STM32F401/411 Dynamic Efficiency: less dynamic power, more performance and integration

The STM32F401/411 Dynamic Efficiency lines solve the challenge to offer less dynamic power and more performance with high integration and light cost.

With a new, Batch Acquisition Mode (BAM), optimizing power consumption during sensor data batching, the STM32F411 takes the Dynamic Efficiency to a new level.

The STM32F401/411 Dynamic Efficiency MCUs enable a sensor agnostic approach and comes with 3rd party advanced motion algorithms to run always ON sensor fusion, gesture recognition, activity monitoring, context awareness and indoor navigation on both Android 4.4 and Windows 8.1 platforms.

**PERFORMANCE**
At 100 MHz, the STM32F411 delivers 125 DMIPS/339 CoreMark performance executing from Flash memory, with 0-wait states using ST’s ART Accelerator. The DSP instructions and the floating point unit enhance the overall processing.

**POWER EFFICIENCY**
ST’s 90 nm process, ART Accelerator and the dynamic power scaling enables the current consumption when executing from Flash memory to be as low as 100 µA/MHz. In Stop mode, the power consumption can be as low as 10 µA.

**INTEGRATION**
The STM32F401/411 devices carry 128 to 512 Kbytes of Flash and up to 128 Kbytes of SRAM. The available packages range from 49 to 100 pins.

- 3x USARTs up to 12.5 Mbit/s
- Up to 5x SPI (mixed with I²S) up to 50 Mbit/s
- Up to 2x full duplex and 3x simplex I²S up to 32-bit/192 KHz
- 3x I²C up to 1Mbps
- 1x SDIO up to 48 MHz and available on all packages
- 1x USB 2.0 OTG full speed
- 12-bit ADC reaching 2.4 MSPS
- 11 timers, 16- and 32-bit, running at up to 100 MHz
STM32F411 BLOCK DIAGRAM

System
- Power supply 1.2 V regulator POR/PDR/PVD
- Xtal oscillators 32 kHz + 4 ~ 26 MHz
- Internal RC oscillators 32 kHz + 16 MHz
- PLL
- Clock control
- RTC/AWU
- 1x SysTick timer
- 2x watchdogs (independent and window)
- 36/48/79/112 I/Os
- Cyclic redundancy check (CRC)

Control
- 5x 16-bit timers
- 1x 16-bit motor control
- PWM synchronized
- AC timer
- 2x 32-bit timers

ART Accelerator™
- ARM Cortex-M4
- 100 MHz
- Floating point unit (FPU)
- Nested vector interrupt controller (NVIC)
- MPU
- JTAG/SW debug/ETM

Multi-AHB bus matrix
- 16-channel DMA with BAM (Batch Acquisition Mode)

Up to 512-Kbyte1 Flash
- 256-Kbyte1 SRAM
- 80-byte backup registers
- 512 OTP bytes

Connectivity
- 5x SPI or 5x I²S, (2x I²S with full duplex)
- 3x PC2
- 1x USB 2.0 OTG FS
- 1x SDIO
- 3x USART, LIN, smartcard, IrDA, modem control

Analog
- 1x 12-bit ADC
- 16 channels / 2.4 MSPS
- Temperature sensor

Notes:
1. 1 Mbyte Flash/256 Kbyte SRAM version to be available in Q2/2015
2. With digital filter feature, up to 1 Mbit/second

SOFTWARE TOOLS
Beyond the wide set of partners and ARM ecosystem solutions, the STM32 Dynamic Efficiency lines are benefiting from dedicated tools and software:
- STM32CubeF4: Embedded software for STM32 F4 series (HAL low level drivers, USB, TCP/IP, File system, RTOS, Graphic coming with examples running on ST boards)
  www.st.com/stm32cube

STM32 DYNAMIC EFFICIENCY PRODUCT LINES

<table>
<thead>
<tr>
<th>Product line</th>
<th>FCPU (MHz)</th>
<th>FLASH (KB)</th>
<th>RAM (KB)</th>
<th>RUN Current (µA/MHz)</th>
<th>STOP Current (µA)</th>
<th>Small package</th>
<th>STM32 Dynamic Efficiency™</th>
</tr>
</thead>
<tbody>
<tr>
<td>STM32F401</td>
<td>84</td>
<td>128 to 512</td>
<td>Up to 96</td>
<td>Down to 128</td>
<td>Down to 10</td>
<td>Down to 3 x 3 mm</td>
<td>Less Dynamic Power</td>
</tr>
<tr>
<td>STM32F411</td>
<td>100</td>
<td>256 to 512*</td>
<td>128*</td>
<td>Down to 100</td>
<td>Down to 10</td>
<td>Down to 3.034 x 3.22 mm</td>
<td>More performance</td>
</tr>
</tbody>
</table>

Note: 1 Mbyte Flash/256 Kbyte SRAM version to be available in Q2/2015

HARDWARE TOOLS
- STM32F401C-DISCO
- STM32F411E-DISCO
- NUCLEO-F401RE
- NUCLEO-F411RE
- www.st.com/stm32discovery
- NUCLEO-F401RE
- NUCLEO-F411RE
- www.st.com/stm32nucleo
- STM32 Cube

Order code: FLSTM324x10215
For more information on ST products and solutions, visit www.st.com

© STMicroelectronics - February 2015 - Printed in United Kingdom - All rights reserved
The STMicroelectronics corporate logo is a registered trademark of the STMicroelectronics group of companies
All other names are the property of their respective owners