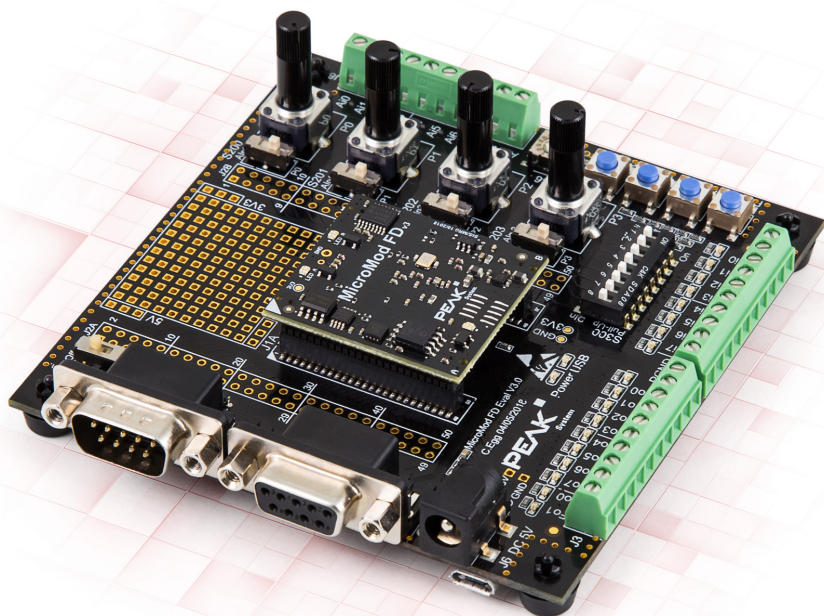


PCAN-MicroMod FD Evaluation Board

User Manual



Relevant Products

Product designation	Model	Part number
PCAN-MicroMod FD Evaluation Board	with PCAN-MicroMod FD	IPEH-003081
PCAN-MicroMod FD Evaluation Kit	with PCAN-MicroMod FD, PC-CAN interface PCAN-USB FD, and terminated CAN cable	IPEH-003082

The picture on the front page shows the Evaluation Board with plugged-on PCAN-MicroMod FD.

Imprint

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Essential changes in this document are listed in Appendix C on page 39.

Contents

Imprint	2
Relevant Products	2
Contents	3
1 Introduction	5
1.1 Features Overview	5
1.2 Operation Requirements	6
1.3 Scope of Supply “Board” (IPEH-003081)	6
1.4 Scope of Supply “Kit” (IPEH-003082)	7
2 Setting Up the Evaluation Kit for Operation	8
3 Components of the Evaluation Board	10
3.1 Socket for PCAN-MicroMod FD (J1A/J1B)	10
3.2 Power Supply (J6, J7)	12
3.3 USB Connector (J7)	13
3.4 CAN Connection (J4)	13
3.5 Analog Inputs (J8) and Potentiometers	15
3.6 Digital Inputs (J9)	16
3.7 Digital and Frequency Outputs (J3)	18
3.8 Module Number (S2)	18
3.9 RS-232 Connector (J5)	19
3.10 Push Buttons for Reset and Flash Mode	20
4 Firmware Update of the PCAN-MicroMod FD	22
4.1 Firmware Update via CAN Bus	22
4.1.1 System Requirements	22
4.1.2 Flash Software Preparation	22
4.1.3 Update Procedure	23
4.1.4 Activate Flash Mode by Hardware	24
4.2 Firmware Update via USB Connection	24
4.2.1 System Requirements	24

4.2.2	Activating the Flash Mode	25
4.2.3	Uploading the Firmware	25
4.3	Firmware Update via Serial RS-232 Interface	26
4.3.1	System Requirements	26
4.3.2	Activating the Flash Mode	26
4.3.3	Uploading the Firmware	26
5	Technical Specifications	28
Appendix A	Dimension Drawing	30
Appendix B	Circuit Diagram Evaluation Board	31
	Schaltplan Evaluation-Board	32
Appendix C	Changelog User Manual	39

1 Introduction

This product is an evaluation board for the PCAN-MicroMod FD and allows the conception and development of own circuits with CAN connection and I/O functionality. It can also be used for training purposes for CAN and CAN FD setups. Via pick-offs, screw terminals, switches, and potentiometers, the user can access the resources of the attached PCAN-MicroMod FD and check configurations or test circuits.

The configuration is done with a supplied Windows software which transfers the configuration data to the module via CAN. The optionally available Evaluation Kit includes the CAN interface and a CAN cable required for this purpose.

This document describes the hardware and functions of the Evaluation Board. A separate document is available for the plug-in board PCAN-MicroMod FD itself.

1.1 Features Overview

- Screw terminal connectors for all I/Os
- CAN bus connection via D-Sub, 9-pin (in accordance with CiA® 303-1)
- Switchable CAN termination of 120 Ohm
- Pick-offs for all pins of the PCAN-MicroMod FD
- Low-side switches for the digital outputs
- DIP switches for status change of the digital inputs
- Protected digital inputs
- LEDs for digital inputs and outputs
- 4 potentiometers for analog inputs
- Soldering fields for individual additional wiring
- RS-232 connection with V.24 signal levels for direct access to the microcontroller
- 4-bit rotary coding switch for setting the module ID

- Configuration via the CAN bus with the Windows software PCAN-MicroMod FD Configuration
- Firmware upload via CAN, USB, or RS-232; switchable via 3 buttons
- Reset button for restarting the board
- Voltage supply 5 V via Micro-USB or barrel connection
- Operating temperature range from 0 to 70 °C (32 to 158 °F)
- Board 102 x 100 mm with rubber feet

1.2 Operation Requirements

- Plugged-in PCAN-MicroMod FD (preinstalled on delivery)
- Power supply 5 V DC, either via the provided USB cable or via the barrel connector (separate power supply unit required)
- For the creation and transfer of a configuration:
Computer with Windows 10, 8.1 (32/64-bit) and a PC-CAN interface from PEAK-System (recommendation: PC-CAN interface with CAN FD capability, e.g. PCAN-USB FD)

The CAN interface PCAN-USB FD is included with the purchase of the PCAN-MicroMod Evaluation Kit.

1.3 Scope of Supply “Board” (IPEH-003081)

- PCAN-MicroMod FD plug-in board (IPEH-003080)
- PCAN-MicroMod FD Evaluation Board (motherboard)
- USB cable for power supply
- Configuration software for Windows
- Manuals in PDF format

1.4 Scope of Supply “Kit” (IPEH-003082)

As above (IPEH-003081) and in addition:

- PC-CAN interface PCAN-USB FD (IPEH-004022)
- CAN cable, terminated with 2 x 120 Ω , 2 m (IPEK-003001)

2 Setting Up the Evaluation Kit for Operation

This chapter gives an overview of the required steps for setting up the Evaluation Kit (includes PC-CAN interface PCAN-USB FD and a terminated CAN cable).



Tip: For the communication with the PCAN-MicroMod FD, you can also use another PC-CAN interface from PEAK-System, preferably one with CAN FD capability.



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

Do the following for the setup:

1. On the PC under Windows, install the **device driver** for our PC-CAN interfaces from the supplied data carrier.
2. Use the supplied **CAN cable** with integrated CAN bus termination to connect the PCAN-USB FD and the Evaluation Board (connector J4 CAN).
3. Connect the **PCAN-USB FD** to a USB port on your PC.
4. To supply the Evaluation Board with **power**, use the **USB cable** to connect the Evaluation Board and either a USB port on the computer or a power supply unit.
5. Under Windows, install the **configuration program** PCAN-MicroMod FD Configuration from the supplied data carrier (Tools section).

6. Start PCAN-MicroMod FD Configuration, create a configuration, and finally send this configuration to the PCAN-MicroMod FD (see program help).

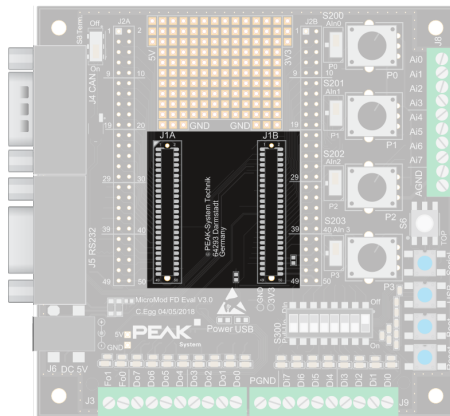
You can now work with signals at the inputs and outputs as defined in the configuration and use the CAN monitor *PCAN-View* on the PC to monitor and send CAN messages.

3 Components of the Evaluation Board

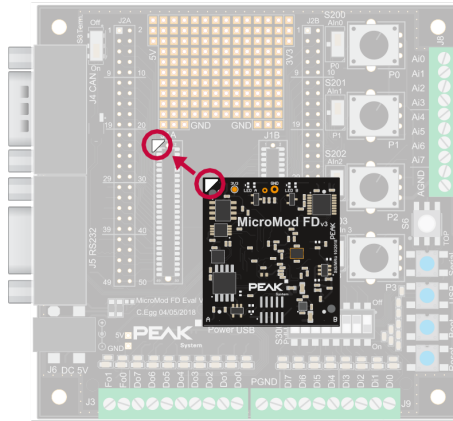
This chapter describes the function units and connectors of the Evaluation Board. For details you can also refer to the circuit diagram, Appendix B *Circuit Diagram Evaluation Board* on page 31.

3.1 Socket for PCAN-MicroMod FD (J1A/J1B)

For orientation when plugging the MicroMod FD onto the evaluation board, white triangular markings are provided both on the MicroMod FD (upper left corner) and on the Evaluation Board. These markings must align.

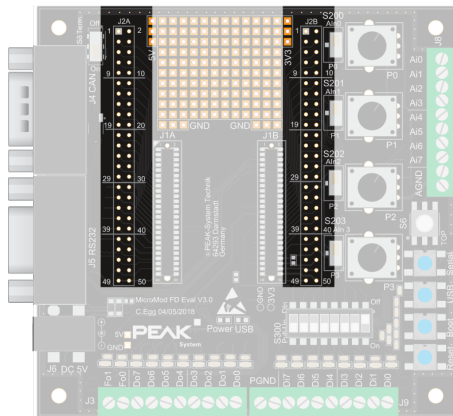


Socket for the PCAN-MicroMod FD



Positioning markings on the PCAN-MicroMod FD and on the Evaluation Board

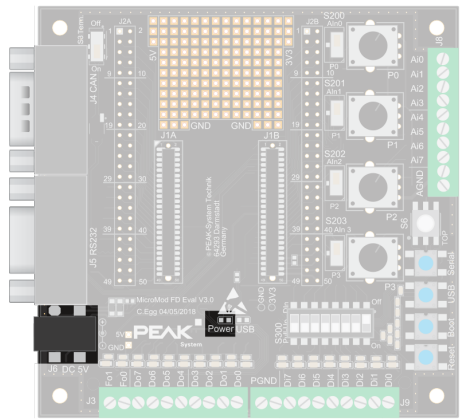
Via the test points on fields J2A and J2B (arranged laterally to the socket strips for the MicroMod FD) each pin of the plugged-on MicroMod FD can be accessed directly.



Test point fields J2A and J2B for all pins of the PCAN-MicroMod FD

3.2 Power Supply (J6, J7)

The Evaluation Board requires a supply voltage of 5 V DC. It can be applied either via the Micro-USB connector or the barrel connector.



Barrel connector J6 for voltage supply, Power LED, Micro-USB connector J7 in the same area on the bottom side of the board (not visible in this figure)



Polarity of the supply socket

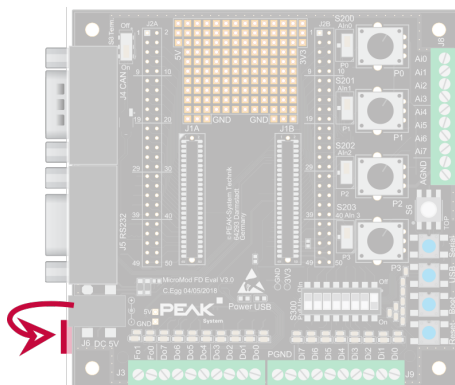


Diameter of barrel connector: a = 5.5 mm, b = 2.5 mm; minimum length: 11 mm

The Power LED indicates that the Evaluation Board is supplied.

3.3 USB Connector (J7)

The Micro-USB connector is located on the left edge of the Evaluation Board, beneath the circuit board. Primarily, it is used for voltage supply of the Evaluation Board with 5 V DC.

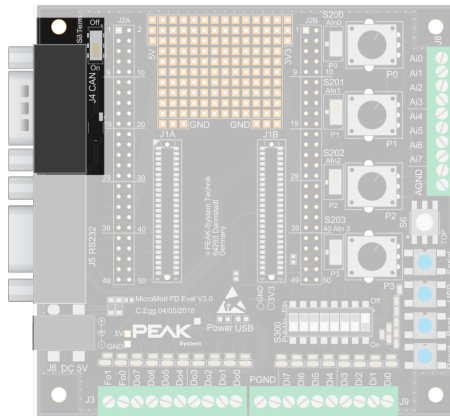


Micro-USB socket on the bottom side of the Evaluation Board

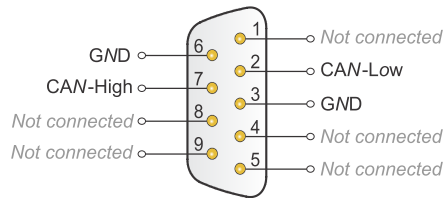
In addition, the USB connector can also be used as a way to transfer new firmware to the PCAN-MicroMod FD.

3.4 CAN Connection (J4)

The 9-pin D-Sub male connector J4 is used for a CAN connection, positioned on the upper left of the Evaluation Board. The pin assignment of the CAN connector corresponds to the specification CiA[®] 303-1.



CAN connector and switch for the CAN bus termination

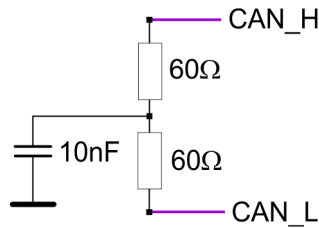


Assignment of the D-Sub male connector for CAN

CAN Bus Termination

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, a termination can be activated on the Evaluation Board. For this purpose, switch S3 (next to the CAN connector) must be set to the *On* position.

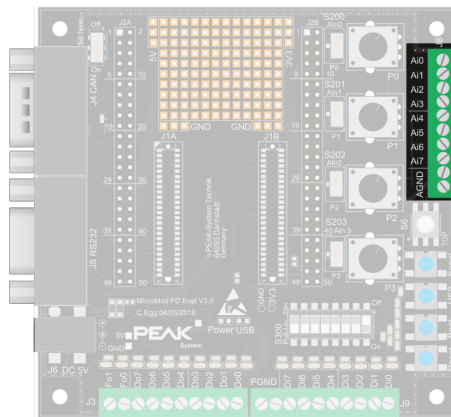
For better electromagnetic compatibility, a split termination is implemented.



Split termination for the High-speed CAN bus

3.5 Analog Inputs (J8) and Potentiometers

The Evaluation Board has 8 analog inputs (Ai0 to Ai7). The corresponding connector is J8 (screw terminals on the upper right).

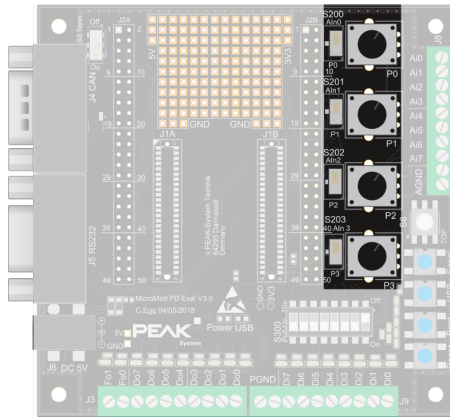


Screw terminals J8 for analog inputs

The analog reference voltage is 3.0 V. The input impedance is 11 kΩ.

The Evaluation Board has 4 potentiometers (P0 to P3) which can be used for simulating input signals. Using the switches S200 to S203, the analog inputs Ai0 to Ai3 are

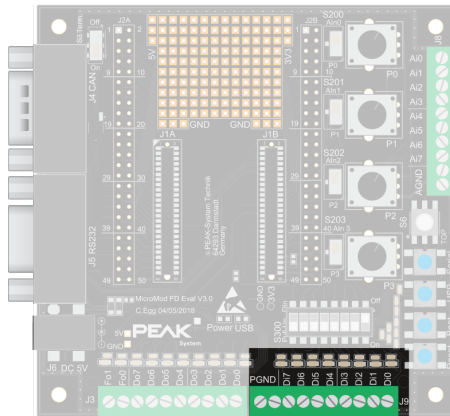
disconnected from the screw terminals and connected to the respective potentiometer.



Potentiometers for analog inputs Ai0 to Ai3

3.6 Digital Inputs (J9)

The Evaluation Board has 8 digital inputs with TTL levels (Di0 – Di7). The corresponding connector is J9 (screw terminals on the lower right).



Screw terminals for digital inputs with associated DIP switches and LEDs

The inputs each have a pull-down resistor and are High-active. The switching thresholds are below 2.2 V to the Low state and above 3.3 V to the High state. Each input status is indicated by an LED.

For test purposes, the individual input signals can be switched via the DIP switches S300. A DIP switch activates a pull-up resistor with 2.7 kΩ to the 5-Volts supply. If it is permanently activated, a low-active signal can be used on the input via the screw terminal (e.g. push button connected to ground).

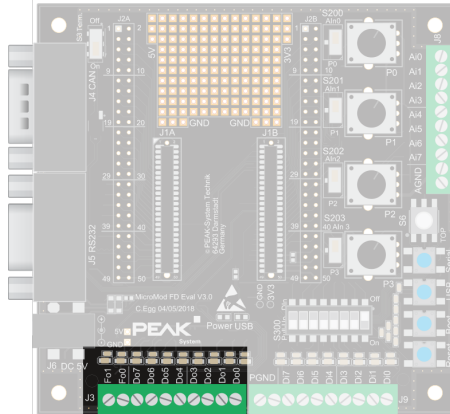
Signals that directly lead to the MicroMod FD can be accessed on the following points of the field J2B:

Pin on J2B Processed input signal (inverted)

31	Di0
33	Di1
35	Di2
37	Di3
39	Di4
41	Di5
43	Di6
45	Di7

3.7 Digital and Frequency Outputs (J3)

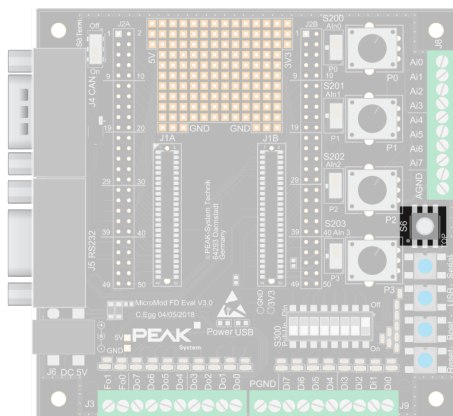
The Evaluation Board has 8 digital outputs (Do0 to Do7) and two frequency outputs (Fo0 and Fo1). Each output status is indicated by an LED. An illuminated LED corresponds to the active state.



Screw terminals J3 for digital outputs and frequency outputs with associated LEDs

3.8 Module Number (S2)

The module number is used for the identification of an individual MicroMod FD on the CAN bus when configurations are sent and received. The rotary switch can be used to set a module number from 0 to 15 (hexadecimal 0 to F).



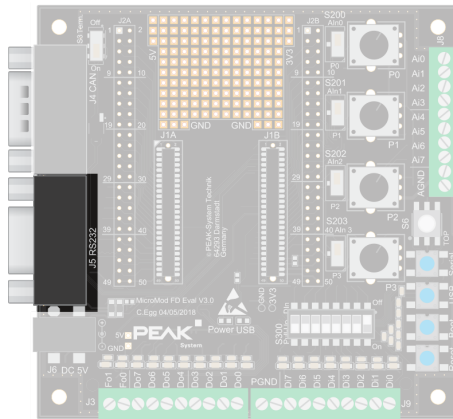
Rotary switch for module number, position 0 on the left

Each MicroMod FD connected to the CAN bus must have a unique module number for the configuration process, else unpredictable configuration results may occur.

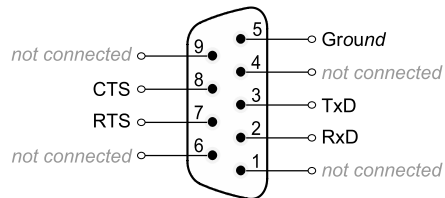
The module number has no influence on the CAN communication during normal operation. If you have more than one MicroMod FD on the CAN bus, you have to make sure by means of different configurations that there is no overlapping of the transmitted CAN IDs.

3.9 RS-232 Connector (J5)

The RS-232 connector can alternatively be used for transferring firmware to the PCAN-MicroMod FD. You need a suitable flashing tool, e.g. Flash Magic (www.flashmagictool.com), and a firmware file in hex format.



RS-232 connector



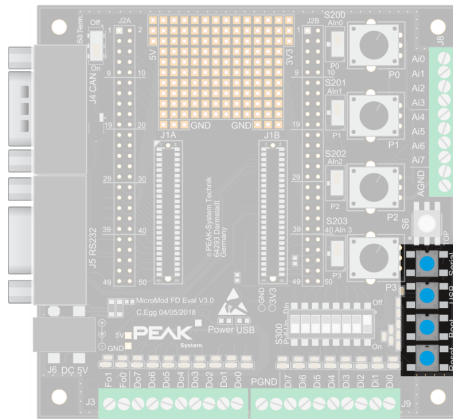
Pin assignment of the D-Sub socket for RS-232

3.10 Push Buttons for Reset and Flash Mode

The four blue push buttons located on the lower right side have the following functions:

Push button Function

Reset	Reset of the PCAN-MicroMod FD, restart of the firmware
Boot	Flash mode for a firmware update via CAN
USB	Flash mode for a firmware update via USB
Serial	Flash mode for a firmware update via RS-232



Blue push buttons

More information about the procedure for firmware updates is available in 4 *Firmware Update of the PCAN-MicroMod FD* on the next page.

4 Firmware Update of the PCAN-MicroMod FD

The PCAN-MicroMod FD can be equipped with new firmware in three different ways:

- via CAN bus (with the Windows program PEAK-Flash)
- via USB connection (easiest way on the Evaluation Board)
- via serial RS-232 interface (only for special purposes)

The following sections describe the procedures. Step through all subsections in a section.

4.1 Firmware Update via CAN Bus

4.1.1 System Requirements

- Computer with Windows 10, 8.1 (32/64-bit) operating system
- PC-CAN interface from PEAK-System
- CAN cabling between the CAN interface and the Evaluation Board with proper termination (120 Ω on each end of the CAN bus)

4.1.2 Flash Software Preparation

With the PEAK-Flash software for Windows, it is possible to update the firmware of our hardware products. This is done via a CAN connection.

The software package is freely available from these places:

- Online on www.peak-system.com in the Support section (recommended for up-to-date version)

- Offline on the supplied data carrier in the `Tools` directory branch

Unpack the downloaded `PEAK-Flash.zip` file to an arbitrary target directory on your Windows computer or copy the `PEAK-Flash` directory from the data carrier. The `PEAK-Flash.exe` file in the target directory is the executable to be used later.

4.1.3 Update Procedure

1. Apply power to the Evaluation Board.
2. Under Windows, start `PEAK-Flash.exe`.

Panel 1 of PEAK-Flash is shown with general information.

3. Click *Next*.

Panel 2 *Select Hardware* of PEAK-Flash is shown.

4. Select *Modules connected to the CAN bus*.
5. From the list *Channels of connected CAN hardware*, select the CAN interface that establishes the connection to the CAN bus.
6. From the *Bit rate* list, select 500 kbit/s (usually pre-selected).
7. Click *Detect*.

After a few seconds, a new entry with the name “PCAN-MicroMod FD Evaluation Board” is shown in the field below, including the current module ID and firmware version.

8. Click *Next*.

Panel 3 *Select Firmware* of PEAK-Flash is shown.

9. Leave *Embedded Firmware* selected if it is suitable for the firmware update.

Alternatively:

Select *Firmware File* and then browse for the `*.bin` file to be flashed.

10. Click *Next* and check the provided information on panel 4 of PEAK-Flash.

11. Click *Start* and observe the log output.

During the flash process, LED B on the PCAN MicroMod FD is blinking quickly in orange color. The flash process is running for about 30 seconds.

12. Click *Reset Module*.

The PCAN MicroMod FD is now ready for use with the new firmware.

4.1.4 Activate Flash Mode by Hardware

If the PCAN MicroMod FD cannot be set to Flash mode via PEAK-Flash, this can be done alternatively by hardware.

Do the following to set the PCAN-MicroMod FD to flash mode for CAN:

1. Make sure that the Evaluation Board is supplied with power (*Power* LED on the Evaluation Board is on).
2. Press and hold the button for the *Boot* flash mode.
3. Press the *Reset* button briefly.
4. Keep the button for the flash mode pressed for at least 1 second and then release it.

LED B on the MicroMod FD blinks quickly orange.

4.2 Firmware Update via USB Connection

4.2.1 System Requirements

- Arbitrary operating system on the PC
- USB connection between Evaluation Board and PC

4.2.2 Activating the Flash Mode

Do the following to set the PCAN-MicroMod FD to flash mode for USB:

1. Make sure that the Evaluation Board is supplied with power (*Power* LED on the Evaluation Board is on).
2. Press and hold the button for the *USB* flash mode.
3. Press the *Reset* button briefly.
4. Keep the button for the flash mode pressed for at least 1 second and then release it.

LEDs A and B on the MicroMod FD stay off.

In the operating system of the connected PC, the MicroMod FD appears as USB mass storage device “CRP DISABLD”.

4.2.3 Uploading the Firmware

1. On the PC, open the folder of the connected USB mass storage device.
The folder contains the (virtual) file `firmware.bin` as only entry.
2. Delete the `firmware.bin` file on the USB mass storage device.
3. On the PC, rename the file with the new firmware for the MicroMod FD to `firmware.bin` (observe lower case).
4. Copy the new firmware file to the USB mass storage device and wait for the end of the copy process (takes up to 10 seconds).
5. Disconnect the USB cable between the PC and the Evaluation Board.
6. Restart the MicroMod FD (for example with the blue Reset button).

4.3 Firmware Update via Serial RS-232 Interface

4.3.1 System Requirements

- Serial RS-232 port on the computer (D-Sub, 9-pin, m)
- Serial 1:1 cable with D-Sub connectors, 9-pin, m-f (not in scope of supply of the Evaluation Board)
- Operating system Windows 10, 8.1 (32/64-bit)
- Free available Windows program Flash Magic (www.flashmagictool.com)
- Firmware file in hex format (*.hex)

4.3.2 Activating the Flash Mode

Do the following to set the PCAN-MicroMod FD to flash mode for RS-232:

1. Make sure that the Evaluation Board is supplied with power (*Power* LED on the Evaluation Board is on).
2. Press and hold the button for the *Serial* flash mode.
3. Press the *Reset* button briefly.
4. Keep the button for the flash mode pressed for at least 1 second and then release it.

LEDs A and B on the MicroMod FD stay off.

4.3.3 Uploading the Firmware



Note: When doing a firmware update, take care of the settings in the flash program, especially the used addresses. Otherwise parts of the previous firmware in the flash memory can be unintentionally deleted or overwritten (e.g. the CAN bootloader in the address range 0x0000-0x7fff).

1. On the PC, start the Windows program “Flash Magic”.
2. On the *Device* panel, click *Change* and select *LPC54000 > UART > LPC54618J512*.
3. Select the RS-232 interface used on the PC at *Serial Port* and set the *Baudrate* to *57600*.
4. On the *Erase* panel, select *Sectors used by file* from the drop-down list.
5. On the *Options* panel, enable *Verify after Programming*.
6. On the *Firmware* panel, specify the wanted firmware file (* .hex), either by typing or via *Browse*.
7. Click *Start* for the firmware update.
8. When the update process is *Finished* (corresponding message), quit the Flash Magic program and restart the MicroMod FD (for example with the blue Reset button).

5 Technical Specifications

This chapter covers the technical specifications of the PCAN-MicroMod FD Evaluation Board with plugged-on PCAN-MicroMod FD. Further data about the PCAN-MicroMod FD can be found in the separate manual for the module. Information about the PC-CAN interface PCAN-USB FD from the Kit is available in the corresponding separate manual.

Supply

Supply voltage	5 V DC
Connection options	Supply socket for barrel plug 5.5 mm outside/2.5 mm inside Micro-USB socket
Current consumption	max. 300 mA (incl. PCAN-MicroMod FD)

Digital Inputs

Count	8
Sampling functions	Static state: 0, 1 Frequency: 0 – 20 kHz (only inputs 0 ... 5) Duty cycle: 0.0 – 100.0 % (only inputs 0 ... 5) Manual rotary encoder (occupies 2 digital inputs each): standard quadrature with 2 bit, max. 500 pulses/sec.
Switching thresholds	1: $U > 3.3 \text{ V typ.}$ 0: $U < 2.2 \text{ V typ.}$
Additional circuits	DIP switch for each input for test purposes

Analog Inputs

Count	8
Input voltage	0 – 33 V
Resolution	12 bits
Sample rate	1 kHz
Input impedance	11 k Ω
Additional circuits	Inputs Ai0 to Ai3 individually switchable to potentiometers P0 to P3

Digital Outputs

Count	8
Functions	Static state: 0, 1 PWM at 1 – 10,000 Hz (common frequency for all outputs)
Type	Low-side switch
Load	max. 900 mA per output

Frequency/PWM Outputs

Count	2
Frequency	20 kHz max.

CAN

Transmission standard	High-speed CAN ISO 11898-2
Termination	120 Ω (split termination), can be enabled with switch
Connector	D-Sub 9-pin m, assignment according to CiA® 303-1

Measures

Size of circuit board	102 x 38 x 100 mm (W x H x D, H incl. potentiometer pegs) See also Appendix A <i>Dimension Drawing</i> on page 30
Weight	83 g without PCAN-MicroMod FD 92 g with PCAN-MicroMod FD

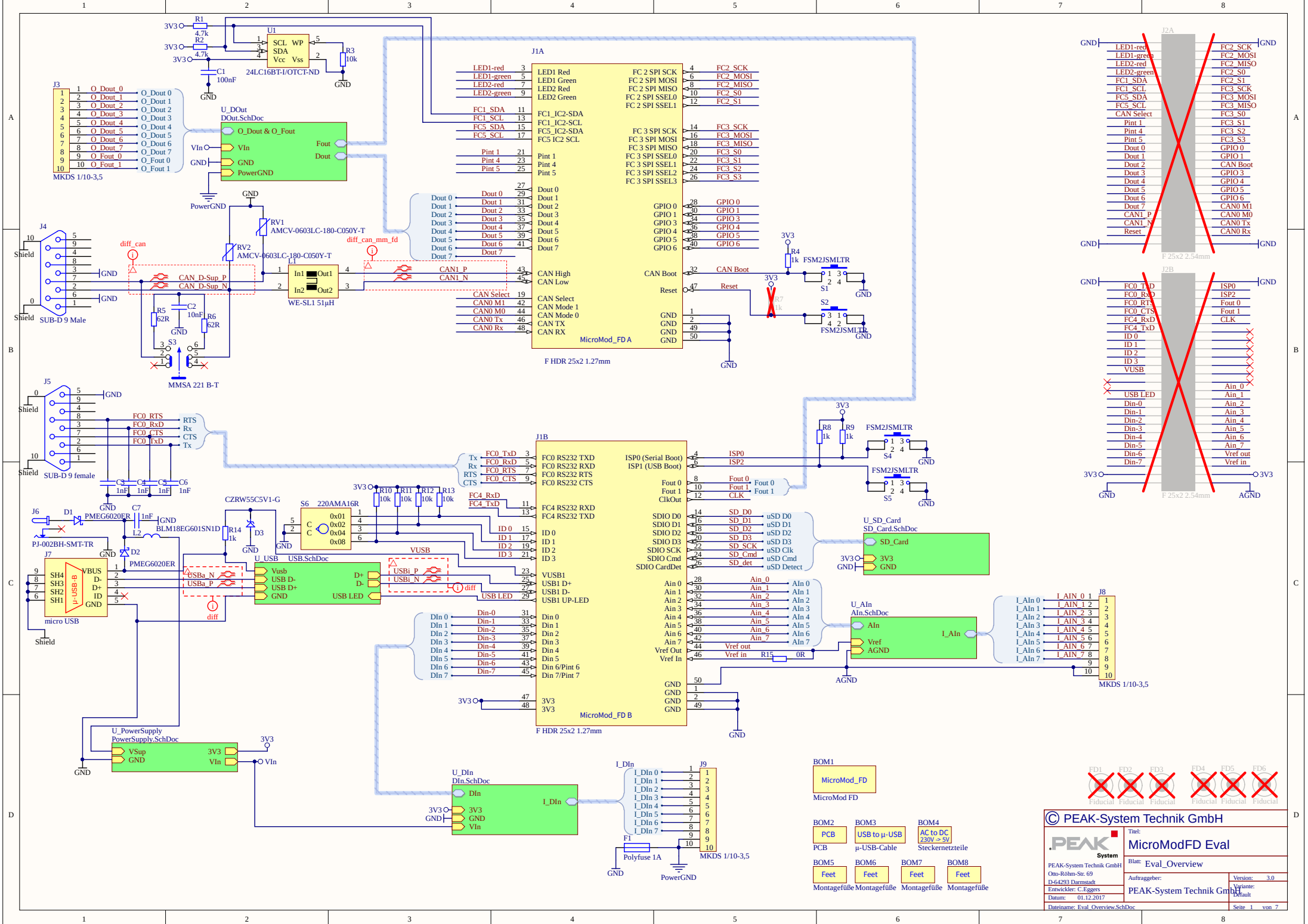
Environment

Operating temperature	0 – +85 °C (32 – 185 °F)
Temperature for storage and transport	–40 – +100 °C (–40 – +212 °F)
Relative humidity	15 – 90 %, not condensing

30

Appendix B Circuit Diagram Evaluation Board

The following pages show the electronic circuit diagram of the Evaluation Board for the PCAN-MicroMod FD. For example, it can be used as a reference for your own MicroMod FD circuitry.



FD1

FD2

FD3

FD4

FD5

FD6

PEAK

System

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D-64293 Darmstadt

Entwickler: C.Eggert

Datum: 01.12.2017

Dateiname: Eval_Overview.SchDoc

Titel:

MicroModFD Eval

Blatt:

Eval_Overview

Auftraggeber:

PEAK-System Technik GmbH

Version:

3.0

Variant:

Default

Seite

1

von

7

BOM1

MicroMod_FD

MicroMod FD

BOM2

PCB

PCB

BOM3

USB to µ-USB

µ-USB-Cable

BOM4

AC to DC

230V ~ 5V

Steckernetzteile

BOM5

Feet

Montagefüße

BOM6

Feet

Montagefüße

BOM7

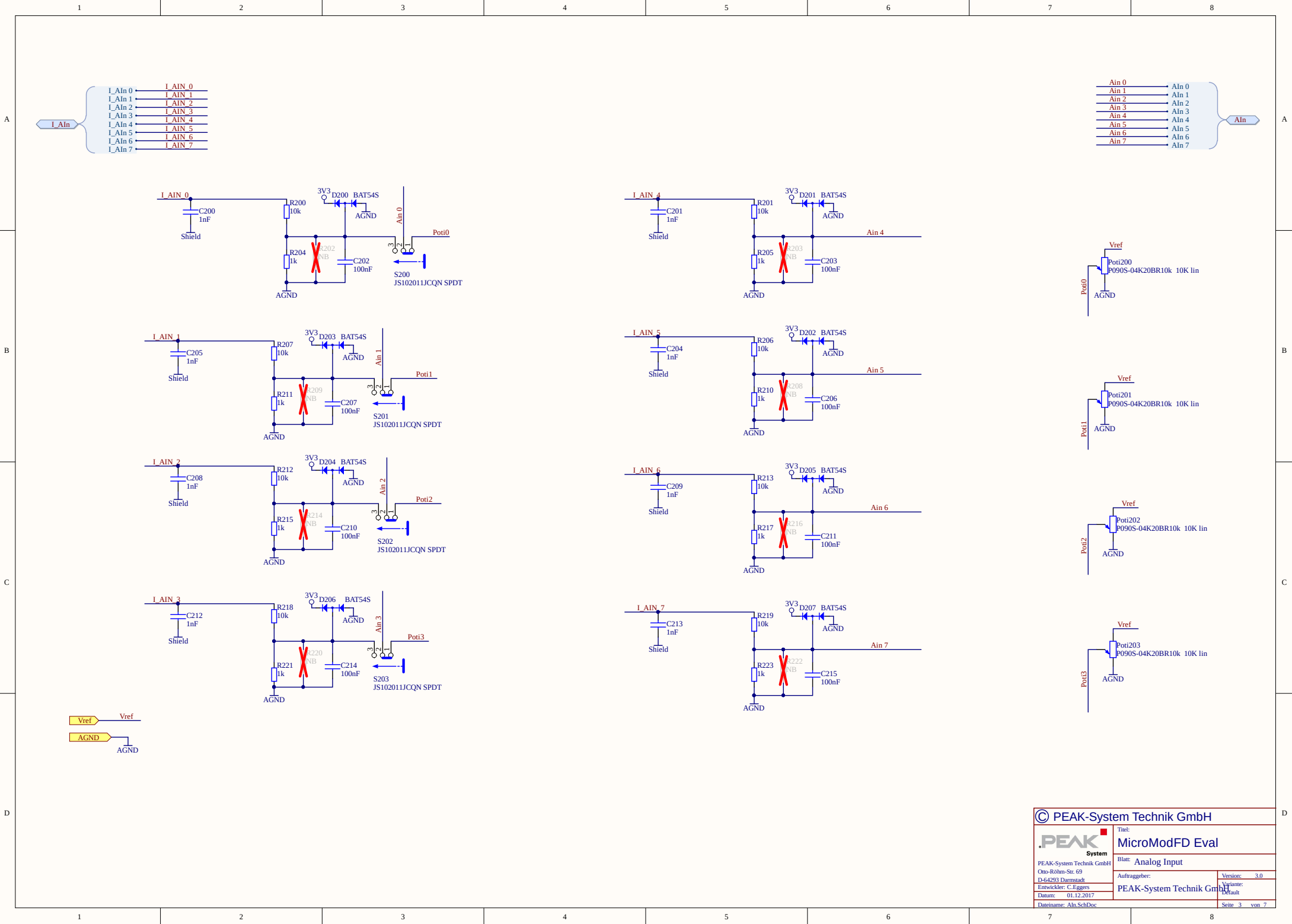
Feet

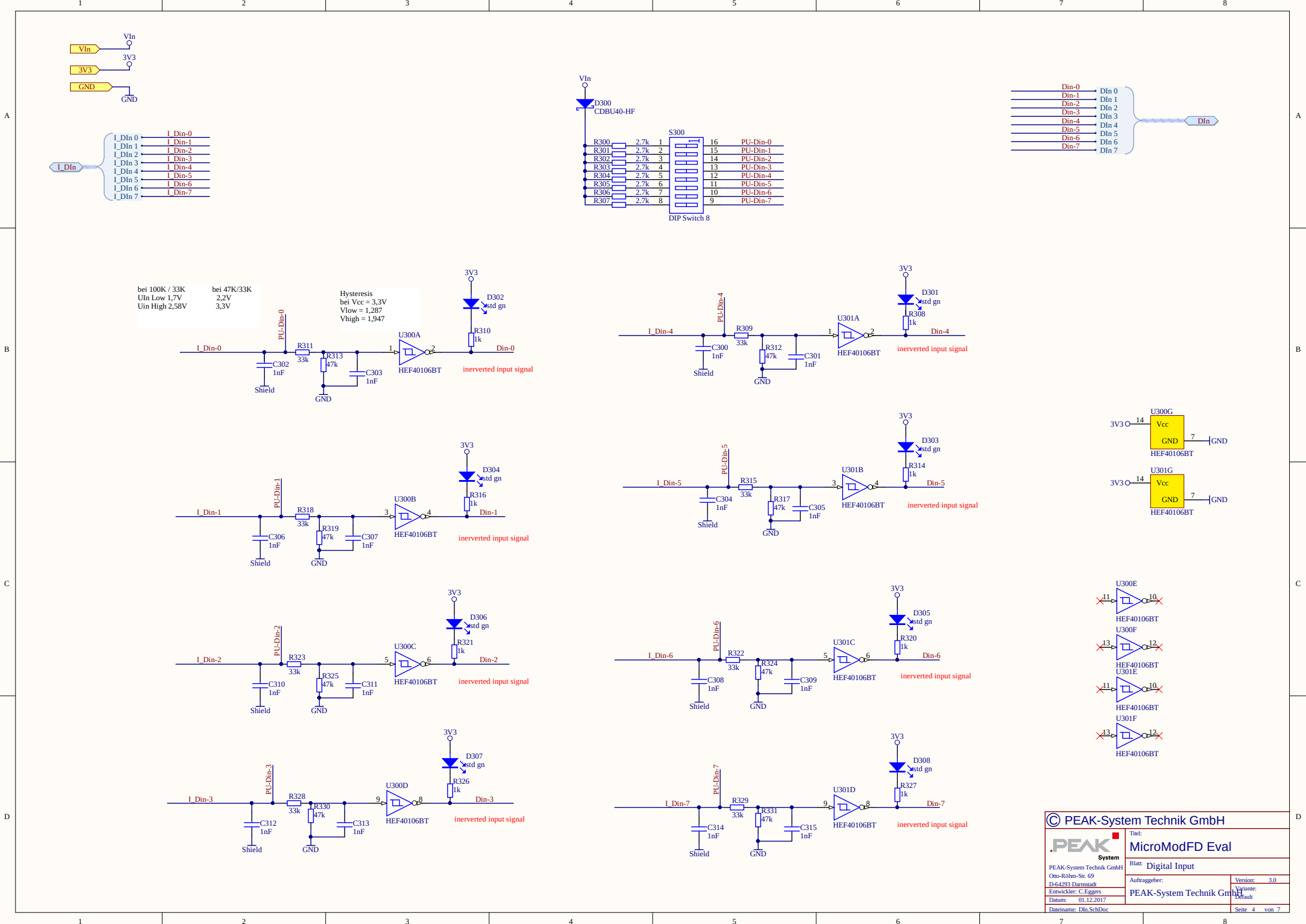
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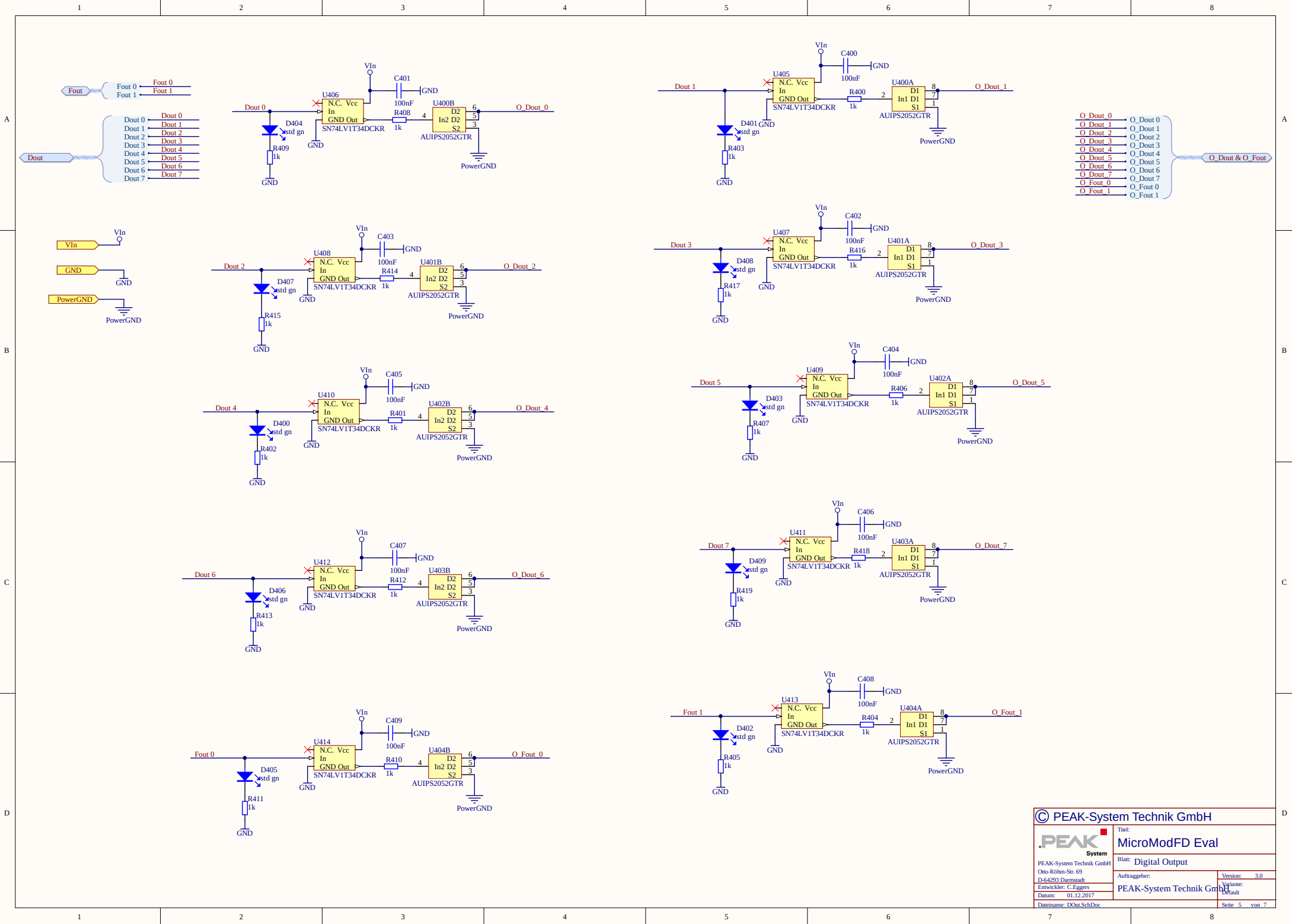
BOM8

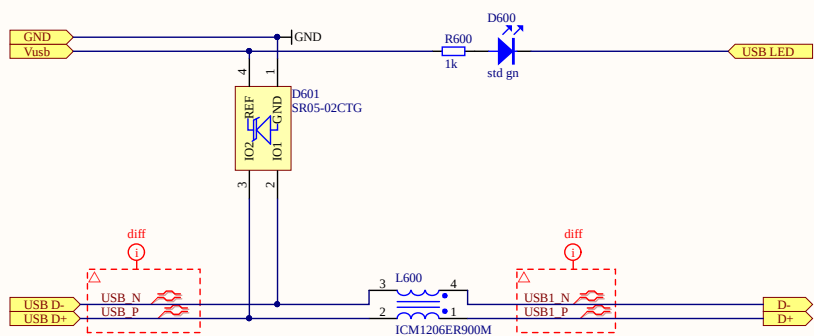
Feet

Montagefüße









Appendix C Changelog User Manual

This section lists the major changes in the recent User Manual releases.

1.1.0

- Firmware update via CAN: PEAK-Flash replaces PCAN-Flash, thereby changed procedure (on page 22)

1.0.0

First edition