TABLE: Significant Joule self-heating pervasive in the emergent thin-film transistor studies.

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TABLE S1. A few illustrative cases of field-effect transistor (FET) studies of metal-halide perovskites, conjugated polymers, and small-molecule organic semiconductors, where high power density (P_{max}) and/or power (W_{max}) have been apparently reached in the transistors' channel. Parameters, including the channel width (W) and length (L), the effective source-drain electric field (E_{DS}), and the maximum source-drain current ($|I_{DS}|^{max}$), are also listed, along with the studied material and the corresponding Figure.

E_{DS} is the effective longitudinal (source-drain) electric field in a FET channel applied during the recording of transfer curves corresponding to the extracted W_{max} and P_{max}, defined as $E_{DS} \equiv |V_{DS}|/L$, where V_{DS} is the source-drain voltage applied during the measurement, and L is the channel length.

W_{max} is the maximum apparent electric power dissipated in the channel of the reported FET, calculated from the corresponding transfer curve as $W_{max} \equiv |I_{DS}|^{max} \cdot |V_{DS}|$.

P_{max} is the corresponding maximum apparent electric power density emitted in the channel, calculated from the reported transfer curve as $P_{max} \equiv |I_{DS}|^{max} \cdot |V_{DS}|/(LW)$.

For the control experiment on infra-red imaging of the surface temperature distribution of biased devices, emulating specific experimental conditions used in Ref. [1], see Supplementary video (a separate file).

#	Reference	semiconductor	Fig.	W (μm)	L (μm)	$|I_{DS}|^{max}$ (A)	E_{DS} (kV·cm^{-1})	W_{max} (W)	P_{max} (W·cm^{-2})*
1	H. Zhu *et al.*, *Nat. Electron.* (2023)[1]	Hybrid tin halide perovskite, (Cs_xFA_{1-x})$PEA_2Sn_8I_{25}$, x = 10%)	1c	1000	200	0.01	**2**	**0.4**	**200**
2	A. Liu *et al.*, *Nat. Electron.* (2022)[2]	Tin halide perovskite, $CsSnI_3$	1d	1000	150	6.8×10^{-3}	**2.67**	**0.27**	**181**
3	W. Yang *et al.*, *Adv. Mater.* (2024)[3]	Hybrid tin halide perovskite, FASnI3 with F-PEAI	3i	1000	100	9×10^{-3}	**4**	**0.36**	**361**
4	F. Yang *et al.*, *Org. Electron.* (2016)[4]	Conj. polymer, P2MDPP2T-DTT	2c	1400	40	4.23×10^{-3}	**25**	**0.42**	**755**
5	Y. Ji *et al.*, *Adv. Mater.* (2016)[5]	Conj. polymer, PDPPMT-2T	2c	1400	40	4×10^{-3}	**25**	**0.4**	**709**

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[*] For comparison:

(a) The working surface of a typical household clothes iron emits about 0.36 W·cm^{-2} at full-power operation.

(b) The integral power density emitted by the Sun at its surface is ~ 6.4 kW·cm^{-2}.

(c) The power density of a CO_2 laser beam in industrial laser cutting machines for plastics, wood and leather is 3 - 10 kW·cm^{-2}.

#	Reference	semiconductor	Fig.	W (μm)	L (μm)	$\lvert I_{DS}\rvert^{max}$ (A)	E_{DS} (kV·cm^{-1})	W_{max} (W)	P_{max} (W·cm^{-2})*
6	Y. Diao *et al.*, *Nat. Mater.* (2013)[6]	Small mol., TIPS-pentacene	5b	1000	50	2×10^{-3}	**20**	**0.2**	**400**
7	A. Zhang *et al.*, *Macromol.* (2016)[7]	Conj. polymer, PDPP4T-2M	3c	1400	50	2.8×10^{-3}	**20**	**0.28**	**400**
8	J. Lee *et al.*, *J. Am. Chem. Soc.* (2013)[8]	Conj. polymer, PTDPPSe-SiC4	5d	1000	50	2.12×10^{-3}	**20**	**0.21**	**424**
9	H.-R. Tseng *et al.*, *Nano Lett.* (2012)[9]	Conj. polymer, PCDTBT	3c	1000	20	6.4×10^{-3}	**20**	**0.26**	**1280**
10	J. Mahmood *et al.*, *Adv. Mater.* (2021)[10]	2D fused aromatic networks (43 nm-thick)	4c	4	0.5	1.55×10^{-3}	**2**	**1.6×10^{-4}**	**7750**
11	V. K. Bandari *et al.*, *Adv. Funct. Mater.* (2019)[11]	Small mol., BTBT-T_6	4b	5	4.4	6.7×10^{-5}	**52**	**1.5×10^{-3}**	**7052**
12	J. Liu *et al.*, *Nat. Commun.* (2015)[12]	Small mol., 2,6-diphenylanthracene	3a	3.3	16.5	9.2×10^{-6}	**36**	**0.6×10^{-3}**	**1000**
13	H. Li *et al.*, *J. Am. Chem. Soc.* (2012)[13]	C_{60}	4b	8.7	40	1.6×10^{-5}	**25**	**1.6×10^{-3}**	**457**
14	G. Giri *et al.*, *Nature* (2011)[14]	Small mol., TIPS-pentacene	4c	1000	50	6.25×10^{-4}	**20**	**62.5×10^{-3}**	**125**
15	H. Iino *et al.*, *Nat. Commun.* (2015)[15]	Small mol., Ph-BTBT-C_{10}	3b	500	100	10^{-3}	**10**	**0.1**	**200**
16	H.-R. Tseng *et al.*, *Adv. Mater.* (2014)[16]	Conj. polymer, PCDTPT	1c	1000	80	1.53×10^{-3}	**10**	**0.12**	**153**
17	C. Luo *et al.*, *Nano Lett.* (2014)[17]	Conj. polymer, PCDTPT	4c	800	80	1.2×10^{-3}	**10**	**0.1**	**150**

For the analysis of FET mobilities and the corresponding mobility reliability factors in some of these papers, see Refs. [18-21].

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