ISSUE: May 2024

Motor Gate-Driver IC Eases Migration From 12-V To 48-V Systems

Infineon Technologies' MOTIX TLE9140EQW gate-driver IC for brushless dc motors targets the demanding 24-V/48-V market. The TLE9140 is tailored for automotive motor control applications featuring higher voltage requirements from 24 V up to a maximum of 72 V, where higher system reliability and faster switching behavior are necessary.

The IC complements Infineon's MOTIX MCU TLE987x and TLE989x 32-bit motor control SoC solutions but is also suitable as a 48-V BLDC driver when paired with common MCUs on the market. Typical applications include pumps and fans, windshield wipers, the HVAC module, or e-compressors. In addition, the TLE9140 is applied as three-phase motor gate driver for applications in commercial, construction, and agricultural vehicles as well as in light electric vehicles such as e-bikes, e-scooters or e-motorcycles.

"Our new motor gate driver IC allows customers to easily scale their existing 12-V MOTIX TLE987x and TLE989x motor control designs to 24-V or 48-V systems", says Andreas Doll, senior vice president, and general manager Smart Power at Infineon. "The TLE9140EQW enables the reuse of hardware and software designs, allowing our customers to shorten their time-to-market and optimize their development costs when moving to 24-/48-V systems." See Figs. 1 and 2.

The gate-driver IC offers functional safety according to ISO 26262 ASIL B. It is housed in a small TS-DSO-32 package. The IC features a high-voltage capability up to 110 V, a gate driver capability of ~230 nC/MOSFET up to 20 kHz as well as SPI communication. Additionally, it has an active low-side (LS) freewheeling function during V SM overvoltage (OV) and a wide range of important diagnostic and protection functions such as timeout-watchdog, drain-source monitoring, overvoltage, undervoltage, cross-current and overtemperature protection as well as off-state diagnostics.

What's more, the TLE9140 includes Infineon's patented gate-shaping function, an adaptive MOSFET control that can compensate for fluctuations in the MOSFET parameters in the system. It automatically adjusts the gate current to achieve the desired switching behavior. This allows the system to be optimized in terms of electromagnetic emissions (EMI) by slower slew rates, while minimizing power dissipation through shorter dead times and shorter rise/fall times.

To accelerate the evaluation and design-in process, Infineon's MOTIX motor control ICs are accompanied by a wide range of software and tools. The TLE9140 evaluation board is user-friendly and enables rapid evaluation and prototyping. In addition, Infineon provides a configuration wizard and a device driver for the TLE9140 that provides a simple API for generating the control frames for the external bridge driver via SPI. Both are available free of charge.

The MOTIX TLE9140 motor gate driver is available now. More information is available on the TLE9140EQW page.

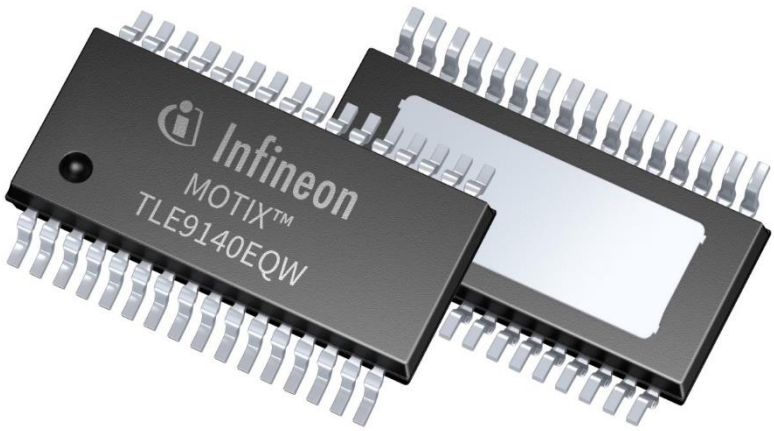

Fig. 1. The MOTIX TLE9140EQW gate-driver IC can be used together with MOTIX MCU to transfer 12-V applications to 24-V or 48-V platforms with only minor software development effort.

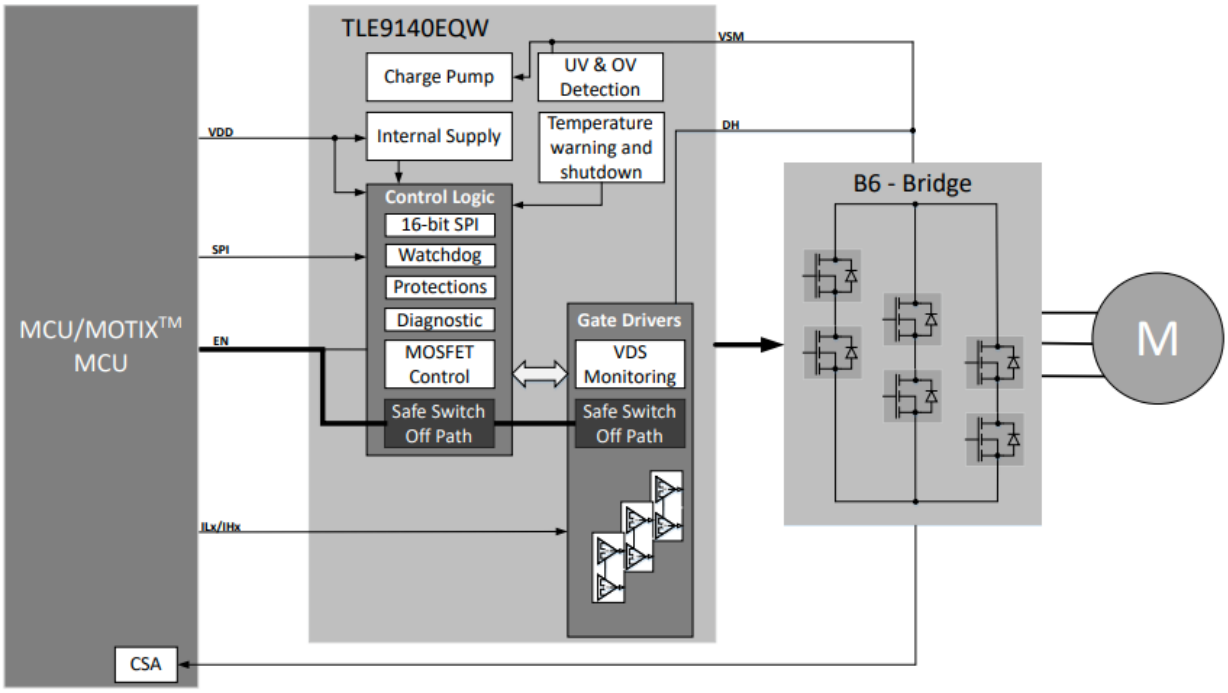

Fig. 2. Compatible with both MOTIX MCUs and other MCUs on the market, this 48-V MOSFET gate driver can drive three half-bridges in a 24-V/48-V platform. In doing so, it provides protection features but also enables using the diagnostic features integrated in the MOTIX MCUs.