

# TAKAMIYA LAB.

## [Electronics to Create IoT]

Department of Informatics and Electronics

Versatile LSI System Design

Department of Electrical Engineering and Information Systems

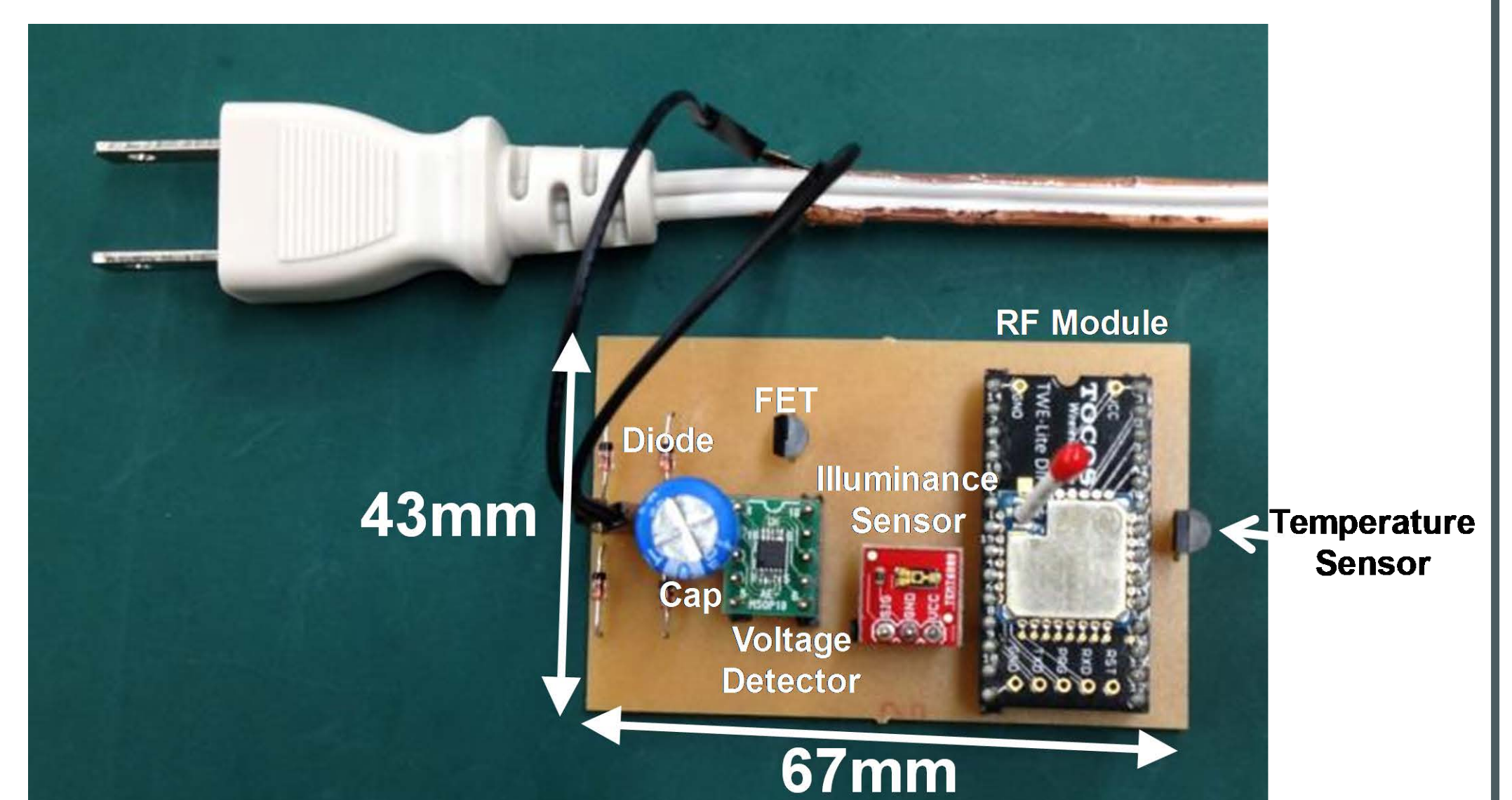
<http://www.k-ishiilab.iis.u-tokyo.ac.jp>

### Integrated Power Management Circuit

The application scope of electronics such as IoT, wearables, and implants is expanding from the thing to the surface and inside of the body. The key to realizing them is power supply technology. Takamiya Laboratory conducts research on power supply technology for IoT nodes, power devices, ultra-thin flexible electronics, and microprocessors, with LSI system design as the core technology.

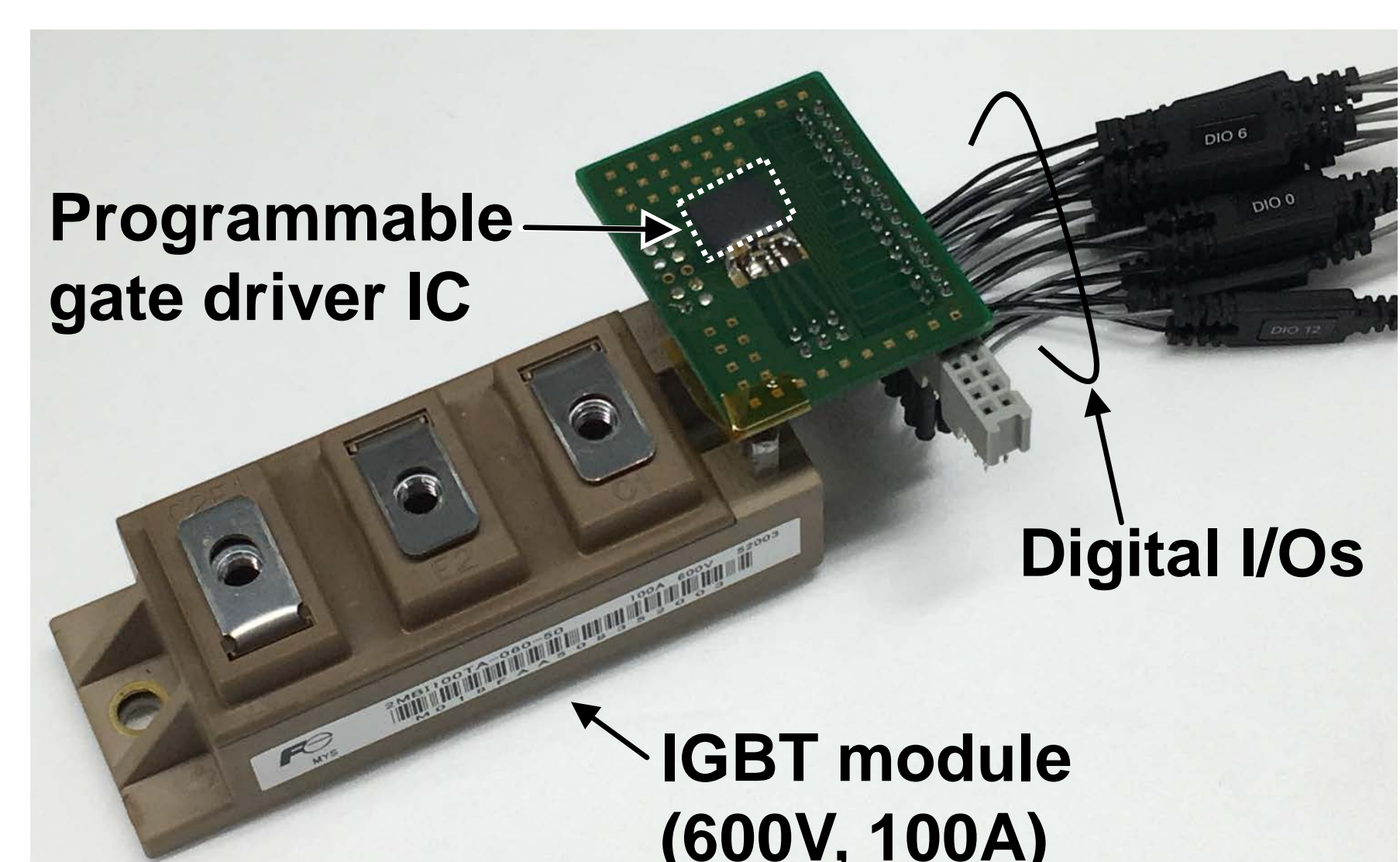
### Energy Harvesting and Wireless Power Transfer for IoT Nodes

As an example of energy harvesting, we show a temperature / illuminance sensor node that obtains power from the power cord skin. We proposed electric field energy harvesting from the power cord skin to reduce the time of battery replacement for wireless sensor nodes that measure air temperature and illuminance and transmit wirelessly for energy management in buildings.



### Programmable Gate Driver IC for Power Transistor (IGBT)

By merging different fields of power electronics and LSI, we have developed a programmable gate driver IC that can change the gate drive current of a power transistor (IGBT) with a digital interface. By automatically optimizing the gate voltage waveform in the IGBT switching process using AI, both switching loss and switching noise can be reduced.



### Luciola: A Millimeter-Scale Light-Emitting Particle Moving in Mid-Air

Using a focused ultrasound beam, we developed a small LED light source operating 4 mm in diameter, wirelessly powered, floating, and moving. Applications to light emitting pixels for aerial displays are expected.

