Supporting Information

Metal–elastomer bilayered switches by utilizing the superexponential behavior of crack widening†

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Figure S1. Comparison of on/off ratio with variation of strains between our work and the previous studies.

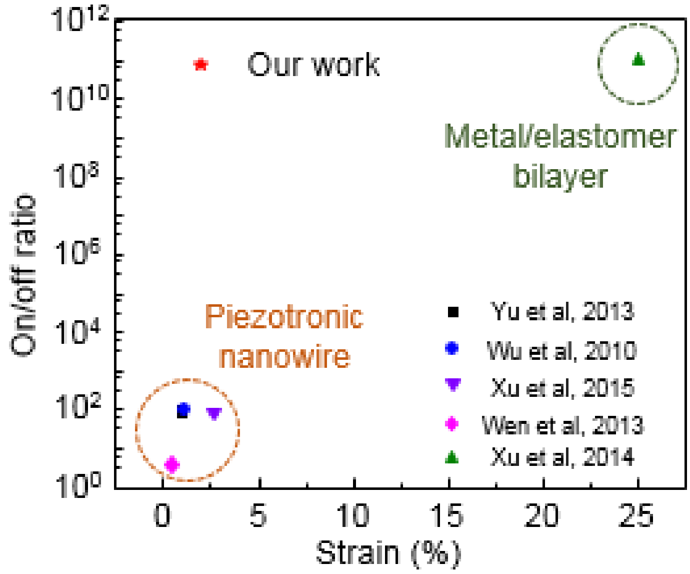


Figure S2. Fabrication process for the strain gated switch. (a) Deposition of platinum (Pt) onto the silicone rubber substrate. (b) Pt crack generation by stretching out the metal deposited silicone rubber substrate.

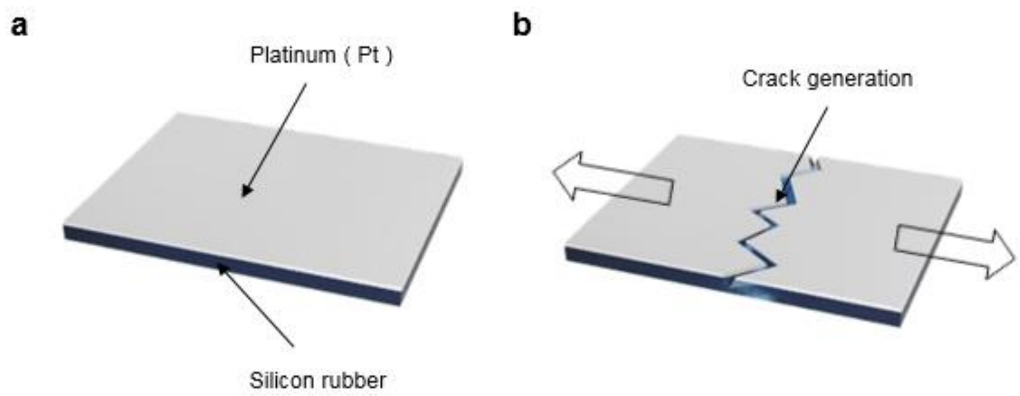


Figure S3. Optical microscope camera images of the Pt layer. The orange arrows indicate the tensile direction.

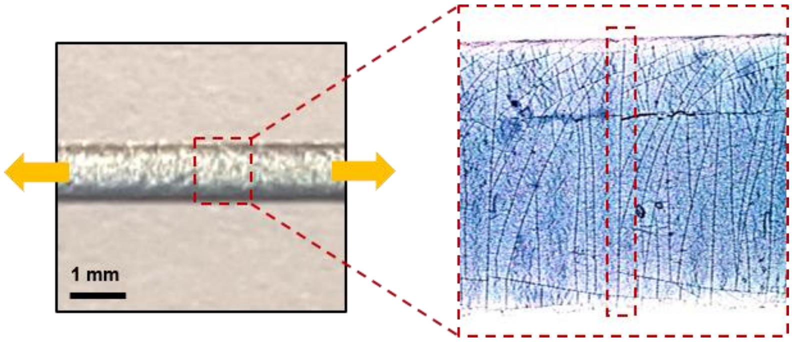


Figure S4. Strain-dependent gauge factor by taking the derivative of R/R_0 with respect to strains from 0 % to 1.6 %.

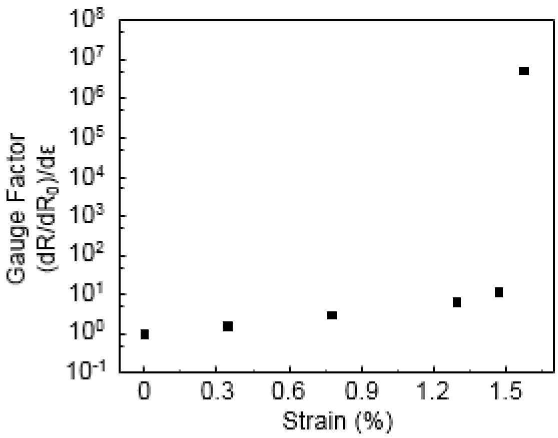


Figure S5. A marathon test of the strain gated switch by repeating about 5,000 cycles of loading/unloading process at strain from 0 % to 1.6 %. (a) A final normalized resistance of the marathon test at a certain period (about 500 cycles). (b) Loading/unloading test after 5,000 cyclic tests. The depth profile of crack measured by AFM at 1.6 % strain. After 1 cycle (c) and 5000 cycles (d) of loading/unloading process at strain from 0 % to 1.6 %

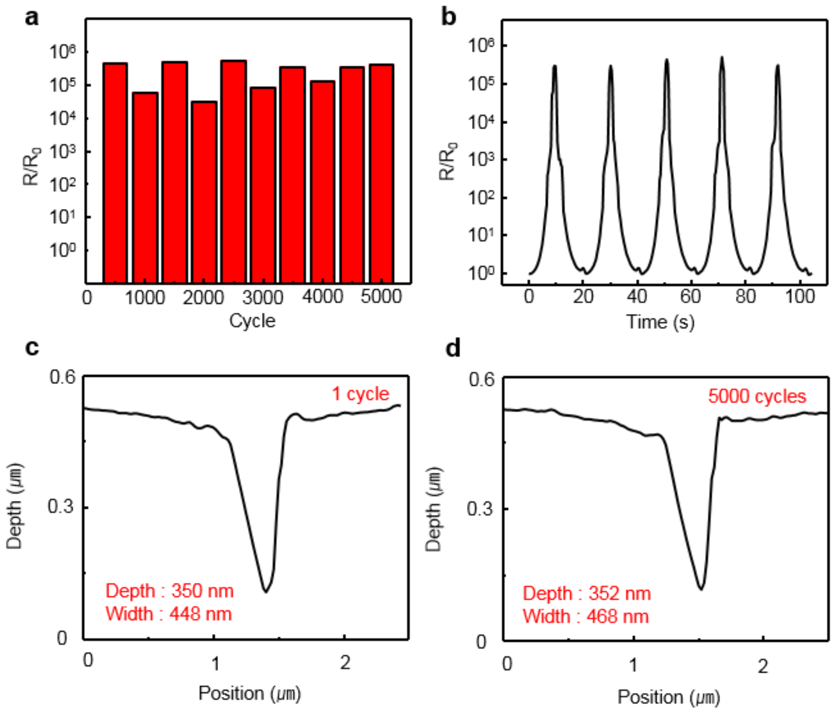


Figure S6. Operating principle of a motion induced logic gate. (a,b) open collector crack switch circuits, (c,d) totem pole crack switch circuit.

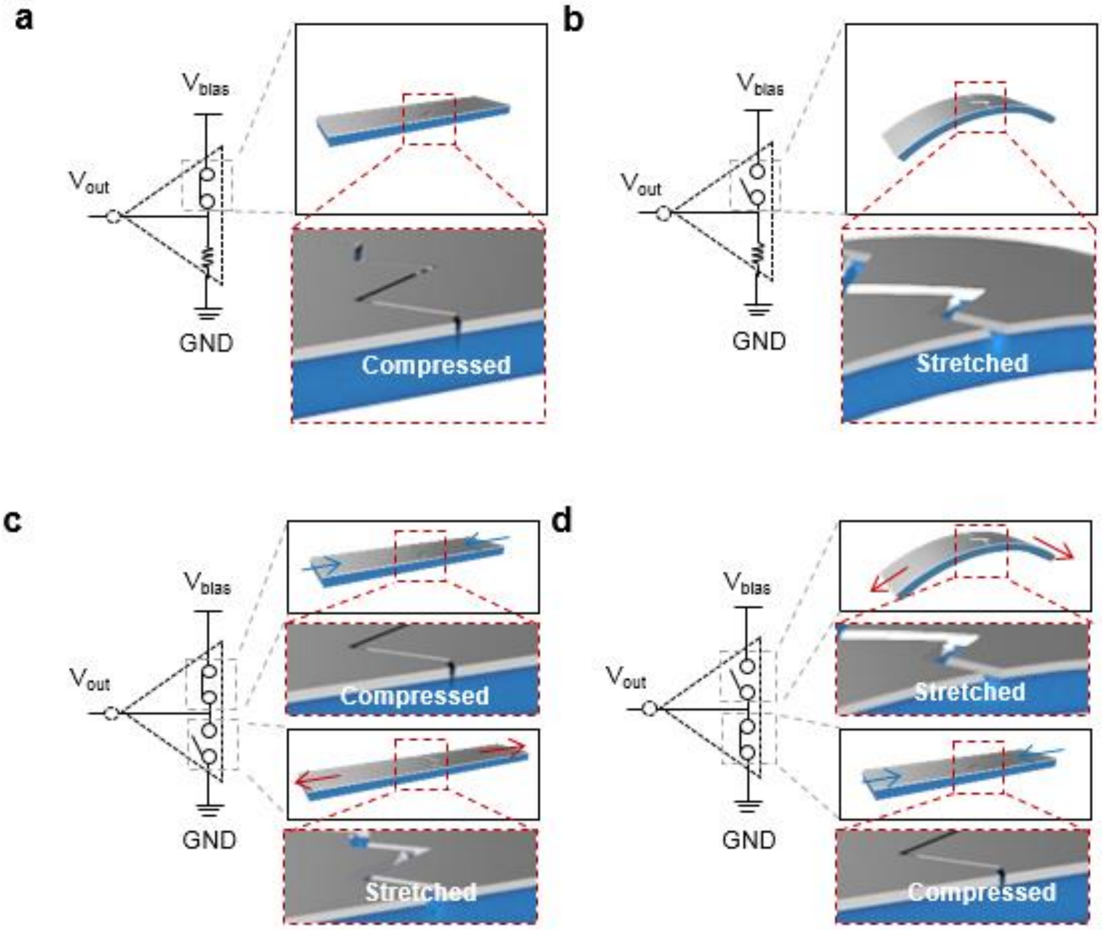
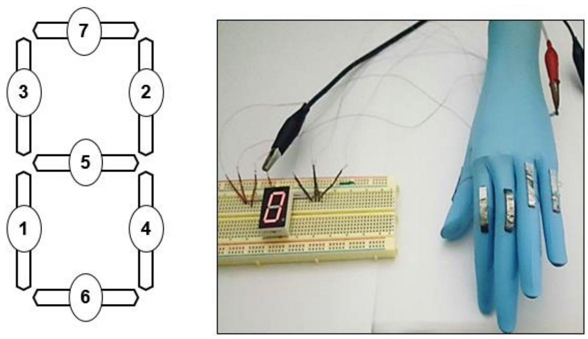


Figure S7. (a) Composition of seven-segment connected with the strain gated switches, (b) Logical table showing the relation of the expressing number and the motion of fingers, (c) Demonstration of expressing numbers from “0” to “9” with the varied motion of fingers.

a



b

Finger		Thumb	Fore finger		Middle finger		Ring finger	Little finger
			Up	Down	Up	Down		
Location		1	2	3	4	5	6	7
Number	0	O	O	O	O	X	O	O
	1	X	O	X	O	X	X	X
	2	O	O	X	X	O	O	O
	3	X	O	X	O	O	O	O
	4	X	O	O	O	O	X	X
	5	X	X	O	O	O	O	O
	6	O	X	O	O	O	O	O
	7	X	O	O	O	X	X	O
	8	O	O	O	O	O	O	O
	9	X	O	O	O	O	O	O

c

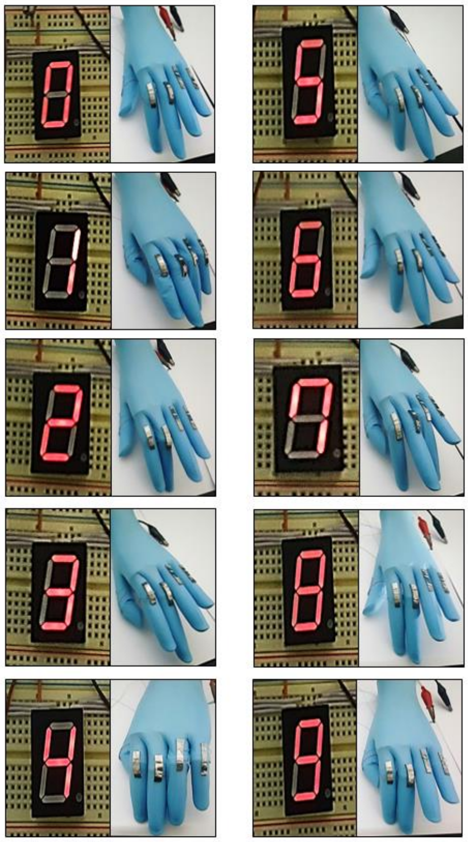


Figure S8. A graph of resistance with varied strains, which shows the controllable threshold strain with variation of applied pre-strain of lower substrate from 0% to 15 %.