The IoT: Wireless connectivity product WiFi & BT

Jesse Wang

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What is the IoT?

Things, people and cloud services getting connected via the Internet to enable new use cases and business models.

How is IoT different than M2M?

- M2M focused on connecting machines – mainly proprietary closed systems
- IoT is about harmonizing the way humans and machines connect using common public services.
Why now?

- More products are adding intelligence with MCUs to support more sophisticated control
- Adding connectivity is getting easier & cheaper
- Low-power semiconductors allow for more battery-powered applications
- Wi-Fi and Internet access broadly available
- Tablets, PCs and Smartphones broadly available – can be leveraged as a gateway
- Connectivity brings control, sensing & ability to update system software over the internet

We are at the IoT inflection point
Why TI Wireless?
# TI broad portfolio: A solution for each industry challenge

## Wireless Connectivity Portfolio

<table>
<thead>
<tr>
<th>Proximity</th>
<th>Personal area networks</th>
<th>Local area networks</th>
<th>Neighborhood area networks</th>
</tr>
</thead>
<tbody>
<tr>
<td>NFC RFID, RFID Identification</td>
<td>Bluetooth® Bluetooth LE Personal Connection</td>
<td>Proprietary 2.4GHz Customizable</td>
<td>6LoWPAN IP Mesh</td>
</tr>
<tr>
<td>Up to 848Kbps</td>
<td>Up to 3Mbps</td>
<td>Up to 1Mbps</td>
<td>Up to 100Mbps</td>
</tr>
<tr>
<td>No battery to coin cell</td>
<td>Coin cell to AAA</td>
<td>Coin cell</td>
<td>AA battery</td>
</tr>
<tr>
<td></td>
<td></td>
<td>AAA battery</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Coin cell</td>
</tr>
</tbody>
</table>

### Key Attributes

<table>
<thead>
<tr>
<th>Proximity</th>
<th>Personal area networks</th>
<th>Local area networks</th>
<th>Neighborhood area networks</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Low / no power</td>
<td>• IOP</td>
<td>• Standardized mesh</td>
<td>• Longest range</td>
</tr>
<tr>
<td>• Diverse apps</td>
<td>• Large install base</td>
<td>• Large area coverage</td>
<td>• Customizable to application</td>
</tr>
<tr>
<td>• In mobile devices</td>
<td>• Robust RF</td>
<td>• Robust RF</td>
<td>• Robust RF</td>
</tr>
</tbody>
</table>

### Key Differences

<table>
<thead>
<tr>
<th>Proximity</th>
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<td>No battery to coin cell</td>
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<td>Coin cell</td>
<td>AA battery</td>
</tr>
</tbody>
</table>

### Range

<table>
<thead>
<tr>
<th>Proximity</th>
<th>Personal area networks</th>
<th>Local area networks</th>
<th>Neighborhood area networks</th>
</tr>
</thead>
<tbody>
<tr>
<td>cm</td>
<td>Up to 100m</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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**TX INSTRUMENTS**
From idea to market, safe and quickly

Enabling your Alpha prototype with TI’s “Out-of-the-box” tools and software solutions

We have module partners with pre-certified solutions
Extensive support infrastructure for hassle-free development

TI has tools to discover your chosen technology and run “Hello World”

Broad range of reference designs

IR temperature
Humidity
Magnetometer
Gyroscope
Pressure
Accelerometer

Broad range of reference designs

We have module partners with pre-certified solutions
Extensive support infrastructure for hassle-free development

TI E2E Community
Join Today

Step 1
Sign up and activate a myTI account

Step 2
Once your myTI account is activated go to e2e.ti.com and sign in. Once you are signed into E2E for the first time your account is activated

Texas Instruments
Wireless Connectivity Wiki Page


Wireless Connectivity

Overview of Wireless Connectivity

- NFC
- RFID
- Bluetooth (BT)
- Bluetooth LE (BLE) RTSAFE

Personal Area Networks

- Proprietary ZigBee
- Proprietary 802.15.4

Local Area Networks

- WiFi
- Proprietary Sub-1GHz

Neighborhood Area Networks

- Proprietary

Featured WiKis

- Single Mode BLE
- CC2564 BLE
- CC2564 BT + BLE
- CC2650 BLE

E2E Forums

- CC2564 BLE Forum
- WiLink WiFi Forum
- RFM97 Thread Forum
- Simple Link Wireless Forum

Key Attributes

- Low power
- Low latency
- Large range
- Customizable
- Extended battery life
- Long range
- High output
- Low power
- Expandable

Texas Instruments
## TI Wireless Connectivity Portfolio:
The broadest in the industry

<table>
<thead>
<tr>
<th>THE Largest selection</th>
<th>THE lowest power</th>
<th>Easiest to design with</th>
</tr>
</thead>
<tbody>
<tr>
<td>Support for all key technologies and standards for industrial, automotive and consumer</td>
<td>Use a coin cell for multi-year, always-on operation or go battery-less with energy harvesting</td>
<td>Quickest learning-curve and development time with full broad market ecosystem</td>
</tr>
<tr>
<td>A solution for any application. Future proof. Leverage your investment</td>
<td>Ultra-low power by design</td>
<td>Software, tools, E2E, certified TI modules, TI Designs, SensorTag</td>
</tr>
</tbody>
</table>

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Connect More with TI

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**Texas Instruments**
WiFi SimpleLink

SimpleLink™
Smart RF Transceivers
Wireless Networking Solutions
Wireless MCUs
## SimpleLink™ Wi-Fi® platform

Lowest power, programmable wireless MCU, easiest to use

### Value Propositions

<table>
<thead>
<tr>
<th>Proposition</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>The lowest power:</strong> Run for over a year on two AA batteries</td>
<td></td>
</tr>
<tr>
<td><strong>First single chip programmable Wi-Fi solution:</strong> Add Wi-Fi to any system</td>
<td></td>
</tr>
<tr>
<td><strong>Easiest to design with:</strong> No Wi-Fi experience needed; HW designs, 30+ software examples, extensive documentation and TI E2E support forum all readily available</td>
<td></td>
</tr>
</tbody>
</table>

### Products

- **CC3200** (Wireless MCU)
  - Integrated ARM Cortex-M4 MCU + Wi-Fi network processor
  - First programmable single chip Wi-Fi solution
- **CC3100** (Internet-on-a-chip Wi-Fi network processor)
  - Embedded TCIP/IP stack
  - Connect any MCU to the Internet of Things

### Features

- On-chip Internet & Wi-Fi Security
- Wireless MCU separate from TCP/IP Stack, free for customer applications
- Flexible provisioning such as SmartConfig, WAC, & AP Mode
- Cloud supported
- FCC/CE/ETSI certified modules
- SDK for development with CCS and IAR support

### Applications

- Internet of Things (IoT)
- Home automation & appliance
- Safety and security
- Smart energy
- Industrial M2M communication
- Wireless audio streaming
SimpleLink Wi-Fi CC3100 & CC3200 brings…

Industry’s first single-chip Wi-Fi solution with built-in programmable MCU

Ability to run on two AA batteries for over a year, bringing the capabilities of Wi-Fi to battery-operated end-equipments

All you need to easily create IoT solutions - robust security, quick connection, cloud support and more
Deep dive into CC3100 & CC3200

Two pin compatible products based on the same Wi-Fi network processor

CC3100 Internet on a chip
Wi-Fi Network Processor
Embedded TCP/IP stack for systems using external low-cost MCU

CC3200 Internet on a chip + MCU
Wireless MCU
80MHz ARM® Cortex™-M4 integrated + Wi-Fi network processor

Same Core
Best in class security – chip to cloud **FAST**

**On Chip Wi-Fi® security**
- WPA2 Personal
- WPA2 Enterprise
- WPS2
- 802.1x
- EAP Fast
- EAP PEAPv0/1
- EAP PEAPv0 TLS
- EAP PEAPv1 TLS
- EAP TLS
- EAP TTLS TLS
- EAP TTLS MSCHAPv2

**On-Chip Internet security**
- SSL 3.0
- TLS 1.2
- X.509
- DES3
- AES256
- MD5
- SHA2
- RSA
- ECC

**HW encryption engines establish TLS/SSL connection in 200mSec**
### Most Flexible Wi-Fi provisioning Options

<table>
<thead>
<tr>
<th>Provisioning Method</th>
<th>Access Point Mode</th>
<th>SmartConfig™</th>
<th>WPS</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>What’s needed</strong></td>
<td>Web browser</td>
<td>Android or iOS phone app</td>
<td>Push button on router</td>
</tr>
<tr>
<td><strong>Networks supported</strong></td>
<td>Any Network</td>
<td>Networks connections with MIMO, 5GHz, SISO-40MHz, and proprietary modulation schemes, are not supported</td>
<td>WPS enabled routers only</td>
</tr>
<tr>
<td><strong>How many Steps</strong></td>
<td>Multiple Steps</td>
<td>1 step</td>
<td>1 step (push button)</td>
</tr>
<tr>
<td><strong>Number of devices configured</strong></td>
<td>Configure one device</td>
<td>Configure multiple devices</td>
<td>Configure one device</td>
</tr>
<tr>
<td><strong>Home network connection</strong></td>
<td>Phone must disconnect from home network</td>
<td>Phone stays connected to the home network</td>
<td>N/A</td>
</tr>
<tr>
<td><strong>Secure</strong></td>
<td>Can be secure</td>
<td>Can be secure</td>
<td>Not secured</td>
</tr>
<tr>
<td><strong>Remote App</strong></td>
<td>Not Required</td>
<td>Required Supported by Android 4.2+, and iOS 6+</td>
<td>N/A</td>
</tr>
<tr>
<td><strong>Additional Notes</strong></td>
<td>N/A</td>
<td>SSID in Chinese or Asian characters are not recognized</td>
<td>N/A</td>
</tr>
</tbody>
</table>

**Note:** Products with SmartConfig, **should** also have AP mode or WPS as provisioning fall backs

For more details on provisioning see [Provisioning Wiki](#).
SimpleLink Wi-Fi Modules Now Available

Key module features
• Includes on module clocks, SPI Flash, and passives
• Connects to an external on-board antenna
• 17.5x20.5 mm Land Grid Array footprint with 1.27mm pitch for low cost PCB design
• Modular FCC, IC, CE, TELEC & Wi-Fi Alliance Certifications to save customer effort, time and money
• CC3100 Wi-Fi network processor and CC3200 wireless MCU pin compatible variants

Resources
• Hardware Design
  – CC3200 module TI Design
  – CC3100 module TI Design
• Software – same as for QFN Device
  – CC3200 SDK & Firmware
  – CC3100 SDK & Firmware
• Evaluation Tools and Support
  – Module LaunchPad CC3200MODLAUNCHXL
  – Module BoosterPack CC3100MODBOOST
  – CC3100MODBOOST-CC31XXEMUBOOST
  – CC3100MODBOOST-CC31XXEMUBOOST-MSP-EXP430FR5969 - $86.99
  – E2E Support Forum

Texas Instruments
CC3100/CC3200 Module Certification Summary

Save substantial costs and time using TI’s FCC ID and modular certifications

TI’s FCC/ETSI test reports can be used to file for certifications with 40+ other countries

No Part 15.247 radio testing required to obtain FCC/IC certifications

• Save 1-2 months of reporting and filing
• Save upfront certification (~$30k) and RF design resources (~$10-15K contracted)
• No risk of testing failure, which is common without RF expertise resources
• Less paperwork and simpler application process for full certification

Design has an external antenna, but is still certified

More information can be found on the certification website for CC3100 & CC3200

Please consult with your Telecommunication Certification Body (TCB) regarding any regulatory certifications. The information are recommended guidelines only and shall not be used as a process for regulatory Host End Product, Module or any other regulatory certifications.
SimpleLink™ Wi-Fi ® IoT & Integrated MCU SW

CC3200 Software Highlights

- SimpleLink™ – Leveraging TI’s Cortex-M Software Ecosystem
  - Free license and royalty free use on SimpleLink™ Wireless MCUs
  - Customers focus on their application, not on our microcontroller
  - Key functional areas
    - Peripheral driver library (all peripherals covered)
    - Code utilities and examples
    - Includes reference application software

- Embedded ROM featuring Internet-on-a-chip
  - Embedded Wi-Fi Driver supports 802.11 b/g/n, Station, Access Point, WiFi Direct, WPA2 Personal & Enterprise Security
  - Embedded TCP/IP & TLS/SSL stacks supports 8 Simultaneous TCP/UDP sockets using Industry-standard BSD Socket APIs

- Internet & Wi-Fi Applications made easy with 30+ Sample applications for Wi-Fi, internet, security and more

- RTOS & IDE Options
  - Energia
  - TI-RTOS
  - FreeRTOS
  - IAR Systems
  - CCS
  - GCC

SimpleLink™ SDK
Click Here SDK and Firmware

We understand software drives time-to-market. That is why we created SimpleLink SDKs

Cloud partnerships

Energia TI-RTOS FreeRTOS IAR Systems CCS GCC

Texas Instruments
<table>
<thead>
<tr>
<th>Platform</th>
<th>Kits &amp; Bundles</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>CC3200</strong></td>
<td>Kits</td>
</tr>
<tr>
<td>Industry's first single-chip Wi-Fi solution with user-dedicated programmable microcontroller (MCU)</td>
<td>• <strong>NEW</strong> Module LaunchPad <a href="#">CC3200MODLAUNCHXL</a> - $59.99</td>
</tr>
<tr>
<td></td>
<td>• QFN Device LaunchPad <a href="#">CC3200-LAUNCHXL</a> - $29.99</td>
</tr>
<tr>
<td><strong>CC3100</strong></td>
<td>Kits</td>
</tr>
<tr>
<td>Internet-on-a-chip™ solution Connect any MCU to the Internet of Things</td>
<td>• <strong>NEW</strong> Module BoosterPack <a href="#">CC3100MODBOOST</a> - $49.99</td>
</tr>
<tr>
<td></td>
<td>• QFN Device BoosterPack <a href="#">CC3100BOOST</a> - $19.99</td>
</tr>
<tr>
<td></td>
<td>• BOOST required to Flash CC3100 - <a href="#">CC31XXEMUBOOST</a> - $22.99</td>
</tr>
<tr>
<td></td>
<td>Bundles</td>
</tr>
<tr>
<td></td>
<td>• <a href="#">CC3100BOOST-CC31XXEMUBOOST</a> - $41</td>
</tr>
<tr>
<td></td>
<td>• <a href="#">CC3100BOOST-CC31XXEMUBOOST-MSP-EXP430F5529LP</a> - $53.99</td>
</tr>
<tr>
<td></td>
<td>• <a href="#">CC3100BOOST-MSP-EXP430FR5969</a> - $34</td>
</tr>
<tr>
<td></td>
<td>• <a href="#">CC3100MODBOOST-CC31XXEMUBOOST</a> - $71</td>
</tr>
<tr>
<td></td>
<td>• <a href="#">CC3100MODBOOST-CC31XXEMUBOOST-MSP-EXP430FR5969</a> - $86.99</td>
</tr>
</tbody>
</table>
SimpleLink™ Wi-Fi® Key Resources

• TI Landing page - [http://www.ti.com/simplelinkwifi](http://www.ti.com/simplelinkwifi)
  – Product information, feature/benefit, applications, getting started, tools & software, ecosystem (cloud) & support/community

  Organize information for Getting started, Hardware details, Software details including porting information, Test/Certification and Support and Community

• **How to Get Started**

• Product Pages
  – [www.ti.com/product/CC3200](http://www.ti.com/product/CC3200) - datasheet, key documents, kits, software

• **E2E Support Forum**
WiFi SimpleLink

Success Story Sharing
Market trends driving Wi-Fi growth

**Home & Building Automation**
- Bringing intelligence, convenience and lifestyle

**Smart Energy**
- Adding power awareness to products and helping to save energy

**Multimedia**
- Wireless audio streaming and advanced remote controls

**Security and Safety**
- Improving remote control and home monitoring

**Industrial M2M Communication**
- Internet enhanced M2M communication using existing Wi-Fi infrastructure
Integrated Internet Protocols for easy Development

Integrated Internet Protocols
Already in CC3100/CC3200

TCP/IP Stack
HTTP server – on chip web server
mDNS – local service discovery
DNS – Access internet

HTTP Server
web page hosted on CC3100/CC3200 device

Integrated TCP/IP

Application Layer
Transport Layer
Network Layer
Link Layer

The OSI network model

The TCP/IP protocol stack

mDNS – Service Discovery

- Allow devices to advertise themselves in local network without DNS server
- Easily discover embedded Wi-Fi devices, available on your network

See all examples in CC3100SDK or CC3200SDK
Key Sample Applications – CC3100/CC3200

Wi-Fi Station and Access Point Mode
- Station Mode - connect to access point (with or without security) and can use the internet services
- Access Point Mode – allowing a station to connect to CC3100 or CC3200

XMPP – Instant Messaging
Enables chatting with Instant Messaging

Simple Email
Sends email over SMTP
App sends a preconfigured email at the push of a button or a user-configured email through the CLI (Command Line Interface).

Wi-Fi Direct
Fully integrated feature:
Enables Peer to Peer communication using Wi-Fi Direct

See all examples in CC3100SDK or CC3200SDK
Where We Won

What TI Part #: CC3100/CC3200

End Equipment: Alarm, security camera, home control over internet using mobile phone, Thermostat, Wi-Fi based sensors, appliances.

What was the customer problem that needed to be solved? Need:

- IP based system
- Low power for battery operation
- Easily integrate into existing system
- Indoor/outdoor 30-300m range, displayless configuration

Why was TI selected for this design?

- Low Power – always connected vs intermittently connected mode
- Ease of Design, single chip offering
- Wi-Fi and internet security protocols, HW encryption engine
- Flexibility to switch between CC3100 and CC3200
- iHomekit support
- IOP robustness
## Where We Won

**What TI Part #:** CC3200  
**End Equipment:** speaker, headset, soundbars

## What was the customer problem that needed to be solved? Need:

- 2.4GHz 802.11n and 5GHz  
- Up to 100m range (whole home coverage)  
- Airplay support  
- Sufficient memory for audio buffering  
- Timing synch (Wi-Fi WFA)  
- Option for synch between multiple speakers

## Why was TI selected for this design?

- Low Power – always connected vs intermittently connected mode  
- Ease of Design, single chip offering  
- Airplay support (in development)  
- Scale through partners  
- Addition of 5GHz (roadmap)
Success Stories: CC3100/CC3200 Industrial

Where We Won

What TI Part #: CC3100/CC3200, CC3200MOD

End Equipment: Asset Tracking, POS, Gas Detection, Scales, Barcode scanners.

What was the customer problem that needed to be solved? Need:

- Easily add high speed wireless access using phone or tablet
- Easy to use service interface (HTTP server)

Why was TI selected for this design?

- Low Power – always connected vs intermittently connected mode
- Tag\Sensor profile power optimization
- Ease of Design, single chip offering
- Pre-certified, integrated modules at competitive prices.
Bluetooth Smart Ready

Dual Mode BT/BLE
Choosing the Right BT Device and MCU

**Low Power Sensors**

- CC2540/1
- 8/16 bit MCU
- 1 year+ on Coin Cell Battery
- No Apple MFi Royalties
- Less than 100Kbps data rate

**Data**

- CC2560/4
- MSP430
- Supports new and old phones (BT and BLE)
- No Apple MFi Royalties
- Up to 3Mbps data rate

**Music**

- CC2560/4
- 32 Bit MCU
- Use A2DP Profile to stream music from phones
- ARM Cortex solution or low end with MSP430
## Dual-mode Bluetooth (Classic + BLE)

Bluetooth connection across any end point (BLE or classic); enables bridge between BLE and classic

### Value Propositions

<table>
<thead>
<tr>
<th>Tools/Modules/TI Designs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Best Performance: reliable connection over a long range (100m) with optimized power consumption</td>
</tr>
<tr>
<td>Flexible: connect to any host (MCU or processor)</td>
</tr>
<tr>
<td>Most proven solution: 300 millions devices shipped, robust royalty free SW, solution available for broad market</td>
</tr>
<tr>
<td>FCC, IC, CE &amp; Bluetooth SIG Fully Certified module</td>
</tr>
</tbody>
</table>

### Products

- Smart RF transceivers
  - CC2560 (Classic only)
  - CC2564 (Classic + BLE)
  - Pin-to-pin compatible
- TI modules
  - CC2564MODN
- 3 Parties Modules
- Audio TI Designs (sink and source)

### Features

- Performance over long range (100m) with throughput up to 3Mbps
- Connect to any MCU or processor
- BT stack runs on external host
- Bluetooth 2.1 +EDR/ BT 4.0
- Fully certified module (FCC, IC, CE, Bluetooth SIG)

### Applications

- Embedded audio
- Heath and medical care
- Mobile device accessories
- Toys

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TXAS INSTRUMENTS
**Bluetooth + Bluetooth LE (CC2560B/2564B)**

### Total Solution Cost

#### Cost Effective
- Low cost HW
  - QFN package – lowest cost
  - Reference design – low development cost
  - TI module – no development cost

#### High Performance
- Range
  - Up to 100m
  - Tx Power +12dBm w/o external PA
- Low power
  - Sleep current 40μA
  - GFSK full throughput 38.5mA
- High sensitivity
  - Rx GFSK -95dBm

### Design → Production

#### Easy to use
- Production ready – 7th generation
  - Pre-integrated, validated, tested
  - Module FCC, IC, CE, SIG certified

#### Support
- **Wiki** page – easy access & informative
- **Online** community – knowledgeable & active

### Flexible

#### Simultaneous BT/BLE

#### HW options
<table>
<thead>
<tr>
<th>IC – QFN</th>
<th>TI module</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Lowest</strong> cost</td>
<td><strong>Fastest</strong> TTM</td>
</tr>
</tbody>
</table>

#### SW options

<table>
<thead>
<tr>
<th>Basic</th>
<th>Customizable</th>
</tr>
</thead>
<tbody>
<tr>
<td>Royalty free w/ TI MCU A2DP, HFP, HID + BLE</td>
<td>Additional stack, profiles and MCU support available from partner Stonestree One</td>
</tr>
</tbody>
</table>

**Texas Instruments**
TI Modules!

**CC2564MODN**

HCl Dual Mode Module

Available Now

**CC2564MODA**

HCl Dual Mode Module w/ Integrated Antenna

Available Now
**Development**

**Bluetooth® Classic/Dual Mode Development Kits**

**EZ430-RF256x**
- PAN1323 Bluetooth module with antenna
- Pre-flashed eZ430-RF256x SDK
- Used for evaluation and simple development
- [How to get the Kits](#)

**CC256x Bluetooth® Developing kit**
- Based on TI CC256x Bluetooth Reference Design – CC256XQFNEM (QFN device) or CC2564MODNEM (TI module)
- EM connectors works with MSP-EXP430F5529, MSPEXP5438 and Tiva C Series EK-LM4F232 boards
- Support of bluetooth stack, profiles and sample applications
- [How to get the Kits](#)

**Bluetooth and MSP430 Audio Sink – BT-MSPAUDSINK**
- Enables Bluetooth audio (SBC encode/decode)
- Design offloads audio processing which enables low power audio
- Core of the solution is best in class
- Using TI’s low power digital input speaker amplifier
- Bluetooth Subsystem QDIDs.
- [How to get the Kits](#)
# CC256x Bluetooth

## Getting Started
- CC256x Overview
- Get the Kit!
- Beginners Guide
- FAQ

## More Information
- CC2560 Product Folder
- CC2564 Product Folder
- CC256x Datasheet

## Information
- Modules
- EVM Platforms

## Design Guides
- QFN EM User Guide
- QFN Reference Design (swr117)
- System Design Guide
- CC256x QFN PCB Guidelines (swr420)
- Schematic and Layout Checklist

## Downloads
- Service Packs
- Sample Code and Demos Downloads

## Third Party
- StoneStreet Bluetooth Information
- Bluetooth Download

## Hardware Tool
Below tool can be used to evaluate the CC256x module.
- Bluetooth Hardware Evaluation Tool
- Bluetooth Hardware Evaluation Tool Download

## System Level Test
- Testing Guide
- Vendor Specific HCI Commands

## Production Line Testing
- Production Line Testing Guide

## Certification
- FCC
- Bluetooth SIG

*Available Soon...

### Development Tools
- Code Composer
- IAR Workbench for MSP430
- IAR Embedded Workbench for TI MSP430
  - Download from IAR
  - IAR at TI Wiki

### Host Processor Tools
- FET-PRO430 Lite Version
  - FET-Pro430 Web Site
  - Binary Download using FETPRO430
- MSP-EXP430FR5438 USB Drivers
- MSP430 USB Debugging Interface

### Suport & Community

### Information

#### E2E Forums
- Bluetooth Applications Forum
- Wireless Connectivity Forums

#### Videos
- Adding Bluetooth to MCU-Based Systems
- Helping You Add Bluetooth® to MSP430 Products
- A Bluetooth demonstration of the E2430-RF2560 kit
- A demonstration of the PAN1315 evaluation module kit with Bluetooth Low Energy
- Demo of TI's ANT+ Bluetooth® Health & Fitness Aggregator Kit
- Stellaris® 2.4 GHz CC2560 Bluetooth® Wireless Kit

#### Blogs
- Wireless Connectivity Blog
Bluetooth Smart Ready

Success Story Sharing
# Bluetooth End Equipment

## Health & Fitness
- Heart rate monitor
- Treadmill
- Smart band
- Sports equipment

## Wireless Audio
- Sound bar
- Speaker
- Headset

## Remote Control
- Voice activated remote control
- HID (keyboard, mouse, etc.)

## Toys
- Remote control toys
- Audio streaming

## Automotive & Industrial
- On-board diagnostics
- After market hands free, audio streaming

<table>
<thead>
<tr>
<th>CC2564</th>
<th>CC2560</th>
<th>CC2560</th>
<th>CC2564</th>
<th>CC2564</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heart rate monitor</td>
<td>Sound bar</td>
<td>Voice activated remote control</td>
<td>Remote control toys</td>
<td>On-board diagnostics</td>
</tr>
<tr>
<td>Treadmill</td>
<td>Speaker</td>
<td>HID (keyboard, mouse, etc.)</td>
<td>Audio streaming</td>
<td>After market hands free, audio streaming</td>
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<tr>
<td>Smart band</td>
<td>Headset</td>
<td></td>
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<tr>
<td>Sports equipment</td>
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</tbody>
</table>
## Why we win

- Provided excellent applications support at every stage of customer’s design
- Does not require previous Bluetooth knowledge, easy to implement

## Who

- Bar Code Scanner Manufacturer

## Where

- Data transfer from bar code scanner to hub unit
Breathalyzer: Simply Blue
(Bluetooth Modules)

Why we win
• Simple solution to implement
• Fully certified module (FCC, IC, CE, Japan, Korea)
• Does not require previous Bluetooth knowledge

Who
• Australia breathalyzer maker

Where
• Data transfer from breathalyzer to printer wirelessly
WiFi Wilink

WiLink™
Combo Solutions
## Connecting applications with TI Wi-Fi®

### Wi-Link™

**WL183xMOD**
- **Highest Performance & Integration**
  - Wi-Fi, BT/BLE combos
  - Attaches to MPUs (Sitara)
  - TI certified module

**WL180xMOD**
- **Highest Performance**
  - Wi-Fi
  - Attaches to MPUs (Sitara)
  - TI certified module

### SimpleLink™

**CC3100**
- **Wi-Fi Network Processor**
  - Internet-on-a-chip™ solution
  - Integrated Wi-Fi, internet and security protocols
  - Attaches to MCUs

**Module and QFN Device**

**CC3200**
- **Wireless MCU**
  - Same features as C3100 +
  - customer programmable Cortex M4 MCU

**Module and QFN Device**

### Applications

- Portable consumer & enterprise, Automotive, Connected Home, Smart Energy, Health
- Home automation, Smart energy, connected appliances, M2M communication, Health & fitness
WiLink™ combo solutions
High-performance Wi-Fi + Classic Bluetooth/BLE RF transceivers

<table>
<thead>
<tr>
<th>Value Propositions</th>
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</thead>
<tbody>
<tr>
<td><strong>Tools/modules for easy development</strong></td>
</tr>
<tr>
<td><strong>Performance and low power</strong>: 100Mbps with the lowest power (800uA IDLE)</td>
</tr>
<tr>
<td><strong>Certified and easy to use</strong>: Pre-integrated, certified, production ready solutions, software downloadable. Open documentation (Wiki), forums (E2E), TI and 3rd party network</td>
</tr>
<tr>
<td><strong>Integrated and scalable</strong>: Single chip, multi-combo with pin-to-pin compatible variants, consumer, industrial (85 degree C) and automotive grade (Q100)</td>
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</tbody>
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<table>
<thead>
<tr>
<th>Products</th>
</tr>
</thead>
<tbody>
<tr>
<td>RF transceivers</td>
</tr>
<tr>
<td>• WL18xx transceivers</td>
</tr>
<tr>
<td>TI modules</td>
</tr>
<tr>
<td>• WL1801MOD</td>
</tr>
<tr>
<td>• WL1805MOD</td>
</tr>
<tr>
<td>• WL1831MOD</td>
</tr>
<tr>
<td>• WL1835MOD</td>
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<tr>
<td>3rd party modules</td>
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</tbody>
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<table>
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<tr>
<th>Features</th>
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<tbody>
<tr>
<td>Combo dual-mode Bluetooth + Wi-Fi on a single chip</td>
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<tr>
<td>Performance over long range</td>
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<tr>
<td>Connect to processors(high level OS) and MCUs running the stack</td>
</tr>
<tr>
<td>Industrial temp -40 to 85 C</td>
</tr>
<tr>
<td>2.4 GHz and 5 GHz support</td>
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<tr>
<td>Fully certified module (FCC, IC, CE, Bluetooth)</td>
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<table>
<thead>
<tr>
<th>Applications</th>
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</thead>
<tbody>
<tr>
<td>Embedded wireless audio</td>
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<tr>
<td>Gateways</td>
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<tr>
<td>Industrial panel/ HMI</td>
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<tr>
<td>Remote control</td>
</tr>
<tr>
<td>Professional camera</td>
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<tr>
<td>Wearable</td>
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</table>
WiLink8 Multi IP Combo device

Bringing High Performance WiFi, Bluetooth / Bluetooth Low Energy & GPS in a fully Certified Module

Easy Integration
- Quick HW design with TI module & reference designs
- WiFi drivers support Linux, Android, Win & RTOS
- Linux tested packages on TI AM335x A8 processor
- Linux releases & Certified BT stack Stone Street One

Performance
- Best in class Wi-Fi with high Performance Audio and Video streaming reference applications
- Supports simultaneously Station and AP/P2P
- BT/BLE concurrent support and coexistence

Low Power
- Low power radio & low power sleep
- Dynamic TX power controlled by device
- Configurable filters to keep host in suspend
- Best in class IDLE power consumption <750 uA
**WiFi Direct Multi-Channel Multi-Role**

**Wi-Fi Direct**
Allows wireless devices to directly connect with each other (peer to peer) without the need for an access point.

**Multi-Channel Multi-Role**
Support 2 different Role Simultaneously, can connect on different RF Channel.

**Wi-Fi Direct**
(Peer-2-Peer)
Group Owner

**Internet Uplink**

**Wi-Fi Direct**
(Peer-2-Peer)
Client

**WiLink8 MultiRole**
(AP / P2P Client)

**MultiRole**
(WiFi Direct)

**Wi-Fi Station**

**Wi-Fi Access Point**

**Infotainment Unit**

**Kid Playing Game**

**Wi-Fi Miracast**

**Wi-Fi Direct Client**

**Wi-Fi Direct Group Owner**

**Wi-Fi Station**

**Channel 11**

**Channel 1**

**Channel 6**

**Texas Instruments**
Regulatory Certification - TI coverage

- Wi-Fi operates in the unlicensed 2.4GHz and 5GHz bands, so licenses are not required to communicate between two devices.
- WiFi is an intentional transmitter and therefore requires certification of the device with industry regulations. WiLink module come pre-certified with:

  - **FCC**: The Federal Communications Commission is an independent agency of the US government
  - **IC**: Industry Canada is the Canadian Agency regulating the electronics industry
  - **CE**: The CE marking is a mandatory conformance mark on many products in the European Economic Area
  - **ETSI**: The European Telecommunications Standards Institute produces globally-applicable standards for Information and Communications
  - **Telec**: Telecommunications Engineering Center runs the Japanese equipment authorization program

- FCC, IC, CE costs ~$25K for compliance testing.
- Certifications Covered by module with customers that copy the TI Reference Layout (1).

(1) Customers can change reference and leverage TI certification as long as use same or lower gain antenna. WL1835 reference antenna is 2.4GHz only while WL1837 reference antenna supports also 5GHz. These two antennas don’t have the same foot-print or gain.

**Texas Instruments**
Wireless Interoperability

Over 150 Access Points and Routers
Most popular APs and Routers were selected
Secure connection with industry known devices
TCP and UDP traffic Both Tx and Rx
All Routers and APs use default parameters
WL1835MOD evaluation tools

**COM8 Evaluation Board**
- WL1835MOD reference design
- Attaches to TI AM335x EVM and other TI’s EVMs & Ref. Designs
- FCC/IC/ETSI Certified (2 Dual-band Chip Antennae included)
- WL1835MOCOM8 Available on TI E-store

**WL8 Beagle Bone Cape**
- WL1835 Low cost evaluation & Software development platform
- Attached to Beagle Bone White & Black
- FCC/IC/ETSI Certified (2 Dual-band Chip Antenna included)
- WL1835MOD Cape Available on boardzoo.com
Wilink8 Well documented

http://www.ti.com/wilink

Overview for WiLink Combo Solutions

TI’s WiLink™ Combo Solutions offer fully integrated, high-performance Wi-Fi and Bluetooth/Bluetooth low energy modules and development tools designed to pair with microprocessors such as TI’s Sitara™ Microprocessors. The pre-integrated and pre-certified modules provide faster time-to-market, lower manufacturing costs, and save board space while minimizing the level of RF expertise required.

WiLink™ 8 Wi-Fi®+ Bluetooth®/BLE Modules

TI’s WiLink 8 modules enable fully integrated Wi-Fi and Bluetooth/ BLE with co-existence in a power-optimized design for home automation, smart energy, multimedia, and security safety applications.

Linux and Android drivers are pre-integrated with software development kits. Sample applications, API guide, user documentation and support are available.
WiFi Wilink

Success Story Sharing
WiLink™ 8 in the Embedded market

| Audio Appliance | ✓ High Performance WiFi with Multi Role Multi Channel support  
|                 | ✓ Wi-Fi/Bluetooth single antenna with built in coexistence mechanism  
|                 | ✓ Built-in power management with advanced low-power modes  |

| WiFi Gateway | ✓ Multi standards supported in TI portfolio  
|             | ✓ WiLink8 propriety coexistence implementation with TI Zigbee/6lopan  
|             | ✓ WiFi Performance and unique SoftAP and multi-role support  |

| Professional WiFi Camera | ✓ Wi-Fi up to 110 Mbps (UDP) throughput with MIMO and MRC support  
|                          | ✓ Wi-Fi direct & multi-role with concurrent operation support  
|                          | ✓ Flexibility and ease of integration with high end processors and GPS  |

| Industrial | ✓ *Fully Certified* module FCC/CE/ETSI reducing production costs  
|           | ✓ *Tested and Certified for Industrial grade products*  
|           | ✓ *2.4GHz only and Dual Band (w 5GHz) modules with single Antenna*  |

| Enterprise | ✓ WiFi Pre-Certification covered by TI with enterprise security modes  
|           | ✓ High touch in market with proven IoP to industry leading devices  
|           | ✓ Ease of integration with lead OS Linux/Windows/RTOS proven solutions  |
Embedded Wireless Audio Appliance

**TI Strengths**

Add WiFi/BT/BLE to your portfolio quickly and easily with our streaming audio reference design, getting you to market faster!

Proven combination that is optimized and tested, enabling higher throughput and lower power, while minimizing your risk.

Powerful reference with TI processor Cortex-A8 @ 1 GHz and implemented Streaming Audio Protocols, Internet Radio Services etc.

---

**Market Solutions**

- **Portable Speakers**
- **Sound Bars**
- **AVRs**
- **Connectivity modules**

---

**Audio Streaming Reference Design Block Diagram**

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**Key features - complete solution for AVR**

- **DSP**
  - Best in Class Audio Processing
  - DA8xx
  - Pin compatible DSP only and Integrated ARM + DSP options
  - C67x4 DSP up to 456 MHz handles audio
  - ARM9 system controller up to 456MHz
  - Audio Processing Algorithms
    - Dolby, DTS decode and post processing
    - Differentiate with custom post-processing algorithms
    - Various algorithms offered by 3rd parties
  - Best in class C compiler and development tools

- **Sitara**
  - AM335x
  - Host Processor for HMI and Connectivity
  - Up to 1GHz Cortex-A8
  - WiFi/BT/BLE Drivers
  - Optional Graphics Engine
  - Variety of Operating Systems
    - Linux, Android, RTOS, and many more
  - Streaming Audio Protocols
    - DLNA, Airplay, iPod/Android Docking
  - Internet Radio Services
    - Pandora, Spotify, vTuner, Rhapsody

- **WiLink 8**
  - WL18xx
  - WiFi + Bluetooth + BLE
  - Highest level of Integration
  - WiFi/Bluetooth single antenna co-existence
  - Same module footprint for BT, WiFi 2.4MIMO & 5 GHz
  - FCC/IC/ETSI Certified TI Modules
  - Superior Wi-Fi Performance & Range
    - Up to 100 Mbps with 40MHz and 2x2 20MHz channels
  - Enhanced Low Power Modes for portable applications
  - Wi-Fi Direct and Multi-Channel Multi-Role support(STA + AP)
Due to fragmentation of wireless tech in the market, there is need for multi-radio systems with WiFi/Zigbee/BLE/<1GHz.

Strong demand for gateway products with operators and suppliers such as Comcast, AT&T, Verizon, Cisco etc. all getting into the gateway market.

Even with WiFi in the home, there is a demand for a separate WiFi network for security and home automation devices.

**Smart Grid Reference**

- **Key features – Smart Grid TI solution**
  - WiFi Direct and multi-role/channel
  - WiFi/Zigbee/BT/BLE co-existence TI IP
  - Single supplier for all radios
  - TI Smart Energy Reference design
  - Supports up to 10 WiFi clients
  - NFC capability using ext dongle
Wireless Professional Camera

TI Strengths

Reference platforms with partner Ambarella and TI Devinci platform DM813

Wilink8 WiFi high performance (MIMO, MRC) and Multi Role with concurrent operation makes it perfect connectivity solution (Android & iOS)

BLE and GPS, with Low power modes. designed to be “always connected” with best-in-class power consumption enabling “instant access” to network.

WiFi Camera Reference

Key features - Integrated IP’s, High perf

- Integrated BLE for remote control
- Position and location from GPS
- Integrated & tested SW solution with Ambarella and TI DM83x
- Supports IOS and Android connection at the same time

Contact information

Eran Zigman

Market Solutions

WL8 integrated on the A7-L platform

- Full WiLink drivers available to support WiFi, BT/BLE
- Also available GPS with Jorjin module, drivers integrated.

Texas Instruments
Thanks

Q & A