

STM8L MCU family

Ultra-low-power 8-bit microcontrollers



Rolling **energywise**

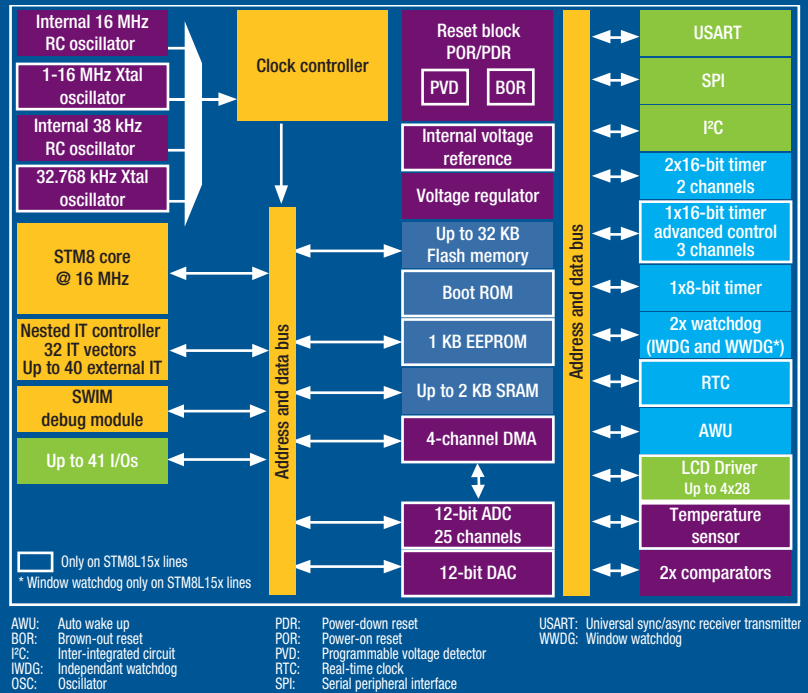
September 2009

STM8L ultra-low-power MCU family

STMicroelectronics has developed an ultra-low-power family of MCUs based on the 8-bit STM8 core. Paving the way for a future comprehensive ultra-low-power platform, the STM8L family combines high performance and ultra-low power consumption thanks to a new proprietary ultra-low leakage process and optimized architecture. This family is declined in three different lines making the STM8L an optimal family to support many applications with special care on power savings.

STM8L1xx applications and block diagram

- Medical equipment
 - Glucose meters
 - Insulin pumps
 - Diabetes care
 - Blood pressure monitors
 - Cholesterol electronic monitors
 - Patient monitoring
 - Heart monitors
- Metering
 - Electricity/gas/water/heat meters
 - Scales
- Alarm systems
 - Central processor units
 - Wired/wireless sensors
 - Door locks
- GP portable devices
 - Mobile phones/accessories
 - 3D mouse and remote controls
 - Gaming
 - GPS watches
 - Sports equipment
 - Games and toys

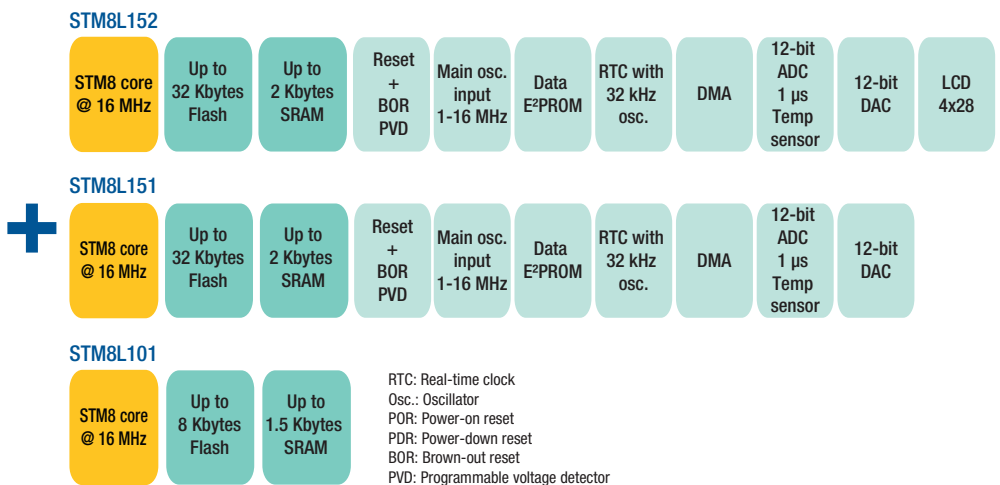


STM8L, more choice with 3 different lines

The STM8L101 is the entry point for the ultra-low-power 8-bit portfolio. It is cost optimized and offers a high level of integration in an ultra small footprint. The STM8L151 is the feature-rich 8-bit solution. It has more Flash, SRAM and peripherals on board, with external crystal/clock capability, more analog features, a real-time clock and enhanced reset, EEPROM with true RWW, DMA, fast ADC and DAC. The STM8L152 has an additional segment LCD driver compared to the STM8L151.

All lines include:

- 16 MHz STM8 CPU
- Communication peripherals USART, SPI, I²C
- Multiple 16-bit timers
- Internal 16 MHz and 38 kHz RC oscillators
- Watchdog (Dual Watchdogs on STM8L15x)
- Reset circuitry POR/PDR
- 2x comparators



STM8L family description

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

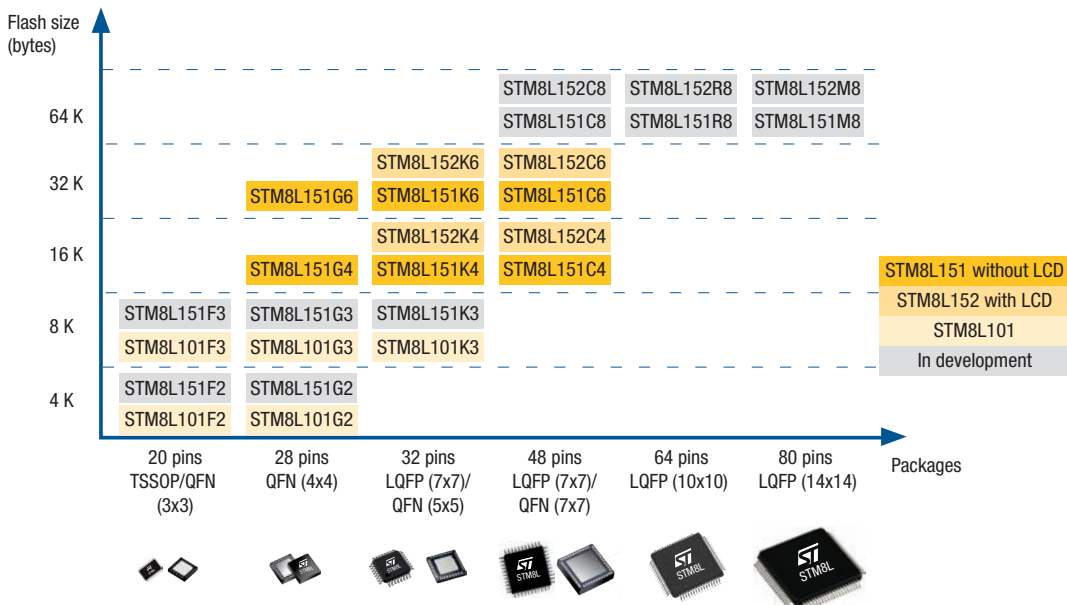
- STM8 16 MHz CPU
- 4 to 32 Kbytes of embedded Flash, up to 2 Kbytes of SRAM
- Three lines: pin-to-pin, software and peripheral compatibility across lines
- Supply voltage: 1.8 V to 3.6 V (down to 1.65 V at power down)
- Up to four ultra-low-power modes: down to 350 nA with SRAM and context retention
- Run mode dynamic consumption down to 150 µA/MHz
- State-of-the-art digital and analog peripherals
- -40 to +85 °C, or up to 125 °C operating temperature range
- Free touch sensing library

Features and benefits

Features	Benefits
Ultra-low-power proprietary 130 nm technology	Speed and power consumption independant of MCU power supply, Ultra-low leakage
Ultra-low-power design (clock gating, low-power Flash with power-off capability)	Reduced overall run and wait mode current consumption by turning off clocks of unused peripherals or Flash
Sub 1 µA hardware RTC and AWU system unit	Ultra-low-power modes for applications requesting regular wake up
Range of low-power modes (up to 4)	Suitable for many applications from complete switch off to continuous monitoring at ultra low frequency
Advanced and flexible clock system (multiple internal and external clock sources)	Switch and adjust frequency and clock sources on the fly depending on application needs
Direct memory access on board (4-channel DMA)	Autonomy for peripherals, independent from core; can switch off Flash memory and CPU (large current consumption contributors) while keeping peripherals active
Ultra-low-power and ultra-safe reset system POR/ PDR; additional optional activation BOR	Integrated safety and security for application
Ultra-fast wake up from lowest low-power mode (4 µs)	Fast switching from static and dynamic power modes
Analog functional down to 1.8 V, programming down to 1.65 V	Full functionality over the complete Vdd range

STM8L portfolio

26 compatible devices available now



STM8L: power saving features and benefits

The STM8L lines embed up to 4 different ultra-low-power modes to offer users a high level of flexibility depending on their application, whether they need it to be continuously on at ultra-low frequency for monitoring or if they wish to switch it completely off. On top of this, the dynamic run consumption has been optimized.

Up to four ultra-low-power modes

- Low-power run mode:** the CPU is still running.
 - Execution is done from RAM with a low-speed oscillator (RTC or internal). Consumption is less than 6 μA typical.
- Low-power wait:** offers the capability to keep RTC and a few other peripherals active (such as the timer) with a consumption of less than 5 μA typical. The CPU is off.
 - The Flash is switched off and the regulator is put in ultra-low-power mode, the CPU is stopped, the RTC and peripherals can be activated.

These 2 modes are ideal for applications that need constant monitoring with a sub 6 μA budget.

- Active halt mode:** the CPU, main clocks and peripherals are off. The RTC can be still running. Wake up can be done through an interrupt on the peripherals. For fast wake up, SRAM and context are kept.
- Halt mode:** the CPU, main clocks and peripherals are off, the RTC is off, SRAM and context are kept.

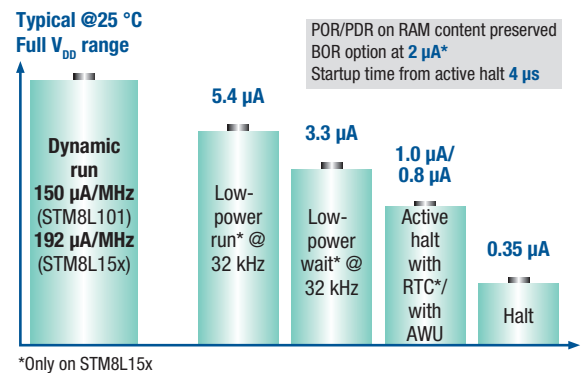
Supply monitoring and reset circuitry

- Full reset circuitry, supply monitoring
 - Power-on reset/power-down reset, “zero power” – permanently enabled
 - Brown-out detection (BOR) can be on or off in low-power modes
 - Programmable voltage detection – can be on or off
 - Extended battery lifetime down to 1.65 V during power-down
- BOR complies with all Vdd rise/fall times, so no constraints on power supply shape

STM8L ultra-low-power consumption values

Operating modes (typ, 3 V, 25 °C)	STM8L101	STM8L15x
Dynamic run mode from Flash	150 $\mu\text{A}/\text{MHz}$	192 $\mu\text{A}/\text{MHz}$
Dynamic run from RAM	75 $\mu\text{A}/\text{MHz}$	90 $\mu\text{A}/\text{MHz}$
Active halt mode with full RTC	na	1 μA
Active halt with AWU	0.8 μA	0.9 μA
Halt mode	0.35 μA	0.4 μA

STM8L1xx consumption value



Device summary

Part number	Program memory		RAM (bytes)	Data EPROM (bytes)	A/D inputs	Timer functions			Serial interface	LVD levels	I/Os (high current)	Packages	
	Type	Size				16-bit (IC/OC/PWM)	8-bit (IC/OC/PWM)	Others					
STM8L101 Ultra-low-power line: 16 MHz and 38 kHz internal RC, AWU, reset system, 2x comparators, 1.65 to 3.6 V supply voltage													
20 pins	STM8L101F2	●	4	1.5 K	-	-	2x16-bit (4/4/4)	1x8-bit	2x WDG, beep	1xSPI, 1xI ² C, 1xUSART (IrDa, ISO 7816)	-	18(16)	TSSOP20, UFQFPN20 (3x3)
	STM8L101F3	●	8	1.5 K	-	-	2x16-bit (4/4/4)	1x8-bit			-	18(16)	TSSOP20, UFQFPN20 (3x3)
28 pins	STM8L101G2	●	4	1.5 K	-	-	2x16-bit (4/4/4)	1x8-bit			-	26(24)	WFQFPN 28 (4x4)
	STM8L101G3	●	8	1.5 K	-	-	2x16-bit (4/4/4)	1x8-bit			-	26(24)	WFQFPN 28 (4x4)
32 pins	STM8L101K3	●	8	1.5 K	-	-	2x16-bit (4/4/4)	1x8-bit	-	30(28)	LQFP32, WFQFPN32 (5x5)		
STM8L151 Ultra-low-power line: 16 MHz and 32 kHz oscillator, hardware RTC, 12-bit DAC, 16 MHz and 38 kHz internal RC, 4 low-power modes, 2x comparators, DMA, reset system + BOR, 1.8 to 3.6 V supply voltage													
28 pins	STM8L151G4	●	16 K	2 K	1 K	18x12-bit	3x16-bit (7/7/8)	1x8-bit	2x WDG, RTC, beep	1xSPI, 1xI ² C, 1xUSART (IrDa, ISO 7816)	7	26(24)	WFQFPN 28 (4x4)
	STM8L151G6	●	32 K	2 K	1 K	18x12-bit	3x16-bit (7/7/8)	1x8-bit			7	26(24)	
32 pins	STM8L151K4	●	16 K	2 K	1 K	22x12-bit	3x16-bit (7/7/10)	1x8-bit			7	30(28)	LQFP32, WFQFPN32 (5x5)
	STM8L151K6	●	32 K	2 K	1 K	22x12-bit	3x16-bit (7/7/10)	1x8-bit			7	30(28)	
48 pins	STM8L151C4	●	16 K	2 K	1 K	25x12-bit	3x16-bit (7/7/10)	1x8-bit	7	41(39)	LQFP48, VQFN48		
	STM8L151C6	●	32 K	2 K	1 K	25x12-bit	3x16-bit (7/7/10)	1x8-bit	7	41(39)			
STM8L152 Ultra-low-power line: 16 MHz and 32 kHz oscillator, hardware RTC, 12-bit DAC, 16 MHz and 38 kHz internal RC, 4 low-power modes, 2x comparators, DMA, LCD segment, reset system + BOR, 1.8 to 3.6 V supply voltage													
32 pins	STM8L152K4	●	16 K	2 K	1 K	21x12-bit	3x16-bit (7/7/10)	1x8-bit	2x WDG, RTC, beep	1xSPI, 1xI ² C, 1xUSART (IrDa, ISO 7816)	7	29(27)	LQFP32, WFQFPN32 (5x5)
	STM8L152K6	●	32 K	2 K	1 K	21x12-bit	3x16-bit (7/7/10)	1x8-bit			7	29(27)	
48 pins	STM8L152C4	●	16 K	2 K	1 K	25x12-bit	3x16-bit (7/7/10)	1x8-bit			7	41(39)	LQFP48, VQFN48
	STM8L152C6	●	32 K	2 K	1 K	25x12-bit	3x16-bit (7/7/10)	1x8-bit			7	41(39)	

STMicroelectronics ultra-low-power microcontroller platform

Commitment to ultra-low power

Lower power consumption is increasingly required in all types of market applications. Several parameters are driving this demand: new national and international norms to reduce power consumption, the increasing number of battery-powered applications, development of new green technologies, or simply the need to be environmentally friendly. To better serve this market, STMicroelectronics is developing a platform of ultra-low-power MCUs as a natural extension to the existing successful STM8S and STM32F families.

This platform for the 8-bit STM8L and 32-bit STM32L MCUs is based on a proprietary 130 nm ultra-low-leakage process technology.

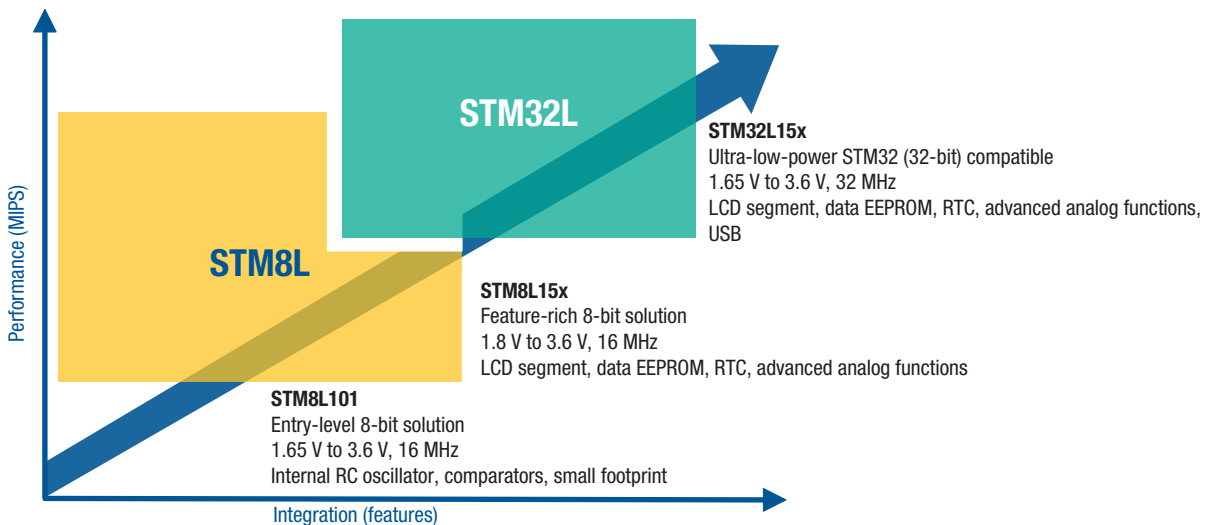
The STM8L and STM32L offer specific features for ultra-low-power applications, such as advanced ultra-low-power modes, optimized dynamic run consumption and specific safety features.

ST's commitment to ultra-low power is total, with ongoing development of future technologies and devices that will complement the existing portfolio of ultra-low-power MCUs giving our customers access to a new level of power saving.

Ultra-low-power platform key features applicable to all products

- Platform for 8-bit STM8L and 32-bit STM32L MCUs
- ST 130 nm ultra-low-leakage process technology - speed and power consumption are independent of MCU power supply
- Ultra-low-power modes: down to 350 nA with SRAM retention
- Ultra-low voltage supply: 1.8 V to 3.6 V (down to 1.65 V at power down)
- Advanced analog functions down to 1.8 V
- Fast wake up in 4 μ s
- On-board security and safety for critical applications

8/32-bit ultra-low-power range



STMicroelectronics' ultra-low-power portfolio includes the full range of 8-bit to 32-bit MCUs and so addresses most applications requiring reduced current consumption, from ultra-simple, cost-optimized feature needs to complex, high-performance requirements.

Development tools

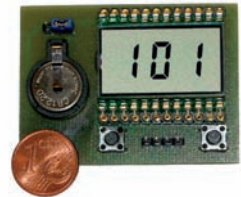
Software development tools

Hardware	Starter kit	Evaluation board	In-circuit debugger	Emulator	3rd-party programmer	
STM8L101		STM8L101-EVAL	STX-RLINK	STICE-SYS005	BP Microsystems	www.bpmicro.com
STM8L15x		STM8L1526-EVAL		STICE-SYS007	Data I/O	www.data-io.com
					Segger	www.segger.com
					Softec Microsystems	www.softecmicro.com
Software	Description				Supplier	
IDE	ST MCU toolset				STMicroelectronics	www.st.com/mcu
	ST Visual Develop (STVD) ST Visual Programmer (STVP), free					
Compiler	RIDE Raisonance				Raisonance	www.raisonance.com
	RIDE with RBuilder and Rflasher, free					
Compiler	Cosmic C Compiler, free up to 16 Kbytes				Cosmic Software	www.cosmic-software.com
	Raisonance C compiler, free up to 16 Kbytes					

Low-cost and application-specific starter kit

STM8L101 LCD board: STEVAL-IAS003V1

STM8L101 low-power demonstrator with software driven LCD. Featuring 1.25 μ A consumption @ 36 Hz refresh rate with a 3-digit LCD glass driven by software, this tool highlights the optimization of the power consumption with the STM8L101. It is also provided at a very low cost.



STM8L15x low-power board: STM8L15LPBOARD

Ultra-low-power and low-cost board for STM8L15x to demonstrate all different low-power modes and functionalities and provide a means to measure current sourced by the battery while paused in each of the modes



Evaluation boards STM8L101-EVAL and STM8L1526-EVAL

Complete hardware emulation platforms with the STM8L101 or the STM8L152, implementing the full range of device peripherals and features



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