Abstract

The trend toward increased bit rates and digital signal processing augment the dynamic range and the bandwidth needed at the A/D interface. Among the existing A/D architectures, Sigma-Delta A/D converters exhibit a large tolerance for component mismatch and circuit non-idealities. The main weakness of Sigma-Delta ADCs is however the reduced conversion rate due to the need of oversampling.

Up to the present, several attempts have been made to increase the conversion rate by minimizing the oversampling ratio, but another important aspect has been somehow overlooked, i.e., the maximization of the sampling frequency. In this design both aspects are instead considered. Since the specifications of the analog building blocks are determined by the selected architecture, the choice of an architecture that puts low speed specifications on the analog building blocks despite high sampling rates constitutes a central point in this design. Furthermore, sufficient dynamic range at low oversampling ratio is provided as well. The modulator is implemented in a 1 poly, 6 metals 0.18um CMOS technology with MIM capacitor option. The measured peak SNR and SNDR are 82dB and 72dB respectively, the dynamic range is 84dB. Conversion rate and sampling frequency are 25MS/s and 200MHz, respectively. The core chip area is about 1mm², the total power consumption is 200mW, including the consumption of a fast reference buffer.

With this chip it has been demonstrated for the first time that Sigma-Delta ADCs with conversion rates up to several MS/s and resolution of 14b can be implemented.

Biography

Pio Balmelli was born in Lugano, Switzerland, in 1973. He received the Diploma in electrical engineering from the Swiss Federal Institute of Technology (ETH), Zurich, in 1998. In the same year, he joined the Integrated System Laboratory of the ETH Zurich, where he was involved in the design and implementation of broadband Sigma-Delta modulators. He received the Ph.D. degree in December 2003. Since July 2004, he has been with Silicon Laboratories, Austin, TX.