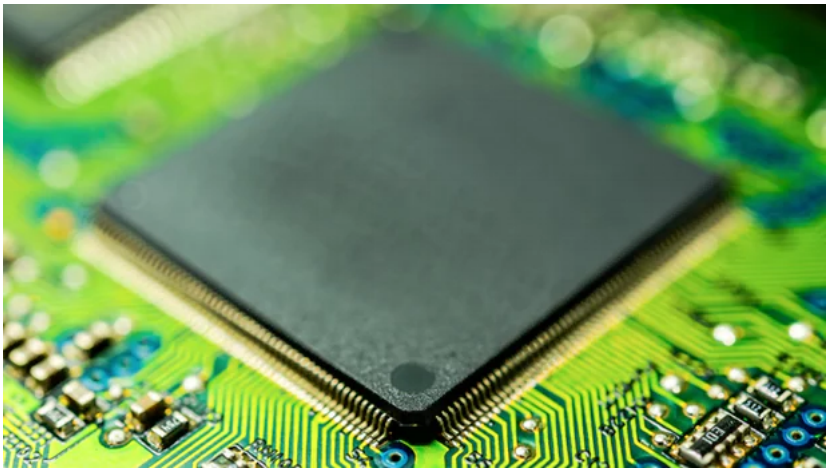
COMPUTERS

ReRAM can now store and process data in the same chip

Michael Irving | January 17th, 2017



Researchers in Singapore and Germany have developed a chip that can not only process data, like the one above, but can also act as memory storage (Credit: Mark800/Depositphotos)

Those lucky enough to work from home will probably tell you that one of the best things about it is the time saved by not commuting to the office. Inside a computer, data goes through a similar process, commuting between its "home" in the system memory to "work" in the processor, but now researchers in Singapore and Germany have found a way to help that data effectively work from home. The team is developing memory chips that can process information right where it's stored, potentially allowing for faster, smaller and more efficient computers and mobile devices.

The new circuit is based on Resistive switching RAM (ReRAM) memory chips, which are just starting to become commercially available. These chips store information by effectively remembering a variable value of electrical resistance, which can be changed by applying different currents, and being non-volatile, they can retain that memory even while turned off. Also known as a "memristors," these chips are said to function like the neurons in a human brain, and are sought after due to the fact that they're faster, smaller, can store more data and require less energy to run.

Memristors have been projected to be the future of both memory and processors, and the new circuit combines them both into one device. Developed by scientists at Nanyang Technological University in Singapore, RWTH Aachen University, and the Forschungszentrum Juelich research center, the ReRAM chip could remove the need for separate processing and memory components, leading to smaller and thinner devices that use less power. And since there's no wait time for data to run between the storage and processor, they will be faster too.

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"ReRAM is a versatile non-volatile memory concept," says Professor Rainer Waser, co-author of the study. "These devices are energy-efficient, fast, and they can be scaled to very small dimensions. Using them not only for data storage but also for computation could open a completely new route towards an effective use of energy in the information technology."

The binary system, where information is represented with a series of ones and zeroes, is standard practice, but the team says translating data into this digital language takes time and can slow the process down.

"This is like having a long conversation with someone through a tiny translator, which is a time-consuming and effort-intensive process," says Anupam Chattopadhyay, co-author of the study. "We are now able to increase the capacity of the translator, so it can process data more efficiently."

To do so, the team is making use of ReRAM's ability to store data in an analog format - that is, it can register on a more detailed gradient scale, rather than the simple on or off of binary. The prototype circuit uses what's called the Ternary number system, which can store and process data using three states: zero, one or two. While it's not truly analog yet, it's a step in that direction.

The next step for the researchers is to develop a system that allows ReRAM to process and store data with higher amounts of states, as well as reaching out to companies to help develop commercial products that make use of the findings.

The research was published in the journal *Scientific Reports*.

Source: Nanyang Technological University

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