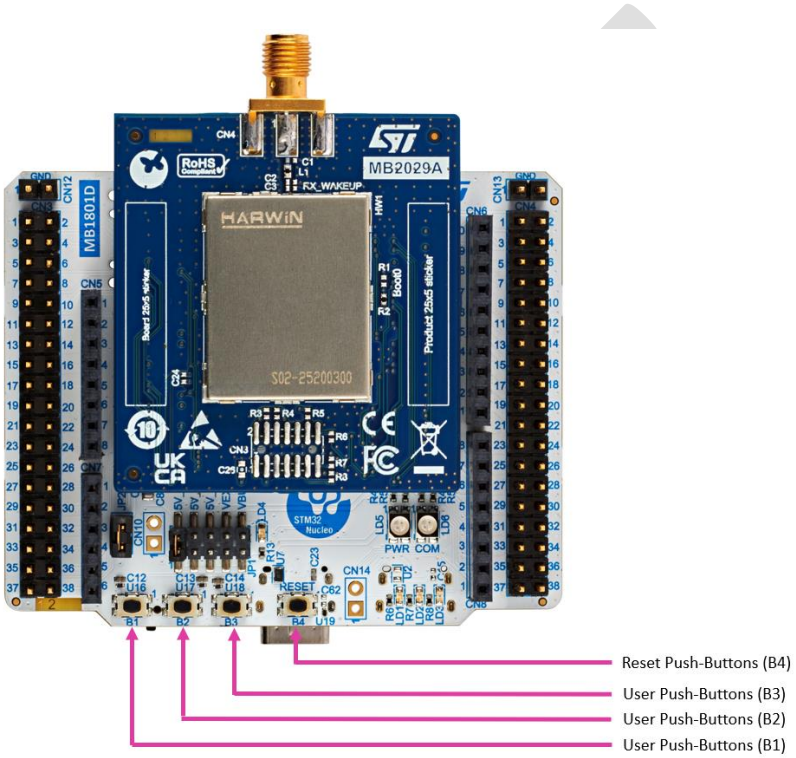
7.7 Push-buttons

7.7.1 Description

NUCLEO-WL33CC provides 4 buttons:

- USER1 push-button (B1)
- USER2 push-button (B2)
- USER3 push-button (B3)
- Reset push-button (B4), used to reset the Nucleo board.

Figure 11 : Push-buttons location



7.7.2 Reset push-button

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

7.7.3 User push-buttons

There are two push-buttons available for the user application. They are connected to PA0, PA11 and PB15. It is possible to use for GPIO reading.

Note that those los are also connected to ARDUINO® and ST morpho connectors as GPIO, depending on the use case that can generate conflict. In this case, it is possible to remove the connection to push-buttons, see MB1801 solder bridges configuration table.

Table 6 : I/O configuration for the user push buttons.

Name	I/O
USER1 pushbutton (B1).	PA0
USER2 pushbutton (B2)	PA11
USER3 pushbutton (B3)	PB15

7.8 RF stage

The RF front end is designed to match and filter RF on 3 different paths: TX, RX and RX_WAKEUP. Nucleo-WL33CC is embedding an IPD (Integrated passive Device) that combines both TX and RX matching and filtering in a tiny package. Figure 12 gives a representation of external and internal RF blocks.

STM32WL33CCV6 has two output power pins TX and TX_HP, that are used in this way:

- TX pin alone is used for output power up to 10dBm
- TX_HP pin alone is used for output power up to 16dBm.
- Above 16dBm, both TX and TX_HP pins are used.

On Nucleo-WL33CCx, only TX_HP pin is connected for output power up to 16dBm.

Internal PA are biased by SMPS, SMPS being in range 1.2 to 2.4V

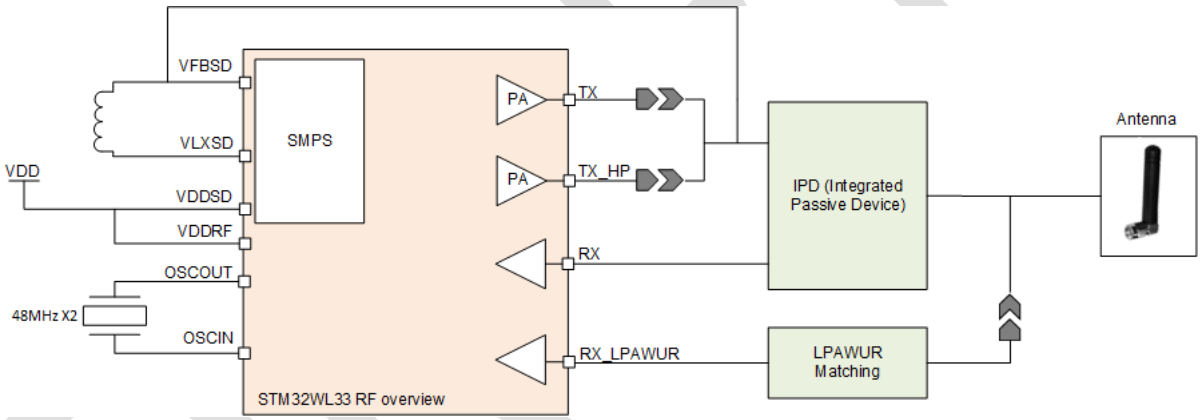
The board comes with a shielded can. This shielded can is not intended to be removed.

The antenna is glued to the SMA connector. A different reference antenna is used for lower and higher bands :

Nucleo-WL33CC1 is equipped with LPRS SR-900 antenna.

Nucleo-WL33CC2 is equipped with LPRS SR-433 antenna.

Figure 12 : RF block diagram



Nucleo-WL33CC board variant are embedding a different IPD. Table 7 gives the part number and a description of IPD for each variant.

Table 7 : IPD reference for Nucleo-WL33CC variant

Nucleo-WL33CC variant	Part Number	Description
Nucleo-WL33CC1	MPLF-WL-01D3	IPD for STM32WL33, 862-928MHz, 16dBm, on a 4 layers PCB
Nucleo-WL33CC2	MPLF-WL-04D3	IPD for STM32WL33, 412-479MHz, 16dBm, on a 4 layers PCB

7.8.1 RX_LPAWUR

The STM32WL33 features a Low power Autonomous Wake-Up Receiver, meant to receive dedicated wake-up frames during a deep sleep Mcu state. The LPAWUR can work on 3 different frequency bands. By default, this feature is not connected to the antenna path, C3 is not fitted.

BOM changes could be needed depending on the frequency band used, as shown in Table 8.

Table 8 : LPAWUR RX BOM according to frequency band

Frequency band	L4	L3	C3
A (860-928MHz)	6.8nH	5.6nH	100pF
B (2400-2483.5MHz)	10pF (1)	2.7pF	1.8pF
C (433MHz)	47nH	OFF	100pF

1. *Inductor is replaced by a capacitor of indicated value.*

Nucleo-WL33CC1 is fitted with RX LPAWUR BOM for frequency band A.

Nucleo-WL33CC2 is fitted with RX LPAWUR BOM for frequency band C.

7.9 ARDUINO® connectors

7.9.1 Description

On the bottom side of the board, there is an ARDUINO® Uno V3 connector. 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.

7.9.2 ARDUINO® interface and pinout

Figure 14 shows the position of the ARDUINO® shield when it is plugged into NUCLEO-WL33CC with the pinout. The pinout shown in Figure 14 corresponds to standard ARDUINO® naming. To see the correspondence with the STM32, refer to Table 9.

Figure 13 : ARDUINO® Uno connectors and shield location

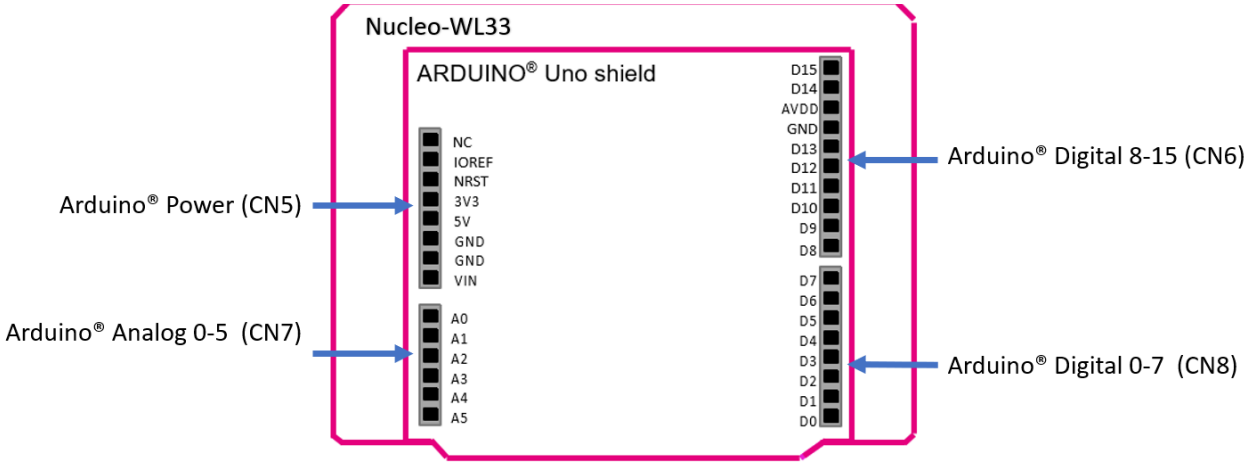


Table 9 : Pinout of the ARDUINO® connectors

Connector	Pin number	Signal name	STM32 pin	Main function
CN5	1	NC	-	NC
	2	3V3 (IOREF)	-	IOREF (V_TARGET)
	3	NRST	NRST	NRST
	4	3V3	-	3V3
	5	5V	-	5V
	6	GND	-	GND
	7	GND	-	GND
	8	VIN	-	External supply input (7-12 V)
CN7	1	A0	PB0	ADC_VINM1
	2	A1	PB1	ADC1_VINP1/LCA
	3	A2	PB2	ADC1_VINM0/LCB
	4	A3	PB3	ADC_VINP0
	5	A4	PB14	PVD_VIN
	6	A5	PB5	ADC_VINP3/LD3

CN8	1	ARD_D0	**PB7**/ PA8(1)	**LPUART1_RX**/USART1_RX
	2	ARD_D1	**PB6**/ PA9(1)	**LPUART1_TX**/USART1_TX
	3	ARD_D2	**PA9**/PB6(1)	**USART1_TX**/LPUART1_TX
	4	ARD_D3	PA0	GPIO/B1
	5	ARD_D4	**PA8**/PB7(1)	**USART1_RX**/LPUART1_RX
	6	ARD_D5	PA13	GPIO
	7	ARD_D6	PA12	GPIO
	8	ARD_D7	PA4	GPIO/LCB
CN6	1	ARD_D8	PA5	GPIO
	2	ARD_D9	PA14	GPIO/LD1/LCB
	3	ARD_D10	PB10	SPI1_NSS
	4	ARD_D11	PB9	SPI1_MOSI
	5	ARD_D12	PB8	SPI1_MISO
	6	ARD_D13	PB11	SPI1_SCK
	7	GND	-	GND
	8	AVDD	-	-
	9	ARD_D14	PA7	I2C2_SDA
	10	ARD_D15	PA6	I2C2_SCL

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

7.10 ST morpho connectors

7.10.1 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 14 : ST morpho connectors location

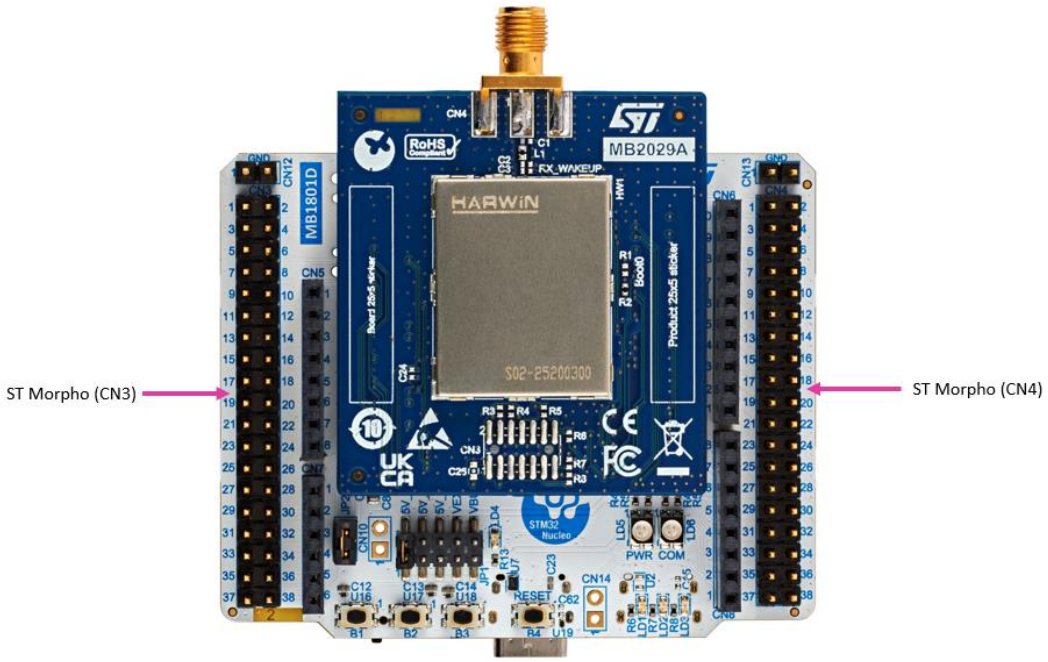


Table 10 : Pinout of the ST morpho connectors

CN3					
Pin number	Main function	MCU pin	Pin number	Main function	MCU pin
1	-	-	2	-	-
3	-	-	4	-	-
5	VDD	-	6	5V_EXT	-
7	BOOT0	PA10	8	GND	-
9	SWDIO	PA2	10	5V_INT	-
11	SWCLK	PA3	12	IOREF	-
13	-	-	14	NRST	NRST
15	-	-	16	3V3	-
17	-	-	18	5V	-
19	GND	GND	20	GND	GND

21	-	-	22	GND	-
23	LD2	PB4	24	VIN	-
25	OSC_32_IN	PB13(1)	26	-	-
27	OSC_32_OUT	PB14(1)	28	ADC_VINM1	PB0
29	-	-	30	ADC1_VINP1/LCA	PB1
31	-	-	32	ADC1_VINM0/LCB	PB3
33	VBAT	-	34	ADC_VINP0	PB4
35	VCP1_RX	PA15	36	PVD_VIN	PB14
37	VCP1_TX	PA1	38	ADC_VINP3/LD3	PB5

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

CN4					
Pin number	**Main function**	**MCU pin**	**Pin number**	**Main function**	**MCU pin**
1	-		2	-	-
3	I2C2_SCL	PA6	4	-	-
5	I2C2_SDA	PA7	6	LD1	PA14
7	VDDA	-	8	5V_USB_MCU	-
9	GND	GND	10	-	-
11	SPI1_SCK	PB11	12	-	-
13	SPI1_MISO	PB8	14	-	-
15	SPI1_MOSI	PB9	16	-	-
17	SPI1_NSS	PB10	18	-	-
19		PA14	20	GND	GND
21		PA5	22	-	-
23		PA4	24	-	-
25		PA12	26	-	-
27		PA13	28	-	-
29	**USART1_RX**/LPUART1_RX	PA8/PB7(1)	30	B2	PA11
31		PA0	32	GND	GND
33	**USART1_TX**/LPUART1_TX	PA9/PB6(1)	34	B3	PB15
35	**LPUART1_TX**/USART1_TX	PB6/PA9(1)	36	B1	PA0
37	**LPUART1_RX**/USART1_RX	PB7/PA8(1)	38	LD3	PB5

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

7.11 Solder bridges configuration and purpose

MB1801 has 33 solder bridges and MB2032 has 19 solder bridges. They allow an important number of configurations. Table 11 describes their purpose for MB1801 and table 11 for MB2029. Default configuration is shown in bold.

7.11.1 MB1801 Mezzanine board solder bridges

MB1801 solder bridges allow different configuration of Power tree, user LEDs and buttons and ST-Link. Some of the configurations aren't relevant for Nucleo-WL33CC. MB1801 solder bridges are all located on bottom side.

Table 11 : Mezzanine board solder bridges

Solder bridge control	Solder bridge (SB)	State[1]	Description[1]
AVDD[2]	SB1	**ON**	**VDDA domain is connected to VDD domain**
		OFF	VDDA domain is separated of VDD domain.
B1	SB2	**ON**	**User button B1 is connected to PA0**
		OFF	User button B1 is disconnected
VCP1_TX	SB3	**ON**	**VCP1 of ST-Link is connected to target MCU [3] TX**
		OFF	VCP1 is disconnected from target MCU TX [3]
B2	SB4	**ON**	**User button B2 is connected to PA11**
		OFF	User button B2 is disconnected
VCP1_RX	SB5	**ON**	**VCP1 of ST-Link is connected to target MCU [3] RX**
		OFF	VCP1 is disconnected from target MCU RX [3]
B3 [2]	SB6	**ON**	**User button B3 is connected to Morpho CN4**
		OFF	User button B3 is disconnected
VCP2_RX [2]	SB7	ON	VCP2 of ST-Link is connected to target MCU [3] RX
		OFF	**VCP2 is disconnected from target MCU RX [3]**
VCP2_TX [2]	SB8	ON	VCP2 of ST-Link is connected to target MCU [3] TX
		OFF	**VCP2 is disconnected from target MCU TX [3]**
LD1	SB9	**ON**	**User led LD1 is connected to PA14**
		OFF	User led LD1 is disconnected
LD2	SB10	**ON**	**User led LD2 is connected to PB4**
		OFF	User led LD2 is disconnected
LD3	SB11	**ON**	**User led LD3 is connected to PB5**
		OFF	User led LD3 is disconnected
JTDO [2]	SB12	ON	JTDO of target MCU [3] is connected to ST-Link
		OFF	**JTDO of target MCU [3] is disconnected from ST-Link**
JTDI [2]	SB13	ON	JTDI of target MCU [3] is connected to ST-Link
		OFF	**JTDI of target MCU [3] is disconnected from ST-Link**
USB user P [2]	SB14	ON	USB user (CN9) positive bus is connected to target MCU [3]
		OFF	**USB user (CN9) positive bus is disconnected**
SWCLK	SB15	**ON**	**SWCLK of target MCU [3] is connected to ST-Link**
		OFF	SWCLK of target MCU [3] is disconnected from ST-Link

1. *Default configuration in Bold*
2. *Those solder bridges have no impact on Nucleo-WL33CC. The function is not implemented or not available on STM32WL33.*
3. *For Nucleo-WL33CC, target MCU is STM32WL33*

Solder bridge control	Solder bridge (SB)	State[1]	Description[1]
USB user N[2]	SB16	ON	USB user (CN9) negative bus is connected to target MCU [3]
		OFF	**USB user (CN9) negative bus is disconnected**
SWDIO	SB17	**ON**	**SWDIO of target MCU [3] is connected to ST-Link**
		OFF	SWDIO of target MCU [3] is disconnected from ST-Link
User LEDs Supply	SB18	**ON**	**User LEDs, LD1, LD2 and LD3 are supplied by V_Target**
		OFF	User LEDs, LD1, LD2 and LD3 aren't supplied by V_Target
	SB19	ON	User LEDs, LD1, LD2 and LD3 are supplied by 3V3
		OFF	**User LEDs, LD1, LD2 and LD3 are not supplied by 3V3**
VEXT to U3	SB20	ON	External supply on CN10 (VEXT) is connected to U3 LDO (5V_INT on JP1). This configuration is used if applied voltage on CN10 is in 7-12V range.
		OFF	**VEXT and VIN domain are disconnected**
VEXT to U4	SB21	**ON**	**External supply on CN10 is connected to U4 LDO (VEXT on JP1). This configuration is used if applied voltage on CN10 is in 3.3-7V range.**
		OFF	VEXT is disconnected from U4 LDO and JP1 (VEXT)
VEXT to target MCU [3]	SB22	ON	External supply VEXT on CN10 is connected directly to target MCU [3] through SW1. This configuration is used if applied voltage on CN10 is directly in range of the MCU power supply
		OFF	**External supply VEXT is not connected directly to MCU**
VCP2_RTS [2]	SB23	ON	VCP2 of ST-Link is connected to target MCU [3] RTS
		OFF	**VCP2 is disconnected from target MCU [3] RTS**
	SB26	ON	VCP2 of ST-Link is connected to target MCU [3] RTS
		OFF	**VCP2 is disconnected from target MCU [3] RTS**
VCP2_CTS [2]	SB24	ON	VCP2 of ST-Link is connected to target MCU [3] CTS
		OFF	**VCP2 is disconnected from target MCU [3] CTS**
	SB25	ON	VCP2 of ST-Link is connected to target MCU [3] CTS
		OFF	**VCP2 is disconnected from target MCU [3] CTS**
	SB27	ON	VCP2 of ST-Link is connected to target MCU [3] CTS
		OFF	**VCP2 is disconnected from target MCU [3] CTS**
BOOT0	SB28	**ON**	**Boot0 of target MCU [3] can be controlled by ST-link IO**
		OFF	Boot0 of target MCU [3] is disconnected from ST-link
RESET	SB29	**ON**	**Target MCU [3] reset is controlled by ST-link specific IO**
		OFF	Target MCU [3] reset is disconnected
	SB30	**ON**	**Target MCU [3] reset is controlled by STLINK standard IO**
		OFF	Target MCU [3] reset is disconnected
RESET on B4	SB31	**ON**	**B4 triggers target MCU [3] reset and is connected to STLINK standard IO**
		OFF	B4 is disconnected from target MCU [3]
	SB32	**ON**	**B4 triggers target MCU [3] reset and is connected to STLINK bridge IO**
		OFF	B4 is disconnected from target MCU [3]
5VEXT	SB33	**ON**	**5V_EXT of Morpho connector CN3 is connected to VEXT on JP1**
		OFF	5V_EXT is disconnected from power tree

1. *Default configuration in Bold*
2. *Those solder bridges have no impact on Nucleo-WL33CC. The function is not implemented or not available on STM32WL33.*
3. *For Nucleo-WL33CC, target MCU is STM32WL33*

7.11.2 MB2029 MCU RF board solder bridges

MB2029 solder bridges allow different configuration of STM32WL33 IOs and alternate function, crystal output on mezzanine board and TX power configurations. MB2029 solder bridges are located on the bottom side. To access these solder bridges, it is needed to separate the Mezzanine and Mini board. Please be careful when doing this action and pay attention to the position on connectors CN1 and CN2.

Table 12 : Mcu RF board solder bridges

Solder bridge control	Solder bridge (SB)	State(1)	Description(1)
TX_HP	SB1	**ON**	**TX_HP pin is connected to RF TX path**
		OFF	TX_HP pin is disconnected from RF TX path
TX	SB2	ON	TX pin is connected to RF TX path
		OFF	**TX pin is disconnected from RF TX path**
X1-LSE	SB3	ON	OSC32_IN is output on Morpho CN3
		OFF	**OSC32_IN is disconnected**
	SB4	ON	OSC32_OUT is output on Morpho CN3
		OFF	**OSC32_OUT is disconnected**
LD1(2)	SB5	**ON**	**LD1 is connected to PA14**
		OFF	LD1 is disconnected
Arduino D4	SB6	ON	Arduino D4 is connected to PB7
		OFF	**Arduino D4 is disconnected from PB7**
	SB7	**ON**	**Arduino D4 is connected to PA8**
		OFF	Arduino D4 is disconnected from PA8
Arduino D3	SB8	**ON**	**Arduino D3 is connected to PA0**
		OFF	Arduino D3 is disconnected from PA0
Arduino D2	SB9	ON	Arduino D2 is connected to PB6
		OFF	**Arduino D2 is disconnected from PB6**
	SB10	**ON**	**Arduino D2 is connected to PA9**
		OFF	Arduino D2 is disconnected from PA9
Arduino D1 (TX)	SB11	ON	Arduino D1 (TX) is connected to PA9 (USART1_TX)
		OFF	**Arduino D1 is disconnected from PA9**
	SB13	**ON**	**Arduino D1 (TX) is connected to PB6 (LPUART1_TX)**
		OFF	Arduino D1 is disconnected from PB6
VCP1_RX (2)	SB14	**ON**	**VCP1_RX is connected to PA15 (USART1_RX)**
		OFF	VCP1_RX is disconnected from PA15
Arduino D0 (RX)	SB15	**ON**	**Arduino D0 (RX) is connected to PB7 (LPUART1_RX)**
		OFF	Arduino D0 is disconnected from PB7
	SB17	ON	Arduino D0 (RX) is connected to PA8 (USART1_RX)
		OFF	**Arduino D0 is disconnected from PA8**
VCP1_TX (2)	SB16	**ON**	**VCP1_TX is connected to PA1 (USART1_TX)**
		OFF	VCP1_TX is disconnected from PA1

B1 (2)	SB18	**ON**	**User button B1 is connected to PA0**
		OFF	User button B1 is disconnected
LD3 (2)	SB19	**ON**	**User led LD3 is connected to PB5**
		OFF	User led LD3 is disconnected

1. *Default configuration in Bold*
2. *Those solder bridges are redundant with MB1801 solder bridges. It is easier to change MB1801 solder bridges.*

8 NUCLEO-WL33CC product information

8.1 Product marking

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

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

Product order code Product identification

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

MBxxxx-Variant-yzz syywwxxxxx	

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

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

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

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

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

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

8.2 NUCLEO-WL33CC product history

Table 13 : Product history

Order code	Product identification	Product details	Product change description	Product limitations
NUCLEO-WL33CC1 & NUCLEO-WL33CC2	Nucleo-WL33CC1: NUWL33CC1$CR1 Nucleo-WL33CC2: NUWL33CC2$CR1	MCU: STM32WL33CCV6	Revision of MB2029 embedding IPD front-end MB1801 rev D featuring an embedded ST-link V3EC.	No limitation
		Boards: •MB1801-NoUSB-D03 (Mezzanine board) • MB2029-Highband-B02 for CC1 (MCU RF board) • MB2029-Lowband-B01 for CC2 (MCU RF board)		

NOTE: Nucleo-WL33CC1 & Nucleo-WL33CC2 embeds an STM32WL33CCV6 MCU. Possible limitations of this component are given in the Errata sheet : *ES0612 - STM32WL33xx device errata*

8.3 Board revision history

Table 14 : Board revision history

Board reference	Board variant and revision	Board change description	Board limitations
MB1801 (Mezzanine board)	MB1801-NoUSB-D03	MB1801 board with an embedded STlink-V3EC	Current measurement in deep stop can be interfered by ST-link/VCP signals depending on set-up.
MB2029 (MCU RF board)	MB2029-Lowband-B01 & MB2029-Highband-B02	Initial revision with IPD	No limitation

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

9.1 FCC Compliance Statement

Identification of products: NUCLEO-WL33CC1.

FCC ID: YCP-MB202900

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 circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

Responsible party (in the USA)

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-WL33CC1.
IC: 8976A-MB202900

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 radiation exposure limits set forth for general population. This device must be installed to provide a separation distance of at least 20cm 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 20cm 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 RED Compliance Statement

Déclaration de conformité CE simplifiée :

Le soussigné, STMicroelectronics, déclare que l'équipement radioélectrique du type Nucleo-WL33CC1 et Nuceo-WL33CC2 sont conformes à la directive 2014/53/UE. Le texte complet de la déclaration UE de conformité est disponible à l'adresse internet suivante : *www.st.com*.

Bande de fréquence utilisée en transmission et puissance max rayonnés dans ces bandes :

Nucleo-WL33CC1 :

Bande de fréquence : 869.4-869.65MHz

Puissance Max : 16dBm

Nucleo-WL33CC2 :

Bande de fréquence : 433.05 – 434.79MHz
Puissance Max: 10dBm

Simplified EC compliance statement:

Hereby, STMicroelectronics declares that the radio equipment type "Nucleo-WL33CC1" and "Nucleo-WL33CC2" are in compliance with Directive 2014/53/EU. The full text of the EU declaration of conformity is available at the following internet address: *www.st.com*.

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

Nucleo-WL33CC1 :

Frequency range: 869.4-869.65MHz

Maximal power: 16dBm

Nucleo-WL33CC2 :

Frequency range : 433.05 – 434.79MHz
Maximal power: 10dBm

Revision history

Table 15 : Document revision history

Date	Revision	Changes
Sept-2024	1.0	Initial revision with MB2029 rev B

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