Supplementary Information

Realizing Low-voltage Operating Crystalline Monolayer Organic Field-effect Transistors with Low Contact Resistance

Longfeng Jiang,[ab] Jie Liu,*[b] Yanjun Shi,[b] Danlei Zhu,[b] Hantang Zhang,*[bc] Yuanyuan Hu,[d] Junsheng Yu,[a] Wenping Hu[d] and Lang Jiang*[b]

[a] State Key Laboratory of Electronic Thin Films and Integrated Devices, School of Optoelectronic Science and Engineering, University of Electronic Science and Technology of China (UESTC), Chengdu 610054, China

[b] Beijing National Laboratory for Molecular Sciences, Key Laboratory of Organic Solids, Institute of Chemistry, Chinese Academy of Sciences, Beijing 100190, China

[c] College of Chemistry and Material Science, Shandong Agricultural University, Taian 271018, Shandong, China

[d] Key Laboratory for Micro/Nano Optoelectronic Devices of Ministry of Education, School of Physics and Electronics & Hunan Provincial Key Laboratory of Low-Dimensional Structural Physics and Devices, Hunan University, Changsha 410082, China

[e] Tianjin Key Laboratory of Molecular Optoelectronic Science, Department of Chemistry, School of Science, Tianjin University & Collaborative Innovation Center of Chemical Science and Engineering (Tianjin), Tianjin 300072, China

*Corresponding author. E-mail address: liujie2009@iccas.ac.cn, htzhang@iccas.ac.cn, ljiang@iccas.ac.cn.

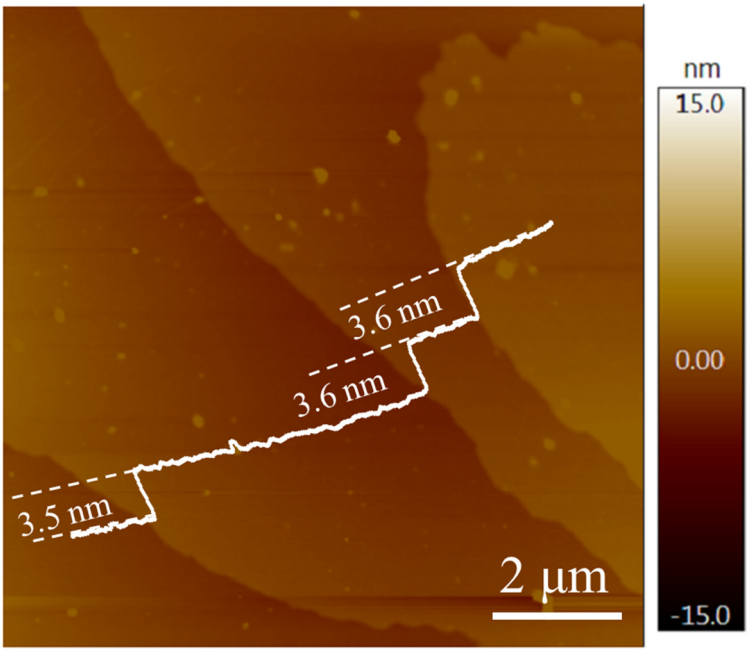

Figure S1. AFM image of HTEB 2D molecular crystals on Si/SiO_2 with layer-by-layer structure.

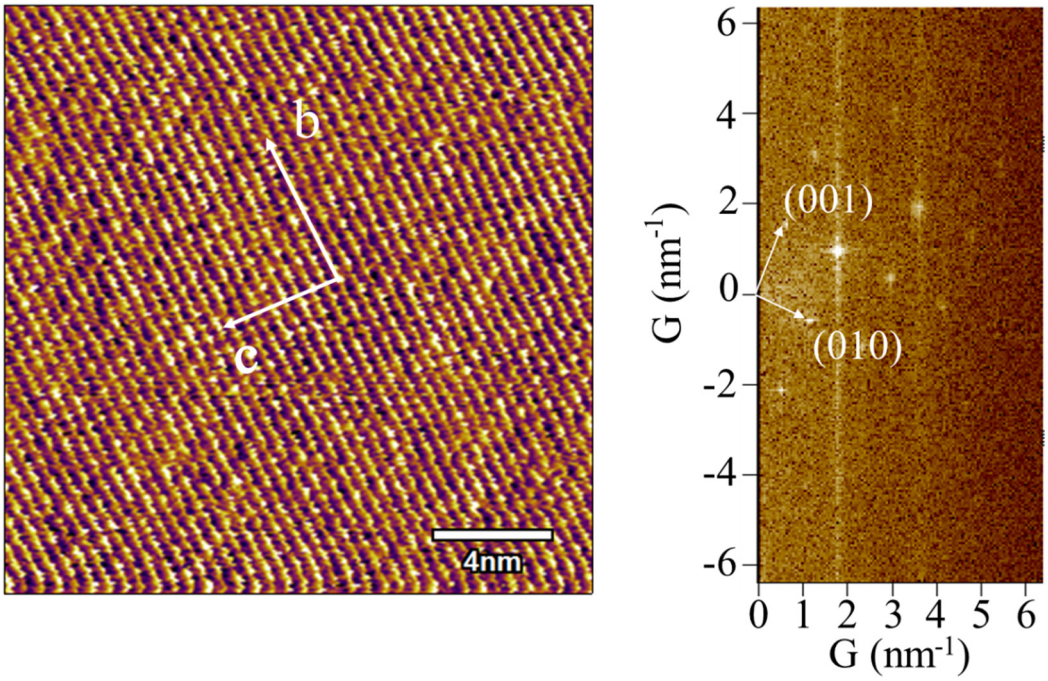

Figure S2. HR-AFM image and corresponding 2D FFT pattern of the HTEB multilayer crystal on Si/SiO_2. Lattice constants were estimated to be b = 6.0 Å, c = 7.8 Å and θ = 85.9°.

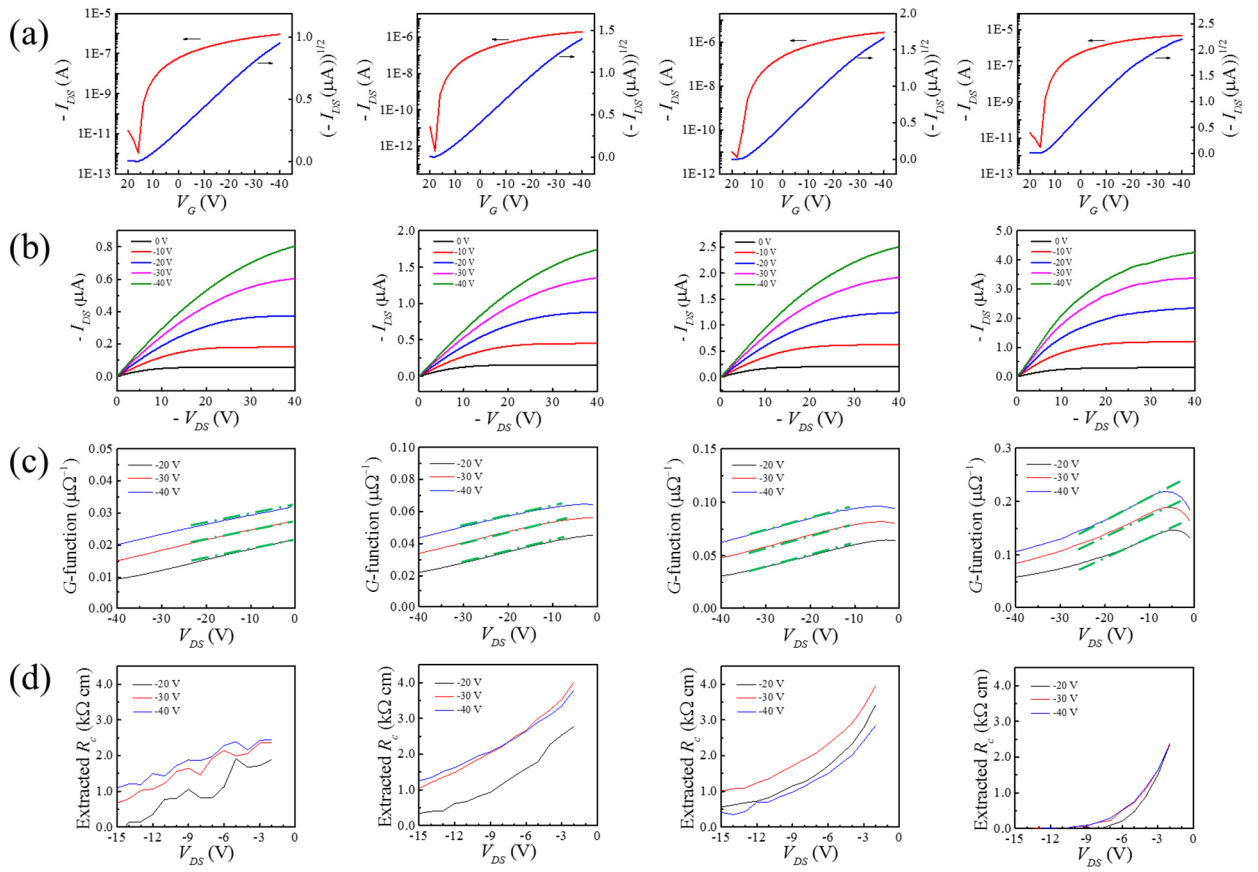

Figure S3. (a) Transfer curves, (b) output curves, (c) *G*-function curves and (d) extracted R_c curves of the four HTEB MMC devices fabricated on Si/SiO_2 with channel length of 85.3 μm, 42.9 μm, 28.0 μm and 9.7 μm, respectively.

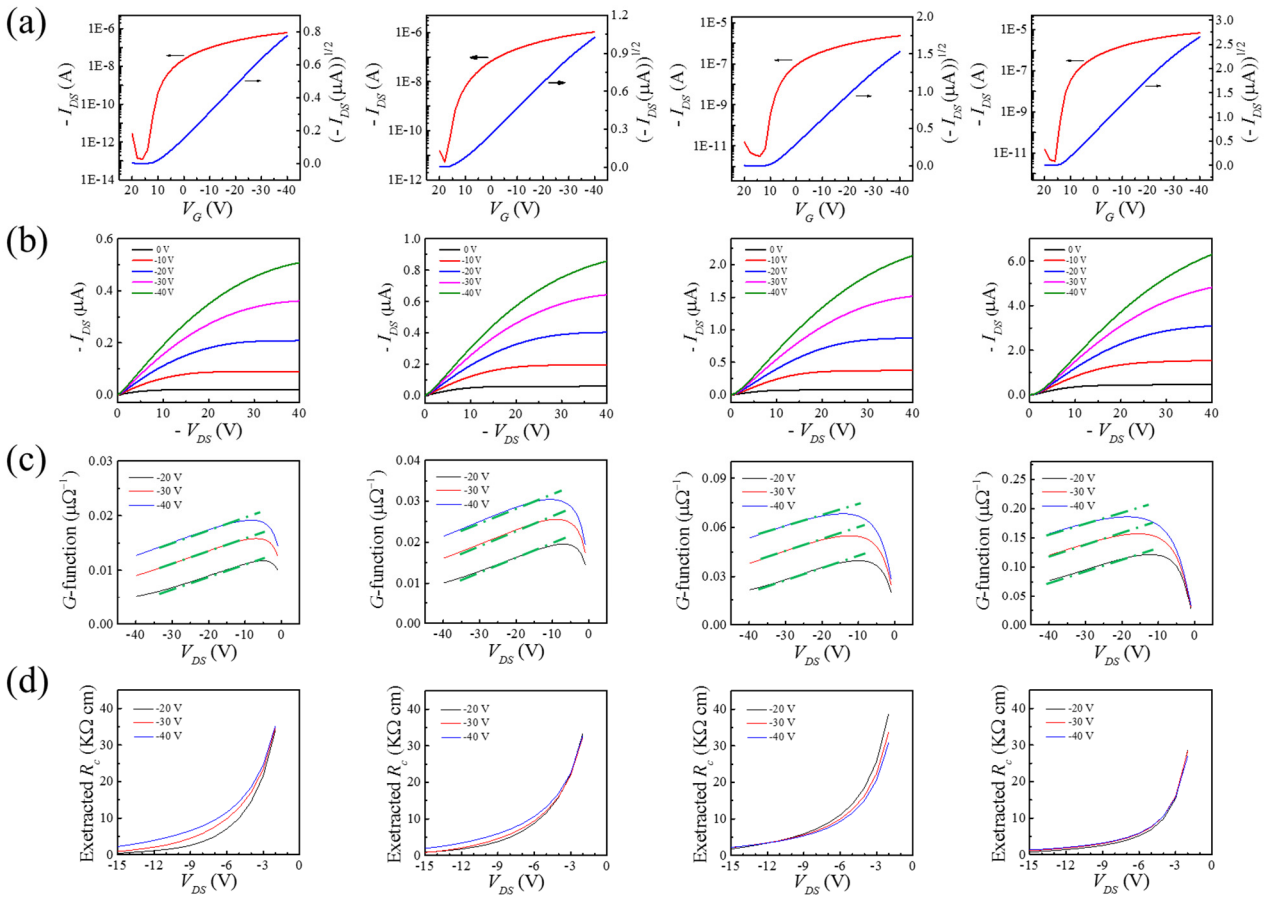

Figure S4. (a) Transfer curves, (b) output curves, (c) G-function curves and (d) extracted R_c curves of the four HTEB 4-layer single-crystal devices fabricated on Si/SiO_2 with channel length of 86.8 μm, 54.1 μm, 22.3 μm and 9.2 μm, respectively.

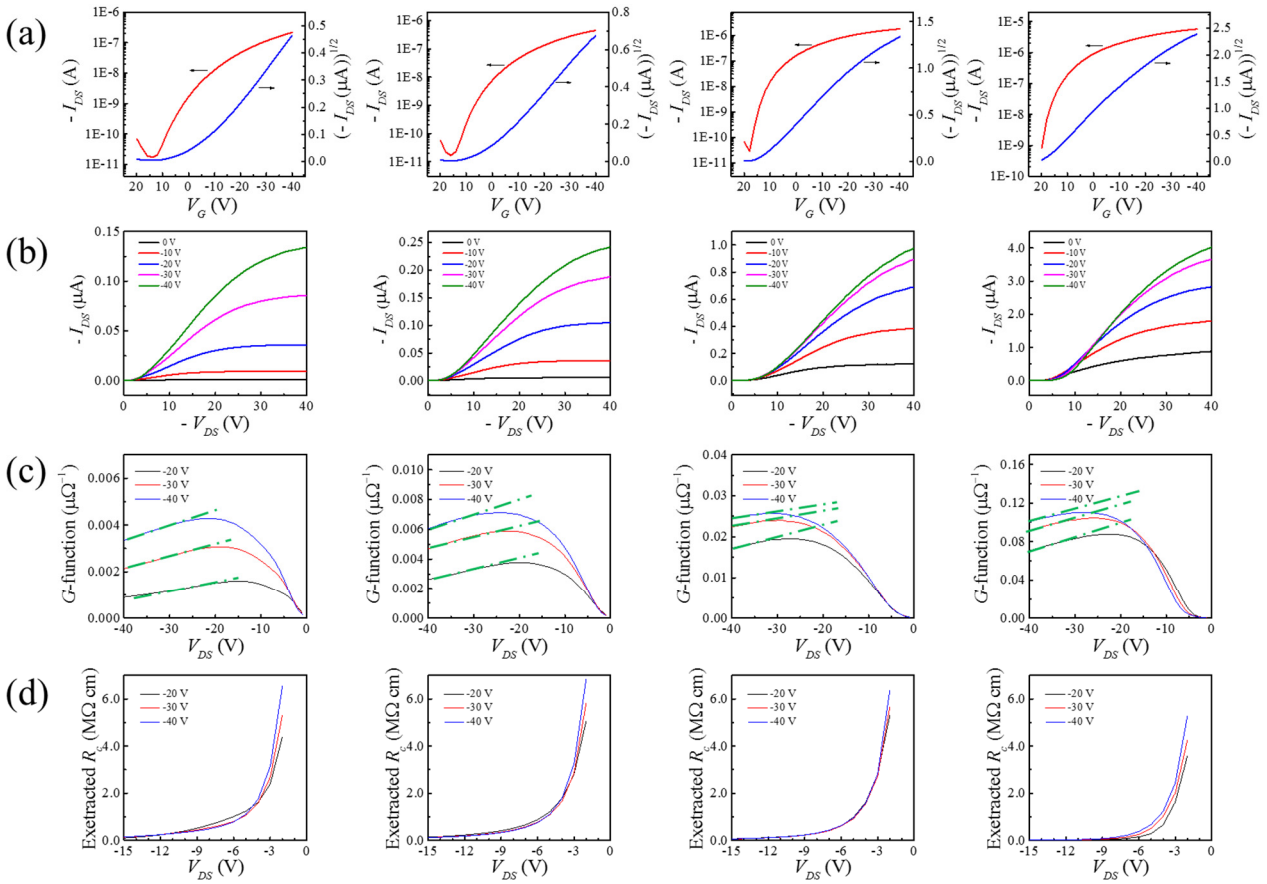

Figure S5. (a) Transfer curves, (b) output curves, (c) *G*-function curves and (d) extracted R_c curves of the four HTEB 15-layer single-crystal devices fabricated on Si/SiO_2 with channel length of 96.7 μm, 54.8 μm, 27.4 μm and 8.8 μm, respectively.

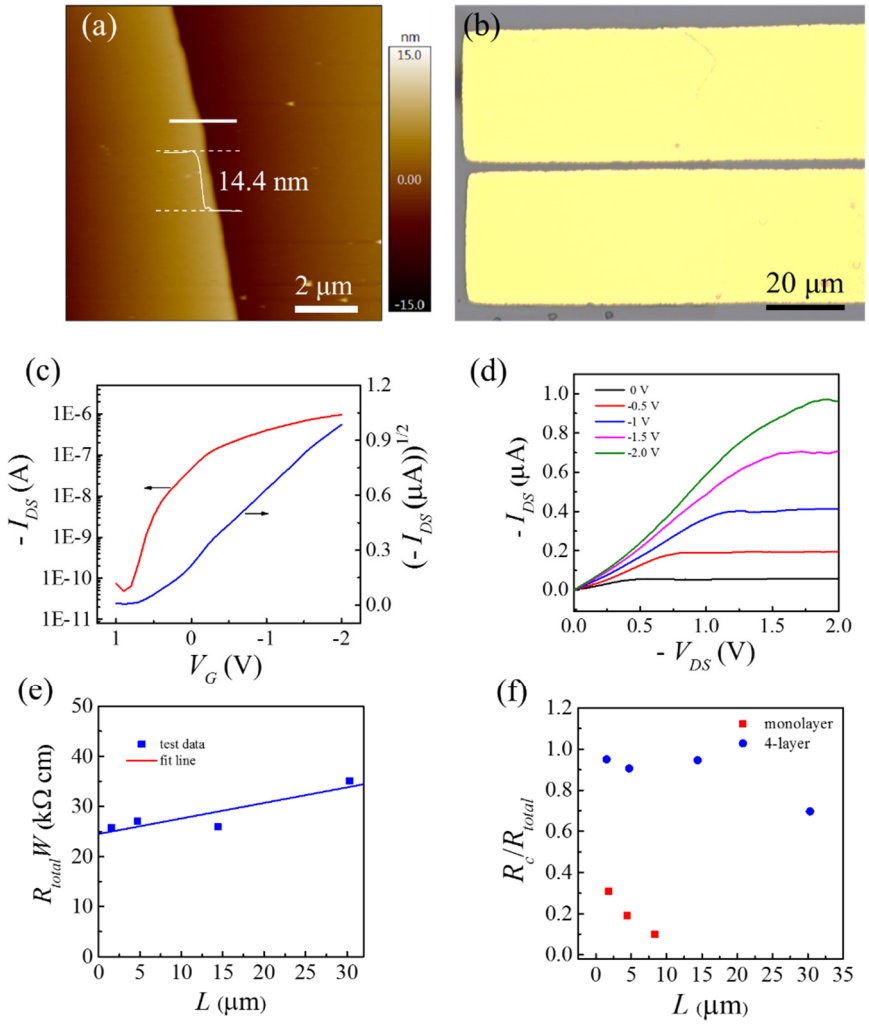

Figure S6. HTEB 4-layer crystal on HfO_2 insulator layer. (a) AFM image of HTEB 4-layer crystal, (b) OM image, (c) transfer curve and (d) output curve of the 4-layer single-crystal OFET with L = 1.5 μm and W = 83.5 μm. (e) $R_{total}W$ as a function of channel length for 4-layer single-crystal OFETs at V_G = -2 V. (f) R_c/R_{total} as the function of channel length for monolayer and 4-layer single-crystal OFETs.