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Silicon-based current-controlled reconfigurable magnetoresistance logic combined with non-volatile memory XIAOZHONG ZHANG, Tsinghua University, ZHAOCHU LUO, Tsinghua Universitycn — Silicon-based complementary metal-oxide-semiconductor (CMOS) transistors have achieved great success. However, the traditional development pathway is approaching its fundamental limits. Magnetoelectronics logic, especially magnetic-field-based logic, shows promise for surpassing the development limits of CMOS logic. Existing proposals of magnetic-field-based logic are based on exotic semiconductors and difficult for further technological implementation. We proposed a kind of diode-assisted geometry-enhanced low-magnetic-field magnetoresistance (MR) mechanism. It couples p-n junction's nonlinear transport characteristic and Lorentz force by geometry, and shows extremely large low-magnetic-field MR (>120% at 0.15 T) Further, it is applied to experimentally demonstrate current-controlled reconfigurable MR logic on the silicon platform at room temperature [1]. This logic device could perform Boolean logic AND, OR, NAND and NOR in one device. Combined with non-volatile magnetic memory, this logic architecture has the advantages of current-controlled reconfiguration, zero refresh consumption, instant-on performance and would bridge the processor-memory gap. [1] *Z.C Luo, X.Z. Zhang, et al., Adv Func Mater, DOI: 10.1002/adfm.201402955*

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