SimpleLink MCU Platform One environment.

Unlimited potential.







New SimpleLink[™] MCU platform One environment. Unlimited potential.



End-to-end development resources



TI Wireless Broad Portfolio Solutions for every Industry Challenge







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Why Sub-1 GHz? **Better** range, Lower power, More robust, Diverse Applications.



What's new with Bluetooth 5? Longer range, <u>Higher</u> speed, <u>More</u> data, <u>Diverse</u> Applications.





Why Thread?

The best way to connect and control products in the home





2.4 GHz Wireless Technology Summary

Grid infrastructure, Factory automation, Building automation



Sub-1 GHz Wireless Technology Summary

Grid infrastructure, Building automation



CC13x0/CC26x0 Introduction

SimpleLink[™] Sub-1 GHz, BLE, Dual-Band and Multi-Protocol Ultra-low power Wireless MCUs







CC26x0/CC13x0 One architecture, several technologies



SimpleLink[™] CC13x0/CC26x0 Architecture



Key Features

CC1310

Sub-1 GHz only

CC1350

Dual-band (Sub-1 GHz + BLE)

CC2640R2F

Bluetooth 5

<u>CC2650</u>

2.4 GHz Multi-Protocol

Ultra-low Power Consumption

- 61 µA/MHz ARM Cortex M3
- 8.2 µA/MHz Sensor Controller
- 1 µÅ sleep with retention and RTC
- 5.9 mA RX (single-ended)
- 6.1 mA TX (single-ended)
- <3uA while running 10 ADC samples
- 4x4, 5x5, and 7x7 mm packaging (2.7x2.7 WCSP for CC2640R2F)

Wireless MCU Key Features

- Autonomous sensor controller engine
- 1.7 1.95 V or 1.8 3.8 V supply range
- 275 KB of non-volatile memory
- 128 KB Flash
- 20 KB RAM + 8 KB Cache

RF Key Features

- Output power;
 - +5 dBm (BLE)
 - +14 dBm (Sub-1GHz)
- Sensitivity;
 - -97 dBm @ 1Mbps, -103 dBm @ 125Kbps (BLE)
 - -110 dBm (50kbps GFSK, Sub-1GHz)
- · Pin compatible and SW compatible across protocols and frequency bands



CC13x2/CC26x2 Introduction SimpleLink[™] Sub-1 GHz, Dual-Band and Multi-Protocol Ultra-low power Wireless MCUs







CC26x2/CC13x2

One architecture, several technologies



SimpleLink[™] CC13x2/CC26x2 **Architecture** 2.4 GHz Sub-1 GHz



Key Features

More memory

- 608 KB non-volatile memory
- 352kB kB Flash memory + 256 KB ROM
- 80kB SRAM
- Device is equivalent to a 512kB device (including ROM)

Improved RF

- Sub-1GHz, 2.4 GHz and true dual band support with dedicated RF ports
- +20 dBm power amplifier
- · Narrowband long range
- Support for 169 MHz

More peripherals

- Enhanced security (hardware acceleration, AES-128/256, SHA-256, ECC, RSA-2048)
- 1 Additional UART

Lower power

- Faster start-up times
- · Standby current as low as 0.9uA
- Ultra-low power sensor controller with current consumption as low as 1 uA during operation

More processing power

- ARM Cortex M4F core (1-cycle MAC, SIMD, floating-point)
- 7x7mm pin compatible with CC1310 / CC2640R2F





<SimpleLink Multi-Band CC1352R Wireless MCU>

Features	Benefits					
Low power Sensor controller (2 MHz mode) - 0.8uA standby current Enhanced features - Multi-band, Sub-1 GHz + 2.4 GHz support (including BLE connected, Thread, Zigbee) - 352KB flash, 256KB ROM, 80KB RAM - Security - AES-256, ECC and RSA public key, SHA2-512, True Random Number Generator (TRNG) Comprehensive software offering - SimpleLink CC13x2 SDK with code portability to SimpleLink Platform devices - Sensor to Cloud – End-to-end solution enabling cloud connectivity for long range, Sub-1 GHz networks	Long battery life (10 years on a coin cell) Future proof and expand applications Fast time to market					
Key Applications Image: Thermostat Image: Electronic lock Simoke / heat detector Image: Door / window lock Motion detector Image: Electric meter Water meter Gas meter	Radio Redio Redio					
Product folder LaunchPad Development kit CC13x2 Software Development Kit Resource Explorer E2E online support forum	Cortex®-M4F SCE Memory Peripherals / modules UCC REA with an and an an and an an and an an an and an and an an an and an an an and an					

🔱 Texas Instruments



<SimpleLink Sub-1 GHz CC1312R Wireless MCU>

Features	Benefits						
Low power Sensor controller (2 MHz mode) O.8uA standby current Enhanced features SazKB flash, 256KB ROM, 80KB RAM Security - AES-256, ECC and RSA public key, SHA2-512, True Random Number Generator (TRNG) Comprehensive software offering SimpleLink CC13x2 SDK with code portability to SimpleLink Platform devices Ti 15.4-Stack – Complete Sub-1 GHz star network solution Security - End to end colution and und end end end end end end end end with a solution	 Long battery life (10 years on a coin cell) Expanded applications Fast time to market 						
$\begin{array}{c} \label{eq:GHZ} \hline \end{tabular} \begin{tabular}{c} \label{eq:GHZ} \end{tabular} $	Radio Radio						
Product folder LaunchPad Development kit CC13x2 Software Development Kit Resource Explorer E2E online support forum	Cortex®-M4F SCE Memory Peripherals / modules LCC.RBA with the former source to the former so						





<SimpleLink Multi-Standard CC2652R Wireless MCU>

Features	Benefits					
Low power - Sensor controller (2 MHz mode) - 0.8uA standby current Enhanced features - Multi-standard support for Bluetooth 5, Thread, and Zigbee - 352KB flash, 256KB ROM, 80KB RAM - Security - AES-256, ECC and RSA public key, SHA2-512, True Random Number Generator (TRNG) Comprehensive software offering - SimpleLink CC26x2 SDK with code portability to SimpleLink Platform devices	Long battery life (10 years on a coin cell) Future proof and expand applications Fast time to market					
Key Applications Thermostat Electronic lock Smoke / heat detector Door / window Motion detector	Radio					
Tools & Resources Product folder LaunchPad Development kit CC26x2 Software Development Kit Resource Explorer E2E online support forum	Cortex/®-M4F SCE Memory Beripherals / modules					





<SimpleLink Bluetooth low energy CC2642R Wireless MCU>

Features	Benefits					
Low power - Sensor controller (2 MHz mode) - 0.8uA standby current Enhanced features - Support for Bluetooth 5 long range and high speed - 608 KB non-volatile memory (352KB flash, 256KB ROM – with embedded BLE stack, 80KB RAM) - Security - AES-256, ECC and RSA public key, SHA2-512, True Random Number Generator (TRNG) Comprehensive software offering - SimpleLink CC26x2 SDK with code portability to SimpleLink Platform devices - Fully qualified BLE stack	 Long battery life (10 years on a coin cell) Expand applications Fast time to market 					
Key Applications	ARM®					
Tools & Resources Product folder LaunchPad Development kit CC26x2 Software Development Kit Resource Explorer E2E online support forum	Cortex®-M4F SCE Memory Peripherals / modules Peripherals / modules The set of the set o					





SimpleLink[™] Sub-1 GHz **Sensor to Cloud** Long Range Solution **€**





SimpleLink Sub-1 GHz Sensor to Cloud What is it? Why is it needed?

SimpleLink[™] Sub-1 GHz Sensor to Cloud Long Range Solution

Fast time to market. Long range applications to the cloud. Flexible gateway solution

What is it? An end-to-end solution providing cloud connectivity for sending and receiving sensor data over a long range Sub-1 GHz network.

Why is it needed? The Sub-1 GHz band is very fragmented with no single dominant technology that provides an end-to-end solution for devices to access the cloud over a Sub-1 GHz network. The TI Sensor to Cloud is this solution.

Key Features

- IEEE 802.15.4g star networking solution
- AES-128 encryption and message integrity code
- Frequency hopping enabling robustness
- Scalable cloud integration
- Certification-ready design





SimpleLink Sub-1 GHz Sensor to Cloud Choose your solution

Learn more

TI-RTOS-based wireless MCU gateway

- Fully integrated wireless gateway
- Low power solution
- Unprecedented scalability with the SimpleLink MCU platform
- Cost-optimized solution

Supported operating system: TI-RTOS

SimpleLink Wi-Fi CC3220

ARM® Cortex®-M4

Order now

- Dedicated network processor and additional application MCU
- Chip-level Wi-Fi Alliance certification
- 256K RAM or 256K RAM + 1 MB Flash and advanced security features
- Linux-based processor gateway Enables enhanced user interface Ability to run concurrent applications Support for various wireless technologies like Bluetooth® low energy, Wi-Fi, zigbee®, Thread, etc. Wired and wireless gateway option Supported operating system: Linux Sitara AM335x Scalable ARM® Cortex®-A8 from 300 MHz - 1 GHz 3D graphics option for enhanced user interface Premium secure boot option . Dual-core PRU-ICSS Order now Learn more





Sensor to Cloud Long Range Solution

SimpleLink[™] Sub-1 GHz

Sensor to Cloud Gateway Connections

SimpleLink[™] Sub-1 GHz Sensor to Cloud Long Range Solution











SimpleLink[™] Wi-Fi[®] CC3220

Enabling Security for IoT Products







Target Applications in Industrial Market



Customized Power Modes for Every Use Case



* Estimated, actual life time depends on customer system configurations





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SimpleLink[™] Wi-Fi[®] Wireless MCU CC3220 - NWP



Network Processor

The network processor offloads networking and internet tasks from the application MCU

Wi-Fi Core

- 802.11 b/g/n at 2.4GHz
- Modes: STA, AP (4 stations), Wi-Fi Direct®
- Wi-Fi Security: WEP, WPA, WPA2
- Provisioning: AP mode, SmartConfig™, WPS
- Throughput: 16 Mbps UDP, 13Mbps TCP

Built In Power Management

- Integrated DC2DC
 - V_{Bat}: **2.1** V to **3.6** V
 - Pre-regulated:1.85 V
- · Low power modes
 - Shutdown(1uA)
 - Hibernate (4.5uA),
 - Low power deep sleep (135uA)
 - Rx beacon listen (37mA)

Internet & Application Protocols

- Embedded webserver (HTTPs)
- Supports IPv4 & IPv6 TCP/IP Stack
- 16 Sockets (6 TLS v1.2 / SSL 3.0)

Powerful HW Crypto Engine

Enables fast secured Wi-Fi and internet connections within 200mSec

Industrial Temp

Supports -40°C to +85 °C

SimpleLink[™] Wi-Fi[®] Wireless MCU CC3220 - MCU



Applications MCU

Physically separate MCU and memory, dedicated to the user's applications.

Programmable Applications MCU

- · Peripheral drivers and Libraries
- Supports no-OS or TI-RTOS/Free-RTOS

Application-dedicated Memory

- 256KB RAM
- Additional 1MB XIP Flash (CC3220SF)

Rich Set of Peripherals & Timers

- 27 I/O pins with flexible muxing options
- 4x General purpose (with PWM support)

Enhanced Features

Rich multi-layer set of security features, within a single chip, to help protect IP and data

- TI Root-of-trust and TI Certificate catalog
- File System Security
- Cloning protection
- Initial secure programming
- Secure content delivery
- Enabling Applications with HomeKit Technology
- OTA support
- SimpleLink™ Connected MCU Platform support



SimpleLink[™] Wi-Fi[®] Family Simple Integration, Powerful Features

CC32xx - Wireless Microcontroller (SoC)



SimpleLink™ Wi-Fi® Family – Gen2 Raising the Bar - New Features Highlights



Gen 2 San	Larger on-chip memory AP mode support of 4 STAs				Embedde System S IPv6 and	bedded IP and File stem Security			> 3 Enl	 > 30% longer battery life Enhanced provisioning 				
_	Device	Wii-Fi Network Processor	Wireless MCU (SoC) Integrated ARM Cortex M4	Application Memory	Internet Protocols supported	# Secure Sockets (TLS/SSL)	# STA supported, in AP Mode	Wi-Fi + Internet level Security	Application level Security	SimpleLink MCU Ecosystem Support	HomeKit & WAC support	Moo without Antenna	dules with Antenna	
	CC3220SF	•	•	256KB RAM + 1MB XIP Flash	IPv6 + IPv4	6	4	•	•	•	•	•	•	
n 2	CC3220S	•	•	256KB	IPv6 + IPv4	6	4	•	•	•	•	•	•	
Ge	CC3220R	•	•	256KB	IPv6 + IPv4	6	4	•		•				
	CC3120R	•			IPv6 + IPv4	6	4	•		•		•		
n 1	CC3200	•	•	256KB	IPv4	2	1	•				•		
Gel	CC3100	•			IPv4	2	1	•				•		





SimpleLinkTME4

May 2017 **Connected MCU**

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SimpleLink MSP432 MCUs | Wireless Host MCU

Ultra-low-power High-precision ADC High performance Ethernet MAC+PHY

Differentiate **wireless sensor nodes** with highest precision integrated ADC and local analytics Develop **smarter industrial gateways** with simplified ETH design and multiwireless protocol attach

Seamlessly add SimpleLink wireless connectivity options: BLE, Wi-Fi, or Sub-1 GHz, with SDK Plugins to **build differentiated industrial wireless networks, from sensor to gateway to cloud**



MSP432E4 Target applications



MSP432E4 in Building Automation







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Getting started with SimpleLink Ethernet MCUs



SimpleLink Ethernet LaunchPad[™] development kit - \$19.99 www.ti.com/tool/msp-exp432e401y

SimpleLink MSP432E4 SDK www.ti.com/tool/simplelink-msp432-sdk

SimpleLink Ethernet MCU production silicon \$9.00 in 1ku www.ti.com/product/msp432e411y www.ti.com/product/msp432e401y



SimpleLink Academy dev.ti.com/MSP432E4-Simplelink-Academy





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Thank you



