STM32WB series MCU with built-in Bluetooth® 5.0 and IEEE 802.15.4
Make the choice of STM32WB series the 7 keys points to make the difference

- Open 2.4 GHz radio Multi-protocol
- Dual-core / Full control Ultra-low-power
- IoT Protection ready
- Massive integration Cost saving
- 1MB Flash
- 3.6 V
- 129-pin
- A large offer
- 1.7 V
- 256KB Flash
- 48-pin
- Advanced RF tool, Energy control with C code generation
- No matter what!
Multiprotocol and open radio

- Fully certified Bluetooth® 5.0 radio
- 2x faster speed with 2Mbps capable mode
- Extend network coverage with BLE Mesh

- Last IEEE 802.15.4 standard ready
- OpenThread, Zigbee PRO / Zigbee 3.0
- Bluetooth 5.0 and 802.15.4 protocols in Static and Dynamic concurrent mode

- Proprietary protocol capable (Bluetooth Low Energy like or 802.15.4)
- Best-in-class RF with up to +6dBm output power and 102 dB link budget
- Energy sensitive application with only 4.5mA in RX and 5.2mA in TX (@ 0dBm)
- BOM cost reduction thanks to Integrated balun

STM32WB

2.4 GHz
Open

STM32WB

Bluetooth® 5

OpenThread

Zigbee

BLE Mesh

2.4 GHz
Open

STM32WB

Bluetooth® 5

OpenThread

Zigbee
Make it yours

Profiles

Bluetooth® 5

Zigbee

IEEE 802.15.4 MAC

ZCL

6LoWPAN (RPL)

OpenThread

LLD 802.15.4

2.4 GHz Radio
+6 dBm output / -100 dBm sensitivity (802.15.4)
-96 dBm sensitivity (BLE 1 Mbps)

Antenna
Simplicity of development

2 independent cores for real-time execution

**Mono-core**

- CPU -x
  - Application Firmware
  - Peripherals
  - Radio stack

**Benefits**

- SOC solution (1 single die)
- Full flexibility - Easy development – User experience
- Increase battery life
- All-in-1 solution - cost saving
- Speed up time to market
- Easy certification process

**Drawbacks**

- Time sharing
- Longer processing time – Greedy current consumption
- Need companion MCU (increased cost)

**STM32WB**

- Arm® Cortex®-M4
  - Application Firmware + Peripherals
- Arm® Cortex®-M0+
  - Radio Stack
KEY FEATURES

2 independent cores for real time execution

Ultra-low-power consumption
- 50 µA/MHz Active mode (at 3.0V)
- 2.1 µA Stop mode (Radio in standby + 256KB RAM)
- < 50 nA Shutdown mode

Peripherals
- 2xI²C, 1xUSART, 1xLP-UART, 2xSPI, 1x USB 2.0 FS device supporting Battery Charging Detection, 1xSAI, Quad-SPI (XIP), 6x 16-bit timer (including LPWM and low-power one)

1.7 to 3.6V voltage range (DC/DC, LDO)

-40°C to +105°C temperature range
Benefit of dual cores processing

1. **Independent Radio activity**
   - Uploading data to mesh network or smartphone
   - OTA of Radio protocol stack or application FW
   - Running on Arm Cortex-M0+

2. **Energy saving mode**
   - RAM + RTC running @ 2.1 μA
   - Fast wake up @ 5μs

3. **Main application activity**
   - Computing data (sensor fusion …)
   - Flexible Arm Cortex-M4 CPU speed up to 64 MHz
   - Batch Acquisition Mode (BAM) with CPU & Flash turned off

4. **Dual CPU activity**
   - 50μA/MHz only!
   - Both Radio and Application running independently

5. **Super saving mode**
   - Shutdown < 50 nA
   - Battery energy saving
All in one MCU
full flexibility control

- Retrofit legacy product to Bluetooth® 5.0 and concurrency mode
- Remotely upgrade device with OTA capability
- Brand protection with Authenticated FW upgrade system

- Multipoint BLE 5 connections
- Small form factor design with CSP100 pins
- Battery life time care with < 50 nA Shutdown mode
- Dynamic Efficient 50 µA/MHz
- Extend memory storage with Quad-SPI
- Handle advanced algorithm with 1 Mbyte of Flash
- Cost optimized product with USB 2.0 crystal-less device

- -100 dBm sensitivity to increase area coverage
- Customer Key Storage (CKS) for trustable Application update
- Manage full duplex audio with embedded SAI
- USB FS 2.0 with Battery Charging Detection for remote device

Robust RF link -100dBm sensitivity with IEEE 802.15.4 and +6 dBm output power
Upgrade legacy 802.15.4 device to Bluetooth 5.0
Update securely Radio and stack firmware with build-in FUS
Bluetooth 5 and 802.15.4 protocols Mesh capable to extend network range

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- Up to 105°C radio capable
- External PA support to get ultra wide communication distance
- Down to 600 nA mode with RTC and 32KB of RAM
- Only 5µs wakeup time over 16 wakeup lines
- PCROP, ECC, TRNG, PKA, for best design robustness
- Reduce BOM cost with built-in LCD booster

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- Beacon profile available among a huge list
- Embedded balun to minimize design cost
- Only 5.2mA Radio TX current to extend beacon life time
- Up to +6 dBm output power to get best beacon range
- < 2.1 µA Stop mode with full RAM for battery life optimization
- Down to 1.71 full feature capable

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IoT protection ready (1/2)
radio stack and/or application FW update

1. New FW package received
2. New FW detected
   Update is launched
3. App Processor send New FW package signature and encryption key for authentication
   Authentication signature matches preprogrammed key
   Case not, the process is aborted and device resets
4. New FW package is decrypted with proprietary Key. Device upload on going.
# IoT protection ready (2/2)

## STM32WB countermeasure against attacks

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# Massive cost saving

## The more feature integration, the more the BOM drops down!

### Silicon cost
- RF balun cost: Embedded
- External components: 7
- 32 kHz Master clock output available
- Crystal for USB 2.0 FS operation: embedded
- LCD display booster: embedded (only single glass)
- Capacitive touch controller: embedded
- PCB cost: 2 layers PCB only

### Ecosystem cost
- Bluetooth® 5.0 stack: Free of charge
- ZigBee PRO stack: Free of charge
- OpenThread stack: Free of charge
- Generic 802.15.4 MAC: Free of charge
- Generic HCI drivers: Free of charge
- STM32CubeMX: Free of charge
- STM32CubeMonitor-RF: Free of charge
- IDEs (AC6: SW4STM32; ST: STM32CubeIDE): Free of charge
- BLE and 802.15.4 concurrency avoids to use a second radio MCU
STM32WB50 value line

Essentials features product targeting entry-level Bluetooth® 5.0 and Mesh application

- Dual Core
- Full speed 64MHz
- 7x7mm
- 1MB Flash 128KB RAM
- Protocol flavors
- +4 dBm -96 dBm
- -10; +85°C
STM32WB50 positioning

- **Radio standard**: BLE, 802.15.4
- **Concurrent**: BLE, 802.15.4
- **Bluetooth® data rate (bps)**: 2M, 1M, 128K, 256K
- **Security**: CKS, AES-256/128, AES-128
- **Supply mode**: DCDC + LDO, LDO
- **Min Power supply (V)**: 2
- **Max Output Power (dBm)**: +4, +6, +10, +40, +85
- **Sensitivity (dBm)**: -96, -40, +105
- **Temperature range (°C)**: -40, +105
- **RAM memory (bytes)**: 256K, 128K
- **Flash memory (bytes)**: 1M, 128K, 256K
- **Flash memory (bytes)**: 256K, 128K, 1M

STM32WB50

STM32WB55
STM32WB - a large offer

Bluetooth® 5.0, OpenThread, Zigbee and proprietary protocol capable

from 1.7 V to 3.6 V from -40°C to +105°C
Advanced functionalities

Audio - Voice & streaming
Full-duplex audio streaming over Bluetooth® 5.0 using Opus codec
STM32Cube function pack for STM32WB MCU: FP-AUD-BVLINKWB1

Sensor fusion & activity recognition
BLE connectivity with environmental and motion sensors
STM32Cube function pack for STM32WB MCU: FP-SNS-MOTENVWB1

STM32WB Nucleo-64 development board
Motion MEMS and Environmental Sensor Expansion board

STM32WB Nucleo development board
+ Digital MEMS microphones Expansion board

Both packages are compatible with STBLESensor app for iOS and Android
Prototyping made as easy as 1,2,3

Hardware Evaluation Pack

STM32CubeMX
STM32CubeWB
Code generation
Power calculation
STM32CubeMonRF
IPD - MLPF-WB55-01E3
harmonic filter with integrated impedance matching

Integrated Balun

STM32WB

Arm Cortex-M4
Application Firmware + Peripherals

Arm Cortex-M0+
Radio Stack

MLPF-WB55-01E3

Integrated STM32WB impedance matching

Deep rejection harmonic filter
• Exercise wireless features of STM32WB55
  • Bluetooth® Low Energy (BLE) commands
  • BLE RF tests
  • send OpenThread commands
  • perform 802.15.4 RF tests

• DUT - Nucleo, USB dongle or customer boards.
• USB or UART to Virtual Com Port

STM32CubeMonitor-RF

Mode selection
Software development tools

A complete flow, from configuration up to monitoring

STM32CubeMX
Configure & Generate Code

Partners IDEs
Compile and Debug

STM32CubeMonRF
STM32CubeProg

STM32Cube
Configure & Generate Code

Windows
macOS®

More to come after mass market launch
Find easily the MCU that suits YOU tablets/phones/computers ST MCU finder

- Browse STM32 & STM8 families wide portfolio and select the product that best fit their needs
- Access to technical information
- Also works offline!

www.st.com/STMCUFinder
End-to-End Ecosystem

Software Tools

1. Configuration
   - STM32CubeMX
   - STM32CubeIDE

2. Development
   - STM32CubeIDE
   - IAR Systems
   - arm KEIL
   - STM32CubeProgrammer

3. Programming
   - STM32CubeMonitor
   - STM32CubeMonitor-RF

4. Monitoring

Embedded Software

STM32Cube MCU Package

STM32Cube Expansions & Function Packs

STM32Cube Expansion
## STM32 MCU “Wireless” series

### High Perf MCUs
- **STM32F2**
  - 398 CoreMark
  - 120 MHz

### Mainstream MCUs
- **STM32F0**
  - 106 CoreMark
  - 48 MHz
- **STM32G0**
  - 142 CoreMark
  - 64 MHz
- **STM32F1**
  - 177 CoreMark
  - 72 MHz
- **STM32F3**
  - 245 CoreMark
  - 72 MHz
- **STM32G4**
  - 550 CoreMark
  - 170 MHz

### Ultra-low Power MCUs
- **STM32L0**
  - 75 CoreMark
  - 32 MHz
- **STM32L1**
  - 93 CoreMark
  - 32 MHz
- **STM32L5**
  - 442 CoreMark
  - 110 MHz
- **STM32L4**
  - 273 CoreMark
  - 80 MHz
- **STM32L4+**
  - 409 CoreMark
  - 120 MHz

### Wireless MCUs
- **STM32WL**
  - 161 CoreMark
  - 48 MHz
- **STM32WB**
  - 216 CoreMark
  - 64 MHz

### Arm® Cortex® core
- **-M0**
- **-M0+**
- **-M3**
- **-M33**
- **-M4**
- **-M7**

- Optimized for mixed-signal applications
- Cortex-M0+ Radio co-processor
Releasing your creativity

/STM32

@ST_World

community.st.com

www.st.com/STM32WB

Online Training

MOOC

Blog article
Thank you