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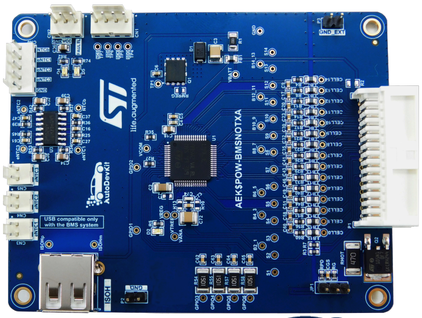
AEK-POW-BMSNOTX

Data brief

Non-isolated Battery Management node dedicated to auxiliar battery packs able to directly connect the MCU via standard SPI protocol



AutoDevKit

SPC5 Studio

Features

- The board hosts the L9963E AEC-Q100 qualified automotive multicell battery monitoring and balancing IC
- Voltage monitoring of every single cell and of the entire battery node
- Current sensing of the entire battery node
- 4 GPIOs to connect NTC sensors present on the battery pack connector
- 3 NTC sensors that can be connected to CN3, CN4 and CN5 connectors
- 1 NTC sensor to measure the board temperature
- CN1 connector to communicate with an MCU board via SPI
- CN2 connector for diagnostic functions
- CN6 connector for MCU ADCs dedicated to the NTC sensors reading
- Passive balancing available
- Compact size: 100 mm x 76 mm
- Included in the AutoDevKit ecosystem

Product summary	
Non-isolated Battery Management node dedicated to auxiliar battery packs able to directly connect the MCU via standard SPI protocol	AEK-POW-BMSNOTX
Automotive chip for battery management applications with daisy chain up to 31 devices	L9963E
MCU discovery board for SPC5 Chorus 4M automotive microcontroller with CAN transceivers	AEK-MCU-C4MLIT1
STSW AutoDevKit Embedded Software	AutoDevKit
Application	Auxiliary power BMS

Description

The AEK-POW-BMSNOTX is a battery management system (BMS) evaluation board that manages from 4 to 14 battery cells.

The board is based on the L9963E Li-ion battery monitoring and protection chip for high-reliability automotive applications.

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 embedded L9963E can act as a transceiver, directly communicating with an MCU via SPI.

The board is particularly fit for auxiliary battery systems to supply power for devices (such as audio system, window cleaning system, seat heating, light system, light signalization, climate control system) connected to your vehicle (even when the engine is not running), ensuring the main starting battery is reserved for engine cranking and vehicle electrical requirements.

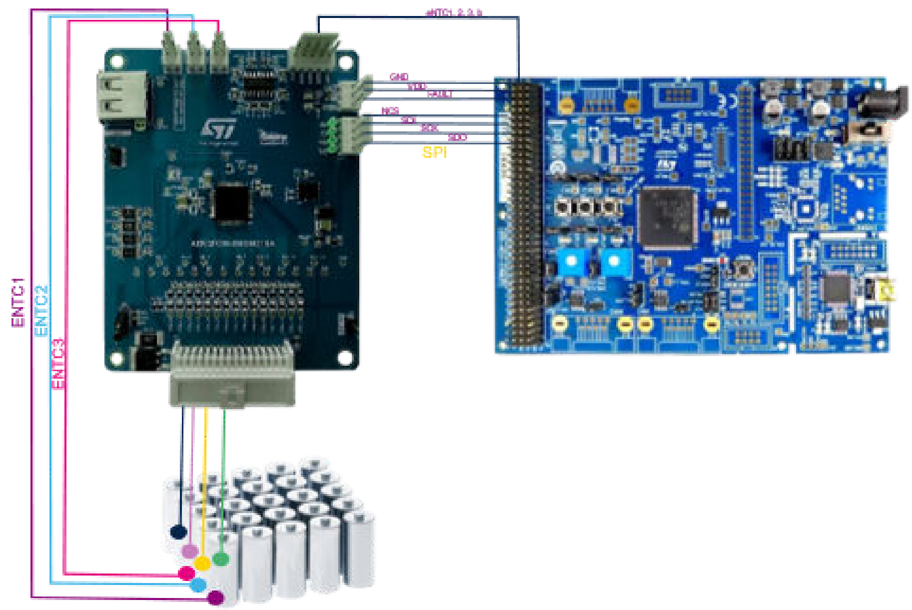
The AEK-POW-BMSNOTX provides an elaborate monitoring network to sense the voltage of each cell. It is possible to sense the current of the entire battery pack. This sensing allows elaborating the SOC of each battery cell and, consequently, the state of charge of all battery packs. The SOC allows assessing the remaining battery capacity, which equates to the remaining driving range. 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. Thus, the SOC evolution over time 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. However, 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, etc., on the basis of the battery chemical composition and production lot used. Thanks to the partnership with About:Energy, it is possible to access various battery data models.

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 can be performed either via the L9963E internal MOSFETs or via external 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-C4MLIT1, and other ASIL-B and ASIL-D microcontrollers of the SPC58 chorus family.

1 Block diagram

Figure 1. Block diagram



2 Schematic diagrams

Figure 2. AEK-POW-BMSNOTX circuit schematic (1 of 2)

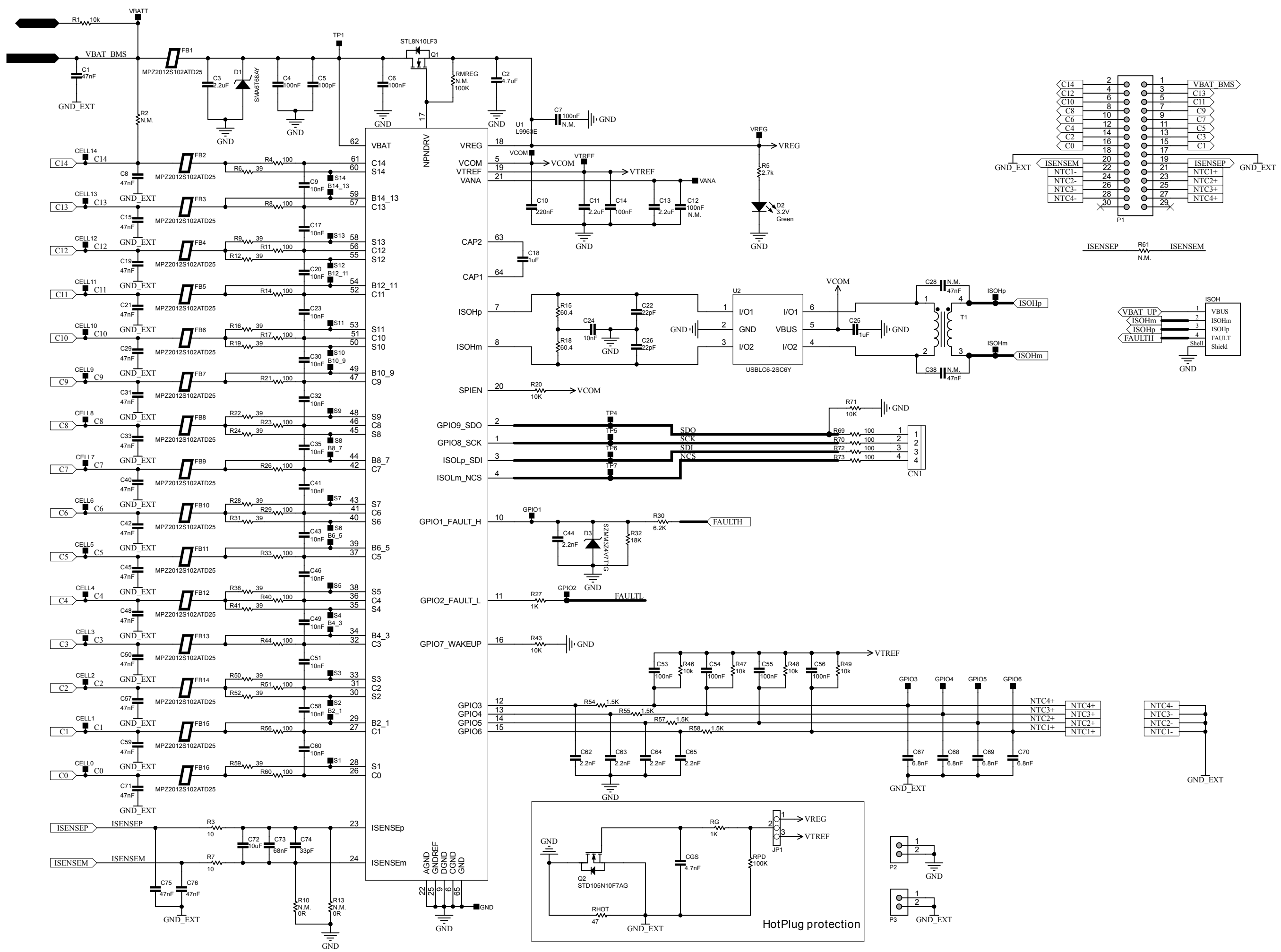
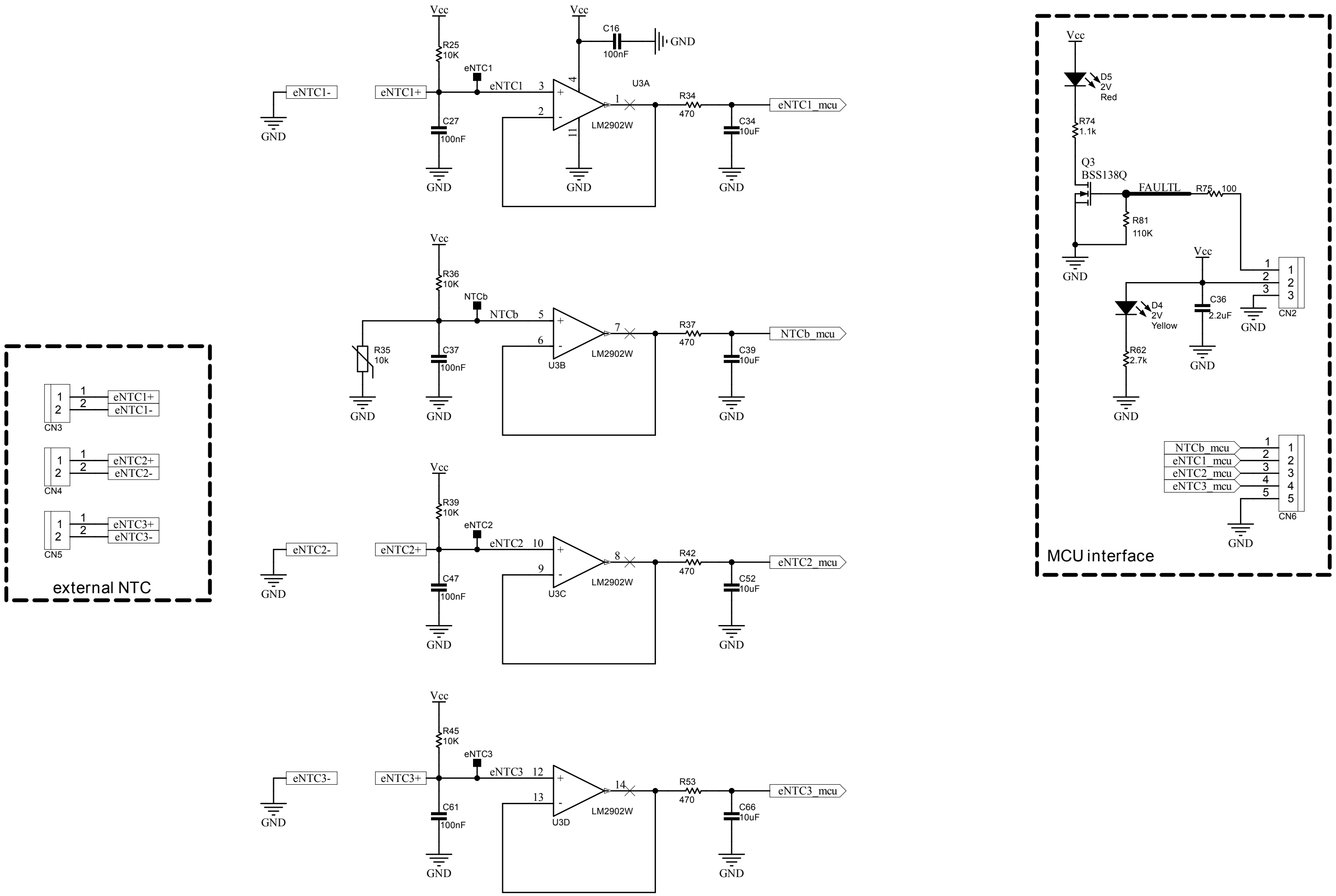


Figure 3. **AEK-POW-BMSNOTX circuit schematic (2 of 2)**



3 Board versions

Table 1. AEK-POW-BMSNOTX versions

Finished good	Schematic diagrams	Bill of materials
AEK$POW-BMSNOTXA(1)	AEK-POW-BMSNOTX schematic diagrams	AEK-POW-BMSNOTX bill of materials

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

Revision history

Table 2. **Document revision history**

Date	Revision	Changes
17-Apr-2024	1	Initial release.