Electronic Supplementary Information (ESI)

Rational Design of Junction Structure to Realize NIR-Selective Narrowband Organic Thin-Film Photodiode

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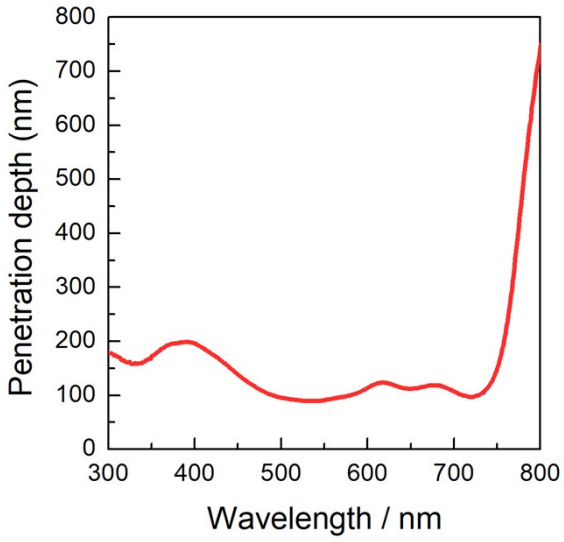

Fig. S1 Cacluated penetration depth of PCE10:P3HT p-complex film from Beer-Lambert law.

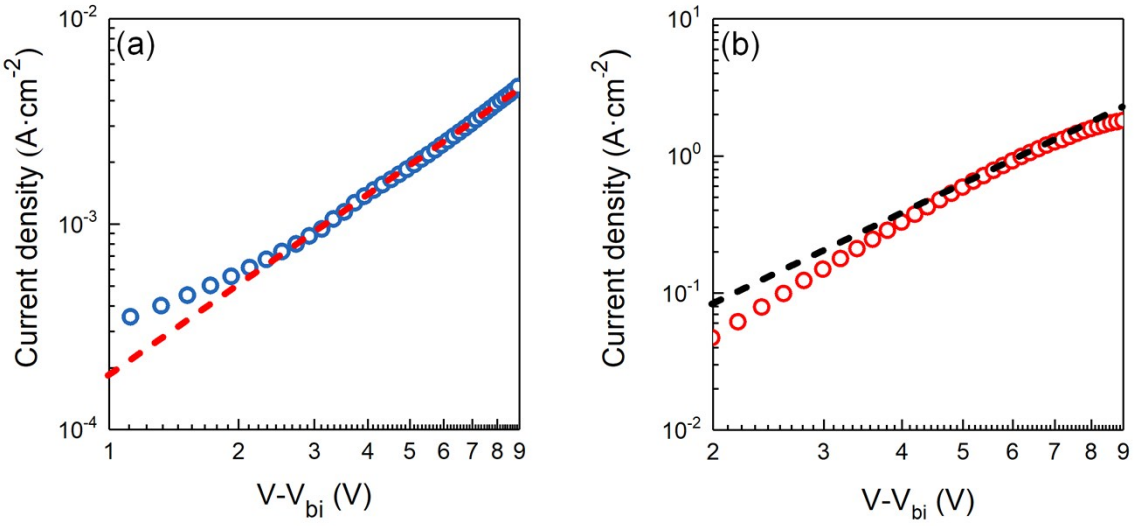

Fig. S2 SCLC plots of (a) hole-only and (b) electron-only devices to extract hole and electron mobilities.

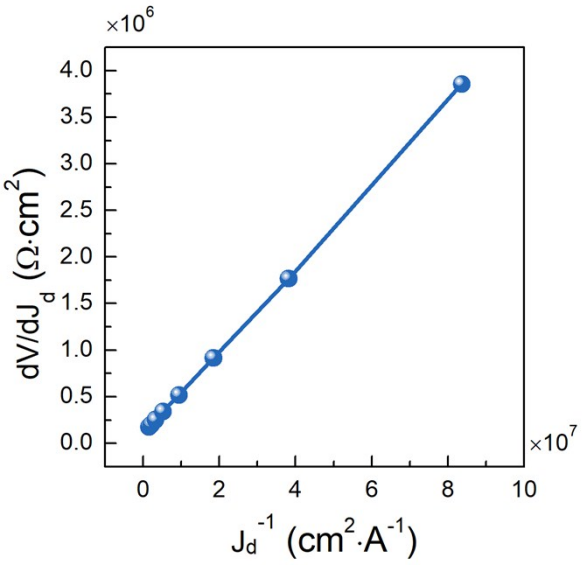

Fig. S3 J_d^{-1} vs dV dJ_d^{-1} plot to calculate ideality factor (dots and line correspond to experimental data and theoretical fitting, respectively).

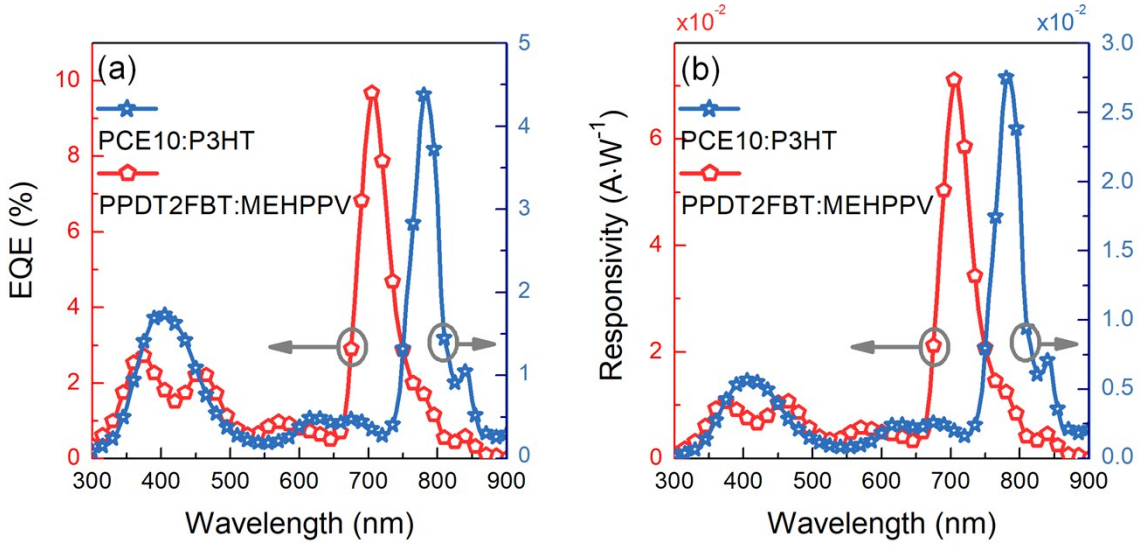

Fig. S4 (a) The EQE and (b) responsivity spectra of optimized PCE10:P3HT and PPDT2FBT:MEH-PPV p-complexes photodiodes.

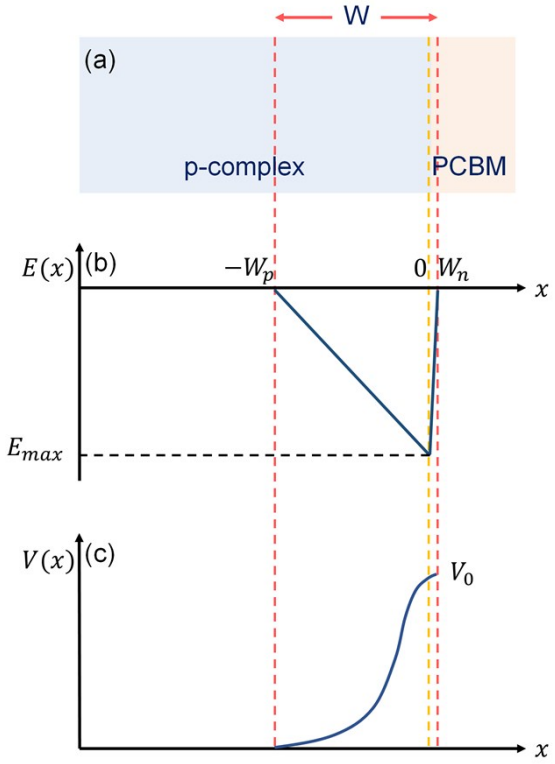

Fig. S5 (a) Schematic description of abrupt PN junction used in this study. The corresponding (b) effective electric field distribution and (c) electric potential distribution.

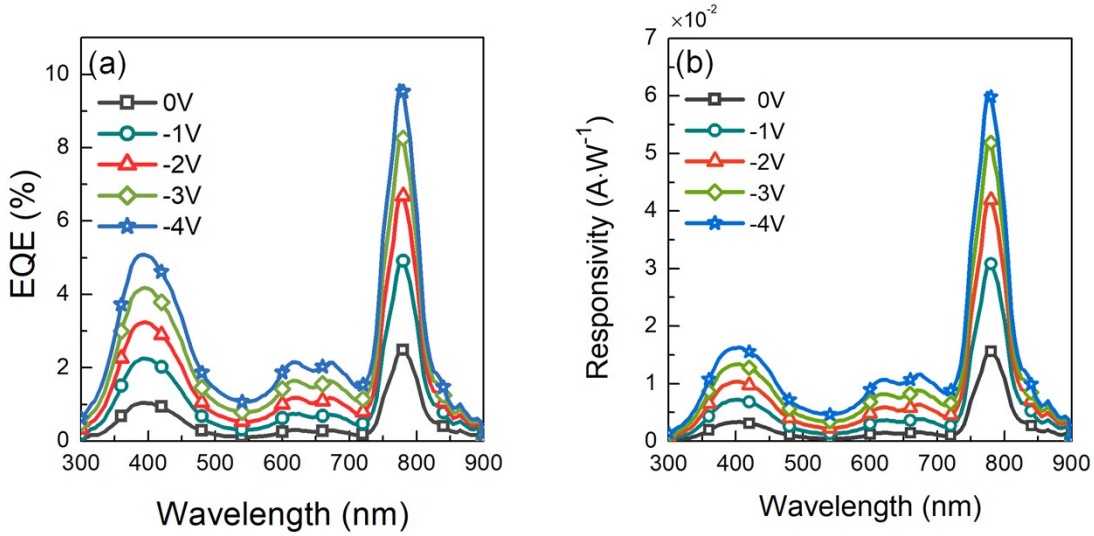

Fig. S6 (a) The EQE and (b) responsivity spectra of PCE10:P3HT photodiode under different reverse biases.

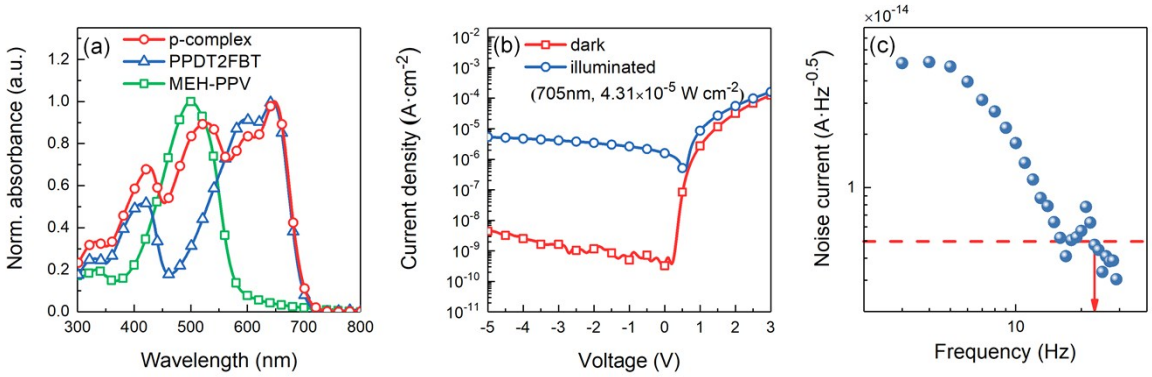

Fig. S7 (a) UV-vis absorption spectra of pristine PPDT2FBT, MEH-PPV and their mixture (p-complex) films. (b) Measured dark and illuminated (780 nm wavelength and 25.7 μW cm^{-2} intensity) *J-V* characteristics and (c) Noise current spectrum of optimized photodiode which p-complex is PPDT2FBT:MEH-PPV. Noise current value was extracted at 23 Hz.

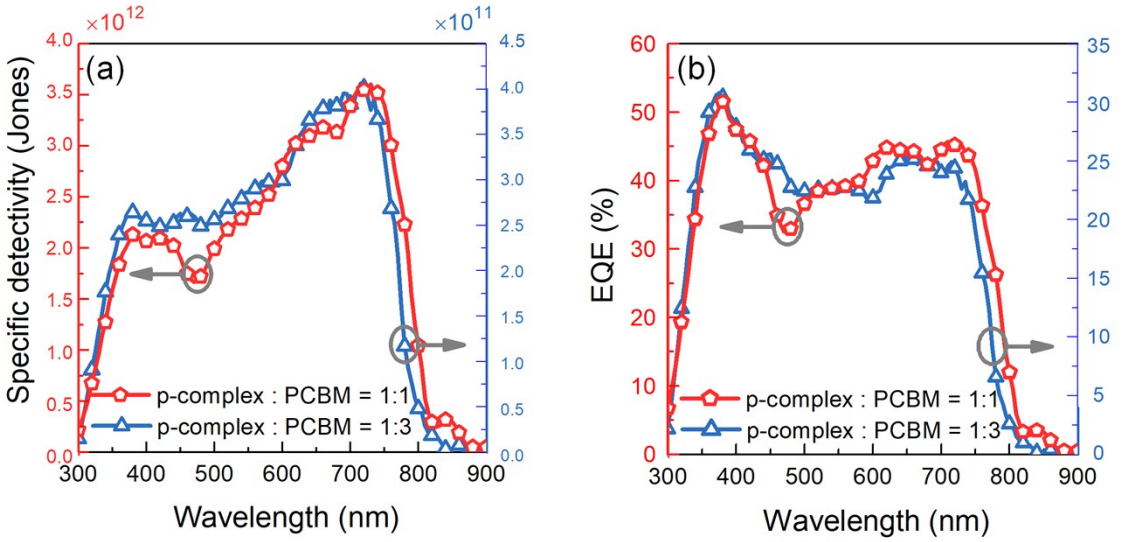

Fig. S8 (a) The calculated detectivity spectra and (b) EQE spectra of BHJ photodiodes with different ratio of (PCE10:P3HT):PCBM = 1:1, 1:3 to show that NIR-selective mechanism is attributed to the rational design of junction structure of PHJ which selectively quenches non-desired visible photons even with thin film active layer thickness.