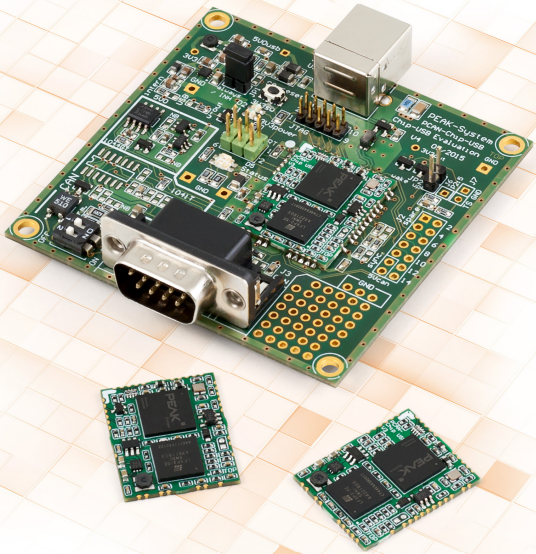
# PCAN-Chip USB

## Stamp Module for the Implementation of CAN FD to USB Connections

# User Manual



Document version 1.5.0 (2023-06-23)

PEAK System

## Relevant products

| Product Name | Part number |
|---|---|
| PCAN-Chip USB | IPEH-004025 |
| PCAN-Chip USB Eval | IPEH-004025-EVAL |

The cover picture shows the stamp module PCAN-Chip USB (two times) and the affiliated evaluation board.



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# Contents

# 1 Introduction

For custom hardware designs a CAN connection can be implemented with the stamp module which communicates via USB 2.0 with the hardware. The integrated CAN controller supports the protocols CAN 2.0 A/B as well as CAN FD. The physical CAN connection is determined by external wiring. The stamp module with its single-sided mounting and plated half-holes is suitable for automatic assembly.

The optional PCAN-Chip USB Eval board simplifies the development of a custom board based on the stamp module. The board is equipped with the CAN transceiver NXP TJA1044GT.

In addition to the documentation for the integration of the stamp module, the scope of supply of the PCAN-Chip USB includes licenses for the Windows and Linux device drivers, for the CAN monitor PCAN-View, and for the PCAN-Basic API.

**Note:** This user manual refers to the PCAN-Chip USB and the optional developer board PCAN-Chip USB Eval.

## 1.1 Properties of the PCAN-Chip USB at a Glance

- High-Speed-USB 2.0 (compatible with USB 1.1 and 3.0)
- FPGA implementation of the CAN FD controller
- Complies with CAN specifications 2.0 A/B and FD
- CAN FD support for ISO and Non-ISO standard switchable
- Measurement of bus load including error frames on the physical bus

- Induced error generation for incoming and outgoing CAN messages
- 100-percent compatible with the USB device drivers and the software from PEAK-System
- Connections for 2 status LEDs
- 5 digital inputs/outputs + 1 analog input (access via PCAN-Basic API)
- Voltage supply 3.3 V DC
- Firmware update via USB
- Dimensions: 25 x 20 mm
- Extended operating temperature range of -40 to +85 °C (-40 to +185 °F)

## 1.2 Properties of the PCAN-Chip USB Evaluation Board at a Glance

- CAN bus connection via D-Sub, 9-pin (in accordance with CiA® 106)
- CAN transceiver NXP TJA1044GT
- USB connector type B, standard ESD protection
- Dual-color LED for CAN status and power supply
- Power supply via USB
- Extended operating temperature range of -40 to +85 °C (-40 to +185 °F)

## 1.3 System Requirements for the Operation of the Evaluation Board

- A free USB port (USB 1.1, USB 2.0, or USB 3.0) on the computer or on a self-powered USB hub connected to the computer
- Operating system Windows 11 (x64/ARM64), 10 (x64) or Linux

## 1.4 Scope of Supply PCAN-Chip USB

- Stamp module PCAN-Chip USB; delivery, depending on quantity, as cut tape or reel for automatic placement machines
- Documentation about the external circuits and the integration of the module incl. example circuit diagram
- One license per stamp module for:
  - Device driver for Windows and Linux
  - CAN monitor PCAN-View for Windows
  - Programming interface PCAN-Basic for the development of applications with CAN connection
  - Programming interfaces for standardized protocols from the automotive sector

The license fees for CAN to Robert Bosch GmbH are included.

## 1.5 Scope of Supply PCAN-Chip USB Eval

- PCAN-Chip USB Evaluation Board with soldered stamp module
- USB connection cable
- Further scope of supply as for PCAN-Chip USB

# 2 External Circuits Stamp Module

This chapter describes the functions of each port (contact) on the stamp module and contains instructions for external circuits. The circuit diagram in Appendix A on page 51 provides further criteria for external circuits.

## 2.1 Connectors

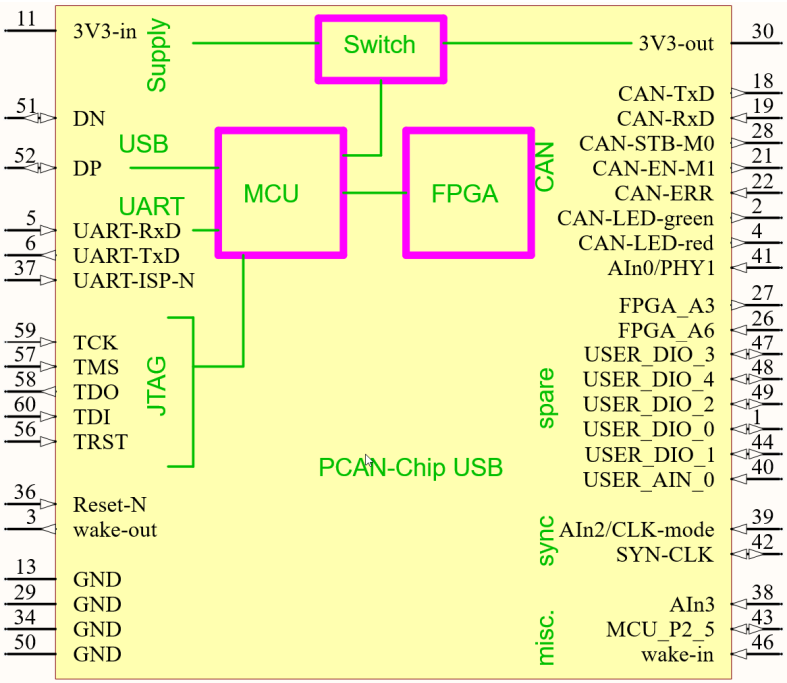



Figure 1: Block diagram PCAN-Chip USB

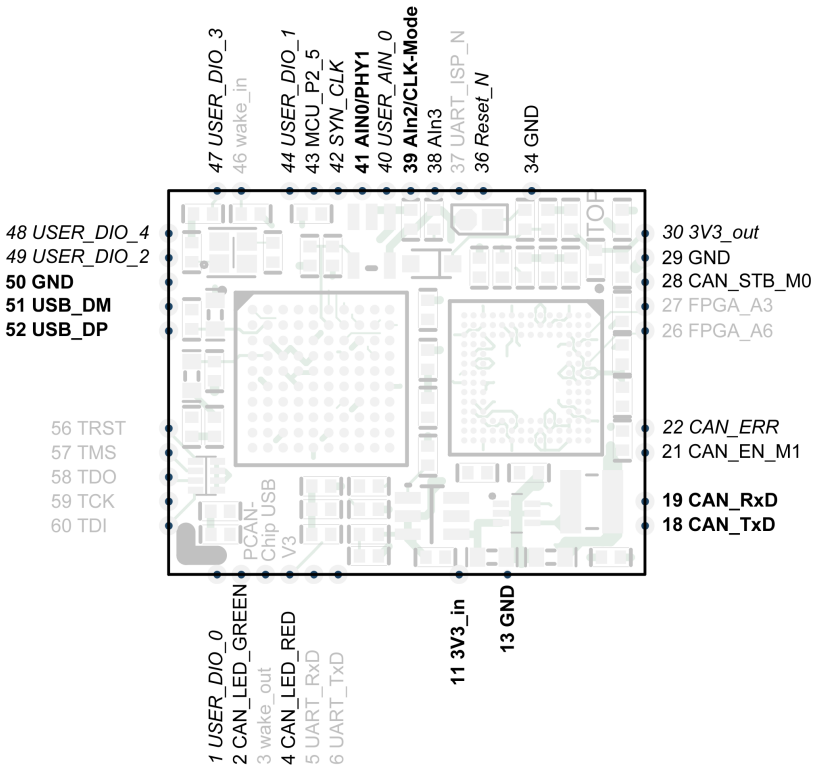



Figure 2: Signal assignment at the contacts on the stamp module, numbering from 1 to 60 counterclockwise, pitch 50 mil (1.27 mm)

Legend:

| | |
|---|---|
| **Bold:** | **required connection** |
| Normal: | recommended connection |
| *Italic:* | *optional connection* |
| Gray: | no connection |

| Contact no. | Signal | Function | Connection |
|---|---|---|---|
| *1* | *USER_DIO_0* | *Digital input/output, µC pin [1], software access via PCAN-Basic API* | *Free for customer application* |
| 2 | CAN-LED-green | CAN status LED (green), µC pin [1]<br>- On: initialized by driver<br>- Slow blinking: connection to software application<br>- Fast blinking: CAN data transfer | Via series resistor to LED green anode (6 mA max.) |
| 3 | wake-out | Reserved for wake-up output (not implemented in the firmware) | Do not connect |
| 4 | CAN-LED-red | CAN error LED, µC pin [1]<br>- Blinking: data error CAN | Via series resistor to LED red anode (6 mA max.) |
| 5 | UART-RxD | Reserved | Do not connect |
| 6 | UART-TxD | Reserved | Do not connect |
| **11** | **3V3-in** | **Module supply 3.3 V** | **Supply from power unit: 3.3 V ±0.15 V, min. 150 mA** |
| **13** | **GND** | **Module GND** | **Low impedance, short connection to the GND plane of the mother-board** |
| **18** | **CAN-TxD** | **CAN data, outgoing, FPGA pin [2]** | **Tx transceiver, pull-up recommended** |
| **19** | **CAN-RxD** | **CAN data, incoming, FPGA pin [2]** | **Rx transceiver** |
| 21 | CAN-EN-M1 | Enable signal for CAN transceiver, µC pin [1] | Depending on transceiver type, see circuit diagram on page 58 |
| *22* | *CAN-ERR* | *Reserved for CAN-ERR (not processed by the firmware)* | *CAN-ERR output of the CAN transceiver* |
| 26 | FPGA_A6 | Reserved | Do not connect |
| 27 | FPGA_A3 | Reserved | Do not connect |
| 28 | CAN-STB-M0 | Standby signal for CAN transceiver, µC pin [1] | Depending on transceiver type, see circuit diagram on page 58 |

| Contact no. | Signal | Function | Connection |
|---|---|---|---|
| 29 | GND | Module GND | Low impedance, short connection to the GND plane of the mother-board |
| *30* | *3V3-out* | *3.3-Volts output for supply of external components<br>- ON when supply power is present (µC firmware initialized)<br>- OFF if supply power is not present or USB Suspend* | *Free for customer application* |
| 34 | GND | Module GND | Low impedance, short connection to the GND plane of the mother-board |
| *36* | *Reset-N* | *Module reset<br>Parallel to the OC output of the module's reset chip (3.3-Volts monitoring) at the reset input of the µC; pull-up 1 kΩ on the module* | *If required, to Low-active (open collector) reset of the overall system; no external pull-up!* |
| 37 | UART-ISP-N | Boot source UART, µC pin, pull-up 10 kΩ on the module | Do not connect |
| 38 | AIn3 | Reserved | Pull-down 4.7 kΩ |
| **39** | **AIn2/CLK-Mode** | **Activation and master-slave selection for synchronization of multiple chip modules (see section 2.2 on page 13), µC pin** | **- Pull-down 4.7 kΩ for stand-alone<br>- Pull-up und pull-down 4.7 kΩ for Sync master<br>- Pull-up 4.7 kΩ for Sync slave** |
| *40* | *USER_AI_0* | *Analog input 0 – 3.3 V, 10 bit, µC pin, software access via PCAN-Basic API* | *Connection of a voltage to be measured in the range of 0 – 3.3 V, protective circuit recommended* |
| **41** | **AIn0/PHY1** | **Analog input 0 – 3.3 V, Determination/detection CAN transceiver type (see section 2.3 on page 14)** | **Resistor to GND (value: see section 2.3 on page 14)** |

| Contact no. | Signal | Function | Connection |
|---|---|---|---|
| *42* | *SYN-CLK* | *Synchronization clock I/O using multiple modules (see section 2.2 on page 13)* | *Connection SYN-CLK of all modules, series resistor 33 Ω at the output of the Sync master* |
| *43* | *MCU_P2_5* | *Reserved µC pin [1]* | *Pull-down 10 kΩ* |
| *44* | *USER_DIO_1* | *Digital input/output, µC pin [1], software access via PCAN-Basic API* | *Free for customer application* |
| 46 | wake-in | Reserved for wake-up input (not implemented in the firmware), µC pin, pull-up 4.7 kΩ on the module | Do not connect |
| *47* | *USER_DIO_3* | *Digital input/output, µC pin [1], software access via PCAN-Basic API, pull-down 4.7 kΩ on the module* | *Free for customer application* |
| *48* | *USER_DIO_4* | *Digital input/output, µC pin [1], software access via PCAN-Basic API* | *Free for customer application* |
| *49* | *USER_DIO_2* | *Digital input/output, µC pin [1], software access via PCAN-Basic API* | *Free for customer application* |
| **50** | **GND** | **Module GND** | **Low impedance, short connection to the GND plane of the mother-board** |
| **51** | **USB-DM** | **USB data, negative, µC pin, no protective circuit on the module** | **USB - DM ESD protection and common mode filter recommended** |
| **52** | **USB-DP** | **USB data, positive, µC pin, no protective circuit on the module** | **USB - DP ESD protection and common mode filter recommended** |

| Contact no. | Signal | Function | Connection |
|---|---|---|---|
| 56 | TRST | Reserved JTAG | Do not connect |
| 57 | TMS | | |
| 58 | TDO | | |
| 59 | TCK | | |
| 60 | TDI | | |

Legend:

| | |
|---|---|
| **Bold:** | **required connection** |
| Normal: | recommended connection |
| *Italic:* | *optional connection* |
| Gray: | no connection |

[1] I/O pin on microcontroller
5-Volts-tolerant if 3.3-Volts supply is applied
$V_{IH}$ > 2.4 V, $V_{IL}$ < 0.9 V
$V_{OH}$ > 2.75 V, $V_{OL}$ < 0.4 V; $I_{OUTmax}$ = 6 mA

[2] I/O pin on FPGA (LVCMOS33)
$V_{IH}$ > 2.0 V, $V_{IL}$ < 0.8V; $V_{in}$ max. = 3V3-In
$V_{OH}$ > 2.75 V, $V_{OL}$ < 0.4 V; $I_{OUTmax}$= 4 mA

## 2.2 Synchronization of Several Stamp Modules

When using several stamp modules, a synchronization of the time stamps for the CAN messages can be done. This happens by connecting the SYN-CLK port (42) of all stamp modules.

The analog input AIn2/CLK-Mode (39) is used to configure the synchronization. One stamp module is the master, all others are slaves.

| Mode | Voltage at AIn2/CLK-Mode (39) | Circuit recommendation |
|---|---|---|
| Stand-alone | 0 V (GND) | Pull-down 4.7 kΩ |
| Slave (Clk in) | 3.3 V (supply) | Pull-up 4.7 kΩ |
| Master (Clk out) | 1.65 V | Voltage divider with pull-up and pull-down, each 4.7 kΩ |

## 2.3 CAN Transceiver Type Detection

Depending on the detected CAN transceiver type, the firmware of the PCAN-Chip USB adapts its use of the control signals to the CAN transceiver

The CAN transceiver type is detected by the stamp module with the proportion of the input voltage at the analog input AIn0/PHY1 (41) to 3.3 V. The voltage divider is recommended with a resistor of 1 kΩ against 3.3 V and a resistor against ground, according to the following table.

| Transceiver type | Voltage proportion at AIn0/PHY1 (41) | Resistor against ground |
|---|---|---|
| TH8056<br>Single-wire CAN SAE J2411 | 20 % | 270 Ω |
| TJA1055<br>Low-speed CAN ISO 11898-3 | 40 % | 680 Ω |
| TJA1044GT<br>High-speed CAN FD ISO 11898-2 | 70 % | 2400 Ω |
| 82C251<br>High-speed CAN ISO 11898-2 | 80 % | 3900 Ω |
| TJA1041<br>High-speed CAN ISO 11898-2 | 90 % | 9100 Ω |

If you implement another CAN transceiver, compare its properties with the ones of the CAN transceivers listed here in order to select the appropriate voltage proportion.

## 2.4 Additional Notes

- Supplied with 3.3 V DC, core supply is generated within the PCAN-Chip USB
- Stamp module without protection circuits; external protective circuits required (see 2.1 Connectors on page 8 and Appendix C *Circuit Diagram of the Evaluation Board* on page 56)
- CAN transmission mode (OSI layer 1) is determined by the external CAN transceiver, connections for control and status lines are available
- Status indication with two external LEDs (series resistors required)
- Firmware update possible via USB

# 3 Stamp Module Mounting

The stamp module with its single-sided mounting and plated half-holes is suitable for automatic assembly.

**Attention!** Electrostatic discharge (ESD) can damage or destroy components on the stamp module. Take precautions to avoid ESD when handling the stamp module.

## 3.1 Dimensions and Contacts Stamp Module

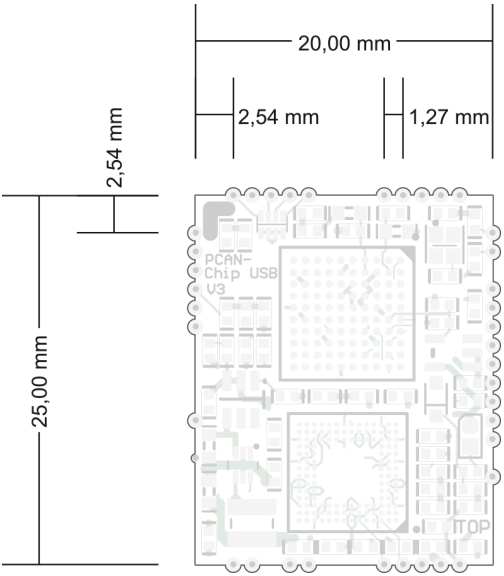



Figure 3: Dimensions of the stamp module
(figure not in original size)

- Contact positions in 50 mil (1.27 mm) grid
- Numbering system for contacts: start is on the right to the corner marking, raising numbers counterclockwise, 17 contact positions on the long edge, 13 on the short one (results in contact positions 1 to 60), not all positions with contacts
- Contacts: half holes with metallization on the board edge, extended on the bottom side of the board as pads

## 3.2 Layout on the Target System

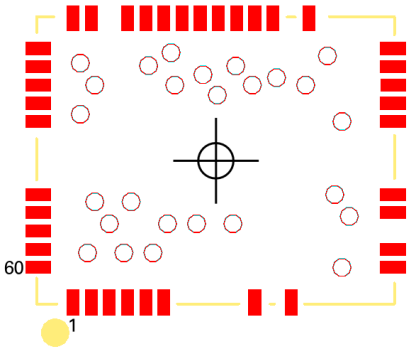



Figure 4: Footprint of the stamp module on the target system (crosshair: zero point of coordinates, red circles: keep-out areas)

The footprint of the stamp module is also available as file in different types:

- CAD data
- Library for Altium Designer

### Connection Pads

We recommend the following properties for the pads on the target system in order to connect the stamp module:

- Rectangular, 0.9 x 1.8 mm
- Solder Stop Exemption +0.05 mm (2 mil)
- Paste 0 mm

The coordinates of the connection points of the stamp module are given in the following table related to the center of module:

| Connection point | Coordinates [mm] | |
|---|---|---|
| | X | Y |
| 1 | -9.96 | -9.32 |
| 2 | -8.69 | -9.32 |
| 3 | -7.42 | -9.32 |
| 4 | -6.15 | -9.32 |
| 5 | -4.88 | -9.32 |
| 6 | -3.61 | -9.32 |
| 11 | 2.74 | -9.32 |
| 13 | 5.28 | -9.32 |
| 18 | 11.82 | -7.47 |
| 19 | 11.82 | -6.20 |
| 21 | 11.82 | -3.66 |
| 22 | 11.82 | -2.39 |
| 26 | 11.82 | 2.70 |
| 27 | 11.82 | 3.97 |
| 28 | 11.82 | 5.24 |
| 29 | 11.82 | 6.51 |
| 30 | 11.82 | 7.78 |
| 34 | 6.55 | 9.32 |
| 36 | 4.01 | 9.32 |
| 37 | 2.74 | 9.32 |
| 38 | 1.47 | 9.32 |

| Connection point | Coordinates [mm] | |
|---|---|---|
| | X | Y |
| 39 | 0.20 | 9.32 |
| 40 | -1.07 | 9.32 |
| 41 | -2.34 | 9.32 |
| 42 | -3.61 | 9.32 |
| 43 | -4.88 | 9.32 |
| 44 | -6.15 | 9.32 |
| 46 | -8.69 | 9.32 |
| 47 | -9.96 | 9.32 |
| 48 | -11.82 | 7.78 |
| 49 | -11.82 | 6.51 |
| 50 | -11.82 | 5.24 |
| 51 | -11.82 | 3.97 |
| 52 | -11.82 | 2.70 |
| 56 | -11.82 | -2.38 |
| 57 | -11.82 | -3.65 |
| 58 | -11.82 | -4.92 |
| 59 | -11.82 | -6.19 |
| 60 | -11.82 | -7.46 |

### Keep-out areas

The stamp module lies flat on the target system and has several bare areas on its bottom side (test points). Therefore, the top layer of the target system must not have traces or vias in several keep-out areas beneath the stamp module.

In Figure 4 above the keep-out areas are indicated by circles (diameter 1.27 mm = 50 mil). The following table contains the center point coordinates of the keep-out areas related to the center of the stamp module.

| Keep-out area (test point) | Coordinates [mm] | |
|---|---|---|
| | X | Y |
| TP1 | -2.85 | 5.25 |
| TP2 | 9.34 | -3.90 |
| TP3 | 7.83 | 7.27 |
| TP4 | 1.21 | -4.41 |
| TP5 | 1.41 | 6.55 |
| TP6 | -3.36 | -4.41 |
| TP7 | 6.29 | 5.24 |
| TP8 | -1.32 | -4.41 |
| TP9 | -5.90 | -2.88 |
| TP10 | 2.57 | 5.23 |
| TP11 | -7.41 | -4.41 |
| TP12 | -8.44 | -2.88 |
| TP13 | -4.37 | -6.44 |
| TP14 | -6.40 | -6.44 |
| TP15 | -9.46 | 3.20 |
| TP16 | -8.44 | 5.24 |
| TP17 | -3.11 | 7.51 |
| TP18 | -4.68 | 6.53 |
| TP19 | -9.45 | 6.76 |
| TP20 | 8.32 | -2.38 |
| TP21 | 8.83 | 2.70 |
| TP22 | 8.84 | -7.47 |
| TP23 | -8.94 | -6.44 |
| TP24 | 4.26 | 5.74 |
| TP25 | -0.88 | 5.98 |
| TP26 | 0.12 | 4.54 |

## 3.3 Handling and Soldering

An MSL (Moisture Sensitivity Level) of 3 applies to the stamp module. This value refers to the moisture sensitivity during packaging, storage, and assembly.

- Note for the soldering process:
  - Only one-time soldering of the stamp module on the target hardware
  - Peak reflow temperature of 260 °C (+0/-5 °C) in a time window of 10 to 30 seconds

# 4 Installing Software and Starting the Hardware

For operation of the PCAN-Chip USB under Windows, the installation of the standard driver package from PEAK-System is necessary. Exemplary the start of the evaluation board which holds the PCAN-Chip USB is described in this chapter.

- Install the driver for the PCAN-Chip USB on your PC:

  1. Download the device driver setup from our website: www.peak-system.com/quick/DL-Driver-E
  2. Unpack the file `PEAK-System_Driver-Setup.zip`.
  3. Double-click the file `PeakOemDrv.exe`.

     The driver setup starts.
  4. Follow the program instructions.

- Connect the evaluation board:

  1. With the supplied USB cable, connect the USB socket on the evaluation board and the PC. The evaluation board is supplied with power and the PCAN-Chip USB is interconnected to the operating system.

     The green LEDs D1 “3V3power” and D2 “3V3sw” are on (position: see figure Figure 5 below).

     Windows detects the new hardware and completes the driver installation.
  2. Check the LED D5 “Status”. If the LED is green, then the driver was initialized successfully.

The evaluation board with the PCAN-Chip USB is ready for use.

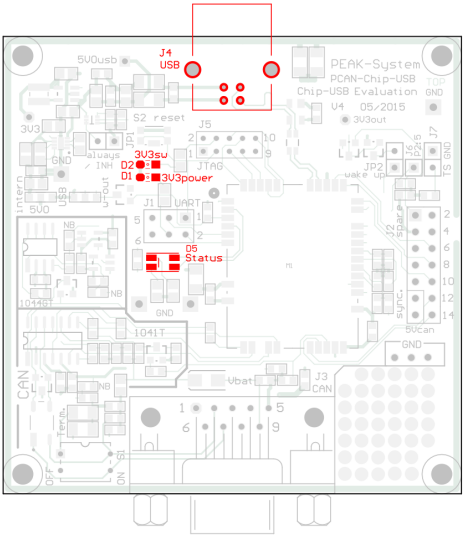



Figure 5: Position of the USB socket and the status LEDs

## Unplugging the USB Connection

On Windows, the icon for removing hardware safely is not used with the PCAN-Chip USB. You can unplug the PCAN-Chip evaluation board from the computer without any preparation.

# 5 Components of the Evaluation Board

This chapter describes the most important components of the PCAN-Chip USB evaluation board. For additional details, refer to the circuit diagram in Appendix A on page 51.

## 5.1 USB (Supply Voltage)

The evaluation board is supplied with power via the USB cable connected at the USB socket type B (position J4). Furthermore, a connection is established via USB between the PCAN-Chip USB and a PC.

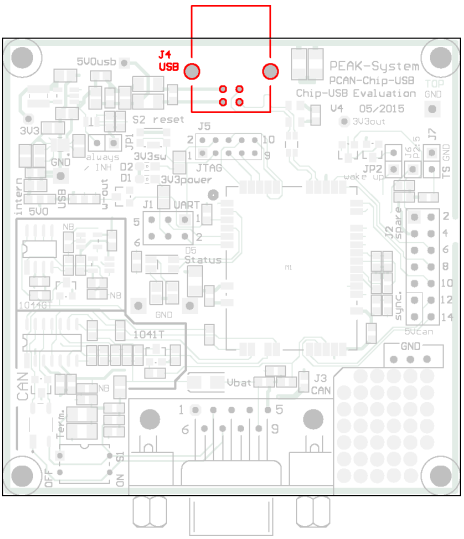



Figure 6: Position of the USB connector

## 5.2 Status LEDs

The PCAN-Chip USB evaluation board has three status LEDs.

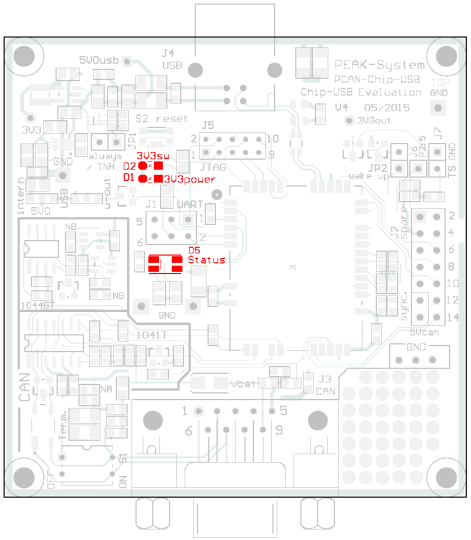



Figure 7: Positions of the status LEDs

### LED D5 “Status”

The LED indicates the status of the stamp module PCAN-Chip USB associated with the device driver that is installed on the connected computer.

| Indication | Meaning |
|---|---|
| Green on | There's a connection to a driver of the operating system. |
| Green slow blinking | A software application is connected to the stamp module. |
| Green quick blinking | Data is transmitted via the connected CAN bus. |
| Red blinking | An error is occurring during the transmission of CAN data. |

### LEDs D1 “3V3power” and D2 “3V3sw”

Both LEDs indicate the status of the supply voltage of 3.3 Volts which are generated on the evaluation board out of the 5 Volts from the USB connection.

| LED position | Indication | Meaning |
|---|---|---|
| D1 “3V3power” | Green on | The evaluation board receives supply voltage. |
| D2 “3v3sw” | Green on | The stamp module receives supply voltage. |

## 5.3 CAN Connector

The 9-pin D-Sub plug on position J3 is used as CAN connector. The pin assignment of the CAN connector corresponds to the specification CiA® 106.

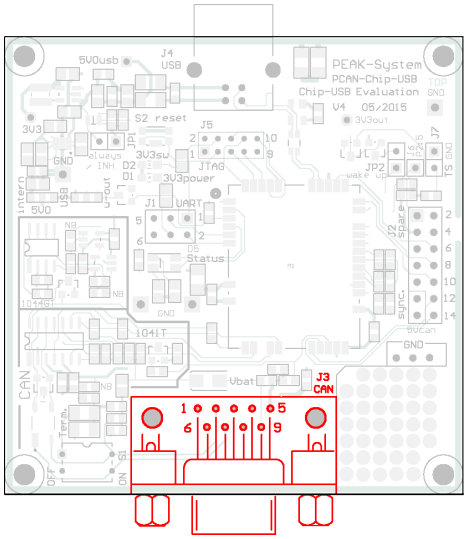



Figure 8: Position of the CAN connector

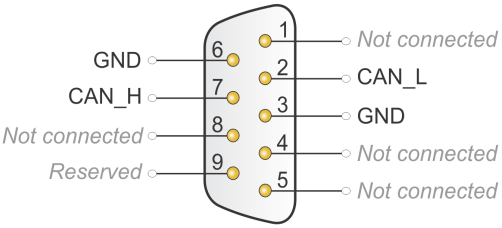



Figure 9: Assignment of the D-Sub male connector for CAN

## 5.4 Internal Termination of the High-speed CAN Bus

If the evaluation board is connected to one end of the High-speed CAN bus and the CAN bus is not terminated at that end, an internal termination of 120 Ohms can be activated on the evaluation board with the DIP switches at position S1. Both DIP switches 1 and 2 must be set to ON.

At delivery, both DIP switches are set to OFF. The internal termination is not activated.

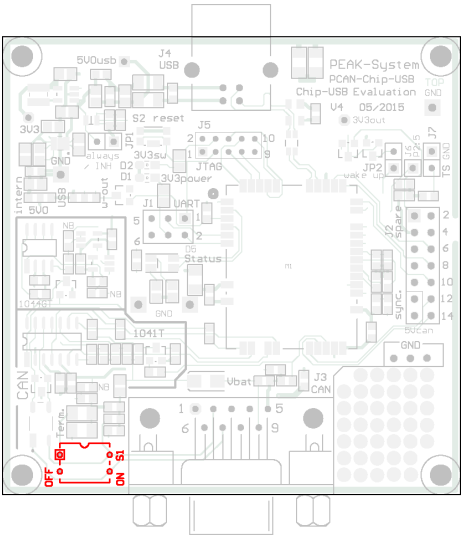



Figure 10: Position of the DIP switches (S1) for the termination

## 5.5 Connector for Time Stamp Synchronization

On position J7 is a connector for synchronization of time stamps if several stamp modules (PCAN-Chip USB) are used in a system.

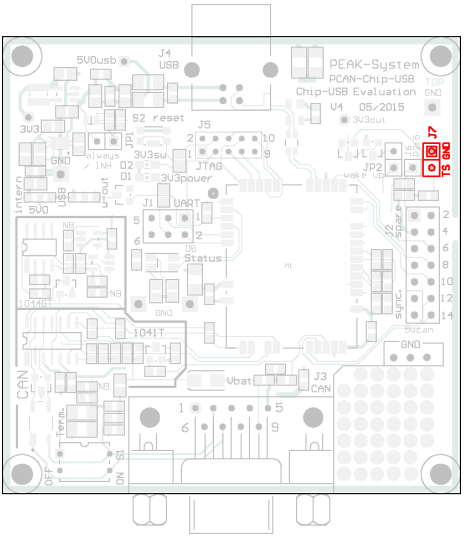



Figure 11: Position of connector J7

See section 2.2 *Synchronization of Several Stamp Modules* on page 13 for further information.

## 5.6 Prototyping Area

The PCAN-Chip USB evaluation board has 39 soldering pads (vias) in a 100-mil grid. They don't have any connection to the electronics on the evaluation board. Small circuits can be added here to the inputs and outputs.

Above are 3 additional soldering pads for connections to ground (GND).

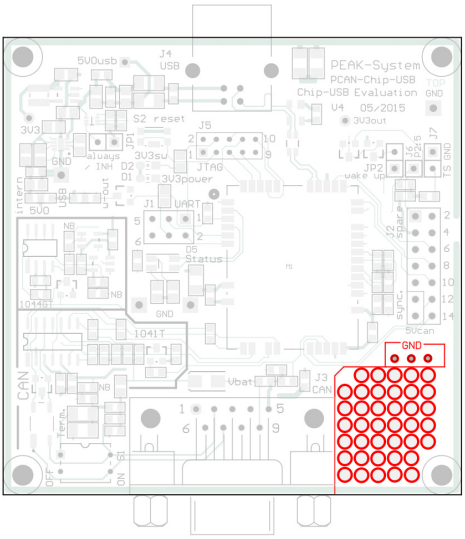



Figure 12: Position of the prototyping area

## 5.7 Reset Button

With the reset button on position S2, you can perform a hardware reset.

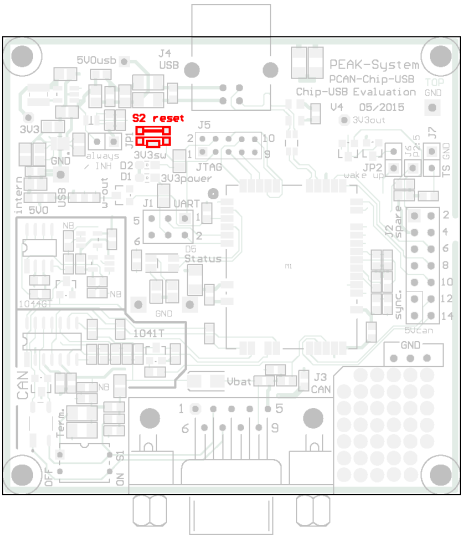



Figure 13: Position of the reset button

## 5.8 Mounting Holes (Dimension Drawing)

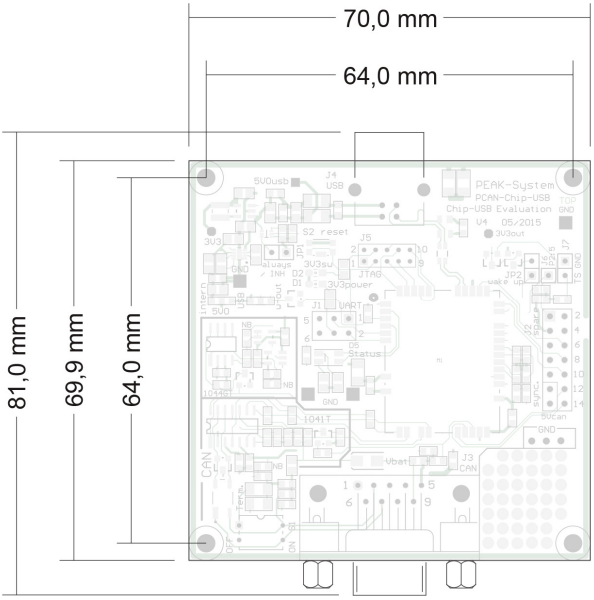



Figure 14: Main dimensions of the evaluation board
(figure not in original size)

# 6 Software and API

This chapter covers the provided software PCAN-View and the programming interface PCAN-Basic.

## 6.1 Monitoring Software PCAN-View

PCAN-View for Windows is a simple CAN monitoring program for viewing, transmitting, and logging CAN and CAN FD messages.

**Note:** This chapter describes the use of PCAN-View with a CAN FD interface.

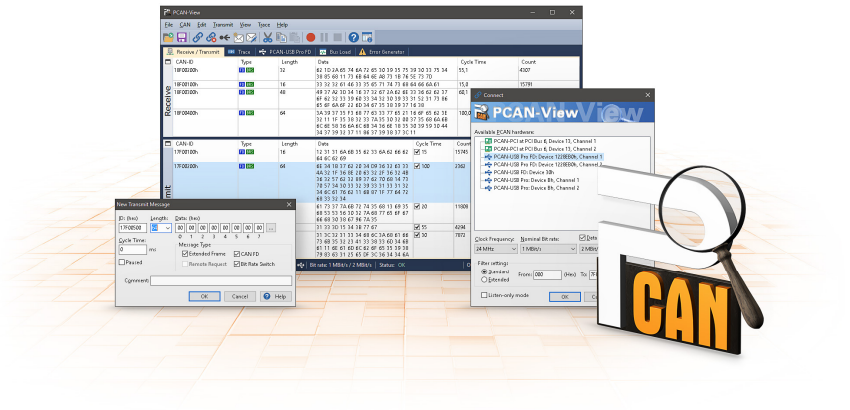



Figure 15: PCAN-View for Windows

Do the following to start and initialize PCAN-View:

1. Open **PCAN-View** via the Windows Start menu.

The **Connect** dialog box appears.

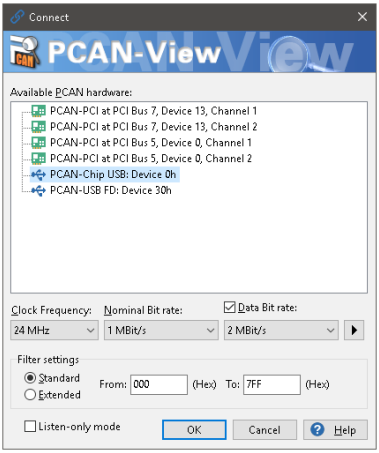



Figure 16: Selection of the hardware and parameters

2. Select the desired CAN interface (for some interfaces also the CAN channel) from the **Available PCAN Hardware** list.
3. Select the **Clock Frequency**. This determines which bitrates are available in the following.
4. Select the **Nominal Bitrate** which is used for the arbitration phase of CAN FD frames (max. 1Mbit/s).
5. Enable the **Data Bitrate** checkbox and select a bitrate from the list below. This is the raised transfer rate for the data fields of CAN FD frames.

**Note**: Both bitrates must match the ones from other participants on the CAN bus.

**Tip**: Click on the arrow button (▶) if you want to use user-defined bitrates.

6. Under **Filter settings**, you can limit the range of CAN IDs to be received, either for standard frames (11-bit IDs) or for extended frames (29-bit IDs).

7. Activate the **Listen-Only mode** if you do not actively participate in the CAN traffic and just want to observe. This also avoids an unintended disruption of an unknown CAN environment (e.g. due to different bit rates).

8. Finally confirm the settings in the dialog box with **OK**. The main window appears (see Figure 17).

### 6.1.1 Receive/Transmit Tab

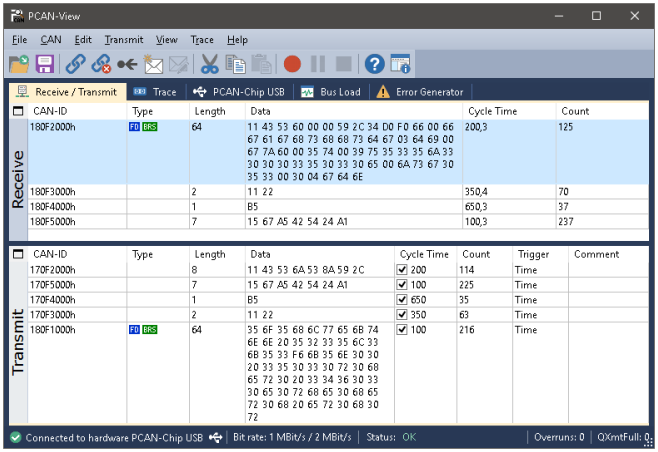



Figure 17: Receive/Transmit tab

The **Receive/Transmit** tab is the main element of PCAN-View. It contains two lists, one for received messages and one for the transmit messages. The CAN data format is hexadecimal by default.

Do the following to transmit a CAN FD message:

1. Select the menu command **Transmit** > **New Message** (alternatively or Ins).

   The **New Transmit Message** dialog box appears.

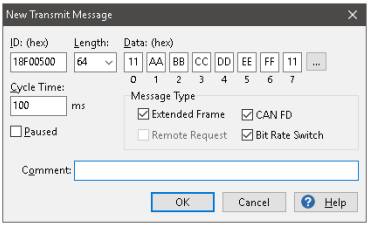



Figure 18: Dialog box New Transmit Message

2. Enable the **CAN FD** checkbox to define a CAN FD message with a maximum length of 64 data bytes.
3. Enter the **ID**, the data **Length** in Bytes, and the **Data** for the new CAN message. With a length of more than 8 bytes, click on ... and enter the data bytes in the editor.

**Note:** With program version 4 of PCAN-View, the DLC field was renamed to **Length**. Latter reflects the actual data length.

4. The **Cycle Time** field indicates if the message will be transmitted manually or periodically. Enter a value greater than 0 to transmit periodically. Enter the value 0 to transmit only manually.
5. Enable **Bit Rate Switch** in order to transmit the data of a CAN FD message with the data bitrate.
6. Confirm the entries with **OK**.

   The created transmit message appears on the **Receive/Transmit** tab.

7. Trigger selected transmit messages manually with the menu command **Transmit** > **Send** (alternatively Space bar). The manual transmission for CAN messages being transmitted periodically is carried out additionally.

**Tip**: Using the menu command **File** > **Save** the current transmit messages can be saved to a list and loaded for reuse later on.

### 6.1.2 Trace Tab

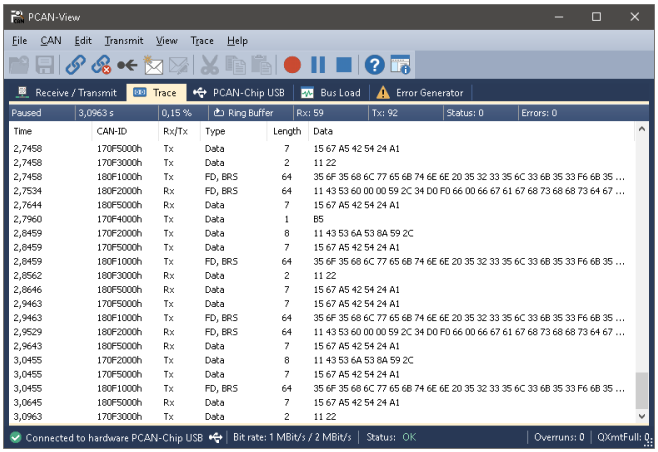



Figure 19: Trace tab

On the **Trace** tab, the tracer (data logger) of PCAN-View is used to record the communication on a CAN bus. During this process, the messages are cached in the working memory of the PC. Afterwards they can be saved to a file.

The Tracer runs either in linear or in ring buffer mode. In linear buffer mode the logging is stopped as soon as the buffer is filled completely. The ring buffer mode overwrites the oldest messages by new ones as soon as the buffer is full.

### 6.1.3 PCAN-CHIP USB Tab

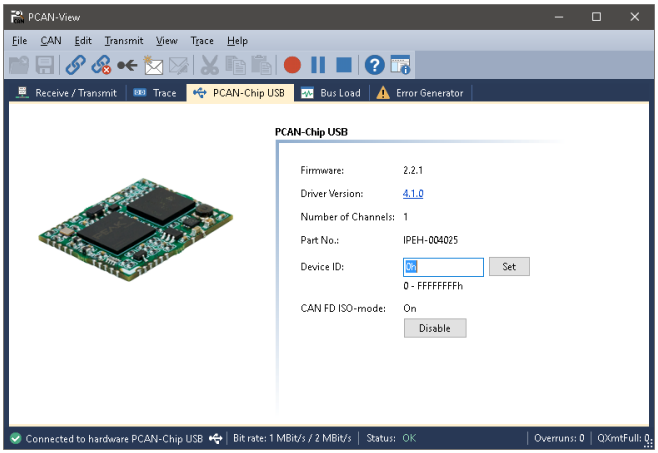



Figure 20: PCAN-Chip USB tab

The **PCAN-Chip USB** tab shows information about the used CAN hardware, e.g. the current firmware version. Moreover, you can assign a **device ID** to a stamp module. Then it can be clearly identified during operation of several modules in one computer.

#### CAN FD ISO mode

The CAN FD standard that is defined in ISO 11898-1 is not compatible to the original protocol. PEAK-System takes this into account by supporting both protocol versions in their CAN FD interfaces.

You can switch to the CAN FD protocol used in the environment with the **Disable** / **Enable** button (Non-ISO or ISO).

### 6.1.4 Bus Load Tab

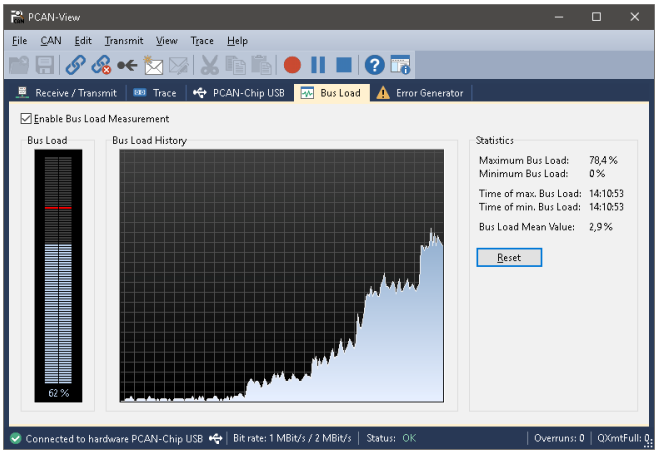



Figure 21: Bus Load tab

On the **Bus Load** tab, the current bus load, time course, and statistical information of the CAN channel are displayed. The CAN bus load reflects the utilization of transmission capacity.

### 6.1.5 Error Generator Tab

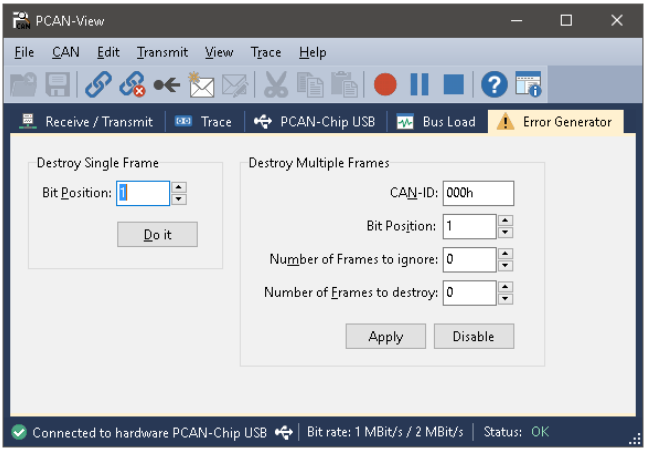



Figure 22: Error Generator tab

Via the **Error Generator** tab, the communication on the CAN bus can be disturbed for testing purposes by 6 consecutive dominant bits. This is a violation of the CAN protocol on the CAN bus which must be recognized as an error by the connected CAN nodes.

You can destroy CAN frames with the error generator by one of two methods:

- once after activation
- repeatedly at specific intervals related to a CAN ID

The **Destroy Single Frame** area refers to the next CAN frame that is recognized by the adapter after activation.

- Do the following to destroy a single CAN frame:

  1. Enter the **Bit Position** where in the CAN frame the error is to be generated. The count includes the stuff bits.
  2. Confirm the entries with **Do it**.

     The next received or transmitted CAN frame will be destroyed at the selected bit position.

The **Destroy Multiple Frames** area refers to a CAN ID whose frames are to be destroyed in specific intervals.

- Do the following to destroy multiple CAN frames:

  1. Enter the **CAN ID** of the frame to be destroyed.
  2. Enter the **Bit Position** where in the CAN frame the error is to be generated. The count includes the stuff bits.
  3. The **Number of Frames to ignore** field specifies the number of CAN frames with the given ID that are ignored before a frame is destroyed.
  4. The **Number of Frames to destroy** field specifies the number of CAN frames with the given ID that are destroyed consecutively.
  5. Confirm the entries with **Apply** to activate the error generator.
  6. Stop destroying further CAN frames with **Disable**.

### 6.1.6 Status Bar


Figure 23: Indication of the status bar

The status bar shows information about the current CAN connection, about error counters (Overruns, QXmtFull), and shows error messages.

There's further information about the use of PCAN-View in the help which you can invoke in the program via the **Help** menu or with the F1 key.

## 6.2 Linking Own Programs with PCAN-Basic (Version 4 or Higher)

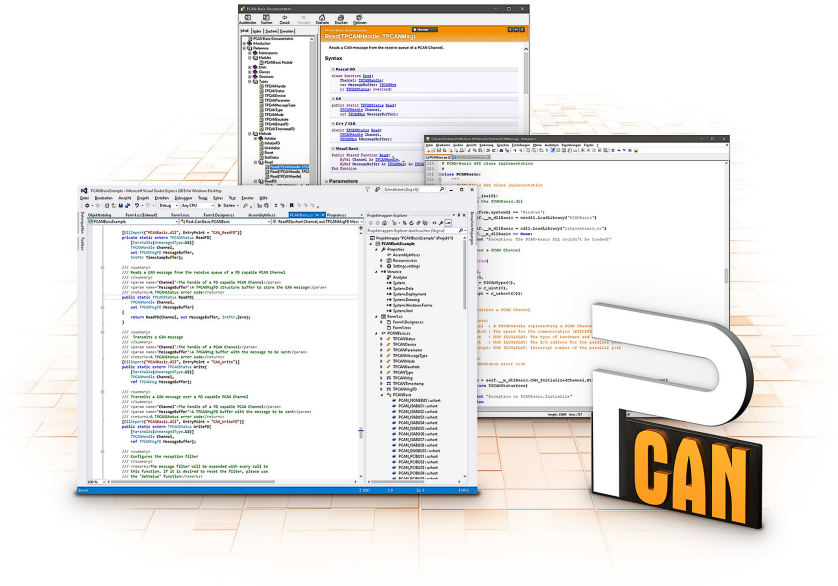



Figure 24: PCAN-Basic

**Note:** The intended use of PCAN-Basic requires compliance with the license rights. Read the license agreement for end users at www.peak-system.com/quick/eula.

The programming interface (API) PCAN-Basic provides basic functions for the connection of own programs to the CAN-Interface of PEAK-System. PCAN-Basic is the interface between the program and the device driver. In Windows operating systems this is a DLL (Dynamic Link Library) and in Linux operating systems an SO (Dynamic Shared Object). PCAN-Basic is designed to be cross-operating system compatible. Software projects can be ported between supported systems with little effort.

With the installation of the device driver package under Windows the DLL files of the API PCAN-Basic are placed in the system folder. Examples for all common programming languages as well as libraries and help files are available as download package at www.peak-system.com/quick/DL-Develop-E.

For Linux a download of the API is available under this link. For a use of PCAN-Basic another driver package with chardev driver is needed, because an access under SocketCAN is not possible. The "Driver Package for Proprietary Purposes", the user manual, and further information about the implementation can be found at www.peak-system.com/linux.

### 6.2.1 Features of PCAN-Basic

- API for developing applications with CAN and CAN FD connections
- Support for CAN specifications 2.0 A/B and FD
- Application development for the platforms Windows® 11 (x64/ARM64), 10 (x86/x64), and Linux
- Multiple PEAK-System applications and your own can be operated on a physical channel at the same time
- Use of a single DLL for all supported hardware types
- Use of up to 16 channels for each hardware type (depending on the PEAK CAN interface used)
- Simple switching between channels of a PEAK CAN interface
- Access to the CAN channels of a PCAN-Gateway via the new PCAN-LAN hardware type
- Driver-internal buffering of up to 32,768 CAN messages per CAN channel
- Precision of time stamps on received messages up to 1 µs (depending on the PEAK CAN interface used)

- Supports PEAK-System's trace formats version 1.1 and 2.0 (for CAN FD applications)
- Access to specific hardware parameters, such as listen-only mode
- Notification of the application through Windows® events when a message is received
- Support of CAN error frames
- Confirmation of physical transmission by CAN echo frames
- Extended system for debugging operations
- Multilingual debugging output
- Output language depends on operating system
- Debugging information can be defined individually
- Thread-safe API

**Tip:** An overview of the API functions is located in the header files. Detailed information about the PCAN-Basic API is in the text and help files (file name extensions `.txt` and `.chm`).

### 6.2.2 Principle Description of the API

The PCAN-Basic API is the interface between the user application and device driver. In Windows operating systems this is a DLL (Dynamic Link Library).

Accessing the CAN interface is divided into three phases:

1. Initialization
2. Interaction
3. Completion

#### Initialization

A CAN channel must be initialized before using it. This is done by the call of the `CAN_Initialize` function for CAN or the `CAN_InitializeFD` function for CAN FD. Depending on the type of the CAN hardware, up to 16 CAN channels can be opened at the same time. After a successful initialization the CAN channel is ready. No further configuration steps are required.

#### Interaction

For receiving and transmitting CAN messages, the functions `CAN_Read` and `CAN_Write` as well as `CAN_ReadFD` and `CAN_WriteFD` are available. Additional settings can be made, e.g. setting up message filters to confine to specific CAN IDs or setting the CAN controller to listen-only mode.

When receiving CAN messages, events are used for an automatic notification of an application (client). This offers the following advantages:

- The application no longer needs to check for received messages periodically (no polling).
- The response time at reception is reduced.

#### Completion

To end the communication the function `CAN_Uninitialize` is called in order to release the reserved resources for the CAN channel, among others. In addition the CAN channel is marked as "Free" and is available to other applications.

### 6.2.3 Notes about the License

Device drivers, the interface DLL, and further files needed for linking are property of the PEAK-System Technik GmbH and may be used only in connection with a hardware component purchased from

PEAK-System or one of its partners. If a CAN hardware component of third-party suppliers should be compatible to one of PEAK-System, then you are not allowed to use or to pass on the driver software of PEAK-System.

If a third-party supplier develops software based on the PCAN-Basic and problems occur during the use of this software, consult the software provider.

# 7 Technical Specifications

## 7.1 Stamp Module

| **Power Supply** | |
|---|---|
| Supply voltage | 3.3 V DC ±0.15 V |
| Current consumption | max. 130 mA |

| **Measures** | |
|---|---|
| Size | 25 x 20 mm (L x W) |
| Weight | about 3 g |

| **Environment** | |
|---|---|
| Operating temperature | -40 to +85 °C (-40 to +185 °F) |
| Temperature for storage and transport | -40 to +100 °C (-40 to +212 °F) |
| Relative humidity | 15 to 90 %, not condensing |

| **USB** | |
|---|---|
| Type | 2.0 (high-speed), compatible with USB 1.1 and USB 3.0 |
| Peculiarities | Supply of the stamp module via USB |

| **CAN** | |
|---|---|
| Controller | FPGA implementation |
| Protocols | CAN FD (ISO, non-ISO), CAN 2.0 A/B |
| Channels | 1 |
| Timestamp resolution | 1 µs |
| Physical transmission | Determined by the external CAN transceiver |
| Bitrates | 5 kbit/s to 12 Mbit/s (minimum and maximum depending on CAN transceiver) |

| Module Electronics | |
|---|---|
| Signal levels at contacts | CMOS 3.3 V |
| Protective circuits | none |
| Power management | USB Suspend |

| Handling and Soldering | |
|---|---|
| Moisture Sensitivity Level | MSL 3 |
| Peak reflow temperature | 260 °C (±5 °C) |

| Packaging | |
|---|---|
| Type | Cut tape or reel |
| Dimensions cut tape | See Appendix A *Dimension Drawing Cut Tape* on page 51 |
| Dimensions reel | 330 mm diameter and 45 mm width |

| Conformity | |
|---|---|
| RoHS | EU Directive 2011/65/EU (RoHS 2) + 2015/863/EU (revised list of restricted substances)<br>DIN EN IEC 63000:2019-05 |

## 7.2 Evaluation Board

The stamp module is already soldered on the board. The technical specifications of the stamp module are noted in the previous section.

| Connectors | |
|---|---|
| USB | USB socket type B<br>High-Speed-USB 2.0<br>(compatible with USB 1.1 and 3.0) |
| CAN | D-Sub (m), 9 pins<br>Pin assignment according to specification CiA® 106 |

| **CAN** | |
|---|---|
| Transmission standards | CAN FD, ISO 11898-2 (High-speed CAN) |
| Transceiver | NXP TJA1044GT |
| CAN bitrates | 25 kbit/s to 1 Mbit/s |
| CAN FD bitrates | 25 kbit/s to 12 Mbit/s |
| Supply for external devices | D-Sub pin 1, 5 V, max. 50 mA, not assigned at delivery |
| Internal termination | 120 Ω, via DIP switches, not activated at delivery |

| **Power supply** | |
|---|---|
| Supply voltage | +5 V DC (via USB port) |
| Current consumption | max. 160 mA |

| **Measures** | |
|---|---|
| Size of circuit board | 70 x 70 mm (W x L) |
| Length USB cable | 1.80 m |
| Weight | 31 g |

| **Environment** | |
|---|---|
| Operating temperature | -40 to +85 °C (-40 to +185 °F) |
| Temperature for storage and transport | -40 to +100 °C (-40 to +212 °F) |
| Relative humidity | 15 to 90 %, not condensing |

| **Conformity** | |
|---|---|
| RoHS 2 | EU Directive 2011/65/EU (RoHS 2) + 2015/863/EU (revised list of restricted substances)<br>DIN EN IEC 63000:2019-05 |

# Appendix A Dimension Drawing Cut Tape

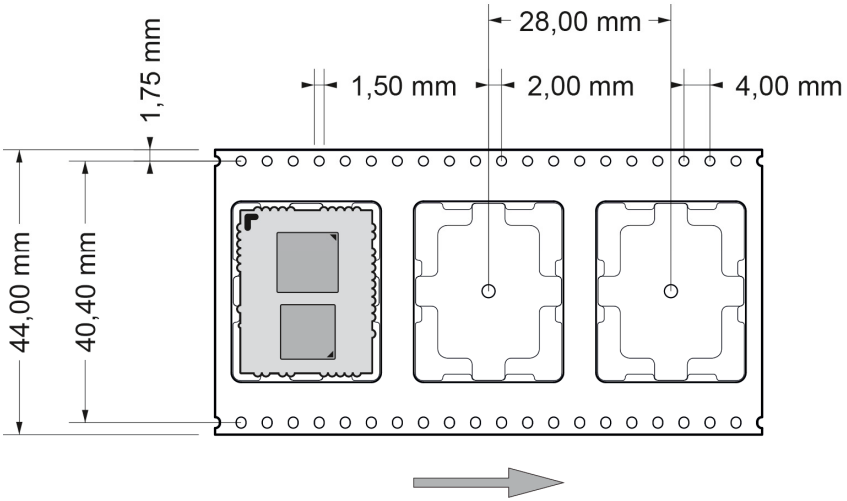



Figure 24: Dimensional drawing of the strip with rolling direction (see arrow); reel dimension: 330 mm diameter, 45 mm width

# Appendix B Certificates of Conformity

## B.1 CE PCAN-Chip USB

### EU Declaration of Conformity

This declaration applies to the following product:

| | |
|---|---|
| Product name: | **PCAN-Chip USB** |
| Item number(s): | **IPEH-004025** |
| Manufacturer: | PEAK-System Technik GmbH<br>Otto-Röhm-Straße 69<br>64293 Darmstadt<br>Germany |

We declare under our sole responsibility that the mentioned product is in conformity with the following directives and the affiliated harmonized standards:

**EU Directive 2011/65/EU (RoHS 2) + 2015/863/EU (amended list of restricted substances)**

**DIN EN IEC 63000:2019-05**
Technical documentation for the assessment of electrical and electronic products with respect to the restriction of hazardous substances (IEC 63000:2016);
German version of EN IEC 63000:2018

Darmstadt, 23 June 2023

Uwe Wilhelm, Managing Director

## B.2 UKCA PCAN-Chip USB

# UK Declaration of Conformity

This declaration applies to the following product:

Product name: **PCAN-Chip USB**

Item number(s): **IPEH-004025**

**Manufacturer:**
PEAK-System Technik GmbH
Otto-Röhm-Straße 69
64293 Darmstadt
Germany

**UK authorized representative:**
Control Technologies UK Ltd
Unit 1, Stoke Mill,
Mill Road, Sharnbrook,
Bedfordshire, MK44 1NN, UK

We declare under our sole responsibility that the mentioned product is in conformity with the following UK legislations and the affiliated harmonized standards:

**The Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment Regulations 2012**

**DIN EN IEC 63000:2019-05**
Technical documentation for the assessment of electrical and electronic products with respect to the restriction of hazardous substances (IEC 63000:2016);
German version of EN IEC 63000:2018

Darmstadt, 23 June 2023

Uwe Wilhelm, Managing Director

## B.3 CE PCAN-Chip USB Eval

### EU Declaration of Conformity

This declaration applies to the following product:

| | |
|---|---|
| Product name: | **PCAN-Chip USB Eval** |
| Item number(s): | **IPEH-004025-EVAL** |
| Manufacturer: | PEAK-System Technik GmbH<br>Otto-Röhm-Straße 69<br>64293 Darmstadt<br>Germany |

We declare under our sole responsibility that the mentioned product is in conformity with the following directives and the affiliated harmonized standards:

**EU Directive 2011/65/EU (RoHS 2) + 2015/863/EU (amended list of restricted substances)**

**DIN EN IEC 63000:2019-05**
Technical documentation for the assessment of electrical and electronic products with respect to the restriction of hazardous substances (IEC 63000:2016);
German version of EN IEC 63000:2018

Darmstadt, 23 June 2023

Uwe Wilhelm, Managing Director

## B.4 UKCA PCAN-Chip USB Eval

# UK Declaration of Conformity

This declaration applies to the following product:

Product name: **PCAN-Chip USB Eval**

Item number(s): **IPEH-004025-EVAL**

**Manufacturer:**
PEAK-System Technik GmbH
Otto-Röhm-Straße 69
64293 Darmstadt
Germany

**UK authorized representative:**
Control Technologies UK Ltd
Unit 1, Stoke Mill,
Mill Road, Sharnbrook,
Bedfordshire, MK44 1NN, UK

UK CA

We declare under our sole responsibility that the mentioned product is in conformity with the following UK legislations and the affiliated harmonized standards:

**The Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment Regulations 2012**

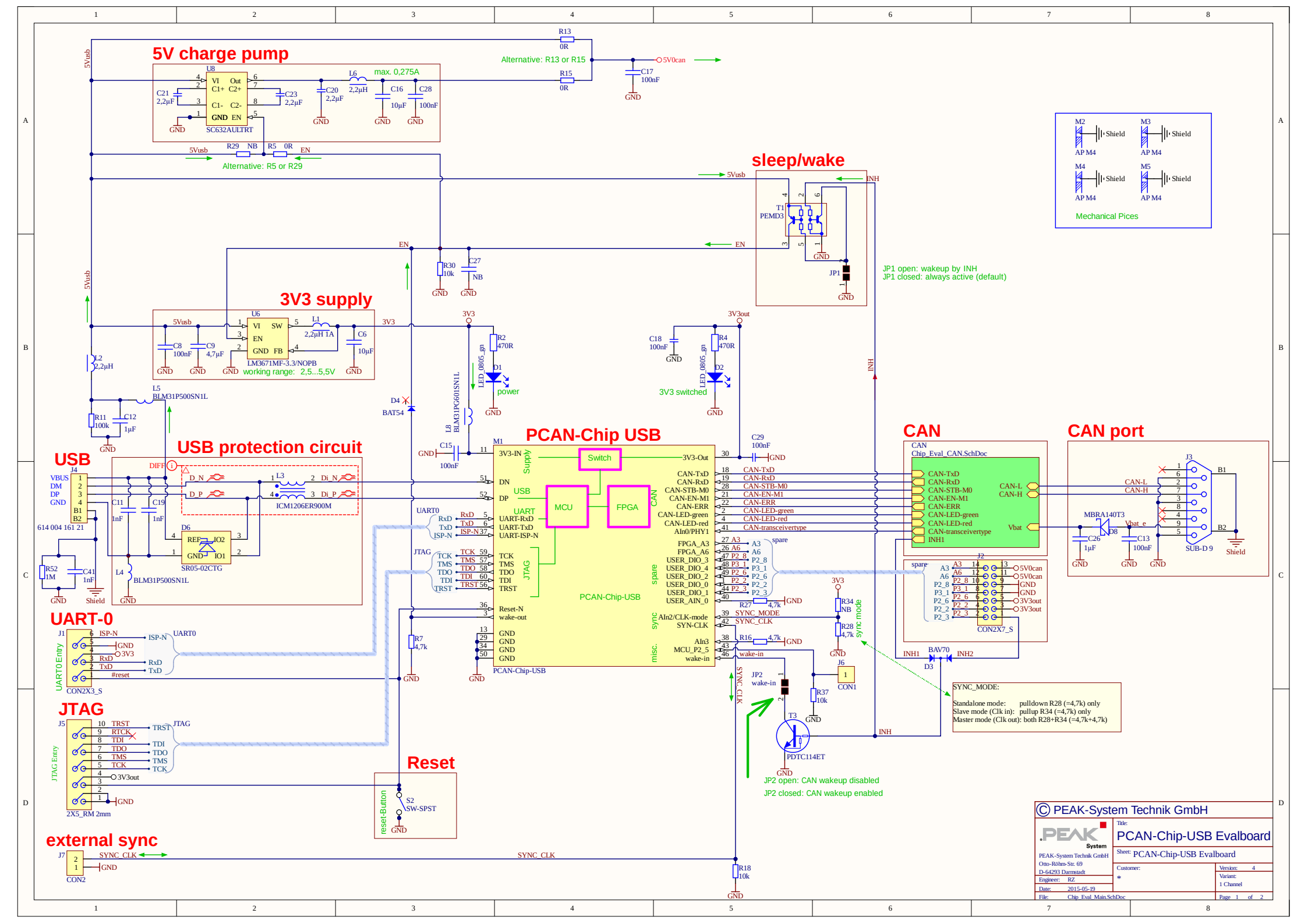
**DIN EN IEC 63000:2019-05**
Technical documentation for the assessment of electrical and electronic products with respect to the restriction of hazardous substances (IEC 63000:2016);
German version of EN IEC 63000:2018

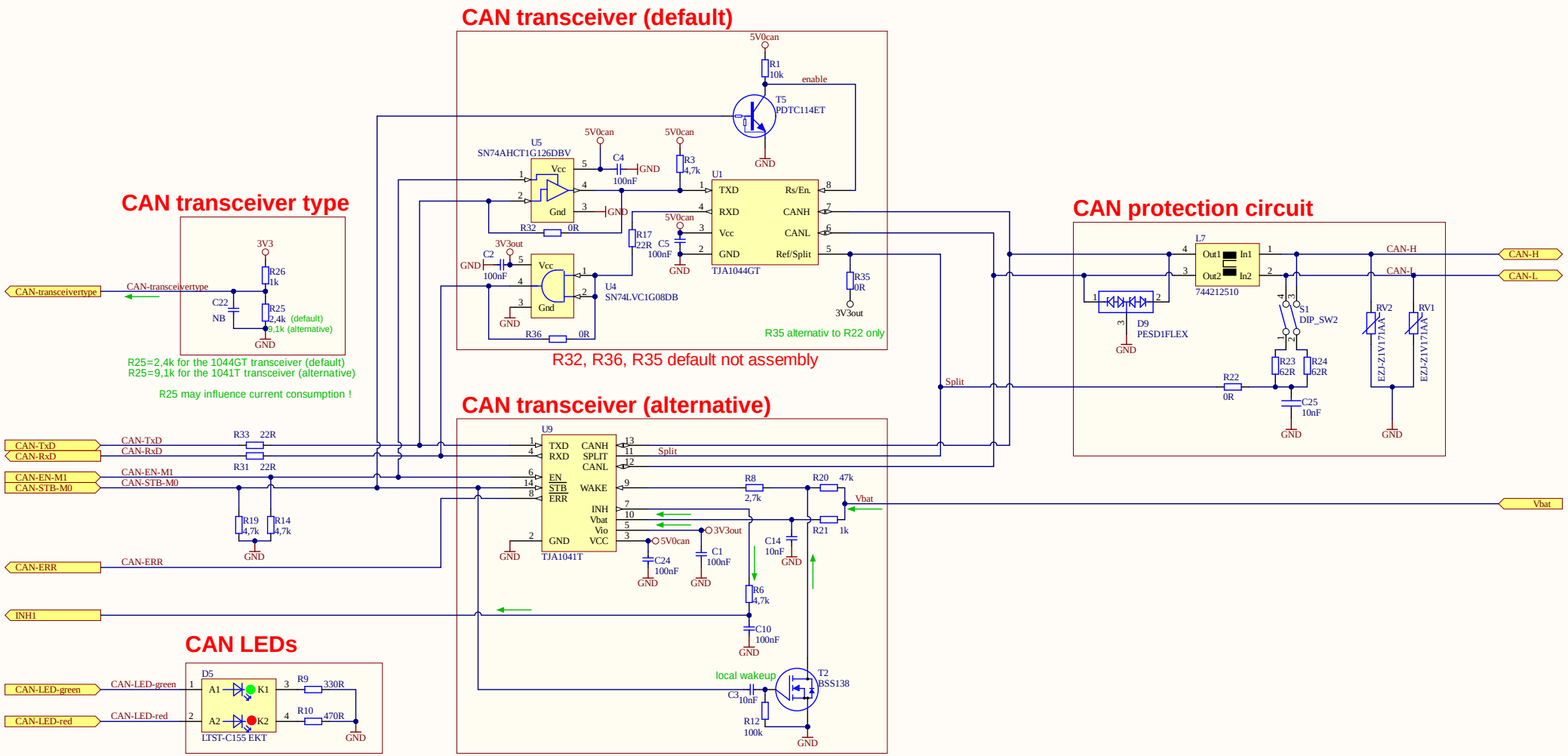
Darmstadt, 23 June 2023

Uwe Wilhelm, Managing Director

# Appendix C Circuit Diagram of the Evaluation Board

As a reference for the use of the evaluation board and for the implementation of the stamp module into self-designed systems, the circuit diagram of the evaluation board is shown on the next two pages.


5V charge pump
U8
SC632AULTRT
max. 0,275A
Alternative: R13 or R15
Alternative: R5 or R29
5V0can
sleep/wake
T1
PEMD3
JP1
JP1 open: wakeup by INH
JP1 closed: always active (default)
3V3 supply
U6
LM3671MF-3.3/NOPB
working range: 2,5...5,5V
3V3 switched
power
Mechanical Pices
USB
USB protection circuit
ICM1206ER900M
SR05-02CTG
PCAN-Chip USB
PCAN-Chip-USB
CAN
Chip_Eval_CAN.SchDoc
CAN port
SUB-D 9
UART-0
UART0Entry
CON2X3_S
JTAG
JTAG Entry
2X5_RM 2mm
Reset
reset-Button
S2
SW-SPST
external sync
CON2
SYNC_MODE:
Standalone mode: pulldown R28 (=4,7k) only
Slave mode (Clk in): pullup R34 (=4,7k) only
Master mode (Clk out): both R28+R34 (=4,7k+4,7k)
JP2 open: CAN wakeup disabled
JP2 closed: CAN wakeup enabled
© PEAK-System Technik GmbH
PCAN-Chip-USB Evalboard
PEAK-System Technik GmbH
Otto-Röhm-Str. 69
D-64293 Darmstadt
Engineer: RZ
Date: 2015-05-19
File: Chip_Eval_Main.SchDoc
Customer: *
Version: 4
Variant: 1 Channel
Page 1 of 2






PEAK System

PEAK-System Technik GmbH
Otto-Röhm-Str. 69
D-64293 Darmstadt

Engineer: RZ
Date: 2015-05-18
File: Chip_Eval_CAN.SchDoc

Title: PCAN-Chip-USB Evalboard
Sheet: CAN
Customer: *
Version: 4
Variant: *
Page 2 of 2