Wi-Fi®/Bluetooth®/802.15.4 connectivity expansion board based on the ST67W611M1 module for STM32 Nucleo boards

Introduction

The X-NUCLEO-67W61M1 expansion board provides an affordable and flexible way for users to try out new concepts and build prototypes with the ST67W series ST67W611M1 coprocessor module.

Interfacing with the host is possible through SPI via the ARDUINO® Uno V3 or expansion connectors. This expansion board is stackable on Nucleo-64, Nucleo-144, and Discovery boards. The main hosts are the STM32U5, STM32H5, STM32H7, and STM32N6 product families.

Powered by all-in-one 2.4 GHz Wi-Fi® 6/Bluetooth® combo SoC, the ST67W611M1 LGA module is purposely designed to pack the processing capabilities, Wi-Fi®/Bluetooth® combo connectivity, and on-module memory into a single 32-pin LGA form factor.

For more details on the ST67W611M1 coprocessor module, refer to its datasheet at *www.st.com*.

Figure 1. X-NUCLEO-67W61M1 top view

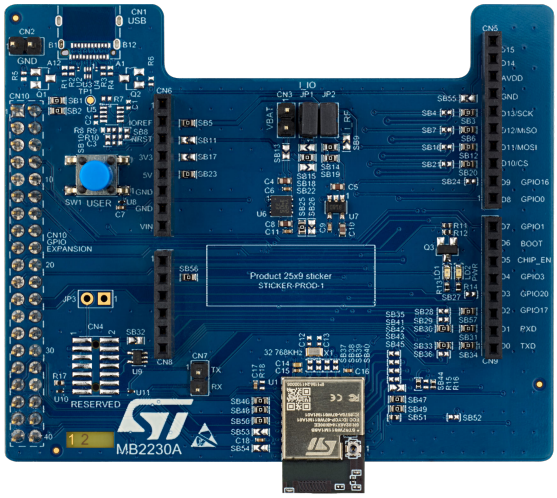
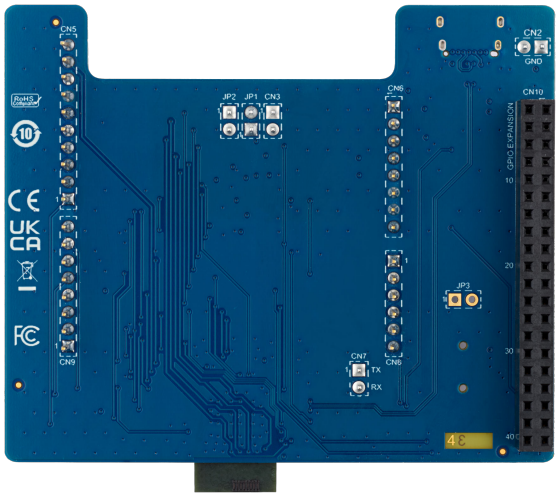


Figure 2. X-NUCLEO-67W61M1 bottom view



Pictures are not contractual.

1 Features

- ST67W611M1 module, 32-pin, 4-side LGA 1.27-mm pitch (12.28 x 17.28 x 2.2 mm) package featuring:
  - 2.4 GHz Wi-Fi®/Bluetooth® combo all-in-one SoC
  - Wi-Fi® 6, coprocessor IEEE 802.11 b/g/n/ax
  - Single-band 2.4 GHz
  - Low-power Wi-Fi® with various sleep modes
  - PCB antenna and antenna connector
- User LED
- User push button
- Board connectors:
  - ARDUINO® Uno V3
  - Raspberry Pi® 40-pin GPIO header
- Scalable solution, capable of cascading multiple boards for larger systems
- Free comprehensive development firmware library and examples, compatible with the X-CUBE-ST67W61 expansion software package for STM32Cube

2 Ordering information

To order the X-NUCLEO-67W61M1 expansion board, refer to Table 1. Additional information is available from the datasheet and reference manual of the ST67W611M1 module at *www.st.com*.

Table 1. Ordering information

Order code	Board reference	Target ST67
X-NUCLEO-67W61M1	MB2230(1)	ST67W611M1A6B

1. *Expansion board*

2.1 Codification

The meaning of the codification is explained in Table 2.

Table 2. Codification explanation

X-NUCLEO-XXWYZMT	Description	Example: X-NUCLEO-67W61M1
X-NUCLEO	Type of board	STM32 Nucleo expansion boards
XX	MCU series in coprocessor series	ST67W ST Wi-Fi® coprocessor series
W	Wireless technology	Wi-Fi®
Y	Protocol	Wi-Fi® protocol: Wi-Fi® 6
Z	Die version	Die version 1
M	Module	Module
T	Sequential number	First Wi-Fi® Nucleo expansion board

3 Development environment

3.1 EDA resources

All board design resources, including schematics, EDA databases, manufacturing files, and the bill of materials, are available from the X-NUCLEO-67W61M1 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 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, 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 might be damaged when shorted.
- Do not put any liquid on the board. Avoid operating the board close to water or at a high humidity level.
- Do not operate the board if dirty or dusty.

6 Quick start

The X-NUCLEO-67W61M1 expansion board product is an easy-to-use and low-cost development kit used to evaluate and start development quickly with an ST67W611M1A6B module. Before installing and using the product, accept the evaluation product license agreement from the *www.st.com/epla* web page. For more information on the X-NUCLEO-67W61M1 expansion board product and demonstration software, visit the *www.st.com/stm32nucleo* web page.

6.1 Getting started

Follow the sequence below to configure the product and launch the demonstration application (refer to Figure 4 for component location):

1. Check jumper positions on board, JP1 (IDD_RF) ON, JP2 (IDD_IO) ON, JP3 (internal) OFF. The default jumper position on the board is explained in Table 4.
2. Connect the X-NUCLEO-67W61M1 board to a host (such as a NUCLEO-U575ZI board) through the ARDUINO® connector.
3. Supply the host board and launch `NCP_update_mission_profile.bat` to program the corresponding binary on the target device. `NCP_update_mission_profile.bat` is included in the X-Cube-FW package (`X_CUBE_ST67W61_V0.2.0\Utilities\NCP_Tools`).
4. On the PC, connect a UART terminal (TeraTerm) to the board using the following settings:
   - UART terminal: select new line received = auto; new line transmit = LF (line feed).
   - Serial port setting: Select COM port number, 921600 baud rate, 8-bit data, parity none, one stop bit, and no flow control.
5. Press the reset button of the host board, then “enter” on a Tera Term console.
6. Then enter “wifi_scan” to get all available Wi-Fi® networks.
7. This demonstration application software is available on the *www.st.com* website.

Note: For more information, refer to the corresponding wiki page on http://www.st.com.

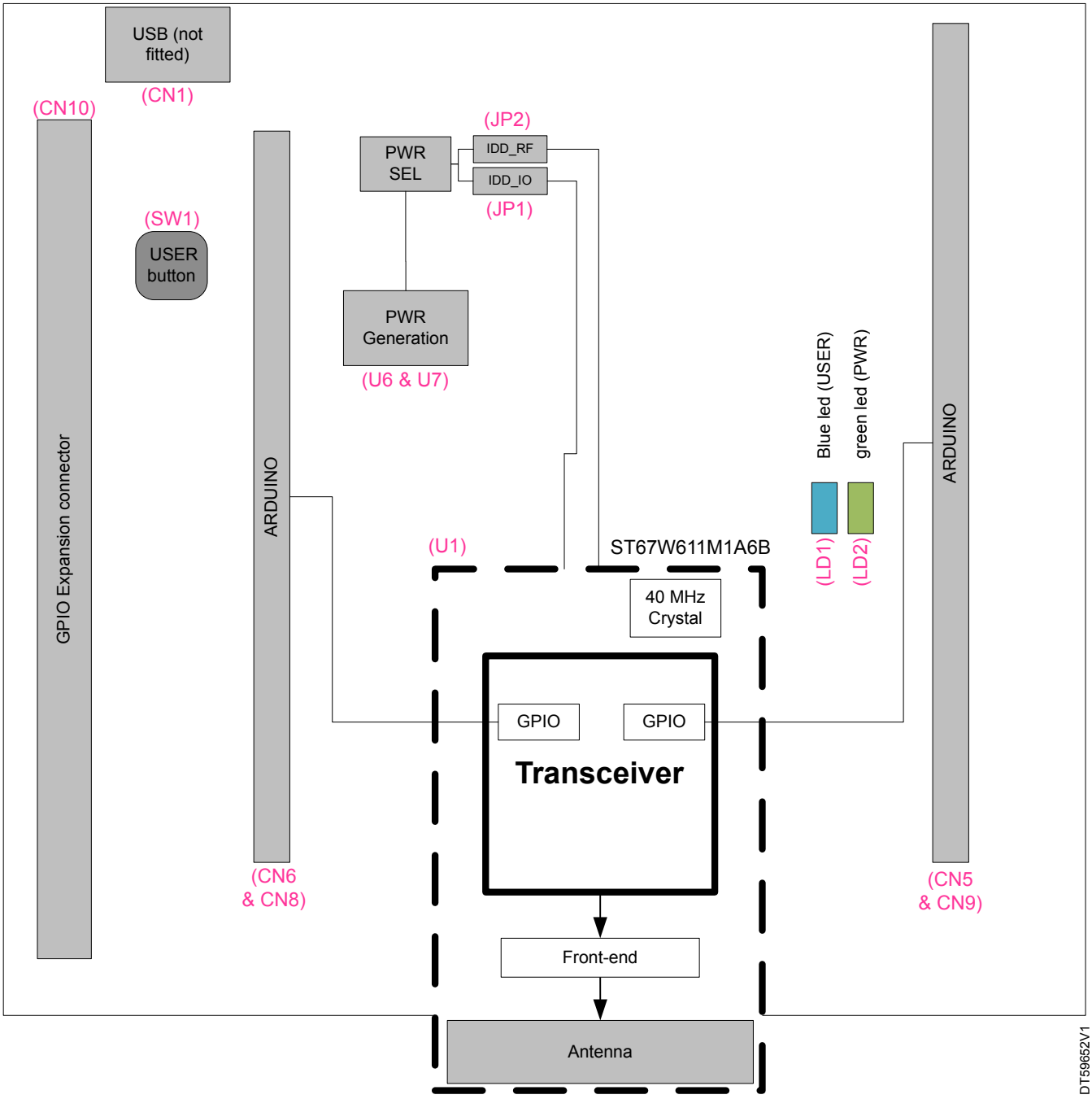
Table 4. Jumper default configuration

Jumper	Definition	Position	Comment
JP1	VDD_IO current measurement	ON	For ST67W611M1A6B current measurements (IO part)
JP2	VDD_RF current measurement	ON	For ST67W611M1A6B current measurements (RF part)
JP3	RESERVED	NA	JP3 not implemented

7 Hardware layout and configuration

The X-NUCLEO-67W61M1 expansion board product is designed around the ST67W611M1A6B coprocessor module. Figure 3 shows the connections between the module and its peripherals such as push buttons, LEDs, or ARDUINO® Uno and GPIO expansion connectors. Figure 4 and Figure 5 show the location of these features on the X-NUCLEO-67W61M1 expansion board. The mechanical dimensions of the board are shown in Figure 6.

Figure 3. X-NUCLEO-67W61M1 hardware block diagram



7.1 PCB layout

Figure 4. **X-NUCLEO-67W61M1 top layout**

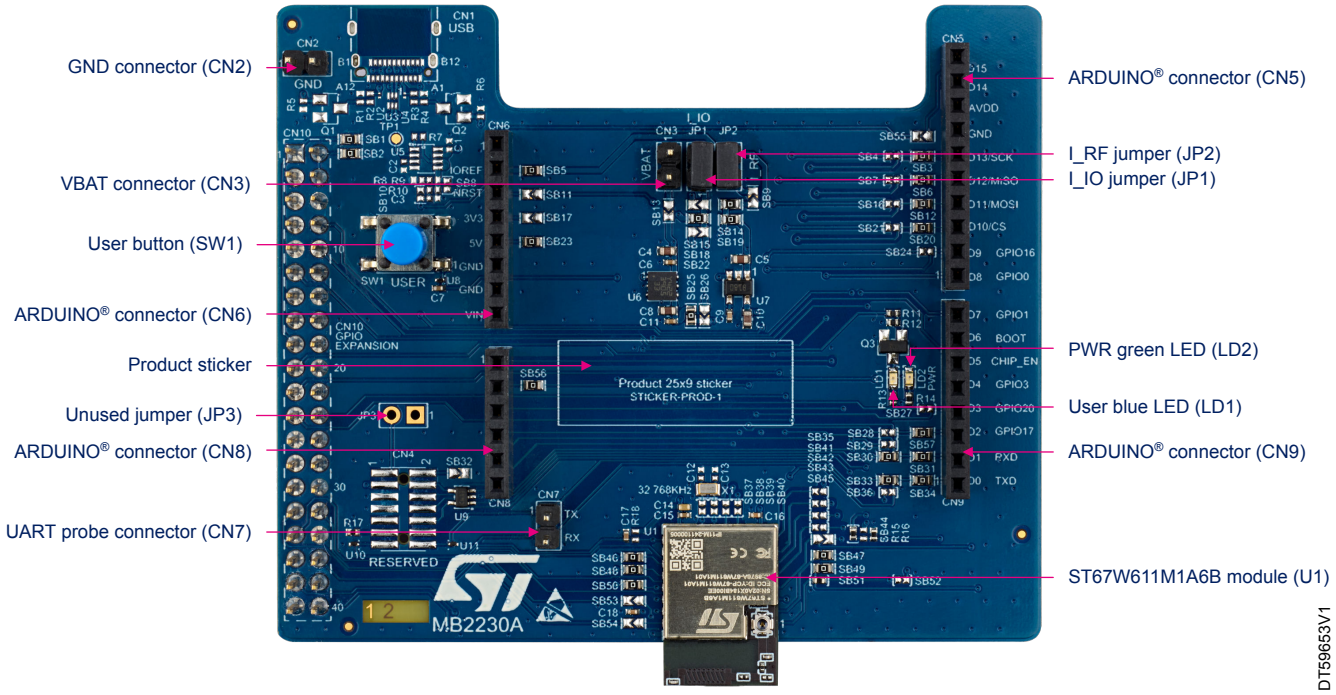
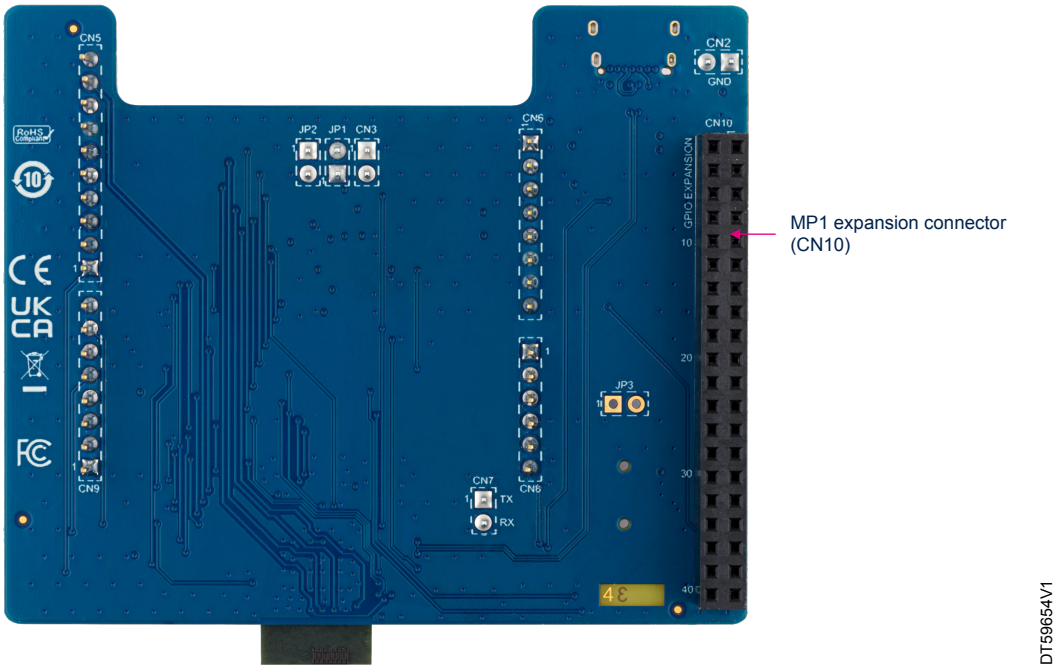
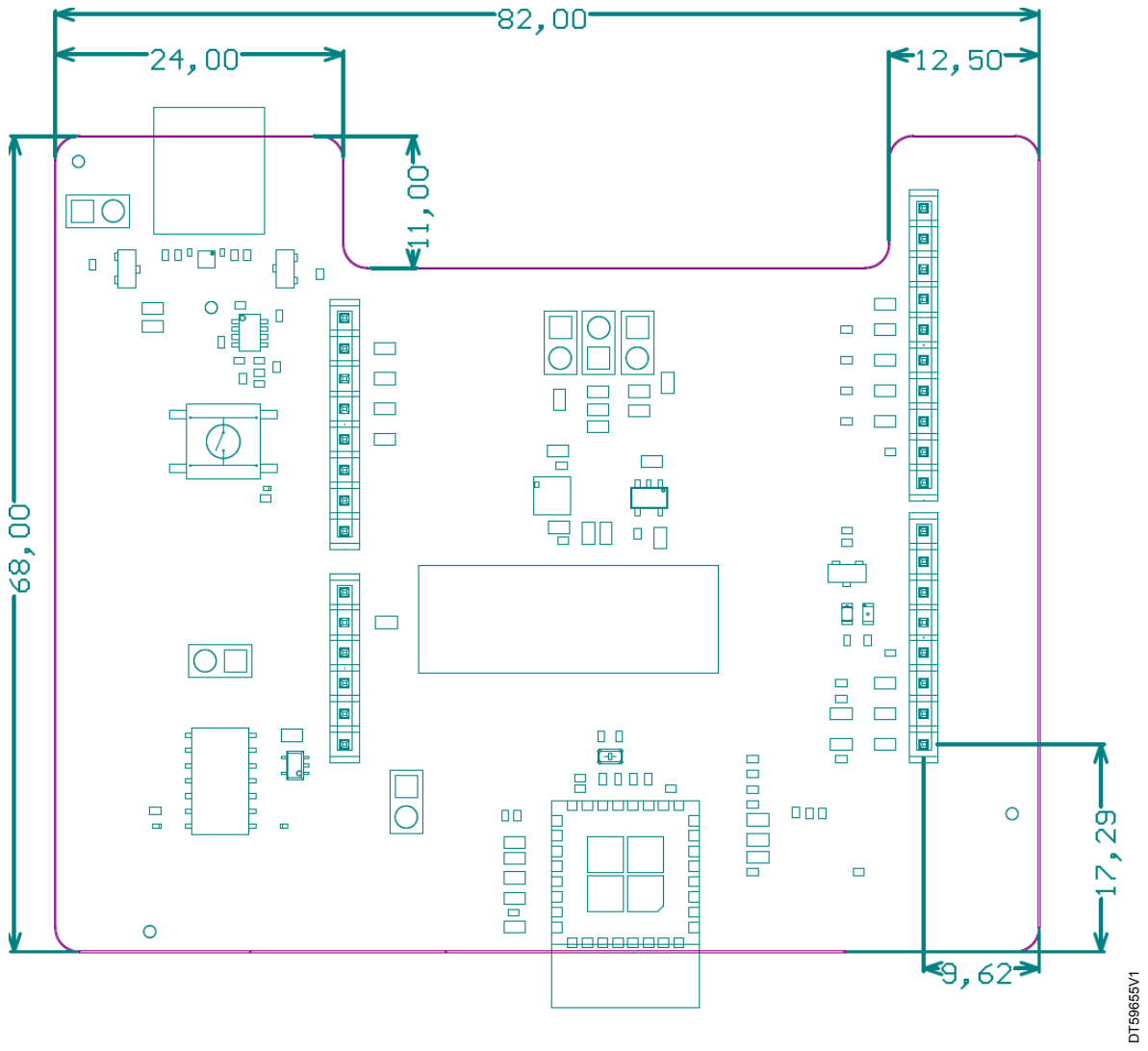


Figure 5. **X-NUCLEO-67W61M1 bottom layout**



7.2 Mechanical drawing

Figure 6. **X-NUCLEO-67W61M1 board mechanical drawing (in millimeters)**

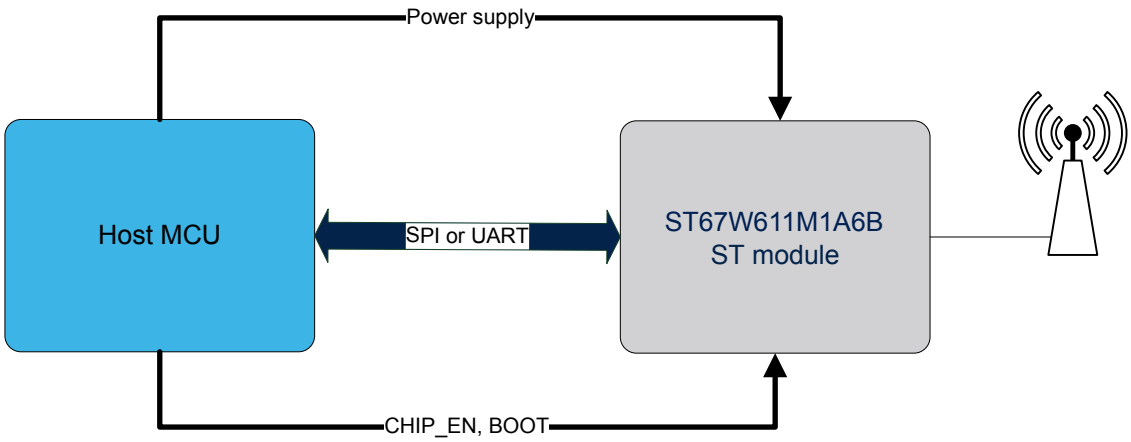


7.3 Board setup

The ST67W611M1A6B module is a coprocessor. Therefore, a host board with an MCU is required to manage communication and configuration. Figure 7 represents the interaction between the coprocessor module and its host.

Data exchange and configuration are performed through SPI and UART. CHIP_EN and BOOT signals are used to place the coprocessor in different modes.

Figure 7. ST67W611M1A6B host interaction



7.3.1 Main host boards and associated connectors

Different connectors might be used to interface X-NUCLEO with the host board.

In global cases, interfacing X-NUCLEO and STM32 boards is performed through:

- ARDUINO® for Nucleo-144 or Nucleo-64 boards
- Raspberry Pi® 40-pin GPIO header

Table 5. X-NUCLEO host board connections

Board reference	Description	Main interface	Connector used
MB1549 (NUCLEO-U575ZI-Q)	Nucleo-144 with STM32U575ZI-Q MCU	ARDUINO® Uno interface	CN6, CN5, CN8, and CN9
MB1404 (NUCLEO-H563ZI)	Nucleo-144 with STM32H563ZI MCU	ARDUINO® Uno interface	CN6, CN5, CN8, and CN9
MB1737 (NUCLEO-H7S3L8)	Nucleo-144 with STM32H7S3L8 MCU	ARDUINO® Uno interface	CN6, CN5, CN8, and CN9
MB1940 (NUCLEO-N657X0-Q)	Nucleo-144 with STM32N657X0 MCU	ARDUINO® Uno interface	CN6, CN5, CN8, and CN9
MB1272 (STM32MP157D-DK1 and STM32MP157F-DK2)(1)	Discovery kit with STM32MP157D/F MPU	Raspberry Pi® 40-pin GPIO header	CN10

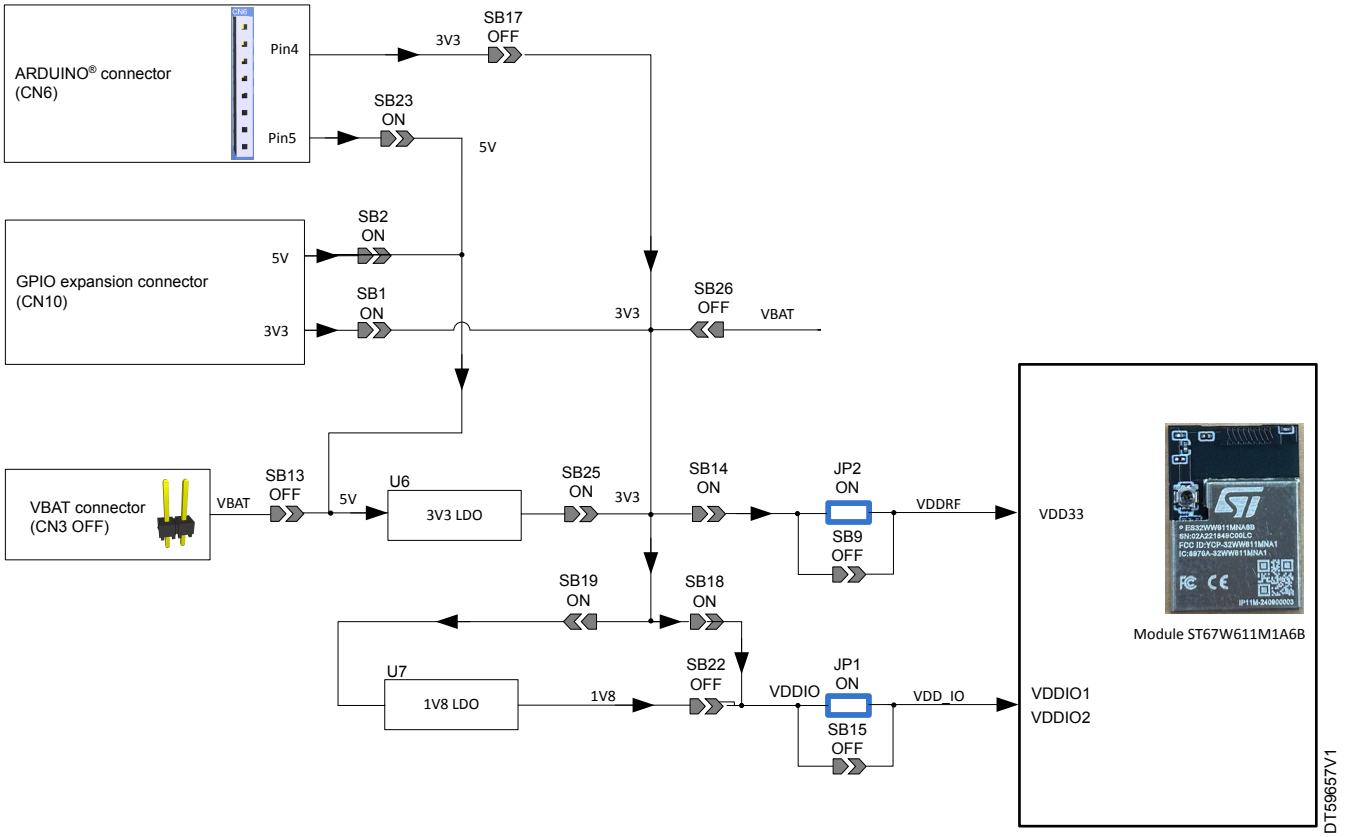
1. *This host is not addressed in the first software release.*

7.4 Power supply

The X-NUCLEO-67W61M1 expansion board offers various power supply configurations, depending on the used host board. In addition, the ST67W611M1A6B module has two power domains (VDD33 and VDDIO). The X-NUCLEO-67W61M1 board embeds 3.3 and 1.8 V LDO regulators. The user chooses the configuration by setting different solder bridges. Figure 8 shows the global power. The board supply and module domains are detailed in the next sections.

Note: The power supply tree includes the board and ST67W611M1A6B module power domain supply selections, LDO, headers, and current measurement jumpers.

Figure 8. X-NUCLEO-67W61M1 power tree



7.4.1 Board power supply

Different sources can provide the power supply:

- Supply 3V3 from the host through the ARDUINO® connector
- Supply 5V from the host through the ARDUINO® connector (default setting)
- Supply 3V3 from the host through the expansion connector
- Supply 5V from the host through the expansion connector
- An external battery cell or voltage generator connected to CN3 to provide 5V
- An external battery cell or voltage generator connected to CN3 to provide 3V3

Note: The external power supply must be compliant with the EN 62368-1:2014+A11:2017 standard. It must be a safety extralow voltage (SELV) with limited power capability.

For power supply selections, refer to Table 6 and the following sections.

Table 6. Supply source selection

Main supply source(1)	Connector(1)	SB ON(1)	SB OFF(1)
ARDUINO® 3.3 V	CN6	SB17	SB13, SB23, SB25, and SB26
ARDUINO® 5 V	**CN6**	**SB23 and SB25**	**SB13, SB17, and SB26**
Expansion connector 3V3	CN10	SB2	SB1, SB13, SB23, SB25, and SB26
Expansion connector 5V	CN10	SB1	SB2, SB13, SB17, and SB26
VBAT header for 5V supply	CN3	SB13	SB17, SB23, and SB26
VBAT header for 3V3 supply	CN3	SB26	SB13, SB23, and SB26

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

Note: Additional more complex power supply configurations might be used. In such cases, the user must carefully check solder bridge configurations according to the power tree, to avoid any damages.

Warning: *Due to solder bridge usage, pay attention to SB ON and OFF configuration. Any mistake might lead to irreversible damages on the X-NUCLEO board or host.*

7.4.2 ST67W611M1A6B module power domains

The ST67W611M1A6B module has two supply domains: VDD_IO for I/Os and VDD33 for the radio processor unit (RPU). Those two domains can be powered in different ways, 3.3 V, 1.8 V, or directly from the battery connector (CN3), depending on the targeted application. The supply is selected with solder bridges. Table 7 gives the different power supply possibilities:

Table 7. ST67W611M1A6B power domain capabilities

-	VDD_IO	VDD_RF
Power supplies capabilities	1.8 and 3.3 V	VBAT and 3.3 V

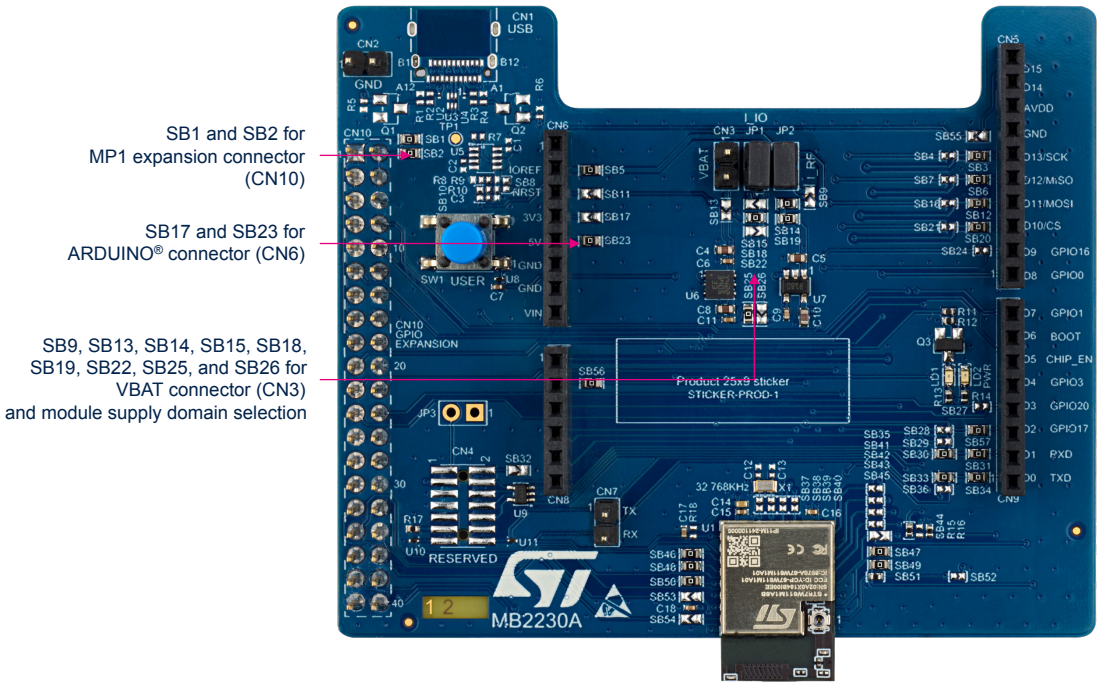
In the default MCU power supply configuration, VDDIO and VDDRF are supplied by 3V3 from LDO (U6). To get VDD_IO with 3V3, SB18 must be ON and SB22 must be OFF. This is the default configuration. To get VDD_IO = 1V8, then SB18 must be OFF and SB22 must be ON.

Caution: *Hazardous solder bridge configuration might lead to damage on the board or ST67W611M1A6B module. Indeed, note that SB18 and SB22 are exclusive: SB18 or SB22 cannot be ON at the same time, otherwise there is a voltage conflict with 1V8 and 3V3 at VDD_IO.*

7.4.3 Power supply solder bridge locations on X-NUCLEO

Figure 9 gives the location of the power supply solder bridges on the board. The concerned solder bridges are located in three areas: GPIO selection near the CN10 connector, ARDUINO® selection near the bottom of CN6, VBAT, and power domain selection around LDOs (U6 and U7).

Figure 9. Power supply solder bridge locations



7.4.4 Power supply limitations

In some configurations, the X-NUCLEO power configurations are limited:

- If the entire board is battery-powered on CN3 and the battery voltage is lower than ~3V3, it might be impossible to supply 3V3 from the LDO (U6). In this case, the only possible configuration is to supply VDDRF directly from VBAT (SB26 ON and SB25 OFF).

7.5 Clock sources

7.5.1 High-speed clock

The 40 MHz clock high precision quartz for best RF performances is on the ST67W611M1A6B module.

7.5.2 Low-speed clock (low-speed external clock)

To get the low-power mode feature with the ST67W611M1A6B module, the host must provide a 32 KHz frequency clock to the ST67W611M1A6B module. 32 KHz can be provided either:

- By the onboard 32 KHz crystal (X1). To do that, SB37 and SB38 must be ON, and SB52 remains OFF. In addition, adjust the C12 and C13 external load capacitor values are adjusted if needed.
- Externally with a signal to output the 32 KHz clock on GPIO17. On the STM32U5 Nucleo-144 board (MB1549) with its STM32U575ZI microcontroller (main development stream), LSCO is on PA2. And PA2 is also on the ARDUINO® connector (A1 pin connected to GPIO17).

7.6 LEDs

The user LED (LD1) is at the user's disposal. This LED is 1.8 or 3.3 V-driven depending on the VDDIO power supply configuration.

User LED (LD1)

This blue LED is a user LED connected to ST67W611M1A6B module pin 21 (GPIO20). To light the LD1 LED, a HIGH logic state must be written in the corresponding GPIO20. There is a possibility to control LD1 from the host board through the ARDUINO® D3 pin on CN9.

When SPI is selected as the communication protocol between the host and the module, the user cannot use GPIO20 to control the user LED directly because it must be used as SPI DATA READY.

Power LED (LD2)

This power green LED is connected to the 3V3 of the board to indicate that the 3V3 voltage is present.

7.7 Push button

User push button (SW1)

The user button is connected to the ST67W611M1A6B module pin 1 (GPIO0). SW1 is active LOW.

7.8 Current consumption measurement

X-NUCLEO-67W61M1 offers the possibility to measure the ST67W611M1A6B module current consumption for both supply domains VDD_IO and VDD_RF. The measurement is done by removing a jumper and inserting an ammeter on the supply path. The current measurement method is the same for both VDD_IO and VDD_RF supplies. The two IDD jumpers are:

- JP1 (I_IO): Measures ST67W611M1A6B module I/O parts, such as GPIO and SPI.
- JP2 (I_RF): Measures ST67W611M1A6B module radio unit consumption.

The overall consumption of the ST67W611M1A6B module Wi-Fi®coprocessor is the sum of the current flowing through JP1 and JP2.

When the current measurement is not needed, JP1 and JP2 are not mounted. SB9 and SB10 must be ON to bypass the current measurement feature.

7.9 USART and Virtual COM port usage

The ST67W611M1A6B module USART is addressed on different connectors of the X-NUCLEO-67W61M1 board:

- On ARDUINO® (CN9) for host communication,
- On the expansion connector (CN10) for host communication,
- And on a 2-point header connector (CN7).

As the default configuration, UART is connected to the ARDUINO® connector. Solder bridges can be removed to isolate UART to a specific connector. Table 8 gives different possibilities.

Table 8. USART usage selection

SB ON	SB OFF	UART available on connector
SB31, SB34, SB30, and SB33(1)	**SB29 and SB36**(1)	**ARDUINO® (CN9) and 2-pin header UART (CN7)**(1)
SB29 and SB36	SB31, SB34, SB30, and SB33	GPIO expander (CN10) only
SB31, SB34, SB30, SB33, SB29, and SB36	-	ARDUINO® CN9, 2-pin header UART (CN7), and GPIO expander (CN10)

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

7.10 Solder bridges

Fifty-six solder bridges are located on the X-NUCLEO-67W61M1 board. All the solder bridges present in the board are used to configure several I/Os and power supply pins for feature and pinout compatibility with the host.

Table 9. Solder bridge summary

Solder bridge control	Solder bridge	State(1)	Description(1)
Main 5 V input	SB2	ON	The 5V supply is provided by the GPIO expansion connector (CN10)
		OFF	**The 5V supply is not provided by CN10**
	SB13	ON	The 5V supply is provided by the VBAT connector (CN3)
		OFF	**The 5V supply is not provided by CN3**
	SB23	**ON**	**The 5V supply is provided by the ARDUINO® connector (CN6)**
		OFF	The 5V supply is not provided by CN6
Main 3V3 input	SB1	ON	The 3V3 supply is provided by the GPIO expansion connector (CN10)
		OFF	**The 3V3 supply is not provided by CN10**
	SB17	ON	The 3V3 supply is provided by the VBAT connector (CN3)
		OFF	**The 3V3 supply is not provided by CN3**
	SB26	ON	The 3V3 supply is provided by the ARDUINO® connector (CN6)
		OFF	**The 3V3 supply is not provided by CN6**
SDIO signals (from ST67W611M1A6B) present at the ARDUINO® connector	SB35, SB39, SB40, SB41, SB42, SB43	ON	The SDIOs signals are present on CN5 and CN8 (ARDUINO®)
		OFF	**The SDIOs signals are not present on CN5 and CN8**
32 KHz crystal (X1)	SB37, SB38	ON	The 32 KHz crystal (X1) provides a 32 KHz clock to ST67W611M1A6B
		OFF	**The 32 KHz crystal does not provide a clock to the ST67W611M1A6B**
VBUS detection	SB8	ON	VBUS detection connected to 5V (USB-C® connector detection)
		OFF	**VBUS detection not connected to 5V**
VBUS_DETECT range	SB10	ON	VBUS_DETECT range is 3V3
		OFF	**VBUS_DETECT range is 1V8**
VDDIO connected at IOREF	SB5	ON	VDDIO connected at IOREF
		OFF	**VDDIO not connected with IOREF**
SPI interface connected to the Raspberry Pi® 40-pin GPIO header	SB4	ON	SPI_CLK signal connected to the GPIO expansion connector (CN10)
		OFF	**SPI_CLK signal not connected to CN10**
	SB7	ON	SPI_MISO signal connected to the GPIO expansion connector (CN10)
		OFF	**SPI_MISO signal not connected to CN10**
	SB16	ON	SPI_MOSI signal connected to theGPIO expansion connector (CN10)
		OFF	**SPI_MOSI signal not connected to CN10**
	SB21	ON	SPI_NSS signal connected to the GPIO expansion connector (CN10)
		OFF	**SPI_NSS signal not connected to CN10**

Solder bridge control	Solder bridge	State(1)	Description(1)
UART interface connected to the GPIO expansion connector	SB29	ON	UART_RXD signal connected to theGPIO expansion connector (CN10)
		OFF	**UART_RXD signal not connected to CN10**
	SB36	ON	UART_TXD signal connected to the GPIO expansion connector (CN10)
		OFF	**UART_TXD signal not connected to CN10**
GPIO signals connected to the GPIO expansion connector	SB24	ON	GPIO16 signal connected to the GPIO expansion connector (CN10)
		OFF	**GPIO16 signal not connected to CN10**
	SB27	ON	GPIO20 signal connected to the GPIO expansion connector (CN10)
		OFF	**GPIO20 signal not connected to CN10**
	SB28	ON	GPIO17 signal connected to the GPIO expansion connector (CN10)
		OFF	**GPIO17 signal not connected to CN10**
CHIP_EN on NRST pin of ARDUINO® connector	SB11	ON	CHIP_EN signal connected to NRST pin of ARDUINO® connector
		OFF	**CHIP_EN signal not connected to NRST pin of ARDUINO® connector**
GPIO17 on CN8 ARDUINO® connector	SB56	**ON**	**GPIO17 connected on CN8 ARDUINO® connector (ARD.A2)**
		OFF	GPIO17 not connected on CN8 ARDUINO® connector (ARD.A2)
SPI interface connected to CN5 (ARDUINO® connector)	SB3	ON	SPI_CLK signal connected to (CN5) ARDUINO® connector
		OFF	**SPI_CLK signal not connected to CN5**
	SB6	ON	SPI_MISO signal connected to (CN5) ARDUINO® connector
		OFF	**SPI_MISO signal not connected to CN5**
	SB12	ON	SPI_MOSI signal connected to (CN5) ARDUINO® connector
		OFF	**SPI_MOSI signal not connected to CN5**
	SB20	ON	SPI_NSS signal connected to (CN5) GPIO ARDUINO® connector
		OFF	**SPI_NSS signal not connected to CN5**
UART interface connected to CN5 (ARDUINO® connector)	SB31	**ON**	**UART_RXD signal connected to (CN9) ARDUINO® connector ARD.D1**
		OFF	UART_RXD signal not connected to (CN9) ARDUINO® connector ARD.D1
	SB34	**ON**	**UART_TXD signal connected to (CN9) ARDUINO® connector ARD.D0**
		OFF	UART_TXD signal not connected to (CN9) ARDUINO® connector ARD.D0
UART interface connected to CN7 (2-pin header)	SB30	**ON**	**UART_RXD signal connected to (CN7)**
		OFF	UART_RXD signal not connected to (CN7)
	SB33	**ON**	**UART_TXD signal connected to (CN7)**
		OFF	UART_TXD signal not connected to (CN7)
USB pins connected to USB connector (CN1)	SB46, SB48	ON	USB pins (USB_DM and USB_DP) connected to USB connector (CN1)
		OFF	**USB pins not connected to USB connector (CN1)**
SB to short circuit JP2	SB9	ON	JP2 is shorted (no I_RF current measurement is possible)

Solder bridge control	Solder bridge	State(1)	Description(1)
SB to short circuit JP2	SB9	**OFF**	**JP2 is open (I_RF current measurement is possible at JP2)**
SB to short circuit JP1	SB15	ON	JP1 is shorted (no I_IO current measurement is possible)
		OFF	**JP2 is open (I_IO current measurement is possible at JP1)**
3V3 connected to JP2	SB14	**ON**	**3V3 voltage connected to JP2**
		OFF	3V3 voltage not connected to JP2
3V3 LDO input connected to 3V3	SB19	**ON**	**The 3V3 LDO (U7) input is connected to 3V3**
		OFF	The 3V3 LDO (U7) input is isolated from 3V3 (U7 is not powered)
5V LDO output connected to 3V3	SB25	**ON**	**The 5V LDO (U6) output is connected to 3V3**
		OFF	The 5V LDO (U6) output is isolated from 3V3
CN4 pin2 connected to GND	SB32	ON	The CN4 pin2 is connected to GND
		OFF	**The CN4 pin2 is isolated from GND**
VDDIO voltage at either 1V8 or 3V3	SB18	**ON**	**VDDIO = 3V3 (SB18 and SB22 are exclusive)**
		OFF	VDDIO = 1V8 (SB18 and SB22 are exclusive)
	SB22	ON	VDDIO = 1V8 (SB18 and SB22 are exclusive)
		OFF	**VDDIO = 3V3 (SB18 and SB22 are exclusive)**
GPIO2/BOOT_SEL connected to T_JTDO	SB44	**ON**	**GPIO2/BOOT_SEL connected to T_JTDO**
		OFF	GPIO2/BOOT_SEL not connected to T_JTDO
GPIO3 connected to T_JTDI	SB45	ON	GPIO3 connected to T_JTDI
		OFF	**GPIO3 not connected to T_JTDI**
GPIO1 connected to T_JTCK	SB47	**ON**	**GPIO1 connected to T_JTCK**
		OFF	GPIO1 not connected to T_JTCK
GPIO0 connected to T_JTMS	SB49	**ON**	**GPIO0 connected to T_JTMS**
		OFF	GPIO0 not connected to T_JTMS
GPIO20 connected to LED1	SB50	**ON**	**GPIO20 connected to LED1**
		OFF	GPIO20 not connected to LED1
GPIO0 connected to the button	SB51	**ON**	**GPIO0 connected to the button**
		OFF	GPIO0 not connected to the button
GPIO16 connected to the button	SB52	ON	GPIO16 connected to the button
		OFF	**GPIO16 not connected to the button**
GPIO30 connected to T_JTDO	SB53	ON	GPIO30 connected to T_JTDO
		OFF	**GPIO30 not connected to T_JTDO**
VBUS_DETECT connected to GPIO28	SB54	ON	VBUS_DETECT connected to GPIO28
		OFF	**VBUS_DETECT not connected to GPIO28**
VBUS_DETECT connected to ARDUINO® connector	SB55	ON	VBUS_DETECT connected to ARD.D15 (ARDUINO® connector CN5)
		OFF	**VBUS_DETECT not connected to ARD.D15**

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

8 Board connectors

The four different board connectors and their pinouts are detailed in this section.

8.1 MB2230 2-pin VBAT connector (CN3)

The CN3 connector is a standard 2-pin VBAT connector (2.54-mm pitch). The X-NUCLEO board can be powered from the VBAT connector (CN3) by either:

- Plugging an external 5 V voltage supply (from 3.6 up to 5.5 V)
- Plugging a battery pack

Figure 10. 2-pin VBAT connector (CN3)

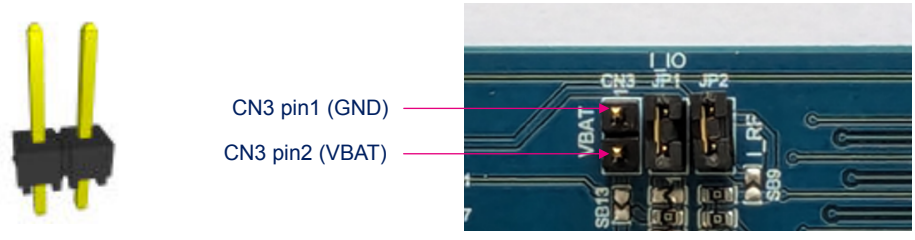


Table 10. External power source VBAT (CN3)

Connector	Pin number	Pin name	Signal name	Function
CN3	1	GND	GND	GND
	2	VBAT	VBAT	VBAT power

8.2 MB2230 2-pin UART connector (CN7)

The CN7 connector is a standard 2-pin UART connector (2.54-mm pitch). CN7 is placed on the X-NUCLEO to easily probe UART signals.

Figure 11. 2-pin UART connector (CN3)

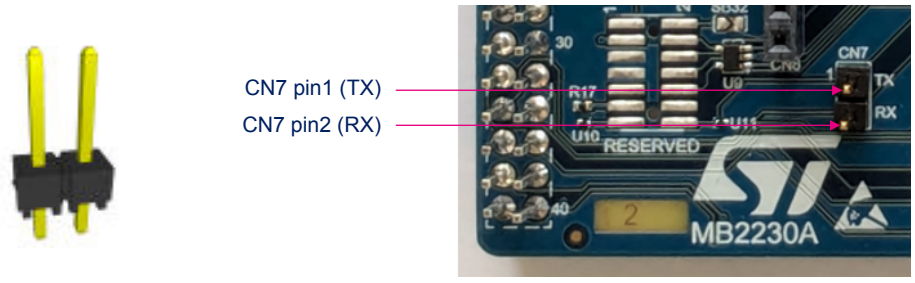


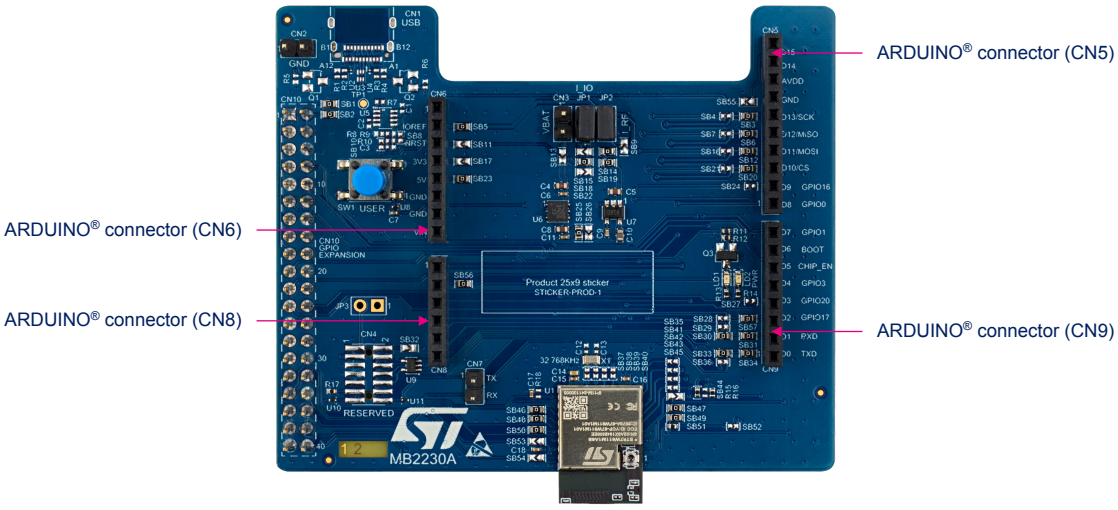
Table 11. UART connector (CN7)

Connector	Pin number	Pin name	Signal name	Function
CN7	1	TX	TX	UART TX (ST67W611M1 module side) UART RX (host side)
	2	RX	RX	UART TX (ST67W611M1 module side) UART RX (host side)

8.3 ARDUINO® Uno V3 connector

CN5, CN6, CN8, and CN9 are bottom-male, top-female connectors compatible with the ARDUINO® standard. These connectors can be used for SPI data exchange with the host, power supply, USART, LED, button, and GPIO control. Refer to Figure 12 for their location.

Figure 12. ARDUINO® connectors



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

Table 12. ARDUINO® connector pinout

Connector	Pin number	Pin name	Signal name	ST67W611M1A6B module pin(1)	Function(1)
CN6	1	NC	-	-	-
	2	IOREF	-	-	I/O reference
	3	NRST	T_NRST	NRST	RESET
	4	3V3	-	-	3.3 V input
	5	5V	-	-	5 V output
	6	GND	-	-	GND
	7	GND	-	-	GND
	8	VIN	-	-	VIN to host Board
CN8	1	-	GPIO10	GPIO10	SDIO.D2
	2	-	GPIO17	GPIO17	External 32 KHz
	3	-	GPIO12	GPIO12	SDIO.CMD
	4	-	GPIO13	GPIO13	SDIO.CLK
	5	-	GPIO14	GPIO14	SDIO.D0
	6	-	GPIO15	GPIO15	SDIO.D1
CN5	10	D15	-	-	VBUS_DETECT
	9	D14	GPIO11	GPIO11	SDIO.D3
	8	AVDD	-	-	-
	7	GND	-	-	GND
	6	D13/SCK	SPI1_CLK	GPIO29	SPI1_SCK
	5	D12/MISO	SPI1_MISO	GPIO30	SPI1_MISO
	4	D11/MOSI	SPI1_MOSI	GPIO27	SPI1_MOSI
	3	D10/CS	SP1/NSS	GPIO28	SPI1_NSS
	2	D9	GPIO16	GPIO16	**GPIO16**/button
	1	D8	GPIO0	GPIO0	GPIO0/**button**
CN9	8	D7	GPIO1	GPIO1	T_JTCK
	7	D6	GPIO2/BOOT_SEL	GPIO2/BOOT_SEL	**BOOT**/T_JTDO
	6	D5	CHIP_EN	CHIP_EN	CHIP_EN
	5	D4	GPIO3	GPIO3	T_JTDI
	4	D3	GPIO20	GPIO20	LED1
	3	D2	GPIO17	GPIO17	GPIO17
	2	D1/TX	UART_RXD	UART_RXD	UART_TX
	1	D0/RX	UART_TXD	UART_TXD	UART_RX

1. *The default configuration is in bold.*

8.4 Raspberry Pi® GPIO header

CN10 is a female bottom, male top standard expansion connector, compatible with the Raspberry Pi® GPIO header. It transmits SPI, USART, power supply, and control signals. It is intended to interface X-NUCLEO with STM32MPxx DK1 or any other boards with an expansion connector. Refer to Table 13 for their location.

CN5, CN6, CN8, and CN9 are bottom-male, top-female connectors compatible with the ARDUINO® standard. These connectors can be used for SPI data exchange with the host, power supply, USART, LED, button, and GPIO control. Refer to Figure 13 for their location.

Figure 13. X-NUCLEO GPIO expansion connector

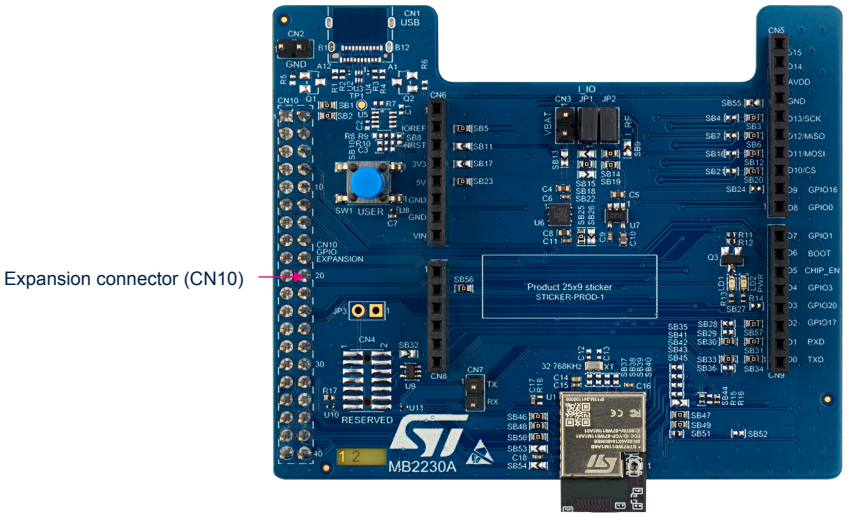


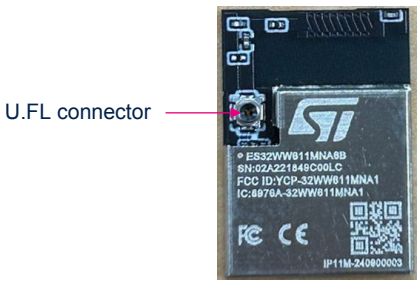
Table 13. **Expansion connector (CN10) pinout**

GPIO			
Pin	**Signal**	**Pin**	**Signal**
1	3V3	2	5V
3	-	4	5V
5	-	6	GND
7	-	8	UART_RXD
9	GND	10	UART_TXD
11	GPIO0	12	-
13	-	14	GND
15	-	16	-
17	3V3	18	-
19	SPI1_MOSI	20	GND
21	SPI1_MISO	22	-
23	SPI1_CLK	24	SPI1_NSS
25	GND	26	-
27	-	28	-
29	-	30	GND
31	GPIO2/BOOT_SEL	32	GPIO3
33	CHIP_EN	34	GND
35	GPIO16	36	GPIO1
37	GPIO17	38	-
39	GND	40	GPIO20

8.5 RF connector

The ST67W611M1A6B module includes the Wi-Fi®/Bluetooth®/802.15.4 transceiver, the complete front-end structure, a PCB antenna (12.28 x 17.28 x 2.2 mm, 1.27-mm pitch, 32-pin, 4-side LGA (4-layer PCB)). An RF U.FL connector is also implemented on the module to allow conducted measurements.

Figure 14. **U.FL connector**



DT59659V1

To carry out conducted measurements on the ST67W611M1A6B module, a specific cable connector such as the Murata MXHQ87WJ3000, available from authorized distributors, is required: *https://www.mouser.fr/ProductDetail/Murata-Electronics/MXHQ87WJ3000?qs=tCuqrAZu8bYUL83%2Fv%2FTPMQ%3D%3D*

9 ST67W611M1A6B module I/O assignment

Table 14. **ST67W611M1A6B module I/O assignment**

Pin	Module name	Pin name	Power domain	ARDUINO® pin	Main/optional feature(1)
1	JTMS	GPIO0	VDDIO1	ARD_D8	**Button**/T_JTMS
2	JTCK	GPIO1	VDDIO1	ARD_D7	T_JTCK
3	BOOT	GPIO2/BOOT_SEL	VDDIO1	ARD_D6	**BOOT**/T_JTDO
4	JTDI	GPIO3	VDDIO1	ARD_D4	T_JTDI
5	RESERVED	GPIO12	VDDIO1	ARD_A3	SDIO.CMD
6	RESERVED	GPIO11	VDDIO1	ARD_D14	SDIO.D3
7	RESERVED	GPIO10	VDDIO1	ARD_A1	SDIO.D2
8	RESERVED	GPIO14	VDDIO1	ARD_A5	SDIO.D0
9	VDDIO1	VDDIO1	-	-	Host I/O voltage input GPIO0~15
10	GND	GND	GND	ARD_GND	GND
11	RESERVED	GPIO13	VDDIO1	ARD_A4	SDIO.CLK
12	RESERVED	GPIO15	VDDIO1	ARD_A6	SDIO.D1
13	GPIO17	GPIO17	VDD33	ARD_A2/ARD_D2	32 KHz external (U5 host)/GPIO17
14	GPIO16	GPIO16	VDD33	ARD_D9	**GPIO16**/button
15	GND	GND	GND	ARD_GND	GND
16	VDD33	VDD33	-	ARD_3V3	Power input (2.97 to 3.63 V)
17	CHIP_EN	CHIP_EN	-	ARD_D5	Chip power ON
18	GND	GND	GND	ARD_GND	GND
19	USB_DP	USB_DP	-	-	USB data plus
20	USB_DN	USB_DN	-	-	USB data minus
21	SPI_CLK_REQ	GPIO20	VDDIO2	ARD_D3	GPIO20/User LED LD1(2)
22	UART_RX	GPIO21	VDDIO2	ARD_D0	UART_TXD (device side)
23	UART_TX	GPIO22	VDDIO2	ARD_D1	UART_RXD (device side)
24	DEVICE_WAKEUP	GPIO28	VDDIO2	ARD_D10	**GPIO28**/SPI_NSS
25	VDDIO2	VDDIO2	-	-	Host I/O voltage input GPIO20~30
26	GND	GND	GND	ARD_GND	GND
27	SPI_MOSI	GPIO27	VDDIO2	ARD_D11	SPI_MOSI
28	SPI_CLK	GPIO29	VDDIO2	ARD_D13	SPI_CLK
29	SPI_MISO	GPIO30	VDDIO2	ARD_D12	SPI_MISO
30	GND	GND	GND	ARD_GND	GND
31	NC	NC	-	-	Pin not connected
32	GND	GND	GND	ARD_GND	GND
33	GND	GND	GND	ARD_GND	Expose pad
34	GND	GND	GND	ARD_GND	Expose pad
35	GND	GND	GND	ARD_GND	Expose pad
36	GND	GND	GND	ARD_GND	Expose pad

1. *The default configuration is shown in bold.*
2. *When SPI is selected as the communication protocol between the host and the module, the user cannot use GPIO20 to control the user LED directly because it must be used as SPI DATA READY.*

10 X-NUCLEO-67W61M1 product information

10.1 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:

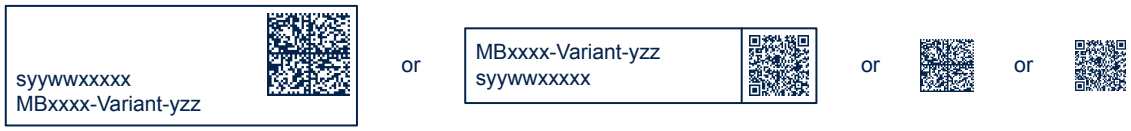
  

  Dual-sticker example:

- 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.

10.2 X-NUCLEO-67W61M1 product history

Table 15. Product history

Order code	Product identification	Product details	Product change description	Product limitations
X-NUCLEO-67W61M1	XN67W61M1$CZ1	MCU: • ST67W611M1A6B MCU errata sheet: • No errata sheet. Board: • MB2230-ANTENNA-A04 (expansion board)	Initial revision	The current module revision is at 100 µA power consumption in shutdown mode (instead of 0.2 µA).
	XN67W61M1$CZ2	MCU: • ST67W611M1A6B MCU errata sheet: • No errata sheet. Board: • MB2230-ANTENNA-A04 (expansion board)	Box product and certification label sticker	The current module revision is at 100 µA power consumption in shutdown mode (instead of 0.2 µA).

10.3 Board revision history

Table 16. Board revision history

Board reference	Board variant and revision	Board change description	Board limitations
MB2230 (expansion board)	ANTENNA-A04	Initial revision	No limitation

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

11.1 FCC Compliance Statement

Identification of products: X-NUCLEO-67W61M1

Contains an STMicroelectronics transmitter module, model ST67W611M1A6B.

FCC ID: YCP-67W611M1A01

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

11.2 ISED Compliance Statement

Identification of products: X-NUCLEO-67W61M1
Contains an STMicroelectronics transmitter module, model ST67W611M1A6B.
IC: 8976A-67W611M1A01

Identification du produit : X-NUCLEO-67W61M1
Contient le module émetteur de STMicroelectronics, modèle ST67W611M1A6B.
IC : 8976A-W611M1A01

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 (B) / NMB (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 (B) / NMB (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.

12 UKCA Compliance Statement

SIMPLIFIED UK DECLARATION OF CONFORMITY

Hereby, the manufacturer STMicroelectronics, declares that the radio equipment type “X-NUCLEO-67W61M1” 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*.

13 RED Compliance Statement

Simplified EU declaration of conformity

Hereby, STMicroelectronics declares that the radio equipment type "X-NUCLEO-67W61M1" 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 (Wi-Fi®/Bluetooth® LE)
- Maximal power for Wi-Fi®: 100 mW E.I.R.P.
- Maximal power for Bluetooth® LE: 10 mW E.I.R.P.

Déclaration de conformité UE simplifiée

STMicroelectronics déclare que l'équipement radioélectrique du type "X-NUCLEO-67W61M1" 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*.

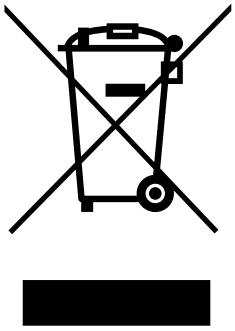
Bande de fréquence utilisée en transmission et puissance maximale rayonnée dans cette bande :

- Bande de fréquence : 2400 - 2483.5 MHz (Wi-Fi®/Bluetooth® LE)
- Puissance maximale Wi-Fi® : 100 mW E.I.R.P.
- Puissance maximale Bluetooth® LE : 10 mW E.I.R.P.

14 Product disposal

Disposal of this product: WEEE (Waste Electrical and Electronic Equipment)

(Applicable in Europe)



This symbol on the product, accessories, or accompanying documents indicates that the product and its electronic accessories should not be disposed of with household waste at the end of their working life.

To prevent possible harm to the environment and human health from uncontrolled waste disposal, please separate these items from other type of waste and recycle them responsibly to the designated collection point to promote the sustainable reuse of material resources.

Household users:

You should contact either the retailer where you buy the product or your local authority for further details of your nearest designated collection point.

Business users:

You should contact your dealer or supplier for further information.

Revision history

Table 17. **Document revision history**

Date	Revision	Changes
02-Jun-2025	1	Initial release.

Contents

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