

Magneto-diode: principle and application to chameleon processor

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Chameleon processor provides novel functions such as programmable logic operation and non-volatile built-in memory. We introduce a new semiconductor magneto-electronic device that could be a good candidate of chameleon process [1]. It can offer excellent fan-out if combined with low power spintronic devices. Operation of our modified avalanche diode is based on magnetoconductance that depends on Lorentz force deflection of carriers in a magnetic field and subsequent recombination. The device can be characterized as a current switch with ON and OFF states. In this talk, we describe our prototype devices, which have demonstrated magnetoconductance ratios of more than 500% in a magnetic field of 1,000 Oe. We then discuss feasibility for integrated avalanche diode logic devices in which the magnetic field is provided by the local fringe field of a patterned ferromagnetic film with nanometer dimensions. We provide estimates of the characteristics of a model cell scaled to a feature size of about 100 nm and predict that an appropriately designed cell will have current gain.

References

1.S. Joo, et al. Nature 494, 72 (2013)