Memristor – the fourth fundamental circuit element (**Memristorul** - cel de al patrulea element fundamental de circuit)

English version

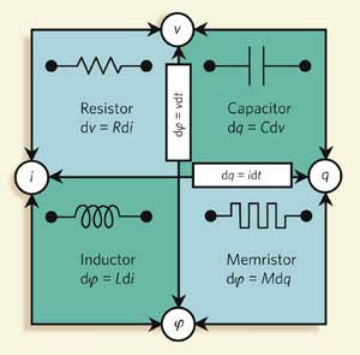
Leon Chua, a professor at the University of California at Berkeley, said 37 years that there should be a fourth fundamental circuit element next to resistor, capacitor and inductor. Resistor resists the flow of electricity, capacitor stores electricity, inductor resists changes to the flow of electrical current and the fourth theoretical circuit element, which Chua called a memristor, would register how much current has passed.

HYP scientists finally managed to create world's first memristors. The new circuit elements will be useful in the creation of very dense, energy efficient memory chips : Williams and other scientists at Hewlett-Packard published recently (April 30, 2008) a paper demonstrating that these things actually exist. HP has a few discrete memristors as well as a silicon chip embedded with memristors. It's a first, according to HP.

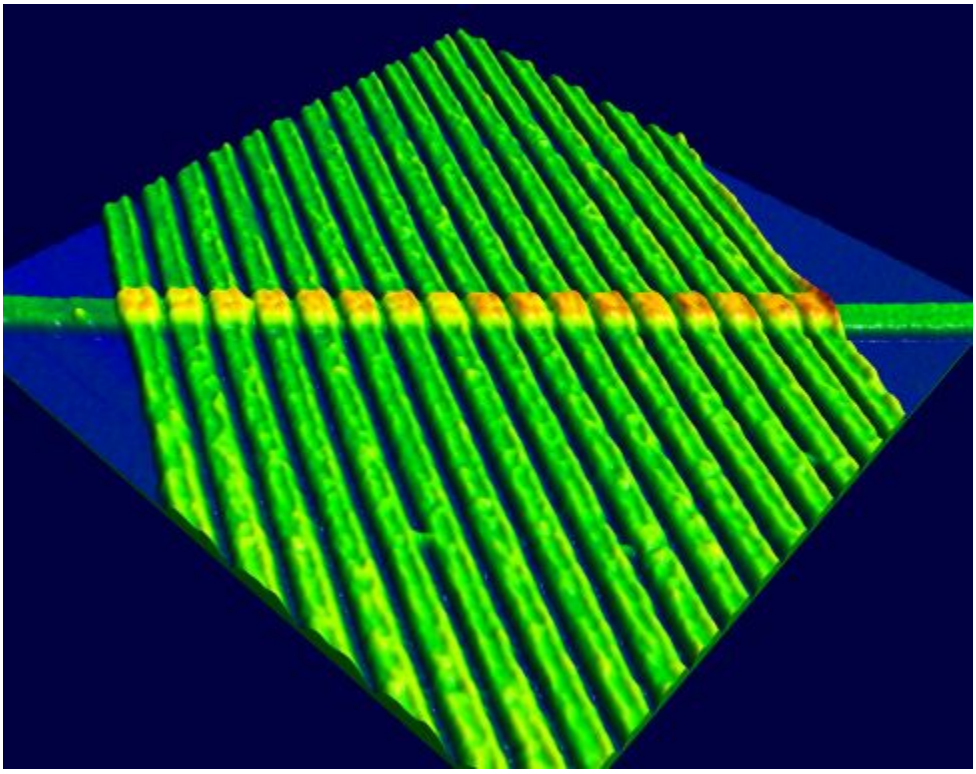
If memristors can be commercialized, it could lead to very dense, energy-efficient memory chips. Scientists have made devices that function like memristors, but it took a good number of transistors and several capacitors, Williams said. Memristor chips will function like flash memory and retain data even after a computer is turned of, but require less silicon, consume less energy, and require fewer transistors.

A memristor effectively stores information because the level of its electrical resistance changes when the current is applied. A typical resistor provides a stable level of resistance. By contrast, a memristor can have a high level of resistance, which can be interpreted by a computer as a "1" in data terms, and a low level can be interpreted as a "0". Thus data can be recorded and rewritten by controlling current, Williams said.

In fact the memristor is an electrical resistor with memory properties. The name comes from "memory resistor"(mem-resistor). The memristor is able to store and retrieve a vast array of intermediate values, not just binary "1" and "0" like contemporary chips do make ! This prospective is more than amazing ! Moreover, memristors can function in either digital mode, in which a memory cell is "on" or "off", or in analog mode, in which each cell holds some value in-between. These values grow every time the cell receives an electrical signal, mimicking the way neurons in the brain build stronger memories the more they are stimulated.



The four fundamental circuit elements: the resistor, the capacitor, the inductor, the memristor



Memristor close-up: An atomic force microscope image shows 17 memristors in a row. Each has a bottom wire that contacts one side of the device and a top wire that contacts the other. The wires in this image are 50nm, or about 150 atoms, wide. Photo by J. J. Yang, HP Labs