

Table S1. Analysis of X-ray photoelectron spectroscopy

Element	Scanning peak/eV	Theoretical peak/eV	Peak area ratio	Theoretical ratio	Peak	Valence state
Mo	229.8	229.1	1:0.92	3:2	Mo 3d _{5/2}	Mo ⁴⁺
	233.0	232.3			Mo 3d _{3/2}	
S	162.6	162.1	1:0.47	2:1	S 2p _{3/2}	S ²⁻
	163.9	163.2			S 2p _{1/2}	

Supplementary Figures

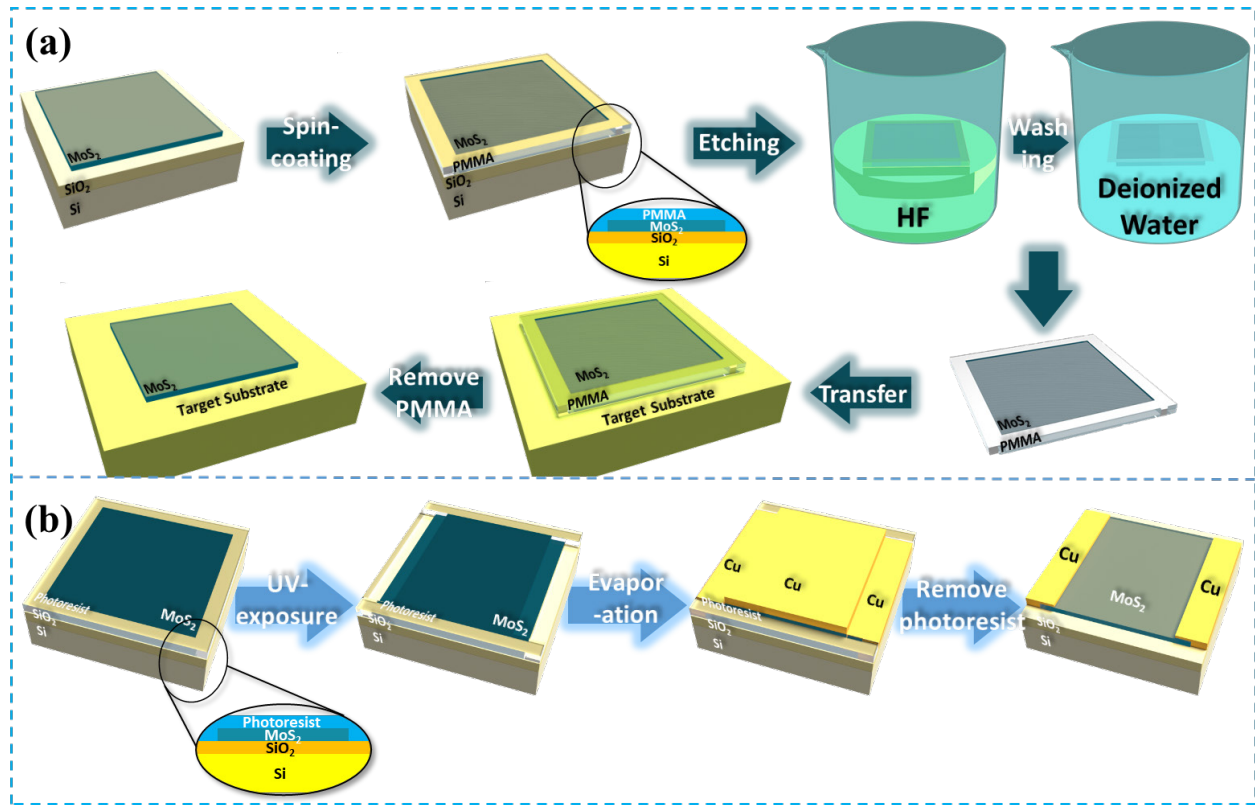


Figure S1. Schematic diagram of device fabrication. (a) Schematic diagram of MoS₂ transfer process. (b) Schematic diagram of MoS₂ two-dimensional device preparation process.

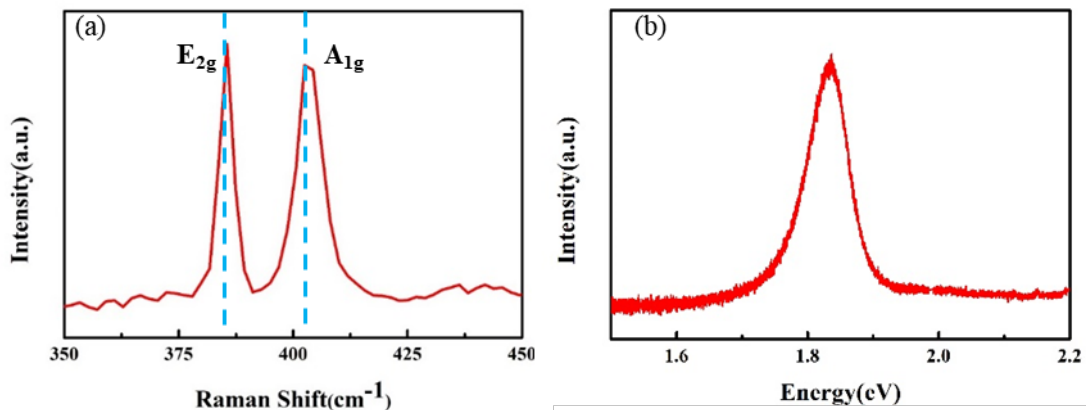


Figure S2. Raman spectroscopy and photoluminescence spectroscopy of MoS₂. (a) Raman spectroscopy. (b) Photoluminescence spectroscopy.

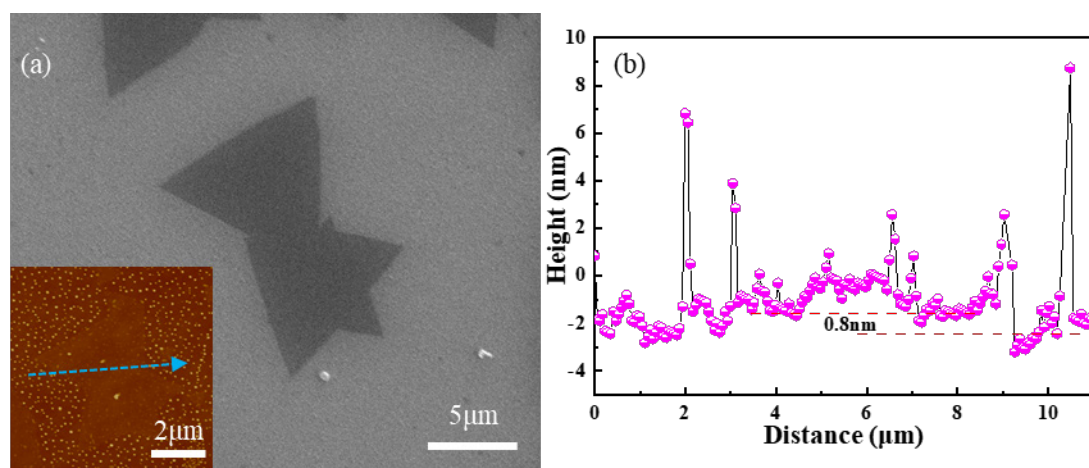


Figure S3. Contaction between monolayer MoS₂ during lateral growth. (a) SEM image of MoS₂. Inset is the selected region AFM image of MoS₂. (b) Corresponding height profile along the dashed line.

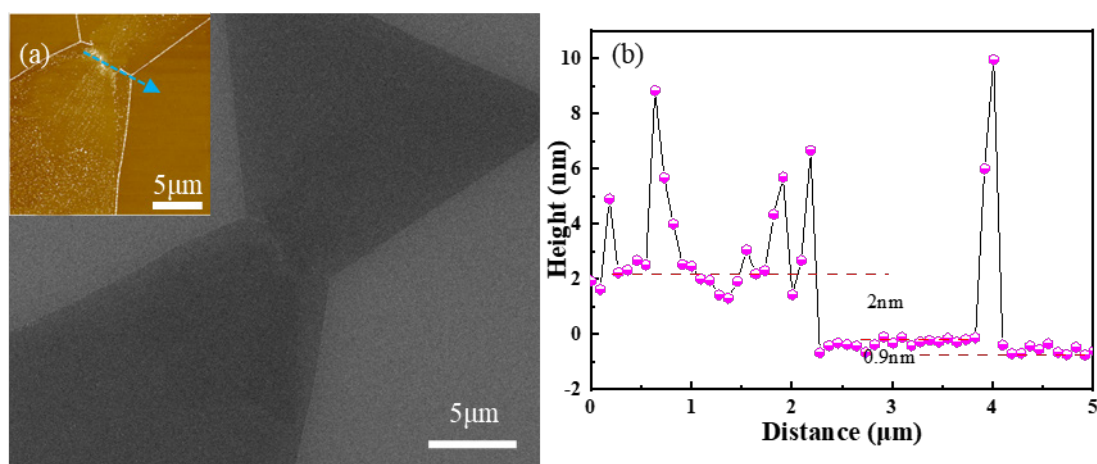


Figure S4. Contaction between MoS₂ during vertical stacking. (a) SEM image of MoS₂. Inset is the selected region AFM image of MoS₂. (b) Corresponding height profile along the dashed line.

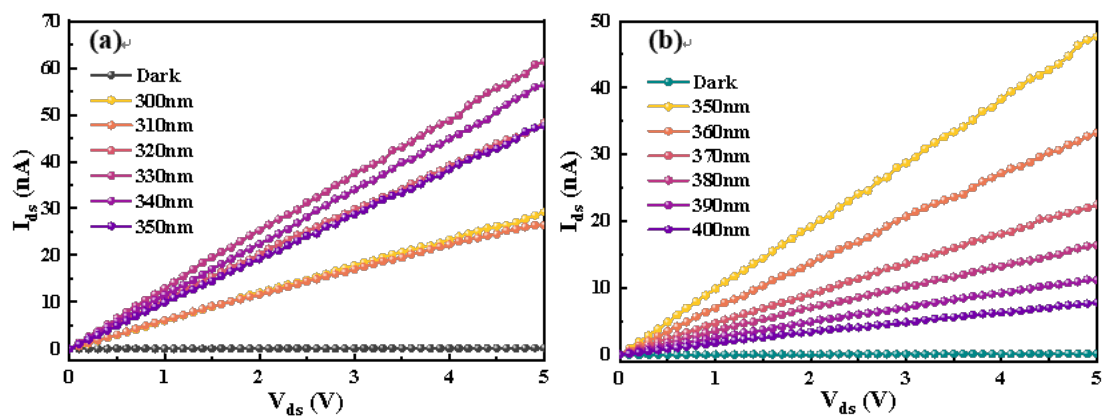


Figure S5. Output curves of MoS₂ photodetector under 300-400nm monochromatic light with intensity of 0.564 mW/cm². (a) 300-350nm. (b) 350-400nm.

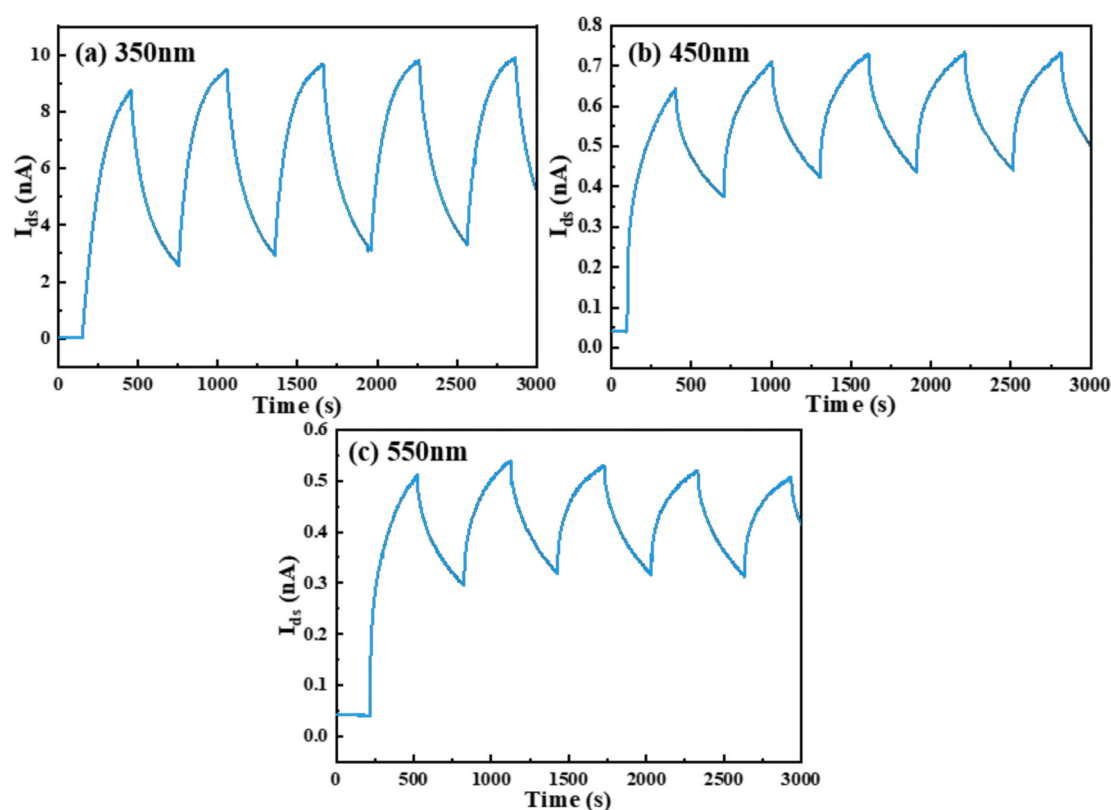


Figure S6. I-t curves of MoS₂ photodetector under different wavelength with intensity of 0.564 mW/cm². (a)350nm. (b)450nm. (c)550nm.

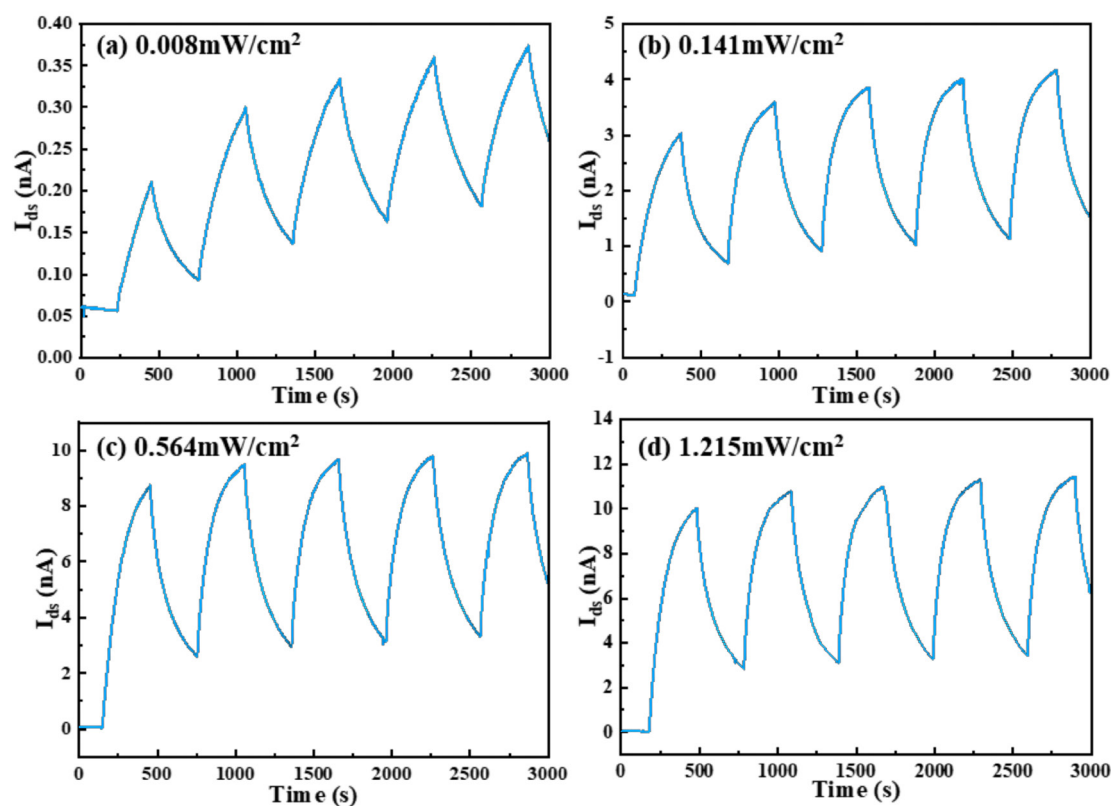


Figure S7. I-t curves of MoS₂ photodetector under different light intensities at 350nm wavelength. (a) 0.008 mW/cm². (b) 0.141 mW/cm². (c) 0.564mW/cm² (b) 1.215mW/cm².