STM32G4 Nucleo-64 boards (MB1367)

Introduction

The STM32G4 Nucleo-64 boards based on the MB1367 reference board (NUCLEO-G431RB, NUCLEO-G474RE) provide an affordable and flexible way for users to try out new concepts and build prototypes with the STM32G4 Series microcontrollers, choosing from the various combinations of performance, power consumption and features. The Arduino™ Uno V3 connectivity and the ST morpho headers provide an easy means of expanding the functionality of the Nucleo open development platform with a wide choice of specialized shields. The STM32G4 Nucleo-64 boards do not require any separate probe as they integrate the STLINK-V3E debugger/programmer. The STM32G4 Nucleo-64 boards come with the comprehensive free software libraries and examples available with the STM32CubeG4 MCU Package.

Figure 1. NUCLEO-G474RE top view

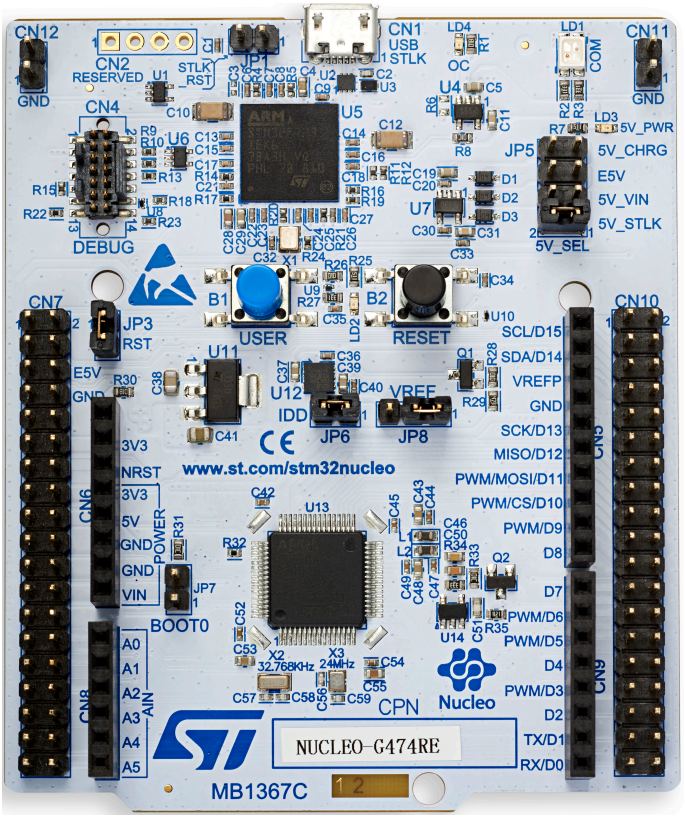
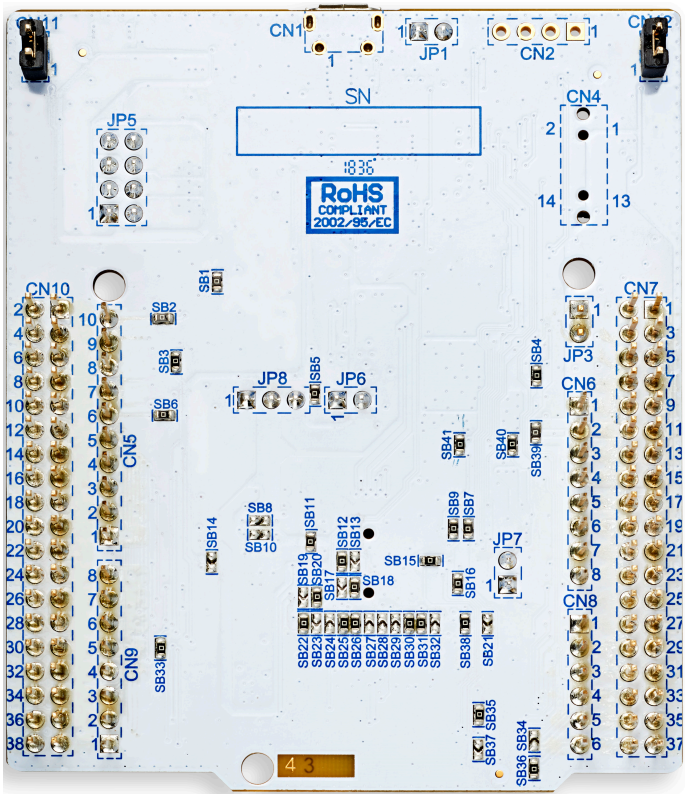


Figure 2. NUCLEO-G474RE bottom view



Pictures are not contractual.

1 Features

- STM32G4 microcontroller (Arm® Cortex®-M4 at 170 MHz) in LQFP64 package featuring:
  - 128 KBytes of Flash memory and 32 Kbytes of SRAM for STM32G431RBT6
  - 512 KBytes of Flash memory and 128 Kbytes of SRAM for STM32G474RET6
- Fully compatible with STM32G473RET6 (512 Kbytes of Flash memory and 128 Kbytes of SRAM)
- 1 user LED
- 1 user and 1 reset push-buttons
- 32.768 kHz LSE crystal oscillator
- 24 MHz HSE on-board oscillator
- Board connectors:
  - USB with Micro-AB
  - MIPI® debug connector
  - Arduino™ Uno V3 expansion connector
  - ST morpho extension pin headers for full access to all STM32G4 I/Os
- Flexible power-supply options: ST-LINK USB V_{BUS} or external sources
- On-board STLINK-V3E debugger/programmer with USB re-enumeration capability: mass storage, Virtual COM port, and debug port
- Comprehensive free software libraries and examples available with the STM32CubeG4 MCU Package
- Support of a wide choice of Integrated Development Environments (IDEs) including IAR™, Keil®, GCC-based IDEs

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

2 Ordering information

To order an STM32G4 Nucleo-64 board, refer to Table 1. Additional information is available from the datasheet and reference manual of the target STM32.

Table 1. List of available products

Order code	Board reference	Target STM32
NUCLEO-G431RB	MB1367	STM32G431RBT6U
NUCLEO-G474RE		STM32G474RET6U

2.1 Product marking

Evaluation tools marked as “ES” or “E” are not yet qualified and therefore not ready to be used as reference design or in production. Any consequences deriving from such usage will not be at ST charge. In no event, ST will be liable for any customer usage of these engineering sample tools as reference design or in production.

“E” or “ES” marking examples of location:

- On the targeted STM32 that is soldered on the board (for 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.

In order to use the same commercial stack in his application, a developer may need to purchase a part number specific to this stack/library. The price of those part numbers includes the stack/library royalties.

2.2 Codification

The meaning of the codification is explained in Table 2.

Table 2. Codification explanation

NUCLEO-G4XXRY	Description	Example: NUCLEO-G474RE
G4	MCU series in STM32 Arm Cortex MCUs	STM32G4 Series
XX	MCU line in the series	STM32G474 line
R	STM32 package pin count	64 pins
Y	STM32 Flash memory size: • B for 128 Kbytes • E for 512 Kbytes	512 Kbytes

The order code is mentioned on a sticker placed on the top side of the board.

3 Development environment

3.1 System requirements

- Windows® OS (7, 8 and 10), Linux® 64-bit, or macOS®
- USB Type-A to Micro-B cable

Note: macOS® is a trademark of Apple Inc. registered in the U.S. and other countries.

3.2 Development toolchains

- Keil® MDK-ARM (see note)
- IAR™ EWARM (see note)
- GCC-based IDEs

Note: 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 should be 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

5 Quick start

The STM32G4 Nucleo-64 board is a low-cost and easy-to-use development kit, used to evaluate and start a development quickly with an STM32G4 Series microcontroller in LQFP64 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 STM32G4 Nucleo-64 and for demonstration software, visit the www.st.com/stm32nucleo webpage.

5.1 Getting started

Follow the sequence below to configure the STM32G4 Nucleo-64 board and launch the demonstration application (refer to Figure 4 for component location):

1. Check the jumper position on the board (refer to Table 4)
2. For the correct identification of the device interfaces from the host PC and before connecting the board, install the Nucleo USB driver available on the www.st.com/stm32nucleo website
3. To power the board, connect the STM32G4 Nucleo-64 board to a PC with a USB cable (Type-A to Micro-B) through the USB connector CN1 of the board
4. Then, green LED LD3 (5V_PWR) and red LED LD1 (COM) light up, green LED LD2 (USER) blinks
5. Press user button B1 (left blue USER button)
6. Observe how the blinking of the green LED LD2 changes according to the clicks on button B1
7. The software demonstration and the several software examples that allow users exercise Nucleo features, are available on the www.st.com/stm32nucleo webpage
8. Develop your own application using the available examples

Table 4. Jumper configuration

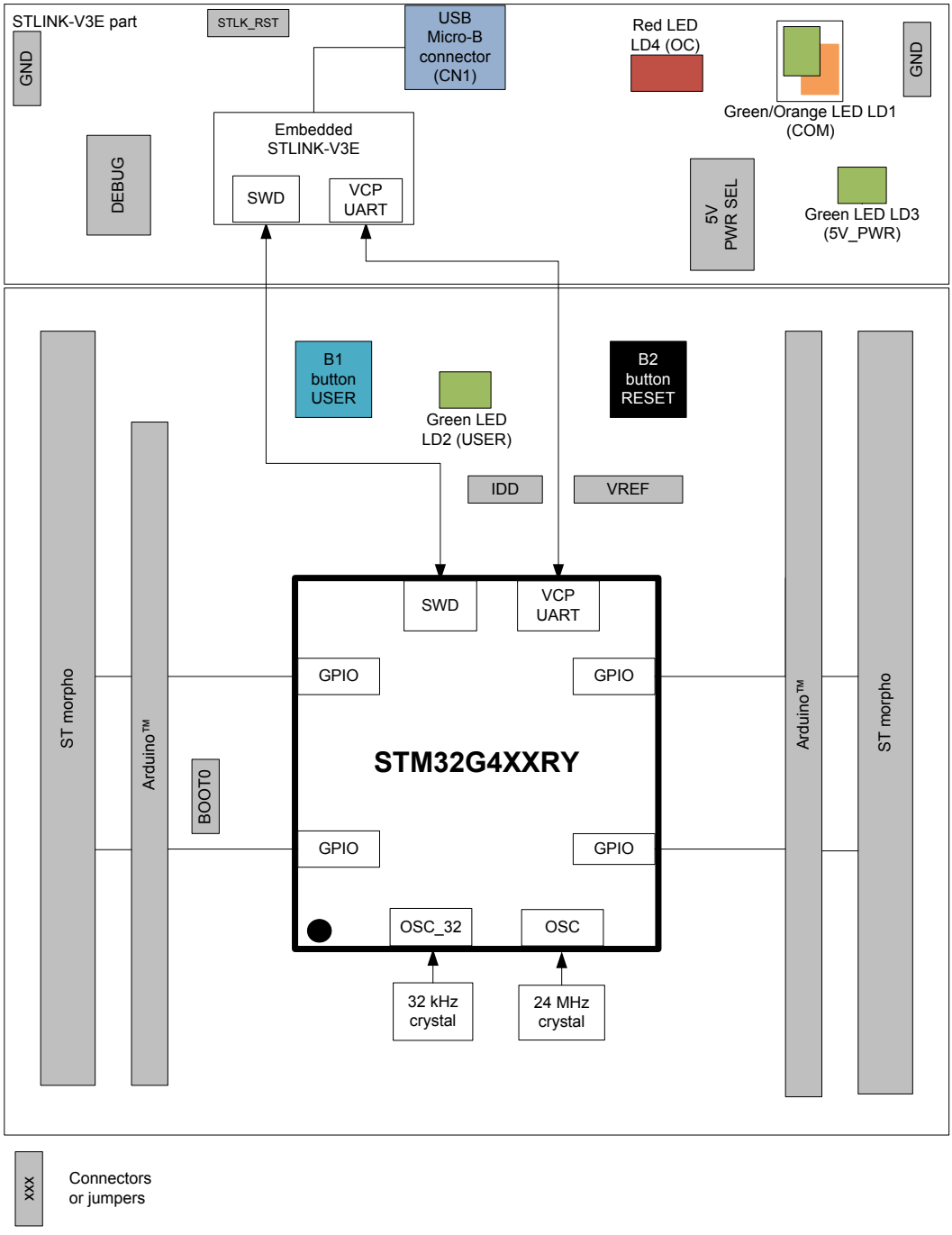
Jumper	Definition	Position(1)	Comment(1)
JP1	NRST	OFF	STLINK-V3E reset
JP3	T_RST	ON	-
JP5	5 V power-source selection	**ON [1-2] (Default)**	**5V_USB_STLK (from ST-LINK)**
		ON [3-4] (optional)	5V_VIN
		ON [5-6] (optional)	E5V
		ON [7-8] (optional)	5V_USB_CHGR
JP6	IDD	ON	
JP7	BOOT0	OFF	
JP8	VREF+ selection (VREF or VDD voltage supply selection)	**ON [1-2] (Default)**	**VREF+ supplied with VREF**
		ON [2-3] (optional)	VREF+ supplied with VDD

1. *Default jumper state is shown in bold.*

6 Hardware layout and configuration

The STM32G4 Nucleo-64 board is designed around the STM32 microcontrollers in a 64-pin LQFP package. Figure 3 shows the connections between the STM32 and its peripherals (STLINK-V3E, push-buttons, LEDs, USB, Arduino™ Uno and ST morpho headers). Figure 4 and Figure 5 show the location of these features on the STM32G4 Nucleo-64 board. The mechanical dimensions of the board are shown in Figure 6.

Figure 3. Hardware block diagram



6.1 PCB layout

Figure 4. **Top layout**

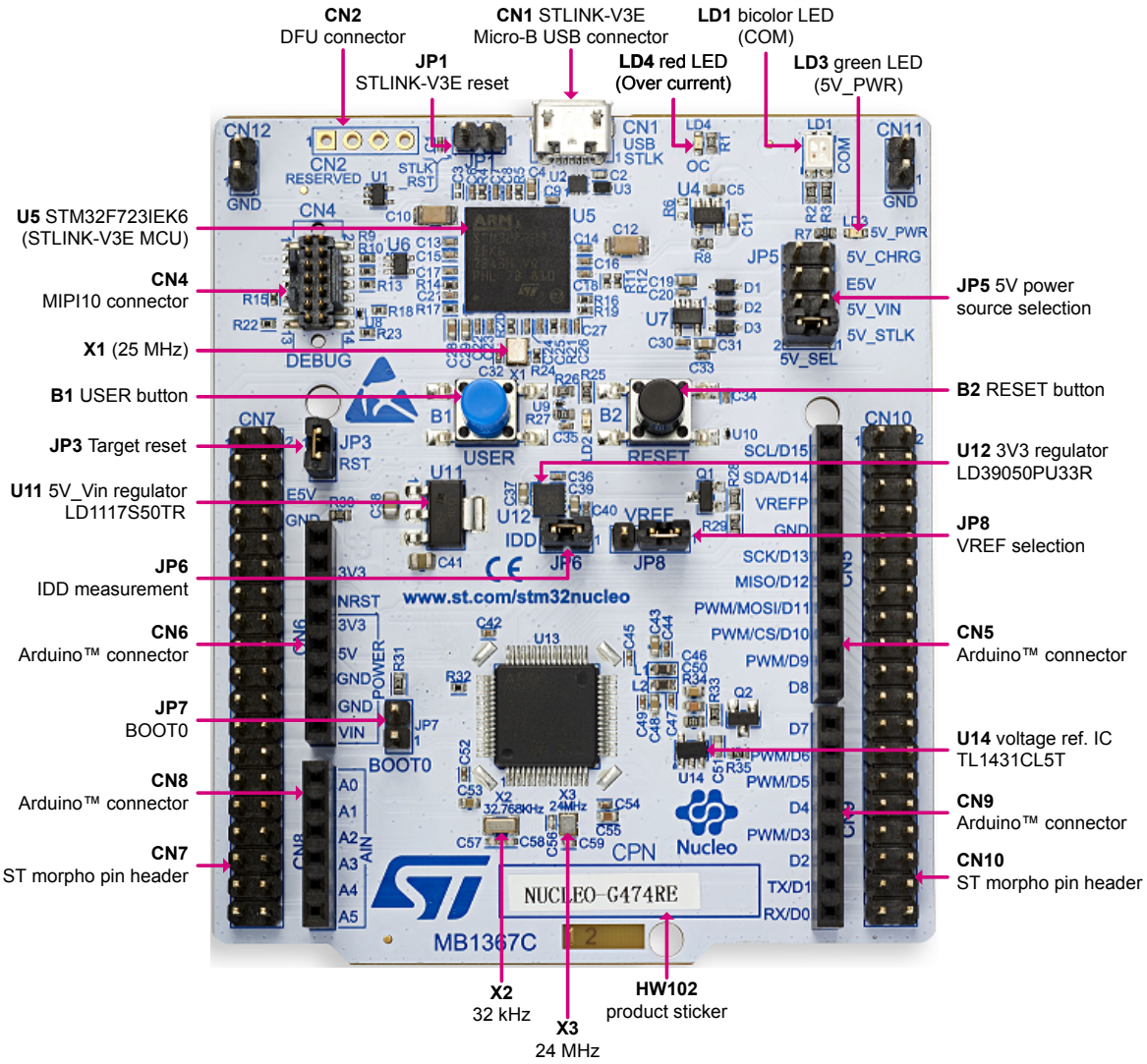
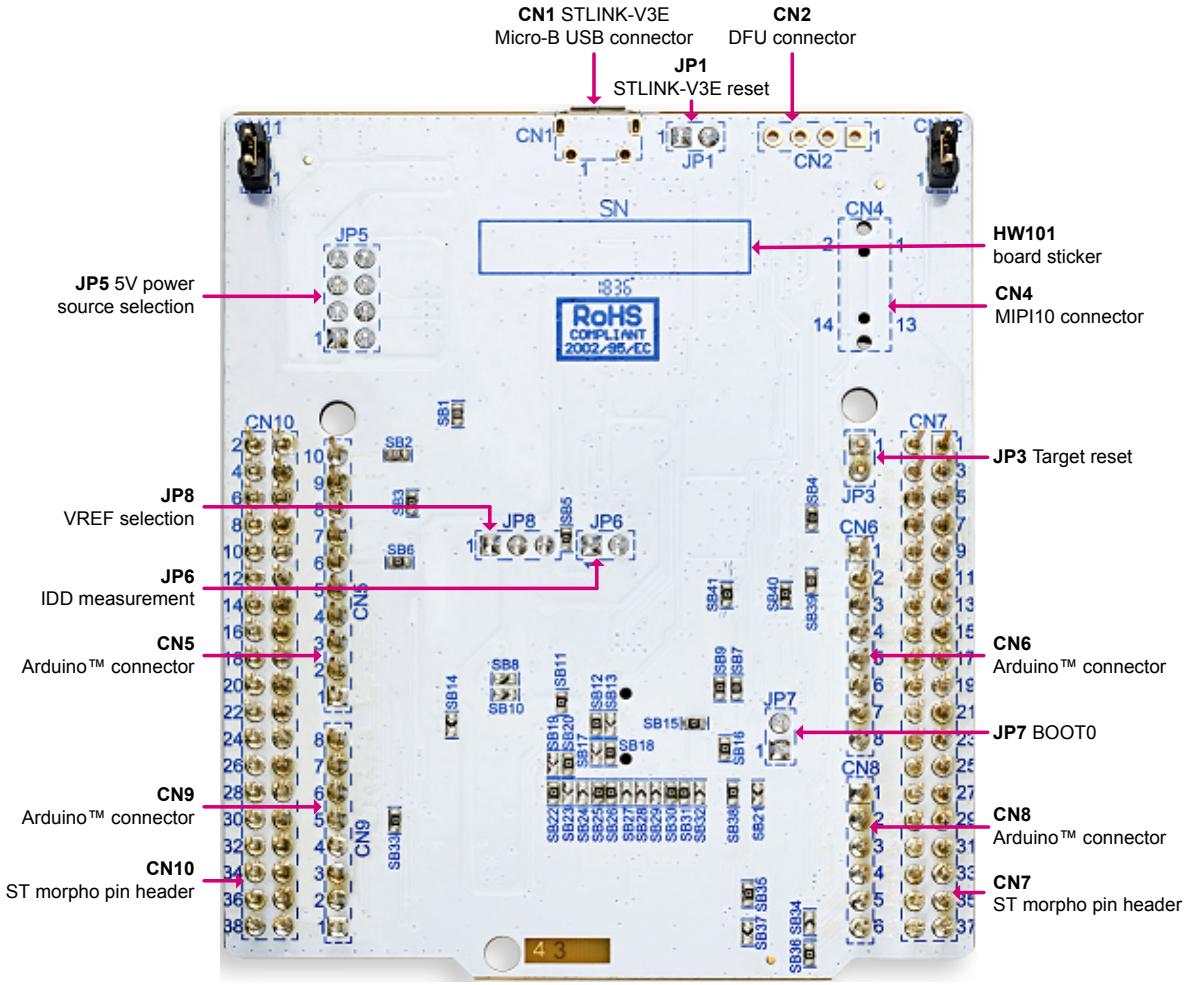
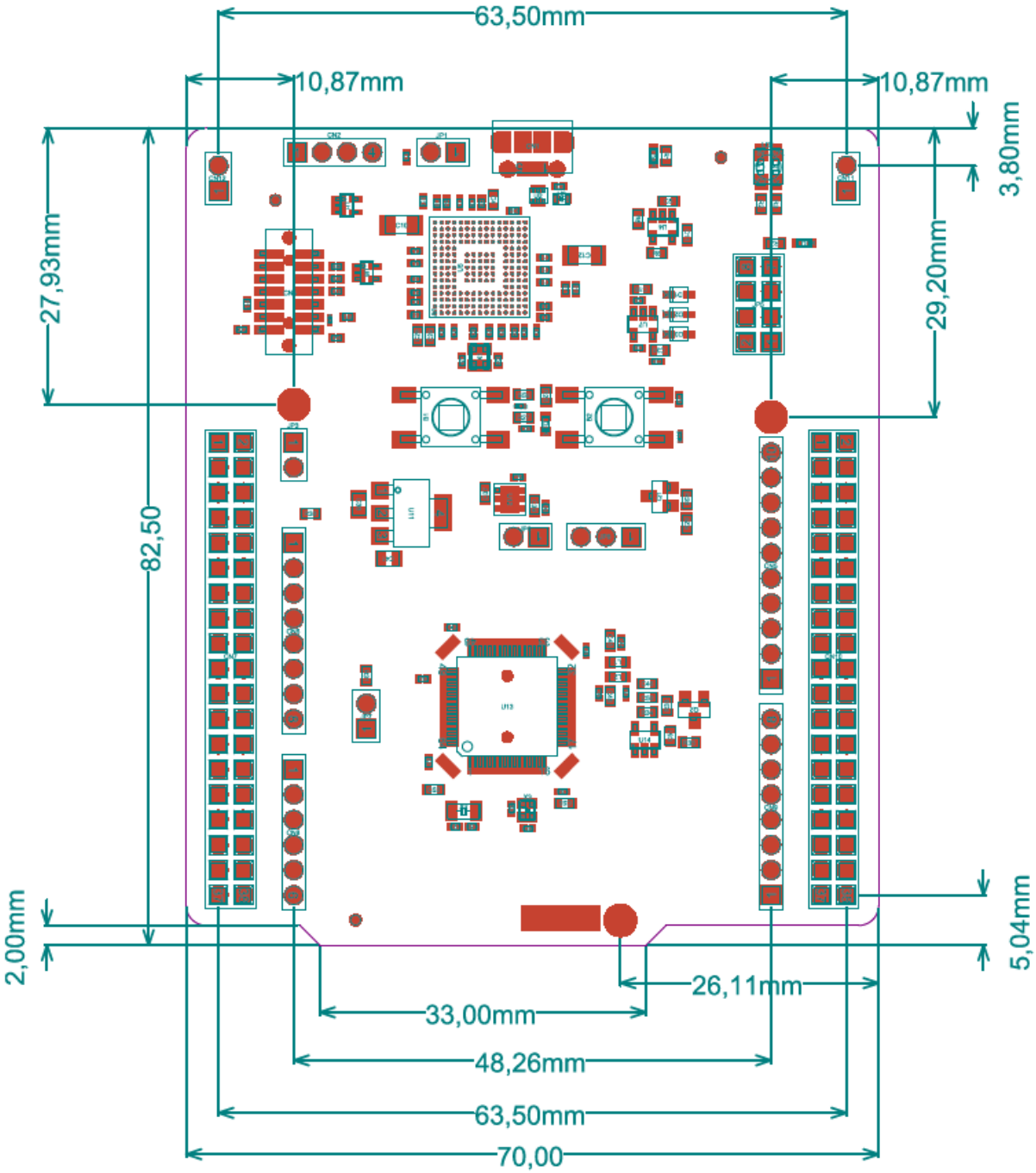


Figure 5. **Bottom layout**



6.2 Mechanical drawing

Figure 6. **STM32G4 Nucleo 64 board mechanical drawing (in millimeter)**



6.3 Embedded STLINK-V3E

There are two different ways to program and debug the onboard STM32 MCU:

- Using the embedded STLINK-V3E
- Using an external debug tool connected to the CN4 MIPI10 connector.

The STLINK-V3E programming and debugging tool is integrated in the STM32G4 Nucleo-64 board.

The embedded STLINK-V3E supports only SWD and VCP for STM32 devices. For information about debugging and programming features of STLINK-V3, refer to the *STLINK-V3SET debugger/programmer for STM8 and STM32* user manual (UM2448), which describes in details all the STLINK-V3 features.

Features supported on STLINK-V3E:

- 5V power supplied by USB connector (CN1)
- USB 2.0 high-speed-compatible interface
- JTAG/serial wire debugging (SWD) specific features:
  - 3 V to 3.6 V application voltage on the JTAG/SWD interface and 5 V tolerant inputs
  - JTAG
  - SWD and serial viewer (SWV) communication
- Direct Firmware Update (DFU) feature (CN2)
- MIPI10 connector (CN4)
- Status LED LD1 (COM) that blinks during communication with the PC
- Fault red LED LD4 (OC) alerting on USB overcurrent request
- 5 V / 300 mA output power supply capability (U4) with current limitation and LED
- 5 V power green LED LD3 (5V_PWR)

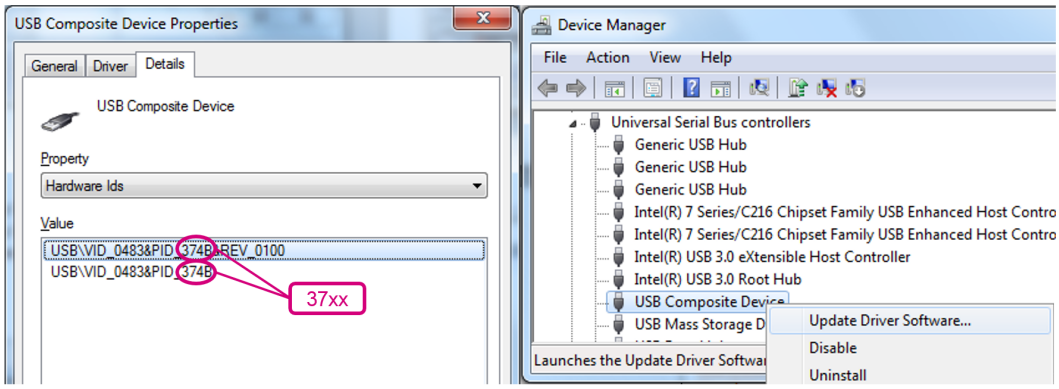
6.3.1 Drivers

Before connecting the STM32G4 Nucleo-64 board to a Windows 7®, Windows 8® or Windows 10® PC via USB, a driver for the STLINK-V3E must be installed (not required for Windows 10®) . It is available at the *www.st.com* website.

In case the STM32G4 Nucleo-64 board is connected to the PC before the driver is installed, some STM32G4 Nucleo-64 interfaces may be declared as “Unknown” in the PC device manager. In this case, the user must install the dedicated driver files, and update the driver of the connected device from the device manager a shown in Figure 7.

Note: Prefer using the USB Composite Device handle for a full recovery.

Figure 7. USB composite device



Note: 37xx:

- *374E for STLINK-V3E without bridge functions*
- *374F for STLINK-V3E with bridge functions*

6.3.2 STLINK-V3E firmware upgrade

The STLINK-V3E embeds a firmware upgrade mechanism for in-situ upgrade through the USB port. As the firmware may evolve during the lifetime of the STLINK-V3E product (for example new functionalities, bug fixes, support for new microcontroller families), it is recommended to visit the www.st.com website before starting to use the STM32G4 Nucleo-64 board and periodically, to stay up-to-date with the latest firmware version.

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

There are two basic ways to support an external debug tool:

1. Keep the embedded STLINK-V3E running. Power on the STLINK-V3E at first until the COM LED turns red. Then connect the external debug tool through the CN4 STDC14/MIPI-10 debug connector
2. Set the embedded STLINK-V3E in hig-impedance state: when jumper JP1 (STLK_RST) is ON, the embedded STLINK-V3E is in RESET state and all GPIOs are in high-impedance; then, connect the external debug tool to debug connector CN4.

Figure 8. Connecting an external debug tool to program the on-board STM32G4

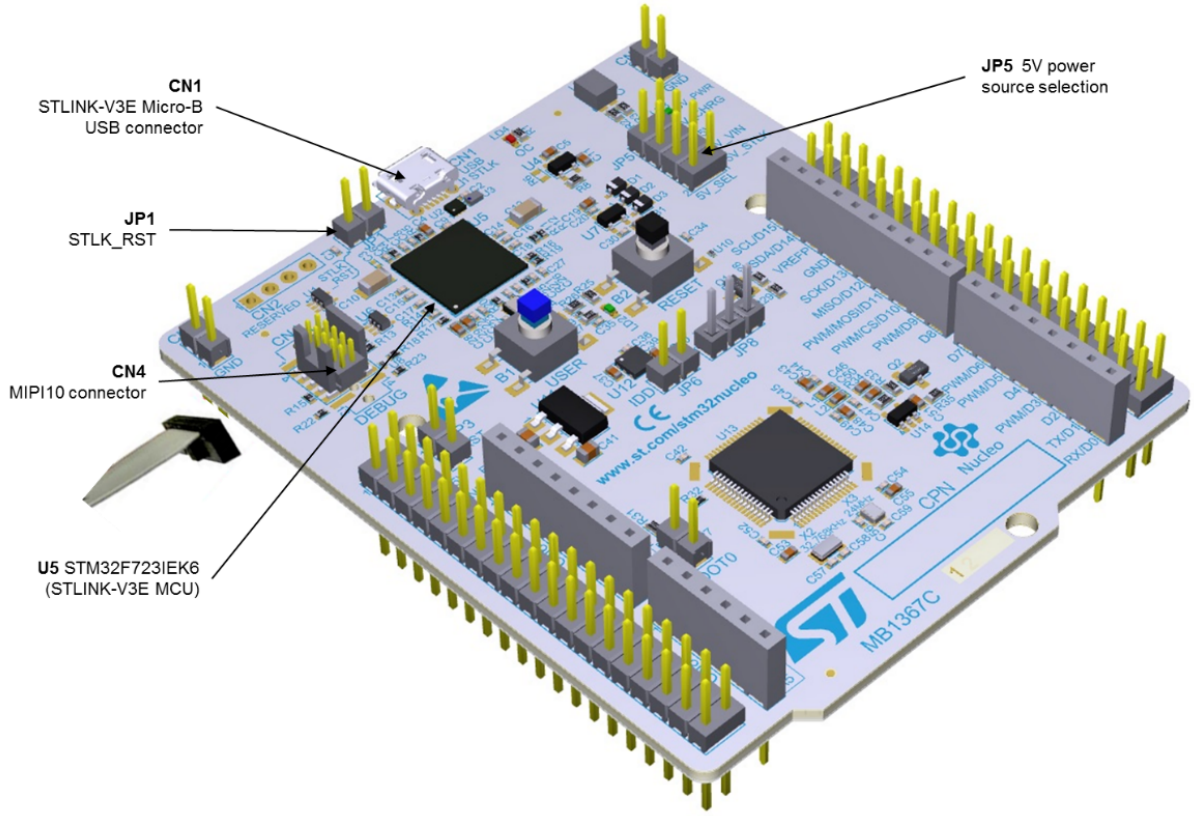


Table 5. MIPI10 / STDC14 debug connector (CN4)

MIPI10 pin	STDC14 pin	CN4	Function
-	1	NC	Reserved
-	2	NC	Reserved
1	3	3V3	Target VCC
2	4	T_SWDIO	Target SWDIO using SWD protocol or Target JTMS (T_JTMS) using JTAG protocol
3	5	GND	Ground
4	6	T_SWCLK	Target SWCLK using SWD protocol or Target JCLK (T_JCLK) using JTAG protocol
5	7	GND	Ground
6	8	T_SWO	Target SWO using SWD protocol or Target JTDO (T_JTMS) using JTAG protocol
7	9	NC	Not connected

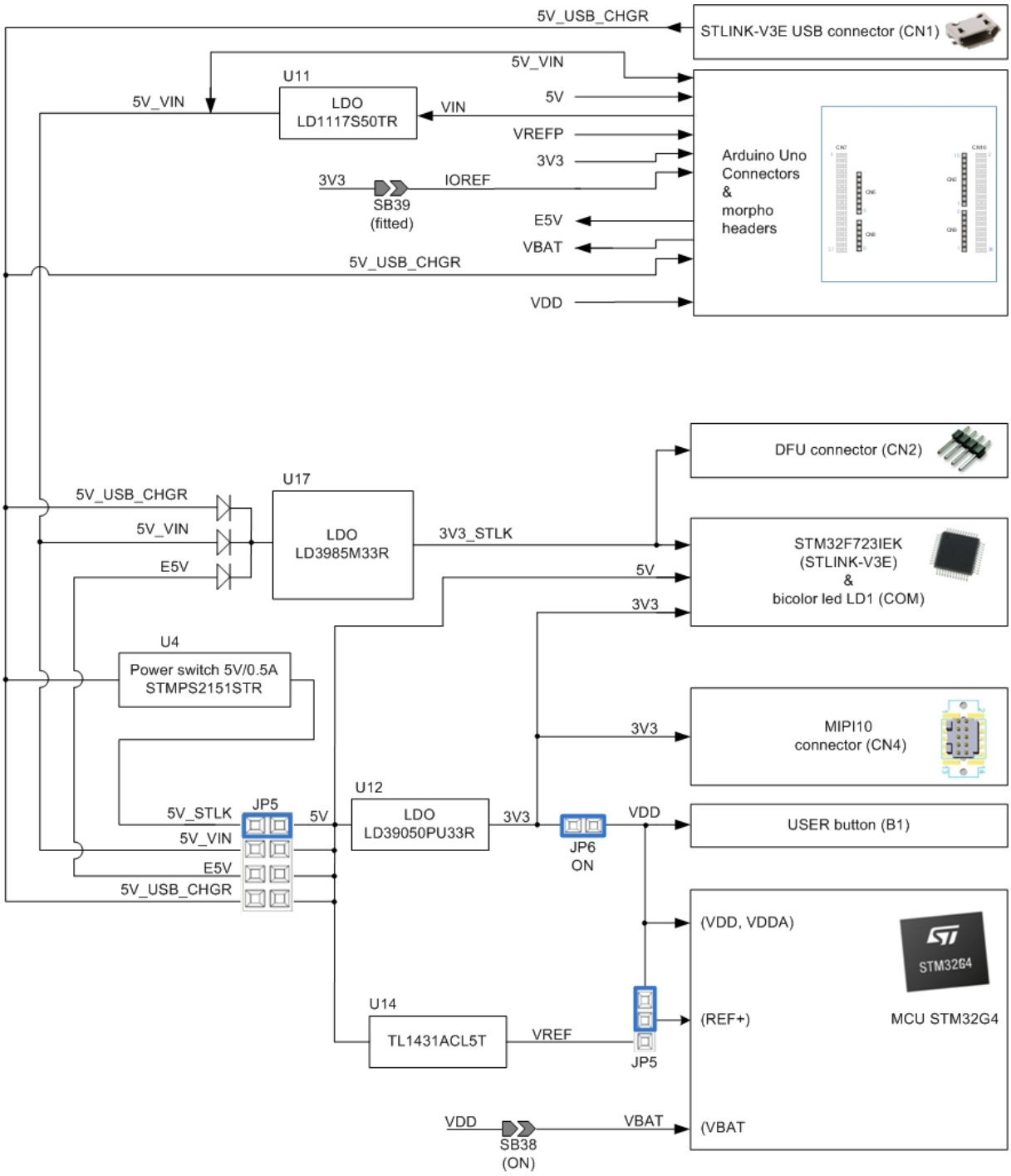
MIPI10 pin	STDC14 pin	CN4	Function
8	10	T_JTDI	Not used by SWD protocol, Target JTDI (T_JTDI) using JTAG protocol, only for external tools
9	11	GNDDetect	GND detect for plug indicator, used on SWD and JTAG neither
10	12	T_NRST	Target NRST using SWD protocol or Target JTMS (T_JTMS) using JTAG protocol
-	13	T_VCP_RX	Target RX used for VCP (must be UART dedicated to bootloader)
-	14	T_VCP_TX	Target TX used for VCP (must be UART dedicated to bootloader)

6.4 Power supply

The power supply can be provided by five different sources:

- A host PC connected to CN1 through a USB cable (default setting)
- An external 7 V - 12 V (VIN) power supply connected to CN7 pin 24
- An external 5 V (E5V) power supply connected to CN7 pin 6
- An external 5 V USB charger (5V_USB_CHGR) connected to CN1
- An external 3.3 V power supply (3V3) connected to CN7 pin 16

Figure 9. **STM32G4 Nucleo-64 board power tree**



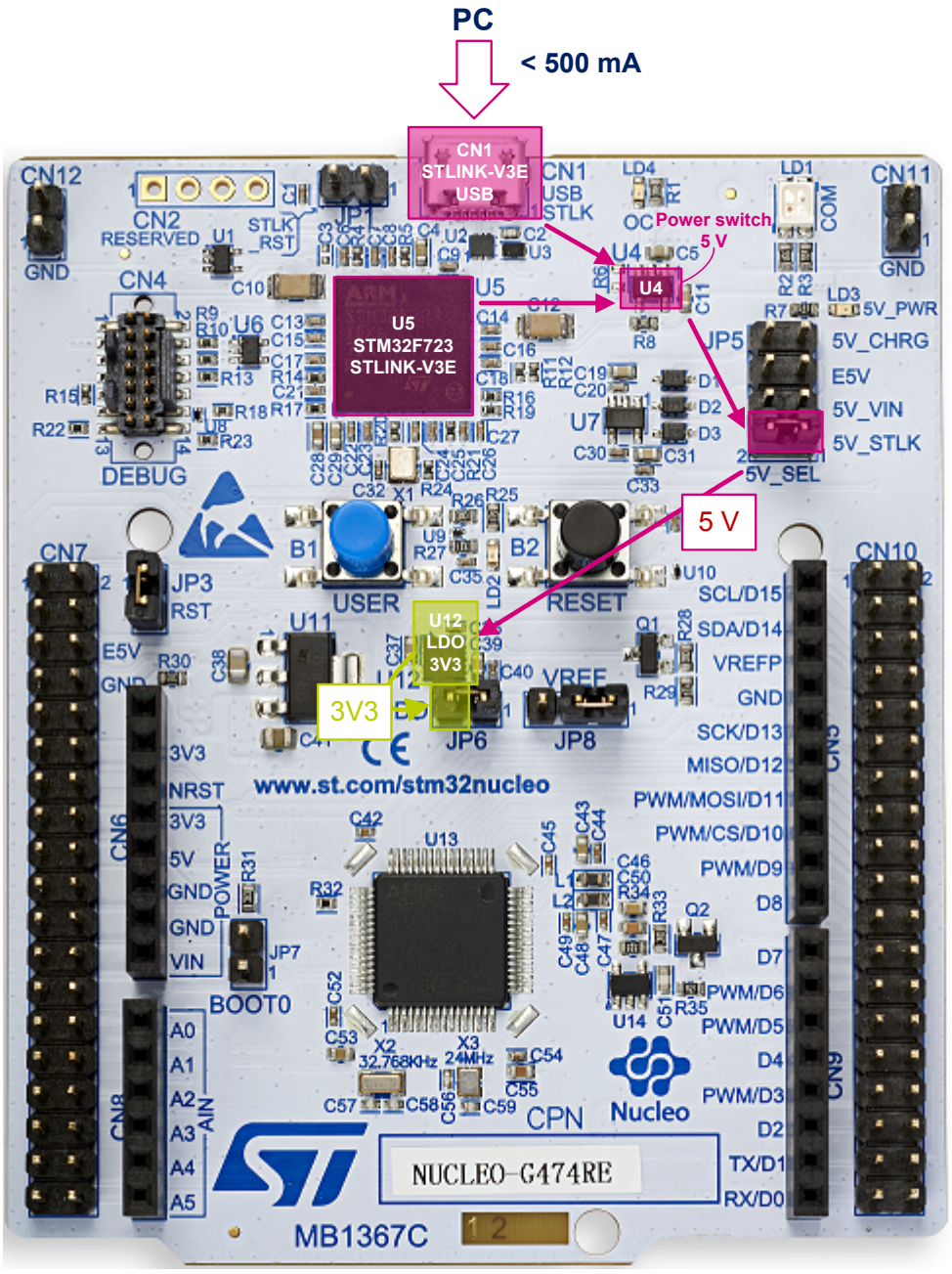
In case 5V_VIN, E5V, 5V_USB_CHGR, or 3V3 is used to power the STM32G4 Nucleo-64 board, this power source must comply with the EN-60950-1: 2006+A11/2009 standard and must be Safety Extra Low Voltage (SELV) with limited power capability.

If the power supply is 3V3, the ST-LINK is not powered and cannot be used.

Power supply input from STLINK-V3E USB connector (default setting)

The STM32G4 Nucleo-64 board and shield can be powered from STLINK-V3E connector CN1 (5 V) by placing a jumper between pins 1-2 of JP5, “5V_SEL”, as illustrated in Figure 10. This is the default setting.

Figure 10. Power supply input from STLINK-V3E USB connector with PC (5 V, 500 mA max)



If the USB enumeration succeeds, the 5V_USB_STLK power is enabled, by asserting the T_PWR_EN signal from STM32F723IEK6 “STLINK V3” (U5). This pin is connected to a power switch STMPS2151STR (U4), which powers the board. The power switch STMPS2151STR (U4) features also a current limitation to protect the PC in case of short-circuit on board. If an overcurrent (more than 500 mA) happens on board, the red LED LD4 is lit.

The Nucleo board and its shield can be powered from ST-LINK USB connector CN1, but only ST-LINK circuit gets 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 500 mA power from the host PC.

- If the host is able to provide the required power, the enumeration finishes by a “SetConfiguration” command and then, the power switch STMPS2151STR is switched ON, the green LED LD3 (5V_PWR) is turned ON, thus Nucleo board and its shield on it can consume 500 mA at the maximum.
- If the host is not able to provide the requested current, the enumeration fails. Therefore, the STMPS2151STR power switch (U4) remains OFF and the MCU part including the extension board is not powered. As a consequence, the green LED LD5 remains turned OFF. In this case, it is mandatory to use an external power supply.

Caution: If the maximum current consumption of the STM32G4 Nucleo-64 board and its shield boards exceeds 300 mA, it is mandatory to power the STM32G4 Nucleo-64 board with an external power supply connected to E5V, VIN or 3.3 V.

External power supply input from VIN (7 V - 12 V, 800 mA max)

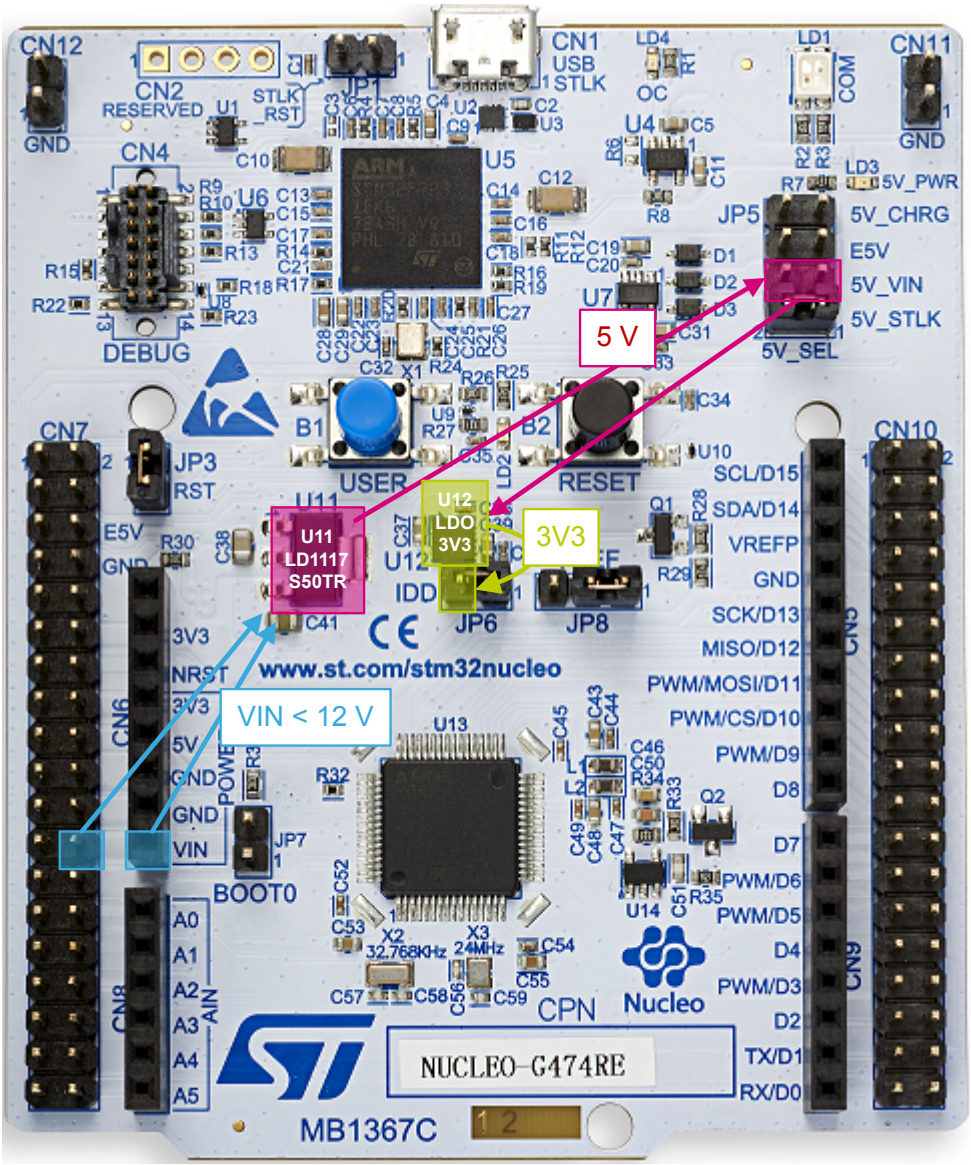
When the STM32G4 Nucleo-64 board is power-supplied by VIN (refer to Table 6 and Figure 11), the jumper configuration must be the following: jumper JP2 on pins 3-4 “5V_VIN”.

The STM32G4 Nucleo-64 board and its shield boards can be powered in three different ways from an external power supply, depending on the voltage used. The three cases are summarized in Table 6.

Table 6. External power sources: VIN (7 V - 12 V)

Input power name	Connector pins	Voltage range	Maximum current	Limitation
VIN	CN6 pin 8 CN7 pin 24	7 V to 12 V	800 mA	From 7 V to 12 V only and input current capability is linked to input voltage: • 800 mA input current when VIN = 7 V • 450 mA input current when 7 V < VIN < 9 V • 250 mA input current when 9 V < VIN < 12 V

Figure 11. **Power supply input from VIN (7 V - 12 V, 800 mA max)**



Legend: VIN < 12 V | 5 V | 3.3 V

Refer to Section 6.4.1 for debugging when using an external power supply.

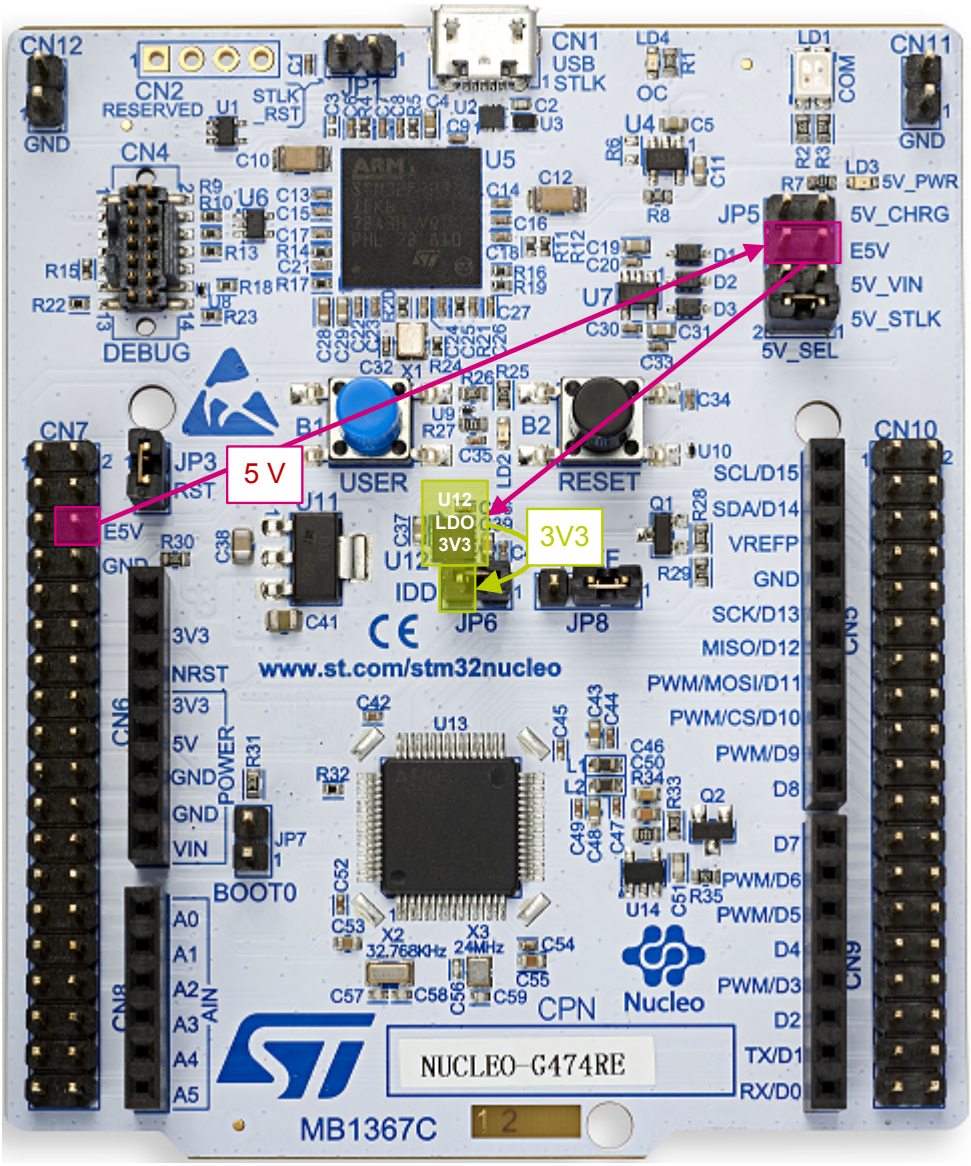
External power supply input from E5V (5 V, 500 mA max)

When the STM32G4 Nucleo-64 board is power-supplied by E5V (refer to Table 7 and Figure 12), the jumper configuration must be the following: jumper JP5 on pins 5-6 “E5V”.

Table 7. **External power sources: E5V (5 V)**

Input power name	Connector pins	Voltage range	Maximum current
E5V	CN7 pin 6	4.75 V to 5.25 V	500 mA

Figure 12. **Power supply input from 5V_EXT (5 V, 500 mA max)**



Refer to Section 6.4.1 for debugging when using an external power supply.

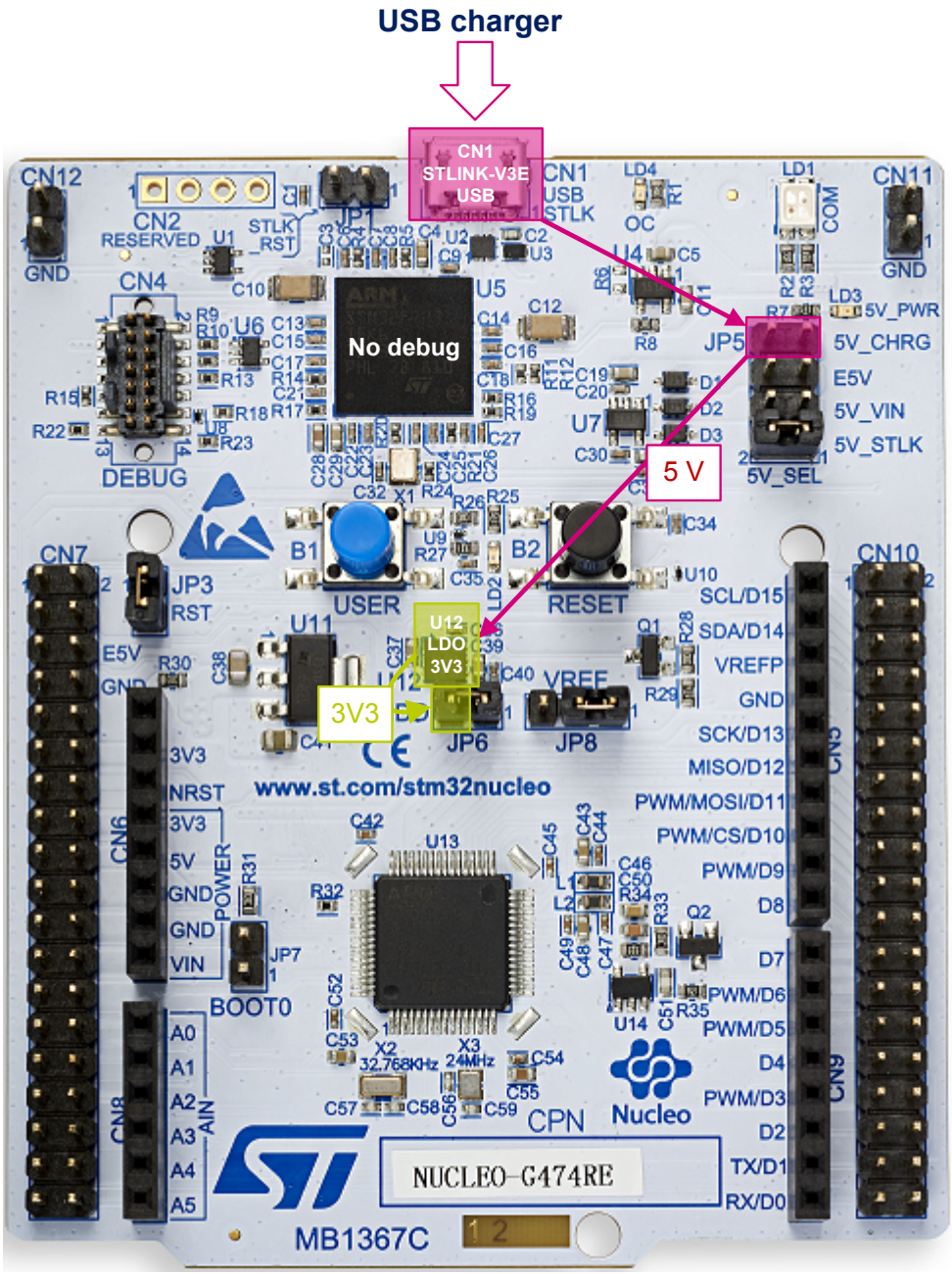
External power supply input from USB charger (5 V)

When the STM32G4 Nucleo-64 board is power-supplied by a USB charger on CN1 (refer to Table 8 and Figure 13), the jumper configuration must be the following: jumper JP2 on pins 7-8 “5V_CHGR”.

Table 8. **External power sources: 5V_CHGR (5 V)**

Input power name	Connector pins	Voltage range	Maximum current
5V_CHGR	CN1	5 V	-

Figure 13. **Power supply input from ST-LINK USB connector with USB charger (5 V)**



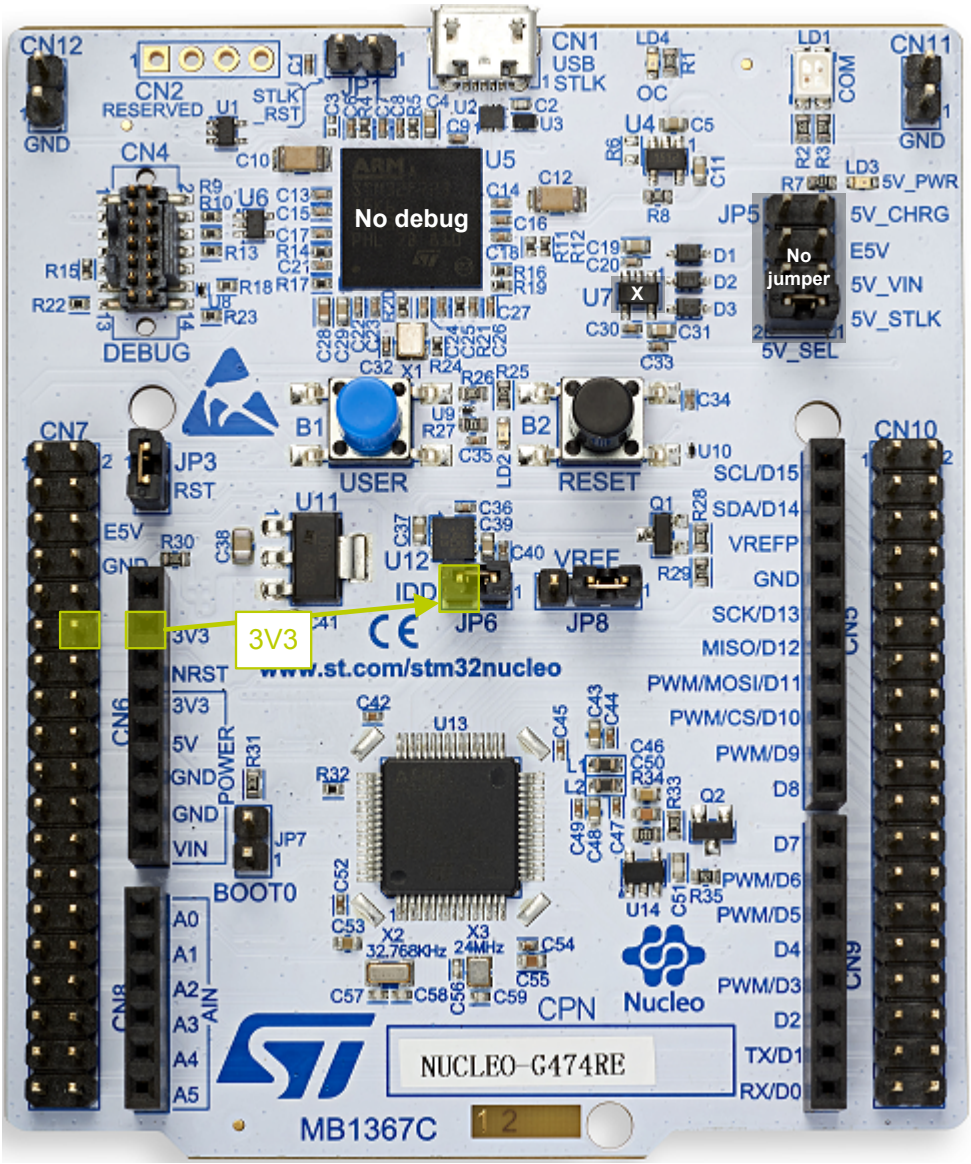
External power supply input from external 3.3 V

When the 3.3 V is provided by a shield board, it is interesting to use the 3.3 V (CN6 pin 4 or CN7 pin 16) directly as power input (refer to Table 9 and Figure 14). In this case, the programming and debugging features are not available, since the ST-LINK is not powered.

Table 9. External power sources: 3V3

Input power name	Connector pins	Voltage range	Maximum current
3V3	CN6 pin 4 CN7 pin 16	3 V to 3.6 V	1.3 A

Figure 14. **Power supply input from external 3V3**



Legend: 3.3 V

6.4.1 Debugging while using VIN or EXT as an external power supply

When powered by VIN or E5V, it is still possible to use the ST-LINK for programming or debugging only, but it is mandatory to power the board first using VIN or EXT, then to connect the USB cable to the PC. In this way the enumeration succeeds, thanks to the external power source.

The following power-sequence procedure must be respected:

1. Connect jumper JP5 between pins 5 & 6 for E5V or between pins 3 & 4 for VIN
2. Connect the external power source to VIN or E5V
3. Power on the external power supply 7V < VIN < 12 V for VIN, or 5V for E5V
4. Check that the green LED LD3 is turned ON
5. Connect the PC to the USB connector CN1

If this order is not respected, the board may be powered by USB first, then by VIN or E5V as the following risks may be encountered:

1. If more than 300 mA current is needed by the board, the PC may be damaged or the current supplied can be limited by the PC. As a consequence, the board is not powered correctly.
2. 300 mA is requested at enumeration so there is risk that the request is rejected and the enumeration does not succeed if the PC cannot provide such current. Consequently, the board is not power supplied (LED LD3 remains OFF).

6.5 Clock sources

6.5.1 HSE clock (high-speed external clock)

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

- **MCO from ST-LINK**: MCO output of ST-LINK is used as input clock. This frequency cannot be changed, it is fixed at 8 MHz and connected to the PF0-OSC_IN of the STM32 microcontroller. The configuration must be:
  - SB27 ON
  - SB25 and SB26 OFF
  - SB24 and SB28 OFF
- **HSE on-board oscillator from X3 crystal (default)**: For typical frequencies and its capacitors and resistors, refer to the STM32 microcontroller datasheet and to the Oscillator design guide for STM8S, STM8A and STM32 microcontrollers Application note (AN2867) for the oscillator design guide. The X3 crystal has the following characteristics: 24 MHz, 6 pF load capacitance, 20 ppm. It is recommended to use NX2016SA-24MHz-EXS00A-CS10820 manufactured by NDK. The configuration must be:
  - SB25 and SB26 ON
  - SB24 and SB28 OFF
  - SB27 OFF
  - C56 and C59 soldered with 6.8 pF capacitors
- **Oscillator from external PF0**: from an external oscillator through the pin 29 of the CN7 connector. The configuration must be:
  - SB28 ON
  - SB24 OFF
  - SB25 and SB26 OFF
  - SB27 OFF
- **HSE not used**: PF0 and PF1 are used as GPIOs instead of as clock. The configuration must be:
  - SB24 and SB28 ON
  - SB27 OFF
  - SB25 and SB26 OFF

6.5.2 LSE clock (low-speed external clock) – 32.768 kHz

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

- **On-board oscillator (default)**: X2 crystal. Refer to the *Oscillator design guide for STM8S, STM8A and STM32 microcontrollers* application note (AN2867). It is recommended to use NX3215SA-32.768kHz-EXS00A-MU00525 (32.768 kHz, 6 pF load capacitance, 20 ppm) from NDK.
  - SB30 and SB31 ON
  - SB29 and SB32 OFF
- **Oscillator from external PC14**: from external oscillator through the pin 25 of CN7 connector. The configuration must be:
  - SB29 and SB32 ON
  - SB30 and SB31 OFF
- **LSE not used**: PC14 and PC15 are used as GPIOs instead of low-speed clock. The configuration must be:
  - SB29 and SB32 ON
  - SB30 and SB31 OFF

6.6 Board functions

6.6.1 LEDs

LD1 STLINK-V3E COM LED

The bicolor LED LD1 (green, red) provides information about STLINK-V3E communication status. LD1 default color is red. LD1 turns to green to indicate that communication is in progress between the PC and the STLINK-V3E, with the following setup:

- Blinking red: the first USB enumeration with the PC is taking place
- Red on: when the initialization between the PC and STLINK-V3E is complete
- Blinking red/green: during communication with target
- Green on: communication finished and successful
- Orange on: communication failure

LD2 USER

This green LED is a user LED connected to STM32G4 I/O PA5 (SB6 ON) corresponding to the Arduino™ D13. To light LED LD2, a high logic state “1” must be written in the corresponding GPIO PA5. A transistor is used to drive the LED LD2. LD2 consumption does not impact the VDD STM32G4 power measurement, since LD2 is isolated from it.

LD3 PWR

The green LED indicates that the STM32G4 part is powered and +5 V power is available on CN6 pin 5 and CN7 pin 18.

LD4 USB power fault (OC, overcurrent)

LD4 indicates that the board power consumption on USB ST-LINK exceeds 500 mA. Consequently, the user must power the board using an external power supply.

6.6.2 Push-buttons

B1 USER (blue button)

The user button is connected to the STM32G4 I/O PC13 by default (Tamper support, SB16 ON and SB21 OFF) or PA0 (Wakeup support, SB21 ON and SB16 OFF) of the STM32G4 microcontroller.

B2 RESET (black button)

This push-button is connected to NRST (PG10-NRST) and is used to RESET the STM32G4 microcontroller.

6.6.3 MCU voltage selection on VREF+

The STM32G4 Nucleo-64 board offers the possibility to supply the STM32G4 microcontroller with either VREF or VDD on its VREF+ input voltage pin.

VREF+ is targeted to offer high-end analog device, especially for precise analog applications (ADC converters usage) with the STM32G4 microcontroller.

In the STM32G4 Nucleo-64 board, the VREF+ can be supplied with a very stable output voltage provided by the TL1431CL5T. The TL1431CL5T is an adjustable shunt voltage reference with guaranteed temperature stability over the entire operating temperature range. The output voltage may be set to any value between 2.5 V and up to 36 V with two external resistors. The TL1431CL5T operates with a wide current range from 1 mA to 100 mA with a typical dynamic impedance of 0.2 Ω.

JP8 jumper is used to select either the VREF or VDD voltage for VREF+.

- Place the JP8 jumper on [1-2] to supply the MCU VREF+ with VREF
  - To have VREF at 2.5 V, then SB14 is fitted and R34 is not fitted
  - To have VREF at 3.25 V, then SB14 is not fitted. VREF = 2,5 × (1 + (R33 / R34)) = 2,5 × (1 + (10k / 33k)).

- Place the JP8 jumper on [2-3] to supply the MCU VREF+ with VDD

6.6.4 Current consumption measurement (IDD)

Jumper JP6, labeled IDD, is used to measure the STM32G4 microcontroller consumption by removing the jumper and by connecting an ammeter:

- JP6 ON: STM32 is powered with 3V3 voltage (default)
- JP6 OFF: an ammeter must be connected to measure the STM32G4 current. If there is no ammeter, the STM32 is not powered.

To get a correct and complete current consumption of the STM32G4, jumper JP8 must be set to [2-3] to supply the MCU VREF+ with VDD, otherwise, the current consumption at pin VREF+ is not taken into account in the IDD (through jumper JP6).

6.6.5 Virtual COM port (VCP): LPUART and USART

The STM32G4 Nucleo-64 board offers the possibility to connect an LPUART or a USART interface to the STLINK-V3E, Arduino™ Uno V3 connector (CN9 pins 2 and 1), or ST morpho connector (CN10 pins 35 and 37).
The selection is done by setting the related solder bridges as detailed in Table 10 and Table 11.

Table 10. USART1 connection

Solder bridge configuration[1]	Feature[1]
SB13, SB19: ON **SB12, SB20, SB18, SB22: OFF**	**USART1 (PC4/PC5) connected to Arduino™ (D1 & D0) and ST morpho connector (CN10 pin 35 & 37).**
SB12, SB20: ON SB13, SB19, SB17, SB23: OFF	USART1 (PC4/PC5) connected to STLINK-V3E Virtual COM port.

1. *The default configuration is shown in bold*

Table 11. LPUART1 connection

Solder bridge configuration[1]	Feature[1]
SB17, SB23: ON **SB18, SB22, SB12, SB20: OFF**	**LPUART1 (PA2/PA3) connected to STLINK-V3E Virtual COM port.**
SB18, SB22: ON SB17, SB23, SB13, SB19: OFF	LPUART1 (PA2/PA3) connected to Arduino™ (D1 & D0) and ST morpho connector (CN10 pin 35 & 37).

1. *The default configuration is shown in bold*

By default:

- Communication between the target STM32G4 and the STLINK-V3E MCU is enabled on LPUART1 to support the Virtual COM port
- Communication between the target STM32G4 and Arduino™ (and ST morpho) connectors is enabled on USART1

6.7 Solder bridges

All 41 solder bridges are located on the bottom layer of the STM32G4 Nucleo-64 board.

Table 12. **Solder bridge configuration**

Solder bridge control	Solder bridge (SB)	State[1]	Description[1]
100 nF on PG10-NRST	SB1	**ON**	**100 nF capacitor grounded to PG10-NRST of the STM32G4**
		OFF	100 nF capacitor disconnected from PG10-NRST of the STM32G4
PB8 on ARD_D14	SB2	**ON**	**PB8 connected to Arduino™ D14**
		OFF	PB8 not connected to Arduino™ D14
PC5 on ST morpho	SB3	**ON**	**PC5 connected to ST morpho CN10 pin 6**
		OFF	PC5 not connected to ST morpho CN10 pin 6
PB8 on Morpho	SB4	**ON**	**PB8 connected to ST morpho CN7 pin 7**
		OFF	PB8 not connected to ST morpho CN7 pin 7
3.3 V LDO output	SB5	**ON**	**U12 LDO output provides 3.3 V**
		OFF	U12 LDO output does NOT provide 3.3 V, user must connect an external 3.3 V source.
User LED LD2	SB6	**ON**	**User LED driven by PA5 (ARD_D13)**
		OFF	User LED not driven
PA15 on Morpho	SB7	**ON**	**PA15 connected to ST morpho CN7 pin 17**
		OFF	PA15 not connected to ST morpho CN7 pin 17
SMD ferrite bead L1	SB8	ON	SMD ferrite bead L1 shunted. VDDA connected on VDD voltage supply
		OFF	**SMD ferrite bead L1 on STM32G4 VDDA voltage supply**
JTDI on MIPI10	SB9	**ON**	**JTDI connected to MIPI10 connector (CN4 pin 10)**
		OFF	JTDI not connected to MIPI10 connector (CN4 pin 10)
SMD ferrite bead L2	SB10	ON	SMD ferrite bead L2 shunted. VREF+ connected to either VREF or VDD depending on the jumper position on JP8
		OFF	**SMD ferrite bead L2 on VREF+ (either VREF or VDD voltage supply (depending on the jumper position on JP8)).**
AGND	SB11	**ON**	**AGND connected to GND. Reserved, do not modify.**
		OFF	AGND not connected to GND.
PC4 USART1 TX	SB12	ON	STLINK_TX (T_VCP_TX) connected to USART1 TX PC4
		OFF	**STLINK_TX (T_VCP_TX) not connected to USART1 TX PC4**
	SB13	**ON**	**ARD_D1_TX connected to USART1 TX PC4**
		OFF	ARD_D1_TX not connected to USART1 TX PC4
VREF voltage (3.25 V or 2.5 V)	SB14	ON	R33 = 10 kΩ is shunted. Then VREF = 2.5 V. Do not forget to remove in that case R34 = 33 kΩ.
		OFF	**R33 = 10 kΩ is not shunted. Then VREF = 3.25 V. In that case, R34 = 33 kΩ must be fitted.**
T_SWO on PB3	SB15	**ON**	**T_SWO connected to PB3.**
		OFF	T_SWO not connected to PB3 and isolated from ARD_D3.

Solder bridge control	Solder bridge (SB)	State[1]	Description[1]
PA2 LPUART1 TX	SB17	**ON**	**STLINK_TX (T_VCP_TX) connected to LPUART1 TX PA2.**
		OFF	STLINK_TX (T_VCP_TX) not connected to LPUART1 TX PA2.
	SB18	ON	ARD_D1_TX connected to LPUART1 TX PA2.
		OFF	**ARD_D1_TX not connected to LPUART1 TX PA2.**
PA3 LPUART1 RX	SB23	**ON**	**STLINK_RX (T_VCP_RX) connected to LPUART1 RX PA3.**
		OFF	STLINK_RX (T_VCP_RX) not connected to LPUART1 RX PA3.
	SB22	ON	ARD_D0_RX connected to LPUART1 RX PA3.
		OFF	**ARD_D0_RX not connected to LPUART1 RX PA3.**
PC5 USART1 RX	SB20	ON	STLINK_RX (T_VCP_RX) connected to USART1 RX PC5.
		OFF	**STLINK_RX (T_VCP_RX) not connected to USART1 RX PC5.**
	SB19	**ON**	**ARD_D0_RX connected to USART1 RX PC5.**
		OFF	ARD_D0_RX not connected to USART1 RX PC5.
USER button	SB16	**ON**	**USER button connected to PC13.**
		OFF	USER button not connected to PC13.
	SB21	ON	USER button connected to PA0.
		OFF	**USER button not connected to PA0.**
HSE CLK selection	SB25 & SB26	**ON**	**HSE provided by external HSE 24 MHz CLK X3.**
		OFF	HSE not provided by external HSE 24 MHz CLK X3.
	SB24	ON	PF1-OSC_IN connected to ST morpho connector I/O usage (CN7 pin 31).
		OFF	**PF1-OSC_IN not connected to ST morpho connector.**
	SB28	ON	PF0-OSC_OUT connected to ST morpho connector I/O usage (CN7 pin 29).
		OFF	**PF0-OSC_OUT not connected to ST morpho connector.**
	SB27	ON	ST-LINK MCO used for HSE CLK.
		OFF	**ST-LINK MCO not used for HSE CLK.**
PC4 on ST morpho	SB33	**ON**	**PC4 connected to Morpho CN10 pin 34.**
		OFF	PC4 not connected to Morpho CN10 pin 34.
VBAT	SB38	**ON**	**VBAT (pin1 of STM32G4) powered by VDD.**
		OFF	VBAT (pin1 of STM32G4) supplied separately (through morpho connector CN7 pin 33).

Solder bridge control	Solder bridge (SB)	State[1]	Description[1]
LSE CLK selection	SB31 & SB30	**ON**	**LSE provided by external LSE 32.768 kHz CLK X2.**
		OFF	LSE not provided by external LSE 32.768 kHz CLK X2.
	SB32	ON	PC14-OSC32_IN connected to ST morpho connector I/O usage (CN7 pin 25).
		OFF	**PC14-OSC32_IN not connected to ST morpho connector.**
	SB29	ON	PC15-OSC32_OUT connected to ST morpho connector I/O usage (CN7 pin 27).
		OFF	**PC15-OSC32_OUT not connected to ST morpho connector.**
PB9 on ARD_A4	SB34	ON	PB9 connected to ARD_A4 and connected to CN7 pin 36.
		OFF	**PB9 not connected to ARD_A4 and connected to CN7 pin 36.**
PC1 on ARD_A4	SB35	**ON**	**PC1 connected to ARD_A4 and connected to CN7 pin 36.**
		OFF	PC1 not connected to ARD_A4 and connected to CN7 pin 36.
PC0 on ARD_A5	SB36	**ON**	**PC0 connected to ARD_A5 and connected to CN7 pin 38.**
		OFF	PC0 not connected to ARD_A5 and connected to CN7 pin 38.
PA15 on ARD_A5	SB37	ON	PA15 connected to ARD_A5 and connected to CN7 pin 38.
		OFF	**PA15 not connected to ARD_A5 and connected to CN7 pin 38.**
IOREF and 3V3 connection	SB39	**ON**	**IOREF connected to 3V3 power supply.**
		OFF	IOREF not connected to 3V3 power supply.
T_SWDIO on PA13	SB40	**ON**	**T_SWDIO connected to PA13.**
		OFF	T_SWO not connected to PA13.
T_SWCLK on PA14	SB41	**ON**	**T_SWCLK connected to PA14.**
		OFF	T_SWCLK not connected to PA14.

1. *The default SB state is in bold.*

All the other solder bridges present on the STM32G4 Nucleo-64 board are used to configure several I/Os and power-supply pins for compatibility of features and pinout with the target STM32G4 supported.

7 Board connectors

Several connectors are implemented on the STM32G4 Nucleo-64 board.

7.1 STLINK-V3E USB Micro-B connector CN1

The USB connector CN1 is used to connect the embedded STLINK-V3E to the PC for the programming and debugging purposes.

Figure 15. USB Micro-B connector CN1 (front view)

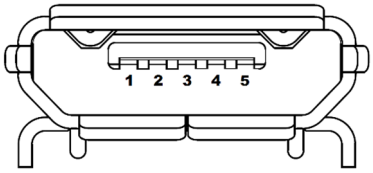
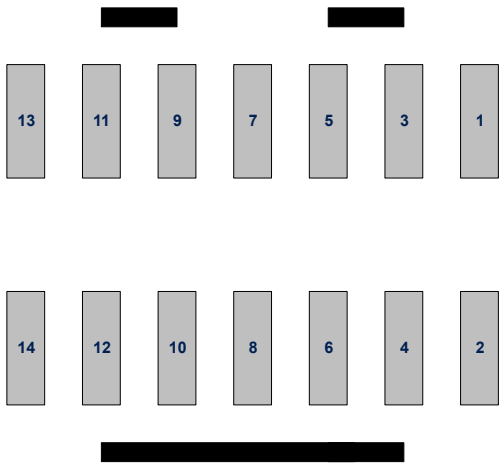


Table 13. USB Micro-B connector CN1 pinout

Connector	Pin number	Pin name	Signal name	STLINK-V3E MCU pin	Function
CN1	1	VBUS	5V_USB_CHGR	-	5 V power
	2	DM	USB_DEV_HS_CN_N	R14	USB diff pair N
	3	DP	USB_DEV_HS_CN_P	R15	USB diff pair P
	4	ID	-	-	-
	5	GND	-	-	GND

7.2 MIPI10 connector CN4

Figure 16. MIPI10 connector CN4



The MIPI10 connector is implemented with a footprint compatible with the STDC14 footprint. The related pinout for the MIPI10 connector is listed in Table 14.

Table 14. MIPI10 connector CN4 pinout (STDC14 pinout compatible)

Connector	Pin number	Description	Pin number	Description
CN4	1	-	2	-
	3	VDD (3V3)	4	T_SWDIO (PA13)
	5	GND	6	T_SWCLK (PA14)
	7	KEY (connected to GND)	8	T_SWO (PB3)
	9	-	10	T_JTDI (PA15)
	11	GNDDetect (connected to GND through a 100 Ω resistor)	12	T_NRST
	13	T_VCP_RX (PA3 by default or PC5)	14	T_VCP_TX (PA2 by default or PC4)

7.3 Arduino™ Uno V3 connectors CN5, CN6, CN8 and CN9

The Arduino™ connectors CN5, CN6, CN8 and CN9 are female connectors compatible with the Arduino™ standard. Most shields designed for Arduino™ can fit with the STM32G4 Nucleo-64 board.

The Arduino™ connectors on the STM32G4 Nucleo-64 board support the Arduino™ Uno V3.

Figure 17. Arduino™ connectors

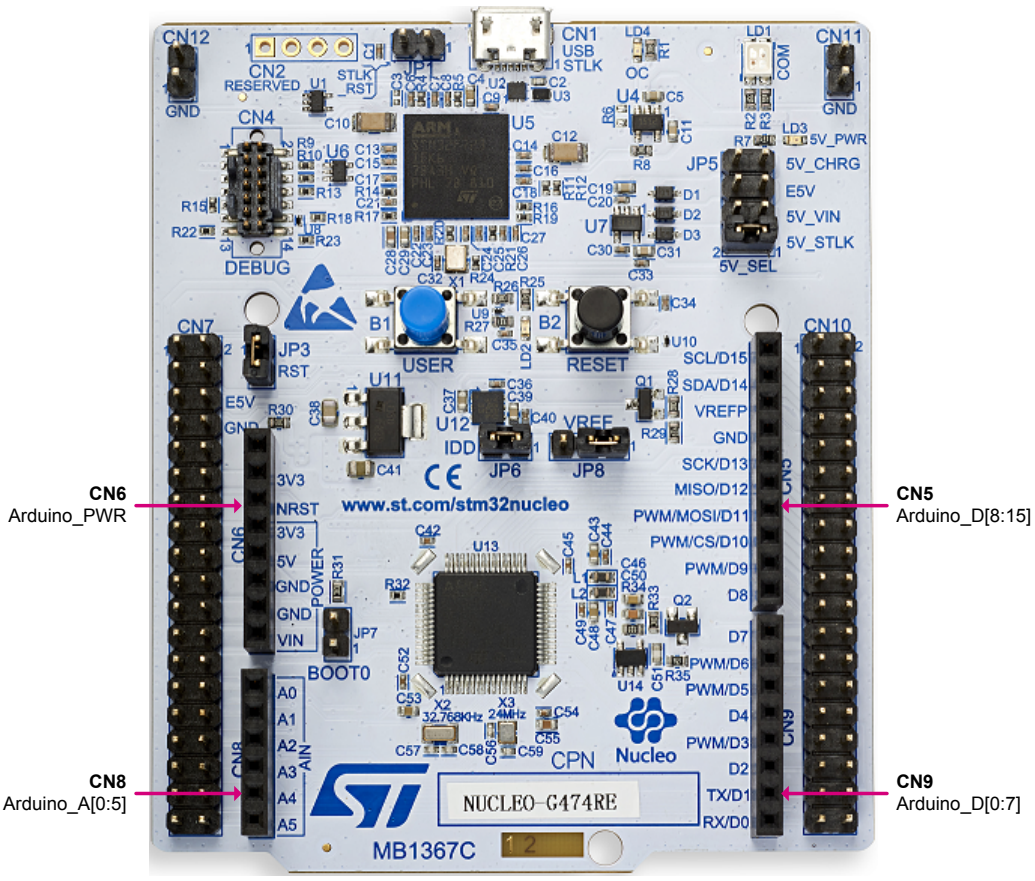
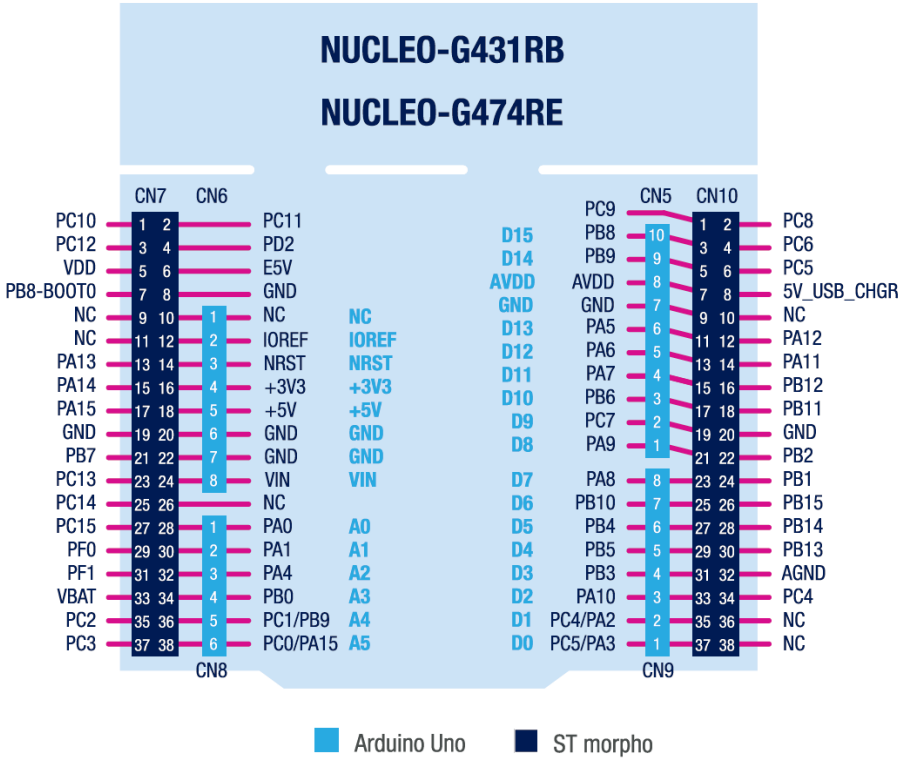


Figure 18. **Arduino™ and ST morpho connectors pinout**



Note: Arduino™ Uno V3 D0 and D1 signals are connected by default on USART1 (MCU I/O PC4 and PC5). For details about how to modify the UART interface, refer to Section 6.6.5 Virtual COM port (VCP): LPUART and USART.

Table 15. **Arduino™ connectors pinout**

Connector	Pin number	Pin name	Signal name	STM32 pin(1)	Function(1)
CN6	1	NC	-	-	Reserved for test
	2	IOREF	-	-	I/O reference
	3	NRST	NRST	PG10-NRST	RESET
	4	3V3	-	-	3V3 input/output
	5	5V	-	-	5 V output
	6	GND	-	-	GND
	7	GND	-	-	GND
	8	VIN	-	-	7 V - 12 V input power
CN8	1	A0	ADC	PA0	ADC12_IN1
	2	A1	ADC	PA1	ADC12_IN2
	3	A2	ADC	PA4	ADC2_IN17
	4	A3	ADC	PB0	ADC3_IN12 or ADC1_IN15
	5	A4	ADC	**PC1**/ PB9	**ADC12_IN7**/ I2C1_SDA
	6	A5	ADC	**PC0**/ PA15	**ADC12_IN6**/ I2C1_SCL

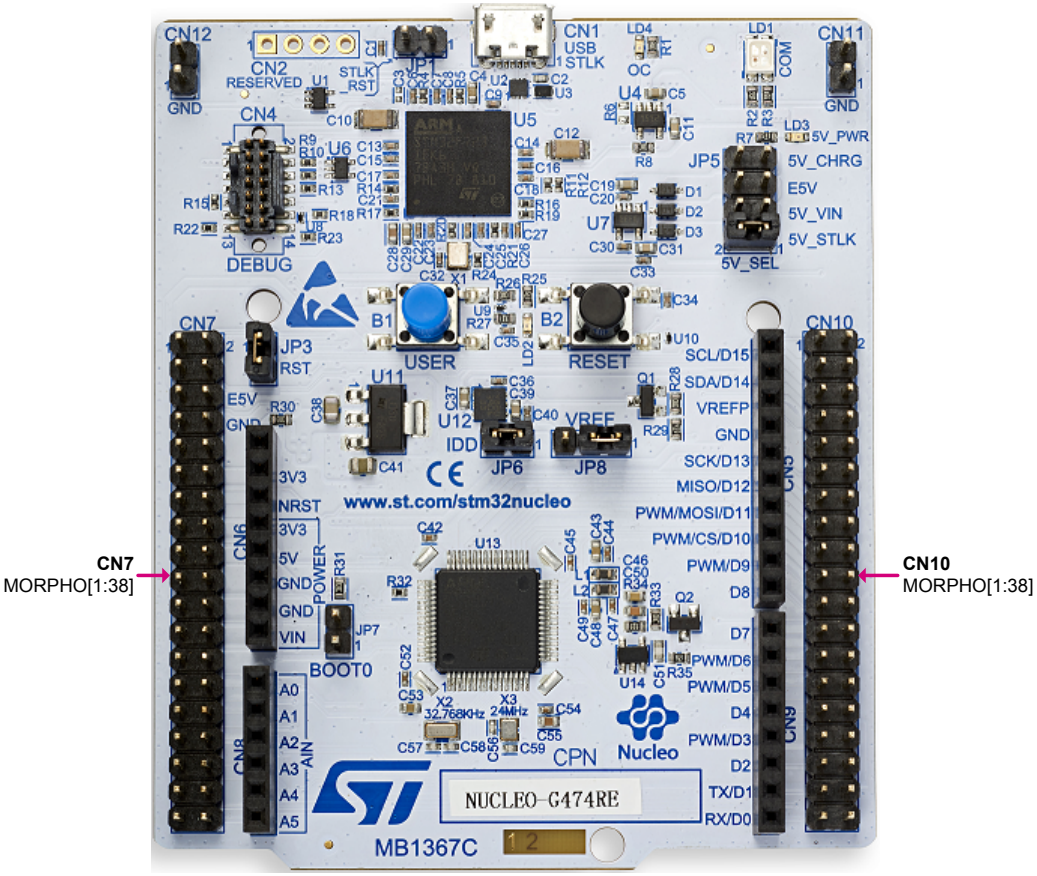
Connector	Pin number	Pin name	Signal name	STM32 pin(1)	Function(1)
CN5	10	SCL/D15	ARD_D15	PB8	I2C1_SCL
	9	SDA/D14	ARD_D14	PB9	I2C1_SDA
	8	VREFP	VREFP	VREF+	Voltage reference
	7	GND	-	-	GND
	6	SCK/D13	ARD_D13	PA5	SPI1_SCK
	5	MISO/D12	ARD_D12	PA6	SPI1_MISO
	4	PWM/MOSI/D11	ARD_D11	PA7	TIM3_CH2/SPI1_MOSI
	3	PWM/CS/D10	ARD_D10	PB6	TIM4_CH1/SPIx_CS
	2	PWM/D9	ARD_D9	PC7	TIM3_CH2 or TIM8_CH2
	1	D8	ARD_D8	PA9	IO
CN9	8	D7	ARD_D7	PA8	IO
	7	PWM/D6	ARD_D6	PB10	TIM2_CH3
	6	PWM/D5	ARD_D5	PB4	TIM3_CH1
	5	D4	ARD_D4	PB5	IO
	4	PWM/D3	ARD_D3	PB3	TIM2_CH2
	3	D2	ARD_D2	PA10	IO
	2	TX/D1	ARD_D1	PA2 / **PC4**	LPUSART1_TX / **USART1_TX**
	1	RX/D0	ARD_D0	PA3 / **PC5**	LPUSART1_RX / **USART1_RX**

1. *Default configuration is in bold.*

7.4 ST morpho connectors CN7 and CN10

ST morpho connectors CN7 and CN10 are male pin headers accessible on both sides of the board. All signals and power pins of the STM32G4 MCU are available on the morpho connectors. These connectors can also be probed by an oscilloscope, logical analyzer, or voltmeter.

Figure 19. ST morpho connectors



The pinout of ST morpho connectors CN7 and CN10 is shown in Figure 18. Arduino™ and ST morpho connectors pinout.

Note: The D0 and D1 signals are connected by default to USART1 (MCU I/O PC4 and PC5). For details about how to modify the UART interface, refer to Section 6.6.5 Virtual COM port (VCP): LPUART and USART.

Table 16 shows the pin assignment of each STM32G4 I/O on the ST morpho connector.

Table 16. Pin assignment of the ST morpho connectors

CN7 odd pins		CN7 even pins		CN10 odd pins		CN10 even pins	
Pin nbr	Pin name	Pin nbr	Pin name(1)	Pin nbr	Pin name(1)	Pin nbr	Pin name
1	PC10	2	PC11	1	PC9	2	PC8
3	PC12	4	PD2	3	PB8	4	PC6
5	VDD	6	E5V	5	PB9	6	PC5
7	BOOT0(2)	8	GND	7	VREFP(3)	8	5V_USB_CHGR(4)
9	NC	10	NC	9	GND	10	NC
11	NC	12	IOREF	11	PA5	12	PA12
13	PA13(5)	14	NRST	13	PA6	14	PA11
15	PA14(5)	16	3V3	15	PA7	16	PB12
17	PA15	18	5V	17	PB6	18	PB11

CN7 odd pins		CN7 even pins		CN10 odd pins		CN10 even pins	
Pin nbr	Pin name	Pin nbr	Pin name(1)	Pin nbr	Pin name(1)	Pin nbr	Pin name
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	26	NC	25	PB10	26	PB15
27	PC15	28	PA0	27	PB4	28	PB14
29	PF0	30	PA1	29	PB5	30	PB13
31	PF1	32	PA4	31	PB3	32	AGND
33	VBAT	34	PB0	33	PA10	34	PC4
35	PC2	36	**PC1**/PB9	35	PA2 / **PC4**	36	NC
37	PC3	38	**PC0**/PA15	37	PA3 / **PC5**	38	NC

1. *Default configuration in bold.*
2. *BOOT0 is not connected by default. The BOOT0 function is done by SW:*
   - *Option byte nSWBOOT0 must be set to 0 (in that case, BOOT0 is taken from the Option byte nBOOT0)*
   - *Option byte nBOOT0 must be set to 1 (in that case BOOT0 is active low).*

   If nSWBOOT0 is set to 0, the BOOT0 is taken from pin PB8 / BOOT0.
3. *AVDD connected to VREF+*
4. *5V_USB_CHGR is the 5 V power from the STLINK-V3E USB connector that rises first. It rises before the 5 V rising on the board.*
5. *PA13 and PA14 are shared with SWD signals connected to STLINK-V3E. It is not recommended to use them as I/O pins.*

8 STM32G4 Nucleo-64 I/O assignment

Table 17. **Nucleo-64 I/O assignment**

Pin	Pin name	Signal or label	Main feature / optional feature / (SB)[1]
1	VBAT	VBAT	VBAT voltage supply
2	PC13	PC13	**USER button** / IO
3	PC14-OSC32_IN	OSC32_IN / PC14	**LSE CLK** / IO
4	PC15-OSC32_OUT	OSC32_OUT / PC15	**LSE CLK** / IO
5	PF0-OSC_IN	OSC_IN / PF0	**HSE CLK** / I
6	PF1-OSC_OUT	OSC_OUT / PF1	**HSE CLK** / O
7	PG10-NRST	T_NRST	STM32G4 RESET
8	PC0	PC0	ARD_A5 - ADC12_IN6
9	PC1	PC1	ARD_A4 - ADC12_IN7
10	PC2	PC2	IO
11	PC3	PC3	IO
12	PA0	PA0	**ARD_A0 - ADC12_IN1** / User Button
13	PA1	PA1	ARD_A1 - ADC12_IN2
14	PA2	LPUART1_TX	ARD_D1 / **STLINK_TX (T_VCP_TX)**
15	VSS	GND	PWR GND
16	VDD	VDD	PWR VDD supply
17	PA3	LPUART1_RX	ARD_D0 / **STLINK_RX (T_VCP_RX)**
18	PA4	PA4	ARD_A2 - ADC2_IN17
19	PA5	PA5	ARD_D13 - SPI1_CLK
20	PA6	PA6	ARD_D12 - SPI1_MISO
21	PA7	PA7	ARD_D11 - TIM3_CH2 / SPI1_MOSI
22	PC4	PC4	IO
23	PC5	PC5	IO
24	PB0	PB0	ARD_A3 - ADC3_IN12
25	PB1	PB1	IO
26	PB2	PB2	IO
27	VSSA	AGND	AGND
28	VREF+	VREFP	Reference voltage supply
29	VDDA	AVDD	Analog voltage supply
30	PB10	PB10	ARD_D6 / TIM2_CH3
31	VSS	GND	GND
32	VDD	VDD	VDD voltage supply
33	PB11	PB11	IO
34	PB12	PB12	IO
35	PB13	PB13	IO
36	PB14	PB14	IO
37	PB15	PB15	IO

Pin	Pin name	Signal or label	Main feature / optional feature / (SB)[1]
38	PC6	PC6	IO
39	PC7	PC7	ARD_D9-TIM3_CH2 (or TIM8_CH2) / IO
40	PC8	PC8	IO
41	PC9	PC9	IO
42	PA8	PA8	ARD_D7 - IO
43	PA9	PA9	ARD_D8 - IO
44	PA10	PA10	ARD_D2 - IO
45	PA11	PA11	IO
46	PA12	PA12	IO
47	VSS	GND	GND
48	VDD	VDD	VDD voltage supply
49	PA13	T_SWDIO	T_SWDIO
50	PA14	T_SWCLK	T_SWCLK
51	PA15	T_JTDI	**T_JTDI** / I2C1_SCL
52	PC10	PC10	IO
53	PC11	PC11	IO
54	PC12	PC12	IO
55	PD2	D2	IO
56	PB3	PB3	ARD_D3 - TIM2_CH2 / T_SWO
57	PB4	PB4	ARD_D5 - TIM3_CH1 / IO
58	PB5	PB5	ARD_D4 - IO
59	PB6	PB6	ARD_D10 - SPIx_CS / TIM4_CH1
60	PB7	PB7	IO
61	PB8-BOOT0	BOOT0	BOOT0
62	PB9	PB9	ARD_D14 - I2C1_SDA
63	VSS	GND	GND
64	VDD	VDD	VDD voltage supply

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

9 Limitation

Issue observed

The OPAMP offset value is minimized using a trimming circuitry. At startup, the trimming values are initialized with the preset factory trimming values. The trimming values of OPAMP1, OPAMP2 and OPAMP4 are not programmed correctly, resulting in a large offset compared to the one specified.

Proposed workaround

The offset values of OPAMP1, OPAMP2 and OPAMP4 must be calibrated by software, applying the calibration procedure described in the *STM32G4 Series advanced Arm®-based 32-bit MCUs* reference manual (RM0440), in the *Calibration* section of the *Operational amplifiers (OPAMP)* chapter. Such a procedure is already implemented in the STM32CubeG4 MCU Package.

Parts impacted

This applies only to the MB1367-based NUCLEO-G474RE boards within the following range of serial numbers: A191300001-A191304602.

10 Federal Communications Commission (FCC) and Industry Canada (IC) Compliance Statements

10.1 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)

Terry Blanchard
Americas Region Legal | Group Vice President and Regional Legal Counsel, The Americas
STMicroelectronics, Inc.
750 Canyon Drive | Suite 300 | Coppell, Texas 75019
USA
Telephone: +1 972-466-7845

10.2 IC Compliance Statement

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

Revision history

Table 18. **Document revision history**

Date	Version	Changes
28-Mar-2019	1	Initial release.
17-Apr-2019	2	Added the Limitation section.

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