

# STM32F401/10/11/12/13

## High-performance Access lines



### STM32F4 Access lines: performance, less dynamic power, high integration, and rich connectivity for cost-conscious applications

#### STILL AN STM32F4!

The STM32F4 Access lines, made of STM32F401, STM32F410, STM32F411, STM32F412 and STM32F413<sup>4</sup> MCUs, are the entry level devices of the STM32F4 series that target cost-conscious applications. They are the right proposal when you reach the limits of your Cortex-M0+/ M3 designs and look for more performance and integration. These lines implement STM32 Dynamic Efficiency™ technology and solve the challenge of offering less dynamic power and more performance with high integration and lower cost. With a new Batch Acquisition Mode (BAM) that optimizes power consumption during sensor data batching, the STM32F4 Access lines take Dynamic Efficiency to a new level.

#### PERFORMANCE

Up to 100 MHz  $f_{CPU}$  delivering 125 DMIPS/339 CoreMark performance executing from Flash memory, with 0-wait states using ST's ART Accelerator™.

The DSP instructions and the floating point unit enhance the overall processing.

#### POWER EFFICIENCY

ST's 90-nm process, ART Accelerator and dynamic power scaling enables the current consumption when executing from Flash memory to be as low as 89  $\mu$ A/MHz. In Stop mode, the power consumption can be as low as 6  $\mu$ A.

#### INTEGRATION

STM32F4 Access lines devices carry from 128 Kbytes to 1.5 Mbyte of Flash memory and up to 320 Kbytes of SRAM.

Available packages range from 36 to 144 pins.

- 10x USARTs up to 12.5 Mbits/s
- Up to 5x SPI (mixed with I<sup>2</sup>S) up to 50 Mbit/s

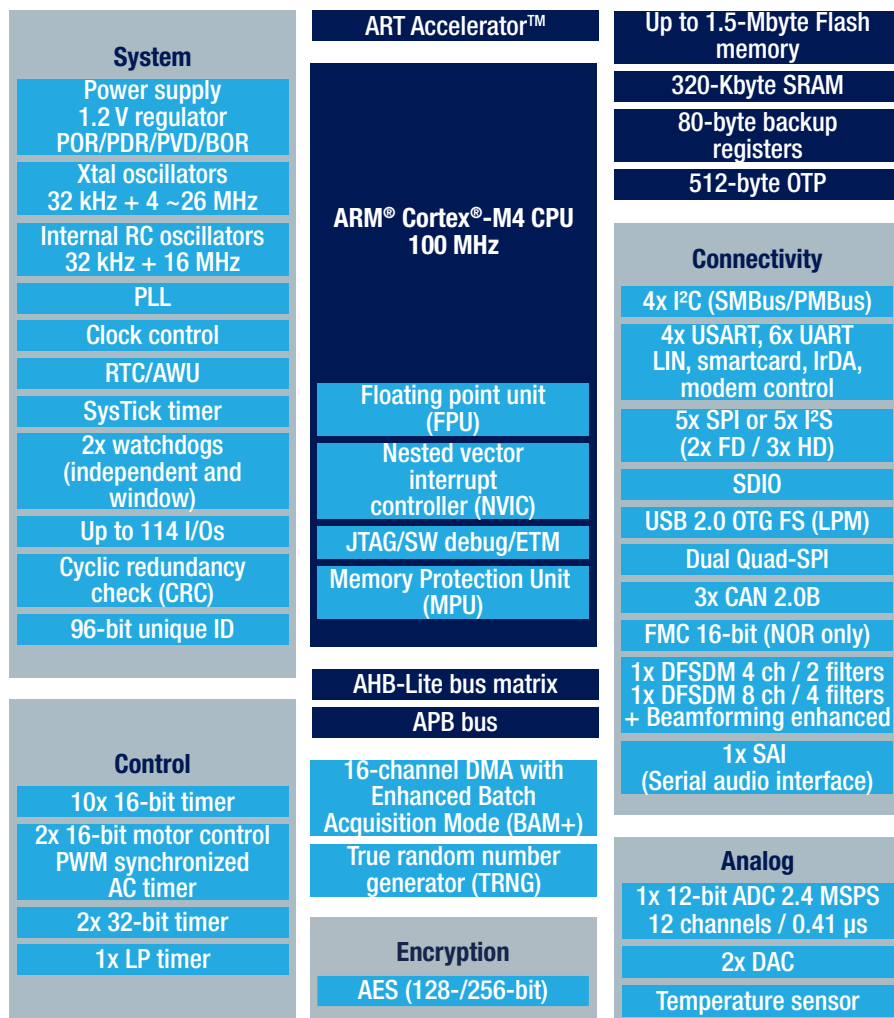
- Up to 4x I<sup>2</sup>C up to 1 Mbits/s
- 1x SDIO up to 48 MHz and available on all packages<sup>1</sup>
- 1x USB 2.0 OTG full speed<sup>1</sup>
- Up to 2x full-duplex and 3x simplex I<sup>2</sup>S up to 32-bit/192 kHz
- Up to 3x CAN (2.0B Active)
- 12-bit ADC reaching 2.4 MSPS
- Up to 2x 12-bit DAC<sup>2</sup>
- True random number generator<sup>2</sup>
- Up to 18x 16- and 32-bit timers running at up to 100 MHz
- Flexible external static memory controller with up to 16-bit data bus: SRAM, PSRAM, NOR Flash memory<sup>3</sup>
- Dual mode Quad-SPI interface<sup>3</sup>
- LCD parallel interface, 8080/6800 modes<sup>3</sup>
- Up to 6x PDM interfaces, stereo microphone support<sup>3</sup>

#### Notes:

1. except STM32F410
2. on STM32F410, F412 and F413
3. on STM32F412 and F413
4. STM32F423: HW AES encryption (128-/256-bit) version

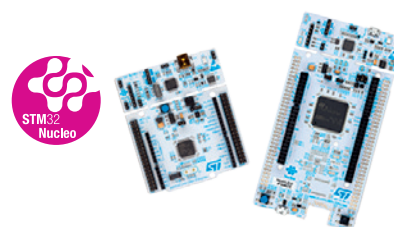


## STM32F423 BLOCK DIAGRAM



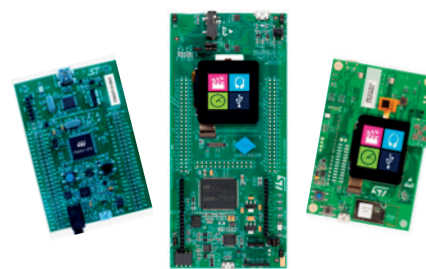
## HARDWARE TOOLS

### Nucleo boards



NUCLEO-F401RE  
 NUCLEO-F410RB  
 NUCLEO-F411RE  
 NUCLEO-F412ZG  
 NUCLEO-F413ZH  
[www.st.com/stm32nucleo](http://www.st.com/stm32nucleo)

### Discovery kits



STM32F401C-DISCO  
 STM32F411E-DISCO  
 STM32F412G-DISCO  
 STM32F413H-DISCO  
[www.st.com/stm32f4-discovery](http://www.st.com/stm32f4-discovery)

## SOFTWARE TOOLS

In addition to the wide set of partners and ARM® ecosystem solutions, the STM32F4 Access lines benefit from dedicated tools and software including STM32CubeF4 embedded software (HAL, Low-Layer APIs and CMSIS (CORE, DSP, RTOS), and a set of USB, TCP/IP, file system, RTOS, and graphic middleware components) with examples running on STM32 Nucleo, discovery kits and evaluation boards.



[www.st.com/stm32cube](http://www.st.com/stm32cube)

## STM32F4 ACCESS LINES

<b>ARM® Cortex®-M4 (DSP + FPU) – Up to 180 MHz</b>	<ul style="list-style-type: none"> <li>• ART Accelerator™</li> <li>• SDIO</li> <li>• USART, SPI, I<sup>2</sup>C</li> <li>• I<sup>2</sup>S + audio PLL</li> <li>• 16 and 32-bit timers</li> <li>• 12-bit ADC (0.41 μs)</li> <li>• True Random Number Generator</li> <li>• Batch Acquisition Mode</li> <li>• Low voltage 1.7 to 3.6 V</li> <li>• Temperature: -40 °C to 125 °C</li> </ul>	Product lines	FCPU (MHz)	Flash (Kbytes)	RAM (KB)	RUN current (μA/MHz)	STOP current (μA)	Small package (mm)	FSMC (NOR/PSRAM/LCD support)	OSPI	DFSDM	CAN 2.0B	DAC	TRNG	DMA Batch Acquisition Mode	USB 2.0 OTG FS	
		STM32F401	84	128 to 512	up to 96	Down to 128	Down to 10	Down to 3x3									•
		STM32F410	100	64 to 128	32	Down to 89	Down to 6	Down to 2.553x 2.579						•	•	BAM	-
		STM32F411	100	256 to 512	128	Down to 100	Down to 12	Down to 3.034x 3.22								BAM	•
		STM32F412	100	512 to 1024	256	Down to 112	Down to 18	Down to 3.653x 3.651	•	•	•	•			•	BAM	• +LPM <sup>1</sup>
		STM32F413 <sup>2</sup>	100	1024 to 1536	320	Down to 115	Down to 18	Down to 3.951x 4.039	•	•	•	•	•	•	•	BAM	• +LPM <sup>1</sup>

Notes:

1. Link Power Management
2. The same devices are also found with embedded HW AES encryption (128-/256-bit) named STM32F423

