



# Spintronics, The Future Technology

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## THE CURRENT TECHNOLOGY

Undoubtedly electronic devices form an essential part of our daily life. Majority of these devices are based on silicon semiconductor's technology which constitute a \$1000 billion market in 2010.

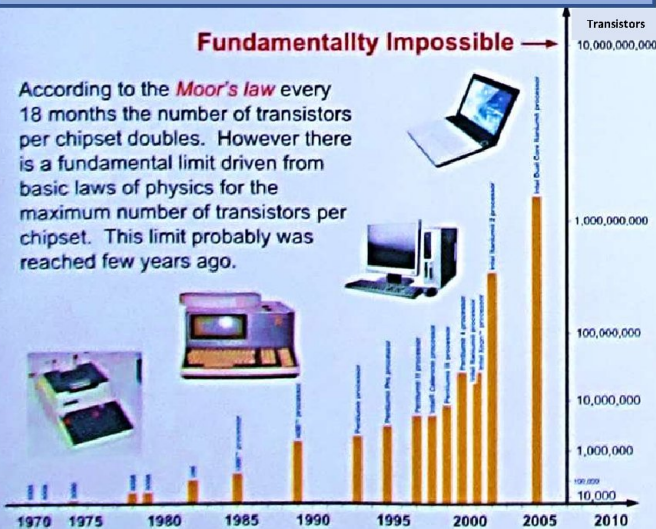


The market demand for higher performance devices has pushed the entire silicon industry to its technological limit.

## THE PROBLEM

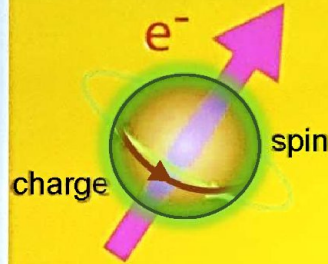
**Fundamentally Impossible** →

According to the *Moor's law* every 18 months the number of transistors per chipset doubles. However there is a fundamental limit driven from basic laws of physics for the maximum number of transistors per chipset. This limit probably was reached few years ago.



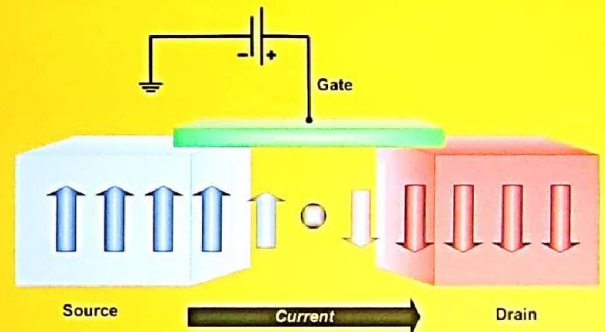
Higher performance is usually achieved by fabricating more transistors on the silicon chipset. However as the number of transistors per chipset increases, the generated heat in the chipset will eventually renders the chipset dysfunctional.

## THE SOLUTION

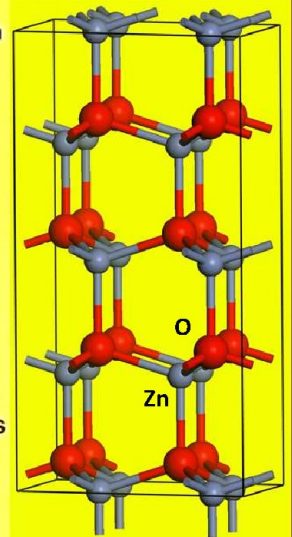


In conventional silicon technology, all functions are controlled via electron's charge. However, electrons possess another property and that is their "*spin*".

Controlling electron's spin requires far less energy than electron's charge, thus producing less heat in the chipset. Consequently spin-controlled or "*Spintronic*" devices will be a solution for the disaster predicted by Moor's law.



Our research results indicate that zinc oxide (ZnO) is the perfect alternative for silicon to fabricate spintronic devices. ZnO is a widely available and non-toxic compound that already has vast applications in electronics. This allows not only to surmount the fundamental limit of current electronic technology, but also to combine the current applications of ZnO with the future spintronic innovations resulting in *multi-functional* devices.



### Further Reading:

Google: Materials Science UNSW

Wikipedia: ZnO based diluted magnetic semiconductors

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