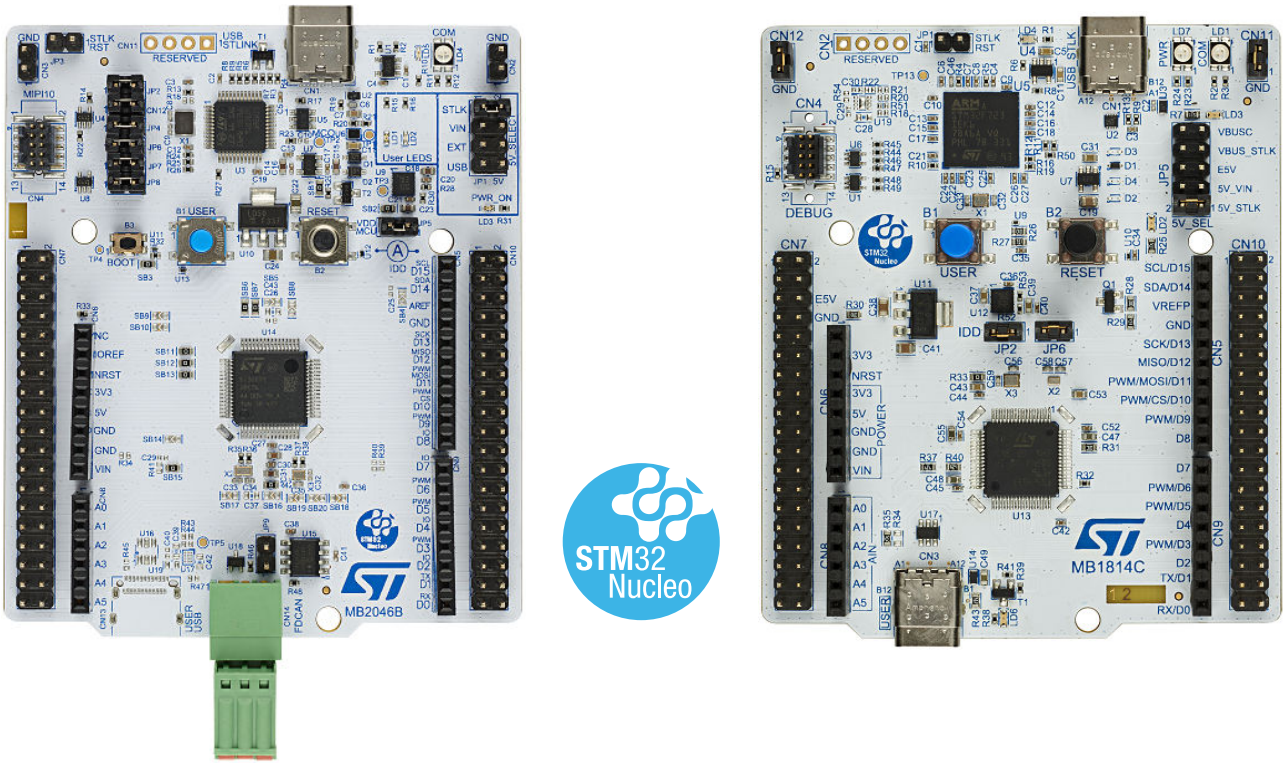
NUCLEO-xxxxCx NUCLEO-xxxxRx NUCLEO-xxxxRx-P NUCLEO-xxxxRx-Q

Data brief

STM32 Nucleo-64 boards



NUCLEO-C092RC (left) and NUCLEO-H533RE (right) examples. Boards with different references show different layouts. Pictures are not contractual.

Product status link
NUCLEO-xxxxCx
NUCLEO-C031C6, NUCLEO-C051C8
NUCLEO-xxxxRx
NUCLEO-C071RB, NUCLEO-C092RC, NUCLEO-F030R8, NUCLEO-F070RB, NUCLEO-F072RB, NUCLEO-F091RC, NUCLEO-F103RB, NUCLEO-F302R8, NUCLEO-F303RE, NUCLEO-F334R8, NUCLEO-F401RE, NUCLEO-F410RB, NUCLEO-F411RE, NUCLEO-F446RE, NUCLEO-G070RB, NUCLEO-G071RB, NUCLEO-G0B1RE, NUCLEO-G431RB, NUCLEO-G474RE, NUCLEO-G491RE, NUCLEO-H503RB, NUCLEO-H533RE, NUCLEO-L010RB, NUCLEO-L053R8, NUCLEO-L073RZ, NUCLEO-L152RE, NUCLEO-L452RE, NUCLEO-L476RG, NUCLEO-U031R8, NUCLEO-U083RC
NUCLEO-xxxxRx-P
NUCLEO-L412RB-P, NUCLEO-L433RC-P, NUCLEO-L452RE-P
NUCLEO-xxxxRx-Q
NUCLEO-U545RE-Q

Features

Common features

- STM32 microcontroller in an LQFP64 or LQFP48 package
- 1 user LED shared with ARDUINO®
- 1 user and 1 reset push-buttons
- 32.768 kHz crystal oscillator
- Board connectors:
  - ARDUINO® Uno V3 expansion connector
  - ST morpho extension pin headers for full access to all STM32 I/Os
- Flexible power-supply options: ST-LINK USB V_{BUS} or external sources
- 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

Features specific to some of the boards
(refer to the ordering information section of the data brief for details)

- Second user LED
- External or internal SMPS to generate V_{core} logic supply
- 24 MHz or 48 MHz HSE
- User USB Device full speed, or USB SNK/UFP full speed
- Cryptography
- CAN FD transceiver
- Board connectors:
  - External SMPS experimentation dedicated connector
  - USB Type-C®, Micro-B, or Mini-B connector for the ST-LINK
  - USB Type-C® user connector
  - MIPI® debug connector
  - CAN FD header
- On-board ST-LINK (STLINK/V2-1, STLINK-V3E, STLINK-V2EC, or STLINK-V3EC) debugger/programmer with USB re-enumeration capability: mass storage, Virtual COM port, and debug port

Description

The STM32 Nucleo-64 board 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 STM32 microcontroller. For the compatible boards, the internal or external SMPS significantly reduces power consumption in Run mode.

The ARDUINO® Uno V3 connectivity support and the ST morpho headers allow the easy expansion of the functionality of the STM32 Nucleo open development platform with a wide choice of specialized shields.

The STM32 Nucleo-64 board does not require any separate probe as it integrates the ST-LINK debugger/programmer.

The STM32 Nucleo-64 board comes with the STM32 comprehensive free software libraries and examples available with the STM32Cube MCU Package.

1 Ordering information

To order an STM32 Nucleo-64 board, refer to Table 1. For a detailed description of each board, refer to its user manual on the product web page. Additional information is available from the datasheet and reference manual of the target STM32.

Table 1. List of available products

Order code	Board reference	User manual	Target STM32	Differentiating features
NUCLEO-C031C6	MB1717	UM2953	STM32C031C6T6	• ST-LINK/V2-1 on USB Micro-B connector • 48 MHz HSE • LQFP48
NUCLEO-C051C8			STM32C051C8T6	• ST-LINK/V2-1 on USB Micro-B connector • 48 MHz HSE • LQFP48
NUCLEO-C071RB	MB2046	UM3353	STM32C071RBT6	• Second user LED • USB FS (device only) on USB Type-C® connector • STLINK-V2EC on USB Type-C® connector • MIPI® debug connector • 48 MHz HSE • LQFP64
NUCLEO-C092RC			STM32C092RCT6	• Second user LED • CAN FD • STLINK-V2EC on USB Type-C® connector • MIPI® debug connector • 48 MHz HSE • LQFP64
NUCLEO-F030R8	MB1136	UM1724	STM32F030R8T6	• ST-LINK/V2-1 on USB Mini-B connector • LQFP64
NUCLEO-F070RB			STM32F070RBT6	• ST-LINK/V2-1 on USB Mini-B connector • LQFP64
NUCLEO-F072RB			STM32F072RBT6	• ST-LINK/V2-1 on USB Mini-B connector • LQFP64
NUCLEO-F091RC			STM32F091RCT6	• ST-LINK/V2-1 on USB Mini-B connector • LQFP64
NUCLEO-F103RB			STM32F103RBT6	• ST-LINK/V2-1 on USB Mini-B connector • LQFP64
NUCLEO-F302R8			STM32F302R8T6	• ST-LINK/V2-1 on USB Mini-B connector • LQFP64
NUCLEO-F303RE			STM32F303RET6	• ST-LINK/V2-1 on USB Mini-B connector • LQFP64

Order code	Board reference	User manual	Target STM32	Differentiating features
NUCLEO-F334R8	MB1136	UM1724	STM32F334R8T6	• ST-LINK/V2-1 on USB Mini-B connector • LQFP64
NUCLEO-F401RE			STM32F401RET6	• ST-LINK/V2-1 on USB Mini-B connector • LQFP64
NUCLEO-F410RB			STM32F410RBT6	• ST-LINK/V2-1 on USB Mini-B connector • LQFP64
NUCLEO-F411RE			STM32F411RET6	• ST-LINK/V2-1 on USB Mini-B connector • LQFP64
NUCLEO-F446RE			STM32F446RET6	• ST-LINK/V2-1 on USB Mini-B connector • LQFP64
NUCLEO-G070RB	MB1360	UM2324	STM32G070RBT6	• ST-LINK/V2-1 on USB Micro-B connector • LQFP64
NUCLEO-G071RB			STM32G071RBT6	• ST-LINK/V2-1 on USB Micro-B connector • LQFP64
NUCLEO-G0B1RE			STM32G0B1RET6	• ST-LINK/V2-1 on USB Micro-B connector • LQFP64
NUCLEO-G431RB	MB1367	UM2505	STM32G431RBT6	• STLINK-V3E on USB Micro-B connector • 24 MHz HSE • MIPI® debug connector • LQFP64
NUCLEO-G474RE			STM32G474RET6	• STLINK-V3E on USB Micro-B connector • 24 MHz HSE • MIPI® debug connector • LQFP64
NUCLEO-G491RE			STM32G491RET6	• STLINK-V3E on USB Micro-B connector • 24 MHz HSE • MIPI® debug connector • LQFP64
NUCLEO-H503RB	MB1814	UM3121	STM32H503RBT6	• USB FS (device only) on USB Type-C® connector • STLINK-V3EC on USB Type-C® connector • MIPI® debug connector • LQFP64
NUCLEO-H533RE			STM32H533RET6	• USB FS (device only) on USB Type-C® connector • STLINK-V3EC on USB Type-C® connector • MIPI® debug connector • Cryptography • LQFP64

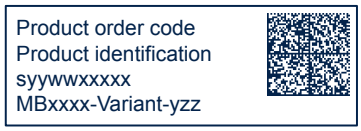
Order code	Board reference	User manual	Target STM32	Differentiating features
NUCLEO-L010RB	MB1136	UM1724	STM32L010RBT6	• ST-LINK/V2-1 on USB Mini-B connector • LQFP64
NUCLEO-L053R8			STM32L053R8T6	• ST-LINK/V2-1 on USB Mini-B connector • LQFP64
NUCLEO-L073RZ			STM32L073RZT6	• ST-LINK/V2-1 on USB Mini-B connector • LQFP64
NUCLEO-L152RE			STM32L152RET6	• ST-LINK/V2-1 on USB Mini-B connector • LQFP64
NUCLEO-L412RB-P	MB1319	UM2206	STM32L412RBT6P	• ST-LINK/V2-1 on USB Micro-B connector • External SMPS • LQFP64
NUCLEO-L433RC-P			STM32L433RCT6P	• ST-LINK/V2-1 on USB Micro-B connector • External SMPS • LQFP64
NUCLEO-L452RE	MB1136	UM1724	STM32L452RET6	• ST-LINK/V2-1 on USB Mini-B connector • LQFP64
NUCLEO-L452RE-P	MB1319	UM2206	STM32L452RET6P	• ST-LINK/V2-1 on USB Micro-B connector • External SMPS • LQFP64
NUCLEO-L476RG	MB1136	UM1724	STM32L476RGT6	• ST-LINK/V2-1 on USB Mini-B connector • LQFP64
NUCLEO-U031R8	MB1932	UM3256	STM32U031R8T6	• STLINK-V2EC on USB Type-C® connector • MIPI® debug connector • LQFP64
NUCLEO-U083RC			STM32U083RCT6	• STLINK-V2EC on USB Type-C® connector • MIPI® debug connector • Cryptography • LQFP64
NUCLEO-U545RE-Q	MB1841	UM3062	STM32U545RET6Q	• USB SNK/UFP (FS mode) on USB Type-C® connector • STLINK-V3EC on USB Type-C® connector • Cryptography • Internal SMPS • LQFP64

1.1 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:

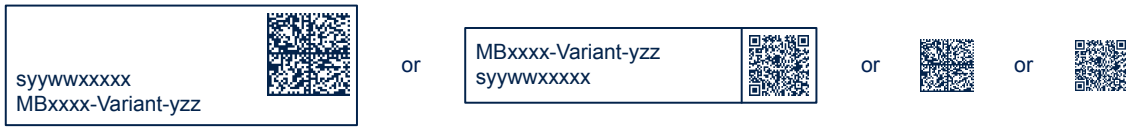
  

  Dual-sticker example:

- 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.

1.2 Codification

The meaning of the codification is explained in Table 2.

Table 2. Codification explanation

NUCLEO-XXYYZT NUCLEO-XXYYZT-P NUCLEO-XXYYZT-Q	Description	Example: NUCLEO-L452RE
XX	MCU series in STM32 32-bit Arm Cortex MCUs	STM32L4 Series
YY	MCU product line in the series	STM32L452
Z	STM32 package pin count • C for 48 pins • R for 64 pins	64 pins
T	STM32 flash memory size: • 6 for 32 Kbytes • 8 for 64 Kbytes • B for 128 Kbytes • C for 256 Kbytes • E for 512 Kbytes • G for 1 Mbyte • Z for 192 Kbytes	512 Kbytes
-P	STM32 has an external SMPS function	No SMPS
-Q	STM32 has an internal SMPS function	

2 Development environment

STM32 32-bit microcontrollers are based on the Arm® Cortex®-M processor.

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

2.1 System requirements

- Multi-OS support: Windows® 10, Linux® 64-bit, or macOS®
- USB Type-A or USB Type-C® to Micro-B cable, or USB Type-A or USB Type-C® to Mini-B cable, or USB Type-A or USB Type-C® to USB Type-C® cable (depending on the board reference)

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.

2.2 Development toolchains

- IAR Systems® - IAR Embedded Workbench®(1)
- Keil® - MDK-ARM(1) (2)
- STMicroelectronics - STM32CubeIDE

1. *On Windows® only.*
2. *Free MDK-ARM for Arm® Cortex®-M0/M0+ cores.*

2.3 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*.

Revision history

Table 3. **Document revision history**

Date	Revision	Changes
10-Feb-2014	1	Initial release.
13-Feb-2014	2	Added *Table 1: Device summary* and updated *Table 2: Ordering information*.
11-Apr-2014	3	Extended the applicability to NUCLEO-F302R8. Updated *Table 1: Device summary* and *Table 2: Ordering information*.
26-May-2014	4	Extended the applicability to NUCLEO-L053R8, NUCLEO-F072RB, NUCLEO-F334R8, and NUCLEO-F411RE. Updated *Table 1* and *Table 2*.
09-Sep-2014	5	Extended the applicability to NUCLEO-F091RC and NUCLEO-F303RE. Updated *Features*. Updated *Table 1: Device summary* and *Table 2: Ordering information*.
16-Dec-2014	6	Extended the applicability to NUCLEO-F070RB, NUCLEO-L073RZ, and NUCLEO-L476RG. Updated *Table 1: Device summary* and *Table 2: Ordering information*.
08-Jul-2015	7	Extended the applicability to NUCLEO-F410RB, NUCLEO-F446RE. Updated *Table 1: Device summary* and *Table 2: Ordering information*.
29-Nov-2016	8	Extended the applicability to NUCLEO-L452RE. Updated *Table 1: Device summary* and *Table 2: Ordering information*. Added *Table 3: Codification explanation*.
16-Nov-2017	9	Extended document scope to the NUCLEO-L452RE-P and NUCLEO-L433RC-P boards: • Updated *Features* • Updated *Table 1: Device summary*, *Table 2: Ordering information*, and *Table 3: Codification explanation* • Updated *System requirement*, *Development toolchains*, and *Demonstration software*
15-Dec-2017	10	Updated *Features*, *Description*, and *System requirement*. Extended document scope to the NUCLEO-L010RB board: updated *Table 1: Device summary* and *Table 2: Ordering information*.
24-Aug-2018	11	Extended document scope to the NUCLEO-L412RB-P board: updated *Table 1: Device summary* and *Table 2: Ordering information*.
22-Oct-2018	12	Extended document scope to the NUCLEO-G070RB and NUCLEO-G071RB boards: • Updated *Table 1: Device summary* and *Table 2: Ordering information* • Added NUCLEO-GXXXRX top view on the cover page
08-Apr-2019	13	Revised the entire document to accommodate to multiple feature combinations: • Reorganized *Features* • Updated *Description* • Added *Ordering information* and *Development environment* • Updated *Table 1. List of available products* and *Table 2. Codification explanation* Extended document scope to the NUCLEO-G431RB and NUCLEO-G474RE boards.
25-Oct-2020	14	Extended document scope to the NUCLEO-G0B1RE and NUCLEO-G491RE: updated *List of available products*.

Date	Revision	Changes
17-Dec-2021	15	Extended document scope to the NUCLEO-C031C6. Updated ST-LINK USB connectors in *List of available products*. Removed the references to Arm® Mbed™.
06-Feb-2023	16	Extended document scope to the NUCLEO-H503RB. Added board-specific user USB in *Features*. Updated ST-LINK USB connector range in *Features* and *System requirements*. Updated *Product marking*.
20-Feb-2023	17	Extended document scope to the NUCLEO-U545RE-Q.
19-Feb-2024	18	Extended document scope to the NUCLEO-H533RE, NUCLEO-U031R8, and NUCLEO-U083RC boards. Updated *Features* with additional details in the section related to the board-specific features.
24-Jun-2024	19	Extended document scope to the NUCLEO-C071RB board.
22-Nov-2024	20	Extended document scope to the NUCLEO-C051C8 and NUCLEO-C092RC boards. Updated Features and Product marking.