A SUB MICRO-WATT MAXIMUM POWER POINT TRACKING CIRCUIT FOR PHOTOVOLTAIC SYSTEMS

Ahmed A. Abdelmoaty

A maximum power point tracking (MPPT) circuit with very low power consumption for photovoltaic (PV) systems is presented in this work. The proposed circuit leverages a three-point comparison instead of the traditional two-point comparison adopted in the Perturb and Observe algorithm to track the PV's maximum power. The technique of using the three-point comparison shifts the design complexity of the MPPT engine from digital domain and microcontrollers into analog domain at which power consumption can be tweaked to minimum. A full circuit design and implementation of the proposed circuit including an analog single-quadrant linear multiplier and a digital MPPT core are presented in this work. The proposed MPPT circuit is implemented with a complete PV system in TSMC 0.18µm BiCMOS technology. The full system is tested with a modeled solar cell with an open circuit voltage of 5V and a short circuit current of 120mA. The proposed chip occupies 1.5 mm^2 and achieves MPPT efficiency of 98% and the digital MPPT core dissipates less than 1µWatt running at 500 KHz and a supply voltage of 1.8V.