

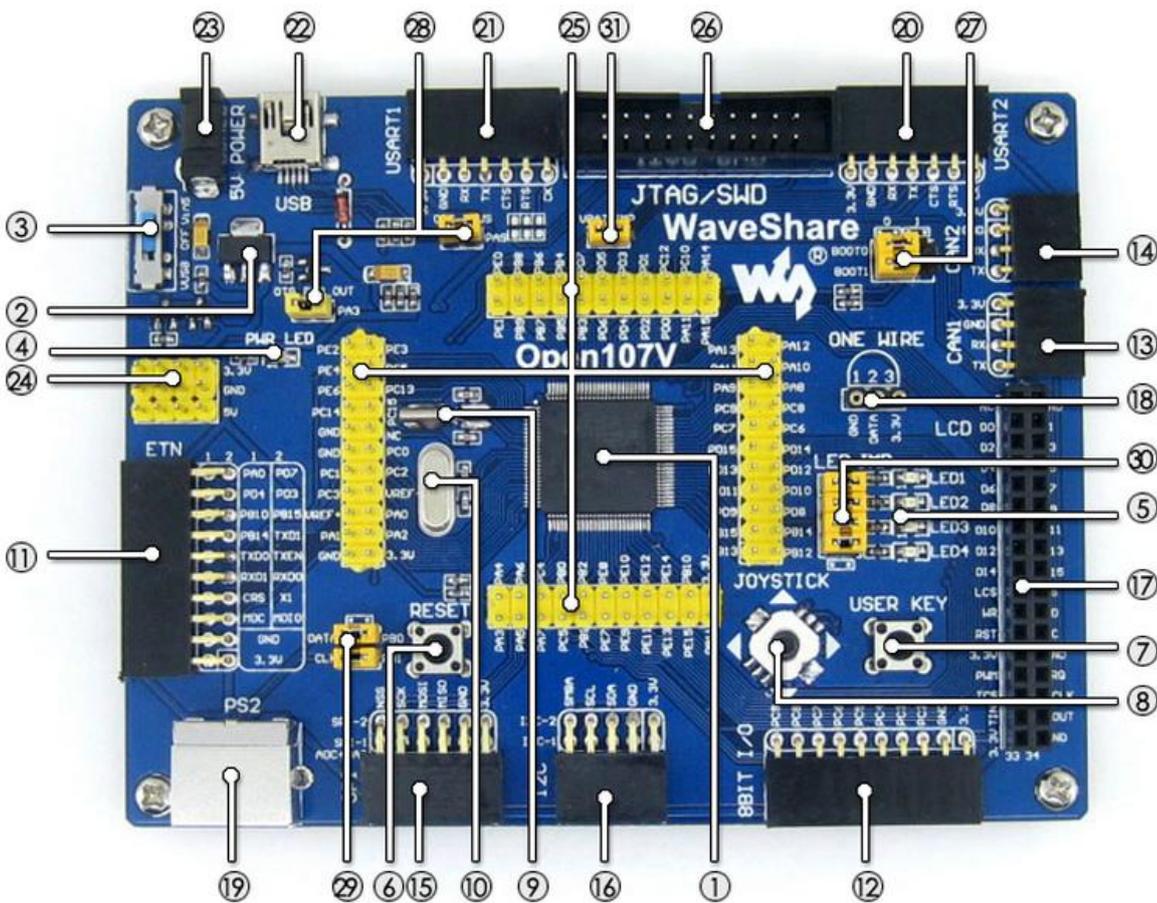
Open107V User Manual

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1. Overview

1.1. What's on board



[MCU]

- STM32F107VCT6**
 the high performance STM32 MCU which features:
 - Core:** Cortex-M3 32-bit RISC;
 - Operating Frequency:** 72MHz, 1.25 DMIPS/MHz;
 - Operating Voltage:** 2-3.6V;
 - Package:** LQFP100; I/Os: 80;
 - Memories:** 256kB Flash, 64kB RAM;
 - Communication Interfaces:** 3 x SPI, 3 x USART, 2 x UART, 2 x I2S, 2 x I2C; 1 x Ethernet MAC, 1 x USB OTG, 2 x CAN;
 - AD & DA converters:** 2 x AD (12-bit, 1 μ s,

[Other component]

- Power supply switch**
 5V DC or USB
- Power indicator**
- LEDs**
 Convenient for indicating I/O status or program running state
- Reset button**
- User key**
 Convenient for indicating I/O status or program running state
- Joystick**
 Convenient for I/O input (five positions)
- 32.768K crystal oscillator**

shares 16 channels); 2 x DA (12-bit)

Debugging/Programming: supports JTAG/SWD (serial wire debug) interfaces, supports IAP

2. **AMS1117-3.3**

3.3V voltage regulator

[Interface]

11. **Ethernet Interface**

easily connects the MCU to Ethernet network by using an additional Ethernet module

12. **8 I/O Interface**

easily connects to keypad, motor, etc.

13. **CAN1 Interface**

communicates with accessory boards which feature the CAN device conveniently

14. **CAN2 Interface**

communicates with accessory boards which feature the CAN device conveniently

15. **SPI1/SPI2 Interface**

easily connects to SPI peripherals such as DataFlash (AT45DBxx), SD card, MP3, etc. SPI1 features AD/DA alternative function, supports connecting AD/DA module as well

16. **I2C1/I2C2 interface**

easily connects to I2C peripherals such as I/O expander (PCF8574), FRAM (FM24CLxx), etc.

17. **LCD Interface**

easily connects to the touch screen LCD

18. **ONE-WIRE Interface**

easily connects to ONE-WIRE devices (TO-92 package), such as temperature sensor (DS18B20), electronic registration number (DS2401), etc.

19. **PS/2 Interface**

easily connects to PS/2 keyboard or mouse

20. **USART1 Interface**

easily connects to RS232, RS485, USB TO 232;

21. **USART2 Interface**

easily connects to RS232, RS485, USB TO 232;

22. **USB OTG**

for internal RTC

10. **25M crystal oscillator**

[Other interfaces]

23. **5V DC jack**

24. **5V/3.3 V power input/output**

usually used as power output, also common-grounding with other user board

25. **MCU pins connector**

all the MCU pins are accessible on expansion connectors for further expansion;

26. **JTAG/SWD interface**

for debugging/programming;

[Jumper]

23. **Boot Mode Selection**

for configuring the BOOT0 and BOOT1 pins;

24. **USB OTG Selection Jumper**

Short the jumper to enable USB OTG, connects to MCU I/O

Open the jumper to disable USB OTG, disconnects from MCU I/O

25. **PS/2 Interface Jumper**

Short the jumper to connect the PS/2 device to default I/Os;

Open the jumper to connect the PS/2 device to custom I/Os via DuPont wires;

26. **LEDs Jumper**

Short the jumper to connect the LEDs to default I/Os;

Open the jumper to connect the LEDs to custom I/Os via DuPont wires;

27. **VBAT Selection Jumper**

Short the jumper to use system power supply;

Open the jumper to connect the VBAT to external power, such as battery;

Communicating with USB Device or USB Host

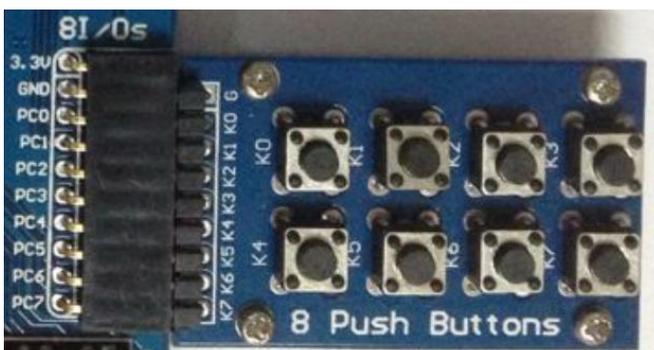
2. Demo

- KEIL MDK Version: 4.54
- Programmer/Debugger: ULINK/V2
- Programming/Debugging interface: JTAG/SWD
- 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. 8IOs

- ◆ Overview
8IOs demo, detect the 8 independent button is pressed or not
- ◆ Hardware connection

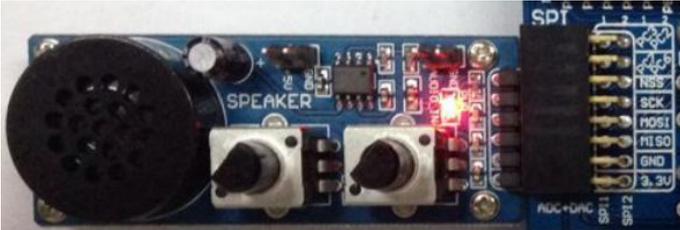


- Connect the "8 Push Button " to the onboard 8IOs interface (make sure the G pin on the module connects to the GND pin on the 8IOs)

- ◆ Operation and result
 - Push the button, the LED will keep blinking accordingly.

2.2. ADC+DMA

- ◆ Overview
 - AD acquisition demo, gather voltage information of Analog Test Board
- ◆ Hardware connection



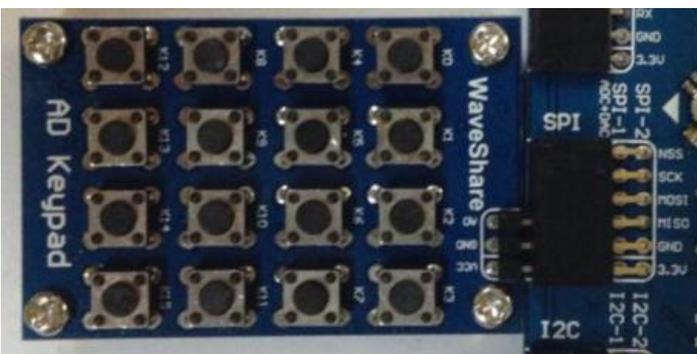
- Connect the Analog Test Board to the board via SPI1 (ADC+DAC) interface

- ◆ Operation and result
 - Rotate the potentiometer on the Analog Test Board, the below information will be printed on the serial debugging assistant:

```
*****
The current AD value = 2.36V
The current AD value = 2.36V
The current AD value = 3.30V
The current AD value = 2.83V
The current AD value = 0.72V
The current AD value = 0.01V |
The current AD value = 0.01V
```

2.3. ADC+DMA+KEYPAD

- ◆ Overview
 - AD acquisition demo, gather voltage information of AD Keyboard
- ◆ Hardware connection



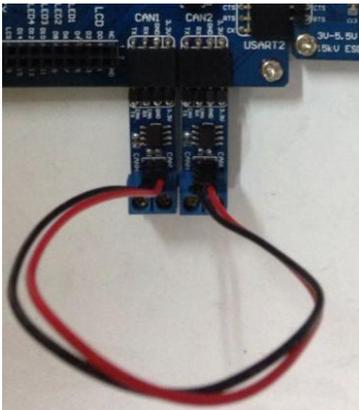
- Connect the AD Keypad board to the board via SPI1 (ADC+DAC) interface

- ◆ Operation and result
 - Press the button on the AD Keypad, the below information will be printed on the serial debugging assistant:

```
The current AD value = 1.0264V
The current AD value = 1.2319V
The current AD value = 2.6837V
The current AD value = 2.4750V
```

2.4. CAN- Normal

- ◆ Overview
CAN1 TO CAN2 communication demo
- ◆ Hardware connection



- Two "SN65HVD230 CAN Board" are required, connect them to two Open103C board respectively
- Connect the two "SN65HVD230 CAN Board" via DuPont wire(CANL<->CANL, CANH<->CANH)

- ◆ Operation and result

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

```
*****
CAN-Bus Test
CAN2 Receive Data: 0
CAN1 Receive Data: 10000

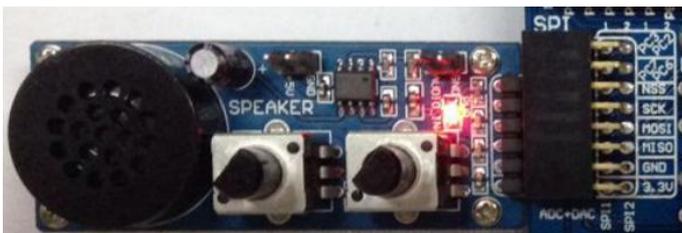
CAN2 Receive Data: 1
CAN1 Receive Data: 9999

CAN2 Receive Data: 2
CAN1 Receive Data: 9998

CAN2 Receive Data: 3
CAN1 Receive Data: 9997
```

2.5. DAC

- ◆ Overview
DA output demo, output via DMA channel
- ◆ Hardware connection



- Connect the Analog Test Board to the board via SPI1 (ADC+DAC) interface
- Connect the 5V pin headers on both the main board and the Analog Test Board via jumper wire

- ◆ Operation and result

- You should hear sound from the Analog Test Board

2.6. ETH_LwIP

- ◆ Overview
 - The board communicates with the PC via Internet
- ◆ Hardware connection



- Connect the DP83848 Ethernet Board to the board via SPI1 (ADC+DAC) interface

- ◆ The IP of the PC configuring as 192.168.0.xxx; for example:
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 addresses : 192.168.0.138
 - Subnet Mask: 255.255.255.0
 - Default Gateway: 192.168.0.1

- ◆ Operation and result
Open the browser; enter 192.168.0.100/888; press the Enter key:



2.7. GPIO LED JOYSTICK

- ◆ Overview
 - Change the LED status via button, joystick
- ◆ Hardware connection
 - Short the LED JMP, JOYSTICK JMP, KEY JMP

◆ Operation and result

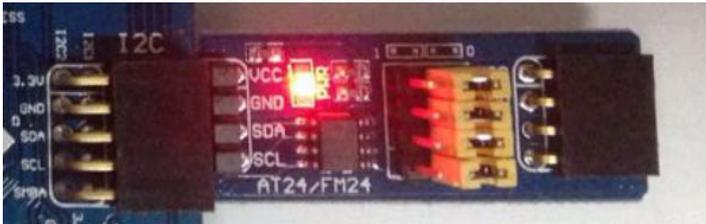
Push the button or joystick, the LED status should keep changing accordingly

2.8. I2C

◆ Overview

Read and write data on E2PROM via I2C protocol

◆ Hardware connection



- Connect the AT24/FM24 Board to the board via I2CX interface(connect to I2C1 or I2C2 depends on the program)

◆ Operation and result

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

```
*****
EEPROM 24C02 Write Test
EEPROM 24C02 Write Test OK
EEPROM 24C02 Read Test
EEPROM 24C02 Read Test OK
```

2.9. LCD

◆ Overview

Control the LCD via FSMC

◆ Hardware connection



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

◆ Operation and result

- Display image on the LCD:



2.10. One-Wire

◆ Overview

Connect the DS18B20 board; detect the temperature

◆ Hardware connection

Connect the DS18B20 to the onboard One-wire socket.

◆ Operation and result

The below information will be printed on the serial debugging assistant:

```
*****
DS18B20's ID :0x28 0x76 0xfe 0x49 0x5 0x2 0x0 0x20 Temperature:8 °C
Temperature:30 °C
Temperature:29 °C
Temperature:30 °C
Temperature:29 °C
Temperature:30 °C
Temperature:29 °C
Temperature:30 °C
```

2.11. PS2

◆ Overview

Drive the PS2 keyboard via two GPIO

◆ Hardware connection



- Connect the PS2 keyboard to the board via PS2 interface
- Short the PS2 JMP.

◆ Operation and result

The below key value will be printed on the serial debugging assistant while push keys the PS2 keyboard:

```
Please Input Keyboard!
Keyboard Input : u
Keyboard Input : y
Keyboard Input : h
Keyboard Input : g
Keyboard Input : f
```

2.12. RTC

- ◆ Overview

Development board RTC demo

- ◆ Hardware connection

Connect a serial port converter to the onboard USART2 interface

- ◆ Operation and result

The below information will be printed on the serial debugging assistant:

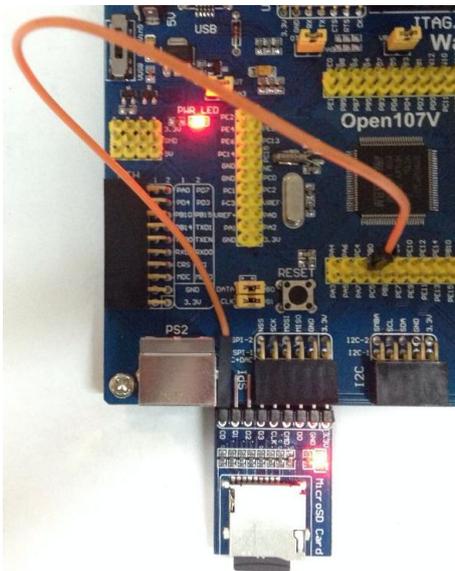
```
*****
External Reset occurred...
No need to configure RTC...
Time: 2012-1-1 00:00:08
Time: 2012-1-1 00:00:09
Time: 2012-1-1 00:00:10
Time: 2012-1-1 00:00:11
```

2.13. FATFS V0.08A-SD Card

- ◆ Overview

Read information in the SD card; SD card is FAT file system

- ◆ Hardware connection



- Connect the Micro SD Storage Board (with SD card) to the board via SPI1 interface
- Connect the CD pin header of Micro SD Storage Board to the PB0 pin header on the board via DuPont wire

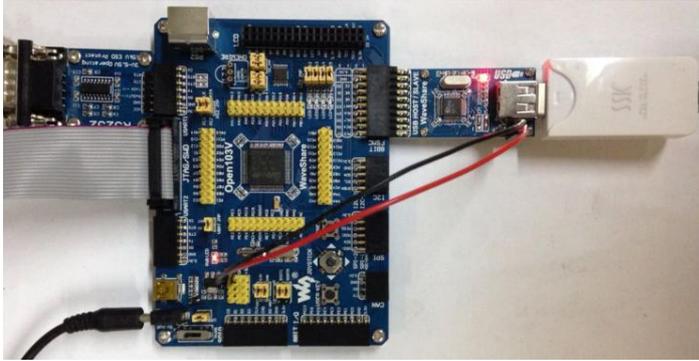
- ◆ Operation and result

The below information will be printed on the serial debugging assistant:

```
-- SD card detected OK
Card Type           : SD V2
Card Type           : SD V2
Card Type           : SD V2
```

2.14. SL811 USB

- ◆ Overview
Operate low speed USB via “SL811 USB Board”
- ◆ Hardware connection



- Connect the SL811 USB Board to the board via 8BIT+FSMC interface

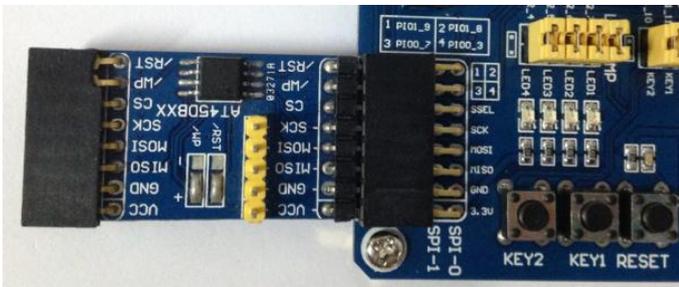
- ◆ Operation and result
 - The serial debugging assistant read information in the USB flash disk
 - The below information will be printed on the serial debugging assistant:

```

hip revision: 0E
Please connect USB device...
USB Low speed device !!!
hip revision: AE
Please connect USB device...
USB Full speed device detected
Device descriptor :
10 C3 C3 C4 C4 C5 C5 C6 10 CE CE CF CF D0 D0 D1 20 D8
Configuration descriptor :
10 F3 F3 F4 F4 F5 F5 F6 10 FE FE 10 11 12 13 14
10 24 25 26 27 28 29 2A 10 3A 3B 3C 3D 3E 3F 40
    
```

2.15. AT45DB-SPI

- ◆ Overview
Drive AT45DBXX DataFlash Board via SPI interface
- ◆ Hardware connection



- Connect the AT45DBXX DataFlash Board to the board via SPIX interface(connect to SIP1 or SPI2 depends on the program)

- ◆ Operation and result
The below information will be printed on the serial debugging assistant:

```
*****  
SPI is ready!  
AT45DBXX had been Init!  
AT45DBXX ID is 0x1f 0x24 0x0 0x0
```

2.16. TouchPanel

- ◆ Overview
Control LCD via FSMC, display touch function of the LCD
- ◆ Hardware connection



- Connect the board to 5V power via 5VDC interface
- Connect the ULINK2 board to the board via SWD interface
- Connect the 3.2inch 320x240 Touch LCD (A) to the board

- ◆ Operation and result
Calibrate the LCD first, then touch it, draw any line on it.

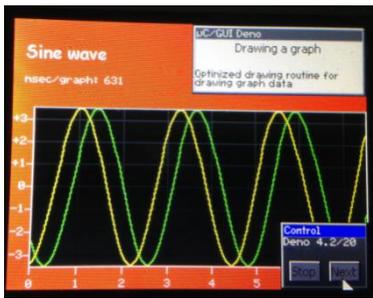
2.17. uCOSII2.91+UCGUI3.90A

- ◆ Overview
UcosII+GUI demo
- ◆ Hardware connection



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

- ◆ Operation and result
 - Display image on the LCD:



2.18. USART

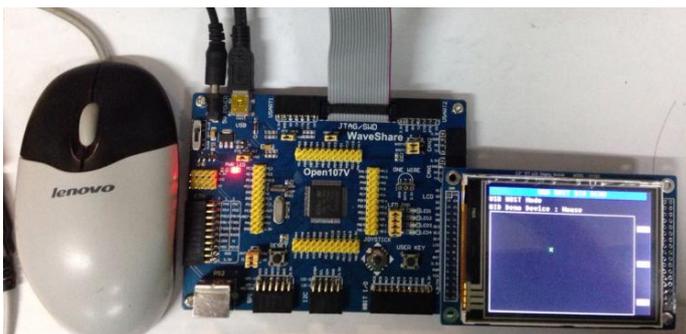
- ◆ Overview
USART serial port communication demo
- ◆ Hardware connection
- ◆ Operation and result

The below information will be printed on the serial debugging assistant:

```
Waveshare!  
Waveshare!  
Waveshare!
```

2.19. USB_Host_HID_KBrd_Mouse

- ◆ Overview
Mouse demo, the development board works as USB host
- ◆ Hardware connection



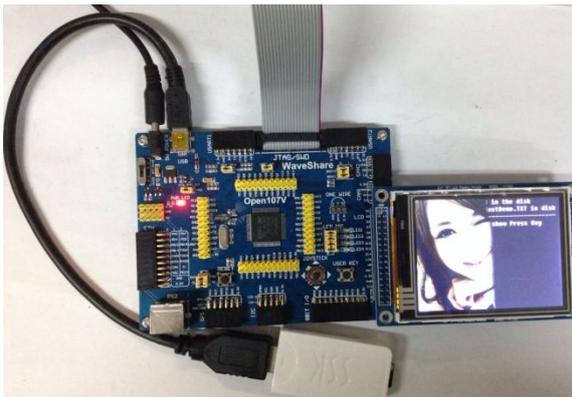
- Connect the mouse to the board via OTG cable.
- Connect the 3.2inch 320x240 Touch LCD (A) to the board

- ◆ Operation and result
 - The green dot in the middle of the LCD will move accordingly while moving the mouse:



2.20. USB_Host_MSC(efsl)

- ◆ Overview
USB flash drive demo, the development board works as USB host
- ◆ Hardware connection



- Connect the USB flash drive to the board via OTG cable.
- Connect the 3.2inch 320x240 Touch LCD (A) to the board

- ◆ Operation and result
 - The picture in BMP format will display on the LCD.

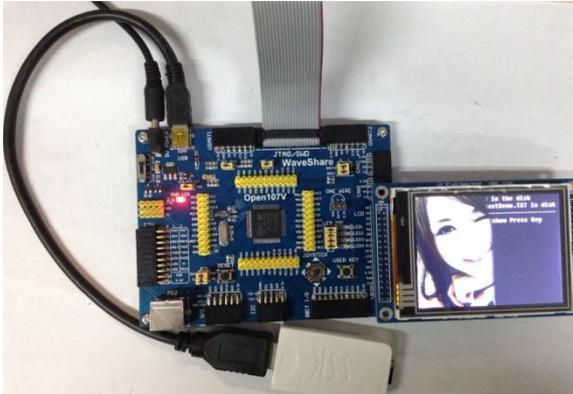


2.21. USB_Host_MSC(FATFS)

- ◆ Overview

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

◆ Hardware connection



- Connect the USB flash drive to the board via OTG cable
- Connect the 3.2inch 320x240 Touch LCD (A) to the board

◆ Operation and result

- The picture in BMP format will display on the LCD.



2.22. USB-JoyStickMouse

◆ Overview

Mouse demo, the development board works as USB device to control the mouse

◆ Hardware connection

- Connect the board to the PC through USB cable

◆ Software configuration

◆ Operation and result

An USB device will appear on the PC device manager

Control the computer cursor by joystick

2.23. USB-Mass_Storage-MCU Flash

◆ Overview

USB flash drive demo, the development board Open103C works as USB device to control the mouse

◆ Hardware connection

- Connect the board to the PC through USB cable

- ◆ Software configuration
- ◆ Operation and result

An USB device and a removable disk will appear on the PC device manager:

2.24. VS1003B

- ◆ Overview
 - Play Music via VS1003B module
- ◆ Hardware connection



- Connect the "VS1003B MP3 Board" to the onboard SPI interface

- ◆ Operation and result
 - VS1003 (GPIO): P0 LED keep blinking
 - VS1003 (line in): can hear music from the PC
 - VS1003 (line out): can hear music from the MCU FLASH
 - VS1003 (record): can hear sound from the microphone

3. Revision history

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