

Category	Contents
Keywords	Mini PCI Express, CAN(FD) interface card
Abstract	MiniPCleCANFD is a dual-channel CAN (FD) interface card that meets MiniPCle specifications. Backward compatibility with CAN 2.0 A/B standard enables industrial notebook computers/portable industrial computers/single board computers (SBC) to be connected to CAN/CAN(FD) networks through MiniPCI-E interfaces. This constitutes a data acquisition and data processing system in CAN/CAN(FD) network applications such as laboratories, industrial control, and smart communities.

### Revision History

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## 1. Product Introduction

### 1.1 Product Overview

CAN FD (CAN Flexible Data-rate) is the latest version of the CAN bus, with a maximum of 64 bytes of data, and a flexible data field with a baud rate of up to 5 Mbps.

The MiniPCIeCANFD CAN(FD) interface card is a MiniPCIe to dual-channel CAN(FD) communication interface card compatible with PCI Express r1.0a developed by Guangzhou ZLG Electronics. The MiniPCIeCANFD interface card provides a peripheral controller interface for MiniPCI Express multi-function devices, which enables the computer to be easily connected to the CAN/CAN(FD) bus network and monitor multiple bus networks in real time. It is compact and can be easily embedded in single board computers (SBC), portable industrial control hosts, and industrial notebooks. It is easy to install and easy to use.

The MiniPCIeCANFD provides two completely independent isolated CAN (FD) channels, in line with CAN FD ISO 11898-1:2015 specification (compatible with CAN 2.0A/B standard). It supports a transmission rate of up to 5 Mbps, which enables flexible and convenient applications. To improve system reliability, MiniPCIeCANFD interface card adopts 2,500 V DC electrically isolated CAN (FD) transceiver circuit, which protects the computer from the influence of ground circulation and enhances the system reliability in harsh environments. To facilitate expansion, the second function pin of CAN signals can be switched to the reserved PIN of the MiniPCIe golden finger through jumper welding, which allows users to design CAN transceiver circuits on the baseboard by themselves.

The MiniPCIeCANFD interface card provides a unified application programming interface and complete and diverse application demonstration codes, including development routines such as VC, VB, Delphi and labview, which facilitates application development. MiniPCIeCANFD supports OPC interfaces and can be used in configuration software that supports OPC. In addition, we provide powerful ZCANPRO general-purpose CAN-BUS test software for CAN/CAN (FD) message sending and receiving and monitoring, which facilitates development and debugging.

Note: MiniPCIeCANFD is collectively referred to as PCIeCANFD interface card below.



Figure 1.1 MiniPCIeCANFD appearance

## 1.2 Functions

- PC interface: standard MiniPCIe interface, PCI Express x1 specification;
- Comply with CAN FD ISO 11898-1:2015 specification (compatible with CAN 2.0A/B standard);
- Number of channels: dual-channel isolated CAN interface, standard DB-9 connector provided through the interface board;
- CAN controller transceiver signal can be switched to gold finger reserved pins, which helps users design CAN transceiver circuits by themselves;
- Compatible with high-speed CAN and CANFD;
- The CAN interface is electrically isolated from 2,500 V DC;
- The CAN communication baud rate can be arbitrarily programmable between 4 Kbps and 1 Mbps;
- CANFD accelerated baud rate can be arbitrarily programmable between 1 Mbps and 5 Mbps;
- Maximum data flow for single channel transmission: 4,000 frames per second (remote frame, single frame transmission);
- The highest data flow rate received by a single channel: 10,000 frames per second (remote frame);
- The interface board has a built-in 120 ohm terminal resistance, which can be connected and disconnected by using the DIP switch;
- Support ZCANPRO test software (support Windows 7 and Windows 10);
- Operating temperature: -40°C to +85°C;
- Storage temperature: -40°C to +85°C;
- Length, width and height: 50.95 mm x 30 mm x 5.85 mm (thickness).

## 1.3 Product Specifications

### 1.3.1 Electrical Specifications

The PCIeCANFD interface card needs an electrical environment to work safely and stably. Table 1.1 lists the electrical parameters of the interface card. Exceeding the specifications listed in the table may cause the product to work unstable and fail, or even burn the board.

Table 1.1 Electrical specifications

Item		Test Conditions	Minimum	Typical Value	Maximum	Unit
Operating voltage	MiniPCIe slot	Dual channel transceiver	3.2	3.3	3.4	V
Operating current	External input DC power supply	Dual channel transceiver	--	350	--	mA
CAN interface	Bus pin withstand voltage	CANH, CAHL	-42	--	42	V
	Terminal resistance	Enable terminal resistance	--	120	--	Ω
	Isolation withstand voltage (between channels)	Leakage current less than 1 mA	--	2500	--	VDC
	Isolation withstand voltage (channel to system ground)	Leakage current less than 1 mA	--	2500	--	VDC

### 1.3.2 Specifications

Table 1.2 Product specifications

Item	Specification
	MiniPCIeCANFD PCI-9820I PCI-9840I PCI-9820
Number of CAN channels	2. circuits 2-way 4 cameras 2-way
Operating voltage	3.3V±5%
Power consumption	≤3W
Isolation voltage	2500VDC
Output terminal	2x1.25-3P connector, converted into 2xDB9 through the interface board
CAN baud rate	40Kbps - 1Mbps (CAN) 1Mbps - 5Mbps (CANFD acceleration)
Data receiving capability	10,000 frames/second/channel (remote frame, single frame transmission)
Data sending capability	4,000 frames/second/channel (remote frame)
Windows system driver	Support Support Support Support
Linux system driver	Support - - Support Support
VxWorks driver	- - Support Support
Dimensions (length x width)	PCB dimensions (WLH): 30.2 x 51.0 mm x 5.85 mm; PACK board dimensions (WLH): 31.9 mm x 36.3 mm x 14.1 mm (the length does not include DB9). 130 x 90 mm 130 x 90 mm 130 x 90 mm
Operating temperature	-40°C to +85°C
Ambient humidity	10%-90% (no condensation)
Environmental requirements	Away from corrosive gas

### 1.3.3 Operating Temperature

The PCIeCANFD interface card can work in an industrial-grade environment. Its applicable operating temperature range: -40°C~+85°C. Using the interface card in too low or too high ambient temperature will make it work abnormally and shorten its service life.

### 1.4 Typical Applications

- CAN(FD)-Bus network diagnosis and test;
- Electric power communication network;
- Industrial control equipment;
- Vehicle network debugging;
- Automotive electronics applications;

## 2. Hardware Interfaces

### 2.1 CAN Communication Interface

MiniPCleCANFD uses a 1.25-3P connector. The signal definition converted to DB9 interface pins through the attached PACK interface board meets the requirements of the CiA standard. The signal definition is detailed in Table 2.1.

### 2.2 DB-9 Connector Definition

Table 2.1 DB-9 pin connector pin definition

Pin	Signal	Description	Interface Diagram
1	NC	—	
2	CAN_L	CAN_L signal cable	
3	CAN_GND	Reference ground	
4	NC	—	
5	CAN_SHIELD	Shielded wire	
6	CAN_GND	Reference ground	
7	CAN_H	CAN_H signal cable	
8	NC	—	
9	NC	—	

The signal from the DB-9 connector can be transferred to the 5-pin OPEN5 connector through the optional DB9-OPEN5 converter.

Table 2.2 Pin definition of OPEN5 socket

Pin	Signal	Description	Interface Diagram
1	V-	Network power supply negative	
2	CAN_L	CAN_L signal cable	
3	CAN_SHIELD	Shielded wire	
4	CAN_H	CAN_H signal cable	
5	V+	Network power supply positive	

### 2.3 Terminal Resistance

As shown in Figure 2.3, the PACK interface board attached to the MiniPCleCANFD interface card has a built-in 120 ohm terminal resistor. Use the DIP switch S1 to select whether the CAN channel terminal resistance is connected to the bus network. As shown in Figure 2.4, set whether the CAN channel uses the 120 ohm terminal resistance. Before delivery, the DIP switch is set to "ON" by default, that is, the 120 ohm terminal resistance is connected to the corresponding bus network.

The interface card corresponds to the CAN channel at the endpoint of a CAN network. Set the DIP switch of the corresponding channel to "ON", or connect a 120 ohm terminal resistance between CAN\_H and CAN\_L of the corresponding CAN channel.





Figure 2.1 Terminal resistance selection switch

## 2.4 CAN Second Function Pin Switch

When designing the CAN transceiver circuit or improving the protection level of the CAN signal cable, consider connecting the second function pin of the CAN signal to the backplane through the MiniPCIe reserved pin. Design the CAN transceiver circuit by yourself to improve the system flexibility.

The second function pin of the CAN signal is switched through the jumper JP1 (as shown in Figure 2.2). JP1 is disconnected by default, and the system uses the default on-board CAN transceiver. When JP1 is short-circuited with solder, the second function pin of CAN signal is automatically enabled when the system is powered on. Table 2.3 lists the pin definitions.

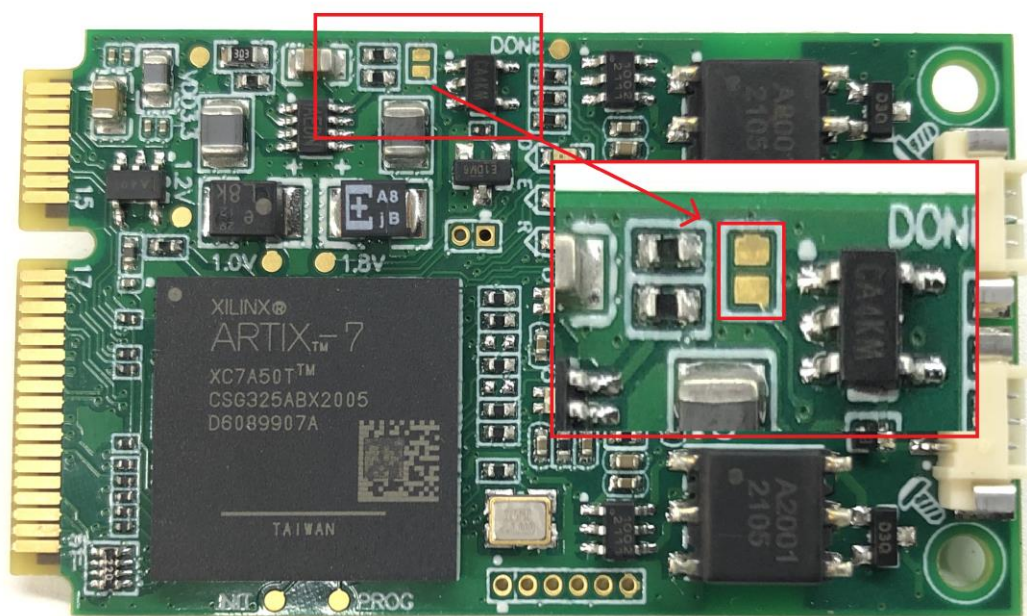


Figure 2.2 CAN-TTL switch jumper



## 2.5 MiniPCle Goldfinger Definition



Figure 2.1 MiniPCle pin sequence

Table 2.3 lists the MiniPCle interface definitions. The pins 17, 19, 37, 39 are the second function pins of CAN.

Table 2.3 MiniPCle interface definition

Signal Name	Pin No.	Description
nWAKE	1	nWAKE signal/default pull-up
nRESET	22	nRESET signal/not used
TD0_REV	17	CAN0 TXD second function IO
RD0_REV	19	CAN0 RXD second function IO
TD1_REV	37	CAN1 TXD second function IO
RD1_REV	39	CAN1 RXD second function IO
REFCLK_N/P	11, 13	PCIE reference clock pair
PCIE_TX_N/P	23, 25	PCIE send pair
PCIE_RX_N/P	31, 33	PCIE receiving pair
3.3V	2, 24, 52	Power supply
GND	9, 15, 18, 21, 26, 27, 29, 34, 35, 40, 50	Ground

## 2.6 Signal Indicators

The MiniPCleCANFD interface card has one system operation indicator, one dual-color CAN0 indicator, and one dual-color CAN1 indicator to indicate the device operating status. Table 2.1 lists the functions of the indicators. When the indicators are in various states, the status of the CAN bus is shown in Table 2.2.

Table 2.4 Indicator functions

Indicator	Status	Indication Status
R (RUN)	Green	System operation instructions
CAN0	Green	The CAN interface is working properly
	Red	The CAN interface is faulty
CAN1	Green	The CAN interface is working properly
	Red	The CAN interface is faulty

After the MiniPCleCANFD interface card is powered on, the system status indicator RUN is green, indicating that the device is powered on, and the system is operating properly; if the system status indicator RUN is off, the system power supply fails or a serious error occurs in the system.

When the CAN0 and CAN1 indicators are green, the CAN controller has been initialized and is working properly.

When the CAN controller has an error, the CAN0 and CAN1 indicators are red; when the error of the CAN controller is cleared, the CAN0 and CAN1 indicators are green.

Table 2.5 CAN bus status

CAN Indicator Status	CAN Bus Status
CAN0 and CAN1 indicators are all off	The CAN controller is disconnected from the bus
CAN0 and CAN1 indicators blink in red and green alternately	The CAN controller is not started, and the user is prompted to start the CAN controller
CAN0 and CAN1 green indicators are always on	The CAN bus is operating properly
CAN0 and CAN1 red indicators blink	The CAN-bus bus has an error or data overflow, and it may lose frames

## 2.7 Board Installation

### 2.7.1 Precautions

MiniPCIeCANFD series interface cards are electrostatic sensitive products and should be packed in a special anti-static protective bag before delivery. Therefore, when operating the interface card, take necessary protective measures to ensure that the interface card is not damaged by human contact with static electricity.

The MiniPCIeCANFD interface card should be installed when the PC/industrial computer has been **powered off**. Similarly, the interface card should also be disassembled when the PC/industrial computer is powered off.

MiniPCIeCANFD series interface cards do not have any switches and jumpers for assigning interrupts and I/O addresses, which are automatically assigned by the computer BIOS. Therefore, the board must be installed in the MiniPCI-E slot before you install the driver. Figure 2.3 shows the installation procedure:

1. Power off the computer and open the computer case cover;
2. Insert the end of the MiniPCIeCANFD series interface card diagonally upward into the free MiniPCI-E slot, and then gently press it down;
3. Tighten the screws to fix the board;
4. Power on the computer. At this time, the BIOS automatically assigns interrupts and I/O addresses to the MiniPCIeCANFD interface card;
5. Install the driver.

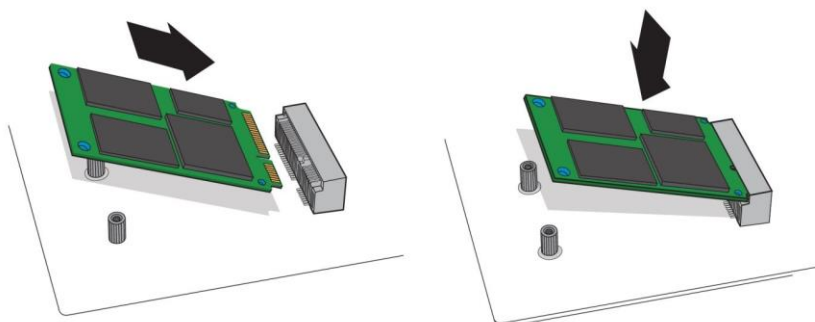


Figure 2.3 MiniPCIeCANFD installation

**Note: Do not remove or insert the PCI-E interface card with power is on; it is forbidden to touch the device with your hands during installation to prevent static electricity from damaging the device.**

### 2.7.2 Product Dimensions

The physical dimensions of the MiniPCIeCANFD: 30 mm x 50.95 m, the highest device height on the top side is 3.5-4.0 mm, and the highest device height on the bottom side is 1.75 mm, as shown in Figure 2.4.

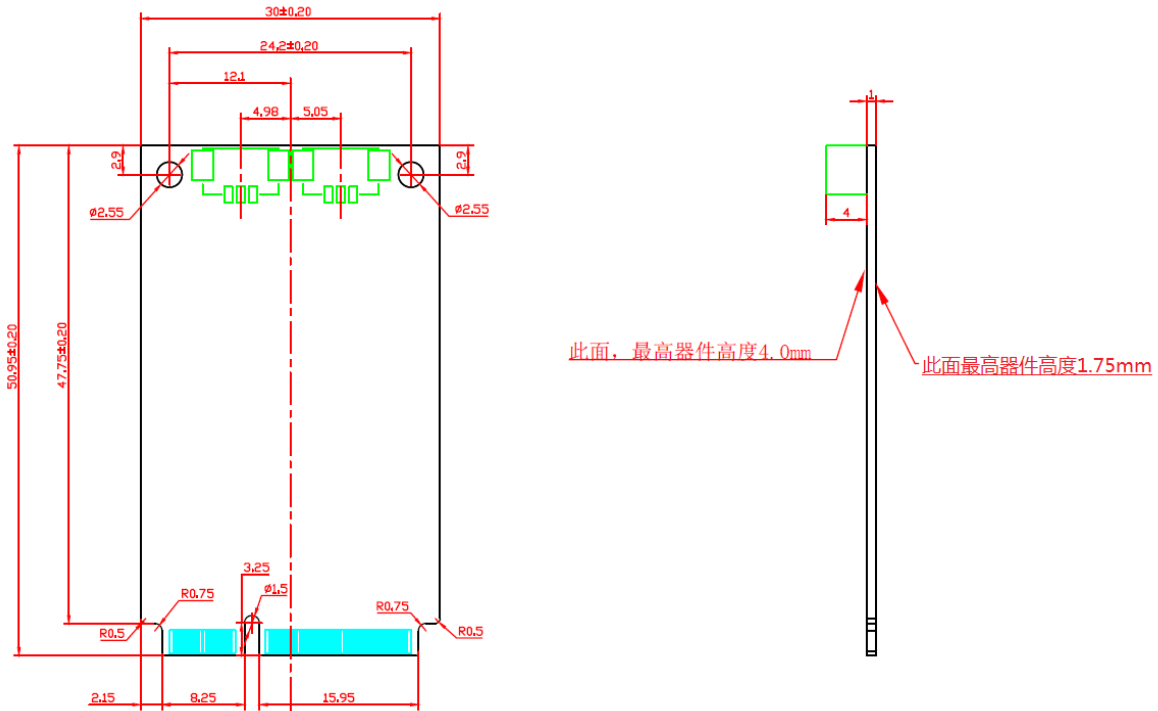


Figure 2.4 Product dimensions

### 2.8 System Connections

When the PCIeCANFD interface card is connected to the CAN-bus bus, you need only to connect CAN\_L to CAN\_L and CAN\_H to CAN\_H signals. The CAN-bus network adopts a linear topology, and the two terminals of the bus need to be installed with a 120 ohm terminal resistor; if the number of nodes is greater than 2, the 120 ohm terminal resistor is not required for the intermediate nodes. For branch connections, the length should not exceed 3 m. Figure 2.2 shows the CAN-bus bus connection.

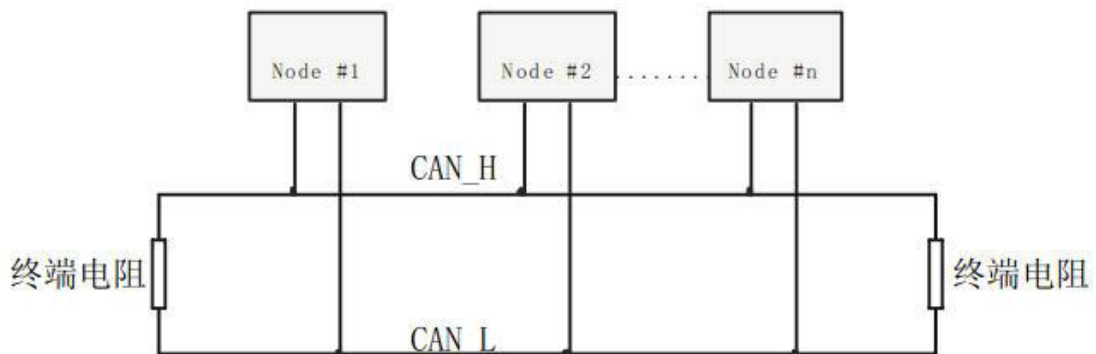


Figure 2.5 Linear topology of CAN-bus network

In the CAN-bus network, shielded cables are often used for interconnection, so as to enhance the anti-interference ability. However, there are many types of shielded cables and field wiring is complicated.

Therefore, the wiring diagrams of different types of cables in application are shown below, including the connection diagrams of double-core single-layer shielded cable, double-core double-layer shielded cable, and three-core single-layer shielded cable (The "equipment iron shell" in the pictures refers to the outer shell of the device, which is grounded by default). Regardless of the type of cable, reasonable changes must be made according to the complexity of the field wiring. Ensure the reliable grounding of the single point of the shielded cable or ground wire at any time, and carry out on-site wiring in strict accordance with the wiring specifications to minimize communication errors and abnormalities, and improve the communication quality and service life of the bus.

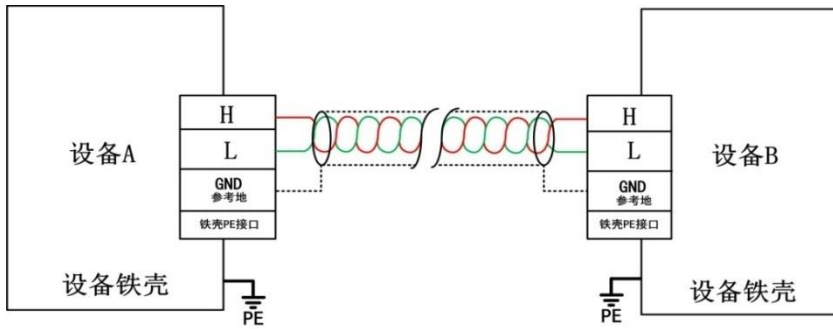


Figure 2.6 Dual-core single-layer shielded cable connection

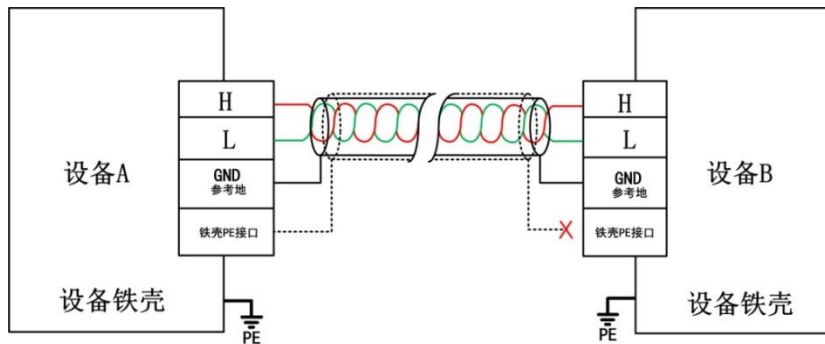


Figure 2.7 Double-core double-layer shielded cable connection

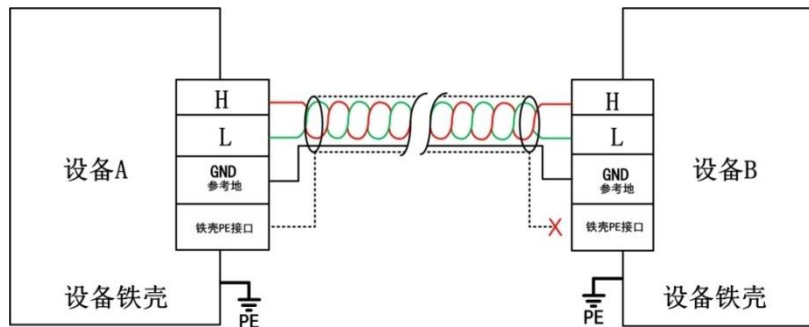


Figure 2.8 Three-core single-layer shielded cable connection

### 3. Driver Installation

This document uses a PC running Windows 7 as an example to describe how to install the MiniPCIeCANFD driver.

#### 3.1 Installing the Driver under Windows

Insert the MiniPCIeCANFD interface card into the MiniPCIe card slot of the computer with power off, and start the computer.

Click the official driver installation application `pcie-canfd-x00u-install.exe` to display the driver software interface, as shown in Figure 3.1.

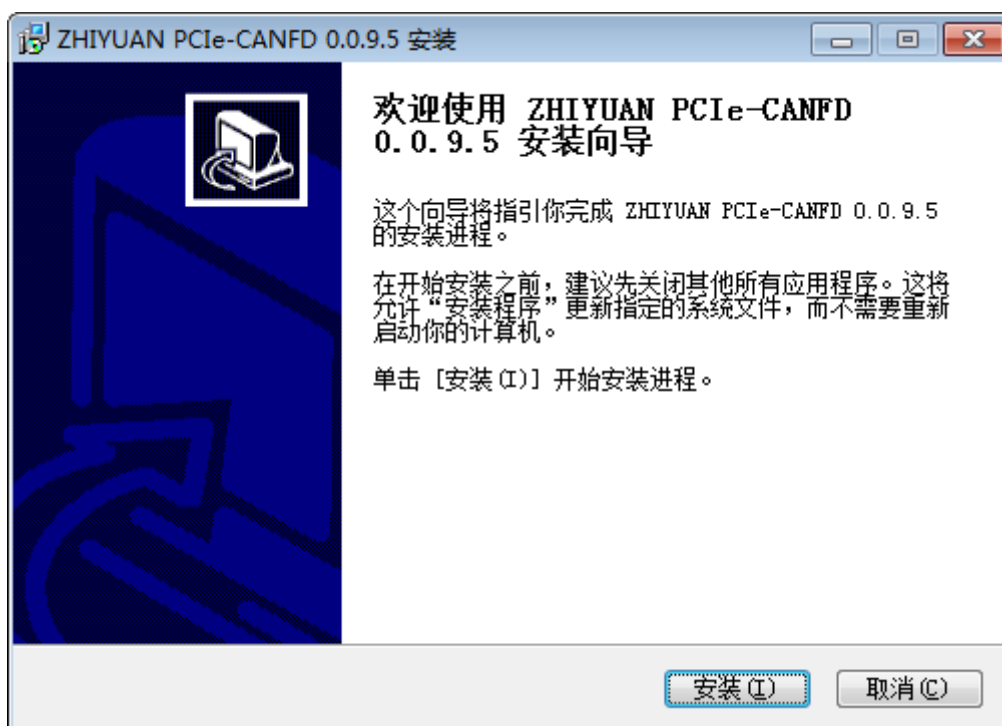


Figure 3.1 Driver software

As shown in Figure 3.2, click [Install] and wait until the driver is installed.



Figure 3.2 Installing the driver

After the installation is complete, the "Completing" dialog box appears. Click the [Finish] button to complete the installation, as shown in Figure 3.3.

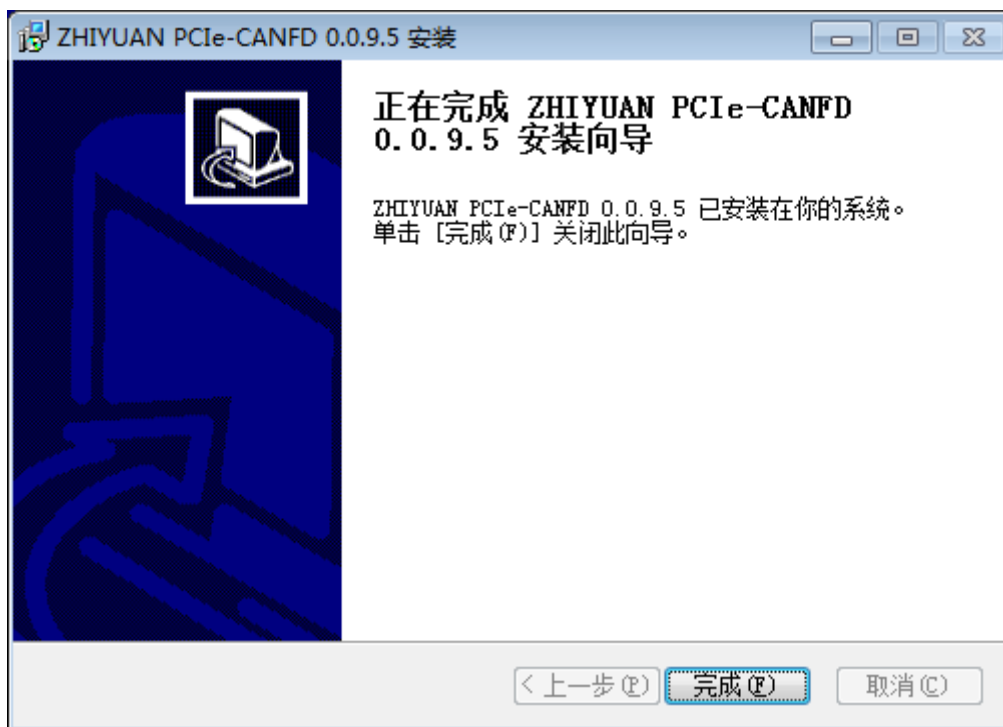



Figure 3.3 Driver installation complete

After the driver is installed, if the PCIeCANFD interface card is normal,  ZHIYUAN PCIE CAN-FD appears in the device manager, indicating that the driver is installed correctly and a PCIeCANFD interface card is inserted. In this case, the CANFD card has been connected to the PC, and the host computer software can be used to send and receive CAN (FD) messages. It is recommended to use the ZCANPRO software provided by ZLG Electronics as the host computer software. Users can also develop their own host computer software by using the provided secondary development function library.

## 4. Packing List

Table 4.1 MiniPCIeCANFD Packing List V1.00

No.	Name	Quantity	Unit	Remarks
1	MiniPCIeCANFD card	1	Piece	
2	mPCIeCANFD-PACK interface board	2	Piece	
3	1.25-3P double-headed cable	2	Nr.	Used to connect the board and the interface board
4	DB-9 nut	4	Piece	Used to fix the interface board
5	After-sales Service Guide	1	Pcs	
6	Certificate of Conformity	1	Piece	



## 5. Quick User Guide


### 5.1 Introduction to ZCANPRO Software

ZCANPRO is the supporting software for CAN/CANFD series products produced by Guangzhou ZLG Electronics Co., Ltd., which can perform operations such as raw data transmission and reception, data playback, and high-level protocol analysis. The software is easy to operate and powerful, and it is a good helper for CAN bus testing, monitoring, diagnosis, and development.

ZCANPRO software can be downloaded from the ZLG Electronics official website <http://www.zlg.cn>.

### 5.2 Using MiniPCIeCANFD on ZCANPRO

After the device driver and ZCANPRO are installed, MiniPCIeCANFD can be used on the ZCANPRO software

For details about how to use MiniPCIeCANFD on ZCANPRO, click  in the upper right corner of the software main interface and select [Quick Use Guide] in the drop-down box (as shown in Figure 4.1). For detailed instructions for the ZCANPRO software, see [User Manual].

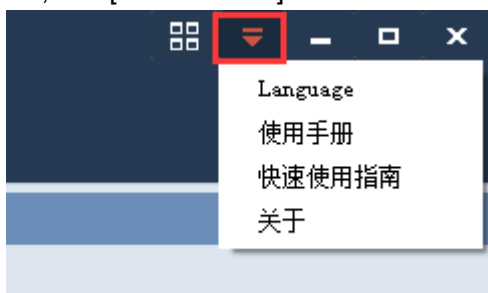


Figure 5.1 Opening the Quick Guide

## 6. Disclaimer

Based on the principle of providing better service for users, Guangzhou ZLG Electronics Co., Ltd. ("ZLG Electronics") will try to present detailed and accurate product information to users in this manual. However, due to the effectiveness of this manual within a particular period of time, ZLG Electronics does not guarantee the applicability of this document at any time. ZLG Electronics shall reserve the right to update this manual without prior notice. To get the latest version, please visit the official website of ZLG Electronics regularly or contact ZLG Electronics. Thank you!

### Right to modify the document

Guangzhou ZLG Electronics Co., Ltd. shall reserve the right to modify related documents of PCIeCANFD interface card series products at any time without prior declaration.

### ESD protection

The PCIeCANFD interface card series products have electrostatic protection capabilities to ensure the stable operation of the products. When using PCIeCANFD interface card series products, first discharge the static electricity on the body. For example, wear a reliable grounding static ring, or touch a water pipe connected to the earth.



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