Qualcomm

Qualcomm® QCC5100 Series Bluetooth Audio SoCs

Extremely low-power, premium-tier SoCs designed for compact, feature-rich wireless earbuds, headsets and speakers.

QCC5100 is a family of breakthrough Bluetooth® audio System-on-Chips (SoCs) based on a low-power architecture. This series is designed to meet consumer demand for robust, high quality, wireless listening experiences in smaller devices with low power consumption for longer audio playback.

QCC5100 series architecture is engineered for low-power performance. Power consumption can be reduced by up to 73 percent compared to our earlier Qualcomm® CSR867x, and is optimized for demanding use cases so as to support longer battery life in virtually all operating modes.

The flexibility provided by the programmable applications processor and audio DSPs helps manufacturers to differentiate their products with new features. The SoCs are designed to support cloud-based voice assistants through the voice assistant's respective cloud services.

The QCC5100 series features ultra-low-power digital active noise cancelling (ANC) technology integrated in the SoC, designed to eliminate the need for an external ANC solution. This feature can help reduce the complexity, cost and PCB space needed for adding ANC to earbuds, hearables and other portable audio devices.

With Qualcomm TrueWireless™ Stereo technology, the QCC5100 family is engineered to deliver robustness and a sophisticated user experience. Our latest Qualcomm TrueWireless Mirroring improves robustness even further, offering dynamic bud-to-bud role-swapping with Bluetooth address handover, and also evens out power distribution between both earbuds.

Highlights

Quad-core processing

Quad-core processing[1] architecture provides two application processors and two DSP units, designed to allow for an extensive degree of parallel processing, supporting the delivery of user experiences not possible using previous generation devices.

Ultra-low power

The QCC5100 series is designed for unprecedented efficiency in power consumption compared to our previous technology. These SoCs support the development of very small form factor, richly-featured earbuds that can be used for up to 10 hours with a 65mHA battery.[2]

High quality wireless audio

Qualcomm® aptX™ Audio, aptX HD and aptX Adaptive audio technologies are designed to deliver consistent, high-quality audio streaming over Bluetooth. The internal 24-bit end-to-end audio pipeline and high-performance DACs support high resolution audio through the audio processing chain.

Qualcomm TrueWireless Mirroring

The Qualcomm® QCC514x devices feature Qualcomm TrueWireless Mirroring, a new topology that combines the best of our eavesdropping and relay solutions to deliver robustness while also supporting role-swapping and bud-to-bud Bluetooth address handover, dynamically with virtually no audio interruption.

Innovative, customizable platform

The QCC5100 audio platform includes a comprehensive and customizable Audio Development Kit (ADK) and several example designs that help to address the key challenges faced when developing products.

[1] Quad-core processing is available on Qualcomm® QCC5121, Qualcomm® QCC5126 and Qualcomm® QCC5127 variants
[2] Example use case stereo headset decoding A2DP stream, SBC at 350kbps/48 kHz. audio processing in by-pass

Qualcomm QCC5100, Qualcomm QCC5121, Qualcomm QCC5126, Qualcomm QCC5127, Qualcomm QCC514x, Qualcomm CSR867x, Qualcomm TrueWireless and Qualcomm aptX are products of Qualcomm Technologies, Inc. and/or its subsidiaries.

Features

- Extremely low-power design
- Qualcomm® QCC512x qualified to Bluetooth 5.1; QCC514x qualified to Bluetooth 5.2 (LE Audio ready)
- 2Mbps Bluetooth low energy (LE) support
- 4mm x 4mm Ultra-small form factor enabling highly miniaturized earbuds
- Dual-core 32-bit processor application subsystem
- Dual-core Qualcomm® Kalimba™ DSP Audio subsystem (Total quad-core processor[1] architecture, supporting complex use cases)
- Embedded ROM + RAM and external Q-SPI Flash
- Integrated PSRAM for audio buffering[2]
- High performance, low-power audio codec suited to high resolution audio use cases
- 2-ch 98dBA headset class D
- 2-ch 99dBA line inputs (single-ended) 192kHz 24-bit I2S & SPDIF interfaces
- Fully programmable digital ANC – no PCB size penalty and ultra low-power
- Designed to support digital assistants with minimal integration effort
- Designed for reduced eBoM through highly integrated SoC design
- Button press of wake-word activated including on-board voice activity detection
- Flexible software platform with powerful new IDE support
- Designed to support aptX Adaptive, backward compatible with aptX and aptX HD
- Designed to support Qualcomm TrueWireless Stereo and Qualcomm TrueWireless Mirroring
- Integrated battery charger supporting internal mode (up to 200 mA) and external mode (up to 1.8 A)

[1] Quad-core processing is available on QCC5121, QCC5126 and QCC5127 variants
[2] Integrated PSRAM on QCC5126 only; QCC5127 supports external PSRAM

QCC5100 Block Diagram

* Integrated PSRAM on QCC5126 only
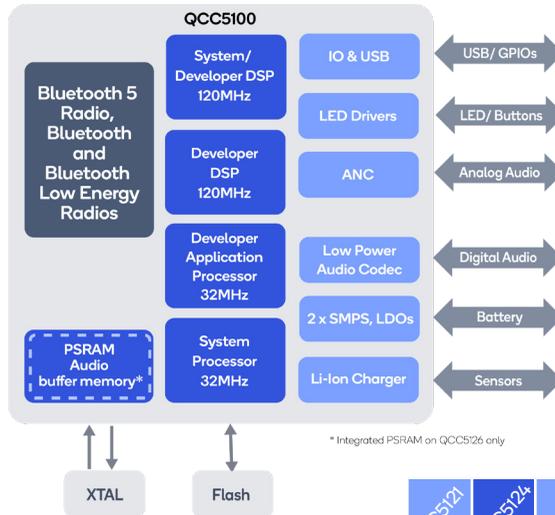
	QCC5121	QCC5124	QCC5125	QCC5126	QCC5127	QCC5141	QCC5144
Support for Digital Assistant - Push to Talk	✓	✓	✓	✓	✓	✓	✓
Support for Digital Assistant - Voice Activated	✗	✗	✗	✗	✗	✓[4]	✓[4]
Support for Qualcomm TrueWireless Mirroring	✗	✗	✗	✗	✗	✓	✓
Bluetooth 5.2 qualified (LE Audio ready)	✗	✗	✗	✗	✗	✓	✓
Digital ANC - FeedForward/Feedback/Hybrid	✓	✓	✓	✓	✓	✓	✓
Support for aptX Adaptive	✓	✓	✓	✓[3]	✓[3]	✓[4]	✓[4]
Support for aptX Voice	✗	✗	✗	✗	✗	✓[4]	✓[4]
Power Consumption (A2DP streaming)	~6ma	~6ma	~10ma	~6ma	~6ma	~5ma	~5ma

[3] For stereo headsets only   [4] For wireless earbuds only

QCC5100 Specifications

Bluetooth	Bluetooth 5 including 2 Mbps Bluetooth LE Single ended antenna connection with on-chip balun and Tx/Rx switch
Audio DSP	Dual 120MHz Kalimba audio DSP cores Flexible clock speed from 2MHz up to 120MHz
Application Subsystem	32-bit firmware processor 32-bit 32/80MHz developer processor
Memory	80KB program RAM, 256KB data RAM **(QCC512x)** 112KB program RAM, 448KB data RAM **(QCC514x)**
Interfaces	UART, 2x Bit Serializers (I2C/SPI), USB 2.0, SDIO, QSPI, NOR flash, up to 55x PIO
Power Management	Integrated power management unit (PMU) Dual switch-mode power supply (SMPS)
Battery Support	Integrated battery charger supporting internal mode (up to 200 mA) & external mode (up to 1.8 A)

QCC5100 Target Applications

- Bluetooth Earbuds
- Bluetooth Headphones
- Bluetooth Headsets
- Bluetooth Hearables
- Bluetooth Portable Speakers