

## Supporting Information for

### High Performance DUV-visible 4H-SiC based Multilayered SnS<sub>2</sub> dual-mode Photodetectors

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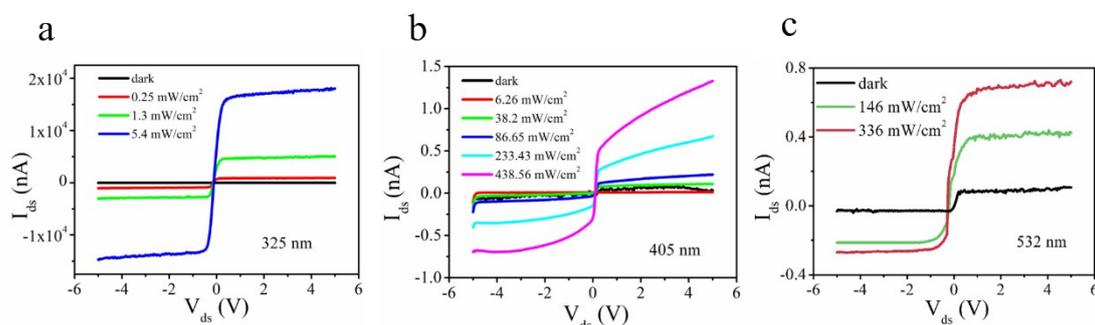
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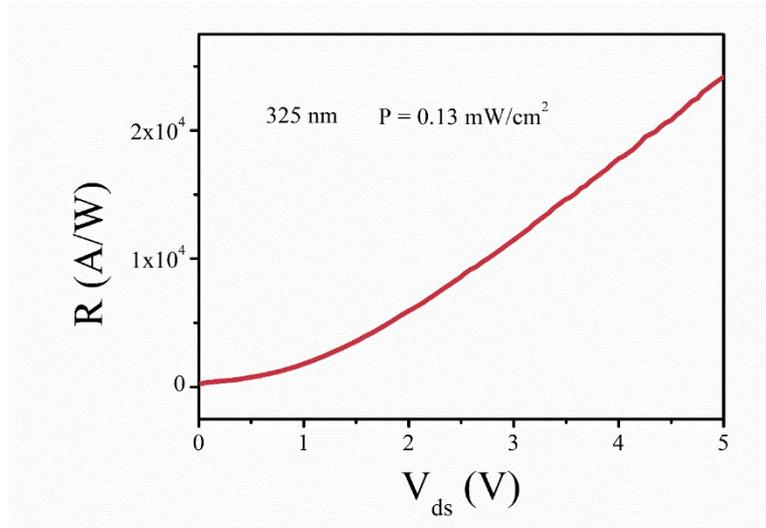
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510006, P. R. China

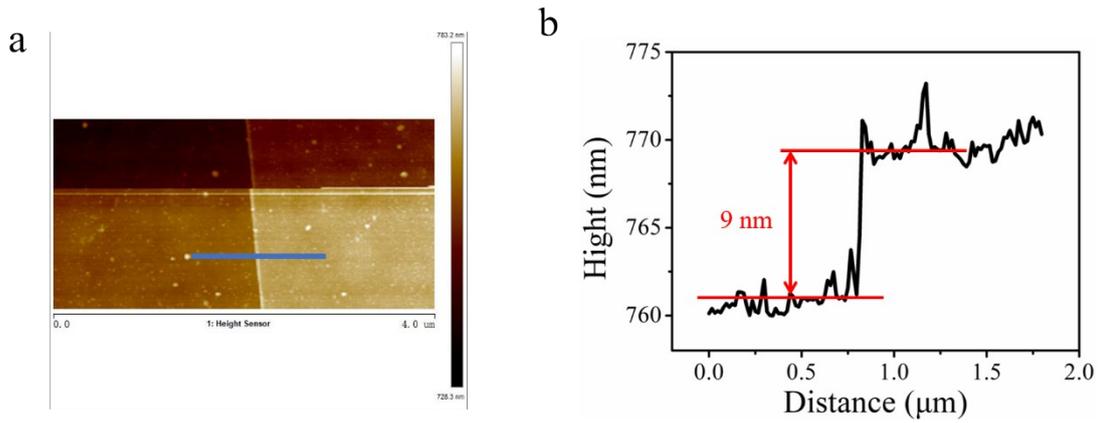
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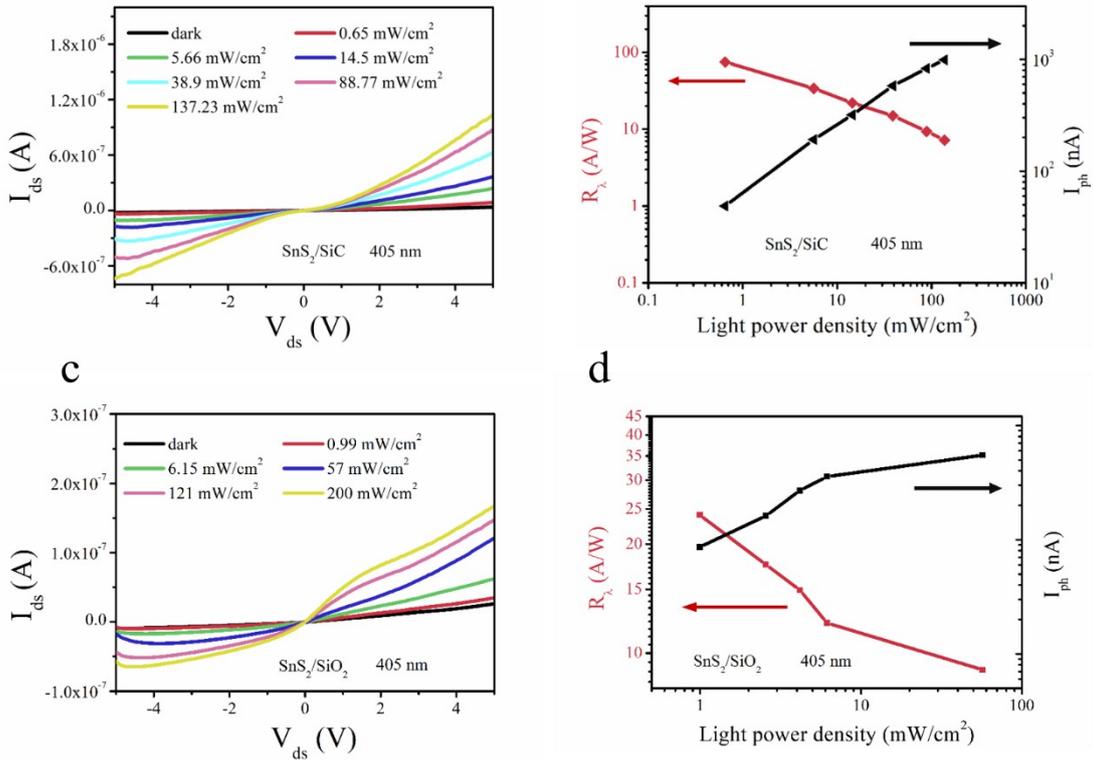
**Figure S1.** Optoelectrical characteristics of the pure 4H-SiC.  $I_{ds}$ - $V_{ds}$  curves dependent on the light power density under a) 325 nm illumination and in darkness, b) 405 nm illumination and in darkness and c) 532 nm illumination and in darkness.



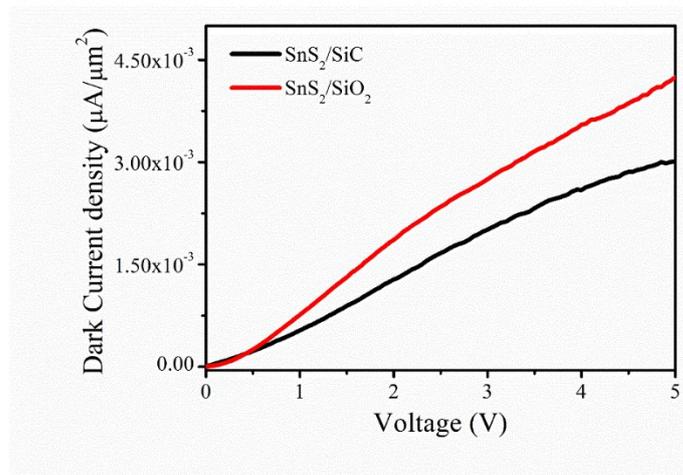
**Figure S2.** Responsivity of SnS<sub>2</sub>/SiC as a function of bias voltage under 325 nm laser (the light power density is 0.13 mW/cm<sup>2</sup>).



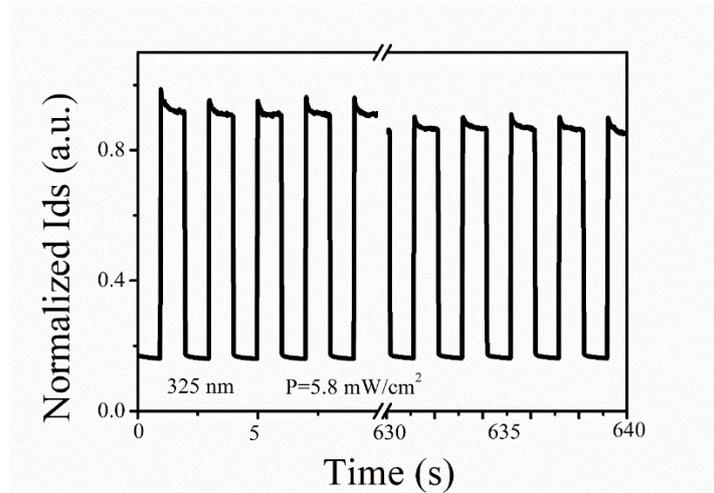
**Figure S3.** (a) AFM image of the thin SnS<sub>2</sub>. (b) The corresponding height profile along the blue line.



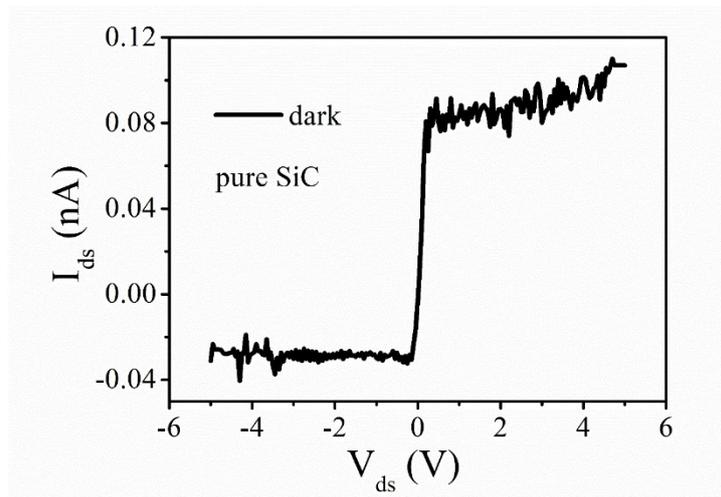
**Figure S4.** I-V curves of thinner SnS<sub>2</sub> based photodetectors on SiC substrate a) and SiO<sub>2</sub> substrate c) under 405 nm illuminations. Photocurrent and responsivity of thinner SnS<sub>2</sub>/SiC b) and SnS<sub>2</sub>/SiO<sub>2</sub> d) photodetectors under 405 nm illuminations with bias of 5 V.



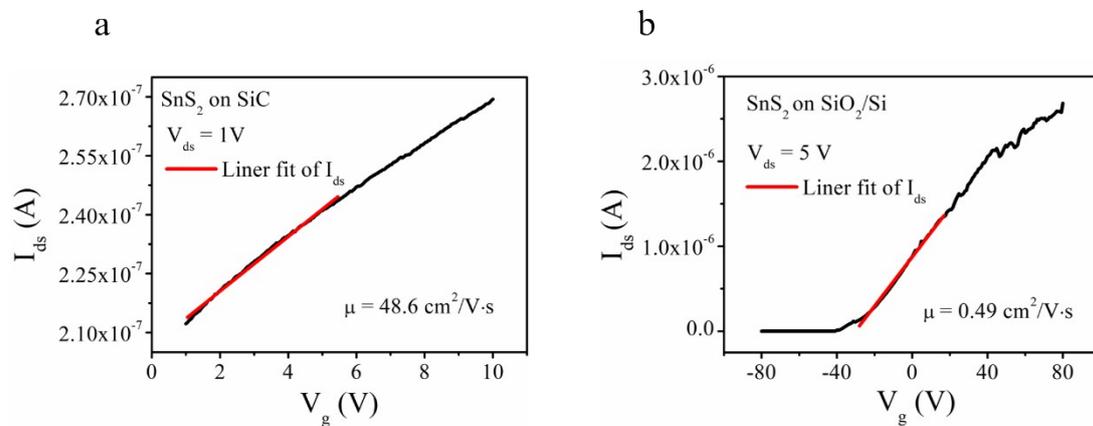
**Figure S5.** The dark current density of SnS<sub>2</sub>/SiC and SnS<sub>2</sub>/SiO<sub>2</sub> based PDs as a function of bias voltage.



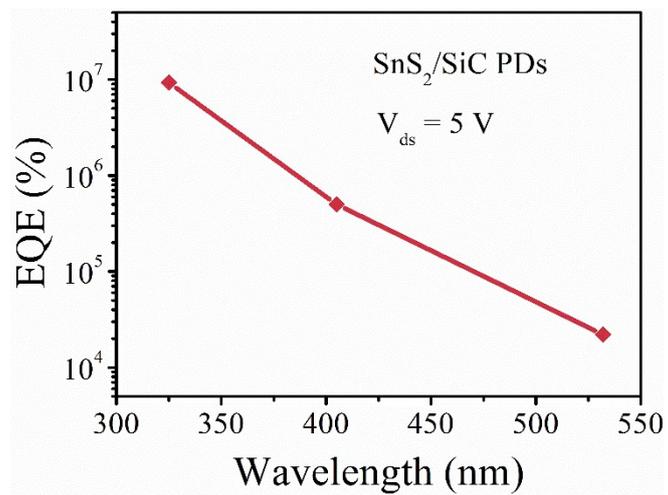
**Figure S6.** Time-resolved photoresponse of the SnS<sub>2</sub>/SiC device measured under alternating dark and 325 nm laser illumination (5.8 mW/cm<sup>2</sup>, V<sub>ds</sub> = 5 V).



**Figure S7.** I<sub>ds</sub>-V<sub>ds</sub> curve of SiC substrate in dark condition



**Figure S8.** Transfer curve of SnS<sub>2</sub> photodetector on (a) 4H-SiC substrate and (b) SiO<sub>2</sub>/Si substrate.



**Figure S9.** External quantum efficiency as function of wavelength of SnS<sub>2</sub>/SiC PDs.