

Piezoelectric Energy Harvesting Using Synchronized Switching Techniques

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ABSTRACT

The application of synchronized switching techniques has significantly enhanced the power harvested from ambient vibrations using piezoelectric devices. In some instances the power increase has been demonstrated to be in the order of ten times the power output compared to the standard energy harvesting approach. In this paper, an up-to-date review of synchronized switching techniques employed in conversion of ambient mechanical energy into useful electrical energy using piezoelectric materials is given. The basic concepts involved in the standard energy harvesting approach and synchronized switch harvesting techniques are presented. A comparative analysis of these techniques is discussed, highlighting the strengths and limitations of each approach in terms of power conversion efficiency, load independence, complexity of implementation, and adaptability for wireless self-powered systems applications. Finally, future trends and research needs that are critical to piezoelectric energy harvesting interface electronics for wireless sensor devices are discussed.