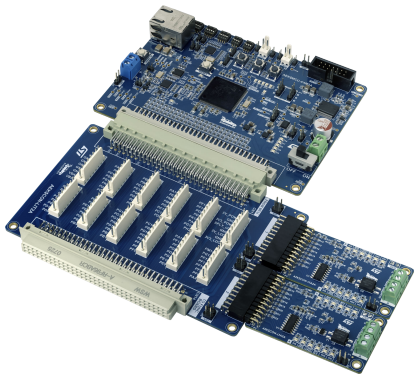
AEK-MCU-C4MLIT2

Data brief

MCU discovery kit for SPC58EC80E5 Chorus 4M automotive microcontroller featuring CAN-FD, ISO-SPI, 10BASE-T1S, 100BASE-TX and unified automotive connector



Product summary	
MCU discovery kit for SPC58EC80E5 Chorus 4M automotive microcontroller featuring CAN-FD, ISO-SPI, 10BASE-T1S, 100BASE-TX and unified automotive connector	AEK-MCU-C4MLIT2
32-bit Power Architecture MCU for Automotive General-Purpose Applications - Chorus family	SPC58EC80E5QMC1Y
L99VR02J automotive linear voltage regulator with configurable output	L99VR02JTR
Electronic fuses for 3.3 V/5 V lines	STEF033APUR/ STEF05LAPUR
AutoDevKit Studio for 32-bit power	STSW-AUTODEVKIT

Features

- AEK-MCU-C4M2 MCU board featuring the SPC58EC80E5 32-bit power architecture MCU for automotive general-purpose applications
- AEK-CON-LIT2 connector board for external functional board connection
- Two AEK-CON-LTA2 transceiver boards for dual ISO-SPI communication
- 12 V DC power supply connector
- L99VR02J automotive linear voltage regulator with configurable output voltage
- L5963 automotive dual monolithic switching regulator with LDO, featuring two step-down synchronous switching voltage regulators with internal power switches
- Two voltage configurations for the microcontroller peripherals (5 or 3.3 V)
- STEF033/STEF05L – electronic fuses for 3.3 and 5 V lines
- JTAG connector
- 100BASE-TX Ethernet connector
- 10BASE-T1S Ethernet connector
- DIP switches to configure the bootstrap for 100BASE-TX
- One 10BASE-T1S and one 100BASE-TX Ethernet physical layer transceivers
- 10BASE-T1S MAC-PHY Ethernet controller with SPI, featuring CSMA/CD medium access control and PLCA
- Ultralow power sleep mode
- Five generic LEDs
- Reset and general-purpose buttons
- Bidirectional voltage-level translator (5 to 3.3 V)
- Standardized 96-pin plug-and-play automotive unified connector, featuring external supply voltage and general-purpose pins for ADCs, EMIOs, interrupts, GPIOs, DSPI, CAN, I^2C, and UART
- Two CAN-FD transceivers
- Protected against short to ground and unsupplied short to battery
- Programmable under voltage battery detector
- Load dump protection
- Extremely low quiescent current in standby conditions
- Power good/adjustable voltage detector outputs for customized power up/ down sequences
- Compact sizes:
  - AEK-MCU-C4M2: 127 x 80 mm
  - AEK-CON-LIT2: 132 x 82 mm
  - AEK-CON-LTA: 60.5 x 33 mm
- Included in the AutoDevKit ecosystem

Product summary	
architecture MCUs	
10BASE-T1S MAC-PHY evaluation board	AEK-COM-10BASET
Applications	Domain and zone controllers Automotive gateways General purpose Automotive MCU boards In-vehicle high speed network

Description

The AEK-MCU-C4MLIT2 evaluation kit consists of an MCU board (AEK-MCU-C4M2), a connector board (AEK-CON-LIT2), and two ISOSPI (Isolated SPI) transceiver boards (AEK-CON-LTA2).

The kit is ideally suited for developers building the next generation of connected vehicles, where automotive edge nodes are enriched with a various set of communication peripherals.

With support for both sensor/actuator networking and high-speed Ethernet backbones, the AEK-MCU-C4MLIT2 helps customers move from concept to implementation faster, while reducing integration complexity and supporting modern automotive system architectures.

The AEK-MCU-C4M2 enhances the offer of a standard microcontroller board. Leveraging on a user-friendly interface, this high-performance board speeds development, allowing rapid and easy ECU prototyping and evaluation.

The board is designed to address automotive and transportation applications as well as other applications requiring automotive safety and security levels.

A dedicated cryptography MCU core acts as a hardware secure module (HSM). It pairs with a dual 180 MHz general-purpose 32-bit core. This setup hosts the on-board SPC58EC80E5 MCU featuring 4 MB of flash memory.

The AEK-MCU-C4M2 combines a powerful dual-core microcontroller from the SPC58EC80E5 chorus family. It also includes innovations from the 10BASE-T1S and 100BASE-TX specifications. Additionally, it features other automotive interfaces, such as CAN, CAN-FD, and SPI. This provides significant flexibility for designing systems that translate or relay messages across heterogeneous vehicle network architectures.

It perfectly meets the requirements of new megatrends in the automotive industry. These trends include personalization, electrification, autonomy, and full connectivity. They shift in-vehicle networks away from domain-based solutions. Instead, they move towards new zonal architectures.

The board is very flexible, allowing several gateway packet conversions to and from 10BASE-T1S, 100BASE-TX, 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.

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

This protocol 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 10BASE-T1S multidrop topology, multiple applications can be implemented on a single cable in zonal architecture (for example, in the door zone, the window lift, mirror control, speakers, lock, ultrasonic, ambient light, and indicator lights). P2P communication is also featured.

10BASE-T1S implements CSMA/CD to manage access to the shared medium and handle collisions, while the devices listen for carrier signals before transmitting and detecting collisions to avoid data corruption.

The onboard PHY-MAC transceiver communicates with the MCU via SPI, while the PHY-only transceiver requires an Ethernet MAC to run in the MCU, using the MII port.

In our board, the PHY-MAC transceiver supports only half-duplex communication. In contrast, the PHY-only transceiver supports full-duplex communication.

The board also features a 100BASE-TX transceiver and could be exploited in a ZCU for zonal architecture.

The 100BASE Ethernet protocol operates at 100 Mbps, which requires higher signal integrity and lower latency compared to 10 Mbps networks.

It can be used in the star topology, where each device is connected to a central hub or switch, or in point-to-point (P2P) topology.

In star topology, a central hub manages data traffic between connected devices, ensuring efficient and collision-free communication. Each device has a dedicated communication path to the central switch, ensuring high signal integrity and efficient performance. The dedicated paths reduce the risk of signal degradation and interference, which can be more prevalent in a shared medium like a multidrop network.

100BASE-TX is designed to support full-duplex operation, where data can be transmitted and received simultaneously without collisions.

The physical layer specifications of 100BASE-TX are optimized for point-to-point connections, ensuring proper signal transmission and reception over the specified cable lengths.

Two CAN-FD transceivers support high-speed CAN-FD applications, up to 8 Mbps communication speed, featuring low quiescent current, electromagnetic compatibility (EMC) and electrostatic discharge (ESD).

The board 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 or the L99VR02J, according to the selected voltage.

The board has a dedicated supply capacity for an external 5 or 3.3 V load.

Two e-fuses (STEF05L for 5 V and STEF033 for 3.3 V) are used to increase the output voltage in a smooth and controlled manner, at board power-up. This careful ramp-up helps prevent a surge of inrush current from the power source to the load, thereby protecting the power supply from overload. This feature is particularly helpful in setups where one power supply feeds multiple loads.

For system reset during the development phase, a reset button was added to the board layout, while a reverse battery protection circuit has been integrated for robust protection.

The board features a preloaded demo example available in the AutoDevKit studio toolchain.

The embedded firmware can manage a software-implemented Ethernet MAC and runs under FreeRTOS™.

The MCU board can be used standalone or easily connected to another functional board, thanks to the standardized 96-pin plug-and-play automotive unified connector.

If the functional board you are using does not feature the same 96-pin connector, you can connect it to the MCU board through the AEK-CON-LIT2 connector board (not available for separate sale) included in the kit carton box. This connector board also facilitates signal acquisition through an oscilloscope.

Through the AEK-CON-LTA2 transceiver boards, you can further adapt the kit to your own project, choosing to use one or both boards for isolated communication.

The AEK-CON-LTA2 board supports master and slave operation modes. In the default slave configuration, the board can propagate an SPI signal at frequencies up to 10 MHz. In master mode, the board can generate signals up to 8 MHz, provided that the relevant resistor on the board is adjusted accordingly.

The ISOSPI signals can travel for more than 10 meters. This protocol is suitable for automotive high-voltage applications. It meets safety standards that require electrical isolation. The cable length can affect communication among devices in distant parts of the vehicle. Moreover, it is possible to set the amplitude and speed of the isolated signal to slow mode at 333 kbps or fast mode at 2.66 Mbps.

The boards use the L9963T transceiver. This transceiver is a general-purpose SPI to isolated SPI bidirectional device. It transfers data from a 4-wire SPI interface to a 2-wire isolated interface, and it also transfers data in the opposite direction.

Finally, the board communication capability can be extended with another board belonging to the AutoDevKit ecosystem, namely the AEK-COM-10BASET featuring additional four CAN-FD ports, and two 10BASE-T1S ports.

1 Block diagram

Figure 1. **AEK-MCU-C4MLIT2 evaluation kit connections**

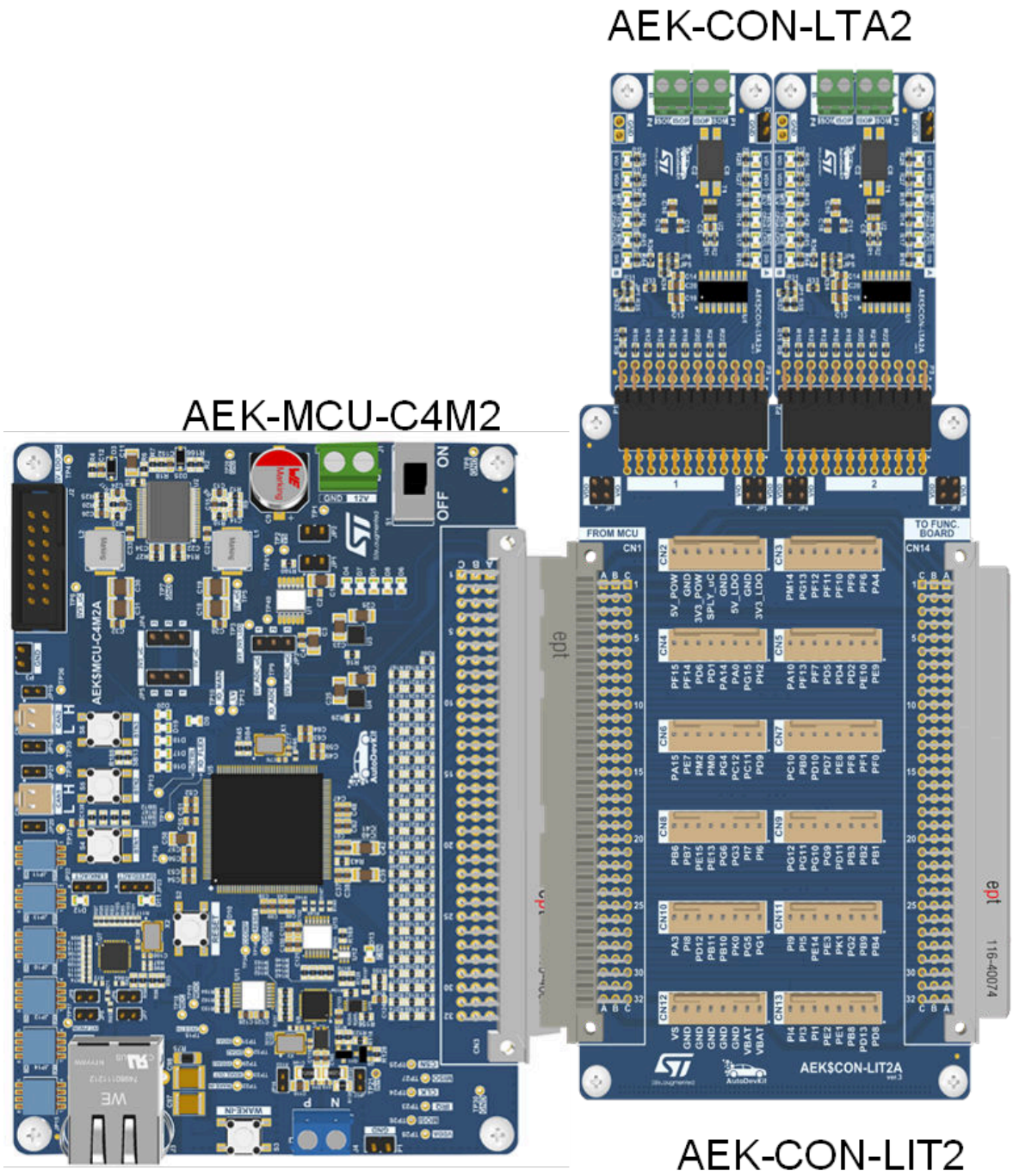
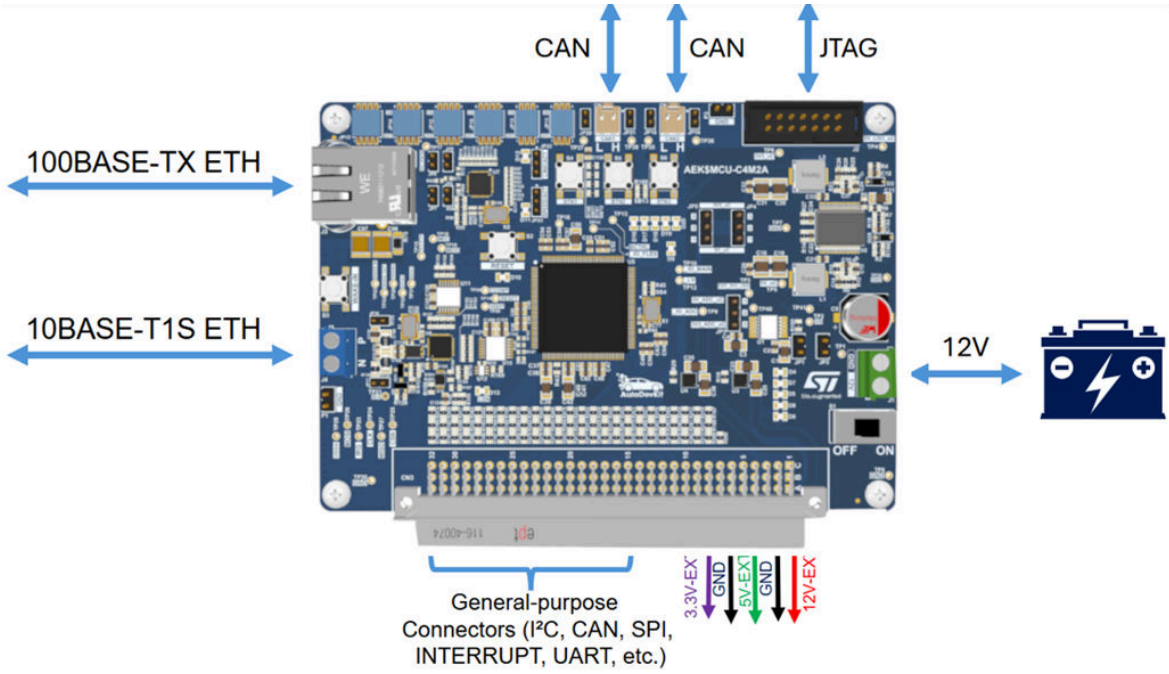


Figure 2. **AEK-MCU-C4M2 connection diagram**



2 Network evolution: automotive edge node (AEN)

Most car makers are settling on a mixed topology for car architecture (zonal/domain), at least for the current and next-generation models.

It becomes necessary to build new extremely flexible development tools able to easily adapt to the different car network topologies. In its quest to democratize automotive technology and throw open rapid prototyping.

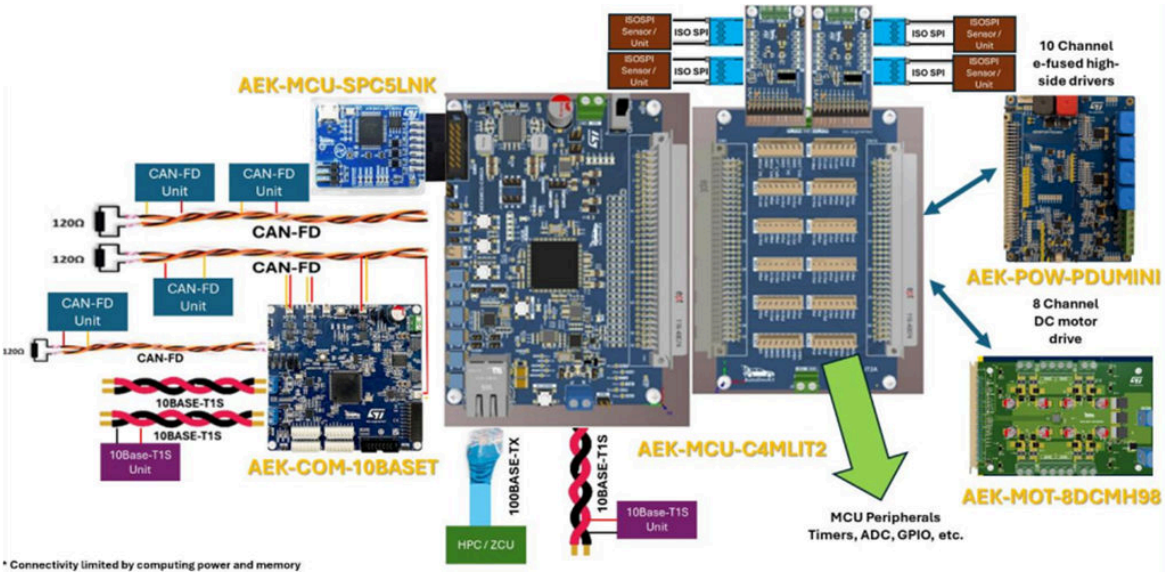
AutoDevKit has been enhanced with automotive edge node (AEN), a new set of functional boards seamlessly integrating a wide set of connectivity and actuation capabilities.

The AEK-MCU-C4MLIT2 is a set of boards sold in one package representing the corner ST-ONE for the AEN.

The kit features a dedicated connector for actuator boards. Two types of I/O aggregator boards are currently supported:

- AEK-POW-PDUMINI providing 10 e-fused high-side channels with advanced standby performance
- AEK-MOT-8DCMH98 providing up to 8 half-bridge (or 4 full-bridge) high current motor drives

Figure 3. Automotive edge node block diagram



3 Schematic diagrams

Figure 4. AEK-MCU-C4M2 circuit schematic (1 of 11)

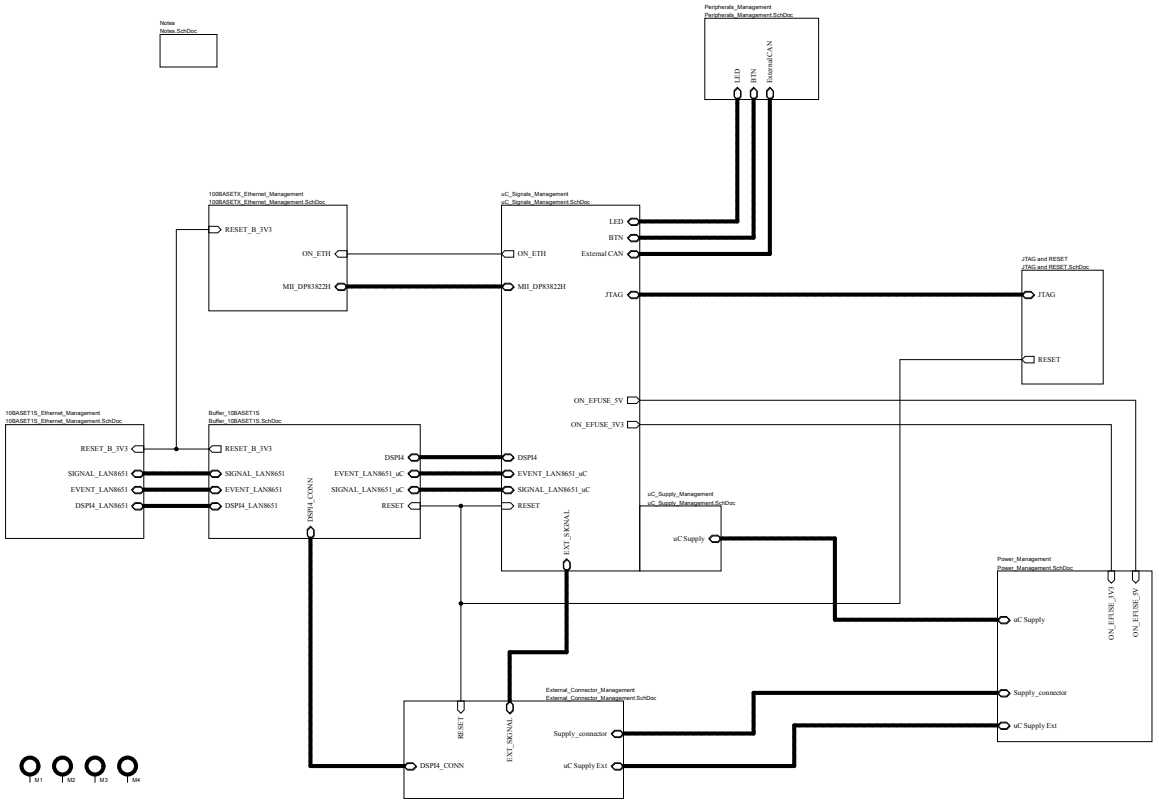


Figure 5. AEK-MCU-C4M2 circuit schematic (2 of 11)

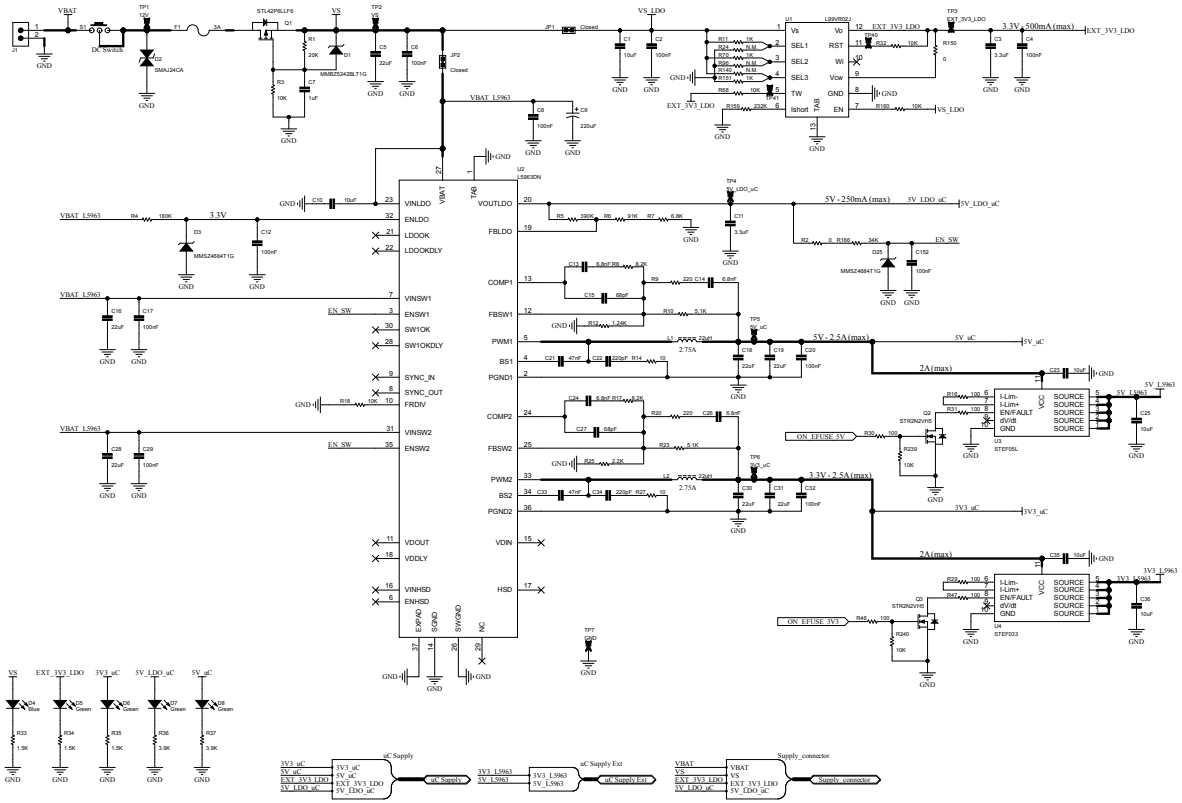


Figure 6. AEK-MCU-C4M2 circuit schematic (3 of 11)

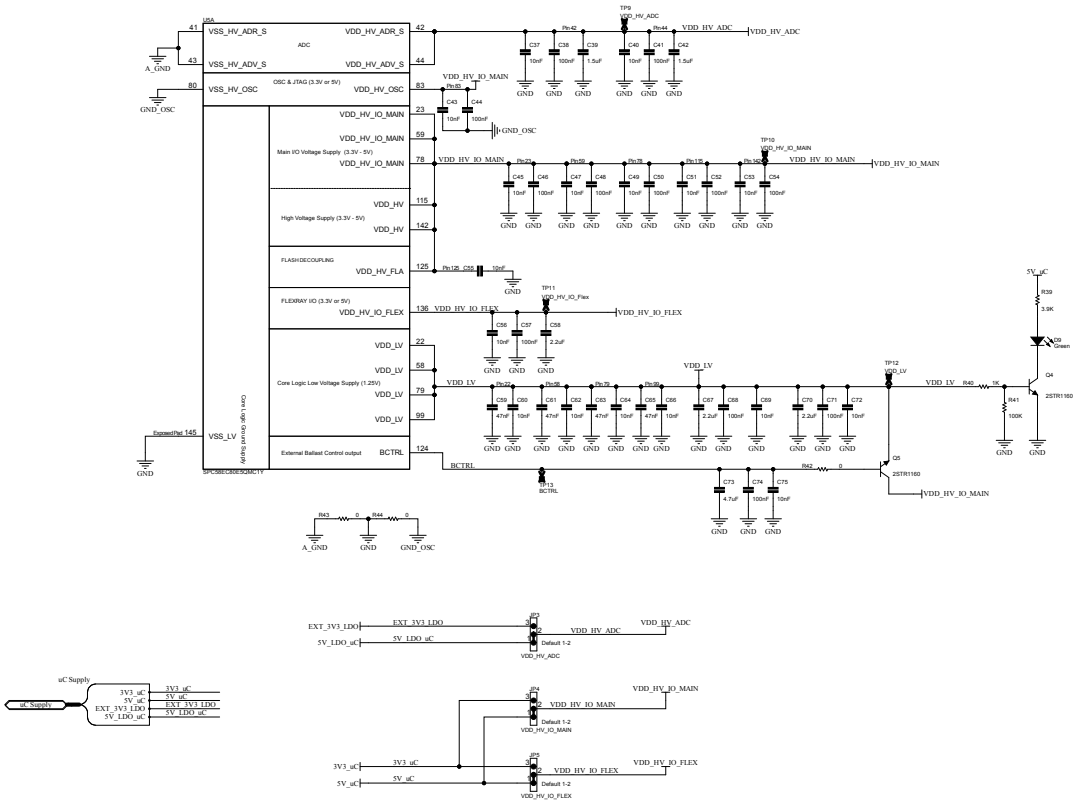


Figure 7. AEK-MCU-C4M2 circuit schematic (4 of 11)

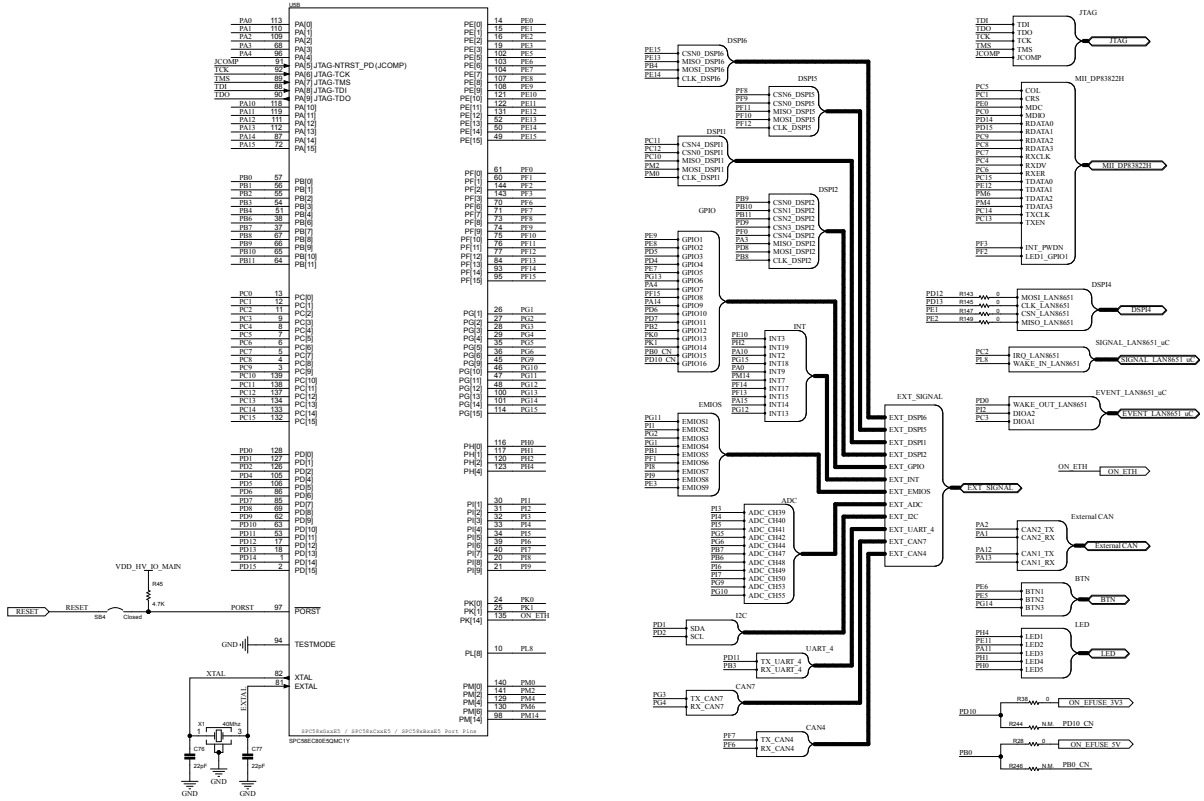


Figure 8. AEK-MCU-C4M2 circuit schematic (5 of 11)

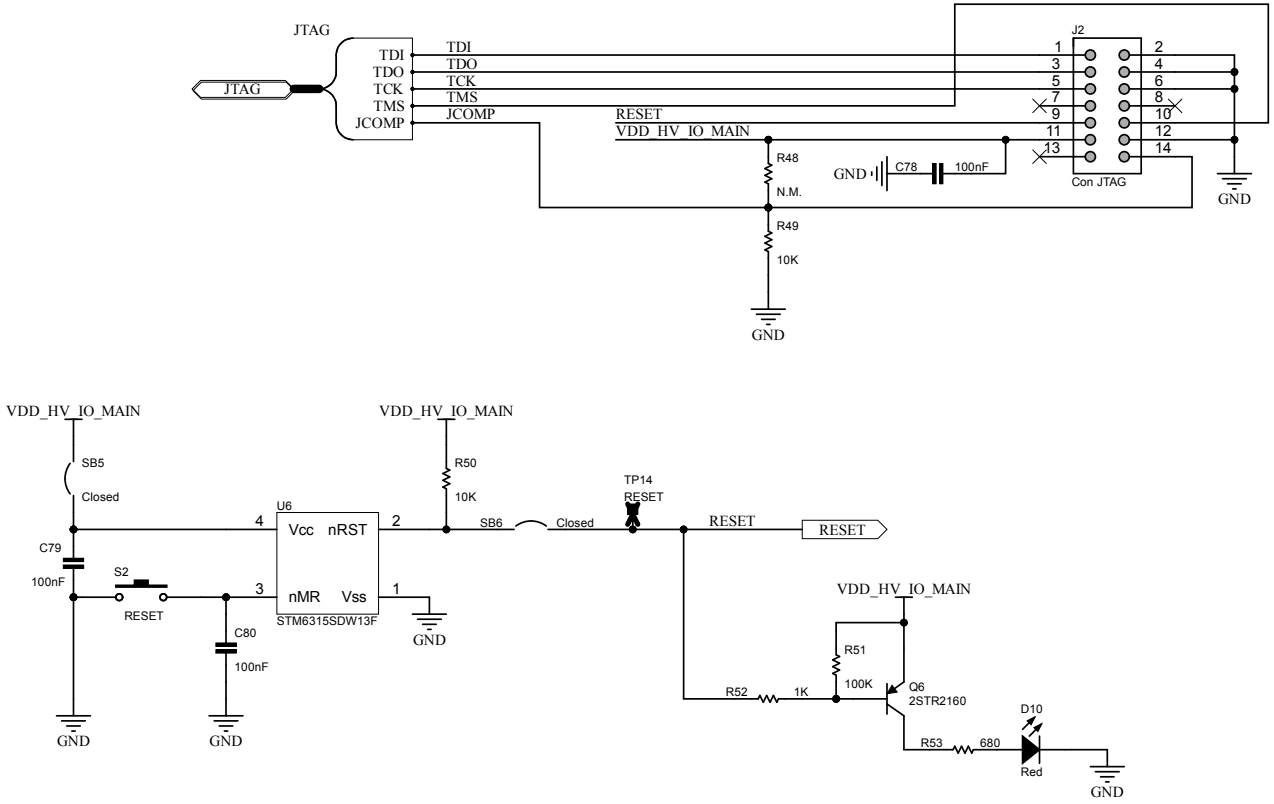


Figure 9. AEK-MCU-C4M2 circuit schematic (6 of 11)

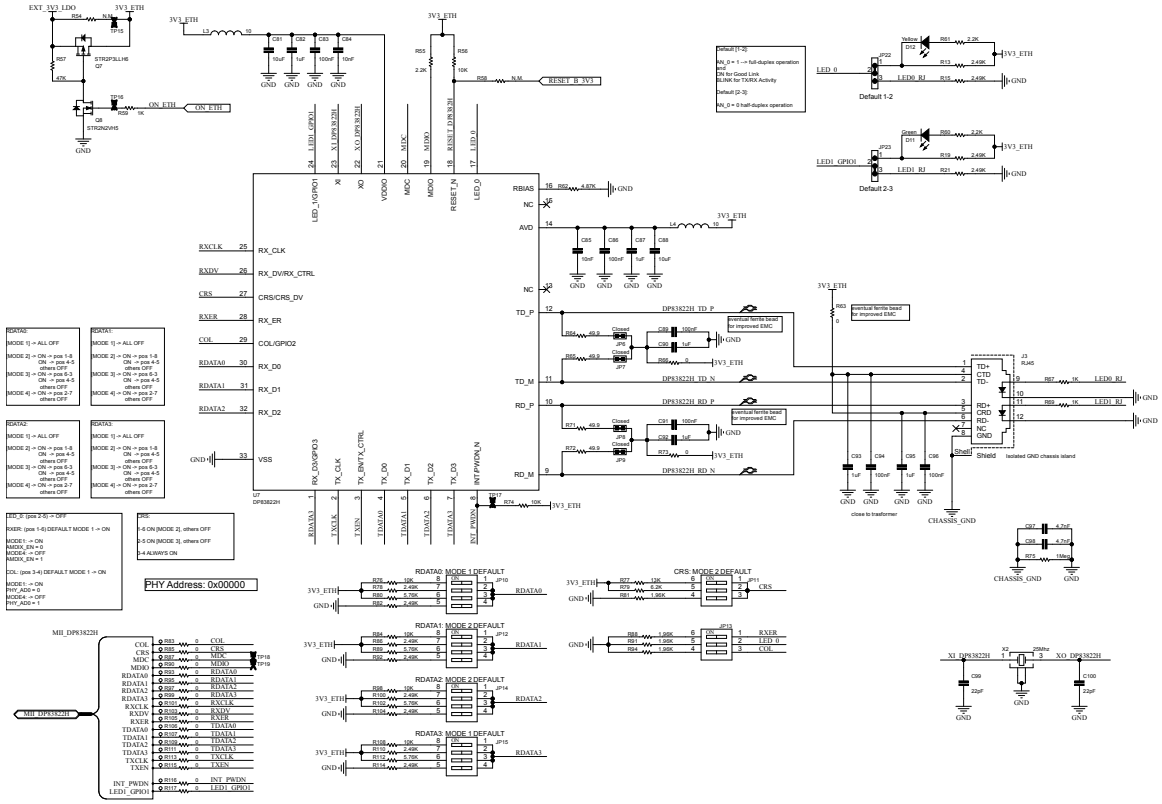


Figure 10. AEK-MCU-C4M2 circuit schematic (7 of 11)

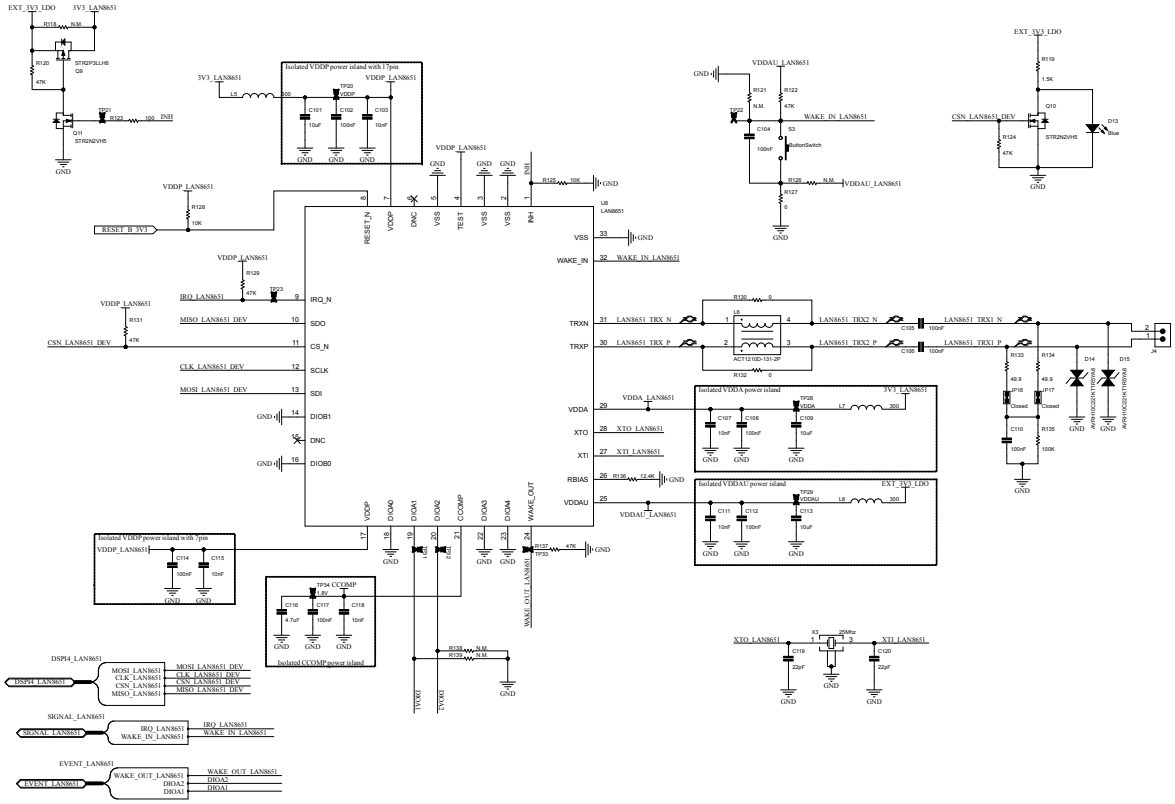


Figure 11. AEK-MCU-C4M2 circuit schematic (8 of 11)

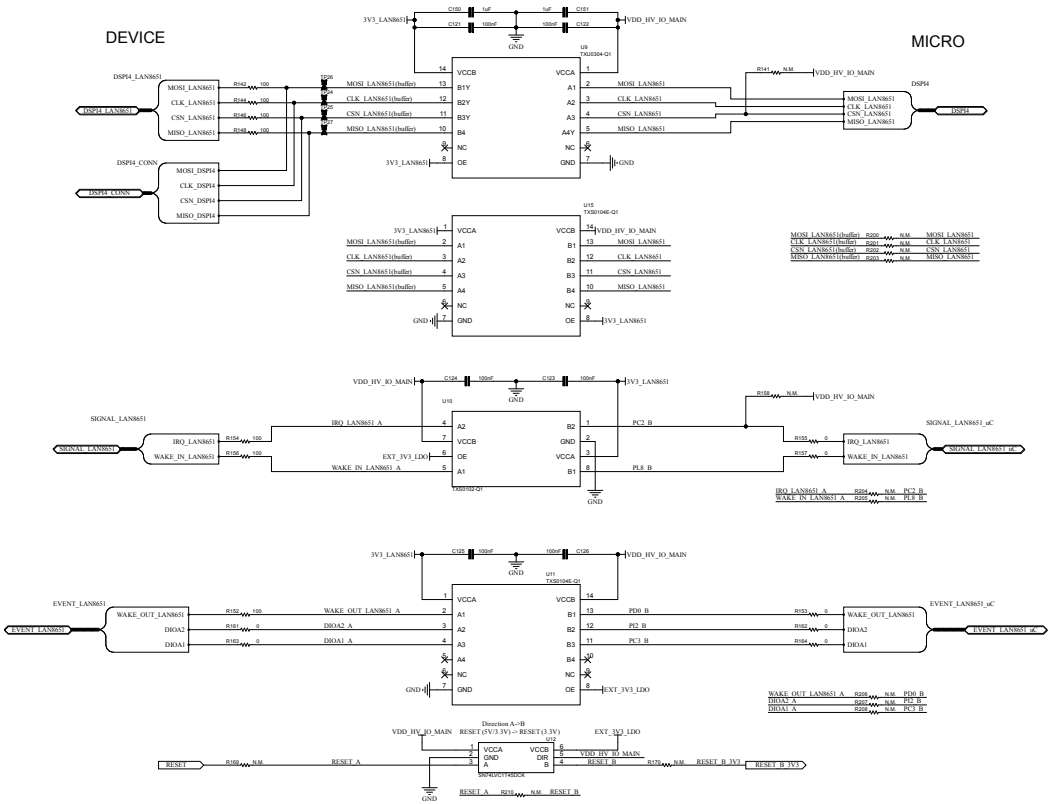


Figure 12. AEK-MCU-C4M2 circuit schematic (9 of 11)

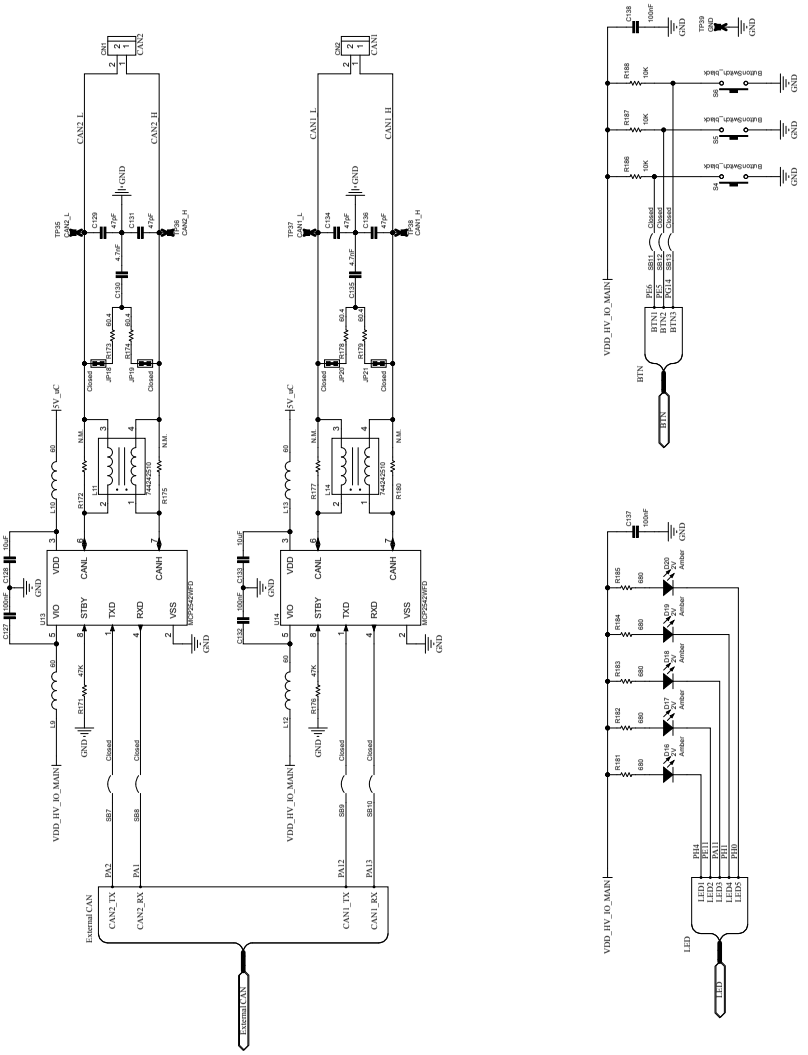


Figure 13. AEK-MCU-C4M2 circuit schematic (10 of 11)

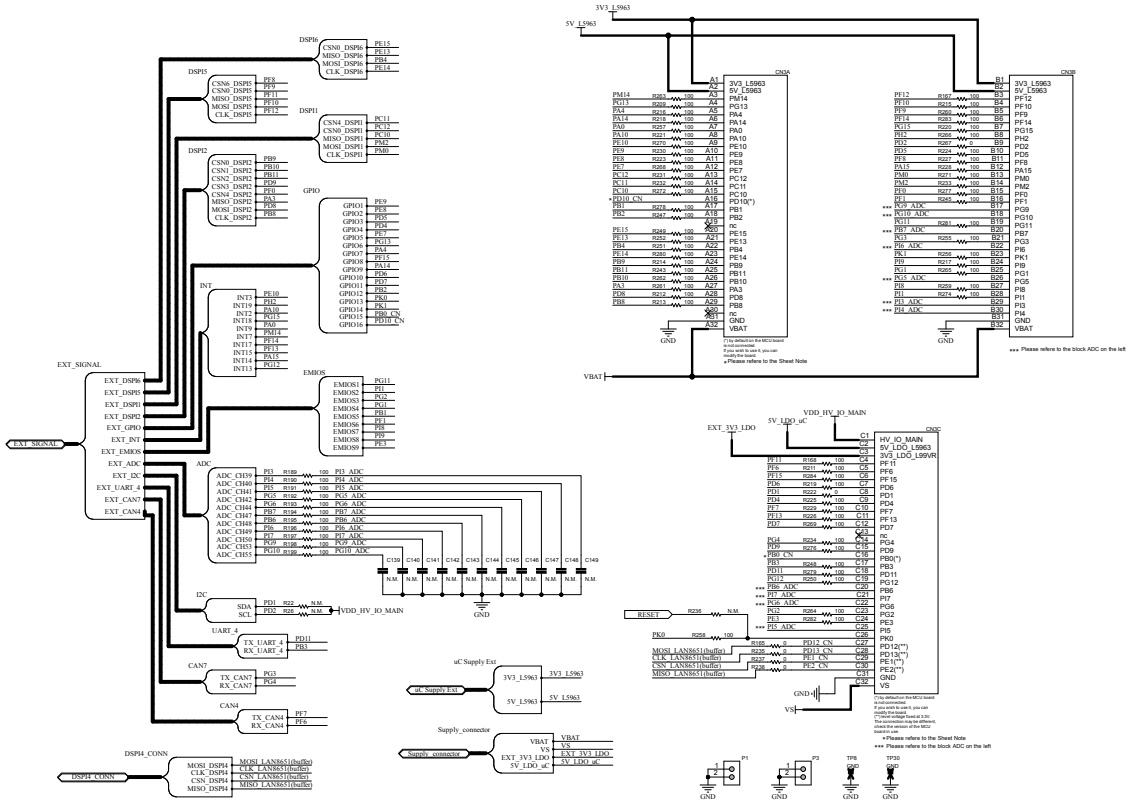
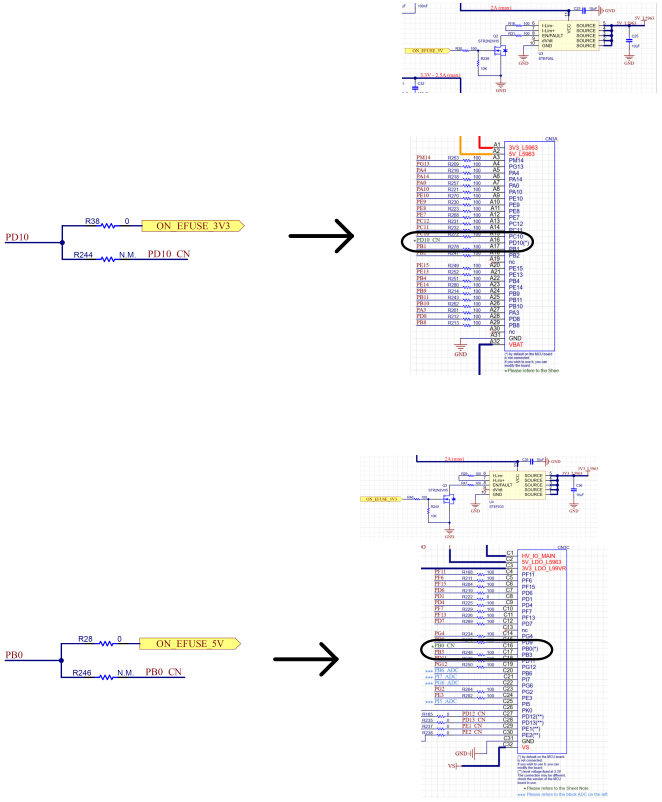


Figure 14. AEK-MCU-C4M2 circuit schematic (11 of 11)



Pin not connected on the “96pin connector,” by default it is used to enable/disable the eFuse @5V (U3_STEF05L).

To connect PB0 to the “96pin connector” remove R28 and mount a 0R on R246 (this way the eFuse always stays on and is no longer managed by the MCU)

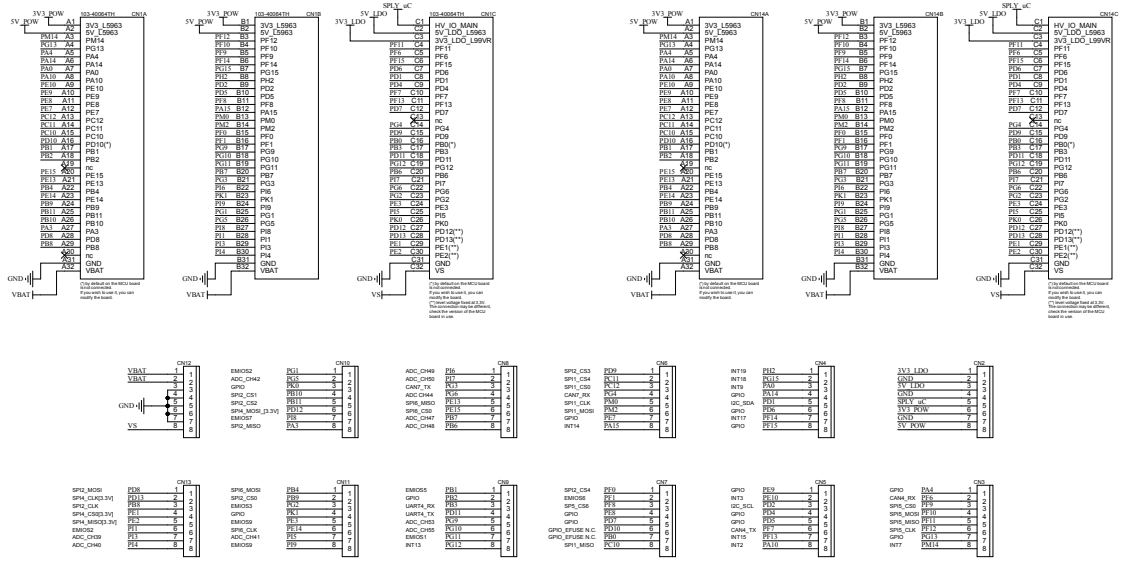
Pin not connected on the “96pin connector,” by default it is used to enable/disable the eFuse @3.3V (U4_STEF033).

To connect PD10 to the “96pin connector” remove R38 and mount a 0R on R244 (this way the eFuse always stays on and is no longer managed by the MCU).

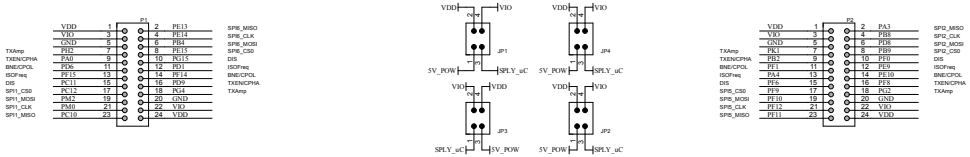
Figure 15. AEK-CON-LIT2 circuit schematic

MALE CONNECTOR

FEMALE CONNECTOR



First Module (A) ISO-SPI <AEK-CON-LTA2>



Second Module (B) ISO-SPI <AEK-CON-LTA2>

Figure 16. AEK-CON-LTA2 circuit schematic (1 of 3)

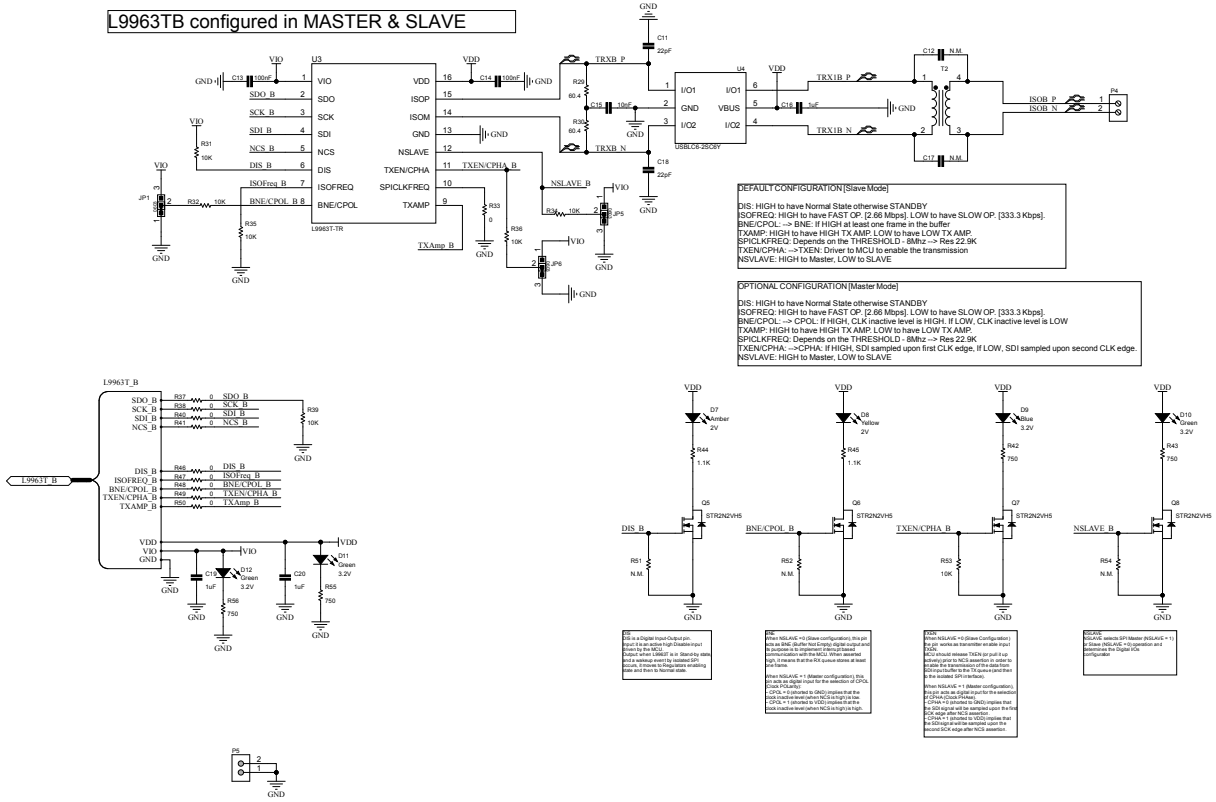


Figure 17. AEK-CON-LTA2 circuit schematic (2 of 3)

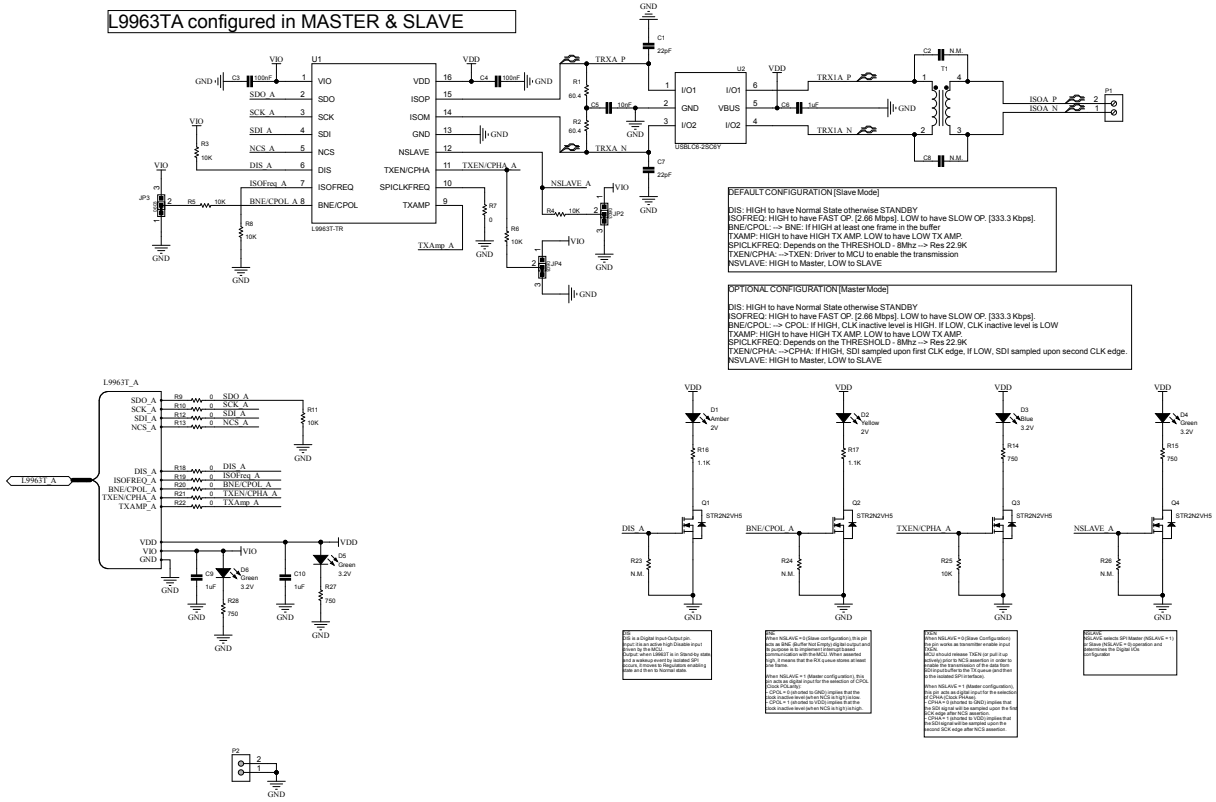
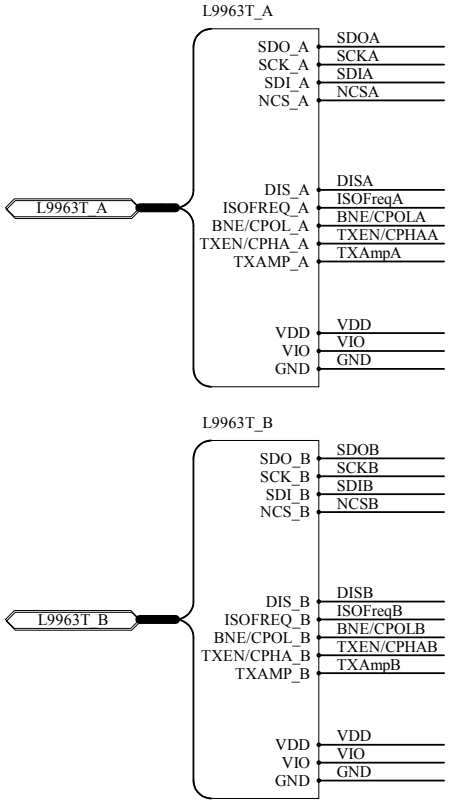
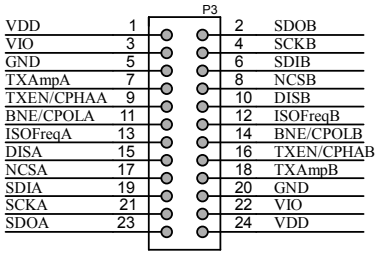


Figure 18. **AEK-CON-LTA2 circuit schematic (3 of 3)**





4 Board versions

Table 1. AEK-MCU-C4MLIT2 versions

Finished good	Schematic diagrams	Bill of materials
AEK$MCU-C4MLIT2A(1)	AEK$MCU-C4MLIT2A schematic diagrams	AEK$MCU-C4MLIT2A bill of materials

1. *This code identifies the AEK-MCU-C4MLIT2 evaluation board first version.*

Revision history

Table 2. **Document revision history**

Date	Revision	Changes
21-Sep-2026	1	Initial release.
19-Oct-2026	2	Updated Cover image.

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