Discovery kit with STM32WBA65RI MCU

Introduction

The STM32WBA65I-DK1 Discovery kit is a complete demonstration and development platform for the STM32WBA65RIV7 microcontroller, featuring an Arm® Cortex®-M33 core with Arm® TrustZone® and mainline security extension, 2 Mbytes of flash memory, and 512 Kbytes of SRAM, as well as smart peripheral resources.

The STM32WBA65I-DK1 Discovery kit embeds a powerful and ultra-low-power radio compliant with the Bluetooth® LE SIG resources. This Discovery kit enables a wide diversity of applications by exploiting low-power communication, the Bluetooth® SIG isochronous channel feature related to audio capability for Bluetooth® LE audio, Matter, and Zigbee®.

The support for ARDUINO® Uno V3 connectivity provides expansion capabilities with a wide choice of specialized add-on boards.

The STM32WBA65I-DK1 Discovery kit integrates an STLINK-V3EC embedded in-circuit debugger and programmer for the STM32 microcontroller with a USB Virtual COM port bridge. It comes with the STM32CubeWBA MCU Package, which provides an STM32 comprehensive software HAL library and various software examples.

The STM32WBA65I-DK1 Discovery kit leverages the STM32WBA series key assets to enable prototyping for a variety of wireless, low-energy applications in fitness, metering, industry, or medicine, with state-of-the-art energy efficiency, and higher security.

Figure 1. STM32WBA65I-DK1 top view

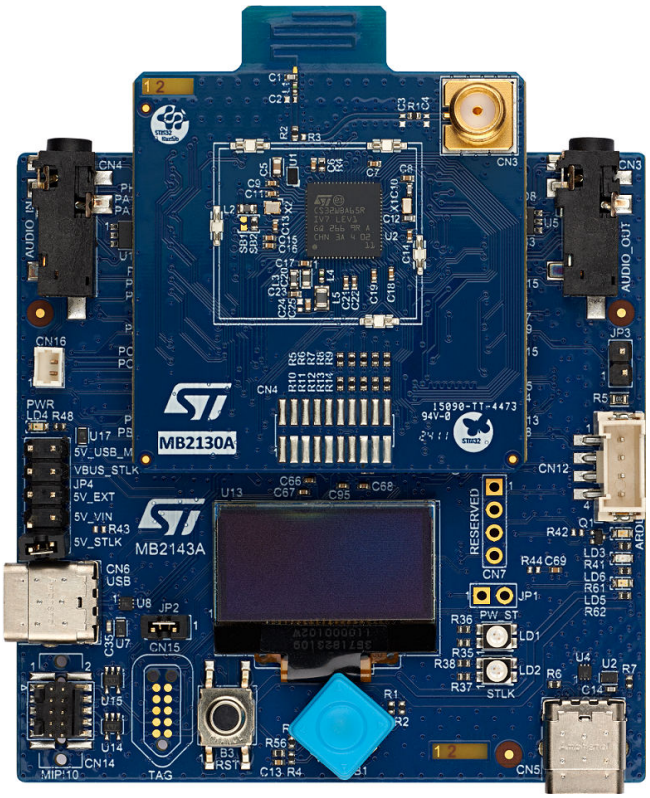
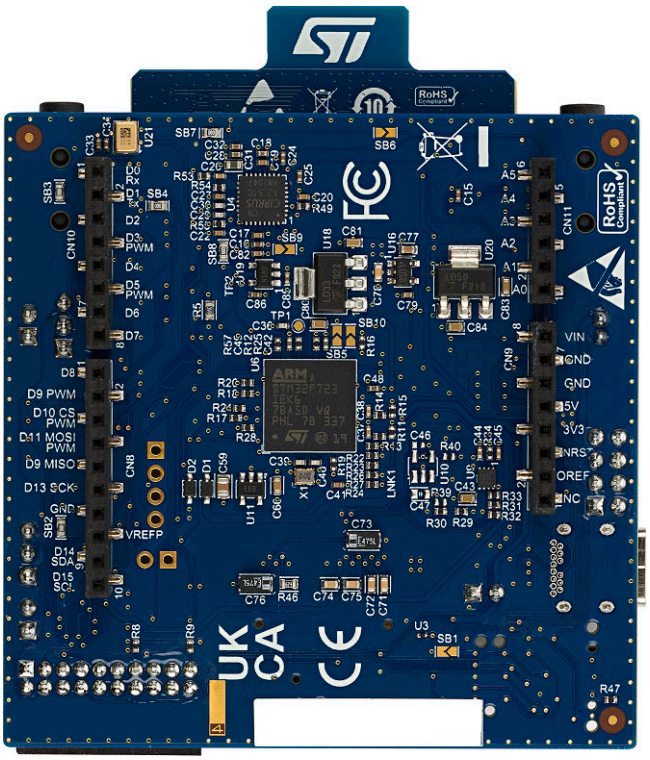


Figure 2. STM32WBA65I-DK1 bottom view



Pictures are not contractual.

1 Features

- Ultra-low-power wireless STM32WBA65RIV7 microcontroller based on the Arm® Cortex®-M33 core, featuring 2 Mbytes of flash memory and 512 Kbytes of SRAM in a VFQFPN68 package
- MCU RF board (MB2130):
  - 2.4 GHz RF transceiver supporting Bluetooth® LE
  - Bluetooth® LE:
    - LE 2M
    - LE Coded
    - Direction-finding
    - LE Power control
    - Isochronous channels
    - Extended advertising
    - Periodic advertising
    - LE Secure connections
    - LE Audio
    - Mesh networking
    - Core specification v6.0
  - Arm® Cortex®-M33 CPU with Arm® TrustZone®, MPU, DSP, and FPU
  - Integrated PCB antenna
- One digital microphone
- OLED display
- Three user LEDs
- User joystick with 4-direction control and selector button
- Reset push button
- Board connectors:
  - ARDUINO® Uno V3 expansion connector
  - Grove
  - USB Type-C®
  - Battery
  - Two 3.5 mm stereo jack sockets for input and output with microphone
  - MIPI10
  - Tag-Connect™ 10-pin footprint
- Flexible power-supply options: ST-LINK USB V_{BUS} or external sources
- On-board STLINK-V3EC debugger/programmer with USB re-enumeration capability: mass storage, Virtual COM port, and debug port
- 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

Note: Arm and TrustZone are registered trademarks of Arm Limited (or its subsidiaries) in the US and/or elsewhere.

2 Ordering information

To order the STM32WBA65I-DK1 Discovery kit, 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 reference	Target STM32
STM32WBA65I-DK1	• MB2143(1) • MB2130(2)	STM32WBA65RIV7

1. *Mezzanine board*
2. *MCU RF board*

2.1 Codification

The meaning of the codification is explained in Table 2.

Table 2. Codification explanation

STM32XXXYYZ-DKT	Description	Example: STM32WBA65I-DK1
XXX	MCU series in STM32 32-bit Arm Cortex MCUs	STM32WBA series
YY	MCU product line in the series	STM32WBA64/65 product line
Z	STM32 flash memory size: • I for 2 Mbytes	2 Mbytes
DK	Toolkit type: • Discovery kit	Discovery kit
T	Toolkit configuration: • Sequential number	First Discovery kit version

3 Development environment

3.1 System requirements

- Multi-OS support: Windows® 10, 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 CAD resources

All board design resources, including schematics, CAD databases, manufacturing files, and the bill of materials, are available from the STM32WBA65I-DK1 product page at *www.st.com*.

4 Conventions

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

Table 3. ON/OFF convention

Convention	Definition
Jumper JPx ON	Jumper fitted
Jumper JPx OFF	Jumper not fitted
Jumper JPx [1-2]	Jumper fitted between pin 1 and pin 2
Solder bridge SBx ON	SBx connections closed by 0 Ω resistor
Solder bridge SBx OFF	SBx connections left open
Resistor Rx ON	Resistor soldered
Resistor Rx OFF	Resistor not soldered
Capacitor Cx ON	Capacitor soldered
Capacitor Cx OFF	Capacitor not soldered

5 Safety recommendations

5.1 Targeted audience

This product targets users with at least basic electronics or embedded software development knowledge like engineers, technicians, or students.

This board is not a toy and is not suited for use by children.

5.2 Handling the board

This product contains a bare printed circuit board and as with all products of this type, the user must be careful about the following points:

- The connection pins on the board might be sharp. Be careful when handling the board to avoid hurting yourself
- This board contains static-sensitive devices. To avoid damaging it, handle the board in an ESD-proof environment.
- While powered, do not touch the electric connections on the board with your fingers or anything conductive. The board operates at voltage levels that are not dangerous, but components might be damaged when shorted.
- Do not put any liquid on the board. Avoid operating the board close to water or at a high humidity level.
- Do not operate the board if dirty or dusty.

6 Quick start

This section describes how to start development quickly using STM32WBA65I-DK1.

To use the product, the user must accept the evaluation product license agreement from the www.st.com/epla webpage.

Before the first use, make sure that no damage occurred to the board during shipment:

- All components are firmly secured in their sockets.
- No component is loose in the carton box.

STM32WBA65I-DK1 is an easy-to-use Discovery kit to evaluate and start development with an STM32 microcontroller in a VFQFPN68 package.

6.1 Getting started

Follow the sequence below to configure the STM32WBA65I-DK1 Discovery board and launch the demonstration application (refer to Figure 4 for component locations):

1. Check jumper positions on board: JP4 in the 5V_STLK position and JP2 ON.
2. Connect the Discovery board with a USB Type-C® cable through the USB connector (CN6).
3. Connect a headset (optionally with microphone and 4-pin jack to enable bidirectional streams) on the 3.5-mm jack connector (CN3).
4. At startup, press the right direction on the joystick two times to start advertising.
5. A device compatible with Bluetooth® LE audio unicast client role, like a smartphone supporting the low-energy audio feature, can connect to the unicast server and link up the available services. Once the unicast client is connected, start a streaming procedure, media playback, or call, to send audio to the unicast server. Ensure that the volume is up.
6. For further information, refer to the ST Bluetooth® LE audio wiki pages.

7 Hardware layout and configuration

The STM32WBA65I-DK1 Discovery kit is designed around the STM32WBA65RIV7 in a VFQFPN68 package. The hardware block diagram in Figure 3 illustrates the connection between the MCU and peripherals, such as embedded ST-LINK, ARDUINO® Uno shields, STMod+ connector, digital microphones, audio codec, and OLED display. Figure 4 and Figure 5 help to locate these features on the Discovery board.

Figure 3. Hardware block diagram

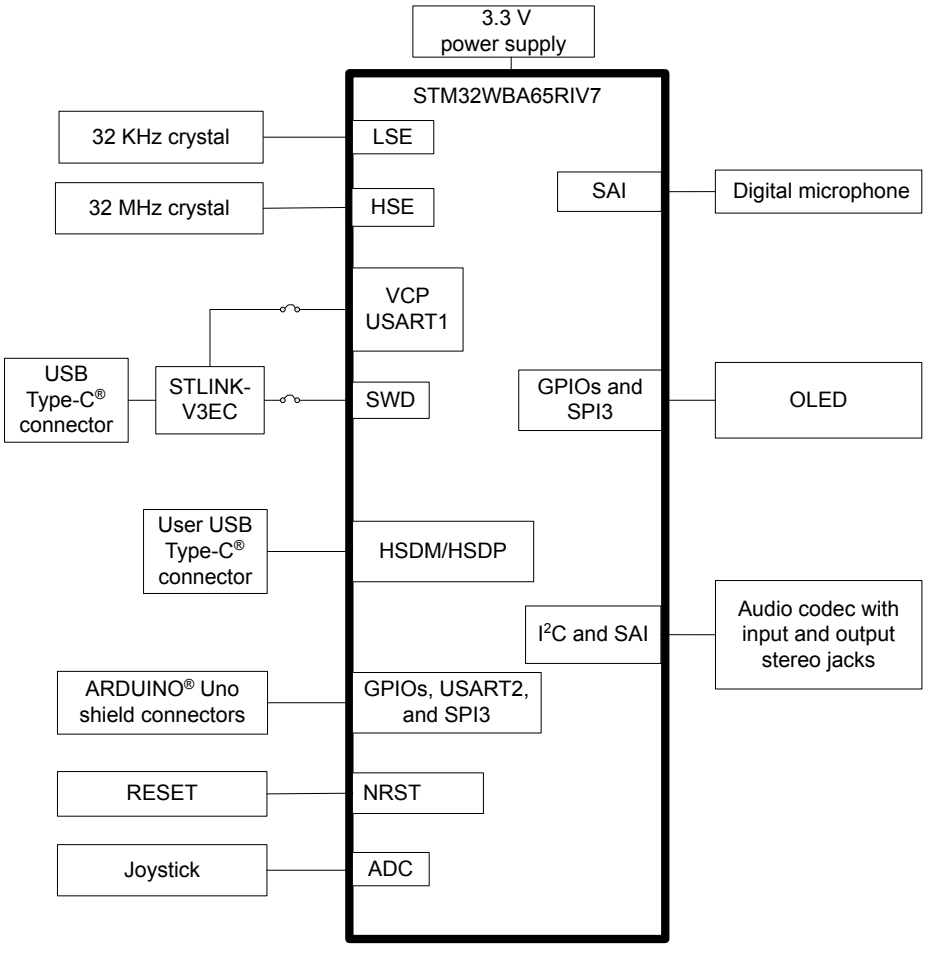


Figure 4. STM32WBA65I-DK1 Discovery kit IoT node board (top view)

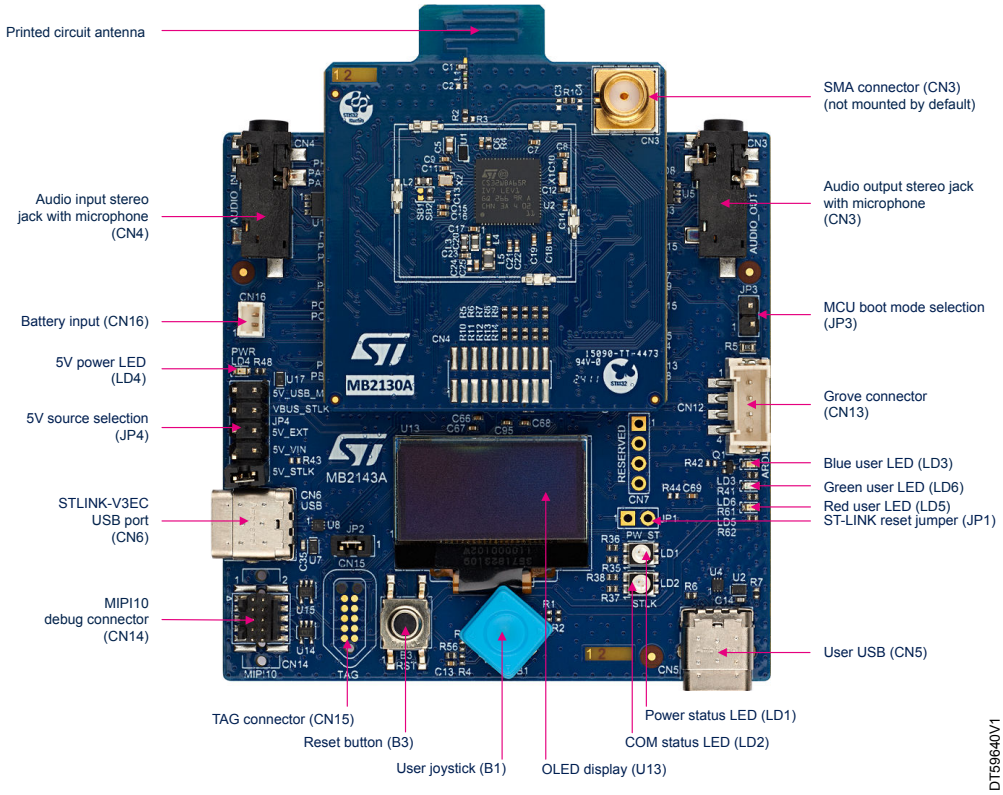


Figure 5. STM32WBA65I-DK1 Discovery kit IoT node (bottom view)

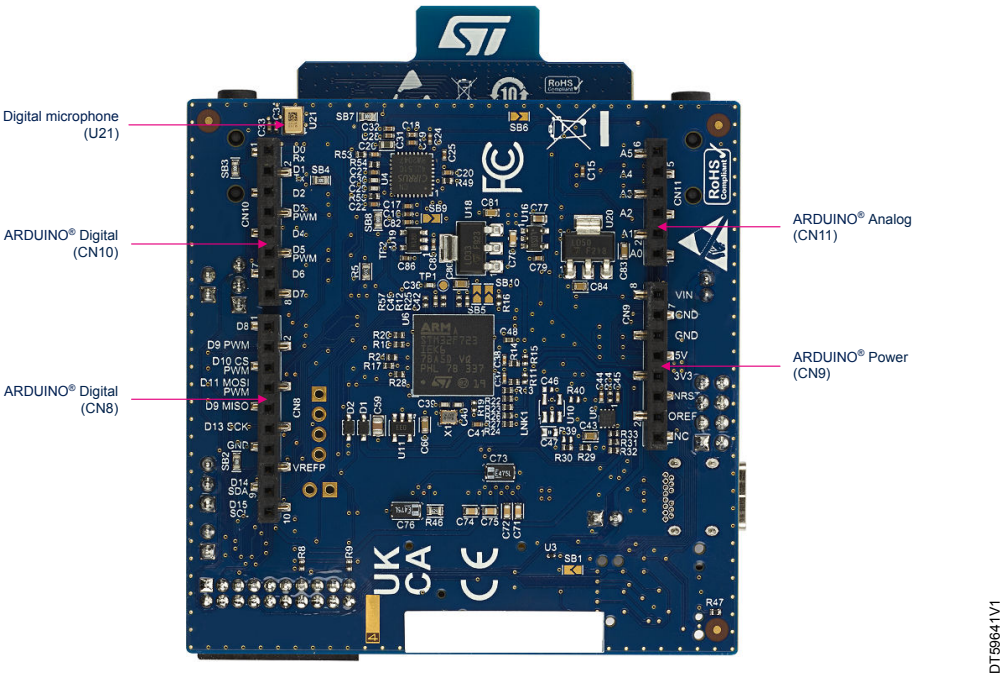


Figure 6. **STM32WBA65I-DK1 MB2143 Discovery board mechanical drawing (top view, in millimeters)**

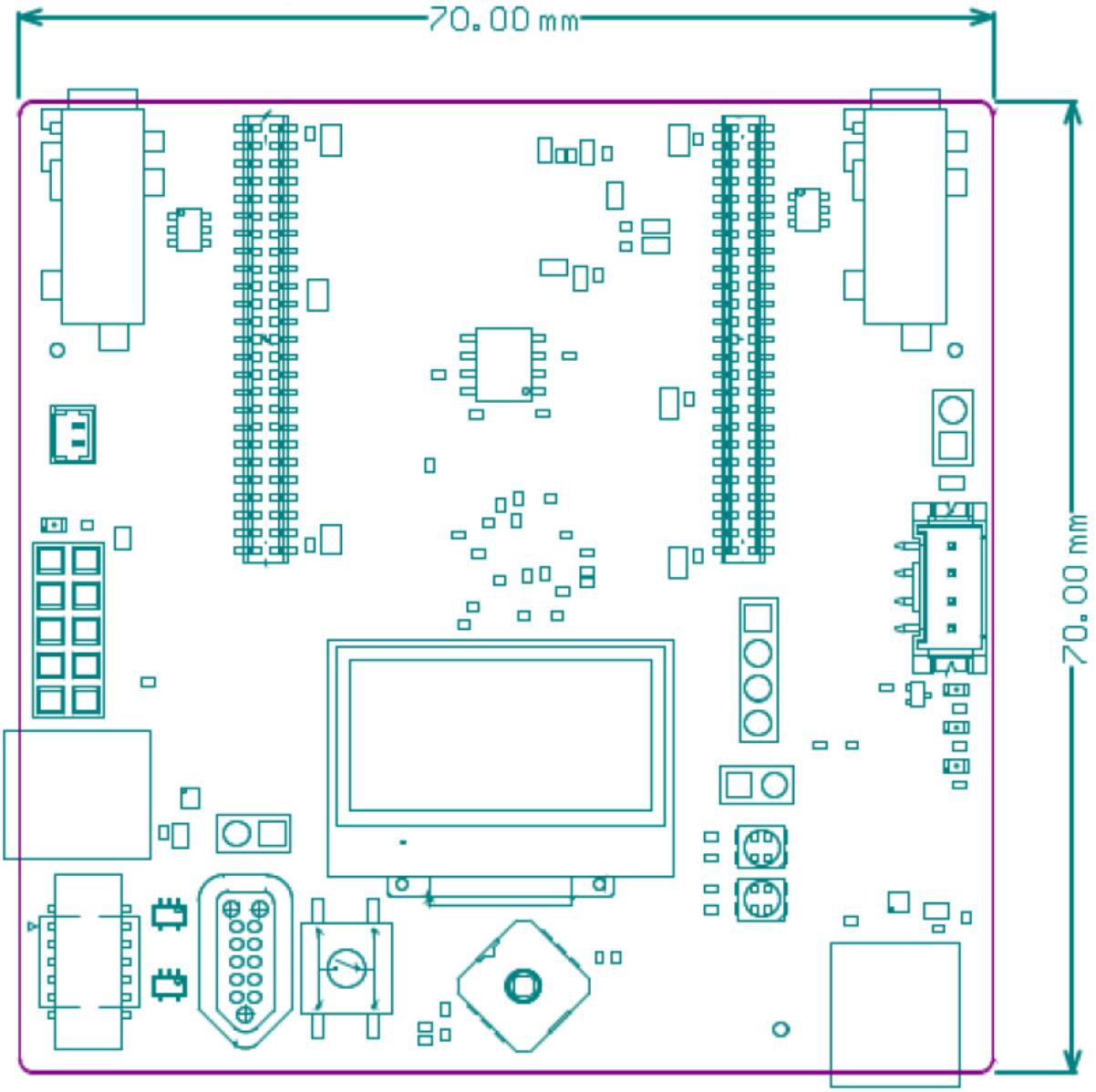
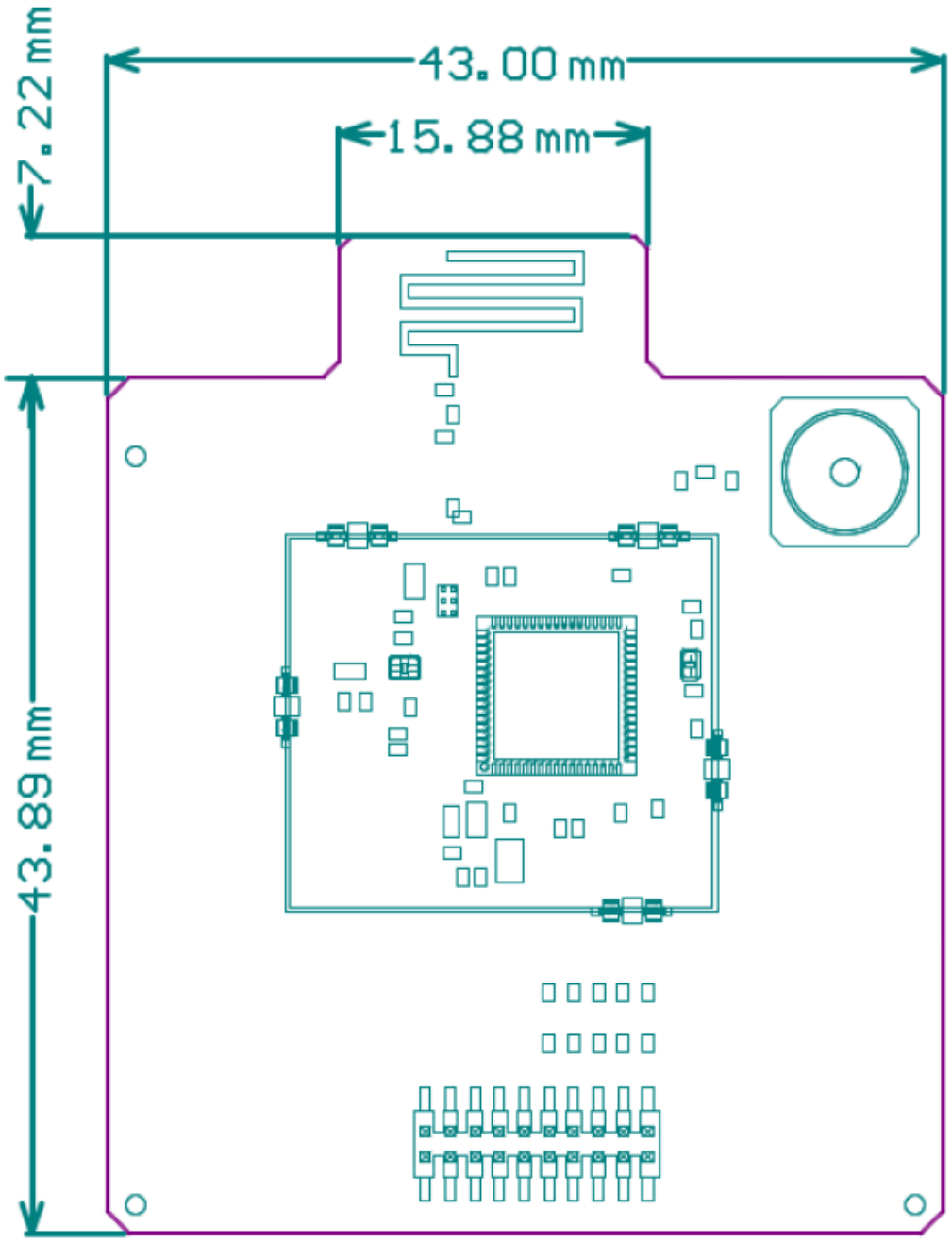


Figure 7. **STM32WBA65I-DK1 MB2130 Discovery board mechanical drawing (top view, in millimeters)**



7.1 Embedded STLINK-V3EC

The STLINK-V3EC programming and debugging tool is integrated into the STM32WBA65I-DK1 Discovery kit.

Features supported on STLINK-V3EC:

- USB 2.0 high-speed-compatible interface
- JTAG communication support up to 21 MHz
- SWD and SWV communication support up to 24 MHz
- 3 to 3.6 V application voltage on the JTAG/SWD interface and 5 V tolerant inputs
- Virtual COM port (VCP) up to 16 Mbit/s
- Optional drag-and-drop flash memory programming binary files
- Multipath bridge USB to SPI/UART/I^2C/GPIOs
- Status COM LED (LD2) which blinks during communication with the PC (red by default)
- Fault LED (LD1) alerting on USB overcurrent (green, orange, or red)
- USB-C® overvoltage protection (U9) with current limitation

For detailed information about the STLINK-V3EC capabilities such as LED management, drivers, and firmware, refer to the technical note *Overview of ST-LINK derivatives* (TN1235) at *www.st.com*.

For information about the debugging and programming features of STLINK-V3EC, refer to the user manual *STLINK-V3SET debugger/programmer for STM8 and STM32* (UM2448) at *www.st.com*.

7.1.1 Drivers

The driver installation is not mandatory since Windows® 10 but if done, it allocates an ST-specific name to the ST-LINK COM port in the system device manager.

For detailed information on the ST-LINK USB drivers, refer to the technical note *Overview of ST-LINK derivatives* (TN1235).

7.1.2 STLINK-V3EC firmware upgrade

The STLINK-V3EC embeds a firmware upgrade mechanism through the USB port. The firmware might evolve during the lifetime of the STLINK-V3EC product (for example to add new functionalities, fix bugs, and support new microcontroller families). Make sure to have the latest ST-LINK firmware version before using the STM32WBA65I-DK1 board. The newest version of this firmware is available from the *www.st.com* website.

For detailed information on the ST-LINK firmware upgrade, refer to the technical note *Overview of ST-LINK derivatives* (TN1235).

7.1.3 Using an external debug tool to program and debug the on-board STM32

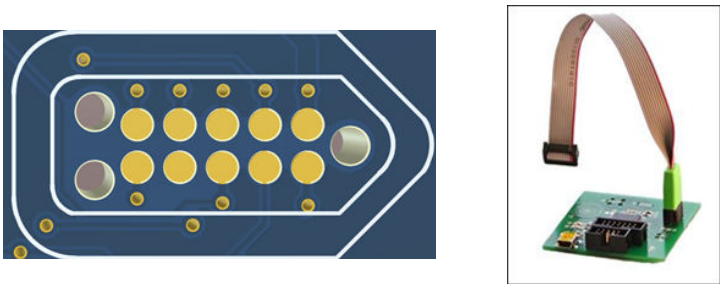
Set the embedded STLINK-V3EC to a high-impedance state. When the jumper JP1 (STLK_RST) is ON, the embedded STLINK-V3EC is put in Reset state and all GPIOs in high impedance, then the user can connect the external debug tool on the debug connector (CN14).

Table 4. MIPI10 debug connector (CN14) pinout

MIPI10 pin	CN14	Function
-	NC	Reserved
-	NC	Reserved
1	T_VCC	Target VCC
2	T_SWDIO	Target SWDIO using SWD protocol or target JTMS (T_JTMS) using JTAG protocol
3	GND	Ground
4	T_SWCLK	Target SWCLK using SWD protocol or target JCLK (T_JCLK) using JTAG protocol
5	GND	Ground
6	T_SWO	Target SWO using SWD protocol or target JTDO (T_JTMS) using JTAG protocol
7	T_JRCLK	Not used by SWD protocol, target JRCLK (T_JRCLK) using JTAG protocol, only for specific use
8	T_JTDI	Not used by SWD protocol, target JTDI (T_JTDI) using JTAG protocol, only for external tools
9	GNDdetect	Ground detection for plug indicator, used on SWD and JTAG neither
10	T_NRST	Target NRST using SWD protocol or target JTMS (T_JTMS) using JTAG protocol
-	T_VCP_RX	Target Rx used for VCP (must be UART dedicated to the bootloader
-	T_VCP_TX	Target Tx used for VCP (must be UART dedicated to the bootloader

The TAG connector is implemented on the STM32WBA65I-DK1 Discovery kit IoT node board. The TAG connector is a 10-pin footprint that supports SWD and JTAG modes.

Figure 8. TAG connector



DT59239V1

Table 5. TAG footprint (CN15) pinout for TC2050-IDC-NL cable

CN15 pin	Signal	Function
1	3V3	Target power(2)
2	MCU.SWDIO	Target SWDIO using SWD protocol or target JTMS (T_JTMS) using JTAG protocol
3	GND	Ground
4	MCU.SWCLK	Target SWCLK using SWD protocol or target JTCK (T_JTCK) using JTAG protocol
5	GND	Ground It must be disconnected (SB1) if the debugger probe provides a power supply on this pin.
6	MCU.SWO	Target SWO using SWD protocol or target JTDO (T_JTDO) using JTAG protocol(3)
7	NC	Not connected(1)
8	MCU.JTDI	Not used by SWD protocol, target JTDI (T_JTDI) using JTAG protocol
9	JNTRST	JTAG reset
10	NRST	Target NRST using SWD protocol or target JTMS (T_JTMS) using JTAG protocol

1. *Not connected on this board*
2. *Output for this board*
3. *SWO is optional and required only for Serial Wire Viewer (SWV) trace.*

7.2 Power supply

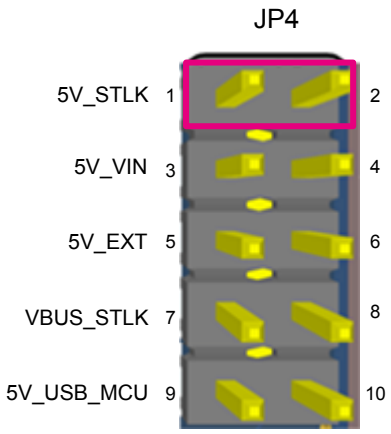
The STM32WBA65I-DK1 Discovery kit IoT node board is designed to be powered by a 5 V DC power supply. It is possible to configure the Discovery board using a jumper on JP4 to use any of the following five sources for the power supply: 5V_USB_STLK, 5V_VIN, 5V_EXT, 5V_USB_CHGR, and 5V_USB_MCU. The user must only connect one source at a time.

A power supply unit or auxiliary equipment complying with EN 62368-1:2014+A11:2017 or its superseding standard must power the product. It must also be a safety extralow voltage (SELV) with limited power capability.

7.2.1 5V_STLK

5V_STLK is a 5 V DC power with limitation from the STLINK-V3EC USB Type-C® connector (CN6). In this case, a jumper must be set on [1-2] to select the 5V_USB_STLK power source on the JP4 silkscreen (refer to Figure 9 below). This is the default setting. If the USB enumeration succeeds (as explained below), the 5V_STLK power is enabled by asserting the T_PWR_EN signal (from STLINK-V3EC MCU). This pin is connected to a power controller, which powers the board. This power controller also features a current limitation to protect the PC, in case of a short circuit on the board or if the USB port cannot provide the necessary current.

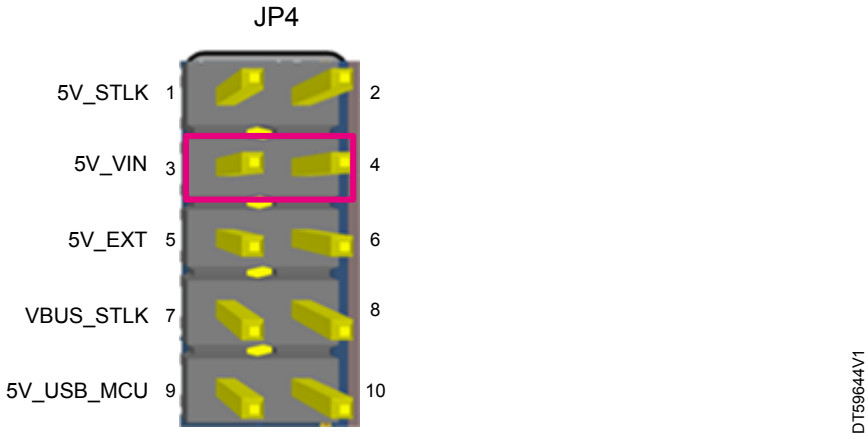
Figure 9. 5V_USB_STLK selection: JP4 [1-2]



7.2.2 5V_VIN

5V_VIN is the 7 to 12 V DC power from the ARDUINO® connector (CN9 pin 8) named VIN on the ARDUINO® connector silkscreen (the extension connectors for ARDUINO® Uno shields or daughterboards). In this case, a jumper must be set on [3-4] to select the 5V_VIN power source on the JP4 silkscreen (refer to Figure 10 below). In this case, the DC power can come from the power supply through the ARDUINO® battery shield (compatible with the Adafruit® PowerBoost 500 shield).

Figure 10. 5V_VIN selection from CN17 (VIN): JP4 [3-4]

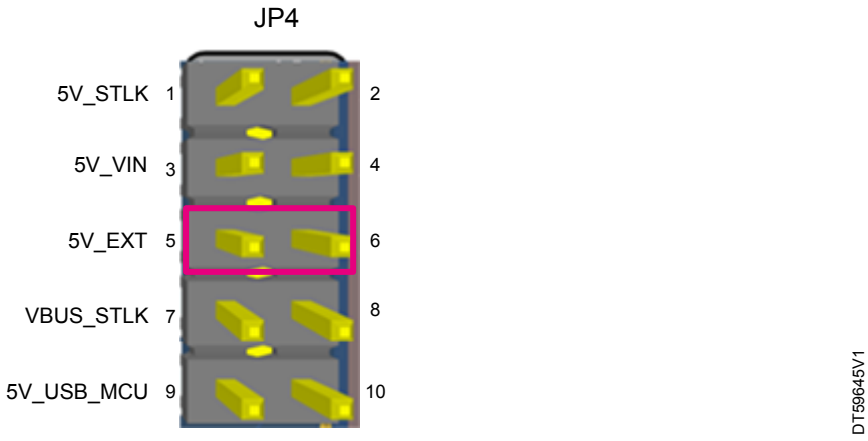


7.2.3 5V_EXT

5V_EXT is the 5 V DC power provided by an external source like a battery or regulator from the CN16 connector. In this case, a jumper must be set on [5-6] to select the 5V_EXT on the JP4 silkscreen (refer to Figure 11).

A voltage source or auxiliary equipment compliant with EN 62368-1:2014+A11:2017 or its superseding standard must power the product.

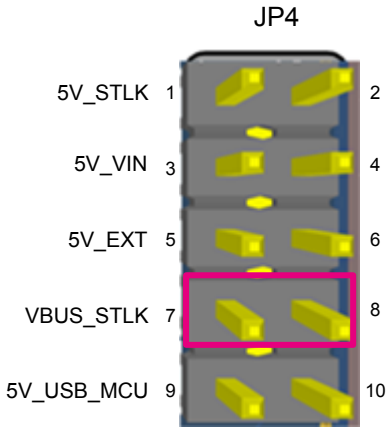
Figure 11. 5V_EXT selection: JP4 [5-6]



7.2.4 VBUS_STLK

5V_USB_CHGR is the DC power charger connected to the USB STLINK (CN6). A jumper must be set on [7-8] to select the 5V_USB_CHARGER power source on the JP4 silkscreen. In this case, if the STM32WBA65I-DK1 Discovery board is powered by an external USB charger, the debug is not available. If a PC is connected instead of the charger, the limitation is no longer effective and this might damage the PC.

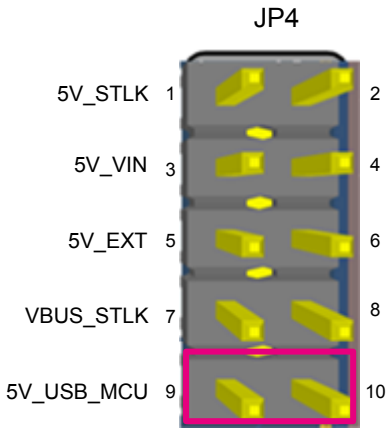
Figure 12. 5V_USB_CHGR selection: JP4 [7-8]



7.2.5 5V_USB_MCU

5V_USB_MCU is the DC power coming from the user USB (CN5) Then, a jumper must be set on [9-10] to select the 5V_USB_MCU power source on the JP4 silkscreen. In this case, if the STM32WBA65I-DK1 Discovery board is powered by a USB charger, the debug is not available. If a PC is connected instead of the charger, then the limitation is no more effective and that might damage the PC.

Figure 13. 5V_USB_CHGR selection: JP4 [9-10]

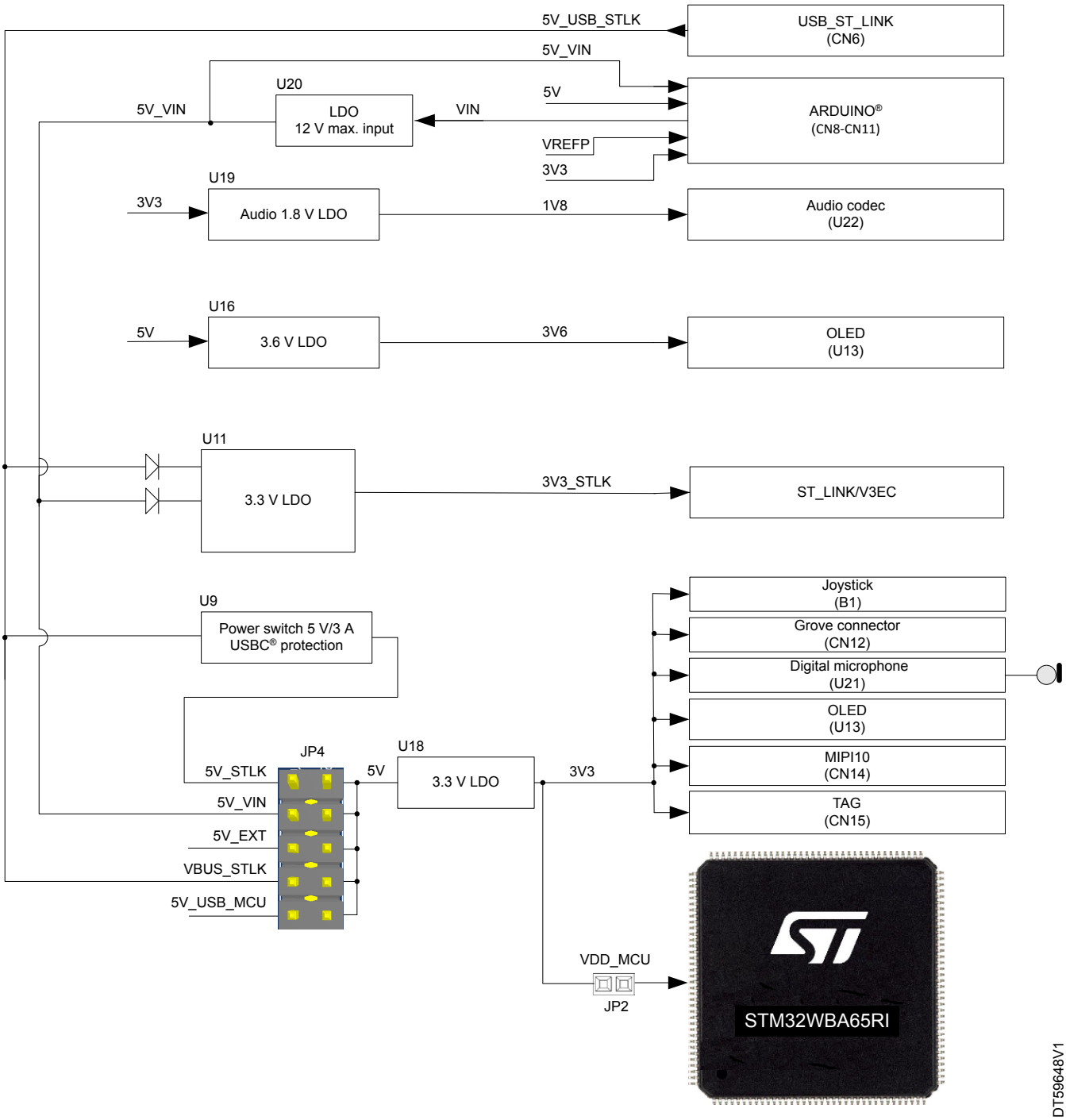


Note: If the board is powered by a USB charger, there is no USB enumeration, so the red LED (LD2) remains OFF permanently.

Caution: *Be aware that, if you connect a PC to the ST-LINK connector (CN6), the PC is not protected. The green LED (LD1) is lit when 5V correctly powers the STM32WBA65I-DK1 Discovery board.*

The power tree is the following one:

Figure 14. Power tree

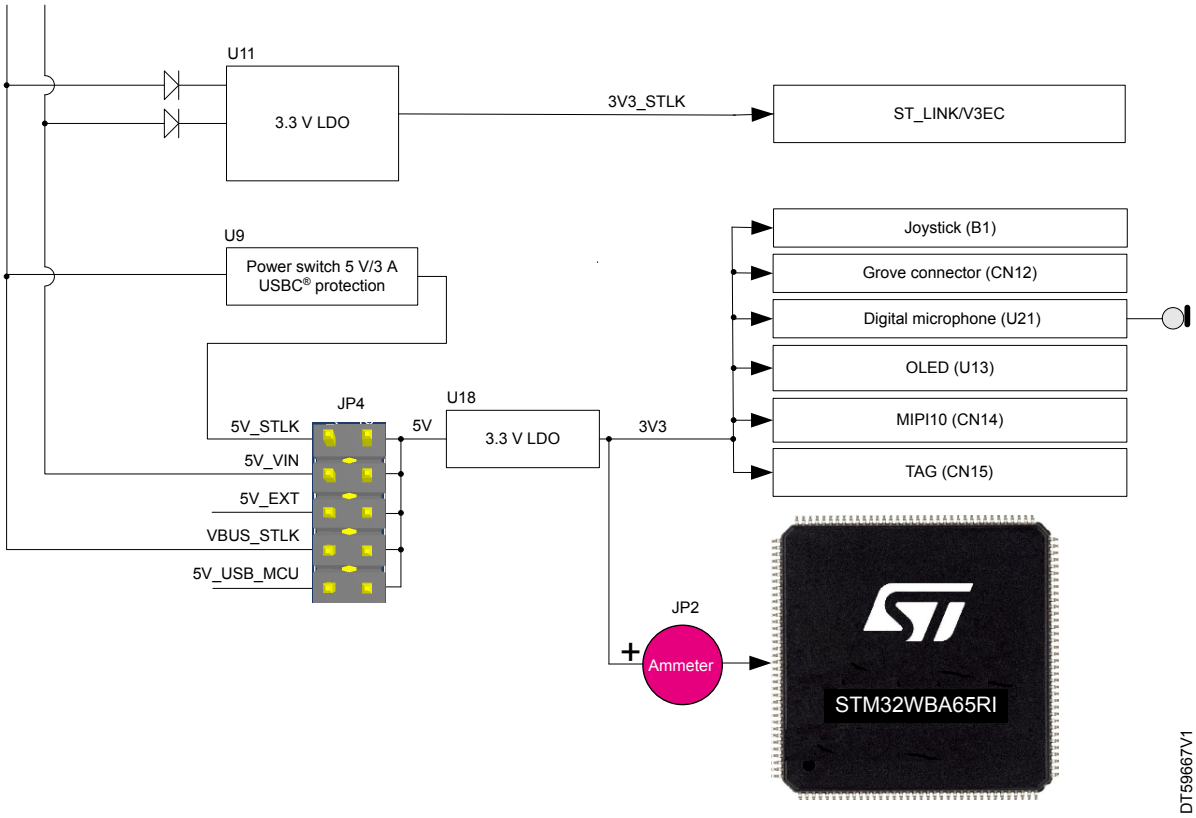


7.2.6 Current measurement

The device has low-power features. It can be interesting to measure the current consumed by the STM32WBA65RI on the discovery board. To do this measurement easily, there are two possibilities:

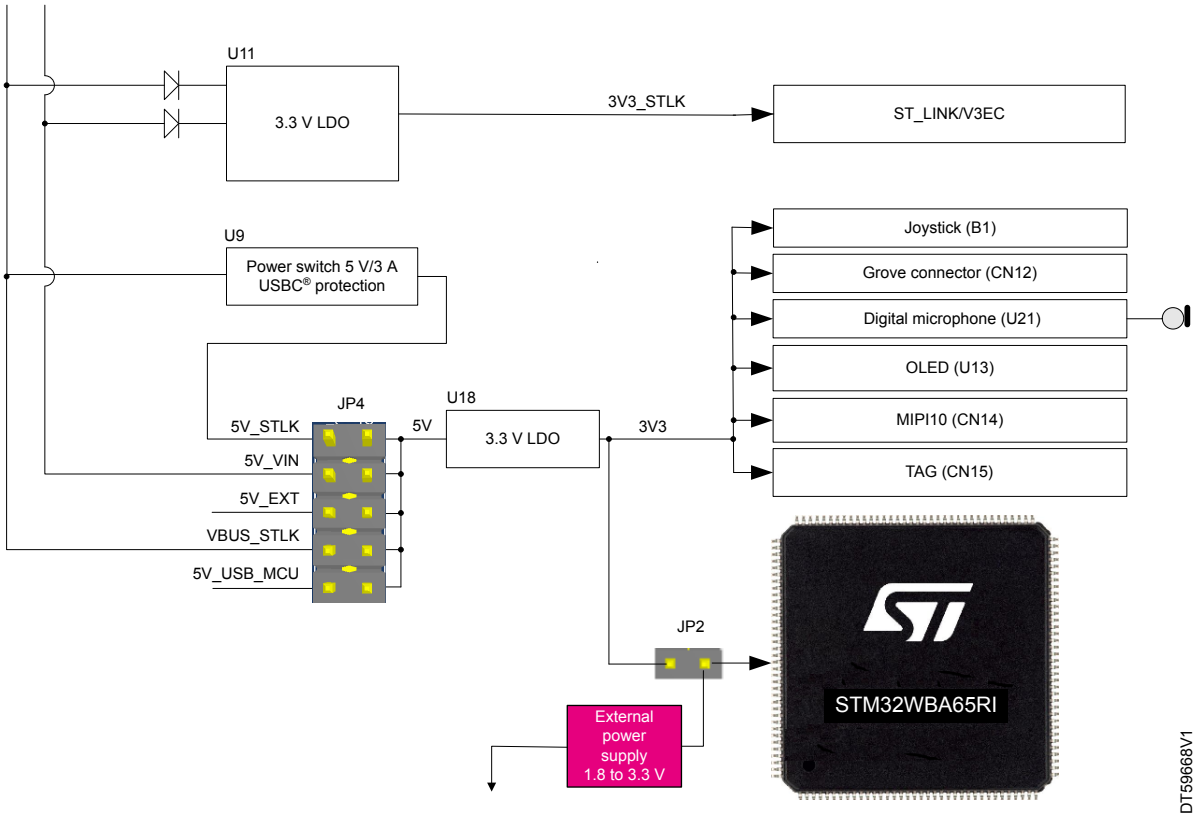
1. Measure the supply current of the SoC using an ammeter in place of the jumper (JP2). Refer to Figure 15 below.

Figure 15. Current measurement with an ammeter



2. Use an external power supply with current measurement capability. In this case, the jumper (JP2) must be OFF and the supply must be connected to pin 1 of JP2 (refer to Figure 16). The supply voltage must be between 1.8 and 3.3 V. The rest of the board is powered by any other supply on JP4.

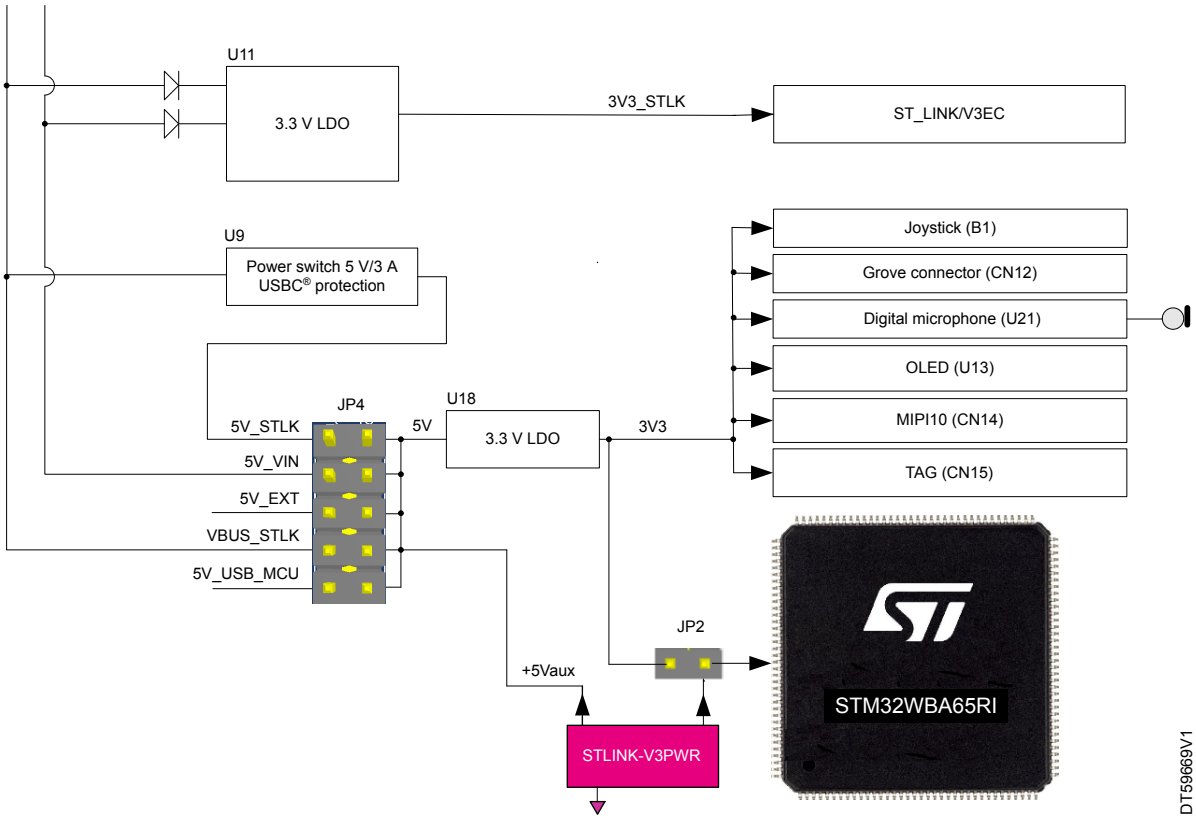
Figure 16. Current measurement with an external power supply



Caution: *As explained above, the supply voltage VDD must be between 1.8 and 3.3 V.*

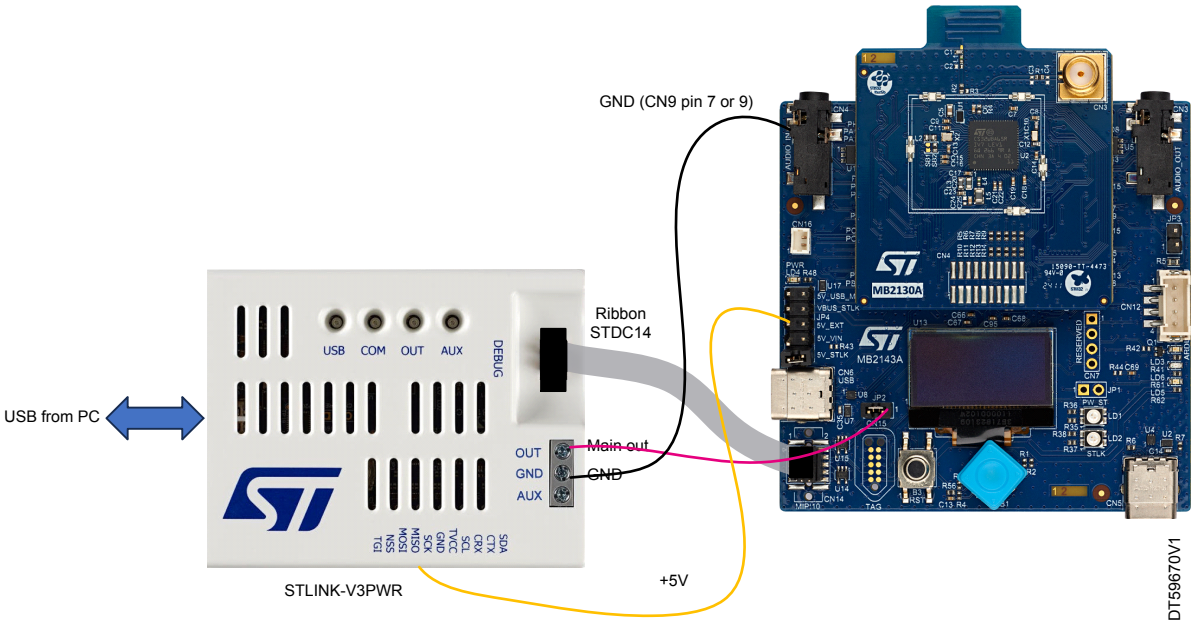
3. If it is necessary to do power consumption measurement during debugging, STMicroelectronics has an interesting solution. It is possible to use an STLINK-V3PWR. This product allows two sources of supply: a first for the current measurement on the STM32WBA65RI, and a second source to supply the rest of the board (LEDs). As in the previous case, the jumper (JP2) must be OFF, and the main supply (for current measurement) connected to pin 1 of JP2 (refer to Figure 17). For the second source (+5V), it is necessary to set JP4 OFF and connect this source to the top side (pin 10, 8, 6, 4, or 2 of JP4).
The supply voltage on JP2 must be 3V3.

Figure 17. Current measurement with STLINK-V3PWR



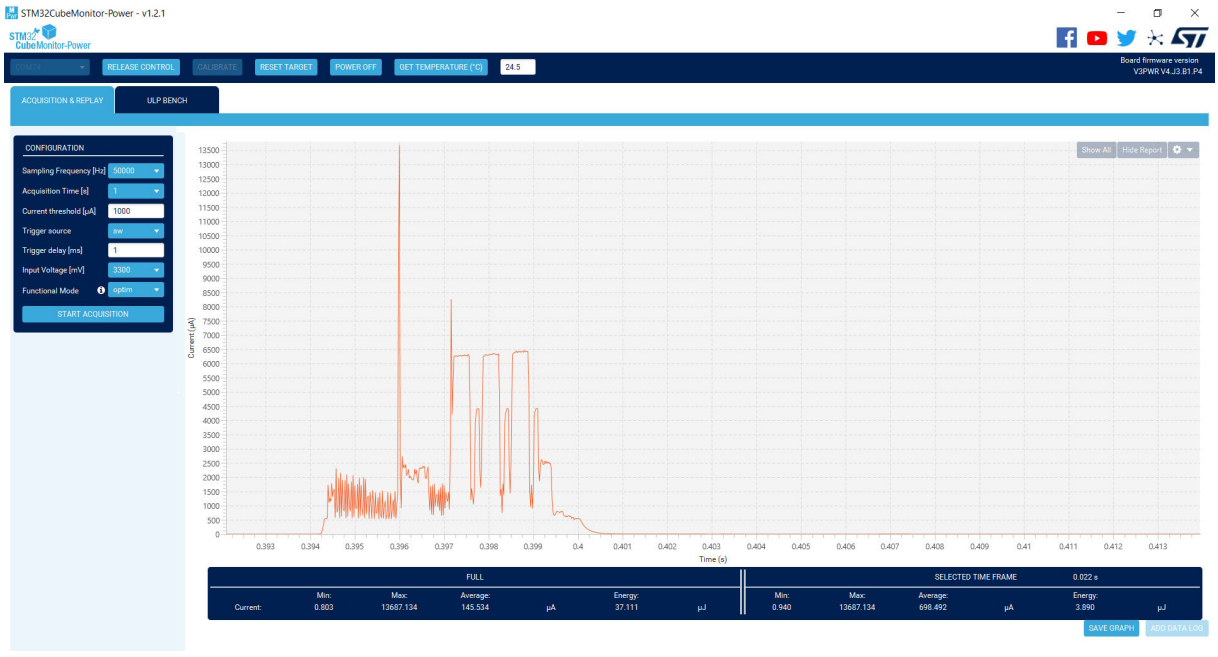
The details above concern the supply of the board by STLINK-V3PWR. The debug probe must be connected on the CN14 on the mezzanine board (MB2143).

Figure 18. Configuration for current measurement with STLINK-V3PWR



After connection, download STM32CubeMonitor-Power (STM32CubeMonPwr) from the *www.st.com* website and install it. This software allows the user to carry out dynamic current measurements with ease. Figure 19 shows an example of a current measurement (firmware: *Heart Rate* from the STM32CubeWBA firmware package).

Figure 19. Example of current measurement with an external STLINK-V3PWR



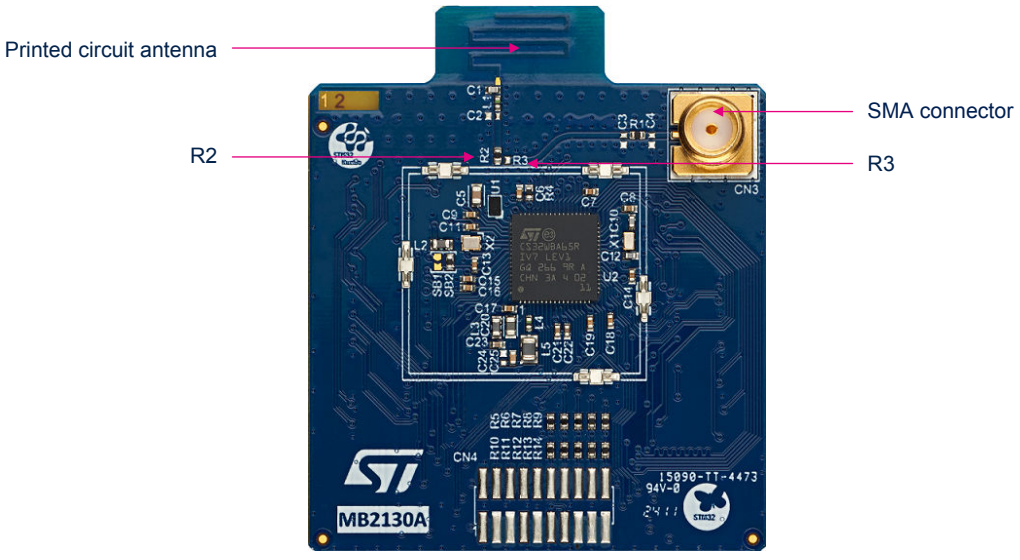
For more details on using STLINK-V3PWR, a dedicated page is available on the *www.st.com* website.

Note: To measure microampere current, resistors R8 and R9 must be OFF (I^2C pull-up resistors).

7.3 Radio output configuration

- By default, the board is configured with R2 ON and R3 OFF to use the PCB antenna.
- The configuration using the SMA antenna is R2 OFF and R3 ON. The user must assemble the SMA connector, which is not present by default.

Figure 20. Antenna elements on MCU RF board



7.4 Clock sources

7.4.1 HSE clock reference

A 32 MHz crystal oscillator is used as the high-speed clock (HSE) of the MCU. The HSE oscillator is trimmed during board manufacturing.

7.4.2 LSE clock reference

A 32.768 kHz crystal oscillator is used as the low-speed clock (LSE) of the MCU.

7.5 Reset sources

The reset signal of the STM32WBA65I-DK1 Discovery kit is active at a low level and the reset sources can come from:

- The reset push button (B3),
- The CN9 pin3 of the ARDUINO® connector,
- The embedded STLINK-V3EC debugger,
- Or the MIPI10 and TAG interfaces.

7.6 Virtual COM port

The serial interface USART1 is directly available as a Virtual COM port of the PC, connected to the STLINK-V3EC USB connector (CN6).

7.7 Audio codec

There is a low-power stereo audio codec (U22) with a headphone amplifier, provided with STM32WBA65I-DK1. Input and output stereo jacks are also provided.

The MCU is connected to the audio codec using an I^2C interface for the control path (I2C1) and the SAI1 interface for the data path.

7.8 Onboard MEMS audio sensor omnidirectional digital microphone

A miniature high-performance low-power silicon digital microphone with a single-bit PDM output is available on this Discovery board and connected to the SAI and codec interfaces by default.

7.9 Display

On the STM32WBA65I-DK1 Discovery board, an OLED display with a panel matrix of 128×64 and 2000/1 contrast is provided on SPI3.

7.10 Buttons and LEDs

Joystick

A joystick is provided on the Discovery board with the position detected by the STM32 ADC PA3 pin.

Table 6 lists the positions with the associated ADC level to be detected:

Table 6. Document revision history

Position	Ratio	ADC4 channel 8
Select	0.00	0.00 V
Left	0.20	0.67 V
Down	0.40	1.32 V
Up	0.61	2.01 V
Right	0.80	2.65 V

On the top side, the black button (B3) resets the STM32WBA65RIV7 microcontroller. Refer to Figure 4. Table 7 explains the assignment of control ports to the LED indicators.

Table 7. Button and LED control port

Reference	Color	Name	Comment
B1 (PA3)	Blue	Joystick	User button with five positions
B3	Black	Reset	MCU reset
LD1	Tricolor (red, green, and orange)	PW_ST	Power status (refer to Embedded for more detail)
LD2	Tricolor (red, green, and orange)	STLK	ST-LINK LED (refer to Embedded)
LD3 (PB0)	Blue	User LED	Driven by GPIO on a high state
LD4	Green	5V LED	5V available
LD5 (PD9)	Red	User LED	Driven by GPIO on a low state
LD6 (PD8)	Green	User LED	Driven by GPIO on a low state

7.11 ARDUINO® Uno V3 connector

CN8, CN9, CN10, and CN11 are female connectors (SMD component devices) compatible with the ARDUINO® standard. Most shields designed for ARDUINO® can fit the STM32WBA65I-DK1 Discovery board.

The ARDUINO® connectors on the Discovery board support the ARDUINO® Uno V3.

The I/Os of this STM32WBA65RIV7 microcontroller are 5 V tolerant and there are no issues with ARDUINO® Uno compatibility.

The connector provides the PTA signal for Wi-Fi® coexistence and audio for use with DSP.

The normal MCU I/Os on the ARDUINO® must be programmed in high impedance when using PTA or audio on the ARDUINO® connector to avoid short circuits on the I/Os.

Figure 21. ARDUINO® connector location (front view)

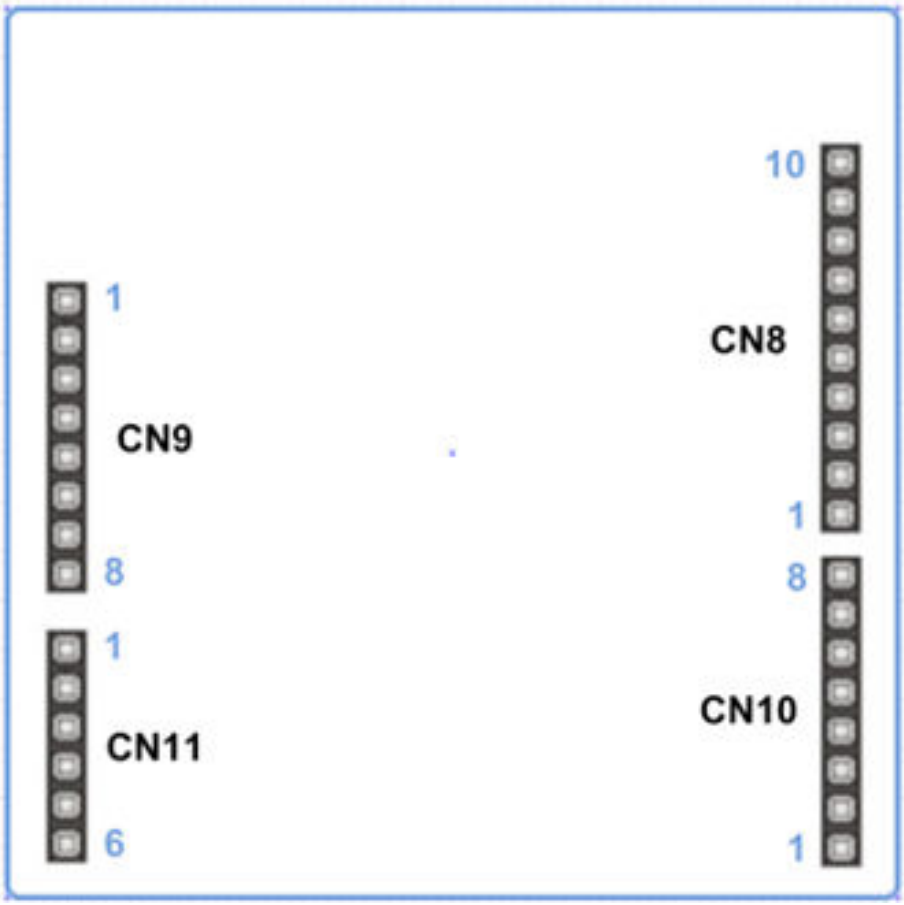


Table 8. **Pinout of the ARDUINO® connectors**

Left connectors					Right connectors				
Connector	Pin number	Pin name	MCU pin	Function	Function	MCU pin	Pin name	Pin number	Connector
					I2C1 SCL	PB2	SCL/D15	10	CN8 digital
					I2C1 SDA	PB1	SDA/D14	9	
					Reference voltage	-	AVDD (R44 ON)	8	
					Ground	-	GND	7	
CN9 power	1	NC	-	-	SPI2_SCK/LED3 (R42 ON)	PB10	SCK/D13	6	
	2	IOREF	-	3V3 reference	SPI2_MISO	PA9	MISO/D12	5	
	3	NRST	NRST	System reset	SPI2_MOSI/TIM3_CH1	PC3	PWM/MOSI/D11	4	
	4	3V3	-	3V3	SPI2_NSS/TIM1_CH3N	PB9	PWM/CS/D10	3	
	5	5 V	-	5 V	TIM1_CH1	PB11	PWM/D9	2	
	6	GND	-	Ground	GPIO/Audi.MCLK_A (SB8 ON)	PA10	D8	1	
	7	GND	-	Ground					
	8	VIN	-	Power input	GPIO/Audio.SCK_A (SB9 ON)	PD14	D7	8	CN10 digital
					By default, GPIO drives LD3 (SB2 ON)	PB0	PWM/D6	7	
CN11 analog	1	A0	PA4	ADC/PTA_GRA (SB5 ON)	GPIO/Audio.FS_A (SB22 ON)	PB14	PWM/D5	6	
	2	A1	PA6	ADC/PTA-STA (SB20 ON)	INT	PC13	D4	5	
	3	A2	PA2	ADC/PTA_PRI (SB23 ON)	TIM3_CH4/Audio.SD_A (SB24 ON)	PB13	PWM/D3	4	
	4	A3	PA1	ADC/PTA-ACT (SB28 ON)	GPIO/Audio.SD_B (SB26 ON)	PE0	D2	3	
	5	A4	PA5	ADC/I2C1_SDA (SB27 ON)	UART2_TX	PA12	TX/D1	2	
	6	A5	PA0	ADC/I2C1_SCL (SB29 ON)	UART2_RX	PA11	RX/D0	1	

7.12 Jumper overview

Table 9. Jumper reference table

Reference	Default position	Comment
JP1	OFF	STLINK-V3EC reset, active low
JP2	ON	Jumper for MCU current measurement. MCU current measurement can be performed on JP2. By default, JP2 is ON. For the current measurement configuration, an ammeter must replace the JP2 jumper.
JP3	OFF	MCU boot mode selection By default, BOOT0 at a low level to boot on internal flash memory
JP4	5V_STLK	Board power source selection. Refer to Section 7.2.

8 Limitations on MB2143

8.1 ARDUINO® and memory

ARDUINO® ADC_A3 is exclusive to Mem_MISO on PA1.

ARDUINO® ADC_A5 is exclusive to Mem.SP3_SCK on PA0.

8.2 ARDUINO® and OLED

ARDUINO® ADC_A5 is exclusive to OLED.spi3_SCK on PA0.

9 MB2143 B01 I/O assignment updates

Table 10. **STM32WBA65I-DK1 I/O assignment**

VFQFPN68 pinout	Pin name	Main function pinout assignment	Alternate function pinout assignment
1	VSS	Ground	-
2	VDDSMPS	SMPS power supply	-
3	VLXSMPS	SMPS feedback	-
4	PB12	MCU.VCP1_TX	-
5	PB11	ARD.D9_TIM	-
6	PA8	MCU.VCP_RX	-
7	PA7	Audio.SCK_A	-
8	PA6	ARD_ADC.A1	-
9	VREFP	Reference voltage	-
10	VDDAP	Power supply	-
11	PA5	ARD_ADC.A4	-
12	PA4	ARD_ADC.A0	-
13	PA3	Joystick (user button)	-
14	PB10	ARD.D13_SPI2_SCK	-
15	PA2	ARD_ADC.A2	SPI3_MOSI
16	VDDIO	I/O power supply	-
17	PA1	ARD_ADC.A3	Audio.1_CK1, Mem_MISO
18	PA0	ARD_ADC.A5	OLED.SP3_SCK/Mem.SP3_SCK
19	PB9	ARD.D10_TIM_SPI2_NSS	-
20	VDDUSB	USB power supply	-
21	PD9	User LED red	-
22	PD8	User LED green	-
23	PD7	USB_HS_N	-
24	PD6	USB_HS_P	-
25	PD5	Audio.SD_A	-
26	PB8	OLED.SPI3_MOSI/Mem_MOSI	-
27	VDD	Power supply	-
28	PC15	LSE out	-
29	PC14	LSE in	-
30	PC13	ARD.D4_INT	-
31	VDD	Power supply	-
32	PB4	WIFI.PTA_PRI on ARDUINO® CN11	-
33	PE3	OLED.RST	-
34	PE2	Audio.MCLK_A	-
35	PE1	OLED.CS	-
36	PE0	ARD.D2_IO/OLED.D/C	-
37	PD14	ARD.D7_IO	-
38	VDD	Power supply	-

VFQFPN68 pinout	Pin name	Main function pinout assignment	Alternate function pinout assignment
39	PB3	MCU.SWO	WIFI.PTA_ACT on ARDUINO® CN11
40	PA15	MCU.JTDI	-
41	PA14	MCU.SWCLK	-
42	PA13	MCU.SWDIO	-
43	PA12	ARD.D1_TX/MCU.VCP2_TX	-
44	PA11	ARD.D0_RX/MCU.VCP2_RX	-
45	PB2	I2C1_SCL	-
46	PB1	I2C1_SDA	-
47	PB0	ARD.D6_TIM	-
48	PB15	WIFI.PTA_GRA on ARDUINO® CN11	MCU.CTS
49	PH3	BOOT0/Mem_NSS	-
50	VDD	Power supply	-
51	NRST	Controller reset active low	-
52	RF_OUT	RF output	-
53	VDDHPA	Power supply	-
54	VDDANA	Power supply	-
55	VDD	Power supply	-
56	XOUT	HSE out	-
57	XIN	HSE in	-
58	VDD	Power supply	-
59	VDD	Power supply	-
60	VDD11	Power supply	-
61	PC5	Audio.SD_B	-
62	PC4	Audio.FS_A	-
63	PC3	ARD.D11_TIM_SPI2_MOSI	-
64	PA10	ARD.D8_IO	Audio.1_D1
65	PA9	ARD.D12_SPI2_MISO	-
66	PB14	ARD.D5_TIM	-
67	PB13	ARD.D3_TIM	-
68	VDD	Power supply	-
69	VSS	ground	-

10 STM32WBA65I-DK1 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:

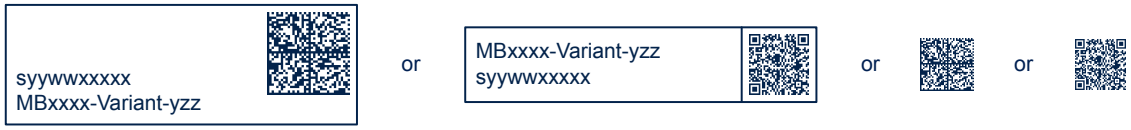
  

  Dual-sticker example:

- 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 STM32WBA65I-DK1 product history

Table 11. Product history

Order code	Product identification	Product details	Product change description	Product limitations
STM32WBA65I-DK1	DK32WBA65I1$DR1	MCU: • STM32WBA65RIV7 silicon revision "B"	Initial revision	No limitation
		MCU errata sheet: • *STM32WBA6xxx device errata* (ES0644)		
		Boards: • MB2143-WBA65I-A02 (mezzanine board) • MB2130-WBA65RI-A03 (MCU RF board)		

10.3 Board revision history

Table 12. Board revision history

Board reference	Board variant and revision	Board change description	Board limitations
MB2143 (mezzanine board)	WBA65I-A02	Initial revision	No limitation
MB2130 (MCU RF board)	WBA65RI-A03	Initial revision	No limitation

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

11.1 FCC Compliance Statement

Identification of products: STM32WBA65I-DK1

Contains FCC ID: YCP-MB213000

Part 15.19

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Part 15.21

Any changes or modifications to this equipment not expressly approved by STMicroelectronics may cause harmful interference and void the user's authority to operate this equipment.

Part 15.105

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates uses and can radiate radio frequency energy and, if not installed and used in accordance with the instruction, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception which can be determined by turning the equipment off and on, the user is encouraged to try to correct interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

Note: Use only shielded cables.

To satisfy FCC RF exposure requirements, a separation distance of 20 cm or more should be maintained between the antenna of this device and persons during operation. To ensure compliance, operation at a closer distance than this is not recommended. This transmitter must not be collocated or operating in conjunction with any other antenna or transmitter.

Responsible Party – U.S. Contact Information:

Francesco Doddo
STMicroelectronics, Inc.
200 Summit Drive | Suite 405 | Burlington, MA 01803
USA
Telephone: +1 781-472-9634

11.2 ISED Compliance Statement

Identification of products: STM32WBA65I-DK1
Contains IC: 8976A-MB180300

Identification du produit : STM32WBA65I-DK1
Contient sous-ensemble certifié IC : 8976A-MB180300

Compliance Statement

Notice: This device complies with ISED Canada licence-exempt RSS standard(s). Operation is subject to the following two conditions: (1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device.

ISED Canada ICES-003 Compliance Label: CAN ICES-3 (B) / NMB-3 (B).

Déclaration de conformité

Avis: Le présent appareil est conforme aux CNR d'ISDE Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes : (1) l'appareil ne doit pas produire de brouillage, et (2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

Étiquette de conformité à la NMB-003 d'ISDE Canada : CAN ICES-3 (B) / NMB-3 (B).

RF exposure statement

This device complies with ISED radiation exposure limits set forth for general population. This device must be installed to provide a separation distance of at least 20 cm from all persons and must not be co-located or operating in conjunction with any other antenna or transmitter.

Le présent appareil est conforme aux niveaux limites d’exigences d’exposition RF aux personnes définies par ISDE. L’appareil doit être installé afin d’offrir une distance de séparation d’au moins 20 cm avec les personnes et ne doit pas être installé à proximité ou être utilisé en conjonction avec une autre antenne ou un autre émetteur.

12 UKCA Compliance Statement

SIMPLIFIED UK DECLARATION OF CONFORMITY

Hereby, the manufacturer STMicroelectronics, declares that the radio equipment type “STM32WBA65I-DK1” is in compliance with the UK Radio Equipment Regulations 2017 (UK S.I. 2017 No. 1206). The full text of the UK Declaration of Conformity is available at the following internet address: *www.st.com*.

13 RED Compliance Statement

Simplified EU declaration of conformity

Hereby, STMicroelectronics declares that the radio equipment type "STM32WBA65I-DK1" is in compliance with Directive 2014/53/EU.

The full text of the EU declaration of conformity is available at the following internet address: *www.st.com*.

Déclaration de conformité UE simplifiée

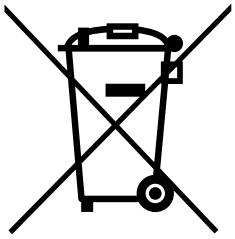
STMicroelectronics déclare que l'équipement radioélectrique du type "STM32WBA65I-DK1" est conforme à la directive 2014/53/UE.

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

14 Product disposal

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

(Applicable in Europe)



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

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

Household users:

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

Business users:

You should contact your dealer or supplier for further information.

Revision history

Table 13. **Document revision history**

Date	Revision	Changes
28-Feb-2025	1	Initial release.

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