

Electronic Supplementary Information

Video 1:

The video of a 2.5 μl water droplet pumping back and forth across a 200 μm -wide gap between two separate top plates by switching 100 Vrms and 2 kHz sine wave signal on the driving electrodes at the rate of 1 Hz. Captured images are shown in Fig. 1(e).

Video 2:

The video of a 2.5 μl water droplet pumping back and forth across a modular interface with two 50 μm -wide gaps by switching 80 Vrms and 2 kHz sine wave signal on the driving electrodes at the rate of 1 Hz. Captured images are shown in Fig. 2(c)-(h).

Video 3: The video a 2.5 μl water droplet transporting clockwise and counterclockwise in the assembled DOW by switching 100 Vrms and 2 kHz sine wave signal on the driving electrodes at different rates indicated in the video. Captured images are shown in Fig. 4.

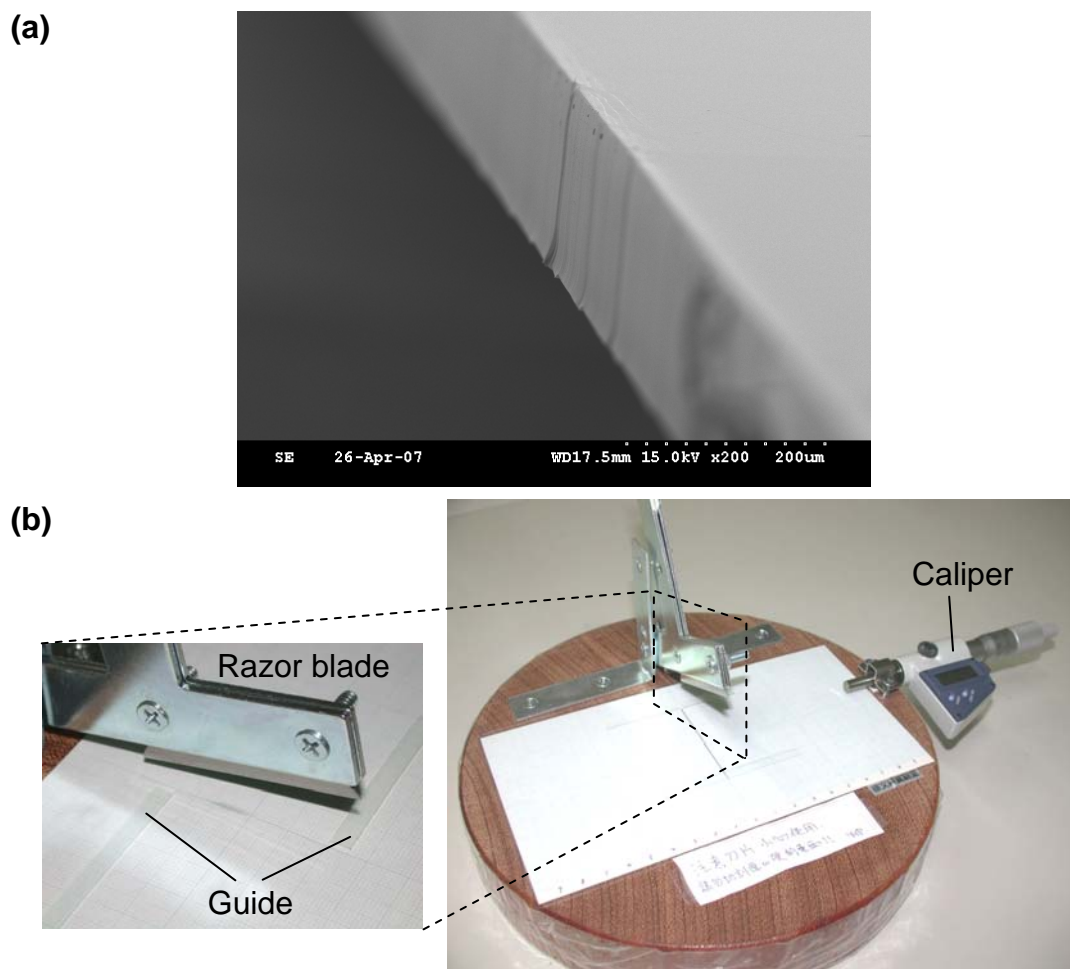


Fig. s1 Preparation of clean and smooth kerfs of the PET substrates. (a) SEM photograph of the perpendicular sidewall of a 175 μm -thick PET substrate after machining by a home-made cutter. (b) Razor blade cutter for PET substrate machining.

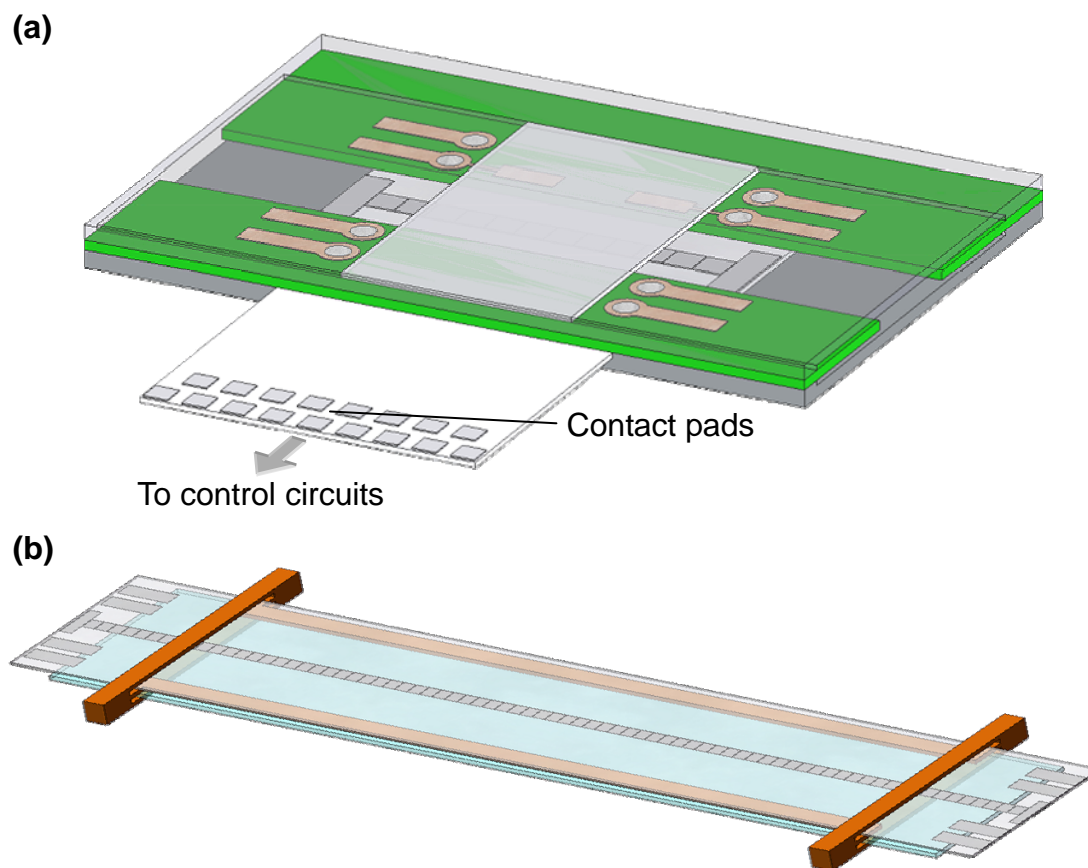


Fig. s2 Sketch of the assembled modules. (a) Module 1. (b) Module II and IV.

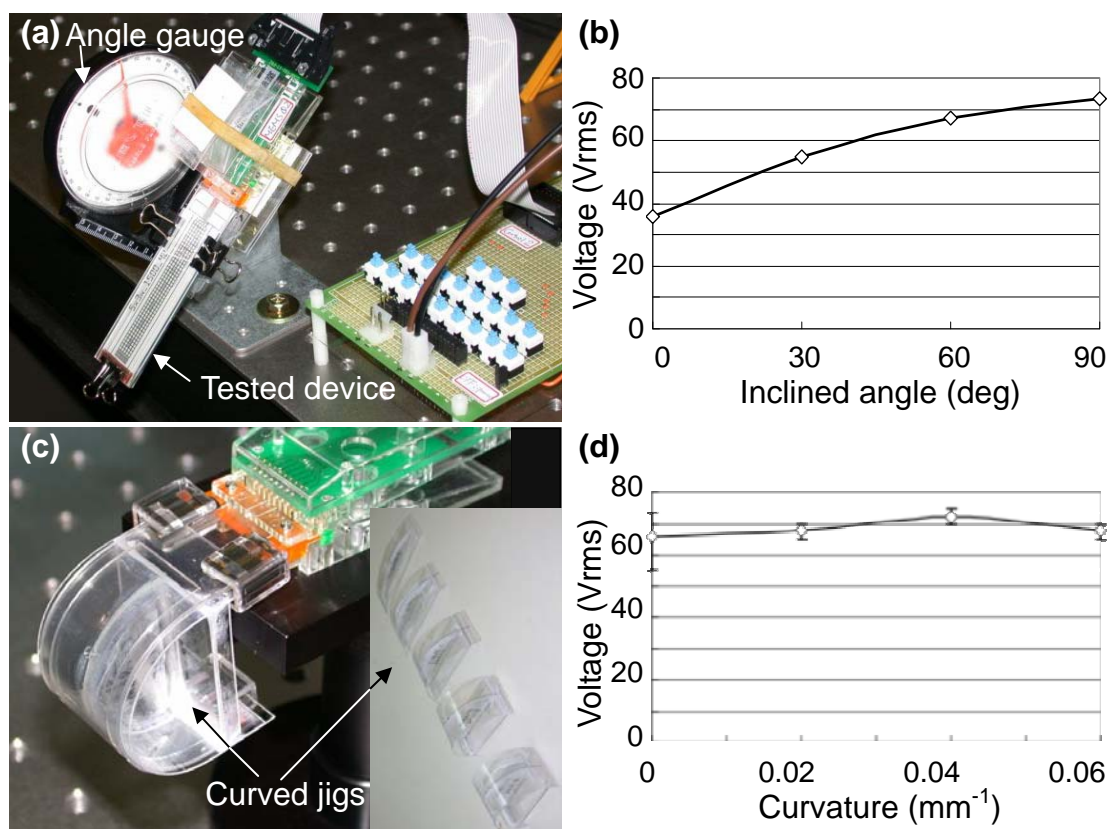


Fig. s3 Pumping a 2.5 μl droplet against gravity along the 45 electrodes between inclined or curved plates. (a) Droplet driving between inclined plates at specified angles indicated by the angle gauge. (b) Required voltage for 0, 30, 60, and 90° inclined angles. (c) Driving droplets between curved plates whose curvature was determined by home-made curved jigs. (d) Required voltage for 0, 0.02, 0.04, 0.06 mm^{-1} curvatures.

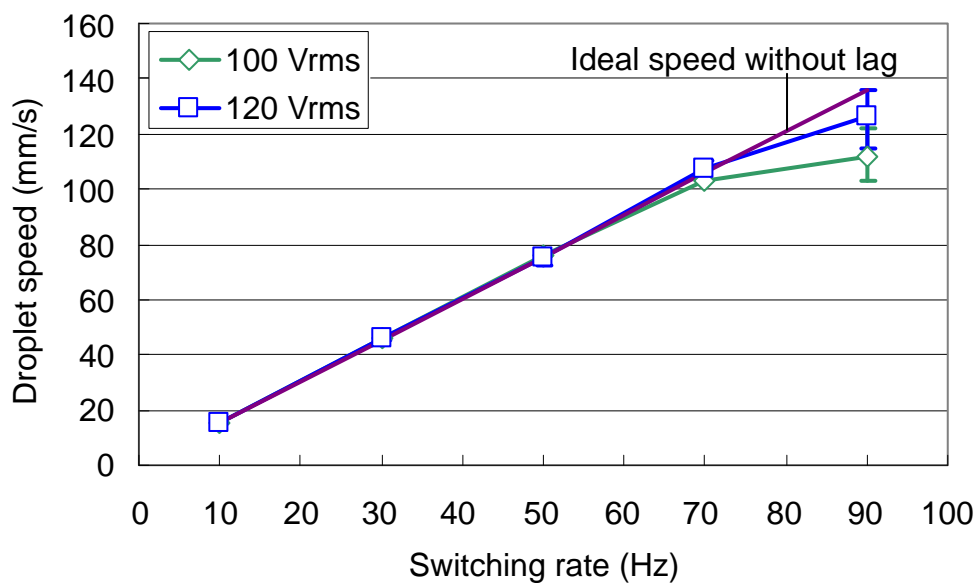


Fig. s4 Droplet (2.5 μ l) speed at various switching rates when 100 and 120 Vrms were applied on the DOW. At higher switching rates, the droplet started to lag behind the switching signal and the average speed was lower than the ideal speed.