MOTIX™ TLE9190 gate driver IC for 48V/24V BLDC motors

Features

AEC Qualified

RoHS

ISO 26262 compliant

- High power 3-phase bridge driver for switching of six N-channel FETs with a Q_{Gtot} of 230 nC at a 20 kHz PWM
- Current source controlled output stages Gxx with adaptive MOSFET gate control
- 0…100% duty cycle, adjustable without restrictions
- Extended functional supply voltage range of 8 V to 70 V for a 24 V and 48 V battery supply systems
- High robustness of motor connection pins of -13 V to 110 V
- Three current sense amplifiers for low side shunt current measurement with high accuracy of 1% and fast settle time of 1 µs
- Extended monitoring and diagnostic functions via serial peripheral interface (SPI)
- Support of self-test features
- SPI window watchdog for microcontroller supervision
- Configurable failure reactions including motor brake function
- Additional safe state control pin SOFF_N
- High voltage rated digital input pins to microcontroller interface
- Developed according to ISO 26262 ASIL-D
- ISO 26262 safety element out of context for safety requirements up to ASIL D
- Safety manual available
- Passive clamping of external FETs
- Low quiescent current mode
- Optimized pinout for 24V/48V layout
- Green product (RoHS-compliant)
- Soldering: automated optical inspection capability (AOI)

Potential applications

- 24 V and 48 V electric power steering (EPS)
- 24 V and 48 V electric brake booster (EBB)
- 24 V and 48 V functional safety related BLDC or PMSM motor drive applications

Product validation

Product validation according to AEC-Q100, Grade 0. Qualified for automotive applications.

Product description

The TLE9190 is a powerful gate driver for six N-channel power MOSFETs forming an inverter for 3-phase BLDC motors in the automotive applications. TLE9190 is addressing 24 V and 48 V battery voltage systems.

All low- and high-side output stages use current controlled gate driver concept and with 230 nC capable of driving a wide range of N-channel power MOSFETs. An adaptive MOSFET control concept allows to program the gate current sequence of each MOSFET in any desired way to optimize EMC and power dissipation performance. The device withstands voltages between -12 V and 110 V at motor phase related pins.

The individual switches are directly controlled via input pins allowing maximal flexibility for all kind of motor control schemes (for example FOC algorithm). Any duty cycle can be applied without restriction (0-100%). TLE9190 includes three current sense amplifiers to measure ground-based phase currents with high accuracy of 1% and fast settling time of 1 µs.

An SPI interface is used to control and configure the TLE9190. The SPI is protected by cyclic redundancy check over data and address bits to secure a safe communication and data integrity.

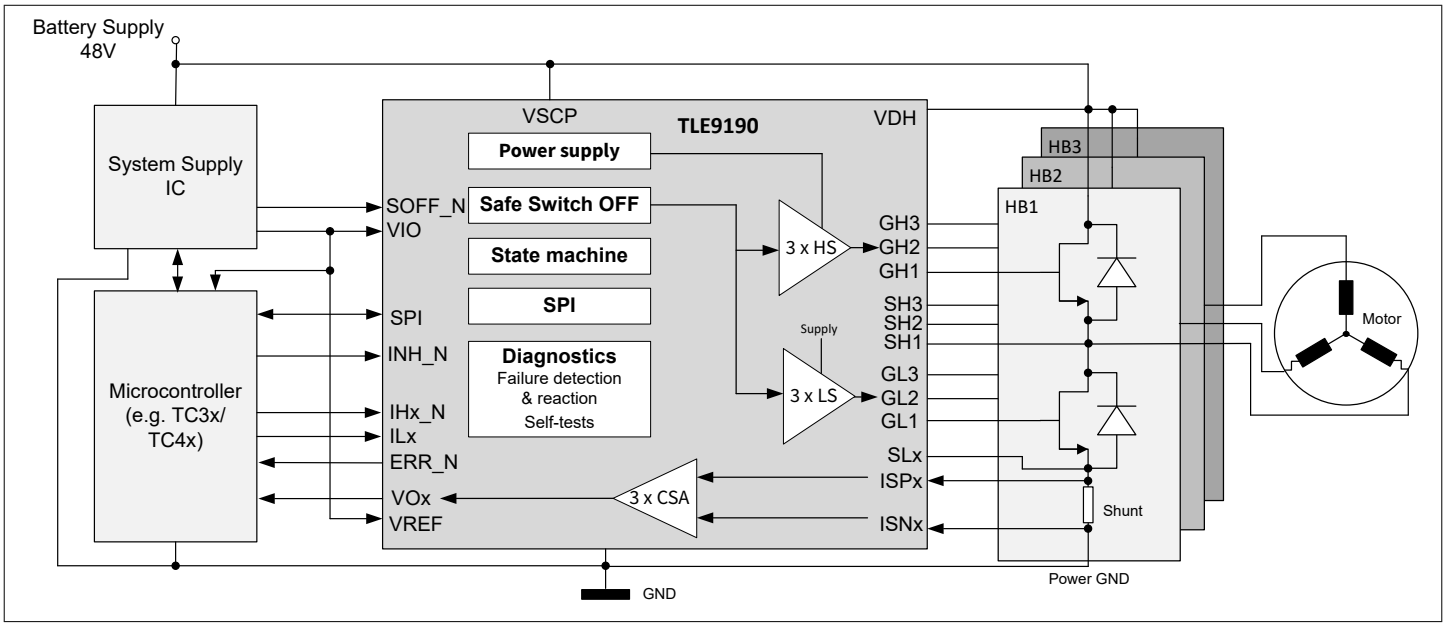
The TLE9190 offers a wide range of diagnostic features, like monitoring of power supply voltages as well as system parameter monitoring. Failure behavior, threshold voltages and filter times of the supervisions of the device are fully adjustable via SPI.

TLE9190 provides configurable failure reaction modes, including the option to decelerate a spinning motor by turning on the low side MOSFETs.

Product description

The TLE9190 is especially designed for safety relevant motor drive applications and is developed according to the ISO 26262:2018 as a hardware safety element out of context with ASIL D. An optimized monitoring and diagnostic concept, including built-in self-test functions ensures high flexibility on fault reactions and low FIT rates for the relevant failure modes.

TLE9190 is offered in VQFN 48 pin package with an exposed pad for an optimized thermal performance and provides special leads allowing an automated optical inspection.



Simplified application diagram

Product type	Package	Marking
TLE9190	VQFN-48	TLE9190QVW

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1 Package

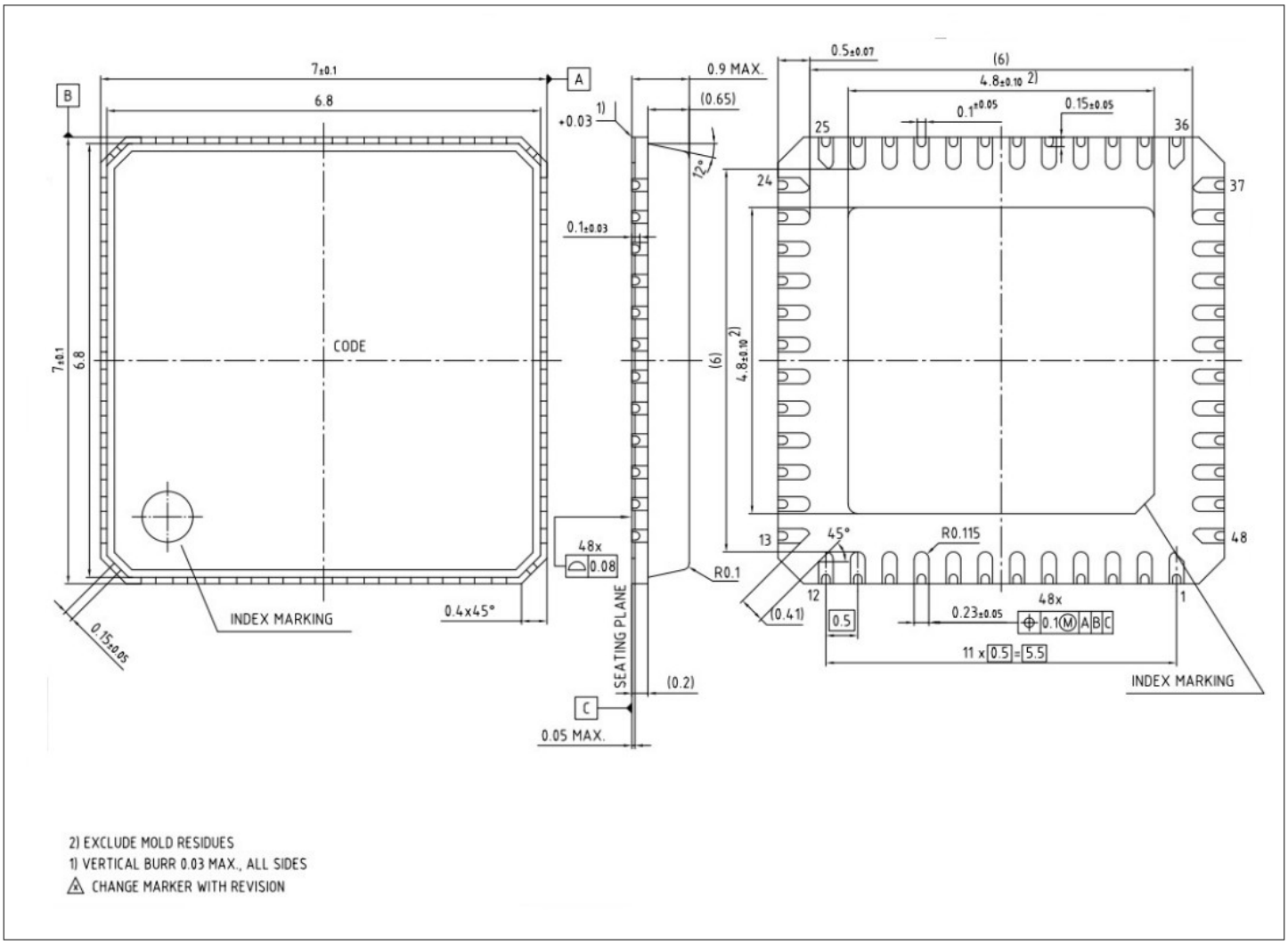

Figure 2 Package outline VQFN-48

To meet the world-wide customer requirements for environmental friendly products and to be compliant withgovernment regulations the device is available as a green product. Green products are RoHS-Compliant (i.e lead-free finish on leads and suitable for Pb-free soldering according to IPC/JEDEC J-STD-020).

Revision history

Document version	Date of release	Description of changes
1.00	2026-03-26	Product overview available

Trademarks

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