

# XENSIV™ KP497



## Infineon's integrated smart barometric pressure sensor for efficient thermal detection in electrical vehicles

The United Nations Global Technical Regulation (UN GTR) has, in a first step – GTR20 Phase 1 – introduced performance-based requirements that address potential safety risks of electric vehicles during use, including potential hazards associated with lithium-ion batteries and/or other rechargeable electrical-energy storage systems, especially with flammable electrolyte. In a second step – GTR20 Phase 2 – these safety precautions should also apply when parking. The safety goal is to avoid hazards to occupants and the environment and, therefore, to detect the first thermal runaway of a single battery cell. The warning must be given within a time window of 5 minutes before a dangerous situation occurs in the passenger cabin. Especially in parking mode, classic detection methods using voltage and temperature sensors are no longer sufficient to adequately consider these regulatory regulations.

Additionally, an EU regulation for the so-called battery passport is underway. The battery passport requires information to be stored that allows an estimate of the state of health (SoH) of the battery. The SoH of a battery is severely impacted by mechanical shocks, particularly shocks in the vertical direction.

Infineon has therefore developed an air pressure sensor specifically designed for thermal runaway detection with extremely low power consumption that at the same time provides acceleration measurements for shock detection and offers memory for the storage of battery passport data.

KP497 is an advanced low power barometric air pressure and acceleration sensor. In addition to a pressure sensor, it also provides a one-axis acceleration sensor and a temperature sensor. The KP497 can be operated as a normal digital sensor via the I<sup>2</sup>C or 3-wire SPI interface. Additionally, the KP497 features a multi-phase, low-power autonomous state in which the sensor regularly performs pressure and/or acceleration measurements and evaluates user defined thresholds. In the autonomous state, the KP497 can trigger a wake-up when a user defined threshold is exceeded. The selection of the measurements as well as their intervals and thresholds for each phase can be configured independently. These configurations are stored in the internal non-volatile memory, which are retained even when the power supply is cut, and can be changed in the field via the serial interface.

The KP497 supports a typical BMS pressure range of 20 kPa to 250 kPa and converts a physical pressure measurement into a 16-bit digital value while transmitting the information via the I<sup>2</sup>C or SPI interface. In addition, a temperature sensor is integrated on-chip. The device features a sleep mode as well as a particular autonomous state which offers an independent operation of the sensor in battery monitoring applications without a running master device, in order to detect pressure pulses caused by thermal runaway events with lowest possible current consumption.

The integrated diagnostics feature is a special reliability enhancement, which allows testing the sensor cells as well as the signal path. Diagnostics that cover the sensor cells and their bond, run autonomously with every measurement. Additionally, diagnostics can be triggered with an I<sup>2</sup>C or SPI command. The sensors are developed and qualified to operate permanently for a full vehicle lifetime of 15 years.

### Key features

- Autonomous mode feature for event detection and host wake-up
- Pressure range for thermal runaway detection: 20 kPa to 250 kPa
- Integrated pressure and 1-axis acceleration sensor
- ISO 26262-compliant (ASIL A)
- 3 kB of flash memory available for storage of customer-specific data, e.g., battery-passport-relevant data
- High accuracy pressure sensing
- Interfaces: I<sup>2</sup>C, SPI
- Operating ambient temperature range -40°C to +105°C

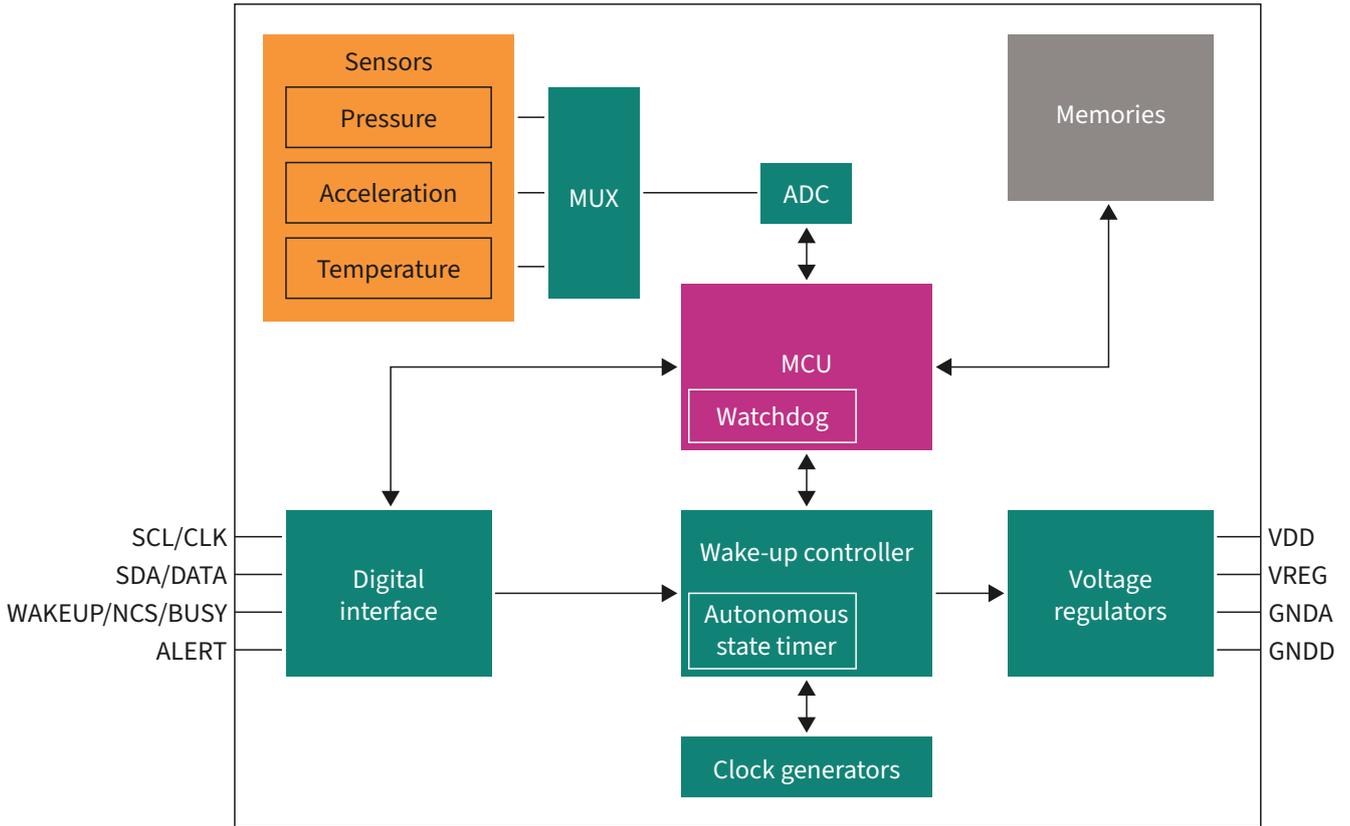
### Key benefits

- Advanced and flexible autonomous mode features further adjustable by customer software allowing maximum battery power savings while parking
- Shock detection for battery damage estimation, driving vibrations
- Sensor settings/algorithm parameter adjustable in field OTA (Over the Air) updates possible
- High quality solution



PRODUCT BRIEF

KP497 block diagram



Product summary

Product name	Interface	Pressure range [kPa]	Temperature range [°C]	Pressure accuracy [kPa]	Application	Package	Ordering code
KP497	I <sup>2</sup> C, SPI	20 to 250	-40 to 105	±1 (relative), ±2 (absolute)	BMS thermal-runaway detection	PG-DSOSP-14-84	SP006004123

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