Electronic Supplementary Material (ESI) for Nanoscale.

Broadband, Self-Biased Photodiode Based on Antimony Telluride (Sb_2Te_3) Nanocrystals/Silicon Heterostructure

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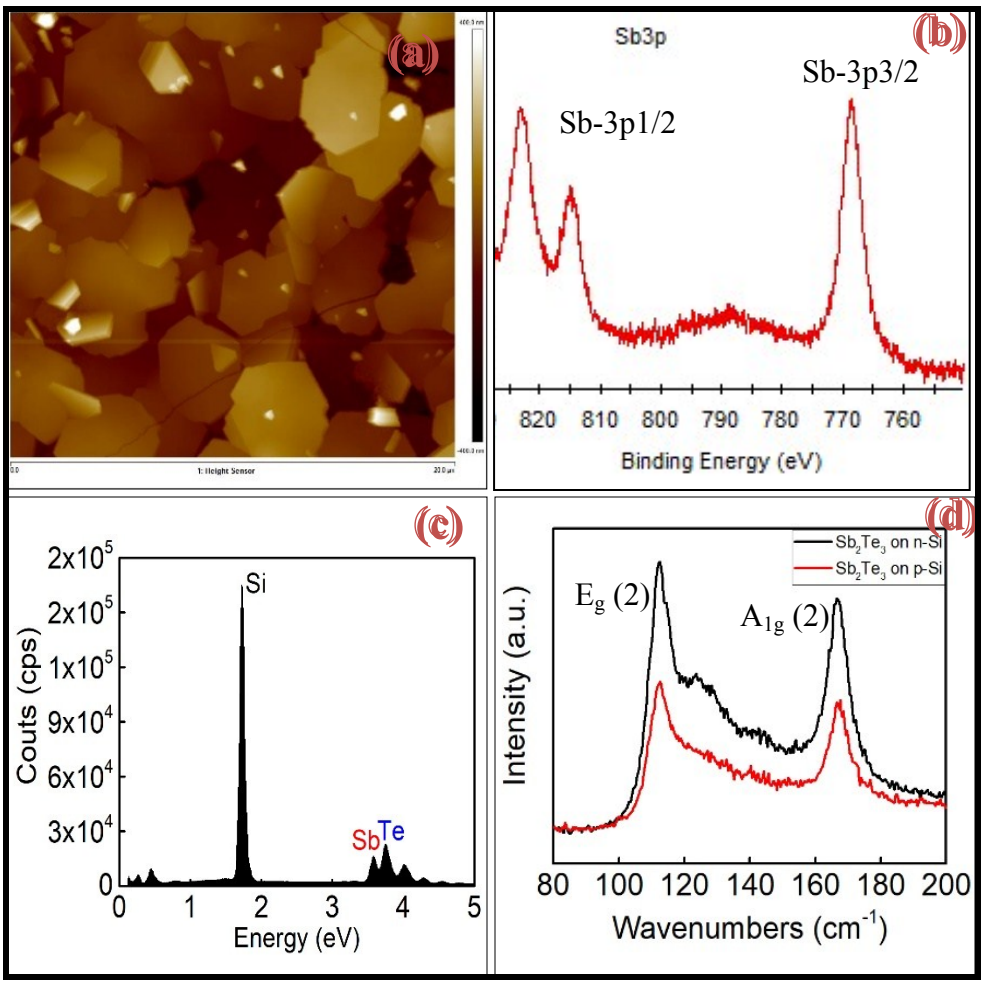

Figure S1: (a) AFM image of Sb_2Te_3 nanocrystals on p-Si showing hexagonal structures. (b) XPS analysis of core-level spectra Sb3p. (c) EDX spectrum map of Sb_2Te_3. (d) Raman spectra of Sb_2Te_3 showing Eg (2) and A1g (2) modes on both n-Si and p-Si.

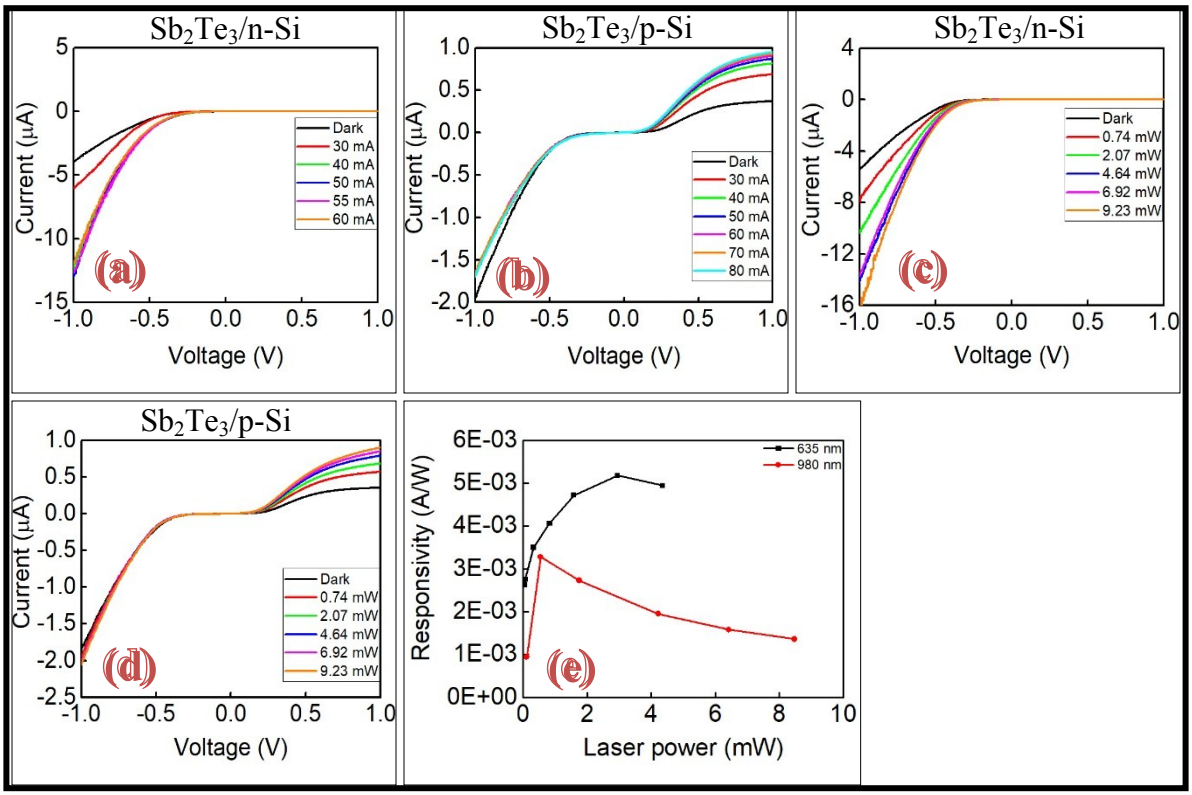

Figure S2: (a) and (b) I-V characteristic measured under 520 nm light source respectively at different intensities for Sb_2Te_3/n-Si and Sb_2Te_3/p-Si respectively. (c) and (d) I-V characteristic measured under 980 nm light source respectively at different intensities for Sb_2Te_3/n-Si and Sb_2Te_3/p-Si respectively. (e) Light intensity dependent photo responsivity plot under 635 nm (black) and 980 nm (red) light source.

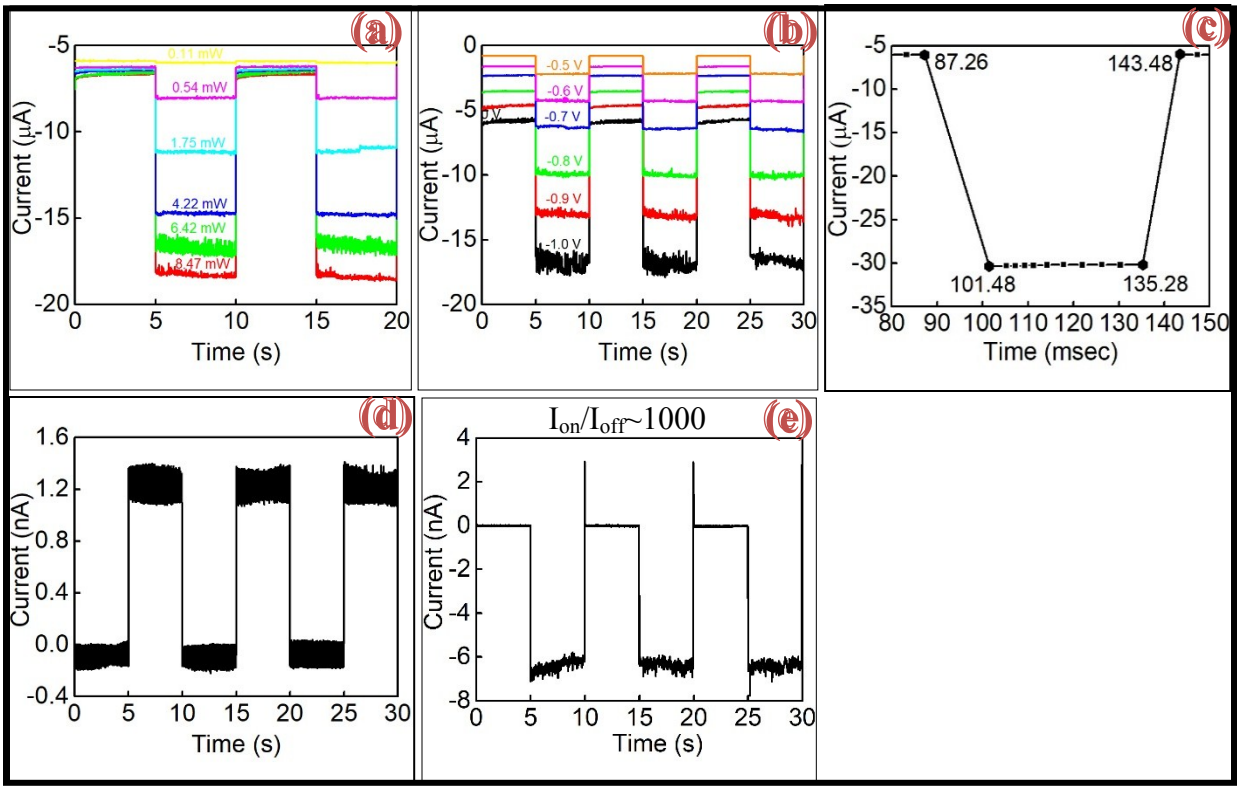

Figure S3: (a) Photocurrent switching behavior of Sb_2Te_3/n-Si under reverse bias illuminated with 980 nm light source under varying intensities. (b) Photocurrent switching behavior of Sb_2Te_3/n-Si illuminated with 980 nm light source under varying reverse bias voltages. (c) Photocurrent switching plot showing rise (t_r) and fall (t_f) times. (d) The self-biased behavior of Sb_2Te_3/p-Si photodiode. (e) The Self-biased behavior of Sb_2Te_3/n-Si displaying excellent on/off ratio.

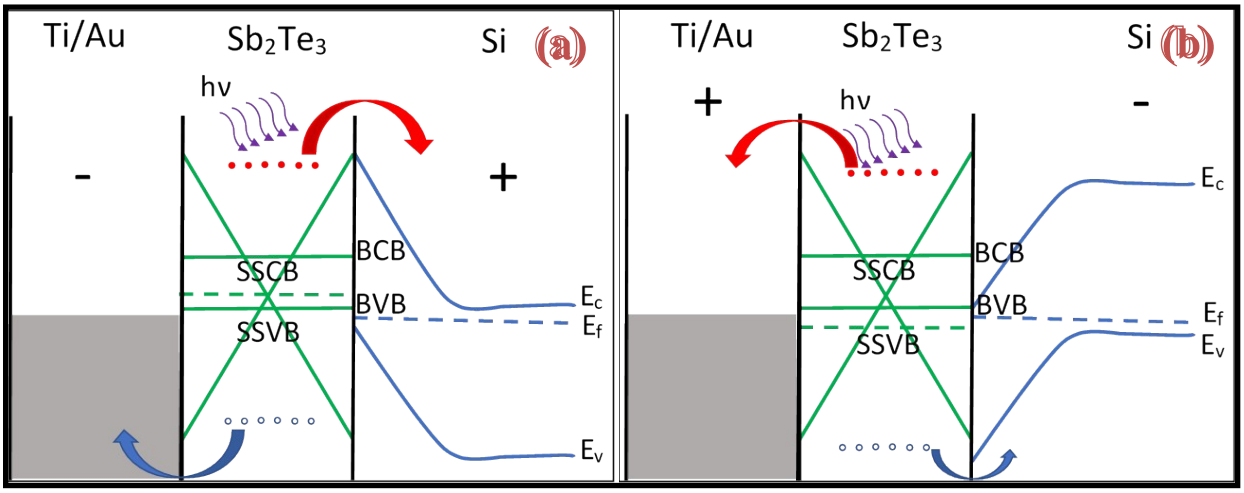

Figure S4: Qualitative illustration of energy band diagram of Sb_2Te_3/Si heterostructure photodiode in reverse bias condition. BCB, BVB, SSCB, and SSVB are bulk conduction band, bulk valence band, surface state conduction band and surface state valence band of Sb_2Te_3. E_c and E_v are conduction and valence band of Si, E_f is the Fermi level. The band bending and depletion regions are not scaled. (a) Sb_2Te_3/n-Si in reverse bias condition (b) Sb_2Te_3/p-Si in reverse bias condition.