

High-speed USB Converter Chip CH347 Evaluation Board Description and Application Reference

Version: 1C

<http://wch.cn>

1. Introduction

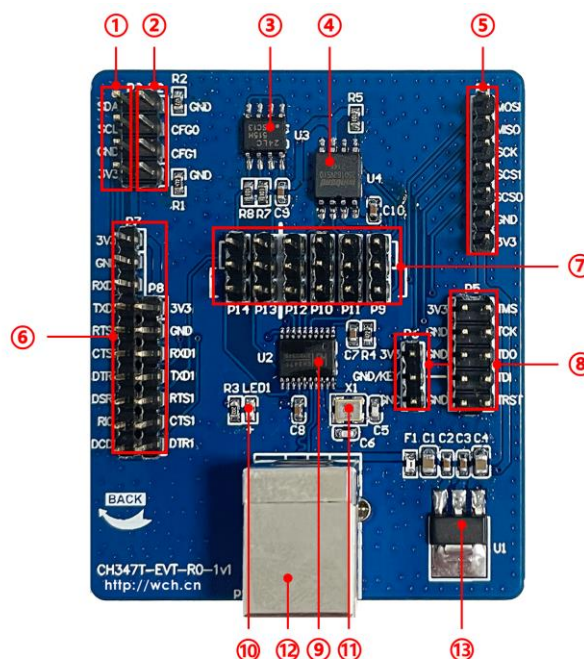
CH347 evaluation board is used to demonstrate interface functions of 480Mbps high-speed USB convert chip CH347 for USB to UART/HID, USB to UART/ SPI/I2C/JTAG/GPIO, programming of EEPROM and FLASH. CH347 has built-in EEPROM. Configure parameters such as VID, PID, vendor and product information string, etc. can be configured by software CH34xSercfg.exe.

USB to UART of CH347 used to upgrade directly from normal serial product to USB 2.0. CH347 provides two high-speed UART which supports controlling RS485 to transmit-receive switch, hardware flow control, and common MODEM communication signals. USB to SPI interface (SCS line, SCK/CLK line, MISO/SDI/DIN line, MOSI/SDO/DOOUT line) can be used to control a variety of SPI-compatible devices or communicate with FPGA and other devices in high rate (up to 60MHz), USB to JTAG interface (TMS, TCK, TDI, TDO and TRST) can be used to operate CPU, DSP, FPGA, CPLD and other devices to achieve debug and download functions (up to 60MHz), USB to GPIO function can be used for simple digital I/O control. USB to I2C synchronous serial port (SCL line, SDA line) can be used to control various I2C compatible devices, such as serial EEPROM.

2. Evaluation board hardware

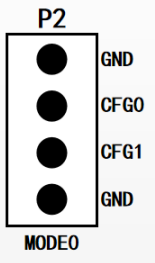
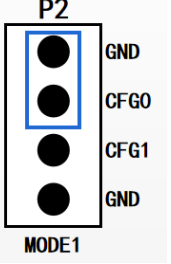
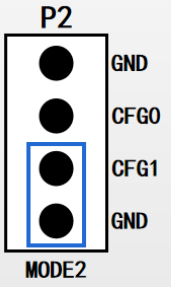
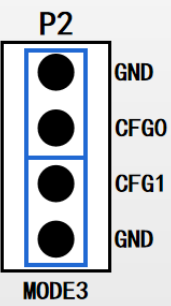
Refer to CH347SCH.pdf document for evaluation board design.

The physical picture of the evaluation board is shown below:



Function description of each unit:

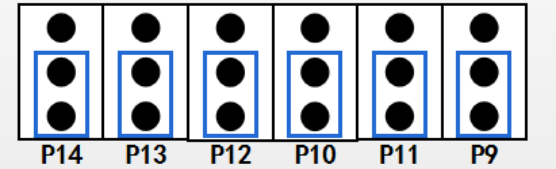
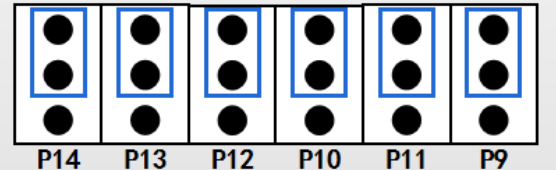
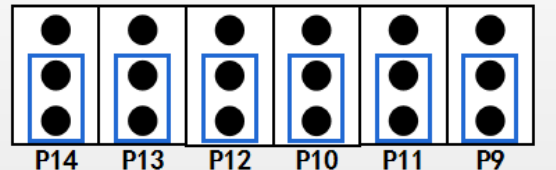
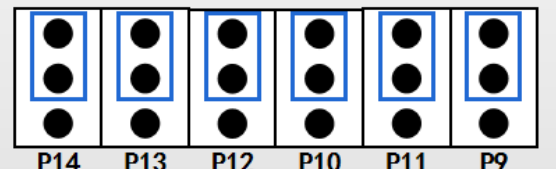
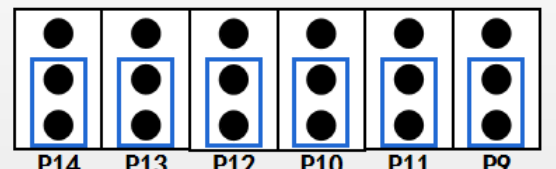
- ①: P3-I2C communication interface, led out by connector
- ②: CH347 switch pin of working mode (pin level is high in dangling state)

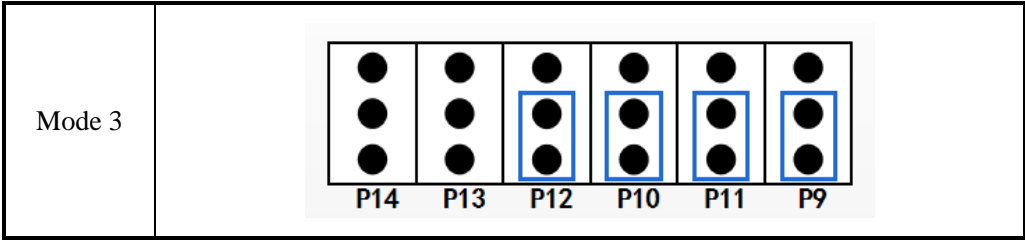
Mode	Mode Description	CFG0	CFG1	Evaluation board wiring diagram
Mode 0	USB to dual high-speed UART	1	1	
Mode 1	USB to single high-speed UART (VCP) +SPI+I2C	0	1	
Mode 2	USB to single high-speed UART (HID) +SPI+I2C	1	0	
Mode 3	USB to single high-speed UART (VCP) +JTAG	0	0	

- ③: EEPROM device 24C02, CH347 can operate this device in operating mode 1/2
- ④: FLASH device 25Q16, CH347 can operate this device in operating mode 1/2
- ⑤: P4-SPI communication interface, by connector out
- ⑥: TTL UART 0/1, led out through connector. Mode 0: Supports UART 0 and 1
Mode 1/2/3: Supports only UART 1
- ⑦: P9-P14 function pin configuration area

Connector	P14	P13	P12	P10	P11	P9
1	SDA	SCL	MOSI	MISO	SCK	CS0
2	RXD0/ SDA	RI0/ SCL	TXD0/MOSI/ TDI	RTS0/MISO/ TDO	CTS0/SCK/ TCK	DSR0/CS0/ TMS
3	RXD0	RI0/ GP3	TXD0	RTS0/GP1	CTS00/GP0	DSR0/GP2

Pin configuration connections in different modes

MODE	Pin area configuration (Unmarked areas are not connected)
Mode 0	 <p>P14 P13 P12 P10 P11 P9</p>
Mode 1	 <p>P14 P13 P12 P10 P11 P9</p> <p>EEPROM and FLASH on operation board</p>  <p>P14 P13 P12 P10 P11 P9</p> <p>Use SPI+I2C interface</p>
Mode 2	 <p>P14 P13 P12 P10 P11 P9</p> <p>EEPROM or FLASH on operation board</p>  <p>P14 P13 P12 P10 P11 P9</p> <p>Use SPI+I2C interface</p>



- ⑧: P5, P6-JTAG communication interface, by connector out
- ⑨: Main control chip CH347T
- ⑩: LED1-ACT pin indicator, which indicates the USB configuration status
- ⑪: Passive crystals, frequency is 8MHz
- ⑫: P1-USB interface, connected to USB host via USB data cable
- ⑬: U1-3.3V voltage conversion chip, converts VBUS of USB interface to 3.3V for main chip power supply, during design, CH347T and peripherals can be powered by an external 3.3V power supply.

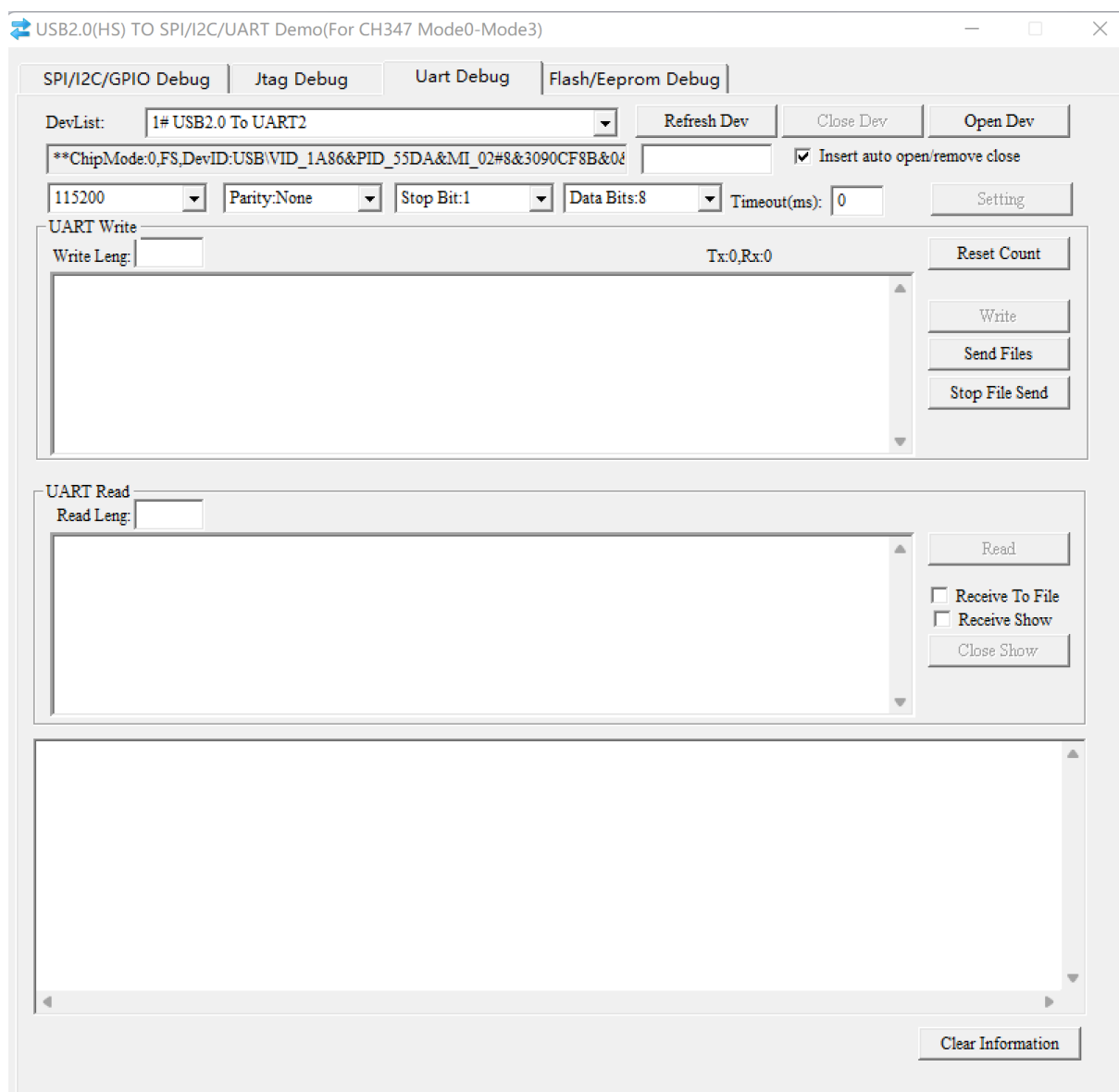
3. Function descriptions and software usage introduction

CH347Demo is a functional demonstration software used for USB to SPI, JTAG, I2C, and UART, etc. of USB2.0 high-speed conversion chip CH347.

CH347Demo supports hot swap detection. The software automatically obtains and display the current working mode of CH347, supports device scan and automatic startup. You can use device event notification to obtain CH347 connection and disconnection status in real time. CH347DLL dynamic library monitors the plug and unplug of CH347 and provides functions for searching, opening, closing, and operating each hardware interface. For details, see *CH347 Application Development Manual.PDF*.

3.1. USB to UART

CH347 provides UART function in 4 working modes. With a HID UART in mode 2, a VCP UART in other modes, UART0 and UART1 in mode 0, and UART1 in other modes. You can use UART Debug page of CH347Demo software to test UART function in all modes.



CH347 VCP UART supports universal UART debugging tool, USB to HID UART can directly use CH347Demo or use CH347DLL interface library serial port operation functions for secondary development.

“Uart Debug” page of CH347Demo:

“Refreshing the Device List”: Obtain all CH347 devices on the current PC

“Open Device”: Open CH347

“Parameter Settings”: UART Parameter Setting

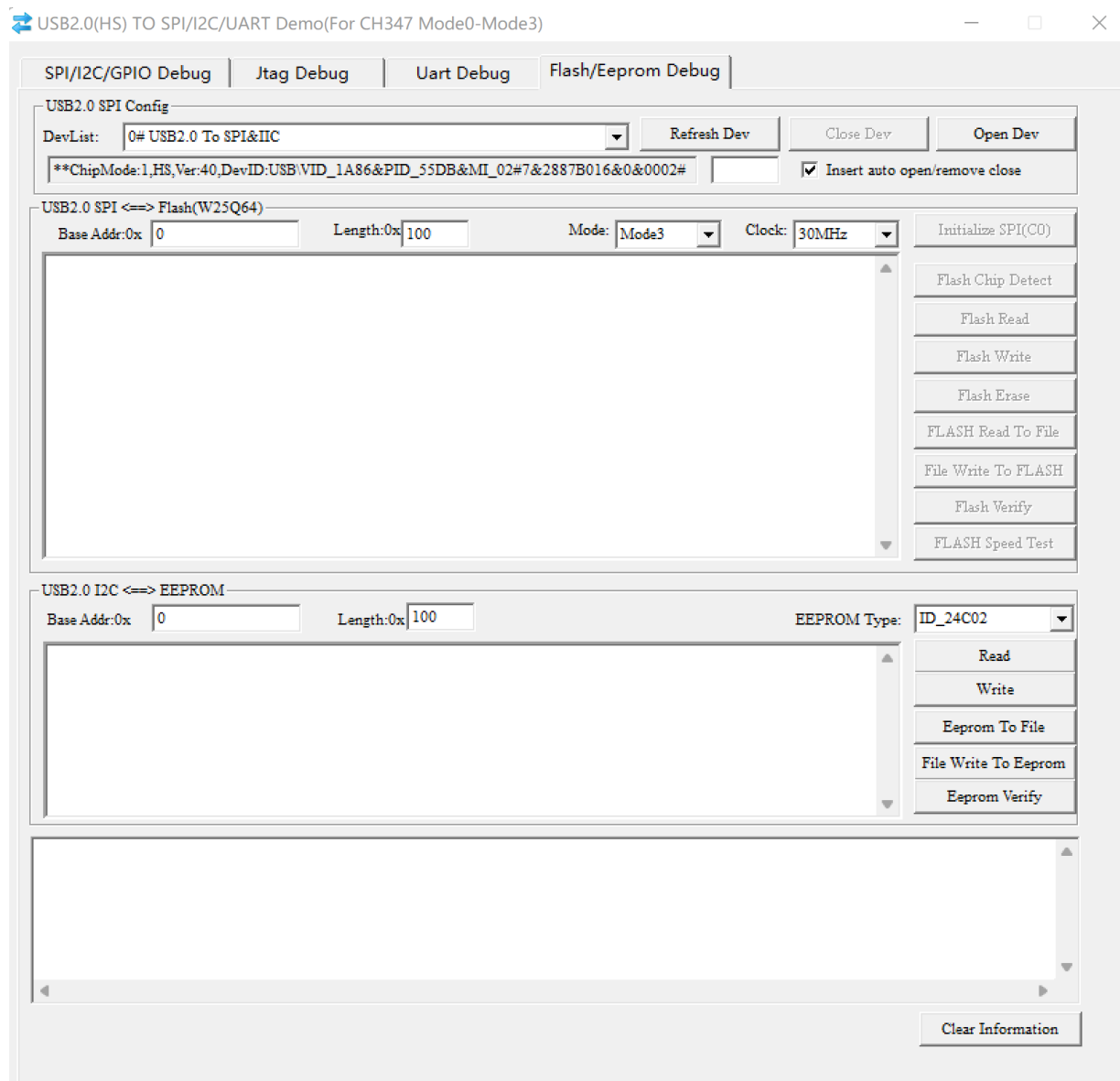
“Automatic receiving display”: Real-time display of data received by serial port

3.2. USB to SPI/I2C/GPIO

SPI and I2C interfaces can be used in modes 1 and 2 of CH347. The evaluation board must be configured according to P9-P14 function connector configuration diagram. Together with CH347Demo, you can operate peripherals connected to SPI and I2C interfaces, or operate EEPROM and FLASH devices on the evaluation board.



" Level (H is selected) " : Set the level state of GPIO in the output direction, and obtain the level state of GPIO in the input direction



In mode 1/2, you can operate onboard EEPROM device 24C02 and FLASH device 25Q16, and configure the pins according to P9-P14 function pin area. Users can also change to other types as required.

FLASH/EEPROM Debug page provides common operations on EEPROM and FLASH. Default I2C communication rate is 750KHz. After selecting an EEPROM type, you can read and write EEPROM content, write files to EEPROM, or read EEPROM content and save it to a file.

FLASH can be operated in 0 or 3 mode. Clock supports 60MHz, 30MHz, 15MHz, 7.5MHz, 3.75MHz, 1.875MHz, 937.5KHZ, and 468.75KHZ. Click "Initialize SPI(C0)" to complete the initialization of SPI interface. Then FLASH device model can be automatically identified, read and write content, write files to FLASH or save FLASH content to files after reading, and test speed.

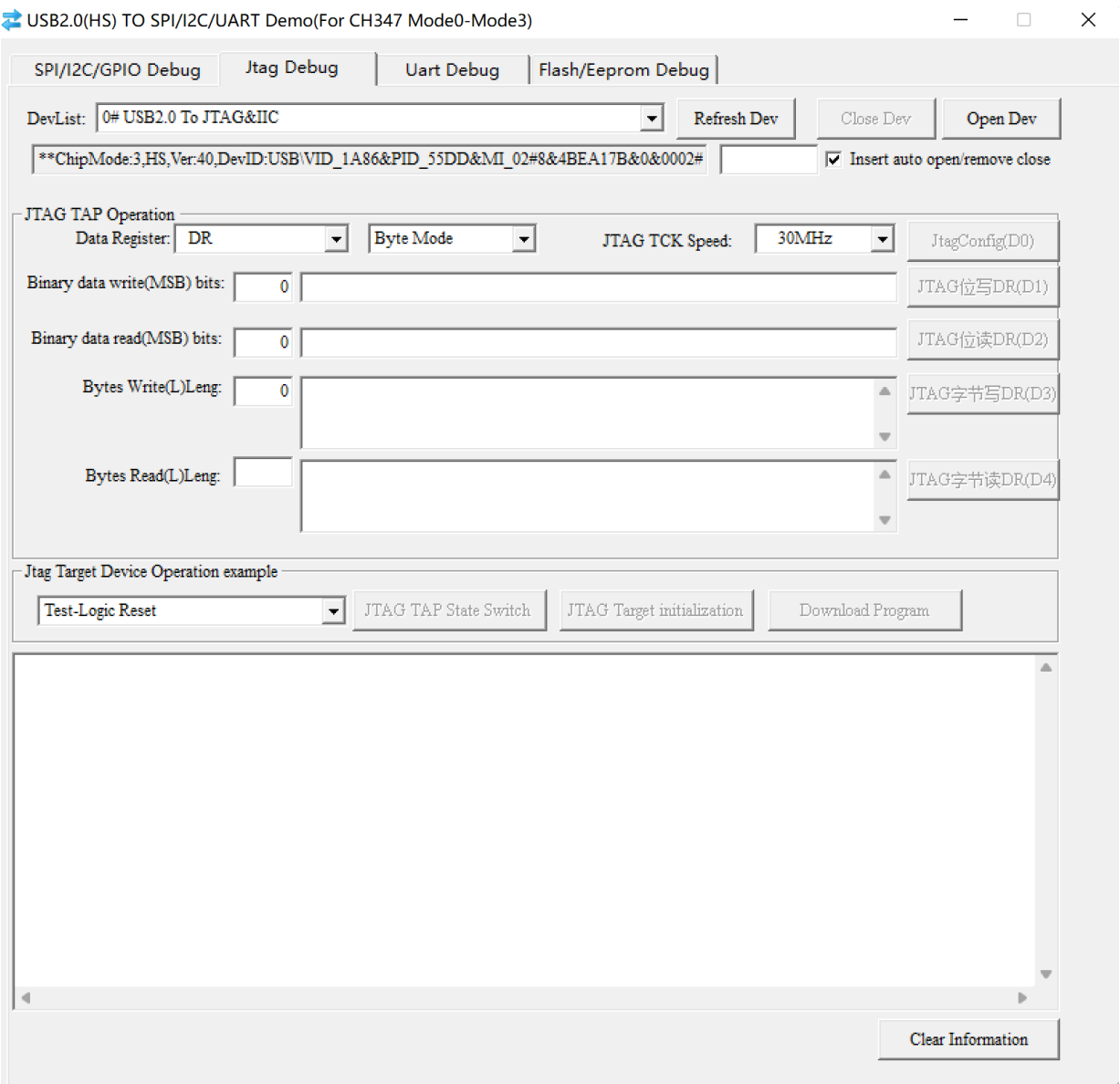
"FLASH verification": Verifies whether FLASH data matches the selected target file.

“FLASH speed measurement”: After the target file is written into FLASH, read and verify the contents, and display FLASH read, write and erase speed of this process in the information output area.

3.3. USB to JTAG

CH347 supports USB to 5 cable JTAG port. Test JTAG function on “JTAG Debug” page, click “Open Device”, select JTAG clock frequency, and click “JtagConfig(D0)” to configure JTAG function.

Select “Read/Write Register” to switch Target board to Shift-DR or Shift-IR for read/write. You can select Byte mode or Bit mode for read/write, when you switch to Shift-IR, you can input command data in Bit mode. When you switch to Shift-DR, you can read or write command data in batches in Byte mode.



“JTAG TAP status switch”: JTAG status switch, supports the conversion from Run-Test /Idle state to Shift-DR/Shift-IR state and then to Run-Test /Idle state.

“JTAG Target Initialization”: Example Switch the current state from Target to Test-Logic-Reset.

“Download the program through JTAG”: After the Target state is switched to Shift-DR, data is written in bulk to simulate program download. This function is only used to test the batch read/write speed of JTAG interface in Shift-DR state, but not a real program download function.