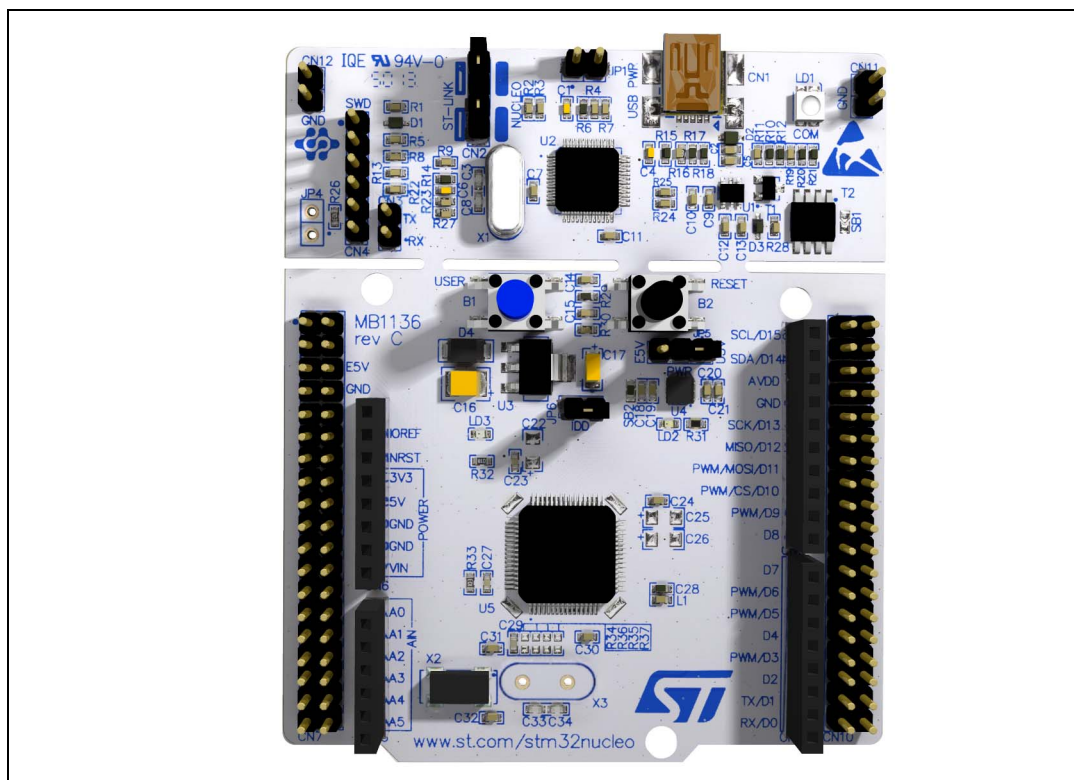


STM32 Nucleo开发板

简介

STM32 Nucleo开发板（NUCLEO-F030R8, NUCLEO-F070RB, NUCLEO-F072RB, NUCLEO-F091RC, NUCLEO-F103RB, NUCLEO-F302R8, NUCLEO-F303RE, NUCLEO-F334R8, NUCLEO-F401RE, NUCLEO-F411RE, NUCLEO-L053R8, NUCLEO-L073RZ, NUCLEO-L152RE, NUCLEO-L476RG）为用户试验新想法提供了一条成本低廉且灵活的途径，并且用户可以根据从性能、功耗和功能的不同组合中选择出的任何STM32微控制器产品线构建原型。通过选择众多的专属扩展板，Arduino™的连接支持和ST Morpho引脚很容易地扩展STM32 Nucleo开放式开发平台的功能。STM32 Nucleo开发板集成了调试器/编程器ST-LINK/V2-1，因此不需要任何单独的探头。STM32 Nucleo开发板自带STM32全面的软件HAL库，其中包含各种打包的软件示例，并且能在mbed.org直接访问mbed在线资源。

图1. STM32 Nucleo开发板⁽¹⁾

1. 图片不具法律效力。

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1 订购信息

表 1 列出了订购代码和相应的目标MCU

表1. 订购信息

订购代码	目标 MCU
NUCLEO-F030R8	STM32F030R8T6
NUCLEO-F070RB	STM32F070RBT6
NUCLEO-F072RB	STM32F072RBT6
NUCLEO-F091RC	STM32F091RCT6
NUCLEO-F103RB	STM32F103RBT6
NUCLEO-F302R8	STM32F302R8T6
NUCLEO-F303RE	STM32F303RET6
NUCLEO-F334R8	STM32F334R8T6
NUCLEO-F401RE	STM32F401RET6
NUCLEO-F411RE	STM32F411RET6
NUCLEO-L053R8	STM32L053R8T6
NUCLEO-L073RZ	STM32L073RZT6
NUCLEO-L152RE	STM32L152RET6
NUCLEO-L476RG	STM32L476RGT6

NUCLEO-TXXXRY 编码的含义如下：

- TXXX 表示STM32微控制器产品线
- R 表示引脚数（R代表64引脚）
- Y 表示容量大小 (8 代表 64K, B 代表 128K, C 代表 256K, E 代表 512K, G 代表 1MB, Z 代表192K)

订购代码打印在电路板顶部或者底部的标签位置。



2 约定

表 2 列出了用于本文档中的ON和OFF设置的约定。

表 2. ON/OFF 约定

约定	定义
跳线 JP1 ON	安装跳线
跳线 JP1 OFF	不安装跳线
焊桥SBX ON	通过焊锡或者0欧电阻短接SBx
焊桥SBX OFF	SBx连接开路

本文档中的关于“STM32 Nucleo board” 和 “STM32 Nucleo boards”的所有信息适用于所有在销售的型号。

3 快速入门

STM32 Nucleo开发板是一个低成本且易于使用的开发平台，可以用于快速评估和开始开发 LQFP64封装的STM32微控制器。

在安装和使用本产品之前，请接受www.st.com/epl的评估产品许可协议。

有关STM32 Nucleo开发板的更多信息以及获取演示软件，请访问 www.st.com/stm32nucleo。

3.1 入门

按照下面的顺序来配置STM32 Nucleo板并启动演示软件：

1. 检查开发板上的跳线位置，JP1关，JP5（PWR）位于U5V，JP6位于（IDD），选择CN2（NUCLEO）。
2. 连接开发板之前，为能够正确识别主机设备的所有接口，首先应安装NUCLEO的USB驱动程序，可以在www.st.com/stm32nucleo找到。
3. 使用A型USB转Mini-B型USB缆线将NUCLEO连接到PC，通过USB连接器接口CN1的给开发板供电。连接到。红色LED灯LD3（电源）和LD1（通讯）应该亮起。LD1（通讯）和绿色LED灯LD2应该闪烁。
4. 按下B1按钮（左边的按钮）。
5. 通过点击B1按钮，观察绿色LED灯LD2的闪烁是如何变化的。
6. 在www.st.com/stm32nucleo可以找到关于如何使用STM32 NUCLEO开发板的功能演示软件和一些软件的例程。
7. 使用现有的例程开发自己的应用程序。

3.2 系统要求

- Windows PC (XP, 7, 8)
- A型USB转Mini-B型USB缆线

4 特性

STM32 Nucleo板具有下列特性：

- STM32微控制器，LQFP64封装
- 两种类型的扩展资源
 - Arduino Uno第3版连接
 - ST Morpho扩展插头，支持完全访问所有STM32的I/O
- 支持mbed^(a)
- 板载SWD接口的ST-LINK/V2-1调试器/编程器
 - 选择模式开关将将该套件用作独立的ST-LINK/V2-1
- 灵活的电源供电
 - USB VBUS
 - Arduino连接器或者ST Morpho连接器的外部VIN (7V<VIN<12V) 电源电压
 - ST Morpho连接器的外部5V (E5V) 电源电压
 - Arduino连接器或者ST Morpho连接器的外部+3.3V电源电压
- 三个LED
 - USB通讯灯(LD1)，用户LED灯(LD2)，电源LED灯(LD3)
- 两个按钮：USER和RESET
- LSE晶振：
 - 32.768kHz 晶体振荡器（决定于开发板版本）
- USB重列举能力：USB支持三种不同的接口
 - 虚拟串口
 - 大容量存储器
 - 调试端口
- 全面的免费软件HAL库，包括各种各样的软件示例
- 支持集成开发环境（IDE）的多种选择，包括IAR、Keil、基于GCC的IDE

4.1 硬件配置的不同

该开发板交付使用时，目标MCU的振荡器的配置可能不同。关于高速振荡器配置的详细信息请参阅第5.7.1节。关于低速振荡器配置的详细信息请参见5.7.2节。

a. 请查看 <http://mbed.org/>

5 硬件布局 and 配置

STM32 NUCLEO板专为64引脚LQFP封装的STM32微控制器设计。

图2给出了STM32及其外设（ST-LINK / V2-1，按钮，LED，Arduino的连接器和ST Morpho连接器）之间的连接图。

图3和图4给出了这些功能在STM32 NUCLEO板的位置。

图2. 硬件框图

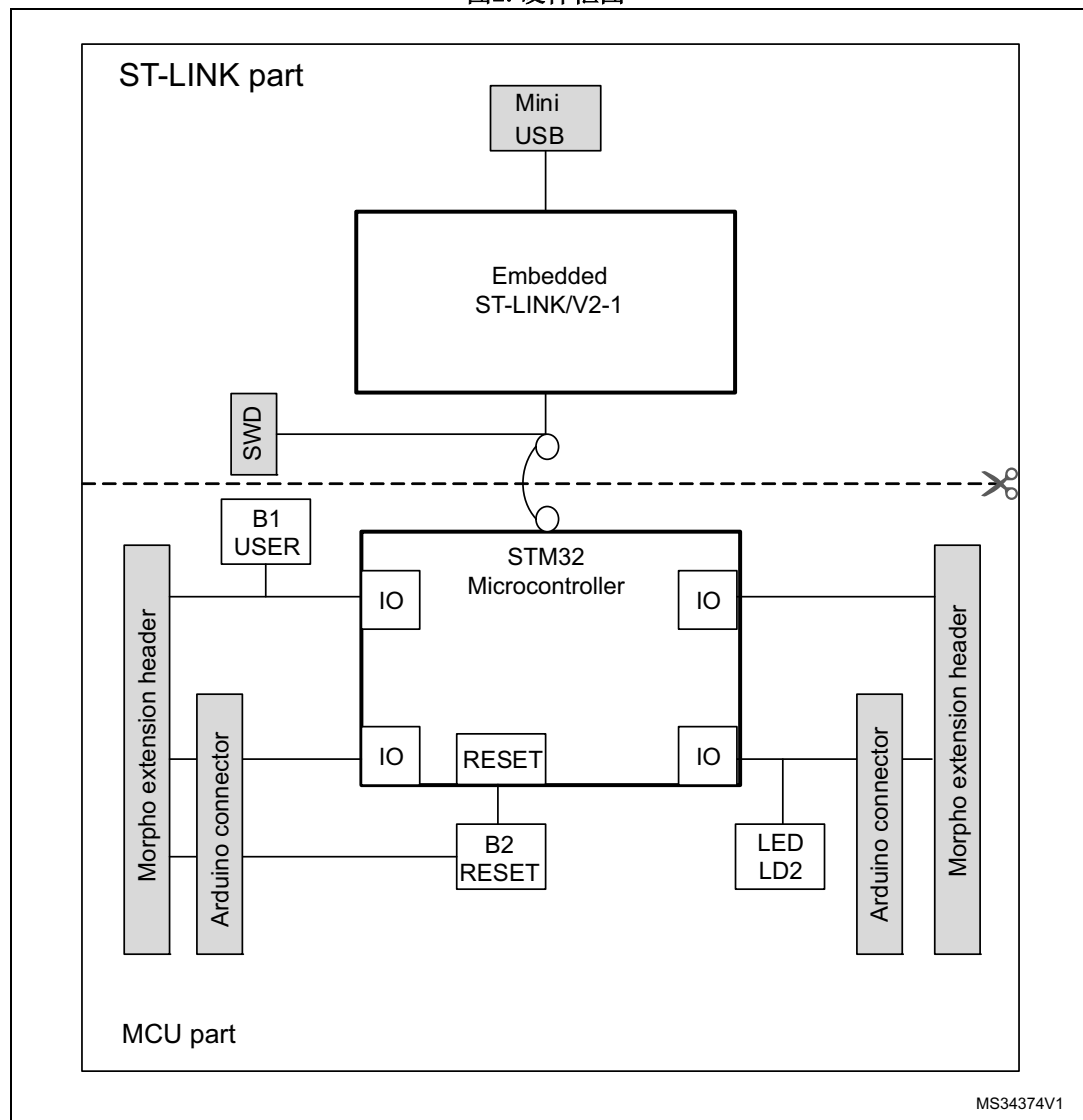
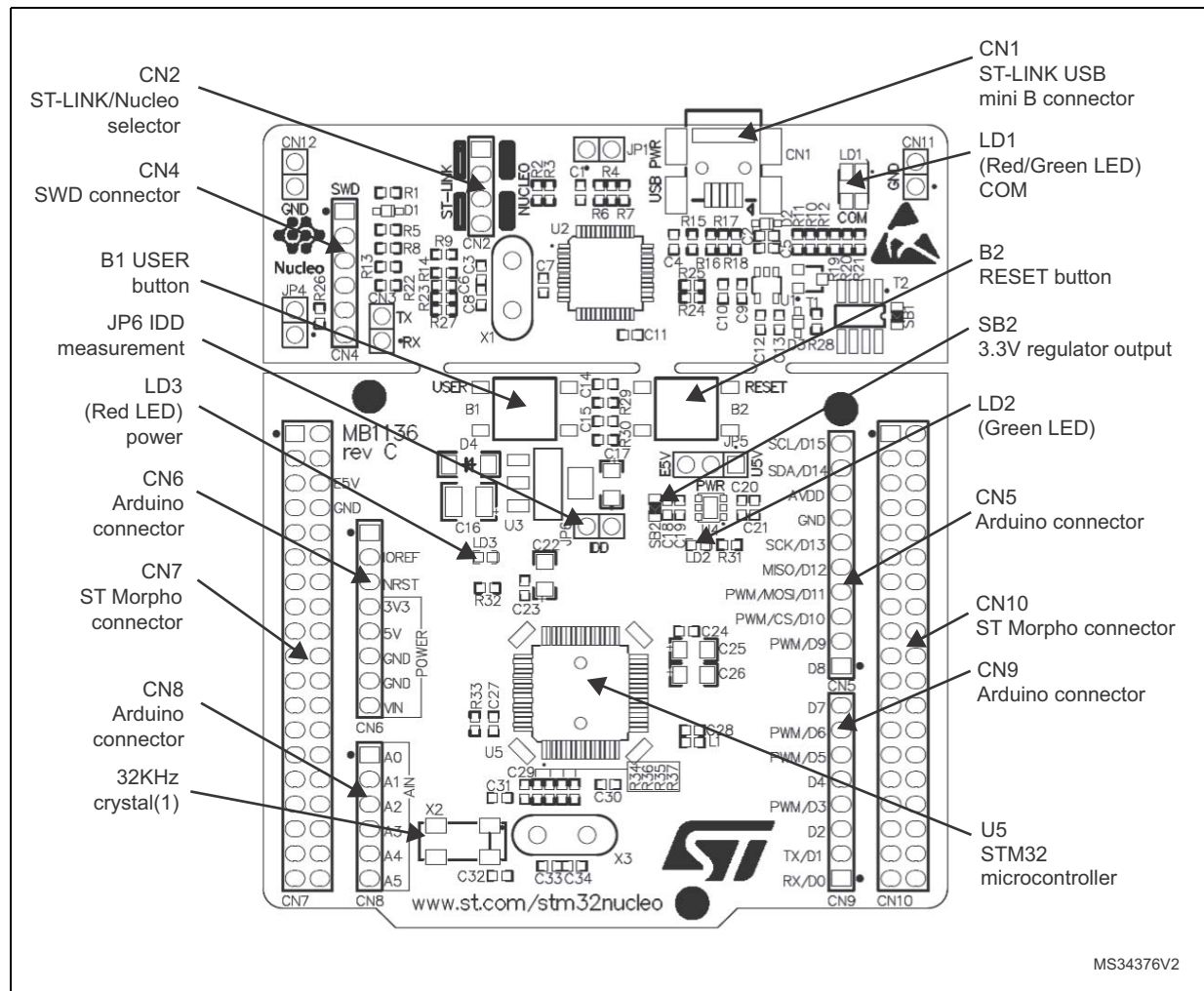
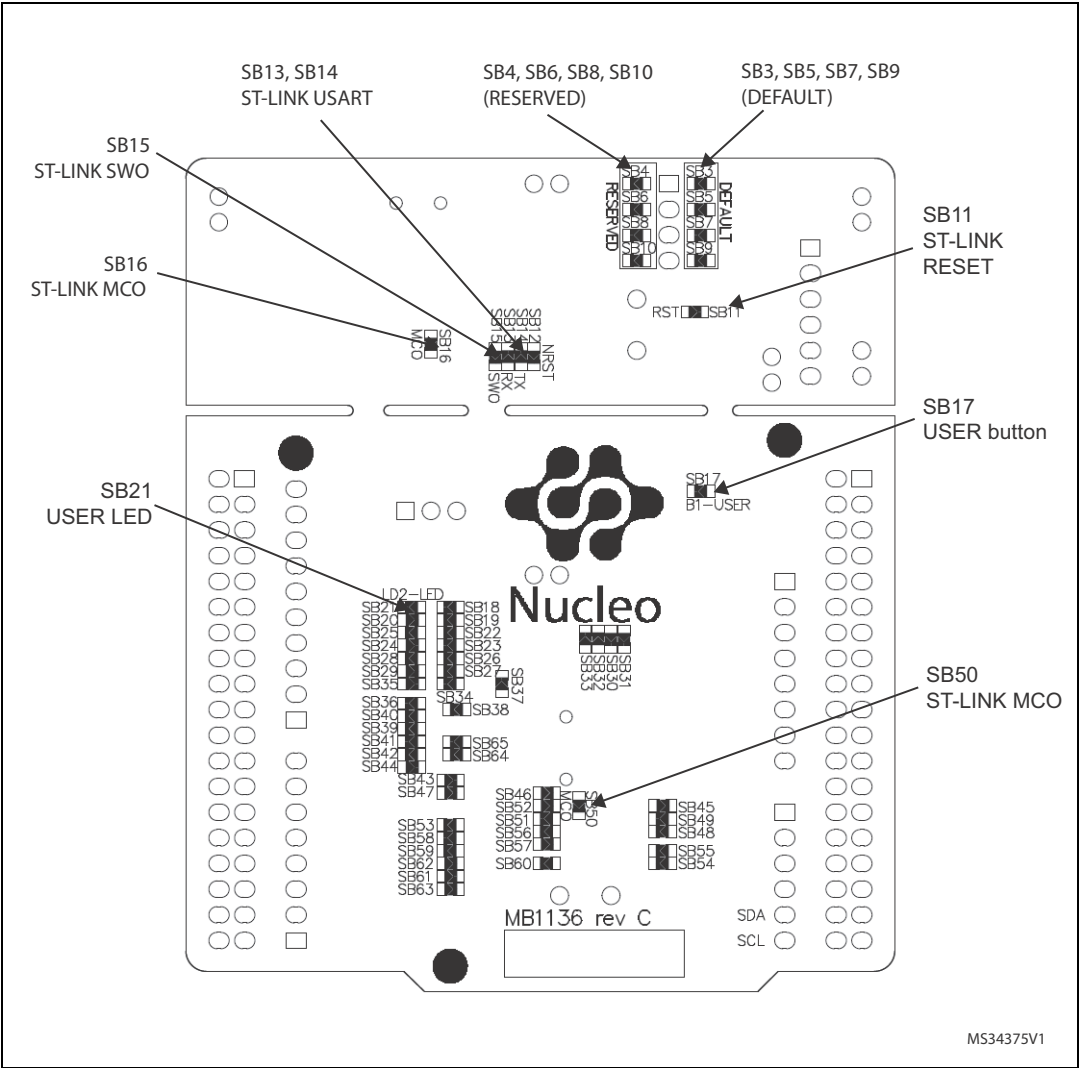


图3.顶部布局



1. Crystal may be present or not depending on board version, refer to [Section 5.7.2](#)

图4.底部布局



5.1 可切割的PCB

STM32 NUCLEO板分为两个部分：ST-LINK部分及目标MCU部分。PCB的STLINK部分可以被切除掉，以减小电路板的尺寸。在这种情况下，剩下的目标MCU部分的只能由ST Morpho连接器CN7的VIN、E5V和3.3V或者Arduino的连接器的VIN和3.3V供电。目标MCU部分仍然可以使用的ST-LINK部分通过CN4和ST Morpho连接器的SWD信号（SWCLK CN7 15引脚和SWDIO CN7 13引脚）之间的连线对主MCU进行编程。

5.2 内嵌ST-LINK/V2-1

STM32 NUCLEO板集成了ST-LINK/V2-1编程器和调试器。

ST-LINK/V2-1使得STM32 NUCLEO板支持mbed。

对于STM32器件，内嵌的ST-LINK/ V2-1只支持SWD模式。有关调试和编程功能的信息请参阅用户手册UM1075 - ST-LINK/ V2在电路调试器/编程器（STM8和STM32），里面详细描述了ST-LINK/ V2所有的功能。

下面列出了相对于ST-LINK / V2版本的变化：

- ST-LINK/ V2-1支持新的功能：
 - USB软件重新枚举
 - 在USB端口虚拟串口接口
 - 在USB端口虚拟大容量存储
 - USB电源管理，满足USB端口大于100mA。
- ST-LINK/ V2-1不支持的功能：
 - SWIM接口。
 - 支持的最小应用电压限制为3 V。
- 已知的限制：
 - 激活ST-Link/ V2-1目标的读取保护功能会使得目标应用程序被读出之后无法运行。ST-Link/ V2-1板目标的读取保护功能必须保持禁用。

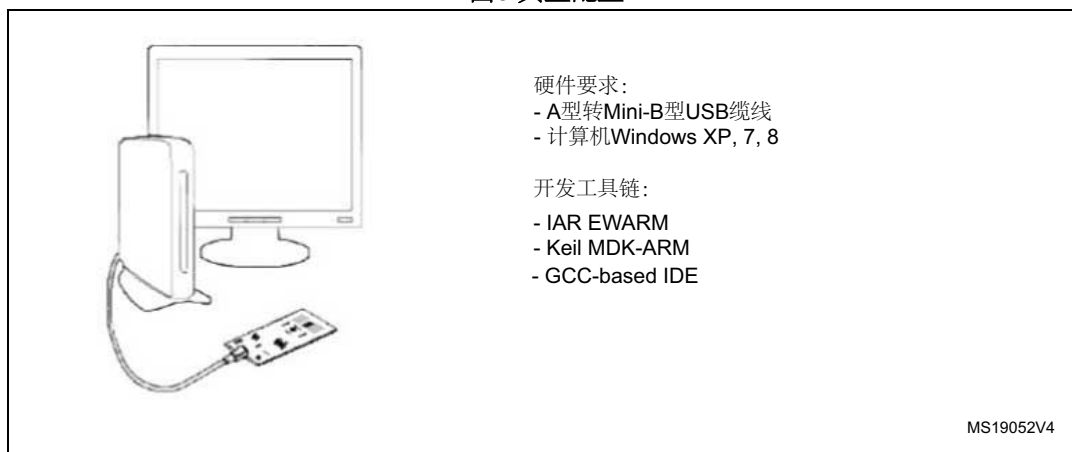
有两种不同的方式来使用内嵌的ST-LINK/ V2-1根据跳线状态（见表3和图5）：

- 编程/调试板载的MCU（第5.2.2节）
- 使用连接SWD接口CN4的线缆编程/调试外部应用电路板的MCU（第5.2.4节）。

表3.跳线状态

跳线状态	描述
CN2两个跳线 ON	启用ST-LINK/ V2-1支持板载的编程功能（默认）
CN2两个跳线 OFF	启用ST-LINK/ V2-1支持外部连接器CN4的功能（支持SWD）

图5.典型配置



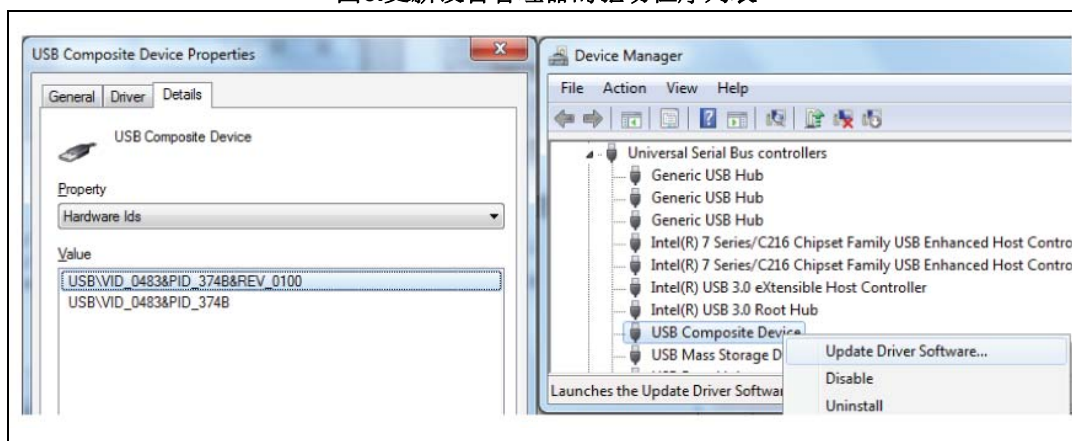
5.2.1 驱动

ST-LINK/ V2-1需要一个专用的USB驱动程序，可以在www.st.com找到，适用于Windows XP, 7, 8系统。在Windows XP系统上使用的ST-LINK/ V2-1之前，需要先安装WinUSB后才能安装ST-LINK/ V2-1驱动程序，WinUSB可从Microsoft网站下载或者包含在XP系统下ST-LINK/ V2的USB驱动程序）。

当STM32 NUCLEO板安装驱动程序之前连接到PC机上时，一些NUCLEO板在PC设备管理器显示为“未知”。在这种情况下，用户必须安装驱动程序文件（图6），并在设备管理器更新所连接的设备的驱动程序。

注：推荐使用“USB Composite Device”修复。

图6.更新设备管理器的驱动程序列表



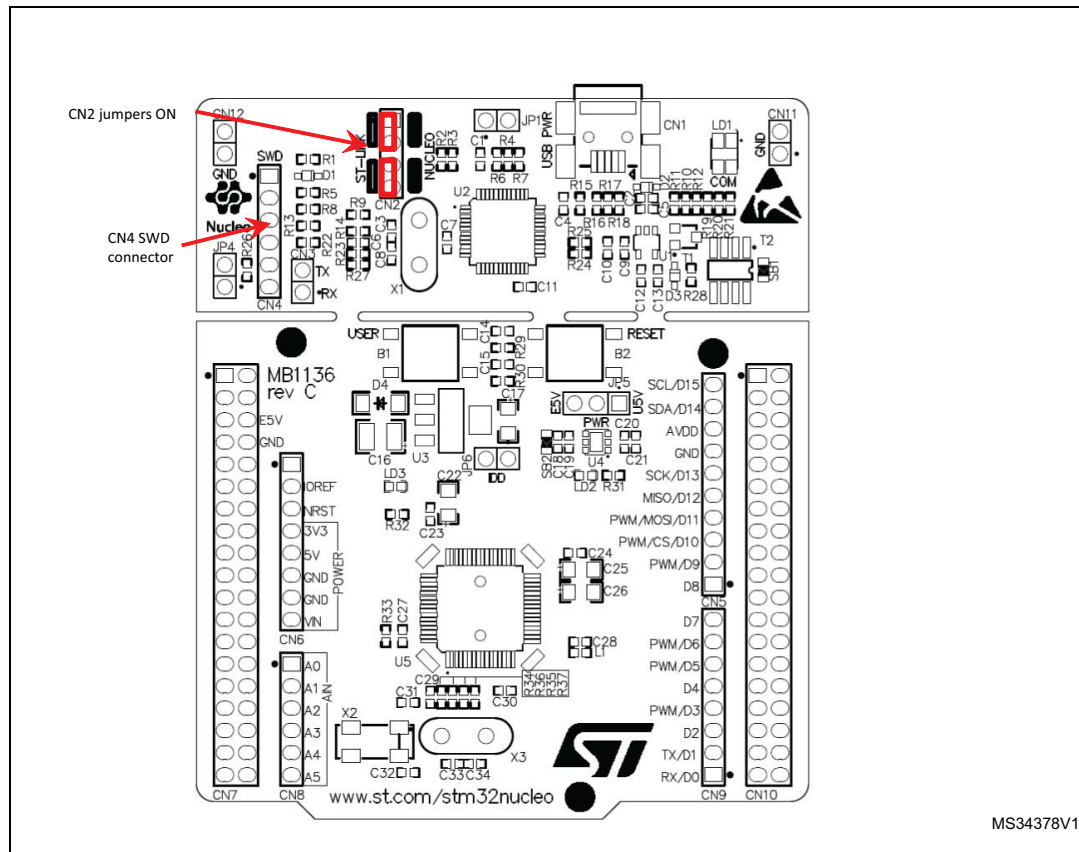
5.2.2 ST-LINK/V2-1固件更新

ST-LINK/ V2-1嵌入了固件升级机制以实现通过USB端口原地升级。由于在ST-LINK/ V2-1产品的生命周期内固件可能会发生变化（例如新功能，修复bug，新的微控制器系列支持），建议在开始使用STM32 NUCLEO板前访问www.st.com，并且定期访问以保持最新的固件版本。

5.2.3 使用ST-LINK/ V2-1编程/调试板载的STM32

编程板上的STM32时，插入CN2上的两个跳线，如图7的红色所示。不要使用CN4连接器，因为这可能会干扰与STM32 NUCLE0板的STM32微控制器的通信。

图 7. 连接STM32 NUCLEO板并编程板载的STM32



5.2.4 使用ST-LINK/V2-1编程/调试外部STM32应用

很容易实现使用ST-LINK/V2-1编程外部应用程序的STM32。只需要从CN2卸下两个跳线如图8，并根据表4将应用程序连接到CN4调试接口。

注: 如果在外部应用程序你使用CN4的引脚5, SB12 NRST (目标MCU RESET) 必须关闭。

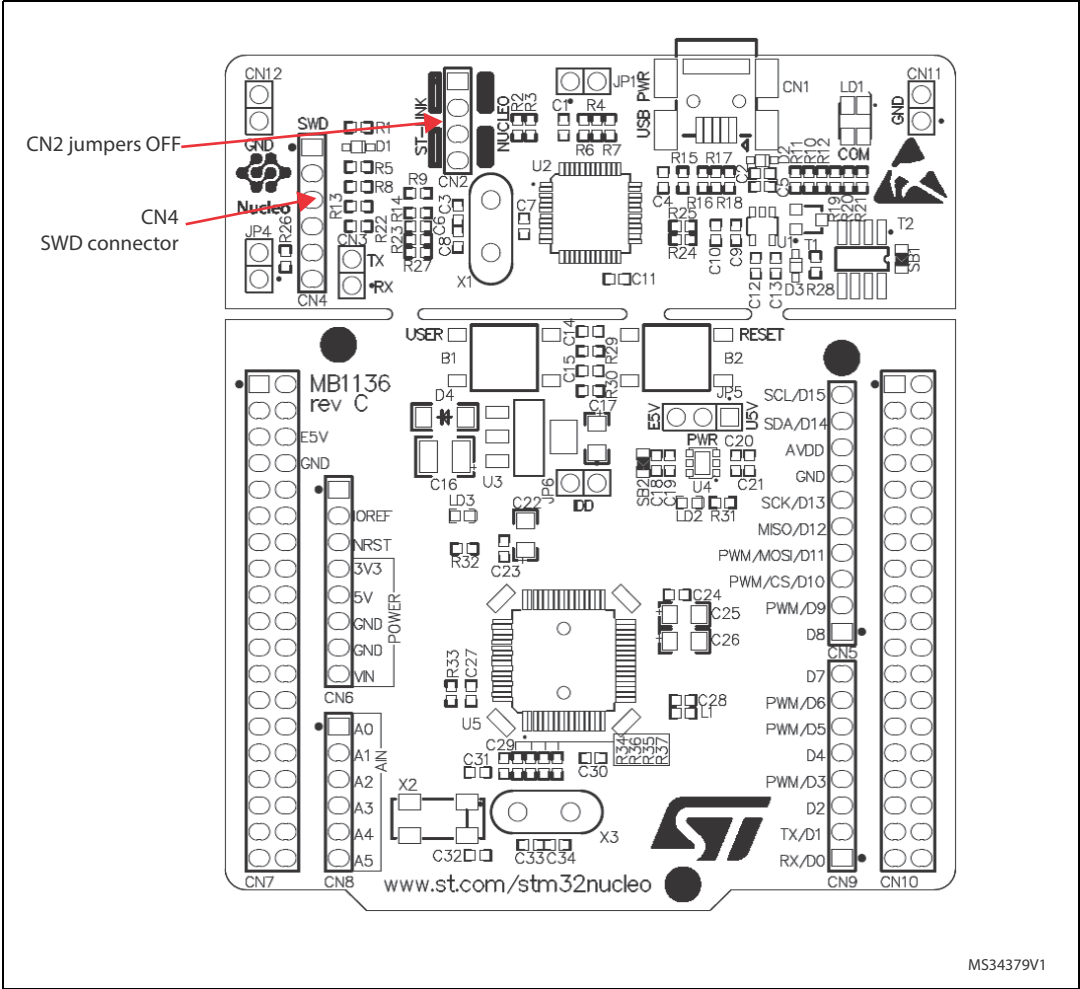
表4.调试连接器CN4 (SWD)

引脚	CN4	描述
1	VDD_TARGET	应用程序的VDD
2	SWCLK	SWD 时钟
3	GND	地
4	SWDIO	SWD 数据输入/输出

表4.调试连接器CN4（SWD）（续上表）

5	NRST	目标MCU的RESET
6	SWO	保留

图 8. 使用ST-LINK/ V2-1编程/调试外部STM32应用



5.3 电源供电和电源选择

电源供电可以由PC主机通过USB电缆提供，也可以外部电源CN6或者CN7的电源引脚VIN（7V–12V），E5V（5V）或+3V3提供。如果使用外部电源装置或辅助设备提供的VIN，E5V或+3V3用于NUCLEO板供电时，所用电源必须符合标准EN-60950-1：2006 + A11/ 2009，而且必须是有限功率容量的安全特低电压（SELV）。

5.3.1 从USB接口接入电源

ST-LINK/ V2-1支持USB电源管理机制，允许从PC主机吸收超过100mA的电流。

STM32 NUCLEO核心板和扩展板的所有部件都可以由ST-LINK的USB连接端口CN1（U5V或VBUS）供电。请注意，在USB枚举之前只有ST-LINK部分供电，因为那时主机只可以向NUCLEO板提供100 mA的电流。在USB枚举过程中，STM32的核蛋白板需要吸收来自主机PC的300毫安电流。如果主机能够提供所需的电源，目标STM32微控制器供电，红色LED LD3接通，此时STM32 NUCLEO板及其扩展板可以消耗最大300 mA的电流，不能更多。如果主机不能够提供所需的电流，目标STM32微控制器和MCU部分包括扩展板不供电。其结果，红色LED LD3仍保持断开。在这样的情况下，必须使用外部电源，将在下一章说明。

当核心板由USB提供的电源（U5V）供电时，JP5的引脚1与引脚2之间的跳线必须短接，如表7所示。

当核心板由USB（U5V）供电时，JP1是根据核心板的最大消耗电流对JP1进行配置。在NUCLEO板由USB供电和最大电流消耗上U5V供电不会超过100mA（包括最终扩展板或Arduino的护罩）时 JP1跳线可以被短接。在这样的条件下USB枚举过程总是成功，因为不需要向PC请求超过100mA的电流。JP1的可能的结构总结于表5中。

表 5. JP1 配置信息表

跳线转态	电源	允许电流
JP1跳线处于OFF	通过USB（CN1）供电	最大300 mA
JP1跳线处于ON		最大100 mA

警告：如果NUCLEO板及扩展板的最大消耗电流超过300mA时，必须使用连接至E5V或VIN的外部电源向NUCLEO板供电。

注: 如果NUCLEO板由USB充电器供电，这时因为没有USB枚举过程，所以LD3指示灯将会永久处于灭状态，而且目标MCU未通电。在这种特定的情况下，跳线JP1需要被设置为ON，以允许任何时候都向目标MCU供电。

5.3.2 外接电源输入：VIN和EV5

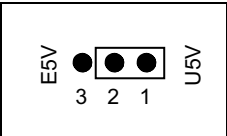
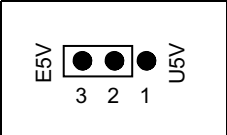
外接电源VIN和EV5的方式总结在表6中。当使用VIN或E5V向核心板供电时，跳线必须按照以下方式进行配置：

- 使用跳线短接JP5的2脚和3脚
- 去掉JP1的跳线

表6.外部电源

输入电源名称	连接引脚	电压范围	最大电流	限制
VIN	CN6 的 8脚 CN7 的 24脚	7 V - 12 V	800 mA	输入电压仅为7V到12V，输入电流容量和输入电压有关： 当Vin=7 V时输入电流800mA 当7V < Vin <= 9 V时输入电流450mA 当9V < Vin <= 12 V时输入电流250mA
E5V	CN7 的 6脚	4.75 V - 5.25 V	500 mA	-

表7. 电源相关的跳线

跳线	描述
JP5	<p>当JP5如下图设置时，U5V（ST-LINK VBUS）作为电源（默认设置）</p> 
	<p>当JP5设定如下所示时，VIN或E5V作为电源。</p> 

使用VIN或者E5V作为外部电源

当NUCLEO核心板及扩展板消耗的电流超过USB允许的电流值的情况下，可以使用VIN或者E5V作为外部电源输入。这种情况下，仍然是可以使用USB作为通讯、编程或者仅调试，但是将USB电缆连接到PC之前，必须首先使用VIN或者E5V向NUCLEO板供电才能使用。这样处理保证在使用外部电源供电的情况下，可以确保产生USB的枚举过程。

请注意以下的上电的顺序：

1. 连接JP5的引脚2和引脚3之间的跳线。
2. 检查JP1的跳线是否被取掉。
3. 连接外部电源VIN或E5V。
4. 外部电源上电，VIN的电压范围是7 V < VIN < 12 V，E5V的电压是5V。
5. 检查LD3是否点亮。
6. 将PC连接到USB接口CN1。

如果没有遵守该顺序，NUCLEO板首先由VBUS供电，然后由VIN或E5V供电，这时将有可能遇到以下风险：

1. 如果NUCLEO板需要超过300mA的电流，那么PC有可能被损坏，或者是PC限制提供的电源电流。 结果是NUCLEO电路板不能正常供电.
2. 由于JP1处于OFF状态时，枚举过程需要300mA的电流，因此有可能该请求被拒绝，如果PC无法提供这样的电流，枚举过程会不成功。然后，该板不能被供电, LD3灯保持熄灭状态。

5.3.3 外接电源输入：+3V3

有趣的是，NUCLE0板可以直接使用+3V3（CN6的4脚或者CN7的12脚和16脚）作为电源的输入，例如使用扩展板提供的3.3V供电的情况。当使用+3.3V向NUCLE0板供电时，ST-LINK没有上电，因此编程及调试功能都是不可以使用的。使用外部电源+3.3V的情况总结在表8中：

表8. +3.3V外接电源

输入电源名称	连接引脚	电压范围	限制条件
+3V3	CN6的4脚 CN7的12脚和16脚	3 V - 3.6 V	使用在ST-LINK部分被切除掉或者SB2和SB12未焊接

可以使用+3V3为电路板供电的两种不同的配置：

- ST-LINK部分被切除掉或者
- SB2和SB12未焊接

5.3.4 外部电源输出

使用USB、VIN或者E5V供电时，+5V可以用作输出电源向Arduino板或扩展板供电。这种情况下，应当注意表6中提到的供电电源的最大电流。

+3.3V（CN6的4脚或者CN7的12脚、16脚）也可以用作电源输出。该电流限制为电源转换器U4能输出的最大电流（最大为500mA）。

5.4 LEDs

三色LED（绿色，橙色，红色）LD1（COM）提供了有关ST-LINK通信状态信息。LD1默认的颜色是红色。LD1变成绿色，表明PC和ST-LINK / V2-1的通讯正在进行中，包含以下设置：

- 红灯缓慢闪烁/关闭：USB初始化之前上电。
- 红灯快速闪烁/关闭：在PC和STLINK V2-1之间的第一次正确通讯后（枚举）
- 红灯常亮：当PC和ST-LINK / V2-1之间的初始化完成
- 绿灯常亮：一次成功与目标通信初始化后
- 红灯/绿灯交替闪烁：与目标通信时
- 绿灯常亮：通信完成，并且成功。
- 橙色灯常亮：通讯故障

用户指示灯LD2：绿色LED灯是用户指示灯，连接到Arduino接口的信号D13，根据STM32的目标MCU，该信号对应于单片机的I / O引脚PA5（引脚21）或者PB13（引脚34）。请参考表10至表19。

- 当I / O为高电平时，该指示灯常亮。
- 当I / O为低电平时，该指示灯熄灭。

电源指示灯LD3：红色Led灯常亮表示MCU部分上电，并且+5V电源可用。

5.5 手按开关

用户按钮B1: 用户按钮连接到STM32微控制器的I / O PC13（引脚2）。

复位按钮B2: 这个按钮连接到NRST，并且用来复位STM32微控制器。

注意: 放置在按钮的蓝色和黑色的塑料帽在需要时可以去掉，例如当扩展板或应用电路板插在NUCLEO板的上部时。这将避免按压按钮并因此导致的可能的永久目标MCU复位。

5.6 JP6 (IDD)

跳线JP6，标记为IDD，用来通过去掉该跳线并连接一个电流表来测量STM32微控制器的功耗。

- 跳线ON: STM32微控制器上电（默认）。
- 跳线OFF: 必须连接一台电流表来测量STM32微控制器的电流。如果没有电流表，STM32微控制器不会被通电。

5.7 OSC时钟

5.7.1 OSC时钟源

有四种方法可以配置相应的外部高速时钟外部（HSE）的引脚：

- **来自ST-LINK的MCO:** ST-LINK MCU的MCO输出用来作为输入时钟。该时钟频率不能改变，固定为8MHz，连接到STM32微控制器的OSC_IN-PF0/PD0/PH0。

需要以下配置：

- SB54和SB55 OFF
- SB16和SB50 ON
- 去掉R35和R37

- **板载来自X3晶体（未提供）的HSE振荡器：**典型的频率和它的电容和电阻，请参考STM32微控制器的数据表。有关STM32微控制器的振荡器设计指南请参阅AN2867。X3晶体具有以下特点：8 MHz，16 pF的，20ppm的，以及DIP封装。推荐使用香港X'tals有限公司制造的9SL8000016AFXHF0。

需要以下配置：

- SB54和SB55 OFF
- 焊接R35和R37
- 用20pF电容焊接C33和C34
- SB16和SB50 OFF

- **来自外部PF0/ PD0/ PH0的振荡器：**通过连接器CN7引脚29的外部振荡器。

需要以下配置：

- SB55 ON
- SB50 OFF
- 去掉R35和R37

- **不使用HSE：**PF0/PD0/PH1和PF1/PD1/PH1被用作GPIO而不是时钟。

需要以下配置：

- SB54和SB55 ON
- SB16和SB50 (MCO) OFF
- 去掉R35和R37

根据NUCLE0板的硬件版本号，HSE管脚有两种默认配置：

主板的版本号MB1136 C-01或者MB1136 C-02在贴于PCB电路板的底面上的标签上有提及。

标记为MB1136 C-01的主板表示该主板配置为未使用HSE。

标记为MB1136 C-02（或者更高）的主板表示该主板配置为使用ST-LINK的MCO作为时钟输入。

注意： 对于NUCLEO - L476RG，为了降低在低功率模式下的功耗，ST-Link的MCO输出没有连接到OSCIN。因此NUCLEO - L476RG配置符合未使用HSE。

5.7.2 OSC 32 kHz时钟源

有三种方式来配置低速时钟（LSE）相应的引脚：

- **板载振荡器：**X2晶体。请参阅STM32微控制器振荡器设计指南AN2867。X2晶体具有以下特点：32.768kHz，6pF，20PPM，以及SM308封装。推荐使用ABRACON公司制造的ABS25-32.768KHZ-6-T。
- **来自外部PC14的振荡器：**通过连接器CN7的25引脚的外部振荡器。

需要以下配置：

- SB48和SB49 ON
- 去掉R34和R36

- **不使用LSE：**PC14和PC15用作GPIO，而不是低速时钟。

需要以下配置：

- SB48和SB49 ON
- 去掉R34和R36

根据NUCLEO板的硬件版本号，LSE有两种默认配置。

主板的版本号MB1136 C-01或者MB1136 C-02在贴于PCB电路板的底面上的标签上有提及。

标记为MB1136 C-01的主板表示该主板配置为未使用LSE。

标记为MB1136 C-02（或者更高）的主板表示该主板配置为使用板载32kHz振荡器。

标记为MB1136 C-03（或者更高）的主板表示该主板配置为使用板载新的LSE振荡器（ABS25）并且C26，C31以及C32的值更新了。

5.8 USART通信

STM32微控制器的PA2和PA3可以用作USART2接口，该接口可以连接到ST-LINK的MCU，ST的Morpho连接器或者Arduino连接器。可以通过设置相关的焊接桥改变选择。默认情况下，目标MCU与ST-LINK的MCU之间的USART2通信是可用的，为了能够支持mbed的虚拟串口（SB13和SB14 ON，SB62和SB63 OFF）。如果需要目标MCU的PA2（D1）或者PA3（D0）与模块或扩展板之间进行通讯，那么SB62和SB63应该处于ON状态，SB13和SB14处于OFF状态。在这样的情况下，可能就需要通过使用Morpho和CN3之间的飞线将另外一个USART连接到ST-LINK的MCU。例如，在NUCLEO-F103RB上，可以将PC10（TX）及PC11（RX）用作USART3使用。需要连接的两根飞线如下：

- CN7的1脚PC10（USART3_TX）连接到CN3的RX引脚。
- CN7的2脚PC11（USART3_RX）连接到CN3的TX引脚

5.9 Solder bridges

Table 9. Solder bridges

Bridge	State (1)	Description
SB54, SB55 (X3 crystal) ⁽²⁾	OFF	X3, C33, C34, R35 and R37 provide a clock as shown in Chapter 7: Electrical schematics PF0/PD0/PH0, PF1/PD1/PH1 are disconnected from CN7.
	ON	PF0/PD0/PH0, PF1/PD1/PH1 are connected to CN12. (R35, R37 and SB50 must not be fitted).
SB3,5,7,9 (DEFAULT)	ON	Reserved, do not modify.
SB4,6,8,10 (RESERVED)	OFF	Reserved, do not modify.
SB48,49 (X2 crystal) ⁽³⁾	OFF	X2, C31, C32, R34 and R36 deliver a 32 kHz clock. PC14, PC15 are not connected to CN7.
	ON	PC14, PC15 are only connected to CN7. Remove only R34, R36
SB17 (B1-USER)	ON	B1 push button is connected to PC13.
	OFF	B1 push button is not connected to PC13.
SB12 (NRST)	ON	The NRST signal of the CN4 connector is connected to the NRST pin of the STM32 MCU.
	OFF	The NRST signal of the CN4 connector is not connected to the NRST pin of the STM MCU.
SB15 (SWO)	ON	The SWO signal of the CN4 connector is connected to PB3.
	OFF	The SWO signal is not connected.
SB11 (STM_RST)	OFF	No incidence on STM32F103CBT6 (ST-LINK MCU) NRST signal.
	ON	STM32F103CBT6 (ST-LINK MCU) NRST signal is connected to GND.
SB1 (USB-5V)	OFF	USB power management is functional.
	ON	USB power management is disabled.
SB2 (3.3 V)	ON	Output of voltage regulator LD39050PU33R is connected to 3.3V.
	OFF	Output of voltage regulator LD39050PU33R is not connected.
SB21 (LD2-LED)	ON	Green user LED LD2 is connected to D13 of Arduino signal.
	OFF	Green user LED LD2 is not connected.
SB56,SB51 (A4 and A5)	ON	PC1 and PC0 (ADC in) are connected to A4 and A5 (pin 5 and pin 6) on Arduino connector CN8 and ST Morpho connector CN7. Thus SB46 and SB52 should be OFF.
	OFF	PC1 and PC0 (ADC in) are disconnected to A4 and A5 (pin 5 and pin 6) on Arduino connector CN8 and ST Morpho connector CN7.
SB46,SB52 (I2C on A4 and A5)	OFF	PB9 and PB8 (I2C) are disconnected to A4 and A5 (pin 5 and pin 6) on Arduino connector CN8 and ST Morpho connector CN7.
	ON	PB9 and PB8 (I2C) are connected to A4 and A5 (pin 5 and pin 6) on Arduino connector CN8 and ST Morpho connector CN7 as I2C signals. Thus SB56 and SB51 should be OFF.

Table 9. Solder bridges (continued)

Bridge	State (1)	Description
SB45 (VBAT/VLCD)	ON	VBAT or VLCD on STM32 MCU is connected to VDD.
	OFF	VBAT or VLCD on STM32 MCU is not connected to VDD.
SB57 (VREF+)	ON	VREF+ on STM32 MCU is connected to VDD.
	OFF	VREF+ on STM32 MCU is not connected to VDD and can be provided from pin 7 of CN10
SB62, SB63 (USART)	ON	PA2 and PA3 on STM32 MCU are connected to D1 and D0 (pin 7 and pin 8) on Arduino connector CN9 and ST Morpho connector CN10 as USART signals. Thus SB13 and SB14 should be OFF.
	OFF	PA2 and PA3 on STM32 MCU are disconnected to D1 and D0 (pin 7 and pin 8) on Arduino connector CN9 and ST Morpho connector CN10.
SB13, SB14 (ST-LINK-USART)	OFF	PA2 and PA3 on STM32F103CBT6 (ST-LINK MCU) are disconnected to PA3 and PA2 on STM32 MCU.
	ON	PA2 and PA3 on STM32F103CBT6 (ST-LINK MCU) are connected to PA3 and PA2 on STM32 MCU to have USART communication between them. Thus SB61,SB62 and SB63 should be OFF.
SB16,SB50(MCO) ⁽²⁾	OFF	MCO on STM32F103CBT6 (ST-LINK MCU) are disconnected to PF0/PD0/PH0 on STM32 MCU.
	ON	MCO on STM32F103CBT6 (ST-LINK MCU) are connected to PF0/PD0/PH0 on STM32 MCU.

1. The default SBx state is shown in bold.
2. Default configuration depends on board version. Please refer to chapter 5.7.1 for details
3. Default configuration depends on board version. Please refer to chapter 5.7.2 for details.

All the other solder bridges present on the STM32 Nucleo board are used to configure several IOs and power supply pins for compatibility of features and pinout with STM32 MCU supported.

All STM32 Nucleo boards are delivered with the solder-bridges configured according to the target MCU supported.

5.10 Extension connectors

The following figures show the signals connected by default to Arduino Uno Revision 3 connectors (CN5, CN6, CN8, CN9) and to STMicroelectronics Morpho connector (CN7 and CN10), for each STM32 Nucleo board.

Figure 9. NUCLEO-F030R8

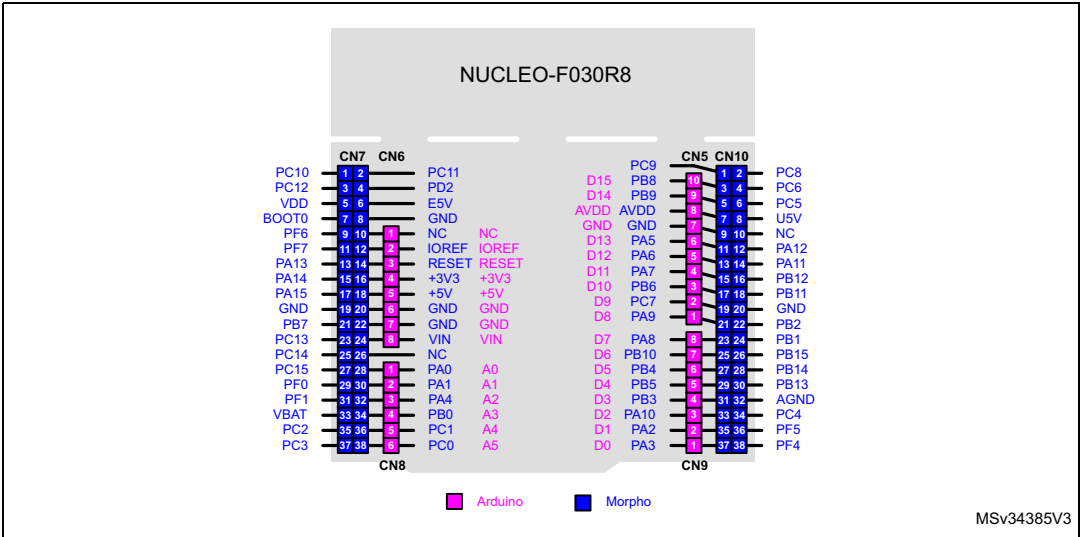


Figure 10. NUCLEO-F070RB

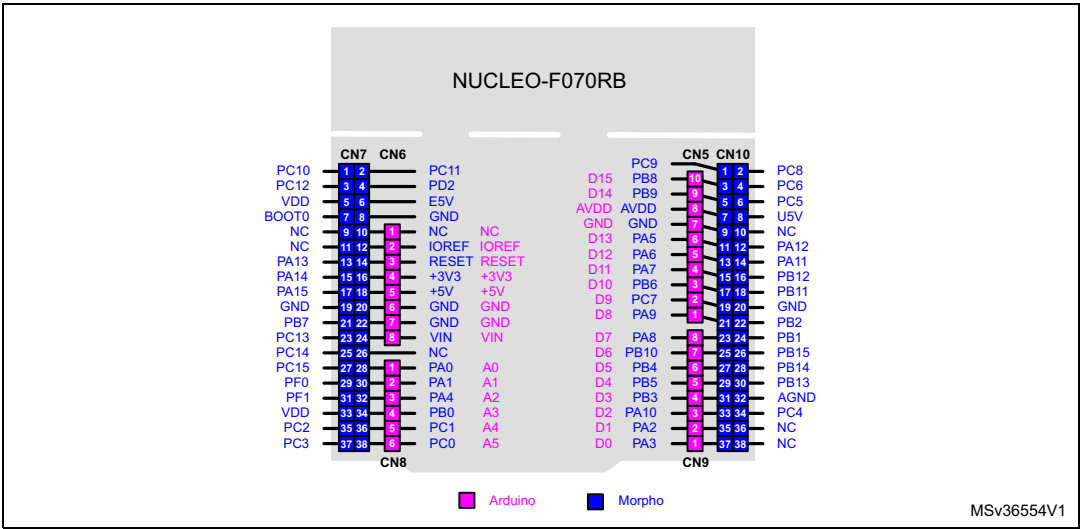


Figure 11. NUCLEO-F072RB

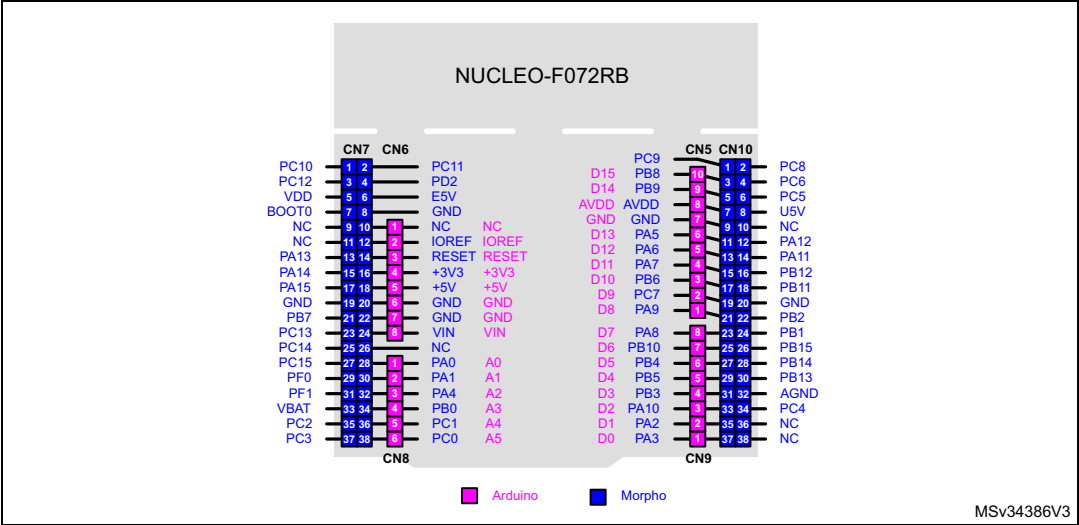


Figure 12. NUCLEO-F091RC

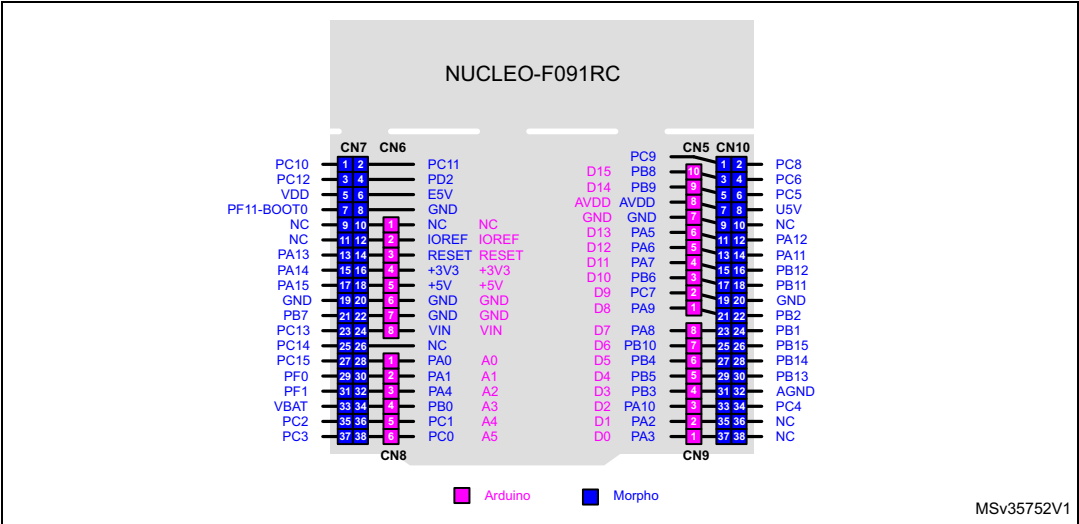
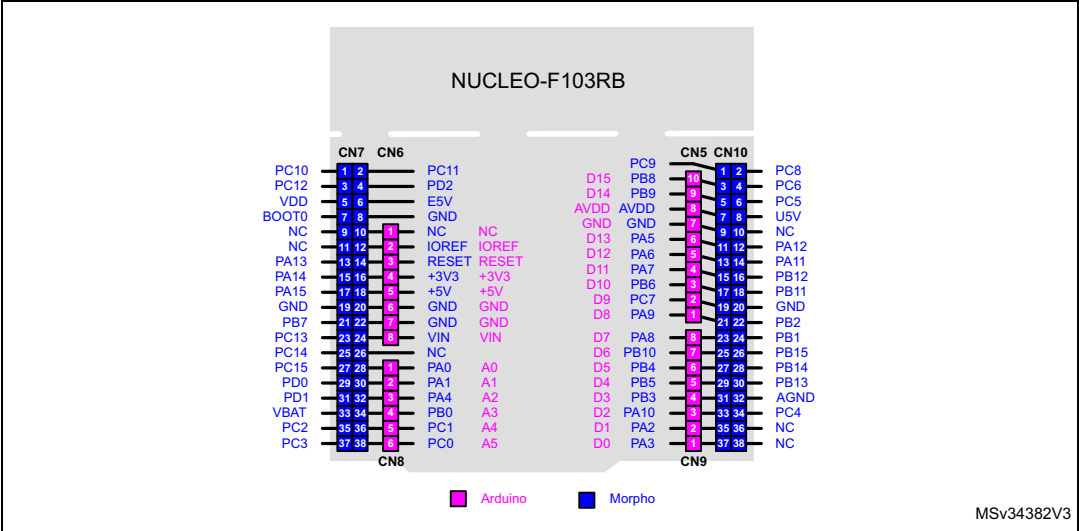
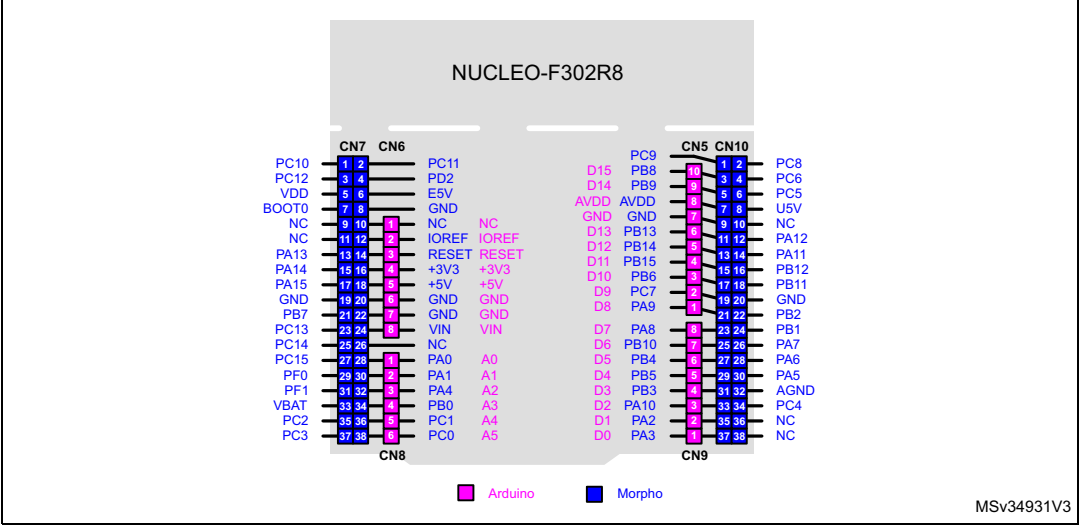


Figure 13. NUCLEO-F103RB



MSv34382V3

Figure 14. NUCLEO-F302R8



MSv34931V3

Figure 15. NUCLEO-F303RE

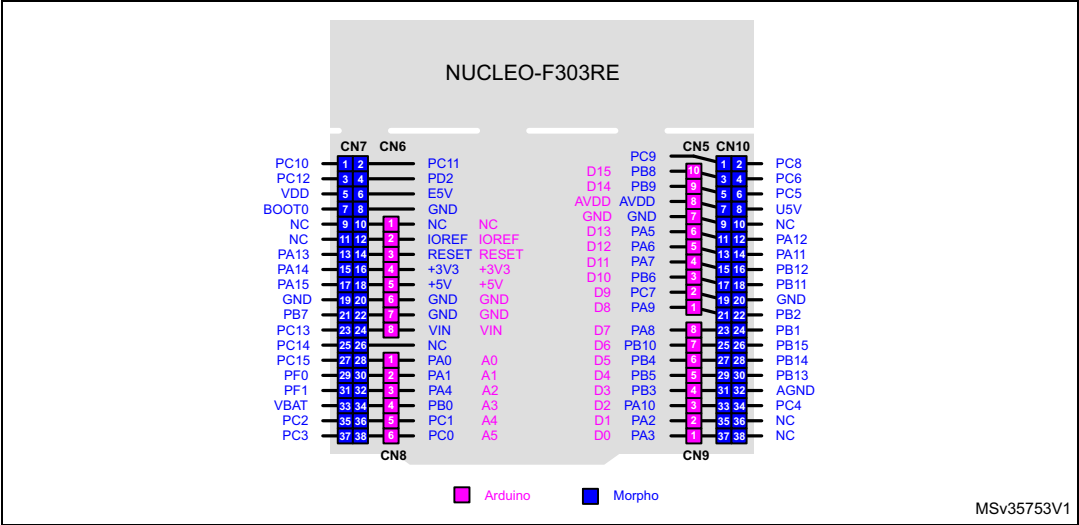


Figure 16. NUCLEO-F334R8

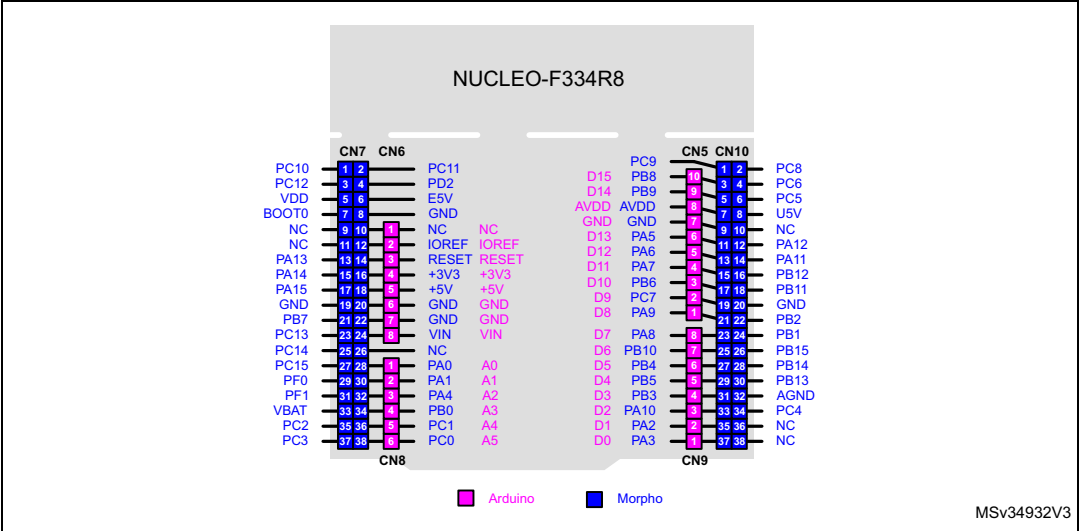


Figure 17. NUCLEO-F401RE

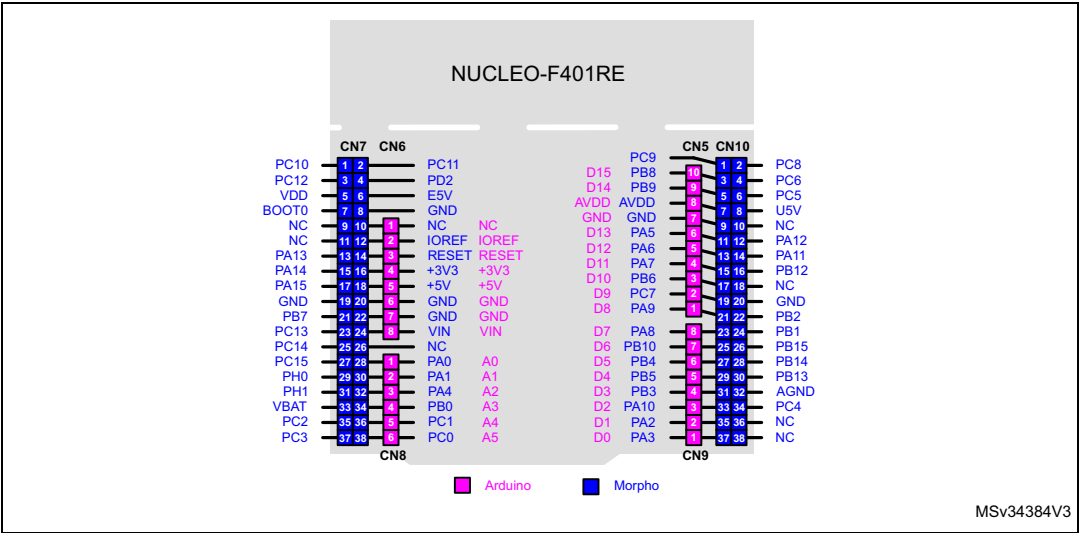


Figure 18. NUCLEO-F411RE

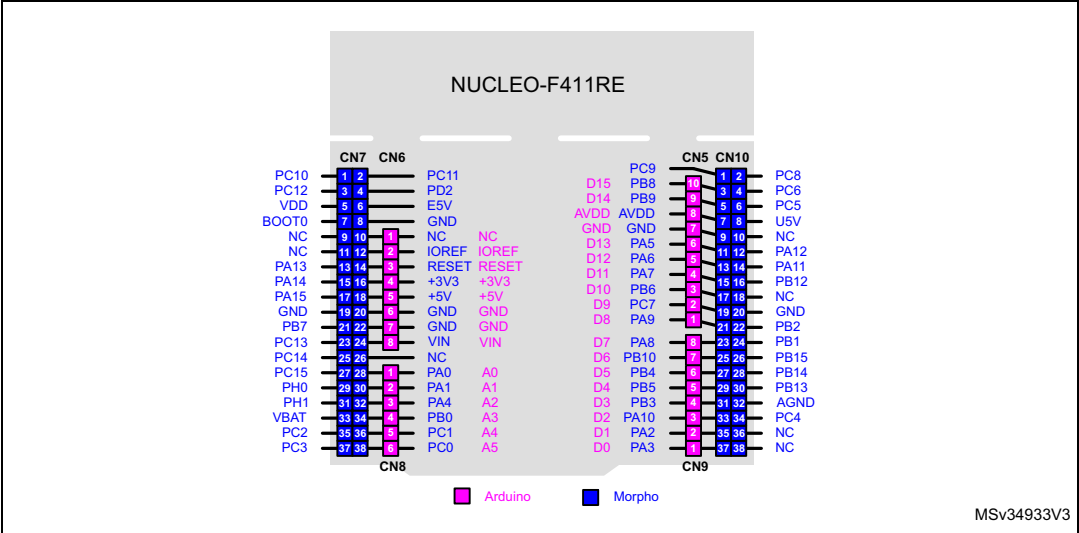


Figure 19. NUCLEO-L053R8

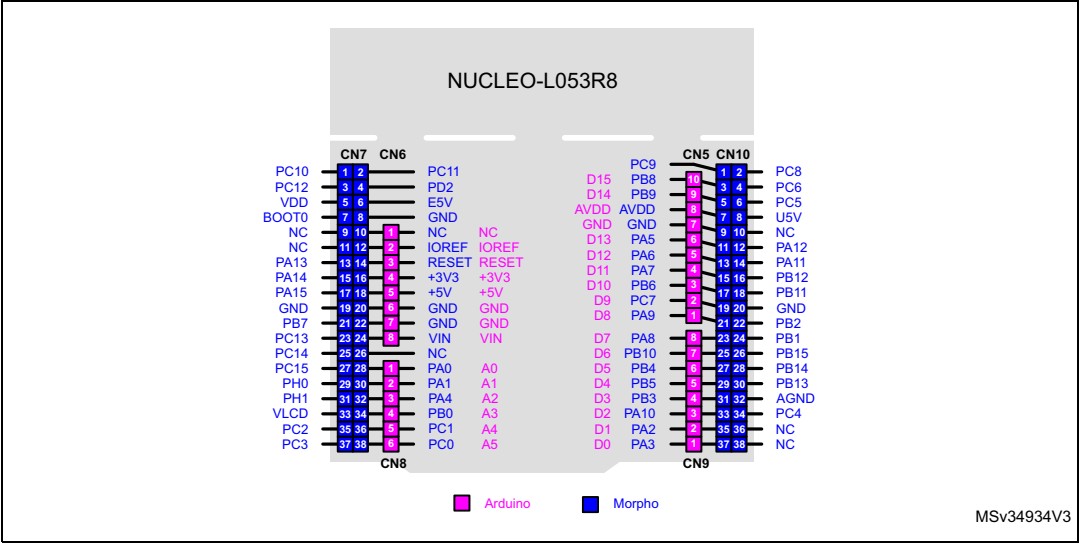


Figure 20. NUCLEO-L073RZ

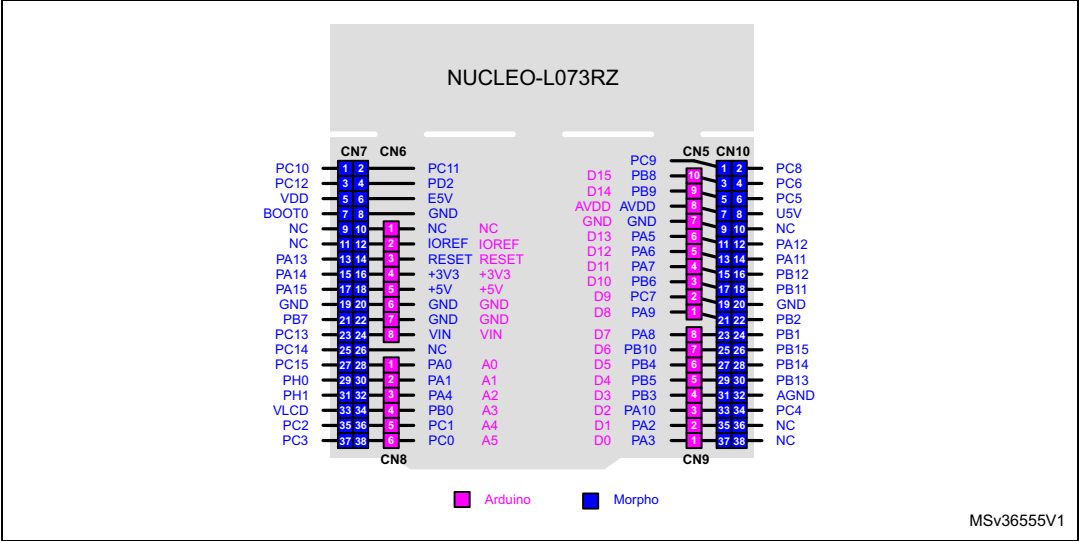


Figure 21. NUCLEO-L152RE

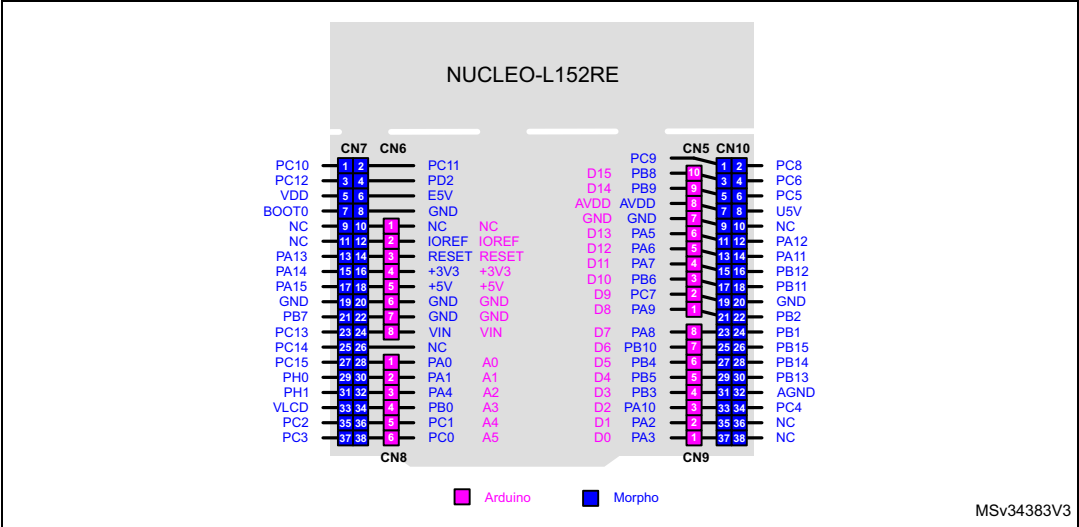
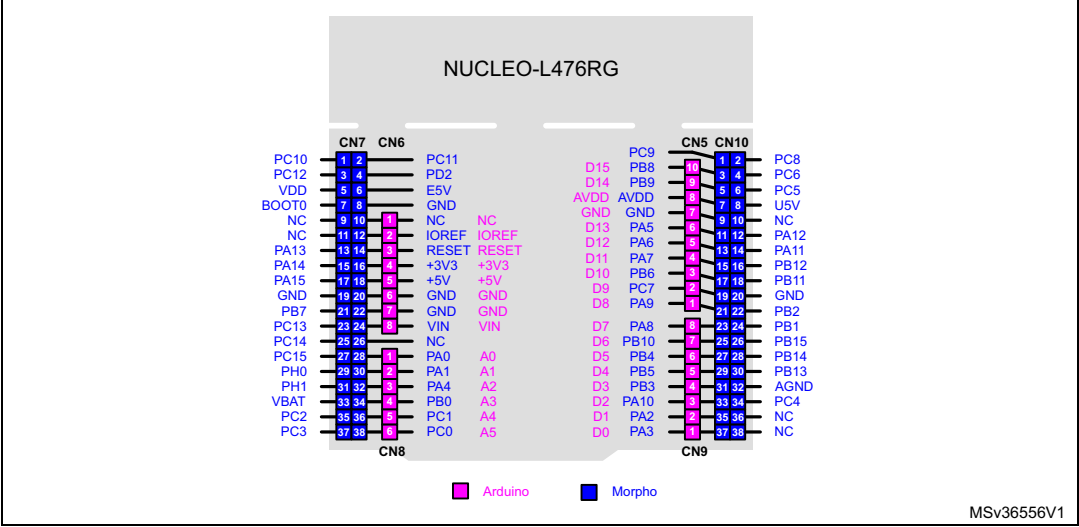


Figure 22. NUCLEO-L476RG



5.11 Arduino connectors

CN5, CN6, CN8 and CN9 are female connectors compatible with Arduino standard. Most shields designed for Arduino can fit to the STM32 Nucleo boards.

The Arduino connectors on STM32 Nucleo board support the Arduino Uno Revision 3.

For compatibility with Arduino Uno Revision 1, apply the following modifications:

- SB46 and SB52 should be ON,
- SB51 and SB56 should be OFF to connect I2C on A4 (pin 5) and A5 (pin 6 of CN8).

Caution: The IOs of STM32 microcontroller are 3.3 V compatible instead of 5 V for Arduino Uno.

[Table 10](#) to [Table 19](#) show the pin assignment of each main STM32 microcontroller on Arduino connectors.

**Table 10. Arduino connectors on
NUCLEO-F030R8, NUCLEO-F070RB, NUCLEO-F072RB, NUCLEO-F091RC**

CN No.	Pin No.	Pin name	MCU pin	Function
Left connectors				
CN6 power	1	NC	-	-
	2	IOREF	-	3.3V Ref
	3	RESET	NRST	RESET
	4	+3V3	-	3.3V input/output
	5	+5V	-	5V output
	6	GND	-	Ground
	7	GND	-	Ground
	8	VIN	-	Power input
CN8 analog	1	A0	PA0	ADC_IN0
	2	A1	PA1	ADC_IN1
	3	A2	PA4	ADC_IN4
	4	A3	PB0	ADC_IN8
	5	A4	PC1 or PB9 ⁽¹⁾	ADC_IN11 (PC1) or I2C1_SDA (PB9)
	6	A5	PC0 or PB8 ⁽¹⁾	ADC_IN10 (PC0) or I2C1_SCL (PB8)

**Table 10. Arduino connectors on
NUCLEO-F030R8, NUCLEO-F070RB, NUCLEO-F072RB, NUCLEO-F091RC (continued)**

CN No.	Pin No.	Pin name	MCU pin	Function
Right connectors				
CN5 digital	10	D15	PB8	I2C1_SCL
	9	D14	PB9	I2C1_SDA
	8	AREF	-	AVDD
	7	GND	-	Ground
	6	D13	PA5	SPI1_SCK
	5	D12	PA6	SPI1_MISO
	4	D11	PA7	TIM17_CH1 or SPI1_MOSI
	3	D10	PB6	TIM16_CH1N or SPI1_CS
	2	D9	PC7	TIM3_CH2
	1	D8	PA9	-
CN9 digital	8	D7	PA8	-
	7	D6	PB10	TIM2_CH3 ⁽²⁾
	6	D5	PB4	TIM3_CH1
	5	D4	PB5	-
	4	D3	PB3	TIM2_CH2 ⁽³⁾
	3	D2	PA10	-
	2	D1	PA2	USART2_TX
	1	D0	PA3	USART2_RX

1. Please refer to [Table 9: Solder bridges](#) for details.
2. Warning: PWM is not supported by D6 on STM32F030 and STM32F070 since the timer is not available on PB10.
3. Warning: PWM is not supported by D3 on STM32F030 and STM32F070 since timer is not available on PB3.

Table 11. Arduino connectors on NUCLEO-F103RB

CN No.	Pin No.	Pin name	MCU pin	Function
Left connectors				
CN6 power	1	NC	-	-
	2	IOREF	-	3.3V Ref
	3	RESET	NRST	RESET
	4	+3V3	-	3.3V input/output
	5	+5V	-	5V output
	6	GND	-	Ground
	7	GND	-	Ground
	8	VIN	-	Power input
CN8 analog	1	A0	PA0	ADC_0
	2	A1	PA1	ADC_1
	3	A2	PA4	ADC_4
	4	A3	PB0	ADC_8
	5	A4	PC1 or PB9 ⁽¹⁾	ADC_11 (PC1) or I2C1_SDA (PB9)
	6	A5	PC0 or PB8 ⁽¹⁾	ADC_10 (PC0) or I2C1_SCL (PB8)
Right connectors				
CN5 digital	10	D15	PB8	I2C1_SCL
	9	D14	PB9	I2C1_SDA
	8	AREF	-	AVDD
	7	GND	-	Ground
	6	D13	PA5	SPI1_SCK
	5	D12	PA6	SPI1_MISO
	4	D11	PA7	TIM3_CH2 or SPI1_MOSI
	3	D10	PB6	TIM4_CH1 or SPI1_CS
	2	D9	PC7	TIM3_CH2
	1	D8	PA9	-
CN9 digital	8	D7	PA8	-
	7	D6	PB10	TIM2_CH3
	6	D5	PB4	TIM3_CH1
	5	D4	PB5	-
	4	D3	PB3	TIM2_CH2
	3	D2	PA10	-
	2	D1	PA2	USART2_TX
	1	D0	PA3	USART2_RX

1. Please refer to [Table 9: Solder bridges](#) for detail.

Table 12. Arduino connectors on NUCLEO-F302R8

CN No.	Pin No.	Pin name	MCU pin	Function
Left connectors				
CN6 Power	1	NC	-	-
	2	IOREF	-	3.3V Ref
	3	RESET	NRST	RESET
	4	+3V3	-	3.3V input/output
	5	+5V	-	5V output
	6	GND	-	Ground
	7	GND	-	Ground
	8	VIN	-	Power input
CN8 Analog	1	A0	PA0	ADC_IN1
	2	A1	PA1	ADC_IN2
	3	A2	PA4	ADC_IN5
	4	A3	PB0	ADC_IN11
	5	A4	PC1 or PB9 ⁽¹⁾	ADC_IN7 (PC1) or I2C1_SDA (PB9)
	6	A5	PC0 or PB8 ⁽¹⁾	ADC_IN6 (PC0) or I2C1_SCL (PB8)
Right connectors				
CN5 digital	10	D15	PB8	I2C1_SCL
	9	D14	PB9	I2C1_SDA
	8	AREF	-	AVDD
	7	GND	-	Ground
	6	D13	PB13	SPI2_SCK
	5	D12	PB14	SPI2_MISO
	4	D11	PB15	TIM15_CH2 or SPI2_MOSI
	3	D10	PB6	TIM16_CH1N or SPI2_CS
	2	D9	PC7	-
	1	D8	PA9	-
CN9 digital	8	D7	PA8	-
	7	D6	PB10	TIM2_CH3
	6	D5	PB4	TIM16_CH1
	5	D4	PB5	-
	4	D3	PB3	TIM2_CH2
	3	D2	PA10	-
	2	D1	PA2	USART2_TX
	1	D0	PA3	USART2_RX

1. Please refer to [Table 9: Solder bridges](#) for details.

Warning: PWM is not supported by D9 on STM32F302 since the timer is not available on PC7.

Table 13. Arduino connectors on NUCLEO-F303RE

CN No.	Pin No.	Pin name	MCU pin	Function
Left connectors				
CN6 Power	1	NC	-	-
	2	IOREF	-	3.3V Ref
	3	RESET	NRST	RESET
	4	+3V3	-	3.3V input/output
	5	+5V	-	5V output
	6	GND	-	Ground
	7	GND	-	Ground
	8	VIN	-	Power input
CN8 Analog	1	A0	PA0	ADC1_IN1
	2	A1	PA1	ADC1_IN2
	3	A2	PA4	ADC2_IN1
	4	A3	PB0	ADC3_IN12
	5	A4	PC1 or PB9 ⁽¹⁾	ADC12_IN7 (PC1) or I2C1_SDA (PB9)
	6	A5	PC0 or PB8 ⁽¹⁾	ADC12_IN6 (PC0) or I2C1_SCL (PB8)
Right connectors				
CN5 Digital	10	D15	PB8	I2C1_SCL
	9	D14	PB9	I2C1_SDA
	8	AREF	-	AVDD
	7	GND	-	Ground
	6	D13	PA5	SPI1_SCK
	5	D12	PA6	SPI1_MISO
	4	D11	PA7	TIM17_CH1 or SPI1_MOSI
	3	D10	PB6	TIM4_CH1 or SPI1_CS
	2	D9	PC7	TIM3_CH2
	1	D8	PA9	-
CN9 Digital	8	D7	PA8	-
	7	D6	PB10	TIM2_CH3
	6	D5	PB4	TIM3_CH1
	5	D4	PB5	-
	4	D3	PB3	TIM2_CH2
	3	D2	PA10	-
	2	D1	PA2	USART2_TX

1. Please refer to [Table 9: Solder bridges](#) or details.

Table 14. Arduino connectors on NUCLEO-F334R8

CN No.	Pin No.	Pin name	MCU pin	Function
Left connectors				
CN6 power	1	NC	-	-
	2	IOREF	-	3.3V Ref
	3	RESET	NRST	RESET
	4	+3V3	-	3.3V input/output
	5	+5V	-	5V output
	6	GND	-	Ground
	7	GND	-	Ground
	8	VIN	-	Power input
CN8 analog	1	A0	PA0	ADC1_IN1
	2	A1	PA1	ADC1_IN2
	3	A2	PA4	ADC2_IN1
	4	A3	PB0	ADC1_IN11
	5	A4	PC1 or PB9 ⁽¹⁾	ADC_IN7 (PC1) or I2C1_SDA (PB9)
	6	A5	PC0 or PB8 ⁽¹⁾	ADC_IN6 (PC0) or I2C1_SCL (PB8)
Right connectors				
CN5 digital	10	D15	PB8	I2C1_SCL
	9	D14	PB9	I2C1_SDA
	8	AREF	-	AVDD
	7	GND	-	Ground
	6	D13	PA5	SPI1_SCK
	5	D12	PA6	SPI1_MISO
	4	D11	PA7	TIM17_CH1 or SPI1_MOSI
	3	D10	PB6	TIM16_CH1N or SPI1_CS
	2	D9	PC7	TIM3_CH2
	1	D8	PA9	-
CN9 digital	8	D7	PA8	-
	7	D6	PB10	TIM2_CH3
	6	D5	PB4	TIM3_CH1
	5	D4	PB5	-
	4	D3	PB3	TIM2_CH2
	3	D2	PA10	-
	2	D1	PA2	USART2_TX
	1	D0	PA3	USART2_RX

1. Please refer to [Table 9: Solder bridges](#) for details.

Table 15. Arduino connectors on NUCLEO-F401RE, NUCLEO-F411RE

CN No.	Pin No.	Pin name	MCU pin	Function
Left connectors				
CN6 power	1	NC	-	-
	2	IOREF	-	3.3V Ref
	3	RESET	NRST	RESET
	4	+3V3	-	3.3V input/output
	5	+5V	-	5V output
	6	GND	-	Ground
	7	GND	-	Ground
	8	VIN	-	Power input
CN8 analog	1	A0	PA0	ADC1_0
	2	A1	PA1	ADC1_1
	3	A2	PA4	ADC1_4
	4	A3	PB0	ADC1_8
	5	A4	PC1 or PB9 ⁽¹⁾	ADC1_11 (PC1) or I2C1_SDA (PB9)
	6	A5	PC0 or PB8 ⁽¹⁾	ADC1_10 (PC0) or I2C1_SCL (PB8)
Right connectors				
CN5 digital	10	D15	PB8	I2C1_SCL
	9	D14	PB9	I2C1_SDA
	8	AREF	-	AVDD
	7	GND	-	Ground
	6	D13	PA5	SPI1_SCK
	5	D12	PA6	SPI1_MISO
	4	D11	PA7	TIM1_CH1N or SPI1_MOSI
	3	D10	PB6	TIM4_CH1 or SPI1_CS
	2	D9	PC7	TIM3_CH2
	1	D8	PA9	-
CN9 digital	8	D7	PA8	-
	7	D6	PB10	TIM2_CH3
	6	D5	PB4	TIM3_CH1
	5	D4	PB5	-
	4	D3	PB3	TIM2_CH2
	3	D2	PA10	-
	2	D1	PA2	USART2_TX
	1	D0	PA3	USART2_RX

1. Please refer to [Table 9: Solder bridges](#) for details.

Table 16. Arduino connectors on NUCLEO-L053R8

Connect or No.	Pin No.	Pin name	MCU pin	Function
Left connectors				
CN6 power	1	NC	-	-
	2	IOREF	-	3.3V Ref
	3	RESET	NRST	RESET
	4	+3V3	-	3.3V input/output
	5	+5V	-	5V output
	6	GND	-	Ground
	7	GND	-	Ground
	8	VIN	-	Power input
CN8 analog	1	A0	PA0	ADC_IN0
	2	A1	PA1	ADC_IN1
	3	A2	PA4	ADC_IN4
	4	A3	PB0	ADC_IN8
	5	A4	PC1 or PB9 ⁽¹⁾	ADC_IN11 (PC1) or I2C1_SDA (PB9)
	6	A5	PC0 or PB8 ⁽¹⁾	ADC_IN10 (PC0) or I2C1_SCL (PB8)
Right connectors				
CN5 digital	10	D15	PB8	I2C1_SCL
	9	D14	PB9	I2C1_SDA
	8	AREF	-	AVDD
	7	GND	-	Ground
	6	D13	PA5	SPI1_SCK
	5	D12	PA6	SPI1_MISO
	4	D11	PA7	TIM12_CH2 or SPI1_MOSI
	3	D10	PB6	SPI1_CS
	2	D9	PC7	TIM12_CH2
	1	D8	PA9	-
CN9 digital	8	D7	PA8	-
	7	D6	PB10	TIM2_CH3
	6	D5	PB4	TIM12_CH1
	5	D4	PB5	-
	4	D3	PB3	TIM2_CH2
	3	D2	PA10	-
	2	D1	PA2	USART2_TX
	1	D0	PA3	USART2_RX

1. Please refer to [Table 9: Solder bridges](#) for details.

Warning: PWM is not supported by D10 on STM32L053 since the timer is not available on PB6.

Table 17. Arduino connectors on NUCLEO-L073RZ

CN No.	Pin No.	Pin name	MCU pin	Function
Left connectors				
CN6 power	1	NC	-	-
	2	IOREF	-	3.3V Ref
	3	RESET	NRST	RESET
	4	+3V3	-	3.3V input/output
	5	+5V	-	5V output
	6	GND	-	Ground
	7	GND	-	Ground
	8	VIN	-	Power input
CN8 analog	1	A0	PA0	ADC_IN0
	2	A1	PA1	ADC_IN1
	3	A2	PA4	ADC_IN4
	4	A3	PB0	ADC_IN8
	5	A4	PC1 or PB9 ⁽¹⁾	ADC_IN11 (PC1) or I2C1_SDA (PB9)
	6	A5	PC0 or PB8 ⁽¹⁾	ADC_IN10 (PC0) or I2C1_SCL (PB8)
Right connectors				
CN5 digital	10	D15	PB8	I2C1_SCL
	9	D14	PB9	I2C1_SDA
	8	AREF	-	AVDD
	7	GND	-	Ground
	6	D13	PA5	SPI1_SCK
	5	D12	PA6	SPI1_MISO
	4	D11	PA7	TIM22_CH2 or SPI1_MOSI
	3	D10	PB6	SPI1_CS
	2	D9	PC7	TIM3_CH2
	1	D8	PA9	-
CN9 digital	8	D7	PA8	-
	7	D6	PB10	TIM2_CH3
	6	D5	PB4	TIM3_CH1
	5	D4	PB5	-
	4	D3	PB3	TIM2_CH2
	3	D2	PA10	-
	2	D1	PA2	USART2_TX
	1	D0	PA3	USART2_RX

1. Please refer to [Table 9: Solder bridges](#) for details.

Warning: PWM is not supported by D10 on STM32L073 since the timer is not available on PB6.

Table 18. Arduino connectors on NUCLEO-L152RE

CN No.	Pin No.	Pin name	MCU pin	Function
Left connectors				
CN6 power	1	NC	-	-
	2	IOREF	-	3.3V Ref
	3	RESET	NRST	RESET
	4	+3V3	-	3.3V input/output
	5	+5V	-	5V output
	6	GND	-	Ground
	7	GND	-	Ground
	8	VIN	-	Power input
CN8 analog	1	A0	PA0	ADC_IN0
	2	A1	PA1	ADC_IN1
	3	A2	PA4	ADC_IN4
	4	A3	PB0	ADC_IN8
	5	A4	PC1 or PB9 ⁽¹⁾	ADC_IN11 (PC1) or I2C1_SDA (PB9)
	6	A5	PC0 or PB8 ⁽¹⁾	ADC_IN10 (PC0) or I2C1_SCL (PB8)
Right connectors				
CN5 digital	10	D15	PB8	I2C1_SCL
	9	D14	PB9	I2C1_SDA
	8	AREF	-	AVDD
	7	GND	-	Ground
	6	D13	PA5	SPI1_SCK
	5	D12	PA6	SPI1_MISO
	4	D11	PA7	TIM11_CH1 or SPI1_MOSI
	3	D10	PB6	TIM4_CH1 or SPI1_CS
	2	D9	PC7	TIM3_CH2
	1	D8	PA9	-
CN9 digital	8	D7	PA8	-
	7	D6	PB10	TIM2_CH3
	6	D5	PB4	TIM3_CH1
	5	D4	PB5	-
	4	D3	PB3	TIM2_CH2
	3	D2	PA10	-
	2	D1	PA2	USART2_TX
	1	D0	PA3	USART2_RX

1. Please refer to [Table 9: Solder bridges](#) for details.

Table 19. Arduino connectors on NUCLEO-L476RG

CN No.	Pin No.	Pin name	MCU pin	Function
Left connectors				
CN6 power	1	NC	-	-
	2	IOREF	-	3.3V Ref
	3	RESET	NRST	RESET
	4	+3V3	-	3.3V input/output
	5	+5V	-	5V output
	6	GND	-	Ground
	7	GND	-	Ground
	8	VIN	-	Power input
CN8 analog	1	A0	PA0	ADC12_IN5
	2	A1	PA1	ADC12_IN6
	3	A2	PA4	ADC12_IN9
	4	A3	PB0	ADC12_IN15
	5	A4	PC1 or PB9 ⁽¹⁾	ADC123_IN2 (PC1) or I2C1_SDA (PB9)
	6	A5	PC0 or PB8 ⁽¹⁾	ADC123_IN1 (PC0) or I2C1_SCL (PB8)
Right connectors				
CN5 digital	10	D15	PB8	I2C1_SCL
	9	D14	PB9	I2C1_SDA
	8	AREF	-	AVDD
	7	GND	-	Ground
	6	D13	PA5	SPI1_SCK
	5	D12	PA6	SPI1_MISO
	4	D11	PA7	TIM17_CH1 or SPI1_MOSI
	3	D10	PB6	TIM4_CH1 or SPI1_CS
	2	D9	PC7	TIM3_CH2
	1	D8	PA9	-
CN9 digital	8	D7	PA8	-
	7	D6	PB10	TIM2_CH3
	6	D5	PB4	TIM3_CH1
	5	D4	PB5	-
	4	D3	PB3	TIM2_CH2
	3	D2	PA10	-
	2	D1	PA2	USART2_TX
	1	D0	PA3	USART2_RX

1. Please refer to [Table 9: Solder bridges](#) for details.

5.12 STMicroelectronics Morpho connector

The STMicroelectronics Morpho connector consists in male pin headers (CN7 and CN10) accessible on both sides of the board. They can be used to connect the STM32 Nucleo board to an extension board or a prototype/wrapping board placed on top or on bottom side of the STM32 Nucleo board. All signals and power pins of the MCU are available on STMicroelectronics Morpho connector. This connector can also be probed by an oscilloscope, logical analyzer or voltmeter.

[Table 20](#) to [Table 26](#) show the pin assignment of each main MCU on STMicroelectronics Morpho connector.

Table 20. STMicroelectronics Morpho connector on NUCLEO-F030R8

CN7 odd pins		CN7 even pins		CN10 odd pins		CN10 even pins	
Pin No.	Name	Name	Pin No.	Pin No.	Name	Name	Pin No.
1	PC10	PC11	2	1	PC9	PC8	2
3	PC12	PD2	4	3	PB8	PC6	4
5	VDD	E5V	6	5	PB9	PC5	6
7	BOOT0 ⁽¹⁾	GND	8	7	AVDD	U5V ⁽²⁾	8
9	PF6	-	10	9	GND	-	10
11	PF7	IOREF	12	11	PA5	PA12	12
13	PA13	RESET	14	13	PA6	PA11	14
15	PA14	+3V3	16	15	PA7	PB12	16
17	PA15	+5V	18	17	PB6	PB11	18
19	GND	GND	20	19	PC7	GND	20
21	PB7	GND	22	21	PA9	PB2	22
23	PC13 ⁽³⁾	VIN	24	23	PA8	PB1	24
25	PC14 ⁽³⁾	-	26	25	PB10	PB15	26
27	PC15	PA0	28	27	PB4	PB14	28
29	PF0	PA1	30	29	PB5	PB13	30
31	PF1	PA4	32	31	PB3	AGND	32
33	VBAT	PB0	34	33	PA10	PC4	34
35	PC2	PC1 or PB9 ⁽⁴⁾	36	35	PA2	PF5	36
37	PC3	PC0 or PB8 ⁽⁴⁾	38	37	PA3	PF4	38

1. Default state of BOOT0 is 0. It can be set to 1 when a jumper is on pin5-7 of CN7. Two unused jumpers are available on CN11 and CN12 (bottom side of the board).
2. U5V is 5 V power from ST-LINK/V2-1 USB connector and it rises before +5V.
3. PA13 and PA14 share with SWD signals connected to ST-LINK/V2-1, it is not recommend to use them as IO pins if ST-LINK part is not cut.
4. Please refer to [Table 9: Solder bridges](#) for detail

Table 21. STMicroelectronics Morpho connector on NUCLEO-F070RB

CN7 odd pins		CN7 even pins		CN10 odd pins		CN10 even pins	
Pin No.	Name	Name	Pin No.	Pin No.	Name	Name	Pin No.
1	PC10	PC11	2	1	PC9	PC8	2
3	PC12	PD2	4	3	PB8	PC6	4
5	VDD	E5V	6	5	PB9	PC5	6
7	BOOT0 ⁽¹⁾	GND	8	7	AVDD	U5V ⁽²⁾	8
9	-	-	10	9	GND	-	10
11	-	IOREF	12	11	PA5	PA12	12
13	PA13 ⁽³⁾	RESET	14	13	PA6	PA11	14
15	PA14 ⁽³⁾	+3V3	16	15	PA7	PB12	16
17	PA15	+5V	18	17	PB6	PB11	18
19	GND	GND	20	19	PC7	GND	20
21	PB7	GND	22	21	PA9	PB2	22
23	PC13	VIN	24	23	PA8	PB1	24
25	PC14	-	26	25	PB10	PB15	26
27	PC15	PA0	28	27	PB4	PB14	28
29	PF0	PA1	30	29	PB5	PB13	30
31	PF1	PA4	32	31	PB3	AGND	32
33	VDD	PB0	34	33	PA10	PC4	34
35	PC2	PC1 or PB9 ⁽⁴⁾	36	35	PA2	-	36
37	PC3	PC0 or PB8 ⁽⁴⁾	38	37	PA3	-	38

1. Default state of BOOT0 is 0. It can be set to 1 when a jumper is on pin5-7 of CN7.
2. U5V is 5 V power from ST-LINK/V2-1 USB connector and it rises before +5V.
3. PA13 and PA14 share with SWD signals connected to ST-LINK/V2-1, it is not recommend to use them as IO pins if ST-LINK part is not cut.
4. Please refer to [Table 9: Solder bridges](#) for detail

**Table 22. STMicroelectronics Morpho connector on
NUCLEO-F072RB, NUCLEO-F091RC, NUCLEO-F303RE, NUCLEO-F334R8**

CN7 odd pins		CN7 even pins		CN10 odd pins		CN10 even pins	
Pin No.	Name	Name	Pin No.	Pin No.	Name	Name	Pin No.
1	PC10	PC11	2	1	PC9	PC8	2
3	PC12	PD2	4	3	PB8	PC6	4
5	VDD	E5V	6	5	PB9	PC5	6
7	BOOT0 ⁽¹⁾⁽²⁾	GND	8	7	AVDD	U5V ⁽³⁾	8
9	-	-	10	9	GND	-	10
11	-	IOREF	12	11	PA5	PA12	12
13	PA13 ⁽⁴⁾	RESET	14	13	PA6	PA11	14
15	PA14 ⁽⁴⁾	+3V3	16	15	PA7	PB12	16
17	PA15	+5V	18	17	PB6	PB11	18
19	GND	GND	20	19	PC7	GND	20
21	PB7	GND	22	21	PA9	PB2	22
23	PC13	VIN	24	23	PA8	PB1	24
25	PC14	-	26	25	PB10	PB15	26
27	PC15	PA0	28	27	PB4	PB14	28
29	PF0	PA1	30	29	PB5	PB13	30
31	PF1	PA4	32	31	PB3	AGND	32
33	VBAT	PB0	34	33	PA10	PC4	34
35	PC2	PC1 or PB9 ⁽⁵⁾	36	35	PA2	-	36
37	PC3	PC0 or PB8 ⁽⁵⁾	38	37	PA3	-	38

1. Default state of BOOT0 is 0. It can be set to 1 when a jumper is on pin5-7 of CN7. Two unused jumpers are available on CN11 and CN12 (bottom side of the board).
2. CN7 pin 7 (BOOT0) can be configured by engi byte as PF11 on NUCLEO-F091RC.
3. U5V is 5 V power from ST-LINK/V2-1 USB connector and it rises before +5V.
4. PA13 and PA14 share with SWD signals connected to ST-LINK/V2-1, it is not recommended to use them as IO pins if ST-LINK part is not cut.
5. Please refer to [Table 9: Solder bridges](#) for detail.

Table 23. STMicroelectronics Morpho connector on NUCLEO-F103RB

CN7 odd pins		CN7 even pins		CN10 odd pins		CN10 even pins	
Pin No.	Name	Name	Pin No.	Pin No.	Name	Name	Pin No.
1	PC10	PC11	2	1	PC9	PC8	2
3	PC12	PD2	4	3	PB8	PC6	4
5	VDD	E5V	6	5	PB9	PC5	6
7	BOOT0 ⁽¹⁾	GND	8	7	AVDD	U5V ⁽²⁾	8
9	-	-	10	9	GND	-	10
11	-	IOREF	12	11	PA5	PA12	12
13	PA13 ⁽³⁾	RESET	14	13	PA6	PA11	14
15	PA14 ⁽³⁾	+3V3	16	15	PA7	PB12	16
17	PA15	+5V	18	17	PB6	PB11	18
19	GND	GND	20	19	PC7	GND	20
21	PB7	GND	22	21	PA9	PB2	22
23	PC13	VIN	24	23	PA8	PB1	24
25	PC14	-	26	25	PB10	PB15	26
27	PC15	PA0	28	27	PB4	PB14	28
29	PD0	PA1	30	29	PB5	PB13	30
31	PD1	PA4	32	31	PB3	AGND	32
33	VBAT	PB0	34	33	PA10	PC4	34
35	PC2	PC1 or PB9 ⁽⁴⁾	36	35	PA2	-	36
37	PC3	PC0 or PB8 ⁽⁴⁾	38	37	PA3	-	38

1. The default state of BOOT0 is 0. It can be set to 1 when a jumper is on pin5-7 of CN7. Two unused jumpers are available on CN11 and CN12 (bottom side of the board).
2. U5V is 5 V power from ST-LINK/V2-1 USB connector and it rises before +5 V
3. PA13 and PA14 share with SWD signals connected to ST-LINK/V2-1, it is not recommended to use them as IO pins if ST-LINK part is not cut.
4. Please refer to [Table 9: Solder bridges](#) for detail

Table 24. STMicroelectronics Morpho connector on NUCLEO-F302R8

CN7 odd pins		CN7 even pins		CN10 odd pins		CN10 even pins	
Pin No.	Name	Name	Pin No.	Pin No.	Name	Name	Pin No.
1	PC10	PC11	2	1	PC9	PC8	2
3	PC12	PD2	4	3	PB8	PC6	4
5	VDD	E5V	6	5	PB9	PC5	6
7	BOOT0 ⁽¹⁾	GND	8	7	AVDD	U5V ⁽²⁾	8
9	-	-	10	9	GND	-	10
11	-	IOREF	12	11	PB13	PA12	12
13	PA13 ⁽³⁾	RESET	14	13	PB14	PA11	14
15	PA14 ⁽³⁾	+3V3	16	15	PB15	PB12	16
17	PA15	+5V	18	17	PB6	PB11	18
19	GND	GND	20	19	PC7	GND	20
21	PB7	GND	22	21	PA9	PB2	22
23	PC13	VIN	24	23	PA8	PB1	24
25	PC14	-	26	25	PB10	PA7	26
27	PC15	PA0	28	27	PB4	PA6	28
29	PF0	PA1	30	29	PB5	PA5	30
31	PF1	PA4	32	31	PB3	AGND	32
33	VBAT	PB0	34	33	PA10	PC4	34
35	PC2	PC1 or PB9 ⁽⁴⁾	36	35	PA2	-	36
37	PC3	PC0 or PB8 ⁽⁴⁾	38	37	PA3	-	38

1. Default state of BOOT0 is 0. It can be set to 1 when a jumper is on pin5-7 of CN7. Two unused jumpers are available on CN11 and CN12 (bottom side of the board).
2. U5V is 5V power from ST-LINK/V2-1 USB connector and it rises before +5V.
3. PA13 and PA14 share with SWD signals connected to ST-LINK/V2-1, it is not recommend to use them as IO pins if ST-LINK part is not cut.
4. Please refer to [Table 9: Solder bridges](#) for details.

**Table 25. STMicroelectronics Morpho connector on NUCLEO-F401RE,
NUCLEO-F411RE**

CN7 odd pins		CN7 even pins		CN10 odd pins		CN10 even pins	
Pin No.	Name	Name	Pin No.	Pin No.	Name	Name	Pin No.
1	PC10	PC11	2	1	PC9	PC8	2
3	PC12	PD2	4	3	PB8	PC6	4
5	VDD	E5V	6	5	PB9	PC5	6
7	BOOT0 ⁽¹⁾	GND	8	7	AVDD	U5V ⁽²⁾	8
9	-	-	10	9	GND	-	10
11	-	IOREF	12	11	PA5	PA12	12
13	PA13 ⁽³⁾	RESET	14	13	PA6	PA11	14
15	PA14 ⁽³⁾	+3V3	16	15	PA7	PB12	16
17	PA15	+5V	18	17	PB6	-	18
19	GND	GND	20	19	PC7	GND	20
21	PB7	GND	22	21	PA9	PB2	22
23	PC13	VIN	24	23	PA8	PB1	24
25	PC14	-	26	25	PB10	PB15	26
27	PC15	PA0	28	27	PB4	PB14	28
29	PH0	PA1	30	29	PB5	PB13	30
31	PH1	PA4	32	31	PB3	AGND	32
33	VBAT	PB0	34	33	PA10	PC4	34
35	PC2	PC1 or PB9 ⁽⁴⁾	36	35	PA2	-	36
37	PC3	PC0 or PB8 ⁽⁴⁾	38	37	PA3	-	38

1. Default state of BOOT0 is 0. It can be set to 1 when a jumper is on pin5-7 of CN7. Two unused jumpers are available on CN11 and CN12 (bottom side of the board).
2. U5V is 5 V power from ST-LINK/V2-1 USB connector and it rises before +5V
3. PA13 and PA14 share with SWD signals connected to ST-LINK/V2-1, it is not recommend to use them as IO pins if ST-LINK part is not cut.
4. Please refer to [Table 9: Solder bridges](#) for detail

**Table 26. STMicroelectronics Morpho connector on
NUCLEO-L053R8, NUCLEO-L073RZ, NUCLEO-L152RE**

CN7 odd pins		CN7 even pins		CN10 odd pins		CN10 even pins	
Pin No.	Name	Name	Pin No.	Pin No.	Name	Name	Pin No.
1	PC10	PC11	2	1	PC9	PC8	2
3	PC12	PD2	4	3	PB8	PC6	4
5	VDD	E5V	6	5	PB9	PC5	6
7	BOOT0 ⁽¹⁾	GND	8	7	AVDD	U5V ⁽²⁾	8
9	-	-	10	9	GND	-	10
11	-	IOREF	12	11	PA5	PA12	12
13	PA13 ⁽³⁾	RESET	14	13	PA6	PA11	14
15	PA14 ⁽³⁾	+3V3	16	15	PA7	PB12	16
17	PA15	+5V	18	17	PB6	PB11	18
19	GND	GND	20	19	PC7	GND	20
21	PB7	GND	22	21	PA9	PB2	22
23	PC13	VIN	24	23	PA8	PB1	24
25	PC14	-	26	25	PB10	PB15	26
27	PC15	PA0	28	27	PB4	PB14	28
29	PH0	PA1	30	29	PB5	PB13	30
31	PH1	PA4	32	31	PB3	AGND	32
33	VLCD	PB0	34	33	PA10	PC4	34
35	PC2	PC1 or PB9 ⁽⁴⁾	36	35	PA2	-	36
37	PC3	PC0 or PB8 ⁽⁴⁾	38	37	PA3	-	38

1. Default state of BOOT0 is 0. It can be set to 1 when a jumper is on pin5-7 of CN7. Two unused jumpers are available on CN11 and CN12 (bottom side of the board).
2. U5V is 5 V power from ST-LINK/V2-1 USB connector and it rises before +5V.
3. PA13 and PA14 share with SWD signals connected to ST-LINK/V2-1, it is not recommend to use them as IO pins if ST-LINK part is not cut.
4. Please refer to [Table 9: Solder bridges](#) for detail

Table 27. STMicroelectronics Morpho connector on NUCLEO-L476RG

CN7 odd pins		CN7 even pins		CN10 odd pins		CN10 even pins	
Pin No.	Name	Name	Pin No.	Pin No.	Name	Name	Pin No.
1	PC10	PC11	2	1	PC9	PC8	2
3	PC12	PD2	4	3	PB8	PC6	4
5	VDD	E5V	6	5	PB9	PC5	6
7	BOOT0 ⁽¹⁾	GND	8	7	AVDD	U5V ⁽²⁾	8
9	-	-	10	9	GND	-	10
11	-	IOREF	12	11	PA5	PA12	12
13	PA13 ⁽³⁾	RESET	14	13	PA6	PA11	14
15	PA14 ⁽³⁾	+3V3	16	15	PA7	PB12	16
17	PA15	+5V	18	17	PB6	PB11	18
19	GND	GND	20	19	PC7	GND	20
21	PB7	GND	22	21	PA9	PB2	22
23	PC13	VIN	24	23	PA8	PB1	24
25	PC14	-	26	25	PB10	PB15	26
27	PC15	PA0	28	27	PB4	PB14	28
29	PH0	PA1	30	29	PB5	PB13	30
31	PH1	PA4	32	31	PB3	AGND	32
33	VBAT	PB0	34	33	PA10	PC4	34
35	PC2	PC1 or PB9 ⁽⁴⁾	36	35	PA2	-	36
37	PC3	PC0 or PB8 ⁽⁴⁾	38	37	PA3	-	38

1. Default state of BOOT0 is 0. It can be set to 1 when a jumper is on pin5-7 of CN7.
2. U5V is 5 V power from ST-LINK/V2-1 USB connector and it rises before +5V.
3. PA13 and PA14 share with SWD signals connected to ST-LINK/V2-1, it is not recommend to use them as IO pins if ST-LINK part is not cut.
4. Please refer to [Table 9: Solder bridges](#) for detail

6 Mechanical drawing

Figure 23. STM32 Nucleo board mechanical drawing

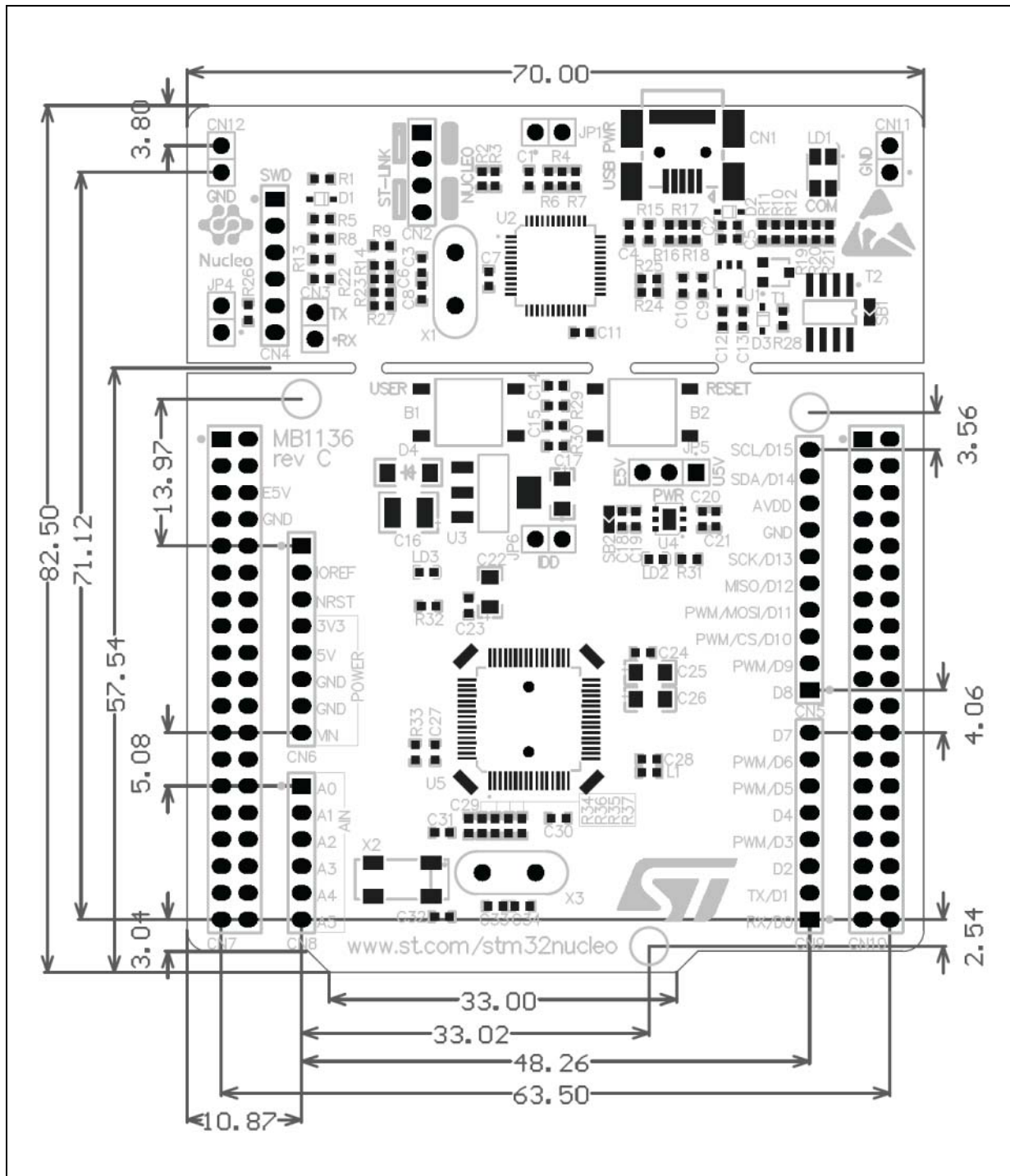


Figure 24 to Figure 27 show the electrical schematics of the STM32 Nucleo board.

Figure 24. Electrical schematics (1/4)

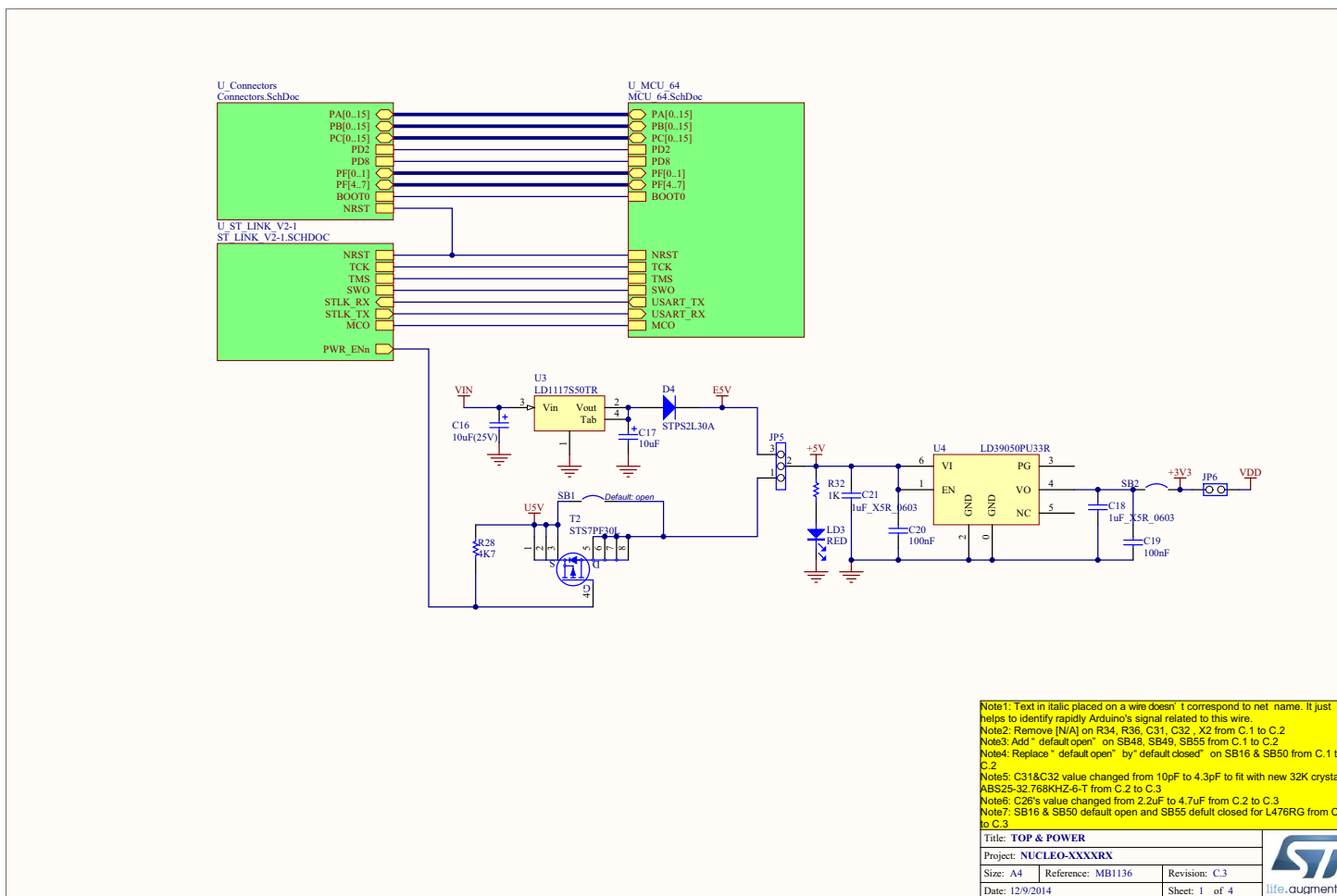


Figure 25. Electrical schematics (2/4)

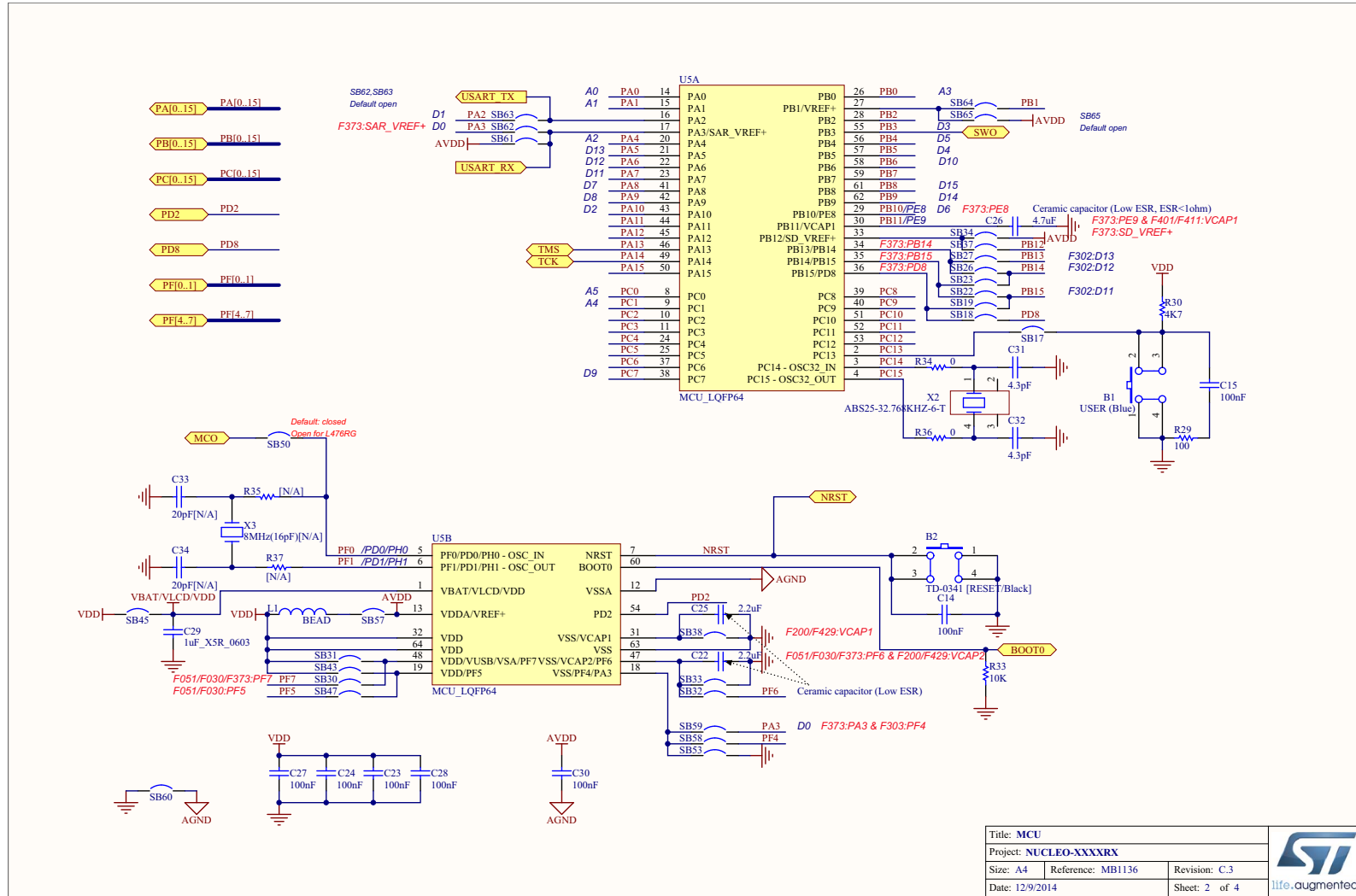


Figure 26. Electrical schematics (3/4)

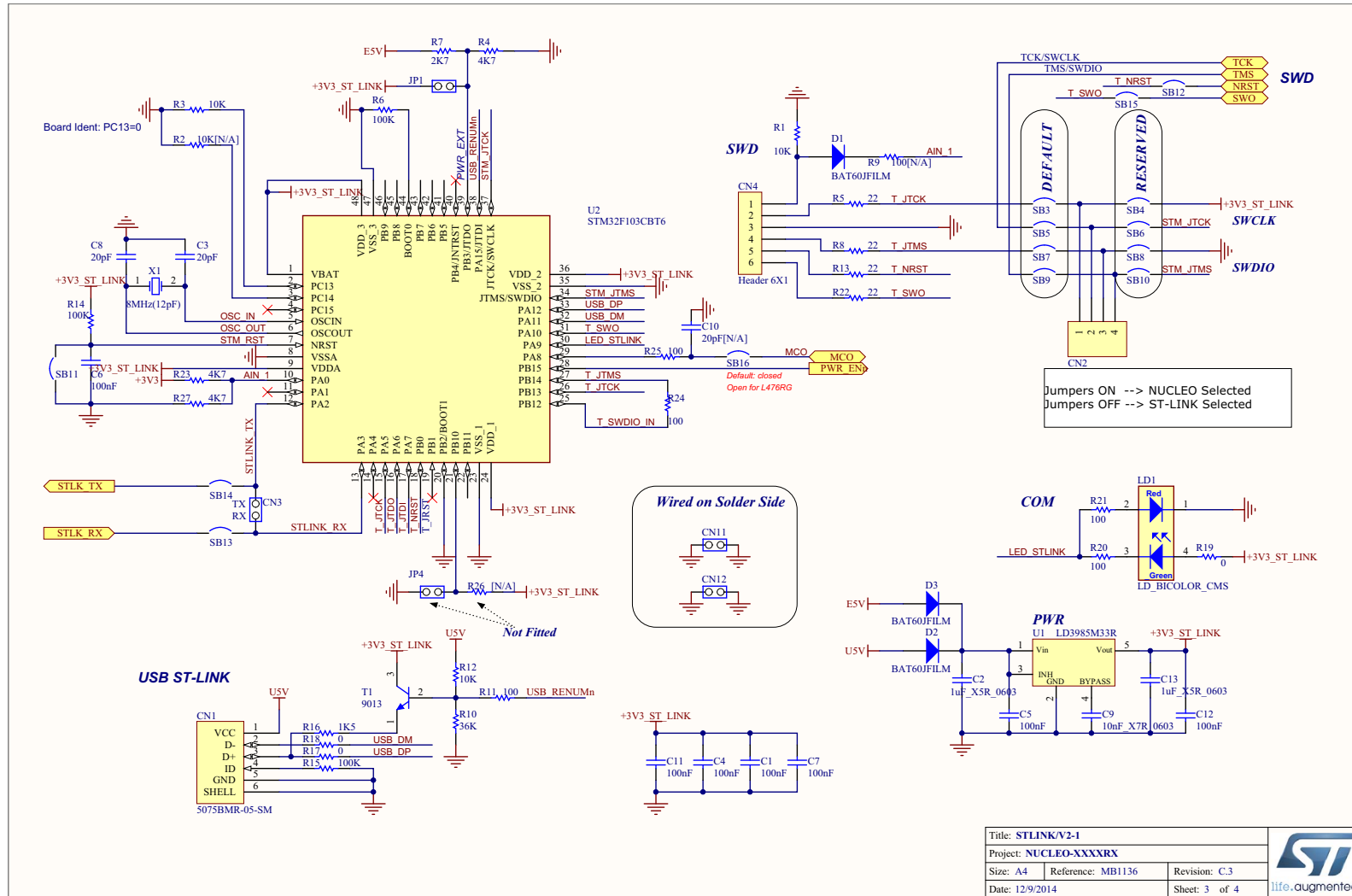
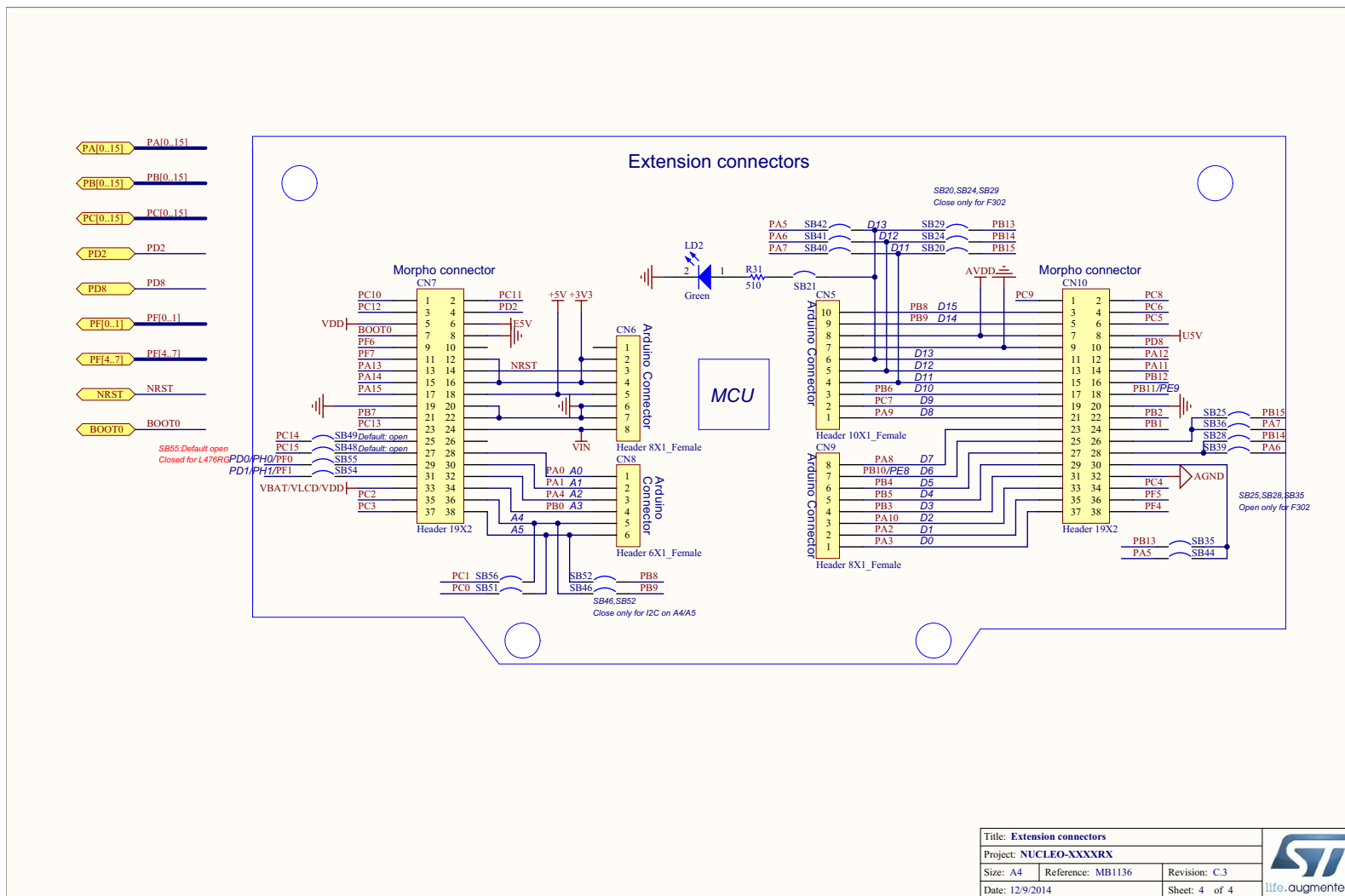


Figure 27. Electrical schematics (4/4)



8 References

1. UM1075 - ST-LINK/V2 in-circuit debugger/programmer for STM8 and STM32, User manual

9 Revision history

Table 28. Document revision history

Date	Revision	Changes
10-Feb-2014	1	Initial release.
13-Feb-2014	2	Updated Figure 1 , Chapter 4 and Table 9 .
11-Apr-2014	3	Extended the applicability to NUCLEO-F302R8. Updated Table 1: Ordering information , Section 5.11: Arduino connectors and Section 5.12: STMicroelectronics Morpho connector . Updated Figure 1
10-June-2014	4	Updated the board figure: Figure 1 . Updated HSE and LSE configuration description: Section 5.7.1 , Section 4 and Section 5.7.2 . Extended the applicability to NUCLEO-F334R8, NUCLEO-F411RE and NUCLEO-L053R8.
20-June-2014	5	Updated the electrical schematics figures: Figure 24 , Figure 25 , Figure 26 and Figure 27 . Refer to the AN2867 for oscillator design guide for STM32 microcontrollers in Section 5.7.1: OSC clock supply and Section 5.7.2: OSC 32 kHz clock supply .

Table 28. Document revision history

Date	Revision	Changes
30-Sept-2014	6	<p>Extended the applicability to NUCLEO-F091RC and NUCLEO-F303RE;</p> <p>Updated Table 1: Ordering information;</p> <p>Updated Table 10: Arduino connectors on NUCLEO-F030R8, NUCLEO-F070RB, NUCLEO-F072RB, NUCLEO-F091RC;</p> <p>Updated Table 22: STMicroelectronics Morpho connector on NUCLEO-F072RB, NUCLEO-F091RC, NUCLEO-F303RE, NUCLEO-F334R8;</p> <p>Updated Figure 5: Typical configuration;</p> <p>Added Figure 12: NUCLEO-F091RC;</p> <p>Added Figure 15: NUCLEO-F303RE;</p> <p>Updated Section 5.7.2: OSC 32 kHz clock supply;</p> <p>Updated Figure 24: Electrical schematics (1/4) ,Figure 25: Electrical schematics (2/4);</p>
19-Jan-2015	7	<p>Extended the applicability to NUCLEO-F070RB, NUCLEO-L073RZ and NUCLEO-L476RG;</p> <p>Updated Table 1: Ordering information;</p> <p>Updated Section 5.2: Embedded ST-LINK/V2-1;</p> <p>Updated Section 5.7.1: OSC clock supply;</p> <p>Added Figure 10: NUCLEO-F070RB;</p> <p>Added Figure 20: NUCLEO-L073RZ;</p> <p>Added Figure 22: NUCLEO-L476RG</p> <p>Updated Table 10: Arduino connectors on NUCLEO-F030R8, NUCLEO-F070RB, NUCLEO-F072RB, NUCLEO-F091RC</p> <p>Added Table 17: Arduino connectors on NUCLEO-L073RZ</p> <p>Added Table 19: Arduino connectors on NUCLEO-L476RG</p> <p>Added Table 21: STMicroelectronics Morpho connector on NUCLEO-F070RB</p> <p>Updated Table 26: STMicroelectronics Morpho connector on NUCLEO-L053R8, NUCLEO-L073RZ, NUCLEO-L152RE</p> <p>Added Table 27: STMicroelectronics Morpho connector on NUCLEO-L476RG</p> <p>Updated schematics from Figure 24: Electrical schematics (1/4) to Figure 27: Electrical schematics (4/4)</p>

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