Integrated single-mode and dual-mode Bluetooth connectivity SoCs for the Internet of Things
The CSR102x product family is optimized for IoT applications including wireless remote controls, smart watches, home automation solutions, and beacons. Where balancing performance, battery life, and cost is critical, the CSR102x products bring extensive and flexible I/O capabilities designed to simplify integration and eliminate expensive interface components.

### CSR102x SoC Product Family

**CSR1020**
- All-purpose cost-optimized general platform
- 15x GPIO
- 1x AIO

**CSR1020A06-IQQX-R**
- 80KB RAM; no flash
- QFN 36-lead package
- 5 x 5 x 0.65mm; 0.5mm pitch
- Pin compatible with CSR1024

**CSR1021**
- High I/O count cost-optimized variant
- 37x GPIO
- 2x AIO

**CSR1021A06-IQQS-R**
- 80KB RAM; no flash
- QFN 60-lead package
- 8 x 8 x 0.65mm; 0.5mm pitch
- Pin compatible with CSR1025

**CSR1024**
- All-purpose upgradeable platform
- 15x GPIO
- 1x AIO

**CSR1024A06-ILLP-R**
- 80KB RAM
- 256KB internal flash
- LGA 36-lead package
- 5 x 5 x 0.75mm; 0.5mm pitch

**CSR1025**
- High I/O count upgradeable platform
- 33x GPIO
- 2x AIO

**CSR1025A06-ILLQ-R**
- 80KB RAM
- 256KB internal flash
- LGA 60-lead package
- 8 x 8 x 0.75mm; 0.5mm pitch

### CSR102x Specifications

**Bluetooth Version**
- Bluetooth v5.0 compliant with Bluetooth mesh support

**MCU**
- 80MHz embedded RISC co-processor

**DSP**
- 40MHz, 24-bit embedded DSP

**Memory**
- 8Mb internal ROM, 56KB RAM
  - External SQIF support up to 64Mb

**Bluetooth**
- TX/RX 9.0dBm RF transmit power w/ level control
- On-chip 6-bit DAC over a dynamic range >30 dB;
- -90 dBm receive sensitivity; Integrated channel filters
- (No external power amplifier or TX/RX switch required)

**Interfaces**
- UART, I^2^C, SPI, USB 2.0, Up to 22 PIOs
- 22x AIOs (can be configured as digital I/O as required)
- SPI debug and programming interface,
- 7x PWM blocks: 4 dedicated to LED[3:0] 3 assignable to PIO
- 1x digital microphone channel (CSR5342/5348)

**Power Consumption**
- Standby: <0.15 mA, Operating: <1 mA

**Operating Voltage**
- 1.8V / 2.8V / 3.2V configurable
- LDO linear regulator

**Operating Temperature**
- -30°C to +85°C

### CSR102x Features

- Bluetooth 5.0 compliant stack with Bluetooth mesh support
- Direct 500Ω connection to antenna
- Low BoM count with single crystal operation
- Integrated channel filters
- 4x hardware link controllers
- Variety of integrated hardware accelerators and peripheral interfaces
- Wake-up from interrupt on any input pin in low power sleep modes
- Time-stamping hardware blocks
- Key matrix scanning block
- Integrated audio codecs & audio interfaces
- On-chip temperature and battery monitoring
- PWM hardware blocks for LED patterns and motor control
- Cryptographic accelerators & application security features
- Bluetooth low energy SDK with IDE and debugging tools

### CSR102x Block Diagram

**Peripherals**
- UART
- PC MASTER/SLAVE
- SPI MASTER/SLAVE
- GPIO
- ADC
- 2x EDGE COUNTERS
- KEY SCANNER
- 4x QUADRATURE DECODERS
- 5x PWM
- IR
- DIRECT LCD DRIVE
- DIMMER
- PCM I^2^C PDM
- G722 CODEC
- G711 CODEC
- 8051 COPROCESSOR

Qualcomm CSR102x is a product of Qualcomm Technologies, Inc. and/or its subsidiaries.

Materials are subject to change without notice.
## CSR102x Development Boards and Kits

### CSR102x STARTER Development Kit
- **Contents**
  - Target board
  - Mini-USB cable and flexible cable
  - Prototyping leads
  - Setup Guide
  - Activation code for latest SDK
- **Applications**
  - Heart rate sensor, Security tags

### IOT Development Kit
- **Contents**
  - 3x IoT target boards
  - Programmer board
  - Mini-USB cable & flexible cable
  - Setup Guide
  - Activation code for latest SDK
- **Applications**
  - Lighting, Home automation, Sensor networks

### BLUETOOTH NODE Development Kit
- **Contents**
  - Bluetooth node target board
  - Setup Guide
- **Applications**
  - Beacon, Proximity tag, Footpod form factor

### PROFESSIONAL Development Kit
- **Contents**
  - Professional target board
  - Pluggable CSR1025 module
  - Setup Guide
  - Mini-USB cable & flexible cable
  - Prototyping leads
  - Activation code for latest SDK
- **Applications**
  - Auto keyless entry, Fitness & Health, Keyboards and mice, Beacons, Alert tags

### SPORT WATCH Application Board
- **Contents**
  - Application plug-in board
  - Setup Guide
- **Applications**
  - Wearables

### SMART REMOTE Application Board
- **Contents**
  - Application plug-in board
  - Setup Guide
- **Applications**
  - Accessories

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Qualcomm CSR102x Starter Development Kit, Qualcomm IoT Development Kit, CSRmesh, Qualcomm Bluetooth Node Development Kit, Qualcomm Professional Development Kit, Qualcomm Sport Watch Application Board and Qualcomm Smart Remote Application Board are products of Qualcomm Technologies, Inc. and/or its subsidiaries.

To learn more visit: [qualcomm.com](https://www.qualcomm.com) or [developer.qualcomm.com](https://developer.qualcomm.com)
CSR101x SoC Product Family

The CSR101x product family consists of five product variants designed to develop devices that use Bluetooth low energy. The CSR101x series provides a built-in processor to run the customer application as well as the qualified Bluetooth single mode stack and radio. CSR101x chips can run directly from a 3V coin cell, and connect directly to a PCB antenna.

**CSR101x Specifications**

**MCU**
- 16MHz 16MIPS XAP application processor (RISC) with hardware link controller

**Bluetooth Version**
- Bluetooth v4.1 specification compliant

**Memory**
- 128KB Memory: 64KB RAM & 64KB ROM

**Bluetooth TX/RX**
- +9.5dBm max RF transmit power
- -93dBm receive sensitivity
- No external power amplifier or TX/RX switch required

**Interfaces**
- UART, I²C, PIO controller, 4x PWM modules
- 2x hardware quadrature decoders
- 12x or 32x re-assignable GPIOs plus dedicated WAKE pin
- 10-bit SAR ADC/DAC with 1x or 3x AIO
- 32kHz or 16MHz clock output

**Current Consumption**
- <20mA peak current
- 5µA in deep sleep
- 900nA in dormant mode

**Operating Voltage**
- 1.8 to 4.3V

**Operating Temperature**
- -40°C to +85°C
- -30°C to +105°C (CSR1010D)

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**Features**

- Bluetooth 4.1 low energy radio with direct single-ended 50Ω antenna connection
- 50kB of user app space
- Switch-mode power supply and linear regulators
- Up to 4.4V direct supply connection for Li-poly batteries
- Wake-up interrupt and watchdog timer
- Time-stamping hardware
- 1 µA integrated key scanning hardware
- Peripheral (I²C) and debug interfaces (SPI)
- Integrated Bluetooth 4.1 qualified stack
- On-chip temperature and battery monitoring
- PWM hardware blocks for LED patterns and motor control
- Master and slave operation, including encryption
- Software development kit with C compiler and debug tools
CSR101x
Development Boards and Kits

CSR101x STARTER Development Kit

The Qualcomm® CSR101x Starter Development Kit is a simplified yet comprehensive kit designed for developers and designers who need to get prototypes of their Bluetooth low energy products up and running fast, and then move quickly to production.

Applications: Supports multiple applications

Contents

• Target board
• Mini USB cable
• Setup Guide, SDK & other docs on CD-ROM
• Activation code for latest SDK

PROXIMITY BEACON Development Kit

The Qualcomm® Proximity Beacon development kit provides a simplified yet comprehensive development platform for product designers who want to rapidly develop and prototype Bluetooth beacons in real world use cases.

Applications: Industrial, Retail, Home automation

Contents

• 3x Beacon development boards
• 3x plastic beacon enclosures
• USB programmer & interface cables
• Example beacon applications
• Activation code for latest SDK

ENVIRONMENTAL SENSOR Board

The Qualcomm® Environmental Sensor board is designed to help developers create next generation MEMS-enabled Bluetooth devices. This plug-in expansion board is designed to work with the CSR101x Starter Development Kit or the CSR1011 development board and provides Gyroscopic, Magnetic, Temperature, Pressure, Humidity and Acceleration MEMS sensors.

Applications: Home automation, Wearables

Contents

• Target board which includes the following sensors:
  • Accelerometer (Analog Devices ADXL 362)
  • Temperature (STMicroelectronics STTS751)
  • Pressure (Saw Components T5400)
  • Magnetometer (Aichi Steel AMI304E)
  • Humidity (Sensirion SHT21)
  • Angular rate (InvenSense ITG3050)

To learn more visit:
developer.qualcomm.com
or qualcomm.com
The CSRB534x series of Bluetooth Stereo dual-mode SoCs (System-on-Chip) features a rich Bluetooth v4.1 compliant platform and offers a powerful, versatile and cost-effective solution, making it ideal for a variety of next generation wireless and VR (virtual reality) gaming accessories and embedded modules.

CSRB534x Specifications

**Bluetooth Version**
- Bluetooth v4.1 specification compliant

**MCU**
- 80MHz embedded RISC co-processor

**DSP**
- 40MHz, 24-bit embedded DSP

**Memory**
- 8Mb internal ROM, 56kB RAM
- External SQIF support up to 64Mb

**Bluetooth TX/RX**
- 9.0dBm RF transmit power with level control from on-chip 6-bit DAC over a dynamic range >30 dB; -90 dBm receive sensitivity
- Integrated channel filters
- No external power amplifier or TX/RX switch required

**Interfaces**
- UART, I²C, SPI, USB 2.0, Up to 22x PIOs
- 22x AIOs (can be configured as digital I/O as required)
- SPI debug and programming interface
- 7x PWM blocks: 4 dedicated to LED[3:0] 3 assignable to PIO
- 1x digital microphone channel (CSRB5342/5348)

**Power Consumption**
- Standby: <0.15 mA, Operating: <1 mA

**Operating Voltage**
- 1.8V / 2.8V / 3.2V configurable
- LDO linear regulator

**Operating Temperature**
- -20°C to +70°C (CSRB5341/5342)
- -40°C to +85°C (CSRB5348)

Features

- Integrated application processor with internal ROM, a power management subsystem and LED drivers in a SoC IC
- Programmable DSP for exclusive use of customer applications
- 22 programmable digital I/O & 22 analog I/O
- Optional serial flash interface
- On-chip balun (50Ω impedance in TX and RX modes)
- Integrated 1.35V switch-mode regulator
- All internally required regulators integrated on chip
- Integrated Li-Ion battery charger with instant-on (CSRB5342/48 only) or dry-cell battery technology (CSRB5341)
- Dedicated SDK includes xIDE & market leading Bluetooth stack
- OTA/USB updates for future proofing products
- 7 hardware PWM controllers, 4 on dedicated LED pads
- Keyscan hardware
- Requires minimum external components

CSRB534x Block Diagram
The Qualcomm CSRB534x Development Boards and Kits are compliant platforms for development of next-gen wireless gaming controllers and more. They are designed to provide for low latency control and ultra-low power operation with enhanced connection topologies for improved smart device and accessory support.

### CSRB5341 Development Kit
- **Contents:**
  - CSRB534x development board
  - CSRB5341 QFN example board
  - Micro and mini USB leads
  - Setup Guide
- **Applications:** Wireless gaming controllers, TV remote controls, VR accessories, toys and modules

### CSRB5342 Development Kit
- **Contents:**
  - CSRB534x development board
  - CSRB5342 BGA example board
  - Micro and mini USB leads
  - 560mAh Li-ion battery
  - Setup Guide
- **Applications:** Wireless gaming controllers, TV remote controls, VR accessories, toys and modules

### CSRB5348 Development Kit
- **Contents:**
  - CSRB534x development board
  - CSRB5348 BGA example board
  - Micro and mini USB leads
  - 560mAh Li-ion battery
  - Setup Guide
- **Applications:** Embedded modules, Industrial and home automation, EPOS, data loggers, barcode readers, metering devices and systems with large interface requirements

### Where to Buy
- Futureelectronics.com
- Maxtek-icrep.com.tw
- Kanematsu.co.jp
- Nexty-ele.com
- Oscokorea.com
- Unquest.co.kr
- Wpgholdings.com/wpig
- Kr.wpgholdings.com
- AITgroup.com
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- Btc.macnica.co.jp
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- Fortune-co.com
- CEACSZ.com.cn
- Codico.com
- Digikey.com
- Excelpoint.com
- Fortune-co.com

**Locate Distributors:** [https://www.qualcomm.com/contact/distributors/distributor-list](https://www.qualcomm.com/contact/distributors/distributor-list)

Qualcomm Technologies International, Ltd. works with some of the world’s leading module manufacturers to create pre-certified solutions that reduce time to market and meet technical qualifications and quality requirements. Our third party module suppliers will be able to help you with all pricing, detailed features and purchasing inquiries.

**Contact Module Suppliers:** [https://developer.qualcomm.com/hardware/bluetooth/ble-module-suppliers](https://developer.qualcomm.com/hardware/bluetooth/ble-module-suppliers)
Qualcomm® Bluetooth Mesh

Qualcomm Bluetooth mesh is a protocol designed to run over existing Bluetooth low energy compatible devices, helping to add mesh networking capability for a security focused Bluetooth wireless network for IoT. Bluetooth mesh networking supports many-to-many (m:m) device communications and helps developers and system integrators create IoT solutions where tens, hundreds, or thousands of devices need to securely communicate with one another.

Features

- Designed to ensure that all levels of the technology are comprehensively specified with an extensive stack solution that helps define the low-level radio up to the high-level application layer
- Reliability: Supports inherently self-healing networks with no single points of failure
- High capacity for scalability of industrial grade solutions:
  - Up to 32,000 nodes
  - Up to 127 hops per message
  - High speed radio
  - Small packet size
- Designed to provide industrial-grade security features for protection against known attacks
- Multicast support for groups, ideal for lighting
- Designed to directly control, configure and interact with many Bluetooth low energy devices from a mobile device
- Supports a wide variety of control and automation applications, retail advertising, commercial and industrial opportunities, and new IoT use cases like lighting, indoor positioning and asset tracking.
- Use CSR102x IoT Development Kit for Qualcomm Bluetooth Mesh

Qualcomm Bluetooth Mesh Capabilities

Messages are sent to individual devices; groups; or all devices.

For example:

“Switch on living room lights”
“Lower thermostat”
“Switch off all devices”

Multiple controllers supported:

- Android and iOS devices, smart home hubs and smart wearables
- Cloud connected devices

The underlying principles of CSRmesh and Qualcomm Bluetooth mesh are the same, although there are changes in the Protocol stack and packet structure. The table below helps to highlight the differences.

Learn more about Qualcomm Bluetooth Mesh

https://www.qualcomm.com/solutions/networking/features/csr-mesh

Qualcomm Bluetooth Mesh is a product of Qualcomm Technologies, Inc. and/or its subsidiaries.