

ECEN 449 – Microprocessor System Design



The AC97 CODEC

Objectives of this Lecture Unit

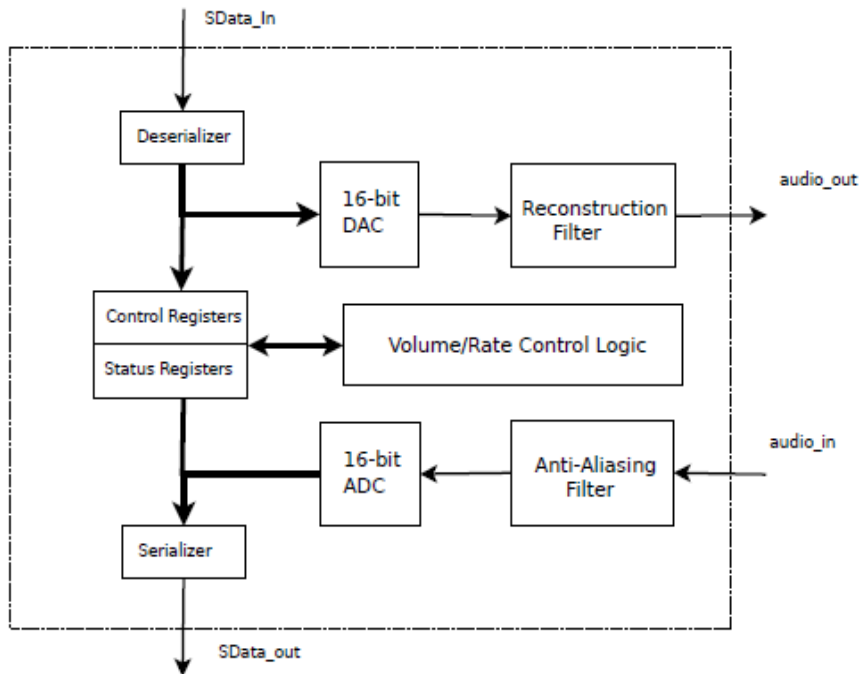
- Get familiar with the AC97 “CODEC”
 - Popular standard for computer audio
 - We will discuss its specification and architecture

AC97 history

- AC97 = “Audio CODEC 97”
- Developed in 1997, was Intel's standard for audio in motherboards, modems, sound cards etc.
- Technically a CODEC converts one binary representation to another.
 - AC97 is an analog to digital “CODEC” in a sense
- Superseded by HD-audio standard

AC97 Architecture

- AC97 consists of a digital controller and audio/modem codecs
 - AC97 has a serial interface
 - 16/20b sound, with surround sound support
 - Supports 96KHz sampling at 20 bit stereo. Typical sampling rate is 48KHz
 - Full duplex
 - Standard requires an ADC and a DAC to interface to the analog world



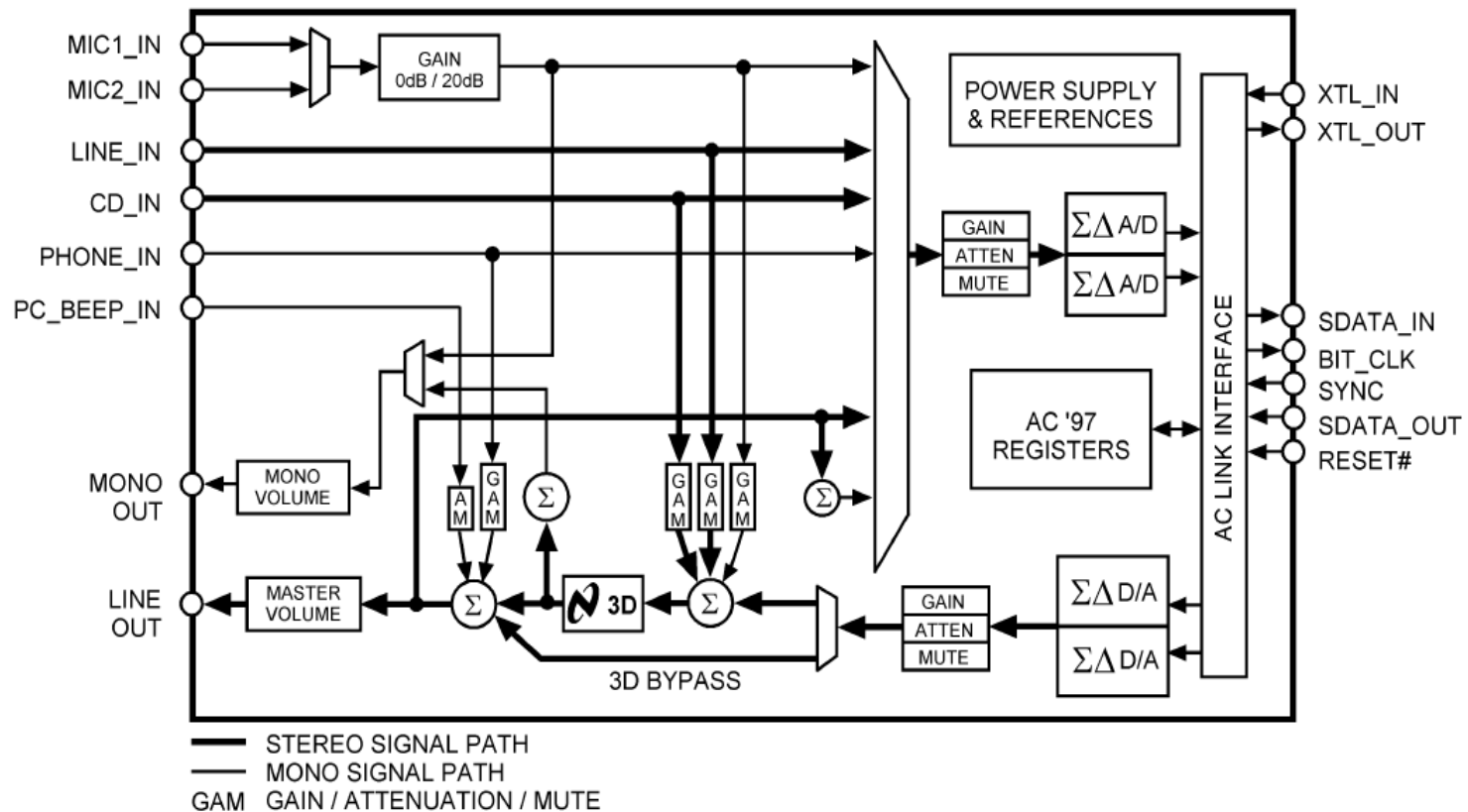
AC97 Specification

- Clock is at 12.288MHz.
- Assume a sampling rate of 48K frames per second (the sampling rate required by AC97)
 - This yields $12288/48 = 256$ bit frames
 - Each 256b frame consists of a 16-bit address slot and 20-bit data slots (12 such slots), using TDM
 - So we can address 12 (out of a maximum of 256) audio codecs at a time.
 - Each codec slot has a sampling rate of 48K samples per second, or 960Kbps. Can combine up to 4 slots to get a 192K samples per second
 - Sample rate conversions done by the digital converter

AC97 Interface

- The interface is a 5-wire serial interface
 - Clock, sync, reset and 2 serial wires (for input and output)
 - Each of the data slots uses audio which utilizes PCM

AC97 Implementation Example



DS100906-1

FIGURE 1. LM4540 Block Diagram

Source : NS LM4540 datasheet