Design of 1st order Sigma-Delta Modulator ADC

R. V. S. Muralinadh
Sir C R Reddy College Of Engineering, Eluru.
08 October 2022

Abstract: Mixed-signal applications constitute a significant trend in the semiconductor industry Oversampled analog-to-digital converters (ADCs) are attractive for VLSI implementation because they are especially tolerant of circuit nonidealities and component mismatch.Analog modules appear to be precise and quite resistant to a variety of sources of noise and interference. Most of the highly precise A/D converters involve the use of sigma-delta modulation which is associated with oversampling and noise shaping. These converters use the least parasitic capacitances and small feature sizes characteristic of scaled VLSI technology by trading speed for resolution.

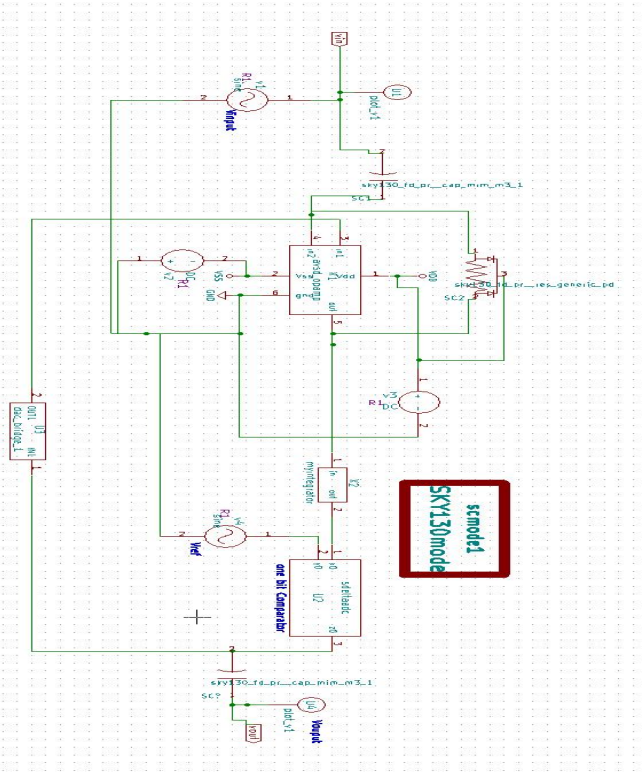
Key Words: ADC, Converters.

Project Circuit Details

The proposed Sigma-Delta ADC is a SystemVerilog-based real number model, which consists of a difference amplifier, an integrator, a comparator, and a switch, or 1-bit DAC. The differential amplifier, the integrator, the comparator and the switch consist the analog part, while the digital filter and the decimator the digital part of the design. As such, the Sigma-Delta modulator transmits the changes in, or the gradient of, an input signal. If the input signal has increased, it generates a logical one. If it has decreased, it generates a logical zero. The output of the modulator is a bit stream. This output stream is digitally filtered to obtain a digital n-bit representation of the analog input. The presented model compares its simulation run time with a Verilog-AMS Sigma-Delta ADC, having its design implemented and simulated in Cadence Virtuoso and AMS. Comparatively, the proposed real number model using SystemVerilog displays high simulation time gains, along with acceptable accuracy.

The design of the Sigma Delta ADC architecture is being given by a input analog signal and results in a series of discrete digital pulse stream of data.

Reference Circuit Design



Reference waveforms