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Gate-Tunable Superconductor-Insulator Transition in Bilayer-Graphene Josephson Junctions DONGCHAN JEONG, GIL-HO LEE, Pohang University of Science and Technology, YONG-JOO DOH, Korea University, HU-JONG LEE, Pohang University of Science and Technology — Bilayer graphene shows opening of electric-field-induced band gap, the size of which is proportional to the intensity of the electric field. We report electronic transport measurements on superconducting proximity effect in planar dual-gated bilayer-graphene Josephson junction with $Pb_{0.93}In_{0.07}$ (PbIn) electrodes ($\Delta_{PbIn} \sim 1.1$meV, $T_c = 7.0$ K). The junction resistance along the charge-neutral point (CNP) increases as we modulate top- and back-gate voltages away from the zero-gap CNP. The resistive state near the CNP shows a variable-range-hopping-type insulating behavior in R-T curve with lowering temperature crossing the superconducting transition of PbIn electrodes. However, a highly doped regime shows metallic R-T behavior and junction becomes superconducting below T_c. Moreover, magnetic-field-induced Fraunhofer supercurrent modulation, microwave-induced Shapiro steps, and multiple Andreev reflection (MAR) are observed, which indicate the formation of genuine Josephson coupling across the planar junctions below T_c with sufficiently transparent superconductor$-$bilayer graphene interface. The separatrix of the superconductor-insulator transition corresponds to the square junction conductance of $G_{sq} \sim 6{-}8e^2/h$.

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