

# Solution-processed and High-performance Ionic-paper Gated Field-effect Transistors from Two-dimensional Layered Semiconductor Nanosheets with High Thermal Resolution

*Guokeng Liu*<sup>a,b</sup>, *Chunyang Jin*<sup>a,b</sup>, *Binlai Hu*<sup>a,b</sup>, *Lihua Zhang*<sup>a,b</sup>, *Guozheng Zeng*<sup>a,b</sup>, *Haihua Xu*<sup>a,b\*</sup>

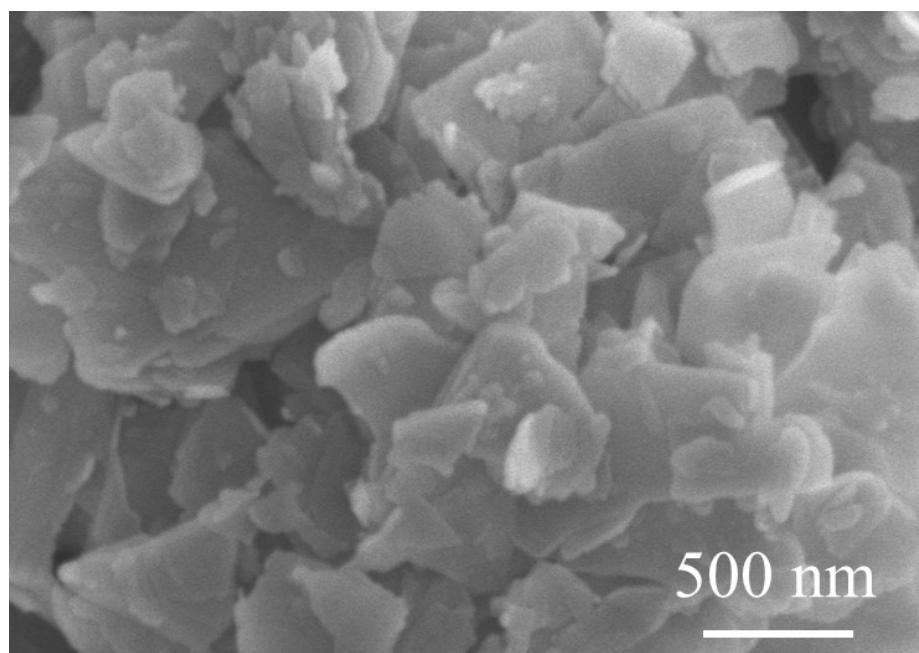
<sup>a</sup>Department of Biomedical and Engineering, School of Medicine, Shenzhen University, Shenzhen, China.

<sup>b</sup>Guangdong Key Laboratory for Biomedical Measurements and Ultrasound Imaging, Shenzhen, China.

\*Corresponding E-mail address: [hhxu@szu.edu.cn](mailto:hhxu@szu.edu.cn)

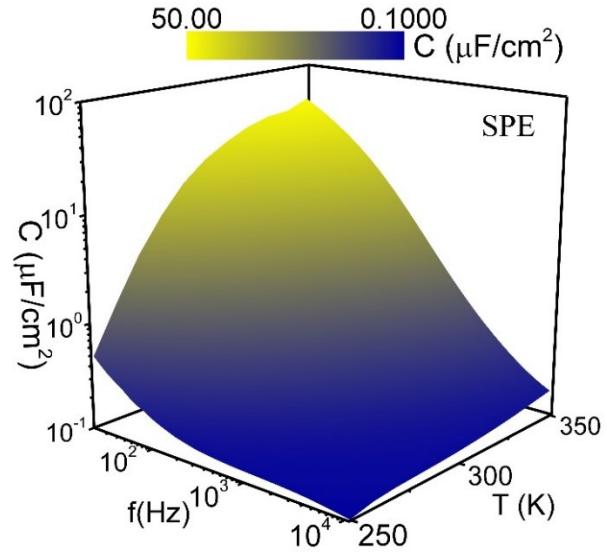
## Support Information

### 1. Scanning electron microscope (SEM) of the WSe<sub>2</sub> LSNs



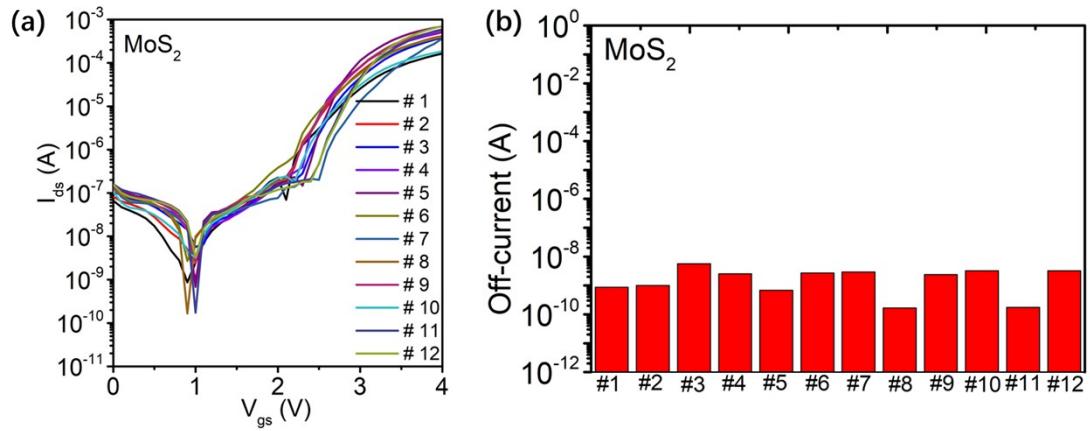
**Fig. S1** The SEM image of the WSe<sub>2</sub> LSNs obtained from liquid-phase exfoliation.

## 2. The EDL capacitance of the “*i*-gel” film



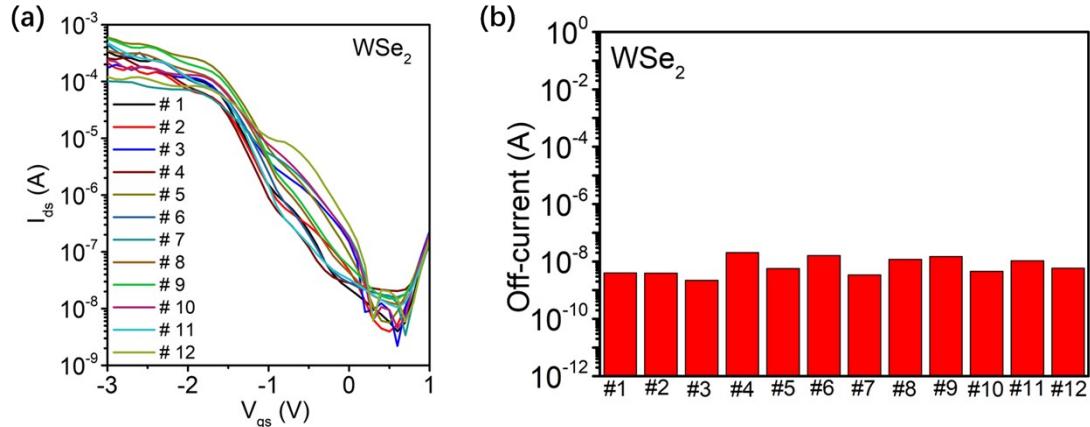
**Fig. S2** Contour map of the temperature-dependent EDL capacitance as a function of frequency at the *i*-gel/LSN interface.

## 3. Off-current of the *i*-paper gated MoS<sub>2</sub> FETs



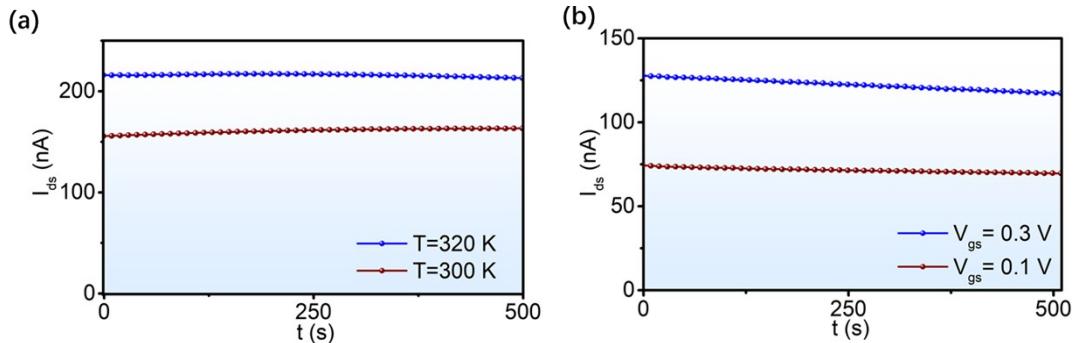
**Fig. S3** (a) Transfer characteristics and (b) the off-currents of the 12 *i*-paper gated MoS<sub>2</sub> FETs.

## 4. Off-current of the *i*-paper gated MoS<sub>2</sub> FETs



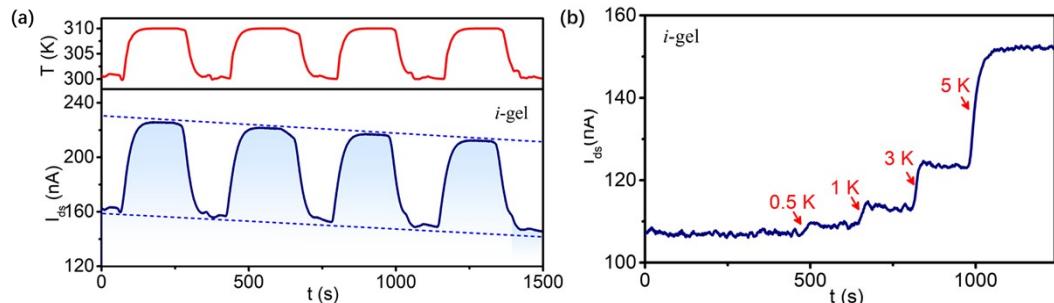
**Fig. S4** (a) Transfer characteristics and (b) the off-currents of the 12 *i*-paper gated WSe<sub>2</sub> FETs.

## 5. Operation stability of the thermal sensor



**Fig. S5** Real-time  $I_{ds}$  curves of the n-type *i*-gel gated LSN FET at (a) constant temperatures ( $T = 320\text{ K}$  and  $300\text{ K}$ ) and (b) constant biases ( $V_{gs} = 0.3\text{ V}$  and  $0.1\text{ V}$ ).

## 6. Transient response of the thermal sensor



**Fig. S6** (a) Transient response of the thermal sensor using the n-type *i*-gel gated LSN FET as switching the temperature from  $300\text{ K}$  to  $310\text{ K}$ . (b) Real-time recording of  $I_{ds}$  at  $V_{gs} = 0.1\text{ V}$ , measured by increasing different temperatures.