MLE’s patent pending technology allows to utilize standard FPGA I/O pins for analog inputs and outputs.

MLE provides the softADC and the softDAC: www.missinglinkelectronics.com/softanalog

The softADC is a direct integration of an AD-Converter into modern FPGA devices.

Benefits and Use Cases

- PCB footprint and BOM reduction
- No active peripheral ADCs required
- Design flexibility:
  - many ADCs without multiplexing
  - flexible analog setup: „one more I/O“
  - adaptive ADC parameter setting
- Simultaneous and time-synchronous multi-channel sampling
- Move signal processing power close to acquisition

Applications

- Flexible data acquisition and monitoring systems
- Embedded systems with many sensor inputs, sensor networks
- Voltage-based actuator control, DC motor control (with softDAC)
- Audio applications for FPGA
- Integrated microcontrollers with reduced risk of parts obsolescence

Key Features

AC Performance
- Up to 200 kSPS sample rate
- 64 dB SNR at 96 kSPS
- 69 dB SNR at 1 kSPS
- ~ 60dB SINAD
- 11 bit ENOB
- 0.002% THD

Configurability
- Sample rate
- Cut-off frequency
- Gain / Offset compensation

Avalon bus register interface
- Input: Channel configuration
- Output: 16-bit sample data

Resources per channel
- LE: 100-200, depending on filter
- Pins: 1 LVDS receiver pair, 1 LVTTL
- Analog: 2 resistors, 1 capacitor
Typical Characteristics: Output Spectrum

The figures below illustrate the output frequency spectrum of the softADC when measuring an input sine wave at a given frequency. The output frequency spectrum comprises of three spectral components: The amplitude peak of the input sine wave, harmonic peaks at multitude of the input sine wave and a continuous noise floor.

1 kHz Sample rate

Spectrum at 100 Hz

Spectrum at 200 Hz

96 kHz Sample rate

Spectrum at 5 kHz

Spectrum at 10 kHz
Typical Characteristics: Histogram

The figures below illustrate the distribution of output voltages of the softADC when measuring a given DC input voltage. Each histogram comprises of 81920 single measurements. As expected, the distributions conform to the Gaussian bell curve, whereas a thinner curve stands for higher DC precision.
Availability and Contact

Evaluation Kit

Allows evaluation of MLE's softADC and softDAC technology and comes pre-configured. Included materials:
- Terasic DE0-Nano FPGA Development board
- MLE passive-only ADC connector board
Included software:
- MLE Evaluation FPGA reference design

Product Integration Roadmap

1. Evaluation Kit
   To evaluate technology and principles of operation
2. Requirements & Feasibility Service
   To optimize configuration for given applications
3. Production License

Contact MLE

MLE US: +1 (408) 475-1490 San Jose, United States
MLE Europe: +49 (731) 141149-0 Neu-Ulm, Germany

eMail: info@missinglinkelectronics.com
More info: www.missinglinkelectronics.com/softanalog