



# **ROHM's 800VDC Architecture Solutions for AI Servers**

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## 0. Abstract

As the demand for AI servers continues to grow, traditional power systems are facing critical limitations. In conventional architecture, rising GPU power consumption leads to higher current flowing through the power cables, resulting in greater transmission losses and heat generation. To address this issue, supply voltages must be raised, thereby reducing the current flowing through the wiring. One architecture gaining significant traction is the **800VDC distribution system**.

Pioneered by NVIDIA, this approach not only enhances efficiency and power density, but also reduces copper cabling requirements, contributing to both performance optimization and environmental sustainability.

**ROHM** provides a comprehensive portfolio of power devices optimized for the power delivery block of the 800VDC architecture. In this system, the traditional centralized PSU is restructured:

- The ACDC conversion stage is relocated to a side-rack power source, where efficiency optimization is critical
- The DCDC stage remains within the IT rack, where maximizing power density is essential to free usable board area

Based on internal analysis, the optimal configuration is achieved by using **SiC (Silicon Carbide)** devices in the Power Source stage and **GaN (Gallium Nitride)** devices in the IT Rack.

This white paper presents estimated losses and board size calculations for each block and concludes with an overview of ROHM's SiC and GaN devices, including examples of their adoption in real-world applications.

## 1. Introduction

### 1-1) Market Trends

The exponential growth of AI hardware is placing unprecedented demands on data center power infrastructure. As rack-level power consumption climbs from tens and hundreds of kilowatts to the megawatt scale, the traditional 48VDC distribution architecture is reaching both its physical and economic limits. To overcome these challenges, the industry is shifting toward higher voltage DC distribution systems, with 800VDC architecture emerging as a leading solution.

This next-generation approach is designed for future megawatt-scale ‘AI factories,’ fundamentally restructuring data center power systems to deliver higher efficiency while dramatically reducing copper usage. In doing so, 800VDC represents a bold reimagining of AI infrastructure, one that enables maximum efficiency, sustainability, and scalability.

- **Limitations of Existing Architectures**

Rapid advancements in AI hardware are dramatically increasing both power consumption and density within data centers. In just a few years, the power requirements of AI accelerators have surged from 100W to over 1000W, pushing rack-level demands from 20–30kW to more than 100kW, with projections reaching up to 500 kW in the near future. Under these conditions, conventional power supply methods are approaching their physical and operational limits.

- **Increasing Power Demand in AI Server Applications**

The rapid rise in power consumption of high-performance AI servers—particularly GPUs—is driving a fundamental rethinking of data center power delivery. Traditional multi-stage conversion systems incur substantial energy losses, making efficient power delivery increasingly challenging.

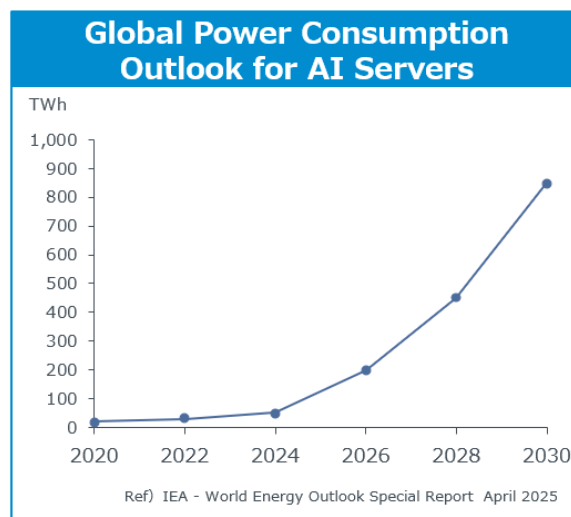


Figure 1. Global Power Consumption Outlook for AI Servers

- **Reducing Conversion Stages to Improve Efficiency**

Higher voltage DC distribution offers a transformative solution. By minimizing the number of

conversion steps, 800VDC increases overall system efficiency, reduces component count, and lowers operational risk.

## ● Integrating Renewable Energy Sources

Meeting the energy requirements of next-generation data centers also demands greater use of renewable sources such as solar and wind. An 800VDC grid provides an ideal framework for integrating renewables directly into the distribution system, simultaneously enhancing sustainability and improving power delivery efficiency.

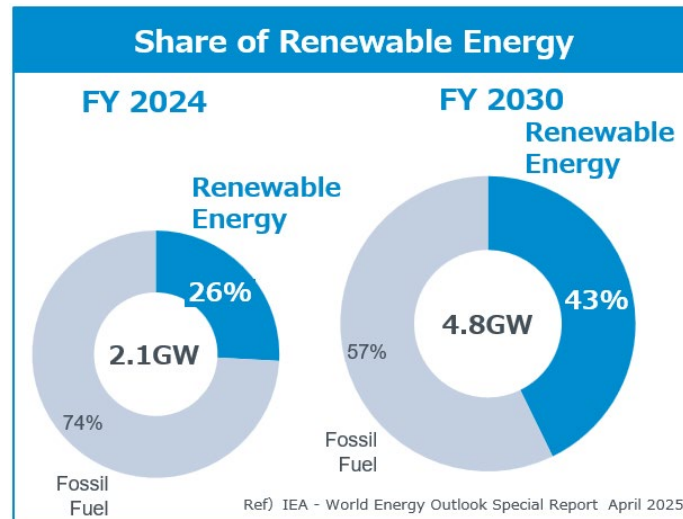


Figure 2. Share of Renewable Energy

## ● High-Density AI Server Racks

Rather than simply increasing the number of server racks, modern data centers are trending toward densification—adding more CPUs, GPUs, and functional boards within each rack. This approach significantly increases the computing power per rack, maximizing performance within limited physical space.

All of these applications rely on SiC and GaN power semiconductors.

## 2. The Need for 800VDC Architecture

### 2-1) Limitations of Legacy Architectures

Traditional low-voltage distribution systems (e.g., 48V or 12V) are increasingly unable to meet the demands of AI and High-Performance Computing (HPC) workloads. As rack power requirements scale beyond 100kW, several critical issues emerge:

- **Excessive Power Loss:** Delivering high power at low voltage requires extremely large currents, resulting in severe resistive losses ( $P_{loss}=I^2R$ ). This leads to wasted energy and increased heat generation.

## 800VDC Architecture Solutions for AI Servers [ROHM White Paper]

- **Physical Constraints:** High current necessitates the use of thick, heavy copper cables. These cables take up valuable rack space, restrict airflow, and significantly increase both material and infrastructure costs.
- **Scalability Limits:** Conventional architectures have reached their physical and practical limits in supporting the extreme power densities of modern AI server racks, which frequently exceed 100 kW.

### 2-2) Evolution of Sidecar Racks and Power Supply Units (PSUs)

To overcome these limitations, the data center industry is transitioning to a more efficient power delivery model. One key innovation is the sidecar rack configuration, which offers several advantages.

- **Improved Rack Density:** By relocating the ACDC conversion units (PSUs) from the main server rack to a dedicated sidecar rack, valuable space is freed for IT equipment and advanced cooling systems.
- **Increased Efficiency and Simplicity:** The sidecar model delivers power at a higher voltage (such as 800V DC), reducing current requirements and simplifying power distribution while enhancing efficiency.

### 2-3) Benefits of the 800VDC Architecture

The **800VDC** architecture represents a revolutionary design tailored for next-generation AI infrastructure. Key benefits include:

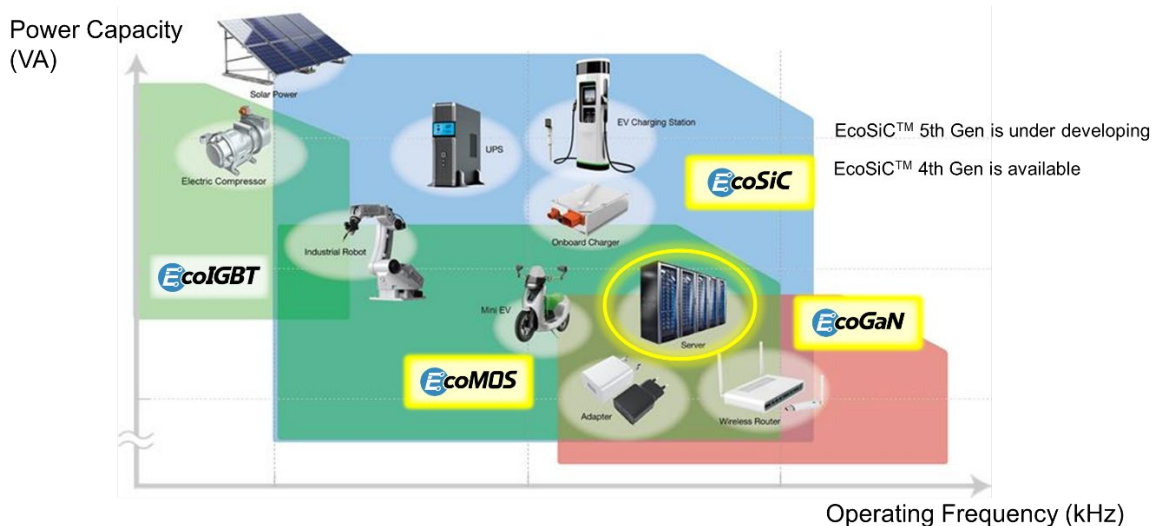
- **Maximum Efficiency:** By converting 13.8kV AC grid power directly to 800VDC at the data center entrance, intermediate conversion stages are eliminated, increasing overall power efficiency by up to **5%<sup>\*1</sup>**.
- **Reduced Copper Usage:** Doubling the voltage halves the current required to deliver the same amount of power. This enables the use of thinner cables and reduces copper usage by up to **45%<sup>\*1</sup>**, lowering cost while reducing cable weight and volume, improving cooling efficiency.
- **Support for Extreme Power Density:** The 800VDC system is engineered to safely and efficiently handle even the most demanding AI workloads, which can exceed 1MW per rack.

\*1: Source: <https://developer.nvidia.com/blog/nvidia-800-v-hvdc-architecture-will-power-the-next-generation-of-ai-factories/>

## 3. Recommended Topologies for 800VDC Systems

### 3-1) Power Device Selection

ROHM offers both SiC and GaN devices, which are essential for achieving high efficiency and power density in 800VDC architectures. The distinct characteristics of each device type are illustrated in Figure 3. As shown, EcoSiC™, which leverages EcoMOS™ technology, excels in high-power applications, while EcoGaN™ delivers superior high-frequency switching performance.



**Figure 3. Eco Family Application Range**

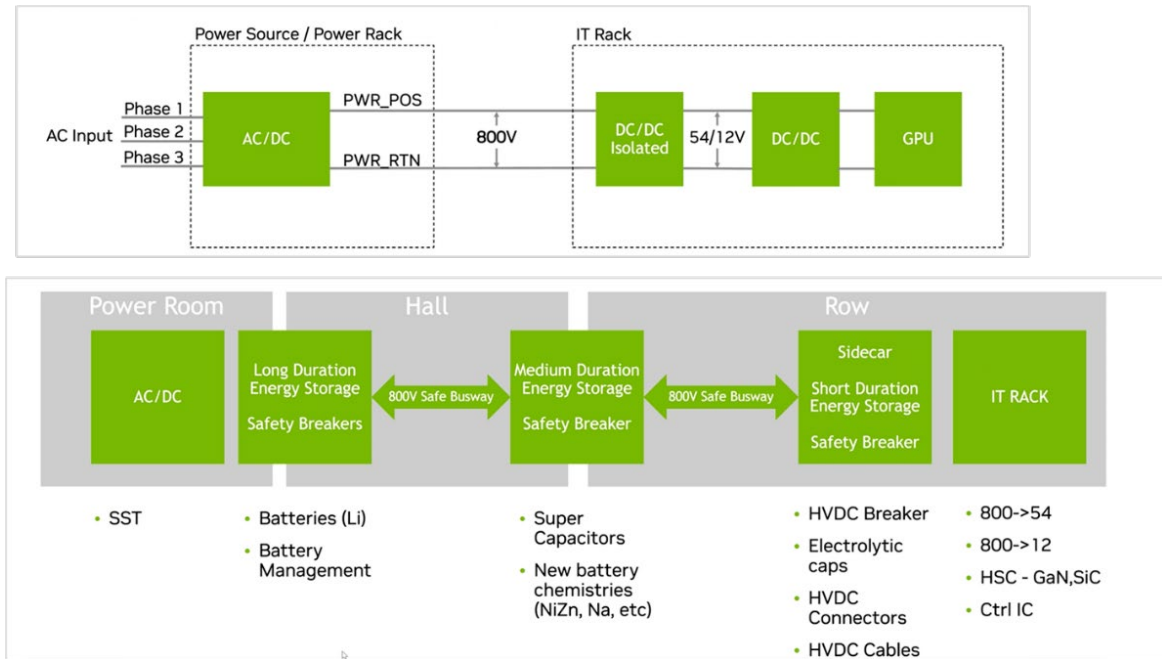
SiC devices are inherently suited to high-power applications due to their low resistance and high current delivery in discrete form. This makes EcoSiC™ the preferred choice for server systems requiring robust power delivery.

In contrast, EcoGaN™ offers significant advantages in high-frequency applications. The HEMT structure of GaN devices achieves dramatically lower gate charge (Qg) and output charge (Qoss) compared to SiC. This enables faster switching with lower losses while also allowing the miniaturization of peripheral components, boosting overall system power density.

### 3-2) 800VDC System Overview

In 800VDC architecture, the ACDC conversion stage is relocated from the server rack to a dedicated Power Source rack (Figure 4). This shift enables more efficient topologies to be deployed compared to conventional systems.

# 800VDC Architecture Solutions for AI Servers [ROHM White Paper]

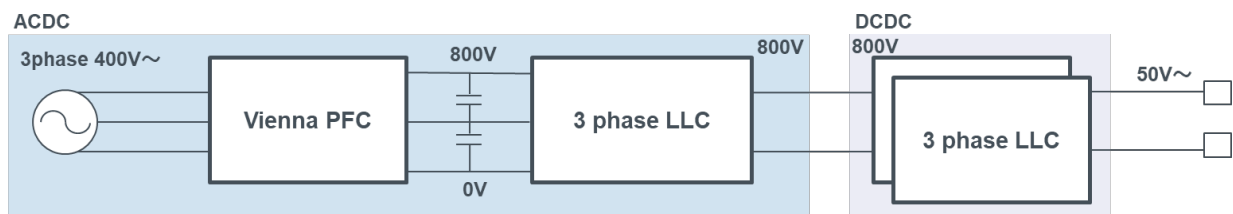


**Figure 4. 800VDC Architecture Block Diagram**

## SiC-Based 800VDC Architecture

SiC power devices have gained widespread adoption in industrial and automotive markets due to their superior performance as wide-bandgap solutions. For AI server systems requiring both higher power and efficiency, SiC is particularly well-suited for 800VDC systems due to its 1200V high-voltage capabilities. ROHM provides a complete range of power solutions, including advanced discrete packages and modules, designed to maximize power density.

The following sections outline optimal solutions for the Power Source (ACDC) and IT Rack (DCDC block) topologies.



**Figure 5. 800VDC Architecture Power Tree**

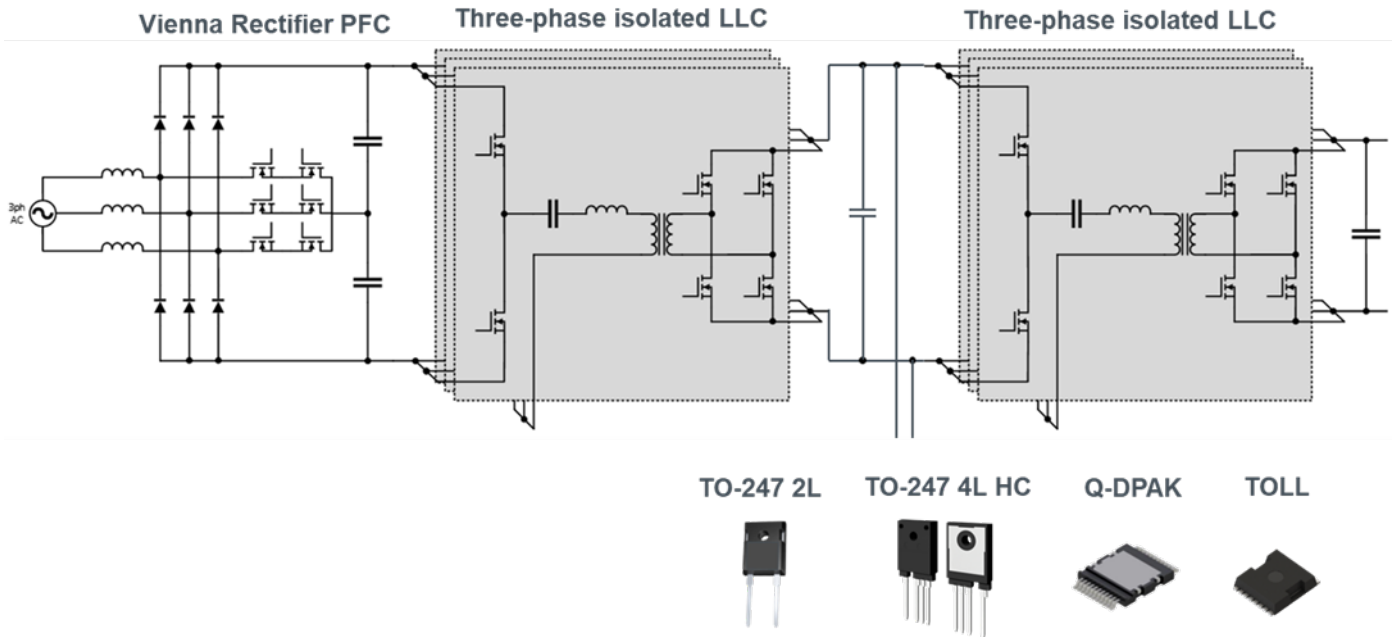


Figure 6. 800VDC Block Diagram

### 3-3) Power Source / Side Power Rack Design

Existing ACDC converters typically target the 20kW to 33kW range, with output power levels expected to scale even higher. For 800VDC systems, ROHM recommends an optimal ACDC topology that combines a Vienna Rectifier PFC with a three-phase isolated LLC converter (Fig. 7).

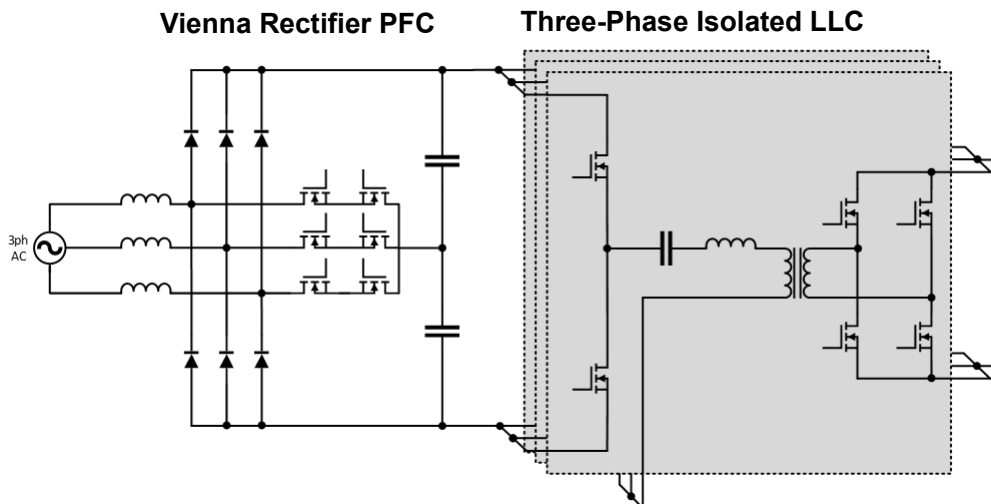


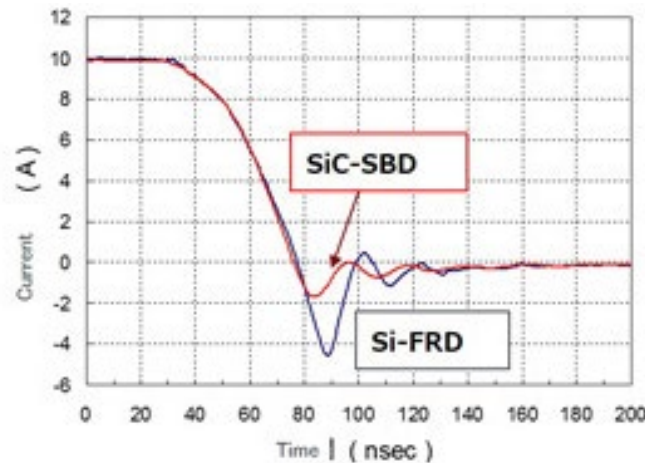
Figure 7. Circuit Diagram of Vienna Rectifier PFC and Three-Phase Isolated LLC Converter

The Power Source consists of a Vienna rectifier that converts three-phase 400VAC to 800VAC, followed by an LLC converter for galvanically isolated 800VDC output. High efficiency is paramount for this stage.

Operating in a three-level configuration, the rectifier applies only half the voltage to switching

devices compared to a conventional two-level PWM rectifier (B6). This reduces switching losses and enables the use of lower-Ron, lower-voltage components for improved efficiency. Additionally, the three-level operation produces smaller voltage changes across the inductor, leading to lower ripple current and reduced noise.

The diodes used in Vienna rectifiers require 1200V rating and excellent recovery characteristics, making SiC SBDs the ideal choice. Unlike Si FRDs, SiC SBDs are unipolar and do not accumulate minority carriers, eliminating recovery loss (Figure 8).



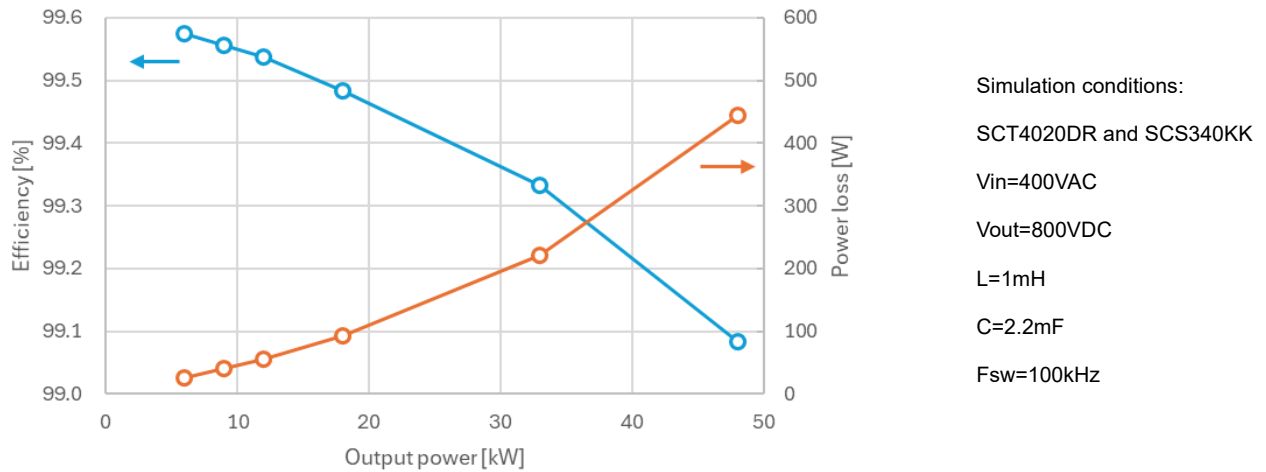
**Figure 8. Reverse Recovery Current Waveforms of Si FRDs and SiC SBDs**

For the bidirectional switches, back-to-back devices rated at 650V or higher are typically used. This configuration doubles the conduction resistance, making low on-resistance, fast-switching characteristics essential. ROHM's 750V-rated SiC MOSFETs meet these requirements, combining industry-leading low Ron with high-speed switching performance, optimizing performance in hard-switching environments. (see Fig. 22 Recommended Parts List)

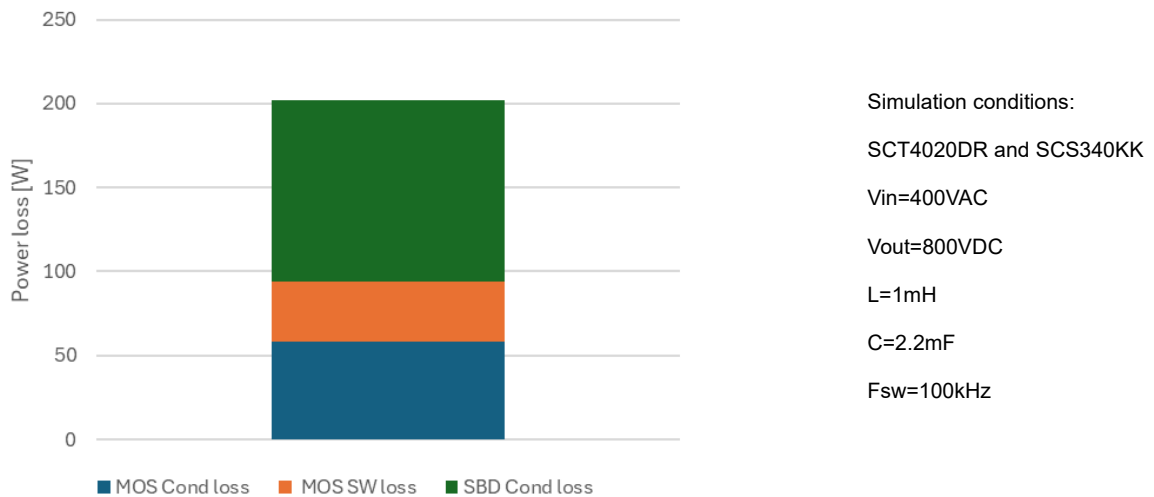
ROHM also offers a DOT-247 package that integrates two SiC MOSFETs in a common-source configuration. The optimized design reduces parasitic inductance, enabling high-speed switching while contributing to miniaturization by requiring fewer components than conventional discrete implementations. (see Fig. 24)

Simulation results for the conversion efficiency and power loss in the Vienna rectifier are shown in Fig. 9. Note that simulations account for power device losses but exclude peripheral components such as reactors and capacitors. PLECS<sup>®</sup> was used for all simulation calculations. This methodology applies to all subsequent simulation analyses. The results demonstrate a conversion efficiency exceeding 99% at up to 50kW. Fig. 10 provides a detailed breakdown of power losses for SiC MOSFETs (conduction + switching losses) and SiC SBDs (conduction loss) at 33kW output power.

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**Figure 9. Simulation Results of Efficiency and Power Losses vs Output Power in a Vienna Rectifier PFC**



**Figure 10. Breakdown of Power Losses for the Vienna rectifier PFC in a Power Rack (Pout=33kW)**

The three-phase LLC converter utilizes resonant operation to minimize switching losses during MOSFET turn-ON, enabling high-efficiency power conversion. ROHM recommends 1200V-rated SiC MOSFETs for both the primary and secondary sides.

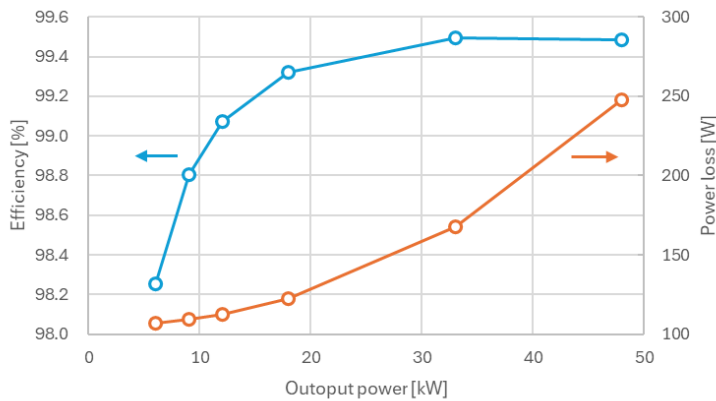
Although ZVS operation eliminates turn-ON losses, the primary-side devices undergo hard switching at turn-OFF. Therefore, fast-switching SiC MOSFETs are ideal to maximize efficiency.

Fig. 11 illustrates the simulation results for conversion efficiency and power losses of the three-phase LLC converter under defined operating conditions. To prioritize efficiency, the transformer's excitation inductance was intentionally set high, making further efficiency improvements challenging. The design achieves approximately 99.5% efficiency at 33kW. Fig. 12 breaks down power losses for the primary-side SiC MOSFETs (turn-OFF and conduction losses) and secondary-side SiC MOSFETs (conduction loss) at 33kW output. Turn-OFF losses account for

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approximately 60% of total circuit losses, underscoring their significant impact on LLC converter efficiency.

It should be noted that the large excitation inductance setting used in this simulation requires careful consideration. While this approach reduces conduction and turn-off losses in the primary-side MOSFETs, it also degrades load response and line regulation performance. Accordingly, designers must assess whether this trade-off is acceptable within the context of the overall system requirements before finalizing the LLC converter design.



Simulation conditions:

SCT4011KR, and SCT4018KR

Vin=800VDC

Vout=800VDC

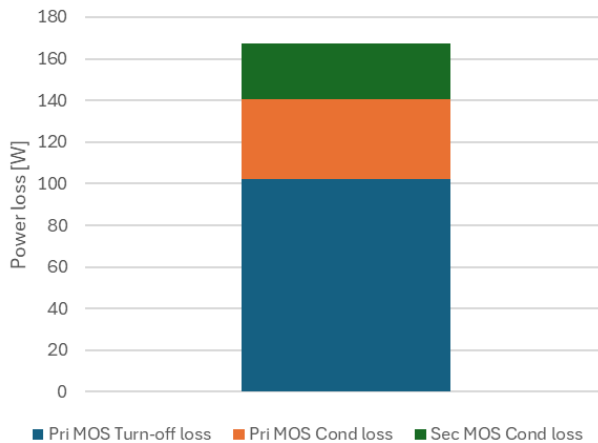
Pout=33kW

Cr=220nF

Lr=7.3μH

Lm=73μH

**Figure 11. Simulation Results of Efficiency and Power Loss vs Output Power of a Three-phase LLC Converter in a Power Rack**



Simulation condition

SCT4011KR, and SCT4018KR

Vin=800Vdc

Vout=800Vdc

Pout=33kW

Cr=220nF

Lr=7.3μH

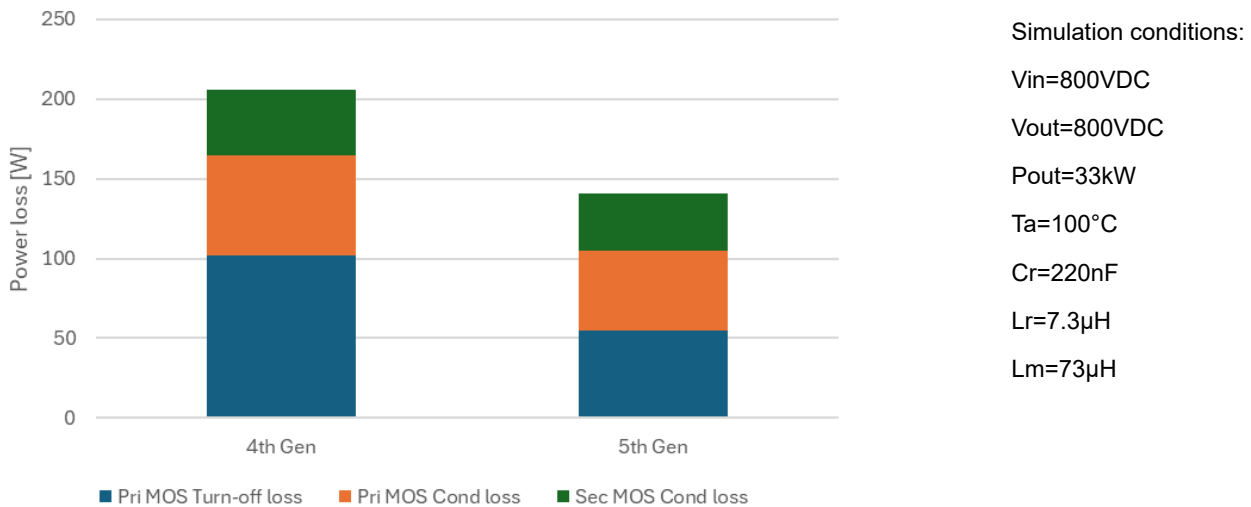
Lm=73μH

**Figure 12. Breakdown of Power Losses in Simulation Results for a Three-phase LLC Converter in a Power Rack (Pout=33kW)**

ROHM is currently developing 5<sup>th</sup> Gen SiC MOSFETs that reduce normalized ON resistance by approx. 30% vs 4<sup>th</sup> Gen devices. This enables low-loss operation under the demanding high-temperature, heavy-load environments of AI servers. What's more, the expanded negative gate voltage bias rating (Vgsn) supports operation down to -5V (with a Vgsn DC rating of -7V), further reducing loss through faster turn-OFF operation. Simulation results (Fig. 13) show that at 33kW

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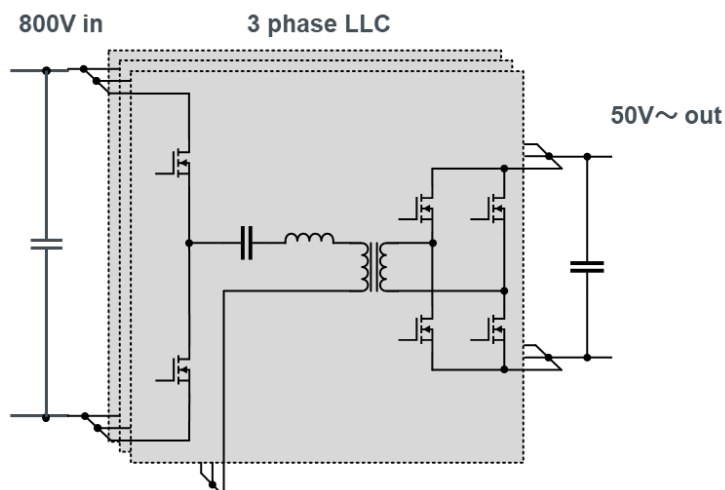
and 100°C, 5<sup>th</sup> Gen MOSFETs reduce total losses (conduction + switching) by ~33% compared to 4<sup>th</sup> Gen devices, contributing to improved overall efficiency.



**Figure 13. Comparison of Power Losses in 4<sup>th</sup> Gen and 5<sup>th</sup> Gen MOSFETs in a Three-Phase LLC Converter (Ta=100°C)**

## 3-4) IT Rack Configuration

To step down from the 800VDC bus voltage distributed to server racks into downstream supply voltages, an isolated DCDC converter block is required. Because this block is implemented inside the rack, improving power density - defined as the output power per unit volume - is a critical design metric. ROHM recommends a three-phase LLC converter topology (Fig. 14) for achieving the necessary power density.

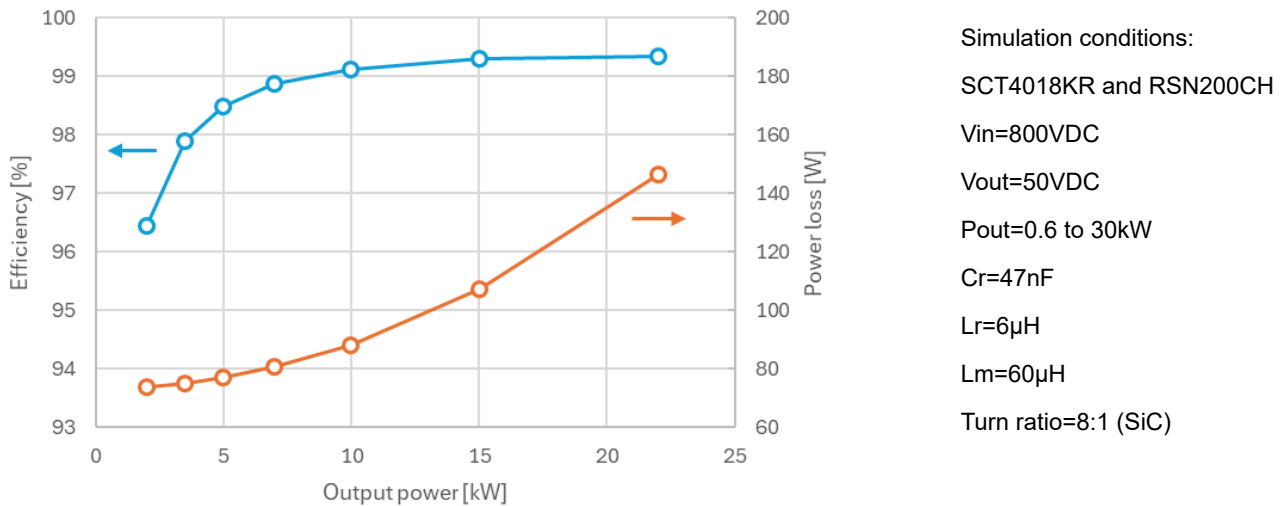


**Figure 14. Circuit Diagram of a Three-Phase Isolated LLC Converter**

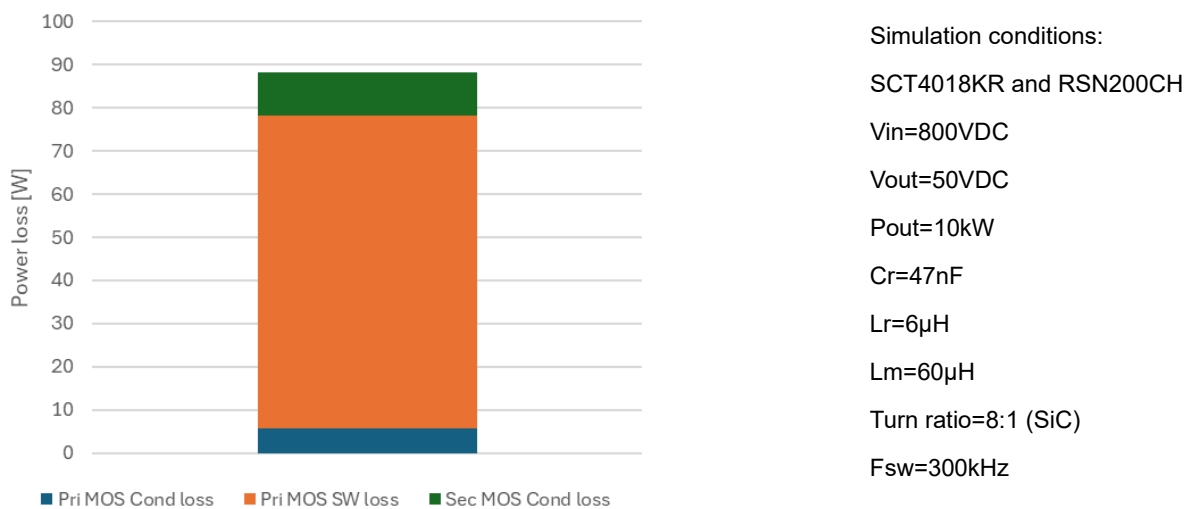
## 800VDC Architecture Solutions for AI Servers [ROHM White Paper]

ROHM recommends 1200V SiC MOSFETs for the primary-side circuit of LLC converters. Their low switching losses support higher switching frequencies, making it possible to reduce passive component size and increase overall power density.

For the secondary-side synchronous rectification, ROHM suggests Si MOSFETs rated at 80V or higher to ensure efficient voltage conversion and reliable operation. Fig. 15 illustrates the conversion efficiency and power loss of the three-phase LLC converter (excluding losses from reactors, etc.), while Fig. 16 breaks down the power losses, focusing solely on those from power devices.



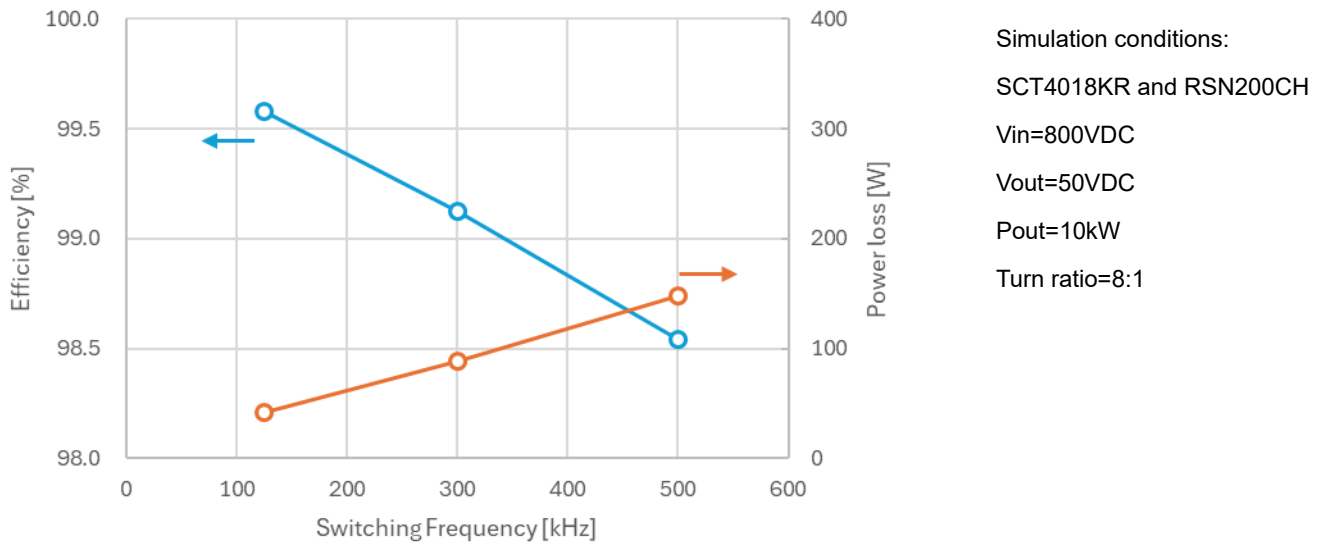
**Figure 15. Simulation Results of Efficiency and Power Loss vs Output Power of a Three-phase LLC Converter in an IT Rack**



**Figure 16. Breakdown of Power Losses in a Three-Phase LLC Converter in an IT Rack**

## 800VDC Architecture Solutions for AI Servers [ROHM White Paper]

The relationship between conversion efficiency and switching frequency at 10kW output is illustrated in Fig. 17.



**Figure 17. Simulation Results of Efficiency and Power Loss vs Switching Frequency of a Three-phase LLC Converter in an IT Rack**

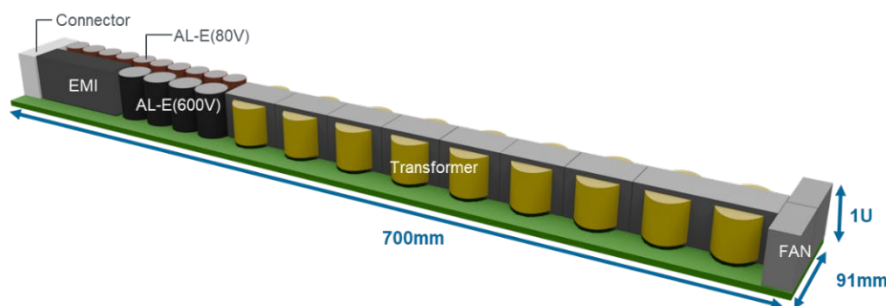
At switching frequencies of 125kHz or below, efficiency exceeds 99%. While higher frequencies allow for the miniaturization of passive components such as capacitors and transformers, efficiency declines as frequency rises. Thus, simply increasing the switching frequency does not guarantee higher power density.

By contrast, SiC devices operating at 100kHz enable a high-frequency single-stage power conversion architecture. To validate this, a design study was conducted for a 20kW IT rack using a three-phase LLC topology with three parallel modules. Transformer dimensions were calculated accordingly, resulting in the following rack specifications:

**Dimensions:** 40mm × 91mm × 700mm

**Power Density:** 7.8 W/cc (129 W/in<sup>3</sup>)

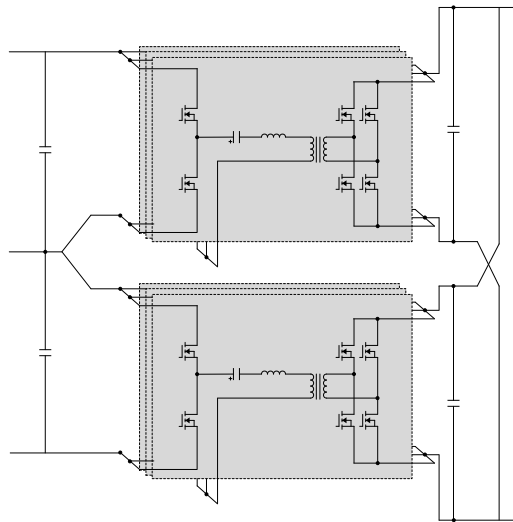
This configuration demonstrates the potential of SiC-based high-frequency designs to deliver compact, high-density power conversion suitable for next-generation AI server infrastructure.



**Figure 18. Board Size Estimation for IT Rack Using SiC**

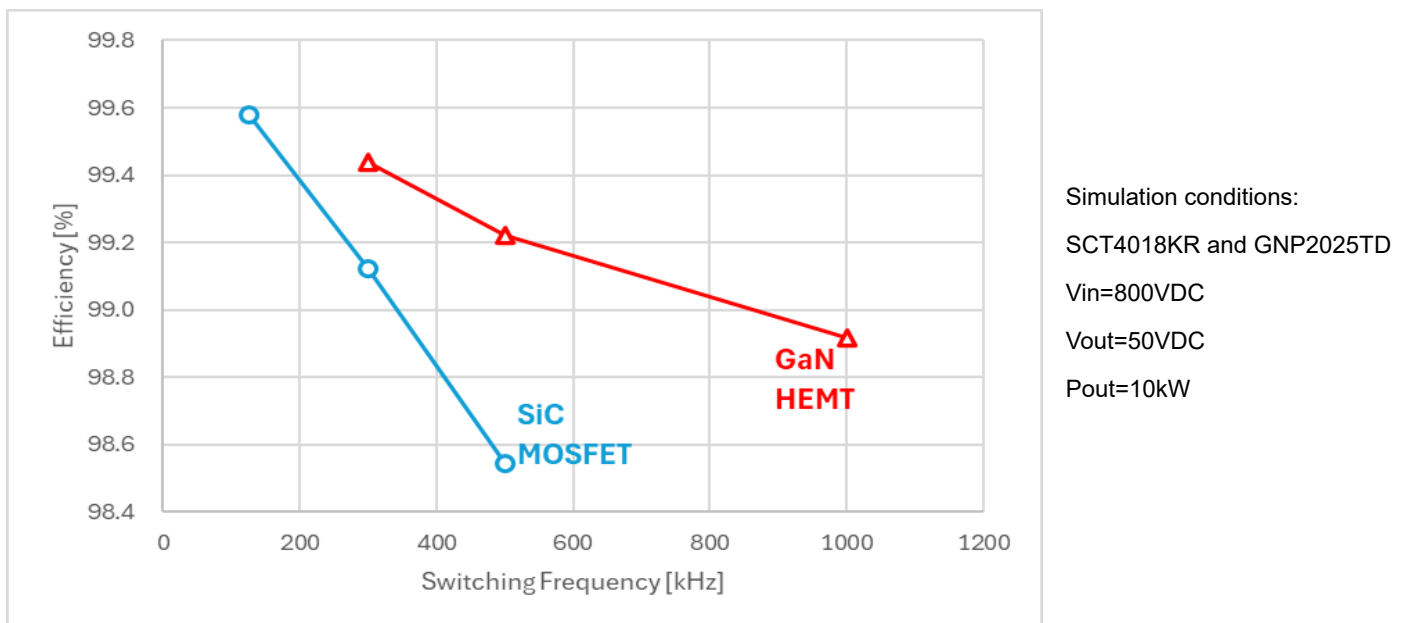
As a forward-looking solution, ROHM proposes a Cascade Three-phase LLC topology (Fig. 19) utilizing GaN devices on the primary side. Leveraging GaN technology allows for higher frequencies, which in turn enables the miniaturization of the transformer and surrounding components.

The cascade structure also halves the current flowing through the primary side and transformer, further improving efficiency. ROHM's recommends the GNP2025TD 650VGaN HEMT for this application.



**Figure 19. Circuit Diagram of Cascade Three-Phase Isolated LLC Converter Using 650V GaN HEMTs**

Simulation results (Fig. 20) show that GaN-based converters maintain 99% efficiency up to 500kHz, offering a pathway to even higher power densities.



**Figure 20. Simulation Comparison of Efficiency vs Switching Frequency of SiC MOSFETs and GaN HEMTs in a Three-phase LLC Converter for IT Rack Applications**

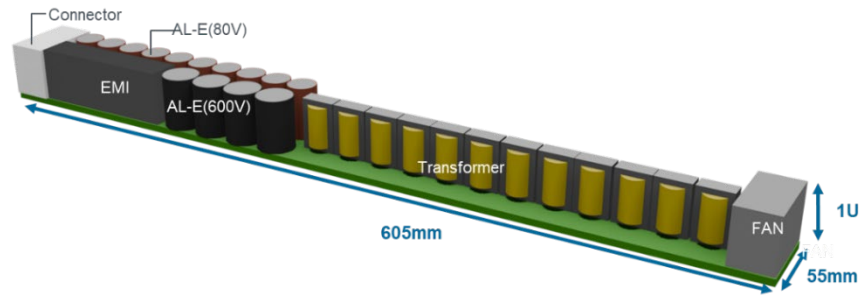
## 800VDC Architecture Solutions for AI Servers [ROHM White Paper]

A 20kW IT Rack using GaN HEMTs was also evaluated, yielding the following results:

**Dimensions:** 40mm × 55mm × 605mm

**Power Density:** 15 W/cc (246 W/in<sup>3</sup>)

This configuration highlights the advantages of GaN in achieving ultra-compact, high-density power delivery, making it ideal for future AI server deployments.



**Figure 21. Estimated Board Dimensions for IT Rack Using GaN**

## 3-5) Recommended Components

The following table summarizes the recommended part numbers for both the ACDC and DCDC stages described in the previous sections.

Power Rack		ACDC				
Topology	Device	Voltage	$I_D / I_F$	$R_{DS(on)}$ typ (25°C)	Part number	PKG
Vienna Rectifier PFC	SiC SBD	1200V	40A	-	SCS340KK	TO-247 2L
	SiC MOS	750V	105A	13mohm	SCT4013DR	TO-247 4L
72A			20mohm	SCT4020DR		
LLC Primary	SiC MOS	1200V	130A	11mohm	SCT4011KR* / SCT4011KRG*	TO-247 4L / TO-247 HC 4L
			158A	11mohm	SCT4011KQ*	Q-DPAK
			81A	18mohm	SCT4018KR / SCT4018KRG*	TO-247 4L / TO-247 HC 4L
LLC Secondary	SiC MOS	1200V	81A	18mohm	SCT4018KR / SCT4018KRG*	TO-247 4L / TO-247 HC 4L
			57A	27mohm	SCT4027KR* / SCT4027KRG*	

IT Rack		DCDC				
Topology	Device	Voltage	$I_D / I_F$	$R_{DS(on)}$ typ (25°C)	Part number	PKG
LLC Primary	SiC MOS	1200V	130A	11mohm	SCT4011KR* / SCT4011KRG*	TO-247 4L / TO-247 HC 4L
			158A	11mohm	SCT4011KQ*	Q-DPAK
			81A	18mohm	SCT4018KR / SCT4018KRG*	TO-247 4L / TO-247 HC 4L
	GaN	650V	59.7A	25mohm	GNP2025TD	TOLL-8N
-			18~50mohm	GNP30XXTD*	TOLL-8N	
LLC Secondary	Si MOS	80V	295A	1.43mohm	RS7N200CH*	DFN5060-8S
			450A	0.86mohm	RJ2N17BCH*	TOLL
		100V	200A	2.6mohm	RS7P200CH*	DFN5060-8S
			370A	1.35mohm	RJ2P17BCH*	TOLL
			200A	4.0mohm	RS7P200BM(WideSOA)	DFN5060-8S
			290A	2.2mohm	RJ2P17BBM(WideSOA)*	TOLL

**Figure 22. Recommend SiC Discrete Products for Power and IT Rack Circuits**  
(\*Under development)

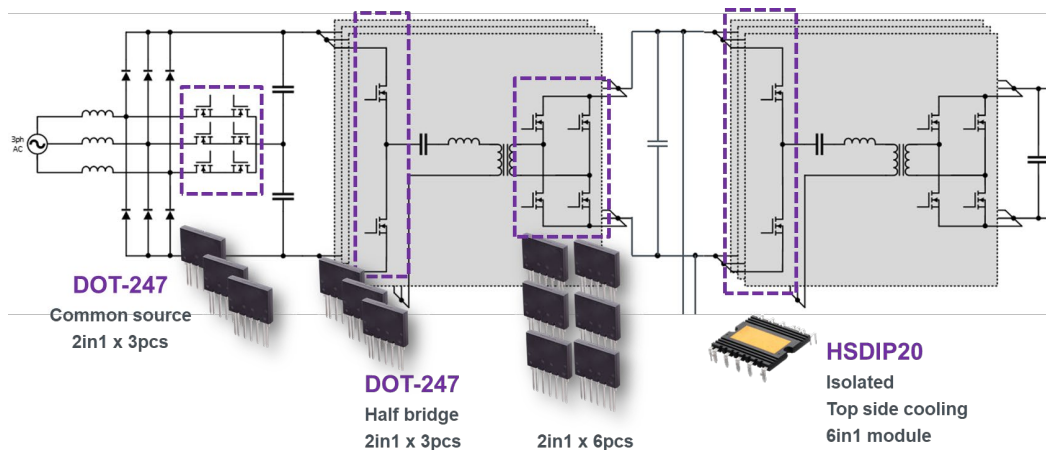
## 3-6) SiC Power Modules

While previous sections focused on solutions using discrete packages, the increasing power demands of AI servers are driving the need for integrated module-based solutions that can simplify design and improve thermal performance.

For the DCDC stage, ROHM recommends the DOT-247 (2-in-1) package in combination with the HSDIP20 (4-in-1/6-in-1) module (Fig. 24). While for the ACDC stage, the DOT-247 package, which integrates two or four TO-247 devices into a single package, is the optimal choice. It can be deployed in the bidirectional switches of Vienna Rectifier PFCs or in the front-end or back-end stages of three-phase LLC converters. Using the DOT-247 for the main switch in the ACDC section reduces component count to just 12 parts (compared to 24 to 30 with discrete TO-247s). In addition, the DOT-247's screwless mounting structure enhances heat dissipation compared to conventional products.

For the primary side of the three-phase LLC converter in the DCDC section, a surface-mount type DIP module is recommended. The 6-in-1 configuration consolidates all primary-side MOSFETs into a single module, enabling greater miniaturization.

The HSDIP20 further simplifies implementation with built-in isolation, a low-profile design, and top-side heat dissipation, making it ideal for high-density IT rack mounting. ROHM is developing even smaller surface-mount modules with superior heat dissipation to meet evolving AI infrastructure needs. ROHM proposes modules tailored to customer needs besides the following packages.



**Figure 23. Recommend SiC Module Products for Power and IT Rack Circuits**

# 800VDC Architecture Solutions for AI Servers [ROHM White Paper]

Power Rack		ACDC				
Topology	Module Type	Voltage	$I_D / I_F$	$R_{DS(on)}$ typ (25°C)	Part number	PKG
Vienna Rectifier PFC	SiC MOS	750V	96A	13mohm	SCZ4013DTB*	DOT-247-7L Common source
LLC Primary LLC Secondary	SiC MOS	1200V	76A	6mohm	SCZ4006KTA	DOT-247-7L 2 in 1
			149A	9mohm	SCZ4009KTA*	
			106A	11mohm	SCT4011KTA	
			76A	18mohm	SCT4018KTA*	

IT Rack		DCDC				
Topology	Device	Voltage	$I_D / I_F$	$R_{DS(on)}$ typ (25°C)	Part number	PKG
LLC Primary	SiC MOS	1200V	70A	18mohm	BST70T2P4K01	HSDIP20 6 in 1

**Figure 24. SiC Module Product List for Power and IT Rack Circuits (\*Under development)**

DOT-247

[ROHM Launches 2-in-1 SiC Molded Module “DOT-247”](#)

HSDIP20

[ROHM Develops New High Power Density SiC Power Modules](#)

## 4. Advantages of ROHM’s 800VDC Solutions

AI server technology is advancing at an unprecedented pace. With each new generation of CPUs and GPUs, rack-level power consumption continues to rise sharply, driving demand for solutions that deliver both high efficiency and power density. To meet these requirements, SiC and GaN wide bandgap devices are becoming indispensable.

NVIDIA's next-generation architecture illustrates this trend clearly: GPU products are being developed and released annually on shorter development cycles. To keep pace with this rapid evolution, ROHM is committed to the timely introduction of optimized devices and packages. Beyond its 5th Gen SiC MOSFETs, ROHM is already progressing on 6<sup>th</sup> and 7<sup>th</sup> Gen devices, ensuring a steady pipeline of competitive, high-performance solutions.

As previously announced, we have accelerated our product release timeline ahead of the original schedule and remain committed to delivering competitive solutions that keep pace with the rapidly evolving AI infrastructure market.

Beyond discretely, ROHM is leveraging decades of accumulated LSI expertise to develop SiP (System in Package) solutions that integrate GaN devices and gate drivers. Such integration is essential for maximizing the performance of high-speed switching devices operating at high frequencies. This approach is essential for delivering the efficiency and power density that modern AI servers demand.

Through these innovations ROHM is uniquely positioned to facilitate the adoption of high-voltage DC systems, a market segment projected for substantial future growth.

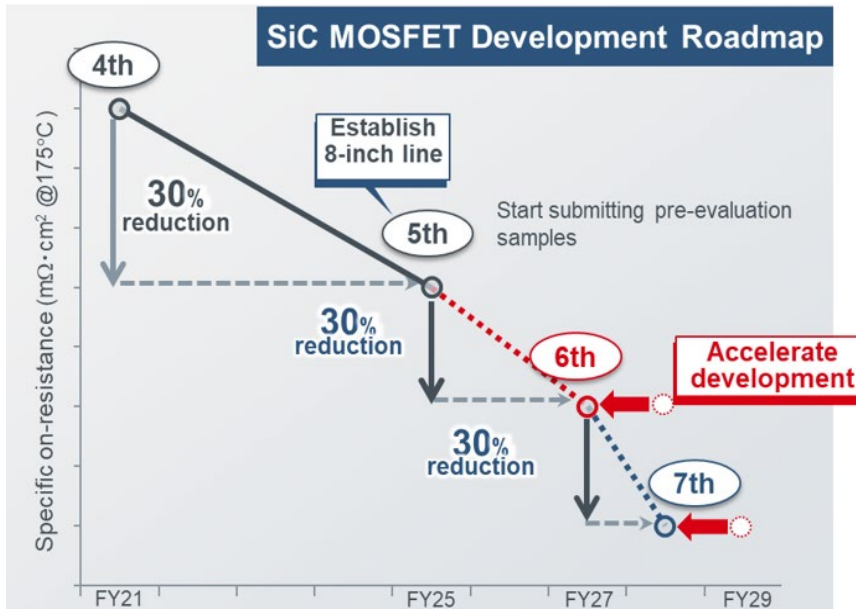


Figure 25. ROHM SiC MOSFET Development Roadmap

## ● Adoption Examples

### (1) COSEL : HFA/HCA Series

ROHM's EcoSiC™ Technology has been Adopted in COSEL's HFA/HCA Series of 3.5kW Output AC-DC Power Supply Units

December 4<sup>th</sup>, 2024

ROHM has announced the adoption of its EcoSiC™ products, including SiC MOSFETs and SiC Schottky barrier diodes (SBDs) in the HFA/HCA series of 3.5kW output AC-DC power supply units for 3-phase applications from COSEL, a leading power supply manufacturer in Japan. Incorporating ROHM SiC MOSFETs and SiC SBDs into the forced air-cooled HFA series and conduction-cooled HCA series achieves up to 94% efficiency. The HCA series has been mass produced since 2023, while the HFA series began mass production in 2024.

Many industrial applications that handle high power in the industrial sector, including MRI machines and CO<sub>2</sub> lasers, require 3-phase power supplies that differ from the single-phase power supplies used in households. COSEL's AC-DC power supply units - equipped with ROHM's EcoSiC™ technology that excels in high-temperature, high-frequency, high-voltage environments - are compatible with 3-phase power supplies from 200VAC to 480VAC, contributing to improved power supply efficiency across a wide range of industrial equipment worldwide.



[ROHM's EcoSiC™ Technology has been Adopted in COSEL's HFA/HCA Series of 3.5kW Output AC-DC Power Supply Units | ROHM Semiconductor - ROHM Co., Ltd.](#)

\*(All information in this article is current as of September 2025.)

## (2) Murata Power Solutions : Data Center PSUs

### SiC SBDs from ROHM chosen by Murata Power Solutions for Data Center PSUs

March 7<sup>th</sup>, 2023

ROHM has announced that Murata Power Solutions is using its high performance silicon carbide (SiC) Schottky Barrier Diodes (SBD) to increase performance and reduce the size of Power Supply Units (PSUs) for data center applications. ROHM's SiC SBDs, [SCS308AH](#) feature high surge resistance and short recovery time, enabling high-speed switching.

Murata's D1U front end AC-DC power supply series include many active units such as the D1U54P-W-2000-12-HB3C and D1U54P-W-1200-12-HC4PC, highly-efficient power-factor-corrected front-end power supplies that provide 12V main and 12V/3.3V standby output. Multiple units can share current and operate in parallel. The power supplies support hot-plugging and are protected from fault conditions such as over-temperature, over-current and over-voltage. What's more, the low profile 1U package make them ideal for delivering reliable, efficient power to servers, workstations, storage systems and other 12V distributed power systems while minimizing the number of required power modules.



[SiC SBDs from ROHM chosen by Murata Power Solutions for Data Center PSUs | ROHM Semiconductor - ROHM Co., Ltd.](#)

\*(All information in this article is current as of September 2025.)

### 4-2) EcoGaN™ Technology

ROHM offers the EcoGaN™ series, a lineup of GaN devices optimized for 800VDC systems. As GaN is a relatively new technology, questions often arise regarding its practical implementation. ROHM addresses these challenges through the development of proprietary LSI technologies that maximize the performance of GaN devices. Building on this innovation, ROHM has successfully delivered a wide range of products that have earned strong market recognition and positive industry reception.

## Technology that Maximizes Device Performance

### (1) High-Frequency Control Technology with GaN

Evaluation conditions:  $V_{in}=48V$ ,  $V_{out}=0.6V$ ,  $F_{sw}=3MHz$ , pulse width=5ns (PCIM Asia)

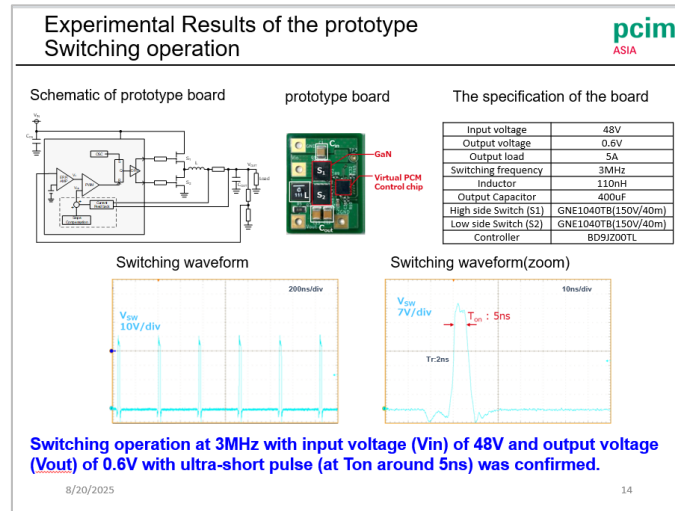


Figure 26. Evaluation results(waveform)

### (2) Gate Drive Stabilization Technology for GaN at High-Frequency Drive

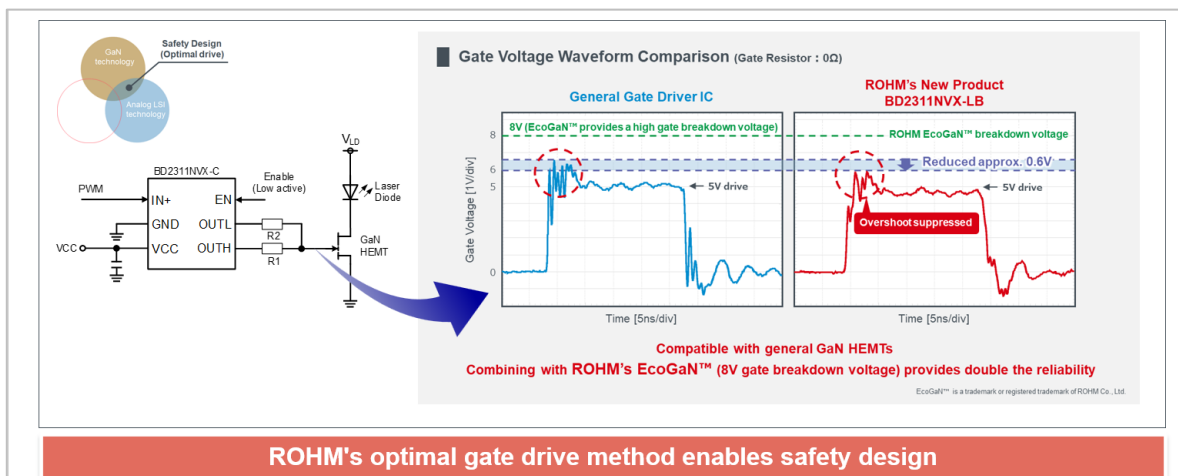


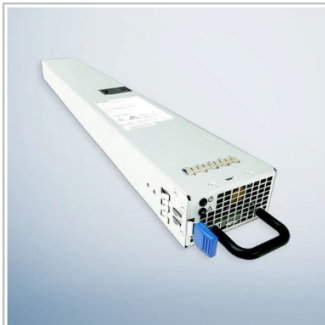
Figure 27. Evaluation results(waveform)

## ● Adoption Examples

### (1) Murata Power Solutions: AI server

#### Dr. Joe Liu, Technical Fellow, Murata Power Solutions

“We are pleased to have successfully designed AI server power supply units featuring higher efficiency and power density by incorporating ROHM’s GaN HEMTs. The high-speed switching capability, low parasitic capacitance, and zero reverse recovery characteristics of GaN HEMTs help minimize switching losses. This allows for higher operating frequencies in switching converters, reducing the size of magnetic components. ROHM’s GaN HEMTs deliver competitive performance and exceptional reliability, yielding excellent results in the development of Murata Power Solutions’ 5.5kW AI server power supply units. Going forward, we will continue our collaboration with ROHM, a leader in power semiconductors, to improve the efficiency of power supplies and address the social issue of increasing power demand.”



[ROHM’s EcoGaN™ has been Adopted for AI Server Power Supplies by Murata Power Solutions | ROHM Semiconductor - ROHM Co., Ltd.](#)

\*(All information in this article is current as of September 2025.)

## (2) Delta: Innergie

**Jason Chen, General Manager,  
Innergie, a brand of Delta**

The development of GaN power devices is a major focus in the global electronics industry, and therefore, we have deepened our collaboration with ROHM over the past several years. Moreover, in 2022, we initiated a strategic partnership to jointly develop next-generation power semiconductors for power supply systems. This partnership has delivered ROHM's advanced 650V GaN (GNP1150TCA-Z) devices, which are now supporting Innergie's new products. The C4 Duo is the first model from Innergie's One for All Series adapters to use ROHM's GaN devices, and we expect more models to adopt this state-of-the-art technology. We believe that, by strengthening our collaboration with ROHM, we will be able to provide customers adapters featuring higher power efficiency and capability, but with much smaller product size.



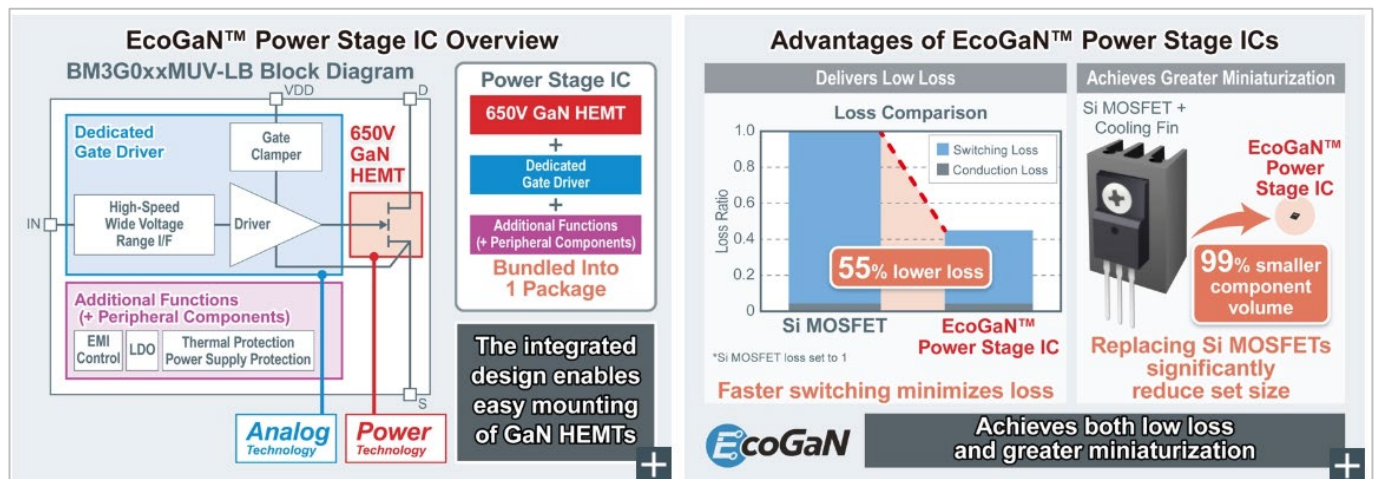
[ROHM's EcoGaN™ has been adopted in the 45W Output USB-C Charger C4 Duo from Innergie, a brand of Delta | ROHM Semiconductor - ROHM Co., Ltd.](#)

\*(All information in this article is current as of September 2025.)

## (3) Delta: SiP

GaN devices are attracting a great deal of attention in the industries as a device that greatly contributes to the miniaturization and energy saving of equipment.

The ROHM's new products have realized high speed and safe gate drive by using ROHM's original analog technology. These products will further promote the use of GaN power devices, which are expected to grow.



[ROHM's New EcoGaN™ Power Stage ICs Contribute to Smaller Size and Lower Loss | ROHM Semiconductor - ROHM Co., Ltd.](#)

\*(All information in this article is current as of September 2025.)

## (4) Mazda: Joint Development of Automotive Components

Since 2022, Mazda and ROHM have been advancing the joint development of inverters using silicon carbide (SiC) power semiconductors under a collaborative framework for the development and production of electric drive units. Now, they have also embarked on the development of automotive components using GaN power semiconductors, aiming to create innovative automotive components for next-generation electric vehicles.

GaN is attracting attention as a next-generation material for power semiconductors. Compared to conventional silicon (Si) power semiconductors, GaN can reduce power conversion losses and contribute to the miniaturization of components through high-frequency operation.

Both companies will collaborate to transform these strengths into a package that considers the entire vehicle, and into solutions that innovate in weight reduction and design. Mazda and ROHM aim to materialize the concept and unveil a demonstration model within FY2025, with practical implementation targeted for FY2027.

“As the shift towards electrification accelerates in pursuit of carbon neutrality, we are delighted to collaborate with ROHM, which aims to create a sustainable mobility society with its outstanding semiconductor technology and advanced system solution capabilities, in the development and production of automotive components for electric vehicles” said **Ichiro Hirose, Director, Senior Managing Executive Officer and CTO of Mazda**. “We are excited to work together to create a new value chain that directly connects semiconductor devices and cars. Through collaboration with partners who share our vision, Mazda will continue to deliver products filled with the 'joy of driving' that allows customers to truly enjoy driving, even in electric vehicles.”

[Mazda and ROHM Begin Joint Development of Automotive Components Using Next-Generation Semiconductors | ROHM Semiconductor - ROHM Co., Ltd.](#)

\*(All information in this article is current as of September 2025.)

## 5. Appendix

### A-1) DC Link Capacitor Selection Guidelines

In mission-critical systems such as AI servers, continuous operation must be maintained even during power disturbances or grid failures. To achieve this, backup mechanisms are implemented at multiple levels, as illustrated in Fig. A1-1.

- CBU (Capacitor Backup Unit): Provides power until the BBU boots (utilizing high-capacitance capacitors)
- BBU (Battery Backup Unit): Maintains supply until the motor generator is started (sealed lead-acid batteries)
- Motor Generator: Ensures sustained operation during prolonged power outages

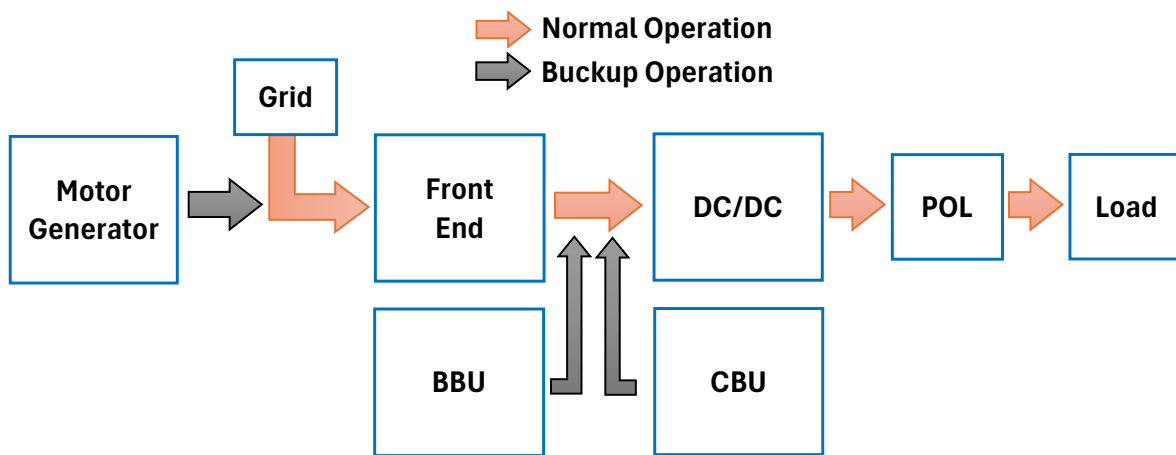


Figure A1-1. General Power Supply System in a Server

Under normal conditions, each backup unit remains on standby and only activates when a power failure occurs. A key design consideration is the required power delivery and duration of backup. Longer backup times demand proportionally higher stored energy, which influences the choice of backup method and components. Historically, server power systems have operated at voltages shown in Fig.A-2, allowing for well-optimized power supply designs.

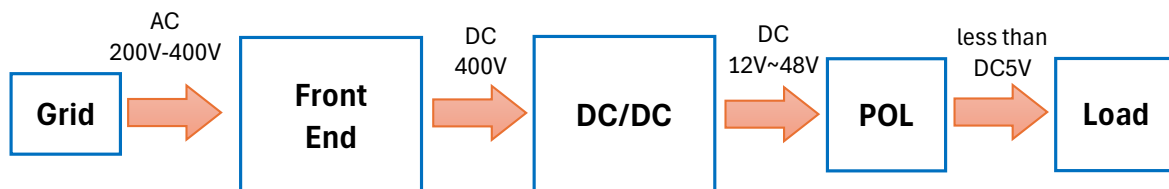
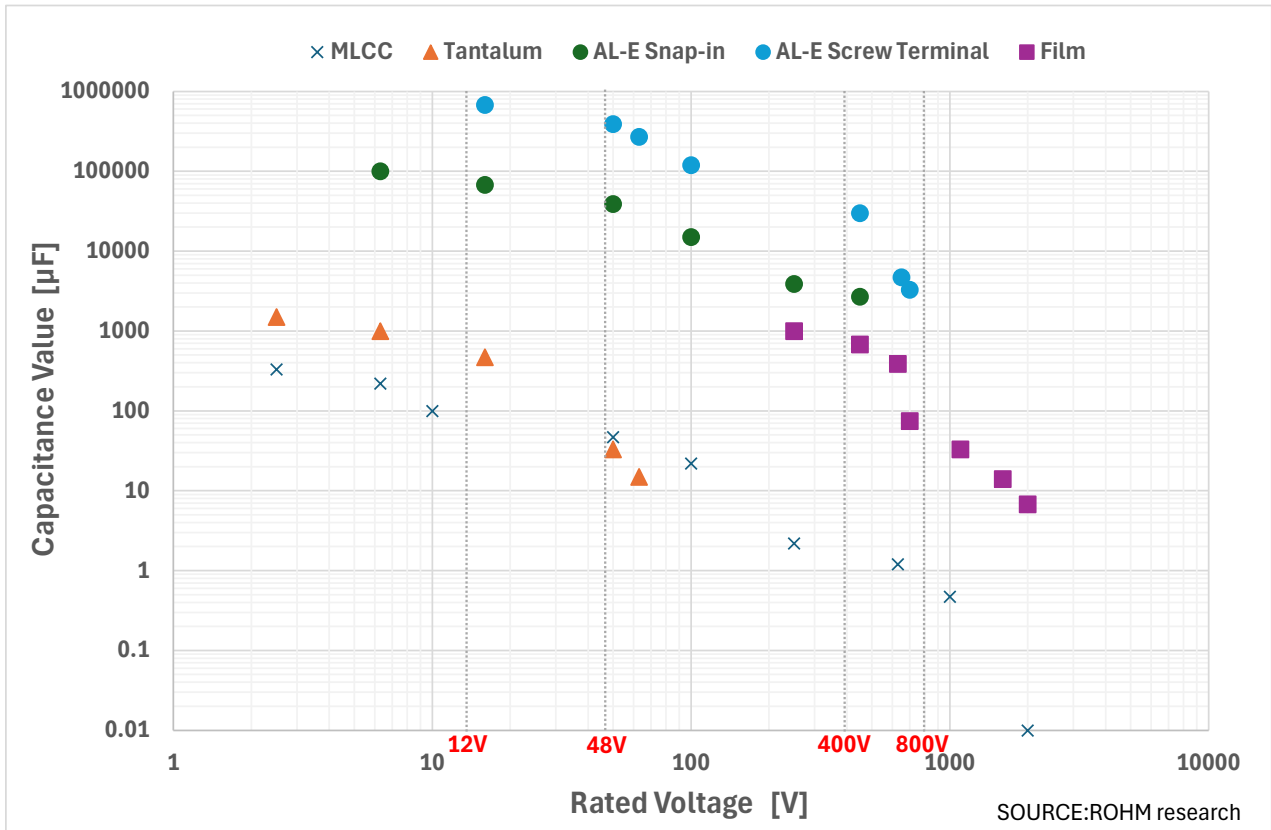


Figure A1-2. Voltages in Server Power Systems

With the dramatic rise in power requirements for AI servers, however, continuing to rely on the existing architecture would result in excessive current levels and substantial power losses. To address this, the industry is moving toward higher-voltage architectures that reduce current while significantly improving efficiency.

## 800VDC Architecture Solutions for AI Servers [ROHM White Paper]

One major challenge in such architectures is DC link capacitor selection. While traditional systems operating at up to 400VDC had no difficulty sourcing suitable capacitors, higher-voltage designs face limitations. Fig.A1-3 illustrates how capacitance varies with rated voltage across different capacitor types. To maximize backup capability, capacitors with the highest possible capacitance should be chosen. Aluminum electrolytic capacitors offer the highest capacitance per voltage rating, but are limited to 700V due to material constraints.



**Figure A1-3. Capacitance vs Rated Voltage for Various Capacitor Types**

For systems operating above 700V, capacitor options are restricted to film capacitors or MLCCs. However, these alternatives provide drastically lower capacitance, by factors ranging from 1/100~1/10000 compared to aluminum electrolytics. This inevitably leads to increased component counts, higher costs, and larger board area along with greater mounting complexity.

At present no definitive solution to this limitation exists. Nevertheless, since the stored charge (and thus energy) scales with the square of the applied voltage, operating downstream power supplies over a wider, higher-voltage input range can extend backup duration. This strategy helps reduce the total number of capacitors required, minimizing both board area and cost.

Therefore, when defining power supply operating specifications, it is necessary to consider not only semiconductor device selection but also the careful choice of passive components.

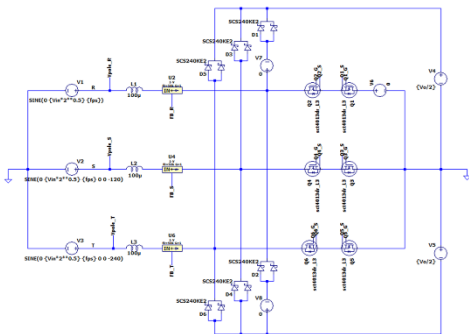
## A-2) Simulation Support

To streamline circuit design, ROHM provides pre-configured simulation circuits for Vienna PFC and LLC converter topologies. These resources enable efficient device selection and parameter optimization, significantly reducing design time and effort.

- LTspice® Circuit Libraries

ROHM offers downloadable circuit libraries compatible with the LTspice® simulation platform that allow users to modify devices, parameters, and circuits.

### Vienna PFC

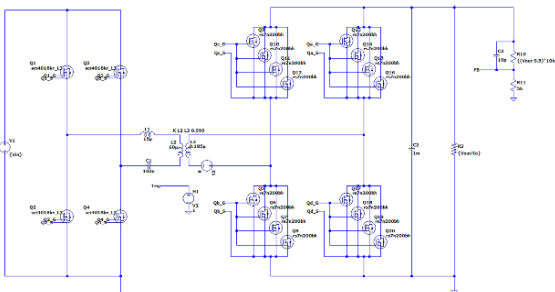


[Doc.] [Vienna PFC Circuit Information](#)

[Lib.] [Vienna PFC LTspice® Circuit](#)

Figure A2-1. Vienna PFC Circuit

### LLC Converter



[Doc.] [LLC Converter Circuit Information](#)

[Lib.] [LLC Converter LTspice® Circuit](#)

Figure A2-2. LLC Converter Circuit

Additional LTspice® circuit libraries are available [here](#).

Beyond LTspice®, ROHM supports multiple simulation platforms to address diverse design needs:

- PLECS® Circuits – Simplifies the evaluation of circuit loss
- [SPICE Models \(L3\)](#) – Enables high-speed, high-accuracy simulation
- [ROHM Solution Simulator](#) – A free web-based simulation tool accessible without software installation

\*LTspice® is a registered trademark of Analog Devices, Inc.

\*PLECS® is a registered trademark of Plexim GmbH.

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