# DSD PROJECT REPORT

## Audio Demo on Nexys 4 DDR Board

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# I. INTRODUCTION:

Today every other device use audio input and process them. In our digital world, every day we use these types of applications like; In mobiles, PC's, Robots and speech recognition or in security mechanisms. This Project is designed to take audio input, store it and then process it and send it to mono audio out. This project is designed to understand how the devices in our daily life take input audio and process them.

# II. FLOW DIAGRAM:

In our Project data is taken from external mic through ADC and then the data is passed to recorder where it is saved in BRAM and then when recorder is in "Playback mode" the data is send to PWM controller through volume control module.
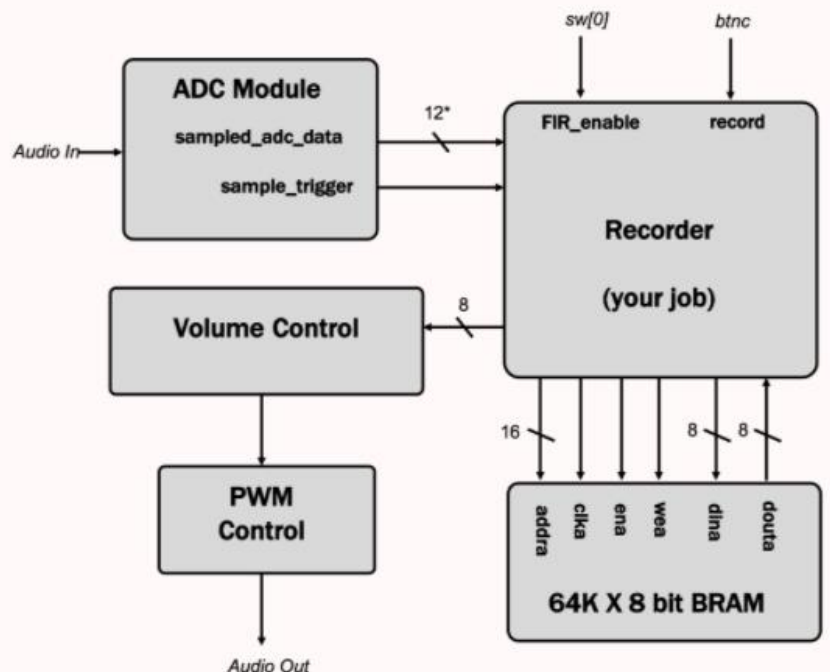


# III. MODULES:

1. TOP LEVEL MODULE
   a. In this module, we have code for ADC ready and 3 modules(Recorder, volume control & Pwm ) are instantiated and data is passed from each module to other one.
2. ADC IP

Here we have created an ADC interface to the AD3P and AD3N pins on the JXADC PMOD port (the upper right PMOD port on the board). This ADC will measure the voltage between the AD3P and AD3N pins. The maximum value this port can measure is +1V and minimum is 0V.
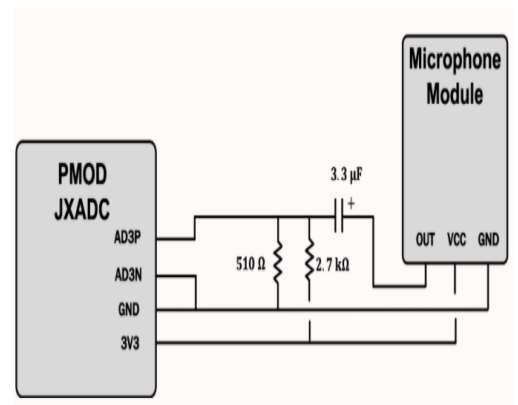
3. RECORDER MODULE
   a. In this module, two modes are available. One is "record mode" where audio is recorded in to BRAM memory, other one is "Playback mode" where audio is played back from BRAM Memory.
   b. Filter module is also instantiated here, which takes data from BRAM and send it to filter Module.
4. BRAM IP
   a. Here we have created IP of BRAM, that enables us to save data in memory.
5. FILTER MODULE
   a. Here we have designed a Moving Averaging Filter (LOW PASS FILTER) that basically takes data from BRAM and do its convolution with coefficients.

$$y[n] = \sum_{i=0}^{30}(c_i \cdot x[n-i])$$

6. VOLUME CONTROL MODULE
   a. This module is used to control Volume of data at output.
7. PWM MODULE
   a. This Module is used to create PWM.

# IV.  MODULAR APPROACH:

Modular approach is used in this project for better understanding of project.