STM8L and STM32 L1 series

Ultra-low-power platform
## 8-bit and 32-bit MCU families

### 8-bit Core
- STM8S Mainstream
- STM8A F and STM8AL Automotive
- **STM8L Ultra-low-power**

### 32-bit Core
- STM32 F4 - Cortex-M4
- STM32 F3 - Cortex-M4
- STM32 F2 - Cortex-M3
- STM32 F1 - Cortex-M3
- STM32 F0 - Cortex-M0
- **STM32 L1 Ultra-low-power** Cortex-M3

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### Flash (bytes)

- 2 M
- 1 M
- 128 K
- 16 K
- 2 K
STM8L/STM32 L1 series

Highlights

- Commitment to ultra-low power
  - Ultra-low-power platform for 8-bit (STM8L) and 32-bit (STM32 L1) MCUs
  - Leveraging Ultra Low-Power ST Technology.

- Pure energy efficiency
  - High-performance combined with ultra-low power gives high energy savings

- Ultra-low-power members of the STM8 and STM32 portfolios
  - Extends both the ultra-low-power platform and STM8/STM32 portfolio
    - Enables easy access to low ultra low power from STM8 and STM32
    - One Ecosystem, platform developments benefit
Ultra-low-power portfolio

Notes:
1. 80 pins for STM8L15x/16x only
2. BGA100 on STM32L15x up to 128 Kbytes only

Legend:
- STM8L:
  051/52 Value line, 151 without LCD, 152 with LCD and 128-bit AES
- STM32 L1:
  100 Value line, 151 without LCD, 152 with LCD and 128-bit AES
STM8L/STM32 L1 series

Wide range of application

**Consumer**
- Digital cameras
- Gaming
- GPS
- Bar code

**Industrial**
- Electricity meters
- Home automation
- Water meters

**Healthcare and fitness**
- Glucose meters,
  insulin pumps,
  ECG, sports watches
Common peripherals and architecture

Shared technology, architecture and peripherals

• ST’s 110 and 130 nm **ultra-low-leakage** process technology

• Multiple communication peripherals USART, SPI, I²C

• Multiple timers

• Internal 16 MHz and 38 kHz RC oscillators

• 2x watchdogs

• Reset circuitry
  • POR/PDR
  • BOR/PDV*

• 2x comparators

• Hardware encryption AES 128-bit

Note: * Except for STM8L101 entry line
### Ultra-low-power product lines

#### 32-bit solution: STM32L151/152/162 line

<table>
<thead>
<tr>
<th>Feature</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>32 MHz Cortex-M3 CPU</td>
<td>Up to 384 KB Flash / Dual bank SRAM Up to 12 KB data EEPROM</td>
</tr>
<tr>
<td>Main osc. input 1-24 MHz</td>
<td>RTC with 32 kHz osc.</td>
</tr>
<tr>
<td>Up to 256 KB Flash</td>
<td>Up to 16 KB SRAM</td>
</tr>
<tr>
<td>12-bit ADC (1 μs) 2x 12-bit DAC</td>
<td>LCD 8x40 4x44</td>
</tr>
<tr>
<td>AES 128-bit</td>
<td>MPU ETM</td>
</tr>
<tr>
<td>USB FS</td>
<td>FSMC</td>
</tr>
<tr>
<td>3x op-amps</td>
<td></td>
</tr>
</tbody>
</table>

#### 32-bit solution: STM32L100 Value line

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<td>32 MHz Cortex-M3 CPU</td>
<td>Up to 256 KB Flash</td>
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<tr>
<td>Main osc. input 1-24 MHz</td>
<td>RTC with 32 kHz osc.</td>
</tr>
<tr>
<td>Up to 16 KB SRAM</td>
<td>Up to 4 KB data EEPROM</td>
</tr>
<tr>
<td>12-bit ADC (1 μs) 2x 12-bit DAC</td>
<td>LCD 8x40</td>
</tr>
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#### 8-bit solution: STM8L151/152/162 line

<table>
<thead>
<tr>
<th>Feature</th>
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<tbody>
<tr>
<td>STM8 core @ 16 MHz</td>
<td>Up to 64 KB Flash</td>
</tr>
<tr>
<td>Main osc. input 1-16 MHz</td>
<td>RTC with 32 kHz osc.</td>
</tr>
<tr>
<td>Up to 2 KB data EEPROM</td>
<td>Up to 4 ch DMA</td>
</tr>
<tr>
<td>12-bit ADC (1 μs) 12-bit DAC</td>
<td>LCD 8x40 4x44</td>
</tr>
<tr>
<td>AES 128-bit</td>
<td></td>
</tr>
</tbody>
</table>

#### 8-bit solution: STM8L101 entry line

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<th>Feature</th>
<th>Specification</th>
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<tr>
<td>STM8 core @ 16 MHz</td>
<td>Up to 8 KB Flash*</td>
</tr>
<tr>
<td>Main osc. input 1-16 MHz</td>
<td>RTC with 32 kHz osc.</td>
</tr>
<tr>
<td>Up to 1.5-KB SRAM</td>
<td>Up to 4 ch DMA</td>
</tr>
<tr>
<td>12-bit ADC (1 μs)</td>
<td>LCD 8x40 4x44</td>
</tr>
</tbody>
</table>

#### 8-bit solution: STM8L051/052 Value line

<table>
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<th>Feature</th>
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<tr>
<td>STM8 core @ 16 MHz</td>
<td>Up to 64 KB Flash</td>
</tr>
<tr>
<td>Main osc. input 1-16 MHz</td>
<td>RTC with 32 kHz osc.</td>
</tr>
<tr>
<td>Up to 4 KB data EEPROM</td>
<td>4 ch DMA</td>
</tr>
<tr>
<td>12-bit ADC (1 μs) Temp. sensor</td>
<td>LCD 4x28 8x24</td>
</tr>
</tbody>
</table>

Note: * Embedded EEPROM in the Flash
STM8L Ultra-low-power modes

Typical current @25 °C

- Dynamic Run from Flash: 192µA/MHz
- Dynamic Run from RAM: 90µA/MHz
- Low-power Run@ 32 kHz: 5.1µA
- Low-power Wait@ 32 kHz: 3.0µA
- Active Halt with RTC: 1.2µA
- Halt: 0.4µA

Notes:
- POR/PDR on
- RAM content preserved
- BOR option at 2.4 μA
- Startup time from active Halt 5 μs
- Run and Wait consumption values are independent of $V_{DD}$
- Active Halt and Halt values measured at $V_{DD} = 1.8$ V
STM32 L1 Ultra-low-power modes

Typical current $V_{DD}$ range

- **Dynamic Run from Flash**
  - 340µA/MHz
  - 218µA/MHz
  - Full speed (32 MHz)
  - 162µA/MHz
  - MSI clock (4.2 MHz)

- **Low-power Run @ 32 kHz**
  - 12µA
  - 9 µA

- **Low-power sleep @ 32 kHz**
  - 6.2µA
  - 4.4 µA

- **Stop with or without RTC**
  - 2.7µA
  - 1.2µA
  - 500nA

- **Standby**
  - 1.4µA
  - 900nA

Wake-up time
- Stop to Run : 8µs
- Standby to Run: 50µs

1. Dhrystone power consumption value executed from Flash with $V_{DD} = 3V$
2. Stop and Stand by with RTC given with $V_{DD} = 1.8V$
3. Stop and Stand by without RTC given with $V_{DD} = 3V$
STM32L1 Polyvalent Platform

- Ultra-low-power and efficient with 1.65V to 3.6V VDD range
  - Run on Multispeed Internal Clock (MSI): 162 µA/MHz (Most power efficient ACTIVE mode)
  - Run full speed (32 MHz): 218 µA/MHz with 2.61 CoreMark/MHz
  - Run low-power (32 kHz – 137 kHz): from 9 µA to 37 µA (down to 4.4 µA in Low-power Sleep)
  - Additional 2 ultra-low-power modes
    - Stop mode: down to 500 nA with Full RAM retention (1.2 µA with RTC, 16 wakeup line)
    - Standby mode: down: 300 nA (with POR, PDR, 3 wakeup pins and 20byte of backup RAM retention)

- Dynamic voltage scaling

- Security and safety
  - Clock Security System
  - Reset circuitry
  - Unique ID
  - Dual watchdog
  - JTAG fuse
  - Supply monitoring
  - Memory protection unit
  - Anti tamper
  - Back-up clock
  - AES Encryption
  - Back-up register
  - Flash & E² with ECC

Value given for $V_{DD}=3V$ @ 25°C – Execution from Flash
1/ Run from Flash with int. osc. at min values
Save energy with STM32 L1 MCUs

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

STM32 L1

Energy saving (µA/DMIPS)

Down to 162 µA/DMIPS from Flash memory in Run mode

33.3 DMIPS at 32 MHz
More than ultra-low-power: energy saving!

- Low-power mode (nA)
- Medium performance (DMIPS)

- Ultra-low-power static modes (nA)
- Optimized dynamic modes (µA)
- High performance (DMIPS)
STM8L/STM32 L1 - Ultra-low-power MCUs

• With the ultra-low-power platform, STMicroelectronics is strongly committed to ultra-low-power MCUs

• Energy saving
  • Ultra-low-power advanced architecture
  • High-performance core
  • Ultra-low-power in dynamic and static modes

• New STM8L/STM32 L1 series increase STM8/STM32 offer
  • Enriches both the ultra-low-power platform and STM8/STM32 portfolio
  • More than 100 part numbers for ultra-low-power lines
Ultra-low-power discovery kits

www.st.com/stm8l-discovery

www.st.com/stm32l1-discovery
For more information

www.st.com/stm8l

www.st.com/stm32l1