

## Supplementary Information

### **Memory Effect and Coexistence of Negative and Positive Photoconductivity in Black Phosphorus Field Effect Transistor for Neuromorphic Vision Sensors**

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Figure S1 (a) depicts the transistor current throughout a sequence of pulses applied to the gate ( $V_{gs} = \pm 20$  V) at pressure of 2 mbar. Similarly, Figure S1 (b) shows the transistor current after  $V_{gs} = \pm 20$  V pulses, at the lower pressure of  $10^{-5}$  mbar. The transient memory response of the device is compared across various temperatures, at fixed  $V_{ds} = 100$  mV and at the pressures of 2 mbar and  $10^{-5}$  mbar, respectively.

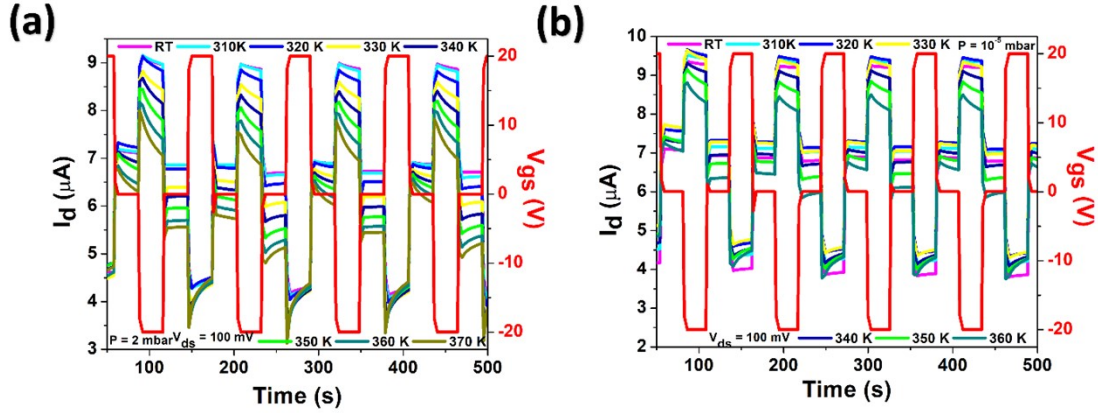


Figure S1. (a) SET/RESET/READ cycles at different temperatures and under 2 mbar pressure; (b) SET/RESET/READ cycles at different temperatures and under  $10^{-5}$  mbar pressure.

In Figure S2 it is shown the slow decay of the transistor current after illumination (persistence). The current returns to the pristine dark level in a time exceeding 8000 s.

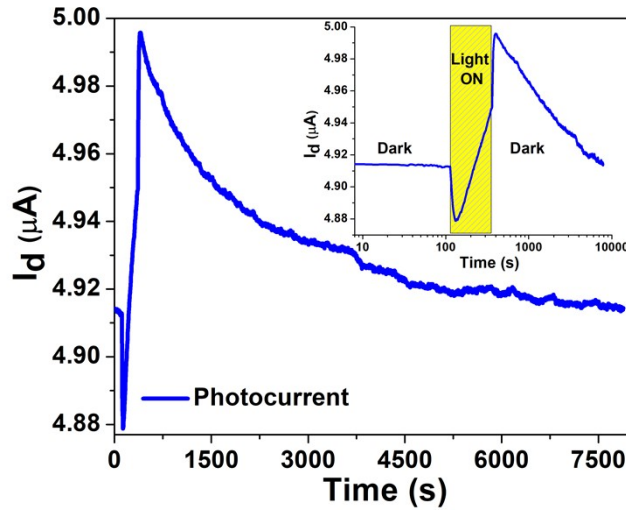


Figure S2. Transient photocurrent measurement with a decay recorded up to 8000 s. The inset shows the same plot with the time on logarithmic scale.