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Summary of IEDM Conference

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Abstract

This is a summary of some of the papers presented at the International Electron Device Meeting (IEDM), held in San Francisco, Dec, 2021. As in the past, this conference covered many areas of semiconductors and their applications. Some of the areas of interest include Integration Technology, Quantum Computing hardware, Automobile radar, RF, Gallium Nitride (GaN) and Silicon Carbide (SiC) technologies.

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This is a summary of some of the papers presented at the International Electron Device Meeting (IEDM), held in San Francisco, Dec, 2021. As in the past, this conference covered many areas of semiconductors and their applications. Some of the areas of interest include Integration Technology, Quantum Computing hardware, Automobile radar, RF, Gallium Nitride (GaN) and Silicon Carbide (SiC) technologies.

As mentioned in the keynote talk, "the importance of semiconductors in today's day and age cannot be overstated. Semiconductors have greatly contributed to the well-being of society, and they expect future innovations to have an even greater impact". Despite all the highly impacful progress that were made, the industry's capability to remain on its growth trajectory path remains in question, given that technological advances are increasingly becoming more challenging, evolutionary, and costly. But human creativity will continue to surprise us. In quantum computing technology, the IBM Quantum Development Roadmap laid out their vision of developing the entire quantum computing system, namely, from the qubit to the quantum processor technology, control circuits to algorithms implemented both in the cloud and working closely with the local high performance computing hardware.

The author of a paper on automobile radar, emphasized that in the longer run, the importance of integration of analog and digital circuits and control and calibration circuitries will promote full "radar on chip" concepts

At this conference, there were 7 GaN papers presented. 3 papers were related to GaN on Si and two on p-type GaN, one on low noise GaN and one discussed about electrostactic issue It seems there are increasing attention paid to p type GaN to allow digital GaN possible but also to promote integration technology of GaN. For p-type GaN, a 75 nm wide FinFETs could achieve the highest ever reported, a "normally-off" device with an "on-current" of 65 mA/mm, highest. At the same time, a Ion/Ioff >107 ratio was also attained. In another paper, a GaN/SiC-based hybrid high electron mobility transistors were experimentally demonstrated to address the destructive breakdown problem in many GaN devices. It uses the concept of technology integration whereby a GaN-based HEMT and a SiC-based PN diode are monolithically integrated. Breakdown voltage of 1.27 kV was achieved.

Integration technologies were heavily promoted at this conference. Heterogeneous, monolithic and 3D stack circuit and 3D silicon on chip were discussed. As stated by one of the authors: "Partition of monolithic 2D (M2D) chip and heterogeneous integration of resultant chiplets are inevitable in the near future due to rising cost of transistor and complexity of process."

A paper on analog memory was presented using a superlattice FerroFET-based technology. The paper claimed with experimental work to achieve a high precision analog weight cell with good linearity results.

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