

Isolated IGBT/SiC MOSFET Gate Driver Benefits HEV/EV Applications

[Texas Instruments'](#) UCC5870-Q1 is a 15-A isolated IGBT/SiC MOSFET gate driver that is functional safety compliant and targets automotive applications. Designed to drive high-power SiC MOSFETs and IGBTs in HEV/EV applications, this driver IC features integrated diagnostics and protection, supporting functional safety goals enabling ISO 26262 compliance up to ASIL D, while reducing powertrain system cost (see Fig. 1).

It includes adjustable "on the fly" gate drive strength and split driver outputs that provide 15-A source and 15-A sink currents. Nagarajan Sridhar, automotive marketing lead, High Voltage Power, High Power Drivers observes that the ability to adjust gate-drive strength allows designers to optimize inverter output for motor requirements.

In EV traction inverter applications, the functional integration provided by the UCC5870-Q1 enables board-space reductions as depicted in Figs. 2 and 3.

Other benefits:

- SPI programmability enables configuration across multiple platforms with a single gate driver.
- The IC eliminates discrete components with its high drive strength, built-in self test and diagnostics (ADC, ASC).
- The company provides risk-mitigated continuous high-volume supply with multiple manufacturing locations qualified for isolation technology.

The UCC5870-Q1 is housed in a 12.8-mm x 7.5-mm, 36-pin SSOP. The pre-production version of the device is available now, only on TI.com, priced at \$4.416 each in 1000-unit quantities. A full evaluation module (EVM) is also available. For more information on the gate driver IC, see the UCC5870-Q1 [data sheet](#). For more on the EVM see the [user guide](#).

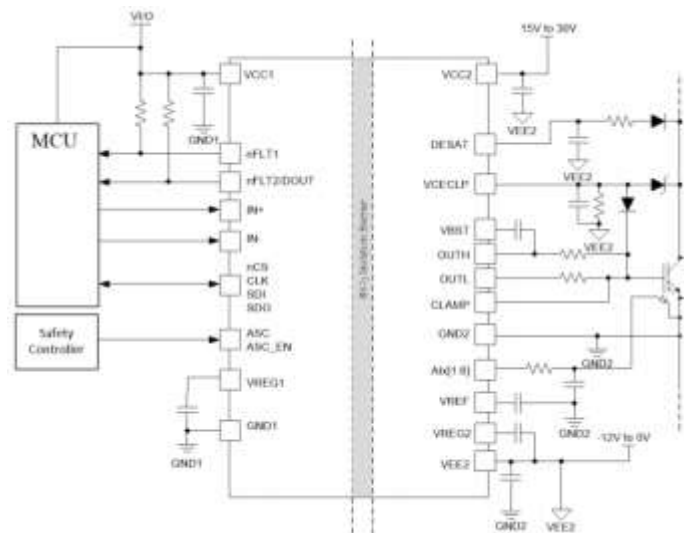


Fig. 1. The UCC5870-Q1 device is a functional safety compliant, isolated, highly configurable single-channel gate driver targeted to drive high-power SiC MOSFETs and silicon IGBTs in EV/HEV applications. Power transistor protections such as shunt-resistor-based overcurrent, NTC-based overtemperature, and DESAT detection, including selectable soft turn off or two-level turn off during these faults. To further reduce the application size, the UCC5870-Q1 integrates a 4-A active Miller clamp during switching, and an active gate pull-down while the driver is unpowered. An integrated 10-bit ADC enables monitoring of up to six analog inputs and the gate driver temperature for enhanced system management. Diagnostics and detection functions are integrated to simplify the design of ASIL-D compliant systems. The parameters and thresholds for these features are configurable using the SPI interface, which allows the device to be used with nearly any SiC MOSFET or silicon IGBT.

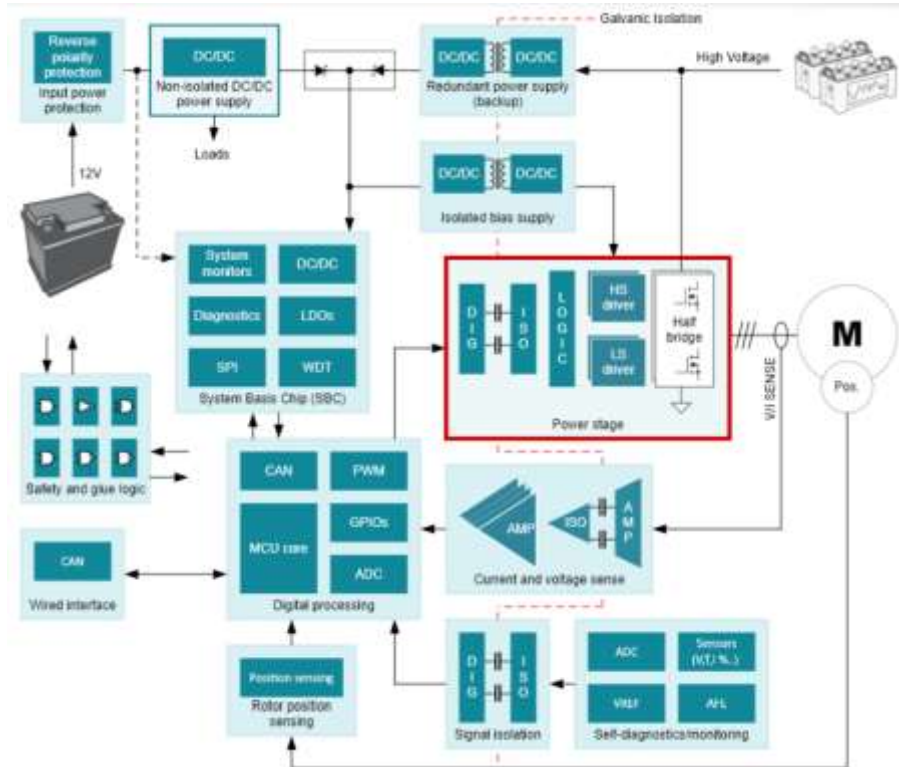


Fig. 2. Use of the UCC5870-Q1 isolated IGBT/SiC MOSFET gate driver can reduce board size by at least 50% to increase system-level power density in the traction inverter.

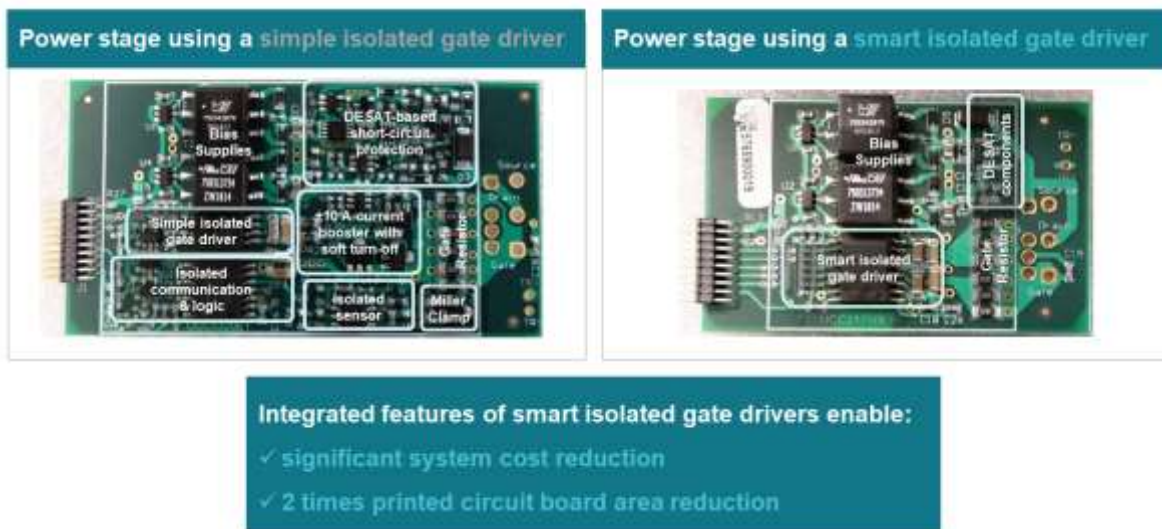


Fig. 3. The UCC5870-Q1 provides a dramatic benefit in component reduction, enabling lower design-to-cost and the ability to achieve the desired ASIL level. These photos illustrate the board-level benefits of integration in a traction inverter system.