

Supplementary Information

Two-Dimensional Electronic Devices Modulated by the Activation of Donor-Like States in Boron Nitride

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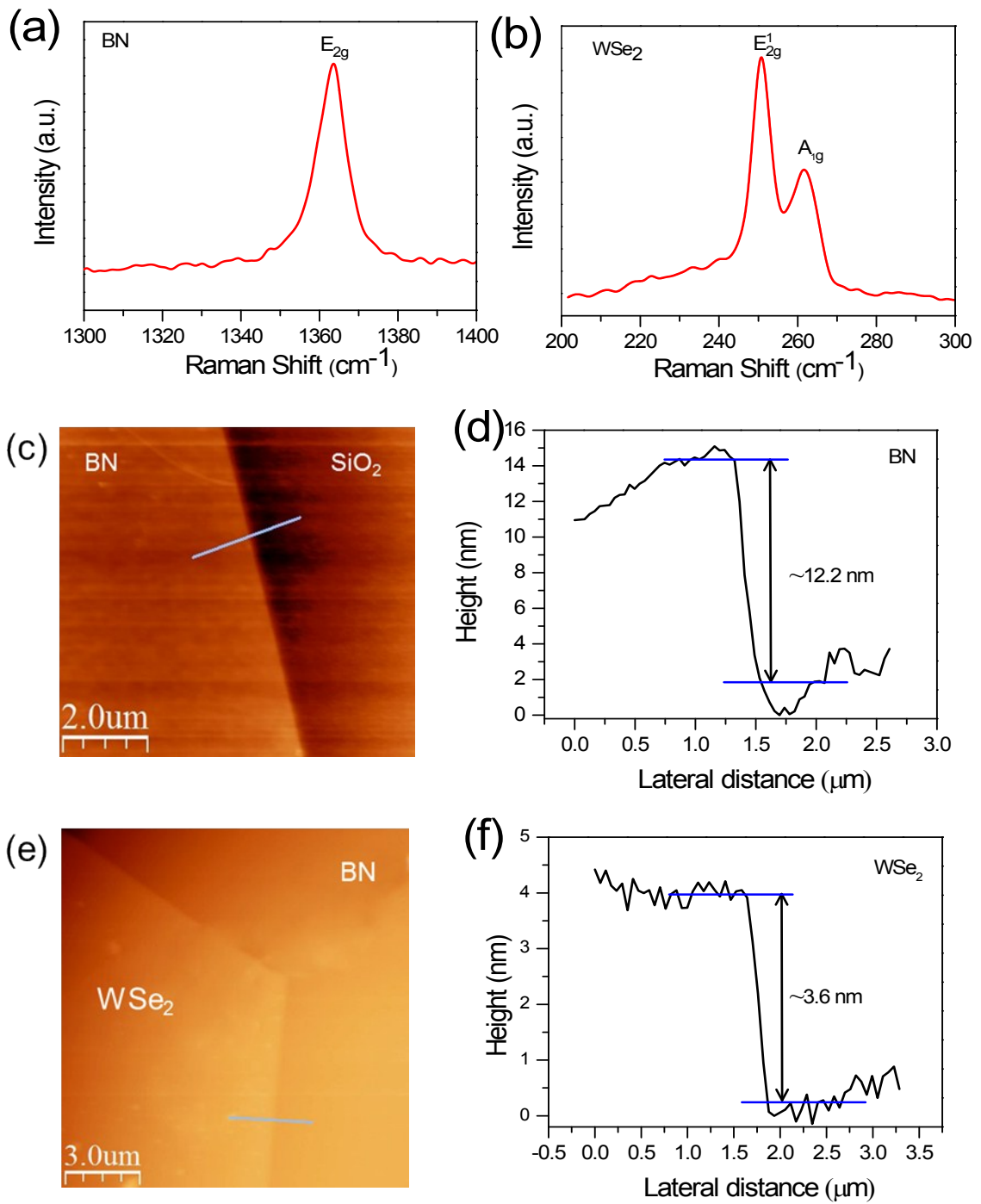


Figure S1. Raman spectra of (a) BN and (b) WSe₂. (c) Typical AFM image of BN on SiO₂/Si substrate. (d) Corresponding step profile height from the atomic force microscopy (AFM) line scan as indicated in the AFM image. The BN flake demonstrates a thickness of ~12.2 nm. (e) Typical AFM image of WSe₂ on the BN substrate. (f) Corresponding step profile height from the AFM line scan as indicated in the AFM image. The WSe₂ flake demonstrates a thickness of ~3.6 nm.

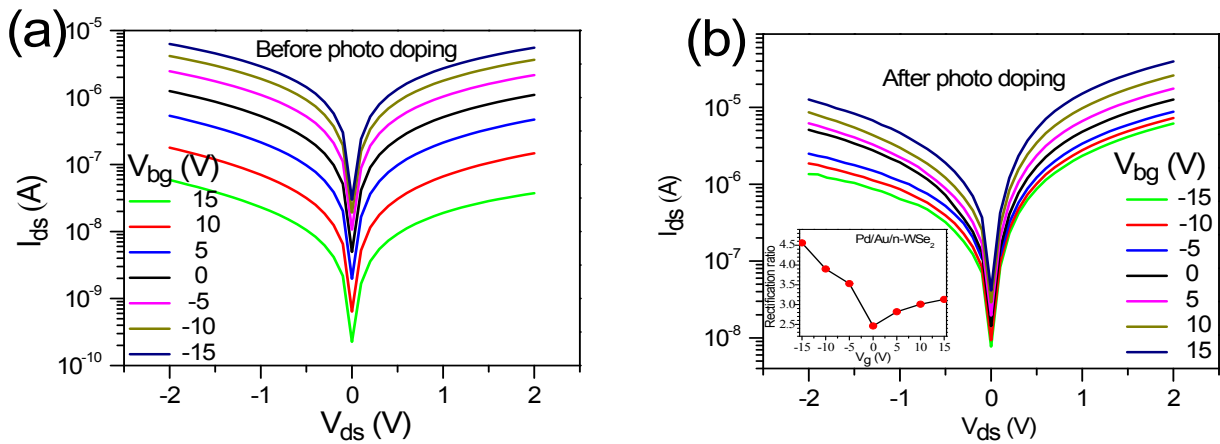


Figure S2. (a) I_D - V_D characteristics of p-WSe₂ in the log scale as a function of V_{bg} . Ohmic behavior is observed with the Pd/Au metal contacts. (b) I_D - V_D characteristics of n-WSe₂ in the log scale as a function of V_{bg} . Schottky contact behavior is observed with the Pd/Au metal contacts. Inset shows the plot of the rectification ratio as a function of V_{bg} .

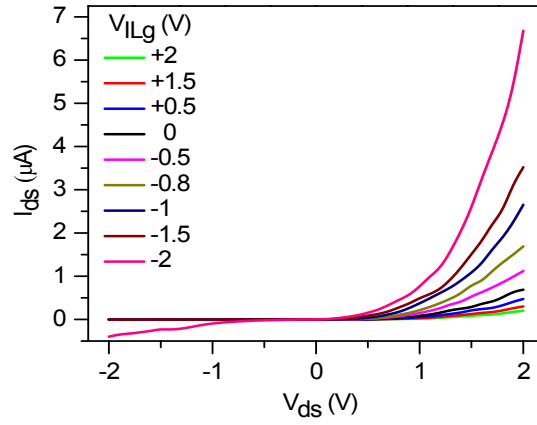


Figure S3. Gate-dependent rectifying effect of the homojunction diode in the linear scale as a function of top ionic liquid gate voltage (V_{ILg}).

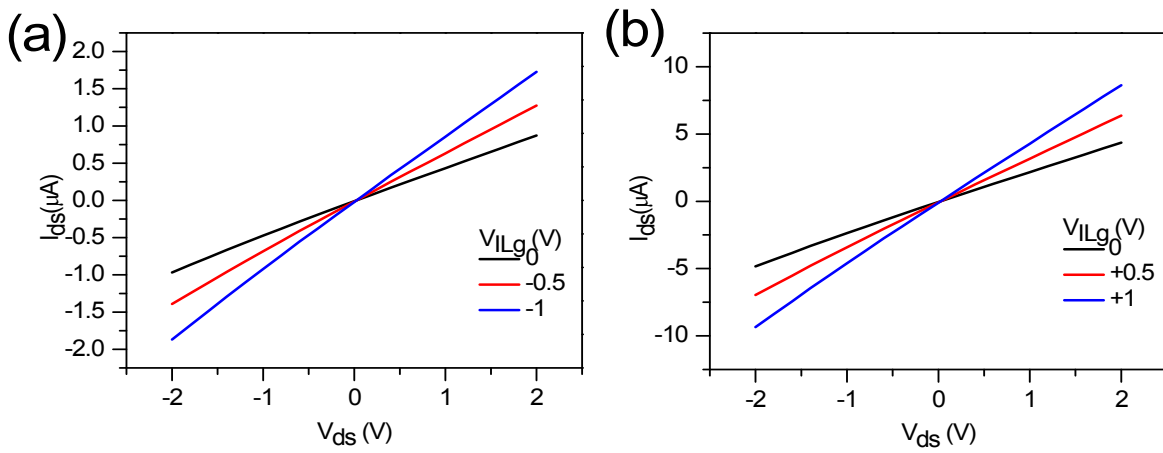


Figure S4. I_D - V_D characteristics of (a) p-WSe₂ with Pd/Au and (b) n-WSe₂ with Al/Au as a function of V_{ILg} . Ohmic contact contribution is observed.

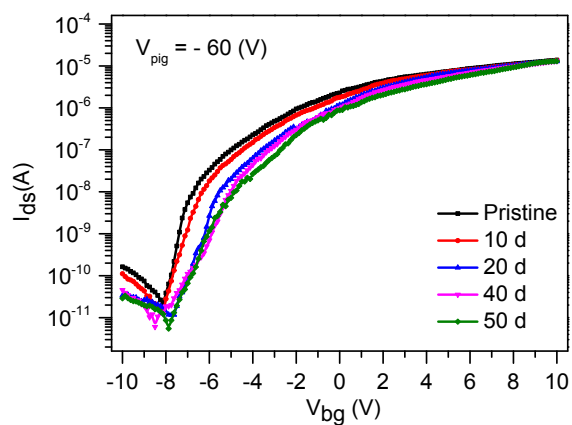


Figure S5. Transfer characteristics of n-WSe₂ after photo-doping treatment showing the stability of the devices in an atmospheric environment.

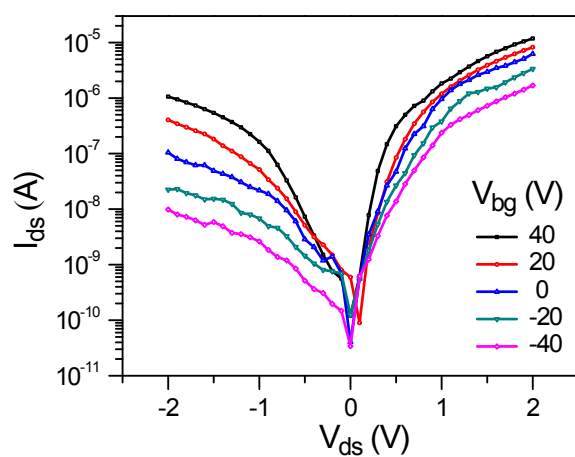


Figure S6. Gate-dependent rectifying effect of the WSe₂ flake with Pd/Au and Al/Au source and drain electrodes in the log scale.

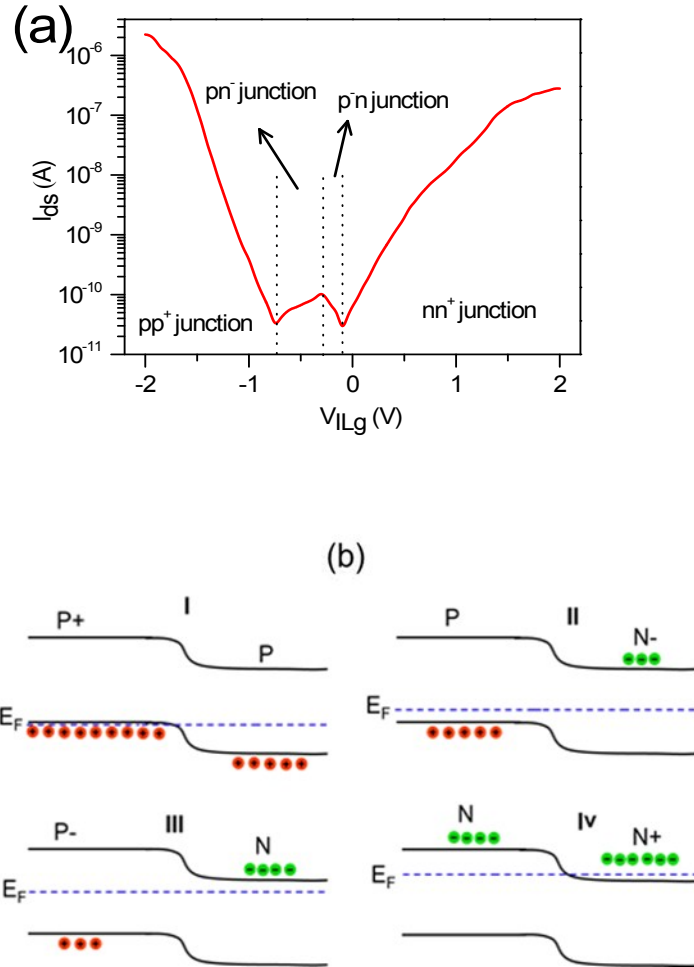


Figure S7. (a) Transfer characteristics of the diode at $V_{ds} = 0.5$ V for four doping regimes as a function of top gate voltage. (b) Schematic energy band diagrams at ($V_{ds} = 0.5$ V $>$ 0) for the four doping configurations of the diode under the modulation of top gate voltage (V_{ILg}), presenting the tunability of built-in potential.