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Three-terminal field effect switches probing the electrically triggered Metal-Insulator Transition in Vanadium dioxide GOKUL GOPALAKRISHNAN, CHANGHYUN KO, DMITRY RUZMETOV, VENKATESH NARAYANAMURTI, SHRIRAM RAMANATHAN, School of Engineering & Applied Sciences, Harvard University — Electrostatic control of the Metal-Insulator Transition (MIT) in correlated oxides is valuable, both as a probe of the nature of the phase transition, as well as being a critical aspect of novel switching devices based on Mott insulators. Of much recent interest among this class of materials, is vanadium dioxide (VO_2), a correlated semiconductor which exhibits a thermally induced MIT close to room temperature, and has also been shown to undergo an ultra-fast switching of conductivity by optical and electrical means. Among many of the experiments demonstrating an electrically triggered transition, however, the attendant phenomenon of Joule heating in the current channel raises questions about the triggering mechanism. To carefully address this issue, we explore the fabrication of three terminal field-effect devices, in which the resistance of a VO_2 based channel may be modulated by a gate electric field in the absence of any significant current induced heating. In this talk we present details of the fabrication, the technical challenges involved in implementing them, and results of gated I-V measurements performed on these devices along with our interpretation of the observed effects.

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