L9965AE

Data brief

Automotive 18s/16s Battery Monitor

Features

- AEC-Q100 qualified
- Temperature grade 1: –40°C to +125°C operating temperature range
- HBM ESD classification level 2
- CDM ESD classification level C4B
- Full ISO26262 compliant, ASIL-D systems ready, documentation available
- Fully synchronized high accuracy measurements on cell voltage, busbar, and stack voltage with dedicated ADC:
  - Total error including aging and post soldering <1.4 mV at 3.3 V, -40°C to 105°C
  - 16-bit resolution
  - Cell range: -1 to 5.5 V
  - Integrated digital filtering with programmable cutoff frequency from 3.3 kHz to 4.4 Hz
  - Fully redundant architecture
  - Cell and busbar support on every channel
  - Dedicated busbar channel with ±1 V range
- Passive internal cell balancing up to 400 mA, supporting time-continuous and PWM modes, with automatic cool down based on external NTC sensing. Overcurrent protection during balancing is also available in low-power mode
- Integrated DC-DC converter for energy efficiency:
  - Deep-sleep: <12 µA
  - Cyclic WAKEUP mode: <20 µA
  - Normal mode: <2 mA
- 10 configurable GPIO
- SPI controller and I2C controller peripherals for interfacing external EEPROMs and sensors
- SPI target for direct MCU interface
- Stackable architecture for high-voltage battery packs up to 59 devices
- Embedded NVM for configuration parameters storage and runtime configuration integrity check
- Ultrafast vertical interface peripheral for isolated communication
- Compatible with L9965C pack monitoring chip with a max desynchronization time of 7 us at system level

Application

- Automotive battery monitoring systems 
- Energy storage systems
- UPS

Table 1. **Ordering information**

Order code	Package	Packing
L9965AE-TR	TQFP64	Tape and reel
L9965AE16-TR	TQFP64	Tape and reel

Description

The L9965AE/L9965AE16 are a 18/16 channel battery cells monitoring and balancing IC. The devices belong to the L9965 chipset family for high-voltage battery management systems monitoring and control.

1 Overview

The L9965AE/L9965AE16 BMIC devices provide all the functions needed to manage battery pack configurations up to 18s or 16s. They feature a comprehensive set of cell/pack monitoring, balancing, and protection functions designed to achieve ASIL-D targets in demanding systems.

L9965AE/L9965AE16 uses dedicated high precision ADCs synchronously acquiring cells, busbar, and pack voltage. The cell measurement ranges from -1 V to 5.5 V, making the L9965 family suitable for most battery chemistries.

Every cell voltage pair and a dedicated BB channel can monitor an arbitrary number of busbars.

The BMIC is supplied via an efficient buck preregulator, thus optimizing energy consumption and heat dissipation. It also integrates a 5V LDO available for biasing external sensors and supplying external EEPROMs.

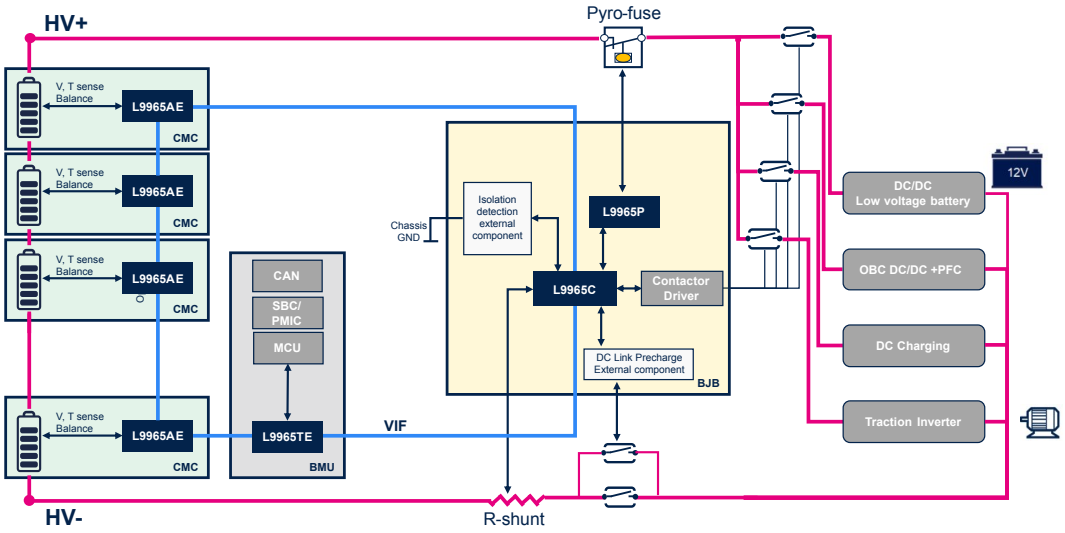
A SPI controller and I2C controller peripherals allow interfacing the device with external sensors and EEPROMs.

Passive balancing is available in both continuous and PWM mode.

Up to 59 addressable devices can be stacked in a vertical isolated communication interface.

L9965AE/L9965AE16 implements an ultrafast isolated communication protocol allowing to transfer voltage and temperature data of the whole daisy-chain and in less than 10ms.

Figure 1. L9965AE battery monitor in BMS system



L9965AE/L9965AE16 embeds a functional state machine to optimize system power consumption without compromising safety functions:

- NORMAL: full operation mode.
- CYCLIC WAKEUP: low-power mode to perform cyclic diagnostics during low-power operation and trigger the chained devices. In this state, the device is sensitive to fault/wake-up tones from the VIF.
- SILENT BALANCING: Low-power state for managing long balancing periods. In this state the device is sensitive to wake-up tones both from the VIF in case of fault and from the SPI if directly connected to the MCU, moreover the balancing overcurrent is active.
- DEEP SLEEP: Ultralow power state for managing long inactive periods. In this state, the device is sensitive to wake-up tones both from the VIF in case of fault and from the SPI if directly connected to the MCU.

Revision history

Table 2. **Document revision history**

Date	Version	Changes
28-Apr-2026	1	Initial release.

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