Electronic Supplementary Material (ESI) for Lab on a Chip.

Supporting information for

Cancer Drug Screening with On-Chip Multi-Drug Dispenser in Digital Microfluidics

Jiao Zhai, [a, b] Caiwei Li, [a, c] Haoran Li,[a, c] Shuhong Yi,[d] Ning Yang, [e] Kai Miao,[f, g] Chuxia Deng, [f, g] Yanwei Jia, [a, c, f, g, *], Pui-In Mak [a, c] and Rui P. Martins [a, c, h]

[a] State Key Laboratory of Analog and Mixed-Signal VLSI, Institute of Microelectronics, University of Macau, Macau, China. Email: yanweijia@um.edu.mo

[b] Department of Biomedical Sciences/ Toung Biomedical Sciences Centre, City University of Hong Kong, Hong Kong, China

[c] Faculty of Science and Technology – DECE, University of Macau, Macau, China

[d] Liver Transplantation Center, the Third Affiliated Hospital, Sun Yat-sen University, Guangzhou, China

[e] Department of Electronic Information Engineering, Jiangsu University, Zhenjiang, China

[f] Faculty of Health Sciences, University of Macau, Macau, China

[g] MoE Frontiers Science Center for Precision Oncology, University of Macau, Macau, China

[h] on leave from Insituto Superior Tecnico, Universidade de Lisboa, Portugal

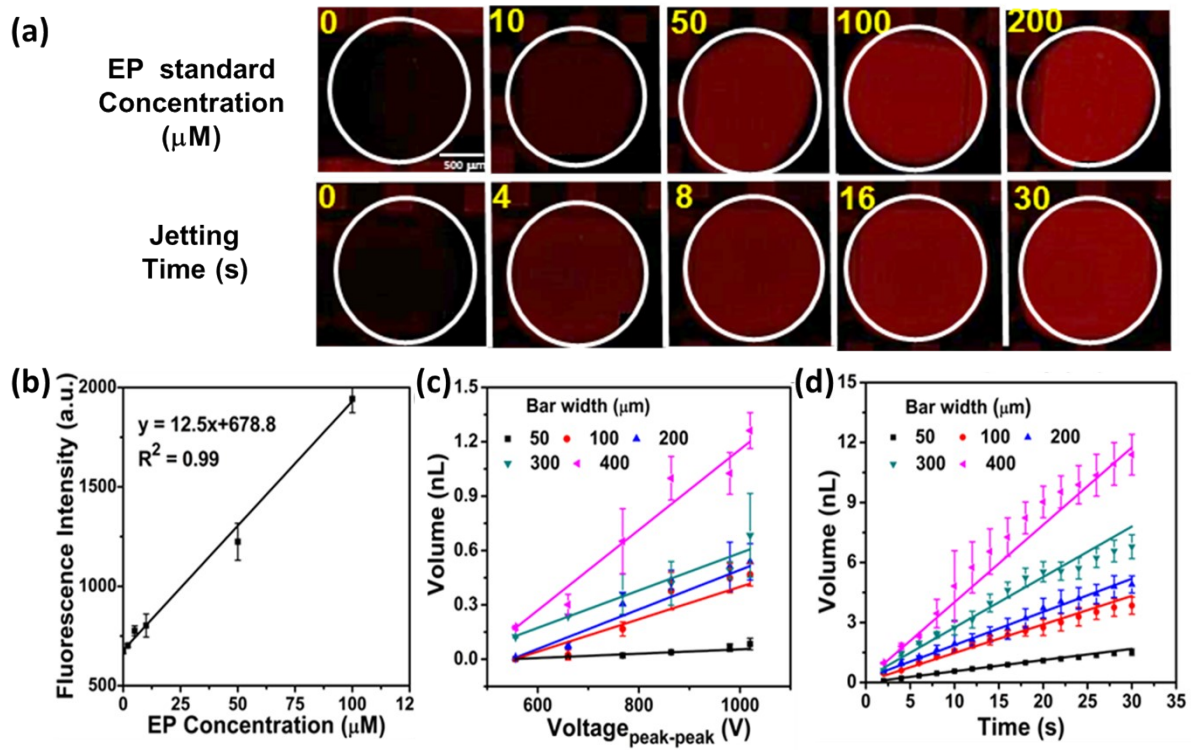

Fig. S1. (a) The fluorescence imaging results of a series of EP standard concentration droplets and the DMEM medium droplets after mixing with certain time ejected EP tiny droplets. (b) The calibration line of drug EP concentration towards the fluorescence intensity. (c) jetting voltage and (d) jetting time on jetting volume with the jetting bar width from 50 μm to 400 μm. The jetting frequency was fixed at 800 Hz. The drug used in the experiment was EP.

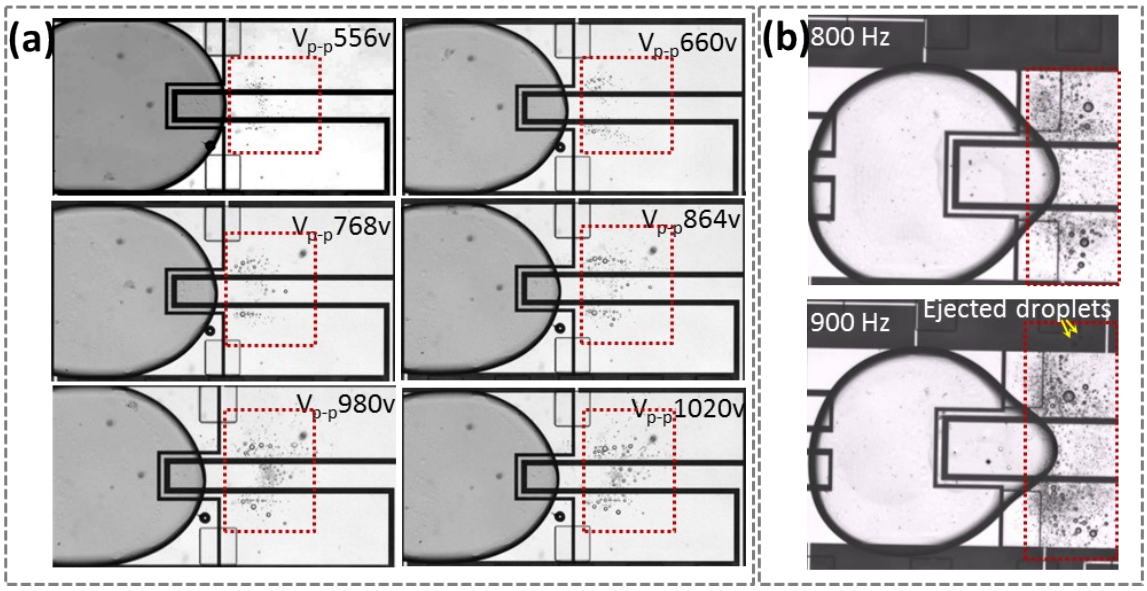

Fig. S2. The images of the splash pattern of the daughter droplets with the different parameters. (a) A jetting bar width of 200 μm, jetting voltages of Vp-p 556 V, 660 V, 768 V, 864 V , 980 V , 1020 V, and a jetting frequency of 800 Hz ; (b) a jetting bar width of 400 μm, a jetting voltage of Vp-p 1020 V and jetting frequencies of 800 Hz and 900 Hz.

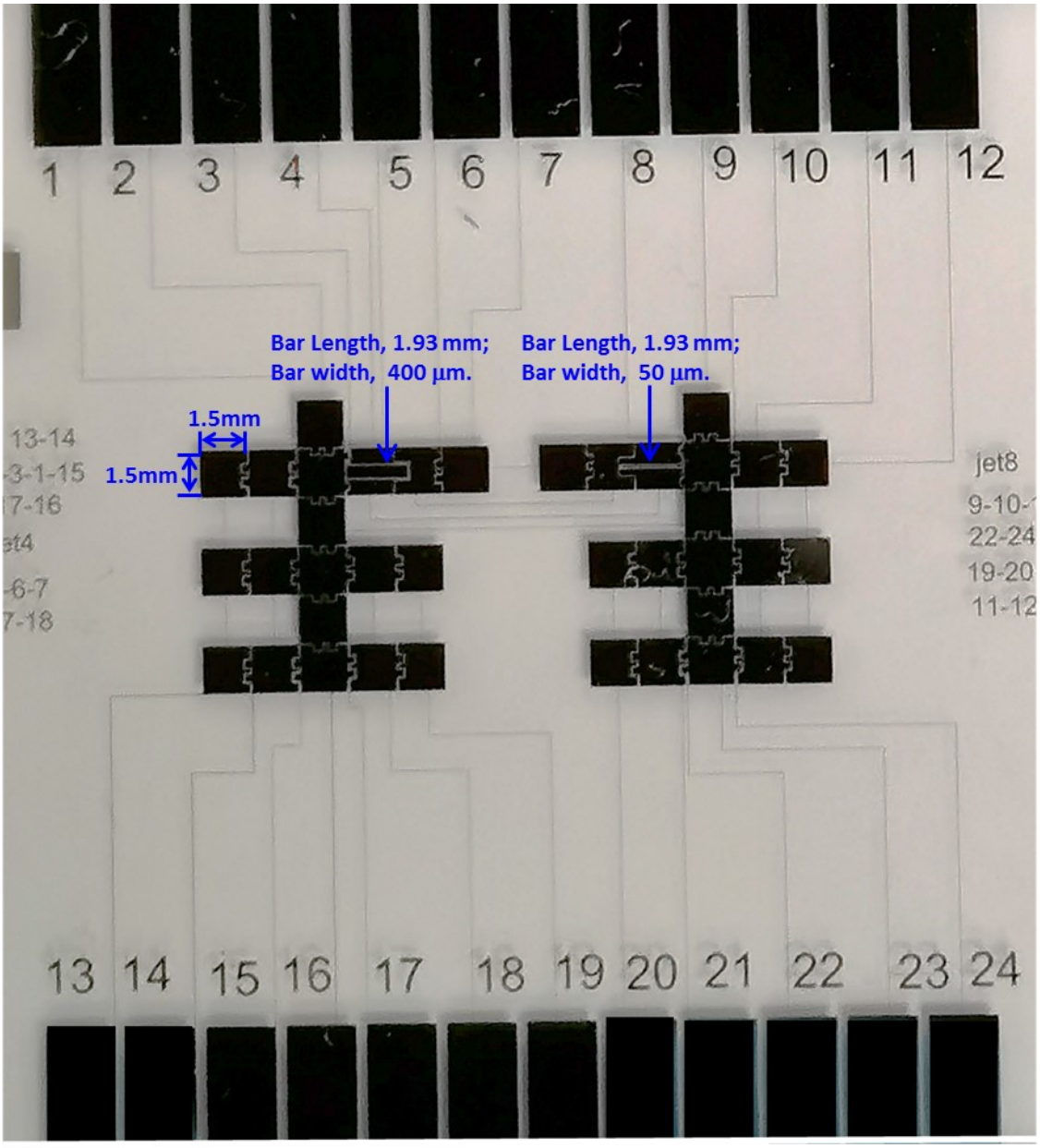

Fig. S3. The image for the chip with single drug dispenser.

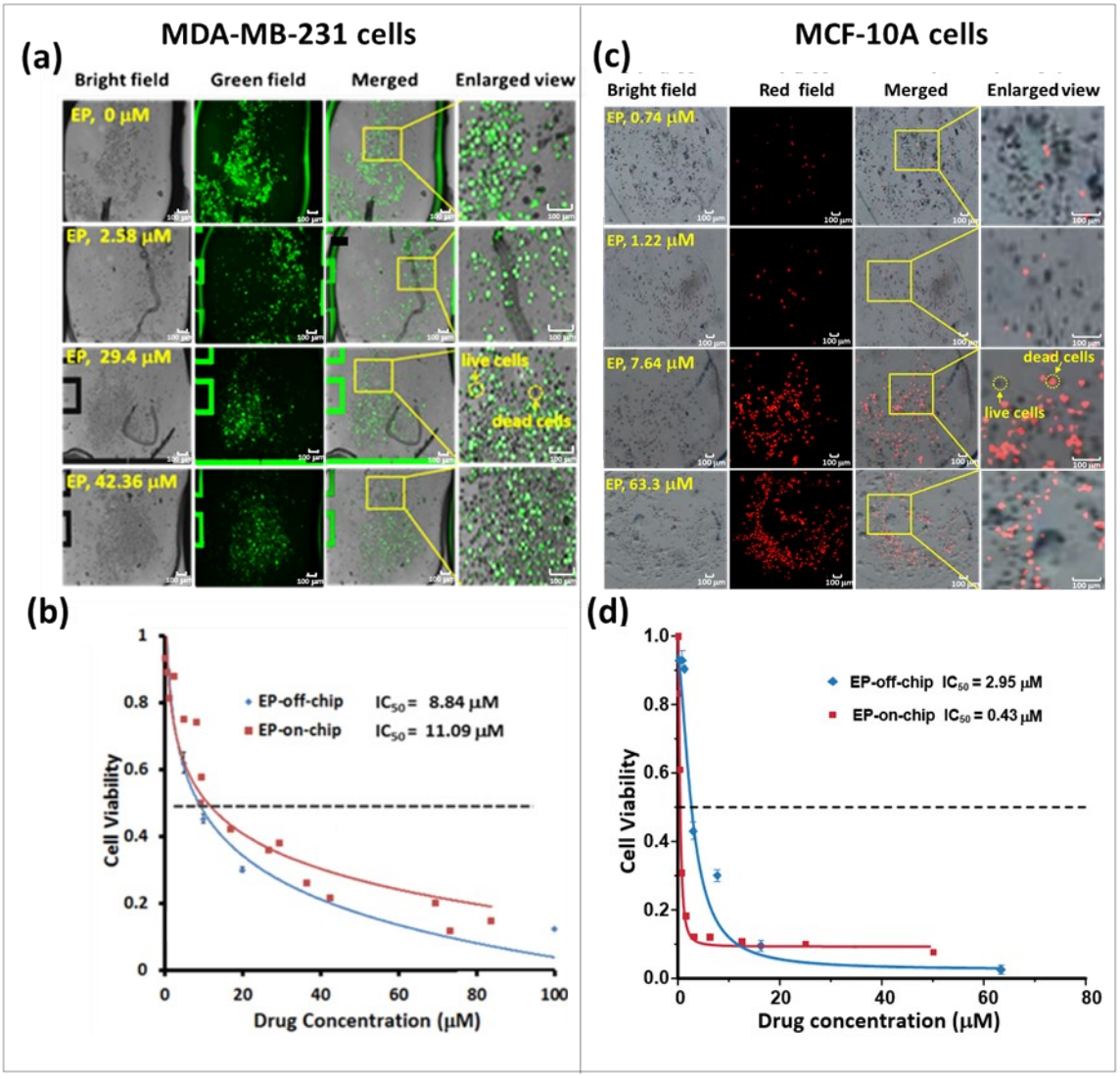

Fig. S4. Single-drug screening on a digital microfluidic (DMF) chip with an on-chip drug dispenser. Representative images of the on-chip drug epirubicin (EP) toxicity results for (a) breast cancer cells MDA-MB-231 and (c) breast normal cells MCF-10A after 24 h culture with various concentrations generated by the drug dispenser. The drug epirubicin (EP) toxicity test results for (b) breast cancer cells MDA-MB-231 and (d) breast normal cells MCF-10A for 24 h both on-chip and off-chip (96-well plate). Abbreviation: IC_{50}, half maximal inhibitory concentration.

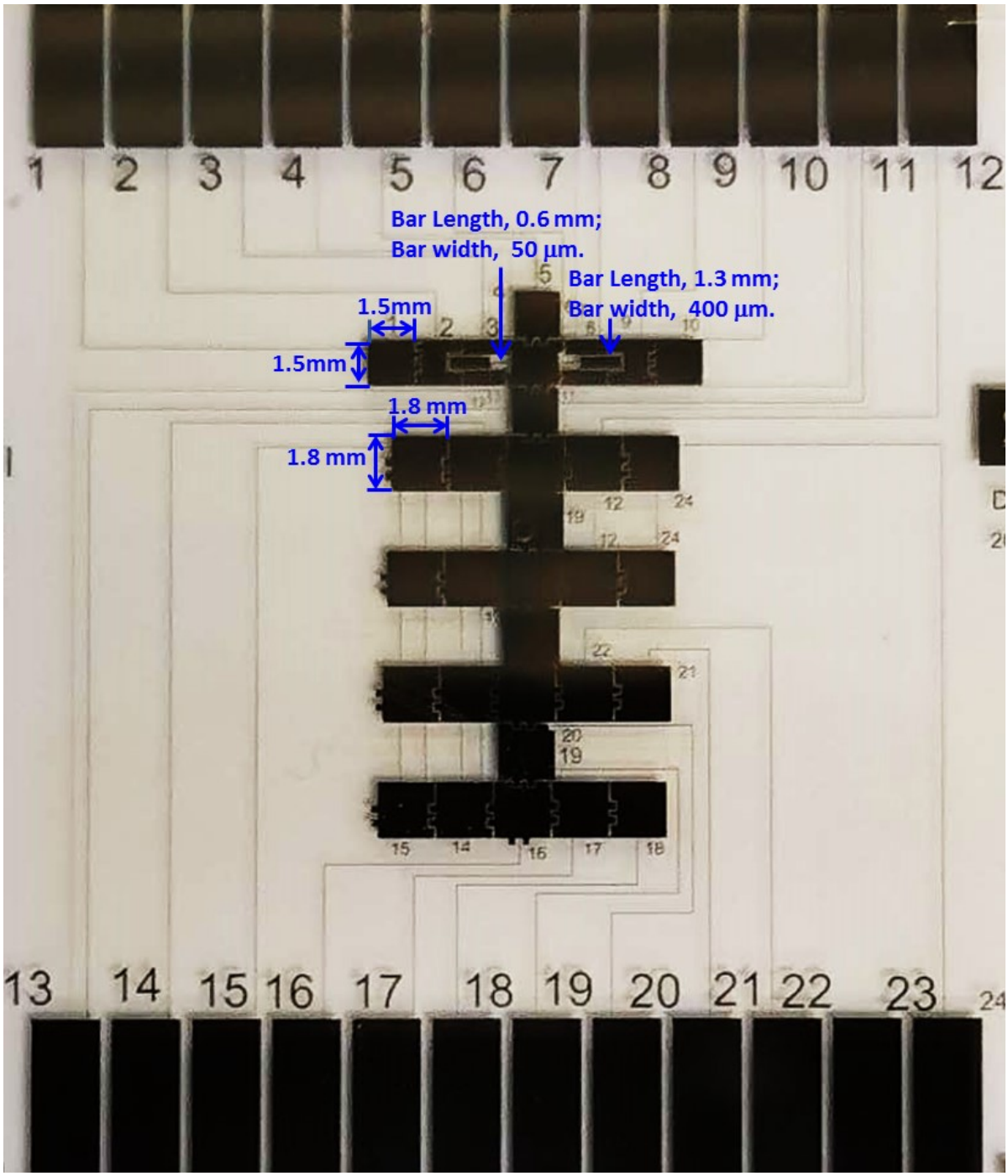

Fig. S5. The image for the chip with multi-drug dispenser.

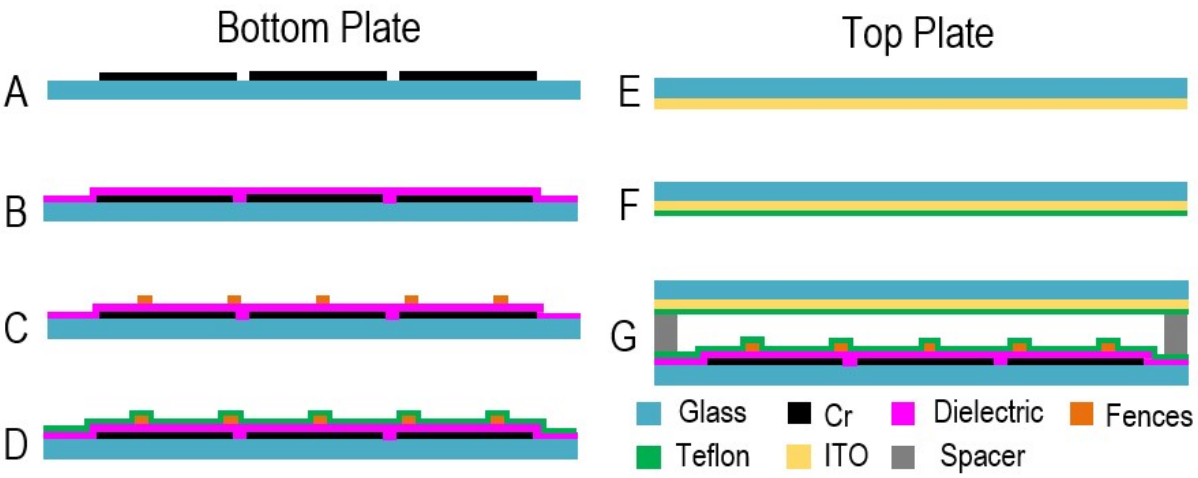

Fig. S6. The illustration for the fabrication details and chip assembly.

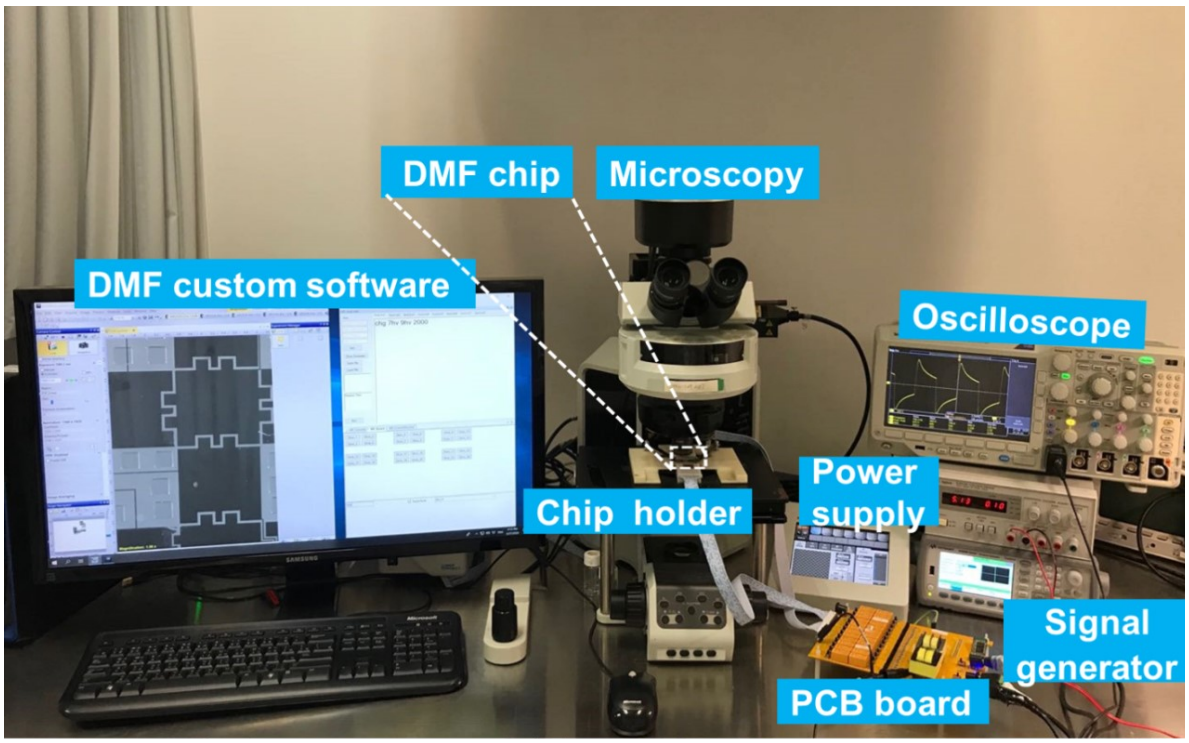

Fig. S7. System setup. The DMF system included four parts: the DMF chip, control electronics (power supply, signal generator, PCB board), a fluorescent microscope and a custom software.

Table S1. Combination drug screening of MDA-MB-231 off-chip (cell viability determined with CCK-8)

Off-chip result

cis concentration	ep=0	error	ep=0.1	error	ep=2	error
100.00	0.27	0.01	0.35	0.03	0.30	0.01
50.00	0.38	0.06	0.43	0.01	0.38	0.00
25.00	0.53	0.00	0.45	0.01	0.39	0.01
12.50	0.58	0.03	0.51	0.01	0.41	0.00
6.25	0.67	0.03	0.52	0.02	0.44	0.01
3.13	0.76	0.00	0.55	0.01	0.44	0.03
1.56	0.82	0.07	0.62	0.02	0.41	0.02
0.78	0.84	0.03	0.65	0.07	0.46	0.01
0.39	0.90	0.04	0.76	0.03	0.47	0.01
0.00	1.00	0.00	0.78	0.02	0.46	0.01

ep concentration	cis=0	error	cis=1	error	cis=10	error
50.00	0.38	0.01	0.28	0.01	0.26	0.01
25.00	0.39	0.04	0.39	0.03	0.31	0.02
12.50	0.44	0.02	0.40	0.00	0.34	0.04
6.25			0.59	0.02	0.49	0.02
3.13	0.51	0.06	0.53	0.00	0.49	0.03
1.56	0.61	0.02	0.62	0.05	0.48	0.01
0.78	0.62	0.03	0.65	0.01	0.54	0.04
0.39	0.72	0.06	0.69	0.00	0.56	0.04
0.20	0.85	0.02	0.66	0.04	0.54	0.02
0.00	1.00	0.00	0.72	0.01	0.61	0.06

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