

Supplementary Information

Integrated Bidirectional and Polarization-Sensitive Photodetection in ReSe₂/graphene/WSe₂ Heterostructure

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Note S1: Calculation of surface potential difference (SPD)

The SPD between ReSe₂, Gr, and 2H-WSe₂ under dark conditions is extracted by Kelvin probe force microscopy (KPFM). Here, the SPD between the probe tip, ReSe₂, Gr, and 2H-WSe₂ can be followed as:

$$eSPD_{ReSe_2} = (W_{tip} - W_{ReSe_2}) = 787 \text{ meV}$$

$$eSPD_{Gr} = (W_{tip} - W_{Gr}) = 690 \text{ meV}$$

$$eSPD_{WSe_2} = (W_{tip} - W_{WSe_2}) = 675 \text{ meV}$$

where e stands for elementary charge, and W_{tip} , W_{ReSe_2} , W_{Gr} , and W_{2H-WSe_2} represent the work function of the KPFM tip, ReSe₂, Gr, and 2H-WSe₂, respectively. Obviously, the Fermi level difference (ΔE_f) between ReSe₂/Gr and Gr/2H-WSe₂ is given by.

$$\Delta E_{f1} = eSPD_{Gr} - eSPD_{ReSe_2} = W_{ReSe_2} - W_{Gr} = -97 \text{ meV}$$

$$\Delta E_{f2} = eSPD_{WSe_2} - eSPD_{Gr} = W_{Gr} - W_{WSe_2} = -15 \text{ meV}$$

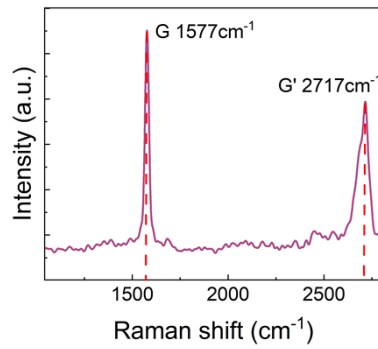


Fig. S1 Raman spectra of Graphene.

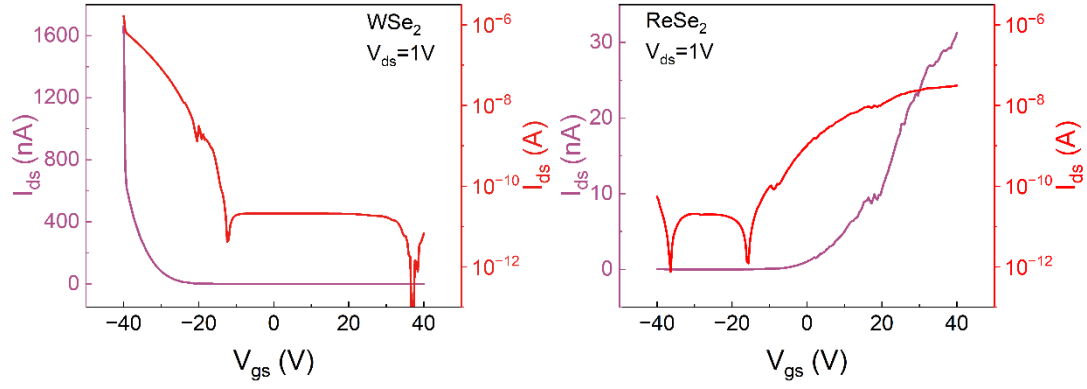


Fig. S2 The transfer characteristic curves for WSe₂ and ReSe₂, respectively.

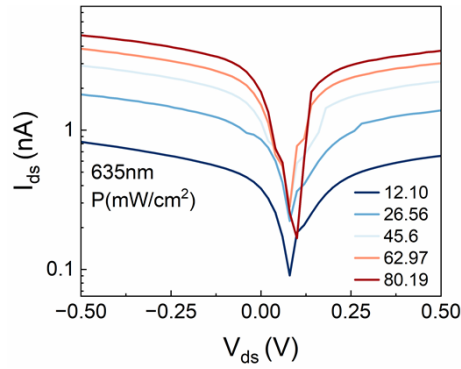


Fig. S3. Device performance in logarithmic coordinates at different optical power levels.

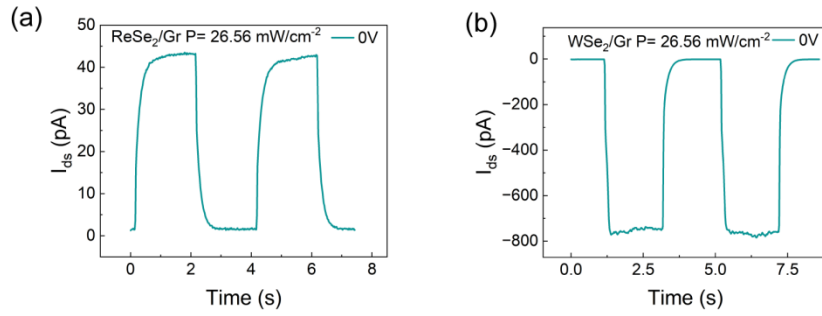


Fig. S4 I-T curves for different Schottky junctions (all connection graphene at the source electrode).