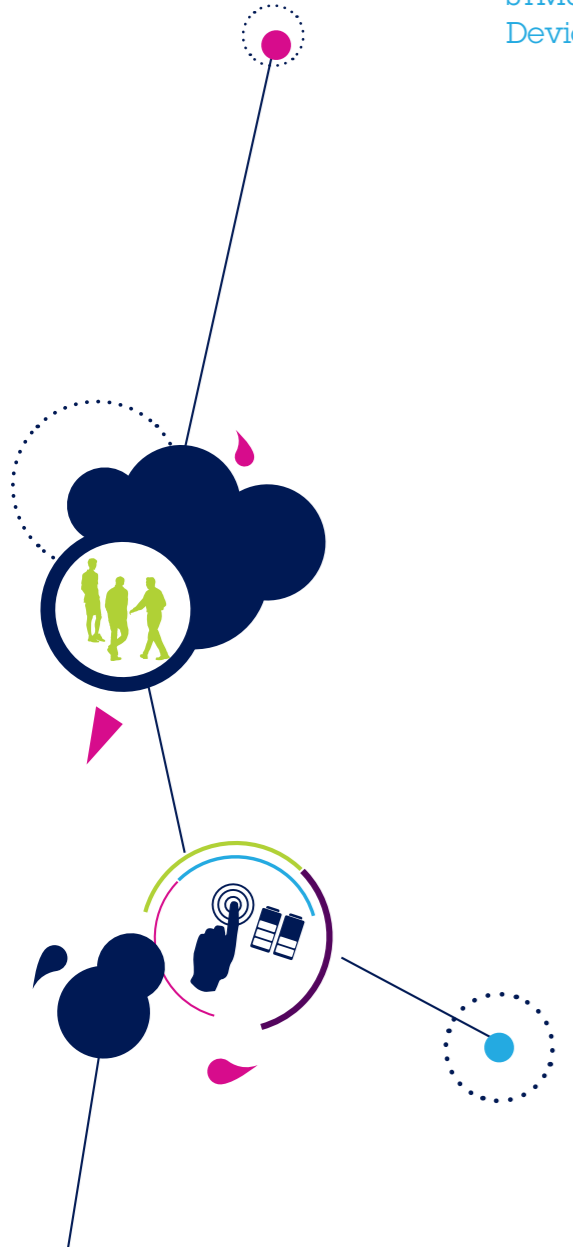


# STM32 F4 series Cortex™-M4 MCUs Releasing your creativity



- STM32 F4 series ..... 3
- Key applications ..... 3
- Block diagram ..... 4
- Features and benefits ..... 4
- High performance ..... 6
- STM32 Dynamic Efficiency™ ..... 7
- Hardware tools ..... 8
- Software solutions ..... 10
- C/C++ development ..... 10
- BEYOND C/C++ DEVELOPMENT ..... 11
- STM32 F4 Product lines ..... 12
- STM32 F4 portofolio ..... 14
- Device summary ..... 16



## 32-bit Flash MCU, up to 180 MHz/225 DMIPS, with DSP instructions, floating point unit and advanced peripherals

ST is extending its range of target applications with the STM32 F4 series. Based on the Cortex™-M4 core, this series opens the door to the digital signal controller (DSC) market. This extension to our STM32 product portfolio offers devices that are pin-to-pin and software compatible with the STM32 F2 series, but with more performance, DSP capability, a floating point unit, more SRAM, and peripheral improvements such as a TFT LCD controller with graphics acceleration, SDRAM, serial audio interface, less than 1 µA RTC and 2.4 MSPS ADCs. The ARM® Cortex-M4 core features built-in single-cycle multiply-accumulate (MAC) instructions, optimized SIMD and saturated arithmetic instructions.

The adaptive real-time ART Accelerator™ combined with ST's 90 nm technology provides linear performance up to 180 MHz, unleashing the full performance of the core. The Chrom-ART Accelerator™ offers twice as much performance for graphics content creation and handling. The STM32 F4 series now provides products offering the best balance between performance (105 DMIPS), following STM32 Dynamic Efficiency™ guiding principle to achieve as low as 128 µA/MHz in Run mode, 9 µA typ in Stop mode, and offering high integration with packages as small as 3 x 3 mm package. These features expand the number of addressable applications in the industrial, consumer and healthcare segments.

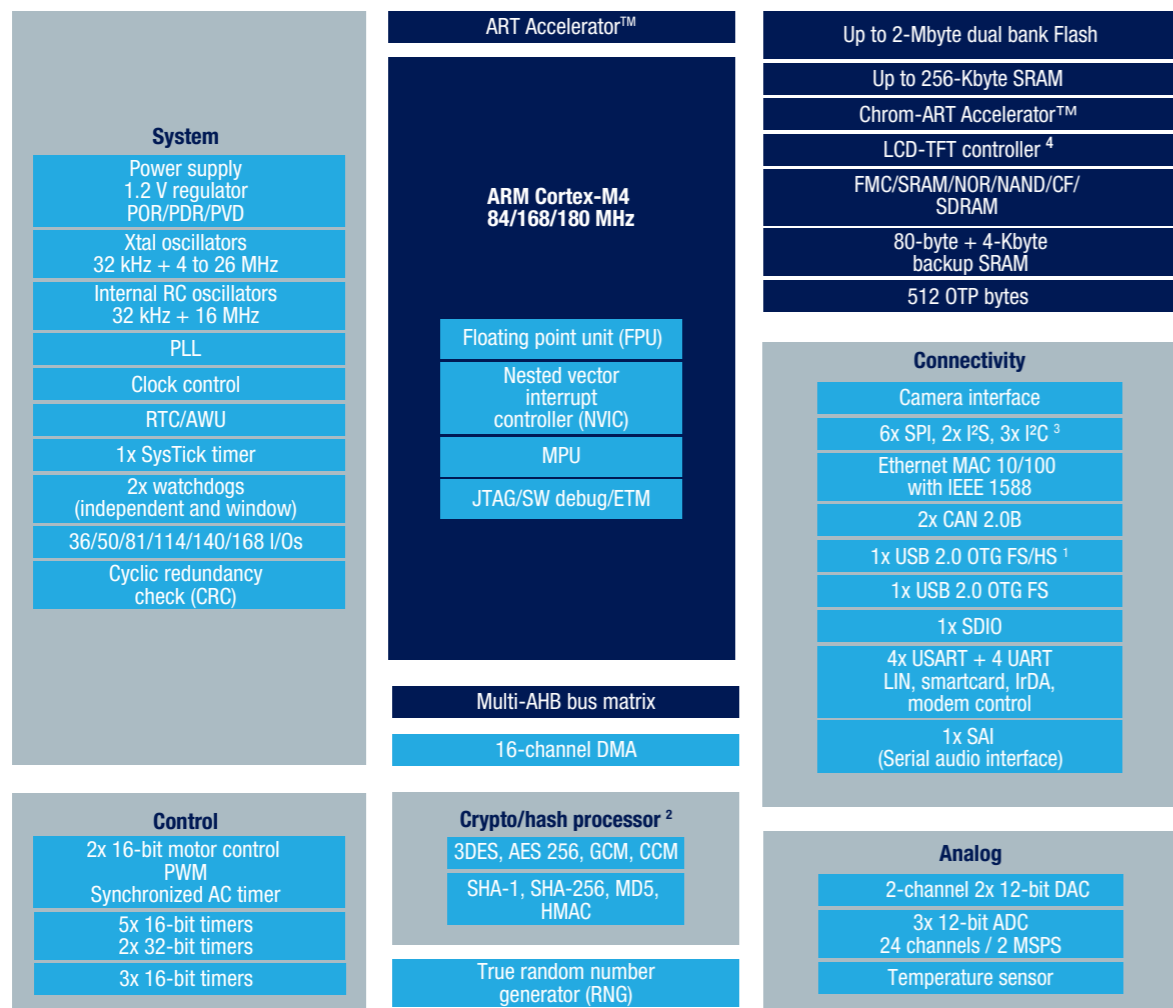
The STM32 F4 series includes devices with 128 Kbytes to 2 Mbytes of on-chip Flash memory, and up to 256 Kbytes of SRAM, and 20 communication interfaces.

WLCSP (down to 3 x 3mm), UFQFPN48, LQFP64, LQFP100, LQFP144, LQFP176, UFBGA100, UFBGA169, UFBGA176, LQFP208, TFBGA64, TFBGA216 packages are available.

### KEY APPLICATIONS

- Industrial and medical
  - Control panels with LCD screens for alarm systems, high-end meters, factory automation
  - Medical: respiratory equipment, patient monitors
  - EPOS: scanners, cash registers, tax machines, vending machines, printers
  - Industrial AC servos, general-purpose inverters, solar inverters and robots
  - Surveillance cameras
- Consumer
  - HMI for appliances
  - DAB, car radios and infotainment
  - Home audio, switch boxes, headsets
  - Sensor hubs for mobile devices

**BLOCK DIAGRAM**



- Notes:
- HS requires an external PHY connected to the ULPI interface
  - Crypto/hash processor on STM32F415, STM32F417, STM32F437 and STM32F439 only
  - With digital filter feature, up to 1 Mbit/s
  - For STM32F4x9 only

**FEATURES AND BENEFITS**

Features	Benefits
<p><b>High performance</b></p> <ul style="list-style-type: none"> <li>Up to 180 MHz/225 DMIPS Cortex-M4 with single cycle DSP MAC and floating point unit</li> <li>CoreMark score: 608 at 180 MHz</li> <li>CoreMark/MHz: 3.37</li> </ul>	<ul style="list-style-type: none"> <li>Boosted execution of control algorithms</li> <li>More features for your applications</li> <li>Ease of use</li> <li>Better code efficiency</li> <li>Faster time to market</li> <li>Elimination of scaling and saturation</li> <li>Easier support for meta-language tools</li> </ul>
<p><b>Maximum integration</b></p> <p>Up to 2 Mbytes of on-chip dual bank Flash memory, up to 256 Kbytes of SRAM, reset circuit, internal RCs, PLLs, ultra-small packages (WLCSP)</p>	<ul style="list-style-type: none"> <li>Read while write operations support</li> <li>More features in space constrained applications</li> <li>Use of high-level languages: Java, .Net</li> </ul>

**FEATURES AND BENEFITS**

Features	Benefits
<p><b>Designed for high performance and ultra-fast data transfers</b></p> <ul style="list-style-type: none"> <li>ART Accelerator™: memory accelerator</li> <li>Chrom-ART Accelerator™: graphics accelerator (rectangle filling, rectangle copy with pixel format conversion and blending)</li> <li>32-bit, 7-layer AHB bus matrix with up to 10 masters and 8 slaves including 3 blocks of SRAM</li> <li>Multi DMA controllers: 2 general-purpose, 1 for USB HS, one for Ethernet</li> <li>One 4th SRAM block dedicated to the core</li> <li>Flexible memory interface with SDRAM support: up to 90 MHz, 32-bit parallel</li> </ul>	<ul style="list-style-type: none"> <li>Performance equivalent to zero-wait execution from Flash</li> <li>Graphics content is created twice as fast and independently from the CPU</li> <li>Concurrent execution and data transfer</li> <li>Simplified resource allocation</li> <li>High bandwidth for external memories</li> <li>Cost-effective external RAM</li> </ul>
<p><b>Outstanding power efficiency</b></p> <ul style="list-style-type: none"> <li>Ultra-low dynamic power in Run mode: 128 uA/MHz at 84 MHz (STM32F401), 260 uA/MHz at 180 MHz (STM32F429/439) running CoreMark benchmark from Flash memory (peripherals off)</li> <li>RTC &lt;1 uA typ in V<sub>BAT</sub> mode</li> <li>Down to 9 uA typ (STM32F401) 100 uA typ (STM32F429/439) in Stop mode</li> <li>3.6 V down to 1.7 V<sup>1</sup> V<sub>DD</sub></li> <li>1.2 V voltage regulator with power scaling capability</li> </ul>	<ul style="list-style-type: none"> <li>Extra flexibility to reduce power consumption for applications requiring both high-processing and low-power performance when running at low voltage or on a rechargeable battery</li> </ul>
<p><b>Superior and innovative peripherals and connectivity</b></p> <ul style="list-style-type: none"> <li>Connectivity: camera interface, crypto/hash HW processor with AES GCM and CCM support, and SHA-256</li> <li>Ethernet MAC10/100 with IEEE 1588 v2 support, 2 USB OTG (one with HS support)</li> <li>Up to 20 communication interfaces (including 4x USART + 4x UART, 6x SPI, 3x I<sup>2</sup>C with digital filter, 2x CAN, SDIO)</li> <li>USART at 11.25 Mbit/s; SPI at 45 Mbit/s</li> <li>Audio: dedicated audio PLL, 2x I<sup>2</sup>S and 1x SAI with TDM<sup>2</sup> support</li> <li>LCD TFT controller</li> <li>Up to XGA (1024x768)</li> <li>Up to 24-bit RGB parallel pixel output</li> <li>2-layer support with blending</li> <li>Analog: 2x 12-bit DACs, 3x 12-bit ADCs reaching 7.2 MSPS in interleaved mode</li> <li>Up to 17 timers: 16 and 32 bits running up to 180 MHz</li> </ul>	<ul style="list-style-type: none"> <li>New possibilities to connect and communicate high-speed data</li> <li>High-quality multi-channel audio support</li> <li>Support for cost-effective standard displays</li> <li>More precision thanks to high resolution</li> </ul>
<p><b>High integration</b></p> <ul style="list-style-type: none"> <li>WLCSP49 3 x 3 mm (STM32F401, 256-Kbyte Flash/64-Kbyte SRAM), WLCSP90 4 x 4.2 mm (STM32F405/F415, 1-Mbyte Flash/192-Kbyte SRAM), WLCSP143 4.5 x 5.5 mm (STM32F429/439, 2-Mbyte Flash/256-Kbyte SRAM)</li> </ul>	<ul style="list-style-type: none"> <li>Smaller board space allowing for smaller applications</li> </ul>
<p><b>Extensive tools and software solutions</b></p> <ul style="list-style-type: none"> <li>Hardware sector protection with execute only access</li> <li>Various IDE, starter kits, libraries, RTOS and stacks, either open source or provided by ST or 3rd parties, including the ARM CMSIS DSP library optimized for Cortex-M4 instructions</li> </ul>	<ul style="list-style-type: none"> <li>Software IP protection</li> <li>A wide choice within the STM32 ecosystem to develop your applications</li> </ul>

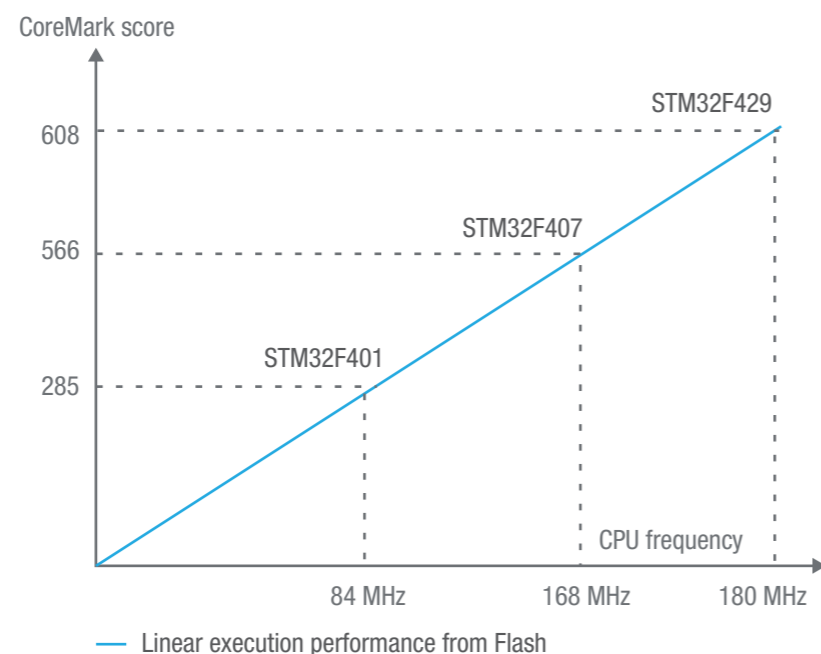
- Note:
- Except LQFP64 and LQFP100 packages
  - TDM: time division multiplex

## HIGH PERFORMANCE

### ART Accelerator performance

Unleashing the full performance of the core beyond the embedded Flash's intrinsic speed is an art. Combined with ST's 90 nm technology, our ART Accelerator™ achieves a linear performance up to 180 MHz, offering 225 DMIPS and 608 CoreMark performance executing from Flash. The acceleration mechanism is made possible using a prefetch queue, a branch cache and a smart arbitration mechanism.

- MCUs using less advanced accelerators or slower embedded Flash memories impact execution performance as wait states occur.
- MCUs using faster Flash but no branch cache acceleration to achieve performance usually show higher power consumption as a result of more accesses to a power-hungry Flash.



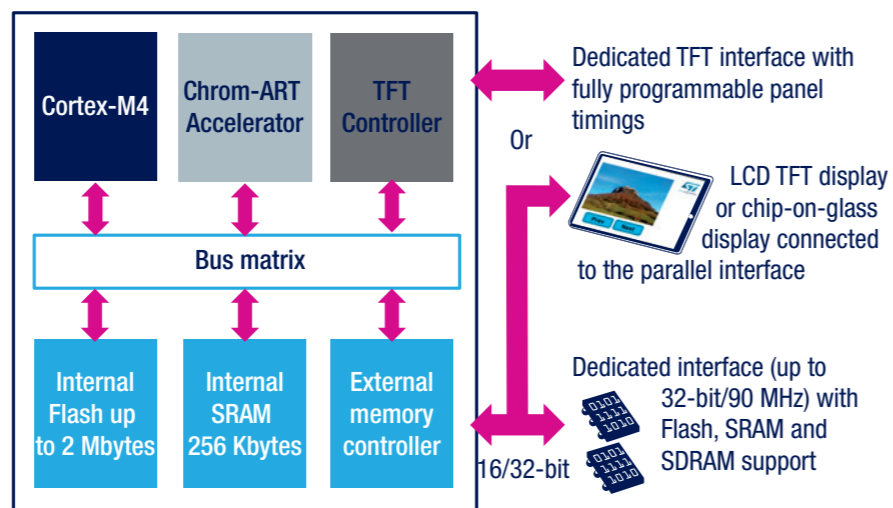
6

### Richer graphics and animations with ST Chrom-ART Accelerator

The ST Chrom-ART™ Accelerator efficiently handles the repetitive and heavy graphics content creation operations. Raw data copies, image blending and pixel format conversion are processed by the Chrom-ART™ Accelerator independently from the CPU and twice more efficiently. STM32F429 MCUs combine an LCD-TFT controller with the external memory interface supporting static and SDRAM memories, inside a high-performance system architecture allowing maximum data throughput to support resolutions up to XGA (1024 x 768) with up to 20 frames/s motion rate while keeping CPU and resources available for real-time applications.

Human machine interface implementation example

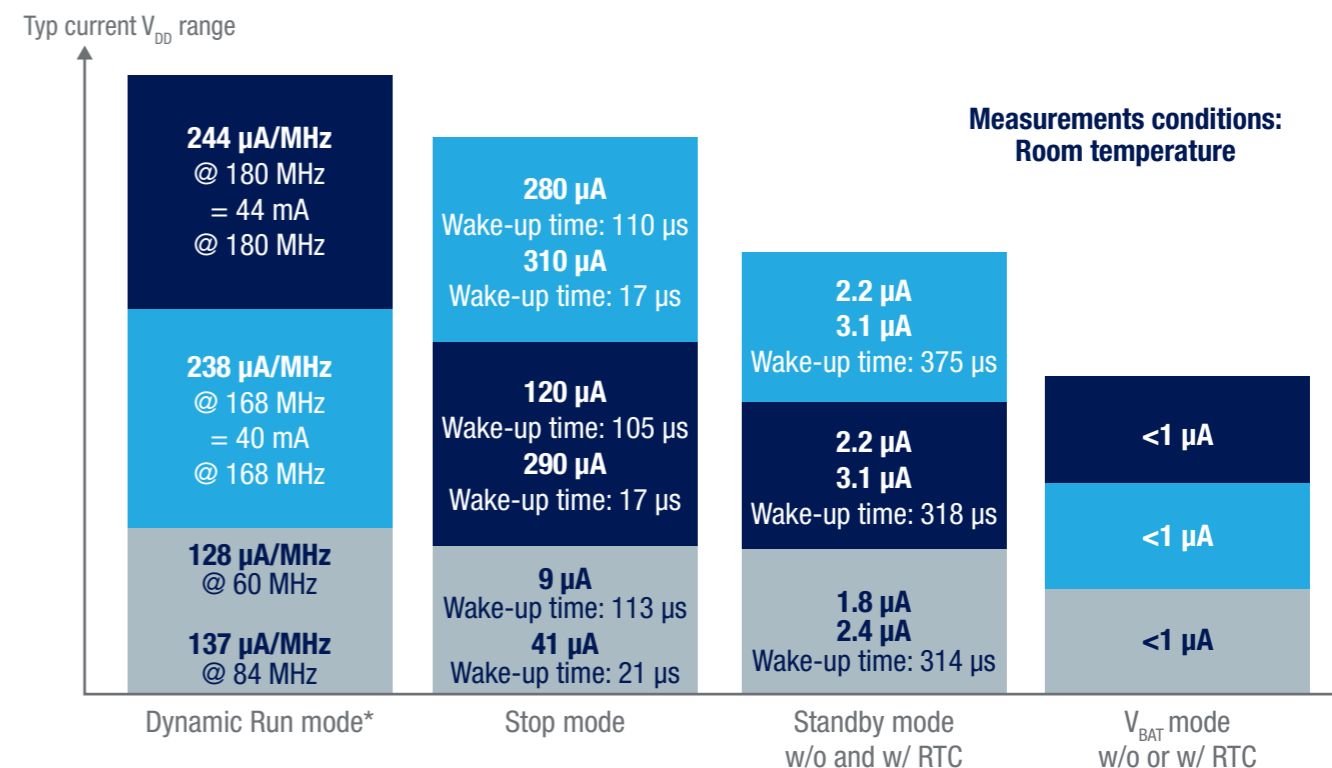
- STM32F427/429 using Chrom-ART Accelerator, internal or external memory for frame buffer and TFT controller for display
  - Up to XGA (1024 x 768)
  - 16-/32-bit external memory interface
  - Recommended packages: LQFP100, LQFP144, LQFP176/BGA176 or LQFP208/BGA216



## STM32 DYNAMIC EFFICIENCY™

### Less dynamic power. More performance.

Technologies featured in STM32F401 follow STM32 Dynamic Efficiency™ guiding principle and include the unique ART Accelerator™, a prefetch queue and branch cache. This allows zero-wait-state execution from Flash which boosts performance to 105 DMIPS (285 CoreMark) at 84 MHz and helps achieve RUN current down to 128µA/MHz. In addition, 90nm process technology boosts performance and reduces dynamic power, while dynamic voltage scaling optimizes the operating voltage to meet performance demands and minimize leakage. Stop mode current is only 9µA at 1.8V.



■ STM32F427/437 and STM32F429/439 ■ STM32F405/415 and STM32F407/417 ■ STM32F401

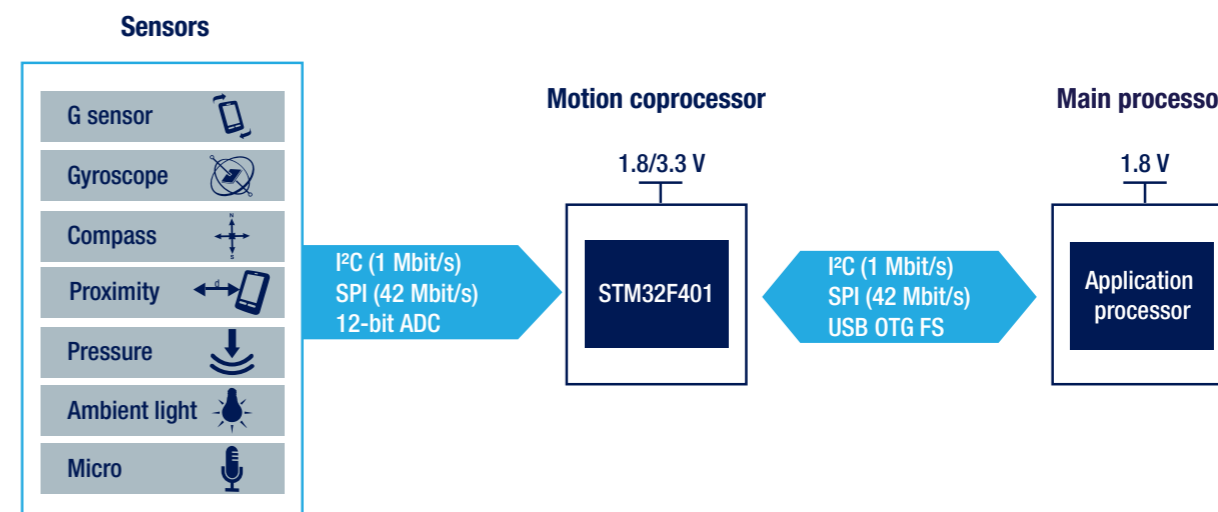
Notes:  
\* Run mode conditions: CoreMark executed from Flash, peripherals off

7

## HIGH INTEGRATION

Many consumer and industrial applications are seeking smaller form factors to offer more portability and freedom to the end consumer. Thanks to ST's 90 nm process and best-in-class design strategies, the STM32 F4 series is available in packages as small as 3 x 3 mm with rich connectivity and features sets.

### STM32F401 as sensor hub in medical, industrial and consumer applications







# Hardware tools

A comprehensive choice of hardware tools helps you benefit from the STM32 F4's wide set of features.

- STM32 F4 Discovery kits are user-friendly demo boards available at affordable prices. Various versions are proposed with specific sets of companion devices (such as MEMS audio microphones, LCD displays, MEMS sensors) and software examples to facilitate evaluation. All include the following:  
ST-LINK/V2 in-circuit debugger/programmer so that you can directly program STM32 F4 microcontrollers with your own applications. More details at: [www.st.com/stm32discovery](http://www.st.com/stm32discovery)  
Associated expansion boards are proposed adding Ethernet, IEEE 802.11b/g/n Wi-Fi, 1.3 Mpixel CMOS camera. More details at: [www.st.com/stm32evaltools](http://www.st.com/stm32evaltools)



STM32F429I-DISCO



STM32F401C-DISCO



STM32F4-DISCOVERY

- STM32 F4 evaluation boards are premium development platforms implementing the full range of device peripherals. Several form factors are proposed with a large set of resources such as up to 2-Mbyte Flash, up to 32-Mbyte SDRAM, up to 5.7 inch LCD display. All provide a large range of extensions, a ST-LINK/V2 in-circuit debugger/programmer, as well as a comprehensive free software library (image browser, audio player). You will find more details by typing "STM32 eval" in an ST website search.



STM3241G-EVAL

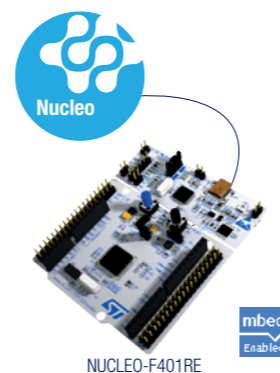


STM32429I-EVAL1



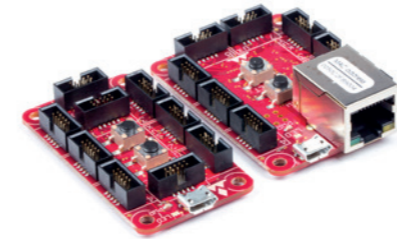
STM32439I-EVAL2

- ST's new Nucleo boards propose open platforms with unified extension capability at budget costs. Arduino™ connectivity support and full access to all device peripherals make it easy to expand the functionality of the STM32F401 Nucleo board with a wide choice of specialized shields. Besides, the STM32F401 Nucleo is mbed-enabled, so you can benefit from instant access to online IDE at [mbed.org](http://mbed.org) (nothing to install). Get the full benefits of your STM32F401 Nucleo in just a few minutes. More details at: [www.st.com/stm32nucleo](http://www.st.com/stm32nucleo)



NUCLEO-F401RE

- Complementary STM32 F4 board solutions from ST partners include:
  - IAR Experiment! (magnetometer, game controller) and KickStart kits, Keil Starter kit, as well as the Raisonance EvoPrimer platform
  - STM32F4 Java evaluation kit made in collaboration with IS2T
  - Mountaineer Microsoft .NET Micro Framework platform



STM3240G-ETH/NMF and  
STM3240G-ETH/NMF



STM3240G-SK/IAR



STM3240G-SK/KEI



STM3242I-SK/IAR



STM32F4DIS-BB; STM32F4DIS-CAM; STM32F4DIS-LCD  
and STM32F4DIS-WIFI

STM32 F4 microcontrollers can be programmed using classic C/C++, but also with some other means such as Java or Matlab/Simulink. ST's partners provide a large offer around the STM32 F4, from software tools to embedded software solutions.

## C/C++ DEVELOPMENT

STM32 F4 microcontrollers are supported by a wide choice of integrated development environments from partners. These include project managers, editors, debuggers, optimizing C/C++ compilers, flash loaders and example projects, as well as full collections of embedded software libraries.

### Software development tools

- IAR Embedded Workbench EWARM IDE
- Keil MDK-ARM uVision IDE
- GCC-based IDEs

### Embedded software

- Alpwise, with their Bluetooth stack solutions
  - FreeRTOS, the open-source real-time operating system
  - Micrium  $\mu$ C collection, with for instance  $\mu$ C/TCP-IP internet stack
  - Express Logic, with for instance the TheadX real-time operating system
  - HCC, with for instance with the USB libraries
- More information at <http://www.st.com/stm32-stm8-firmware>

ST complements these offers from partners with some unique software, dedicated to STM32 development.

- STM32Cube™: free from ST, simplifies and speeds up developers' work, by allowing them focus on their added value by offering an easy and fast way to configure the microcontroller. It is composed of 2 main elements: software on the PC and a complete set of embedded software bricks.
  - STM32CubeMX: a software tool on the PC, providing an easy step-by-step approach to configure the STM32 via wizards (pinout conflict handling, clock and peripheral configuration, power consumption, and more), and generating initialization C code depending on user choices, including project files for user's favorite development environment.
  - STM32CubeF4: a set of generic bricks for the STM32 F4, ensuring easy portability towards other STM32 series. Comes with full peripheral coverage, production-ready drivers and a set of middleware (USB, TCP/IP, graphics from partnership around Segger emWin, RTOS, file system, and more) and hundreds of examples. The user can

therefore focus on the added value for the application and forget about implementation details. License terms are highly permissive, with the driver layer being fully open source. More on STM32Cube at [www.st.com/stm32cube](http://www.st.com/stm32cube)



- STM32 F4 applications are fine-tuned with STM Studio, a free graphical tool to monitor and display variables at run time. Connected to the STM32 F4 via a standard design probe, STM Studio reads variables on-the-fly while the application is running (non-intrusive). Various graphics views are available to meet your needs. More details at: [www.st.com/stm-studio](http://www.st.com/stm-studio)

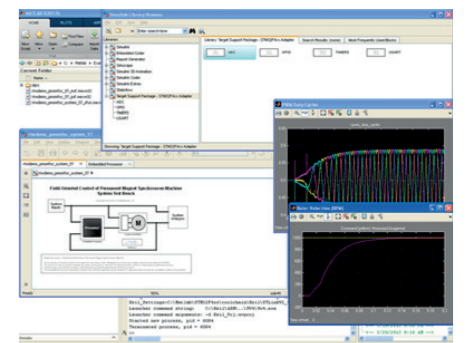
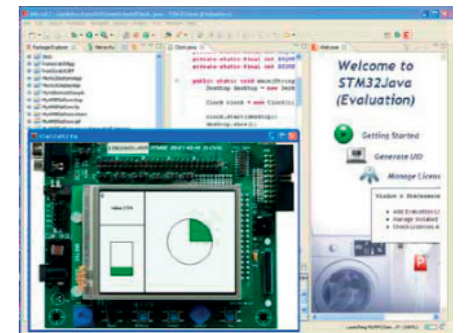
### Application-specific bricks:

- STM32 audio solutions: Full range of audio software bricks, optimized for the STM32 F4:
  - Adapted transport layers, such as USB synchronization, Bluetooth profiles, and more
  - Music codecs: MP3, WMA, AAC-LC, HE-AACv1, HE-AACv2, OGG Vorbis, SBC, and more
  - Speech codecs: Speex, G726, G711, G729, G722, and more
  - Post-processing algorithms such as sample rate converters, filters (enabling a graphical equalizer, loudness, bass mix, and more), stereo widening, smart volume control (digital volume control with no saturation), and more. Coming with a PC tool to help user fine-tuning.
- Smartphone accessory libraries, such as iAP (iPod application protocol) interface or Android interfacing
- Contact your sales office for information on availability for specific STM32 part numbers.
- STM32 industrial protocols: Full range of supported industrial protocols, including Profinet, EtherCAT, Modbus, DeviceNet, CANopen, and more, via our partner network, making the most of the STM32 F4 with, in particular, its IEEE 1588 feature for synchronized nodes
- STM32 cryptographic library: Implementation of cryptographic algorithms, using STM32F41x or STM32F43x hardware acceleration when available, or 100% implemented by software for the others, but with same API.



## BEYOND C/C++ DEVELOPMENT

- STM32 Java development environment ([www.st.com/stm32-java](http://www.st.com/stm32-java)) featuring:
  - Full development environment, Eclipse-based, and including a simulator
  - Java Virtual Machine and mechanisms to call legacy C code
  - Specific user interface pack, allowing users to develop GUI in Java while benefiting from STM32 hardware acceleration when available (Chrom-ART) .
- NET Micro Framework enabling the use of Microsoft Visual Studio for STM32 development
- Matlab/Simulink integration with peripheral modelization - can be used together with Matlab 2013b that generates a code-based Cortex-M DSP library (download available for free from [www.st.com/stm32-mat-target](http://www.st.com/stm32-mat-target))





# STM32 F4 Product lines

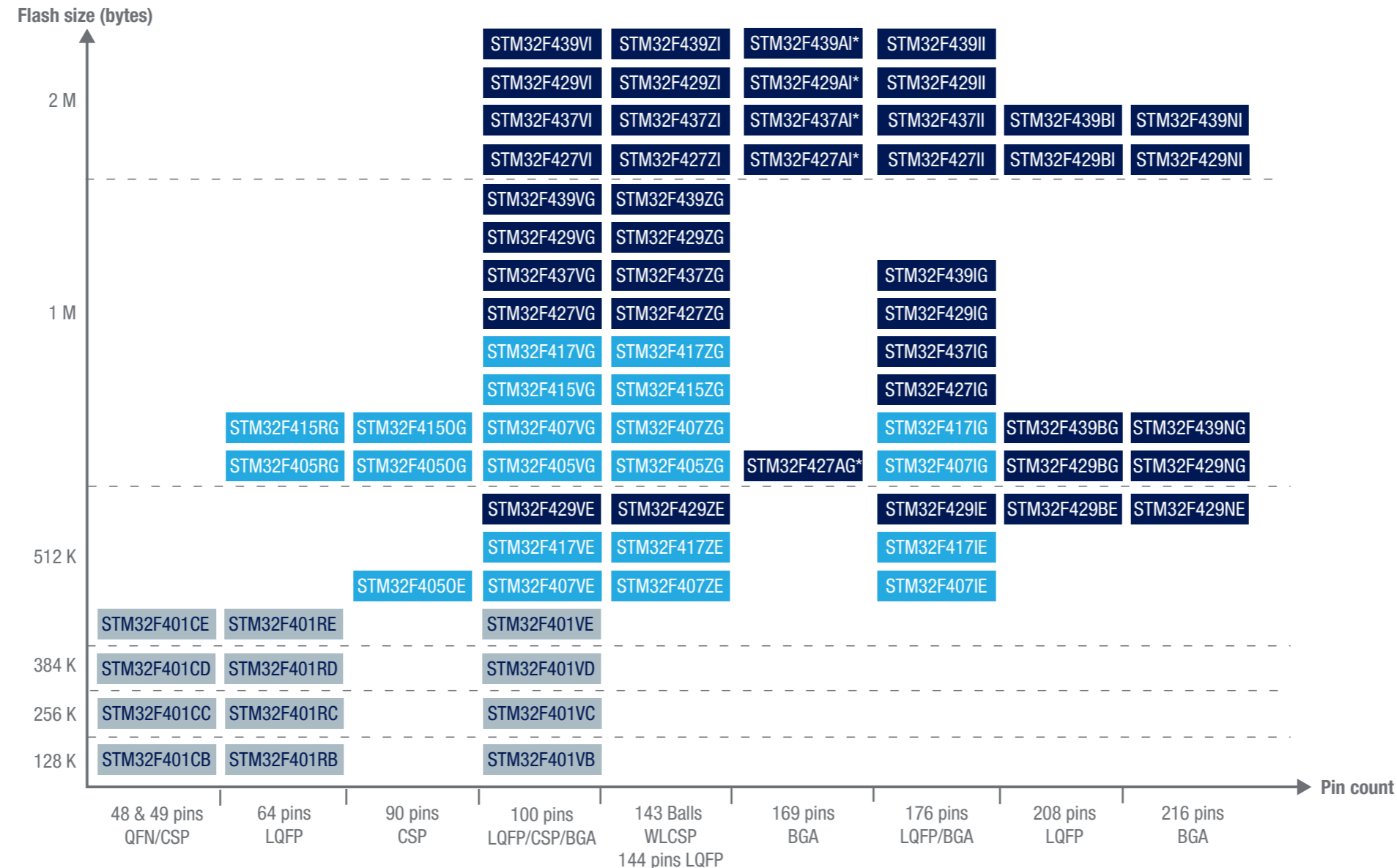
Main common features	STM32F429/439									
	<ul style="list-style-type: none"> <li>Cortex™-M4 (DSP + FPU)</li> <li>Up to 2x USB 2.0 OTG FS/HS</li> <li>SDIO</li> <li>USART, SPI, I<sup>2</sup>C</li> <li>I<sup>2</sup>S + audio PLL</li> <li>16- and 32-bit timers</li> <li>Up to 3x 12-bit ADC (0.41 μs)</li> <li>Low voltage 1.7<sup>1</sup> to 3.6 V</li> </ul>	180 MHz	Crypto /hash <sup>2</sup> RNG	2x 12-bit DAC	Ethernet IEEE 1588 2x CAN Camera I/F	SDRAM interface FMC	Serial audio interface (SAI)	Chrom-ART Accelerator	TFT LCD controller	
		STM32F427/437								
		180 MHz	Crypto /hash <sup>2</sup> RNG	2x 12-bit DAC	Ethernet IEEE 1588 2x CAN Camera I/F	SDRAM interface FMC	Serial audio interface (SAI)	Chrom-ART Accelerator		
		STM32F407/417								
		168 MHz	Crypto /hash <sup>2</sup> RNG	2x 12-bit DAC	Ethernet IEEE 1588 2x CAN Camera I/F					
STM32F405/415										
168 MHz	Crypto /hash <sup>2</sup> RNG	2x 12-bit DAC								
STM32F401										
84 MHz										
128- to 512-KB Flash										
96-KB SRAM										
								<ul style="list-style-type: none"> <li>STM32 Dynamic Efficiency™:</li> <li>Run mode down to 128 μA/MHz</li> <li>Stop mode down to 9 μA typ</li> <li>Small form factor: down to 3 x 3 mm</li> </ul>		

Notes:  
 1. 1.7 V min on specific packages  
 2. Hardware crypto/hash on F415/417 and F437/439 only





# STM32 F4 portofolio



Note:  
\* Available in July 2014



## STM32 F4 SERIES - ARM CORTEX™-M4 HIGH-PERFORMANCE MCUS WITH DSP AND FPU

Part number	Flash size (Kbytes)	Internal RAM size (Kbytes)	Package	Timer functions		12-bit		I/Os	Serial interface							Supply voltage (V)	Supply current (I <sub>cc</sub> )		
				16-/32-bit timers	Others	ADC	DAC		SPI	SAI	I <sup>2</sup> S	I <sup>2</sup> C	USART + UART <sup>4</sup>	USB OTG	CAN 2.0B		SDIO	Ethernet MAC10/100	Lowest power mode (μA)
<b>STM32F401 line: USB OTG (FS), low power (9 μA typ. in Stop mode) - 84 MHz CPU</b>																			
STM32F401CB	128	64	WLCSP49 UFQFPN48	6/2		10		36	3		2	3	3	1			1.7 <sup>3</sup> to 3.6	1.8	128
STM32F401RB	128	64	LQFP64	6/2		16		50	3		2	3	3	1	1		1.7 <sup>3</sup> to 3.6	1.8	128
STM32F401VB	128	64	LQFP100 UFBGA100	6/2		16		81	4		2	3	3	1	1		1.7 <sup>3</sup> to 3.6	1.8	128
STM32F401CC	256	64	WLCSP49 UFQFPN48	6/2		10		36	3		2	3	3	1			1.7 <sup>3</sup> to 3.6	1.8	128
STM32F401RC	256	64	LQFP64	6/2		16		50	3		2	3	3	1	1		1.7 <sup>3</sup> to 3.6	1.8	128
STM32F401VC	256	64	LQFP100 UFBGA100	6/2	2x WDG, RTC, 24-bit down counter	16		81	4		2	3	3	1	1		1.7 <sup>3</sup> to 3.6	1.8	128
STM32F401CD	384	96	WLCSP49 UFQFPN48	6/2		10		36	3		2	3	3	1			1.7 <sup>3</sup> to 3.6	1.8	137
STM32F401RD	384	96	LQFP64	6/2		16		50	3		2	3	3	1	1		1.7 <sup>3</sup> to 3.6	1.8	137
STM32F401VD	384	96	LQFP100 UFBGA100	6/2		16		81	4		2	3	3	1	1		1.7 <sup>3</sup> to 3.6	1.8	137
STM32F401CE	512	96	WLCSP49 UFQFPN48	6/2		10		36	3		2	3	3	1			1.7 <sup>3</sup> to 3.6	1.8	137
STM32F401RE	512	96	LQFP64	6/2		16		50	3		2	3	3	1	1		1.7 <sup>3</sup> to 3.6	1.8	137
STM32F401VE	512	96	LQFP100 UFBGA100	6/2		16		81	4		2	3	3	1	1		1.7 <sup>3</sup> to 3.6	1.8	137
<b>STM32F405/415 line: USB OTG (FS/HS<sup>1</sup>), crypto/hash processor<sup>2</sup> - 168 MHz CPU</b>																			
STM32F4050E	512	192	WLCSP90	12/2		13	2	72	3		2	3	4+2	2	2	1	1.7 <sup>3</sup> to 3.6	2.5	238
STM32F4050G	1024	192	WLCSP90	12/2		13	2	72	3		2	3	4+2	2	2	1	1.7 <sup>3</sup> to 3.6	2.5	238
STM32F4150G <sup>2</sup>	1024	192	WLCSP90	12/2		13	2	72	3		2	3	4+2	2	2	1	1.7 <sup>3</sup> to 3.6	2.5	238
STM32F405RG	1024	192	LQFP64	12/2		16	2	51	3		2	3	4+2	2	2	1	1.8 to 3.6	2.5	238
STM32F415RG <sup>2</sup>	1024	192	LQFP64	12/2	2x WDG, RTC, 24-bit down counter	16	2	51	3		2	3	4+2	2	2	1	1.8 to 3.6	2.5	238
STM32F405VG	1024	192	LQFP100	12/2		16	2	82	3		2	3	4+2	2	2	1	1.8 to 3.6	2.5	238
STM32F415VG <sup>2</sup>	1024	192	LQFP100	12/2		16	2	82	3		2	3	4+2	2	2	1	1.8 to 3.6	2.5	238
STM32F405ZG	1024	192	LQFP144	12/2		24	2	114	3		2	3	4+2	2	2	1	1.7 <sup>3</sup> to 3.6	2.5	238
STM32F415ZG <sup>2</sup>	1024	192	LQFP144	12/2		24	2	114	3		2	3	4+2	2	2	1	1.7 <sup>3</sup> to 3.6	2.5	238

## STM32 F4 SERIES - ARM CORTEX™-M4 HIGH-PERFORMANCE MCUS WITH DSP AND FPU

Part number	Flash size (Kbytes)	Internal RAM size (Kbytes)	Package	Timer functions		12-bit		I/Os	Serial interface							Supply voltage (V)	Supply current (I <sub>cc</sub> )			
				16-/32-bit timers	Others	ADC	DAC		SPI	SAI	I <sup>2</sup> S	I <sup>2</sup> C	USART + UART <sup>4</sup>	USB OTG	CAN 2.0B		SDIO	Ethernet MAC10/100	Lowest power mode (μA)	Run mode (per MHz) (μA)
<b>STM32F407/417 line: 2x USB OTG (FS/HS<sup>1</sup>), camera IF, crypto/hash processor<sup>2</sup> - 168 MHz CPU</b>																				
STM32F407IE	512	192	UFBGA176 LQFP176	12/2		24	2	140	3		2	3	4+2	2	2	1	Yes	1.7 <sup>3</sup> to 3.6	2.5	238
STM32F417IE <sup>2</sup>	512	192	UFBGA176 LQFP176	12/2		24	2	140	3		2	3	4+2	2	2	1	Yes	1.7 <sup>3</sup> to 3.6	2.5	238
STM32F407VE	512	192	LQFP100	12/2		16	2	82	3		2	3	4+2	2	2	1	Yes	1.8 to 3.6	2.5	238
STM32F417VE <sup>2</sup>	512	192	LQFP100	12/2		16	2	82	3		2	3	4+2	2	2	1	Yes	1.8 to 3.6	2.5	238
STM32F407ZE	512	192	LQFP144	12/2		24	2	114	3		2	3	4+2	2	2	1	Yes	1.7 <sup>3</sup> to 3.6	2.5	238
STM32F417ZE <sup>2</sup>	512	192	LQFP144	12/2	2x WDG, RTC, 24-bit down counter	24	2	114	3		2	3	4+2	2	2	1	Yes	1.7 <sup>3</sup> to 3.6	2.5	238
STM32F407IG	1024	192	UFBGA176 LQFP176	12/2		24	2	140	3		2	3	4+2	2	2	1	Yes	1.7 <sup>3</sup> to 3.6	2.5	238
STM32F417IG <sup>2</sup>	1024	192	UFBGA176 LQFP176	12/2		24	2	140	3		2	3	4+2	2	2	1	Yes	1.7 <sup>3</sup> to 3.6	2.5	238
STM32F407VG	1024	192	LQFP100	12/2		16	2	82	3		2	3	4+2	2	2	1	Yes	1.8 to 3.6	2.5	238
STM32F417VG <sup>2</sup>	1024	192	LQFP100	12/2		16	2	82	3		2	3	4+2	2	2	1	Yes	1.8 to 3.6	2.5	238
STM32F407ZG	1024	192	LQFP144	12/2		24	2	114	3		2	3	4+2	2	2	1	Yes	1.7 <sup>3</sup> to 3.6	2.5	238
STM32F417ZG <sup>2</sup>	1024	192	LQFP144	12/2		24	2	114	3		2	3	4+2	2	2	1	Yes	1.7 <sup>3</sup> to 3.6	2.5	238
<b>STM32F427/437 line: 2x USB OTG (FS/HS<sup>1</sup>), camera IF, crypto/hash processor<sup>2</sup>, SDRAM interface, dual-bank Flash - 180 MHz CPU</b>																				
STM32F427AG <sup>5</sup>	1024	256	UFBGA169	12/2		24	2	140	6	1	2	3	4+4	2	2	1	Yes	1.7 <sup>3</sup> to 3.6	2.5	260
STM32F427IG	1024	256	UFBGA176 LQFP176	12/2		24	2	140	6	1	2	3	4+4	2	2	1	Yes	1.7 <sup>3</sup> to 3.6	2.5	260
STM32F427VG	1024	256	LQFP100	12/2		16	2	82	6	1	2	3	4+4	2	2	1	Yes	1.8 to 3.6	2.5	260
STM32F427ZG	1024	256	LQFP144	12/2		24	2	114	6	1	2	3	4+4	2	2	1	Yes	1.7 <sup>3</sup> to 3.6	2.5	260
STM32F437IG <sup>2</sup>	1024	256	UFBGA176 LQFP176	12/2		24	2	140	6	1	2	3	4+4	2	2	1	Yes	1.7 <sup>3</sup> to 3.6	2.5	260
STM32F437VG <sup>2</sup>	1024	256	LQFP100	12/2	2x WDG, RTC, 24-bit down counter	16	2	82	6	1	2	3	4+4	2	2	1	Yes	1.8 to 3.6	2.5	260
STM32F437ZG <sup>2</sup>	1024	256	LQFP144	12/2		24	2	114	6	1	2	3	4+4	2	2	1	Yes	1.7 <sup>3</sup> to 3.6	2.5	260
STM32F427AI <sup>5</sup>	2048	256	UFBGA169	12/2		24	2	140	6	1	2	3	4+4	2	2	1	Yes	1.7 <sup>3</sup> to 3.6	2.5	260
STM32F427II	2048	256	UFBGA176 LQFP176	12/2		24	2	140	6	1	2	3	4+4	2	2	1	Yes	1.7 <sup>3</sup> to 3.6	2.5	260
STM32F427VI	2048	256	LQFP100	12/2		16	2	82	6	1	2	3	4+4	2	2	1	Yes	1.8 to 3.6	2.5	260
STM32F427ZI	2048	256	LQFP144	12/2		24	2	114	6	1	2	3	4+4	2	2	1	Yes	1.7 <sup>3</sup> to 3.6	2.5	260
STM32F437AI <sup>5</sup>	2048	256	UFBGA169	12/2		24	2	140	6	1	2	3	4+4	2	2	1	Yes	1.7 <sup>3</sup> to 3.6	2.5	260

STM32 F4 SERIES - ARM CORTEX™-M4 HIGH-PERFORMANCE MCUS WITH DSP AND FPU

Part number	Flash size (Kbytes)	Internal RAM size (Kbytes)	Package	Timer functions		12-bit		I/Os	Serial interface							Supply voltage (V)	Supply current (Icc)			
				16-/32-bit timers	Others	ADC	DAC		SPI	SAI	I <sup>2</sup> S	I <sup>2</sup> C	USART + UART <sup>4</sup>	USB OTG	CAN 2.0B		SDIO	Ethernet MAC10/100	Lowest power mode (µA)	Run mode (per MHz) (µA)
STM32F437II <sup>2</sup>	2048	256	UFBGA176 LQFP176	12/2	2x WDG, RTC, 24-bit down counter	24	2	140	6	1	2	3	4+4	2	2	1	Yes	1.7 <sup>3</sup> to 3.6	2.5	260
STM32F437VI <sup>2</sup>	2048	256	LQFP100	12/2		16	2	82	6	1	2	3	4+4	2	2	1	Yes	1.8 to 3.6	2.5	260
STM32F437ZI <sup>2</sup>	2048	256	LQFP144	12/2		24	2	114	6	1	2	3	4+4	2	2	1	Yes	1.7 <sup>3</sup> to 3.6	2.5	260
STM32F429/439 line: Same as STM32F427/437 line + TFT LCD controller - 180 MHz CPU																				
STM32F429BE	512	256	LQFP208	12/2	2x WDG, RTC, 24-bit down counter	16	2	168	6	1	2	3	4+4	2	2	1	Yes	1.7 <sup>3</sup> to 3.6	2.5	260
STM32F429IE	512	256	UFBGA176 LQFP176	12/2		16	2	140	6	1	2	3	4+4	2	2	1	Yes	1.7 <sup>3</sup> to 3.6	2.5	260
STM32F429NE	512	256	TFBGA216	12/2		16	2	168	6	1	2	3	4+4	2	2	1	Yes	1.7 <sup>3</sup> to 3.6	2.5	260
STM32F429VE	512	256	LQFP100	12/2		16	2	82	6	1	2	3	4+4	2	2	1	Yes	1.8 to 3.6	2.5	260
STM32F429ZE	512	256	LQFP144	12/2		16	2	114	6	1	2	3	4+4	2	2	1	Yes	1.7 <sup>3</sup> to 3.6	2.5	260
STM32F429BG	1024	256	LQFP208	12/2		24	2	168	6	1	2	3	4+4	2	2	1	Yes	1.7 <sup>3</sup> to 3.6	2.5	260
STM32F429IG	1024	256	UFBGA176 LQFP176	12/2		24	2	140	6	1	2	3	4+4	2	2	1	Yes	1.7 <sup>3</sup> to 3.6	2.5	260
STM32F429NG	1024	256	TFBGA216	12/2		24	2	168	6	1	2	3	4+4	2	2	1	Yes	1.7 <sup>3</sup> to 3.6	2.5	260
STM32F429VG	1024	256	LQFP100	12/2		16	2	82	6	1	2	3	4+4	2	2	1	Yes	1.8 to 3.6	2.5	260
STM32F429ZG	1024	256	LQFP144 WLCSP143	12/2		24	2	114	6	1	2	3	4+4	2	2	1	Yes	1.7 <sup>3</sup> to 3.6	2.5	260
STM32F439BG <sup>2</sup>	1024	256	LQFP208	12/2		24	2	168	6	1	2	3	4+4	2	2	1	Yes	1.7 <sup>3</sup> to 3.6	2.5	260
STM32F439IG <sup>2</sup>	1024	256	UFBGA176 LQFP176	12/2		24	2	140	6	1	2	3	4+4	2	2	1	Yes	1.7 <sup>3</sup> to 3.6	2.5	260
STM32F439NG <sup>2</sup>	1024	256	TFBGA216	12/2		24	2	168	6	1	2	3	4+4	2	2	1	Yes	1.7 <sup>3</sup> to 3.6	2.5	260
STM32F439VG <sup>2</sup>	1024	256	LQFP100	12/2		16	2	82	6	1	2	3	4+4	2	2	1	Yes	1.8 to 3.6	2.5	260
STM32F439ZG <sup>2</sup>	1024	256	LQFP144 WLCSP143	12/2		24	2	114	6	1	2	3	4+4	2	2	1	Yes	1.7 <sup>3</sup> to 3.6	2.5	260
STM32F429AI <sup>5</sup>	2048	256	UFBGA169	12/2		24	2	140	6	1	2	3	4+4	2	2	1	Yes	1.7 <sup>3</sup> to 3.6	2.5	260
STM32F429BI	2048	256	LQFP208	12/2		24	2	168	6	1	2	3	4+4	2	2	1	Yes	1.7 <sup>3</sup> to 3.6	2.5	260
STM32F429II <sup>2</sup>	2048	256	UFBGA176 LQFP176	12/2		24	2	140	6	1	2	3	4+4	2	2	1	Yes	1.7 <sup>3</sup> to 3.6	2.5	260
STM32F429NI	2048	256	TFBGA216	12/2		24	2	168	6	1	2	3	4+4	2	2	1	Yes	1.7 <sup>3</sup> to 3.6	2.5	260
STM32F429VI	2048	256	LQFP100	12/2		16	2	82	6	1	2	3	4+4	2	2	1	Yes	1.8 to 3.6	2.5	260
STM32F429ZI	2048	256	LQFP144 WLCSP143	12/2	24	2	114	6	1	2	3	4+4	2	2	1	Yes	1.7 <sup>3</sup> to 3.6	2.5	260	
STM32F439AI <sup>5</sup>	2048	256	UFBGA169	12/2	24	2	140	6	1	2	3	4+4	2	2	1	Yes	1.7 <sup>3</sup> to 3.6	2.5	260	
STM32F439BI <sup>2</sup>	2048	256	LQFP208	12/2	24	2	168	6	1	2	3	4+4	2	2	1	Yes	1.7 <sup>3</sup> to 3.6	2.5	260	

STM32 F4 SERIES - ARM CORTEX™-M4 HIGH-PERFORMANCE MCUS WITH DSP AND FPU

Part number	Flash size (Kbytes)	Internal RAM size (Kbytes)	Package	Timer functions		12-bit		I/Os	Serial interface							Supply voltage (V)	Supply current (Icc)			
				16-/32-bit timers	Others	ADC	DAC		SPI	SAI	I <sup>2</sup> S	I <sup>2</sup> C	USART + UART <sup>4</sup>	USB OTG	CAN 2.0B		SDIO	Ethernet MAC10/100	Lowest power mode (µA)	Run mode (per MHz) (µA)
STM32F439II <sup>2</sup>	2048	256	UFBGA176 LQFP176	12/2	2x WDG, RTC, 24-bit down counter	24	2	140	6	1	2	3	4+4	2	2	1	Yes	1.7 <sup>3</sup> to 3.6	2.5	260
STM32F439NI <sup>2</sup>	2048	256	TFBGA216	12/2		24	2	168	6	1	2	3	4+4	2	2	1	Yes	1.7 <sup>3</sup> to 3.6	2.5	260
STM32F439VI <sup>2</sup>	2048	256	LQFP100	12/2		16	2	82	6	1	2	3	4+4	2	2	1	Yes	1.8 to 3.6	2.5	260
STM32F439ZI <sup>2</sup>	2048	256	LQFP144 WLCSP143	12/2		24	2	114	6	1	2	3	4+4	2	2	1	Yes	1.7 <sup>3</sup> to 3.6	2.5	260
						24	2	114	6	1	2	3	4+4	2	2	1	Yes	1.7 <sup>3</sup> to 3.6	2.5	260

Notes: Operating temperature: -40 to 85 °C for WLCSP packages and -40 to 105 °C for all other packages

1. HS requires an external PHY connected to ULPi interface

2. Crypto/hash processor on STM32F417, STM32F415, STM32F437, STM32F439

3. 1.7 V requires external reset circuitry and the device operates in the 0 to 70 °C temperature range

4. Marked in the table (3+2) means 3 USART and 2 UART. All UARTs have LIN master/slave function. All USARTs have IrDA, ISO 7816, modem control and LIN master/slave functions

5. Available in July 2014

# life.augmented



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