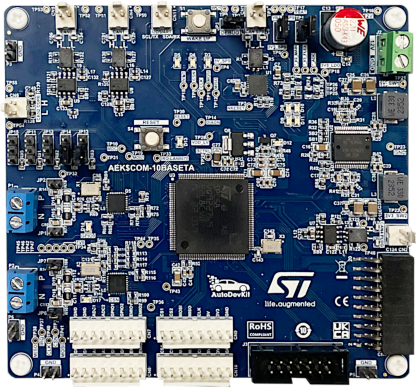
AEK-COM-10BASET

Data brief

10BASE-T1S MAC-PHY evaluation board



Product summary	
10BASE-T1S MAC-PHY evaluation board	AEK-COM-10BASET
Automotive dual monolithic switching regulator with LDO and HSD	L5963DN-EHT
Automotive Power Management IC with LIN and CAN-FD	SPSB0813-TR
32-bit Power Architecture MCU for Automotive General Purpose Applications - Chorus family	SPC58EC80E5QMC1Y
Application	Automotive gateway/In-vehicle high speed network

Features

- 2x 10BASE-T1S ports:
  - 1x port with PHY-MAC transceiver converting from 10BASE-T1S to SPI
  - 1x port with PHY transceiver converting from 10BASE-T1S to media-independent interface (MII)
- The two transceivers are connected with the main board SPC58EC80E5 MCU
- The MCU firmware supports both transceivers at the same time allowing them to work in parallel
- For the transceiver with PHY, we implement a dedicated Ethernet MAC inside the MCU firmware
- The MCU firmware runs under FreeRTOS™ implementation on SPC58EC80E5
- 10BASE-T1S according to standard protocol:
  - Point-to-point direct connection or multidrop topology with up-to-eight nodes
  - Up to 10 Mbit/s data is transferred over a single pair of wires
  - Physical layer collision avoidance (PLCA)
  - Carrier sense multiple access/Collision detection (CSMA/CD) media access control
- SPSB0813 automotive power management IC (PMIC) with CAN-FD transceiver
- JTAG integrated programmer and debugger
- 5 CAN-FD transceivers (including the one integrated in the SPSB0813 PMIC)
- 1 connector for I2C/UART serial communication
- Wake up and reset buttons
- 2 general-purpose connectors (8 pins each)
- 2 SPI ports
- One plug connector to plug in an eventual daughter board, a power distribution unit (PDU)
- Reverse battery-protection dedicated circuit
- L5963 integrated DC-DC converter for potential system supply
- Compact size: 110 mm x 100 mm
- Included in the AutoDevKit ecosystem

Description

The AEK-COM-10BASET evaluation board is a powerful tool to explore various vehicle network architectures, leveraging on the new 10BASE-T1S automotive Ethernet protocol implementation and other on-board legacy automotive interfaces (CAN, CAN-FD and SPI).

This board merges the innovations brought by the new 10BASE-T1S specification with the high-performance dual-core SPC58EC80E5 chorus family microcontroller.

The AEK-COM-10BASET perfectly meets the requirements of new megatrends in the automotive industry, such as personalization, electrification, autonomy, and full connectivity, which are moving in-vehicle networks away from domain-based solutions, gravitating towards new zonal architectures.

The 10BASE-T1S automotive Ethernet enhances in-vehicle network (IVN) architectures by connecting sensors, car body and infotainment engine control units (ECUs).

This protocol supports half-duplex and full-duplex communication, allowing either a point-to-point direct connection between two nodes, or use of a multidrop topology with up-to-eight nodes connected on a single 25 m bus segment.

The 10BASE-T1S reduces total system cost by using a single pair of wires and a multidrop bus architecture. It also increases system scalability since several nodes can operate on the same bus line with high data throughput.

Thanks to the multidrop topology, multiple applications can be implemented on a single cable in zonal architectures. For example, in the door zone, the window lifter, mirror control, speakers, lock, ultrasonic, ambient light, and indicator light.

The AEK-COM-10BASET essentially acts as a gateway to interconnect incompatible communication systems, allowing a vehicle zone sensor/actuator to receive messages in the 10BASE-T1S protocol format even if the zone components are not able to communicate via Ethernet.

The AEK-COM-10BASET features a PHY-MAC transceiver, which communicates with the MCU via SPI, and a PHY only transceiver requiring an Ethernet MAC to run in the MCU.

The transceivers support only half-duplex communication. Both are connected to the MCU, one using the MII port while the other using a SPI channel.

The firmware embedded in the board can manage a software-implemented Ethernet MAC and runs under the FreeRTOS™ operating system.

The AEK-COM-10BASET is very flexible, allowing several gateway packet conversions to and from 10BASE-T1S, CAN-FD and SPI. The function can be limited to gateway purposes or can also be extended to decode actuation commands and forward them to several daughter boards via the available ports. For example, a Power Distribution Unit (PDU) daughter board containing E-fuses can be controlled via CAN or SPI by decoding 10BASE-T1S frames.

The board features a preloaded demo example. This example involves a loopback test among the two 10BASET1S channels and two CAN channels. The message is sent via CAN sender port, packed in 10BASET1S sent to the other 10BASET1S channel, and finally unpacked for a CAN receiving port.

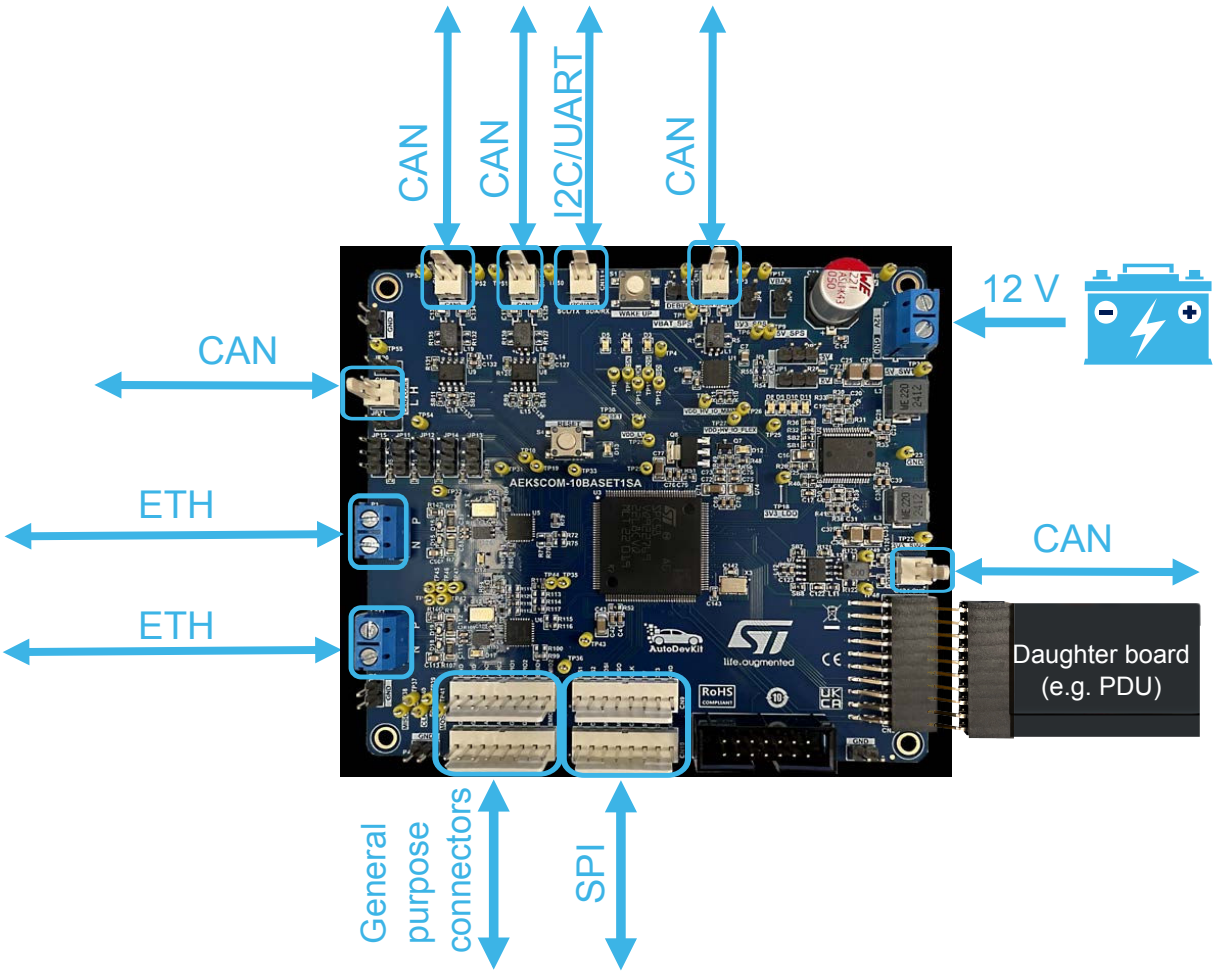
The AEK-COM-10BASET also hosts an OpenOCD debugger/programmer, MCU peripheral connectors, wake up, and reset buttons.

The MCU ADC reference voltage is provided by a stable linear voltage regulator (LDO) embedded in the L5963 IC.

A reverse battery protection circuit has been integrated for higher safety.

1 Block diagram

Figure 1. **AEK-COM-10BASET block diagram**



2 Schematic diagrams

Figure 2. AEK-COM-10BASET circuit schematic (1 of 10)

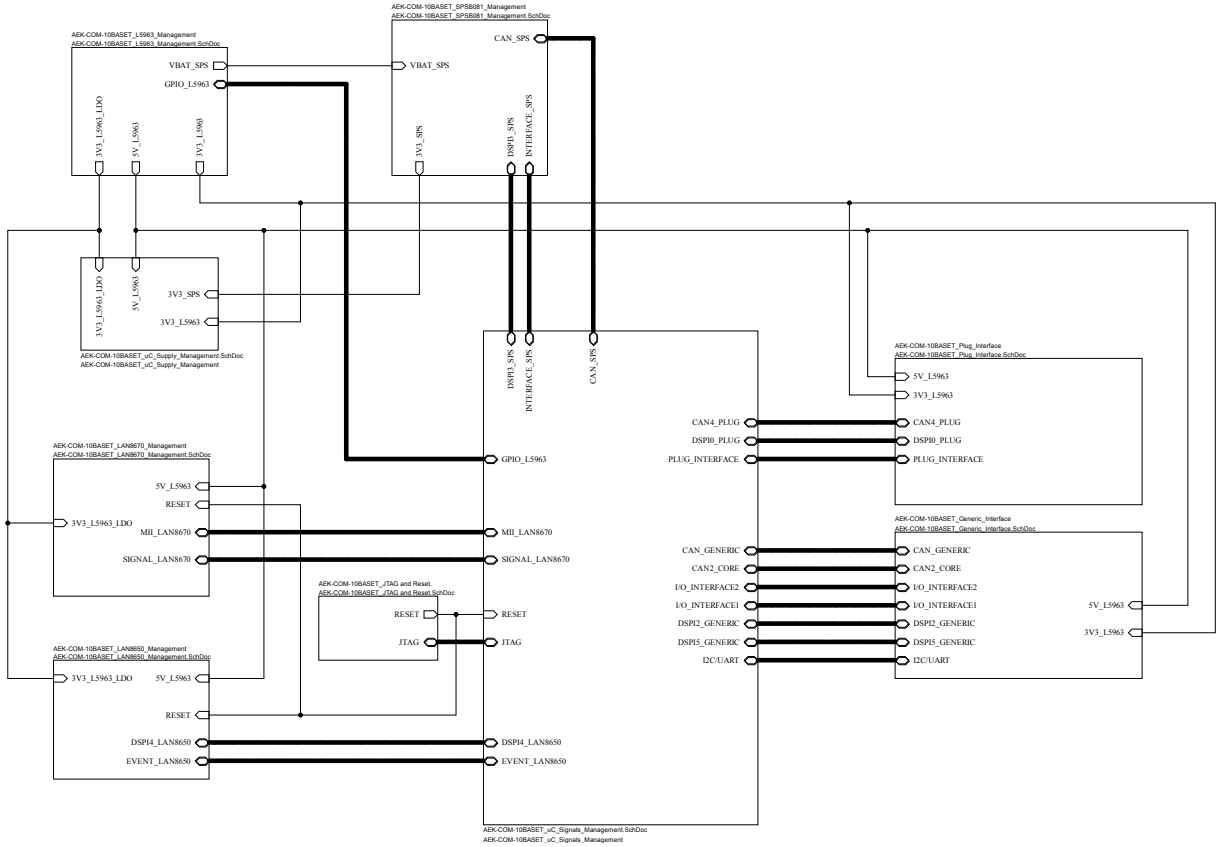


Figure 3. AEK-COM-10BASET circuit schematic (2 of 10)

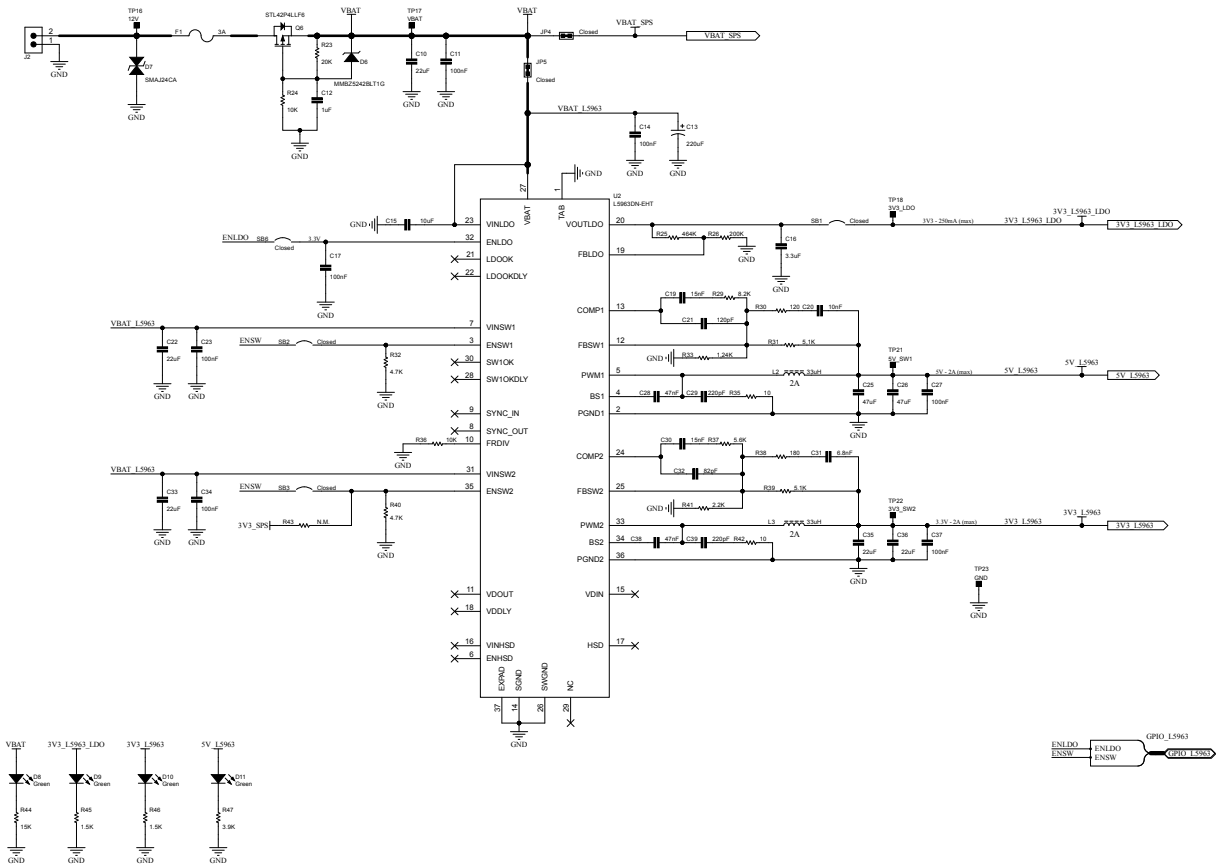


Figure 4. AEK-COM-10BASET circuit schematic (3 of 10)

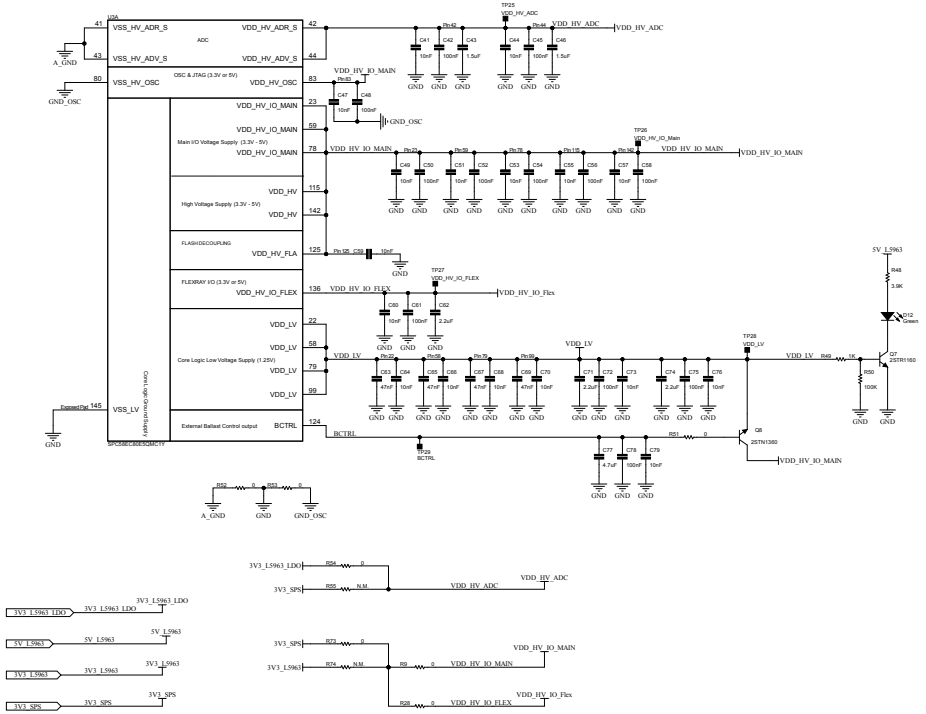


Figure 5. **AEK-COM-10BASET circuit schematic (4 of 10)**

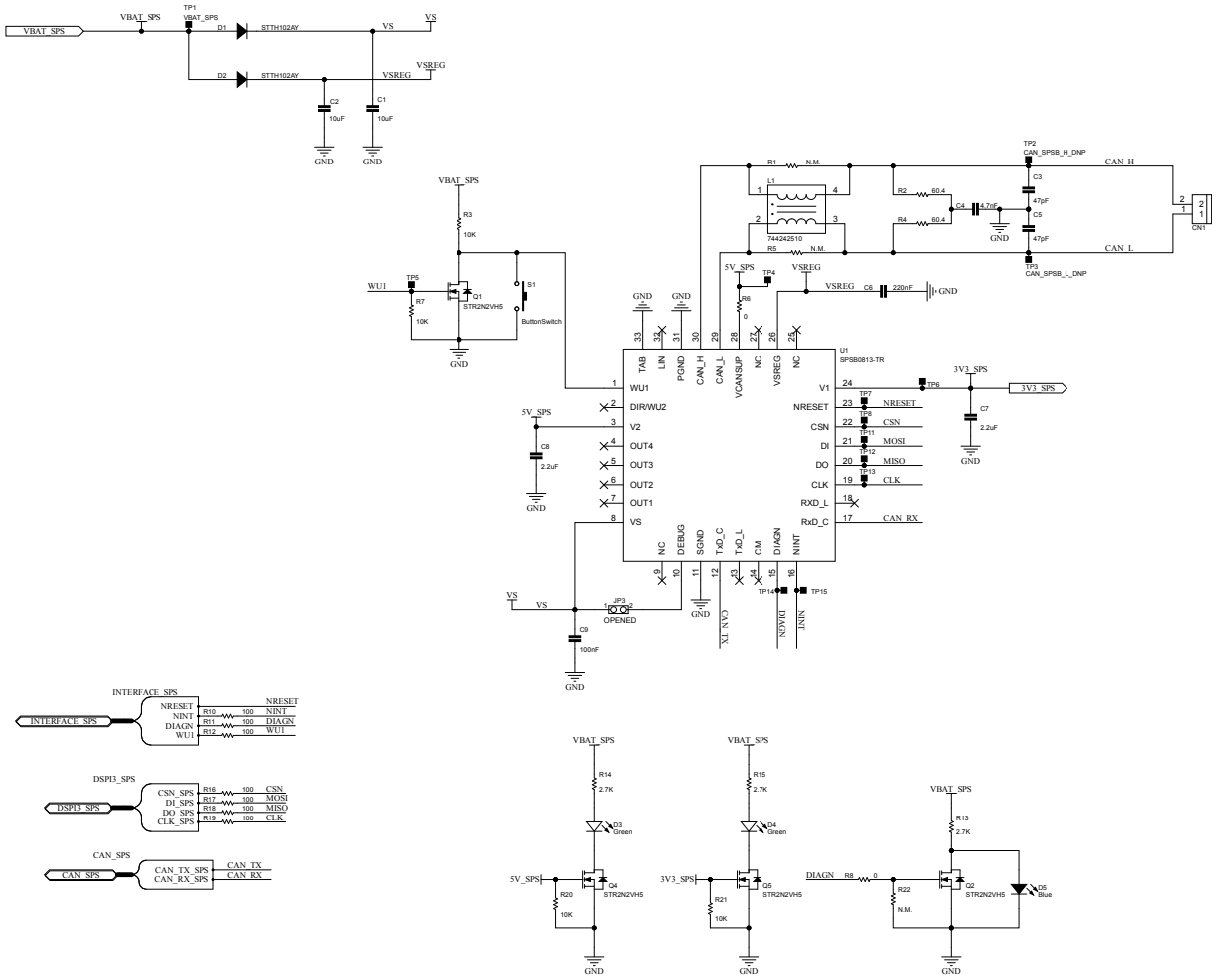


Figure 6. **AEK-COM-10BASET circuit schematic (5 of 10)**

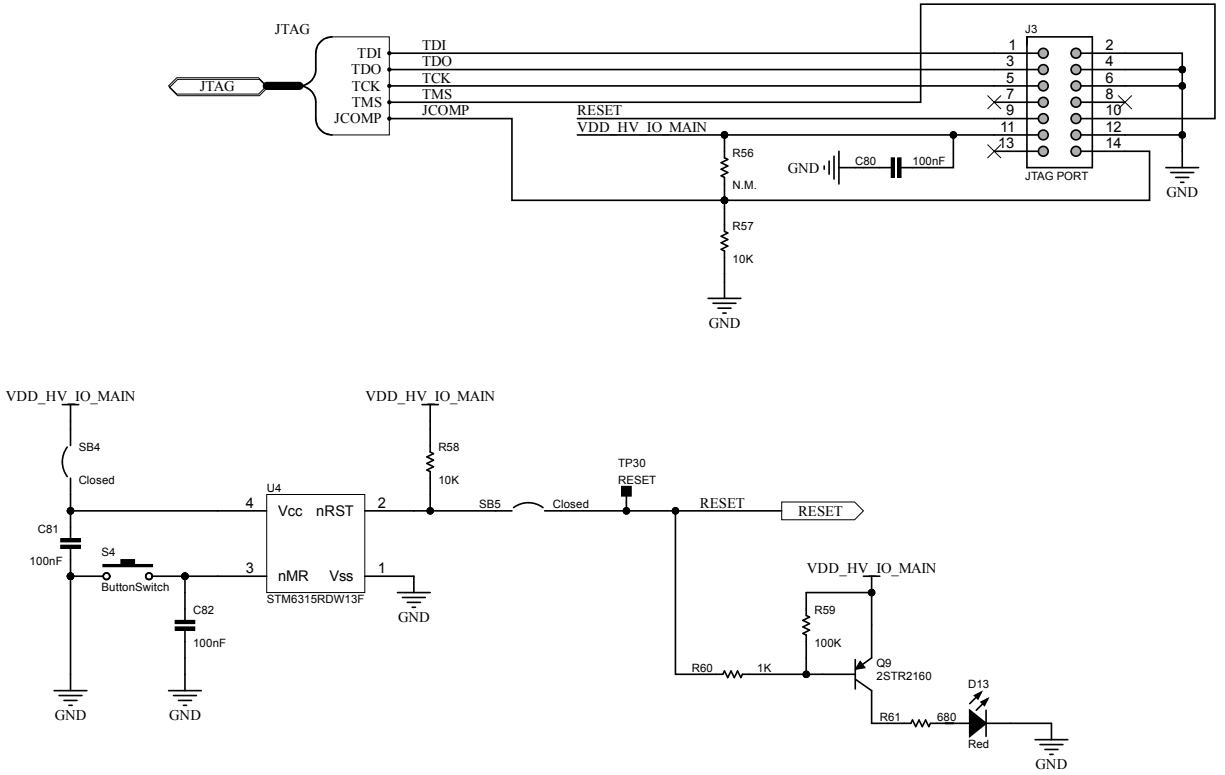


Figure 7. AEK-COM-10BASET circuit schematic (6 of 10)

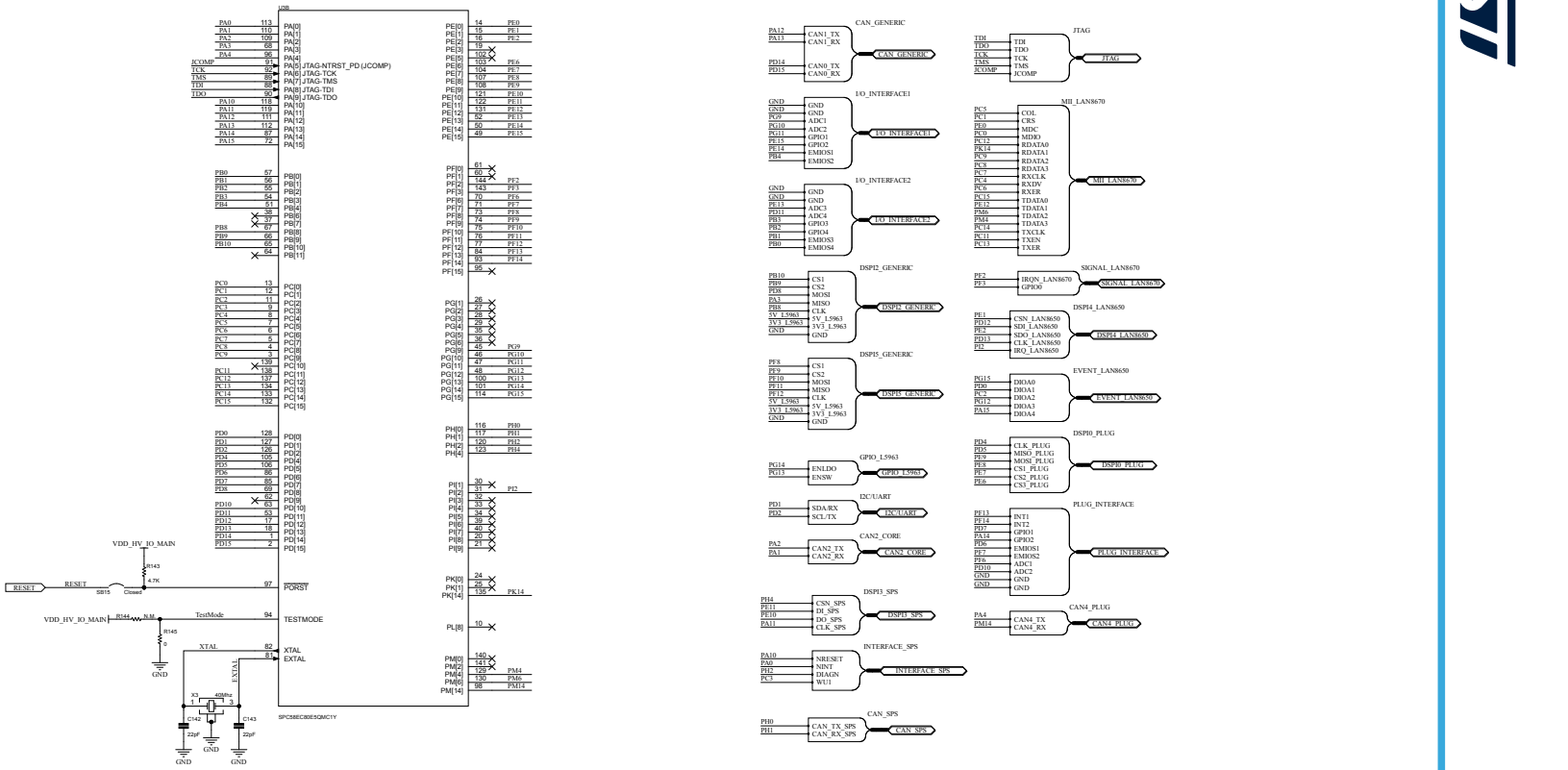


Figure 8. AEK-COM-10BASET circuit schematic (7 of 10)

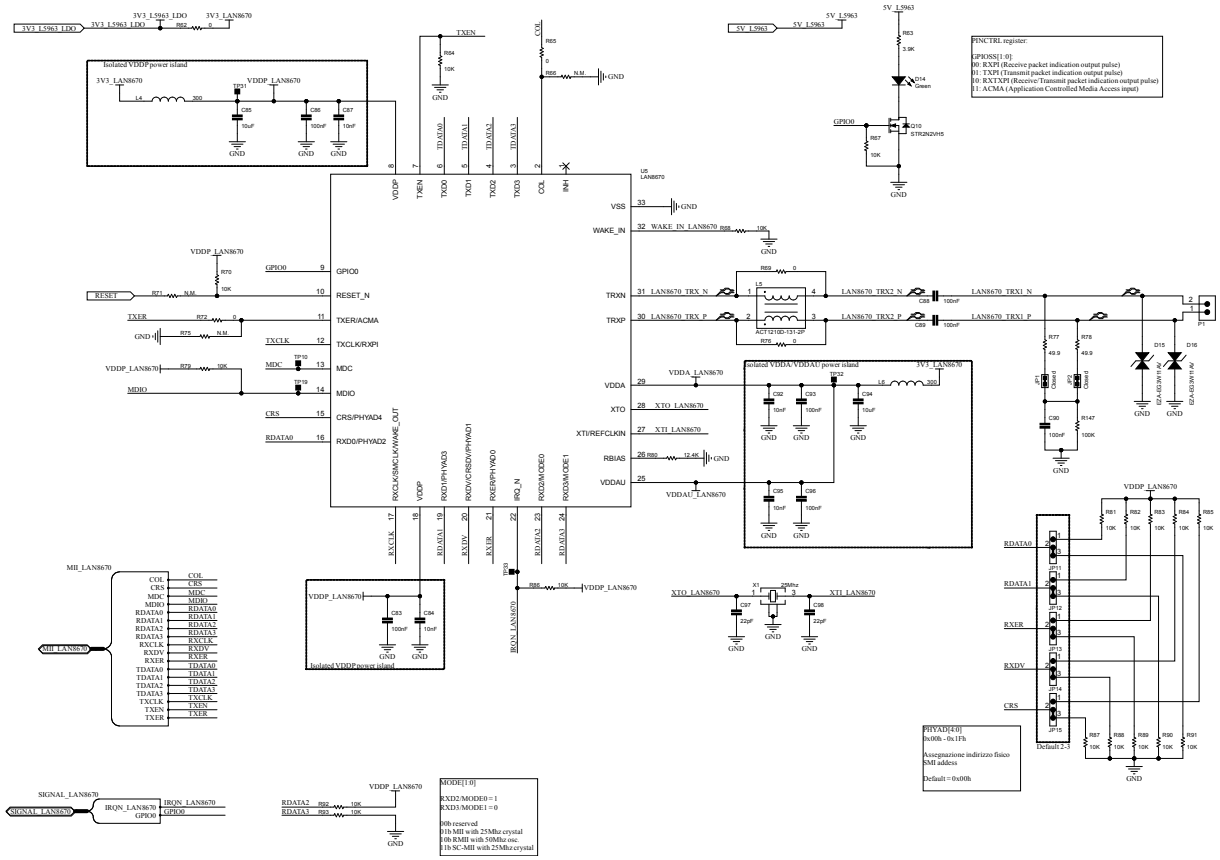


Figure 9. AEK-COM-10BASET circuit schematic (8 of 10)

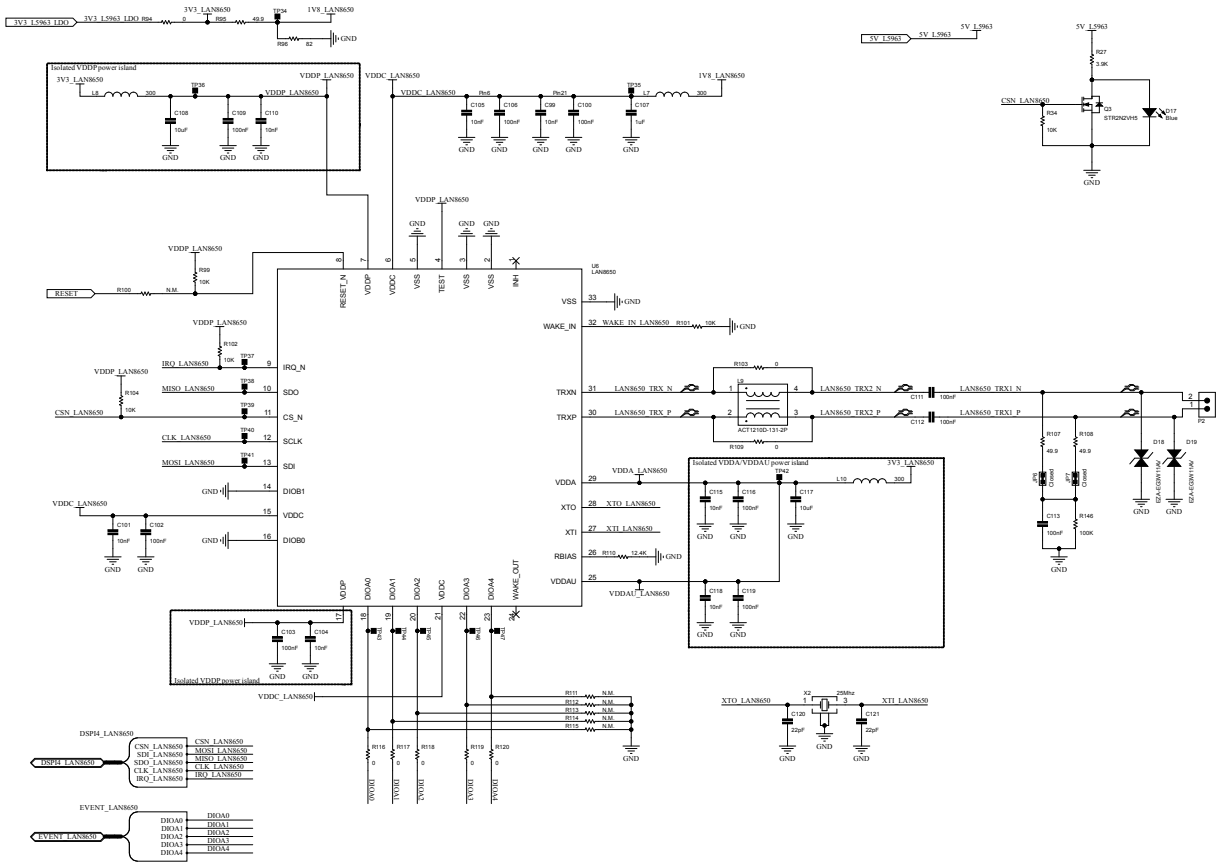


Figure 10. AEK-COM-10BASET circuit schematic (9 of 10)

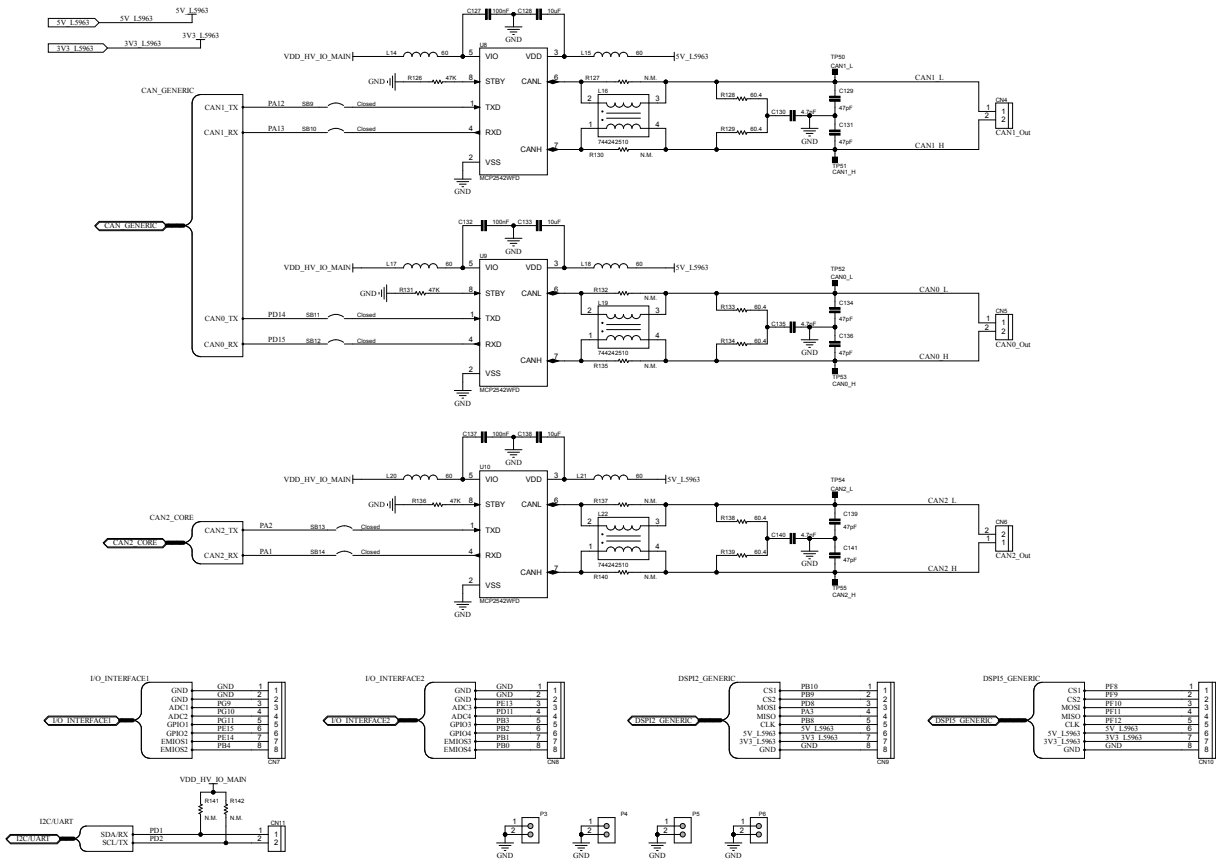
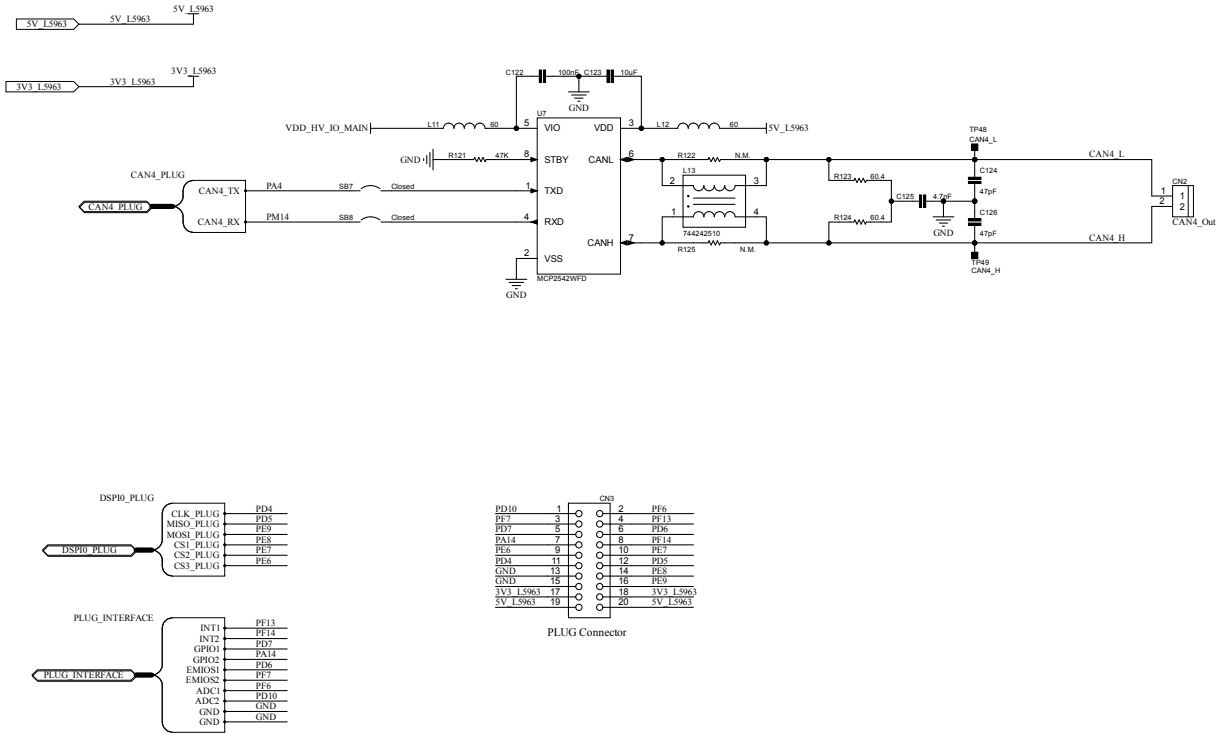


Figure 11. **AEK-COM-10BASET circuit schematic (10 of 10)**



3 Board versions

Table 1. AEK-COM-10BASET versions

Finished good	Schematic diagrams	Bill of materials
AEK$COM-10BASETA(1)	AEK$COM-10BASETA schematic diagrams	AEK$COM-10BASETA bill of materials

1. *This code identifies the AEK-COM-10BASET evaluation board first version.*

Revision history

Table 2. **Document revision history**

Date	Revision	Changes
16-Dec-2024	1	Initial release.

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