


## H-bridge gate driver for automotive applications



Product status link

L99H92

### Features

- AEC-Q100 qualified 
- RoHs compliant device
- Power supply operating range from 4.51 V to 28 V (gate drivers operative from 5.41 V)
- 3.3/5 V compatible I/Os
- All pins linked to the microcontroller, fail-safe input and VDD are made tolerant to battery exposure
- Dual half-bridge driver compatible with standard level threshold MOSFETs
- Configurable full-bridge or dual independent half-bridges control
  - Programmable recirculation path in case of full-bridge control
- Dual stage charge pump supporting 100% PWM duty cycle down to 5.41 V battery voltage
  - High-side and low-side minimum  $V_{GS} = 6.2$  V at  $V_{DH} = 5.5$  V and charge pump load current ( $I_{CPLOAD}$ ) equal to 5 mA
  - High-side and low-side minimum  $V_{GS} = 8.2$  V at  $V_{DH} \geq 8$  V and charge pump load current ( $I_{CPLOAD}$ ) equal to 10 mA
- Charge pump output available for driving an external reverse battery MOSFET protection
- Programmable gate driving current (up to 170 mA) for output voltage slew rate control
- Programmable drain-source monitoring for overcurrent protection and programmable crosscurrent protection time (dead-time)
- Open load and output short-circuit detection in off-state diagnostic mode
- SPI for control and diagnosis (ST SPI 4.1)
- Programmable diagnostic output
- Two independent current sense amplifiers
  - Low offset with extremely low thermal drift
  - Suitable for high-side, in-line, and low-side current sensing
  - Independently programmable gain (10x, 20x, 50x, 100x)
  - Analog output centered at  $V_{DD}/2$  or  $V_{DD}/22$
- Over temperature prewarning and shutdown
- Analog and digital power supply inputs over/under voltage protections
- Asynchronous and logic independent fail-safe input to switch off all the MOSFETs
- Low quiescent current

### Applications

- Generic DC motor drives (for example: sun-roof, power trunk lift gate, sliding doors, window lift, seat-belt pretensioners)
- Engine vibrations compensation system
- Electric park brake system
- Throttle control

## Description

The L99H92 is designed to drive 4 external N-channel MOS transistors, in single H-bridge or dual independent half-bridge configuration, for DC-motor control in automotive applications. Two free configurable current sense amplifiers are integrated.

The device has a low power mode (standby mode) where the current consumption is less than 5  $\mu$ A.

Programmable gate driving current allows minimizing EMI. Each gate driver monitors independently its external MOSFET drain-source voltage for fault conditions.

Programmable crosscurrent protection time avoids concurrency of high-side and low-side activation for each half-bridge.

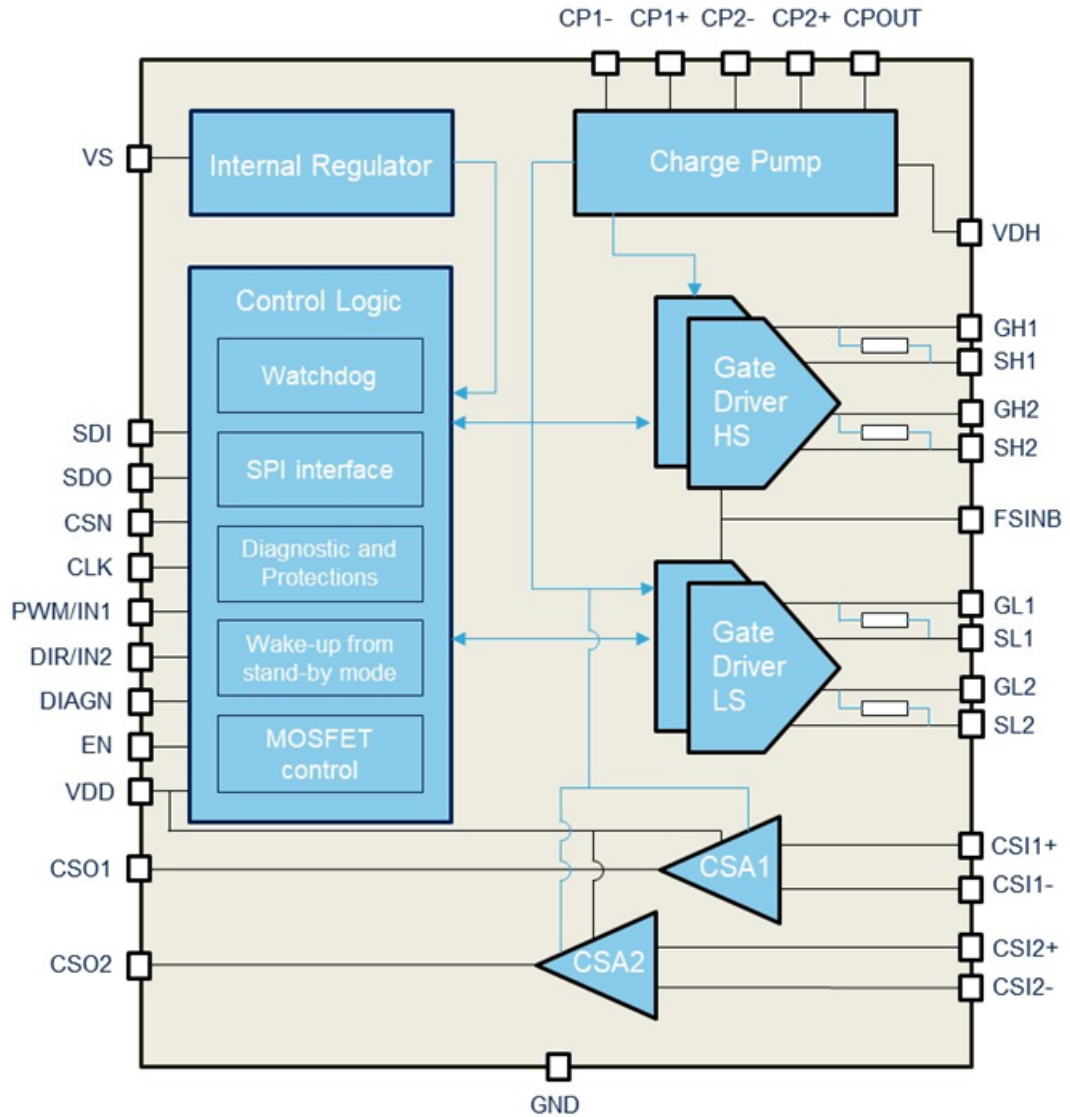
Two off-state diagnostic comparators detect potential short to ground, short to battery or open load conditions.

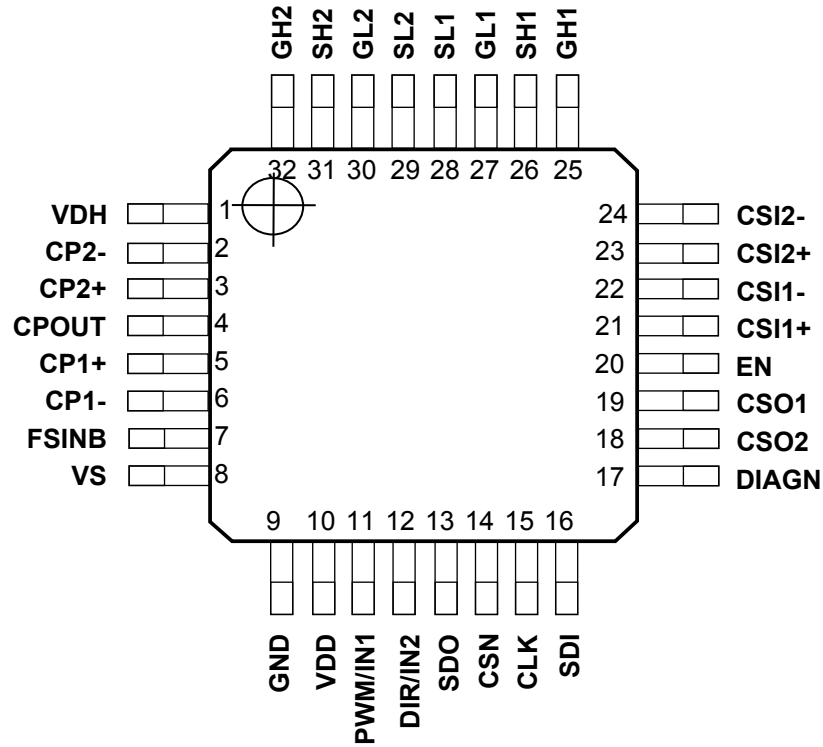
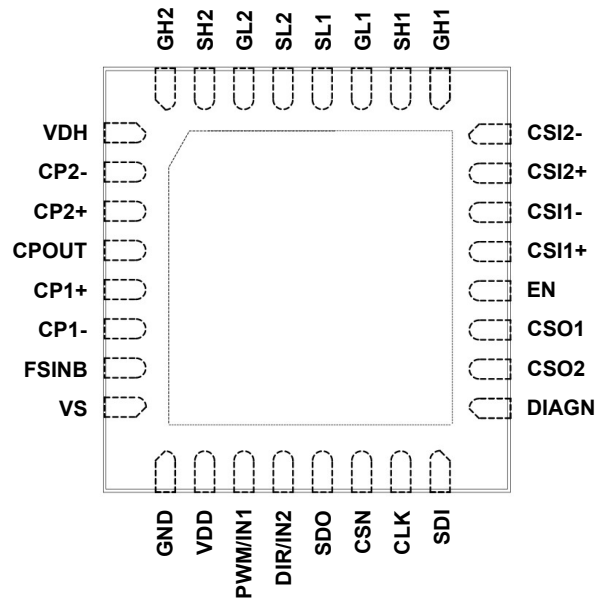
The integrated standard serial peripheral interface (SPI) controls the device and provides diagnostic information. An additional DIAGN output pin alerts the microcontrollers of a fault occurred into the device faster than the SPI communication.

The L99H92 device implements diagnostic and protection features such as supply voltage monitoring, charge pump voltage monitoring, overcurrent protection, temperature warning and over-temperature shutdown.

The device is hosted in either a TQFP32 or QFN32 package, both with the exposed pad. QFN32 has wettable flanks for easy visual inspection of the solder joint.

# 1 Block diagram and pins description

**Figure 1. Block diagram**


**Figure 2. Pin connection (TQFP32)**

**Figure 3. Pin connection (QFN32)**


**Table 1. Pins function**

Pin count	Name	Description
1	VDH	High-side drain connection
2	CP2-	Charge pump stage 2 negative connection
3	CP2+	Charge pump stage 2 positive connection
4	CPOUT	Charge pump output
5	CP1+	Charge pump stage 1 positive connection
6	CP1-	Charge pump stage 1 negative connection
7	FSINB	Fail-safe input not
8	VS	Power supply input
9	GND	Ground connection
10	VDD	3.3V/5V supply for I/Os and current sense amplifiers output stage
11	PWM/IN1	PWM input or leg 1 input
12	DIR/IN2	Direction input or leg 2 input
13	SDO	SPI serial data output
14	CSN	SPI chip select not
15	CLK	SPI serial clock
16	SDI	SPI serial data input
17	DIAGN	Diagnostic output not
18	CSO2	Current sense amplifier 2 output
19	CSO1	Current sense amplifier 1 output
20	EN	Enable input
21	CSI1+	Current sense amplifier 1 positive input
22	CSI1-	Current sense amplifier 1 negative input
23	CSI2+	Current sense amplifier 2 positive input
24	CSI2-	Current sense amplifier 2 negative input
25	GH1	High-side gate of leg 1
26	SH1	High-side source of leg 1 and low-side drain of leg 1
27	GL1	Low-side gate of leg 1
28	SL1	Low-side source of leg 1
29	SL2	Low-side source of leg 2
30	GL2	Low-side gate of leg 2
31	SH2	High-side source of leg 2 and low-side drain of leg 2
32	GH2	High-side gate of leg 2
EXPOSED PAD		Connection to GND is recommended

## 2 Ordering information

**Table 2. Order codes**

Order code	Package	Packing
L99H92Q5	QFN32 5x5 exposed pad	Tray
L99H92QF	TQFP32 7x7 exposed pad	Tray
L99H92Q5-TR	QFN32 5x5 exposed pad	Tape and reel
L99H92QF-TR	TQFP32 7x7 exposed pad	Tape and reel

## Revision history

**Table 3. Document revision history**

Date	Version	Changes
27-Jun-2022	1	Initial release.

**IMPORTANT NOTICE – READ CAREFULLY**

STMicroelectronics NV and its subsidiaries (“ST”) reserve the right to make changes, corrections, enhancements, modifications, and improvements to ST products and/or to this document at any time without notice. Purchasers should obtain the latest relevant information on ST products before placing orders. ST products are sold pursuant to ST’s terms and conditions of sale in place at the time of order acknowledgment.

Purchasers are solely responsible for the choice, selection, and use of ST products and ST assumes no liability for application assistance or the design of purchasers’ products.

No license, express or implied, to any intellectual property right is granted by ST herein.

Resale of ST products with provisions different from the information set forth herein shall void any warranty granted by ST for such product.

ST and the ST logo are trademarks of ST. For additional information about ST trademarks, refer to [www.st.com/trademarks](http://www.st.com/trademarks). All other product or service names are the property of their respective owners.

Information in this document supersedes and replaces information previously supplied in any prior versions of this document.

© 2022 STMicroelectronics – All rights reserved