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Supplementary Information

Facile route to a high-quality graphene/MoS_2 vertical field-effect transistor with gate-modulated photocurrent response

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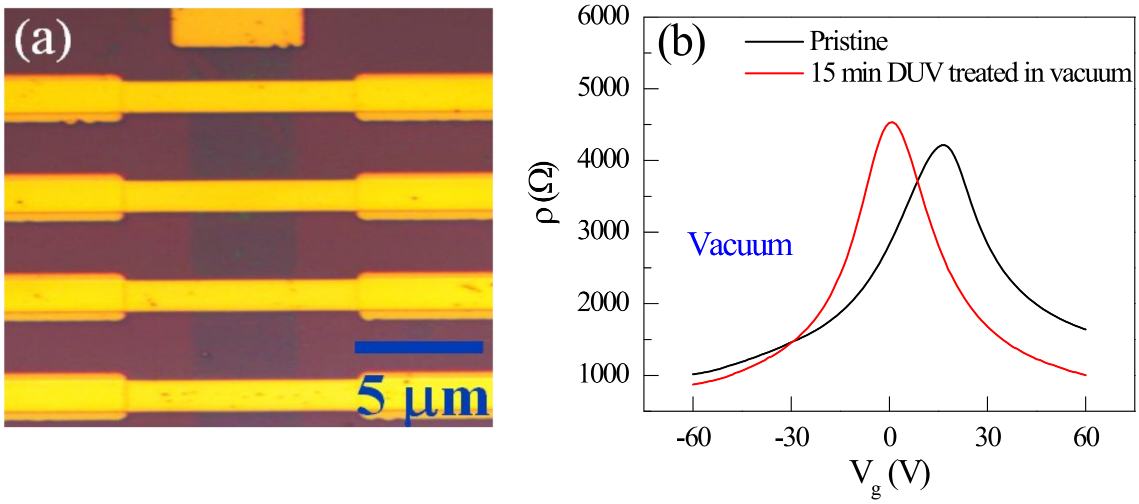

Figure S1. Device fabrication and electrical transport measurement of planar graphene FET device. (a) Optical image of graphene FET device. **(b)** Transfer characteristics (resistivity as function of V_g) of pristine and DUV treated graphene FETs.

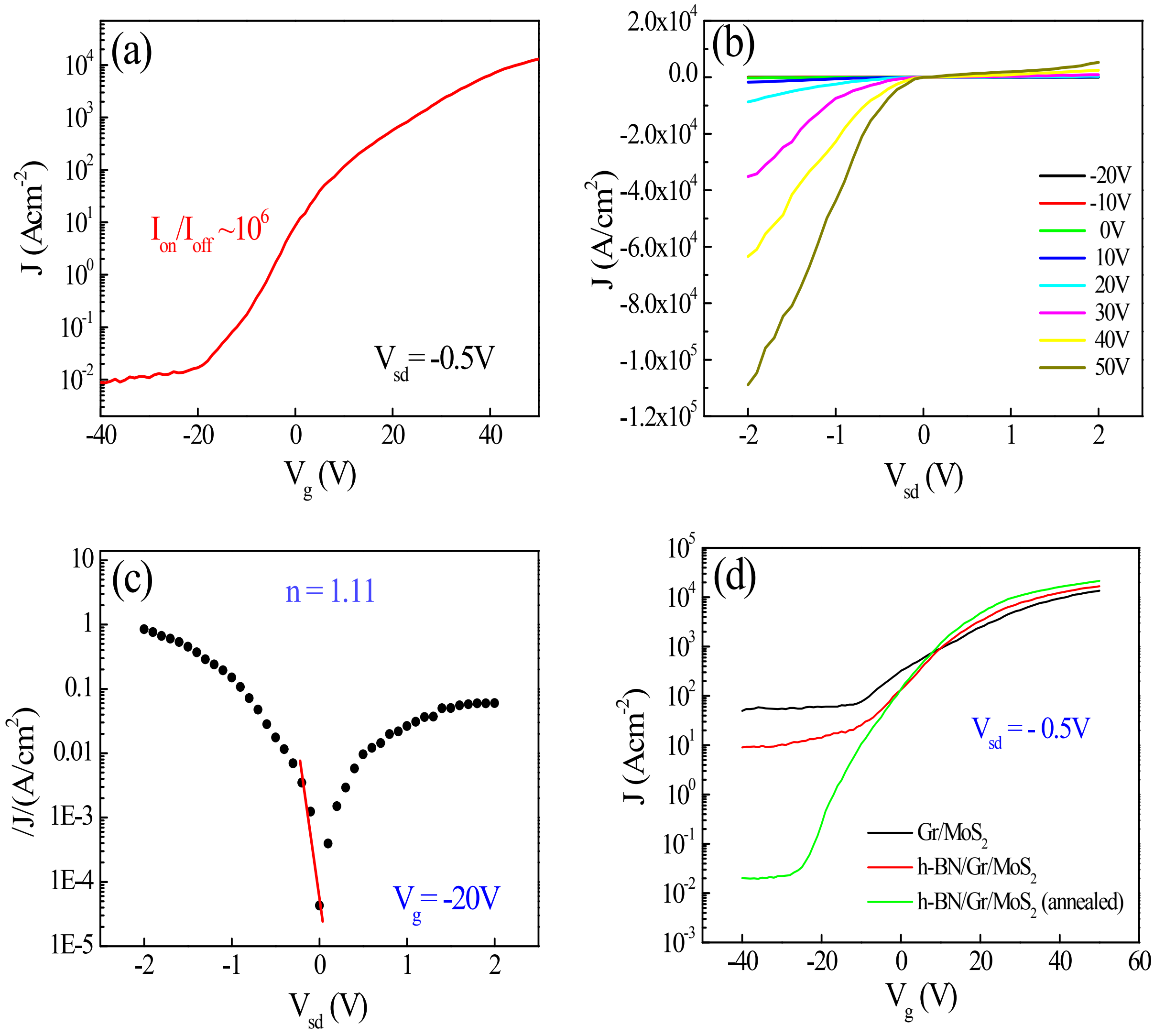

Figure S2. Electrical transport measurement of vertical MoS_2 FET device. (a) *J*–*V*$_g$ transfer characteristics of h-BN/Gr/MoS_2/Mo FET. **(b)** Current density versus V_{sd} of vertical FET device. **(c)** *J*–*V* curve at V_g = -20 V for vertical FET. The ideality factor was identified by linear regression (red line). **(d)** Transfer characteristics of Gr/MoS_2 devices. The ON-OFF ratio was enhanced with h-BN substrate, and then further enhanced after the annealing in a high vacuum (~10^{-6} torr) at 200 °C.

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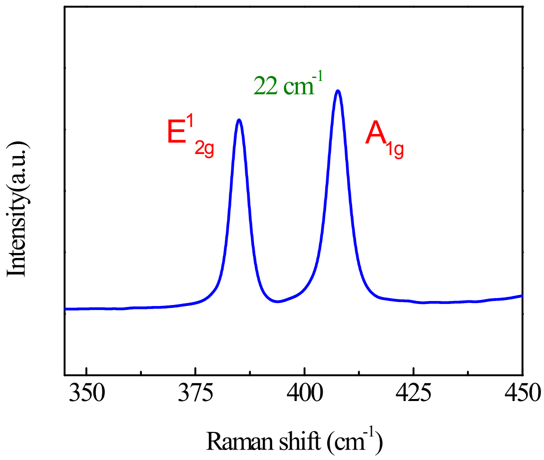

Figure S3. Raman spectrum of FL MoS_2 flake in the planar MoS_2 FET device. The gap between two peaks is ~22 cm^{-1}, which suggests that the flake is not more than 4 or 5 layers.