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. Qualcomm® QCC515x and Qualcomm® QCC517x are designed for the future of wireless audio with support for Snapdragon Sound™ technology (our optimized chain of super audio connectivity and mobile innovations). Furthermore the QCC517x is designed to support LE Audio use cases.

The flexibility provided by the QCC5100 series' programmable applications processor and audio DSPs helps manufacturers to differentiate and deliver on their unique product vision. QCC517x SoCs are designed for concurrent support for our superior audio features and are further enhanced with AI, bringing added potential to reduce BOM, while delivering equal or better levels of performance.

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, QCC515x and QCC517x include Qualcomm® Adaptive Active Noise Cancellation (ANC), designed to deliver enhanced ear comfort and performance, while compensating for variations in earbud fit.

Our Qualcomm TrueWireless™ Mirroring is engineered to deliver a sophisticated user experience, offering dynamic bud-to-bud role-swapping and evening out power distribution between both earbuds. The QCC517x brings support for LE Audio use cases alongside traditional Bluetooth tech, for superior listening experiences in a wide range of environments.

[1] Example use case stereo headset decoding A2DP stream, SBC at 350kbps/48 kHz. audio processing in by-pass
[2] QCC514x, QCC515x and QCC517x only.

Highlights

Ultra-low power

The QCC5100 series is designed for unprecedented efficiency in power consumption and support the development of very small form factor, richly-featured earbuds that can be used for up to 16 hours with a 65mAh battery[1]. QCC517x SoCs are optimized for AI and deliver double the compute power compared to the previous generation devices, at no compromise to our industry leading ultra-low power performance.

LE Audio

QCC517x is designed to support a range of LE Audio enabled use cases for earbuds, including audio sharing, broadcast, low latency gaming, and stereo recording. This dual-mode platform integrates the best of LE Audio and traditional Bluetooth to enable smooth feature adoption for real-world listening scenarios.

CD Lossless and high resolution audio

With Qualcomm® aptX™ Adaptive Audio and high-performance DACs these platforms are designed to deliver high resolution (24-bit 96kHz) and low latency audio through the Bluetooth audio processing chain. The QCC517x features CD-Lossless audio with Snapdragon Sound, designed to dynamically scale the Bluetooth connection to deliver 16-bit 44.1kHz lossless audio.

Integrated 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. QCC517x is designed to support our third-generation Qualcomm Adaptive ANC, with full-band ambient mode for strong, effective noise cancellation and a natural feeling spatial awareness of the listener's surrounding environment.

Innovative, customizable platform

The QCC5100 series is designed specifically to help our customers to innovate with 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[2] voice assistants.

QCC5100 Target Applications

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

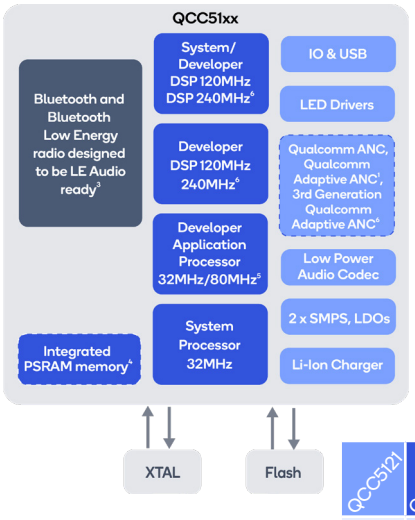
Features

- Qualcomm® QCC512x qualified to Bluetooth 5.1; QCC514x qualified to Bluetooth 5.2, and QCC515x and QCC517x qualified to Bluetooth 5.3
- QCC517x is designed to support the LE Audio standard
- 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[10] architecture, supporting complex use cases)
- Embedded ROM + RAM and external Q-SPI Flash
- Integrated PSRAM for audio buffering[4]
- High performance, low-power audio codec suited to high resolution audio use cases
- High quality 2-ch Class D analog output
- High quality 2-ch Class AB analog output
- Up to 4-ch[6] high quality line inputs.
- 192kHz 24-bit I²S & SPDIF interfaces
- Fully programmable Qualcomm Adaptive ANC – no PCB size penalty and ultra low-power[1,2,6]
- Designed to support button press or wake word activated[1,6] digital assistants with minimal integration effort
- Designed to help reduce eBoM through highly integrated SoC design
- Flexible software platform with new IDE support
- Designed to support aptX Adaptive up to 96KHz[1,6], backward compatible with aptX and aptX HD
- Designed for CD Lossless audio with Snapdragon Sound[6]
- Designed to support Qualcomm TrueWireless Stereo and Qualcomm TrueWireless Mirroring[1,6]
- Designed to support Qualcomm® cVc™ Echo Cancellation (ECNS) and Noise Suppression technologies

Ordering Information

Product	Part Number
QCC5121	QCC-5121-0-81WLNSP
QCC5125	QCC-5125-0-CSP905
QCC5126	QCC-5126-0-CSP906
QCC5127	QCC-5127-0-124CSP
QCC5141	QCC-5141-0-WLNSP94B
QCC5144	QCC-5144-0-CSP90B4
QCC5151	QCC-5151-0-WLNSP94B
QCC5171	QCC-5171-0-WLNSP99

QCC51xx Block Diagram



[1] QCC514x and Qualcomm® QCC5151 only
[2] QCC512x only
[3] QCC5151 & Qualcomm® QCC5171 only
[4] Qualcomm® QCC5126 only
[5] Qualcomm® QCC5125 is 32MHz only
[6] QCC5171 only
[7] For stereo headsets only
[8] For wireless earbuds only
[9] 3rd generation Qualcomm ANC
[10] Quad-core processing is available on all QCC5100 variants (except QCC5125)
[11] QCC514x only

	QCC5121	QCC5125	QCC5126	QCC5127	QCC5141	QCC5144	QCC5151	QCC5171
Support for Snapdragon Sound	✗	✗	✗	✗	✓	✓	✓	✓
Support for Digital Assistant - Push to Talk	✓	✓	✓	✓	✓	✓	✓	✓
Support for Digital Asst.- Wake Word Activated	✗	✗	✗	✗	✓[7]	✓[8]	✓[8]	✓
Support for Qualcomm TrueWireless Mirroring	✗	✗	✗	✗	✓	✓	✓	✓
Bluetooth 5.1/5.2/5.3 qualified	5.1	5.1	5.1	5.1	5.2	5.2	5.3	5.3
LE Audio use cases	✗	✗	✗	✗	✗	✗	✗	✓
Qualcomm ANC	✓	✓	✓	✓	✓	✓	✓	✓[9]
Qualcomm Adaptive ANC	✗	✗	✗	✗	✓	✓	✓	✓[9]
aptX Adaptive	✓	✓	✓[7]	✓[7]	✓	✓	✓[8]	✓
aptX Voice	✗	✗	✗	✗	✓	✓	✓[8]	✓
CD Lossless audio with Snapdragon Sound	✗	✗	✗	✗	✗	✗	✗	✓
Power Consumption (A2DP streaming)	~6ma	~10ma	~6ma	~6ma	~5ma	~5ma	~5ma	~4ma

QCC51xx Specifications

Bluetooth	Bluetooth 5.1[2]/5.2[11]/5.3[3] including 2 Mbps Bluetooth LE Single ended antenna connection with on-chip balun and Tx/Rx switch
Audio DSP	Dual 120MHz (240MHz[6]) Kalimba audio DSP cores Flexible clock speed from 2MHz up to 120MHz (240MHz[6])
Application Subsystem	32-bit firmware processor 32-bit 32/80MHz developer processor[5]
Memory	80KB program RAM, 256KB data RAM (QCC512x) 112KB program RAM, 448KB data RAM (QCC514x/QCC515x) 384KB program RAM, 1408KB data RAM (QCC517x)
Interfaces	UART, USB 2.0, SDIO, QSPI, 2x bit serializers (QCC512x - QCC515x), 3x bit serializers (QCC517x) (I²C/SPI), 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 QCC5125, Qualcomm QCC5126, Qualcomm QCC5127, Qualcomm QCC5141, Qualcomm QCC5144, Qualcomm QCC5151 and Qualcomm QCC5171 are products of Qualcomm Technologies, Inc. and/or its subsidiaries.

0222A

Qualcomm