Supplementary Information:

Highly Sensitive Flexible Three-Axis Tactile Sensors Based on the Interface Contact Resistance of Microstructured Graphene

J. Zhang*[a, c], L. J. Zhou[b], H. M. Zhang[a], Z. X. Zhao[a], S. L. Dong[a], S. Wei[a], J. Zhao[c], Z. L. Wang[a, c], B. Guo*[a], P. A. Hu*[a, c]

[a]Key Laboratory of Microsystems and Microstructure Manufacturing, Ministry of Education, Harbin Institute of Technology, No. 2 Yikuang Street, Harbin, 150080, China.
[b]School of Mechanical and Power Engineering, Harbin university of science and technology, No. 52, Xuefu Road, Harbin, 150080, China.
[c]State Key Laboratory of Robotics and System, Harbin Institute of Technology, No. 2 Yikuang Street, Harbin, 150080, China.
*Corresponding Authors: zhangjia@hit.edu.cn. guobin@hit.edu.cn. hupa@hit.edu.cn

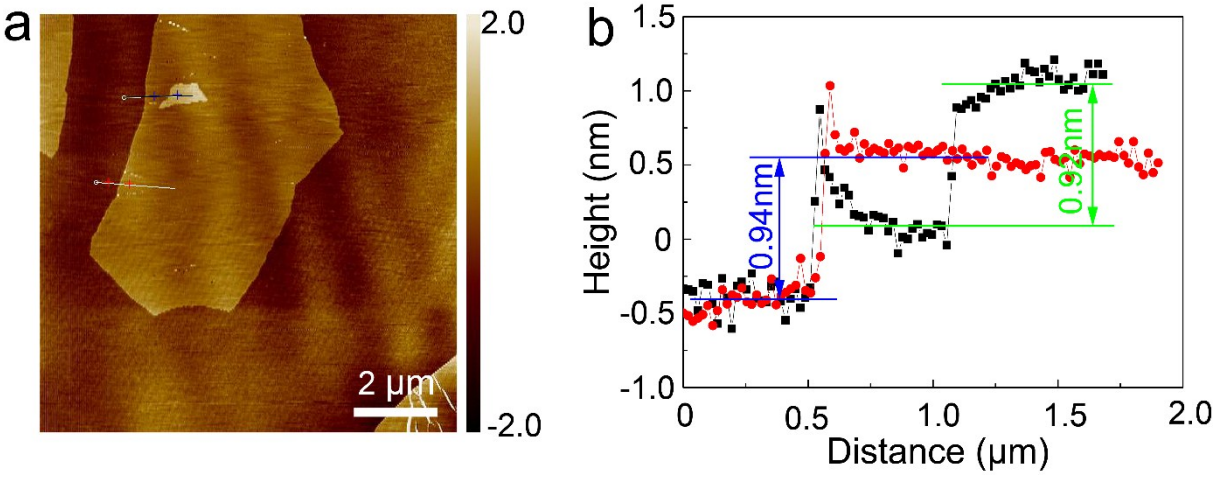

Fig. S1 (a) AFM image of single graphene oxide sheet on the mica substrate. (b) Cross-section profile of lines marked in (a).

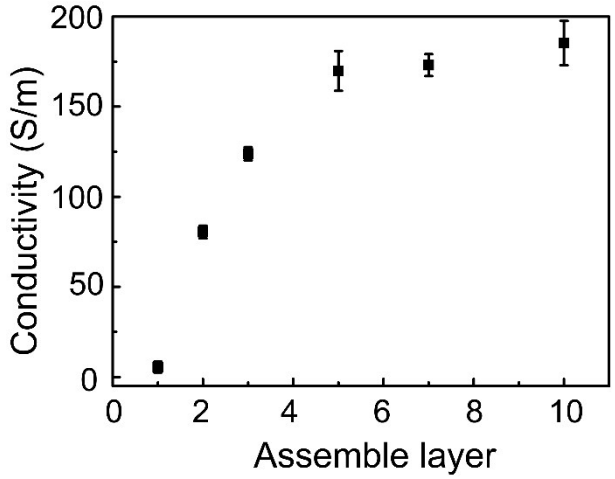

Fig. S2 Conductivity of the hydrazine vapor reduced (rGO/PDDA)n film with different layers (n=1-10).

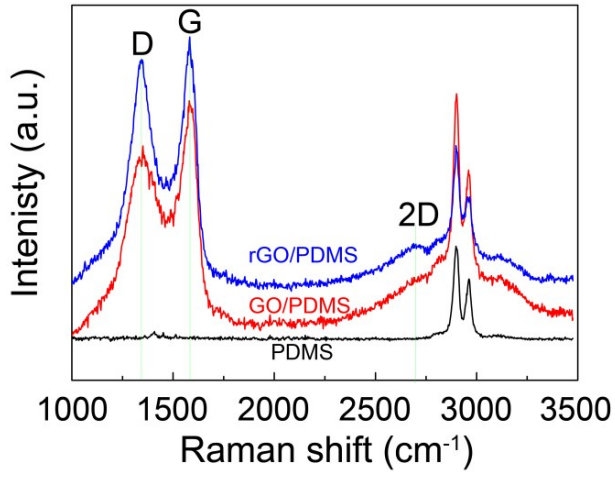

Fig. S3 Raman spectra of patterned PDMS film, LBL assembled GO/PDMS, and hydrazine vapor reduced rGO/PDMS.

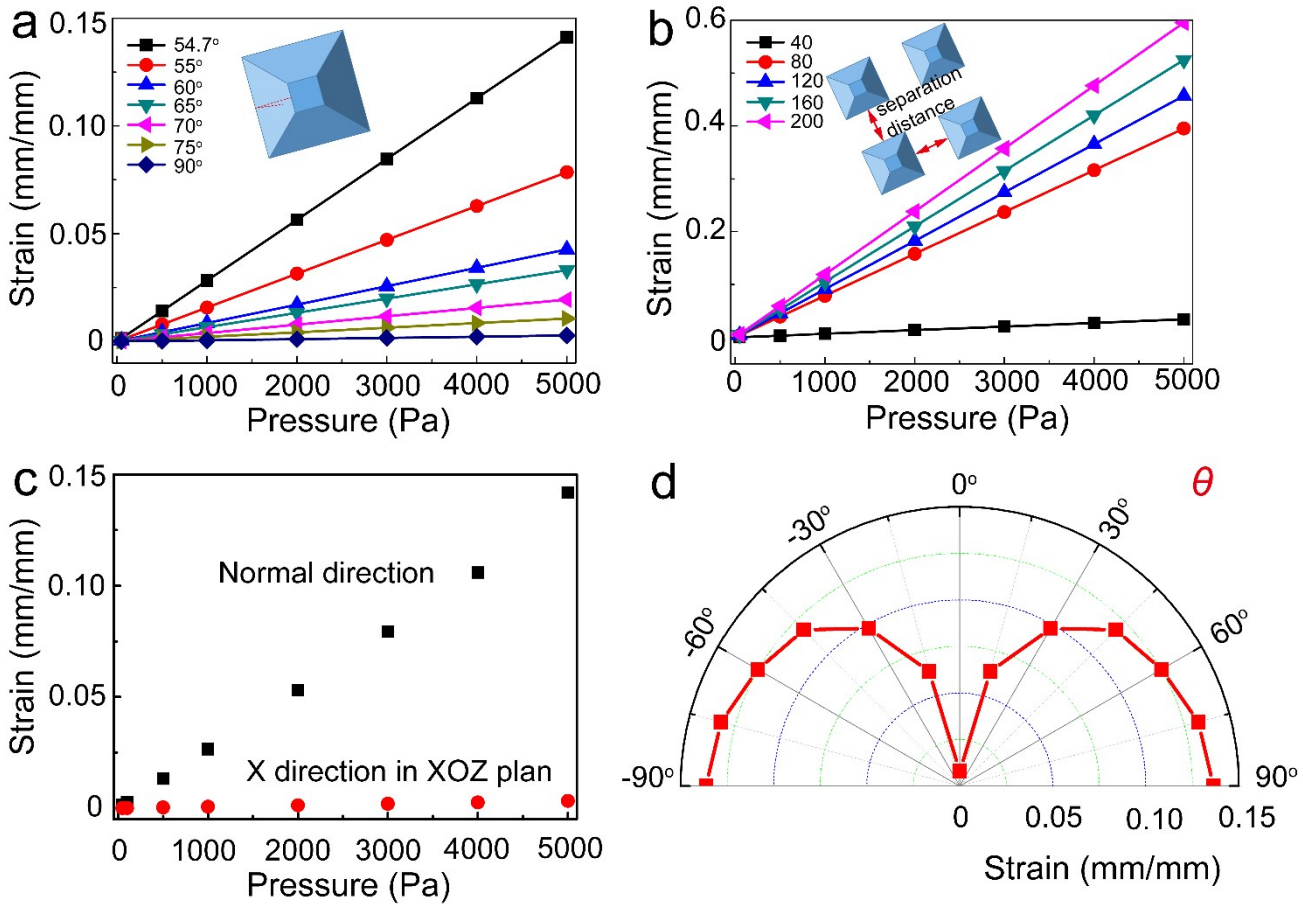

Fig. S4 Simulation data of strain-stress relationship with different structural parameters. (a) Strain in the normal direction (Z-axis) under the applied pressure at the different sidewall angled patterns. (b) Strain in the normal direction with an increasing separation of pyramid-like patterns at the sidewall angle of 54.7°. (c) Maximum strain on the top of pyramid structure under the normal pressure and tangential pressure in XOZ plan along the X direction. (d) Plot strain of pyramid pattern to angles in the polar coordinates, applied force F=1 N.

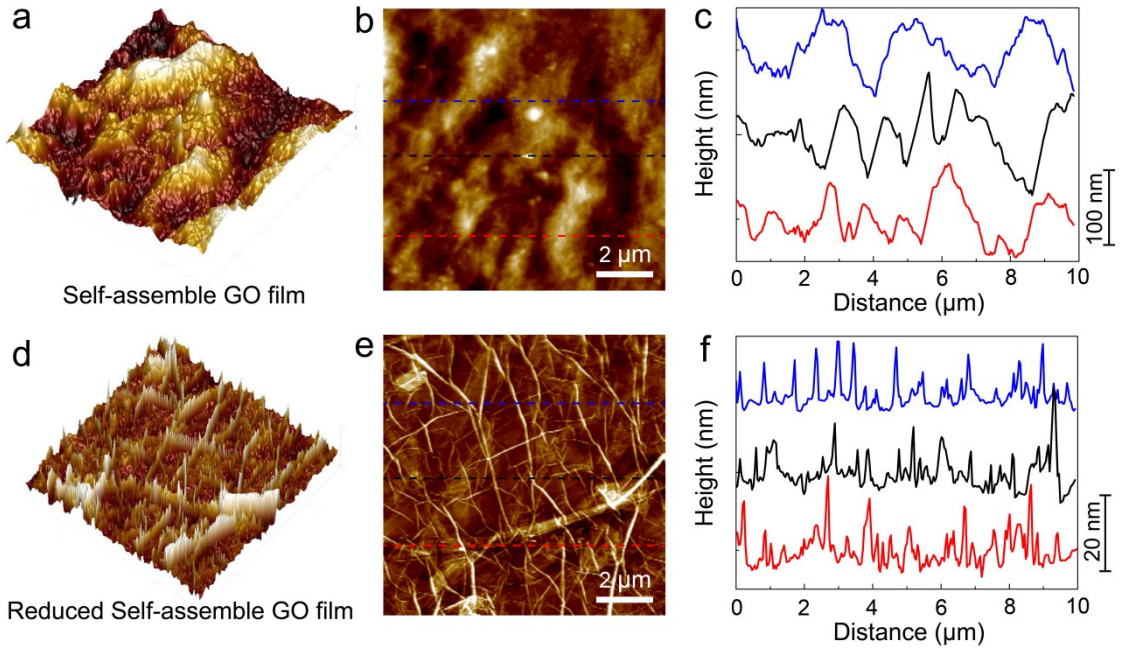

Fig. S5 AFM images of LBL GO film and rGO film. (a) 3D view of LBL GO film, (b) Height image of GO film, (c) Cross-section profile of line marked in (b). (d) 3D view of LBL rGO film, (e) Height image of rGO film, (f) Cross-section profile of line marked in e).

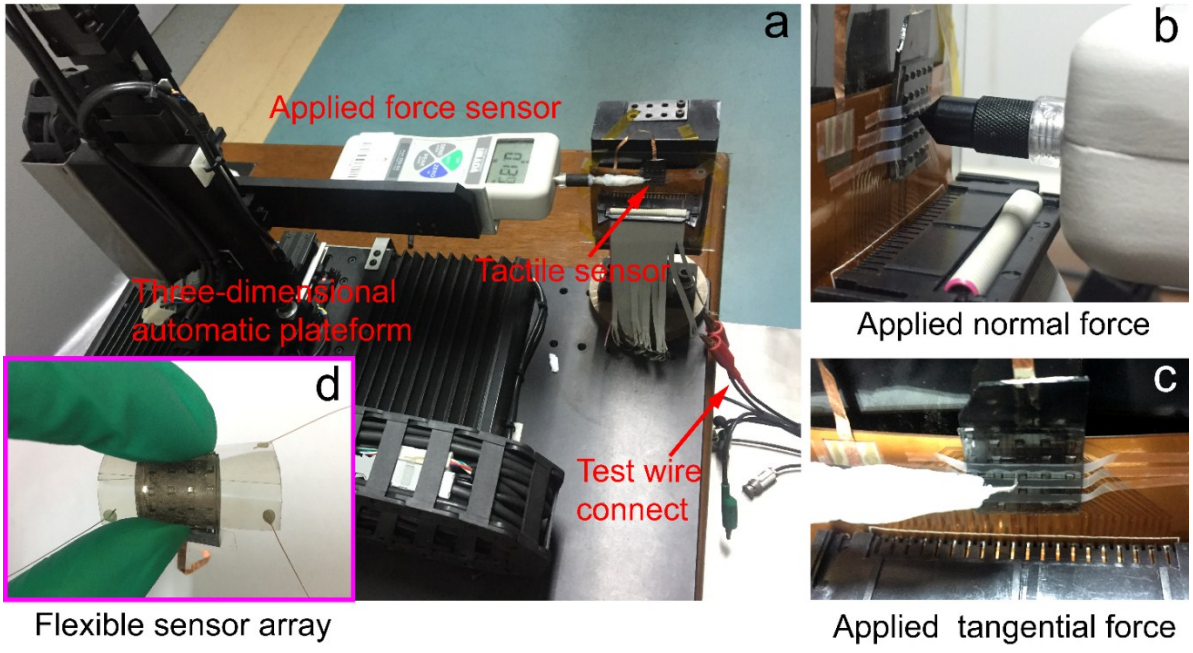

Fig. S6 A home-made stage for tactile sensor tests. (a) Digital picture of the whole set up, (b) Applied normal force, (c) Applied tangential force. (d) A prototype flexible sensor array.

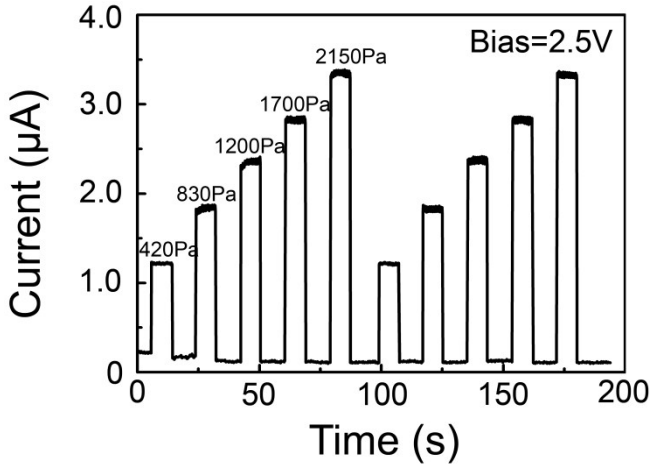

Fig. S7 Stability of the sensor under the different applied pressures.

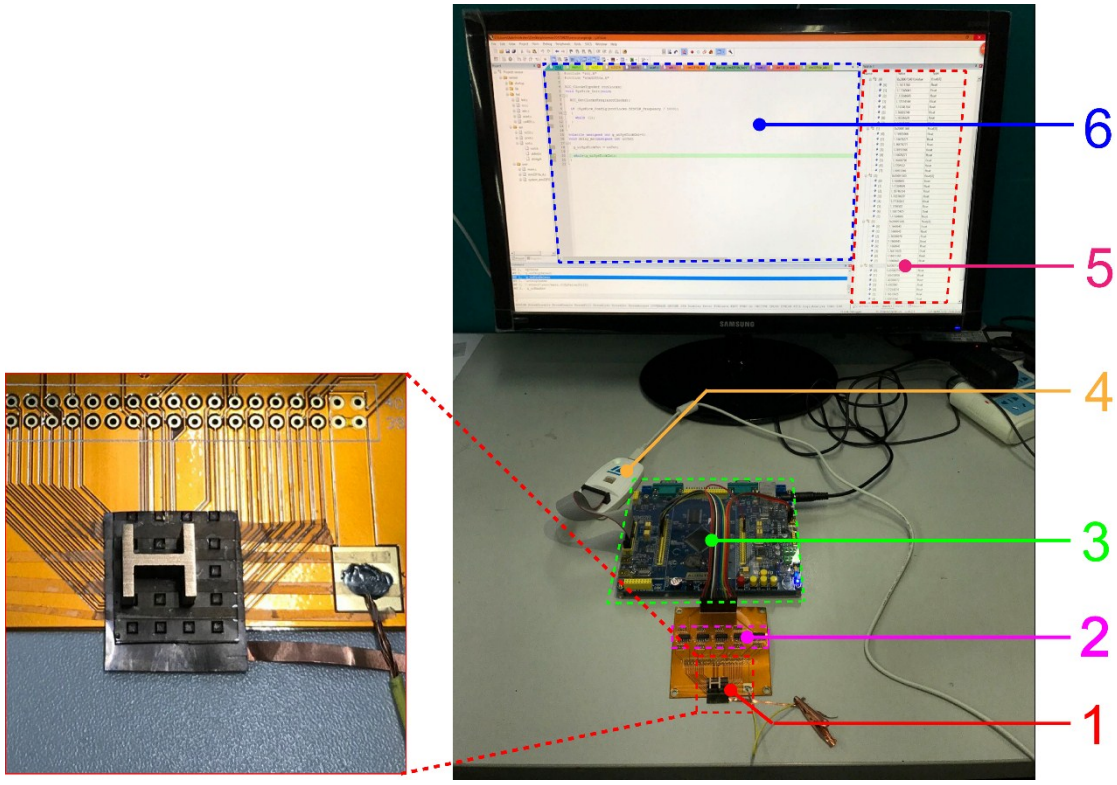

Fig. S8 Proof of concept of integration sensor array with a home-made signal collection system including: 1-Flexible sensor, 2-Multi-channel signal acquistion, 3-STM32 microcontroller, 4-Data downloader, 5-Data displaying interface, 6-Main program interface.