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Transport studies of dual-gated ABA- and ABC-stacked trilayer graphene K. ZOU, Department of Physics, The Pennsylvania State University, University Park, PA 16802, F. ZHANG, Department of Physics, The University of Texas at Austin, Austin, TX 78701, C. CLAPP, Department of Chemistry, Amherst College, Amherst, MA 01002, A.H. MACDONALD, Department of Physics, The University of Texas at Austin, Austin, TX 78701, J. ZHU, Department of Physics, The Pennsylvania State University, University Park, PA 16802 — We present electrical transport studies of dual-gated ABA- and ABC-stacked trilayer graphene field effect transistors. Employing high-quality thin HfO_2 layers as the top and back gate dielectrics, we independently tune the carrier density and control the band structure of trilayer graphene via the application of a perpendicular electric field E_{perp}. The large gating efficiency of the two gates (5.53 x 10^{12}/cm^2 per Volt) and their high breakdown voltage (> 6 V) enable us to reach exceedingly large carrier densities and E_{perp} values, which results in wide tuning of the conductivity of the trilayer devices. Results on ABA-stacked trilayer graphene confirm its semi-metallic nature and reveal evidence of the band structure changes induced by E_{perp}. The resistance at the charge neutrality point of ABC-stacked trilayer graphene increases by many orders of magnitude with increasing E_{perp} due to the gradual opening of a band gap. Our results suggest a saturation of the gap size at perpendicular displacement fields greater than 3.5 V/nm, in agreement with theoretical calculations.

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