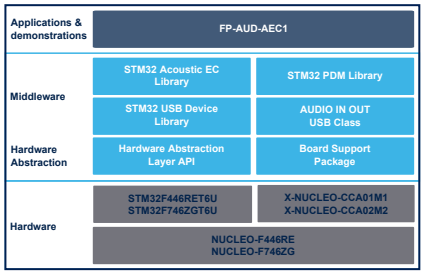
FP-AUD-AEC1

Data brief

STM32Cube function pack for acoustic echo cancellation



STM32 Open Development Environment

STM32 Cube

Product summary	
STM32Cube function pack for acoustic echo cancellation	FP-AUD-AEC1
Sound terminal expansion board based on STA350BW for STM32 Nucleo	X-NUCLEO-CCA01M1
Digital MEMS microphone expansion board based on MP34DT06J for STM32 Nucleo	X-NUCLEO-CCA02M2
MEMS audio sensor omnidirectional stereo digital microphone	MP34DT06J
Applications	Speakers Sound Sensing

Features

- Specific example fully focused on acoustic echo cancellation
- Implementation of a USB smart speaker use case with microphone
- Based on STM32 AcousticEC library
- Support for audio in/out streaming via USB through a dedicated USB AUDIO IN OUT class

Description

FP-AUD-AEC1 is an STM32Cube function pack which features an example fully focused on acoustic echo cancellation and provides an implementation of a USB smart speaker use case with microphone.

The package includes the AcousticEC library which provides an implementation for a real-time echo cancellation routine based on the MDF algorithm SPEEX implementation.

The function pack also includes an implementation example for NUCLEO-F446RE or NUCLEO-F746ZG development boards equipped with X-NUCLEO-CCA01M1 expansion board, based on the STA350BW Sound Terminal 2.1-channel high-efficiency digital audio output system, or X-NUCLEO-CCA02M2 expansion board, based on digital MEMS microphones and designed around MP34DT06J digital microphones.

After the initialization of all the required elements, the device is recognized by a host PC as a USB microphone and USB speaker at the same time.

You can record and save the real-time audio streaming and, in the meanwhile, send the preferred audio signal to the loudspeaker connected to the expansion board. The stereo track contains the processed signal in which the acoustic echo cancellation has removed the far-end signal from the audio acquired by a microphone and an omnidirectional microphone as a reference.

The software is available also on GitHub, where the users can signal bugs and propose new ideas through [**Issues**] and [**Pull Requests**] tabs.

1 Detailed description

1.1 What can you do with STM32Cube function packs?

STM32Cube function packs leverage the modularity and interoperability of STM32 Nucleo and X-NUCLEO boards together with STM32Cube and X-CUBE software to create function examples for some of the most common use cases of different application technologies.

These software function packs are designed to exploit the underlying STM32 ODE hardware and software components as much as possible to best satisfy the requirements of final user applications.

Moreover, function packs may include additional libraries and frameworks that are not present in the original X-CUBE packages, thus enabling new functionalities allowing real and usable system for developers.

1.2 What is STM32Cube?

STM32Cube is a combination of a full set of PC software tools and embedded software blocks running on STM32 microcontrollers and microprocessors:

- STM32CubeMX configuration tool for any STM32 device; it generates initialization C code for Cortex-M cores and the Linux device tree source for Cortex-A cores
- STM32CubeIDE integrated development environment based on open-source solutions like Eclipse or the GNU C/C++ toolchain, including compilation reporting features and advanced debug features
- STM32CubeProgrammer programming tool that provides an easy-to-use and efficient environment for reading, writing and verifying devices and external memories via a wide variety of available communication media (JTAG, SWD, UART, USB DFU, I2C, SPI, CAN, etc.)
- STM32CubeMonitor family of tools (STM32CubeMonRF, STM32CubeMonUCPD, STM32CubeMonPwr) to help developers customize their applications in real-time
- STM32Cube MCU and MPU packages specific to each STM32 series with drivers (HAL, low-layer, etc.), middleware, and lots of example code used in a wide variety of real-world use cases
- STM32Cube expansion packages for application-oriented solutions.

1.3 How does this function pack complement STM32Cube?

This software is based on the STM32CubeHAL. It extends STM32Cube by providing a board support package (BSP) for the MEMS microphone expansion board and some middleware components for PDM to PCM conversion, acoustic echo cancellation and USB communication with a PC.

The drivers abstract low-level details of the hardware and allow the middleware components and applications to access audio data in a hardware-independent manner.

The package also includes a sample application that developers can use to start experimenting with the code.

The sample application has been developed to enable device recognition as a standard USB microphone and speaker on a PC.

Any freeware or commercial audio recording and player software can be used.

Revision history

Table 1. **Document revision history**

Date	Version	Changes
11-Jan-2021	1	Initial release.
11-Nov-2022	2	Updated cover page description.