

STM32 MCU family

32-bit Flash microcontrollers powered by
ARM® Cortex™ -M processor



STM32  Releasing your **creativity**

May 2010

Welcome to the world of STM32

Releasing your creativity

The STM32 family of 32-bit Flash microcontrollers based on ARM Cortex™-M processor is built to offer new degrees of freedom to MCU users. It brings 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 feature integration, its easy-to-use architecture, its low-power capability and cost-effectiveness.

The STM32 family helps you create new applications and design in the innovations you have been long dreaming about.

STMicroelectronics is a lead partner in developing Cortex-M cores and, with the STM32, offers a comprehensive portfolio of advanced MCUs that we are committed to extending in capability, price range and features to cover the needs of microcontroller convergence.

STM32 key benefits

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



Real-time performance



Leading edge architecture
Excellent real-time behavior

Outstanding power efficiency



Sub μ A RTC,
low voltage
low-power modes

Superior and innovative peripherals



USB OTG,
Ethernet, dual CAN,
ADC 12-bit,
advanced timers

Maximum integration



Reset circuitry clocks,
oscillators,
PLL regulator
RTC, watchdog

Extensive tools and software



Various IDE,
starter kits,
libraries,
RTOS and stacks

Future proof design

Environment friendly, suits low-power operation

Address all your needs and beyond

Cost and space saving

More time for innovation



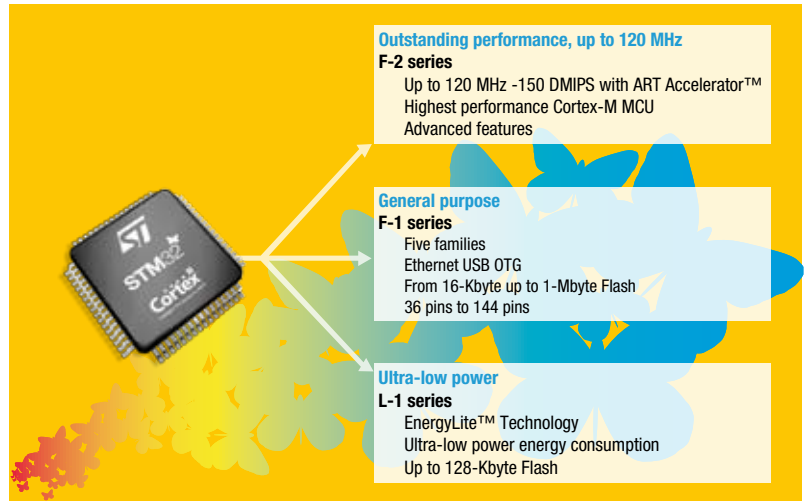
**STM32 platform
more than 130 compatible devices**

STM32, a solid foundation for growth

The STM32 platform is a strong foundation on which we grow our portfolio. With new products addressing new applications, the complete STM32 product family now comprises three series, each dedicated to a specific segment.

More choice with STM32 series

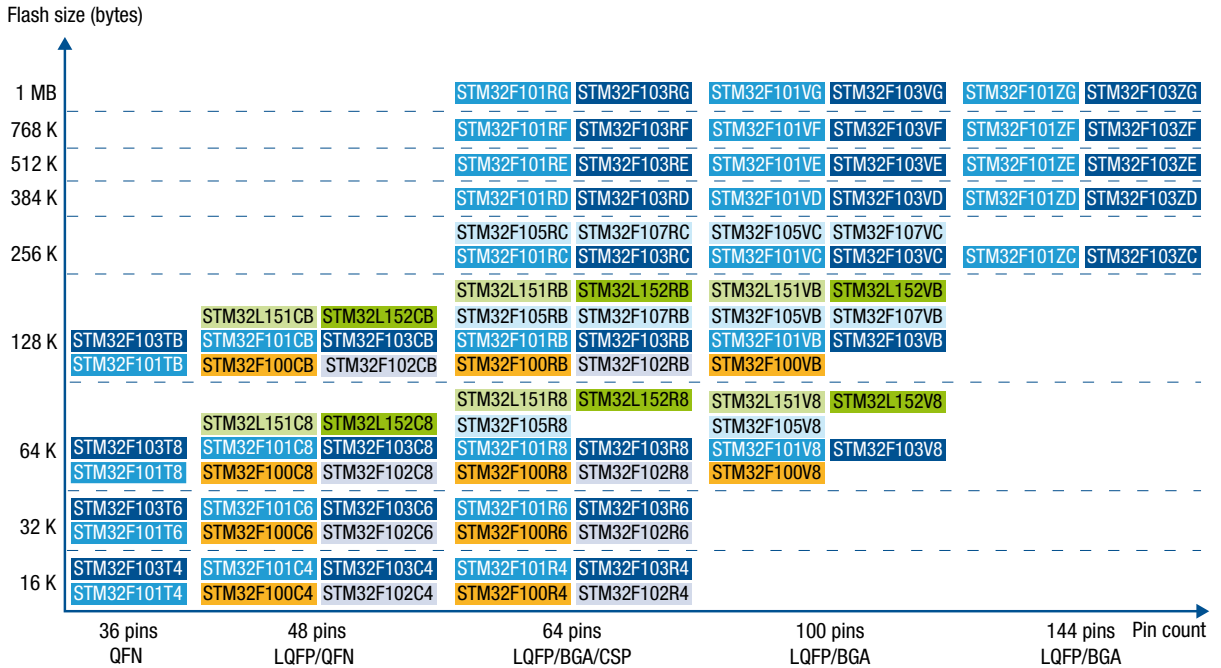
- The general purpose F-1 series addresses a wide range of applications, from the lowest price-sensitive design to the computing intensive, high memory footprint.
- Get the highest performance with the F-2 series for computing intensive application and advanced connectivity. The F-2 series maintains the compatibility with the F-1 series.
- Design ultra-low-power applications with the L-1 series for those who are power conscious and seek the absolute lowest energy consumption. The L-1 series maintains the compatibility with the F-1 series.



STM32, the optimal platform choice

The STM32 is the optimal choice to support many applications with the same platform. All product lines in the three series are pin-to-pin and software compatible, making it easy to upgrade to higher or downgrade to lower memory size. Numerous applications may be addressed using the sole STM32 platform.

STM32 portfolio



STM32 F-1 series
 Connectivity line | USB Access line | Value line | Performance line | Access line

STM32 L-1 series
 STM32L152 | STM32L151

STM32 product lines

Common core peripherals and architecture

Communication peripherals: USART, SPI, I ² C
Multiple general purpose timers
Integrated reset and brown-out warning
Multiple DMA
2x watchdogs Real-time clock
Integrated regulator, PLL and clock circuit
External memory interface (EMI)
Dual 12-bit DAC
Main oscillator and 32 kHz oscillator
Low-speed and high-speed internal RC oscillators
-40 °C +85 °C and up to 105 °C operating temperature range
Low voltage 2.0 to 3.6 V or 1.65 to 3.6 V (L-1 series) 5.0 V tolerant I/Os
Temperature sensor



F-1 series - Connectivity line STM32F105/STM32F107

72 MHz Cortex-M3 CPU	Up to 64-Kbyte SRAM	Up to 256-Kbyte Flash	2 x 12-bit ADC (1 µs)	3-phase MC timer	USB 2.0 OTG FS	2 x CAN 2.0B	2 x I ² S audio class	Ethernet IEEE 1588	
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F-1 series - Performance line STM32F103

72 MHz Cortex-M3 CPU	Up to 96-Kbyte SRAM	Up to 1-Mbyte Flash	2/3 x 12-bit ADC (1 µs)	3-phase MC timer	USB FS device	CAN 2.0B	2 x I ² S	SDIO	
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F-1 series - USB Access line STM32F102

48 MHz Cortex-M3 CPU	Up to 16-Kbyte SRAM	Up to 128-Kbyte Flash	12-bit ADC (1 µs)	USB FS device					
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F-1 series - Access line STM32F101

36 MHz Cortex-M3 CPU	Up to 80-Kbyte SRAM	Up to 1-Mbyte Flash	12-bit ADC (1 µs)						
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F-1 series - Value line STM32F100

24 MHz Cortex-M3 CPU	Up to 8-Kbyte SRAM	Up to 128-Kbyte Flash	12-bit ADC (1.2 µs)	3-phase MC timer	CEC				
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L-1 series - STM32L151/2

32 MHz Cortex-M3 CPU	Up to 16-Kbyte SRAM	Up to 128-Kbyte Flash	12-bit ADC (1 µs)	USB FS device	Data EEPROM 4 K	LCD 8x40	ULP MSI	Brown out reset	Comparator	Voltage scaling
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ULP: Ultra-low-power
 MSI: Multi speed internal oscillator
 RNG: Random number generator
 CEC: Consumer electronic control
 SDIO: Secure digital input output

Applications

- Industrial
 - PLC
 - Inverters
 - Printers, scanners
 - Industrial networking
 - Solar inverters
- Building and security
 - Alarm systems
 - Access control
 - HVAC
 - Power meters
- Medical
 - Glucose meters
 - Portable medical care
 - VPAP, CPAP
 - Patient monitoring
- Appliances
 - 3-phase motor drives
 - Application control
 - User interfaces
 - Induction cooking
- Consumer
 - Home audio
 - Gaming
 - PC peripherals
 - Digital cameras, GPS

STM32 F-1 series block diagram

This block diagram shows all the available peripherals. For exact product content, please refer to the device summary.



Superior and innovative peripherals

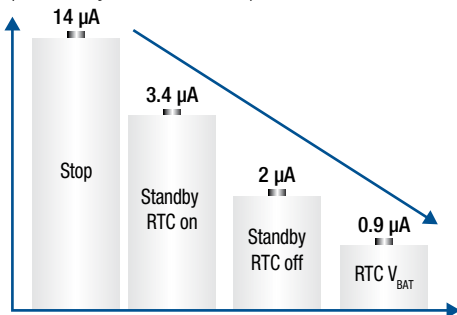
The need for speed	
USB FS	12 Mbit/s
USART	Up to 4.5 Mbit/s
SPI	Up to 18 Mbit/s
I ² C	I ² C 400 kHz
GPIO	Up to 18 MHz
3-phase MC timer	PWM timer 72 MHz clock input
SDIO	SDIO up to 48 MHz
I ² S	From 8 kHz to 96 kHz sampling frequencies
The need for analog	
ADC	1 μ s conversion time (1 MSPS)
DAC	2-channel, 12-bit
The need for connectivity	
Dual CAN	Up to 2 independent CAN
Ethernet	10/100 Mbit/s MAC with hardware IEEE 1588
USB OTG	Full speed host, device or OTG
CEC bus	Consumer electronic control for consumer devices
Flexible static memory interface	4 independent banks, 8/16 bit data bus up to 60 MHz, supports SRAM, PSRAM, NAND and NOR Flash, parallel graphic LCD

Outstanding power efficiency

STM32F10x typical current

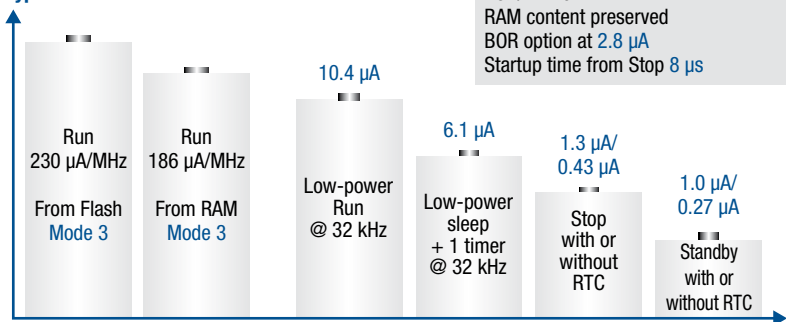
Typical current

(on 128-Kbyte device @ 25 °C)



STM32L15x typical current consumption

Typical @ 25 °C



Notes:

- Run and Sleep consumption value independent V_{DD}
- Stop and standby values measured at V_{DD} = 1.8 V
- These values are preliminary

POR/PDR on
RAM content preserved
BOR option at 2.8 μ A
Startup time from Stop 8 μ s

Motor control

The STM32 is perfectly suited to three-phase brushless motor control:

- Advanced PWM timer, fast ADC, high-performance core
- Free motor control firmware libraries supporting AC induction motor (sensored) and PMSM motor (sensorless, Hall-sensor or encoder) vector control
- Class B compliancy with the EN/IEC 60335-1 norm
- STM3210B-MCKIT full developer kit for vector drives



STM32 Value line

32-bit microcontrollers give greater choice for cost-sensitive applications

The STM32 Value line complements our STM32 Cortex-M microcontroller product portfolio by offering a low-cost product line that is pin-to-pin compatible with the whole STM32 portfolio. The line brings new features such as new 16-bit timers and CEC function to expand the range of applications addressed in consumer, appliance and industrial segments.

Based on the ARM Cortex-M core running at up to 24 MHz, the STM32 Value line offers an excellent cost-performance-peripherals trade-off.

The STM32 Value line provides all the essential features that make it the perfect choice to develop cost-effective applications traditionally addressed by 16-bit microcontrollers.



STM32 Connectivity line

Superior connectivity and superior audio support

The STM32 Connectivity line makes networking economical for a wide range of products, with its embedded Ethernet MAC with dedicated DMA and IEEE 1588 precision time protocol hardware support.

The USB 2.0 OTG peripheral makes the STM32 Connectivity line a turnkey solution to add a USB device, host or OTG function to a product. In addition, the line brings a dual CAN making it the MCU of choice for CAN gateways. The two audio class I²S of the STM32 Connectivity line, combined with the embedded USB OTG peripheral, address requirements of most audio applications.



STM32 F-2 series

The F-2 series brings more performance, memory and advanced peripherals

- New technologies: 90 nm process, advanced real-time (ART) accelerator
- More performance: Zero-wait execution at 120 MHz/150 DMIPS
- Outstanding dynamic power: 22.5 mA at 120 MHz



Full sample availability in Q4/2010

STM32 L-1 series

STM32L ultra-low-power MCU family

The STM32L15x enriches ST's ultra-low-power EnergyLite™ platform and the STM32 portfolio.

- High-performance ARM Cortex™-M3: up to 33 DMIPS
- Ultra-low energy consumption: down to 185 μ A/DMIPS
- Power supply: 1.65 to 3.6 V
- 6 ultra-low-power modes including new low-power run and low-power sleep
- Stop mode at 1.3 μ A with RTC and full RAM retention
- Enhanced security and safety features



Full sample availability in Q4/2010

Development tools

STMicroelectronics' STM32 family of 32-bit ARM Cortex™-M-core-based microcontrollers are supported by a complete range of high-end and low-cost evaluation, software, debugging and programming tools.

This complete line includes third-party solutions that come complete with C/C++ compiler, integrated development environment and in-circuit debugger/programmer featuring a JTAG application interface. Developers can also explore and start applications easily with any of a range of affordable, easy-to-use starter kits.

The superb combination of a state-of-the-art and efficient library of software drivers and extensive support for all major tool providers offers a fast route to best-fit and an optimized development process.

Promotion kits

Play, explore and develop applications on the **STM32 Primer** and **Primer 2** with Raisonance toolset, free demos and an online community at www.stm32circle.com to stimulate creative designs.

Evaluate STM32 performance in real time with the innovative **STM32-PerformanceStick** and the networking features of the STM32 Connectivity line with **STM32-ComStick**. These kits include an integrated debugging/programming capability via USB and unlimited Hitex HiTOP5 and Tasking VX C compiler.



The **STM32 Value Discovery (STM32VLDISCOVERY)** kit is the cheapest and quickest way to discover the STM32. Based on the STM32 Value line, this quick-start evaluation board includes the ST-LINK debugger and is delivered with IDE from Keil, IAR and Atollic. This low-cost evaluation kit will satisfy hobbyists, first-time developers and students. Available in Q2 2010.

Starter kits

Part number	Featured product	Description
STM3210B-SK/HIT STM3210E-SK/HIT	STM32F103RBT6	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
STM3210B-SK/IAR STM3210C-SK/IAR STM3210E-SK/IAR	STM32F103RBT6 STM32F107RCT6 STM32F103RET6	IAR Embedded Workbench for ARM (for up to 32 Kbytes of code), IAR C/C++ compiler, J-Link (USB/JTAG), evaluation board
STM3210B-SK/KEIL STM3210C-SK/KEIL STM3210E-SK/KEIL	STM32F103RBT6 STM32F107RCT6 STM32F103RET6	Keil RealView MDK with uVision 3 (for up to 16 Kbytes of code), ARM C/C++ compiler, ULINK (USB/JTAG), evaluation board
STM3210B-SK/RAIS STM3210C-SK/RAIS	STM32F103RBT6 STM32F107RCT6	Raisonance REva kit with RIDE (debug up to 32 Kbytes of code), GNU C/C++ compiler, modular evaluation hardware with integrated RLink (USB/JTAG)
STM3210B-MCKIT	STM32F103RBT6	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 for STM32

Several hardware platforms from a range of third-party tool developers, and open-platform evaluation boards from ST implement the complete range of device peripherals for STM32 devices.

For more information, visit www.st.com/stm32

STM32 embedded firmware

STM32 firmware library: Complete set of device drivers for all the standard device peripherals.

STM32 USB developer kit: Complete firmware package for USB slave interface.

DSP Software Library: DSP (digital signal processor) software library including digital filters and FFT.

STM32 Speech Codec Software Library: Speech codec software to compress/decompress speech data.

STM32 self-test routines Class B norm certification: Complete software for EN/IEC 60335-1 Class B norm.

STM32 motor control software: Complete 3-phase motor-control library supporting PMSM motors in sensed and sensorless mode and AC induction motors in sensed mode, and a patented single-shunt algorithm. This software is included in the STM32 motor control starter kit.

STM32 Spirit Audio Engine: This professional audio engine from the leading technology company Spirit is a high-quality and fully-supported solution. It removes the hurdles associated with open source solutions, and insures a fast development with professional results for audio applications. The solution supports the popular MP3 and WMA key formats, supported by a set of must-have add-ons such as a channel mixer, standalone 3-band parametric equalizer and loudness control.

Development tools, operating systems, solution stacks and more

Choose from a full range of development solutions from lead suppliers that deliver start-to-finish control of application development from a single integrated development environment. Access a variety of royalty-free, small-footprint operating systems and a wealth of off-the-shelf stacks from numerous third-party suppliers.

For detailed information, see www.st.com/stm32tools



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