VLSI 2020 Highlights

A Virtual Version in Response to COVID-19

Due to COVID-19, for the first time in its history, the 2020 Symposia on Very Large-Scale Integration (VLSI) Technology and Circuits was held virtually. The event is the premier gathering for the advancement of microelectronics technology and circuits. All regular content from the normal symposia was available via streaming on demand using the ON24 platform. In addition to streaming on-demand content, live streaming events and discussion blogs were held that focused on interaction among speakers, experts, and audiences. The live events were held from 15 to 18 June for 3–4 h per day in both Asia-friendly and Europe-/North America-friendly time zones. The event was organized around the theme The Next 40 Years of VLSI for Ubiquitous Intelligence.

Symposia Highlights

Plenary Sessions (15 and 17 June)

The symposia incorporated two plenary sessions. The first, on 15 June, included two presentations: "5G Evolution and 6G" by Takehiro Nakamura, senior vice president and general manager of 5G Laboratories, NTT Docomo, and "Silicon is Greener: Why Innovation in Circuits Is Needed for Sustainability" by Jen Lloyd, vice president of the Precision Technology and Platforms Group, Analog Devices. The second plenary session, on 17 June, included "The Future of

Compute: How the Data Transformation Is Reshaping VLSI" by Michael C. Mayberry, senior vice president and chief technology officer at Intel, and "Empowering Next-Generation Applications Through Flash Innovation" by Shigeo (Jeff) Ohshima, technology executive at Kioxia (formerly Toshiba Memory).

Joint Focus Sessions

The ongoing integration of symposia elements included a series of joint focus sessions presenting contributed papers from the technology and circuits programs. The topics included silicon photonics, 5G/millimeter-wave, system–technology co-optimization/design–technology co-optimization, and future opportunities for magnetoresistive random-access memory beyond spin–torque transfer.

Panel Sessions (16 and 18 June)

The technology panel discussion on 16 June, moderated by Gary Bronner, senior vice president of Rambus Labs, addressed the question of whether artificial intelligence (AI)/machine learning will bring divergent memory and logic technology back together? The topic of the circuits panel session, held on 18 June, was the future role of AI/machine learning in circuit design (human versus machine).

Short Courses (15 June)

Two technology short courses took place. The first, "Future of Scaling for Logic and Memory," covered a range of topics, including nanosheet transistors, on-die interconnect challenges, a review of previous memory-scaling challenges, ferroelectric hafnium oxide applications in memory, and the use of extreme ultraviolet lithography. The second, "More Than Moore," addressed emerging technologies for through-silicon, via-free monolithic 3D ICs, in-situ BELO transistors and oxides, and layer transfer technologies for heterogeneous integration.

The circuits short course, "Trends and Advancement in Circuit Design," addressed a variety of topics, including topologies of switched capacitor converters, noise-shaping-successive-approximation-register analog-to-digital converter techniques, next-generation resistor-based sensors, time reference and frequency generation, ultraminiaturized wireless transceiver IC design, high-speed serial links for high-density input/output (I/O) applications, and design considerations for emerging memories and in-memory computing. A joint technology/circuits short course, "Heterogeneous Integration: To Boldly Go Where No Moore Has Gone Before," covered a range of topics, including chiplet design benefits and limitations, heterogeneous system partitioning, back-end 2.5D/3D solutions, heterogeneous integration for AI, 3D packaging for microelectromechanical systems and sensors, I/O circuits, tools and flows, and design strategies for memories.

Demonstration Session

The popular demonstration session consisted of a prerecorded video

presentation. All the accepted demonstration videos have been posted online, and viewers can click through them and post comments, providing interaction between the authors and virtual attendees.

"Friday Forum" (17 June)

The symposia program included a virtual forum session (formerly known as the "*Friday Forum*"), which involved a series of presentations focusing on technologies and circuits for edge intelligence, led by experts in the field who helped guide participants through discussions concerning the contributions of technology and the circuits needed to drive the future of advanced edge computing.

Workshops (16 and 17 June)

Held before the main symposia technical sessions began, these workshops provided additional learning opportunities for participants. The topic titles included the following:
- "Know Where You Are Going: Metrology in the New Age of Semiconductor Manufacturing"
- "Analog Computing Technologies and Circuits for Efficient Machine Learning Hardware"
- "Quantum Computing: Maximizing the Impact of the Semiconductor Industry."

The two symposia have been held together since 1987, providing an opportunity for the world's top device technologists and circuit and system designers to exchange leading-edge research on microelectronics technology, with alternating venues between Hawaii and Japan. A single registration enabled participants to attend both events.

Sponsoring Organizations

The Symposium on VLSI Technology is sponsored by the IEEE Electron Devices Society and the Japan Society of Applied Physics, in cooperation with the IEEE Solid-State Circuits Society (SSCS). The Symposium on VLSI Circuits is sponsored by the SSCS and the Japan Society of Applied Physics, in cooperation with the Institute of Electronics, Information, and Communication Engineers.

—Deidre Artis and Bill Bowhill

Highlights of CICC 2020

The First SSCS Virtual Conference

The 41st annual IEEE Custom IC Conference (CICC 2020) was held virtually between 22 and 25 March 2020. *Virtually* is probably the key word. For the first time in its history, the IEEE Solid-State Circuits Society

(SSCS) and its affiliates gathered from the safety of homes and offices, with attendees keeping a safe social distance from their colleagues, thanks to the worldwide spread of the Internet. No flights were taken, and no hotel rooms were booked. Due to the inevitable time zone differences, some attendees even courageously joined sessions in their nightwear, long after normal working hours, to participate in the live Q&A sessions.

In this new setting, our community succeeded in in getting together to share cutting-edge updates, from ultralow-power wireless transceivers to neural network acceleration,

An invited paper on low-power receivers for IoT applications, by David Wentzloff, University of Michigan.

An industry presentation during the Journey of a Start-Up forum discussed venture capital funding.