Audio kit software expansion for STM32Cube

X-CUBE-AUDIO-KIT

LiveTune			

User application

Application

LiveTune	**AudioChain**	**Audio peripherals**	**RTOS**
	Algorithms / **Algorithms (external source)**		

Framework and middleware

HAL	BSP

Drivers

STM32H5 MCUs	STM32H7 MCUs	STM32N6 MCUs

Hardware components

STM32H573I-DK	STM32H735G-DK	STM32H7S78-DK	STM32N6570-DK
STEVAL-MIC008A (optional)			

Development boards

DT73515V3
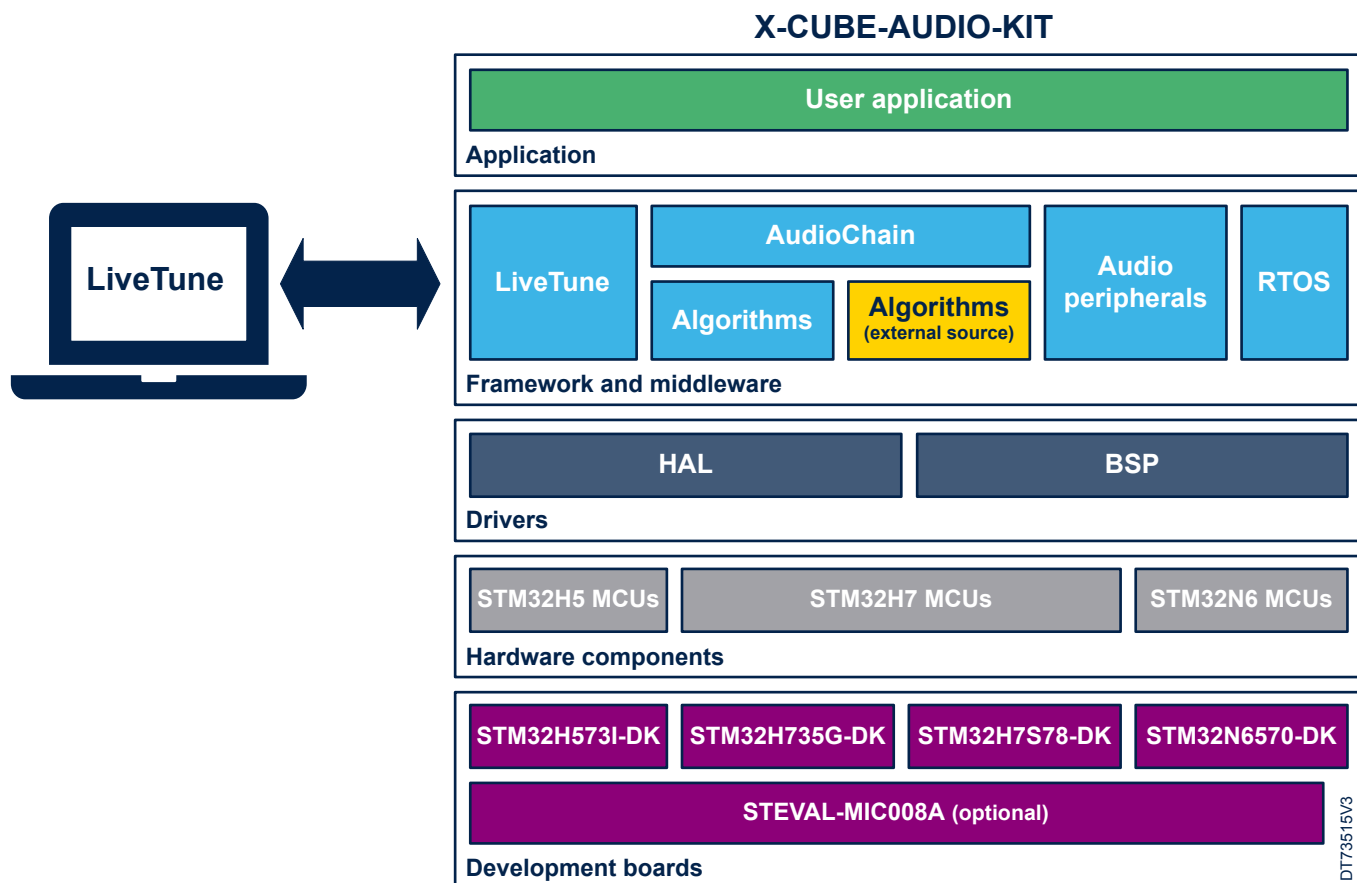
Product status link
X-CUBE-AUDIO-KIT

DB5111 - Rev 5 - April 2025
For further information, contact your local STMicroelectronics sales office.

www.st.com

Features

- Framework to support audio processing data flow
  - Up to 48 kHz
  - 16-bit fixed PCM, 32-bit fixed PCM, 32-bit floating-point PCM, PDM, 8-bit compressed samples (G.711 µ-law and A-law)
  - Mono, stereo, or a wider range of channels, interleaved or not
  - Configurable latency mode and audio buffer sizes adjustable down to fractions of milliseconds
  - Time and frequency domains
- Library of audio processing algorithms
  - Generic processing algorithms such as FIR and IIR filters, and equalizers
  - Voice use case oriented such as noise reduction, echo cancellation, beamforming, and far-field denoiser for speech recognition
  - Audio output enhancement such as multiband compressor and mixer
  - Musical effects such as echo, reverb, delay, and distortion
  - Sound generation with MIDI player
- Tool to design and tune audio processing data flow and algorithm parameters
  - Real-time testing and tuning on the board
  - Automatic generation of an equivalent C code for the final product
- Profiling commands for detailed analysis of CPU load and memory usage
- Memory allocation policy control
- Capability to integrate the user's algorithms
- Use cases and examples of data flows
- Management of different audio peripherals
  - On-board microphone, line input, and audio output: supports `int16` and `int32` formats
  - STEVAL-MIC008A dual microphone extension (optional)
  - USB audio interface UAC 2.0: supports `int16` and `int32` formats
  - USB MIDI input
- Support for STM32H573I-DK
- Support for STM32H735G-DK
- Support for STM32H7S78-DK
- Support for STM32N6570-DK

Description

The X-CUBE-AUDIO-KIT Expansion Package provides an integrated platform for designing, implementing, and fine-tuning audio processing data flows on supported series of STM32 microcontrollers.

With LiveTune, a graphical user interface accessible through an HTML5 navigator, users can design and fine-tune data flows in real time on STM32 devices.

The Expansion Package includes a library of algorithms from STMicroelectronics and external sources.

Additionally, the users can integrate their own custom algorithms into the environment, allowing their execution and fine-tuning within the data flows.

This Expansion Package aims at use cases such as:

- Voice denoising for speech recognition or voice communication
- Audio output enhancement
- Audio conditioning
- Sound generation
- Audio effects
- Audio analysis
- Any other audio processing use case

X-CUBE-AUDIO-KIT includes one generic designer firmware for each of the STM32H573I-DK, STM32H735G-DK, STM32H7S78-DK, and STM32N6570-DK Discovery kits. Each firmware features a set of algorithms, the AudioChain framework, and the LiveTune interface.

1 General information

The X-CUBE-AUDIO-KIT STM32Cube Expansion Package runs on:

- The STM32H5 microcontrollers based on the Arm® Cortex®-M33 processor.
- The STM32H7 microcontrollers based on the Arm® Cortex®-M7 processor
- The STM32N6 microcontrollers based on the Arm® Cortex®-M55 processor.

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arm

1.1 Ordering information

X-CUBE-AUDIO-KIT is available for free download from the *www.st.com* website.

1.2 What is STM32Cube?

STM32Cube is an STMicroelectronics original initiative to improve designer productivity significantly by reducing development effort, time, and cost. STM32Cube covers the whole STM32 portfolio.

STM32Cube includes:

- A set of user-friendly software development tools to cover project development from conception to realization, among which are:
  - STM32CubeMX, a graphical software configuration tool that allows the automatic generation of C initialization code using graphical wizards
  - STM32CubeIDE, an all-in-one development tool with peripheral configuration, code generation, code compilation, and debug features
  - STM32CubeCLT, an all-in-one command-line development toolset with code compilation, board programming, and debug features
  - STM32CubeProgrammer (STM32CubeProg), a programming tool available in graphical and command-line versions
  - STM32CubeMonitor (STM32CubeMonitor, STM32CubeMonPwr, STM32CubeMonRF, STM32CubeMonUCPD), powerful monitoring tools to fine-tune the behavior and performance of STM32 applications in real time
- STM32Cube MCU and MPU Packages, comprehensive embedded-software platforms specific to each microcontroller and microprocessor series (such as STM32CubeN6 for the STM32N6 series), which include:
  - STM32Cube hardware abstraction layer (HAL), ensuring maximized portability across the STM32 portfolio
  - STM32Cube low-layer APIs, ensuring the best performance and footprints with a high degree of user control over hardware
  - A consistent set of middleware components such as ThreadX, FileX, LevelX, NetX Duo, USBX, USB PD, video encoder API, and OpenBL
  - All embedded software utilities with full sets of peripheral and applicative examples
- STM32Cube Expansion Packages, which contain embedded software components that complement the functionalities of the STM32Cube MCU and MPU Packages with:
  - Middleware extensions and applicative layers
  - Examples running on some specific STMicroelectronics development boards

2   License

X-CUBE-AUDIO-KIT is delivered under the SLA0048 software license agreement and its Additional License Terms.

Revision history

Table 1. Document revision history

Date	Revision	Changes
07-Dec-2023	1	Initial release.
10-Apr-2024	2	Updated *Features* and *Description* with details on formats, algorithms, toolkit features, and target use cases.
29-Jul-2024	3	Updated *Features* and *Description* for use cases, MIDI, USB, PDM, and profiling.
12-Dec-2024	4	Added the support for the STM32N6570-DK Discovery kit and STM32N6 microcontrollers, added latency mode configurability, and updated audio peripheral formats: • Updated the cover image • Updated *Features* and *Description* • Updated *General information*
04-Apr-2025	5	Added the support for the STM32H7S78-DK Discovery kit and STM32H7Rx/7Sx microcontrollers, added far-field denoising for speech recognition, and added the control of the memory allocation policy: • Updated the cover image • Updated Features and Description

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