

Title: A Step-up mu-Power Converter for Solar Energy Harvesting Applications, using Hill Climbing Maximum Power Point Tracking

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Abstract: This paper presents a step-up micro-power converter for solar energy harvesting applications. The circuit uses a SC voltage tripler architecture, controlled by an MPPT circuit based on the Hill Climbing algorithm. This circuit was designed in a 0.13 μm CMOS technology in order to work with an a-Si PV cell. The circuit has a local power supply voltage, created using a scaled down SC voltage tripler, controlled by the same MPPT circuit, to make the circuit robust to load and illumination variations. The SC circuits use a combination of PMOS and NMOS transistors to reduce the occupied area. A charge re-use scheme is used to compensate the large parasitic capacitors associated to the MOS transistors. The simulation results show that the circuit can deliver a power of 1266 μW to the load using 1712 μW of power from the PV cell, corresponding to an efficiency as high as 73.91%. The simulations also show that the circuit is capable of starting up with only 19% of the maximum illumination level.

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