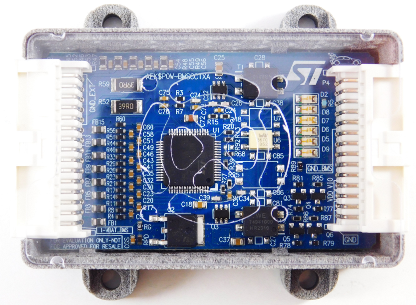
AEK-POW-BMSCCTX

Data brief

Optimized form-factor and packaged battery management system module based on L9963E and L9963T for battery pack easy mounting



Product summary	
Optimized form-factor and packaged battery management system module based on L9963E and L9963T for battery pack easy mounting	AEK-POW-BMSCCTX
Optimized form-factor and packaged battery management system module based on L9963E for battery pack easy mounting	AEK-POW-BMSCC
Automotive chip for battery management applications with daisy chain up to 31 devices	L9963E
Automotive general purpose SPI to isolated SPI transceiver	L9963T
Battery holder for cylindrical batteries and battery management system node for automotive applications	AEK-POW-BMSHOLD
All-in-one, fast-prototyping, user-friendly MCU	AEK-MCU-C4MINI1
AutoDevKit Studio for 32-bit power architecture MCUs	STSW-AUTODEVKIT
Application	Automotive Battery Management System (BMS)

Features

- Hosts the L9963E AEC-Q100 qualified automotive multicell battery monitoring and balancing IC
- Hosts the L9963T AEC-Q100 qualified automotive general-purpose SPI to isolated SPI bidirectional transceiver
- Voltage monitoring of up to 14 battery cells
- Current sensing of the entire battery node
- 5 configurable GPIOs, pluggable with NTCs for temperature measurements
- SPI interface to communicate with an MCU
- ISO SPI interface to communicate with an optional AEK-POW-BMSCC node, creating a BMS chain
- P1 connector that interfaces directly to an MCU board for control and diagnostic functions
- Passive cell balancing
- Packaged and very compact size: 70 x 45 mm
- Included in the AutoDevKit ecosystem

Description

The AEK-POW-BMSCCTX is a packaged very compact battery management system (BMS) evaluation board that can handle from 1 to 31 BMS nodes.

Each battery node manages from 4 to 14 battery cells. The total voltage of the chain may range between 48 and 800 V.

The main advantage of this evaluation board is ensuring isolated connection to an external MCU, thanks to the embedded transceiver.

The ability to easily integrate into a system, compact dimensions, and a wide range of applications make this compact BMS system ideal for any solution enhancing battery life, efficiency, and cost effectiveness during use and operation.

The small size allows for greater flexibility in battery pack installation, addressing the challenges of using a BMS in confined spaces.

Its compact design allows it to fit easily, enabling more batteries to be installed within the same volume.

This increases the overall battery storage, providing robust performance without adding unnecessary weight. It emphasizes the growing trend of making energy solutions more accessible and effective across different applications.

The board is based on the L9963E Li-ion battery monitoring and protection chip for high-reliability automotive applications and the L9963T general-purpose SPI to isolated SPI bidirectional transceiver.

The main activity of the L9963E is monitoring the cells and battery node status through stack voltage measurement, cell voltage measurement, temperature measurement, and coulomb counting.

Measurement and diagnostic tasks can be executed either on demand or periodically, with a programmable cycle interval.

Measurement data are available for an external microcontroller to perform charge balancing and to compute the state of charge (SoC) and the state of health (SOH).

The L9963T general-purpose SPI to isolated SPI bidirectional transceiver can transfer communication data incoming from a classical 4-wire based SPI interface to a 2-wire isolated interface (and vice versa). In our board, the transceiver is configured as a slave.

The AEK-POW-BMSCCTX provides an elaborate monitoring network to sense the voltage of each cell.

It is possible to sense the current of the entire battery pack. This sensing allows elaborating the SoC of each battery cell and, consequently, the state of charge of all battery packs.

The SoC allows assessing the remaining battery capacity. For maintenance reasons, it is important to monitor the SoC estimation over time.

According to our algorithm for the SoC calculation, the more the SoC differs from its nominal value (that is, its value when the batteries are new), the more a cell of the battery pack risks overdischarging.

The SoC evolution overtime allows asserting the state of health (SOH) of a cell or a battery pack to spot early indications that a cell is at risk of overdischarge or overcharging.

The SoC of a battery cell is required to maintain its safe operation and duration during charge, discharge, and storage.

The SoC cannot be measured directly and is estimated from other measurements and known parameters (such as characterization curves or look-up tables). This information on the battery cells is necessary to determine how the voltage varies according to the current, the temperature, based on the battery chemical composition and production lot used.

In the AutoDevKit ecosystem software package, we created an example to elaborate SoC and SOH, using Li-ion batteries. Battery packs may have different SOCs, and balancing is necessary to bring them all to the same charge level.

After detecting the lowest charge in the battery pack, all the other battery nodes are discharged to reach its level. The demo explains how to activate the internal MOSFETs of the L9963E, which short-circuit the cell on an external dissipation resistor (resistors are already mounted on the board) to discharge it.

Passive cell balancing is performed via the L9963E internal MOSFETs. The controller can either manually control the balancing drivers or start a balancing task with a fixed duration.

In the second case, the balancing may be programmed to continue even when the IC enters a low-power mode called silent balancing, to avoid unnecessary current absorption from the battery pack.

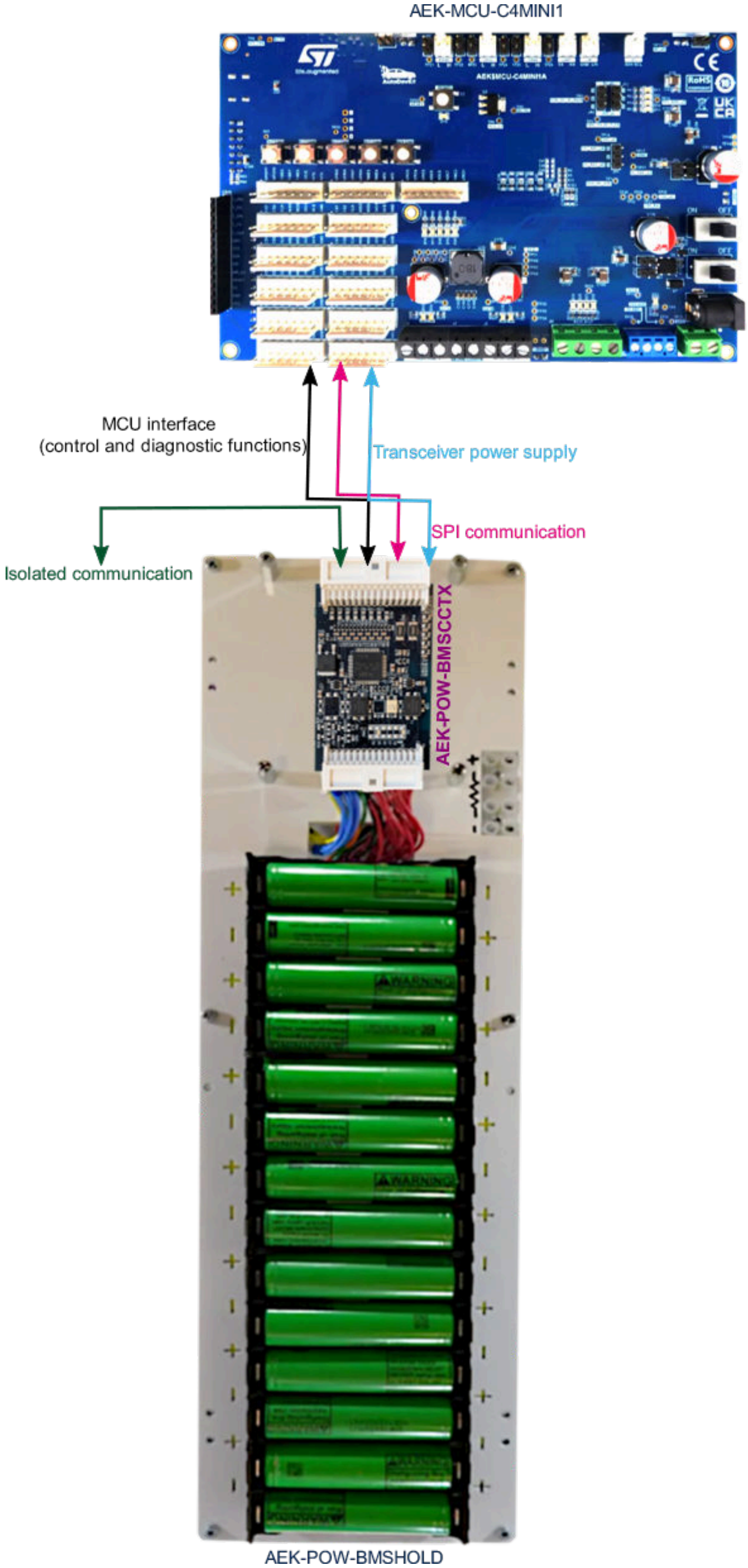
The balancing function is necessary to lengthen the battery capacity and its duration.

Different MCUs can be used. In our demos, we used the AEK-MCU-C4MINI1 and other ASIL-B and ASIL-D microcontrollers of the SPC58 chorus family.

State of charge, voltage, current, balancing status of selected chains and nodes can be monitored through a dedicated GUI.

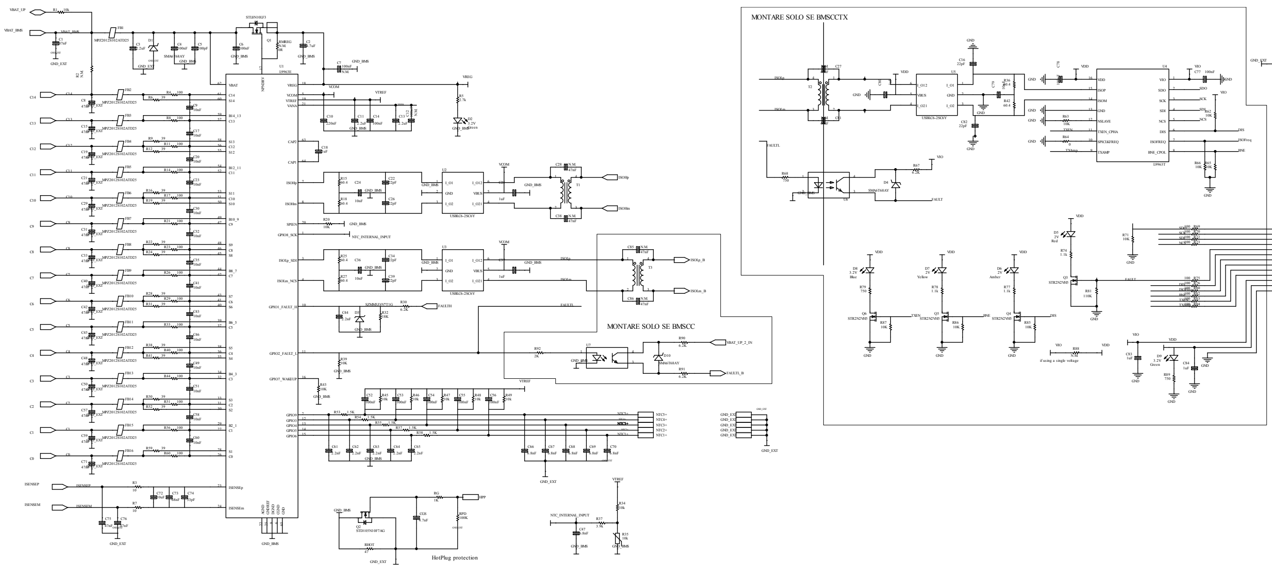
1 Block diagram

Figure 1. AEK-POW-BMSCCTX block diagram



2 AEK-POW-BMSCCTX schematic diagrams

Figure 2. AEK-POW-BMSCCTX schematic diagram



3 Board versions

Table 1. AEK-POW-BMSCCTX versions

PCB version	Schematic diagrams	Bill of materials
AEK$POW-BMSCCTXA [(1)]	AEK$POW-BMSCCTXA schematic diagrams	AEK$POW-BMSCCTXA bill of materials

1. *This code identifies the AEK-POW-BMSCCTX evaluation board first version. It is printed on the board PCB.*

Revision history

Table 2. **Document revision history**

Date	Revision	Changes
15-May-2025	1	Initial release.