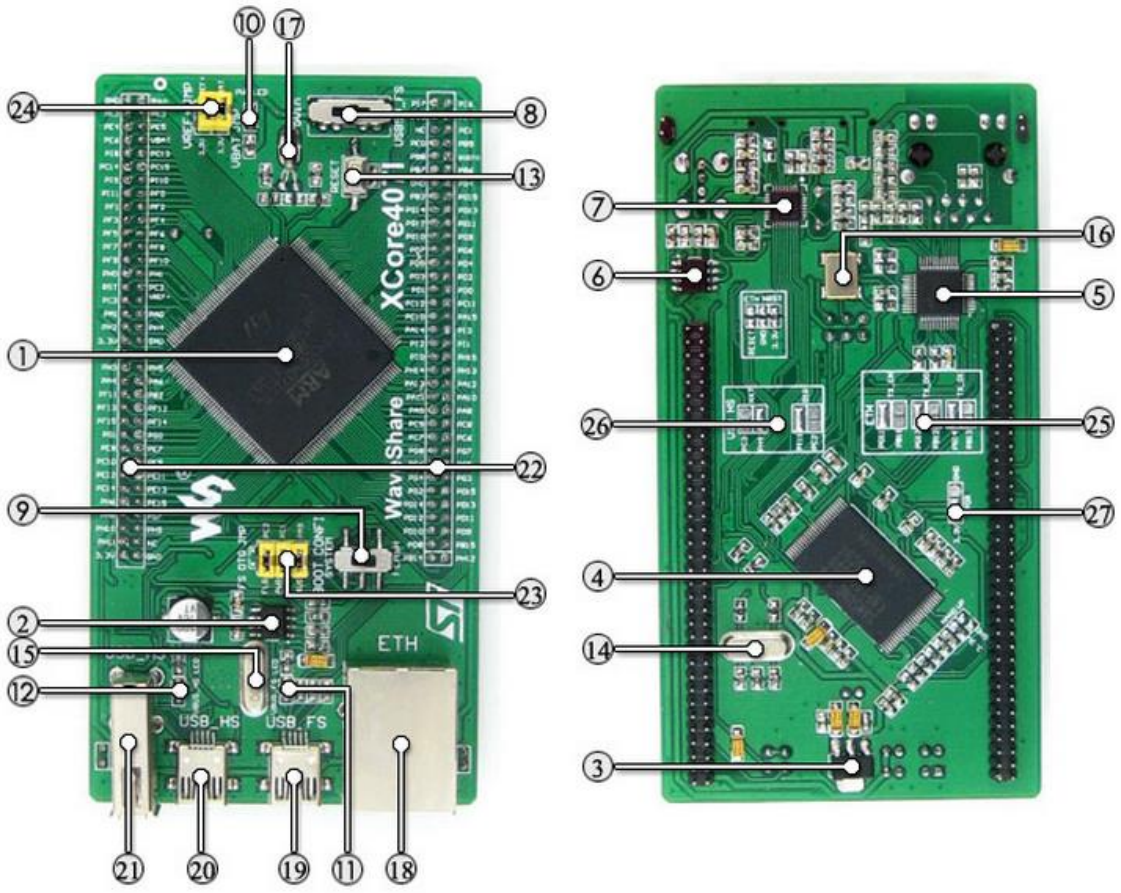
EVK407I User Manual

1. Overview

1.1. What's on board



[MCU]

1. **STM32F407IGT6**
   Core：Cortex-M4 32-bit RISC；
   Feature：a full set of single-cycle DSP instructions；
   Operating Frequency：168MHz，210 DMIPS/1.25 DMIPS/MHz；
   Operating Voltage：1.8V-3.6V；
   Package：LQFP176；
   Memories：1024kB Flash，192+4kB SRAM；
   MCU communication Interfaces：3 x SPI，4 x USART，2 x UART，2 x I2S，3 x I2C；1 x FSMC，

[Others]

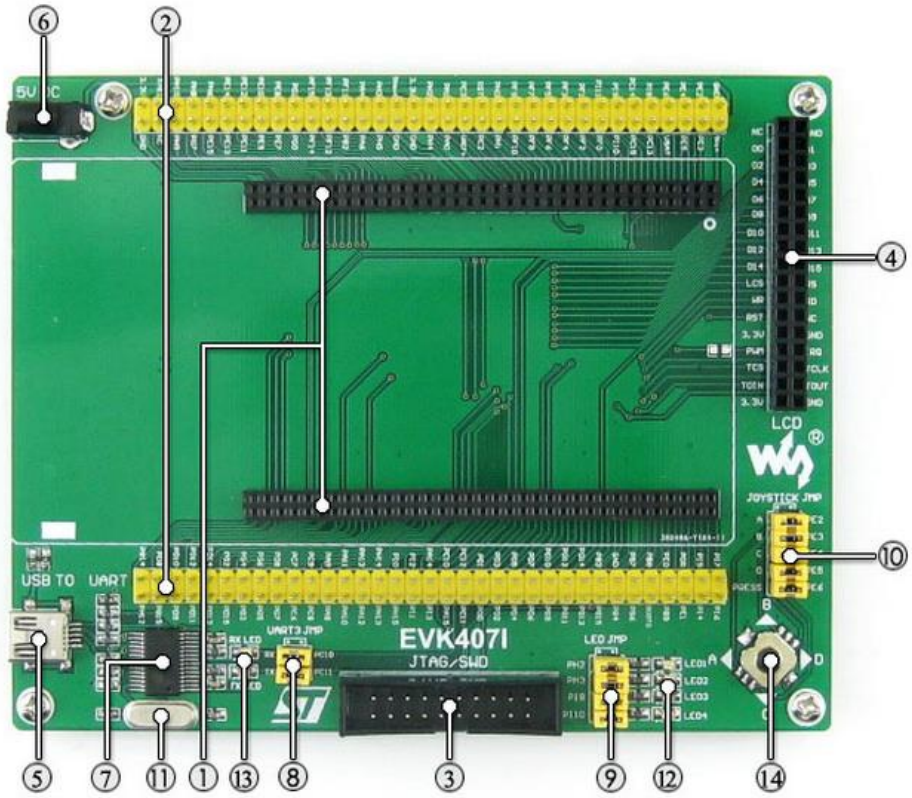
8. **5Vin or USB power supply switch**
9. **BOOT Mode Selection**
   BOOT0 can be configured （BOOT1 can be changed mode by controlling the pins as it is seldom used）
10. **Power LED**
11. **USB FS LED**
12. **USB HS LED**
13. **Reset button**
14. **8M crystal oscillator**
    MCU clock enables the MCU run at higher

1 x SDIO, 2 x CAN；
1 x USB 2.0 FS/HS controller with dedicated DMA;
1 x USB HS ULPI;（for connecting outboard USB HS PHY）
1 x 10/100 Ethernet MAC；1 x 8 to 14-bit parallel camera interface；3 x AD（12-bit, 1μs, shares 24 channels），2 x DA（12-bit）；
Debugging/Programming: supports JTAG/SWD (serial wire debug) interfaces, supports IAP.

2. **MIC2075-2**
   onboard USB FS power management device.
3. **AMS1117-3.3**
   3.3V voltage regulator
4. **K9F1G08U0D**
   1G Bit NandFlash
5. **DP83848**
   Ethernet PHY。
6. **MIC2075-1**
   onboard USB HS power management device.
7. **USB3300**
   USB HS PHY

speed by frequency multiplication.

15. **24M crystal oscillator**
    USB3300 clock
16. **50M crystal oscillator**
    DP83848 clock
17. **32.768K crystal oscillator**
    for internal RTC with calibration
18. **Ethernet connector**
19. **USB FS mini connector**
20. **USB HS mini connector**
21. **USB HS type A connector**
22. **MCU pins expander**
    VCC, GND and all the idle I/O ports are accessible on expansion connectors for further expansion.
23. **USB OTG/HOST jumper**
24. **VREF/VBAT jumper**
25. **Ethernet I/O selection solder joint**
26. **USB HS I/O selection solder joint**
27. **PDR selection solder joint**
    1.8-3.6V, -40～105℃ OR 1.7-3.6V, 0～70℃



[Connector]

1. **MCU core board connector**

   for easily connecting core boards

2. **XCore407I MCU pins expander**
   convenient for testing
3. **JTAG/SWD interface**
   for debugging/programming
4. **LCD interface**
   for connecting touch screen LCD
5. **USB connector**
   USB TO UART
6. **5V DC jack**

[MCU]

7. **PL2303TA**
   onboard USB TO UART controller

[Jumper]

8. **PL2303 jumper**
9. **User LED jumper**
10. **Joystick jumper**
    short the jumper to connect the joystick to default I/Os used in example code;

    short the jumper to connect the joystick to default I/Os used in example code

[Component]

11. **12M crystal oscillator**
    PL2303 clock
12. **User LED**
    convenient for indicating I/O status and/or program running state.
13. **UART LED**
    UART TX/RX indicator.
14. **Joystick**
    five positions.

2. Demos

- KEIL MDK version: 4.7
- Debugger/programmer:**Ulink2**
- Programming Interface: JTAG/SWD
- Connect PC to the onboard USB TO UART interface via USB cable
- Result of demos which based on serial port are all checked via SSCOM32, default connection is connect the serial port converter to the USART1 interface. Serial port assistant SSCOM3.2 settings:

Select a proper COM port	
Baud rate	115200
Data bits	8
Stop bits	1
Parity bits	None
Flow control	None

2.1. GPIO_Key

2.1.1 Overview

Change LED status via button, joystick.

2.1.2 Hardware connection

Short LED JMP、JOYSTICK JMP.

2.1.3 Operation and result

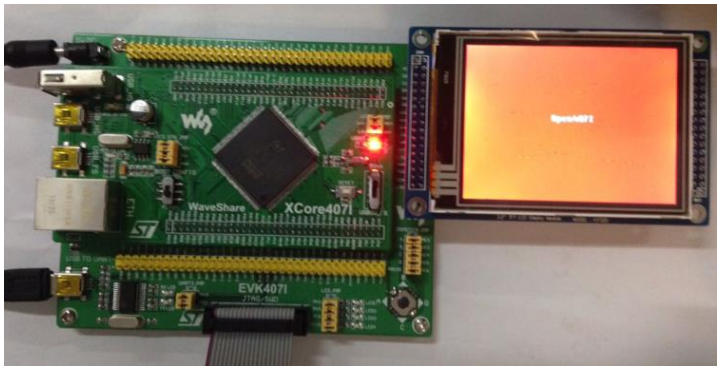
Push the button or joystick, the LED status should keep changing accordingly.

2.2. LCD

2.2.1 Overview

Control LCD via FSMC.

2.2.2 Hardware connection



- Connect the 3.2inch 320x240 Touch LCD (A) to the board

2.2.3 Operation result

- Info/messages displayed on the LCD.

2.3. NandFlash_SCB0

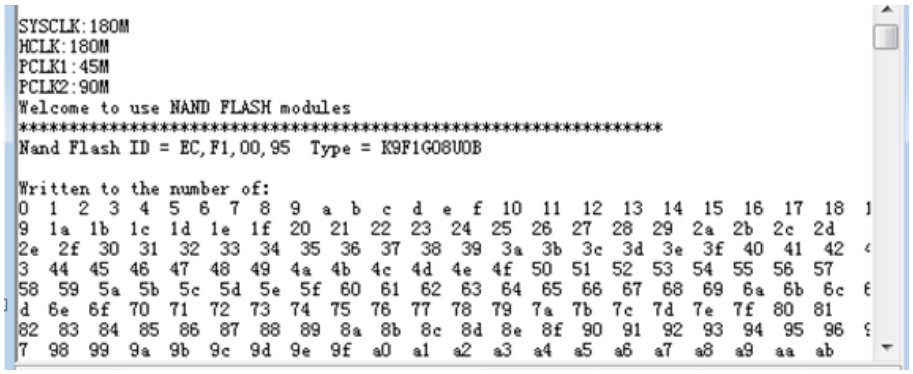
2.3.1 Overview

Read and write NAND FLASH via FSMC.

2.3.2 Hardware connection

2.3.3 Operation result

- The following information will be printed on the serial debugging assistant:



2.4. RTC

2.4.1 Overview

RTC demo

2.4.2 Hardware connection

2.4.3 Operation and result

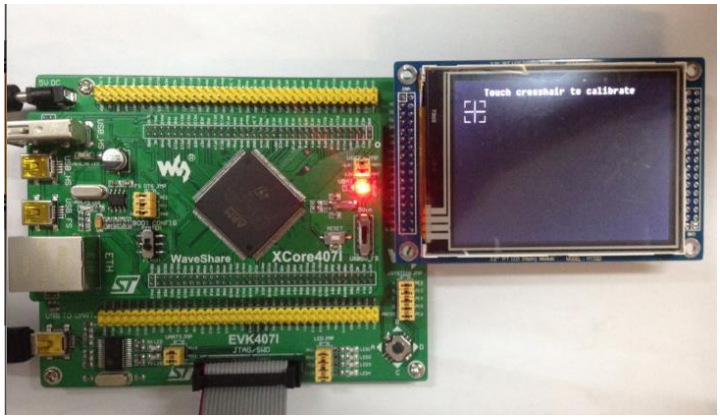
Info/messages will be printed on the serial debugging assistant

2.5. TouchPanel

2.5.1 Overview

Read and write LCD via FSMC.

2.5.2 Hardware connection



- Connect the 3.2inch 320x240 Touch LCD (A) to the board.

2.5.3 Operation and result

- It allows to draw any lines on the LCD.

2.6. uCOSII2.91+UCGUI3.90A

2.6.1 Overview

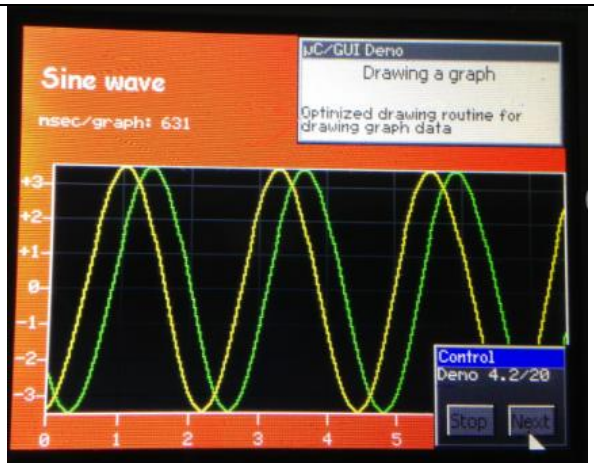
UcosII+GUI demo

2.6.2 Hardware connection

Connect the 3.2inch 320x240 Touch LCD (A) to the board.

2.6.3 Operation and result

- Info/messages displayed on the LCD.



2.7. USARTx_pritf

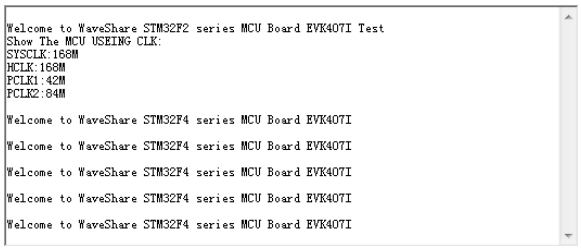
2.7.1 Overview

USART serial port communication demo

2.7.2 Hardware connection

2.7.3 Operation and result

Info/messages will be printed on the serial debugging assistant.



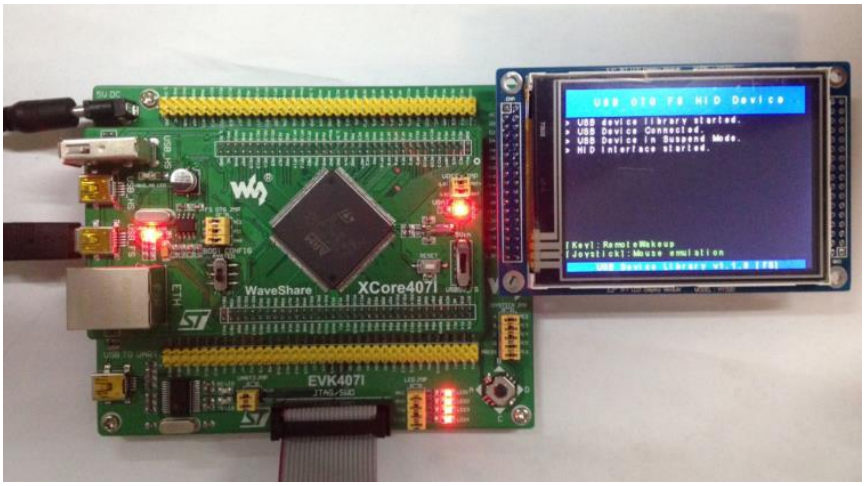
2.8. USB FS

2.8.1. USB FS Examples（USB_Device_Examples-HID）

- Overview

  FS USB demo, the development board works as USB device; USB mouse demo

- Hardware connection



- Connect the onboard USB_FS interface and PC USB port through a USB cable
- Connect the 3.2inch 320x240 Touch LCD (A) to the board.

◆ Operation and result

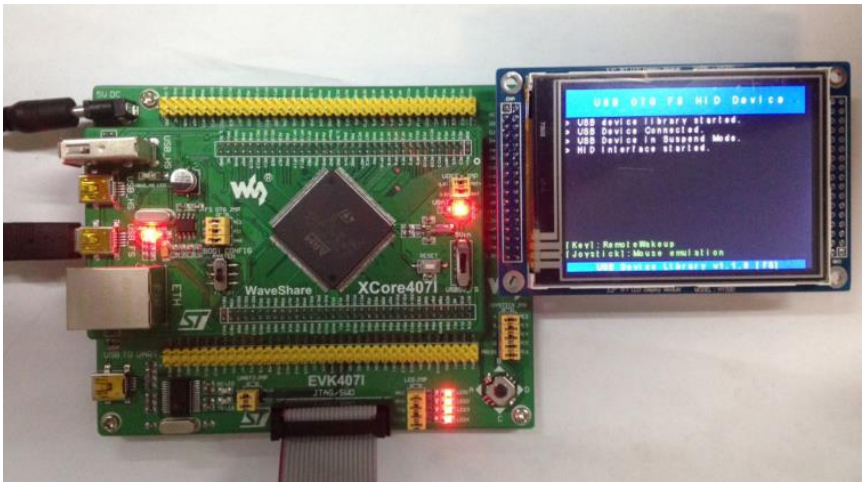
A USB device will appear on the computer Device Manager; control the computer cursor by joystick

2.8.2. USB FS Examples（USB_Device_Examples-VCP）

◆ Overview

FS USB demo, the development board works as USB device; USB Virtual Com Port example

◆ Hardware connection



- Connect the onboard USB_FS interface and PC USB port through a USB cable
- Connect the 3.2inch 320x240 Touch LCD (A) to the board.

◆ Operation and result

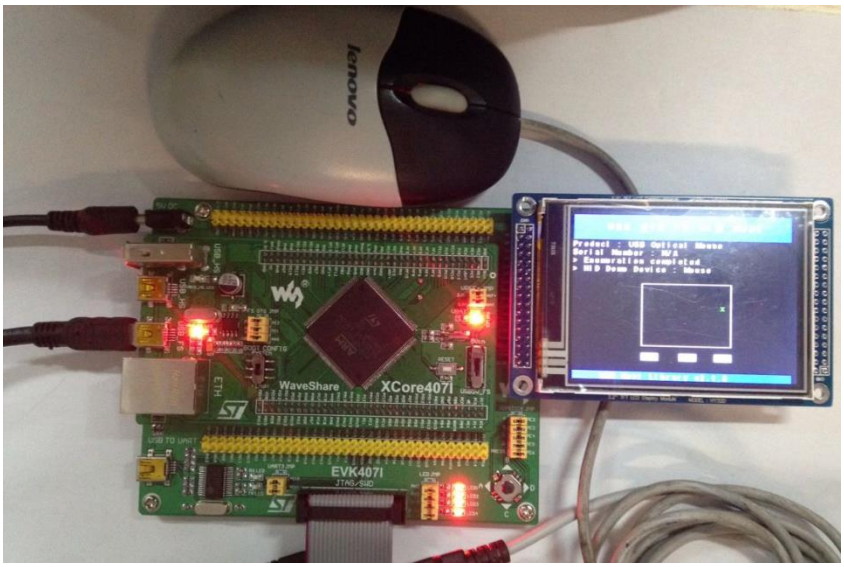
STMicroelectronics Virtual COM Port (COM3) appear on the computer device manager.

2.8.3. USB FS Examples（USB_Host_Examples-HID）

◆ Overview

FS USB demo, the development board works as USB host; USB mouse demo

◆ Hardware connection



- Connect a USB mouse to the onboard USB-FS interface through a USB OTG cable
- Connect the 3.2inch 320x240 Touch LCD (A) to the board

◆ Operation and result

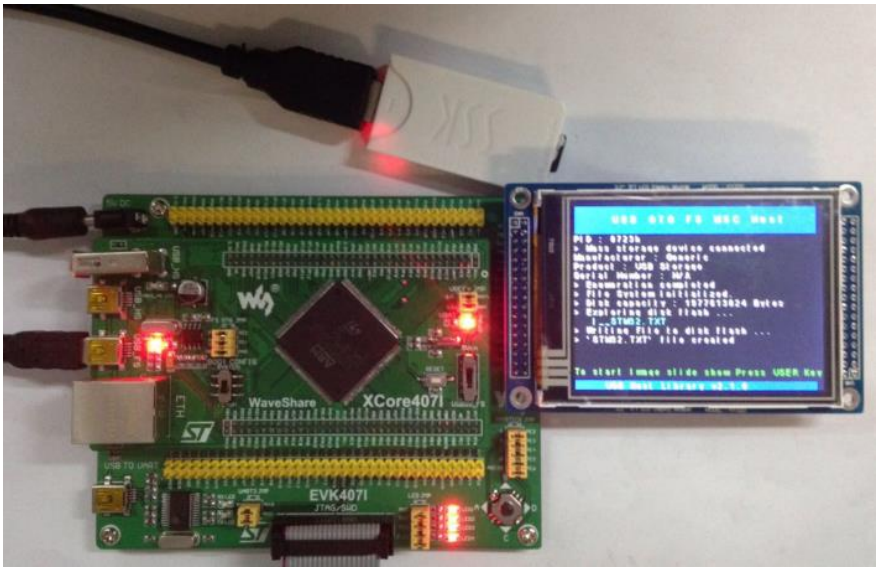
The green dot on the LCD will move following the mouse.

2.8.4. USB FS Examples（USB_Host_Examples-MSC）

◆ Overview

FS USB demo, the development board works as USB host; USB flash disk demo

◆ Hardware connection



- Connect a USB flash drive to the onboard USB_FS interface through a USB OTG cable
- Connect the 3.2inch 320x240 Touch LCD (A) to the board.

◆ Operation and result

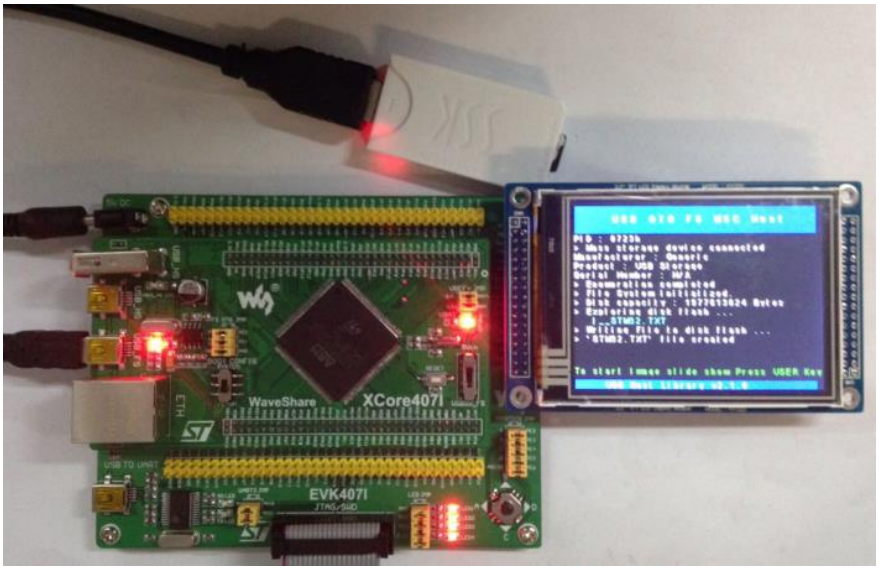
The LCD will display the file list in the USB flash drive

2.8.5. USB FS Examples（USB_Host_Device_Examples-DRD）

◆ Overview

FS USB demo, the development board works as USB host, device.

◆ Host mode



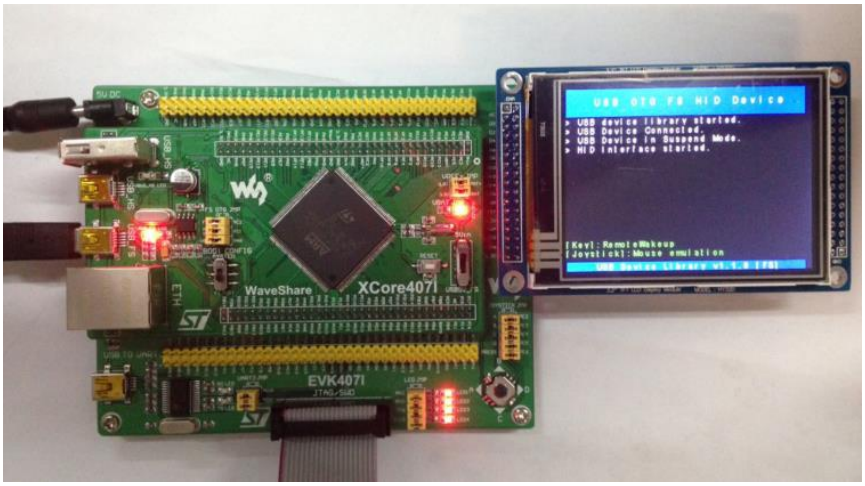
- Open FS OTG JMP
- Connect a USB Flash drive to the onboard USB-FS interface.
- Connect the 3.2inch 320x240 Touch LCD (A) to the board.

◆ Operation and result

The LCD will display the file list in the USB flash drive

◆ Device Mode

◆ Hardware connection



- Open FS OTG JMP
- Connect the onboard USB-FS interface and the PC USB port via a USB cable.
- Connect the 3.2inch 320x240 Touch LCD (A) to the board.

◆ Operation and result

“USB Mass storage device” will appeared on the computer Device Manager.

Connect the Micro SD Storage Board to pinheaders below (insert the SD card):

D0:PC8,CMD:PD2,CLK:PC12,D3:PC11,D2:PC10,D1:PC9,CD:PG8. The USB flash drive can be opened in “My computer”.

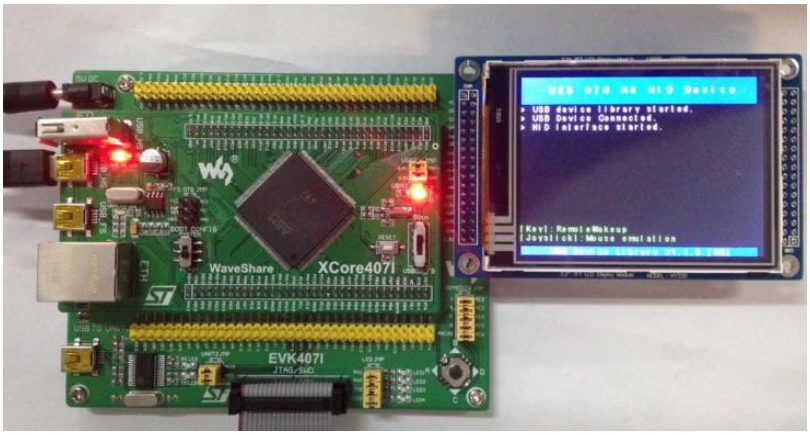
2.9. USB HS

2.9.1. USB HS Examples（USB_Device_Examples-HID）

◆ Overview

HS USB demo, the development board works as USB device; USB mouse demo

◆ Hardware connection



- Open FS OTG JMP
- Connect the onboard USB_HS interface and the PC USB port through an USB wire.
- Connect the 3.2inch 320x240 Touch LCD (A) to the board.

◆ Operation and result

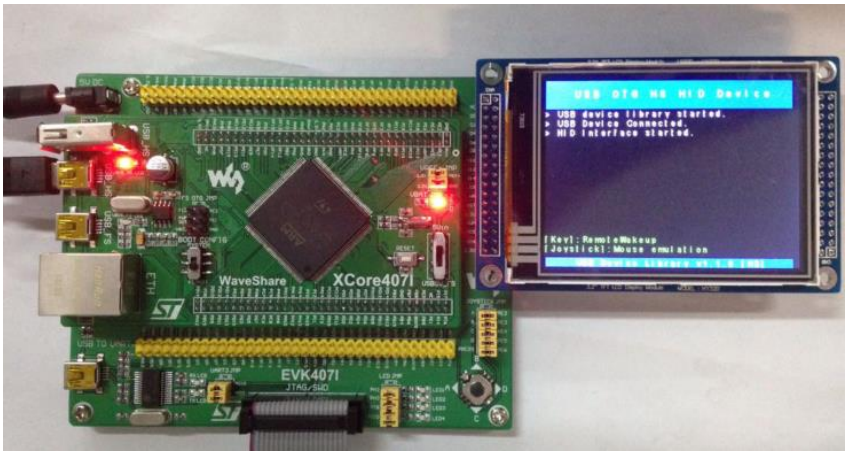
An USB device will appear on the computer device manager; Control the computer cursor by joystick.

2.9.2. USB HS Examples（USB_Device_Examples-VCP）

◆ Overview

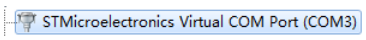
HS USB demo, the development board works as USB device; USB VCP (Virtual Com Port) demo

◆ Hardware connection



- Open FS OTG JMP;
- Connect the onboard USB_HS interface and the PC USB port through an USB wire.
- Connect the 3.2inch 320x240 Touch LCD (A) to the board.

◆ Operation and result



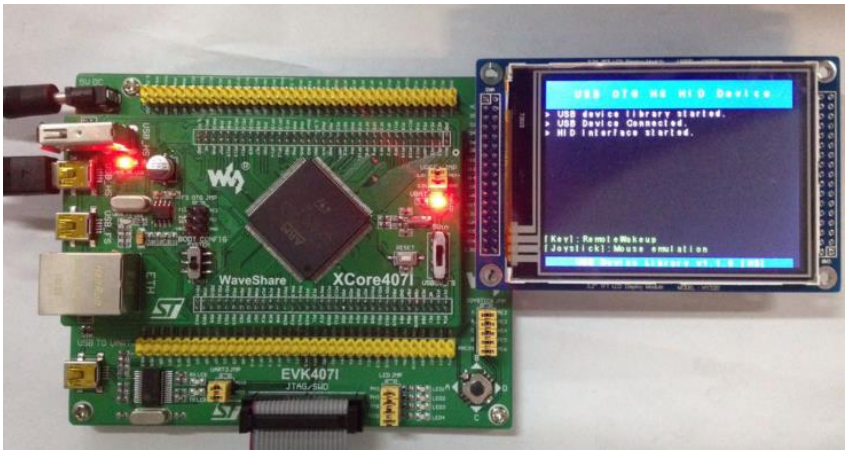
Appear on the computer Device Manager.

2.9.3. USB HS Examples（USB_Device_Examples- DualCore）

◆ Overview

FS USB HID, HS USB MSC USB demo

- HS USB MSC hardware connection



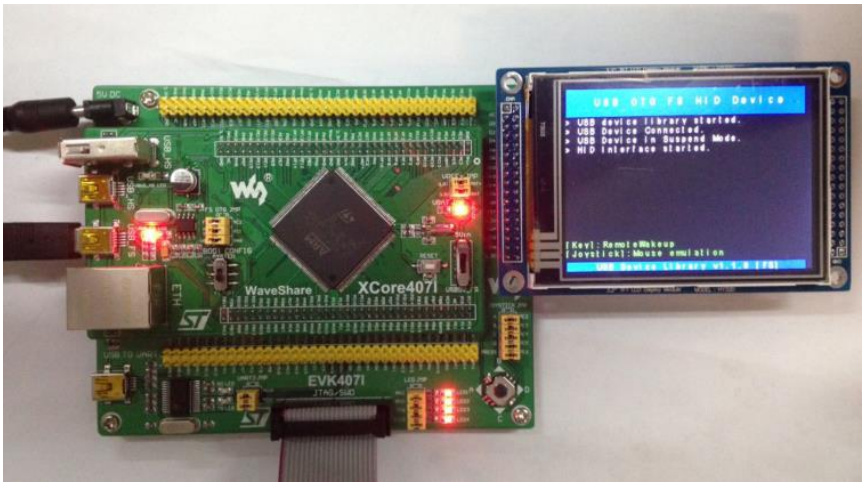
- Connect the onboard USB_HS interface and the PC USB port through an USB wire.
- Connect the 3.2inch 320x240 Touch LCD (A) to the board.

- Operation and result

"USB Mass storage device" will appeared on the computer Mouse Manager.

Connect the Micro SD Storage Board to pin headers below (insert the SD card): D0:PC8,CMD:PD2,CLK:PC12,D3:PC11,D2:PC10,D1:PC9,CD:PG8. The USB flash disk can be opened in "My computer".

- FS USB HID hardware connection



- Short FS OTG JMP
- Connect the onboard USB_HS interface and the PC USB port through an USB cable.
- Connect the 3.2inch 320x240 Touch LCD (A) to the board.

- Operation and result

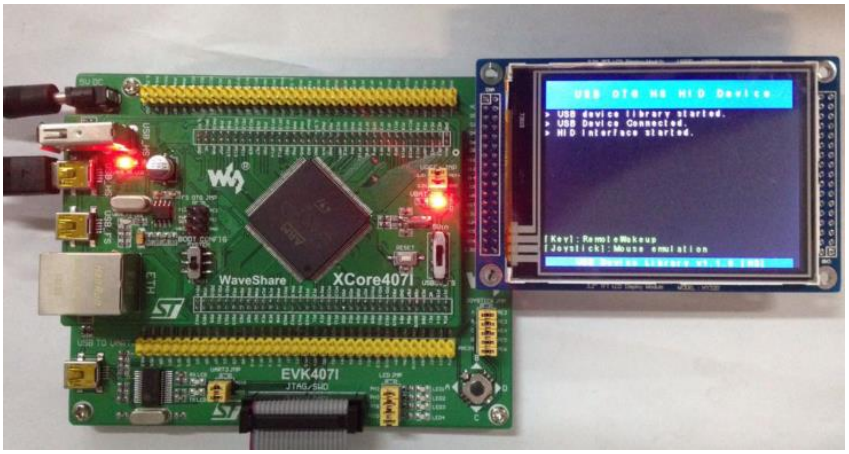
The USB device will appear on the computer device manager; Control the computer cursor by joystick.

2.9.4. USB HS Examples（USB_Host_Examples-HID）

- Overview

HS USB demo, the development board works as USB host; USB mouse demo

- Hardware connection



- Open FS OTG JMP
- Connect an USB mouse to the onboard FS USB interface through a USB OTG cable
- Connect the 3.2inch 320x240 Touch LCD (A) to the board.

◆ Operation and result

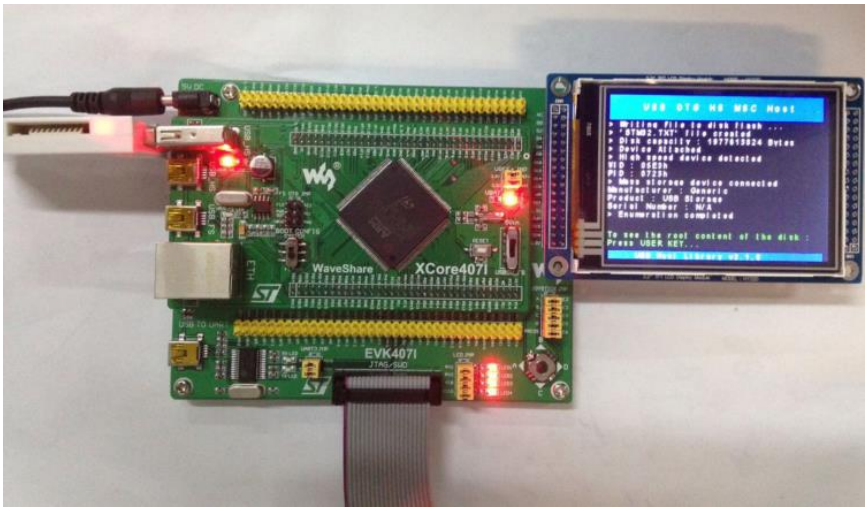
The green dot on the LCD will move following the mouse.

2.9.5. USB HS Examples（USB_Host_Examples-MSC）

◆ Overview

HS USB demo, the development board works as USB host; USB flash drive demo

◆ Hardware connection



- Open FS OTG JMP
- Connect an USB flash drive to the onboard USB_HS interface.
- Connect the 3.2inch 320x240 Touch LCD (A) to the board.

◆ Operation and result

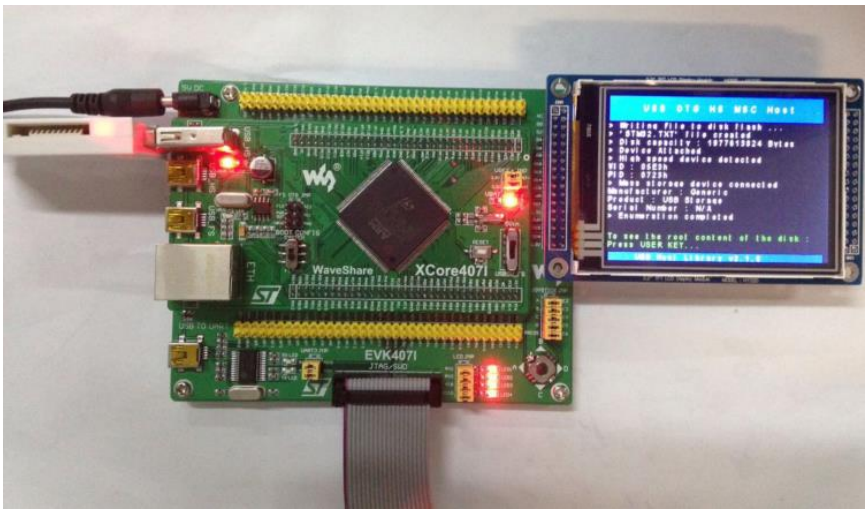
The LCD will display the file list in the USB flash drive

2.9.6. USB HS Examples（USB_Host_Device_Examples-DRD）

◆ Overview

HS USB demo, the development board works as USB host, device;

◆ Host Mode



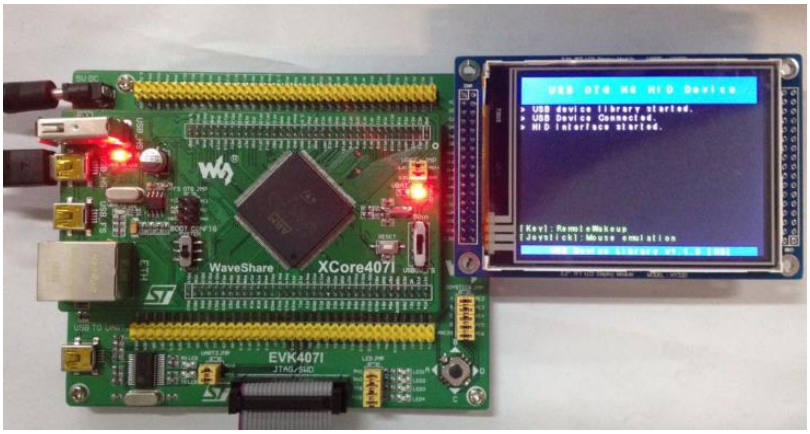
- Open FS OTG JMP
- Connect an USB flash drive to the onboard USB_HS interface.
- Connect the 3.2inch 320x240 Touch LCD (A) to the board.

◆ Operation and result

The LCD will display the file list in the USB flash drive

◆ Device Mode

◆ Hardware connection



- Open FS OTG JMP
- Connect the onboard USB_HS interface and the PC USB port through an USB wire.
- Connect the 3.2inch 320x240 Touch LCD (A) to the board.

◆ Operation and result

“USB Mass storage device” will appeared on the computer Mouse Manager.

Connect the Micro SD Storage Board to pinheaders below (insert the SD card):

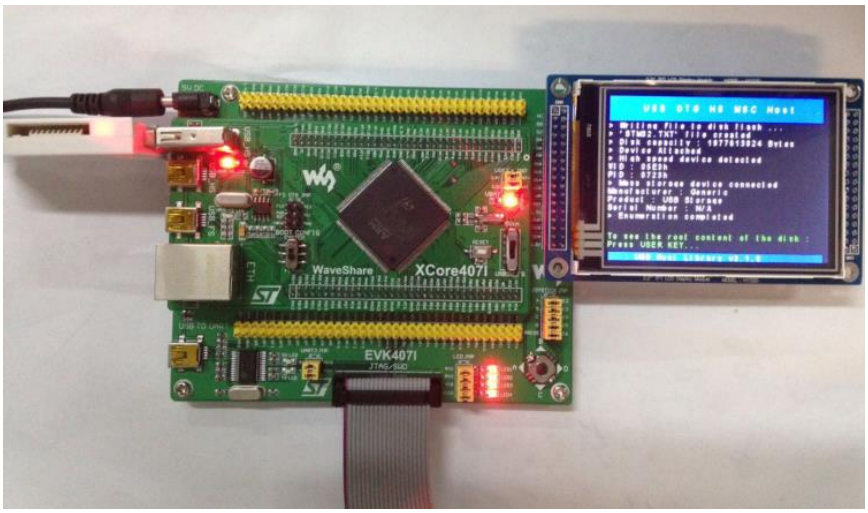
D0:PC8,CMD:PD2,CLK:PC12,D3:PC11,D2:PC10,D1:PC9,CD:PG8. The USB flash disk can be opened in “My computer”.

2.9.7. USB HS Examples（USB_Host_Examples-DualCore）

◆ Overview

HS USB flash drive demo, FS USB mouse demo.

◆ Hardware connection

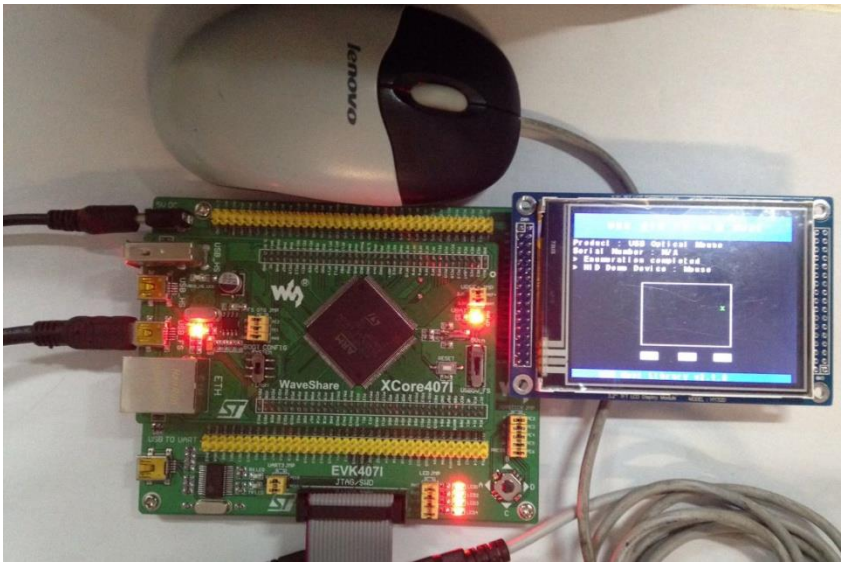


- Open FS OTG JMP
- Connect a USB flash drive to the onboard USB_HS interface.
- Connect the 3.2inch 320x240 Touch LCD (A) to the board.

◆ Operation and result

The LCD will display the file list in the USB flash drive

◆ Hardware connection



- Connect a USB mouse to the onboard FS USB interface through a USB OTG cable
- Connect the 3.2inch 320x240 Touch LCD (A) to the board.

◆ Operation and result

The green dot on the LCD will move following the mouse.

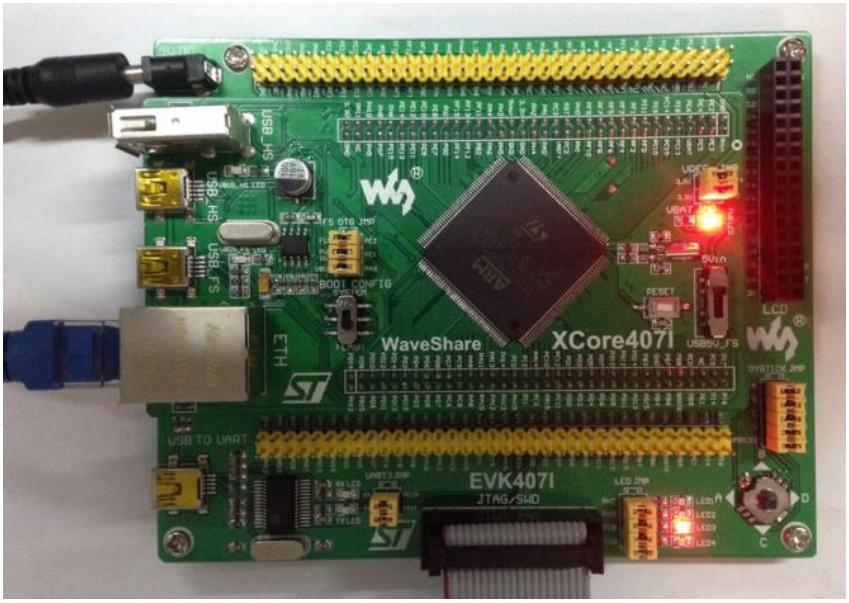
2.10. ETH Examples

◆ Overview

Connection of Ethernet on both the development board and the PC demo;

ETH demo requests to copy echotool.exe under path ETH\Tool\PC_Software to C Disk root directory.

◆ Hardware connection



➢ Connect the PC to the onboard ETH interface via an Ethernet wire.

◆ PC IP configuration

Configuring IP of both the PC and the module on the same network：

Right click the 【Internet】 -》 【Properties】 -》 Click【Local connection】-》Click【Properties】-》 Find Internet Protocol Version4（TCP/IP V4, the following dialog box will pop up, set the appropriate IP address, subnet mask, and default gateway：

IP address : 192.168.1.11

Subnet Mask: 255.255.255.0

Default Gateway: 192.168.1.1

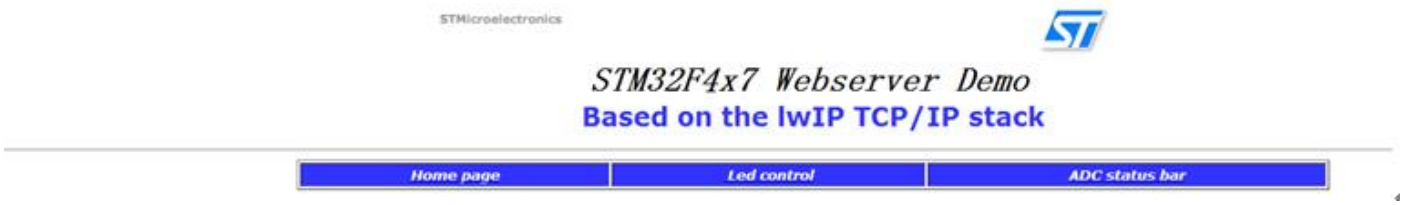
◆ Operation and result

◆ Http server

Program download path：

ETH\STM32F4x7_ETH_LwIP_V1.0.0\Project\Standalone\httpserver\MDK-ARM

Operation and result：



Control the onboard LED by clicking “LED control”.

◆ tcp_echo_client

Program download path：

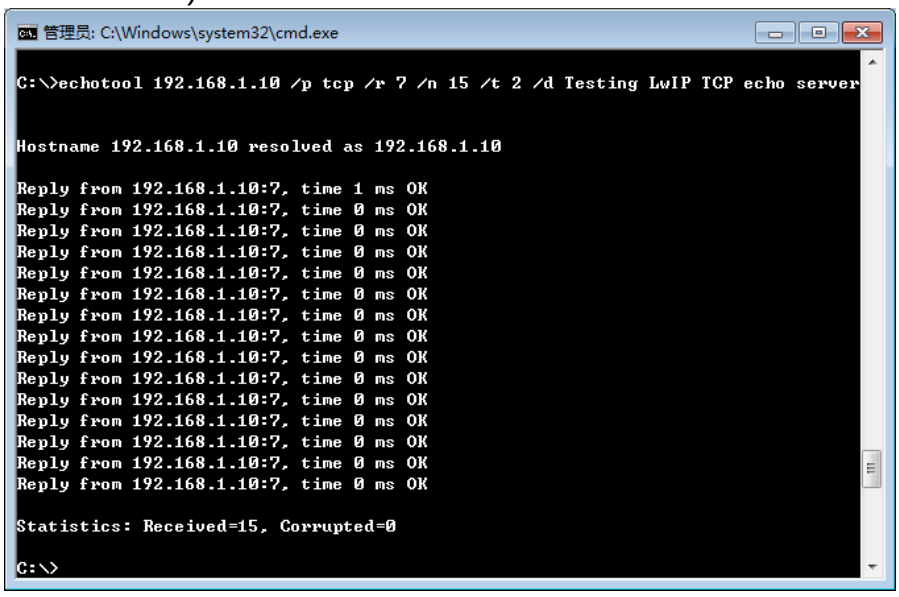
ETH\STM32F4x7_ETH_LwIP_V1.0.0\Project\Standalone\tcp_echo_client\MDK-ARM

Enter “C:\>echotool /p tcp /s” on command prompt window（cmd.exe）, the PC will answer when press the “PRESS” key on the board.

```
C:\Users\Administrator>cd C:\

C:\>echotool /p tcp /s

Waiting for TCP connection on port 7. Press any key to exit.

Client 192.168.1.10:4163 accepted at 18:39:50
18:39:50 received [sending tcp client message 4]

Session closed by peer.
Waiting for TCP connection on port 7. Press any key to exit.

Client 192.168.1.10:4164 accepted at 18:39:52
18:39:52 received [sending tcp client message 5]

Session closed by peer.
Waiting for TCP connection on port 7. Press any key to exit.
```

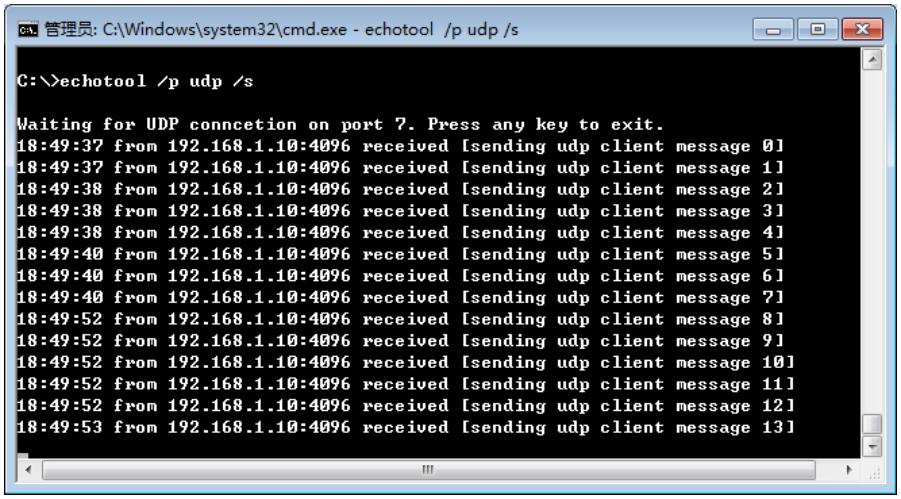
◆ tcp_echo_server

Program download path：
ETH\STM32F4x7_ETH_LwIP_V1.0.0\Project\Standalone\tcp_echo_server\MDK-ARM
Enter “C:\>echotool IP_address /p tcp /r 7 /l 7 /n 15 /t 2 /d Testing LwIP TCP echo server” on command prompt window（cmd.exe）, press “enter”, the PC will answer(IP_address 192.168.1.10)



◆ udp_echo_client

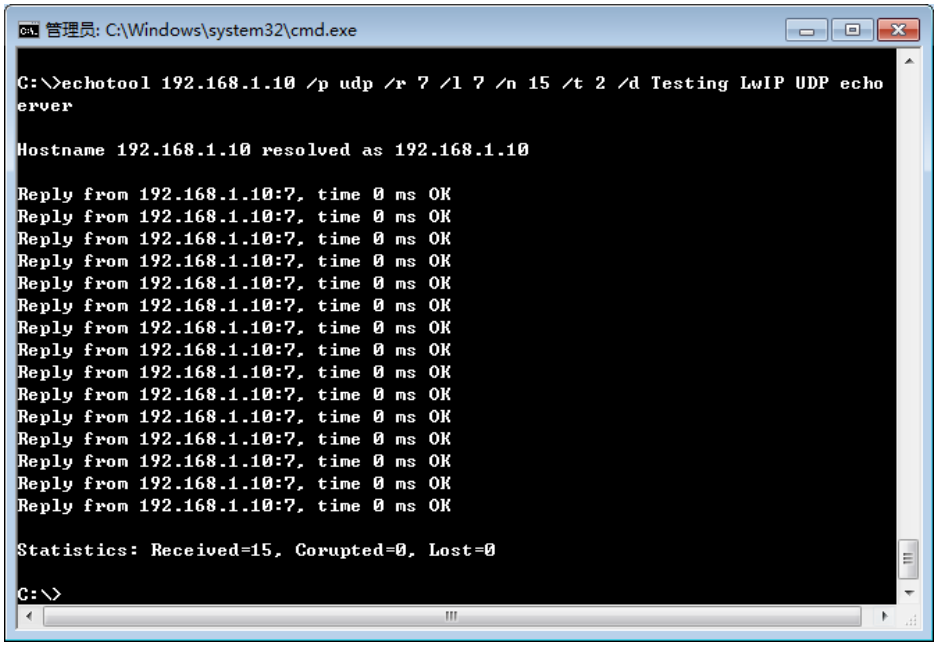
Program download path ： ETH\STM32F4x7_ETH_LwIP_V1.0.0\Project\Standalone\udp_echo_client\MDK-ARM
Input “C:\>echotool /p udp /s” on command prompt window（cmd.exe）, press the USER KEY on the board, the PC will answer.



◆ udp_echo_server

Program download path ： ETH\STM32F4x7_ETH_LwIP_V1.0.0\Project\Standalone\udp_echo_server\MDK-ARM

Input “C:\>echotool IP_address /p udp /r 7 /l 7 /n 15 /t 2 /d Testing LwIP UDP echo server” on command prompt window（cmd.exe）, then press “Enter”, PC will have answer(IP_address: 192.168.1.10)

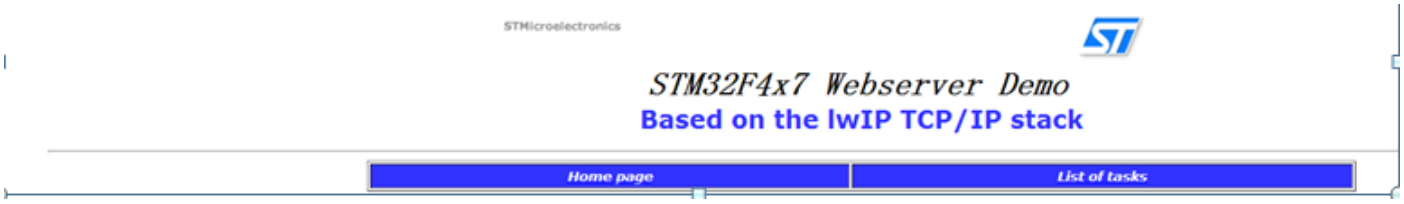


◆ httpserver_netconn

Program download path：

ETH\STM32F4x7_ETH_LwIP_V1.0.0\Project\FreeRTOS\httpserver_netconn\MDK-ARM

Input 192.168.1.10 on the internet explorer



◆ http server_socket

Program download path：ETH\STM32F4x7_ETH_LwIP_V1.0.0\Project\FreeRTOS\httpserver_socket\MDK-ARM

Input 192.168.1.10 on the internet explorer

◆ udptcp_echo_server_netconn

Program download path:

ETH\STM32F4x7_ETH_LwIP_V1.0.0\Project\FreeRTOS\udptcp_echo_server_netconn\MDK-ARM

Input 192.168.1.10 on the internet explorer

3. Revision history

Version	Description	Date	Author
V1.0	Initial revision	2014/05/17	Waveshare team