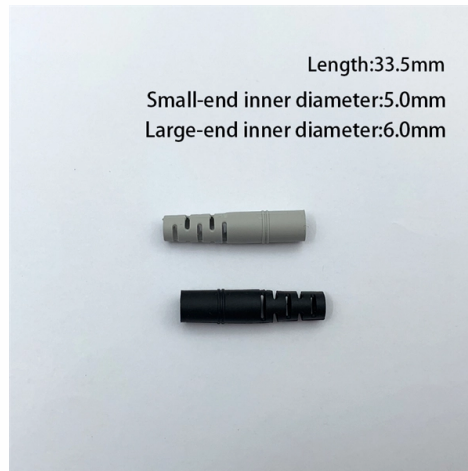


New High-Frequency Switching Power Supply for Smart Cities



Overview

Modeling and Simulation of High-frequency Switching Power Supplies The growing demand for smaller, lighter, and more efficient electronic devices has spurred.

Key Takeaways

High-frequency switching power supplies (HF-SMPS) are enabling compact, efficient, and resilient power solutions for smart city infrastructure, integrating renewable energy, EV charging, and smart grid technologies. Overview of HF-SMPS Technology High-frequency switching power supplies operate by rapidly switching semiconductor devices, such as transistors, at frequencies typically ranging from tens of kilohertz to several megahertz. This high-frequency operation allows for smaller passive components like inductors and capacitors, resulting in compact, lightweight, and energy-efficient designs suitable for urban infrastructure applications.

Modern HF-SMPS designs also improve power quality, reduce total harmonic distortion, and provide faster transient response, which is critical for dynamic loads in smart cities.

Applications in Smart Cities



Smart Grids and Transformers: HF-SMPS are integral to smart transformers (STs) and solid-state transformers (SSTs), which enable bidirectional power flow, voltage regulation, fault current limiting, and harmonic suppression. These transformers support integration of renewable energy sources and distributed generation, ensuring reliable and high-quality power for urban areas. **Electric Vehicles and Data Centers:** The growing demand for short-duration, high-intensity EV charging and dynamic loads at AI data centers requires resilient and adaptive power systems.

HF-SMPS provide the necessary fast control loops and high efficiency to handle these variable loads while minimizing energy losses. **Renewable Energy Integration:** HF-SMPS facilitate efficient conversion of solar and wind energy, enabling smart city grids to incorporate distributed energy resources (DERs) while maintaining stability and reducing greenhouse gas emissions.

Technical Advantages

Miniaturization: High-frequency operation reduces the size of magnetic and capacitive components, allowing for space-efficient installations in urban environments. **High Efficiency:** Advanced semiconductor devices and soft-switching techniques reduce conduction and switching losses, achieving conversion efficiencies above 95% in smart transformer prototypes. **Improved Power Quality:** High-frequency switching pushes harmonic content away from the fundamental frequency, simplifying filtering and improving overall grid stability.

Dynamic Response: Faster switching enables rapid adaptation to load changes, essential for smart city applications with fluctuating demand. **Cost and Operational Savings:** Smaller, lighter components reduce installation, maintenance, and operational costs, while improving energy efficiency and reducing electricity bills.

Market Trends

The HF-SMPS market is projected to grow from \$15 billion in 2025 to approximately \$25 billion by 2033, driven by renewable energy adoption, EV infrastructure, 5G networks, and smart city initiatives. Voltage mode control remains dominant, but current mode control is gaining traction for applications requiring superior transient response. Challenges such as electromagnetic interference and high initial costs are being mitigated through technological advancements and economies of scale.

Conclusion High-frequency switching power supplies are transformative for smart city energy systems, offering compact, efficient, and resilient solutions for integrating renewable energy, EV charging, and smart grid technologies. Their adoption in smart transformers and solid-state transformers ensures reliable power quality, rapid response to dynamic loads, and reduced operational costs, making them a cornerstone of modern urban infrastructure.

Article Content

Modeling and Simulation of High-frequency Switching Power Supplies

The growing demand for smaller, lighter, and more efficient electronic devices has spurred significant research into the modeling and simulation of high-frequency switching power supplies.

Deep Dive into High-Frequency Switching-Mode Power Supply ...

The High-Frequency Switching-Mode Power Supply (HF-SMPS) market is booming, projected to reach \$25 billion by 2033, driven by renewable energy, EVs, and data centers. Explore

Soft-Switching Smart Transformer Design and Application for ...

The dynamic and experimental results of the proposed bidirectional smart transformer demonstrate the success in preventing power quality problems for photovoltaic integrated smart city

Power Supply Solutions: The Invisible Force That Keeps Smart Cities

MASL delivers engineered power solutions that keep smart cities alive — no matter the grid, the weather, or the demand. Because in a connected city, real intelligence starts with power that...

IoT-based Smartgrid System for Continuous Power Supply in Smart

This research investigates an uninterrupted power supply model in terms of a smart grid by integrating an IoT-based microgrid system for smart cities. This case study has been investigated by creating a

PowerPlus High Frequency Power Supply | NWL

NWL first developed the PowerPlus™ switch mode power supply (SMPS) to provide an integrated high voltage system for electrostatic precipitator applications. With

High-frequency switch mode power supply supports high pulse

The new AWG by Astrodyne TDI can support high pulse currents and peak power, input overhead voltage to overcome lead inductance during pulse rise time, and manage repetitive peak

Wireless energy: Paving the way for smart cities and a greener future

Combining WPT with renewable energy, electric vehicles, and recharge infrastructure is a promising new application for smart city development.

Switching loss analysis of IGBT and MOSFET in single phase

Here we are comparing the most widely used semiconductor switches like Insulated Gate Bipolar Transistor (IGBT) and Metal Oxide Semiconductor Field Effect Transistor (MOSFET). A

Press | Company | Siemens

Expansion of production of high-efficiency power distribution systems for data centers, e-mobility and industrial automation Expansion of Frankfurt switchgear factory, new supplier facility in

stemnet2.txt · 60856c1d2f06b2e3d4cea3560375fd3cf447af61 · etcart ...

etcart / 60856c1d2f06b2e3d4cea3560375fd3cf447af61 Switch branch/tag RIVet stemnet2.txt Find file Blame History Permalink added sorted cache for slower harddrives · 60856c1d etcart committed May

Smart energy systems for sustainable smart cities: Current developments ...

Reliable, efficient and low carbon energy supply is one of the key requirements for next generation smart cities . The close proximity of multiple energy vectors like electric power, heat

Technological advancements toward smart energy management in smart cities

Abstract This comprehensive review paper examines the technological advancements towards smart energy management in smart cities. It provides an overview of the concept of smart

Integrated Very-High-Frequency Switch Mode Power Supplies: Design ...

This paper presents a power supply using an increased switching frequency to minimize the size of energy storing components, thereby addressing the demands for increased power

The Design of High Frequency LLC Switching Power Supply

The combination of LLC resonant converter and GaN device can further improve the switching frequency and power density of the power supply. In order to meet the needs of power

Soft-Switching Smart Transformer Design and Application for ...

Smart city power distributions have become promising technologies to meet the demand for energy in developed countries. However, increase in smart grids causes several power quality

High Frequency Power Electronics at the Grid ...

High Frequency Power Electronics at the Grid Edge: A Bottom Up Approach towards the Smart Grid Minjie Chen, H. Vincent Poor High Frequency Power Electronics at the Grid Edge: Motivations

Energy and Sustainable Development in Smart Cities: An Overview

Smart cities are an innovative concept for managing metropolitan areas to increase their residents' sustainability and quality of life. This article examines the management and evolution of

Contact Us

Continue your research online:

Website: <https://metramarket.es>

Technical inquiry: <https://metramarket.es/contact.html>

This document is for preliminary research. Verify specifications against current standards, product documentation and project requirements.

