

# **ZLSN2003S/ZLSN2 043S**

## **Ultra-small Networking Module**

**Embedded Device Networking Solution**

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## Version Information

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# 1. Summary

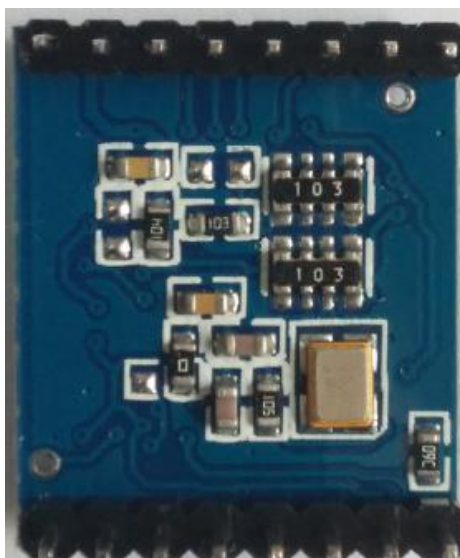
The ZLSN2003S is an embedded module that connects Ethernet (TCP/IP) via a serial port (TTL level UART). It can do transparent conversion between serial port data and TCP/UDP data. It uses the newest generation of ZLAN1003 single-chip solution of Shanghai ZLAN, makes the product with “ultra-small” volume (16.3 × 19.1mm), and have a high degree of integration, with multiple functions: 100 TCP connections, DNS, DHCP, Web page custom download, and so on. It is the important epoch-making products of the serial to Ethernet network products to the miniaturization, integration of the demand.

ZLSN2003S internally operates ZLAN protocol stack with independent intellectual property rights, to ensure the stability of the operation of the product. In the hardware, it's with industrial grade operating temperature range of minus 40 degrees to 85 degrees.

ZLSN2003S internally has the remote network program installation function of ZLAN1003 chip, it can install a variety of customized applications on the firmware, to facilitate the realization of personalized design.



Figure 1 ZLAN2003S Front View

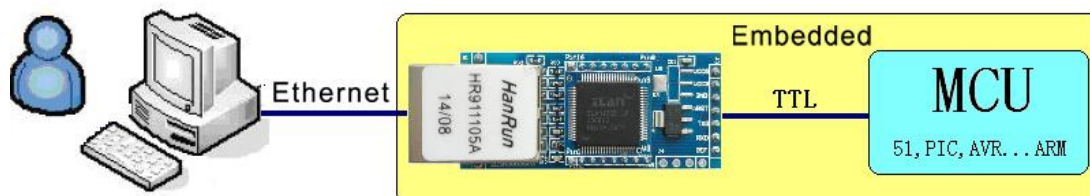


**Figure 2 ZLAN2003S Back View**

The high integration, convenient, cost-effective, stability of ZLSN2003S can allow the electronic systems easily realize network access.

ZLSN2003S uses double row pin structure. As long as connecting power, GND, serial transceiver, Ethernet port 4 lines, it can be used. Which Ethernet port 4 lines need to go through the network transformer or RJ45 with network transformer connecting to the external network cable.

Easy to integrate into the user acquisition, control system. So that the user's acquisition function system has the functions of network acquisition, network control. The specific approach is to connect ZLSN2003S TTL level serial port with the user's control panel MCU TTL serial port, to achieve data transmission network. As shown in Figure 3. Users can also purchase products with RJ45, model is ZLSN3003S.



**Figure 3 ZLAN2003S Using Diagram**

It can also be the original RS232 / 485/422 device accessing to the network, ZLAN ZLVircom can use virtual serial port technology, and then converting the network data to the virtual serial port, make the user's original serial software can also receive network data.

ZLSN2003S can be used for intelligent home, IoT data acquisition and control, access control security systems, industrial control acquisition system, energy monitoring, factory automation, intelligent transportation and other fields.

## 2. Interface Definition

The ZLSN2003S use dual-pin structure. The front pin as below figure 4:

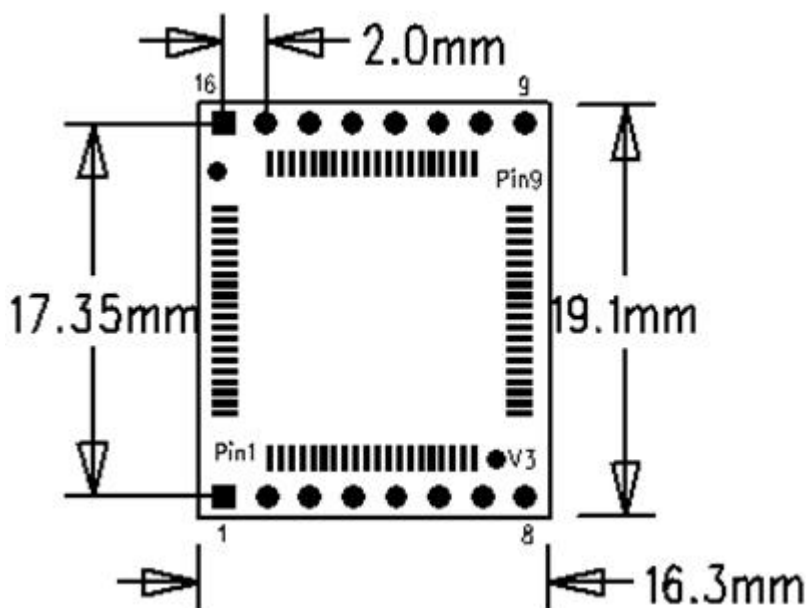


Figure 4 ZLSN2003S Front Pin

Pin definition as below:

Table 1 ZLSN2003S Pin Definition

| Pin | Name          | Function   |
|-----|---------------|--|
| 1   | GND           | Grounding  |
| 2   | VCC33         | 3.3V Power Input   |
| 3   | nRST          | Low level reset, when not in use can hang. Suggest to connect positive of diodes (1N4007), the other end of diodes control reset via IO.   |
| 4   | TXD           | TTL level output, can directly connect RXD of user MCU with 5V or 3.3V (TTL level is 3.3V)   |
| 5   | RXD           | TTL level input, can directly connect TXD of user MCU with 5V or 3.3V  |
| 6   | CTS           | TTL lever, serial port flow control pin, as RTS instruction.   |
| 7   | RTS/100M_LINK | TTL Level, serial port flow control pin.<br>(1) When Flow control is None and XON/XOFF the two pin has no use, usually RTS=0.<br>(2) Flow control set as CTS/RTS, DTR/DSR, usually RTS=0, when |

|    |         |  |
|----|---------|--|
|    |         | <p>RTS=1 means the module cannot receive data, the user MCU should stop to send data. The reasons of module cannot receive data: module in initialization, TCP connection hasn't been built, the receiving buffer of module serial port is full. The user MCU can only be set as 0, the module can output data from serial port.</p> <p>(3) RTS can be indicator of module initialization. When flow control is NONE and XON/XOFF, RTS=1 means the module is in initialization, RTS=0 means initialization finish. So can use RTS=1 to check the module whether doing reset operation including the reset after modifying parameter through ZLVircom.</p> <p>(4) 100M_LINK. When the flow control set as NONE and XON/XOFF, the cable must connect to the pin so it's low level, the pin can be used as 100M_LINK pin. Can connect to LED negative pole via 1K resistance.</p> |
| 8  | 485_TEN | 485 sending control end, usually 0, when module sending data to serial port is 1. Can directly connect TXD_EN pin of MAX485 chip.  |
| 9  | DEF     | When be 0 and time keep over 1s, the module will restart with default IP in static mode, Gateway 255.255.255.0, 192.168.1.1. This is avail for user forgot IP. Pull-up to VCC by 1K resist means high, connect to GND means low.   |
| 10 | NET_RX+ | Ethernet receiving, need connect external cable through network transformer. The following 4 pin support auto-cross, without considering it's receiving or sending pin.  |
| 11 | NET_RX- | Ethernet receiving   |
| 12 | NET_TX+ | Ethernet sending   |
| 13 | NET_TX- | Ethernet sending   |
| 14 | LINK    | When 0, means module has built TCP connection with network server or in UDP Mode, and the cable connection normally, thus the module can send and receive data. If cut cable, the LINK will be 1. The control of Ethernet port LINK led is from this pin.  |
| 15 | ACT     | ACT: when 0, means the serial port of module has the data send-receiving. But the pin will be in change between 0 and 1 when there has data, ACT=1, cannot be sign of non-data communication. Can connect to LED negative pole via 1K resistance.  |
| 16 | VCC18   | 1.8V Power Input   |

## 3. Feature

### 1.1 General software functions

In function, the ZLSN2003S is not just a simple serial-to-TCP/IP module, but also provides powerful support and companion features, including:

- 1) In the data stability ZLSN2003S can support two-way transmission of large amounts

data in 115200bps baud rate, will not lose a byte. Can work the all year, all day.  
Supports industrial temperature range.

- 2) Support online upgrade firmware program to install specific features via network, users can get software upgrade tools and upgrade firmware from ZLAN company, and then can upgrade to the highest version.
- 3) Using the configured ZLVircom tool can search, manage ZLSN2003S module on the LAN (support cross-network search) and on the Internet. All parameters of the module can be one-touch configured. Device configuration, management is very convenient. It can use the serial port of ZLSN2003S to configure all its parameters, the command format similar to the AT command, and can directly control, read its running status.
- 4) Support DHCP function, you can dynamically get IP assigned by the DHCP server in the LAN.
- 5) Support DNS, automatically resolve the destination domain name as IP, the destination IP can be the dynamic domain name.
- 6) As TCP Server, support the unique powerful connectivity of 100 connections.
- 7) As a TCP client, support the connection with eight target servers. As a TCP client, you can automatically reconnect after a wire break. Support implied heartbeat technology to ensure the resumption after the network disconnection.
- 8) Support UDP, UDP multicast and other functions.
- 9) Data bits support 5 to 9 bits, parity bit can be five ways: None, Odd, Even, Mark, Space. Support CTS / RTS, DSR / DTR, XON / XOFF flow control, 1 ~ 2 stop bit.
- 10) Provide Host development examples, the program include: VC, VB, Delphi, C ++ Builder, Java, C# routines. Can also provide a DLL library, and the library calling method source code, the code can be downloaded from the ZLAN website.

## **1.2 Advanced Software Features**

ZLSN2043S 4 indicates that advanced soft functions are supported:

- 1) Supports Modbus gateway and transfer from Modbus RTU to Modbus TCP. It can support storage Modbus, which can automatically collect device data and store it. Non-storage Modbus gateways are also supported.



2) Multi-host: In q&A mode, multiple computers on the network port can access the same serial port device at the same time.

3) Supports user-defined heartbeat packets and registration packets: facilitates communication with the cloud and device identification

4) Password authentication is required to establish TCP connections, ensuring connection security

5) Supports the transcode function to translate protocols on specific devices and connect different devices to a unified software platform

6) Supports HTTP data submission and delivery. The cloud can directly use HTTP GET commands to interact with serial port data

## 4. Technical Parameter

|  |  |               |                                  |
|--|--|---------------|----------------------------------|
| <b>Figure</b>                              |  |               |                                  |
| Interface:                                 | Dual-Row 2.0mm*8 Pin                               |               |                                  |
| Size:                                      | 19.1x16.3mm  |               |                                  |
| <b>Serial Port Parameter</b>               |  |               |                                  |
| Baud Rate:                                 | 1200~115200bps                                     | Parity Bit    | None, Odd, Even, Mark, Space     |
| Data Bit:                                  | 5~9  | Flow Control: | RTS/CTS, DSR/DTR, XON/XOFF, NONE |
| <b>Communication</b>                       |  |               |                                  |
| Ethernet:                                  | can connect 10/100M auto-adaptive Ethernet         |               |                                  |
| Serial Port:                               | TTL×1: RXD, TXD, GND, interface level 3.3V         |               |                                  |
| <b>Software</b>                            |  |               |                                  |
| Protocol:                                  | ETHERNET, IP, TCP, UDP, HTTP, ARP, ICMP, DHCP, DNS |               |                                  |
| Configuration Method:                      | ZLVirCOM, WEB Brower, Serial Port                  |               |                                  |
| Communication Method:                      | Socket, Virtual Port                               |               |                                  |
| <b>Work Mode</b>                           |  |               |                                  |
| TCP Server, TCP Client, UDP, UDP Multicast |  |               |                                  |
| <b>Power</b>                               |  |               |                                  |

|   |           |
|---|-----------|
| Dual power: 3.3V+1.8V or single 3.3V<br>ZLSN2003SH High-speed: 170mA; ZLSN2003SH Low-speed: 140mA |           |
| <b>Environment</b>  |           |
| Operating Temp:   | -40~85°C  |
| Storage Temp.:  | -60~125°C |
| Humidity:   | 5~95%RH   |

## 5. Usage

### 5.1 Sub-Models

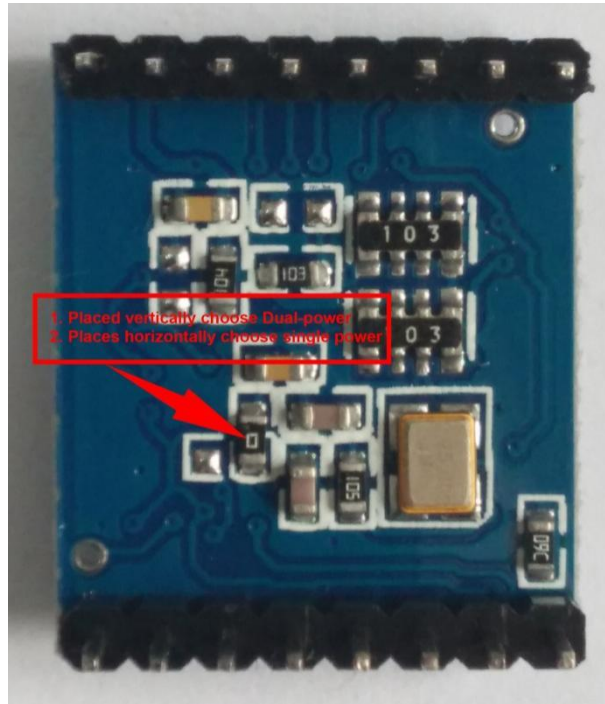
ZLSN2003S provide 4 optional models:

**Table 2 ZLSN2003 Sub-models**

| Sub-model      | Instruction                       | Work Temp.(°C) | Highest Baud Rate | Current(mA) |
|----------------|-----------------------------------|----------------|-------------------|-------------|
| ZLSN2003SH     | 3.3V, 1.8V dual power, high speed | 52             | 115200            | 170         |
| ZLSN2003SH-3.3 | 3.3V single power, high speed     | 69             | 115200            | 170         |
| ZLSN2003SL     | 3.3V, 1.8V dual power, low speed  | 45             | 38400             | 140         |
| ZLSN2003SL-3.3 | 3.3V single power, low speed      |                | 38400             | 140         |

The difference of dual power supply and single-supply sub-model is: single power supply only provide power 3.3V in the VCC33 pin, the module internal regulator will produce 1.8V voltage to the internal power supply; dual power supply needs supply VCC3.3V and VCC1.8V in the VCC33 and VCC18 pin. The benefit of dual power supply is to reduce the module operating temperature, as shown in Table 2.

The difference between the single power supply and the dual power supply module on the hardware is:



**Figure 5 Dual-power and Single-power difference**

As shown in Table 2, the suffix is H for the high-speed module, L for the low-speed module. The difference between the two is that the high-speed module has a higher temperature, but can support a higher baud rate. For the ordinary 9600 serial baud rate, you can choose the model ZLSN2003SL. The default is ZLSN2003SH products, user can choose ZLSN2003SL to their demand.

## 5.2 Module Configuration

ZLSN2003S can be searched and configured through the network tool ZLVircom. Also you can do the configuration after login in the Web by entering the IP address of the module in the browser. Because of the convenient of configuration via network tools, here is the example of ZLVircom configuration. Click "device manage" and you'll see a list of devices.

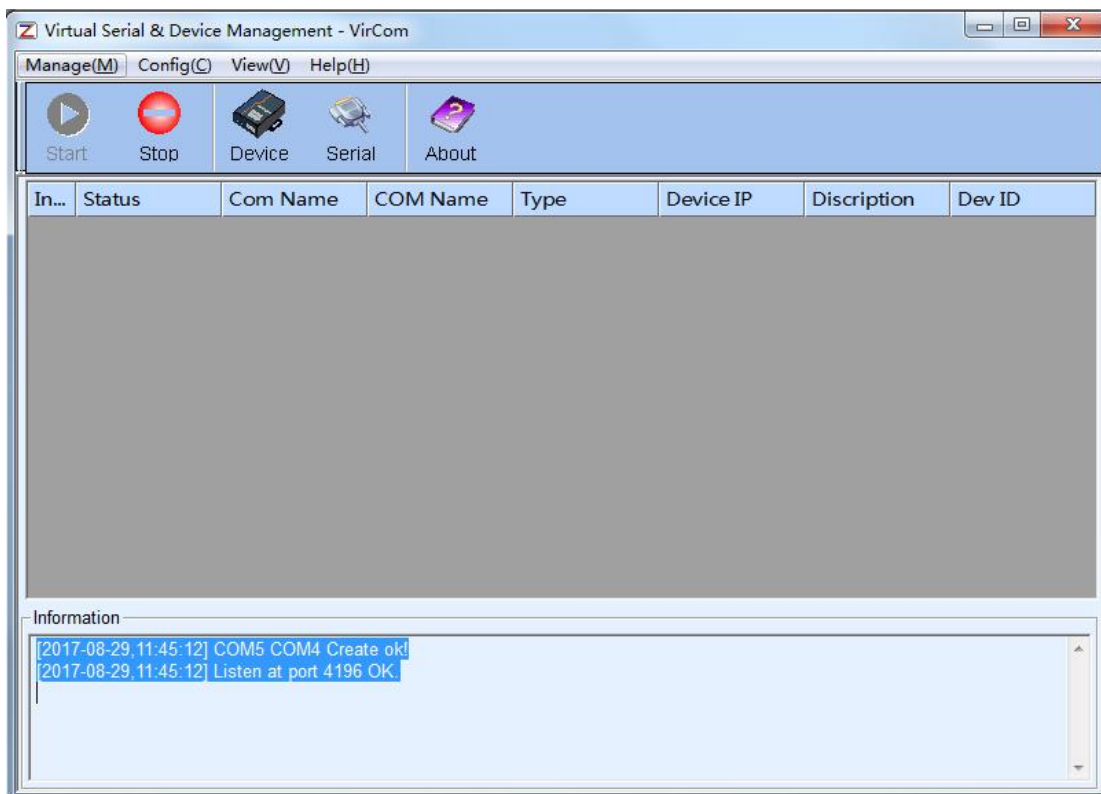


Figure 6 ZLVircom Main Interface

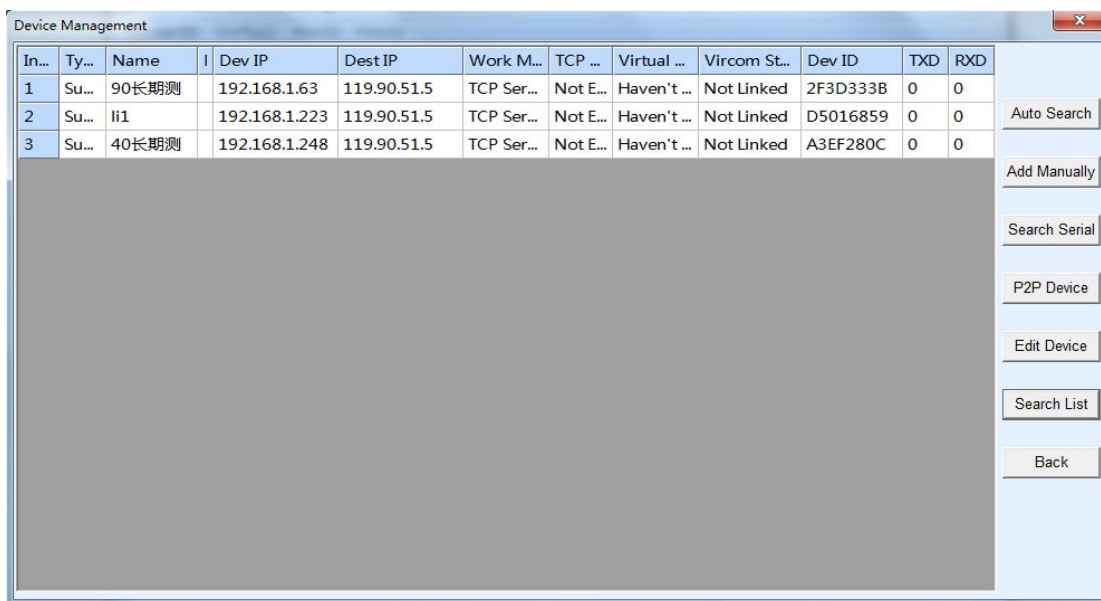
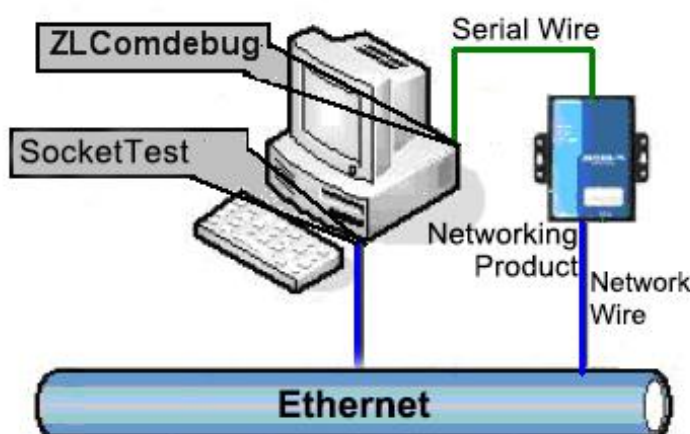


Figure 7 Device List

You can see all the current online devices from the device list. Click "Edit Device" to configure the parameters. The main configuration parameters are device IP, baud rate, etc. For specific details, please refer to the <User Guide of Networking Products>.

## 5.3 Simple TCP Connection Test

Now we need to test the transparent communication function of the networking products. The transparent communication is what data the computer sends to a networking product, the serial port of the networking product outputs what data. Instead, what data is received that the serial port of the networking products will send to the computer on the network.



**Figure 8 Transparent Transmission Diagram**

If the COM port of PC is connected with the serial port of networking product, then open the ZLComDebug serial port debugging assistant, the ZLComDebug can communicate with the serial port of networking product. Open TCP&UDP debugging assistant SocketTest, and as TCP client, connect to the 4196 port under the IP (currently 192.168.1.200) of the networking product, and the TCP link can be established with networking products.

Since then, the data sent by SocketTest can be received by ZLComDebug, and the data sent by ZLComDebug can also be received by SocketTest.

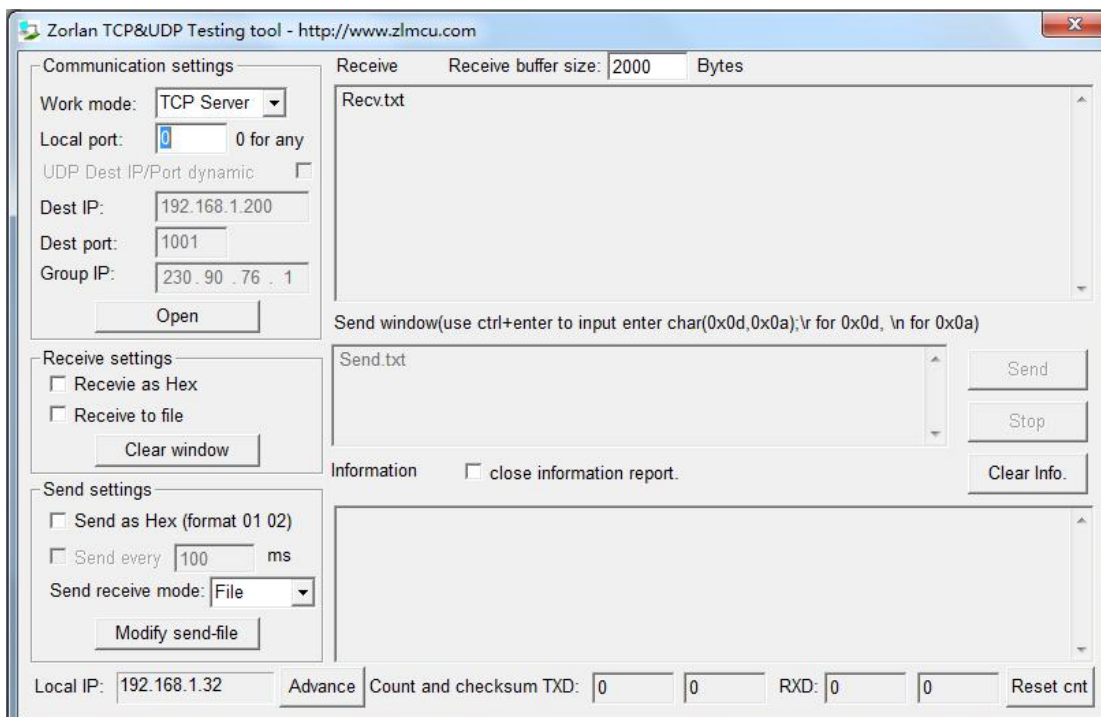


Figure 9 SocketTest Send-receive Interface

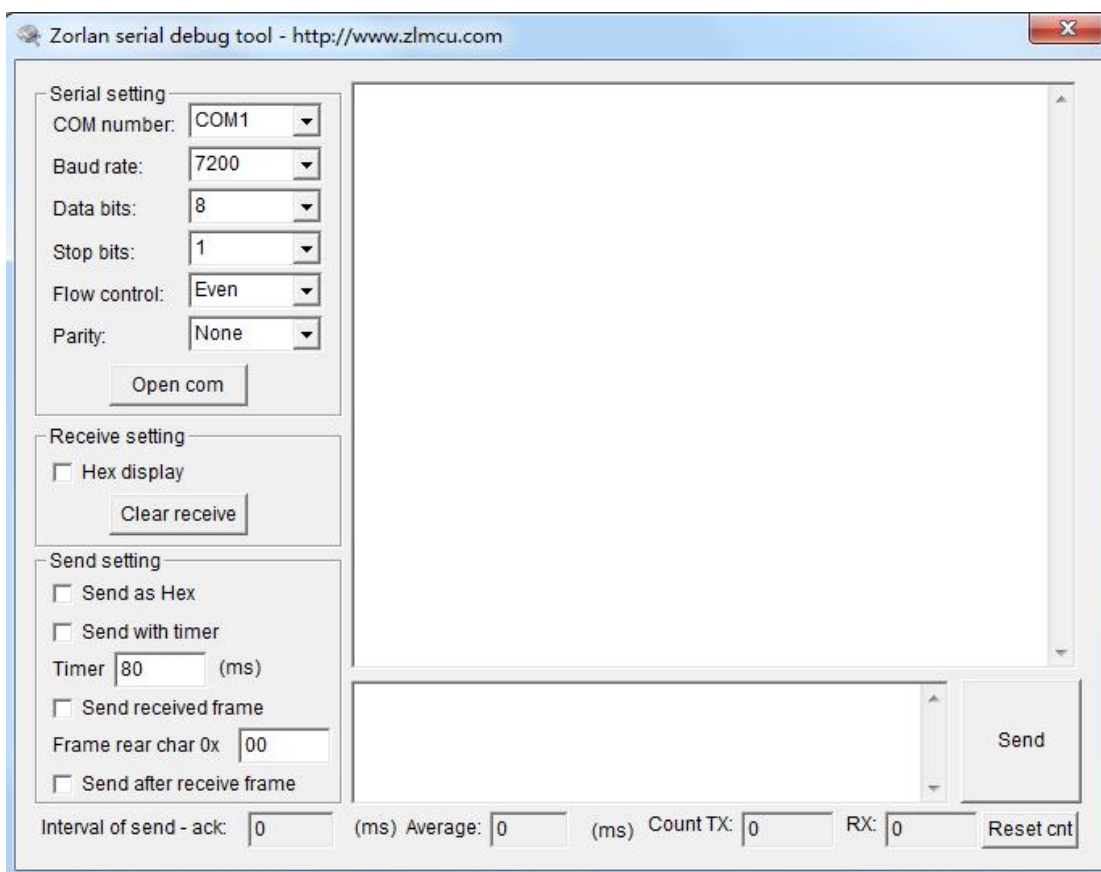


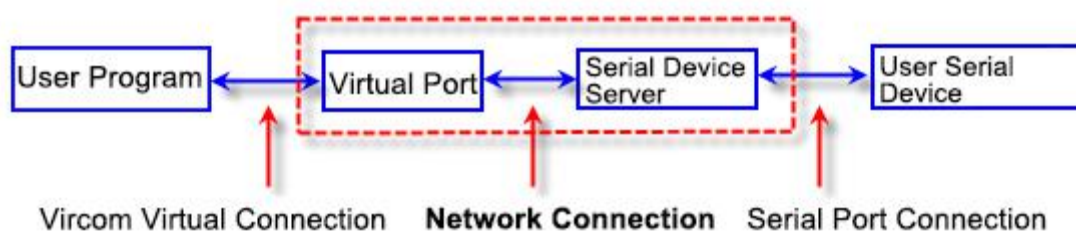
Figure 10 ComDebug Send-receive Interface

From FIG. 9 and FIG. 10, transparent communication between serial port and network port is carried out. If the serial port is connected to a user's serial port

device, it can communicate with device serial port through the network TCP connection for data collection and control.

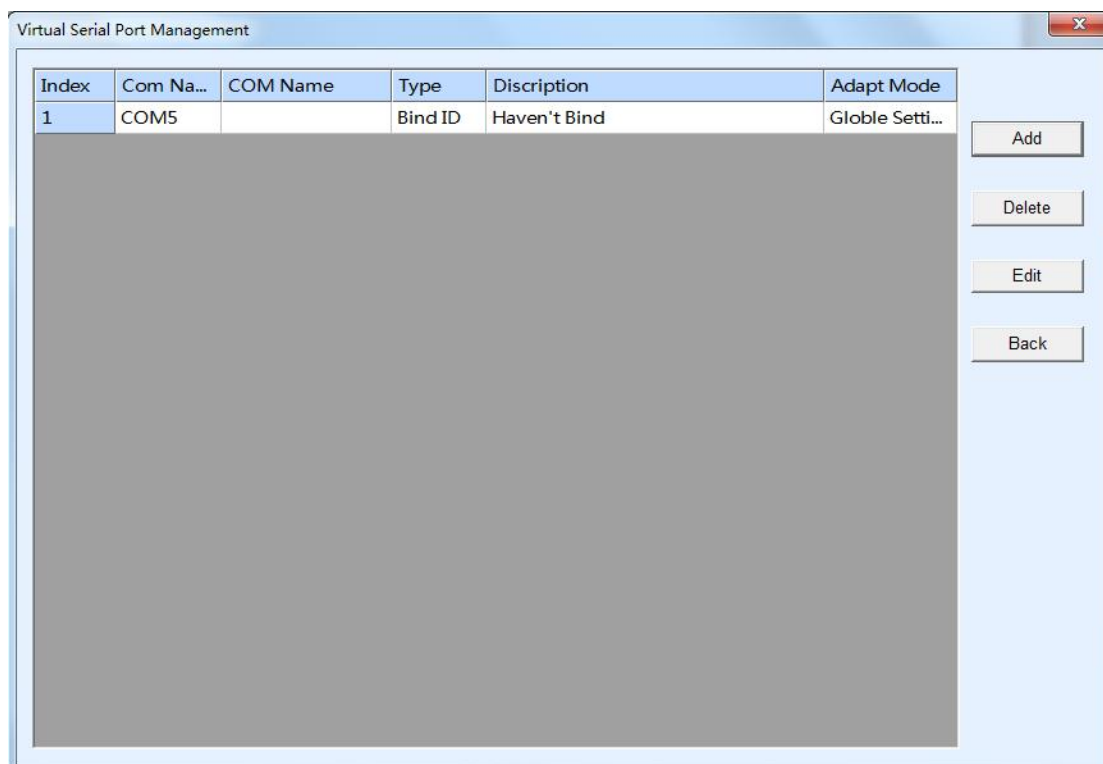
## 5.4 Simple Virtual Serial Port Test

In FIG. 8 SocketTest is through TCP&UDP to communicate with device, in order to let the user's developed serial port software can be used but no need to be modified for TCP communications, need to add a converting step of COM port to TCP between the user program and TCP. ZLVircom can do this.



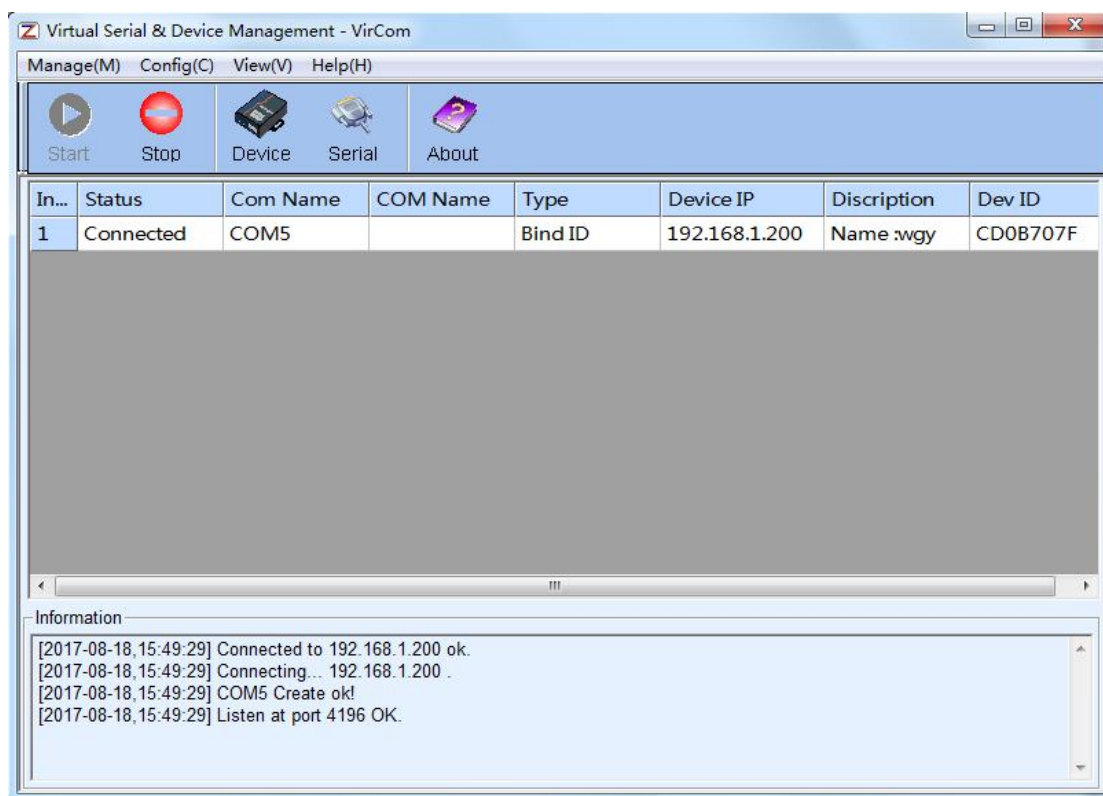
**Figure 11 Virtual Port Usage**

Click on the "Serial Manage" of the main interface of ZLVircom, then click "Add", and select COM5, where COM5 is the COM port that didn't exist on the computer.



### Figure 12 Add Virtual Serial Port

Then enter the "device manage", and double-click the device that you need to bind to the COM5. As shown in FIG. 7, select COM5 from the "virtual serial port" list in the upper left corner. Then click "modify Settings". And return to the main interface of ZLVircom. You can see that the COM5 has been connected to a device with IP 192.168.1.200. You can use COM5 instead of SocketTest to communicate.



**Figure 13 Virtual Serial Port has been connected**

Now close the before SocketTest and open a new ZLComdebug as the user's serial port program, now open COM5. At this point, COM5 (virtual serial port) and COM4 (hardware serial port) can send-receive data through networking products. If the serial port of the connected product is not connected to the COM port of PC, but a serial port device, then the COM5 can be opened to communicate with the device. And it's just use the network way now.



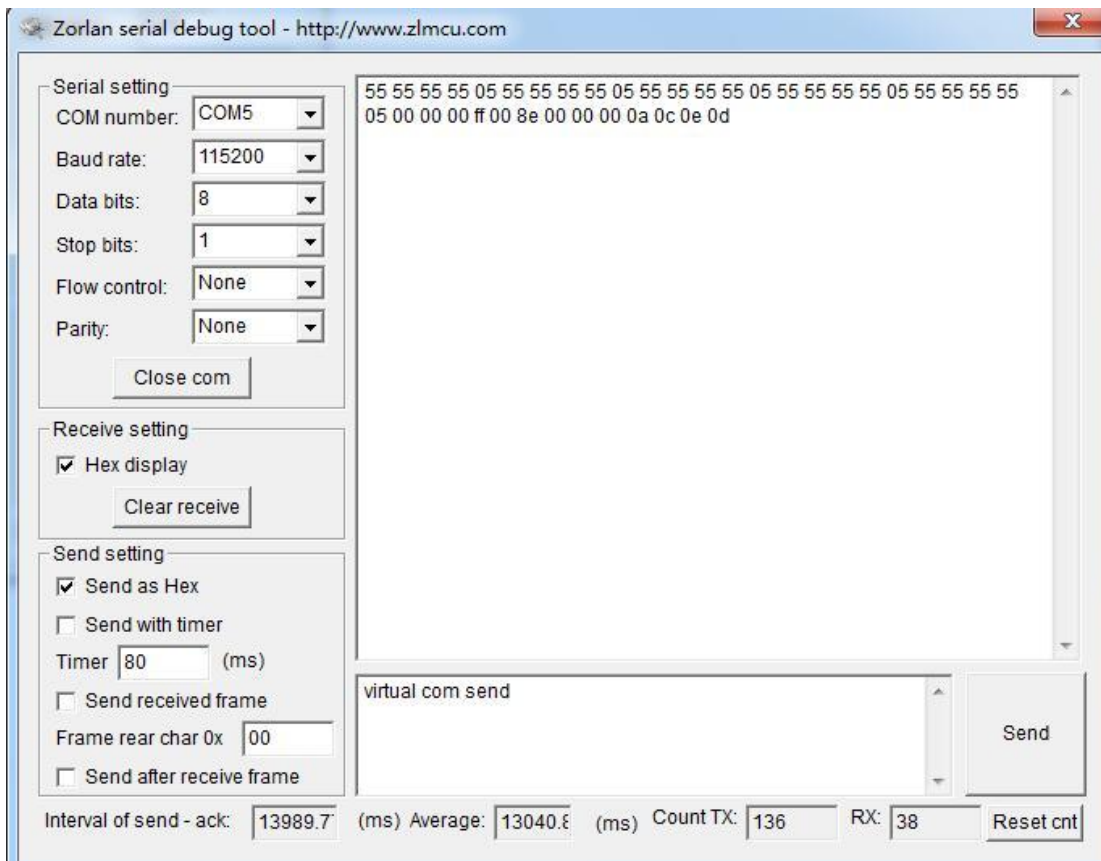


Figure 14 Communication via Virtual Serial Port

## 5.5 Firmware Program Installation

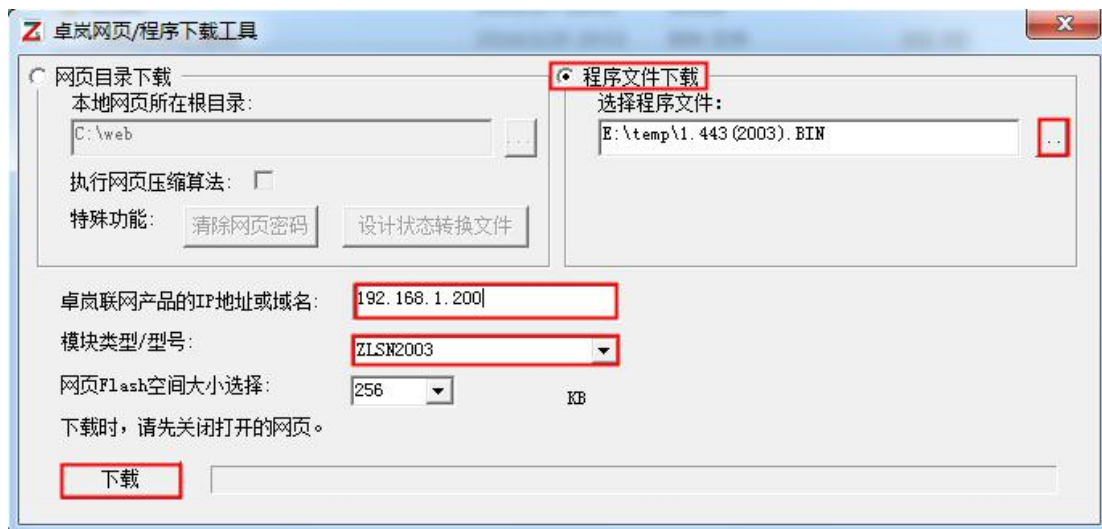
- 1) Get the firmware program file from ZLAN, for example 1.443(2003).BIN.
- 2) Open the "ZLAN web/program download tool" -- ZLFsCreate. As shown in Figure 15, view the software version, if the version is greater than 1.10 so that it supports ZLSN2003 firmware upgrade.



Figure 15 View the ZLFsCreate version

- 3) As shown in Figure 16, select the "Program File Download" option. In the program file, select the Firmware file. Enter the IP address of the ZLSN2003S device, the module type/model select ZLSN2003S. Then click

## Download.

**Figure 16 ZLSN2003 Firmware Upgrade Method**

- 4) At this time, the download progress bar began to move, download time about 20 seconds. In the download process will see the device's ACT light flashes, at the end of the download, will see LINK lights flash a few times. Then the program pops up the "Download success" prompt box. Click OK to complete the download.
- 5) After the completion, generally the program will automatically restart, will see the running light flashes. If there is no automatic restart, please wait 5 seconds or more, re-power.
- 6) Note: If prompted to download failed, it will not damage the device, please start to download. If the download fails many times, please use the computer with the direct cable to download. Also at the download end, the green light flashes, please do not power off, otherwise the device will be damaged. Check the firmware version number with ZLVircom to see if the new firmware has been downloaded successfully.
- 7) After the firmware upgrade, the configuration page within the module also needs to be updated, or can no longer through the Web configuration. Download the Web method is: as shown in Figure 16, modify the "program file" download mode to "Web directory download". And select the root directory of the local web page as the directory of the webpage file for the

need to download (the directory can be obtained from ZLAN), click to download, all the files on the local web directory will be downloaded to the ZLSN2003 device internal file system.

## 6. Hardware Design Guide

The Min hardware connection of ZLSN2003S is 8 pin: RXD, TXD, VCC33, GND, NET\_RX+, NET\_RX-, NET\_TX+, NET\_TX-.

### 6.1 Power Part Recommended Circuit

The default of ZLSN2003S is dual-power supply, as VCC33 and VCC18 respectively supply 3.3V and 1.8V power. Here for example of dual-power supply, if single-power just removing the 1.8V regulator.

If the input power over 5V please use DC-DC to transform circuit in your best to prevent heating and increase power efficiency. Shown as 17(1), can convert 9~24V power supply to 3.3V, the main chip use MC34063 power chip. The power input using 5V power-supply is shown as 17(2).

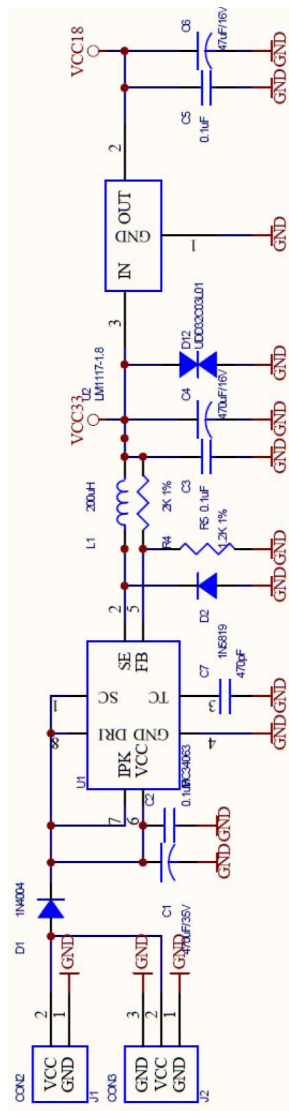


Figure 17(1) DC-DC Power

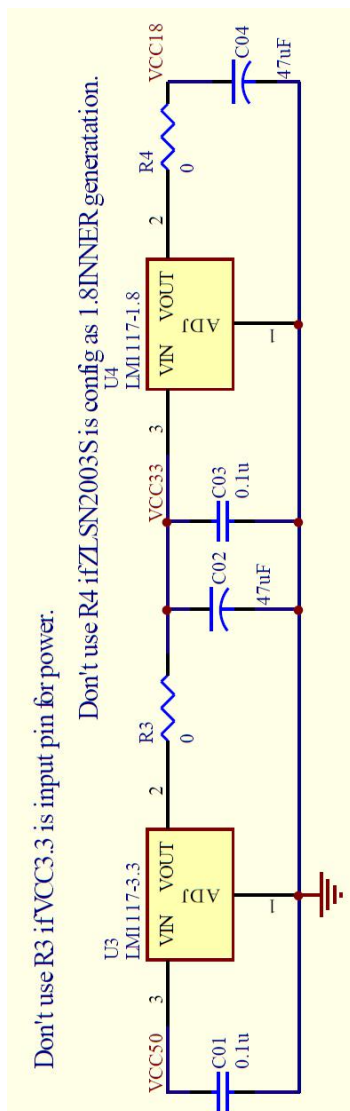


Figure 17(2) Simple Power

## 6.2 Network transformer Recommended Circuit

Suggest to use RJ45 with network transformer as Ethernet Port, it can save PCB space, and the suggestion Ethernet Port is HR911105A, shown as Figure 18. If use Separation-type, the suggestion transformer is PM44\_11BG, shown as Figure 19.

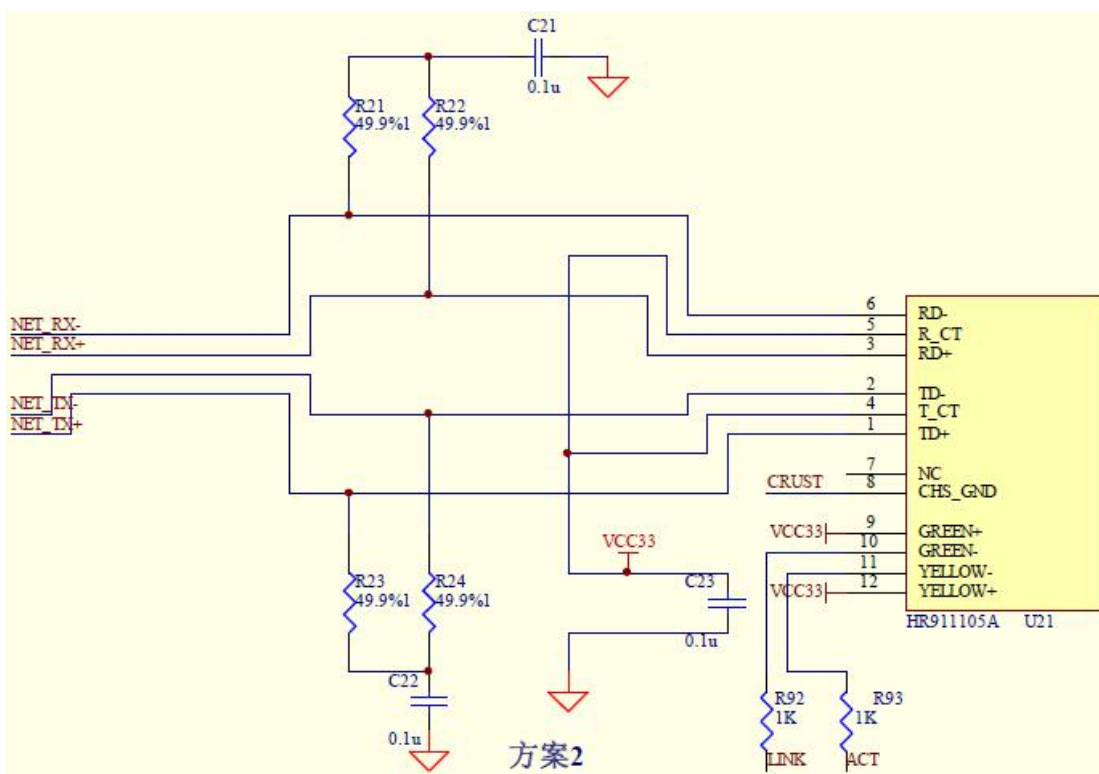


Figure 18 RJ45 with network transformer

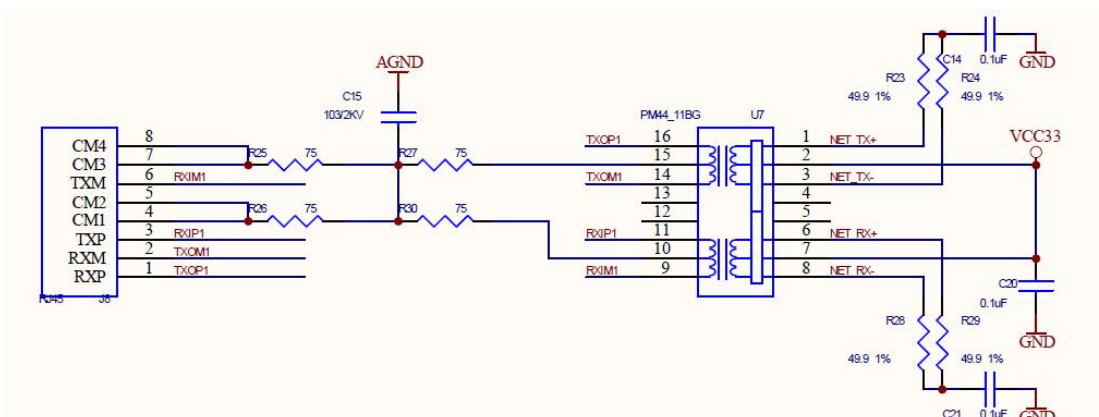


Figure 19 RJ45 and Network Transformer Separation-type

### 6.3 Other circuit

The other suggestion pin: 100M\_LINK, LINK, ACT. The indicator can effectively indicate status of module.

If needs to do reset, connect nRST pin.

### 6.4 Design result

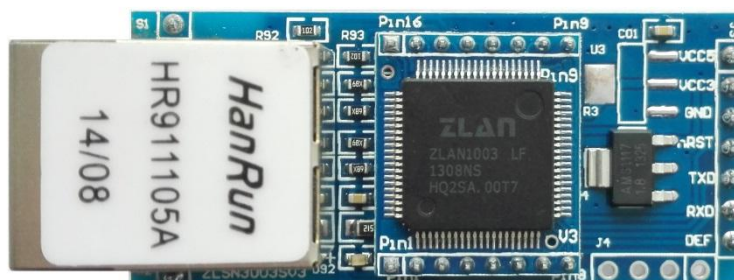


Figure 20 ZLSN3003S Appearance

## 7. Model Choose

| Model      | Instruction   |
|------------|---|
| ZLSN2003S  | Include ZLSN2003SH, ZLSN2003SL, ZLSN2003SH-3.3, ZLSN2003SL-3.3  |
| ZLSN2043S  | Support Modbus TCP to RTU, support the multi-host function as multiple TCP control one serial device at the same time |
| ZLSN2003SW | The function of controlling device through webpage  |

## 8. After-Service

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