

# Digitally Controlled Synchronous Bidirectional DC-DC Buck/Boost Converter Used in Smart Grid

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## Abstract

*Global energy consumption has tripled in the last century; the electrical infrastructure of several cities cannot sustain the amount of energy required. Since changing the infrastructure is not a possibility, being too expensive, a solution is to be on renewable energy with an adequate power management system. You can either save the energy and use it later or sell it back to the power company. In this paper we describe a solution for the power management system which is a digitally controlled synchronous bidirectional DC-DC buck/boost. The implementation of a digital PID was chosen instead of the analog one, due to increased flexibility by changing the software. Both modes are controlled using the average current mode control. The software algorithm decides if the converter should operate in a buck or boost topology. All simulations were obtained using PSIM. Finally, the behavior of the circuit is shown when changing the direction of energy flow, instantaneously.*