

Three-Phase MOSFET Gate Driver Maximizes Battery Life And Cuts Component Count

From [TRINAMIC Motion Control](#), now part of Maxim Integrated Products, the fully integrated TMC6140-LA three-phase MOSFET gate driver simplifies design and maximizes battery life of brushless dc motor drives such as those that may be used in power tools (Fig. 1). The TMC6140-LA three-phase MOSFET gate driver integrates all three bottom shunt amplifiers to provide a complete motor drive solution with 30% improved power efficiency, while simplifying design by reducing component count by half when compared to similar solutions, according to the vendor.

The TMC6140-LA is optimized for performance over a wide voltage range, making it well suited for servo motors, brushless motors and permanent magnet synchronous motors. The three-phase gate driver is equipped with pins to add a charge pump, statically stabilizing the gate voltages of external MOSFETs in three-phase motors with up to 100 A of coil current.

The TMC6140-LA integrates three bottom shunt amplifiers for current sense and diagnostics, as well as a switching regulator, simplifying design and reducing component count by 50% compared to similar solutions, according to the vendor. For applications at 15 V or lower, the switching regulator output can be used to stabilize the power supply, which maintains the output signals to ensure consistent operation over an extended battery life. Additionally, the integrated shunt amplifiers provide current sensing for status information. An analog programmable short detection and diagnostic output reports status back to the host (Fig. 2).

“The integrated current sense and diagnostics features are key for enabling functional safety without adding complicated circuitry or additional components to any system’s design,” said Michael Randt, founder of Trinamic Motion Control. “This allows engineers to increase efficiency by 30 percent with minimal effort.”

The TMC6140-LA is available for \$2.68 each in quantities of 1000-up from Trinamic’s authorized distributors. The TMC6140-EVAL evaluation board and TMC6140-EVAL-KIT evaluation kit with both bridge and driver evaluation boards are also offered for \$66 and \$130, respectively. For more information, see the [TMC6140-LA page](#) and the [TMC6140-EVAL-KIT page](#).



Fig. 1. The fully integrated TMC6140-LA simplifies design of high-performance brushless dc motor drives and improves efficiency by 30%, according to the vendor. Offered in a 36-pin QFN package, the gate driver is a flexible solution offering 0.5-A or 1.0-A gate drive current for 5-V to 30-V battery-powered applications, such as power tools where voltages can drop below 10 V. Integrated current sense and diagnostics features add functional safety while simplifying design.

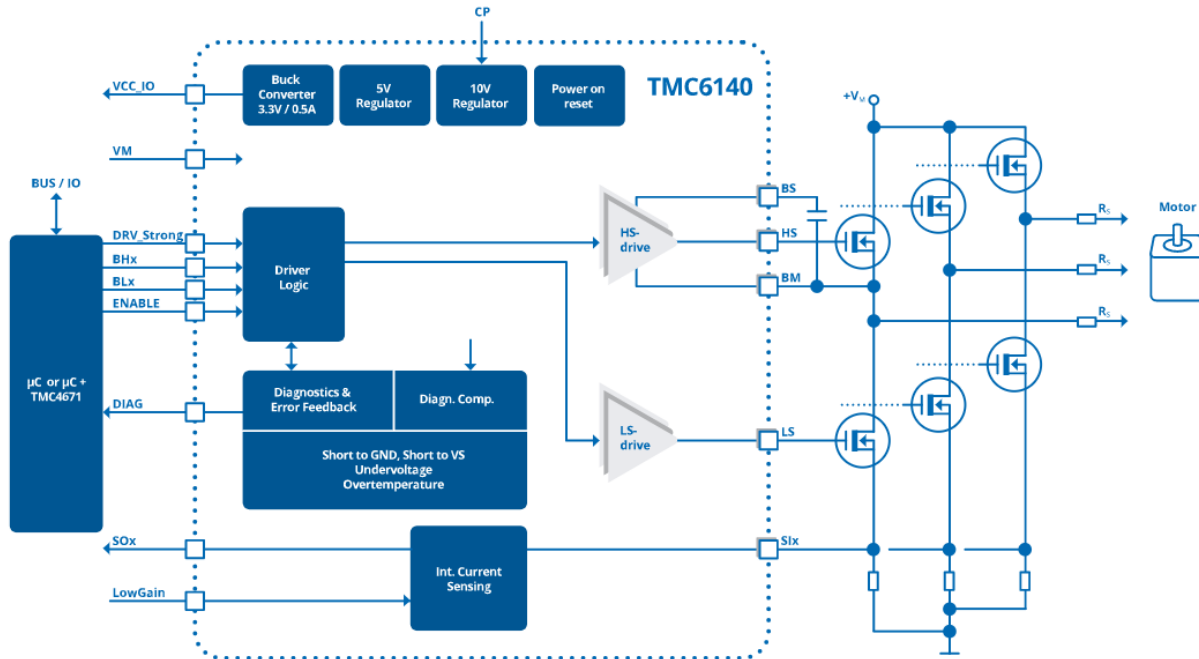


Fig. 2. Simplified block diagram for the TMC6140-LA, a fully integrated universal three-phase MOSFET gate driver for PMSM servo or BLDC motors. External MOSFETs for up to 100 A motor current are supported. Three bottom shunt amplifiers allow easy current sensing and enhanced commutation of the motor. A switching regulator (3.3 V, 0.5 A, internal Schottky diode for up to 100 mA) generates enough power for the IOs and the microcontroller. Further on, it can serve as step-up converter to stabilize statically the gate voltages of the MOSFETs. A DIAG output for further diagnostics and two different power down modes are available.