<Professor Minkyu Je's Lab.>

IMPACT Lab
Integrated Microsystems Powered with Advanced Circuit Technology

■ **Contact information**
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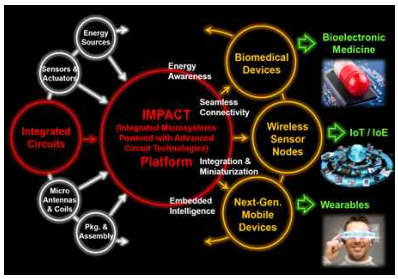
■ **Current state of the Lab. (in 2025 Spring Semester)**
Postdoctoral Fellows : 2 PhD Students: 21 Master's Student: 21

■ Research Areas



The core technology of the research is analog, mixed-signal, and RF integrated circuit design techniques, especially focusing on intelligent sensor interface circuits and ultra low power wireless communication circuits.

▷ **Intelligent sensor interface**

The sensor interface circuit that works with the sensor is an essential component to acquire the information of the real physical world. It has to provide sufficient performance while consuming low power. In particular, we aim to develop an intelligent interface circuit that can compensate the deficiencies of the sensor and extract meaningful information even under imperfect conditions.

▷ **Ultra-low-power wireless communication**

Particularly, we are interested in the technology that realizes the short distance communication in the vicinity of the human body with high energy efficiency as well as the various circuit techniques for duty-cycling the wireless communication circuits which consume the most power in the wireless sensor microsystems as much as possible.

▷ **Microsystem convergence for emerging applications**

Based on this low-power integrated circuit technology, the extremely small and intelligent systems can be integrated for various applications expected to play an important role in the future. Especially, the miniaturized medical device that can be implanted inside a human body for therapeutics, brain research, and neuromodulation is the main application area. We are also interested in wearable devices which are expected to be the next generation mobile devices, and ultra low power wireless sensor nodes which are key to the implementation of the internet of things.

■ Recommended courses & Career after graduation

Courses on circuit and system design as well as wireless communication are recommended, which include circuit theory, electronic circuits, analog electronic circuits, digital electronic circuits, digital systems, digital signal processing, communication engineering, and radio engineering. After graduation, your career can be furthered at a variety of domestic and foreign companies, research institutes, or universities related to integrated circuit and microsystem design as well as research and development in the application areas of IoT, wearables, and medical devices.

■ Introduction to other activities besides research

The IMPACT lab. is fairly new in that we started in 2016 at KAIST. Therefore, the members can make an important contribution in forming the culture of the laboratory. The best possible support will be provided to create an environment in which the members can engage in research with pleasant passion, voluntary commitment, and open exchange, based on strong mutual trust. A variety of non-research activities are also being created in line with this.

■ Introduction to the Lab.

We are not just targeting to develop new circuit design techniques, but to create substantial achievement that can greatly affect our future lives, by working together with experts from diverse fields including sensor, energy, communication, packaging, as well as medical devices and IT applications through an international collaborative research network.

■ Recent research achievements (2025)

[1] A No-Patient-Data Seizure Classifier SoC for Real-Time Classification of Seven Seizure Types Using Feature Fusion and Near-Memory Computing, in Proc. IEEE Symposium on VLSI Technology and Circuits (SOVC), Jun. 2025.

[2] A Temperature-Insensitive PM Capacitance-to-Digital Converter with DLL-Based Comparator Delay Compensation Achieving 53.5ppm/°C Without Calibration, in Proc. IEEE Symposium on VLSI Technology and Circuits (SOVC), Jun. 2025.

[3] A 16-QAM-based Multi-node BCC System with Bias-Electrode-Free Multi-channel ExG Readout ICs, in Proc. IEEE Symposium on VLSI Technology and Circuits (SOVC), Jun. 2025.

[4] A 189.3 dB-FOMS 14.5fJ/Conversion-Step Continuous-Time Noise-Shaping SAR Capacitance-to-Digital Converter, in Proc. IEEE International Solid-State Circuits Conference (ISSCC), Feb. 2025.

[5] An 18.5 nF-Input-Range PM-SAR Hybrid Capacitance-to-Digital Converter Achieving 6.1 μs Conversion Time at 18.1 pF Input Capacitance, in Proc. IEEE International Solid-State Circuits Conference (ISSCC), Feb. 2025.

[6] An Enhanced-Frequency-Splitting-Based Wireless Power and Data Transfer System Achieving 60.2 % End-to-End Efficiency and 1Mb/s Data Rate with a Sub-cm RX Coil for Miniaturized Implants, in Proc. IEEE International Solid-State Circuits Conference (ISSCC), Feb. 2025.

[7] A Wireless Adiabatic Stimulator System with Current-Mode Power Reception and Stimulus Current Regulation Achieving Precise Charge Delivery and Electrode Scalability for Miniaturized Electroceuticals, in Proc. IEEE International Solid-State Circuits Conference (ISSCC), Feb. 2025.