

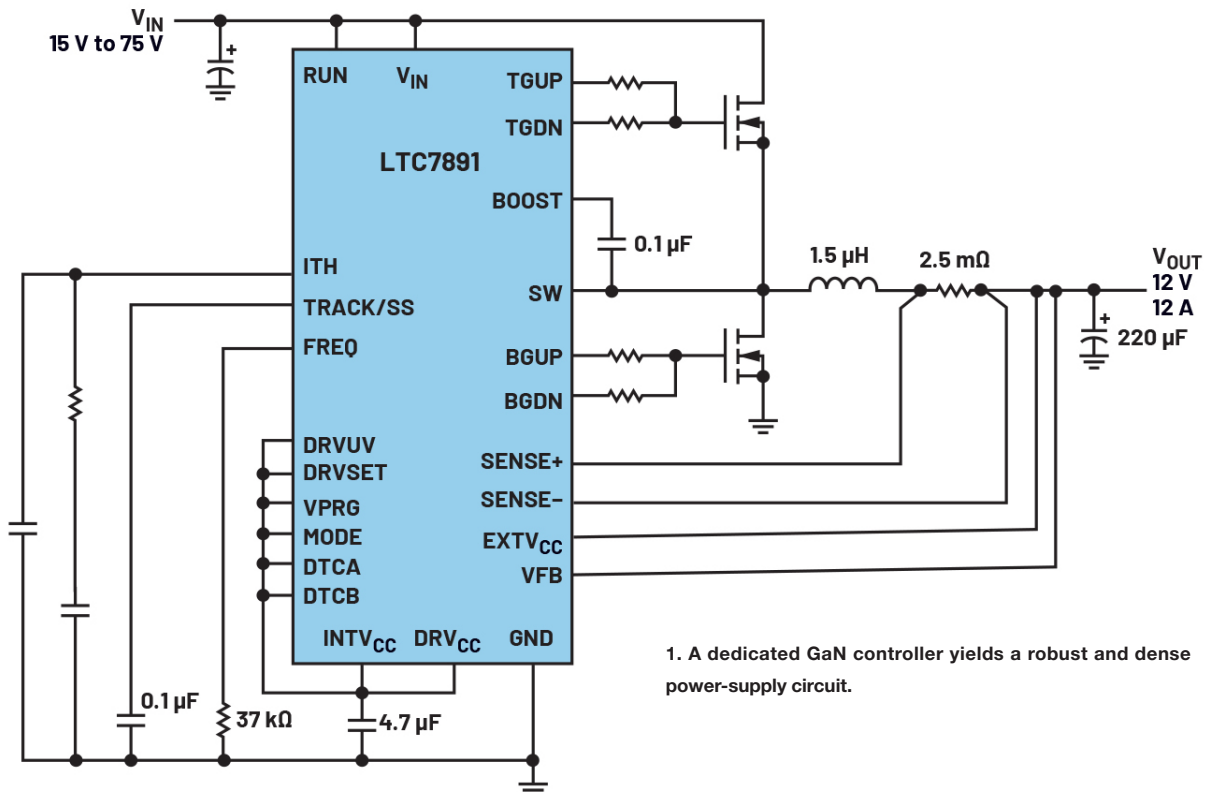
# Moving On to GaN Switches in Switch-Mode Power Supplies

GaN switches promise higher efficiency and higher power density in SMPS. This article discusses the readiness of this technology and its challenges, and provides an outlook on being a replacement for silicon in these power supplies.

A common question comes up among power-management design engineers these days: “Is it time to switch from silicon power switches to GaN-based ones? Gallium-nitride (GaN) technology offers many advantages over traditional silicon-

based MOSFETs. As a wide-bandgap semiconductor, GaN allows power switches to operate at high temperatures and achieve high power density.

Due to its high breakdown voltage, GaN is suitable for applications above 100 V. Even below 100 V, its high power



1. A dedicated GaN controller yields a robust and dense power-supply circuit.



is to select a SMPS controller IC, such as Analog Devices' (ADI) LTC7891 single phase, step-down (buck) GaN controller. Selecting a dedicated GaN controller makes a GaN power-supply design simple and robust.

All of the challenges previously mentioned are addressed and solved with such controllers. *Figure 1* shows the simplicity of a step-down power design using GaN FETs controlled by a dedicated GaN controller like the LTC7891.

If an existing power supply with an existing controller IC needs to be repurposed to control a GaN-based power supply, it makes sense to use a dedicated GaN driver. It takes care of solving the challenges with GaN and allows for a simple and robust design. *Figure 2* shows the power stage of a buck regulator implemented with an LT8418 driver IC.

### **Taking the First Steps**

Once suitable hardware, controller IC, and GaN switches have been selected, a great way to get the first evaluation results is via a detailed circuit simulation. ADI's [LTspice](#) offers complete circuit models that may be used for simulation free of charge. It provides a convenient way to learn about using GaN switches. *Figure 3* shows a simulation schematic with the LTC7890, a dual-channel version of the LTC7891.

### **Making the Move to GaN**

GaN technology for switch-mode power supplies has reached a solid development state in which many power-supply applications can be designed with them. However, each new generation of GaN switches will undergo further development. The existing SMPS controllers and drivers for GaN from ADI are a flexible, yet dependable way to work with GaN FETs from different vendors now and in the future.