onsemi Unveils Vertical GaN Semiconductors: A Breakthrough for AI and Electrification

October 30, 2025

Built on novel GaN-on-GaN technology, onsemi's vertical GaN architecture sets a new benchmark for power density, efficiency and ruggedness

Scottsdale, Ariz, Oct. 30, 2025 (GLOBE NEWSWIRE) -- **Summary** -- As global energy demand surges from AI data centers, electric vehicles, and other energy intensive applications, onsemi has introduced vertical gallium nitride (vGaN) power semiconductors, setting a new benchmark for power density, efficiency and ruggedness for these applications. These groundbreaking next-generation GaN-on-GaN power semiconductors conduct current vertically through the compound semiconductor, enabling higher operating voltages and faster switching frequencies, leading to energy savings to deliver smaller and lighter systems across AI data centers, electric vehicles (EVs), renewable energy, and aerospace, defence and security.

News Highlights

- Proprietary GaN-on-GaN technology conducts current vertically at higher voltages, enabling faster switching and more compact designs.
- Breakthrough solution can reduce energy loss and heat, reducing losses by almost 50%.
- Developed by onsemi's Syracuse, New York, R&D team; 130+ patents spanning fundamental process, device architecture, manufacturing and systems innovations.
- onsemi is sampling both 700V and 1,200V devices to early access customers.

What's New: onsemi's vGaN technology is a breakthrough power semiconductor technology that sets a new benchmark for efficiency, power density and ruggedness for the age of AI and electrification. Developed and manufactured at onsemi's fab in Syracuse, NY, onsemi holds over 130 global patents covering a range of fundamental process, device design, manufacturing and systems innovations for vertical GaN technology.

"Vertical GaN is a game-changer for the industry and cements onsemi's leadership in energy efficiency and innovation. As electrification and AI reshape industries, efficiency has become the new benchmark that defines the measure of progress. The addition of vertical GaN to our power portfolio gives our customers the ultimate toolkit to deliver unmatched performance. With this breakthrough, onsemi is defining the future where energy efficiency and power density are the currency of competitiveness." Dinesh Ramanathan, Senior Vice President of Corporate Strategy, onsemi.

Why it Matters: The world is entering a new era where energy is the defining constraint on technological progress. From electric vehicles and renewable energy to AI data centers that now consume more power than some cities, the demand for electricity is rising faster than our ability to generate and deliver it efficiently. Every watt saved now counts.

onsemi's vGaN technology is designed to handle high voltages in a monolithic die – 1,200 volts and beyond – switching high currents at high frequency with superior efficiency. High end power systems built with this technology can reduce losses by almost 50% and by operating at higher frequencies can also reduce the size, including passives like capacitors and inductors by a similar amount. Additionally, compared to commercially available lateral GaN, vGaN devices are approximately three times smaller. This makes onsemi's vGaN ideal for critical high-power applications where power density, thermal performance and reliability are paramount, including:

- AI Data Centers: Reduced component counts, increased power density for 800V DC-DC converters for AI compute systems to greatly improve cost per rack
- Electric Vehicles: Smaller, lighter and more efficient inverters, for increased EV range
- Charging Infrastructure: Faster, smaller, more rugged chargers
- Renewable Energy: Higher voltage handling, reduced energy losses for solar and wind inverters
- Energy Storage Systems (ESS): Fast, efficient, high-density bidirectional power for battery converters and microgrids
- Industrial Automation: Smaller, cooler, higher efficiency motor drives and robotics
- Aerospace, Defense and Security: Higher performance, enhanced ruggedness and more compact designs

How It Works: Most commercially available GaN devices are built on a substrate that is not GaN – primarily silicon or sapphire. For very high voltage devices, onsemi's vGaN uses a GaN-on-GaN technology that allows current to flow vertically through the chip rather than across its surface. This design delivers higher power density, greater thermal stability and robust performance under extreme conditions. With these benefits, vGaN leapfrogs both GaN-on-silicon and GaN-on-sapphire devices to deliver higher voltage capability, higher switching frequency, superior reliability and enhanced ruggedness. This enables the development of smaller, lighter and more efficient power systems with reduced cooling requirements and lower overall system cost. Key benefits include:

- Higher Power Density: Vertical GaN can handle higher voltages and larger currents in smaller footprints
- Greater Efficiency: Cuts energy losses during power conversion, reducing heat and lowering cooling costs
- Compact Systems: Higher switching frequency reduces the size of passive components such as capacitors and inductors

Availability:
Sampling now to early access customers

Additional Information:
Vertical GaN Overview Presentation
Vertical GaN Fact Sheet
onsemi Vertical GaN (vGaN) Page

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Attachments

- onsemi Vertical GaN Wafer
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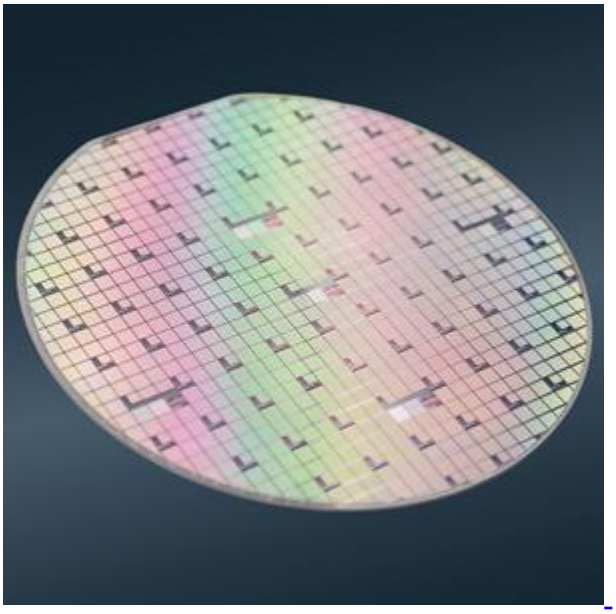
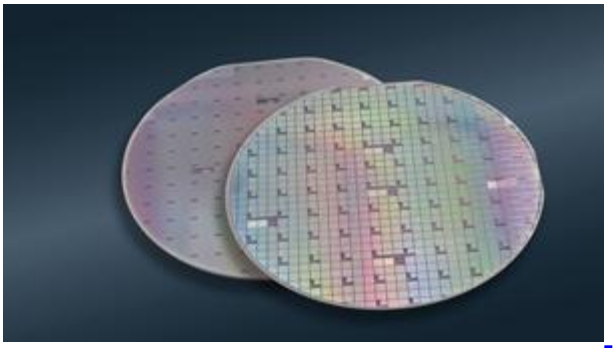
onsemi Vertical GaN Wafer



Fully processed GaN-on-GaN wafers manufactured in onsemi's Syracuse, NY fab.

onsemi Vertical GaN Wafers



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