Qualcomm

Qualcomm® QCS400 Series Smart Audio SoCs

Designed specifically for smart audio applications with our highest level of integration yet, and enhanced with our cutting-edge Qualcomm® Artificial Intelligence (AI) Engine.

Right now, the future of home entertainment and home automation is unfolding all around us, as voice interfaces are being adopted by consumers at an incredibly fast rate.

This is driving an evolution in home audio technologies, as manufacturers seek to deliver smarter end-user experiences by improving on the voice interaction, sound quality and connectivity in smart speakers, home assistants, soundbars and AVRs. Moreover, there is a convergence of technologies across audio, connectivity and display to deliver new, all-in-one consumer experiences.

The Qualcomm QCS400 series of audio System-on-Chips (SoCs) are designed to bring a wealth of new capabilities and smart functionality to our audio portfolio and help deliver the new consumer experiences driving the voice-controlled home audio ecosystem.

These advanced SoCs are based on our high-performance, low-power architecture, with dual DSPs, our AI Engine and superior connectivity. They are designed to deliver this unique and extremely rich feature-set at our highest level of integration yet – thereby helping significantly reduce overall BOM for complex, feature rich, voice-supported home audio products at a range of tiers.

The QCS400 series SoCs are designed for innovation with flexibility across various levels of processing power, scalable connectivity options and machine learning capabilities that product developers can use to generate new and customized experiences.

Highlights

Ultimate audio experiences

QCS400 is designed to provide truly superior audio performance, with support for Dolby Atmos and DTS:X immersive home audio, Qualcomm® DDFA™ amplifier technology and Qualcomm® aptX™ audio for low-latency streaming, as well as a dedicated high-performance audio DSP with hardware enhancement capable of up to 32 channels of audio post processing.

Edge compute and AI

Our integrated AI Engine includes machine learning capabilities configured to help improve local Voice UI, noise reduction, automatic speech recognition and the flexibility to innovate by developing and running custom machine learned inferences.

Dramatically improved power performance

Designed specifically for low-power key-phrase detection, providing a 25 times longer standby with voice wakeup*. Supports new levels of performance for portable and battery-powered speakers, and helps reduce standby current requirements for mains-connected speakers or smart assistants.

Industry-leading connectivity

Advanced, highly-integrated connectivity designed to support low-latency music streaming in a room and throughout the home, as well as superior performance with coexistent Wi-Fi, Bluetooth and Zigbee. Designed with a scalable architecture to help meet various performance, functionality and price points.

*compared to previous generation of our Smart Audio Platform and other conventional architectures
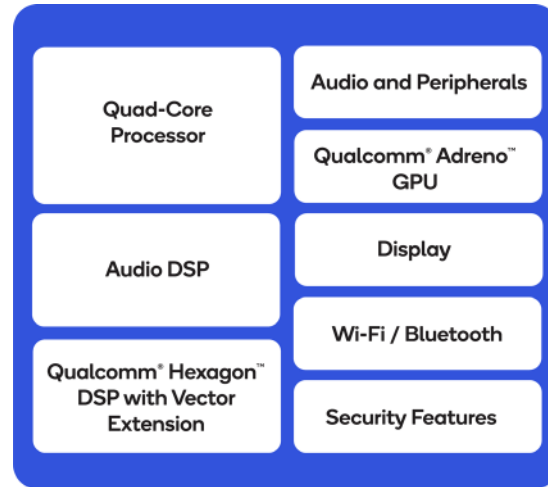
QCS400 Series Target Applications

- Smart Speakers
- Smart Assistants
- Home Hubs

- Smart Soundbars
- Audio Visual Receivers
- Premium Smart Speakers with Display

Features

- Highly-integrated architecture, with up to four cores, Dual-DSP, Wi-Fi, Bluetooth, powerful audio features and our AI engine on a single chip

- Our AI engine supports highly efficient on-device inferences and machine learning-based, embedded automatic speech recognition

- Industry leading connectivity with advanced Wi-Fi, Bluetooth and Zigbee coexistence technology and low-latency streaming

- Qualcomm® Adreno™ GPU and display (QCS407 and QCS405 only)

- Superior audio performance, with support for Dolby Atmos and DTS:X immersive home audio

- High performance, low-power keyword detection pre-loaded and running on an integrated DSP

- Configurable multi-keyword detection with Local Automatic Speech Recognition for customizable user experiences

- Includes multi-mic beamforming noise suppression with mono, stereo and multi-channel echo cancellation

- Support for up to 32 channel audio output to help meet the evolving needs of AVR space

- Compatible with DDFA amplifier technology and aptX audio

- Help to reduce product development time and cost with our Audio Development Kit (ADK), and Software Evaluation Kit, as well as hardware reference designs

- SoC variants at multiple tiers to help OEMs scale across a range of end-product types and applications

To learn more visit: qualcomm.com

QCS400 Block Diagram

QCS400 Series SoC Variants

FEATURES	QCS407	QCS405	QCS404	QCS403
Compute	Quad Core	Quad Core	Quad Core	Dual Core
Adreno 306 GPU/Display	✓	✓	N/A	N/A
Display	✓	✓	N/A	N/A
Audio DSP	✓	✓	✓	✓
Compute DSP with Qualcomm AI Engine	✓	✓	✓	✓
Voice and Machine Learning	- Multi-mic Qualcomm® Noise and Echo Cancellation - Simultaneous multi-keyword detection - ML based wake word detection - Local Automatic Speech Recognition			
Security Features	- Security rich boot - Debug security features - Cryptographic accelerators - Supports trusted execution environment - Key provisioning security features			
Connectivity	- Integrated 2x2 11ac - Co-ex with Bluetooth and Zigbee/154 - Bluetooth 5.1 compliant - aptX adaptive audio - Low-latency whole-home multi-channel audio networking - Expandability to 1x1 or DBS (2x2 + 2x2/4x4)			
Audio I/F Channels DMIC, SPDIF, ARC	32	12	12	12
Wired I/F USB 2.0, USB 3.0, SDIO 3.0, PCIe, Ethernet, UART/SPI/I2C	✓ + HDMI, SPI, RGB	✓ + HDMI, SPI, RGB	✓	✓

Qualcomm Adreno, Qualcomm Hexagon and Qualcomm Noise and Echo Cancellation are products of Qualcomm Technologies, Inc. and/or its subsidiaries.

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