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Bidirectional 650-V GaN Switch Enables More Efficient Power Conversion Across Multiple Applications

Infineon Technologies' CoolGaN bidirectional switch (BDS) G5 is a 650-V gallium nitride (GaN) switch capable of actively blocking voltage and current in both directions. Featuring a common-drain design and a double-gate structure, it leverages Infineon's robust gate injection transistor (GIT) technology to deliver a monolithic bidirectional switch, enabled by Infineon's CoolGaN technology. The device serves as a highly efficient replacement for traditional back-to-back configurations commonly used in converters.

Two devices are initially offered. The IGLT65R055B2 has an $R_{DS(ON)}$ of 55 mΩ typ. (70 mΩ max.) and a Q_g of 5.4 C. The IGLT65R110B2 has 110 mΩ typ. (140 mΩ max) and 1.52 C. Both devices come in a PG-HDSOP-16 package, which has a footprint of approximately 10 x 10 mm (see the figure).

By integrating two switches in a single device, the bidirectional CoolGaN switch simplifies the design of cycloconverter topologies, enabling single-stage power conversion, eliminating the need for multiple conversion stages. This leads to improved efficiency, increased reliability, and a more compact design.

BDS-based microinverters also benefit from higher power density and reduced component count, which simplifies manufacturing and reduces costs. Additionally, the device supports advanced grid functions such as reactive power compensation and bidirectional operation.

As a result, this solution holds significant potential across a wide range of applications, including microinverters for residential and commercial solar installations, and battery chargers and dischargers in energy storage systems (ESSs). Another use is in EV charging systems, where a BDS switch supports faster, more efficient charging while also enabling vehicle-to-grid (V2G) functionality.

The CoolGaN BDS is also well suited for use in current source inverters (CSIs) for industrial motor drives. Compared to traditional voltage source inverters (VSIs), CSIs offer benefits such as:

- Sinusoidal output voltage, which supports longer cable runs, reduced losses, and improved fault tolerance.
- Replacement of the dc-link capacitor with an inductor, improving high-temperature performance and short-circuit protection.
- Higher efficiency at partial loads, lower EMI, inherent buck-boost capability for voltage variation, and scalability for parallel operation.

These features make CSIs a more robust and efficient alternative for industrial motor applications.

One other application is AI server power supplies, where bidirectional switches like CoolGaN support higher switching frequencies and power density in architectures such as Vienna rectifiers and H4 PFCs. A single CoolGaN BDS can replace two conventional switches, reducing component count, cost, size, and overall power losses.

The CoolGaN bidirectional switch (BDS) 650 V G5 is available for ordering now as well as samples of the 110-mΩ product (IGLT65R110B2). More information is available here.

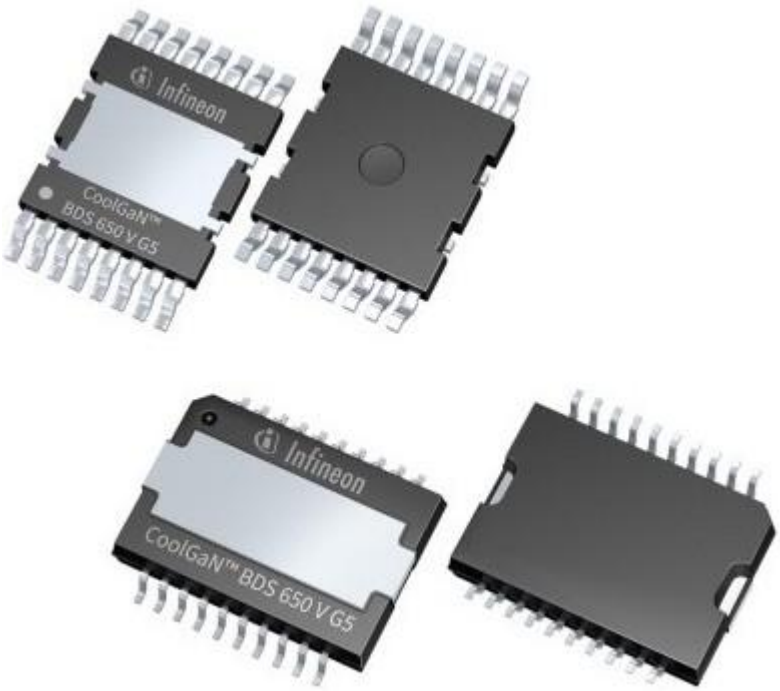

Figure. Infineon's CoolGaN bidirectional switch (BDS) 650 V G5 can replace two conventional switches, reducing component count, cost, size, and overall power losses.