STM32G0 MCU series efficiency at its best

Key messages of STM32G0 series

1 **Efficient**
- Arm® Cortex®-M0+ at 64 MHz
- Compact cost: maximum I/Os count
- Best RAM/Flash Ratio
- Smallest possible package down to 8-pin

- Very low power consumption
  (3 µA in stop, <100µA/MHZ in Run)
- Accurate internal high-speed clock 1% RC
- Best optimization, down to each and every detail
- Offers the best value for money

2 **Robust**
- Low electromagnetic susceptibility, EMC
- Clock Monitoring and 2 Watchdogs
- Error correction on Flash

- IoT ready with embedded security
- Hardware AES-256 encryption or the new Securable Memory Area.
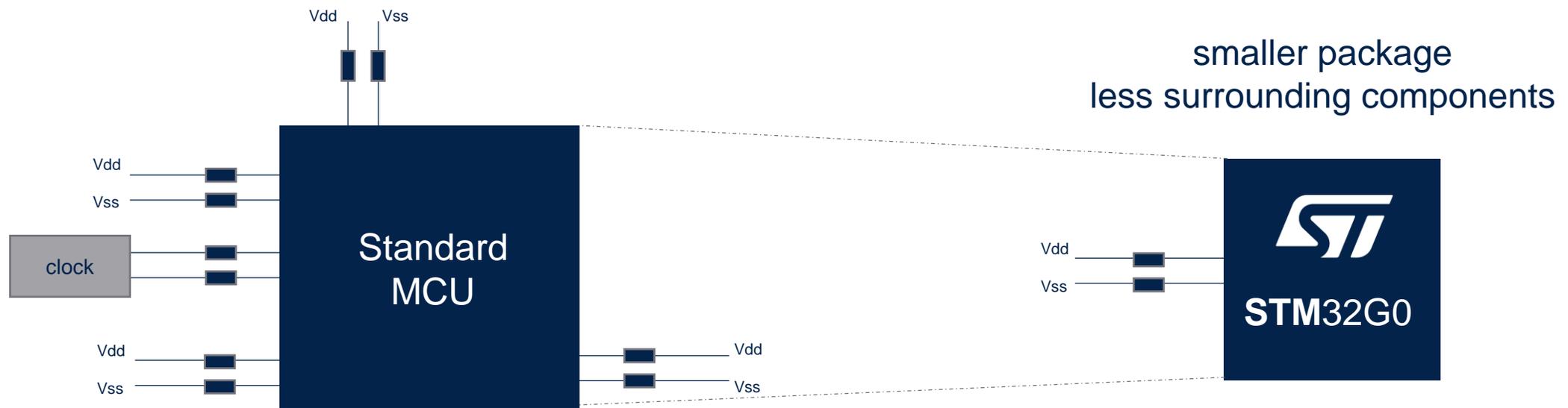- Safe Firmware upgrade / Install

3 **Simple**
- Easy to configure thanks to the intuitive and graphic STM32CubeMX configuration tool.

- Easy to develop based on the Hardware Abstraction Layer library (HAL) or the low-layer library (LL) allowing maximum re-use and faster time-to-market.

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Reducing BOM cost

New platform optimized with 1 power supply pair only
up to 64-pin packages

smaller package
less surrounding components

Vdd Vss

Vdd
Vss

clock

Standard
MCU

Vdd
Vss

Vdd
Vss

Vdd
Vss

STM32G0

Innovations for your benefit

- **No external clock**   **-10cts**
  Accurate internal high speed clock +/-1% for 0 / 90°C

- **No decoupling capacitances**   **-4cts**
  Remove up to 6 decoupling capacitors for supply and clocks

- **Smaller PCB**   **-1cts**
  Smaller package, less components: save on PCB area
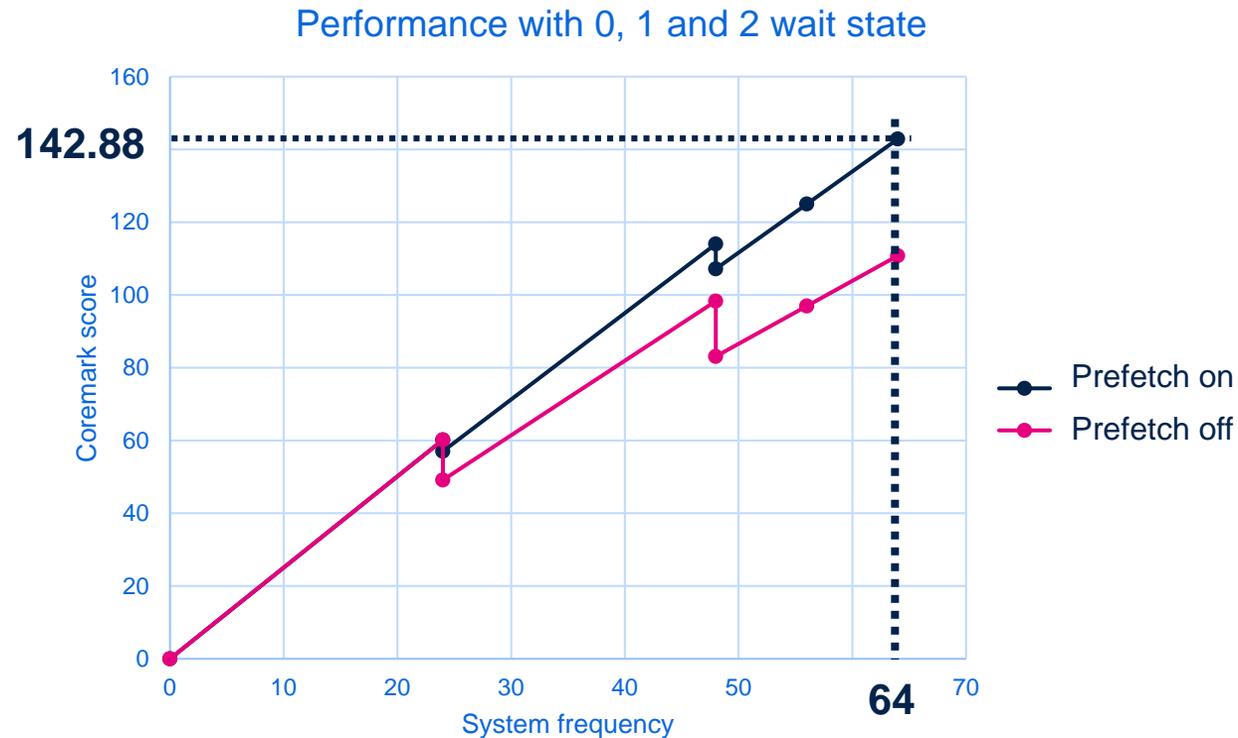
Additional benefits for your convenience:

- **USB-C power delivery**   **-15cts**
  Integrated transceivers, pull-up/down resistors and digital

- **Secure programming**   **-25cts**
  In house or at 3rd parties

You just saved -15cts

Providing more performance

Do not compromise on performance with STM32G0

Performance with 0, 1 and 2 wait state

- **Up to 64** MHz/ **59 DMIPS**

- **Up to >142** CoreMark Result

- Arm Cortex-M0+ with Memory Protection Unit (MPU)

- Flexible **DMA** up to 12 channels

Low-power modes efficiency

When Mainstream MCU Series meets low-power requirements

Wake-up time

	V_{BAT}	10 nA / 400 nA*
250 µs	Shutdown	40 nA / 500 nA*
14 µs	Standby	200 nA / 500 nA*
5 µs	Stop Flash-RTC off-off/off-on/on-off	3.0 µA / 5 µA / 8 µA
6 cycles	Sleep 24 MHz, V_{DD}= 3 V, PLL=on	800 µA
	Run at 64 MHz	<100 µA / MHz

Tamper: few I/Os, RTC

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

Wake-up sources: + BOR, IWDG

Wake-up sources: + all I/Os, PVD, COMPs, LPUART, LPTIM, I²C, UART, USB

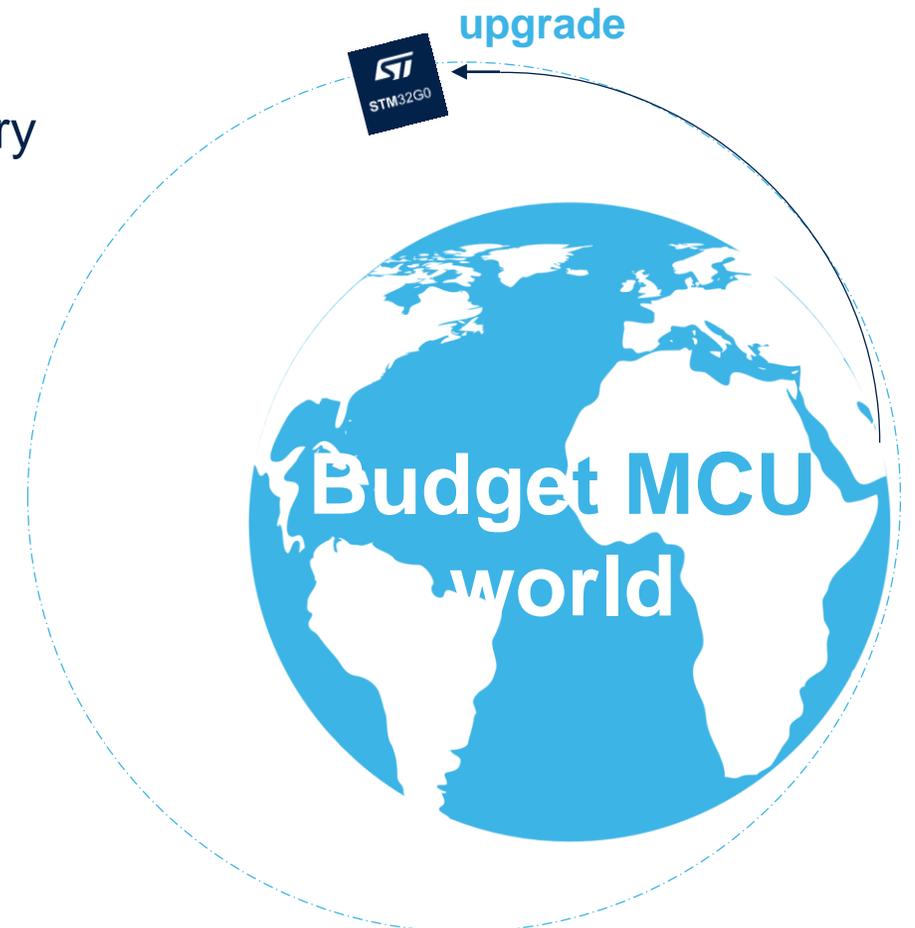Wake-up sources: any interrupt or event

Conditions: 25°C, V_{DD} = 3V
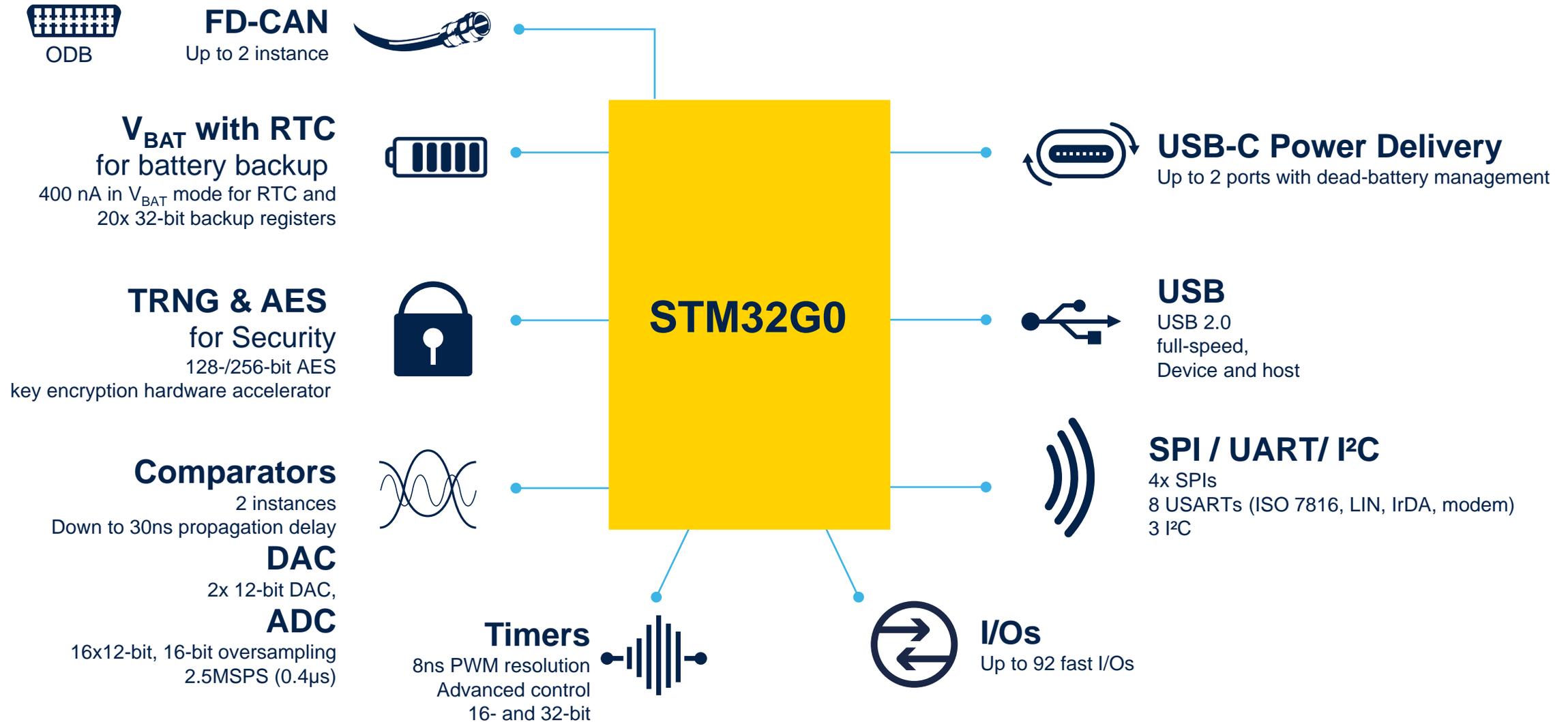
Note : * without RTC / with RTC

Ready for tomorrow

Faster, more accurate analog and digital functions

- More **RAM** for Flash
  - Up to 36KB SRAM for 128KB and 64KB Flash memory

- **Timers** frequency up to **128 MHz** resolution (<**8 ns**)
  - **Advanced control** capabilities

- **12-bit ADC** up to **2.5 MSPS** (0.4µs) conversion time
  - **16-bit** oversampling by hardware

- **32 Mbit/s SPI**, 7 Mbaud/s USART, 1Mbit/s I²C communication

upgrade

STM32G0

Budget MCU world

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FD-CAN
ODB   Up to 2 instance

V$_{BAT}$ with RTC
for battery backup
400 nA in V$_{BAT}$ mode for RTC and
20x 32-bit backup registers

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

Comparators
2 instances
Down to 30ns propagation delay
DAC
2x 12-bit DAC,
ADC
16x12-bit, 16-bit oversampling
2.5MSPS (0.4µs)

STM32G0

USB-C Power Delivery
Up to 2 ports with dead-battery management

USB
USB 2.0
full-speed,
Device and host

SPI / UART/ I²C
4x SPIs
8 USARTs (ISO 7816, LIN, IrDA, modem)
3 I²C

Timers
8ns PWM resolution
Advanced control
16- and 32-bit

I/Os
Up to 92 fast I/Os

Smart integration

Save on battery life

Low consumption process and design
Low-Power UART: wake-up on frame
Low-Power Timer: counts and generate signals
I²C wake-up on address

Save on BOM cost

+/-1% high speed clock internal from 0 to 90°C
+/-2% high speed clock internal from **-40 to 125°C**
IO **max**imization: **smaller package footprint**

More flexibility

More RAM or **more safety** with parity enable/disable
Dynamic DMA assignment on **DMAMUX**
All IOs with external interrupt capability

STM32G0

Always keep control
Diagnose, react

Main Clock monitoring
Backup clock and interrupts
Voltage monitoring: programmable interrupts and reset
Window watchdog on CPU clock
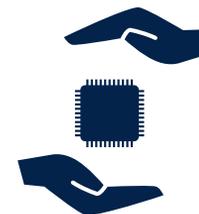**Independent watchdog** on independent clock
Checksum by hardware
ECC on Flash, **Parity** on RAM

High temperature

from -40°C
up to + **125°C**

High robustness

Highly immune to fast-transients
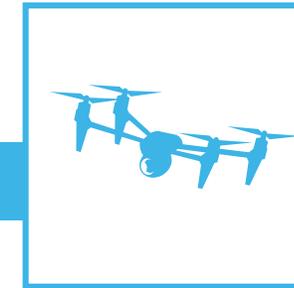**Robust IOs** against negative injections

Smart applications

- High temperature 125°C
  - Fast CPU 64MHz
- Advanced timers with high-resolution 7.8ns
  - Fast comparators
- ADC-12bit, DAC-12bit
- Low-thickness packages
- AES & security for secure upgrades

Lighting

**STM32G0**

Smartphones, IoT devices, rechargeable connected devices, drones, toys
- Low-thickness, small form-factor
- 64MHz CPU with DMA
- Low consumption in run and low-power, fast wake-up
- USB type-C Power Delivery 3.0
- USB FS 2.0 dev/host crystal-less

Consumer objects

Air conditioning, e-bikes, industrial equipment
- High temperature 125°C
  - CANFD support
  - SPI, USART, I²C
  - Advanced timers with high-resolution 7.8ns
- RTC with backup registers
- AES & security for secure upgrades
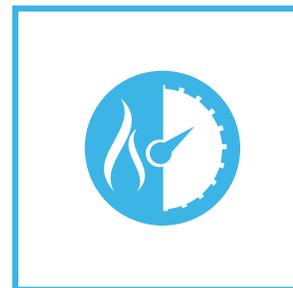
Industrial devices
Motor control
Advanced control

Home appliances, alarms and safety, advanced user interfaces
- High temperature 125°C
- Safety monitoring features
- More RAM for flash
- Low consumption <100µA/MHz in run

Smart Home

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Wider platform

Portfolio stretched for efficient budget applications

Flash size (bytes)

More memory and pin counts

More packages

Big Flash
Small package

512KB Flash memory

Stretch

8pin

512 K

256 K

128 K

64 K

32 K

16 K

Pins

8   20   28   32   48   64   100

SO / TSSOP

WLCSP

BGA

QFN

LQFP

STM32G0 portfolio

Flash memory size / RAM size (bytes)

512 K / 144 K						STM32G0C1KE	STM32G0C1CE	STM32G0C1RE	STM32G0C1VE	
						STM32G0B1KE	STM32G0B1CE	STM32G0B1RE	STM32G0B1VE	
256 K / 144 K						STM32G0C1KC	STM32G0C1CC	STM32G0C1RC	STM32G0C1VC	
						STM32G0B1KC	STM32G0B1CC	STM32G0B1RC	STM32G0B1VC	

Availability: 2020

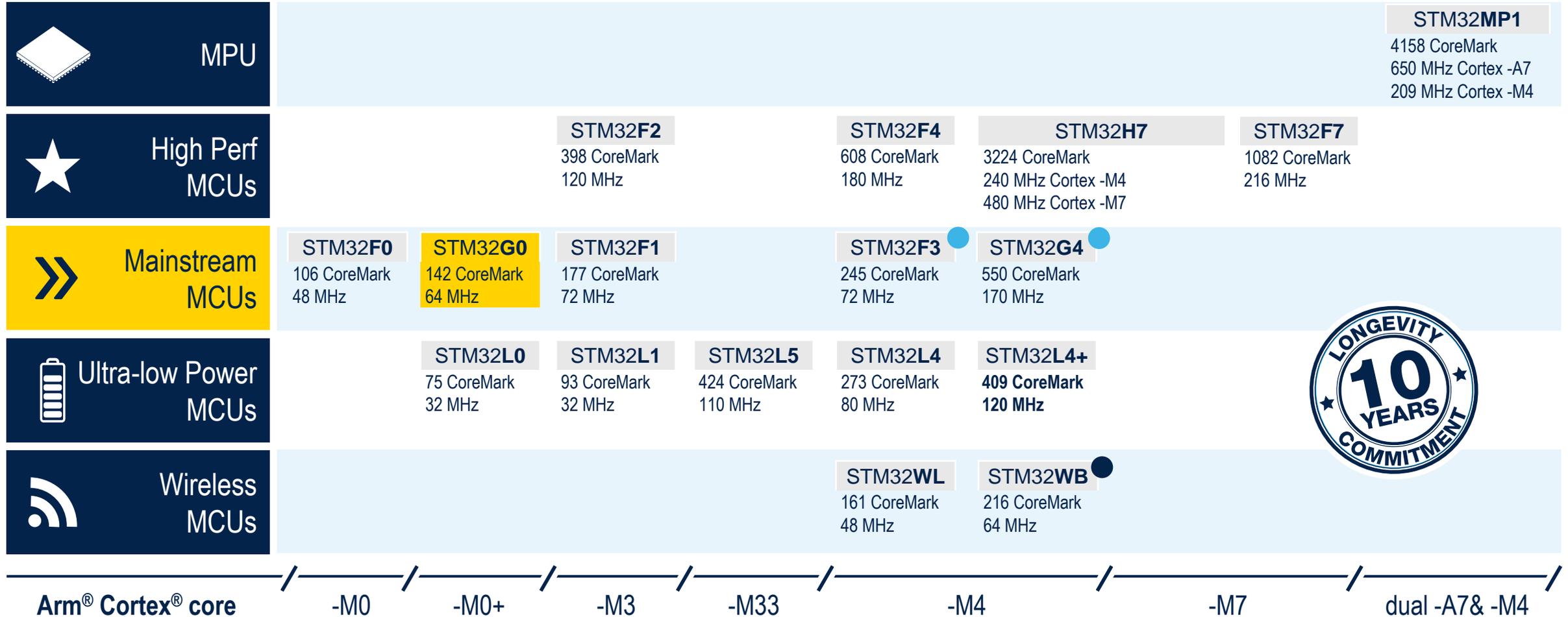|	8-pin SON	20-pin TSSOP *18-pin WLCSP	28-pin UFQFPN *25-pin WLCSP	32-pin LQFP/QFN	48-pin LQFP/QFN	64-pin LQFP UFBGA (0.5 mm pitch)	100-pin LQFP
128 K / 36 K			STM32G081GB	STM32G081KB	STM32G081CB	STM32G081RB	
			STM32G081EB*				
			STM32G071GB	STM32G071KB	STM32G071CB	STM32G071RB	
			STM32G071EB*	STM32G070KB	STM32G070CB	STM32G070RB	
64 K / 36 K			STM32G081G8	STM32G081K8	STM32G081C8	STM32G081R8	
			STM32G071G8	STM32G071K8	STM32G071C8	STM32G071R8	
64 K / 8 K		STM32G041F8	STM32G041G8	STM32G041K8	STM32G041C8		
		STM32G031F8	STM32G031G8	STM32G031K8	STM32G031C8		
		STM32G031Y8*		STM32G030K8	STM32G030C8		
32 K / 8 K	STM32G041J6	STM32G041F6	STM32G041G6	STM32G041K6	STM32G041C6		
	STM32G031J6	STM32G031F6	STM32G031G6	STM32G031K6	STM32G031C6		
	STM32G030J6	STM32G030F6		STM32G030K6	STM32G030C6		
16 K / 8 K	STM32G031J4	STM32G031F4	STM32G031G4	STM32G031K4	STM32G031C4		

Pin count

8-pin

STM32

- ■ STM32G0x1 Access line With 128-/256-bit AES Hardware Encryption
- ■ STM32G0x1 Access line Without 128-/256-bit AES Hardware Encryption
- ■ STM32G0x0 Value line

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STM32G0: great investment

MPU						STM32**MP1** 4158 CoreMark 650 MHz Cortex -A7 209 MHz Cortex -M4
High Perf MCUs		STM32**F2** 398 CoreMark 120 MHz		STM32**F4** 608 CoreMark 180 MHz	STM32**H7** 3224 CoreMark 240 MHz Cortex -M4 480 MHz Cortex -M7	STM32**F7** 1082 CoreMark 216 MHz
Mainstream MCUs	STM32**F0** 106 CoreMark 48 MHz	STM32**G0** 142 CoreMark 64 MHz	STM32**F1** 177 CoreMark 72 MHz	STM32**F3** 245 CoreMark 72 MHz	STM32**G4** 550 CoreMark 170 MHz	
Ultra-low Power MCUs	STM32**L0** 75 CoreMark 32 MHz	STM32**L1** 93 CoreMark 32 MHz	STM32**L5** 424 CoreMark 110 MHz	STM32**L4** 273 CoreMark 80 MHz	STM32**L4+** **409 CoreMark** **120 MHz**	
Wireless MCUs				STM32**WL** 161 CoreMark 48 MHz	STM32**WB** 216 CoreMark 64 MHz	

Arm® Cortex® core   -M0   -M0+   -M3   -M33   -M4   -M7   dual -A7& -M4

10 YEARS LONGEVITY COMMITMENT

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

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Advanced features and solutions

- **32-bit Arm Cortex-M0+ core**
- **1.7 to 3.6V power supply**
- **RAM maximization**
- **1% internal clock**
- **Direct Memory Access (DMA)**
- **Communication peripherals**
- **USB-C Power Delivery**

System
- Power supply POR/PDR/PVD/BOR
- Xtal oscillator 32 kHz + 1 to 64 MHz
- Internal RC oscillators 32 kHz ($\pm$5%) + 16 MHz ($\pm$1%)
- PLL + Prescaler
- Clock control
- RTC/AWU
- Systick timer
- 2x watchdogs (independent and window)
- 60 I/Os on 64 pins
- Cyclic redundancy check (CRC)

Arm® Cortex®-M0+ CPU Up to 64 MHz
- Nested vector interrupt Controller (NVIC)
- SW debug
- Memory Protection Unit
- AHB-Lite bus matrix
- APB bus
- Up to 128-Kbyte Flash memory
- Up to 36-Kbyte SRAM
- 20-byte backup registers
- Boot ROM
- 7-channel DMA

Analog
- Temp. sensor
- 1x 12-bit ADC SAR 16-channels / 2.5 MSPS
- 1x 12-bit DAC 2ch
- 2x comparators

Connectivity
- 2x SPI (I²S)
- 4x USART (2x with LIN, smartcard, IrDA, modem control)
- 1x LPUART
- 2x I²C (SMBus, PMBus, Fast Mode Plus)
- USB Power Delivery (incl. BMC + PHY)

Control
- 1x 32-bit timer
- 1x16-bit Motor C. timer f_{MAX} = 128 MHz 4 PWM + 3 compl.
- 5x16-bit timers 2 PWM each one with f_{MAX} = 128 MHz
- 2x Low-power timers

- **Timers up to 2xfcpu resolution**
- **Real-time Clock**
- **I/O ports maximization**
- **12-bit Ultra-fast ADC**
- **12-bit DAC**
- **Comparators**
- **Safety features**
- **Advanced Security features**

No compromise on what matters

- **32-bit Arm Cortex-M0+ core**
- **2.0 to 3.6V power supply**
- **RAM maximization**
- **1% internal clock**
- **Direct Memory Access (DMA)**
- **Communication peripherals**

System
- Power supply POR/PDR
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Connectivity
- 2x SPI (I²S)
- 4x USART (2x with LIN, smartcard, IrDA, modem control)
- 2x I²C (SMBus, PMBus, Fast Mode Plus)

Control
- 1x 16-bit Motor C. timer 4 PWM + 3 compl.
- 5x 16-bit timers 2 PWM each

- **Timers**
- **Real-time Clock**
- **I/O ports maximization**
- **12-bit Ultra-fast ADC**
- **Safety features**

Integrated security features, ready for tomorrow's needs

User Flash

Firmware IP protection

Mutual distrustful

Secret key storage

STM32G0

Authentication

Securable Memory Area
Execute-only Protection
Read-out Protection
Write Protection
Memory Protection Unit (MPU)
AES-256 / SHA-256 Encryption
True Random Number Generator
Unique ID

Secure firmware upgrade

Securable Memory Area

Standard user flash by default

Can be secured once exiting
No more access nor debug

Configurable size

Good fit to store critical data
- **Critical routines**
- **Keys**

Go fast, be first

HARDWARE TOOLS
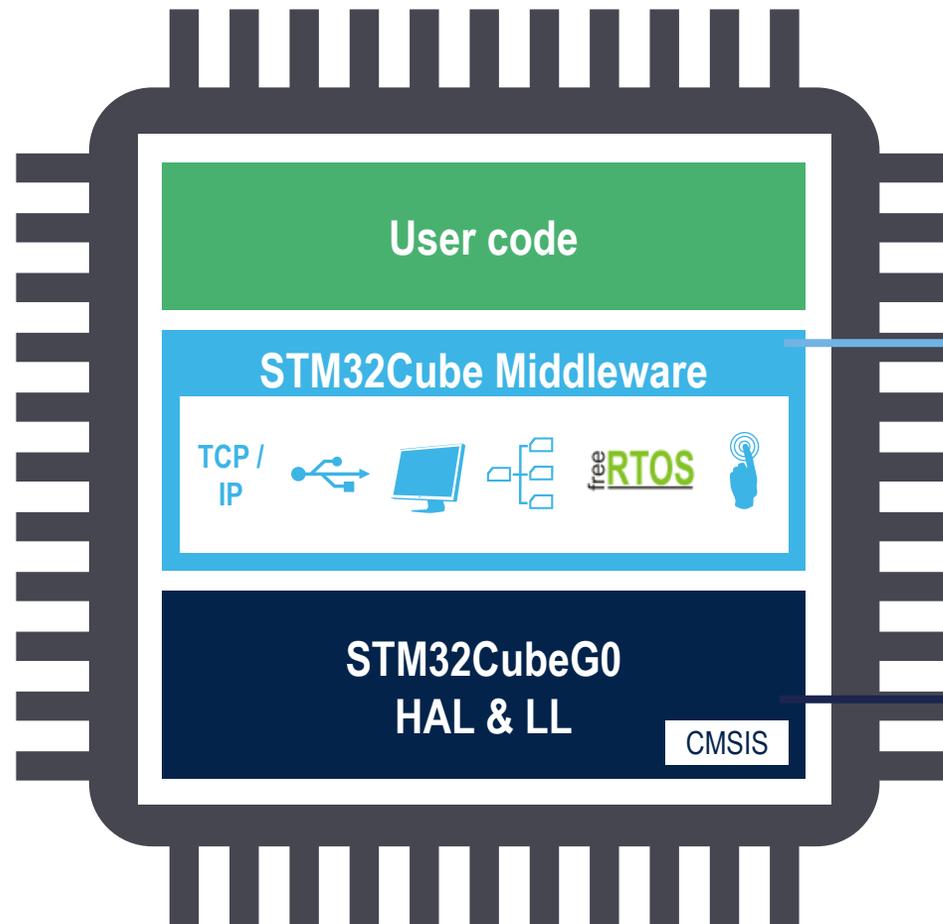
SOFTWARE TOOLS

STM32 Nucleo **Discovery kit** **Evaluation board**

STM32CubeMX featuring intuitive pin selection, clock tree configuration, code generation and power consumption calculation

Flexible prototyping

Key feature prototyping

Full feature evaluation

STM32 Cube

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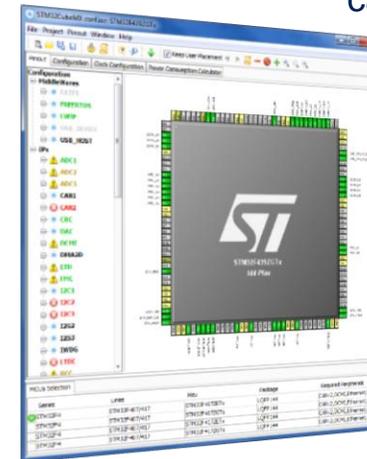
STM32G0 ecosystem

Platform approach or custom code: you choose

EMBEDDED SOFTWARE

User code

STM32Cube Middleware

TCP / IP   freeRTOS

STM32CubeG0 HAL & LL

CMSIS

- 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)
- Dozens of examples

- STM32G0 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

STM32 Cube

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Releasing your creativity

STM32

f /STM32

t @ST_World

✱ community.st.com

🌐 www.st.com/STM32G0

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Thank you

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