



## Gate Drive Optocouplers for GaN Power Devices

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### Introduction

Gallium nitride (GaN) power devices are gaining popularity over silicon power devices because their faster switching capability can improve overall system efficiency and reduce the size of the device and the operating cost. The technical benefits coupled with lower costs due to the increase in GaN production have increased the adoption in applications such as industrial power supplies and renewable energy inverters.

Broadcom<sup>®</sup> Inc. (formerly Avago Technologies) gate drive optocouplers are used extensively in driving silicon-based semiconductors, such as IGBT and power MOSFETs. Optocouplers provide reinforced galvanic insulation between the control circuits and the high voltages. The ability to reject high common mode noise prevents erroneous driving of the power semiconductors during high-frequency switching. This paper describes the benefits of GaN, its gate drive requirements, and the gate drive designs, tests, and performance.

### Benefits of GaN

Gallium nitride is a wide bandgap (3.4 eV) compound made up of gallium and nitrogen. Bandgap is a region formed at the junction of materials where no electron exists. Wide bandgap GaN has a high breakdown voltage and a low conduction resistance. It has a higher electron velocity and a lower parasitic capacitance, which improve its switching speed.

The benefits of GaN over silicon can be summarized by three main points:

- Smaller system designs
- Lower system costs
- Higher system efficiency

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