STM32WL5MOC connectivity expansion board

Introduction

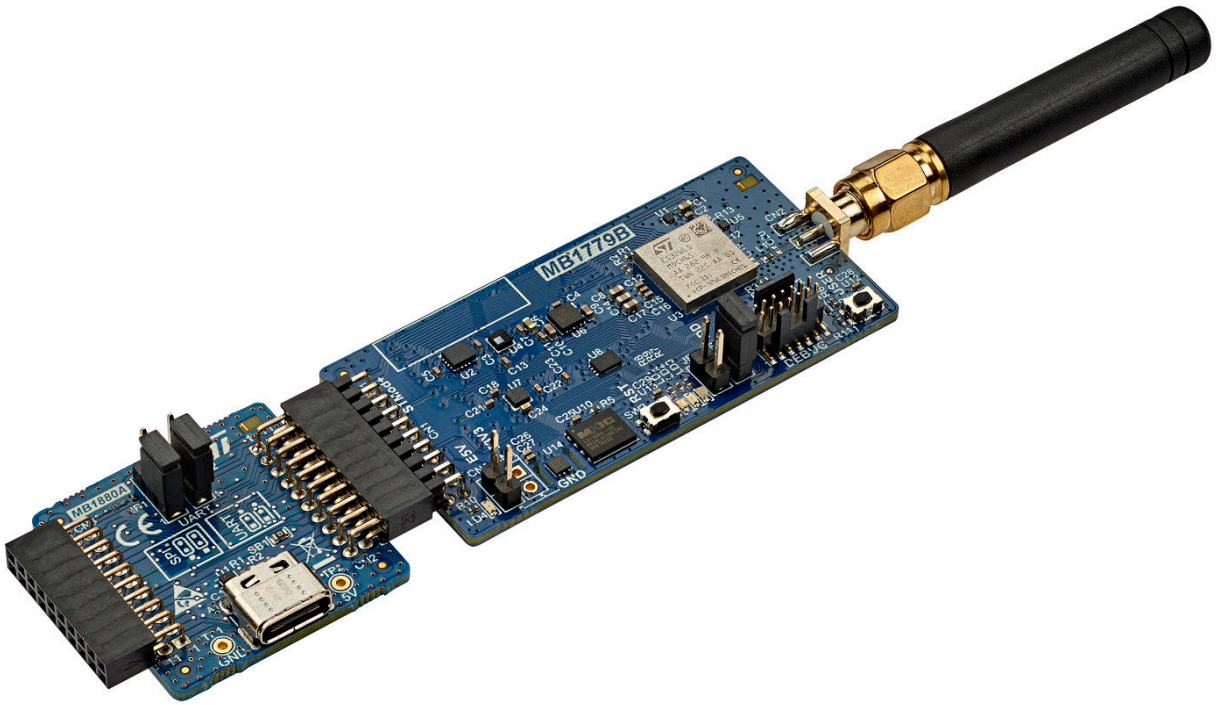
The B-WL5M-SUBG1 STM32WL connectivity expansion board provides an affordable and flexible way for users to try out new concepts and build prototypes with the STM32WL series STM32WL5MOC microcontroller module.

The B-WL5M-SUBG1 product requires a separate probe for programming and debugging. The STLINK-V3SET debugger can be connected through a MIPI10/STDC14 cable.

The B-WL5M-SUBG1 STM32WL connectivity expansion board is provided with a USB Type-C® connector for power only on an add-on STMod+ adapter board.

The B-WL5M-SUBG1 product is provided with the STM32WL comprehensive software HAL library and various packaged software examples available with the STM32CubeWL MCU Package.

Figure 1. B-WL5M-SUBG1 product



Picture is not contractual.

1 Features

- STM32WL connectivity expansion board embedding an STM32WL5MOC module including:
  - Ultra-low-power STM32WL55JC microcontroller multiprotocol LPWAN dual-core based on Arm® Cortex®-M4/M0+, featuring 256 Kbytes of flash memory and 64 Kbytes of SRAM in a UFBGA73 package
  - RF transceiver (150 MHz to 960 MHz frequency range) supporting LoRa®, (G)FSK, (G)MSK, and BPSK modulations
- 4-Mbit CMOS serial flash memory and 256-Kbit serial I^2C bus EEPROM
- MEMS sensors from STMicroelectronics:
  - Integrated high-accuracy temperature sensor
  - High-accuracy, ultra-low-power, 3-axis digital output magnetometer
  - 3D accelerometer and 3D gyroscope
  - Ultracompact piezoresistive absolute pressure sensor
- Three user LEDs
- User and reset push-buttons
- Board connectors:
  - MIPI® debug
  - STMod+
  - Stubby antenna
  - USB Type-C® for power only on add-on STMod+ adapter board
- Flexible power supply options: external sources, or USB V_{BUS} from the add-on board
- Comprehensive free software libraries and examples available with the STM32CubeWL 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 B-WL5M-SUBG1 STM32WL connectivity expansion board, refer to Table 1. Additional information is available from the datasheet and reference manual of the target microcontroller.

Table 1. List of available products

Order code	Board reference	Target STM32
B-WL5M-SUBG1	• MB1779[1] • MB1880[2]	STM32WL5MOCH6TR

1. *Expansion board*
2. *STMod+ adapter board*

2.1 Codification

The meaning of the codification is explained in Table 2.

Table 2. Codification explanation

B-XXYYZZZZT	Description	Example: B-WL5M-SUBG1
B	Expansion board	Connectivity expansion board
XX	MCU series in STM32 32-bit Arm Cortex MCUs	STM32WL series
YY	MCU product line in the series	STM32WL5M line
ZZZZ	Wireless network	Subgigahertz wireless network based on LoRa®, (G)FSK, (G)MSK, and BPSK modulations
T	Sequential number	First SUBG connectivity expansion board

3 Development environment

The B-WL5M-SUBG1 STM32WL connectivity expansion board runs with the STM32WL5MOC module including the STM32WL5MOCH6 32-bit microcontroller based on the Arm® Cortex®-M4/M0+ processor.

3.1 System requirements

- Multi-OS support: Windows® 10 and 11, Linux® 64-bit, or macOS®
- USB Type-A or USB Type-C® to USB Type-C® 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 B-WL5M-SUBG1 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 the board close to water or at a high humidity level.
- Do not operate the board if dirty or dusty.

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.

6 Quick start

The B-WL5M-SUBG1 STM32WL connectivity expansion board is an easy-to-use and low-cost development kit used to evaluate and start development quickly with an STM32WL5MOC 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 B-WL5M-SUBG1 STM32WL connectivity expansion board and demonstration software, visit *www.st.com*.

6.1 Getting started

Follow the sequence below to configure the B-WL5M-SUBG1 STM32WL connectivity expansion board and launch the demonstration application (refer to Figure 3 for component location):

1. Check jumper positions on board, JP2 (IDD) ON, JP1 (internal) OFF. The default jumper position on the board is explained in Table 4.
2. Supply the B-WL5M-SUBG1 STM32WL connectivity expansion board (MB1779). For example, you can connect a power cable to CN4 to supply the board with 5 V (5EV).
3. Connect the B-WL5M-SUBG1 STM32WL connectivity expansion board (MB1779) to an external STLINK-V3SET debugger through the CN3 connector of the MB1779 board. Connect the external STLINK-V3SET debugger to a PC with a standard USB cable. Then the LED4 (5V_PWR) green LED lights up, and the LED3 red LED flashes quickly.
4. On the PC, connect a UART terminal to the board using the following settings:
   – UART terminal: new line received = auto; new line transmit = LF (line feed)
   – Serial port setting: Select COM port number, 9600 baud rate, 8-bit data, parity none, one stop bit, and no flow control
5. Press on the SW2 reset button of the B-WL5M-SUBG1 STM32WL connectivity expansion board (MB1779).
   – The MB1779 board remains silent until it gets a command from the connected PC to send a beacon on one of the beacon frequencies.
   – The frequency is selected depending on the region.
   – After the version check, the first three commands to send to the PC must set region, subregion, and start the beacon (AT+REGION=x and AT_BEACON_ON). The first two commands select the format of the transmission beacon. The third command starts sending the beacon.
   – For a list of available regions run AT_LIST_REGIONS.
6. Then a concentrator (for example a NUCLEO-WL55JC1 board) starts flashing a green LED on each time slot of the network.
7. To get the demonstration fully up and running, up to 14 B-WL5M-SUBG1 STM32WL connectivity expansion board (MB1779) demonstration sensors can be flashed and placed against a Nucleo demonstration concentrator.
8. This demonstration application software is available on the *www.st.com* website.

Table 4. Jumper default configuration

Jumper	Definition	Position(1)	Comment
JP2	IDD	**ON**	For STM32WL5MOC current measurements (RF part)

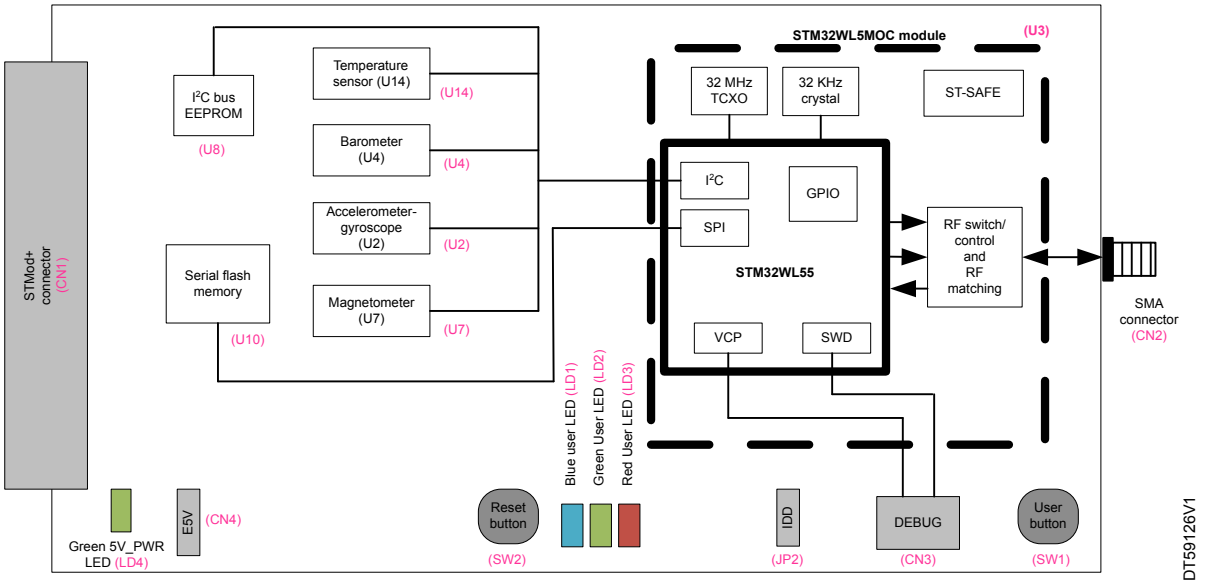
1. *The default jumper state is shown in bold.*

7 Hardware layout and configuration

7.1 Connectivity expansion board (MB1779)

The CEB (connectivity expansion board) MB1779 is designed around the STM32WL5MOC module, which includes an STM32 microcontroller. Figure 2 shows the connections between the STM32WL5MOC module and its peripherals, push-buttons, LEDs, USB, and sensors. Figure 3 and Figure 4 show the location of these features on the CEB MB1779. The mechanical dimensions of the board are shown in Figure 5.

Figure 2. MB1779 hardware block diagram



7.1.1 MB1779 layout

Figure 3. MB1779 top layout

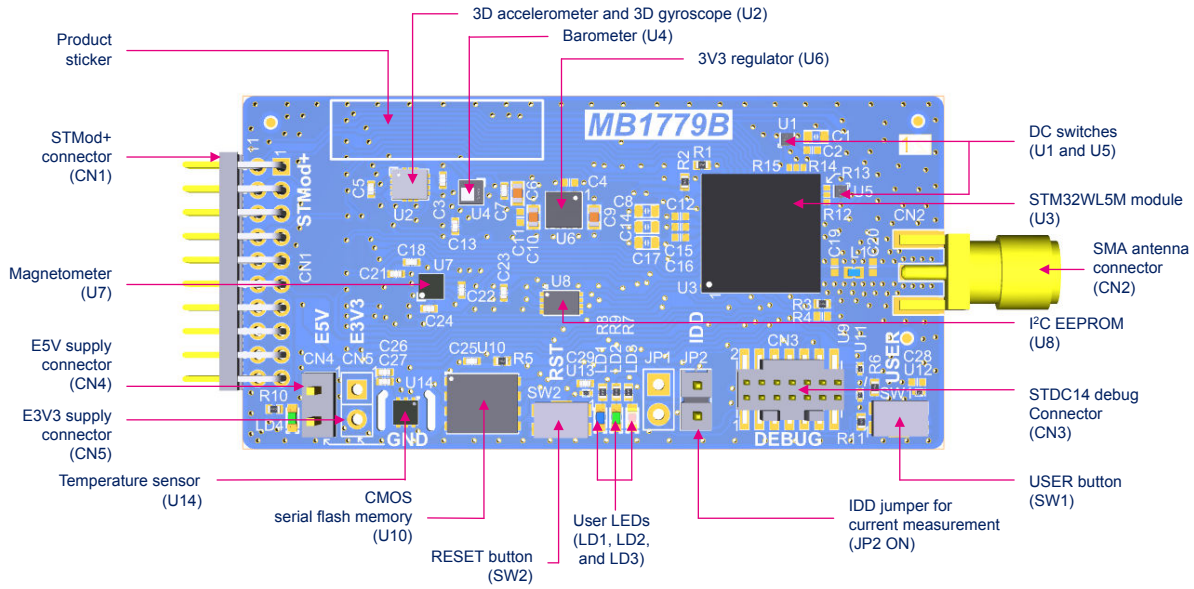
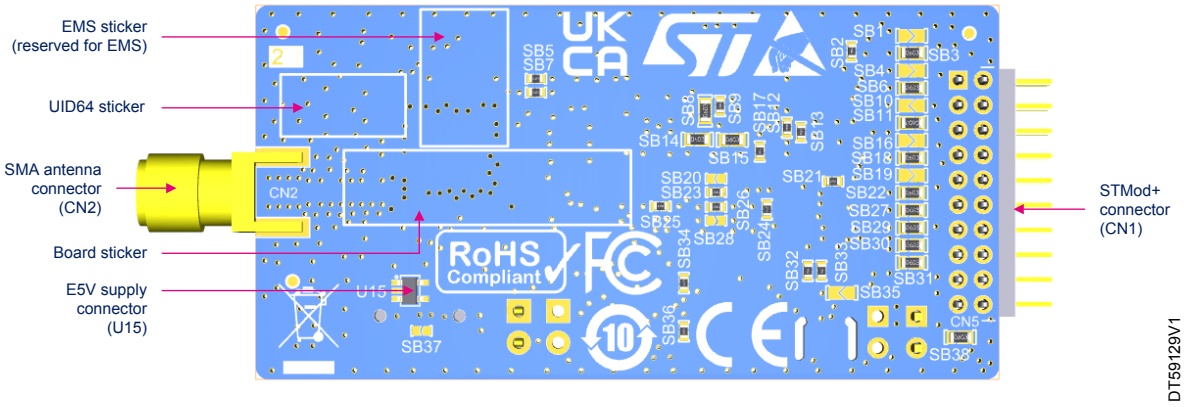


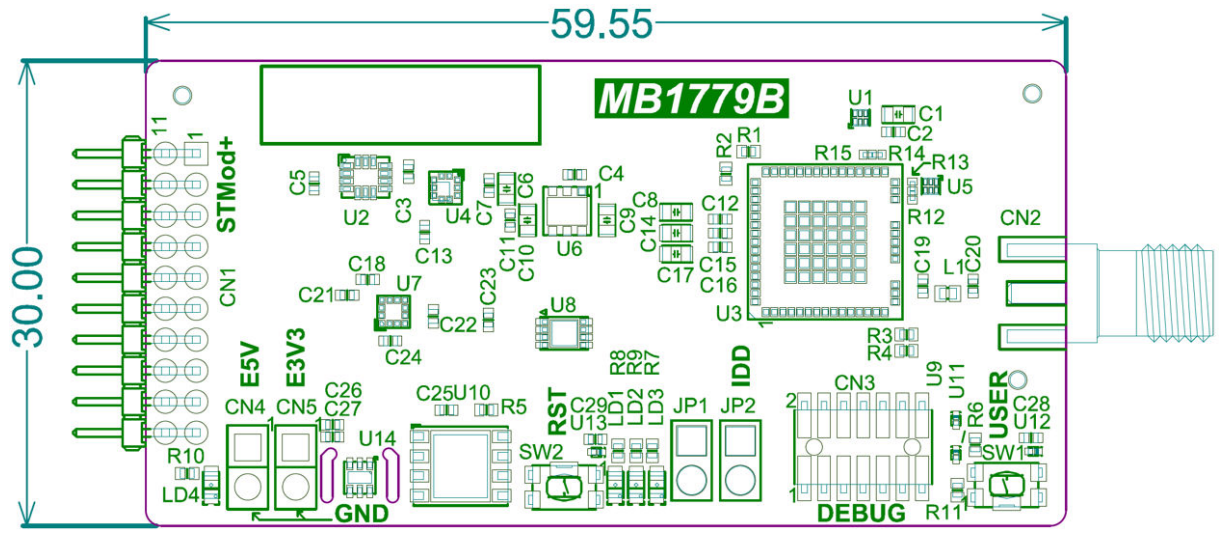
Figure 4. **MB1779 bottom layout**



- The UID64 sticker:
  A 64-bit unique device identification (UID64) is stored in the flash memory and can be accessed by the CPUs, at `0x1FFF7580` base address.
  The UID64 sticker displays the UID information (16 digits as 64-bit codification, displayed in little-endian bytes) which is unique for each STM32WL5MOC module.

7.1.2 MB1779 mechanical drawing

Figure 5. **MB1779 mechanical drawing (in millimeters)**

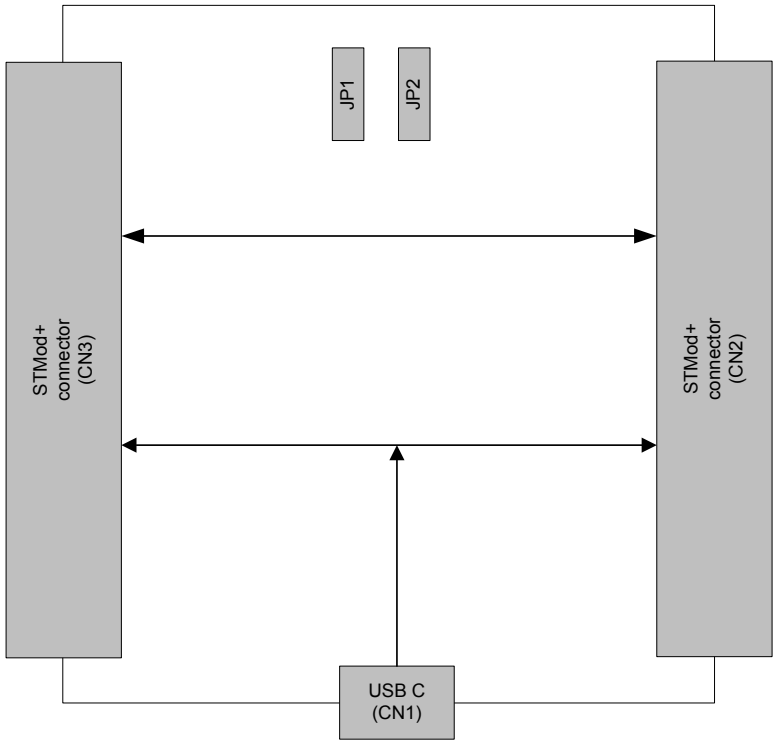


7.2 MB1880 STMod+ adapter board

The MB1880 STMod+ adapter board is a very simple board that allows the MB1779 connectivity expansion board to become a host with the add-on STMod+ connectors (female).

Figure 6 shows the basic hardware block diagram. Figure 7 and Figure 8 show the location of the main components of the MB1880 board. The mechanical dimensions of the board are shown in Figure 9.

Figure 6. MB1880 basic hardware block diagram



7.2.1 MB1880 layout

Figure 7. MB1880 top layout

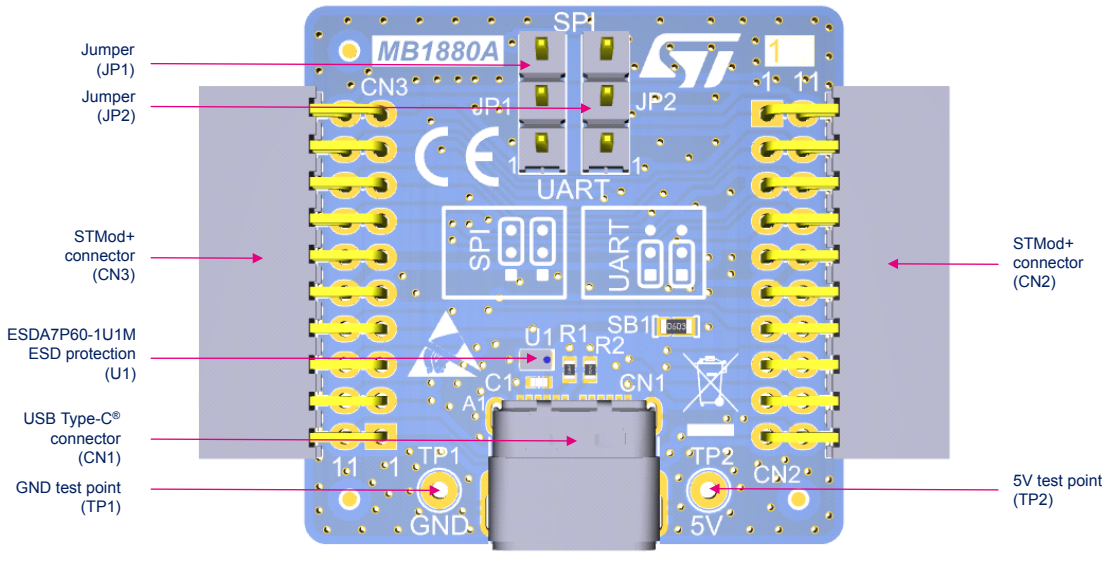
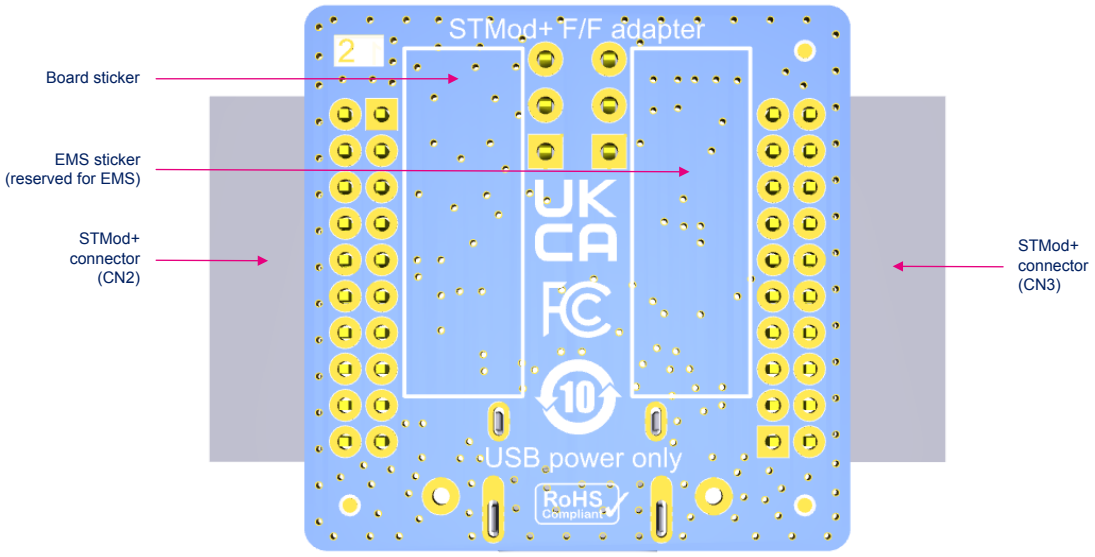
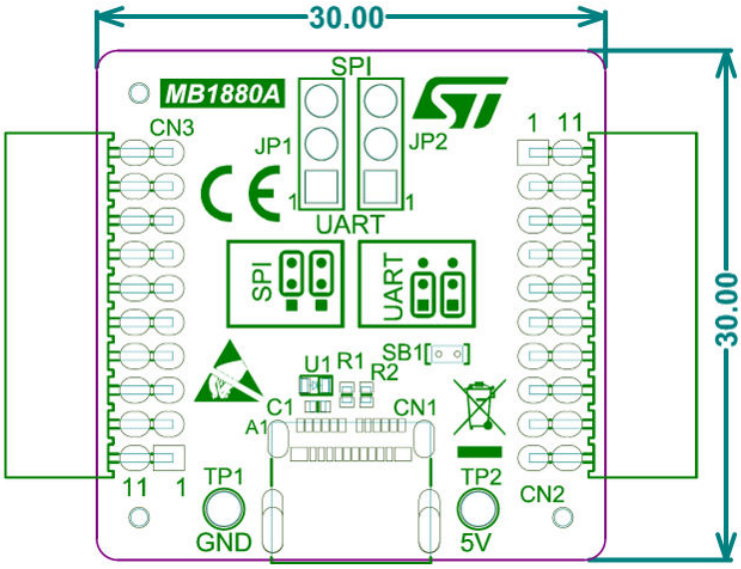


Figure 8. **MB1880 bottom layout**



7.2.2 MB1880 mechanical drawing

Figure 9. **MB1880 mechanical drawing (in millimeters)**



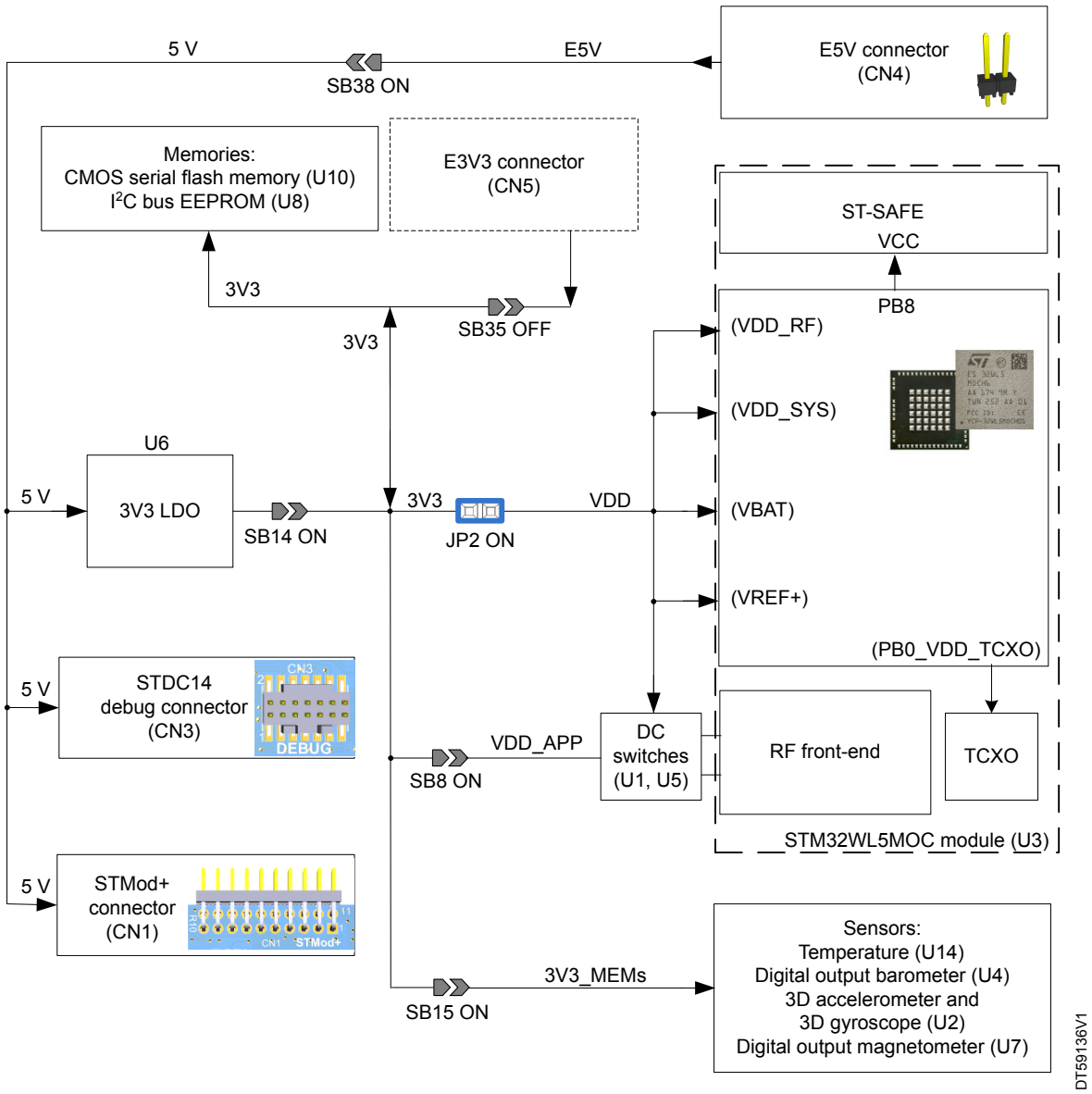
7.3 Power supply

The following sources can provide the power supply

- Connected to the MB1779 expansion board;
  - An external E5V 5 V power supply connected to CN4 (preferred solution)
  - An external E3V3 3.3 V power supply connected to CN5 (not fitted)
- Connected through the MB1880 STMod+ adapter board:
  - 5 V via the USB Type-C® connector
  - 5 V supplied through a host

Four different sources can provide the power supply:

Figure 10. CEB MB1779 power tree



In case an external voltage supply on E5V/E3V3 is used to power the connectivity expansion board MB1779, this E5V/E3V3 power source must comply with the EN-62368-1: 2014+A11:2017 standard and must be safety extralow voltage (SELV) with limited power capability.

7.3.1 Power supply input E5V connector (default setting)

The CEB MB1779 can be powered from the E5V connector (CN4) by either:

- Plugging an external voltage supply (from 3.6 up to 5.5 V)
- Plugging a 3.7 V battery pack

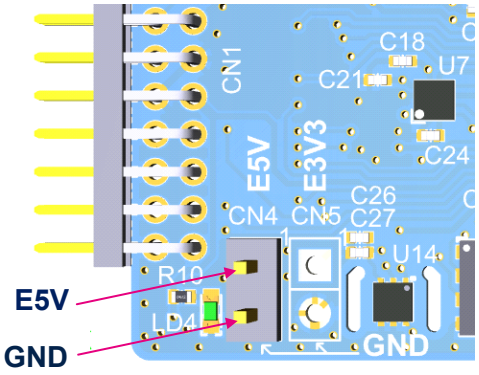
Refer to Table 5. This is the default setting.

Table 5. External power source E5V

Input power name	Connector pins	Voltage range	Maximum current
E5V	MB1779 - CN4 pin 1	3.6 to 5.5 V	500 mA

Make sure you supply the board with the correct power when using CN4. CN4 pin 1 is the E5V supply and pin 2 is the GND, as shown in Figure 11.

Figure 11. E5V and GND pins on CN4



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7.3.2 Power via the STMod+ adapter board (MB1880) supplied through a USB Type-C® connector

The CEB MB1779 can be powered by 5V coming from the USB Type-C® connector of the STMod+ adapter board (MB1880). This USB Type-C® connector can be connected to:

- A PC through a USB cable
- A USB charger

This is displayed in Table 6 and Figure 12.

Figure 12. Power supply from 5V via the STMod+ adapter board (MB1880) connected through a USB connector

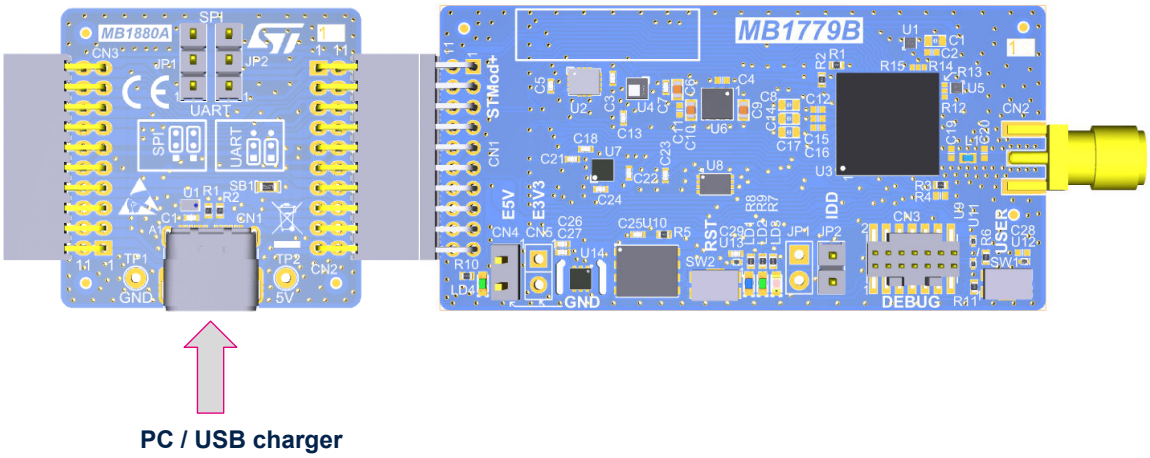


Table 6. External power source 5V (5 V)

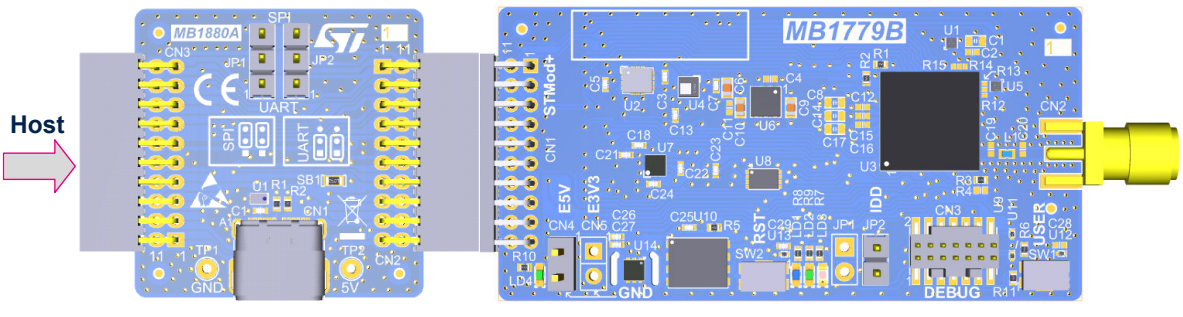
Input power name	Connector pins	Voltage range	Maximum current
5V	MB1880 - CN1	5 V	500 mA

7.3.3 Power via STMod+ adapter board (MB1880) supplied through a host

The CEB MB1779 can be powered by 5V coming from the second STMod+ connector of the STMod+ adapter board (MB1880). This STMod+ connector can be connected to a host.

This is displayed in Figure 13.

Figure 13. Power supply input from 5V via STMod+ adapter board (MB1880) connected to a host



7.3.4 Power supply input E3V3 connector

The CEB MB1779 can be powered by the E3V3 connector (CN5) by plugging an external 3.3 V voltage supply (up to 3.6 V).

Refer to Table 7.

Table 7. External power source E3V3

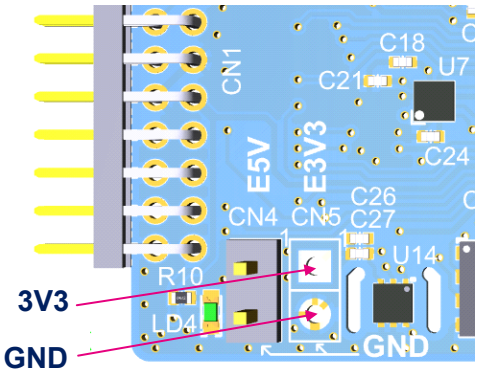
Input power name	Connector pins	Voltage range	Maximum current
E3V3	MB1779 - CN5 pin 1	Up to 3.6 V	500 mA

Make sure to supply the card with the correct power when using CN5.

A 2-pin header must be soldered at CN5.

CN5 pin 1 is the E3V3 supply and pin 2 is the GND, as shown in Figure 14.

Figure 14. E3V3 and GND pins on CN5



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7.4 Board functions

7.4.1 LEDs

User LED (LD1)

This blue LED is a user LED connected to STM32WL5MOC module I/O PB15. To light the LD1 LED, a HIGH logic state must be written in the corresponding GPIO PB15.

User LED (LD2)

This green LED is a user LED connected to STM32WL5MOC module I/O PB9. To light the LD2 LED, a HIGH logic state must be written in the corresponding GPIO PB9.

User LED (LD3)

This red LED is a user LED connected to STM32WL5MOC module I/O PB11. To light the LD3 LED, a HIGH logic state must be written in the corresponding GPIO PB11.

5V_PWR LED (LD4)

This green LED indicates that the CEB MB1779 is powered. 5 V power is available at the input of the 3V3 regulator (U6) to provide the 3.3 V necessary to supply the STM32WL5MOC module.

7.4.2 Push-buttons

SW1 user button

This user button is connected to the STM32WL5MOC module I/O PA0.

SW2 reset button

This push-button is connected to NRST and is used to reset the STM32WL5MOC module.

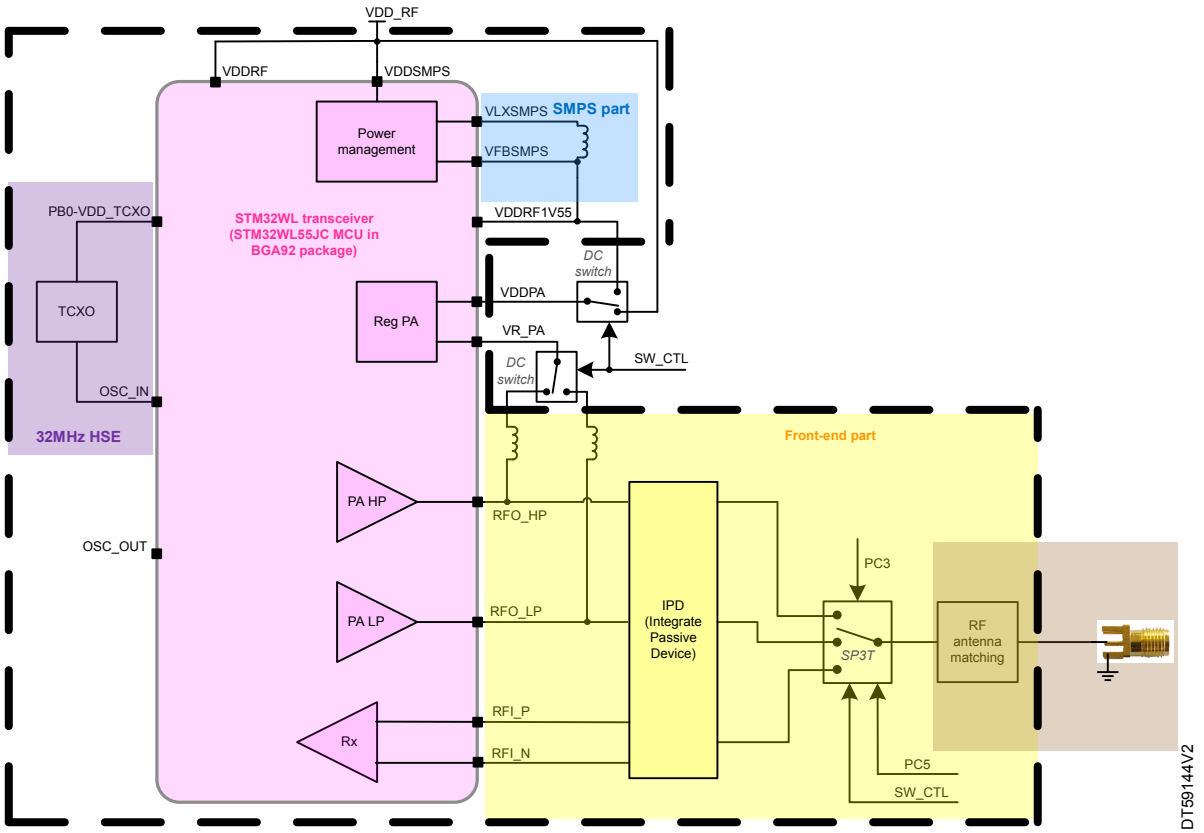
7.4.3 RF overview

The CEB MB1779 board embeds an STM32WL5MOC module and DC switches to address with the same board the three reception, High-power transmission, and Low-power transmission modes. The choice between the two transmission modes can be done dynamically, thanks to two DC switches controlled by SW_CTL (GPIO from the STM32WL series MCU):

- The transmission high-output power amplifier (PA HP) is supplied from the PA regulator (REG PA) up to 3.1 V. For this, the REG PA must be supplied directly from VDDSMPS.
- The transmission default low-output power amplifier (PA LP) can be supplied from the PA regulator (REG PA) up to 1.35 V. For this, the REG PA must be supplied from the regulated VFBSMPS supply at 1.55 V.

The RF block diagram around the STM32WL5MOC module is displayed in Figure 15.

Figure 15. RF block diagram



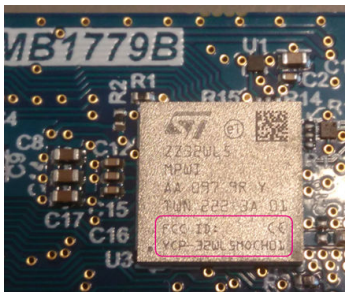
The screwed and glue-fixed antenna to connect to the SMA connector and provided in the carton box is the ANT-SS900 from the LPRS company.

This antenna is used for the different FCC/ISED/CE certifications. It is then mandatory to use this referenced antenna (and only this one) for radiation tests on the CEB MB1779 boards.

The antenna is stuck to the SMA connector because of FCC constraints. Indeed, it is mentioned in the FCC regulations that as soon as a product is considered general public, the FCC implies that the antenna must be stuck to the board connector with epoxy glue. Refer to the FCC documentation BASIC EQUIPMENT AUTHORIZATION GUIDANCE FOR ANTENNAS USED WITH PART 15 INTENTIONAL RADIATORS in the chapter ANTENNA REQUIREMENTS—Section 15.203. The purpose of section 15.203 is to prevent attaching any other antennas [other than approved with the device] to a part 15 transmitter.

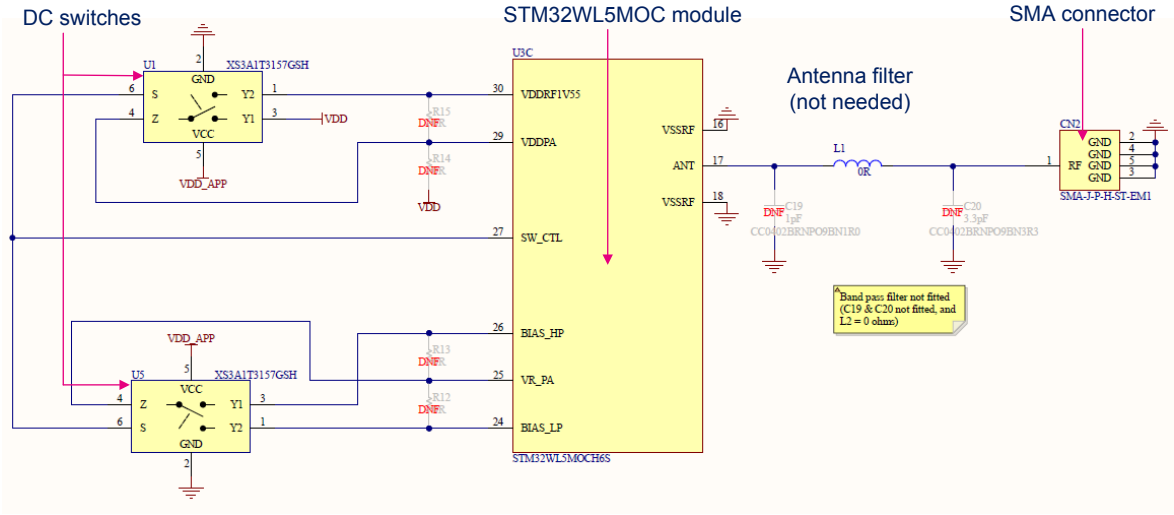
Note that the STM32WL5MOC module and the FCC identifier preceded by the term FCC ID are engraved on the top of the module (YCP-32WL5MOCH01 (first revision of the STM32WL5MOC module including the STM32WL5MOCH6 module)).

Figure 16. FCC identifier on the STM32WL5MOC module



The two DC switches U1 and U5 are used to realize various output power operation modes.

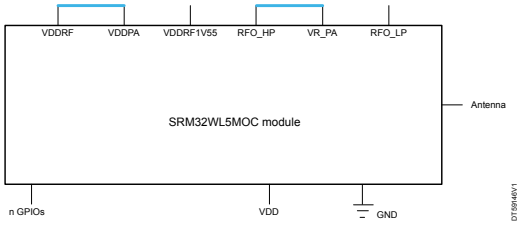
Figure 17. Schematic focus on the RF part



Three output power modes are available:

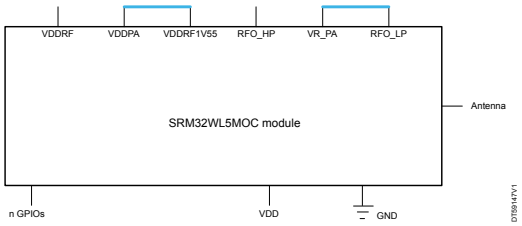
1. HP: High-power mode only
   In this case, R13 and R14 are ON, while R12, R15, U1, and U5 are OFF.

Figure 18. HP configuration without DC switches



2. LP: Low-power mode only
   In this case, R13 and R14 are OFF, while R12 and R15 are ON, and U1 and U5 are OFF.

Figure 19. LP configuration without DC switches



3. HP/LP: Combined High-power and Low-power modes.
   In this case, R13, R14, R12, and R15 are OFF, and U1 and U5 are ON.

Figure 20. HP configuration with DC switches

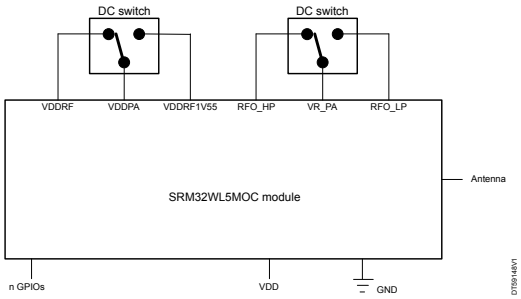
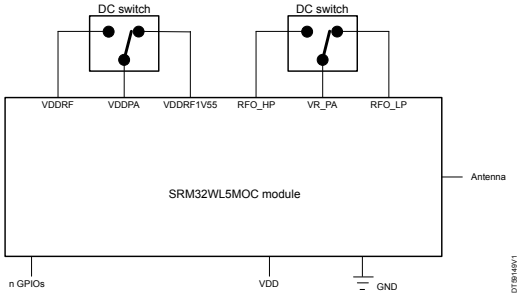


Figure 21. LP configuration with DC switches



The choice between both Tx paths can be done dynamically thanks to the two XS3A1T3157 DC switches (U1 and U5) controlled by SW_CTL (GPIO from the STM32WL series MCU):

- The transmit high output power amplifier (PA HP) is supplied from the PA regulator (REG PA) up to 3.1 V. For this, the REG PA must be supplied directly from VDDSMPS.
- The transmit default output power amplifier (PA LP) can be supplied from the PA regulator (REG PA) up to 1.35 V. For this, the REG PA must be supplied from the regulated VFBSMPS supply at 1.55 V

In addition, PC5 and PC3 are I/Os inside the STM32WL5MOC module and are dedicated to the RF front-end switch control. Table 8 describes the truth table of the RF modes based on the STM32WL5MOC module and associated DC switches.

Table 8. RF transceiver configuration

RF transceiver configuration	SW_CTL	PC5	PC3
Transmit high output power	LOW	HIGH	HIGH
Transmit low output power	HIGH	LOW	HIGH
Receive	HIGH	HIGH	HIGH

7.4.4 STSAFE

Two variants of the STM32WL5MOC module are available.

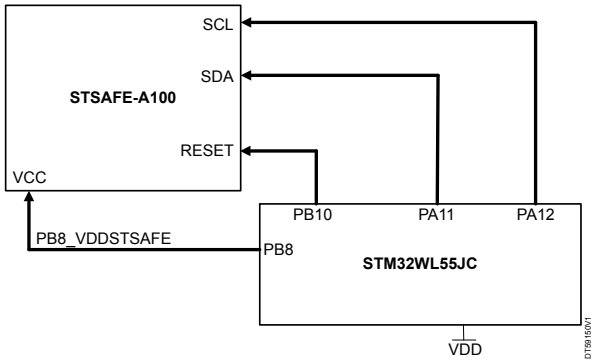
An STSAFE-A100 component, which covers authentication and security for peripherals and IoT devices, can be implemented on the STM32WL5MOC module.

- STM32WL5MOC6 is the module without STSAFE.
- STM32WL5MOC6S is the module with STSAFE.

In the STM32WL5MOC6S, the GPIO PB8 controls the STSAFE supply to optimize the power consumption, especially in low-power mode.

When STSAFE needs to be used, the GPIO PB8 must be set up in the output configuration and forced to the high level. STSAFE can sink up to 21 mA of power consumption. Refer to Figure 22. STSAFE supplied by PB8 (VDD guaranteed above 2.6 V).

Figure 22. STSAFE supplied by PB8 (VDD guaranteed above 2.6 V)

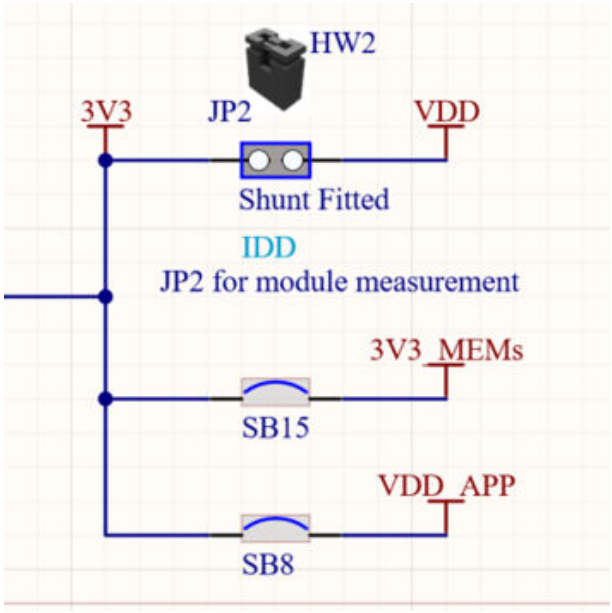


7.4.5 Current consumption measurement (IDD)

The IDD-labeled jumper (JP2) is used to measure the STM32WL5MOC module power consumption by removing the jumper and connecting an ammeter. Its location in the power structure is shown in Figure 23.

1. JP2 ON: STM32WL is powered with 3V3 voltage (default).
2. JP2 OFF: An ammeter must be connected to measure the STM32WL5MOC current. If there is no ammeter, the STM32WL5MOC module is not powered.

Figure 23. JP2 settings for current consumption measurement



Note:

- *IDD (on VDD) is the current consumption of the complete STM32WL5MOC module.*
- *I_VDDAP (on VDD_APP) is the current consumption of both DC switches (U1 and U5).*

The current consumption of both DC switches can be evaluated by connecting an ammeter on both pads of SB8, which is removed.

- *I_MEMs (on 3V3_MEMs) is the current consumption of all the sensors:*
  - *U14: Integrated high-accuracy temperature sensor*
  - *U7: High-accuracy, ultra-low-power, 3-axis digital magnetometer*
  - *U2: 3D accelerometer and 3D gyroscope*
  - *U4: Ultracompact piezoresistive absolute pressure sensor*

The current consumption of all these MEMS can be evaluated by connecting an ammeter on both pads of SB15, which is removed.

7.5 Solder bridges

There are 38 solder bridges on the bottom side of the MB1779 board, and there is one solder bridge on the MB1880 board.

Table 9. Solder bridge configuration on MB1779

Solder bridge (SB)	Function	State[1]	Description[1]
SB1 (SB1 and SB3 are exclusive)	STMOD+_UART1_RTS (PB12)	ON	UART1_RTS connected to pin 1 of the STMod+ connector
		OFF	**UART1_RTS not connected to pin 1 of the STMod+ connector**
SB2	INT1 pin of the accelerometer-gyroscope sensor (U2)	**ON**	**ACCELERO_GYRO_INT signal from the STM32WL5MOC module connected to the INT1 pin of U2.**
		OFF	ACCELERO_GYRO_INT signal from STM32WL5MOC module not connected to the INT1 pin of U2.
SB3 (SB1 and SB3 are exclusive)	STMOD+_SPI1_NSS (PA4)	**ON**	**SPI1_NSS connected to pin 1 of the STMod+ connector**
		OFF	SPI1_NSS not connected to pin 1 of the STMod+ connector
SB4 (SB4 and SB6 are exclusive)	STMOD+_UART1_RX (PC0)	ON	UART1_RX connected to pin 2 of the STMod+ connector
		OFF	**UART1_RX not connected to pin 2 of the STMod+ connector**
SB5	I2C2_SDA	**ON**	**I2C2_SDA connected to MEMs_I2C2_SDA**
		OFF	I2C2_SDA not connected to MEMs_I2C2_SDA
SB6 (SB4 and SB6 are exclusive)	STMOD+_SPI1_MOSIP (PA7)	**ON**	**SPI1_MOSIP connected to pin 2 of the STMod+ connector**
		OFF	SPI1_MOSIP not connected to pin 2 of the STMod+ connector
SB7	I2C2_SDL	**ON**	**I2C2_SDL connected to MEMs_I2C2_SDL**
		OFF	I2C2_SDL not connected to MEMs_I2C2_SDL
SB8	VDD_APP	**ON**	**VDD_APP connected to 3V3**
		OFF	VDD_APP not connected to 3V3 (DC switches U1 and U5 not supplied.
SB9	Barometer (U4) supply	**ON**	**U4 supplied with 3V3_MEMs.**
		OFF	U4 not supplied.
SB10	pin 12 of the STMod+ connector	ON	T_NRST connected to pin 12 of the STMod+ connector
		OFF	**T_NRST not connected to pin 12 of the STMod+ connector**
SB11		ON	PA9 (RESET) connected to pin 12 of the STMod+ connector
		OFF	**PA9 (RESET) not connected to pin 12 of the STMod+ connector**
SB12	QVAR2 pin signal of U4 (barometer)	**ON**	**QVAR2 pin grounded**
		OFF	QVAR2 pin not connected to the ground (floating)
SB13	Accelerometer-gyroscope (U2) supply	**ON**	**U2 supplied with 3V3_MEMs.**
		OFF	U2 not supplied.
SB14	3V3 regulator (LD39050PU33R) output	**ON**	**The LD39050PU33R (3V3 regulator) output is connected to 3V3.**
		OFF	Output of the LD39050PU33R (3V3 regulator) not connected to 3V3.
SB15	3V3_MEMs	**ON**	**3V3_MEMs is connected to 3V3**
		OFF	VDD_APP is not connected to 3V3 (MEMS U2, U4, U7, and U14 is not supplied.

Solder bridge (SB)	Function	State(1)	Description(1)
SB16 (SB16 and SB18 are exclusive)	STMOD+_UART1_TX (PC1)	ON	UART1_TX is connected to pin 3 of the STMod+ connector
		OFF	**UART1_TX is not connected to pin 3 of the STMod+ connector**
SB17	QVAR2 pin signal of U4 (barometer)	**ON**	**QVAR1 pin grounded**
		OFF	QVAR1 pin not connected to the ground (floating)
SB18 (SB16 and SB18 are exclusive)	STMOD+_SPI1_MISOP / UART1_CTS (PA6)	**ON**	**SPI1_MISOP connected to pin 3 of the STMod+**
		OFF	SPI1_MISOP not connected to pin 3 of the STMod+
SB19 (SB19 and SB22 are exclusive)		ON	UART1_CTS connected to pin 4 of the STMod+
		OFF	**UART1_CTS not connected to pin 4 of the STMod+**
SB20 (SB20 and SB23 are exclusive)	Chip enable input (E1) of the I²C EEPROM	ON	Chip enable input (E1) set to 0 (grounded)
		OFF	**Chip enable input (E1) not set to 0 (not grounded) must be set to 1 (3V3) with SB23**
SB21	Magnetometer (U7) supply	**ON**	**U7 supplied with 3V3_MEMs.**
		OFF	U7 is not supplied.
SB22 (SB19 and SB22 are exclusive)	STMOD+_SPI1_CLK (PA5)	**ON**	**SPI1_CLK connected to pin 4 of the STMod+ connector**
		OFF	SPI1_CLK is not connected to pin 4 of the STMod+ connector
SB23 (SB20 and SB23 are exclusive)	Chip enable input (E1) of the I²C EEPROM	**ON**	**Chip enable input (E1) set to 1 (3V3)**
		OFF	Chip enable input (E1) not set to 1 must be set to 0 (grounded) with SB20
SB24	INT1/DRDY pin of U7 magnetometer (PC6)	**ON**	**MAGNETO_INT signal from the STM32WL5MOC module connected to the INT1/DRDY pin of U7.**
		OFF	MAGNETO_INT signal from STM32WL5M module not connected to the INT1/DRDY pin of U7.
SB25	I²C EEPROM (memory) supply	**ON**	**The I²C EEPROM is supplied with 3V3.**
		OFF	The I²C EEPROM is not supplied.
SB26 (SB26 and SB28 are exclusive)	Chip enable input (E2) of I²C EEPROM	**ON**	**Chip enable input (E2) set to 1 (3V3)**
		OFF	Chip enable input (E2) not set to 1 must be set to 0 (grounded) with SB28
SB27	STMOD+_I2C2_SCL (PA12)	**ON**	**I2C2_SCL connected to pin 7 of the STMod+ connector**
		OFF	I2C2_SCL not connected to pin 7 of the STMod+ connector
SB28 (SB26 and SB28 are exclusive)	Chip enable input (E2) of I²C EEPROM	ON	Chip enable input (E2) set to 0 (grounded)
		OFF	**Chip enable input (E2) not set to 0 (not grounded) must be set to 1 (3V3) with SB23**
SB29	STMOD+_SPI1_MOSIS (PB5)	**ON**	**SPI1_MOSIS connected to pin 8 of the STMod+ connector**
		OFF	SPI1_MOSIS not connected to pin 8 of the STMod+ connector
SB30	STMOD+_SPI1_MISOIS (PB4)	**ON**	**SPI1_MISOS connected to pin 9 of the STMod+ connector**
		OFF	SPI1_MISOS not connected to pin 9 of the STMod+ connector
SB31	STMOD+_I2C2_SDA (PA11)	**ON**	**I2C2_SDA connected to pin 10 of the STMod+ connector**
		OFF	I2C2_SDA not connected to pin 10 of the STMod+ connector

Solder bridge (SB)	Function	State[1]	Description[1]
SB32	ALERT/INT pin of U14 temperature sensor (PA1)	**ON**	**TEMP_INT signal from the STM32WL5MOC module connected to the ALERT/INT pin of U14.**
		OFF	TEMP_INT signal from the STM32WL5MOC module connected to the ALERT/INT pin of U14.
SB33	Temperature sensor (U14) supply	**ON**	**U14 supplied with 3V3_MEMs.**
		OFF	U14 not supplied.
SB34	CMOS serial flash memory supply	**ON**	**U10 supplied with 3V3.**
		OFF	U10 is not supplied.
SB35	E3V3	ON	E3V3 connected to 3V3.
		OFF	**E3V3 is not connected to 3V3.**
SB36	HOLD pin of CMOS serial flash memory (PB7)	**ON**	**MEMORY_HOLD signal from the STM32WL5MOC module connected to the HOLD pin of U10.**
		OFF	MEMORY_ HOLD signal from the STM32WL5MOC module not connected to the HOLD pin of U10.
SB37	Pin 2 of DEBUG connector	ON	Pin 2 of the DEBUG connector is connected to the ground.
		OFF	**Pin 2 of the DEBUG connector is not connected to the ground (leaving floating).**
SB38	E5V	ON	E5V connected to 5V.
		OFF	**E5V is not connected to 5V.**

1. *The default configuration is in bold.*

On MB1880, the solder bridge SB1 is located on the top side of the board.

Table 10. Solder bridge configuration on MB1880

Solder bridge control	Function	State[1]	Description[1]
SB1	5V on V_{BUS}	**ON**	**5V voltage supply connected to the V_{BUS} supply of the USB-C® connector.**
		OFF	5V voltage supply not connected to the V_{BUS} supply of the **USB-C® connector.**

1. *The default configuration is in bold.*

7.6 Jumpers

7.6.1 MB1779 jumper

The jumper JP1 labeled IDD, is used to measure the STM32WL5MOC module power consumption by removing the jumper and by connecting an ammeter. Refer to Section 7.4.5.

7.6.2 MB1880 jumpers

The MB1880 board has two parallel jumpers as shown in Figure 7, Figure 8, and Figure 9. Set these jumpers in positions that are consistent with the solder bridges on MB1779 as indicated in Table 11.

Table 11. Consistent JP (MB1880) and SB (MB1779) settings for SPI or UART functions

MB1880 JP1, JP2	Mode	SB1	SB3	SB4	SB6	SB16	SB18	SB19	SB22
[2-3]	SPI	OFF	ON	OFF	ON	OFF	ON	OFF	ON
[1-2]	UART	ON	OFF	ON	OFF	ON	OFF	ON	OFF

7.7 Embedded devices

Embedded sensors and the EEPROM are connected to the STM32WL5MOC module with an I²C bus. The address is a 7-bit address with an additional read/write bit (HIGH for reading, LOW for writing). Table 12 describes the different addresses to read or write action for each component:

Table 12. I²C addresses

Device		Action	Address
U14	Temperature sensor	Read	0111 1111 (0x7F)
		Write	0111 1110 (0x7E)
U2	Accelerometer-gyroscope sensor	Read	1101 0101 (0xD5)
		Write	1101 0100 (0xD4)
U4	Barometer	Read	1011 1001 (0xB9)
		Write	1011 1000 (0xB8)
U7	Magnetometer	Read	0011 1101 (0x3D)
		Write	0011 1100 (0x3C)
U8	Memory array	Read	1010 1101 (0xAD)
		Write	1010 1100 (0xAC)
	Identification page	Read	1011 1101 (0xBD)
		Write	1011 1100 (0xBC)

7.7.1 Temperature sensor (U14)

U14 measures the ambient temperature. It is connected to the STM32WL5MOC through the I²C interface.

7.7.2 3D accelerometer and 3D gyroscope (U2)

U2 is connected to the STM32WL5MOC module through the I²C interface.

U2 is a system-in-package featuring a high-performance 3D digital accelerometer and 3D digital gyroscope tailored for Industry 4.0 applications.

Figure 24. 3D direction for acceleration and angular rate

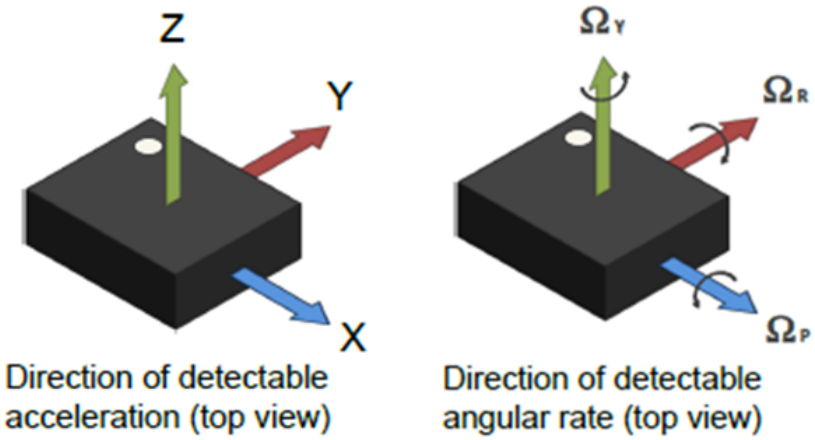
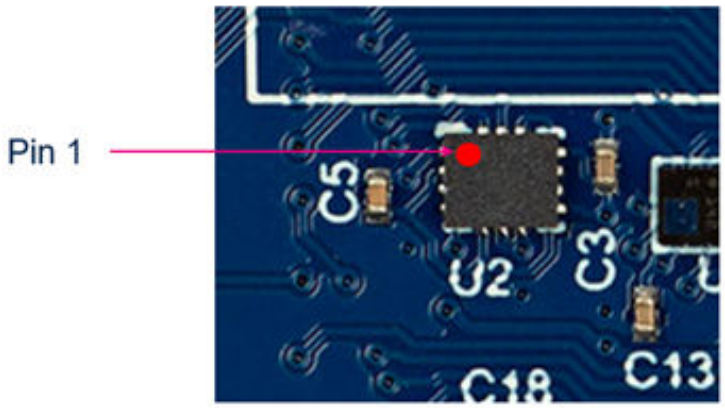


Figure 25. **3D accelerometer and 3D gyroscope (U2) pin 1 location**



7.7.3 Barometer (U4)

U4 is connected to the STM32WL5MOC module through the I^{2}C interface.
U4 is an ultracompact piezoresistive absolute pressure sensor that functions as a digital output barometer.

7.7.4 Magnetometer (U7)

U7 is connected to the STM32WL5MOC module through the I^{2}C interface.
U7 is a high-accuracy, ultra-low-power 3-axis digital magnetic sensor.

Figure 26. **Direction of detectable magnetic fields**

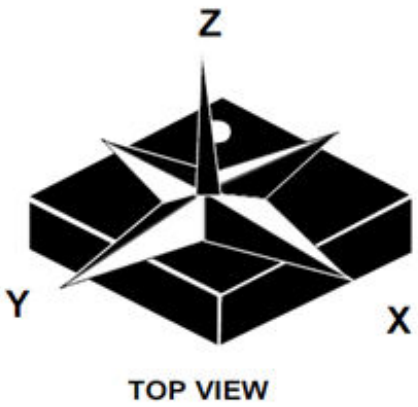
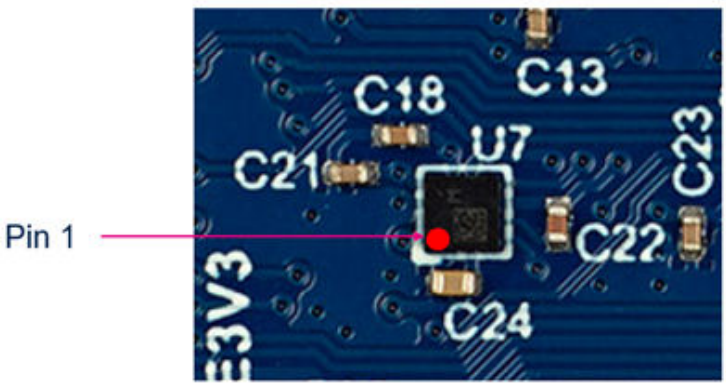


Figure 27. **Magnetometer (U7) pin 1 location**



8 Board connectors

Several connectors are implemented on the B-WL5M-SUBG1 product:

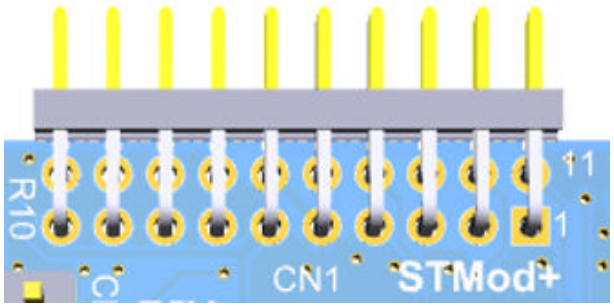
- Five connectors are implemented on the MB1779 expansion board.
- Three connectors are implemented on the MB1880 fan-out board.

8.1 MB1779 STMod+ (CN1)

CN1 is an STMod+ connector (male). This connector allows interfacing the MB1779 board to:

- A host board (having an STMod+ female connector), so that the MB1779 is acting as an expansion board,
- An MB1880 STMod+ adapter board, so that the B-WL5M-SUBG1 product formed by the couple MB1779/ MB1880 is acting as a host board.

Figure 28. STMod+ connector (CN1)



The related pinout for the STMod+ connector is listed in Table 13.

Table 13. STMod+ connector (CN1) pinout

Pin number	STM32 pin(1)	Function(1)
1	**PA4** or PB12	**SPI1_NSS (if SB3 is ON)** or UART1_RTS (if SB1 ON)
2	**PA7** or PC0	**SPI1_MOSIP (if SB6 is ON)** or UART1_RX (if SB4 ON)
3	**PA6** or PC1	**SPI1_ MISOP (if SB18 is ON)** or UART1_TX (if SB16 ON)
4	**PA5** or PA6	**SPI1_SCK (if SB22 is ON)** or UART1_CTS (if SB19 ON)
5	-	GND
6	-	5 V supply
7	PA12	I2C2_SCL
8	PB5	SPI1_MOSIS
9	PB4	SPI1_MISOS
10	PA11	I2C2_SDA

Pin number	STM32 pin[1]	Function[1]
11	PB14	INTERRUPT
12	**PA9** or NRST	**CM4_EVENTOUT (if SB11 ON)** or NRST (if SB10 ON)
13	PB1	ADC (ADC1_IN6)
14	PB2	TIM2CH3
15	-	5 V supply
16	-	GND
17	PB8	GPIO
18	PB10	GPIO
19	PA8	GPIO
20	PC13	GPIO

1. *The default configuration is in bold*

8.2 MB1779 debugging connector (CN3)

This connector is a 2x7-pin 1.27 mm pitch male connector. It allows the connection to a debug probe such as STLINK-V3SET using the SWD protocol, respecting the MIPI10/ARM10 pinout (Arm® Cortex® debug connector). The related pinout for the STDC14 connector is listed in Table 14.

Figure 29. STDC14 debugging connector (CN3) top view

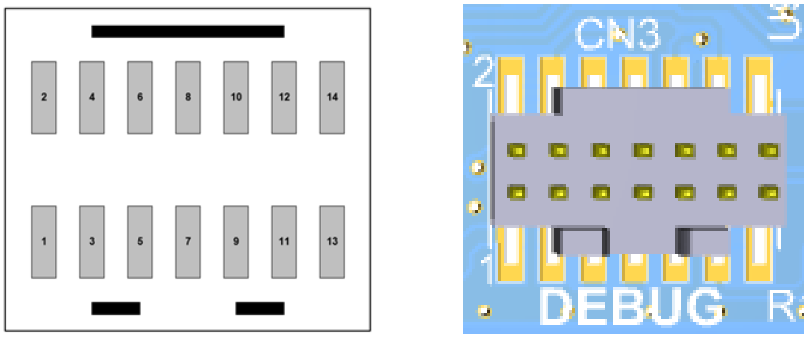


Table 14. STDC14 connector (CN3) pinout

Connector	Pin number	Description	Pin number	Description
CN3	1	-	2	-
	3	VDD (3V3)	4	T_SWDIO (PA13)
	5	GND	6	T_SWCLK (PA14)
	7	KEY (connected to GND)	8	T_SWO (PB3)
	9	-	10	T_JTDI (PA15)
	11	GNDDetect connected to GND through a 100 Ω resistor)	12	T_NRST
	13	T_VCP_RX (PA3)	14	T_VCP_TX (PA2)

8.2.1 STLINK-V3E debugger

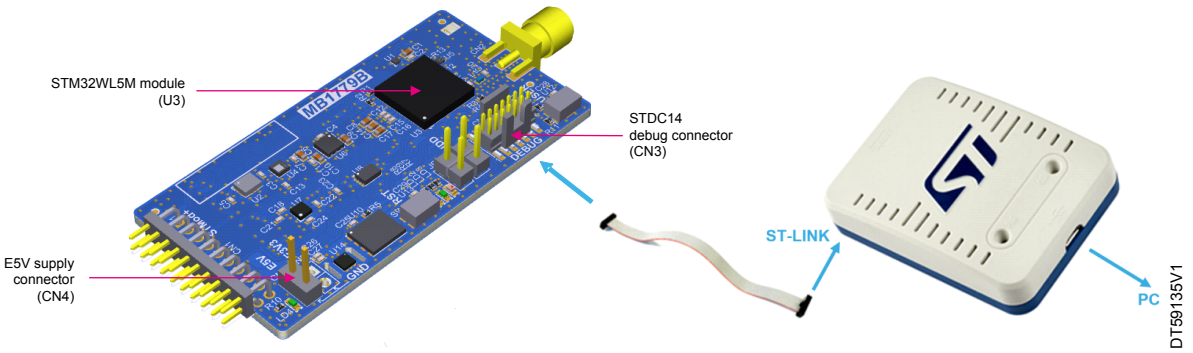
As there is no embedded STLINK-V3E on the CEB MB1779, the only way to program and debug the onboard STM32WL5MOC module is by using an external debug tool connected to the STDC14 connector (CN3).

The external debugger recommended is STLINK-V3SET, which supports SWD and VCP for STM32 devices. For information about the debugging and programming features of STLINK-V3, refer to the user manual *STLINK-V3SET debugger/programmer for STM8 and STM32* (UM2448), which describes in detail all the STLINK-V3 features.

The basic way to support an external debug tool is to connect the external STLINK-V3SET debugger tool:

- To the debug connector (CN3) of the MB1779 board and,
- To a PC with a USB connector, as shown in Figure 30.

Figure 30. Connecting an external debug tool to program the CEB MB1779



8.3 MB1779 2-pin E5V connector (CN4)

The CN4 is a standard 2-pin E5V connector (2.54 mm pitch). The CEB MB1779 can be powered from the E5V connector (CN4) by either:

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

Figure 31. 2-pin 2.54 mm E5V connector (CN4)

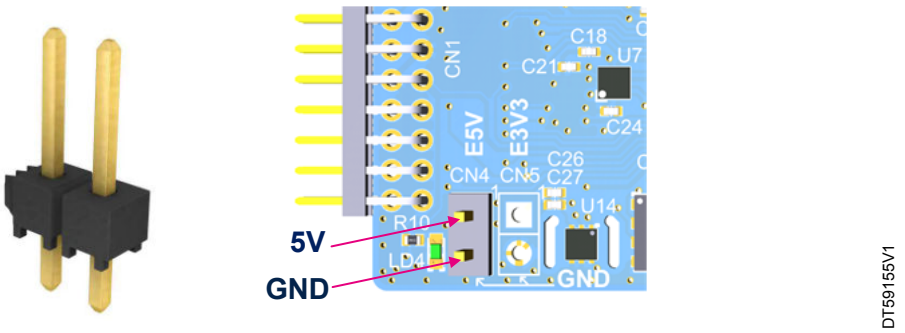


Table 15. External power source E5V (5 V)

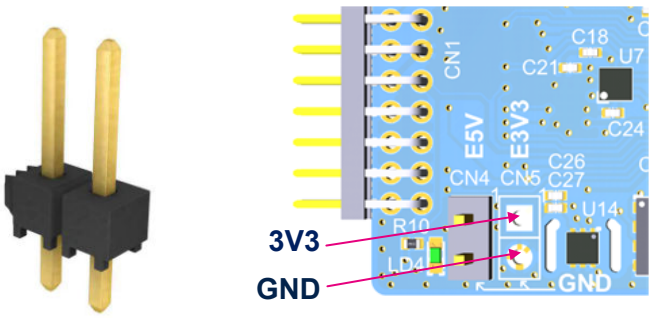
Connector	Pin number	Pin name	Signal name	Functions
CN4	1	E5V	E5V	E5V power
	2	GND	GND	GND

Note: Refer to Power supply for more details.

8.4 MB1779 2-pin E3V3 connector (CN5)

The CN5 is a standard 2-pin E3V3 connector (2.54 mm pitch), not mounted on the CEB board. The CEB MB1779 can be powered from the E3V3 connector (CN5) by plugging an external voltage supply (up to 3.6 V).

Figure 32. 2-pin 2.54 mm E3V3 connector (CN5)



DT59156V1

Table 16. External power source E3V3 (3.3 V)

Connector	Pin number	Pin name	Signal name	Functions
CN5	1	E3V3	E3V3	E3V3 power
	2	GND	GND	GND

Note: Refer to Power supply for more details.

8.5 MB1880 USB-C® connector (CN1)

The MB1880 board can be fully powered by a PC or by an external source supply through the USB Type-C® connector (CN1). Note that only the V_{BUS} voltage is connected on CN1 (no data pins at all). The purpose of this connector is to supply the CEB MB1779 through the STMod+ connector.

8.6 MB1880 STMod+ connectors (CN2 and CN3)

The MB1880 STMod+ adapter board transforms the MB1779 CEB board from an expansion board to a host board.

Table 17. STMod+ pin assignment and description

CN2 pins		CN3 pins	
Pin number	Pin name(1)	Pin number	Pin name(1)
1	**UART1_CTS**(1) or SPI1_NSS(2)	1	**UART1_RTS**(1) or SPI1_NSS(2)
2	SPI1_MOSIP/UART1_RX	2	SPI1_MOSIP/UART1_RX
3	SPI1_MISOP/UART1_TX	3	SPI1_MISOP/UART1_TX
4	**UART1_RTS**(1) or SPI1_SCK(2)	4	**UART1_CTS**(1) or SPI1_SCK(2)
5	GND	5	GND
6	5 V supply	6	5 V supply
7	I2C2_SCL	7	I2C2_SCL
8	SPI1_MOSIS	8	SPI1_MOSIS
9	SPI1_MISOS	9	SPI1_MISOS
10	I2C2_SDA	10	I2C2_SDA
11	INTERRUPT	11	INTERRUPT
12	NRST	12	NRST
13	ADC	13	ADC
14	TIMER	14	TIMER
15	5 V supply	15	5 V supply
16	GND	16	GND
17	GPIO	17	GPIO
18	GPIO	18	GPIO
19	GPIO	19	GPIO
20	GPIO	20	GPIO

1. *Default configuration (jumpers JP1 and JP2 in [1-2]) in bold*
2. *Alternate configuration (jumpers JP1 and JP2 in [2-3])*

9 STM32WL5MOC I/O assignment

Table 18. **STM32WL5MOC I/O assignment**

Pin	Pin name	Signal	Feature
1	NRST	T_NRST	STM32WL5MOC reset
2	PC0	STMOD+_UART1_RX	UART1_RX on pin 2 of the STMod+ connector
3	PB6	MEMORY_SPI_CS	SPI chip select of the CMOS serial flash memory
4	PC1	STMOD+_UART1_TX	UART1_TX on pin 3 of the STMod+ connector
5	PC6	MAGNETO_INT	INT pin of the magnetometer
6	PA1	TEMP_INT	INT pin of the temperature sensor
7	PB11	LD3	User LED3 GPIO
8	PA3	T_VCP_RX	T_VCP_RX on pin 13 of the DEBUG connector (CN3)
9	PA2	T_VCP_TX	T_VCP_TX on pin 14 of the DEBUG connector (CN3)
10	PA7	STMOD+_SPI1_MOSIP	SPI_MOSI on pin 2 of the STMod+ connector
11	PB10	STMOD+_GPIO2	GPIO on pin 18 of the STMod+ connector
12	PA4	STMOD+_SPI1_NSS	SPI_NSS on pin 1 of the STMod+ connector
13	PA5	STMOD+_SPI1_CLK	SPI_NSS on pin 4 of the STMod+ connector
14	PA8	STMOD+_GPIO3	GPIO on pin 19 of the STMod+ connector
15	PH3-BOOT0	BOOT0	BOOT0
16	VSSRF	VSSRF	GND for RF part
17	ANT	ANT	RF antenna path
18	VSSRF	VSSRF	GND for RF part
19 to 23	VSS	VSS	GND
24	BIAS_LP	BIAS_LP	Biasing of the low-power RF path
25	VR_PA	VR_PA	Regulated PA supply output
26	BIAS_HP	BIAS_HP	Biasing of the high-power RF path
27	SW_CTL	SW_CTL	Pin to control both DC switches (to select either low or high power)
28	VDD	VDD	VDD voltage supply
29	VDDPA	VDDPA	Input supply for PA regulator
30	VDDRF1V55	VDDRF1V55	External power supply for the radio
31	PA9	STMOD+_RESET	RESET on pin 12 of the STMod+ connector
32	PB12	STMOD+_UART1_RTS	UART1_RTS on pin 1 of the STMod+ connector
33	PB1	STMOD+_ADC	ADC on pin 13 of the STMod+ connector
34	PA0	BUTTON1	SW1 user button/GPIO PA0
35	PB13	SPI2_CLK	SPI2_CLK
36	PB2	ACCELERO_GYRO_INT	INT pin of accelerometer-gyroscope sensor
37	PB14	STMOD+_INT	INT on pin 11 of the STMod+ connector
38	PC13	STMOD+_GPIO4	GPIO on pin 20 of the STMod+ connector
39	PA10	SPI2_MOSI	SPI2_MOSI
40	PA11	I2C2_SDA	I2C2_SDA
41	PA13	T_SWDIO	T_SWDIO

Pin	Pin name	Signal	Feature
42	PA12	I2C2_SCL	I2C2_SCL
43	PC2	SPI2_MISO	SPI2_MISO
44	PB9	LD2	User LED2 GPIO
45	PB15	LD1	User LED1 GPIO
46	PA14	T_SWCLK	T_SWCLK
47	VBAT	VBAT	Power supply for the RTC, TAMP, 32 KHz external clock oscillator, and backup registers (through the power switch) when VDD is not present
48	VREFP	VREF+	Input reference voltage for ADC
49	VDDA	VDDA	External analog power supply for A/D converters, D/A converters, voltage reference buffers, and comparators.
50	PA6	STMOD+_SPI1_MISOP /UARTU1_CTS	STMOD+_SPI1_MISOPon pin 3 of the STMod+ connector STMOD+_UART1_CTSon pin 4 of the STMod+ connector
51	PA15	T_JTDI	T_JTDI
52	PB7	MEMORY_HOLD	HOLD pin of CMOS serial flash memory
53	PB8	STMOD+_GPIO1	GPIO on pin 17 of the STMod+ connector
54	PB4	STMOD+_SPI1_MISOS	SPI1_MISOSon pin 9 of the STMod+ connector
55	PB5	STMOD+_SPI1_MOSIS	SPI1_MOSIS on pin 8 of the STMod+ connector
56	PB3	T_SWO	T_SWO
57 to 92	VSS	VSS	GND

10 B-WL5M-SUBG1 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:

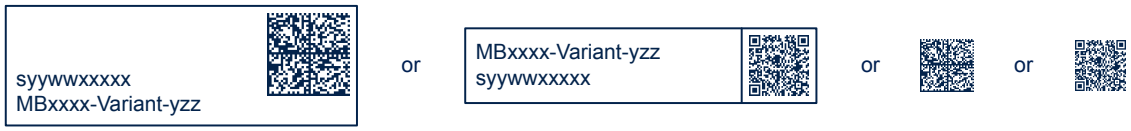
  

  Dual-sticker example:

- 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 B-WL5M-SUBG1 product history

Table 19. Product history

Order code	Product identification	Product details	Product change description	Product limitations
B-WL5M-SUBG1	BWL5MSUBG1$CZ1	MCU: • STM32WL5MOCH6TR silicon revision "1"	Initial revision	No limitation
		Boards: • MB1779-HIGH-BAND-B02 (expansion board) • MB1779-uart-A01 (STMod+ adapter board)		

10.3 Board revision history

Table 20. Board revision history

Board reference	Board variant and revision	Board change description	Board limitations
MB1779 (expansion board)	HIGH-BAND-B02	Initial revision	No limitation
MB1880 (STMod+ adapter board)	uart-A01	Initial revision	No limitation

11 Compliance statements and conformity declarations

11.1 Federal Communications Commission (FCC) compliance statement

Product identification

- Identification of the product: B-WL5M-SUBG1
  Contains a STM32WL5MOC transceiver from STMicroelectronics - FCC ID: YCP-32WL5MOCH01

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

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

Product identification

- Identification of the product: B-WL5M-SUBG1
  Contains a STM32WL5MOC transceiver from STMicroelectronics - IC: 8976A-32WL5MOCH01

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 : B-WL5M-SUBG1
  Contient un émetteur/récepteur STM32WL5MOC de STMicroelectronics - IC : 8976A-32WL5MOCH01

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.

11.3 UKCA conformity

Simplified UK declaration of conformity

Hereby, the manufacturer STMicroelectronics, declares that the radio equipment type B-WL5M-SUBG1 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.

11.4 CE conformity

11.4.1 Simplified EU declaration of conformity

Hereby, STMicroelectronics declares that the radio equipment type B-WL5M-SUBG1 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 B-WL5M-SUBG1:

- Frequency range: 865-870 MHz (LoRa®, (G)FSK, (G)MSK, and BPSK)
- Maximal power: 25 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.

11.4.2 Déclaration de conformité UE simplifiée

STMicroelectronics déclare que l'équipement radioélectrique du type B-WL5M-SUBG1 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 B-WL5M-SUBG1 :

- Plage de fréquences : 865 - 870 MHz (LoRa®, (G)FSK, (G)MSK, et BPSK)
- Puissance maximale : 20 mW PIRE

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

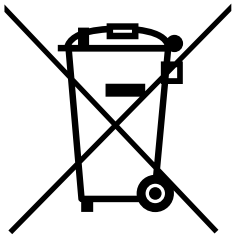
Note:
- *LdSD : directive sur la limitation de l'utilisation des substances dangereuses*
- *RED : directive sur les équipements radio-électriques*

Note: Utiliser uniquement des câbles blindés.

12 Product disposal

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

(Applicable in Europe)



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

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

Household users:

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

Business users:

Contact your dealer or supplier for further information.

Revision history

Table 21. **Document revision history**

Date	Revision	Changes
11-Jan-2024	1	Initial release.
26-Sep-2024	2	Added *Demonstration software*. Updated *FCC Compliance Statement* and *ISED Compliance Statement*. Removed *Trace antenna design* section.
17-Jan-2025	3	Added Safety recommendations, UKCA conformity, and Product disposal sections. Updated Product marking and SW_CTL replaces SW_RF in RF overview.
03-Nov-2025	4	Updated: • Section 3.4: EDA resources • Table 17. STMod+ pin assignment and description • Section 11: Compliance statements and conformity declarations Added: • Section 5.3: Delivery recommendations

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