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# Microfluidic Solution-Processed Organic and Perovskite Nanowires Fabricated for Field-Effect Transistors and Photodetectors

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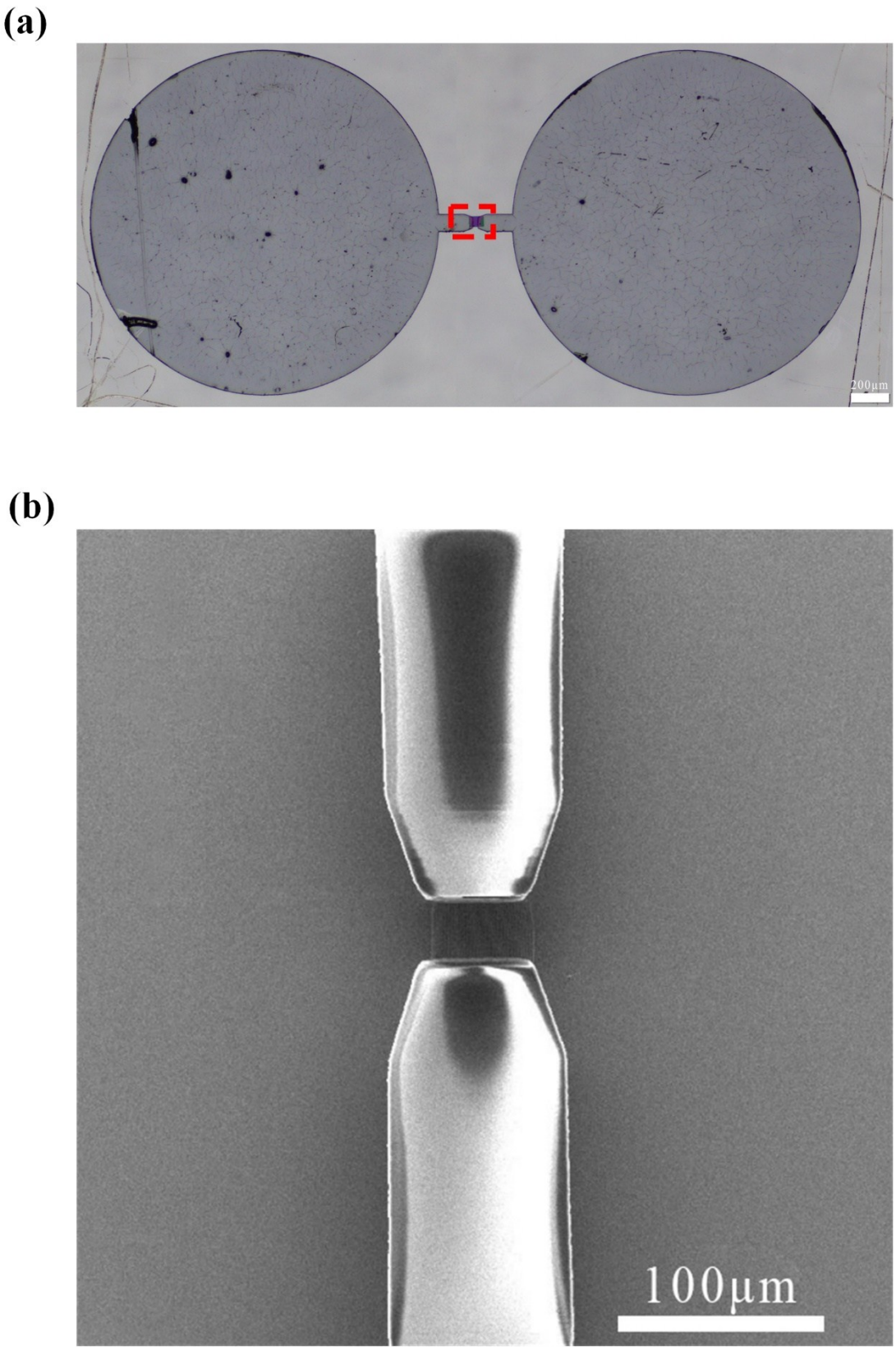


**Figure S1.** (a) Optical microscope image of nanowires template. (b) SEM image of nanowires template.

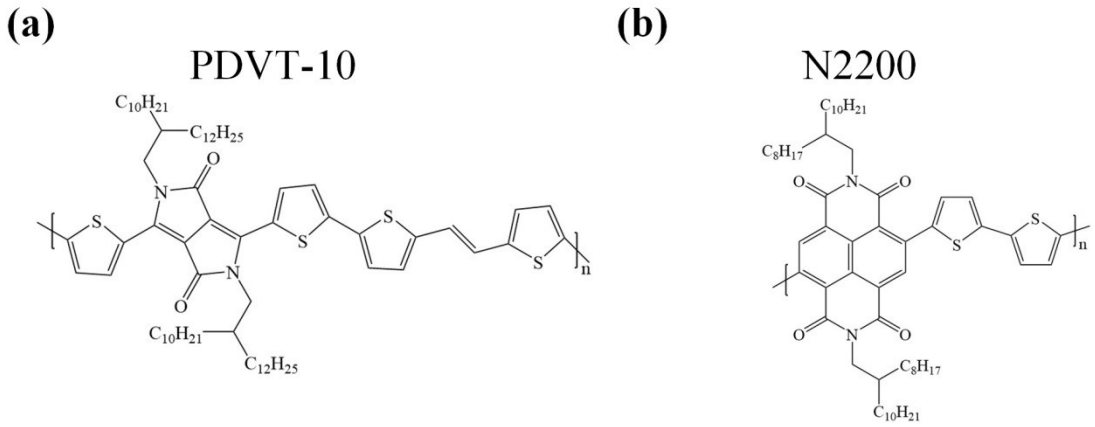


**Figure S2.** The molecule structures of (a) PDVT-10 and (b) N2200.

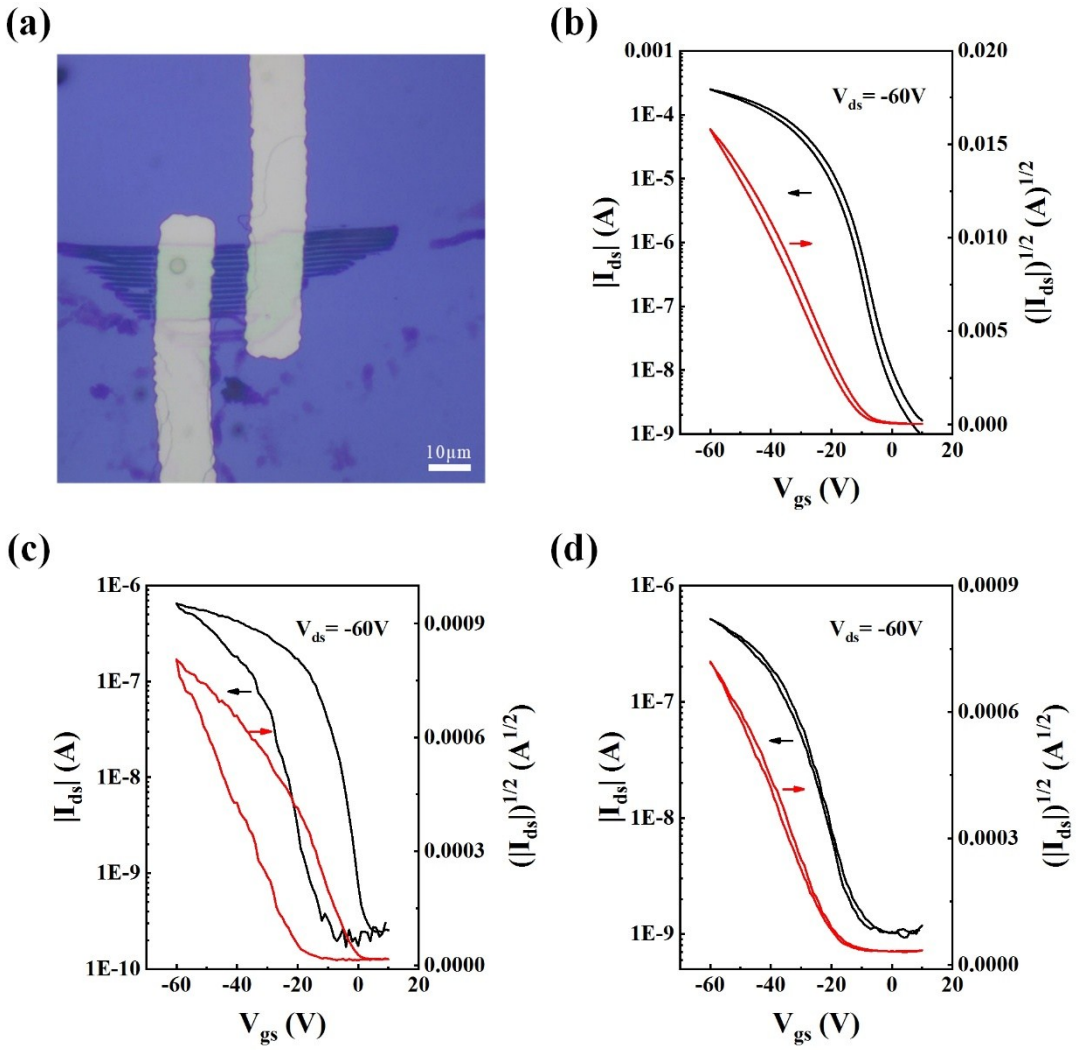


**Figure S3.** (a) Device appearance and channel region. (b) Transfer characteristics ($I_{ds}$-$V_{gs}$) of PDVT-10 thin-film transistors (BGTC) with L = 30 μm and W = 1000 μm, exhibiting a hole mobility of 0.32 $cm^2V^{-1}s^{-1}$ at $V_{ds}$ = −60 V. (c) Transfer characteristics ($I_{ds}$-$V_{gs}$) of PDVT-10 nanowire transistors (BGBC) with L = 20 μm and W = 9 μm, exhibiting a hole mobility of 0.06 $cm^2V^{-1}s^{-1}$ at $V_{ds}$ = −60 V. (d) Transfer characteristics ($I_{ds}$-$V_{gs}$) of PDVT-10 nanowire transistors (TGBC) with L = 20 μm and W = 6.3 μm, exhibiting a hole mobility of 0.1 $cm^2V^{-1}s^{-1}$ at $V_{ds}$ = −60 V.

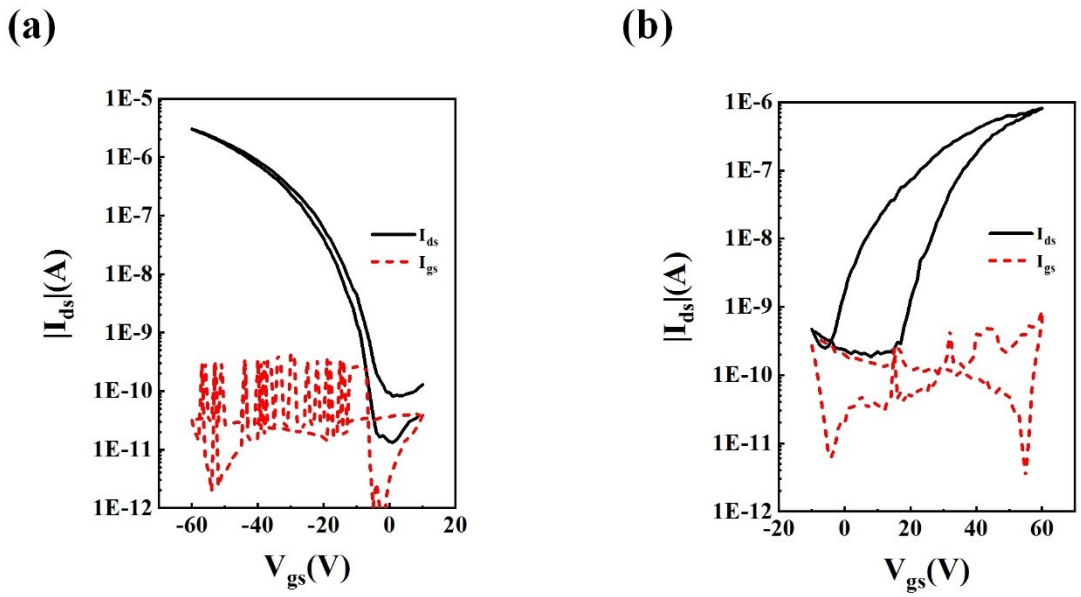


**Figure S4.** Transfer characteristics of (a) PDVT-10 nanowire transistor (BGTC) and (b) N2200 nanowire transistors (BGBC) at $|V_{ds}|$= 60 V.

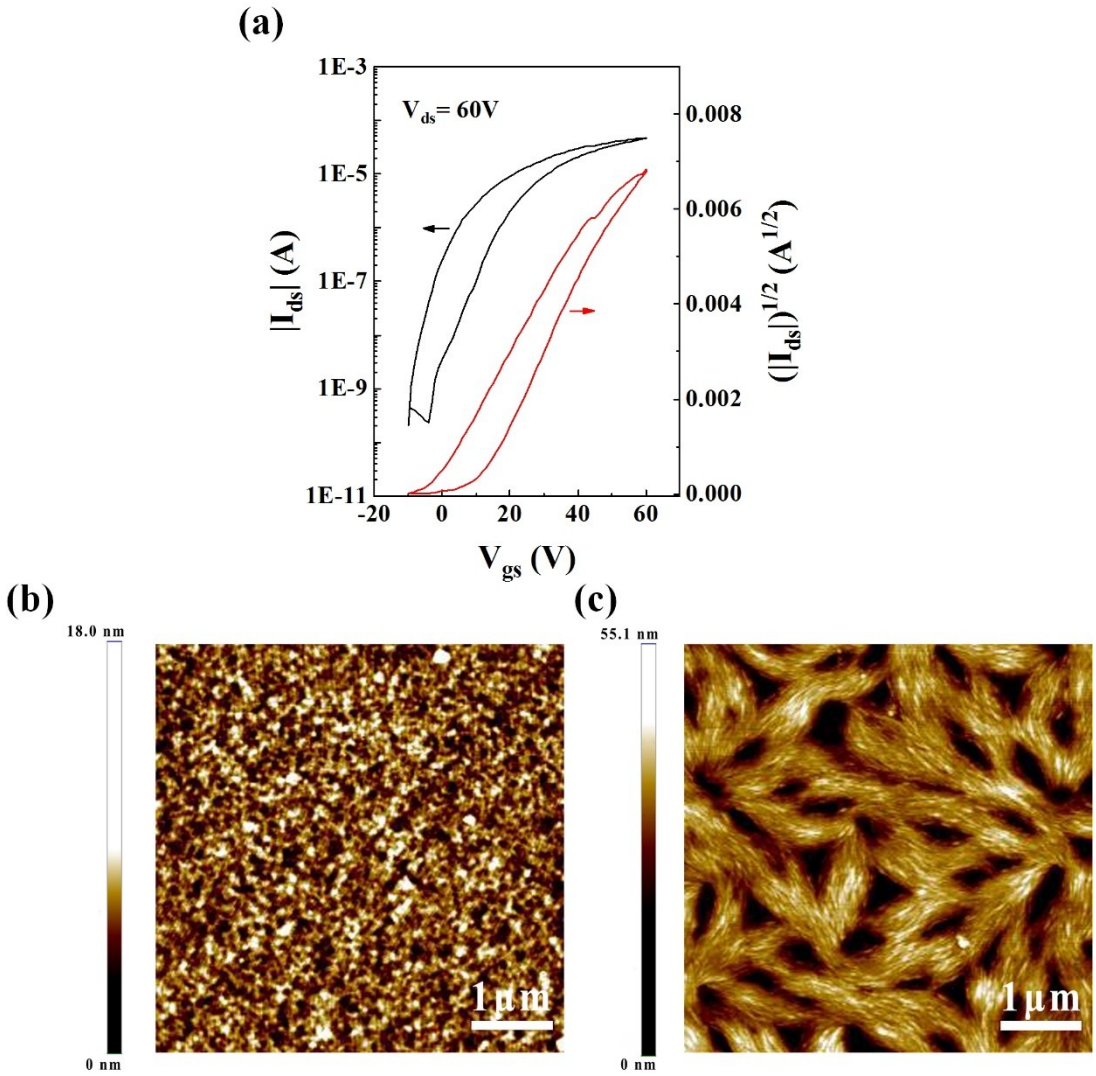


**Figure S5.** (a) Transfer characteristics ($I_{ds}$-$V_{gs}$) of a typical N2200 thin-film transistors (BGBC) with L = 20 µm and W = 1000 µm, exhibiting a hole mobility of 0.02 $cm^2V^{-1}s^{-1}$ at $V_{ds}$ = 60 V. AFM images of (b) PDVT-10 and (c) N2200 thin-film on OTS-modified $Si/SiO_2$ substrates, respectively.

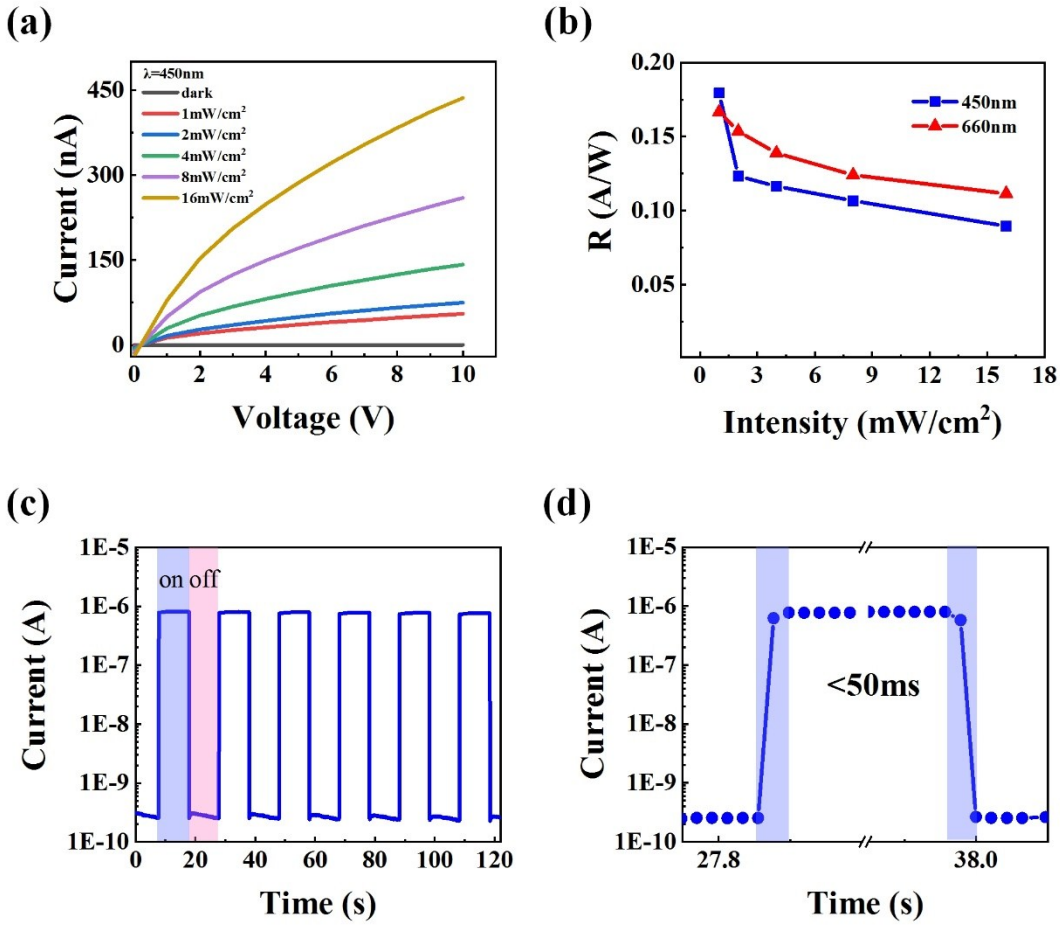


**Figure S6.** (a) *I–V* curves of the pristine $MAPbI_3$ thin-film under illumination of 450 nm with a power density varying from 0 to 16 mW/cm$^2$. (b) Responsivity as a function of the light power density for pristine $MAPbI_3$ film photodetectors at 5 V and wavelengths of 450 nm and 660 nm. (c) The time-dependent photocurrent measurement of $MAPbI_3$ film photodetector under illumination of 450 nm at 5 V, and (d) the rise and fall times response.

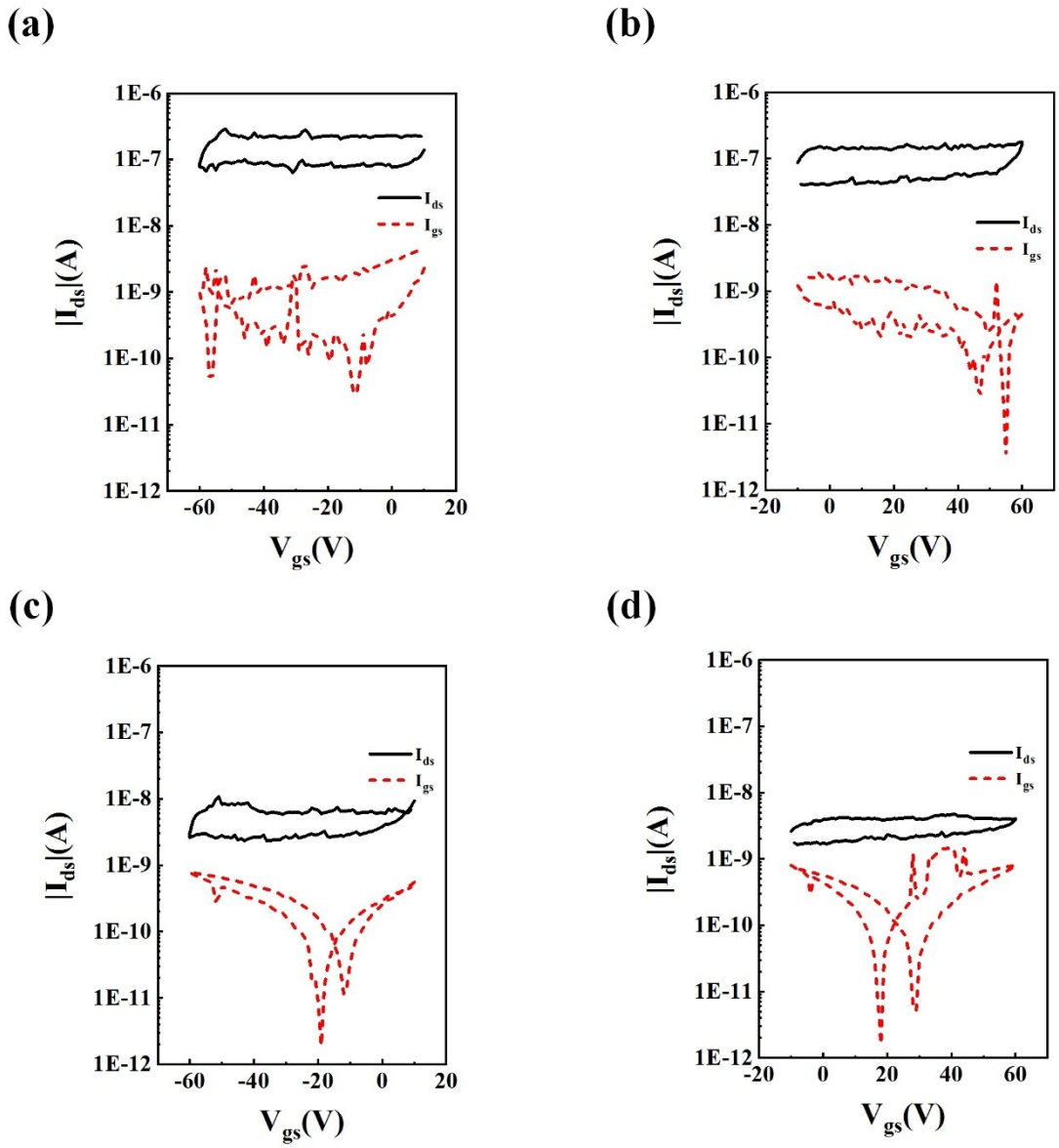


**Figure S7.** Transfer characteristics ($I_{ds}$-$V_{gs}$) of $MAPbI_3$ thin-film transistors under $|V_{ds}|$= 60 V (a) p-type and (b) n-type. Transfer characteristics ($I_{ds}$-$V_{gs}$) of $MAPbI_3$ nanowire transistors under $|V_{ds}|$= 60 V (a) p-type and (b) n-type.

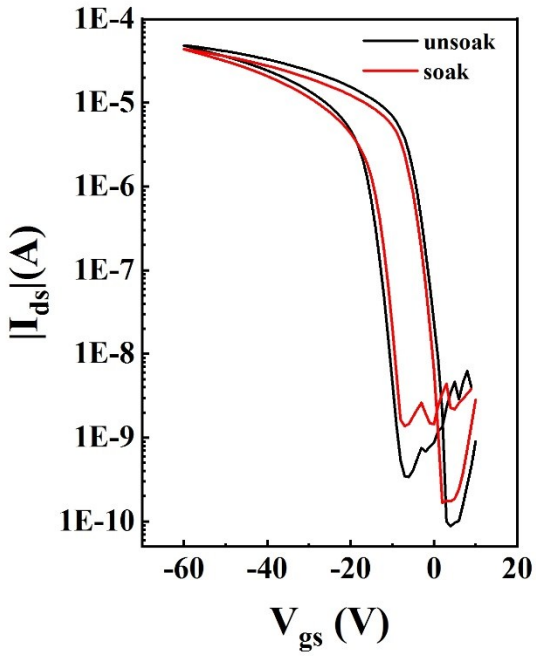


**Figure S8.** Transfer characteristics ($I_{ds}$-$V_{gs}$) of the thin-film (PDVT-10) before and after the immerse.

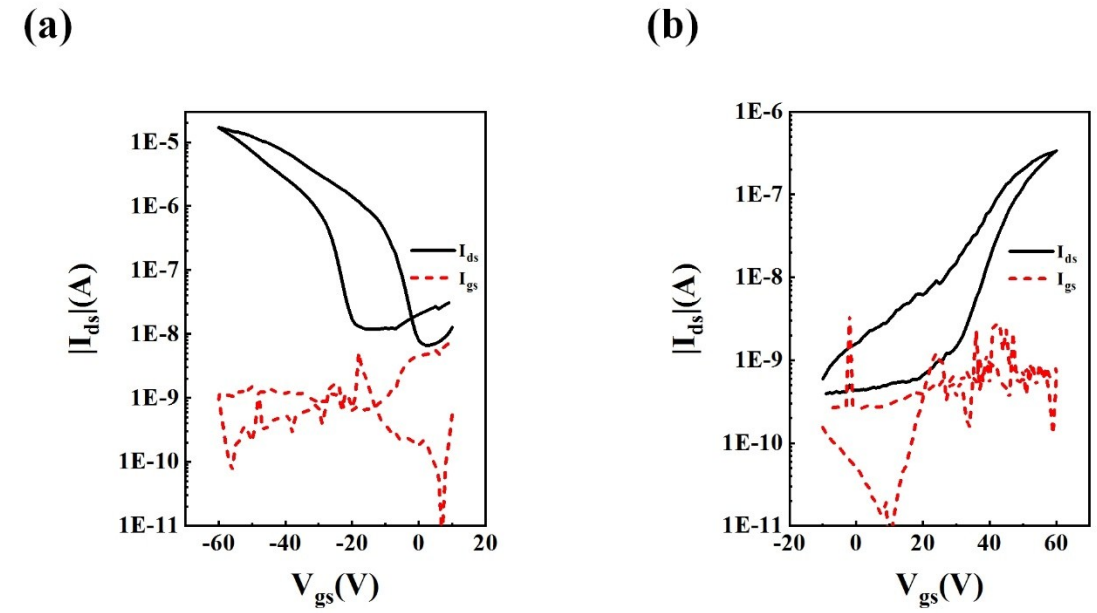


**Figure S9.** Transfer characteristics of (a) $MAPbI_3$/PDVT-10 and (b) $MAPbI_3$/N2200 nanowire heterojunction transistors at $|V_{ds}|$= 60 V.

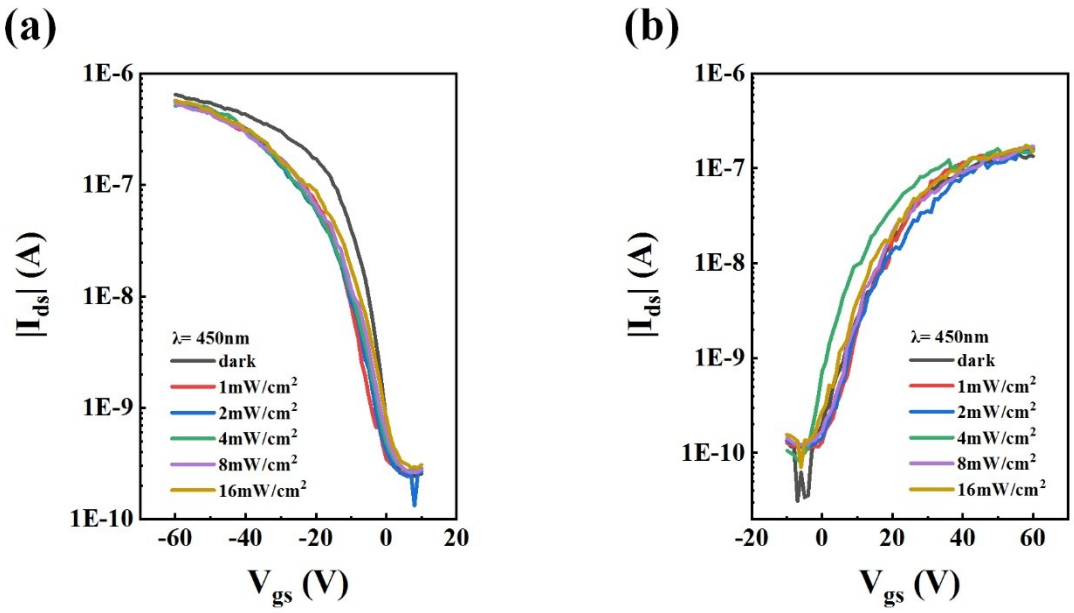


**Figure S10.** Transfer characteristics ($I_{ds}$-$V_{gs}$) of the (a) PDVT-10 and (b) N2200 nanowire transistors under light of 450 nm with power intensity varying from 0 to 16 mW/cm$^2$.

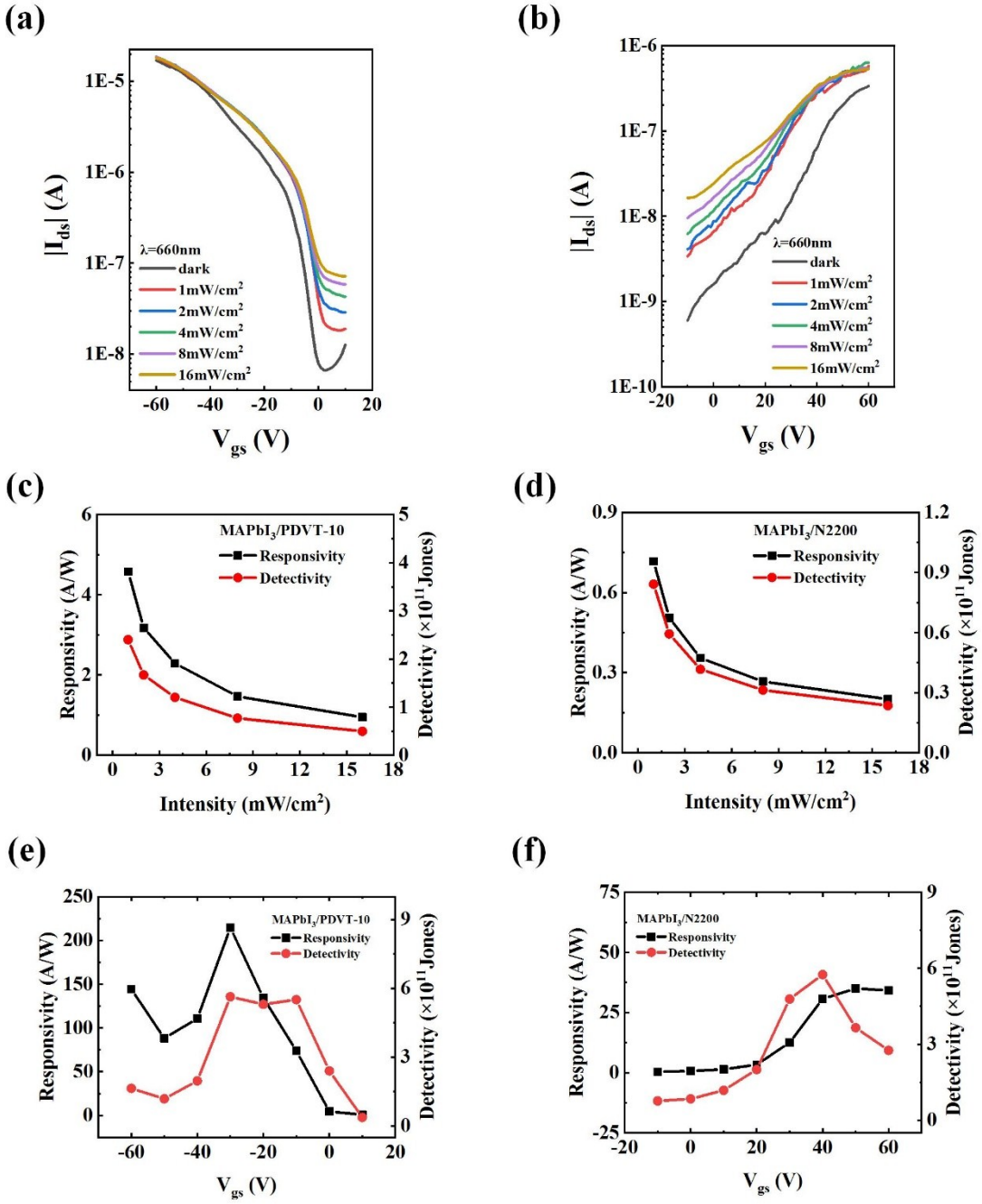


**Figure S11.** Photo response of $MAPbI_3$/OSC nanowire heterojunction transistors. Transfer characteristics ($I_{ds}$-$V_{gs}$) of the (a) $MAPbI_3$/PDVT-10 and (b) $MAPbI_3$/N2200 nanowire heterojunction transistors under illumination of 660 nm light. Photoresponsivity ($R$) and detectivity ($D^*$) characteristics of (c) $MAPbI_3$/PDVT-10 and (d) $MAPbI_3$/N2200 nanowire heterojunction transistors at $V_{gs}$= 0 V under illumination of 660 nm light. The dependences of $R$ and $D^*$ on $V_{gs}$ under illumination of 660 nm light for (e) $MAPbI_3$/PDVT-10 and (f) $MAPbI_3$/N2200 nanowire heterojunction transistors.

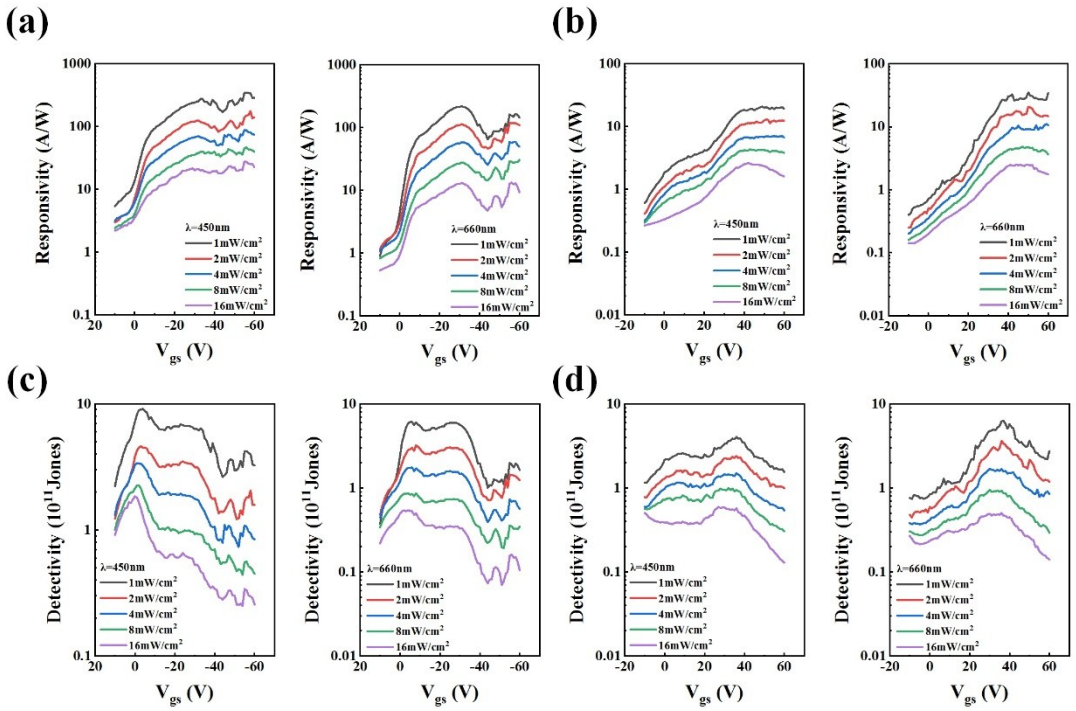


**Figure S12.** The dependences of *R* characteristics on $V_{gs}$ under illumination of 450 nm or 660 nm light for (a) $MAPbI_3$/PDVT-10, (b) $MAPbI_3$/N2200 nanowire heterojunction phototransistors, respectively. The dependences of *D** on $V_{gs}$ under illumination of 450 nm or 660 nm light for (c) $MAPbI_3$/PDVT-10, (d) $MAPbI_3$/N2200 nanowire heterojunction phototransistors, respectively.