STM32L4 MCU series
Ultra-low-power with performance
Key advantages of STM32L4 series

**ULP leader and performance booster**
ST thought the STM32L4 architecture to reach 100 MIPS based on its ARM Cortex-M4 core with FPU and ST ART Accelerator™ at 80 MHz while keeping best-in-class, ultra-low-power (ULP) figures.

**Innovation**
Innovative peripherals are embedded to optimize the BOM cost.

**Integration and safety**
1 MB of Flash and 320-Kbyte of SRAM with safety and security features, smart and numerous peripherals, advanced and low power analog circuits in packages as small as 2.58 x 3.07 mm.

**Great Investment**
Great Investment This new STM32 member benefits from the pin-to-pin compatibility of the STM32 family and the STM32 Ecosystem.
Ultra-low-power and flexibility
FlexPowerControl

STM32L4 is optimized to reduce power consumption and increase flexibility

- External level shifter no longer needed
  Separate $V_{DD}$ supplies (down to 1.08 V)

- 28uA/MHz using external SMPS
  Dedicated $V_{12}$ to the core (down to 1.05 V)

- Down to 200 nA keeping 16 Kbytes of SRAM active in Standby mode

- Wake up MCU with any peripheral
  (Communication I/Fs, analog circuits, timers …)

- I/O level kept in low-power modes
  Optimization of system consumption

- Internal oscillator from 100 kHz to 48 MHz
  (±0.25% int. clock accuracy over voltage/temperature with LSE)

- Down to 8 nA for I/O wake-up
  with additional Shutdown mode

- STM32L4 RTC available for all power modes
  (from Active down to $V_{BAT}$)

- 2 nA $V_{BAT}$ mode with charging capability
  Automatic switch to maintain power for RTC and backup registers

- USB crystal-less capable
  (Dedicated crystal oscillator is no longer needed for USB functions)

STM32L4 is optimized to reduce power consumption and increase flexibility
## Ultra-low-power modes

### Best power consumption numbers with full flexibility

<table>
<thead>
<tr>
<th>Wake-up time</th>
<th>( V_{\text{BAT}} )</th>
<th>Wake-up sources</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>250 ( \mu \text{s} )</td>
<td>2 nA / 200 nA*</td>
<td>any interrupt or event</td>
<td>* without RTC / with RTC</td>
</tr>
<tr>
<td>14 ( \mu \text{s} )</td>
<td>8 nA / 200 nA*</td>
<td>all I²C, UART</td>
<td>** with external SMPS</td>
</tr>
<tr>
<td>14 ( \mu \text{s} )</td>
<td>34 nA / 280 nA*</td>
<td>IWDG, BOR</td>
<td></td>
</tr>
<tr>
<td>5 ( \mu \text{s} )</td>
<td>200 nA / 440 nA*</td>
<td>all I²C, PVD, LCD, COMPs, I²C, LPUART, LPTIM</td>
<td></td>
</tr>
<tr>
<td>4 ( \mu \text{s} )</td>
<td>720 nA / 950 nA*</td>
<td>+ all I²C, UART</td>
<td></td>
</tr>
<tr>
<td>6 cycles</td>
<td>3.2 ( \mu \text{A} ) / 3.4 ( \mu \text{A} *</td>
<td>+ BOR, IWDG</td>
<td></td>
</tr>
<tr>
<td>35 ( \mu \text{A/MHz} ) / 90 ( \mu \text{A/MHz} *</td>
<td>+ all I²C, UART</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* Tamper detection: 2 I/Os, RTC

** Wake-up sources: reset pin, 5 I/Os, RTC

*** Wake-up sources: + BOR, IWDG

**** Wake-up sources: + all I²C, PVD, LCD, COMPs, I²C, LPUART, LPTIM

***** Wake-up sources: any interrupt or event
STM32L4 takes off like a rocket

From 0 to 48 MHz in less than 5 µs

From 0 to 80 MHz in less than 20 µs

Dhrystone

100

MIPS

ULPBENCH™

447

ULPMark-CP

An EEMBC Benchmark

ULPBENCH™

167

ULPMark-PP

An EEMBC Benchmark

COREMARK®

273

An EEMBC Benchmark
Providing more performance

- Up to 80 MHz/ 100 DMIPS with Chrom-ART Accelerator™
- Up to 273 CoreMark result
- Arm® Cortex®-M4 with FPU and DSP instructions
- 2x DMA (14 channels)
- SPI up to 40 Mbit/s, USART 10 Mbit/s

No compromise on performance with STM32L4 MCUs

Execution performance from Flash memory

CoreMark score
273

CPU frequency
80 MHz

Linear performance thanks to ST ART Accelerator™

Competitors: impact of wait states
Digital Filter for Sigma Delta Modulators
8 x parallel inputs with up to 24-bit data output resolution

V_{BAT} with RTC for battery backup
200 nA in V_{BAT} mode for RTC and 32 x 32-bit backup registers

TRNG & AES for Security
128-/256-bit AES key encryption hardware accelerator

FSMC
External memory interface for static memories supporting SRAM, PSRAM, NOR and NAND

STM32L4
Electricity/Gas / Water Smart Meter

LCD Display
SPI, Parallel or TFT Interface

Anti Tamper pin
3 x tamper pins for battery domain

SPI / UART/ SDIO for Wireless
3x SPIs (4x SPIs with the Quad SPI) 6x USARTs (ISO 7816, LIN, IrDA, modem) 1x SDIO

I/Os
Up to 114 fast I/Os for buttons & relays
Smart peripherals
fitness tracker - wristband

STM32L4

Display
FSMC - Parallel interface to TFT
SPI - Up to 40 MHz speed

USB
USB OTG 2.0
full-speed, LPM and BCD

SAI
2x serial audio interfaces

Digital Filter for Sigma Delta Modulators
with PDM (Pulse Density Modulation) microphone input support

Batch Acquisition Mode (BAM)

Sensors

I²C
3x I²C FM+(1 Mbit/s), SMBus/PMBus

SPI / UART
3x SPIs (4x SPIs with the Quad SPI)
6x USARTs (ISO 7816, LIN, IrDA, modem)

SWP
Single wire protocol master interface (SWPMI)

OPAMP
2x op amp with built-in PGA

DAC
2x 12-bit DAC, low-power sample and hold

ADC
3x 12-bit ADC 5 MSPS, up to 16-bit with hardware oversampling, 200 μA/MSPS

ADC
3x 12-bit ADC 5 MSPS, up to 16-bit with hardware oversampling, 200 μA/MSPS
Motor Control:
- 2x 16-bit advanced motor-control timers
- 12-bit ADCs: 5 MSPS, with up to 16-bit with hardware oversampling, 200 μA/MSPS

CAN Bus
(2.0B Active)

TRNG & AES
for Security
- 128/256-bit AES
- key encryption hardware accelerator

FSMC
External memory interface for static memories supporting SRAM, PSRAM, NOR and NAND

STM32L4
Electricity/Gas/Water Smart Meter

I²C
- 3x I²C FM+(1 Mbit/s), SMBus/PMBus

I/Os
Up to 114 fast I/Os for buttons & relays

Display
- FSMC - Parallel interface to TFT
- SPI - Up to 40 MHz speed

High temperature
- from -40°C
- up to +125°C

SPI / UART
- 3x SPIs (4x SPIs with the Octo SPI)
- 6x USARTs (ISO 7816, LIN, IrDA, modem)

We. augmented

9
High integration level with high memory size in small packages

Package size down to 2.58 x 3.07 mm

ARM® Cortex®-M4 CPU
80 MHz
FPU
MPU
ETM

Connectivity
USB OTG Crystal less, 1x SD/SDIO/MMC, 3x SPI, 4x I²C, 2x CAN, 1x Quad SPI (Dual Flash), 5x USART + 1 x ULP UART

Digital
AES (256-bit), SHA (256-bit), TRNG, 2 x SAI, DFSOM (8 channels), Camera I/F, Chrom-ART Accelerator™

Analog
3x 16-bit ADC, 2 x DAC, 2 x comparators, 2 x op amps, 1 x temperature sensor

Display
LCD driver 8 x 40

Timers
17 timers including:
2 x 16-bit advanced motor control timers
2 x ULP timers
7 x 16-bit timers
2 x 32-bit timers

I/Os
Up to 136 I/Os
Touch-sensing controller

Parallel Interface
FSMC 8-/16-bit (TFT-LCD, SRAM, NOR, NAND)
Integrated safety and security features

**SAFETY**
- Brown-out Reset in all modes
- Clock Security System
- SRAM parity check
- Backup byte registers
- Supply monitoring
- Flash with ECC with status register (address)
- Dual watchdog

**SECURITY**
- Anti-tamper detection
- Memory Protection Unit (MPU)
- Read and Write Protection
- Unique ID
- AES-256 / SHA-256 Encryption
- JTAG fuse
- True Random Number Generator
- Software IP Protection
STM32 MCU: Continuity in the STM32 portfolio

STM32MP1
- 4158 CoreMark
- 650 MHz Cortex-A7
- 209 MHz Cortex-M4

STM32H7
- Up to 3224 CoreMark
- Up to 550 MHz Cortex-M7
- 240 MHz Cortex-M4

STM32F2
- Up to 389 CoreMark
- 120 MHz Cortex-M3
STM32F4
- Up to 608 CoreMark
- 180 MHz Cortex-M4
STM32F7
- 1082 CoreMark
- 216 MHz Cortex-M7
STM32H7
- Up to 3224 CoreMark
- Up to 550 MHz Cortex-M7
- 240 MHz Cortex-M4

STM32F0
- 106 CoreMark
- 48 MHz Cortex-M0
STM32G0
- 142 CoreMark
- 64 MHz Cortex-M0+
STM32F1
- 177 CoreMark
- 72 MHz Cortex-M3
STM32F3
- 245 CoreMark
- 72 MHz Cortex-M4
STM32G4
- 550 CoreMark
- 170 MHz Cortex-M4

STM32L4
- 273 CoreMark
- 80 MHz Cortex-M4
STM32L4+
- 409 CoreMark
- 120 MHz Cortex-M4
STM32L5
- 443 CoreMark
- 110 MHz Cortex-M3
STM32U5
- 651 CoreMark
- 160 MHz Cortex-M3

STM32L0
- 75 CoreMark
- 32 MHz Cortex-M0+
STM32L1
- 93 CoreMark
- 32 MHz Cortex-M3
STM32W0
- 162 CoreMark
- 48 MHz Cortex-M4
- 48 MHz Cortex-M0+
STM32WL
- 162 CoreMark
- 48 MHz Cortex-M4
- 48 MHz Cortex-M0+
STM32WB
- 216 CoreMark
- 64 MHz Cortex-M4
- 32 MHz Cortex-M0+

Optimized for mixed-signal applications
Cortex-M0+ Radio co-processor

STM32: Pin-to-pin compatibility across the whole STM32L4 family

- MPU
- High Perf MCUs
- Mainstream MCUs
- Ultra-low Power MCUs
- Wireless MCUs

STM32 Family: 10 Year Commitment
STM32L ULP portfolio

STM32L4 completes the ultra-low-power family

<table>
<thead>
<tr>
<th>Cost-smart ULP champion</th>
<th>Broad-range foundation</th>
<th>ULP With performance</th>
<th>ULP with more performance</th>
<th>Advanced security</th>
</tr>
</thead>
<tbody>
<tr>
<td>STM32L0</td>
<td>STM32L1</td>
<td>STM32L4</td>
<td>STM32L4+</td>
<td>STM32L5</td>
</tr>
<tr>
<td>Cortext-M0+ at 32 MHz</td>
<td>Cortex-M3 at 32 MHz</td>
<td>Cortex-M4 w/ FPU at 80 MHz</td>
<td>Cortex-M4 w/ FPU at 120 MHz</td>
<td>Cortex-M33 w/ FPU at 110 MHz</td>
</tr>
<tr>
<td>1.65 to 3.6V</td>
<td>1.65 to 3.6V</td>
<td>1.71 to 3.6V</td>
<td>1.71 to 3.6V</td>
<td>1.71 to 3.6V</td>
</tr>
<tr>
<td>8-/16-bit applications</td>
<td>Wide choice of memory sizes</td>
<td>High-performance, advanced analog circuits</td>
<td>Wide choice of memory sizes</td>
<td></td>
</tr>
<tr>
<td>Wide range of pin-counts</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3 product lines,</td>
<td>3 product lines,</td>
<td>5 product lines,</td>
<td>4 product lines,</td>
<td>1 product line,</td>
</tr>
<tr>
<td>Smaller packages,</td>
<td>True EEPROM, Dual-bank Flash memory (RWW), 32 to 512 Kbytes of Flash, Up to 80 Kbytes of SRAM</td>
<td>64 Kbytes to 1 Mbyte, Up to 320 Kbytes of SRAM</td>
<td>1 to 2 Mbytes of Flash, Up to 640 Kbytes of SRAM</td>
<td></td>
</tr>
<tr>
<td>USB, LCD, Analog</td>
<td>8 to 192 Kbytes of Flash, Up to 20 Kbytes of SRAM</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8 to 192 Kbytes of Flash</td>
<td>Up to 20 Kbytes of SRAM</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
STM32L, a complete offer

STM32L4+ completes the ultra-low-power family
### STM32L4 serie

<table>
<thead>
<tr>
<th>Product line</th>
<th>Flash (KB)</th>
<th>RAM (KB)</th>
<th>Memory I/F</th>
<th>OPAmp</th>
<th>CAN</th>
<th>Sigma Delta</th>
<th>12-bit ADC</th>
<th>DAC</th>
<th>SAI</th>
<th>USB Device</th>
<th>Segment LCD</th>
<th>Motion-Accelerator</th>
</tr>
</thead>
<tbody>
<tr>
<td>STM32L4x6 - USB OTG + Segment LCD Lines</td>
<td>512 to 1024</td>
<td>320</td>
<td>•</td>
<td>2</td>
<td>2</td>
<td>8x ch</td>
<td>3</td>
<td>2</td>
<td>2</td>
<td>•</td>
<td>Up to 8x40</td>
<td>•</td>
</tr>
<tr>
<td>STM32L476*</td>
<td>256 to 1024</td>
<td>128</td>
<td>•</td>
<td>2</td>
<td>1</td>
<td>8x ch</td>
<td>3</td>
<td>2</td>
<td>2</td>
<td>•</td>
<td>Up to 8x40</td>
<td></td>
</tr>
<tr>
<td>STM32L4x5 - USB OTG lines</td>
<td>256 to 1024</td>
<td>128</td>
<td>•</td>
<td>2</td>
<td>1</td>
<td>8x ch</td>
<td>3</td>
<td>2</td>
<td>2</td>
<td>•</td>
<td>Up to 8x40</td>
<td></td>
</tr>
<tr>
<td>STM32L4x3 - USB Device + Segment LCD lines</td>
<td>128 to 256</td>
<td>64</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>•</td>
<td>Up to 8x40</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>STM32L4x2 - USB Device lines</td>
<td>256 to 512</td>
<td>160</td>
<td>•</td>
<td>1</td>
<td>1</td>
<td>4x ch</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>•</td>
<td></td>
<td></td>
</tr>
<tr>
<td>STM32L4x1 - Access lines</td>
<td>512 to 1024</td>
<td>128</td>
<td>•</td>
<td>2</td>
<td>1</td>
<td>8x ch</td>
<td>3</td>
<td>2</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>STM32L4G71</td>
<td>256 to 512</td>
<td>160</td>
<td>•</td>
<td>1</td>
<td>1</td>
<td>4x ch</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>STM32L4G61</td>
<td>128 to 256</td>
<td>64</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- **STM32L4A6**
- **STM32L4G6**
- **STM32L4G7**
- **STM32L4G2**
- **STM32L4G3**

Note: * HW crypto/hash functions are available on STM32L4G6, STM32L4G3, STM32L4G2, STM32L4G2 and STM32L4G2 - ** on STM32L4A6
<table>
<thead>
<tr>
<th>Flash memory / RAM size (bytes)</th>
<th>Pin Count</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1 M / 320 K</strong></td>
<td></td>
</tr>
<tr>
<td><strong>1 M / 128 K</strong></td>
<td></td>
</tr>
<tr>
<td><strong>512 K / 320 K</strong></td>
<td>72-pin</td>
</tr>
<tr>
<td><strong>512 K / 160 K</strong></td>
<td>48-pin</td>
</tr>
<tr>
<td><strong>512 K / 128 K</strong></td>
<td>49-pin</td>
</tr>
<tr>
<td><strong>256 K / 160 K</strong></td>
<td>32-pin</td>
</tr>
<tr>
<td><strong>256 K / 128 K</strong></td>
<td>48-pin</td>
</tr>
<tr>
<td><strong>256 K / 64 K</strong></td>
<td>100-pin</td>
</tr>
<tr>
<td><strong>128 K / 64 K</strong></td>
<td>132-pin</td>
</tr>
<tr>
<td><strong>128 K / 40 K</strong></td>
<td>144-pin</td>
</tr>
<tr>
<td><strong>64 K / 40 K</strong></td>
<td>169-pin</td>
</tr>
</tbody>
</table>

New devices
STM32L4 ecosystem

**HARDWARE TOOLS**

- **STM32 Nucleo boards**
  - Flexible prototyping
- **Discovery kits**
  - Key feature prototyping
- **Evaluation board**
  - Full feature evaluation

**SOFTWARE TOOLS**

- [github.com/STMicroelectronics](https://github.com/STMicroelectronics)
- [wiki.st.com/stm32mcu](https://wiki.st.com/stm32mcu)

STM32Cube adds major enhancements to boost software development
STM32L4/L4+ ecosystem

EMBEDDED SOFTWARE

- Open-source TCP/IP stack (lwIP)
- USB Host and Device library from ST
- STemWin graphical stack library from ST and SEGGER
- Open-source FAT file system (FatFs)
- Open-source real-time OS (FreeRTOS)
- Touch-sensing library
- Dozens of examples

- STM32L4 Hardware Abstraction Layer (HAL) portable APIs
- **High-performance, light-weight low-layer (LL) APIs**
- High coverage for most STM32 peripherals
- Production-ready and fully qualified
- Dozens of usage examples
- Open-source BSD license
Summary

4 keys of STM32 L4 series

- More performance and still ULP leader
- More Graphics and Innovation
- More Integration
- Great Investment
Releasing your creativity

/STM32

community.st.com

www.st.com/STM32L4

STM32L4 Online training

STM32L4 MOOC
Thank you