# STM32H7Rx/7Sx Nucleo-144 board (MB1737)

## Introduction

The STM32H7Rx/7Sx Nucleo-144 board based on the MB1737 reference board (order code NUCLEO-H7S3L8) 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 STM32H7S3L8H6 microcontroller.

The ST Zio connector, which extends the ARDUINO® Uno V3 connectivity, and the ST morpho headers provide easy expansion of the functionality of the STM32 Nucleo open development platform with a wide choice of specialized shields.

The STM32H7Rx/7Sx Nucleo-144 board does not require any separate probe as it integrates the STLINK-V3EC debugger/ programmer.

The STM32H7Rx/7Sx Nucleo-144 board comes with the STM32 comprehensive free software libraries and examples available with the STM32Cube MCU Package.

**Figure 1. NUCLEO-H7S3L8 top view**

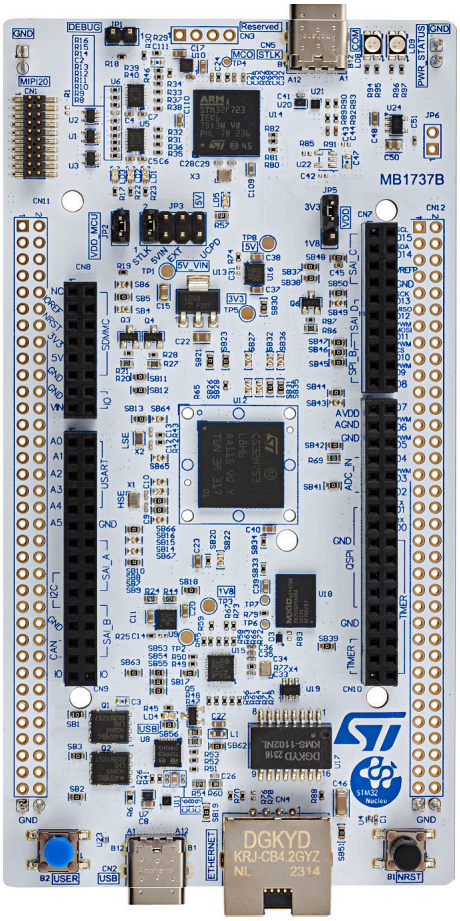
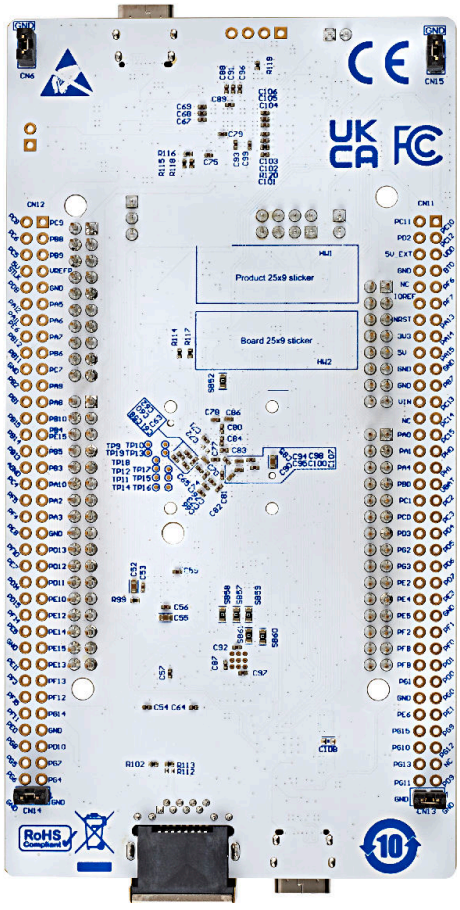



**Figure 2. NUCLEO-H7S3L8 bottom view**




*Pictures are not contractual.*

# 1 Features

- STM32H7S3L8H6 microcontroller based on the Arm® Cortex®-M7 core, featuring 64 Kbytes of flash memory and 620 Kbytes of SRAM in a TFBGA225 package
- 256-Mbit Octo-SPI flash memory
- USB Type-C® with USB 2.0 HS interface, dual-role-power (DRP)
- Three user LEDs
- RESET and USER push-buttons
- 24 MHz and 32.768 kHz crystal oscillators
- Board connectors:
  - USB Type-C® connector
  - Ethernet RJ45 connector
  - MIPI20 for debugging (SWD/JTAG/TRACE)
  - ST Zio expansion connector including ARDUINO® Uno V3
  - ST morpho extension pin headers for full access to all STM32 I/Os
- 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 STM32Cube MCU Package
- Support of a wide choice of Integrated Development Environments (IDEs) including IAR Embedded Workbench®, MDK-ARM, and STM32CubeIDE

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

# 2 Ordering information

To order the STM32H7Rx/7Sx 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 reference | Target STM32 |
|---|---|---|
| NUCLEO-H7S3L8 | MB1737(1) | STM32H7S3L8H6 |

1. *Subsequently named main board in the rest of the document.*

## 2.1 Codification

The meaning of the codification is explained in Table 2.

**Table 2. Codification explanation**

| NUCLEO-XXYYZT | Description | Example: NUCLEO-H7S3L8 |
|---|---|---|
| XX | MCU series in STM32 32-bit Arm Cortex MCUs | STM32H7 series |
| YY | MCU product line in the series | STM32H7R3/7S3 includes the STM32H7S3L8 MCU |
| Z | STM32 package pin count:<br>• L for 225 pins | 225 pins |
| T | STM32 flash memory size:<br>• 8 for 64 Kbytes | 64 Kbytes |

# 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*.

# 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 Quick start

The STM32H7Rx/7Sx Nucleo-144 board is a low-cost and easy-to-use development kit, to evaluate and start development quickly with an STM32H7S3L8H6 microcontroller in a TFBGA225 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 STM32H7Rx/7Sx Nucleo-144 board and demonstration software, visit the *www.st.com/stm32nucleo* webpage.

## 5.1 Getting started

Follow the sequence below to configure the STM32H7Rx/7Sx Nucleo-144 board and launch the demonstration application (refer to Figure 5 for component location):

1. Check the jumper position on the board (refer to Figure 3 for the default board configuration).
2. For the correct identification of the device interfaces from the host PC and before connecting to the board, install the STLINK-V3EC USB driver available on the *www.st.com* website.
3. Connect the STM32H7Rx/7Sx Nucleo-144 board to a PC with a USB cable (USB Type-A or USB Type-C® to USB Type-C®) through the USB connector (CN5) to power the board.
4. The 5V_PWR green (LD5) and COM (LD8) LEDs light up, and the green LED (LD1) blinks.
5. Press the blue user button (B2).
6. Observe how the blinking of the LEDs (LD1, LD2, and LD3) changes, according to the number of clicks on the button (B2).
7. Download the demonstration software and several software examples that help to use the STM32 Nucleo features. These are available on the *www.st.com* website.
8. Develop your application using the available examples.

## 5.2 Default board configuration

By default, the STM32H7Rx/7Sx Nucleo-144 board is configured with a 3V3 VDD_MCU power source. It is possible to set the board for a 1V8 VDD_MCU power source. Before switching to 1V8, check that the extension module and external shield connected to the Nucleo board are 1.8 V compatible.

The default jumper configuration and voltage settings are shown in Table 4.

**Table 4. Default jumper configuration**

| Jumper | Definition | Default position | Comment |
|---|---|---|---|
| JP1 | External debugger selection | OFF | Debug with internal ST-LINK |
| JP2 | IDD measurement | ON | VDD_MCU current measurement |
| JP3 | 5 V power source selection (user USB power source selection) | [1-2] | 5V source from STLINK-V3EC |
| JP5 | VDD voltage selection | [1-2] | The VDD voltage selection is 3V3. |

**Figure 3. Default board configuration**

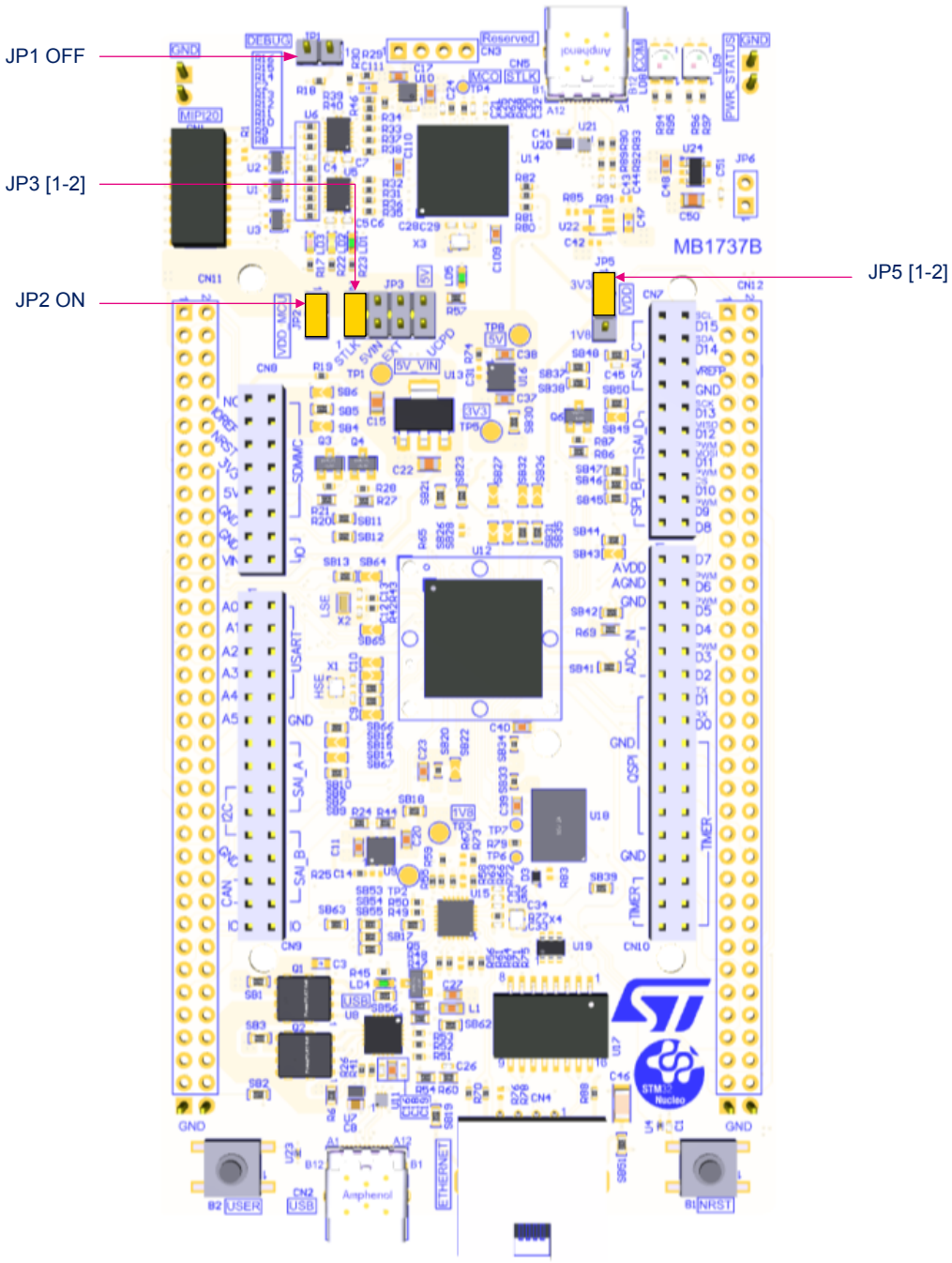


Table 5 explains the other jumper settings and configurations.

**Table 5. Jumper configuration**

| Jumper | Definition | Setting[1] | Comment[1] |
|---|---|---|---|
| JP1 | External debugger selection | **OFF** | **Debug with internal ST-LINK** |
| | | ON | Debug with an external debugger |
| JP2 | IDD measurement | **ON** | **MCU is powered by the on-board power supplies.** |
| | | OFF | Use an ammeter to measure the MCU power consumption, or connect an external 3V3 or 1V8 source on pin 2 to supply the MCU (STLINK-V3PWR tool with the STM32CubeMonitor-Power or ULPBench probe as an example) |
| JP3 | 5 V power source selection (user USB power source selection) | **[1-2]** | **5V source from STLINK-V3EC** |
| | | [3-4] | 5V source from ARDUINO® VIN 7-12 V |
| | | [5-6] | 5V source from 5V_EXT |
| | | [7-8] | 5V source from user USB when it acts as a sink port |
| JP5 | VDD voltage selection | **[1-2]** | **The VDD voltage selection is 3V3.** |
| | | [2-3] | The VDD voltage selection is 1V8. |

1. *The default configuration is in bold*

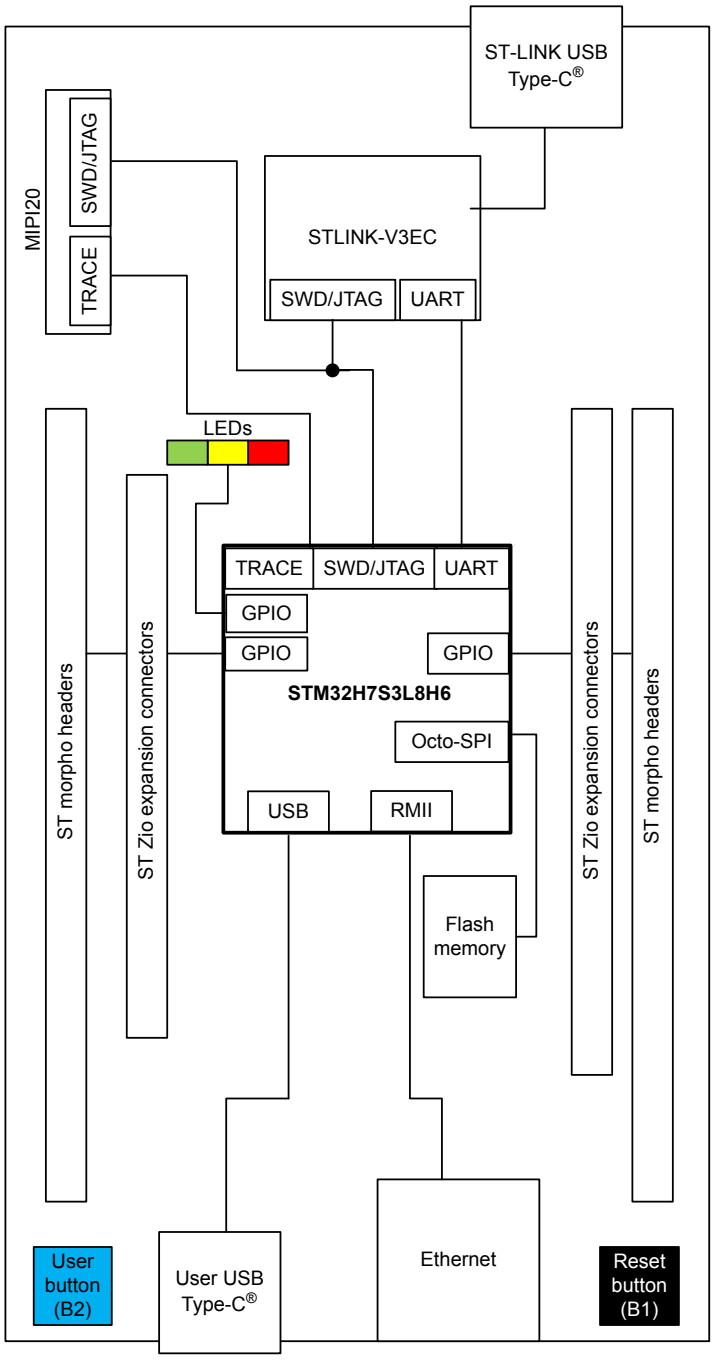
# 6 Hardware layout and configuration

The STM32H7Rx/7Sx Nucleo-144 board is designed around an STM32H7S3L8H6 microcontroller in a TFBGA225 package.

Figure 4 shows the connections between the STM32 and its peripherals (STLINK-V3EC, flash memory, push-button, LEDs, USB, ST Zio expansion connectors, and ST morpho headers). Figure 5 shows the location of these features on the STM32H7Rx/7Sx Nucleo-144 board.

The mechanical dimensions of the board are shown in Figure 6.

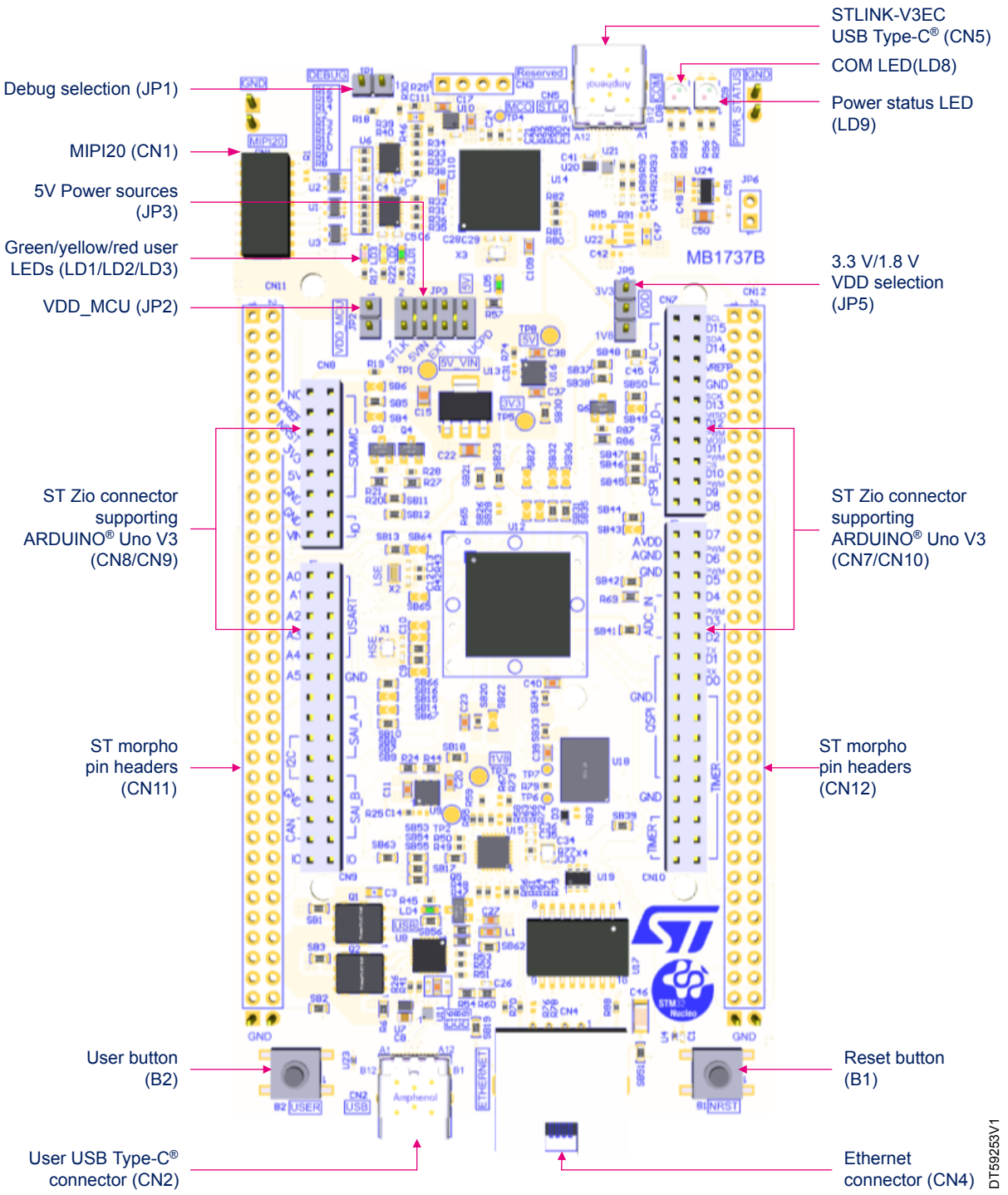
**Figure 4. Hardware block diagram**




DT59252V1

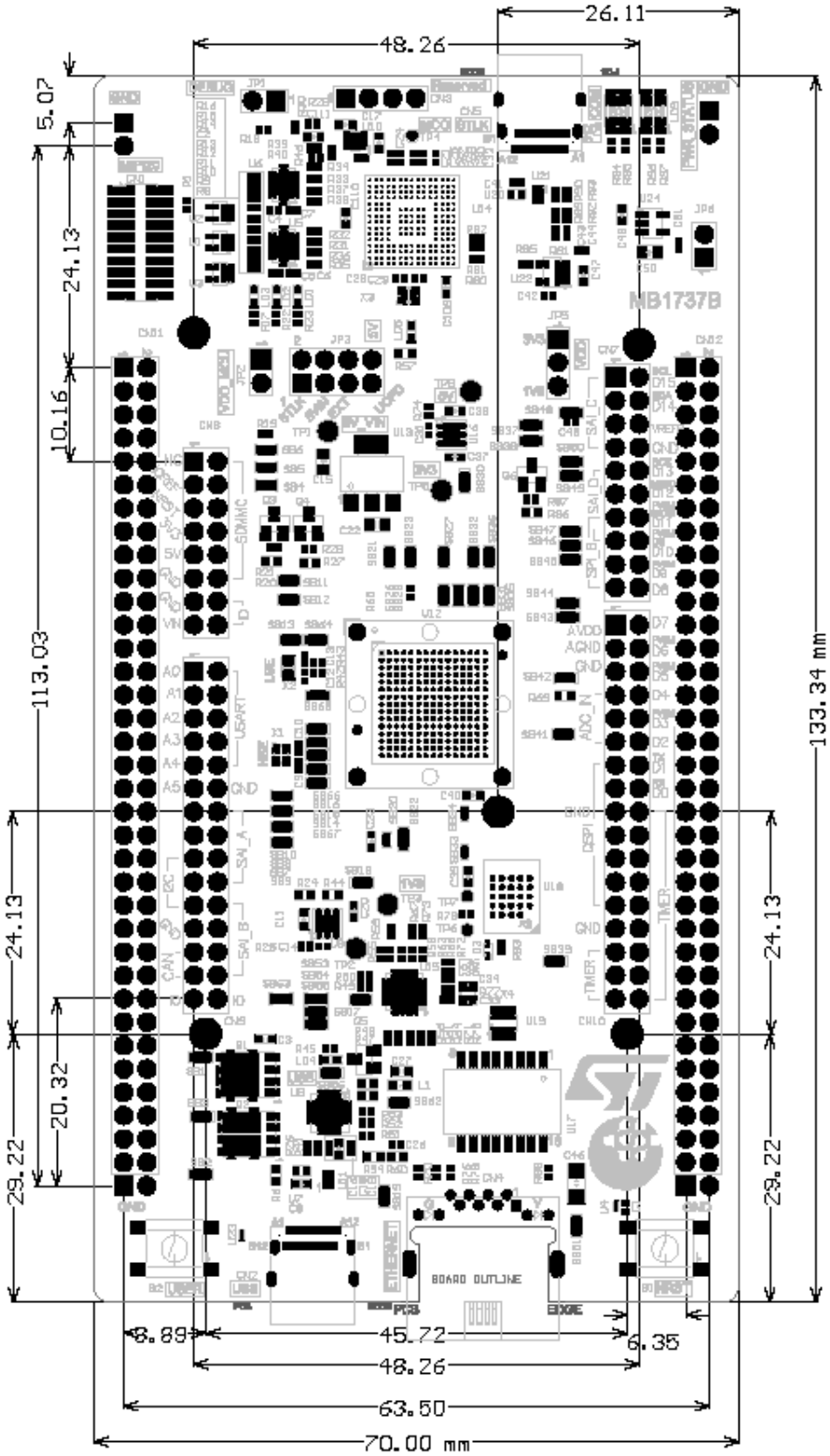
## 6.1 PCB layout

Figure 5. **Top layout**



## 6.2 Mechanical drawing

Figure 6. **STM32H7Rx/7Sx Nucleo-144 board mechanical drawing (in millimeters)**



## 6.3 Embedded STLINK-V3EC

The new STLINK-V3EC is the embedded version of the STLINK-V3 included in the design of the STM32H7Rx/7Sx Nucleo-144 board. It allows access to the program/debug and monitoring functions of the STM32 through the USB ST-LINK connector (CN5).

The STLINK-V3EC facility for debugging and flashing is integrated into the STM32H7Rx/7Sx Nucleo-144 board.

The embedded STLINK-V3EC supports SWD and VCP/JTAG (SB27 ON when using JTAG) for STM32 devices.

Two level shifters are used on the VCP and SWD/JTAG interface to offer a debug capability with a 1V8-powered MCU.

Features supported in STLINK-V3EC:

- 5 V power supplied by the USB Type-C® connector (CN5)
- USB 2.0 USB high-speed-compatible interface
- JTAG and SWD protocols compatible with 1.7 to 3.6 V application voltage and 5 V tolerant input I/Os
- MIPI20 compatible connector (CN1)
- COM status LED (LD8), which blinks during communication with the PC
- Power status LED (LD9), which identifies the status of current output to the board

Table 6 describes the USB Type-C® connector pinout.

**Table 6. USB Type-C® connecter (CN5) pinout**

| Pin | Pin name | Signal name | STLINK-V3E STM32 pin | Function |
|---|---|---|---|---|
| A4, A9, B4, and B9 | VBUS | VBUS_STLK | - | VBUS power |
| A7 and B7 | DM | USB_DEV_HS _N | PB14 | DM |
| A6 and B6 | DP | USB_DEV_HS _P | PB15 | DP |
| A5 | CC1 | UCPD_CC1_C | PC3 | Pull-down by 5.1 kΩ |
| B5 | CC2 | UCPD_CC2_C | PC4 | Pull-down by 5.1 kΩ |
| A1, A12, B1, and B12 | GND | GND | GND | GND |

### 6.3.1 Drivers

The installation of drivers is not mandatory from Windows 10® but 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).

### 6.3.2 STLINK-V3EC firmware upgrade

STLINK-V3EC embeds a firmware upgrade (`stsw-link007`) mechanism through the USB-C® port. As 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), it is recommended to keep the STLINK-V3EC firmware up to date before starting to use the NUCLEO-H7S3L8 board. The latest version of this firmware is available from the *www.st.com* website.

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

**Warning:** *ST-LINK SWO signal is exclusive with Zio D23 due to I/O multiplex on PB3. In this case, ST-LINK SWO cannot work when Zio D23 (I2S3_SCK/SPI3_CK) is used.*

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

The STM32H7Rx/7Sx Nucleo-144 board supports an external debug tool CN1 for SWD/JTAG and trace debugging. Keep the embedded STLINK-V3EC running. Power on the STLINK-V3EC at first until the COM LED turns red. Then connect the external debug tool through the MIPI20 debug connector (CN1).

Table 7 describes the MIPI20 connector (CN1) pinout.

**Table 7. MIPI20 debug connector (CN1) pinout**

| MIPI20 pin number | Signal name | STM32 pin | Function |
|---|---|---|---|
| 1 | VDD | - | Target VDD |
| 2 | MCU.SWDIO | PA13 | Target SWDIO using SWD protocol or target JTMS (T_JTMS) using JTAG protocol |
| 4 | MCU.SWCLK | PA14 | Target SWCLK using SWD protocol or target JTCK (T_JTCK) using JTAG protocol |
| 6 | MCU.SWO | PB3 | Target SWO using SWD protocol or target JTDO (T_JTDO) using JTAG protocol |
| 7 | KEY | - | NC |
| 8 | MCU.JTDI | PA15 | Not used by SWD protocol, target JTDI (T_JTDI) using JTAG protocol (SB27 ON, default OFF) |
| 10 | NRST | NRST | Target NRST |
| 12 | TRACE_CLK | PE2 | Trace clock signal |
| 14 | TRACE_D0 | PE3 | Trace data0 signal |
| 16 | TRACE_D1 | PG14 | Trace data1 signal |
| 18 | TRACE_D2 | PD2 | Trace data2 signal |
| 20 | TRACE_D3 | PC12 | Trace data3 signal |
| 3, 5, 9, 11, 13, 15, 17, 19 | GND | - | Ground |

## 6.4 Power supply and power selection

### 6.4.1 External power supply input

Several DC power supplies can power the Nucleo board. It is possible to configure the Nucleo board to use any of the following sources for the power supply:

- 5V_STLK from STLINK-V3EC USB Type-C® connector (CN5)
- VIN (7 to 12 V) from ARDUINO®-included Zio connector (CN8) or ST morpho connector (CN11)
- 5V_EXT from ST morpho connector (CN11)
- 5V_UCPD from USB Type-C® connector (CN2)

If VIN or 5V_EXT are used to power the STM32H7Rx/7Sx Nucleo-144 board, these power sources must comply with the standard EN-60950-1: 2006+A11/2009 and must be safety extralow voltage (SELV) with limited power capability.

The power supply capabilities are summarized in Table 8.

**Table 8. Power source capabilities**

| Input power name | Connector pins | Voltage range | Maximum current | Limitation |
|---|---|---|---|---|
| 5V_STLK | CN5<br>JP3 [1-2] | 4.75 to 5.25 V | 500 mA/1.5 A/3 A | ST-LINK manages the maximum current. |
| VIN(5VIN) | CN8 pin 15<br>CN11 pin 24<br>JP3 [3-4] | 7 to 12 V | 800 mA | From 7 to 12 V only and input current capability is linked to input voltage:<br>• 800 mA input current when VIN = 7 V<br>• 450 mA input current when 7 V < VIN < 9 V<br>• 250 mA input current when 9 V < VIN < 12 V |
| 5V_EXT | CN11 pin 6<br>JP3 [5-6] | 4.75 to 5.25 V | 500 mA | The maximum current depends on the power source. |
| 5V_UCPD | CN2<br>JP3 [7-8] | 4.75 to 5.25 V | Up to 1.5 A | The maximum current depends on the USB host used to power the Nucleo when the user USB connector (CN2) is used as a sink port |

#### 5V_STLK

5V_STLK is a DC power with the limitation of the STLINK-V3EC USB Type-C® connector (CN5). In this case, the JP3 jumper must be on pin [1-2] to select the 5V_STLK power source.

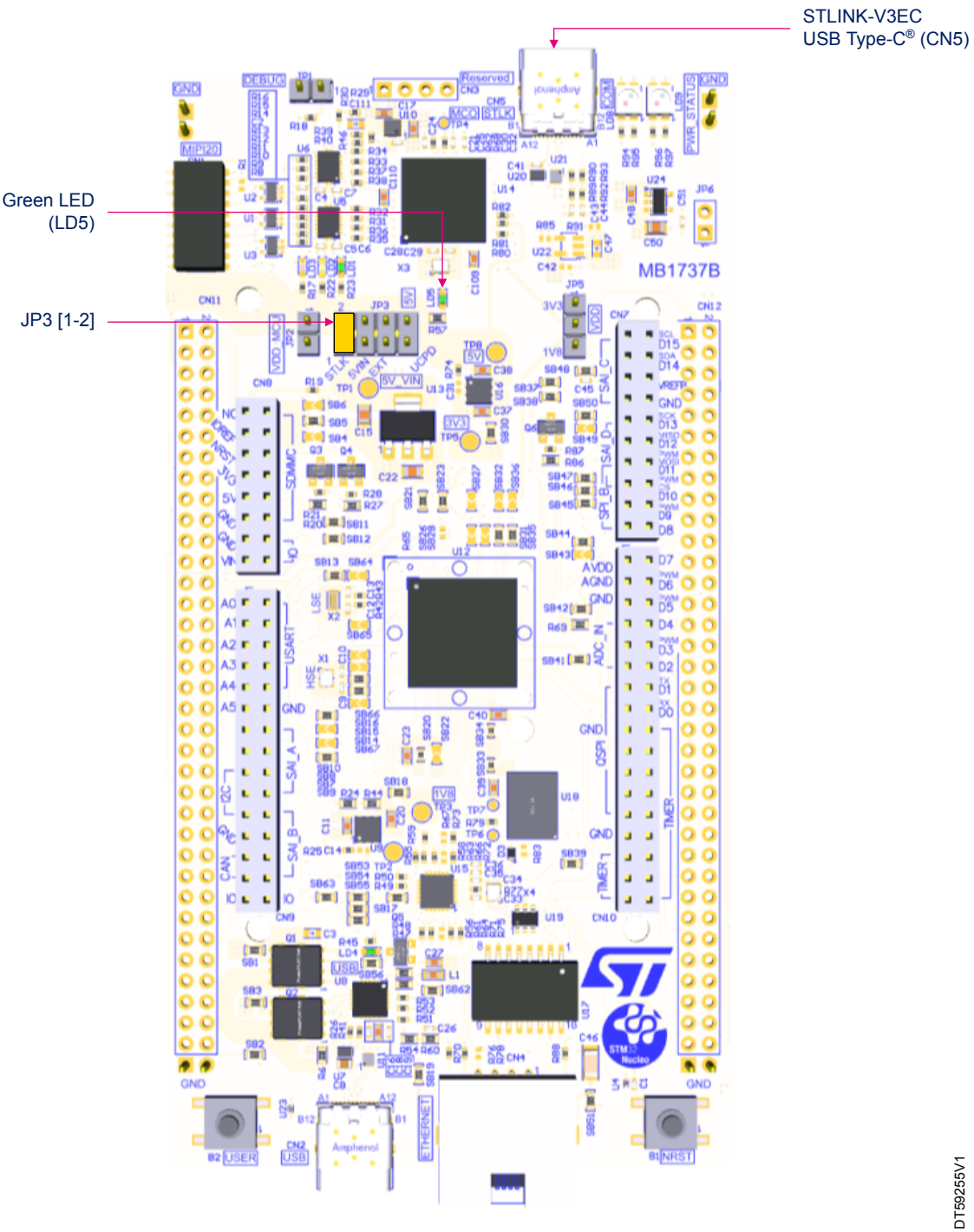
This is the default setting. If the USB enumeration succeeds, the 5V_STLK power is enabled, by asserting the T_PWR_EN signal from STLINK-V3EC MCU (U14). This pin is connected to the U10 power eFuse, which powers the board. This power eFuse also features a fast overvoltage current limitation, to protect the PC in case of an onboard short-circuit. The STLINK-V3EC MCU (U14) determines the maximum current.

The NUCLEO-H7S3L8 Nucleo board with its shield can be powered from the STLINK-V3EC USB connector (CN5), but only the STLINK-V3EC circuit has the power before USB enumeration because the host PC only provides 100 mA to the board at that time. During the USB enumeration, the Nucleo board requires a 500 mA or more current from the USB host.

If the host can provide the required power, the enumeration finishes with a *SetConfiguration* command. Then, the power eFuse (U10) is switched ON, the green LED (LD5) is turned ON, thus the Nucleo board with its shield can consume 500 mA or more current determined by ST-LINK.

5V_STLK configuration: The JP3 jumper is set on [1-2] as shown in Figure 7.

**Figure 7. JP3 [1-2]: 5V_STLK power source**

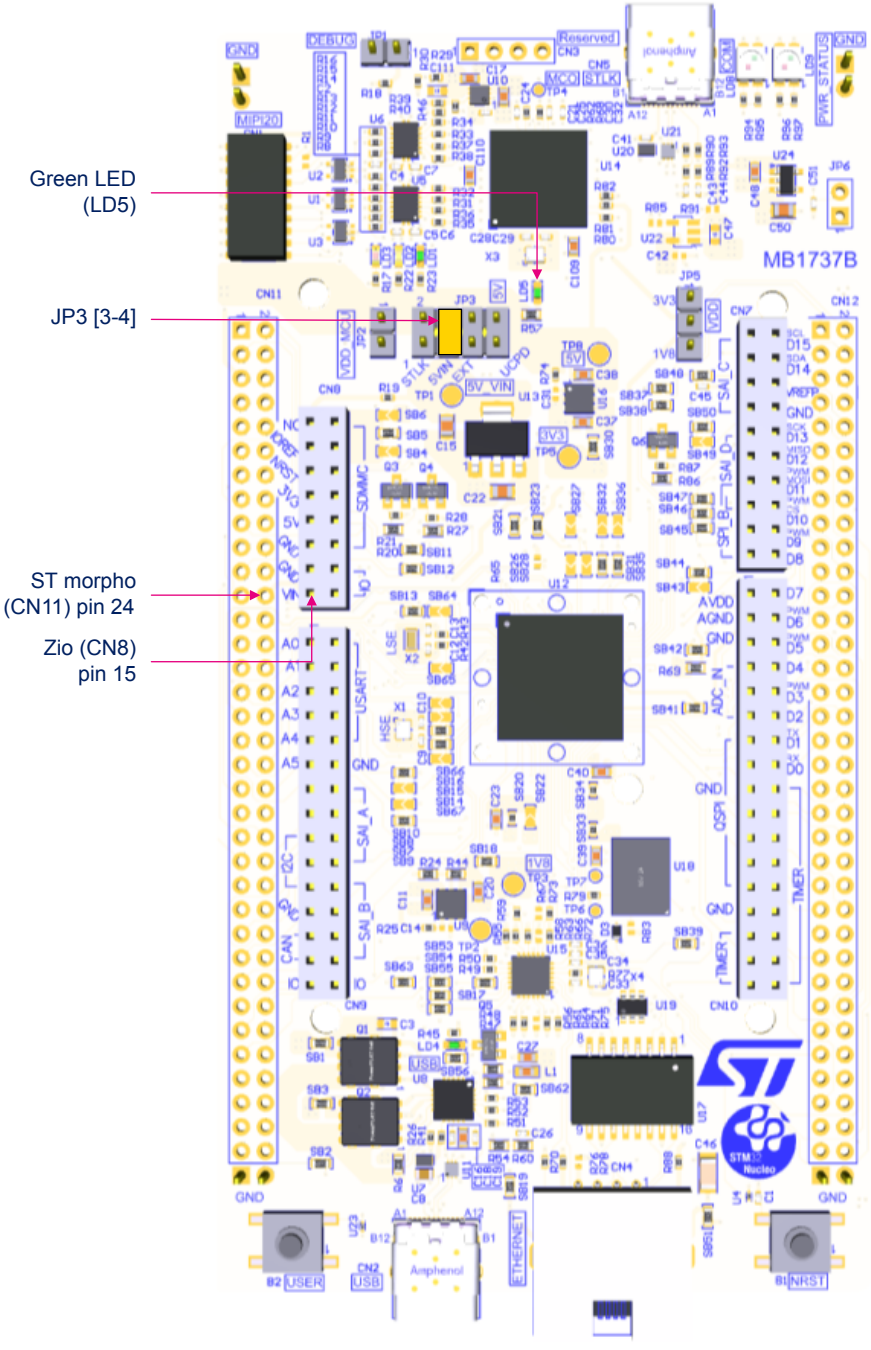


### VIN (5VIN)

VIN (5VIN) is the 7 to 12 V DC power from the ARDUINO®-included Zio connector (CN8) pin 15 named VIN on the connector silkscreen or from the ST morpho connector (CN11) pin 24. The JP3 jumper must be on pin [3-4] to select the 5V_VIN power source. In this case, the DC power comes from the power supply through the ARDUINO® Uno V3 battery shield (compatible with Adafruit PowerBoost 500 shield). The green LED (LD5) is turned ON.

5V_VIN configuration: The JP3 jumper must be set on [3-4] as shown in Figure 8.

**Figure 8. JP3 [3-4]: 5V_VIN power source**

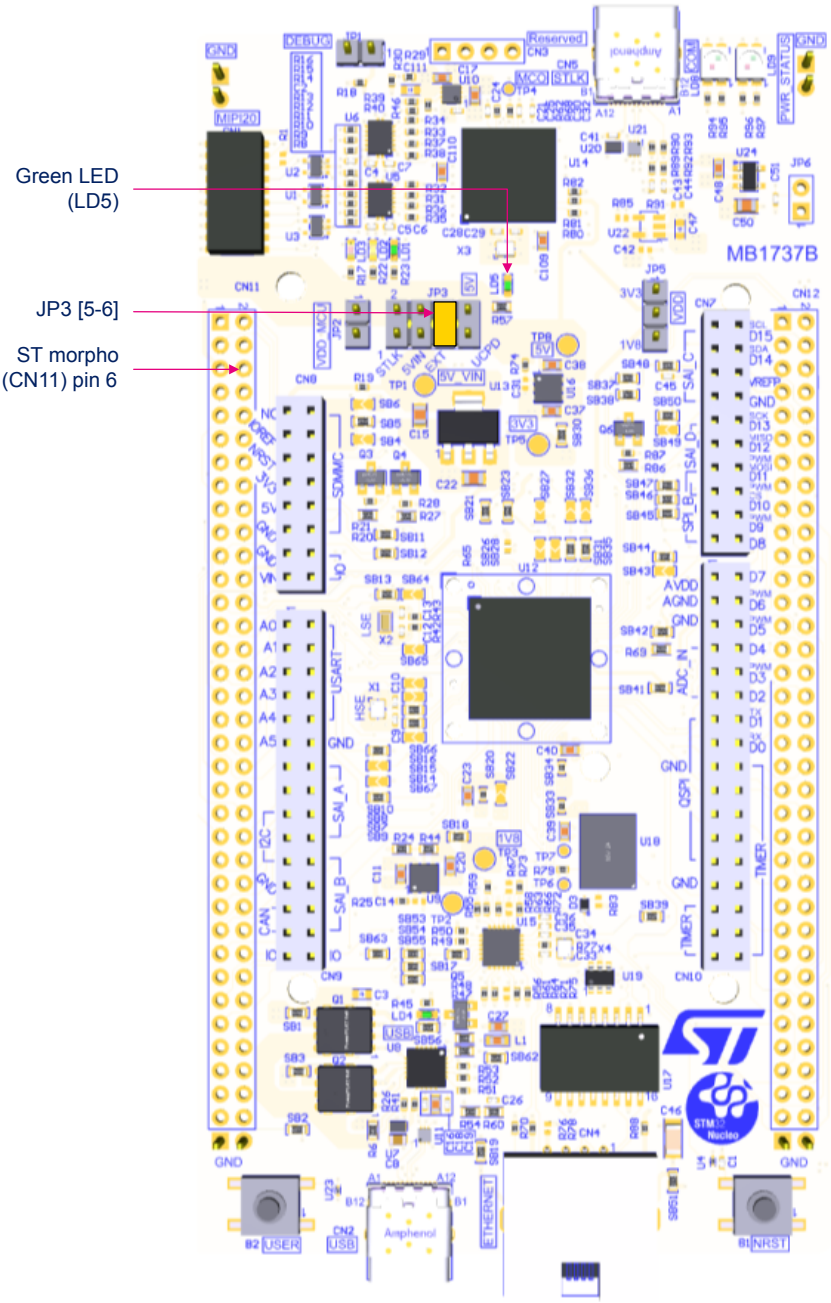


### 5V_EXT

5V_EXT is the DC power coming from an external 5 V DC power from the ST morpho connector (CN11) pin 6. In this case, the JP3 jumper must be set on [5-6] to select the EXT power source. The green LED (LD5) is turned ON

5V_EXT configuration: The JP3 jumper must be set on [5-6] as shown in Figure 9.

**Figure 9. JP3 [5-6]: 5V_EXT power source**



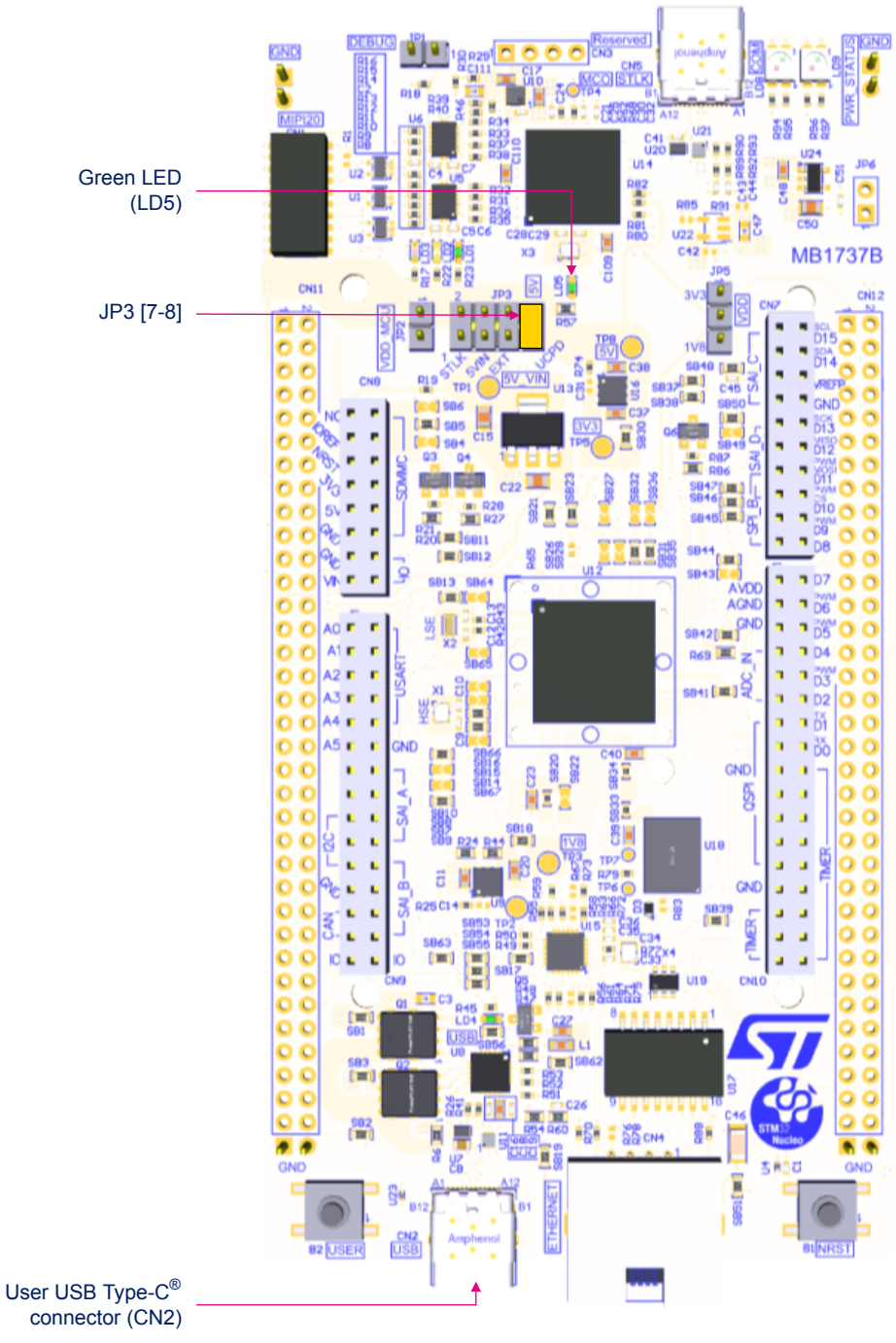

*Note: JP3 is also used as a USB Type-C® user connector (CN2) power source selection when CN2 is used as the source port. LD5 is lit when source power exists for CN2.*

### 5V_UCPD

5V_UCPD is the DC power supply connected to the USB Type-C® user connector (CN2) when it is used as a sink port. In this case, the JP3 jumper must be set on [7-8] to select the UCPD power source. The green LED (LD5) is turned ON.

5V_UCPD configuration: The JP3 jumper must be set on [7-8] as shown in Figure 10:

**Figure 10. JP3 [7-8]: 5V_UCPD power source**



### 6.4.2 Programming/debugging when the power supply is not from STLINK-V3EC (STLK)

VIN, 5V_EXT, or 5V_UCPD can be used as external power supplies in case the current consumption of the Nucleo with expansion boards exceeds the allowed current on USB. In such a condition, it is still possible to use USB for communication for programming or debugging only.

In this case, it is mandatory to power the board first using VIN, 5V_EXT, or 5V_UCPD then connect the USB cable to the PC. Proceeding this way the enumeration succeeds, thanks to the external power source.

The following power sequence procedure must be respected:

1. Set the JP3 jumper according to the selected 5 V power source.
2. Connect the external power source according to JP3.
3. Power on the external power supply.
4. Check that the 5 V green LED (LD5) is turned ON.
5. Connect the PC to the USB ST-LINK connector (CN5).

If this sequence is not respected, the $V_{BUS}$ from STLINK-V3EC might power the board first, and the following risks might be encountered:

- If the board needs more than 500 mA current, the PC might be damaged or the current limited by the PC. Therefore, the board is not powered correctly.
- 500 mA is requested at enumeration. So, there is a risk that the request is rejected and the enumeration does not succeed, as the PC cannot provide such a current. Consequently, the board is not power supplied and the 5 V green LED (LD5) remains OFF.

### 6.4.3 Power supply output

#### 5V

When the Nucleo board is powered by USB, VIN, or 5V_EXT, the 5V present on CN8 pin 9 or CN11 pin 18 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 8 must be respected.

#### 3V3

The internal 3V3, on CN8 pin 7 or CN11 pin 16, can be used also as a power supply output. The current is limited by the 1.3 A maximum current capability of the U16 regulator concerning the Nucleo board with shield consumption.

### 6.4.4 Internal power supply

The Nucleo boards are designed to support two specific voltage configurations:

- 3V3 VDD configuration to reach the Nucleo low-power mode with 3.3 V
- 1V8 VDD configuration to demonstrate the MCU low-voltage capability

JP5 is used to set VDD. Refer to Table 5 for details.

#### 3V3

Regardless of the 5V power source, an LDO is used to switch from 5V to the 3V3 default power source of the VDD. The maximum current capability of this source is 1.3 A. To select the 3V3 voltage for the VDD, set the JP5 jumper on [1-2].

A solder bridge (SB30) is used to disconnect the LDO output when an external 3V3 is applied to the Nucleo board:

- SB30 ON: U16 LDO output provides a 3V3 power supply (default configuration).
- SB30 OFF: U16 LDO output does not provide 3V3. An external 3V3 is needed.

#### 1V8

An adjustable LCD can be used for the MCU to work at 1V8. This helps to demonstrate the 1V8 MCU capability. The LDO capability is also 1.3 A. Before using the 1V8 voltage, it is necessary to check that all interfaces are 1V8 compatible and the maximum current requested does not exceed 1.3 A. To select the 1V8 voltage for the VDD, set the JP5 jumper on [2-3].

A solder bridge (SB18) is used to disconnect the LDO output when an external 1V8 is applied to the Nucleo board:

- SB18 ON: U9 LDO output provides a 1V8 power supply (default configuration).
- SB18 OFF: U9 LDO output does not provide 1V8. An external 1V8 is needed.

### 6.4.5 VDD_MCU IDD measurement

The labeled VDD_MCU jumper (JP2) can measure the consumption of the STM32 microcontroller by replacing the jumper with an ammeter or a current measurement tool:

- Jumper ON: The STM32 microcontroller is powered (default).
- Jumper OFF: An ammeter or an external 3V3 power source must be connected to the power and measures the STM32 microcontroller consumption.

The jumper can measure the current for both 3V3 and 1V8 MCU voltage ranges.

## 6.5 LEDs

**User green LED (LD1)**

The user green LED (LD1) is connected to the PD10 STM32 I/O (SB50 ON and SB49 OFF, default configuration) or PA5 (SB50 OFF and SB49 ON, optional configuration corresponding to the D13 ST Zio expansion connector). A transistor is used to drive the LED whatever the MCU 1V8 or 3V3 voltage range is.

**User yellow LED (LD2)**

The user yellow LED (LD2) is connected to PD13. A transistor is used to drive the LED whatever the MCU 1V8 or 3V3 voltage range is.

**User red LED (LD3)**

The user red LED (LD3) is connected to PB7. A transistor is used to drive the LED whatever the MCU 1V8 or 3V3 voltage range is.

These user LEDs are ON when the I/O is in the HIGH state, and are OFF when the I/O is in the LOW state.

**USB Type-C® green LED (LD4)**

The green LED (LD4) shows the presence of the VBUS on CN2. Refer to Section 6.12: USB Type-C® (HS, DRP) for more details.

**Green PWR LED (LD5)**

The green LED (LD5) indicates that the STM32 part is powered by a 5V source. It also indicates the power source of the user USB connector (CN2) when it is used as the source port.

**Tricolor COM LED (LD8)**

The tricolor (green, orange, and red) LED (LD8) provides information about the STLINK-V3EC communication status. The LD8 default color is red. LD8 turns green to indicate that the communication is in progress between the PC and STLINK-V3EC, with the following setup:

- Red: When the initialization between the PC and STLINK-V3EC is complete
- Green: After a successful target communication initialization
- Red/green fast blinking: During communication with the target
- Orange: Communication failure

#### Tricolor PWR status LED (LD9)

The tricolor (green, orange, and red) LED (LD9) provides information about the STLINK-V3EC target power status.

- LED OFF: The target is not powered by STLINK-V3EC.
- Green: The Nucleo board power request is less or equal to the USB port power capability.
- Orange: The Nucleo board power request is higher than the USB port power capability. It is recommended to connect to another USB port for full functionality of the board.
- Red: The Nucleo board power has been automatically switched off after the detection of an overcurrent. Switch to a more powerful USB port, and if the issue persists, investigate what might cause an overconsumption of the board.
- Red slow blinking: Internal error due to wrong hardware environment. STLINK-V3EC is not functional.

## 6.6 Push-buttons

Two buttons are available on the Nucleo board.

#### Reset button (B1)

The black button connected to NRST is used to reset the STM32 microcontroller. When the button is pressed the logic state is LOW, otherwise, the logic state is HIGH.

#### User button (B2)

The blue button for the user and wake-up functions is connected to PC13 to support the wake-up function of the STM32 microcontroller. When the button is pressed, the logic state is LOW, otherwise, the logic state is HIGH.

## 6.7 Oscillator clock sources

Three clock sources are described below:

- LSE is the 32.768 kHz crystal for the STM32 embedded RTC.
- MCO is the 8 MHz clock from STLINK-V3EC for the STM32 microcontroller
- HSE is the 24 MHz oscillator for the STM32 microcontroller.

### 6.7.1 LSE: OSC 32 KHz clock supply

There are three ways to configure the pins corresponding to the low-speed clock (LSE):

#### LSE on-board oscillator X2 crystal (default configuration)

Refer to the application note *Oscillator design guide for STM8AF/AL/S, STM32 MCUs and MPUs* (AN2867), with the following characteristics: 32.768 kHz, 6 pF, and 20 ppm. It is recommended to use NX2012SA-32.768KHz-EXS00A-MU00527 manufactured by NDK. The following configuration is needed:

- R42 and R43 ON

#### Oscillator from external to PC14

From the external oscillator through PC14, Zio connector (CN11) pin 25. The following configuration is needed:

- R42 and R43 OFF
- SB64 ON

#### LSE not used

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

- R42 and R43 OFF
- SB64 and SB65 ON

### 6.7.2 OSC clock supply

There are four ways to configure the pins corresponding to the high-speed external clock (HSE):

**HSE: On-board oscillator X1 crystal (default configuration)**

For typical frequencies, capacitors, and resistors, refer to the STM32 microcontroller datasheet. Refer to the application note *Oscillator design guide for STM8AF/AL/S, STM32 MCUs and MPUs* (AN2867). The X1 crystal has the following characteristics: 24 MHz, 6 pF, and 20 ppm. It is recommended to use NX2016SA-24MHz-EXS00A-CS10820 manufactured by NDK. The following configuration is needed:

- SB14 and SB15 ON are connected to the external HSE.
- SB16 (MCO) OFF
- SB66 and SB67 OFF. The ST morpho pins are disconnected.

**MCO from STLINK-V3EC**

The MCO output of the STLINK-V3EC MCU is used as an input clock. This frequency cannot be changed. It is fixed at 8 MHz, and connected to PH0 OSC_IN of the STM32 microcontroller. The following configuration is needed:

- SB16 ON. MCO is connected to PH0 and R62 on the STLINK-V3EC side and must be connected to provide the MCO to the STLINK-V3EC output.
- SB14 and SB15 OFF. The external crystal is not connected to HSE.
- SB66 and SB67 OFF. The ST morpho pins are disconnected.

**External oscillator**

The input clock comes from an external oscillator through PH0, CN11 pin 29. The following configuration is needed:

- SB66 ON. The ST morpho connector is connected to PH0.
- SB16 OFF. MCO is not connected to PH0.
- SB14 and SB15 OFF. The external crystal is not connected to HSE.

**HSE not used**

PH0 and PH1 are used as GPIOs instead of clocks. The following configuration is needed:

- SB16 OFF. MCO is not connected to PH0.
- SB14 and SB15 OFF. The external crystal is not connected to HSE.
- SB66 and SB67 ON. The ST morpho pins are connected as GPIOs.

## 6.8 Reset sources

The reset signal of the Nucleo board is active LOW and the reset sources include:

- The RESET button (B1)
- The embedded STLINK-V3EC
- The ARDUINO®-included Zio connector (CN8) pin 5
- The ST morpho connector (CN11) pin 14

## 6.9 Virtual COM port

The serial interface UART3 (PD8/PD9) that supports the bootloader is directly available as a Virtual COM port of the PC connected to the STLINK-V3EC USB connector (CN5). The VCP configuration is the following:

- 115200 bps
- 8-bit data
- No parity
- One-stop bit
- No flow control

## 6.10 Bootloader

The bootloader is located in the system memory, programmed by ST during production. It is used to reprogram the flash memory via USART, $I^2C$, SPI, CAN FD, or USB FS in device mode through the device firmware upgrade (DFU). The bootloader is available on all devices. Refer to the application note *STM32 microcontroller system memory boot mode* (AN2606) for more details.

The root secure services (RSS) are embedded in a flash area named the secure information block, programmed during ST production. For example, it enables secure firmware installation (SFI), thanks to the RSS extension firmware (RSSe SFI). This feature allows customers to protect the confidentiality of the firmware to be provisioned into the STM32 when production is subcontracted to an untrusted third-party. The root secure services are available on all devices, after enabling the TrustZone® through the TZEN option bit.

The I/O BOOT0 gives external hardware access to the bootloader.

By default, this pin is set to level LOW by a pull-down resistor. It is possible to put this I/O to level HIGH by connecting a 2.54 mm pitch jumper between the Zio connector (CN11) pin 7 and VDD pin 5.

As mentioned above, USART3 on PD8/PD9 is connected by default because this interface supports the Bootloader mode.

## 6.11 Octo-SPI flash memory

The Octo-SPI flash memory has the following characteristics: 256 Mbits, 1.8 V, 200 MHz, DTR, read-while-write. It is connected to the OCTOSPI interface of the STM32H7S3L8H6 microcontroller.

The embedded footprint is also compatible with many other references in the BGA24 package. Check the compatibility of the memory datasheet versus the MB1737 schematics.

## 6.12 USB Type-C® (HS, DRP)

The STM32H7Rx/7Sx Nucleo-144 supports a USB HS 2.0 interface on the USB Type-C® receptacle connector (CN2). It offers compatibility with USB Type-C® rev 1.3, USB PD 3.0, PPS, and USB BC 1.2 on the USB Type-C® receptacle connector (CN2).

CN2 can be used as a DRP (dual-role port). Its VBUS can be managed for supplying other platforms as a Provider, or to be supplied as a Consumer. TCPP03-M20 is used to manage DRP functions. It is compatible with VBUS current up to 1.5 A and VBUS 5V only.

By default, the dead battery (DB) feature of this USB connector is managed by TCPP03-M20. If PM2(DB1) and PM3(DB2) of STM32H7S3L8H6 are needed, SB26 and SB28 must be ON (default OFF).

The green LED (LD4) is lit when one of the following events occurs:

- The source path is open and NUCLEO-H7S3L8 provides up to 1.5A 5V power on CN2.
- VBUS is powered by another USB Host when NUCLEO-H7S3L8 works as a sink device.

Table 9 describes the pinout of the USB function.

**Table 9. USB pinout**

| STM32 pin | Signal name | USB connector (CN2) pin | Remark(1) |
|---|---|---|---|
| PM5 | USB_HS_N | A7, B7 | - |
| PM6 | USB_HS_P | A6, B6 | - |
| PM0 | CC1 | A5 | - |
| PM1 | CC2 | B5 | - |
| PM2 | DB1 | - | Connected to CC1 when SB28 ON |
| PM3 | DB2 | - | Connected to CC2 when SB26 ON |
| PM8 | INT | - | Interrupt pin, open drain |
| PM9 | PWR_EN | - | TCPP03 enable pin |
| PF12 | ISENSE | - | SB56 OFF when using ST morpho |
| PF13 | VSENSE | - | SB62 OFF when using ST morpho |
| PA9 | I2C_SDA | - | **I2C3, SB35 ON, SB36 OFF** |
| PF0 | | | I2C2, SB35 OFF, SB36 ON |
| PA8 | I2C_SCL | - | **I2C3, SB31 ON, SB32 OFF** |
| PF1 | | | I2C2, SB31 OFF, SB32 ON |

1. *The default configuration is in bold.*

## 6.13 Ethernet

The STM32H7Rx/7Sx Nucleo-144 supports 10/100-Mbit Ethernet communication with a MICROCHIP LAN8742A-CZ-TR PHY and integrates an RJ45 connector (CN4). The Ethernet PHY is connected to the STM32H7S3L8H6 microcontroller via an RMII interface.

Table 10 describes the pinout of the Ethernet function.

**Table 10. Ethernet pinout**

| STM32 pin | Signal name | Configuration when using Ethernet | Configuration when using ST Zio or ST morpho connector |
|---|---|---|---|
| PB6 | RMII reference clock | SB63 ON | SB63 OFF |
| PA2 | RMII MDIO | SB61 ON | SB61 OFF |
| PG6 | RMII MDC | SB60 ON | SB60 OFF |
| PA7 | RMII RX data valid | SB59 ON | SB59 OFF |
| PG4 | RMII RXD0 | SB57 ON | SB57 OFF |
| PG5 | RMII RXD1 | SB58 ON | SB58 OFF |
| PG11 | RMII TX enable | SB53 ON | SB53 OFF |
| PG13 | RXII TXD0 | SB54 ON | SB54 OFF |
| PG12 | RMII TXD1 | SB55 ON | SB55 OFF |

# 7 Expansion connectors

Six expansion connectors are implemented on the STM32H7Rx/7Sx Nucleo-144 board:

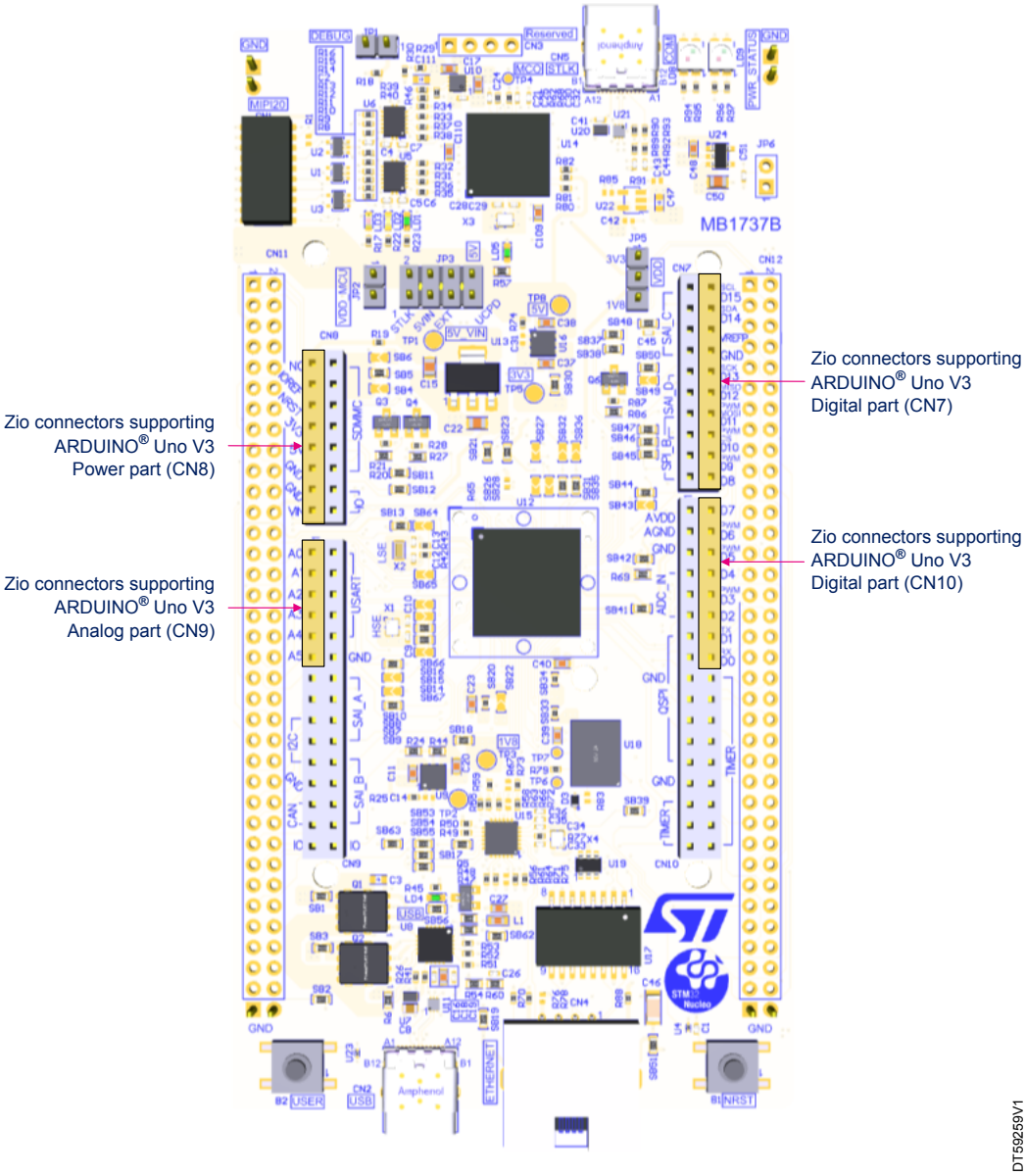
- Zio connectors (CN7, CN8, CN9, and CN10) supporting ARDUINO® Uno V3
- ST morpho expansion connectors (CN11 and CN12).

## 7.1 Zio connectors supporting ARDUINO® Uno V3

The Zio connectors (CN7, CN8, CN9, and CN10) are female connectors supporting the ARDUINO® Uno standard. Most shields designed for ARDUINO® can fit the Nucleo board.

**Caution:** Most of the STM32 microcontroller I/Os are 5V-tolerant, but a few of them are only 3V3-compatible, while ARDUINO® Uno is 5V-compatible. Refer to the STM32H7Sx product datasheets for their I/O structure.

**Figure 11. Zio connectors supporting ARDUINO® Uno**



The related pinout for the Zio connectors supporting ARDUINO® Uno V3 is listed in Table 11, Table 12, Table 13, and Table 14.

**Table 11. ARDUINO®-included Zio connector (CN7) pinout**

| MCU function | STM32 pin | Signal name | Pin name | Pin number | | Pin name | Signal name | STM32 pin | MCU function |
|---|---|---|---|---|---|---|---|---|---|
| I2S2 | PC6 | I2S_A_MCK | D16 | 1 | 2 | D15 | I2C_A_SCL | PB8 | I2C1 |
| I2S2 | PB15 | I2S_A_SD | D17 | 3 | 4 | D14 | I2C_A_SDA | PB9 | I2C1 |
| I2S2 | PB13 | I2S_A_CK | D18 | 5 | 6(1) | VREFP | - | - | - |
| I2S2 | PB12 | I2S_A_WS | D19 | 7 | 8 | GND | - | - | - |
| I2S3/SPI3 | PA15 | I2S_B_WS | D20 | 9 | 10 | D13 | SPI_A_SCK | PA5 | SPI1 |
| I2S3/SPI3 | PC7 | I2S_B_MCK | D21 | 11 | 12 | D12 | SPI_A_MISO | PA6 | SPI1 |
| I2S3/SPI3 | PB2 | I2S_B_SD/ SPI_B_MOSI | D22 | 13 | 14 | D11 | SPI_A_MOSI/ TIM_E_PWM1 | PB5 | SPI1 |
| I2S3/SPI3 | PB3 | I2S_B_CK/ SPI_B_SCK | D23(2) | 15 | 16 | D10 | SPI_A_CS/ TIM_B_PWM3 | PD14 | SPI1/ TIM4_CH3 |
| SPI3 | PA4 | SPI_B_NSS | D24 | 17 | 18 | D9 | TIM_B_PWM2 | PD15 | TIM4_CH4 |
| SPI3 | PB4 | SPI_B_MISO | D25 | 19 | 20 | D8 | IO | PF5 | - |

1. *A solder bridge (SB48) is used to disconnect the VREFP to the ARDUINO® connector (CN7) pin 6.*
   - *SB48 ON: VREFP is connected to the ARDUINO® connector (CN7) pin 6 (default configuration).*
   - *SB48 OFF: VREFP is not connected to the ARDUINO® connector (CN7) pin 6.*
2. *PB3 is shared between $I^2S$/SPI and JTAG SWO function (exclusive).*

**Table 12. ARDUINO®-included Zio connector (CN8) pinout**

| MCU function | STM32 pin | Signal name | Pin name | Pin number | | Pin name | Signal name | STM32 pin | MCU function |
|---|---|---|---|---|---|---|---|---|---|
| - | - | 5V_VIN_RES | NC | 1 | 2 | D43 | SDMMC_D0 | PC8 | SDMMC1 |
| - | - | IOREF | IOREF | 3 | 4 | D44 | SDMMC_D1 | PC9 | SDMMC1 |
| NRST | NRST | NRST | NRST | 5 | 6 | D45 | SDMMC_D2 | PC10 | SDMMC1 |
| - | - | 3V3 | 3V3 I/O | 7 | 8 | D46 | SDMMC_D3 | PC11 | SDMMC1 |
| - | - | 5V | 5V | 9 | 10 | D47(1) | SDMMC_CK | PC12 | SDMMC1 |
| - | - | GND | GND | 11 | 12 | D48(1) | SDMMC_CMD | PD2 | SDMMC1 |
| - | - | GND | GND | 13 | 14 | D49 | IO | PG2 | - |
| - | - | VIN | VIN | 15 | 16 | D50 | IO | PG3 | - |

1. *I/Os are shared between SDMMC and JTAG trace (exclusive). SB11 OFF to disconnect PC12 on Zio. SB12 OFF to disconnect PD2 on Zio.*

**Table 13. ARDUINO®-included Zio connector (CN9) pinout**

| MCU function | STM32 pin | Signal name | Pin name | Pin number | | Pin name | Signal name | STM32 pin | MCU function |
|---|---|---|---|---|---|---|---|---|---|
| ADC12_IN15 | PA3 | ADC | A0 | 1 | 2 | D51 | USART_B_SCLK | PD7 | USART2 |
| ADC12_IN10 | PC0 | ADC | A1 | 3 | 4 | D52 | USART_B_RX | PD6 | USART2 |
| ADC12_IN13 | PC3 | ADC | A2 | 5 | 6 | D53 | USART_B_TX | PD5 | USART2 |
| ADC12_IN4 | PC4 | ADC | A3 | 7 | 8 | D54 | USART_B_RTS | PA1 | USART2 |

| MCU function | STM32 pin | Signal name | Pin name | Pin number | | Pin name | Signal name | STM32 pin | MCU function |
|---|---|---|---|---|---|---|---|---|---|
| ADC12_IN8 | PC5 | ADC | A4(1) | 9 | 10 | D55 | USART_B_CTS | PD3 | USART2 |
| I2C1 | PB9 | I2C_A_SDA | | | | | | | |
| ADC1_IN2 | PF11 | ADC | A5(1) | 11 | 12 | GND | GND | - | - |
| I2C1 | PB8 | I2C_A_SCL | | | | | | | |
| COMP1 | - | NC | D72 | 13 | 14 | D56 | SAI_A_MCLK | PG7 | SAI1_A |
| COMP2 | - | NC | D71 | 15 | 16 | D57 | SAI_A_FS | PE4 | SAI1_A |
| I2C2 | PF2 | I2C_B_SMBA | D70 | 17 | 18 | D58 | SAI_A_SCK | PE5 | SAI1_A |
| I2C2 | PF1 | I2C_B_SCL | D69 | 19 | 20 | D59 | SAI_A_SD | PC1 | SAI1_A |
| I2C2 | PF0 | I2C_B_SDA | D68 | 21 | 22 | D60 | SAI_B_SD | PF6 | SAI1_B |
| - | - | GND | GND | 23 | 24 | D61 | SAI_B_SCK | PF8 | SAI1_B |
| CAN1 | PD0 | CAN_RX | D67 | 25 | 26 | D62 | SAI_B_MCLK | PF7 | SAI1_B |
| CAN1 | PD1 | CAN_TX | D66 | 27 | 28 | D63 | SAI_B_FS | PF9 | SAI1_B |
| - | PG0 | IO | D65 | 29 | 30 | D64 | IO | PG1 | - |

1. *Solder bridges (SB7, SB8, SB9, and SB10) are used to select ADC or $I^2C$ signals to the ARDUINO® connector (CN9) pins 9 and 11.*
   - *SB10 ON and SB8 OFF: The ADC is connected to the ARDUINO® connector CN9 pin 9. SB9 ON and SB7 OFF: The ADC is connected to the ARDUINO® connector (CN9) pin 11 (default configuration).*
   - *SB10 OFF and SB8 ON: I2C_SDA is connected to the ARDUINO® connector (CN9) pin 9. SB9 OFF and SB7 ON: I2C_SCL is connected to the ARDUINO® connector (CN9) pin 11.*

**Table 14. ARDUINO®-included Zio connector (CN10) pinout**

| MCU function | STM32 pin | Signal name | Pin name | Pin number | | Pin name | Signal name | STM32 pin | MCU function |
|---|---|---|---|---|---|---|---|---|---|
| - | - | AVDD | AVDD | 1 | 2 | D7 | IO | PF4 | IO |
| - | - | AGND | AGND | 3 | 4 | D6 | TIM_A_PWM1 | PE9 | TIM1_CH1 |
| - | - | GND | GND | 5 | 6 | D5 | TIM_A_PWM2 | PE11 | TIM1_CH2 |
| ADC12_IN5 | PB1 | ADC_A_IN | A6 | 7 | 8 | D4 | IO | PF3 | IO |
| ADC12_IN12 | PC2 | ADC_B_IN | A7 | 9 | 10 | D3 | TIM_A_PWM3 | PE13 | TIM1_CH3 |
| ADC2_IN6 | PF14 | ADC_C_IN | A8 | 11 | 12 | D2 | IO | PF15 | IO |
| OCTOSPI1 | PO0 | OCTOSPI_CS | D26 | 13 | 14 | D1 | USART_A_TX | PB14 | USART1 |
| OCTOSPI1 | PO4 | OCTOSPI_CLK | D27 | 15 | 16 | D0 | USART_A_RX | PA10 | USART1 |
| - | - | GND | GND | 17 | 18 | D42 | TIM_A_PWM1N | PE8 | TIM1_CH1N |
| OCTOSPI1 | PP3 | OCTOSPI_IO3 | D28 | 19 | 20 | D41 | TIM_A_ETR | PE7 | TIM1_ETR |
| OCTOSPI1 | PP1 | OCTOSPI_IO1 | D29 | 21 | 22 | GND | GND | - | - |
| OCTOSPI1 | PP0 | OCTOSPI_IO0 | D30 | 23 | 24 | D40 | TIM_A_PWM2N | PE10 | TIM1_CH2N |
| OCTOSPI1 | PP2 | OCTOSPI_IO2 | D31 | 25 | 26 | D39 | TIM_A_PWM3N | PE12 | TIM1_CH3N |
| - | - | GND | GND | 27 | 28 | D38 | TIM_A_BKIN2 | PE6 | TIM1_BKIN2 |
| TIM2_CH1 | PA0 | TIM_C_PWM1 | D32 | 29 | 30 | D37 | TIM_A_BKIN1 | PE15 | TIM1_BKIN |
| TIM3_CH3 | PB0 | TIM_D_PWM1 | D33 | 31 | 32 | D36 | TIM_C_PWM2 | PB10 | TIM2_CH3 |
| TIM4_ETR | PE0 | TIM_B_ETR | D34 | 33 | 34 | D35 | TIM_C_PWM3 | PB11 | TIM2_CH4 |

*Note: The OCTOSPI interface is used in quad-mode communication without DQS to support Quad-SPI memories.*

## 7.2 ST morpho headers (CN7 and CN10)

The ST morpho consists of CN11 and CN12 male pin header footprints (not soldered by default). They can be used to connect the STM32 Nucleo-144 board to an extension board or a prototype/wrapping board placed on top of the STM32 Nucleo-144 board. All signals and power pins of the STM32 are available on the ST morpho connector. An oscilloscope, logic analyzer, or voltmeter can also probe this connector.

**Figure 12. ST morpho connectors (CN7 and CN10)**

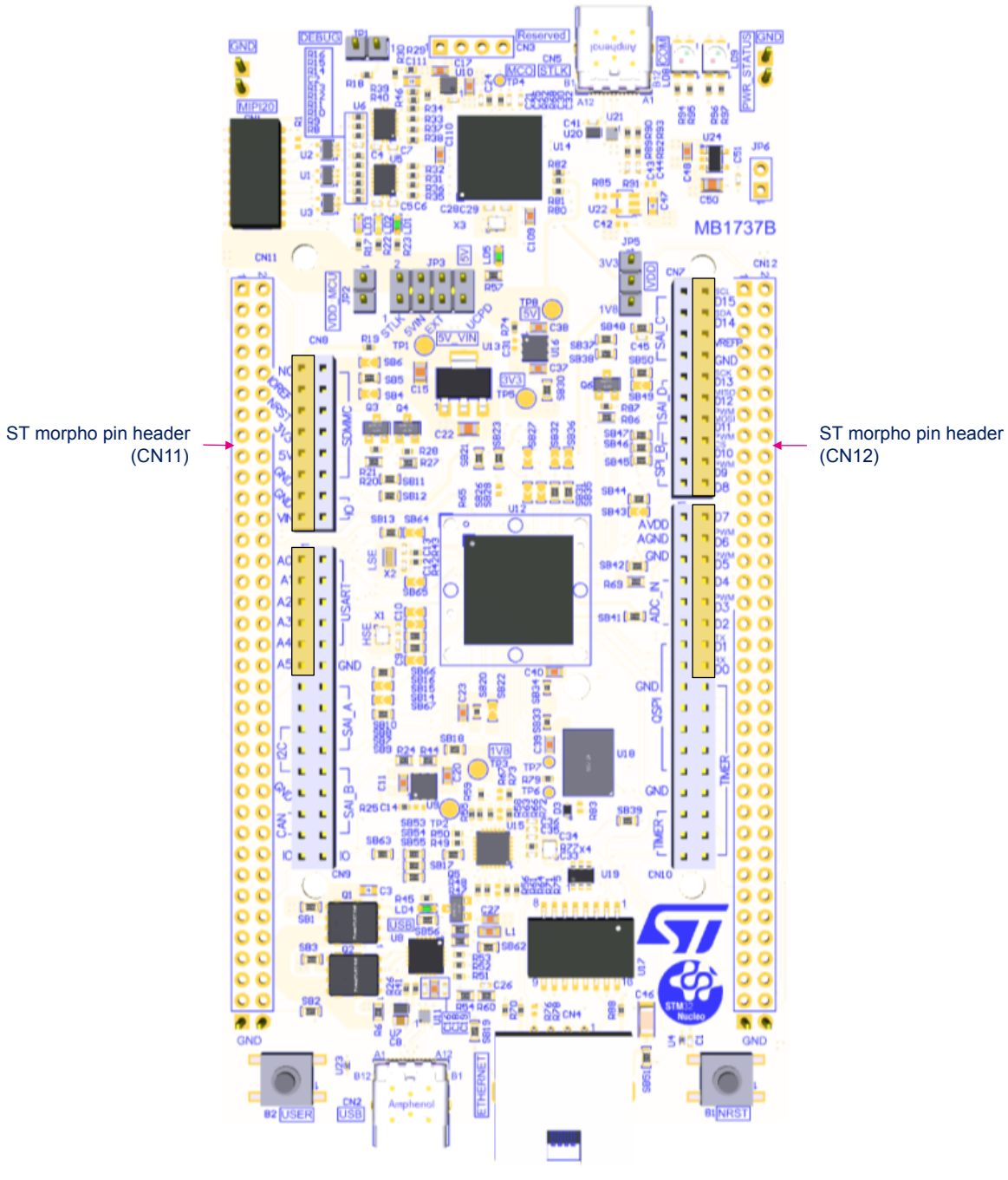


Table 15 shows the pin assignments for the STM32 on the ST morpho connector.

**Table 15. ST morpho connector pin assignment**

| CN7 odd pins | | CN7 even pins | | CN10 odd pins | | CN10 even pins | |
|---|---|---|---|---|---|---|---|
| Pin number | Pin name | Pin number | Pin name | Pin number | Pin name | Pin number | Pin name |
| 1 | PC10 | 2 | PC11 | 1 | PC9 | 2 | PC8 |
| 3 | PC12 | 4 | PD2 | 3 | PB8 | 4 | PC6 |
| 5 | VDD | 6 | 5V_EXT | 5 | PB9 | 6 | PC5 |
| 7 | BOOT0(1) | 8 | GND | 7 | VREFP | 8 | 5V_STLK(2) |
| 9 | PF6 | 10 | - | 9 | GND | 10 | PD8 |
| 11 | PF7 | 12 | IOREF | 11 | PA5 | 12 | PA12 |
| 13 | PA13(3) | 14 | NRST | 13 | PA6 | 14 | PA11(6) |
| 15 | PA14(3) | 16 | 3V3 | 15 | PA7 | 16 | PB12 |
| 17 | PA15 | 18 | 5V | 17 | PB6 | 18 | PB11 |
| 19 | GND | 20 | GND | 19 | PC7 | 20 | GND |
| 21 | PB7 | 22 | GND | 21 | PA9 | 22 | PB2 |
| 23 | PC13 | 24 | VIN | 23 | PA8 | 24 | PB1 |
| 25 | PC14(4) | 26 | - | 25 | PB10 | 26 | PB15 |
| 27 | PC15(4) | 28 | PA0 | 27 | PB4(5) | 28 | PB14 |
| 29 | PH0(4) | 30 | PA1 | 29 | PB5 | 30 | PB13 |
| 31 | PH1(4) | 32 | PA4 | 31 | PB3 | 32 | AGND |
| 33 | VBAT | 34 | PB0 | 33 | PA10 | 34 | PC4 |
| 35 | PC2 | 36 | PC1 | 35 | PA2 | 36 | PF5 |
| 37 | PC3 | 38 | PC0 | 37 | PA3 | 38 | PF4 |
| 39 | PD4 | 40 | PD3 | 39 | GND | 40 | PE8 |
| 41 | PD5 | 42 | PG2 | 41 | PD13 | 42 | PF10 |
| 43 | PD6 | 44 | PG3 | 43 | PD12 | 44 | PE7 |
| 45 | PD7 | 46 | PE2 | 45 | PD11 | 46 | PD14 |
| 47 | PE3 | 48 | PE4 | 47 | PE10 | 48 | PD15 |
| 49 | GND | 50 | PE5 | 49 | PE12 | 50 | PF14 |
| 51 | PF1 | 52 | PF2 | 51 | PE14 | 52 | PE9 |
| 53 | PF0 | 54 | PF8 | 53 | PE15 | 54 | GND |
| 55 | PD1 | 56 | PF9 | 55 | PE13 | 56 | PE11 |
| 57 | PD0 | 58 | PG1 | 57 | PF13 | 58 | PF3 |
| 59 | PG0 | 60 | GND | 59 | PF12 | 60 | PF15 |
| 61 | PE1 | 62 | PE6 | 61 | PG14 | 62 | PF11 |
| 63 | PG9 | 64 | PG15 | 63 | GND | 64 | PE0 |
| 65 | PG12 | 66 | PG10 | 65 | PD10 | 66 | PG8 |
| 67 | - | 68 | PG13 | 67 | PG7 | 68 | PG5 |
| 69 | PD9 | 70 | PG11 | 69 | PG4 | 70 | PG6 |

1. *The default state of BOOT0 is 0. It can be set to 1 when a jumper is on CN11 [5-7].*
2. *ST_STLK is 5V power, coming from an STLINK-V3EC USB connector. It rises before the 5V signal of the board.*
3. *PA13 and PA14 are shared with SWD signals connected to STLINK-V3EC.*

4. *PC14, PC15, PH0, and PH1 are disconnected by default. Refer to Table 16 for details.*
5. *PB4 is on CN12 pin27 by default (SB44 ON and SB43 OFF), if motor shield IHM11 is used, disconnect PB4 and connect PE15 by setting SB44 OFF and SB43 ON.*
6. *PA11 and PE6 are on CN12 pin14 together. When using PA11, keep PE6 as tristate, and vice versa. PE6 is used as a BKIN2 signal for motor shields.*

## 7.3 Solder bridge configuration for the expansion connector

Table 16 details the solder bridges of the STM32H7Rx/7Sx Nucleo-144 board for the expansion connector.

**Table 16. Solder bridge configuration**

| Definition | Solder Bridge | Setting(1) | Comment |
|---|---|---|---|
| IOREF selection | SB4 | **OFF** | **IOREF is not connected to the 3V3 power supply.** |
| | | ON | IOREF is connected to the 3V3 power supply. |
| | SB5 | **ON** | **IOREF is connected to the VDD power supply.** |
| | | OFF | IOREF is not connected to the VDD power supply. |
| | SB6 | **OFF** | **IOREF is not connected to the 1V8 power supply.** |
| | | ON | IOREF is connected to the 1V8 power supply. |
| Zio A4 (CN9 pin9) | SB8 | **OFF** | **PB9 is not connected to CN9 pin9.** |
| | | ON | PB9 is connected to CN9 pin9 as I2C_SDA. |
| | SB10 | **ON** | **PC5 is connected to CN9 pin9 as an ADC input.** |
| | | OFF | PC5 is not connected to CN9 pin9. |
| Zio A5 (CN9 pin11) | SB7 | **OFF** | **PB8 is not connected to CN9 pin11.** |
| | | ON | PB8 is connected to CN9 pin11 as I2C_SCL. |
| | SB9 | **ON** | **PF11 is connected to CN9 pin11 as an ADC input.** |
| | | OFF | PF11 is not connected to CN9 pin11. |
| SDMMC IO PC8/PC9 | SB38 | **ON** | **PC8 is connected to ST morpho CN12 pin 2 and Zio CN8 pin 2: SDMMC_D0 signal quality can be impacted.** |
| | | OFF | PC8 is not connected to ST morpho CN12 pin 2 to avoid stub on Zio CN8 SDMMC_D0. |
| | SB37 | **ON** | **PC9 is connected to ST morpho CN12 pin 1 and Zio CN8 pin 4. SDMMC_D1 signal quality can be impacted.** |
| | | OFF | PC9 is not connected to ST morpho CN12 pin 1 to avoid stub on Zio CN8 SDMMC_D1. |
| Trace data PC12/PD2 | SB11 | **ON** | **PC12 is connected to MIPI20 trace D3 and Zio CN8 pin 10: Trace signal quality can be impacted.** |
| | | OFF | PC12 is not connected to Zio CN8 pin 10 to avoid stub on trace signal. |
| | SB12 | **ON** | **PD2 is connected to MIPI20 trace D2 and Zio CN8 pin 12: Trace signal quality can be impacted.** |
| | | OFF | PD2 is not connected to Zio CN8 pin 12 to avoid stub on trace signal. |
| OSC32_IN PC14 | SB64 | **OFF** | **PC14 is disconnected from ST morpho CN11 pin25.** |
| | | ON | PC14 is connected to ST morpho CN11 pin25. |
| OSC32_OUT PC15 | SB65 | **OFF** | **PC15 is disconnected from ST morpho CN11 pin27.** |
| | | ON | PC15 is connected to ST morpho CN11 pin27. |
| OSC_IN | SB66 | **OFF** | **PH0 is disconnected from ST morpho CN11 pin29.** |

| Definition | Solder Bridge | Setting[1] | Comment |
|---|---|---|---|
| PH0 | SB66 | ON | PH0 is connected to ST morpho CN11 pin29. |
| OSC_OUT<br>PH1 | SB67 | **OFF** | **PH1 is disconnected from ST morpho CN11 pin29.** |
| | | ON | PH1 is connected to ST morpho CN11 pin29. |
| I2S_B_CK/ SPI_B_SCK and SWO<br>PB3 | SB45 | **ON** | **PB3 is used as an $I^2S$/SPI signal on Zio CN7 pin15, but is also connected to STLINK as the SWO signal through SB21.** |
| | | OFF | PB3 is not used as an $I^2S$/SPI signal on Zio CN7 pin15, can be used as the SWO. |
| RMII REF CLK<br>PB6 | SB52 | **ON** | **PB6 is connected to Ethernet as the RMII reference clock and ST morpho CN12 pin 17: Ethernet signal quality can be impacted.** |
| | | OFF | PB6 is not connected to ST morpho CN12 pin 17 to avoid stub on Ethernet. |

1. *The default configuration is in bold.*

# 8 NUCLEO-H7S3L8 product information

## 8.1 Product marking

The stickers located on the top or bottom side of all PCBs provide product information:

- First sticker: product order code and product identification, generally placed on the main board featuring the target device.
  Example:

  Product order code
  Product identification

- Second sticker: board reference with revision and serial number, available on each PCB.
  Example:

  MBxxxx-Variant-yzz
  syywwxxxxx

On the first sticker, the first line provides the product order code, and the second line the product identification.

On the second sticker, the first line has the following format: *"MBxxxx-Variant-yzz"*, where *"MBxxxx"* is the board reference, *"Variant"* (optional) identifies the mounting variant when several exist, *"y"* is the PCB revision, and *"zz"* is the assembly revision, for example B01. The second line shows the board serial number used for traceability.

Parts marked as *"ES"* or *"E"* are not yet qualified and therefore not approved for use in production. ST is not responsible for any consequences resulting from such use. In no event will ST be liable for the customer using any of these engineering samples in production. ST's Quality department must be contacted prior to any decision to use these engineering samples to run a qualification activity.

*"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 evaluation tool ordering part number 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.

## 8.2 NUCLEO-H7S3L8 product history

**Table 17. Product history**

| Order code | Product identification | Product details | Product change description | Product limitations |
|---|---|---|---|---|
| NUCLEO-H7S3L8 | NUH7S3L8$KR1 | MCU:<br>• STM32H7S3L8H6 silicon revision "Y" | Initial revision | No limitation |
| | | MCU errata sheet:<br>• *STM32H7Rxx/Sxx device errata* (ES0596) | | |
| | | Board:<br>• MB1737-H7S3L8-B02 (main board) | | |

## 8.3 Board revision history

**Table 18. Board revision history**

| Board reference | Board variant and revision | Board change description | Board limitations |
|---|---|---|---|
| MB1737 (main board) | H7S3L8-B02 | Initial revision | No limitation |

# 9 Federal Communications Commission (FCC) and ISED Canada Compliance Statements

## 9.1 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 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 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 (in the USA)**

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## 9.2 ISED Compliance Statement

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

# Revision history

Table 19. **Document revision history**

| Date | Revision | Changes |
|---|---|---|
| 08-Feb-2024 | 1 | Initial release. |

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