SEMICONDUCTOR ENERGY LABORATORY

Analog In-Memory Computing Circuit Technology Using Oxide Semiconductors

Background

The rapidly increasing electrical energy consumption of AI computations has become an urgent issue. Given the exponentially growing number of AI users, there is a pressing need to reduce the energy consumption by several orders of magnitude, especially during inference. SEL has developed oxide semiconductor materials and field-effect transistors with extremely low off-state current and, thanks to miniaturization, an on-state current approaching that of Si. The next step is to leverage these breakthrough results and develop ultra-low power, in-memory computing chips for the next-generation AI solutions.

Goal

The goal of this project is to develop circuit technologies and architectures that achieve significantly lower power consumption compared to conventional Si-based AI chips. You will learn about the current issues through literature studies and explore new ways to address the challenges ahead. You may thereby have the opportunity to file patent applications or present the results at academic conferences.

Tasks

1. Discuss research topics with SEL staff and make proposals.
2. Obtain independent operational skills and knowledge of SEL's circuit design and simulation environment.
3. Investigate previous research and devise circuit ideas that lead to low power consumption.
4. Design and simulate the circuit ideas to determine their feasibility.

Required Qualifications

- Knowledge and experience in analog and digital electric circuits.
- Basic programming skills in Python, Excel macros, or similar tools for data analysis.
- English communication skills. Knowledge in Japanese is an advantage but not required.

Contact information

This project is hosted by SEL. Students are invited to apply for a scholarship from SEL through the Sweden-Japan Foundation. For more information, please visit the SEL web site or contact the SEL public relations team at info@sel.co.jp.