Supplementary Information.

Figure S1. Pentacene 1 µm channel length OTFTs.

Transfer characteristics (a) and output characteristics (b) of a device. The field-effect hole mobility in the saturation regime was 0.45 $cm^2V^{-1}s^{-1}$ (channel length of 1 µm, width of 10 µm, SiO_2 thickness of 360nm). Dotted line shows transfer characteristic for reference top contact shadow mask device (channel length of 100 µm, channel width of 1000 µm, SiO_2 thickness of 360 nm). Both reference and lithographically pattern devices show similar mobilities and On/Off ratios of 10^5. We associate 8V shift of the threshold voltage (V_{TH}) of photolithographically made sample with oxygen doping due to processing in air. Oxygen doping is known to cause such threshold voltage changes [R1]

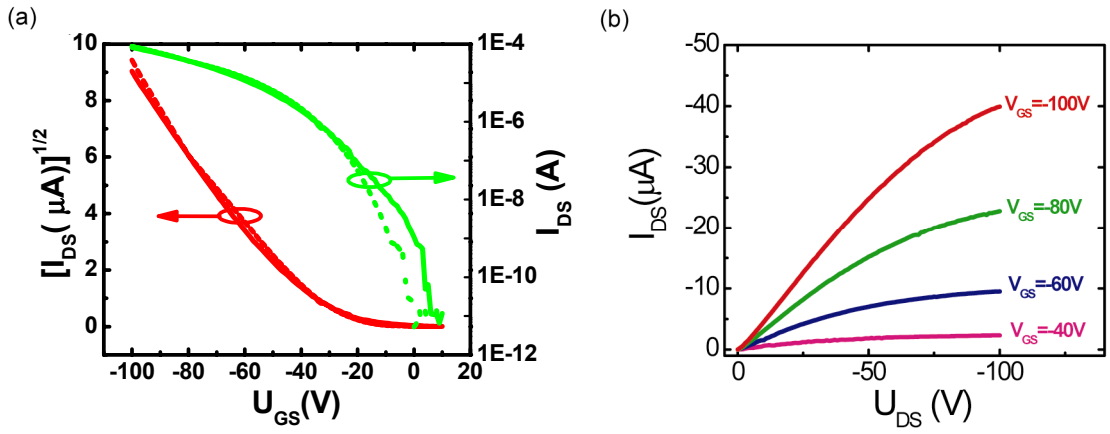


Figure S2. P3HT 200 nm channel length OTFTs.

Transfer characteristics (a) and output characteristics (b) of a device. The field-effect hole mobility in the saturation regime was $2 \cdot 10^{-4}$ $cm^2V^{-1}s^{-1}$, artificially low due to severe contact limitations (channel length of 200 nm, width of 3 µm, SiO_2 thickness of 360nm).

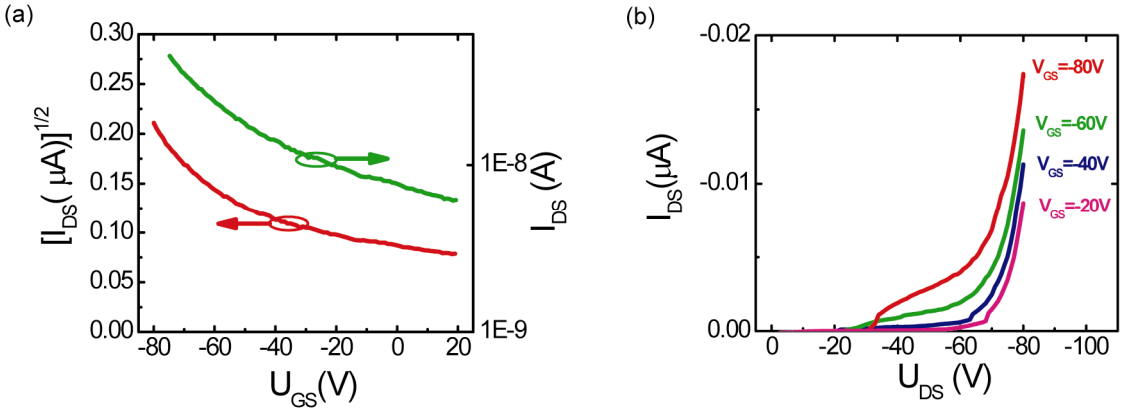
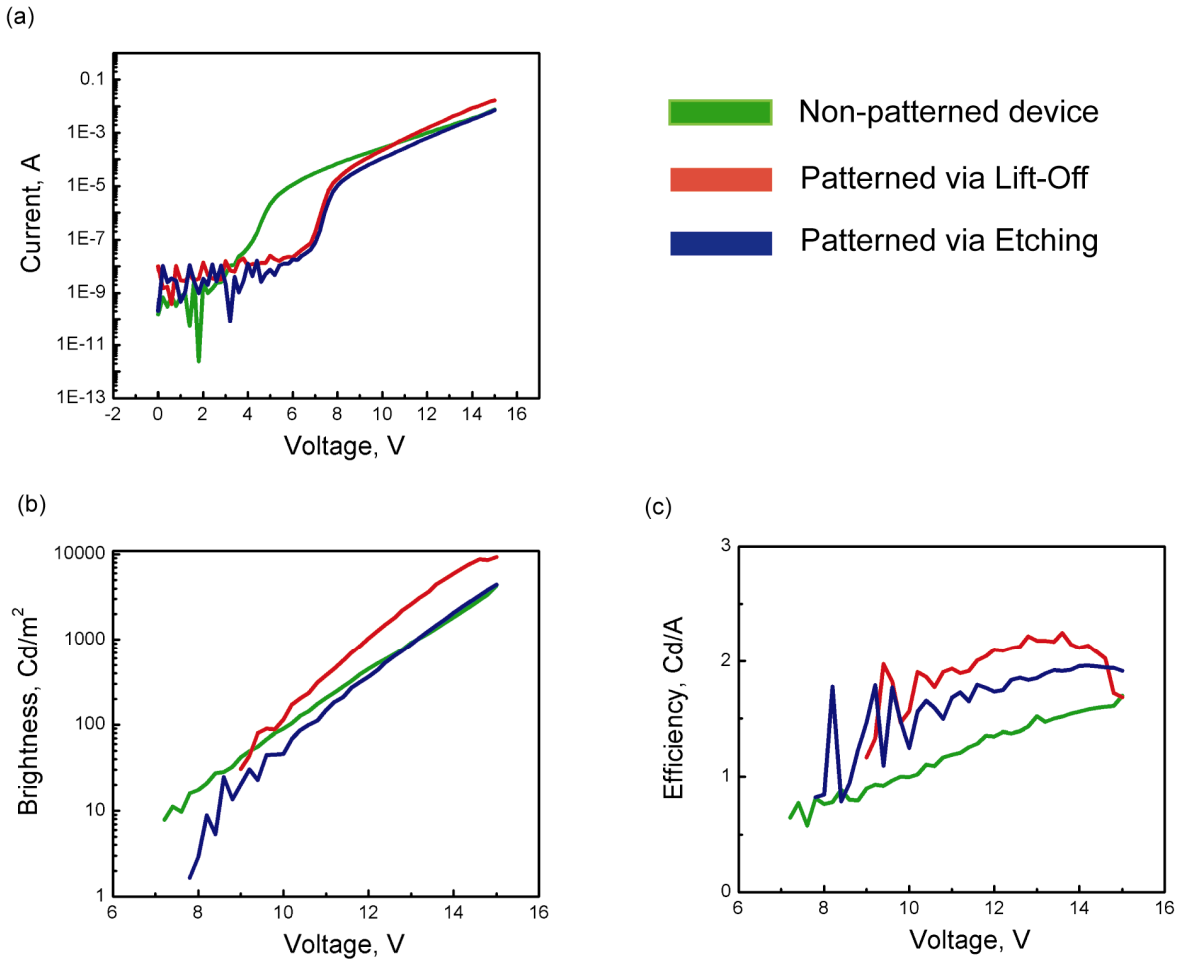


Figure S3. Comparison of OLED device performance.

IVL characteristics (a), brightness (b), and efficiencies (c) of devices patterned by different methods. Device structure is ITO/PEDTO:PSS/F8BT/CsF/Al.



Small amplitude of the oscillations.

It should be noted that the amplitude of the oscillations in Fig 3C is rather small and about 3% of V_{DD}. This is typical for high frequency organic ring oscillators with saturated load inverter design (for example [R2]). The amplitude of oscillations is determined by the condition of AC gain>1 of each inverter. However, single-channel inverters don't have as much gain as CMOS inverters, and inverters made with OTFTs have especially low gain. For high frequency signals, the amplitude of oscillations is further reduced because of the reduced gain value of the inverter. Optimization of W_{load}/L_{load} and W_{drive}/L_{drive} values can improve the amplitude of oscillations in comparison to V_{DD}, however this is beyond the scope of this paper

References:

R1. E.J. Meijer, C. Detcheverry, P.J. Baesjou, E. van Veenendaal, D.M. de Leeuw and T.M. Klapwijk, *J. Appl. Phys*. 2003, **93,** 4831.

R2. S. K. Park et al IEEE Electron Device Lett. 2008, 29, 1004; A.C. Huebler et al Organic Electronics, 2007, 8 480; F. Eder et. al. Appl. phys. lett. 2004, 84, 2673