Qualcomm

Qualcomm® WHS94xx USB-C Audio SoC Series

Series of single-chip USB audio SoCs designed for USB-C connected audio devices including headphones, headsets and dongles.

As smartphone manufacturers move toward slimmer, monolithic handset designs and start to remove the 3.5mm headphone jack, the USB-C connectors offer an excellent option for those who want to continue to use wired headsets and speakers.

The WHS94xx series offers three SoC options which are designed to address the premium, mid and entry-level tiers of this emerging market.

- **WHS9410** is an entry level solution designed to bring quality audio performance to lower tier headsets or dongles with up to 96kHz/24-bit audio support over the USB connection.

- **WHS9415** is designed for mid-tier USB-C headsets and USB-C to 3.5mm jack dongles, with up to 384kHz/32-bit audio support over the USB connection and very high-quality DAC output.

- **WHS9420** adds Active Noise Cancellation (ANC) support for a superior quality digital audio consumer experience over USB-C, with up to 384kHz/32-bit audio support over the USB connection and very high-quality DAC output.

Solution Highlights

Designed to be compliant with the USB-C standard

As more OEMs remove the 3.5mm jack headphone, manufacturers need to find a solution for wired headphones without needing to add batteries to the headset. The WHS94xx solutions are compliant with the USB-C standard which can help to reduce integration efforts and speed time to market.

Superior audio performance

Combines our core strengths in audio for mobile phones with audio expertise in wireless to help bring premium performance at all tiers.
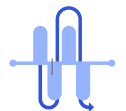
Single-chip solution optimized for ultra-small form factors

Wafer level 3.2mm CSP package available which is ideal for small form factor products including dongles and earbuds.

Integrated Active Noise Cancellation

The WHS9420 SoC offers unique integrated digital ANC support and can help to lower eBom because there is no need for a separate ANC device.
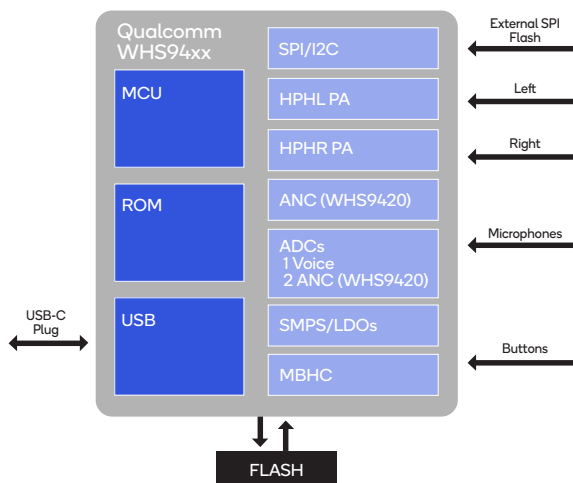
Features

- Specifically designed for digital audio on USB and USB type-C peripherals – headsets and dongles

- Designed to bring superior audio performance to the USB audio segment

- Integrated USB-C PHY up to UAC3

- Designed for extremely low power and ultra-small form factor designs

- Embedded ROM and external optional Flash

- Hi-Fi Audio quality performance and low power audio:

  - Data rate/bitrate to 384KHz/32bit (WHS9420)

  - 2-DACs up to 127dBA/-110dB THD+N (class H headphone driver)

  - 3-ADCs up to 110dBA/-100dB THD+N (1 for voice, 2 for ANC on WHS9420)

- Supports digital ANC (Feedforward, Feedback) with WHS9420

- Support for multi-button headset control

- Supports innovative use cases such as binaural recording

- USB-C "burst mode" (LPM) supports significant power consumption savings

- 3.22mm x 3.22mm WLCSP

Product	Part Number
WHS9410 SoC	WHS-9410-0-60BWLNSP-TR-02-0
WHS9415 SoC	WHS-9415-0-60BWLNSP-TR-02-0
WHS9420 SoC	WHS-9420-0-60BWLNSP-TR-02-0
WHS9410 Dev Board	65-PF991-200
WHS9415 Dev Board	65-PF991-215
WHS9420 DB (FF or FB ANC)	65-PF991-201
WHS9420 DB (Hybrid ANC)	65-PF991-202

To learn more visit: **qualcomm.com** or **developer.qualcomm.com**

WHS94xx Block Diagram

USB-C Audio Features Comparison

	WHS9410	WHS9415	WHS9420	Dual WHS9420
Connectivity	USB-C	USB-C	USB-C	USB-C
USB Audio Class Support	3.0, 2.0, 1.0	3.0, 2.0, 1.0	3.0, 2.0, 1.0	3.0, 2.0, 1.0
Power generation and management from USB VBUS	Integrated	Integrated	Integrated	Integrated
Digital active noise cancellation	No	No	Yes	Yes
Active noise cancellation implementation	No	No	FF or FB	Hybrid
USB-to-3.5mm adapter (dongle)	Yes	Yes	Yes	No
LED driver + PWM controller	1x	1x	3x (RGB)	3x (RGB)
GPIOs support for control buttons	5x	5x	5x	5x
Binaural recoding	No	Yes	Yes	Yes
DSD playback	No	Yes	Yes	Yes
Equalizer	Yes (5-band)	Yes (5-band)	Yes (5-band)	Yes (5-band)
Playback max bitrate/bitwidth	96kHz/24-bit	384kHz/32-bit	384kHz/32-bit	384kHz/32-bit
D/A THD+N (32ohm load)	-95dB	-105dB	-105dB	-110dB
D/A Dynamic Range	120dB	123dB	123dB	127dB
Max Signal (32ohm load)	1.0Vrms	1.0Vrms	1.0Vrms	2.0Vrms
A/D THD+N	-100dB	-100dB	-100dB	-100dB
A/D Dynamic Range	110dB	110dB	110dB	110dB