STM32H5 Nucleo-144 board (MB2129)

Introduction

The STM32H5 Nucleo-144 board based on the MB2129 reference board (order code NUCLEO-H5E5ZJ) provides an affordable and flexible way for users to try out new concepts and build prototypes by choosing from the various combinations of performance and power-consumption features provided by the STM32H5 MCU.

The STM32 Nucleo-144 board offers an easy means to expand the functionality of the Nucleo open development platform with a wide choice of specialized shields through several expansion connectors:

- ARDUINO® Uno V3 connector
- ST morpho headers providing access to the MCU I/O pins

The NUCLEO-H5E5ZJ board does not require any separate probes as it integrates the STLINK-V3EC debugger/programmer.

The STM32H5 Nucleo-144 board comes with the comprehensive free STM32 software libraries and examples available with the STM32CubeH5 MCU Package.

Figure 1. NUCLEO-H5E5ZJ top view

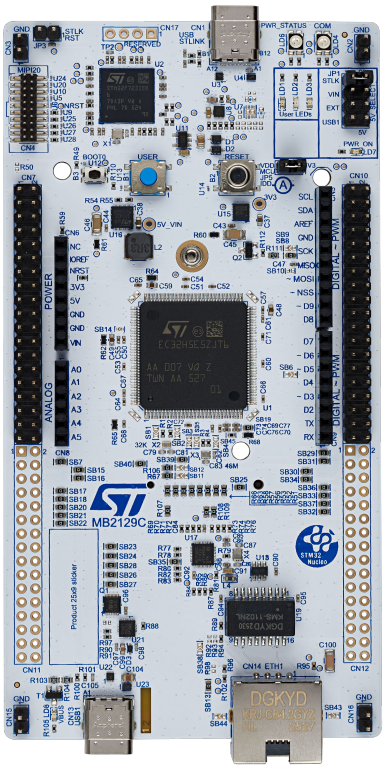
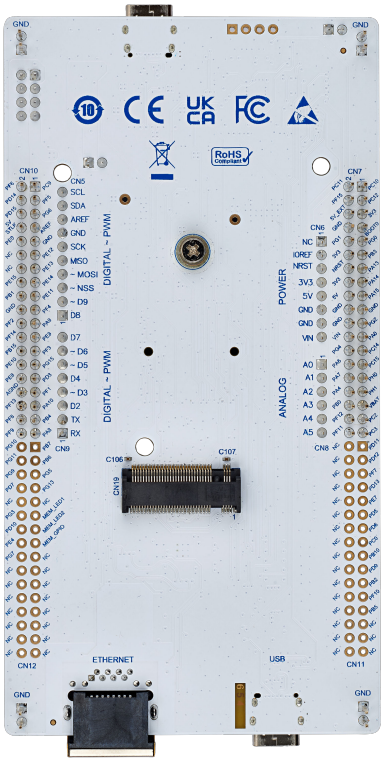


Figure 2. NUCLEO-H5E5ZJ bottom view



Pictures are not contractual.

1 Features

- STM32H5E5ZJT6 MCU, based on the Arm® Cortex®-M33 processor, with 4 Mbytes of flash memory and 1.5 Mbytes of SRAM in an LQFP144 package.
- Ethernet compliant with the IEEE-802.3-2002 standard
- USB Type-C® sink device HS
- Three user LEDs
- Reset, user, and boot mode push-buttons
- 32.768 kHz crystal oscillator
- Board connectors:
  - USB Type-C® connector
  - Ethernet 10/100 Mbps connector
  - ARDUINO® Uno V3 connector
  - ST morpho extension pin headers for full access to most of STM32 I/Os
  - M.2 Key A serial memory connector
- Flexible power-supply options: ST-LINK USB V_{BUS}, USB connector, 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 STM32CubeH5 MCU Package
- Support of a wide choice of Integrated Development Environments (IDEs) including IAR Embedded Workbench®, MDK-ARM, and STM32CubeIDE

arm

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2 Ordering information

To order the NUCLEO-H5E5ZJ Nucleo-144 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
NUCLEO-H5E5ZJ	MB2129[1]	STM32H5E5ZJT6

1. *Subsequently called main board in the rest of the documentation.*

2.1 Codification

The meaning of the codification is explained in Table 2.

Table 2. Codification explanation

NUCLEO-XXYYZT	Description	Example: NUCLEO-H5E5ZJ
XX	MCU series in STM32 32-bit Arm Cortex MCUs	STM32H5 series
YY	MCU product line in the series	STM32H5E5/5F5
Z	STM32 package pin count: • Z for 144 pins	144 pins
T	STM32 flash memory size: • J for 4 Mbytes	4 Mbytes

3 Development environment

3.1 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.

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 NUCLEO-H5E5ZJ 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 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.

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.

5.4 Power supply

A power supply unit or auxiliary equipment complying with the EN 62368-1:2014+A11:2017 standard (or the one replacing it) and safety extralow voltage (SELV/ES1) with limited power capability (LPS/PS2) must power this equipment.

6 Quick start

The NUCLEO-H5E5ZJ board is a low-cost and easy-to-use development kit, to evaluate quickly and start development with an STM32H5E5ZJT6 microcontroller in a LQFP144 package. Before installing and using the product, accept the evaluation product license agreement from the *www.st.com/epla* webpage. For more information on the NUCLEO-H5E5ZJ board and demonstration software, visit the *www.st.com/stm32nucleo* webpage.

6.1 Getting started

Follow the sequence below to configure the NUCLEO-H5E5ZJ board and launch the demonstration application (refer to Figure 5 for component locations):

1. Check the jumper position on the board (refer to Section 6.2 for the default board configuration).
2. To identify the device interfaces from the host PC, before connecting the board, install the STLINK-V3EC USB driver available on the *www.st.com* website.
3. Connect the NUCLEO-H5E5ZJ board to a PC with a USB cable (USB Type-A or USB Type-C® to USB Type-C®) through the USB connector (CN1) to power the board.
4. The 5V_PWR (LD7), COM (LD4), and PWR status (LD6) LEDs light up and the three user LEDs (green LD1, red LD2, and blue LD3) are blinking.
5. Each press of the blue user button (B1) modifies the blinking of the LD1, LD2, and LD3 LEDs.
6. Download the demonstration software and several software examples to use the STM32 Nucleo features, available from the *st.com* website.
7. Develop a custom application using the available examples.

6.2 Default board configuration

By default, the NUCLEO-H5E5ZJ board is configured with ST-LINK power. The default jumper configuration and voltage setting are shown in Table 4.

Table 4. Default jumper configuration

Jumper	Definition	Default position	Comment
JP1	5 V power selection	[1-2]	5 V from STLINK-V3EC
JP3	STLK_RST	OFF	STLINK-V3EC MCU not in reset mode
JP5	IDD measurement	ON	VDD_MCU current measurement

Figure 3. Default board configuration

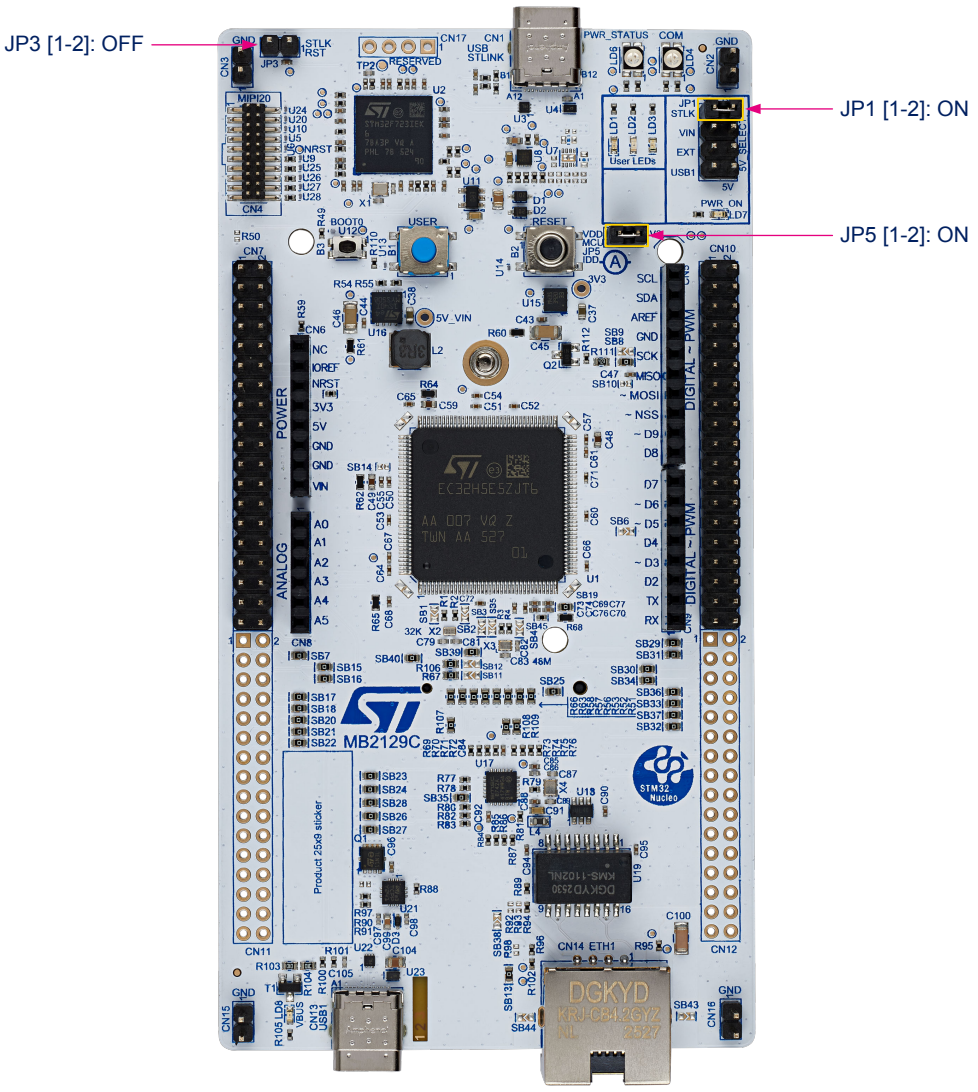


Table 5. Jumper configuration

Jumper	Definition	Configuration(1)	Comments(1)
JP1	5V Power selection	**ON [1-2]**	**5 V source from STLINK-V3EC**
		ON [3-4]	5 V source from ARDUINO® VIN 7-12 V
		ON [5-6]	5 V source from 5V_EXT (ST morpho)
		ON [7-8]	5 V source from USB Type-C®
		OFF	No 5 V power source; configuration when external 3V3 is used
JP3	STLK_RST	ON [1-2]	Used to keep the STLINK-V3EC MCU in reset state when an external debug probe is used.
		OFF	**Normal mode: uses STLINK-V3EC debug probe**
JP5	IDD measurement	**ON [1-2]**	**VDD_MCU = 3V3**
		OFF	Use ammeter to measure VDD_MCU power consumption, or external 3V3 source can be connected to pin 2 (STLINK-PWR tools with STM32CubeMonitor-Power or ULPBench probe as an example).

1. *The default configuration in shown in bold.*

7 Hardware layout and configuration

The NUCLEO-H5E5ZJ board is designed around the STM32H5E5ZJT6 microcontroller in an LQFP144 package. Figure 4 shows the connections between the MCU and its peripherals (STLINK-V3EC, push-buttons, LEDs, USB, and ARDUINO® and ST morpho connectors). Figure 5 and Figure 6 show the location of these features on the NUCLEO-H5E5ZJ board.

The mechanical dimensions of the board are shown in Figure 7.

7.1 Hardware layout

Figure 4. NUCLEO-H5E5ZJ block diagram

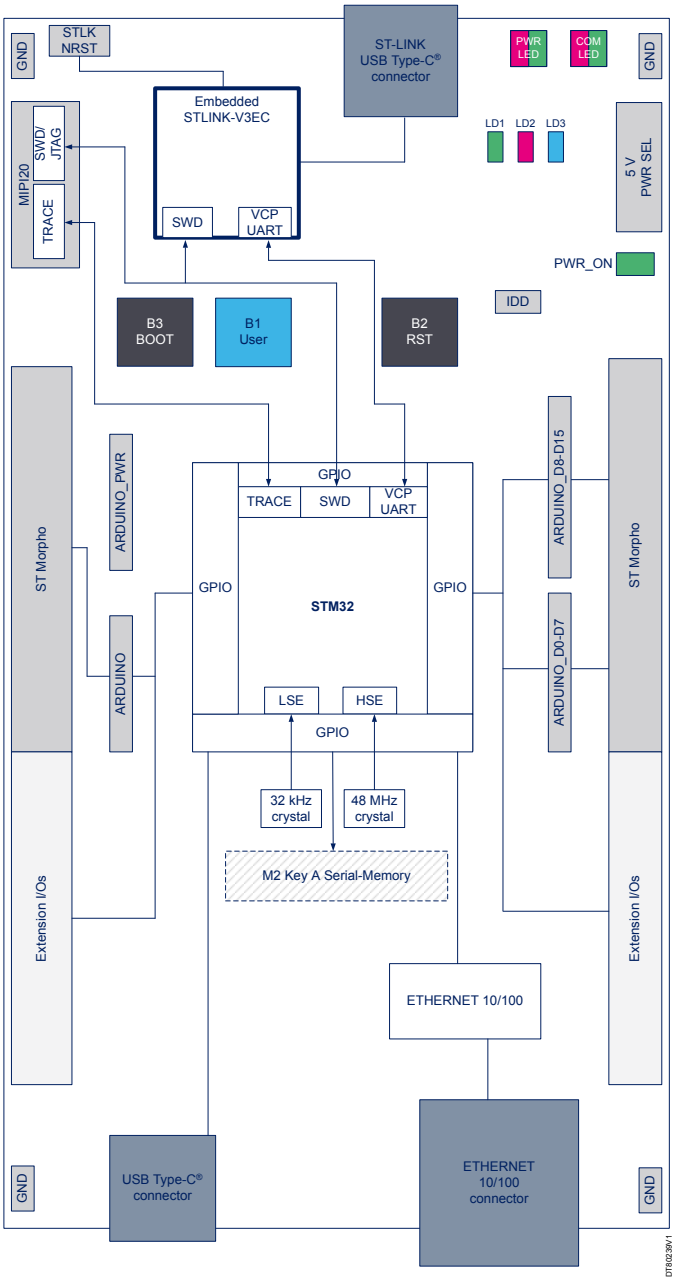


Figure 5. NUCLEO-H5E5ZJ top layout

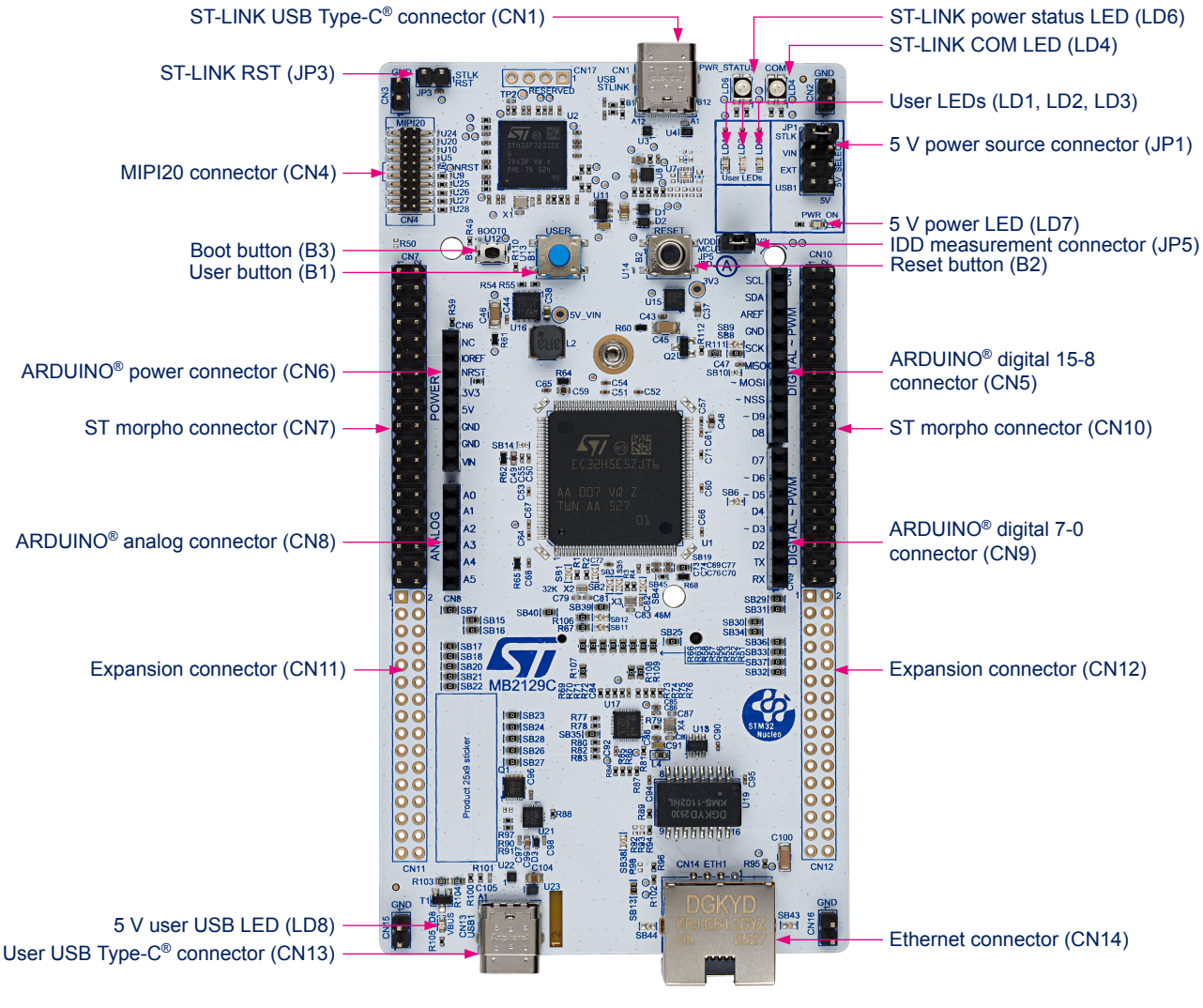
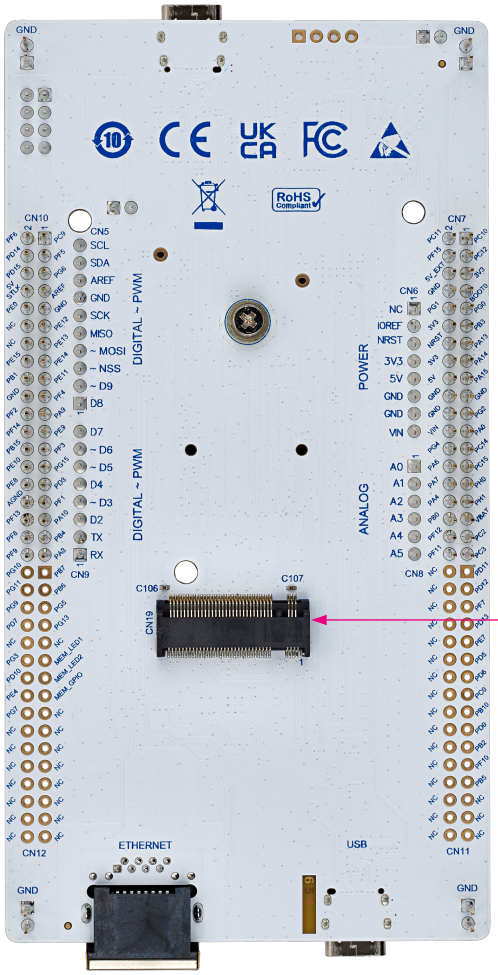
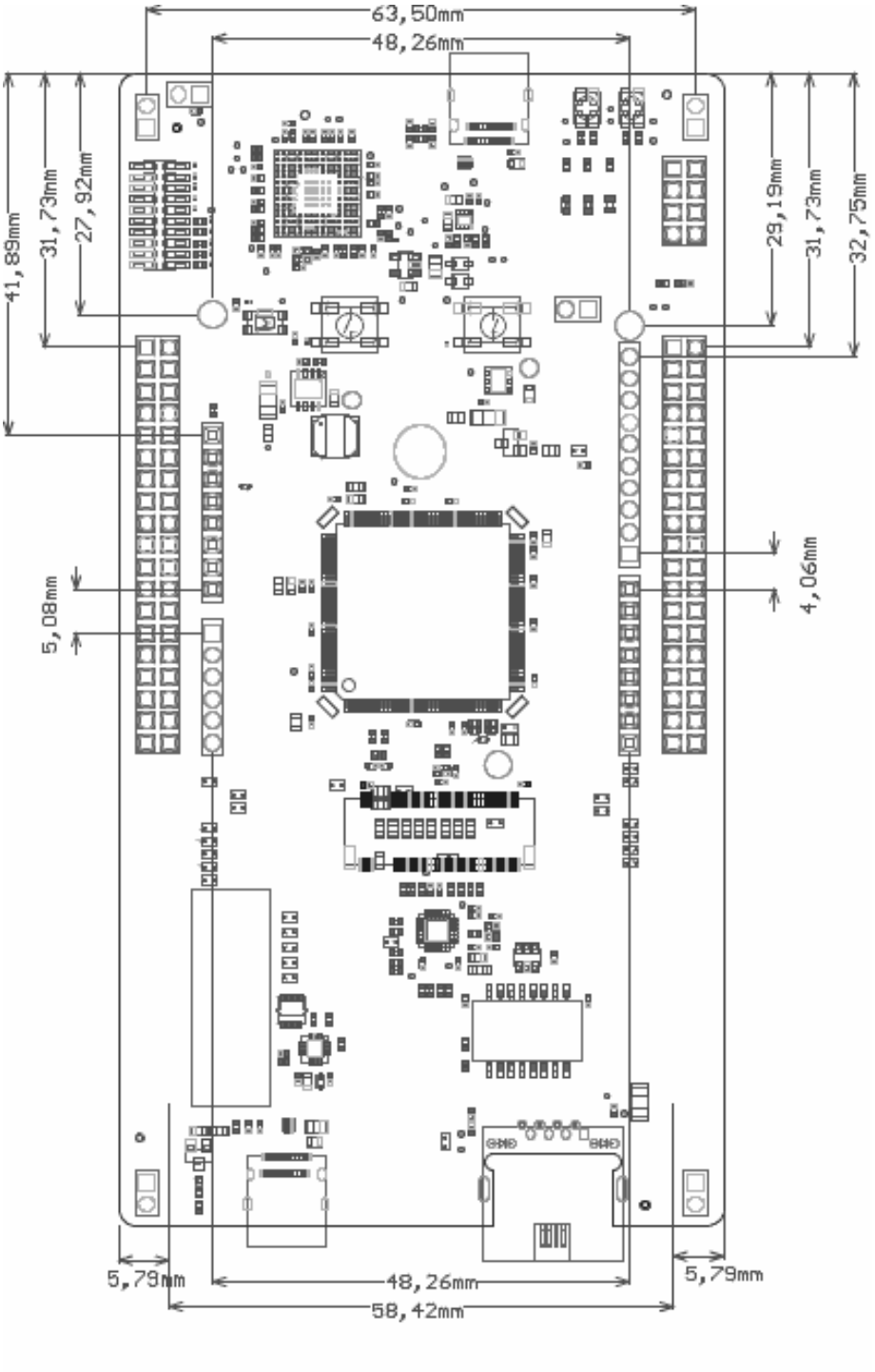


Figure 6. **NUCLEO-H5E5ZJ bottom layout**



7.2 Mechanical dimensions

Figure 7. **NUCLEO-H5E5ZJ mechanical drawing (in millimeters)**



7.3 Embedded STLINK-V3EC

STLINK-V3EC is the embedded version of the STLINK-V3 included in the design of the NUCLEO-H5E5ZJ board. It allows access to the programming, debugging, and monitoring functions of the STM32 microcontroller through the USB STLK connector (CN1).

The following sections describe the implementation of STLINK-V3EC on this STM32H5 Nucleo-144 board.

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

7.3.1 Description

The STLINK-V3EC is integrated in the NUCLEO-H5E5ZJ board. It supports SWD/JTAG and Virtual COM port (VCP) for STM32 devices.

STLINK-V3EC supports the following features:

- 5 V/3 A power supplied by the USB Type-C® connector (CN1)
- USB 2.0 high-speed-compatible interface
- JTAG and Serial Wire Debug (SWD) with Serial Wire Viewer (SWV)
- Virtual COM port
- COM status LED (LD4), which blinks during communication with the PC
- Power status LED (LD6), which identifies the status of current output to the board
- USB Type-C® overvoltage protection (U8) with current limitation

7.3.2 Drivers

Before connecting the NUCLEO-H5E5ZJ board to a Windows® PC through USB, the user must install a driver for STLINK-V3EC (not required for Windows® 10). It is available for download from the *st.com* website.

7.3.3 Firmware upgrade

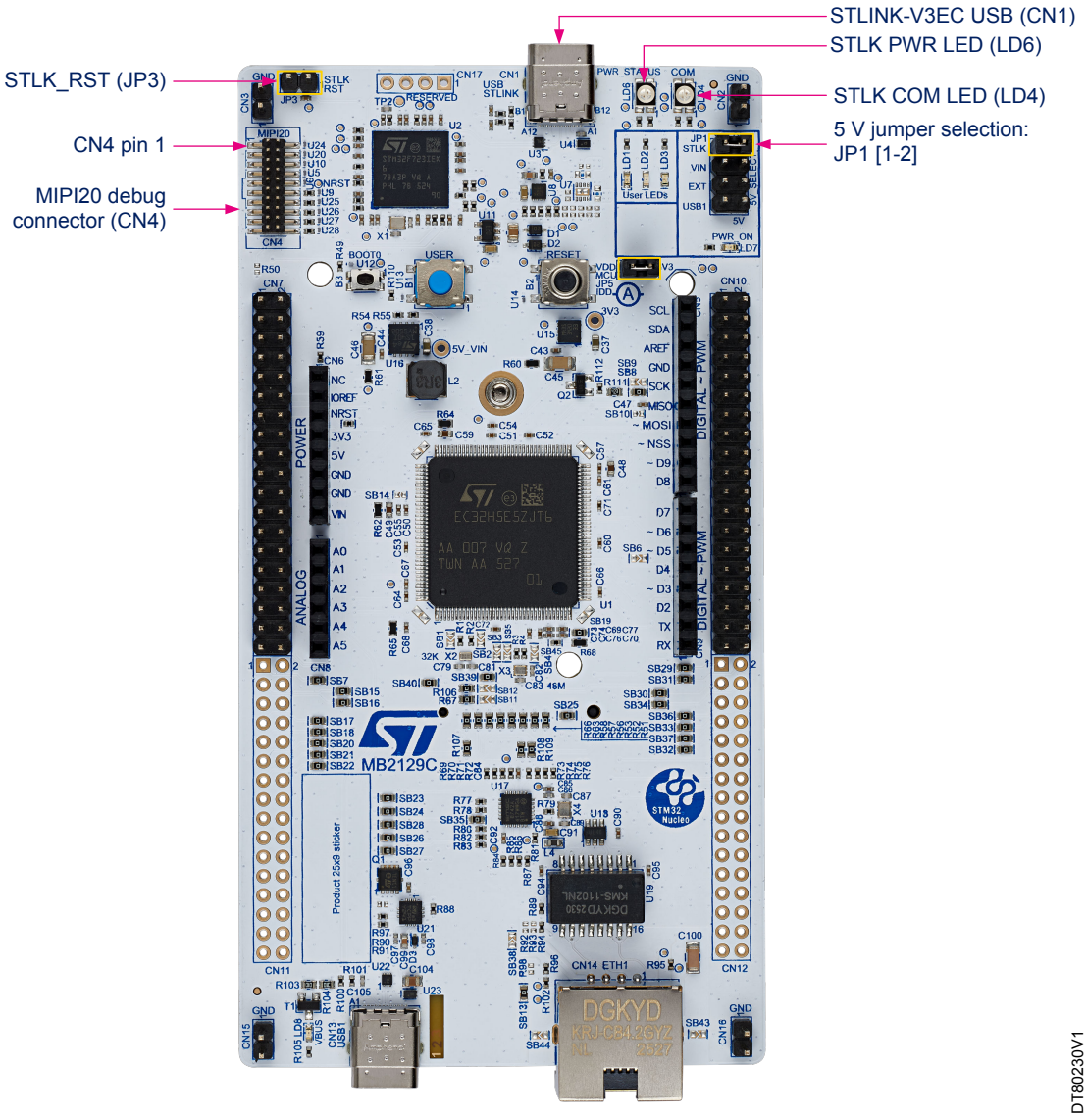
STLINK-V3EC embeds a firmware upgrade (STSW-LINK007) mechanism for in-place upgrades through the USB port. The firmware might evolve during the lifetime of the STLINK-V3EC product (for example, the addition of new functionalities, bug fixes, or support for new microcontroller families). It is recommended to visit the *st.com* website before using the NUCLEO-H5E5ZJ board and to stay up-to-date with the latest firmware version.

7.3.4 Using an external tool to program and debug the onboard STM32 MCU

Before connecting an external debug tool to the MIPI20 debug connector (CN4), fit the jumper on JP3 to disable the ST-LINK MCU (U2) and isolate the SWD and VCP signals from STLINK-V3EC. Refer to Table 4 for further details on the configuration of JP3.

Once the jumper is fitted on JP3, an external debug tool can be connected to the MIPI20 debug connector (CN4).

Figure 8. Connecting an external tool to debug and program the onboard STM32H5 MCU



Note: The MIPI20 TRACE connector supports 3V3 for target reference voltage. When using the MIPI20 external debug connector (CN4), STLINK-V3EC can be used to supply the board through the USB Type-C® connector (CN1). Otherwise, another power supply source can be selected; refer to Section 7.4: Power supply for further details.

Table 6. MIPI20 debug connector (CN4) pinout

MIPI20 pin	CN4	Designation
1	VTref	Target reference voltage (fed from 3V3)
2	SWDIO/JTMS	Target SWDIO using SWD protocol or target JTMS using JTAG protocol
3	GND	Ground
4	SWCLK/JTCK	Target SWCLK using SWD protocol or target JTCK using JTAG protocol
5	GND	Ground
6	SWO/JTDO	Target SWO using SWD protocol or target JTDO using JTAG protocol
7	KEY	Not connected

MIPI20 pin	CN4	Designation
8	JTDI	Not used by SWD protocol, target JTDI using JTAG protocol
9	GND	Ground
10	NRST	Target NRST using SWD protocol
11	GND / TgtPwr	Probe dependent • Ground • 5 V from debugger to target MCU (not supported; R50 unmounted)
12	TRACECLK	Trace CLK
13	GND / TgtPwr	Probe dependent • Ground • 5 V from debugger to target MCU (not supported; R50 unmounted)
14	TRACED0	Trace Data0
15	GND	Ground
16	TRACED1	Trace Data1
17	GND	Ground
18	TRACED2	Trace Data2
19	GND	Ground
20	TRACED3	Trace Data3

7.3.5 Virtual COM port

The USART1 serial interface (PD8/PD9) is directly available as a Virtual COM port of the PC connected to the STLINK-V3EC USB connector (CN1).

7.4 Power supply

7.4.1 External power supply input

The NUCLEO-H5E5ZJ Nucleo-144 board can take any of the following sources as its power supply:

- 5V_STLK: 5 V from the STLINK-V3EC USB Type-C® connector (CN1)
- 5V_VIN: 7 to 12 V from the ARDUINO® (CN6, pin 8) or ST morpho (CN7, pin 24) connector
- 5V_EXT: external 5 V power supply from the ST morpho connector (CN7, pin 6)
- USB1: a host PC connected to the user USB Type-C® connector (CN13) through a USB cable.
- 3V3: an external 3.3 V power supply connected to pin 5 of the ST morpho connector (CN7) or the 3.3 V test point.

If the power supply is +3.3 V, STLINK-V3EC is not powered and cannot be used. If the power supply is a wall charger connected to CN1, debugging through STLINK-V3EC is not possible. An external debug tool must be connected to the MIPI20 connector (CN4).

To power NUCLEO-H5E5ZJ Nucleo-144 board and the associated shield correctly, use a source that supports up to 5 V/2 A or 3.3 V/1.5 A.

The power supply capabilities are summarized in Table 7.

Table 7. Power source capabilities

Input power name	Connector pins	Voltage range	Recommended current	Limitation
STLK	CN1 USB connector JP1 [1-2]	4.75 V to 5.25 V	2 A	Maximum current depending on the presence or absence of USB enumeration and the USB power source used to power the board.
VIN/5V_VIN	CN6 pin 8	7 V to 12 V	2 A	From 7 V to 12 V depending on the shield used.

Input power name	Connector pins	Voltage range	Recommended current	Limitation
	CN7 pin 24 JP1 [3-4]			
EXT	CN7 pin 6 JP1 [5-6]	4.75 V to 5.25 V	2 A	Maximum current depending on the power source.
USB1	CN13 USB connector JP1 [7-8]	4.75 V to 5.25 V	2 A	Maximum current depending on the USB Host used to power the board.
3V3	CN7 pin 5 3.3V TP	3 V to 3.6 V	1.5 A	Maximum current depending on the 3V3 source; 1.5 A recommended. For external 3.3 V, STLINK-V3EC is not powered and cannot be used.

5V_STLK

STLK is the 5 V DC power source coming from the STLINK-V3EC USB connector (CN1) to power the STM32H5 Nucleo-144 board and its shield. To select this power source, JP1 must be set on [1-2] (STLK) (refer to Figure 9). This is the default setting.

If the USB enumeration succeeds, 5V_STLK power is enabled by asserting the T_PWR_EN signal from STLINK-V3EC. This pin is connected to a power switch (U8), which powers the board. This power switch also features a current limitation to protect the PC in case of an onboard short circuit. If an overcurrent (>3.2 A) happens occurs, the PWR_STATUS LED (LD6) lights up in red.

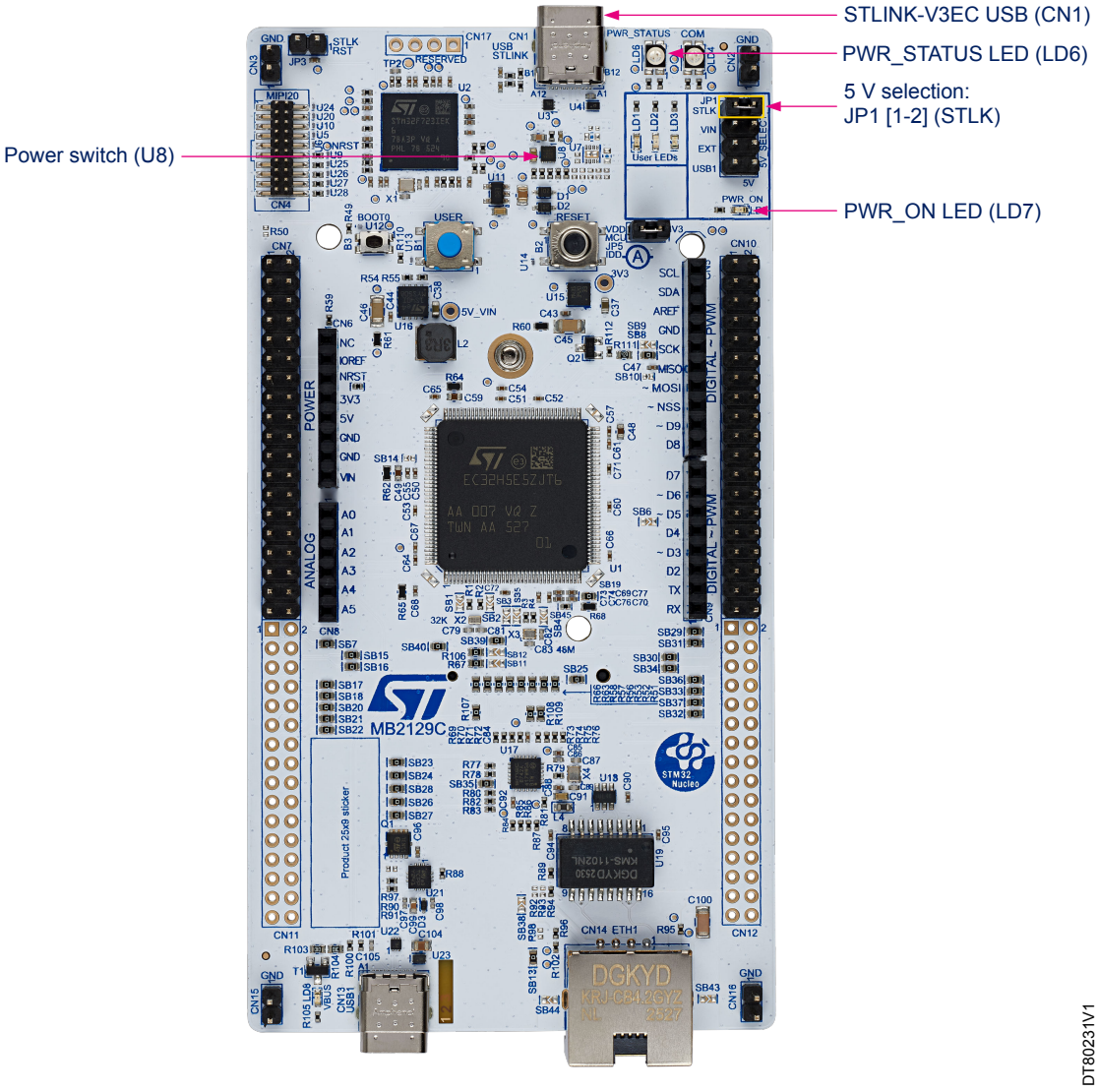
If the host can provide the required power, the power switch and the green PWR_ON LED (LD7) are turned on. The maximum current the board can consume is 3A.

If the host is unable to provide the requested current, the enumeration fails. The power switch (U8) remains off and the MCU, including the extension board, is not powered. Consequently, the green PWR_ON LED (LD7) remains turned off. In this case, using an external power supply is mandatory.

Warning: *If the maximum current consumption of the STM32H5 Nucleo-144 board and its shield exceeds 3.2 A, using an external power supply connected to EXT, VIN, or 3V3 is mandatory to power the board.*

This power supply input can also be used with a USB charger. In this case, the embedded ST-LINK can't be used for debugging. Refer to Section 7.3.4: Using an external tool to program and debug the onboard STM32 MCU for further details.

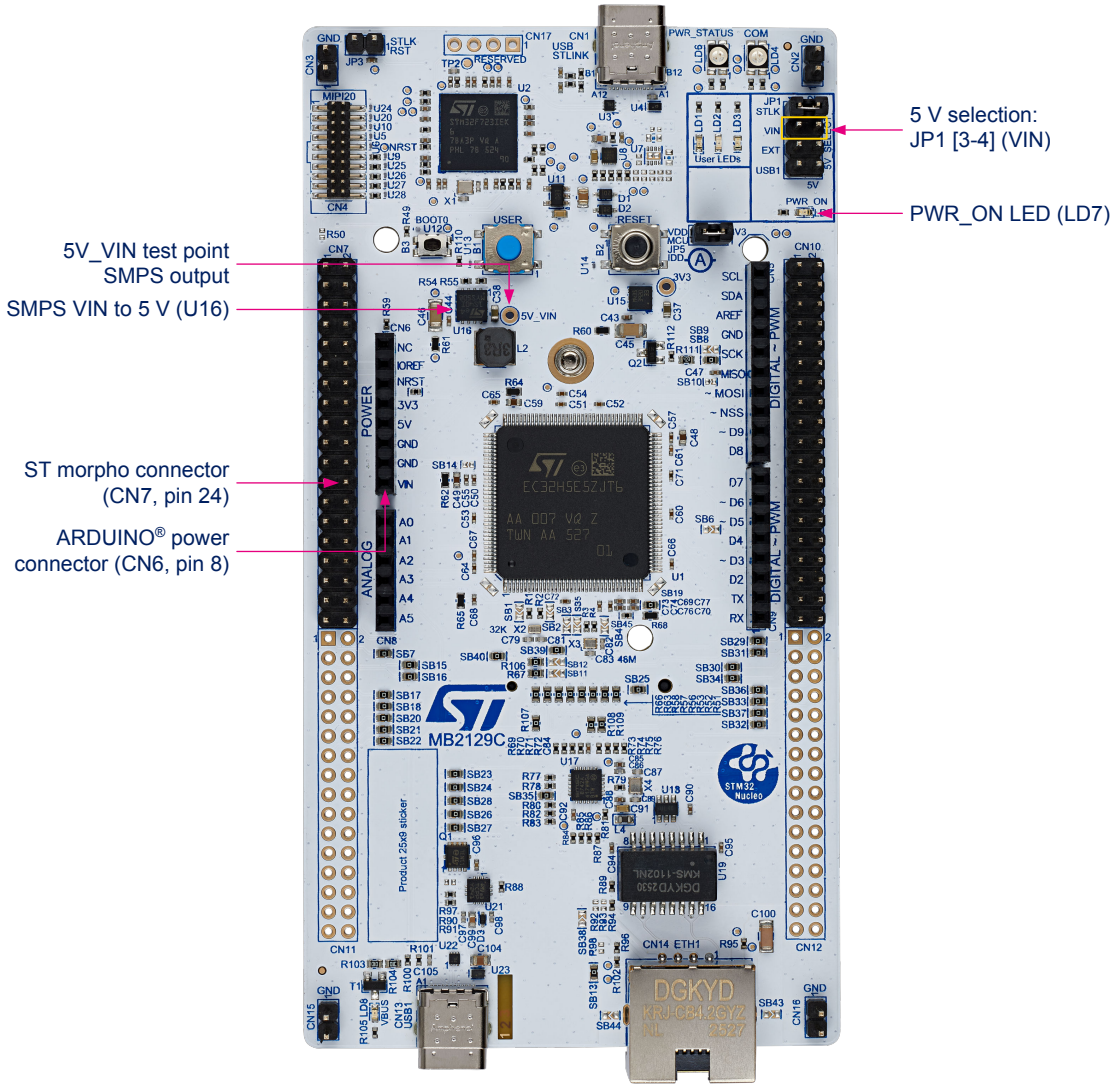
Figure 9. **JP1 [1-2]: 5V_STLK power source**



VIN (5V_VIN)

VIN is the 7 to 12 V DC power from the ARDUINO® connector (CN6) pin 8 named VIN on the connector silkscreen or from the ST morpho connector CN7 pin 24. To select the 5V_VIN power source, the JP1 jumper must be on pin [3-4]. A switched-mode power supply (SMPS, U16) provides the fixed 5 V from VIN (7-12 V).

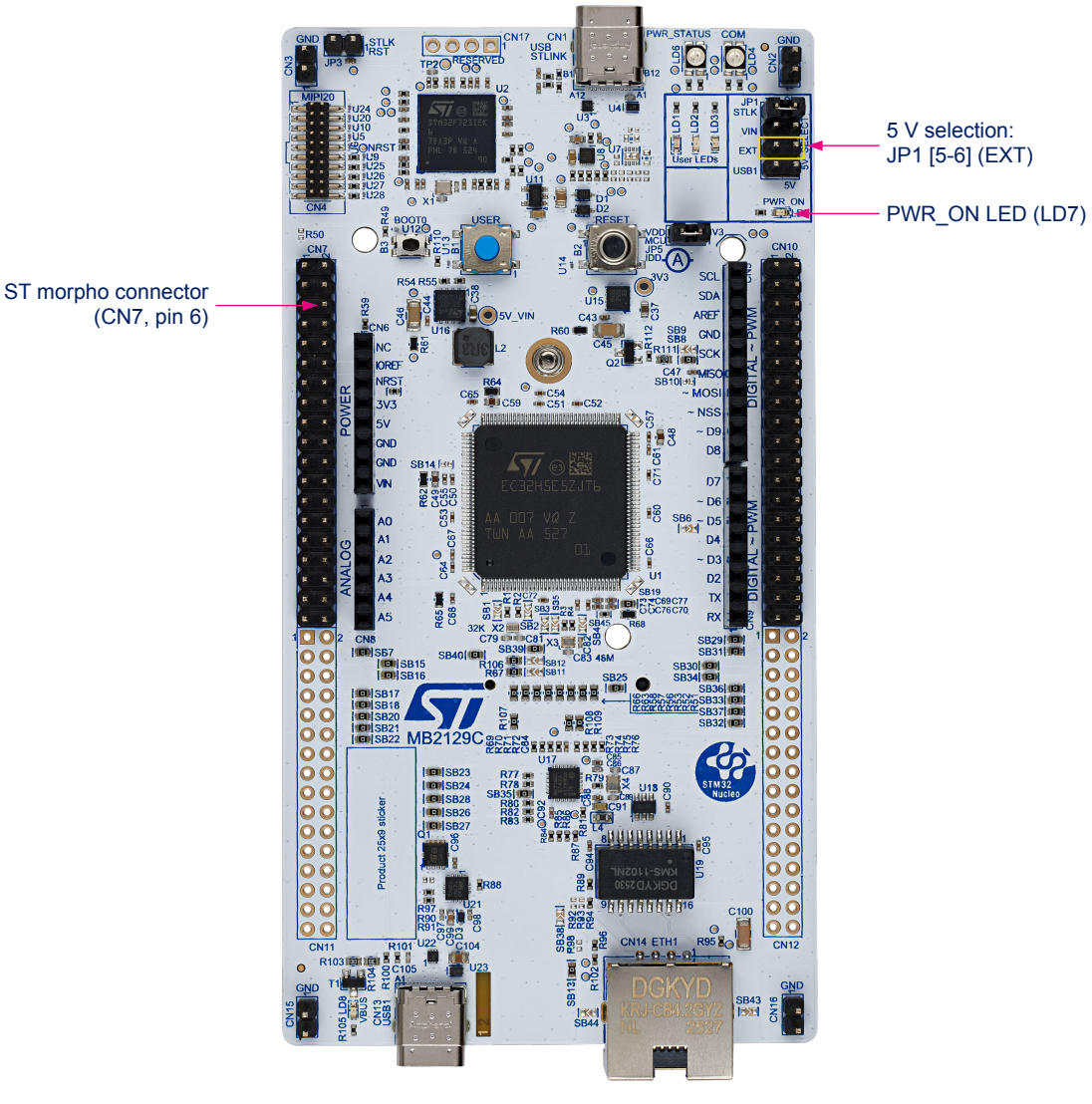
Figure 10. JP1 [3-4]: 5V_VIN power source



5V_EXT

5V_EXT is the DC power coming from an external 5 V DC power source connected to the ST morpho connector (CN7, pin 6). The 5 V jumper selection (JP1) must be on pin [5-6].

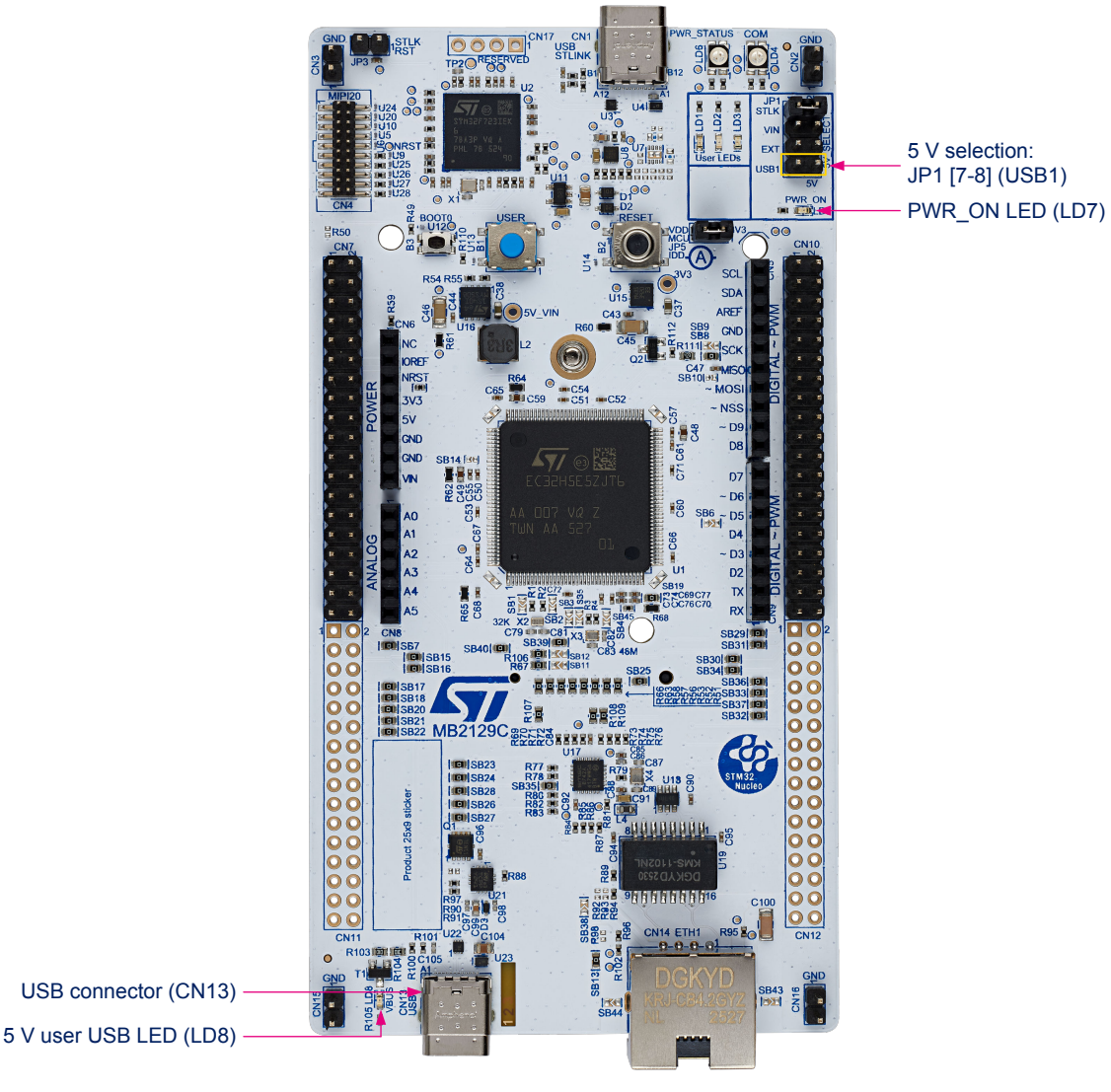
Figure 11. JP1[5-6]: 5V_EXT power source



USB1

USB1 is the DC power supply coming from the user USB Type-C®connector (CN13). To select this power source, the JP1 jumper must be on pin [7-8].

Figure 12. JP1 [7-8]: 5V_USB_SNK power source



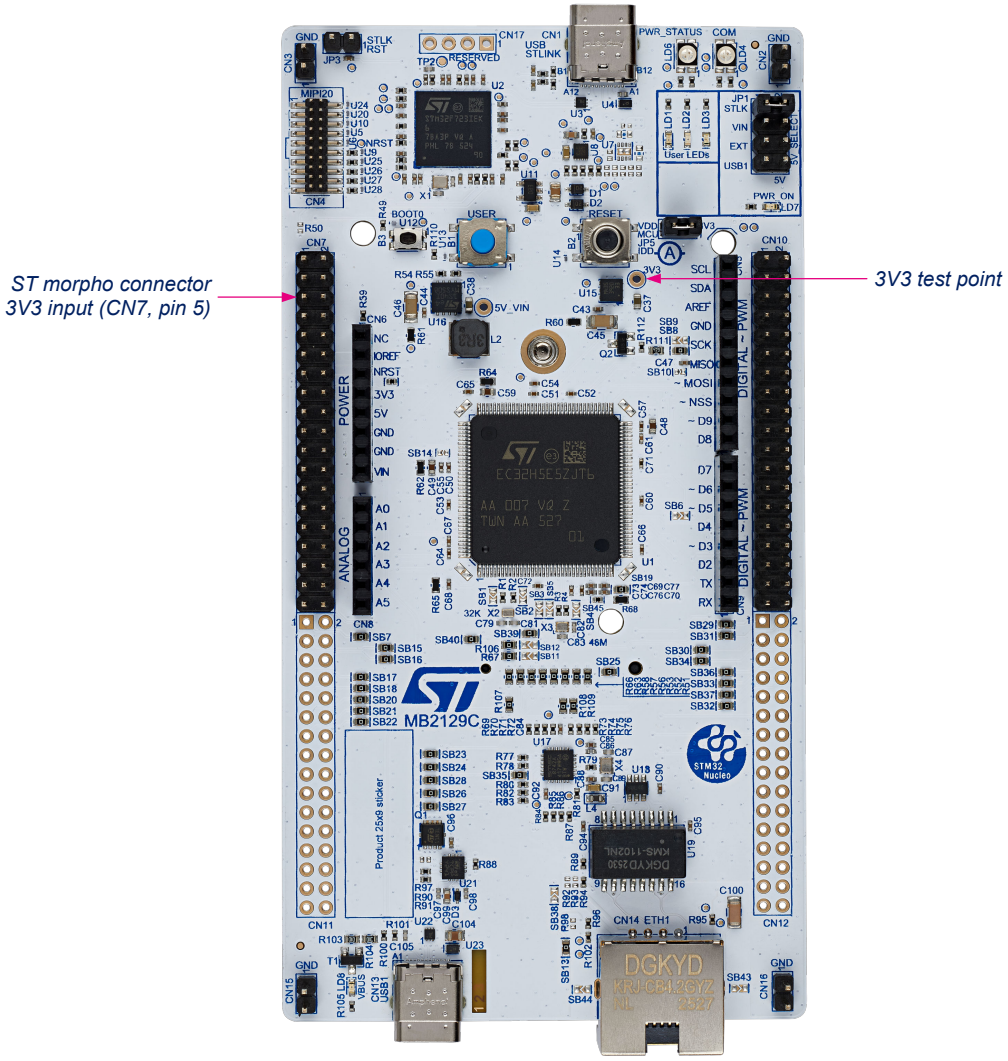
External 3V3

In certain scenarios, like when the 3.3 V supply is provided by an extension board, it can be interesting to use an external 3.3 V source on the 3V3 input (CN7 pin 5) or the 3.3 V test point. When the NUCLEO-H5E5ZJ Nucleo-144 board is powered by a 3.3 V source only, STLINK-V3EC is not powered and programming and debugging are unavailable.

Note: When connecting a 3.3 V power source to pin 5 of CN7 or the 3.3V test point, keep the jumper on JP5 to supply the STM32 target.

Connecting a 3.3 V power source to VDD_MCU only (JP5, pin 2) powers only the STM32 MCU. In this case, STLINK-V3EC, push-buttons, LEDs, and other peripherals are not supplied. This option can be used for MCU power consumption measurement..

Figure 13. ***External 3V3 power supply***



7.4.2 Programing/debugging when the power supply is not from STLINK-V3EC (5V_STLK)

When the board is powered by VIN, EXT, or USB1, the STLINK-V3EC can still be used for programming or debugging. Follow the sequence below to ensure successful enumeration:

1. Set the JP1 jumper according to the selected 5 V external power source.
2. Connect the external power source.
3. Turn on the external power supply.
4. Verify that the green PWR_ON LED (LD7) is illuminated.
5. Connect the PC to the ST-LINK USB connector (CN1) to start programming and debugging.

If this sequence is not followed, the board may be powered first by V_{BUS} from STLINK-V3EC, which can cause the following issues:

- If the board requires more current than the STLINK-V3EC or PC can supply, the PC may be damaged or limit the current, resulting in incorrect board power.
- If the current requested during enumeration is too high, the PC may reject the request, causing enumeration to fail. Consequently, the board does not power on and the green power LED (LD7) remains turned off.

7.4.3 Power supply output

5V

Regardless of the power source (STLINK-V3EC, VIN, EXT, or USB1), the 5 V generated is available on CN6 pin 5 or CN7 pin 18. It can be used as an output power supply for an ARDUINO® shield or an extension board. In this case, the maximum current of the power source specified in Table 7 must be adhered to.

3V3

The internal 3.3V supply, available on CN6 pin 4 or CN7 pin 16, can also be used as a power output. The current is limited by the maximum capacity of the SMPS (3.3 V/2 A, U15), which must support both the Nucleo board and any connected shield consumption.

7.4.4 VDD_MCU: IDD measurement

The labeled IDD jumper (JP5) is used to measure the current consumption of the STM32 MCU by removing the jumper and connecting an ammeter or another current measurement device.

- Jumper ON: the MCU is powered by the internal 3.3 V supply (default).
- Jumper OFF: an ammeter or an external 3.3 V power source must be connected to power the MCU and measure its current consumption.

7.5 Clock sources

7.5.1 LSE clock references

There are three methods to set up the pins associated with the low-speed external clock (LSE), which are detailed below.

LSE onboard oscillator X2 crystal (default configuration)

Refer to the application note *Guidelines for oscillator design on STM8AF/AL/S and STM32 MCUs/MPUs* (AN2867), for details on this LSEclock.

The crystal embedded in the STM32H5 Nucleo-144 board has the following characteristics: 32.768 kHz, 6 pF load capacitance, and 20 ppm.

The following configuration is needed:

- R1 and R2 ON
- SB1 and SB2 OFF

External oscillator on PC14

The input clock comes from an external oscillator via the PC14 signal on the ST morpho connector (CN7 pin 25). The following configuration is needed:

- SB1 ON
- R1, R2, and SB2 OFF

LSE not used

PC14 and PC15 are used as GPIOs instead of low-speed clocks. The following configuration is needed:

- SB1 and SB2 ON
- R1 and R2 OFF

7.5.2 HSE clock references

There are four ways to configure the pins corresponding to the high-speed external clock (HSE), which are detailed below.

HSE onboard oscillator X3 crystal

For typical frequencies, capacitors, and resistors, refer to the STM32 microcontroller datasheet. Refer to the application note *Guidelines for oscillator design on STM8AF/AL/S and STM32 MCUs/MPUs* (AN2867).

The X3 crystal embedded in the NUCLEO-H5E5ZJ board has the following characteristics: 48 MHz, 6 pF load capacitance, and 20 ppm. The following configuration applies:

- R3 and R4 ON
- SB3, SB4, and SB5 (MCO) OFF

External oscillator on PH0

The input clock comes from an external oscillator through PH0, CN7 pin 29. The following configuration is required:

- SB3 ON
- R3, R4, SB4, and SB5 (MCO) OFF

MCO from STLINK-V3EC

The MCO output of the STLINK-V3EC MCU is used as an input clock. The MCO is connected to the PH0-OSC_IN pin of the STM32H5 microcontroller.

The clock frequency can be changed (4.8, 6, or 8 MHz) by using the STLinkUpgrade user interface.

The use of this clock source requires the following configuration:

- SB5 (MCO) ON
- R3, R4, SB3, and SB4 OFF

HSE not used (default configuration)

PH0 and PH1 are used as GPIOs instead of clocks. This requires the following configuration:

- SB3 and SB4 ON
- R3, R4, an SB5 (MCO) OFF

7.6 Boot modes

There is one BOOT pin connected on this board to select the boot mode.

When the user option byte PRODUCT_STATE is 0xED (open), two different boot areas can be selected through the BOOT0 pin on the STM32H5 Nucleo-144 board and the boot base address programmed in the BOOTADD option byte, as shown in Table 8.

Table 8. Boot options

Boot pin level(1)	Boot address option bytes(1)	Boot space(1)
0	**BOOTADD[23:0]**	**Boot address defined by the user option byte BOOTADD[23:0]. ST programmed value: flash memory at 0x1800 0000.**
1	-	Boot address is defined by ST to secure boot within system flash memory (0x1Cxx xxxx).

1. *The default configuration is shown in bold.*

The boot button must be pressed during the RESET state of the board to assert the BOOT0 pin level. When the button is pressed the logic state is HIGH; otherwise, the logic state is LOW.

7.7 Reset sources

The reset signal of the NUCLEO-H5E5ZJ Nucleo-144 board is active LOW and the reset sources include:

- Reset button (B2)
- Embedded STLINK-V3EC (CN1)
- ARDUINO® connector (CN6 pin 3)
- ST morpho connector (CN7 pin 14)

7.8 LEDs

The NUCLEO-H5E5ZJ Nucleo-144 board contains seven LEDs:

- PWR_ON LED (LD7). This green LED indicates that the STM32 part is powered by a 5 V source.
- Three user LEDs (LD1, LD2, LD3):
  - The green LED (LD1) is connected to the PA3 I/O of the STM32 MCU. Active HIGH.
  - The red LED (LD2) is connected to the PF0 I/O of the STM32 MCU. Active LOW.
  - The blue LED (LD3) is connected to the PE5 I/O of the STM32 MCU. Active LOW.
- STLINK-V3EC tricolor LEDs (LD4 and LD6). The tricolor (green, orange, and red) LEDs provide information about the STLINK-V3EC communication status (LD4) and power status (LD6). For detailed information about these LEDs, refer to the technical note *Overview of STLINK derivatives* (TN1235).
- USB Type-C® LED (LD8). This green LED (LD8) indicates the V_{BUS} presence on the user USB Type-C® connector (CN13).

7.9 Push-buttons

Three push-buttons are available on the NUCLEO-H5E5ZJ Nucleo-144 board: the user button (B1), the reset button (B2), and the boot mode button (B3).

User button (B1)

The blue user button is connected to the STM32 PC13 I/O pin. This I/O supports the wake-up functionality of the STM32H5 series microcontroller. When the button is pressed, the logic state is HIGH; otherwise, it is LOW.

Reset button (B2)

This black push-button is connected to the STM32 NRST pin and is used to reset the STM32H5 series microcontroller.

Refer to Section 7.7: Reset sources for a complete overview of the NUCLEO-H5E5ZJ reset sources.

Boot mode button (B3)

This black push-button is connected to the STM32 BOOT0 pin and is used to control the STM32H5E5ZJT6 boot mode.

Refer to Section 7.6: Boot modes for further details on the NUCLEO-H5E5ZJ boot modes.

7.10 USB Type-C® HS

The NUCLEO-H5E5ZJ board supportsUSB high speed (HS) communication through the USB Type-C® connector (CN13). It operates exclusively in USB Type-C® Sink mode. When V_{BUS} is powered by a USB Host and the board functions as a USB Device, the green LED (LD8) illuminates.

USB HS Device

With the USB stack inside the STM32H5 microcontroller, when a USB Host connects to the USB Type-C® connector (CN13) on the NUCLEO-H5E5ZJ board, the board operates as a USB Device.

Depending on the power capability of the USB Host, the board can be powered through the CN13 VBUS terminal, referred to as USB1 in the schematic diagrams. The board supports a 5 V USB supply ranging from 4.75 to 5.25 V. On the MCU side, the VDD_USB pin supports only 3.3 V. Refer to Section 7.4: Power supply for further information on USB1 power options.

The USB HS data interface connects directly between CN13 and the STM32H5 OTG1_DM and OTG1_DP pins.

USB Type-C® Power Delivery (UCPD)

USB Type-C® introduces the USB Type-C® Power Delivery (UCPD) feature. The NUCLEO-H5E5ZJ board supports dead-battery and Sink modes.

In addition to the DP and DM I/Os directly connected to the USB Type-C® connector, five additional I/Os are used for UCPD configuration:

- Configuration channel (UCPD_CC1 and UCPD_CC2)
- VBUS-SENSE
- UCPD dead battery (UCPD_DBn)
- UCPD_FLT (FAULT) feature.

To protect the NUCLEO-H5E5ZJ board from USB overvoltage, a programmable power supply (PPS)-compliant USB Type-C® port protection is used: TCPP01-M12 IEC6100-4-2 level 4-compliant IC.

- **Configuration channel I/O (UCPD_CCx):** connected through the USB port protection IC (TCPP01-M12) to the CCx lines of the USB Type-C® connector. These lines select the USB Type-C® current mode. The board supports Sink mode only.
- **Dead-battery I/O (UCPD_DBn):** connected to the DBn line of TCPP01-M12, which internally manages dead-battery resistors.
- **VBUS fault detection (UCPD_FLT):** provided by the USB port protection IC to report faults to the MCU after detecting abnormal V_{BUS} levels. The board's V_{BUS} protection is set to a maximum of 6 V (R90 is 2.4 kΩ to select this level).

For detailed information on UCPD with TCPP01-M12 USB Type-C® port protection in Sink applications, refer to the application note *Introduction to USB Type-C® Power Delivery for STM32 MCUs and MPUs* (AN5225).

Table 9 provides the hardware configuration for the USB Type-C® Power Delivery feature.

Table 9. UCPD hardware configuration

Pin name	Function	Description
PB13	UCPD_CC1	PB13 is connected to the USB Type-C® port protection and used as UCPD_CC1.
PB14	UCPD_CC2	PB14 is connected to the USB Type-C® port protection and used as UCPD_CC2.
PA11	VBUS_SENSE	PA11 is used to sense the VBUS (GPIO detection)

Pin name	Function	Description
PB9	UCPD_DBn	PB9 is connected to the USB Type-C® port protection and is used as a dead battery feature.
PB8	UCPD_FLT	PB8 is connected to the USB Type-C® port protection and used as overvoltage fault reporting to the MCU

7.11 Ethernet

The NUCLEO-H5E5ZJ board supports 10M/100M Ethernet communication via the LAN8742A-CZ-TR PHY (U17) and RJ45 connector (CN14). The Ethernet PHY connects to the STM32H5 microcontroller through the RMII interface. The PHY RMII_REF_CLK provides a 50 MHz clock to the microcontroller.

Note: To achieve the expected low-power mode current, the LAN8742A PHY must be set to power-down mode, which disables the Ethernet PHY reference clock. This is done by setting bit 11 (power down) of the Ethernet PHY basic control register (address 0x00) to "1". Alternatively, R77 on RMII.REF_CLK can be turned OFF to achieve the same effect.

The LAN8742A PHY must be in power-down mode before using the STM32H5 I/Os on the extension connector, or the corresponding SB can be removed as indicated in the table below.

Table 10. Ethernet pin configuration

Pin name	Function	Description
PA1	RMII reference clock	PA1 is used as RMII REF CLK
PA2	RMII Management Data	PA2 is used as RMII MDIO
PC1	RMII Management data clock	PC1 is used as RMII MDC
PD1	RMII RX data valid (CRS_DV)	PD1 is used as RMII CRS_DV
PC4	RMII RXD0	PC4 is used as RMII RXD0
PC5	RMII RXD1	PB7 is used as RMII RXD1
PA5	RMII TX enable	PA5 is used as RMII TX EN
PB12	RMII TXD0	PB12 is used as RMII TXD0
PG12	RMII TXD1	PG12 is used as RMII TXD1
PD4	ETH CLK	PD4 (ETH CLK) is used as Phy clock

7.12 Virtual COM port (VCP)

An STM32 serial interface is connected to the STLINK-V3EC debug interface. Communication between the target MCU and the STLINK-V3EC MCU is enabled via USART3 on the STM32H5 pins PD8 (USART3_TX) and PD9 (USART3_RX). This interface supports BOOTLOADER mode.

7.13 Solder bridge configuration

Table 11 summarizes the solder bridges on the STM32H5E5ZJT6 board that configure the internal or external usage of the I/O signals on the expansion connector.

Table 11. Solder bridge configuration

Function	Solder bridge	Setting(1) (2)	Comments(1)
LSE (PC14, PC15)	SB1/SB2	**OFF**	**PC14/PC15 connected to the internal crystal for LSE functions. (R1/R2 ON)**
		ON	PC14/PC15 connected to the ST morpho connector. 32 kHz crystal not used. (R1/R2 must be OFF)
HSE (PH0, PH1)	SB3/SB4	**OFF**	**PH0/PH1 connected to the internal crystal for HSE functions. (R3/R4 ON)**

Function	Solder bridge	Setting[1] [2]	Comments[1]
HSE (PH0, PH1)	SB3/SB4	ON	PH0/PH1 connected to the ST morpho connector. 48 MHz crystal not used. (R3/R4 must be OFF)
	SB5	**OFF**	**MCO (8MHz) from STLINK-V3EC not used for HSE**
		ON	MCO (8 MHz) from STLINK-V3EC can be used for HSE. 48 MHz crystal not used (SB3 and R3 must be OFF)

1. *The default configuration is shown in bold.*
2. *All Nucleo products are shipped with solder bridges configured to match the supported target MCU.*

8 Board connectors

Eight expansion connectors are implemented on the NUCLEO-H5E5ZJ board:

- CN5, CN6, CN8, and CN9: ARDUINO® Uno V3 connectors
- CN7 and CN10: ST morpho connectors
- CN11 and CN12: footprints for expansion connectors

8.1 M.2 Key A connector (CN19)

The bottom side of the NUCLEO-H5E5ZJ Nucleo-144 board contains an M.2 Key A connector (CN19) to support external serial memory extensions. The M.2 Key A serial memory connector is connected to the STM32H5 XSPI1 interface and can support Octo-SPI memory.

Table 12. M.2 Key A connector (CN19) pinout

STM32 pin	Signal name	Pin name	Pin	Pin	Pin name	Signal name	STM32 pin
GND			1	2	VDD	3V3	-
-	-	NC	3	4	VDD	3V3	-
-	-	NC	5	6	VDDIO	-	-
GND			7	KEY A			
KEY A				16	GPIO_SPI_SCK	SPI1_SCK	PG11
PD7	SPI1_MOSI	GPIO_SPI_MOSI	17	18	GPIO_LDO_EN	PG5	PG5
PG9	SPI1_MISO	GPIO_SPI_MISO	19	20	OSPI2_NCS	OSPI_NCS1	PB10
PG10	SPI1_NSS	GPIO_SPI_NSS	21	22	OSPI1_NCS	OSPI_NCS2	PD0
GND			23	24	GND		
PB2	OSPI_DQS	OSPI1_DQS	25	26	OSPI_D6	OSPI_IO6	PD6
PC0	OSPI_IO7	OSPI1_D7	27	28	OSPI_D5	OSPI_IO5	PD5
GND			29	30	GND		
PE7	OSPI_IO4	OSP1_D4	31	32	OSPI_D3	OSPI_IO3	PD13
GND			33	34	OSPI_D2	OSPI_IO2	PF7
PD12	OSPI_IO1	XSPI_D1	35	36	GND		
PD11	OSPI_IO0	XSPI_D0	37	38	GPIO_LED2	-	-
GND			39	40	GPIO_ERR_INT	-	-
PF10	OSPI_CLK	XSPI_CLK1	41	42	GPIO_LED1	-	-
PB5	OSPI_NCLK	XSPI_NCLK1	43	44	GND		
GND			45	46	RESERVED	-	-
PC0	OSPI_IO7	OSPI2_D7	47	48	RESERVED	-	-
PD6	OSPI_IO6	OSPI2_D6	49	50	GND		
GND			51	52	-	-	-
PD5	OSPI_IO5	OSPI2_D5	53	54	OSPI2_NCS	OSPI_NCS2	PD0
PE7	OSPI_IO4	OSPI2_D4	55	56	OSPI2_DQS	OSPI_DQS	PB2
GND			57	58	I2C_SDA	I2C_SDA	PB7
PD13	OSPI_IO3	OSPI2_D3	59	60	I2C_SCL	I2C_SCL	PB6
PF7	OSPI_IO2	OSPI2_D2	61	62	GPIO_ERR_INT	PG13	PG13
GND			63	64	VDDIO_SPI_I2C	3V3	3V3
PD12	OSPI_IO1	OSPI2_D1	65	66	NRST	NRST	NRST

STM32 pin	Signal name	Pin name	Pin	Pin	Pin name	Signal name	STM32 pin
PD11	OSPI_IO0	OSPI2_D0	67	68	VDDIO2	-	-
GND			69	70	GND		
PF10	OSPI_CLK	OSPI2_CLK	71	72	3V3	3V3	3V3
PB5	OSPI_NCLK	OSPI2_NCLK	73	74	3V3	3V3	3V3
GND			75	KEY A			

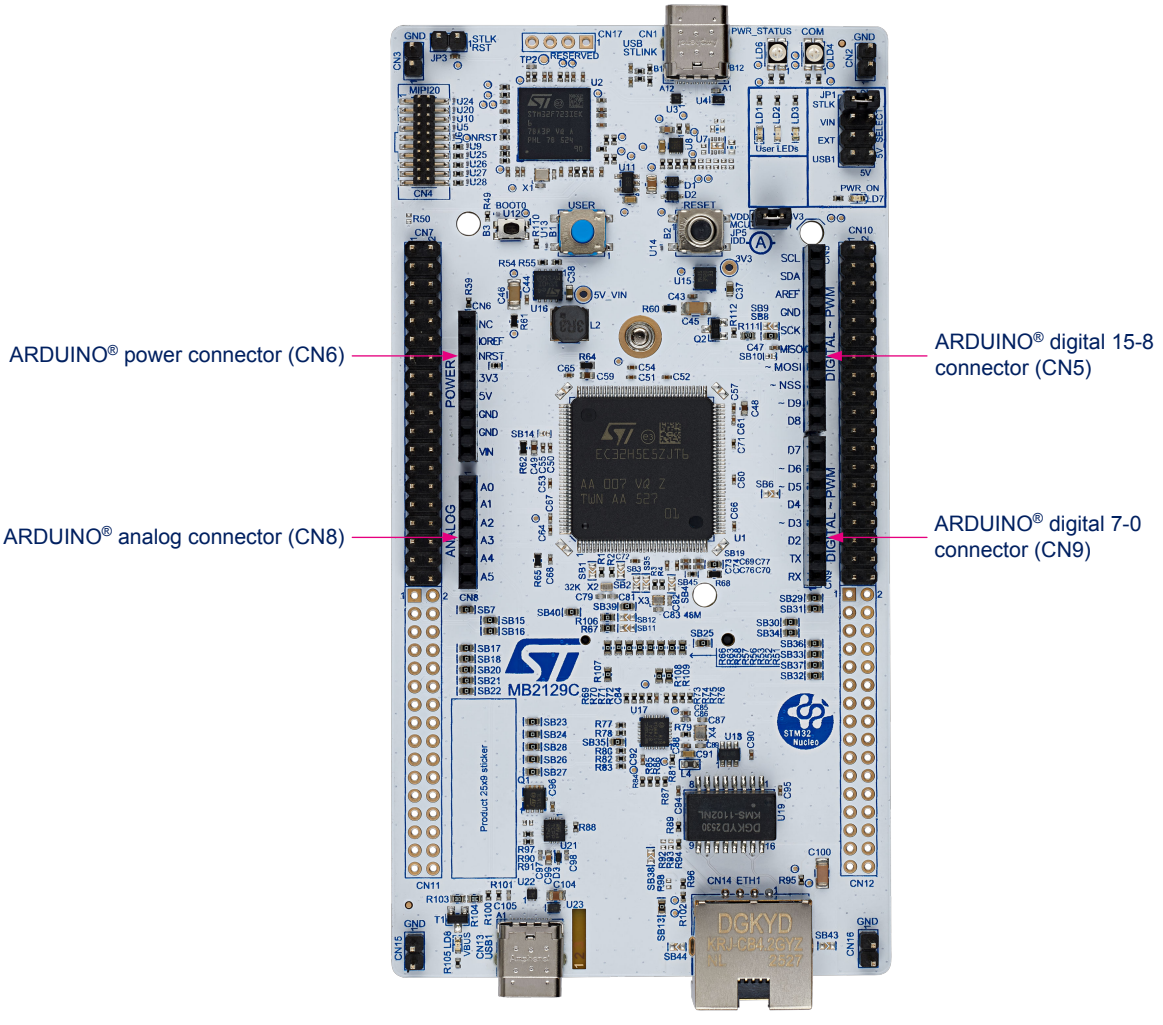
8.2 ARDUINO® Uno V3 connectors (CN5, CN6, CN8, CN9)

The ARDUINO® connectors (CN5, CN6, CN8, and CN9) are female connectors supporting the ARDUINO® Uno V3 standard.

Note: Most of the STM32 microcontroller I/Os are 5 V tolerant, but some are only compatible with 3V3. However, ARDUINO® Uno V3 operates at 5 V only. Refer to the target MCU data brief and datasheet for the detailed I/O structure.

Figure 14 indicates where the connectors are located on the board and tables 13, 14, 15, and 16 provide their pinout configurations.

Figure 14. ARDUINO® Uno V3 connectors



DT80236V1

Table 13. ARDUINO® power connector (CN6) pinout

Pin number	Pin name	Signal name	STM32 pin	MCU function
1	-	-	-	RESERVED
2	IOREF	IOREF	-	3.3 V IO REF
3	NRST	NRST	NRST	RESET
4	3V3	3V3	-	3V3 OUT
5	5V	5V	-	5V OUT
6	GND	GND	-	GND
7	GND	GND	-	GND
8	VIN	VIN	-	VIN (7-12V)

Table 14. ARDUINO® analog connector (CN8) pinout

Pin number	Pin name	Signal name	STM32 pin	MCU function
1	A0	ADC	PA6	ADC12_INP3
2	A1	ADC	PA7	ADC12_INP7
3	A2	ADC	PA4	ADC12_INP18
4	A3	ADC	PB0	ADC12_INP9
5	A4	ADC	PF12	ADC1_INP6
6	A5	ADC	PF11	ADC1_INP2

Table 15. ARDUINO® digital [7-0] connector (CN9) pinout

Pin number	Pin name	Signal name	STM32 pin	MCU function
1	D0	UART_RX	PA8	UART7_RX
2	D1	UART_TX	PB4	UART7_TX
3	D2	IO	PA10	GPIO_TIM1_CH3
4	D3	PWM	PF1	TIM2_CH2
5	D4	IO	PD3	GPIO_WKUP8
6	D5	PWM	PG15	TIM16_CH1
7	D6	PWM	PF3	TIM2_CH3
8	D7	IO	PE9	GPIO_TIM1_CH1

Table 16. **ARDUINO® digital [15-8] connector (CN5) pinout**

Pin number	Pin name	Signal name	STM32 pin	MCU function
1	D8	IO	PA9	GPIO_TIM1_CH2
2	D9	PWM	PF4	TIM2_CH4
3	D10	SPI_NSS / PWM	PE11	SPI4_NSS / TIM1_CH2
4	D11	SPI_MOSI / PWM	PE14	SPI4_MOSI / TIM1_CH4
5	D12	SPI_MISO	PE13	SPI4_MISO
6	D13	SPI_SCK	PE12	SPI4_SCK
7	GND	-	-	-
8	AREF	AREF	VREFP	VREFP(1)
9	D14	I2C_SDA / I3C_SDA	PG6	I2C4_SDA / I3C1_SDA
10	D15	I2C_SCL / I3C_SCL	PF5	I2C4_SCL / I3C1_SCL

1. *A solder bridge (SB10) is used to disconnect the STM32H5 VREFP to the ARDUINO® connector (CN5, pin 8):*
   - *SB10 OFF: VREFP is not connected to the ARDUINO® connector (CN5 pin 8) → AREF (default configuration). The STM32 VREF is directly connected to the internal 3.3 V through SB45 (ON).*
   - *SB10 ON: VREFP is connected to the ARDUINO® connector (CN5, pin 8) → AREF for external analog reference. SB45 must be OFF.*

8.3 ST morpho connectors (CN7, CN10)

The ST morpho connectors (CN7 and CN10) consist of two 2.54-mm pitch male pin header. They can be used to connect the NUCLEO-H5E5ZJ board to X-NUCLEO extension modules or to prototype or wrapping boards placed on top of it. An oscilloscope, a logic analyzer, or a voltmeter can also use this connector.

The default STM32 X-NUCLEO shields compatible with the NUCLEO-H5E5ZJ ST morpho connectors are:

- X-NUCLEO-IHM16M1 for motor control
- X-NUCLEO-GFX01M2 for graphical user interface and SPI memory

Figure 15. **ST morpho connectors (CN7 and CN10)**

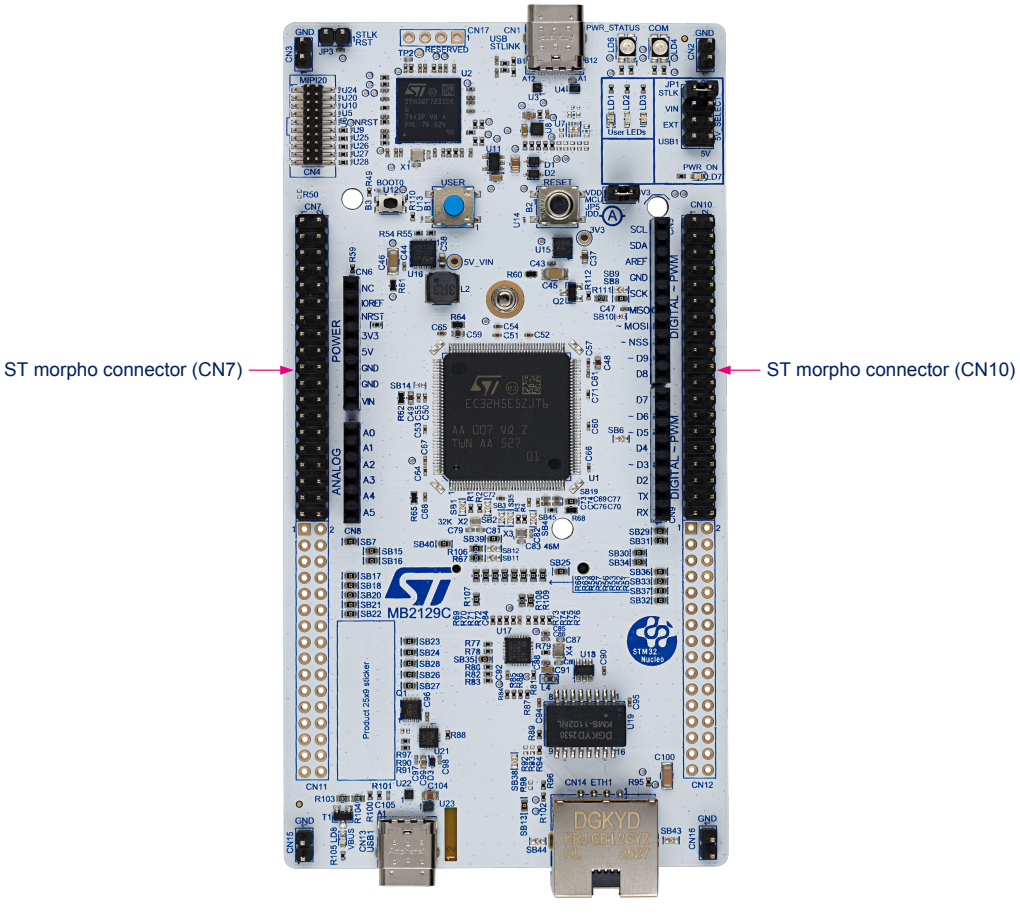


Table 17 and Table 18 show the pin assignments for the STM32 microcontroller on the ST morpho connector.

Table 17. **ST morpho connector (CN7) pinout**

STM32 pin	Main MCU function	ST morpho	Pin	Pin	ST morpho	Main MCU function	STM32 pin
PC10	SDMMC1_D2, I2S3_SCK	SDIO_D2	1	2	SDIO_D3	SDMMC1_D3, I2S3_SDI	PC11
PC12	SDMMC1_CK, I2S3_SDO	SDIO_CK	3	4	SDIO_CMD	SDMMC1_CMD	PF15
-	-	3.3 V	5	6	5 V	-	-
BOOT0	BOOT0	BOOT Mode	7	8	GND	-	-
PG0	GPIO	GPIO	9	10	GPIO	GPIO	PG1
PB3	SWO (3)	SWO	11	12	IOREF	-	-
PA13	SWDIO(3)	SWDIO	13	14	NRST	NRST	NRST
PA14	SWCLK(3)	SWCLK	15	16	3.3 V	-	-
PA15	JTDI(3), TIM2_CH1(2), I2S3_WS	JTDI / PWM	17	18	5 V	-	-
-	-	GND	19	20	GND	-	-
PG2	GPIO	GPIO	21	22	GND	-	-

STM32 pin	Main MCU function	ST morpho	Pin	Pin	ST morpho	Main MCU function	STM32 pin
PA0	WKUP1	WKUP	23	24	VIN	-	-
PC14	OSC32_IN	LSE_IN	25	26	GPIO	GPIO	PG4
PC15	OSC32_OUT	LSE_OUT	27	28	ADC(1)	ADC12_INP3(2)	PA6
PH0	OSC_IN	HSE_IN	29	30	ADC(1)	ADC12_INP7(2)	PA7
PH1	OSC_OUT	HSE_OUT	31	32	ADC(1) / DAC	ADC12_INP18 / DAC1_OUT1	PA4
VBAT	VBAT	VBAT	33	34	ADC(1)	ADC12_INP9(2)	PB0
PC2	ADC12_INP12(2)	ADC	35	36	ADC(1)	ADC1_INP6(2)	PF12
PC3	ADC12_INP13(2)	ADC	37	38	ADC(1)	ADC1_INP2(2)	PF11

1. *Shared pin with the ARDUINO® Uno V3 connector.*
2. *Main feature to support the X-NUCLEO-IHM16M1 motor control shield.*
3. *I/Os shared with the SWD signals connected to STLINK-V3EC.*

Table 18. ST morpho connector (CN7) pinout

STM32 pin	Main MCU function	ST morpho	Pin	Pin	ST morpho	Main MCU function	STM32 pin
PC9	SDMMC1_D1	SDIO_D1	1	2	SDIO_D0	SDMMC1_D0	PF6
PF5	I2C4_SCL / I3C1_SCL	I2C_SCL(1) / I3C_SCL(2)	3	4	GPIO	GPIO	PD14
PG6	I2C4_SDA / I3C1_SDA	I2C_SDA(1) / I3C_SDA(2)	5	6	GPIO	GPIO	PD15
VREFP	VREFP(4)	AREF(1)	7	8	5V_STLK (5)	-	-
-	-	GND(1)	9	10	GPIO	GPIO	PE0
PE12	SPI4_SCK	SPI_SCK(1)	11	12	GPIO / USB_DM	NC	-
PE13	SPI4_MISO	SPI_MISO(1)	13	14	GPIO / USB_DP	NC	-
PE14	SPI4_MOSI, TIM1_CH4	SPI_MOSI / PWM(1)	15	16	PWM_BKIN	TIM1_BKIN(3)	PE15
PE11	SPI4_NSS, TIM1_CH2	SPI_NSS / PWM(1)	17	18	ADC	ADC12_INP5(3)	PB1
PF4	TIM2_CH4	PWM(1)	19	20	GND	-	-
PA9	TIM1_CH2(3)	PWM(1)	21	22	GPIO	GPIO	PF2
PE9	TIM1_CH1(3)	PWM(1)	23	24	GPIO	GPIO	PF14
PF3	TIM2_CH3(3)	PWM(1)	25	26	PWM(3)	TIM1_CH3N(3)	PB15
PG15	TIM16_CH1(3)	PWM(1)	27	28	PWM(3)	TIM1_CH2N(3)	PE10
PD3	WKUP8	WKUP	29	30	PWM(3)	TIM1_CH1N(3)	PE8
PF1	TIM2_CH2(3)	PWM(1)	31	32	AGND	VREFM	VREFM
PA10	TIM1_CH3(3)	PWM(1)	33	34	ADC(3)	ADC2_INP2(3)	PF13
PB4	UART7_TX	UART_TX(1)	35	36	UART_RTS	UART7_RTS	PF8
PA8	UART7_RX	UART_RX(1)	37	38	UART_CTS	UART7_CTS	PF9

1. *Shared pin with the ARDUINO® Uno V3 connector.*
2. *Shared pin with the ARDUINO® Uno V3 connector but with I3C feature on the ST morpho connector.*
3. *Main feature to support the X-NUCLEO-IHM16M1 motor control shield.*

4. *A solder bridge (SB10) is used to disconnect the STM32H5 VREFP to the ARDUINO® connector (CN5, pin 8):*
   - *SB10 OFF: VREFP is not connected to the ARDUINO® connector (CN5 pin 8) → AREF (default configuration). The STM32 VREF is directly connected to the internal 3.3 V through SB45 (ON).*
   - *SB10 ON: VREFP is connected to the ARDUINO® connector (CN5, pin 8) → AREF for external analog reference. SB45 must be OFF.*
5. *5V_STLK is the 5 V power signal, coming from the STLINK-V3EC USB connector. It rises before the 5 V signal of the board.*

8.4 Expansion connectors (CN11, CN12)

The expansion connector consists of two footprints, CN11 and CN12. The connector is not mounted by default. Use these footprints to connect the NUCLEO-H5E5ZJ board to an extension board, a prototype board, or a wrapping board with a 2.54-mm pitch. An oscilloscope, a logic analyzer, or a voltmeter can also probe this connector.

The I/Os on these connectors are used for internal functions by default. To use these I/Os for external purposes, remove the relevant solder bridges to avoid conflicts.

Table 19 and Table 20 demonstrate the pin assignments for the expansion connectors.

Figure 16. Expansion connectors

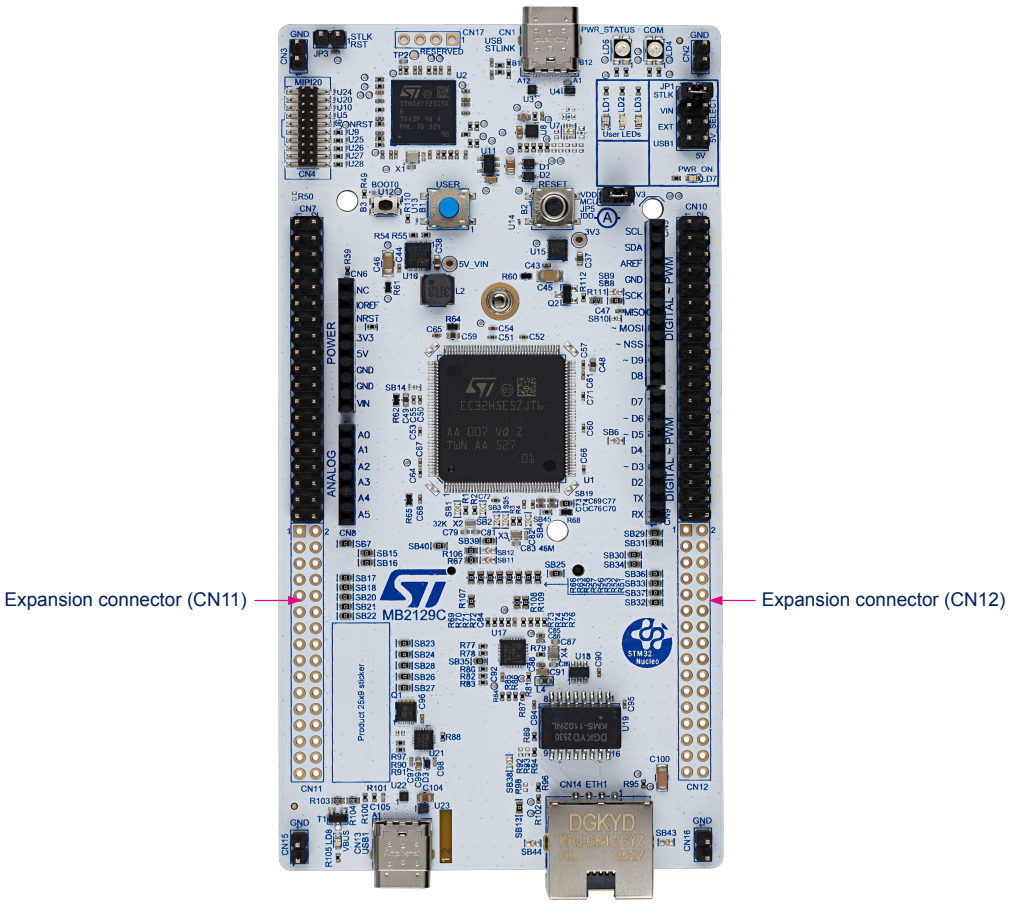


Table 19. **Expansion connector (left side, CN11)**

STM32 pin	Main MCU function	Solder bridge	Pin	Pin	Solder bridge	Main MCU function	STM32 pin
PD11	OCTOSPI_IO0	SB7	1	2	-	-	-
PD12	OCTOSPI_IO1	SB15	3	4	-	-	-
PF7	OCTOSPI_IO2	SB16	5	6	-	-	-
PD13	OCTOSPI_IO3	SB17	7	8	-	-	-
PE7	OCTOSPI_IO4	SB18	9	10	-	-	-
PD5	OCTOSPI_IO5	SB20	11	12	-	-	-
PD6	OCTOSPI_IO6	SB21	13	14	-	-	-
PC0	OCTOSPI_IO7	SB22	15	16	-	-	-
PB10	OCTOSPI_NCS1	SB23	17	18	-	-	-
PD0	OCTOSPI_NCS2	SB24	19	20	-	-	-
PB2	OCTOSPI_DQS	SB28	21	22	-	-	-
PF10	OCTOSPI_CLK	SB26	23	24	-	-	-
PB5	OCTOSPI_NCLK	SB27	25	26	-	-	-
-	-	-	27	28	-	-	-
-	-	-	29	30	-	-	-
-	-	-	31	32	-	-	-

Table 20. **Expansion connector (right side, CN12)**

STM32 pin	MainMCU function	SB	Pin	Pin	SB	MainMCU function	STM32 pin
PB7	I2C_SDA	SB29	1	2	SB31	SPI_CS	PG10
PB6	I2C_SCL	SB30	3	4	SB34	SPI_SCK	PG11
PG5	GPIO	SB36	5	6	SB33	SPI_MISO	PG9
PG13	GPIO	SB37	7	8	SB32	SPI_MOSI	PD7
-	-	-	9	10	-	-	-
-	-	-	11	12	-	GPIO	PG3
-	-	-	13	14	-	GPIO	PD10
-	-	-	15	16	-	GPIO	PE4
-	-	-	17	18	-	GPIO	PG7
-	-	-	19	20	-	-	-
-	-	-	21	22	-	-	-
-	-	-	23	24	-	-	-
-	-	-	25	26	-	-	-
-	-	-	27	28	-	-	-
-	-	-	29	30	-	-	-
-	-	-	31	32	-	-	-

9 NUCLEO-H5E5ZJ product information

9.1 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:

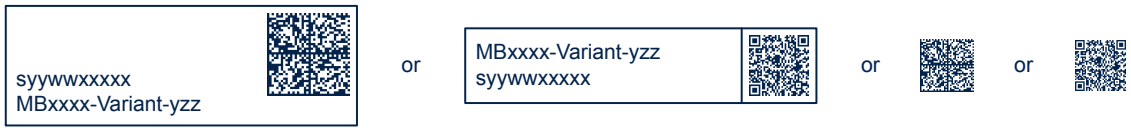
  

  Dual-sticker example:

- 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.

9.2 NUCLEO-H5E5ZJ product history

Table 21. Product history

Order code	Product identification	Product details	Product change description	Product limitations
NUCLEO-H5E5ZJ	NUH5E5ZJ$KR1	MCU: STM32H5E5ZJT6 silicon revision "Z"	Initial revision	No limitation
		MCU errata sheet: *STM32H5Ex/H5Fx device errata* (ES0639)		
		Board: MB2129-H5E5ZJ-D01 (main board)		

9.3 Board revision history

Table 22. Board revision history

Board reference	Board variant and revision	Board change description	Board limitations
MB2129 (main board)	H5E5ZJ-D01	Initial revision	No limitation

10 Compliance statements and conformity declarations

10.1 Federal Communications Commission (FCC) compliance statement

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.

Responsible Party - U.S. Contact Information:

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

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

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.

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.

10.3 UKCA conformity

Simplified UK declaration of conformity

Hereby, the manufacturer STMicroelectronics, declares that the equipment type NUCLEO-H5E5ZJ is in compliance with the UK Electromagnetic Compatibility Regulations 2016 (UK SI 2016 No. 1091) and with the Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment Regulations 2012 (UK SI 2012 No. 3032).

Note: Use only shielded cables.

10.4 CE conformity

10.4.1 Simplified EU declaration of conformity

Hereby, STMicroelectronics declares that the equipment type NUCLEO-H5E5ZJ is in compliance with directives 2011/53/EU and 2015/863/EU (RoHS), and 2014/30/EU (EMC).

Note:
- *RoHS: Restriction of hazardous substances*
- *EMC: Electromagnetic compatibility*

Note: Use only shielded cables.

10.4.2 Déclaration de conformité UE simplifiée

STMicroelectronics déclare que l'équipement électrique du type NUCLEO-H5E5ZJ est conforme aux directives 2011/53/UE et 2015/863/UE (LdSD), et à la directive 2014/30/UE (CEM).

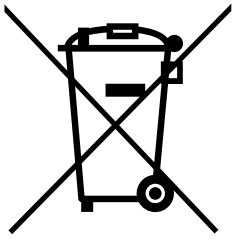
Note:
- *LdSD : directive sur la limitation de l'utilisation des substances dangereuses*
- *CEM : compatibilité électromagnétique*

Note: Utiliser uniquement des câbles blindés.

11 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 23. **Document revision history**

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

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