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
- Massive integration Cost saving
- A large offer
- 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 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
IEEE 802.15.4 MAC

ZCL

6LoWPAN (RPL)

Profiles

Bluetooth 5

ZigBee 3.0

LLD 802.15.4

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

Make it yours
Simplicity of development

2 independent cores for real-time execution

**Mono-core**

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

- **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

- **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
Rich feature set

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

Security
PCROP, PKA, TRNG
AES 256-bit, CKS

Arm® Cortex®-M4 MPU + FPU + DSP Inst.
@ 64 MHz

ART Accelerator™
Up to 1MB Flash
Up to 256KB SRAM

USB 2.0 FS
Crystal-less SPI, I²C
LP-UART
SAI, Quad-SPI

Arm Cortex-M0+ Core
@ 32 MHz
2.4 GHz Radio
Bluetooth 5.0
802.15.4 Concurrent mode

LCD 8x40

ADC 12-bit
2x Comp
Temp sensor
Cap. Touch

Crystal-less SPI, I²C
LP-UART
SAI, Quad-SPI

802.15.4 Concurrent mode
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 withAuthenticated FW upgrade system

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

Fleet maintenance
• Multipoint BLE 5 connections
• Small form factor design with CSP 100 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

Industrial devices
• 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

Lighting
• Retrofit legacy product to Bluetooth 5.0 and concurrency mode
• Remotely upgrade device with OTA capability
• Brand protection withAuthenticated FW upgrade system

Fitness/
Healthcare
• Multipoint BLE 5 connections
• Small form factor design with CSP 100 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

Home security
and Audio
• -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

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

New FW package received

New FW detected
Update is launched

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

New FW package is decrypted with proprietary Key. Device upload on going.

Closed Sub-system
Radio + Key storage

Radio stack

Application Processor
Arm® Cortex®-M4
FPU + MPU
DSP instruction
64 MHz

Network Processor
Arm® Cortex®-M0+
32 MHz

Customer Key Storage

AES 128-bit

2.4 GHz radio
Modem (BLE, 802.14.5)

Antenna
### IoT protection ready (2/2)

**STM32WB counter measure 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 3.0 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
- +4 dBm
- -96 dBm
- -10; +85°C
- Protocol flavors
STM32WB50 positioning

**Radio standard**
- BLE, 802.15.4
- Concurrent

**Bluetooth data rate (bps)**
- 2M
- 1M
- 128K
- 256K
- 1M
- BLE, 802.15.4

**RAM memory (bytes)**
- 256K
- 128K
- 256K
- 1M
- 1M

**Flash memory (bytes)**
- 128K
- 1M
- 256K
- 1.7
- -10;+65
- -40;+105

**Supply mode**
- LDO
- DCDC + LDO
- AES-128
- AES 256/128
- CKS

**Security**
- AES-128
- AES 256/128
- CKS

**Sensitivity (dBm)**
- -96
- +6
- +4
- +1.7

**Max Output Power (dBm)**
- 2

**Min Power supply (V)**
- 2

**Temperature range (°C)**
- -40;+105
- 1.7
- -10;+65

**STM32WB50**
- BLE, 802.15.4
- Concurrent

**STM32WB55**
- BLE, 802.15.4
- Concurrent

**Flash memory (bytes)**
- 128K
- 1M
- 256K
- 1.7
- -10;+65
- -40;+105
STM32WB - a large offer

Bluetooth 5.0, OpenThread, ZigBee 3.0 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
Software development tools

A complete flow, from configuration up to monitoring

STM32CubeMX
Configure & Generate Code

Partners IDEs
Compile and Debug

STM32CubeMonRF
STM32CubeProg

FREE IDE's

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

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