ETAS

DRIVING EMBEDDED EXCELLENCE

ETAS ETK-S4.2 Emulator Probe for Infineon TriCore TC17xx

User Guide

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ETK-S4.2 - User Guide R08 EN - 07.2021

Contents

1 About this Document

1.1 Classification of Safety Messages

The safety messages used here warn of dangers that can lead to personal injury or damage to property:

 **DANGER**

indicates a hazardous situation with a high risk of death or serious injury if not avoided.

 **WARNING**

indicates a hazardous situation of medium risk, which could result in death or serious injury if not avoided.

 **CAUTION**

indicates a hazardous situation of low risk, which may result in minor or moderate injury if not avoided.

NOTICE

indicates a situation, which may result in damage to property if not avoided.

1.2 Presentation of Instructions

The target to be achieved is defined in the heading. The necessary steps for his are in a step-by-step guide:

Target definition

1. Step 1
2. Step 2
3. Step 3

> Result

1.3 Typographical Conventions

Hardware

Bold	Menu commands, buttons, labels of the product
Italic	Emphasis on content and newly introduced terms

1.4 Presentation of Supporting Information

NOTE

Contains additional supporting information.

2 Basic Safety Notices

This chapter contains information about the following topics:

2.1 General Safety Information

Please observe the Product Safety Notices ("ETAS Safety Notice") and the following safety notices to avoid health issues or damage to the device.

NOTE

Carefully read the documentation (Product Safety Advice and this User's Guide) that belongs to the product prior to the startup.

ETAS GmbH does not assume any liability for damages resulting from improper handling, unintended use or non-observance of the safety precautions.

2.2 Requirements for Users and Duties for Operators

The product may be assembled, operated and maintained only if you have the necessary qualification and experience for this product. Incorrect operation or operation by users without sufficient qualification may lead to injuries or death or property damages.

General Safety at Work

The existing regulations for safety at work and accident prevention must be followed. All applicable regulations and statutes regarding operation must be strictly followed when using this product.

2.3 Intended Use

An ETK is an electronic component that is installed in a vehicle control unit (ECU) to read data from the ECU or write data to the ECU.

Application Area of the Product

This product was developed and approved for automotive applications. For use in other application areas, please contact your ETAS contact partner.

Requirements for Operation

The following requirements are necessary for safe operation of the product:

- Use the product only according to the specifications in the corresponding User's Guide. With any deviating operation, the product safety is no longer ensured.
- Observe the regulations applicable at the operating location concerning electrical safety as well as the laws and regulations concerning work safety!
- Do not apply any voltages to the connections of the product that do not correspond to the specifications of the respective connection.
- Connect only current circuits with safety extra-low voltage in accordance with EN 61140 (degree of protection III) to the connections of the product.
- The power supply for the product must be safely disconnected from the supply voltage. For example, use a car battery or a suitable lab power supply.
- Use only lab power supplies with double protection to the supply system.
- Ensure that the connections of the power supply are easily accessible.
- The module does not have an operating voltage switch.
  - Switch on the product by connecting the power supply cable with the power supply or by switching on the power supply.
  - Switch off the product by disconnecting it from the power supply or by switching off the power supply.

DANGER

Connect the power cord only with a vehicle battery or with a lab power supply! A connection to power outlets is prohibited.

- Route the power cord in such a way that it is protected against abrasion, damages, deformation and kinking. Do not place any objects on the power cord.

- Never apply force to insert a plug into a socket. Ensure that there is no contamination in and on the connection, that the plug fits the socket, and that you correctly aligned the plugs with the connection.

- Do not use the product in a wet or damp environment.

- Do not use the product in potentially explosive atmospheres.

- Keep the surfaces of the product clean and dry.

Potential Equalization

CAUTION

Danger from inadvertent current flow!

Depending on the design, the shield of the Ethernet cables can be connected with the housing of the module. Install the products only on components with the same electrical potential or isolate the products from the components.

Requirements for the technical State of the Product

The product is designed in accordance with state-of-the-art technology and recognized safety rules. The product may be operated only in a technically flawless condition and according to the intended purpose and with regard to safety and dangers as stated in the respective product documentation. If the product is not used according to its intended purpose, the protection of the product may be impaired.

Maintenance and Cleaning

The product is maintenance-free. Use a lightly moistened, soft, lint-free cloth for cleaning the product. Ensure that no moisture can enter. Never spray cleaning agents directly onto the product. Do not user any sprays, solvents or abrasive cleaners which could damage the product.

Transport and Installation

CAUTION

The ETK can be damaged or destroyed!

Some components of the ETK board may be damaged or destroyed by electrostatic discharges. Please keep the ETK in its storage package until it is installed.

The board should only be taken from its package, configured, and installed at a work place that is protected against static discharge.

CAUTION

During installation and removal, ECU and ETK must be in a de-eenergized state!

CAUTION

Risk of short circuiting the internal signals of the ETK!

When you mount the ETK to the ECU, you must ensure that the screws and washers used will not penetrate the ETK printed circuit board.

CAUTION

Differences in case ground potentials can cause high currents to flow through the shields of the cables that connect various system modules.

Ensure that the module mounting surfaces are at the same electrical potential or insulate the modules from their mounting surfaces.

Cabling

Use exclusively ETAS cables at the connections of the product! Adhere to the maximum permissible cable lengths! Observe the assignment of the cables to the connectors! Detailed information about cabling is located in the ETK User's Guides.

2.4 Identifications on the Product

Fig. 2-1 Adhesive Label (Example: Label for XETK-S14.0)

The following symbols are used for identifications of the product:

Symbol	Description
	The User's Guide must be read prior to the startup of the product!
	Symbol for WEEE, see chapter 2.5 on page 13
	Marking for CE conformity (Chapter 2.6 on page 13)
	Marking for UKCA conformity (Chapter 2.7 on page 13)
	Symbol for China RoHS, see chapter on page 14
	Symbol for China RoHS, see chapter on page 14
	Symbol for electrostatic sensitive components
XETK-S14.0A	Product designation (example)
F 00K 110 722	Order number of the product (example)
SN: yyxxxxx	Serial number (7-digit)
XXXX/YY	Product version
ZZZZ	Year of manufacture
ETAS GmbH, PO Box 300220, 70442 Stuttgart, Germany	Manufacturer's address

NOTE

For symbols and product information one or several adhesive labels can be used.

2.5 Taking the Product Back and Recycling

The European Union has passed a directive called Waste Electrical and Electronic Equipment, or WEEE for short, to ensure that systems are setup throughout the EU for the collection, treating and recycling of electronic waste.

This ensures that the devices are recycled in a resource-saving way representing no danger to health or the environment.

Fig. 2-2 WEEE-Symbol

The WEEE symbol (see Fig. 2-2 on page 13) on the product or its packaging shows that the product must not be disposed of as residual garbage.

The user is obliged to collect the old devices separately and return them to the WEEE take-back system for recycling. The WEEE directive concerns all ETAS devices but not external cables or batteries.

For more information on the ETAS GmbH Recycling software, contact the ETAS sales and service locations.

2.6 CE conformity

With the CE mark attached to the product or its packaging, ETAS confirms that the product corresponds to the product-specific, applicable directives of the European Union.

The CE Declaration of Conformity for the product is available upon request.

2.7 UKCA conformity

With the UKCA mark attached to the product or its packaging, ETAS confirms that the product corresponds to the product-specific, applicable standards and directives of Great Britain.

The UKCA declaration of conformity for the product is available on request.

2.8 RoHS Conformity

European Union

The EU Directive 2011/65/EU limits the use of certain dangerous materials for electrical and electronic devices (RoHS conformity).

This product does not contain any of the restricted substances specified in the EU Directive 2011/65/EU or exceeds the maximum concentrations stipulated therein. For individual electronic components used in our products, there are currently no equivalent alternative substances, which is why we make use of the exception 7C-I in Annex III of this Directive.

ETAS confirms that the product corresponds to this directive which is applicable in the European Union.

China

ETAS confirms that the product meets the product-specific applicable guidelines of the China RoHS (Management Methods for Controlling Pollution Caused by Electronic Information Products Regulation) applicable in China with the China RoHS marking affixed to the product or its packaging.

2.9 Declarable Substances

European Union

Some products from ETAS GmbH (e.g. modules, boards, cables) use components with substances that are subject to declaration in accordance with the REACH regulation (EU) no.1907/2006.
Detailed information is located in the ETAS download center in the customer information "REACH Declaration" (www.etas.com/Reach). This information is continuously being updated.

2.10 Use of Open Source Software

The product uses Open Source Software (OSS). This software is installed in the product at the time of delivery and does not have to be installed or updated by the user. Reference shall be made to the use of the software in order to fulfill OSS licensing terms. Additional information is available in the document "OSS Attributions List" at the ETAS website www.etas.com.

3 Introduction

This chapter contains information about the following topics:

3.1 Overview

The ETK-S4.2 is an emulator test probe for the Infineon AUDO-NG, AUDO-F and AUDO-MAX microcontroller (Infineon TriCore TC17xx). It is a typical serial ETK with an Infineon specific JTAG interface. This serial ETK can be used for rapid prototyping applications (bypass) as well as for measurement and calibration applications.

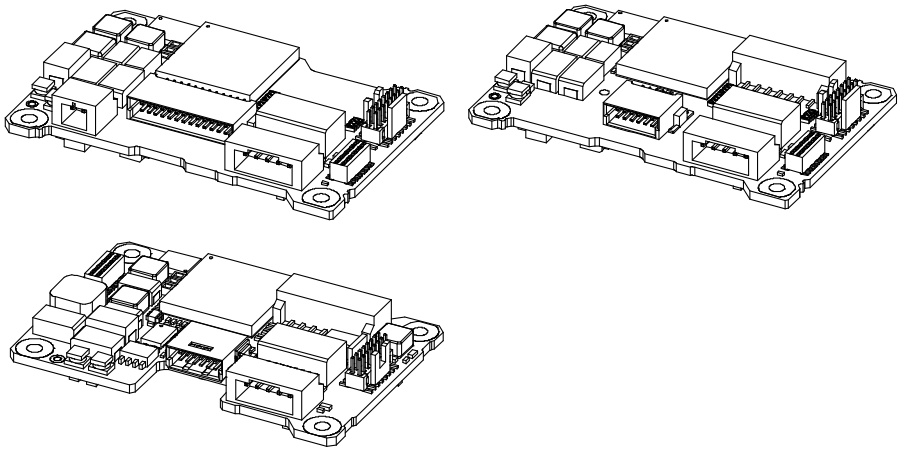

Fig. 3-1 ETK-S4.2 (top left: ETK-S4.2A, top right: ETK-S4.2B, bottom left: ETK-S4.2C)

It is compatible with the ETAS calibration and development system interface (e.g. ES590, ES591, ES592, ES690, ES910 and ES1000.2/ES1000.3 with ES1232-A).

NOTE

The ETK-S4.2 can be ordered in the different functional and mechanical versions ETK-S4.2A, ETK-S4.2B and ETK-S4.2C.

	ETK-S4.2A	ETK-S4.2B	ETK-S4.2C
ECU connector	26 pin ERNI	12 pin ERNI plus 7 pin JST	12 pin ERNI plus 7 pin JST
Power supply for ED devices (VDDSBRAM)	min. 1.5 V	min. 1.5 V	min. 1.3 V
SBRAM sense	Yes, extra pin	Yes, no extra pin	Yes, DAI1 pin, configurable
Trigger pins	4	2	2
DAI triggering	Yes	Yes	Yes [2)]

	ETK-S4.2A	ETK-S4.2B	ETK-S4.2C
Pinless triggering	Yes [1)]	Yes [1)]	Yes
Timer triggering	No	No	Yes

[1)]: depending on used microcontroller
[2)]: only available if the DAI pins are configured for DAI triggering

3.2 Features

- Serial interface with 100 Mbit/s to the calibration and development system
- JTAG interface clock speed configurable: 20 MHz, 30 MHz, 40 MHz (INCA V6.1.0 and higher)
- Concurrent use of calibration and debugging function possible
- Two startup protocols for ETK recognition
  - via DAI pins (all microcontrollers)
  - pinless via JTAG (TC1724ED, TC1728ED, TC1736ED, TC1767, TC1767ED, TC1782ED, TC1791, TC1791ED, TC1793, TC1793ED, TC1797, TC1797ED, TC1798, TC1798ED)
- Supports special coldstart mechanism ("Calibration Wake Up")
- Pull CalWakeUp until Startup Handshake
- Debugger Detection and Watchdog Disable
- Microcontroller capability of internal Flash emulation can be used
- ECU flashing via ETK under ProF control
- Permanent storage of configuration in EEPROM
- ETK powers Emulation Device RAM (for calibration and trace purpose)
- ETK-S4.2 for use with serial processor interface JTAG (Infineon)
- Firmware update (programming of the logic device) through software; removal of ETK or ECU not necessary
- Mounting possibilities inside or on top of ECU
- Selectable 2.5 V and 3.3 V ECU interface voltage levels
- Temperature range suitable for automotive application

For more technical data on the ETK-S4.2 consult the chapter “Technical Data” on page 48.

4 Hardware Description

This chapter contains information about the following topics:

4.1 Architecture

Fig. 4-1 shows the block diagram of the ETK-S4.2A, the ETK-S4.2B and the ETK-S4.2C.

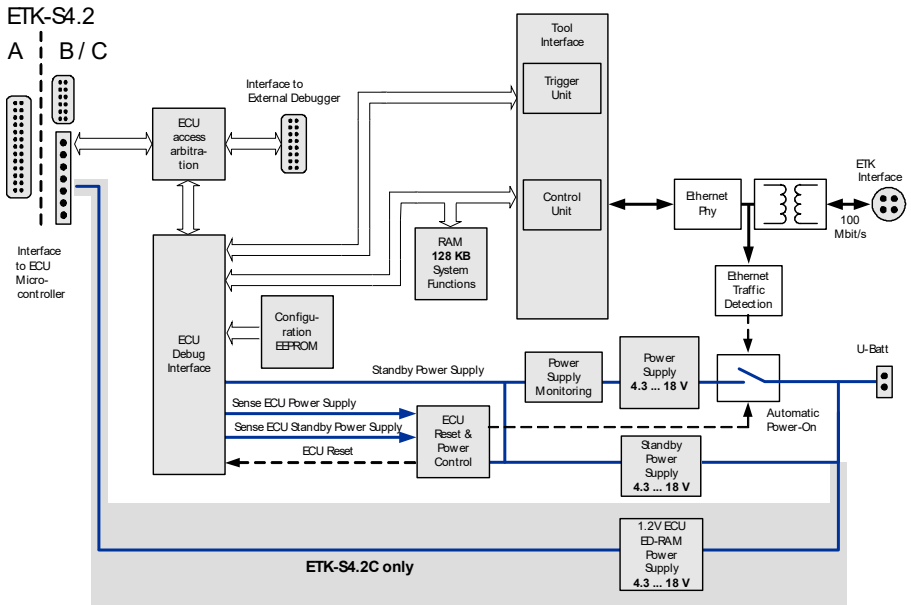

Fig. 4-1 ETK-S4.2 Architecture

The microcontroller can communicate with the memories or peripheral components of the development ECU. The ETK-S4.2 is connected to the serial debug and test interface of the microcontroller (JTAG). It converts these interface to the 100 MBit/s serial ETK interface and extends in this way the length of the connection line.

While the microcontroller accesses the data out of the data emulation memory, the content of the data emulation memory can simultaneously be modified by the calibration and development system through the serial ETK interface. This process enables adjustments of parameters, characteristic lines and maps through the calibration and development system. Using an additional measurement data memory area, the ECU microcontroller can send data to the calibration and development system which receives, buffers and processes this measured data (DISTAB13).

The 100 Mbit/s serial interface provides communication with the calibration and development system.

The power supply for the ETK-S4.2 is provided by a switch mode power supply, to minimize power dissipation.

4.2 ECU Interface

The ECU interface can be flexibly configured for several applications. For a HDC update, it is not necessary to unmount or disconnect the ETK-S4.2 from the ECU.

For currently supported microcontrollers refer to chapter 7.1.2 on page 48.

4.2.1 ETK-S4.2A

The ETK-S4.2A is connected via CON1 to the ECU with an adapter cables (refer to Fig. 4-2 on page 19).

The pin definition depends on the application and the microcontroller type. In general the ECU interface consists of

- 2 ECU voltage lines, which are not used for ETK power supply but only for detection of the ECU status, therefore the power consumption on these lines is negligible (refer to chapter 4.5 on page 24)
- 4 Data Acquisition Interupt lines (DAI lines) which are used for ETK recognition at startup and for Data Acquisition (refer to chapter 4.11 and 4.11.2)
- 1 Reset line which allows the ETK to control the system reset of the ECU
- 7 Debug Interface lines for the communication between the ETK-S4.2 and the microcontroller
- 6 ground lines for a proper shielding of the ECU interface lines.

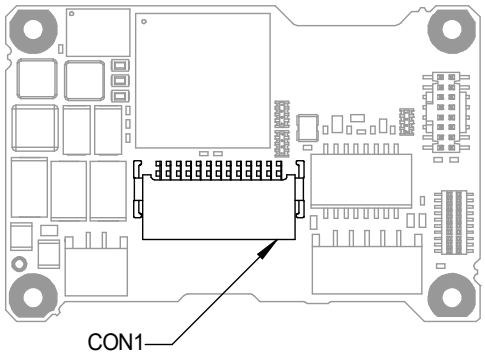

Fig. 4-2 Location of the ECU Interface (ETK-S4.2A)

4.2.2 ETK-S4.2B

The ETK-S4.2B is connected via CON6 and CON7 to the ECU with two adapter cables (refer to Fig. 4-3 on page 20). The pin definition depends on the application and the microcontroller type. In general the ECU interface consists of

- 1 ECU voltage line, which is not used for ETK power supply but only for detection of the ECU status, therefore the power consumption on these line is negligible (refer to chapter 4.5 on page 24)
- 2 Data Acquisition Interupt lines (DAI lines) which are used for ETK recognition at startup and for Data Acquisition (refer to chapter 4.11 and 4.11.2)
- 1 Reset line which allows the ETK to control the system reset of the ECU
- 7 Debug Interface lines for the communication between the ETK-S4.2 and the microcontroller
- 2 ground lines for a proper shielding of the ECU interface lines.

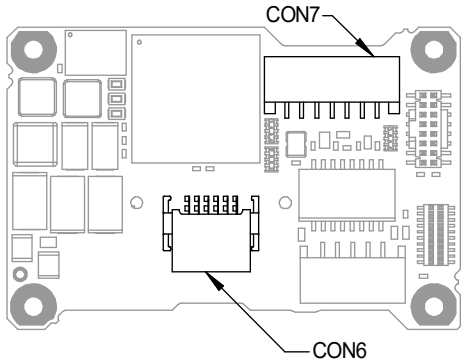

Fig. 4-3 Location of the ECU Interfaces (ETK-S4.2B)

4.2.3 ETK-S4.2C

The ETK-S4.2C is connected via CON6 and CON7 to the ECU with two adapter cables (refer to Fig. 4-4 on page 21). The pin definition depends on the application and the microcontroller type. In general the ECU interface consists of

- 1 ECU voltage line, which is not used for ETK power supply but only for detection of the ECU status, therefore the power consumption on these line is negligible (refer to chapter 4.5 on page 24)
- 2 Data Acquisition Interupt lines (DAI lines) which are used for ETK recognition at startup and for Data Acquisition (refer to chapter 4.11 and 4.11.2)

> **NOTE**
>
> The DAI1 line is configureable as a handshake and trigger line or as a line to sense the backup voltage of the ECU standby RAM provided by ETK.

- 1 Reset line which allows the ETK to control the system reset of the ECU
- 7 Debug Interface lines for the communication between the ETK-S4.2 and the microcontroller
- 2 ground lines for a proper shielding of the ECU interface lines.

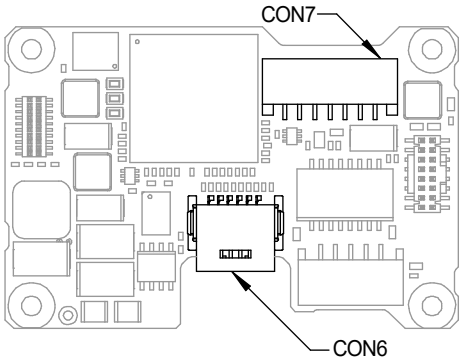

Fig. 4-4 Location of the ECU Interfaces (ETK-S4.2C)

4.3 Serial ETK Interface

The serial 100 Mbit/s ETK-S4.2 interface creates the link to the calibration and development system. The interface utilizes a 100Base-TX transmission to achieve a transmission performance of 100 Mbit/s.

NOTE

To ensure stable communication only 100 Mbit cables delivered by ETAS shall be used.

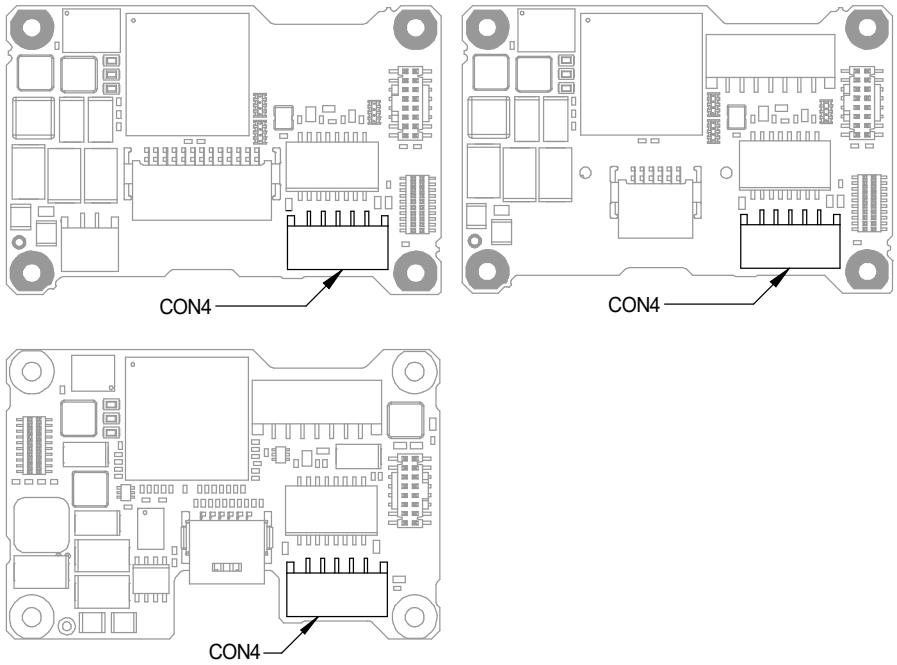

Fig. 4-5 Location of the Serial ETK Interface (top left: ETK-S4.2A, top right: ETK-S4.2B, bottom left: ETK-S4.2C)

4.4 Debug Interface

The ETK-S4.2 features a JTAG debugging interface connector CON5 (Samtec 16 pin). This connector can be used to attach debug tools (e.g. Lauterbach or PLS debugger for Infineon TC1766/TC1796).

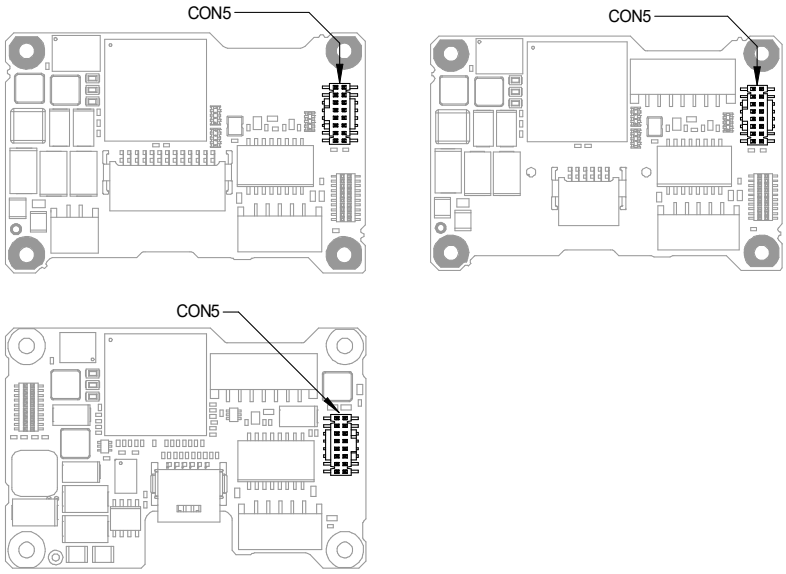

Fig. 4-6 Location of the Debugger Interface (top left: ETK-S4.2A, top right: ETK-S4.2B, bottom left: ETK-S4.2C)

By using the debug interface for serial ETK connection, it is not available for debugging tools anymore. Arbitration mechanisms are required to simultaneously work e.g. with measurement and calibration tools as well as with debugging tools. The ETK-S4.2 supports a hardware arbitration unit for the JTAG interface. This enables parallel use of tools for debugging and ETAS tools for measurement and calibration.

4.5 Power Supply

The ETK-S4.2 needs a permanent power supply. It is powered directly from the car battery. The input voltage may vary between 4.3 V and 18 V. In case of higher input voltages to the ETK an additional voltage converter is required.

All necessary voltages are created through switching power supplies which minimizes power dissipation. The power supply of the ECU is not affected by the ETK-S4.2. An automatic switch ensures that the power supply of the ETK-S4.2 is automatically switched on and off when the ETK enters and leaves its sleep mode.

4.5.1 ETK-S4.2A

The ETK-S4.2A can be supplied with power through the 2-pin power supply connector CON2. The through-hole solder pad CON3 can be used additionally to connect a power supply U_{Batt2}. The power supply on CON3 must use the GND of CON2 (refer to chapter 5.2.2).

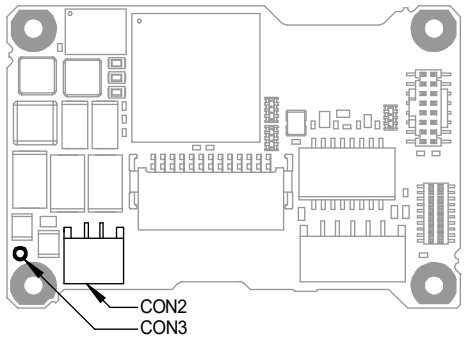

Fig. 4-7 Location of the Power Supply Connectors (ETK-S4.2A)

4.5.2 ETK-S4.2B and ETK-S4.2C

The ETK-S4.2B and the ETK-S4.2C can be supplied with power through seven pins connector CON7. The through-hole solder pad CON3 can be used additionally to connect a power supply U_{Batt2}. The power supply on CON3 must use the GND of CON7 (refer to chapter 5.2.2).

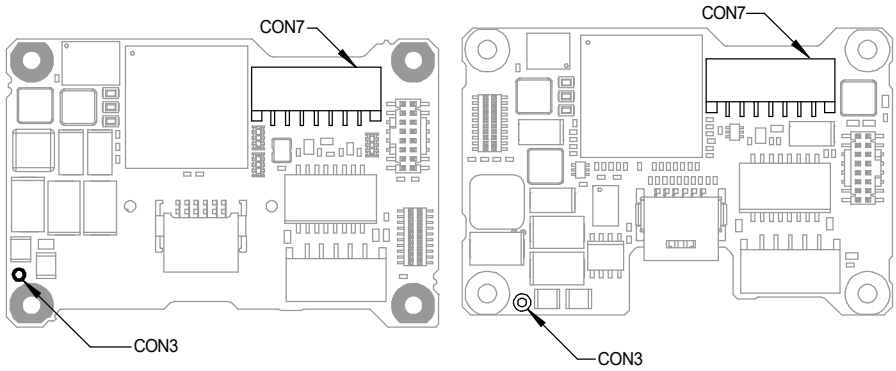

Fig. 4-8 Location of the Power Supply Connectors (left: ETK-S4.2B, right: ETK-S4.2C)

4.6 ECU Voltage Supervisor

The ECU voltage (VDDP) is monitored by the ETK to recognize whether the ECU is switched on or off. Additionally the ECU RAM standby voltage (VDDSBRAM) is monitored to determine if the RAM content is still valid. These two signals are only used for monitoring therefore the load current is negligible.

The ETK-S4.2 provides two oportunities to supply the ECU RAM and to supervise this voltage:

A The ETK-S4.2 supplies the ECU EDRAM and monitores this voltage. The ECU RAM power supply pin has to be connected with the ECU RAM power supply sense pin.

B The ECU supplies the external RAM with voltage and the ETK-S4.2 monitores this voltage. Only the sense pin is connected.

NOTE

The ETK-S4.2 allow switching between reference page and working page only, if there is a valid voltage at the sense pin detected.

The ETK-S4.2A has two pins to serve the two purposes supply (ECU RAM standby voltage) and sense. For simulating a buffered RAM for the ETK-S4.2A the two pins (VDDSBRAM [CON1:A9] and VDDSBRAMOUT [CON1:B13]) have to be connected.

The ETK-S4.2B has a single pin to serve the two purposes supply (ECU RAM standby voltage) and sense.

The ETK-S4.2C can be configured to use two pins (as like as ETK-S4.2A) or a common pin (as like as ETK-S4.2B) to serve the two purposes supply (ECU RAM standby voltage) and sense.

4.7 Status LEDs

There are three LEDs displaying the operating status of the ETK-S4.2 (Fig. 4-9 on page 26).

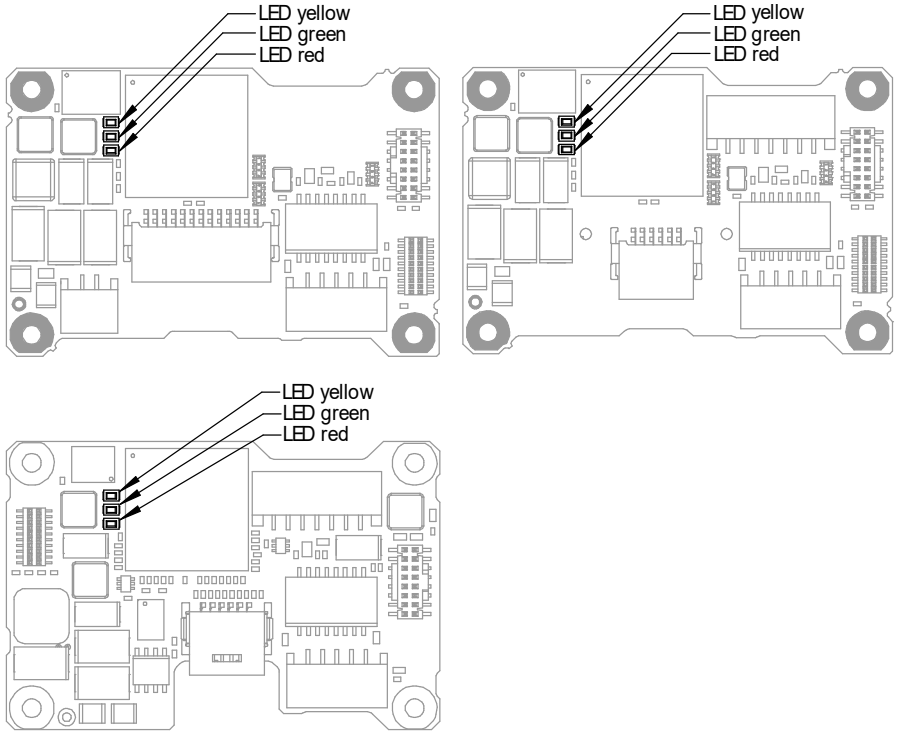

Fig. 4-9 Status LEDs (top left: ETK-S4.2A, top right: ETK-S4.2B, bottom left: ETK-S4.2C)

LED	State	Definition
Red	On	ETK-S4.2 is supplied with power and active (i.e. the ECU is switched on or the ETAS calibration and development system is connected and ready to communicate with the ETK-S4.2)
Green	Off	Working Page contains valid data and is accessible from INCA
	Flashing	ETK-S4.2 is in boot configuration mode: - measurement and calibration are not possible, - after first initialization with INCA flashing stops
	On	Power supply has dropped under selected threshold: - data retention of the calibration data manager in the ECU is no longer ensured - as soon as the ETK-S4.2 switches on again, the ECU switches to the Reference Page. Green LED stays lit until the calibration and development system downloads data into the calibration data memory. Otherwise switching to the Working Page is not possible.

LED	State	Definition
Yellow	Off	ETK-S4.2A/ ETK-S4.2B: 8 Mbit/s communication to calibration system established
		ETK-S4.2C: no link to calibration system established
	On	ETK-S4.2A/ ETK-S4.2B/ ETK-S4.2C: 100 Mbit/s communication to calibration system established

4.8 Data Emulation and Data Measurement

In the case of a serial ETK the measurement RAM is part of the ECU and is not accessible until the ECU is powered up and the basic initialization has been performed. The goal must be to perform the download into the ECU after the ETK's startup message was sent.

All serial ETKs have a system of Reference and Working Page (ETAS two pages ETK concept). The Reference Page is located in the ECU flash and can not be modified by a simple write access. All changes must be done via Flash programming. Due to this a Flash programming algorithm in the ECU and its usage by ProF is very important for the INCA user.

The Working Page is implemented with internal RAM overlaying the flash by using microcontroller internal mechanisms. The overlay RAM used for the emulation of calibration data must not be used by the ECU software directly. The ETK/INCA has the complete control over this RAM and it's contents. When enabling a data emulation or after power loss INCA establishes a basic start-up configuration of the data in the RAM by copying the corresponding data in the Flash to the emulation space.

In contrast to a parallel ETK no flash memory for permanent storage of the adjusted parameters (program data) is available on the ETK.

The switching between Reference and Working Page is performed by switching the data emulation on and off. It is done by modifying overlay registers of the microcontroller, which are dedicated only to the ETK The microcontroller must not change the values of these registers after the startup handshake with the ETK has been performed.

Additionally instead of direct access to internal registers, it is possible to do the page switching via a communication method with the ECU software. In that case a small software protocol between the ECU and the host is needed to get the current page status and perform the switching. In that case the access to the micro controller registers and the real page switching is completely under the control of the EC software.

Common to all overlay strategies is that the access to the Reference Page is only possible in active state (visible by the CPU). In passive state (if the Working Page is active) there is no access of the micro controller to this memory. When using INCA this is not a real restriction, but if the ECU is running from the Working Page, a page switch has to be done to perform actions like upload or checksum calculation on the Reference Page. INCA knows this and asks the user to confirm.

Another important restriction is that no access to memory is possible, while the ECU is not running. To enable a cold start measurement in spite of this restriction, a special procedure was defined to give the user the feeling of a parallel ETK.

4.9 JTAG Interface

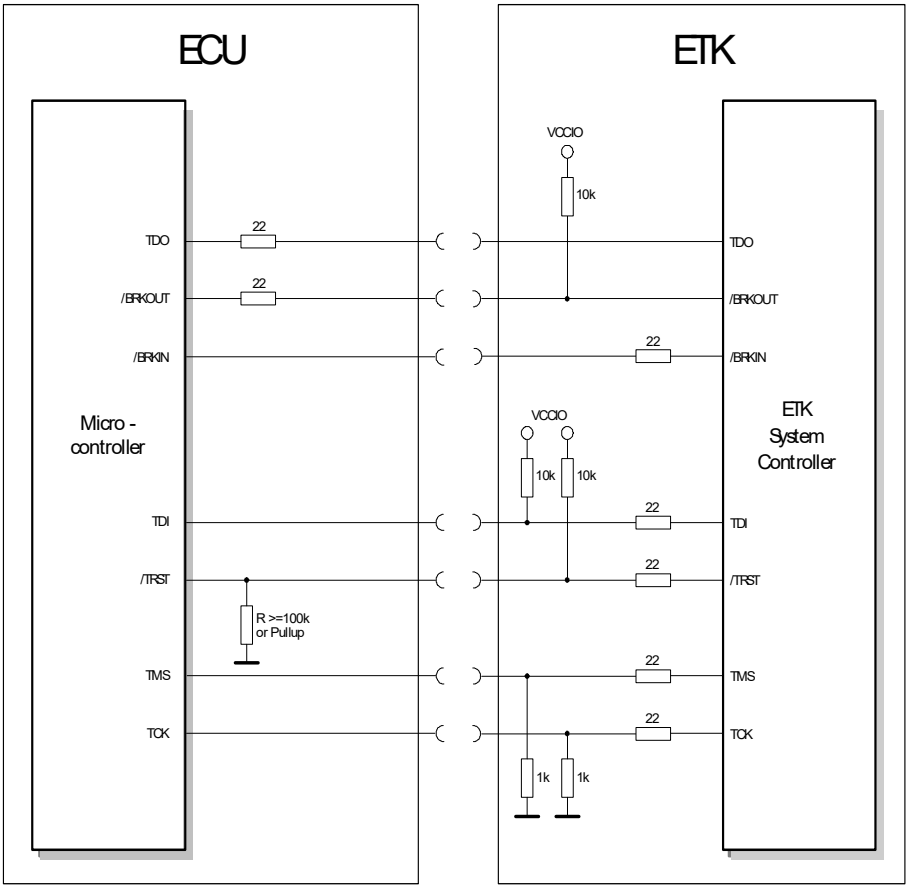

Fig. 4-10 Equivalent Circuitry of the ECU JTAG Interface (ECU)

The ECU part of the JTAG ETK interface is depicted in Fig. 4-10. For proper operation it is mandatory to provide series termination resistors of 22 Ohm in series with the /BRKOUT and TDO lines on the ECU PCB.

The ETK incorporates 22 Ohm series resistors for the /BRKIN, TMS, TCK, TDI and /TRST lines on the ECU interface and for TDO and /BRKOUT lines on the debugger connection. Hence, no additional termination resistors are required on the ECU / debugger PCB for these signals.

4.10 Trigger Modes: Overview

The ETK-S4.2 versions support the following trigger modes:

Trigger Mode	ETK-S4.2A	ETK-S4.2B	ETK-S4.2C
DAI triggering	Yes	Yes	Yes [2)]
Pinless triggering	Yes [1)]	Yes [1)]	Yes
Timer triggering	No	No	Yes

[1)]: depending on used microcontroller
[2)]: only available if the DAI pins are configured for DAI triggering

The trigger mode "Triggering with DAI pins" uses the trigger pins DAI1, DAI2 (all ETK-S4.2 versions) or additional the trigger pins DAI3, DAI4 (ETK-S4.2A only). See also chapter “Triggering with DAI Pins” on page 31.

The trigger mode "Pinless Triggering" uses an internal JTAG register for triggering. See also chapter “Pinless Triggering” on page 34.

The trigger mode "Timer Triggering" uses four internal timers of the ETK for triggering. See also chapter “Timer Triggering” on page 35.

NOTE

Only the ETK version ETK-S4.2C supports this trigger modes in parallel.

4.11 Triggering with DAI Pins

4.11.1 DAI Interfaces

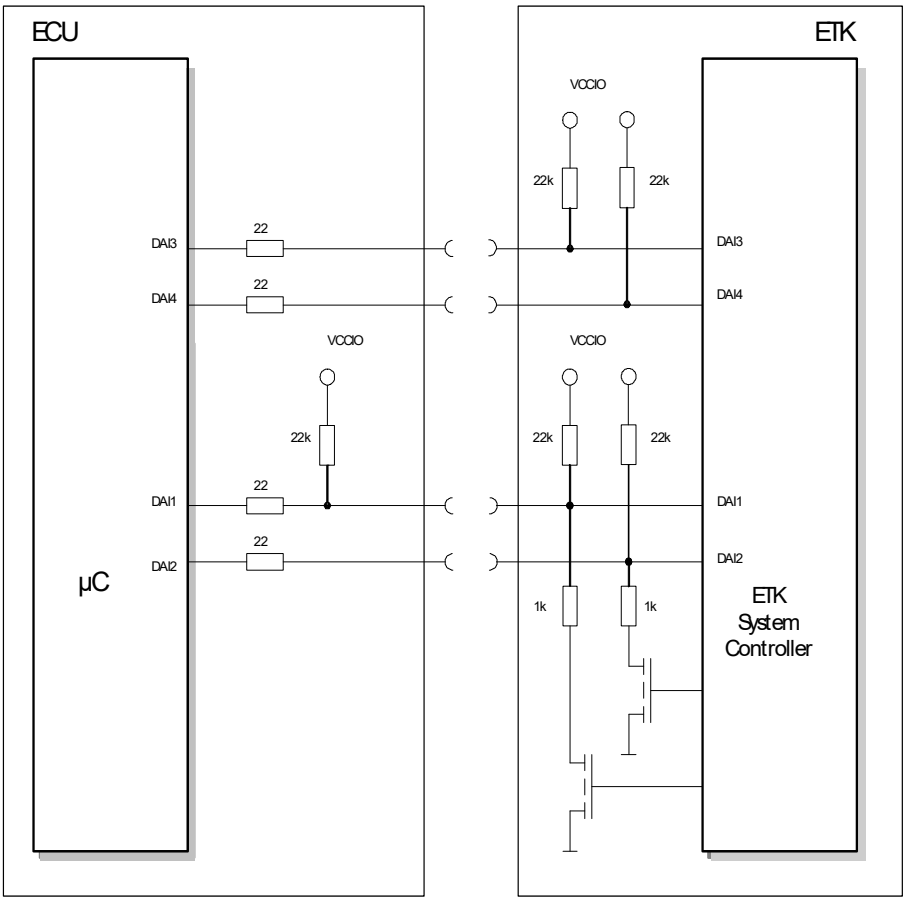

Fig. 4-11 Equivalent Circuitry of the DAI Interface

NOTE

The ETK-S4.2A is equipped with DAI lines DAI1 to DAI4. The ETK-S4.2B and the ETK-S4.2C are only equipped with DAI lines DAI1 and DAI2.

To ensure proper operation of the startup protocol between ECU and ETK the circuitry has to respect the following topics:

- 22 Ohm series resistors on each of the 4 DAI signals are recommended. A 22 kOhm pullup resistor on DAI1 (refer to Fig. 4-11) is required; internal CPU pullup may be used.
- DAI1 and DAI2 must be general purpose I/O pins of the microcontroller that are configured to inputs by any reset.
- DAI1 to DAI4 must be configurable as outputs for ETK-S4.2A.
- DAI1 and DAI2 must be configurable as outputs for ETK-S4.2B/ ETK-S4.2C.
- DAI3 and DAI4 are optional for ETK-S4.2A.

4.11.2 Phases of the Startup Protocol

During the startup phase the ETK and the ECU exhibit a well defined startup procedure.

The DAI1 signal is dedicated to ETK detection, i.e. the ETK pulls DAI1 low. If no ETK is connected, DAI1 will be pulled weakly high via the 22 kOhm pullup resistor on the ECU.

The DAI2 signal is dedicated to signal an ECU Standby power fail of the calibration RAM. DAI2 high indicates that a powerfail occurred and that the calibration RAM content has not been restored by the ETK, while DAI2 low indicates no powerfail.

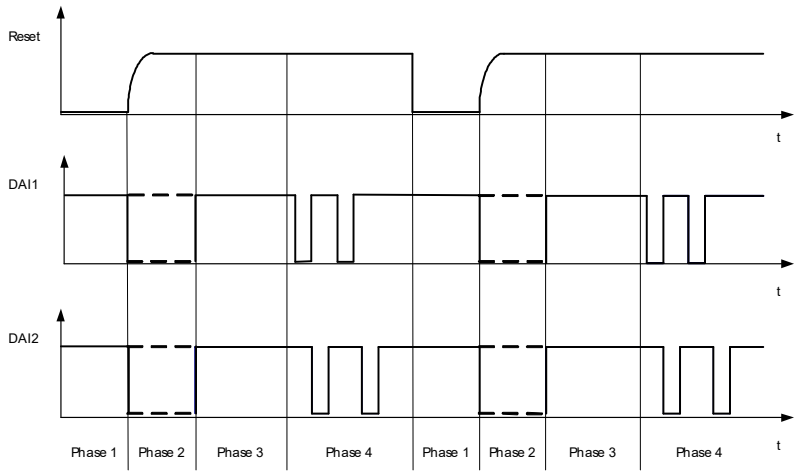

Fig. 4-12 Phases of the Startup Protocol

Successive phases of the startup protocol

A Reset phase: The ECU is in reset, the DAI ports are configured as inputs. The ETK pulls DAI1 and DAI2 weakly high (via 22 kOhm pullup resistors).

B ECU Initialization phase: The ECU performs internal initializations, the DAI ports are still inputs. The ETK pulls DAI1 low via 1 kOhm, DAI2 is pulled either weakly high (via the 22 kOhm pullup resistor) or low (via 1 kOhm).

C Initialization of ECU resources by ETK: The ECU configures the DAI ports as outputs and drives a logical high to signal the transition from phase 2 to phase 3. Then the ETK removes any pulldown resistors and starts initialization of the ECU resources.

D Calibration and data acquisition: The ECU pulls the appropriate DAI port low to signal a trigger condition to the ETK, i.e. a measurement raster is ready for acquisition.

ECU and ETK Reset Detection Levels

There are different reset detection levels of ECU and ETK with resulting uncertainty t_1.

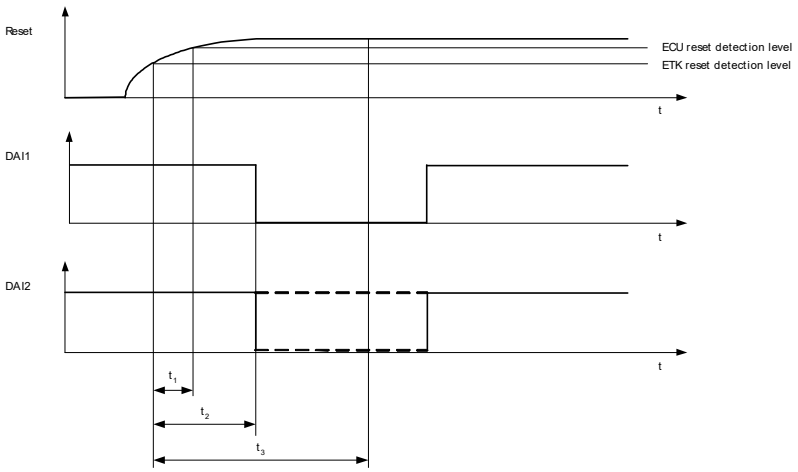

Fig. 4-13 Startup Procedure in Detail

The condition for proper operation is:

$t_1 + t_{HOLD} << t_2 << t_3$

	Description	Agreements
t_1	Max. uncertainty of reset detection	$t_1 < 200$ ns
t_{HOLD}	Hold time of reset configuration	$t_{HOLD} \sim 200$ ns ... 400 ns
t_2	Reset delay of ETK for DAI startup procedure	$t_2 = 800$ ns
t_3	First request for microntroller for ETK detection; Reading of DAI ports	$t_3 >> 800$ ns

Reset Signal Filter

NOTE

For the ETK to detect an ECU reset the /HDRST signal must be held continuously at low level for at least 800 ns. Likewise, the end of the reset phase is determined when a continuous, uninterrupted high level of at least 800 ns is detected on the /HDRST line. In contrast, brief phases of the opposite logic level (glitches, noise) are ignored.

4.11.3 Triggering of Measurement Data Acquisition

Parallel ETKs offer two or more trigger addresses that the ECU can write to for signaling the validity of the specific raster data to the INCA system.

For this reason, serial ETKs use hardwired pins. Currently two to four data acquisition interrupt lines (DAI1 to DAI4) are dedicated as hardware trigger signals.

NOTE

Interrupt lines DAI1 and DAI2 are also used for startup communication, see Chapter 4.11.2 on page 32.

The required circuitry for the trigger lines DAI1 to DAI4 on the ECU is shown in Fig. 4-11 on page 31. The four hardware triggers are active low signals.

4.12 Pinless Triggering

NOTE

The ETK-S4.2A and the ETK-S4.2B can use the pinless startup and triggering feature with the microcontrollers Infineon TC1736ED, TC1767, TC1767ED, TC1797 and TC1797ED. The ETK-S4.2C can use the pinless startup and triggering feature with the microcontrollers Infineon TC1782ED

4.12.1 Startup Handshake

The reset status of the ECU is determined via /ESR0 signal and the registers CBS_TRIG and CBS_OSTATE.OJC are initialized with 0x0 during reset.

When the reset is deactivated (as detected by the /ESR0 signal) a special pattern is written to the OJC[3..1] bits of the CBS_OSTATE register of the CPU by the ETK via the IO_SET_OJCONF JTAG command. This pattern includes the power fail status of the standby supply. (No power fail: write "001", Power fail: write "011").

The ECU internal initialization should take at least 50 µs to give the ETK the chance to complete the IO_SET_OJCONF operation.

Application running

The ECU software detects the connected ETK by reading CBS_OSTATE register. Thereafter the ECU software writes 00005555h to CBS_TRIGS register. The ETK detects xxxx5555h pattern and starts initializations and data acquisition (e.g. checksum, downloads, etc).

4.12.2 ETK Trigger Generation

Initialization

At the end of initialization, the ETK software writes 00005555h to the trigger setting register "CBS_TRIGS". The ETK-S4.2 detects the xxxx5555h pattern and enables the trigger generation.

Application running

For generating triggers, the ECU software sets bits in the trigger register "CBS_TRIG" by writing the associated bits in the trigger setting register "CBS_TRIG".

NOTE

The selective setting of trigger bits is accomplished in hardware by the microcontroller and requires no Read-Modify-Write sequence by the ECU software.

Each bit of the trigger setting register "CBS_TRIGS" corresponds to a bit in the same position in the trigger register "CBS_TRIG", each of them corresponding to an ETK hardware trigger.

The ETK periodically polls the trigger register "CBS_TRIG" via IO_READ_TRIG for detecting triggers. The ETK sends a corresponding trigger message e.g. to the ES590 which starts acquisition of appropriate measurement data. The polling rate is determined by the fastest measurement raster and is configurable in a 10 µs to 50 ms range with a 50 µs default.

Active bits in trigger register "CBS_TRIG" are automatically cleared by CPU when register is read by ETK via "IO_READ_TRIG".

4.13 Timer Triggering

The trigger mode "Timer Triggering" uses four internal timers of the ETK for triggering. Neither DAI pins nor register triggers but timers with a fixed configurable period are used for triggering.

The time intervals between trigger events are in accordance with the configured timer values. This values and their resolution have to be defined in the A2L file. Availaible settings are:

- Minimum time interval 500 µs
- Maximum period duration 1 s
- Timer resolution 1 µs

The timers works in an asynchronous manner to the ECU.

NOTE

Only the ETK version ETK-S4.2C supports this trigger option.

4.14 Flashing the ECU

To support flashing of ECUs not containing software the ETK is capable of stopping the CPU immediately after reseting it (halt after reset). This is accomplished by issuing a special JTAG command upon ProF request.

4.15 Reset

The requirement for ETK reset mechanism is to ensure that power-up and power-down behavior of ECU is clean and smooth. The ETK-S4.2 normally drives /PORST low during ECU power up or upon INCA request.
The signal /HDRST of the microcontroller is used by the ETK-S4.2 to detect when the ECU is in reset.

The ETK-S4.2 senses the switched ECU power supply. This allows it to detect when the ECU is off and forward this information to INCA. In addition, it allows the ETK to enter the power save mode with the calibration system (ES590/ ES591) unplugged.

4.16 Pull CalWakeUp until Startup Handshake

The ETK has the ability to wake up the ECU by applying voltage to the CalWakeUp pin (A3) of the ECU connector. This allows to configure a measurement while the ECU is off.

When waking up the ECU via the CalWakeUp pin it can be selected if the pin is pulled until the microcontroller core voltage (VDDP) is high or the pin should be kept on high state until the start-up handshake between ECU and ETK signals the ETK that the ECU has finished its initialisation.

NOTE

This feature is only supported by using INCA V6.0 or higher (see chapter “Software Support” on page 48).

4.17 Debugger Detection and Watchdog Disable

The /WDGDIS signal on the ETK-S4.2 connector (pin A11) controls the operating mode of a watchdog timer on the ECU.

This signal disables a watchdog timer on the ECU by pulling the /WDGDIS line to GND in the following cases:

- when a debugger is connected to the ETK or
- during programming of the ECU Flash under INCA/ProF control.

The /WDGDIS signal can be configured to be inactive at all times in the following cases:

- if the A11 pin is used for a purpose other than disabling the watchdog timer or
- if the watchdog timer is supposed to remain active even during Flash programming.

If the /WDGDIS signal is configured to be active, the ETK pulls the /WDGDIS line low under the conditions stated above.

CAUTION

Damage of the ETK, the ECU or both may be possible!

If feature "Watchdog Disable" is activated and the A11 pin of the ETK-S4.2 is connected on the ECU board to an output port or to a supply voltage.

NOTE

This feature is only supported by using INCA V6.0 or higher (see chapter “Software Support” on page 48).

5 Installation

This chapter contains information about the following topics:

CAUTION

Some components of the interface board may be damaged or destroyed by electrostatic discharges. Please keep the board in its storage package until it is installed.

The board should only be taken from its package, configured, and installed at a work place that is protected against static discharge.

5.1 Connection to the ECU

CAUTION

Risk of short circuiting the internal signals of the ETK!

When you mount the ETK to the ECU, you must ensure that the screws and washers used will not penetrate the ETK printed circuit board.

5.1.1 ETK-S4.2A

For connecting the ETK-S4.2A to the ECU the ETK adapter ETAF1 is recommended. It need to be ordered seperately (refer chapter “Ordering Information” on page 83). The suitable connector [ERNI 064320] should have been populated onto the ECU PCB.

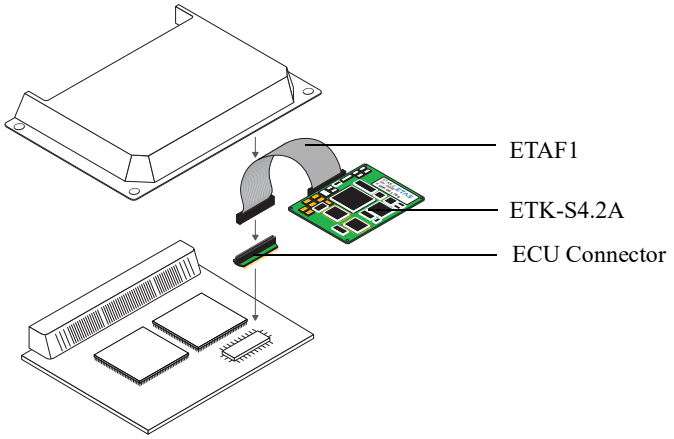

Fig. 5-1 ETK-S4.2A Connection to the ECU

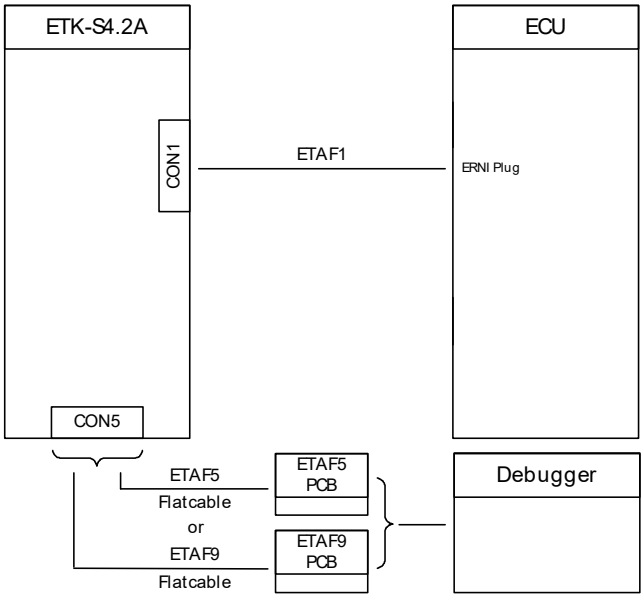

Fig. 5-2 ETK-S4.2A Connection to the ECU and to the Debugger

5.1.2 ETK-S4.2B

For connecting the ETK-S4.2B to the ECU the ETK two adapters are recommended:

- at CON6 adapter ETAI1
- at CON7 either adapter ETAI2 or adapter ETAI3

It need to be ordered seperately (refer chapter “Ordering Information” on page 83).

This suitable connectors should have been populated onto the ECU PCB:

- for adapter ETAI1 SAMTEC bit "FTSH-105-01-F-DV-K" and
- for adapter ETAI3 JST bit "B 7B-PH-SM4-TB".

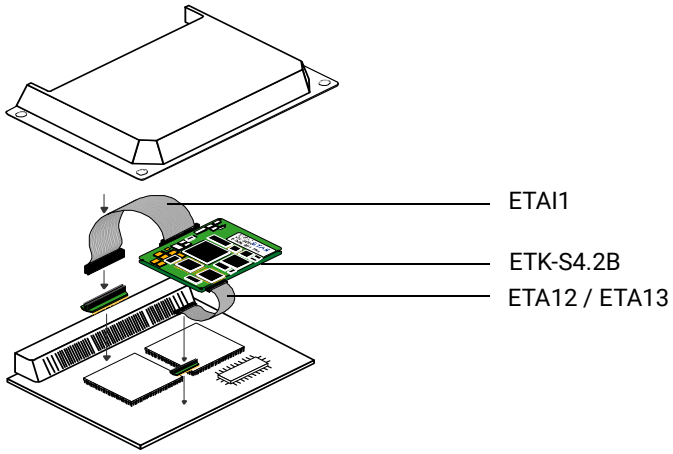

Fig. 5-3 ETK-S4.2B Connection to the ECU

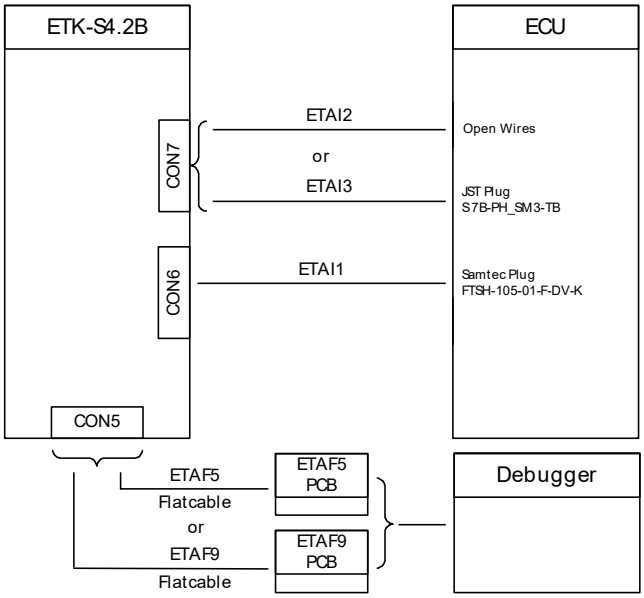

Fig. 5-4 ETK-S4.2B Connection to the ECU and to the Debugger

5.1.3 ETK-S4.2C

For connecting the ETK-S4.2C to the ECU the ETK two adapters are recommended:

- at CON6 adapter ETAI1
- at CON7 adapter ETAI5

It need to be ordered seperately (refer chapter “Ordering Information” on page 83).

The suitable connector SAMTEC bit "FTSH-105-01-F-DV-K" should have been populated onto the ECU PCB for adapter ETAI1.

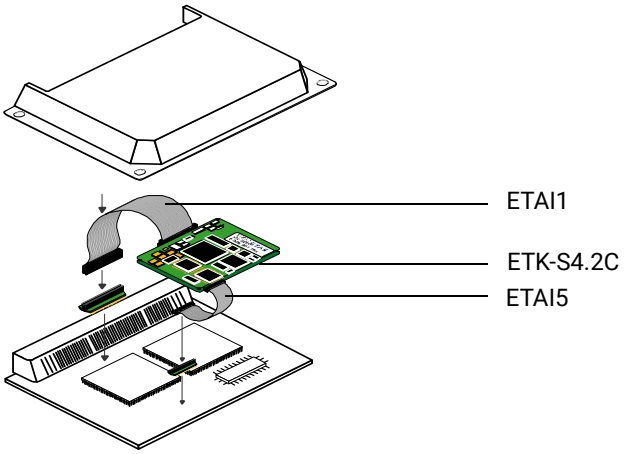

Fig. 5-5 ETK-S4.2C Connection to the ECU

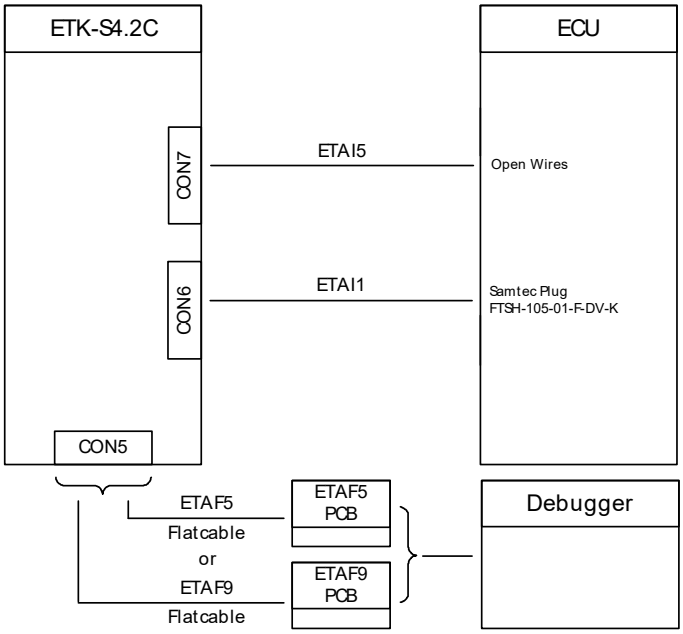

Fig. 5-6 ETK-S4.2C Connection to the ECU and to the Debugger

5.2 Connecting to the Power Supply

The ETK-S4.2 needs a permanent power supply (refer chapter “Power Supply” on page 24). There are different versions to ensure it.

5.2.1 Permanent Power Supply inside ECU available

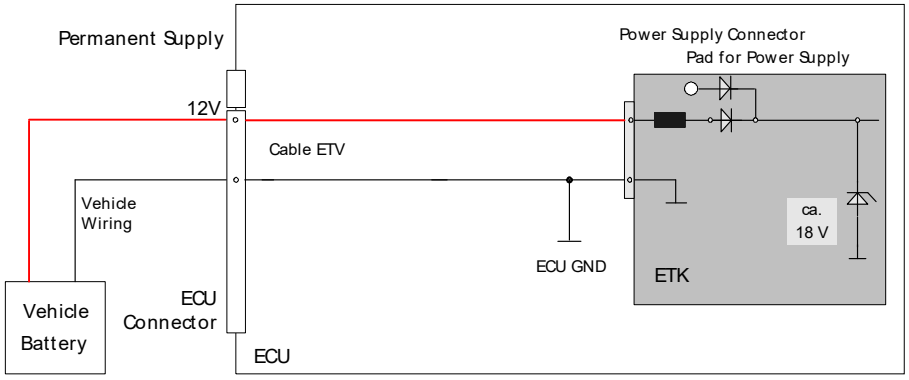

Fig. 5-7 Permanent Power Supply inside ECU available

5.2.2 Permanent Power Supply inside ECU not available

Wiring with KA50 Cable

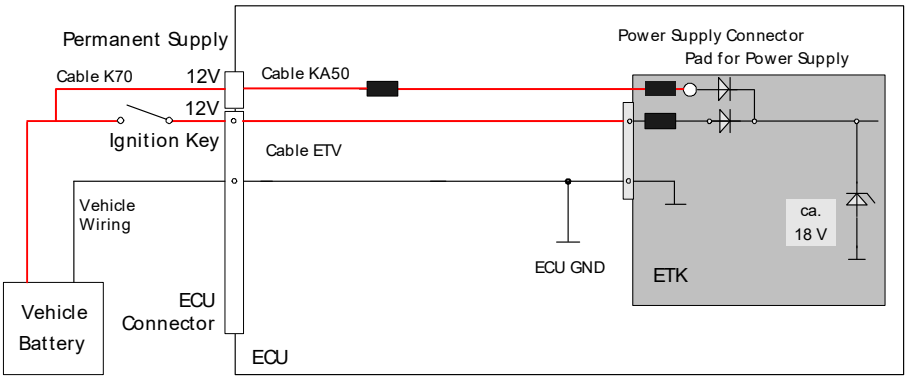

Fig. 5-8 Permanent Power Supply inside ECU not available

Wiring with CBAM210 Cable

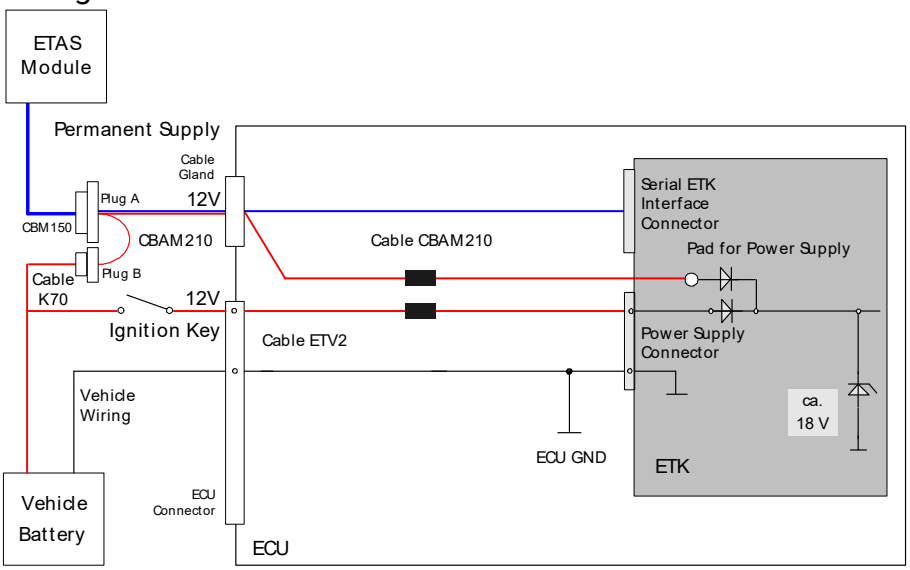

Fig. 5-9 Permanent Power Supply inside ECU not available

5.2.3 Isolated Power Supply inside ECU

The ETK-S4.2 does not require a galvanically isolated power supply. For special applications ETAS offers the isolated power supply ETP2.

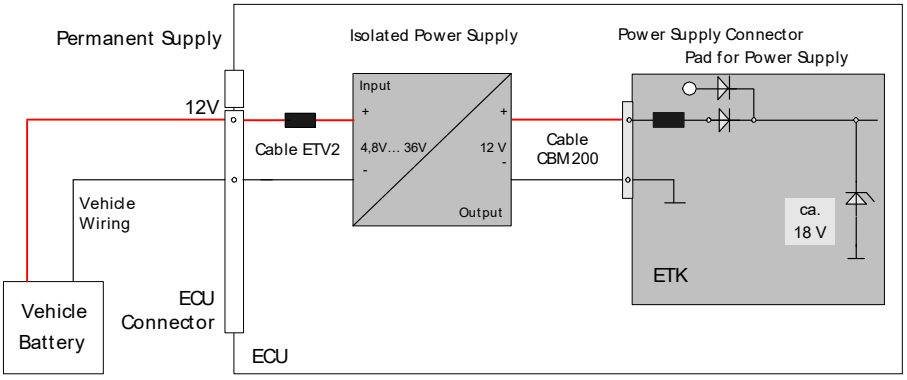

Fig. 5-10 Isolated Power Supply inside ECU

5.3 Connection to the Debugger

For connecting the ETK-S4.2 to the debugger the ETK adapter ETAF9 (including ETAF9 PCB and ETAF9 flatcable) or the ETK adapter ETAF5 (including ETAF5 PCB and ETAF5 flatcable) is required. Its needs to be ordered seperately (refer chapter “Ordering Information” on page 83). A debugger specific cable has to be used to connect the debugger with the ETAF5 or ETAF9 PCB.

NOTE

If automatic debugger detection and watchdog disable features are required an ETAF9 must be used. Otherwise an ETAF5 is also suitable.

For connecting the ETK-S4.2 to the debugger refer to Fig. 5-2 on page 35 and Fig. 5-4 on page 36.

6 ETK Configuration

This chapter contains information about the following topics:

6.1 Overview

As already mentioned in previous chapters, some project-specific adjustments are necessary. Configuration data is stored permanently in a serial E²PROM.

6.2 ETK Configuration Tool

Generating a valid configuration data set is supported by the "ETK Configuration Tool". The "ETK Configuration Tool" contains information on all available ETKs. The user is supported through a graphical interface.

The configuration is done in two steps:

A Generation of the special address offset for the emulation and measurement data memory.

The location of data areas, measured data output areas, trigger segment addresses etc. are familiar to the ECU software developer, or can be generated automatically. If an ECU description database (ASAP, ...) with the corresponding input exists, these inputs can be downloaded from this database. If necessary, a plausibility check is performed.

B Connection of the ETK to the ECU.

The ECU hardware developer defines the connection of the ETK to the ECU. The corresponding signals usually have to be adjusted for each microcontroller. All inputs are checked for plausibility, to make sure that a valid configuration is generated.

The "ETK Configuration Tool" can create the following output:

A Direct ETK configuration

B Storage of the configuration in a data file

C The corresponding ASAP input

The most important outputs are the entries for the ASAP file. The parameter ETK_CFG is created and contains the complete ETK configuration of the ECU interface in hex code. If this parameter is entered correctly in the corresponding ECU description file, it guarantees that every time the calibration system is started, the ETK is checked for the appropriate configuration. If necessary, the ETK will be configured appropriately to the corresponding project.

6.3 Configuration Parameter

The configuration of the ETK-S4.2 is possible with the "ETK Configuration Tool". Not all combinations of parameters make sense. The "ETK Configuration Tool" provides support concerning the configuration parameters. The following is a list with configuration parameters:

6.3.1 Subtypes ETK-S4.1 and ETK-S4.2A / ETK-S4.2B

Standard Features

- ETK used as (ETK-S4.1, ETK-S4.2)

  The ETK-S4.2 provides a compatibility mode in which it can act as an ETK-S4.1. This allows that project setup for ETK-S4.1 can already use the new ETK-S4.1 hardware while keeping the same configuration of the ETK. Old INCA versions that support only ETK-S4.1, but not yet ETK-S4.2 will handle the ETK as if it would be an ETK-S4.1.

- Microcontroller (TriCore 1736ED, TriCore TC1766, TriCore TC1766 Emulation Device, TriCore TC1796, TriCore TC1796 Emulation Device, TriCore TC1767, TriCore TC1767 Emulation Device, TriCore TC1797, TriCore TC1797 Emulation Device)

  The memory layout of these microcontrollers differs significantly, so the ETK Configuration Tool needs know which one is used. As the memory available for Calibration is very limited in the none Emulation Device we recommend the TC1766/ TC1782/ TC1796 Emulation Device.

  The default value is "TriCore TC1766 Emulation Device".

Extended Features

Extended Features are visible when switched on in the Options menu explicitly or when at least one of the features is set different from the default value.

We recommend that only experienced users change the default settings.

- Trigger and ETK Handshake Method (Use DAI pins, Use pinless Triggering)
  - Use DAI pins:

    Only the DAI pins are used for ETK Detection and power fail signalling during boot of the ECU and for triggering during measurement.
  - Use pinless Triggering:

    Only the trigger registers are used for triggering, so the DAI pins of the microcontroller can be used for other purposes.
    The setting "Use pinless Triggering" is only available for TC1736ED, TC1767, TC1767ED, TC1797, and TC1797ED.

  Default value is "Use DAI pins".

- Using OCON register for protocol based page switching (Yes, No)

  It can be configured whether the OCON register shall be used for protocol based page switching. Then all overlay enable bits are changed at once to overlay flash with emulation RAM.

  The TC17x7 microcontrollers offer a new register that allows to overlay the emulation regions at once. This configuration feature allows to select, if this register shall be used or if the overlay shall be done the same way as with TC17x6 microcontrollers.

  TC17x6 microcontroller using of OCON register is imposible, so the ETK configuration tool allows only the selection of "No".

  Default value is "No".

  NOTE

  The ETK Configuration Feature "Using OCON register for protocol based page switching" will have an influence only when using protocol based page switching. During direct register access page switching the OCON register will always be used.

- Debug Interface Voltage Level (3.3 V)

  It is set to the fixed value of 3.3 V and can not be changed. This is only provided for future extensibility.

  Currently all supported microcontroller have a 3.3 V interface.

- ECU Power Supply Supervision Nominal Voltage (3 steps: 2.5 V, 3.3 V and 5.0 V)

  The level for power voltage level supervision including the corresponding thresholds can be set here.

  Default value is "3.3 V".

  The "ETK Configuration Tool" window "ETK Control Panel" displays both power supply supervision states.

  NOTE

  The ECU RAM standby voltage level indicates power losses in the past as well to show that the RAM does not contains useful data.

- ECU Standby RAM Power Supply Supervision Voltage Span (16 steps between 0.80 V and 3.00 V)

  The level for the level supervision of the ECU RAM Standby can be set here. A voltage span is given to consider the tolerance in the voltage comparators.

  The default value is "1.01 V to 1.30 V".

- JTAG Clock Speed (40 MHz, 30 MHz, 20 MHz)

  Here the clock speed of the JTAG debug interface the ETK is using can be configured. Please note that this setting has direct influence on the measurement performance.

  Default is "40 MHz".

- Pull CalWakeUp Pin until Startup Handshake (Yes, No)

  Defines the duration of the period during which the ETK-S4.2 applies voltage to the CalWakeUp pin (A3) of the ECU connector when configuring measurement while the ECU is off.

  – No:

    The CalWakeUp line will be energized until the ETK detects presence of the ECU supply voltage on the VDDP line (A13) of the ETK-S4.2 connector.

  – Yes:

    The CalWakeUp signal remains active until the ETK recognition handshake has completed.

  Default value is "No".

- Use Watchdog Disable Pin (No, Allow Debugger Detection and Disable of Watchdog)

  This configuration item allows to disable the usage of the pin by the ETK, if the ECU uses this pin for a different purpose.

  The /WDGDIS signal on the ETK-S4.2 connector controls the operating mode of a watchdog timer on the ECU.

  – No:

    The /WDGDIS signal remains inactive (high impedance) at all times. This selection is to be made whenever the A11 pin is used for a purpose other than disabling the watchdog timer or if the watchdog timer is supposed to remain active even during Flash programming or while a debugger is connected to the ETK-S4.2.

  – Allow Debugger Detection and Disable of Watchdog:

    Activates the feature, making the ETK pull the /WDGDIS line low under the conditions stated above.
    The watchdog can be disabled via the ETK which can be helpful during reprogramming of the ECU flash.

  Default value is "No".

CAUTION

Damage of the ETK, the ECU or both may be possible!

If feature "Watchdog Disable" is activated and the A11 pin of the ETK-S4.2 is connected on the ECU board to an output port or to a supply voltage.

- Trigger register polling rate (12 steps between 10 µs and 50 ms)

  This defines the rate with which the ETK polls the trigger register of the microcontroller used for handshake during init and signaling trigger from the ECU.

  – 12 steps between 10 µs and 50 ms:

    This value configures the period to read the trigger registers.

  Default value is "50 µs".

6.3.2 ETK Type ETK-S4.2C

Standard Features

- Microcontroller (TriCore TC1724ED, TC1728ED, TC1782 ED, TC1791, TC1791ED, TC1793, TC1793ED, TC1798, TC1798ED)

  The default value is "TriCore TC1782 Emulation Device".

Extended Features

Extended Features are visible when switched on in the Options menu explicitly or when at least one of the features is set different from the default value.

We recommend that only experienced users change the default settings.

- Shared Functionality of DAI pins (Use DAI functionality, Sense ED supply)

  The ETK-S4.2C is equipped with two DAI pins. These pins can either be used for DAI triggering or for sensing the ECU standby RAM power supply.

  – Use DAI functionality

    The DAI pins are used for DAI triggering.

  – Sense ED supply

    DAI1 is used for the sensing and DAI2 is deactivated. Only pinless or timer triggering is possible.

  Default value is "Use DAI functionality".

> **NOTE**
>
> The ETK Configuration Feature "Shared Functionality of DAI pins" is only available for ETK type "ETK-S4.2C".

- Trigger and ETK Handshake Method (Use DAI pins, Use pinless Triggering, Use Pinless and DAI Triggering, Use Timer Triggers)

  – Use DAI pins:

    Only the DAI pins are used for ETK Detection and power fail signalling during boot of the ECU and for triggering during measurement.
    This option is only available if the DAI pins are configured for DAI triggering (see parameter Shared Functionality of DAI pins).

  – Use pinless Triggering:

    Only the trigger registers are used for triggering, so the DAI pins of the microcontroller can be used for other purposes.

  – Use Pinless and DAI Triggering:

    Both DAI pins and trigger registers are used for triggering. The both DAI pins are not additional triggers, they can be used instead of two register triggers (trigger 15 and 16).

> **NOTE**
>
> The option "Use Pinless and DAI Triggering" is only available for ETK type ETK-S4.2 if the DAI pins are configured for DAI triggering (see ETK Configuration Feature "Shared Functionality of DAI pins").

– Use Timer Triggers:

  Neither DAI pins nor register triggers but HDC triggers with a fixed configurable period are used for triggering.

Default value is "Use DAI pins".

- Debug Interface Voltage Level (3.3 V)

  It is set to the fixed value of 3.3 V and can not be changed. This is only provided for future extensibility.

  Currently all supported microcontroller have a 3.3 V interface.

- ECU Power Supply Supervision Nominal Voltage (3 steps: 2.5 V, 3.3 V and 5.0 V)

  The level for power voltage level supervision including the corresponding thresholds can be set here.

  Default value is "3.3 V".

  The "ETK Configuration Tool" window "ETK Control Panel" displays both power supply supervision states.

  NOTE

  The ECU RAM standby voltage level indicates power losses in the past as well to show that the RAM does not contains useful data.

- ECU Standby RAM Power Supply Supervision Voltage Span (16 steps between 0.74 V and 2.90 V)

  The level for the level supervision of the ECU RAM Standby can be set here. A voltage span is given to consider the tolerance in the voltage comparators.

  The default value is "1.00 V to 1.22 V".

- JTAG Clock Speed (40 MHz, 30 MHz, 20 MHz)

  Here the clock speed of the JTAG debug interface the ETK is using can be configured. Please note that this setting has direct influence on the measurement performance.

  Default is "40 MHz".

- Pull CalWakeUp Pin until Startup Handshake (Yes, No)

  Defines the duration of the period during which the ETK-S4.2 applies voltage to the CalWakeUp pin (A3) of the ECU connector when configuring measurement while the ECU is off.

  – No:

    The CalWakeUp line will be energized until the ETK detects presence of the ECU supply voltage on the VDDP line (A13) of the ETK-S4.2 connector.

  – Yes:

    The CalWakeUp signal remains active until the ETK recognition handshake has completed.

  Default value is "No".

- Use Watchdog Disable Pin (No, Allow Debugger Detection and Disable of Watchdog)

  This configuration item allows to disable the usage of the pin by the ETK, if the ECU uses this pin for a different purpose.

  The /WDGDIS signal on the ETK-S4.2 connector controls the operating mode of a watchdog timer on the ECU.

  – No:

    The /WDGDIS signal remains inactive (high impedance) at all times. This selection is to be made whenever the A11 pin is used for a purpose other than disabling the watchdog timer or if the watchdog timer is supposed to remain active even during Flash programming or while a debugger is connected to the ETK-S4.2.

  – Allow Debugger Detection and Disable of Watchdog:

    Activates the feature, making the ETK pull the /WDGDIS line low under the conditions stated above.
    The watchdog can be disabled via the ETK which can be helpful during reprogramming of the ECU flash.

  Default value is "No".

CAUTION

Damage of the ETK, the ECU or both may be possible!

If feature "Watchdog Disable" is activated and the A11 pin of the ETK-S4.2 is connected on the ECU board to an output port or to a supply voltage.

- Use DAI2 pin for Watchdog Disable (No, Yes)

  This configuration item configures the DAI2 pin for detecting that the watchdog is disabled by the ETK.

  – No:

    The DAI1 pin and the DAI2 pin can be used for DAI trigger or for ED supply sense functionality. No watchdog disable functionality via DAI2 pin is available.

  – Yes:

    The usage of this feature requires the following configuration:
    the DAI pins are not configured for DAI triggering (configuration feature "Trigger and ETK Handshake Method" is set to value "Use pinless Triggering or to value "Use Timer Triggers“ and
    the Watchdog Disable feature is activated (configuration feature „Use Watchdog Disable Pin“ is set to value „Allow Debugger Detection and Disable of WatchDog“).

  Default value is "No".

NOTE

This configuration feature is available for the ETK-S4.2 type "ETK-S4.2C" only. It is supported by INCA V7.0, ETK Drivers and Tools V3.8.1, HDC V5.3, and higher versions.

- Trigger register polling rate (12 steps between 10 µs and 50 ms)

  This defines the rate with which the ETK polls the trigger register of the microcontroller used for handshake during init and signaling trigger from the ECU.

  – 12 steps between 10 µs and 50 ms:

    This value configures the period to read the trigger registers.

  – Unused:

    The trigger registers don't get polled at all.

  Default value is "50 µs".

- Using OCON register for protocol based page switching (Yes, No)

  It can be configured whether the OCON register shall be used for protocol based page switching. Then all overlay enable bits are changed at once to overlay flash with emulation RAM.

  Default value is "No".

NOTE

The ETK Configuration Feature "Using OCON register for protocol based page switching" will have an influence only when using protocol based page switching. During direct register access page switching the OCON register will always be used.

7 Technical Data

This chapter contains information about the following topics:

7.1 System Requirements

7.1.1 ETAS Hardware

VME Hardware: ES1000.2/ES1000.3 with ES1232 (INCA/ASCET)

Compact Hardware: ES590, ES591, ES592 (INCA)

Compact Hardware: ES910 (INTECRIO)

7.1.2 Software Support

You need following software versions to support the ETK-S4.2:

Micro-controller	HSP	INCA	ETK Drivers and Tools	ASCET-RP	INTECRIO
TC1724ED	V8.1.4	V6.2.1	V2.1.11	V6.2.0	V3.2.0
TC1728ED	V8.1.4	V6.2.1	V2.1.11	V6.2.0	V3.2.0
TC1736ED [3)]	V7.1.0	V6.2.1	V2.1.0	V6.0.0	V3.1.0
TC1766 [1)]	V4.2	V5.3	n.a.	V5.4	V1.1
TC1766ED [1)]	V4.2	V5.3	n.a.	V5.4	V1.1
TC1767 [3)]	V7.1.0	V6.2.1	V2.1.0	V6.0.0	V3.1.0
TC1767ED	V6.1.1	V6.1	V1.1.1	V5.6	V3.0
TC1782ED	V8.1.0	V6.2.1	V2.1.5	V6.1.0	V3.2.0
TC1791	V8.1.4	V6.2.1	V2.1.9	V6.2.0	V3.2.0
TC1791ED	V8.1.4	V6.2.1	V2.1.9	V6.2.0	V3.2.0
TC1793	V8.1.4	V6.2.1	V2.1.9	V6.2.0	V3.2.0
TC1793ED	V8.1.4	V6.2.1	V2.1.9	V6.2.0	V3.2.0
TC1796 [1)]	V4.2	V5.4	n.a.	V5.4	V1.1
TC1796ED [1)]	V4.2	V5.4	n.a.	V5.4	V1.1
TC1797 [3)]	V7.1.0	V6.2.1	V2.1.0	V6.0.0	V3.1.0

Micro-controller	HSP	INCA	ETK Drivers and Tools	ASCET-RP	INTECRIO
TC1797ED [2]	V6.1.1	V6.1	V1.1.1	V5.6	V3.0
TC1797ED [3]	V6.1.1	V6.1	V1.1.2	V5.6	V3.0
TC1798	V8.1.4	V6.2.1	V2.1.9	V6.2.0	V3.2.0
TC1798	V8.1.4	V6.2.1	V2.1.9	V6.2.0	V3.2.0

[1] Operating the ETK-S4.2 in ETK-S4.1 mode with limited function scope (ETK-S4.2 features "Pull CalWakeUp until Startup Handshake" and "Debugger Detection and Watchdog Disable"are not supported)
[2] Feature "Protocol based page switching using OCON" is not supported
[3] Feature "Protocol based page switching using OCON" is supported

Operating the ETK-S4.2 with older software versions is not possible.

7.2 Microcontroller Memory and Microcontroller Support

7.2.1 Data Emulation Memory and Microcontroller Support

The ETK-S4.2 uses the internal overlay RAM of all in the table listed microcontrollers to emulate data in internal flash.

Microcontroller	Max. RAM [1]	Standby powered	Microcontroller is supported by ETK-S4.2A	ETK-S4.2B	ETK-S4.2C
TC1724ED	384	Yes	No	No	Yes
TC1728ED	384	Yes	No	No	Yes
TC1736ED	256	Yes	Yes	Yes	No
TC1766	8	No	Yes	Yes	No
TC1766ED	256	Yes	Yes	Yes	No
TC1767	8	No	Yes	Yes	No
TC1767ED	256	Yes	Yes	Yes	No
TC1782ED	512	Yes	No	No	Yes
TC1791	128	No	No	No	Yes
TC1791ED	768	Yes	No	No	Yes
TC1793	128	No	No	No	Yes
TC1793ED	768	Yes	No	No	Yes
TC1796	8	No	Yes	Yes	No
TC1796ED	512	Yes	Yes	Yes	No
TC1797	8	No	Yes	Yes	No
TC1797ED	512	Yes	Yes	Yes	No
TC1798	128	No	No	No	Yes
TC1798ED	768	Yes	No	No	Yes

[1]: Max. RAM as working page (kByte)

NOTE

Operating the microcontrollers with other ETK-S4.2 versions is not possible.

7.2.2 Measurement Data Memory

Item	Characteristics
Location	Within the emulation memory when using DISTAB13 hooks

7.3 Configuration

Item	Characteristics
Configuration	Project-specific configuration for - different microcontrollers or - memory configurations stored in EEPROM
Update	Logic devices updated through software

7.4 Serial ETK Interface for Application System

Item	Characteristics
Transmission speed	100 Mbit/s
Cable length	max. 30 m / 100 ft
Serial Interface	DC decoupling

7.5 Environmental Conditions

Item	Characteristics
Temperature range (operation)	- 40 °C to +110 °C/ - 40 °F to +230 °F
Temperature range (storage)	0 °C to +50 °C/ - 18 °F to +122 °F
Relative humidity (non-condensing)	0 to 95%
Operating altitude	max. 5000 m/ 16400 ft
Contamination level	2
Degree of protection	Determined by installation in ECU
Overvoltage category (AC mains supply)	II

7.6 Power Supply

7.6.1 ETK-S4.2A and ETK-S4.2B

Parameter	Symbol	Condition	Min	Typ	Max	Unit
Permanent power supply (car battery)	U_{Batt}	Vehicle usage [1]	4.3 [all values ±0%]	12	18	V
Standby current [2]	I_{STBY}	U_{Batt} = 12 V; ECU off; T = 20 °C	0.1	10	20	mA
Operating current [1]	I_{Batt}	U_{Batt} = 12 V; ECU on; T = 20 °C	20	65	100	mA
Power dissipation	P_{Batt}	U_{Batt} = 12 V; ECU on; T = 20 °C; I = 0 mA at pin VDDSRAM_OUT		0.78		W
Power dissipation	P_{Batt}	U_{Batt} = 12 V; ECU on; T = 20 °C; I = 250 mA at pin VDDSRAM_OUT		1.32		W

[1] The ETK-S4.2 implements reverse voltage protection in the same range and may be used only with central load dump protection.
[2] if I = 0 mA at pin VDDSRAM_OUT

7.6.2 ETK-S4.2C

Parameter	Symbol	Condition	Min	Typ	Max	Unit
Permanent Power Supply (car battery)	U_{Batt}		4.3	12	18	V
Standby current [1]	I_{STBY}	U_{Batt} = 12 V; ECU off; no load from ECU; T = 20 °C	0.1	10	20	mA
Operating current [1]	I_{Batt}	U_{Batt} = 12 V; no load from ECU; T = 20 °C	20	62	100	mA
Power dissipation	P_{Batt}	U_{Batt} = 12 V; I = 0 mA at pin ECU_SBRAM; T = 20 °C		0.74		W
Power dissipation	P_{Batt}	U_{Batt} = 12 V; I = 500 mA at pin ECU_SBRAM; T = 20 °C		1.6		W

[1] if I = 0 mA at pin VDDSRAM_OUT

7.7 Test Characteristics

Parameter	Symbol	Condition	Min	Typ	Max	Unit
Reset delay 1 [1]	t_{Reset1}	U_{Batt} = 12 V VDDP = 0 V ↑ 3.3 V/ 2.5 V without transferring FPGA	29		40	ms
Reset delay 2 [2]	t_{Reset2}	U_{Batt} = 0 V ↑ 12 V transfer FPGA	100		240	ms
JTAG interface clock				20, 30, 40 [3],[4]		MHz
Debug interface clock			5 [5]		20	MHz

[1] Delay of ECU reset through ETK without transferring the FPGA (U_{Batt} present, VDDP will be switched on)

[2] max. delay of ECU reset through ETK (U_{Batt} and VDDP will be switched on)

[3] TC1766/TC1766ED: ensure by ECU hardware design

- Requirement for JTAG clock: $f_{FPI} = f_{CPU} \geq 20$ MHz
- If pin BYPASS = High (CPU clock: crystal): $f_{XTAL} \geq 20$ MHz
- If pin BYPASS = Low (CPU clock: free running VCO): requirement is always satisfied

[4] TC1796/TC1796ED: ensure by ECU software (refer to chapter “Phases of the Startup Protocol” on page 32)

- Boot-up until phase 2 of startup procedure
  - JTAG clock: 10 MHz: requirement $f_{FPI} = f_{CPU} \geq 5$ MHz;
  - If BYPASS = Low, requirement is always satisfied
- From phase 3 of start procedure on
  - JTAG clock: 40 MHz: requirement $f_{FPI} = f_{CPU} \geq 20$ MHz
  - ECU software ensures it by appropriate clock system configuration that $f_{FPI} = f_{CPU} \geq 20$ MHz

[5] recommended; lower debug interface clock frequency impair ETK performance

7.8 JTAG Timing Characteristics

The following diagrams show the timings the ETK-S4.2 can process.

NOTE

JTAG timing parameters in this chapter refer to the JTAG interface (CON1/ CON6) of the ETK-S4.2. The JTAG wiring to the ECU (ETAF1/ ETAI1) must be taken account additionally.
All timings are measured at a reference level of 1.5 V. Output signals are measured with 20 pF to ground and 50 Ω to 1.5 V.

7.8.1 JTAG Timing Parameter

JTAG Clock	20 MHz		30 MHz		40 MHz		
Parameter	Min	Max	Min	Max	Min	Max	Unit
t_{TCK}	50	50	33.33	33.33	25	25	ns
t_{CO_TDI}	-3	3	-3	3	-3	3	ns
t_{CO_TMS}	-3	3	-3	3	-3	3	ns
t_{SU_TDO}	-8	n/a	-8	n/a	-4	n/a	ns
t_{H_TDO}	0	n/a	0	n/a	3	n/a	ns

7.8.2 JTAG Timing Diagrams

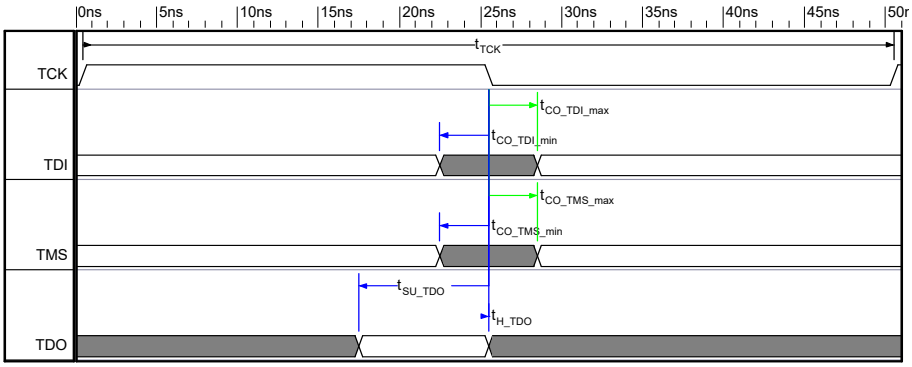

Fig. 7-1 ETK-S4.2 JTAG Timing Diagram (20 MHz)

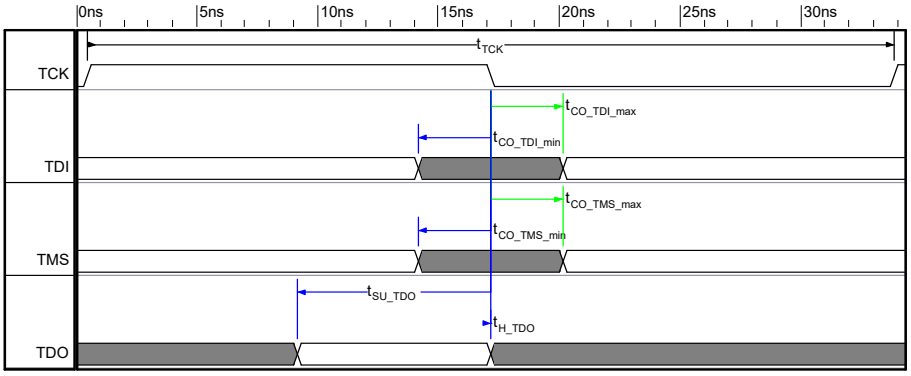

Fig. 7-2 ETK-S4.2 JTAG Timing Diagram (30 MHz)

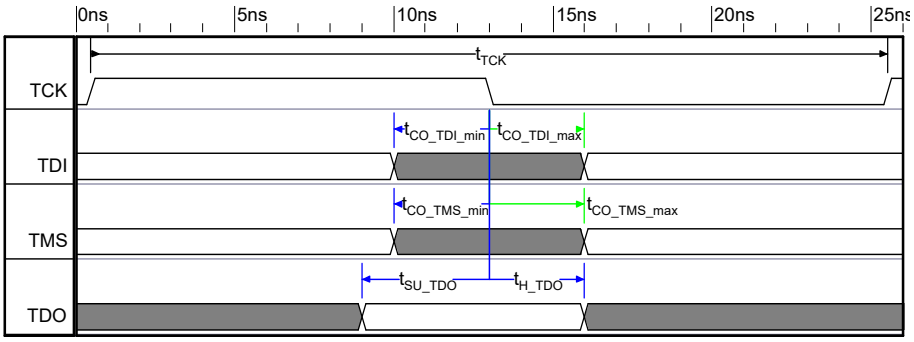

Fig. 7-3 ETK-S4.2 JTAG Timing Diagram (40 MHz)

7.9 Electrical Characteristics

7.9.1 ECU Interface Characteristics (ETK-S4.2A and ETK-S4.2B)

Parameter	Symbol	Condition [1)]	Min	Typ	Max	Unit
CalWakeup Output Voltage	CALWAKEUP	U_{Batt} = 6 - 18 V; max. 50 mA	U_{Batt} - 1 V		U_{Batt}	V
ECU Power Supply Supervision Voltage (2.5 V selected)	VDDP	VDDP ↑	1.92	2.02	2.12	V
		VDDP ↓	1.78	1.88	1.98	V
	I_{VDDP}	VDDP = 2.5 V			150	µA
ECU Power Supply Supervision Voltage (3.3 V selected)	VDDP	VDDP ↑	2.48	2.58	2.68	V
		VDDP ↓	2.33	2.43	2.53	V
	I_{VDDP}	VDDP = 3.3 V			200	µA
ECU Power Supply Supervision Voltage (5.0 V selected)	VDDP	VDDP ↑	2.98	3.08	3.18	V
		VDDP ↓	2.83	2.93	3.03	V
	I_{VDDP}	VDDP = 5.0 V			300	µA
ECU Standby RAM Supervision Voltage ([0.67 V - 0.97 V] selected)	VDDSBRAM	VDDSBRAM ↑	0.77	0.87	0.97	V
		VDDSBRAM ↓	0.67	0.77	0.87	V
	$I_{VDDSBRAM}$	VDDSBRAM = 1.0 V			60	µA
ECU Standby RAM Supervision Voltage ([0.74 V - 1.04 V] selected)	VDDSBRAM	VDDSBRAM ↑	0.84	0.94	1.04	V
		VDDSBRAM ↓	0.74	0.84	0.94	V
	$I_{VDDSBRAM}$	VDDSBRAM = 1.1 V			65	µA
ECU Standby RAM Supervision Voltage ([0.81 V - 1.11 V] selected)	VDDSBRAM	VDDSBRAM ↑	0.91	1.01	1.11	V
		VDDSBRAM ↓	0.81	0.91	1.01	V
	$I_{VDDSBRAM}$	VDDSBRAM = 1.2 V			70	µA

Parameter	Symbol	Condition [1)]	Min	Typ	Max	Unit
ECU Standby RAM Supervision Voltage ([0.92 V - 1.22 V] selected)	VDDSBRAM	VDDSBRAM ↑	1.02	1.12	1.22	V
		VDDSBRAM ↓	0.92	1.02	1.12	V
	$I_{VDDSBRAM}$	VDDSBRAM = 1.3 V			75	µA
ECU Standby RAM Supervision Voltage ([1.01 V - 1.30 V] selected)	VDDSBRAM	VDDSBRAM ↑	1.1	1.2	1.3	V
		VDDSBRAM ↓	1.01	1.11	1.21	V
	$I_{VDDSBRAM}$	VDDSBRAM = 1.4 V			85	µA
ECU Standby RAM Supervision Voltage ([1.11 V - 1.41 V] selected)	VDDSBRAM	VDDSBRAM ↑	1.21	1.31	1.41	V
		VDDSBRAM ↓	1.11	1.21	1.31	V
	$I_{VDDSBRAM}$	VDDSBRAM = 1.5 V			90	µA
ECU Standby RAM Supervision Voltage ([1.22 V - 1.52 V] selected)	VDDSBRAM	VDDSBRAM ↑	1.32	1.42	1.52	V
		VDDSBRAM ↓	1.22	1.32	1.42	V
	$I_{VDDSBRAM}$	VDDSBRAM = 1.6 V			95	µA
ECU Standby RAM Supervision Voltage ([1.36 V - 1.66 V] selected)	VDDSBRAM	VDDSBRAM ↑	1.46	1.56	1.66	V
		VDDSBRAM ↓	1.36	1.46	1.56	V
	$I_{VDDSBRAM}$	VDDSBRAM = 1.7 V			100	µA
ECU Standby RAM Supervision Voltage ([1.51 V - 1.80 V] selected)	VDDSBRAM	VDDSBRAM ↑	1.6	1.7	1.8	V
		VDDSBRAM ↓	1.51	1.61	1.71	V
	$I_{VDDSBRAM}$	VDDSBRAM = 1.9 V			110	µA
ECU Standby RAM Supervision Voltage ([1.67 V - 1.96 V] selected)	VDDSBRAM	VDDSBRAM ↑	1.76	1.86	1.96	V
		VDDSBRAM ↓	1.67	1.77	1.87	V
	$I_{VDDSBRAM}$	VDDSBRAM = 2.0 V			115	µA

Parameter	Symbol	Condition [1)]	Min	Typ	Max	Unit
ECU Standby RAM Supervision Voltage ([1.81 V - 2.11 V] selected)	VDDSBRAM	VDDSBRAM ↑	1.91	2.01	2.11	V
		VDDSBRAM ↓	1.81	1.91	2.01	V
	$I_{VDDSBRAM}$	VDDSBRAM = 2.2 V			130	µA
ECU Standby RAM Supervision Voltage ([1.95 V - 2.25 V] selected)	VDDSBRAM	VDDSBRAM ↑	2.05	2.15	2.25	V
		VDDSBRAM ↓	1.95	2.05	2.15	V
	$I_{VDDSBRAM}$	VDDSBRAM = 2.3 V			135	µA
ECU Standby RAM Supervision Voltage ([2.15 V - 2.44 V] selected)	VDDSBRAM	VDDSBRAM ↑	2.24	2.34	2.44	V
		VDDSBRAM ↓	2.15	2.25	2.35	V
	$I_{VDDSBRAM}$	VDDSBRAM = 2.5 V			145	µA
ECU Standby RAM Supervision Voltage ([2.36 V - 2.66 V] selected)	VDDSBRAM	VDDSBRAM ↑	2.46	2.56	2.66	V
		VDDSBRAM ↓	2.36	2.46	2.56	V
	$I_{VDDSBRAM}$	VDDSBRAM = 2.7 V			155	µA
ECU Standby RAM Supervision Voltage ([2.61 V - 2.91 V] selected)	VDDSBRAM	VDDSBRAM ↑	2.71	2.81	2.91	V
		VDDSBRAM ↓	2.61	2.71	2.81	V
	$I_{VDDSBRAM}$	VDDSBRAM = 3.0 V			175	µA
ECU Standby RAM Supervision Voltage ([2.86 V - 3.16 V] selected)	VDDSBRAM	VDDSBRAM ↑	2.96	3.06	3.16	V
		VDDSBRAM ↓	2.86	2.96	3.06	V
	$I_{VDDSBRAM}$	VDDSBRAM = 3.2 V			185	µA

Parameter	Symbol	Condition [1)]	Min	Typ	Max	Unit
ECU Standby RAM Output Voltage (ETK-S4.2A) [2)]	VDDSBRAM	max. 70 mA	1.42	1.5	1.58	V
		max. 250 mA	1.35	1.5	1.58	V
ECU Standby RAM Output Voltage (ETK-S4.2B) [2)]	VDDSBRAM	max. 250 mA	1.42	1.5	1.58	V

[1)]: VDDP ↑: ECU Power Supply off → ECU Power Supply on
VDDP ↓: ECU Power Supply on → ECU Power Supply off
VDDSBRAM ↑: ECU Standby RAM Power off → ECU Standby RAM Power on
VDDSBRAM ↓: ECU Standby RAM Power on → ECU Standby RAM Power off
[2)]: Current drawn from ETK VDDSBRAM supply must not exceed 250 mA

7.9.2 ECU Interface Characteristics (ETK-S4.2C

Parameter	Symbol	Condition [1)]	Min	Typ	Max	Unit
CalWakeup Output Voltage	CALWAKEUP	U_{Batt} = 6 - 18 V; load 0 - 50 mA	U_{Batt} - 1 V		U_{Batt}	V
ECU Power Supply Supervision Voltage (2.5 V selected)	VDDP	VDDP ↑	1.92	2.02	2.12	V
		VDDP ↓	1.78	1.88	1.98	V
	I_{VDDP}	VDDP = 2.5 V			150	µA
ECU Power Supply Supervision Voltage (3.3 V selected)	VDDP	VDDP ↑	2.48	2.58	2.68	V
		VDDP ↓	2.33	2.43	2.53	V
	I_{VDDP}	VDDP = 3.3 V			200	µA
ECU Power Supply Supervision Voltage (5.0 V selected)	VDDP	VDDP ↑	2.98	3.08	3.18	V
		VDDP ↓	2.83	2.93	3.03	V
	I_{VDDP}	VDDP = 5.0 V			300	µA
ECU Standby RAM Supervision Voltage ([0.74 V - 0.97 V] selected)	VDDSBRAM	VDDSBRAM ↑	0.74	0.84	0.94	V
		VDDSBRAM ↓	0.77	0.87	0.97	V
	$I_{VDDSBRAM}$	VDDSBRAM = 1.0 V			60	µA
ECU Standby RAM Supervision Voltage ([0.81 V - 1.04 V] selected)	VDDSBRAM	VDDSBRAM ↑	0.81	0.91	1.01	V
		VDDSBRAM ↓	0.84	0.94	1.04	V
	$I_{VDDSBRAM}$	VDDSBRAM = 1.1 V			65	µA
ECU Standby RAM Supervision Voltage ([0.87 V - 1.10 V] selected)	VDDSBRAM	VDDSBRAM ↑	0.87	0.97	1.07	V
		VDDSBRAM ↓	0.90	1.00	1.10	V
	$I_{VDDSBRAM}$	VDDSBRAM = 1.2 V			70	µA

Parameter	Symbol	Condition [1)]	Min	Typ	Max	Unit
ECU Standby RAM Supervision Voltage ([0.91 V - 1.14 V] selected)	VDDSBRAM	VDDSBRAM ↑	0.91	1.01	1.11	V
		VDDSBRAM ↓	0.94	1.04	1.14	V
	$I_{VDDSBRAM}$	VDDSBRAM = 1.3 V			75	µA
ECU Standby RAM Supervision Voltage ([1.00 V - 1.22 V] selected)	VDDSBRAM	VDDSBRAM ↑	1.00	1.10	1.20	V
		VDDSBRAM ↓	1.02	1.12	1.22	V
	$I_{VDDSBRAM}$	VDDSBRAM = 1.4 V			85	µA
ECU Standby RAM Supervision Voltage ([1.18 V - 1.41 V] selected)	VDDSBRAM	VDDSBRAM ↑	1.18	1.28	1.38	V
		VDDSBRAM ↓	1.21	1.31	1.41	V
	$I_{VDDSBRAM}$	VDDSBRAM = 1.5 V			90	µA
ECU Standby RAM Supervision Voltage ([1.29 V - 1.51 V] selected)	VDDSBRAM	VDDSBRAM ↑	1.29	1.39	1.49	V
		VDDSBRAM ↓	1.31	1.41	1.51	V
	$I_{VDDSBRAM}$	VDDSBRAM = 1.6 V			95	µA
ECU Standby RAM Supervision Voltage ([1.43 V - 1.65 V] selected)	VDDSBRAM	VDDSBRAM ↑	1.43	1.53	1.63	V
		VDDSBRAM ↓	1.45	1.55	1.65	V
	$I_{VDDSBRAM}$	VDDSBRAM = 1.7 V			100	µA
ECU Standby RAM Supervision Voltage ([1.57 V - 1.79 V] selected)	VDDSBRAM	VDDSBRAM ↑	1.57	1.67	1.77	V
		VDDSBRAM ↓	1.59	1.69	1.79	V
	$I_{VDDSBRAM}$	VDDSBRAM = 1.9 V			110	µA
ECU Standby RAM Supervision Voltage ([1.72 V - 1.95 V] selected)	VDDSBRAM	VDDSBRAM ↑	1.72	1.82	1.92	V
		VDDSBRAM ↓	1.75	1.85	1.95	V
	$I_{VDDSBRAM}$	VDDSBRAM = 2.0 V			115	µA

Parameter	Symbol	Condition [1)]	Min	Typ	Max	Unit
ECU Standby RAM Supervision Voltage ([1.87 V - 2.09 V] selected)	VDDSBRAM	VDDSBRAM ↑	1.87	1.97	2.07	V
		VDDSBRAM ↓	1.89	1.99	2.09	V
	$I_{VDDSBRAM}$	VDDSBRAM = 2.2 V			130	µA
ECU Standby RAM Supervision Voltage ([2.02 V - 2.24 V] selected)	VDDSBRAM	VDDSBRAM ↑	2.02	2.12	2.22	V
		VDDSBRAM ↓	2.04	2.14	2.24	V
	$I_{VDDSBRAM}$	VDDSBRAM = 2.3 V			135	µA
ECU Standby RAM Supervision Voltage ([2.20 V - 2.43 V] selected)	VDDSBRAM	VDDSBRAM ↑	2.20	2.30	2.40	V
		VDDSBRAM ↓	2.23	2.33	2.43	V
	$I_{VDDSBRAM}$	VDDSBRAM = 2.5 V			145	µA
ECU Standby RAM Supervision Voltage ([2.41 V - 2.64 V] selected)	VDDSBRAM	VDDSBRAM ↑	2.41	2.51	2.61	V
		VDDSBRAM ↓	2.44	2.54	2.64	V
	$I_{VDDSBRAM}$	VDDSBRAM = 2.7 V			155	µA
ECU Standby RAM Supervision Voltage ([2.66 V - 2.88 V] selected)	VDDSBRAM	VDDSBRAM ↑	2.66	2.76	2.86	V
		VDDSBRAM ↓	2.68	2.78	2.88	V
	$I_{VDDSBRAM}$	VDDSBRAM = 3.0 V			175	µA

Parameter	Symbol	Condition [1]	Min	Typ	Max	Unit
ECU Standby RAM Supervision Voltage ([2.90 V - 3.13 V] selected)	VDDSBRAM	VDDSBRAM ↑	2.90	3.00	3.10	V
		VDDSBRAM ↓	2.93	3.03	3.1	V
	$I_{VDDSBRAM}$	VDDSBRAM = 3.2 V			185	µA
ECU Standby RAM Output Voltage [2]	VDDSBRAM	max. 600 mA load	1.23	1.3	1.33	V

[1]: VDDP ↑: ECU Power Supply off → ECU Power Supply on
VDDP ↓: ECU Power Supply on → ECU Power Supply off
VDDSBRAM ↑: ECU Standby RAM Power off → ECU Standby RAM Power on
VDDSBRAM ↓: ECU Standby RAM Power on → ECU Standby RAM Power off
[2]: Current drawn from ETK VDDSBRAM supply must not exceed 600 mA

7.9.3 ECU Interface Connector CON1 (ETK-S4.2A)

Signal	Pin Type	V_{OH} (min) [V]	V_{OH} (max) [V]	V_{IL} (max) [V]	V_{IH} (min) [V]	V_{IH} (max) [V]	Leakage current [µA]	Additional Load by ETK (typ) [pF][1)]
TDI, /TRST	O	2.3	3.3	-	-	-	-345 [2)] -225 [3)]	20
TMS, TCK	O	2.3	3.3	-	-	-	+3300 [2)] +2400 [3)]	20
TDO	I			0.7	1.7	4.1	+15 [2)] -15 [3)]	17
/BRKIN	O	2.3	3.3	-	-	-	+10 [2)] -10 [3)]	10
/BRKOUT	I	-	-	0.7	1.7	4.1	-340 [2)] -230 [3))]	10
DAI[1...4]	I [4)]	-	-	0.7	1.7	4.1	-150[2)] -100 [3)]	10
/HDRST	I	-	-	0.7	1.7	5.5	-160 [2)] -90 [3)]	20
/PORST	I [5)]	-	-	0.7	1.7	5.5	-22 [2)] +27 [3)]	48
Reserved0	I	-	-	0.7	1.7	4.6		10
/WDGDIS[6)]	I	-	-	0.7	1.7	5.5	+10 [2)] -10 [3)]	10
/WDGDIS[7,8)]	O	-	-	-	-	5.5	+20 [2)] -20 [3)]	20
Reserved2	I	-	-	0.7	1.7	5.5	+10 [2)] -10 [3)]	10

[1)] Adapter cable and Samtec connector not considered; PCB 1 pF/cm
[2)] max
[3)] min
[4)] Open Drain FET; I_{Dmax} = 500 µA
[5)] Open Drain FET; I_{Dmax} = 0.2 A
[6)] Enabled
[7)] Disabled
[8)] Open Drain FET; I_{Dmax} = 8 mA

7.9.4 ECU Interface Connector CON6 (ETK-S4.2B)

Signal	Pin Type	V_{OH} (min) [V]	V_{OH} (max) [V]	V_{IL} (max) [V]	V_{IH} (min) [V]	V_{IH} (max) [V]	Leakage current [µA]	Additional Load by ETK (typ) [pF] [1]
TDI, /TRST	O	2.3	3.3	-	-	-	-345 [2] -225 [3]	20
TMS, TCK	O	2.3	3.3	-	-	-	+3300 [2] +2400 [3]	20
TDO	I			0.7	1.7	4.1	+15 [2] -15 [3]	17
/BRKIN	O	2.3	3.3	-	-	-	+10 [2] -10 [3]	10
/BRKOUT	I	-	-	0.7	1.7	4.1	-340 [2] -230 [3)]	10
/PORST	I [5]	-	-	0.7	1.7	5.5	-22 [2] +27 [3]	48
Reserved0	I	-	-	0.7	1.7	4.6		10
/WDGDIS[6]	I	-	-	0.7	1.7	5.5	+10 [2] -10 [3]	10
/WDGDIS[7,8]	O	-	-	-	-	5.5	+20 [2] -20 [3]	20

[1] Adapter cable and Samtec connector not considered; PCB 1 pF/cm
[2] max
[3] min
[4] Open Drain FET; I_{Dmax} = 500 µA
[5] Open Drain FET; I_{Dmax} = 0.2 A
[6] Enabled
[7] Disabled
[8] Open Drain FET; I_{Dmax} = 8 mA

7.9.5 ECU Interface Connector CON6 (ETK-S4.2C)

Signal	Pin Type	V_{OH} (min) [V]	V_{OH} (max) [V]	V_{IL} (max) [V]	V_{IH} (min) [V]	V_{IH} (max) [V]	Leakage current [µA]	Additional Load by ETK (typ) [pF][1)]
TDI, /TRST	O	2.3	3.3	-	-	-	-345 [2)] -225 [3)]	20
TMS, TCK	O	2.3	3.3	-	-	-	+3300 [2)] +2400 [3)]	20
TDO	I			0.7	1.7	4.1	+15 [2)] -15 [3)]	17
/BRKIN	O	2.3	3.3	-	-	-	+10 [2)] -10 [3)]	10
/BRKOUT	I	-	-	0.7	1.7	4.1	-340[2)] -230 [3)]	10
DAI[1..2]	I/OD	-	-	0.7	1.7	4.1	-160 [2)] -90 [3)]	25
/HDRST	I	-	-	0.7	1.7	5.5	-160[2)] -90 [3)]	20
/PORST	I [5)]	-	-	0.7	1.7	5.5	-22 [2)] +27 [3)]	48
Reserved0	I	-	-	0.7	1.7	4.6	+10 [2)] -10 [3)]	10
/WDGDIS[6)]	I	-	-	0.7	1.7	5.5	+10 [2)] -10 [3)]	10
/WDGDIS[7,8)]	O	-	-	-	-	5.5	+20 [2)] -20 [3)]	20

[1)] Adapter cable and Samtec connector not considered; PCB 1 pF/cm
[2)] max
[3)] min
[4)] Open Drain FET; I_{Dmax} = 500 µA
[5)] Open Drain FET; I_{Dmax} = 0.2 A
[6)] Enabled
[7)] Disabled
[8)] Open Drain FET; I_{Dmax} = 8 mA

7.9.6 Interface and Power Supply Connector CON7 (ETK-S4.2B)

Signal	Pin Type	V_{OH} (min) [V]	V_{OH} (max) [V]	V_{IL} (max) [V]	V_{IH} (min) [V]	V_{IH} (max) [V]	Leakage current [µA]	Additional Load by ETK (typ) [pF][1)]
DAI[1...2]	I [4)]	-	-	0.7	1.7	4.1	-150 [2)] -100 [3)]	10
/HDRST	I	-	-	0.7	1.7	5.5	-160 [2)] -90 [3)]	20

[1)] Adapter cable and Samtec connector not considered; PCB 1 pF/cm
[2)] max
[3)] min
[4)] Open Drain FET; I_{Dmax} = 500 µA

7.9.7 Interface and Power Supply Connector CON7 (ETK-S4.2C)

Signal	Pin Type	V_{OH} (min) [V]	V_{OH} (max) [V]	V_{IL} (max) [V]	V_{IH} (min) [V]	V_{IH} (max) [V]	Leakage current [µA]	Additional Load by ETK (typ) [pF][1)]
DAI[1...2]	I [4)]	-	-	0.7	1.7	4.1	-160 [2)] -90 [3)]	25
/HDRST	I	-	-	0.7	1.7	5.5	-160 [2)] -90 [3)]	20

[1)] Adapter cable and Samtec connector not considered; PCB 1 pF/cm
[2)] max
[3)] min
[4)] Open Drain FET; I_{Dmax} = 500 µA

7.9.8 Debug Interface Connector CON5

Signal	Pin Type	V_{OH} (min) [V]	V_{OH} (max) [V]	V_{IL} (max) [V]	V_{IH} (min) [V]	V_{IH} (max) [V]	Leakage current [µA]	Additional Load by ETK (typ) [pF] [1]
VOUT	O [4]	2.3	3.3	-	-	-	-	-
TMS, TCK	I	-	-	0.7	1.7	4.1	+720 [2] +495 [3]	20
TDI	I	-	-	0.7	1.7	4.1	-345 [2] -225 [3)]	20
/TRST	I	-	-	0.7	1.7	4.1	-720 [2] -495 [3]	20
TDO	O	2.3	3.3	-	-	-	-345 [2] -225 [3]	25
/BRKIN	I	-	-	0.7	1.7	4.1	-340 [2] -230 [3]	10
/BRKOUT	O	2.3	3.3	-	-	-	+10 [2] -10 [3)]	10
/BREQ	I	-	-	0.7	1.7	4.1	-260 [2] -240 [3]	10
/BGRANT	O	2.3	3.3	-	-	-	-260 [2] -240 [3]	10
/DBGDET	I	-	-	0.7	1.7	4.1	-340 [2] -230 [3]	10
RESERVED3	I	-	-	0.7	1.7	4.1	+720 [2] +500 [3]	10

[1] Adapter cable and Samtec connector not considered; PCB 1 pF/cm
[2] at VDDP = 2.3 V (VDDP configured at 2.5 V)
[3] at VDDP = 3.0 V (VDDP configured at 3.3 V)
[4] Open Drain FET; I_{max} = 10 mA

7.10 Pin Assignment

7.10.1 ECU Interface Connector CON1 (ETK-S4.2A)

Pin	Signal	Direction	Comment
A1	Reserved0		Reserved
A2	/BRKOUT	In	Debugger break signal
A3	CAL Wakeup	Out	Switch to UBatt ECU wake-up signal (for measurement preparation)
A4	/BRKIN	Out	Debugger break signal
A5	TDO	In	JTAG signal
A6	TMS	Out	JTAG signal
A7	TCK	Out	JTAG signal
A8	TDI	Out	JTAG signal
A9	VDDSBRAM (Sense)	In	Comparator input Standby (permanent) power supply of ECU RAMs
A10	/TRST	Out	JTAG signal
A11	/WDGDIS	Out	Watchdog disable signal
A12	Reserved2		Reserved, 5V tolerant
A13	VDDP (Sense)	In	Comparator Input Switched power supply of ECU (ignition)
B1	DAI4	Bidir	Data Acquisition Interrupt Line 4
B2	DAI3	Bidir	Data Acquisition Interrupt Line 3
B3	/HDRST	In	ECU Reset signal for Reset detection 5V tolerant
B4	GND		Ground
B5	GND		Ground
B6	GND		Ground
B7	GND		Ground
B8	GND		Ground
B9	GND		Ground
B10	/PORST	Out	ECU Reset signal (open drain) for Reset assertion Switched Pull-Down, 5V tolerant
B11	DAI2	Bidir	Data Acquisition Interrupt Line 2
B12	DAI1	Bidir	Data Acquisition Interrupt Line 1
B13	VDDSBRAM (Supply)	Out	Standby (permanent) power supply of ECU RAMs, 1.5 V (max. 250 mA)

7.10.2 ECU Interface Connector CON6 (ETK-S4.2B and ETK-S4.2C)

Pin	Signal	Direction	Comment
A1	/TRST	Out	JTAG signal
A2	TCK	Out	JTAG signal
A3	/BRKOUT	In	Debugger break signal
A4	TDI	Out	JTAG signal
A5	TDO	In	JTAG signal
A6	/WDGDIS	Out	Watchdog disable signal
B1	/BRKIN	Out	Debugger break signal
B2	GND		Signal Ground
B3	TMS	Out	JTAG signal
B4	/PORST	Out	ECU Reset signal (open drain) for Reset assertion Switched Pull-Down, 5V tolerant
B5	VDDP (Sense)	In	Comparator Input Switched power supply of ECU (ignition)
B6	Reserved		Reserved

7.10.3 Interface and Power Supply Connector CON7 (ETK-S4.2B)

Pin	Signal	Direction	Comment
1	UBATT	In	U Battery
2	CAL Wakeup	Out	Switch to UBatt ECU wake-up signal (for measurement preparation)
3	GND	-	Signal Ground
4	VDDSBRAM (Supply and sense)	Out	Standby (permanent) power supply of ECU RAMs, 1.5 V
5	/HDRST	In	ECU Reset signal for Reset detection 5V tolerant
6	DAI1	Bidir	Data Acquisition Interrupt Line 1
7	DAI2	Bidir	Data Acquisition Interrupt Line 2

7.10.4 Interface and Power Supply Connector CON7 (ETK-S4.2C)

Pin	Signal	Direction	Comment
1	UBATT	In	Power supply (permanent)
2	CAL Wakeup	Out	Wakeup functionality (12 V output) [1)]
3	GND	-	Ground
4	VDDSBRAM, opt. SENSE	Out	Backup voltage (1.3 V) of ECU standby RAM provided by ETK, optional additional sense [2)]
5	/HDRST	In	ECU reset signal for reset detection
6	DAI1, opt. SENSE	Bidir	GPIO pin for startup communication and triggering, optional additional sense [3)]
7	DAI2	Bidir	GPIO pin for startup communication and triggering

1): if not implemented, do not connect
2): SENSE: Pin 4 configured to supply and sense the VDDSBRAM voltage
3): SENSE: Pin 4 or pin 6 configured to supervise ECU standby RAM by ETK to detect data consistency

7.10.5 Power Supply Connector CON2 (ETK-S4.2A)

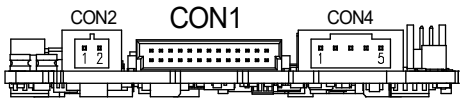

Fig. 7-4 Power Supply Connector CON2

Pin CON2	Signal	Description
1	U_{Batt}	Battery Supply Voltage for ETK
2	GND	Ground

7.10.6 Debug Interface Connector CON5

Pin	Signal	Description
1	TMS	TMS to target
2	3V3	Target supply for sensing
3	TDO	TDO from target
4	GND	Signal Ground
5	/DBGDET	Debugger Presence Detection
6	GND	Signal Ground
7	TDI	TDI to target
8	/MR	/Reset to target
9	/TRST	/TRST to target
10	/BRK_OUT	/BRKOUT from target
11	TCLK	TCLK to target
12	GND	Signal Ground
13	/BRK_IN	/BRK_IN to target
14	/BREQ	Bus Request to ETK
15	/BGRANT	Bus Grant from ETK
16	Reserved3	

7.11 Mechanical Dimensions

The reference measure for all drawings is millimeter.

7.11.1 ETK-S4.2A

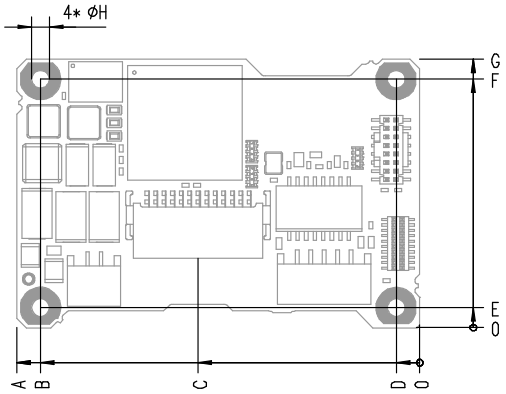

Fig. 7-5 ETK-S4.2A Dimensions - Top View

Item	Dimension [Millimeters]	Tolerance [Millimeters]	Dimension [Inches]	Tolerance [Inches]
A	60.00	+0.2/-0.2	2.362	+0.008/-0.008
B	56.50	+0.1/-0.1	2.224	+0.004/-0.004
C	33.00	+0.2/-0.2	1.299	+0.008/-0.008
D	3.50	+0.1/-0.1	0.138	+0.004/-0.004
E	3.00	+0.1/-0.1	0.118	+0.004/-0.004
F	37.00	+0.1/-0.1	1.457	+0.004/-0.004
G	40.00	+0.2/-0.2	1.575	+0.008/-0.008
H	2.60	+0.1/-0.0	0.102	+0.004/-0.000

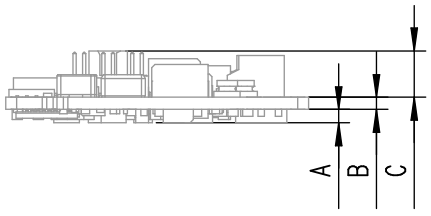

Fig. 7-6 Mechanical Dimensions ETK-S4.2A: Microcontroller with Socket Adapter mounted

Item	Dimension [Millimeters]	Tolerance [Millimeters]	Dimension [Inches]	Tolerance [Inches]
A	2.00	+0.1/-0.1	0.079	+0.004/-0.004
B	1.60	+0.16/-0.16	0.063	+0.006/-0.006
C	6.00	+0.1/-0.1	0.236	+0.004/-0.004

7.11.2 ETK-S4.2B

The reference measure for all drawings is millimeter.

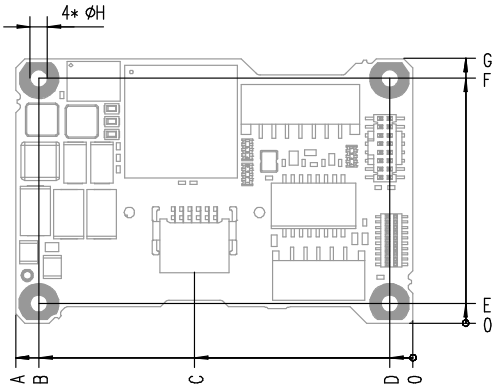

Fig. 7-7 ETK-S4.2B Dimensions - Top View

Dimension	Millimeters	Inches	Dimension	Millime-ters	Inches
A	60.00	2.362	E	3.00	0.118
B	56.50	2.224	F	37.00	1.457
C	33.00	1.299	G	40.00	1.575
D	3.50	0.138	H	2.60	0.102

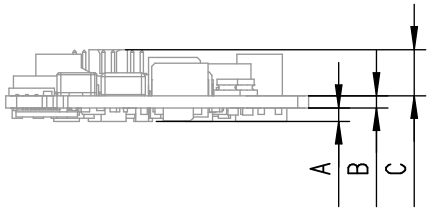

Fig. 7-8 Mechanical Dimensions ETK-S4.2B: Microcontroller with Socket Adapter mounted

Item	Dimension [Millimeters]	Tolerance [Millimeters]	Dimension [Inches]	Tolerance [Inches]
A	2.00	+0.1/-0.1	0.079	+0.004/-0.004
B	1.60	+0.16/-0.16	0.063	+0.006/-0.006
C	6.00	+0.1/-0.1	0.236	+0.004/-0.004

7.11.3 ETK-S4.2C

The reference measure for all drawings is millimeter.

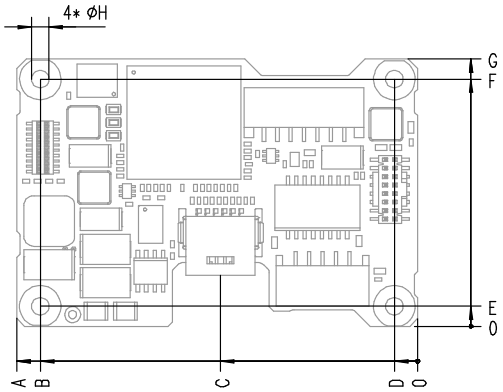

Fig. 7-9 ETK-S4.2C Dimensions - Top View

Item	Dimension [Millimeters]	Tolerance [Millimeters]	Dimension [Inches]	Tolerance [Inches]
A	60.00	+0.2/-0.2	2.362	+0.008/-0.008
B	56.50	+0.1/-0.1	2.224	+0.004/-0.004
C	29.50	+0.2/-0.2	1.161	+0.008/-0.008
D	3.50	+0.1/-0.1	0.138	+0.004/-0.004
E	3.00	+0.1/-0.1	0.118	+0.004/-0.004
F	37.00	+0.1/-0.1	1.457	+0.004/-0.004
G	40.00	+0.2/-0.2	1.575	+0.008/-0.008
H	2.60	+0.1/-0.0	0.102	+0.004/-0.000

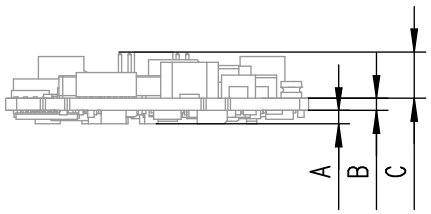

Fig. 7-10 Mechanical Dimensions ETK-S4.2C: Microcontroller with Socket Adapter mounted

Item	Dimension [Millimeters]	Tolerance [Millimeters]	Dimension [Inches]	Tolerance [Inches]
A	2.00	+0.1/-0.1	0.079	+0.004/-0.004
B	1.60	+0.16/-0.16	0.063	+0.006/-0.006
C	6.00	+0.1/-0.1	0.236	+0.004/-0.004

8 Cables and Accessories

8.1 Interface Cables

8.1.1 Cable KA54 (with PG Cable Gland)

NOTE

Cable glands are not included in the delivery. Refer to the cable descriptions for manufacturers and order numbers.

Cable KA54, Proposal 1

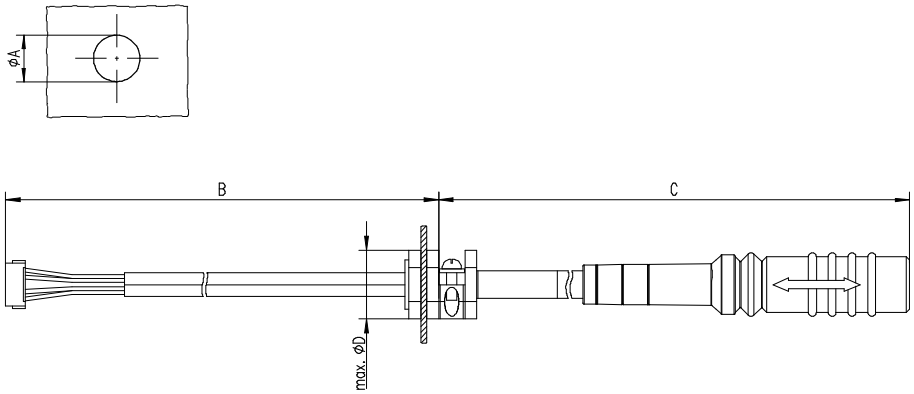

Fig. 8-1 Interface Cable KA54, Proposal 1

Dim	Millimeters	Inches	Dim	Millimeters	Inches
A	12.50	0.492	C	400.00	15.748
B	160.00	6.299	D	19.00	0.748

NOTE

Shield connected to ECU housing.

SKINDICHT compact screwing; Manufacturer: Lapp; Description: SH7; Order-No.: 5200 0830

Nut for compact screwing; Manufacturer: Lapp; Description: SM7; Order-No.: 5200 3490

Cable KA54, Proposal 2

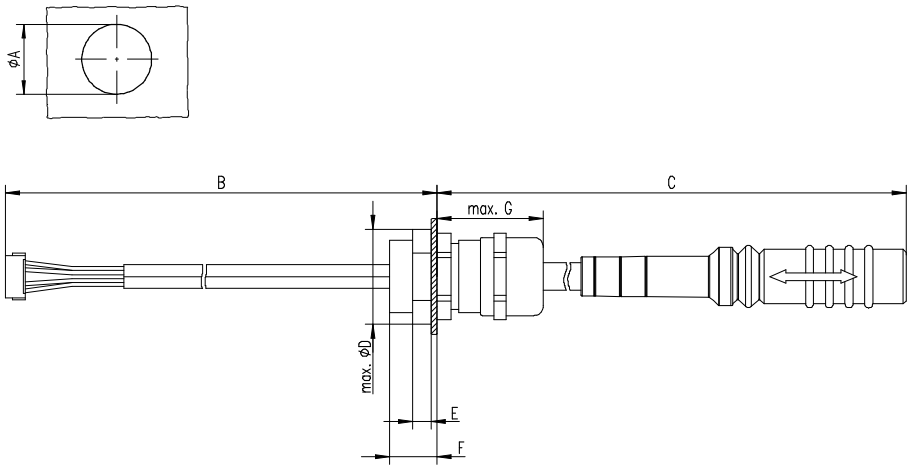

Fig. 8-2 Interface Cable KA54, Proposal 2

Dim	Millimeters	Inches
A	18.80	0.740
B	160.00	6.299
C	400.00	15.748
D	24.25	0.955
E	4.70	0.185
F	12.00	0.472
G	27.00	1.063

NOTE

Shield connected *to ECU housing.*

SKINTOP compact screwing; Manufacturer: Lapp; Description: MS-SC 11 ; Order-No.: 5311 2320

Nut for compact screwing; Manufacturer: Lapp; Description: SM-PE 11 ; Order-No.: 5210 3220

8.1.2 Cable KA55

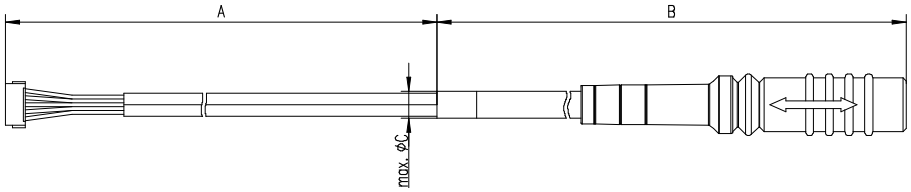

Fig. 8-3 Interface Cable KA55

Dim	Millimeters	Inches
A	160.00	6.299
B	400.00	15.748
C	9.00	0.3543

NOTE

Strain relief on ECU cover necessary. Shield not connected to ECU housing.

8.1.3 Cable CBAM200

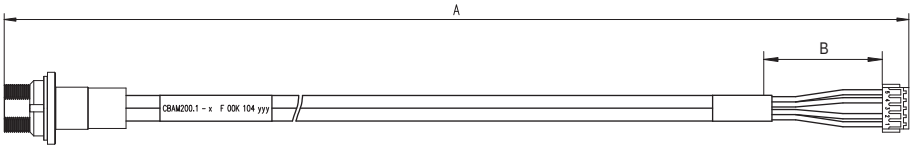

Fig. 8-4 Interface Cable CBAM200-0m38

Dim	Millimeters	Inches
A	380.00	14.96
B	30.00	1.18

NOTE

Shield connected to ECU housing, allows for ECU housing flush mounting.

8.2 Power Supply Cables

8.2.1 Cable ETV

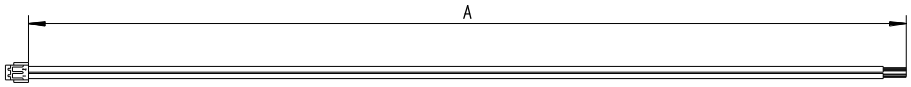

Fig. 8-5 Power Supply Cable ETV

Dim	Millimeters	Inches
A	190.00	7.480

8.2.2 Cable with Filtercoil ETV2

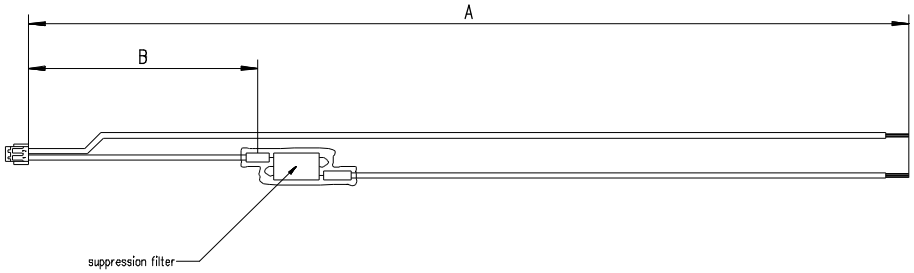

Fig. 8-6 Power Supply Cable with Filtercoil ETV2

Dim	Millimeters	Inches
A	190.00	7.480
B	50.00	1.969

8.2.3 Cable K70

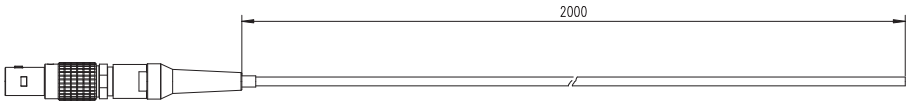

Fig. 8-7 Power Supply Cable K70

Dim	Millimeters	Inches
A	2000	78.74

8.2.4 Cable KA50

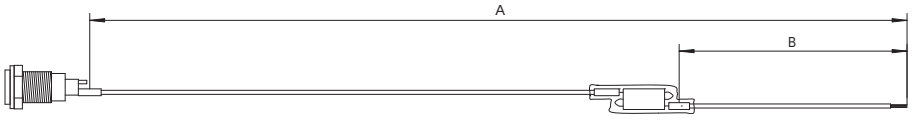

Fig. 8-8 Power Supply Cable KA50

Dim	Millimeters	Inches
A	200	7.87
B	50	1.97

8.2.5 Cable CBM200

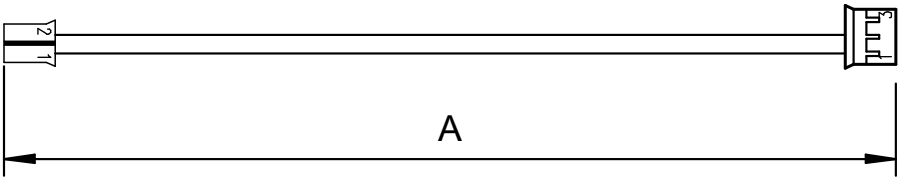

Fig. 8-9 Power Supply Cable CBM200

Dim	Millimeters	Inches
A	100	3.94

8.3 Combined Interface and Power Supply Cables

8.3.1 Cable CBAM210

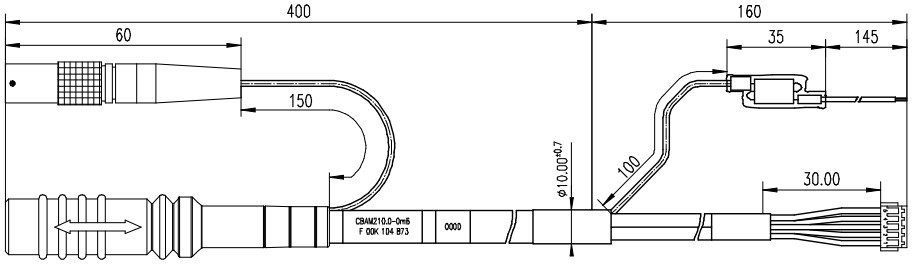

Fig. 8-10 Combined Interface and Power Supply Cable CBAM210

NOTE

Shield not connected to ECU housing.

8.3.2 Cable CBAM220

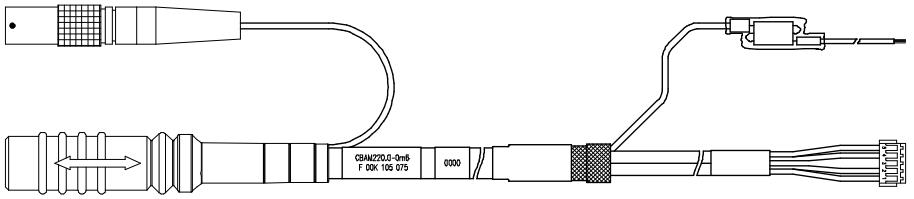

Fig. 8-11 Combined Interface and Power Supply Cable CBAM220

For cable CBAM220 dimensions refer to dimensions of cable CBAM210 in Fig. 8-10.

NOTE

Shield connected *to ECU housing.*

8.4 Adapters

8.4.1 ETK - ECU Adapter ETAF1

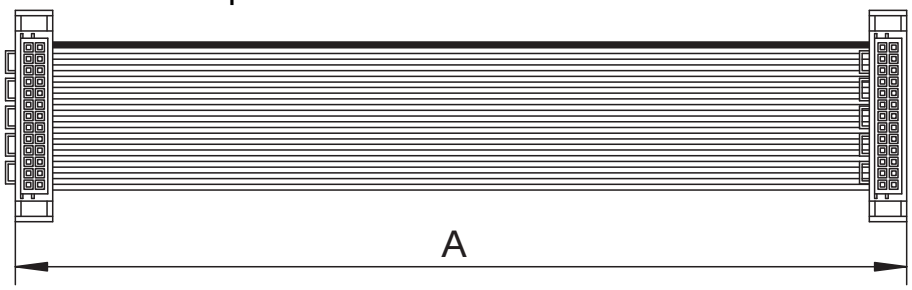

Fig. 8-12 ETK - ECU Adapter ETAF1

Dim	Millimeters	Inches
A	100.00	3.94

8.4.2 ETK - ECU Adapter ETAI1

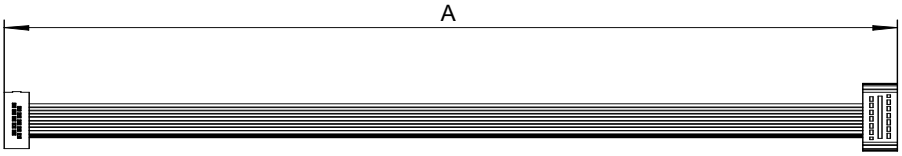

Fig. 8-13 ETK - ECU Adapter ETAI1

Dim	Millimeters	Inches
A	110.00	4.936

8.4.3 ETK - ECU Adapter ETAI2

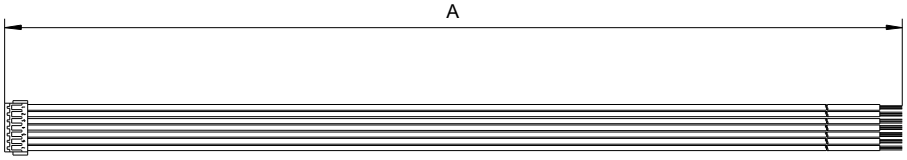

Fig. 8-14 ETK - ECU Adapter ETAI2

Dim	Millimeters	Inches
A	250.00	9.84

8.4.4 ETK - ECU Adapter ETAI3

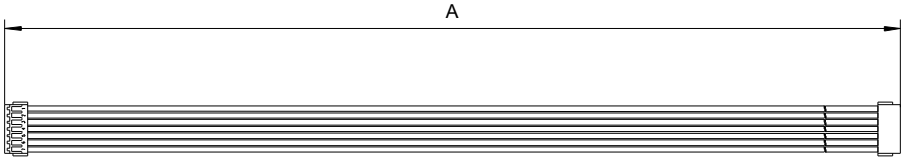

Fig. 8-15 ETK - ECU Adapter ETAI3

Dim	Millimeters	Inches
A	250.00	9.84

8.4.5 ETK - ECU Adapter ETAI5

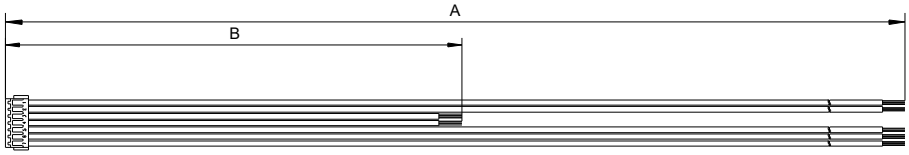

Fig. 8-16 ETK - ECU Adapter ETAI5

Dim	Millimeters	Inches
A	100.00 (+4/-0)	3.04
B	250.00 (+2/-2)	9.84

8.4.6 Debug Adapter ETAF5

ETAF5 Flatcable

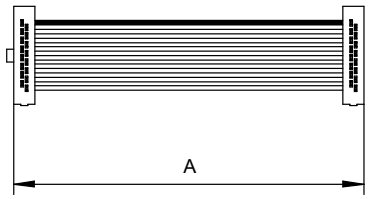

Fig. 8-17 ETAF5 Flatcable

Dim	Millimeters	Inches
A	50.80	2.00

ETAF5 PCB

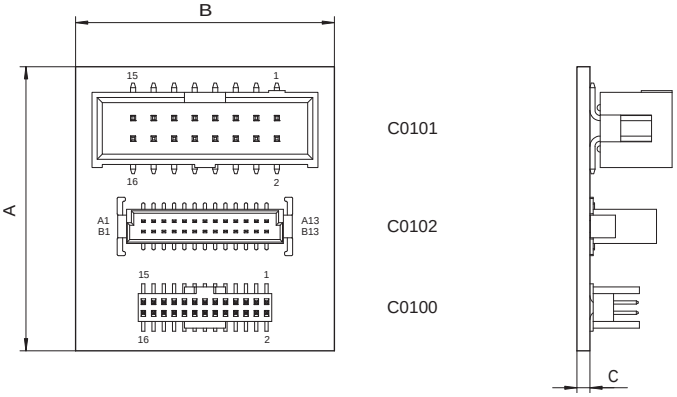

Fig. 8-18 ETAF5 - Mechanical Dimensions and Component Placement

Dim	Millimeters	Inches
A	35.00	1.38
B	32.00	1.26
C	1.60	0.06

Connector	Description
C0100	to ETK Debug Connector
C0101	to Debugger
C0102	to ECU

8.4.7 Debug Adapter ETAF9

ETAF9 Flatcable

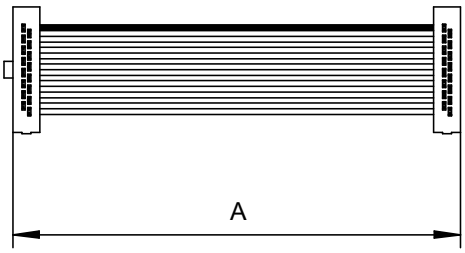

Fig. 8-19 ETAF9 Flatcable

Dim	Millimeters	Inches
A	50.80	2.00

ETAF9 Component Placement

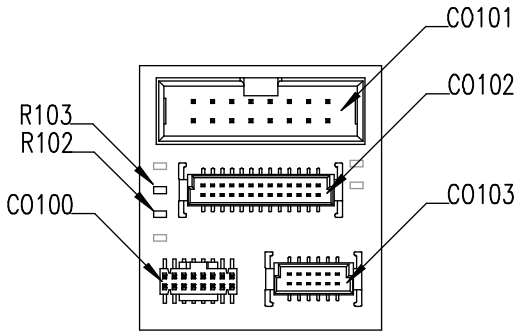

Fig. 8-20 ETAF9 Component Placement

ETAF9 PCB

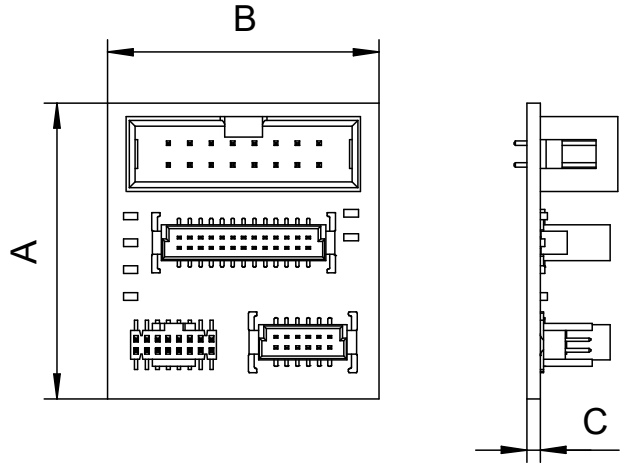

Fig. 8-21 ETAF9 - Mechanical Dimensions and Component Placement

Dim	Millimeters	Inches
A	35.00	1.38
B	32.00	1.26
C	1.60	0.06

9 Ordering Information

9.1 ETK-S4.2

9.1.1 ETK-S4.2A

Order Name	Short Name	Order Number
ETK-S4.2A Emulator Probe for the Infineon AUDO-F or AUDO-NG microprocessor, ECU adaption via 26 pin Erni plug	ETK-S4.2A	F 00K 104 960
Package Contents		
ETK-S4.2A Emulator Probe for the Infineon AUDO-F or AUDO-NG microprocessor, ECU adaption via 26 pin Erni plug • List "Content of this Package" • ETK Safety Advice • China-RoHS-leaflet_Compact_cn		

9.1.2 ETK-S4.2B

Order Name	Short Name	Order Number
ETK-S4.2B Emulator Probe for the Infineon AUDO-F and AUDO-NG microprocessor, ECU adaption via 12 pin Erni and 7 pin JST plug	ETK-S4.2B	F 00K 105 529
Package Contents		
ETK-S4.2B Emulator Probe for the Infineon AUDO-F and AUDO-NG microprocessor, ECU adaption via 12 pin Erni and 7 pin JST plug • List "Content of this Package" • ETK Safety Advice • China-RoHS-leaflet_Compact_cn		

9.1.3 ETK-S4.2C

Order Name	Short Name	Order Number
ETK-S4.2C Emulator Probe for the Infineon AUDO-MAX microprocessor, ECU adaption via 12 pin Erni and 7 pin JST plug	ETK-S4.2C	F 00K 106 737
Package Contents		
ETK-S4.2C Emulator Probe for the Infineon AUDO-MAX microprocessor, ECU adaption via 12 pin Erni and 7 pin JST plug • List "Content of this Package" • ETK Safety Advice • China-RoHS-leaflet_Compact_cn		

9.2 ETK - ECU Adapter

Order Name	Short Name	Order Number
ETAF1 ETK ECU Adapter, Erni - Erni (26fc - 26fc), 0m1	ETAF1	F00K 001 373
ETAI1 ETK ECU Adapter, Erni - Samtec (12fc - 10fc), 0m16	ETAI1	F00K 105 542
ETAI2 ETK ECU Adapter, JST PHR - open wires (7fc - 7c), 0m25	ETAI2	F00K 105 543
ETAI3 ETK ECU Adapter, JST PHR - JST PHR (7fc - 7fc), 0m25	ETAI3	F00K 105 544
ETAI5 ETK ECU Adapter with short ED supply and GND lines, JST PHR - open wires (7fc - 2c+5c), 0m25	ETAI5	F00K 106 773

9.3 Connector ETK - ECU Adapter ETAF1

Connectors are available from local ERNI distributers.

Type	Order Number	Note
	064320	26 pin ERNI-Connector

9.4 Debug Adapter

Order Name	Short Name	Order Number
Debug Adapter from Infineon OCDS1-Plug to ETK (ETAF5 PCB and ETAF5 Flat Cable)	ETAF5	F00K 104 220

9.5 Power Supply

Order Name	Short Name	Order Number
ETK power supply for 6 - 36 V DC input	ETP1	F 00K 000 624
Power Supply Interface for ETK	ETP2	F 00K 104 010

9.6 Cables

Please contact your local ETAS representative for further cable information.

NOTE

The cables showed in chapter “Cables and Accessories” on page 75 are not included in the ETK-S4.2 delivery.

NOTE

The screws for mounting ECU adapter cables are not included in the cable delivery. They need to be ordered separately.

9.6.1 Interface Cables

Order Name	Short Name	Order Number
ETK ECU Adapter Cable, Shield on ECU-Housing, Lemo 1B PHG JST PHR (4fc-5fc), 0m6 [1)]	KA54	F 00K 001 302
ETK ECU Adapter Cable, Lemo 1B PHG JST PHR (4fc-5fc), 0m6 [2)]	KA55	F 00K 001 303
ETK ECU Adapter Cable, Lemo 1B ENG - JST PHR (4fc-5fc), 0m14	KA41	Y 261 A24 729

[1)]: ETK grounded via ECU housing
[2)]: ETK grounded via cable

9.6.2 Power Supply Cables

Order Name	Short Name	Order Number
Cable JST PHR - JST PHR (2fc-3fc), 0m1	CBM200-0m1	F 00K 900 052
ETK Power Supply Cable, JST PHR - open wires (2fc-2c) 0m19	ETV	Y 261 A24 446
ETK Power Supply Cable with Filter Coil, JST PHR open wires (2fc-2c), 0m19	ETV2	F 00K 000 593
External Power Supply Cable for ETKs, Lemo 0B FGG - open wires (2fc-1c), 2 m	K70	Y 261 A24 942
ETK Power Supply Cable for External Supply, with Filter Coil, Lemo 0B EGG - open wire (2fc-1c), 0m2	KA50	F 00K 000 940

9.6.3 Combined Interface and Power Supply Cables

Order Name	Short Name	Order Number
ETK ECU Adapter and Power Supply Cable, Lemo 1B PHG - JST PHR (4fc-5fc) / Lemo 0B PHG - open wires (2fc-2c), 0m6	CBAM210-0m6	F 00K 104 873
ETK ECU Adapter and Power Supply Cable, Shield on ECU-Housing, Lemo 1B PHG - JST PHR (4fc-5fc) / Lemo 0B PHG - open wires (2fc-2c), 0m60	CBAM220-0m6	F 00K 105 075

9.7 Waterproof Case

Order Name	Short Name	Order Number
Water proofed case for ETKS4 and ETKS6 Waterproof case, designed for ETKS6.x and ETKS4.x	ETKS_C2	F00K 104 910

10 Contact Information

ETAS Headquarters

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70469 Stuttgart	Fax:	+49 711 3423-2106
Germany	Internet:	www.etas.com

ETAS Subsidiaries and Technical Support

For details of your local sales office as well as your local technical support team and product hotlines, take a look at the ETAS website:

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ETAS technical support	Internet:	www.etas.com/en/hotlines.php

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