STM32L

Ultra-low-power Cortex™-M3 devices

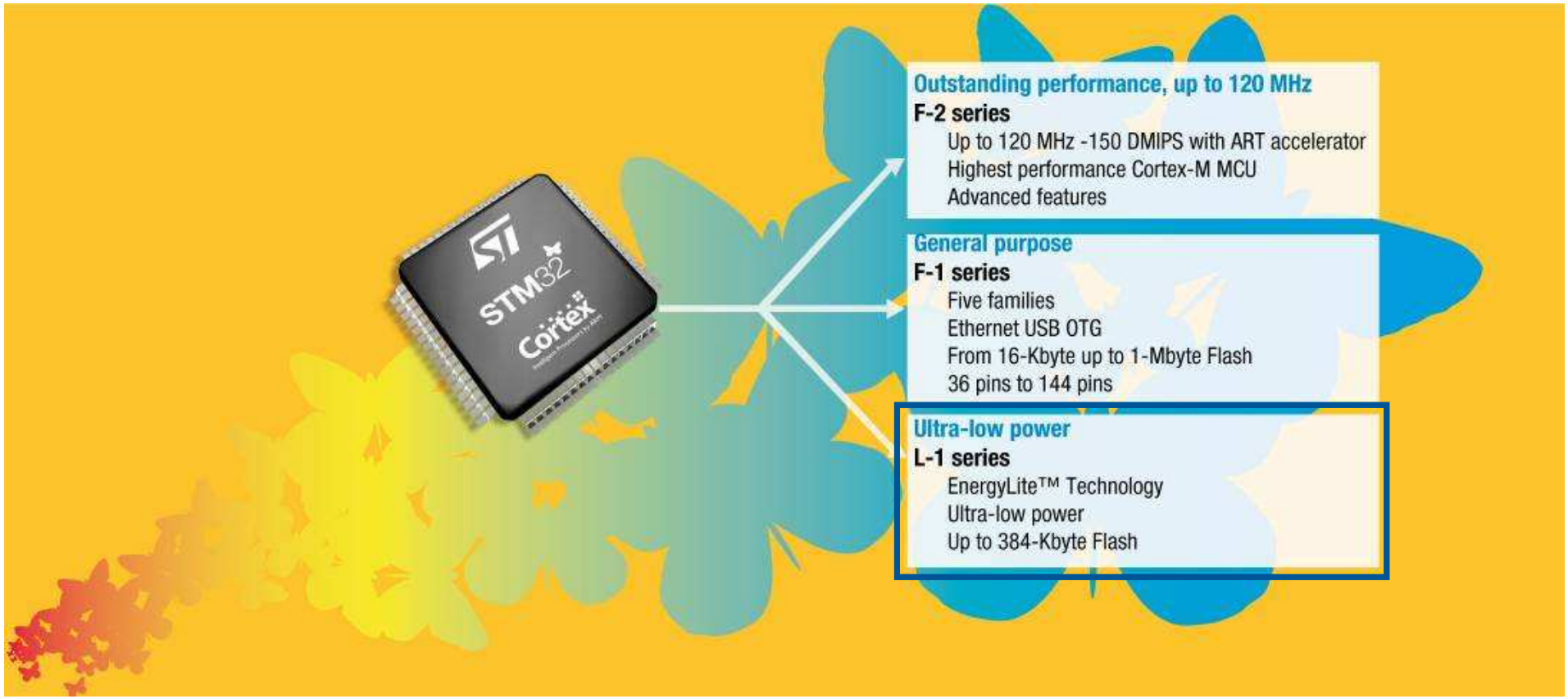
STM32L press release

- STM32L 32- to 128-Kbyte products are entering full production 2nd half March 2011
  - Part of industry's largest ARM® Cortex™-M 32-bit microcontroller family with six STM32 families
- STMicroelectronics is developing the STM32L portfolio up to 384 Kbytes of embedded memory
- STM32L is Continua ready for its USB peripheral driver

STM32L entering production

A solid foundation for growth

STM32L extends STM32 portfolio



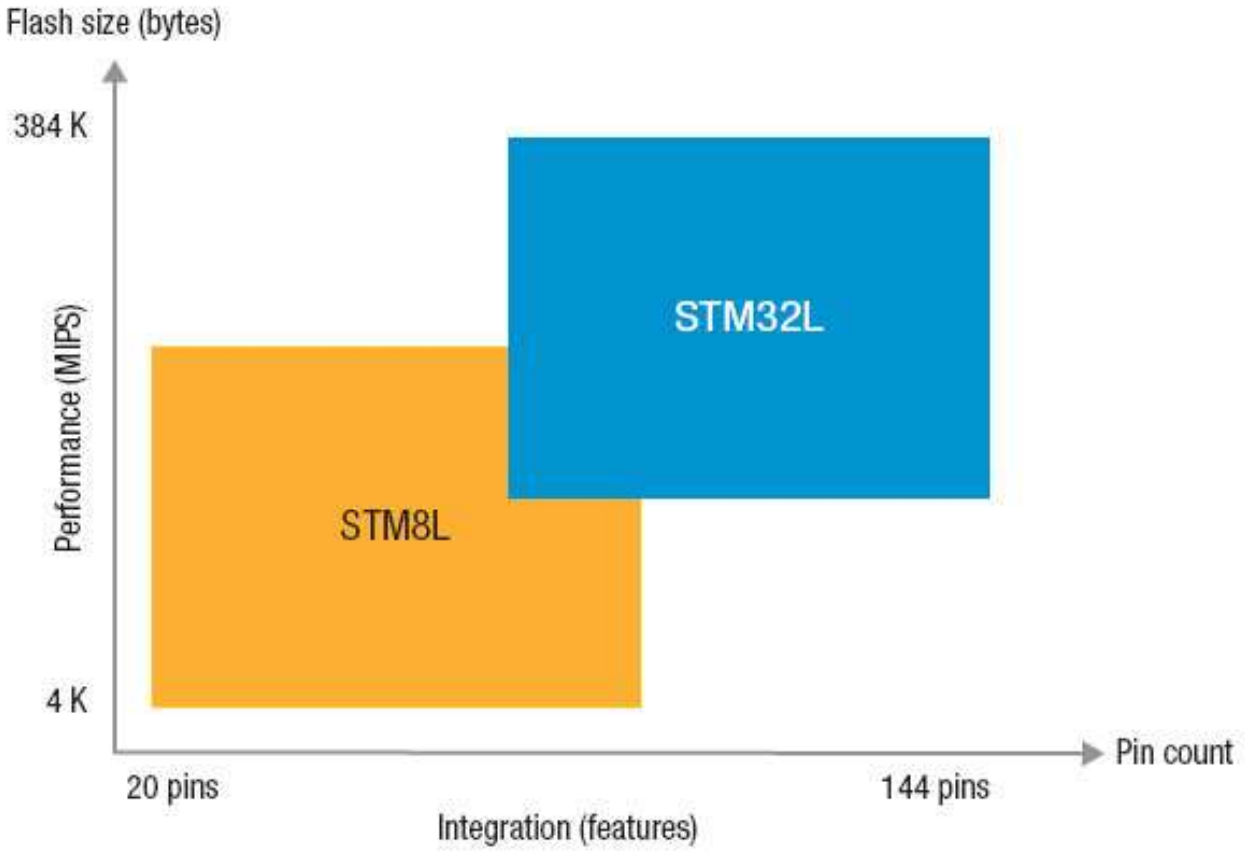
The key messages of STM32L

- **Technology owned by ST**
  - Robustness (derived from automotive qualified process)
  - Permanent source
  - Dual source
- **All inclusive for ultra-low-power applications**
  - Hardware integrated features
  - Software library packages
- ***Just-enough* energy concept**
  - Undervolting
  - User controlled
  - Innovative architecture
- **For less than……..1 µA**

Ultra-low-power EnergyLite™ platform

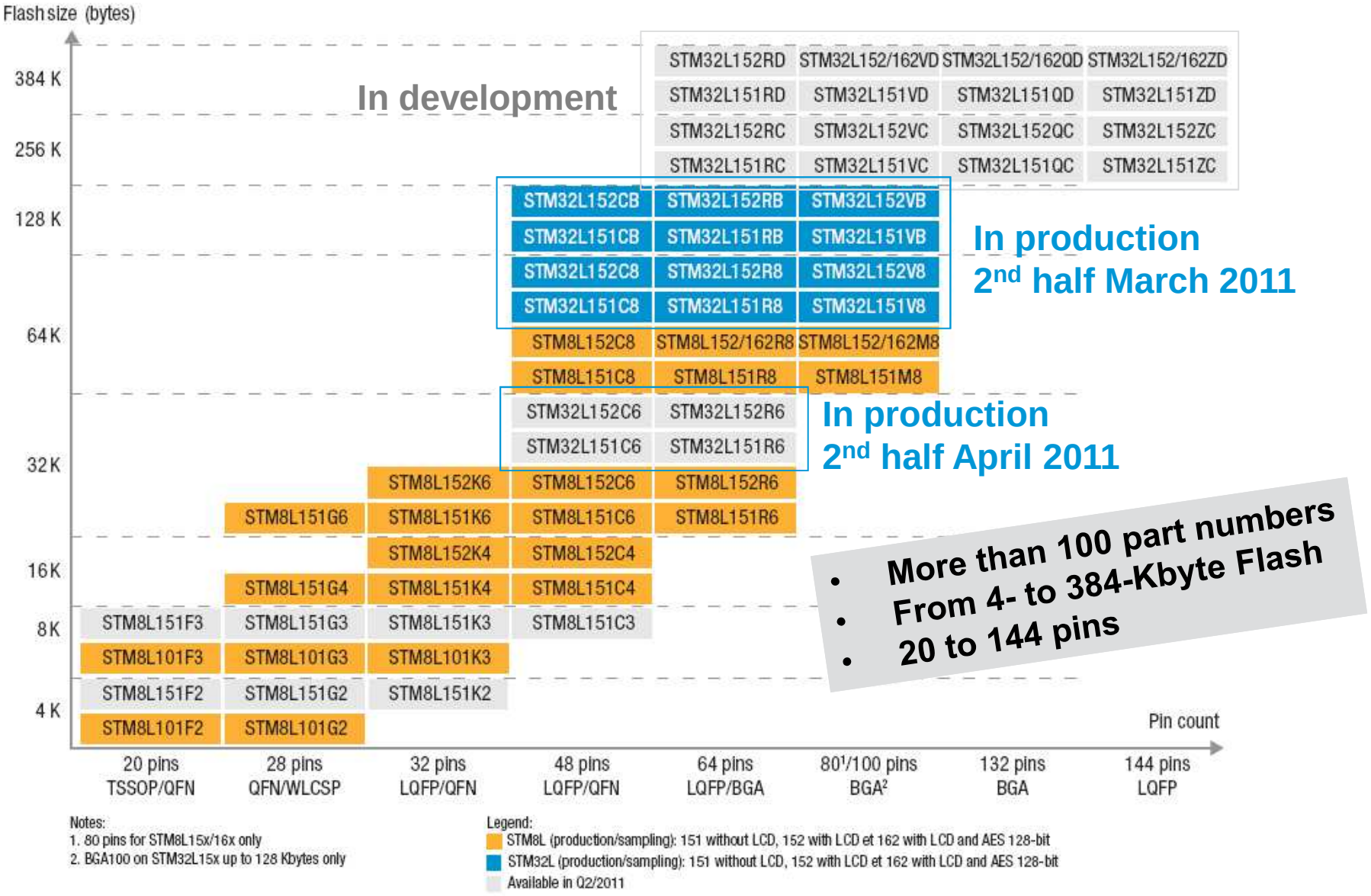
Technology owned by ST

- ST's 130 nm **ultra-low-leakage** process technology
- Shared technology, architecture and peripherals



Ultra-low-power portfolio –2011

Technology owned by ST



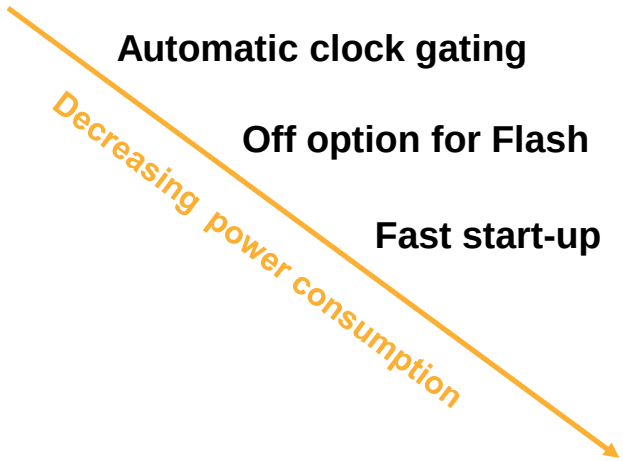
- More than 100 part numbers
- From 4- to 384-Kbyte Flash
- 20 to 144 pins

STM32L – ultra-low-power architecture

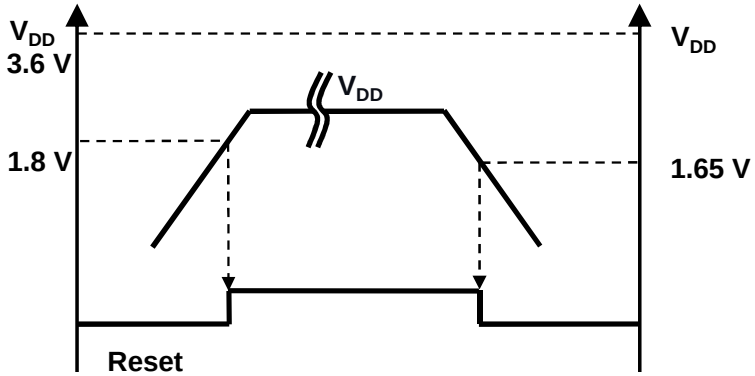
All inclusive for ultra low power applications

Ultra-low-power IPs

IP	Consumption
POR	Included
BOR+PVD	2.6 µA
IWDG	250 nA
RTC	300 nA
LSE	450 nA/1.8 V
I/O leakage	50 nA



Ultra-low voltage



Power supply

- Down to 1.8 V with BOR
- Down to 1.65 V w/o BOR

Analog functional

- Down to 1.8 V

Reprogramming capability

- Down to 1.65 V

STM32L – flexible and secure

All inclusive for ultra low power applications

Flexible clock system

Multiple sources

- HSI
  Internal 16 MHz
- HSE
  External
  1-24 MHz
- MSI
  Internal
  64 kHz to 4 MHz
- LSI
  Internal 38 kHz
- LSE
  External 32 kHz

- **+/- 0.5% internal clock accuracy when trimmed by RTC oscillator**
- **Up to 5 clock sources**
- **MSI to achieve very low power consumption at 7 low frequencies**
  - 750 nA @ 64 kHz
  - 15 µA @ 4 MHz

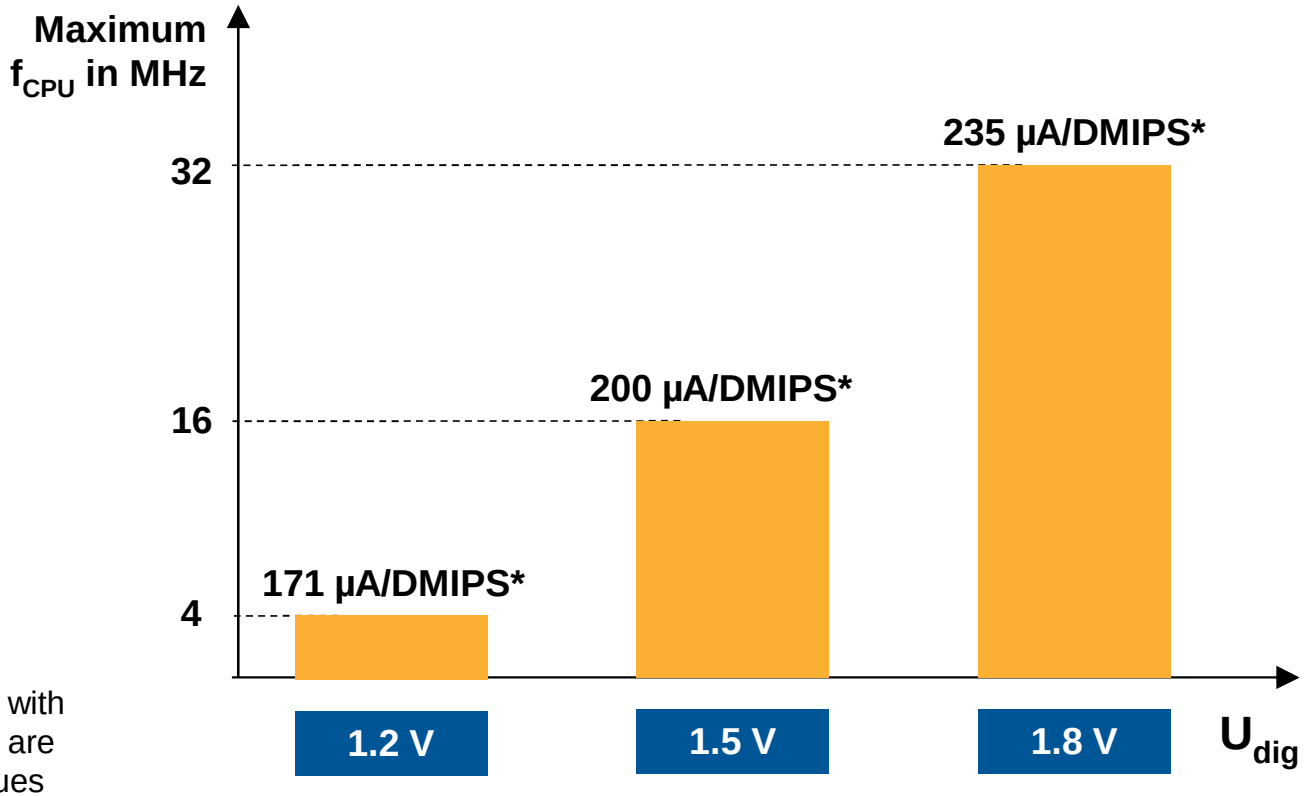
Security and safety

- **Memory protection unit**
- **Anti tamper**
- **Reset circuitry**
- **Dual watchdog**
- **CRC 32-bit**
- **Unique ID**
- **Back-up clock**
- **I/O locking**
- **Back-up register**
- **Supply monitoring**
- **Flash protection**
- **Dual stack pointer**
- **NV memories with ECC**
- **JTAG fuse**

Dynamic voltage scaling in Run mode

Just-enough energy concept

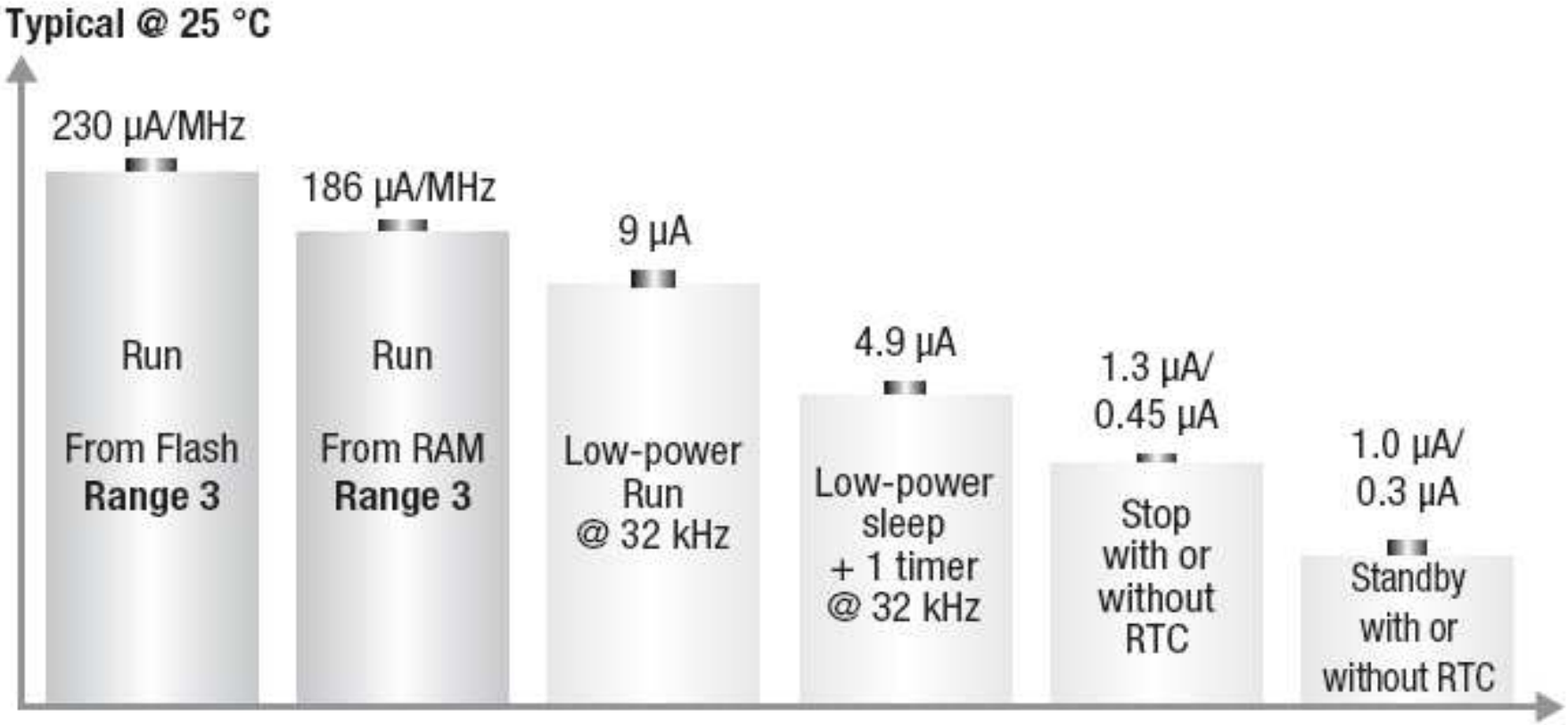
- Voltage scaling optimizes the product efficiency (consumption versus performance)
- User selects a mode (voltage scaling) according to:
  - External V_{DD} supply
  - DMIPS performance required
  - Maximum power consumption



Note:
* Run from Flash with internal oscillator are the minimum values

STM32L ultra-low power consumption

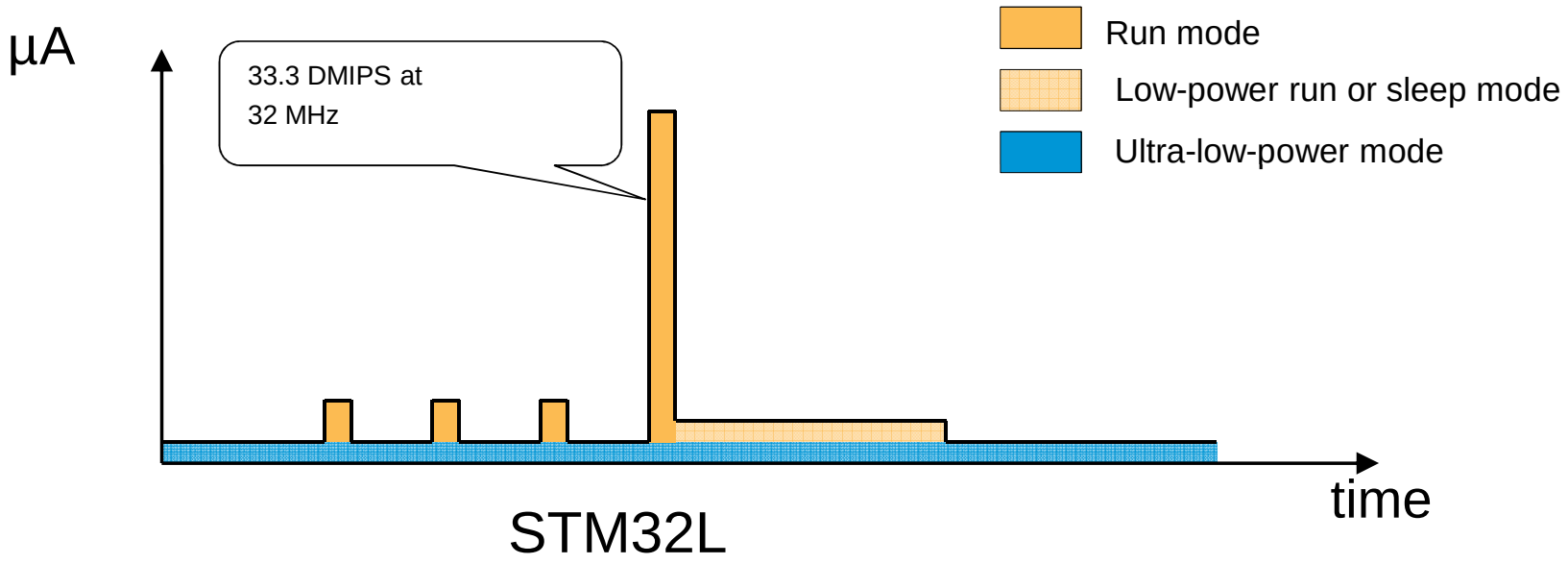
Just-enough energy concept



Notes:
- POR/PDR on
- RAM content preserved
- BOR option at 2.4 µA
- Startup time from Stop 8 µs
- Run and Sleep consumption value are independent of V_{DD}
- Stop and standby values measured at V_{DD} = 1.8 V
- Low-power Run and Low-power Sleep are measured with Flash off

More than ultra-low power – energy saving!

Just-enough energy concept



- Ultra-low-power static modes (nA)
  - Stop 450 nA, Standby 300 nA
- Optimized dynamic modes (µA)
- High performance (DMIPS)

→ Energy saving (µA/DMIPS)

Down to 171 µA/DMIPS from Flash in Run mode

STM32L portfolio extension

Extension of STM32L portfolio

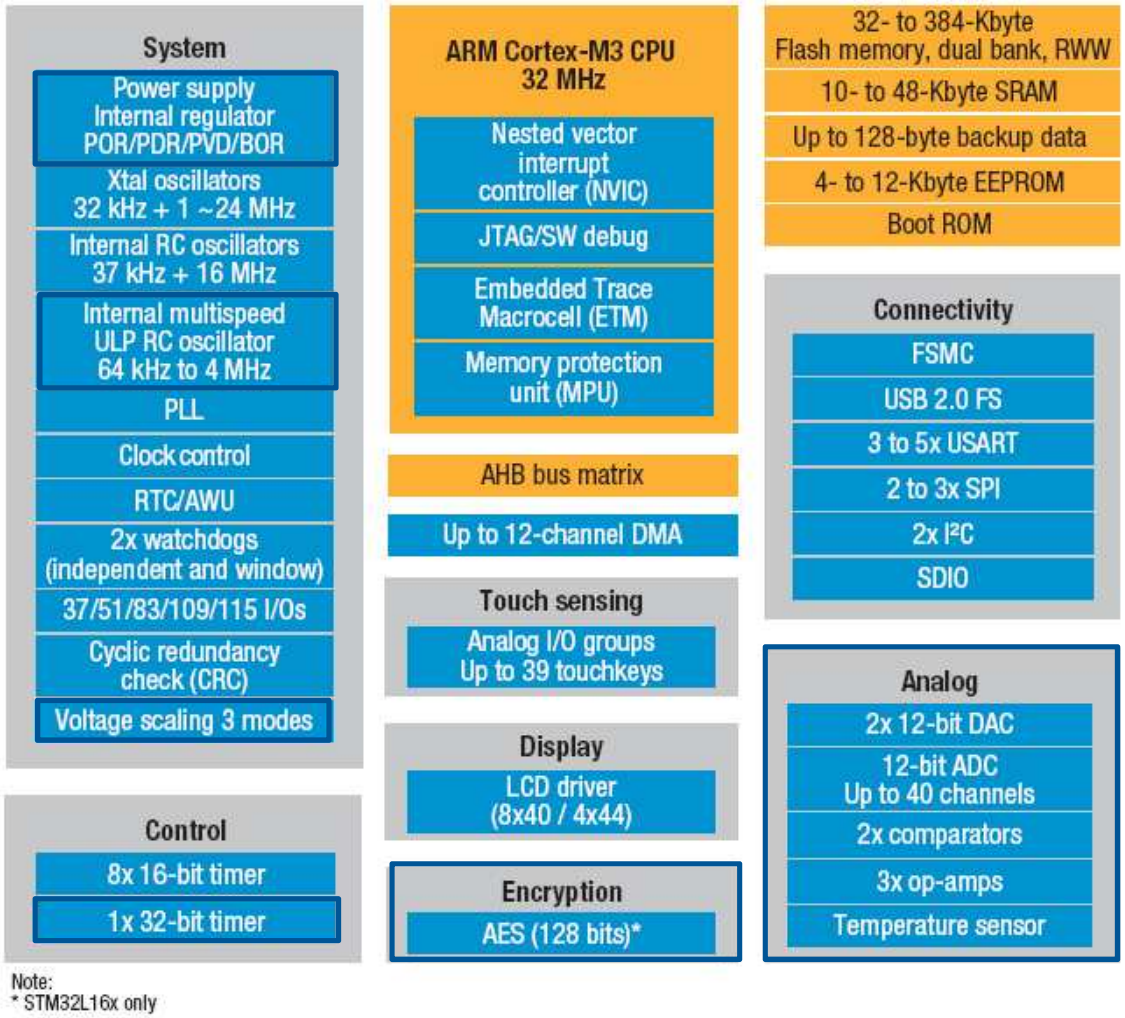
- Ultra-low power available from 32-Kbyte to up to 384-Kbyte of embedded Flash
  - New devices in development up to 384 Kbytes (256-Kbyte and 384-Kbyte sales types)
  - Ultra-low power consumption maintained even with higher memory density

- New features benefitting applications
  - 32-bit timer
  - Additional communication peripherals
  - External memory interface
  - More embedded data EEPROM
  - 384-Kbyte Flash with two banks for safe in-application software upgrading enabling read while write
  - Additional analog inputs (up to 40 channels)
  - Up to 39 touch-sensing analog channels
  - 3 operational amplifiers with ultra-low leakage inputs
  - 128-bit hardware encryption: AES-128

- As well as …
  - MPU to protect specific code or data
  - MSI (multi speed internal oscillator) for low-frequency running at up to 4 MHz with low consumption
  - Voltage scaling to dynamically optimize consumption
  - 6 low-power modes down to 300 nA in Standby

STM32L – block diagram

- Core
  - ARM Cortex-M3 core @ 32 MHz
  - -40 to 85 ℃
  - 1.65 to 3.6 V w/o BOR
  - 1.8 to 3.6 V with BOR
- Memory
  - 32- to 384-Kbyte Flash, dual bank, RWW
  - 10- to 48-Kbyte SRAM
  - Up to 12-Kbyte data EEPROM



Some STM32L applications

Industrial

Home automation

Electricity meters

Water meters

Healthcare and fitness

Glucose meters, insulin pumps, ECG, sports watches

Consumer

Digital cameras

Bar-code scanners

GPS

Gaming

STM32L – Continua®

Continua® for STM32L
PHDC-USB healthcare device class

- Thermometer
- Pulse oximeter
- Pulse/ blood pressure
- Weight scales
- Glucose meters
- Cardiovascular and strength fitness monitors
- Independent living activity
- Medication adherence

Transport independent

ISO IEEE Continua HEALTH ALLIANCE

- 11073-10404 = Pulse oximeter
- 11073-10406 = Pulse / Heart Rate
- 11073-10407 = Blood pressure
- 11073-10408 = Thermometer
- 11073-10415 = Weighing scale
- 11073-10417 = Glucose
- 11073-10441 = Cardiovascular fitness monitor
- 11073-10442 = Strength fitness equipment
- 11073-10471 = Independent living activity
- 11073-10472 = Medication monitor
- 11073-20601 = Base framework protocol

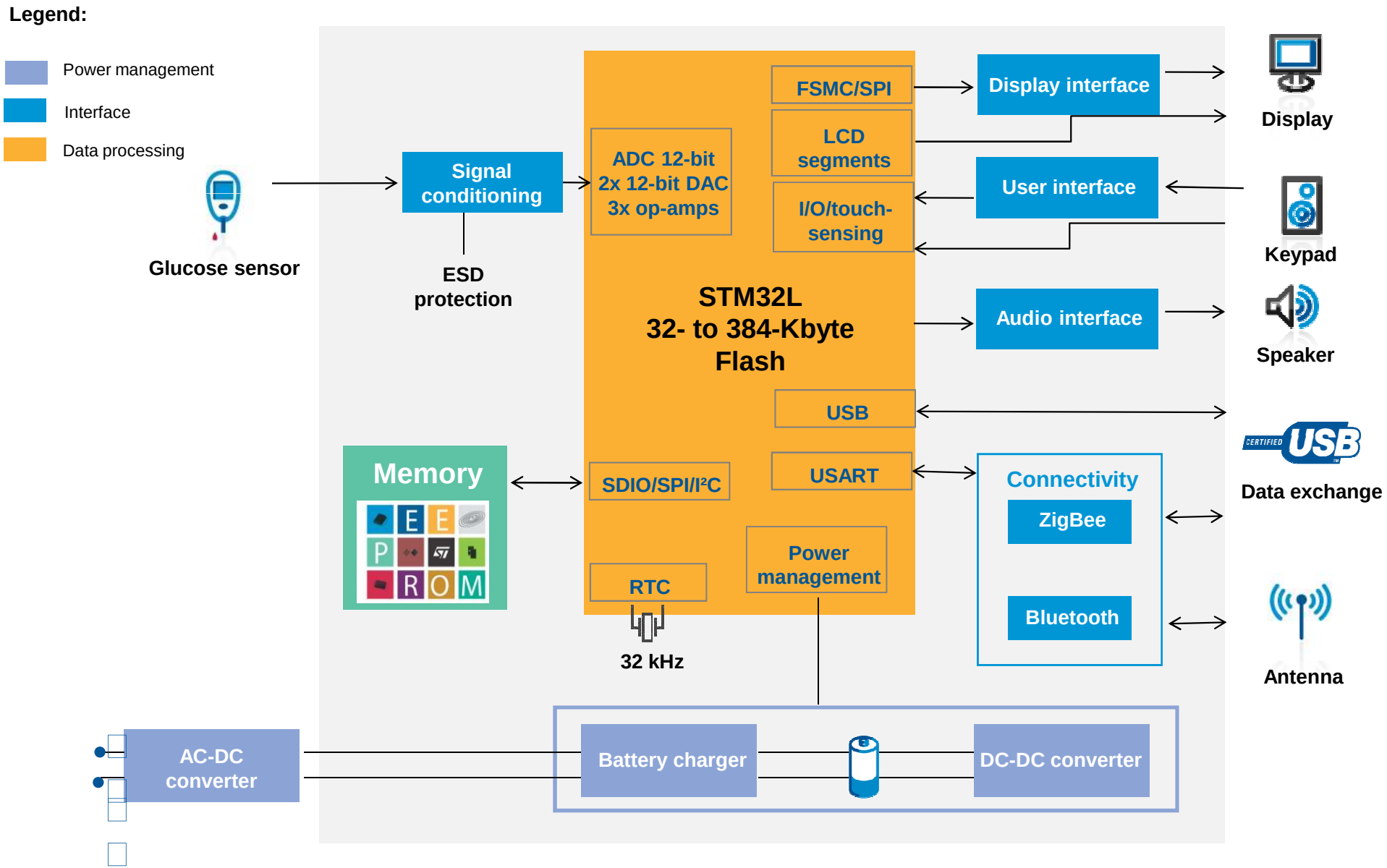
CERTIFIED USB

Personal health device Class specification

- PC
- Personal Health System
- Cell Phone
- Set Top Box

Documentation:
ANxxxx (FW Library) will be available on request end ofQ1/2011
Press release: New ST web site end of Q1/2011
FW code library: in Q1/2011 only for customers who are already Continua members

STM32 – good fit for portable medical devices



Tools offer

Hardware tools offer

- Evaluation board for full product feature evaluation

STM32L152-EVAL

- **STM32L Discovery** low-cost evaluation kit is the cheapest and quickest way to discover the STM32L
  - For fast evaluation or prototyping at less than 10 €
  - Available in April 2011

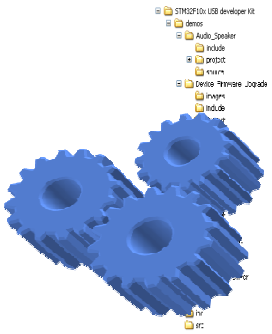
STM32L-DISCOVERY

- Large choice of development IDE solutions

RAISONANCE Embedded Systems Development Tools
aiji SYSTEM 아이지시스템
hitex DEVELOPMENT TOOLS
IAR SYSTEMS
atollic
i SYSTEM
Green Hills SOFTWARE, INC.
SEGGER
KEIL An ARM® Company
LAUTERBACH
SIGNUM SYSTEMS
TASKING
expresslogic
CMX SYSTEMS

Software libraries – speed time-to-market

- STM32 standard peripheral libraries
  - C source code for easy implementation of all STM32 peripherals in any application
- STM32L touch-sensing library
  - Free source code touch-sensing library for easy implementation
- Class B: IEC 60335-1 approved self-diagnostic routines
  - ST's self-test-library software modules have been approved by the VDE



Standard peripheral library

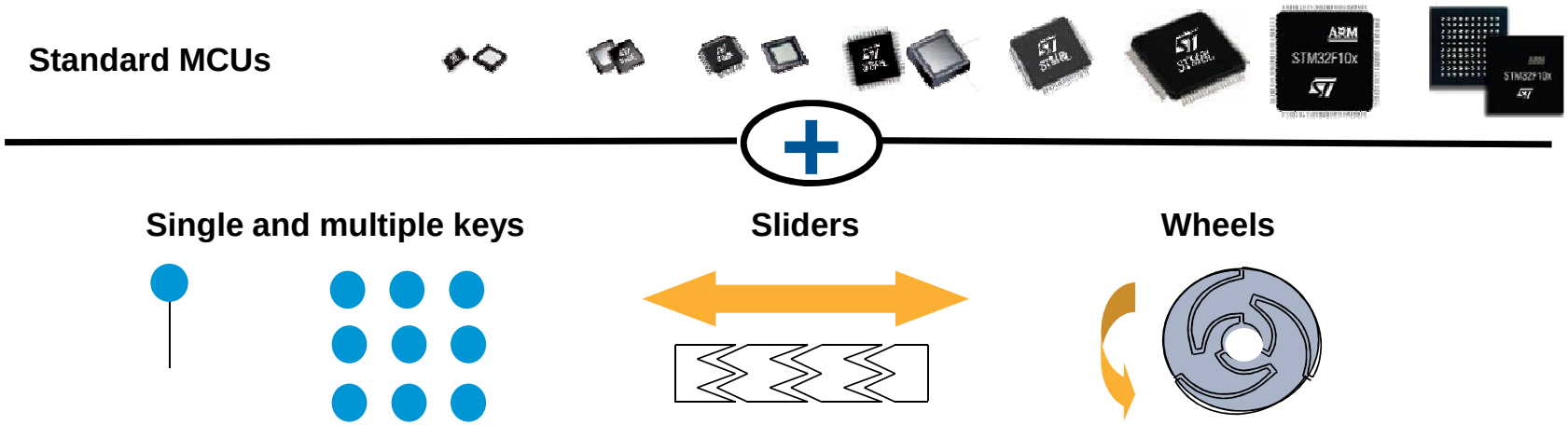
USB device library

Touch-sense library

Self-test routines for EN/IEC 60335-1 Class B

STMTouch™ firmware library

- **NRE/royalty-free source code** solution to provide surface capacitive touch-sensing capabilities for STM8L and STM32L MCUs
- **Easy integration** of keys, sliders and wheels to replace conventional electromechanical switches in human interfaces
- **Complete solution** with acquisition, post processing and API layers, debounce filtering, calibration functions, environment change system (ECS)
- **Multi-function capability** to combine capacitive sensing functions with traditional MCU features (including communication, LED control, beeper, LCD control)



STM32L – to keep in mind

Leadership	Advanced ultra-low-power Cortex-M3 based MCU platform
Process	Cutting-edge proprietary process – robustness
Prospective	Part of a wide 32-bit product portfolio
Energy friendly	*Just-enough* energy concept
Ready to use	All inclusive package applications
History	Our mission is to be a long-term supplier

We provide our customers with a unique advantage

Thank you

www.st.com/stm32l

www.st.com/stm8l