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## *High-Density Power Supply Reference Design Delivers 4.5 kW For AI Data Centers*

Navitas Semiconductor's 4.5-kW AI data center power supply reference design is optimized with the company's GaNSafe and Gen-3 "Fast" (G3F) SiC power components, enabling the world's highest power density with 137 W/in$^3$ and over 97% efficiency, according to the vendor. At the heart of the 4.5-kW CRPS185 design is an interleaved CCM totem-pole PFC using SiC and full-bridge LLC converter with GaN, where the fundamental strengths of each semiconductor technology are exploited for the highest frequency, coolest operation, optimized reliability and robustness, and highest power density and efficiency (Fig. 1).

The 650-V G3F SiC MOSFETs feature "trench-assisted planar" technology which delivers world-leading performance over temperature for the highest system efficiency and reliability in real-world applications, says the vendor. For the LLC stage, the 650-V, 20-mΩ GaNSafe power ICs are well suited due to their integration of power, protection, control, and drive in an easy-to-use, robust, thermally-adept TOLL power package. Additionally, GaNSafe power ICs offer extremely low switching losses, with a transient-voltage capability up to 800 V, and other high-speed advantages such as low gate charge ($Q_g$), output capacitance ($C_{OSS}$), and no reverse-recovery loss ($Q_{rr}$), which are characteristic of GaN power devices.

According to Llew Vaughan-Edmunds, senior director, Product Management & Corporate Marketing, Navitas has leveraged its experience in dedicated design centers to develop its data center power supply reference designs.

Navitas' AI data center power supply reference designs are intended to accelerate customer developments, minimize time-to-market, and set new industry benchmarks in energy efficiency, power density and system cost. These system platforms include complete design collateral with fully tested hardware, embedded software, schematics, bills-of-material, layout, simulation, and hardware test results. Navitas pushes the performance of its reference designs to keep pace with AI processor developments.

For example, next-generation AI GPUs like NVIDIA's Blackwell B100 and B200 each demand over 1 kW of power for high-power computation, 3x higher than traditional CPUs. These new demands are driving power-per-rack specifications from 30 to 40 kW up to 100 kW (Fig. 2).

"AI is dramatically accelerating power requirements of data centers, processors and anywhere AI is going in the decades to come creating a significant challenge for our industry. Our system design center has stepped up to this challenge delivering a 3x increase in power in less than 18 months", said Gene Sheridan, CEO of Navitas Semiconductor. "Our latest GaNFast technology, combined with our G3F SiC technology are delivering the highest power density and efficiency the world has ever seen…the perfect solution for the Blackwell AI processors and beyond."

Navitas announced its AI Power Roadmap in March 2024, showcasing next-generation data center power solutions for the growing demand in AI and high-performance computing (HPC) systems. The first design was a GaNFast-based 3.2-kW ac-dc converter in the Common Redundant Power Supply (CRPS) form factor, as defined by the hyperscale Open Compute Project. The 3.2-kW CRPS185 (for 185-mm length) enabled a 40% size reduction vs. the equivalent legacy silicon approach and easily exceeded the "Titanium Plus" efficiency benchmark, critical for data center operating models and a requirement for European data center regulations.

According to Navitas, the 3.2-kW and 4.5-kW platforms have already generated significant market interest with over 30 data center customer projects in development (Fig. 3). To learn more about Navitas' AI power platform solutions, including the GaNSafe and G3F SiC MOSFETs families, see the website or contact info@navitassemi.com.

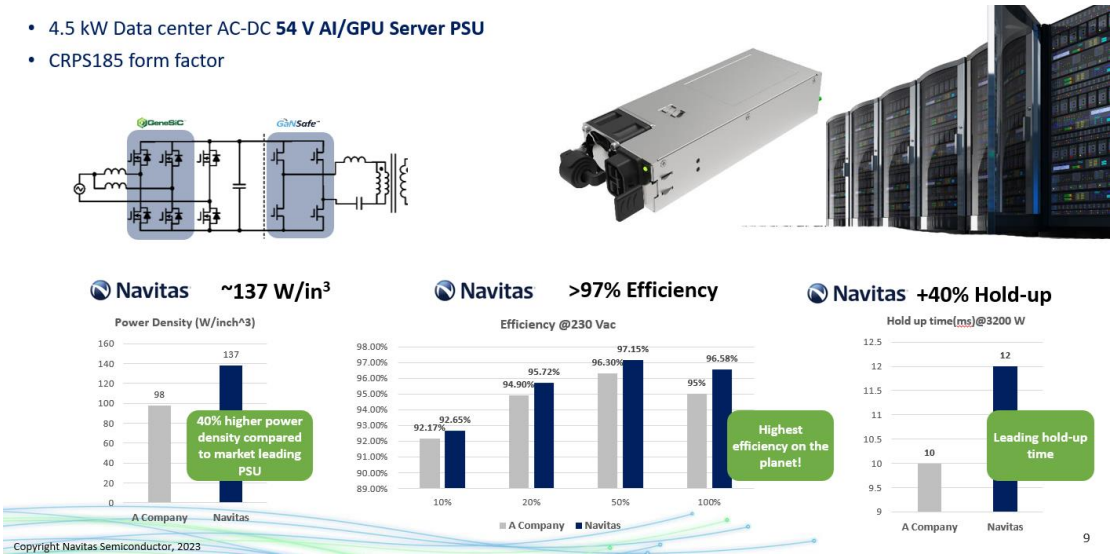


*Fig. 1. The CRPS185 reference design packs 4.5-kW into the 185-mm enclosure shown here. For redundancy, two of these supplies are typically included at the back of a 1U server rack. Use of the company's SiC FETs hard switching at 75 kHz in the interleaved totem-pole PFC stage, GaN ICs soft switching at 300 kHz in the LLC converter, and synchronous rectification (not shown) on the output enable the density and efficiency figures indicated in the graphs.*

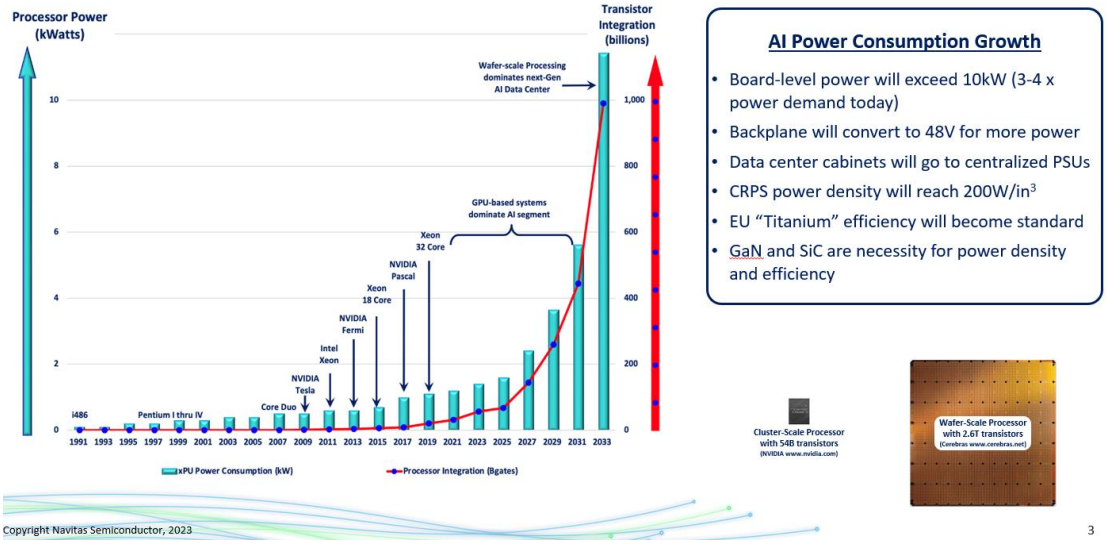


*Fig. 2. As data center processors scale up in the coming decade, their power demands will skyrocket, hitting 10 kW at the board level and up to 100 kW per server rack. According to Navitas' Vaughan-Edmunds, this will drive CRPS power densities to reach 200 W/in.[3]. Also next generation AI server racks driven by OCP guidelines, will transition from having two CRPS power supplies at the back of a 1U server to centralized 48-V PSUs in the cabinets. This will leave more room in the servers for processors.*

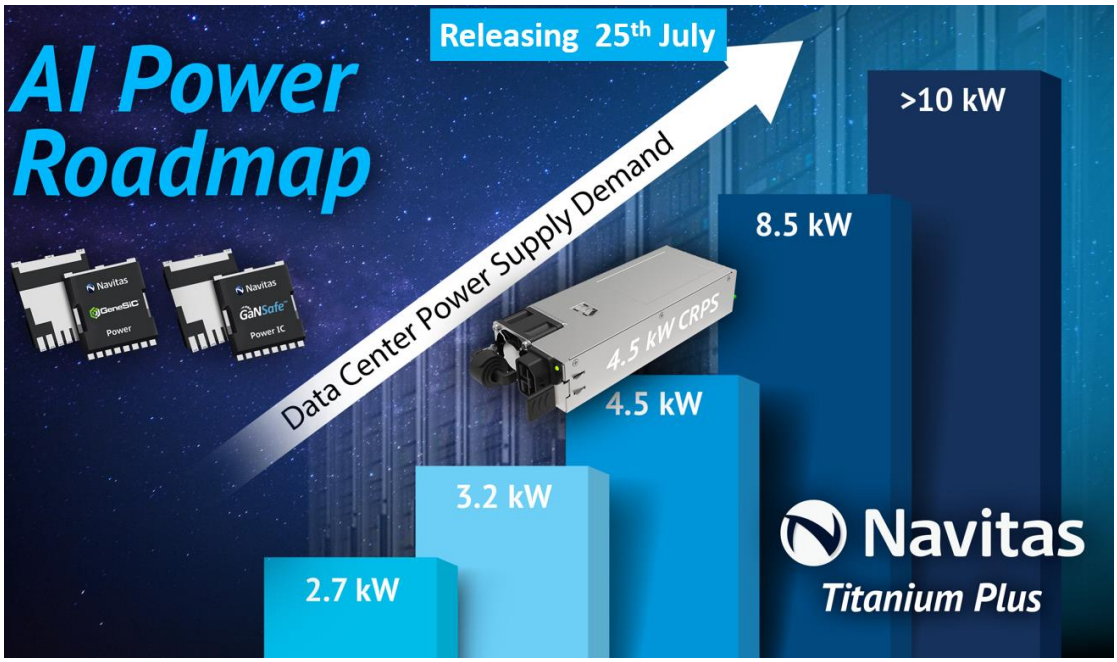


*Fig. 3. Navitas' AI Power Roadmap depicts its plans for continued development of AI data center power supply reference designs. The next major step will be an 8.5-kW design housed in an enclosure with a longer form factor as will be defined by the OCP, says Vaughan-Edmunds.*