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

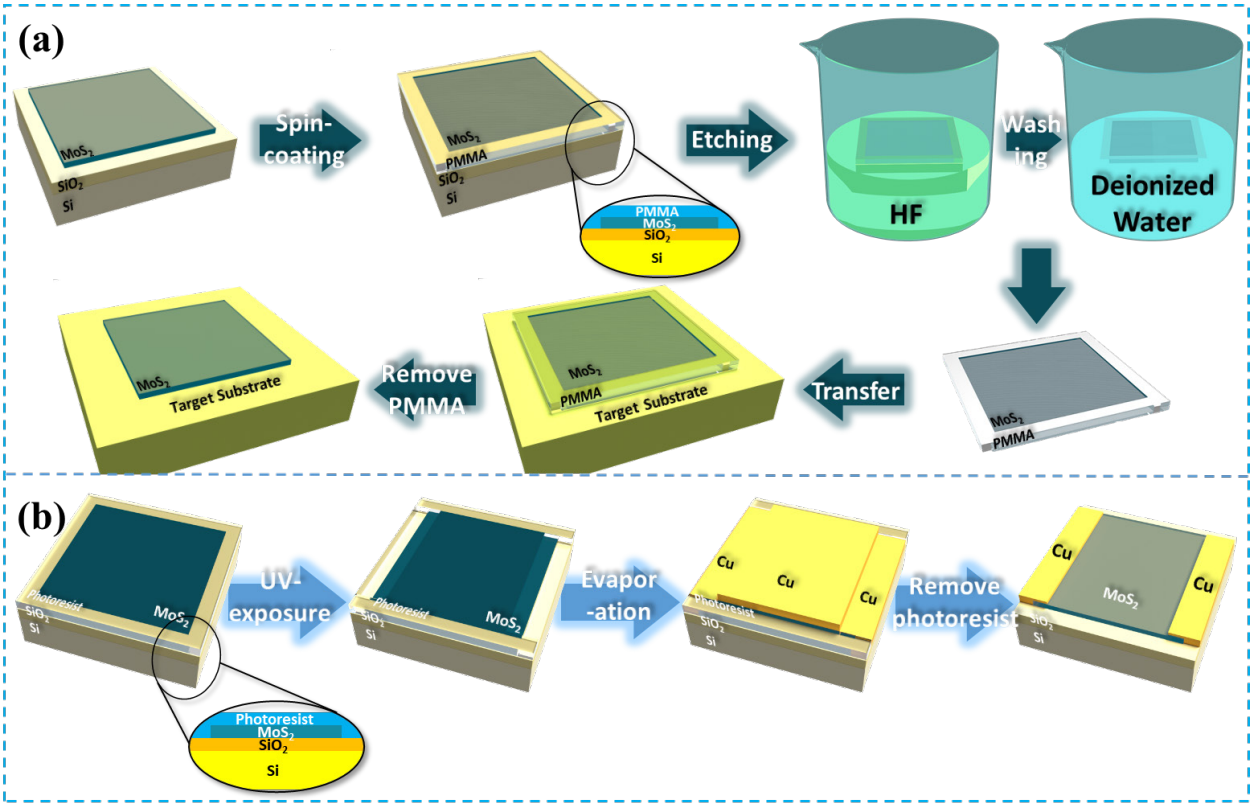

Figure S1. Schematic Diagram of Device Fabrication. (a) Schematic diagram of MoS_2 transfer process. (b) Schematic diagram of MoS_2 two-dimensional device preparation process.

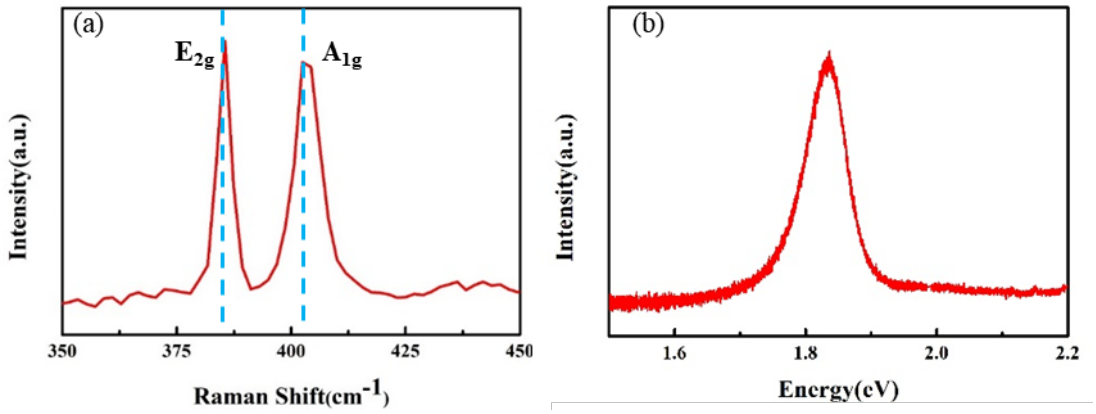

Figure S2. Raman Spectroscopy and Photoluminescence Spectroscopy of MoS_2. (a) Raman spectroscopy. (b) Photoluminescence spectroscopy.

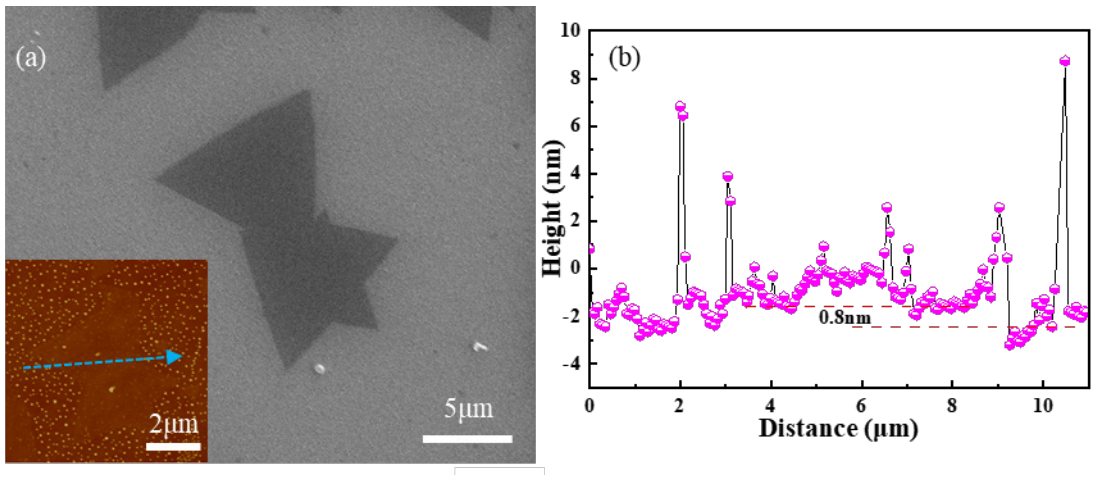

Figure S3. Contaction Between Monolayer MoS_2 during Lateral Growth. (a) SEM image of MoS2. Inset is the selected region AFM image of MoS_2. (b) Corresponding height profile along the dashed line.

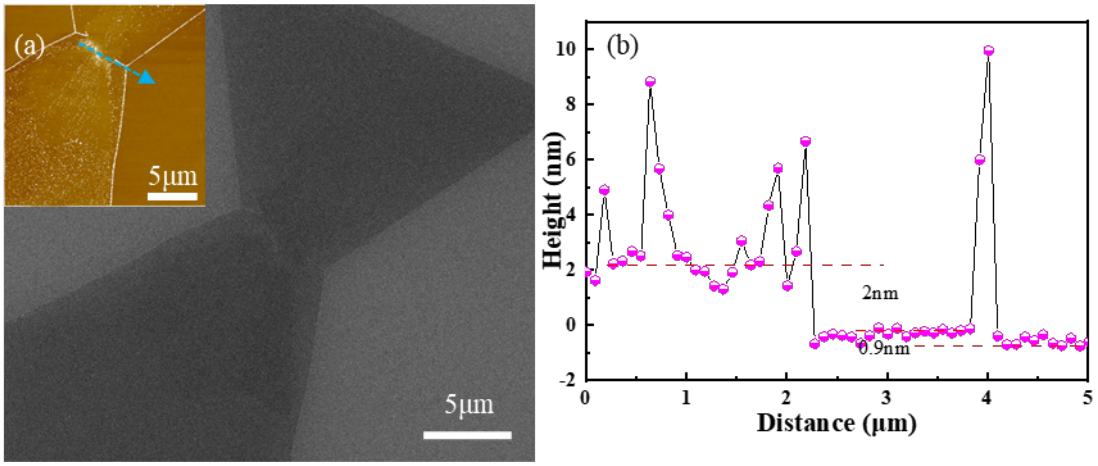

Figure S4. Contaction between MoS_2 during Vertical Stacking. (a) SEM image of MoS_2. Inset is the selected region AFM image of MoS_2. (b) Corresponding height profile along the dashed line.

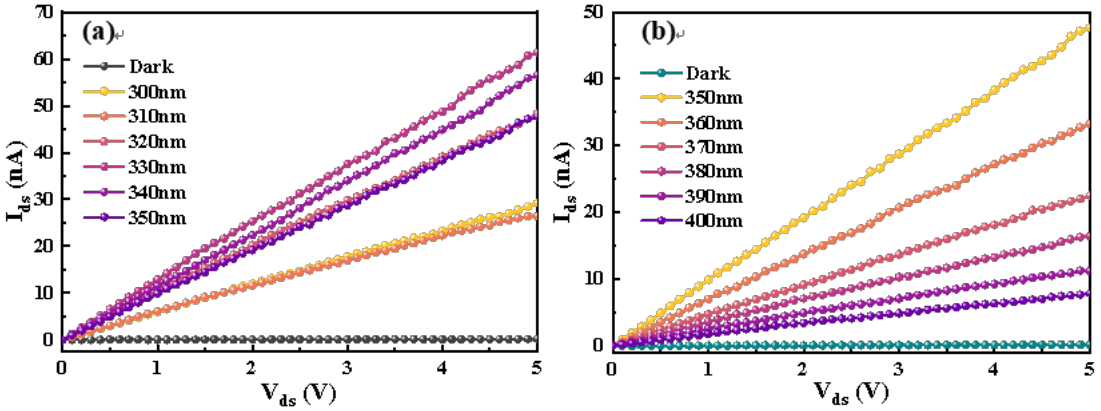

Figure S5. Output Curves of MoS_2 Photodetector under 300-400nm Monochromatic Light with Intensity of 0.564 mW/cm_2. (a) 300-350nm. (b) 350-400nm.

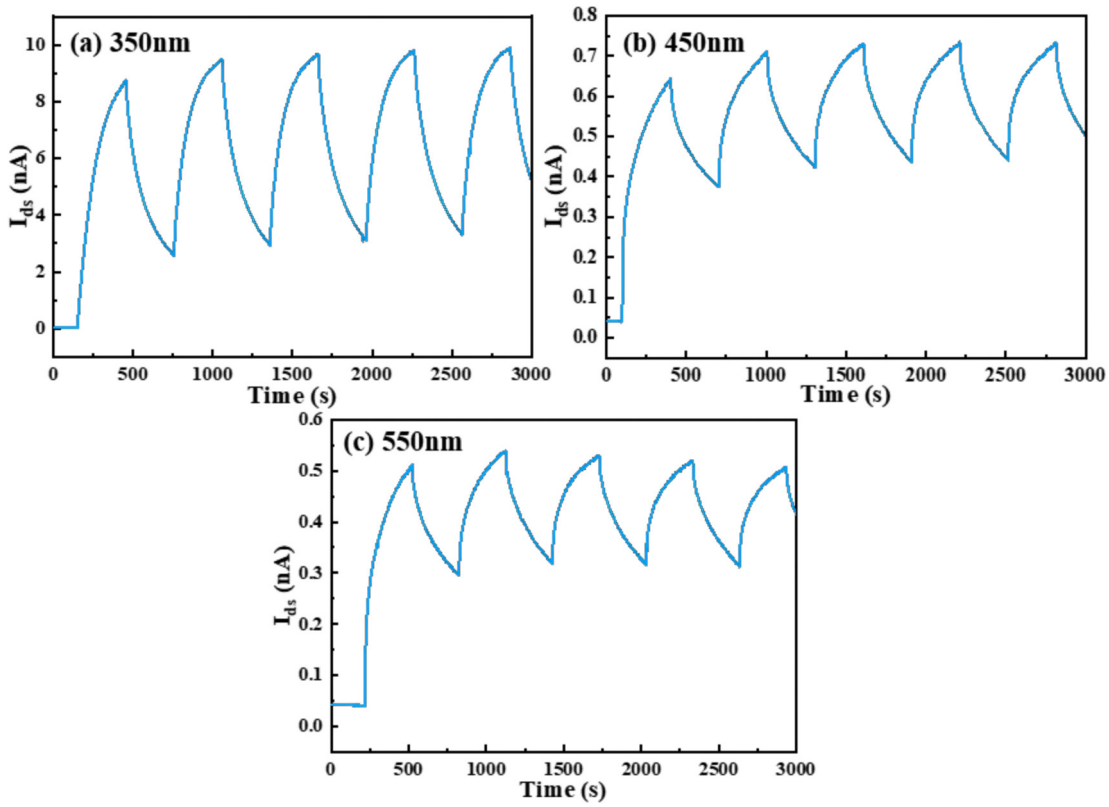

Figure S6. I-t curves of MoS_2 Photodetector under Different Wavelength with Intensity of 0.564 mW/cm2. (a)350nm. (b)450nm. (c)550nm.

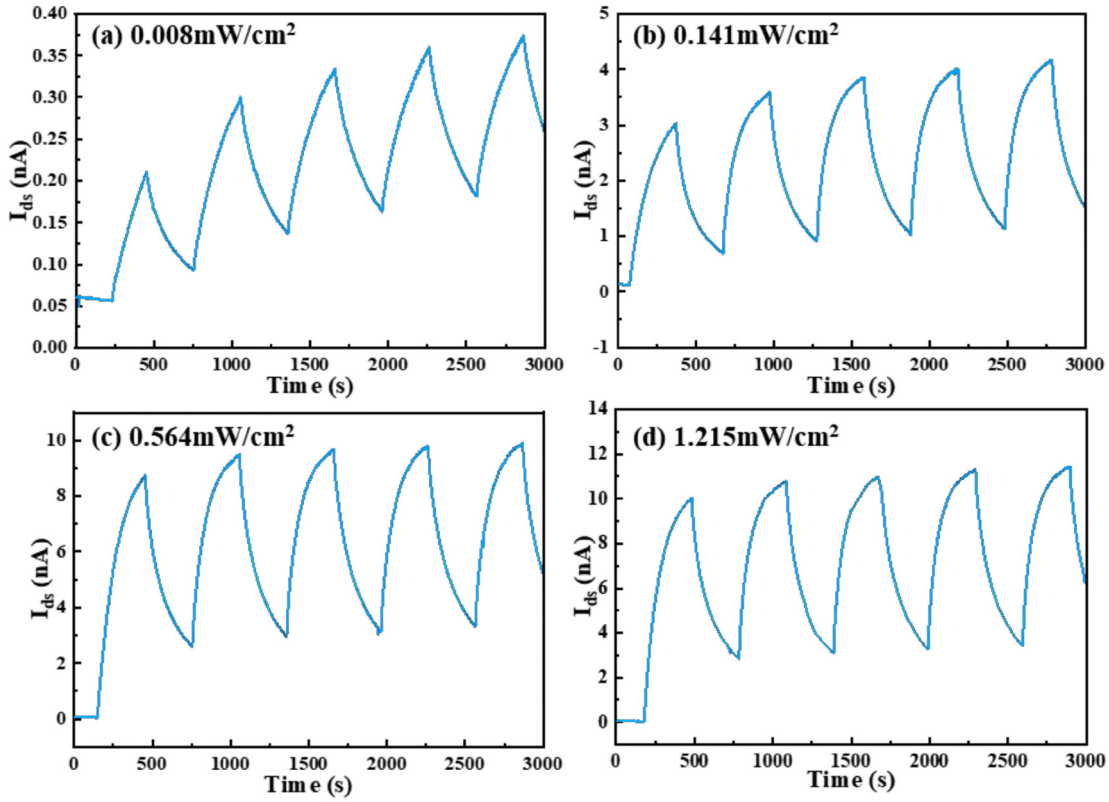

Figure S7. I-t Curves of MoS_2 Photodetector under Different Light Intensities at 350nm Wavelength. (a) 0.008 mW/cm2. (b) 0.141 mW/cm2. (c) 0.564mW/cm2 (b) 1.215mW/cm2.