Reinventing Automotive Power Electronics

With NexGen Vertical GaN™ based Power Conversion Systems

www.nexgenpowersystems.com/automotive

NEXGEN™
POWER SYSTEMS

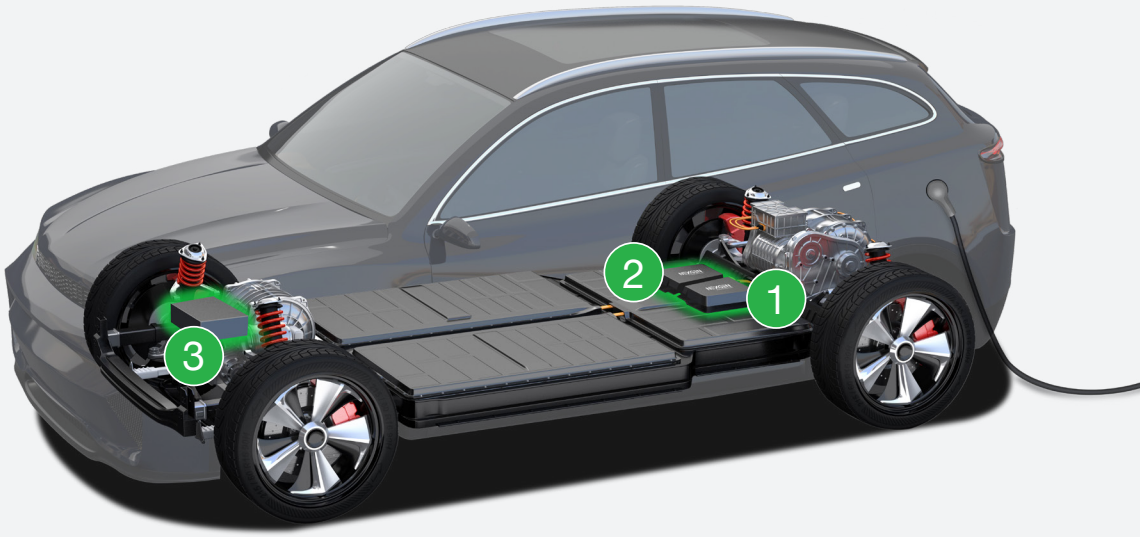
A New Breed of Power-Conversion Systems

The transition to electric vehicles is inevitable and electrification will play an important role in the transformation of the automotive industry. As the electrification of cars continues to rise, the EV market is faced with three key challenges to overcome: range anxiety, performance, and high cost. Improving these parameters today proves to be a challenge due to the limitations of the power conversion systems that require higher efficiency, higher voltage operations, smaller form factors and robust performance. The silicon-based power technology that enabled consumer and industrial electronics in past decades is no longer sufficient for today's advanced needs. Modern EVs require a more advanced power semiconductor technology.

Higher Driving Range

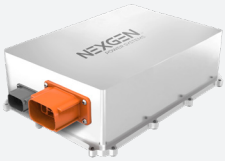
Better Performance

Lowest Cost



NexGen Power Systems EV solutions include three key power conversion systems in an electric vehicle that can radically improve these factors: On-board charger, DC-DC converter and inverter.

1 On-board Charger



Requirements

AC (85 V – 440 V from grid) to DC (400 V – 900 V battery)

Power output: 7 kW– 22 kW

Bi-directional charging (V2G)

NexGen value-add

- >94% Efficiency: Faster charge, lower energy loss
- Smallest form factors (>50% smaller) with 2+ MHz switching speeds
- High breakdown voltage (up to 4 kV)
- Based on NexGen's proven scalable power system architectures

2 DC-DC Converter

Requirements

HV (400–900 V battery) to LV (12 or 48 V batteries)

Power output: 2-5 kW

Bi-directional (LV -> HV)

NexGen value-add

- >96% Efficiency: Reduced cooling requirements
- Lightweight form factor with 1+ MHz switching speeds
- Highly Reliable: 1200 V power devices that avalanche at 1400 V provide system robustness

3 Inverter Systems

Requirements

DC (400 V – 900 V battery) to AC for e-motor drives

Power output: > 100 kW

Bi-directional (regenerative braking)

NexGen value-add

- 5x faster switching frequency of existing inverter designs
- Reduce motor eddy current losses
- Higher efficiency (>95%)
- High breakdown voltage (up to 4 kV)
- >10 µs short-circuit robustness

NexGen Power Platform

NexGen Power Platform based on a scalable, software-configurable architecture incorporates the key building blocks for power conversion systems, enabling the next generation of EV solutions. NexGen has achieved a fundamental breakthrough in power semiconductors, based on our patented NexGen Vertical GaN™ technology allowing us to build EV power conversion systems that can solve the key challenges that exist today.

NEXGEN VERTICAL GaN™

NexGen Vertical GaN™ technology at the core

Powering the NexGen Platform with a new benchmark in power electronics

- Built with GaN grown on a GaN substrate to reduce size and cost
- Switching at a cutting-edge 1+ MHz, 100x the speed of Si
- Inherently reliable with a 4kV breakdown voltage and Avalanche capability
- Manufactured in NexGen's state-of-the-art Fab in Syracuse, NY
- Superior short circuit robustness of >10us

merlin™ power engine

Switching with the Merlin Power Engine

Delivering the World's First 1+ MHz Switching Digital Powertrain Controller

- Enables scalability to higher power through interleaving multiple phases
- Implements Novel Power Control through configurable Software Algorithms
- Flexible architecture to adapt to different power topologies
- Provides advanced features such as Metrology and Intelligent EMI control
- Ready to meet challenging automotive EMI conditions

planar magnetics

Innovation Beyond Power

Revolutionary magnetics and thermal engineering enabled through NexGen World-Class Systems Organization

- Planar Magnetics provides 10x lower leakage than current magnetic solutions
- Implements low profile, flat windings, and reduced noise sources
- Efficient thermal design with advanced thermal impedance management
- Provides excellent repeatability in manufacturing

End-to-End Supply Chain Built for Automotive Quality & Reliability

R&D
In-house system capability to unlock full potential of Vertical GaN

Sourcing
Dual sourcing of wafers from leading suppliers

Fabrication
World's #1 GaN dedicated fab with expansion plans for automotive

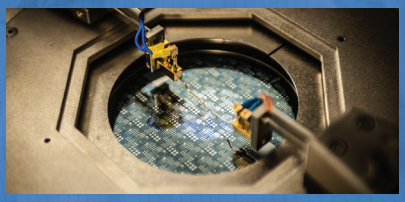
System Integration
Global leading power supply and electronic devices manufacturer

About NexGen Power Systems

NexGen Power Systems, the premier vertically integrated power electronics company, designs, develops, and manufactures innovative power conversion systems with its revolutionary NexGen Vertical GaN™ semiconductor technology.

FAB, Syracuse, NY

The world's largest dedicated Gallium Nitride fabrication facility.



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Founded in 2017, NexGen Power Systems is revolutionizing power electronics with technology solutions utilizing GaN-on-GaN (NexGen Vertical GaN™) discrete semiconductor devices, controllers, modules, and systems that increase efficiency and reliability of power conversion systems while dramatically reducing their cost, size, and weight. Our vision is to create the smallest, lightest, most cost-effective power conversion systems in the world.

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