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AN ISOLATED POWER FACTOR CORRECTED POWER SUPPLY UTILIZING THE TRANSFORMER LEAKAGE INDUCTANCE

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Abstract—The widespread use of electronic devices increases the need for compact power factor corrected power supplies. The use of electronic equipment has increased in last few years. AC rectification is a very inefficient process, resulting in waveform distortion of the current which is drawn from the source. This produces a large spectrum of harmonic signals that may interfere with other equipment. In input rectifier bridge the conventional boost PFC suffers from the high conduction loss This project describes an isolated power factor corrected power supply that utilizes the leakage inductance of the isolation transformer to provide boost inductor functionality. The bulk capacitor is in the isolated part of the power supply allowing for controlled startup without dedicated surge limiting components. A control method based on switch timing and input/output voltage measurements is developed to jointly achieve voltage regulation and input power factor control. A simulation and prototype design is implemented with detailed measurements and waveforms shown to confirm the desired functionality.

Keywords - DCM-discontinuous conduction mode, CCM - continuous conduction mode, THD - total harmonic distortion, PFC - power factor correction, PF - power factor, led - light emitted diode.

I.INTRODUCTION

One type of power factor correction (PFC) involves passive correction, where the reactive power of a system is compensated by adding a component that will use an equal but opposite amount of reactive power. For example, if a load is inductive with a reactive power of 1.754 kVAR, then the system would require a capacitive load with a reactive power of 1.754 kVAR to oppose the inductance. This type of power factor correction works well for linear loads on large scales where the cost of the power factor correction system can be absorbed by the size and cost of the overall system.

A. Active correction:

In active power factor correction, we must use an active power factor circuit that forces the AC current to track the AC voltage. One of the most common active PFC circuits is called the boost PFC converter. The boost PFC circuit cycles rapidly between two states, switch closed and switch open. During this states the inductor and capacitor charges and discharges.

B..Passive correction:

One type of power factor correction (PFC) involves passive correction, where the reactive power of a system is compensated by adding a component that will use an equal but opposite amount of reactive power. For example, if a load is inductive with a reactive power of 1.754 kVAR, then the system would require a capacitive load with a reactive power of 1.754 kVAR to oppose the inductance. This type of power factor correction works well for linear loads on large scales where the cost of the power factor correction system can be absorbed by the size and cost of the overall system.Use either SI (MKS) or CGS as primary units. (SI units are encouraged.) English units may be used as secondary units (in parentheses). An exception would be the use of English units as identifiers in trade, such as "3.5-inch disk drive".