STM32L press release

- STM32L 32- to 128-Kbyte products are entering full production 2\textsuperscript{nd} 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

Outstanding performance, up to 120 MHz
F-2 series
Up to 120 MHz - 150 DMIPS with ART accelerator
Highest performance Cortex-M MCU
Advanced features

General purpose
F-1 series
Five families
Ethernet USB OTG
From 16-Kbyte up to 1-Mbyte Flash
36 pins to 144 pins

Ultra-low power
L-1 series
EnergyLite™ Technology
Ultra-low power
Up to 384-Kbyte Flash

STMicroelectronics
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**
- ST’s 130 nm **ultra-low-leakage** process technology
- Shared technology, architecture and peripherals
Ultra-low-power portfolio –2011
Technology owned by ST

<table>
<thead>
<tr>
<th>Flash size (bytes)</th>
<th>In development</th>
<th>In production 2nd half March 2011</th>
<th>In production 2nd half April 2011</th>
</tr>
</thead>
<tbody>
<tr>
<td>128 K</td>
<td></td>
<td>STM32L152CB, STM32L152CB, STM32L152VB</td>
<td>STM32L152CB, STM32L152CB, STM32L152VB</td>
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<tr>
<td>64 K</td>
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<tr>
<td>32 K</td>
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<td>STM32L152C8, STM32L152C8, STM32L152VB</td>
<td>STM32L152C8, STM32L152C8, STM32L152VB</td>
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<tr>
<td>16 K</td>
<td></td>
<td>STM32L151C8, STM32L151C8, STM32L151VB</td>
<td>STM32L151C8, STM32L151C8, STM32L151VB</td>
</tr>
</tbody>
</table>

Notes:
1. 28 pins for STM8L151x/16x only
2. BGA190 on STM8L15x up to 128 Kbytes only

Legend:
- Gold: (production/sampling): 151 without LCD, 152 with LCD or 162 with LCD and AES 128-bit
- Blue: (production/sample): 151 without LCD, 152 with LCD or 162 with LCD and AES 128-bit
- Available in Q2/2011

- 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

<table>
<thead>
<tr>
<th>IP</th>
<th>Consumption</th>
</tr>
</thead>
<tbody>
<tr>
<td>POR</td>
<td>Included</td>
</tr>
<tr>
<td>BOR+PVD</td>
<td>2.6 µA</td>
</tr>
<tr>
<td>IWDG</td>
<td>250 nA</td>
</tr>
<tr>
<td>RTC</td>
<td>300 nA</td>
</tr>
<tr>
<td>LSE</td>
<td>450 nA/1.8 V</td>
</tr>
<tr>
<td>I/O leakage</td>
<td>50 nA</td>
</tr>
</tbody>
</table>

- Automatic clock gating
- Off option for Flash
- Fast start-up

### 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

- 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

Multiple sources

Security and safety

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

![Graph showing dynamic voltage scaling in Run mode](image)

Note: * Run from Flash with internal oscillator are the minimum values.
STM32L ultra-low power consumption
Just-enough energy concept

Typical @ 25 °C

- 230 µA/MHz
- 186 µA/MHz
- 9 µA
- 4.9 µA
- 1.3 µA/0.45 µA
- 1.0 µA/0.3 µA

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)

STM32L

- Run mode
- Low-power run or sleep mode
- Ultra-low-power mode

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 °C
  - 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
Continua® for STM32L
PHDC-USB healthcare device class

- 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

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

Transport independent

Personal Health System
PC
Cell Phone
Set Top Box

Personal health device
Class specification

Documentation:
ANxxxx (FW Library) will be available on request end of Q1/2011
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

Legend:
- Power management
- Interface
- Data processing

STM32L 32- to 384-Kbyte Flash

- Signal conditioning
- ADC 12-bit
- 2x 12-bit DAC
- 3x op-amps
- ESD protection
- LCD segments
- I/O/touch-sensing
- Display interface
- User interface
- Audio interface
- Connectivity
- ZigBee
- Bluetooth
- Display
- Keypad
- Speaker
- Data exchange
- Antenna

Memory
- SDIO/SPI/USB
- USB
- USART
- Power management
- RTC
- 32 kHz

Battery charger
- AC-DC converter
- DC-DC converter

STMicroelectronics
Tools offer
Hardware tools offer

- Evaluation board for full product feature evaluation

- **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

- Large choice of development IDE solutions
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](image1)
![USB device library](image2)
![Touch-sense library](image3)
![Self-test routines for EN/IEC 60335-1 Class B](image4)
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)

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**Standard MCUs**

- Single and multiple keys
- Sliders
- Wheels

STMicroelectronics
### 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

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We provide our customers with a unique advantage
Thank you

www.st.com/stm32l

www.st.com/stm8l