
FOREWORD

Special Section on Solid-State Circuit Design — Architecture, Circuit, Device and Design Methodology

Semiconductor solid-state integrated circuits promote the evolvement of dedicated hardware for Internet of Things (IoT), Artificial Intelligence (AI), and the fifth generation (5G) mobile communication applications. The continuous efforts have been devoted by circuits and systems designers to develop advanced electronics that meet the fundamental requirements of efficiency, reliability, security as well as safety toward sustainable and healthy societies. Those goals will not be achieved without the enthusiasms by our talented specialists and young engineers in the field of integrated circuits and devices.

It is my great honor to announce the publication of this special section on solid-state circuit design. This section contains 1 invited, 8 regular and 1 brief papers, all devoted to the distinctive exploration of novel techniques on integrated circuits, systems and architectures. Design methodologies for analog, digital, memory, radio frequency (RF), and mixed-signal circuits are widely discussed and explored.

The first paper (invited) is entitled “Secure Cryptographic Unit as Root-of-Trust for IoT Era” and shares the visions of security enhancements throughout a vertically integrated IoT society from edge devices to global systems. This is followed by a paper discussing circuit techniques toward nano-watt sensor nodes. Then, the next two papers are dedicated to the state-of-the-art RF circuits for isolation and oscillation. Two papers are on the topics of true random number generator and variable delay circuits, which promote advanced digital systems implementation. Subsequent two papers discuss hardware acceleration of machine learning with architectures aiming at low overhead and high energy efficiency, and another paper proposes the energy-efficient usage of non-volatile memory for image processing. In the last but not the least, pulse modulation circuits are pursued for in-vehicle digital data communication.

On behalf of the editorial committee, I would like to express my sincere appreciation to all the authors for their contributions and to all the reviewers for their critical inputs. In addition, I would like to thank the editorial committee for their works on this special section.

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Makoto Nagata (*Member*) received the B.S. and M.S. degrees in physics from Gakushuin University, Tokyo, in 1991 and 1993, respectively, and a Ph.D. in electronics engineering from Hiroshima University, Hiroshima, in 2001. He is currently a professor of the graduate school of science, technology and innovation, Kobe University, Kobe, Japan. Dr. Nagata is currently chairing the technology committee of the integrated circuits and devices (ICD) of IEICE and also the technology directions subcommittee for the international solid-state circuits conference (ISSCC) of IEEE. He also served as an associate editor of the IEICE Transactions on Electronics (2002–2005).

