

STM8S

MKT pres.



STM8 Simply smarter



STM8S introduction



The new STM8 CISC microcontroller core

Harvard architecture with **3-stage pipeline** reaching a peak performance of **20 MIPS** at **24 MHz** (<http://www.st.com/mcu/inhtml-pages-stm8s.html>)

An advanced 130nm embedded EEPROM technology

ST-proprietary embedded non-volatile memory technology, excellent characteristics of EEPROM memory with a performing high-density CMOS process and including best analog features

STM8S connectivity and peripheral sets



- **CAN 2.0B, USART, LIN UART, SPI and I2C**
 - **CAN** protocol version 2.0A and B Active
 - **USART** with **LIN, ISO7816-3s** and **IrDa** interface
 - **LIN UART**, full duplex asynchronous communication
 - **SPI** up to 10Mhz maximum speed
 - Multi-master **I2C** up to 400KHz
- **3x16-bit timers, 1x8-bit timer, Beeper, 2xWatchdog**
 - **1x16-bit power control timer** (Motor Control):
4 CAPCOMs, 16-bit up/down count, 16-bit prescaler, **6-step PWM generation, programmable dead time generation**, 3xcomplementary output, various interrupt capabilities
 - **2x16-bit timers** :
2/3 CAPCOMs, 4-bit prescaler, 16-bit Up counter
 - **1x8-bit auto-reload timer** with interrupt generation
 - **Beeper**
- **ADC** 16 channels, 10-bit resolution in 3 usec
 - External trigger, VREF+/-, Single/continuous mode

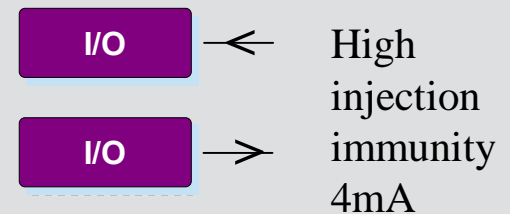
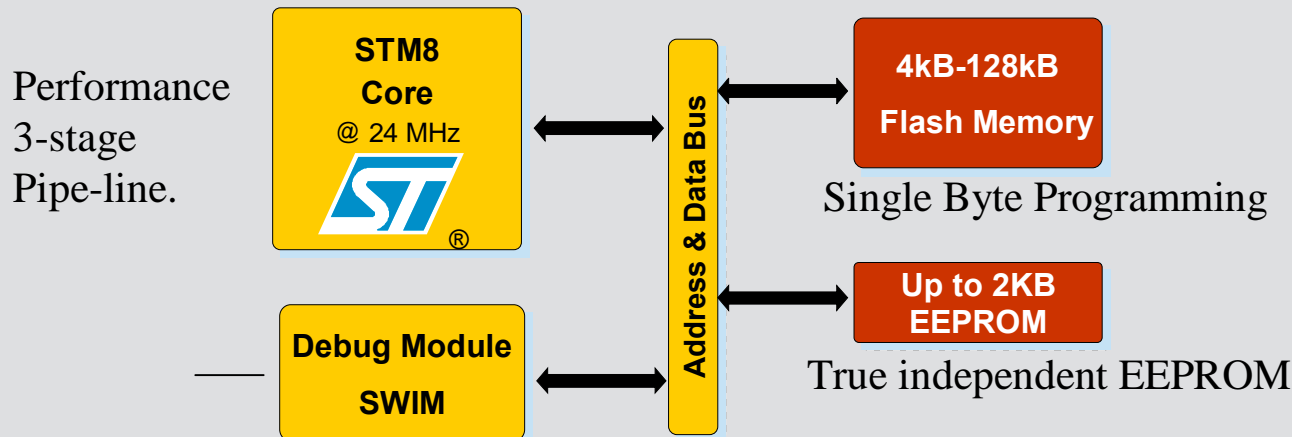
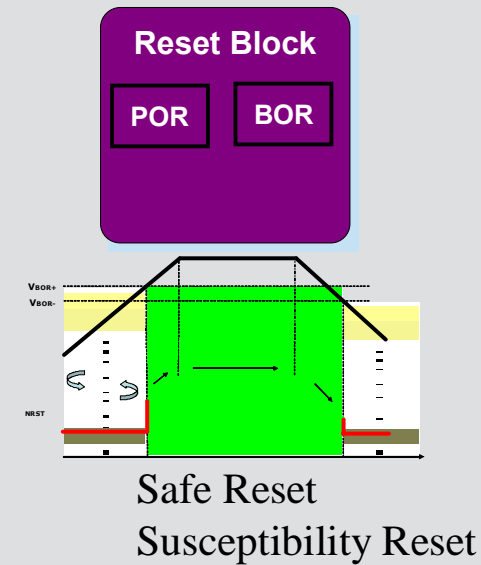
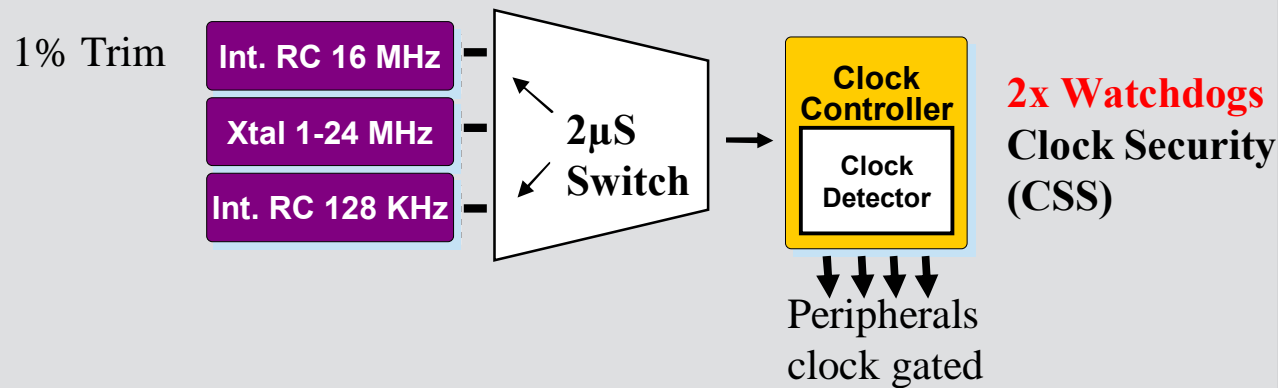
STM8S



- **Independent watchdog, IWDG and window watchdog, WWDG**
- **Clock security system, CSS**, in case of a failure on external clock
- **POR, PDR and LVD**
- **Illegal opcode reset**
- **Error correction code, ECC**, on memory
- **EMS reset** , generated if critical registers are corrupted or badly loaded
- **Internal regulator** for digital operating at 1.8V filtering perturbations
- **Memory write protection, read-out protection**
- **Positive and negative current injection immunity**
- **Latch-up immunity**
- **Optimized layout for supply routing**
- **Slew rate control** on I/Os

STM8 Key Features

- Mission: Robust, reliable, cost effective and simple

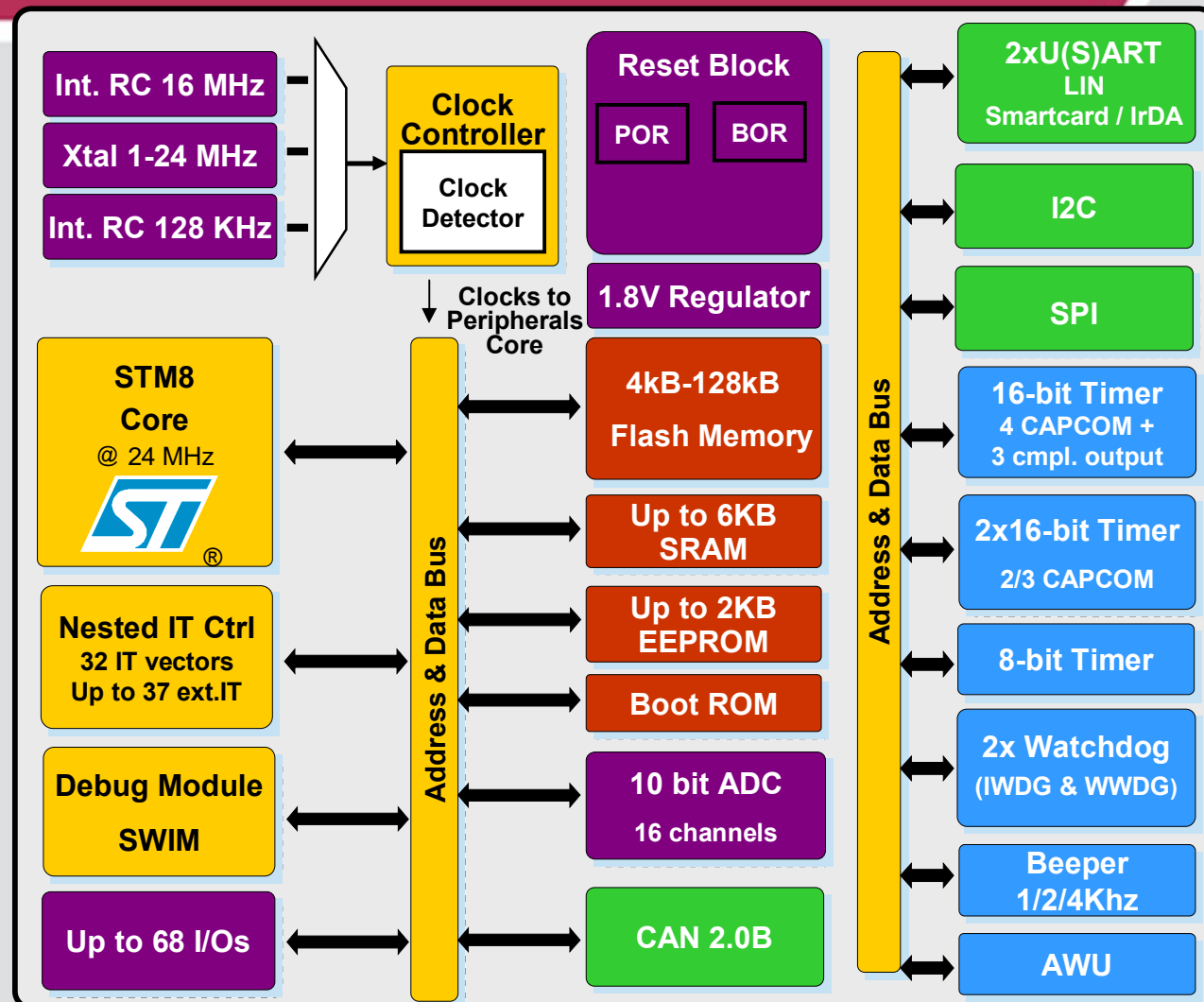


STM8S Block Diagram



Key features

- 3.0-5.5V
- -40 to +125 °C
- 24MHz core frequency (20 MIPS)
- 10K cycles for Flash
- 300K cycles for EEPROM
- 4 Low power modes (~5µA in Halt mode)
- Trimmable HSI RC 16MHz, +/-1%
- IrDA and Smartcard IF
- SWIM for fast programming (<6s for 128KB)
- LQFP 80, 64, 48, 44, 32
VQFN 20, 32, 48
TSSOP 20





STM8S families

- UART
LIN /Smartcard / IrDA
- I2C
400 KHz multi-master
- SPI
10MHz
- Up to 3x16-bit Timer
8-bit Timer
- 2x Watchdog
(IWDG & WWDG)
- AWU
Beeper 1/2/4Khz
- 10-bit ADC
Up to 16 channel
- XTAL
16MHz int.RC osc.
128KHz int.RC osc.
- SWIM
Debug Module

Performance Line STM8S20x

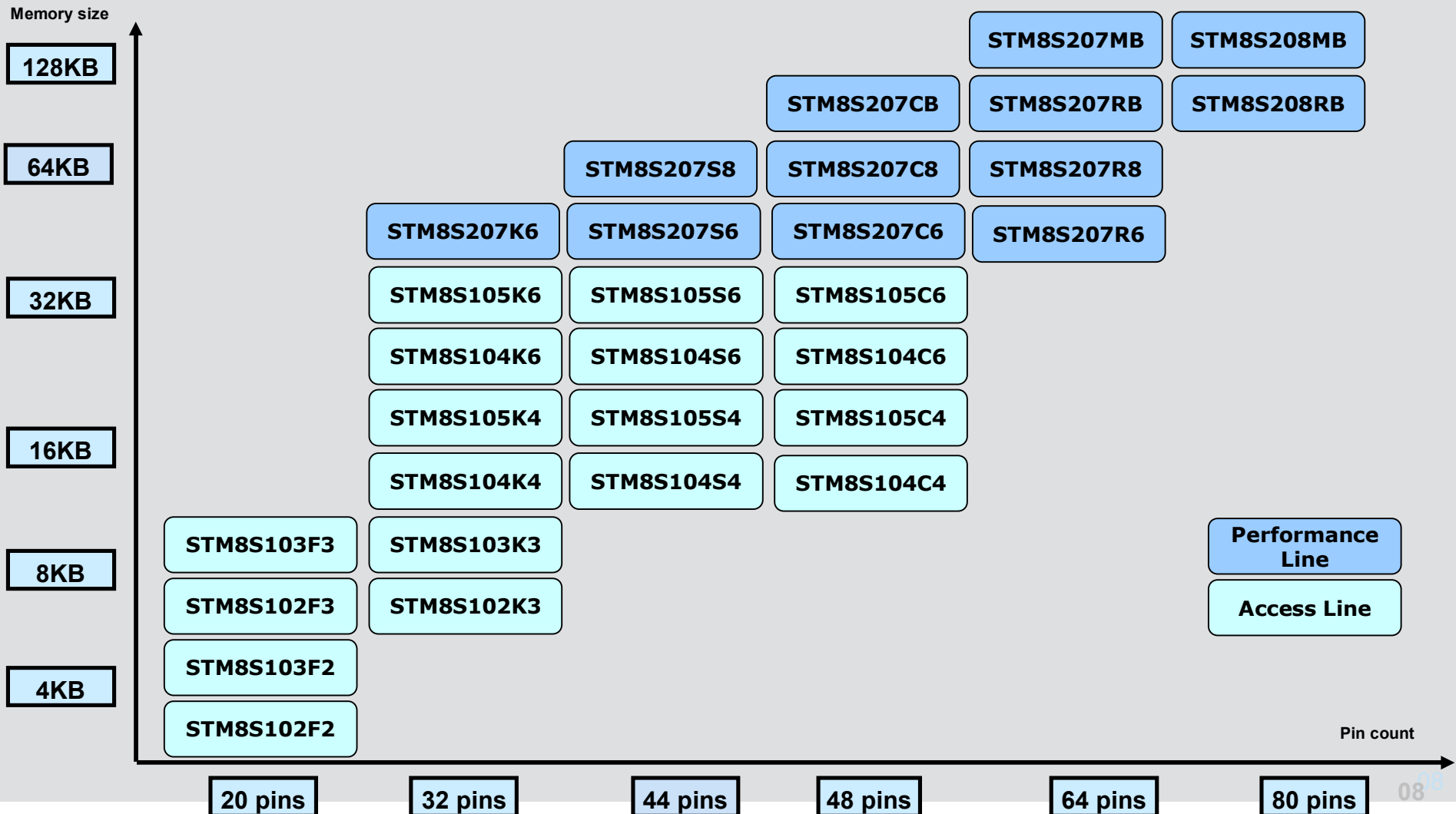
STM8 Core @ 24 MHz 	Up to 6KB SRAM	Up to 2KB EEPROM	CAN 2.0B	2nd UART
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Access Line STM8S10x

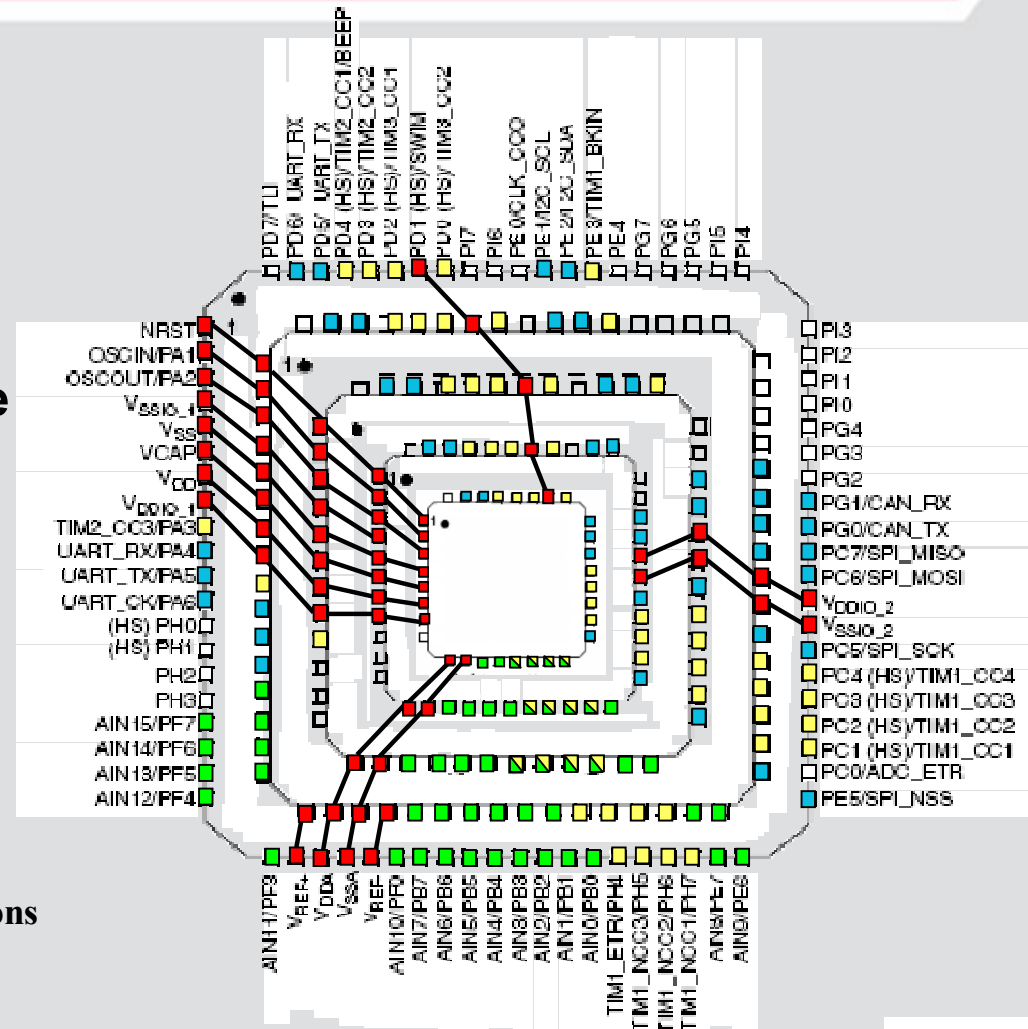
STM8 Core @ 16 MHz 	Up to 2KB SRAM	Up to 1KB EEPROM
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STM8S Portfolio



STM8S Pinout compatibility & scalability

- Easy hardware implementation
- Smooth migration across the package family
- SPI, I²C, UART always available
- Analog on the same side

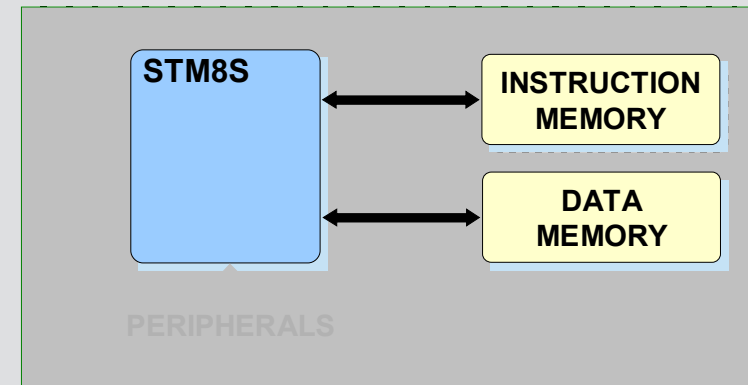


- | | | | |
|--|---------------|--|----------------|
| | Timers | | Communications |
| | Analog Inputs | | System |

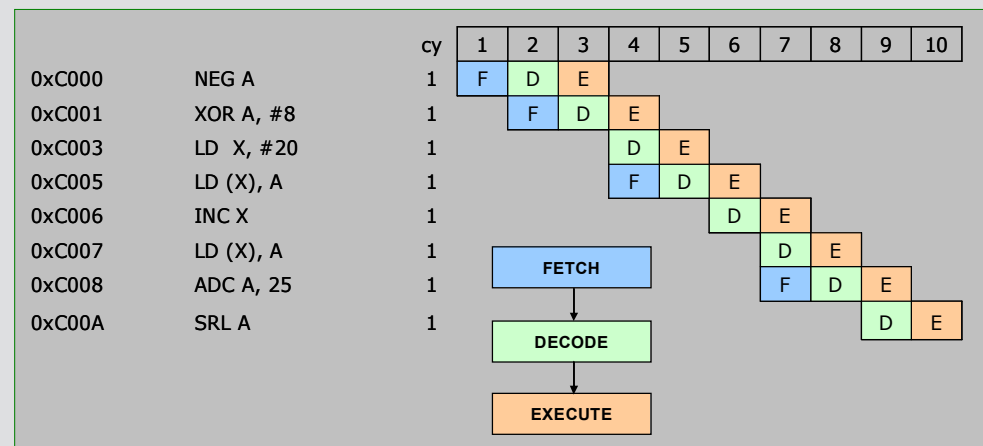
STM8S core and architecture



- Independent busses for instructions and data
- Simultaneous access
- Read & Write in the same cycle



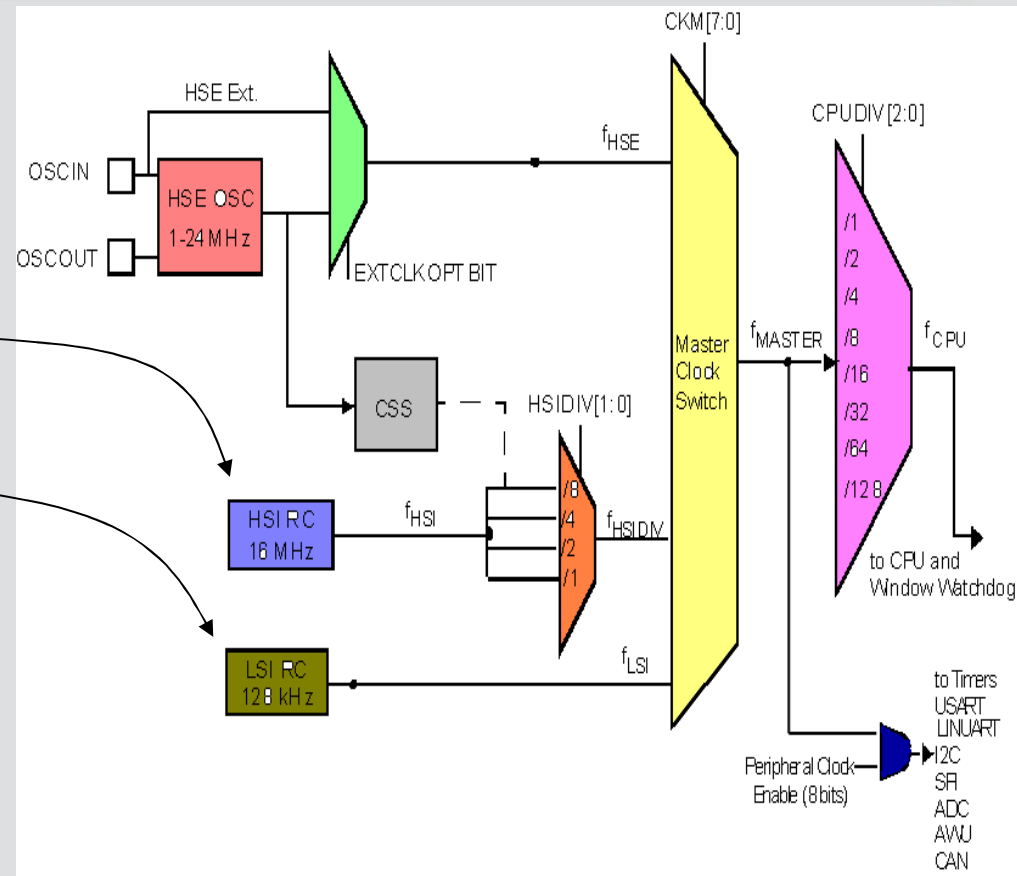
- Separate memories for data and instructions (Harvard Architecture) permits most of the instructions and operands to be fetched, decoded or stored all in a single machine cycle.



STM8S clock controller



- **Clock Security System, CSS:** to monitor external clock source failure
- **High speed internal RC oscillator, HSI RC @16MHz,** calibrated in factory +/-2%, possible to trim down to +/-1%
- **Low speed internal RC oscillator, LSI RC @128kHz,** calibrated in factory to +/-5% accuracy
- **Master clock switching:** a fast and easy clock source switch feature in 2usec
- **Peripherals clock gating:** to disable or enable the clock for each peripheral
- **Configurable clock output, CCO**



STM8S Excellent memory combination linear

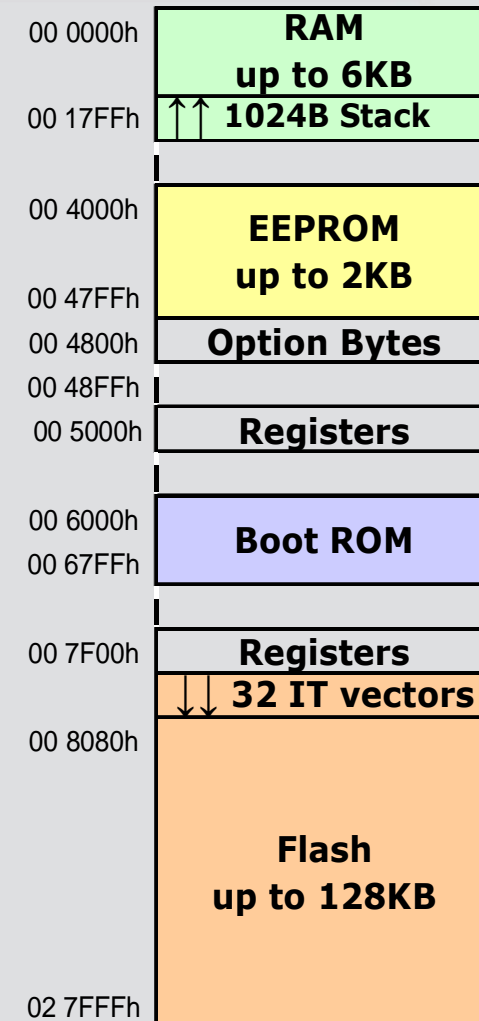


- **Compatible memory map**

- Up to 128KB flash, 10K write/erase cycle
- Up to 6KB RAM
- Up to 2KB data EEPROM, 300K write/erase cycle, read-while-write
- Boot ROM for boot loader code through UART
- 1 byte or block/word programming
- 128KB programming time in 6sec
- 6 bits ECC for 32 data bits (single error correction)
- Efficient read-out protection mechanism
- In-application programming, IAP and in-circuit programming, ICP

- **Scalability in memory size and pin-count**




















- 4KB to 128KB flash in 20/32/44/48/64/80 pin packages
- Package-in-package compatible



STM8S Smart power management



- Advanced Clock Control Architecture allows the device to switch from low speed clock to high speed clock in 2usec

Mode for STM8S208MB	Oscillator	CPU	Peripherals	Wake-up trigger event	Consumption (Typical)
RUN*	ON 	ON 	OFF 		2.5mA
RUN**	ON 	ON 	ON 		1mA+0.6m for/Mhz
Peripheral Clock Gating	ON 	ON 	ON 		To be define
Wait @ RC 16Mhz 5V	ON 	OFF 	ON 	Internal or external IT	1.3mA
Active Halt Fast Wake-up @ RC 128Khz	128Khz	OFF 	OFF 	External IT or AWU (2µS)	250µA
Active Halt Slow Wake-up @ RC 128Khz	128Khz	OFF 	OFF 	External IT or AWU (100µs)	11.5µA
HALT @5V	OFF 	OFF 	OFF 	External IT (100µS)	<1µA

*All peripherals OFF, 16MHz RC at 5V, 25 °C

**All

peripherals ON, all i/o ports toggling in infinite loop with 16MHz RC at 5V, 25 °C

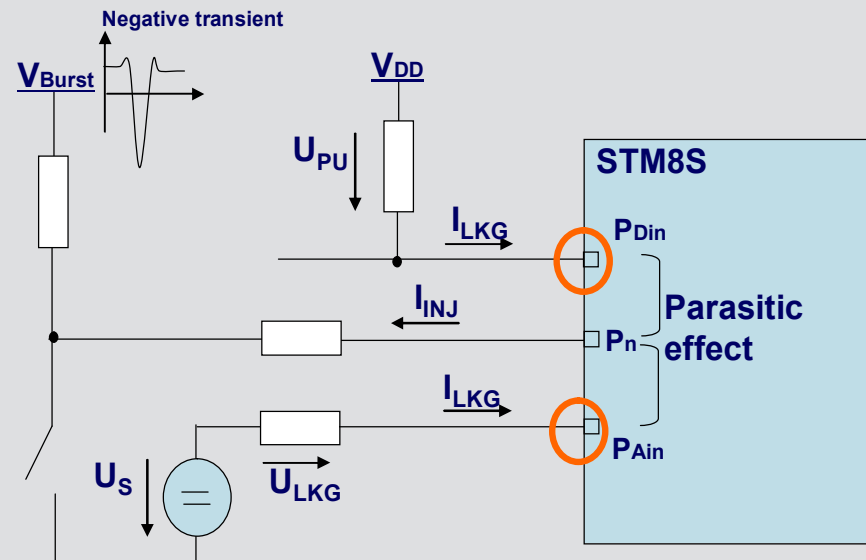
STM8S IO Robustness



- IO ports are robust against current injection in adjacent digital or analog inputs.



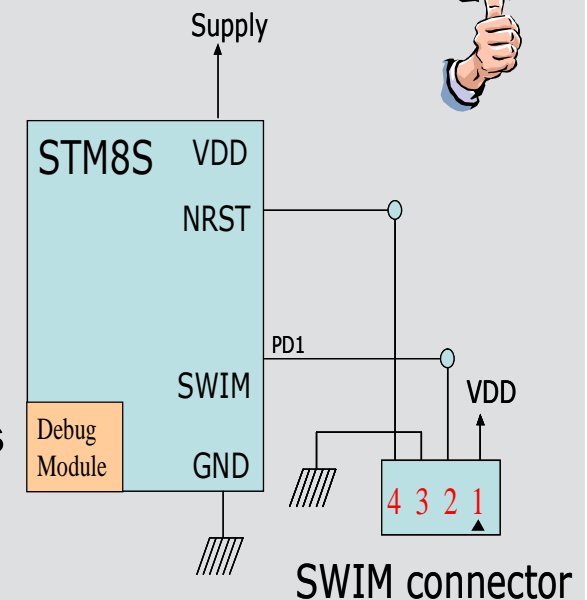
- Injection current of 4mA leads to $I_{LKG} < 1\mu A$
- No external protection elements - simple resistor is enough
- Outstanding robustness against transients and emission



STM8S SWIM and Debug module



- **Non-intrusive, SWIM doesn't use any CPU resource.**
 - No restrictions for addresses and memory space.
 - No monitor code
 - No interrupt remapping
 - Use only single pin
- **Real-time code execution, SWIM steals dead cycles to read RAM and registers**
 - Single wire interface module for non-intrusive in-circuit debugging and fast programming
 - Unlimited instruction breakpoints
 - 2 configurable advance breakpoints up to 23 conditions and data breakpoints
 - Read/write all memory and peripheral registers during application execution



STM8S Compliance to Class B of IEC60335



- **ST is committed to support customers to have IEC 60335 / IEC 60730 compliant end-products**
 - Specific hardware features of STM8S to help in conformance to safety regulations
 - **Dual watchdog architecture**, IWDG+WWDG
 - **Internal clock sources**, HSI and LSI RC
 - **Clock security system**, CSS, to monitor external clock source
 - **Error correction code on memory**, ECC
 - **High impedance state for I/Os under RESET**
 - **Class B self-diagnostic library for STM8**
 - STL, self-test library for CPU, RAM, flash, WDG and clock source check at start-up
 - Run-time test routines for CPU, RAM, flash, WDG, clock source and stack overflow check
 - Application note and user manual for the library
 - Self-test library f/w modules approved by the VDE
 - All f/w libraries are MISRA C compliant



Standard and Touch library solution

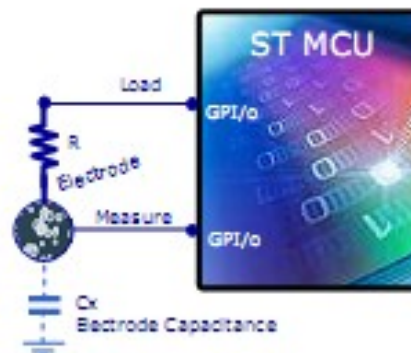
Royalty-free source code enabling STM8 for capacitive touch sensing capability

(www.st.com/touch-sense-sw-lib)

STM8S&L Touch sensing software suite



1. Complete **NRE/Royalty-free** source code solution to enable 8-bit STM8 and 32-bit STM32 Microcontroller platforms for Capacitive Touch Sensing capability.
2. Detect capacitive Human touch by controlling the charge/discharge timing cycle of a RC network formed by a single resistor and the electrode capacitance Cx.



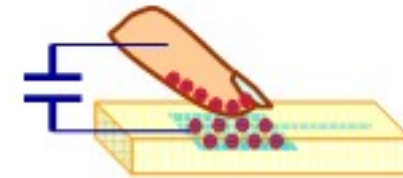
RC acquisition method based on US Patent from '76' now in the public domain.

3. Multi-function capability to combine capacitive sensing function to the traditional MCU features (communication, LED control, beeper, LCD control...)
4. Deliver with Hardware development platform and diagnostic tools to ease the design process.

STM8S&L Touch sensing software suite



- Use capacitive effect of the human finger.



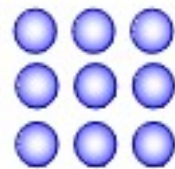
- Detect finger presence near electrode which is behind a panel (glass, plastic, wood...)

- Simple printed board electrodes



- Various electrode shapes

Single and multiple Keys



Wheel



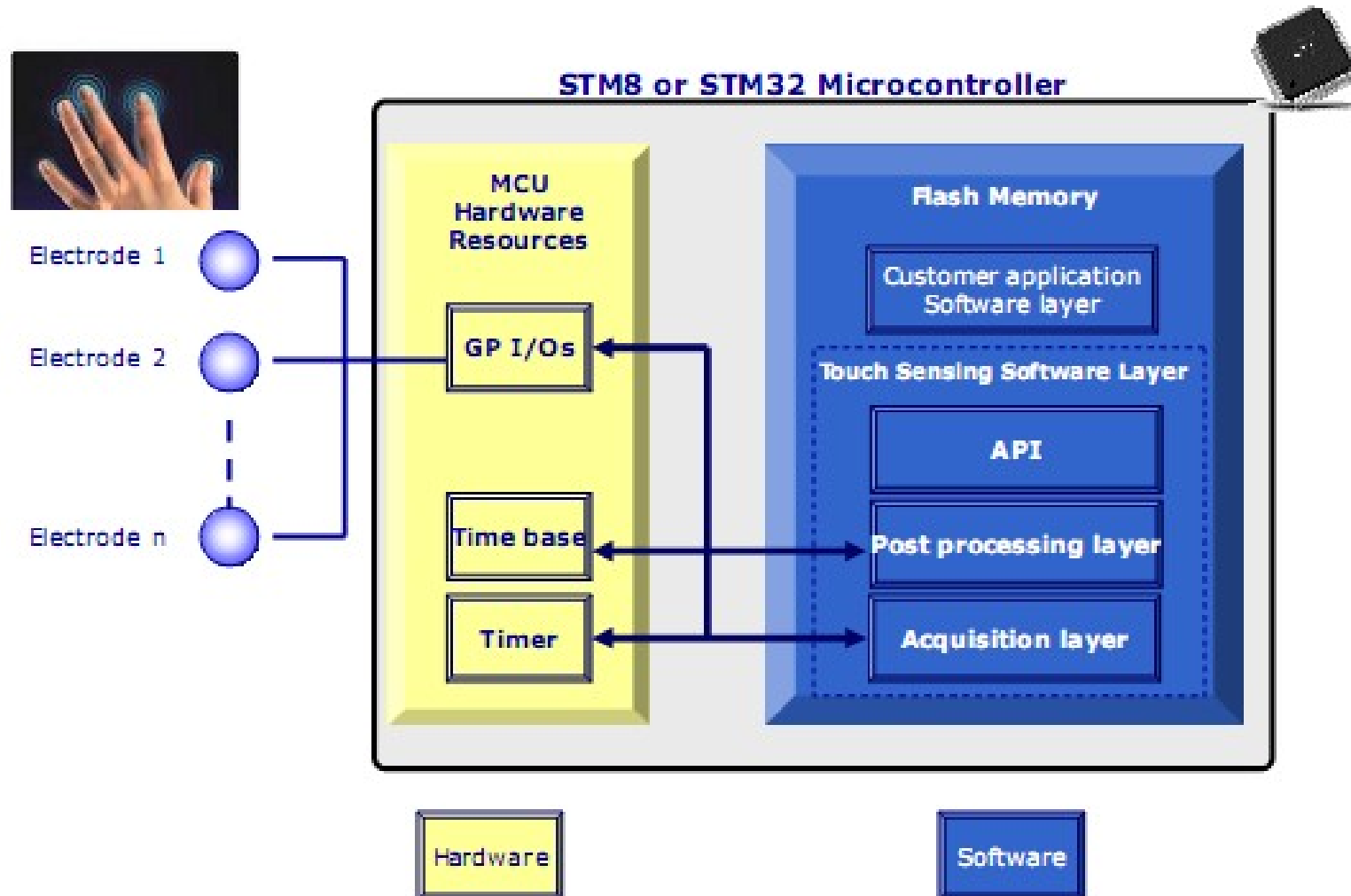
Slider



STM8S&L Touch sensing software suite

- Up to 24 keys + 2 wheels/sliders (MCU dependent)
- Low BOM as only 1 resistor by touch channel is required
- Allow to allocate and configure any MCU GPI/O as touch pad
- SW Library allows easy electrodes configuration and combination of keys and Wheel/slider (ex : 5 keys+1 wheel)
- Acquisition, filtering and calibration functions
(no additional software layer needed)
- Environment Change System (ECS)
- Touch sensing User interface through Software API (status, configuration)
- Touch sensing parameters setting and configuration :
Ex : Acquisition setting, Threshold, Wheel/slider resolution, number of touch pad, type of touch pads (wheel, slider or single keys)...

STM8S&L Touch sensing software suite



STM8S&L Touch sensing software suite



■ MCU hardware

- ✓ 1*16-bit timer (acquisition: RC charge/discharge time measurement)
- ✓ 1*8-bit timer (post processing: time base)
- ✓ 1 GPI/O per channel
- ✓ 1 I/O for LOAD output (common to all channels)

■ MCU Flash memory footprint (library + constants)

- ✓ Keys only : ~ 1900 bytes
- ✓ Keys + 1Wheel/Slider : ~ 3800 bytes
- ✓ Keys + 2Wheels/Sliders : ~ 3900 bytes

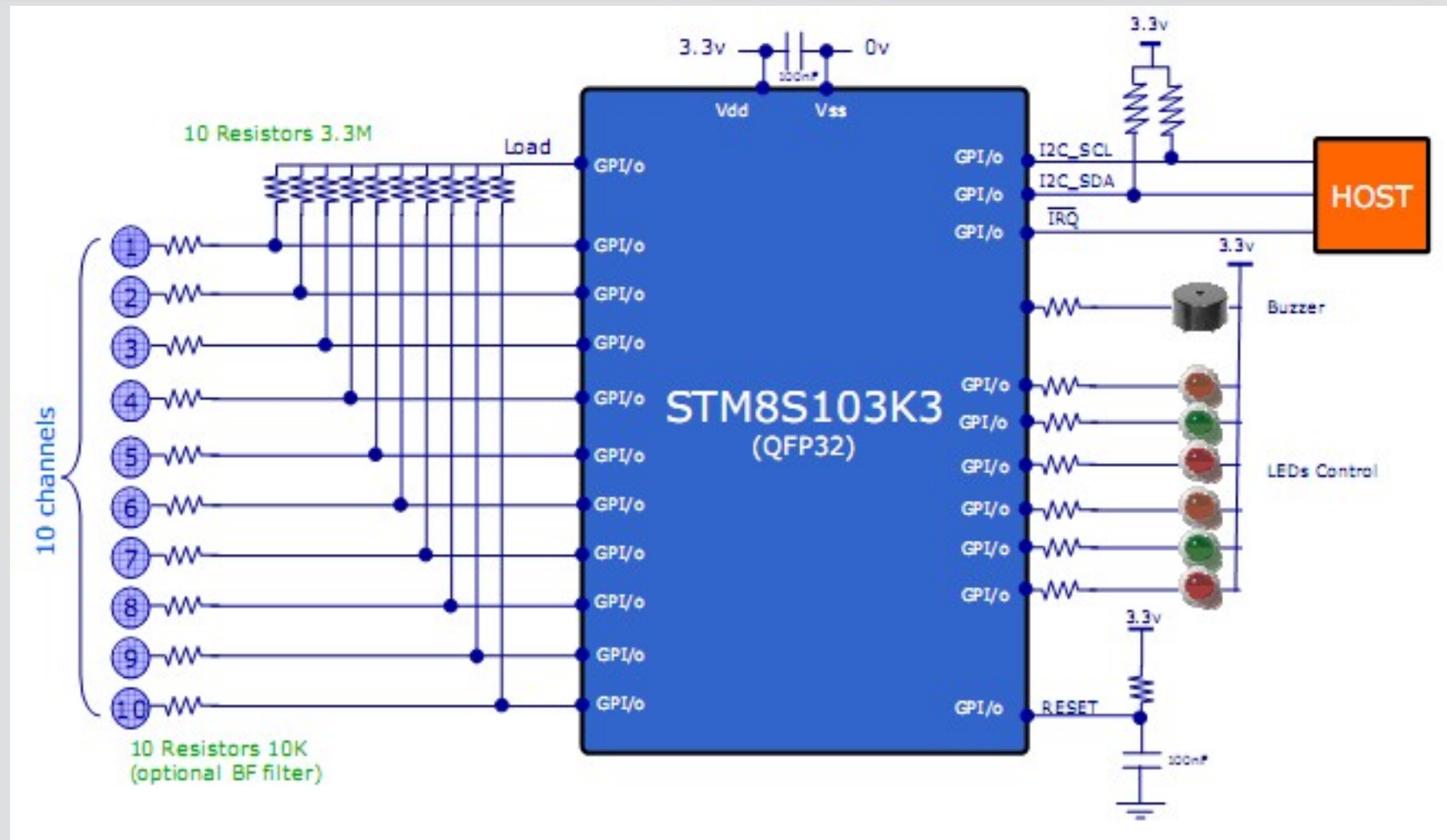
■ RAM

- ✓ Keys only : ~ 57 + (13*(Nb_keys - 1))
- ✓ Keys + 1Wheel/Slider : ~ 112 + (13*(Nb_keys - 1))
- ✓ Keys + 2Wheels/Sliders : ~ 154 + (13*(Nb_keys - 1))

- Ex1 : 10 keys configuration will use 174 bytes in RAM

- Ex2 : 5 keys + 1 Wheel will use 164 bytes in RAM

STM8S&L Touch sensing software suite



STM8S&L Touch sensing software suite



- Kit content :
 - Full STM8S evaluation kit + Touch sensing daughter board and its user manual
 - P/n : STM8/128-EV/TS

STM8S mother board



Touch Sensing daughter board



STM8S Development kits



- **STICE-SYS001**- High-end full featured emulator
- **STM8/128-EVAL**- Evaluation board with full range of peripheral features
- **STM8/128-SK/RAIS**- Starter kit including everything needed to begin a design
- **STX-RLINK**- Programming and debugging dongle



RAISONANCE



STM8/128-EVAL

\$200



STICE-SYS001

\$1990



STM8/128-SK/RAIS

\$219



STX-RLINK

\$59

All recommended resale prices

STM8S Software and firmware library



- ST IDE Visual Develop (STVD), free
 - ST Visual Programmer (STVP), free
 - STM8 peripheral firmware library and examples
 - STM8 IEC 60335 ClassB compliant firmware library, VDE approved
-
- Raisonance RIDE, free IDE with RBuilder and RFlasher
 - Raisonance C Compiler, 16KB free
-
- Cosmic C Compiler, 16KB free



www.st.com/stm8

RAISONANCE

www.raisonance.com



www.cosmic-software.com

STM8S Motor Control Kit



- **Description**

- Complete ready-to-use motor control application kit.
This starter kit is suitable for **3-phase brushless** motor drive (either **AC induction** or **permanent magnet types**) based on scalar control (BLDC or ACIM).
- Hardware and associated **firmware libraries** demonstrate how STM8S can effectively be used in motor control applications.

- **Target markets**

- Cost-sensitive appliances and white good applications.
Some examples are:
heating, ventilation, air-conditioning, blowers, fans, pumps, medical, e-bike, washing machines...

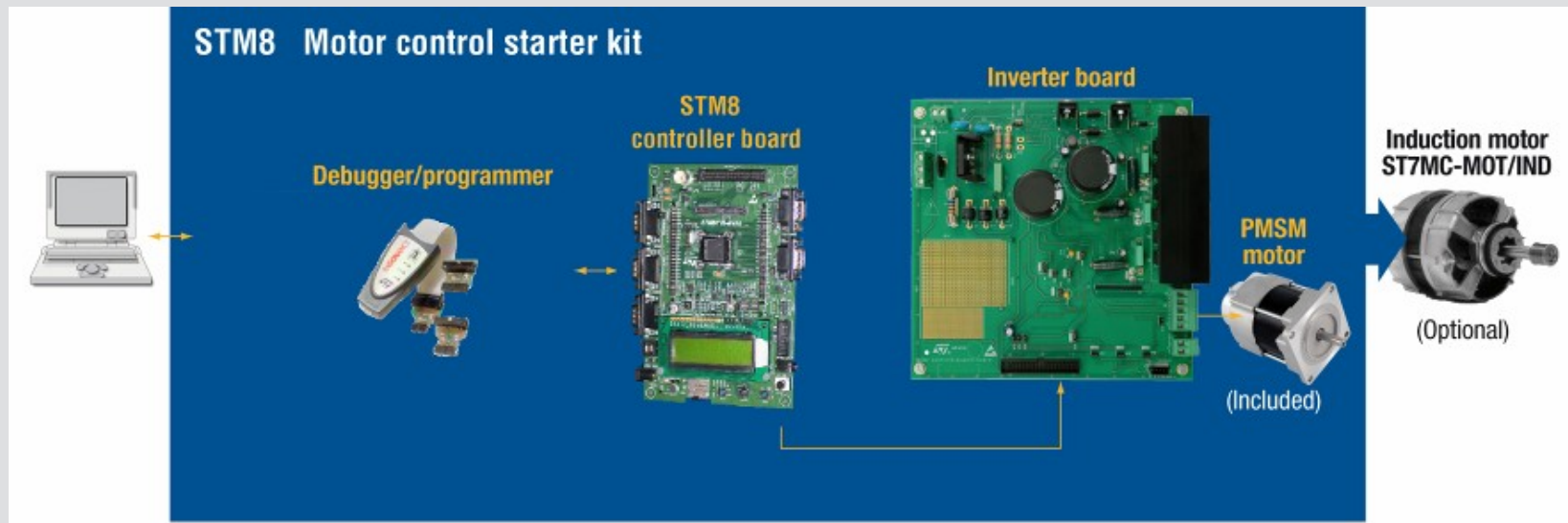
- Salestype: **STM8/128-MCKIT**, at \$1000



STM8S Motor Control Kit

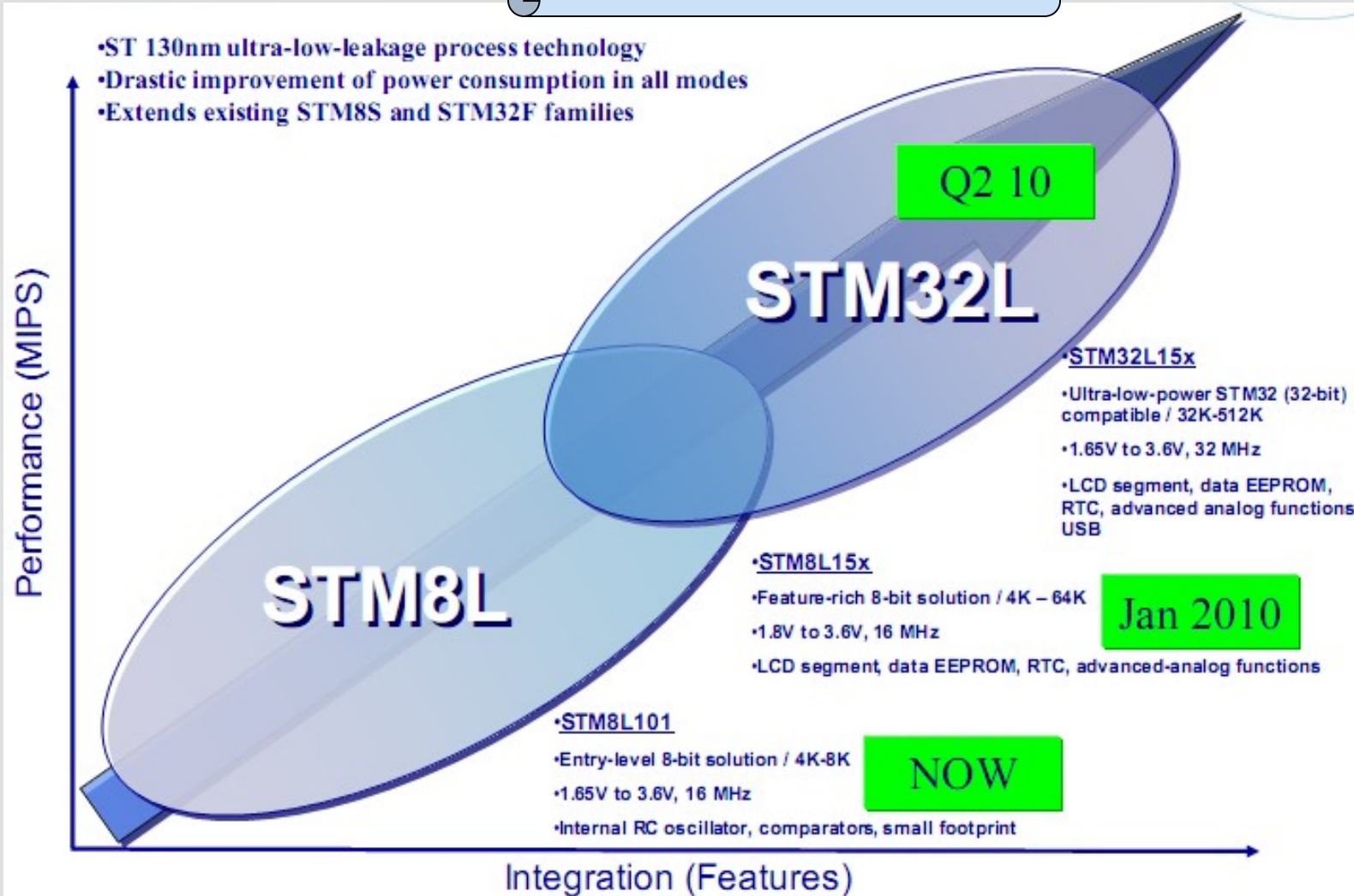


- **Flexible design allowing you to run your motor in just a few minutes:**
 - as a plug-and-play demo with the BLDC motor included in the kit, in sensor less speed control mode.
 - or, driving an external AC induction motor, after reprogramming the microcontroller, in open loop or in speed control mode.
 - or, creating your own application using the software libraries and debugging/programming tools.



STM8L

Disponibili
a partire
da fine 2009



STM8L



STMicroelectronics has introduced its first **ultra-low-power** family based on the **8-bit STM8** core.

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.

STM8L



STM8 16 MHz, up to **16 MIPS**

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)

Ultra-low-power modes: down to **350 nA with SRAM and context retention**

Run mode dynamic consumption down to **150 μ A/MHz**

Fast wakeup from Halt: **5 μ s**

Clock management:

- 1 to 16 MHz crystal oscillator – 32 kHz crystal oscillator
- Internal 16 MHz factory-trimmed RC – Internal 38 kHz low consumption RC
- Clock security system (CSS)

State-of-the-art digital and analog peripherals

- **RTC** – **DMA** – **LCD driver** up to 4x28 segments – **12bit DAC** – **12bit A/D** up to 1Ms
- 2 watchdogs – I2C – USART (IrDA)

Bootloader using **USART**

Operating temperature range: **-40 to +85 °C** or up to **125 °C**

STM8L



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

STM8L152 : Jan 2010

STM8 core @ 16 MHz	Up to 32 KB Flash	Up to 2 KB SRAM	Reset + BOR PVD	Main osc. input 1-16 MHz	Data EPROM	RTC with 32 kHz osc.	4 - chan DMA	12-bit ADC 1µs Temp sensor	12-bit DAC	LCD 4x28
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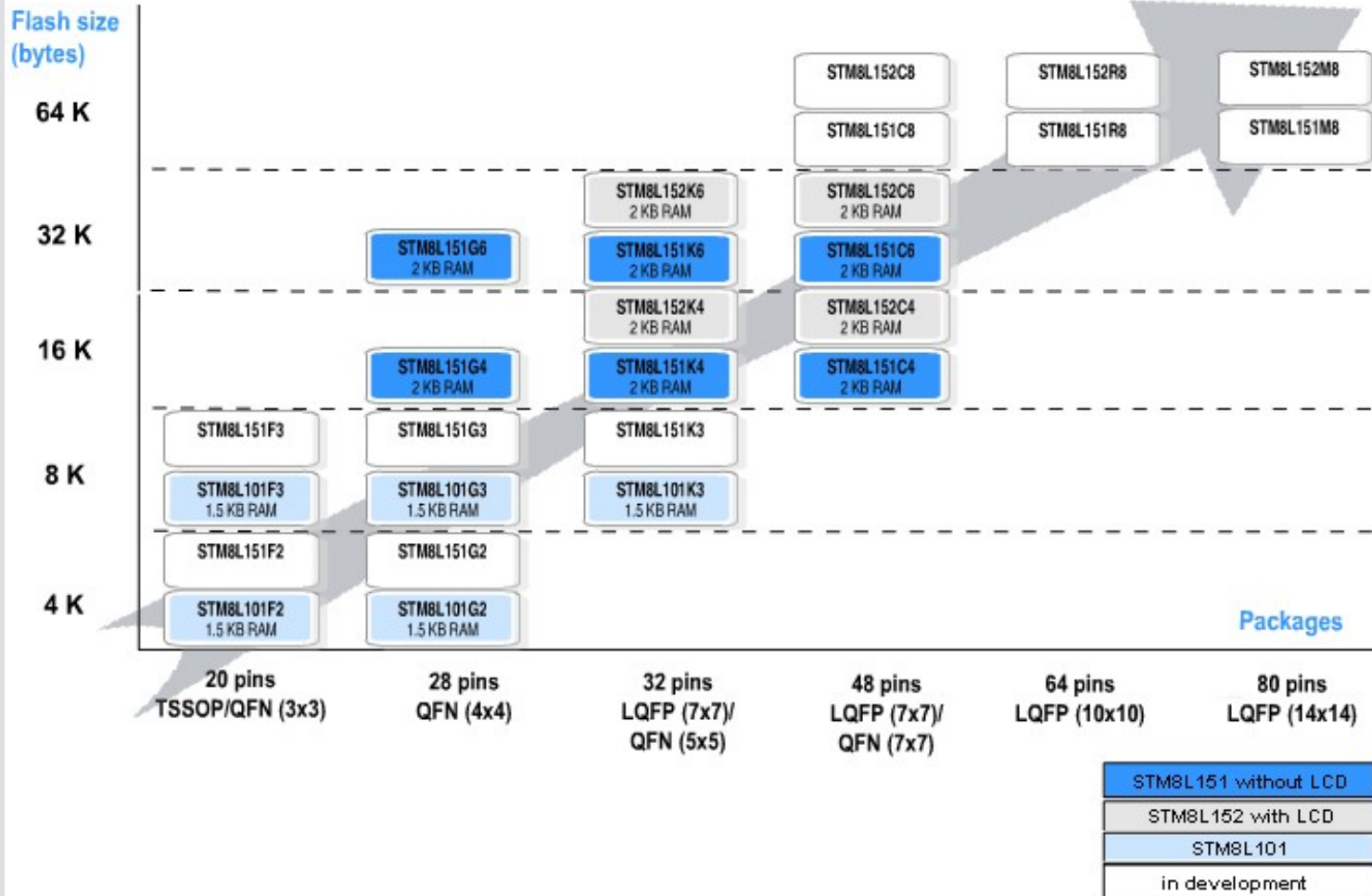
STM8L151 : Jan 2010

STM8 core @ 16 MHz	Up to 32 KB Flash	Up to 2 KB SRAM	Reset + BOR PVD	Main osc. input 1-16 MHz	Data EPROM	RTC with 32 kHz osc.	4 - chan DMA	12-bit ADC 1µs Temp sensor	12-bit DAC	
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STM8L101 : NOW

STM8 core @ 16 MHz	Up to 8 KB Flash	Up to 1.5 KB SRAM								
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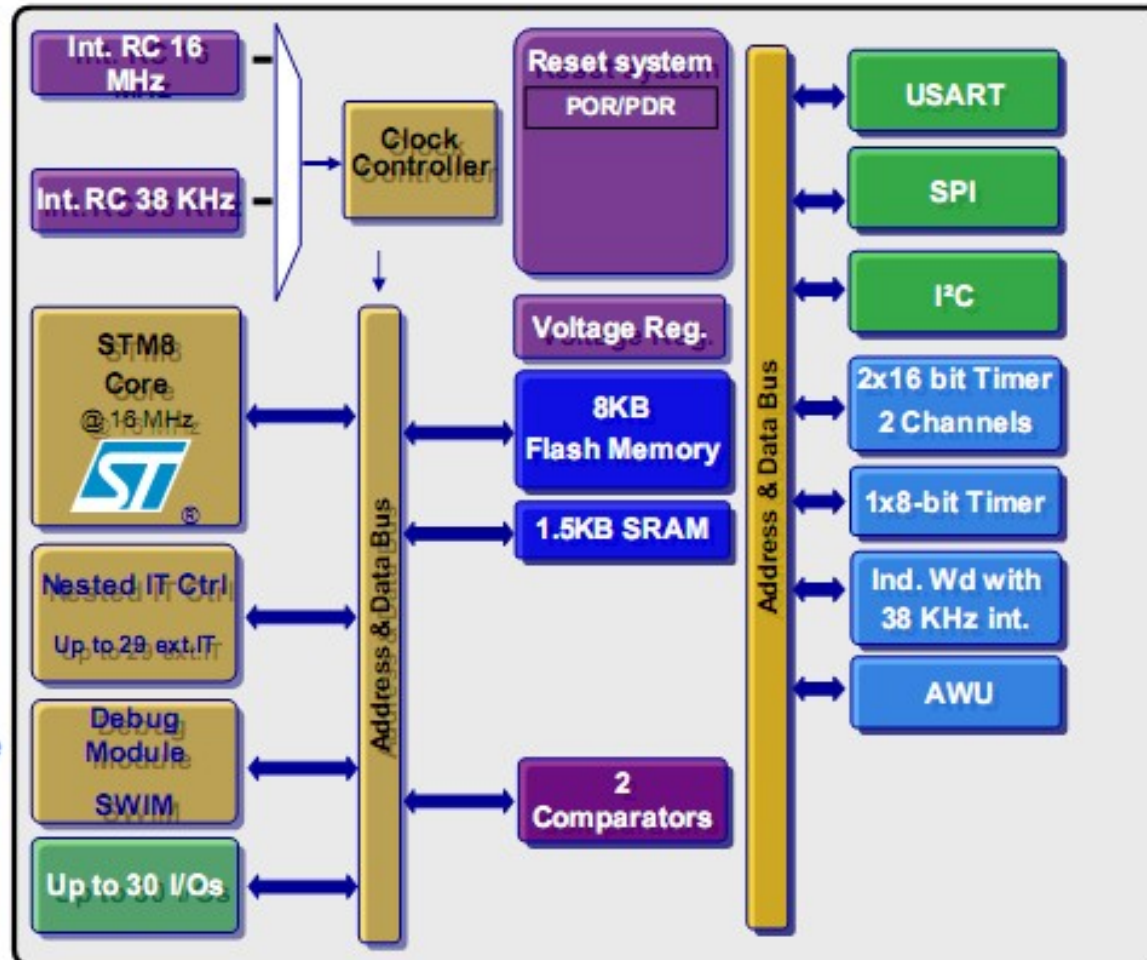
STM8L



STM8L101 8K Block Diagram



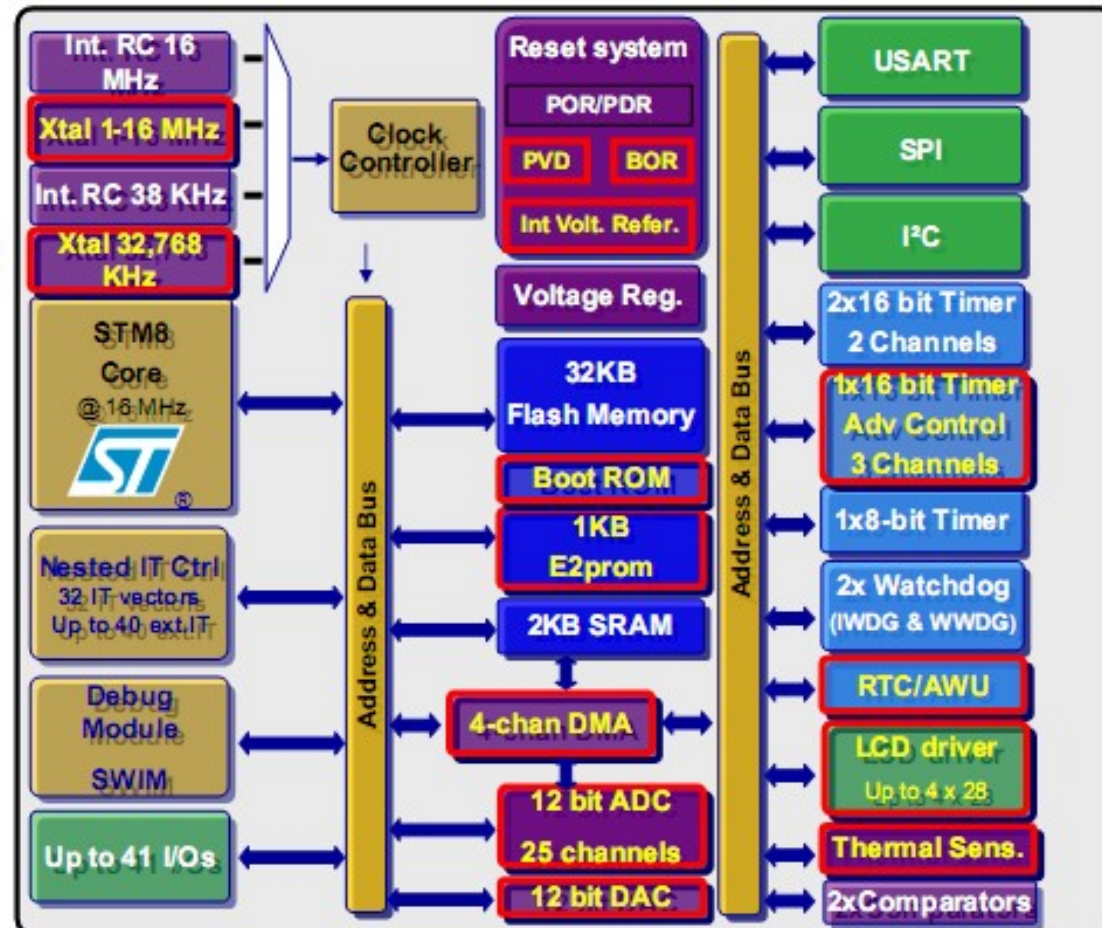
- **Core**
 - STM8 Core@16 MHz F_{cpu}
 - -40 to 125°C
 - 1.65V to 3.6V range
- **Memory**
 - Up to 8K Flash, 1.5K SRAM
- **Features**
 - 2 Ultra-Low-Power modes
 - +/- 1% Internal RC accuracy
 - Low power consumption
0,35µA Halt,
0.8µA Active Halt (with AWU)
 - Safe Reset System (POR/PDR)
 - High ratio high sink/source I/Os (20mA)
- **Packages**
 - 20 pins QFN/TSSOP
 - 28 pins QFN
 - 32 pins LQFP/QFN



STM8L 32K Block Diagram



- Core**
 - STM8 Core@16MHz F_{cpu}
 - 40 to 125°C
 - 1.8V to 3.6V range (down to 1.65V at power down)
- Memory**
 - Up to 32K Flash, 2K SRAM, 1K data EEPROM
- Features**
 - 4 Ultra-Low-Power modes
 - +/- 1% Internal RC accuracy
 - Low power consumption
 - 0.4µA Halt
 - 1µA Active Halt (with RTC)
 - Safe Reset System (POR/PDR, BOR, PVD)
 - All I/Os are high sink/source (20mA)
- Packages**
 - 28 pins QFN
 - 32 pins LQFP/QFN
 - 48 pins LQFP/QFN



STM8L Tools



- Hardware Evaluation Platform for all interfaces
 - **STM8L101-EVAL** (Dec. 2009)
 - STM8L1526-EVAL (Dec. 2009)
- STM8L101 low-power demonstrator with software-driven LCD
 - 1.25 μ A @36Hz refresh rate
 - Order code : STEVAL-IAS003V1 (Dec. 2009)
- STM8L15x Low-Cost/Ultra-Low-Power Demo Board
 - 7 different modes to demonstrate STM8L15x ultra-low power
 - Order code :STM8L15LPBOARD (Dec 2009)



STM8L Software



- **ST software libraries free at www.st.com/mcu**
 - C source code for easy implementation of all STM8L peripherals in any application
 - **Standard library** – source code for implementation of all standard peripherals. Code implemented in demos for STM32 evaluation board
- **Class B: IEC60335-1 approved self-diagnostic routines**
 - ST's self-test-library software modules have been approved by the VDE, a WW recognized test house which pioneered software safety inspection (http://www.vde.com/vde_en/)
 - CPU registers self-test
 - Watchdog self-test (even if not directly asked by the norm)
 - Flash integrity check with a 16-bit CRC
 - RAM functional test (using March C algorithm)
 - External clock-frequency measurement
 - Self-test start-up



STM8 examples:

<http://emcu.altervista.org/>

ST-MCU

<http://www.st.com/mcu/index.html>

STM8S

<http://www.st.com/mcu/inhtml-pages-stm8s.html>

Documents and files for family STM8S

<http://www.st.com/mcu/modules.php?name=mcu&file=familiesdocs&FAM=113>

STM8L

<http://www.st.com/mcu/inhtml-pages-stm8l.html>

Documents and files for family STM8L

<http://www.st.com/mcu/familiesdocs-120.html>

Touch sensing software suite

http://www.st.com/mcu/inhtml-pages-touch_sense_sw_lib.html

MCU Training & Seminars

http://www.st.com/mcu/inhtml-pages-mcu_train.html

Product Brochures & Selectors

http://www.st.com/stonline/products/promlit/p_microcontrollers.htm