

# **ZLAN1003**

# **User Manual**

**Single Chip Serial Port To TCP/IP  
Solution**

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# 1. Summary

## 1.1 Introduction

ZLAN1003 is a powerful single chip for serial port converting to TCP/IP, it internally integrates software function needed by 10/100M fast Ethernet MAC and PHY interface, UART serial port and serial port to TCP/IP. Different from ordinary scheme, ZLAN1003 has 3 advantages: easy to use, stable & reliable, low system cost. ZLAN1003 can be used to maximize the realization of TCP/IP, Internet connectivity products easily.



**Figure 1 ZLAN1003**

The convenience of ZLAN1003 is that it's a real consumed single chip for serial port to TCP/IP without any driver can realize the data transmission from UART to TCP/IP. All the parameters configuration can be done by ZLVircom software through Ethernet port, Users can one-click configure all the interior parameters of ZLAN1003 through ZLVircom software. As a TCP client, ZLAN1003 will automatically establish TCP connection; As the TCP server, automatically accept connection, without any Users MCU intervention. The Users MCU only need to wait ZLAN1003 finishing its initialization then go to send and receive serial port (UART) data.

The stability of ZLAN1003 is that its interior TCP/IP protocol is proved by many years business application practices. The interior includes: TCP, UDP, IPv4, ICMP, ARP, HTTP, etc.

## 1.2 Advantage:

Compared with other similar hardware TCP/IP single chip, ZLAN1003 has the below advantages:

- 1) ZLAN1003 is a Serial Device Server Single Chip, it's higher than hardware TCP/IP protocol stack. ZLAN1003 not only internally integrate TCP/IP-layer protocol, but also integrate the common application-layer protocol in demand. Including:
  - a) HTTP protocol, as it internal integrates a Web Server, and its webpage fully compatible with normal HTML format, user can download any user defined webpage through ZLFsCreate provided by ZLAN. The webpage support configuration of IP, Work Mode, serial port baud rate.
  - b) Device searching configuration protocol. The chip has internally integrated protocol than can convenient to search and configure parameter via Ethernet, the ZLVircom software for this function. So the chip just need to weld can do search and configuration, no need any SCM to do initialization. The dynamic library and protocol provided by ZLVircom can be integrated into user's own software systems.
  - c) The function of serial port and TCP bidirectional data transceiving is strong. Doing transceiver in the highest speed under 115200bps will not lose any data. The user no need to worry data lost and unsuccessful sending, just operate as serial port.
- 2) ZLAN1003 can be used just welded to circuit board. Different from normal hardware protocol stack chip, it needs complicated command to control its TCP connection, IP address configuration, MAC address configuration, but ZLAN1003 need none configuration. As ZLAN1003 support Ethernet searching and configuration, no need MCU to do initialization, it saves the writing of user MCU drive and test of the software. As long as the hardware connection has no problem, user can use immediately, saving the developing cycle.
- 3) Convenient TCP automatic control function.

- a) As TCP Server support 100 TCP connections.
- b) As TCP Client support 8 destination IP, and no need user control, the chip will automatically do the connection.
- c) The destination IP support domain.
- 4) Support upgrading ZLAN1003 firmware through Ethernet port. Upgrading to user customization firmware software at any time, like installing new software in ZLAN1003 system. The upgrading process can be done by users.
- 5) ZLAN1003-W chip support control function through webpage.
- 6) Support Modbus TCP to Modbus RTU protocol, support sending ID Realcom protocol on TCP connections.
- 7) Support doing AT-Class command as connection control, parameter configuration, status reading of chip via serial port.
- 8) Support 7 IO port control via UDP commands.
- 9) Support 485 used in RS485 Bus sending control line RS485\_EN pin, saving the process that user need to deal with the signal pin MAX485.
- 10) Support conflict detection of RS485 Bus as well multi-host processing and control function when multi-TCP simultaneously access.

## 1.3 Application

ZLAN1003 can be applied to many embedded networking control products:

- Intelligence home appliance: intelligence home gateway, intelligence socket, intelligence switch
- Security access control: network access control, alarm device, infrared detection alarm, remote card reader
- Remote IO Controller: industry remote IO input, remote relay control
- Industrial automation production

- Building intelligence and energy monitoring
- Medical monitoring equipment

## 1.4 Feature

- 1) Internally integrate full-featured serial port to TCP/IP software, without complex programming, easy to use.
- 2) Internally integrate MAC and PHY interface of 10M/100M fast Ethernet.
- 3) Support Auto Negotiation Full-duplex & half duplex.
- 4) Support auto cross line detection (MDI/MDIX).
- 5) Support TCP server, TCP client, UDP/UDP multicast working mode.
- 6) As TCP Server can support 100 clients simultaneous communication.
- 7) As TCP client can connect 8 destination IP and port meanwhile.
- 8) 3.3V working voltage, 5V I/O signal tolerance.
- 9) The baud rate support 1200~115200bps, support hardware flow control and software flow control.
- 10) 80 feet LQFP encapsulation, lead free encapsulation.
- 11) Abundant signal light: indicator light for TCP connection establishing, wires connecting, data communication.
- 12) Industrial chip for temperature -40°C to 85°C.
- 13) Support upgrading firmware through Ethernet.
- 14) Support similar AT commands as connecting control, parameter configuration, status reading of the chip through Ethernet.
- 15) Support 485 sending permit control line RS485\_EN pin used on RS485 bus.

## 1.5 Diagram

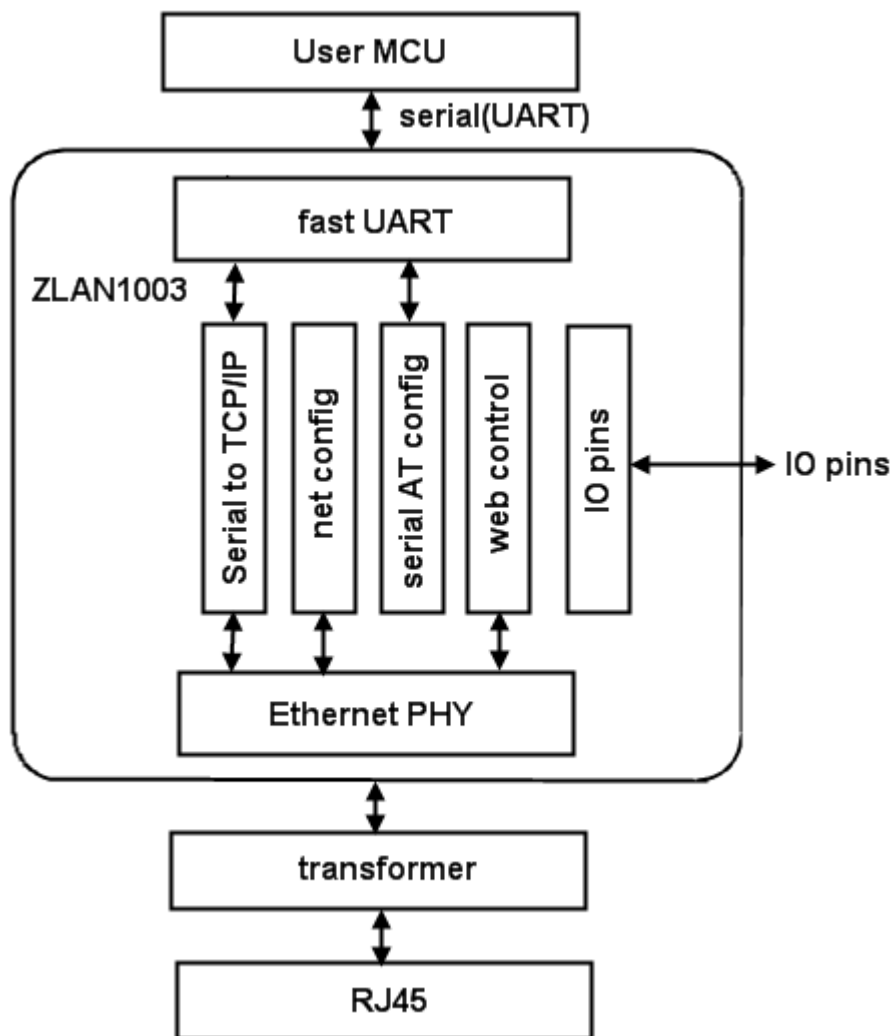


Figure 2 ZLAN1003 Block Diagram

From the block diagram we can see clearly that ZLAN1003 connecting user MCU only needs 2-line serial line, the other end connect RJ45 via network transformer.

The internal of ZLAN1003 integrate the function of chip parameter with network configuration as well the serial to TCP/IP function, the serial has configuration function via AT-Class command and embedded Web. At the same time provide IO control input and output pins.

## 2. Pin Definition



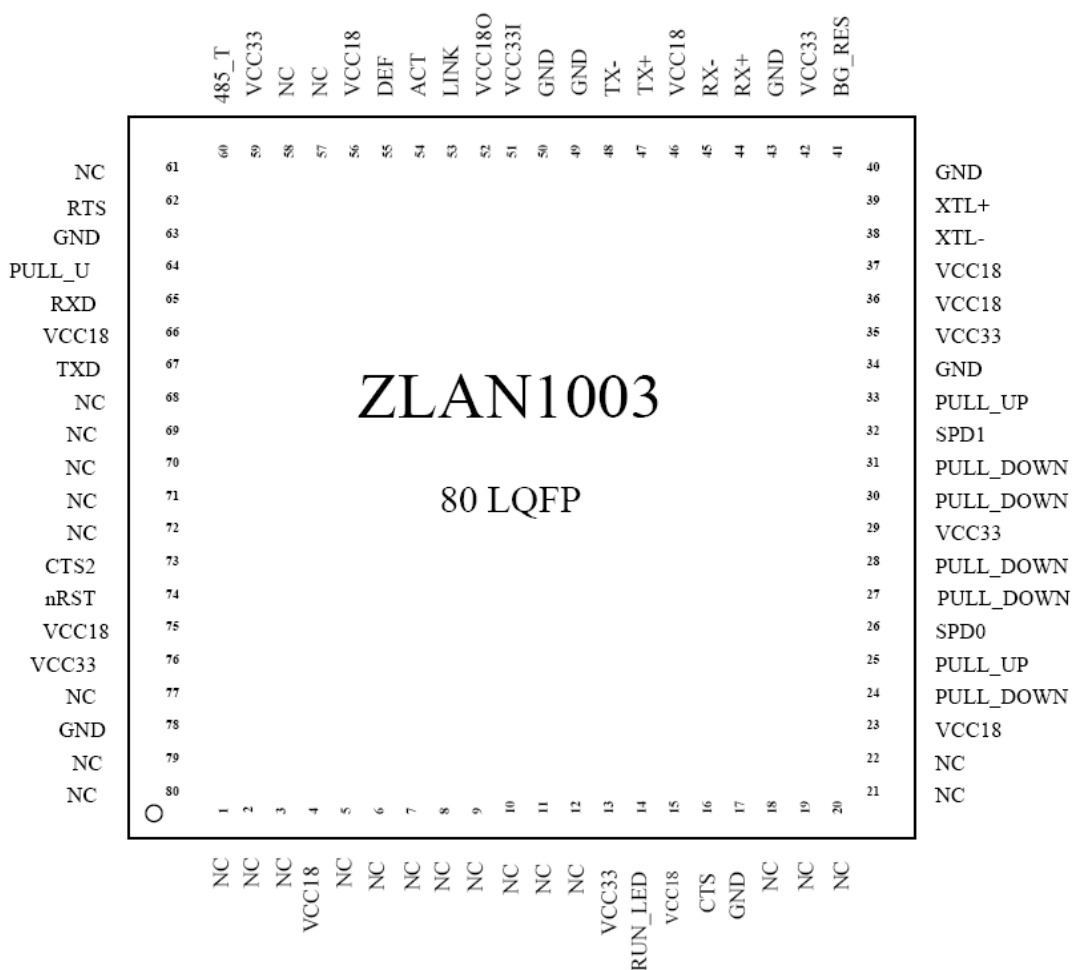


Figure 3 ZLAN Pin

Pin Name	Type	Pin No.	Description
<b>Power, Reset, Oscillator</b>			
VCC33	POWER	13,29,35,42,5 9,76	To connect 3.3V power, main power supply
VCC18	POWER	4,15,23,36,37, 46,56,66,75	To connect VCC18O pin as ZLAN1003 with interior 3.3-1.8 regulator, VCC18I can be provided by VCC18O.
VCC33I	POWER	51	To connect 3.3V power, is the input of regulator output. When no use internal regulator, but the external 1.8V supply, connect the pin to external VCC18.
VCC18O	OUT	52	1.8V output of interior regulator. No use internal regulator, but the external 1.8V supply, connect the pin to external VCC18.
GND	GND	17,34,40,43,4 9,50,63,78	Ground
nRST	IN	74	When nRST is in low electrical level, reset chip. The low level keeping time must over 5ms.

XTL-, XTL+	IN	38,39	25M oscillator.
<b>Ethernet Pin</b>			
RX+,RX-	IN	44,45	Ethernet receiving
TX+,TX-	IN	47,48	Ethernet sending
<b>Serial port Pin</b>			
RXD,TXD	IN/OUT	65,67	3.3V TTL level, serial port input/output pin, can directly connect with MCU port. Note that RXD connect user MCU TXD, TXD connect user MCU RXD.
CTS, CTS2	IN	16	Hardware flow control input, when chip configured as CTS/RTS, DSR/DTR mode, only CTS=0 the chip port will output data. If need hardware flow control support please connect CTS and RTS together, or else no need connect these two pins.
RTS	OUT	62	(1) As flow control: flow control set as CTS/RTS, DTR/DSR, normally RTS=0, when RTS=1 means ZLAN1003 cannot receive data, user MCU should stop to send data to ZLAN1003. The reason ZLAN1003 cannot receive data including: chip in initialization, TCP connection no built, the receiving buffer of ZLAN1003 port is full. (2) As indicator of start ready: when flow control is None, XON/XOFF, RTS=1 means ZLAN1003 in initialization, RTS=0 means ZLAN1003 finishing initialization. So can use RTS=1 to check ZLAN1003 whether do reset, including the reset after modifying parameter through ZLVircom.
<b>Input &amp; Output</b>			
RUN_LED	OUT	14	Run the indicator light, when MCU works normally, it will output a square wave of 2s period. Can light LED via 10K resistor to indicate the chip in work.
LINK	OUT	53	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.
ACT	OUT	54	When 0, means ZLAN1003 port has data transceiver. But the pin will be in change between 0 and 1 when there has data, ACT=1, cannot be sign of non-data communication.

DEF	IN	55	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, can reset it to default.
485_TEN	OUT	60	485 sending control end, normal 0, when sending data to serial port will be 1. Can directly connect TXD_EN pin of MAX485 chip.
<b>Other</b>			
RSET_BG	IN	41	Connect AGND through 1% accuracy 12.1K resistor.
PULL_DOWN WN	IN	24,27,28,30,31	Pull-down to GND via 10K
PULL_UP	IN	25,33,64	Pull-up to VCC33 via 10K
SPD0 SPD1	IN	26,32	Chip running speed configuration. When pull-up to VCC33 via 10K, configure to high-speed status. When pull-down to GND via 10K, configure to low-speed status. Current in low-speed is 140mA, high-speed is 210mA. The low-speed status support highest baud rate 57600bups, high-speed 115200bps.
NC	/	Other	No specified pin please hang in the air.

## 3. Hardware Design Direction

### 3.1 Schematic Diagram Guidance

The reference schematic diagram as Figure 4 & 5.

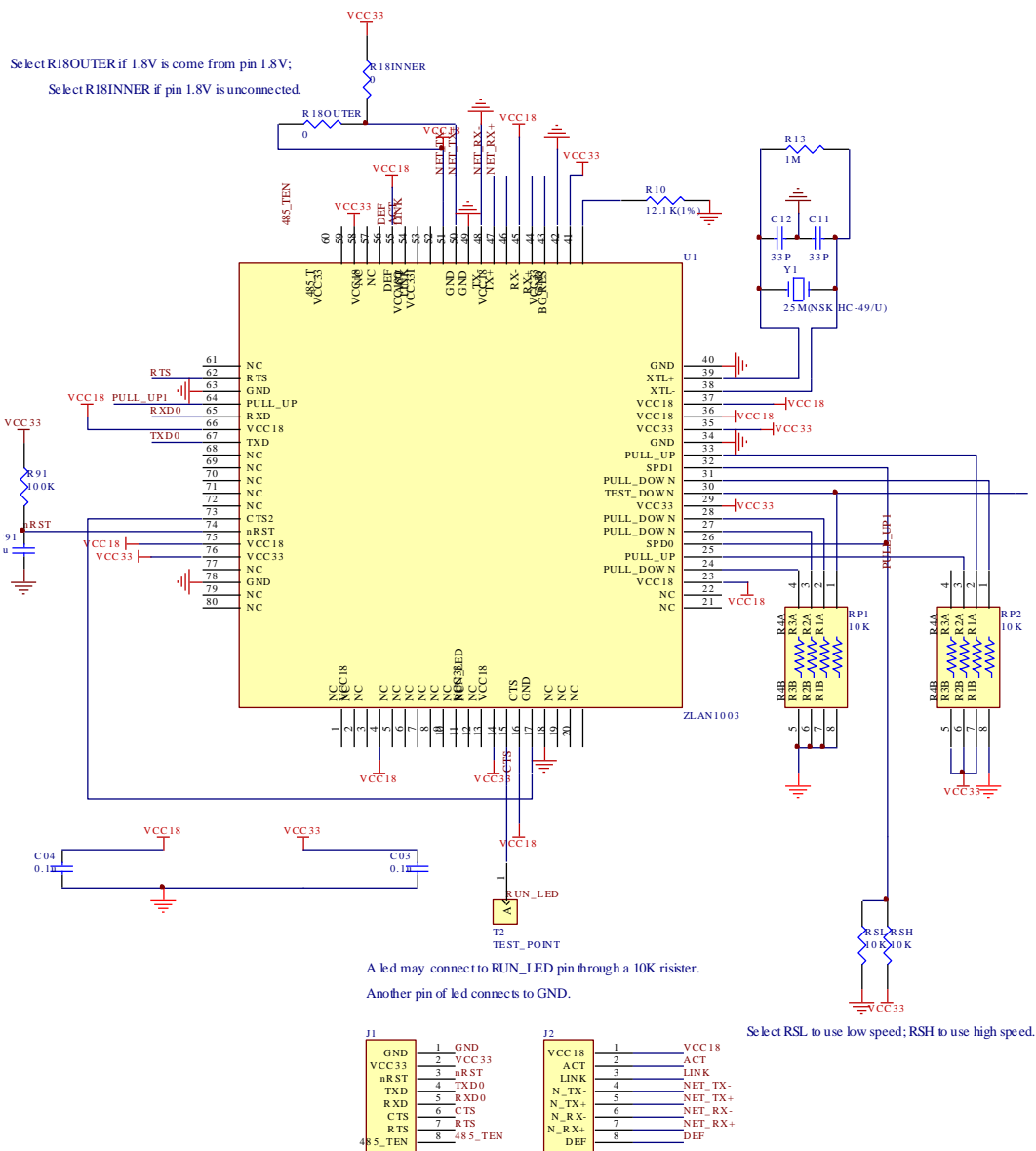
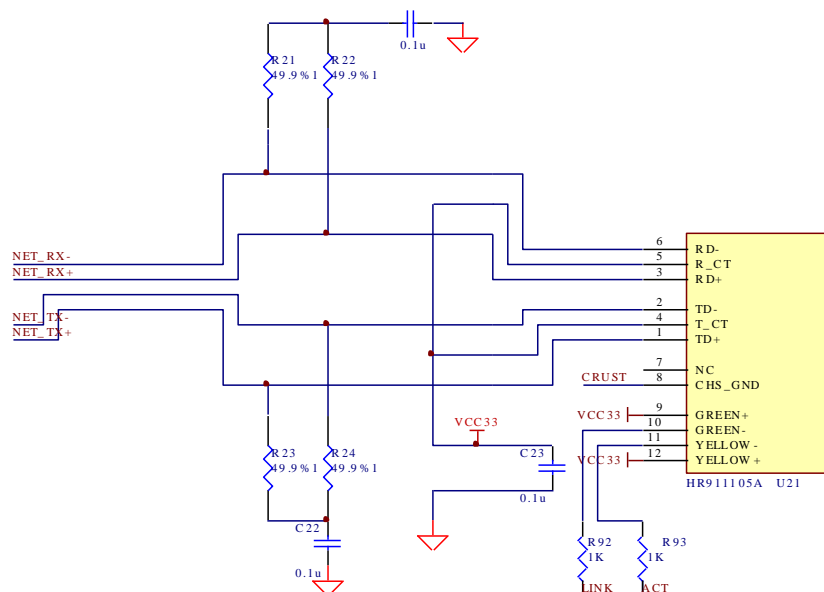
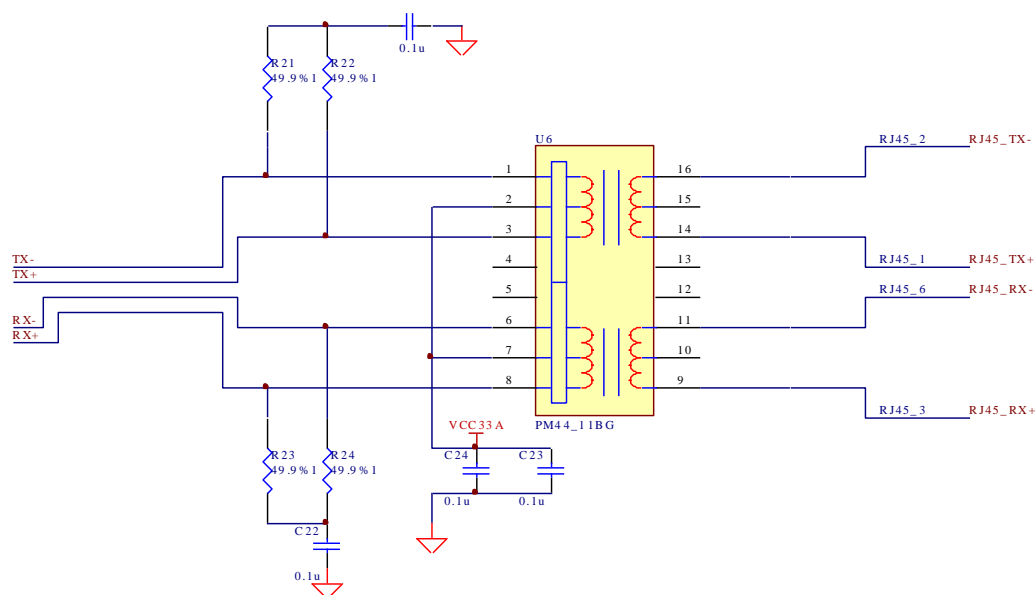


Figure 4 ZLAN1003 Schematic Diagram Part 1 MCU part



**Figure 5 ZLAN1003 Schematic Diagram Part 2 Ethernet interface part (RJ45 integrated network transformer)**



**Figure 6 ZLAN1003 schematic diagram Part 2 Ethernet interface part (independent network transformer)**

The connection circuit of ZLAN1003 is simpler, there have some instructions as below:

- 1) The Figure 4, 2 pin header list detailed definition of some pins can be used externally, refer to <ZLSN2003S User Manual>. In particular, VCC18 is an optional voltage supply input, as shown in next section.
- 2) The Figure 5 shows connection methods of Ethernet port, using RJ45 port with network transformer. You can also use independent network transformer plus RJ45.
- 3) The RUN\_LED in Figure 4 can connect a LED via 10K resistor, then the other end of LED connect GND. The LED flash indicates that chip is in normal working status.
- 4) The external voltage supply increases a large filter capacitance as far as possible, as there is none in Figure 4.
- 5) The NC pin please hang on the air.

## 3.2 Reduce power consumption design

- 1) ZLAN1003 has two working speed: high speed and low speed.

- a) High speed: pull both SPD0 and SPD1 to high level. In figure 4, the RSH resistance is welded and the RSL resistance is not welded. At this time ZLAN1003 highest baud rate reached 115200bps. The total required current of VCC18V is 60mA.
- b) Low speed: both SPD0 and SPD1 are pulled to low level. In figure 4, the RSL resistance is welded and the RSH resistance is not welded. At this time ZLAN1003 highest baud rate reaches 57600bps. The total required current of VCC18V is 10mA.

**2) ZLAN1003 VCC18 power supply has two power supply modes: internal voltage regulator generating and external power supply.**

- a) Internal voltage regulator generating: ZLAN1003 has a regulating circuit inside, in VCC33VI pins enter VCC3.3 V, it produces a 1.8v power output in VCC18O. The VCC18O connecting with other VCC18 pins supply power to the chip. In figure 4, the R18INNER resistance and not welding the R18OUTER, it uses internal regulator generating type. In this way ZLAN1003 will generate additional heat due to stable pressure.
- b) External power supply: disable internal regulating circuit. In Figure 4 welding the R18OUTER resistance and not welding R18INNER resistance. All VCC18 lead in V1.8V power supply through the Pin Header pin at the bottom of figure 4. In practice, users can convert VCC3.3V to 1.8V through a lm1117-1.8 regulating chip, and then supply to ZLAN1003. This will greatly reduce ZLAN1003 fever.

**According to the above analysis, the following methods can be used to reduce the heat of ZLAN1003:**

- a) External power supply: using the external lm1117-1.8 regulating chip to provide 1.8V power supply, and the internal regulator is disabled. Because the heat dissipation of lm1117-1.8 is better than ZLAN1003, the overall heat dissipation effect is better than that of the internal voltage regulator. But this approach will increase the cost of designing a 1.8V regulator. This method is recommended.

- b) Slow operation: lower the speed of the chip by SPD0 and SPD1, and reduce the total required current of VCC18. The effect of this method is not as effective as the first method, because ZLAN1003 still use the regulating circuit of heating, but the heat will decrease obviously. This approach eliminates the need for additional design costs. However, it is important to note that if the user use the baud rate of 115200bps, the method cannot be used because the low-speed operation does not support 115200bps.

## 4. Function Instruction

The functional description and usage please refer to the <ZLSN2003 Product Manual> and <User Guide of Networking Products>.

## 5. Electronic Features

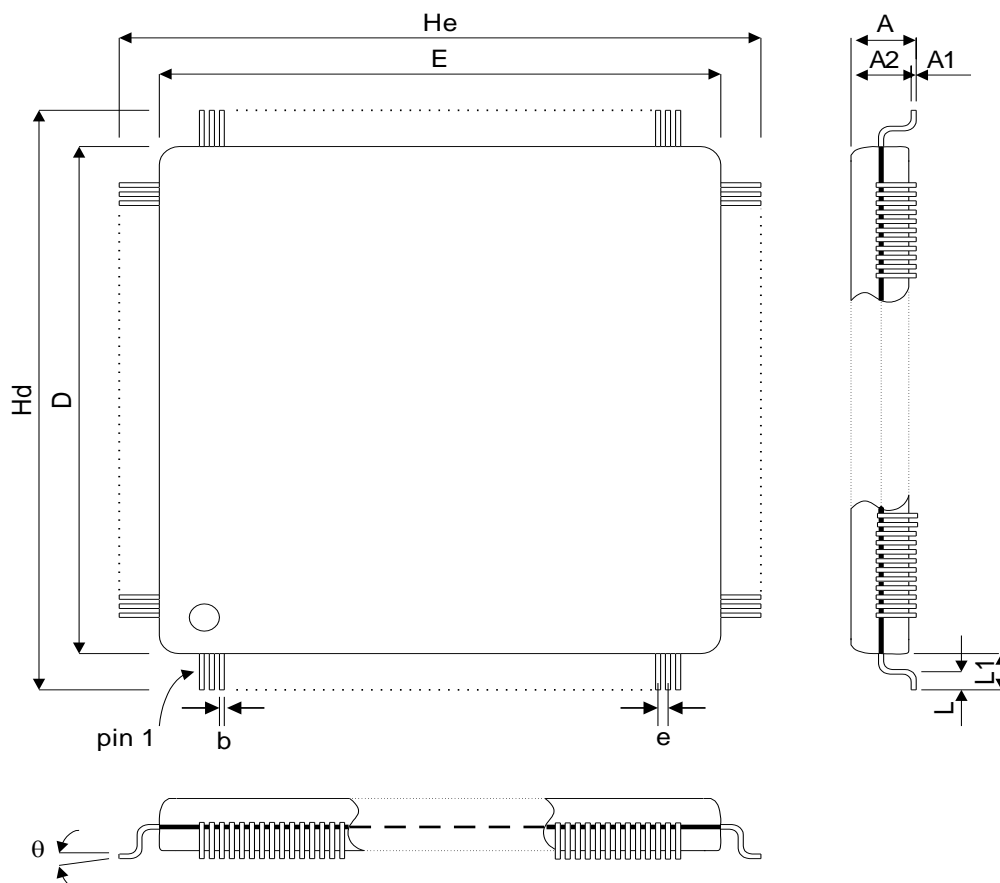
### DC Features

Name	Max Range	Suggest operating range	Typical Value	Instruction
VCC1.8V	-0.3~2.16V	0~1.98V	1.8V	
VCC3.3V	-0.3~3.8V	0~3.6V	3.3V	
IO voltage	-0.3~5.8V	0~5.25V	3.3V	
PIN max current input			20mA	
IO high-level drive current			4mA	
IO low-level drive current			4mA	
Storage temp.	- 40 to 150°C			
3.3V max current			150mA	
1.8V max current			60mA/10mA	SPEED pin configure to high-level as 60mA; speed pin configure to low level as 10mA.
Operating temp.	- 40 to 105°C			
Heat resistance to shell			7.0°C/W	

Heat resistance to environment			45.0°C/W	
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## 6. Encapsulation Size

80-pin LQFP encapsulation



Symbol	Millimeter		
	Min	Typ	Max
A1	0.05	-	0.15
A2	1.35	1.40	1.45
A	-	-	1.60
b	0.17	0.22	0.27
D	12.00 BSC <sup>1</sup>		
E	12.00 BSC		
e	0.50 BSC		
Hd	14.00 BSC		
He	14.00 BSC		
L	0.45	0.60	0.75

<sup>1</sup>BSC as the basic distance to center



L1	1.00 REF		
$\theta$	0°	3.5°	7°

## 7. Order Information

Part Number	Description
ZLAN1003	Normal Model
ZLAN1003-W	Support for special functional chip of web control

## 8. After-service

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