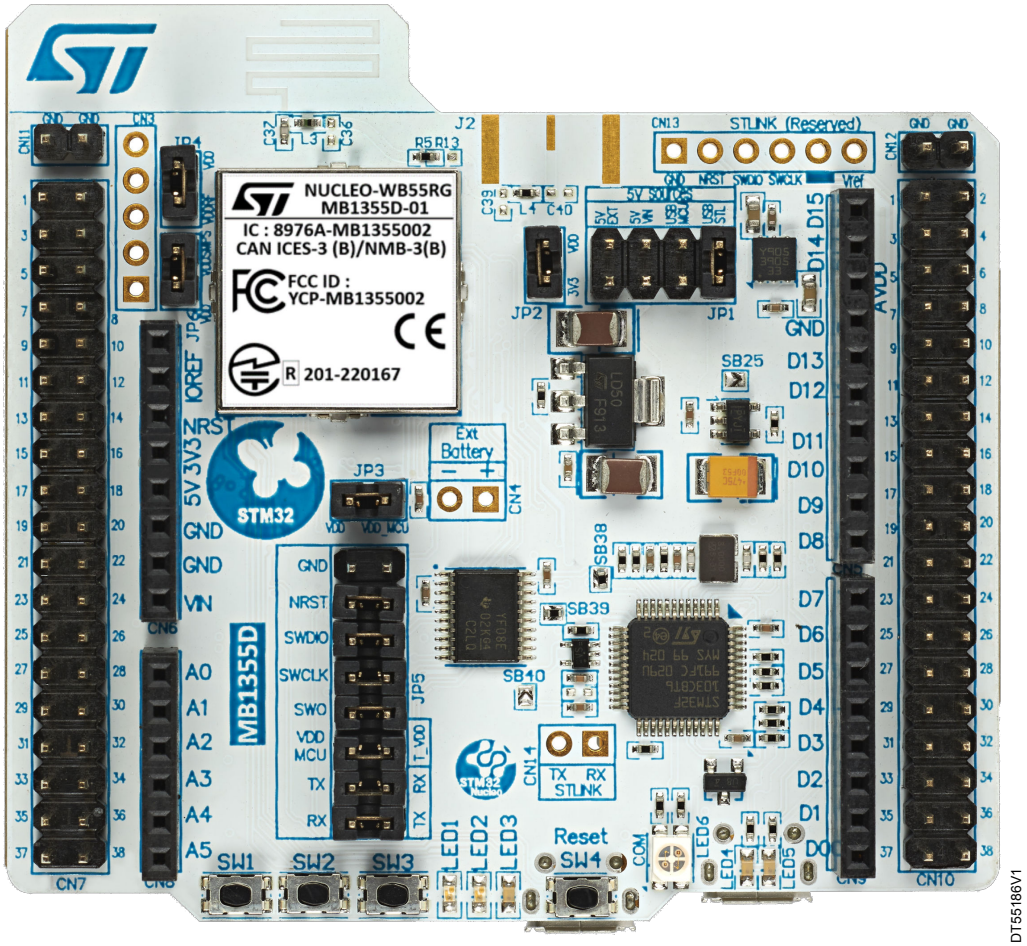
STM32WB Nucleo-64 board (MB1355)

Introduction

The NUCLEO-WB55RG STM32WB Nucleo-64 board is based on the MB1355 board. It 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 and IEEE802.15.4-2011. PHY and MAC are supported.

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. A wide choice of specialized shields is available for this purpose.

Figure 1. NUCLEO-WB55RG top view



Picture is not contractual.

1 Features

- STM32WB55RG ultralow-power wireless microcontroller featuring 1Mbyte of flash memory, 256 Kbytes of SRAM in VFQFPN68 package
- 2.4 GHz RF transceiver supporting Bluetooth® specification v5.4 and IEEE 802.15.4-2011 PHY and MAC
- Dedicated 32-bit Arm® Cortex®-M0+ CPU for real-time radio layer
- SMPS significantly reducing power consumption in Run mode.
- Three user LEDs shared with ARDUINO®
- Four push-buttons
- 32.768 kHz LSE crystal oscillator
- 32 MHz crystal oscillator with integrated trimming capacitors
- Board connectors:
  - ARDUINO® Uno V3
  - ST morpho
- Flexible power-supply options: ST-LINK USB V_{BUS} or external sources
- On-board ST-LINK/V2-1 debugger/programmer with USB re-enumeration capability: mass storage, Virtual COM port, and debug port
- Comprehensive free software libraries and examples available with the 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-WB55RG 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-WB55RG	MB1355[1]	STM32WB55RGU6

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

2.1 Codification

The meaning of the codification is explained in Table 2.

Table 2. Codification explanation

NUCLEO-XXYYZT	Description	Example: NUCLEO-WB55RG
XX	MCU series in STM32 32-bit Arm Cortex MCUs	Wireless Bluetooth® STM32WB series
YY	MCU product line in the series	STM32WB55 product line
Z	STM32 package pin count: • R for 68 pins	68 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-WB55RG 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-WB55RG.

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 STM32WB Nucleo-64 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 Figure 3 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 LED2 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 LED2 green LED blinks for each connection interval. The smartphone application displays the device's service and characteristics.
5. Pushing the SW1 button on the board toggles the alarm on the smartphone display. Pushing the SW2 button changes the connection interval (50 ms, 1 s). The effect is visible directly on the LED2 green LED of the Nucleo board. On the smartphone, push the lamp to switch ON or OFF the Nucleo board LED1 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-WB55RG product location.

7 Hardware layout and configuration

This section shows the architecture of the NUCLEO-WB55RG (MB1355) and the features available.

7.1 MB1355 hardware layout

The NUCLEO-WB55RG Nucleo-64 board is designed around the STM32WB55RG microcontroller. The hardware block diagram in Figure 2 illustrates the connection between NUCLEO-WB55RG and its peripherals (ARDUINO® Uno V3 connector, ST morpho connector, and embedded ST-LINK).

Figure 3 to Figure 5 help the user locate these features on the NUCLEO-WB55RG board.

Figure 2. Hardware block diagram

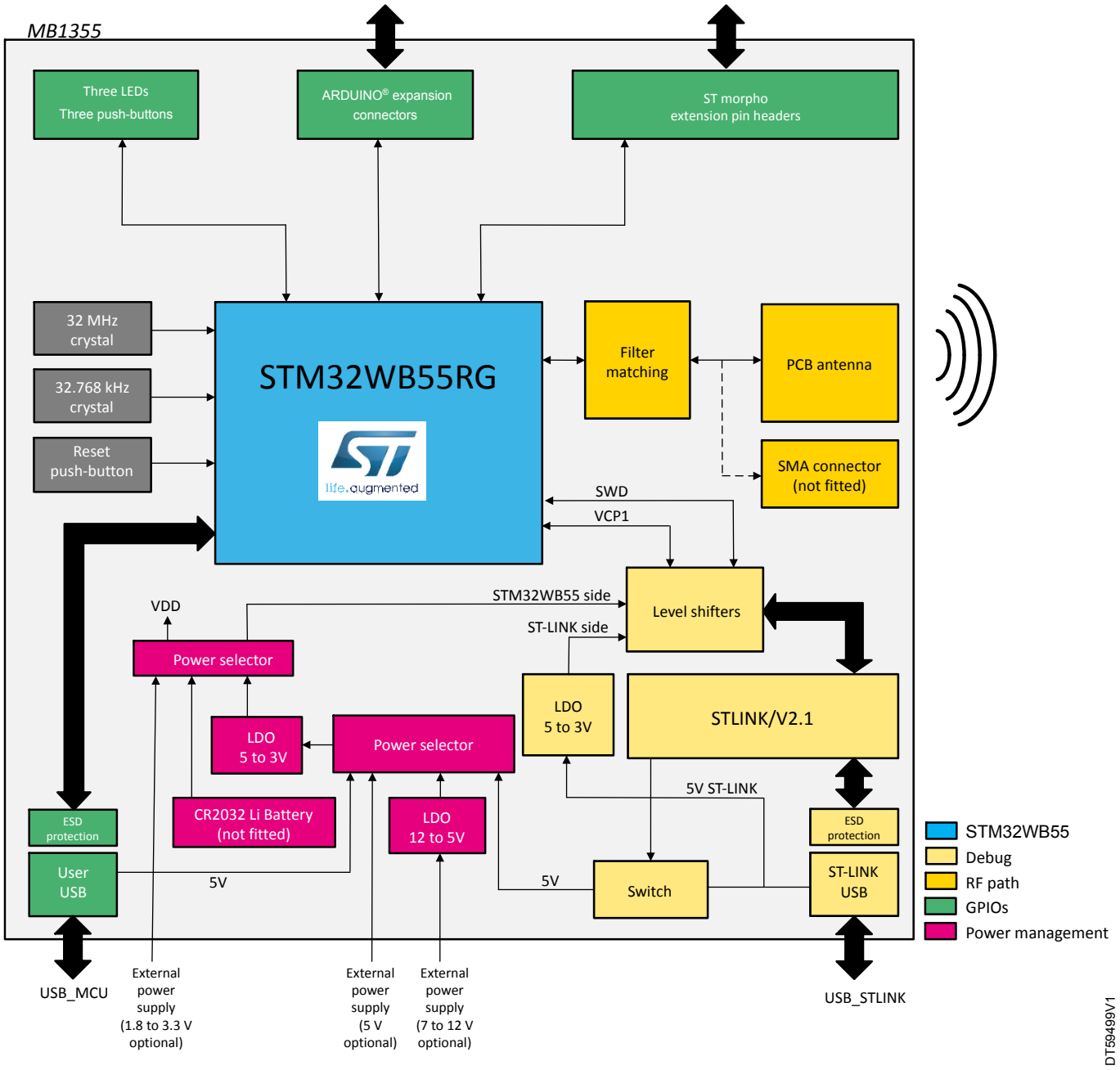


Figure 3. NUCLEO-WB55RG PCB top side

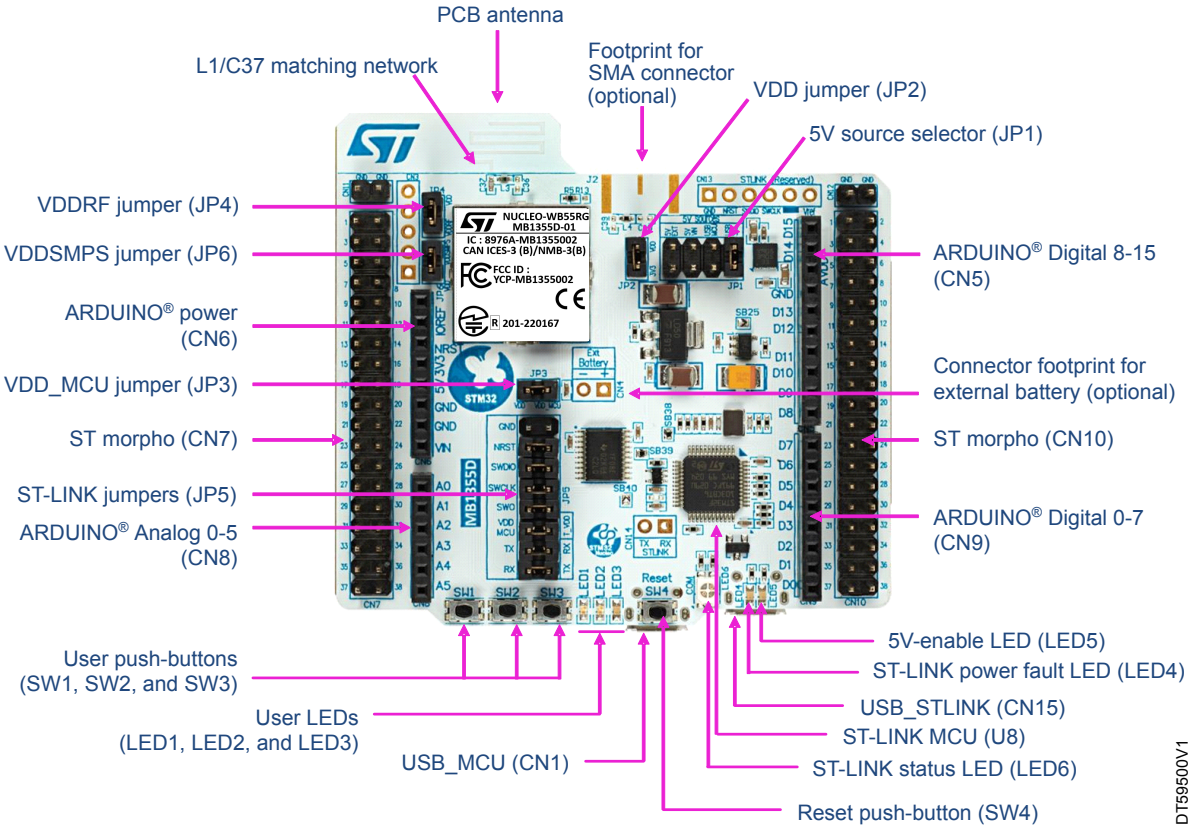


Figure 4. NUCLEO-WB55RG PCB with details of the main part (SoC and RF)

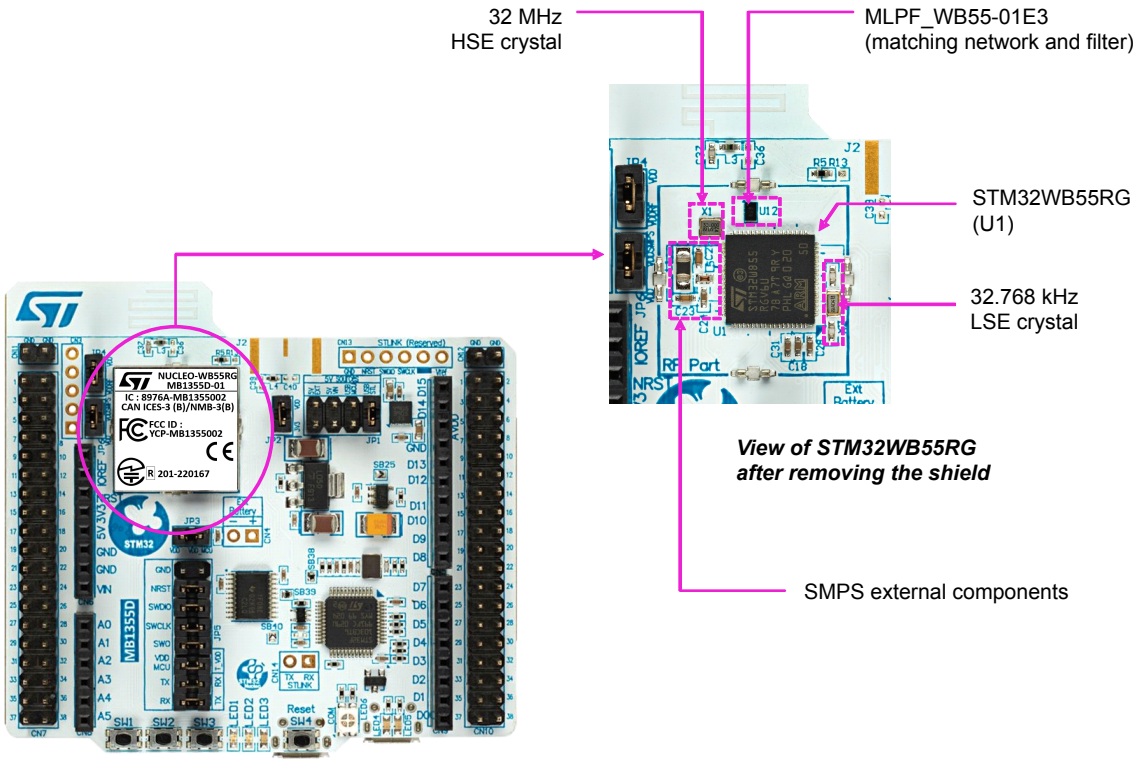
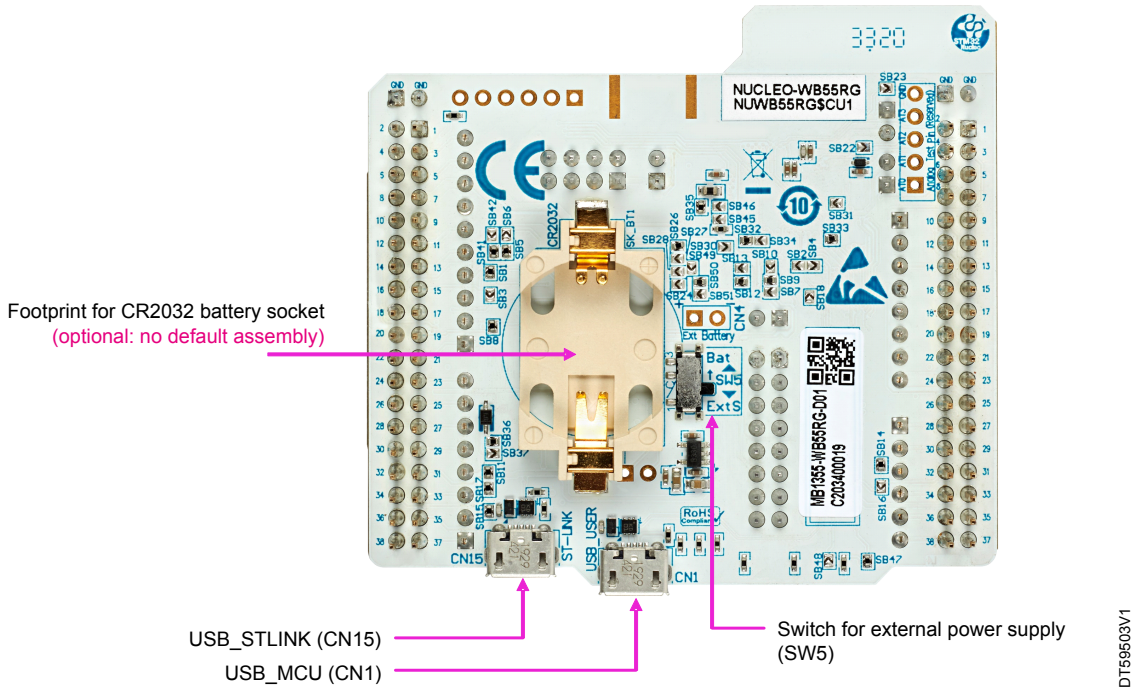
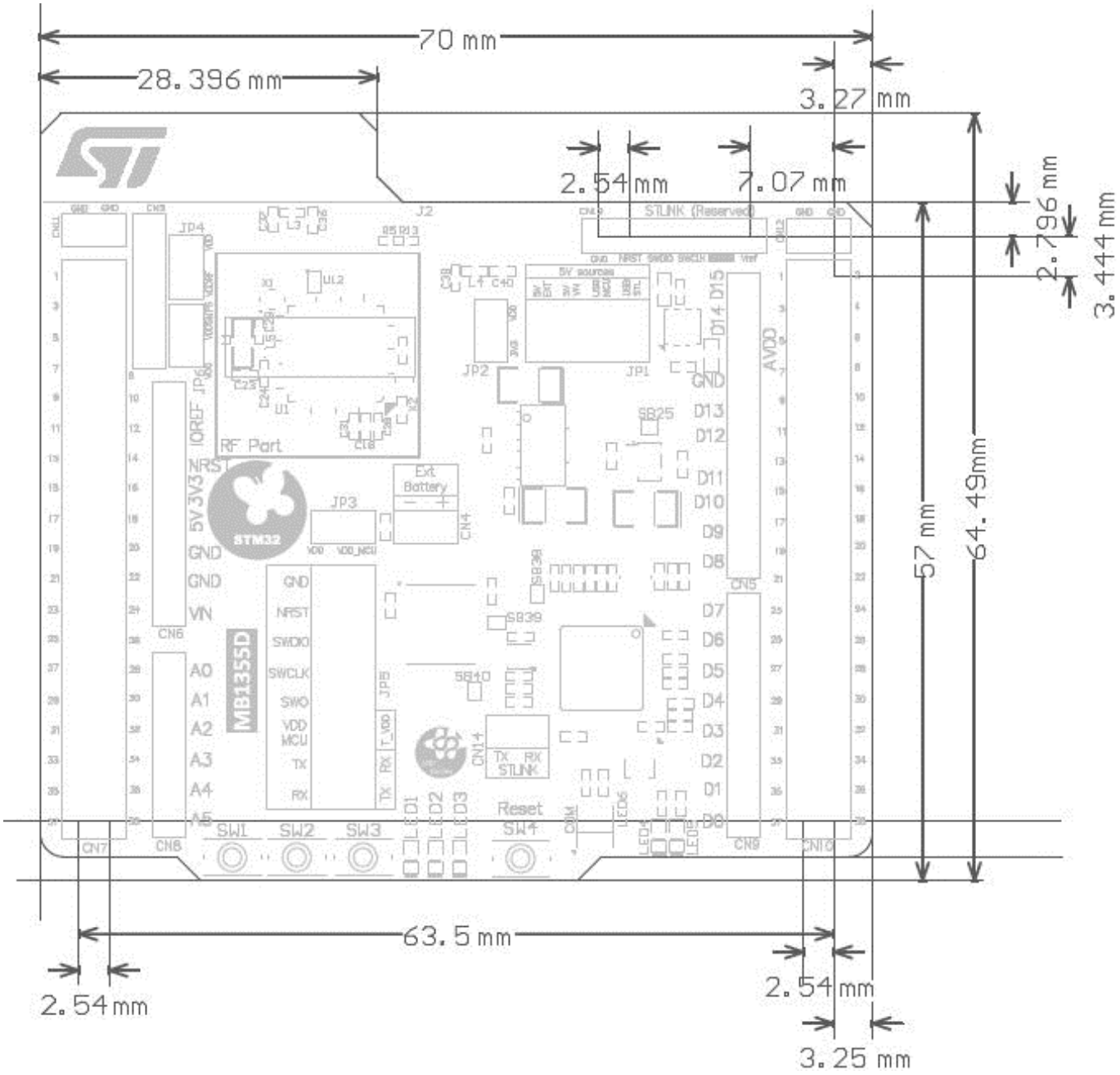


Figure 5. NUCLEO-WB55RG PCB bottom side



7.2 MB1355 mechanical dimensions

Figure 6. **NUCLEO-WB55RG mechanical dimensions (in millimeters)**

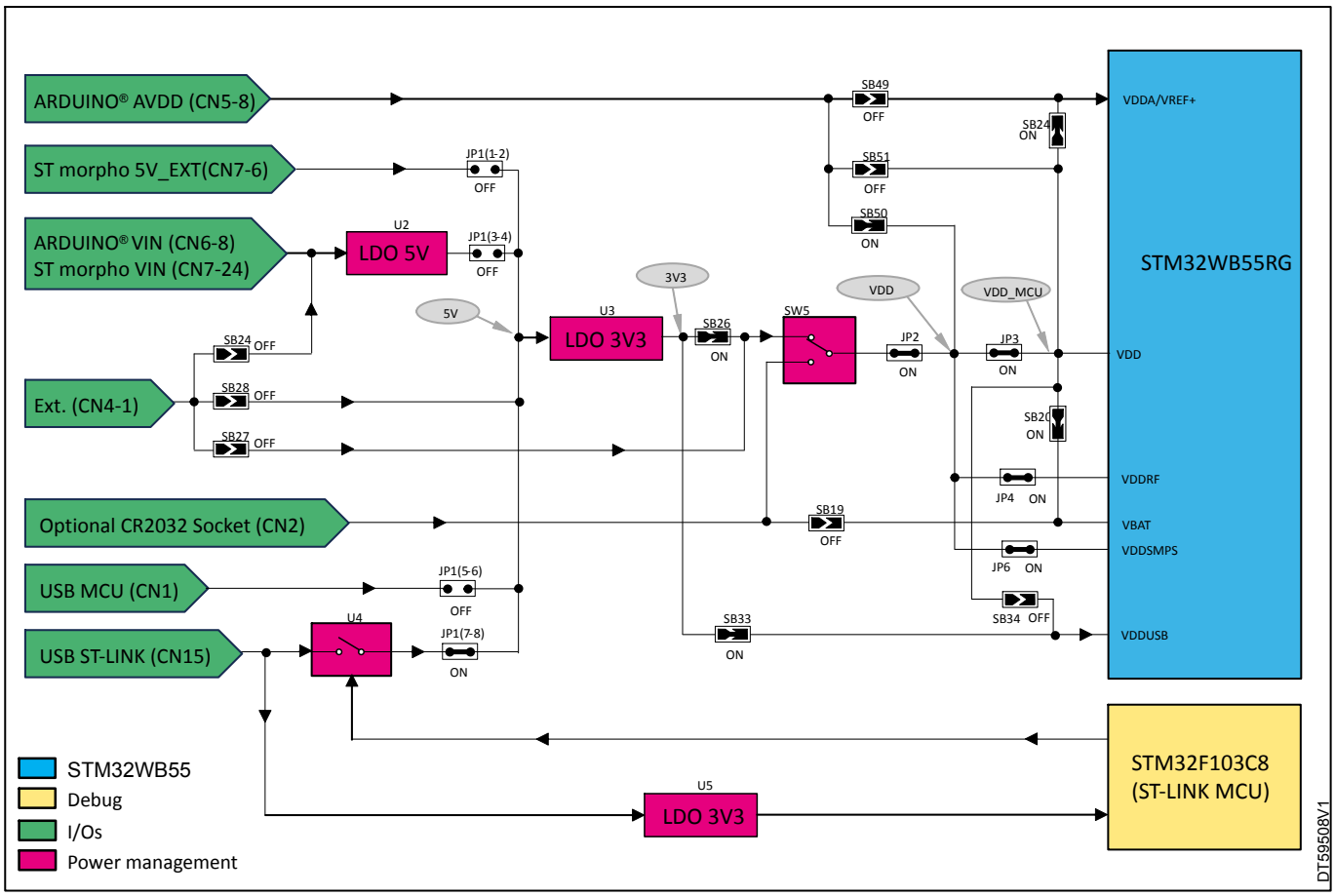


7.3 Power supply

7.3.1 General description

By default, the STM32WB55RG 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 STM32WB55RG 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 7 shows the power tree. Moreover, this figure also shows the default state of the jumpers and the solder bridges.

Figure 7. MB1355 power tree



7.3.2 7 to 12 V power supply

NUCLEO-WB55RG 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 4.

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 7.3.3 for further details.

7.3.3 5 V power supply

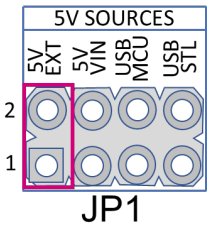
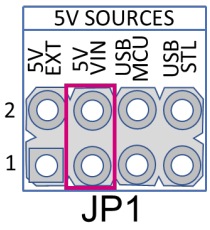
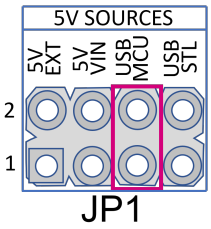
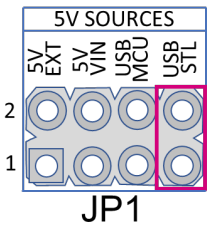
NUCLEO-WB55RG can be powered with a 5 V DC power source. The 5 V can come from several connectors:

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 7.3.2 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 7.3.2 for further details.

The JP1 jumper selects the 5V source. Table 4 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-WB55RG is supplied with the correct power source depending on the current needed.

Table 4. Power supply selector (JP1) description

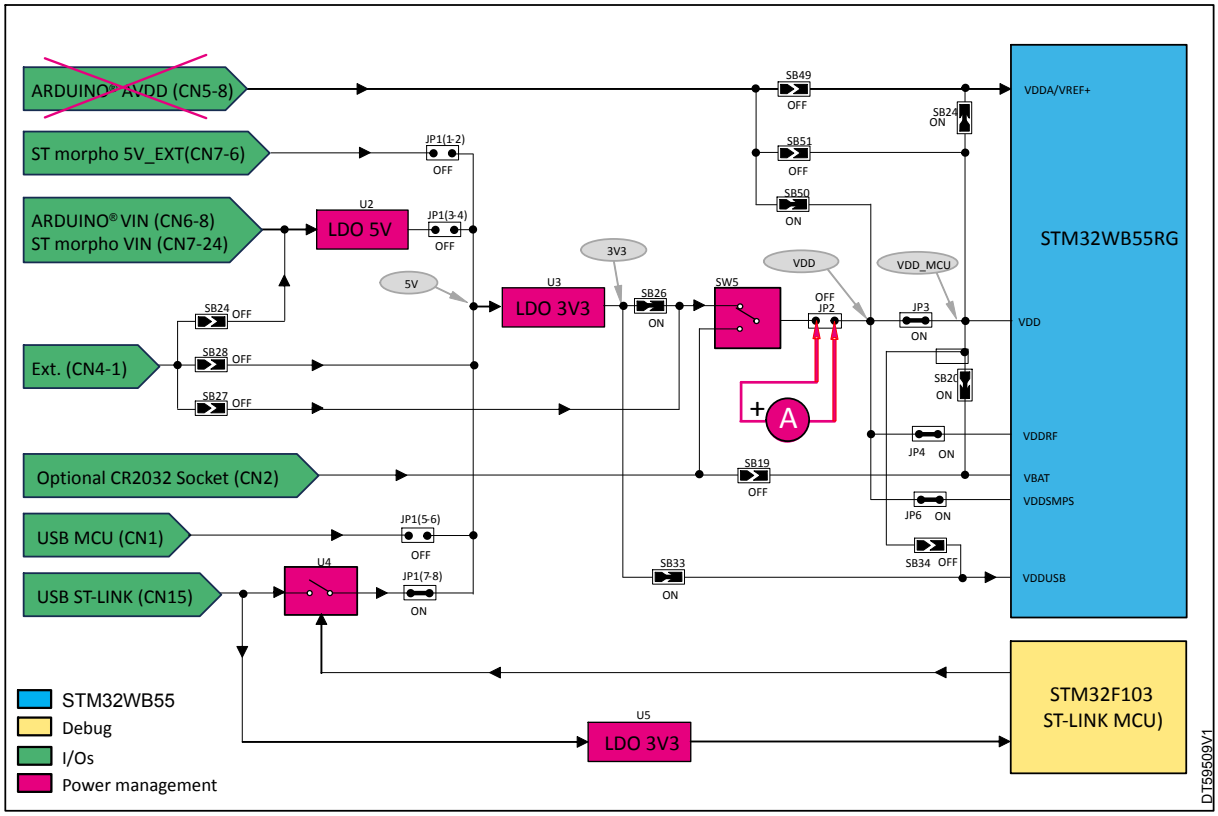
Jumper / Solder bridge	Setting	Configuration
JP1 5V supply source selector		NUCLEO-WB55RG is supplied through CN7 pin 6 directly.
		NUCLEO-WB55RG is supplied through the ARDUINO® CN6 pin 8, or ST morpho CN7 pin 24, or CN4 (Refer to configuration details in the present power supply section).
		NUCLEO-WB55RG is supplied through the CN1 Micro-B USB receptacle (USB_USER)
		NUCLEO-WB55RG is supplied through the CN15 USB Micro-B ST-LINK receptacle.

7.3.4 Current measurement

As the device has low power features, it can be interesting to measure the current consumed by NUCLEO-WB55RG. To easily do this measurement, there are two possibilities:

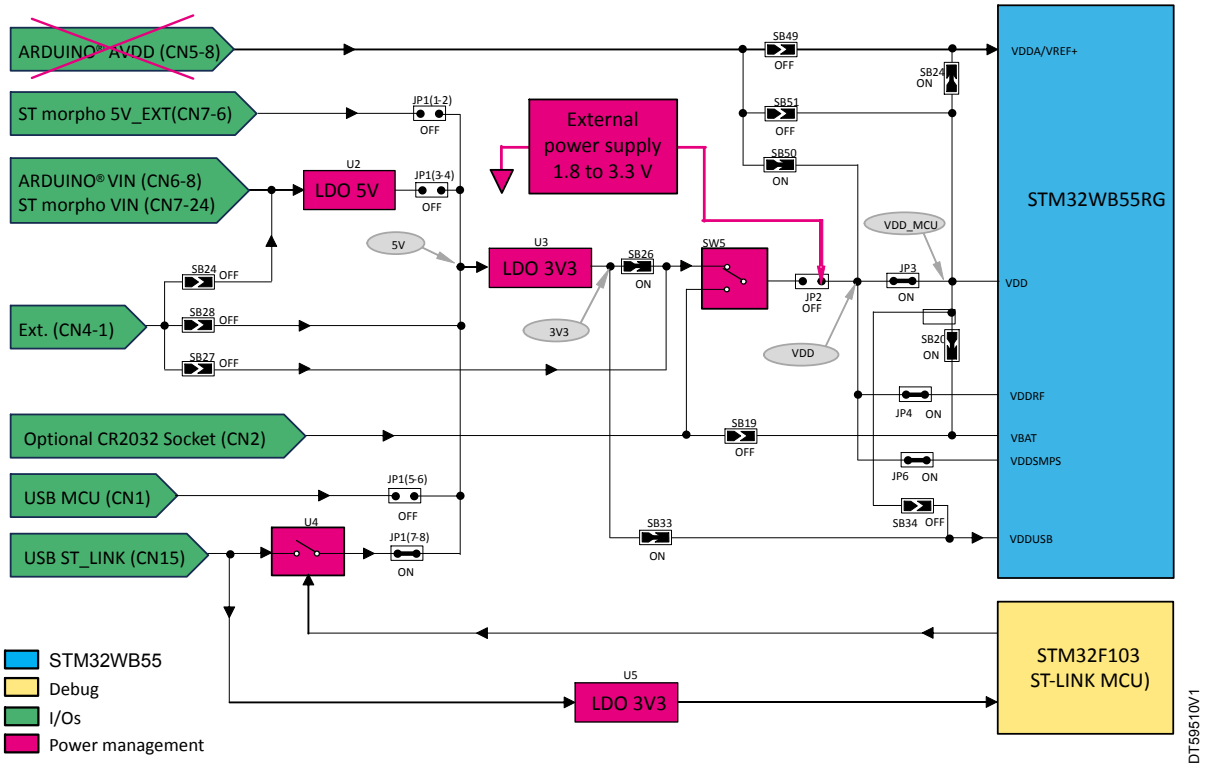
1. Measure the supply current of the SoC using an ammeter in place of the JP2 jumper. In this case, all supply sources can be used except the AVDD coming from the ARDUINO® connector. Figure 8 shows the configuration.

Figure 8. Current measurement with an ammeter



2. Use an external power supply with current measurement capabilities. In this case, the JP2 jumper must be removed, and the supply connected to JP2 pin 2, as shown in Figure 9. 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 9. Current measurement with an external power supply

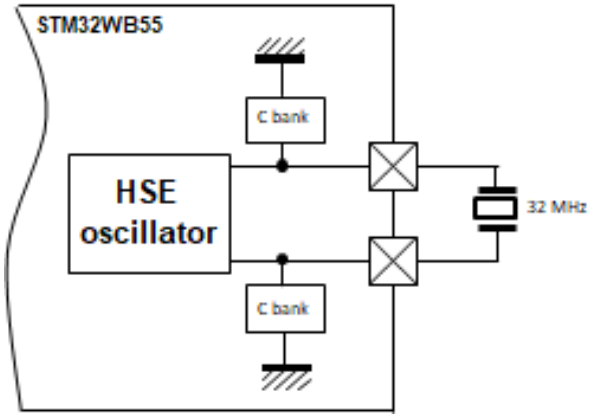


7.4 Clock sources

7.4.1 HSE clock reference

The accuracy of the high-speed clock (HSE) of the SoC is committed to a 32 MHz crystal oscillator. The HSE oscillator is trimmed during board manufacturing. No external capacitors are needed.

Figure 10. HSE oscillator

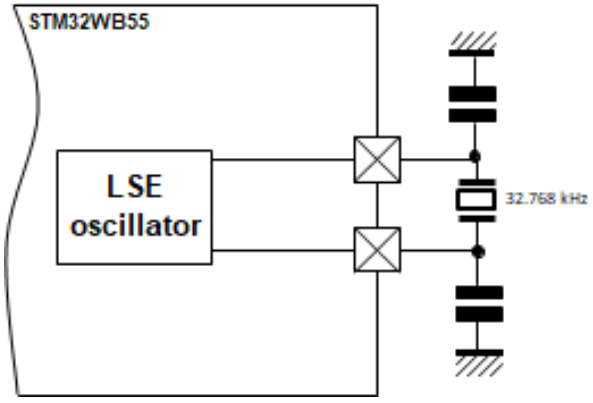


HSE on board oscillator 32 MHz X1 crystal is provided for RF activities. Refer to STM32WB55 datasheet, and to the application note *Guidelines for oscillator design on STM8AF/AL/S and STM32 MCUs/MPUs* (AN2867) for oscillator design.

7.4.2 LSE clock reference

The accuracy of the low-speed clock (LSE) is committed to a 32.768 kHz crystal oscillator. Two capacitors are needed. Their value depends on the crystal selected.

Figure 11. LSE oscillator



LSE on-board oscillator X2 crystal 32.768 kHz, 7 pF, 20 ppm. Refer to the application note *Guidelines for oscillator design on STM8AF/AL/S and STM32 MCUs/MPUs* (AN2867), available at *www.st.com*. SB45 and SB46 must be OFF. With this crystal, two external capacitors are needed. Their common value is 10 pF.

7.5 Reset sources

The NUCLEO-WB55RG reset signal is active LOW. The internal pull-up resistor forces the RST signal to a high level.

The sources of reset are:

- Reset push button (SW4)
- Embedded ST-LINK/V2-1
- ARDUINO® connector (CN5 pin 3) reset from the ARDUINO® board.
- ST morpho connector (CN3 pin 14)

7.6 Embedded ST-LINK/V2-1

The Nucleo board (MB1355) has an integrated ST-LINK/V2-1 programming and debugging tool.

ST-LINK/V2-1 offers the following features:

- USB software re-enumeration
- Virtual COM port interface on USB
- Mass storage interface on USB
- USB power management requests higher than 100 mA on USB

For general information concerning debugging and programming features shared between the ST-LINK V2 and V2-1 versions, refer to the user manual *ST-LINK/V2 in-circuit debugger/programmer for STM8 and STM32* (UM1075) available from *www.st.com*.

The Nucleo board offers optional configurations for ST-LINK:

- The Nucleo board is divided into two parts: ST-LINK and target MCU parts. The PCB area dedicated to the first one can be cut to reduce board size. In this case, the second part can only be powered by VIN, E5V, and 3.3 V on ST morpho connectors, or VIN and 3.3 V on ARDUINO® connectors.
- It is still possible to use the ST-LINK part to program the main MCU using wires between the SWD connector and SWD signals available on ST morpho connectors.

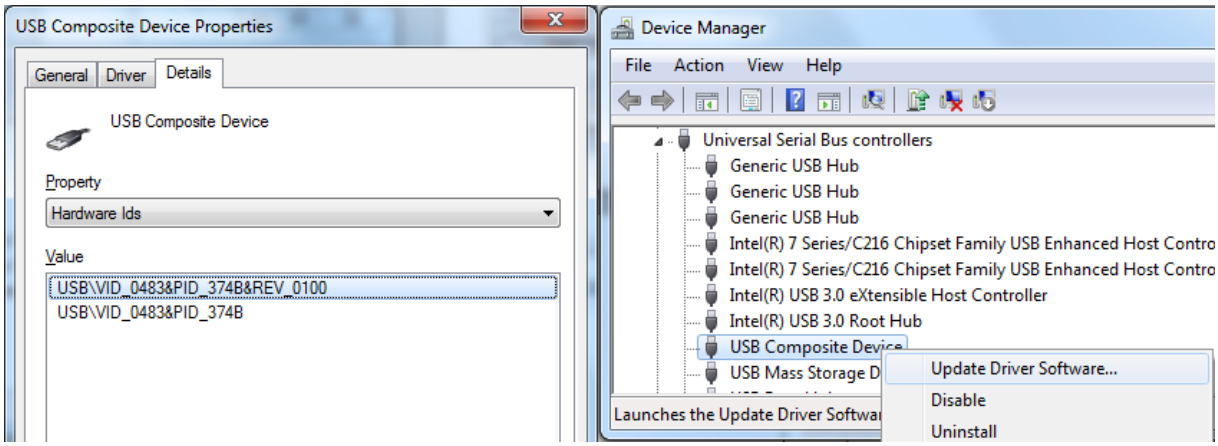
7.6.1 Drivers

When connecting the Nucleo board to a Windows 10® PC via USB, a driver for the ST-LINK is automatically installed.

If the Nucleo board is connected to the PC before the driver is fully installed, some interfaces might be declared as *Unknown* in the PC device manager. In this case, the user must wait for the end of the driver installation.

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

Figure 12. USB composite device

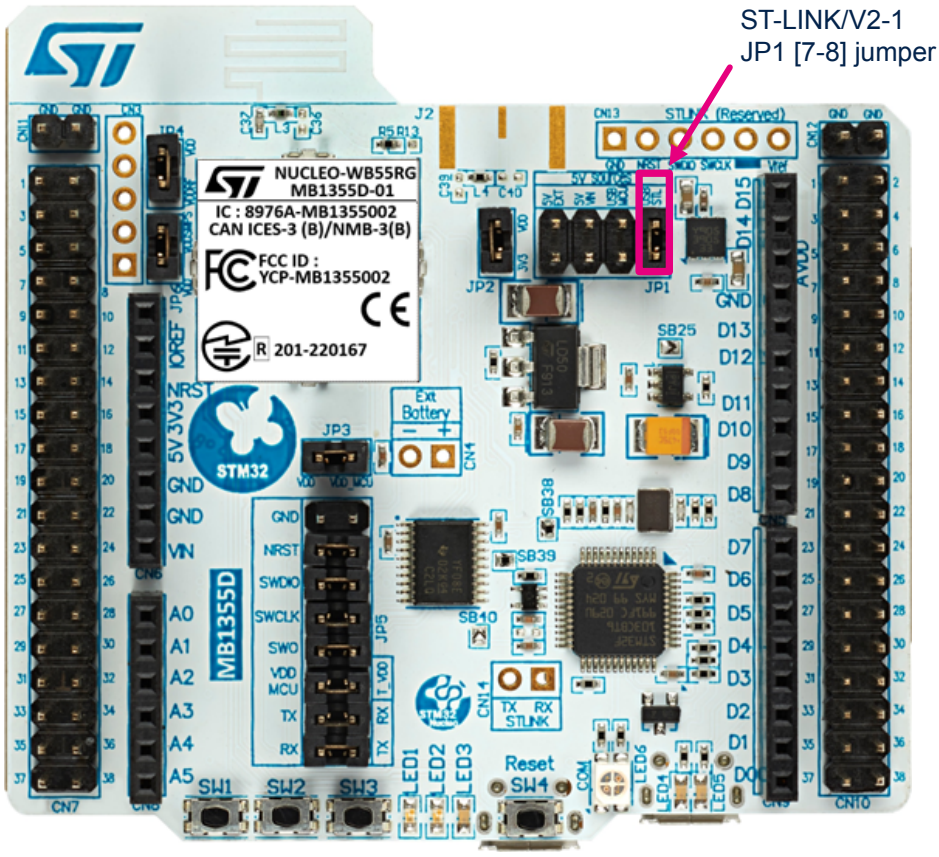


7.6.2 ST-LINK/V2-1 firmware upgrade

The ST-LINK/V2-1 embeds a firmware upgrade mechanism for in-place upgrades through the USB port. The firmware might evolve during the lifetime of ST-LINK/V2-1 (for example, new functionalities, bug fixes, and support for new microcontroller families). It is therefore recommended to check for updates on *www.st.com* before using the Nucleo-64 board.

To program the on-board STM32WB55 microcontroller, plug in the jumper JP1[7-8] connector, as shown in Figure 13.

Figure 13. ST-LINK debugger: JP1 configuration for on-board MCU



DT59514V1

7.6.3 ST-LINK/V2-1 Virtual COM port connected to USART1

On MB1355, the USART1 interface of the STM32 microcontroller on the Nucleo board can be connected to the ST-LINK/V2-1 MCU. The USART1 selection can be changed by setting the relevant solder bridges and jumpers.

Table 5. USART1 connections

Jumper and solder Bridge configuration	Feature
JP5[13-14] ON SB39 ON	USART1_TX (PB6) connected to ST-LINK VCP_RX
JP5[15-16] ON SB38 ON	USART1_RX (PB7) connected to ST-LINK VCP_TX

7.6.4 Level shifter

MB1355 has a system for supplying STM32WB55RG with a different voltage than ST-LINK. ST-LINK is always supplied by 3V3 sources. By default, STM32WB55RG is supplied by the same voltage value as ST-LINK, but it is possible to supply the SoC with another value. It accepts voltages between 1.8 and 3.3 V by using a specific component, the 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 ST-LINK.

7.6.5 Multifunction jumper (JP5)

The JP5 multifunction jumper can connect ST-LINK/V2-1 to STM32WB55RG. It is located between the level shifter and the SoC and referenced to the VDD domain (STM32WB55RG supply voltage domain).

Figure 14. Interconnection bloc diagram between STM32WB55RG and ST-LINK/V2-1

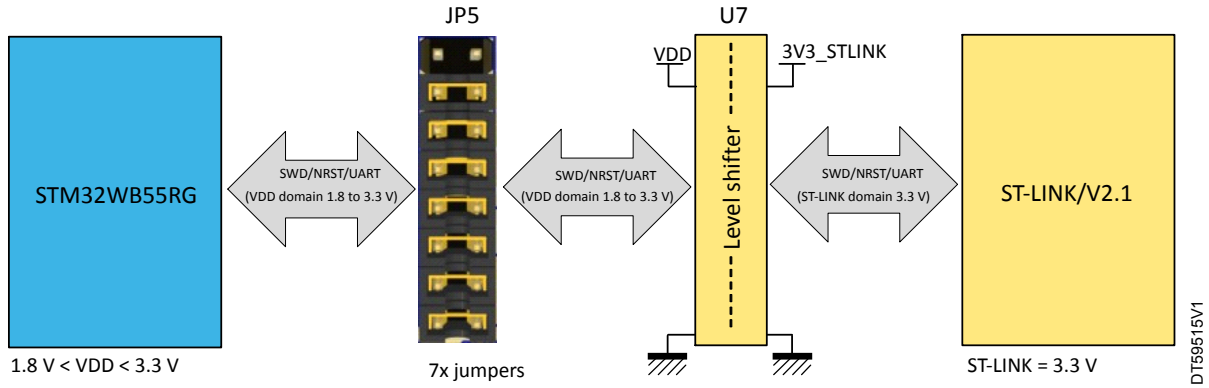


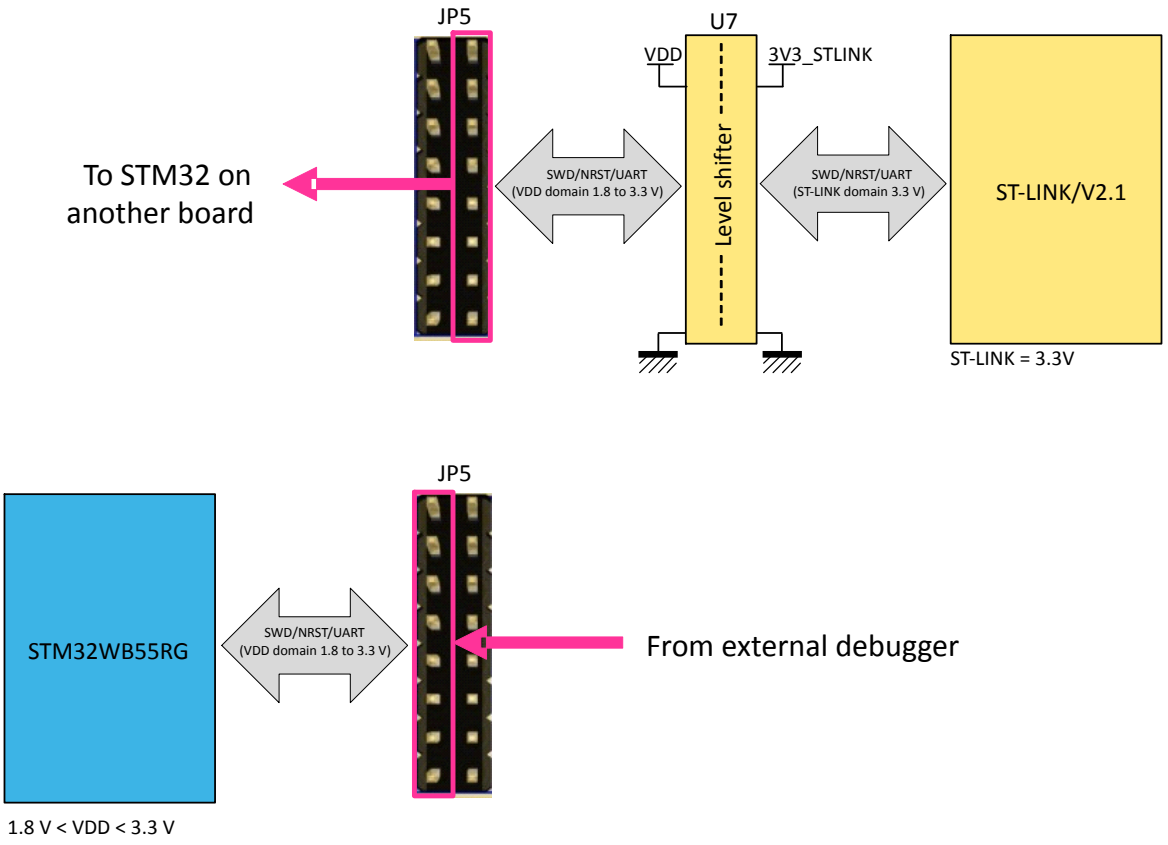
Table 6. JP5 pinout

STM32WB55RG side (VDD)	JP5 pinout		ST-LINK and level shifter side (T_VDD)
GND	1	2	GND
NRST	3	4	T_NRST
SWDIO (PA13)	5	6	T_SWDIO
SWCLK (PA14)	7	8	T_SWCLK
SWO (PB3)	9	10	T_SWO
VDD	11	12	T_VDD
USART1_TX (PA9)	13	14	ST-LINK_RX
USART1_RX (PA10)	15	16	ST-LINK_TX

By default, the jumpers are populated and ST-LINK is connected to STM32WB55RG through level shifters. However, if the jumpers are removed, two other features are available on JP5:

- Use of ST-LINK with another STM32 (connection on ST-LINK side)
- Use of an external debugger (connection on STM32WB55RG side).

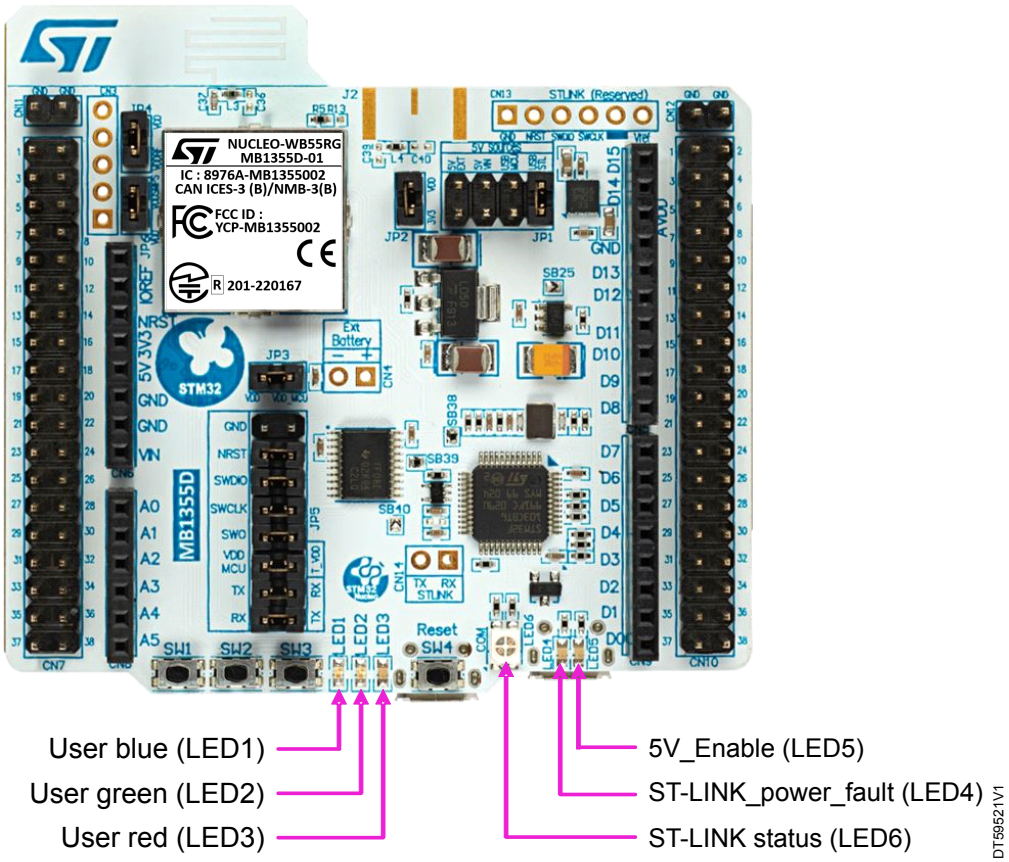
Figure 15. Use case example when JP5 jumpers are removed



7.7 LEDs

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

Figure 16. LED location



1. *LED1: This blue LED is available for user applications.*
2. *LED2: This green LED is available for user applications.*
3. *LED3: This red LED is available for user applications.*
4. *LED4: This LED turns red to indicate that the current distribution cannot be performed as expected when the board is supplied by USB_STLINK.*
5. *LED5: This LED turns green when the 5V is available. To select the 5 V source, refer to Section 7.3.3 for further details.*
6. *LED6 is a bi-color LED. Its 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.*

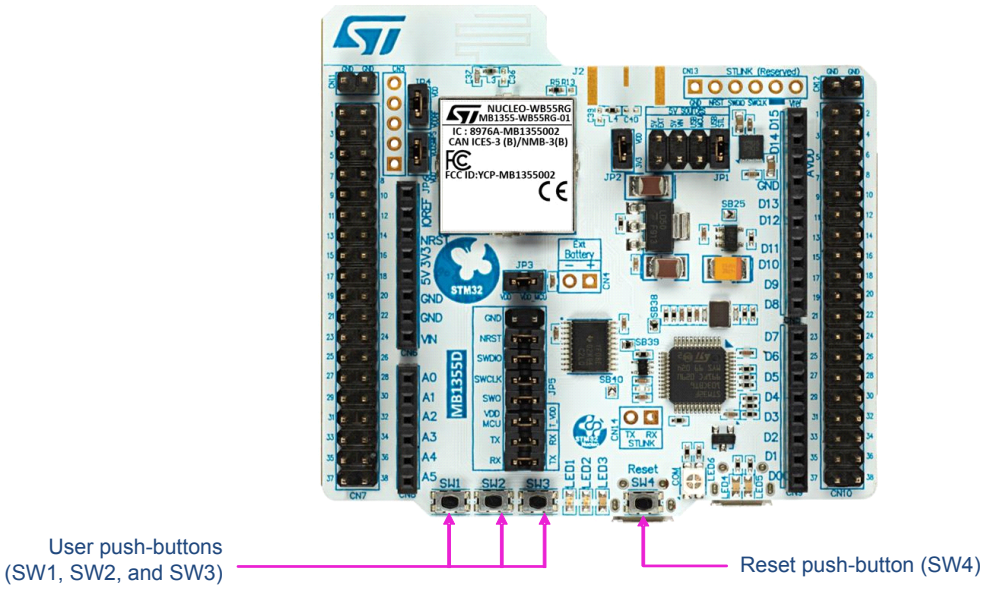
7.8 Push-buttons

7.8.1 Description

NUCLEO-WB55RG provides two types of buttons: user and reset. Four buttons are available on the board:

- User push-button (SW1)
- User push-button (SW2)
- User push-button (SW3)
- Reset push-button (SW4)

Figure 17. Push-button location



7.8.2 Reset push-button

SW4 is dedicated to the hardware reset of the NUCLEO-WB55RG board.

7.8.3 User push-buttons

Three push-buttons are available for the user application. They are connected to PC4 or PC13, PD0, and PD1. It is possible to use them with GPIO reading or to wake up the device (only B1).

Note that PC4, PC13, PD0, and PD1 are also connected to ARDUINO® or ST morpho connectors as GPIOs.

Figure 18. Push-button locations for MB1355

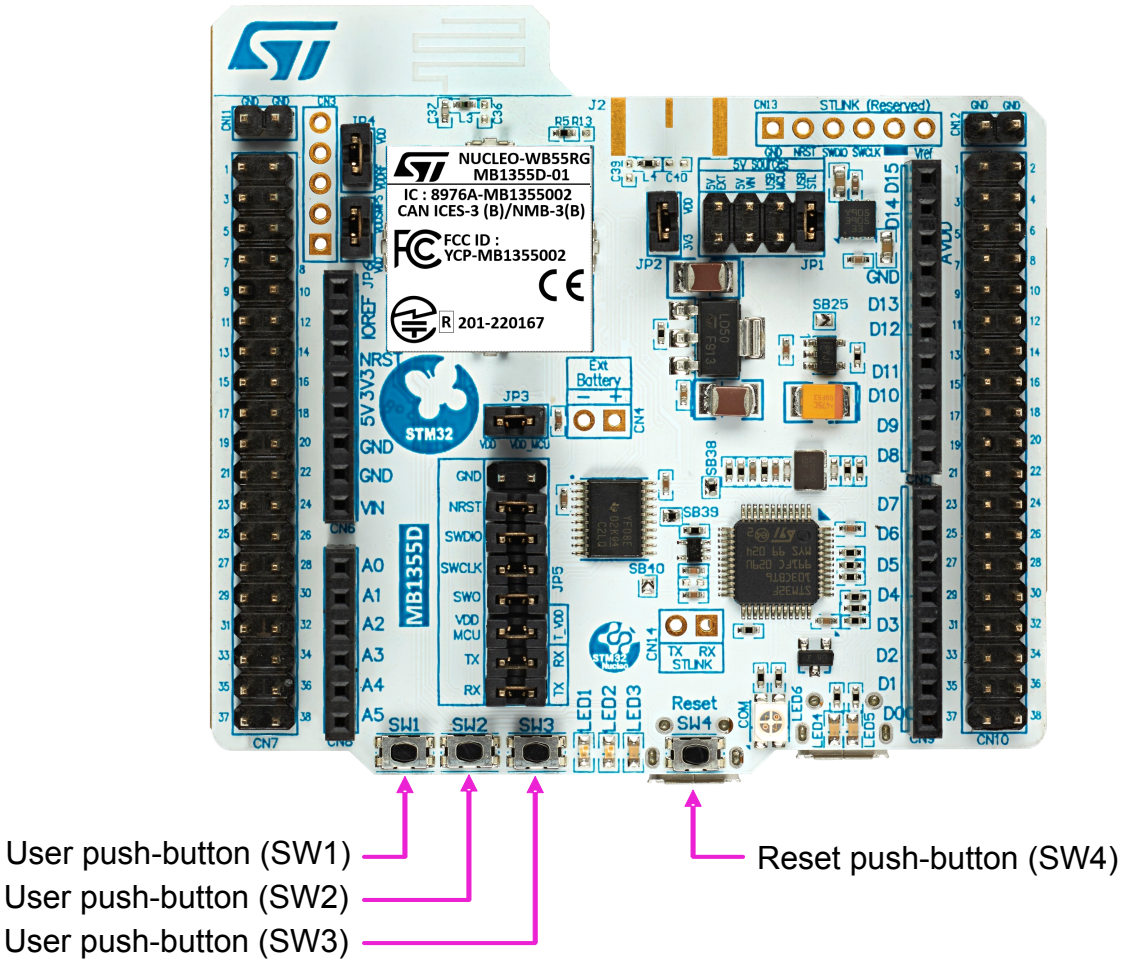


Table 7. MB1355 I/O configuration for the physical user interface

Name	I/O	Wake-Up available
SW1	PC4 if SB47 ON and SB48 OFF (default)	None
	PC13 if SB47 OFF and SB48 ON	WKUP2
SW2	PD0	None
SW3	PD1	None

7.9 RF I/O stage

The output selection between the PCB antenna and the SMA connector is made by a 0-Ω resistor (R5 footprint) for the PCB antenna (default) and R13 for the SMA connector. The SMA connector footprint is compatible with 142-0701-851 from Cinch Connectivity Solutions.

On this version, the STMicroelectronics-specific IPD filter (U12) replaces the matching network of the STM32WB55 and the filter of MB1355. It is a low-pass filter with an impedance that is directly compatible with STM32WB55.

Figure 19. Schematic of the RF path

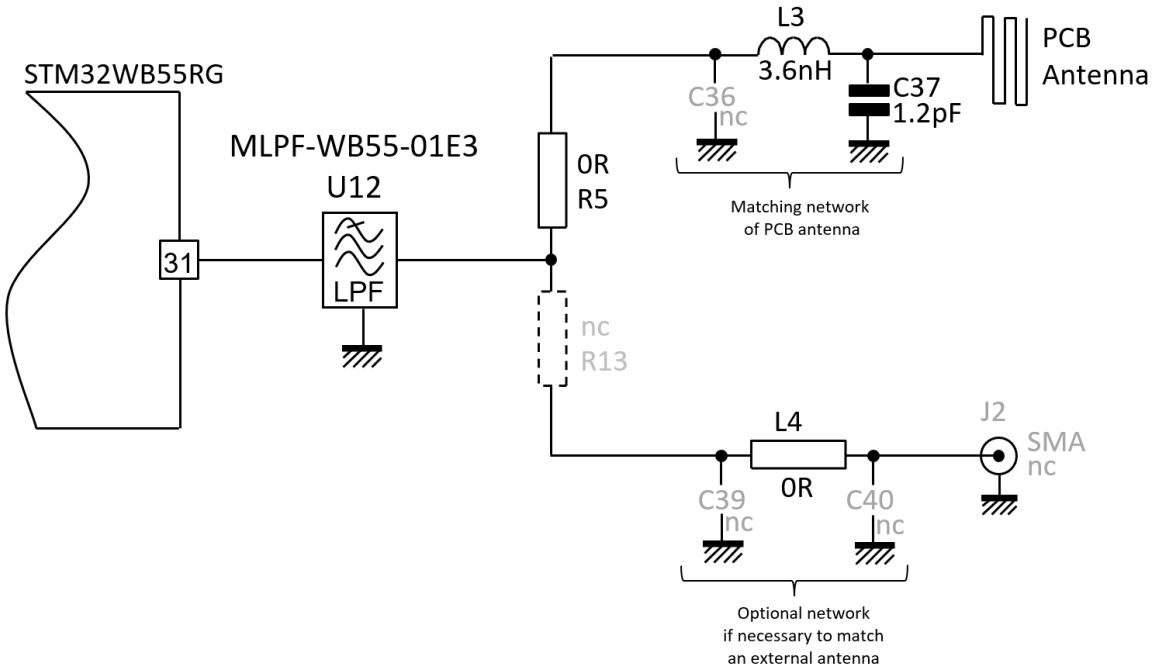


Figure 20. Modification for the SMA path

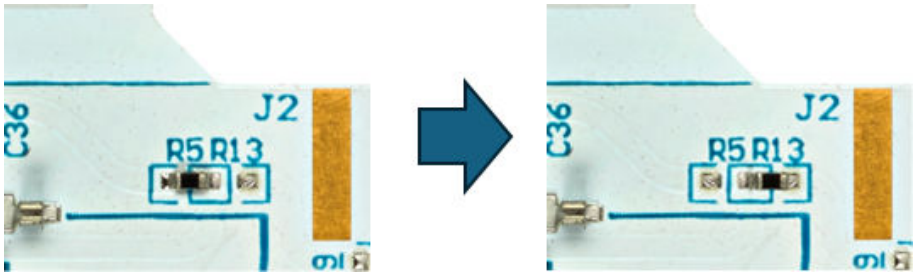
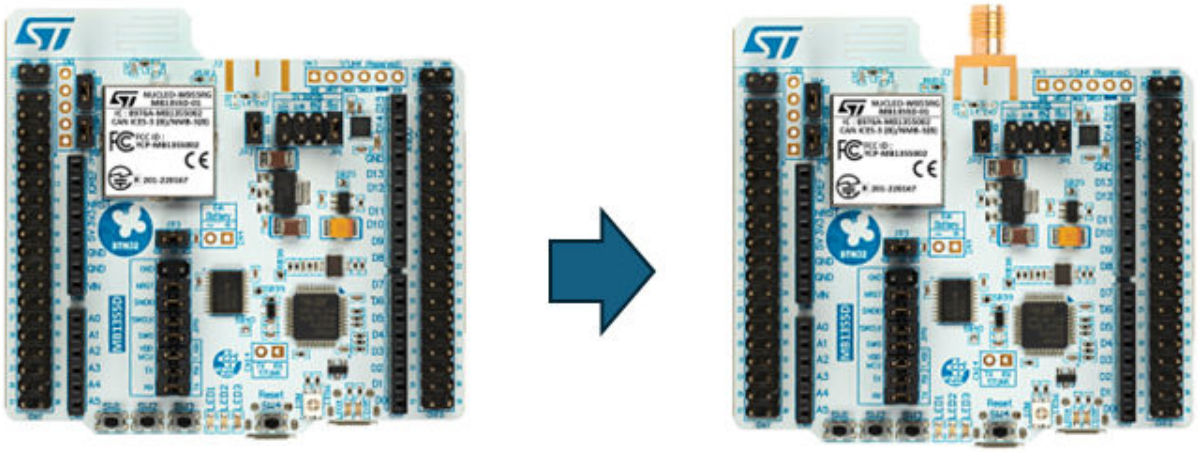


Figure 21. **SMA connector addition to MB1355**



7.10 Embedded SMPS

The STM32WB55 microcontroller on the MB1355 board embeds a DC-DC converter: SMPS (switched-mode power supply). The goal of this SMPS is to optimize the power consumption of the device depending on the supply voltage. STM32WB55 can be used in both modes: SMPS-enabled (SMPS mode) or disabled (LDO mode). The usefulness of the SMPS mode depends on the use case.

Figure 22. Schematic with SMPS mode

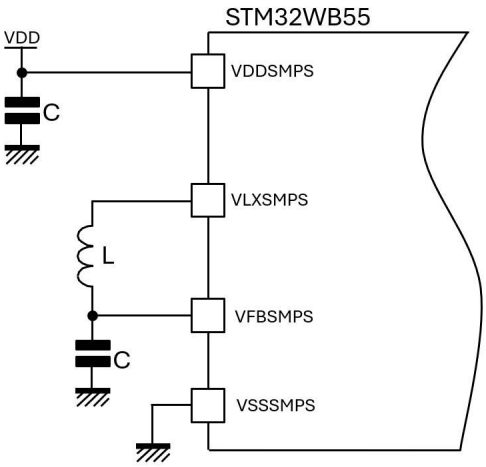
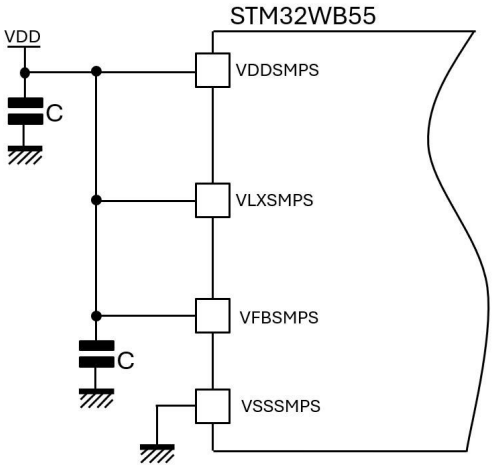


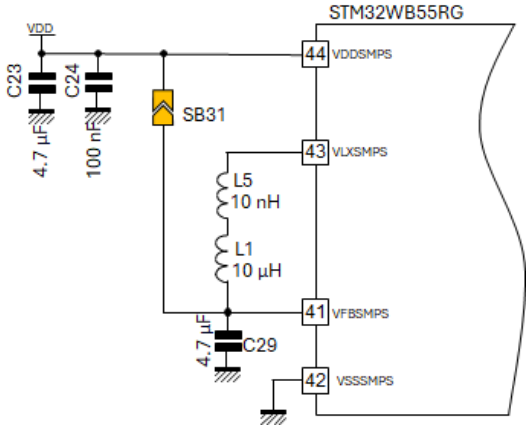
Figure 23. Schematic with LDO mode



Warning: *When the SMPS is not used, it is important to set correctly the configuration registers. Refer to the SMPS sections in the datasheet and reference manual of the product.*

For evaluation reasons, two configurations are possible. For SMPS mode, the solder bridge is OFF (configuration by default). For LDO mode, the solder bridge is ON to bypass the SMPS. Both coils can remain on the circuit without impact due to low DC impedance.

Figure 24. MB1355 schematic



An extra RF coil (L5=10 nH) is added to improve the stability and the performance of the SMPS.

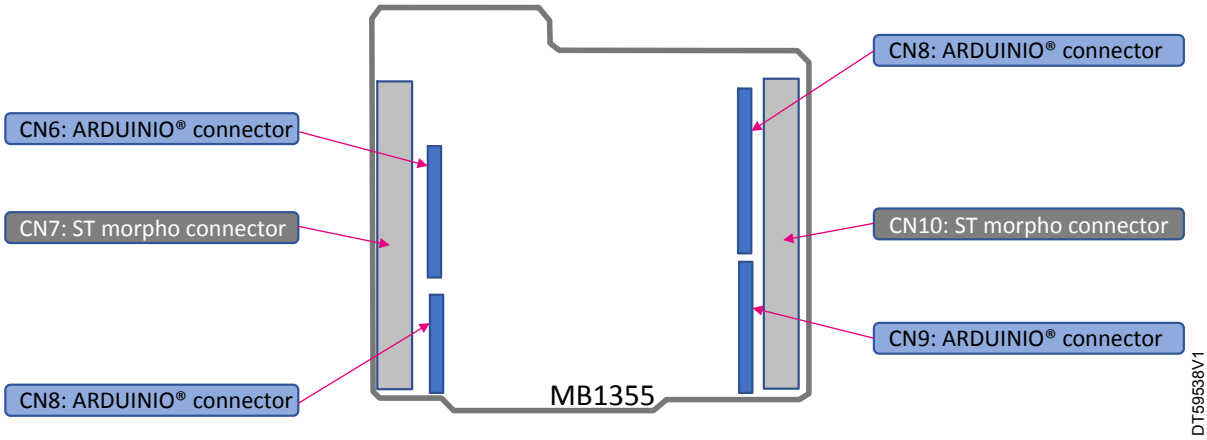
To ensure optimal performance of the SMPS, the external components are very important. Table 8 shows the recommended parts to use.

Table 8. External components for SMPS optimal performance

Designator on MB1355	Component value	Component part number
C23	4.7 µF	GRM155R60J475ME87 (Murata)
C24	100 nF	CC0402KRX7R7BB104 (Yageo)
L1	10 µH	74479777310A (Wurth)
L5	10 nH	LQP15MN10NG02 (Murata)
C29	4.7 µF	GRM155R60J475ME87 (Murata)

7.11 MB1355 extension connector interface and pinout

Figure 25. MB1355 connector location and naming

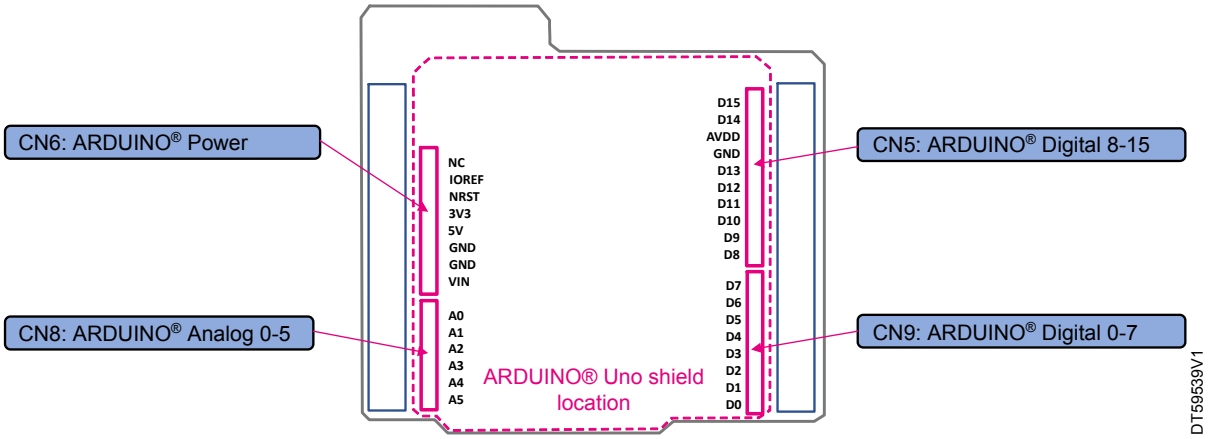


7.11.1 ARDUINO® interface and pinout

Description

On the bottom side of the board, there is an ARDUINO® Uno R3 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 26. ARDUINO® Uno connectors and ARDUINO® shield location



Operating voltage

The ARDUINO® Uno R3 connectors support 5 V, 3.3 V, and VDD for I/O compatibility.

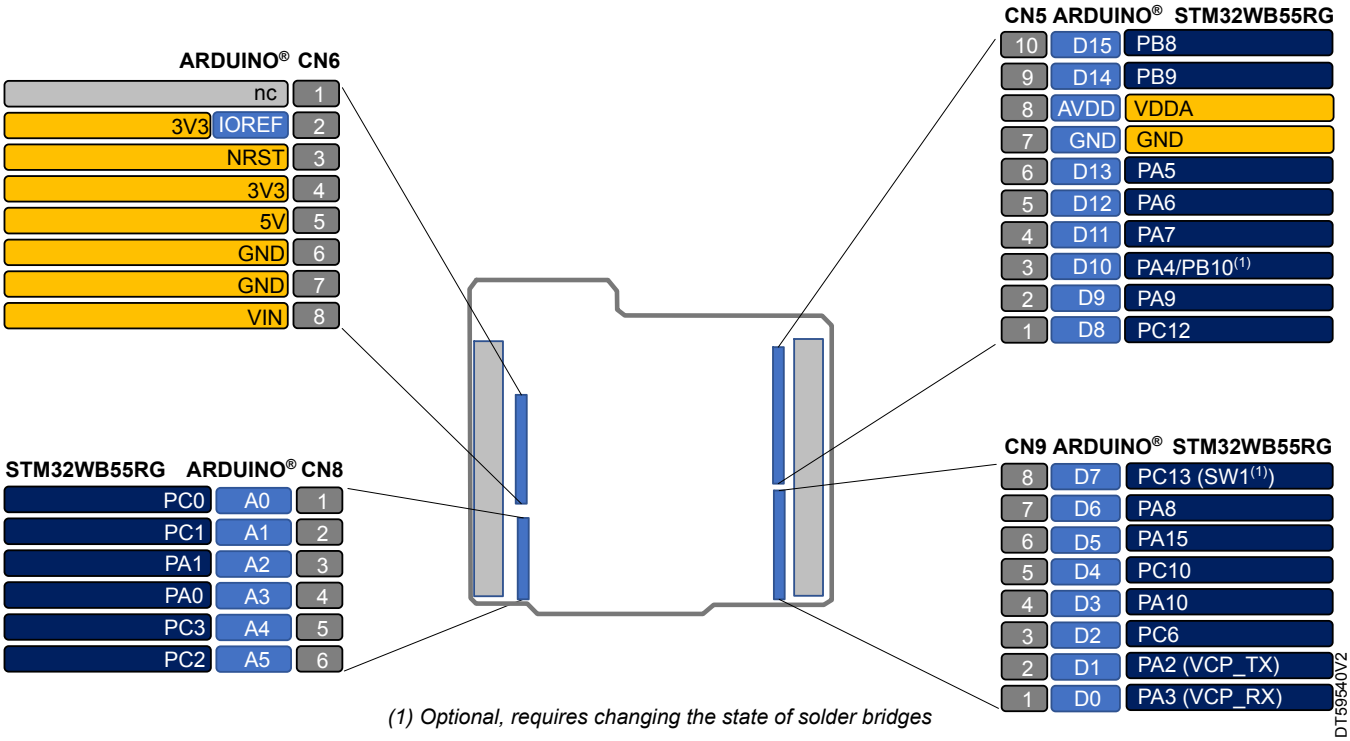
Caution: *Do not supply 3.3 or 5 V from the ARDUINO® shield as this might damage the Nucleo board.*

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

ARDUINO® pinout

Figure 1 and Figure 26 show the position of the ARDUINO® shield when it is plugged into NUCLEO-WB55CG. The pinout shown in Figure 27 corresponds to standard ARDUINO® naming. To see the correspondence with the STM32 device, refer to Table 9.

Figure 27. ARDUINO® connector pinout



(1) Optional, requires changing the state of solder bridges

Table 9. **ARDUINO® connector pinout**

Connector	Pin number	Signal name	STM32 port	Comment
CN6	1	NC	-	NC (reserved for tests)
	2	3V3 (IOREF)	-	IOREF
	3	NRST	NRST	NRST
	4	3V3	-	3V3
	5	5V	-	5V
	6	GND	-	GND
	7	GND	-	GND
	8	VIN	-	External supply input (+12 V maximum)
CN8	1	A0	PC0	ADC1_IN1
	2	A1	PC1	ADC1_IN2
	3	A2	PA1	ADC1_IN6
	4	A3	PA0	ADC1_IN5
	5	A4	PC3	ADC1_IN4
	6	A5	PC2	ADC1_IN3
CN9	1	D0	PA3	TIM2_CH4
	2	D1	PA2	TIM2_CH3
	3	D2	PC6	-
	4	D3	PA10	TIM1_CH3
	5	D4	PC10	-
	6	D5	PA15	TIM2_CH1
	7	D6	PA8	TIM1_CH1
	8	D7	PC13 (SW1[1])	-
CN5	1	D8	PC12	-
	2	D9	PA9	TIM1_CH2
	3	D10	PA4/PB10[1]	SPI1_NSS
	4	D11	PA7	SPI1_MOSI
	5	D12	PA6	SPI1_MISO
	6	D13	PA5	SPI1_SCK
	7	GND	-	GND
	8	AVDD	-	VDDA
	9	D14	PB9	I2C1_SDA
	10	D15	PB8	I2C1_SCL

1. *Optional: This requires to change the state of solder bridges.*

7.11.2 ST morpho interface and pinout

Description

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.

ST morpho pinout

Figure 28 and Table 10 show the ST morpho connector pinout for MB1355.

Figure 28. MB1355 ST morpho connector pinout

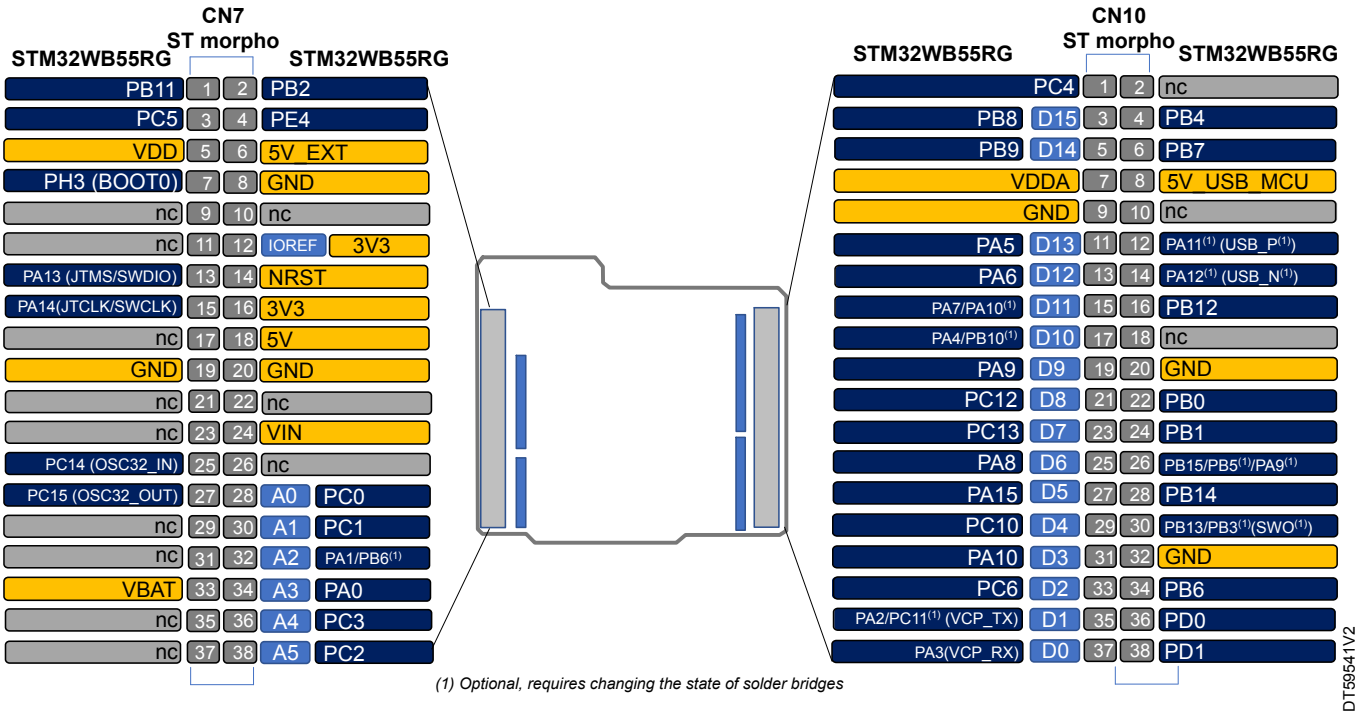


Table 10. ST morpho connector pinout

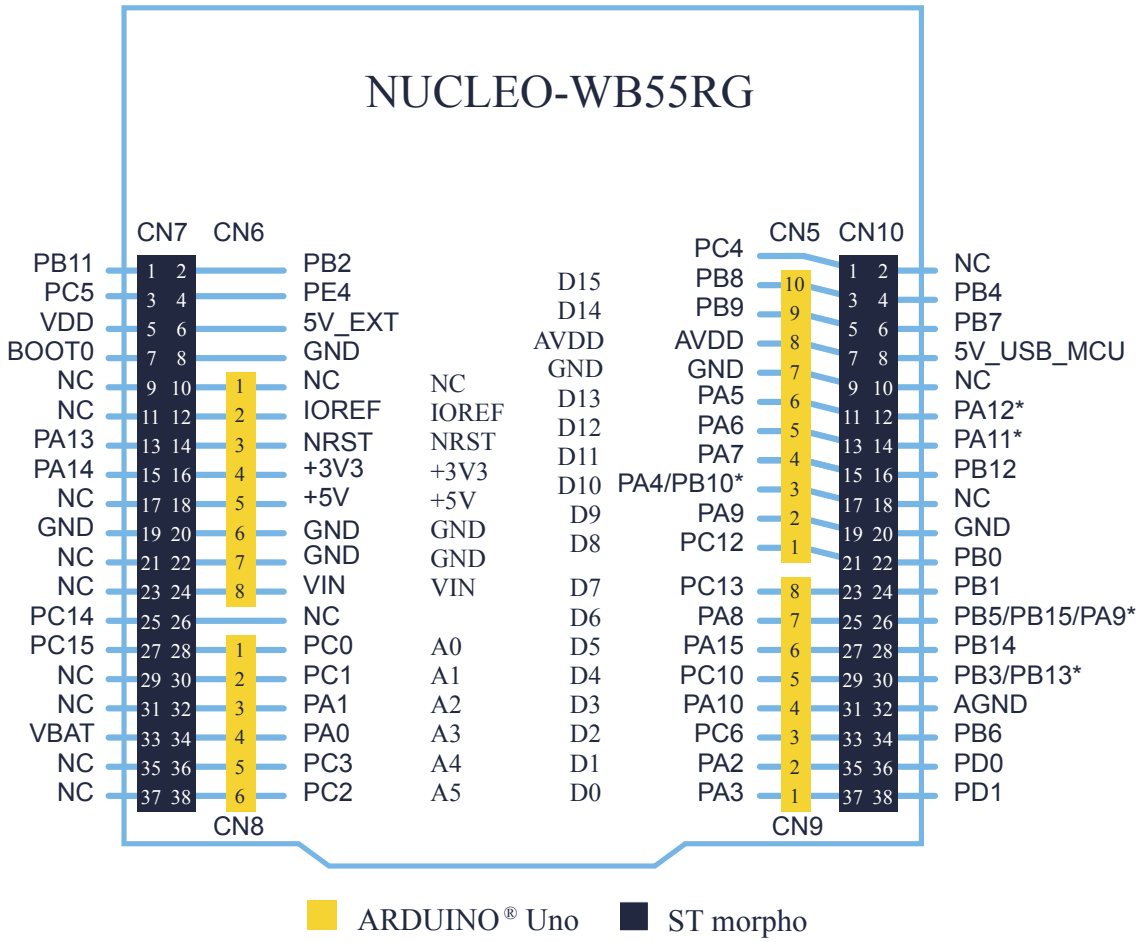
CN7				CN10			
Pin number	STM32WB55RG pin name	Pin number	STM32WB55RG pin name	Pin number	STM32WB55RG pin name	Pin number	STM32WB55RG pin name
1	PB11	2	PB2	1	PC4	2	nc
3	PC5	4	PE4	3	PB8	4	PB4
5	VDD	6	5V_EXT	5	PB9	6	PB7
7	PH3/BOOT0	8	GND	7	VDDA	8	5V_USB_MCU
9	nc	10	nc (reserved for tests)	9	GND	10	nc
11	nc	12	3V3 (IOREF)	11	PA5	12	PA11(1) (USB_P(1))
13	PA13	14	NRST	13	PA6	14	PA12(1) (USB_N(1))
15	PA14	16	3V3	15	PA7/PA10(1)	16	PB12
17	nc	18	5V	17	PA12PA4/PB10(1)	18	nc
19	GND	20	GND	19	PA9	20	GND
21	nc	22	nc	21	PC12	22	PB0
23	nc	24	VIN	23	PC13	24	PB1
25	PC14 (OSC32_IN)	26	nc	25	PA8	26	PB15/PB5(1)/PA9(1)
27	PC15 (OSC32_OUT)	28	PC0	27	PA15	28	PB14
29	nc	30	PC1	29	PC10	30	PB13/PB3(1) (SWO(1))
31	nc	32	PA1/PB6(1)	31	PA10	32	GND
33	VBAT	34	PA0	33	PC6	34	PB6
35	nc	36	PC3	35	PA2/PC11(1) (VCP_TX)	36	PD0
37	nc	38	PC2	37	PA3 (VCP-RX)	38	PD1

1. *Optional: This requires to change the state of solder bridges.*

7.12 NUCLEO-WB55RG 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 29. Pinout of ARDUINO® and ST morpho connectors



(*) Require modifying solder bridge

8 NUCLEO-WB55RG 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:

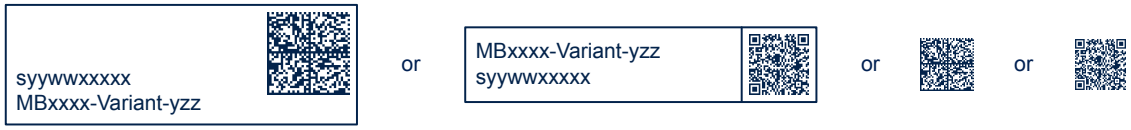
  

  Dual-sticker example:

- 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-WB55RG product history

Table 11. Product history

Order code	Product identification	Product details	Product change description	Product limitations
NUCLEO-WB55RG	NUWB55RG$CU2	MCU: • STM32WB55RGU6 silicon revision "Y"	Initial revision	No limitation
		MCU errata sheet: • *STM32WB55xx/ STM32WB35Cx device errata* (ES0394)		
		Board: • MB1355D-01 (main board)		
	NUWB55RG$CU4	MCU: • STM32WB55RGU6 silicon revision "X"	Board updated with revision “X” of STM32WB55RG	No limitation
		MCU errata sheet: • *STM32WB55xx/ STM32WB35Cx device errata* (ES0394)		
		Board: • MB1355D-01 (main board)		

8.3 Board revision history

Table 12. Board revision history

Board reference	Board variant and revision	Board change description	Board limitations
MB1355 (main board)	MB1355D-01	Initial revision	No limitation

9 Compliance statements and conformity declarations

9.1 Federal Communications Commission (FCC) compliance statement

Product identification

- Identification of the product: NUCLEO-WB55RG
  FCC ID: YCP-MB1355002

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

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

Product identification

- Identification of the product: NUCLEO-WB55RG
  IC: 8976A-MB1355002

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-WB55RG
  IC : 8976A-MB1355002

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.

9.3 UKCA conformity

Simplified UK declaration of conformity

Hereby, the manufacturer STMicroelectronics, declares that the radio equipment type NUCLEO-WB55RG 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.

9.4 Japanese Radio Certification: Ministry of Internal affairs and Communications (MIC) conformity

Identification of the product: NUCLEO-WB55RG

This product is compliant with the Japanese radio law (MIC): [R] 201-220167

9.5 CE conformity

9.5.1 Simplified EU declaration of conformity

Hereby, STMicroelectronics declares that the radio equipment type NUCLEO-WB55RG 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 NUCLEO-WB55RG:

- Frequency range: 2400-2483.5 MHz (Bluetooth®)
- Maximal power: 800 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.

9.5.2 Déclaration de conformité UE simplifiée

STMicroelectronics déclare que l'équipement radioélectrique du type NUCLEO-WB55RG 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 NUCLEO-WB55RG :

- Plage de fréquences : 2400 - 2483,5 MHz (Bluetooth®)
- Puissance maximale : 800 mW PIRE

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

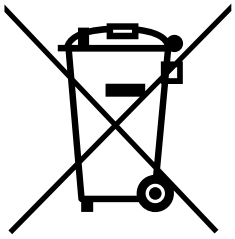
Note:
- *LdSD : directive sur la limitation de l'utilisation des substances dangereuses*
- *RED : directive sur les équipements radio-électriques*

Note: Utiliser uniquement des câbles blindés.

10 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 13. **Document revision history**

Date	Revision	Changes
19-Nov-2025	1	Initial release.

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