PCAN-RS-232 FD

User Manual

PEAK BY HMS NETWORKS

Relevant Products

Product Name	Model	Part Number
PCAN-RS-232 FD	Plastic casing, spring terminal block	IPEH-003120

Imprint

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Contents

1 Introduction

The PCAN-RS-232 FD is a programmable module for converting data traffic between its RS-232 interface and CAN FD connection. For example, machines, PLCs, sensors and actuators with a serial interface can be flexibly integrated into classic CAN or modern CAN FD buses.

The behavior of the PCAN-RS-232 FD can be programmed freely for specific applications. The firmware is created using the included development package with GNU compiler for C and C++ and is then transferred to the module via CAN. Various programming examples facilitate the implementation of own solutions.

On delivery the PCAN-RS-232 FD is provided with a standard firmware that routes from CAN FD to RS-232 and vice versa. It allows to configure the data transfer as well as the hardware with serial control commands. The corresponding source code is included as an example in the scope of supply.

1.1 Properties at a Glance

- NXP LPC54618 microcontroller with Arm® Cortex® M4 core
- High-speed CAN connection (ISO 11898-2)
  - Complies with CAN specifications 2.0 A/B and FD
  - CAN FD bit rates for the data field (64 bytes max.) from 40 kbit/s up to 10 Mbit/s
  - CAN bit rates from 40 kbit/s up to 1 Mbit/s
  - NXP TJA1043 CAN transceiver with wake-up
- CAN termination can be activated through solder jumpers
- Wake-up via CAN bus switchable

- RS-232 connection
  - Texas Instruments transceiver TRSF3221E
  - Bit rates up to 460,800 bit/s
- 8 MByte QSPI flash
- 2 digital I/Os, each usable as input (High-active) or output with Low-side switch
- 2-color LED for status signaling
- Connection via a 10-pole terminal strip (Phoenix)
- Voltage supply from 8 to 32 V
- Extended operating temperature range from -40 to +85 °C (-40 to +185 °F)
- New firmware can be loaded via CAN interface

1.2 Scope of Supply

- PCAN-RS-232 FD in plastic casing
- Mating connector Phoenix Contact FMC 1,5/10-ST-3,5 - 1952348

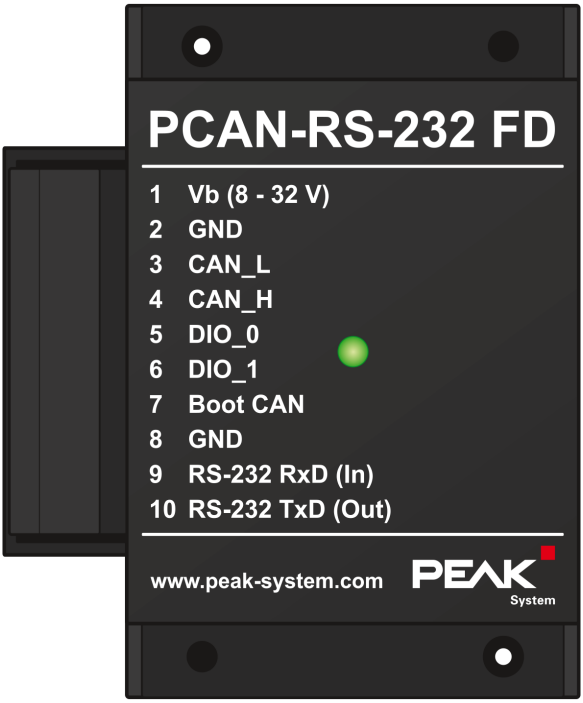
Download

- Windows development package with GCC ARM Embedded and programming examples
- Flash program PEAK-Flash for Windows
- Manual in PDF format

1.3 Prerequisites for Operation

- Power supply in the range of 8 to 32 V DC
- For uploading the firmware via CAN:
  - CAN interface of the PCAN series for the computer (e.g. PCAN-USB FD)
  - Operating system Windows 11 (x64), 10 (x86/x64)

2 Connectors



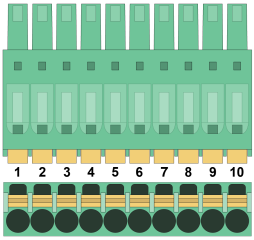
Connector on the left for 10-pin spring terminal block,
JTAG connector inside

The PCAN-RS-232 FD has a 10-pole spring terminal block for connecting the following components:

- Supply voltage
- CAN
- RS-232
- Digital I/Os
- CAN bootloader activation

For direct access to the **debugging ports** (JTAG) of the microcontroller, an additional, yet not equipped, connector panel is available on the circuit board of the PCAN-RS-232 FD.

2.1 Spring Terminal Block



Spring terminal block with 3.5 mm pitch
(mating connector Phoenix Contact FMC 1,5/10-ST-3,5 - 1952348)

Terminal	Identifier	Function
1	$+V_b$	Power supply 8 to 30 V DC
2	GND	Ground
3	CAN_L	Differential CAN signal
4	CAN_H	
5	DIO_0	2 digital I/Os, each usable as input (High-active) or output with Low-side switch
6	DIO_1	
7	Boot CAN	CAN bootloader activation, High-active
8	GND	Ground
9	RS-232 RxD (In)	RS-232 interface
10	RS-232 TxD (Out)	

2.2 JTAG Debugging Ports

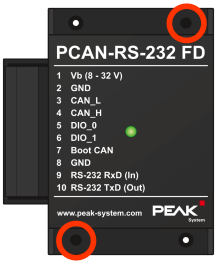
The unpopulated connector panel *Prog* with 50 mil (1.27 mm) pitch on the circuit board of the PCAN-RS-232 FD provides an access option to the JTAG ports of the LPC54618 microcontroller (µC) for hardware debugging.

Procedure for Accessing the Circuit Board

Risk of short circuit! Soldering on the circuit board of the PCAN-RS-232 FD may only be performed by qualified electrical engineering personnel.

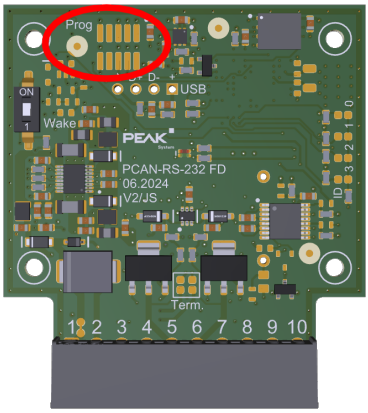
Attention! Electrostatic discharge (ESD) can damage or destroy components on the circuit board. Take precautions to avoid ESD.

1. Remove the Phoenix mating connector from the PCAN-RS-232 FD.
2. Remove the two fastening screws for the upper part of the housing and lift it off the lower part.



3. To reassemble, proceed in reverse order.

Following figure shows the positions of the JTAG panel (not equipped) on the top of board. The table below the figure contains information of the microcontroller and internal wiring.



JTAG panel on the circuit board (not equipped)

Pin	Signal	Port µC	Interne Wiring
1	3,3 V		
2	SWDIO	SWDIO	Pull-up (R204)
3	GND		
4	SWCLK	SWCLK	Pull-down (R203)
5	GND		
6	SWO	PIO0_10/SWO	Pull-up (R202)
7	n/a		
8	n/a		
9	GND		
10	/Reset	RESET_n	Pull-up (R205)

3 Hardware Configuration

For special applications, several settings can be done on the circuit board of the PCAN-RS-232 FD:

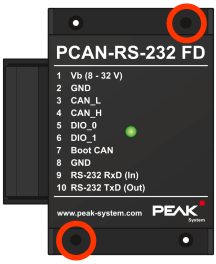
- Coding solder bridges for polling by the firmware
- CAN bus termination
- Permanent wake-up

Procedure for Changing the Hardware Configuration

Risk of short circuit! Soldering on the circuit board of the PCAN-RS-232 FD may only be performed by qualified electrical engineering personnel.

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

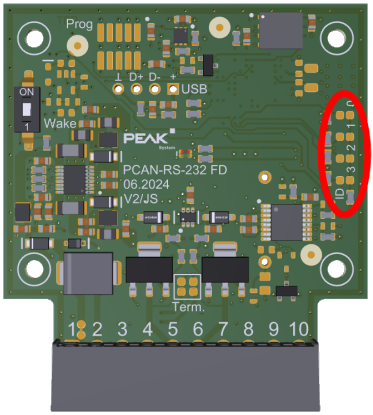
1. Remove the Phoenix mating connector from the PCAN-RS-232 FD.
2. Remove the two fastening screws for the upper part of the housing and lift it off the lower part.



3. Set the desired hardware function on the circuit board. See the relevant section below.
4. To reassemble, proceed in reverse order.

3.1 Coding Solder Jumpers

The board has four coding solder jumpers to assign a permanent state to the corresponding input bits of the microcontroller. The four positions for coding solder bridges (ID 0 to 3) are each assigned to one port of the microcontroller (µC).



Coding solder jumpers on the circuit board

Solder field status	Port status
open	High
closed	Low

Processing in Own Firmware

Own firmware can be programmed to read the status at the corresponding ports of the microcontroller. Due to the existing pull-up circuitry, a bit is physically set (High level) when the corresponding solder jumper is open. A closed solder jumper causes a Low level at the port.

For example, the activation of certain functions of the firmware or the coding of an ID is conceivable here.

Module ID in the Bootloader

For a firmware upload via CAN, the PCAN-RS-232 FD is identified by a 4-bit module ID, which is determined by the solder jumpers. Defined by the bootloader, one bit of the module ID is set (1) if the corresponding solder jumper is closed (default setting: module ID 0, all positions open).

Solder field	ID0	ID1	ID2	ID3
Binary digit	0001	0010	0100	1000
Decimal equivalent	1	2	4	8

See section 6.1 *Uploading Firmware via CAN* on page 20 for more information.

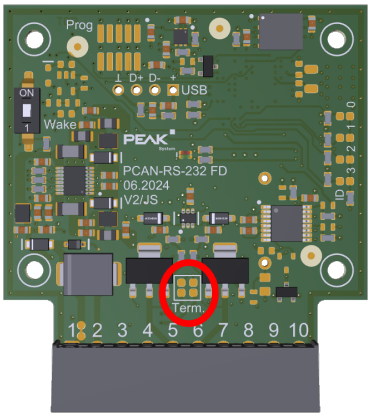
Note for owners of the PCAN-RS-232: With the predecessor product PCAN-RS-232 (IPEH-002100), the coding of the ID solder bridges is inverted in the bootloader. When the solder bridges are open, this results in module ID 15.

3.2 Internal CAN Bus Termination

If the PCAN-RS-232 FD is connected to one end of a CAN bus and if there is no termination of the CAN bus yet, an internal termination with 120 Ω between the lines CAN-High and CAN-Low can be activated. At delivery, the termination is inactive.

The internal CAN bus termination is designed as split termination with two resistors and a capacitor in the middle, stabilized with half the supply voltage.

Tip: We recommend adding the termination at the CAN cabling, for example with the PCAN-Term termination adapter. Thus, CAN nodes can be flexibly connected to the bus.

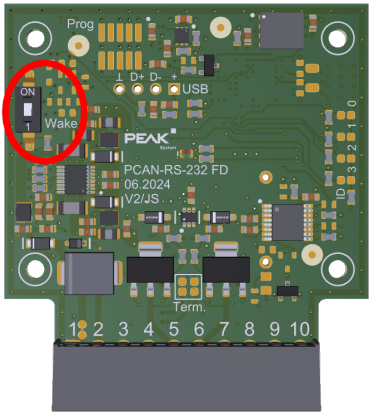


Solder fields for CAN bus termination

Solder fields	Termination
	inactive (Default)
	active

3.3 Permanent Hardware Wake-Up (*Wake* Switch)

The device can be set so that it remains permanently switched on and does not go to sleep mode, thus overwriting any sleep and wake-up functionality of the firmware. This is done via the corresponding *Wake* switch on the circuit board in the device.



Wake switch

Switch state	Permanent wake-up
Off (lower position)	inactive (Default)
“ON” (upper position)	active

4 Operation

The PCAN-RS-232 FD is activated by applying the supply voltage to the respective input pins. More information can be found in chapter 2 *Connectors*. The firmware in the flash memory is subsequently run.

The status indication of the LED depends on the used firmware.

4.1 Standard Firmware

On delivery the PCAN-RS-232 FD is supplied with standard firmware that routes from CAN to RS-232 and vice versa. It allows to configure the data transfer as well as the hardware with serial control commands.

The documentation for the standard firmware can be found in the development package in the following directory branch:

`Hardware\PCAN-RS-232_FD\Examples\00_Standard_Firmware\`

The development package can be downloaded via the following link:

www.peak-system.com/quick/DLP-DevPack

Device Startup

After applying the supply voltage, the status LED blinks orange a number of times, with the quantity of blinks indicating the baud rate of the RS-232 interface.

Number of orange blinks at startup	Baud rate RS-232
1	230,400
2	115,200
3	57,600 (default)
4	38,400
5	19,200
6	9,600
7	2,400

Subsequently, the green LED indicates that the device is ready for operation.

Testing the RS-232 connection

You can use a terminal emulation program (such as PuTTY) to test communication via the RS-232 interface. After establishing a connection with the default baud rate, type (note upper/lower case):

```
V[Enter]
```

In the terminal window, a version number is displayed as answer from the [PCAN-RS-232 FD.

Testing the CAN connection

For testing purposes, connect a CAN bus with 125 kbit/s to the PCAN-RS-232 FD. This bit rate is the default setting of the standard firmware.

In the terminal window, type (note upper/lower case):

```
O[Enter]
```

The LED blinks green. The terminal window now displays the incoming CAN messages.

5 Creating Own Firmware

With the help of the PEAK-DevPack development package, you can program your own application-specific firmware for PEAK-System programmable hardware products. For each supported product, examples are included.

On delivery, the PCAN-RS-232 FD is supplied with the standard firmware `00_Standard_Firmware` that routes from CAN to RS-232 and vice versa. It allows to configure the data transfer and the hardware behavior with serial control commands.

System Requirements

- Computer with operating system Windows 11 (x64), 10 (x86/x64)
- CAN interface of the PCAN series to upload the firmware to your hardware via CAN

Download of the Development Package

www.peak-system.com/quick/DLP-DevPack

Content of the Package

- `Build Tools Win32\`
  Tools for automating the build process for Windows 32-bit
- `Build Tools Win64\`
  Tools for automating the build process for Windows 64-bit
- `Compiler\`
  Compilers for the supported programmable products

- `Debug\`
  - OpenOCD and configuration files for hardware which supports debugging
  - VBScript `SetDebug_for_VSCode.vbs` to modify the example directories for the Visual Studio Code IDE with Cortex-debug
  - Detailed information about debugging in the enclosed documentation of the PEAK-DevPack Debug Adapter
- `Hardware\`

  Sub directories with firmware examples for supported hardware. Use the examples for starting your own firmware development.
- `PEAK-Flash\`

  Windows software for uploading the firmware to your hardware via CAN

  Tip: to support the latest hardware from PEAK-System and us updated firmware versions, we recommend downloading the separate PEAK-Flash version. See section 6.1 *Uploading Firmware via CAN* on page 20
- `LiesMich.txt` and `ReadMe.txt`

  Short documentation how to work with the development package in German and English
- `SetPath_for_VSCode.vbs`

  VBScript to modify the example directories for the Visual Studio Code IDE

Creating Your Own Firmware

1. Create a folder on your computer. We recommend using a local drive.
2. Unzip the development package `PEAK-DevPack.zip` completely into the folder. No installation is required.
3. Run the script `SetPath_for_VSCode.vbs`. This script will modify the example directories for the Visual Studio Code IDE. Afterwards, each example directory has a folder called `.vscode` containing the needed files with your local path information.

4. Launch Visual Studio Code. The IDE is available free of charge from Microsoft: code.visualstudio.com
5. Select the folder of your project and open it. For example: `d:\PEAK-DevPack\Hardware\PCAN-RS-232_FD\Examples\01_CAN_ECHO`
   You can edit the C code and use the the menu *Terminal* > *Run Task* to call *make clean*, *make all*, or to compile a single file.
6. Create your firmware with *make all*. The firmware is in the `out` subdirectory of your project folder and there the file with `.bin` extension.
7. Use the PEAK-Flash tool to upload your firmware to the PCAN-RS-232 FD. Section 6.1 *Uploading Firmware via CAN* on the next page describes the process.

Library

For the development of applications for the PCAN-RS-232 FD, a library is available that includes predefined constants and function calls. They are documented in the header files (`.h`), which are placed in the subdirectory `inc` of each example project. With the available functions, you can access all resources of the PCAN-RS-232 FD. The implementation of the functions is contained by several binary files (`.a`) in the `lib` subdirectory.

6 Firmware Upload

The PCAN-RS-232 FD can be equipped with new firmware via CAN.

6.1 Uploading Firmware via CAN

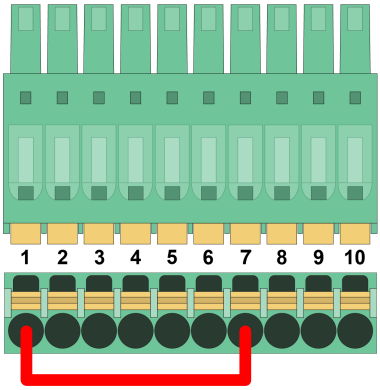
6.1.1 System Requirements

- CAN interface of the PCAN series for the computer, for example PCAN-USB FD
- CAN cabling between the CAN interface and the PCAN-RS-232 FD with correct termination at both ends of the CAN bus with 120 Ohm each.
- Operating system Windows 11 (x64), 10 (x86/x64)
- If you want to update several PCAN-RS-232 FD on the same CAN bus with new firmware, a unique module ID must be assigned to each device. See section 3.1 *Coding Solder Jumpers* on page 12.

6.1.2 Activate CAN Bootloader by Hardware

For an upload of new firmware via CAN, the CAN bootloader must be activated in the PCAN-RS-232 FD.

1. Disconnect the PCAN-RS-232 FD from the power supply.
2. Establish a connection between **Boot CAN** and the power supply **Vb**.



Connection at the spring terminal block between terminals 1 and 7

   Because of that, a High level is later applied to the **Boot CAN** connection.
3. Connect the CAN bus of the device to a CAN interface connected to the computer. Pay attention to the proper termination of the CAN cabling (2 x 120 Ohm).
4. Reconnect the power supply.
   Due to the High level at the **Boot CAN** connection, the PCAN-RS-232 FD starts the CAN bootloader. This can be determined by the status LED blinking orange quickly.

6.1.3 Flash Firmware

The firmware is uploaded via a CAN bus using the Windows software PEAK-Flash.

Download and Installation PEAK-Flash

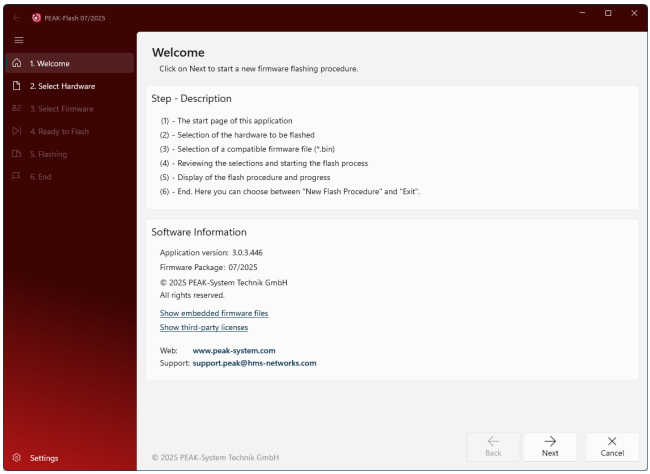
1. For downloading the software, open the following download web page and, on the PEAK-Flash 3 tile, click on the download link.
   www.peak-system.com/quick/DL-Software-E

2. Run the setup file being part of the downloaded Zip file.
3. Follow the instructions of the installation program.

Flash Procedure

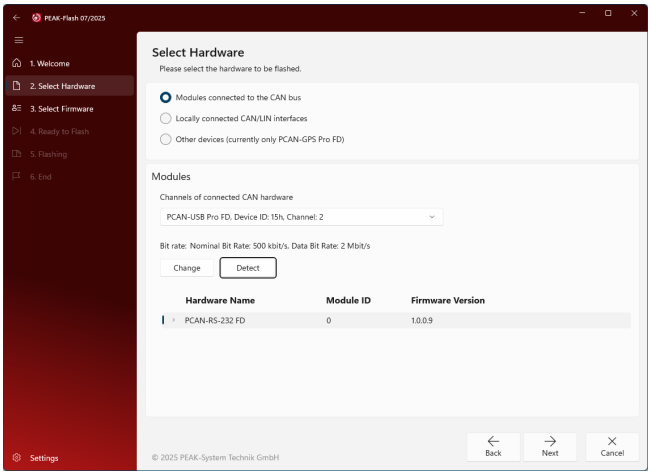
Note: The following figures may differ from the actual program display.

1. Make sure that the PCAN-RS-232 FD is in the bootloader mode (see above).
2. Start PEAK-Flash 3, for example via the Windows Start menu.
   The main window of PEAK-Flash appears.



3. Click the *Next* button.

   The *Select Hardware* window appears.

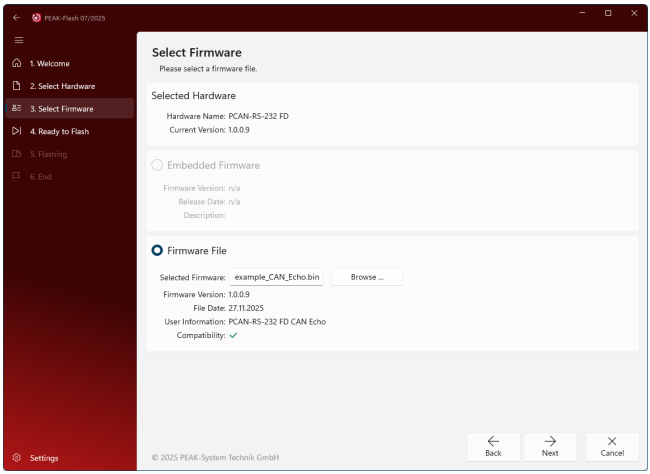


4. Select *Modules connected to the CAN bus*.
5. Under *Channels of connected CAN hardware*, select a CAN interface connected to the computer.
6. In the *Bit rate* field, a nominal bit rate of 500 kbit/s should be selected. If not, adjust it using the *Change* button.
7. Click on *Detect*.

   In the list, the PCAN-RS-232 FD appears together with the Module ID and Firmware version. If not, check the CAN bus and the connections.

8. Click *Next*.

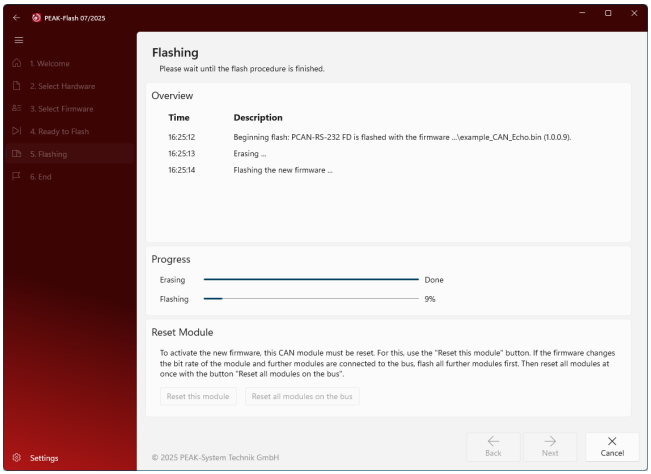
   The *Select Firmware* window appears.



9. In the *Firmware File* field, click *Browse* and select a binary firmware file `.bin` for the PCAN-RS-232 FD.
10. Click *Next*.

    The *Ready to Flash* dialog appears.

11. Click *Start* to transfer the new firmware to the PCAN-RS-232 FD.
    The *Flashing* dialog appears.



12. After the process is complete, click *Next*.
13. You can exit the program.

6.1.4 Reset the Device

1. Disconnect the PCAN-RS-232 FD from the supply voltage.
2. Remove the connection between **Boot** and the power supply connector **Vb**.
3. Reconnect the PCAN-RS-232 FD to the power supply.

You can now use the device with the new firmware.

7 Technical Specifications

Connectors	
Spring terminal block	10-pin, pitch 3.5 mm Phoenix Contact FMC 1,5/10-ST-3,5 - 1952348
JTAG “Prog” on the PCB	10-pin in two rows, pitch 50 mil (1.27 mm), not equipped

Digital I/Os	
Quantity	2 (combined inputs and outputs)
I/O as input:	
Input type	High-active (internal pull-up), inverting
Maximum input frequency	3 kHz
Input switching thresholds	Low → High: U ≥ 2.6 V High → Low: U ≤ 1.3 V
Maximum input level	60 V
Internal resistance	> 33 kΩ
I/O as output:	
Output type	Low-side driver
Maximum voltage at load	60 V
Maximum output current	0.7 A
Short-circuit current	1 A
Internal resistance	0.55 Ω

Power Supply	
Supply voltage (U_b)	8 to 32 V DC
Maximum current consumption	8 V: 60 mA 12 V: 40 mA 24 V: 15 mA 30 V: 12 mA
Current consumption Sleep	70 µA

CAN	
Specification	High-speed CAN channel (ISO 11898-2) complies with CAN specifications 2.0 A/B and FD
Bit rates	Nominal: 40 kbit/s to 1 Mbit/s CAN FD data: 40 kbit/s to 10 Mbit/s*
Transceiver	NXP TJA1043
Internal termination	can be activated via solder jumper
Listen-only mode	Programmable; not activated at delivery
Wake-up	Sleep/Wake via CAN Switching to permanent On via DIP switch Wake-up-sources separately readable

* According to the CAN transceiver data sheet, only CAN FD bit rates up to 5 Mbit/s are guaranteed with the specified timing.

RS-232	
Transceiver	Texas Instruments TRSF3221EIPWR
Maximum transfer rate	1 Mbit/s
ESD protection	± 30 kV

Microcontroller	
CPU	NXP LPC54618J512ET180, Arm®-Cortex®-M4-Core
Crystal clock frequency	12 MHz
Internal clock frequency	max. 180 MHz (programmable via PLL)
EEPROM	MicroChip Technology 24LC08BHT-I/OT, 8 kbit
QSPI	ISSI IS25LP064A-JKLE
Firmware upload	via CAN (PCAN interface required)

Measures		
Size	Casing: Circuit board:	68 x 57 x 25.5 mm (W x D x H) 51 x 54 mm (W x D)
Weight	32 g	

Environment	
Operating temperature	-40 to +85 °C (-40 to +185 °F)
Temperature for storage and transport	-40 to +85 °C (-40 to +185 °F)
Relative humidity	15 to 90 %, not condensing
Ingress protection (IEC 60529)	IP20

Conformity	
RoHS	EU Directives 2011/65/EU (RoHS 2) + 2015/863/EU DIN EN IEC 63000:2019-05
EMV	EU Directive 2014/30/EU DIN EN 61326-1:2022-11

Appendix A CE Certificate

EU Declaration of Conformity

This declaration applies to the following product:

Product name:	**PCAN-RS-232 FD**
Item number(s):	**IPEH-003120**
Manufacturer:	PEAK-System Technik GmbH Leydheckerstraße 10 64293 Darmstadt 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

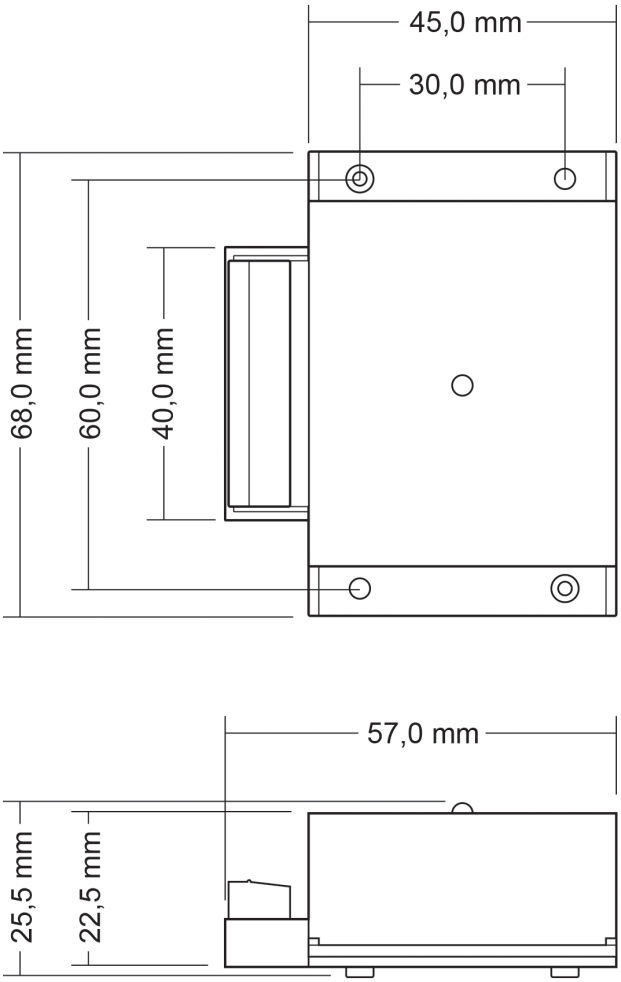
EU Directive 2014/30/EU (Electromagnetic Compatibility)

DIN EN 61326-1:2022-11
Electrical equipment for measurement, control and laboratory use - EMC requirements - Part 1: General requirements (IEC 61326-1:2020);
German version of EN IEC 61326-1:2021

Darmstadt, 20 November 2025

Andreas Staat, Engineering Manager Hardware

Appendix B Dimension Drawing



Appendix C Disposal

The product PCAN-RS-232 FD must not be disposed of in household waste. Dispose it of properly in accordance with local regulations.

The product does not contain any batteries or rechargeable batteries that need to be disposed of separately.