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A Prototyping Hardware Platform for ΔΣ ADCs

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1. Introduction

The project involves development of a generic test-bed for prototyping and characterizing Delta-Sigma Analog-to-Digital Converters (ADCs). The ADCs are designed at the Analog Mixed Signal IC (AMS) Laboratory at Boise State. This is a high-speed evaluation board that can be connected into an FPGA board which assists in controlling the ADC chip and assists in capturing blocks of digital data.

2. Why Generic Test Board?

Semiconductor technology keeps advancing at a rapid pace as stated by Moore’s law. This leads to faster and smaller transistors which lead to faster chips with more functionality. Delta-Sigma ADC directly benefits from the technology scaling leading to higher bandwidth and better resolution. In a research environment, researchers typically use varying range of technology with MOSFET channel length ranging from 0.5 µm to 45 nm which corresponds to supply voltages from 5, 3, 1.8, 1.2, and 1 and so on. These possess a challenge to the researchers when designing test chip. Thus, it is highly desirable for customers to have generic hardware in which they can program the supply voltage required. These kinds of boards are used by research groups in many universities.

3. Hardware Architecture

![Hardware Architecture Block Diagram](image)

The diagram shows the architecture of the hardware platform for Delta-Sigma ADCs. It includes components such as the FPGA board, voltage regulators, and the Delta-Sigma ADC chip.

4. Features

- Controlled by FPGA based FIFO board from Analog Devices (HSC-ADC-EVALC using Xilinx Virtex-4 FPGA).
- DC power supplies to the ADC; 5-Bit Digitally Programmable 1.3V to 3.5V Fixed Output Voltage and Low-Drop-Out, 5V Output Voltage.
- On-board programmable clock synthesizer (Up to 655 MHz Low Jitter Clock) and an External Clock Source.
- Programmable Voltage References (DAC) for testing purposes.
- Surface-mount PLCC44 (DUT) socket enables the users to insert the fabricated ADC chips.

5. FPGA based Controller

![FPGA Control Signals](image)

This section describes the FPGA-based controller and its role in controlling the ADC chip.

6. Programmable DC/DC Converter (LTC1753)

![Block diagram for LTC1753](image)

This converter provides programmable voltage outputs for the ADC.

7. Programmable Clock Synthesizer (AD9540)

![Block diagram for AD9540](image)

This synthesizer provides programmable clock signals for the ADC.

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