

Comparison of different Energy Harvesting solutions for Printed Circuit Board Production

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Accepted for publication on 10th January 2015

For energy harvesting of thermal energy two well-known physical effects are useable, the thermoelectric and the pyroelectric effect. These two effects have been compared in literature in terms of their energy output and the applicability. In this contribution the two effects will be compared in the particular field of the printed circuit board production. For applications without a thermal energy source the approach to use ambient radio frequency energy harvesting will be tested.

The best solution for the chosen scenario will be discussed. Therefore, we use a custom-made sensor system in order to define our boundary conditions and evaluation criteria of the two energy harvesting methods. Furthermore, we present the pure energy output information of the harvesters in the regarded field, so that this results can be compared with other sensor systems. Our system consists of a temperature sensor, a microcontroller and a radio transceiver. The wireless interface enables a real-time sensor-data transfer.

The soldering process is the main focus of research in a PCB production environment (e.g. reflow oven) for our generators, because of the available thermal energy in this process. Nevertheless, the testing of a PCB in a climate test chamber is also a suitable application, since there is a cyclic change of low and high temperature. A thermoelectric generator (TEG) seems to be the best choice for the reflow oven, whereas for the test chamber application a pyroelectric generator (PEG) is preferred, because of the high temperature change. But in other processes where no temperature is involved the radio frequency energy harvesting is an alternative. In our contribution we will focus on the question. What is the best generator solution for the given application?

Keywords: Thermoelectric Generator, Pyroelectric Generator, Printed Circuite Board, Energy Harvesting