

## Electronic Supplementary Information

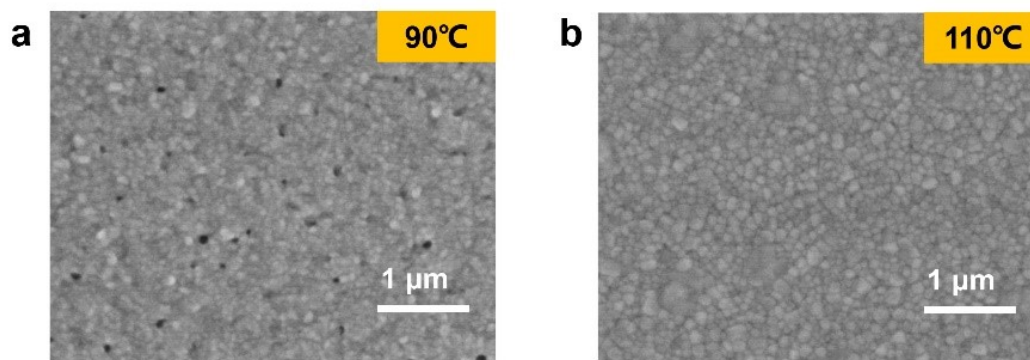
### **Zero-bias Bi-based perovskite image sensor arrays with direct laser-scribing process**

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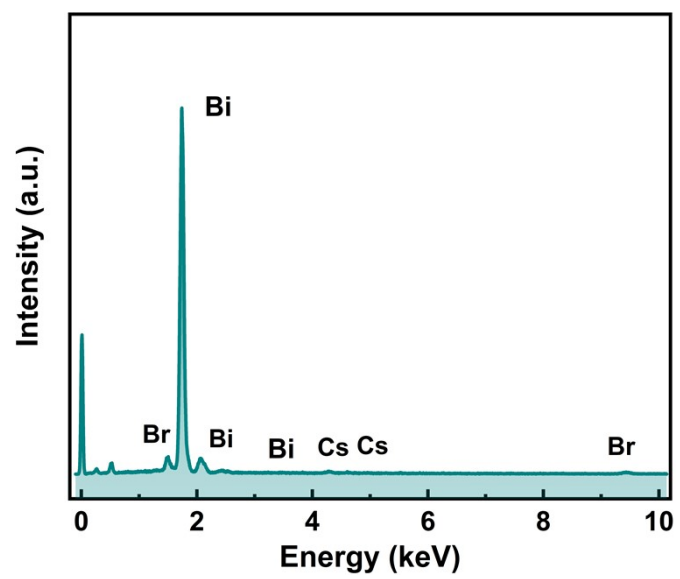
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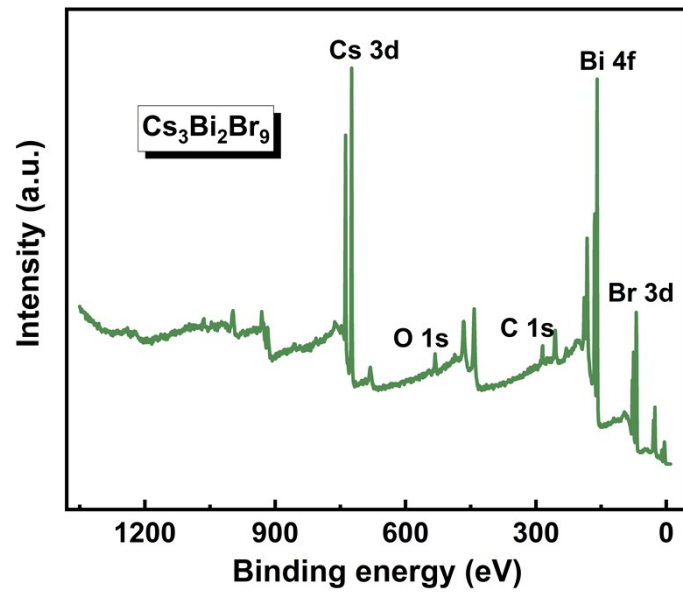
E-mail: liying0326@bit.edu.cn, gzshen@bit.edu.cn



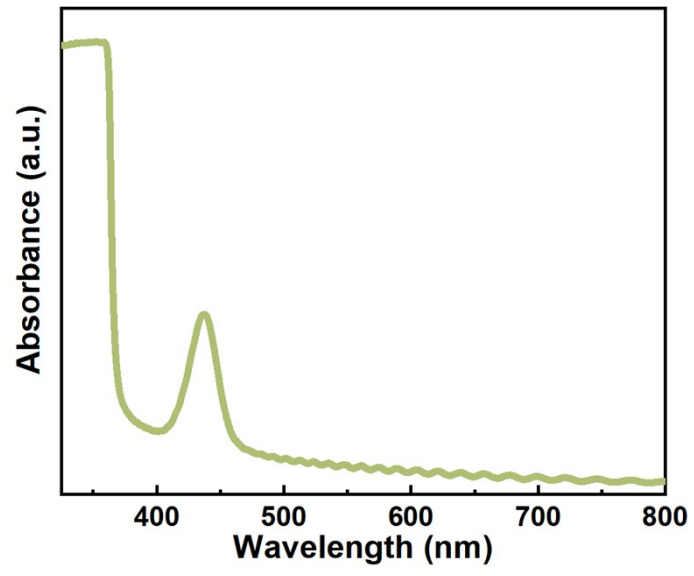
**Figure S1.** Top-view SEM image of Cs<sub>3</sub>Bi<sub>2</sub>Br<sub>9</sub> with annealing temperatures of (a) 90°C and (b) 110°C.



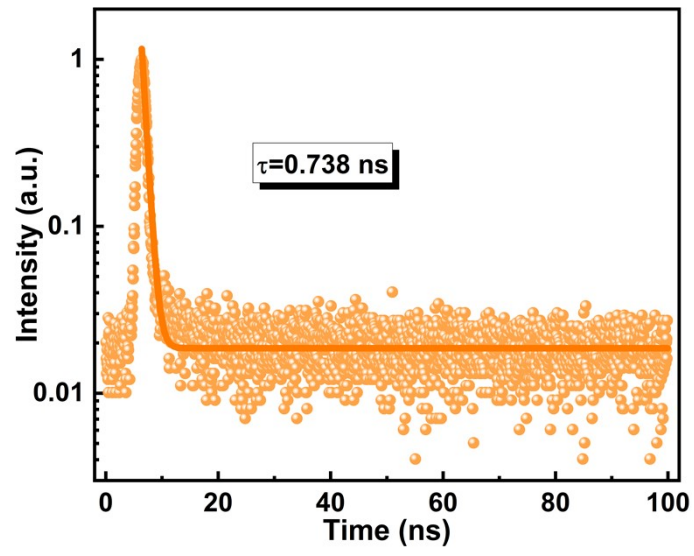
**Figure S2.** EDS spectra of the  $\text{Cs}_3\text{Bi}_2\text{Br}_9$  films.



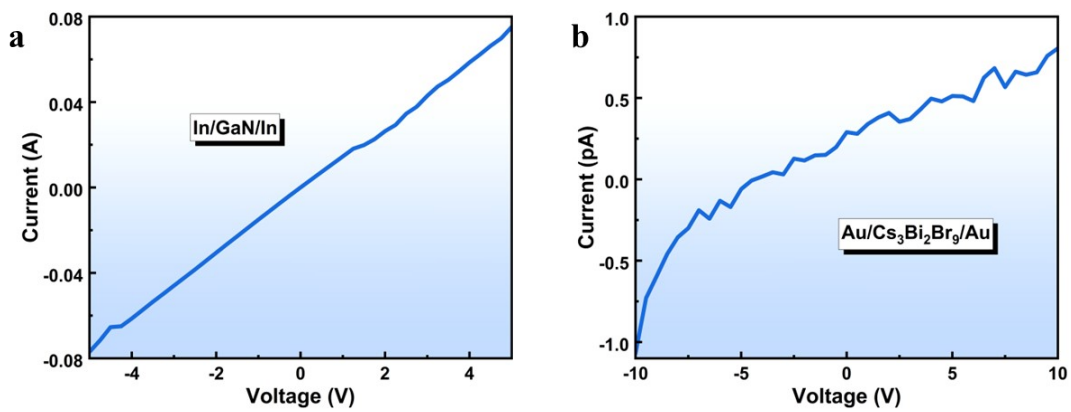
**Figure S3.** XPS spectra of the  $\text{Cs}_3\text{Bi}_2\text{Br}_9$  films.



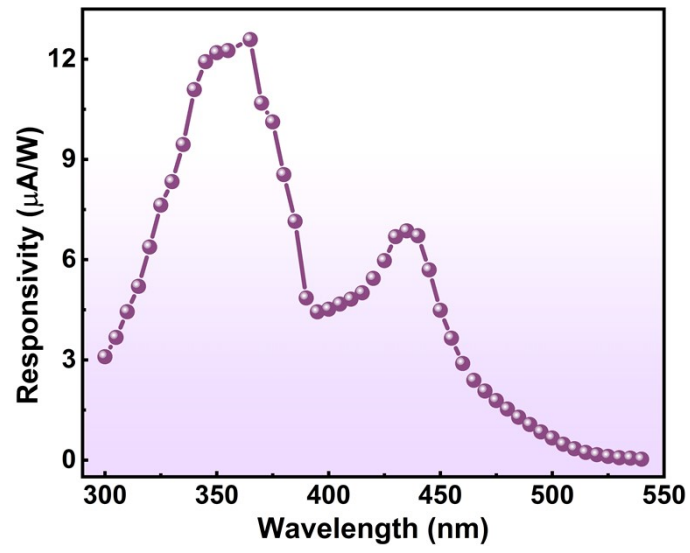
**Figure S4.** Absorption spectrum of the Cs<sub>3</sub>Bi<sub>2</sub>Br<sub>9</sub>/GaN films.



**Figure S5.** The time-resolved PL decay and fitting curve of Cs<sub>3</sub>Bi<sub>2</sub>Br<sub>9</sub>.

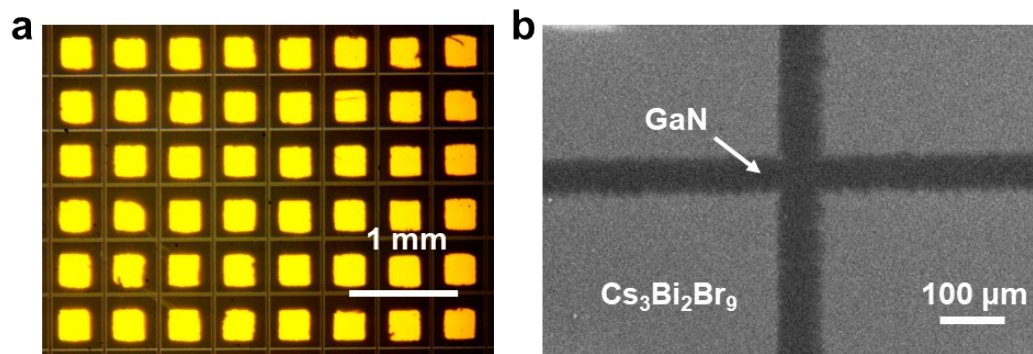


**Figure S6.** (a) *I*-*V* characteristics of In electrodes on GaN. (b) *I*-*V* characteristics of Au electrodes on Cs<sub>3</sub>Bi<sub>2</sub>Br<sub>9</sub>.



**Figure S7.** Spectral response of the device.





**Figure S8.** (a) Optical and (b) SEM image of PDs arrays.

Table S1 Summary of the performance of heterojunction PDs

Device	$P_{\min}$ (mW cm <sup>-2</sup> )	$\lambda$ (nm)	Bias (V)	R (A/W)	$D^*$ (Jones)	$\tau_r/\tau_d$ (s)	Ref
<b>GaN/Cs<sub>3</sub>Bi<sub>2</sub>Br<sub>9</sub></b>	<b><math>1.34 \times 10^{-5}</math></b>	<b>405</b>	<b>0</b>	<b>24.87 m</b>	<b><math>3.02 \times 10^{11}</math></b>	<b>17.4/17.6 m</b>	<b>This work</b>
GaN/CsPbBr <sub>3</sub>	—	310	0	1.08 m	—	0.74/7.20	[1]
CuI/CsCu <sub>2</sub> I <sub>3</sub> /GaN	0.01	365	0	71.7 m	$3.3 \times 10^{12}$	8.8/0.32	[2]
TiO <sub>2</sub> /Cs <sub>2</sub> AgBiBr <sub>6</sub> /Cu SCN	$5 \times 10^{-6}$	405	0	0.34m	$1.03 \times 10^{13}$	—	[3]
(BA) <sub>2</sub> FAPb <sub>2</sub> I <sub>7</sub> :FACl/ C8BTBT	$0.25 \times 10^{-3}$	405	2	2.3	$3.2 \times 10^{12}$	9.74/8.91 $\mu$	[4]
FAPb <sub>0.5</sub> Sn <sub>0.5</sub> I <sub>3</sub> /SnS QDs	—	850	0	0.522	$2.57 \times 10^{12}$	0.029/0.012	[5]
MAPbI <sub>3</sub> /Cs <sub>2</sub> AgBiBr <sub>6</sub>	—	622	-20	16.8 m	$1.33 \times 10^{11}$	70.3/68.6 m	[6]
MAPbI <sub>3</sub> /Si	0.05	970	-2	18.4 m	$1.8 \times 10^{12}$	—	[7]
ZnO/MAPbBr <sub>3</sub> - PMMA/PTAA	244 pW	442	0	0.34	$1.24 \times 10^{13}$	0.18/0.22	[8]

## Reference

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