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Integrated Gate Drivers Simplify Control Of Brushless Motors

STMicroelectronics' STDRIVE102H and STDRIVE102BH integrated gate drivers for three-phase brushless motors boost performance, efficiency, and economy in consumer and industrial equipment (Fig. 1). With an operating-voltage range of 6 V to 50 V, the STDRIVE102H for single-shunt control and STDRIVE102BH for three-shunt control are easily configured through two analog pins.

A simple resistor divider can program the gate-drive current supplied to the external MOSFETs and lets designers optimize the power-stage performance, including limiting the switching slew rate, without using gate resistors. With a low-current standby mode that effectively preserves battery performance, the drivers are suited to cordless power tools and appliances, e-bikes, and mobile robots, as well as industrial drives.

The drivers integrate charge-pump circuitry capable of sustaining unlimited on-time of the high-side MOSFETs, which simplifies the design of applications that require a PWM duty cycle of 100%. Also, the charge pump ensures the high-side and low-side MOSFETs are driven with identical gate-source voltage to balance the behavior of the power stage. In addition, internal low-dropout regulators (LDOs), which provide 12 V and 3.3 V for the drivers' low-side circuitry and analog front-end (AFE), can be used for conveniently powering external components (Fig. 2).

Further features include extensive protection against electrical and thermal hazards. In addition to undervoltage lockout (UVLO) and thermal shutdown, drain-source voltage (VDS) monitoring is provided on both high-side and low-side MOSFETs that guarantees redundancy in overcurrent protection. Rapid fault signaling responds promptly when any protection mechanism is triggered to enhance system safety and reliability.

The EVLDRIVE102H and EVLDRIVE102BH evaluation boards accelerate development of systems using various schemes including field-oriented control (FOC) and six-step motion control. With motor back-EMF sensing on-board, as well as inputs for motors equipped with position sensors for extra precision, the boards provide standard headers for connecting STM32 Nucleo host-microcontroller boards. The X-CUBE-MCSDK STM32 motor-control software development kit (MCSDK) provides the tools and code engineers need to get the motor up and running and develop their application.

The STDRIVE102H and STDRIVE102BH are available now in 5-mm x 5-mm and 6-mm x 6-mm QFN packages, respectively, priced from $1.20 for orders of 1000 pieces. For more information on the gate drivers, see the STDRIVE102H and STDRIVE102BH pages. For more on the eval boards, see the EVLDRIVE102H and EVLDRIVE102BH pages.

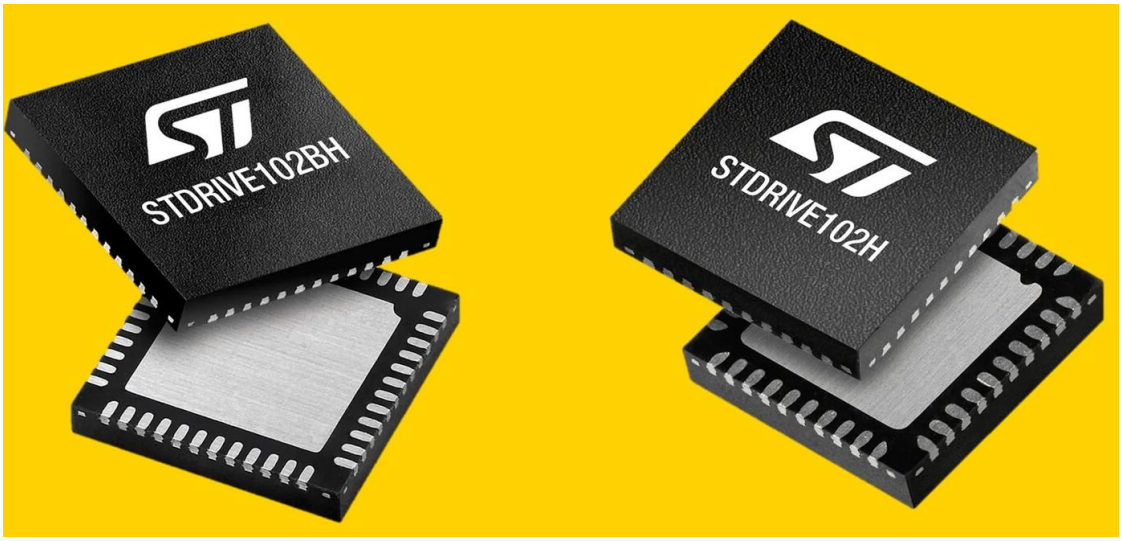
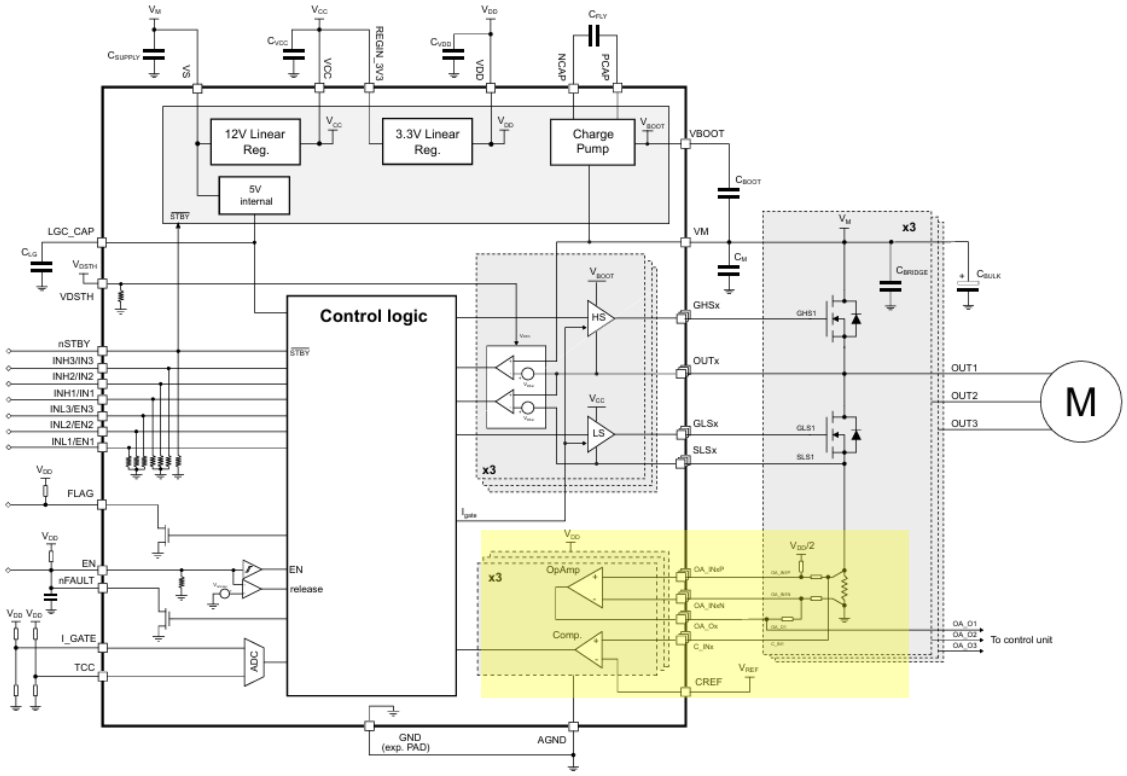
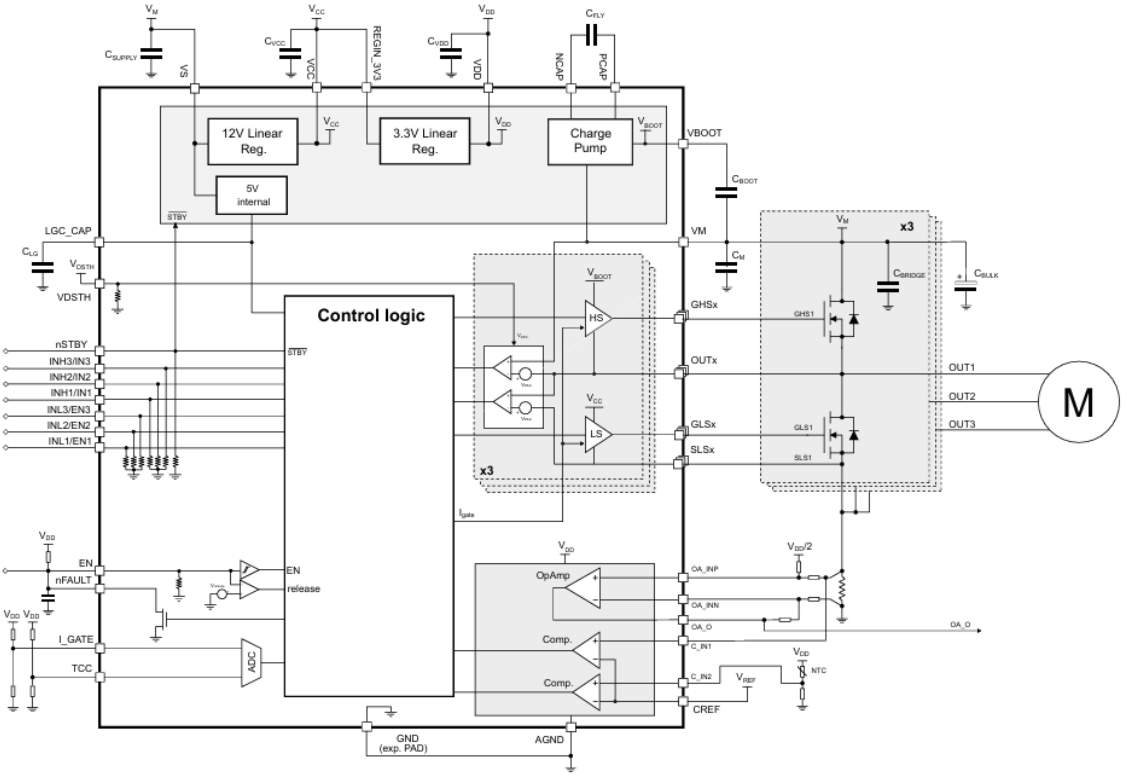


Fig. 1. Offered in a 5-mm x 5-mm and a 6-mm x 6-mm QFN respectively, the STDRIVE102H and STDRIVE102BH are integrated gate drivers for three-phase brushless motors targeting battery-powered motor driver applications such as power tools, vacuum cleaner and small appliances for which they feature a very efficient standby mode. Other applications include e-bikes, industrial automation, robotics, and pumps and fans.



(a)



(b)

Fig. 2. Block diagrams are shown here for the STDRIVE102BH with three-shunt control (a) and the STDRIVE102H with single-shunt control (b). An integrated charge pump supplies the three high-side drivers, enabling unlimited on-time of the high-side MOSFETs.