# STM32L5 MCU series

## Excellence in ultra-low-power with more security

STM32 L5

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# Main Concerns for Embedded Design



- **Security**
  - Protection from hackers

- **Low power consumption**
  - Long life time, small battery size

- **Integration, size, performance**
  - Best fit versus the application requirements

# First STM32 Based on Cortex-M33



## STM32L5 is the answer

- More security with TrustZone and ST security implementation
  - **HW to resist to Logical and board level attack**

- Lower Power consumption
  - **STM32 ultra-low-power technology**

- Integration, Size, performance
  - **More performance, high memory size and wide portfolio**

# Security: Type of Attacks



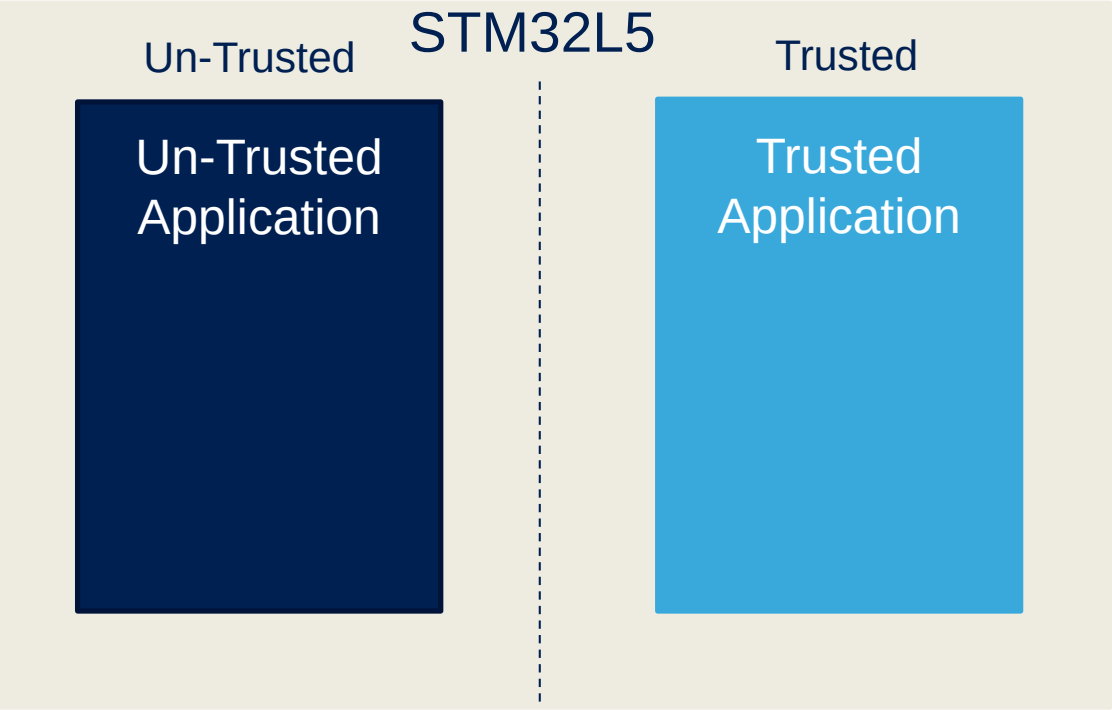
- **Logical attack**
  - Malicious code injection
  - Malware replacing genuine program
  - Man-in-the-middle attack
- **Board level attack**
  - Cloning attack
  - Fault injection
  - Side channel attack

- **Hardware Isolation**
- **Secure Key storage**
- **Encryption**
- **Authentication**
- **IP Protection**
- **Read-out Protection**
- **Active tampering**
- **Certified Crypto library**

# Security: TrustZone for Isolation



## ST implementation provides high granularity of isolation



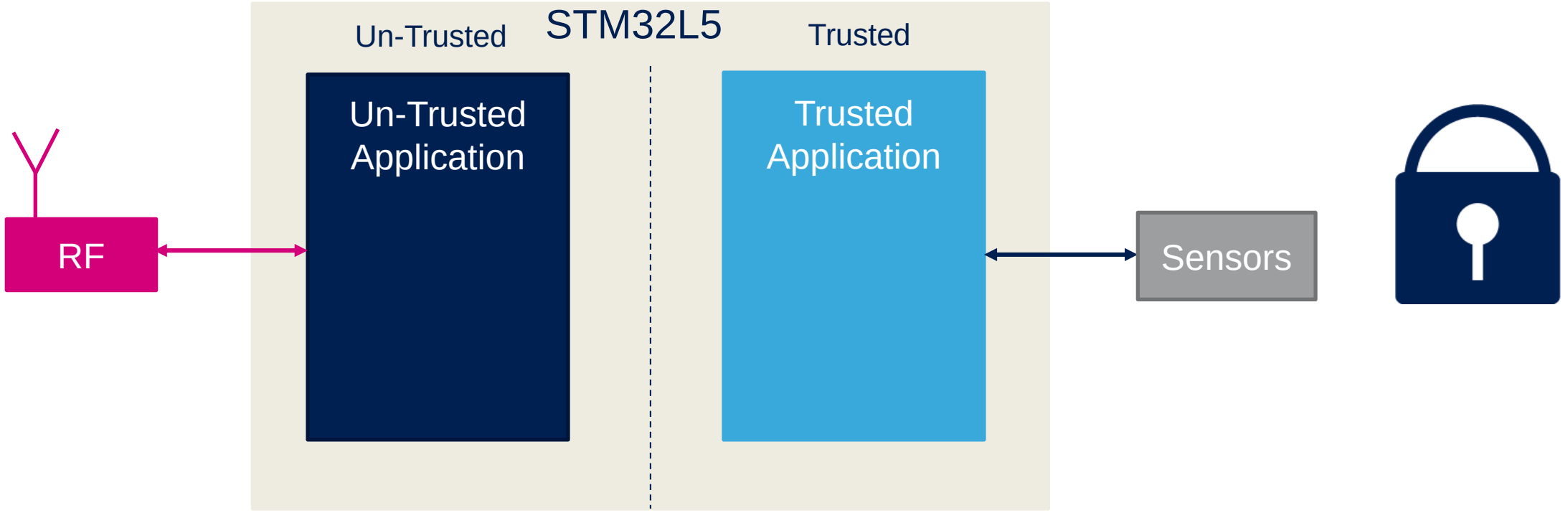

- **Each** GPIO or peripheral, DMA channel, clock configuration register, ART or small part of Flash or SRAM can be configured as **Trusted or un-Trusted**
- **Full isolation** of trusted and non-trusted world

# Security: TrustZone for Isolation



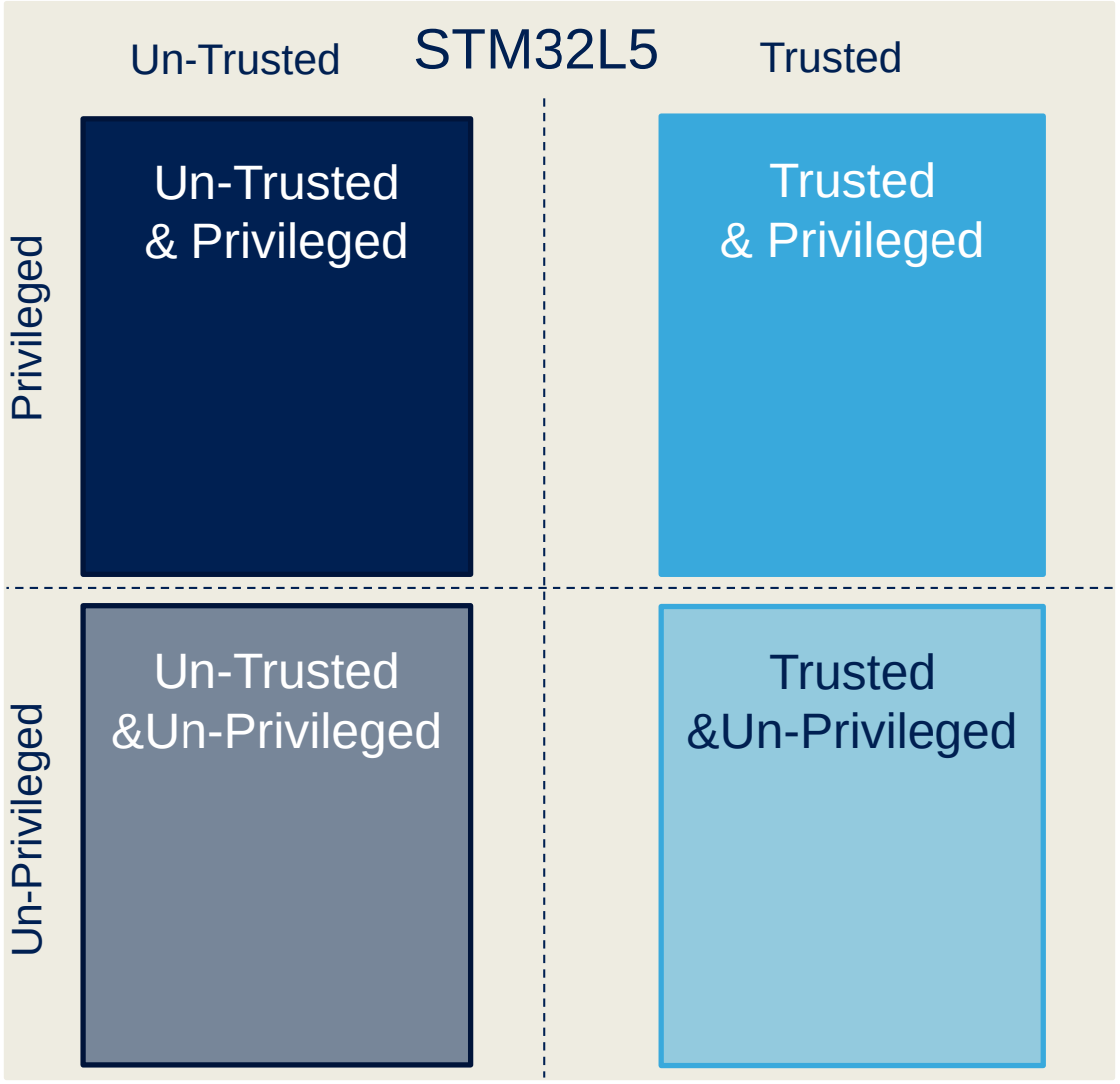
## TrustZone provides full isolation

Example of IoT application implementation



# Security: TrustZone and Privileged






- More partitioning
- Possibility to separate the trusted and un-trusted area with **privileged and un-privileged** zone
- Strong **granularity** to define each part of memory or each peripheral, DMA channel as privileged or un-privileged

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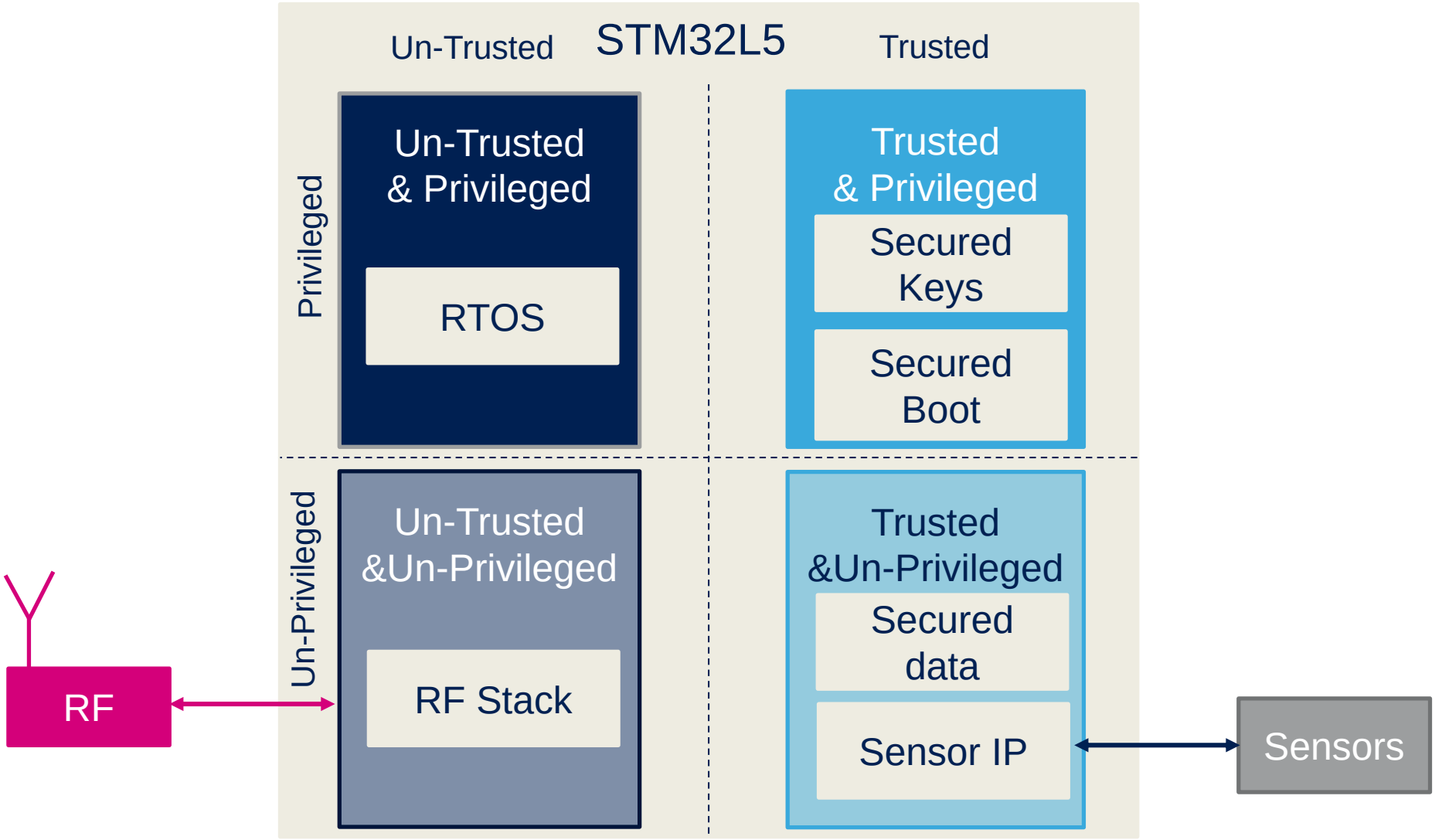
# TrustZone: Example



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# A Full Set of Security



## ENCRYPTION DECRYPTION AUTHENTIFICATION

- AES-128/256 Encryption
- SHA-256 Authentication
- **Public Key Acceleration (PKA): for RSA, Diffie-Hellmann or ECC (Elliptic Curve Cryptography)**
- Certified Crypto library
- True Random Number Generator
- Unique ID
- OTP Zone


## MEMORY and IP PROTECTION

- **Active and static Anti-tamper detection**
- Memory Protection Unit (MPU)
- Secure Boot
- Read and Write Protection
- **HDP (Hide Protect)**
- **OTFDEC (On-the-fly decryption) on Octo SPI to protect external memory**
- JTAG fuse
- **TrustZone**
- **Unique Boot Entry**

# Extend the Battery Life Time



- STM32L5 reuses the STM32L4/L4+ technology achieving **best-in-class** power consumption
- STM32L5 integrates an optional **SMPS** (DC/DC buck voltage regulator) which can be enabled/disabled on the fly to optimize the energy.
- Proven by EEMBC test results:

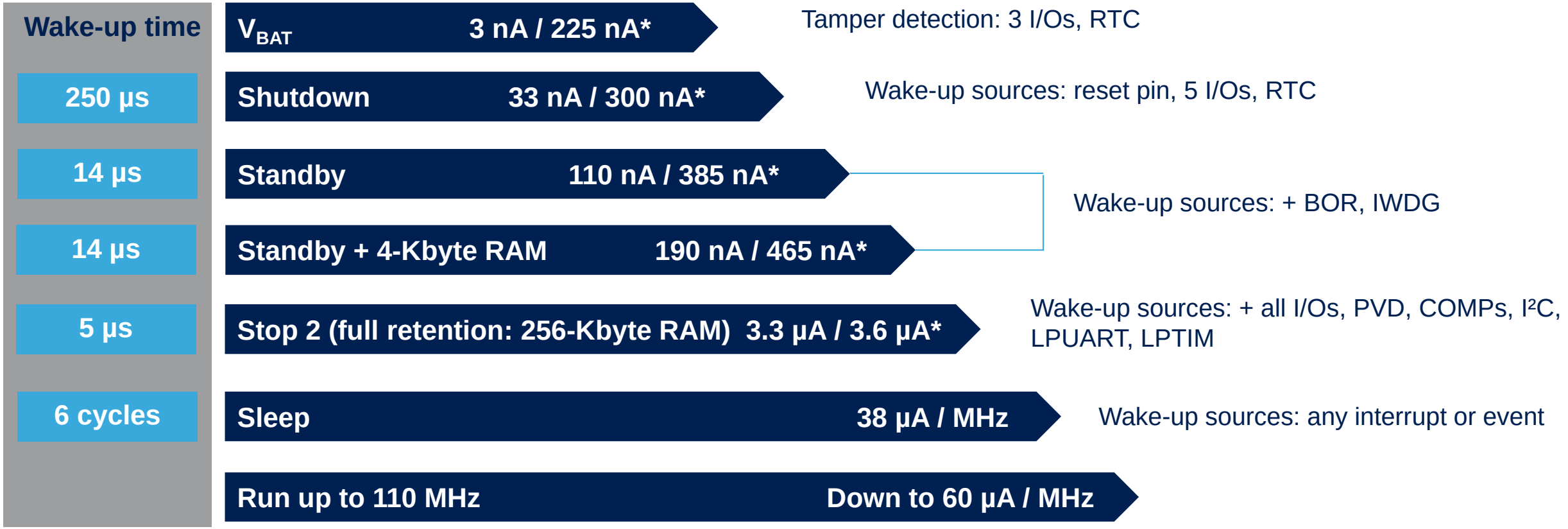
ULPBENCH™ An EEMBC Benchmark **385 ULPMark-CP**

ULPBENCH™ An EEMBC Benchmark **60 ULPMark-PP**

# Ultra-low-power Modes



## Best power consumption numbers with full flexibility




Note : * without RTC / with RTC

# More Performance



## Better responsiveness of the application

- **New** Arm® Cortex®-M33 performance: **+20%** versus Cortex-M4

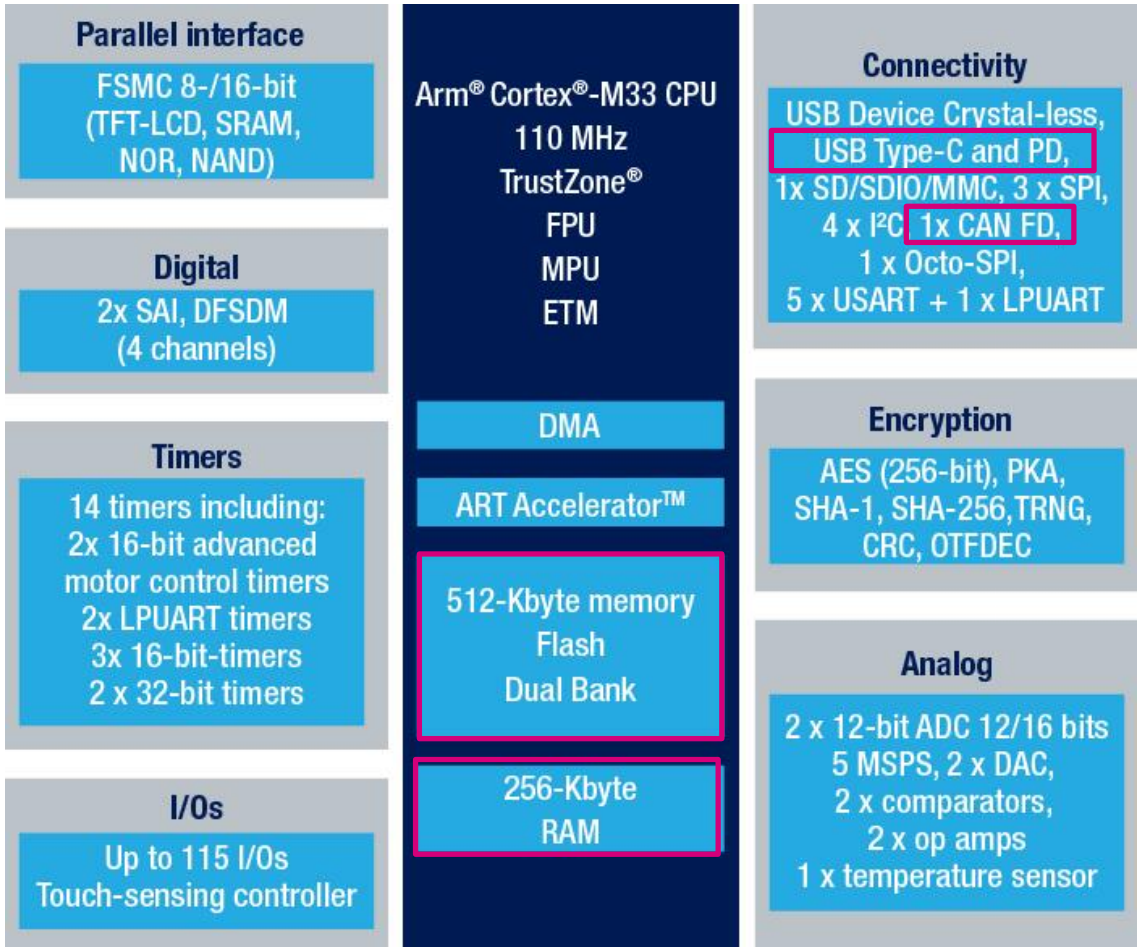
| | | |
|---|---|---|
| 1.5 DMIPS/MHz<br>3.88 CoreMark/MHz | → | 165 DMIPS<br>427 CoreMark |


- **New** ST ART Accelerator™: working both on internal and **external** Flash
  - 8 Kbytes of instruction cache

# High Integration and Innovation



## Large memory, USB Type-C™ w/ power delivery controller, CAN FD

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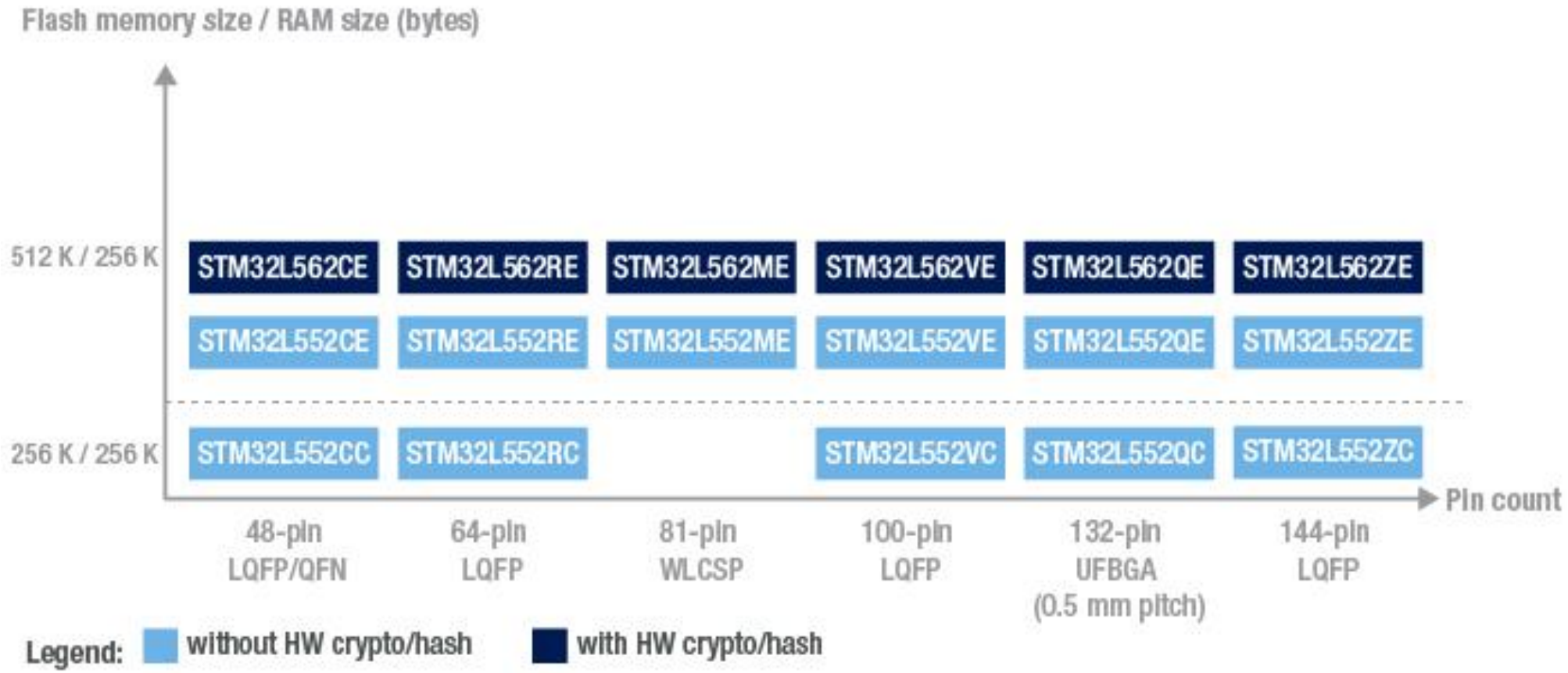
# Large Portfolio



## 7 packages, several options



# STM32L ULP Portfolio



## STM32L5 completes the ultra-low-power subclass

### Cost-smart ULP champion


Cortex-M0+ at 32 MHz
1.65 to 3.6V
8-/16-bit applications
Wide range of pin-counts

3 product lines,
Cost-effective,
Smaller packages,
USB, LCD, Analog
8 to 192 Kbytes of Flash,
Up to 20 Kbytes of SRAM

### Broad-range foundation


Cortex-M3 at 32 MHz
1.65 to 3.6V
Wide choice of memory sizes

3 product lines,
USB, LCD, AES,
Rich Analog
True EEPROM,
Dual-bank Flash memory (RWW),
32 to 512 Kbytes of Flash,
Up to 80 Kbytes of SRAM

### ULP With performance


Cortex-M4 w/ FPU at 80 MHz
1.71 to 3.6V
High-performance, advanced analog circuits

5 product lines,
5-MSPS ADC,
PGA, Compar.,
DAC, Op Amp, USB OTG, LCD, AES
64 Kbytes to 1 Mbyte
Up to 320 Kbytes of SRAM

### ULP With More performance


Cortex-M4 w/ FPU at 120 MHz
1.71 to 3.6V
Wide choice of memory sizes

3 product lines,
5-MSPS ADC,
PGA, Compar.,
DAC, Op Amp, USB OTG, LCD, AES
1 to 2 Mbytes of Flash,
Up to 640 Kbytes of SRAM

### Advanced Security


Cortex-M33 w/ FPU at 110 MHz
1.71 to 3.6V
Wide choice of memory sizes

1 product line,
5-MSPS ADC,
PGA, Compar.,
DAC, Op Amp,
USB Type C, AES, PKA
256 to 512 Kbytes of Flash,
256 Kbytes of SRAM

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# Conclusion



## STM32L5 helps designers to answer to IoT challenges


- More security

- Lower power consumption

- Integration, size, performance

# Thank You




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