Reconfigurable WSe$_2$ device: three fundamental devices in one.
PRATHAMESH DHAKRAS, PRATIK AGNIHOTRI, State Univ of NY - Albany, JI UNG LEE, State Univ of NY - Polytechnic Institute — Moore’s law has, for several decades, governed the transistor scaling and has brought about the technological revolution for better, faster and more efficient devices. However, with the advent of 7nm node, scaling is fast reaching the fundamental material limits, and the need for alternative technologies has never been more pressing. Until recently, most of the efforts have focused on finding alternative channel materials as a direct replacement for Si. Here, we propose an alternative to scaling by completely redesigning the way logic functions are implemented. We report a single multifunctional device fabricated in two-dimensional WSe$_2$ using electrostatic doping that can reconfigure into the three fundamental building blocks of modern electronics: the p-n diode, the metal-oxide-semiconductor field effect transistor, and the bipolar junction transistor. To characterize their properties, we use a single material parameter, the interface density of states, to describe the key figure-of-merit of all three devices.