SimpleLink™ wireless MCUs for Building/Home Automation

June 2021
Gary Lin
Agenda

• Overview of TI connectivity products
• New SimpleLink™ CC26xx/CC13xx wireless MCUs
• Building & Home Automation with TI Solutions
• TI software offering
  – Bluetooth Mesh
  – Connectivity Standards Alliance (Matter)
• Coexistence with Wi-Fi
• Resources
Find all Connectivity products @ TI.com/wireless
Overview of TI connectivity solutions
System solutions for performance and cost
Scalable solutions for all industrial applications

**Transceivers**
- RX and TX for best RF performance
- Protocol software on external MCU or MPU
- Best link budget: 143dBm

**Network processors**
- RF, network and IoT software in one device
- Certified protocol stacks
- Application on external MCU or MPU

**Wireless MCU**
- SoC for wireless and application
- Complete solution in one device
- Applications MCU: ARM M3 or M4F. M0 and M33 in development
- Up to 1MB Flash and 256kB RAM

**Certified modules**
- With or without antenna
- From TI or third party vendor
- Least development effort
- No RF expertise needed

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**Pin to pin**

**Scalable software**
Leading wireless innovation for 20 years
Scalable solutions for all applications

Sub-1GHz
- Best range, up to 20km
- 15 years battery life
- Star or mesh network
- Grid, BA, and more

Bluetooth®
- Best in class Bluetooth LE
- Lowest power
- Star or Bluetooth mesh
- Locationing

Zigbee
- Robust low power mesh for smart home and buildings
- Zigbee 3.0 support
- Zigbee over SubGHz

Wi-Fi
- Best IoT Wi-Fi solution
- Most robust in the market
- Best in class security

 Amazon sidewalk
- Secure IP access from crowd sourced network
- No need to build gateways
- Get started kit available

Wi-SUN
- Long range mesh for large networks
- Frequency hopping interference tolerance

 Thread
- IPv6 base mesh protocol for home and building automation
- Flexible network

Multi-protocol
- Best in class multi-band solutions (DMX)

Proprietary and other
- Use our Ti MAC15.4 stack or build your own protocol from scratch
- MIOTY, 6LoPAN, wMBUS and more
- Automotive solutions

- Star or mesh network
- Grid, BA, and more
- Best TRX in market
- First integrated IC in market
- First BLE chip in the market
- First XTAL free chip
- ZB board from the beginning
- Driving ZB over Sub1GHz
- First WiFi IoT chip in the market
- First IC vendor with modules
- Leading IC vendor

- TI owned SW stack
- Early solutions
- SW defined radio enable the space
- Early solutions

- Connected Home over IP
- Smart Home seamless connection with different ecosystems
- Builds on top of IP protocols
- Early solutions
Leading wireless innovation for 20 years

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<td>Wireless BMS</td>
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Scalable solutions for Smart Buildings

- Robust, reliable connectivity that support easy development, long-range, large deployment and remote monitoring for battery or line powered application
- Monitor home and cities grid systems wirelessly; with reliable, affordable solutions designed outdoor environments

Effective connectivity of energy data

- High quality, reliable, RF modules and SoCs that meets federal security standards, from a stable supplier.
  - because life matters.

Reliable and Certified connectivity

- High quality Auto or functional safety qualified products that meets OEM auto quality with reliable, robust system solution and optimized system cost

Auto Quality System Solution

- Design battery powered, high data-rate SoCs or modules for fast and reliable data transfer at affordable cost

Fast, Efficient Communication

- because life matters.
New SimpleLink™ CC26xx/CC13xx wireless MCUs
Highly flexible radio architecture

**Application MCU**
- Application
- Profiles / services
- TI RTOS, FreeRTOS
- Peripheral drivers and libraries
- Royalty free protocol stacks

**Peripherals / modules**
- DC/DC converter
- Temp/battery monitor
- AES
- GPIO
- Timers
- UART / SPI
- I2C / I2S
- DMA

**Radio**
- Strong Sensitivity:
  - -121 dBm for SimpleLink long-range mode @ 5 kbps
- Power output:
  - +5dBm / +20dBm @ 2.4 GHz
  - +15dBm / +20dBm @ <1 GHz
- LinkLayer in ROM

**Sensor controller engine CPU**
- Software defined peripheral
  - UART emulator, flow meter, inductive sensing, PWM, LCD driver, I2C, etc.
- ADC and comparators
- Digital sensor readings
- Capacitive sensing

**Memory**
- 32kB Flash up to 1MB
- 8kB to 256kB RAM

**QFN packages:**
- 4x4mm, 5x5mm, 7x7mm

**Sub-1GHz**
- Proprietary

**TI-15.4 Stack**
- Bluetooth®
- Thread
- LoWPAN
- Zigbee
- M-Bus
- Amazon Sidewalk
- Wi-Sun
- MiTY

**Memory**
- 32kB Flash up to 1MB
- 8kB to 256kB RAM
Most scalable Connectivity portfolio
Pin & API compatible

Legend:
- Sub-1 GHz
- Sub-1 + 2.4 GHz Dual Band
- 2.4 GHz
- New Devices

Flash / RAM memory (bytes)

- 704k / 152k
  - CC1312R7
  - CC1352P7
  - CC2672R
  - CC2652R7
  - CC2652P7

- 352k / 88k
  - CC1312R
  - CC1352P
  - CC1352R
  - CC2652P
  - CC2652P
  - CC2652RSIP

- 352k / 40k
  - CC1311R3
  - CC1311P3
  - CC2651R3
  - CC2651P3
  - CC2651RSIP

- 128k / 28k
  - CC1310F128
  - CC2640R2F
  - CC2640R2L

- 64k / 28k
  - CC1310F64

- 32k / 24k
  - CC1310F32
  - CC2640R2F
  - CC2640R2L

48-pin VQFN
- 30 GPIOs
- 26 GPIOs
- 28 GPIOs
- 31 GPIOs
- 26 GPIOs
- 32 GPIOs
Higher memory, multiprotocol wireless MCU with an optional integrated power amplifier

Key Applications

- **Building Automation**: wireless sensors, Lighting control, ..
- **Personal Electronics**: toys, HID stylus pens, ..
- **Medical**: toothbrushes, shavers, patient monitoring, IR thermometers, ..
- **Asset tracking**: beacons tags, industrial transportation
- **Retail**: EPOS, ESL
- **Grid**: cable replacement

### CC2652x7

- **704kB Flash**
- **352kB Flash**
- **152kB SRAM + Cache**
- **88kB SRAM + Cache**
Multiprotocol | CC2652x7

RF Features
- 2.4GHz wireless MCU supporting various industry wireless standards
- Bluetooth Low Energy 5.2 features
  - 2M PHY, LR, Direction Finding,
  - Bluetooth mesh (low power node)
- Zigbee 3.0, BLE Mesh 1.0, 15.4 & Proprietary
- Integrated PA optimized for +10dBm and +20dBm
- RX sensitivity: -97dBm @1Mbps, -103dBm @125kbps

Ultra-low Power Consumption (VDDS = 3.0V)
- Standby current < 1.15µA (RTC, RAM retention)
- Radio currents Rx - 6.9mA, Tx @0dBm - 7.3mA , @+10 dbm – 22mA, @ +20 dBm < 85mA

Supply & Temperature
- 1.71V – 3.6 V supply range
- 40C to 105C Temperature

Scalability: PCB pin to pin compatible devices with scalable memory (flash, RAM), OAD options, #IOs, and IP integration.

Higher memory, multiprotocol wireless MCU with an optional integrated power amplifier

Why CC2652x7?
Connectivity
- Ideal for connected gateway products supporting Matter (formerly known as CHIP)
On-chip OAD
- 704kB Flash memory enables end-device apps with on-chip dual image OAD and secure firmware updates.
Scalable stack support
- Programmable radio enables support for latest Bluetooth LE and Zigbee features (e.g. direction finding)
Ease of migration
- Scalability: API compatible with SimpleLink CC13x2 and CC26x2 SDK
- Simplified certification: Inherit TI’s existing Bluetooth (BLE5-Stack) qualification

Key Applications
- Building Automation: wireless sensors, Lighting control, ...
- Personal Electronics: toys, HID stylus pens, ...
- Medical: toothbrushes shavers, patient monitoring, IR thermometers, ...
- Asset tracking: beacons tags, industrial transportation
- Retail: EPOS, ESL
- Grid: cable replacement

Resources / Getting started
- Platform SW scalability with easy migration across device families. Start developing now with CC2652x devices
- For faster development time with easy to use stack APIs, multiple sample examples, demos, and TI resource explorer (TIRex) documentation. Visit www.ti.com/ble for all Bluetooth LE resources
Multi-band & higher memory | CC1352P7 & CC1312R7

Key Applications

- Grid Infrastructure
  E-meters, Flow meters
- Smart City
  Street lighting, Asset Tracking
- Building Automation:
  Gateways, wireless sensors etc

Multiprotocol applications with on-chip over-the-air update capability

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**Multi-band & higher memory | CC1352P7 & CC1312R7**

**RF Features**
- Sub-1 GHz wireless MCU supporting various industry wireless standards
- Excellent RF performance: up to 130dBm link budget @ 50kbps, 868 MHz
- Narrowband long range: up to 141dBm link budget @ 2.5kbps, 868 MHz
- Bluetooth 5 LE coded PHY with -105dBm sensitivity
- Integrated PA optimized for +10dBm and +20dBm

**Ultra-low Power Consumption**
- Standby current 0.95 μA (RTC, RAM retention)
- Radio currents Rx 5.8mA (868MHz), Tx @14dBm 24.9mA

**Supply & Temperature**
- 1.71V – 3.6 V supply range
- -40C to 105C Temperature

**Scalability**
- PCB pin to pin compatible devices with scalable memory (flash, RAM), OAD options, #IOs, and IP integration.

**Resources / Getting started**
- Platform SW scalability with easy migration across device families.
  - Start developing now with CC13x2R/P devices
  - Start SW development with CC13x2 and CC26x2 SDK
- Faster development time with easy to use stack APIs, multiple sample examples, demos, and TI resource explorer (TIRex) documentation
  - Visit [www.ti.com/sub1ghz](http://www.ti.com/sub1ghz) for resources

**Key Applications**
- Grid Infrastructure: E-meters, Flow meters
- Smart City: Street lighting, Asset Tracking
- Building Automation: Gateways, wireless sensors etc

**Why CC1352P7 / CC1312R7?**

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<td>Multi-protocol</td>
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**Multi-protocol applications with on-chip over-the-air update capability**

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Single Protocol | **CC2651x3**

**Key Applications**

- **Building Automation:** wireless sensors, Lighting control, ..
- **Personal Electronics:** toys, HID stylus pens, ..
- **Medical:** toothbrushes, shavers, patient monitoring, IR thermometers,..
- **Asset tracking:** beacons, tags, industrial transportation
- **Retail:** EPOS, ESL
- **Grid:** cable replacement

Single-protocol end-device applications with over-the-air upgrade capability
Single Protocol | CC2651x3

**RF Features**
- 2.4GHz wireless MCU supporting various industry wireless standards
- Bluetooth Low Energy 5.2 features
  - 2M PHY, LR, Direction Finding
  - Bluetooth mesh (low power node)
- Zigbee 3.0, BLE Mesh 1.0, 15.4 & Proprietary
- Integrated PA optimized for +10dBm and +20dBm
- RX sensitivity: -97dBm @1Mbps, -103dBm @125kbps

**Ultra-low Power Consumption** (VDDS = 3.0V)
- Standby current < 0.92uA (RTC, RAM retention)
- Radio currents Rx - 6.8mA, Tx @0dBm - 7.1mA, @+10 dbm – 22mA, @ +20 dBm < 85mA

**Supply & Temperature**
- 1.71V – 3.6 V supply range
- -40C to 105C Temperature

**Scalability**
- PCB pin to pin compatible devices with scalable memory (flash, RAM), OAD options, #IOs, and IP integration.

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**Why CC2651x3?**

**Extended battery life**
- Ultra-low standby current extends battery life significantly for applications with long sleep intervals (>5s)

**On-chip OAD**
- 352kB flash memory enables end-device apps on-chip multi-step OAD and secure firmware updates.

**Scalable stack support**
- Programmable radio enables support for latest Bluetooth LE and Zigbee features

**Ease of migration**
- Scalability: API compatible with SimpleLink CC13x2 and CC26x2 SDK
- Simplified certification: Inherit TI’s existing Bluetooth (BLE5-Stack) qualification

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**Resources / Getting started**

- Platform SW scalability with easy migration across device families.
- Start dev eloping now with CC2652x devices
- Start SW development with CC13x2 and CC26x2 SDK

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**Texas Instruments**
Optimized Sub-1GHz | **CC1311R3 & CC1311P3**

Key Applications

- **Building Automation**: Gateways, PIR sensors, Contact sensors, etc
- **Grid Infrastructure**: Low-cost metering projects
- **Wireless Microphone**: Small size and capable of running SimpleLink Audio Plugin
Optimized Sub-1GHz | CC1311R3 & CC1311P3

RF Features
- Sub-1GHz wireless MCU supporting various industry wireless standards
- Excellent RF performance: up to 130dBm link budget @ 50kbps, 868 MHz
- Narrowband long range: up to 141dBm link budget @ 2.5kbps, 868 MHz
- +20 dBm power amplifier with industry lowest power consumption with CC1311P3

Ultra-low Power Consumption
- RX: 5.8 mA (868 MHz)
- TX at +14 dBm: 24.9 mA (868 MHz)
- Standby: 0.9 µA (RTC on, 32KB RAM and CPU retention)

Supply & Temperature
- 1.71V – 3.6 V supply range
- -40C to 105C Temperature

Scalability: PCB pin to pin compatible devices with scalable memory (flash, RAM), OAD options, #IOs, and IP integration.

Why CC1311x3?
- Extended battery life: Ultra-low standby current extends battery life significantly for applications with long sleep intervals (>5s)
- On-chip OAD: 352kB flash memory enables end-device apps with on-chip multi-step OAD and secure firmware updates.
- Smaller size: CC1311R in 5x5 QFN package enable 22GPIOs with 0.4mm pitch. Enough GPIOs for more applications
- Ease of migration: Scalability: API compatible with SimpleLink CC13x2 and CC26x2 SDK

CC1311R / CC1311P
- Cortex-M4
- 40kB SRAM + Cache
- Drivers: RTOS and Wireless stacks partially in ROM
- No Sensor Controller
- AES128 and TRNG
- 1x UART
- 1x SPI

CC1312R
- Cortex-M4F
- 88kB SRAM + Cache
- Drivers
- Integrated Sensor Controller
- AES-256 and SHA2 integrated
- 2x UART
- 2x SPI

Resources / Getting started
- Platform SW scalability with easy migration across device families. Start developing now with CC13x2 devices
- Start development with CC13x2 and CC26x2 SDK
- Faster development time with easy to use stack APIs, multiple sample examples, demos, and TI resource explorer (TIRex) documentation
- Visit www.ti.com/sub1ghz for resources
Building & Home Automation with TI Solutions
Building Automation key design challenges

1. Full home coverage
   - Increased intelligence with long range sensors

2. Remote monitoring
   - Ability to control & detect through a smart device

3. Long battery life
   - Accurate & reliable sensing with maximum lifetime

4. Small form factor
   - Minimize solution size for space constrained designs

Electronic smart lock reference design
TI 2.4 GHz in Building Automation Sensors

**Examples:**
- Smoke Detectors
- Gas Detectors
- Door Sensors
- Window Sensors

**Key requirements:**
- Power Consumption, Low Cost, Integrated PA for long range, small size
- Battery Life: 10 years on coin cell battery
- Gateway: 1 for 10’s of devices

**WMCUs:**
- CC2651P (Single-protocol)
- CC2652P (Multiprotocol with +20 dBm PA)
- CC2672P (Zigbee/Thread over Sub-GHz)

**Protocols:**
- Standards-based IP mesh: Zigbee, Zigbee Sub-GHz

**Recommended solution**

**Why TI?**
- Leader in low power with Standby current at <1uA
- 4-year battery life on a coin-cell battery (CR2032) using 5 second polling
- Integrated Sensor controller

**Lowest power Integrated PA at 20 dBm providing increased range**
- 10 dBm TX with coin cell across industrial temperature

**TI Available Collateral**
- Connect: What is a sensor controller?
- Range Calculators
- Reference Designs
- SmartRFStudio
- Zigbee Power Calculator
TI 2.4 GHz in HVAC Controls

**Examples:**
- Motor Control/Drivers

**Key requirements:**
- Power Consumption, Low Cost, Integrated
- PA for long range, small size

**Battery Life:**
- 10 years on coin cell battery

**Gateway:**
- 1 for 10’s of devices

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**Recommended solution**

**WMCUs:**
- CC2651P (Single-protocol)
- CC2652P (Multiprotocol with +20 dBm PA)
- CC2672P (Zigbee/Thread over Sub-GHz)

**Protocols:** Standards-based IP mesh: Zigbee, Zigbee Sub-GHz

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**Why TI?**

- Leader in low power with Standby current at <1uA
- 4-year battery life on a coin-cell battery (CR2032) using 5 second polling
- Integrated Sensor controller

**Lowest power Integrated PA**
- at 20 dBm providing increased range
- 10 dBm TX with coin cell across industrial temperature

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**TI Available Collateral**

- Connect: What is a sensor controller?
- Range Calculators
- Reference Designs
- SmartRFStudio
- Zigbee Power Calculator
**TI Sub-1 GHz in door/window sensors**

**Goal:** Linux Gateway with cloud connectivity, small sensor nodes talking to gateway with full-house coverage

**Battery:** Coin cell

**Battery Life:** 5 years

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**Design criteria**

- Devices: **CC1312** (Sub-1 GHz only) or **CC1352P** (Sub-1G + BLE + PA)
- Protocols: TI 15.4 Stack – Non beacon mode @ 5kbps. **Amazon Sidewalk** – Outsource gateway to Amazon

**Recommended solution**

- Full home coverage, robust through walls
- **Sensor Controller** runs PIR sensing, SPI sensor reading, contact sensing, cap touch
- **Ultra-low power**
- Add BLE for easy firmware update

**Why TI?**

**TI Available Collateral**

- Intelligent Sensing White paper
- Connected MCU BA White Paper
- Smart Home Demo video
- Connected Building Demo
- Connected Home Demo
- LPSTK with Hall Effect Sensor
**Goal:** Detect smoke in each apartment with wireless smoke alarm within 20 seconds

**Battery:** AAA

**Battery Life:** 3 years

**Gateway:** Every three apartments

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**Design criteria**

**Recommended solution**

**Devices:**
- CC1310 (Sub-1 GHz only)
- CC1352R (Sub-1G + BLE)

**Protocol:** TI 15.4 Stack – Beacon Mode

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**Why TI?**

More robust than 2.4GHz

Full home coverage

Sensor Controller to alert system if smoke is detected without relying on main CPU

Add BLE for easy configuration

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**TI Available Collateral**

- Sub-1 GHz Smoke Alarm App Note SWRA567b
- Analog Front Ends: Residential AFE TPS8802 Commercial AFE TPS8804
- Why Sub-1 GHz? Educational Video
- Range and Coexistence
**Goal:** Ultra low power with reliable connection to base unit

**Battery:** Coin cell

**Battery Life:** 10 years

**Gateway:** 1 per household unless in assisted living facility

**Design criteria**

**Recommended solution**

**Devices:**
- CC1125 (if CAT1 needed)
- CC1312 (Sub-1 GHz only)
- CC1352R (Sub-1G + BLE)

**Protocol:** TI 15.4 Stack – Beacon Mode + BLE; MIOTY;

**Why TI?**

- More robust than 2.4Ghz
- Full facility coverage
- ESTI CAT 1 receiver
- Sensor controller – low power
- Add BLE for 2.4 Connectivity
- Cost Savings replace TCXO with “software TXCO”

**TI Available Collateral**

- CAT 1 Receiver App Note
- Range and Coexistence
TI Wi-Fi in Video Surveillance

Providing a wireless microcontroller for low-power indoor\outdoor video camera that securely streams video, audio and sensor events to the cloud

- **Certified and robust WiFi MCU**: easy to integrate and fully certified solution allowing ramp into production in as little as 6 months
- **Low power**: ~2 years operation in always connected & over 5 yrs waking up on trigger on 5000mAh battery
  - **Short Wakeup**: supporting low-latency wakeup from external source of <310 msec up to a secure TLS\SSL internet connection
- **Proven streaming throughput**: streaming up to H.264 compressed 1080p @ 30FPS over UDP video via RTP
- **Security**: assisting protection against hostile takeover and IP or video theft
- **Robust solution**:
  - **Interoperability**: >220 APs tested ensuring consistently stable performance with APs world-wide
  - **Range**: up to 100m range to the AP, enabling both indoor and outdoor deployment
  - **Cloud integration**: integration for AWS, HomeKit, IBM and others

Available Reference designs

2 - TI reference designs with Omnivision
2 - Ambarella reference design

Video Doorbell: [One pager](#) | [App Report](#) | [TID](#) | [Video](#) | [Security Video](#) | [Apps Tab](#) | [EERD](#)
Low power Wi-Fi for door lock that could be securely controlled and monitored through the cloud

- **Low power consumption**
  - Up to 3.8 years operation waking up on trigger on 4xAA battery for the entire lock, and 1.5 year in always connected
  - **Short Wakeup**: supporting low-latency wakeup from external source of <310 msec up to a secure TLS/SSL internet connection

- **Best in class IoT security**
  - 30+ embedded security enablers
  - Assist in protection against hostile takeover (e.g. malicious OTA), and IP theft, without external secure components

- **Reliable Wi-Fi with cloud ecosystem**
  - **Leading Interoperability**: >230 APs tested, ensuring consistently stable performance with APs world-wide
  - **IoT cloud ecosystem**: AWS, HomeKit, IBM, Azure, and CHIP Demo (1Q21)

- **Certified and robust WiFi MCU**
  - Easy to integrate and fully certified solution allowing ramp into production in as little as 6 months

**Recommended Devices**
- **CC3220S**: 2.4GHz Wi-Fi wireless MCU
- **CC3230S**: 2.4GHz wireless MCU with BLE coexistence

Learn more: [One pager](#) | [App Report](#) | [TID](#) | [Video](#) | [Security Video](#) | [Blog](#) | [Apps Tab](#)
TI Wi-Fi for HVAC

Creating a low power, connected WiFi based HVAC systems that links a variety of sensors, securely to the Cloud that enables remote monitoring and control.

✓ Dual-band Wi-Fi
  • 2.4 & 5GHz capabilities - reliable Wi-Fi in congested RF environments

✓ Options for integrated MCU & MPU:
  • SimpleLink MCU options include Dual core ARM-M4 SoC & WiFi CERTIFIED NWP
  • WiLink w/ MPU options include high throughput (100Mbps) Single chip Wi-Fi+BLE in WL183x modules

✓ Low power:
  • Low power consumption of the wireless MCU reduces load on 24VAC

✓ Security: embedded enhancements assist in protecting against theft and hostile takeover

✓ Reliable and robust Wi-Fi with cloud ecosystem
  • Leading Interoperability: >230 AP’s tested, ensuring consistently stable performance with AP’s world-wide
  • IoT Cloud ecosystem: AWS, HomeKit, IBM, Azure and others

Recommended Devices
• **CC3235S**: Dual band wireless MCU
• **WL1831MOD**: 2.4GHz Wi-Fi transceiver

Learn more: One pager | App Report | TID | Video | Security Video | Blog | Apps Tab | EERD
TI software offering
Bluetooth low energy software solutions

**Long range with Bluetooth 5**

4x the range with coded PHY rates of 125kbps, enables full home coverage with same TX & RX current consumption

**AoA with Bluetooth 5.1**

RTLS toolbox enables localization on a coin cell, certified solutions with proven interoperability & automotive quality

**Multi-protocol**

Add BLE to a Sub-1 GHz or Zigbee network concurrently for easy smartphone connection/control. Plus Wi-Fi Coex

**Connection monitor**

Enhances secure connections & enables lower power performance by following BLE connections to avoid packet loss

**Bluetooth Mesh**

Extends range & provides direct access to smartphones. Uses Bluetooth LE multichannel operation for better coex
Bluetooth Mesh | Highlights

Industrial-Grade Solution

- **RELIABILITY**: Self-healing, multipath delivery with no single point of failure
- **SCALABILITY**: Support 10’s-100’s nodes with industrial level messaging performance
- **SECURITY**: Mandatory security at mesh network and application levels

Proven, Global Interoperability

- **FULL STACK SOLUTION**: All levels of network technology fully specified
  - SIG specified functional models provide improved vendor interoperability
- **TOOLS AND PROCESS**: Qualification to ensure Global Multi-vendor Interoperability

Mature Technology

- **GLOBAL BRAND AWARENESS**: Mature ecosystem
- **MATURE ECOSYSTEM**: Create products and services with faster time to market

End-user accessibility:

- Mesh nodes accessible by smart devices without a gateway
- Flexibility with device provisioning and configuration
TI Bluetooth Mesh Solution

**HARDWARE**

- **Scalable silicon portfolio** to support mesh nodes with needed memory, IOs, integrated PA, ...
  - TI Bluetooth Mesh Products
- Fully certified modules
- Evaluation Boards
  - CC26x2/CC13x2 LaunchPad development kit
  - LPSTK-CC1352R (LaunchPad SensorTag kit)

**SOFTWARE**

- **Platform software scalability**
- Bluetooth SIG qualified and easy to use stacks ([link](#) Mesh profile QDID)
- Concurrent Bluetooth LE and Bluetooth mesh operation
- Stack support for 1-chip (SoC) and 2-chip (with host) architecture
- **Resource explorer documentation**
- Mesh sample examples

**IDE, APPS**

IDE Support:
- Code Composer Studio (CCS)
- IAR Embedded Workbench

Bluetooth Mesh Provisioner, Configuration Client:
- Mobile app and ADK for Android and iOS
- BlueZ (Linux)
Connectivity Standards Alliance

**Zigbee 3.0**

- Worldwide standard for low-power, self-healing, mesh networks targeting home & building automation
- Battery-less products supported with Green Power Devices
- TI is the Chair for Zigbee Sub-1 GHz & is driving Technical & Marketing Working Groups
- Sample app examples included to easily build your application

**Matter (Formerly CHIP)**

- Matter is a royalty-free connectivity standard developed within the Connectivity Standards Alliance (formerly the Zigbee Alliance) and was started by Amazon, Apple, Google, et al.
- TI SDK will be ready on day one when Matter GA releases 1.0 spec
- Matter development software with demo available on GitHub
- All major Thread based system topologies will be supported

![Zigbee mesh networks](attachment:image)
Sub-1 GHz software solutions

IEEE 802.15.4: TI 15.4 Stack
- Complete standards-based star network
- Low-power end nodes & gateway
- Many RF PHYs to choose from for world-wide regulatory compliance & application needs

MIOTY
- New standards-based LPWAN solution backed by major industry players including TI
- Up to 5km in urban / 15km in rural areas
- Low data rate, low power network

Wi-SUN
- Standards-based robust mesh network, frequency hopping
- Standards-based multi-layer security & IPv6 protocol suite
- Alliance: >230 members from 26 countries, 95M devices deployed WW

MIOTY
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Wireless M-BUS
- Only European standard for metering
- Sub-1GHz star network with long range using 433MHz / 868MHz
- Multiple options to suit your meter with wireless network processor or single SoC

Amazon Sidewalk
- Leverages the 900 MHz band to create a long-range, low-power home network to extend the range of low-bandwidth devices beyond the home Wi-Fi network

Dual-band
- Adding BLE to a Sub-1 GHz stack significantly streamlines device configuration & OTA firmware updates

Texas Instruments
Sub-1 GHz | Software resources

Amazon Sidewalk
Discover what you can connect with TI’s dual-band wireless MCU & the Amazon Sidewalk network

15.4 Stack
Hear from RF experts about TI’s Turbo OAD that enables delta software updates to reduce time, bandwidth, & power

Wi-SUN
Learn from TI & market leader, L+G, about the benefits of Wi-SUN & how it’s shaping the future of smart grid

MIOTY
TI is driving software standardization as a founding member of the MIOTY Alliance – Long range, low data rate, low power

Wireless M-Bus
Read more about Wireless M-Bus, what modes to use, which regional profiles, and where to start with TI

Multi-protocol
Learn how to run two wireless protocols with one device – TI makes it easy with an expanded memory portfolio & Multi-protocol Manager
2.4GHz Wi-Fi + BLE Coexistence

What is it?

Coexistence enables collocated Wi-Fi and Bluetooth® Low Energy radios manage RF activity together to reduce interference when used concurrently in the 2.4GHz frequency band. Having a two-chip solution with two radios improves the radio performance, enables lower power consumption, and increases security.

Key Features

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<th>Feature</th>
<th>Details</th>
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| Improved radio performance with combo 2-Chip design | • Higher performance, ease of design and assured interoperability and standards compliance  
• Supports Wi-Fi 4 + BLE capability for both provisioning & peripheral role as well as concurrent mode of operations |
| Low power design for continuous connectivity  | • Wi-Fi: configurable profiles, 0.7uADTIM 1 beacon receive profile  
• BLE: as low as 0.94uA standby current, -97dBm sensitivity, +5dBm max output power |
| Robust Security features                     | • Wi-Fi: Personal & Enterprise-WPA3 support, encrypted & authenticated executables to resist cloning & hacking, Secure sockets (TLS/SSL) secure boot, UID & integrated Coexistence  
• BLE: Secure boot, AES-128 (CC2640R2), AES-256 (CC2652), SHA2, ECC/RSA, TRNG |
| Ease of certification                        | • Reference Design will be fully tested to ensure compliance for FCC/ISED/CE to reduce risk for customers |

When is it available?

• Available now!

Key devices supported?

• CC2642R
• CC323X
• CC313x

Other Notes

• Based on the 1-wire coexistence scheme supported by the SimpleLink devices

Key Applications

- Thermostat
- Electronic lock
- Smoke/heat detector
- Lighting
- Garage
- Appliances
- Medical

Resources / Getting started

- CC3135, CC3235x SimpleLink™ Wi-Fi® Internet-on-a-Chip™ Solution—BLE Coexistence
- Low-Power Internet Connectivity Over Wi-Fi (Rev. A)
- SimpleLinkSensor Controller: Create smart sensor solutions that run for years on a coin cell battery.
- Secure Boot in SimpleLink: Security enabler to verify integrity and authenticity of code at the time of device booting process
- 3-Wire Coexistence
Tl.com tools - www.ti.com/connectedworld

Development kits
- LaunchPad™ development kits
- LaunchPad SensorTag kit

Training Videos
- Videos
- Podcasts

Design Tools
- Resource Explorer
- Code Composer Studio
- SimpleLink Academy
- E2E™ Forum
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