ETK-T2.1
Emulator Probe for Infineon TC1792, TC1796/TC1796ED and TC1797/ TC1797ED

Data Sheet

Copyright

ETK-T2.1 R1.0.3 EN

Contents

1 General Information

The introductory chapter provides you with information on the basic safety instructions, returning the product and recycling, and how to use this manual.

1.1 Basic Safety Instructions

Please adhere to the following safety instructions to avoid injury to yourself and others as well as damage to the device.

1.1.1 Product Liability Disclaimer (ETAS Disclaimer)

WARNING!

The use and application of this product can be dangerous. It is critical that you carefully read and follow the instructions and warnings below and in the associated user manuals.

This ETAS product enables a user to influence or control the electronic systems in a vehicle or in a testbench. THE PRODUCT IS SPECIFICALLY DESIGNED FOR THE EXCLUSIVE USE BY PERSONNEL WHO HAVE SPECIAL EXPERIENCE AND TRAINING.

Improper use or unskilled application of this ETAS product may alter the vehicle performance or system performance in a manner that results in death, serious personal injury or property damage.

- **Do not use this ETAS product if you do not have the proper experience and training.**
- **Also, if a product issue develops, ETAS will prepare a Known Issue Report (KIR) and post it on the internet. The report includes information regarding the technical impact and status of the solution. Therefore you must check the KIR applicable to this ETAS product version and follow the relevant instructions prior to operation of the product.**

  The Known Issue Report (KIR) can be found here:

  http://www.etasgroup.com/kir
- **Any data acquired through the use of this ETAS product must be verified for reliability, quality and accuracy prior to use or distribution. This applies both to calibration data and to measurements that are used as a basis for calibration work.**

- **When using this ETAS product with vehicle systems that influence vehicle behavior and can affect the safe operation of the vehicle, you must ensure that the vehicle can be transitioned to a safe condition if a malfunction or hazardous incident should occur.**
- **When using this ETAS product with test-bench systems that influence system behavior and can affect the safe operation of the system, you must ensure that the test-bench can be transitioned to a safe condition if a malfunction or hazardous incident should occur.**
- **All legal requirements, including regulations and statutes regarding motor vehicles and test-benches, must be strictly followed when using this product.**
- **It is recommended that in-vehicle use of the ETAS product be conducted on enclosed test tracks.**
- **Use of this ETAS product on a public road should not occur unless the specific calibration and settings have been preciously tested and verified as safe.**

IF YOU FAIL TO FOLLOW THESE INSTRUCTIONS, THERE MIGHT BE A RISK OF DEATH, SERIOUS INJURY OR PROPERTY DAMAGE.

THE ETAS GROUP OF COMPANIES AND THEIR REPRESENTATIVES, AGENTS AND AFFILIATED COMPANIES DENY ANY LIABILITY FOR THE FUNCTIONAL IMPAIRMENT OF ETAS PRODUCTS IN TERMS OF FITNESS, PERFORMANCE AND SAFETY IF NON-ETAS SOFTWARE OR MODEL COMPONENTS ARE USED WITH ETAS PRODUCTS OR DEPLOYED TO ACCESS ETAS PRODUCTS. ETAS PROVIDES NO WARRANTY OF MERCHANTABILITY OR FITNESS OF THE ETAS PRODUCTS IF NON-ETAS SOFTWARE OR MODEL COMPONENTS ARE USED WITH ETAS PRODUCTS OR DEPLOYED TO ACCESS ETAS PRODUCTS.

THE ETAS GROUP OF COMPANIES AND THEIR REPRESENTATIVES, AGENTS AND AFFILIATED COMPANIES SHALL NOT BE LIABLE FOR ANY DAMAGE OR INJURY CAUSED BY IMPROPER USE OF THIS PRODUCT. ETAS PROVIDES TRAINING REGARDING THE PROPER USE OF THIS PRODUCT.

If you cannot agree with these limitations, you may return this product free of charge within a (1) month after receipt. You will immediately be refunded the full purchase price. A return is not possible in case of developments, modifications or services ordered by customer.

1.1.2 Correct Use

ETAS GmbH cannot be made liable for damage which is caused by incorrect use and not adhering to the safety instructions.

1.1.3 Labeling of Safety Instructions

The safety instructions contained in this manual are shown with the standard safety symbol shown in Fig. 1-1.

Fig. 1-1 Standard Safety Symbol

The following safety instructions are used. They provide extremely important information. Please read this information carefully.

WARNING!

Indicates a possible medium-risk danger which could lead to serious or even fatal injuries if not avoided.

CAUTION!

Indicates a low-risk danger which could result in minor or less serious injury or damage if not avoided.

1.1.4 Demands made re the Technical State of the Product

The following requirements are made to ensure safe operation of the module:

- Ensure you observe the notes on environmental conditions (see section 6.2 on page 44).
- Ensure you adhere to the port and setting values (see section 6.3 on page 44).

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!

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!

Potential equalization in the vehicle over the shield of the Ethernet connecting cables of modules may occur!
Mount the modules only to components with the same electrical potential or insulate the modules from the components.

1.2 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. 1-2 WEEE Symbol

The WEEE symbol (see Fig. 1-2 on page 10) 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 Program, contact the ETAS sales and service locations (see chapter 9 on page 67).

1.3 About This Manual

This manual describes the startup and technical data of the ETK-T2.1 Emulator Test Probe.

1.3.1 Structure

This manual consists of eight chapters and an index.

- **Chapter 1: “General Information”**

  The “General Information” (this chapter) provides you with information on the basic safety instructions, returning the product and recycling, and how to use this manual.

- **Chapter 2: "Introduction"**

  The chapter "Introduction" contains information about the basic features and applications of the ETK-T2.1 Interface Board (ETK = Emulator Test Probe), hints to system requirements for operating the ETK-T2.1, and other details.

- **Chapter 3: “Hardware Description”**

  In the "Hardware Description" chapter the function blocks and the interfaces of the ETK-T2.1 are explained in detail.

- **Chapter 4: “Installation”**

  The “Installation” chapter describes the hardware installation of the ETK-T2.1.

- **Chapter 5: “ETK Configuration”**

  The “ETK Configuration” chapter includes a description of important ETK-T2.1 configuration parameters.

- **Chapter 6: “Technical Data”**

  The “Technical Data” chapter contains a summary of all technical data and pin assignments of the ETK-T2.1.

- **Chapter 7: “Cables and Accessories”**

  The “Cables and Accessories” chapter contains an overview of the available cables and accessories.

- **Chapter 8: “Ordering Information”**

  The “Ordering Information” chapter contains the ordering information on the available cables and accessories.

The final chapter, “ETAS Contacts”, gives you information on ETAS’ international sales and service locations.

1.3.2 Using this Manual

Typographic Conventions

The following typographic conventions are used:

Bold	Device labels
Italics	Crucial text

Important notes for the user are shown as follows:

Note

Important note for the user.

2 Introduction

This section contains information about the basic features and applications of the ETK-T2.1 Interface Board (ETK = Emulator Test Probe), hints to system requirements for operating the ETK-T2.1, and other details.

2.1 Applications

The ETK-T2.1 is an emulator probe especially for the Infineon AUDO-NG TC1792/TC1796/TC1797 "series microcontroller" and TC1796ED/TC1797ED "emulation devices".

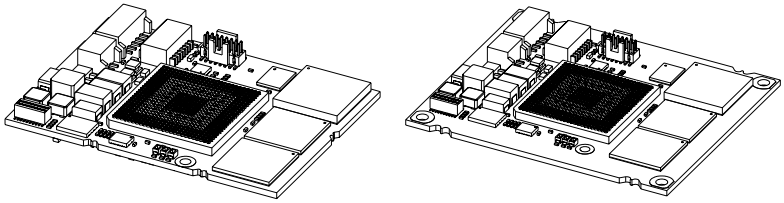

Fig. 2-1 ETK-T2.1A/ ETK-T2.1B (left) and ETK-T2.1C (right)

It is compatible with the ETAS calibration and development system interface (e.g. ES690, ES590, ES591, ES910 and ES1000.2/ES1000.3 with ES1232-A). Earlier systems (e.g. MAC2, ES1000.1 with ES1201 board) are not supported.

The ETK-T2.1 can be ordered in different functional and mechanical versions:

ETK-T2.1 Version	Brainded Flash Support	PCB with Mounting Holes	Directly soldered Microcontroller
ETK-T2.1A	No	No	No
ETK-T2.1B	Yes	No	No
ETK-T2.1C	Yes	Yes	No
ETK-T2.1D	No	No	Yes [1)]

[1)]: Microcontroller provided by customer

2.2 Features

- Applicable for AUDO-NG TriCore with external 32-bit bus
- Supports 32-, 16- and 8-bit access to the data emulation memory
- CPU bus interface voltage 2.5 V compatible (3.3 V tolerant)
- Two pages of data emulation/measurement data memory available, each with 1024 kByte

- Permanent storage of emulation data in flash memory
- Supports "Braindead Flash" function

  (only version ETK-T2.1B and ETK-T2.1C, refer to chapter 3.8 on page 22 and to chapter 8.1 on page 63)
- Provides a JTAG connector to adapt a debugger
- Serial interface with 100 MBit/s to the calibration and development system
- ETK chip select configuration bridge
- Permanent storage of configuration in EEPROM
- ECU flashing via ETK
- Firmware update (programming of the logic device) through software; removal of ETK or ECU not necessary.

For more technical data on the ETK-T2.1 consult the chapter "Technical Data" on page 37.

3 Hardware Description

In this chapter, the function blocks and the interfaces of the ETK-T2.1 are explained in detail.

3.1 ETK-T2.1 Versions

The ETK-T2.1 can be ordered in different functional and mechanical versions:

ETK-T2.1 Version	Brainded Flash Support	PCB with Mounting Holes	Directly soldered Microcontroller
ETK-T2.1A	No	No	No
ETK-T2.1B	Yes	No	No
ETK-T2.1C	Yes	Yes	No
ETK-T2.1D	No	No	Yes [1)]

[1)]: Microcontroller provided by customer

3.2 Architecture

Fig. 3-1 "ETK-T2.1 Architecture" shows the block diagram of the ETK-T2.1. The connection to the ECU is made by an BGA connector.

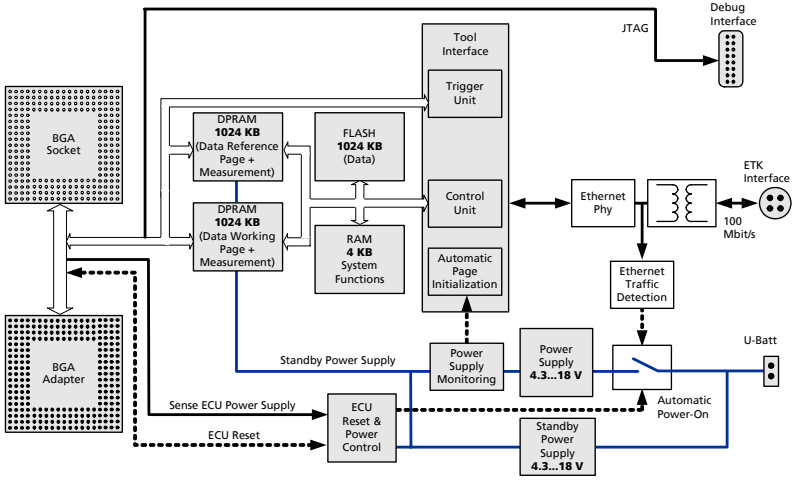

Fig. 3-1 ETK-T2.1 Architecture

The microcontroller can read via the BGA connector from one of the two pages of the data emulation memory and can write its data directly to the measurement data memory. These two memories (data emulation memory, measurement data memory) are using the same address space and are realized inside the same DPRs. Through the BGA connector the microcontroller can communicate with other external memories or peripheral components too. All microcontroller signals are accessible on the BGA connector.

While the microcontroller accesses the program data (not the program code) 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.

A flash memory is available for permanent storage of the adjusted parameters (program data).

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

The ETK-T2.1 uses a 3 V technology. The power supply for the ETK-T2.1 is provided by a switched power supply, to minimize power dissipation.

3.3 BGA Connector

The BGA connector interfaces the ETK-T2.1 with the ECU. All signals of the microcontroller are directly connected to the BGA connector. Also the clock signal must be provided through the connector to the microcontroller.

3.4 Microcontroller Interface

The whole microcontroller interface to the calibration and development system memories has a 32 bit wide data bus and uses only one chip select for read and write accesses.

The microcontroller can read and write its data directly from or to the data emulation and measurement data memory. Fig. 3-2 on page 17 and Fig. 3-3 on page 17 show an overview of the system with "on chip" Flash and RAM and external Flash and RAM memory. It also show the possibilities to access the different memories with its chip selects. The chip select of the data emulation and measurement data memory can be choosen (/CS1, /CS2, /CS3 or /CSCOMB) by soldering the respective bridge on the PCB (see 3.15 "Chip Select Configuration Bridge").

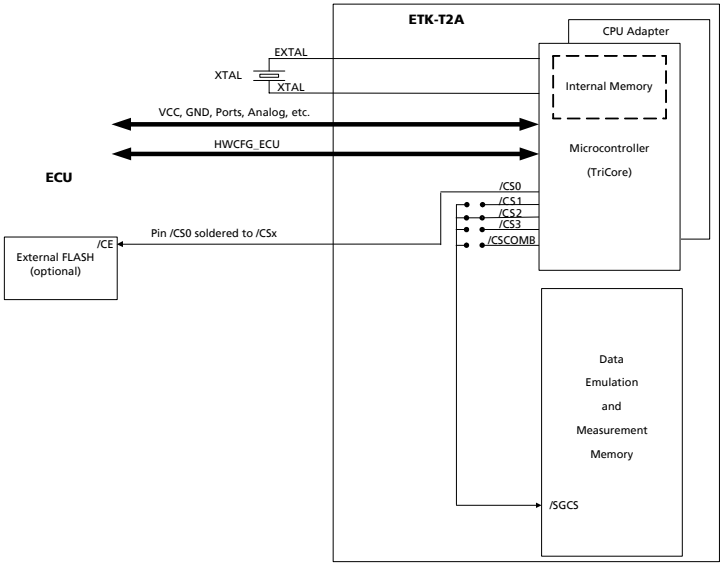

Fig. 3-2 ETK-T2.1A, ETK-T2.1D: internal and external Memory

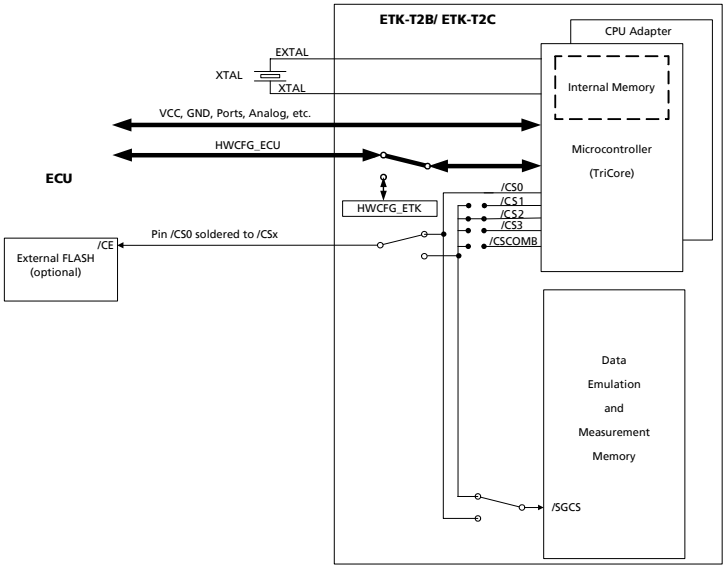

Fig. 3-3 ETK-T2.1B, ETK-T2.1C: internal and external Memory

3.5 Data Emulation and Data Measurement

The complete data emulation and measurement data memory consists of two 1024 kByte pages (Fig. 3-4 "Data Emulation and Measurement Data Memory: 2 Pages with 1024 kByte each"). The address range of the used chip select to address the data emulation and measurement memory must be 1024 kByte and it must be defined at a 1024 kByte boundary.

Data emulation memory and measurement data memory must be located inside this 1024 kByte address range. The segmentation of this address range between both memory parts is variable. The measurement data memory and data emulation memory can have variable size and offset addresses inside this fixed address range.

3.5.1 Data Emulation Memory

During operation of the ECU, only program data, not program code, can be modified by using the data emulation memory. Modification of program code would inevitably lead to a system crash. The program code is continuously processed out of the internal or external memory.

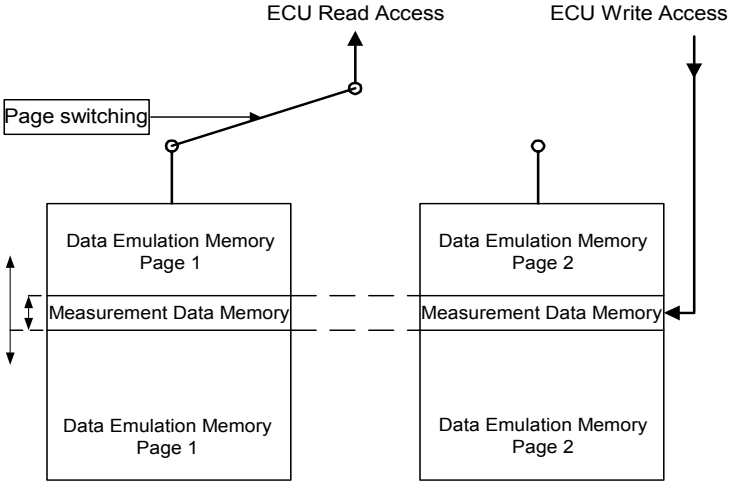

Fig. 3-4 Data Emulation and Measurement Data Memory: 2 Pages with 1024 kByte each

Reference data can be stored on one page ("Reference page") while the data on the other page ("Working page") can be modified. It is possible to switch between the two pages during operation through the application software.

3.5.2 Measurement Data Memory

The measurement data memory must be located within the address space of the data emulation and measurement data memory. It can have variable size.

The measured data stored here can be transferred to the calibration and development system via the serial ETK interface.

Note

Because there is no write protection of the data emulation memory possible, care must be taken not to override emulation data.

3.5.3 Triggering of Measurement Data Capture

The exact procedure for capturing measured data is explained in the documentation Display Tables 12 and 13; only the hardware-specific features are mentioned here. The ECU microcontroller initiates a data acquisition task by writing an arbitrary value to the trigger address at the so called trigger segment. The software of the ECU is able to start different data acquisition tasks by writing different trigger addresses (trigger 0 to trigger 31).

The ETK-T2.1 contains a trigger comparator which selects a segment of 256 Byte out of the measurement data memory address space (at a 256 Byte limit). This limit is known as the trigger segment address. Fig. 3-5 "Division of the 256 Byte Trigger Segment" shows the configuration of the 256 Byte trigger segment.

The ETK-T2.1 supports up to 32 direct hardware triggers by providing 32 trigger addresses within the trigger segment.

Note

The unused address areas within the trigger segment are reserved for future applications and must not be used for other purposes.

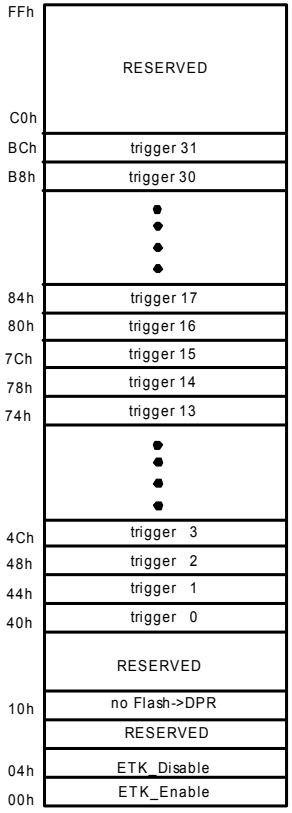

Fig. 3-5 Division of the 256 Byte Trigger Segment

3.5.4 Data Retention in Data Emulation Memory

The data emulation and measurement data memory physically consists of a static Dual Port RAM and is permanently supplied with power from the car battery, to guarantee that data is preserved even when the ignition is switched off. If the ECU with ETK is isolated from the battery, all data will be lost. For brief power interruptions, e.g. during a cold start procedure, buffering is guaranteed through capacitors for several milliseconds.

3.6 Data Flash Memory

Flash memory is provided on the ETK-T2.1 for permanent storage of emulation data. Users can copy the contents of the data emulation and measurement data memory into the flash memory using the operating software. It is recommended that an updated data set is always stored in the flash memory.

The ETK-T2.1 has a circuit which recognizes and stores power failures. If this circuit detects a longer power failure, and therefore a possible inconsistency of the emulation data, the ETK controller initiates a copying procedure Flash memory to DPR upon restart. The Flash memory data is copied to both emulation pages. A green LED on the ETK displays the procedure. The operating software announces the procedure by a message in the status line.

Note

The Flash memory on the ETK-T2.1 *only stores data which exists in the data emulation and measurement data memory of the* ETK-T2.1. *The program code is stored only in the ECU Flash memory.*

3.7 Code Flash Memory

The program code is not emulated by the ETK-T2.1. The program code is stored in the ECU Flash memory ("on chip" and/or external) and is not modified by the ETK-T2.1. Only the accessible emulation data areas are emulated by the ETK-T2.1. The ECU Flash memory can be programmed with the normal Flash memory programming tools.

3.8 Braindead Flashing (ETK-T2.1B and ETK-T2.1C)

Note

Only ETK-T2.1 versions ETK-T2.1B and ETK-T2.1C support the "Braindead Flash" function (refer to chapter 8.1 on page 63).

In order to support braindead flashing the ETK-T2.1B/ ETK-T2.1C provides the hardware prerequisites to allow booting the microcontroller from the ETK memory and making the flash accessible to the software while the microcontroller is running from the ETK memory. For braindead flashing it is required that the microcontroller boots from the ETK memory.

When braindead flashing is initiated, the first step is to force the ECU's microcontroller into a reset.

A valid boot programming code will be downloaded into the ETK-T2.1B/ ETK-T2.1C. The ETK drives the HWCFG input such that the ECU's microcontroller is configured to external boot. If the Reset signal is deactivated the microcontroller accepts the external Reset Configuration presented on HWCFG. The ECU's microcontroller boots from /CS0 (which is now the ETK CS) and executes the boot programming (recovery) code from the ETK memory (see Fig. 3-3 on page 17).

The external flash is mapped to the ETK Chip Select as set by solder bridge (see Fig. 3-11 on page 28).

The recovery program code accepts data via the ETK mailbox and programs it into the internal or external microcontroller flash. When flash programming is done, the microcontroller must be forced into reset again and the changes done before must be reverted. When reset is released next time, the microcontroller takes its Reset Configuration from the ECU and boots from the standard boot memory (i.e. internal or external Flash) to execute the recently programmed code.

3.9 ETK-T2.1 Deactivation

It can be necessary that the ETK is deactivated under certain operating conditions, e.g. when an inconsistent data set is detected.

Therefore, the microcontroller can put the ETK-T2.1 into a "switch-off" state. While the ETK is not physically deactivated in this state it pretends being switched off to the calibration system, thus preventing the calibration tool from accessing the ETK. This "switching on" or "switching off" action is accomplished by the ECU writing into specific location (see Fig. 3-5 on page 20) within the trigger segment of the ETK.

Through writing to the address ETK_Disable (trigger segment address + 0x04h) the "switching off" will be indicated. Through writing to the address ETK_Enable (trigger segment address) the reactivation of the ETK will be indicated. The data used during the write accesses are meaningless.

Note

These two addresses are not protected against accidental write access. Due to the fact that they belong to the trigger segment, they are allocated in the address space of the measurement data memory.

3.10 Reset

The requirement for ETK reset mechanism is to ensure that power-up and power-down behavior of ECU is clean and smooth and to prevent corruption of data stored in the ETK.

To accomplish this the ETK-T2.1 senses the SVDD of the ECU. 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 CAL tool (ES590/ ES591) unplugged. In addition, the ETK-T2.1 senses the status of the /HDRST line to generate a write protect signal for its memory. Finally, the ETK-T2.1 generates a reset signal by pulling /PORST to keep the ECU in reset while the ETK is in power save mode and to prevent the microcontroller from starting until the ETK is ready to work. The ETK is ready to work when it has finished its initialization after leaving power save mode or after initial power-up. This feature allows it also to reset the ECU under tool control (required for INCA and ProF) and to perform an emergency stop of the ECU in case of ETK failure.

3.11 Power Supply

The ETK-T2.1 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.

The ECU voltage (U_{SG}) is monitored by the ETK to recognize whether the ECU is switched on or off. 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 heat build-up. The power supply of the ECU is not affected by the ETK-T2.1. An automatic switch ensures that the power supply of the ETK-T2.1 is automatically switched on and off.

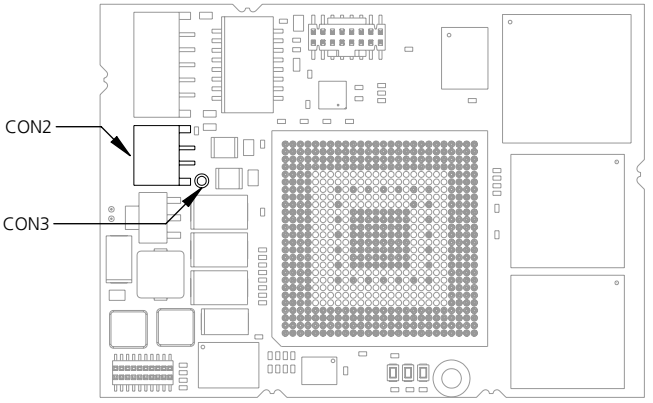

Fig. 3-6 Power Supply Connectors CON2 and CON3

The ETK-T2.1 can be supplied with power through the 2-pin power supply connector CON2. Additionally the through-hole solder pad CON3 can be used to connect a power supply U_{Batt2}. The power supply on CON3 must use the GND of CON2.

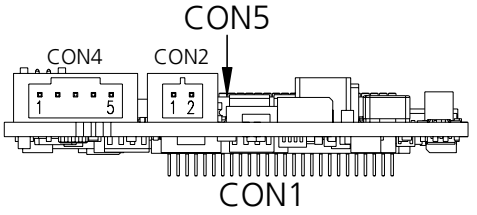

Fig. 3-7 Power Supply Connector CON2

3.12 Serial ETK Interface

The serial 100 MBit/s ETK-T2.1 interface creates the link to the calibration and development system. The ES1232-A plug-in board for the ES1000 high-end system and the ES690 will support the 100 Mbit/s interface.

The interface utilizes a 100Base-TX transmission to achieve an outstanding transmission performance of 100 MBit/s. It is not possible to use the old interface cable (for 8 MBit/s) with the new interface in the 100 MBit/s mode.

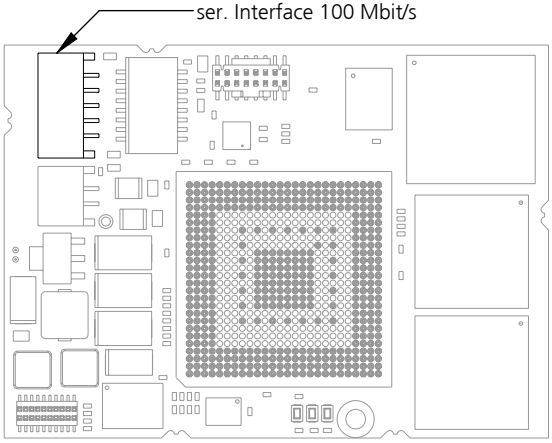

Fig. 3-8 Location of the Serial ETK Interface

3.13 Debug Interface

The ETK-T2.1 features a JTAG debugging interface connector (Samtec 16 pin).

Note

The ETK-T2.1D is delivered without a JTAG debugging interface connector.

This connector can be used to attach debug and trace tools (e.g. Lauterbach or PLS debugger for Infineon TC1792/TC1796).

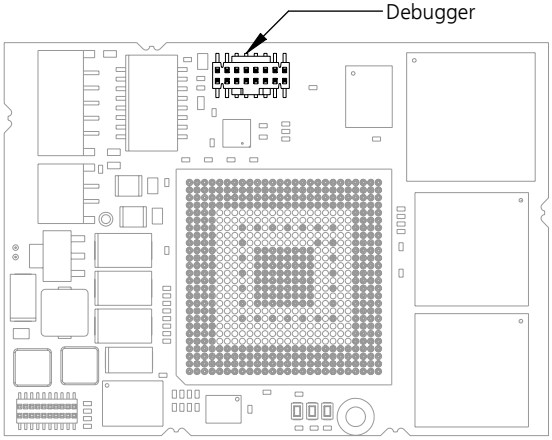

Fig. 3-9 Location of the Debugger Interface

For connecting the ETK-T2.1 to the debugger the ETK adapter ETAF5 (including ETAF5 PCB and ETAF5 flatcable) is required. Its needs to be ordered separately (refer chapter "Ordering Information" on page 63). A debugger specific cable has to be used to connect the debugger with the ETAF5 PCB.

3.14 Status LEDs

There are three LEDs displaying the operating status of the ETK-T2.1 (Fig. 3-10 on page 27).

LED	State	Meaning
Red	On	ETK-T2.1 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-T2.1)
Green	On	When the power supply voltage drops below 3.5 V, the data retention of the DPRs is not longer ensured. As soon as the ETK is switched on again, the content of the ETK-Flash will be copied into reference and working page RAM. The green LED stays lit until the calibration and development system copies new data into RAM.
	Off	Working page may be different to reference page. Working page and reference page may be different to the ETK-Flash.
Yellow	On	100 Mbit/s communication to calibration system established

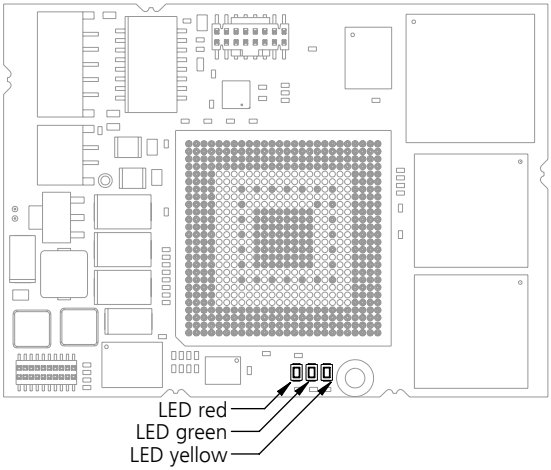

Fig. 3-10 Status LEDs

3.15 Chip Select Configuration Bridge

R108 to R111 are alternately assembled to select the ETK chip select signal.

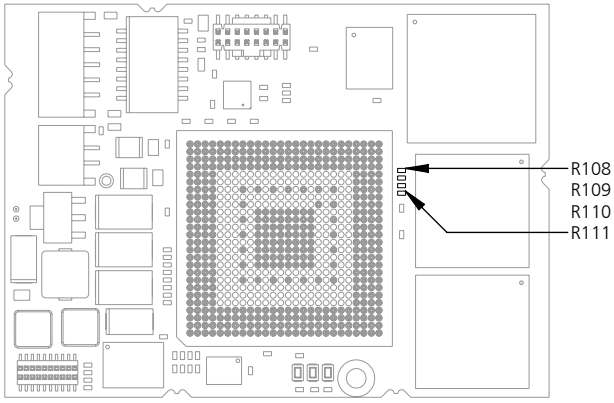

Fig. 3-11 Chip Select Configuration Bridge

Solder bridge	Meaning
R108	ETK-T2.1 uses /CS1
R109	ETK-T2.1 uses /CS2
R110	ETK-T2.1 uses /CS3
R111	ETK-T2.1 uses /CSCOMB

4 Installation

In this chapter, the hardware installation of the ETK-T2.1 is described.

CAUTION!

Some components of the interface board may be damaged or destroyed by electrostatic discharge. 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.

4.1 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 mounting the ETK-T2.1 on the ECU an Advanced Interconnect socket is required. It need to be ordered separately (refer chapter "Ordering Information" on page 63).

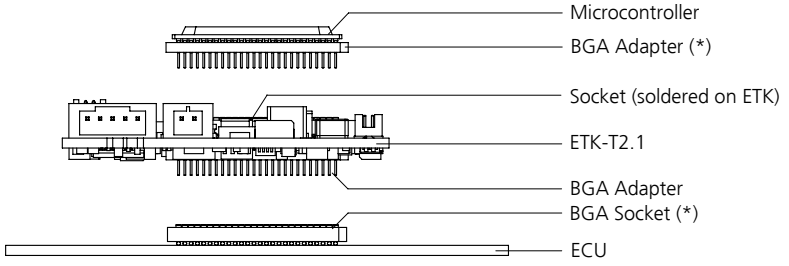

Fig. 4-1 ETK-T2.1 Connection to the ECU

The ETK-T2.1 board fitted with a "BGA adapter" connector allows connection and removal from an ECU development PCB which has been fitted with a compatible "BGA receiver" socket (see Fig. 4-1).

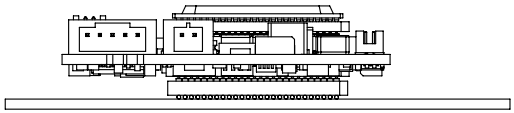

Fig. 4-2 ETK-T2.1 with Microcontroller mounted on ECU

4.2 Connection to the Debugger

For connecting the ETK-T2.1 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 75).

A debugger specific cable has to be used to connect the debugger with the ETAF5 PCB or ETAF9 PCB.

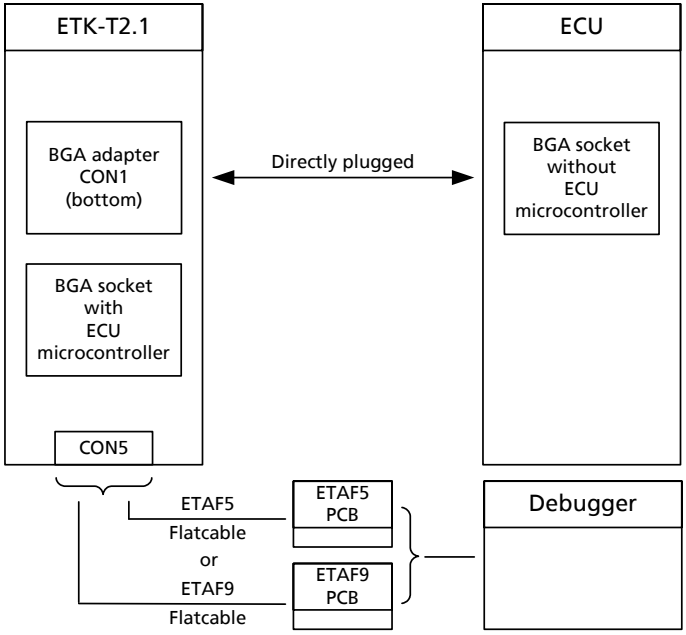

Fig. 4-3 ETK-T2.1 Connection to the ECU and to the Debugger

4.3 Connecting to the Power Supply

The ETK-T2.1 needs a permanent power supply (refer chapter "Power Supply" on page 24). There are different versions to ensure it.

4.3.1 Permanent Power Supply inside ECU available

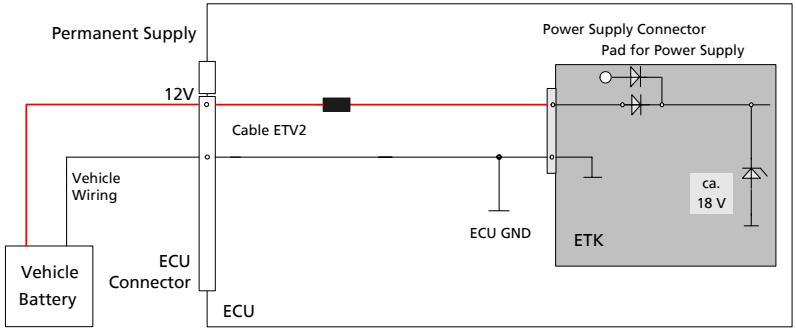

Fig. 4-4 Permanent Power Supply inside ECU available

4.3.2 Permanent Power Supply inside ECU not available

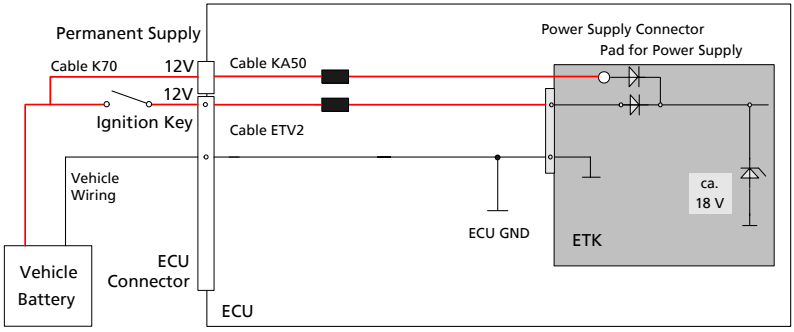

Fig. 4-5 Permanent Power Supply inside ECU not available

4.3.3 Isolated Power Supply inside ECU

The ETK-T2.1 does not require a galvanically isolated power supply. For special applications ETAS offers the isolated power supply ETP2.

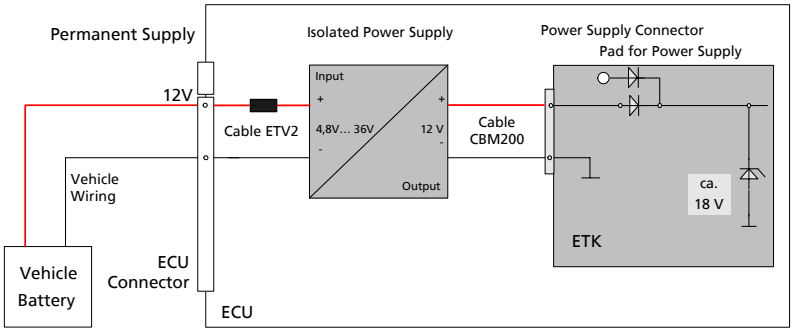

Fig. 4-6 Isolated Power Supply inside ECU

5 ETK Configuration

In this chapter, important configuration parameters of the ETK-T2.1 are described.

5.1 Overview

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

5.2 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:

1. 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.

2. Connection of the ETK to the ECU.

   The connection of the ETK to the ECU is defined by the ETK hardware.

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

1. Direct ETK configuration
2. Storage of the configuration in a data file
3. 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.

5.3 Configuration Parameter

The configuration of the ETK-T2.1 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:

- **BDF is supported by ETK Hardware** (Yes, No)

  The default value is "No".

  Some assembly variants of the ETK have the capability to flash an ECU even if the ECU does not contain any useful code (the ECU is "brain dead", Brain Dead Flashing). This feature can only be configured if no ETK is connected. As soon as an ETK is connected, the ETK Configuration Tool detects automatically if the connected variant supports BDF.

- **Exchange CS of ETK and Flash** (Yes, No)

  The default value is "No".

  During the flashing it is necessary that the ETK places its memory to the location where normally the flash is located. This allows to execute a program from the ETK memory which contains a boot loader. This reconfiguration is done during the flashing script.

- **ETK drive HWCFG[0:3] Signals** (Yes, No)

  The default value is "No".

  During flashing it is necessary that way the microcontroller boots is controlled by the ETK. This is done by driving the HWCFG signals.

Note

The above mentioned features make only sense during the reprogramming of the ECU Flash. In the script used for flashing the ETK gets reconfigured. For normal operation with INCA this settings are always set back to default to avoid unexpected behaviour of INCA.

- **ETK is used as** (ETK-T2.1, ETK-T2.0, ETK-T1.1, ETK-T1.0)

  The default value is "ETK-T2.1".

  The ETK-T2.1 can act as ETK-T2.0, ETK-T1.1 or ETK-T1.0.

  The ETK-T2.1 and the ETKT2.0 has more memory and additional features (like BDF for any versions) that are not available for ETK-T1.0 or ETK-T1.1. For projects which are using older INCA version the ETK-T2.1 and the ETK-T2.0 can act like one of the old ETKs without any changes in the PC software, but with only the capabilities of the old ETKs.

- **BDF is supported by ETK Hardware** (Yes, No)

  The default value (online) depends on used ETK.

  The default value (offline) is "No".
- **Exchange CS of ETK and FLASH** (Yes, No)

  The default value is "No".
- **HWCFG Signal Group** (HWCFG [3:0] for TC1796 or HWCFG [7:0] for TC1797, No)

  The default value is "No".
- **ETK drives HWCFG Signals** (boot mode depends on selected micro-controller, No)

  The default value is "No".

Note

The above mentioned features need not to be modified for normal operation of the ETK. They are only intended for the very experienced user and thus only visible when the extended mode in the options menu of the ETK Configuration mode is set.

6 Technical Data

6.1 ETK-T2.1 Versions

The ETK-T2.1 can be ordered in different functional and mechanical versions:

ETK-T2.1 Version	Brainded Flash Support	PCB with Mounting Holes	Directly soldered Microcontroller
ETK-T2.1A	No	No	No
ETK-T2.1B	Yes	No	No
ETK-T2.1C	Yes	Yes	No
ETK-T2.1D	No	No	Yes [1)]

[1)]: Microcontroller provided by customer

6.2 System Requirements

6.2.1 ETAS Hardware

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

Compact Hardware: ES690, ES590, ES591 (INCA)

Compact Hardware: ES910 (INTECRIO)

6.2.2 Software and supported Microcontrollers

The ETK-T2.1 is suited for ECU's with Infinion TriCore AUDO-NG microcontrollers. You need following software versions to support the ETK-T2.1:

Micro-controller	HSP	INCA	ETK Drivers and Tools	ASCET-RP	INTECRIO
TC1792	V5.0.0	V5.4 .0	n.a.	V5.4	V1.1
TC1796	V5.0.0	V5.4.0	n.a.	V5.4	V1.1
TC1796ED	V5.0.0	V5.4.0	n.a.	V5.4	V1.1

Micro-controller	HSP	INCA	ETK Drivers and Tools	ASCET-RP	INTECRIO
TC1797, TC1797ED [1)]	V5.0.0	V5.4.0	n.a.	V5.4	V1.1
TC1797, TC1797ED [2)]	V5.0.0	V6.1	V1.1.2	V5.4	V1.1

[1)] Operating measurement and calibration, no Braindead Flashing
[2)] Operating measurement, calibration, and Braindead Flashing

Operating the ETK-T2.1 with older software versions is not possible.

The ETK-T2.1 is suited for ECU's with Infinion TriCore AUDO-NG microcontrollers. You need following software versions to support the ETK-T2.1:

6.3 Environmental Conditions

Item	Characteristics
Temperature range	- 40 °C to +110 °C - 40 °F to +230 °F

6.4 Power Supply

Parameter	Symbol	Condition	Min	Typ	Max	Unit
Permanent power supply (car battery)	U_{Batt}		4.3	12	18	V
Standby current	I_{STBY}	U_{Batt} = 12 V; ECU off; T = 20 °C	1	10	30	mA
Operating current	I_{Batt}	U_{Batt} = 12 V; ECU on; T = 20 °C	20	60	110	mA
Power dissipation	P_{Batt}	U_{Batt} = 12 V; ECU on; T = 20 °C		0.72		W

6.5 Memory and Configuration

Item	Characteristics
Emulation Memory	Two memory pages with 1024 kB data memory each
Measured Memory	Within the Emulation Memory, free configurable
Flash Memory	1024 kB Flash (data)
Configuration	Project-specific; stored in EEPROM for different microcontrollers and memory configurations
Update	Logic devices updated through software

6.6 Serial ETK Interface

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

6.7 Microcontroller Bus Interface

Parameter	Symbol	Condition	Min	Typ	Max	Unit
ECU Supply Voltage - Power Detect	V_{DD}	ECU on	1.12	1.22	1.32	V
		ECU off	0.92	1.02	1.12	V
max. load	I_{DD}				0.1	mA
max. load V_{DDEBU}	I_{DDEBU}				2	mA

6.8 Testcharacteristics

Parameter	Symbol	Condition	Min	Max	Unit
Reset delay 1	t_{Reset1}	U_{Batt}=12 V U_{SG}= 0 V ↑ > 3.3 V without transferring Flash	29	40	ms
Reset delay 2	t_{Reset2}	U_{Batt}=12 V U_{SG}= 0 V ↑ 3.3 V with transferring Flash	79	100	ms
Reset delay 3	t_{Reset3}	U_{Batt1}=0 V ↑ 12 V transfer FPGA and Flash	310	350	ms

Note

t_{Reset1}: Delay of ECU reset through ETK without transferring the Flash (U_{Batt1} present, USG will be switched on)
t_{Reset2}: Delay of ECU reset through ETK with transferring the Flash (U_{Batt1} present, transfer active, USG will be switched on)
t_{Reset3}: max. delay of ECU reset through ETK (U_{Batt1} and USG will be switched on)

6.9 Electrical Characteristics

6.9.1 With Braindead Flashing (ETK-T2.1B and ETK-T2.1C)

Signal	Condition	Pin Type	V_{OL} (max) [V]	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)]
ADDR[1...0]		I	-	-	-	0.8	2	3.6	-10/+10	15
ADDR[19...2]		I	-	-	-	0.8	2	3.6	-30/+30	31
DATA[31..0]	ETK is not accessed	I	-	-	-	-	-	3.6	-1/+1	7
	ETK is accessed; I_{OH} = 4 mA; I_{OL} = 4 mA	I/O	0.4	2.2	2.9	0.8	2	3.6	-22/+22	40
/CS0	Used by ECU	I	-	-	-	-	-	3.6	-3/-3	24
	Used for ETK	I	-	-	-	0.8	2	3.6	-300/ -360	59
/CS[3..1], /CSCOMB	Used by ECU	I	-	-	-	-	-	-	-	1
	Used for ETK	I	-	-	-	0.8	2	3.6	-300/ -360	59
RD_/WR; /BC[3..0]		I	-	-	-	0.8	2	3.6	-30/+30	28

Signal	Condition	Pin Type	V_{OL} (max) [V]	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]
/RD		I	-	-	-	0.8	2	3.6	-680/ -710	34
HWCFG96[3..0]	CPU side activ; I_{OH} = 4 mA; I_{OL} = 4 mA	O	0.45	2.4	3.3	-	-	-	-	20
	ECU side activ	I	-	-	-	-	-	4.1	-1/+1	10
	inactiv	I	-	-	-	-	-	4.1	-12/+12	25
HWCFG97[7..0]	CPU side activ; I_{OH} = 4 mA; I_{OL} = 4 mA	O	0.45	2.4	3.3	-	-	-	-	25
	ECU side activ	I	-	-	-	-	-	4.1	-1/+1	10
	inactiv	I	-	-	-	-	-	4.1	-12/+12	30
/PORESET	I_{Dmax} = 0.2A	I/OD	0.4	-	-	0.8	2	3.6	-20/+20	40
/HDRESET		I	-	-	-	0.8	2	3.6	-10/+10	15

[1] CPU and plug not considered; PCB 1 pF/cm

6.9.2 Without Braindead Flashing (ETK-T2.1A)

Signal	Condition	Pin Type	V_{OL} (max) [V]	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)]
ADDR[1...0]		I	-	-	-	0.8	2	3.6	-10/+10	15
ADDR[19...2]		I	-	-	-	0.8	2	3.6	-30/+30	31
DATA[31..0]	ETK is not accessed	I	-	-	-	-	-	3.6	-1/+1	7
	ETK is accessed; I_{OH} = 4 mA; I_{OL} = 4 mA	I/O	0.4	2.2	3.3	0.8	2	3.6	-22/+22	40
/CS[3..0], /CSCOMB	Used by ECU	I	-	-	-	-	-	-	-	1
	Used for ETK	I	-	-	-	0.8	2	3.6	-300/ -360	36
RD_/WR; /BC[3..0]		I	-	-	-	0.8	2	3.6	-30/+30	28
/RD		I	-	-	-	0.8	2	3.6	-680/ -710	34
HWCFG96[3..0]		-	-	-	-	-	-	-	-	3
HWCFG97[7..0]		-	-	-	-	-	-	-	-	6

Signal	Condition	Pin Type	V_{OL} (max) [V]	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)]
/PORESET	I_{Dmax} = 0.2A	I/OD	0.4	-	-	0.8	2	3.6	-20/+20	40
/HDRESET		I	-	-	-	0.8	2	3.6	-10/+10	15

[1)] CPU and plug not considered; PCB 1 pF/cm

6.10 Switching Characteristics

The ETK-T2.1A, the ETK-T2.1B and the ETK-T2.1C have the same timing.

The following diagrams show the timings the ETK-T2.1 can process.

Para.	Description	Min	Max	Unit
t_1	Address access time		15	ns
t_2	Chip select access time		15	ns
t_3	Read access time		10	ns
t_4	Byte enable access time		10	ns
t_5	Data to Chip select hold time		8	ns
t_6	Data to Read hold time		8	ns
t_7	Data to Byte enable hold time		8	ns
t_{10}	Chip select setup to end of write	18		ns
t_{11}	Write pulse width	12		ns
t_{12}	Data setup to end of write	10		ns
t_{13}	Data hold from end of write	2		ns

Note

All timings are measured at a reference level of 1.5 V. Output signals are measured with 10 pF to ground and 50 Ω to 1.5 V.

6.10.1 Read Timing: Data Emulation and Measurement Data DPR

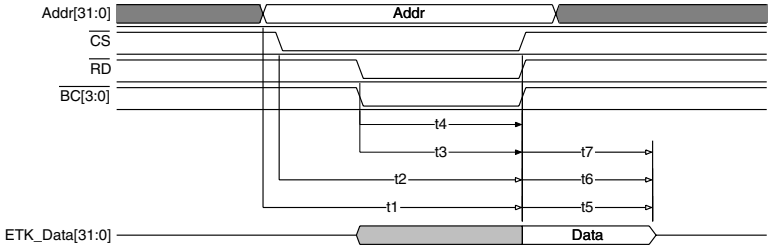

Fig. 6-1 Read Cyle: Data Emulation and Measurement Data DPR

6.10.2 Write Timing: Data Emulation and Measurement Data DPR

.

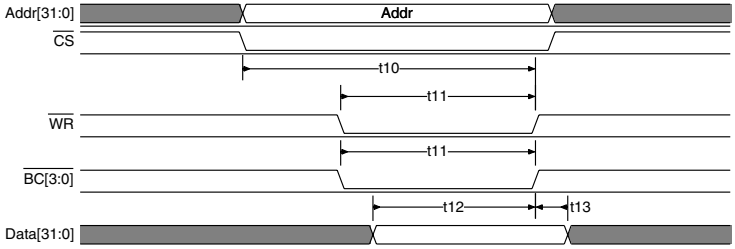

Fig. 6-2 Write Cycle: Data Emulation and Measurement Data DPR

6.11 Power Supply Connector CON2

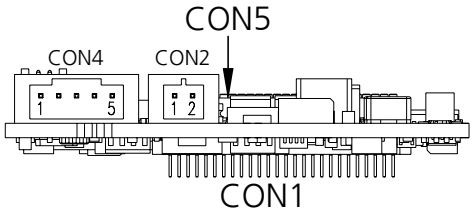

Fig. 6-3 Power Supply Connector CON2

Pin CON2	Signal	Description
1	U_{Batt1}	Battery Supply Voltage for ETK
2	GND	Ground

6.12 Mechanical Dimensions

The reference measure for all drawings is millimeter.

Dimensions	Millimeters	Inches
Thickness of PCB	1.70	0.067
Height of component (upper side)	5.50	0.217
Height of component (lower side)	2.00	0.079

6.12.1 ETK-T2.1A and ETK-T2.1B

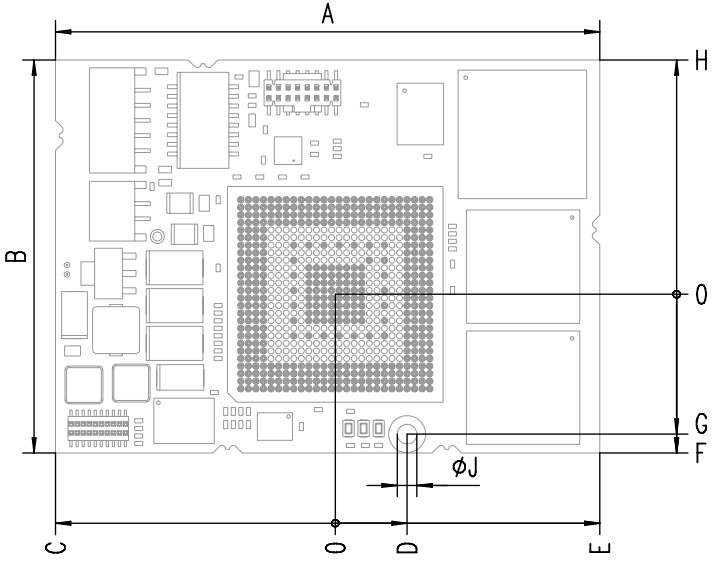

Fig. 6-4 ETK-T2.1A and ETK-T2.1B Dimensions - Top View

Dim	Millimeters	Inches	Dim	Millimeters	Inches
A	72.00	2.835	F	21.00	0.827
B	52.00	2.047	G	18.50	0.728
C	37.00	1.457	H	31.00	1.220
D	9.50	0.374	J	2.60	0.102
E	35.00	1.378			

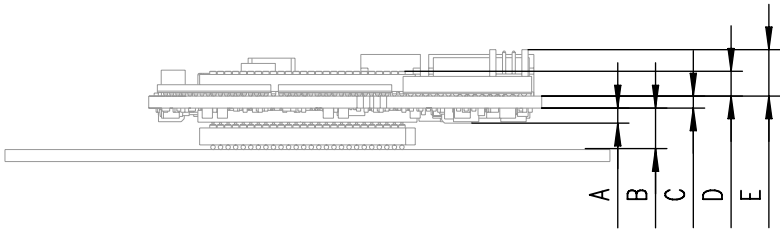

Fig. 6-5 Microcontroller with Socket Adapter mounted (ETK-T2.1A and ETK-T2.1B)

For mounting the ETK on the ECU, and for mounting the MPC on the ETK, the Advanced Interconnect Socket is required (see ordering information).

Dim	Millimeters	Inches
A	2.00	0.079
B	5.36	0.211
C	1.70	0.067
D	3.28	0.129
E	5.50	0.217

6.12.2 ETK-T2.1C

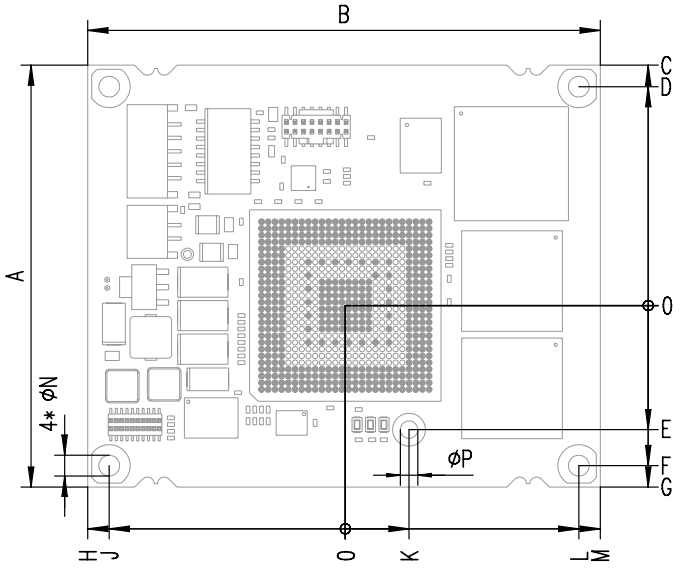

Fig. 6-6 ETK-T2.1C Dimensions - Top View

Dim	Millimeters	Inches	Dim	Millimeters	Inches
A	62.90	2.476	H	38.40	1.512
B	76.40	3.008	J	35.20	1.386
C	35.84	1.411	K	9.50	0.374
D	32.64	1.285	L	34.80	1.370
E	18.50	0.728	M	38.00	1.496
F	23.86	0.939	N	3.20	0.126
G	27.06	1.065	P	2.70	0.106

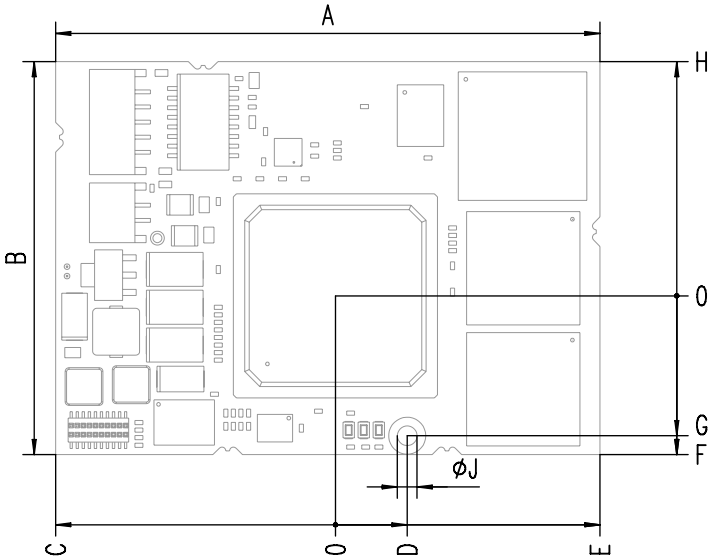

Fig. 6-7 ETK-T2.1D Dimensions - Top View

Dim	Millimeters	Inches	Dim	Millimeters	Inches
A	72.00	2.835	F	21.00	0.827
B	52.00	2.047	G	18.50	0.728
C	37.00	1.457	H	31.00	1.220
D	9.50	0.374	J	2.60	0.102
E	35.00	1.378			

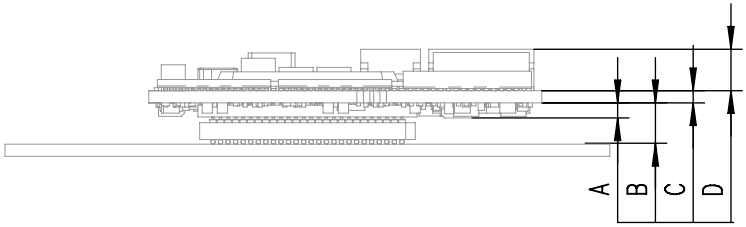

Fig. 6-8 Microcontroller directly soldered (ETK-T2.1D)

.

Dim	Millimeters	Inches
A	2.00	0.079
B	5.36	0.211
C	1.70	0.067
D	3.28	0.129
E	5.50	0.217

7 Cables and Accessories

Cables and adapters can be ordered separately from ETAS. A list of available accessories and ordering information can be found in the chapter "Ordering Information" on page 63 of this manual or in the ETAS product catalog.

7.1 Interface Cables

7.1.1 Interface 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

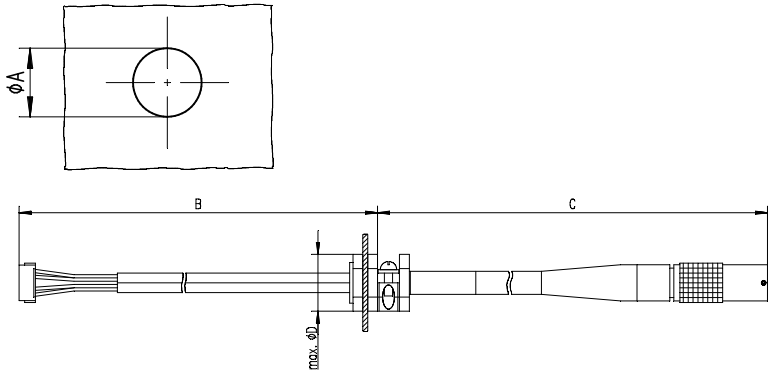

Fig. 7-1 Interface Cable KA54, Proposal 1

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

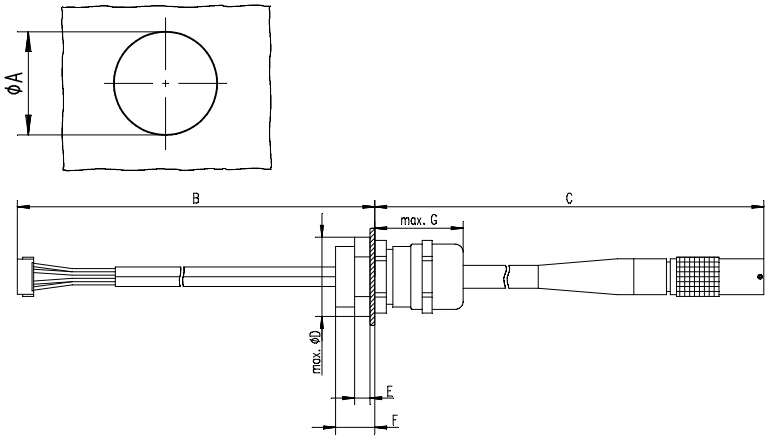

Fig. 7-2 Interface Cable KA54, Proposal 2 (long thread)

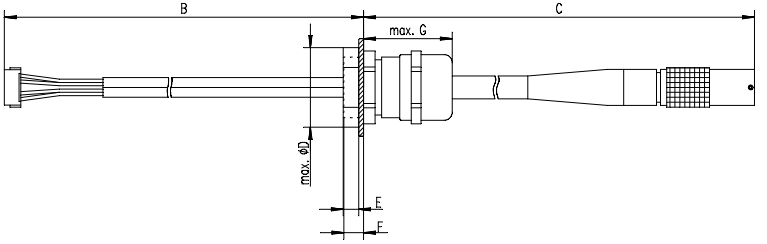

Fig. 7-3 Interface Cable KA54, Proposal 2 (short thread)

Dim	Millimeters	Inches	Dim	Millimeters	Inches
A	18.80	0.740	**E**	4.70	0.185
B	160.00	6.299	$\mathbf{F}_{Long}$	12.00	0.472
C	400.00	15.748	$\mathbf{F}_{Short}$	6.00	0.263
D	24.25	0.955	**G**	27.00	1.063

Note

Shield connected to ECU housing.

SKINTOP *compact screwing;* ***Manufacturer:*** *Lapp;* ***Description:*** *MS-SC 11 ;* ***Order-No.:*** *5311 2320 (long thread) or 5311 2220 (short thread)*

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

7.1.2 Interface Cable KA55

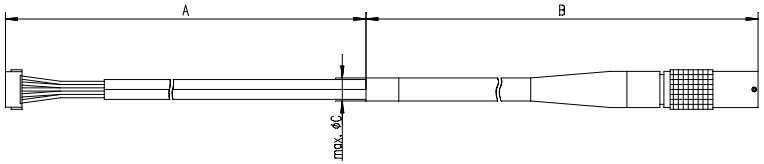

Fig. 7-4 Interface Cable KA55

Dim	Millimeters	Inches
A	160.00	6.299
B	400.00	15.748
C	7.50	0.295

Note

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

7.1.3 Interface Cable CBAM200

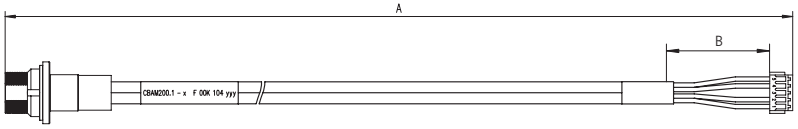

Fig. 7-5 Interface Cable CBAM200-0m38

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.

7.2 Power Supply Cables

7.2.1 Cable ETV

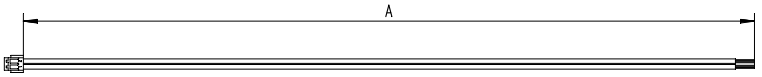

Fig. 7-6 Power Supply Cable ETV

Dim	Millimeters	Inches
A	190.00	7.480

7.2.2 Cable with Filtercoil ETV2

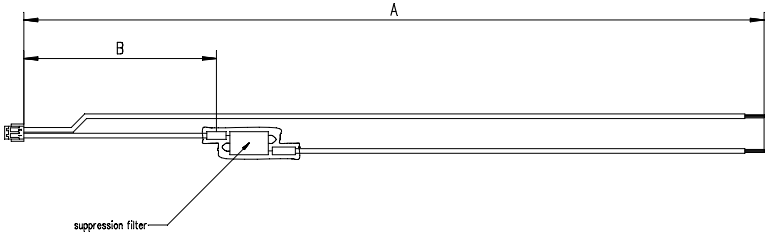

Fig. 7-7 Power Supply Cable with Filtercoil ETV2

Dim	Millimeters	Inches
A	190.00	7.480
B	50.00	1.969

7.2.3 Cable K70

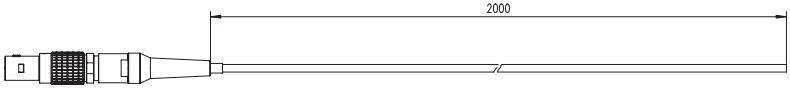

Fig. 7-8 Power Supply Cable K70

Dim	Millimeters	Inches
A	2000	78.74

7.2.4 Cable KA50

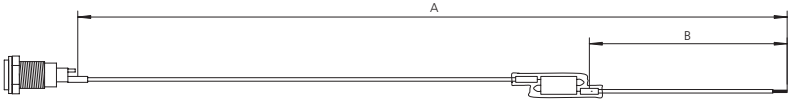

Fig. 7-9 Power Supply Cable KA50

Dim	Millimeters	Inches
A	200	7.87
B	50	1.97

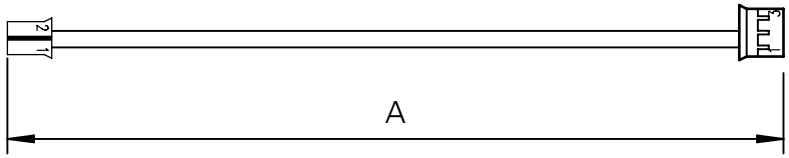

Fig. 7-10 Power Supply Cable CBM200

Dim	Millimeters	Inches
A	100	3.94

7.3 Debug Adapter

7.3.1 Debug Adapter ETAF5

ETAF5 PCB Component Placement

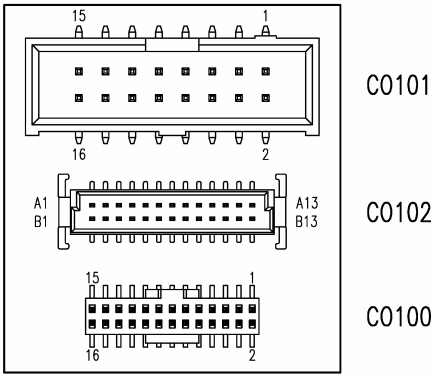

Fig. 7-11 ETAF5 PCB - Component Placement

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

ETAF5 Flatcable

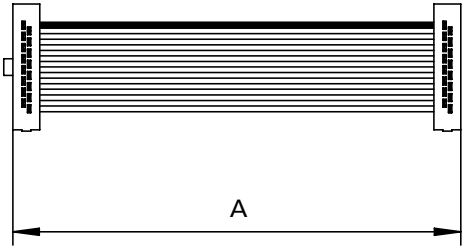

Fig. 7-12 ETAF5 Flatcable

Dim	Millimeters	Inches
A	50.80	2.00

ETAF5 Mechanical Dimensions

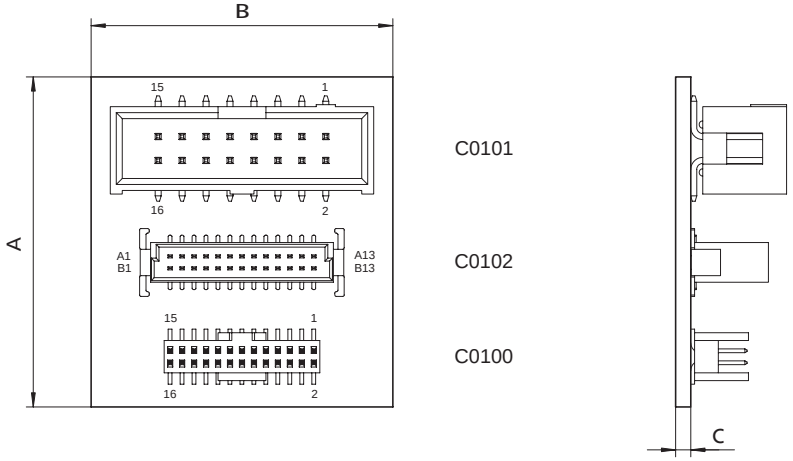

Fig. 7-13 ETAF5 - Mechanical Dimensions

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

7.3.2 Debug Adapter ETAF9

ETAF9 Flatcable

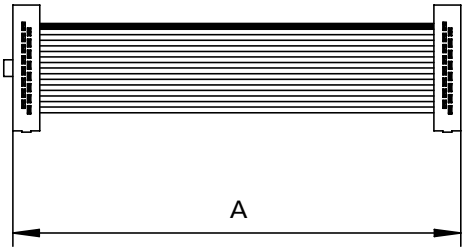

Fig. 7-14 ETAF9 Flatcable

Dim	Millimeters	Inches
A	50.80	2.00

ETAF9 Component Placement

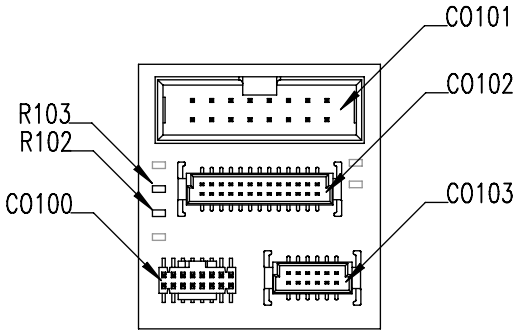

Fig. 7-15 ETAF9 Component Placement

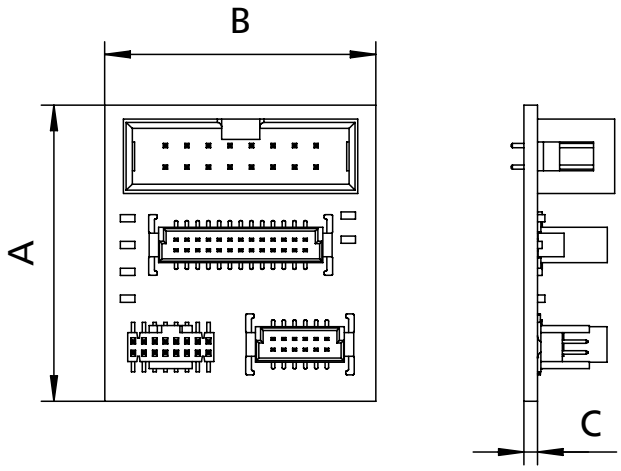

Fig. 7-16 ETAF9 - Mechanical Dimensions

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

8 Ordering Information

8.1 ETK-T2.1

Type	Order-No.	Note
ETK-T2.1A	F-00K-106-042	ETK-T2.1 with 441 pin µC socket and 441 pin adapter for TC1792, TC1796(ED) and TC1797(ED) ECUs; without BDF
ETK-T2.1B	F-00K-106-043	ETK-T2.1 with 441 pin µC socket and 441 pin adapter for TC1792, TC1796(ED) and TC1797(ED) ECUs; with BDF support
ETK-T2.1C	F-00K-106-044	ETK-T2.1 with 441 pin µC socket and 416 pin adapter for TC1792, TC1796(ED) and TC1797(ED) ECUs; with BDF support; with mounting holes for secure fit in harsh environments
ETK-T2.1D	F-00K-106-640	ETK-T2.1D emulator probe with 416 pin adapter for a TC1797ED ECU, without socket, 1 MB memory / page

8.2 ECU/ETK Sockets and Adapters

Sockets are available from local Advanced Interconnect distributors.

8.2.1 Socket ECU - ETK

ECU Controller	ECU Socket
TC1792, TC1796, TC1797, TC1797ED	Advanced Interconnect Socket 5FHSB416-716GG (416 pins)
TC1796ED	Advanced Interconnect Socket 7632TR (441 pins)

8.2.2 BGA Adapter ETK - Microcontroller

Controller	Adapter
TC1792, TC1796, TC1797, TC1797ED	Advanced Interconnect BGA Adapter 5FHAX416-715GG (416 pins)
TC1796ED	Advanced Interconnect BGA Adapter 7633 (441 pins)

8.3 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
Debug Adapter from Infineon OCDS1-Plug to ETK (ETAF9 PCB and ETAF9 Flat Cable)	ETAF9	F00K 105 897

8.4 Power Supply

Type	Order-No.	Note
ETP1	F 00K 000 624	ETK power supply for 6 - 36 V DC input
ETP2	F 00K 104 010	Power Supply Interface for ETK

8.5 Cables

Please contact your local ETAS representative for further cable information.

8.5.1 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, 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), 0m38	CBAM200-0m38	F 00K 104 330
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

8.5.2 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 ETAS Contact Addresses

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70469 Stuttgart	Fax:	+49 711 89661-106
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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:

ETAS subsidiaries	WWW:	www.etas.com/en/contact.php
ETAS technical support	WWW:	www.etas.com/en/hotlines.php

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