USB to serial chip CH340

Manual

Version: 2E

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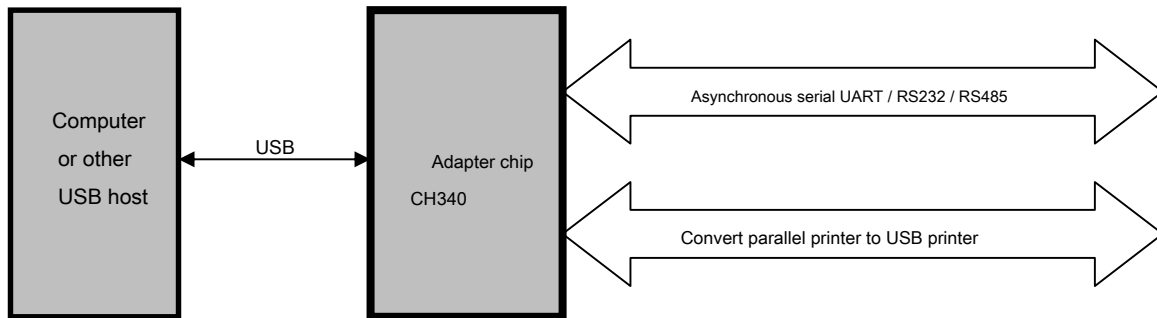
1 Overview

CH340 is a USB bus adapter chip, USB to serial port or a USB port transfer printing. In serial mode, CH340 provide common MODEM communication signals, a computer used to expand UART common serial device or upgrade directly to the USB bus. For a description of USB to printer port, refer to the manual (two) CH340DS2.

2. Features

- Full-speed USB device interface, compatible with USB V2.0.
- Simulate standard serial used to upgrade serial peripheral equipment, or by adding additional USB port.
- Serial application on the computer end of the Windows operating system is fully compatible without modification.
- Full-duplex hardware serial ports, built-in transceiver buffer, supports communication baud rate 50bps ~ 2Mbps.
- Support common MODEM communication signals RTS, DTR, DCD, RI, DSR, CTS.
- By adding level conversion device, providing RS232, RS485, RS422 interfaces.
- CH340R chip supports IrDA SIR specification infrared communication, supports baud rate 2400bps to 115200bps.
- Software compatible with CH341, CH341 use the driver directly.
- Supports 5V and 3.3V supply voltage even 3V supply voltage.
- CH340C / N / E CH340B and built-in clock, no external crystal, CH340B further built-in EEPROM is used to configure serial number.
- Providing SOP-16, SOP-8 SSOP-20 and MSOP-10, and lead-free package, compatible with RoHS.

3, the package
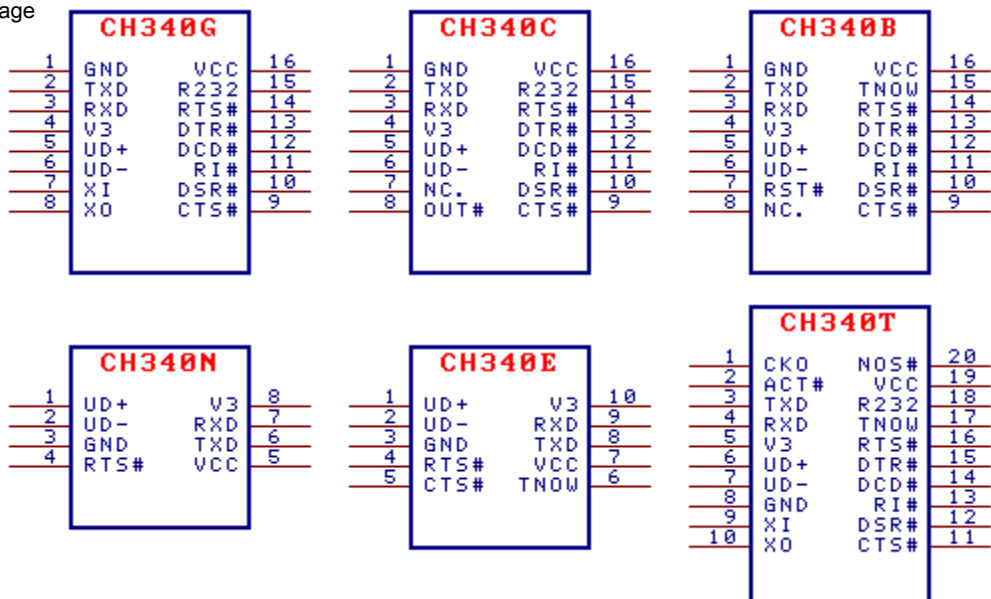
Package	Width of plastic		Lead pitch		Package Description	Ordering
SOP-16	3.9mm	150mil	1.27mm	50mil	Standard 16-pin SMD	CH340G
SOP-16	3.9mm	150mil	1.27mm	50mil	Standard 16-pin SMD	CH340C
SOP-8	3.9mm	150mil	1.27mm	50mil	Standard 8-pin SMD	CH340N
SOP-16	3.9mm	150mil	1.27mm	50mil	Standard 16-pin SMD	CH340B
MSOP-10	3.0mm	118mil	0.50mm	19.7mil	Miniature 10-pin SMD CH340E	
SSOP-20	5.30mm	209mil	0.65mm	25mil	Narrow-type 20-pin SMD	CH340T
SSOP-20	5.30mm	209mil	0.65mm	25mil	Narrow-type 20-pin SMD	CH340R

Model difference: CH340C, CH340N and CH340E and CH340B built-in clock, no external crystal.

CH340B further built-in EEPROM is used to configure the serial number, and some other functions can be

customized. CH340R provide reverse polarity TXD and MODEM signals, has been discontinued.

4 pin

SSOP20 Pin Number	SOP16 Pin Number	SOP8 Pin Number	MSOP10 Pin Number	Pin name Type	Pin Description (explanation in brackets only for CH340R model)
19	16	5	7	VCC	The positive input terminal of the power supply, requires an external power supply decoupling capacitor 0.1µF
8	1	3	3	GND power supply	Common ground terminal directly connected to ground USB bus
5	4	8	10	V3 power supply	connection VCC input at 3.3V external power supply voltage, When the power source voltage 5V external decoupling capacitor 0.1uF capacity
9	7	None	None	XI input	CH340T / R / G: crystal oscillator input terminal, And for an external 12MHz crystal oscillator capacitance
				NC. No connection	CH340C: No connection, must be left open
				RST # input	CH340B: external reset input, active low, the pull-up resistor
10	8	None	None	XO output	CH340T / R / G: the output of the crystal oscillator, And for an external 12MHz crystal oscillator capacitance
				OUT # Output	CH340C: MODEM common output signal, the software defined, low effective
				NC. No connection	CH340B: No connection, must be left open
6	5	1	1	UD + USB Signal	Directly to the USB bus data lines D +
7	6	2	2	UD- USB Signal	D- data lines directly connected to the USB bus
20	No No No			NOS # USB input	devices prohibited pending, active low, the pull-up resistor built 3
	2	6	8	TXD Export	Serial data output (CH340R inverted output model)
4	3	7	9	RXD	Serial data input, the built-in controllable pullup and pulldown resistors
11	9	no	5	CTS # MODEM contact	input signal input, a clear to send, low (high) Effective
12	10	None None		DSR # MODEM input	contact input signal, the data-ready device, a low (high) Effective
13	11	None None		RI # input	MODEM communication input signals, ringing indication, low (high) Effective
14	12	None None		DCD # MODEM input	signal input contacts, carrier detection, low (high) Effective
15	13	None None		DTR # MODEM communication output	an output signal, Data Terminal Ready, low (high) Effective
16	14	4	4	RTS # MODEM communication	output an output signal requesting transmission, low (high) Effective
2	No No No			ACT # Export	USB configuration status output, active LOW
18	15	None None		R232 input	CH340T / R / G / C: auxiliary RS232 enabled, Active high, with pull-down
17	15	no	6	TNOW output	CH340T / E / B: serial transmission progress status indication, Active High
				IR # Input	CH340R: serial mode setting input, the pull-up resistor, A low level SIR infrared port, a high level to a serial port.
1	No No No			CKO output	CH340T: Clock output

				NC. Empty legs	CH340R: No connection, must be left open

NOTE: CH340 to unused I / O pins can be left floating, FIG applied to other CH340T example, it is also applicable to CH340G / C / N / E / B and so on.

5, Function

CH340-chip pull-up resistor USB, UD + and UD- pin should be connected directly to the USB bus. CH340-chip power on reset circuit. CH340B chip also provides an active-low external reset pin. CH340G / CH340T / CH340R chip normally requires external work to provide a 12MHz clock signal XI pin. In general, the clock signal generated by a built-in inverter CH340 through the crystal oscillation frequency stabilization. The peripheral circuit and a 12MHz crystal connected between pins XI and XO, XO and XI respectively and pin capacitance connected to ground.

CH340C, CH340N and CH340E and CH340B chips have built-in clock generator, and no external crystal oscillator capacitance. CH340B EEPROM chip also provides a zone configuration data, by a dedicated computer software tools is provided for each product chip Letter serial number interest Configuration The following table shows the data area.

Byte address referred to		Description of the configuration data area	Defaults
00H	SIG	For CH340B: internal configuration information is valid flag must be 5BH. For CH340H / S: external configuration chip is valid, it must be 53H. Other values are invalid configuration	00H
01H	MODE	Serial mode, it must be 23H	23H
02H	CFG	The specific configuration of the chip, Bit 5 is used to configure serial number string: 0 = active; 1 = invalid.	FEH
03H	WP	Internal configuration information write protection flag is 57H is read-only, or rewritable	00H
05H ~ 04H	VID	Vendor ID, vendor identification code, high byte, an arbitrary value. 0000H or 0FFFFH the VID and PID using the factory default values	1A86H
07H ~ 06H	PID	Product ID, product ID, high byte, an arbitrary value	7523H
0AH	PWR	Max Power, in units of 2mA maximum supply current	31H
17H ~ 10H	SN	Serial Number, serial number ASCII string of 8. The first byte is not ASCII characters (21H ~ 7FH) disables the serial number	12345678
3FH ~ 1AH	PROD	For CH340B: Product String, product descriptions Unicode strings. The first byte is the total number of bytes (not more than 26H), second byte is 03H, followed by Unicode strings, do not meet the above characteristics using the factory default description	The first byte of the default 00H product manual
Other Address		(Retaining unit)	00H or FFH

CH340 chip supports 5V supply voltage or 3.3V supply voltage. When a 5V supply, the VCC pin external 5V power supply, and capacity V3 pin must CH340 chip is external power supply decoupling capacitor is 0.1uF. When a working voltage of 3.3V, the chip CH340 V3 pin should be connected to VCC and input 3.3V power supply, the operating voltage and the other circuit connected to the chip CH340 not exceed 3.3V.

CH340 chip supports USB devices automatically suspend in order to save power consumption, NOS # pin is low disables USB devices to hang. CH340 chip USB DTR # pin before the pin configuration as the configuration input may be an external pull-down resistor 4.7KΩ current power generated during a low default USB enumeration by more configuration descriptor to the USB bus APPLICATIONS .

CH340 pin chip UART mode comprising: a data transmission pin, MODEM signal pin contact, the auxiliary pin. Data transmission pin comprising: TXD and RXD. When serial input idle, RXD should be high. For CH340G / C / T / R chip enable pin is high if R232 RS232 auxiliary function, then the internal RXD pin automatically insert an inverter, the default is a low level. When the serial output idle, CH340G / C / N / E / B / T chip TXD is high, CH340R chip TXD is low.

MODEM liaison signal pins include: CTS # pin, DSR # pin, RI # pins, DCD # pin, DTR # pin, RTS # pin, CH340C also provides OUT # pin. All of these signals are computer MODEM communication application control and define their use.

Auxiliary pin includes: IR # pin, R232 pin, CKO pin, ACT # pin, TNOW pin. IR # pin low will enable the infrared port mode. R232 pin for controlling auxiliary functions RS232, R232 is high RXD pin automatically inverted. ACT # pin to USB device configuration status output (such as USB infrared adapter ready). CH340 pin TNOW indicates a high level from the serial data is being transmitted, after completion of transmission is low, like in a half-duplex RS485 serial port, serial port transceiver TNOW be used to indicate the switching state. IR # R232 and checking pin only after a power-on reset.

CH340 built-in transceiver buffer, supports simplex, half-duplex or full-duplex asynchronous serial communication. Serial data including a low-level start bit, 6, 7 or 8 data bits, 1 stop bit, or two high, supporting odd / even / token / blank correction experience. CH340 supports popular communication baud rate: 50,75,100,110,134.5,150,300,600,900,1200, 1800,2400,3600,4800,9600,14400,19200,28800,33600,38400,56000, 57600,76800,115200, 128000,153600,230400,460800,921600,1500000,2000000 and so on.

CH340 allows the serial baud rate error of the received signal is not less than 2%, the baud rate CH340G / CH340T / CH340R serial transmission signal error is less than 0.3%, the baud rate CH340C / CH340N / CH340E / CH340B serial transmission signal error is less than 1% .

In the computer end of the Windows operating system, CH340 driver can emulate standard serial port, it is fully compatible with most of the original serial application, you typically do not need to make any changes.

CH340 can be used to upgrade serial peripheral devices or additional serial port to the computer via the USB bus. By adding level conversion device may be further provided RS232, RS485, RS422 interfaces.

CH340R only plus infrared transceiver, you can increase the SIR infrared adapter to the computer via the USB bus, infrared ray communication between the computer and the external device complies with IrDA specification.

6, parameters

6.1. Absolute maximum (equal to or exceed absolute maximum value will likely cause the chip does not work properly or even damage)

name	Parameter Description		Minimum	Maximum	Unit	
TA	Ambient temperature at work	CH340G / CH340T / CH340R	- 40	85	℃	
		CH340C / CH340N / CH340E / CH340B	--20	70	℃	
TS	The ambient temperature during storage		- 55	125	℃	
VCC	Supply voltage (VCC power supply connected, GND Ground)		- 0.5	6.0	V	
VIO	Voltage on the input or output pins		- 0.5	VCC + 0.5	V	

6.2 Electrical parameters (test conditions: TA = 25 ℃, VCC = 5V, does not include USB bus connector pin)

(If the supply voltage is 3.3V, then all the current parameters of the table should be multiplied by coefficient of 40%) name

		Parameter Description		Min	Typ	Max	Units	
VCC	voltage	V3 pin VCC pin is not connected		4.0	5	5.3		V
		V3 connect the VCC pin	CH340G / T / R	2.8	3.3	3.6		
			CH340C / N / E / B	3.0	3.3	3.6		
ICC	Work total supply current CH340G / C / N / E / T / R				7	20	mA	
	CH340B				6	15	mA	
ISLP	The total supply current USB suspend	VCC = 5V			0.1	0.2	mA	
		VCC = 3.3V			0.09	0.15	mA	
VIL	Low level input voltage		- 0.5		0.7	V	
VIH	High-level input voltage		2.0		VCC + 0.5	V	
VOL	Low-level output voltage (current suction 4mA)				0.5	V	
VOH	(100uA output current only during a chip reset) High-level output voltage (output current 3mA) VCC-0.5					V	
IUP	Input current on-chip pull-up resistor input terminal		3	150	300	uA	
IDN	Input current pull-down resistor at the input of		--50	- 150	- 300	uA	
VR	The power-on reset voltage threshold		2.4	2.6	2.8	V	

6.3 Timing parameter (test conditions: TA = 25 ℃, VCC = 5V)

name	Parameter Description	Min	Typ	Max	Units		

FCLK	XI frequency of the input clock signal pin	11.98	12.00	12.02	MHz
TPR	A power supply reset time	20	35	50	mS

7, Application

7.1. USB serial transfer line 9 (below)
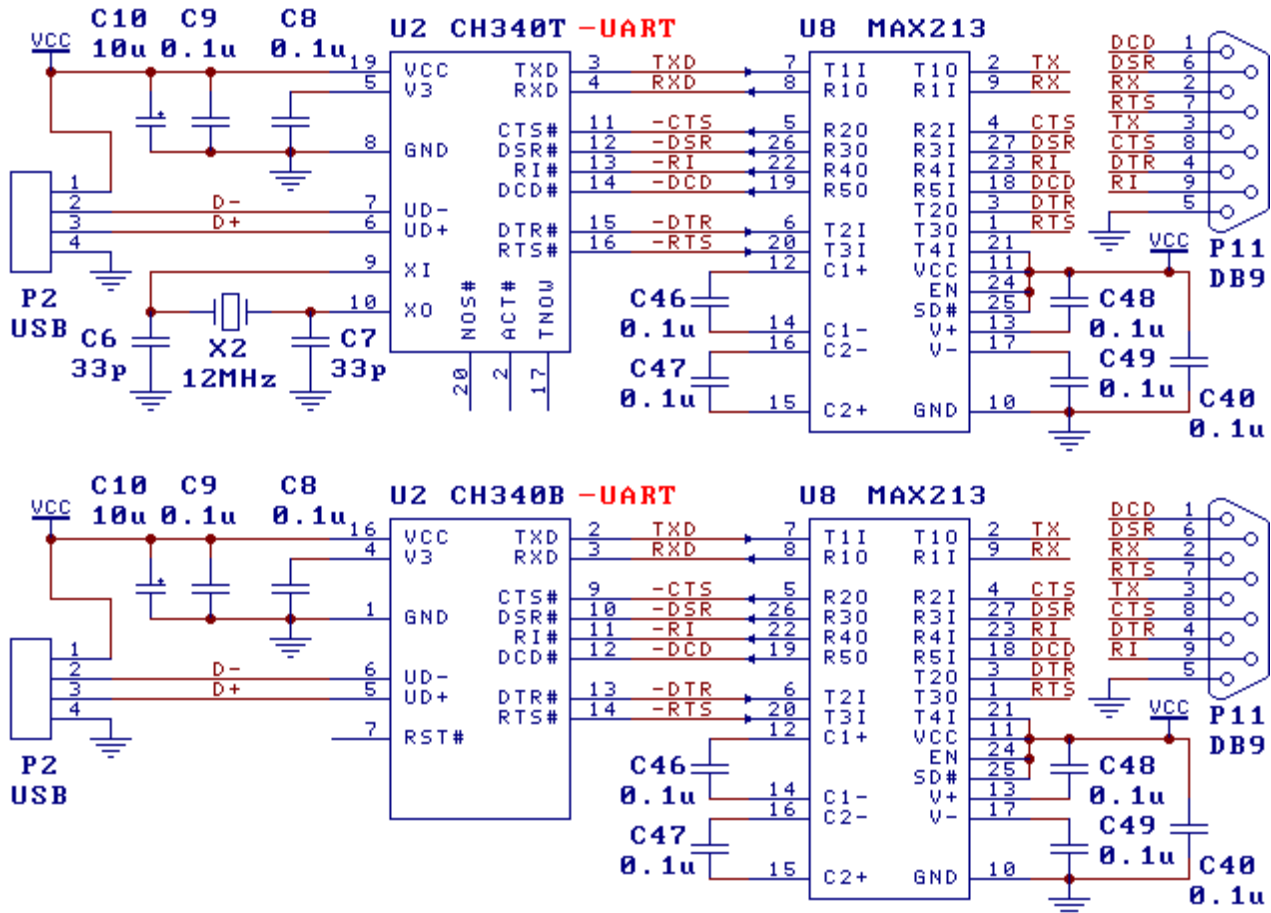
The figure is achieved by CH340T (or CH340C / B) USB to RS232 serial port. CH340 provides a common serial signal and MODEM signals, by the level conversion circuit U8 is converted to TTL serial RS232 serial port DB9 pin P11 is the same as the ordinary and the pin 9-pin serial port of the computer functions, a similar type of U8 there MAX213 / ADM213 / SP213 / MAX211 and so on.

If only USB to serial TTL, it can be removed and U8 of FIG capacitor C46 / C47 / C48 / C49 / C40. FIG signal line may be connected to only RXD, TXD, and a common ground, the other signal wires are optional, are not required to float.

P2 is a USB port, USB 5V power bus comprising a pair of lines and a pair of data signal lines, generally, red + 5V power supply line, a ground line is black, D + signal line is green, D- signal line is white. USB bus provides the maximum power supply current can reach 500mA, under normal circumstances, CH340 chip and a low-power USB 5V power products can be used directly by USB bus. **If the USB products provided by other common power supply, you should use the standing CH340 power supply, I between USB power and avoid / O current intrusion.** If you need to use USB bus power, the resistance value can be from about 1 Ω A resistor connected to the USB bus 5V 5V power supply line and the common power USB products, and both directly connected to the ground line.

Capacity capacitor C8 V3 pin is 0.1μF, 3.3V for the internal power supply node CH340 decoupling, C9 capacity of 0.1μF, an external power supply decoupling.

For CH340G / T / R chip, the crystal X2, capacitors C6 and C7 for clock oscillation circuit. X2 is a quartz crystal frequency of 12MHz, C6 and C7 with a capacity of 33pF monolithic or high frequency ceramic capacitor. If the selection of low-cost ceramic crystal X2, the C6 and C7 capacity must manufacturers recommended value of the crystal, under normal circumstances is 47pF. Difficulty starting crystals of vibration, it is recommended C6 half capacity.

For CH340C / N / E / B chip, no crystal X2 and capacitor C6 and C7.

When designing the PCB, note: decoupling capacitors C8 and C9 are connected to pin as close to CH340; enable signals D + and D- lines are parallel and supply ground or copper on both sides, from the outside to reduce the signal to interference; XO and XI minimize the length of the pin associated signal line, in order to reduce high frequency interference, may surround the ground or copper in relative equipment.

7.2. USB to RS232 serial port (below)

FIG USB change the basic and common 3-wire serial interface RS232, U5 is MAX232 / ICL232 / SP232 and the like. CH340 is not used to signal lines can be suspended. For CH340C / N / E / B chip, no X4 and C21 and C22.
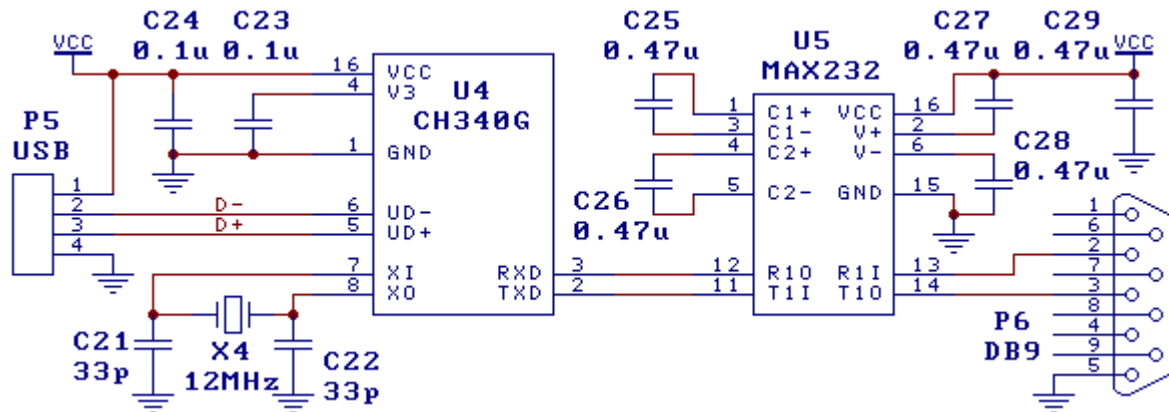
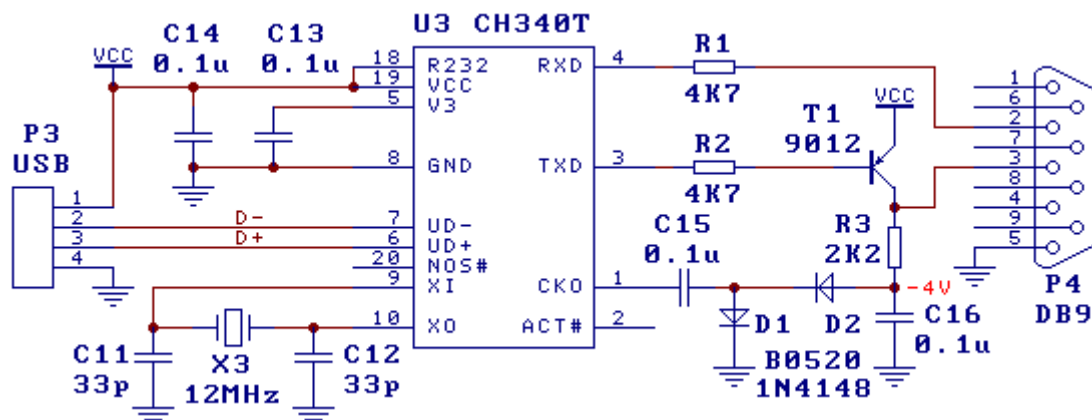## 7.3. USB to RS232 serial port, simple version (below)

Figure 3 is USB-wire RS232 serial interface, and the circuit is the same as 7.2. Section function, but the amplitude of the output level of the signal RS232 slightly. The CH340 R232 pin is high, an auxiliary RS232 function is enabled, only plus diodes, transistors, resistors and capacitors can be replaced by 7.2. Section specific level conversion circuit U5, so that hardware cost is lower.

7.4. USB infrared adapter (below)
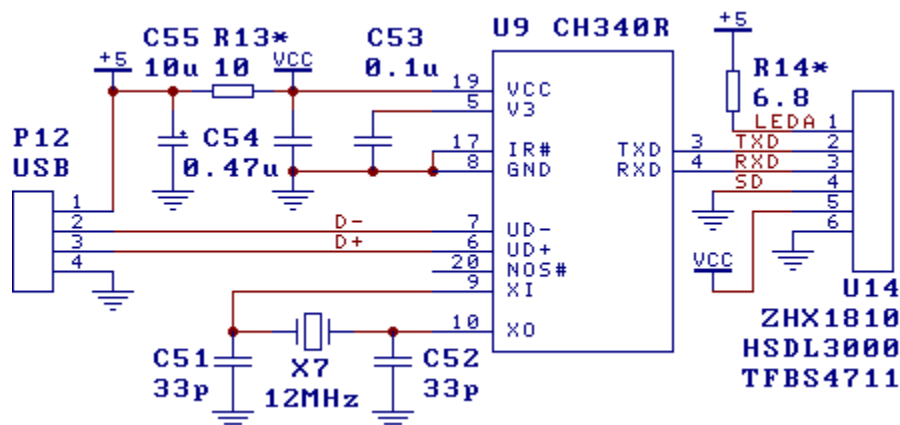
The figure is transferred by the USB IrDA infrared and infrared transceiver chip CH340R U14 (ZHX1810 / HSDL3000 models and the like) USB infrared adapter configuration. Resistor R13 to reduce the influence of an infrared transmission process for a large current to other circuits can be removed if less demanding. A current limiting resistor R14 should be adjusted according to the recommended value of the manufacturer's actual selection of the infrared transceiver U14.

7.5. USB to RS485 serial port

Can (enable high efficient transmission) and the RE # TNOW with the control pin RS485 transceiver DE (active low receiver enable) pin.

7.6. Microcontroller serial connection, common power supply (below)

FIG MCU is the MCU reference circuit chips by TTL serial connection CH340 unified manner powered USB communications. The product from the selected power supply, VCC or 3.3V 5V support (V3 required when the VCC is 3.3V shorted to VCC), do not use the VBUS USB bus power (if required by the MCU can whether I / O series resistance detecting effective). CH340 and MCU use the same power supply VCC, so there is no dual power between the MCU and CH340 case by I / O of each current intrusion.

CH340 is not used to signal lines can be suspended. For CH340C / N / E / B chip, no X6 and C17 and C18.
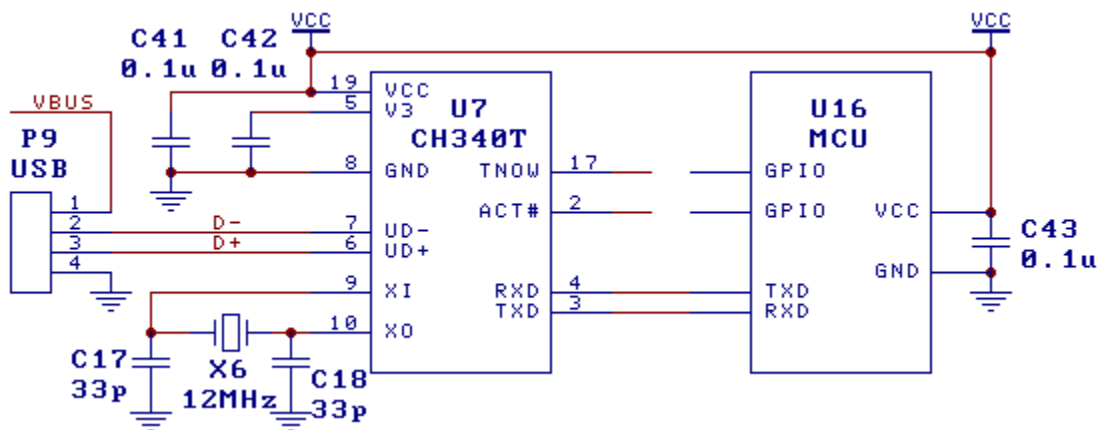
7.7. Microcontroller serial connection, each of the power supply (below)

Below is connected to the reference circuit CH340 MCU chip microcontroller serial TTL dual powered by USB communication manner. CH340 USB bus-powered VBUS, MCU using another power supply VDD, VDD support 5V, 3.3V or even 2.5V, 1.8V, diode D6 and D7 in FIG internally via RXD for relieving or RX mode between a dual power supply with the MCU CH340 diode current problem of intrusion. FIG RX pin of the MCU should be enabled internal pull-up resistor, if not, it is recommended that the RX pin external pull-up resistors of 8KΩ ~ 30KΩ.

CH340 diode D6 for electroless but the MCU TX and high electrical RXD through the internal diode of the current situation to the intrusion CH340; MCU for electroless diode D7 but CH340 high electrical and TXD to the MCU through the internal diode RX current intrusion situation. If it is determined a situation does not occur, the corresponding diode may be removed, for example, MCU permanent self-powered, it may be shorted D7.

Priority Schottky diode with a low-power Schottky diodes, but generally ordinary diodes may be applied, for example IN4148. In addition, with a 1 K [Omega resistance (not more than 2 K) resistance of the diode in place in most cases also acceptable.

Under normal circumstances, we do not recommend CH340 and MCU respective separate power supply is used only when necessary.