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STMicroelectronics SubGHz SoC's Spirit, STM32WL

Tim Nakonsut

Product Marketing, Microcontrollers

SPIRIT

STM32WL

STMicroelectronics Sub-1 GHz offer

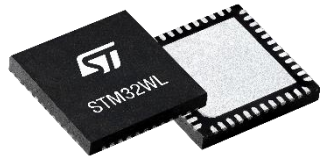
Sub-Ghz Transceiver

SPIRIT + STM32

STM32Cube
Expansion package

Sub-Ghz SoC Application processor

STM32**WL**



LONGEVITY 10 YEARS COMMITMENT

STM32 ecosystem

STM32Cube
MCU package

LoRaWAN™ | ZETA | sigfox | mioty | M-Bus wireless | **SubGHz proprietary** | Wi SUN Alliance | KNX

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STM32 MCU “Wireless” series

More than **60,000 customers** Over **6 billion STM32** shipped since 2007

MPU	STM32**MP1** 4158 CoreMark 650 MHz Cortex –A7 209 MHz Cortex –M4					
High Perf MCUs		STM32**F2** Up to 398 CoreMark 120 MHz Cortex-M3	STM32**F4** Up to 608 CoreMark 180 MHz Cortex-M4	STM32**F7** 1082 CoreMark 216 MHz Cortex-M7	STM32**H7** Up to 3224 CoreMark Up to 550 MHz Cortex -M7 240 MHz Cortex -M4	STM32**H5** 1023 CoreMark 250 MHz Cortex-M33
Mainstream MCUs	STM32**F0** 106 CoreMark 48 MHz Cortex-M0	STM32**G0** 142 CoreMark 64 MHz Cortex-M0+	STM32**F1** 177 CoreMark 72 MHz Cortex-M3	STM32**F3** ● 245 CoreMark 72 MHz Cortex-M4	STM32**G4** ● 550 CoreMark 170 MHz Cortex-M4	
				Optimized for mixed-signal Applications		
Ultra-low Power MCUs	STM32**L0** 75 CoreMark 32 MHz Cortex-M0+	STM32**L1** 93 CoreMark 32 MHz Cortex-M3	STM32**L4** 273 CoreMark 80 MHz Cortex-M4	STM32**L4+** 409 CoreMark 120 MHz Cortex-M4	STM32**L5** 443 CoreMark 110 MHz Cortex-M33	STM32**U5** 651 CoreMark 160 MHz Cortex-M33
Wireless MCUs			STM32**WL** ● **162 CoreMark** **48 MHz Cortex-M4** **48 MHz Cortex-M0+**	STM32**WB** ● 216 CoreMark 64 MHz Cortex-M4 32 MHz Cortex-M0+	STM32**WBA** 407 CoreMark 100MHz Cortex-M33	

LONGEVITY 10 YEARS COMMITMENT

● Optimized for mixed-signal applications ● Dual-core architecture: Cortex-M4 and M0+

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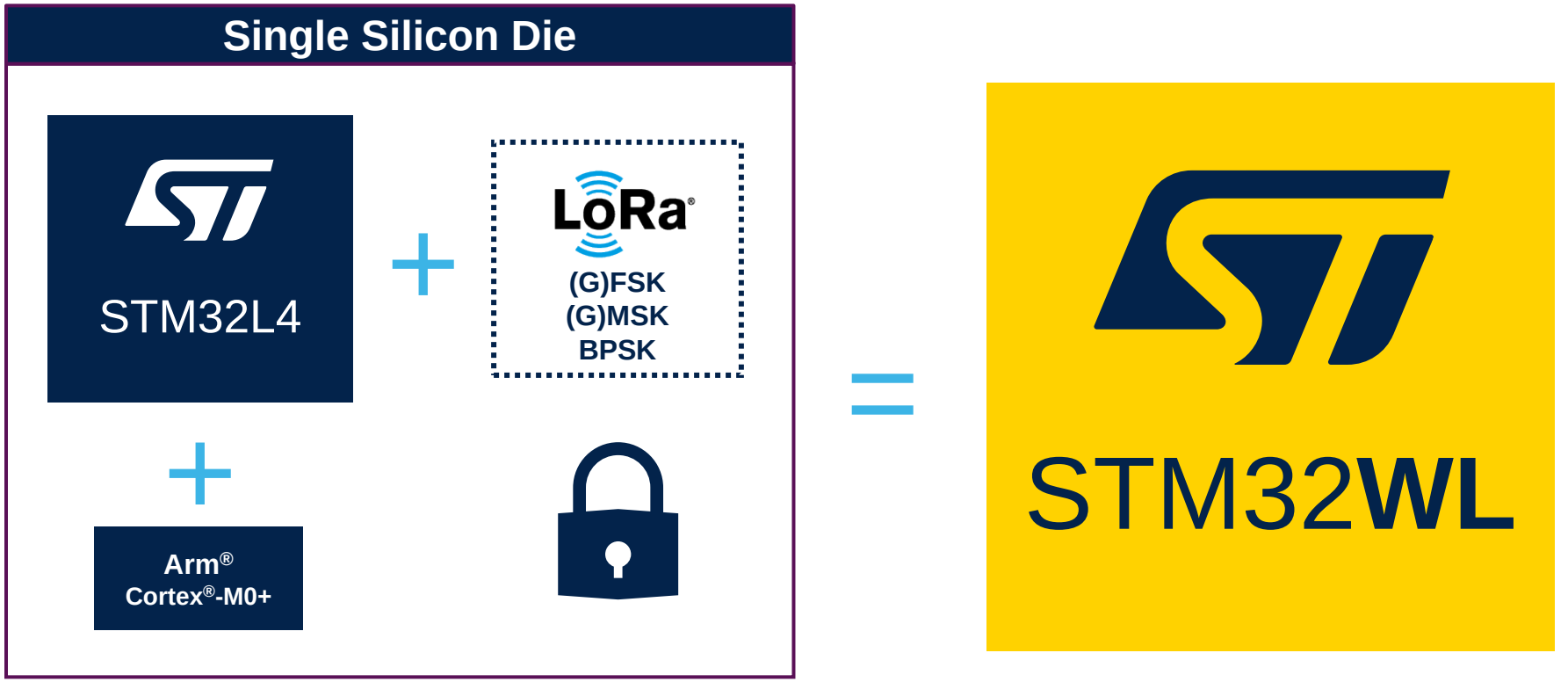
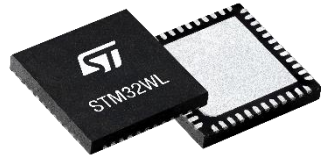
System-on-chip made for versatility

A long-range wireless microcontroller: one die, many IoT possibilities

World first!



STM32 SubGHz Portfolio

SubGhz SoC Dual Core		**STM32WL5x**	
SubGhz SoC Single Core		**STM32WL3x*** **(ex- SPIRIT3)** *Comming soon*	**STM32WLEx**
SubGhz Transceiver	**1st Generation SPIRIT1** 	**2nd Generation S2LP** 	
	General Purpose Sub-1GHz radio	Ultra Low Power Sub-1GHz radio	
	2 (G)FSK (G)MSK - OOK ASK -	**2/4 (G)FSK (G)MSK BPSK (Sigfox) OOK ASK *DSSS on WL3**	**2 (G)FSK (G)MSK BPSK (Sigfox) - - LoRa (WLx5 P/N)**

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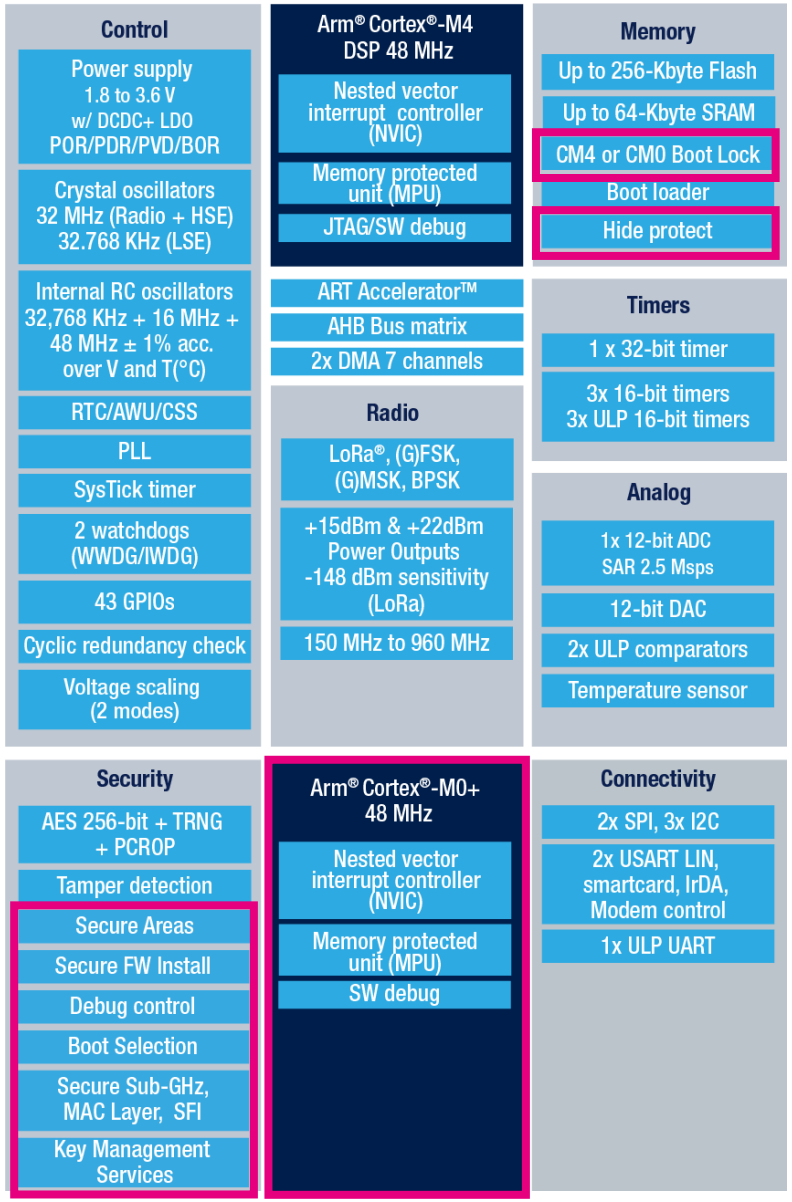
STM32WL5x Line - a rich feature set
Dual-core and enhanced security



KEY FEATURES

- Arm® Cortex®-M4 & DSP up to 48 MHz
- Up to 256 KB Flash and 64 KB SRAM
- Arm® Cortex®-M0+ up to 48 MHz

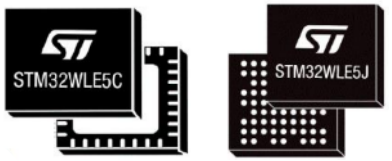
- **Sub-GHz Radio**
  - Multi-modulation: LoRa, (G)FSK, (G)MSK, BPSK
  - 2 embedded power amplifiers:
    - 1 output up to +15 dBm
    - 1 output up to +22 dBm
  - LoRa RX sensitivity: -148 dBm (SF12, BW=10.4kHz)
  - RX: 4.82mA and TX: 15mA (at 10dBm) / 87mA (at 20dBm) [3.3V]

- **Ultra-Low Power consumption**
  - < 71µA/MHz Active mode (3V - RF OFF)
  - 1 µA Stop2 mode with RAM retention
  - 390 nA Standby mode with RTC
  - 31 nA Shutdown mode

- **Peripherals**
  - 3xI²C, 2xUSART, 1xLP-UART, 2xSPI
  - 7x timers + 2x ULP Comparators

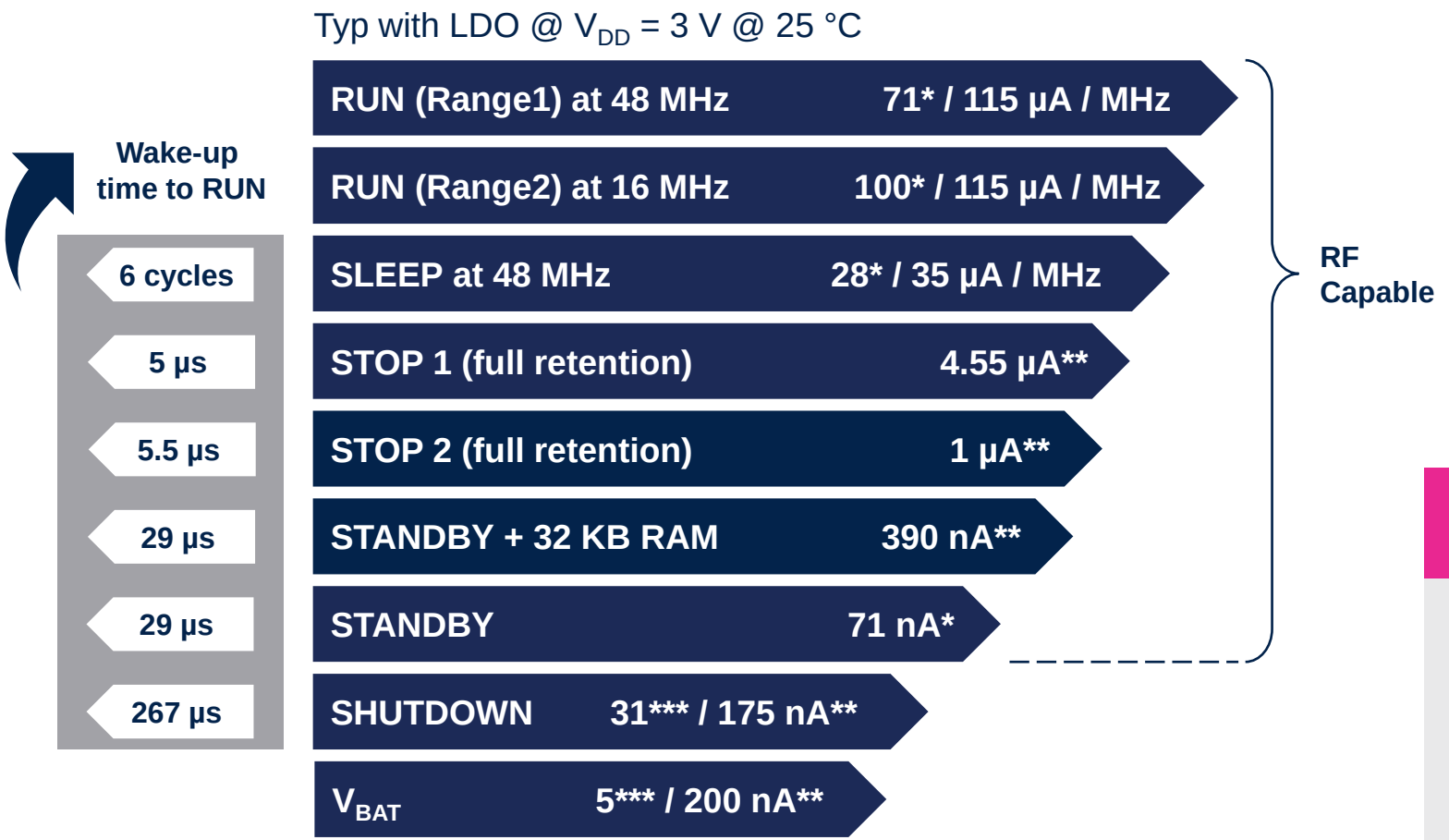
- **Advanced security features**

- 1.8 to 3.6V voltage range (DC/DC, LDO)
- -40 to up to +105°C temperature range



-> Packages: QFN48, BGA73

Flexible power scheme FlexPowerControl



* Typical values with SMPS, **RF OFF**
** with RTC on LSE Bypass
*** All OFF

Benchmark scores

- High Efficiency
  - ➔ CoreMark score = 162
- Ultra Low-Power Platform
  - ➔ ULPBbench score ≈ 204

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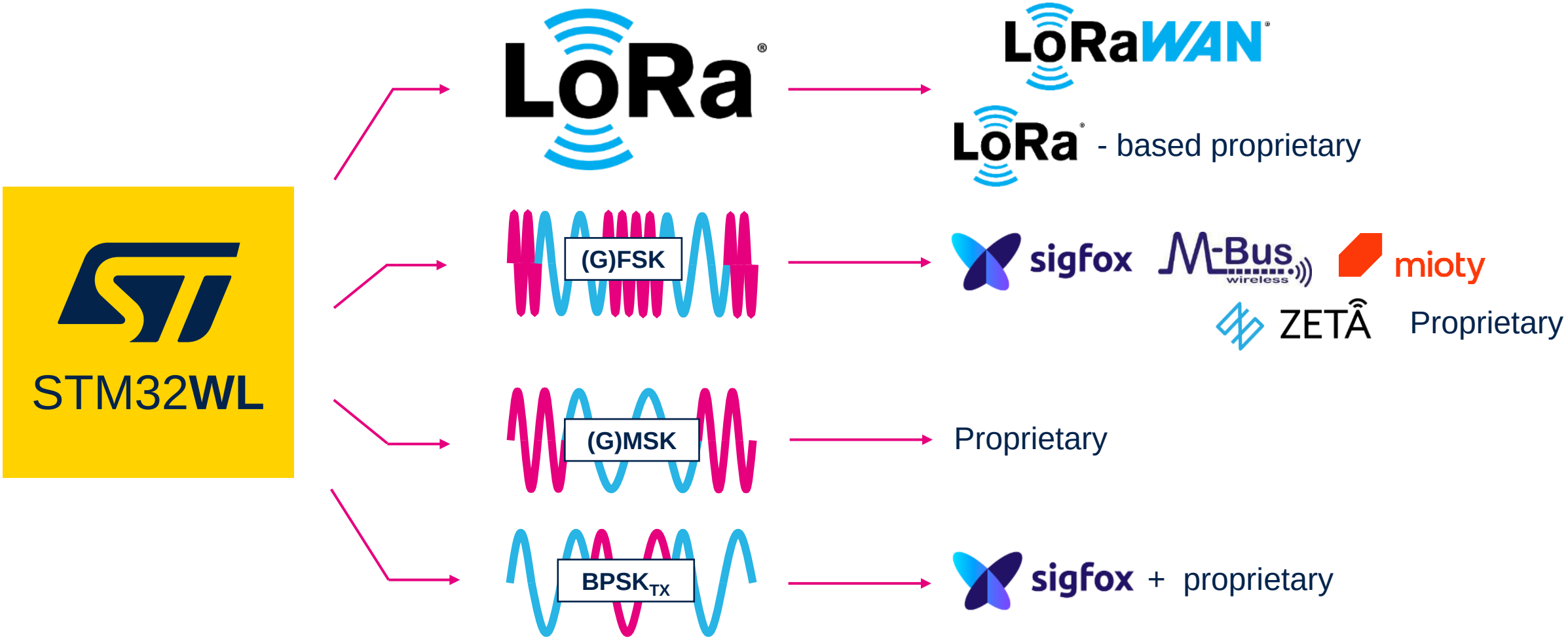
4 modulations - many protocols



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STM32WL - safety and security

Secure your application with embedded safety & security

Safety

- Back-up clock circuitry
- Supply monitoring
- Dual watchdog
- Flash memory with ECC (address status register)
- SRAM Parity check
- Cyclic Redundancy Check
- Brown-out reset in all modes
- Clock Security System
- Backup byte registers

STM32**WL**

Security

- Tamper detection
- Read & Write protection
- Memory Protection Unit (MPU)
- Software IP Protection
- True Random Number Generator
- AES and Public Key Accelerator
- Unique IDs (64- and 96-bit)
- Boot-Lock in user Flash

- **Secure hardware isolation between CM4 / CM0**
- **Boot selection**
- **Secure Boot code protection**
- **Debug control**
- **Secure Firmware Install**
- **Secure Boot Secure Firmware Update***
- **Key Management Services***
- **Crypto Library***

Available on STM32WL5x dual-core versions

** Software downloadable on st.com*

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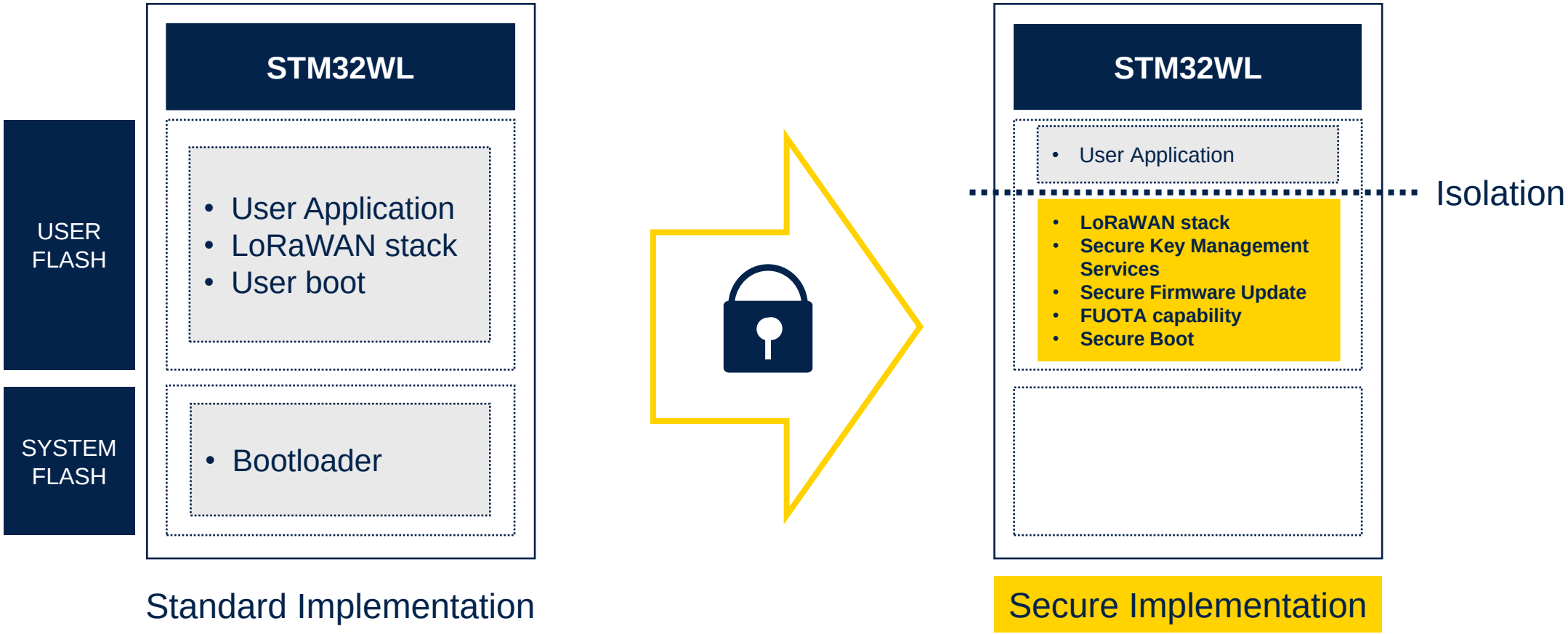
Bring more security to your LoRaWAN apps

Your implementation, your choice



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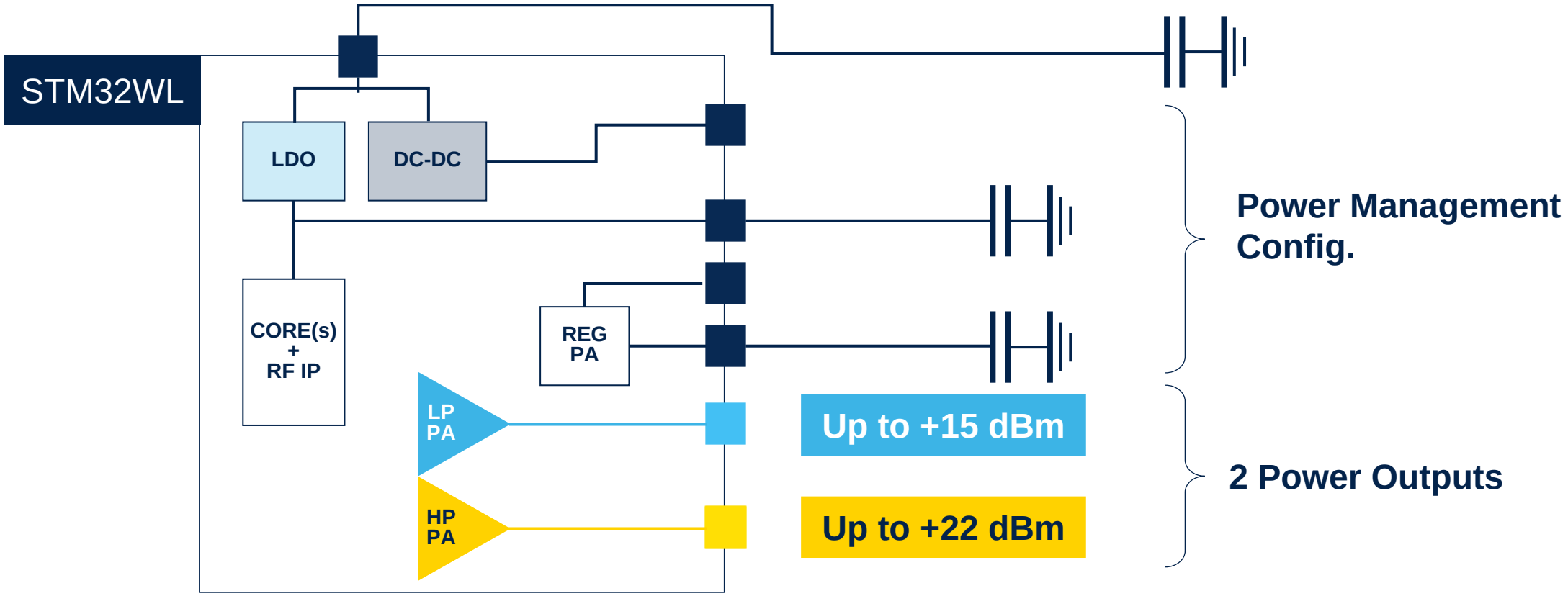
Flexible power implementation

Tailor STM32WL to the requirements of IoT applications

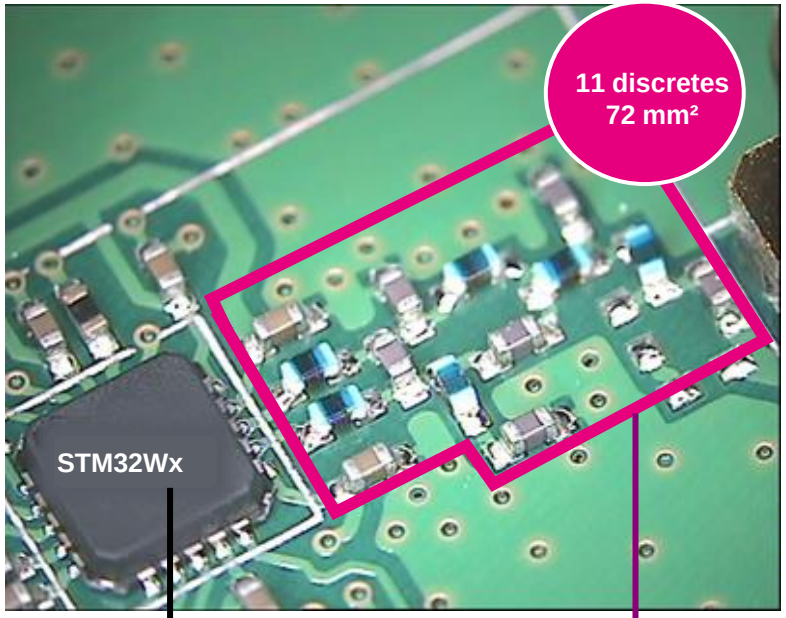


NEW

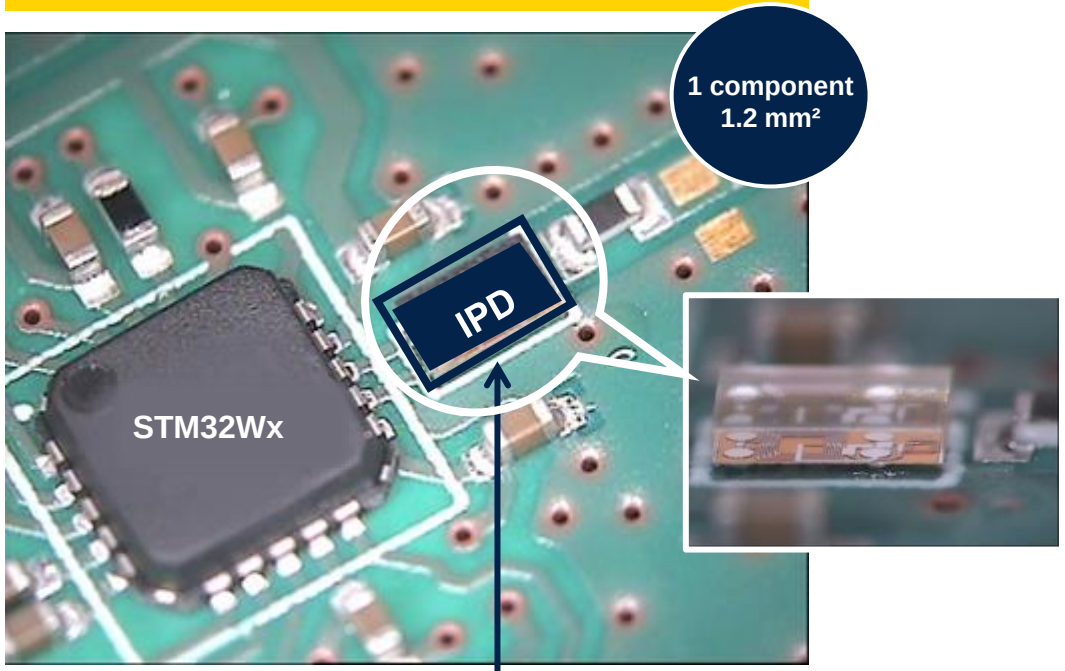
STM32WL IPD
Integrated Passive Device

STM32WL RF Front end in a 1.2mm²

BEFORE



AFTER



Wireless MCU

Discrete balun & matching network

RF IPD balun & matching network

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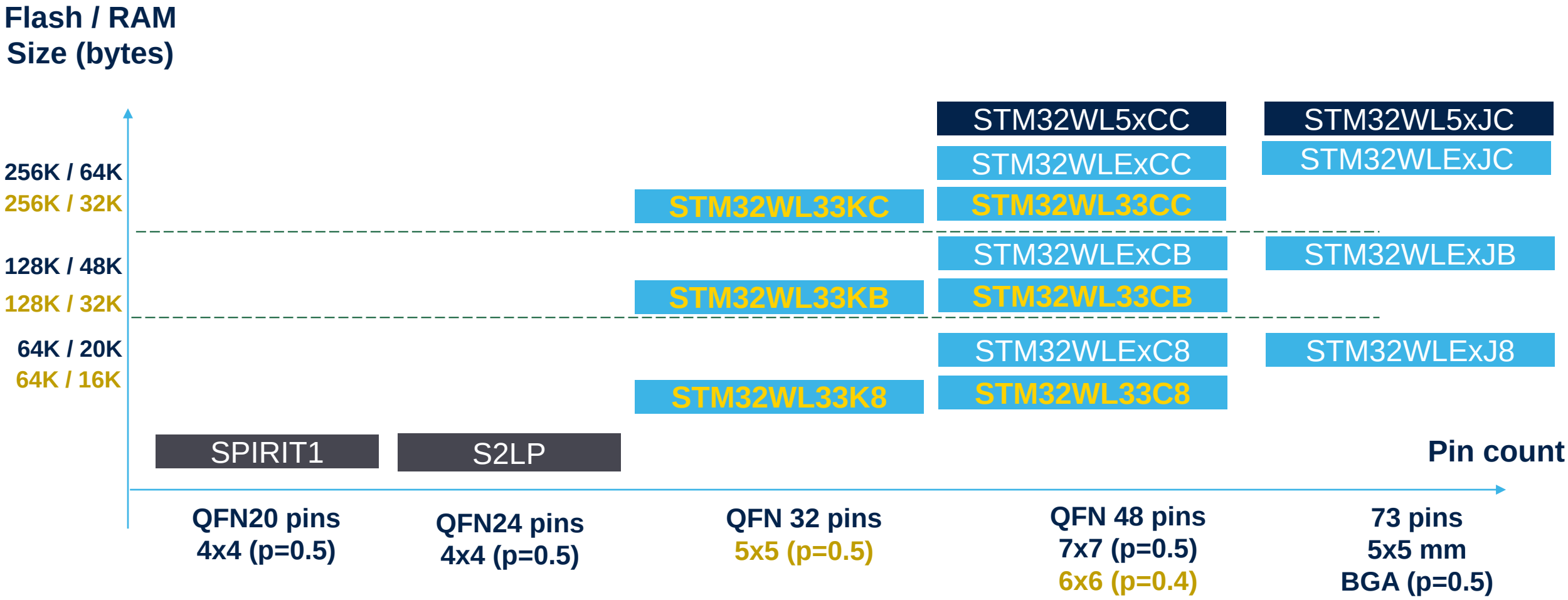
STM32W Sub-GHz – large portfolio



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Transceiver only | **Single** Cortex-M0+ | **Single** Cortex-M4 | **Dual** core: CM4 & CM0+

The STM32WL Nucleo-64 at a glance

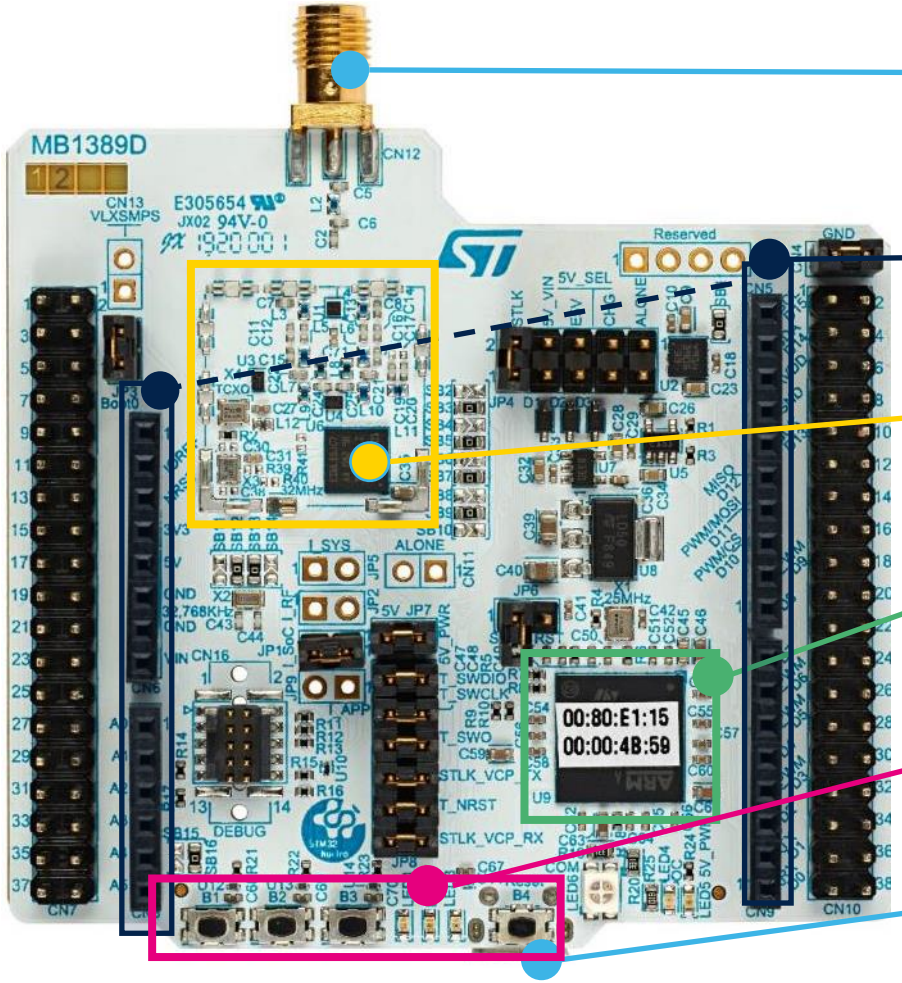
Main Features

NUCLEO-WL55JC1

868/915/923 MHz

NUCLEO-WL55JC2

433/470 MHz



SMA Antenna connector

Arduino™ extension connectors :
easy access to add-ons

STM32WL
(under a metallic shield)

Integrated ST-LINK/V3:
mass storage device flash programming

4 push buttons, 3 color LEDs,
Jumper settings

Flexible board power supply :
through USB or external source

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S2-LP transceiver overview

Performance

S2-LP / S2-LPCB

- 413-479MHz / 826-958MHz
- 452-527 MHz / 904-1055 MHz
- -40°C to +105°C
- QFN24 4x4x1

Radio performance

- 100bps to 500kbps
- -130dBm @ 0.3kbps
- +16dBm output power

Ultra low-power consumption

- Sleep / Shutdown: 700nA / 2.5nA
- Rx peak: 7mA
- Tx peak: 10mA @+10dBm

Protocols

sigfox

6LoWPAN
IPv6-based Low-power Wireless Personal Area Networks

M-Bus wireless

KNX

Wi SUN

Markets

- Remote metering
- Smart living
- Alarm & surveillance
- Smart home
- Smart utilities
- Healthcare & assistance
- Smart parking
- Smart agriculture

S2-LPTX overview
S2-LP based radio transmitter

S2-LPTX

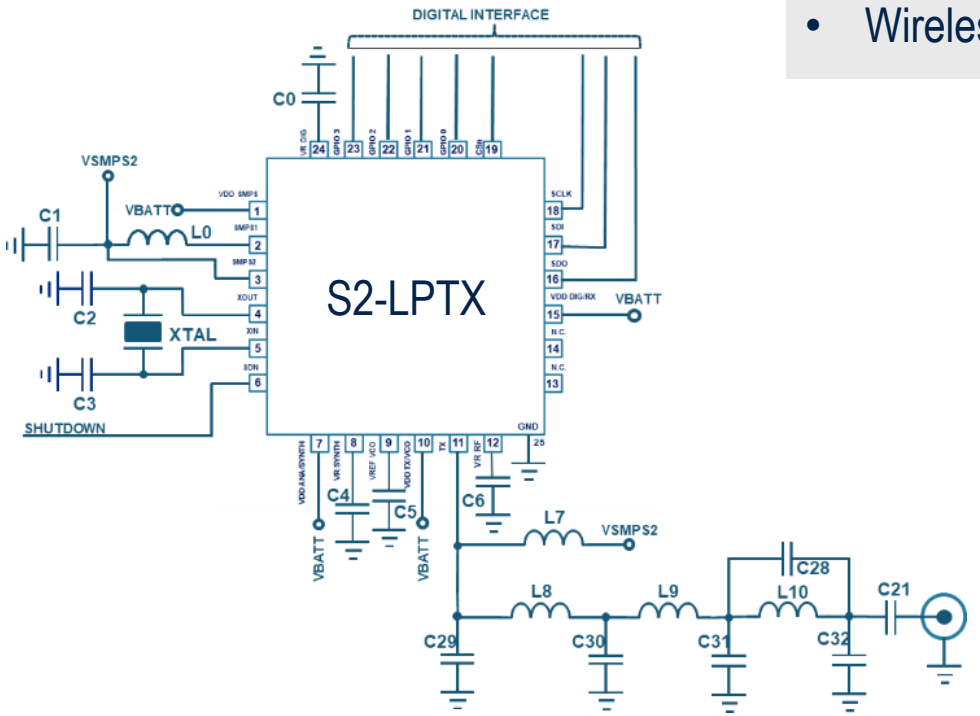
- 413-479MHz / 826-958MHz
- **Pin to Pin compatible** with S2-LP
  - **No need for a new Sigfox certification!**
- QFN24 4x4x1

Radio performance

- 100bps to 500kbps
- **+16 dBm output power**

Ultra low-power consumption

- Sleep / Shutdown: 700 nA / 2.5 nA
- Tx peak current: **10 mA @ +10 dBm**



Applications

- Asset Tracking
- Alarm System
- Home and Building Automation
- Remote key entry
- Wireless Sensor Networks

STM32WL – ecosystem overview

Fully integrated into the rich and market-proven STM32 ecosystem

STM32 CubeMX · STM32 CubeProgrammer · STM32 CubeIDE · STM32 CubeMonitor · STM32 Cube · STM32 Open Development Environment · IAR SYSTEMS · arm KEIL

LoRaWAN · Wi SUN Alliance · mioty · M-Bus wireless · sigfox · ZETA Alliance

STM32 Nucleo-64

NUCLEO-WL55JC1/2
X-NUCLEO-S2868/915A1
STEVAL-FKI915V1

Dev tools

STM32CubeMX
STM32CubeWL
STM32CubeMonitor
STM32CubeProg
X-CUBE-SUBG2
STSW-S2LP-DK
STM32CubeIDE + Partners IDEs

Stacks

LoRaWAN (ST)
Sigfox (ST)
Wireless-MBUS / Mioty (Stackforce)
ZETA (Zifisense)
WiSUN (3rd Party License)

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