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Intrinsic Electron and Hole Transport in Channel Passivated WSe_2 Field-Effect Transistors with Graphene Contacts[1] HSUN JEN CHUANG, Wayne State University, NIRMAL JEEVI GHIMIRE, JIAQIANG YAN, DAVID MANDRU, The University of Tennessee, Knoxville and Oak Ridge National Laboratory, ZHIXIAN ZHOU, Wayne State University — We report electrical transport measurement of high-quality WSe_2 field-effect transistors. As a nearly intrinsic semiconductor with a relatively large bandgap, WSe_2 tends to form substantial Schottky barriers with common contact metals for both electron and hole channels, which obstructs the charge injection especially at low temperatures. In this work, we use highly n- and p-doped graphene as an electrode material to form low resistance electrical contacts to the electron and hole channels, respectively. To minimize surface and interface scattering, hexagonal boron nitride was used to passivate both the top and bottom surfaces of the WSe_2 channel. Four-terminal transport measurement was carried out for a wide temperature range to understand the intrinsic transport properties of atomically thin WSe_2. Field-effect mobility and effective mobility for both electron and hole channels as well as their temperature dependence will be discussed.

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