



CSR102x Bluetooth Smart Product Line Overview

Speaker name

Speaker title

Speaker employing entity

Date

CSR102x Overview



Qualcomm® Bluetooth® Low Energy

Terminology clarification

In this document you will notice a number of references are made to **Qualcomm Bluetooth Low Energy SDK**. While this is the official name of the SDK moving forward, within the actual SDK you will see it currently referred to as **CSR μEnergy**. In addition, many of the directories and folders may have the **CSR μEnergy SDK** naming convention. Please be assured these are the same thing.

Thank you for your understanding while we take the necessary steps to phase out the use of **CSR μEnergy** across our product lines.

CSR102x: optimised Bluetooth® Low Energy SoC



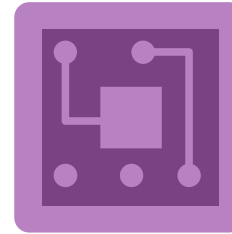
Industry-leading Bluetooth 4.2 radio

- 4x hardware link controllers
 - Lower average current consumption and independent application execution
- Lower power active radio
- Support for Bluetooth 4.2 optional features, including:
 - Secure connections
 - Data length extensions
 - Bluetooth Low Energy Privacy 1.2
 - Connection-oriented channels



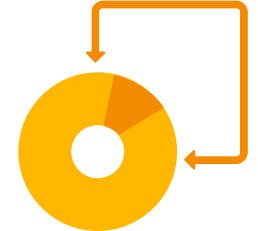
Low-power embedded CPU and subsystem

- Powerful 16-bit 16MHz RISC low power CPU
- Variety of peripherals and hardware algorithm acceleration
- Independent coprocessor for isolated execution
- Flexible memory variants with OTP and integrated and external flash



System cost reduction and compact design

- Minimum eBOM
 - 10 components in total - no external memory, single crystal plus passives
- Integrated G.722 and G.711 codecs with I²S and PDM input options
- Direct 50Ω connection to antenna
- Multiple package options for low-cost board design

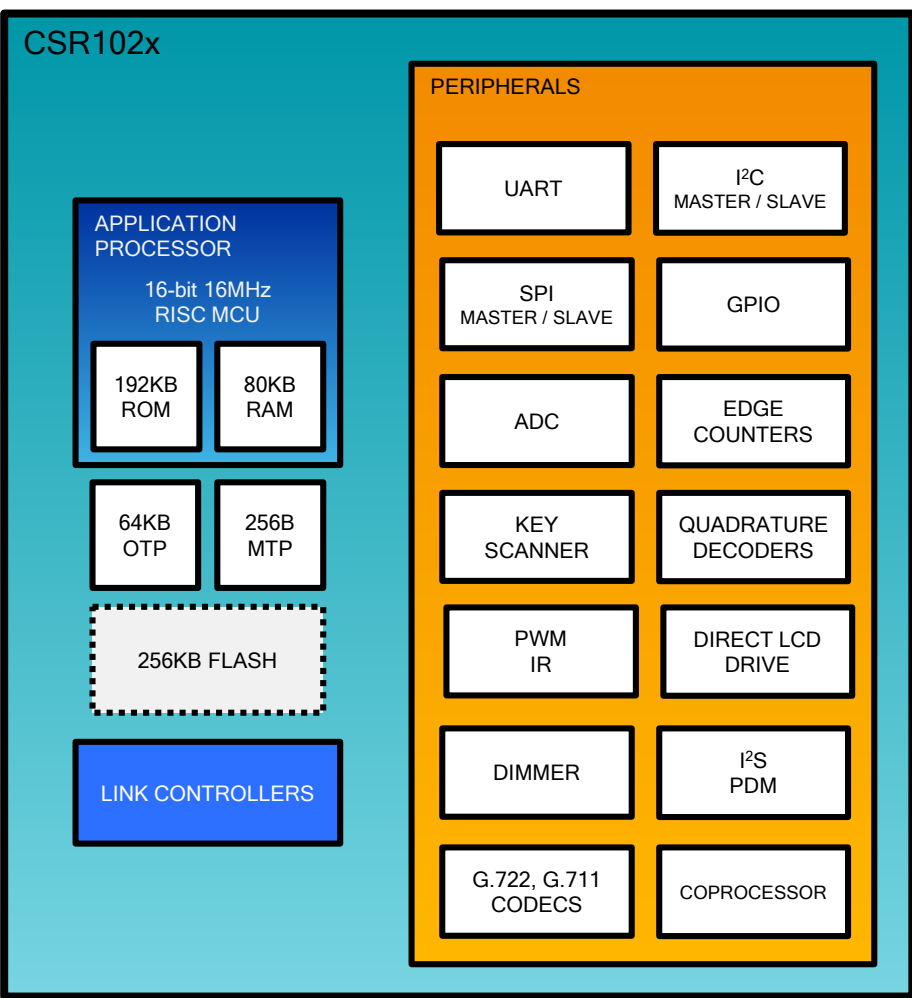


Comprehensive software package

- Easy to use development environment and SDK
- Integrated Bluetooth 4.2 stack
- SDK includes extensive set of example applications, such as
 - Most of the ratified Bluetooth GATT profiles
 - AirFuel™ wireless charging
 - Over-the-air Update
- CSRmesh™ support

What is CSR102x?

Summary



Industry leading Bluetooth 4.2 radio and link controller

Hardware link controllers for lowest power Bluetooth low energy 4.2 radio sub-system. Supports: Data length extensions, L2CAP connection-oriented channels, up to 4 simultaneous independent connections

High performance RF

RX sensitivity: -92dBm, max TX output: +4dBm
Active TX/RX current (total system): <5mA¹

Typical total system current consumption¹

Beacon (100ms): 89µA
Fast advertising (60ms, 20byte payload): 150µA
Voice command continuous streaming (including digital mic): ~3mA

Application processor

Optimised 16bit 16MHz RISC embedded CPU
Memory: 256KB flash (CSR1024 and CSR1025 only), 64KB OTP, 192KB ROM, 256B MTP (NV storage), 16KB Data RAM, 64KB Code Cache / Data RAM, support for external (Q)SPI flash up to 16MBytes

Interfaces and peripherals

I²C, UART, SPI/Q-SPI, ADC (2ch, 10-bit SAR), PWM, IR, 2x edge counters, 15/33/37 GPIOs, 4x high-speed quadrature decoders, hardware key scanning, wake-on any input, direct LCD, low-power 8051-based co-processor

Audio support

Stereo I²S input and output, digital microphone PDM input
Integrated G.722, G.711 (A-law/µ-law companding) codecs

Security

Signed and encrypted application images
Debug bus lock
Hardware encryption acceleration
Unique chip ID

Direct battery connection

0.9V - 3.6V (CSR1020 and CSR1021)
1.4V - 3.6V (CSR1024 and CSR1025)

CSR102x family

Package variants



All-purpose cost-optimized general platform

- 15 GPIO
- 1 AIO
- QFN 36
- 5×5×0.65mm
- 0.5mm pitch
- Pin compatible with CSR1024



High I/O count cost-optimized variant

- 37 GPIO
- 2 AIO
- QFN 60
- 8×8×0.65mm
- 0.5mm pitch
- Pin compatible with CSR1025



All-purpose upgradeable platform

- 15 GPIO
- 1 AIO
- LGA 36
- 5×5×0.75mm
- 0.5mm pitch
- 256KB internal flash



High I/O count upgradeable platform

- 33 GPIO
- 2 AIO
- LGA 60
- 8×8×0.75mm
- 0.5mm pitch
- 256KB internal flash

CSR102x SDK



CSR102x: Accelerating software development

Comprehensive Software Development Kit (SDK)

Structured architecture supports rapid reuse

- Low level drivers for each function
 - e.g. PWM, GPIO, ADC
- Peripheral apps showing driver and API use
 - e.g. UART, timers, direct test mode
- Connection manager abstracts low level firmware GATT API
 - Provided as source code
 - Easy to reuse and create new Bluetooth GATT profiles

Example applications for many of the published Bluetooth SIG profiles

Custom profiles and new use cases

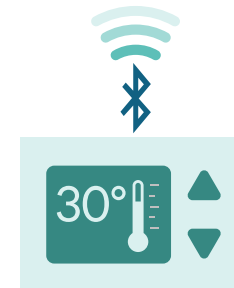
- AirFuel™ wireless charging profile, Serial-over-GATT, Over-the-air update



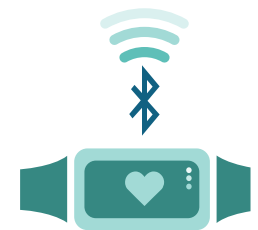
Wireless gaming mice



Wireless keyboards



Thermostats



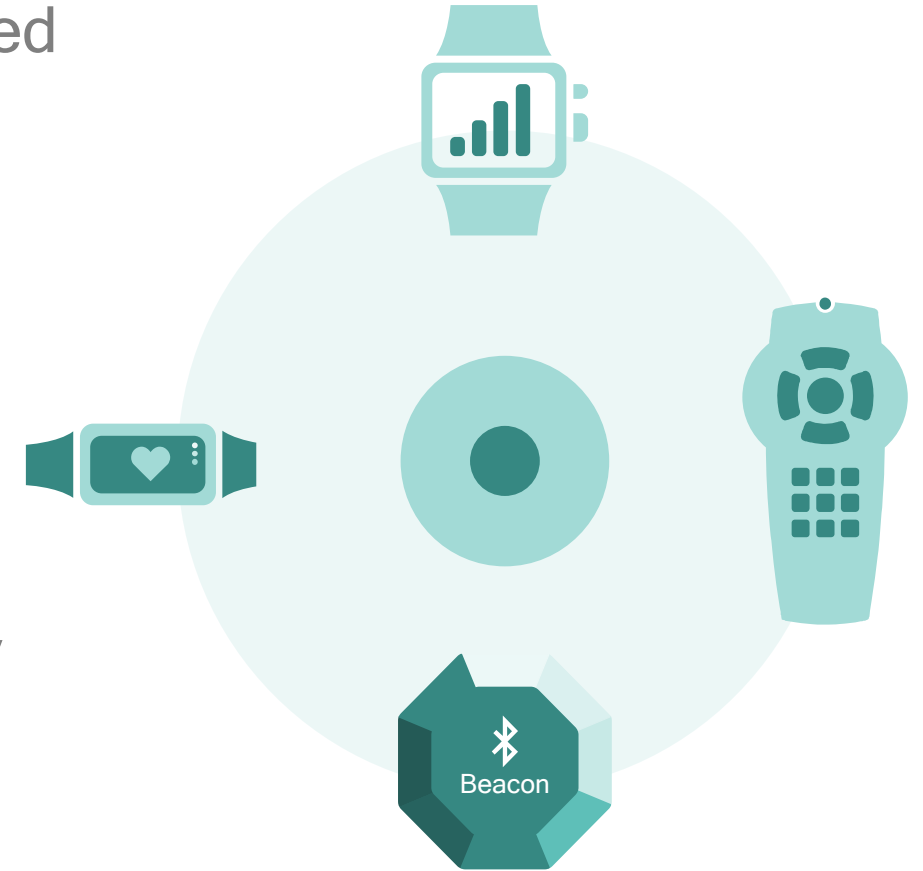
Heart rate monitor

CSR102x: Accelerating product development

Turn-key example applications

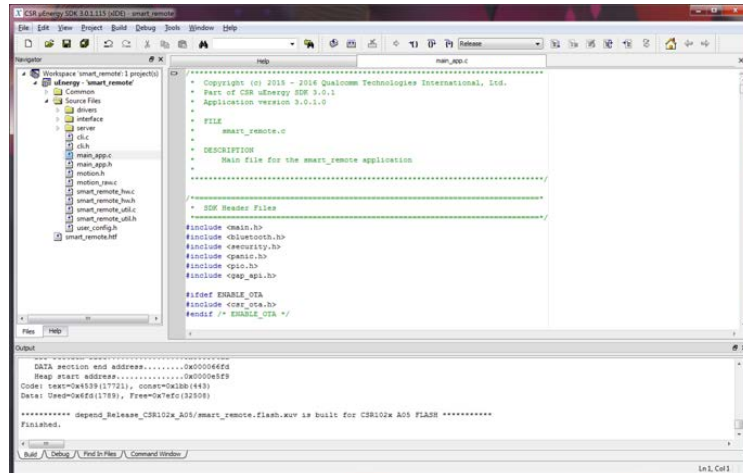
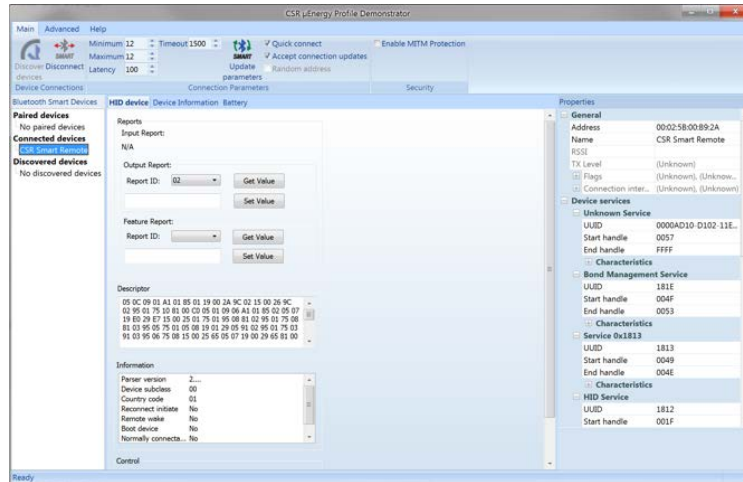
Most of the SDK example applications can be reused with little to no changes in the real products

- Cover various use cases
 - e.g. security tag, heart rate monitor, keyboard, mouse, beacon
- Stress-tested as real products
 - For example, keyboard application is stress-tested on real hardware for days of continuous connection-disconnection cycles and millions of actual key presses
- Includes ready-made complex applications
 - Smart remote control
 - Smart watch



Designing device applications with CSR102x

Comprehensive software package



Qualcomm® Bluetooth® Low Energy SDK

- Comprehensive IDE with debugging tools and gcc-based toolchain

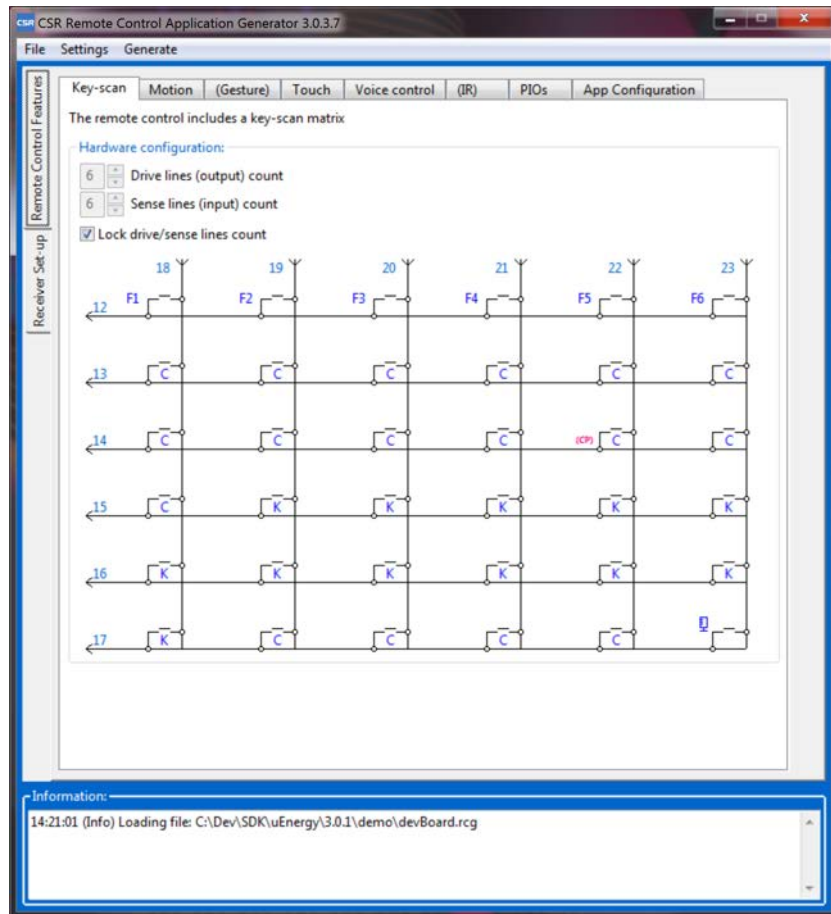
Example applications

- Cover most of the ratified GATT profiles
- Designed and stress-tested for end products
- QRD designs - smart remote, smart watch, keyboard and others
- Peripheral interface and API examples
- Over-the-air update, AirFuel™ wireless charging and other additional use cases
- Connection Manager library to simplify Bluetooth application design
- Host profile test applications for PC and mobile

Mass-production support libraries and tools

Designing input technology with CSR102x

Visual configuration tool for remote control applications

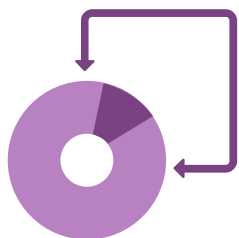


- Supports quick and easy setup and configuration of the remote control applications
 - Design key matrix and assign HID codes to keys
 - Configure peripherals and GPIO allocation
 - Set up audio input and voice codec
 - Add and configure enhanced algorithms
 - “Airmouse” motion library
 - IR database management
 - Customise Bluetooth options
 - Device name, connection parameters etc.
- Generates SDK project with on-chip application source code

CSR102x SDK: Core and Packages

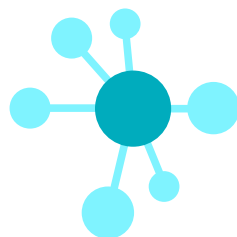
Segment specific package deliverables

Available from <https://www.csrsupport.com/uEnergy/Software> requires registration and Activation Code



Core SDK

Firmware
Profile Demonstrator
GATT Server/Client
Serial Port Server/Client
Alert Tag
Security Tag
Time Client
Peripherals



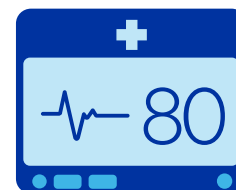
Generic

A4WP PRU
A4WP PTU
Alert Client
ANCS
Beacon
Environment Sensor
Security Tag
Time (Client)



HID

Keyboard
Mouse
Smart Remote



Health and Fitness

Smart Watch
Cycling Speed/Cadence
Running Speed/Cadence
Health Thermometer
Heart Rate
Weight Scale,
Glucose
Blood Pressure



Automotive

Keyless entry system
Multifunction Steering wheel
TPMS

Developer resources



Development kits

Bluetooth® Smart Development Kits

CSR102x Development Kits:

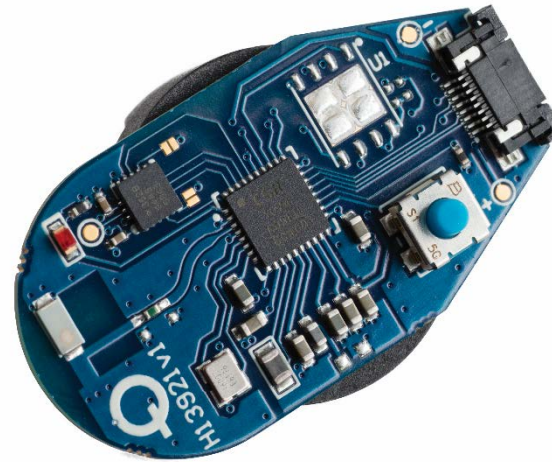
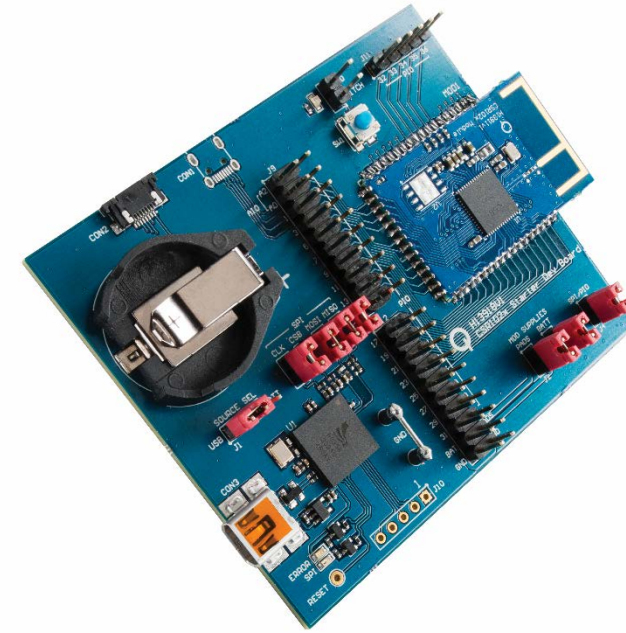
Starter Development Board

Professional Development Board

Application Boards

IoT Development Board

Node Development Board



CSR102x: Application plug-in boards



Sports watch

DB-uEnergy-AB-10244-1A SRP \$49

- Low power 1.26" memory LCD
- Buttons
- Digital microphone
- 6-axis motion sensor
- GPS
- NFC with payment support
- Barometer
- Magnetometer
- Ambient light sensor
- Vibrator
- LED
- Additional SPI flash



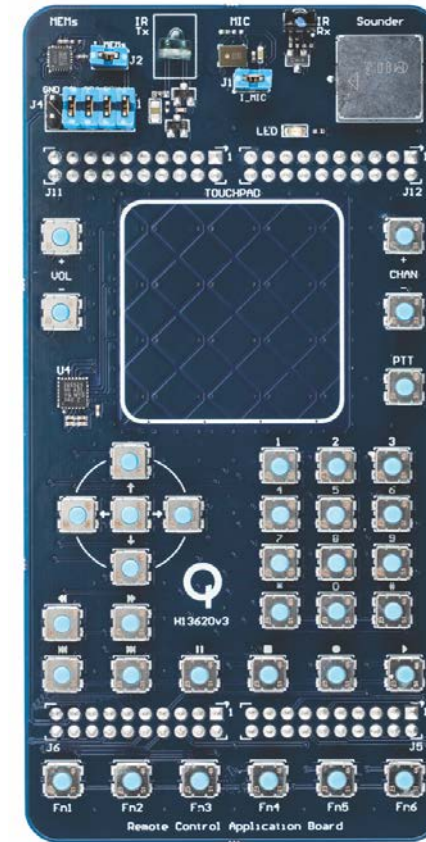
Application source code is included with SDK.



Smart remote control

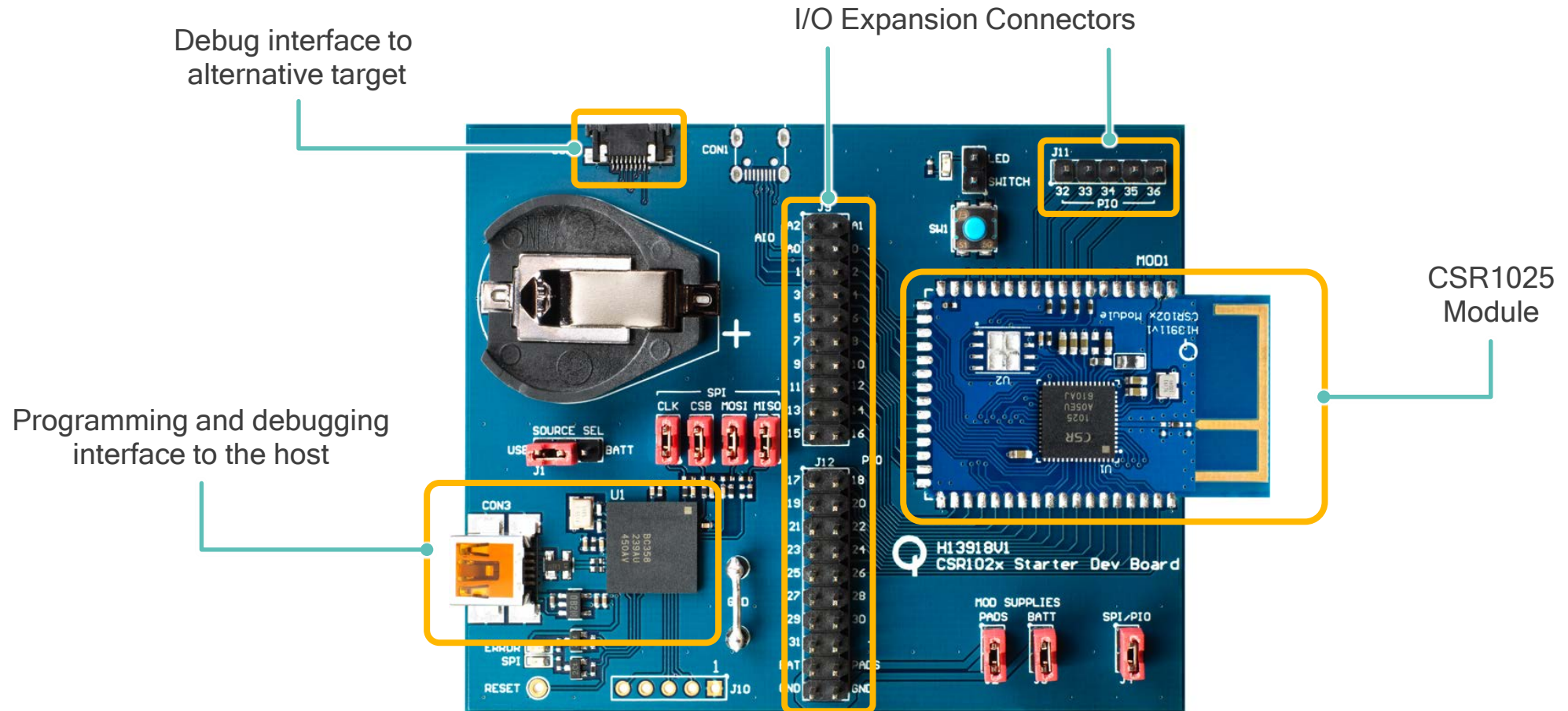
DB-uEnergy-AB-10243-1A SRP \$49

- Buttons
- Touchpad
- Digital microphone
- 6-axis motion sensor
- IR transmitter and IR receiver
- Buzzer
- LED



Starter Development Kit

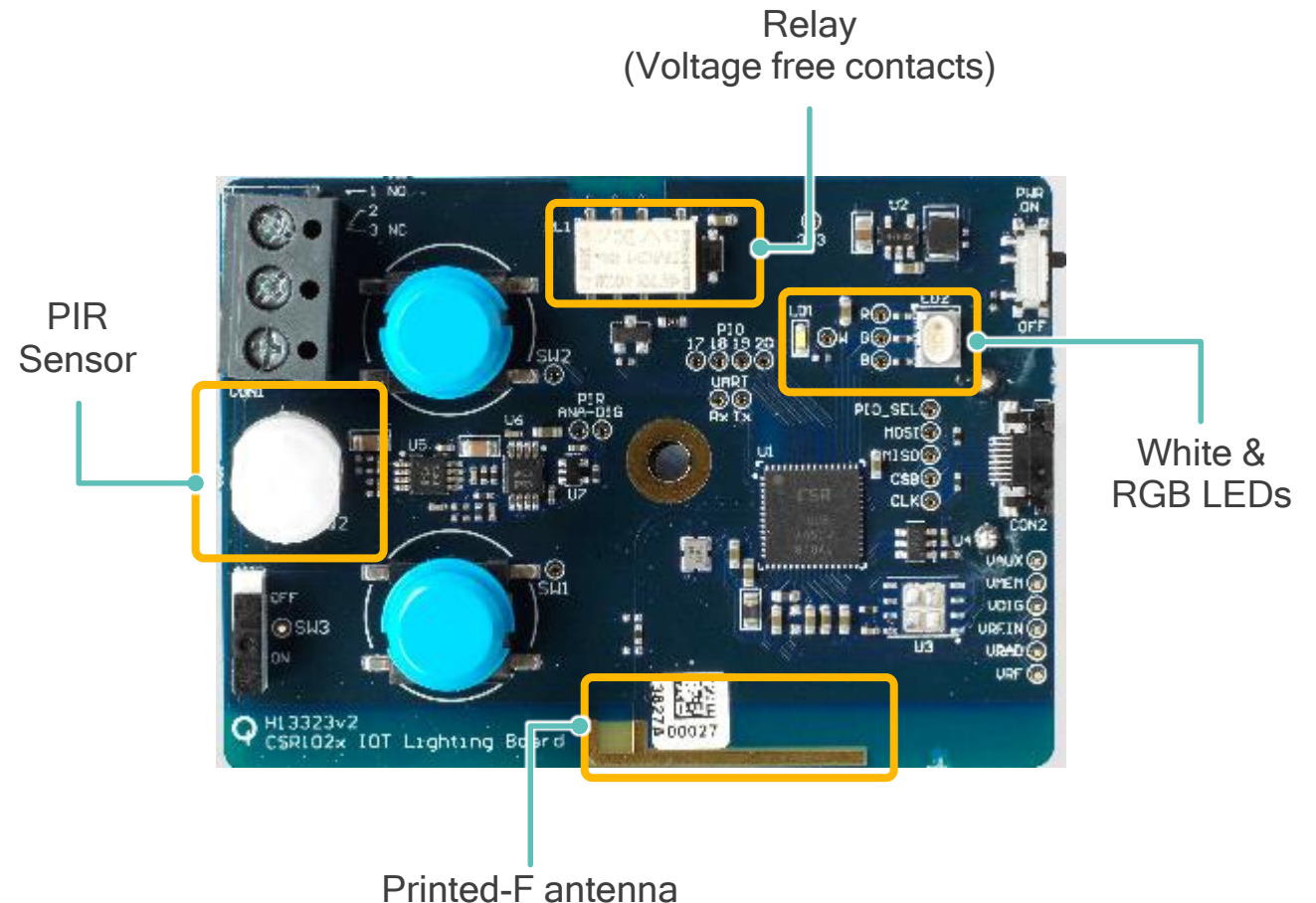
Mass market development platform **DK-CSR1025-10285-1A SRP \$99**



IoT Development Kit

Builds on CSR1010 version **DK-CSR1025-10280-1A SRP SRP \$299**

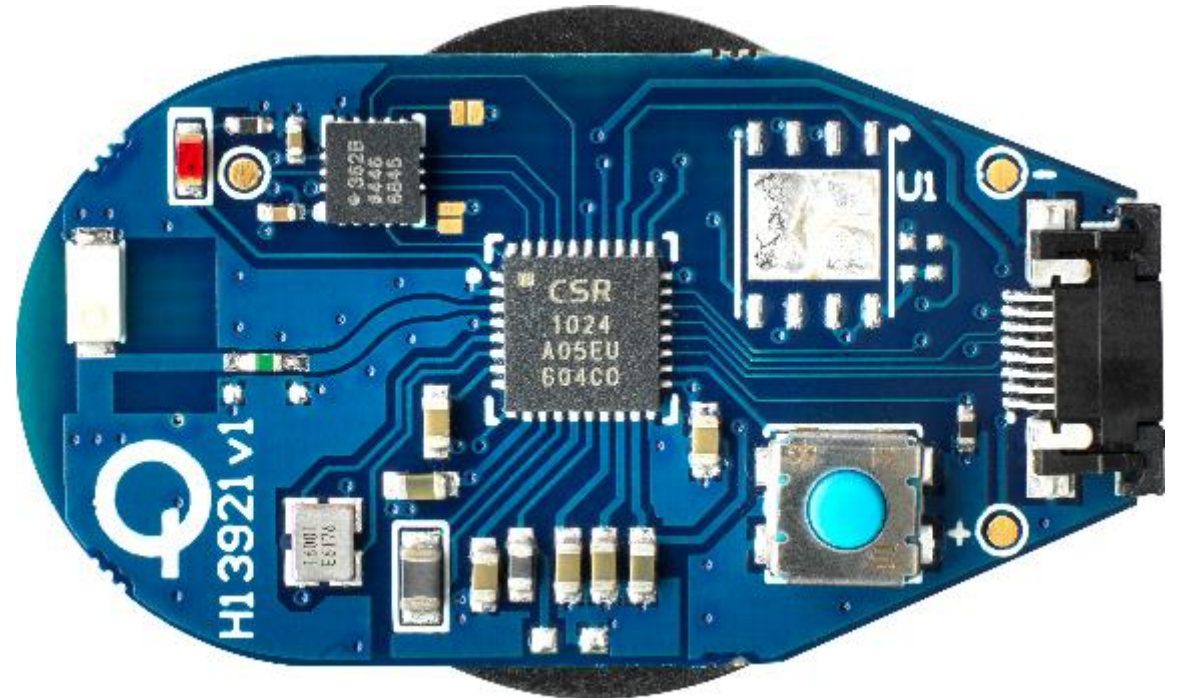
- 3 x development boards included
- White & RGB LEDs
- PIR sensor
- Control relay
- External Flash (option)
- Printed F antenna
- Single crystal
- Activation code enables access to SDK
- Intended for use with CSRmesh 2.1



Bluetooth node Development Kit

Add on board **DK-CSR1024-10284-1A** SRP \$29

- Setup Guide
- Indication LED and button
- Small form factor
- Motion sensor
- Coin cell battery operated
- Access to SDK not included with this kit
- SDK access enabled via purchase of these kits:
 - Starter Dev Kit
 - IoT Dev Kit
 - Professional Dev Kit



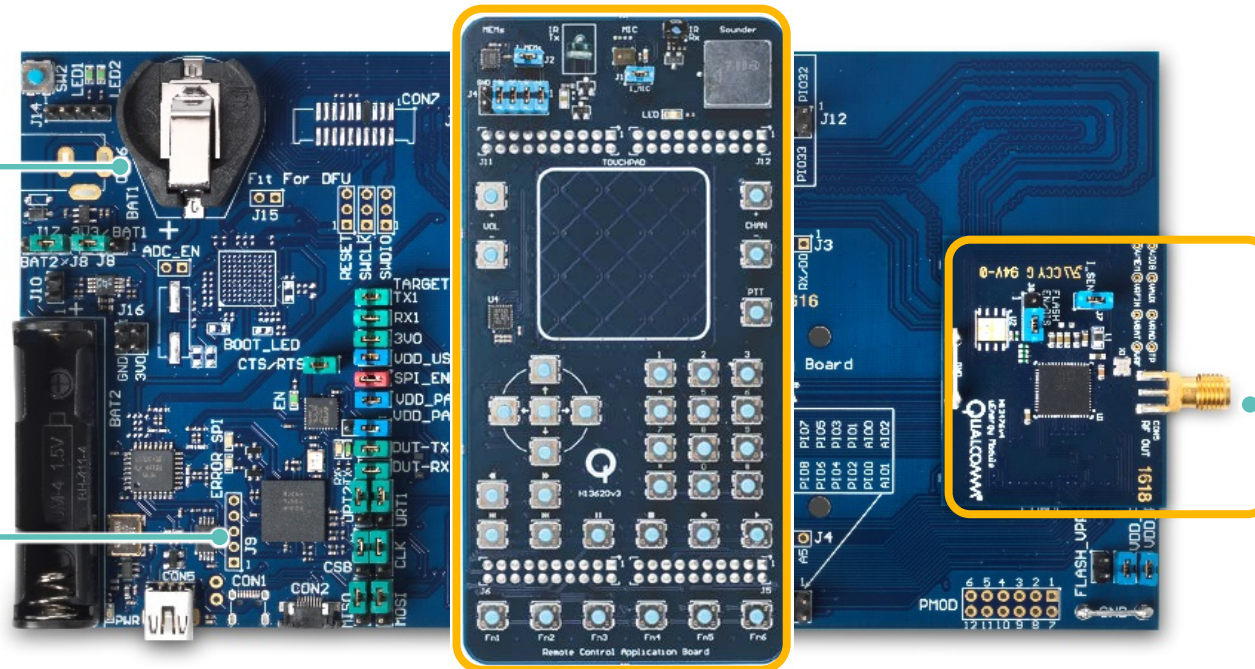
CSR102x: Professional Development Kit

Modular approach. Part Number **DK-uEnergy-PB-10242-1B** SRP \$199



Power Supply
and Control

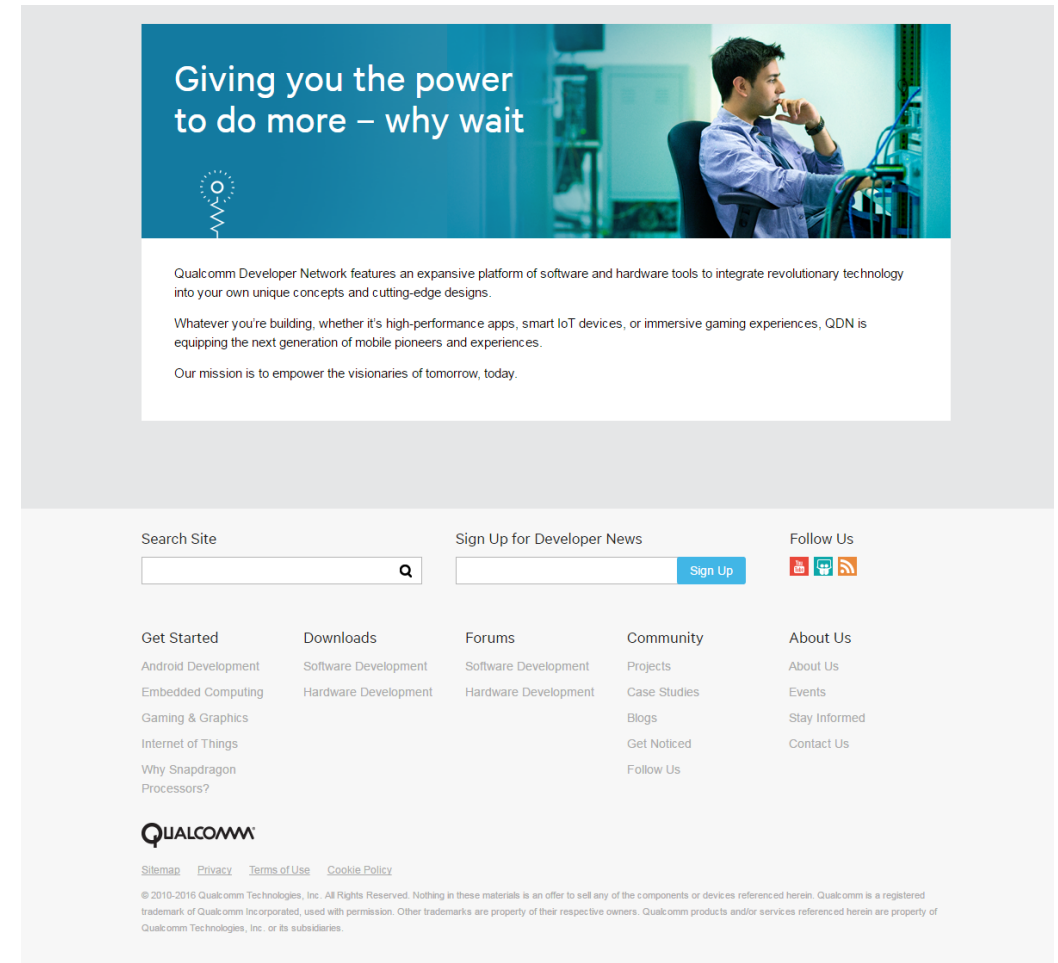
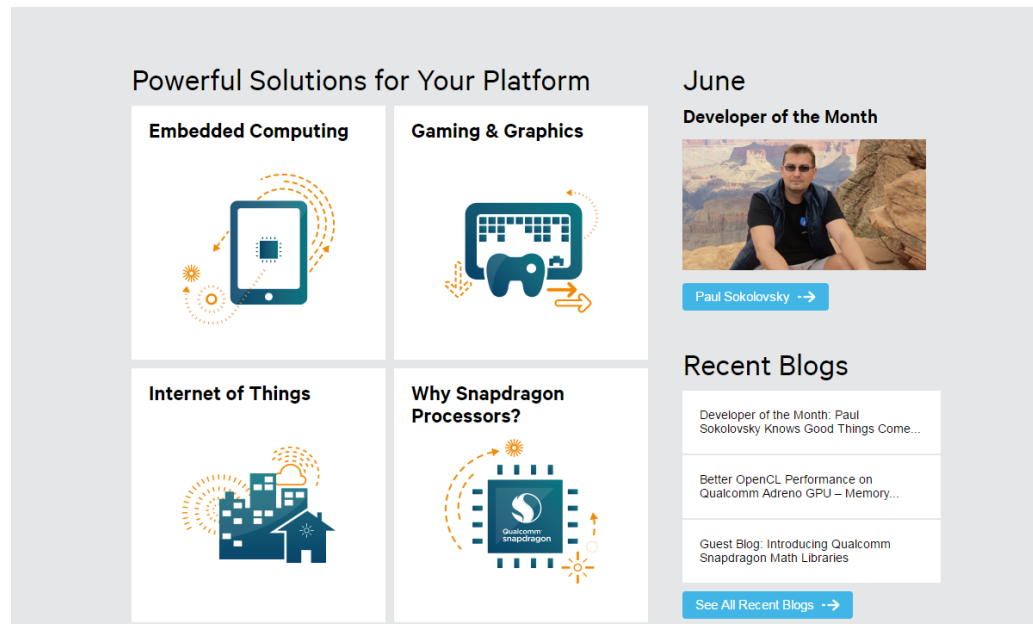
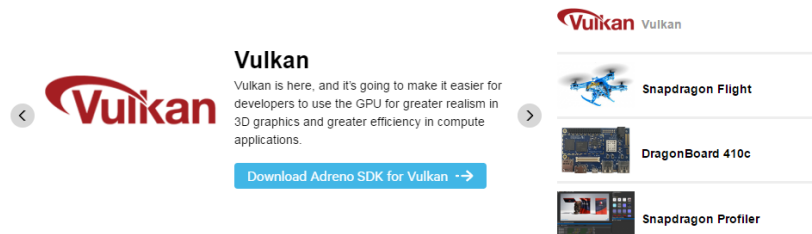
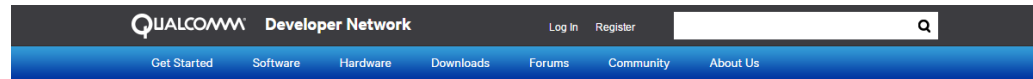
Programming
Interface



Pluggable
Chip Module
(included in the kit)

Developer support

Additional information can be found on QDN at developer.qualcomm.com



Thank you

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