

Active Power Factor Correction Using Switching Regulators

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Abstract – The most of the equipments being used in IT industries, commercial and residential applications are internally working on the DC voltage. So either internal to the equipment or externally they need tonderge conversion from AC to DC for their functioning and operation. Depending on the requirement it consists of Single or Three Phase controlled or uncontrolled rectifier. The simple rectification technique leads to degradation in the quality of the current drawn in terms of Harmonics, wave form Distortion, Power Factor (PF) and affect the power distribution system. The increasing demand of these devices, the line current harmonics and PF pose a major problem by degrading the power quality of the system thus affecting the performance of the other devices also. Hence there is a need to enhance quality of power drawn by these equipments.

This paper propose the front end rectification technique for three phase supply using switching mode active control to enhance these quality factors. The technique is simulated in the MATLAB Simulink environment and results are shown. It also focuses the approach of Pre-regulator integrated circuits towards the power factor correction.

Keywords—Active Power Factor Correction (APFC), Current Loop, Voltage Loop, Harmonic Current.

I. INTRODUCTION

The power supplies in most of the equipments are to convert mains power to the desired level of power that is needed for their proper functioning. This conversion leads to rectification and filtering of input mains power. Then it is scaled down using DC-DC converters as shown in Fig. 1.

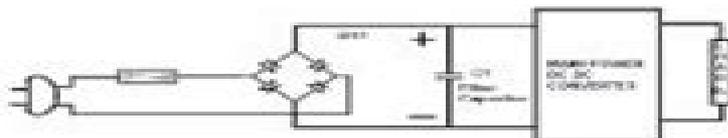


Figure 1. Capacitive line filter

The filter used in the supply draws current only when the line voltage exceeds the filter capacitor voltage and the filter capacitor is charged to near the peak level of the input line voltage as shown in figure 2.



Figure 2. Input Current with Capacitor Filter

As shown in the Fig.2, the current flows for the short duration where the capacitor voltage reaches to peak of input voltage. Due to this short pulses the RMS value of current increases and average value decreases, which adds line losses and power quality issues in the system.

Power factor correction may lead to have benefits like; reduction in distribution cost, more power can be drawn at the same current rating from the line. Presently it is mandatory requirement in many countries for the equipment to comply the standards led by the government.

Active Power Factor Correction Using Switching Regulators

Puja Mehta



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Table of Contents Active Power Factor Correction Using Switching Regulators

1. Understanding the eBook Active Power Factor Correction Using Switching Regulators
 - The Rise of Digital Reading Active Power Factor Correction Using Switching Regulators
 - Advantages of eBooks Over Traditional Books
2. Identifying Active Power Factor Correction Using Switching Regulators
 - Exploring Different Genres
 - Considering Fiction vs. Non-Fiction
 - Determining Your Reading Goals
3. Choosing the Right eBook Platform
 - Popular eBook Platforms
 - Features to Look for in an Active Power Factor Correction Using Switching Regulators
 - User-Friendly Interface
4. Exploring eBook Recommendations from Active Power Factor Correction Using Switching Regulators
 - Personalized Recommendations
 - Active Power Factor Correction Using Switching Regulators User Reviews and Ratings

- Active Power Factor Correction Using Switching Regulators and Bestseller Lists
- 5. Accessing Active Power Factor Correction Using Switching Regulators Free and Paid eBooks
 - Active Power Factor Correction Using Switching Regulators Public Domain eBooks
 - Active Power Factor Correction Using Switching Regulators eBook Subscription Services
 - Active Power Factor Correction Using Switching Regulators Budget-Friendly Options
- 6. Navigating Active Power Factor Correction Using Switching Regulators eBook Formats
 - ePub, PDF, MOBI, and More
 - Active Power Factor Correction Using Switching Regulators Compatibility with Devices
 - Active Power Factor Correction Using Switching Regulators Enhanced eBook Features
- 7. Enhancing Your Reading Experience
 - Adjustable Fonts and Text Sizes of Active Power Factor Correction Using Switching Regulators
 - Highlighting and Note-Taking Active Power Factor Correction Using Switching Regulators
 - Interactive Elements Active Power Factor Correction Using Switching Regulators
- 8. Staying Engaged with Active Power Factor Correction Using Switching Regulators
 - Joining Online Reading Communities
 - Participating in Virtual Book Clubs
 - Following Authors and Publishers Active Power Factor Correction Using Switching Regulators
- 9. Balancing eBooks and Physical Books Active Power Factor Correction Using Switching Regulators
 - Benefits of a Digital Library
 - Creating a Diverse Reading Collection Active Power Factor Correction Using Switching Regulators
- 10. Overcoming Reading Challenges
 - Dealing with Digital Eye Strain
 - Minimizing Distractions
 - Managing Screen Time
- 11. Cultivating a Reading Routine Active Power Factor Correction Using Switching Regulators
 - Setting Reading Goals Active Power Factor Correction Using Switching Regulators
 - Carving Out Dedicated Reading Time
- 12. Sourcing Reliable Information of Active Power Factor Correction Using Switching Regulators
 - Fact-Checking eBook Content of Active Power Factor Correction Using Switching Regulators
 - Distinguishing Credible Sources

13. Promoting Lifelong Learning
 - Utilizing eBooks for Skill Development
 - Exploring Educational eBooks
14. Embracing eBook Trends
 - Integration of Multimedia Elements
 - Interactive and Gamified eBooks

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