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Room-temperature operation of Si spin MOSFET with high on/off spin signal ratio MASASHI SHIRAISHI, Department of Electronic Science and Engineering, Kyoto University, HAYATO KOIKE, Technology HQ, TDK Corporation, TAKAYUKI TAHARA, Department of Electronic Science and Engineering, Kyoto University, TOMOYUKI SASAKI, MAKOTO KAMENO, Technology HQ, TDK Corporation, YUICHIRO ANDO, Department of Electronic Science and Engineering, Kyoto University, KAZUHITO TANAKA, SHINJI MIWA, YOSHISHIGE SUZUKI, Graduate School of Engineering Science, Osaka University — Si spintronics is now one of the pivotal fields in semiconductor spintronics. After the first report on successful propagation of pure spin current in Si, much effort has been paid for realization of Si spin metal-oxide-semiconductor field-effect transistor (MOSFET), since Si spin MOSFETs allow constructing reconfigurable logic circuits with ultra-low energy consumption. Our group achieved the first operation of Si spin MOSFET at room temperature by using non-degenerate n-type Si [1]. However, the remaining issue to be solved was low on/off ratio of spin signals. In this presentation, we report on our experimental demonstration of Si spin MOSFET with high on/off ratio of spin signals. The on/off ratio is greater than 10^3 , whereas on/off ratio in a conventional MOSFET operation is ca. 10^5 . More importantly, the gate voltage dependence of the spin signals and the MOSFET signals are in good agreement [2]. This achievement can pave the way to a practical application of Si spin MOSFETs. References: [1] T. Sasaki, M. Shiraishi et al., Phys. Rev. Applied 2, 034005 (2014). [2] T. Tahara, M. Shiraishi et al., Appl. Phys. Express, in press (selected as Spotlight Paper).

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