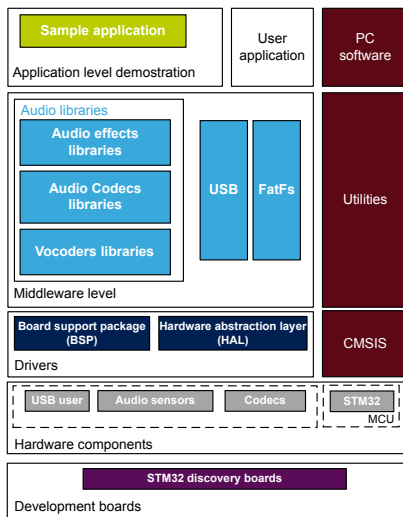


## Audio effects libraries software expansion for STM32Cube



### Features

- STM32Cube audio effect modules and libraries for the STM32F4 and STM32F7 Series of microcontrollers
- 16-bit wave format stereo input at 48 kHz expected by Xcube audio applications
- 32-bit resolution audio library computation and 16- or 32-bit I/O buffers supported
- Bass manager (BAM): management of the low frequencies of a stereo signal, including compressor and limiter
- Generic biquad filter (BIQ): IIR second order filters and predefined standard filters such as peak removal, loudness, notch, voice enhancer, low-pass, and high-pass frequency response for transducer equalization
- Clock drift compensation (CDC): compensation of drift by smoothly adding or removing one sample
- Gain manager (GAM): management of input signal volume with negative gains in range [-80 dB: 0 dB] with 0.5 dB granularity without compression
- Graphical equalizer (GREQ): 5, 8 or 10 bands. Adjustable gain factors from -12 dB to +12 dB in standard mode
- Headphone virtualizer (HPV): audio virtualization for headphones from a 1.0/2.0/5.1/7.1 input stream to a virtualized 2.0 output stream
- MP3 Decoder (MP3Dec): decoder for MPEG-1,2 or 2.5 formats (for layers 1, 2 and 3) supporting constant, free format or VBR variable bit rate for mono or stereo audio input streams with PCM (Pulse Code Modulation) decoded output.
- MP3 encoder (MP3Enc): encoder for MPEG-1,2 or 2.5 formats (for layer 3 only) supporting fixed or free format bit rate for mono or stereo audio input streams.
- Sampling rate converter (SRC236 and SRC441):
  - sampling frequency conversion from any rate with a ratio of 2, 3, 6, 3/2, 1/2, 1/3, 1/6, or 2/3
  - sampling frequency conversion from 44.1 kHz to 48 kHz
- Omni surround multichannel virtualizer (OMNI2):
  - audio virtualization for loudspeakers from a 1.0/2.0/5.1/7.1 input stream to a virtualized 2.0 output stream (including stereo widening effect).
  - Omni surround stereo widener (OMNI2\_SW only) audio virtualization for loudspeakers from a 1.0/2.0 input stream to a widened 2.0 output stream.
- Smart volume control (SVC): management of audio input signal volume including a compression with gains in the range [-80 dB:+36 dB]
- Sound detector (SDR): audio signals detection used to trigger signal processing such as speech recognition
- Sound meter (SMR): level measurement on a logarithmic scale

### Product status link

[X-CUBE-AUDIO](#)



### Description

The X-CUBE-AUDIO package contains a comprehensive set of audio processing components for the STM32F4 and STM32F7 Series of microcontrollers. It is composed of high-quality efficient software libraries and modules ready to be embedded into a variety of audio appliances. All audio binaries are delivered with internal 32-bit processing and support either 16- or 32-bits I/O buffers.

Each audio effect application in X-CUBE-AUDIO expects a 16-bit stereo audio input signal at a 48-kHz sampling rate, using wave format with I/O data buffers dimensioned for 10 ms.

## General information

The X-CUBE-AUDIO embedded software package runs on STM32 32-bit microcontrollers based on the Arm® Cortex®-M processor.

*Note:* Arm is a registered trademark of Arm Limited (or its subsidiaries) in the US and/or elsewhere.



## Ordering Information

X-CUBE-AUDIO is available for free download from the [www.st.com](http://www.st.com) website.

## License

X-CUBE-AUDIO is delivered under the *Mix Liberty + OSS + 3rd party V1* license.

The software components provided in this package come with different license schemes as shown in [Table 1. Software component license agreements](#).

For more details, refer to the license agreement of each component.

**Table 1. Software component license agreements**

Software component	Owner	License
Board Support Package (BSP)	ST	Open source BSD
Cortex®-M CMSIS	Arm®	Open source BSD
HAL STM32 F4/F7	ST	Open source BSD
Libraries for audio effects modules (as PDM, BAM, BIQ, CDC,GAM,GREQ, HPV, OMNI2, OMNI2_SW, SDR, SMR, SRC236, SRC441, SVC)	ST	Image V2
Libraries for Audio codecs: MP3 decoder	ST	Image V2
Libraries for Audio codecs: spiritDSP MP3 encoder	Spirit DSP	Image V2 (binary release)
Libraries for Audio codecs: spiritDSP MP3 decoder	Spirit DSP	Image V2 (binary release)
Libraries for Audio codecs: spiritDSP MP3 wrapper	ST	Ultimate Liberty (source release)
Project examples & Common files	ST	Ultimate Liberty (source release)

## Revision history

**Table 2. Document revision history**

Date	Revision	Changes
03-Jun-2016	1	Initial release.
01-Feb-2018	2	Updated <a href="#">Section Features</a> , <a href="#">Section Description</a> . Replaced X-CUBE-AUDIO-F4 and X-CUBE-AUDIO-F7 RPNs with X-CUBE-AUDIO. Added <a href="#">Section License</a>
03-Jul-2018	3	Updated <a href="#">Section Features</a> and <a href="#">Table 1. Software component license agreements</a>
19-Sep-2018	4	Updated <a href="#">Section Features</a> , <a href="#">Table 1. Software component license agreements</a>
05-Nov-2018	5	Updated <a href="#">Section Features</a> and <a href="#">Table 1. Software component license agreements</a>
03-Apr-2019	6	Updated image on front page, <a href="#">Section Features</a> , <a href="#">Section Description</a> , <a href="#">Table 1. Software component license agreements</a> .

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