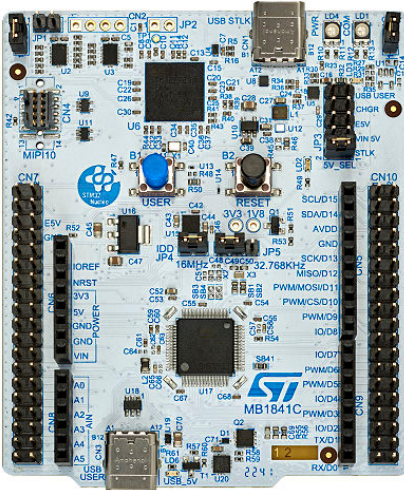


## STM32 Nucleo-64 boards



*NUCLEO-U545RE-Q example. Boards with different references show different layouts. Picture is not contractual.*

### 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
- On-board ST-LINK 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

#### Board-specific features

- External SMPS to generate  $V_{core}$  logic supply
- 24 MHz or 48 MHz HSE
- User USB Device full speed, or USB SNK/USP full speed
- Cryptography
- 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

### 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 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.

Product status link
<b>NUCLEO-XXXXCX</b>
NUCLEO-C031C6
<b>NUCLEO-XXXXRX</b>
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-L010RB, NUCLEO-L053R8, NUCLEO-L073RZ, NUCLEO-L152RE, NUCLEO-L452RE, NUCLEO-L476RG
<b>NUCLEO-XXXXRX-P</b>
NUCLEO-L412RB-P, NUCLEO-L433RC-P, NUCLEO-L452RE-P
<b>NUCLEO-XXXXRX-Q</b>
NUCLEO-U545RE-Q



# 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	<ul style="list-style-type: none"> <li>ST-LINK/V2-1 on USB Micro-B connector</li> <li>48 MHz HSE</li> <li>LQFP48</li> </ul>
NUCLEO-F030R8	MB1136	UM1724	STM32F030R8T6	<ul style="list-style-type: none"> <li>ST-LINK/V2-1 on USB Mini-B connector</li> <li>LQFP64</li> </ul>
NUCLEO-F070RB			STM32F070RBT6	<ul style="list-style-type: none"> <li>ST-LINK/V2-1 on USB Mini-B connector</li> <li>LQFP64</li> </ul>
NUCLEO-F072RB			STM32F072RBT6	<ul style="list-style-type: none"> <li>ST-LINK/V2-1 on USB Mini-B connector</li> <li>LQFP64</li> </ul>
NUCLEO-F091RC			STM32F091RCT6	<ul style="list-style-type: none"> <li>ST-LINK/V2-1 on USB Mini-B connector</li> <li>LQFP64</li> </ul>
NUCLEO-F103RB			STM32F103RBT6	<ul style="list-style-type: none"> <li>ST-LINK/V2-1 on USB Mini-B connector</li> <li>LQFP64</li> </ul>
NUCLEO-F302R8			STM32F302R8T6	<ul style="list-style-type: none"> <li>ST-LINK/V2-1 on USB Mini-B connector</li> <li>LQFP64</li> </ul>
NUCLEO-F303RE			STM32F303RET6	<ul style="list-style-type: none"> <li>ST-LINK/V2-1 on USB Mini-B connector</li> <li>LQFP64</li> </ul>
NUCLEO-F334R8			STM32F334R8T6	<ul style="list-style-type: none"> <li>ST-LINK/V2-1 on USB Mini-B connector</li> <li>LQFP64</li> </ul>
NUCLEO-F401RE			STM32F401RET6	<ul style="list-style-type: none"> <li>ST-LINK/V2-1 on USB Mini-B connector</li> <li>LQFP64</li> </ul>
NUCLEO-F410RB			STM32F410RBT6	<ul style="list-style-type: none"> <li>ST-LINK/V2-1 on USB Mini-B connector</li> <li>LQFP64</li> </ul>
NUCLEO-F411RE			STM32F411RET6	<ul style="list-style-type: none"> <li>ST-LINK/V2-1 on USB Mini-B connector</li> <li>LQFP64</li> </ul>
NUCLEO-F446RE			STM32F446RET6	<ul style="list-style-type: none"> <li>ST-LINK/V2-1 on USB Mini-B connector</li> <li>LQFP64</li> </ul>
NUCLEO-G070RB			MB1360	UM2324

Order code	Board reference	User manual	Target STM32	Differentiating features
NUCLEO-G071RB	MB1360	UM2324	STM32G071RBT6	<ul style="list-style-type: none"> <li>ST-LINK/V2-1 on USB Micro-B connector</li> <li>LQFP64</li> </ul>
NUCLEO-G0B1RE			STM32G0B1RET6	<ul style="list-style-type: none"> <li>ST-LINK/V2-1 on USB Micro-B connector</li> <li>LQFP64</li> </ul>
NUCLEO-G431RB	MB1367	UM2505	STM32G431RBT6	<ul style="list-style-type: none"> <li>STLINK-V3E on USB Micro-B connector</li> <li>24 MHz HSE</li> <li>MIPI® debug connector</li> <li>LQFP64</li> </ul>
NUCLEO-G474RE			STM32G474RET6	<ul style="list-style-type: none"> <li>STLINK-V3E on USB Micro-B connector</li> <li>24 MHz HSE</li> <li>MIPI® debug connector</li> <li>LQFP64</li> </ul>
NUCLEO-G491RE			STM32G491RET6	<ul style="list-style-type: none"> <li>STLINK-V3E on USB Micro-B connector</li> <li>24 MHz HSE</li> <li>MIPI® debug connector</li> <li>LQFP64</li> </ul>
NUCLEO-H503RB	MB1814	UM3121	STM32H503RBT6	<ul style="list-style-type: none"> <li>USB FS (device only) on USB Type-C® connector</li> <li>STLINK-V3EC on USB Type-C® connector</li> <li>LQFP64</li> </ul>
NUCLEO-L010RB	MB1136	UM1724	STM32L010RBT6	<ul style="list-style-type: none"> <li>ST-LINK/V2-1 on USB Mini-B connector</li> <li>LQFP64</li> </ul>
NUCLEO-L053R8			STM32L053R8T6	<ul style="list-style-type: none"> <li>ST-LINK/V2-1 on USB Mini-B connector</li> <li>LQFP64</li> </ul>
NUCLEO-L073RZ			STM32L073RZT6	<ul style="list-style-type: none"> <li>ST-LINK/V2-1 on USB Mini-B connector</li> <li>LQFP64</li> </ul>
NUCLEO-L152RE			STM32L152RET6	<ul style="list-style-type: none"> <li>ST-LINK/V2-1 on USB Mini-B connector</li> <li>LQFP64</li> </ul>
NUCLEO-L412RB-P	MB1319	UM2206	STM32L412RBT6P	<ul style="list-style-type: none"> <li>ST-LINK/V2-1 on USB Micro-B connector</li> <li>External SMPS</li> <li>LQFP64</li> </ul>
NUCLEO-L433RC-P			STM32L433RCT6P	<ul style="list-style-type: none"> <li>ST-LINK/V2-1 on USB Micro-B connector</li> <li>External SMPS</li> <li>LQFP64</li> </ul>
NUCLEO-L452RE	MB1136	UM1724	STM32L452RET6	<ul style="list-style-type: none"> <li>ST-LINK/V2-1 on USB Mini-B connector</li> <li>LQFP64</li> </ul>
NUCLEO-L452RE-P	MB1319	UM2206	STM32L452RET6P	<ul style="list-style-type: none"> <li>ST-LINK/V2-1 on USB Micro-B connector</li> <li>External SMPS</li> <li>LQFP64</li> </ul>



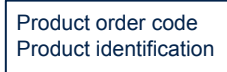
Order code	Board reference	User manual	Target STM32	Differentiating features
NUCLEO-L476RG	MB1136	UM1724	STM32L476RGT6	<ul style="list-style-type: none"><li>• ST-LINK/V2-1 on USB Mini-B connector</li><li>• LQFP64</li></ul>
NUCLEO-U545RE-Q	MB1841	UM3062	STM32U545RET6Q	<ul style="list-style-type: none"><li>• USB SNK/UFP (FS mode) on USB Type-C® connector</li><li>• STLINK-V3EC on USB Type-C® connector</li><li>• Internal SMPS</li><li>• LQFP64</li><li>• Cryptography</li></ul>

## 1.1 Product marking

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

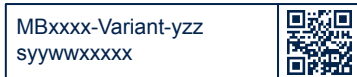
- First sticker: product order code and product identification, generally placed on the main board featuring the target device.

Example:



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

Example:



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-yyz*”, 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](http://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.

## 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 <ul style="list-style-type: none"> <li>• C for 48 pins</li> <li>• R for 64 pins</li> </ul>	64 pins
T	STM32 flash memory size: <ul style="list-style-type: none"> <li>• 6 for 32 Kbytes</li> <li>• 8 for 64 Kbytes</li> <li>• B for 128 Kbytes</li> <li>• C for 256 Kbytes</li> <li>• E for 512 Kbytes</li> <li>• G for 1 Mbyte</li> <li>• Z for 192 Kbytes</li> </ul>	512 Kbytes
-P	STM32 has external SMPS function	No SMPS
-Q	STM32 has 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®<sup>(1)</sup>
- Keil® - MDK-ARM<sup>(1)</sup>
- STMicroelectronics - STM32CubeIDE

1. On Windows® only.

### 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](http://www.st.com).

## Revision history

**Table 3. Document revision history**

Date	Revision	Changes
10-Feb-2014	1	Initial release.
13-Feb-2014	2	Added <i>Table 1: Device summary</i> and updated <i>Table 2: Ordering information</i> .
11-Apr-2014	3	Extended the applicability to NUCLEO-F302R8. Updated <i>Table 1: Device summary</i> and <i>Table 2: Ordering information</i> .
26-May-2014	4	Extended the applicability to NUCLEO-L053R8, NUCLEO-F072RB, NUCLEO-F334R8 and NUCLEO-F411RE. Updated <i>Table 1</i> and <i>Table 2</i> .
9-Sep-2014	5	Extended the applicability to NUCLEO-F091RC and NUCLEO-F303RE. Updated <i>Features</i> . Updated <i>Table 1: Device summary</i> and <i>Table 2: Ordering information</i> .
16-Dec-2014	6	Extended the applicability to NUCLEO-F070RB, NUCLEO-L073RZ and NUCLEO-L476RG. Updated <i>Table 1: Device summary</i> and <i>Table 2: Ordering information</i> .
8-Jul-2015	7	Extended the applicability to NUCLEO-F410RB, NUCLEO-F446RE. Updated <i>Table 1: Device summary</i> and <i>Table 2: Ordering information</i> .
29-Nov-2016	8	Extended the applicability to NUCLEO-L452RE. Updated <i>Table 1: Device summary</i> and <i>Table 2: Ordering information</i> . Added <i>Table 3: Codification explanation</i> .
16-Nov-2017	9	Extended document scope to the NUCLEO-L452RE-P and NUCLEO-L433RC-P boards: <ul style="list-style-type: none"> <li>Updated <i>Features</i></li> <li>Updated <i>Table 1: Device summary</i>, <i>Table 2: Ordering information</i> and <i>Table 3: Codification explanation</i></li> <li>Updated <i>System requirement</i>, <i>Development toolchains</i> and <i>Demonstration software</i></li> </ul>
15-Dec-2017	10	Updated <i>Features</i> , <i>Description</i> and <i>System requirement</i> . Extended document scope to the NUCLEO-L010RB board: updated <i>Table 1: Device summary</i> and <i>Table 2: Ordering information</i> .
24-Aug-2018	11	Extended document scope to the NUCLEO-L412RB-P board: updated <i>Table 1: Device summary</i> and <i>Table 2: Ordering information</i> .
22-Oct-2018	12	Extended document scope to the NUCLEO-G070RB and NUCLEO-G071RB boards: <ul style="list-style-type: none"> <li>Updated <i>Table 1: Device summary</i> and <i>Table 2: Ordering information</i></li> <li>Added NUCLEO-GXXXXRX top view on the cover page</li> </ul>
8-Apr-2019	13	Revised the entire document to accommodate to multiple feature combinations: <ul style="list-style-type: none"> <li>Reorganized <i>Features</i></li> <li>Updated <i>Description</i></li> <li>Added <i>Ordering information</i> and <i>Development environment</i></li> <li>Updated <i>Table 1. List of available products</i> and <i>Table 2. Codification explanation</i></li> </ul> 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 <i>List of available products</i> .



Date	Revision	Changes
17-Dec-2021	15	Extended document scope to the NUCLEO-C031C6. Updated ST-LINK USB connectors in <i>List of available products</i> . Removed the references to Arm® Mbed™.
6-Feb-2023	16	Extended document scope to the NUCLEO-H503RB. Added board-specific user USB in <i>Features</i> . Updated ST-LINK USB connector range in <i>Features</i> and <i>System requirements</i> . Updated <i>Product marking</i> .
20-Feb-2023	17	Extended document scope to the <a href="#">NUCLEO-U545RE-Q</a> .





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