



# STM32WL3x lines

## Wireless MCUs for efficient long-range communications



### Low-power sub-GHz wireless MCU for long-range IoT connectivity

Based on the Arm® Cortex®-M0+ core, up to 64 MHz, the STM32WL3x lines integrate a sub-GHz dual radio for high flexibility and reduced BoM costs.

Offering up to 256 Kbytes of flash memory, the STM32WL3x lines come in compact packages down to 5 x 5 mm. It includes two radios, analog sensing peripherals, and an LCD driver.

With low-power consumption and a dedicated wake-up radio, the STM32WL3x lines ensure extended battery life for IoT devices.

#### STM32WL3x enabling features

##### Enables longer battery lifetime

- Main radio down to 5.6 mA (RX) and 10 mA (TX @ 10 dbm)
- Additional wake up receiver down to 4  $\mu$ A in always on mode
- MCU low-power mode down to 450 nA with RAM retention
- Shutdown mode down to 14  $\mu$ A with 6 wakeup pins

##### Offers flexible & multi-modulation support

- Multiple modulation, IQ interface and H/W packet handler
- Worldwide deployments: 413-479 MHz, 826-958 MHz, 159-185 MHz (on STM32WL3xxxxxA P/N), 276-319 MHz (only for STM32WL3R)

##### Reduces design complexity

- Lower BOM costs thanks to high integration
- SoC integrating MCU + dual radio + LCD and LCSC (fluid flow sensing controller)
- Internal balun: single-ended radio

#### Standard protocols



## STM32WL3x portfolio, now supporting multiple markets

	Applications	Flash	Package	Radio	SPI/ UART	I2C	ADC	LCD/LCSC/ COMP/DAC	RF Bands
<b>STM32WL33x</b> Metering line	Water/ Gas meters Heat cost allocators	64 KB 128 KB 256 KB	QFN32 and QFN48	Main radio <sup>2</sup> + wake-up radio	Yes	Yes	Yes	Yes	169 MHz <sup>1</sup> 433 MHz 868/920 MHz
<b>STM32WL31x</b> IoT line	IoT sensors IoT asset tracking	64 KB 128 KB	QFN32 and QFN48	Main radio	Yes	Yes	Yes	-	433 MHz 868/920 MHz
<b>STM32WL3Rx (new)</b> Remote control line	Remote controls Call/Bell System	64 KB 128 KB	QFN32 up to 6 wake- up pins	Main radio <sup>2</sup>	Yes	Yes	2ch	-	315 MHz 433 MHz 868/920 MHz
<b>STM32WL30x</b> Modem line	Open Co-processor	64 KB 128 KB	QFN32	Main radio	Yes	-	-	-	433 MHz 868/920 MHz

<sup>1</sup> Available on dedicated P/N (STM32WL3xxxxxA)

<sup>2</sup> TX-only version available

## STM32WL3x block diagram and ecosystem

<b>Cortex®-M0+</b> Up to 64MHz  Nested vector interrupt controller (NVIC) Memory protected unit (MPU) SWD interface	<b>Memory</b>  Flash up to 256KB 10k cycles, 2KB page  RAM up to 32KB (full retention)  1KB OTP	<b>Connectivity</b>  Up to 2x SPI (with 1x I2S) 2x I2C 1x USART 1x LPUART  Up to 32 GPIOs 6 wakeup pins <sup>1</sup> from shutdown	<b>Main radio</b>  8mA @ +10dBm Tx 4mA Rx  2-(G)FSK, 4-(G)FSK, (G)MSK, OOK, ASK, DSSS, DBPSK  Up to +20dBm Tx power -132dBm Rx sensitivity  413-479MHz 826-958MHz 276-319 MHz <sup>1</sup> 159-185MHz <sup>2</sup>  16-bit IQ access  Direct radio registers access
	<b>Accelerators</b>  CRC calculation unit  DMA 8 channels	<b>Security</b>  AES 128 16-bit TRNG 64-bits unique ID  Secure boot with SWD disabling  Bootloader with write and read-out protection	<b>Timers</b>  2x 16-bit GP timers 1x LP timer RTC  Watchdog: IWDG SysTick
	<b>System</b>  48MHz (Radio + HSE) 64MHz HSI 32.768kHz (LSE) Internal 32kHz RCO (LSI) RTC 20bytes backup registers LDO, POR/PDR/PVD/BOR VDD 1.7-3.6V	<b>Analog</b>  12-bit ADC SAR 1MSPS  Temperature sensor  Analog comparator + DAC	<b>Display</b>  LCD driver 12x8 / 16x4  <b>Fluid sensor controller</b>  2x LC channel (wheel rotation) 1x LC channel (tamper)
			<b>Wake-up on radio</b>  RX OOK @ -50dBm  100MHz- 2.4GHz  Down to 4µA Always on

<sup>1</sup> Available only for STM32WL3R product line <sup>2</sup> 159-185MHz on dedicated P/N (STM32WL3xxxxxA)

Radio features MCU features

### Nucleo boards



**NUCLEO-WL33CC1**  
**NUCLEO-WL33RKB1**  
High band: 826-958 MHz  
  
**NUCLEO-WL33CC2**  
**NUCLEO-WL33RKB2**  
Low band: 413-479 MHz

### Reference designs



**STDES-WL3xxxx**

Resources as: schematics,  
layout, BoM and firmware  
examples to get you  
started

**Start developing  
now!**



More than 1 million developers have  
chosen **STM32Cube**, making it the  
reference in the industry.

**Wireless M-Bus link layers**  
supporting modes T2, C2, S2



### Radio development tools: WiSE Studio

The **STM32CubeWiSE** is a graphical user interface to interact with the STM32WL3x and evaluate their radio capabilities.  
The **STM32CubeWiSEcg** is a PC application to build flowgraph to define radio actions using the sequencer driver.



### MLPF-WL-0xD3 RF IPDs

The STM32WL3's IPD portfolio, helps in reducing PCB footprint and achieving optimal RF performance by integrating the RF BoM of harmonic filters and impedance matching into a tiny footprint.



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