

AudioSmart Far-Field 4-Mic Development Kit for Amazon AVS with Conexant Voice Processing and Alexa Wake Word

Product Overview

Conexant's AudioSmart™ 4-Mic Development Kit for Amazon AVS features Conexant's CX20924 Voice Input Processor with embedded far-field voice processing technology, Smart Source Locator™ (SSL) that detects the direction of a user, and preloaded Alexa™ wake word. For optimal audio quality for music and Alexa voice prompts, Conexant's CX22721 Audio Playback CODEC is also integrated to power speakers. The kit is designed to help manufacturers and developers quickly and easily build smart home device prototypes that offer an ideal voice user experience.

Enabling speech recognition from a distance requires overcoming substantial acoustic challenges related to echo cancellation, background noise, microphone position, speaker placement and more. Conexant's four-microphone voice processing solution is designed to recognize the Alexa wake word and deliver speech requests for processing, from anywhere in a room, even in noisy, real-world conditions. The solution also enables voice barge-in capabilities, allowing users to interrupt their Alexa device when it's playing sound.

The AudioSmart 4-Mic Development Kit for Amazon AVS reduces engineering time and costs associated with developing noise-robust voice-enabled devices.

The core component of the kit is Conexant's AudioSmart CX20924 Voice Input Processor running its industry-leading far-field voice pre-processing software technology. The Conexant far-field voice input processor system captures the user's voice from anywhere within the room, separates the voice commands from music and voice prompts being played out of the device, even with background noise present, and provides a clean audio signal to the speech recognition engine. This solution ensures that the speech recognition engine hears only the user's command, and nothing else - providing consistent accuracy and an ideal end-user experience.

The AudioSmart 4-Mic Development Kit for Amazon AVS is compatible with the Amazon AVS for Raspberry Pi (RPi) Project.

Key Features and Benefits

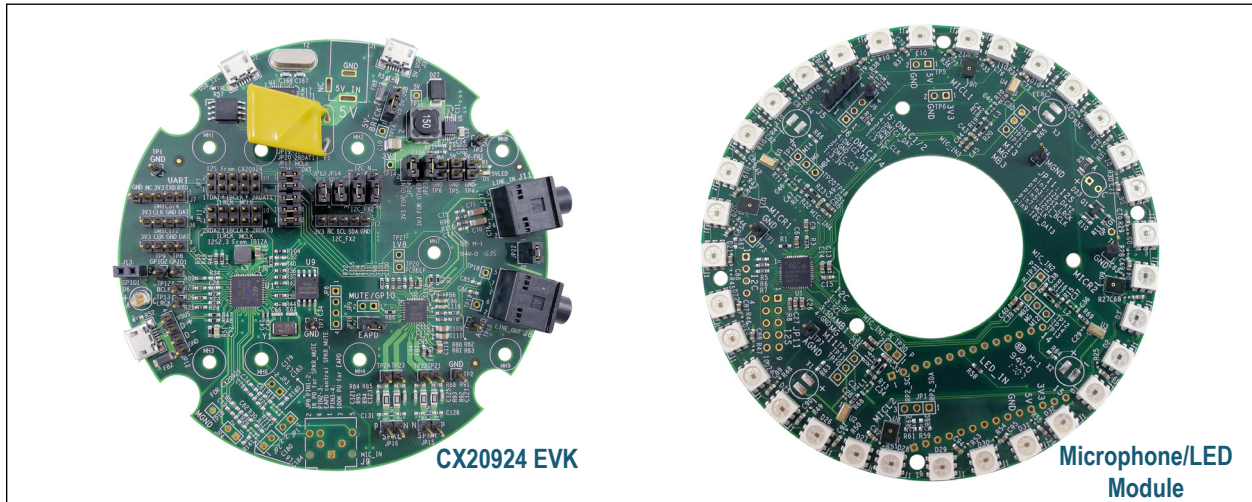
- Industry-leading far-field voice interaction with four microphones.
- Proprietary Smart Source Locator technology identifies direction of user 360-degrees around the device.
- Proprietary Smart Source Pickup™ (SSP) technology detects voice and cancels noise from all directions around the device (omnidirectionally), even if noise sources are from the same direction as the user.
- Enhanced noise suppression: Improved AVS speech recognition performance through improved suppression of non-stationary ambient noise sources such as TVs.
- Voice barge-in enabled by full duplex acoustic echo cancellation (AEC): detects the Alexa wake word even when the device is playing music or voice prompts loudly.
- Integrated voice trigger function that supports low system power Wake-on-Voice (WoV) function.
- Multiple Integrated Interchip Sound (I²S) serial data interface.
- High performance, 2W stereo class-D speaker amplifier with digital I²S I/O with I²C control.
- Inter-Integrated Circuit (I²C) serial control interface.
- SPI for low-cost flash support.

Applications

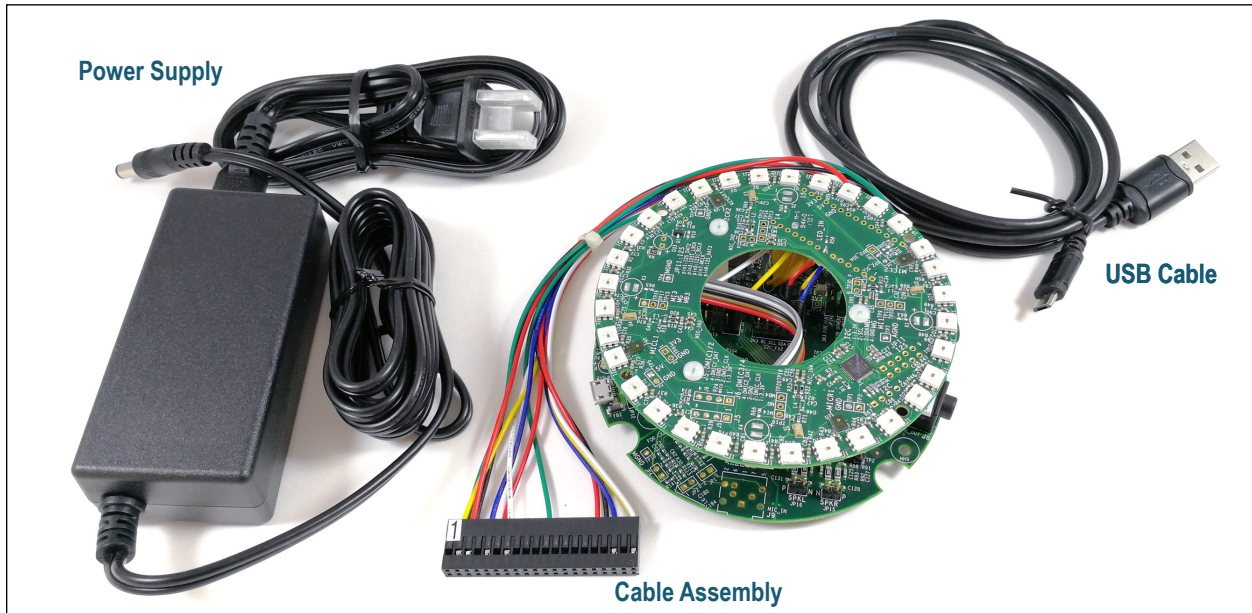
- Voice-controlled Smart TV/STB
- Home Gateway/Controller
- Smart Bluetooth/WiFi speaker
- Voice interactive smart appliance
- Internet of Things (IoT) devices

AudioSmart 4-Mic Development Kit for Amazon AVS

CX20924 EVK and Microphone/LED Module



Kit Contents



The Conexant CX20924 AudioSmart 4-Mic Development Kit for Amazon AVS includes the following:

- CX20924 EVK, G600Z-C00691R40
- Microphone/LED module with four omnidirectional digital MEMS mics, G600Z-C00713R20
- USB cable
- Cable assembly
- +5V power supply for the CX20924 EVK

Note: Other components required for kit evaluation are the Raspberry Pi (RPi2) and powered loudspeakers. These items are not included in the kit.

AudioSmart 4-Mic Development Kit for Amazon AVS Specifications

CX20924 EVK Features

Physical Characteristics

Dimensions (mm) Radius 51.0 ± 10%

Operating temperature (Max/Min) °C 125/0

External Interfaces

Processed Voice Signal and Control (USB) Output of CX20924 processing signal (J4). Also, control of the CX20924 is enabled in the firmware.

- Full speed USB2.0 Device

I2C slave J2: Maximum clock frequency 1 MHz (fast mode plus). The I²C connection is used to program the firmware on the CX20924 EVK.

Input Power (USB or Brick) Input power requirement:

- 5V, min 4A
- USB (J3)
- Brick (J1)

Power connection is only required via J3 or J1, but not both.

SPI Master Maximum clock frequency of up to 50 MHz. See separate Application Note for list of supported SPI Flash devices. U9 is the SPI Flash component used to store CX20924 firmware.

UART J7: Maximum baud rate up to 1.5625 Mbps

GPIO1/2 Two GPIOs are available:

- GPIO1: GPIO dedicated to a WoV function that toggles to wake an external device when the CX20924 recognizes an audio wake trigger event. Used for the low-power embedded trigger mode.
- GPIO2: GPIO multiplexed with I²S TX CLK 2.

Master Clock Set to 12.888 MHz by the firmware.

Input Audio Characteristics

DMIC Supports four PDM digital microphones using two stereo data pins, stereo operation, and independent sample rates from 8 kHz to 96 kHz.

Output Audio Characteristics

CX22721 Playback Conexant's AudioSmart I²S CODEC:

- Supports AVS playback stream for speech and music content via an I²S connection from the RPi2 to the CX22721 device.
- Linux driver is required for the RPi2. Follow the instructions provided in the *Conexant AudioSmart 4-Mic Development Kit for Amazon AVS* (005UGR0x).
- Provides echo reference signal to the CX20924 device.
- The CX22721 device is controlled via the RPi I²C interface.
- Supports powered speakers or passive speaker:
 - J8: Labeled as LINEOUT to connect to Powered Speakers.
 - JP15 and JP16 to connect to passive 4-ohm or 8-ohm speakers. Make sure to note the speaker's polarity.

CX20924 Microphone/LED Module Features

Physical Characteristics

Dimensions (mm) Radius 51.0 ± 10%

Operating temperature (Max/Min) °C 125/0

Microphones

- Specifications
- Four Digital MEMS Omnidirectional Microphones: AKU242.
 - Microphone signals are by default connected to the main CX20924 EVK via soldered wires through connectors J5 and J6.
 - Microphone signals are processed using Conexant's AudioSmart far-field voice input processing software.

LEDs

- Specifications
- 32 RGB LEDs are used to show the 360-degree SSL.
 - Code to control the LEDs must be installed in the RPi2. Follow the instructions provided in the *Conexant AudioSmart 4-Mic Development Kit for Amazon AVS* (005UGR0x).
 - Connected between the input pin for the LEDs and a PWM GPIO on RPi2.

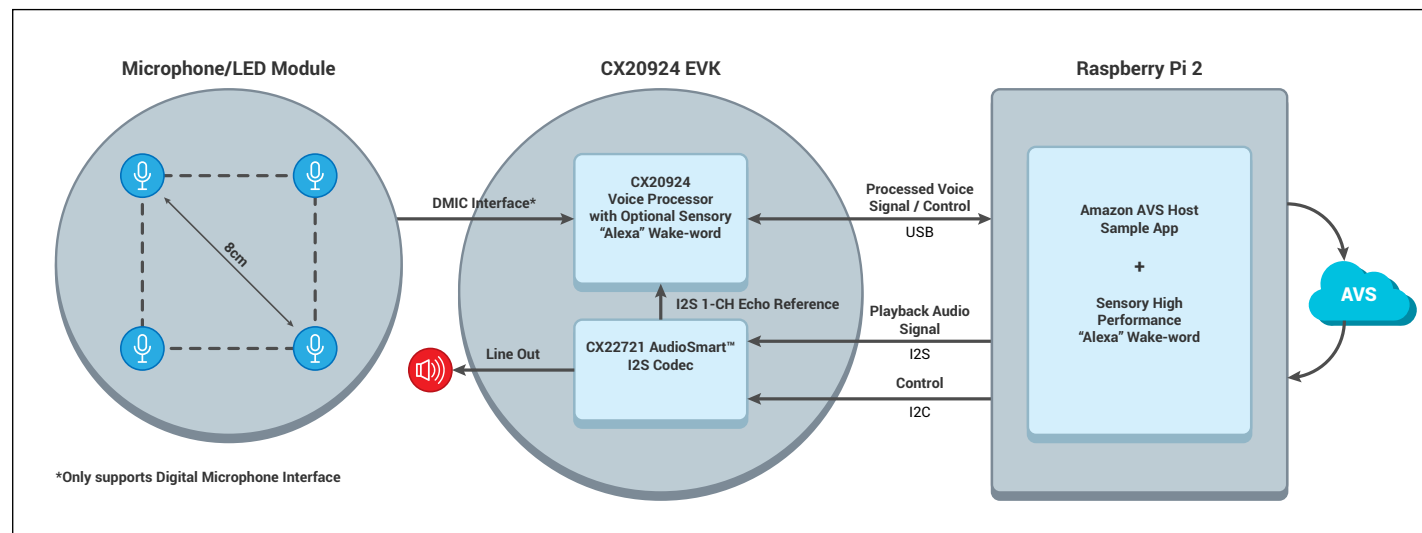
External Cables

USB Cable J4: Sends the processed microphone signal to AVS.

- Cable Assembly
- Connection from CX20924 EVKs to RPi2 is established through this cable:
- I²S signal for the playback signal
 - Power signal for the RPi2
 - CX22721 I²C slave signals
- Connection from the Microphone/LED Module to the RPi2 is established through this cable:
- PWM GPIO connection for LED control.

Input Power J1: +5V power supply is provided with the kit.

CX20924 EVK Functional Block Diagram




Ordering Information

Distributor	URL	Part Number	Description
Arrow Electronics	https://www.arrow.com/en/products/ds20924-evk/conexant-systems	DS20924-EVK	AudioSmart 4-Mic Development Kit, for Amazon AVS

To learn more about Conexant and its development kit, please visit <http://www.conexant.com/amazon-avs/>

To learn more about Amazon Alexa Voice Service and access the Amazon AVS API reference guide, visit <https://developer.amazon.com/alexa-voice-service/>

The devices in this publication are lead-free (Pb-Free) and China RoHS compliant . Contact the local Conexant sales office for advanced software options.

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