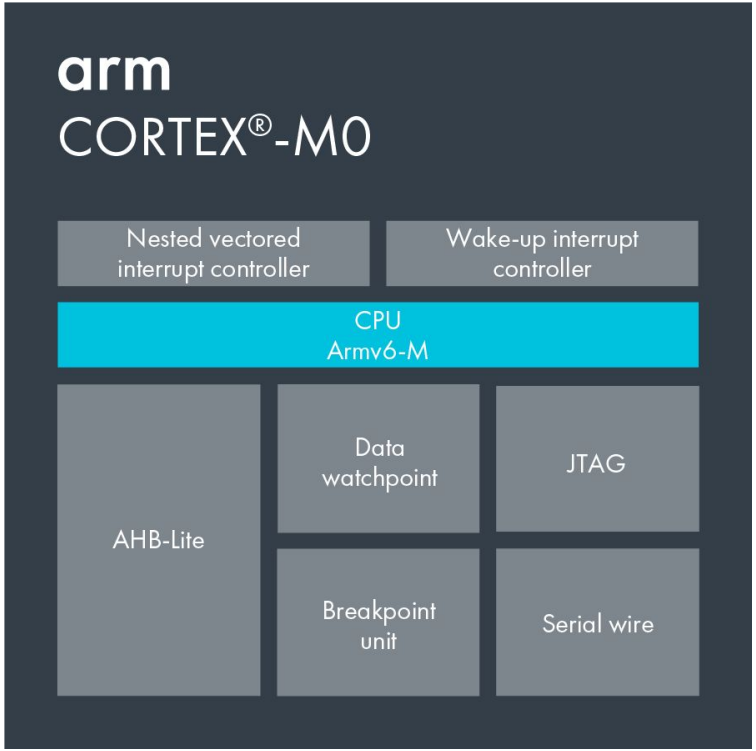
STM32 course

Back to definitions and jump-start to the RCC and GPIO

Moscow Institute Of Physics and Technology

A few words about previous lecture

- Cortex-M0 core
  - Diagram
  - Core registers
  - Exceptions and interrupts
  - Memory Map
  - NVIC
- Toolchain
- A bit practice

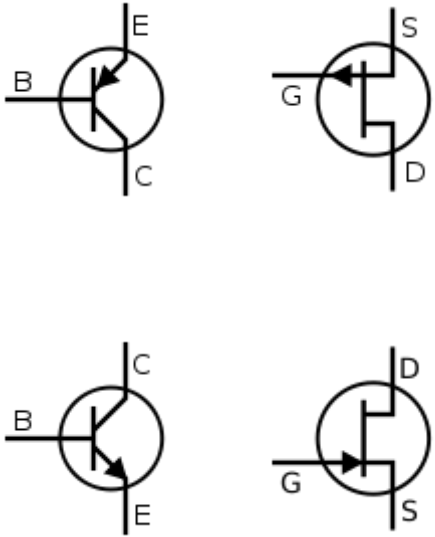


Today’s outline

- Main concept of digital electronics
- Definitions
- SysTick
- STM32F0 SoC overview
- GPIO

Main concept of digital electronics

- Based on transistors
- Two types of digital logic
  - Combinational logic
  - Sequential logic

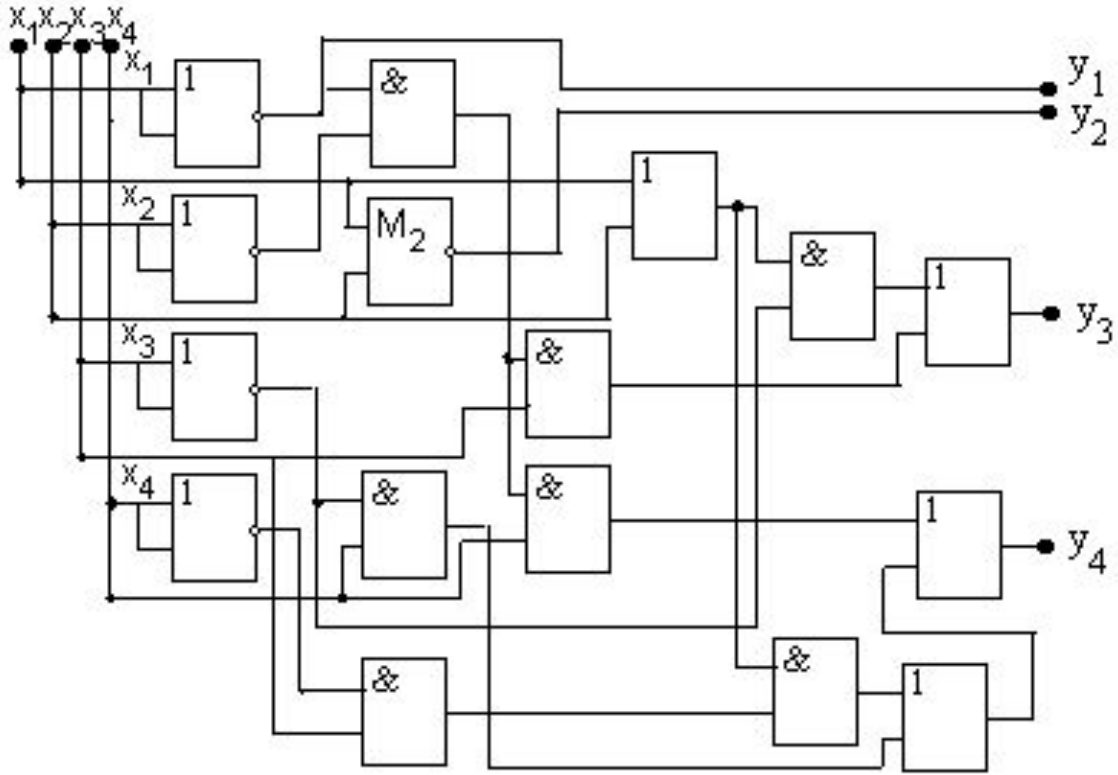


Combinational logic

- Also referred to as time-independent logic
- Implemented by Boolean circuits, where the output is a pure function of the present input only

A	B	C	Result	Logical equivalent
F	F	F	F	$\neg A \cdot \neg B \cdot \neg C$
F	F	T	F	$\neg A \cdot \neg B \cdot C$
F	T	F	F	$\neg A \cdot B \cdot \neg C$
F	T	T	F	$\neg A \cdot B \cdot C$
T	F	F	T	$A \cdot \neg B \cdot \neg C$
T	F	T	F	$A \cdot \neg B \cdot C$
T	T	F	F	$A \cdot B \cdot \neg C$
T	T	T	T	$A \cdot B \cdot C$

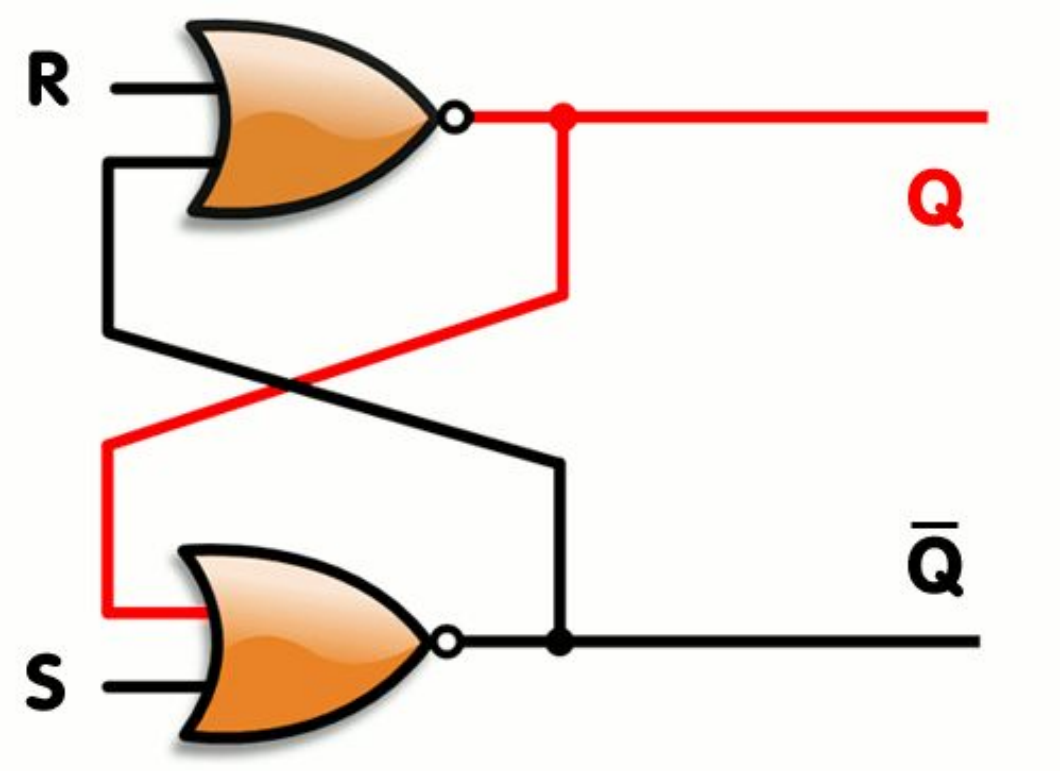
Combinational logic



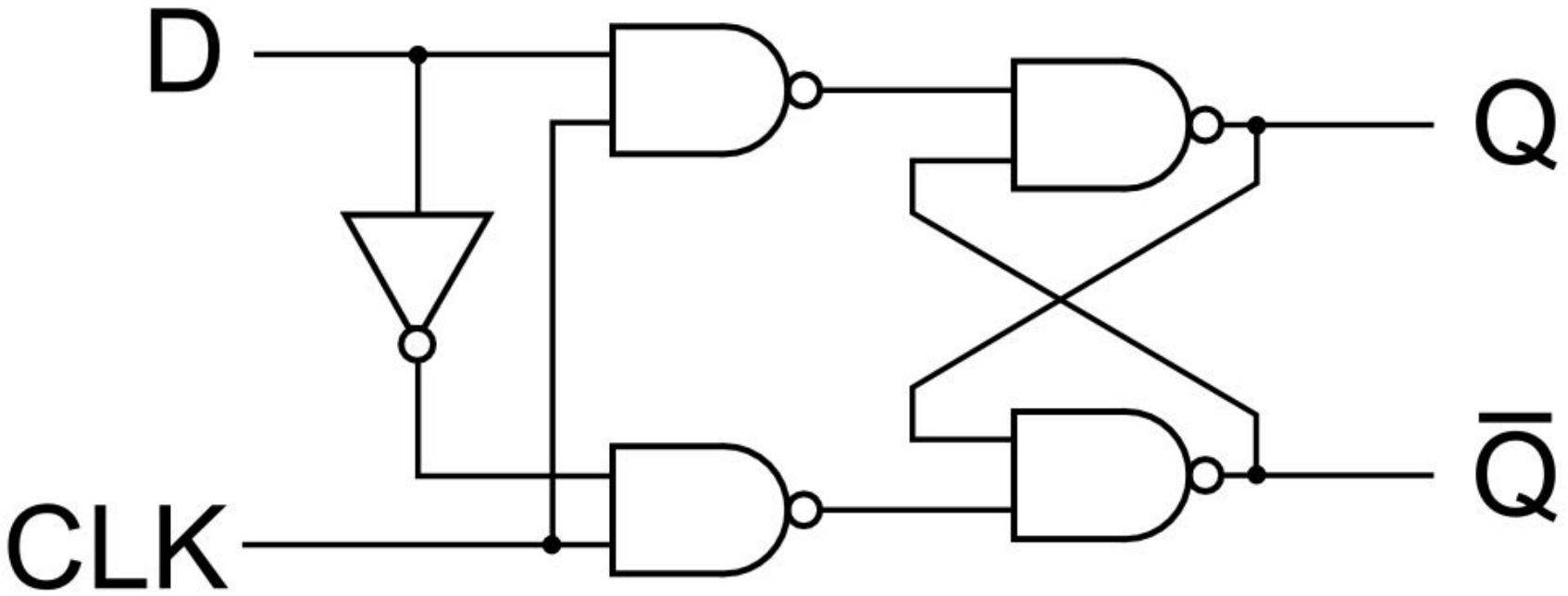
Sequential logic

- logic circuit whose output depends not only on the present value of its input signals but on the sequence of past inputs, the input history
- Needs a clock signal to work
- The basic memory element in sequential logic is the flip-flop

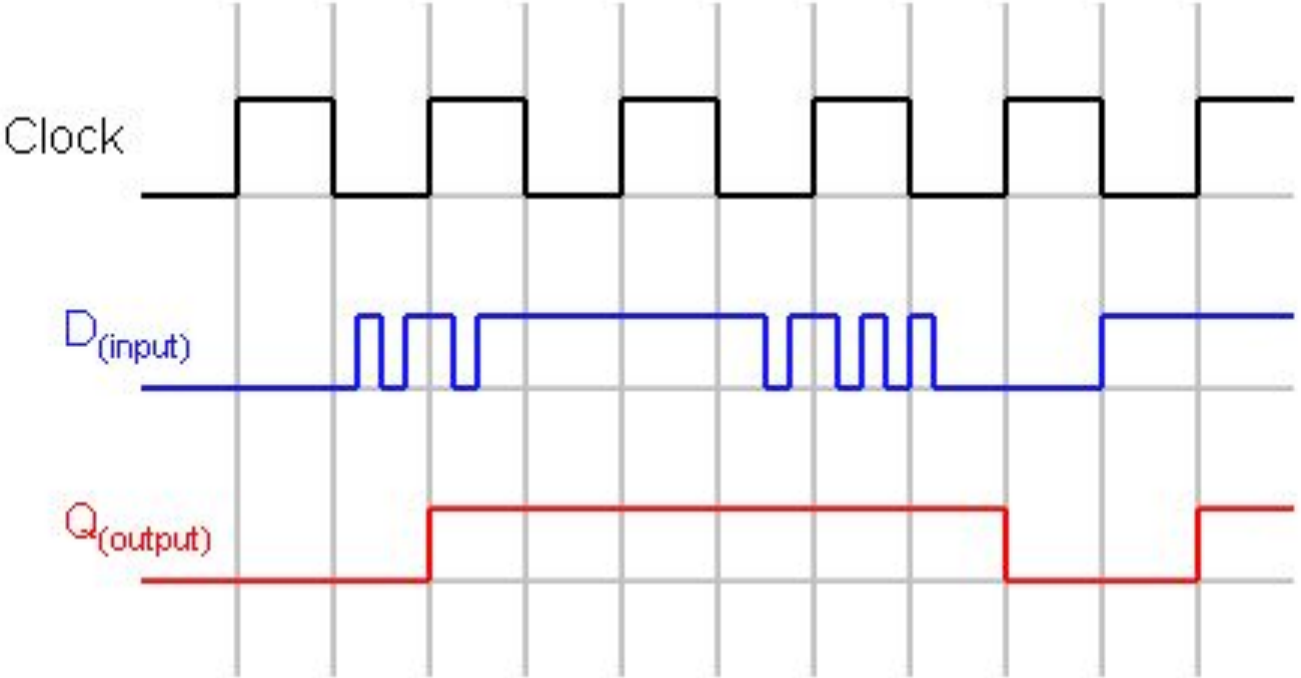
Sequential logic



Sequential logic

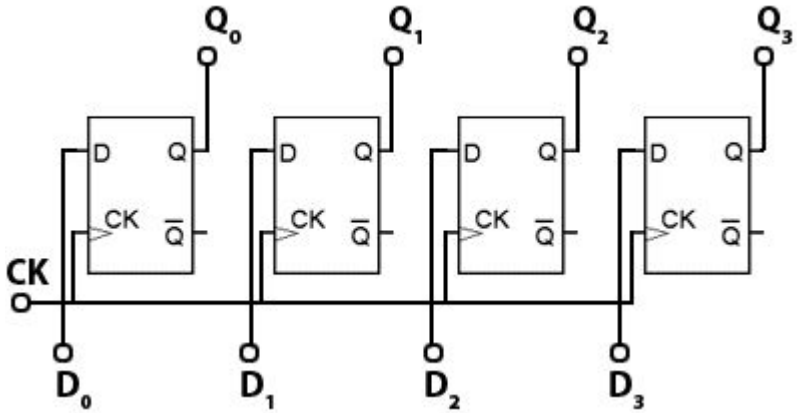


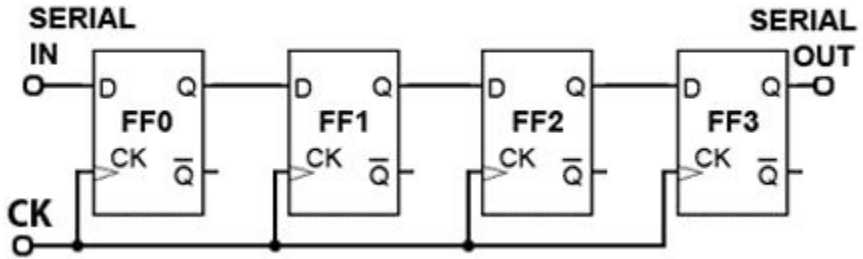
Sequential logic



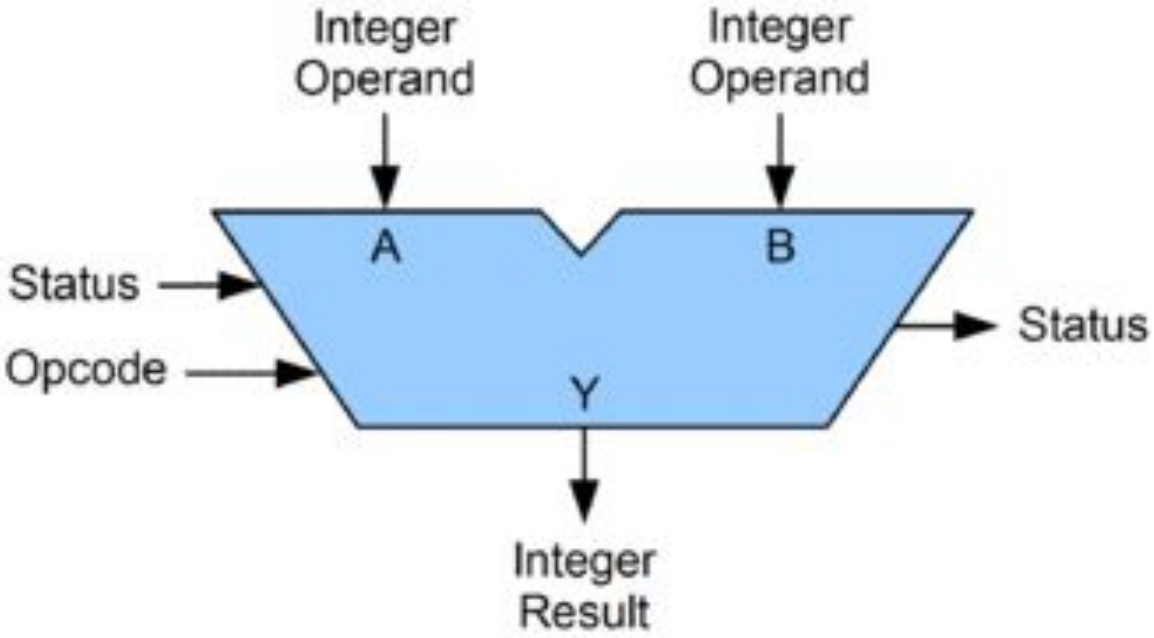
Register

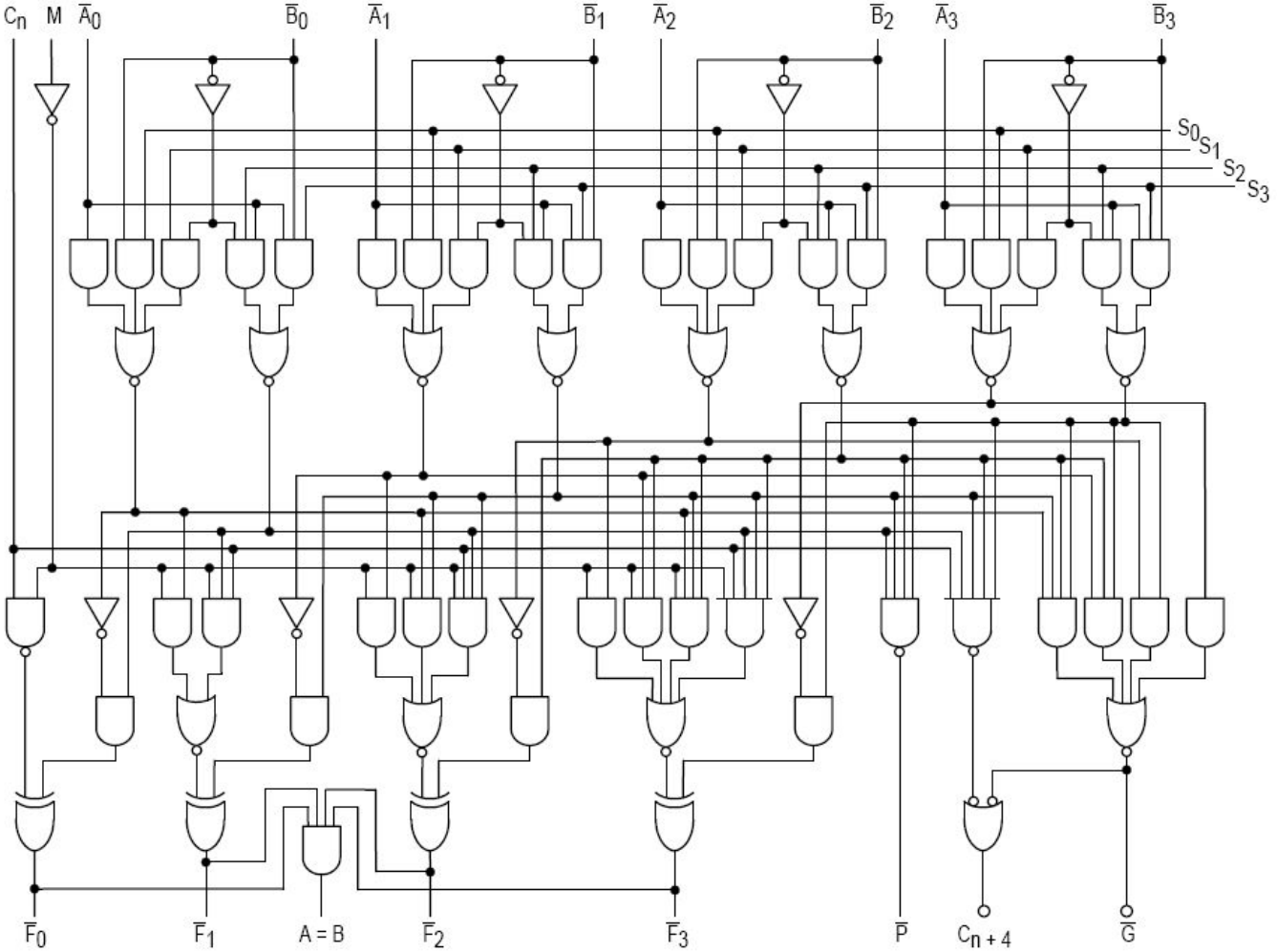
- Composed of flip flops
- Stores data throughout the one period of clock





Arithmetic logic unit




C_n
M
$\overline{A}_0$
$\overline{B}_0$
$\overline{A}_1$
$\overline{B}_1$
$\overline{A}_2$
$\overline{B}_2$
$\overline{A}_3$
$\overline{B}_3$
S_0
S_1
S_2
S_3
$\overline{F}_0$
$\overline{F}_1$
A = B
$\overline{F}_2$
$\overline{F}_3$
$\overline{P}$
C_{n+4}
$\overline{G}$

System timer

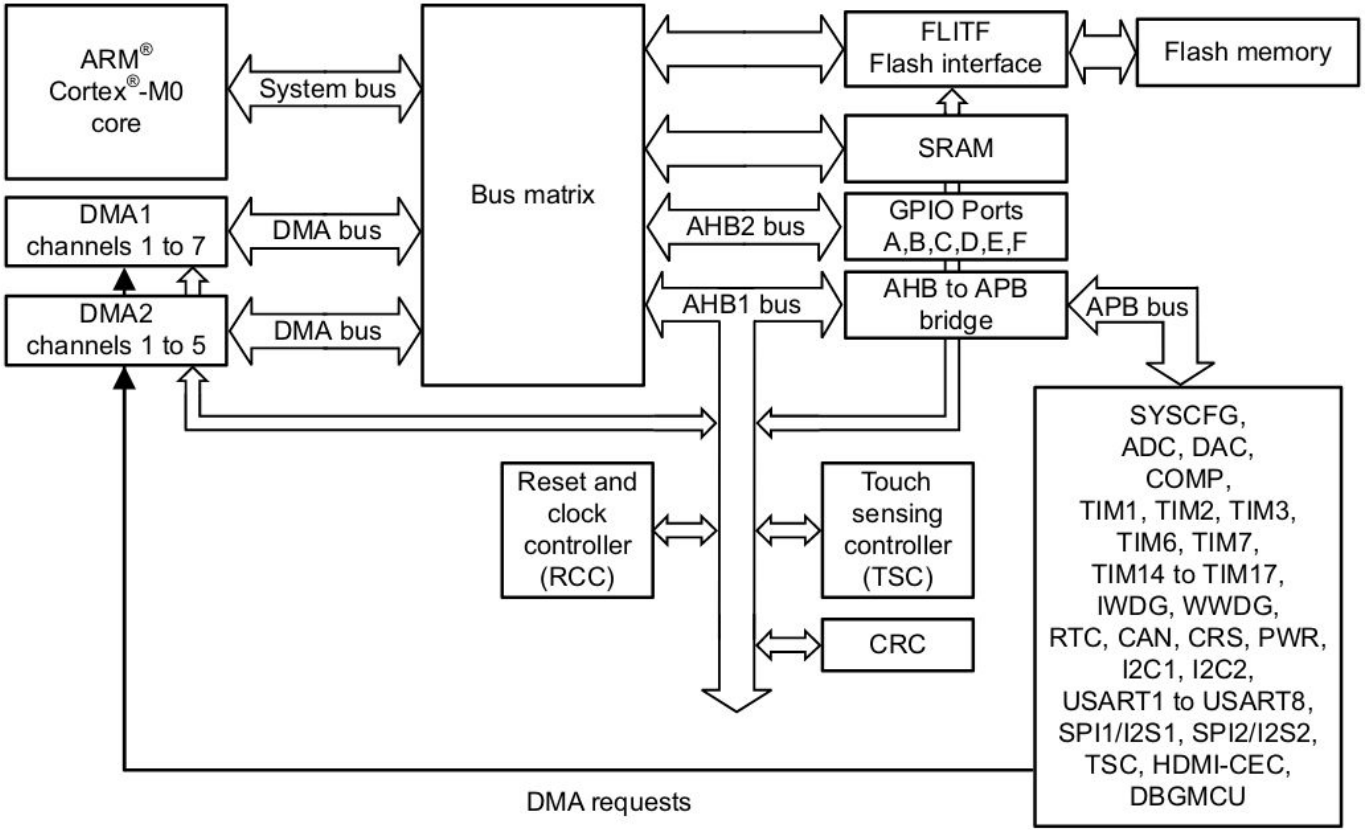
When enabled, the timer:

- Counts down from the reload value to zero,
- Reloads the value in the STK_RVR on the next clock cycle
- then decrements on subsequent clock cycles.

System timer

- SysTick control and status register (STK_CSR)
  - COUNTFLAG (returns 1 if counted to 0, since read)
  - CLKSOURCE (0 - ext, 1 - clk)
  - TICKINT (turn on/off exception)
  - ENABLE
- SysTick reload value register (STK_RVR) (start value)
- SysTick current value register (STK_CVR)
- SysTick calibration value register (STK_CALIB)

STM32F0 SoC overview



GPIO (General purpose input/output)

Let’s switch to Reference Manual!