# STM32 Ultra-low-power Cortex™-M0+

STM32 L0

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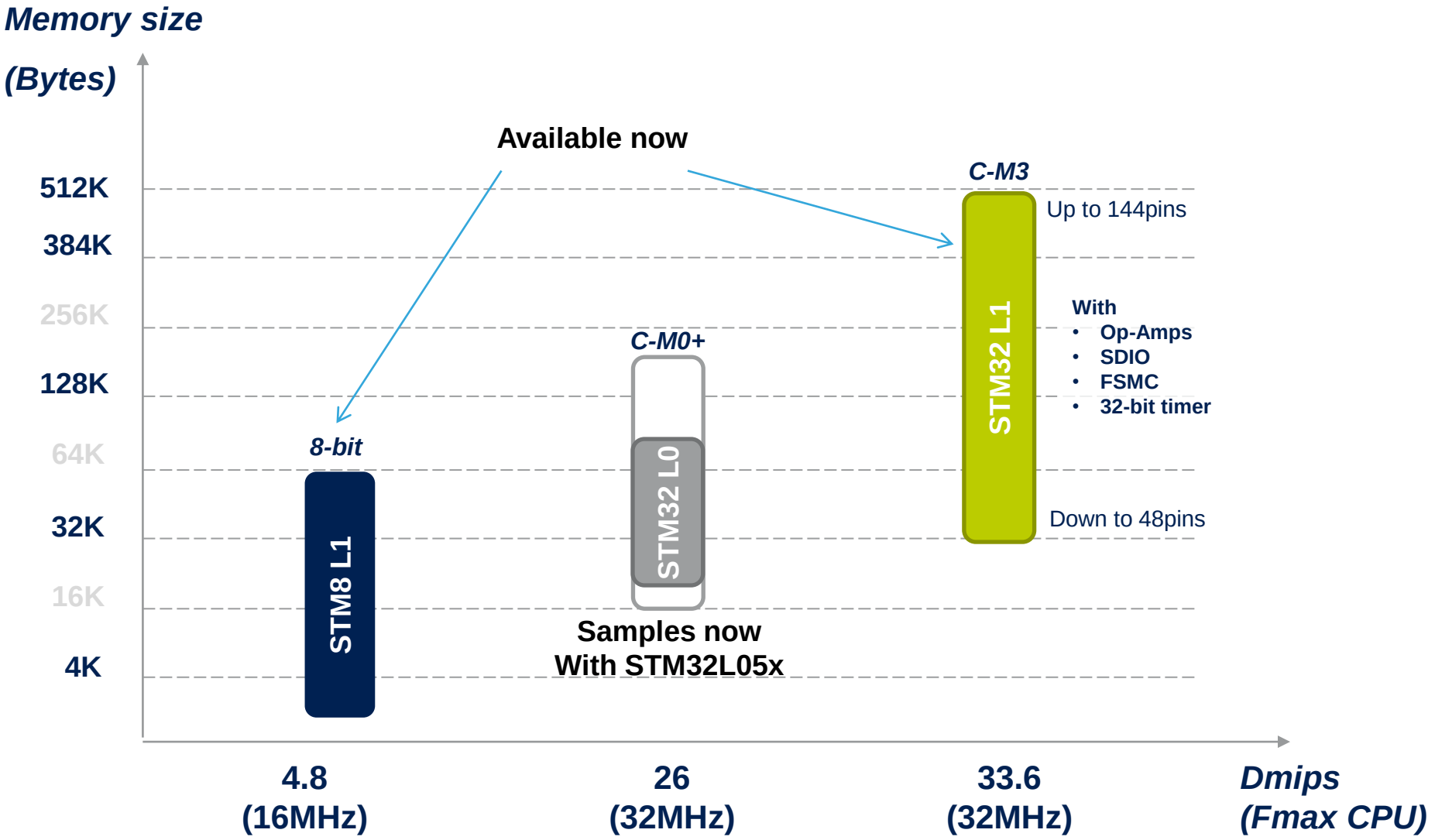
# STMx Ultra-low-power Family



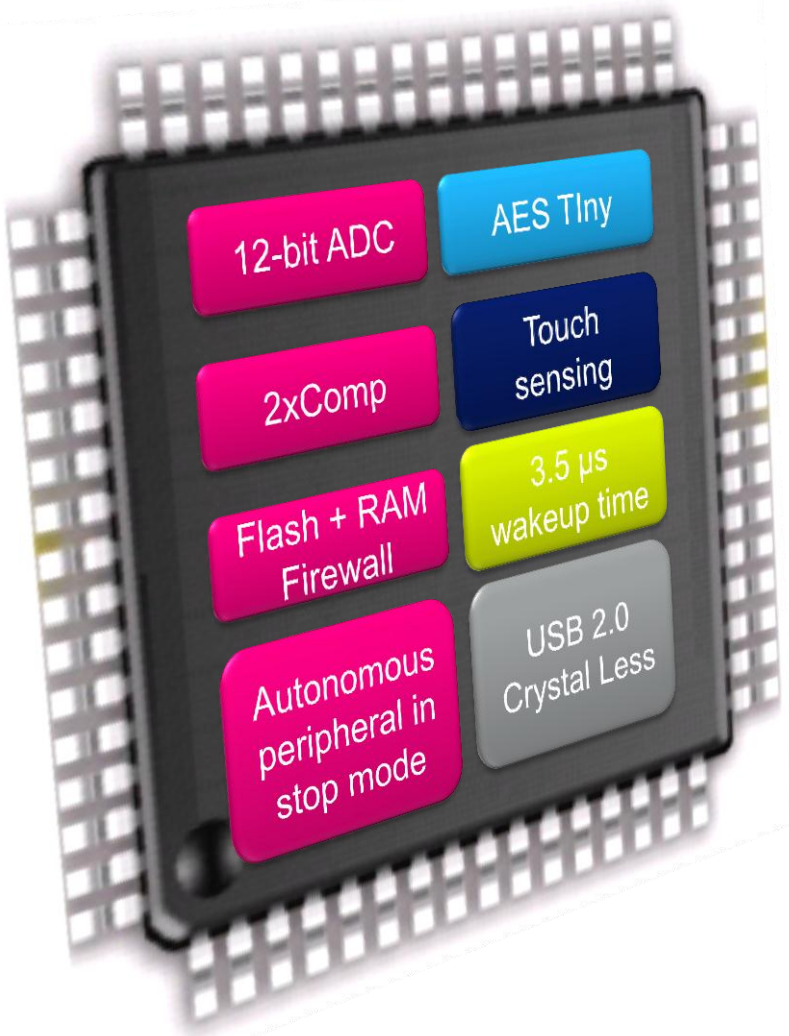
# What's new on STM32L0 Platform

- Cortex™-M0+ on board with MPU
- Smaller package for STM32L family MCU (down to 20pins)
- Aggressive power consumption: -20% vs. STM32L1 (Active mode)
- Stop mode down 950nA with
  - Full RAM retention (400 nA)
  - RTC Running (400 nA)
  - Pulse Counter (150 nA)
  - Snooze wakeup on UART
- Larger temperature range functionality: -40°C up to +125°C[1]
- New analog peripherals (12-bit ADC 1Msps @ 240 µA)
- USB 2.0 FS: Crystal less, BCD[2], LPM[3]

1 125°C $T_J$ : +105°C $T_A$ full feature set or +120°C in low power mode dissipation.
2. BCD: Battery Charging Detection
3. LPM: Link Power Management

# Innovative Peripherals

- Autonomous Peripherals
  - **Low-power Pulse counter**
    - Independent 16-bit timer, available also in Stop mode
    - Pulse counter with no clock running
    - Or clocked by LSE, LSI, HSI, APB.
    - It is able to wakeup the system from Stop mode.
    - Programmable digital glitch filter
    - Encoder mode
  - **UART**
    - Snooze wakeup
    - Wake from Stop using UART with dedicated ID/Byte
    - Baud rate independent from APB clock
  - **Low-Power UART**
    - Up to 9600 bauds running on LSE 32kHz
    - Snooze wakeup
    - Wake from Stop using UART with dedicated ID/Byte
  - **I2C**
    - with FM+ (programmable add, data bit length)
    - frequency independent from APB clock
- Analog
  - **12 bit ADC: 1MSPS ➔ 240 µA / 10kSPS ➔ 24 µA**
- system
  - **Firewall**
  - **Wakeup on MSI, HSI or HSI/4**
  - **USB+CRS= crystal less**



# STM32 L0xx – Product lines

**Common features architecture**

- Cortex-M0+ 32 MHz speed with MPU
- Multiple USART, SPI, I²C Low-power UART
- Multiple 16-bit timers Low-power 16-bit timer
- Built-in 16 MHz and 38 kHz RC oscillators
- 2x watchdogs
- Reset circuitry POR/PDR
- Brown Out Reset Program Voltage Detector
- 2x comparators
- AES 128-bit
- Dynamic Voltage Scaling
- Firewall protection (Flash and RAM)

### STM32L0x3 – USB & LCD line – 32-K to 192-Kbyte Flash

| Up to 192-KB Flash* | 16-KB SRAM | Up to 6-KB EEPROM | Main osc. input 1-24 MHz | RTC with 32 kHz osc. | 7 ch DMA | ADC 12-bit 1Msps 12-ch | DAC 2x 12-bit | USB2.0 Crystal Less, LPM, BCD | Touch Sense | True RNG | LCD 8x48 4x52 |
|---|---|---|---|---|---|---|---|---|---|---|---|

32 pins to 100pins

### STM32L0x2 – USB line - 32 to 192-Kbyte Flash

| Up to 128-KB Flash | 16-KB SRAM | Up to 6-KB EEPROM | Main osc. input 1-24 MHz | RTC with 32 kHz osc. | 7 ch DMA | 12-bit ADC 1Msps 12-ch | DAC 2x 12-bit | USB2.0 Crystal Less, LPM, BCD | Touch Sense | True RNG |
|---|---|---|---|---|---|---|---|---|---|---|

32 pins to 100pins

### STM32L0x1 – Access line - 16-K to 192-Kbyte Flash

| Up to 128-KB Flash | 16-KB SRAM | Up to 6-KB EEPROM | Main osc. input 1-24 MHz | RTC with 32 kHz osc. | 4 ch DMA | 12-bit ADC 1Msps 12-ch |
|---|---|---|---|---|---|---|

20 pins to 100pins

Note *: Dual bank flash and Rww Flash to EEPROM

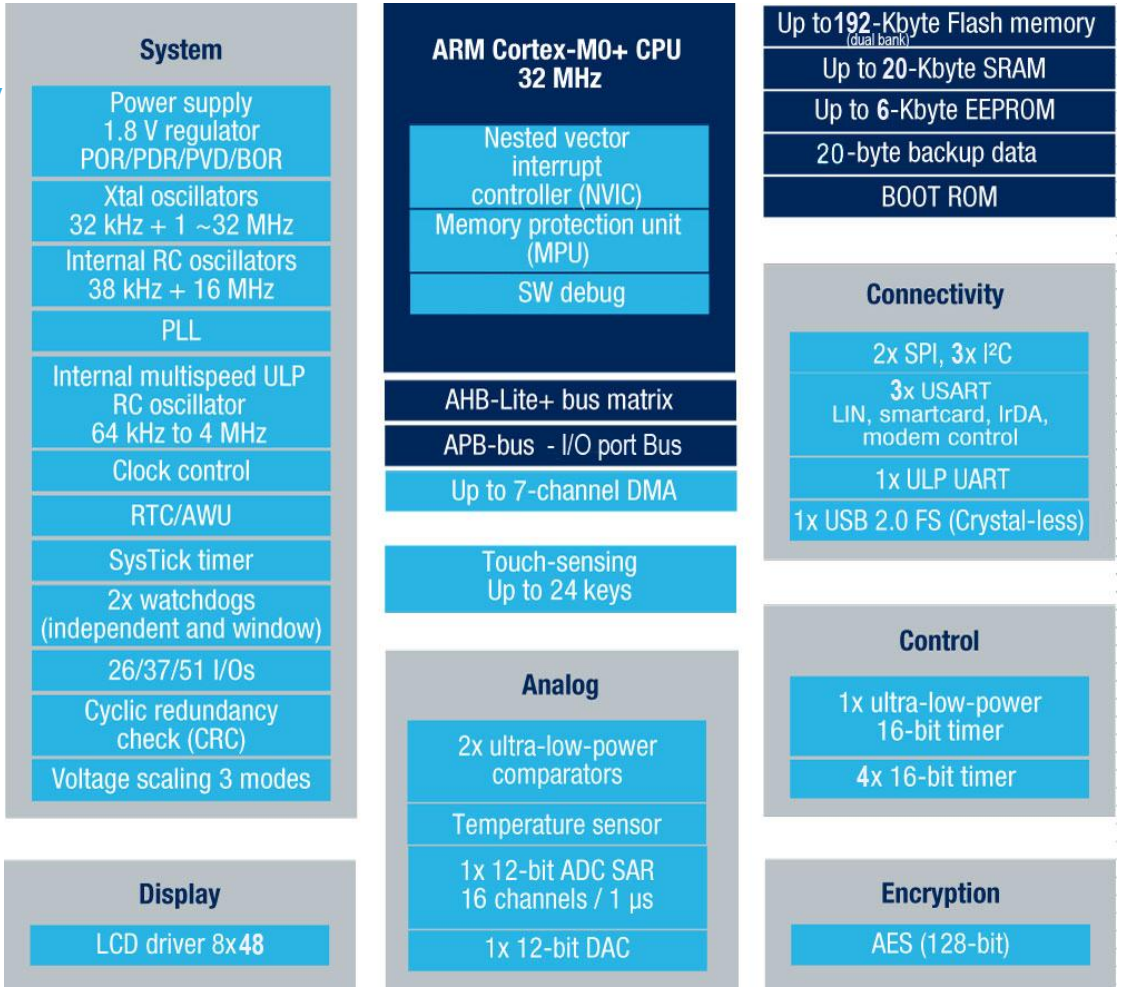
# STM32L05* block diagram - 64-KB



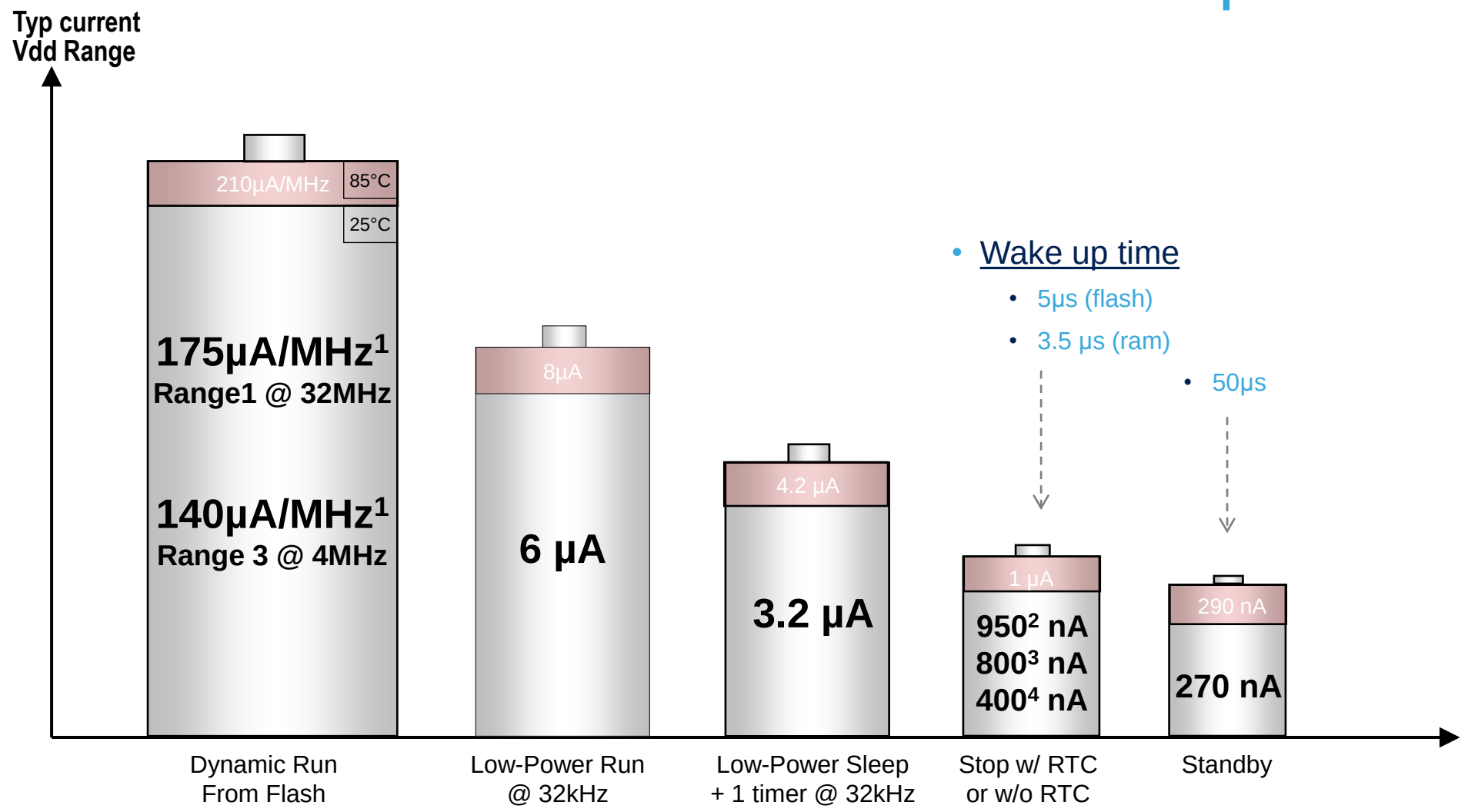
- Key features
  - 2x12-bit DAC
  - USB FS  Charging class/ Clock recove
  - 2 SPI, 1 I2S
  - Touch-Sensing up to 24 keys
  - LCD Display 8x28
  - Flash + Ram Firewall
  - 3x16 bit timers (1x4ch + 2x2ch)
  - AES 128-bit
- Improvement
  - Full 1.8V to 3.6V functional @32MHz
  - SAR 12-bit-ULP 1Msps (240µA-linear)
  - Com. periph.
    - 2xI²C  (1 available in stop)
    - 2xUSART
    - 1xLPUART  available in stop
  - 16-bit LPTIM
  - 175 µA/MHz product
  - 0.8 µA: Stop mode + RTC + 8KB RAM
  - Wakeup time from stop
    - <5µs from Flash
    - <3.5µs from Ram

# STM32L07* block diagram - 192-KB

- Key features
  - 2x12-bit DAC
  - USB FS  Charging class/ Clock recovery
  - 2 SPI, 1 I2S
  - Touch-Sensing up to 24 keys
  - LCD Display 8x48
  - Flash + Ram Firewall
  - 4x16 bit timers (2x4ch + 2x2ch)
  - AES 128-bit
- Improvement
  - Full 1.8V to 3.6V functional @32MHz
  - SAR 12-bit-ULP 1Msps (240µA-linear)
  - Com. periph.
    - 3xI²C, 1 available in stop
    - 4xUSART
    - 1xLPUART  available in stop
  - 16-bit LPTIM
  - 175 µA/MHz product
  - 0.8 µA: Stop mode + RTC + 20KB RAM
  - Wakeup time from stop
    - <5µs from Flash
    - <3.5µs from Ram



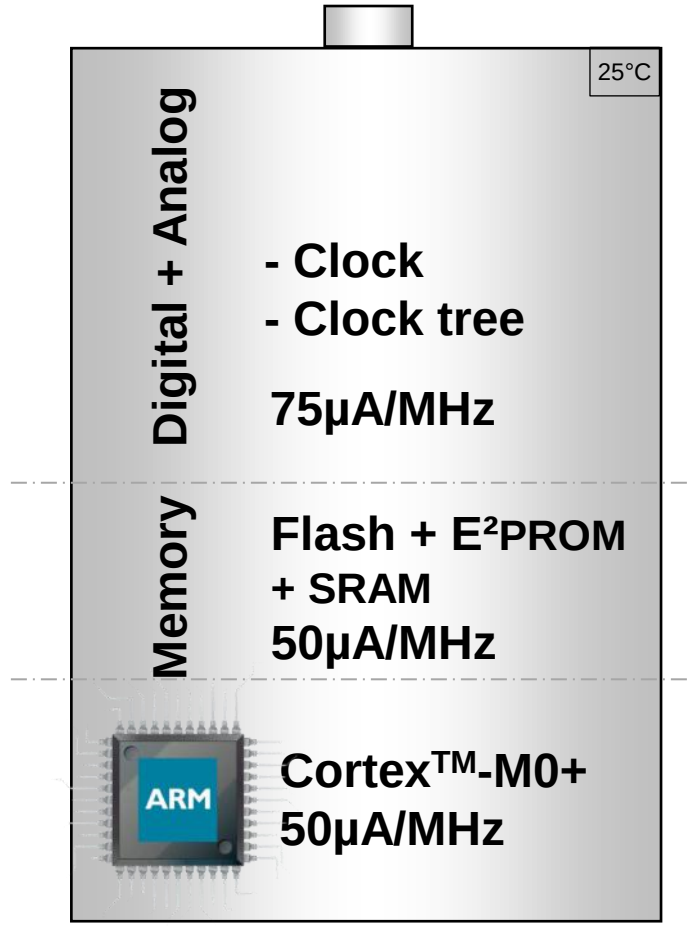
# STM32 L05* - Power consumption




1. Dhrystone power consumption value executed from Flash with VDD=3V
2. **STOP mode consumption with : Full Ram retention + RTC + Low-power Pulse counter**
3. STOP mode consumption with : Full Ram retention + RTC
4. STOP mode consumption with : Full Ram retention

# STM32 L05* - Ultra-low-power platform



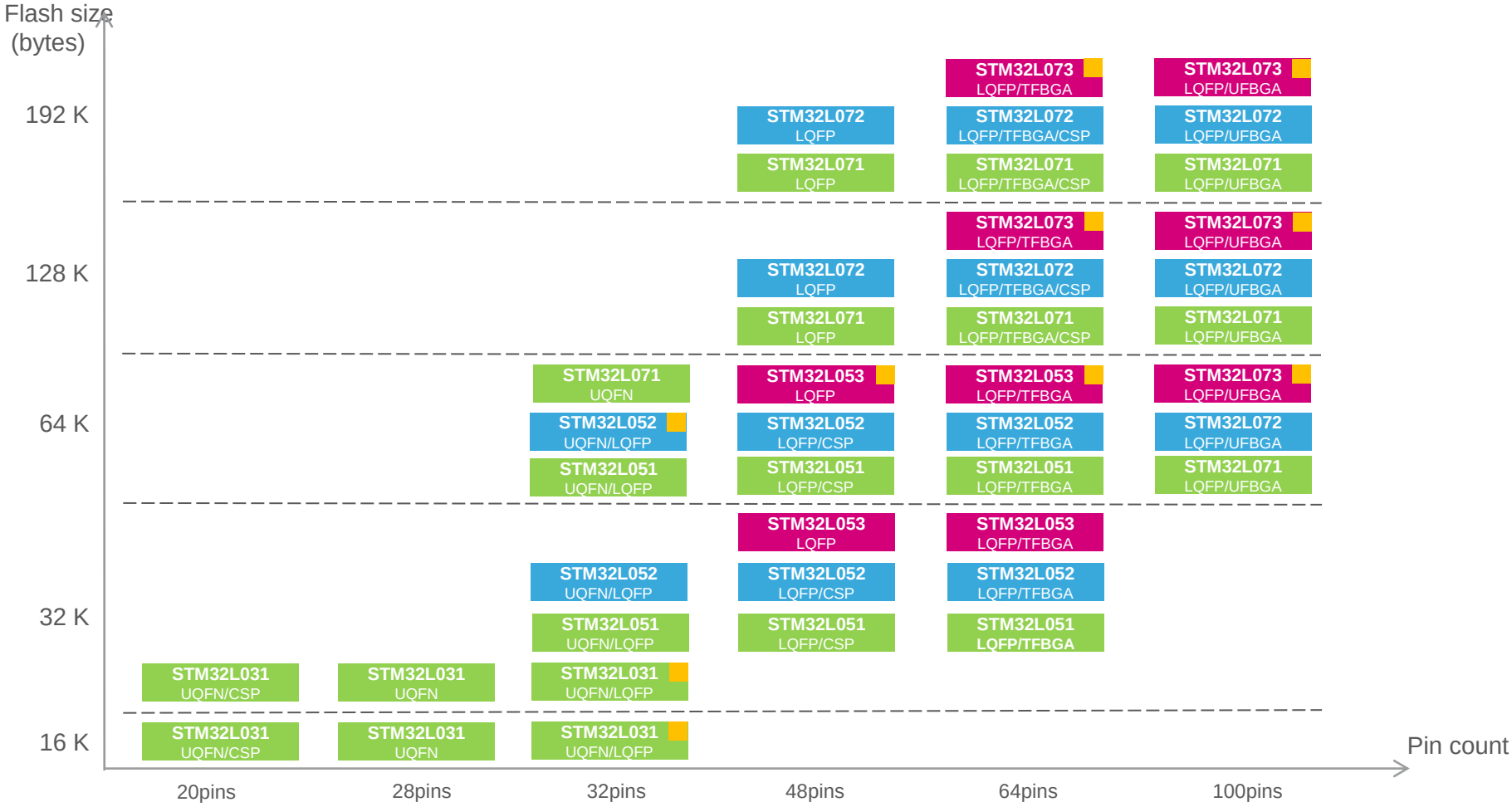



Dynamic Run From Flash
VDD=3.6V – CPU speed 32MHz

* is used as a wildcard character for related part numbers

# STM32L0x – portfolio

*Cortex™-M0+ @ 32MHz – 100+ P/N*




**Package size**
UQFN: 20pins in 3x3mm / 28pins in 4x4mm / 32pins in 5x5mm
LQFP: 32-to 48pins in 7x7mm / 64pins in 10x10mm / 100pins in 14x14mm
BGA: 64pins in 5x5mm / 100pins in 7x7mm

- STM32L0x**1 - Access Line**
- STM32L0x**2 - USB Line**
- STM32L0x**3 - USB & LCD Line**
- AES option: UQFN32 and LQFP48/64/100

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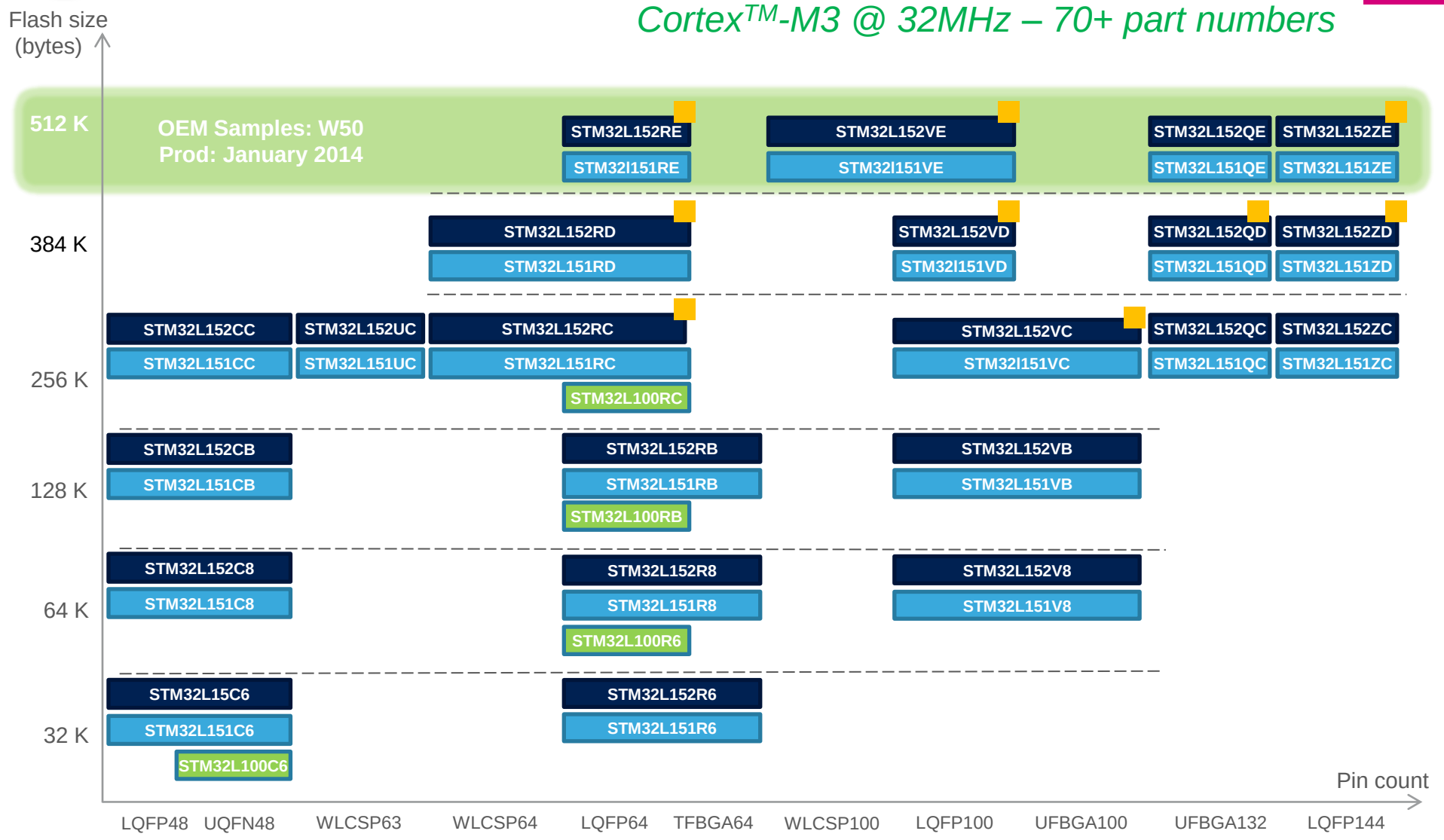
# STM32L1x – portfolio



*Cortex™-M3 @ 32MHz – 70+ part numbers*

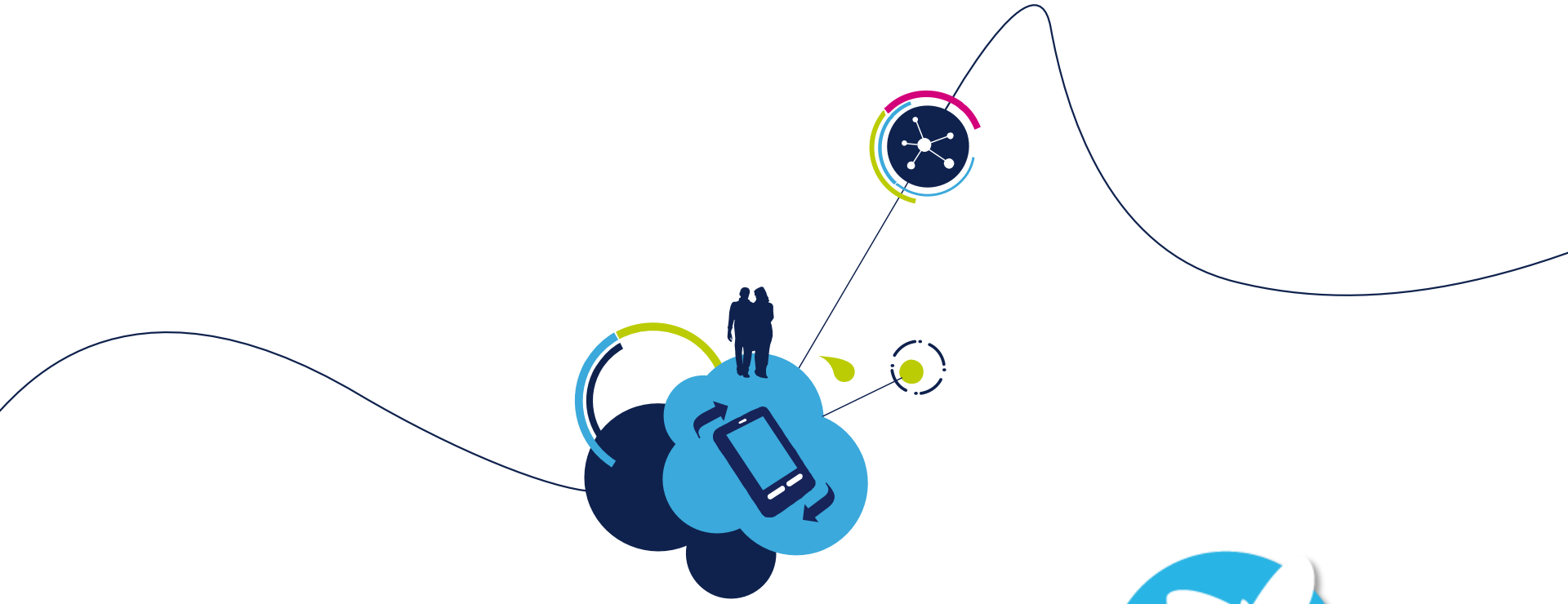



STM32L151x = **USB 2.0 FS** + Analog 12-bit ADC & AC

STM32L152x = STM32L151x + **LCD**

STM32L100: **USB 2.0 FS** + analog + LCD

STM32L162x = STM32L152x + **AES 128-bit**



# Thank you

## Question time

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