



[New tools for driving GaN E-HEMT transistors](#)

[Steve Taranovich](#) - October 22, 2016



This product is featured in EDN's Hot 100 products of 2016. See all 100 [here](#).

The world already consumes too much energy. Globally, as the middle class grows, even more energy will be required. Government regulations and increasingly stringent emissions standards compound the need to conserve by using materials and energy more efficiently. Consequently, to meet customer demands and their desire to remain competitive, power supply designers and manufacturers are in an endless quest to develop solutions with both higher power density (W/mm³) and higher efficiency.

Power electronics companies have switched from silicon transistors to gallium nitride (GaN) E-HEMT transistors because they allow much higher switching frequencies while maintaining or increasing efficiency. GaN transistors allow power designers to realize the benefits of these devices over their silicon predecessors by reducing system size and weight up to 5 times, by decreasing power losses up to 90%, and by lowering BOM cost.

Today, power engineers use GaN transistors to help design more efficient power supply solutions. GaN Systems' family of 650 V GaN E-HEMT transistors provide an extensive series of solutions for designers to address their power challenges.

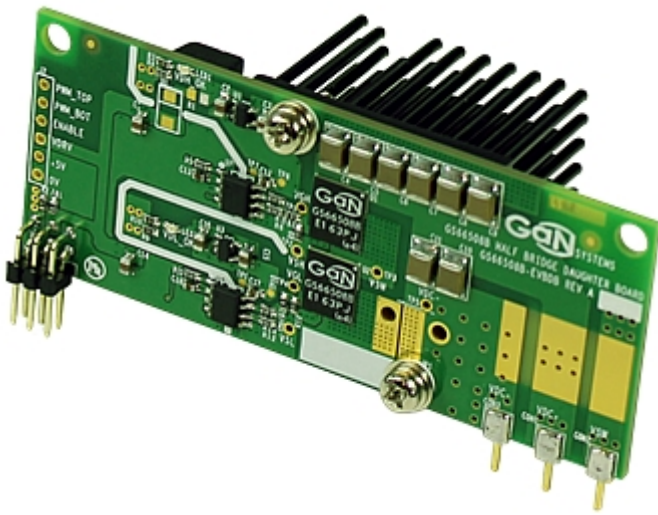


Figure 1 GaN Systems' GS66508B half bridge daughter board

GaN transistors' very fast switching speed requires gate drivers that combine very high timing accuracy with excellent common-mode transient immunity (CMTI). Silicon Labs addresses this need by providing a family of isolated gate drivers which are incorporated into GaN Systems' evaluation boards. For example, the [Si827x](#) ISOdriver family exhibits very high noise immunity (200 kV/ μ s) and latch-up immunity (400 kV/ μ s). Their high CMTI makes the Si827x drivers ideal for fast-switching GaN transistors and mitigating potentially noisy power supply systems.

To simplify engineers' product development efforts, power design optimization can be achieved by using a common evaluation motherboard GS665MB-EVB, paired with one of several daughter boards (**Figure 1**) that can be configured as a buck, boost or double-pulse tester. Interchangeable daughter cards containing 650V GaN E-HEMT transistors ranging from 15 A to 60 A and Silicon Labs' fast switching Si827x isolated gate driver plug into the motherboard, which can be used as a reference design for many system applications.

The combination of GaN transistors, Silicon Labs Si827x ISOdrivers and the GS66508B-EVBHB evaluation board provides power system designers with an indispensable tool for continually improving the performance of their power supply products. These tools allow engineers to meet their market challenges by facilitating the design of more efficient systems, and by helping power supply manufacturers to maintain a competitive advantage.

To demonstrate the performance of the Si827x ISOdrivers, Silicon Labs' Si8271 isolated driver was used on a GS66508B-EVBHB evaluation board, and a switching test was conducted under 400V/30A with \sim 100V/ns. The results of two double pulse switching tests follow. **Figure 2** shows GaN Systems' GS66508B, driven by the Si8271 driver, switching to 30A at a voltage of 400V.

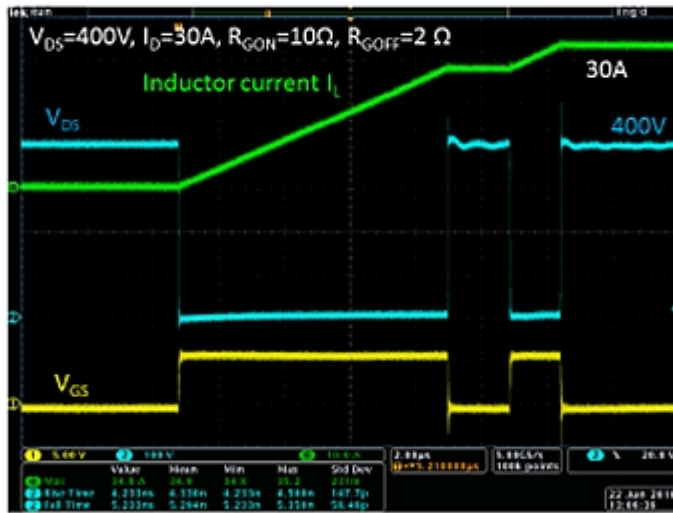


Figure 2 GaN Systems' GS66508B-EVBDB evaluation card in a double pulse test

Figure 3 shows a close-up view of the turn-on and turn-off periods, demonstrating the effectiveness of the driver and GaN devices working together. There are no Miller effect false turn-on periods, and the dv/dt reaches 95V/ns. This combination of an optimized layout and an effective driver results in highly efficient systems with very low switching losses.

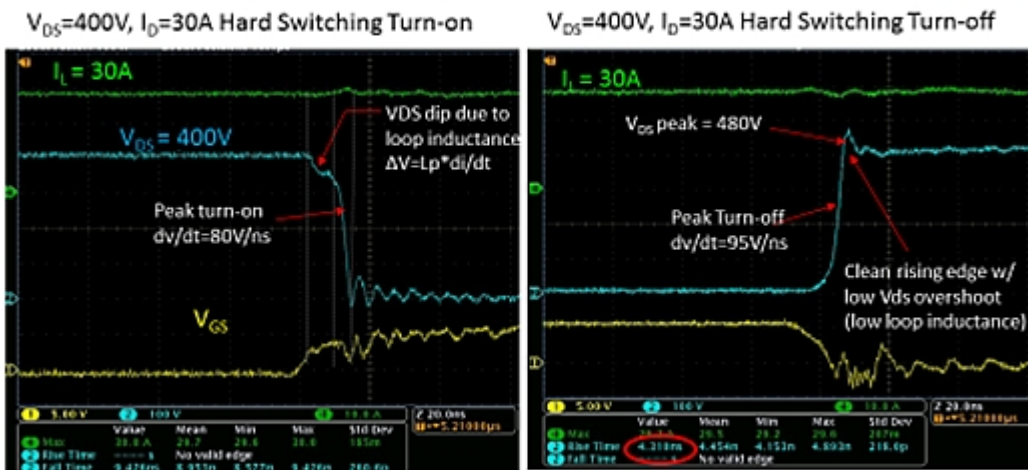


Figure 3 An optimized layout with a Si8271 driver combine for exceptional switching

While this discussion has focused on optimizing power supply performance, it should be noted that this same approach has already been extended to using GaN transistors for other applications where saving energy is paramount. Today products are appearing in many other application areas, including solar power inverters and microinverters, class D amplifiers, motor controllers, and chargers for electric vehicle/hybrid-electric vehicles (EV/HEV).

For more on driving GaN transistors, see [How to drive GaN E-mode transistors](#). And for more on Silicon Labs' Si827x ISODriver family, including development tools and data sheets, [visit this page](#).

