

# STM32 MCU family

32-bit Flash microcontrollers powered by  
ARM® Cortex™-M3



STM32<sup>🦋</sup> Releasing your **creativity**

September 2008

# Welcome to the world of STM32

## Releasing your creativity

The STM32 family of 32-bit Flash microcontrollers is based on the breakthrough ARM Cortex-M3 core – a core specifically developed for embedded applications that require a combination of high-performance, real-time, low-power and low-cost operation. The STM32 family benefits from the Cortex-M3 architectural enhancements (including the Thumb-2® instruction set) that deliver improved performance combined with better code density, and a tightly coupled nested vectored interrupt controller that significantly speeds response to interrupts, all combined with industry-leading power consumption. STMicroelectronics was a lead partner in developing the Cortex-M3 core and is now the first leading MCU supplier to introduce a product family based on the core.

The STM32 family is built to offer new degrees of freedom to MCU users. It offers a complete 32-bit product range that combines high-performance, real-time, low-power and low-voltage operation, while maintaining full integration and ease of development.

It eases migration from the 16-bit world thanks to its high level of features integration, its easy-to-use architecture, its low-power capability and cost-effectiveness.

This new family will enable you to create new applications, and design in the innovations you have been long dreaming about.

### The right core

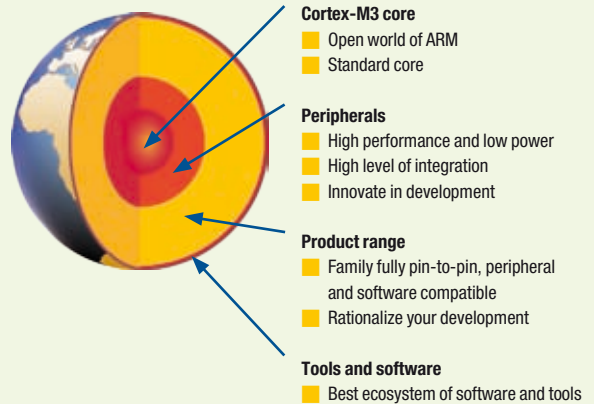
The STM32 is built around the industry-standard ARM 32-bit RISC architecture. The Cortex-M3 is the latest core from ARM.

The Cortex-M3 core targets the microcontroller and embedded markets. The advanced architectural features of the Cortex-M3 processor reduce memory size while delivering industry-leading performance in a small, power-efficient RISC core. It thus provides an ideal platform for the migration of many different applications around the world from legacy devices to the 32-bit microcontroller world.

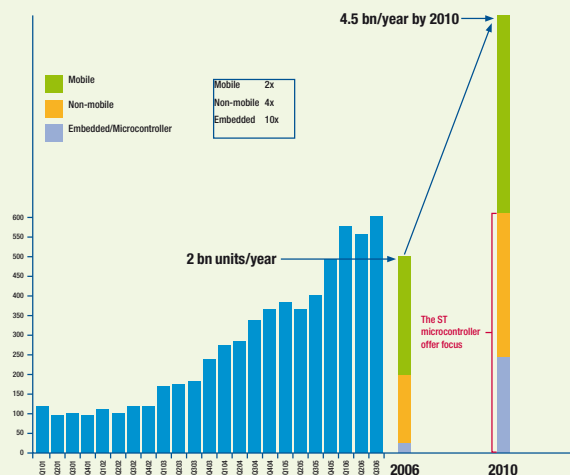


### The right choice

#### The world of STM32



### ARM: driving momentum



### The STM32 family gives you more performance and features without compromising power and cost.

As a result:

1. You access the open world of ARM technology with a standard core and the best ecosystem of software and tools
2. You rationalize your development, because the same family fits many platforms
3. You innovate in your projects with the latest software technology (such as RTOS), and by rethinking your hardware and software partitioning to bring breakthrough improvements in your applications

## The STM32 key benefits

- Leading-edge architecture with the latest Cortex-M3 core from ARM
- Excellent real-time behaviour
- Outstanding power efficiency
- Superior and innovative peripherals
- Maximum integration
- Easy development, fast time to market



## STM32, the optimal platform choice

The STM32 is an optimal choice to support many applications with the same platform:

- From reduced memory and pin requirements to larger needs
- From performance demanding to battery operated
- From simple cost-sensitive to complex high-value

The total pin-to-pin, peripheral and software compatibility across the family gives you full flexibility across 60 devices.

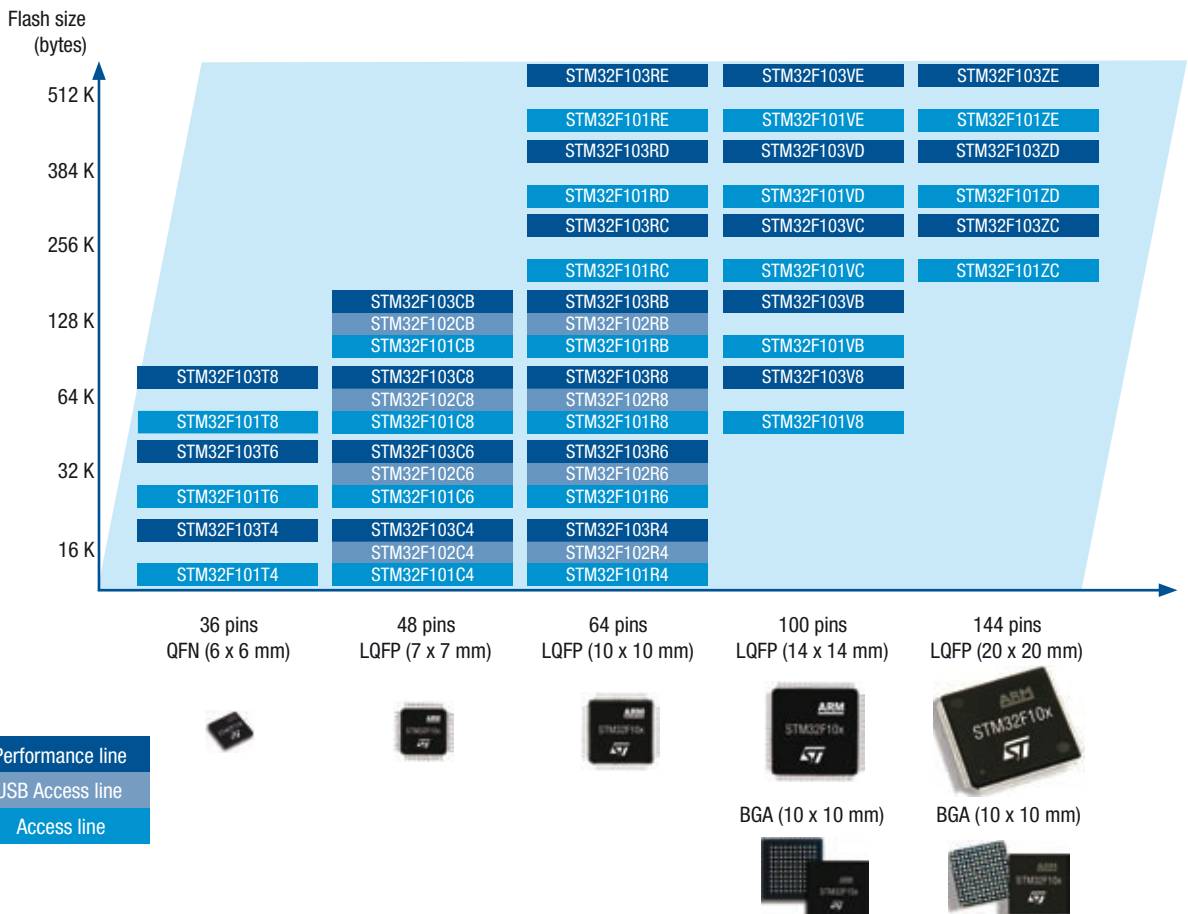
You can upgrade to a higher or downgrade to a lower memory size, or use different packages without changing your initial layout or software.

### 72 MHz Cortex-M3 CPU – wide selection of devices:

- 4-Kbyte to 64-Kbyte SRAM
- Three lines: Performance, USB Access and Access lines
- Pin-to-pin, software and peripheral compatibility across family
- 2.0 to 3.6 V power supply / 5 V tolerant I/Os
- -40 to +85 °C or up to 105 °C operating temperature range

## STM32F10x portfolio

60 fully compatible devices



## Applications

### Industrial:

- PLC
- Inverters
- Printers, scanners
- Industrial networking

### Building and security:

- Alarm systems
- Video intercom
- HVAC

### Low power:

- Glucose meters
- Power meters
- Battery operated applications

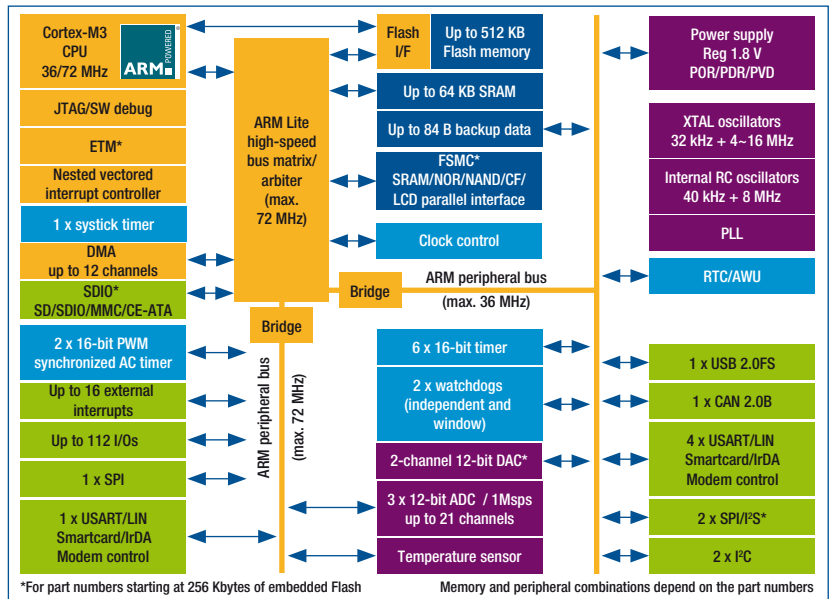
### Appliances:

- Motor drive
- Application control

### Consumer:

- PC peripherals, gaming
- Digital camera, GPS platforms

## STM32F10x block diagram



|   |                                 |  |
|---|---------------------------------|--|
| AWU: Auto wake-up capability with RTC alarm | IrDA: Infrared Data Association | PVD: Programmable voltage detector               |
| CAN: Controller area network                | I²S: Inter-IC sound             | RTC: Real-time clock                             |
| CF: CompactFlash                            | LIN: Local interconnect network | SDIO: Secure digital input output                |
| DMA: Direct memory access                   | MMC: MultiMediaCard             | SD: Secure digital                               |
| ETM: Embedded Trace Macrocell               | PDR: Power-down reset           | USART: Universal sync/async receiver transmitter |
| FSMC: Flexible static memory controller     | POR: Power-on reset             |  |

## STM32, more choice with three complete lines

The Performance line, STM32F103, operates at 72 MHz, with more on-chip RAM and peripherals. The USB Access line, STM32F102 operates at 48 MHz and has an additional USB peripheral compared to the Access line which operates at 36 MHz. The three lines are pin-to-pin and software-compatible, and offer the same embedded Flash options.

The Performance line takes the 32-bit MCU world to new levels of performance and energy efficiency. With its Cortex-M3 core at 72 MHz, it is able to perform

high-end computation. Its peripheral set brings superior control and connectivity.

The USB Access line is the intermediary between Performance and Access line. it's 48MHz CPU maximum speed allows to get excellent performance while keeping the dynamic power consumption very low. It has been made also for users that requires mandatorily the USB peripheral.

The Access line is the entry point of the STM32 family. It has the power of the 32-bit MCU but at a 16-bit MCU cost. Its peripheral set offers excellent connectivity and control.

## STM32F10x: product lines

### Both lines include:

|   |
|---|
| Multiple communication peripherals<br>Up to 5 x USART, 3 x SPI, 2 x I²C |
| ETM*  |
| FSMC*   |
| 2-channel x 12-bit DAC*   |
| Up to 6 x 16-bit timers   |
| Main oscillator 4-16 MHz  |
| Internal 8 MHz and 40 kHz RC oscillators                                |
| Real-time clock with battery domain and 32 kHz external oscillator      |
| 2 x watchdogs   |
| Reset circuitry and brown out warning                                   |
| Up to 12-channel DMA  |



### Performance line STM32F103

|            |                                       |  |               |       |     |     |           |
|------------|---------------------------------------|--|---------------|-------|-----|-----|-----------|
| 72 MHz CPU | Up to 512 Kbyte Flash / 64 Kbyte SRAM | 2/3 x 12-bit ADC (1 µs) Temperature sensor | USB FS device | SDIO* | I²S | CAN | PWM timer |
|------------|---------------------------------------|--|---------------|-------|-----|-----|-----------|

### USB Access line STM32F102

|            |                                       |  |               |  |  |  |  |
|------------|---------------------------------------|--|---------------|--|--|--|--|
| 48 MHz CPU | Up to 128 Kbyte Flash / 16 Kbyte SRAM | 1 x 12-bit ADC (1 µs) Temperature sensor | USB FS device |  |  |  |  |
|------------|---------------------------------------|--|---------------|--|--|--|--|

### Access line STM32F101

|            |                                       |  |  |  |  |  |  |
|------------|---------------------------------------|--|--|--|--|--|--|
| 36 MHz CPU | Up to 512 Kbyte Flash / 48 Kbyte SRAM | 1 x 12-bit ADC (1 µs) Temperature sensor |  |  |  |  |  |
|------------|---------------------------------------|--|--|--|--|--|--|

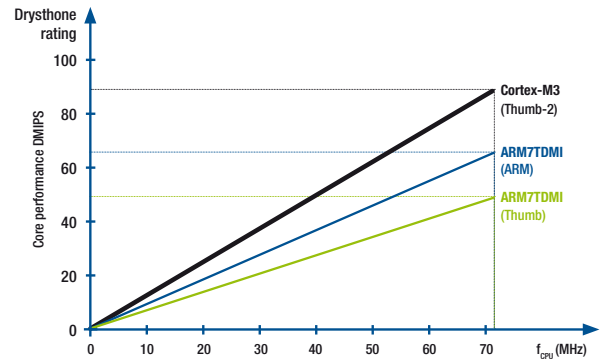
\*For part numbers starting at 256 Kbytes of embedded Flash

# STM32 key benefits

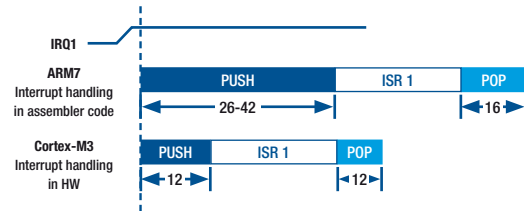
## Leading-edge architecture with Cortex-M3 core

- Harvard architecture
- 1.25 DMIPS/MHz and 0.19 mW/MHz
- Thumb-2 instruction set brings 32-bit performance with 16-bit code density
- Single cycle multiply and hardware division
- Embedded, fast interrupt controller is now inside the core allowing:
  - Excellent real-time behaviour
  - Low latency down to six CPU cycles inter-interrupt
  - Six CPU cycles wake-up time from low-power mode
- Up to 35% faster and up to 45% less code than ARM7TDMI®

## Cortex-M3 performance versus ARM7TDMI



## Cortex-M3 interrupt versus ARM7TDMI



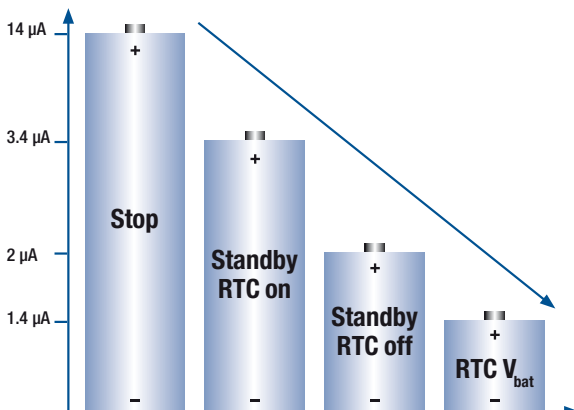
## Outstanding power efficiency

High performance does not mean high power consumption. We have taken special care to address three main energy requirements driven by the market:

- High dynamic power efficiency in running mode
  - Extremely low power when the application is in standby
  - Low-voltage capability for direct battery operation
- In run mode, executing from Flash at full 72 MHz CPU speed, the STM32 has a current consumption as low as 27 mA.

## STM32F10x typical current

(V<sub>DD</sub>: 3.3 V on 128-Kbyte device @ 25 °C)



In standby mode, current consumption is as low as 2 µA typical, with reset circuitry active. Finally, its 2.0 V to 3.6 V power supply enables its use for battery operated applications.

The STM32 has three different low-power modes and a versatile clocking scheme so that users can optimize power consumption versus performance.

The STM32 also embeds a real-time clock (RTC) running either from a 32 kHz quartz oscillator or an internal RC oscillator. The RTC has a separate power domain, with an embedded switchover to run either from a dedicated coin cell battery or from the main supply. Its typical current consumption is 1.4 µA at 3.3 V. It embeds up to 84 bytes for data backup. Start-up time from low-power modes is lower than 6 µs typical from stop mode, and 50 µs typical from standby mode and reset.

- Low voltage **2.0 V to 3.6 V** operation
- Down to 27 mA in run mode from Flash at 72 MHz
- Startup time from stop < **6 µs**
- Startup time from standby **50 µs**
- Reset circuitry always active

## High level of integration

- Built-in supervisor reduces need for external components:
  - Power-on reset, low-voltage detect, brown-out detect, watchdog timer with independent clock
- One main crystal drives entire system:
  - Inexpensive 4-16 MHz crystal drives CPU, USB and all peripherals
  - Embedded PLL generates multiple frequencies
  - Optional 32 kHz crystal for RTC
- Embedded factory trimmed 8 MHz RC oscillator can be used as main clock
- Additional low-frequency RC oscillator for RTC or watchdog
- Only 7 external passive components required for base system on LQFP100 package



**7 power capacitors only!**

## Flexible static memory controller (FSMC)

The flexible static memory controller offers:

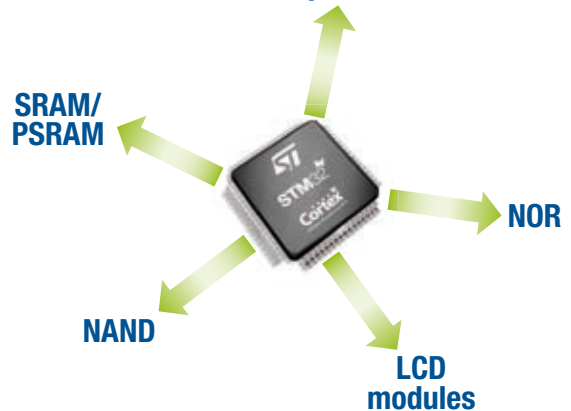
- 4 independent banks to support external memory with frequency up to 36 MHz when system is at 72 MHz
- CompactFlash, SRAM, PSRAM, NOR and NAND memories support
- Programmable timings to support a wide range of devices
- Code execution from external memory
- Parallel interface to LCD controllers, Intel 8080 / Motorola 6800 modes support

## Superior and innovative peripherals

| The need for speed |   |
|--------------------|---|
| USB                | 12 Mbit/s                                 |
| USART              | up to 4.5 Mbit/s                          |
| SPI                | 18 MHz master and slave                   |
| I <sup>2</sup> C   | 400 kHz                                   |
| GPIO               | 18 MHz maximum toggle                     |
| PWM timer          | 72 MHz clock input                        |
| SDIO               | Up to 48 MHz                              |
| I2S                | From 8 kHz to 48 kHz sampling frequencies |

| The need for analog |                              |
|---------------------|------------------------------|
| ADC                 | 12-bit, 1 μs conversion time |
| DAC                 | 2-channel, 12-bit            |

### CompactFlash



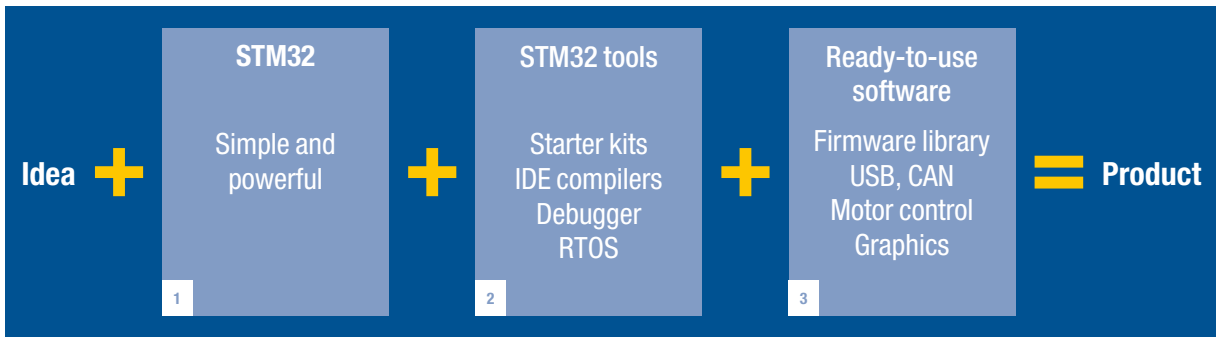
## Motor control

- The STM32 Performance line embeds features that are perfectly suited to three-phase brushless motor control:
  - Powerful Cortex-M3 core
  - 6 PWM advanced control timers with embedded dead-time generation
  - Numerous PWM outputs allowing multiple DC-brush, stepper or universal motor drives
  - Dual sample and hold ADC, 12-bit resolution, 1 μs conversion time
- Free motor control firmware libraries supporting AC induction motor (sensored) and PMSM motor (sensorless, Hall-sensor or encoder) vector control
  - Less than 21 μs for sensorless vector control loop
  - Class B compliancy with the EN/IEC60335-1 norm:
    - Pre-certified full set of self-test routines
  - Run your motor in just a few steps:
    - STM3210B-MCKIT full developer kit for vector drives
  - For devices starting at 256 Kbytes of Flash, two advanced control PWM timers and three ADCs are on board for dual motor control, triple sample and hold capabilities.



# STM32 easy development, fast time to market

From ideas to reality. As easy as 1, 2, 3



## STM32 firmware library

The STM32 firmware library provides easy access to all features of the standard device peripherals of the STM32. This free software package provides drivers for all standard device features and peripherals, from GPIO and timers to CAN, I<sup>2</sup>C, FSMC, I<sup>2</sup>S, SDIO, DAC, SPI, UART, ADC and more.

The fully documented and tested C source code requires only basic knowledge of C programming, is compatible with any C compiler for ARM-core-based microcontrollers, and is MISRA C-compliant (2004 rules).

The STM32 library shares the same APIs with the STR7 and STR9 libraries.

## USB developer kit

The USB developer kit facilitates USB implementation in a full range of applications by providing a complete, USB-certified firmware package that allows developers to painlessly develop any flavor of USB firmware including:

- Control transfer with generic device management tasks
- Interrupt transfer with HID mouse/joystick demo
- Bulk transfer with mass storage demo
- Isochronous transfer with voice speaker/microphone demo

The kit implements device firmware updates (DFU) on USB, and Virtual COM (CDC class) for emulation of an RS232 interface on USB.

## STM32 motor control firmware library for vector drive

Optimized and documented C firmware libraries for control of both PMSM and AC induction brushless motors in vector mode (FOC) are provided for free upon request. These modular libraries support both types of motors in standalone mode using ST hardware. The source files are provided free of charge and are MISRA C (latest rules) compliant, which helps for compliancy with IEC 60730.

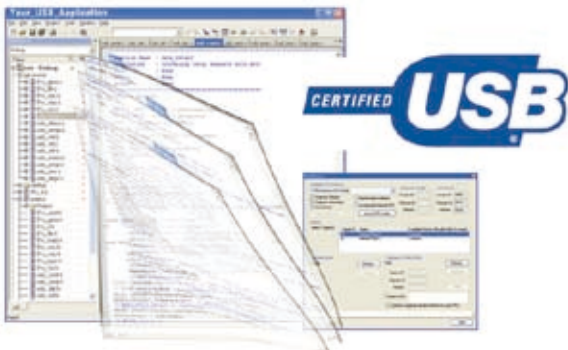
## Internet support

The latest news, downloads and documentation for STM32 microcontrollers can be found at: [www.st.com/stm32](http://www.st.com/stm32).

Here, you will also find:

- A complete selection guide for ST microcontrollers and development tools
- Downloads of free software and documentation
- Microcontroller and application-specific online forums and FAQs

For further information about a specific third-party tool, please visit the website of the relevant third-party tool supplier.





## Device summary

| Part number  | Program memory |          | RAM (bytes) | A/D inputs | Timer functions          |                     | Serial interface   | I/Os (high current <sup>2</sup> )  | Packages | Supply voltage (V)   | Special features   |
|--|----------------|----------|-------------|------------|--------------------------|---------------------|--|--|----------|--|--|
|  | Type           | Size     |             |            | 12 or 16-bit (IC/OC/PWM) | Others              |  |  |          |  |  |
|  | Flash          | (Kbytes) |             |            |                          |                     |  |  |          |  |  |
| <b>STM32 (ARM® Cortex™-M3) – 32-bit microcontrollers</b> |                |          |             |            |                          |                     |  |  |          |  |  |
| 36 pins  | STM32F101T4    | ●        | 16          | 4 K        | 10x12-bit                | 2x16-bit (8/8/8)    | 2 x WDG, 24-bit down counter                             | 1xSPI, 1xPC, 2xUSART (IrDA, ISO 7816)  | 26(26)   | QFN36  | Access line:<br>36 MHz CPU speed, EMI (100 and 144 pins), 2-channel DAC, V <sub>DD</sub> pin, low-power features, embedded POR, PDR and PVD, 8 MHz and 40 kHz internal RC, 4-16 MHz main oscillator, dedicated 32 kHz oscillator, -40 to 85 °C |
|  | STM32F101T6    | ●        | 32          | 6 K        | 10x12-bit                | 3x16-bit (12/12/12) |  |  | 26(26)   | QFN36  |  |
|  | STM32F101T8    | ●        | 64          | 10 K       | 10x12-bit                | 2x16-bit (8/8/8)    |  |  | 36(36)   | LQFP48   |  |
| 48 pins  | STM32F101C4    | ●        | 16          | 4 K        | 10x12-bit                | 2x16-bit (8/8/8)    | 2 x WDG, RTC, 24-bit down counter                        | 2xSPI, 2xPC, 3xUSART (IrDA, ISO 7816)  | 36(36)   | LQFP48   |  |
|  | STM32F101C6    | ●        | 32          | 6 K        | 10x12-bit                | 3x16-bit (12/12/12) |  |  | 36(36)   | LQFP48   |  |
|  | STM32F101C8    | ●        | 64          | 10 K       | 10x12-bit                | 2x16-bit (8/8/8)    |  |  | 51(51)   | LQFP64   |  |
| 64 pins  | STM32F101R4    | ●        | 16          | 4 K        | 16x12-bit                | 2x16-bit (8/8/8)    | 2 x WDG, RTC, 24-bit down counter                        | 1xSPI, 1xPC, 2xUSART (IrDA, ISO 7816)  | 51(51)   | LQFP64   |  |
|  | STM32F101R6    | ●        | 32          | 6 K        | 16x12-bit                | 3x16-bit (12/12/12) |  |  | 51(51)   | LQFP64   |  |
|  | STM32F101R8    | ●        | 64          | 10 K       | 16x12-bit                | 6x16-bit (16/16/16) |  |  | 51(51)   | LQFP64   |  |
| 100 pins   | STM32F101RC    | ●        | 256         | 32 K       | 16x12-bit                | 2x16-bit (8/8/8)    | 2 x WDG, RTC, 24-bit down counter, 2x16-bit basic timers | 3xSPI, 2xPC, 5xUSART/UART (IrDA, ISO 7816)                                     | 51(51)   | LQFP64   |  |
|  | STM32F101RD    | ●        | 384         | 48 K       | 16x12-bit                | 3x16-bit (12/12/12) |  |  | 51(51)   | LQFP64   |  |
|  | STM32F101RE    | ●        | 512         | 48 K       | 16x12-bit                | 2x16-bit (8/8/8)    |  |  | 51(51)   | LQFP64   |  |
| 144 pins   | STM32F101V8    | ●        | 64          | 10 K       | 16x12-bit                | 3x16-bit (12/12/12) | 2 x WDG, RTC, 24-bit down counter                        | 2xSPI, 2xPC, 3xUSART (IrDA, ISO 7816)  | 80(80)   | LQFP100  |  |
|  | STM32F101VB    | ●        | 128         | 16 K       | 16x12-bit                | 6x16-bit (16/16/16) |  |  | 80(80)   | LQFP100  |  |
|  | STM32F101VC    | ●        | 256         | 32 K       | 16x12-bit                | 2x16-bit (8/8/8)    |  |  | 80(80)   | LQFP100  |  |
| 48 pins  | STM32F101VD    | ●        | 384         | 48 K       | 16x12-bit                | 2x16-bit (8/8/8)    | 2 x WDG, RTC, 24-bit down counter, 2x16-bit basic timers | 3xSPI, 2xPC, 5xUSART/UART (IrDA, ISO 7816)                                     | 80(80)   | LQFP100  | USB Access line:<br>48 MHz CPU speed, V <sub>DD</sub> pin, low-power features, embedded POR, PDR and PVD, 8 MHz and 40 kHz internal RC, 4-16 MHz main oscillator, dedicated 32 kHz oscillator, -40 to 85 °C                                    |
|  | STM32F101VE    | ●        | 512         | 48 K       | 16x12-bit                | 3x16-bit (12/12/12) |  |  | 112(112) | LQFP144  |  |
|  | STM32F101ZC    | ●        | 256         | 32 K       | 16x12-bit                | 2x16-bit (8/8/8)    |  |  | 112(112) | LQFP144  |  |
| 64 pins  | STM32F101ZD    | ●        | 384         | 48 K       | 16x12-bit                | 2x16-bit (8/8/8)    | 2 x WDG, RTC, 24-bit down counter                        | 1xSPI, 1xPC, 2xUSART (IrDA, ISO 7816), USB                                     | 36(36)   | LQFP48   |  |
|  | STM32F101ZE    | ●        | 512         | 48 K       | 16x12-bit                | 3x16-bit (12/12/12) |  |  | 36(36)   | LQFP48   |  |
|  | STM32F102C4    | ●        | 16          | 4 K        | 10x12-bit                | 2x16-bit (8/8/8)    |  |  | 36(36)   | LQFP48   |  |
| 48 pins  | STM32F102C6    | ●        | 32          | 6 K        | 10x12-bit                | 3x16-bit (12/12/12) | 2 x WDG, RTC, 24-bit down counter                        | 2xSPI, 2xPC, 3xUSART (IrDA, ISO 7816), USB                                     | 36(36)   | LQFP48   |  |
|  | STM32F102C8    | ●        | 64          | 10 K       | 10x12-bit                | 2x16-bit (8/8/8)    |  |  | 36(36)   | LQFP48   |  |
|  | STM32F102R4    | ●        | 16          | 4 K        | 16x12-bit                | 2x16-bit (8/8/8)    |  |  | 51(51)   | LQFP64   |  |
| 64 pins  | STM32F102R6    | ●        | 32          | 6 K        | 16x12-bit                | 3x16-bit (12/12/12) | 2 x WDG, RTC, 24-bit down counter                        | 2xSPI, 2xPC, 3xUSART (IrDA, ISO 7816), USB                                     | 51(51)   | LQFP64   |  |
|  | STM32F102R8    | ●        | 64          | 10 K       | 16x12-bit                | 2x16-bit (8/8/8)    |  |  | 51(51)   | LQFP64   |  |
|  | STM32F102RB    | ●        | 128         | 16 K       | 16x12-bit                | 3x16-bit (12/12/14) |  |  | 26(26)   | QFN36  |  |
| 36 pins  | STM32F103T4    | ●        | 16          | 6 K        | 10x12-bit                | 4x16-bit (16/16/18) | 1xSPI, 1xPC, 2xUSART (IrDA, ISO 7816), USB, CAN          | 26(26)   | QFN36    | Performance line:<br>72 MHz CPU speed, EMI (100 and 144 pins), 2-channel DAC, V <sub>DD</sub> pin, low-power features, embedded POR, PDR and PVD, 8 MHz and 40 kHz internal RC, 4-16 MHz main oscillator, dedicated 32 kHz oscillator, 1 x high-speed USART 4.5 Mbit/s, motor control oriented PWM, 3 x ADC (triple sample and hold capability), -40 to 85 °C or -40 to 105 °C |  |
|  | STM32F103T6    | ●        | 32          | 10 K       | 10x12-bit                | 3x16-bit (12/12/14) |  | 26(26)   | QFN36    |  |  |
|  | STM32F103T8    | ●        | 64          | 20 K       | 10x12-bit                | 2x16-bit (8/8/8)    |  | 36(36)   | LQFP48   |  |  |
| 48 pins  | STM32F103C4    | ●        | 16          | 6 K        | 10x12-bit                | 3x16-bit (12/12/14) | 2 x WDG, RTC, 24-bit down counter                        | 2xSPI, 2xPC, 3xUSART (IrDA, ISO 7816)  | 36(36)   |  | LQFP48   |
|  | STM32F103C6    | ●        | 32          | 10 K       | 10x12-bit                | 4x16-bit (16/16/18) |  |  | 36(36)   |  | LQFP48   |
|  | STM32F103C8    | ●        | 64          | 20 K       | 10x12-bit                | 3x16-bit (12/12/14) |  |  | 51(51)   |  | LQFP64   |
| 64 pins  | STM32F103CB    | ●        | 128         | 20 K       | 10x12-bit                | 2x16-bit (8/8/8)    | 2 x WDG, RTC, 24-bit down counter                        | 1xSPI, 1xPC, 2xUSART (IrDA, ISO 7816)  | 36(36)   |  | LQFP48   |
|  | STM32F103R4    | ●        | 16          | 6 K        | 16x12-bit                | 4x16-bit (16/16/18) |  |  | 51(51)   |  | LQFP64   |
|  | STM32F103R6    | ●        | 32          | 10 K       | 16x12-bit                | 8x16-bit (24/24/28) |  |  | 51(51)   |  | LQFP64   |
| 100 pins   | STM32F103R8    | ●        | 64          | 20 K       | 16x12-bit                | 2x16-bit (8/8/8)    | 2 x WDG, RTC, 24-bit down counter, 2x16-bit basic timers | 3xSPI, 2xPC, 2xI <sup>2</sup> C, 5xUSART/UART (IrDA, ISO 7816), SDIO, USB, CAN | 51(51)   |  | LQFP64   |
|  | STM32F103RB    | ●        | 128         | 20 K       | 16x12-bit                | 4x16-bit (16/16/18) |  |  | 51(51)   |  | LQFP64   |
|  | STM32F103RC    | ●        | 256         | 48 K       | 16x12-bit                | 2x16-bit (8/8/8)    |  |  | 51(51)   |  | LQFP64   |
| 144 pins   | STM32F103RD    | ●        | 384         | 64 K       | 16x12-bit                | 2x16-bit (8/8/8)    | 2 x WDG, RTC, 24-bit down counter                        | 2xSPI, 2xPC, 3xUSART (IrDA, ISO 7816)  | 51(51)   | LQFP64   |  |
|  | STM32F103RE    | ●        | 512         | 64 K       | 16x12-bit                | 4x16-bit (16/16/18) |  |  | 51(51)   | LQFP64   |  |
|  | STM32F103V8    | ●        | 64          | 20 K       | 16x12-bit                | 8x16-bit (24/24/28) |  |  | 80(80)   | LQFP100, BGA100  |  |
| 64 pins  | STM32F103VB    | ●        | 128         | 20 K       | 16x12-bit                | 2x16-bit (8/8/8)    | 2 x WDG, RTC, 24-bit down counter                        | 3xSPI, 2xPC, 5xUSART/UART (IrDA, ISO 7816), SDIO, USB, CAN                     | 80(80)   | LQFP100, BGA100  |  |
|  | STM32F103VD    | ●        | 256         | 48 K       | 16x12-bit                | 4x16-bit (16/16/18) |  |  | 80(80)   | LQFP100, BGA100  |  |
|  | STM32F103VE    | ●        | 384         | 64 K       | 16x12-bit                | 2x16-bit (8/8/8)    |  |  | 80(80)   | LQFP100, BGA100  |  |
| 100 pins   | STM32F103VE    | ●        | 512         | 64 K       | 16x12-bit                | 2x16-bit (8/8/8)    | 2 x WDG, RTC, 24-bit down counter                        | 3xSPI, 2xPC, 5xUSART/UART (IrDA, ISO 7816), SDIO, USB, CAN                     | 80(80)   | LQFP100, BGA100  |  |
|  | STM32F103ZC    | ●        | 256         | 48 K       | 21x12-bit                | 8x16-bit (24/24/28) |  |  | 112(112) | LQFP144, BGA144  |  |
|  | STM32F103ZD    | ●        | 384         | 64 K       | 21x12-bit                | 2x16-bit (8/8/8)    |  |  | 112(112) | LQFP144, BGA144  |  |
| 144 pins   | STM32F103ZE    | ●        | 512         | 64 K       | 21x12-bit                | 2x16-bit (8/8/8)    | 112(112)   | LQFP144, BGA144  |          |  |  |



## Development tools

A complete range of high-end and low-cost development tools is available, including complete tool solutions, easy-to-use starter kits, and embedded operating systems, all tailored to the STM32.

### Third-party development solutions

Choose from a full range of solutions that offer start-to-finish control of application development from a single environment that includes development environment, C/C++ compiler and in-circuit emulator.

| Supplier   | Description   |
|--|---|
| Altium/Tasking<br><a href="http://www.tasking.com">www.tasking.com</a>   | EDE development environment, Tasking VX compiler, debugging/programming via JTAG                |
| Green Hills Software<br><a href="http://www.ghs.com">www.ghs.com</a>     | Multi development environment, GHS C/C++ compiler and Green Hills probe (USB or Ethernet/JTAG)  |
| Hitex<br><a href="http://www.hitex.com">www.hitex.com</a>                | HITOP5 development environment, Tasking VX compiler and Tantino (USB/JTAG)                      |
| IAR<br><a href="http://www.iar.com">www.iar.com</a>                      | EWARM development environment, IAR C/C++ compiler and J-Link (USB/JTAG)                         |
| iSYSTEM<br><a href="http://www.isystem.com">www.isystem.com</a>          | WinIdea development environment, ARM, GHS, GNU, IAR, Keil, Tasking compiler and iONE (USB/JTAG) |
| Keil<br><a href="http://www.keil.com">www.keil.com</a>                   | RealView MDK with uVision3 software, ARM C/C++ compiler and ULINK (USB/JTAG)                    |
| Lauterbach<br><a href="http://www.lauterbach.com">www.lauterbach.com</a> | TRACE32 PowerView development environment, supporting a wide range of C/C++ compilers           |
| Raisonance<br><a href="http://www.raisonance.com">www.raisonance.com</a> | RIDE development environment with GNU C/C++ compiler and RLink (USB/JTAG)                       |
| Rowley<br><a href="http://www.rowley.co.uk">www.rowley.co.uk</a>         | CrossWorks with CrossStudio software, GNU C/C++ compiler and CrossConnect (JTAG)                |

For information about compatibility with other tools, refer to the relevant third-party internet site.

### Operating systems

A range of portable royalty-free, small-footprint operating systems to meet a variety of application constraints from low cost to high security.

| RTOS supplier   | RTOS         |
|---|--------------|
| CMX Systems: <a href="http://www.cmx.com">www.cmx.com</a>             | CMX-RTX      |
| Express Logic: <a href="http://www.rtos.com">www.rtos.com</a>         | ThreadX      |
| FreeRTOS: <a href="http://www.FreeRTOS.org">www.FreeRTOS.org</a>      | FreeRTOS     |
| IAR: <a href="http://www.iar.com">www.iar.com</a>                     | PowerPac     |
| Keil: <a href="http://www.keil.com">www.keil.com</a>                  | ARTX-ARM     |
| Micrium: <a href="http://www.micrium.com">www.micrium.com</a>         | µC/OS-II     |
| Quadros Systems: <a href="http://www.quadros.com">www.quadros.com</a> | RTXC Quadros |
| Segger: <a href="http://www.segger.com">www.segger.com</a>            | embOS, emWIN |

## Low-cost and application-specific starter kits

Play, explore and develop applications on the STM32 Primer with Raisonance toolset, free demos and an online community at [www.stm32circle.com](http://www.stm32circle.com) to stimulate creative designs.

Evaluate STM32 performance in real time, with the innovative STM32-PerformanceStick and DashBoard performance evaluation GUI, sample applications and unlimited Hitex toolset.



| Part number  | Description  |
|--|--|
| <b>STM3210B-PRIMER</b><br><b>STM3210E-PRIMER</b>   | Raisonance STM32 Primer with RIDE (debug up to 32 Kbytes of code), GNU C/C++ compiler, and a fun, stimulating learning and development platform with MEMS-based controls and integrated RLink (USB/JTAG)     |
| <b>STM3210B-PFSTICK</b>                            | STM32-PerformanceStick with integrated debugging/programming via USB, unlimited Hitex HiTOP5 and Tasking VX compiler and DashBoard GUI   |
| <b>STM3210B-SK/HIT</b>                             | Hitex kit with unlimited HiTOP5, Tasking VX compiler, STM32-PerformanceStick with integrated debugging/programming via USB, extension I/O board with peripheral evaluation features, DashBoard GUI           |
| <b>STM3210B-SK/IAR</b><br><b>STM3210E-SK/IAR</b>   | IAR Embedded Workbench for ARM (for up to 32 Kbytes of code), IAR C/C++ compiler, J-Link (USB/JTAG), evaluation board  |
| <b>STM3210B-SK/KEIL</b><br><b>STM3210E-SK/KEIL</b> | Keil RealView MDK with uVision 3 (for up to 16 Kbytes of code), ARM C/C++ compiler, ULINK (USB/JTAG), evaluation board   |
| <b>STM3210B-SK/RAIS</b>                            | Raisonance REva kit with RIDE (debug up to 32 Kbytes of code), GNU C/C++ compiler, modular evaluation hardware with integrated RLink (USB/JTAG)  |
| <b>STM3210B-MCKIT</b>                              | ST motor-control starter kit with complete sensor and sensorless libraries, evaluation hardware platform for vector drive of three-phase PMSM and induction motors, plus Segger J-Link for host PC interface |

## Evaluation board STM3210B-EVAL and STM3210E-EVAL

Complete hardware evaluation platform with the STM32F103, implementing the full range of device peripherals and features.

For more information, visit [www.st.com/stm32](http://www.st.com/stm32)



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