WebChip™ Series Material

PSM2000ACD
WebChip™ Module
Datasheet

P&S DataCom

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Claims

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Table of Contents

1 Introduction

The PSM2000ACD is one member of the WebChip^{TM} family of products.   The module contains a network communication controller PS2000, an RS-232 transceiver, an RS-485 transceiver, an embedded Modem controller and a standard Modem interface.   The PSM2000ACD provides a convenient interface for users to develop applications for various networking intelligent devices.   It uses a standard Serial Peripheral Interface (SPI) communication port to connect to the user's MCU and conforms to the MCUnet^{TM} protocol.   The PSM2000ACD connects to a server gateway WebChipServer^{TM} through any of the following: RS-232, RS-485, embedded Modem or standard Modem.

2 Features

- A single +5V power supply

- Each module has a unique ID number

- Supports multiple communication modes

    —RS-232 mode: the module has a built-in interface, a MAX232 (from MAXIM), which performs the conversion between TTL/CMOS signals and RS-232 format.

    —RS-485 mode: the module has a built-in interface that features transient voltage suppression and thermal shutdown; at most, 64 transceivers can be connected to the bus.

    —Embedded Modem mode: the module has a built-in embedded Modem and DTMF generation circuit that support both the standard V.22bis protocol and V.22 protocol.

    —Standard Modem mode: it provides an interface connection to a standard Modem.

- Provides a standard SPI port that can be connected to various MCUs

- Easy to design networking MCU application system

- Supports any gateway software with MCUap^{TM} protocol

- Maximum operating current: 100mA in embedded Modem mode

3 Typical Applications

- Intelligent Networking Consumer Products

- Building Control Systems

- Security Systems

- Utility Management Systems

- Remotely Monitored Industrial Control Equipments

- Computer Peripherals

- Remote Medical Monitoring Systems

- Transportation and Automotive Systems

- Communication Products

4 Block Diagram

The PSM2000ACD module block diagram is shown in Figure 1.   It consists of the following functional circuits.

- PS2000 network communication controller

- Interface circuits

  —RS-232 transceiver compliant with the RS-232 standard

  —RS-485 transceiver compliant with the RS-485 standard

  —Embedded Modem which conforms to standard communication protocol ITU-T V.22bis and ITU-T V.22

- Status indicating LED

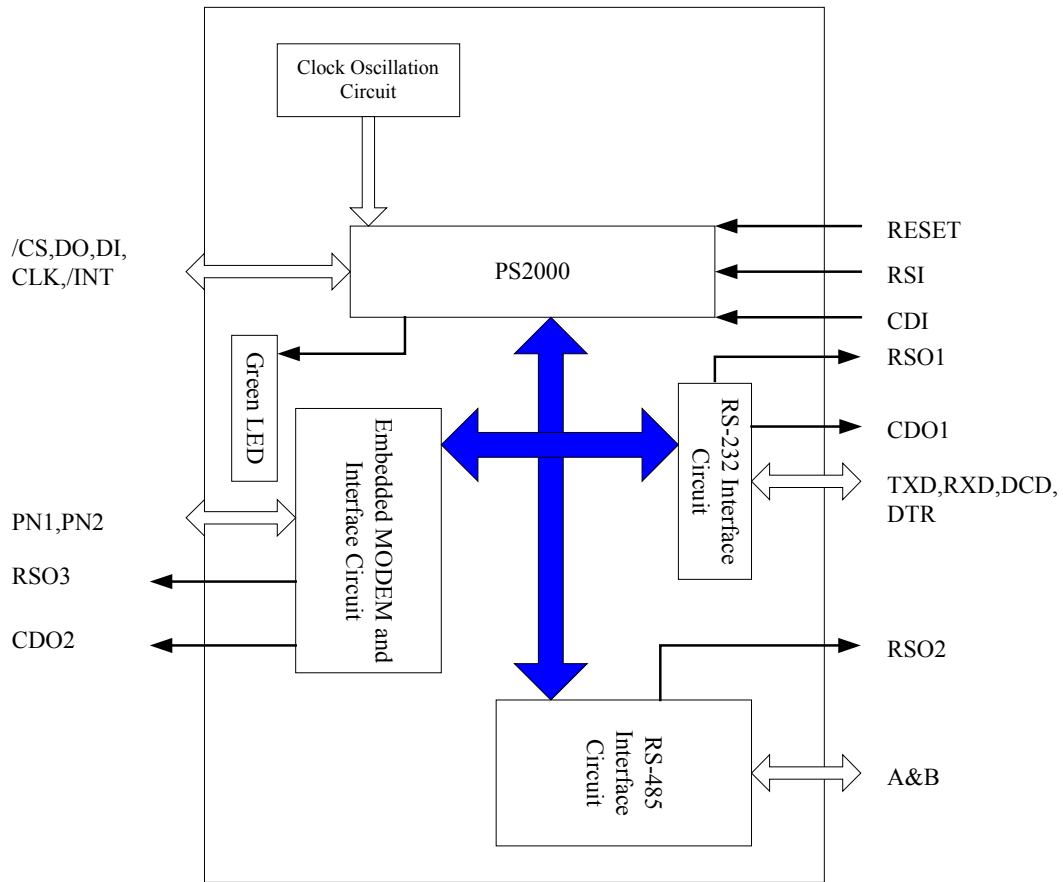 —LED blinks to indicate data is being transferred; LED turns off to indicate no data is being transferred.

Figure 1   PSM2000ACD Block Diagram

5 Pin Configuration and Descriptions

5.1   Pin Configuration

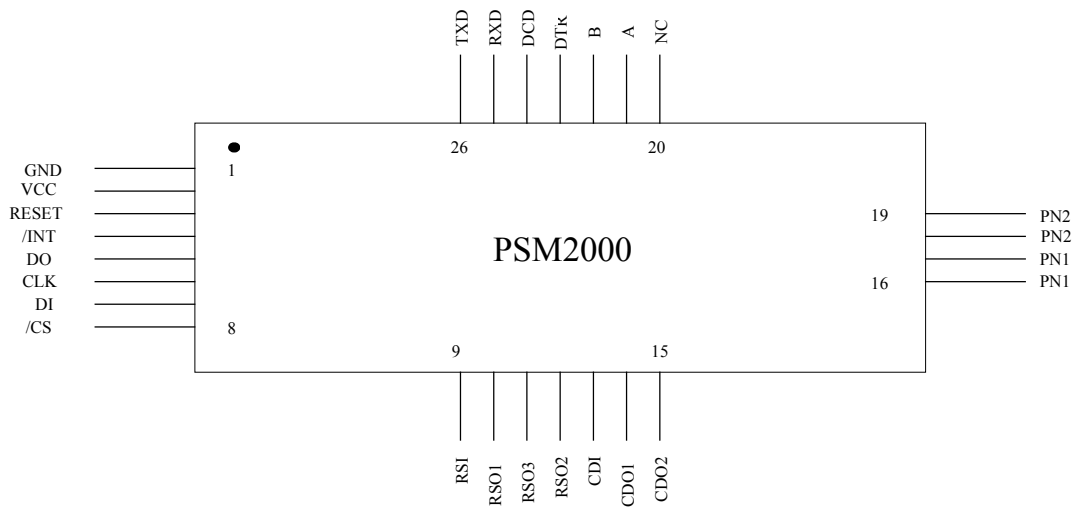PSM2000ACD is a complete communication function module. Its pin configuration is shown in Figure 2.

Figure 2   PSM2000ACD Pin Configuration

5.2   Pin Descriptions

The pin descriptions for PSM2000ACD are shown in Table 1.

Table 1   Pin Descriptions

Name	Pin	I/O/P note 1	Description
GND	1	P	Supply ground
VCC	2	P	Positive supply
RESET	3	I	Active high reset input. To reset the module reliably, the high level of the pin must be held over 50μ s at least.
/INT	4	O	PS2000ACD data exchange request signal output
DO	5	O	PS2000ACD SPI serial data output
CLK	6	I	PS2000ACD SPI serial clock input
DI	7	I	PS2000ACD SPI serial data input
/CS	8	I	PS2000ACD chip select input, it is active low
RSI	9	I	PS2000ACD serial data receiving pin note 2
RSO1	10	O	Serial data output of RS-232 receiver note 2
RSO3	11	O	Serial data output of embedded Modem note 2
RSO2	12	O	Serial data output of RS-485 receiver note 2
CDI	13	I	DCD receiving pin of PS2000ACDnote 2
CDO1	14	O	DCD output of RS-232 receiver note 2
CDO2	15	O	DCD output of embedded Modem note 2
PN1	16	I/O	Telephone line pin 1
PN1	17	I/O	Telephone line pin 1
PN2	18	I/O	Telephone line pin 2
PN2	19	I/O	Telephone line pin 2
NC	20		Reserved, unused
A	21	I/O	Terminal A of RS-485 interface circuit
B	22	I/O	Terminal B of RS-485 interface circuit
DTR	23	O	Data terminal ready output RS-232 level
DCD	24	I	Data carrier detect input RS-232 level
RXD	25	I	Receive data pin RS-232 level
TXD	26	O	Transmit data pin RS-232 level

NOTE 1:   O=OUTPUT,   I/O=INPUT/OUTPUT,   I=INPUT,   P =POWER SUPPLY.

NOTE 2:   RSO1 PIN MUST BE CONNECTED TO RSI PIN DIRECTLY WHEN RS-232 COMMUNICATION MODE IS USED.

RSO2 pin must be connected to RSI pin directly when RS-485 communication mode

is used.

When standard Modem communication mode is used, RSO1 pin must be connected to RSI pin, and CDO1 pin must be connected to CDI pin directly.

When embedded Modem communication mode is used, RSO3 pin must be connected to RSI pin, and CDO2 pin must be connected to CDI pin directly.

6 Recommended Operating Conditions

The recommended operating conditions of PSM2000ACD are shown in Table 2.

Table 2   Recommended Operating Conditions

		MIN	NOM	MAX	UNIT
Operating ambient temperature		0		+70	C°
Supply voltage		4.75	5	5.25	V
High level operating voltage, (/INT, DO, DI, CLK, /CS, RSI, RSO1, RSO3, RSO2, CDI, CDO1, CDO2)		2			V
Low level operating voltage, (INT, DO, DI, CLK, CS, RSI, RSO1, RSO3, RSO2, CDI, CDO1, CDO2)			0.8		V
RS-232 receiver's input voltage, (RXD, DCD)			±30		V
RS-485 high level output current	Driver		-60		mA
	Receiver		-8		mA
RS-485 low level output current	Driver		60		mA
	Receiver		4		mA

7   Application Notes

7.1   PSM2000ACD and User MCU Interface Method

As shown in Figure 3, the PSM2000ACD uses a standard SPI to connect to the user MCU, and the communication protocol conforms to the MCUnet^{TM} protocol.   If the user's MCU doesn't have an SPI interface available, a common I/O port can be used to make up an SPI port.   For detailed information on the interface methods between the PSM2000ACD and the user MCU, please refer to the PSM20XX Family WebChip^{TM} Module User's Guide, the application note on Interfacing the PSM20XX Family to 8051 Type Microcontrollers, and the MCUnet^{TM} Protocol.
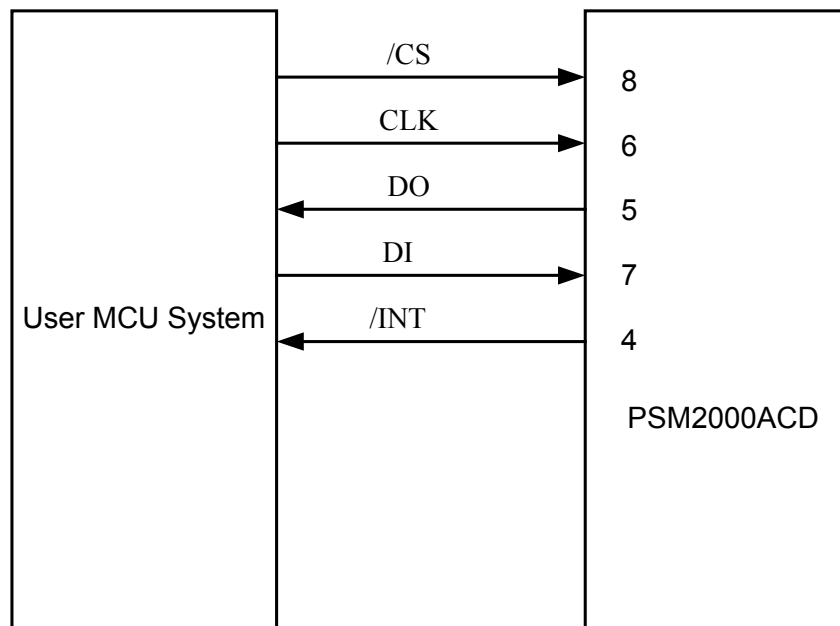

Figure 3   PSM2000ACD Connects to the MCU Through a Standard SPI Interface

7.2   PSM2000ACD and User MCU Interface Timing

The communication process between the PSM2000ACD and the MCU includes two steps:

1. PSM2000ACD sends data to the MCU

2. PSM2000ACD receives data from the MCU
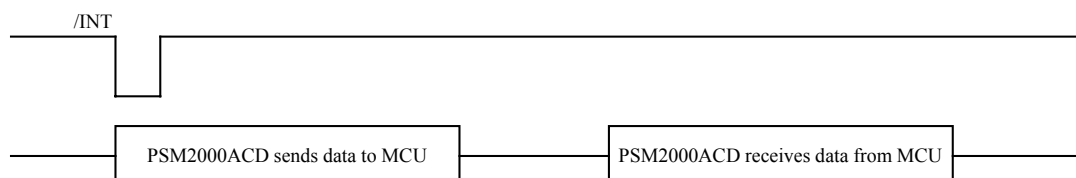
The process flow is shown in the Figure 4.

Figure 4   One Communication Process between PSM2000ACD and MCU

The communication timing between the PSM2000ACD and the MCU conforms to the following rules:

1. First, the PSM2000ACD sends an /INT signal to request a data exchange with the MCU.   The following communication transaction will be controlled by the MCU; that is, the MCU sends the chip select signal /CS and the clock signal CLK.

2. Data will be transferred in byte form. The MSB is transferred first until the LSB is received.

3. Data is sampled on the falling edge of CLK and shifted on the rising edge.

4. When the PSM2000ACD doesn't exchange data with the MCU, the MCU must set /CS and CLK high.

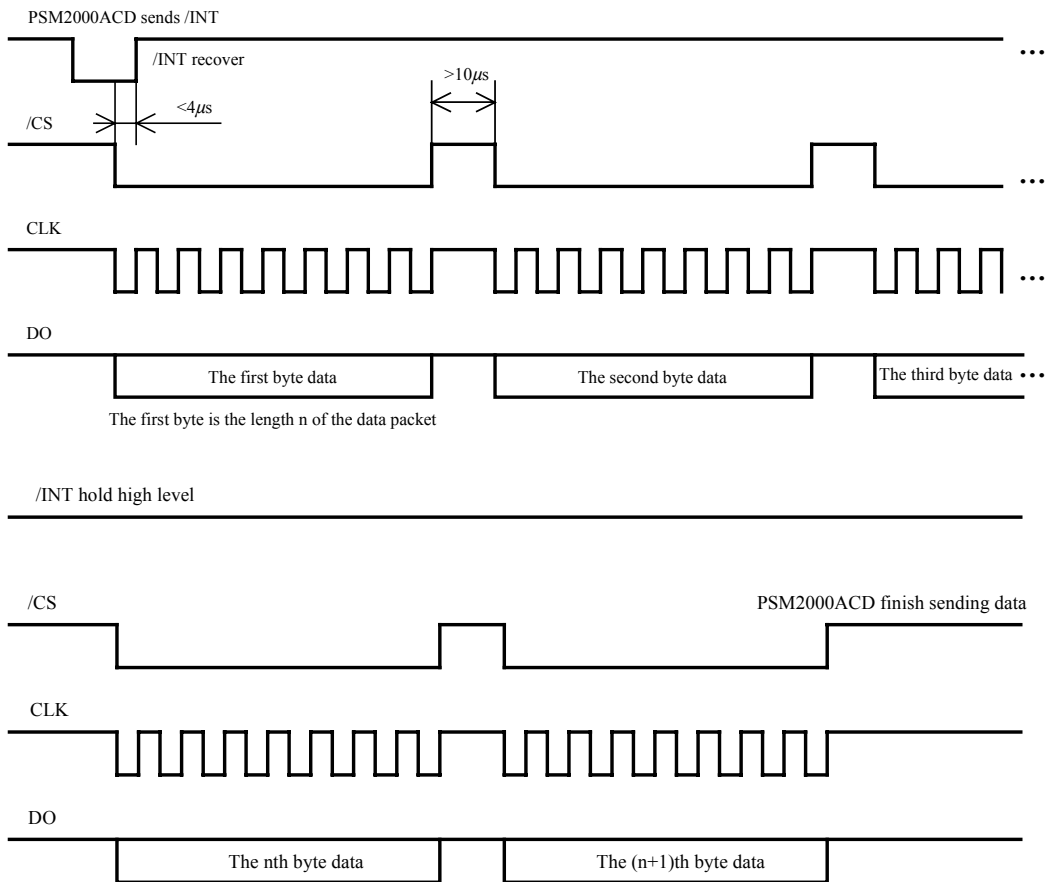The timing of the PSM2000ACD sending data to the MCU is shown in figure 5.

Figure 5   Timing of PSM2000ACD Sending Data to MCU

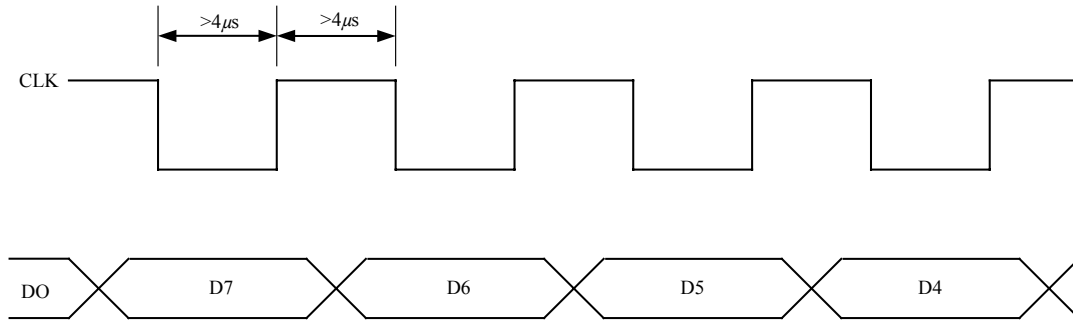The enlarged CLK and DO timing is shown in Figure 6.

Figure 6   Enlarged CLK and DO Timing

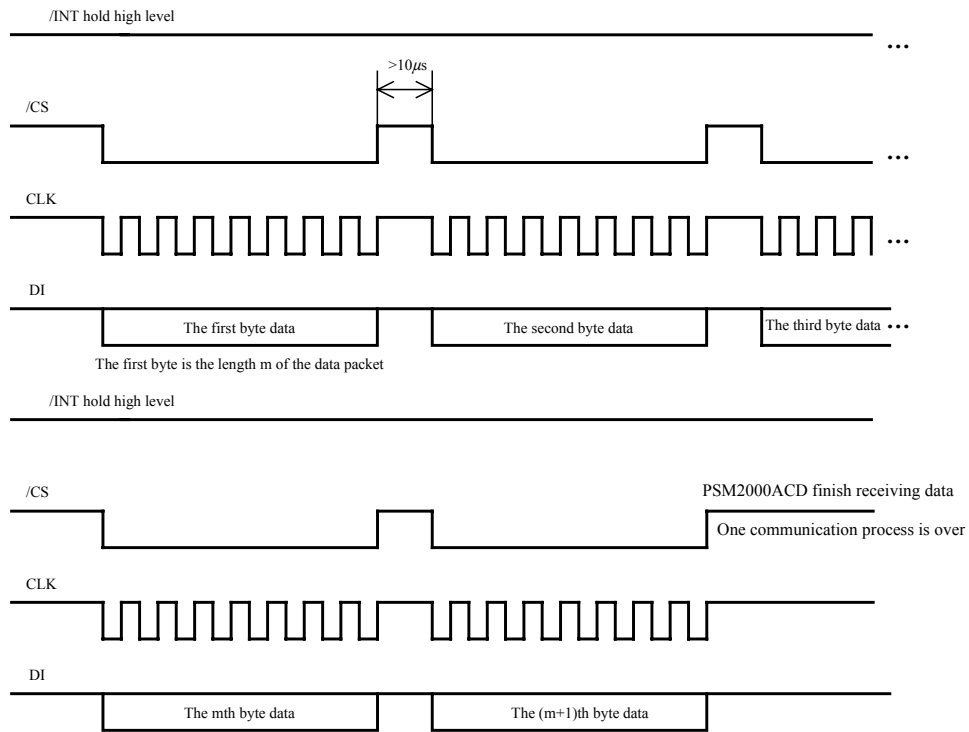The timing of PSM2000ACD receiving data from MCU is shown in Figure 7.

Figure 7   Timing of PSM2000ACD Receiving Data from MCU
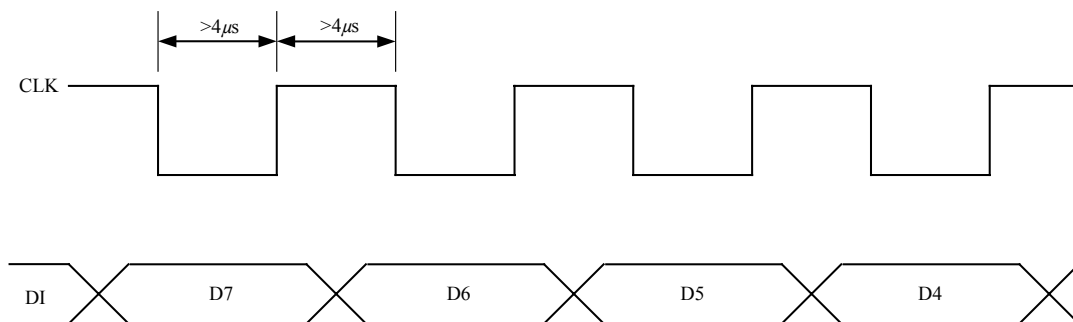
The enlarged CLK and DI timing is shown in Figure 8.

Figure 8   Enlarged CLK and DI Timing

7.3   PSM2000ACD and Server Gateway Interface Method and Configuration

PSM2000ACD conforms to the MCUap^{TM} Protocol to interface with the server gateway.   PSM2000ACD is able to interface with the gateway through any of the following four modes.   The following describes the configuration and connection of these modes.

7.3.1   RS-232 Mode

As shown in Figure 9, the PSM2000ACD connects to the server gateway through the RS-232 connection mode.   It should be noted that the RSO1 pin of the PSM2000ACD must be connected to the RSI pin directly.   RXD and TXD are the receiving pin and transmitting pin respectively.   Other unused pins must be left open.
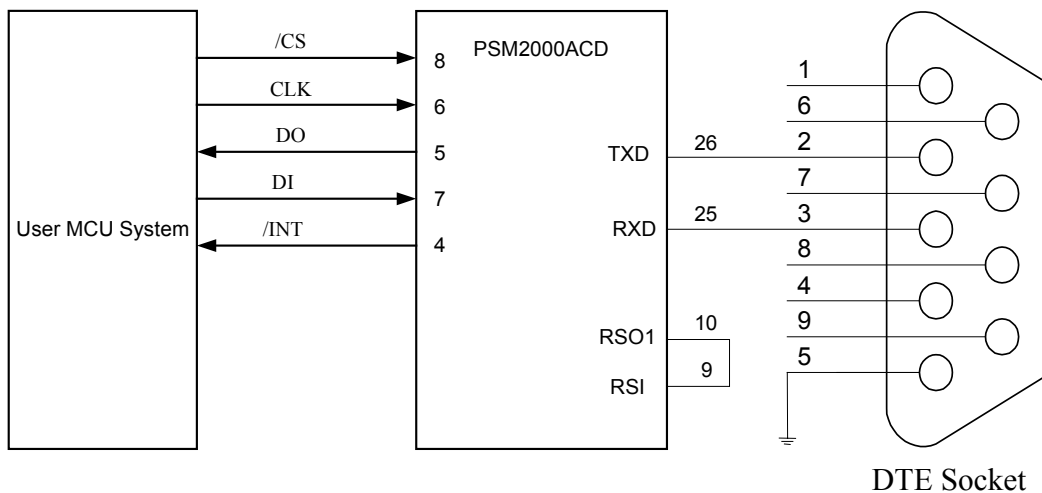

Figure 9   RS-232 Connection Mode

In the figure, DTE is the abbreviation for data terminal equipment.

7.3.2   RS-485 Mode

As shown in Figure 10, PSM2000ACD connects to the server gateway through the RS-485 mode.   It should be noted that the RSO2 pin of the PSM2000ACD must be connected to the RSI pin directly, and other unused pins must be left open.
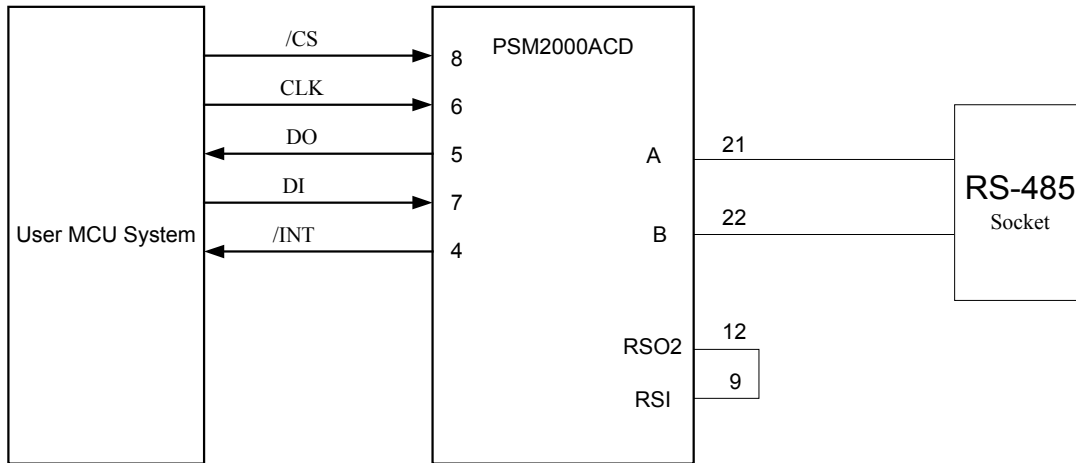
Figure 10   RS-485 Connection Mode

7.3.3   Embedded Modem Mode

As shown in Figure 11, the PSM2000ACD connects to the server gateway through the embedded Modem connection mode.   It should be noted that the RSI pin and the CDI pin of the PSM2000ACD must be connected to the RSO3 pin and the CDO2 pin respectively, and other unused pins must be left open.
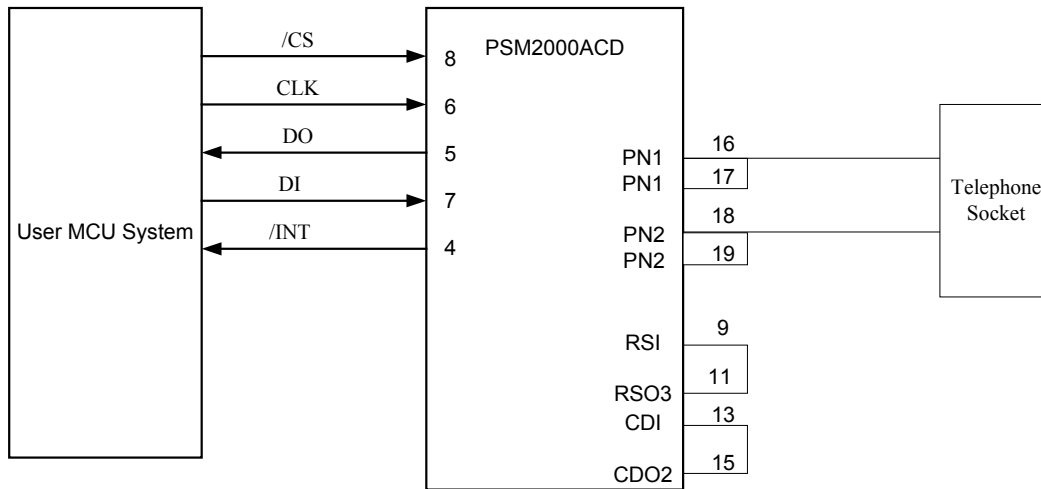

Figure 11   Embedded Modem Connection Mode

7.3.4   Standard Modem Mode

As shown in Figure 12, PSM2000ACD connects to the server gateway through the standard Modem connection mode.   It should be noted that the RSI pin and the CDI pin of the PSM2000ACD must be connected to RSO1 pin and CDO1 pin respectively, and other unused pins must be left open. Pin 7 and 8 of the DCE socket must be connected directly.
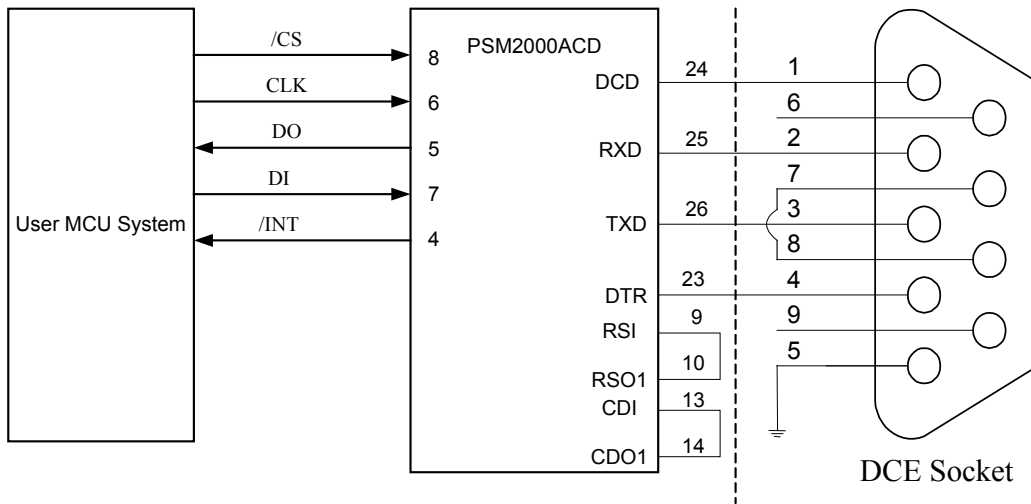
Figure 12   Standard Modem Connection Mode

In the figure above, DCE is the abbreviation for data communication equipment.

7.4   ID Number in WebChip^{TM} Products

Both the WebChip^{TM} and the WebChip^{TM} module PSM20XXACD have an ID number that consists of 8 bytes. In addition to a parity code of one byte, the remaining 7 bytes have up to 7.2×10^{16} of coding capacity, which ensure that every WebChip^{TM} product has a unique ID number. Therefore, users will also have a unique ID number when designing their own networking products with WebChip^{TM} products. With the help of the ID number, users can communicate with the unique device anywhere in the world through the server gateway.

The ID number is usually printed on the bottom or side of the PSM200xACD.

8 Troubleshooting

| Number	Troubles	Troubleshooting
1	After connecting to the supply, the status indicator of PSM2000ACD doesn't turn on	1. Check if the hardware connection is correct 2. Check if PSM2000ACD is initialized by user's program correctly
2	After connecting to the supply, the status indicator of PSM2000ACD turns on, but the PSM2000ACD doesn't work in RS-232 mode normally	1. Check if the TXD of PSM2000ACD is connected to pin 2 of DTE, the RXD of PSM2000ACD is connected to pin 3 of DTE, and pin 5 of DTE is connected to GND 2. Check if the baud rate of the PSM2000ACD is the same as that of serial port of the PC 3. Check if the serial port of the PC is connected correctly 4. Check if pin 9 of the PSM2000ACD is connected to pin 10 of PSM2000ACD directly 5. Check if the access device ID configured by the gateway software is the same as the one that was printed on the label on the board
3	After connecting to the supply, the status indicator of PSM2000ACD turns on, but the PSM2000ACD doesn't work in RS-485 mode normally	1 Check if the serial port of the PC in which gateway software is programmed has a RS-232 to RS-485 connector 2 Check if ID of the device accessed by the gateway is the same as that of the board 3 Check if the PSM2000ACD is initialized by user's program correctly 4 Check if terminal A and B of RS-485 is connected correctly 5 Check if pin 9 of the PSM2000ACD is connected to pin 12 of the PSM2000ACD directly 6 Check if the baud rate of the PSM2000ACD is the same as that of serial port of the PC
4	After connecting to the supply, the status indicator of PSM2000ACD turns on, but the PSM2000ACD doesn't work in Modem normal mode	1. In embedded Modem mode: Check if pin 9 of the PSM2000ACD is connected to pin 11 of the PSM2000ACD directly, pin 13 should be connected to pin 15 directly 2. In standard Modem mode: Check if pin 9 of the PSM2000ACD is connected to pin 10 of the PSM2000ACD directly, pin 13 should be connected to pin 14 directly 3. Check if there is dial tone on the telephone line 4. Check if user's program has a valid telephone number

9 Dimensions

Please see Figure 13.
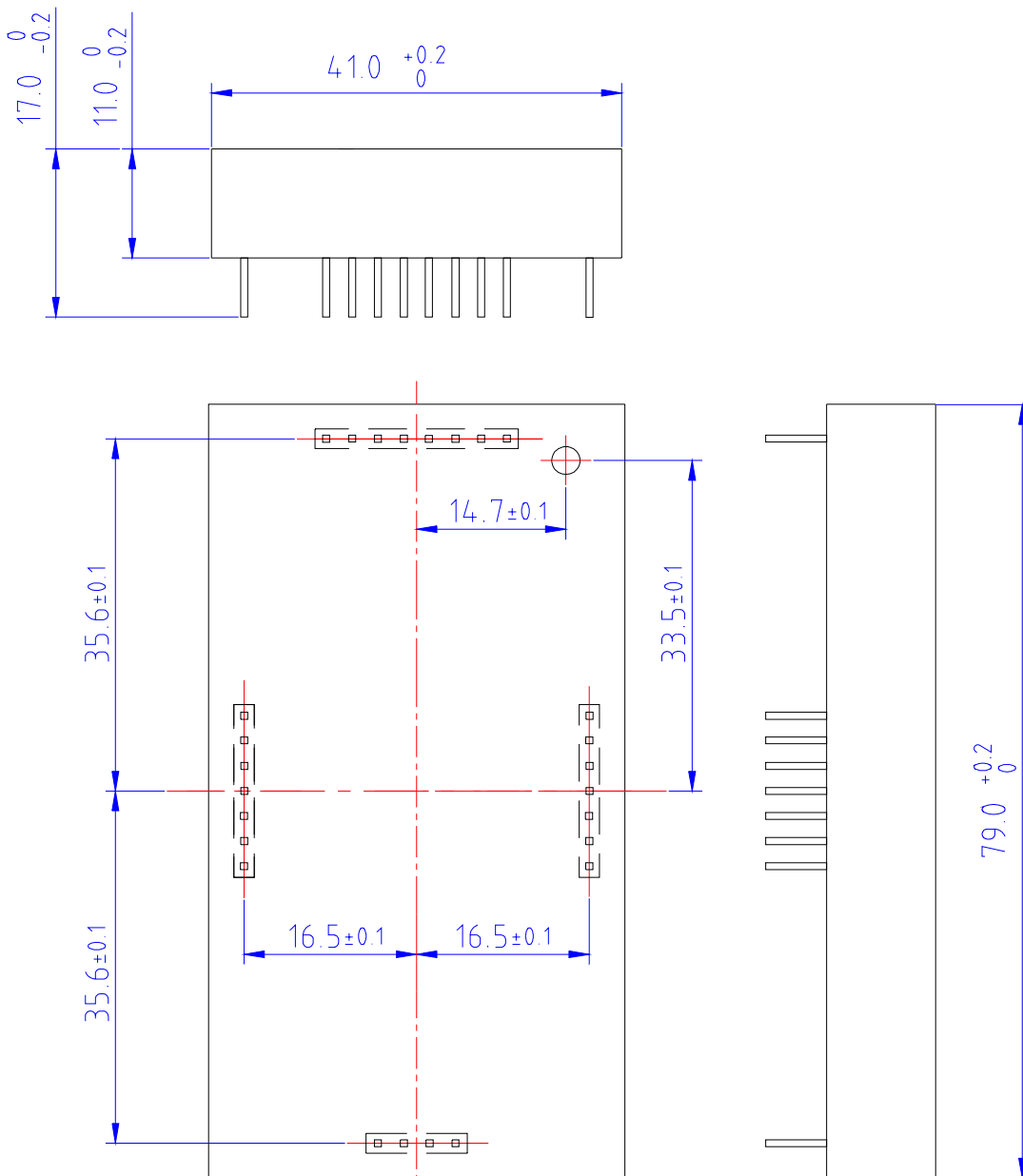
Figure 13   Dimensions of PSM2000ACD (unit: mm)