SINGLE BOARD COMPUTER 4010

SBC 4010 Single Board Computer

4 Contents

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Name: Datasheet SBC 4010 Single Board Computer Version of Product 1.5
Purpose: Data-Sheet

1 Introduction

This single board computer is composed of a high speed multitasking controller TINY-Tiger™ Plus.

Four Power open drain FETs can be used for switching loads up to 1A.

Four analog inputs are available on the SBC4010 for measure analog signals. It is possible to configure it to 0..10V or 0..20mA inputs.

A 4x20 character text display can be plugged in to visualize information. The backlight ensures readability of the display in dark rooms, as well.

A 4x4 key matrix can be connected to the SBC 4010, as well. It can be used for interacting with your own application. These keys are freely programmable.

Two different serial ports can be used to communicate with other devices. The RS485 interface is designed to use the SBC4010 in a network. So you can connect several SBCs with each other.
For comfortable controlling your network of single board computers we recommend our TP1000.

The TINY-Tiger™ Plus can be programmed in system over the RS232 port with the powerful, well known and easy to learn Tiger-Multitasking™.

2 Applications

- Analog measurement and local controlling
- Bus line operation for central data storage and analyses
- Multiple board mode via RS485 bus available
- Interact with your application via key matrix
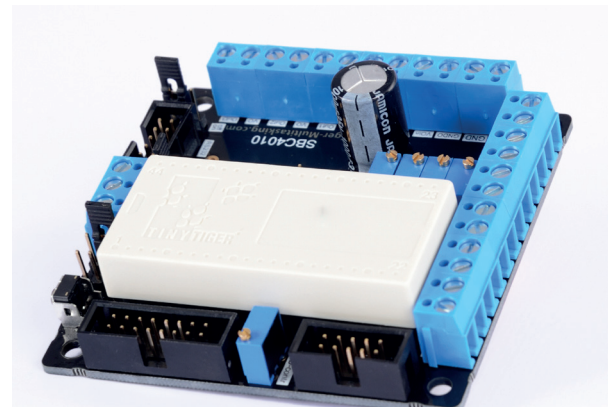
3 Features

- In circuit programmable TINY-Tiger™ Plus multitasking controller
- Connector for text LCD with backlight
- Connector for 4x4 key matrix
- 1x RS232 port
- 1x RS485 port
- 4x Power open drain FETs 24V/1A
- 4x analog inputs 0...20mA or 0...10V
- 4x PWM and sound output
- RESET button and PC-Mode jumper
- battery for RTC and RAM buffering applicable
- 2x digital CMOS inputs
- Power supply 9...24V DC
- Temp range: -20° ... 80° C (without battery)
- Dimensions: 80x80x30mm

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4 Connections and Control Elements Overview
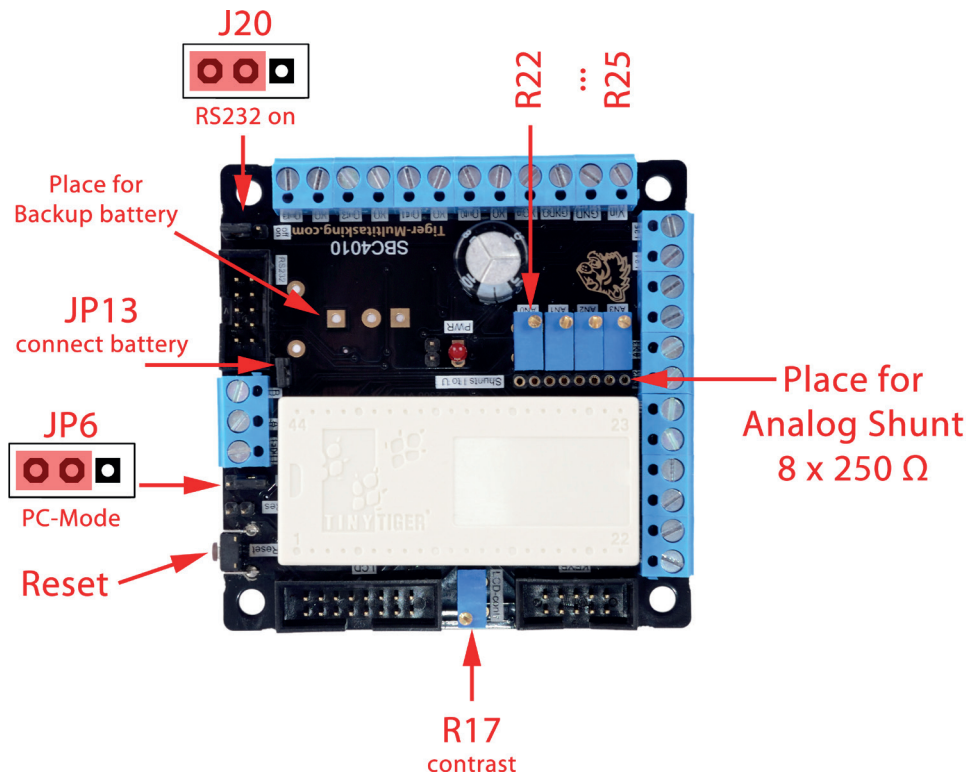
5 Control Elements

5.1 Contrast Adjustment for Text LCD

You can adjust the contrast of the text LC display at R17.
Note: You can reduce the contrast of the display down to no contrast. If you can't see your outputs at the display increase the contrast. If the screen is too black, reduce the contrast.

5.2 Backlight for text LCD and Key Matrix

The backlight of the text LCD and key matrix can be controlled by the TINY Tiger™ Plus pin L33. A ‚high'on this pin turns the backlight on. A ‚low' levelon L33 turns it off again. Controlling the backlight of LCD and key matrix separately is not possible.

5.3 Backlight resistors

You have to figure out the right value of the resistor for your backlight of text LCD and key matrix. It depends on your power supply voltage (Uin) and the used backlight (ILED, ULED). The resistor R can be calculated with following equation:

```
R=(Uin - ULED)/ILED
```

Typical values for backlight of text LCDs are ILED=120mA and ULED=4.2V. If you use a 9V Power Supply you can choose a 40Ω resistor for backlight.
For the backlight of the key matrix you can choose a different value. The backlight of LCD and key matrix can be used at same time.

5.3.1 R-LCD

You have to plug in the resistor R to the position ‚R-LCD' of connector J2 if you connect the backlight LED to the connector J4 (Text LCD).

5.3.2 R-Key

You have to plug in the J4 resistor R to the position ‚R-Key' of connector J3 if you connect the back light LED to the connector J2 (key matrix).

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5.4 RESET Button and RUN/PC Mode Jumper

Pressing the RESET button will restart the user program if the Mode Jumper is set to ‚RUN'.
If the mode Jumper is set to ‚PC', the TINY Tiger™ Plus will enter PC mode after pressing the RESET button.

5.5 Disable serial port 1

It is possible to disable the serial port 1 with jumper J20. Set jumper J20 to position 1-2 or remove this jumper to disable Port 1. In this case no updates of the TINY Tiger™ Plus program are possible! In position 2-3 of jumper J20 serial port 1 is enabled. In this position downloads to the TINY Tiger are possible.

J20	description
1-2	Disable Ser. 1
2-3	Enable Ser. 1
No jumper	Disable Ser. 1

5.6 Configure Analog Inputs

The SBC 4010 includes four analog inputs (0...3). Each input can be individually set to 0...10V. To calibrate the 0...5V range apply 2.5V to the analog inputs 0...3 and read it out. Adjust with R22...R25 until you read 512. Likewise usable as 20mA current input if a 8x250Ω SIL array is placed on the shunt connector.

5.7 RTC/RAM Backup Battery (optional)

Option for a backup battery is available for the SBC 4010. It backups the RTC and data stored in RAM of the TINY Tiger™ Plus if the power supply shuts down. The battery will be charged if the power supply is plugged in again. Remove Jumper JP13 to disable RAM and RTC backup. If the jumper is removed, the battery will be charged but won't backup the Tiger.

For RTC backup only (without RAM). To ensure a longer battery operation, please contact our support team.

The SBC 4010 optionally is assembled with a 3.6V/140mAh accumulator to backup RTC and RAM. Wilke Technology is obliged to take back the old accumulators and to dispose them in accordance with the provisions of the German Waste Management and Recycling Act.

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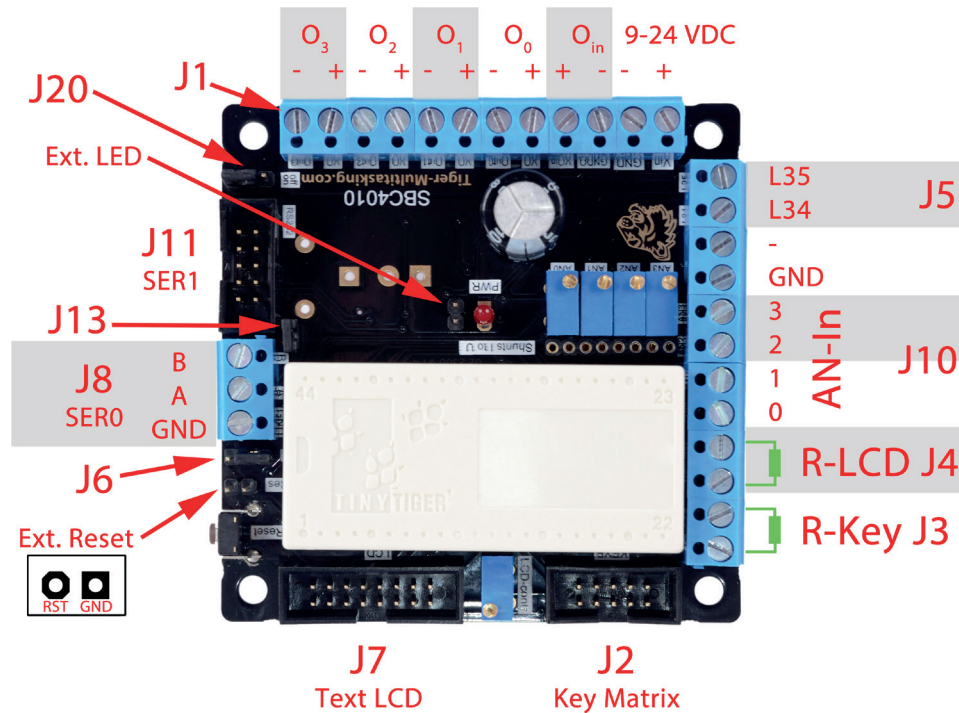
6 Connectors

6.1 Connector J1

6.1.1 Power Supply
You can connect the power supply 9...24V DC at connector J1 (-GND 9-24V +). A red LED lights up if power supply is detected.
Note: Please notice this power input is unfused! You have to use a fused power supply.

6.1.2 Power open drain FETs
The SBC 4010 includes four powerful open drain FETs. Each channel is able to switch current up to 1A. The input voltage is limited to 24V DC. An onboard recovery diode protects the FET in case of switching inductive loads. The FETs can be switched by the TINY Tiger™ Plus pins L70 to L73. L70 controls open drain FET output 0 and L73 controls FET output 3. A high level on these pins will turn the load on and a low level will turn it off again.
Note: L72 (O2) and L73 (O3) can be used as PWM outputs.

6.2 Connector J3 and J4

6.2.1 R-Key
Here you can connect the resistor for the back light LED, available on connector J3 (key matrix). Please refer to chapter ,Control Elements' for more details.

6.2.2 R-LCD
Here you can connect the resistor for the backlight LED, available on connector J7 (Text LCD). Please refer to chapter ,Control Elements' for more details.

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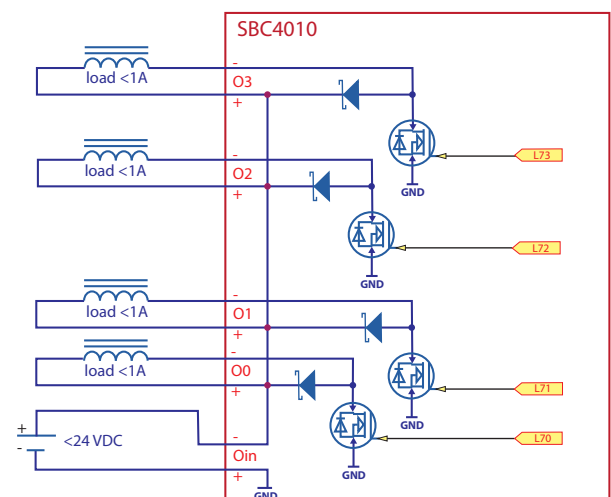
6.2.3 Analog Inputs

The SBC4010 supports four analog inputs of the TINY Tiger™ Plus. It can be configured as voltage or current input. Please refer to chapter „Control Elements" for more details.

Sensors with 0...10V or 0...20mA outputs can be directly connected to the SBC 4010 on connector J10. Please don't forget to connect GND of the sensor to the SBC 4010.

To read out the analog inputs use the device driver "analog1.tdp".

Analog current inputs:

Analog voltage inputs:
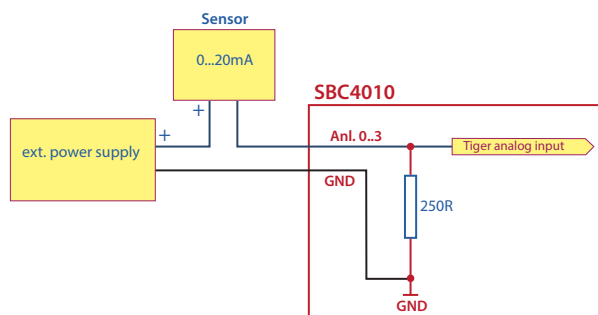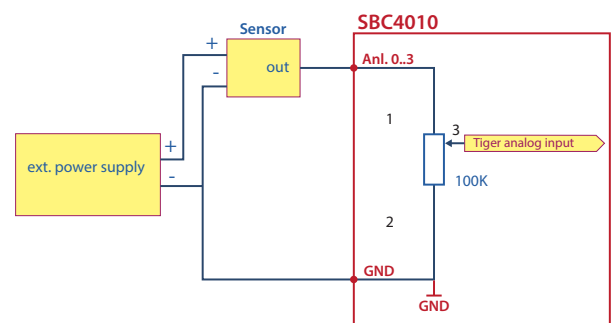
6.2.4 Digital Inputs L34, L35

The SBC 4010 includes two digital CMOS inputs. They can be used for reading out digital inputs up to 24V. These inputs are connected to the TINY Tiger™ pin L34 and L35. Use the ‚in' command for read out:

```
dir_pin 3,4,1      ,L34 set to input
in 3, value        ,read out port 3
if (bit(value,4)=1) then
        ,do s.th. If L34 is high
else
        ,do s.th. If L34 is low
endif
```

6.3 Text LCD

Connect your text LCD on Connector J7. Use the device driver LCD1.tdp.
The cable length connected here must not exceed 0.5m.

Connector J7

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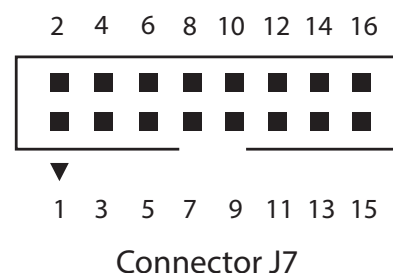
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Pin	Signal	Description
1	Vss	power supply (GND)
2	Vdd	power supply (+)
3	Vo	contrast adjust
4	RS	register select
5	R/W	read /write
6	E	enable
7	D0	data bus line
8	D1	data bus line
9	D2	data bus line
10	D3	data bus line
11	D4	data bus line
12	D5	data bus line
13	D6	data bus line
14	D7	data bus line
15	BLA	back light anode
16	BLK	back light cathode

6.4 Key matrix

The SBC 4010 supports a 4x4 key matrix. You can read out up to 16 keys. The four rows and columns are directly connected to port 8 of the TINY Tiger™ Plus. The key matrix can be plugged in to connector J2:

Peripheral	Tiger				Tiger	Peripheral
Col 0	L80	1		2	L81	Col 1
Col 2	L82	3		4	L83	Col 3
Row 0	L84	5		6	L85	Row1
Row 2	L86	7		8	L87	Row3
back light	-	9		10	-	back light
K						A

Connector J2 (key matrix)

6.5 Serial ports

The SBC 4010 includes two different serial ports for communication with other devices. Please use our latest serial device driver and include the following source code in your application:

```
INSTALL_DEVICE #SER, „SER1B_K1.TDP", &
BD_38_400, DP_8N, YES, & ,SER0
BD_38_400, DP_8N, YES, & ,SER1
00100000b, 9, 0 ,L95 = RTS0
```

6.6 Ser1: RS232

On RS232 port you can have a full duplex point to point connection to another device.
If the SBC 4010 is started in PC Mode then this RS232 port can be used as download and debug port.
Please check also jumper J20. Set it to position 2-3 to enable serial port 1!

```
 - 1  ◄  ■ ■   2 DTR
TxD 3    ■ ■   4 -
RxD 5    ■ ■   6 -
 - 7     ■ ■   8 -
GND 9    ■ ■  10 -
```

Connector J11 (Ser.1 - male)

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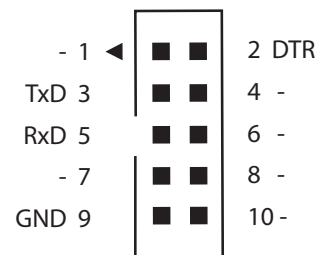
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6.6.1 Ser 0: RS485

The serial port 0 of the TINY-Tiger™ Plus is used as RS485 port. Bit 5 of port 9 is used as transmit enable pin of the RS485 bus driver. With `print/put` or `get` you can easily send or receive messages from the RS485 bus. For example send ‚Hello World' to another device:

```
PRINT #SER, #0, „Hello World"
```

The RS485 signals are available at the connector J8.
With the RS485 port a bus connection of multiple boards up to 32 devices is possible. You should implement a software protocol to prevent that more than one circuit is writing to the bus at the same time. All circuits must use the same baud rate.

RS485
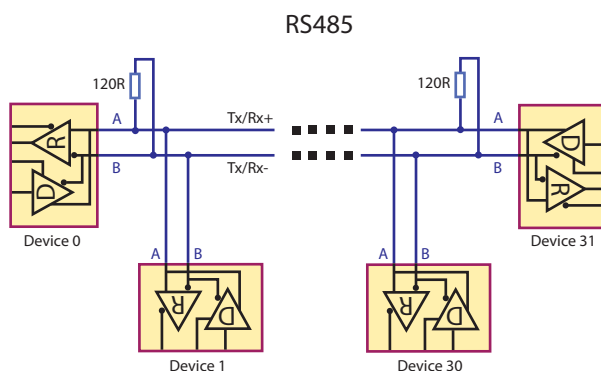
Note: The line should be terminated at both ends in its characteristic impedance. Stub lengths off the main line should be kept as short as possible.
You have to connect GND to each module if a separate power supply is used!

7 Used Tiger Pins

TINY-Tigers I/O	used for:
L33	Turn back light on/off
L34	Digital Input up to 24V
L35	Digital Input up to 24V
L36	enable signal for text LCD high active output
L37	register select for text LCD
L41	PC mode jumper input.
L60 to L67	data lines used by text LCD
L70 to L73	Open drain FETs 0...3
L80	Key matrix, column 0
L81	Key matrix, column 1
L82	Key matrix, column 2
L83	Key matrix, column 3
L84	Key matrix, row 0
L85	Key matrix, row 1
L86	Key matrix, row 2
L87	Key matrix, row 3
L90	TxD0 (RS485)
L91	RxD0 (RS485)
L92	Not used, but connected to gnd
L93	TxD1 (RS232)
L94	RxD1 (RS232)
L95	RTS0 (transmit enable RS485)

8 Used Analog Inputs

TINY-Tiger analog inputs	used for:
A/D Ref Low	GND
A/D Ref High	4V
Analog in 0	0...10V or 0...20mA
Analog in 1	0...10V or 0...20mA
Analog in 2	0...10V or 0...20mA
Analog in 3	0...10V or 0...20mA

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9 Technical Specification

9.1 Absolute maximum Ratings

(beyond which permanent damage may occur)

supply voltage U_in (screw terminal 1 in respect of GND)	30V DC
maximum current at each FET output	1A
maximum voltage at FET outputs	24V DC
input voltage at digital inputs	-0.3...24V DC
operating temperature without backup battery with backup battery	-20...80°C 0...45°C

Do not connect any signal connector of the SBC4010 directly to wires which are outside a building.
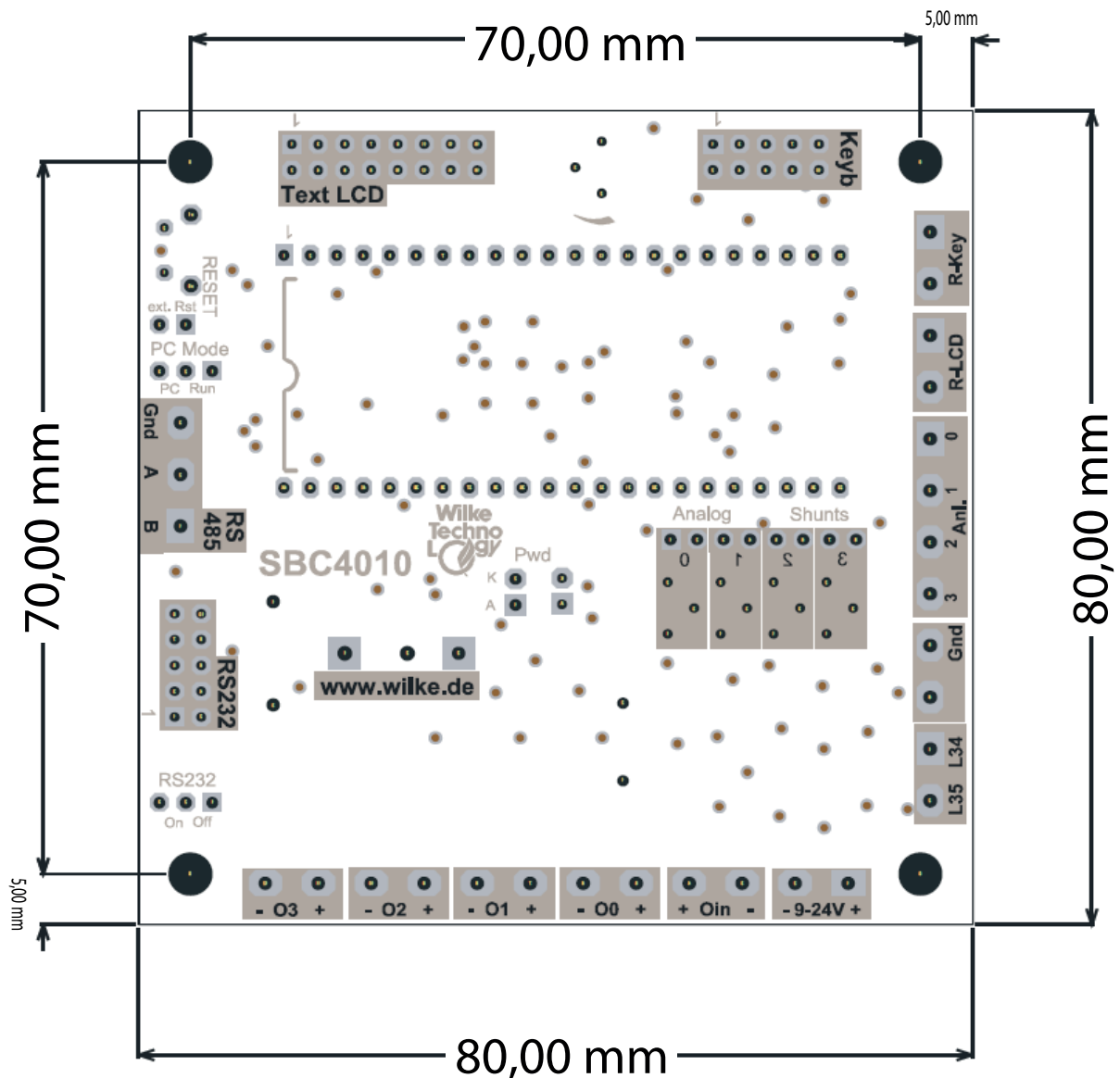
9.2 Electrical Specifications

supply voltage U_in	9V...24V DC
supply current at 9V input voltage at 24V input voltage at 9V input voltage with text LCD connected at 24V input voltage with text LCD connected	 125mA 120mA 225mA 220mA
Tolerances of analog inputs at 25°C temperature drift	 ‹ 1.0% ‹ 50ppm/°C
CMOS logic levels high input V_{IH} low input V_{IL}	 › 2V ‹ 0.8V

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9.3 Mechanical Specifications

The PCB has dimensions of width = 80mm, long = 80mm and height = 30mm. It can be mounted with four screws M3x8 (min) considering thickness of the board 1.6mm and spacers between the board and the mounting pad of at least 4mm.

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10 Documentation

10.1 Document History

Version of Documentation	Board Version	Description / Changes
V011	V1.1	Starting document history
V012	V1.1	Correct picture of connectors
V013	V1.4	New hardware version, compatible to Tiger plus RAM battery buffering is now removable by keeping the RTC backupped.
V014	V1.4	New document layout
V015	V1.5	Images updated. Jumper descriptions corrected. Overall various errors and typos in text corrected.

10.2 Product History

Board Version	Description / Changes
V1.4	Starting product history
V1.5	Changes for improving manufacturing

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