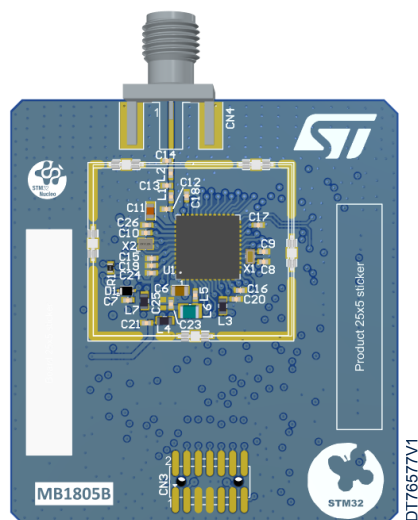


Reference designs for STM32WBA5xxx microcontrollers



STDES-WBA5U4D2B top view. Designs with different references show different layouts. Picture is not contractual. PCB color may differ.

Product status
STDES-WBA5xxxxx
STDES-WBA5I4D3B, STDES-WBA5U4D0A, STDES-WBA5U4D2A, STDES-WBA5U4D2B, STDES-WBA5Y6D1B

Features

Includes ST state-of-the-art patented technology

Reference design

- Microcontroller RF board

Microcontroller

- STM32WBA5xxx microcontrollers in a variety of packages
- 2.4 GHz transceiver supporting Bluetooth® specification v5.4
- Dedicated Arm® Cortex®-M33 processor for real-time radio layer

Connectors

- Two 50-pin MCU RF board headers
- MIP110 or STDC14 (14-pin ST-LINK)
- RF SMA

Power supply

- Through the mezzanine board (MB1801)
- Through the STDC14 connector
- Through the CN1 and CN2 connectors

Debugging/Programming

- Suitable for the STLINK-V3 debugger/programmer embedded on the mezzanine board, with debugging/programming, mass storage, and Virtual COM port

Software

- Comprehensive free software libraries and examples available with the [STM32CubeWBA](#) MCU Package
- Support of a wide choice of Integrated Development Environments (IDEs) including IAR Embedded Workbench®, MDK-ARM, and STM32CubeIDE

Description

The main objective of the STM32WBA5xxx microcontroller reference designs is to recommend a layout and associated BOM for dedicated applications (these boards are not for sale).

These reference designs can be manufactured from files available for download from the www.st.com website. The access to all GPIOs allows the prototyping of a complete application.

Sensitive layout parts can be extracted and pasted in any user board design with the same PCB characteristics and feature set.

The STM32WBA5xxx microcontroller reference designs are provided with the STM32WBA comprehensive software HAL library. The [STM32CubeWBA](#) MCU Package contains many software examples developed with the [NUCLEO-WBA52CG](#) or [NUCLEO-WBA55CG](#) Nucleo-64 boards. These examples can be easily adapted for the STM32WBA5xxx microcontroller reference designs.

The mezzanine board (MB1801) is one of the boards of the NUCLEO-WBA52CG and NUCLEO-WBA55CG products. All STM32WBA5xxx microcontroller reference designs are compatible with it.

1 General information

The STM32WBA5xxx microcontroller reference designs run the Bluetooth® LE stack on STM32WBA5xxx microcontrollers based on the Arm® Cortex®-M33 processor.

Note: Arm is a registered trademark of Arm Limited (or its subsidiaries) in the US and/or elsewhere.



2 Main features

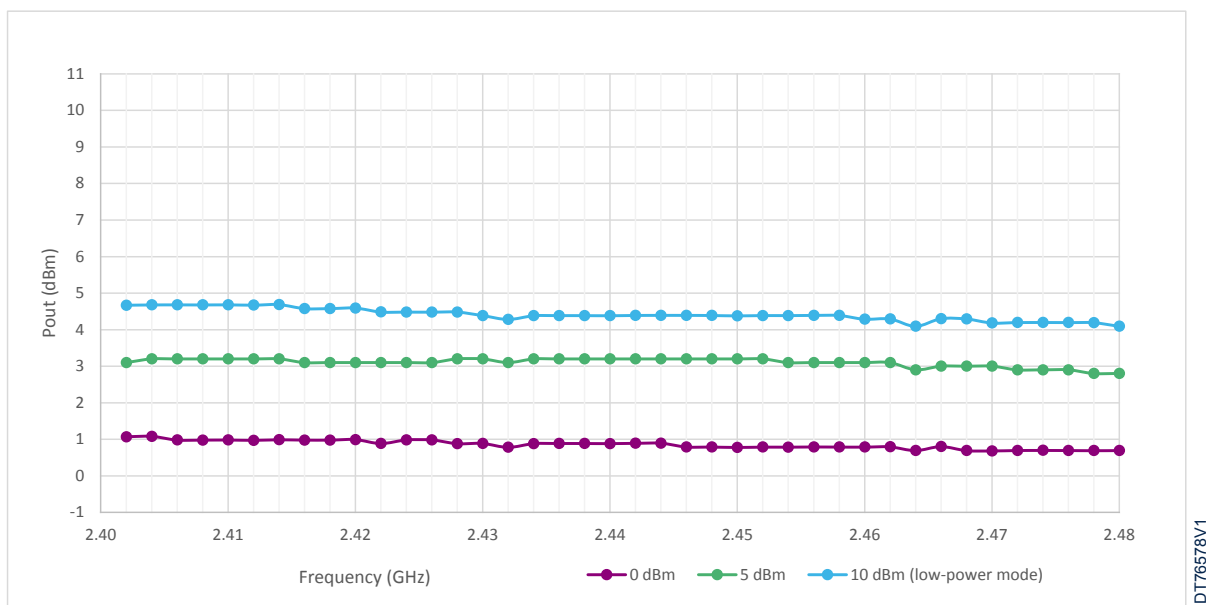
2.1 STM32WBA5xxx MCUs transmitter output power

This section presents examples of Tx output power measurements for each reference design. These measurements are not contractual.

STDES-WBA5I4D3B reference design (MB1807)

For the measurements in Figure 1, MB1807 is configured in the SMPS mode.

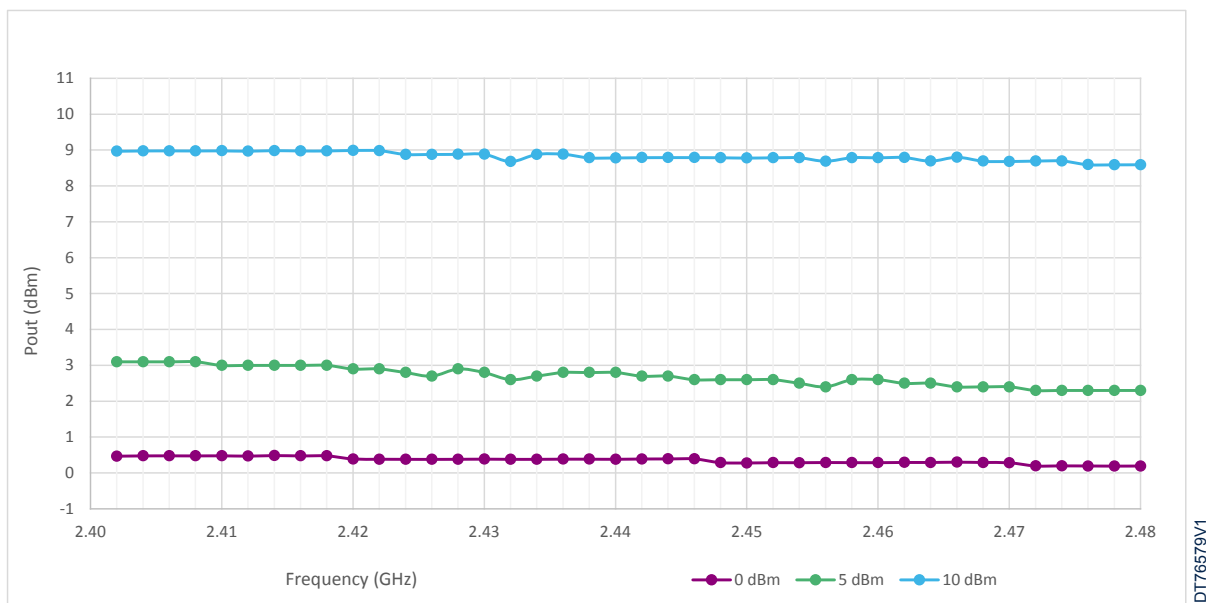
Figure 1. STDES-WBA5I4D3B Tx power measurements



STDES-WBA5U4D0A reference design (MB1806)

For the measurements in Figure 2, MB1806 is in the LDO mode.

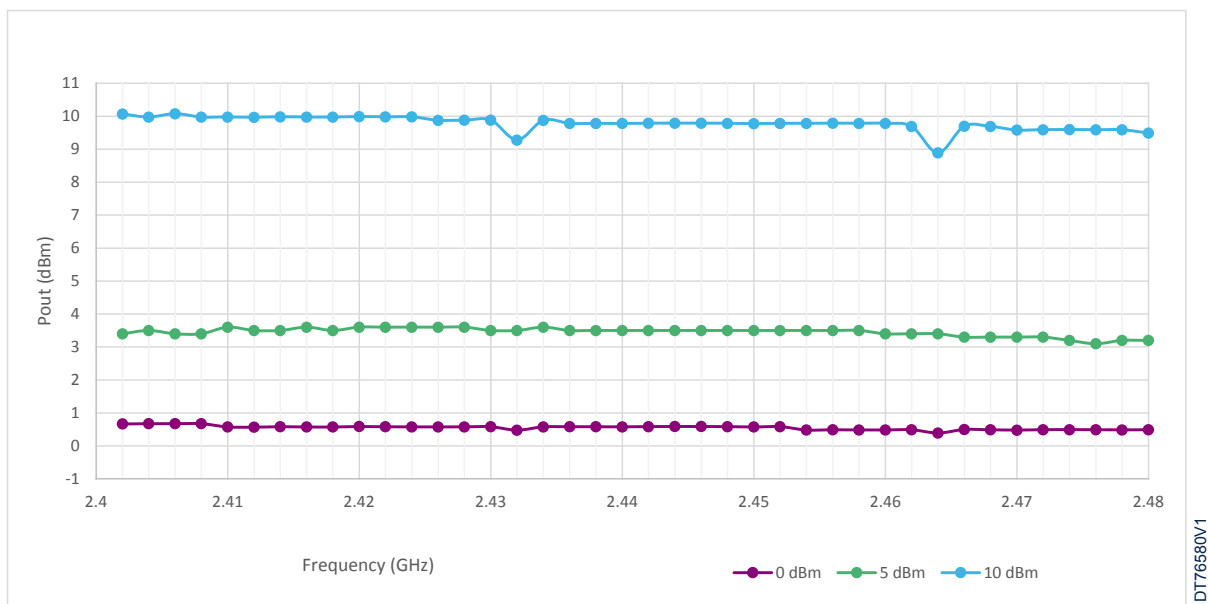
Figure 2. STDES-WBA5U4D0A Tx power measurements



STDES-WBA5U4D2A reference design (MB1845)

For the measurements in Figure 3, MB1845 is in the LDO mode.

Figure 3. STDES-WBA5U4D2A Tx power measurements

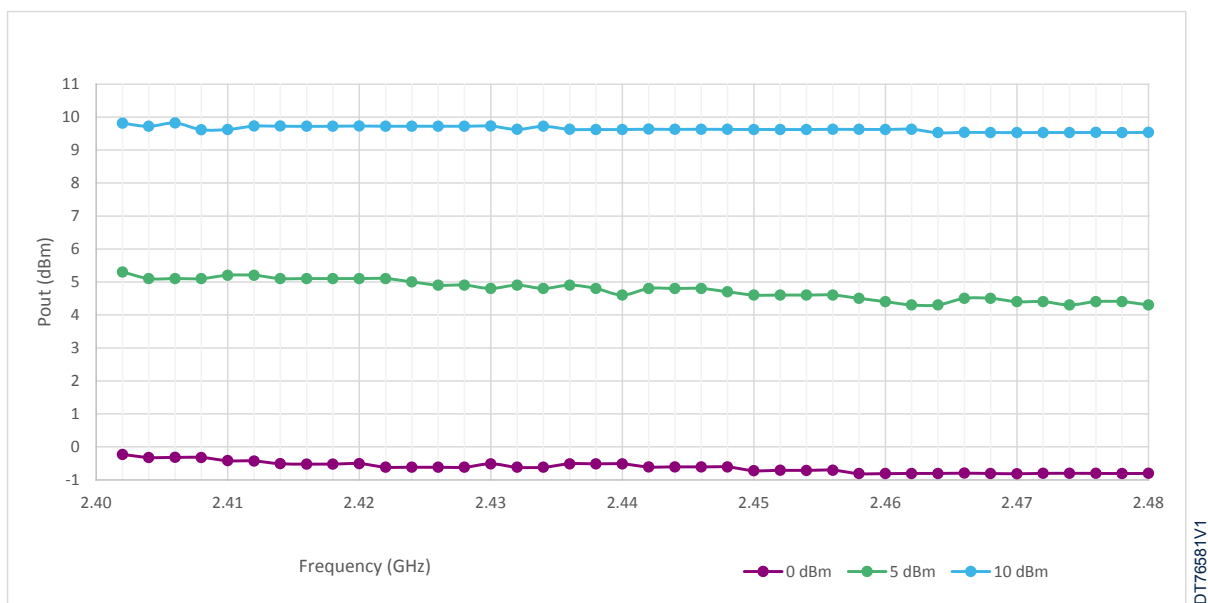


DT76580V1

STDES-WBA5U4D2B reference design (MB1805)

For the measurements in Figure 4, MB1805 is configured in the SMPS mode.

Figure 4. STDES-WBA5U4D2B Tx power measurements

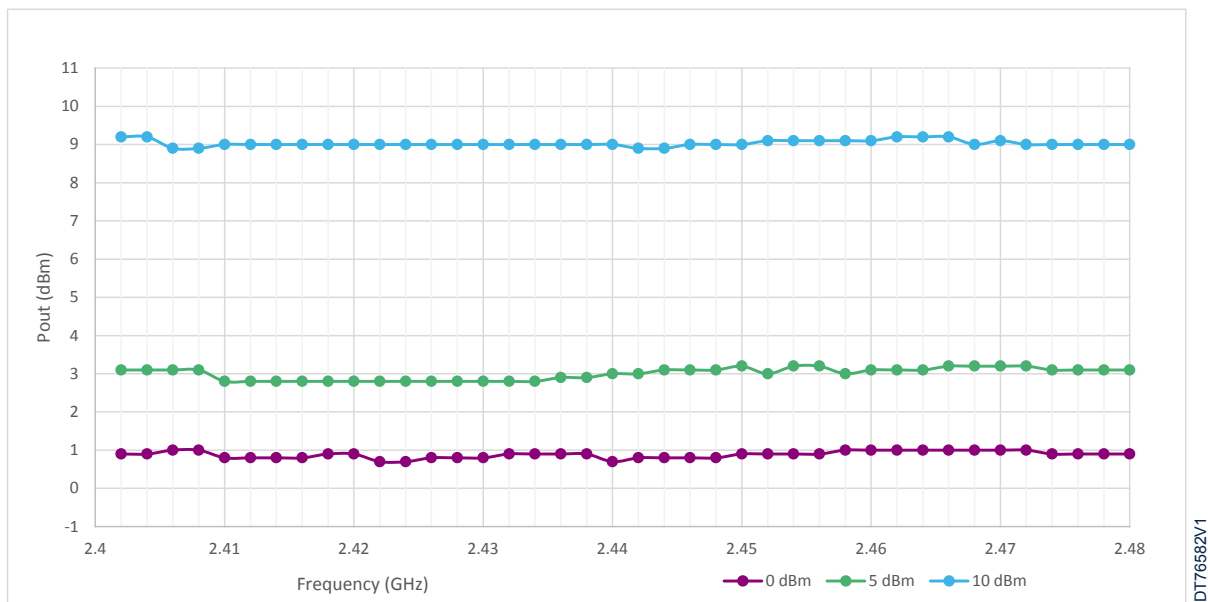


DT76581V1

STDES-WBA5Y6D1B reference design (MB2018)

For the measurements in Figure 5, MB2018 is configured in the LDO mode.

Figure 5. STDES-WBA5Y6D1B Tx power measurements

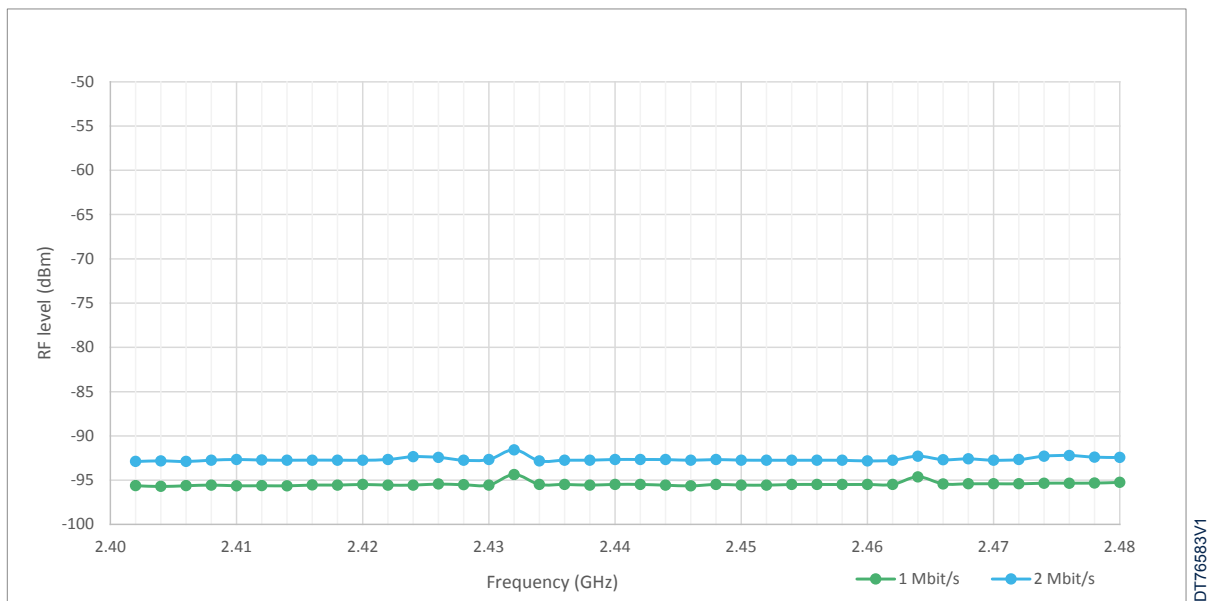


2.2 STM32WBA5xxx MCUs Rx sensitivity

This section presents examples of Rx sensitivity measurements for each reference design. These measurements are not contractual.

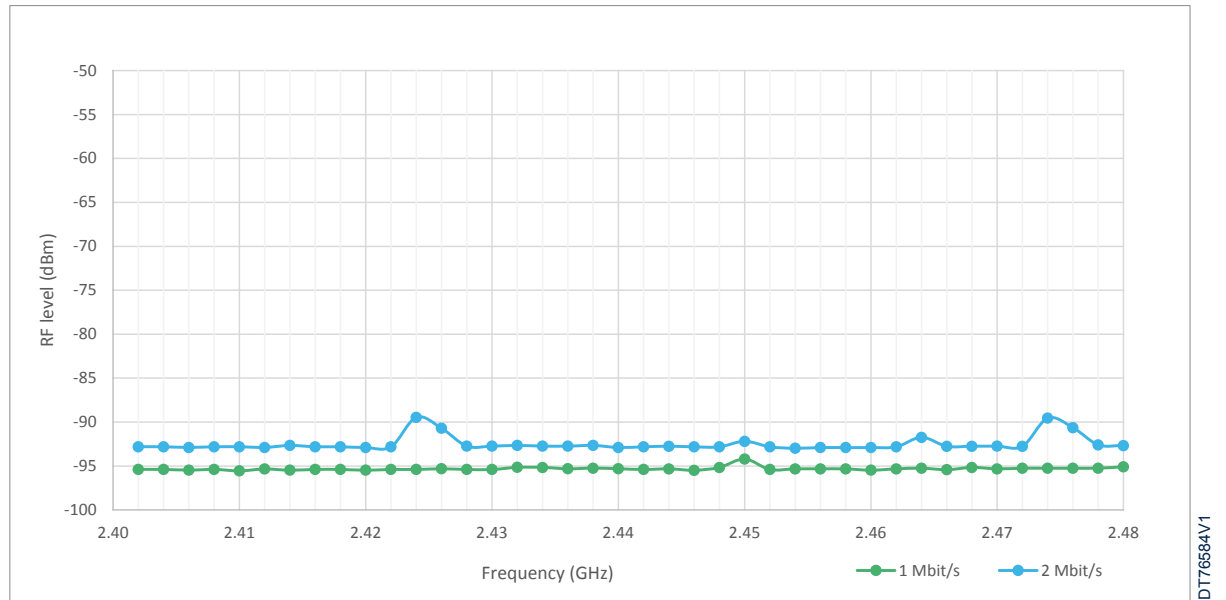
STDES-WBA5I4D3B reference design (MB1807)

Figure 6. STDES-WBA5I4D3B Rx sensitivity measurements



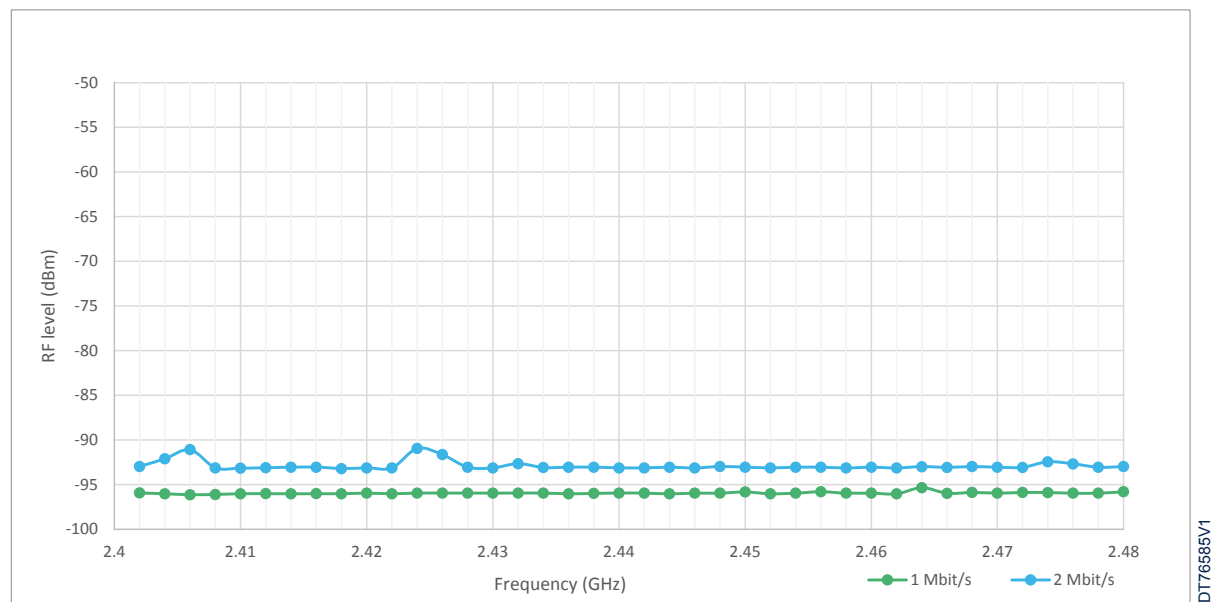
STDES-WBA5U4D0A reference design (MB1806)

Figure 7. STDES-WBA5U4D0A Rx sensitivity measurements



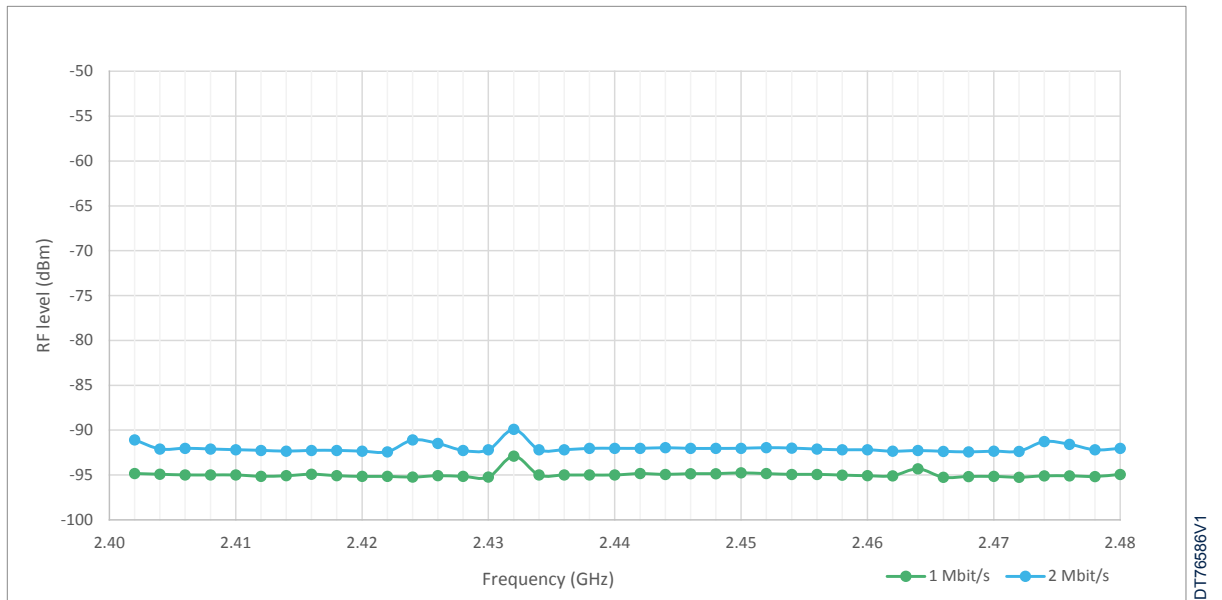
STDES-WBA5U4D2A reference design (MB1845)

Figure 8. STDES-WBA5U4D2A Rx sensitivity measurements



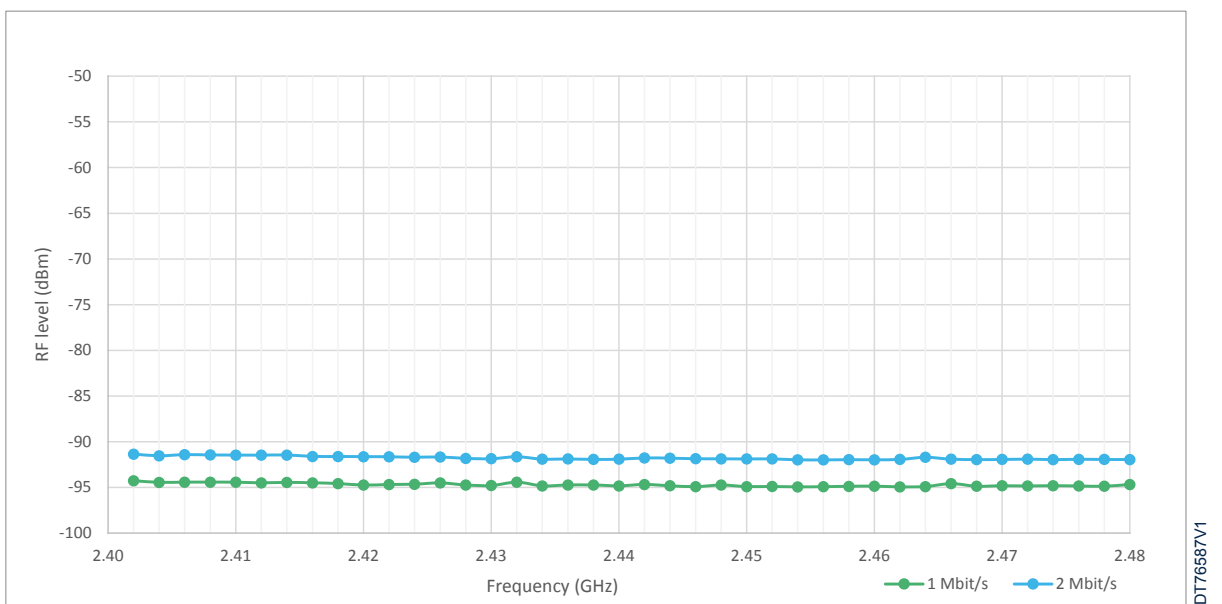
STDES-WBA5U4D2B reference design (MB1805)

Figure 9. STDES-WBA5U4D2B Rx sensitivity measurements



STDES-WBA5Y6D1B reference design (MB2018)

Figure 10. STDES-WBA5Y6D1B Rx sensitivity measurements



3 Boards overview

3.1 Printed circuit boards

The STM32WBA5xxx reference designs are based on four or six-layer PCBs with an FR4 substrate. [Table 1](#) details the type of PCB used for each reference design.

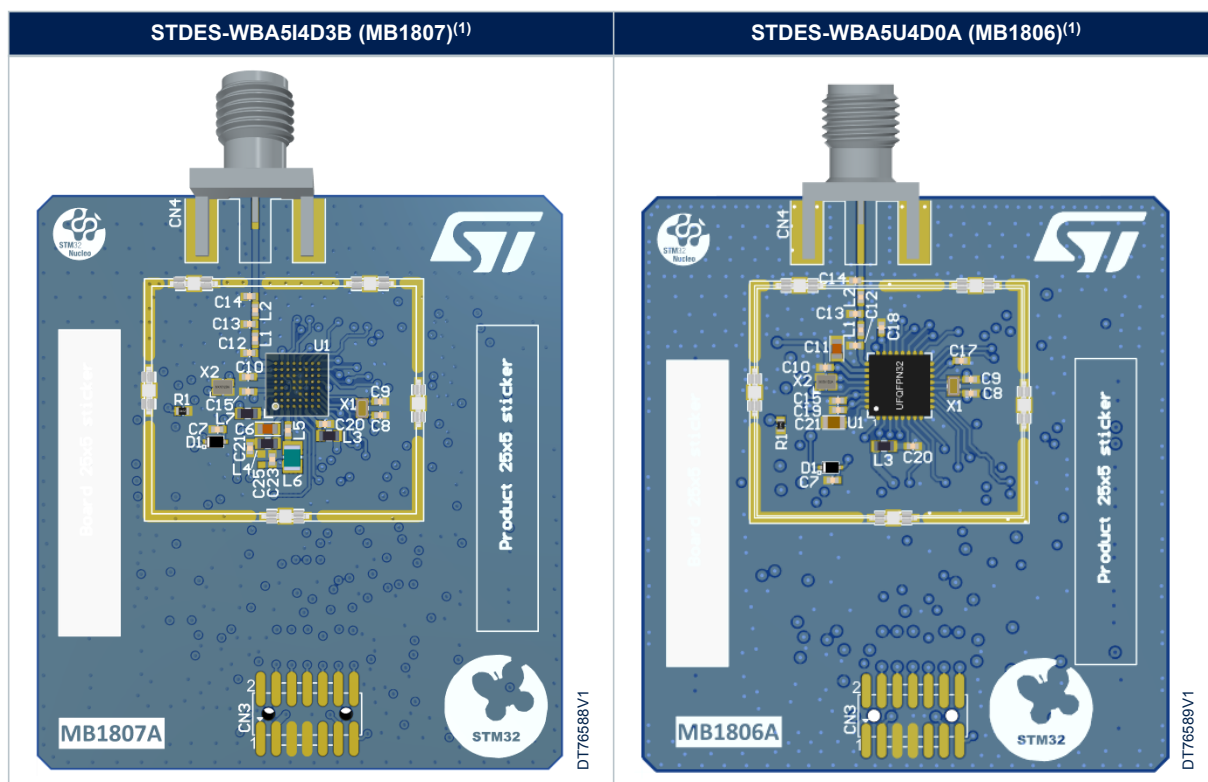
Table 1. STM32WBA5xxx microcontroller reference designs

Reference design	Board reference	Number of layers	Substrate	Thickness
STDES-WBA5I4D3B	MB1807	4	FR4	1.6 mm
STDES-WBA5U4D0A	MB1806	4	FR4	1.6 mm
STDES-WBA5U4D2A	MB1845	4	FR4	1.6 mm
STDES-WBA5U4D2B	MB1805	4	FR4	1.6 mm
STDES-WBA5Y6D1B	MB2018	6	FR4	1.6 mm

3.2 Top views of the reference designs

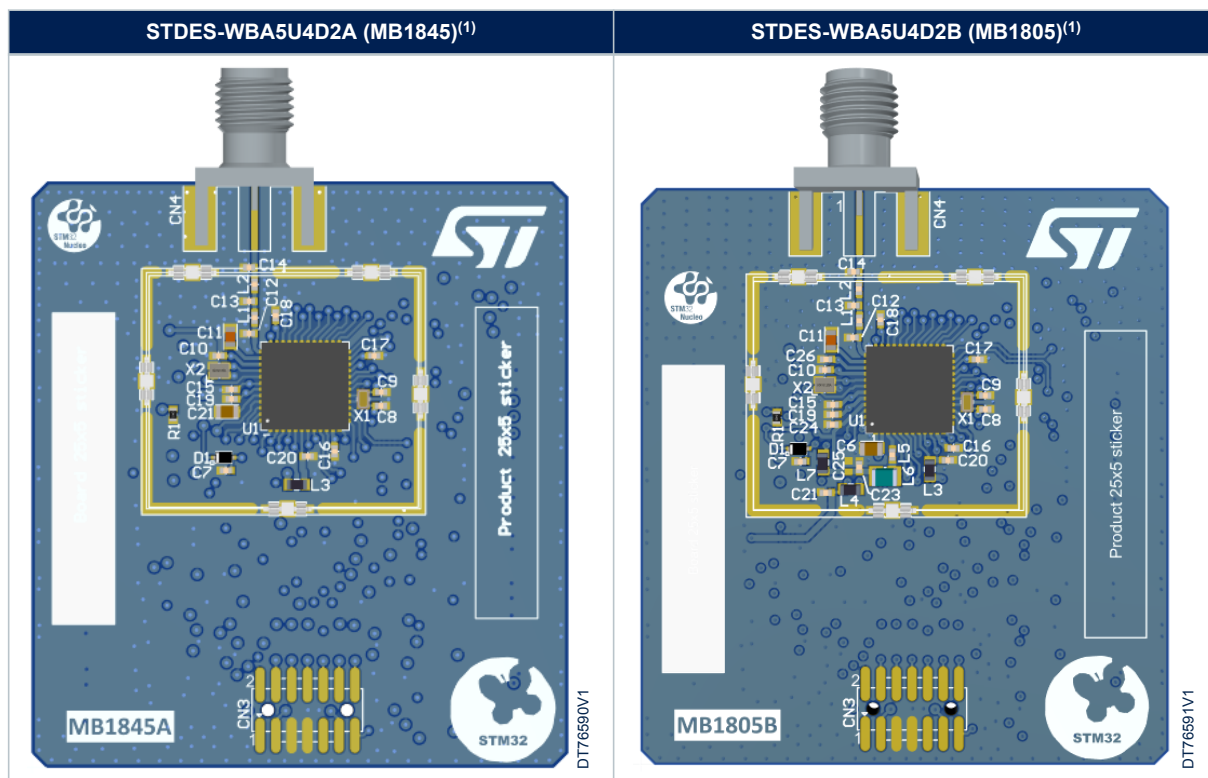
The STM32WBA5xxx reference designs include various STM32WBA5xxx packages. [Table 2](#), [Table 3](#), and [Table 4](#) present the board top views of the different STM32WBA5xxx reference designs.

Table 2. Top views of the reference designs (1 of 3)



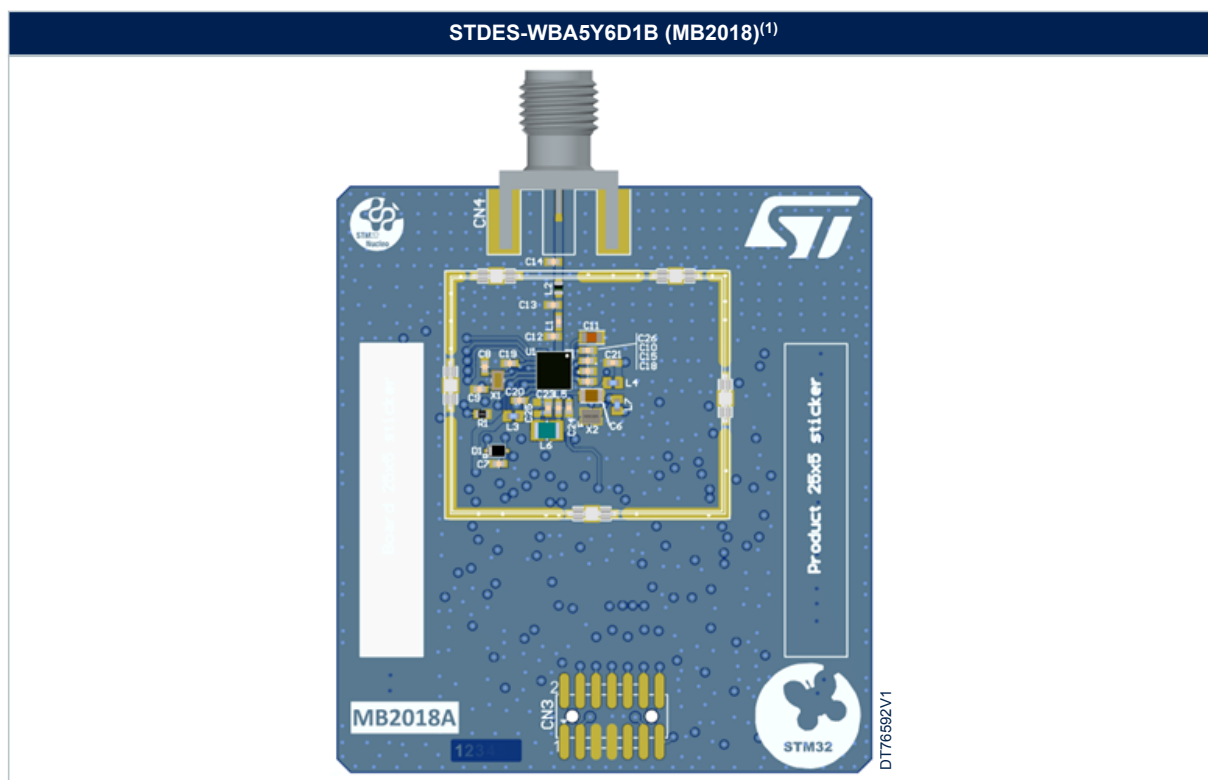
1. *Picture is not contractual.*

Table 3. Top views of the reference designs (2 of 3)



1. Picture is not contractual.

Table 4. Top views of the reference designs (3 of 3)



1. Picture is not contractual.

4 STM32WBA5xxx microcontroller reference designs and codification

Table 5. STM32WBA5xxx microcontroller reference designs

Web reference	Board reference	MCU part number	MCU package	Number of layers	Type
STDES-WBA5I4D3B	MB1807	STM32WBA55UGI6	UFBGA59	4	LDO/SMPS
STDES-WBA5U4D0A	MB1806	STM32WBA54KGU6	UFQFPN32	4	LDO
STDES-WBA5U4D2A	MB1845	STM32WBA52CGU6	UFQFPN48	4	LDO
STDES-WBA5U4D2B	MB1805	STM32WBA55CGU6	UFQFPN48	4	LDO/SMPS
STDES-WBA5Y6D1B	MB2018	STM32WBA55HGF6	WLCSP41	6	LDO/SMPS

Table 6. STM32WBA5xxx microcontroller reference designs codification

Example:	STDES-	WBA5	U	4	D	0A
Device family						
STDES- = STMicroelectronics reference design						
Wireless product						
WBA5 = Wireless Bluetooth® STM32WBA5xxx microcontrollers						
Wireless microcontroller package						
I = UFBGA U = UFQFPN Y = WLCSP						
Number of layers						
4 = Four layers 6 = Six layers						
RF path configuration						
D = Discrete components with direct tie						
Configuration						
0A = 32 pins, LDO only 1B = 41 pins, LDO and SMPS 2A = 48 pins, LDO only 2B = 48 pins, LDO and SMPS 3B = 59 pins, LDO and SMPS						

5 Hardware layout and configuration

5.1 EDA resources

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

5.2 Solder bridges

The reference designs can be configured to meet the specific requirements of the application. Refer to the board schematics for details.

Table 7. Solder bridge configurations

Solder bridge function	Board reference					Solder bridge state	Description
	MB1805	MB1806	MB1807	MB1845	MB2018		
LSE configuration (32.768 kHz)	SB37 SB38	SB37 SB38	SB36 SB37	SB37 SB38	SB37 SB38	ON ⁽¹⁾	LSE provided by external 32.768 kHz LSE CLK
						OFF ⁽²⁾	LSE connected to embedded 32.768 kHz crystal
HSE configuration (32 MHz)	SB39 SB40	SB39 SB40	SB38 SB39	SB39 SB40	SB39 SB40	ON ⁽¹⁾	HSE provided by external 32 MHz HSE CLK
						OFF ⁽²⁾	HSE connected to embedded 32 MHz crystal
RF PA power supply	SB41	N/A ⁽³⁾	SB41	N/A ⁽³⁾	SB41	ON ⁽¹⁾	Internal RF PA supplied by internal SMPS (low power consumption mode)
	SB6		SB40		SB6	OFF ⁽²⁾	
	SB41		SB41		SB41	OFF ⁽²⁾	Internal RF PA supplied directly by 3V3 (high RF power mode)
	SB6		SB40		SB6	ON ⁽¹⁾	

1. Connection closed by a 0 Ω resistor.

2. Connection left open.

3. Not applicable: For the LDO versions of the STM32WBA5xxx microcontrollers, the internal RF PA is always connected to 3V3, since there is no internal SMPS.

5.3 Firmware programming

To download firmware, it is enough to connect a serial-wire debug port from an external probe. For example, the [STLINK-V3SET](#) through the MB1801 mezzanine board can be used to perform the connection easily.

Revision history

Table 8. Document revision history

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

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