

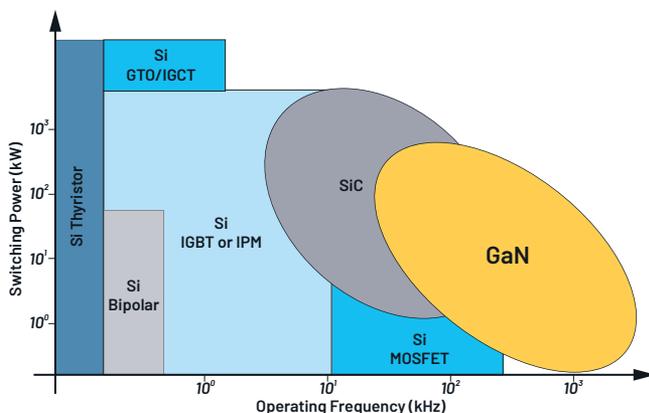
# GaN Power Solutions

Power You Can Trust

## Robust System Performance with Analog Devices' GaN Power Solutions

The superior switching performance of gallium nitride (GaN) FETs enables higher power density for space constrained applications. Analog Devices' GaN power solutions provide reliable control, design flexibility, and robust system performance for wide-band gap GaN HEMTs (high electron mobility transistor) in applications within industrial motor control, data center power, communication, EV power train, and renewable energy.

Explore how Analog Devices' GaN power solutions simplify the design process and enable energy-efficient performance.



### Designing with GaN FETs Challenges

- Advanced Gate Control compared to Si MOSFETs
- Ensuring robust and reliable system operation
- Sensitive printed circuit board layout

### Benefits

- Lower switching losses and increased efficiency
- Simpler system design for power conversion
- Miniaturization of the power solution



# GaN Maximizes Efficiency for DC-to-DC Power Conversion

## Smaller Footprint

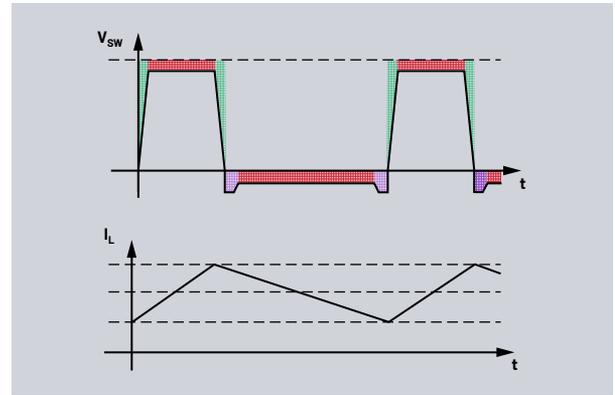
- Low  $R_{ON}$  GaN FET available in a smaller footprint compared to an equivalent silicon solution

## Minimize Switching Loss

- GaN FET have significantly lower total gate charge than comparable Si MOSFET
- Strong pull-up and pull-down current for the gate driver

## Minimize Dead Times Losses

- GaN FET: higher power loss when the GaN FET has reverse current flow and the gate driver is not driving the gate
- ADI gate drivers and controllers offer the flexibility to minimize dead time



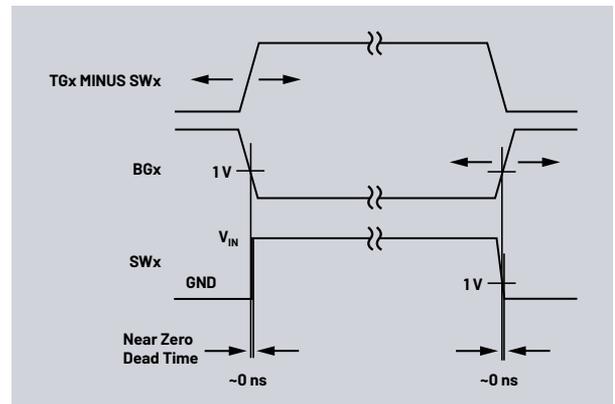
# GaN Controller Decreases Dead Time to Near-Zero

## Smart Dead Time Control

- When the BG edge achieves approximately 1V (rising or falling), the SW activates the TG
- Reduces dead time to near-zero to lower power loss while both FETs are in the off state
- Increases overall efficiency and maximizes GaN performance

## Acronyms

- TG = Top Gate
- BG = Bottom Gate
- SW = Switch Node
- GND = Ground



# LTspice® Simulation for GaN Power Solutions

## High Performance Tool for the Design and Optimization of Analog and Power Circuits

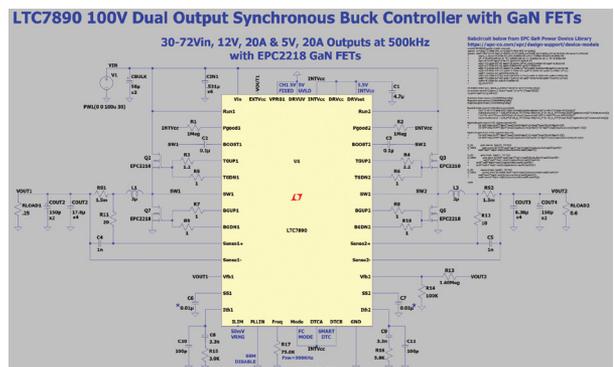
- Schematic capture—probe nodes of interest
- Waveform viewer—AC and noise analysis
- Example circuits—models ready to run

## LTspice Simulation

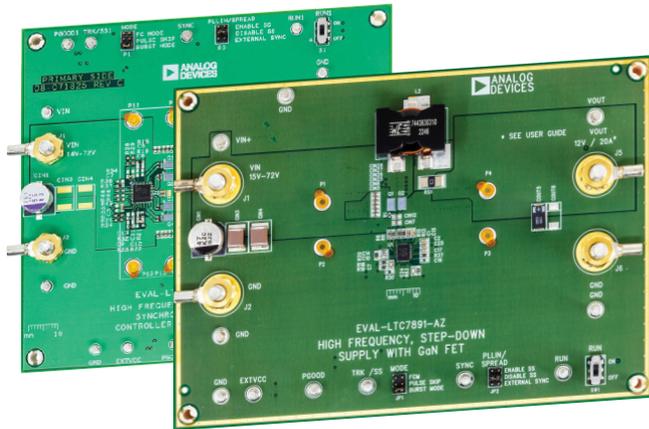
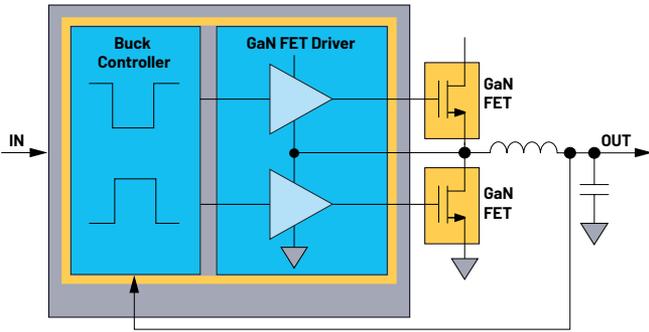
Get the Software—[LTspice](#)



Chat with Other Engineers—[Visit the LTspice Forum in EngineerZone®](#)



# GaN FET Step-Down Controllers



## Features

### Robust

- Precise gate drive voltage optimizes performance and protects the GaN FET
- High switching frequency up to 3 MHz

### Smart

- Smart integrated bootstrap switch
- Smart near-zero dead time increases efficiency and maximizes GaN performance

### Control

- Split gate drive for pull-up and pull-down
- Dead time control adaptive or with a resistor



### LTC7890

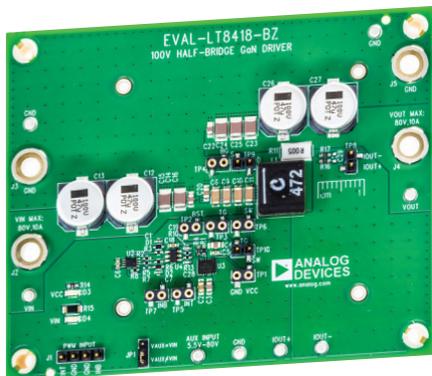
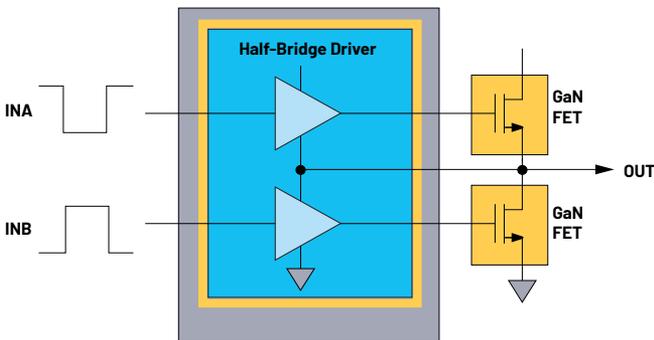
Low  $I_Q$ , Dual, 2-Phase Synchronous Step-Down Controller for GaN FETs



### LTC7891

100 V, Low  $I_Q$ , Synchronous Step-Down Controller for GaN FETs

# GaN Gate Drivers



## Features

### Flexible

- Split gate drivers for adjustable turn-on/off behavior
- 4 A peak source, 8 A peak sink current capability

### Control

- Low propagation delay: 10 ns typical
- Tight propagation delay matching: 1.5 ns typical
- High dv/dt immunity: up to 50 V/ns

### Robust

- Smart integrated bootstrap switch
- Undervoltage and overvoltage lockout



### LT8418

100 V Half-Bridge GaN Driver with Smart Integrated Bootstrap Switch

# GaN Technology Performance



## Industrial Automation

- Reduced solution size for compact, high power systems
- Increased switching frequency for higher bandwidth and more precise motor control
- High efficiency for lower power consumption in battery back-up systems



## Data Center

- Reduced system power lowers the power needed for cooling
- Better overall operating efficiency
- Increase in power density frees up physical space



## Automotive

- Lightweight and flexible battery designs for longer drive distance
- Efficiency improves charging performance
- Optimized energy usage improves the management of vehicle power



## Communication

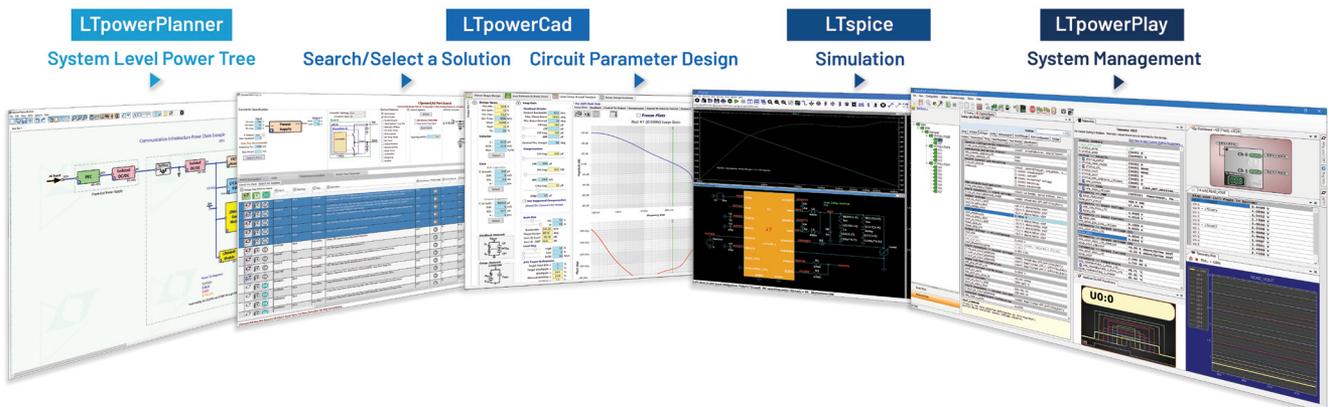
- Reliability for high capacity and high speed data transmissions
- Supports higher voltages without compromising performance
- Efficiency supports expansion of advanced communication infrastructure



## Renewable Energy

- Durable performance supports long lifetimes in energy storage systems
- Ensures stable, high quality power to and from the grid
- Efficient conversion of DC electricity advances energy production

## Power Design Tools



Start Your GaN Power Solution with Analog Devices

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