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Supporting Information

Towards scaling up of perovskite solar cells and modules

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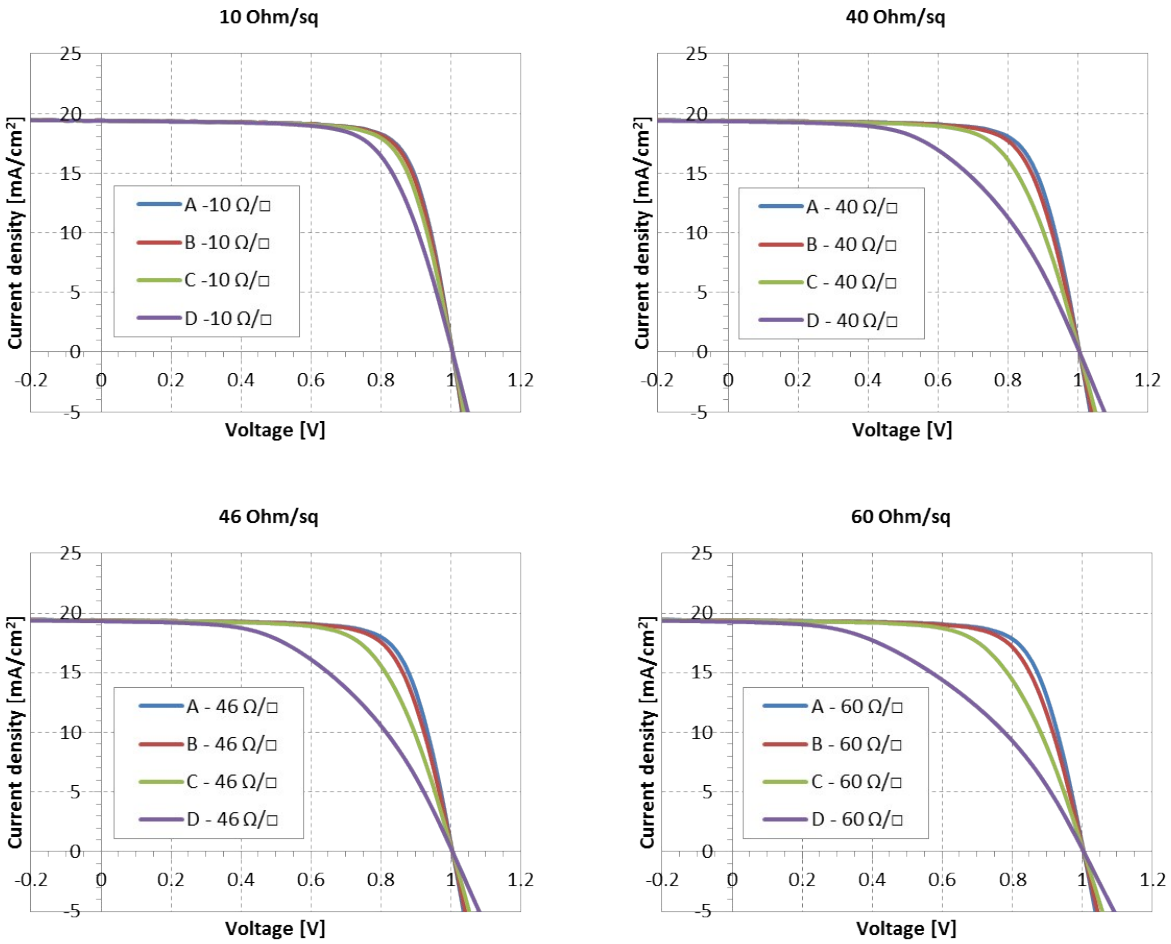

Figure S1. Simulated JV-curves of the A, B, C and D cells (ABCD design), with different sheet resistances of the TCO (10, 40 and 60 Ω/□).

Table S1. Simulated PV parameters of the PSC devices (ABCD design), with different sheet resistances of the TCO (10, 40 and 60 Ω/□).

Modeling	Jsc [mA/cm²]	Voc [V]	FF [-]	Pmax [mW/cm²]
A - 10 Ω/□ (3x3)	19.424	1.005	0.756	14.76
A - 40 Ω/□ (3x3)	19.403	1.005	0.743	14.49
A - 60 Ω/□ (3x3)	19.392	1.005	0.733	14.29
B - 10 Ω/□ (4x4)	19.418	1.005	0.751	14.66
B - 40 Ω/□ (4x4)	19.392	1.005	0.727	14.17

B - 60 Ω/□ (4x4)	19.383	1.005	0.708	13.80
C - 10 Ω/□ (6x6)	19.394	1.005	0.737	14.37
C - 40 Ω/□ (6x6)	19.377	1.005	0.679	13.22
C - 60 Ω/□ (6x6)	19.362	1.005	0.634	12.35
D - 10 Ω/□ (10x10)	19.377	1.005	0.687	13.39
D - 40 Ω/□ (10x10)	19.319	1.005	0.531	10.31
D - 60 Ω/□ (110x10)	19.260	1.005	0.449	8.68

Table S2. Comparison of experimental (a) simulated (b) PV parameters of the PSC devices (ABCD design), where the sheet resistance of the TCO is 46 Ω/□.

a) Experiment	**Jsc [mA/cm^2]**	**Voc [V]**	**FF [-]**	**Pmax [mW/cm^2]**
A - 46 Ω/□ (3x3)	19.43	1005.04	76.24	14.89
B - 46 Ω/□ (4x4)	18.24	1020.61	73.26	13.64
C - 46 Ω/□ (6x6)	19.62	1032.00	63.76	12.91
D - 46 Ω/□ (10x10)	19.29	1046.78	50.66	10.23

b) Modeling	**Jsc [mA/cm^2]**	**Voc [V]**	**FF [-]**	**Pmax [mW/cm^2]**
A - 46 Ω/□ (3x3)	19.397	1.005	0.740	14.429
B - 46 Ω/□ (4x4)	19.391	1.005	0.721	14.060
C - 46 Ω/□ (6x6)	19.368	1.005	0.666	12.956
D - 46 Ω/□ (10x10)	19.310	1.005	0.502	9.751

Table S3. Simulated PV parameters of the PSC devices (BS002 design), with different sheet resistances of the TCO (10, 40 and 60 Ω/□).

Modeling	**Jsc [mA/cm^2]**	**Voc [V]**	**FF [-]**	**Pmax [mW/cm^2]**

Input IV	19.43	1.01	0.76	14.89
13 Ω/□	19.35	1.01	0.62	12.06
40 Ω/□	19.3	1.01	0.51	9.86
46 Ω/□	19.29	1.01	0.49	9.49
60 Ω/□	19.26	1.01	0.45	8.74

Table S4: Simulated PV parameters of the perovskite modules, with different width of the sub-cells and different sheet resistances of the TCO: (a) 10 Ω/□, (b) 40 Ω/□, (c) 46 Ω/□ and (d) 60 Ω/□.

a) 10 Ω/□

Cell width [mm]	**Jsc [mA/cm^2]**	**Voc [V]**	**FF [-]**	**Pmax [mW/cm^2]**
1	13.95	1.01	0.76	10.71
3	17.57	1.01	0.76	13.38
5	18.29	1.01	0.75	13.72
7	18.60	1.01	0.73	13.61
10	18.82	1.00	0.69	13.01
15	18.97	1.01	0.59	11.23
20	18.99	1.01	0.48	9.09

b) 40 Ω/□

Cell width [mm]	**Jsc [mA/cm^2]**	**Voc [V]**	**FF [-]**	**Pmax [mW/cm^2]**
1	13.95	1.01	0.76	10.69
3	17.57	1.01	0.74	13.15
5	18.28	1.01	0.71	13.01
7	18.57	1.01	0.65	12.14
10	18.75	1.01	0.53	10.06
15	18.54	1.01	0.38	7.00

20	14.77	1.01	0.35	5.25

c) 46 Ω/□

Cell width [mm]	**Jsc [mA/cm²]**	**Voc [V]**	**FF [-]**	**Pmax [mW/cm²]**
1	13.95	1.01	0.76	10.68
3	17.57	1.01	0.74	13.10
5	18.28	1.01	0.70	12.84
7	18.56	1.01	0.63	11.82
10	18.74	1.01	0.51	9.52
15	17.91	1.01	0.36	6.53
20	13.78	1.01	0.35	4.89

d) 60 Ω/□

Cell width [mm]	**Jsc [mA/cm²]**	**Voc [V]**	**FF [-]**	**Pmax [mW/cm²]**
1	13.95	1.01	0.76	10.67
3	17.57	1.01	0.73	12.98
5	18.27	1.00	0.68	12.46
7	18.55	1.01	0.59	11.04
10	18.70	1.01	0.45	8.47
15	16.00	1.01	0.35	5.71
20	12.05	1.01	0.35	4.27