



第七讲：CDC串口设备案例

USB技术 应用与开发

演讲人：蔡亮

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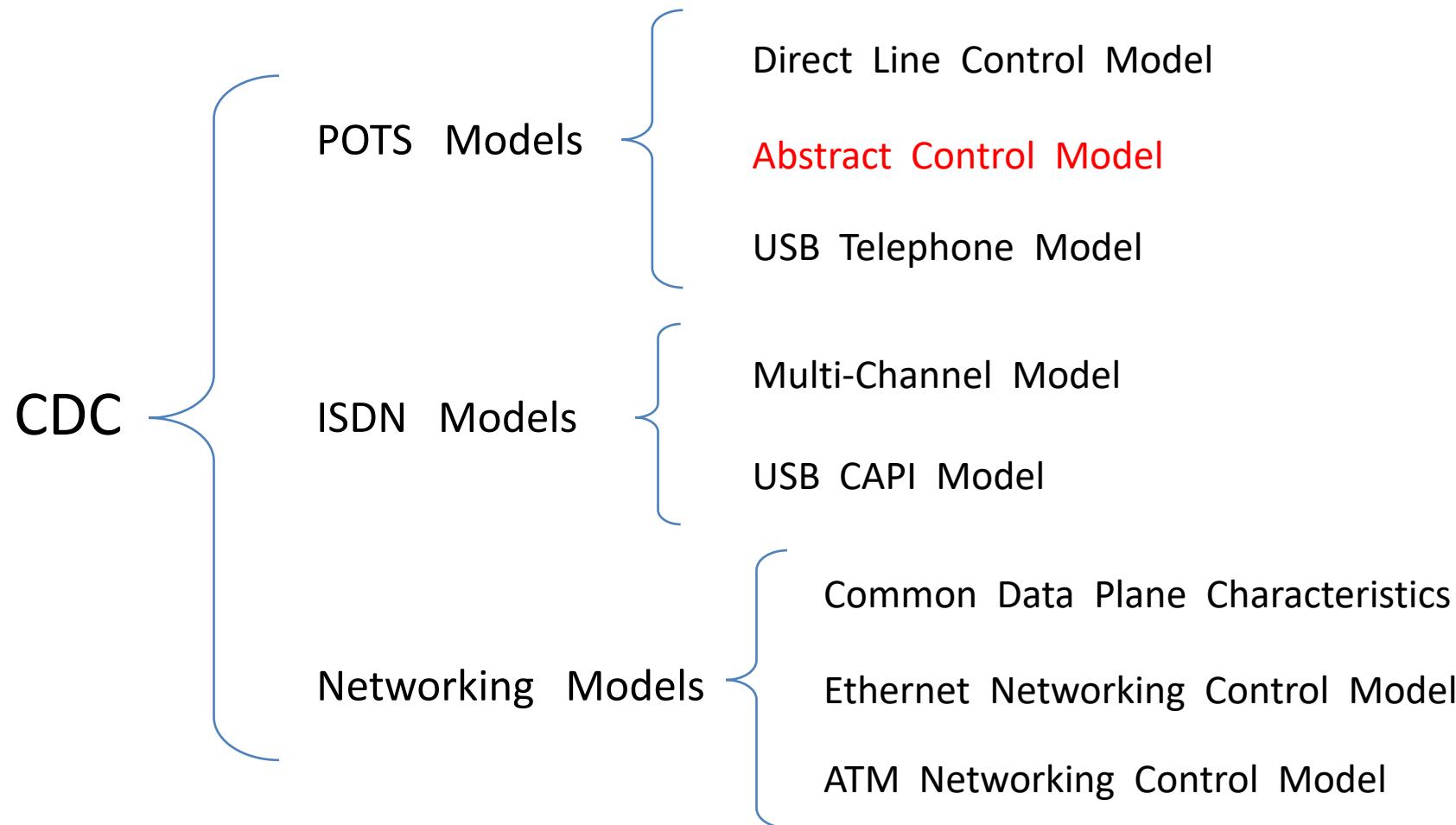
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CDC – Communication Device Class

USB通讯设备类



01

描述符及类请求

U盘描述符



Table 20: Communication Device Class Descriptor Requirements

Offset	Field	Size	Value	Description
4	<i>bDeviceClass</i>	1	02h	Communication Device Class code as defined in Table 14.
5	<i>bDeviceSubClass</i>	1	00h	Communication Device Subclass code, unused at this time.
6	<i>bDeviceProtocol</i>	1	00h	Communication Device Protocol code, unused at this time.

Table 14: Communication Device Class Code

Code	Class
02h	Communication Device Class

U盘描述符

使用USB协议标准配置描述符



Table 4.4 - Configuration Descriptor

Offset	Field	Size	Value	Description										
0	<i>bLength</i>	Byte	09h	Size of this descriptor in bytes.										
1	<i>bDescriptorType</i>	Byte	02h	CONFIGURATION Descriptor Type.										
2	<i>wTotalLength</i>	Word	????h	Total length of data returned for this configuration. Includes the combined length of all descriptors (configuration, interface, endpoint, and class- or vendor-specific) returned for this configuration.										
4	<i>bNumInterfaces</i>	Byte	??h	Number of interfaces supported by this configuration. The device shall support at least the Bulk-Only Data Interface.										
5	<i>bConfigurationValue</i>	Byte	??h	Value to use as an argument to the <i>SetConfiguration()</i> request to select this configuration.										
6	<i>iConfiguration</i>	Byte	??h	Index of string descriptor describing this configuration.										
7	<i>bmAttributes</i>	Byte	?0h	Configuration characteristics: <table><thead><tr><th>Bit</th><th>Description</th></tr></thead><tbody><tr><td>7</td><td>Reserved (set to one)</td></tr><tr><td>6</td><td>Self-powered</td></tr><tr><td>5</td><td>Remote Wakeup</td></tr><tr><td>4..0</td><td>Reserved (reset to zero)</td></tr></tbody></table> <p>Bit 7 is reserved and must be set to one for historical reasons. For a full description of this <i>bmAttributes</i> bitmap, see the <i>USB 1.1 Specification</i>.</p>	Bit	Description	7	Reserved (set to one)	6	Self-powered	5	Remote Wakeup	4..0	Reserved (reset to zero)
Bit	Description													
7	Reserved (set to one)													
6	Self-powered													
5	Remote Wakeup													
4..0	Reserved (reset to zero)													
8	<i>MaxPower</i>	Byte	??h	Maximum power consumption of the USB device from the bus in this specific configuration when the device is fully operational. Expressed in 2mA units (i.e. 50 = 100mA)										

U盘描述符



Table 21: Communication Class Interface Descriptor Requirements

Offset	Field	Size	Value	Description
5	<i>bInterfaceClass</i>	1	Class	Communication Interface Class code, as defined in Table 15.
6	<i>bInterfaceSubClass</i>	1	SubClass	Communication Interface SubClass code, as defined in Table 16.
7	<i>bInterfaceProtocol</i>	1	Protocol	Communication Interface Class Protocol code, which shall be the same as the previous field, is defined in Table 17.

02h: Communication Interface Class

02h: Abstract Control Model

00h: No class specific protocol required

Table 22: Data Class Interface Descriptor Requirements

Offset	Field	Size	Value	Description
5	<i>bInterfaceClass</i>	1	0Ah	Data Interface Class code, as defined in Table 18.
6	<i>bInterfaceSubClass</i>	1	00h	Data Class SubClass code.
7	<i>bInterfaceProtocol</i>	1	Protocol	Data Class Protocol code, which shall be the same as the previous field, is defined in Table 19.

00h: No class specific protocol required



Table 23: Functional Descriptor General Format

Offset	Field	Size	Value	Description
0	<i>bFunctionLength</i>	1	Number	Size of this descriptor.
1	<i>bDescriptorType</i>	1	Constant	CS_INTERFACE, as defined in Table 24.
2	<i>bDescriptorSubtype</i>	1	Constant	Identifier (ID) of functional descriptor. For a list of the supported values, see Table 25.
3	(function specific data0)	1	Misc.	First function specific data byte. These fields will vary depending on the functional descriptor being represented.
...
N+2	(functional specific data N-1)	1	Misc.	Nth function specific data byte. These fields will vary depending on the functional descriptor being represented.

U盘描述符

使用USB协议标准配置描述符



Table 4.6 - Bulk-In Endpoint Descriptor

Offset	Field	Size	Value	Description								
0	<i>bLength</i>	Byte	07h	Size of this descriptor in bytes.								
1	<i>bDescriptorType</i>	Byte	05h	ENDPOINT Descriptor Type.								
2	<i>bEndpointAddress</i>	Byte	8?h	The address of this endpoint on the USB device. The address is encoded as follows: <table><thead><tr><th>Bit</th><th>Description</th></tr></thead><tbody><tr><td>3..0</td><td>The endpoint number</td></tr><tr><td>6..4</td><td>Reserved, set to 0</td></tr><tr><td>7</td><td>1 = In</td></tr></tbody></table>	Bit	Description	3..0	The endpoint number	6..4	Reserved, set to 0	7	1 = In
Bit	Description											
3..0	The endpoint number											
6..4	Reserved, set to 0											
7	1 = In											
3	<i>bmAttributes</i>	Byte	02h	This is a Bulk endpoint.								
4	<i>wMaxPacketSize</i>	Word	00??h	Maximum packet size. Shall be 8, 16, 32 or 64 bytes (08h, 10h, 20h, 40h).								
6	<i>bInterval</i>	Byte	00h	Does not apply to Bulk endpoints.								

Table 4.7 – Bulk-Out Endpoint Descriptor

Offset	Field	Size	Value	Description								
0	<i>bLength</i>	Byte	07h	Size of this descriptor in bytes.								
1	<i>bDescriptorType</i>	Byte	05h	ENDPOINT descriptor type.								
2	<i>bEndpointAddress</i>	Byte	0?h	The address of this endpoint on the USB device. This address is encoded as follows: <table><thead><tr><th>Bit</th><th>Description</th></tr></thead><tbody><tr><td>3..0</td><td>Endpoint number</td></tr><tr><td>6..4</td><td>Reserved, set to 0</td></tr><tr><td>7</td><td>0 = Out</td></tr></tbody></table>	Bit	Description	3..0	Endpoint number	6..4	Reserved, set to 0	7	0 = Out
Bit	Description											
3..0	Endpoint number											
6..4	Reserved, set to 0											
7	0 = Out											
3	<i>bmAttributes</i>	Byte	02h	This is a Bulk endpoint.								
4	<i>wMaxPacketSize</i>	Word	00??h	Maximum packet size. Shall be 8, 16, 32 or 64 bytes (08h, 10h, 20h, or 40h).								
6	<i>bInterval</i>	Byte	00h	Does not apply to Bulk endpoints.								

类请求

GetLineCoding

bmRequestType	bRequest	wValue	wIndex	Wlength	Data
10100001B	GET_LINE_CODING	Zero	Interface	Size of Structure	Line Coding Structure

21h

SetLineCoding

bmRequestType	bRequest	wValue	wIndex	WLength	Data
00100001B	SET_CONTROL_LINE_STATE	Control Signal Bitmap	Interface	Zero	None

20h

Offset	Field	Size	Value	Description
0	<i>dwDTERate</i>	4	Number	Data terminal rate, in bits per second.
4	<i>bCharFormat</i>	1	Number	Stop bits 0 - 1 Stop bit 1 - 1.5 Stop bits 2 - 2 Stop bits
5	<i>bParityType</i>	1	Number	Parity 0 - None 1 - Odd 2 - Even 3 - Mark 4 - Space
6	<i>bDataBits</i>	1	Number	Data bits (5, 6, 7, 8 or 16).

类请求

SetControlLineState

bmRequestType	bRequest	wValue	wIndex	WLength	Data
00100001B	SET_CONTROL_LINE_STATE	Control Signal Bitmap	Interface	Zero	None

22h

Bit position	Description
D15..D2	RESERVED (Reset to zero)
D1	Carrier control for half duplex modems. This signal corresponds to V.24 signal 105 and RS-232 signal RTS. 0 - Deactivate carrier 1 - Activate carrier The device ignores the value of this bit when operating in full duplex mode.
D0	Indicates to DCE if DTE is present or not. This signal corresponds to V.24 signal 108/2 and RS-232 signal DTR. 0 - Not Present 1 - Present

类请求

SerialState

bmRequestType	bNotification	wValue	wIndex	wLength	Data
10100001B	SERIAL_STATE	Zero	Interface	2	UART State bitmap

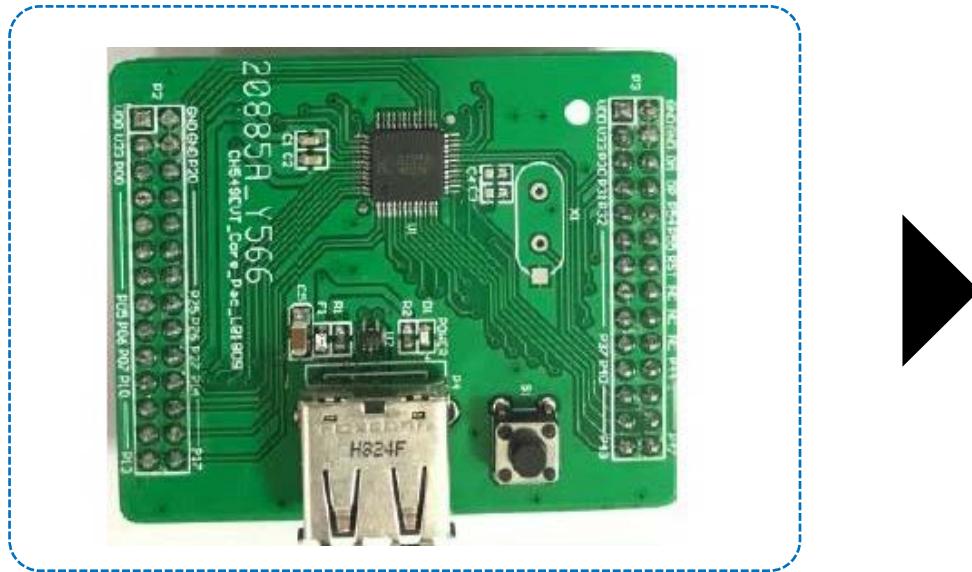
Bits	Field	Description
D15..D7		RESERVED (future use)
D6	<i>bOverRun</i>	Received data has been discarded due to overrun in the device.
D5	<i>bParity</i>	A parity error has occurred.
D4	<i>bFraming</i>	A framing error has occurred.
D3	<i>bRingSignal</i>	State of ring signal detection of the device.
D2	<i>bBreak</i>	State of break detection mechanism of the device.
D1	<i>bTxCarrier</i>	State of transmission carrier. This signal corresponds to V.24 signal 106 and RS-232 signal DSR.
D0	<i>bRxCarrier</i>	State of receiver carrier detection mechanism of device. This signal corresponds to V.24 signal 109 and RS-232 signal DCD.

02

软件实现及效果演示

硬件平台

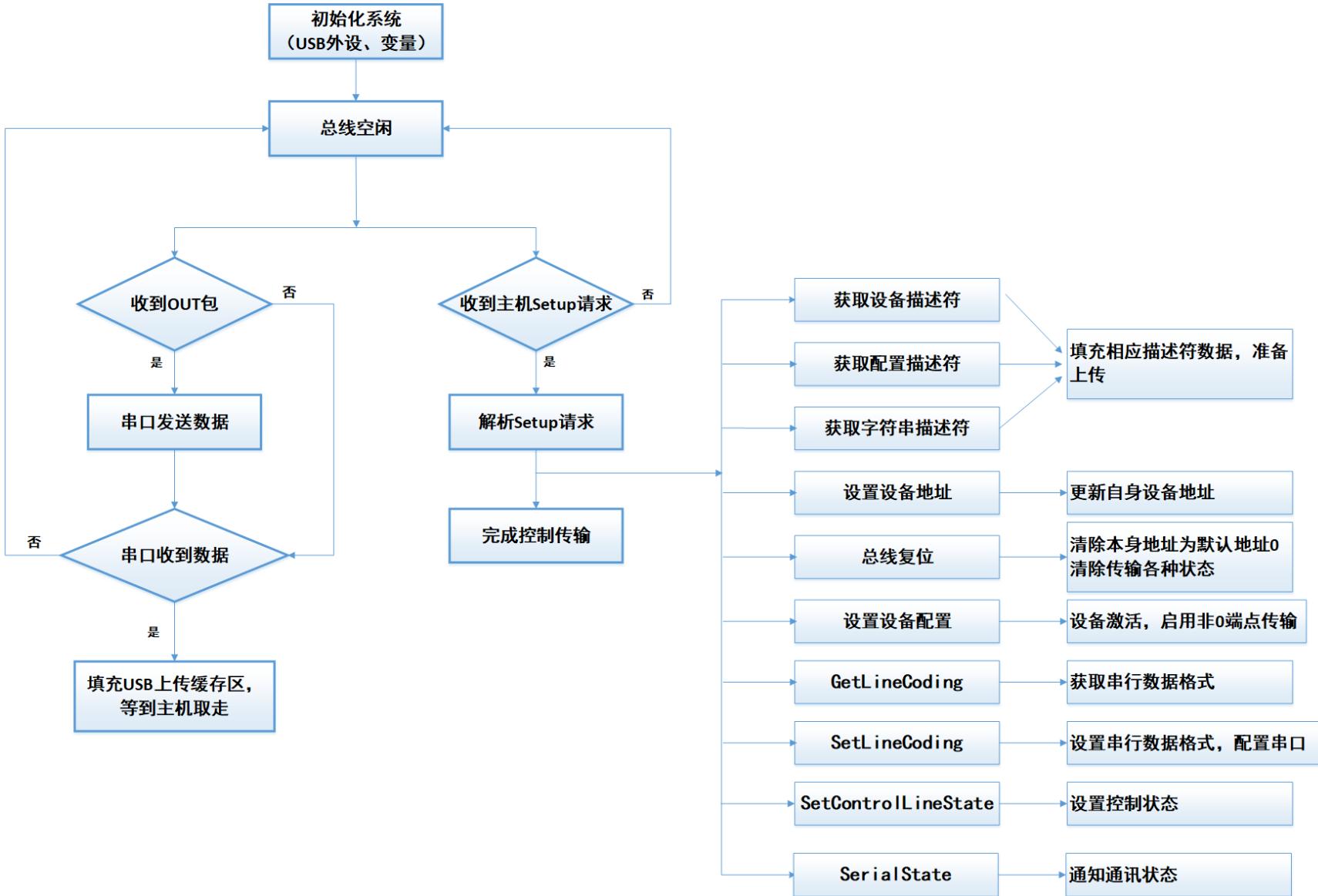
应用：以CH549为例，作为USB主机，识别接入的USB设备，并找出HID类设备获取有效数据



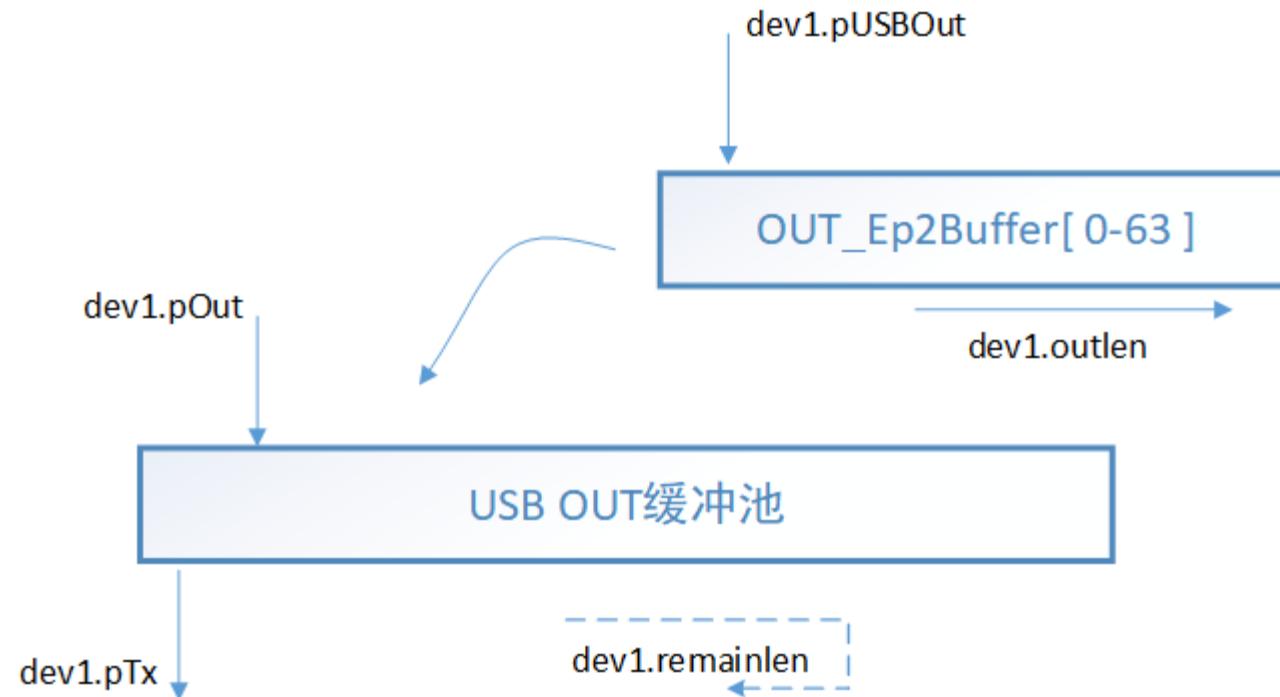
供电：3.3V和5V供电系统皆可
最简外围：只需2个退耦电容
USB功能：USB主设备或者USB从设备
下载方式：串口或者USB口下载

Part NO.	Freq/Max	Flash	RAM	DataFlash	USB	TouchKey	Type-C	ADC	LEDC	Timer	CAP	PWM	UART	SPI	I/O	Built-in OSC/WDOG	VDD/V	Package
CH549	L	12/48MHz	63K	2K+256	1K	1*H/1*D	16	✓	-	3*16b	3	8	4	1	44	✓/✓	3.3/5	LQFP48
	F	12/48MHz	63K	2K+256	1K	1*H/1*D	10	✓	-	3*16b	2	5	4	1	25	✓/✓	3.3/5	QFN28
	G	12/48MHz	63K	2K+256	1K	1*H/1*D	5	✓	-	3*16b	2	3	2	1	13	✓/✓	3.3/5	SOP16

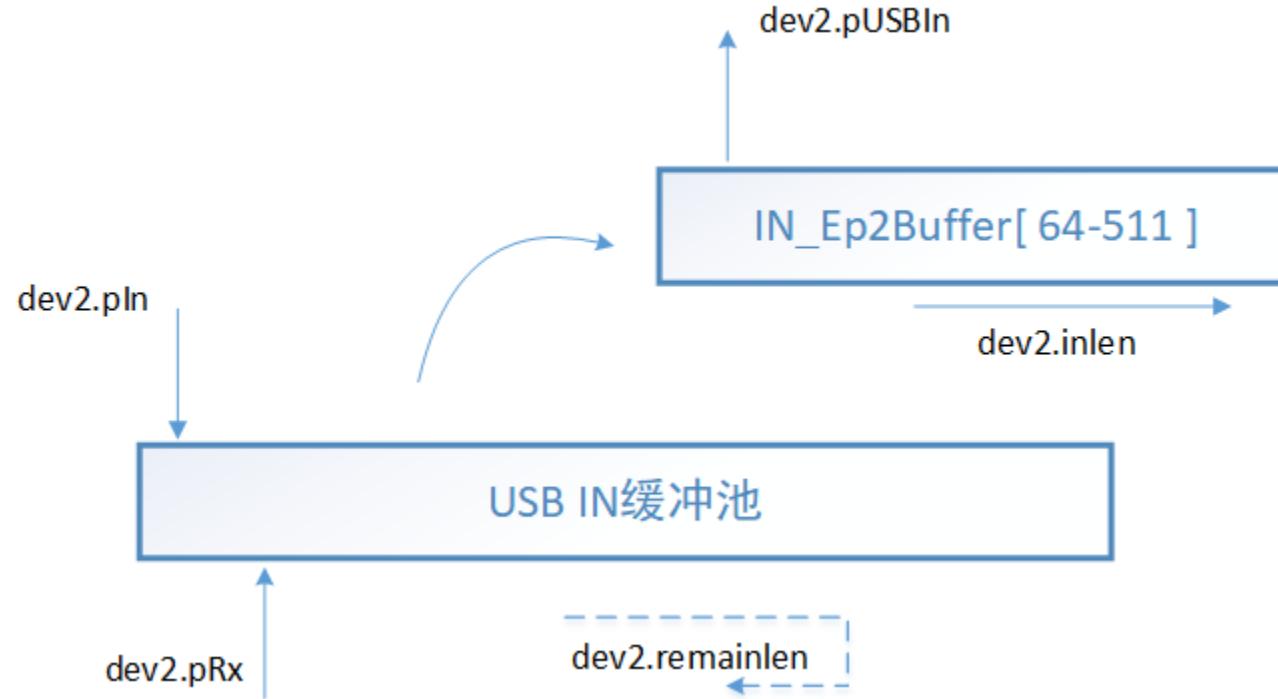
软件框架



USB下传接串口发送处理



USB上传及串口接收处理



03

inf 文件

inf 文件



作用：指定VID/PID，关联到系统中的usbser.sys文件，一般在Win10以下版本中需要提供此文件，用于安装系统驱动



Thank you

感谢观赏



微信公众号

<http://wch.cn>
tech@wch.cn
025-84730668