Analog Integrated Circuits and Signal Processing, 8, 5–6 (1995)

Guest Editorial

This Special Issue is dedicated to low-voltage low-power analog integrated circuits. Low-voltage low-power circuit techniques are applied in the area of battery-operated systems. In particular they are of crucial importance for implantable devices, such as pacemakers, blood flow meters and auditory stimulators. Also, as more and increasingly complex systems are integrated on the same chip, area minimization becomes of primary importance. Typical examples of these types of systems are portable radios, hand-carried radiotelephones, pagers and hearing instruments. As the size of batteries is now becoming the limiting factor, it is not sufficient to reduce the size of the other bulky components by integrating them; the reduction of the power dissipation is also very important. Therefore, the key is to develop, simultaneously, both low-voltage and low-power operating integrated circuits in order to reduce the battery size.

This Special Issue contains six selected papers that present recent developments in the field of low-voltage low-power analog electronics.

The first paper, by Michiel Steyaert, Jan Crols and Geert van der Plas, presents a high-performance RDS (Radio-Data-System) detector for low voltage (1.8 V) applications. The non-conventional topology, consisting of a mixer and a low-pass filter, guarantees an improved performance, despite the low supply voltage.

In the second paper "Partial positive feedback for gain enhancement of low-power CMOS OTAS," by Rongtai Wang and Ramesh Harjani, it is shown that, for a fixed power consumption, partial positive feedback can be used to increase both the gain and bandwidth of low-power CMOS OTA designs.

The third paper, by Wim C. M. Renirie, Klaas-Jan de Langen and Johan H. Huijsing, presents five class-AB control circuits for low-voltage bipolar rail-to-rail output stages of operational amplifiers. These circuits have been designed in such a way that temperature, supply voltage and process parameters have little influence on the performance.

In the fourth paper "Low-voltage low-power opamp-based amplifiers," by Johan H. Huijsing, Klaas-Jan de Langen, Ron Hogervorst and Ruud G. H. Eschauzier, it is argumented that amplifiers operating under low-voltage and low-power conditions are severely limited in dynamic range and bandwidth. Several techniques are presented to reach both the maximally attainable dynamic range and bandwidth.

In the fifth paper, by Arie van Staveren, Jeroen van Velzen, Chris J. M. Verhoeven and Arthur H. M. van Roermund, an integrable second-order compensated bandgap reference for 1-V supply, in which a linear combination of only two base-emitter voltages is applied to compensate implicitly for the temperature behavior of these base-emitter voltages, is presented.

The sixth paper, by Christian C. Enz, François Krummenacher and Eric A. Vittoz, presents a fully analytical MOS transistor model dedicated to the design and analysis of low-voltage low-current analog circuits. In this model, all the large- and small-signal variables, namely the currents, the transconductances, the intrinsic capacitances, the non-quasi-static transadmittances and the thermal noise, are continuous in all regions of operation, including weak inversion, moderate inversion, strong inversion, conduction and saturation.

Finally, in the seventh paper "Design Principles for Low-Voltage Low-Power Analog Integrated Circuits," by Wouter A. Serdijn, Albert C. van der Woerd, Arthur H. M. van Roermund and Jan Davidse, it is argumented that there are good reasons to choose current as the information-carrying quantity in case of low-voltage low-power design constraints. This paper focuses on the influence of the transfer quality on that choice. To obtain power-efficient transfer quality, indirect feedback is shown to be a good alternative to traditional feedback techniques.

The editors would like to thank all the authors who submitted papers, all the reviewers who participated in the final selection of the papers, and the Kluwer

Editorial Staff for their efforts in creating this Special Issue. We hope that this issue will provide you, the reader, with a useful introduction to the potential of low-voltage low-power analog integrated circuits.

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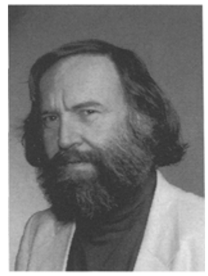
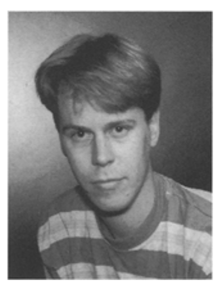
Wouter A. Serdijn was born in Zoetermeer, the Netherlands, in 1966. He started his course at the Faculty of Electrical Engineering at the Delft University of Technology in 1984, and received his 'ingenieurs' (M.Sc.) degree in 1989. Subsequently, he joined the Electronics Research Laboratory of the same university where he received his Ph.D. in 1994. His research includes developing a formal design theory for low-voltage low-power analog integrated circuits along with the development of circuits for hearing instruments.



Albert C. van der Woerd was born in 1937 in Leiden, the Netherlands. In 1977 he received his 'ingenieurs' (M.Sc.) degree in electrical engineering from the Delft University of Technology, Delft, the Netherlands. He was awarded his Ph.D. in 1985. From 1959 to 1966 he was engaged in research on and development of radar and TV circuits at several industrial laboratories. In 1966 he joined the Electronics Research Laboratory of the Faculty of Electrical Engineering of the Delft University of Technology. During the first 11 years he carried out research on electronic musical instruments. For the next 8 years his main research subject was carrier domain devices. More recently he has specialized in the field of low-voltage low-power analog circuits and systems. He teaches design methodology.



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