Guest Editors' Introduction: Circuits and Systems for VLSI IoT Devices

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THIS SPECIAL ISSUE explores the challenges posed by the design of very-large-scale integration (VLSI) nodes for the Internet-of-Things (IoT) systems. These systems use wireless communication to link together physical devices into distributed real-time embedded systems. IoT systems are used in a wide range of applications, including industrial control, vehicles, smart grids, and medical and health care systems.

IoT systems pose design and test challenges for VLSI devices that are designed to operate as IoT nodes. IoT nodes must provide sensing, actuation, processing, and communication at ultralow-power levels and at very low cost. They must be designed to be resilient in the face of harsh environments, challenging communication requirements, and long lifetimes that may reach beyond the useful lives of the individual nodes. Nodes must provide safe operation and satisfy strict security requirements in the face of ever-changing Internet threats.

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A wide range of IoT systems have been deployed using existing CMOS technologies and wireless communication systems. As the demand for IoT-enabled applications is increasing, we expect new device and circuit technologies to expand the design space of IoT nodes. We also expect IoT system architectures to be refined to allow rapid deployment by nonexperts with reliable operation over a period of years.

This special issue includes two contributions, each at a different level of the design hierarchy. The article "Compact Modeling of Thin-Film Transistors for Flexible Hybrid IoT Design" describes circuit simulation models for thin-film transistors that can be used in flexible electronics. The article "Introducing Hardware-Based Intelligence and Reconfigurability on Industrial IoT Edge Nodes" describes FPGA-based architectures for IoT edge devices with compute capability. We would like to thank the contributors and reviewers for their efforts. ■

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