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InAs Nanowire Josephson Field Effect Transistors Y.-J. DOH, J.A. VAN DAM, L.P. KOUWENHOVEN, S. DE FRANCESCHI, Delft University of Technology, A.L. ROEST, E.P.A.M. BAKKERS, Philips Research Laboratories — We have fabricated superconducting nano-junctions using InAs nanowires contacted with Al superconducting electrodes. The diameter of nanowire is about 70 nm with source-drain spacing of 200 nm. Low Ohmic metallic contacts are formed at the interface with typical $R_N A$ value of 3×10^{-7} Ω cm^2. Below the superconducting transition temperature T_C = 1.1 K, the devices show clear conductance enhancements below the superconducting gap $2\Delta_0$ = 210 μeV, which is explained by multiple Andreev reflection. Near zero-bias voltage, conductance diverges to show supercurrent in V(I) curve. Maximum critical current is about I_C = 130 nA at T = 30 mK with $I_C R_N$ product of 60 μV. Irradiated with microwave, constant voltage plateaus are observed satisfying ac Josephson relation. By applying back-gate voltage, critical currents are suppressed to be zero near pinch-off gate voltage V_g = -70 V. Universal conductance fluctuations of nanowire and its corresponding critical current fluctuations are discussed from the viewpoint of truly mesoscopic Josephson field effect transistors.

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