Electronic Supplementary Material (ESI) for Physical Chemistry Chemical Physics.

Supporting Information

Non-classical Logic Inverter Coupling a ZnO Nanowire-based Schottky Barrier Transistor and Adjacent Schottky Diode

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SI 1: Comparison of power consumption of Non-classical and classical inverter

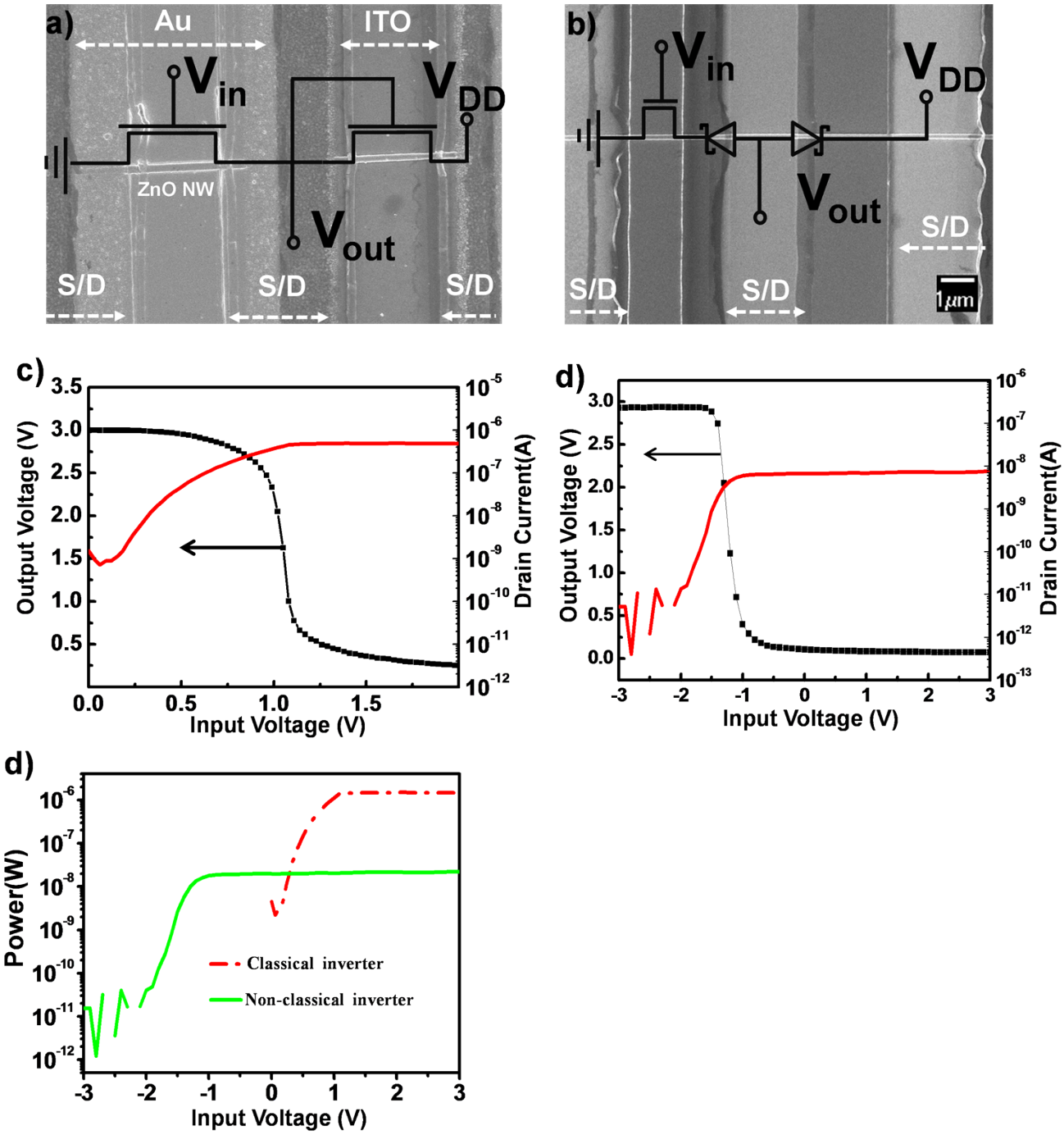

Figure S1: (a) SEM image of a classical inverter composed of two FETs with gold and ITO top gate electrodes (inset shows the circuit diagram for the inverter).[1] (b) SEM image of non-classical inverter comprised of ITO top gate SB-FET and adjacent Schottky diode along with voltage circuit diagram. (c)

Voltage Transfer Curve of classical inverter at V_{DD} of 3V.[1] (d) Voltage Transfer Curve of non-classical inverter with the same supply voltage as classical one (e) Power consumption plots of classical and Non-classical inverter at V_{DD} of 3V. See the thickness and channel length of ZnO nanowires in both classical and non-classical cases, which are similar each other.

SI 2: Output voltage dynamics of a classical inverter for different modulated input voltage frequencies

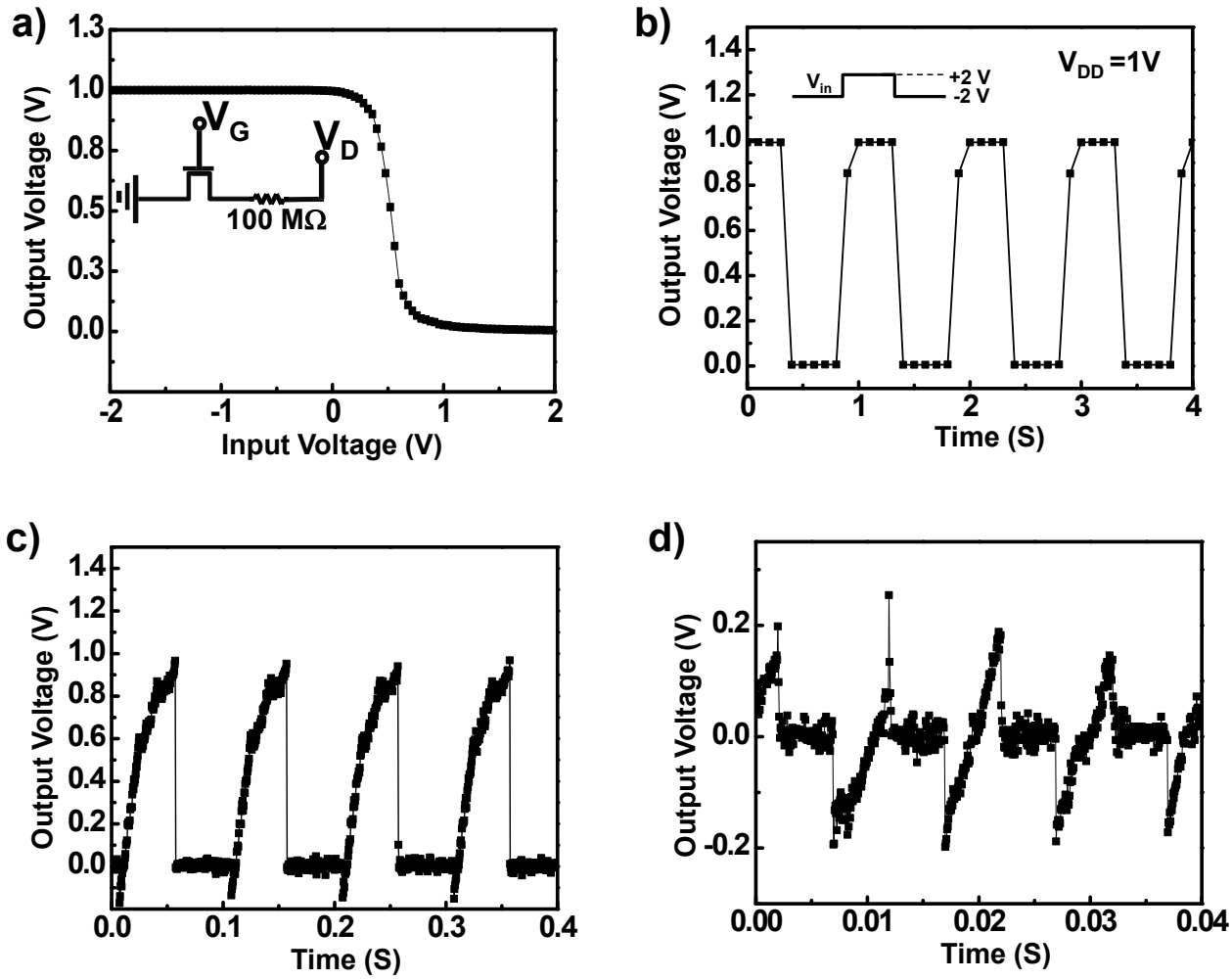

Figure S2: (a) Voltage Transfer Curve of classical inverter comprised of a top gate FET and 100 MΩ external resistors at V_{DD} of 1V. Voltage circuit of inverter is depicted in the inset. (b) Output voltage dynamics for square wave input voltage with maximum (minimum) +2V (-2V) at 1Hz, (c)10 Hz, and (d) 100 Hz modulated frequencies for supply voltage V_{DD} of 1V.

SI 3: 3D energy band diagram of SB-FET under illumination

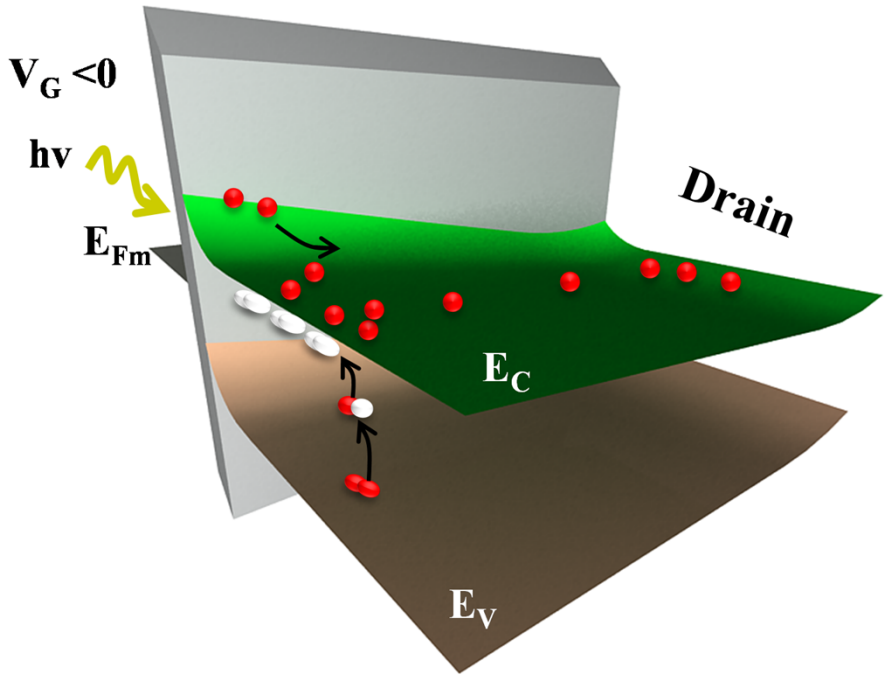

Figure S3: 3D band diagram of SB-FET under illumination. ZnO NW in SB FET meets with totally different situation, since the NW area exposed to the visible photons is now under an E-field induced by negative gate voltage. Under illumination deep neutral oxygen vacancy states (V_O) are photo-ionized or excited to shallow donor states (V_O^{++}) or less deep states (V_O^{+}), and photo-released electron charges are collected by the drain as signal.

Reference

(1) Lee, Y. T.; Raza, S. R. A.; Jeon, P. J.; Ha, R.; Choi, H.-J.; Im, S. *Nanoscale* **2013,** 5, 4181-4185.