Electronic Supplementary Information for

High-performing near-infrared organic phototransistors based on diketopyrrolopyrrole conjugated polymers with partial removal of long branched alkyl side chains

Yu Tang, [a,†] Weijie Ge, [a,†] Ping Deng, [b] Qiaoming Zhang, [a] Yingjie Liao,[c] Zuhong Xiong [a] Weixia Lan,[c] Bin Wei,[c] and Yanlian Lei[a]*

[a] School of Physical Science and Technology, Southwest University, Chongqing 400715, China
[b] College of Materials Science and Engineering, Fuzhou University, Fuzhou 350108, China.
[c] Key Laboratory of Advanced Display and System Applications (Ministry of Education), Shanghai University, Shanghai 200072, China

† These two authors contributed equally to this work

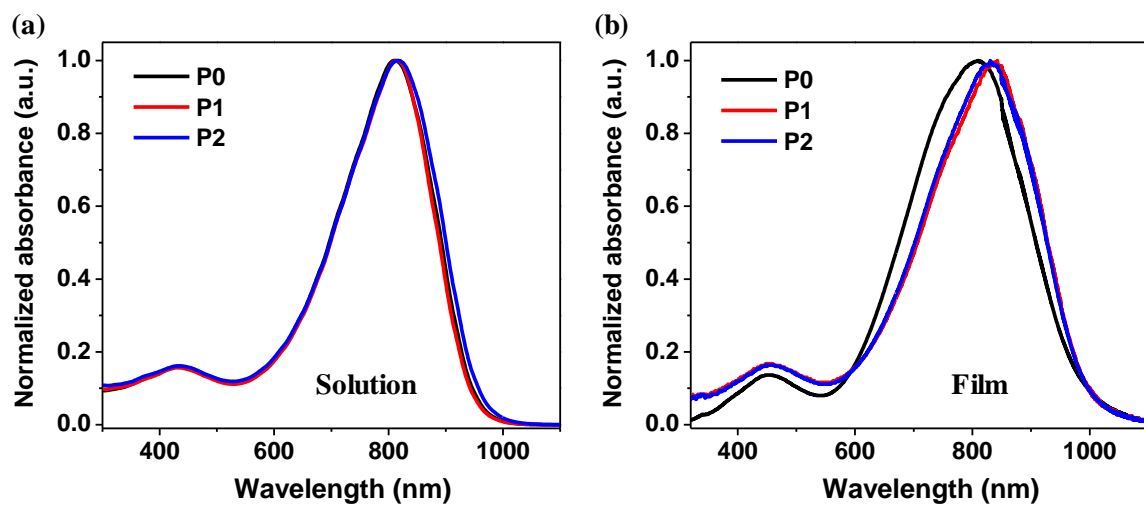*Corresponding author. E-mail address: yllei@swu.edu.cn

Figure S1. Absorption spectra of the copolymers **P0**, **P1**, and **P2** (a) in dilute chlorobenzene solutions and (b) as thin films.
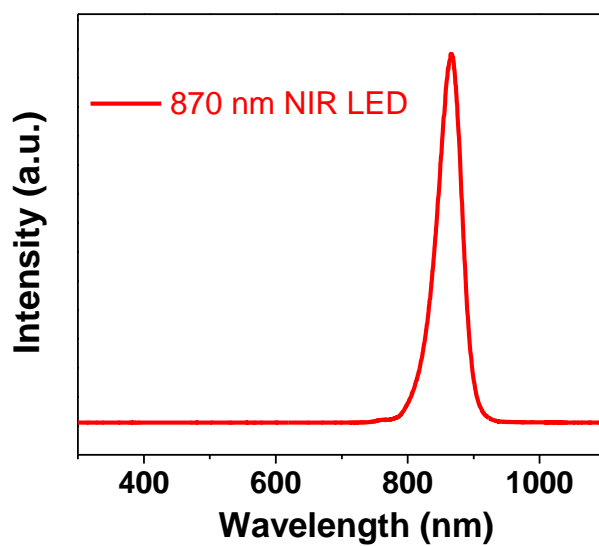

Figure S2. Electroluminescence spectrum of the 870 nm NIR LED.
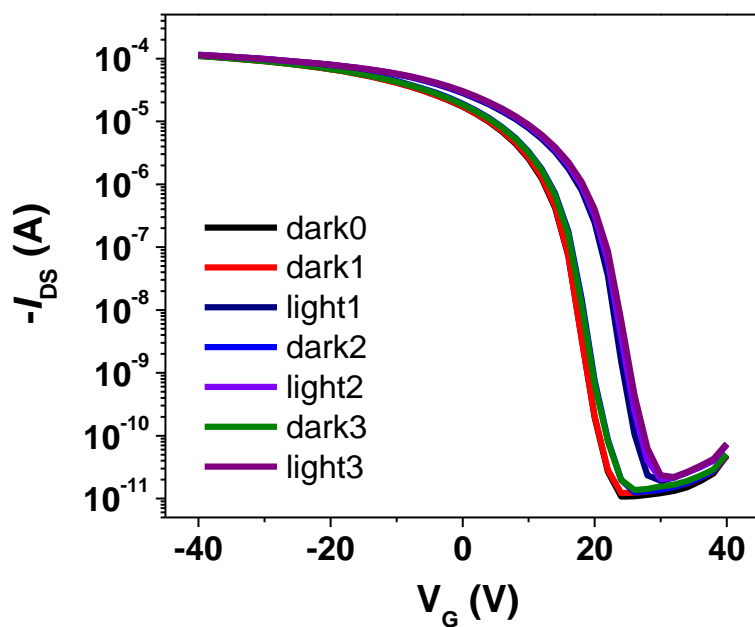
Figure S3. Transfer curves of the NIR OPTs measured alternately for three times before and after the exposure to the NIR light.
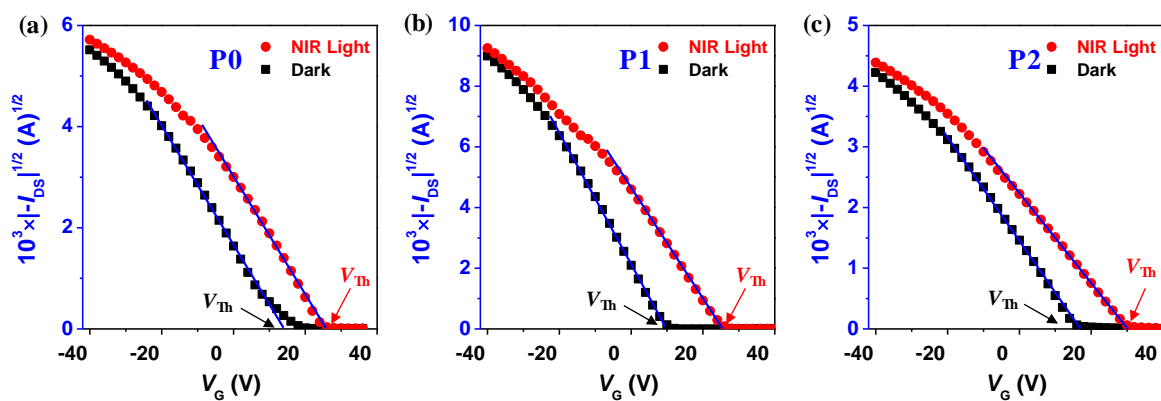

Figure S4. Positive shift of the threshold voltage (V_{Th}) under NIR light for the NIR OPTs based on (a) **P0**, (b) **P1**, and (c) **P2**.
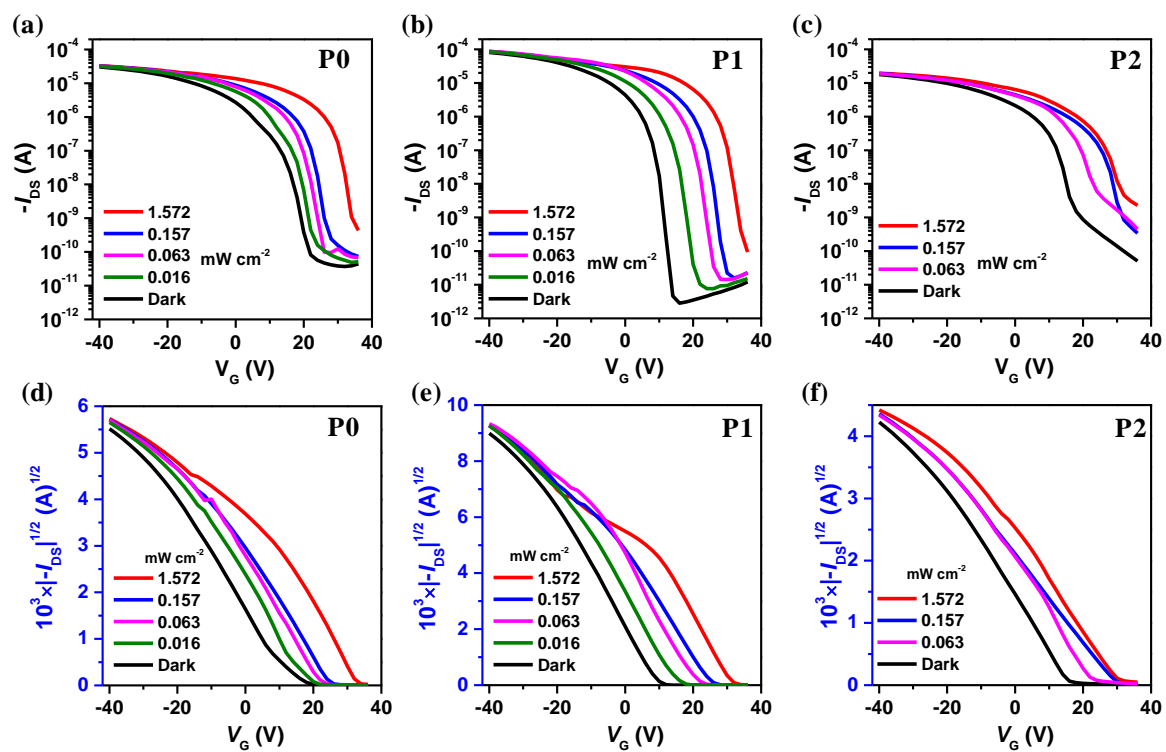
Figure S5. Transfer characteristics of the NIR OPTs based on (a, d) **P0**, (b, e) **P1**, and (c, f) **P2** in dark and under different NIR intensities (V_{DS} = -40V)
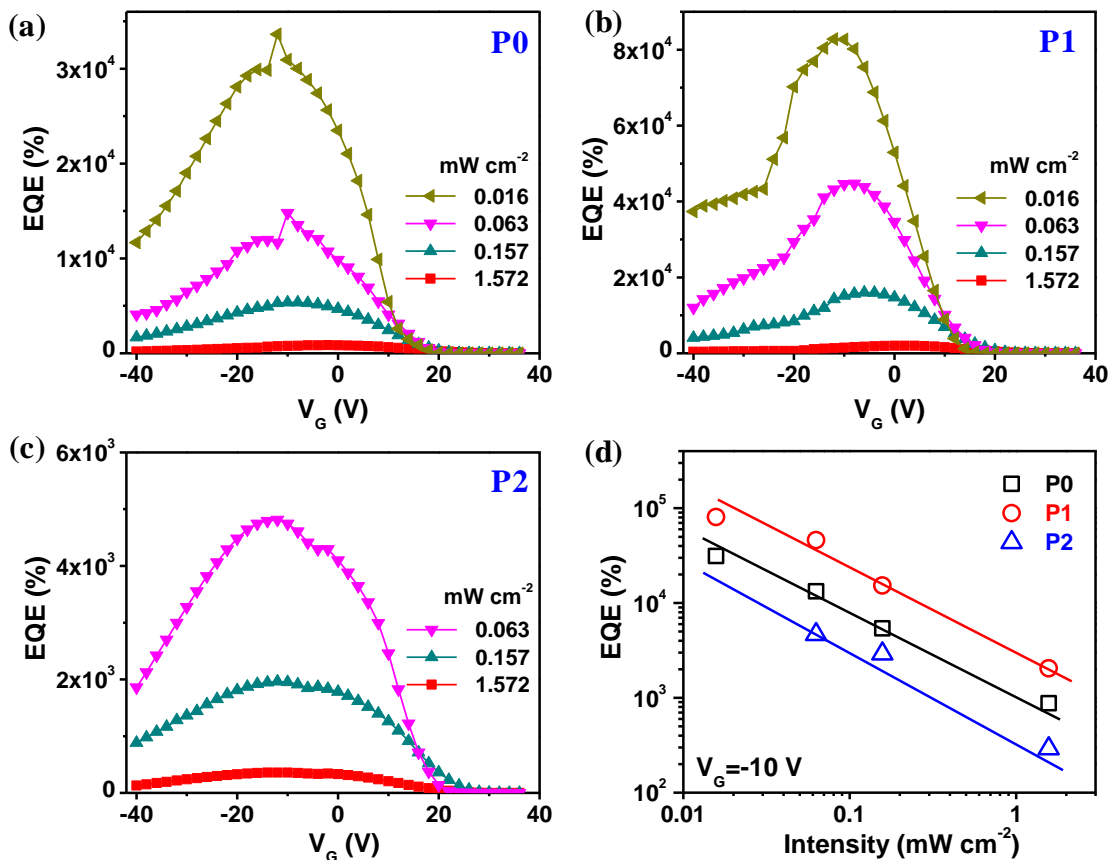
Figure S6. The calculated EQE as a function of V_G under different NIR intensities for the NIR OPTs based on (a) **P0**, (b) **P1**, and (c) **P2**. (d) EQE of the three NIR OPTs as a function of NIR power intensity at V_G = -10 V. The EQE were calculated based on the equation of EQE=(hc/λq)•**R**.
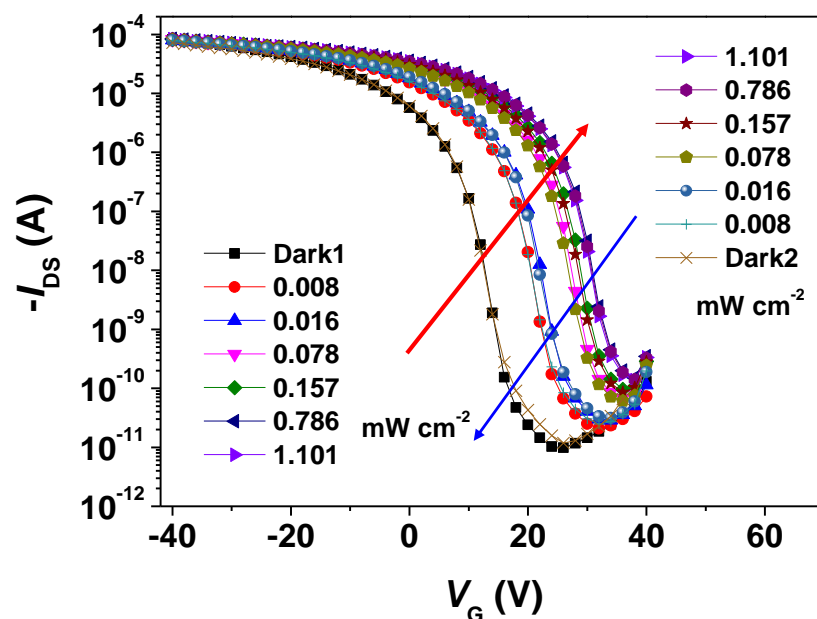
Figure S7. Transfer characteristics of the **P1**:PC$_{61}$BM-based NIR OPTs in dark and under different NIR intensities. The device exhibited a stable and reversible response to NIR light with different intensities from 0.008 to 1.101 mW cm^{-2} (red arrow) and then from 1.101 to 0.008 mW cm^{-2} (blue arrow).
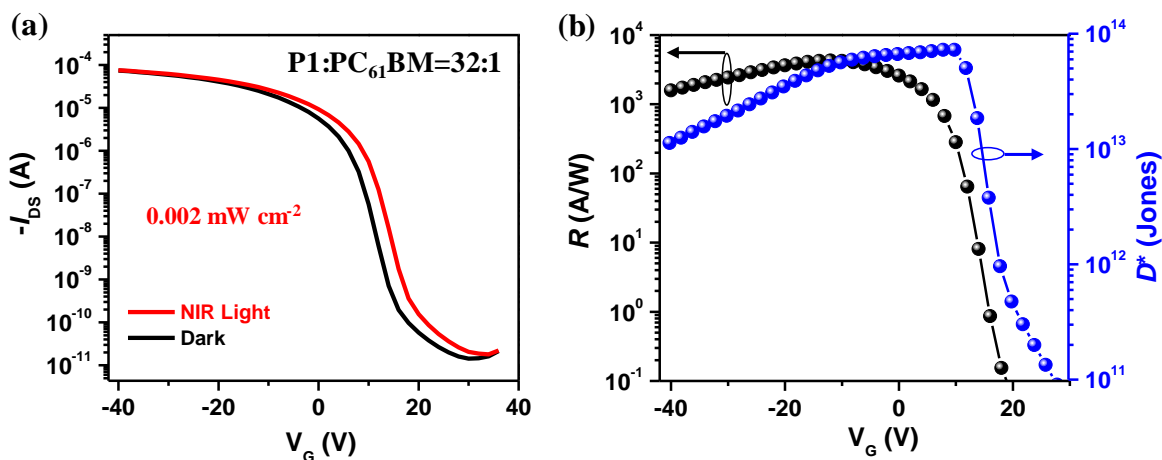

Figure S8. Photoresponse behaviors of the NIR OPTs based on **P1**:PC$_{61}$BM (32:1, *by weight*) under ultralow NIR light intensity of 0.002 mW cm^{-2}. (a) Transfer curves of the OPTs in dark and under NIR light illumination; (b) corresponding **R** and **D*** as a function of **V**$_G$.
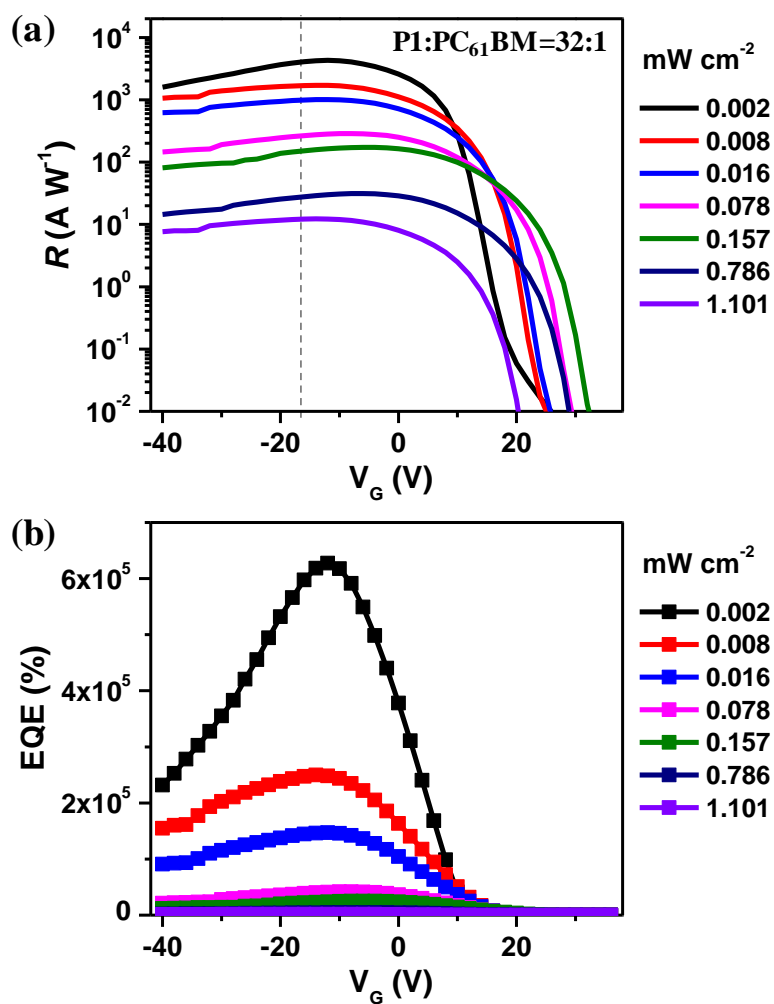
Figure S9. The calculated (a) *R* and (b) EQE as a function of V_G under different NIR intensities for the NIR OPTs based on **P1**:PC$_{61}$BM (32:1, *by weight*).
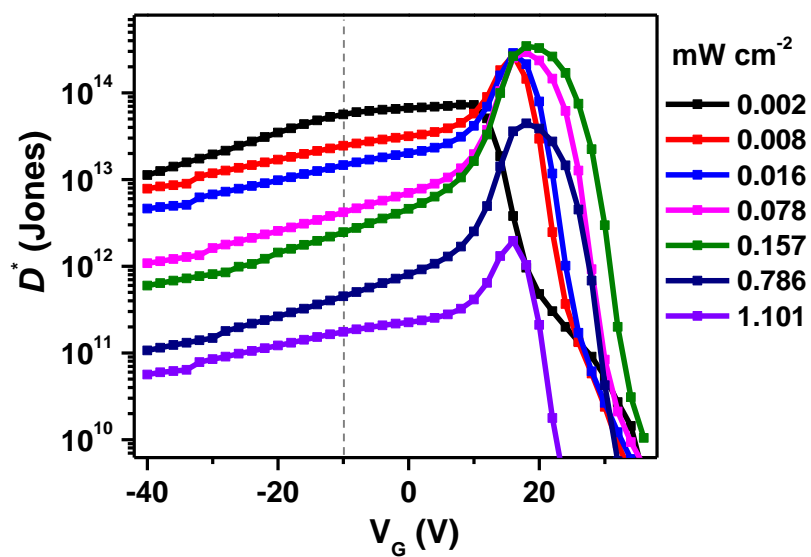
Figure S10. The calculated D^* as a function of V_G under different NIR intensities for the NIR OPTs based on **P1**:PC$_{61}$BM (32:1, *by weight*).