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mLogic: All Spin Logic Device and Circuits for Future Electronics¹

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Utilizing Spin Hall Effect to drive domain wall motion for state-switching, mCell is a four terminal device with separate read/write paths. In a mCell, write path is a multilayer thin film stack of perpendicular anisotropy with a single domain wall trapped within. A read path consists of two laterally placed MTJs. An entire family of logic circuits, referred to as mLogic, can be configured solely using mCells without using any semiconductor transistors. In this talk, micromagnetic modeling and circuit simulations will be presented to show the technology potential. We will also present experimental fabrication of mCells and mLogic circuits. Kerr microscopy has been used to investigate current-driven domain wall motion in various magnetic multilayer structured read path. Electric testing of the fabricated mCell devices shows reliable state-switching of the mCells.

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