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

Product Overview
Synaptics’ AudioSmart 4-Mic Development Kit for Amazon AVS features Synaptics’ 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, Synaptics’ 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. Synaptics’ 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 Synaptics’ AudioSmart CX20924 Voice Input Processor running its industry-leading far-field voice pre-processing software technology. The Synaptics 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.

Features
- 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 interfaces.
- 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

AudioSmart™ Product Brief

AudioSmart 4-Mic Development Kit for Amazon AVS

Kit Contents

CX20924 EVK

Microphone/LED Module

Power Supply

USB Cable

Cable Assembly
AudioSmart® 4-Mic Development Kit for Amazon AVS
AudioSmart Product Brief

Kit Contents Description

The Synaptics 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

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<td>Master Clock</td>
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Input Audio Characteristics

- 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

- Synaptics' 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 Synaptics 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.
AudioSmart® 4-Mic Development Kit for Amazon AVS
AudioSmart Product Brief

Microphone Module/LED Features

| Physical Characteristics |  |
|--------------------------|-----------------
| Dimensions (mm)          | Radius 51.0 ± 10% |
| Operating temperature    | 125°C/0°C (Max/Min) |

Microphones

Specifications
- Four Digital MEMS Omnidirectional Microphones
- Microphone signals are by default connected to the main CX20924 EVK via soldered wires through connectors J5 and J6.
- Microphone signals are processed using Synaptics’ 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 Synaptics AudioSmart 4-Mic Development Kit User Guide for Amazon AVS.
- 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

<table>
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<tr>
<th>Distributor</th>
<th>URL</th>
<th>Part Number</th>
<th>Description</th>
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<td>Arrow Electronics</td>
<td><a href="https://www.arrow.com/en/products/">https://www.arrow.com/en/products/</a> ds20924-evk/conexant-systems</td>
<td>DS20924-EVK</td>
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The devices in this publication are lead-free (Pb-Free) and China RoHS compliant.  
Contact your local Synaptics sales office for advanced software options.  
To learn more about Synaptics and its development kit, please visit [http://synaptics.com/partners/amazon/ds20924](http://synaptics.com/partners/amazon/ds20924)  
To learn more about Amazon Alexa Voice Service and access the Amazon AVS API reference guide, visit: [https://developer.amazon.com/alexa-voice-service/](https://developer.amazon.com/alexa-voice-service/)

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Synaptics is the pioneer and leader of the human interface revolution, bringing innovative and intuitive user experiences to intelligent devices. Synaptics’ broad portfolio of touch, display, biometrics, voice, audio, and multimedia products is built on the company’s rich R&D, extensive IP and dependable supply chain capabilities. With solutions designed for mobile, PC, smart home, and automotive industries, Synaptics combines ease of use, functionality and aesthetics to enable products that help make our digital lives more productive, secure and enjoyable. (NASDAQ: SYNA).

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