Supporting Information

Large-Area High-Performance Flexible Pressure Sensor with Carbon Nanotube Active Matrix for Electronic Skin

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S1. Raman spectra of the deposited CNT random network

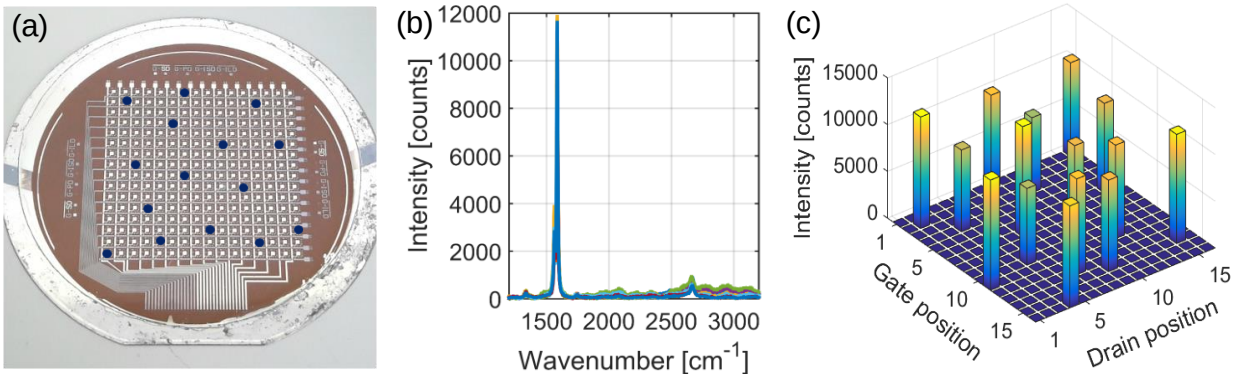

Figure S1: **Raman spectra of the deposited CNT network over a large area.** (a) Blue dots indicate the 15 different TFTs on the flexible sensor sample that are randomly picked for Raman spectrum analysis. (b) Raman spectra for the 15 TFT channels on the sample. The average G band peak intensity is 10161 counts while the standard deviation is 1268 counts. (c) G peak intensity plot for the sampled spots.

S2. Color mappings of TFT ON current and ON/OFF ratio in the active matrix

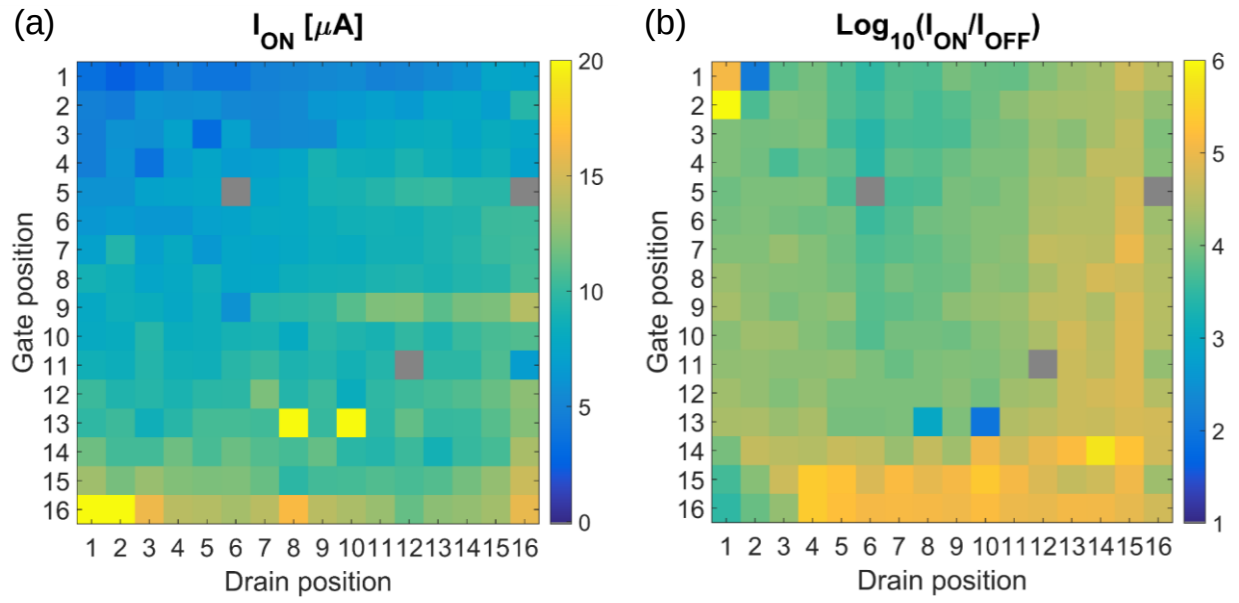

Figure S2: **Statistics of CNT TFTs**. Color mappings of the active matrix of 16×16 CNT flexible TFTs: (a) ON current and (b) I_{ON}/I_{OFF} current ratio. The 3 defective pixels out of 256 TFTs due to drain-to-gate leakage are labeled in gray color. The overall device yield is 98.8%. Such a high device yield achieved in an offline lab on flexible substrates is remarkable especially considering the large sample area. The statistical analysis yields I_{ON} = 9.17±2.96 μA and $\log_{10}(I_{ON}/I_{OFF})$ = 4.26±0.49.

S3. TFT time response characterizations for f = 100 kHz and f = 1 MHz

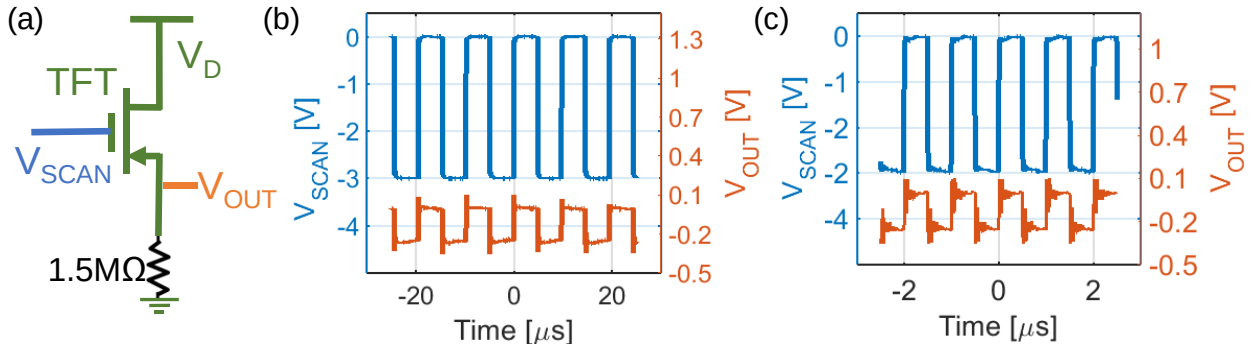

Figure S3: **Time-response characterization for a representative TFT.** (a) Circuit diagram used to characterize the TFT response time. Drain bias V_D is set to -1 V while the gate is biased with a square wave with voltage pulses between -3 V and 0 V with variable frequency. A 1.5 MΩ resistor is connected in series to the source to transduce the current signal into voltage which is then monitored by an oscilloscope. (b) Time response for input frequency of 100 kHz. (c) Time response for input frequency of 1 MHz.

S4. Hysteresis in CNT TFT

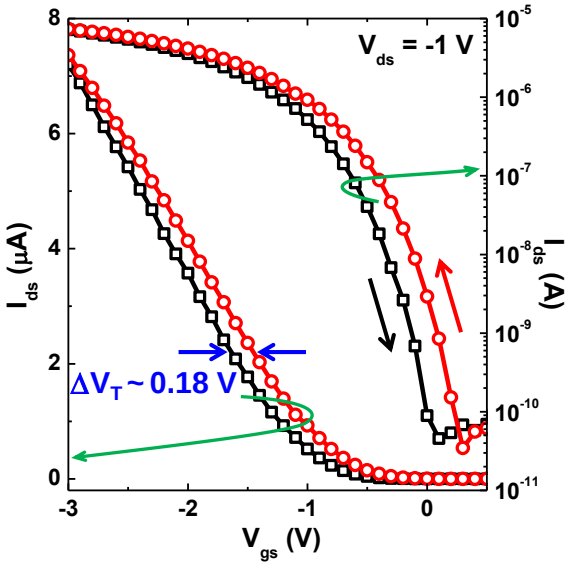

Figure S4: **Hysteresis in CNT TFT.** Dual-sweep I_{ds}−V_{gs} transfer curves at V_{ds} = −1 V of a typical CNT TFT in both linear scale (left axis) and logarithmic scale (right axis). Only a small hysteresis (ΔV_T ~ 0.18V) was observed as the CNT TFT was passivated by the 20 nm-thick ALD Al_2O_3 in the interlayer dielectric. The pressure sensor performance was not impacted by the presence of such a small hysteresis, because the leakage from the inactivated pixels (I_{ds} less than 5 nA with grounded gate lines of V_{gs} = 0 V) is still much lower than the ON current of the selected pixel (I_{ds} of several μA under V_{gs} = −3 V). The high I_{ON}/I_{OFF} ratio and carefully tuned threshold voltage in our CNT TFTs allows the pressure sensor to tolerate a small hysteresis.