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**Effects of Contact Geometry on Measurements of Contact and Film Resistance in Thin $MoS_2$ Films** JINSONG XU, YUNQIU LUO, Department of Physics, Ohio State University, ROLAND KAWAKAMI, Department of Physics, Ohio State University; Department of Physics and Astronomy, University of California, Riverside, JONATHAN PELZ, Department of Physics, Ohio State University — There is great interest in $MoS_2$ films and other 2D materials for fundamental studies and possible applications. However, the critical contacts to these films are not well understood, in part because of the strong band bending, depletion, and lateral Schottky barriers (SB). We report measurements and finite-element modeling of Au contacts on few-layer $MoS_2$ films on $SiO_2$/Si substrates, and find that certain common contact geometries produce mixing of contact and film resistance and highly/completely-misleading results in 3- and 4-probe measurements, and that lateral depletion can produce errors in TLM measurements. However, with appropriate contact geometry and comparison to modeling, contact and film resistances can be independently monitored. Both are found to have strong back-gate and temperature dependence, with small ($\sim$ 10 – 30 meV) but different activation energies (AEs) near 100 – 300 K. The contact AE is similar to several previous reports. The activated film resistance has not been previously reported, though evidence can be seen some previous published data. Possible origins of these temperature dependences will be discussed, as well as implications for determining contact SB heights.

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