PRODUCT BRIEF

TLE9743QK

Traction inverter power management IC

ISO 26262 compliant

The OPTIREG™ application-specific PMIC TLE9744QK is a system chip including the complete power supply functionality and application-specific features for high-voltage main traction inverter systems. The power supply includes two pre-regulators to supply separate integrated linear regulator rails for microcontroller supply, communication supply, and a precise voltage reference. As well two voltage trackers are available to supply off-board sensors. In addition to the standard power supply functionalities, the TLE9744QK provides application-specific functionalities for high-voltage main traction inverter systems:

- Buck-boost pre-regulator for external devices (for example for high-voltage gate driver supply).
- Comprehensive high-voltage side monitoring functions with safety I/Os.
- Redundant supply input for the internal Safety Engine (ISL) and tracker 2.

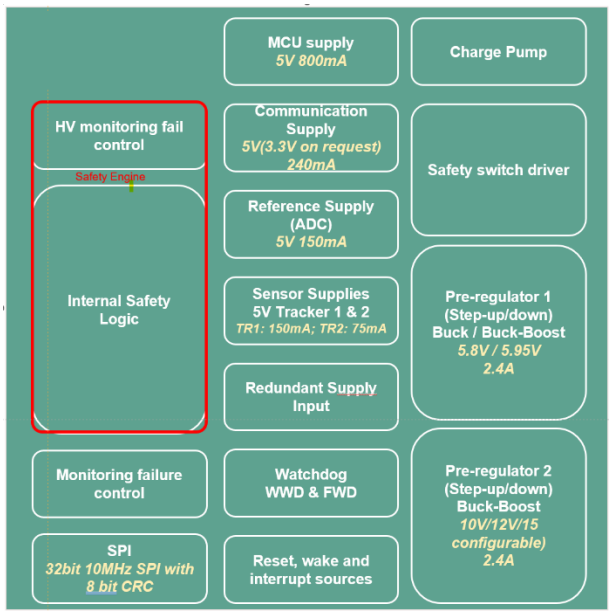
For functional safety support, a safety switch driver for external N-channel MOSFET power switch is integrated as well as a charge pump, which can also supply an active reverse-polarity protection circuitry. The TLE9744QK comes with a window watchdog and a functional watchdog, AURIX™ FSP monitoring, low voltage monitoring functions, and reset/interrupt input/outputs (bidirectional). It has been developed according to ISO 26262, targeting systems up to ASIL D and it supports a junction temperature of up to 150°C.

Applications

– Traction inverter

Device block diagram





Key features

– Pre-regulator 1 & 2: For internal and external post-regulators:
PR1: 5.8/5.95 V @ 2.4 A
PR2: 10/12/15-16 V @ 2.4 A, for external supply, e.g. gate driver supply
– 5 V LDOs for µC-supply and
– Communication supply
– 2x 5 V tracker for sensor supplies
– 5 V reference-LDO
– 32-bit 10 MHz SPI: with 8-bit CRC
– Configurable Watchdog (WWD and FWD) and AURIX™ FSP monitoring

Application specific:

– Integrated Safety Logic (ISL) for:
– *Phase current monitoring (3 phases)*
– *DC-Link voltage monitoring*
– *Gate Driver status monitoring*
– *MCU clock monitoring*
– *DC-Link Active Discharge Control*
– *Torque control (Active Short Circuit, FreeWheeling) for a 3-phase motor*
– Redundant supply input for Safety Engine and tracker 2

Key benefits

– Integrated inverter specific features allowing reduced BOM component count, reduced BOM cost and reduced BOM space
– Interoperable with AURIX™, EiceDRIVER™

Developed acc. to ISO 26262, enabling systems up to ASIL D

PMIC OPTIREG™ Traction inverter xEV

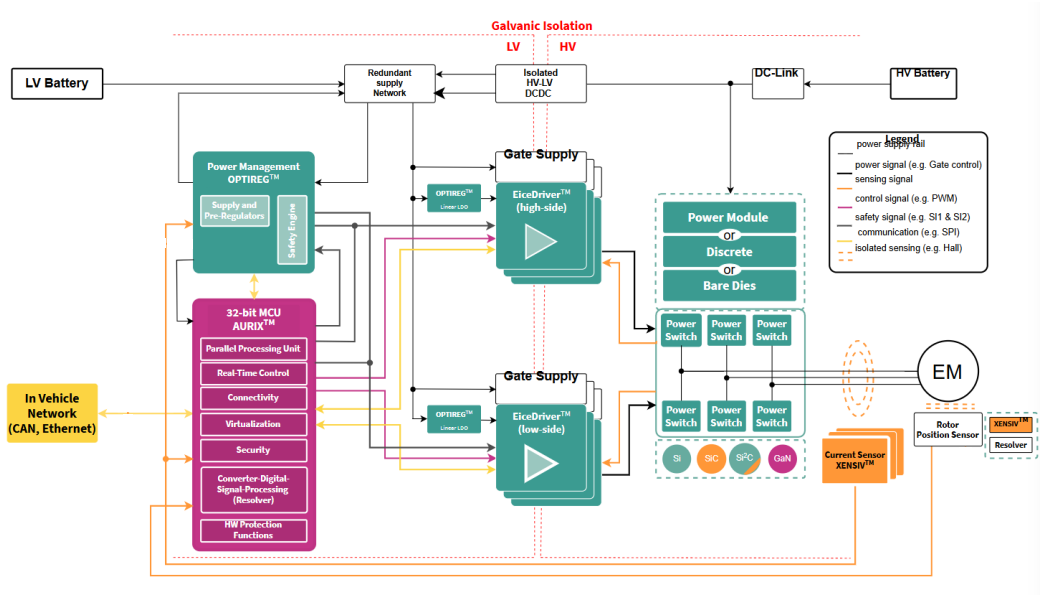
Application specific safety features

The TLE9744QK is equipped with advanced monitoring capabilities, allowing to track phase currents, phase speed and DC-Link voltage through six analog input pins (A_N1 to 6). Additionally, digital input pins (D_N1 to 5) are used to monitor gate driver status, MCU Level 2 signals, and other digital or delta-sigma input signals.

The Integrated Safety Logic (ISL) is a critical component of the PMIC, enabling autonomous safety reactions based on system feedback received through analog and digital inputs and is highly configurable. This allows the safety engine to take user-desired safety reactions in the absence of the microcontroller, with priority defined by the customer configuration in the C-MTP or during runtime from the microcontroller.

The safety reactions taken by the safety engine are communicated to gate drivers or other devices in the system using digital output pins (D_OUT 1 to 4). These outputs can be used to apply active discharge to the system DC-Link and trigger torque control, such as active short circuit or freewheeling. The VRDD pin serves as a redundant supply input, providing power to the Safety Engine and Tracker 2. This design feature ensures that even in the event of a main power supply failure, the ISL remains operational and can continue to monitor phase currents, detect anomalies, and take corrective action to bring the system to a controlled safe state.

Example block diagram



Product summary

Sales name	OPN	SP	Package
TLE9743QK	TLE9743QKXUMA1	SP006206976	PG-LQFP-64

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