USB to serial port chip CH340

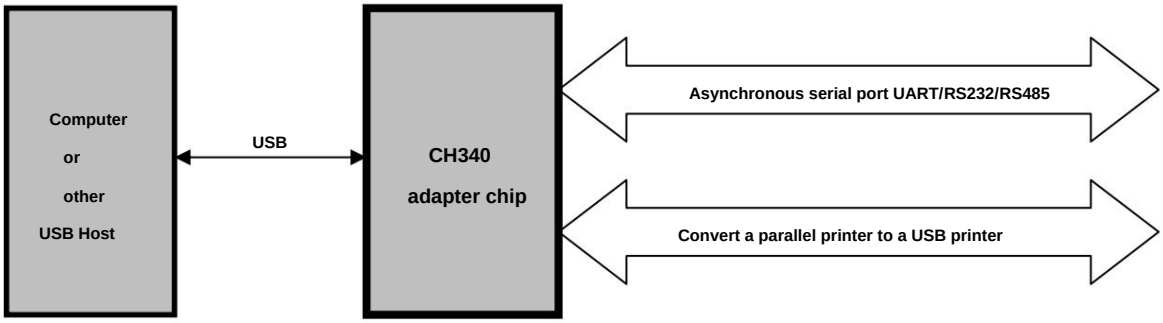
Manual

version: 3C

http://wch.cn

1. Overview

CH340 is a USB bus adapter chip that realizes USB to serial port or USB to printer port. In serial port mode, CH340 provides common MODEM communication signals to expand asynchronous serial ports for computers, or convert ordinary The serial port device is directly upgraded to the USB bus. For instructions on USB to printer port, please refer to Manual (II) CH340DS2.

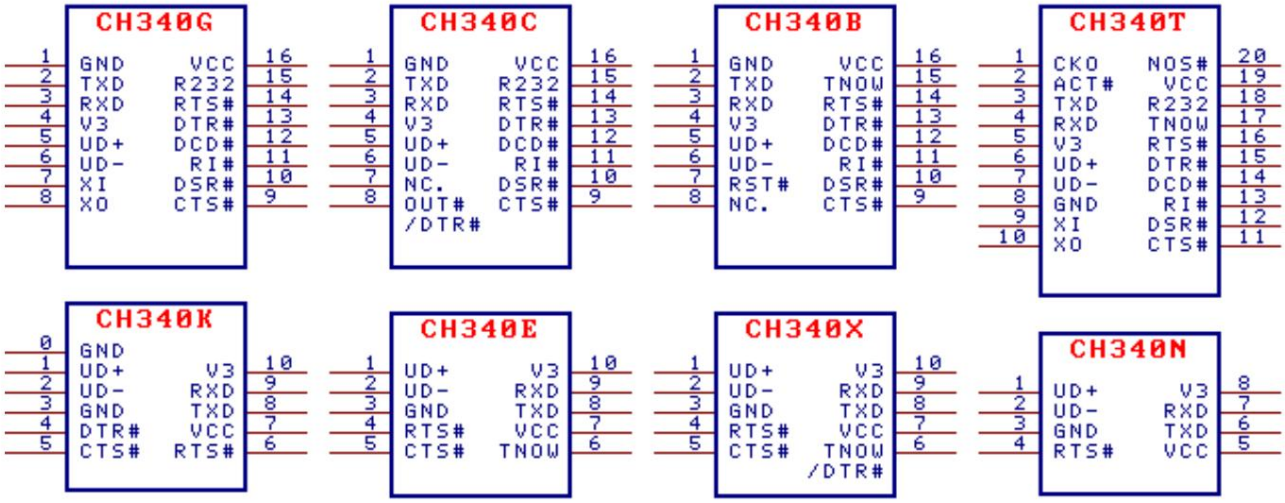


2. Features

• Full-speed USB device interface, compatible with USB V2.0.

• Emulate standard serial port, used to upgrade the original serial port peripherals, or add additional serial ports through USB. • The serial port application under the Windows operating system on the computer is fully compatible and does not need to be modified. • Hardware full-duplex serial port, built-in send and receive buffer, supports communication baud rate 50bps~2Mbps. • Supports commonly used MODEM contact signals RTS, DTR, DCD, RI, DSR, CTS. • Through the external level conversion device, it provides RS232, RS485, RS422 and other interfaces. • The CH340R chip supports IrDA standard SIR infrared communication, and supports baud rate 2400bps to 115200bps. • Built-in firmware, software compatible with CH341, can directly use the VCP driver of CH341. • Support 5V power supply voltage and 3.3V power supply voltage. • CH340C/N/K/E/X/B has built-in clock, no external crystal is needed, CH340B also has built-in EEPROM for configuring serial number, etc. • Provide SOP-16, SOP-8 and SSOP-20 as well as ESSOP-10, MSOP-10 lead-free packages, RoHS compatible.

3. Packaging



Package Type	Plastic Body Width		Pin pitch	Packaging Description	Order Model
SOP-16	3.9mm	150mil	1.27mm	50mil standard 16-pin patch CH340G 50mil standard 16-	
SOP-16	3.9mm	150mil	1.27mm	pin patch CH340C 50mil standard 16-pin patch CH340B	
SOP-16	3.9mm	150mil	1.27mm	50mil standard 8-pin patch 39mil narrow pitch 10-pin	
SOP-8	3.9mm	150mil	1.27mm	patch with base plate CH340K	CH340N
ESSOP-10	3.9mm	150mil	1.00mm	0.50mm 19.7mil micro-miniature 10-pin patch CH340E	
MSOP-10	3.0mm	118mil	0.50mm 19.7mil micro-miniature 10-pin patch CH340X 25mil reduced		
MSOP-10	3.0mm	118mil	20-pin patch CH340T 0.65mm 25mil reduced 20-pin patch CH340R		
SSOP-20	5.3mm	209mil			
SSOP-20	5.3mm	209mil	0.65mm		

Note: CH340C, CH340N, CH340K, CH340E, CH340X and CH340B have built-in clocks and do not require external crystal oscillators.

CH340B has built-in EEPROM for configuring serial number, and some functions can be customized, etc. If small size is required, CH343P is recommended.

CH340K has three built-in diodes to prevent the MCU from backflowing current to CH340 through the I/O pins when the power supply is independent.

The CH340K baseboard has pin 0# GND, which is an optional connection; pin 3# GND is a necessary connection.

CH340X is an improvement on CH340E, adding the 5V tolerance feature of IO when powered by 3.3V.

If an external resistor is added to the 6# pin of CH340X, the 6# pin can be switched from TNOW to DTR#. The two configurations are detailed in Section 5.3.

CH340C If the batch number starts with 4 and the last 3 digits are greater than B40, a 4.7Kÿ pull-down resistor can be added to the 8# pin to change it to DTR#.

The CH340R provides reverse polarity TXD and MODEM signals and has been discontinued.

The USB transceiver of CH340 is designed as USB2.0 with full built-in support. It is recommended not to connect additional resistors in series to the UD+ and UD- pins.

4. Pins

SSOP20 Pin Number	SOP16 Pin Number	ESSOP10 Pin Number	SOP8 Pin Number	Pinout Name	Type Pin Description (Descriptions in brackets are only for CH340R model)
19	16	7	5	VCC	Power positive power input terminal, requires an external 0.1uF power decoupling capacitor
8	1	3ÿ0	3	GND	Power common ground terminal, directly connected to the ground of the USB bus
5	4	10	8	V3	Power Supply: Connect VCC to external power supply at 3.3V power supply voltage. At 5V power supply voltage, the external capacity is 0.1uF decoupling capacitor
9	7	None		XI	Input: CH340T/R/G: Input terminal of crystal oscillator, Requires external 12MHz crystal and oscillation capacitor
				NC.	Empty feet: CH340C: Empty pin, must be left floating
				RST#	Input: CH340B: External reset input, Low level is effective, with built-in pull-up resistor
10	8	None		XO	Output: CH340T/R/G: output end of crystal oscillator, Requires external 12MHz crystal and oscillation capacitor
				OUT#	Output: CH340C: MODEM general output signal, software defined, Low is effective. Some batches of CH340C can be switched to the second DTR#
				NC.	Empty pin CH340B: Empty pin, must be left floating
6	5	1	1	UD+	USB signal is directly connected to the D+ data line of the USB bus, without series resistor
7	6	2	2	UD-	USB signal is directly connected to the D-data line of the USB bus, without series resistor
20	No	No	No	NOS#	Input prohibits USB device suspend, low level is effective, built-in pull-up resistor
3	2	8	6	TXD	output serial data output (CH340R model is inverted output)
4	3	9	7	RXD	input serial data input, built-in controllable pull-up and pull-down resistors
11	9	5	No	CTS#	input MODEM communication input signal, clear to send, low (high) effective
12	10	None	None	DSR#	Input MODEM communication input signal, data device ready, low (high) effective
13	11	No	No	RI#	Input MODEM communication input signal, ringing indication, low (high) effective
14	12	No	No	DCD#	Input MODEM communication input signal, carrier detection, low (high) effective

15	13	4 No	DTR#	output	MODEM communication output signal, data terminal ready, low (high) effective
16	14	6	4	RTS# Output	MODEM communication output signal, request to send, low (high) effective
2 None None None				ACT# Output	USB configuration completed status output, low level is valid
18	15 No No		R232	Input	CH340T/R/G/C: Auxiliary RS232 enable, High level valid, built-in pull-down
17	15 None			TNOW output	CH340T/E/X/B: Serial port sends status indication in progress. High level is valid. CH340X external resistor can be switched to
				IR# Input	DTR# CH340R: Serial port mode setting input, built-in pull-up resistor Low level is SIR infrared serial port, high level is ordinary serial port
1 None None None				CKO Output	CH340T: Clock output
				NC. Empty feet	CH340R: Empty pin, must be left floating

Note: The unused I/O pins of CH340 can be left floating. The application diagram takes CH340T as an example, which is also applicable to CH340G/C/N/K/E/X/B.

5. Functional description

5.1. Clock, Reset, Power, Connection

When the CH340G/CH340T/CH340R chip is working normally, it needs to provide a 12MHz clock signal to the XI pin.
The clock signal is generated by the built-in inverter of CH340 through crystal frequency oscillation. The peripheral circuit only needs to connect a
A 12MHz crystal is used and oscillation capacitors are connected to ground for the XI and XO pins respectively.

CH340C/N/K/E/X/B chips all have built-in clock generators, no external crystals or capacitors are required.

The CH340 chip has a built-in power-on reset circuit. The CH340B chip also provides a low-level effective external reset input pin.

The CH340 chip supports 5V power supply voltage or 3.3V power supply voltage. When using 5V working voltage, the VCC pin of the CH340 chip
Input external 5V power supply, and the V3 pin should be connected to a 0.1uF power decoupling capacitor. When using 3.3V operating voltage,
The V3 pin of the CH340 chip should be connected to the VCC pin, and an external 3.3V power supply should be input and connected to the CH340 chip.
The operating voltage of other circuits cannot exceed 3.3V.

The IO of CH340X and CH340C/N starting with batch number 4 supports 5V withstand voltage to prevent inward current backflow.

CH340K not only prevents inward current backflow, but also reduces the external driving capability, which can reduce the outward current backflow of CH340.

The CH340 chip automatically supports USB device suspension to save power consumption. When the NOS# pin is at a low level, USB device suspension is prohibited.

The DTR# pin of the CH340G/C/T/K chip is used as a configuration input pin before the USB configuration is completed. It can be connected to a 4.7Kÿ pull-down resistor.
The resistor generates a default low level during USB enumeration, requesting more power current from the USB bus via the configuration descriptor.

The CH340 chip has built-in USB pull-up resistors, and the UD+ and UD- pins should be directly connected to the USB bus.

The pins of the CH340 chip in asynchronous serial port mode include: data transmission pin, MODEM contact signal pin, and auxiliary pin.

Data transmission pins include: TXD pin and RXD pin. When the serial port input is idle, RXD should be high level.
If the R232 pin is high and the auxiliary RS232 function is enabled, an inverter is automatically inserted into the RXD pin.
When the serial port output is idle, the TXD of the CH340G/C/N/E/X/B/T chip is high level, and the TXD of the CH340K chip is weak.
The TXD of CH340R chip is at a high level, and the TXD of CH340R chip is at a low level.

MODEM communication signal pins include: CTS# pin, DSR# pin, RI# pin, DCD# pin, DTR# pin, RTS# pin,
CH340C also provides OUT# pin. All these MODEM communication signals are controlled and defined by computer application.

Auxiliary pins include: IR#, R232, CKO, ACT#, TNOW. IR# low level will start
Use infrared serial port mode. R232 pin is used to control auxiliary RS232 function. When R232 is high level, RXD pin input is automatically inverted.
The ACT# pin is the USB device configuration completion status output (for example, the USB infrared adapter is ready). The TNOW pin indicates that CH340 is high.
Data is being sent from the serial port. After the sending is completed, it is low level. In half-duplex serial port modes such as RS485, TNOW can be used to indicate the serial port status.
The IR# and R232 pins are only checked once after a power-on reset.

5.2. CH340B configuration information

The CH340B chip also provides an EEPROM configuration data area, which can be used to set the production data for each chip through a dedicated computer tool software.
The configuration data area is shown in the following table.

Byte address abbreviation		Description of the configuration	default value
00H	SAY	data area For CH340B: Internal configuration information valid flag, must be 5BH. For CH340H/S: External configuration chip valid flag, must be 53H. Other values are invalid.	00H
01H	MODE	Serial port mode, must be 23H	23H
02H	CFG	specific configuration, bit 5 is used to configure the product serial number string: 0 = valid; 1 = invalid	FEH WP
03H		internal configuration information write protection flag, 57H is read-only, otherwise it can be rewritten	00H
05Hÿ04H	VID	Vendor ID, manufacturer identification code, high byte at the end, any value. If set to 0000H or 0FFFFH, VID and PID use the manufacturer's default values.	1A86H
07Hÿ06H	PID	Product ID, product identification code, high byte at the end, any value	7523H
0AH	PWR	Max Power, the maximum supply current in 2mA units	31H
17Hÿ10H	SN	Serial Number: product serial number ASCII string, length is 8. If the first byte is not an ASCII character (21H to 7FH), the serial number is disabled.	12345678
3FHÿ1AH	PROD	For CH340B: Product String, product description Unicode string. The first byte is the total number of bytes (not exceeding 26H), the second byte is 03H, and the following are Unicode string, if it does not meet the above characteristics, the manufacturer's default description is used	First byte 00H Use default Product Description
Other Addresses		(Reserved Unit)	00H or FFH

5.3. DTR and Multi-mode MCU Download

For CH340X, the 6# pin is TNOW by default, with a weak pull-up during power-on or reset, and TNOW is output during normal operation. By adding a resistor to pin 6#, TNOW can be switched to DTR#. The two options are as follows:

ÿ. If a 4.7Kÿ pull-down resistor is connected to GND for pin 6#, the open source DTR enhanced mode will be entered, and pin 6# will automatically switch to The DTR# of the open source driver is used to connect the BOOT mode pin of the MCU. By default, DTR# is not output and is kept at a low level by an external resistor. However, the application can set the DTR# pin to output high level or not output, which is used for multi-mode MCU download with DTR# default low level.

ÿ If a 4.7Kÿ resistor is connected between pin 6# and pin 5#, the push-pull DTR enhancement mode will be entered, and pin 6# will automatically switch to The push-pull driven DTR# is used to connect the control pin of the MCU. The application can set the DTR# pin to output high or low level. Used for multi-mode MCU download with DTR# default high level.

For CH340C with batch number starting with 4 and the last 3 digits greater than B40, the 8# pin is OUT# by default and has a weak pull-up during power-on or reset. During normal operation, it is the OUT# output of the MODEM. If a 4.7Kÿ pull-down resistor is connected to the 8# pin, it will enter the open source DTR enhancement mode. Mode, 8# pin automatically switches to the second DTR# of the open source driver for connecting to the BOOT mode of the MCU. By default, the second DTR# is not output. The DTR# pin is held at a low level by an external resistor, but can be set by the application to output a high level or not output. In addition, the original DTR# of pin 13 is used for multi-mode MCU download with DTR# default high level.

5.4. Serial port features

CH340 has built-in independent transmit and receive buffers, supporting simplex, half-duplex or full-duplex asynchronous serial communication. Serial data includes 1 Low level start bit, 5, 6, 7 or 8 data bits, 1 or 2 high level stop bits, support odd/even/flag check/ Blank check. CH340 supports common communication baud rates: 50, 75, 100, 110, 134.5, 150, 300, 600, 900, 1200, 1800ÿ2400ÿ3600ÿ4800ÿ9600ÿ14400ÿ19200ÿ28800ÿ33600ÿ38400ÿ56000ÿ57600ÿ76800ÿ115200ÿ 128000, 153600, 230400, 460800, 921600, 1500000, 2000000, etc.

For applications with unidirectional 1Mbps and above, or bidirectional 500Kbps and above, it is recommended to use CH343 to enable hardware automatic flow control.

The baud rate error of the CH340 serial port receiving signal is about 2%, and the baud rate error of the CH340G/CH340T/CH340R serial port sending signal is about 2%. The difference is less than 0.3%, and the baud rate error of the CH340C/340N/340K/340E/340X/340B serial port sending signal is less than 1.2%.

In the Windows operating system on the computer side, the CH340 driver can emulate the standard serial port, so most of the original serial port Applications are fully compatible and usually do not require any modifications.

CH340 can be used to upgrade the original serial port peripherals, or to add additional serial ports to the computer through the USB bus. The conversion device can further provide RS232, RS485, RS422 and other interfaces.

CH340R only needs to add an infrared transceiver, and you can add a SIR infrared adapter to the computer through the USB bus to achieve computing

Infrared communication between the machine and external devices that comply with the IrDA specification.

6. Parameters

6.1. Absolute maximum values (critical or exceeding the absolute maximum values may cause the chip to malfunction or even be damaged)

name	Parameter Description		Minimum	Maximum	Unit
FACING	At work Ambient temperature	CH340G/CH340T/CH340R	-40	85	ÿ
		CH340C/CH340N/CH340K/CH340E/CH340B	-20	70	ÿ
		CH340X/CH340C/N starting with batch number 4	-40	85	ÿ
TS	Storage environment		-55	125	ÿ
VCC	temperature Power supply voltage (VCC connected to		-0.5	6.0	In
SAW	power supply, GND connected to ground) Voltage on input or output pin		-0.5	VCC+0.5	In

6.2. 5V electrical parameters (test conditions: TA=25ÿ, VCC=5V, excluding the pins connected to the USB bus)

Name	Parameter Description		Min	Typ	Max	Unit
VCC	power supply voltage V3 pin only connects to external capacitor, not connected to		4.0	5	5.3	In
ICC	VCC when working power supply current	CH340G/C/N/K/E/X/T/R Total		7	20	m.a.
		CH340B		6	15	m.a.
ISLP	USB Suspend Total supply current	CH340G/K/T/R/B		0.09	0.2	m.a.
		CH340C/N/E/X Low		0.05	0.15	m.a.
WILL	level input voltage		0		0.9	In
HIV	High level input voltage		2.3		VCC	In
VOL	Low level output voltage (6mA sink current)				0.5	In
VOH	High level output voltage (2mA output current) (Only 100uA output current during chip reset)		VCC-0.6			In
IUP	Input current of the input terminal with built-in pull-up resistor		3	150	300	a
IDN	Input current of the input terminal with built-in pull-down resistor -40 V Power-			-100	-300	a
VR	on reset voltage threshold		2.4	2.6	2.8	In

6.3. 3.3V electrical parameters (test conditions: TA=25ÿ, VCC=V3=3.3V, excluding the pins connected to the USB bus)

name	Parameter Description			Min	Typ	Max	Unit
VCC	Power Supply Voltage	V3 pin connection VCC Pin	CH340G/T/R	2.9	3.3	3.6	In
			CH340C/N/K/E/X/B	3.1	3.3	3.6	
ICC	At work Total supply current		CH340G/C/N/K/E/X/T/R		4	12	m.a.
			CH340B		3	9	m.a.
ISLP	USB Suspend Total supply current		CH340G/K/T/R/B		0.08	0.2	m.a.
			CH340C/N/E/X		0.04	0.15	m.a.
WILL	Low-level input voltage			0		0.8	In
HIV	High-level input voltage			1.9		VCC	In
VOL	Low-level output voltage (4mA sink current)					0.5	In
VOH	High-level output voltage (2mA output current) (Only 40uA output current during chip reset)			VCC-0.6			In
IUP	Input current of the input terminal with built-in pull-up resistor			3	70	200	a
IDN	Input current of the input terminal with built-in pull-down resistor -30 Power-on				-70	-200	a
VR	reset voltage threshold			2.4	2.6	2.8	In

6.4. Timing parameters (test conditions: TA=25ÿ, VCC=5V or 3.3V)

name	Parameter Description	Min	Typ	Max	Unit
FCLK	Frequency of the input clock signal at the XI pin	11.98	12.00	12.02	MHz
TPR	Reset time after power-on	20	35	50	mS

7. Application

7.1. USB to 9 -wire serial port (see the figure below)

The following figure shows the USB to RS232 serial port conversion implemented by CH340T (or CH340C/B). CH340 provides commonly used serial port signals and MODEM Signal, through the level conversion circuit U8 to convert the TTL serial port to RS232 serial port, port P11 is DB9 pin, its pin and function are the same as The same as the ordinary 9-pin serial port of the computer, similar models of U8 include MAX213/ADM213/SP213/MAX211, etc.

If you only need to implement USB to TTL serial port conversion, you can remove U8 and capacitors C46/C47/C48/C49/C40 in the figure. The signal lines can only be connected to RXD, TXD and the common ground line. Other signal lines can be selected as needed and can be left floating when not needed.

P2 is a USB port. The USB bus includes a pair of 5V power lines and a pair of data signal lines. Usually, the +5V power line is red. The ground wire is black, the D+ signal wire is green, and the D- signal wire is white. The maximum current provided by the USB bus is 500mA. Generally, CH340 chip and low-power USB products can directly use the 5V power provided by the USB bus.

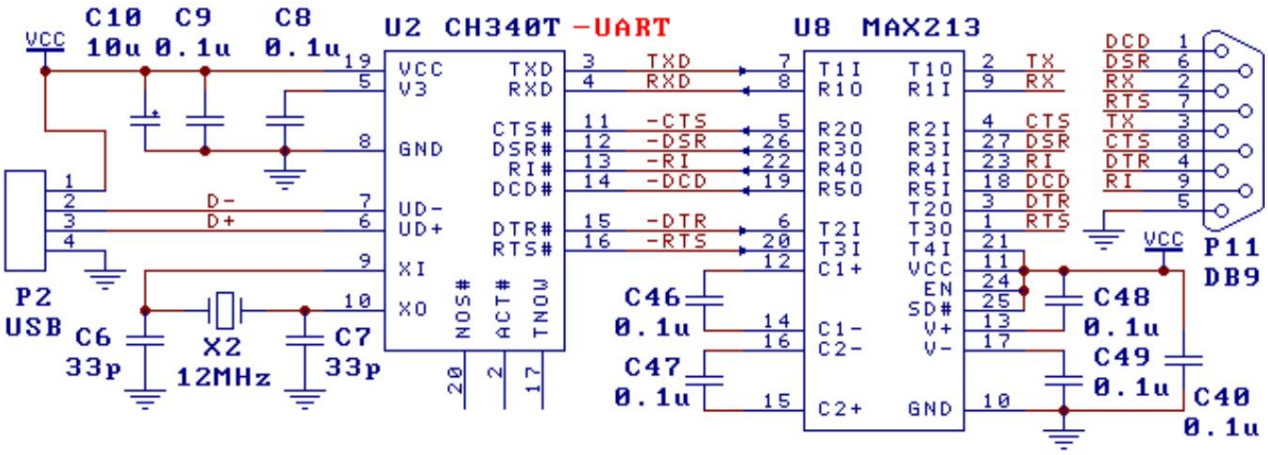
If the CH340 uses other power supply methods to provide standby power, then the CH340 should also use the standby power supply to avoid the problem of interference with the USB power supply. I/O current backflow. If you need to use the power of the USB bus at the same time, you can connect the USB bus through a resistor with a resistance of about 1ÿ. The 5V power line of the USB product is connected to the 5V standby power supply of the USB product, and the ground lines of the two are directly connected.

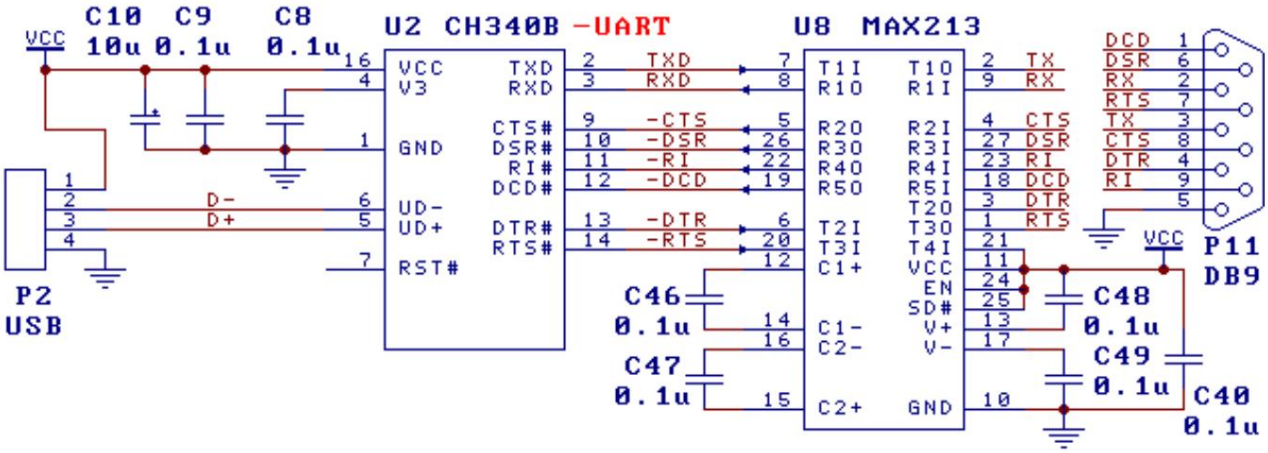
The capacitance of capacitor C8 of V3 pin is 0.1ÿF, which is used for decoupling the internal 3.3V power node of CH340. The capacitance of capacitor C9 is 0.1ÿF, which is used for External power supply decoupling.

For CH340G/T/R chips, crystal X2, capacitors C6 and C7 are used for the clock oscillation circuit. X2 is a quartz crystal with a frequency of 12MHz. C6 and C7 are monolithic or high-frequency ceramic capacitors with a capacity of 33pF. If X2 uses a low-cost ceramic crystal, then C6 and C7 The capacitance must be the value recommended by the crystal manufacturer, which is generally 47pF. For crystals that are difficult to oscillate, it is recommended that the capacitance of C6 be halved.

For CH340C/N/K/E/X/B chips, crystal X2 and capacitors C6 and C7 are not required.

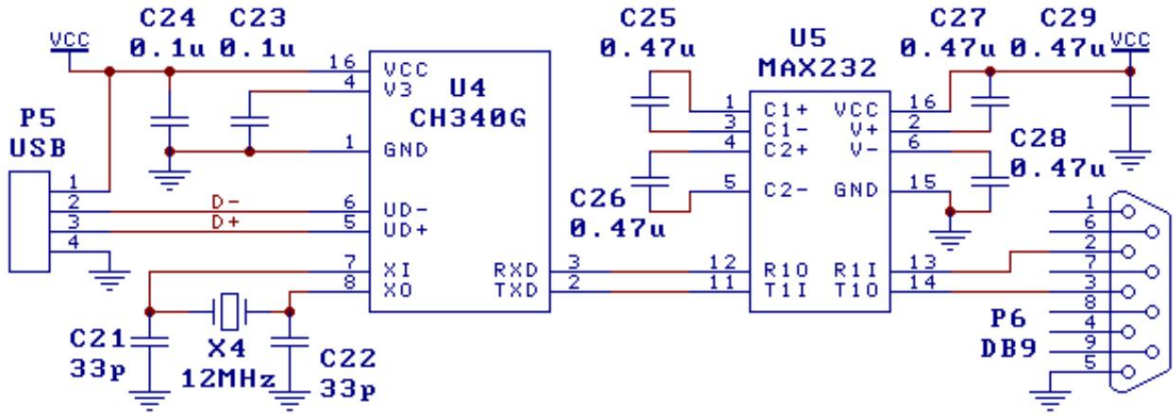
When designing the printed circuit board (PCB), please note that: decoupling capacitors C8 and C9 should be as close to the connected pins of CH340 as possible; D- signal lines should be laid in parallel, and ground wires or copper should be provided on both sides to reduce signal interference from the outside world; shorten XI and The length of the signal line related to the XO pin can be increased by surrounding the related components with ground wires or copper to reduce high-frequency interference.





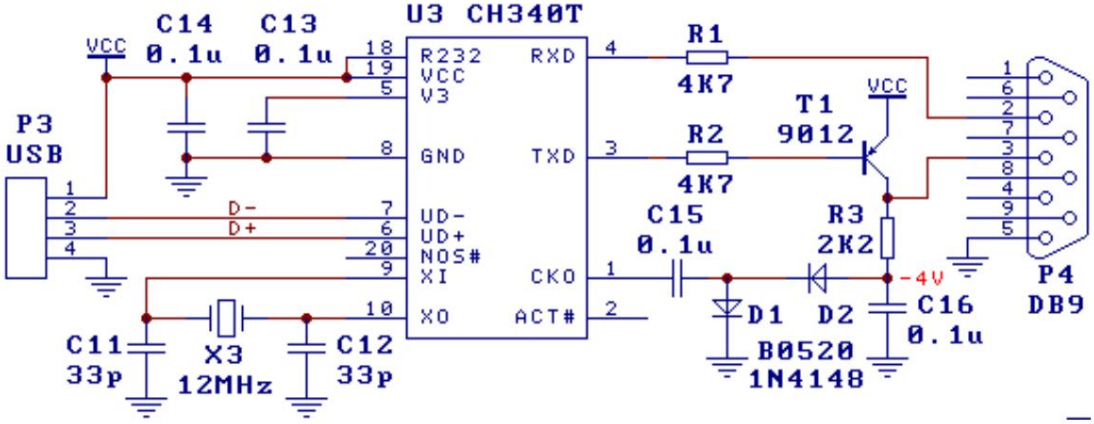
7.2. USB to RS232 serial port (below)

The picture shows the most basic and most commonly used 3-wire RS232 serial port from USB, U5 is MAX232/ICL232/SP232, etc. The signal lines not used by CH340 can be left floating. For CH340C/N/K/E/X/B chips, X4, C21 and C22 are not required.



7.3. USB to RS232 serial port, simplified version (below)

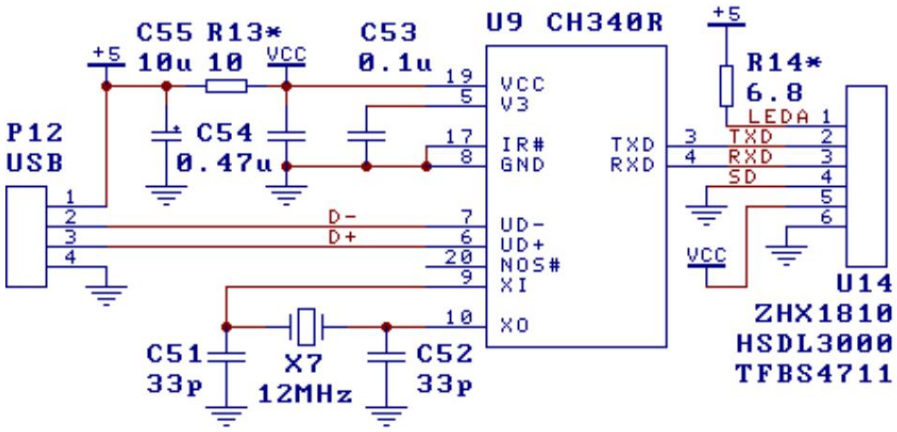
The figure also shows a USB to 3-wire RS232 serial port. This circuit has the same function as Section 7.2, except that the output RS232 signal level is slightly lower. The R232 pin of CH340 is high level, enabling the auxiliary RS232 function. Only diodes, transistors, resistors and capacitors are needed to replace the dedicated level conversion circuit U5 in Section 7.2, so the hardware cost is lower.



7.4. USB to RS485 serial port

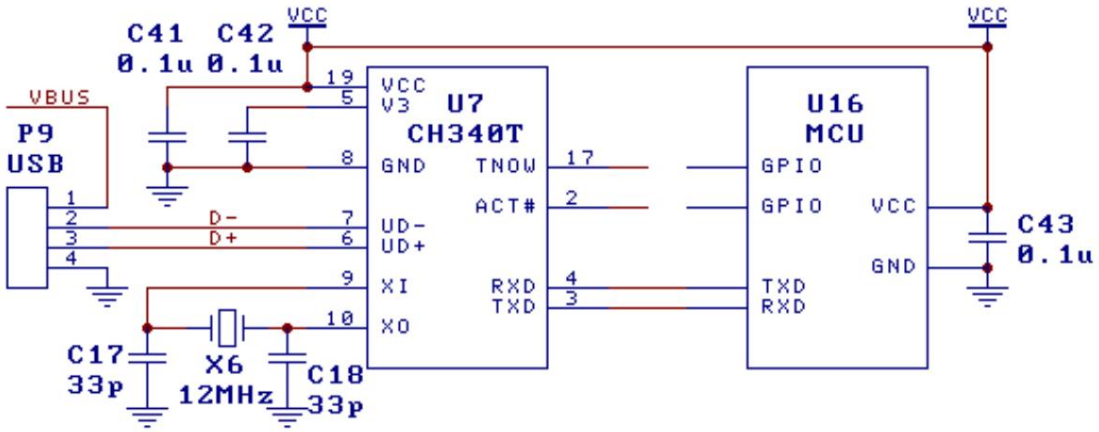
The TNOW pin can be used to control the DE (active high transmit enable) and RE# (active low receive enable) pins of the RS485 transceiver.

7.5. USB infrared adapter (below)



The above figure shows a USB infrared adapter composed of a USB to IrDA infrared chip CH340R and an infrared transceiver U14 (ZHX1810/HSDL3000 or similar models). Resistor R13 is used to reduce the impact of high current on other circuits during infrared transmission. It can be removed if the requirements are not high. The current limiting resistor R14 should be adjusted according to the recommended value of the manufacturer of the infrared transceiver U14 actually sele

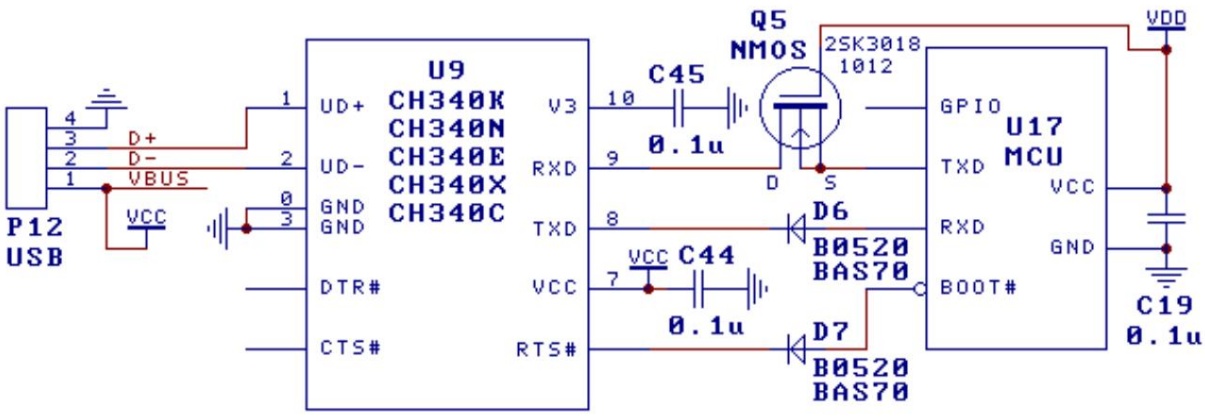
7.6. Connect to the MCU serial port and provide unified power supply (see the figure below)



The figure shows a reference circuit for USB communication with the MCU connected to the CH340 chip through a TTL serial port under unified power supply mode. This product uses self-power supply mode, VCC supports 5V or 3.3V (when VCC is 3.3V, V3 needs to be shorted to VCC), and does not use the USB bus power VBUS at all (if necessary, the MCU can detect whether it is effective after connecting a resistor in series with the I/O). CH340 and MCU use the same power supply VCC, so there is no situation where the dual power supplies between CH340 and MCU flow back each other through the I/O.

The signal lines not used by CH340 can be left floating. For CH340C/N/K/E/X/B chips, X6, C17 and C18 are not required.

7.7. Connect MCU, power each device separately, and prevent flooding in both directions (see the figure below)



The figure above is a reference circuit for USB communication between MCU and CH340 chip through TTL serial port in dual power supply mode. The USB bus supplies power to VBUS, and the MCU uses another power supply VDD, which supports 5V, 3.3V, and even 2.5V and 1.8V.

The RXD pin of the MCU in the figure should have an internal pull-up resistor enabled. If not, it is recommended to add a 2Kÿ~22Kÿ pull-up resistor to the RXD pin and connect it to the MCU power supply VDD. This

prevents external inrush when the CH340 is powered but the MCU is not powered. The diodes D6 and D7 and the NMOS tube Q5 in the figure are used to prevent the CH340 from flowing back to the power-off MCU through the MCU's RXD or TXD internal diodes in the dual power supply mode. The connection of D7 and RTS/BOOT0# is optional. The diode D6 is used to prevent the CH340's TXD high level from flowing back to the MCU through the MCU's RXD internal diode; the diode D7 is used to prevent the CH340's RTS high level from flowing back to the MCU through the MCU's BOOT internal diode; the NMOS tube Q5 is used to prevent the CH340's RXD internal pull-up current from flowing back to the MCU through the MCU's TXD internal diode.

Prevent internal inflow when CH340 is without power but MCU is powered. The IO of CH340K, CH340X, CH340C and CH340N starting with batch number 4 are automatically protected from internal inflow, that is, when CH340 is without power but MCU is powered, no inflow current will be generated. In addition, D6, D7 and Q5 can prevent CH340 from externally injecting current into the power-off MCU, so the above figure can achieve complete bidirectional protection against inflow.

For CH340 of other batches or models, an additional anti-inward injection circuit is required. Usually, an NMOS tube is connected in series with a Schottky diode to prevent bidirectional backflow. For example, a Schottky diode is connected in series at the drain D end of Q5 and its anode end is connected to the RXD of CH340, and an NMOS tube is connected in series between D6 and CH340 and its drain is connected to D6 and the gate is connected to the power supply VCC of CH340.

If it is determined that a certain situation will not occur, the corresponding NMOS tube or diode can be removed. For example, the IO of some MCU models supports anti-backflow or 5VT, or the MCU has a permanent self-contained power supply, so there is no need to worry about CH340 injecting current into the MCU. In this case, D6, D7, and Q5 can all be removed and short-

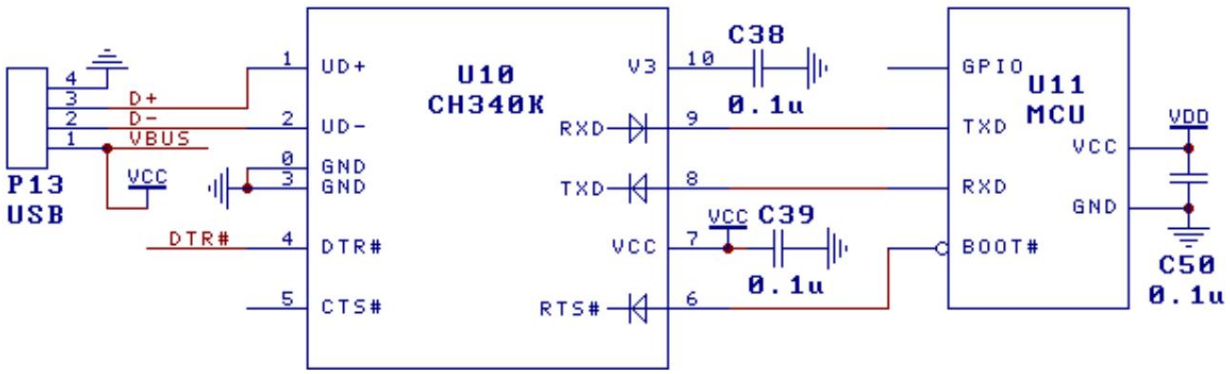
circuited. The diode should preferably use a low-power Schottky diode BAS70, BAT54, or B0520, etc.

NMOS tubes with low power and small capacitance should be used first, such as 2SK3018, 1012, etc. In

general, it is not recommended to power CH340 and MCU separately. If necessary, CH340K or

The USB to serial port chip CH343 has a VIO power pin that supports independent I/O power supply.

7.8. Connect MCU, power each, and prevent internal flooding (see the figure below)



The figure above is a reference circuit for USB communication between the MCU and CH340K chip through the TTL serial port in dual power supply mode. CH340K is powered by the USB bus VBUS (VCC), and the MCU uses another power supply VDD, which supports 5V, 3.3V, and even 2.5V and 1.8V. The bottom plate of the CH340K package is an optional GND pin, which can be connected to GND or left floating according to the PCB routing.

The TXD and RTS# pins and RXD pins of the CH340K chip have built-in diodes to prevent current inflow (as shown in the figure), and a weak pull-up resistor of about 75Kÿ is built-in to maintain the high level in the default or idle state (not marked in the figure), which can not only achieve low-level drive and weak high-level drive, but also reduce the current backflow when the CH340K and MCU are powered independently. The CH340K can completely prevent the MCU power supply from inflowing current into the power-off CH340K, and can also reduce the current outflow of the CH340K power supply to the power-off MCU (no more than 150ÿA).

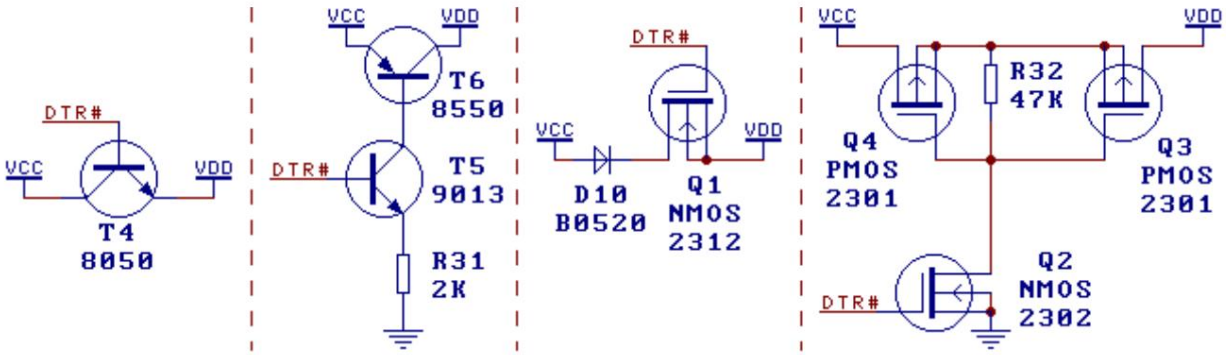
In addition, CH340X and CH340C and CH340N starting with batch number 4 can also completely prevent the MCU power supply from injecting current into the power-off CH340, thereby avoiding the CH340 from wasting the MCU power supply current after the USB power

is off. If you need to completely prevent the CH340K power supply from injecting current into the power-off MCU, refer to the figure in Section 7.7 to add NMOS and diodes. When used for communication baud rates above 120Kbps, it is recommended to enable a built-in or external 2Kÿ~22Kÿ pull-up for the MCU's RX pin Resistors, or choose other types of USB to serial port chips with VIO power pins that support independent I/O power supply.

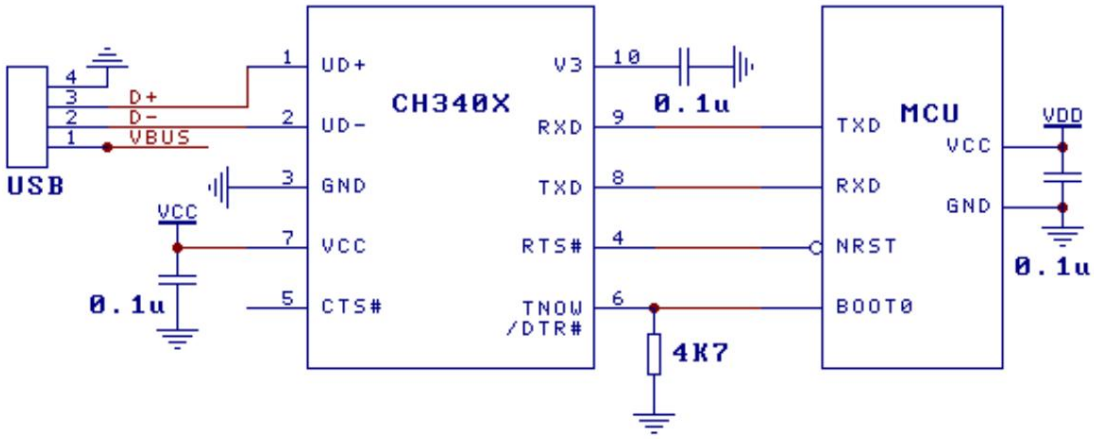
The DTR# pin of the CH340K chip is a normal push-pull output, and the CTS# pin is a normal input with a built-in pull-up resistor. Neither of these two pins has a built-in diode, nor does it have the function of preventing current backflow, and is generally not used to connect to the MCU.

DTR# can be used to control the power switch from VCC to VDD. As shown in the figure below, there are 4 power control schemes available.

The Q1 solution (Q1 should be an N-MOSFET with a lower Vth) is a simplified solution, with a VDD output voltage of about VCC-0.8V and a current not exceeding 200mA; the T6 solution and Q3 solution are complete solutions. In the figure, D10 is used to prevent VDD from supplying power to VCC, and is optional.



7.9. MCU USB one-key download (below)



The above figure is a reference circuit for one-key download of multi-mode MCU based on USB to serial port, which does not require manual setting or manual reset. The above figure is for MCU types: the MCU itself needs to support one-key download of serial port, NRST is a reset input terminal with low level validity, BOOT0 defaults to low level to select application, and high level to select Boot-Loader download. For example, 32F103, etc. The figure shows CH340X, and the 4.7Kÿ pull-down resistor can be selected from 3 to 5.6Kÿ. This resistor also serves as the MCU's BOOT0 pull-down resistor. For For CH340C with batch number starting with 4 and the last 3 digits greater than B40, you can use OUT# with a pull-down resistor as the second DTR# connected to BOOT0.

Note: For other MCUs with opposite BOOT mode levels, you can directly use CH340C/G's DTR# control (default high level), or The other uses the DTR# control of CH340X with a resistor between pins 6# and 5# (push-pull DTR enhancement mode, high level by default).

MCU normal working state: The pull-down resistor makes CH340X enter the open source DTR enhanced mode, and the 6# pin is switched to DTR#. No output is recognized, BOOT0 remains at a low level, RTS# defaults to a high level, and the MCU runs the application program normally.

One-key download: Open the serial port with the download tool on the computer, set DTR# to high level, set RTS# to low level, and then high level, and the MCU enters the BOOT download program. After the download is complete, set DTR# to low level, set RTS# to low level, and then high level, and the MCU runs the application program normally. Keep DTR# unchanged before closing the serial port. Note that the MODEM data and pin level are inverted.

Unified power supply mode: CH340X uses the same 5V or 3.3V power supply as the MCU. The disadvantage is that CH340X will consume tens of uA of sleep power. flow.

Independent power supply mode: CH340X uses the VBUS power supply of USB, and does not consume the MCU power supply current at all. After CH340X itself is powered off, it basically does not affect the MCU's IO, but it is necessary to avoid the situation where some MCUs are powered by USB but not MCU. If you need to completely prevent the CH340 power supply from externally pouring current into the power-off MCU, refer to the figure in Section 7.7 to add NMOS and diodes.

If the NRST pin needs to support additional manual reset, a 1~2Kÿ resistor can be connected in series between RTS# and NRST, or a diode with the anode connected to NRST can be connected.