ETAS

DRIVING EMBEDDED EXCELLENCE

ETAS ETK-S6.0
Emulator Probe for Infineon TC1766

User Guide

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ETK-S6.0 - User Guide R13 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 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 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 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 Guide must be read prior to the startup of the product!
	Symbol for WEEE, see chapter 2.5 on page 12
	Marking for CE conformity, see chapter 10 on page 59)
	Marking for UKCA conformity, see chapter 2.7 on page 12)
	Symbol for China RoHS, see chapter2.8.2 on page 13
	Symbol for China RoHS, see chapter2.8.2 on page 13
	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 12) 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

2.8.1 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.

2.8.2 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 Applications

The ETK-S6.0 is an emulator probe for the Renesas SH725xx microcontroller family. It is a typical serial ETK and is selectable by configuration for Renesas specific AUD-II or for H-UDI microcontroller debug interface. This serial ETK can be used for rapid prototyping applications (bypass) as well as for measurement and calibration applications.

ETK-S6.0 Configuration Type	Serial Interface
ETK-S6.0A	Renesas Advanced User Debugger (AUD-II) interface
ETK-S6.0B	Renesas H-UDI interface

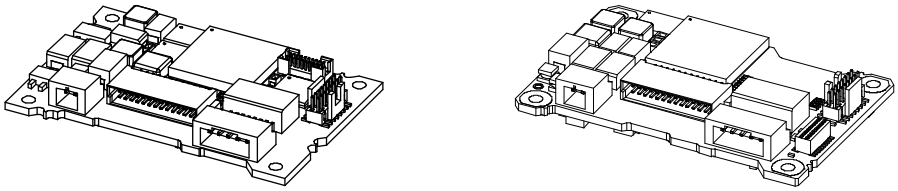

Fig. 3-1 ETK-S6.0 (left: Rev. A, right: Rev. B)

NOTE

The ETK-S6.0 can be shipped in the mechanical versions revision A and revision B. Both ETK-S6.0 versions have the same features, functions and technical data.
Both mechanical versions can be configured to use the ECU interface either as an AUD-II interface or as an H-UDI interface. The used microcontroller determines additionally which interface is supported by the ETK-S6.0.

3.2 Features

- By configuration selectable serial processor interface
  - Configuration type ETK-S6.0A: AUD-II interface
  - Configuration type ETK-S6.0B: H-UDI interface
- JTAG debugger interface
- Serial interface to the calibration and development system (100 Mbit/s)
- AUD-II interface clock speed: 10 MHz or 20 MHz (depending of used microcontroller)
- H-UDI interface clock speed: 20 MHz
- Concurrent use of calibration and debugging function possible (configuration type ETK-S6.0A)
- Special startup protocol for ETK recognition
- Coldstart functionality will be supported
- Microcontroller capability of internal Flash emulation can be used
- ECU flashing via ETK under ProF control
- Permanent storage of configuration in EEPROM
- Voltage supply for EDRAM by ETK
- Firmware update (programming of the logic device) through software; removal of ETK or ECU not necessary
- Mounting possibilities inside or on top of ECU
- The interface voltage level is 3.3 V. The supervisor voltage level is configurable
- Temperature range suitable for automotive application

For more technical data on the ETK-S6.0 refer the chapter “Technical Data” on page 37.

4 Hardware Description

This chapter contains information about the following topics:

4.1 Architecture

Fig. 4-1 "ETK-S6.0 Architecture" shows the blockdiagram of the ETK-S6.0.

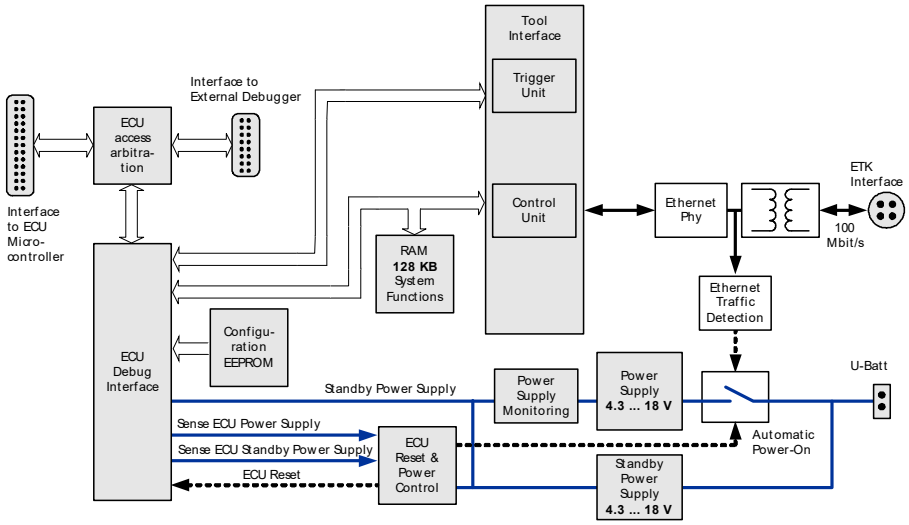

Fig. 4-1 ETK-S6.0 Architecture

The microcontroller can communicate with the memories or peripheral components of the development ECU.

The ETK-S6.0 is connected to the serial debug and test interface of the microcontroller (AUD-II or H-UDI). 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-S6.0 is provided by a switch mode power supply, to minimize power dissipation.

4.2 ETK-S6.0 Subtypes

The ETK-S6.0 contains two independently working subtypes ETK-S6.0A and ETK-S6.0B. The ETK subtypes are selectable by configuration.

4.2.1 Configuration Subtype ETK-S6.0A

If the ETK is configured in subtype ETK-S6.0A the ETK uses the AUD-II interface and the debugger the H-UDI interface. In this configuration ETK and debugger can work in parallel.

4.2.2 Configuration Subtype ETK-S6.0B

If the ETK is configured in subtype ETK-S6.0B the ETK or the debugger uses the H-UDI interface. In this configuration ETK and debugger can *not* work in parallel. If the debugger is connected to the ETK the H-UDI interface is used by the debugger only. The ETK is automatically disabled.

4.3 ECU Interface

NOTE

Both mechanical versions can be configured to use the ECU interface either as an AUD-II interface or as an H-UDI interface. The used microcontroller determines additionally which interface is supported by the ETK-S6.0.

The debug interface lines for the communication between the ETK-S6.0 and the ECU microcontroller can be configured to use this lines either as an AUD-II interface (ETK-S6.0 configuration type A) or as an H-UDI interface (ETK-S6.0 configuration type B). The configuration is supported by the "ETK Configuration Tool".

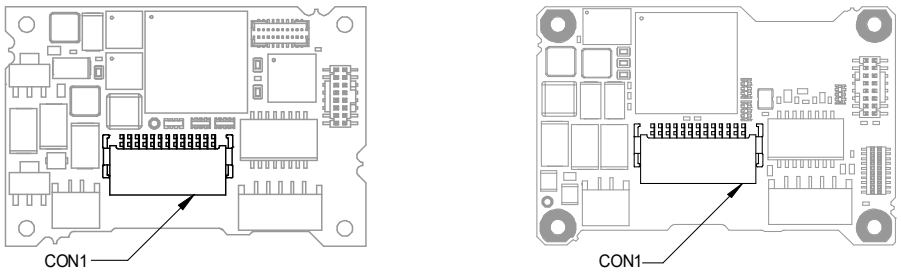

Fig. 4-2 Location of the ECU Interface (left: Rev. A, right: Rev. B)

The ECU interface can be flexibly configured for several applications. For a HDC update, it is not necessary to unmount or disconnect the ETK-S6.0 from the ECU.

The ETK-S6.0 is connected to the ECU via an adapter cable with 26 pins, where the pin definition depends on the application and the microcontroller type.

For currently supported microcontrollers refer to chapter 7.1.3 on page 38.

4.3.1 AUD-II Interface

In general the ECU interface configured for AUD-II operation (ETK-S6.0 configuration subtype A, see chapter 6.3 on page 33) consists of

- 8 AUD-II lines for the communication between the ETK-S6.0 and the ECU microcontroller
- 5 JTAG interface lines which are fed to a separate connector for connection of an external debugger
- 1 reset line which allows the ETK to control the system reset of the ECU
- Voltage and ground lines
  - 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 4.6 on page 23)
  - 6 ground lines for a proper shielding of the ECU interface lines.

If the debug interface lines between the ETK-S6.0 and the ECU microcontroller are configured as an AUD-II interface no handshake or trigger pins are needed.

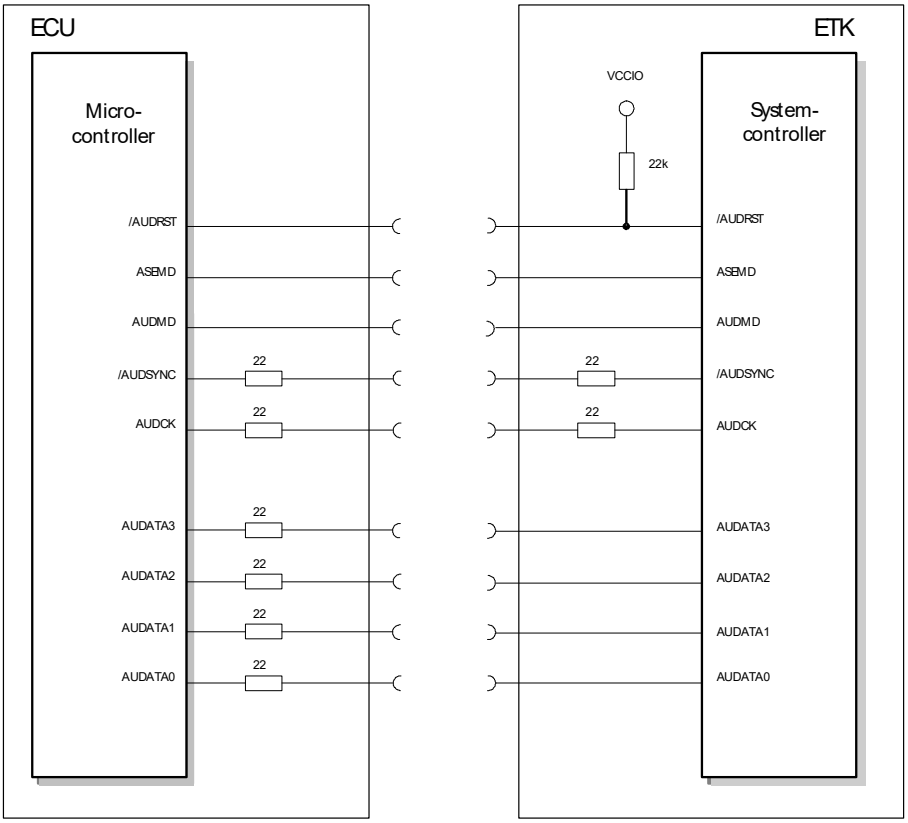

Fig. 4-3 Equivalent Circuitry of the AUD-II Interface

To ensure proper operation of the startup protocol between ECU and ETK the circuitry has to respect the following topics (refer to Fig. 4-3):

- 22 Ohm series resistors on each of the 4 AUDATA signals, on the AUDCK and /AUDSYNC signal of the ECU part are recommended.
- The ETK incorporates 22 Ohm series resistors for the /AUDSYNC and AUDCK lines on the ECU interface.
- The ETK incorporates a 22 kOhm pullup resistor on /AUDRST.

4.3.2 H-UDI Interface

In general the ECU interface configured for H-UDI operation (ETK-S6.0 configuration subtype B, see chapter 6.3 on page 33) consists of

- 8 AUD-II lines for the communication between the ETK-S6.0 and the ECU microcontroller
- 5 JTAG interface lines which are fed to a separate connector for connection of an external debugger
- 1 reset line which allows the ETK to control the system reset of the ECU
- Voltage and ground lines
  - 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 4.6 on page 23)
  - 6 ground lines for a proper shielding of the ECU interface lines.

If the debug interface lines between the ETK-S6.0 and the ECU microcontroller are configured as an H-UDI interface at least two GPIO pins are required: the usage of the DAI1/ DAI2 signals is mandatory, if more trigger options are required the DAI3/ DAI4 signals can be additionally applied.

4.3.3 ECU and ETK DAI Port Voltage Level

The DAI ports of the ECU and the DAI ports of the ETK are normally not on the same voltage level. To use the H-UDI Debug interface it is necessary to shift the voltage levels at the ECU. There are two methods for shifting the voltage level:

- usage of level shifter ICs (monolithic implementation)
- usage of diodes and resistors (discrete implementation).

The voltage level of the DAI ports of the ECU (5 V) has to be shifted to the voltage level of the DAI ports of the ETK system controller (3.3 V).

4.3.4 Recommended Voltage Level Shifting Method

It is recommended to use level shifter ICs (e.g. 74CB3T3306) to shift the voltages of the DAI ports of the ECU and of the DAI ports of the ETK at the same level (see Fig. 4-4 on page 20).

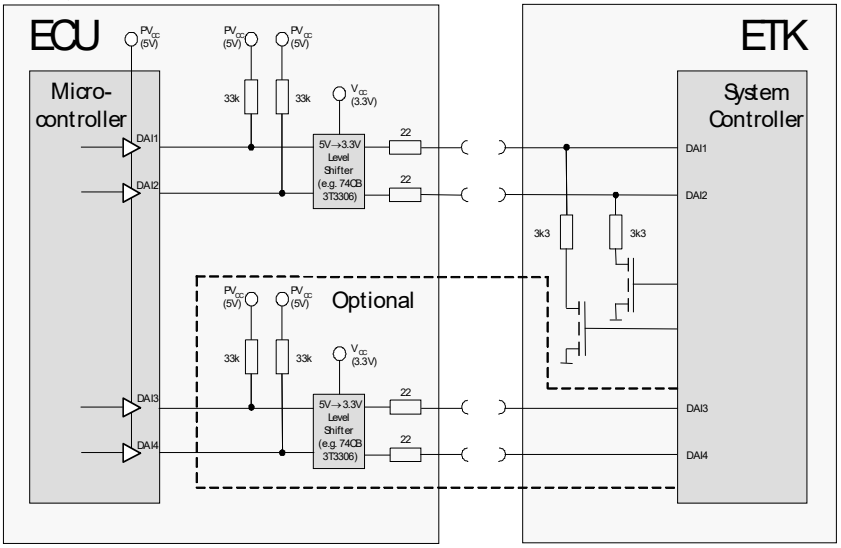

Fig. 4-4 Usage of level shifter ICs

4.3.5 Alternative Voltage Level Shifting Method

An other method to shift the voltages of the DAI ports of the ECU and of the DAI ports of the ETK at the same level is the usage of diodes and resistors (see Fig. 4-5 on page 20).

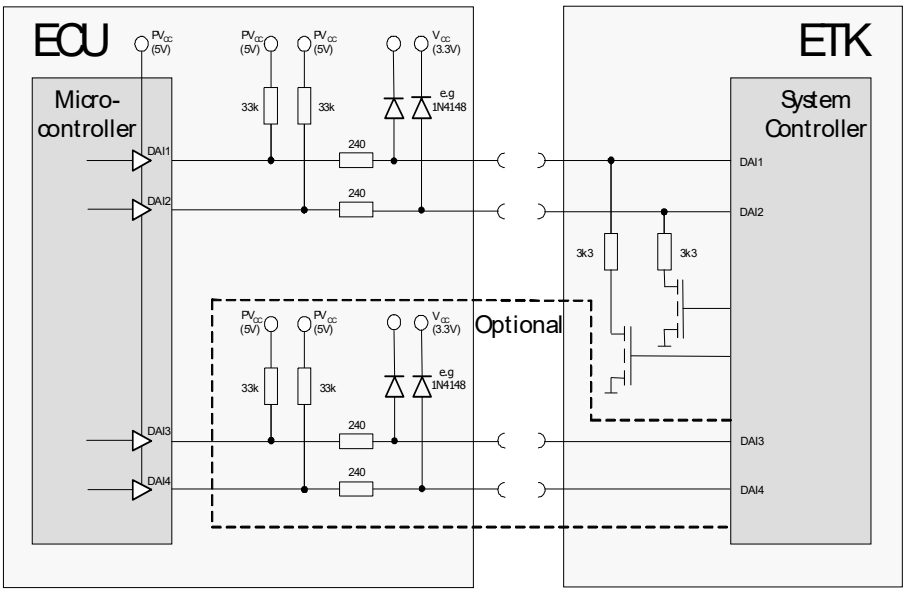

Fig. 4-5 Usage of diodes and resistors

4.4 Serial ETK Interface

The serial 100 Mbit/s ETK-S6.0 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.

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

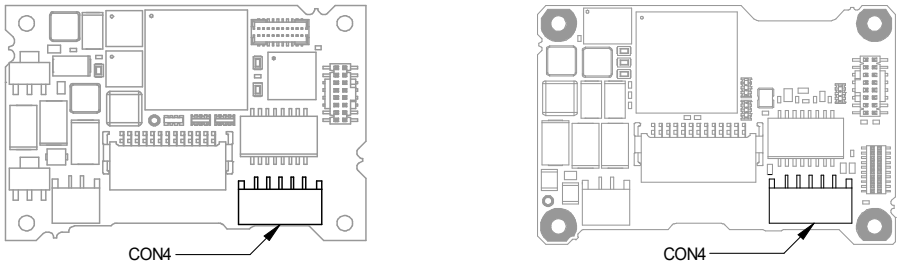

Fig. 4-6 Location of the Serial ETK Interface (left: Rev. A, right: Rev. B)

4.5 Debug Interface

The ETK-S6.0 features a AUD-II debugging interface connector CON5 (Samtec 16 pin).

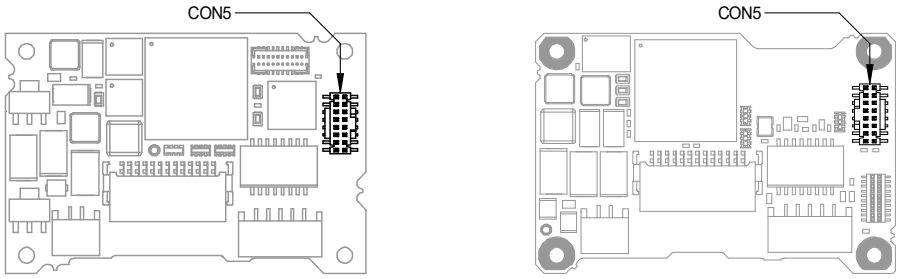

Fig. 4-7 Location of the Debugger Interface (left: Rev. A, right: Rev. B)

This connector can be used to attach debug tools (e.g. Lauterbach or Renesas debugger for Renesas SH72513FCC).

By using the AUD-II interface for serial ETK connection, it is not available for debugging tools anymore. Therefore a feedthrough for a second debugger interface (JTAG) is provided. This enables parallel use of tools for debugging and ETAS tools for measurement and calibration.

JTAG Interface for external Debugger

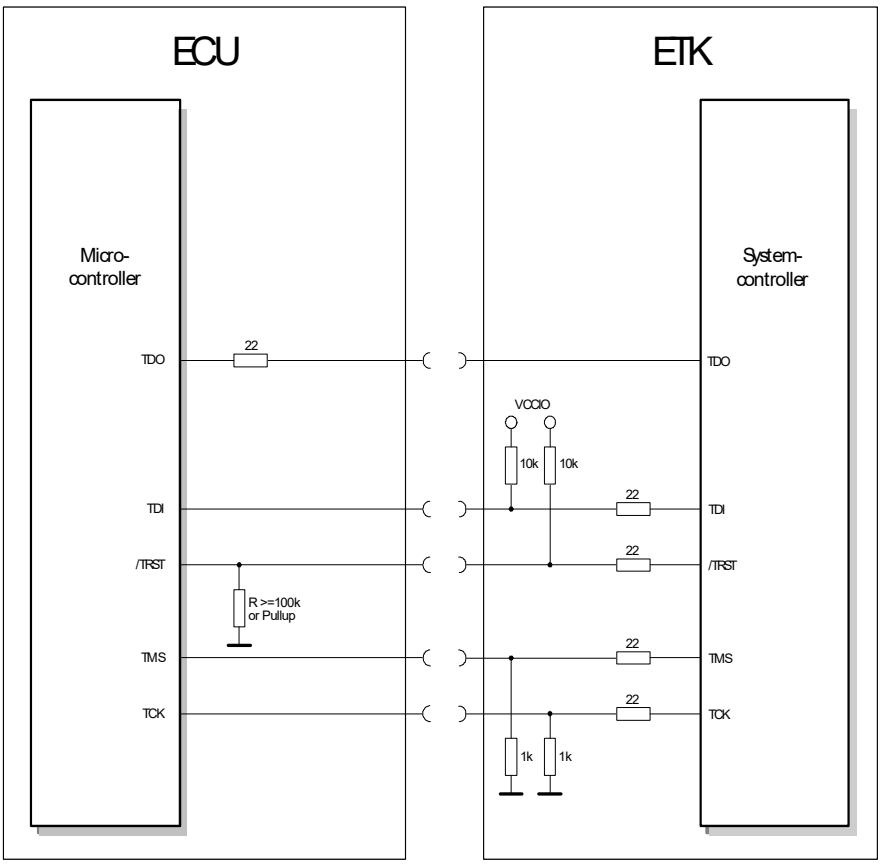

Fig. 4-8 Equivalent Circuitry of the ECU JTAG Interface (ECU)

The ECU part of the JTAG ETK interface is depicted in Fig. 4-8. For proper operation it is mandatory to provide series termination resistors of 22 Ohm in series with the TDO line on the ECU PCB.

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

4.6 Power Supply

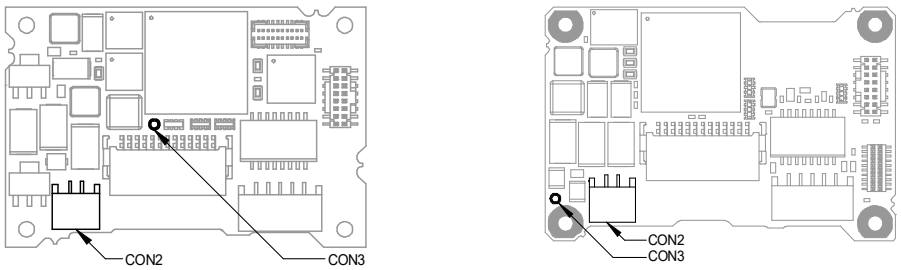

Fig. 4-9 Power Supply Connectors CON2 and CON3 (left: Rev. A, right: Rev. B)

The ETK-S6.0 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-S6.0. An automatic switch ensures that the power supply of the ETK-S6.0 is automatically switched on and off when the ETK enters and leaves its sleep mode.

The ETK-S6.0 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 5.3.2).

4.7 ECU Voltage Supervisor

The ECU voltage (USG) is monitored by the ETK to recognize whether the ECU is switched on or off.

Additionally the ECU RAM standby voltage (USGSTBY) 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.

4.8 Status LEDs

There are three LEDs displaying the operating status of the ETK-S6.0 (Fig. 4-10 on page 24).

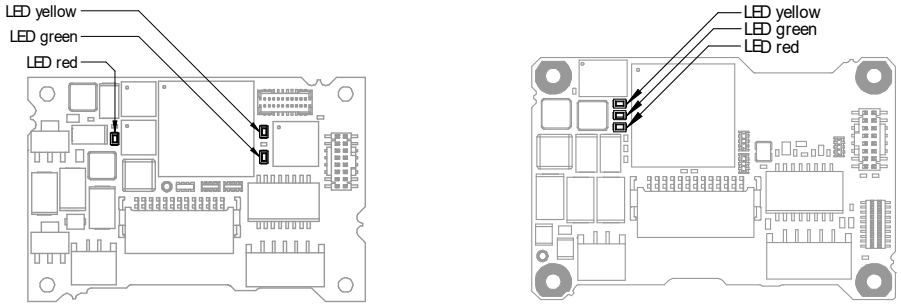

Fig. 4-10 Status LEDs (left: Rev. A, right: Rev. B)

LED	State	Definition
Red	On	ETK-S6.0 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-S6.0)
Green	Off	Working Page contains valid data and is accessible from INCA
	Flashing	ETK-S6.0 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-S6.0 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.
Yellow	On	100 Mbit/s communication to calibration system established

4.9 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.

4.10 Startup, Trigger and Reset

NOTE

For further information refer to the ETAS document "ETK-S6.0 Solution Proposal for ECU Integration".

4.10.1 Phases of the Startup Protocol for AUD-II Operation

If the ETK-S6.0 is configured in the "ETK Configuration Tool" as "ETK-S6.0 Configuration A" (see chapter 6.4 on page 34) the ETK is activated for AUD-II operation.

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

During the reset phase the ETK applies a special pattern to its AUDATA[3...0] lines. The value of the pattern is dependent on the detection of a power fail of the ECU standby power supply by the ETK-S6.0. In the case of power failure the calibration RAM content has not been restored by the ETK. When the reset signal is de-asserted the CPU latches the AUDATA[3..0] value into a special register AUDISR. The CPU detects the presence of the ETK through the special pattern in the AUDISR and subsequently writes an acknowledgement pattern in another special register AUDMBR. This is detected by the ETK and signalled to the measurement and calibration system and the measurement data acquisition triggers are enabled.

Successive phases of the startup protocol

A Reset phase: The ECU is in reset and a special pattern is applied to the AUDATA lines. At the end of the reset phase the pattern on the AUDATA lines is latched into the AUDISR register.

B ECU Initialization phase: The ECU performs internal initializations. After finishing the initializations it writes a special pattern into the AUDMBR register.

C Calibration and data acquisition: The ECU uses the AUDMBR register to signal a trigger condition to the ETK, i.e. a measurement raster is ready for acquisition. The ETK-S6.0 periodically polls the AUDMBR to detect the triggers. The AUDISR is not used in this mode.

4.10.2 Phases of the Startup Protocol for H-UDI Operation

If the ETK-S6.0 is configured in the ETK Configuration Tool as "ETK-S6.0 Configuration B" (see chapter 6.4 on page 34) the ETK is activated for H-UDi operation.

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 33 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.

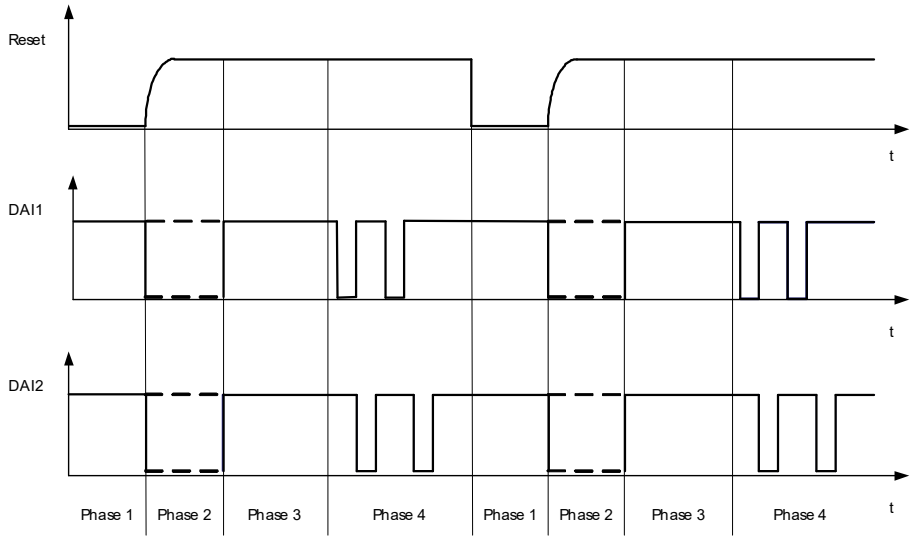

Fig. 4-11 Phases of the Startup Protocol

4.10.3 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 33 kOhm pullup resistors).

B ECU Initialization phase: The ECU performs internal initializations, the DAI ports are still inputs. The ETK pulls DAI1 low via 3k3 kOhm, DAI2 is pulled either weakly high (via the 33 kOhm pullup resistor) or low (via 3k3 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.

4.10.4 ECU and ETK Reset Detection Levels

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

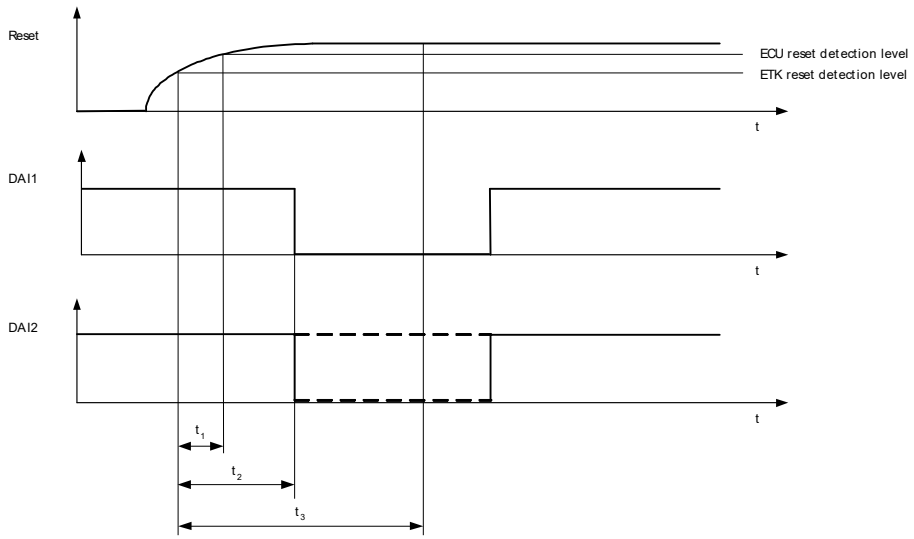

Fig. 4-12 Startup Procedure in Detail

The condition for proper operation is:

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

Item	Description	Agreements
t_1	Max. uncertainty of reset detection	t_1 < 200 ns
t_{HOLD}	Hold time of reset configuration	t_{HOLD} ~ 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

4.10.5 Triggering of Measurement Data Acquisition

4.10.5.1 Triggering of Measurement Data Acquisition (Configuration Type -A)

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

For serial ETKs this implementation is not feasible since this would require periodic polling of the ECU memory by the ETK with all the associated drawbacks (e.g. waste of debug interface bandwidth, time stamp accuracy, etc.).

The ETK-S6.0 uses a special register AUDMBR in the CPU hardware for signalling measurement triggers. For Renesas SH2A generation microcontrollers this interface is 16 bit wide, therefore, up to 16 dedicated hardware trigger signals can be used with the ETK-S6.0.

NOTE

The AUDATA[3..0] lines are also used for startup communication and general data transfer between ETK and ECU, see Chapter 4.10.1 "Phases of the Startup Protocol for AUD-II Operation".

4.10.5.2 Triggering of Measurement Data Acquisition (Configuration Type -B)

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 4.10.2 "Phases of the Startup Protocol for H-UDI Operation".

The required circuitry for the trigger lines DAI1 to DAI4 on the ECU is shown in Fig. 4-8 "Equivalent Circuitry of the ECU JTAG Interface (ECU)". The four hardware triggers are active low signals.

4.10.6 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-S6.0 normally drives /RES low during ECU power up or upon INCA request. The signal /RES of the microprocessor is used by the ETK-S6.0 to detect when the ECU is in reset.

The ETK-S6.0 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/ES592/ES595) unplugged.

ECU Reset Detection Delay

To adapt the ETK detection scheme to different system architectures the reset detection delay of the ETK-S6.0 is configurable: either a short delay of 2 µs or an extended delay of 30 µs can be selected via configuration feature. The result is that the ETK detection pattern is applied to the AUDATA lines for a short period of time after the reset has been de-asserted. This ensures that the pattern is safely detected by the ECU.

5 Installation

This chapter contains information about the following topics:

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.

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.

For connecting the ETK-S6.0 to the ECU the ETK adapter ETAF1 is recommended. It need to be ordered seperately (refer chapter “Ordering Information” on page 57).The suitable connector [ERNI 064320] should have been populated onto the ECU PCB.

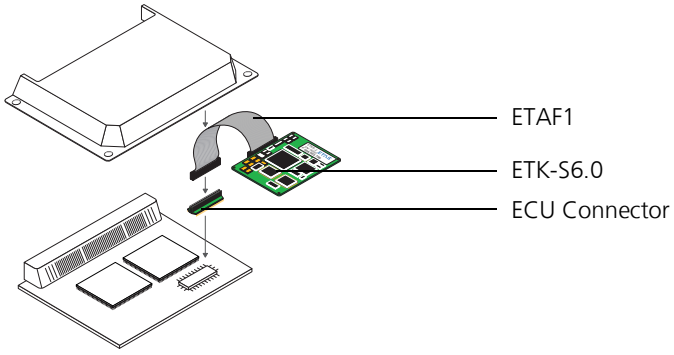

Fig. 5-1 ETK-S6.0 Connection to the ECU

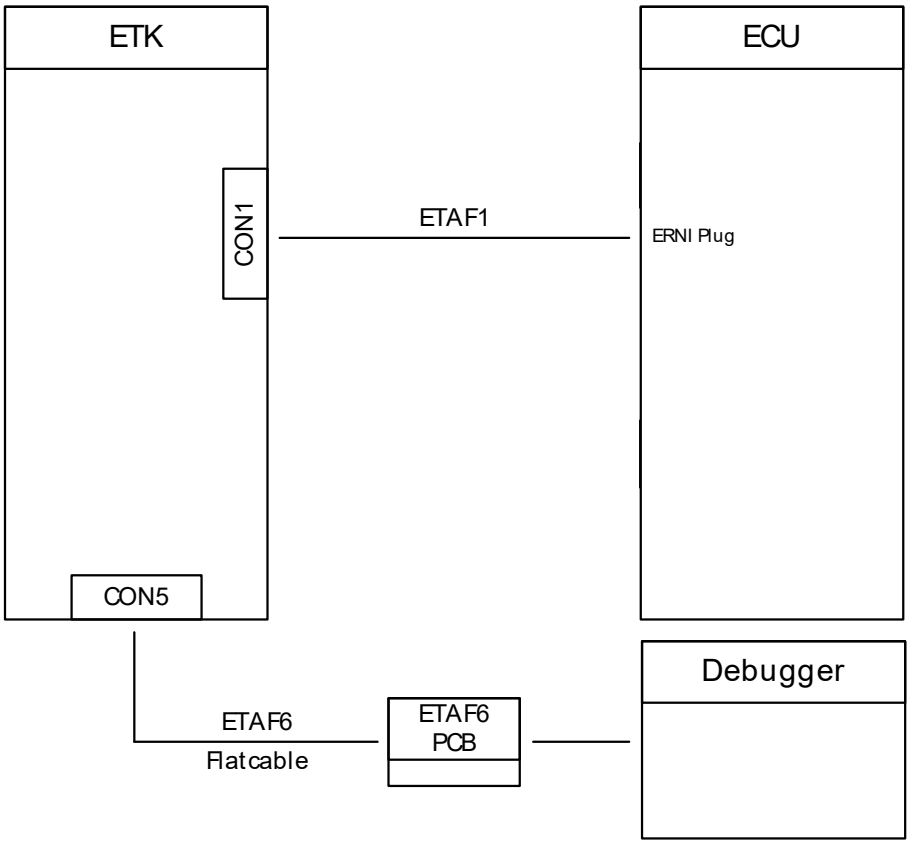

Fig. 5-2 ETK-S6.0 Connection to the ECU and to the Debugger

5.2 Connection to the Debugger

For connecting the ETK-S6.0 to the debugger the ETK adapter ETAF6 (including ETAF6 PCB and ETAF6 flatcable) is required. Its needs to be ordered seperately (refer chapter “Ordering Information” on page 57). A debugger specific cable has to be used to connect the debugger with the ETAF6 PCB. For connecting the ETK-S6.0 to the debugger refer to Fig. 5-2 on page 31.

5.3 Connecting to the Power Supply

The ETK-S6.0 needs a permanent power supply (refer chapter “Power Supply” on page 23). There are different versions to ensure it.

5.3.1 Permanent Power Supply inside ECU available

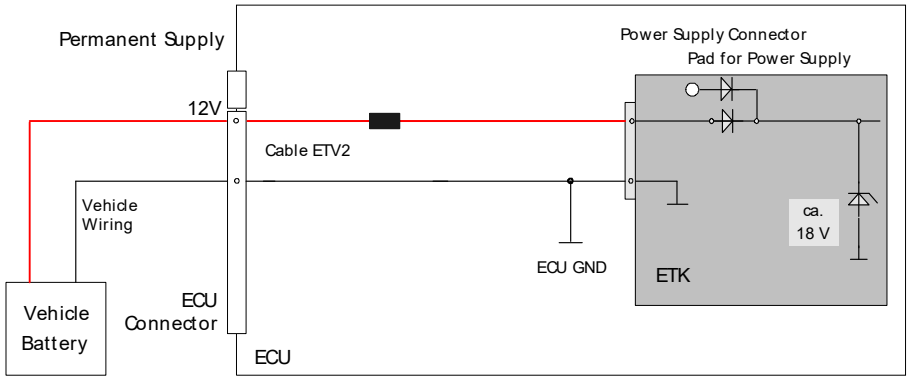

Fig. 5-3 Permanent Power Supply inside ECU available

5.3.2 Permanent Power Supply inside ECU not available

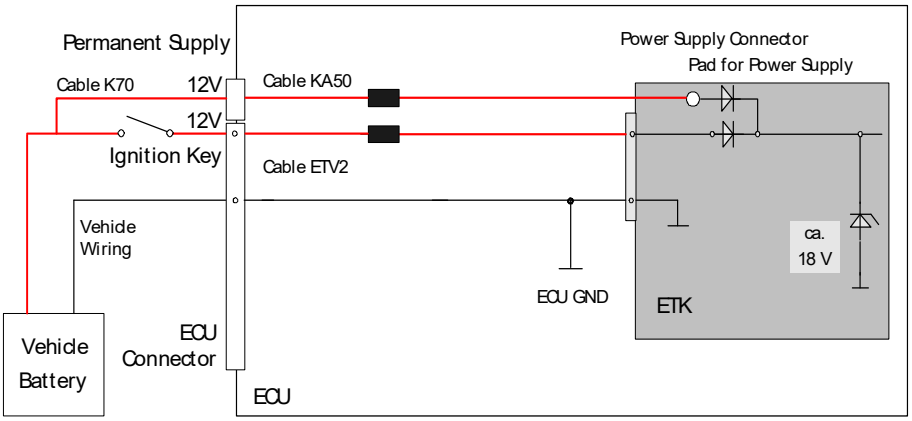

Fig. 5-4 Permanent Power Supply inside ECU not available

5.3.3 Isolated Power Supply inside ECU

The ETK-S6.0 does not require a galvanically isolated power supply. For special applications ETAS offers the isolated power supply ETP2.

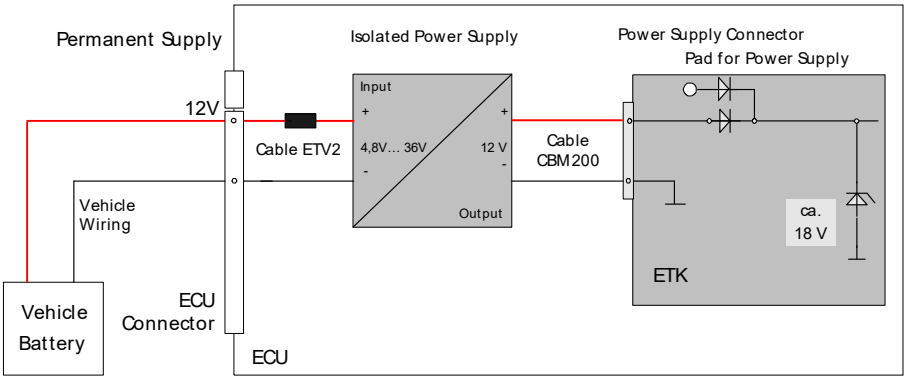

Fig. 5-5 Isolated Power Supply inside ECU

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 ETK-S6.0 Subtypes

The ETK-S6.0 contains two independently working subtypes ETK-S6.0A and ETK-S6.0B.

The "ETK Configuration Tool" supports the user to switch between the both subtypes of the ETK-S6.0 by using the menu

Hardware > Functions > ChangeSubType

Within INCA the ETK_CFG string in the A2l file will result in automatically setting the right subtype.

6.4 Configuration Parameter

The configuration of the ETK-S6.0 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.

6.4.1 Subtype ETK-S6.0A

In this setting the ETK-S6.0 uses the AUD interface to interface the microcontroller.

- Microcontroller (SH72544, SH72544R, SH72546RFCC, SH72567BFCC)

  The memory layout of these microcontrollers differs significantly, so the ETK Configuration Tool needs know which one is used.

- 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.

  – Use Fixed Memory (Yes, No)

    The default value is "No".
    The default value is the normal usage of the emulation regions as separate data regions. With this feature the emulation region of the microcontroller can be used as one single emulation memory block. This can be useful to have particular memory maps supported.
    Please note that there are further restrictions when using the Fixed Memory Mode, like there is only one Data region allowed and it needs to have at least a size of 2 emulation regions (128 KByte). The block can only start on a 128 KByte alignment border. A further restriction is that Fixed Memory Mode will not operate together with Limited Emulation Ram Toolbox, but in case of Fixed Memory Mode all Calibration Variables defined in the A2l must be within this single emulation memory.

  – 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
    (5.0 V:
    thresholds Low > High = 3.15 V, High > Low = 3.50 V,
    3.3 V:

thresholds Low > High = 2.33 V, High > Low = 2.68 V,
3.3 V:
thresholds Low > High = 2.55 V, High > Low = 2.90 V)
The default value is "5.0 V".
The level for power voltage level supervision can be set here. To display the properties of the used voltage comparators the Low > High and High > Low thresholds are shown as well.
The "ETK Configuration Tool" window "ETK Control Panel" displays both power supply supervision states.

– ECU Standby RAM Power Supply Supervision Voltage Span
(Data retention CPU 2.0 V:
thresholds Low > High = 2.00 V, High > Low = 2.30 V,
Data retention CPU 2.7 V:
thresholds Low > High = 2.70 V, High > Low = 3.00 V)
The default value is "Data retention of CPU 2.7 V".
The level for the level supervision of the ECU RAM Standby can be set here. To display the properties of the used voltage comparators the Low > High and High > Low thresholds are shown as well.
– AUD Clock Speed (10 MHz and 20 MHz)
The default value is "20 MHz".
The ETK can operate with two AUD interface clock speeds. Please note that the performance of the measurement system and thus the number of variables that can be selected depends on the AUD clock speed. For best performance we recommend to use the default of 20 MHz.
– Trigger register polling rate (12 steps between 10 µs and 50 ms)
The default value is "50 µs".
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.
– Reset Delay (2 µs and 30 µs)
The default value is "2 µs".
This specifies if the microcontroller stays in reset longer than the actual reset signal is present. This information is important for the ETK to allow a proper handshake after reset allow an detection the ETK by the ECU.

6.4.2 Subtype ETK-S6.0B

In this setting the ETK-S6.0 uses the JTAG H-UDI interface to interface the microcontroller.

- Microcontroller (SH72531F, SH72531FCC, SH72533FCC)
The default value is "SH72531FCC".
The memory layout of these microcontrollers differs significantly, so the ETK Configuration Tool needs know which one is used.
- 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.

- Use Fixed Memory (Yes, No)

  The default value is "No".
  The default value is the normal usage of the emulation regions as separate data regions. With this feature the emulation region of the microcontroller can be used as one single emulation memory block. This can be useful to have particular memory maps supported.
  Please note that there are further restrictions when using the Fixed Memory Mode, like there is only one Data region allowed and it needs to have at least a size of 2 emulation regions (128 KByte). The block can only start on a 128 KByte alignment border. A further restriction is that Fixed Memory Mode will not operate together with Limited Emulation Ram Toolbox, but in case of Fixed Memory Mode all Calibration Variables defined in the A2l must be within this single emulation memory.
- 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

  (5.0 V:
  thresholds Low > High = 3.15 V, High > Low = 3.50 V,
  3.3 V:
  thresholds Low > High = 2.33 V, High > Low = 2.68 V,
  3.3 V:
  thresholds Low > High = 2.55 V, High > Low = 2.90 V)

  The default value is "5.0 V".
  The level for power voltage level supervision can be set here. To display the properties of the used voltage comparators the Low > High and High > Low thresholds are shown as well.
  The "ETK Configuration Tool" window "ETK Control Panel" displays both power supply supervision states.
- ECU Standby RAM Power Supply Supervision Voltage Span

  (Data retention CPU 2.0 V:
  thresholds Low > High = 2.00 V, High > Low = 2.30 V,
  Data retention CPU 2.7 V:
  thresholds Low > High = 2.70 V, High > Low = 3.00 V)

  The default value is "Data retention of CPU 2.7 V".
  The level for the level supervision of the ECU RAM Standby can be set here. To display the properties of the used voltage comparators the Low > High and High > Low thresholds are shown as well.
- Key Code

  The microcontrollers are equipped with a protection mechanism that allows access via JTAG H-UDI only if the right key code is used by the ETK. The key code can be specified within the "ETK Configuration Tool" window "ETK Hardware".
  We recommend to program the ECU with "0xFFFF FFFF FFFF FFFF" as key code. In this case the ECU accepts any key code.

7 Technical Data

This chapter contains information about the following topics:

NOTE

The ETK-S6.0 can be shipped in the mechanical versions revision A and revision B. Both ETK-S6.0 versions have the same features, functions and technical data.

7.1 System Requirements

This section tells you which hardware and software are needed to operate your ETK-S6.0 and which microcontrollers are supported.

7.1.1 ETAS Hardware

VME Hardware: ES1000.2/ES1000.3 with ES1232

Compact Hardware: ES590, ES591, ES592, ES595 and ES910

7.1.2 PC with one Ethernet Interface

A PC with one open Ethernet interface (1 Gbit/s) with RJ-45 connection is required to connect the ETAS module. Ethernet interfaces that are implemented with an additional network card in the PC must feature a 32-bit data bus.

7.1.2.1 Requirement to ensure successful Initialization of the Module

NOTE

It is imperative you disable the function which automatically switches to power-saving mode on your PC network adapter when there is no data traffic on the Ethernet interface!

To deactivate the Power saving Mode

Choose in Windows System Control Center / Device Manager / Network Adapter the used network adapter by double-click. Deactivate the "Allow the computer to turn off this device to save power" option in the "Power Management" register. Confirm your configuration.

The manufacturers of network adapter have different names for this function.

Example:

- "Link down Power saving"
- "Allow the computer to turn off this device to save power"

7.1.3 Software

You need following software versions to support the ETK-S6.0:

Micro-controller	HSP	INCA	ETK Drivers and Tools	ASCET-RP	INTECRIO
SH72544 [1)]	V5.1.0	V6.1.0	n.a.	V5.6.0	V2.1
SH72544R [1)]	V7.1.0	V6.2.1	V2.1.0	V6.0.1	V3.1
SH72546RFCC [1)]	V5.1.0	V6.1.0	V1.1.0	V5.6.0	V2.1
SH72567BFCC [1)]	V7.1.3	V6.2.1	V2.1.13	V6.0.1	V3.1
SH72531F [2)]	V7.1.3	V6.2.1	V2.1.2	V6.0.1	V3.1
SH72531FCC [2)]	V7.1.3	V6.2.1	V2.1.2	V6.0.1	V3.1
SH72533FCC [2)]	V7.1.3	V6.2.1	V2.1.11	V6.0.1	V3.1

[1)]: with ETK-S6.0, configuration type A
[2)]: with ETK-S6.0, configuration type B

Operating the ETK-S6.0 with older software versions is not possible.

The configuration instructions for the ETK-S6.0 under INCA, ASCET-RP or INTECRIO are contained in the relevant software documentation.

7.2 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

7.3 Power Supply

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	I_{STBY}	U_{Batt} = 12 V; ECU off; T = 20 °C	0.1	10	20	mA
Operating Current	I_{Batt}	U_{Batt} = 12 V; ECU on; T = 20 °C	20	60	100	mA

1) The ETK-S6.0 implements reverse voltage protection in the same range and may be used only with central load dump protection.

7.4 Memory

7.4.1 Data Emulation Memory

Microcontroller	Characteristics
SH72546RFCC [1], SH72531FCC [2], SH72533FCC [2], SH72567BFCC [1]	ETK-S6.0 can be used to perform measurement and calibration. Internal overlay RAM of the micrcocontroller is used to emulate data in internal Flash.
	max. 512 kByte (as working page)
	Standby powered
SH72544 [1], SH72544R [1], SH72531F [2]	ETK-S6.0 can be used to perform measurement only. Calibration is not possible due to the lack of emulation memory in these controllers.
	Standby powered

[1]: with ETK-S6.0, configuration type A
[2]: with ETK-S6.0, configuration type B

7.4.2 Measurement Data Memory

Item	Characteristics
Location	Within the emulation memory when using DISTAB13 hooks

7.5 Configuration

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

7.6 Serial ETK Interface for Application System

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

7.7 Testcharacteristics

Parameter	Symbol	Condition	Min	Typ	Max	Unit
Reset delay 1 [1)]	t_{Reset1}	U_{Batt} = 12 V USG = 0 V ↑ 3.3 V without transferring FPGA	29		40	ms
Reset delay 2 [2)]	t_{Reset2}	U_{Batt} = 0 V ↑ 12 V transfer FPGA	100		240	ms
AUD-II interface clock [3)]				20/10		MHz
JTAG interface clock [4)]				20		MHz
JTAG interface clock [5)]					20 [6)]	MHz

[1)]: Delay of ECU reset through ETK without transferring the FPGA (U_{Batt} present, USG will be switched on)
[2)]: max. delay of ECU reset through ETK (U_{Batt} and USG will be switched on)
[3)]: configurable
[4)]: generated by ETK if ETK is operating in H-UDI mode (configuration B)
[5)]: for attached debugger
[6)]: must be less than periphal clock PΦ

7.7.1 ECU Interface Characteristics

Parameter	Symbol	Condition [1]	Min	Typ	Max	Unit
ECU Power Supply Supervision Voltage (3.3 V, treshold Low -> High = 2.33 V, treshold High -> Low = 2.68 V selected)	USG	USG ↑	2.48	2.58	2.68	V
		USG ↓	2.33	2.43	2.53	V
	I_{USG}	USG = 2.68 V			102	µA
ECU Power Supply Supervision Voltage (3.3 V, treshold Low -> High = 2.55 V, treshold High -> Low = 2.90 V selected)	USG	USG ↑	2.7	2.8	2.9	V
		USG ↓	2.55	2.65	2.75	V
	I_{USG}	USG = 2.90 V			110	µA
ECU Power Supply Supervision Voltage (5.0 V selected)	USG	USG ↑	3.3	3.4	3.5	V
		USG ↓	3.15	3.25	3.35	V
	I_{USG}	USG = 3.5 V			133	µA
ECU Standby RAM Supervision Voltage (Data Retention CPU 2.0 V selected)	USTBY	USTBY ↑	2.1	2.2	2.3	V
		USTBY ↓	2.0	2.1	2.2	V
	I_{USTBY}	USTBY = 2.3 V			88	µA
ECU Standby RAM Supervision Voltage (Data Retention CPU 2.7 V selected)	USTBY	USTBY ↑	2.8	2.9	3.0	V
		USTBY ↓	2.7	2.8	2.9	V
	I_{USTBY}	USTBY = 3.0 V			115	µA

1):
USG ↑: ECU Power Supply off → ECU Power Supply on
USG ↓: ECU Power Supply on → ECU Power Supply off
USTBY ↑: ECU Standby RAM Power off → ECU Standby RAM Power on
USTBY ↓: ECU Standby RAM Power on → ECU Standby RAM Power off

7.8 Electrical Characteristics

7.8.1 ECU Interface Connector CON1

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 [2] [µA]	Additional Load by ETK (typ) [1] [pF]
TDI, /TRST	O	2.3	3.3	-	-	-	-225	20
TMS, TCK	O	2.3	3.3	-	-	-	+2400	20
TDO	I			0.7	1.7	4.1	-15	15
ASEMD, AUDMD, AUDCK	O	2.3	3.3	-	-	-	-10	10
/BRKOUT, /ASEBRKAK	I	-	-	0.7	1.7	4.1	-230	10
AUDATA[3...0] [3]	I/ O	2.75	3.3	0.7	1.7	4.1	-20	10
AUDATA[3...0] [4]	I/ O	2.40	3.3	0.7	1.7	4.1	-100	10
/AUDRST	O	2.3	3.3	-	-	-	-150	12
/RES	I/O [5]	-	-	0.7	1.7	4.1	-10	40

[1] Adapter cable and Samtec connector not considered; PCB 1 pF/cm
[2] at USG = 3.0 V (USG configured at 3.3 V)
[3] at /RES = Low
[4] at /RES = High
[5] Open Drain FET; I_{Dmax} = 0.2 A, $V_{OL(max)}$ = 0.45 V

7.8.2 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 [2] [µA]	Additional Load by ETK (typ) [1] [pF]
TMS, TCK	I	-	-	0.7	1.7	4.1	+495	20
TDI	I	-	-	0.7	1.7	4.1	-225	20
/TRST	I	-	-	0.7	1.7	4.1	-495	25
TDO	O	2.3	3.3	-	-	-	-225	10
AUDCK, /ASEBRKAK	O	2.3	3.3	-	-	-	-10	10
/DETECT	I	-	-	0.7	1.7	4.1	-240	10

[1] Adapter cable and Samtec connector not considered; PCB 1 pF/cm
[2] at USG = 3.0 V (USG configured at 3.3 V)

7.9 Pin Assignment

7.9.1 ECU Interface Connector CON1 (ETK-S6.0 Configuration A)

Pin	Signal	Direction	Comment
A1	/AUDSYNC	Out	AUD-II signal
A2	/ASCBRKAK	In	Debugger break signal
A3	NC		Not connected
A4	AUDCK	Out	AUD-II clock signal
A5	TDO	In	JTAG signal
A6	TMS	Out	JTAG signal
A7	TCK	Out	JTAG signal
A8	TDI	Out	JTAG signal
A9	USGSTBY (Sense)	In	Comparator input Standby (permanent) power supply of ECU RAMs
A10	/TRST	Out	JTAG signal
A11	ASEMD	Out	Control signal
A12	AUDMD	Out	AUD-II signal
A13	USG (Sense)	In	Comparator Input Switched power supply of ECU (ignition)
B1	AUDATA3	Bidir	Data Acquisition Interrupt Line 4
B2	AUDATA2	Bidir	Data Acquisition Interrupt Line 3
B3	AUDRST	Out	AUD-II Reset signal
B4	GND		
B5	GND		
B6	GND		
B7	GND		
B8	GND		
B9	GND		
B10	/RES	Bidir	ECU Reset signal (open drain) for Reset assertion and Reset detection Switched Pull-Down, 3.3 V tolerant
B11	AUDATA1	Bidir	Data Acquisition Interrupt Line 2
B12	AUDATA0	Bidir	Data Acquisition Interrupt Line 1
B13	NC		Not connected

7.9.2 ECU Interface Connector CON1 (ETK-S6.0 Configuration B)

Pin	Signal	Direction	Comment
A1	Reserved		
A2	/ASEBRKAK		Feed-through to debugger
A3	NC		Not connected
A4	Reserved		
A5	TDO	In	JTAG signal
A6	TMS	Out	JTAG signal
A7	TCK	Out	JTAG signal
A8	TDI	Out	JTAG signal
A9	USGSTBY (Sense)	In	Comparator input Standby (permanent) power supply of ECU RAMs
A10	/TRST	Out	JTAG signal
A11	ASEMD	Out	Control signal
A12	Reserved		
A13	USG (Sense)	In	Comparator Input Switched power supply of ECU (ignition)
B1	AUDATA3	Bidir	Data Acquisition Interrupt Line 4 (optional)
B2	AUDATA2	Bidir	Data Acquisition Interrupt Line 3 (optional)
B3	Reserved		
B4	GND		
B5	GND		
B6	GND		
B7	GND		
B8	GND		
B9	GND		
B10	/RES	Bidir	ECU Reset signal (open drain) for Reset assertion and Reset detection Switched Pull-Down, 5 V tolerant
B11	AUDATA1	Bidir	Data Acquisition Interrupt Line 2 (mandatory)
B12	AUDATA0	Bidir	Data Acquisition Interrupt Line 1 (mandatory)
B13	NC		Not connected

7.9.3 Power Supply Connector CON2

Fig. 7-1 Power Supply Connector CON2 (left: Rev. A, right: Rev. B)

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

7.9.4 Debug Interface Connector CON5

Pin	Signal	Description
1	TMS	TMS to target
2	USG	Target supply for sensing
3	TDO	TDO from target
4	GND	Signal Ground
5	AUDCK	AUD-II clock
6	GND	Signal Ground
7	TDI	TDI to target
8	/RES	/Reset to target
9	/TRST	/TRST to target
10	/ASEBRKAK	/Break signal from target
11	TCLK	TCLK to target
12	GND	Signal Ground
13	NC	Not connected
14	/DETECT	Debugger detect signal
15	NC	Not connected
16	Reserved3	

7.10 Mechanical Dimensions

The reference measure for all drawings is millimeter.

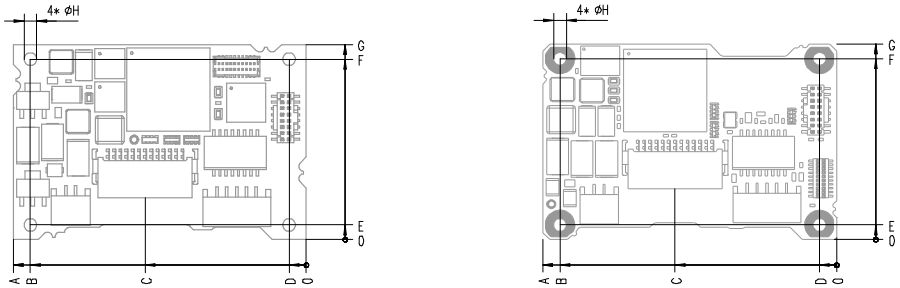

Fig. 7-2 ETK-S6.0 Dimensions - Top View (left: Rev. A, right: Rev. B)

Dimension	Millimeters	Inches	Dimension	Millimeters	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

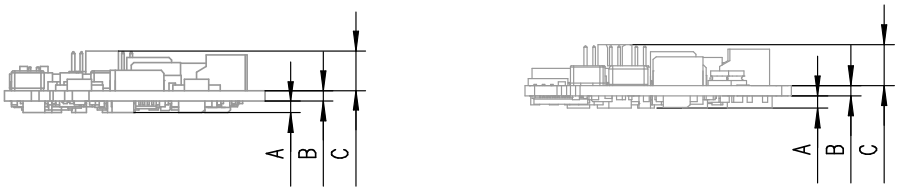

Fig. 7-3 Mechanical Dimensions ETK-S6.0: Microcontroller with Socket Adapter mounted

Dimension	Millimeters	Inches
A	2.00	0.079
B	1.70	0.067
C	6.10	0.240

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.

Interface Cable KA54, Proposal 1

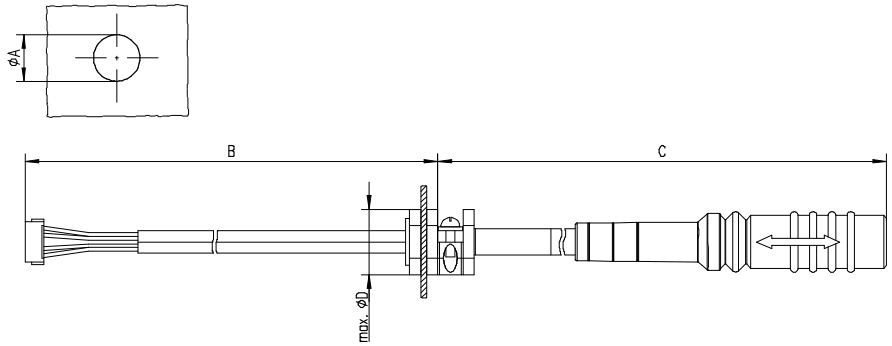

Fig. 8-1 Interface Cable KA54, Proposal 1

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

Interface Cable KA54, Proposal 2

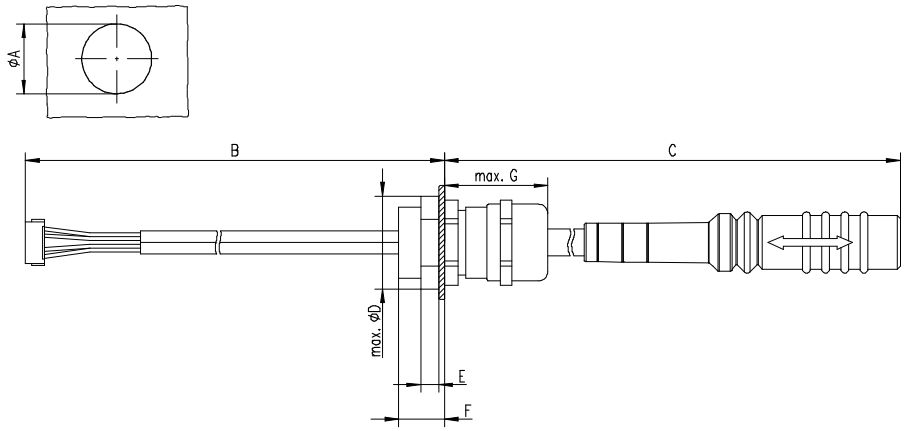

Fig. 8-2 Interface Cable KA54, Proposal 2

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 KA41

NOTE

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

Cable KA41, Proposal 1

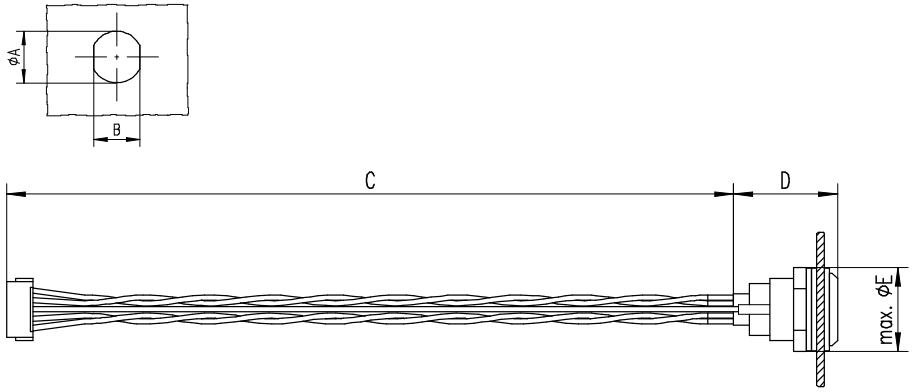

Fig. 8-3 Interface Cable KA41, Proposal 1

Dim	Millimeters	Inches
A	13.90	0.547
B	12.30	0.484
C	140.00	5.512
D	20.00	0.787
E	16.20	0.636

NOTE

Shield not connected to ECU housing.

Cable KA41, Proposal 2

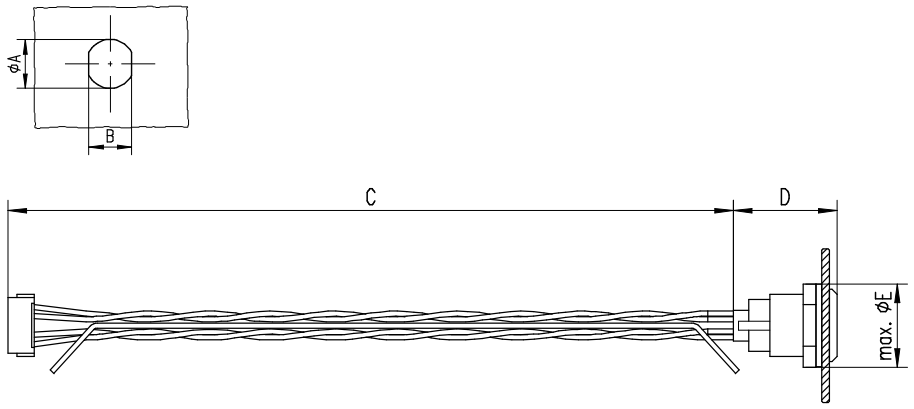

Fig. 8-4 Interface Cable KA41, Proposal 2

Dim	Millimeters	Inches
A	12.10	0.476
B	10.60	0.417
C	140.00	5.512
D	20.00	0.787
E	16.20	0.636

NOTE

Shield connected *to ECU housing.*

8.1.3 Cable KA55

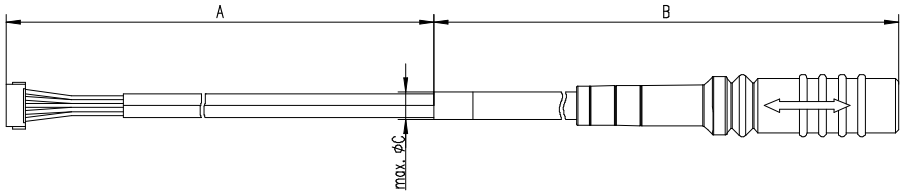

Fig. 8-5 Interface Cable KA55

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.

8.1.4 Cable CBAM200

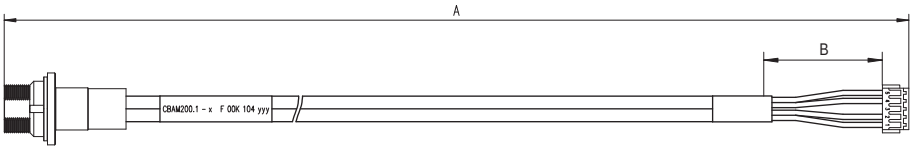

Fig. 8-6 Interface Cable CBAM200-0m38

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

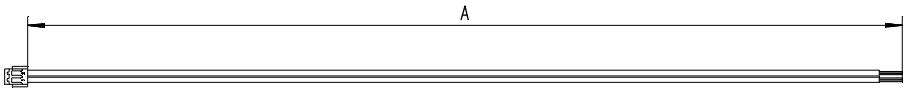

Fig. 8-7 Power Supply Cable ETV

Dim	Millimeters	Inches
A	190.00	7.480

8.2.2 Cable with Filtercoil ETV2

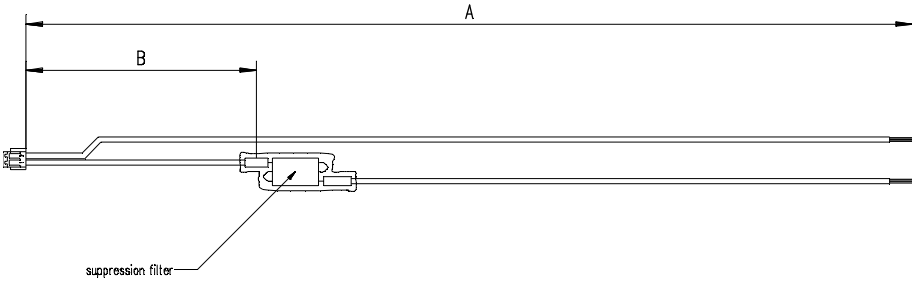

Fig. 8-8 Power Supply Cable with Filtercoil ETV2

Dim	Millimeters	Inches
A	190.00	7.480
B	50.00	1.969

8.2.3 Cable K70

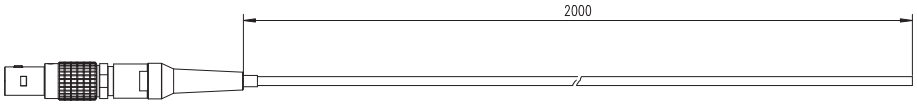

Fig. 8-9 Power Supply Cable K70

Dim	Millimeters	Inches
A	2000	78.74

8.2.4 Cable KA50

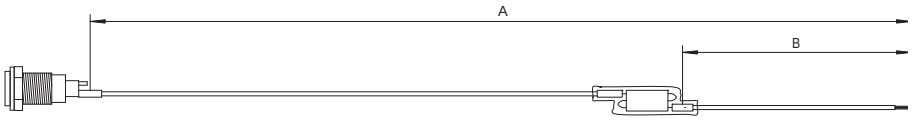

Fig. 8-10 Power Supply Cable KA50

Dim	Millimeters	Inches
A	200	7.87
B	50	1.97

8.2.5 Cable CBM200

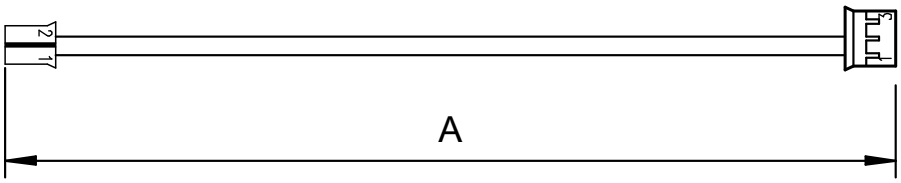

Fig. 8-11 Power Supply Cable CBM200

Dim	Millimeters	Inches
A	100	3.94

8.3 Adapters

8.3.1 ETK - ECU Adapter ETAF1

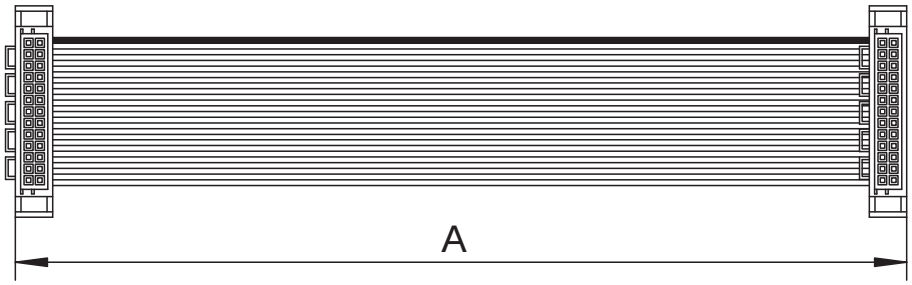

Fig. 8-12 ETK - ECU Adapter ETAF1

Dim	Millimeters	Inches
A	100.00	3.94

8.3.2 Debug Adapter ETAF6

8.3.2.1 ETAF6 Flatcable

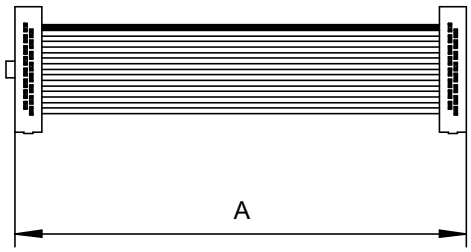

Fig. 8-13 ETAF6 Flatcable

Dim	Millimeters	Inches
A	50.80	2.00

8.3.2.2 ETAF6 PCB

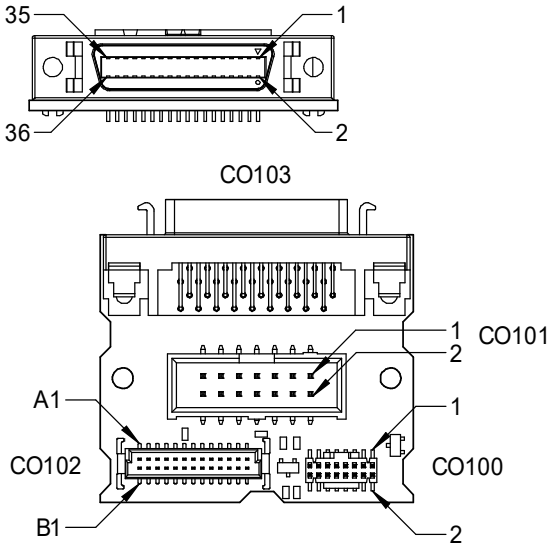

Fig. 8-14 ETAF6 - Mechanical Dimensions and Component Placement

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

9 Ordering Information

9.1 ETK-S6.0

Order Name	Short Name	Order Number
ETK-S6.0 Emulator Probe for the Renesas AUD-II and H-UDI Debug Interface	ETK-S6.0	F 00K 104 790

Package Contents

ETK-S6.0 Emulator Probe for the Renesas AUD-II and H-UDI Debug Interface
- List "Content of this Package"
- ETK Safety Advice
- China-RoHS-leaflet_Compact_cn

9.2 Connector ECU - ETK Adapter ETAF1

Connectors are available from local ERNI distributers.

Type	Order-No.	Note
	064320	26 pin ERNI-Connector

9.3 Adapters

Type	Order-No.	Note
ETAF1	F00K 001 373	ETK Adapter with 26 pin ERNI-Plug

9.4 Debug Adapters

Type	Order-No.	Note
ETAF6	F00K 104 773	Debug Adapter for Renesas SH72xx-Debugger to ETK

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 49 are not included in the ETK-S6.0 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	KA54	F 00K 001 302
ETK ECU Adapter Cable, Lemo 1B PHG JST PHR (4fc-5fc), 0m6	KA55	F 00K 001 303
ETK ECU Adapter Cable, Lemo 1B ENG - JST PHR (4fc-5fc), 0m14	KA41	Y 261 A24 729
ETK ECU Adapter Cable, Shield on ECU-housing, Lemo 1B HMG JST PHG (4fc-5fc), 0m130	CBAM200-0m130	F 00K 104 852
ETK ECU Adapter Cable, Shield on ECU-housing, Lemo 1B HMG JST PHG (4fc-5fc), 0m085	CBAM200-0m085	F 00K 104 312
ETK ECU Adapter Cable, Shield on ECU-housing, Lemo 1B HMG JST PHG (4fc-5fc), 0m115	CBAM200-0m115	F 00K 104 311

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

10 Contact Information

ETAS Headquarters

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Germany	Internet:	www.etas.com

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

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