

# Society 5.0を支える集積システムの創出



International industry-academic collaboration (CIES consortium) enhances creation of innovative integrated electronic technologies from materials/equipment/devices to LSI/software/system for Society 5.0

東北大学 国際集積エレクトロニクス研究開発センター

Center for Innovative Integrated Electronic Systems (CIES), Tohoku University

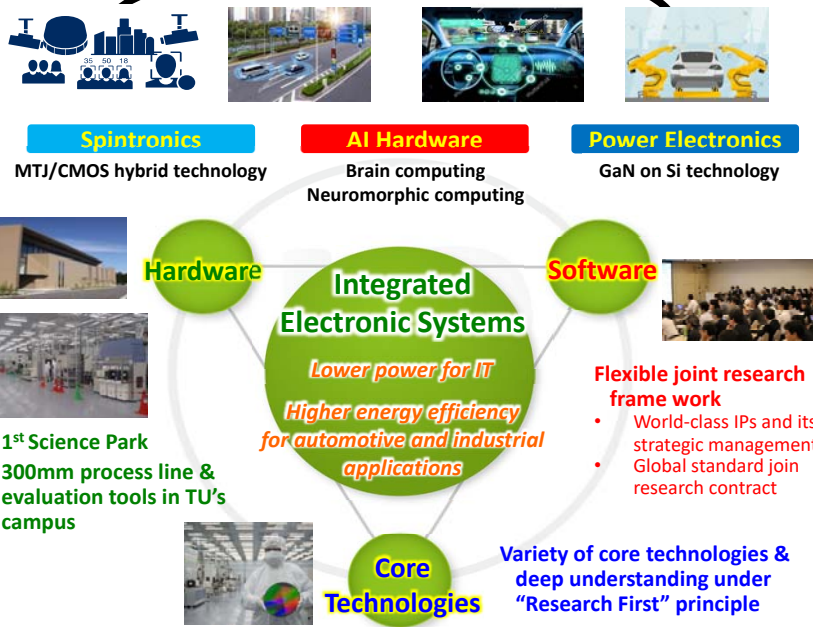
- Mission**
- ▶ Enhancement of global competitiveness in the field of next-generation integrated electronics systems.
  - ▶ Practical realization of applications of this technology field and creation of new industries.

- Vision**
- ▶ Establishment of R&D consortium with industries
  - ▶ Development of innovative technologies for Integrated systems and creation of new industries.



Tetsuo Endoh  
Director of CIES

## Society 5.0



## Innovative Technologies for Energy-Saving & Intelligence

### Spintronics

- CMOS/spintronics fusion technologies
- 3D-structured silicon device technologies
- IoT edge computing device technologies, etc.

### AI Hardware

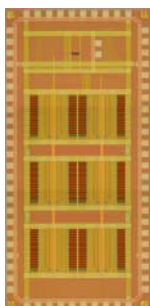
- Brain-type nonvolatile IC technologies
- Intelligent computing system technologies, etc.

### Power Electronics

- GaN/Si power device technologies
- Low-loss hybrid power integrated device technologies
- High-efficiency power electronics technologies
- Innovative power management system technologies, etc.

## World-Leading Accomplishments

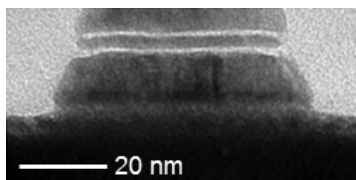
### STT-MRAM based AI processor (12 cores)



MMM 2016  
JJAP 2016  
SEMICON China 2017

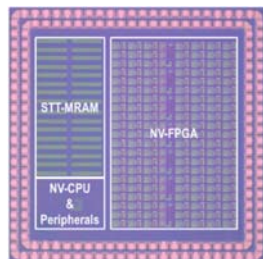
Reactive etching process suitable for high-density STT-MRAM manufacturing

Collaboration with Tokyo Electron



Tohoku Univ. Press Release May 2018

### Ultralow power FPGA MCU @47μW (Energy harvesting)

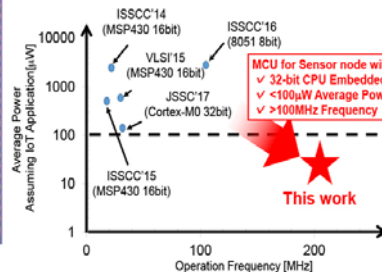


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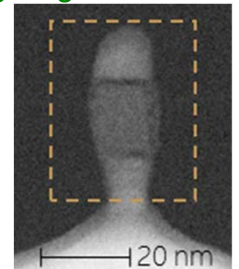
Measurement system for STT-MRAM

Collaboration with Keysight Technologies

Tohoku Univ.  
Press Release  
September 2017  
& May 2018



### Single-digit-nanometer MJT



Nature Communication 2018

Memory LSI tester for STT-MRAM

Collaboration with Advantest, TOKYO SEIMITSU, MICRONICS JAPAN, Toei Scientific Industrial

