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, designed to meet consumer demand for robust, high quality, wireless listening in smaller devices with longer audio playback.

QCC5100 series is engineered for low-power performance, and is optimized for demanding use cases so as to support longer battery life in virtually all operating modes.[1]

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

All QCC5100 series SoCs feature integrated ultra-low power Qualcomm® Active Noise Cancellation (ANC), reducing PCB area and supporting ANC in small form factors. Additionally, Qualcomm® QCC514x and Qualcomm® QCC515x include Qualcomm® Adaptive Active Noise Cancellation, designed to deliver enhanced ear comfort and performance while compensating for variations in earbud fit.

Our latest Qualcomm TrueWireless™ Mirroring is engineered to deliver robustness and a sophisticated user experience, offering dynamic bud-to-bud role-swapping with Bluetooth address handover and evening out power distribution between both earbuds.

The QCC515x is qualified to Bluetooth 5.2 with support for Isochronous channels, helping to support the forthcoming LE Audio standard and the new audio sharing use case in 2021. This SoC is being developed to offer LE Audio interoperability with our 2021 season of Premium Tier Qualcomm® Snapdragon™ based Smartphone.

[1] Comparisons are solely made against our existing technology. Battery life varies significantly based on device, settings, usage, and other factors.

Highlights

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]

Qualcomm TrueWireless Mirroring

The QCC514x and QCC515x devices feature Qualcomm TrueWireless Mirroring, a new topology that combines the best of our eavesdropping and relay solutions designed to deliver robustness while also supporting role-swapping and bud-to-bud Bluetooth address handover, dynamically with virtually no audio interruption.

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 Active Noise Cancellation

Our range of integrated digitally-programmable ANC solutions support great noise cancellation without compromising on battery life, even in ultra-small form factors. Our ANC is designed to operate smoothly across virtually all use cases, such as music listening, hands-free calling, digital assistant use and idle modes. Our superior low latency helps deliver a natural leak through experience.

Innovative, customizable platform

The QCC5100 series is designed specifically to help our customers to innovate. All variants include two comprehensively programmable DSPs, and with our Audio Development Kit (ADK) developers can create unique and differentiated products. The QCC5100 series is designed to support both button-press and wake word activated[3] voice assistants.

[2] Example use case stereo headset decoding A2DP stream, SBC at 350kbps/48 kHz. audio processing in by-pass

[3] QCC514x and QCC515x only.

QCC5100 Target Applications

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

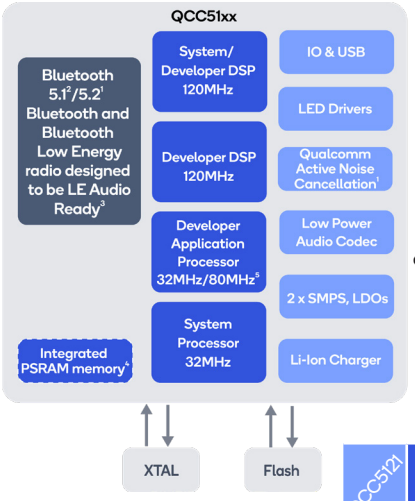
Bluetooth®

Features

- Extremely low-power design
- Qualcomm® QCC512x qualified to Bluetooth 5.1; QCC514x and QCC515x qualified to Bluetooth 5.2
- QCC515x is designed to support upcoming LE Audio standard including audio sharing use cases
- 2Mbps Bluetooth low energy (LE) support
- From 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 Qualcomm Adaptive Active Noise Cancellation – no PCB size penalty and ultra low-power[5]
- Designed to support button press or wake word activated[5] digital assistants with minimal integration effort
- Designed to help reduce eBoM through highly integrated SoC design
- Flexible software platform with powerful new IDE support
- Designed to support aptX Adaptive up to 96KHz[5], backward compatible with aptX and aptX HD
- Designed to support Qualcomm TrueWireless Stereo and Qualcomm TrueWireless Mirroring[5]
- Designed to support Qualcomm® cVc™ Echo Cancellation and Noise Suppression technologies

[1] Quad-core processing is available on Qualcomm® QCC5121, Qualcomm® QCC5126 and Qualcomm® QCC5127 variants
[2] Integrated PSRAM on QCC5126 only; QCC5127 supports external PSRAM
[5] QCC514x and Qualcomm® QCC5151 only

QCC51xx Block Diagram



1. QCC515x and QCC514x only
2. QCC512x only
3. QCC515x only
4. Qualcomm® QCC5126 only
5. Qualcomm® QCC5125 is 32MHz only

	QCC5121	QCC5124	QCC5125	QCC5126	QCC5127	QCC5141	QCC5144	QCC5151
Support for Digital Assistant - Push to Talk	✓	✓	✓	✓	✓	✓	✓	✓
Support for Digital Asst.- Wake Word Activated	✗	✗	✗	✗	✗	✓[4]	✓[4]	✓[4]
Support for Qualcomm TrueWireless Mirroring	✗	✗	✗	✗	✗	✓	✓	✓
Bluetooth 5.1/5.2 qualified	5.1	5.1	5.1	5.1	5.1	5.2	5.2	5.2
LE Audio Ready	✗	✗	✗	✗	✗	✗	✗	✓
Qualcomm ANC	✓	✓	✓	✓	✓	✓	✓	✓
Qualcomm Adaptive ANC	✗	✗	✗	✗	✗	✓	✓	✓
Support for aptX Adaptive	✓	✓	✓	✓[3]	✓[3]	✓	✓	✓[4]
Support for AptX Voice	✗	✗	✗	✗	✗	✓	✓	✓[4]
Power Consumption (A2DP streaming)	-6ma	-6ma	-10ma	-6ma	-6ma	-5ma	-5ma	-5ma

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

QCC51xx Specifications

Bluetooth	Bluetooth 5.1/5.2 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/QCC5151)
Interfaces	UART, 2x Bit Serializers (I^2C/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)

Qualcomm Kalimba, Qualcomm cVc, Qualcomm QCC512x, Qualcomm QCC5121, Qualcomm QCC5124, Qualcomm QCC5125, Qualcomm QCC5126, Qualcomm QCC5127, Qualcomm QCC5141, Qualcomm QCC5144 and Qualcomm QCC5151 are products of Qualcomm Technologies, Inc. and/or its subsidiaries.

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