ES5436.1 Current Source Load Board (48-CH)

User's Guide

Copyright

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Contents

1 Introduction

This User's Guide contains the description of the ES5436.1 Current Source Load Boards.

CAUTION!

Some components of the ES5436.1 can be damaged or destroyed by electrostatic discharges. Leave the board in its transport packaging until it is installed.
Only remove, configure and install the ES5436.1 at a workplace that is protected against electrostatic discharges.

CAUTION!

If cards (e.g. for startup or calibration) are unlocked but not completely removed from the housing, they have to be pulled out far enough that the distance between the respective card and the backplane of the housing is at least 1 cm! Otherwise, contacts may be established between the cards and lead to their destruction.

This chapter contains information about the following topics:

1.1 Properties

The ES5436.1 Current Source Load Board is a plug-in board for a ES5300.1 Housing, for simulating the load in a LABCAR HiL-system.

The ES5436.1 provides 48 channels as power sources. Each power source can generate a current between 5 mA and 150 mA. Each channel can be configured independently as pull-up or pull-down. Two neighboring channels can be configured in pairs as an H-bridge.

- 48 channels as power sources for currents from 5 mA to 150 mA
- Wiring of the channels with pull-up, pull-down and in pairs as H-bridge configuration possible
- Adjustable current values: 5 mA to 150 mA, accuracy: 3 mA
- Maximum battery voltage Ubatt: 60 V

Fig. 1-1 shows the wiring as pull-up and pull-down. Fig. 1-2 shows the wiring as an H-bridge.

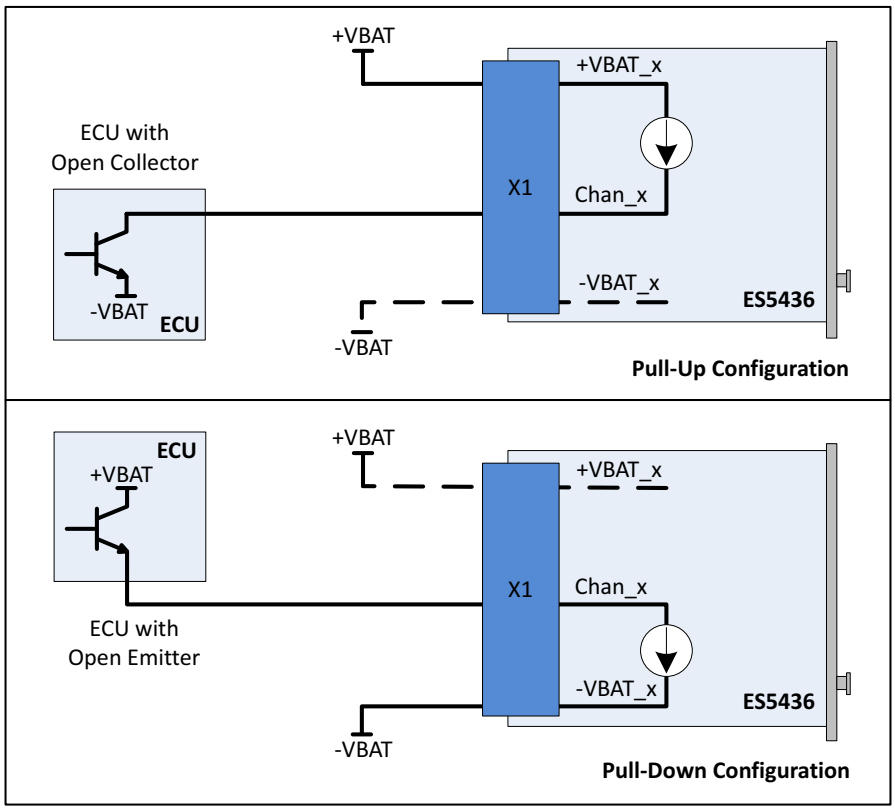

Fig. 1-1 Block diagram for open collector, open emitter

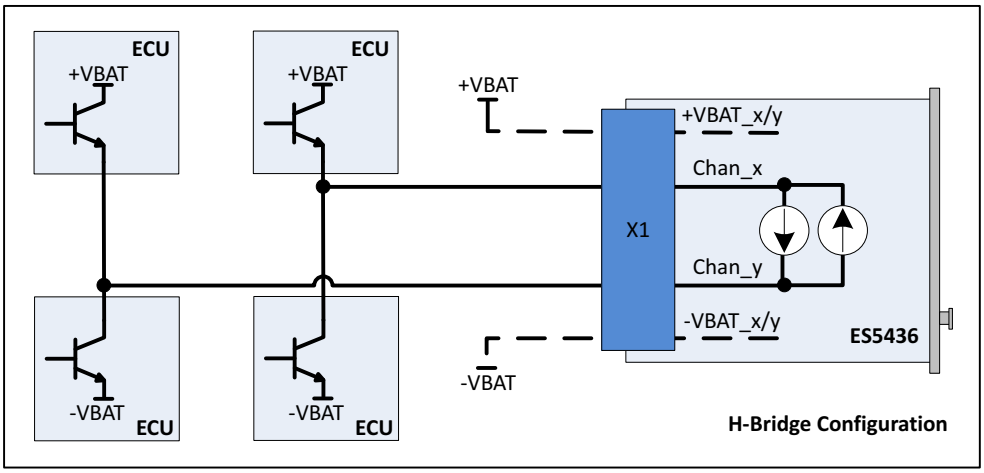

Fig. 1-2 Block diagram for H-bridge

1.2 Basic Safety Notices

Please observe the following safety notices to avoid health issues or damage to the device.

1.2.1 Identification of Safety Notices

The safety notices contained in this manual are identified with the danger symbol shown below:

The safety notices shown below are used for this purpose. They notify you of extremely important information. Please read this information carefully.

CAUTION!

indicates a danger with low risk of minor or moderate injury or property damage, if not avoided.

WARNING!

indicates a possible danger with moderate risk of death or (serious) injury, if not avoided.

DANGER!

indicates an immediate danger with a high risk of death or serious injury, if not avoided.

1.2.2 General Safety Information

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

Note

The User's Guide must be read prior to the startup of the product!

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

1.2.3 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. Improper use or use by a user without sufficient qualification can lead to damages or injuries to one's health or damages to property.

The system integrator is responsible for the safety of systems that use the product!

General Safety at Work

Follow the existing regulations for work safety and accident prevention. All applicable regulations and laws regarding operation must be strictly adhered to when using this product.

1.2.4 Intended Use

The ES5436.1 is a plug-in board for the ES5300 system housing for simulating pull-up and pull-down resistors and for simulating loads. This enables open collector and open emitter inputs and outputs to be wired. In addition, the ES5436.1 can be used to simulate the load for an H-bridge.

The ES5436.1 plug-in board consists of the following:

- Power sources for simulating loads up to 3 W
- Interface for battery node activation signals for switching the 48 power sources on and off
- Interface to the ES5300 system housing

The ES5436.1 may only be installed and operated in the ES5300.1-A Housing and the ES5300.1-B Housing and must not be operated as a stand-alone unit.

The intended use of the ES5436.1 in an ES5300.1-A Housing or ES5300.1-B Housing is:

- Use in industrial lab facilities or at industrial workplaces.
- As a Hardware interface for ECUs in a hardware-in-the-loop test system.
- In Conjunction with ETAS software that supports the ES5300.1-A Housing or the ES5300.1-B Housing.
- As an Interface in conjunction with software programs that operate the standardized, documented and open APIs of ETAS software products.

The ES5436.1 is **not** intended for the following:

- Use within a vehicle on the road.
- Use as part of a life support system.
- Use as part of a medical application.
- In applications where misuse can lead to injuries or damages.
- Use in environments in which conditions prevail that fall outside the specified ranges: see "Ambient conditions" on page 38.
- Use with signal conditioning that falls outside the specified ranges: see "Technical Data and Standards" on page 37 (voltages, currents and power consumption).

Requirements for Operation

The following requirements are necessary for safe operation:

- Use the product only according to the specifications in the corresponding User's Guide. If the product is used in any other way, the product safety is no longer ensured.
- Do not use the product in a wet or damp environment.
- Do not use the product in potentially explosive atmospheres.

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 must only be operated in a technically flawless state, in accordance with its intended purpose and in a safety-conscious and hazard-aware manner under consideration of the documentation regarding the product. If the product is not used in accordance with its intended purpose, its product safety may be impaired.

Electrical Safety and Power Supply

Observe the regulations applicable at the operating location concerning electrical safety as well as the laws and regulations concerning work safety.

WARNING!

Fire Hazard!
Only use fuses that comply with the specification in the User's Guide for the product. Never bridge defective fuses!
Failure to observe the fuse specification can lead to excess currents, short circuits and fires.

Power Supply

The product is powered by the ES5300.1-A Housing or the ES5300.1-B Housing via the PCIe backplane connector.

The electrical connection is made via the backplane connector CO200.

Insulation Requirements for lab power supplies to circuits connected to the HiL-System:

- The power supply to live circuitry must be safely isolated from the supply voltage. For example, use a car battery or a suitable lab power supply.
- Only use lab power supplies with dual protection for the supply network (with double/reinforced insulation (DI/RI)). Lab power supplies that comply with IEC/EN 60950 or IEC/EN 61010 meet this requirement.
- The lab power supply must be approved for use at a height of 2000 m and in ambient temperatures of up to 40 °C.

De-energizing the Plug-in board

Switch off the ES5300.1-A Housing or the ES5300.1-B Housing and external power supplies and unplug the power plug and other connectors attached to the plug-in board. Wait at least three minutes before removing the plug-in board.

Approved Cables

The signal lines must not exceed a maximum length of 3 m.

WARNING!

Fire hazard!
Use only approved cables for creating cable assemblies (e.g. for connecting the ECU and external loads). The cables used must, in particular, be suitable for the currents, voltages and temperatures which occur and must be flame-retardant in accordance with one of the following standards
IEC60332-1-2, IEC60332-2-2, UL2556/UL1581VW-1!

Requirements for the Installation Location

WARNING!

This is class A equipment. This equipment can cause radio interference in residential areas. Should that be the case, the operator may be requested to institute reasonable measures.

Requirements for Ventilation

CAUTION!

The air circulation inside the ES5300.1-A Housing or the ES5300.1-B Housing can be ensured only if all free slots are covered with front plates. Otherwise, it may lead to overtemperatures and trip the overtemperature protection of the ES5300.1-A or the ES5300.1-B.
For this reason, install front plates in all free slots!

Transport and Installation

To avoid damages to the hardware from electrostatic discharge, please observe the following precautionary measures:

CAUTION!

Some components of the ES5436.1 can be damaged or destroyed by electrostatic discharges. Leave the plug-in card in its transport packaging until its installation.
The ES5436.1 may be removed from the transport packaging, configured and installed only at a workplace that is secured against electrostatic discharges.

CAUTION!

In order to prevent damage to the plug-in board and the LABCAR-Housing and thereby also avoid damage to property or health, observe the installation instructions and information contained in the relevant User's Guide.

CAUTION!

If cards (e.g. for startup or calibration) are unlocked but not completely removed from the housing, they have to be pulled out far enough that the distance between the respective card and the backplane of the housing is at least 1 cm! Otherwise, contacts may be established between the cards and lead to their destruction.

Connecting/Disconnecting Devices

To avoid injuries and hardware damages, please observe the following precautionary measures:

- Do not apply any voltages to the connections of the ES5436.1 that do not correspond to the specifications of the respective connection. The exact specification of the I/O hardware is located in the manuals of the corresponding boards.
- Do not connect or disconnect any devices while the ES5300.1-A Housing, the ES5300.1-B Housing or external devices are switched on. First, switch off the ES5300.1-A Housing or the ES5300.1-B Housing by shutting down the real-time PC and by activating the On/Off switch at the rear, then unplug the power plug.
- When plugging in connectors, ensure that they are inserted straight and no pins are bent.

Maintenance

The device does not require maintenance.

Repairs

If an ETAS hardware product needs to be repaired, return the product to ETAS.

Cleaning

The product is not expected to require cleaning.

1.3 Identifications on the Product

The following symbols are used for product labeling:

Symbol	Description
	The User's Guide must be read prior to the startup of the product
	Marking for CE conformity, see "CE mark" on page 7
	Marking for China RoHS, see "RoHS conformity" on page 7
	Marking for conformity with WEEE directive, see "Product return and recycling" on page 8

Please observe the information in the chapter "Technical Data and Standards" on page 37.

1.3.1 CE Mark

With the CE mark attached to the product or its packaging, ETAS confirms that the product corresponds to the product-specific, applicable European Directives. The CE Declaration of Conformity for the product is available upon request.

1.3.2 RoHS Conformity

European Union

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

ETAS confirms that the product meets this directive applicable in the European Union.

China

With the China RoHS identification attached to the product or its packaging, ETAS confirms that the product meets the guidelines of the "China RoHS" (Management Methods for Controlling Pollution Caused by Electronic Information Products Regulation) applicable in the People's Republic of China.

1.4 Product Return and Recycling

The European Union (EU) released the Directive for Waste Electrical and Electronic Equipment - WEEE to ensure the setup of systems for collecting, treating and recycling electronic waste in all countries of the EU.

This ensures that the devices are recycled in a resource-friendly way that does not represent any risk to personal health and the environment.

Fig. 1-3 WEEE symbol

The WEEE symbol on the product or its packaging identifies that the product may not be disposed of together with the remaining trash.

The user is obligated to separately collect old devices and provide them to the WEEE return system for recycling.

The WEEE Directive applies to all ETAS devices, but not to external cables or batteries.

Additional information about the recycling program of ETAS GmbH is available from the ETAS sales and service locations (see "ETAS contact information" on page).

1.5 Declarable Substances

European Union

Some products from ETAS GmbH (e.g. modules, boards, cables) use components with materials 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.

1.6 About this Manual

This manual consists of the following chapters:

- "Introduction" on page 5
  This chapter
- "Design, Installation and Fuses" on page 17
  This chapter contains information about the design and installation of ES5436.1, as well as information about the fuses.
- "Signals" on page 21
  This chapter contains a description of the signals of the ES5436.1.
- "Connections and Connectors" on page 27
  This section provides a description of the different connections, connectors and pin assignments of the ES5436.1.
- "Technical Data and Standards" on page 37
  This chapter contains the technical data of the ES5436.1. It also contains the norms and standards.
- "Ordering Data" on page 39

1.6.1 Working with this manual

Presentation of information

All activities to be performed by the user are presented in a "Use Case" format. That is, the goal to be accomplished is briefly defined in the heading, and the respective steps required for reaching this goal are then presented in a list. The presentation looks as follows:

Target definition

Any advance information...

1. Step 1

   Any explanation for step 1...
2. Step 2

   Any explanation for step 2...

Any concluding comments...

Specific example:

Creating a new file

Before creating a new file, no other file may be open.

1. Select **File** → **New**.

   The "Create File" dialog box appears.
2. Enter the name of the new file in the "File name" field.

   The file name may not have more than 8 characters.
3. Click on **OK**.

The new file will be created and saved under the name you specified. You can now work with the file.

Typographical conventions

The following typographical conventions are used:

Select **File** → **Open**.	Menu commands are displayed in bold/ blue.
Click on **OK**.	Buttons are displayed in bold/blue.
Press <ENTER>.	Key commands are printed in small capitals enclosed in angle brackets.
The "Open file" dialog window appears.	Names of program windows, dialog windows, fields and similar are given in quotation marks.
Select the `setup.exe` file.	Text in selection lists, program code, as well as path and file names are displayed in `Courier` font.
A conversion between the logical and arithmetic data types is *not* possible.	Content-based highlights and newly introduced terms are placed in *italics*.

Important notes for the user are presented as follows:

Note

Important note for the user.

2 Design, Installation and Fuses

This chapter contains information about the design and installation of ES5436.1, as well as information about the fuses.

CAUTION!

Some components of the ES5436.1 can be damaged or destroyed by electrostatic discharges. Leave the board in its transport packaging until it is installed.
Only remove, configure and install the ES5436.1 at a workplace that is protected against electrostatic discharges.

2.1 Scope of Supply

You can find the scope of supply in chapter"Ordering Data" on page 39.

2.2 Design of ES5436.1

This chapter provides information about the ES5436.1 and the position of the plug connectors.

Fig. 2-1 shows a view of the ES5436.1.

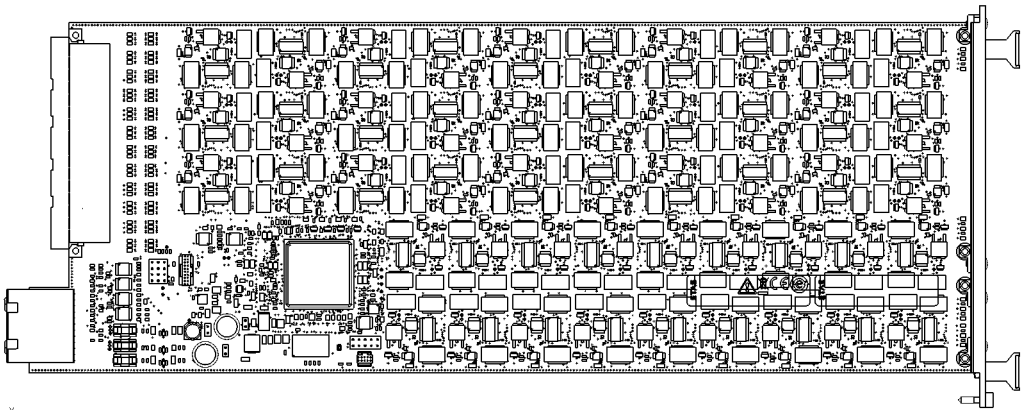

Fig. 2-1 View of the ES5436.1

Fig. 2-2

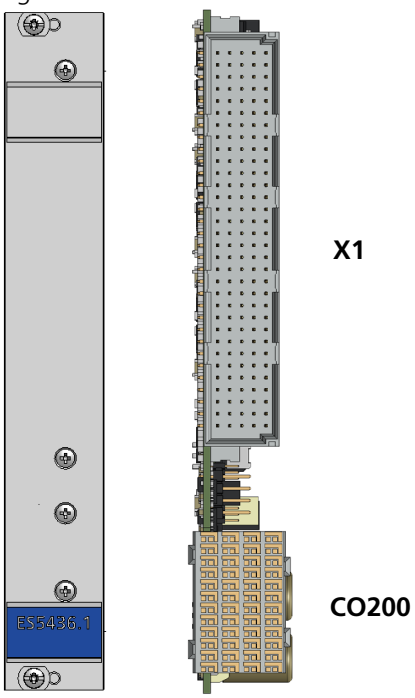

Fig. 2-2 Front plate and plug side of the ES5436.1

2.3 Backplane plug "CO200" and I/O plug X1

The connection of ES5436.1 to the ES5300.1-A Housing or to the ES5300.1-B housing is done via the PCIe connector "CO200" (on page 18). CO200 is also used to provide the voltage supply of the ES5436.1.

A control unit can be connected via plug connector X1.

The pin assignments of the plugs are located in the chapter "Connections and Connectors" on page 27.

2.4 Fuses

The signal paths (or voltages) of the ES5436.1 are equipped with fuses. In case of a fuse defect, we recommend sending the board to ETAS for further testing. For this purpose, the device should be sent to ETAS (see "ETAS Contact Addresses" on page 41).

If a fuse trips multiple times, the device must be sent to ETAS.

WARNING!

Fire Hazard!
Only use fuses that comply with the specification in Tab. 2-1 on page 19. Never bridge defective fuses!
Failure to observe the fuse specification can lead to excess currents, short circuits and fires.

Position of fuses

Fig. 2-3 shows the position of the fuses.

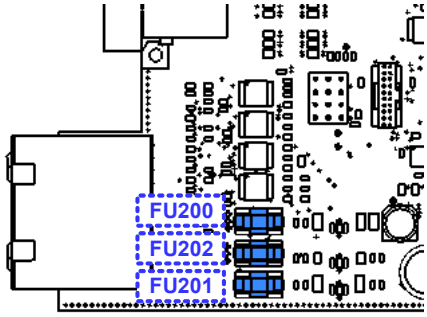

Fig. 2-3 Position of fuses (in blue) on the ES5436.1.

Specification of fuses

The specification of the fuses is as follows:

Fuse	Type	Specification	Fuse protection of
FU200	NANO2® Slo-Blo® Fuse 452/454 Series	T 2 A	VCC3_3 (+3.3 V)
FU201	NANO2® Slo-Blo® Fuse 452/454 Series	T 3 A	VCC12 (+12 V)
FU202	NANO2® Slo-Blo® Fuse 452/454 Series	T 1 A	VCC5 (+5 V)

Tab. 2-1 Specification of fuses

2.5 Installation in the ES5300.1-A and the ES5300.1-B housing

A description for installing the ES5436.1 in the ES5300.1-A Housing or the ES5300.1-B housing is located in the manual for the ES5300.1-A Housing or the ES5300.1-B housing.

The installation of the ES5436.1 may be performed only by trained personnel in an ESD-safe area.

CAUTION!

Do not install the ES5436.1 while the ES5300.1-A Housing or the ES5300.1-B housing is switched on. First, switch off the ES5300.1-A housing or the ES5300.1-B housing by shutting down the real-time PC and by activating the On/Off switch at the rear.

CAUTION!

Some components of the ES5436.1 can be damaged or destroyed by electrostatic discharges. Leave the board in its transport packaging until it is installed.
Only remove, configure and install the ES5436.1 at a workplace that is protected against electrostatic discharges.

CAUTION!

The air circulation inside the ES5300.1-A Housing or the ES5300.1-B Housing can be ensured only if all free slots are covered with front plates. Otherwise, it may lead to overtemperatures and trip the over-temperature protection of the ES5300.1-A or ES5300.1-B. For this reason, install front plates in all free slots!

Installation of the ES5436.1 in the ES5300.1-A Housing or ES5300.1-B Housing

1. Ensure that ESD-compliant conditions exist at your workplace.
2. Shut down the real-time PC and switch off the power supply of the ES5300.1-A or ES5300.1-B using the switch at the rear of the housing.
3. Wait a few minutes for the components (capacitors, etc.) to be discharged.
4. Insert the ES5436.1 (handle at the front plate must point down!) into the upper and lower rail of the slot and push it in a little bit.
5. Carefully push in the carrier board until the back-plane connector of the ES5436.1 is completely inserted in the socket of the backplane.

Note

Watch for cables in the insertion area while pushing in the board – pull the lines to the front door area if necessary.

6. Secure the carrier card by fastening the front plate with screws.
7. Install front plates at all open slots before starting up the ES5436.1.

3 Signals

This chapter contains a description of the signals of the ES5436.1.

3.1 Properties

The ES5436.1 Current Source Load Board is a plug-in board for a ES5300.1 Housing, for simulating the load in a LABCAR HiL-system.

The ES5436.1 provides 48 channels as power sources. Each power source can control a current between 5 mA and 150 mA. Each channel can be configured independently as pull-up, pull-down or in pairs as an H-bridge.

- 48 channels as power sources as current from 5 mA to 150 mA
- Wiring of the channels with pull-up, pull-down and in pairs as H-bridge configuration possible
- Adjustable current values: 5 mA to 150 mA, accuracy: 3 mA
- Maximum battery voltage VBAT: 60 V

3.2 Configuration as Pull-Up / Pull-Down

Fig. 3-1 shows the wiring as pull-up and pull-down.

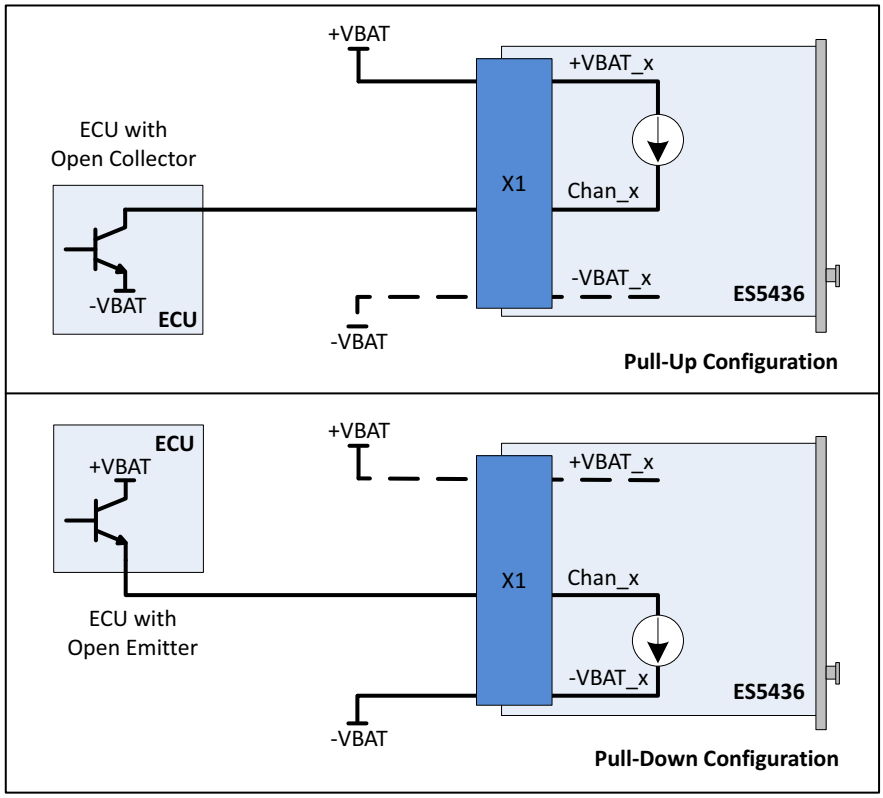

Fig. 3-1 Block diagram for pull-up (top) and pull-down configuration (below)

Note

The ES5436.1 use cases "Pull-Up", "Pull-Down" and "Bipolar" (for H-bridge) can be configured by software.
For this reason, make sure that +VBAT and -VBAT are always connected.

Technical Data of the ES5436.1 Power Sources

Output	Data
Output current	5 mA to 150 mA
Output voltage	Passive circuit
Accuracy	+/- 3 mA at 150 mA
Galvanic isolation	max. 60 V to ground potential (functional separation)
Overvoltage protection	60 V abs. max.

Tab. 3-1 Technical data of the power sources

Note

In the idle state (non activated load channel, operation mode "disabled") the power source's idle state current is ~70 µA.

Note

If the external voltage +VBAT < 6 V the power source doesn't carry any current.

3.3 Configuration with ES5321 to Measure ECU Digital Output Signals

Digital outputs of ECUs are often configured as open emitter or open collector. In a vehicle, such outputs are connected to small loads.

To measure such digital output signals of an ECU in a HiL setup, the ES5436.1 can be used as load simulation and the ES5321 for measurement.

A schematic diagram for the ECU, the ES5321 and the ES5436.1 is shown in Fig. 3-2 on page 23.
The schematic diagram for H-bridge configuration is shown in Fig. 3-3 on page 25.

The ES5436.1 has 48 current channels for currents in the range of 5 mA to 150 mA. These current channels can be combined with the 48 digital inputs of the ES5321.1 or the ES5321.2.

CAUTION!

Before connecting the ES5321.1 or the ES5321.2, read the corresponding User's Guide.

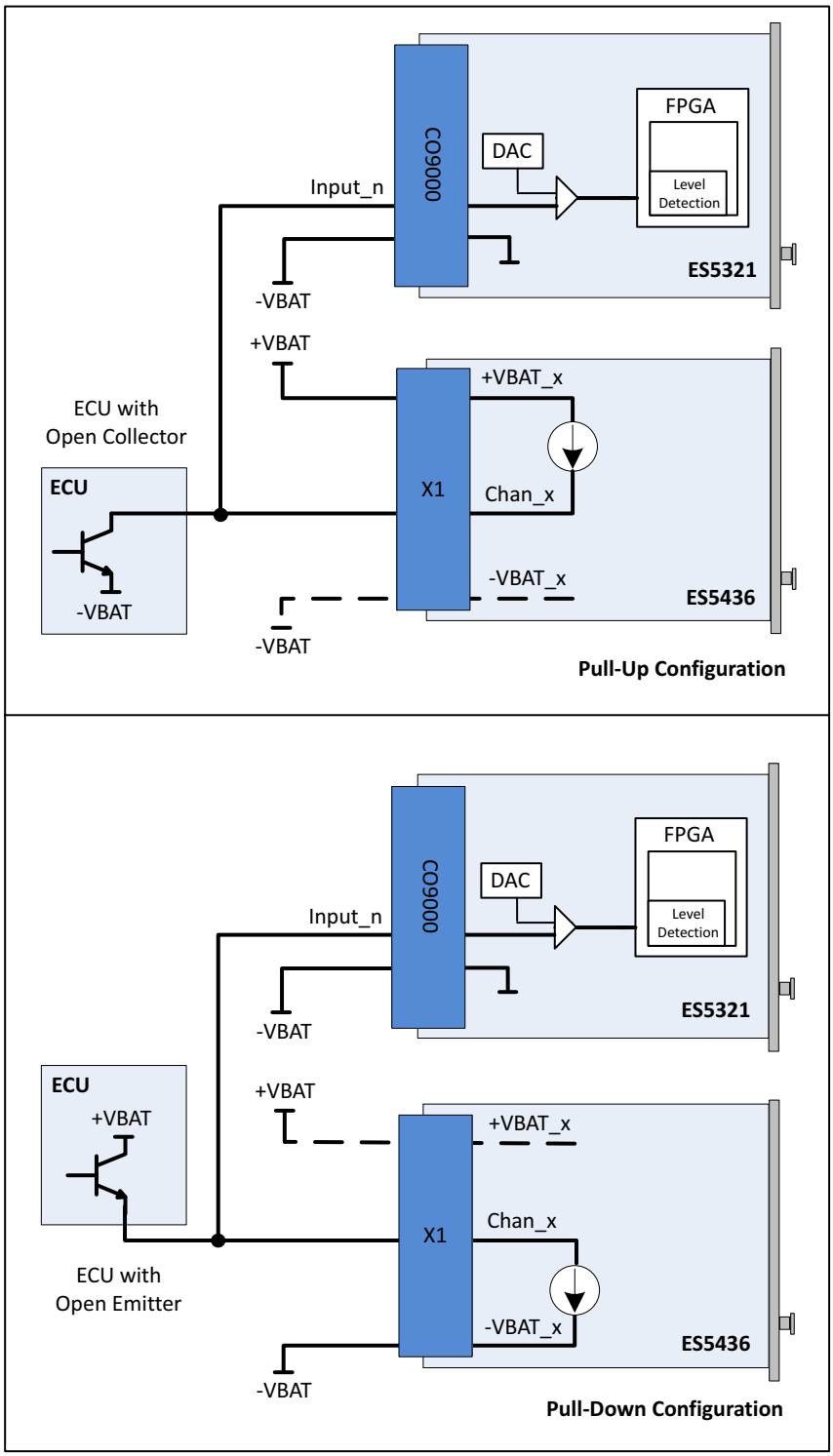

Fig. 3-2 Measurement of digital ECU output signals in the configuration "Pull-Up" or "Pull-Down" using ES5321 for measurement and ES5436.1 as load simulation

Note

The ES5436.1 use cases "Pull-Up", "Pull-Down" and "Bipolar" (for H-bridge) can be configured by software.
For this reason, make sure that +VBAT and -VBAT are always connected.

Technical Data ES5321.1/.2 Inputs

Number	48
Input voltage range	0 V..+56 V
Input impedance	1 MΩ
Frequency range	1 Hz...100 kHz
Duty cycle	0%...100%
Duty cycle resolution	0.1%
Accuracy in range of 1 Hz to 10 kHz	±0.04%
Accuracy in range of 10 kHz to 100 kHz	±0.4%
Resolution	8 ns (125 MHz)
Counter	31 bit
Pulse width	120 ns to 17 s (= $[2^{31} - 1] * 8$ ns); Resolution: 8 ns
Programmable thresholds for high/low detection of input signal	+1 V...+10 V
Threshold resolution	10 bit
Hysteresis (fix)	max. 0.5 V
Glitch filter	120 ns to 5000 ns or "Off"; resolution; 8 ns
Electric strength	±60 V
Galvanic groups	4 groups with 12 channels each
Max. number of SENT signals	4
SENT Specification (version)	SAE J2716

3.4 Configuration as H-bridge

Fig. 3-3 shows the configuration as H-bridge.

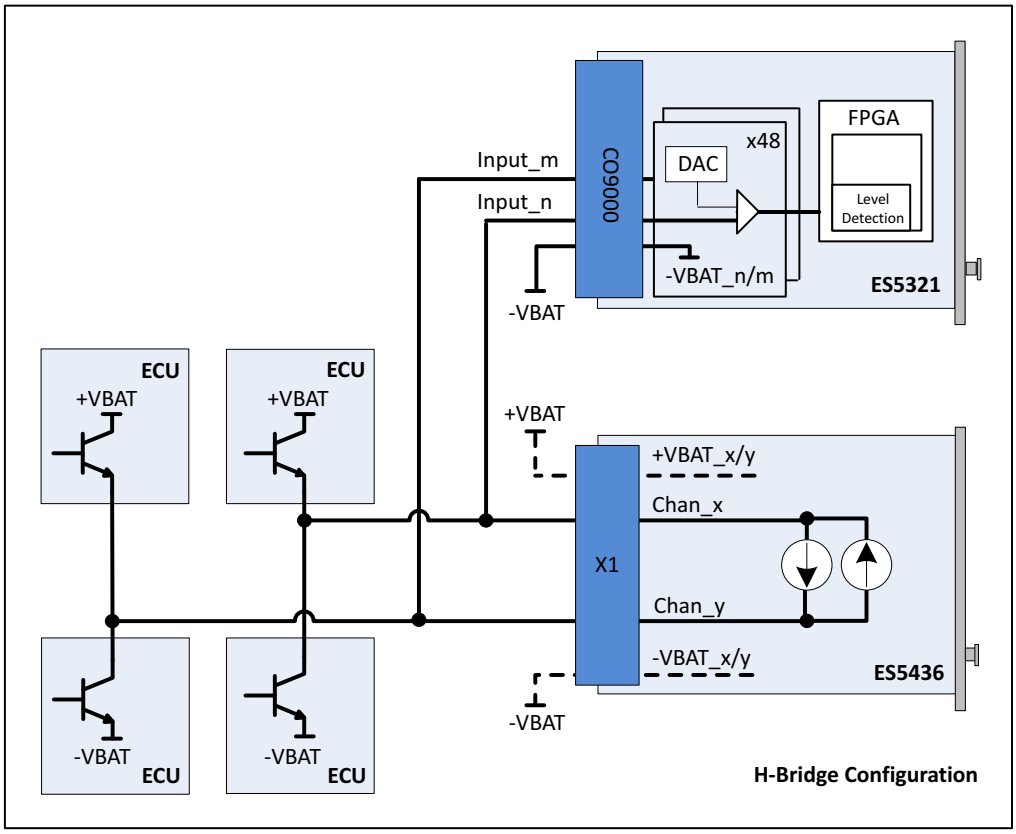

Fig. 3-3 Block diagram for configuration as H-bridge using ES5321 for measuring Chan_x and Chan_y

In case of H-bridge configuration, observe the following notes:

Note

Channel 2i and channel 2i+1 of the ES5436.1 are coupled in each case and can be used for an H-bridge. Only if channels 2i and 2i+1 are used, there will be a current flow through the H-bridge.

Note

The ES5436.1 use cases "Pull-Up", "Pull-Down" and "Bipolar" (for H-bridge) can be configured by software.
For this reason, make sure that +VBAT and -VBAT are always connected.

Note

For the ES5321.1/.2, Input_m and Input_n (Fig. 3-3) must be in the same galvanic group.

ES5436.1 Technical Data for the Configuration as H-bridge

Output	**Data**
Output current	5 mA to 150 mA
Output voltage	Passive circuit
Accuracy	+/- 3 mA at 150 mA
Galvanic isolation	max. 60 V to ground potential (functional separation)
Overvoltage protection	60 V abs. max.

Tab. 3-2 Technical data of H-bridge configuration

4 Connections and Connectors

This section provides a description of the different connections, connectors and pin assignments of the ES5436.1.

- "Backplane Connector (CO200)" on page 27
- "Plug Connector X1" on page 29
- "Connecting Cable" on page 35

4.1 Backplane Connector (CO200)

Type: ERNI ERMet ZD 4-pair angled female multipoint connector (4-12) (order no. 973099)

Counterplug (in ES5300): ERNI ERMet ZD 4-pair straight male multipoint connector (4-12) (order no. 973096)

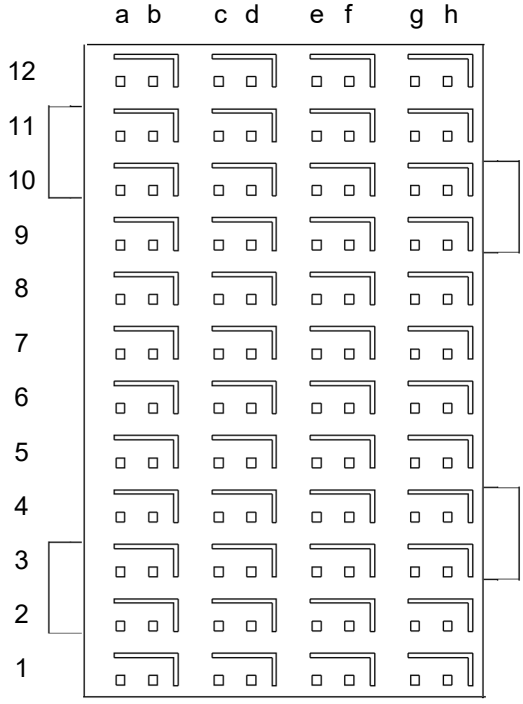

Fig. 4-1 Connector to backplane (top view)

- The assignment of the pins is as follows (the maximum possible pin assignment for the ES5300.1-A Housing and the ES5300.1-B Housing is given):

	h	g	f	e	d	c	e	a
12	GBLI_TX_n_0	GBLI_TX_p_0	GBLI_RX_n_0	GBLI_RX_p_0	M_LVDS_n_7	M_LVDS_p_7	BN_5	BN_4
12-shield	GND		GND		GND		GND	
11	GBLI_TX_n_1	GBLI_TX_p_1	GBLI_RX_n_1	GBLI_RX_p_1	M_LVDS_n_6	M_LVDS_p_6	SPI_CS_B_n	SPI_CS_A_n
11-shield	GND		GND		GND		GND	
10	GBLI_TX_n_2	GBLI_TX_p_2	GBLI_RX_n_2	GBLI_RX_p_2	M_LVDS_n_5	M_LVDS_p_5	SPI_MOSI	SPI_CLK
10-shield	GND		GND		GND		GND	
9	GBLI_TX_n_3	GBLI_TX_p_3	GBLI_RX_n_3	GBLI_RX_p_3	M_LVDS_n_4	M_LVDS_p_4	PCIE_WAKEn	SPI_MISO
9-shield	GND		GND		GND		GND	
8	GBLI_PRESENT_n	GEO_ADDR_4	PCIE_REFCLK_n	PCIE_REFCLK_p	M_LVDS_n_3	M_LVDS_p_3	n.c.	n.c.
8-shield	GND		GND		GND		GND	
7	PCIE_RX_n_0	PCIE_RX_p_0	PCIE_TX_n_0	PCIE_TX_p_0	M_LVDS_n_2	M_LVDS_p_2	n.c.	n.c.
7-shield	GND		GND		GND		GND	
6	Ass. internally	Ass. internally	Ass. internally	Ass. internally	M_LVDS_n_1	M_LVDS_p_1	PCIE_JTAG_TCK	PCIE_JTAG_TDI
6-shield	GND		GND		GND		GND	
5	Ass. internally	Ass. internally	Ass. internally	Ass. internally	M_LVDS_n_0	M_LVDS_p_0	PCIE_JTAG_TDO	PCIE_JTAG_TMS
5-shield	GND		GND		GND		GND	
4	Ass. internally	Ass. internally	IAss. internally	Ass. internally	GEO_ADDR_1	GEO_ADDR_0	BN_3	BN_2
4-shield	GND		GND		GND		GND	
3	VCC24	VCC24	GEO_ADDR_3	GEO_ADDR_2	PCIE_SMBDAT	PCIE_SMBCLK	BN_1	BN_0
3-shield	VCC3_3		VCC3_3		VCC3_3		VCC3_3	
2	VSS12	VSS12	VCC3_3	VCC5	PCIE_PERSTn	PCIE_PRSNT1n	PCIE_PRSNT2n_X1	PCIE_PRSNT2n_X4
2-shield	VCC12		VCC12		VCC12		VCC12	
1	VCC3_3	VCC3_3	VCC5	VCC5	VCC12	VCC12	VCC12	VCC12
1-shield	VCC12		VCC12		VCC12		VCC12	

4.2 Plug Connector X1

The plug connector X1 enables the connection to an ECU.

Type: Erni Eurocard DIN 41612 Connector, 5 rows, male
Order number: 384299

Mating plug: HARTING DIN 41612 plug connector
Order number: 02 05 000 0003

Crimp contacts: Harting Crimp contacts
Order number: 02 05 000 2511

Note

Crimp tongs are necessary for attaching the crimp contacts.

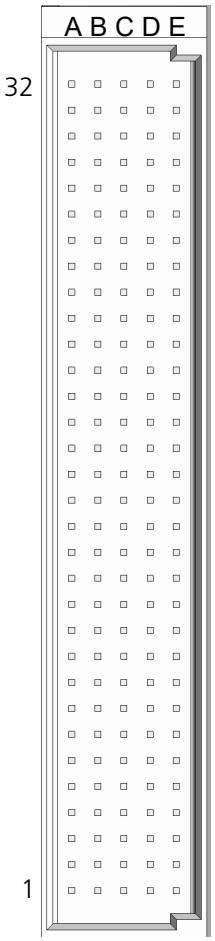

Fig. 4-2 Plug connector X1

Tab. 4-1 lists the pin assignment.

Pin assignment of X1

Shortname	Type	Pin (Signal)
Chan_0_VBAT_P	**+VBAT**	**D1**
Chan_0	**Current Sink/Source**	**D2**
Chan_0_VBAT_N	**-VBAT**	**D3**
Chan_1_VBAT_P	**+VBAT**	**C1**
Chan_1	**Current Sink/Source**	**C2**
Chan_1_VBAT_N	**-VBAT**	**C3**
Chan_2_VBAT_P	**+VBAT**	**E4**
Chan_2	**Current Sink/Source**	**E5**
Chan_2_VBAT_N	**-VBAT**	**E6**
Chan_3_VBAT_P	**+VBAT**	**E1**
Chan_3	**Current Sink/Source**	**E2**
Chan_3_VBAT_N	**-VBAT**	**E3**
Chan_4_VBAT_P	**+VBAT**	**A1**
Chan_4	**Current Sink/Source**	**A2**
Chan_4_VBAT_N	**-VBAT**	**A3**
Chan_5_VBAT_P	**+VBAT**	**D4**
Chan_5	**Current Sink/Source**	**D5**
Chan_5_VBAT_N	**-VBAT**	**D6**
Chan_6_VBAT_P	**+VBAT**	**C4**
Chan_6	**Current Sink/Source**	**C5**
Chan_6_VBAT_N	**-VBAT**	**C6**
Chan_7_VBAT_P	**+VBAT**	**B1**
Chan_7	**Current Sink/Source**	**B2**
Chan_7_VBAT_N	**-VBAT**	**B3**
Chan_8_VBAT_P	**+VBAT**	**A4**
Chan_8	**Current Sink/Source**	**A5**
Chan_8_VBAT_N	**-VBAT**	**A6**
Chan_9_VBAT_P	**+VBAT**	**E7**
Chan_9	**Current Sink/Source**	**E8**
Chan_9_VBAT_N	**-VBAT**	**E9**

Shortname	Type	Pin (Signal)
Chan_10_VBAT_P	**+VBAT**	**D7**
Chan_10	**Current Sink/Source**	**D8**
Chan_10_VBAT_N	**-VBAT**	**D9**
Chan_11_VBAT_P	**+VBAT**	**B4**
Chan_11	**Current Sink/Source**	**B5**
Chan_11_VBAT_N	**-VBAT**	**B6**
Chan_12_VBAT_P	**+VBAT**	**B7**
Chan_12	**Current Sink/Source**	**B8**
Chan_12_VBAT_N	**-VBAT**	**B9**
Chan_13_VBAT_P	**+VBAT**	**A7**
Chan_13	**Current Sink/Source**	**A8**
Chan_13_VBAT_N	**-VBAT**	**A9**
Chan_14_VBAT_P	**+VBAT**	**E10**
Chan_14	**Current Sink/Source**	**E11**
Chan_14_VBAT_N	**-VBAT**	**E12**
Chan_15_VBAT_P	**+VBAT**	**C7**
Chan_15	**Current Sink/Source**	**C8**
Chan_15_VBAT_N	**-VBAT**	**C9**
Chan_16_VBAT_P	**+VBAT**	**C10**
Chan_16	**Current Sink/Source**	**C11**
Chan_16_VBAT_N	**-VBAT**	**C12**
Chan_17_VBAT_P	**+VBAT**	**D10**
Chan_17	**Current Sink/Source**	**D11**
Chan_17_VBAT_N	**-VBAT**	**D12**
Chan_18_VBAT_P	**+VBAT**	**B10**
Chan_18	**Current Sink/Source**	**B11**
Chan_18_VBAT_N	**-VBAT**	**B12**
Chan_19_VBAT_P	**+VBAT**	**A10**
Chan_19	**Current Sink/Source**	**A11**
Chan_19_VBAT_N	**-VBAT**	**A12**

Shortname	Type	Pin (Signal)
Chan_20_VBAT_P	**+VBAT**	**E13**
Chan_20	**Current Sink/Source**	**E14**
Chan_20_VBAT_N	**-VBAT**	**E15**
Chan_21_VBAT_P	**+VBAT**	**D13**
Chan_21	**Current Sink/Source**	**D14**
Chan_21_VBAT_N	**-VBAT**	**D15**
Chan_22_VBAT_P	**+VBAT**	**C13**
Chan_22	**Current Sink/Source**	**C14**
Chan_22_VBAT_N	**-VBAT**	**C15**
Chan_23_VBAT_P	**+VBAT**	**B13**
Chan_23	**Current Sink/Source**	**B14**
Chan_23_VBAT_N	**-VBAT**	**B15**
Chan_24_VBAT_P	**+VBAT**	**A13**
Chan_24	**Current Sink/Source**	**A14**
Chan_24_VBAT_N	**-VBAT**	**A15**
Chan_25_VBAT_P	**+VBAT**	**E16**
Chan_25	**Current Sink/Source**	**E17**
Chan_25_VBAT_N	**-VBAT**	**E18**
Chan_26_VBAT_P	**+VBAT**	**D16**
Chan_26	**Current Sink/Source**	**D17**
Chan_26_VBAT_N	**-VBAT**	**D18**
Chan_27_VBAT_P	**+VBAT**	**C16**
Chan_27	**Current Sink/Source**	**C17**
Chan_27_VBAT_N	**-VBAT**	**C18**
Chan_28_VBAT_P	**+VBAT**	**B16**
Chan_28	**Current Sink/Source**	**B17**
Chan_28_VBAT_N	**-VBAT**	**B18**
Chan_29_VBAT_P	**+VBAT**	**A16**
Chan_29	**Current Sink/Source**	**A17**
Chan_29_VBAT_N	**-VBAT**	**A18**

Shortname	Type	Pin (Signal)
Chan_30_VBAT_P	**+VBAT**	**E19**
Chan_30	**Current Sink/Source**	**E20**
Chan_30_VBAT_N	**-VBAT**	**E21**
Chan_31_VBAT_P	**+VBAT**	**D19**
Chan_31	**Current Sink/Source**	**D20**
Chan_31_VBAT_N	**-VBAT**	**D21**
Chan_32_VBAT_P	**+VBAT**	**C19**
Chan_32	**Current Sink/Source**	**C20**
Chan_32_VBAT_N	**-VBAT**	**C21**
Chan_33_VBAT_P	**+VBAT**	**B19**
Chan_33	**Current Sink/Source**	**B20**
Chan_33_VBAT_N	**-VBAT**	**B21**
Chan_34_VBAT_P	**+VBAT**	**A19**
Chan_34	**Current Sink/Source**	**A20**
Chan_34_VBAT_N	**-VBAT**	**A21**
Chan_35_VBAT_P	**+VBAT**	**E22**
Chan_35	**Current Sink/Source**	**E23**
Chan_35_VBAT_N	**-VBAT**	**E24**
Chan_36_VBAT_P	**+VBAT**	**B22**
Chan_36	**Current Sink/Source**	**B23**
Chan_36_VBAT_N	**-VBAT**	**B24**
Chan_37_VBAT_P	**+VBAT**	**C22**
Chan_37	**Current Sink/Source**	**C23**
Chan_37_VBAT_N	**-VBAT**	**C24**
Chan_38_VBAT_P	**+VBAT**	**D22**
Chan_38	**Current Sink/Source**	**D23**
Chan_38_VBAT_N	**-VBAT**	**D24**
Chan_39_VBAT_P	**+VBAT**	**A22**
Chan_39	**Current Sink/Source**	**A23**
Chan_39_VBAT_N	**-VBAT**	**A24**

Shortname	Type	Pin (Signal)
Chan_40_VBAT_P	**+VBAT**	**E25**
Chan_40	**Current Sink/Source**	**E26**
Chan_40_VBAT_N	**-VBAT**	**E27**
Chan_41_VBAT_P	**+VBAT**	**D25**
Chan_41	**Current Sink/Source**	**D26**
Chan_41_VBAT_N	**-VBAT**	**D27**
Chan_42_VBAT_P	**+VBAT**	**C25**
Chan_42	**Current Sink/Source**	**C26**
Chan_42_VBAT_N	**-VBAT**	**C27**
Chan_43_VBAT_P	**+VBAT**	**B25**
Chan_43	**Current Sink/Source**	**B26**
Chan_43_VBAT_N	**-VBAT**	**B27**
Chan_44_VBAT_P	**+VBAT**	**A25**
Chan_44	**Current Sink/Source**	**A26**
Chan_44_VBAT_N	**-VBAT**	**A27**
Chan_45_VBAT_P	**+VBAT**	**C28**
Chan_45	**Current Sink/Source**	**C29**
Chan_45_VBAT_N	**-VBAT**	**C30**
Chan_46_VBAT_P	**+VBAT**	**B28**
Chan_46	**Current Sink/Source**	**B29**
Chan_46_VBAT_N	**-VBAT**	**B30**
Chan_47_VBAT_P	**+VBAT**	**A28**
Chan_47	**Current Sink/Source**	**A29**
Chan_47_VBAT_N	**-VBAT**	**A30**

Tab. 4-1 Pin assignment of X1

Note

Channel 2i and 2i+1 are coupled in each case and can be used for an H-bridge.

4.3 Connecting Cable

Use only approved cables in the manufacture of cable harnesses (e.g. for connecting the ECU and external loads). The cable length must not exceed 3 m.

WARNING!

Fire hazard!
Use only approved cables for creating cable assemblies (e.g. for connecting the ECU and external loads). The cables used must, in particular, be suitable for the currents, voltages and temperatures which occur and must be flame-retardant in accordance with one of the following standards
IEC60332-1-2, IEC60332-2-2, UL2556/UL1581VW-1!

Note

The signal lines may not exceed a maximum length of 3 m!

5 Technical Data and Standards

This chapter contains the technical data of the ES5436.1. It also contains the norms and standards.

5.1 Technical Data

Inputs

Input quantity	Data
+VBAT	6 to 60 V
-VBAT	< +VBAT - 6 V

Outputs

Output	Data
Output current	5 mA to 150 mA
Output voltage	Passive circuit
Accuracy	+/- 3 mA at 150 mA
Galvanic isolation	max. 60 V to ground potential (functional separation)
Overvoltage protection	60 V abs. max.

Power supply

Current consumption	100 mA @ +3.3 V DC 200 mA @ +5 V DC 200 mA @ +12 V DC 200 mA @ -12 V DC

Electrical data ES5300.1-A, ES5300.1-B PCI backplane

Max. permissible power consumption	16 W at 12 V 1 W at 5 V 1 W at 3.3 V

Storage conditions

Temperature	-20 °C to 85 °C (-4 °F to 185 °F)
Relative humidity	0 to 95% (non-condensing)

Ambient conditions

Environment	Use only inside enclosed and dry rooms
Max. contamination level	2
Temperature during operation	5 °C to 40 °C (41 °F to 104 °F)
Relative humidity	0 to 95% (non-condensing)
Altitude	-200 m to 2000 m above sea level

Physical Dimensions

Height	4 U
Width	5 HP
Weight	0,5 kg

5.2 Norms and Standards met

The ES5436.1 meets the following norms and standards:

Standard	Test
IEC 61326-1	Electrical equipment for measurement, control and laboratory use – EMC requirements (industrial setting)
IEC 61010-1	Safety requirements for electrical equipment for measurement, control and laboratory use - Part 1: General requirements

The module is only intended for use in industrial settings in accordance with EN 61326-1. Avoid potential radio interference when using the module outside of the industrial settings with additional shielding measures!

WARNING!

This is class A equipment. This equipment can cause radio interference in residential areas. Should that be the case, the operator may be requested to institute reasonable measures.

Note

The signal lines may not exceed a maximum length of 3 m!

6 Ordering Data

Order name	Short name	Order number
Current Source Load Board (48-CH)	ES5436.1	F-00K-110-485
Calibration Service for ES5436	K_ES5436.1	F-00K-110-486
Scope of Supply	**Number**	
ES5436.1 Current Source Load Board	1	

7 ETAS Contact Addresses

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Germany WWW: www.etas.com

ETAS Subsidiaries and Technical Support

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

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

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