STM32 F2 series
High-performance Cortex-M3 MCUs

STM32 Releasing your **creativity**

STM32 F2

STMicroelectronics

32-bit Flash microcontrollers, 120 MHz/150 DMIPS
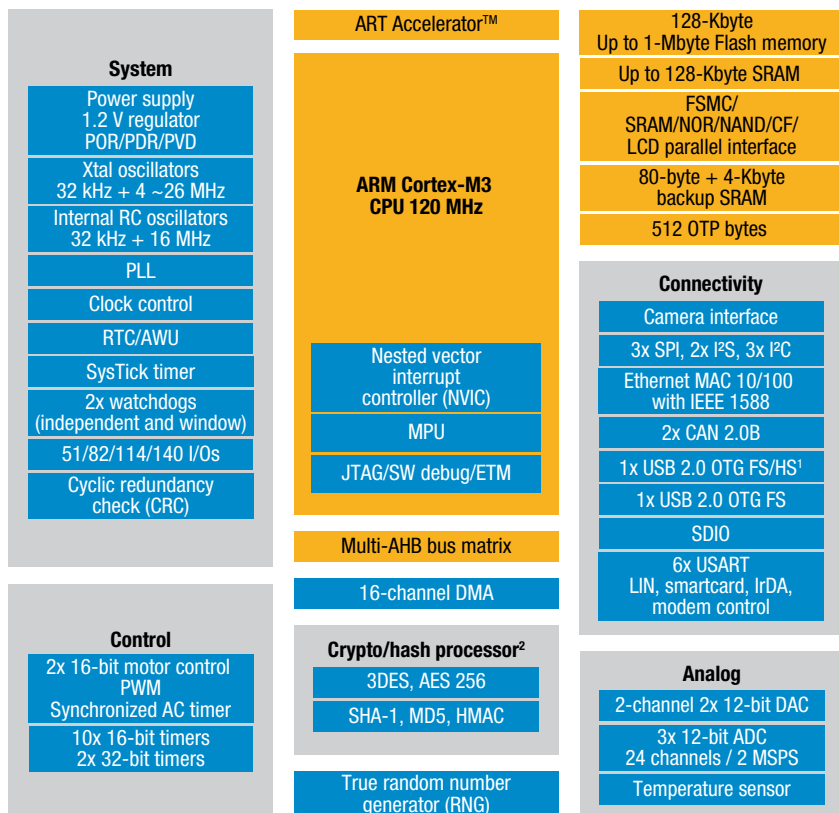with ART Accelerator™ and advanced peripherals

STM32 F2 series

The STM32 F2 series complements our STM32 product portfolio by offering devices with close pin-to-pin compatibility, with more performance, more Flash and SRAM memories, and advanced peripherals such as a camera interface, crypto/hash processor, full/high speed USB-OTG, Ethernet, CAN, and external memory interface. These expand the number of addressable applications in the industrial, consumer, and medical segments.

Based on Cortex™-M3 running at 120 MHz, the STM32 F2 series allows a performance equivalent to zero-wait execution from Flash using the adaptive real-time ART Accelerator™ technology.

The STM32 F2 series includes devices with 128 Kbytes to 1 Mbyte of on-chip Flash memory, 64 Kbytes to 128 Kbytes of SRAM, and 15 communication interfaces.

LQFP64, LQFP100, LQFP144, WLCSP64 (< 4 x 4 mm), UFBGA176 and LQFP176 packages are available.

STM32 F2 block diagram

System
- Power supply 1.2 V regulator POR/PDR/PVD
- Xtal oscillators 32 kHz + 4 ~26 MHz
- Internal RC oscillators 32 kHz + 16 MHz
- PLL
- Clock control
- RTC/AWU
- SysTick timer
- 2x watchdogs (independent and window)
- 51/82/114/140 I/Os
- Cyclic redundancy check (CRC)

Control
- 2x 16-bit motor control PWM Synchronized AC timer
- 10x 16-bit timers 2x 32-bit timers

ART Accelerator™

ARM Cortex-M3 CPU 120 MHz
- Nested vector interrupt controller (NVIC)
- MPU
- JTAG/SW debug/ETM

Multi-AHB bus matrix

16-channel DMA

Crypto/hash processor[2]
- 3DES, AES 256
- SHA-1, MD5, HMAC

True random number generator (RNG)

128-Kbyte Up to 1-Mbyte Flash memory

Up to 128-Kbyte SRAM

FSMC/ SRAM/NOR/NAND/CF/ LCD parallel interface

80-byte + 4-Kbyte backup SRAM

512 OTP bytes

Connectivity
- Camera interface
- 3x SPI, 2x I²S, 3x I²C
- Ethernet MAC 10/100 with IEEE 1588
- 2x CAN 2.0B
- 1x USB 2.0 OTG FS/HS[1]
- 1x USB 2.0 OTG FS
- SDIO
- 6x USART LIN, smartcard, IrDA, modem control

Analog
- 2-channel 2x 12-bit DAC
- 3x 12-bit ADC 24 channels / 2 MSPS
- Temperature sensor

Applications
- Industrial
  - PLC
  - Inverters
  - Power meters
  - Printers, scanners
  - Industrial networking
- Building and security
  - Alarm systems
  - Access control
  - HVAC
- Medical
  - High-end glucose meters
  - Power meters
  - Battery-operated applications
- Appliances
  - Motor drive
  - Application control
- Consumer
  - PC peripherals, gaming
  - Digital cameras, GPS platforms
  - Home audio

Notes:
1. HS requires an external PHY connected to the ULPI interface
2. Crypto/hash processor on STM32F217 and STM32F215

STM32 F2 series product lines

Common core peripherals and architecture:

6x USART, 3x SPI, 3x I²C
2x CAN
Multiple 16-bit and 32-bit timers
2x advanced timers
Dual DAC
FSMC
2x I²S
MPU
ETM with JTAG fuse security
Main 4-26 MHz oscillator
Internal 16 MHz and 32 kHz RC oscillators
Real-time clock
4-Kbyte battery backed up SRAM
2x watchdogs
Reset circuitry
Up to 16-channel DMA
80 % GPIO ratio, up to 60 MHz
3x 12-bit ADC (2 MSPS)
Temperature sensor
1.7[3] to 3.6 V V_{DD}

+

STM32F207/217

120 MHz CPU	Up to 128-Kbyte SRAM	Up to 1-Mbyte Flash	2x USB 2.0 OTG FS/HS[1]	USB 2.0 OTG FS	Camera interface	SDIO	RNG	Crypto/ hash processor[2]	Ethernet IEEE 1588

STM32F205/215

120 MHz CPU	Up to 128-Kbyte SRAM	Up to 1-Mbyte Flash	1x USB 2.0 OTG FS/HS[1]	SDIO	RNG	Crypto/ hash processor[2]

Notes:
1. HS requires an external PHY connected to ULPI interface
2. Crypto/hash processor on STM32F217 and STM32F215
3. 1.7 V for WLCSP64 package only and 1.8 V for all other packages

Abbreviations:
FSMC: Flexible static memory controller
RNG: Random number generator

STM32 F2 series portfolio

Flash size (bytes)

	64 pins WLCSP*/LQFP	100 pins LQFP	144 pins LQFP	176 pins UFBGA/LQFP
1 M	STM32F215RG / STM32F205RG	STM32F217VG / STM32F207VG / STM32F215VG / STM32F205VG	STM32F217ZG / STM32F207ZG / STM32F215ZG / STM32F205ZG	STM32F217IG / STM32F207IG
768 K	STM32F205RF	STM32F207VF / STM32F205VF	STM32F207ZF / STM32F205ZF	STM32F207IF
512 K	STM32F215RE / STM32F205RE	STM32F217VE / STM32F207VE / STM32F215VE / STM32F205VE	STM32F217ZE / STM32F207ZE / STM32F215ZE / STM32F205ZE	STM32F217IE / STM32F207IE
256 K	STM32F205RC	STM32F207VC / STM32F205VC	STM32F207ZC / STM32F205ZC	STM32F207IC
128 K	STM32F205RB	STM32F205VB		

Pin count

Note:
* STM32F205RG and STM32F205RE only

Legend:
- STM32F207 — Ethernet, 2x USB OTG, camera interface
- STM32F217 — Ethernet, 2x USB OTG, camera interface, crypto/hash processor
- STM32F205 — 1x USB OTG FS/HS
- STM32F215 — 1x USB OTG FS/HS, crypto/hash processor

STM32 F2 key features

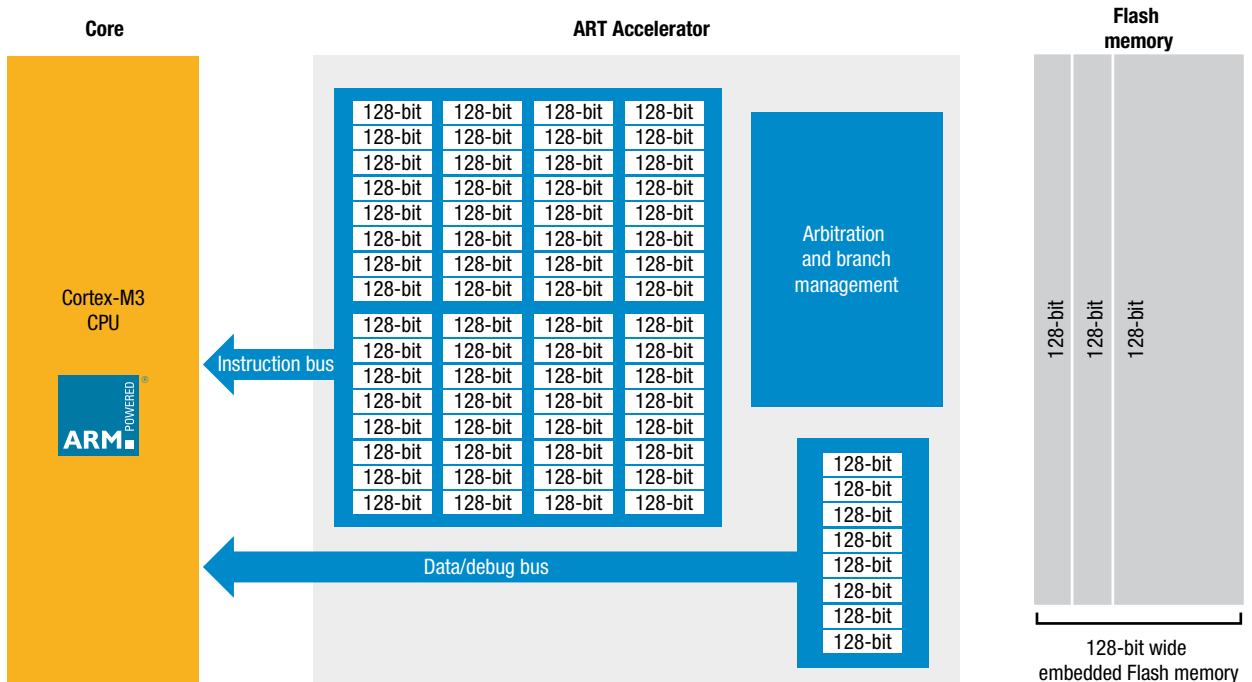| Real-time performance	Outstanding power efficiency	Superior and innovative peripherals	Maximum integration	Extensive tools and software
Cortex — Intelligent Processors by ARM + ART Accelerator, Multi-AHB bus matrix, Excellent real-time 120 MHz/150 DMIPS zero-wait state execution performance from Flash	RTC in V_{BAT} mode, ultra-low dynamic power consumption 1.7 to 3.6 V V_{DD}	USB-OTG High Speed, camera interface, Ethernet, CAN, crypto/hash processor, external memory interface	1-Mbyte Flash, 128-Kbyte SRAM, 512 OTP bytes, 4-Kbyte backup SRAM, reset circuitry, voltage regulator, internal RC oscillator, PLL	Various IDE starter kits, libraries, RTOS and stacks

STM32 F2 series, over 50 part numbers, a new addition to the STM32 platform now counting over 250 compatible devices

Unleashing the full performance of the core beyond the embedded Flash speed is an art.

Real-time performance

To free the full performance of the Cortex-M3 core, ST has developed a leading-edge 90 nm process and a unique technology, the adaptive real-time ART Accelerator™. The ART Accelerator uses an advanced prefetch queue and branch cache to offer a performance equivalent to zero-wait execution from embedded Flash memory.

Core — ART Accelerator — Flash memory

Cortex-M3 CPU — ARM POWERED — Instruction bus — Data/debug bus

Arbitration and branch management

128-bit wide embedded Flash memory

Combined with ST's 90 nm technology, the ART Accelerator achieves a linear performance up to 120 MHz, offering 150 DMIPS and 254 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 will 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.
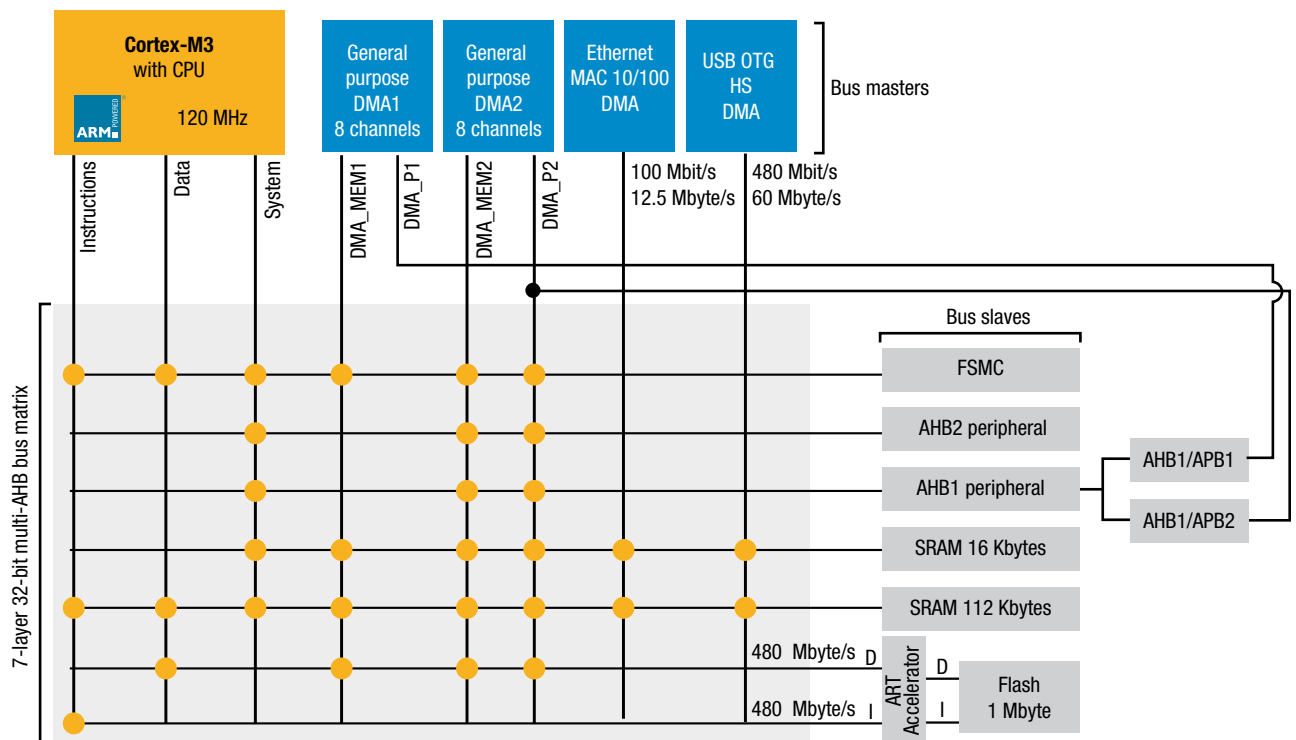
ART Accelerator™ performance result
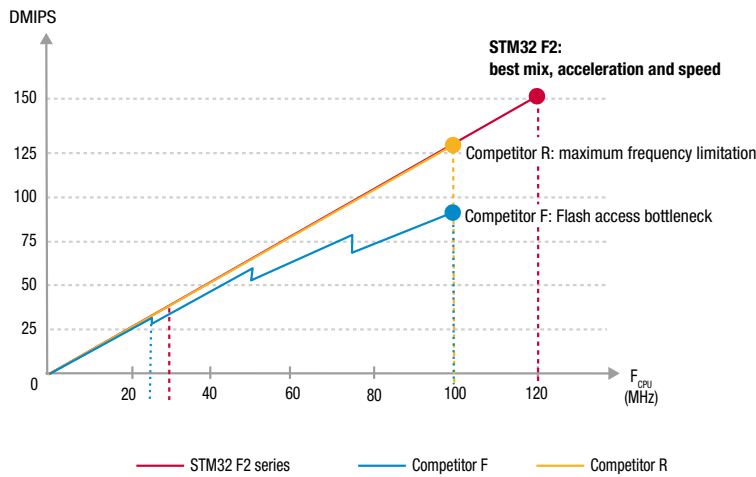
The 32-bit multi-AHB bus matrix allows concurrent execution and data transfers. It interconnects all masters and slaves and ensures seamless and efficient operation even when several high-speed peripherals are working simultaneously.

For example, the following may all be performed at the same time.

- The core accesses the Flash and 112-Kbyte SRAM block through the ART Accelerator
- The DMA2 controller transfers data from the camera interface located on the AHB2 peripheral bus to an LCD connected to the FSMC
- The USB OTG High Speed interface stores received data in the 16-Kbyte SRAM block

Outstanding power efficiency

188 µA/MHz, 22.5 mA at 120 MHz (executing EEMBC CoreMark V1.0 from Flash memory, with the ART Accelerator enabled and all peripherals off). Who said performance and dynamic power efficiency were incompatible! The key to such power efficiency in Run mode is twofold:

- ST's 90 nm process allowing the CPU core to run at only 1.2 V
- The ART Accelerator reducing the number of accesses to Flash

Further contributing to the outstanding power efficiency:

- Advanced low-power modes and features such as battery back-up with RTC and 4-Kbyte back-up SRAM
- V_{DD} min down to 1.7 V on CSP package

Superior and innovative peripherals

The STM32 F2 series introduces new peripherals to the STM32 platform:

- Ethernet MAC 10/100 with IEEE 1588 v2 hardware support
- USB OTG with high speed support (external PHY required)
- Audio class architecture: I²S and USB peripherals with advanced PLL and data synchronization schemes
- Camera interface, 8- to 14-bit parallel, up to 48 Mbyte/s at 48 MHz
- Flexible static memory interface (FSMC) running at up to 60 MHz to expand memory space or support an LCD
- Crypto/hash processor: 3DES, AES 256/SHA-1, MD5, HMAC
- 3x SPI running at up to 30 Mbit/s, 6x USART running at up to 7.5 Mbit/s
- 3x 12-bit ADC, 2 MSPS and up to 6 MSPS in interleaved mode
- RTC with hardware calendar support
- True random number generator
- Fast GPIO (60 MHz toggling speed)

Maximum integration

The Flash and SRAM memories available in the product can accommodate advanced software stacks and user data, with no need for external memories.

In addition, 512 bytes of OTP memory make it possible to store critical user data such as Ethernet MAC addresses or cryptographic keys.

The reset circuitry and the internal RC oscillators make the STM32 F2 series a cost-optimized solution.

Extensive tools and SW

A complete range of high-end and low-cost tools is available to provide software and hardware development solutions.

ST provides an evaluation board allowing full access to the STM32 F2 series features such as external memories, Ethernet, the two USB OTG connectors, touchscreen TFT display, CMOS camera audio output and exchange audio PLL. The board provides connection to all I/Os and all peripherals available in the chip.

The order codes are: STM3220G-EVAL (board with STM32F207IGH6 chip, no encryption support) and STM3221G-EVAL[1] (board with STM32F217IGH6 chip, encryption support).

For a quick start with the STM32 F2 series, starter kits are available from IAR and Keil, along with an EvoPrimer from Raisonance. Respective order codes are STM3220G-SK/IAR, STM3220G-SK/KEI and STM3220G-PRIMER.
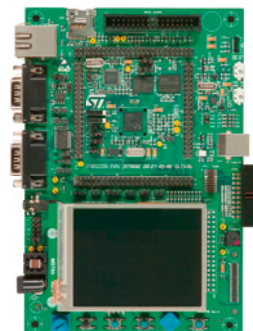
Java for STM32

With the STM32 F2 series, start developing embedded applications in Java. Benefit from the highly-optimized STM32 Java virtual machine to increase software engineering productivity.

Order code: STM3220G-JAVA

Note:
1. Contact your local ST sales office.

Device summary

Part number	Package	Flash size (Kbytes)	Internal RAM size (Kbytes)	Timer functions 16-bit (IC/OC/PWM)	Others	ADC	DAC	I/Os (high current)	Serial interface	Supply voltage (V)	Supply current (I$_{CC}$) Lowest power mode (µA)	Run mode (µA/MHz)	Temperature (°C)
STM32F205/215 – 120 MHz CPU, 1x USB OTG (FS/HS[1]), crypto/hash processor[2]
STM32F205RB	LQFP64 (10x10)	128	64	12x16-bit (24/24/30)		16x12-bit	2x12-bit	51(51)		1.8 to 3.6	2.5	188	-40 to +85 or -40 to +105
STM32F205RC	LQFP64 (10x10)	256	96	12x16-bit (24/24/30)		16x12-bit	2x12-bit	51(51)		1.8 to 3.6	2.5	188	-40 to +85 or -40 to +105
STM32F205RE	LQFP64 (10x10) WLCSP64 (less than 4x4)	512	128	12x16-bit (24/24/30)		16x12-bit	2x12-bit	51(51)		1.7[3]/1.8 to 3.6	2.5	188	-40 to +85 or -40 to +105
STM32F215RE[2]	LQFP64 (10x10)	512	128	12x16-bit (24/24/30)		16x12-bit	2x12-bit	51(51)		1.8 to 3.6	2.5	188	-40 to +85 or -40 to +105
STM32F205RF	LQFP64 (10x10)	768	128	12x16-bit (24/24/30)		16x12-bit	2x12-bit	51(51)		1.8 to 3.6	2.5	188	-40 to +85 or -40 to +105
STM32F205RG	LQFP64 (10x10), WLCSP64 (less than 4x4)	1024	128	12x16-bit (24/24/30)		16x12-bit	2x12-bit	51(51)		1.7[3]/1.8 to 3.6	2.5	188	-40 to +85 or -40 to +105
STM32F215RG[2]	LQFP64 (10x10)	1024	128	12x16-bit (24/24/30)		16x12-bit	2x12-bit	51(51)		1.8 to 3.6	2.5	188	-40 to +85 or -40 to +105
STM32F205VB	LQFP100 (14x14)	128	64	12x16-bit (24/24/30)	2x32-bit timers (8/8/8), 2x WDG, RTC, 24-bit down counter, 2x16-bit basic timers	16x12-bit	2x12-bit	82(82)	3xSPI, 2xI²S, 3xI²C, 3xUSART (IrDa, ISO 7816), 3xUART, 1xUSB OTG FS/HS, 2xCAN, SDIO	1.8 to 3.6	2.5	188	-40 to +85 or -40 to +105
STM32F205VC	LQFP100 (14x14)	256	96	12x16-bit (24/24/30)		16x12-bit	2x12-bit	82(82)		1.8 to 3.6	2.5	188	-40 to +85 or -40 to +105
STM32F205VE	LQFP100 (14x14)	512	128	12x16-bit (24/24/30)		16x12-bit	2x12-bit	82(82)		1.8 to 3.6	2.5	188	-40 to +85 or -40 to +105
STM32F215VE[2]	LQFP100 (14x14)	512	128	12x16-bit (24/24/30)		16x12-bit	2x12-bit	82(82)		1.8 to 3.6	2.5	188	-40 to +85 or -40 to +105
STM32F205VF	LQFP100 (14x14)	768	128	12x16-bit (24/24/30)		16x12-bit	2x12-bit	82(82)		1.8 to 3.6	2.5	188	-40 to +85 or -40 to +105
STM32F205VG	LQFP100 (14x14)	1024	128	12x16-bit (24/24/30)		16x12-bit	2x12-bit	82(82)		1.8 to 3.6	2.5	188	-40 to +85 or -40 to +105
STM32F215VG[2]	LQFP100 (14x14)	1024	128	12x16-bit (24/24/30)		16x12-bit	2x12-bit	82(82)		1.8 to 3.6	2.5	188	-40 to +85 or -40 to +105
STM32F205ZC	LQFP144 (20x20)	256	96	12x16-bit (24/24/30)		16x12-bit	2x12-bit	114(114)		1.8 to 3.6	2.5	188	-40 to +85 or -40 to +105
STM32F205ZE	LQFP144 (20x20)	512	128	12x16-bit (24/24/30)		16x12-bit	2x12-bit	114(114)		1.8 to 3.6	2.5	188	-40 to +85 or -40 to +105
STM32F215ZE[2]	LQFP144 (20x20)	512	128	12x16-bit (24/24/30)		16x12-bit	2x12-bit	114(114)		1.8 to 3.6	2.5	188	-40 to +85 or -40 to +105
STM32F205ZF	LQFP144 (20x20)	768	128	12x16-bit (24/24/30)		16x12-bit	2x12-bit	114(114)		1.8 to 3.6	2.5	188	-40 to +85 or -40 to +105
STM32F205ZG	LQFP144 (20x20)	1024	128	12x16-bit (24/24/30)		16x12-bit	2x12-bit	114(114)		1.8 to 3.6	2.5	188	-40 to +85 or -40 to +105
STM32F215ZG[2]	LQFP144 (20x20)	1024	128	12x16-bit (24/24/30)		16x12-bit	2x12-bit	114(114)		1.8 to 3.6	2.5	188	-40 to +85 or -40 to +105

Device summary

Part number	Package	Flash size (Kbytes)	Internal RAM size (Kbytes)	Timer functions 16-bit (IC/OC/PWM)	Others	ADC	DAC	I/Os (high current)	Serial interface	Supply voltage (V)	Supply current (I_{cc}) Lowest power mode (µA)	Run mode (µA/MHz)	Temperature (°C)
STM32F207/217 – 120 MHz CPU, 2x USB OTG (FS + FS/HS[1]), camera IF, crypto/hash processor[2]													
STM32F207VC	LQFP100 (14x14)	256	128	12x16-bit (24/24/30)		16x12-bit	2x12-bit	82(82)		1.8 to 3.6	2.5	188	-40 to +85 or -40 to +105
STM32F207VE	LQFP100 (14x14)	512	128	12x16-bit (24/24/30)		16x12-bit	2x12-bit	82(82)		1.8 to 3.6	2.5	188	-40 to +85 or -40 to +105
STM32F217VE[2]	LQFP100 (14x14)	512	128	12x16-bit (24/24/30)		16x12-bit	2x12-bit	82(82)		1.8 to 3.6	2.5	188	-40 to +85 or -40 to +105
STM32F207VF	LQFP100 (14x14)	768	128	12x16-bit (24/24/30)		16x12-bit	2x12-bit	82(82)		1.8 to 3.6	2.5	188	-40 to +85 or -40 to +105
STM32F207VG	LQFP100 (14x14)	1024	128	12x16-bit (24/24/30)		16x12-bit	2x12-bit	82(82)		1.8 to 3.6	2.5	188	-40 to +85 or -40 to +105
STM32F217VG[2]	LQFP100 (14x14)	1024	128	12x16-bit (24/24/30)		16x12-bit	2x12-bit	82(82)		1.8 to 3.6	2.5	188	-40 to +85 or -40 to +105
STM32F207ZC	LQFP144 (20x20)	256	128	12x16-bit (24/24/30)		24x12-bit	2x12-bit	114(114)		1.8 to 3.6	2.5	188	-40 to +85 or -40 to +105
STM32F207ZE	LQFP144 (20x20)	512	128	12x16-bit (24/24/30)		24x12-bit	2x12-bit	114(114)		1.8 to 3.6	2.5	188	-40 to +85 or -40 to +105
STM32F217ZE[2]	LQFP144 (20x20)	512	128	12x16-bit (24/24/30)	2x32-bit timers (8/8/8), 2x WDG, RTC, 24-bit down counter, 2x16-bit basic timers	24x12-bit	2x12-bit	114(114)	3xSPI, 2xI²S, 3xI²C, 3xUSART (IrDa, ISO 7816), 3xUART, 2xUSB OTG (FS +FS/HS), 2xCAN, Ethernet MAC10/100, SDIO	1.8 to 3.6	2.5	188	-40 to +85 or -40 to +105
STM32F207ZF	LQFP144 (20x20)	768	128	12x16-bit (24/24/30)		24x12-bit	2x12-bit	114(114)		1.8 to 3.6	2.5	188	-40 to +85 or -40 to +105
STM32F207ZG	LQFP144 (20x20)	1024	128	12x16-bit (24/24/30)		24x12-bit	2x12-bit	114(114)		1.8 to 3.6	2.5	188	-40 to +85 or -40 to +105
STM32F217ZG[2]	LQFP144 (20x20)	1024	128	12x16-bit (24/24/30)		24x12-bit	2x12-bit	114(114)		1.8 to 3.6	2.5	188	-40 to +85 or -40 to +105
STM32F207IC	UFBGA176 (10x10) LQFP176 (24x24)	256	128	12x16-bit (24/24/30)		24x12-bit	2x12-bit	140(140)		1.8 to 3.6	2.5	188	-40 to +85 or -40 to +105
STM32F207IE	UFBGA176 (10x10) LQFP176 (24x24)	512	128	12x16-bit (24/24/30)		24x12-bit	2x12-bit	140(140)		1.8 to 3.6	2.5	188	-40 to +85 or -40 to +105
STM32F217IE[2]	UFBGA176 (10x10) LQFP176 (24x24)	512	128	12x16-bit (24/24/30)		24x12-bit	2x12-bit	140(140)		1.8 to 3.6	2.5	188	-40 to +85 or -40 to +105
STM32F207IF	UFBGA176 (10x10) LQFP176 (24x24)	768	128	12x16-bit (24/24/30)		24x12-bit	2x12-bit	140(140)		1.8 to 3.6	2.5	188	-40 to +85 or -40 to +105
STM32F207IG	UFBGA176 (10x10) LQFP176 (24x24))	1024	128	12x16-bit (24/24/30)		24x12-bit	2x12-bit	140(140)		1.8 to 3.6	2.5	188	-40 to +85 or -40 to +105
STM32F217IG[2]	UFBGA176 (10x10) LQFP176 (24x24)	1024	128	12x16-bit (24/24/30)		24x12-bit	2x12-bit	140(140)		1.8 to 3.6	2.5	188	-40 to +85 or -40 to +105

Notes:
1. HS requires an external PHY connected to ULPI interface
2. Crypto/hash processor on STM32F217 and STM32F215
3. 1.7 V min on WLCSP64 package only, 1.8 V min on other packages

Dedicated part numbers are available to support Java and MP3 software subject to royalties. Please check online for more information