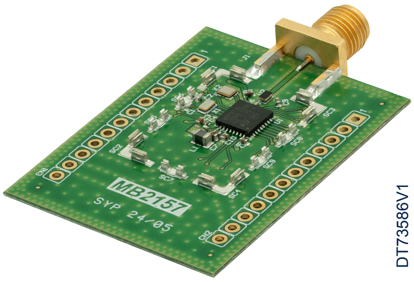
STDES-WB0xxxxxx

Data brief

Reference designs for STM32WB0 series microcontrollers



Designs with different references show different layouts. Picture is not contractual. PCB color may differ.

Product status link
STDES-WB0xxxxxx
STDES-WB05KV2LD, STDES-WB05KV2LI, STDES-WB07CV2LD, STDES-WB07CV2LI, STDES-WB09KV2LD, STDES-WB09KV2LI

Features

Includes ST state-of-the-art patented technology

Reference designs

- Fully open hardware platforms
- Suitable for rapid prototyping of end nodes based on Bluetooth® Low Energy

STM32WB0 series microcontroller

- Arm® Cortex®-M0+ at 64 MHz
- Ultra-low power
- Bluetooth® Low Energy and 2.4 GHz proprietary protocols
- Up to 512 Kbytes of flash memory and 64 Kbytes of SRAM

Oscillators

- 32.768 kHz LSE crystal
- 32 MHz HSE crystal

Connector

- SMA

Power

- 1.7 V to 3.6 V through external sources

Debugging/Programming

- Through SW-DP to connect an external ST-LINK

Software

- Comprehensive free software libraries and examples available with the STM32CubeWB0 MCU Package

Description

The main objective of the STM32WB0 series 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 STM32WB0 series reference designs are provided with the STM32WB0 series comprehensive software HAL library. The STM32CubeWB0 MCU Package contains many software examples developed with the STM32WB0 series Nucleo-64 boards. These examples can be easily adapted for the STM32WB0 series reference designs.

The firmware source code corresponding to the selected reference design is available on *www.st.com*. This associated firmware is distributed free of charge under business-friendly license terms.

Using the reference designs to design the user application helps to get the right RF performance and to pass certification.

1 General information

The STM32WB0 series reference designs run the Bluetooth® Low Energy stack on STM32WB0 series microcontrollers based on the Arm® Cortex®-M0+ processor.

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

2 Main features

- STM32WB0 series MCUs
  - Transmitter high output power, programmable up to +8 dBm
  - Rx sensitivity: -97 dBm at 1 Mbit/s, -104 dBm at 125 kbit/s (long range)
- 2 and 4-layer PCBs supported
- Various STM32WB0 series packages supported

3 STM32WB0 series reference designs and codification

Table 1. STM32WB0 series reference designs

Web reference	Board reference	MCU order code	MCU package	Number of layers	SMD or IPD
STDES-WB05KV2LD	MB2161	STM32WB05KZV6	VFQFPN32	2	SMD
STDES-WB05KV2LI	MB2157	STM32WB05KZV6	VFQFPN32	2	IPD MLPF-NRG-01D3
STDES-WB07CV2LD	MB2173	STM32WB07CCV6	VFQFPN48	2	SMD
STDES-WB07CV2LI	MB2172	STM32WB07CCV6	VFQFPN48	2	IPD MLPF-NRG-01D3
STDES-WB09KV2LD	MB2161	STM32WB09KEV6	VFQFPN32	2	SMD
STDES-WB09KV2LI	MB2157	STM32WB09KEV6	VFQFPN32	2	IPD MLPF-NRG-01D3

Table 2. STM32WB0 series reference designs codification

Example: STDES- WB0 5 K V 2L D

Device family

STDES- = STMicroelectronics reference design

Wireless products

WB0 = Ultra-low-power Bluetooth® Low Energy STM32WB0 series microcontrollers

Wireless microcontroller product line

5 = STM32WB05 MCU

7 = STM32WB07 MCU

9 = STM32WB09 MCU

STM32WB0 series MCU pin count

K = 32 pins

C = 48 pins

STM32WB0 series MCU package

V = VFQFPN

Reference design number of layers

2L = Two layers

Antenna matching and Tx/Rx path connection to antenna

D = SMD with direct tie

I = IPD with direct tie

4 Hardware layout and configuration

4.1 Schematics and BOM (bill of materials)

A zip file including the following items is available for download:

- Board schematics
- Board Gerber files
- BOMs for various configurations

4.2 IPD (integrated passive device)

STMicroelectronics develops integrated passive device (IPD) companion chips for optimized matching, filtering, and balun. The IPD is an all-in-one very compact solution covering each package.

4.3 Solder bridges

The reference designs can be configured to meet the specific requirements of the application.

Table 3. **Solder bridge configurations**

Solder bridge control	Board reference				Solder bridge status	Description
	MB2157	MB2161	MB2172	MB2173		
LSE control	SB1/SB2	SB1/SB2	SB1/SB2	SB1/SB2	ON	LSE provided by external 32.768 kHz LSE CLK X2
					OFF	LSE not provided by external 32.768 kHz LSE CLK X2

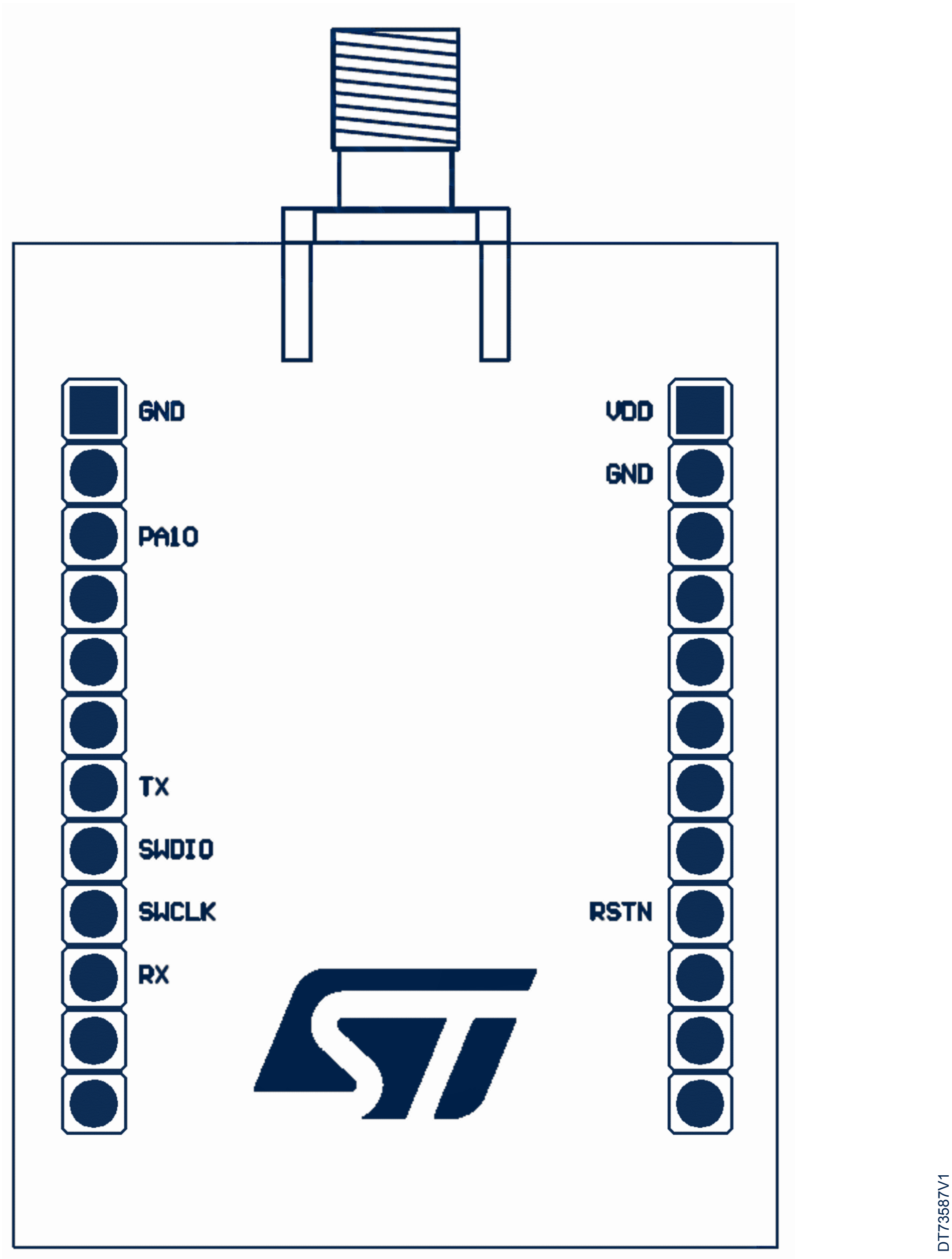
5 Firmware programming

To download firmware, it is enough to connect a serial-wire debug port from an external probe. For example, the STLINK-V3SET can be used to perform the connection easily.

SWDIO is linked to PA2 and SWCLK to PA3.

The SWD pins location in the side connectors is marked on the bottom silkscreen. RSTN and PA10 (BOOT pin) are indicated as well. Finally, power supply connections are highlighted as VDD and GND. An example is presented below.

Figure 1. MB2157 SWD and power supply connections (bottom view)



6 Transparent mode and UART pins

To test the RF performance using the transparent mode firmware, a UART must be connected. The DUT UART Tx and Rx pins are indicated on the bottom silkscreen (see Figure 1).

For more information about how to use the transparent mode firmware for performance measurements, refer to the *RF test panel* section of the user manual *STM32CubeMonitor-RF software tool for wireless performance measurements* (UM2288).

7 Conventions

Table 4. 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

Revision history

Table 5. **Document revision history**

Date	Revision	Changes
28-Aug-2024	1	Initial release.

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