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Supplementary

Optoelectronic Properties of Hexagonal Boron Nitride Shielded Molybdenum Diselenide/Black-Phosphorus Based Heterojunction Field Effect Transistor

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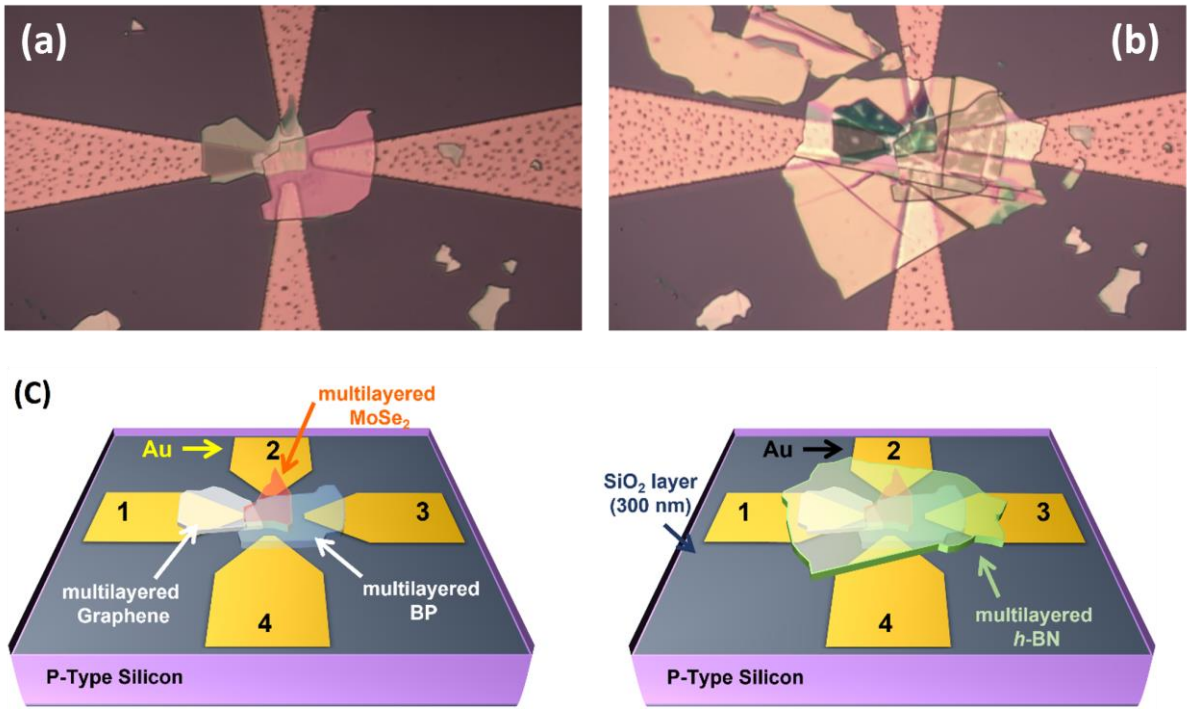


Figure S1. Optical images of (**a**) Gr/n-$MoSe_2$/p-BP and (**b**) Gr/n-$MoSe_2$/p-BP shielded by h-BN, and (**c**) schematic of the device before and after shielding.

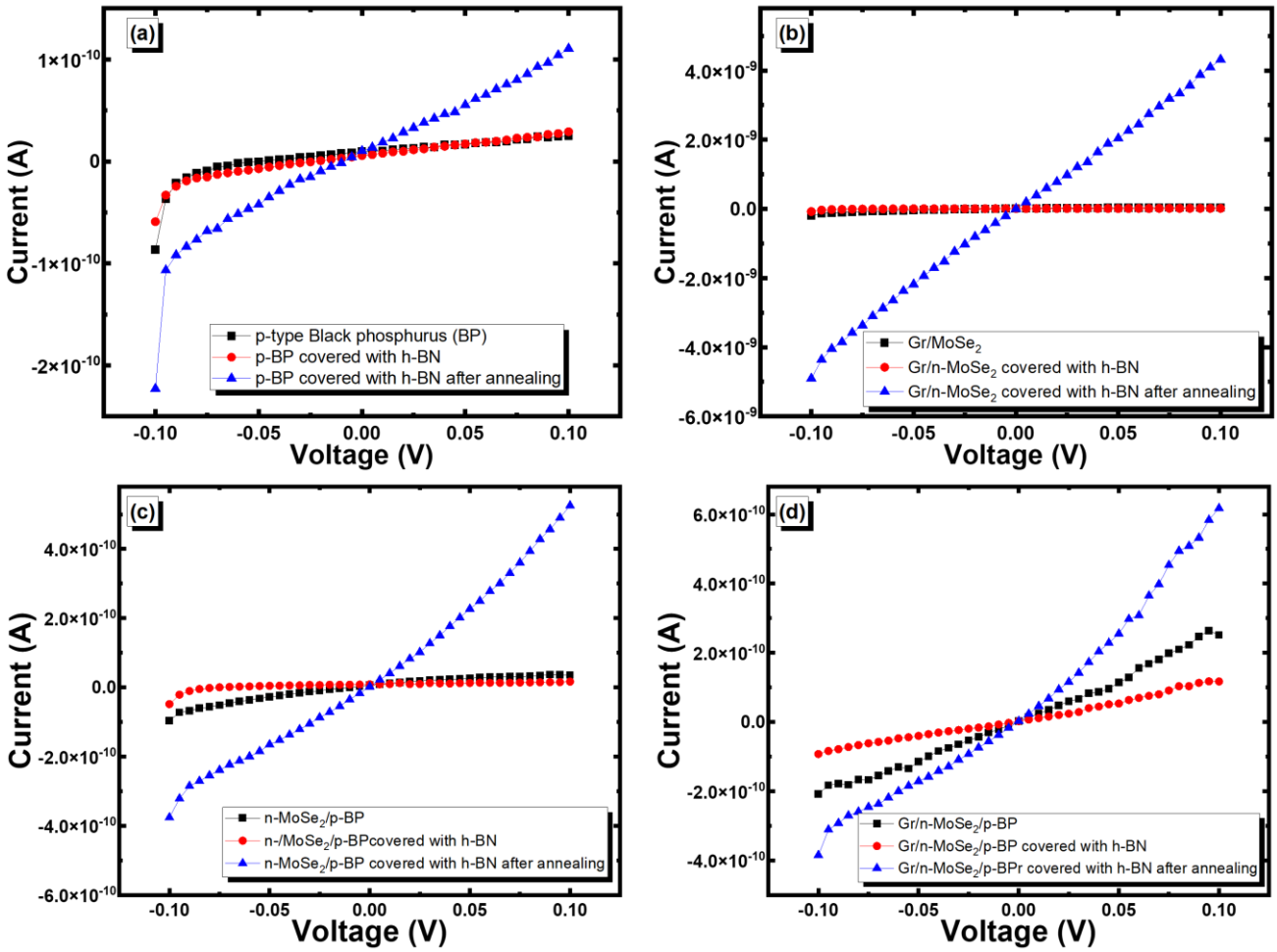


Figure S2. Electrical properties of the as-fabricated device, h-BN-covered device and h-BN-covered device after annealing of (**a**) Black-phosphorous (BP) (I_{34}–V_{34}), (**b**) graphene/n-$MoSe_2$ (I_{12}–V_{12}), (**c**) n-$MoSe_2$/p-BP (I_{23}–V_{23}), and (**d**) Gr/n-$MoSe_2$/p-BP (I_{13}–V_{13}).

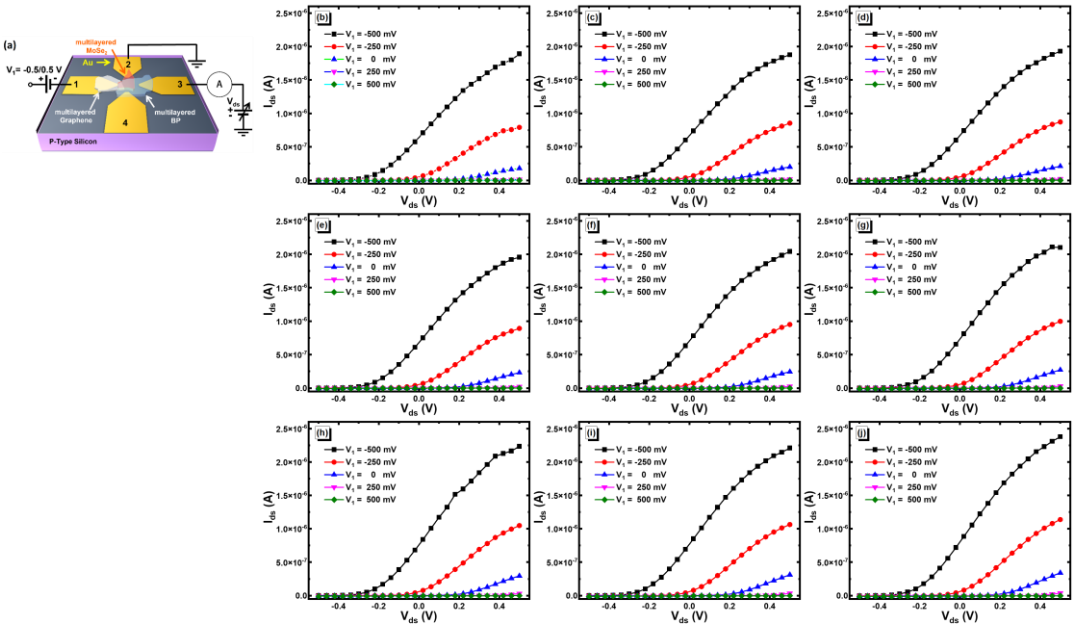


Figure S3. (**a**) Schematic illustration of electrical polarization configuration of n-$MoSe_2$/p-BP when MTL Gr is used as gate, and its output characteristics at (**b**) dark, (**c**) 0.016 μW, (**d**) 0.047 μW, (**e**) 0.326 μW, (**f**) 0.744 μW, (**g**) 1.442 μW, (**h**) 2.992 μW, (**i**) 5.177 μW, and (**j**) 7.549 μW.

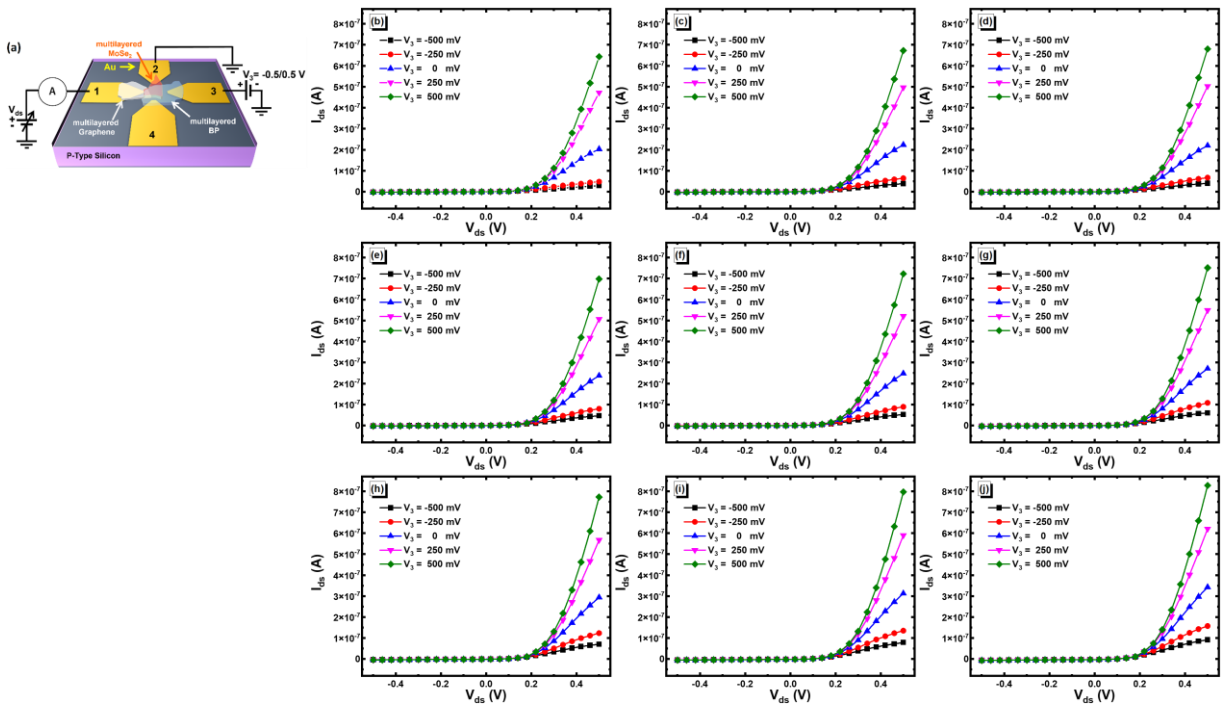


Figure S4. (**a**) Schematic illustration of electrical polarization configuration of Gr/n-$MoSe_2$ when MTL p-BP is used as gate, and its output characteristics at (**b**) dark, (**c**) 0.016 μW, (**d**) 0.047 μW, (**e**) 0.326 μW, (**f**) 0.744 μW, (**g**) 1.442 μW, (**h**) 2.992 μW, (**i**) 5.177 μW, and (**j**) 7.549 μW.

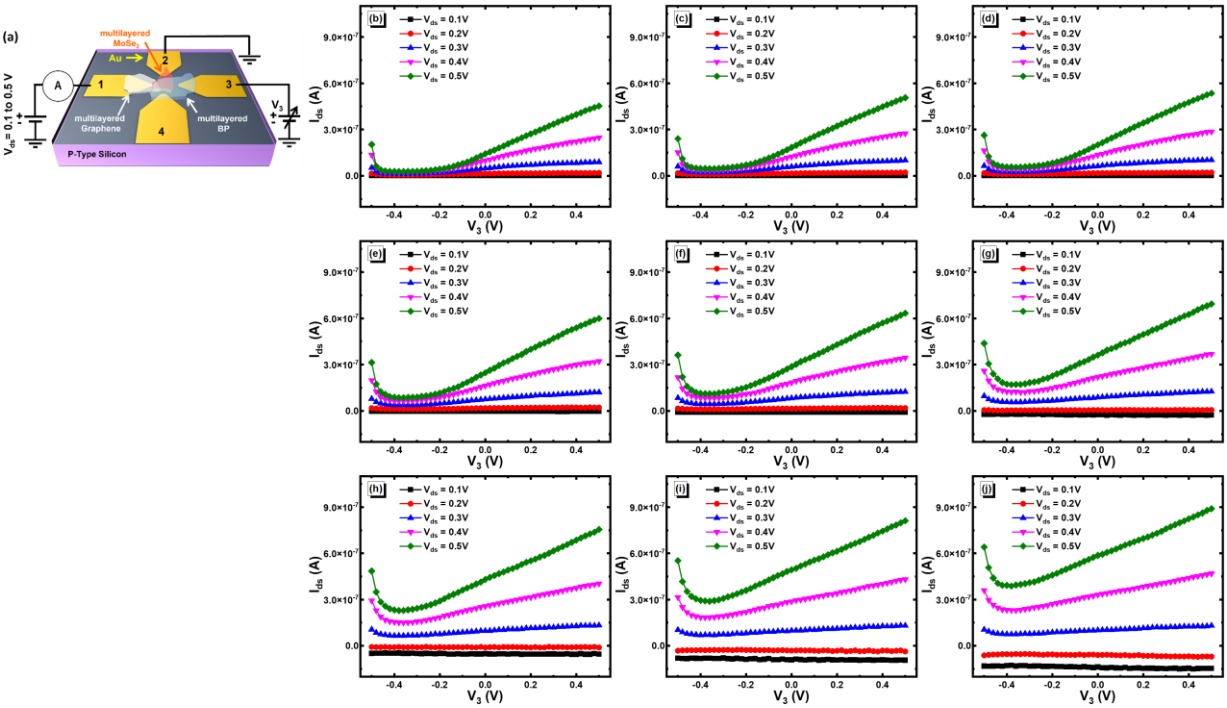


Figure S5. (**a**) Schematic illustration of electrical polarization configuration of Gr/n-$MoSe_2$ when MTL p-BP is used as gate, and its I_{DS}–V_G Transfer characteristics at (**b**) dark, (**c**) 0.016 μW, (**d**) 0.047 μW, (**e**) 0.326 μW, (**f**) 0.744 μW, (**g**) 1.442 μW, (**h**) 2.992 μW, (**i**) 5.177 μW, and (**j**) 7.549 μW..