Introducing STM32U5, the flagship of ultra-low-power MCUs
## STM32 portfolio

### MPU

**STM32MP1**
- 4158 CoreMark
- 650 MHz Cortex-M7
- 208 MHz Cortex-M4

### High Perf MCUs

**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

**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

#### Optimized for mixed-signal Applications

### Mainstream MCUs

**STM32L0**
- 75 CoreMark
- 32 MHz Cortex-M0+

**STM32L1**
- 93 CoreMark
- 32 MHz Cortex-M3

**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

### Ultra-low-power MCUs

**STM32W1**
- 162 CoreMark
- 48 MHz Cortex-M4

**STM32W2**
- 216 CoreMark
- 64 MHz Cortex-M4

### Wireless MCUs

**STM32WL**
- 162 CoreMark
- 48 MHz Cortex-M4

**STM32WB**
- 216 CoreMark
- 64 MHz Cortex-M4

### Optimized for mixed-signal applications
- STM32G0
- STM32F3

### Cortex-M0+ Radio co-processor
- STM32MP1
Applications are more and more demanding!

more autonomy
more integration
more security

Application examples:
- Gas and water meter
- Fitness band
- Medical monitoring devices
- POS
Continuing our leadership in ultra-low-power MCUs

2021

STM32U5
First ultra-low-power STM32 with 40 nm technology

2020  2 billion ultra-low-power STM32s shipped
2019  STM32L5  Introduction of M33, excellence in ultra-low-power with certified security
2017  STM32L4+  Ultra-low-power excellence with more performance
2015  STM32L4  Leadership ultra-low-power Cortex-M4 (#1 ULP 447 ULPBench™) MCUs
2014  STM32L0  Entry cost ultra-low-power MCU
2009  STM32L1  World 1st Cortex-M ultra-low-power MCU
Enabling key new features for embedded developers

STM32U5

**Lower power consumption**
New power management
LPBAM*, DMA and IP autonomous in LP mode

**Higher security**
AES and PKA, side attack resistant

**Higher level of safety**
ECC on Flash and SRAM

**Improved data storage**
100 kcycles for 512 kB of Flash

**Better accuracy**
ADC 14-bit

* Low Power Background Autonomous Mode
Cut MCU power consumption by 90%*

Low Power Background Autonomous Mode (LPBAM)

STM32U5

stm32

Cortex-M33

SRAM

PERIPHERALS

DMA

wake-on-complete

Low-power TIMER

trigger

Peripherals:
- I2C master or slave
- SPI / UART reception or transmission
- ADC / DAC
- Voice Activity Detection
- LPTIM
- I/O

* Typical application where peripherals need to acquire data regularly
Extends battery life

Improved flexibility versus existing STM32L series

• The STM32U5 provides a **large choice of low power modes** with fast wake-up times

See below some examples to illustrate the best-in class power consumption:

- **300 nA**  Standby
- **1.7 µA**  Stop3 (with 16kB SRAM)
- **6.6 µA**  Stop 2 (full retention: 786-Kbyte RAM)
- **Down to 19 µA / MHz**  (Run up to 160 MHz)
STM32U5 efficiency proven by benchmarks

Best performances among 32-bit MCUs available on the market

- **ULPBENCH™ 535 ULPMark-CP**
  - True energy cost of deep-sleep modes

- **ULPBENCH™ 149 ULPMark-PP**
  - Common peripherals' energy impact on deep-sleep

- **ULPBENCH™ 58 ULPMark-CM**
  - Active power, using CoreMark as the workload

- **ULPBENCH™ 133000 SecureMark-TLS**
  - Efficiency of cryptographic processing solutions
STM32 U5

• Arm® Cortex®-M33 at 160 MHz
  240 DMIPS or 651 Coremark

• Mathematics accelerators: FMAC and Cordic

• Cache for execution and data for internal and external memory (ART Accelerator)
STM32U5, the new flagship of STM32 ULP series

Memory size (Bytes)

ULPMark-CP* | 233 | 155 | 447 | 285 | 370 | 535
|---|---|---|---|---|---|
| Dmips* (Fmax CPU) | 30 (32MHz) | 33.6 (32MHz) | 100 (80MHz) | 150 (120MHz) | 165 (110MHz) | 230 (160MHz)

Highest DMIPS
Best ULP

*the higher the better
<table>
<thead>
<tr>
<th>Parallel Interface</th>
<th>Timers</th>
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</thead>
<tbody>
<tr>
<td>FSMC 8-/16-bit</td>
<td>19 timers including:</td>
</tr>
<tr>
<td>(TFT-LCD, SRAM, NOR, NAND)</td>
<td>2 x 16-bit advanced motor control timers</td>
</tr>
<tr>
<td></td>
<td>4 x ULP timers</td>
</tr>
<tr>
<td></td>
<td>5 x 16-bit-timers</td>
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<tr>
<td></td>
<td>4 x 32-bit timers</td>
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<table>
<thead>
<tr>
<th>I/Os</th>
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<tbody>
<tr>
<td>Touch-sensing controller</td>
<td></td>
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<tr>
<td>Camera Interface</td>
<td></td>
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<table>
<thead>
<tr>
<th>Arm® Cortex®-M33 CPU</th>
<th>Connectivity</th>
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<tbody>
<tr>
<td>160 MHz FPU</td>
<td>USB OTG +PD,</td>
</tr>
<tr>
<td>MPU</td>
<td>2x SD/SDIO/MMC,</td>
</tr>
<tr>
<td>TrustZone® MPU</td>
<td>3 x SPI,</td>
</tr>
<tr>
<td>ETM</td>
<td>4 x I2C,</td>
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<tr>
<td></td>
<td>1x CAN FD,</td>
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<tr>
<td></td>
<td>2 x Octo SPI,</td>
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<tr>
<td></td>
<td>5 x USART + 1 x ULP UART,</td>
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<tr>
<td></td>
<td>1 x SWP</td>
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<table>
<thead>
<tr>
<th>Digital</th>
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<tbody>
<tr>
<td></td>
<td>AES (256-bit),</td>
</tr>
<tr>
<td></td>
<td>SHA-1, SHA-256,</td>
</tr>
<tr>
<td></td>
<td>TRNG, PKA,</td>
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<tr>
<td></td>
<td>2 x SAI,</td>
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<tr>
<td></td>
<td>MDF, ADF</td>
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</tbody>
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<table>
<thead>
<tr>
<th>Analog</th>
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<tbody>
<tr>
<td></td>
<td>1x 14-bit ADC 2MSPS,</td>
</tr>
<tr>
<td></td>
<td>1x 12-bit ADC 2MSPS</td>
</tr>
<tr>
<td></td>
<td>2 x DAC,</td>
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<tr>
<td></td>
<td>2 x comparators,</td>
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<tr>
<td></td>
<td>2 x op amps</td>
</tr>
<tr>
<td></td>
<td>1 x temperature sensor</td>
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<table>
<thead>
<tr>
<th>High level of integration</th>
<th>Numerous integrated peripherals</th>
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<tbody>
<tr>
<td>Large embedded memory</td>
<td>Advanced accelerators</td>
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- High level of integration
- Numerous integrated peripherals
- Advanced accelerators
- Large embedded memory
Enhanced security

Extensive functionality to protect your assets

<table>
<thead>
<tr>
<th>Isolation</th>
<th>Cryptography</th>
<th>Security assurance level</th>
</tr>
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<tbody>
<tr>
<td>TrustZone® Secure Peripherals Secure DMA</td>
<td>Side channel AES, PKA Additional AES, PKA, SHA, TRNG CAVP certified CryptoLib</td>
<td>L3 laCmL3 SESIP</td>
</tr>
</tbody>
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<tr>
<th>Lifecycle</th>
<th>Memory protections</th>
<th>Active tamper</th>
<th>Trust anchor</th>
</tr>
</thead>
<tbody>
<tr>
<td>RDP: 4 protection level states Password based regression</td>
<td>OTP, HDP, WRP, RDP, MPU Ext. Flash encryption OTFDec Secure Debug</td>
<td>4x active pair of tamper pins. Volt. &amp; Temp. monitoring (Vbat) Total tamper I/Os: 8</td>
<td>TF-M, Secure Boot, Secure Firmware Install Hardware Unique Keys</td>
</tr>
</tbody>
</table>

New features for STM32 in bold

1\textsuperscript{st} MCU to reach Level 3
Multiple options to meet the needs of developers

8 different packages
- 48-pin QFN
- 90-pin WLCSP
- 48/64/100/144-pin LQFP
- 132/169-pin UFBGA

2 memory size configurations
- 1 M Flash / 786 K RAM
- 2 M Flash / 786 K RAM

Optional security
- without HW crypto
- with HW crypto

24 variants
Microsoft Azure RTOS bringing additional Key benefits to well-know STM32Cube software Suite

STM32Cube Software Suite

Faster & Easier Development
Business-friendly terms
Better Quality
Fast performance
Complete consistent solution
Industry certifications
Early adoption by partners

STM32U5 selected for IoT and cloud connection solutions

Microvisor simplifies the transition to connected products for embedded engineers, with support for secure boot, over-the-air firmware upgrades, and remote debugging.

B-U585I-IOT02A discovery kit selected as reference board for Microsoft Azure Certified Device program.
Start your project based on the STM32U5 now!

STM32U5
Ultra-low-power
Performance
Security

Sampling now
Mass market in Sept -21
Releasing your creativity

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github.com/STMicroelectronics
STM32U5 blog articles
Thank you