The Office of Technology Management

UNIVERSITY OF TEXAS ARLINGTON

Cold-Electron Transistor – for Extremely Energy Efficient Electronics

Tech ID: UTA 13-34

INVENTOR: Dr. Seong Jin Koh

TECHNOLOGY NEED

As electronic devices get more powerful while becoming more and more compact, they require more energy (therefore dissipating more heat). As the current transistor architecture is approaching its limit, no viable path has yet been seen to dramatically reduce the energy consumption and heat dissipations of electronic devices.

INVENTION DESCRIPTION/SOLUTION

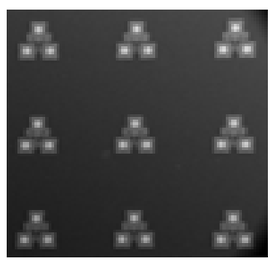
We have developed a new technology in which electrons are effectively cooled to –228 °C by a quantum well state at room temperature (*Nature Communications*). Built on this technology, we have developed a new disruptive device named cold-electron transistor. This cold-electron transistor could operate with extremely little energy, about 100 times less energy (100 times less heat generation) compared to the currently most advanced transistors.

APPLICATIONS

- Electronic gadgets with extremely-low power consumption (*e.g.*, laptops, smartphones, tablets that can operate for weeks without recharging)
- Military Electronic devices
- Supercomputers (*e.g.*, for data centers for Google, Amazon, etc.)

KEY BENEFITS

- Extremely low energy consumption
- Increased battery life (by ~100 times)
- Extremely low heat dissipation



Scanning electron microscope (SEM) image of fabricated device

STAGE OF DEVELOPMENT

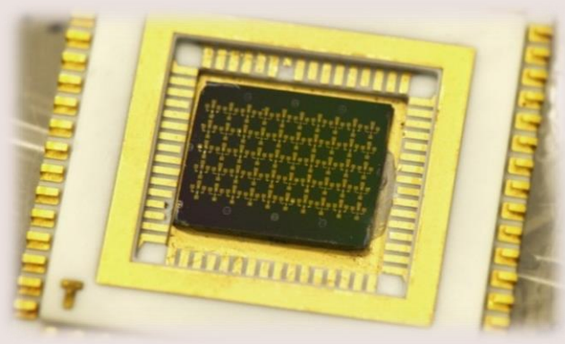
- Prototype – Device structure fabricated

INTELLECTUAL PROPERTY STATUS

- US Granted Patent **US9704977 B2** ; **US10038084B2**
- Patent Pending – **US20180323290A1**
- Patent Pending (China, Europe, Japan & Korea)

PUBLICATION

Koh et. al,. Energy-filtered cold electron transport at room temperature, Nature Communications, Volume 5, Article number: 4745 (2014).



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