Bluetooth® LE expansion board based on the STM32WBA25CE MCU for STM32 Nucleo boards

Introduction

The X-NUCLEO-WBA25A1 ARDUINO® interface board provides Bluetooth® LE connectivity for developer applications and can be plugged into an STM32 Nucleo board, such as NUCLEO-U385RG-Q, using the ARDUINO® Uno V3 connectors.

The ARDUINO® interface board features the Bluetooth® v6.0-compliant and FCC-certified STM32WBA25CE SoC. This device manages the complete Bluetooth® LE stack and protocols using its Arm® Cortex®-M33 core and programmable flash memory.

X-NUCLEO-WBA25A1 uses the universal asynchronous receiver transmitter (UART) interface to communicate with the STM32 Nucleo board. It supports operations with or without hardware flow control. A full-duplex serial peripheral interface (SPI) with an interrupt line is also available. The firmware loaded on the module determines the host interface. To change the interface, update the firmware without modifying the hardware.

Figure 1. X-NUCLEO-WBA25A1 global view

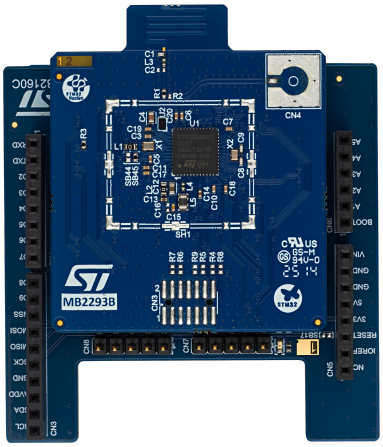
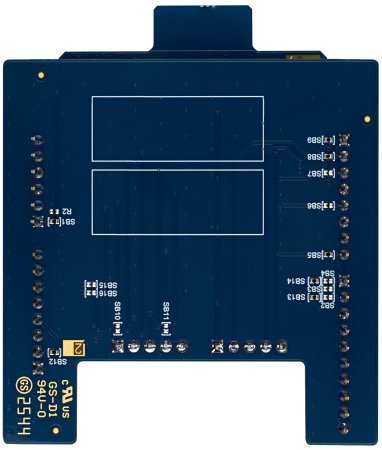


Figure 2. X-NUCLEO-WBA25A1 bottom view



Pictures are not contractual.

1 Typical application

The X-NUCLEO-WBA25A1 expansion board can be used for the evaluation of the STM32WBA25CE device in many applications, such as:

- Point-to-point communication
- Sensor application
- Home automation and lighting
- Direct test mode (DTM)

2 Features

- Bluetooth® v6.0 compliant expansion board based on the STM32WBA25CE MCU and featuring preloaded network coprocessor firmware with a UART interface
- Embedded MLPF-WB-04D3 impedance matching network and harmonics filter
- On-board PCB antenna
- Optional SPI through dedicated firmware
- ARDUINO® Uno V3 expansion connector
- Compatible with STM32 Nucleo boards
- Scalable solution, capable of cascading multiple boards for larger systems
- Free comprehensive development firmware library and examples, compatible with the X-CUBE-WBA expansion software package for STM32CubeWBA

arm

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3 Ordering information

To order the X-NUCLEO-WBA25A1 expansion board, refer to Table 1. Additional information is available from the datasheet and reference manual of the target STM32.

Table 1. Ordering information

Order code	Board references	Target STM32
X-NUCLEO-WBA25A1	• MB2160[1] • MB2293[2]	STM32WBA25CE

1. *ARDUINO® interface board*
2. *MCU RF board*

3.1 Codification

The meaning of the codification is explained in Table 2.

Table 2. Codification explanation

X-NUCLEO-XXXYYZT	Description	Example: X-NUCLEO-WBA25A1
X-NUCLEO	Type of board	STM32 Nucleo expansion board
XXX	STM32 MCU series	STM32WBA series
YY	MCU product line in the series	STM32WBA25 product line
Z	Type of connector: • A for ARDUINO®	ARDUINO®
T	Index	First generation of Bluetooth® LE expansion boards based on the STM32WBA25CE MCU for STM32 Nucleo boards

4 Development environment

4.1 System requirements

- Multi-OS support: Windows® 10 or 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.

4.2 Development toolchains

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

1. *On Windows® only.*

4.3 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. The latest versions of the demonstration source code and associated documentation can be downloaded from *www.st.com*.

4.4 EDA resources

All board design resources, including schematics, EDA databases, manufacturing files, and the bill of materials, are available from the X-NUCLEO-WBA25A1 product page at *www.st.com*.

5 Conventions

Table 3 provides the conventions used for the ON and OFF settings in the present document.

Table 3. Conventions for solder bridges

Convention	Definition
Solder bridge SBx ON	SBx connections closed by 0 Ω resistor
Solder bridge SBx OFF	SBx connections left open

6 Safety recommendations

6.1 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.

6.2 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 injury.
- This board contains static sensitive devices. To avoid damaging it, handle the board in an ESD-proof environment.
- While powered, do not touch the electric connections on the board with your fingers or anything conductive. The board operates at a voltage level that is not dangerous, but components might be damaged when shorted.
- Do not put any liquid on the board and avoid operating it close to water or at a high humidity level.
- Do not operate the board if it is dirty or dusty.
- The pins of the board are exposed and must not come into contact with a metal surface, as this can produce a short circuit and damage the board.

6.3 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.

7 Quick start

The X-NUCLEO-WBA25A1 expansion board is a low-cost, easy-to-use development kit that enables rapid evaluation and development with an STM32WBA25CE microcontroller in a UFQFPN48 package.

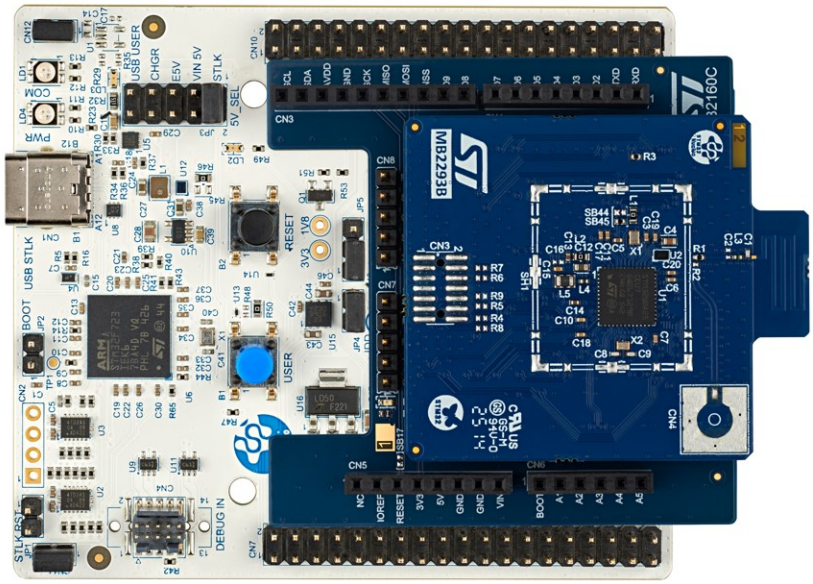
It is designed for use with any STM32 Nucleo board equipped with an ARDUINO® Uno V3 connector.

7.1 Getting started

Note: The X-NUCLEO-WBA25A1 expansion board is preloaded with the demonstration software.

1. To use an STM32 Nucleo board with the X-NUCLEO-WBA25A1 expansion board, connect the boards as shown in Figure 3. The expansion board must be plugged into the matching pins of the STM32 Nucleo board ARDUINO® Uno V3 connector.

Figure 3. X-NUCLEO-WBA25A1 plugged into NUCLEO-U385RG-Q



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2. Connect the STM32 Nucleo board to a PC using a USB cable (USB Type-A or USB Type-C® to USB Type-C®) through the ST-LINK USB connector (CN1) to power the board.
3. Download the demonstration firmware to the STM32 Nucleo board to use X-NUCLEO-WBA25A1 as a network coprocessor. Demonstration firmware and several software examples are available on the ST website.
4. The evaluation kit is ready to use. Develop an application using the available examples.

8 Hardware layout and configuration

The X-NUCLEO-WBA25A1 expansion board is designed around the STM32WBA25CEU7 microcontroller in a UFQFPN48 package.

The expansion board includes two boards:

- ARDUINO® interface board
- MCU RF board

The ARDUINO® interface board (MB2160), includes ARDUINO® Uno V3 expansion connectors, an SWD connector, a UART connector, and one user LED. The board connects to the MCU RF board using two 50-pin connectors.

The MCU RF board (MB2293), embeds the STM32WBA25 application processor.

Figure 4 shows the connections between the STM32 MCU and its peripherals, such as the user LED, ARDUINO® Uno V3 connector, and debug connector. Figure 5 and Figure 6 show the location of these features on the X-NUCLEO-WBA25A1 expansion board.

Figure 7 shows the mechanical dimensions of the expansion board.

8.1 Hardware layout

Figure 4. **X-NUCLEO-WBA25A1 block diagram**

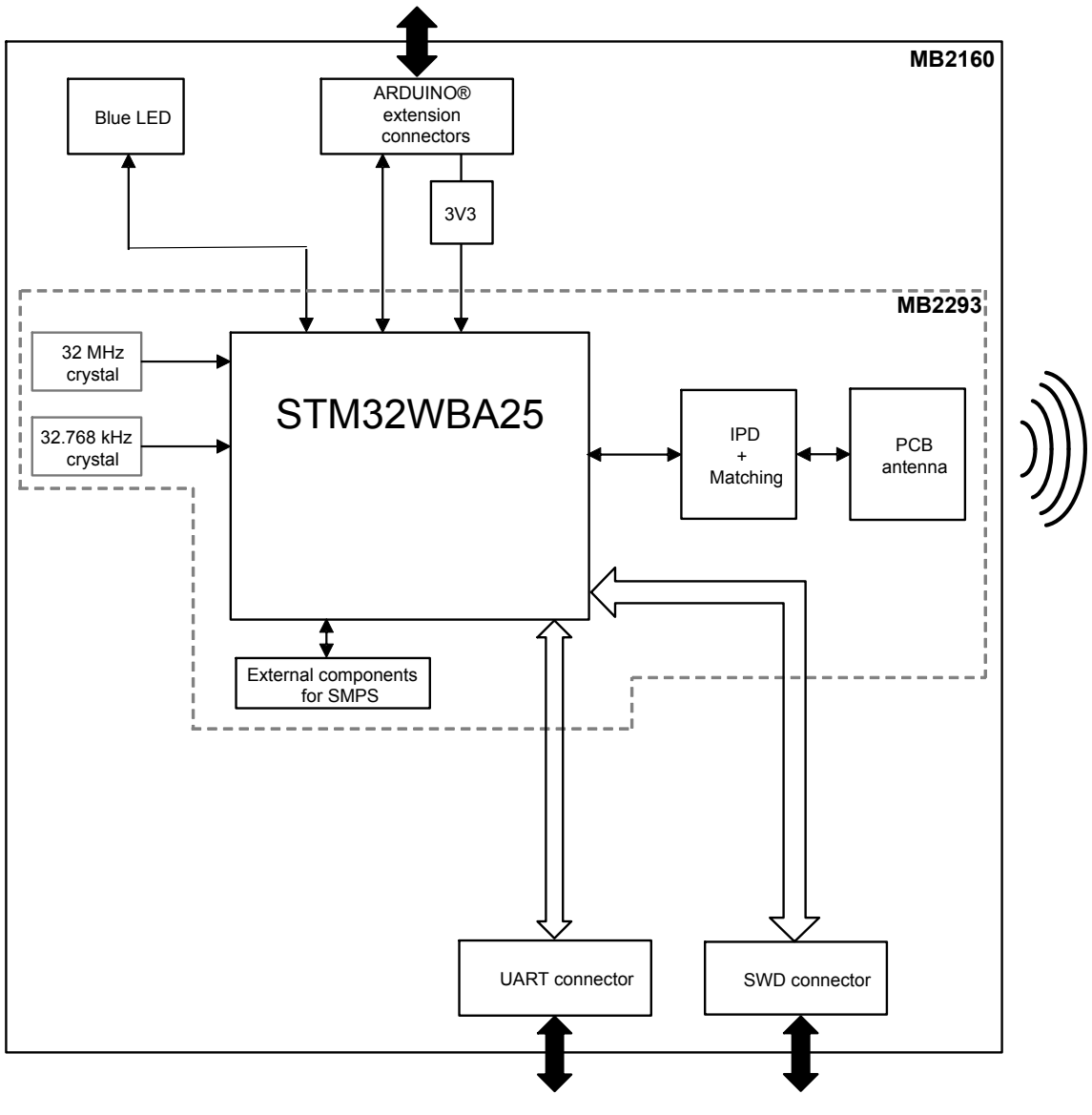


Figure 5. **X-NUCLEO-WBA25A1 top layout**

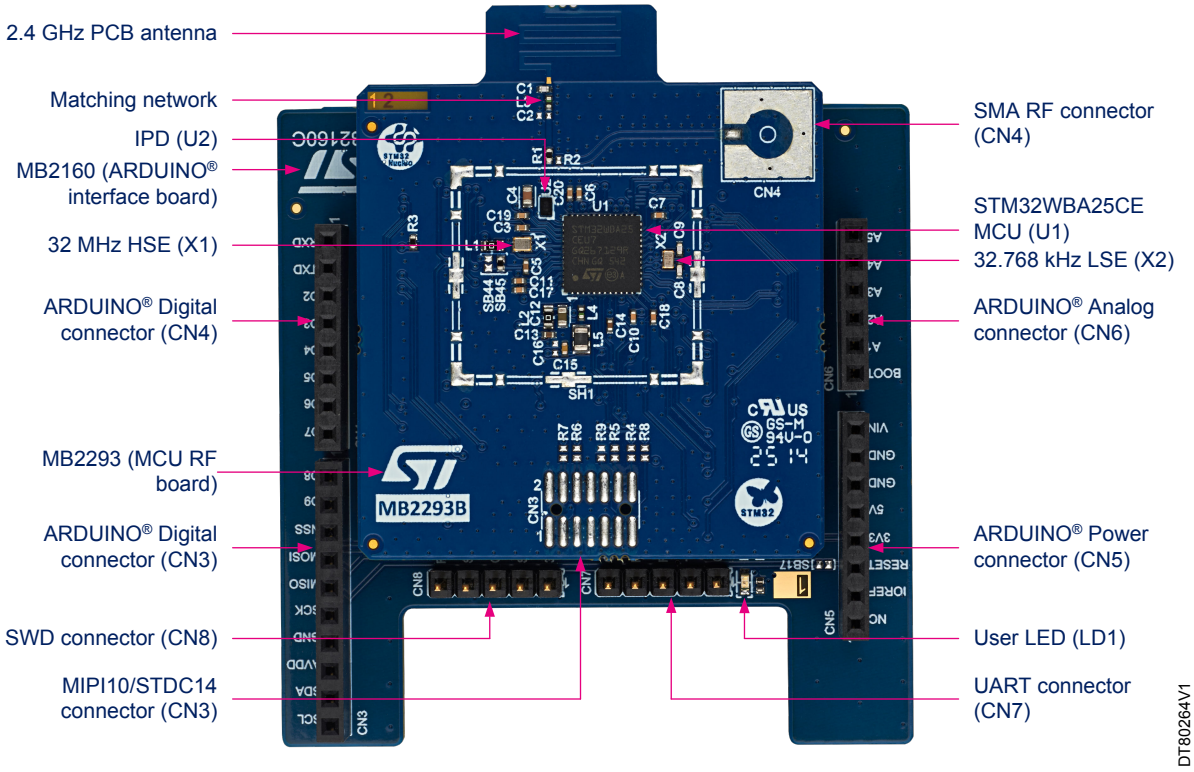
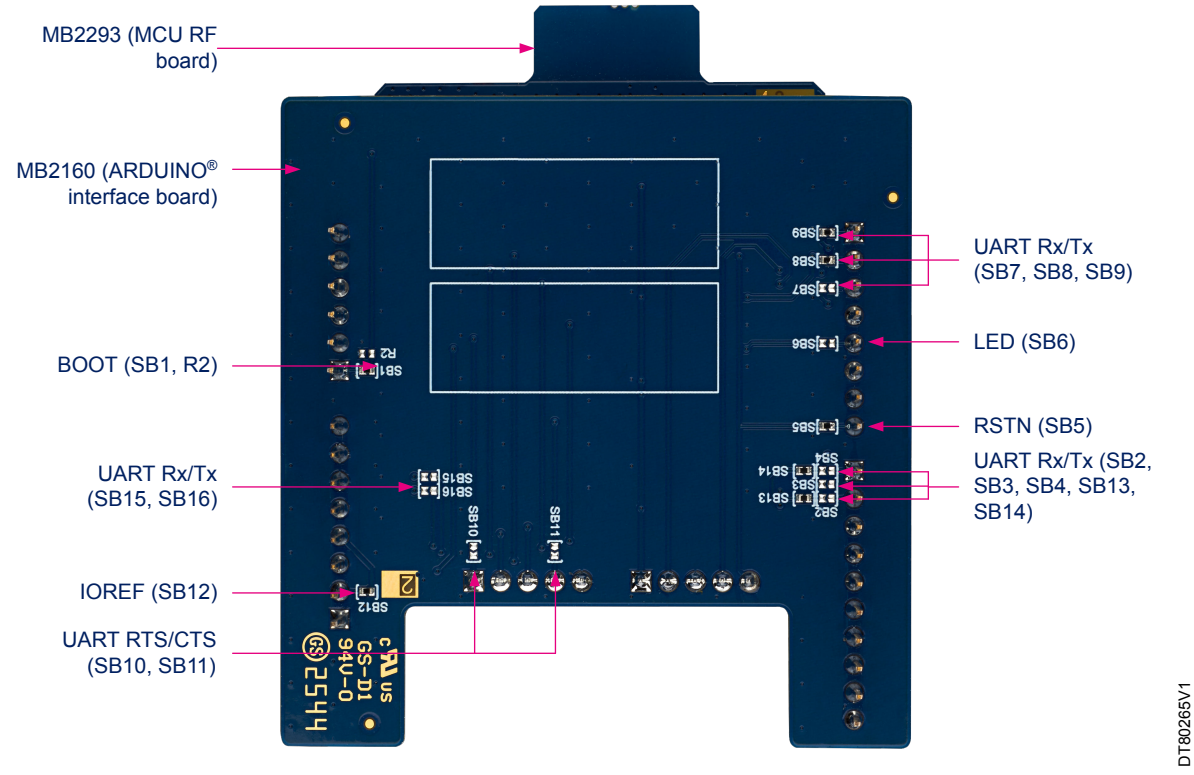


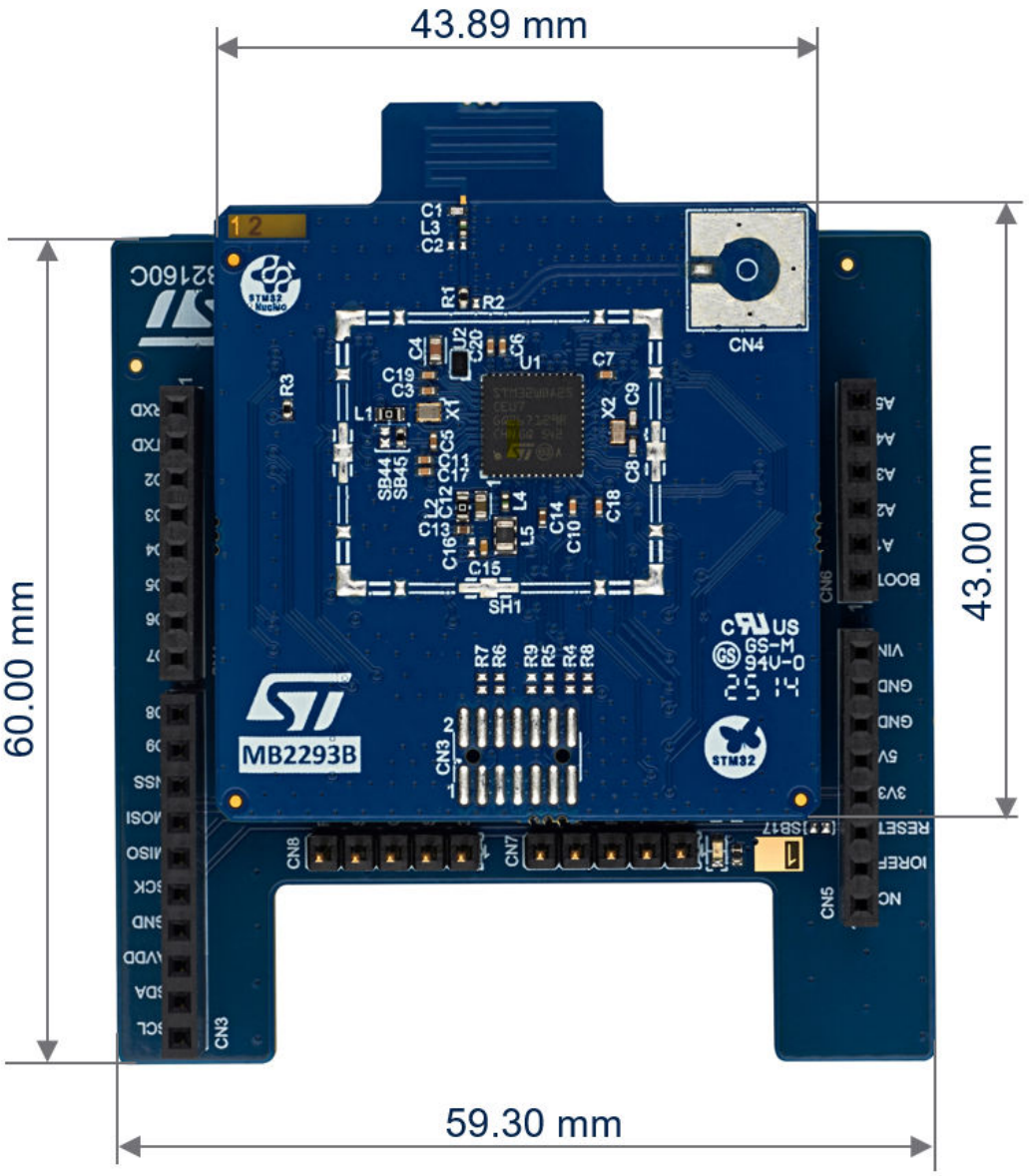
Figure 6. **X-NUCLEO-WBA25A1 bottom layout**



Pictures are not contractual.

8.2 Mechanical dimensions

Figure 7. **X-NUCLEO-WBA25A1 mechanical dimensions**



8.3 Power supply

X-NUCLEO-WBA25A1 is powered by 3V3 from the STM32 Nucleo board through the ARDUINO® Uno V3 expansion connector (CN5, pin 4).

VDD supplies of the STM32WBA25CE MCU are directly connected to 3V3.

8.4 Power management

The X-NUCLEO-WBA25A1 expansion board provides two methods to supply the RF power amplifier, depending on the required Tx output power:

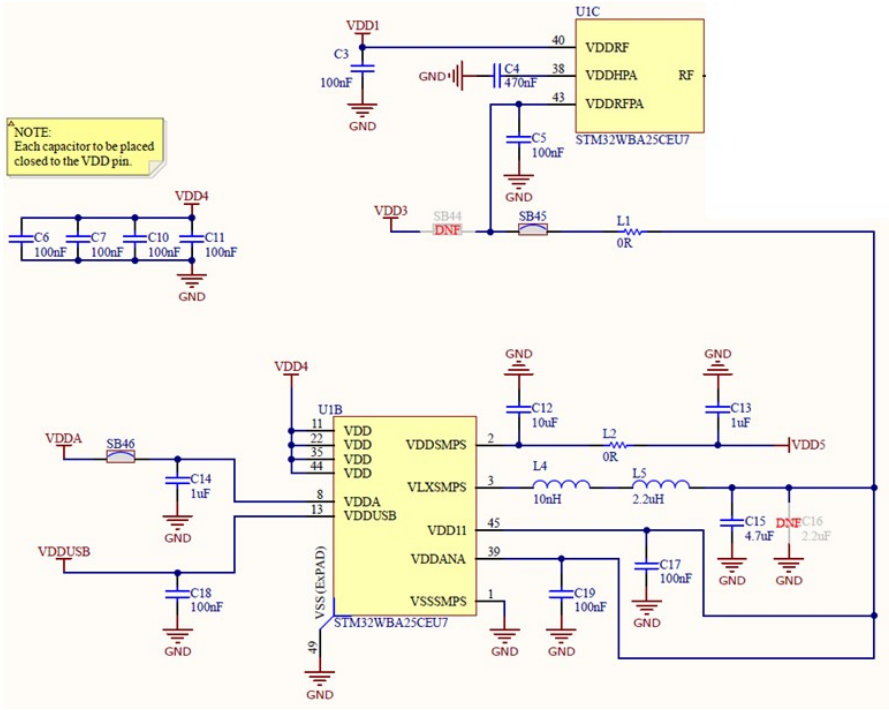
- Uses the switched-mode power supply (SMPS) to reduce power consumption by connecting VDDRFPA to the SMPS. This configuration supports up to 6 dBm.
- For higher Tx output power, up to 10 dBm, connect VDDRFPA to VDD3 (3.3 V).

Table 4 shows the Tx output power management configurations. The default configuration is shown in bold. Figure 8 shows the MCU power schematic.

Table 4. Tx output power management

Tx output power	Solder bridge configuration	Description
Output power ≤ +6 dBm	**SB45 ON** **SB44 OFF**	**VDDRFPA connected to SMPS (1.2 V)**
Output power > 6 dBm	SB45 OFF SB44 ON	VDDRFPA connected to VDD3 (3V3)

Figure 8. MCU power schematic



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8.5 Clock sources

8.5.1 LSE clock references

The accuracy of the low-speed external clock (LSE) of the MCU RF board depends on a 32.768 kHz crystal oscillator.

8.5.2 HSE clock references

The accuracy of the high-speed external clock (HSE) of the MCU RF board depends on a 32 MHz crystal oscillator.

The HSE oscillator is trimmed during board manufacturing.

8.6 Reset sources

The reset signal of the X-NUCLEO-WBA25A1 expansion board is active LOW. The internal pull-up resistor of the STM32WBA25 microcontroller forces the RSTN signal to a high level.

The following reset sources are available:

- Reset push-button on the STM32 Nucleo board, connected to the ARDUINO® Uno V3 connector CN5, pin 3.
- GPIO from the host MCU on the STM32 Nucleo board, connected to the ARDUINO® Uno V3 connector CN4 pin 8; this is the default configuration.

8.7 User LED

One blue general-purpose LED (LD1) is available for user applications. It is connected to pin 5 of CN4 and emits with a high level of the corresponding port of the host MCU connected to CN4, pin 5.

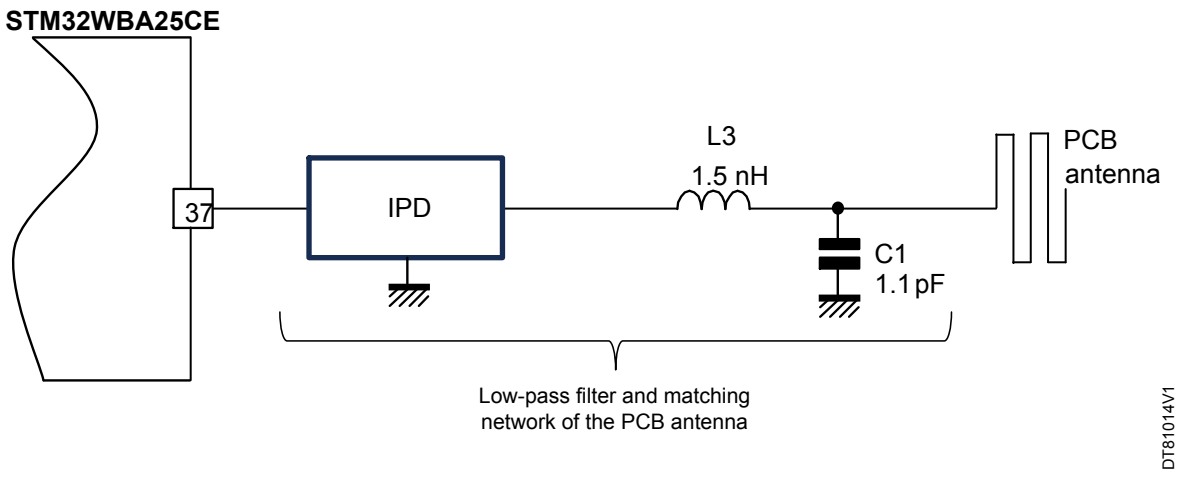
8.8 RF I/O stage

Due to FCC and ISED constraints, the RF antenna is not removable. The board contains a PCB antenna by default. For further details on the antenna, refer to the application note *Guidelines for meander design using low-cost PCB antennae with 2.4 GHz radio for STM32WB/WB0 MCUs* (AN5129), available from www.st.com.

An integrated passive device (IPD) is placed between the STM32WBA25CE MCU and the antenna. The IPD significantly reduces harmonics and matches the output to 50 Ω. This design facilitates compliance with certification requirements, such as FCC, ISED, RED, and MIC.

Two passive components for antenna matching are located at the IPD output: L3 and C1. This configuration ensures a sufficient margin in all cases. The study considers component drift (accuracy and temperature), PCB drift, and STM32WBA25CE variation. Depending on the component manufacturer and PCB specifications, these values may change after optimization.

Figure 9. RF I/O stage



8.9 UART/SPI connection options

Two options are available on the X-NUCLEO-WBA25A1 expansion board to communicate with the STM32 Nucleo board:

- UART interface (with or without flow control)
- SPI interface (with an interrupt line)

UART interface options

X-NUCLEO-WBA25A1 interfaces with the microcontroller of the STM32 Nucleo board using UART (default) with and without hardware flow control.

Several UART connection options between the STM32 Nucleo board and the X-NUCLEO-WBA25A1 expansion board are available. The options depend on the Nucleo board used or if a signal conflict occurs when using other expansion boards. To determine which UART signals to connect, review the STM32 Nucleo schematics.

SPI interface option

X-NUCLEO-WBA25A1 can also interface with the STM32 Nucleo microcontroller using full duplex SPI with an interrupt line. For SPI connection details, refer to Table 9.

9 Board connectors

9.1 SWD connector (CN8)

X-NUCLEO-WBA25A1 has an SWD connector (CN8) on the ARDUINO® interface board (MB2160) for debugging and programming the STM32WBA25CE MCU. Before using it, make sure nothing is connected to the MIPI10/STDC14 connector (CN3) on MB2293.

Table 5 provides the pinout for the SWD connector.

Table 5. MB2160 debugging/programming connector pinout (CN8)

Pin	CN8	Designation
1	3V3	VDD from application
2	SWCLK	Target SWD clock
3	GND	Ground
4	SWDIO	Target SWDIO data input/output
5	RSTN	RESET of target

9.2 UART connector (CN7)

The ARDUINO® interface board (MB2160) of X-NUCLEO-WBA25A1 can interface with the STM32 Nucleo microcontroller using a UART connector (CN7) with hardware flow control.

Table 6 describes the UART connector pinout.

Table 6. MB2160 UART connector pinout (CN7)

Pin	CN7	Designation
1	T_UART_CTS	Target UART_CTS (clear to send)
2	T_UART_TX	Target UART_TX
3	T_UART_RX	Target UART_RX
4	T_UART_RTS	Target UART_RTS (request to send)
5	GND	Ground

9.3 MIPI10/STDC14 connector (CN3)

The MCU RF board (MB2293) of X-NUCLEO-WBA25A1 includes a footprint for direct debugging and programming. This footprint is compatible with MIPI10 and STDC14 connectors. The STDC14 connector is an extension of the MIPI10 connector.

By default, the connector is not assembled on this footprint (CN3). A MIPI10 or STDC14 connector can be soldered to enable the use of an external debugger. In this configuration, make sure nothing is connected to the SWD connector (CN8) of the ARDUINO® interface board (MB2160).

Table 7 describes the pinout for the MIPI10/STDC14 connector footprint.

Table 7. **MB2293 MIPI10/STDC14 connector footprint pinout (CN3)**

MIPI10 pin	STDC14 pin	CN3	Description
-	1	Not connected	
-	2	Not connected	
1	3	VDD4	Target VDD from the application (3V3)
2	4	JTMS/SWDIO	Target SWDIO using SWD protocol (R7 ON)
3	5	GND	Ground
4	6	JTCK/SWCLK	Target SWCLK using SWD protocol (R6 ON)
5	7	GND	Ground
6	8	Not connected	
7	9	Not connected	
8	10	Not connected	
9	11	GND Detect	GND detection for plug indicator (R9 ON)
10	12	NRST	Target NRST (R5 ON)
-	13	VCP_RX	TargetRx used for VCP (R8 ON)
-	14	VCP_TX	TargetTx used for VCP (R4 ON)

9.4 Interconnection details

Connection between the MCU RF board and the ARDUINO® interface board

The X-NUCLEO-WBA25A1 expansion board contains two connectors (CN1 and CN2) that are used to plug the MCU RF board (MB2293) into the ARDUINO® interface board (MB2160). Table 8 provides the MCU RF board CN1 and CN2 pinout.

Connection between the X-NUCLEO-WBA25A1 expansion board and the STM32 Nucleo board

The X-NUCLEO-WBA25A1 expansion board plugs onto an STM32 Nucleo board through its ARDUINO® Uno V3 connectors (CN3, CN4, CN5, and CN6).

Table 9 describes the connection between the X-NUCLEO-WBA25A1 expansion board and an STM32 Nucleo board; NUCLEO-U385RG-Q is used as an example here.

Table 8. MCU RF board CN1 and CN2 connector pinout

CN1				CN2			
Pin number	MCU pin name	Pin number	MCU pin name	Pin number	MCU pin name	Pin number	MCU pin name
1	GND	2	VDD1	1	NC	2	GND
3	NC	4	NC	3	NC	4	NC
5	NC	6	GND	5	NC	6	NC
7	GND	8	PA10(1)	7	PB2(1)	8	GND
9	PH3 (BOOT0)	10	NC	9	PA11(1)	10	PA7(1)
11	NC	12	NRST	11	PA8 (SPI3_SCK)	12	NC
13	PA13 (SWDIO)	14	GND	13	PA10 (SPI3_MISO)	14	GND
15	PA14 (SWCLK)	16	NC	15	PA9 (SPI3_MOSI)	16	PB8(1)
17	GND	18	VDD3	17	NC	18	PB9(1)
19	NC	20	VDDA	19	NC	20	GND
21	NC	22	GND	21	PA5 (SPI3_NSS)	22	PB15(1)
23	NC	24	PA7 (USART1_CTS)	23	PA6(1)	24	NC
25	GND	26	PA1(1)	25	PB2(1)	26	GND
27	NC	28	GND	27	PA11(1)	28	NC
29	PB12(1)	30	VDD4	29	PA7(1)	30	NC
31	GND	32	VDD5	31	NC	32	GND
33	PC14(1)	34	GND	33	NC	34	PB15(1)
35	PC15(1)	36	PA2 (USART1_RTS)	35	PA8(1)	36	NC
37	GND	38	PA5(1)	37	PA9(1)	38	GND
39	NC	40	GND	39	PB12(1)	40	PC13(1)
41	NC	42	PA8	41	PC13(1)	42	PA2(1)
43	NC	44	PA6	43	PH3(1)	44	GND
45	PA12 (VCP1_RX)	46	GND	45	PA1(1)	46	PA1(1)
47	PA6 (VCP1_TX)	48	VDD_QSPI	47	NC	48	PB15(1)
49	GND	50	VDDUSB	49	NC	50	GND

1. *Optional; not connected by default. To change the connection, modify the state of the solder bridges. Refer to the MB2293-WBA2-B08 schematics, available from www.st.com.*

Table 9. **X-NUCLEO-WBA25A1 and NUCLEO-U385RG-Q connection details**

Left connectors					Right connectors				
X-NUCLEO connector	Pin number	Signal name	X-NUCLEO-WBA25A1 signal(1)	NUCLEO-U385RG-Q MCU port(1)	X-NUCLEO-WBA25A1 signal(1)	NUCLEO-U385RG-Q MCU port(1)	Signal name	Pin number	X-NUCLEO connector
					-	PB8	D15	10	CN3 Digital
					-	PB9	D14	9	
					-	VREFP	AVDD	8	
					GND	**GND**	GND	7	
CN5 Power	1	-	-	5V_IN test	**PA8/SPI3_SCK**	**PA5/SPI_SCK**	D13	6	
	2	IOREF	**IOREF**	**IOREF**	**PA10/SPI3_MISO**	**PA6/SPI_MISO**	D12	5	
	3	NRST	RSTN	NRST	**PA9/SPI3_MOSI**	**PA7/SPI_MOSI**	D11	4	
	4	3V3	**3V3**	**3V3**	**PA5/SPI3_NSS**	**PC9/SPI_NSS**	D10	3	
	5	5V	-	5V	PA12/USART_RX	PC6(2)	D9	2	
	6	GND	**GND**	**GND**	PA6/USART_TX/ USART_RX	PC7(2)	D8	1	
	7	GND	**GND**	**GND**					
	8	VIN	-	VIN	**RSTN**	**PA8**	D7	8	CN4 Digital
					-	PB10	D6	7	
CN6 Analog	1	A0	**PH3/BOOT/SPI_IRQ**	**PA0**	-	PB4	D5	6	
	2	A1	-	PA1	LED	PB5	D4	5	
	3	A2	-	PA4	-	PB3	D3	4	
	4	A3	-	PB0	PA6/UART_TX	PC8(2)	D2	3	
	5	A4	-	PC1	**PA12/USART_RX**	**PA2/USART_TX**	D1	2	
	6	A5	-	PC0	**PA6/USART_TX**	**PA3/USART_RX**	D0	1	

1. *Default connected signals are shown in bold.*
2. *UART function not supported by NUCLEO-U385RG-Q.*

10 X-NUCLEO-WBA25A1 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:

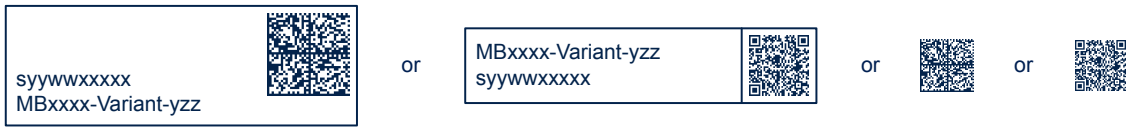
  

  Dual-sticker example:

- 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-WBA25A1 product history

Table 10. Product history

Order code	Product identification	Product details	Product change description	Product limitations
X-NUCLEO-WBA25A1	XNWBA25A1$CZ1	MCU: STM32WBA25CEU7 silicon revision "Z"	Initial revision	No limitation
		MCU errata sheet: *STM32WBA2xxx device errata* (ES0673)		
		Boards: • MB2160-WBA2-C01 (ARDUINO® interface board) • MB2293-WBA2-B08 (MCU RF board)		

10.3 Board revision history

Table 11. Board revision history

Board reference	Board variant and revision	Board change description	Board limitations
MB2160 (ARDUINO® interface board)	WBA2-C01	Initial revision	No limitation
MB2293 (MCU RF board)	WBA2-B08	Initial revision	No limitation

11 Compliance statements and conformity declarations

11.1 Federal Communications Commission (FCC) compliance statement

Product identification

- Identification of the product: X-NUCLEO-WBA25A1
  FCC ID: YCP-MB229301

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: X-NUCLEO-WBA25A1
  IC: 8976A-MB229301

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 : X-NUCLEO-WBA25A1
  IC : 8976A-MB229301

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 X-NUCLEO-WBA25A1 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 X-NUCLEO-WBA25A1 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 X-NUCLEO-WBA25A1:

- Frequency range: 2400 - 2483.5 MHz (Bluetooth®)
- Maximal power: 8 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 X-NUCLEO-WBA25A1 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 X-NUCLEO-WBA25A1 :

- Plage de fréquences : 2400 - 2483,5 MHz (Bluetooth®)
- Puissance maximale : 8 mW PIRE

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

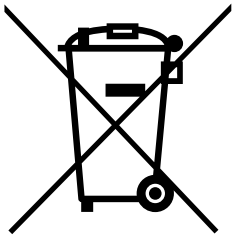
Note:
- *LdSD : directive sur la limitation de l'utilisation des substances dangereuses*
- *RED : directive sur les équipements radio-électriques*

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 12. **Document revision history**

Date	Revision	Changes
24-Feb-2026	1	Initial release.

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