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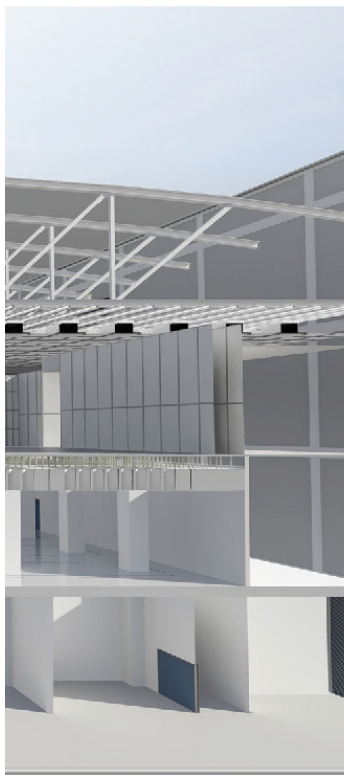
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GaN Power Semiconductors Redefine a Growing Number of Market Landscapes

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GaN power semiconductors have firmly established their presence in core markets, including data centers, automotive, and consumer electronics. They are rapidly extending their influence on applications in micro-mobility, solar energy, and power tools.

GAN POWER SEMICONDUCTORS CONTINUE to bring about significant advancements in power-reliant industries, substantially impacting the global economy. Markets such as consumer electronics, automotive, and data centers are experiencing massive transformations as GaN power transistors replace traditional silicon in power system designs.

This shift has resulted in products that are now smaller, lighter, and more energy-efficient than their predecessors, offering numerous benefits. For instance, electric vehicles can travel longer distances on a single charge, energy-intensive data centers operate more efficiently, and consumer electronics charge faster. Recognizing the advantages, additional markets, including micro-mobility, solar energy, and power tools, are increasingly adopting GaN.

The global revolution of micro-mobility

The global micro-mobility market is projected to reach USD \$69.32 billion by 2028, driven partly by the massive shift toward more cost-effective and eco-friendly transportation options. Micro-mobility is an evolving field of transportation that includes travel undertaken using a range of light vehicles such as electric kick scooters, electric skateboards, and electric bicycles. Factors such as increasing road congestion, rising oil and gas prices, ease of parking, and saturation within the automotive sector are expected to drive market growth during the forecast

period. According to The Faraday Institute, the global population of urban areas is set to increase by 50 percent to 6.7 billion by 2050, making the management of mobility in cities crucial to achieving greater sustainability.

Powered micro-mobility devices benefit from designs that deliver excellent energy efficiency and power density, smaller and lighter physical designs, and overall cost efficiencies. GaN helps motor drive efficiency and charging effectiveness as with power





tools. Due to these and other advantages, GaN is well-positioned to reshape the micro-mobility market globally.

For e-bikes, GaN-based power electronics are used in controllers to improve energy efficiency and reduce power losses. GaN makes e-bike motor controllers smaller and lighter, resulting in more compact and lightweight e-bike designs. GaN-based power electronics are also used in battery chargers to reduce charging times.

Several companies are changing the micro-mobility market with their GaN-powered motor drives, converters, and inverters. Innovative and pioneering designs in precision motor control systems deliver next-generation GaN-powered motor drives for personal electric vehicles (EVs), including e-scooters, e-bikes, and e-mopeds. The motor drives combine high-performance, high-frequency GaN transistors with state-of-art software and cutting-edge hardware to create powertrain solutions that increase the range and power of micro-mobility devices by as much as 30 percent.

With social, economic, and environmental pressures to create more accessible electric micro-mobility solutions, GaN is poised to be a significant partner in making sustainable and cost-effective transportation accessible to millions worldwide.

Supercharging solar efficiency: GaN enables the full potential of solar energy

The solar panel market is poised for remarkable growth, projected to achieve a compound annual growth rate (CAGR) of 18 percent by 2030. By 2027, the global solar market is estimated to soar to an impressive USD \$13.33 billion. These figures are propelled by technology innovation, rising demand for renewable energy sources from consumers and businesses alike, and proactive measures taken by governments worldwide to tackle renewable energy adoption and reduce carbon footprints.

In this dynamic landscape, GaN is emerging as a game-changer. GaN's efficiency, compactness, lightweight design, and extended lifespan make it a formidable force in reshaping key aspects of solar energy utilization. GaN is paving the way for transformative advancements in solar technology, from solar inverters and optimizers to solar energy storage solutions.

Solar Inverters: Embracing GaN

for Efficiency and Reliability Solar inverters have long been crucial in converting DC electricity from solar panels into usable AC electricity. Traditionally relying on silicon-based semiconductors, these inverters faced efficiency and power density limitations. However,

the emergence of GaN technology significantly impacts the solar energy landscape.

GaN-based solar inverters offer a host of advantages over their silicon counterparts. They are smaller, lighter, and more cost-effective, simplifying installation and delivering substantial savings, particularly for large-scale projects. With enhanced resilience and reliability, GaN inverters minimize maintenance costs and system downtime, ensuring optimal performance.

Estimates suggest that GaN technology brings over ten times the frequency capabilities, enabling significant cost reductions of up to 25% for micro-inverters. Moreover, GaN-based solutions can yield up to 40% energy savings, leading to improved installation cost payback of over 10% compared to traditional silicon inverters.

The benefits of GaN extend beyond solar inverters. Solar optimizers, which share similar functionality with micro-inverters, can leverage GaN technology to reduce energy losses during switching. GaN implementation in optimizers also results in smaller, lighter devices. Furthermore, GaN's ability to operate at higher frequencies enables faster and more accurate optimization. GaN-based FETs exhibit superior thermal resilience, allowing higher operating temperatures, enhanced reliability, and extended lifetimes.

By embracing GaN-based solar inverters and optimizers, the solar energy industry can achieve more significant energy savings, improved performance, and accelerated adoption of renewable energy sources.

Solar energy storage: Unlocking efficiency and cost savings with GaN

power electronics As consumers increasingly seek economic advantages in home solar power storage, efficient bidirectional operation becomes paramount. GaN is a game-changer in this domain, enabling highly efficient

charging and discharging at high and low power levels.

One of the standout benefits of GaN is its ability to maximize energy storage and retrieval in battery systems. The improved efficiency of GaN-based power electronics allows for greater energy storage in the battery and more efficient power extraction when needed, particularly for day-to-day household usage. In contrast, traditional silicon-based solutions often prove inefficient in low-power scenarios.

By harnessing GaN technology, solar energy storage systems become significantly smaller and lighter, taking up only a third of the space and weight compared to conventional approaches. Furthermore, GaN-based power electronics reduce power losses by a notable 50% and contribute to lowering the system's overall bill of materials (BOM) cost.

With the ability to maximize energy production, drive down costs, enhance reliability, and optimize system performance, GaN-based power electronics present a compelling solution to tackle the world's energy challenges. Embracing GaN technology in solar energy storage paves the way for a greener, more sustainable future, empowering individuals and communities to make significant strides in renewable energy adoption.

Redefining the power tools market

Professional and consumer needs and technological advancements are propelling the global power tools market to new levels of growth. The market is projected to surge from \$26.61 billion in 2022 to an estimated \$35.13 billion by 2029. The construction and automotive industries will exhibit profound demand for power tools. Stakeholders will continue to inject funds into advanced tools amid the rising popularity of cordless equipment. This upward trajectory is fueled by a convergence of factors,

including the rise of IoT-enabled tools, a growing DIY culture, and the emergence of robust global economies.

As the market surges, competition intensifies, and manufacturers must prioritize innovation to meet consumers' performance, features, and price expectations. Power tools come in various forms, including battery-operated, corded, and gasoline-powered variants.



However, industry manufacturers are increasingly concerned about the inconveniences of cords, the pollution and noise associated with engines, and other issues related to power, efficiency, and cost. As a result, the industry is calling for a total shift to battery-powered solutions, with wireless functionality on the horizon.

GaN is well-positioned for widespread adoption in the power tools market, as it:

- Enhances energy efficiency within power tools themselves
- Boosts the power of battery-operated tools by enabling compact controller electronics
- Facilitates the development of compact and energy-efficient chargers, even as battery packs expand in size and voltage capacity

GaN power semiconductors are well-positioned to become the ubiquitous choice for the next generation of power tools. Additionally, in the future, wireless charging powered by GaN will become increasingly prevalent.

Wireless charging has posed challenges for power tools and consumer devices for decades. As such, the need for more convenient and safer charging methods for accessories and high-power batteries has become increasingly apparent. GaN-based wireless power solutions will pave the way for faster charging, higher power transfer, and revolutionary system designs that transcend the limitations of distance and power.

GaN power semiconductors: Driving the mainstream revolution across industries

GaN power semiconductors have firmly established their presence in core markets, including data centers, automotive, and consumer electronics. They are rapidly extending their influence on applications in micro-mobility, solar energy, and power tools. Moreover, GaN is gaining traction in diverse sectors like appliances, LED lighting, and Class D audio, offering a glimpse into its wide-ranging capabilities.

GaN power semiconductors are also transforming the audio market with superior sounding, higher-performance, smaller, and more efficient Class D audio systems. For instance, a groundbreaking audio amplifier platform from AudioControl leverages GaN power semiconductors. So too, do next-generation Daniel Hertz high-performance Wi-Fi speakers, designed by Mark Levinson, enabling pure analog sound from digital content.

The versatility and adaptability of GaN make it a promising solution across multiple industries, catering to the growing demand for efficient and sustainable technologies. With GaN revolutionizing core markets and expanding its reach into diverse applications, the next phase of the GaN revolution has already taken flight, reshaping industries and propelling innovation forward. 