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Ionic-Liquid Gated Bilayer  $MoS_2$  Field-Effect Transistors<sup>1</sup> MEEGHAGE MADUSANKA PERERA, HSUN-JEN CHUANG, MING-WEI LIN, BHIM CHAMLAGAIN, XUEBIN TAN, MARK MING-CHENG CHENG, ZHIX-IAN ZHOU, Wayne State University — We report the electrical characterization of ionic-liquid-gated bilayer  $MoS_2$  field-effect transistors. An On-Off current ratio greater than  $10^6$  is achieved for hole transport, while that for electron transport exceeds  $10^8$ . The subthreshold swing of our bilayer  $MoS_2$  devices reaches as low as 47 mV/dec at 230 K, approaching the theoretical limit. We also demonstrate that 1) the extrinsic mobility of back-gated  $MoS_2$  field-effect transistors is largely limited by the contact resistance; and 2) the extremely large electrical-double-layer capacitance of ionic liquid significantly reduces the Schottky contact barrier leading up to three orders of magnitude mobility increase for electron transport.

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