GaN Power ICs Enter The Market

Navitas Semiconductor has announced the immediate availability of production qualified iDrive Gallium Nitride (GaN) power ICs using the company's proprietary AllGaN technology. The NV6131, NV6105 and NV6115 offer a high-efficiency 650-V, 160-mΩ power FET with increasing integration of digital and analog circuits, leading to ground breaking speed, energy efficiency, power density and reduced system cost, according to the company. The NV6131 contains just the 650-V GaN FET, while the NV6105 adds driver and logic circuitry and the NV6115 contains all of that plus a regulator. All three devices are offered a in 5-mm x 6-mm QFN (Fig. 1.)

GaN can enable up to 100x higher frequencies than silicon but driving, controlling and protecting such high-speed power devices has been an industry challenge that has limited adoption. By integrating these critical digital and analog circuits monolithically with the GaN power device, these system-level problems have been eliminated, according to Navitas. One of the problems addressed by integration is the optimization of the driver-FET interface. A monolithic approach largely eliminates parasitic inductance in the gate driver loop, achieving clean and fast switching transitions (Fig. 2.) This tight integration also eliminates the need for a gate resistor as would be required to eliminate spikes with an external driver (Fig. 3.)

Navitas GaN Power ICs with iDrive are said to guarantee optimized and robust performance for any application. According to the company, in these new chips a 10 to 100x increase in system operating frequency is combined with higher efficiencies to enable up to a 5x increase in power densities and 20% lower system costs.

"GaN Power ICs, with the monolithic integration of logic, analog & power, represent an industry breakthrough that will change the landscape of power electronics as we know it," explains Navitas CEO Gene Sheridan. "By integrating all gate-drive-related circuitry, virtually all frequency-related power losses are eliminated, opening the door to significant frequency and efficiency gains. We anticipate a major upgrade cycle in mobile fast chargers, thin TVs, high-efficiency data centers, LED lighting, solar and electric vehicle markets as this new high-speed revolution in power electronics gets underway," Sheridan added.

"The Center for Power Electronics Systems (CPES) at Virginia Tech has been pioneering the advancement of high-frequency power systems for over three decades" explains Fred Lee, the university's distinguished and globally recognized professor. "The invention of GaN power ICs represents a major industry breakthrough and is a critical ingredient to make high-speed, high-efficiency power systems a reality. This is an exciting time for the power industry."

Leading power semiconductor market researcher, Hong Lin at Yole Developpement, goes on to explain "it has been well-recognized that GaN has the potential to displace a large percentage of the $15B power silicon market, but adoption has been partially limited by the system challenges in cost-effectively driving and controlling the GaN power device at high speeds. The integration of logic, analog and power in a GaN power IC solves this remaining roadblock and positions GaN to realize its full potential."

The NV6131, NV6105 & NV6115 (in 5-mm x 6-mm QFNs) are available immediately to qualified partners. Datasheets, samples and pricing are still under NDA for now to qualified customers/partners.

For more details, see www.navitassemi.com. Navitas will demonstrate the NV61xx series in a demonstration suite at the Applied Power Electronics Conference (APEC), which is being held March 26 - 30, 2017 in Tampa, Florida. Contact info@navitassemi.com for more information.

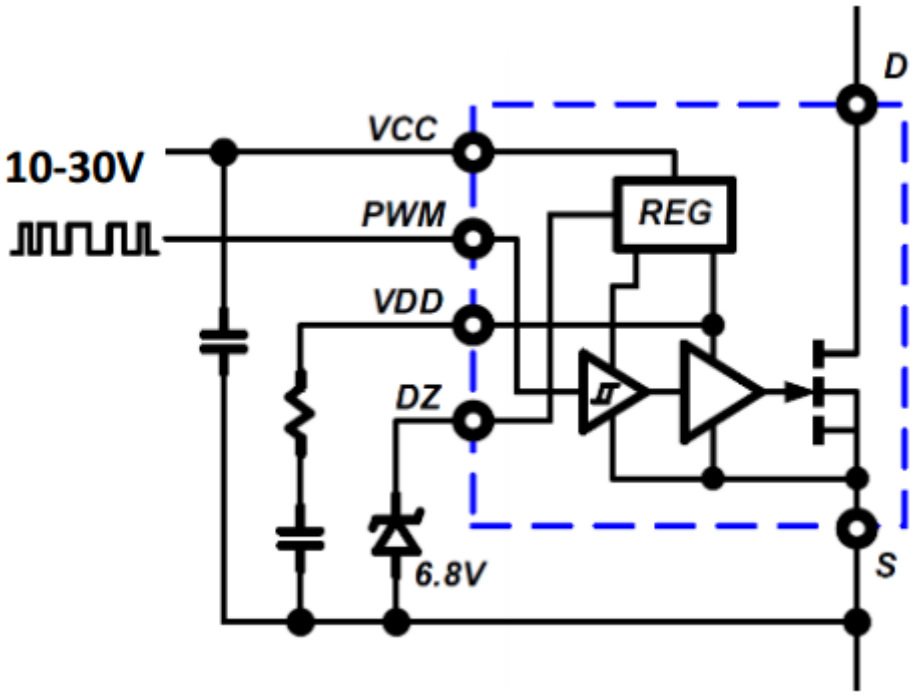
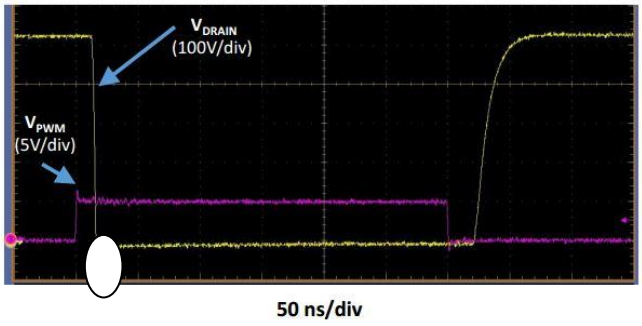


Fig. 1. The most integrated of the new GaN power ICs, the NV61159 (shown within the blue box) combines a 650-FET with driver and logic circuitry and a voltage regulator.

- Prop delays 10-20 ns
  - From PWM input to 10% of FET V_{DS} change
- Turn-on & turn-off times 10-15 ns
- Zero gate loop inductance



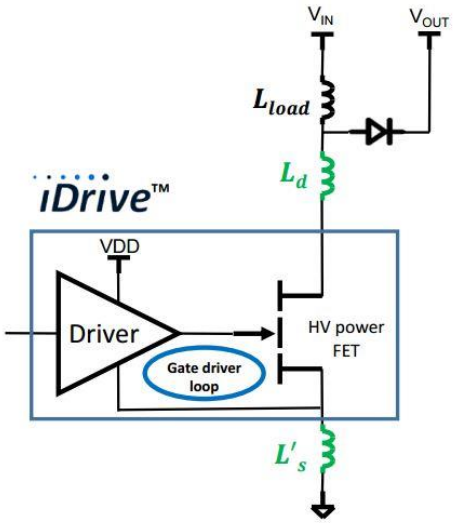


Fig. 2. Monolithic integration of gate driver and FET enables short propagation delays and fast and clean rise and fall times on the switch-node waveforms. As this measurement shows, there's just a slight undershoot during turnoff.

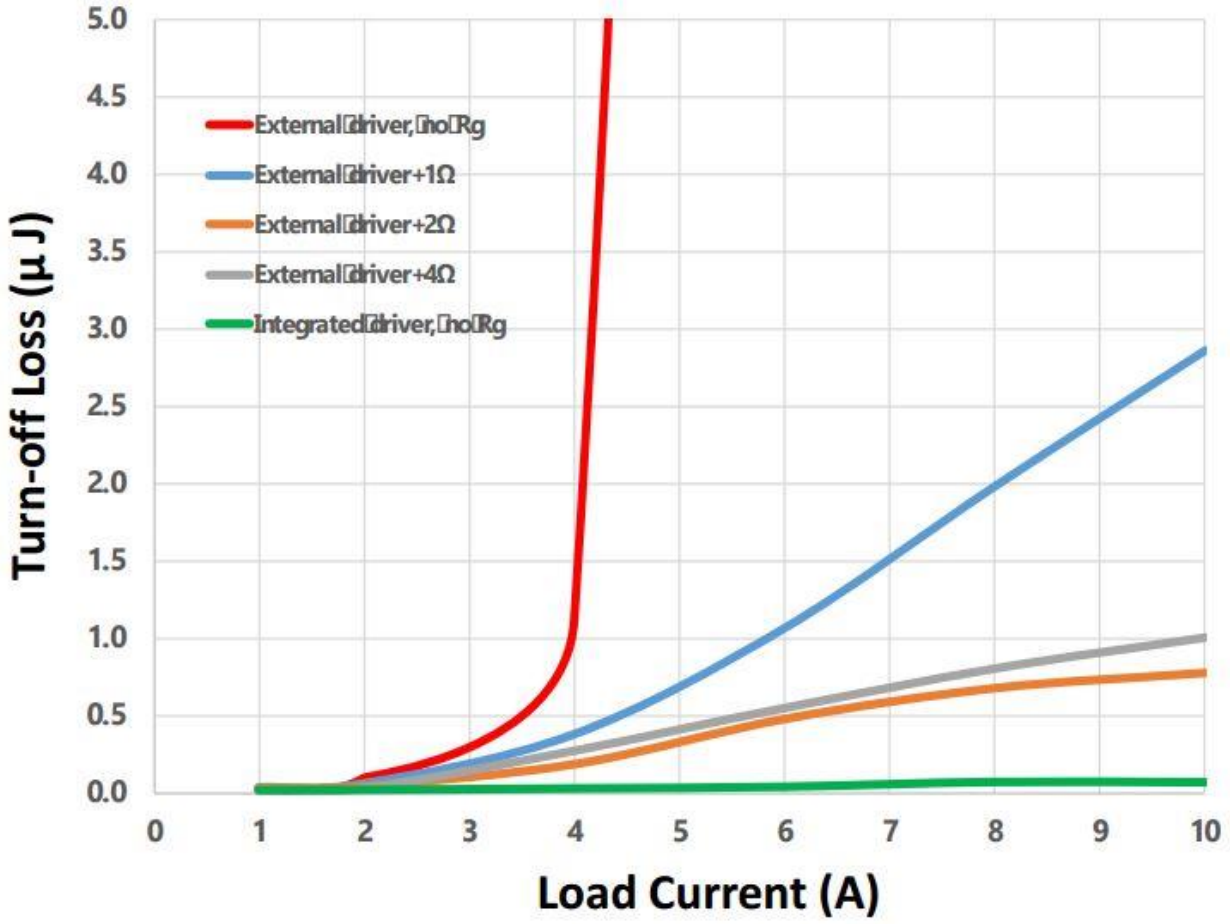


Fig. 3. Having the driver and FET on the same chip eliminates the need for a gate resistor to suppress voltage spikes during switching. Eliminating the gate resistor, in turn, dramatically reduces turn-off losses as shown here.