

What are the power supply systems for high-frequency communication

Article Overview

High-frequency communication systems require highly efficient, stable, and compact power supplies capable of supporting both high-speed digital circuits and analog components, often using advanced AC/DC and DC/DC conversion topologies.

Key Design Considerations

Efficiency and Power Density: Modern communication systems, including 5G base stations and AI data centers, demand high-efficiency power supplies to minimize energy loss and heat generation. High-density PSUs, such as the 3.3 kW and 8 kW high-frequency units, achieve peak efficiencies above 97% while maintaining compact form factors, enabling integration into space-constrained environments .

Voltage Regulation and Multiple Outputs: Communication systems often require multiple tightly regulated low-voltage supplies for digital ASICs, FPGAs, and high-voltage analog circuits. Distributed voltage bus architectures, such as the +12V Intermediate Bus Architecture (IBA), allow efficient conversion from a -48V telecom bus to multiple low-voltage outputs using point-of-load (POL) modules or hybrid isolated converters .

High-Frequency AC and DC Conversion: High-frequency AC power supplies, like the DF-CM series, provide stable, precise sine wave outputs over a wide frequency range (200 Hz to 2500 Hz), suitable for testing, calibration, and operation of high-frequency communication equipment . On the DC side, advanced topologies such as interleaved bridgeless totem-pole AC/DC converters and GaN half-bridge LLC DC/DC converters offer low total harmonic distortion (THD), isolation, and fast transient response .

Redundancy and Reliability: Telecom power supplies must ensure uninterrupted operation. Designs often include N+1 redundancy, backup batteries, or generators. Active-clamp forward converters (ACFC) are commonly used to convert -48V DC to positive voltages with soft switching, reducing EMI and switching losses while protecting primary switches .

Integration and Compactness: Highly integrated power ASICs, such as LM5041 and LM5030, allow embedding isolated power supplies directly onto motherboards or line cards, reducing PCB area and component count while maintaining efficiency . This is critical for high-frequency systems where space and thermal management are constraints.

Practical Implementation

- o **Front-End AC/DC Conversion:** Provides power factor correction (PFC) and regulates intermediate bulk voltage. Interleaved or bridgeless topologies improve efficiency and reduce harmonic distortion .
- o **Back-End DC/DC Conversion:** GaN-based half-bridge or full-bridge LLC converters provide isolated, regulated outputs for sensitive digital and analog loads .
- o **Point-of-Load Modules:** Small, surface-mount POL converters supply multiple low-voltage rails efficiently, often in SIP or SMD packages .
- o **High-Frequency AC Supplies:** For laboratory or industrial testing, units like the DF-CM series offer

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adjustable voltage and frequency ranges with precise digital control and monitoring .

Summary

High-frequency communication systems require power supplies that combine high efficiency, precise voltage regulation, high power density, and reliability. Advanced AC/DC and DC/DC topologies, high-frequency AC supplies, and integrated POL modules are essential to meet the demands of modern telecom infrastructure, including 5G networks, AI data centers, and high-speed digital communication equipment .

This paper summarizes the contributions in recent years in application of very high frequency (VHF) technologies in

High-frequency AC (HFAC) power distribution systems have been the subject of great interest over the last several decades. This

A wide range of power-line communication technologies is needed for different applications, ranging from home automation to

High-voltage module power supplies, with their high integration, high efficiency, and flexible configuration, have become crucial for

High frequency electronics refers to electronic devices and systems that operate at high frequencies, typically in the microwave

For historical, practical, and technical reasons, telecom systems typically utilize a -48 V DC power supply. In the

This high-frequency switching reduces the size of passive components like inductors and capacitors, leading to compact power

This presentation provides a brief overview of HF, HF Communications, introduces its primary capabilities and

High-Frequency Integrated Circuits - February 2013 Wireless and fiber-optic communication systems Communication

HF wideband Beyond line of sight communications BLOS communications - HF vs. SATCOM High frequency (HF) hardware and

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Evolution of Very High Frequency Power Supplies Abstract: The ongoing demand for smaller and lighter power

High-frequency products, or high-frequency power supply components, are crucial for electronics. Learn how using custom

Increasing data transmission rates and bandwidth both belong to the challenges of the development of high-performance wireless

Get a full breakdown of high frequency communication circuits--from analog to digital types, PCB layout tips, and

This paper presents a power supply using an increased switching frequency to minimize the size of energy storing

L3Harris HF systems, including ARGUS-HF and the AN/PRC-160, deliver assured voice and data, even in the most

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