Title: Microcontroller-based Power Factor Corrector

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Abstract

The purpose of this project is to examine the possibility of using a digital function control implemented via a “simple” micro-controller algorithm for controlling the level of power factor correction (PFC) in switched pulse-width modulation (PWM) converters of up to 1KW. The project is based on the implementation of PFC according to Resistive Input Characteristic, on switched PWM converters through analog components.

Overview

The current interest in active power factor correction (APFC) prompts investigators to look for improved methods to shape the input current of pulse-width modulation (PWM) converters. Our project deals with a method that applies indirect input current control. The information regarding the desired input current shape is obtained by sensing the inductor current, the switch current, or the diode current. In active power-factor correction systems, Vout needs to be stabilized and Re adjusted as a function of the load and input voltage.

The proposed methodology was based on the Boost converter. The switching is done at variable duty-cycles according to the micro-controller algorithm. The objective is to work with high switching frequencies, which must be used with high-speed Power-MOSFET.

Closing the control loops is done by a system based on a micro-controller device from MICROCHIP, PIC16F87x series. Software development has been accomplished means of a development kit which consists of an assembly compiler on a PC and an in-circuit debugger (ICD) that connects the PC to the evaluation board and allows software to be downloaded and debugged.