Chapter 2
STM32L0 Architecture

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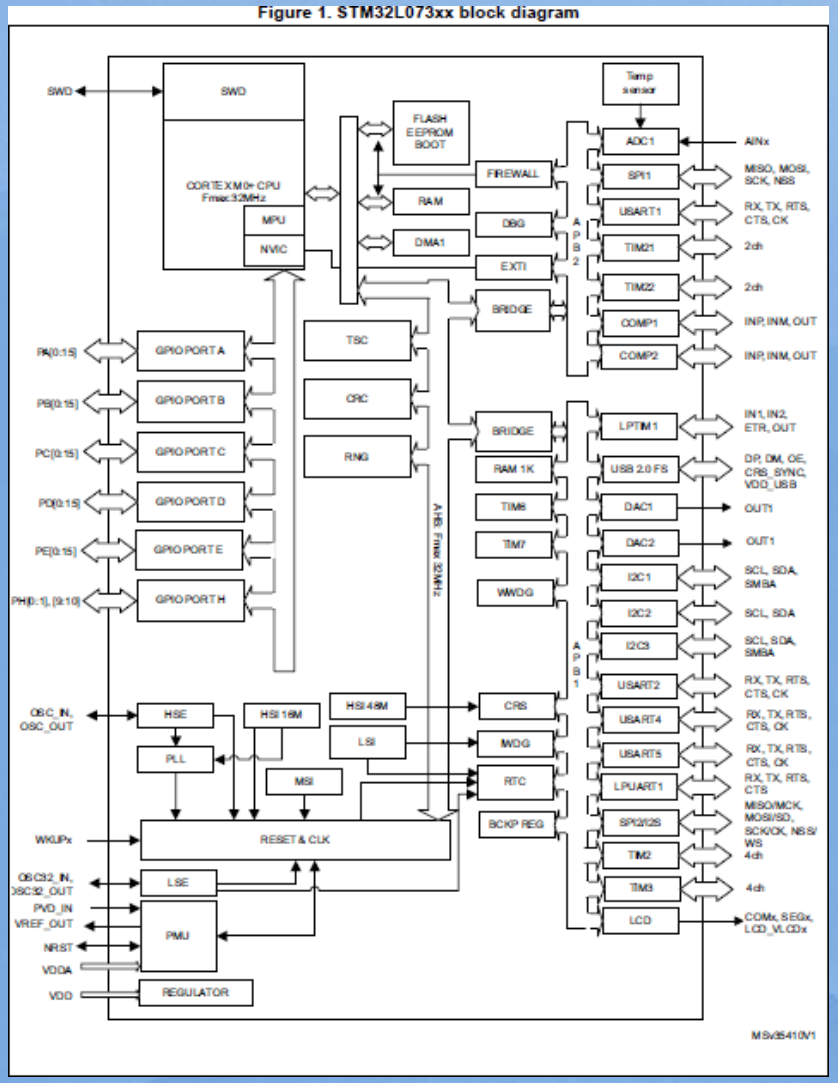
  - Forming a Complete Assembly Program
  - Executing the Machine Language Code in the Microcontroller
- The NUCLEO-L073RZ Board
  - General Information
  - Pin Layout
  - Powering and Programming the Board

Course

Introduction

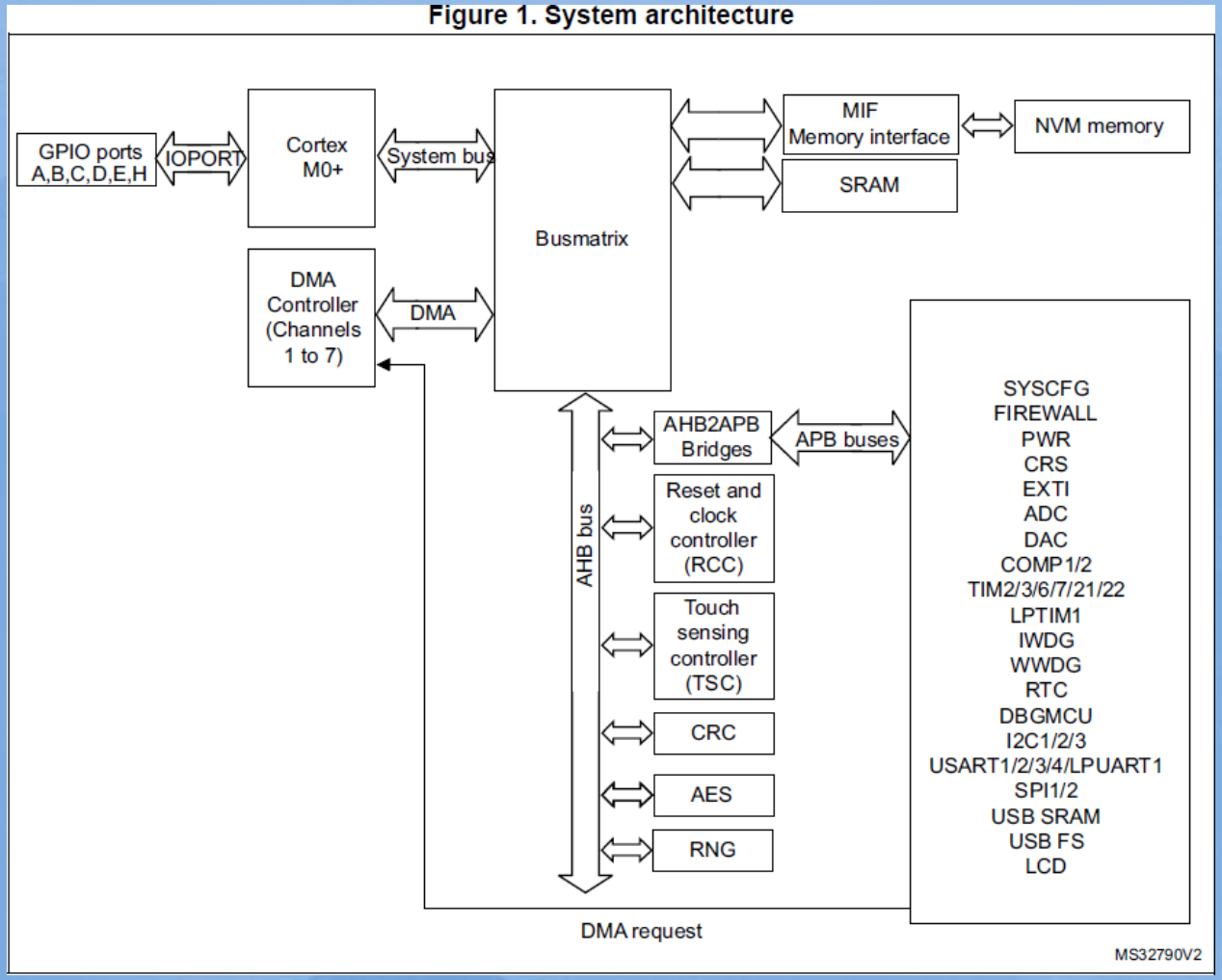
- This chapter introduces the architecture of the STM32L0 microcontroller. Architecture consists of
  - hardware modules
  - software commands, (aka assembly language)
- We will see each hardware module as microcontroller unit and peripheral unit in detail in the following chapters.
- Here, we aim to show the connection between these modules.

The STM32L0 Microcontroller



Functional Block Diagram of the STM32L073RZ Microcontroller

The STM32L0 Microcontroller



System architecture

Central Processing Unit

The STM32L0 microcontroller has

- 32 MHz CPU with ARM Cortex M0+ architecture
- ARM Cortex M0+ architecture
  - Description

Central Processing Unit

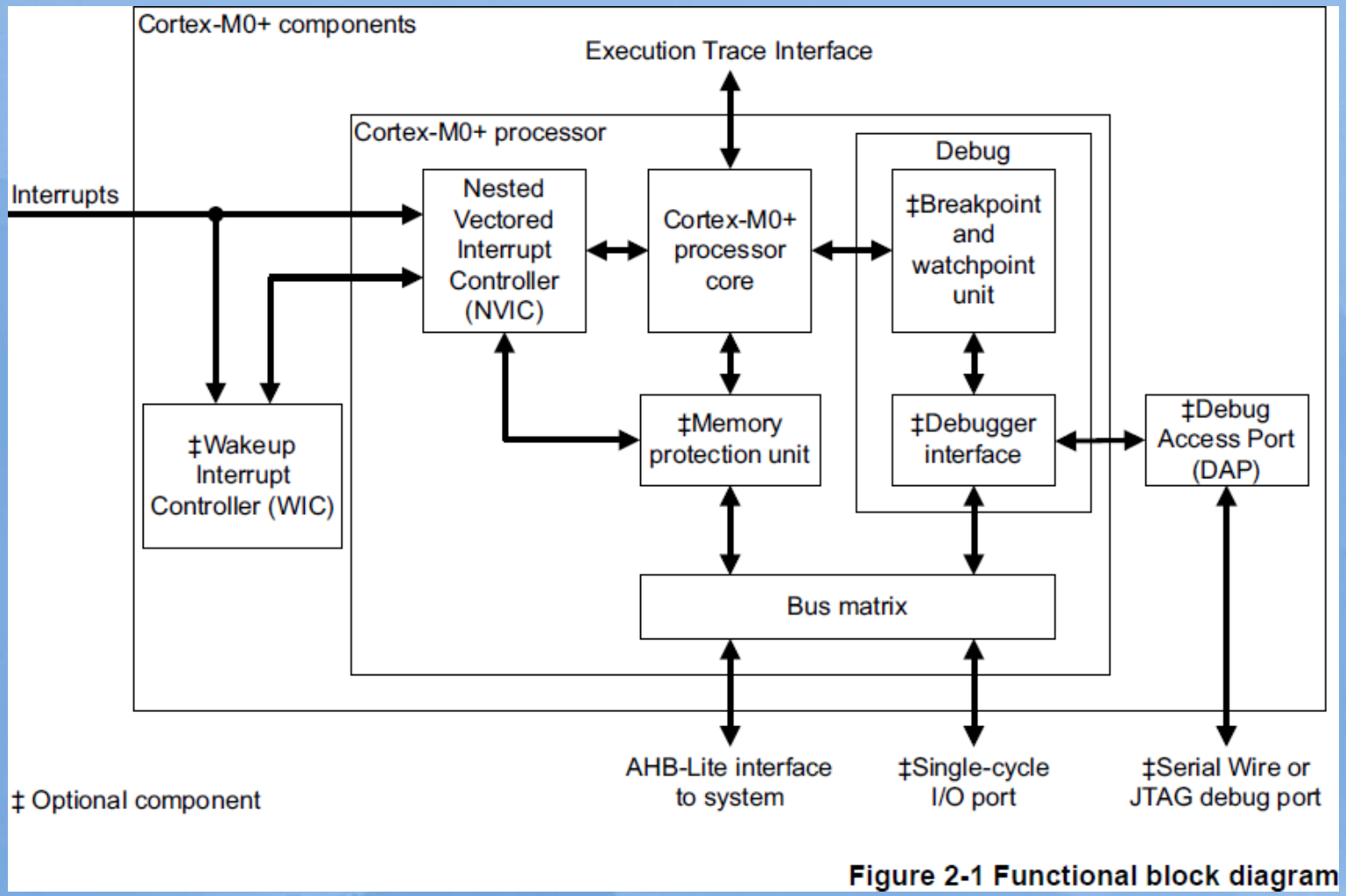


Figure 2-1 Functional block diagram

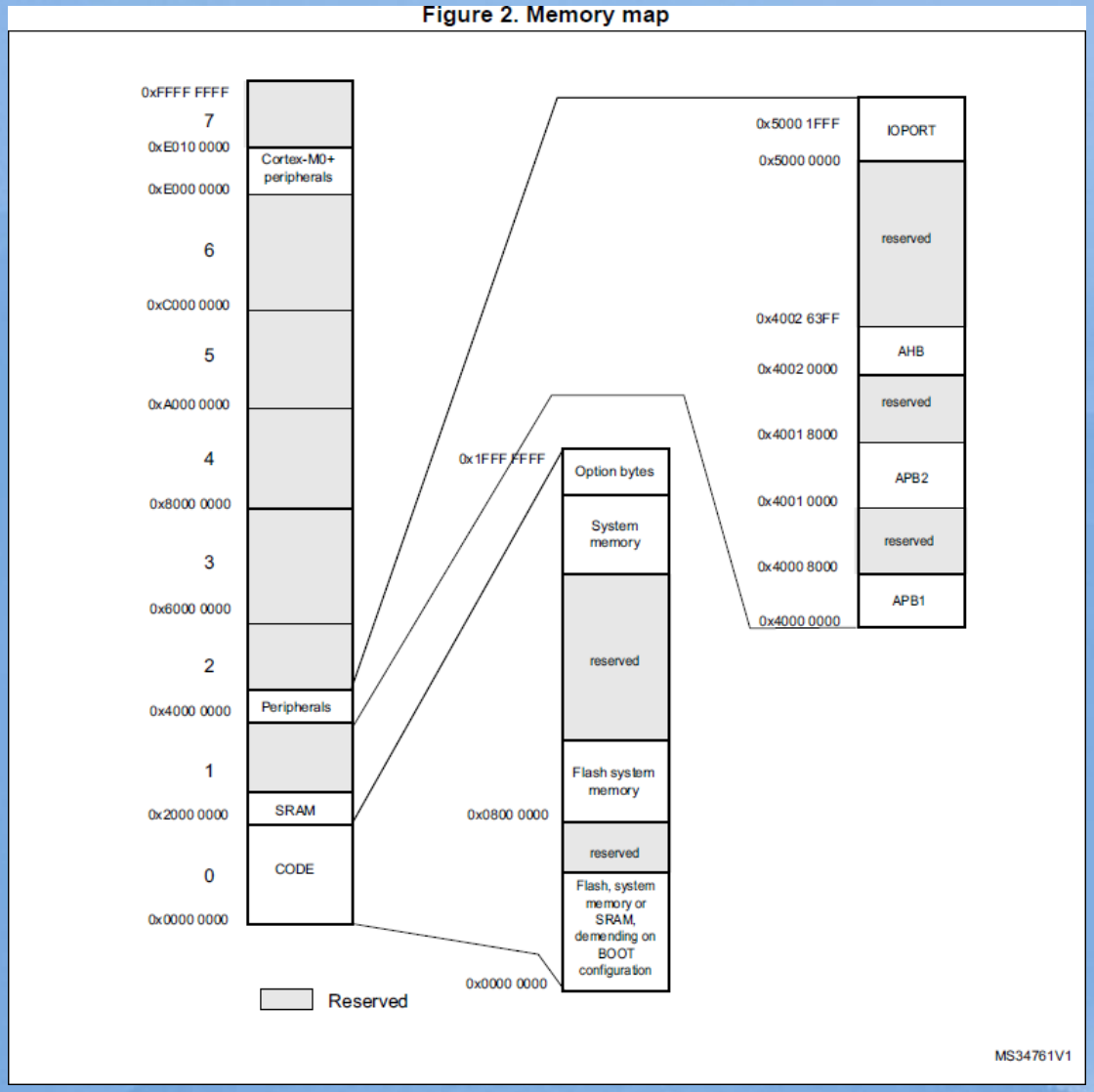
Functional block diagram

Memory

The STM32L0 microcontroller memory types

- RAM
  - Description
  - STM32L0 RAM size
- ROM (Flash)
  - Description
  - STM32L0 Flash size

Memory



Memory map of the STM32L0 microcontroller

Memory

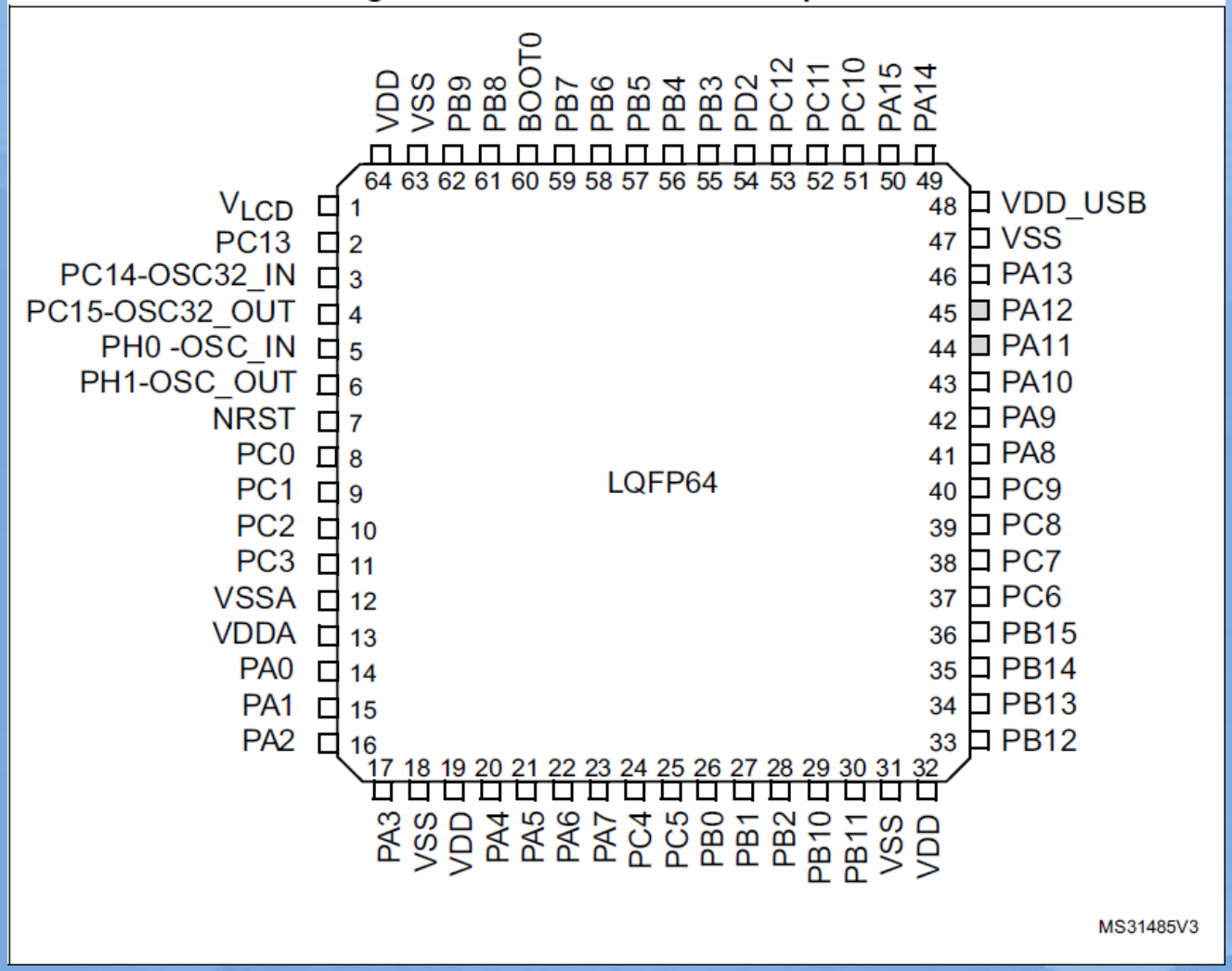
- Working Principles
  - Smallest element
- Memory Address description
  - Reaching a specific memory address
- More

General Purpose Input and Output Ports

- Unlike desktop or laptop computers, the STM32L0 microcontroller does not have a keyboard (input) or a screen (output).
- Instead there are general purpose input and output ports (GPIO) within the microcontroller.
- Each port has up to16 pins associated with it.
- These pins can be used to input and output data (in analog or digital form) to and from the STM32L0 microcontroller.

General Purpose Input and Output Ports

Figure 5. STM32L073xx LQFP64 pinout



The STM32L0 microcontroller pin layout

Clock and Timer Modules

- With each clock cycle (MCLK), the processor performs an action that corresponds to an instruction phase.
- Cycles Per Instruction (CPI) is the average number of clock cycles required for a processor to execute an instruction.
- Millions of instructions per second (MIPS) is a unit used to characterize a processor's performance and corresponds to the processor frequency (MCLK) divided by the average cycles per second (CPI).

Analog Modules

- When we want to process an analog signal via the STM32L0 microcontroller, we will need an analog to digital converter (ADC).
- In the same manner, we will need a digital to analog converter (DAC) if we want to feed an analog circuit via the STM32L0 microcontroller.
- The STM32L0 microcontroller has specific modules to handle the ADC and DAC operations.

Digital Communication Modules

- The STM32L0 microcontroller offers several methods for digital communication. Among these
  - Universal Asynchronous Receiver/Transmittter (UART)
  - Universal Synchronous Receiver/Transmittter (USART) are important.

- These may be used to establish a communication between two or more microcontrollers.

- They may also be used between the microcontroller and a peripheral.

Other Modules

- There are also other modules under the STM32L0 microcontroller.
- We will not deal with them here.
- Please see the microcontroller user's guide for these.

Assembly Language

- The Arm Cortex M0+ Instruction Set
- Forming a Complete Assembly Program
- Executing the Machine Language Code in the Microcontroller

The NUCLEO-L073RZ Board

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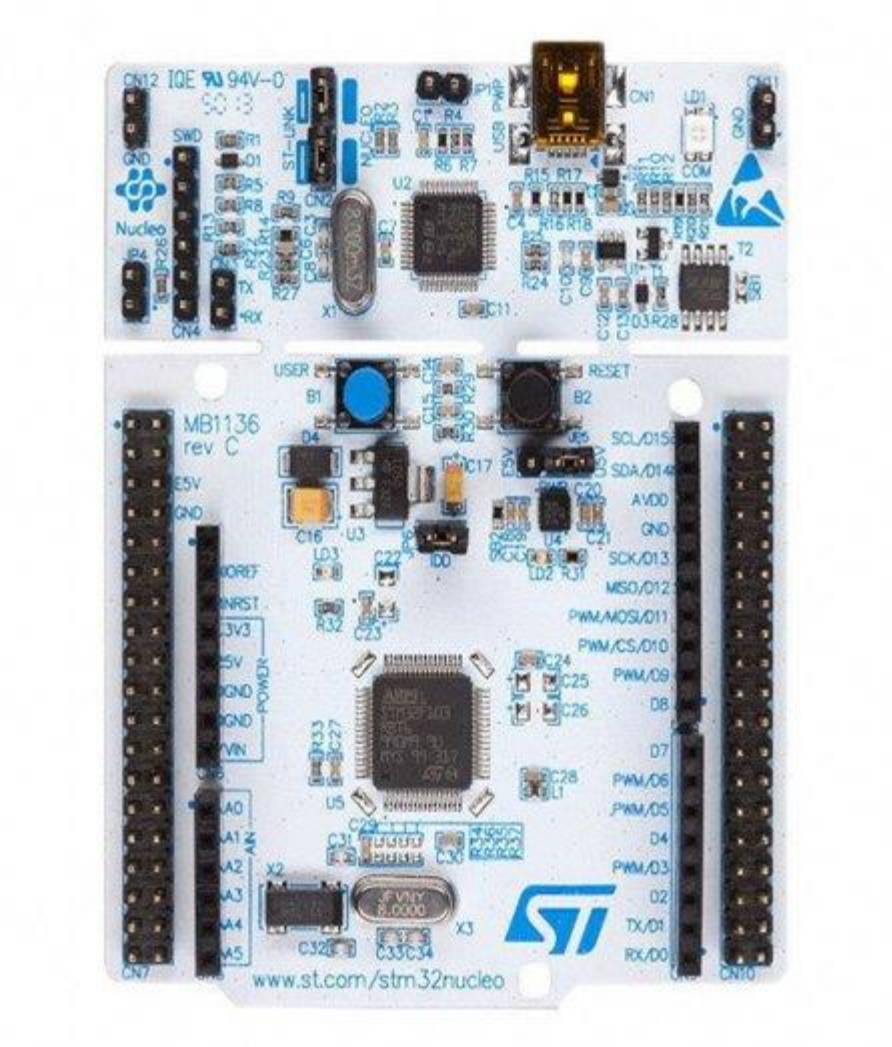
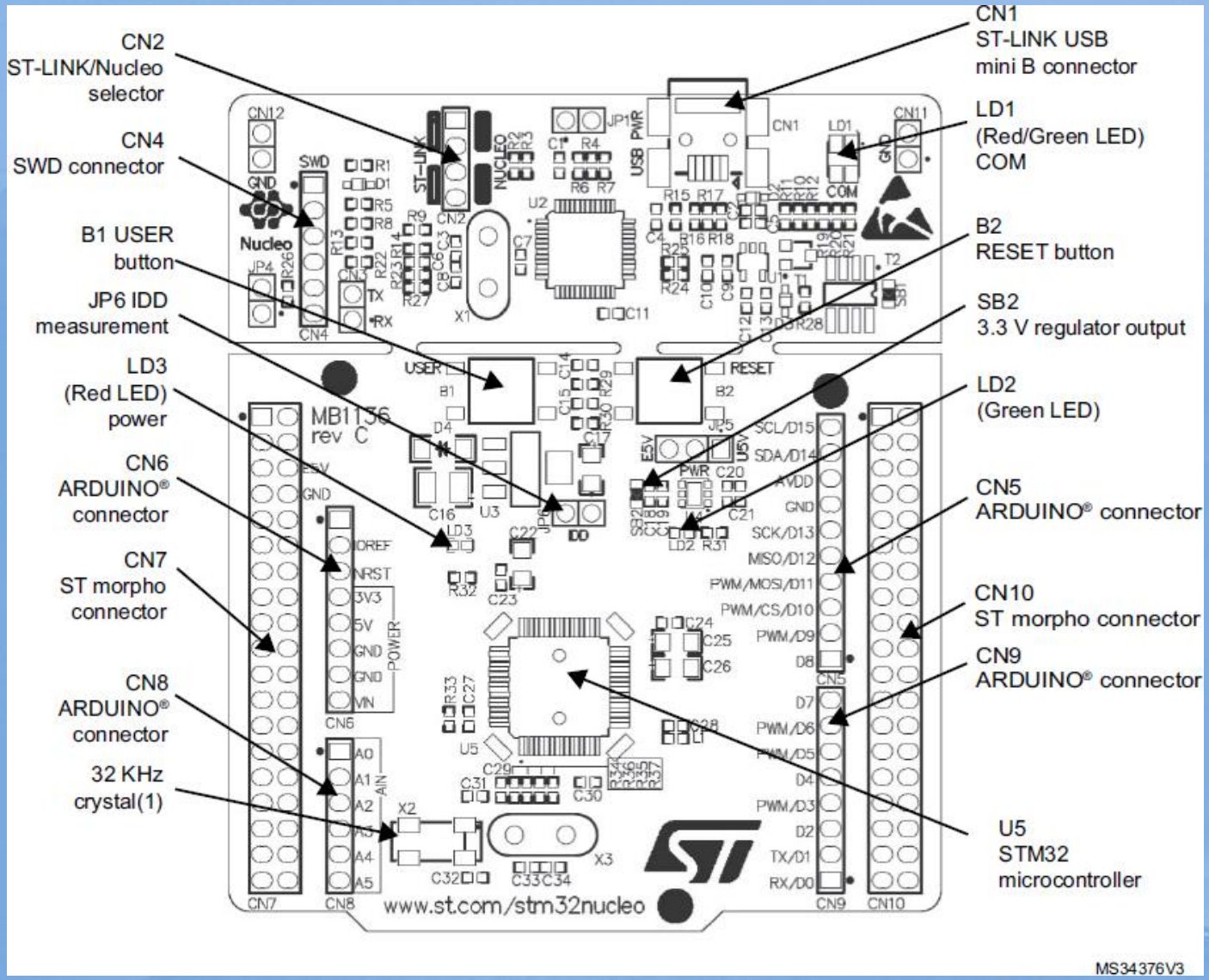
The NUCLEO-L073RZ Board



General Information

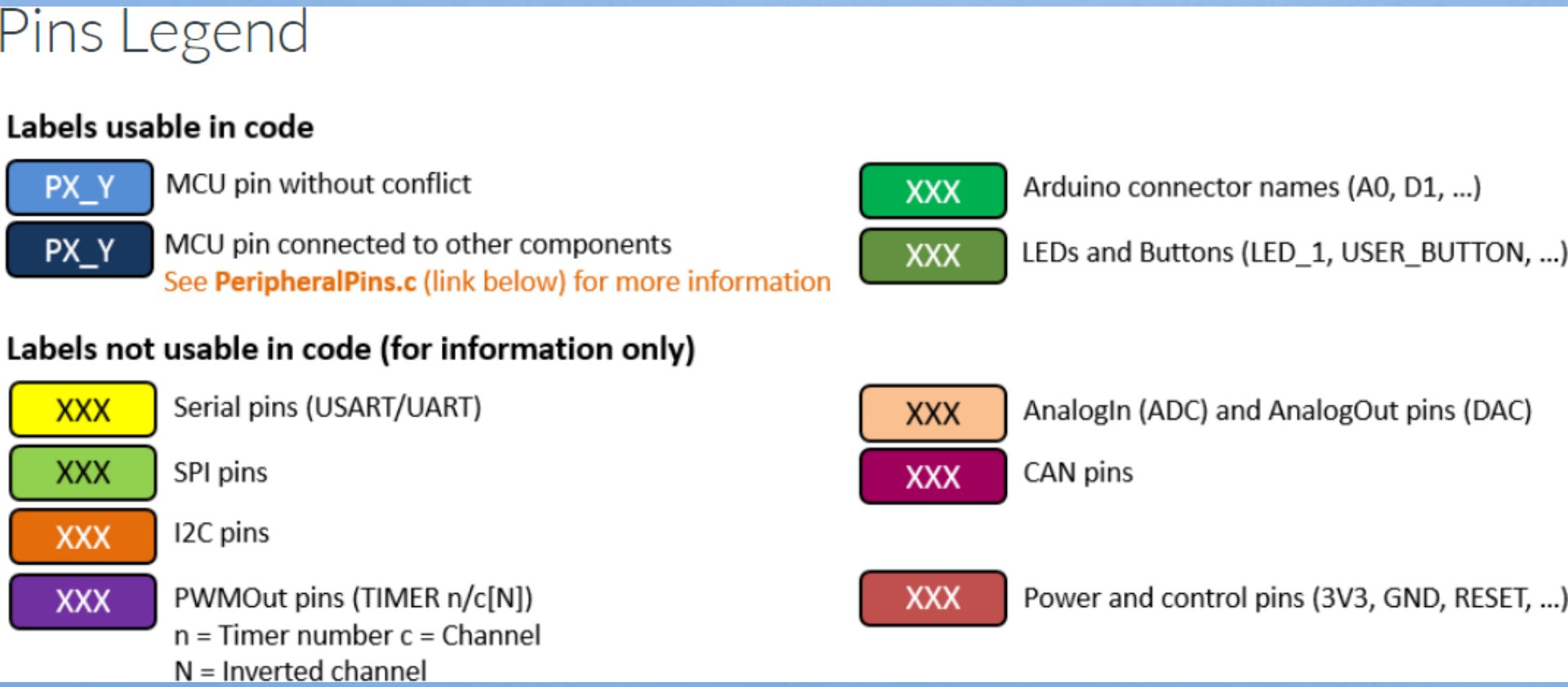
The NUCLEO-L073RZ Board



General Information

The NUCLEO-L073RZ Board

Pin Layout



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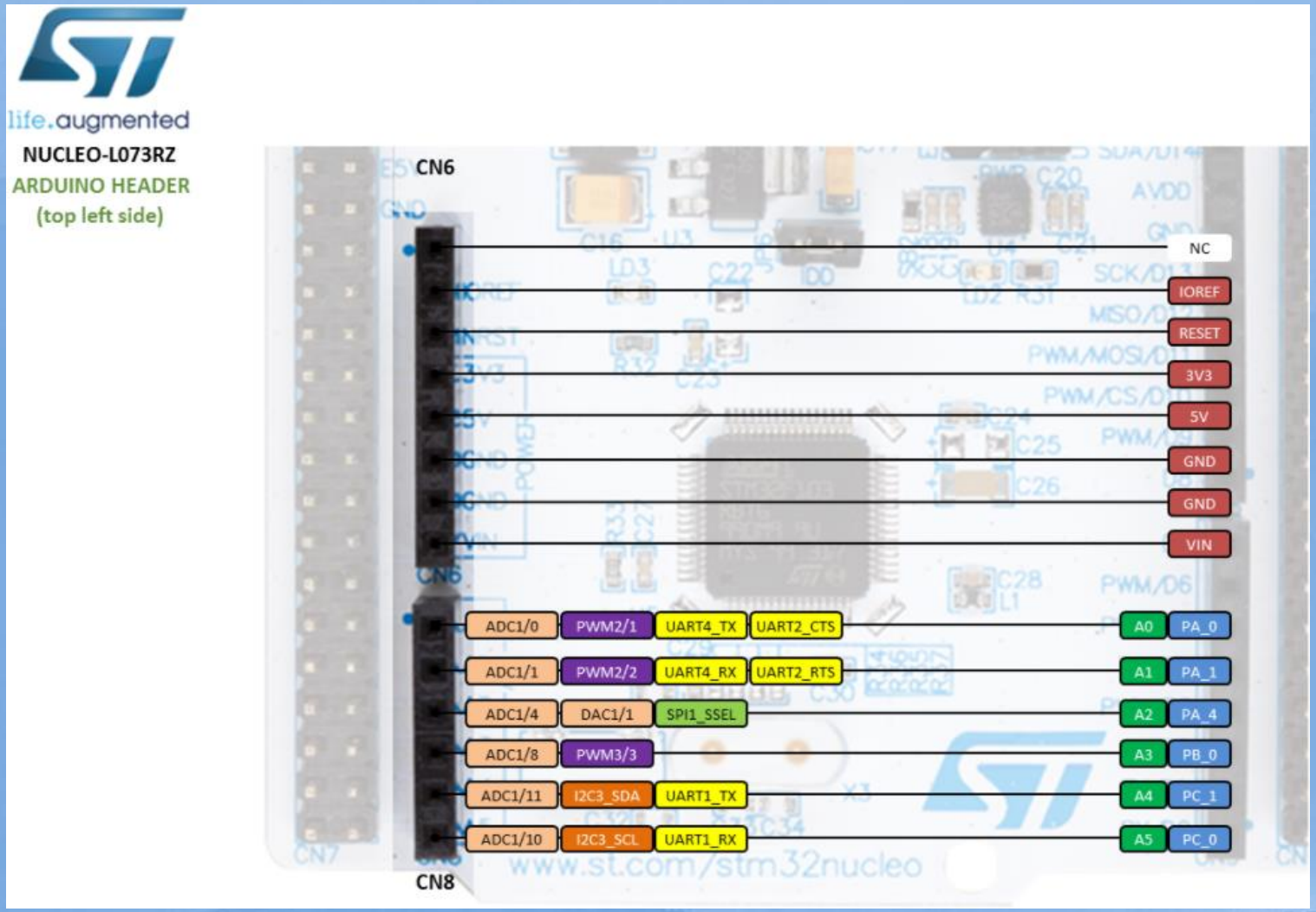
The NUCLEO-L073RZ Board



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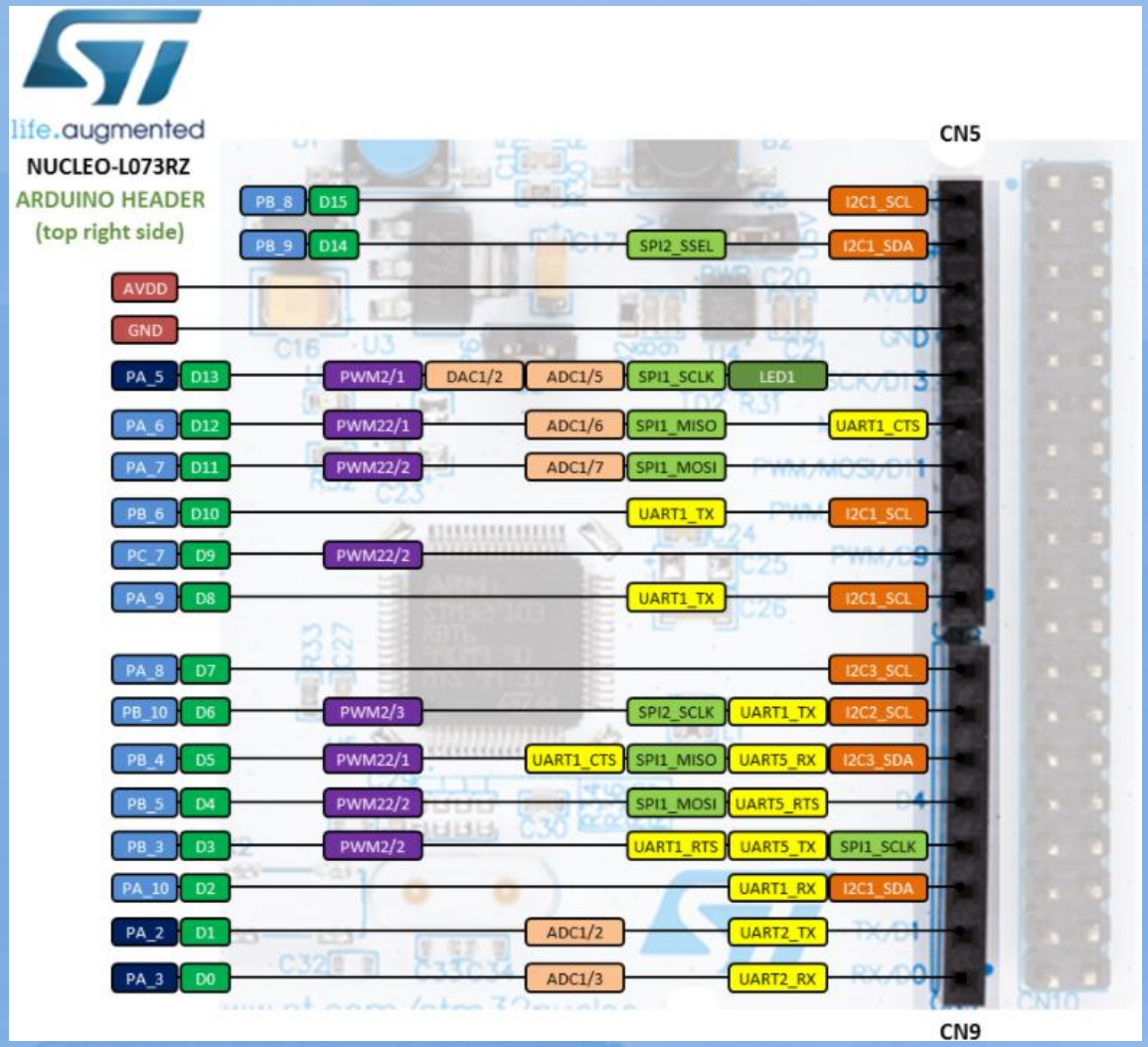

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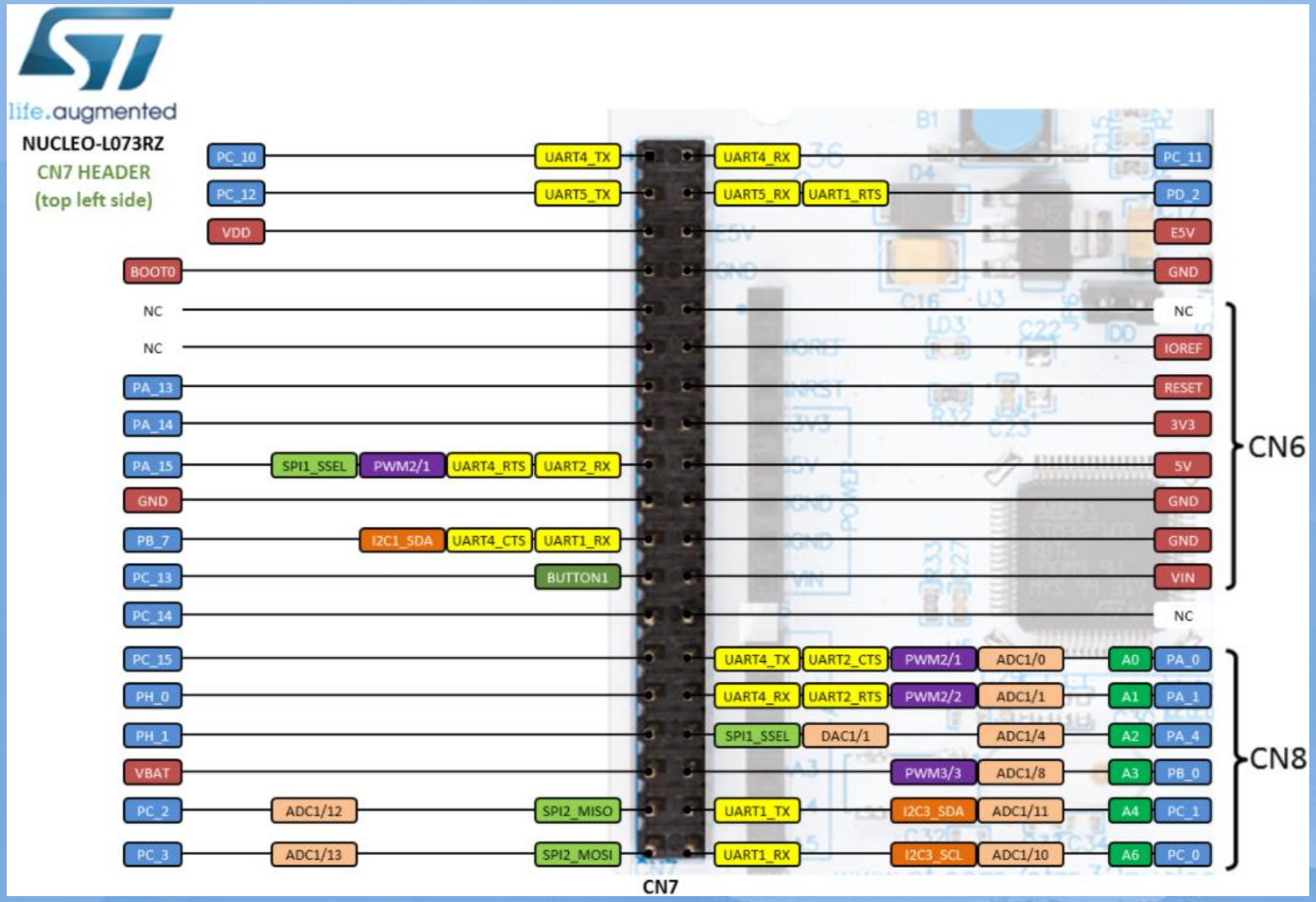

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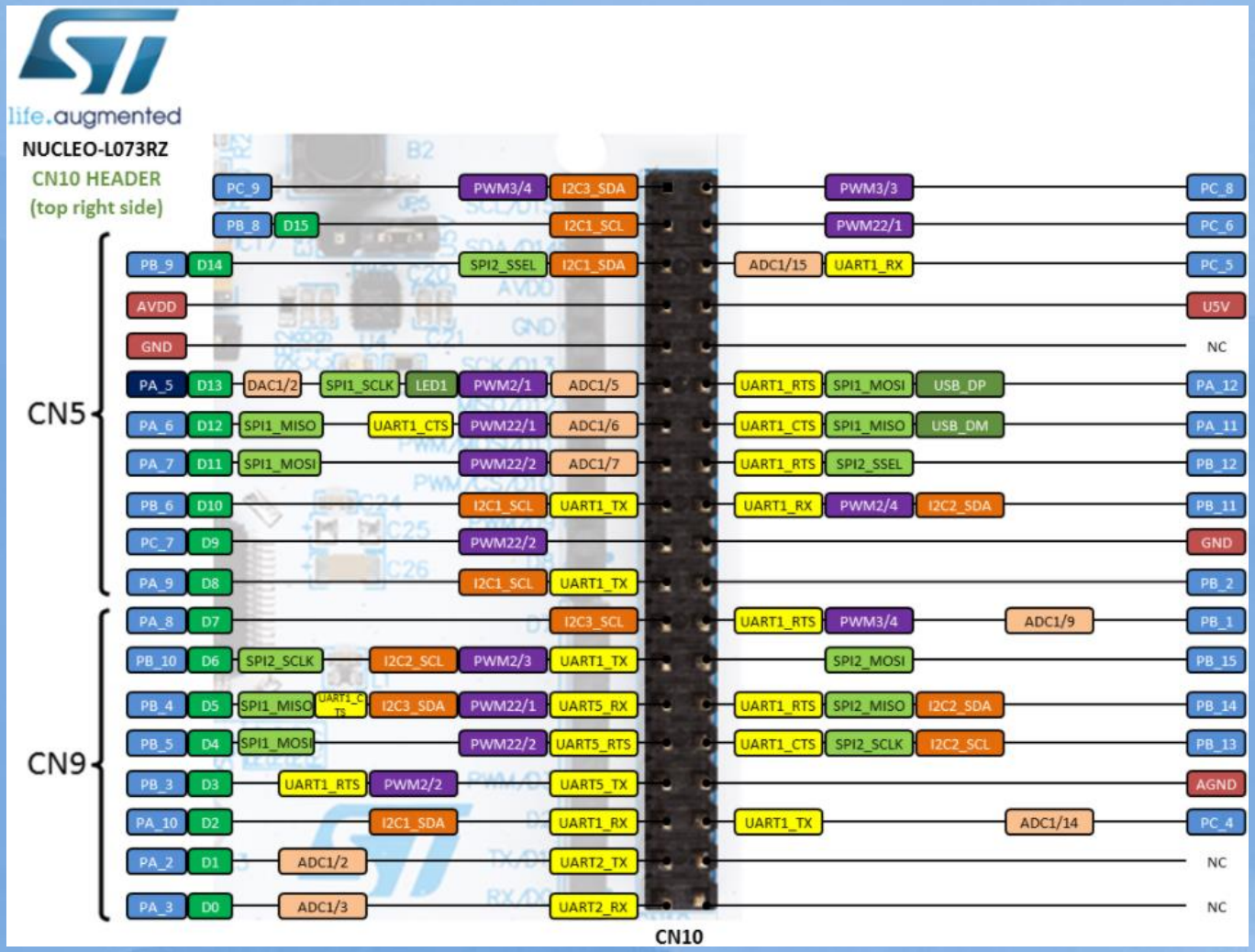

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