Supplementary Information: Physical Chemistry Chemical Physics: Gate tunable self-powered few-layer black phosphorus broadband photodetector

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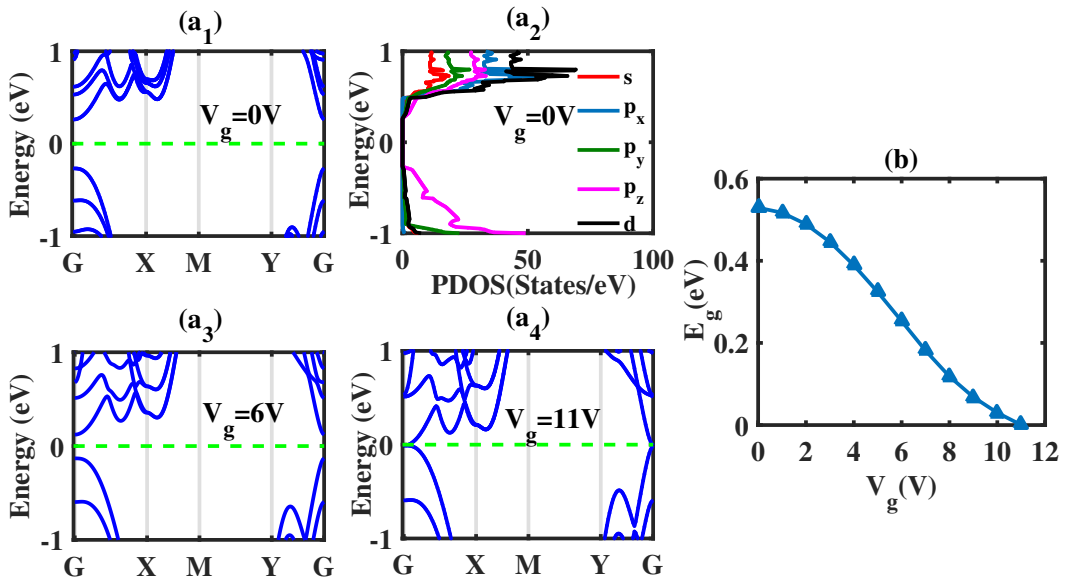

Figure S1 Band structure of three-layer BP when (a_1) $V_g = 0V$; (a_3) $V_g = 6V$; (a_4) $V_g = 11V$. (a_2) The projected density of states (PDOS) of three-layer BP when $V_g = 0V$. (b) Band gap E_g of three-layer BP versus the applied vertical gate voltage V_g in the system.

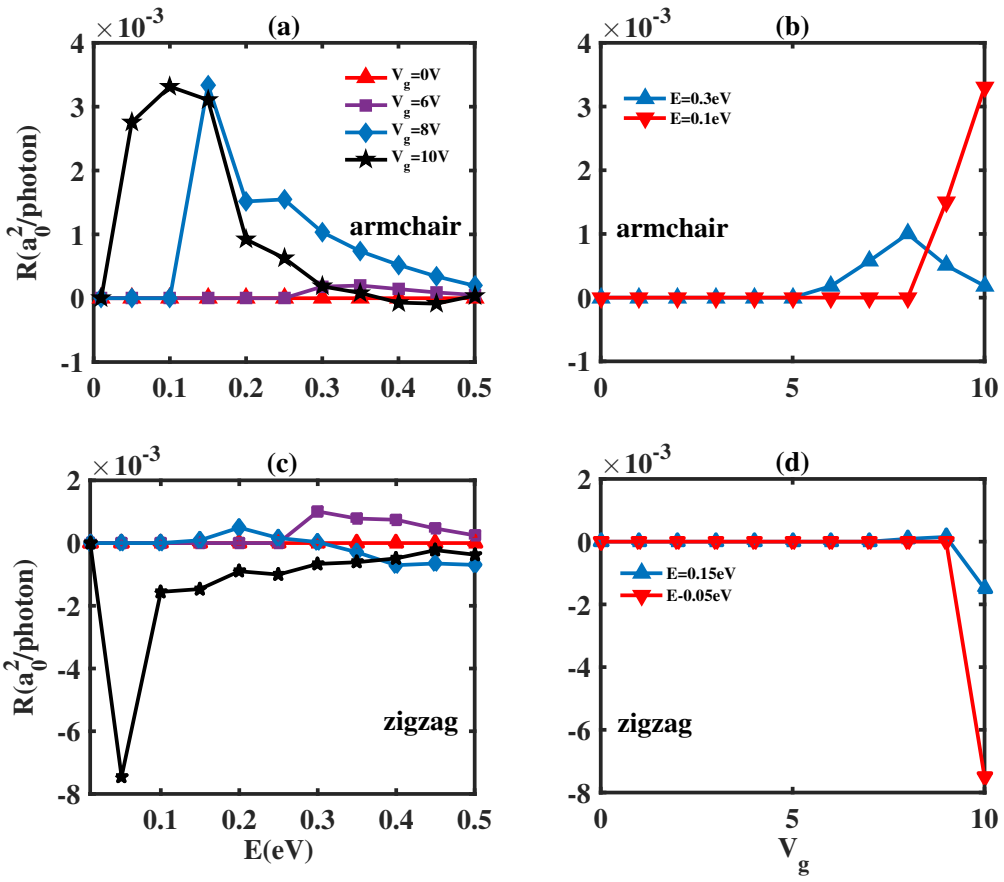

Figure S2 (a,b) The photoresponse of three-layer BP device along armchair direction versus photon energy E and the gate voltage V_g by circularly polarized photogalvanic effect (CPGE), respectively. (c,d) Photoresponse of three-layer BP device along zigzag direction versus photon energy E and the gate voltage V_g under illumination by CPGE, respectively. The polarization angle $\phi = 45°$.

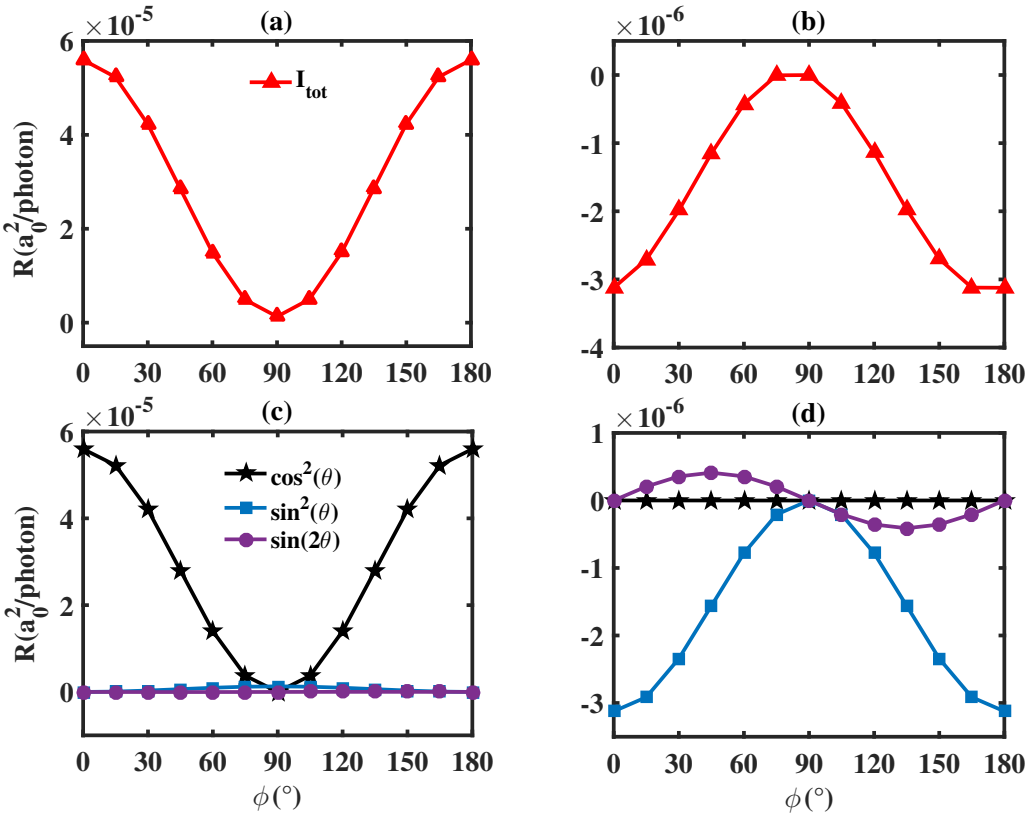

Figure S3 (a,b) The photoresponse versus the circular polarization angle ϕ along the armchair and zigzag directions, respectively. (c,d) The three components of the photoresponse versus the circular polarization angle ϕ along the armchair and zigzag directions, respectively. The three-layer BP device is illuminated by the circularly polarized light. The photon energy is fixed as $E = 0.025$eV.

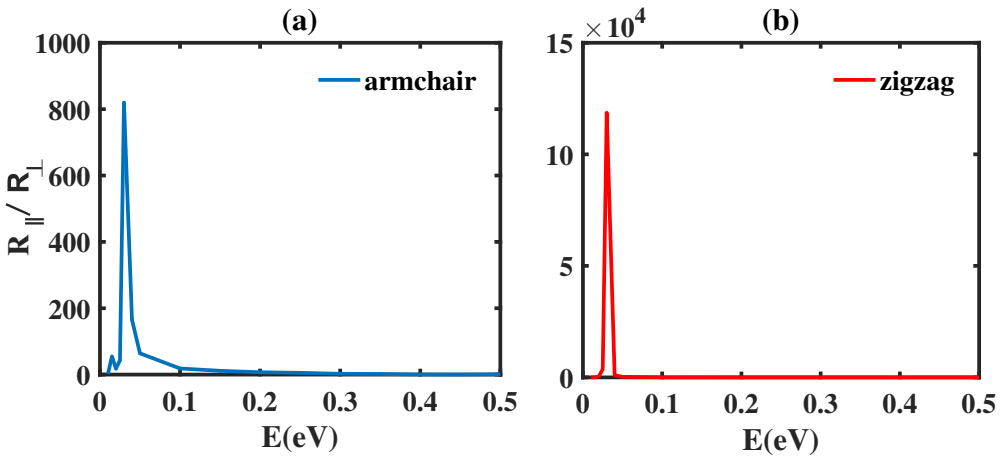

Figure S4 (a) The extinction ratio versus with photon energy along the armchair and zigzag directions, respectively.