

# STM32F40x/41x 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 MCUs, are the entry level devices of the STM32F4 wseries that target cost-conscious applications. These lines implement STM32 Dynamic Efficiency<sup>™</sup> 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 fCPU delivering 125 DMIPS/ 339 CoreMark performance executing from Flash memory, with 0-wait states using ST's ART Accelerator<sup>™</sup>

#### **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 µA/MHz. In Stop mode, the power consumption can be as low as 6 µA.

## INTEGRATION

- Up to 1.5 Mbyte of Flash memory 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 I2S) up to 50 Mbit/s
- Up to 4x I<sup>2</sup>C up to 1 Mbits/s
- 1x SDIO up to 48 MHz
- 1x USB 2.0 OTG full speed1
- 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 generator2
- Up to 18x 16- and 32-bit
- Flexible external static memory controller with up to 16-bit data bus: SRAM, PSRAM, NOR Flash memory3

## STM32F423 BLOCK DIAGRAM

			HANDWARE TOOLS						
System	ART Accelerator™	Up to 1.5-Mbyte Flash memory	Nucleo boards						
Power supply 1.2 V regulator POR/PDR/PVD/BOR Xtal oscillators 32 kHz + 4 ~26 MHz		320-Kbyte SRAM 80-byte backup registers 512-byte OTP							
Internal RC oscillators 32 kHz + 16 MHz	Arm <sup>®</sup> Cortex <sup>®</sup> -M4 CPU 100 MHz	Connectivity							
PLL Clock control		4x I <sup>2</sup> C (SMBus/PMBus) 4x USART, 6x UART LIN, smartcard, IrDA,	STM32 Nucleo						
RTC/AWU SysTick timer 2x watchdogs	Floating point unit (FPU)	modem control 5x SPI or 5x I <sup>2</sup> S (2x FD / 3x HD)	NUCLEO-F410RB NUCLEO-F411RE NUCLEO-F412ZG						
(independent and window)	Nested vector interrupt controller (NVIC)	SDIO USB 2.0 OTG FS (LPM)	NUCLEO-F413ZH www.st.com/stm32nucleo						
Up to 114 I/Os Cyclic redundancy check (CRC)	JTAG/SW debug/ETM Memory Protection Unit	Dual Quad-SPI 3x CAN 2.0B	Discovery kits						
96-bit unique ID	(MPU)	FMC 16-bit (NOR only)							
	AHB-Lite bus matrix APB bus	1x DFSDM 4 ch / 2 filters 1x DFSDM 8 ch / 4 filters + Beamforming enhanced 1x SAI							
Control 10x 16-bit timer 2x 16-bit motor control	16-channel DMA with Enhanced Batch Acquisition Mode (BAM+)	(Serial audio interface)							
PWM synchronized AC timer	True random number generator (TRNG)	Analog 1x 12-bit ADC 2.4 MSPS	STM32F411E-DISCO						
2x 32-bit timer 1x LP timer	Encryption	12 channels / 0.41 μs 2x DAC	STM32F411E-DISCO STM32F412G-DISCO STM32F413H-DISCO www.st.com/stm32f4-discover						
	AES (128-/256-bit)	Temperature sensor	www.st.com/stm5214-discover						

# **SOFTWARE TOOLS**

In addition to the wide set of partners and Arm<sup>®</sup> 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.



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**HARDWARE TOOLS** 

www.st.com/stm32cube

## **STM32F4 ACCESS LINES**

Arm ° Cortex '-M4 (DSP + FPU) – Up to 180 MHz	•	ART Accelerator™ SDIO USART, SPI, I <sup>2</sup> C	Product lines	FCPU (MHz)	Flash (Kbytes)	RAM (KB)	RUN cur - rent (µA/MHz)	STOP cur - rent (µA)	Small pac- kage (mm)	FSMC (NOR/PS - RAM/LCD	OSPI	DFSDM	CAN 2.0B	DAC	TRNG	DMA Batch Acquisition Mode	USB 2.0 0TG FS
	•	I <sup>2</sup> S + audio PLL 16 and 32-bit timers	STM32F401	84	128 to 512	up to 96	Down to 128	Down to 10	Down to 3x3								•
	ľ	12-bit ADC (0.41 µs) True Random Number	STM32F410	100	64 to 128	32	Down to 89	Down to 6	Down to 2.553x 2.579					•	•	BAM	-
		Generator Batch Acquisition Mode	STM32F411	100	256 to 512	128	Down to 100	Down to 12	Down to 3.034x 3.22							BAM	•
	•	Low voltage 1.7 to 3.6 V	STM32F412	100	512 to 1024	256	Down to 112	Down to 18	Down to 3.653x 3.651	•	•	•	•		•	BAM	• +LPM <sup>1</sup>
	•	Temperature: -40 °C to 125 °C	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

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



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