

STM32F0 series


Mainstream 32-bit MCUs

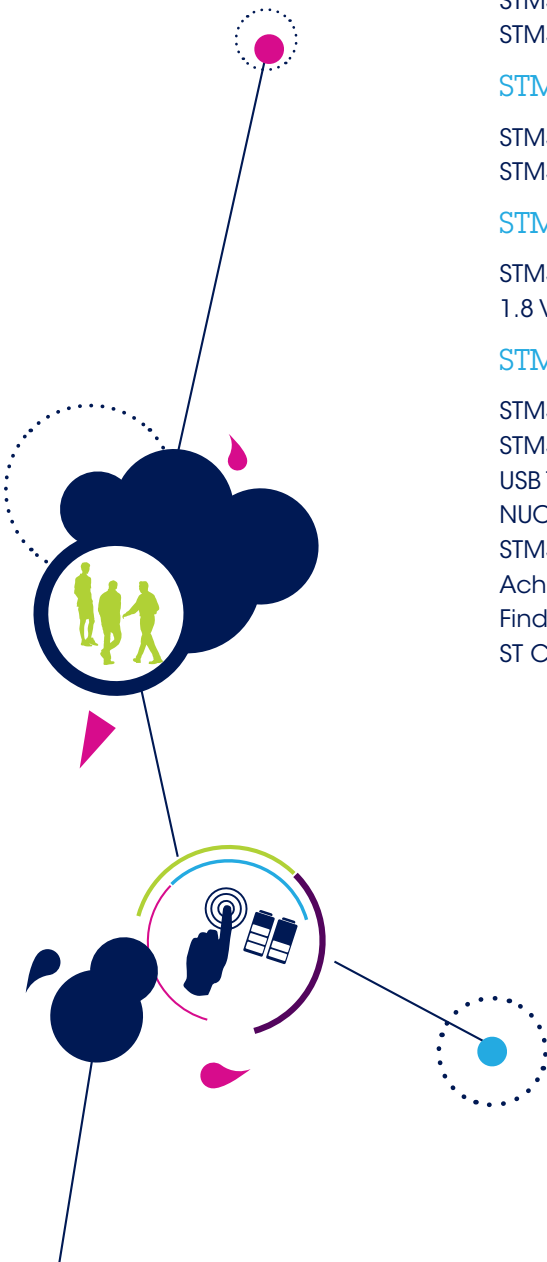
Releasing your creativity





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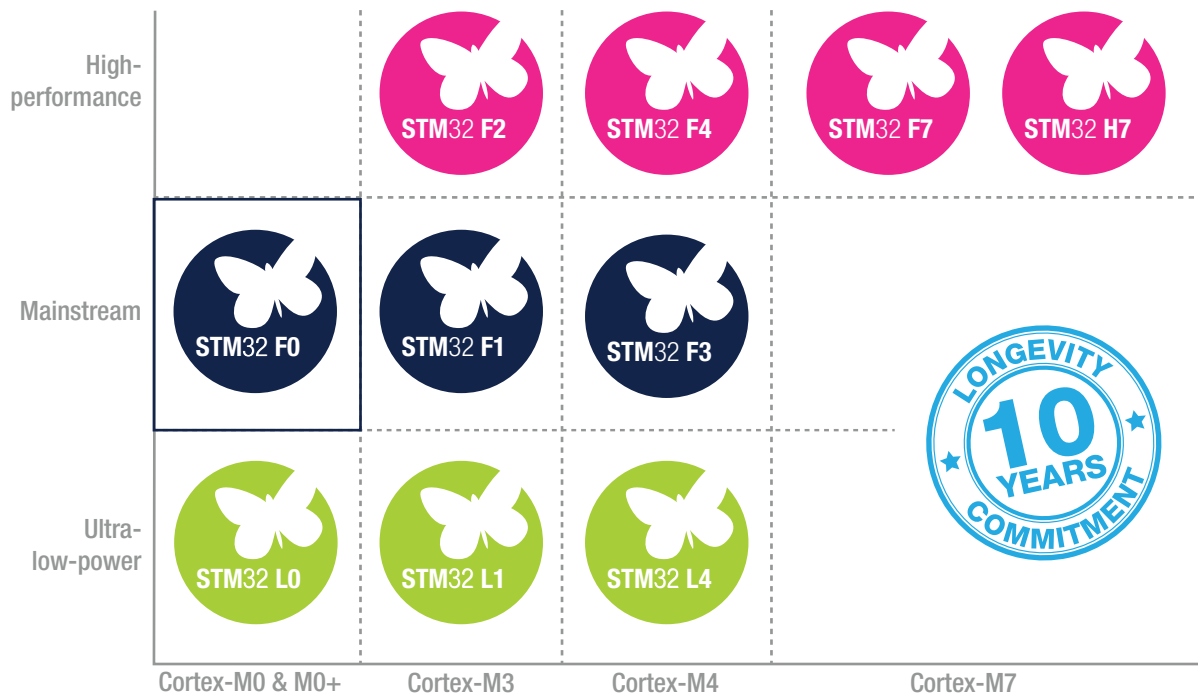


F0 inside STM32 family

By choosing an STM32 microcontroller for your embedded application, you gain from our market-leading expertise in MCU architecture, technology, multi-source manufacturing and long-term supply.

10 PRODUCT SERIES – MORE THAN 40 PRODUCT LINES

The STM32 portfolio offers an extraordinary variety of options including ARM® Cortex®-M cores (M0, M0+, M3, M4, and M7), giving developers flexibility to find the perfect match for their application. Particular attention is paid to make it easy to switch from one device to another. The compatibility of binaries combined with the similar pinout assignment, proliferation of hardware IPs and higher-level programming languages greatly facilitates the work of developers.



The Mainstream family addresses a large variety of needs found in general-purpose applications, while the STM32 portfolio offers the possibility to boost performance with more MIPS or improve ultra-low power values. The STM32F0 series is the entry level of the three series of the Mainstream family, where price effectiveness and simplicity are primary requirements. The pin compatibility with STM32F1 or STM32F3 series makes navigation across the board extremely convenient.

The STM32F0 series with a Cortex®-M0 core addresses cost-sensitive designs originally served by 8- or 16-bit microcontrollers. The “STM32 at 32 cents” offer is a clear illustration of this capability.



STM32F0 Entry-level MCU

The STM32F0 series is well balanced for efficiency

Devices in ST's ARM Cortex-M0-based STM32F0 series deliver 32-bit performance while featuring the essentials of the STM32 family and are particularly suited for cost-sensitive applications. STM32F0 MCUs combine real-time performance, low-power operation, and the advanced architecture and peripherals of the STM32 platform.

- The STM32F0x0 Value line is highly competitive in traditional 8-bit and 16-bit markets
- The STM32F0x1 line provides a high integration of functions and covers a wide range of memory sizes and packages
- The STM32F0x2 line provides rich connectivity with a crystal-less USB 2.0 interface
- The STM32F0x8 line operating at $1.8V \pm 8\%$ is well suited for use in portable consumer applications



STM32F0 PRODUCT LINES

ARM® Cortex®-M0 – 48 MHz	<ul style="list-style-type: none"> Reset POR/PDR 2x watchdogs Hardware CRC Internal RC Crystal oscillators PLL RTC calendar 16- and 32-bit timers 1x12-bit ADC Temperature sensor Multiple-channel DMA Single-wire debug Unique ID 	Product lines	Flash (Kbytes)	RAM (Kbytes)	Power supply	20-byte backup data	12-bit DAC	Touch sense	Up to 2x SPI/I²S, 2x I²C	USART	CEC	CAN	USB
		STM32F0x0 Value line	16 to 256	4 to 32	2.4 to 3.6 V				•	6			•
		STM32F0x1 Access line	16 to 256	4 to 32	2.0 to 3.6 V	•	•	•	•	8	•	•	
		STM32F0x2 USB line	16 to 128	4 to 16	2.0 to 3.6 V	•	•	•	•	4	•	•	(crystal-less)
		STM32F0x8 Low-voltage line	32 to 256	4 to 32	1.8 V \pm 8%	•	•	•	•	8	•		(crystal-less)

www.st.com/stm32f0

The same system block is common within the STM32F0 family. Migration across the lines is facilitated as the same peripherals, IP-set and pinouts are shared.

By construction, the parameters are guaranteed over all voltage ranges, eliminating performance degradation due to unstable supply voltages.

With very flexible power consumption settings, developers can adjust the working modes on the fly, ensuring a fine control of the device.

TYPICAL CONSUMPTION VALUES ACROSS STM32F0 POWER MODES

VBAT	0.5 μ A	at 1.65 V with LSE clock @32 kHz, RTC on
STANDBY	2.5 μ A	at 2 V
STOP no RTC	4.9 μ A	RAM retention at 2 V, oscillator off, V_{DDA} monitoring
STOP with RTC	5.4 μ A	RAM retention at 2 V, oscillator off, V_{DDA} monitoring
SLEEP	500 μ A	with HSI clock at 8 MHz, PLL off
RUN	250 μ A/MHz	at f_{CPU} =48 MHz, peripherals off



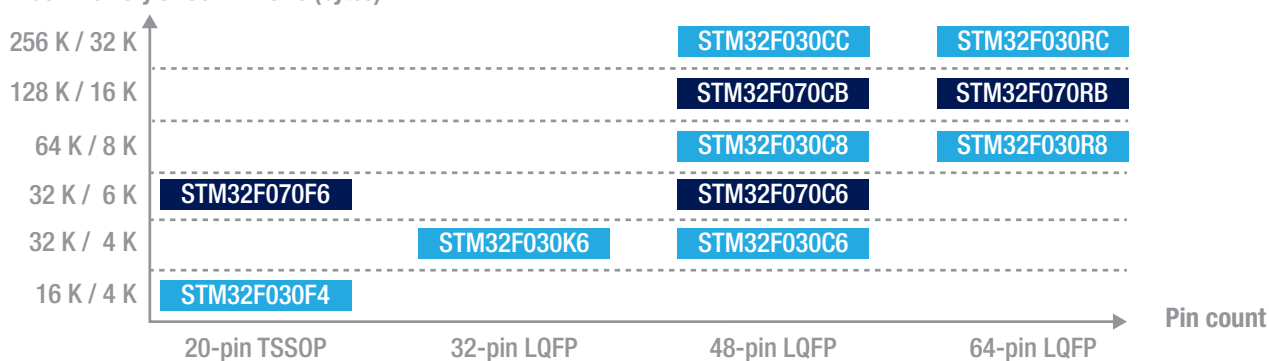
STM32F0x0 Value line

The STM32F0x0 features an ARM Cortex-M0 core and runs at speeds up to 48 MHz

The STM32F0x0 Value line covers the main needs for memory and pin count combinations with fewer devices to increase focus on the overall cost efficiency of your projects. Application designers starting with the STM32F0x0 benefit from being able to upgrade to any of the devices in the powerful STM32 portfolio at any time with an extraordinary degree of reusability of tools and application software.

STM32F0 VALUE LINE PORTFOLIO

Flash memory size / RAM size (bytes)

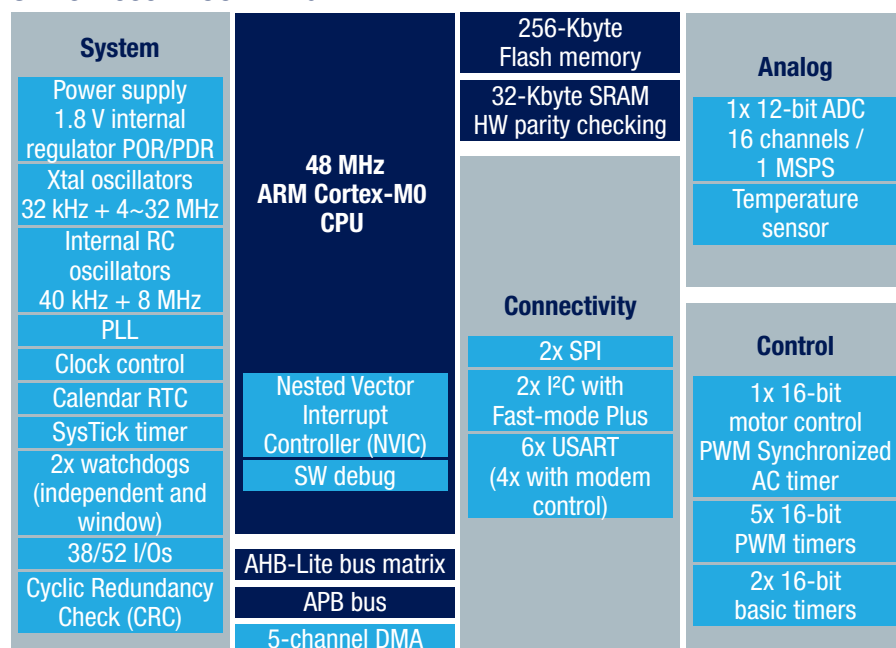


■ USB

Economy of scales realized by reducing the quantity of variances directly benefit our customers.

Respecting the most stringent quality requirements, the Value line is produced in high volume, making the supply chain and inventory management less costly for our customers.

STM32F030 BLOCK DIAGRAM



The system block is very similar to other STM32F0 lines, making the extension for additional voltage range or functionality more convenient.

Upward compatibility with STM32F0x1 and F0x2 devices is guaranteed from a hardware and software viewpoint.





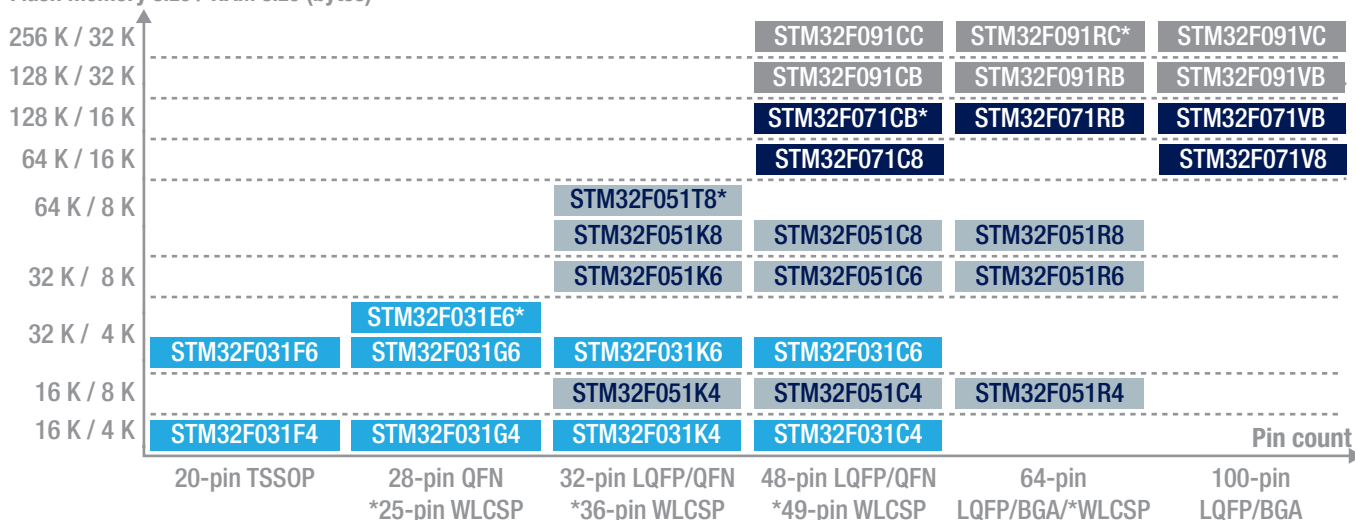
STM32F0x1 line

STM32F0x1 offers better user experience with high integration

STM32F0x1 devices are intended to address 8- and 16-bit applications where satisfactory performance is required, for example in home-entertainment products, appliances and industrial equipment. The portfolio covers from 16 to 256 Kbytes of on-chip Flash memory, up to 32 Kbytes of SRAM, and several communication interfaces including USART, SPI, I²S, I²C, CAN, HMDI CEC and 16-bit PWM standard or motor control dedicated timers. The latest addition to ST's STM32F0x1 series, the STM32F091, comes with up to eight USARTs. Its 256 Kbytes of on-chip Flash memory and 32 Kbytes of SRAM enable the implementation of high level languages such as a Javascript or Python stack.

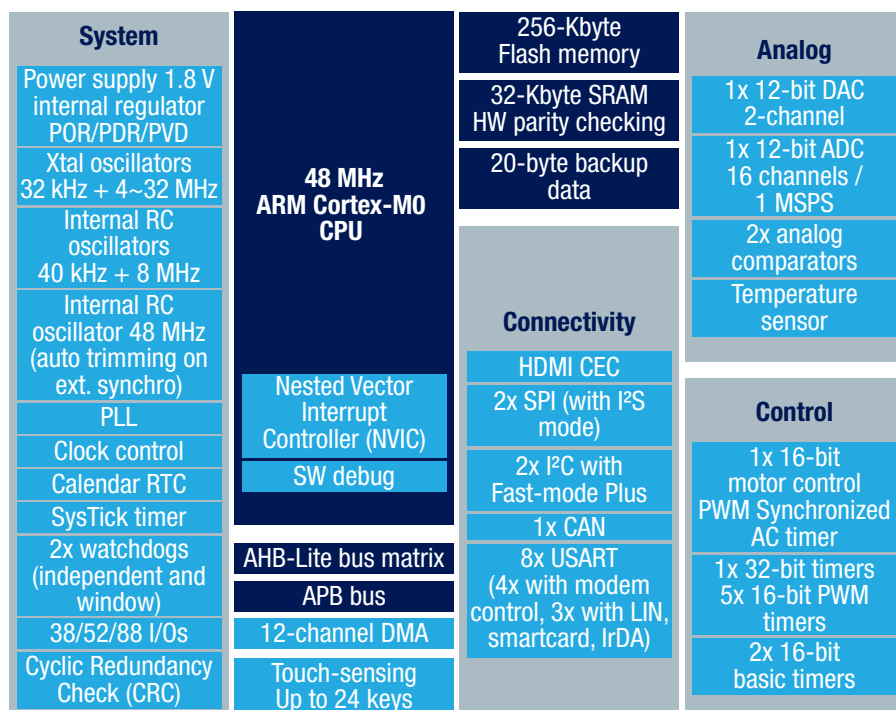
STM32F0x1 PORTFOLIO

Flash memory size / RAM size (bytes)



Flexible hardware selection with a 48-pin package covering from 256 Kbytes all the way down to 16 Kbytes of program memory.

STM32F091 BLOCK DIAGRAM



The STM32F0x1 line gives developers the opportunity to maintain the whole development configuration as the system block remains unchanged. Adjusting the peripheral selection according to hardware or software needs has never been so easy.





STM32F0x2 line

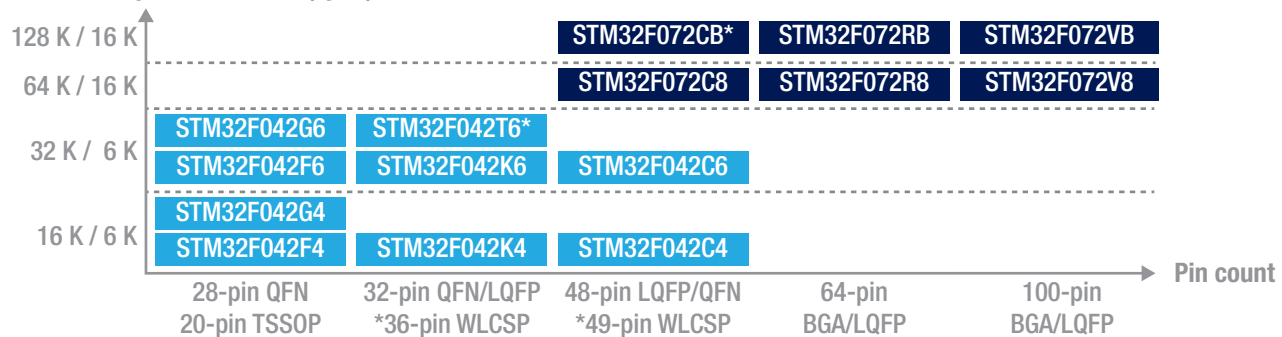
STM32F0x2 crystal-less USB 2.0 FS and CAN interfaces

These new STM32F0 devices are the first 32-bit Cortex-M0 MCUs in the industry offering a crystal-less USB 2.0 FS interface with a link power management (LPM) feature and compliant with battery charger detection (BCD) specification 1.2, thus eliminating the need for an external crystal oscillator to generate the precision clock required by the USB protocol. Together with the support of CAN, USART, I²C, SPI (I²S) and HDMI CEC interfaces, the new STM32F0 devices enable product developers to increase system integration, reduce costs, and exceed the traditional price performance limitations imposed by older, proprietary 8-bit or 16-bit microcontrollers for USB device or controller applications.

The STM32F0x2 series provides from 16 to 128 Kbytes of Flash memory in 20- to 100-pin packages. These popular package styles are the perfect fit for PC or mobile applications and accessories.

STM32F0x2 PORTFOLIO

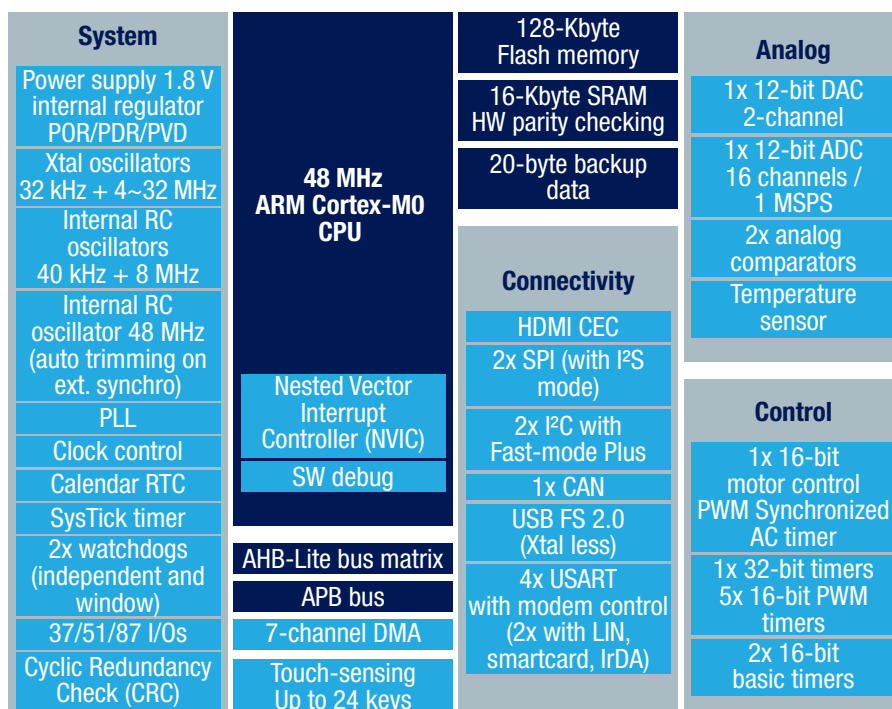
Flash memory size / RAM size (bytes)



The STM32F0x2 has a built-in USB DFU bootloader.

Designers can program blank STM32F0x2 devices in a newly-assembled board or upgrade the application firmware during development or pre-production via USB without the need of specific programming tools or cables.

STM32F072 BLOCK DIAGRAM



The combination of the USB Full Speed device interface together with a large variety of analog and digital peripherals make the design more compact and more integrated.

To simplify development for non-USB experts, we provide a free USB Full-Speed Device Library as well as a set of examples and a demo based on various audio, CCID, CDC, HID, VCP, and MSC classes.





STM32F0x8 line

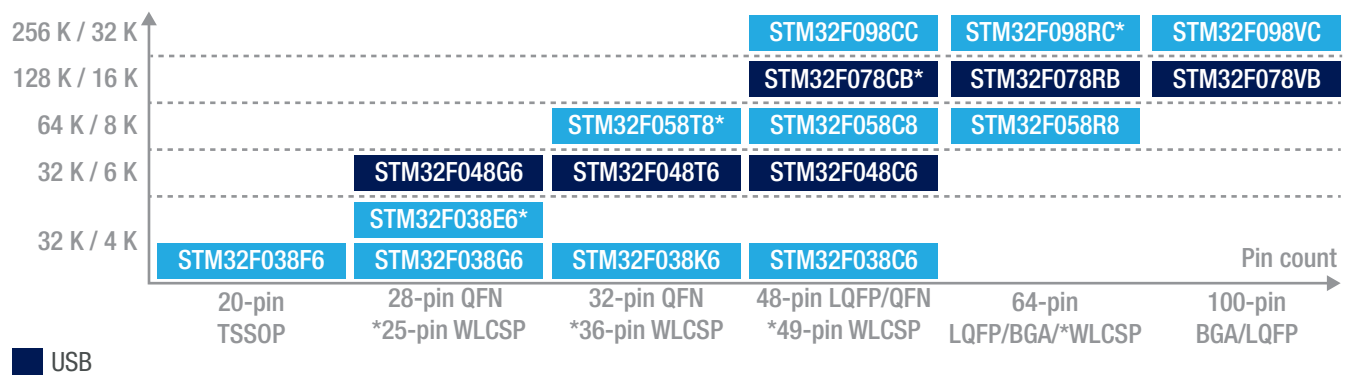
The STM32F0x8 low-voltage 1.8 V family

The STM32F0x8 line operates at $1.8\text{ V} \pm 8\%$. It is well suited for use in portable consumer applications such as smartphones, accessories and media devices, and allows designers to take advantage of the same features as the STM32F0 series with no compromise or degradation in processing performance when operating at lower voltages.

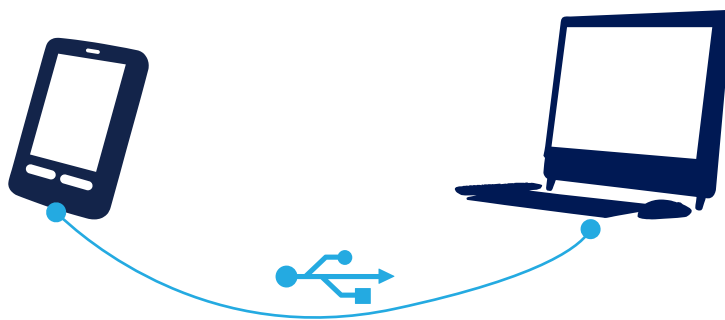
The combination of a 1.8 V digital supply voltage, a separate I/O voltage supply rail and an independent analog domain is an advantage in heterogeneous system architectures, leading to simplified system design and connected cost savings. The STM32F0x8 devices are ideal low-voltage companion microcontrollers, allowing to maintain a wide analog dynamic range or to directly connect USB devices.

STM32F0x8 PORTFOLIO

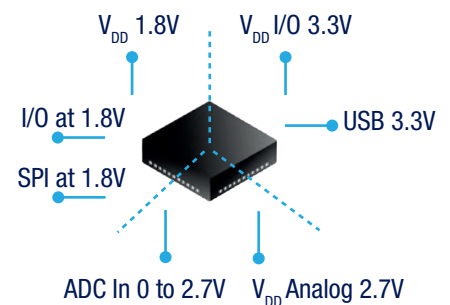
Flash memory size / RAM size (bytes)



1.8 V STM32 BRIDGES MOBILE PLATFORM SUBSYSTEMS



1.8V STM32



A single device will accept various voltage levels, bridging heterogeneous hardware implementation without the need for voltage level shifters.



STM32F0 ecosystem

Hardware tools

Various types of development boards let you get started with STM32F0 products.

The STM32 Nucleo boards provide an affordable and flexible way for users to try out new ideas and build prototypes with a wide choice of specialized expansion boards. The Discovery kits let developers quickly explore key features of STM32F0 products, while the evaluation boards highlight all MCU functions. All these development boards include an integrated debugger programmer as well as ready-to-use software examples helping developers to promptly get started.

STM32 Nucleo

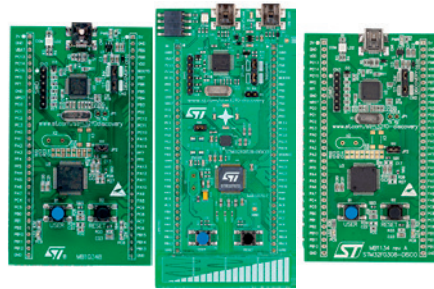


Flexible prototyping

NUCLEO-F030R8 NUCLEO-F070RB
NUCLEO-F031K6 NUCLEO-F072RB
NUCLEO-F042K6 NUCLEO-F091RC

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Discovery kit

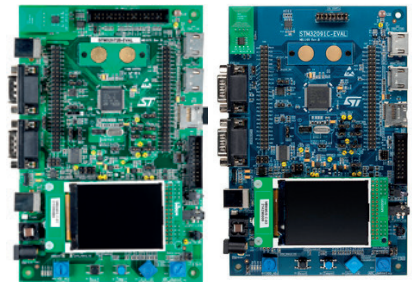


Key feature prototyping

STM32F0DISCOVERY
32F072BDISCOVERY
32F0308DISCOVERY

www.st.com/stm32f0-discovery

Evaluation board



Full feature evaluation

STM32072B-EVAL
STM32091C-EVAL

www.st.com/stm32evaltools

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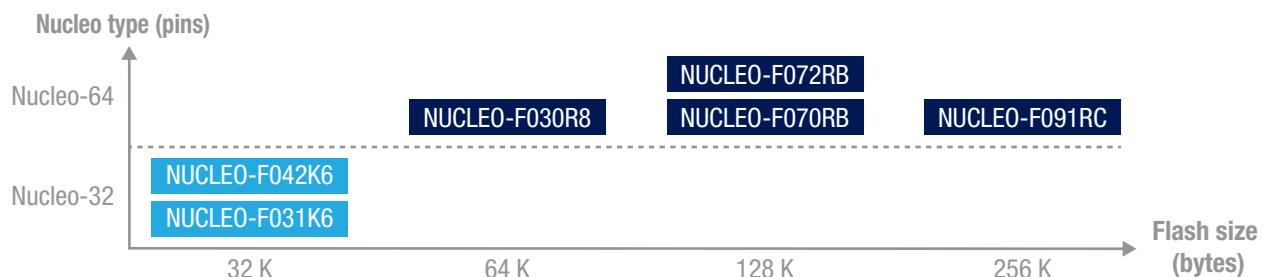
STM32 NUCLEO

- Open platform with a single STM32 MCU and integrated debugger/programmer.
- At least one board per main series.
- Different types of connectors for unlimited expansion possibilities.
- Support for multiple IDEs and mbed online tools.
- \$10.32 recommended resale price.

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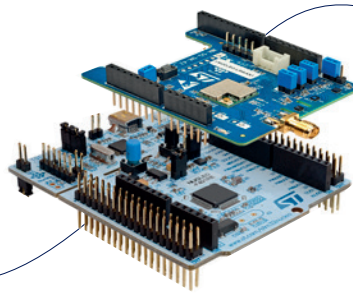


STM32 NUCLEO PORTFOLIO



STM32 NUCLEO EXPANSION BOARDS

- Expansion boards allow you to add specialized functions (sense, connectivity...) with companion chips through Arduino™ or ST morpho connectors.
- The portability of associated software components let you target several STM32 MCUs.



www.st.com/x-nucleo

USB TYPE-C AND POWER DELIVERY NUCLEO PACKS WITH NUCLEO-F072RB

P-NUCLEO-USB001 and P-NUCLEO-USB002 are STM32 Nucleo packs for learning and developing certified solutions based on USB Type C™ and Power Delivery technologies.

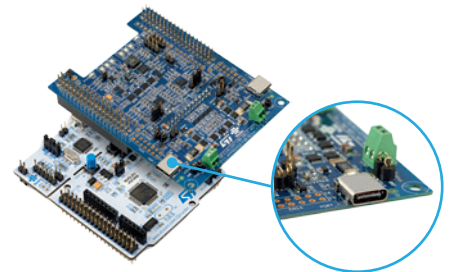
ST's latest P-NUCLEO-USB002 Nucleo pack is compliant with USB Type-C™ Rev. 1.2 and USB Power Delivery Rev. 2.0 specifications and supports a dual-port USB Type-C expansion board based on the STUSB1602 high-voltage analog front-end. The hardware leverages on the performance of an STM32F072 32-bit microcontroller and two STUSB1602 USB Type-C™ port controllers guaranteeing clean USB Power Delivery communication and high voltage protection up to 28V.

When used with the USB IF certified embedded X-CUBE-USB-PD software, the P-NUCLEO-USB002 enables fast prototyping of certified source, sink or dual-role power (DRP) USB PD applications for under \$50.

The P-NUCLEO-USB001 a simple analog front end PHY based on discrete components used to interface the STM32F072 MCU with the Configuration Channels (CC lines) of the Type-C receptacles.



P-NUCLEO-USB001



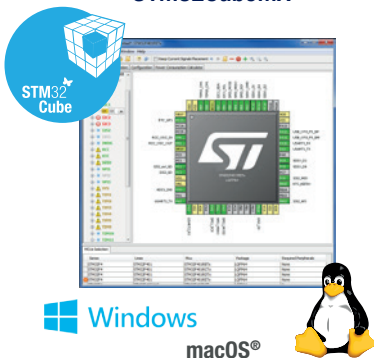
P-NUCLEO-USB002

Software development tools offer

ST proposes a 3-step approach for standard development in C:

- 1/ Configure the microcontroller using STM32CubeMX tool and optionally generate code depending on user choices.
- 2/ Develop the application, compile and debug, using a partner integrated development environment (IDE) such as IAR, Keil, AC6, Atollic, Coocox, Emprog, iSystem, Keolabs, Rowley, Segger, and Tasking.
- 3/ Monitor the application while it is running without being intrusive with STMStudio.

STM32CubeMX



Windows
macOS®

Partners IDEs



Free IDE

STMStudio



Configure and generate code

Compile and debug

Monitor

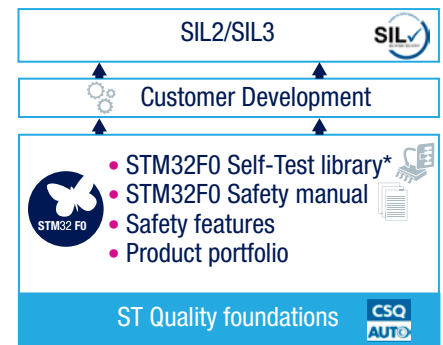
ACHIEVING SIL2/3 WITH STM32F0

Quickly achieve IEC 61508 Safety Integrity Level (SIL) certification with the STM32F0 Functional Safety Package:

- STM32F0 Safety Manual: a user guide including detailed list of safety requirements and examples.
- STM32F0 Self-test library*: ready to use and certified software to address application independent failures of the MCU.



www.st.com/stm32safety

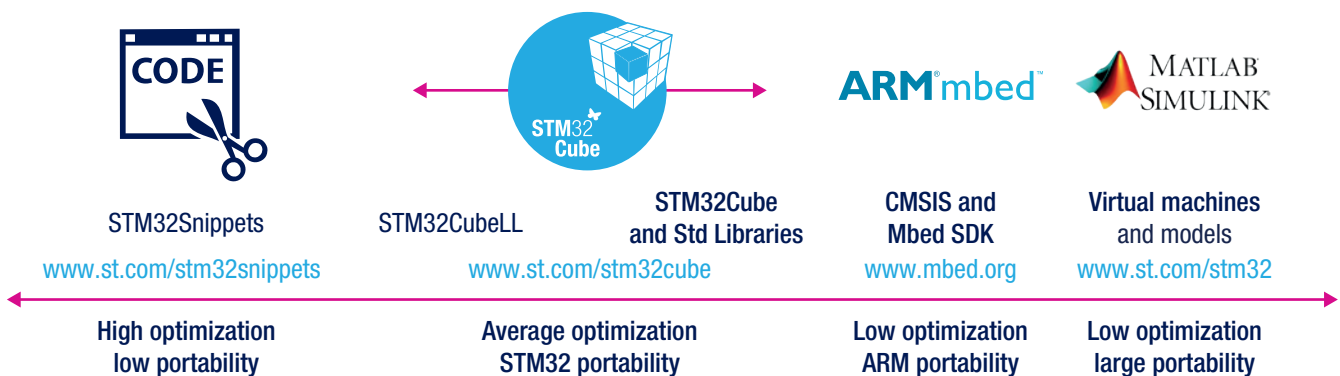


*Available in December 2017

Recommendations for choosing embedded software

When choosing between a strategy for code optimization or portability, here are some recommendations:

- **STM32Snippets**: a collection of examples, optimized for direct access to registers
 - Best option for users looking for size and performance optimization.
 - It is also a good choice for 8-bit MCU users wishing to start on a 32-bit MCU, granting access to a level of control very close to hardware, with a very well-fit footprint.
 - STM32SnippetsF0 examples are also included in STM32F0 MCU reference manuals
- **Standard Peripheral Library**: for portability at the STM32 series level. For instance, easy portability within the STM32F0 series
 - Good tradeoff for users willing to remain within the STM32F0 series.
- **STM32Cube** embedded software: for portability at the entire STM32 family level. Easing the reuse of applications from one STM32 MCU to another
 - Correct choice for users who may want to easily port their application to another STM32 MCU
 - Benefits from the full features of the STM32CubeMX tool on the PC, enabling access to code generation based on the user configuration and STM32CubeF0 embedded software
- **CMSIS** Driver and mbed abstraction layer: an abstraction layer for any ARM® Cortex®-M based microcontroller
- **Solutions outside the microcontroller world**: .Net Micro framework, or MATLAB/Simulink



Collaterals

FIND INFORMATION AND SUPPORT

- Visit www.st.com for valuable online information and support on our products to bring your project to life.
- Find the right STM32 MCU and instantly access documentation and the STM32 ecosystem from any desktop or mobile device with the [ST MCU Finder](#).
- Ask, learn, share, discuss, and engage with STM32 enthusiasts and developers on [ST Ccommunity](#).
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ST COMMUNITY

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