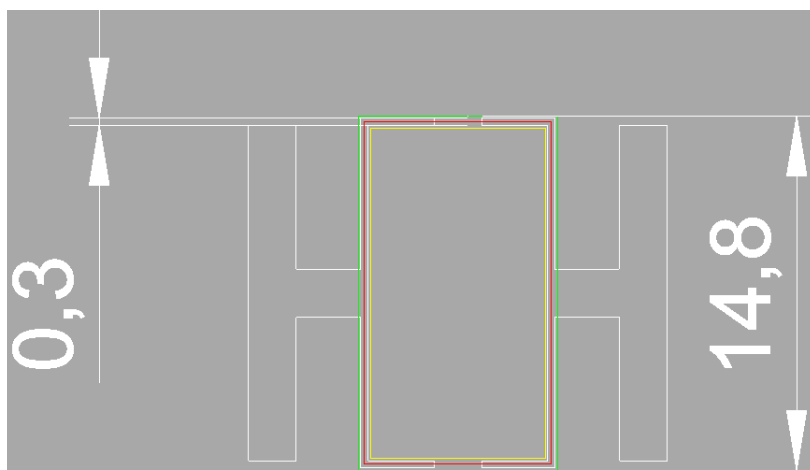
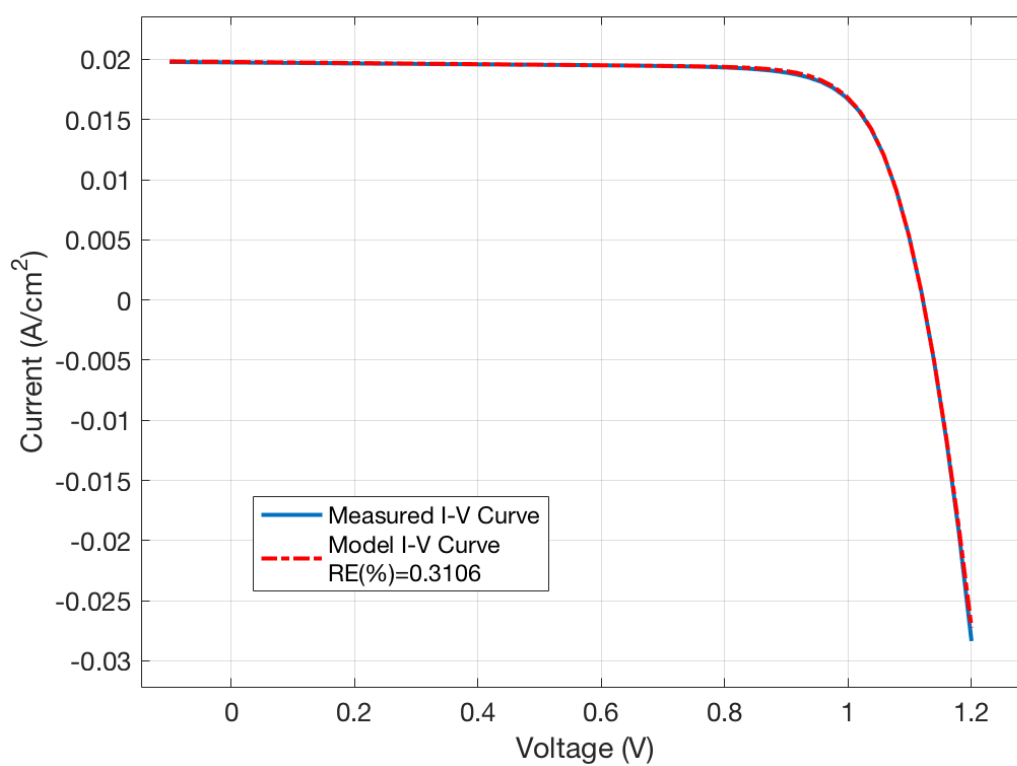


## Supplementary information

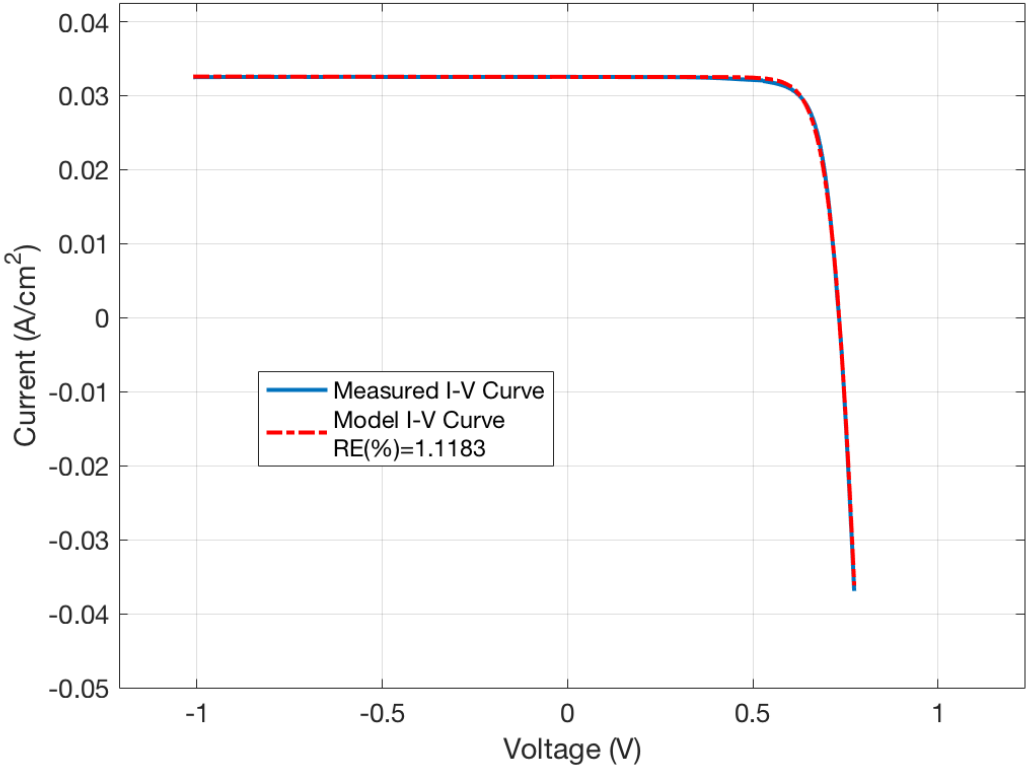
**SP1.** Sketch of a Pk/Si tandem solar cell. The illuminated area is framed in yellow, the top ITO in red, the top contact in white and the bottom contact in green. The latter is also the area of the two monolithically connected junctions



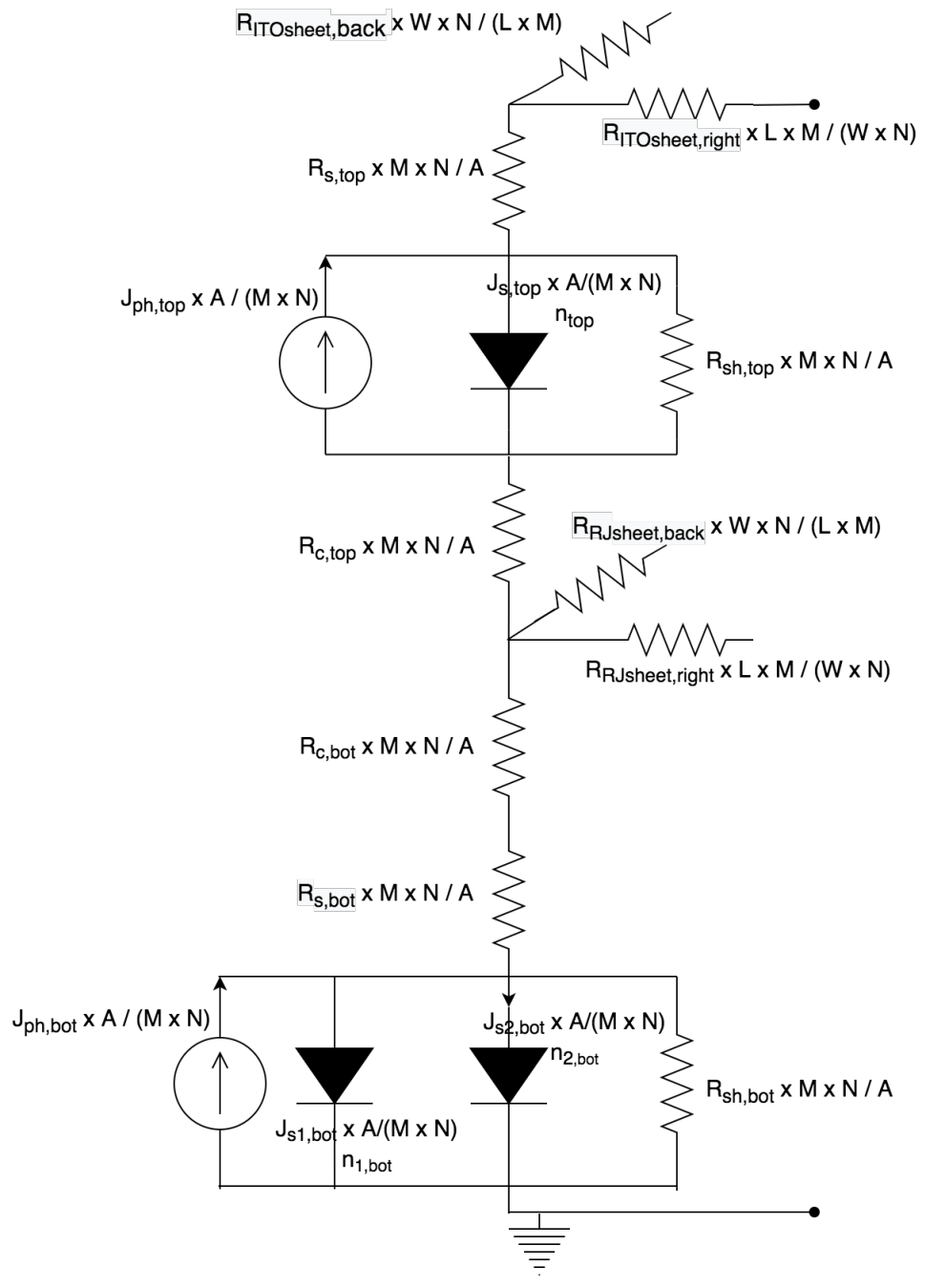
**SP2.** LIV curve of the perovskite single junction fitted to the one-diode model



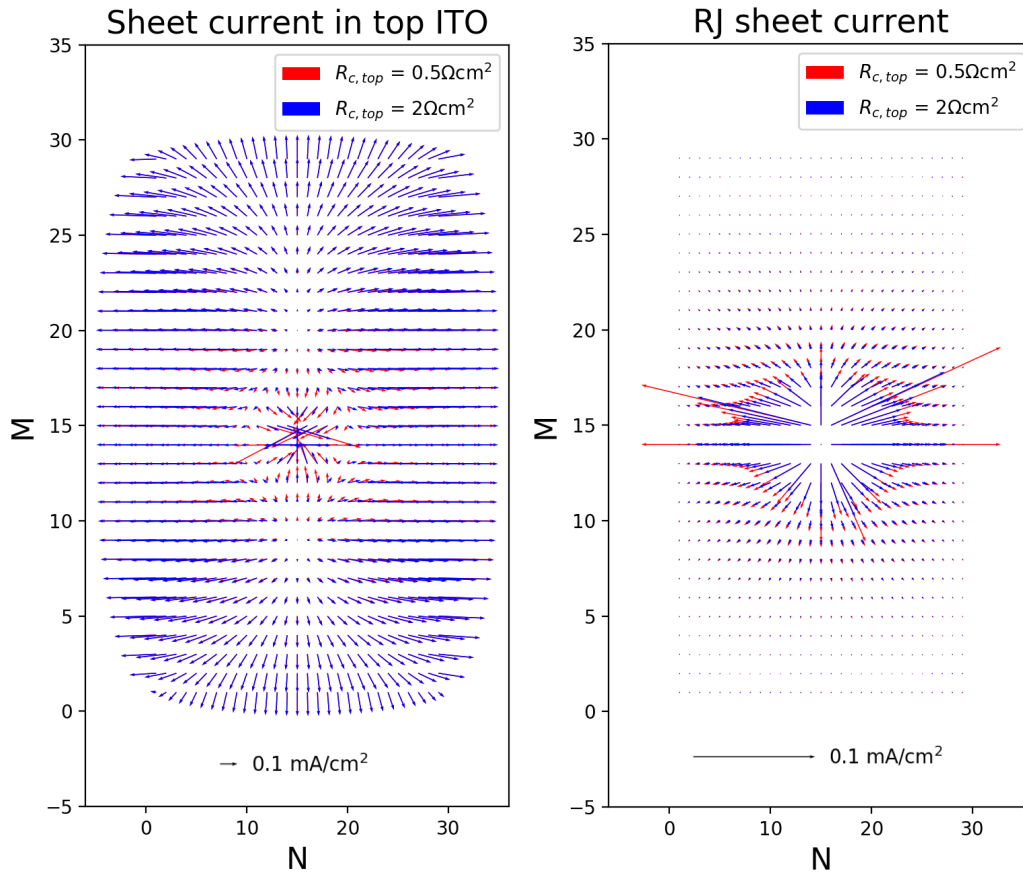
**SP3.** LIV curve of the silicon single junction fitted to the two-diode model



**SP4.** Diagram of the scaling of each parameter of the single elements constituting the 2D equivalent circuit ( $M \times N$  array for a cell of dimensions  $M \times L$ )



**SP5.** Lateral current maps in the top ITO layer (left) and RJ (right) of a 0.4% top shunted perovskite/silicon tandem in the cell centre at MPP conditions, comparing the current amplitude in cells with the default (red) and optimal (blue) contact resistances  $R_{c,top}$



**SP6.** Efficiency as a function of the shunted cell fraction for a top shunted cells with the baseline RJ sheet resistance ( $R_{RJ, sheet} = 450 \Omega/\square$ ) (blue) and with an optimised RJ sheet resistance (green)

