

Article Overview

The AI server power supply (PSU) converts and regulates electrical power to meet the high, fluctuating demands of AI servers while ensuring efficiency, reliability, and system stability.

Core Functions

Power Conversion and Regulation: AI server PSUs convert AC input from the data center into stable DC voltages required by CPUs, GPUs, and AI accelerators. They maintain precise voltage levels to support high-performance components that demand rapid and consistent power delivery . **Handling High Power and Peak Loads:** AI servers, especially those with multiple GPUs or AI accelerators, can consume up to 6000 watts per unit, with peak loads significantly higher. PSUs are designed to manage these peaks using energy buffers, such as capacitor backup units (CBUs) or power pulsation buffers (PPBs), preventing grid overload and ensuring uninterrupted operation . **Efficiency and Thermal Management:** Modern AI PSUs employ advanced wide bandgap devices like silicon-carbide (SiC) and gallium-nitride (GaN) transistors, which allow higher switching frequencies, reduced losses, and improved thermal performance. This enhances energy efficiency and reduces heat generation in dense server racks . **Digital Control and Monitoring:** AI server PSUs integrate microcontrollers with digital signal processing (DSP) capabilities to optimize power distribution in real time. These controllers manage algorithms for power factor correction, synchronous rectification, and predictive maintenance, ensuring reliable operation and minimizing downtime . **Redundancy and Reliability:** To prevent interruptions during critical AI workloads, multiple PSU modules are often deployed in parallel. This redundancy ensures continuous power delivery even if one module fails, which is crucial for AI model training and inference tasks . **Support for Scalable AI Infrastructure:** AI PSUs are designed to accommodate high-density server racks and evolving AI workloads. They provide fast transient response, robust isolation, and scalable power delivery to support GPUs, TPUs, and other accelerators in hyperscale data centers .

Summary

In essence, the AI server power supply is not just a power converter; it is a sophisticated system that ensures stable, efficient, and reliable power delivery to meet the extreme and dynamic demands of AI computing. Its functions include power conversion, peak load management, digital control, efficiency optimization, and redundancy, all of which are critical for maintaining uptime and performance in modern AI data centers .

Digital power conversion and advanced algorithms play a crucial role in maintaining peak efficiency for these power

Energy supply for AI Global electricity supply to meet data centre demand Global electricity generation to

The Role of AI Server Power Supply

The AI server PSU market is propelled by the exponential growth of AI adoption across various industries, the

To support GPUs, AI servers require 3~10 times higher power than traditional servers. The GPU, which supports 48 V, has changed

Anticipate innovations like AI-controlled power supplies that monitor and optimize energy distribution based on real

Choosing the right power supply ensures not only the smooth operation of AI servers but also provides assurance for

Most of the electricity used by data centers - about 60% on average, the IEA reports - powers the servers that

Infineon's 8-kW reference design for data centers features Si, SiC, and GaN technologies to help quench AI's thirst for

0. Abstract As the demand for AI servers continues to grow, traditional power systems are facing critical limitations. In conventional

AI will be the most significant driver of this increase, with electricity demand from AI-optimised data centres projected

Abstract The rapid growth of artificial intelligence (AI) is driving an unprecedented increase in the electricity demand of

Server power supplies benefit from SiC rectifiers and PFC circuits, contributing to overall energy savings. Battery

In addition, we considered how Infineon is working on innovative power solutions designed to make AI processing in

Comparing Power Supply Technologies in AI Data Centers and Telecom Why SiC is the Right Fit With the onset of 5G Networks, we

Powering the Next Era of AI Infrastructure As AI data centers scale toward multi-megawatt clusters and rack densities approach one

Within the power tray, the PSU serves as the primary power conversion and conditioning system for AI servers, transforming high

