OpenX05R-C User Manual

1. Overview

1.1. What's on board

[MCU]

1. **MCU core board connector**
   for easily connecting the CoreX05R
2. **UART3 interface**
   easily connects to RS232, USB TO 232, etc.
3. **SDIO interface**
   for connecting Micro SD module, features much faster access speed rather than SPI
4. **I2S2/I2S3/I2C1**
   for connecting I2S peripherals, such as Audio module

[Other interfaces]

14. **5V DC jack**
15. **5V/3.3 V power input/output**
    usually used as power output, also common-grounding with other user board
16. **MCU pins connector**
    VCC, GND, and all the I/O ports are accessible on expansion connectors for further expansion

[Jumper]

5. **I2C1/I2C2 interface**
   easily connects to I2C peripherals such as I/O expander (PCF8574), FRAM (FM24CLxx), etc.

6. **SPI1/SPI2 + AD/DA interface**
   easily connects to SPI peripherals such as DataFlash (AT45DBxx), SD card, MP3 module, etc.
   SPI1 features AD/DA alternative function, supports connecting AD/DA module as well

7. **USART2 interface**
   easily connects to RS232, RS485, USB TO 232, etc.

8. **LCD interface**
   for connecting touch screen LCD

9. **ULPI interface**
   for connecting high-speed USB peripheral (the STM32F405R integrates USB HS controller without any PHY device)

10. **UART1 interface**
    easily connects to RS232, USB TO 232, etc.

11. **CAN2 interface**
    communicates with accessory boards which feature the CAN device conveniently

12. **CAN1 interface**
    communicates with accessory boards which feature the CAN device conveniently

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

17. **LEDs jumper**
    short the jumper to connect to default I/Os used in example code
    open the jumper to connect to custom I/Os via jumper wires

18. **Joystick jumper**
    short the jumper to connect to default I/Os used in example code
    open the jumper to connect to custom I/Os via jumper wires

19. **User key/Wake-Up button jumper**
    short the jumper to connect to default I/Os used in example code
    open the jumper to connect to custom I/Os via jumper wires

20. **5V power selection jumper**
    powered from Core 5V or 5V DC

[Component]

21. **LEDs**
    convenient for indicating I/O status and/or program running state

22. **User key**
    convenient for I/O input and/or interact with running code

23. **Wake-Up button**
    wake up the STM32 MCU from sleep mode, also used as regular user key

24. **Joystick**
    convenient for I/O input (five positions)

2. Demo

➢ KEIL MDK Version：4.7
➢ Programmer/Debugger: ULINK2
➢ Programming/Debugging interface: SWD
➢ Serial port settings:

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

2.1. ADC+DMA

◆ Overview
ADC+DMA demo
◆ Hardware connection
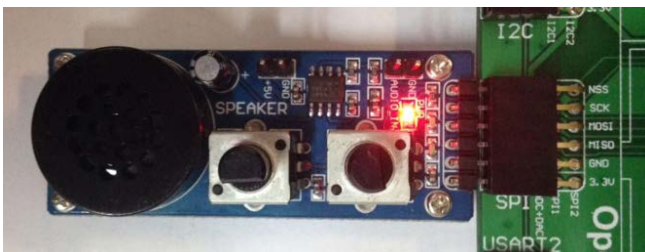
➢ Connect the Analog Test Board to the board via SPI1（ADC+DAC）interface

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

2.2.   CAN1 TO CAN2-Normal

◆ Overview
    CAN demo
◆ Hardware connection

➢ Two "SN65HVD230 CAN Board" are required, connect them to the board respectively

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

```
CAN-Bus Test
CAN-Bus Speed 100kHz
Please press the JOYSTICK middle button to continue!
CAN2 Receive Data
CAN2 ID 123
CAN2_DATA0 ee |
CAN2_DATA1 de
CAN2_DATA2 b8
CAN2_DATA3 5f
CAN2_DATA4 f3
CAN2_DATA5 65
CAN2_DATA6 3c
CAN2_DATA7 c
CAN1 Receive Data
CAN1 ID 321
CAN1_DATA0 84
CAN1_DATA1 b8
CAN1_DATA2 d5
```
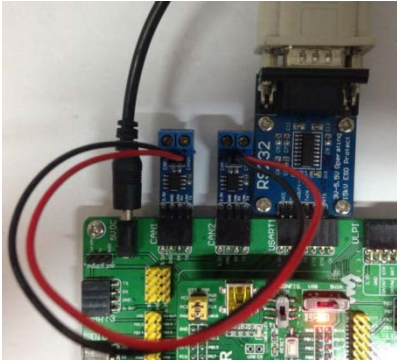
2.3.   CAN-Normal

◆ Overview
    CAN demo in Normal mode
    Hardware connection

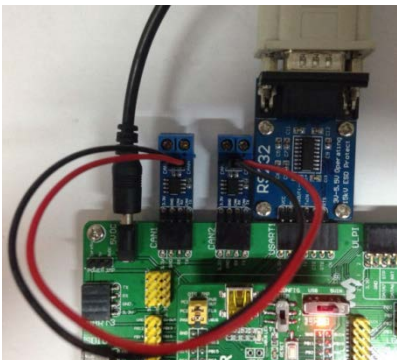➢ Two "SN65HVD230 CAN Board" are required, connect them to the board respectively
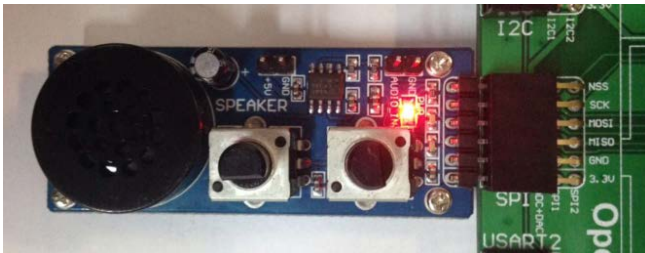
◆ Operation and result
    ➢ The below information will be printed on the serial debugging assistant:

```
CAN-Bus Test
CAN-Bus Speed 100kHz
Please press the JOYSTICK middle button to continue!
CAN2 Receive Data
CAN2 ID 123
CAN2_DATA0 ee |
CAN2_DATA1 de
CAN2_DATA2 b8
CAN2_DATA3 5f
CAN2_DATA4 f3
CAN2_DATA5 65
CAN2_DATA6 3c
CAN2_DATA7 c
CAN1 Receive Data
CAN1 ID 321
CAN1_DATA0 84
CAN1_DATA1 b8
CAN1_DATA2 d5
```

2.4. DAC

◆ Overview

DAC demo

◆ Hardware connection

➢ Connect the Analog Test Board to the board via SPI1（ADC+DAC）interface
➢ Connect the 5V pinheaders 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.

2.5. DS18B20

◆ Overview

DS18B20 temperature measurement

◆ Hardware connection

Insert the DS18B20 to the ONEWIRE 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 Temperture:8 'C
 Temperture:30 'C
 Temperture:29 'C
 Temperture:30 'C
 Temperture:29 'C
 Temperture:30 'C
 Temperture:29 'C
 Temperture:30 'C
```
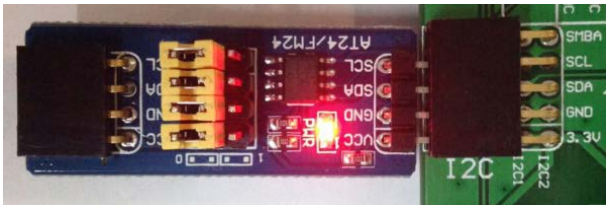
2.6. GPIO_LED_KEY

◆ Overview

LED, push button, joystick demo

◆ Hardware connection

Short the LED jumper, joystick jumper on the board

◆ Operation and result

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

2.7. I2C

◆ Overview

I2C EEPROM demo

◆ Hardware connection

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

◆ Software configuration

Connect the module to I2C1 interface	Connect the module to I2C2 interface
#define Open_I2C1 //#define Open_I2C2	//#define Open_I2C1 #define Open_I2C2

◆ 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
```

2.8. I2S_UDA1380

◆ Overview

I2S demo using UDA1380 Board

◆ Hardware connection
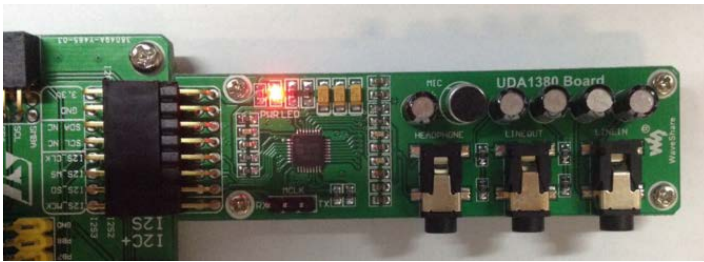
➢ Connect the UDA1380 Board to the onboard I2S interface
➢ Connect the headphone to the HEADPHONE jack

◆ Operation and result
Push the RESET key, you should hear music from the board.

2.9. LCD22-picture

◆ Overview
LCD demo
◆ Hardware connection

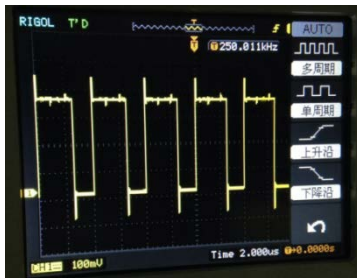

➢ Connect the 2.2inch 320x240 Touch LCD (A) to the board.

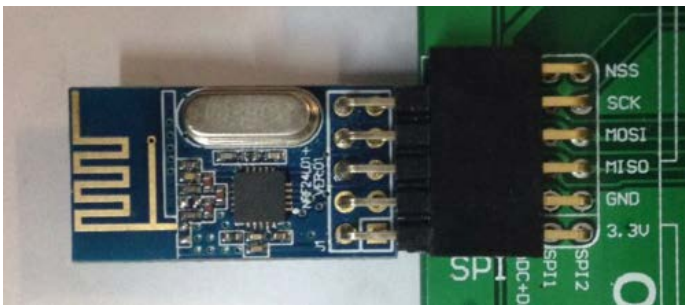◆ Operation and result
Display image on the LCD:

2.10. MCO_OUT

◆ Overview
Clock signal output demo
◆ Hardware connection
Connect the oscilloscope probe to the onboard PA8 pinheader
◆ Operation and result
The below external crystal signal will display on the Oscilloscope:

2.11. NRF24L01

◆ Overview
NRF24L01 demo
◆ Hardware connection

➢ Connect a serial port converter to the onboard USART1 interface
➢ Two " NRF24L01 Board" are required, connect them to two Open103R board respectively

◆ Software configuration
Two NRF24L01 are needed for this demo, the software configuring as below:
When configuring as mode of transmitting, enabled: #define T_O_R 1, comment out: //#define T_O_R 0;
When configuring as mode of receiving, enable: #define T_O_R   0, comment out: //#define T_O_R 0
◆ Operation and result
The below information will be printed on the serial debugging assistant:

2.12. SD_FatFS

◆ Overview
SD_FatFS demo
◆ Hardware connection
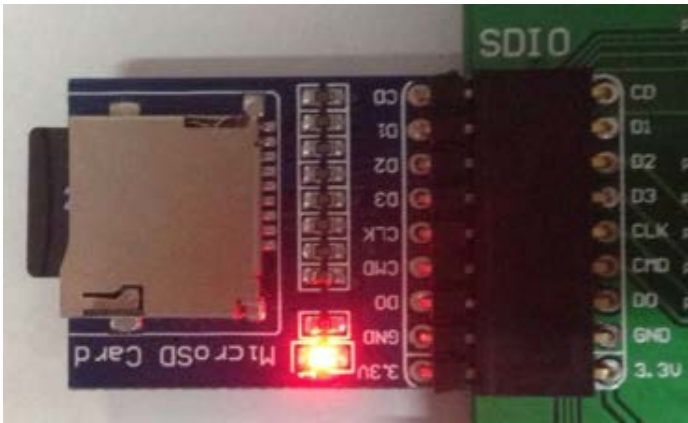
> ➢ Connect the Micro SD Storage Board (with SD card) to the board via SPI1 interface

◆ Operation and result
Message will be printed on the serial debugging assistant.

2.13. SDIO

◆ Overview
SDIO demo
◆ Hardware connection

> ➢ Connect the Micro SD Storage Board (with SD card) to the board via SPI1 interface

◆ Operation and result
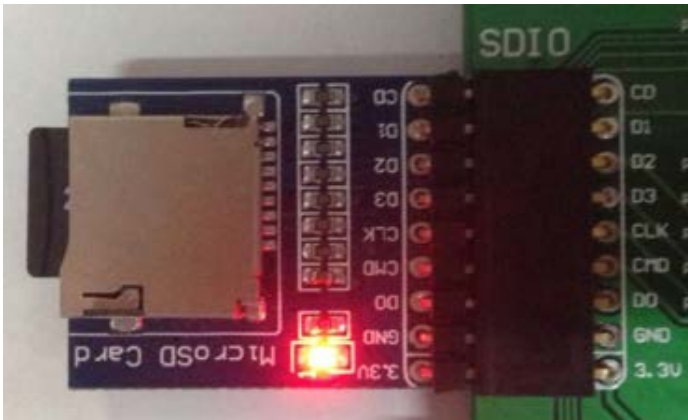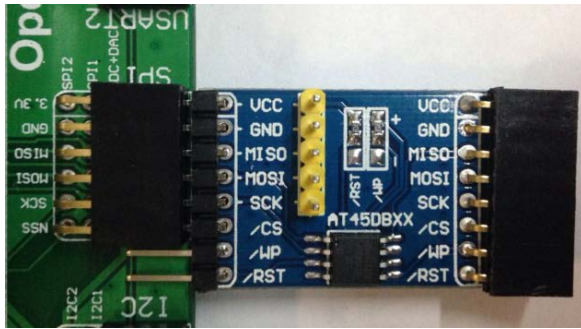Message will be printed on the serial debugging assistant.

2.14. SPI

◆ Overview
SPI FLASH demo
◆ Hardware connection

> ➢ Connect the AT45DBXX DataFlash Board to the board via SPIX interface(connect to SPI1 or SPI2 depends on the program)

◆ Configuration

Connect the module to the board via SPI1 interface	Connect the module to the board via SPI2 interface
#define Open_SPI1	//#define Open_SPI1
//#define Open_SPI2	#define Open_SPI2

◆ Operation and result

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

```
SYSCLK:180M
HCLK:180M
PCLK1:45M
PCLK2:90M

Welcome to WaveShare STM32F4 series MCU Board Open429Z-D
SPI is ready!
AT45DBXX had been Init!
AT45DBXX ID is 0x1f  0x24  0x0  0x0

FALSH AT45DBXX Write Test:
  0   1   2   3   4   5   6   7   8   9  10  11  12  13  14  15  16  17  18  19  20
 21  22  23  24  25  26  27  28  29  30  31  32  33  34  35  36  37  38  39  40  41
 42  43  44  45  46  47  48  49  50  51  52  53  54  55  56  57  58  59  60  61  62
 63  64  65  66  67  68  69  70  71  72  73  74  75  76  77  78  79  80  81  82  83
 84  85  86  87  88  89  90  91  92  93  94  95  96  97  98  99 100 101 102 103 104
105 106 107 108 109 110 111 112 113 114 115 116 117 118 119 120 121 122 123 124 125
```

2.15. TouchPanel

◆ Overview

LCD demo

◆ Hardware connection

Connect the 2.2inch 320x240 Touch LCD (A) to the board

◆ Operation and result

Message will be displayed on the LCD

Touch-screen
calibration
interface

◆ Application
Handheld device display

2.16. uCGUI3.9-LCD22

◆ Overview
GUI demo
◆ Hardware connection

➢ Connect 2.2inch 320x240 Touch LCD (A) to the board

◆ Operation and result
➢ Display image on the LCD

2.17. uCOSII2.91+UCGUI3.90A
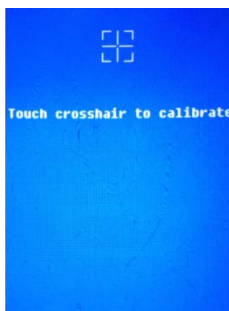
◆ Overview
uCOSII2.91+UCGUI3.90A demo
◆ Hardware connection

> Connect the 2.2inch 320x240 Touch LCD (A) to the board

◆ Operation and result
> Information will be displayed on the LCD; the LED will keep blinking.

2.18. USARTx_pritf

◆ Overview
USART serial port demo
◆ Hardware connection
◆ Operation and result
The below information will be printed on the serial debugging assistant:

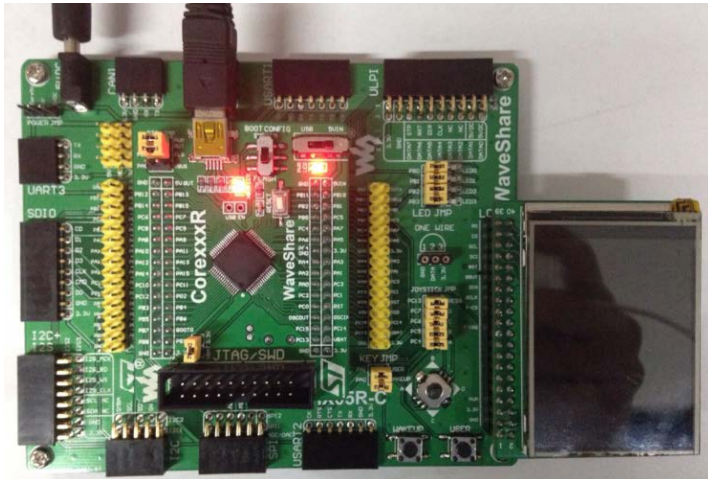# 2.19. USB FS

2.19.1 USB FS Examples（**USB_Device_Examples-HID**）

◆ Overview
USB Device HID example
◆ Hardware connection

- ➤ Open the LED jumper; Short the OTG jumper.
- ➤ Connect the onboard FS USB interface and PC USB port through a USB cable
- ➤ Connect the 2.2inch320x240Touch LCD (A) to the board

◆ Operation and result

◆ HID

The USB device will be appeared on the computer device manager, control the computer cursor by joystick.

2.19.2 USB FS Examples（**USB_Device_Examples-MSC**）

◆ Overview

USB Device Mass Storage example（FATFS）

◆ Hardware connection

- ➤ Open the LED jumper; Short the OTG jumper.
- ➤ Connect the Micro SD Storage Board (with SD card) to the onboard SDIO interface
- ➤ Connect the onboard FS USB interface and PC USB port through a USB cable
- ➤ Connect the 2.2inch320x240TouchLCD (A) to the board

◆ Operation and result

➤ MSC

"USB Mass storage device" will appeared on the computer Device Manager, the SD card appears as a removable hard drive on the PC:

2.19.3 USB FS Examples（**USB_Device_Examples-VCP**）

◆ Overview

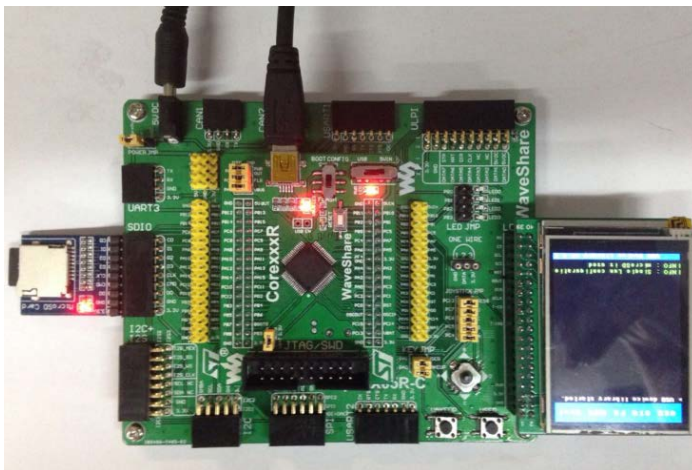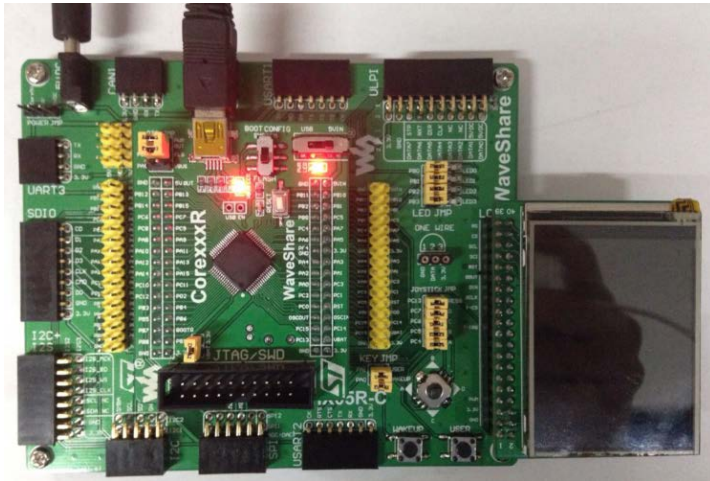USB Device VCP (Virtual Com Port) example

◆ Hardware connection

> Open the LED jumper; Short the OTG jumper.
> Connect the onboard FS USB interface and PC USB port through a USB cable
> Connect the 2.2inch320x240TouchLCD (A) to the board

◆ Operation and result
  > VCP

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

2.19.4 USB FS Examples（**USB_Host_Device_Examples - DRD**）

◆ Overview
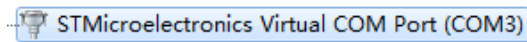 USB Manual Dual role device example
◆ Hardware connection

> Open the LED jumper; Short the OTG jumper.
> Connect the onboard FS USB interface and PC USB port through a USB cable
> Connect the 2.2inch320x240Touch LCD (A) to the board

◆ Operation and result
  Below information displayed on the LCD:

Choose Host or Slave via joystick:

➢ Part 1:

➢ Connect the Micro SD Storage Board (with SD card) to the onboard SDIO interface

➢ Connect the onboard USB interface and PC USB port through a USB cable

➢ Connect the 2.2inch320x240TouchLCD (A) to the board

➢ Part 2：

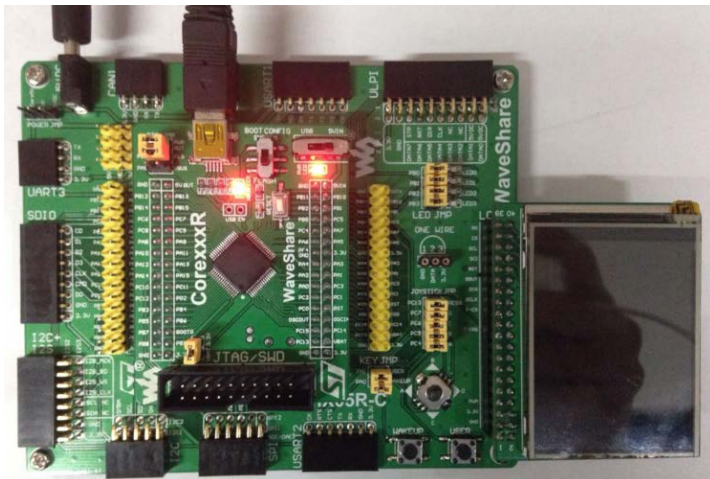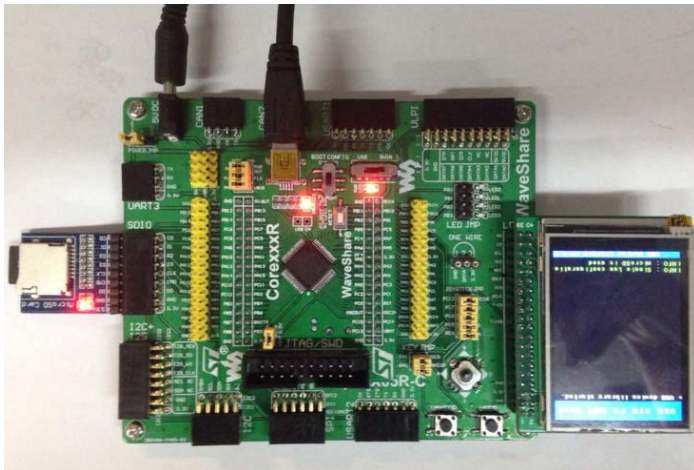> ➢ Connect the Micro SD Storage Board (with SD card) to the onboard SDIO interface
> ➢ Connect the onboard USB interface and PC USB port through a USB cable

"USB Mass storage device" will appeared on the computer Device Manager, the SD card appears as a removable hard drive on the PC

2.19.5 USB FS Examples（USB_Host_Examples-HID）

◆ Overview
USB Host HID example
◆ Hardware connection

> ➢ Open the LED jumper; Short the OTG jumper.
> ➢ Connect a USB mouse to the on board USB interface through an USB OTG cable
> ➢ Connect the 2.2inch320x240Touch LCD (A) to the board

◆ Operation and result
➢ HID
The green dot on the LCD will move following the mouse.

2.19.6 USB FS Examples（USB_Host_Examples-MSC）

◆ Overview
   USB Host MSC example
◆ Hardware connection

➢ Open the LED jumper; Short the OTG jumper.
➢ Connect a USB Flash Drive(Place picture.bmp into the USB Flash Drive) to the on board USB interface through an USB OTG cable;
➢ Connect the 2.2inch320x240Touch LCD (A) to the board.
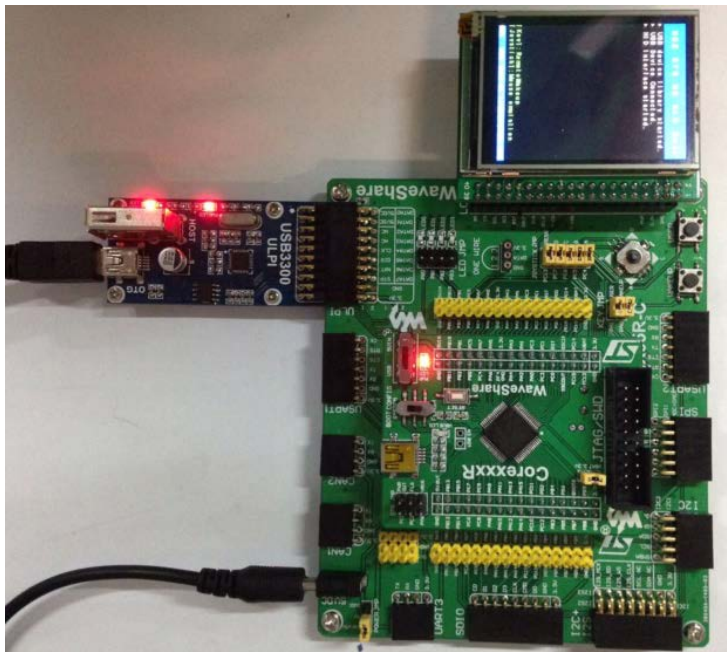
◆ Operation and result
   ➢ MSC
      Display message/info on the LCD, the example code will place a TXT file into the USB Flash Drive, list the files in the USB Flash Drive, and display the picture.bmp

2.20. USB HS

2.20.1 USB HS Examples（USB_Device_Examples-HID）

◆ Overview
   USB Device HID (Joystick) example
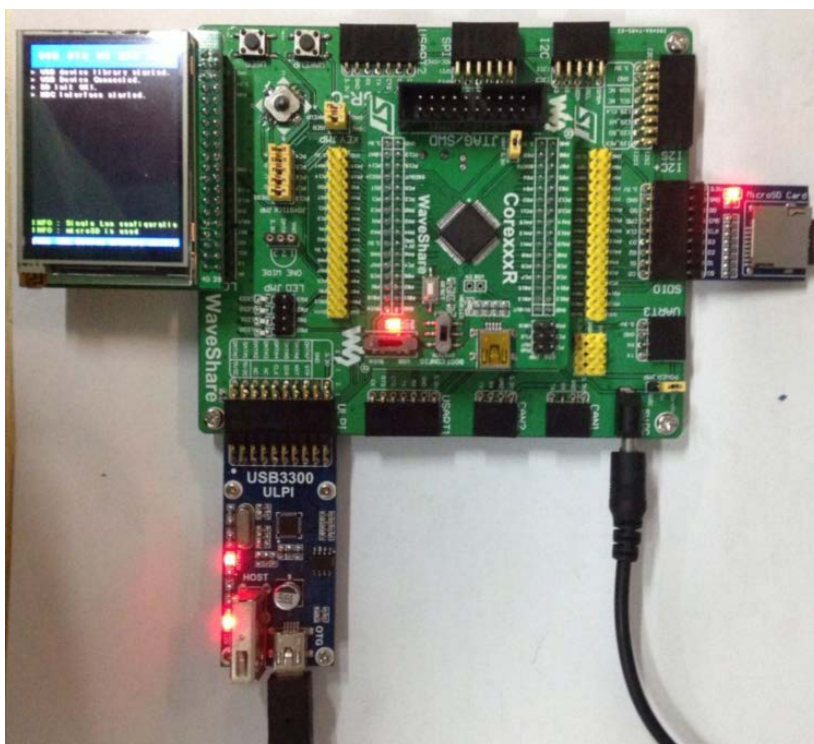◆ Hardware connection

> ➢ Open the LED、OTG jumper;
> ➢ Connect the USB3300 board to the onboard ULPI interface.
> ➢ Connect the USB3300 USB HS Board OTG interface and PC USB port through a USB cable
> ➢ Connect the 2.2inch320x240Touch LCD (A) to the board

◆ Operation and result
  ➢ HID
    Control the computer cursor by joystick

2.20.2 USB HS Examples（USB_Device_Examples-MSC）

◆ Overview
  USB Device Mass Storage example
◆ Hardware connection

> ➢ Open the LED、OTG jumper;
> ➢ Connect the USB3300 board to the onboard ULPI interface.
> ➢ Connect the Micro SD Storage Board (with SD card) to the board via SDIO interface
> ➢ Connect the USB3300 USB HS Board OTG interface and PC USB port through a USB cable
> ➢ Connect the 2.2inch320x240Touch LCD (A) to the board
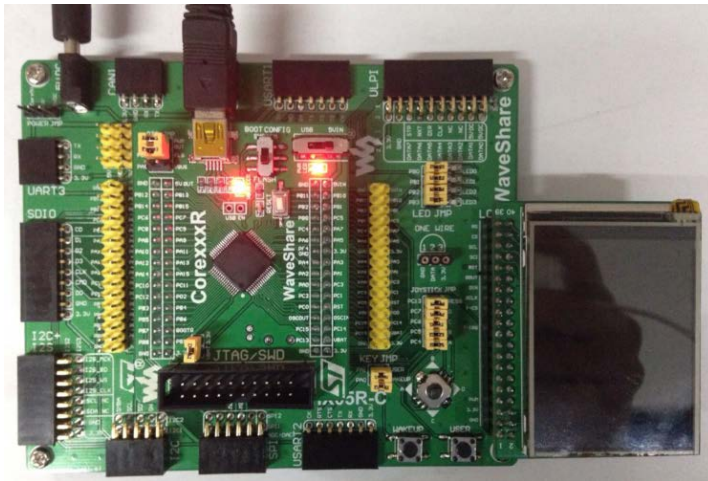
◆ Operation and result
  ➢ MSC
"USB Mass storage device" will appeared on the computer Device Manager, the SD card appears as a removable hard drive on the PC.

2.20.3 USB HS Examples（**USB_Device_Examples-VCP**）

◆ Overview
  USB Device VCP (Virtual Com Port) example
◆ Hardware connection

  ➢ Open the LED、OTG jumper;
  ➢ Connect the onboard FS USB interface and PC USB port through a USB cable
  ➢ Connect the 2.2inch320x240Touch LCD (A) to the board

◆ Operation and result
  ➢ VCP
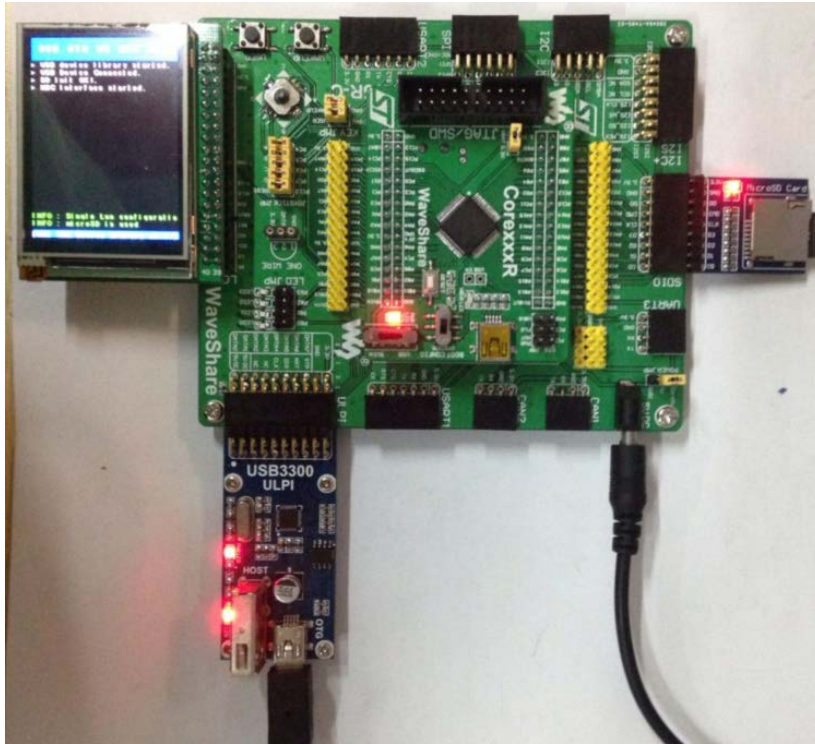A USB VCP (Virtual Com Port) exists on the PC, short the RX TX pins of USART3 for self sending-receiving.

2.20.4 USB HS Examples（**USB_Device_Examples- DualCore**）

◆ Overview
  USB Device Dual Core example
◆ Hardware connection

> ➢ Open the LED、OTG jumper;
> ➢ Connect the USB3300 board to the onboard ULPI interface.
> ➢ Connect the Micro SD Storage Board (with SD card) to the board via SDIO interface
> ➢ Connect the USB3300 Mini USB interface and PC USB port through a USB cable
> ➢ Connect the 2.2inch320x240Touch LCD (A) to the board

◆ Operation and result
   ➢ DualCore
   Part 1：Connect the onboard FS USB interface and PC USB port through a USB cable; Control the computer cursor by joystick;
   Part 2： Connect the USB3300 USB HS Board USB interface and PC USB port through a USB cable; you should find the SD card as a removable storage device on the computer.

2.20.5 USB HS Examples（USB_Host_Examples-HID）
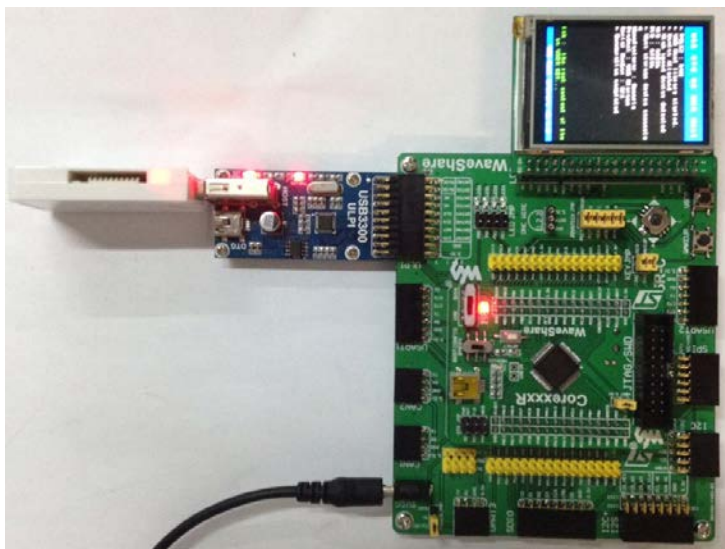
◆ Overview
   USB Host HID example
◆ Hardware connection

> Open the LED、OTG jumper;
> Connect the USB3300 board to the onboard ULPI interface.
> Connect a USB mouse to the USB3300 board USB interface.
> Connect the 2.2inch320x240Touch LCD (A) to the board

◆ Operation and result
  ➢ HID
    The green dot on the LCD will move following the mouse.

2.20.6 USB HS Examples（USB_Host_Examples-MSC）

◆ Overview
  USB Host MSC example
◆ Hardware connection

> Open the LED、OTG jumper;
> Connect the USB3300 board to the onboard ULPI interface.
> Connect a USB flash drive to the USB3300 board via Mini USB interface
> Connect the 2.2inch320x240Touch LCD (A) to the board

◆ Operation and result
  ➢ MSC

Display message/info on the LCD, the example code will place a TXT file into the USB Flash Drive, list the files in the USB Flash Drive.

2.20.7 USB HS Examples（USB_Host_Examples- DualCore）

◆ Overview
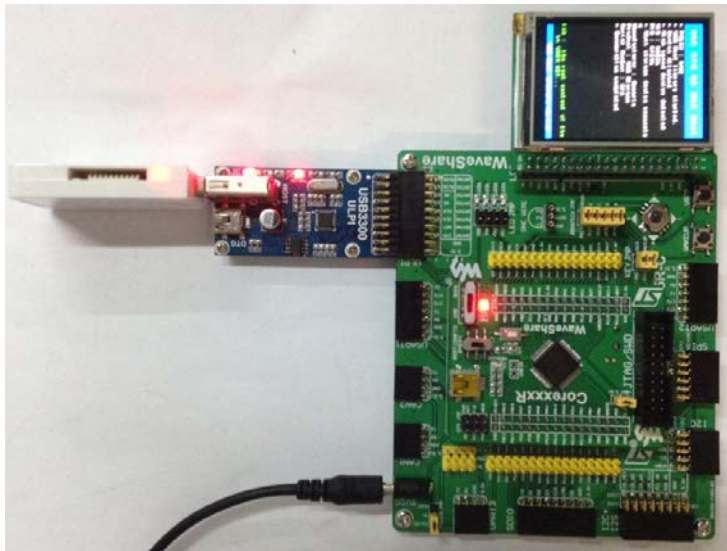   USB Host Dual Core example
◆ Part 1：HS Host
◆ Hardware connection

➢ Open the LED、OTG jumper;
➢ Connect the USB3300 board to the onboard ULPI interface.
➢ Connect a USB flash drive to the USB3300 board via Mini USB interface
➢ Connect the 2.2inch320x240Touch LCD (A) to the board

◆ Operation and result
   ➢ MSC
      Display message/info on the LCD, the example code will place a TXT file into the USB Flash Drive, list the files in the USB Flash Drive.
◆ Part 2：FS Host：
   ◆ Hardware connection

> Open the LED jumper ； Short the OTG jumper.
> Connect a USB mouse to the on board USB interface through an USB OTG cable
> Connect the 2.2inch320x240Touch LCD (A) to the board

◆ Operation and result
  ➢ HID
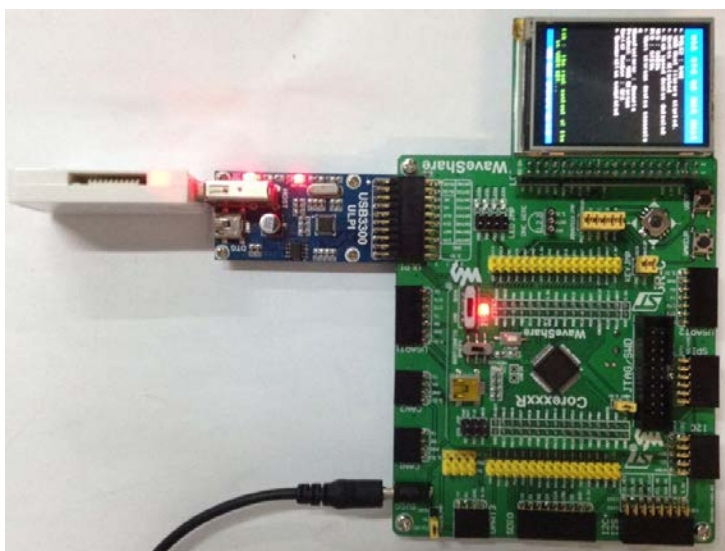   The green dot on the LCD will move following the mouse.

2.20.8 USB HS Examples（USB_Host_Device_Examples- DRD）

◆ Overview
  USB_Host_Device_Examples
◆ Part 1：HS Host
◆ Hardware connection

> Open the LED、OTG jumper;
> Connect the USB3300 board to the onboard ULPI interface.
> Connect a USB flash drive to the USB3300 board via Mini USB interface
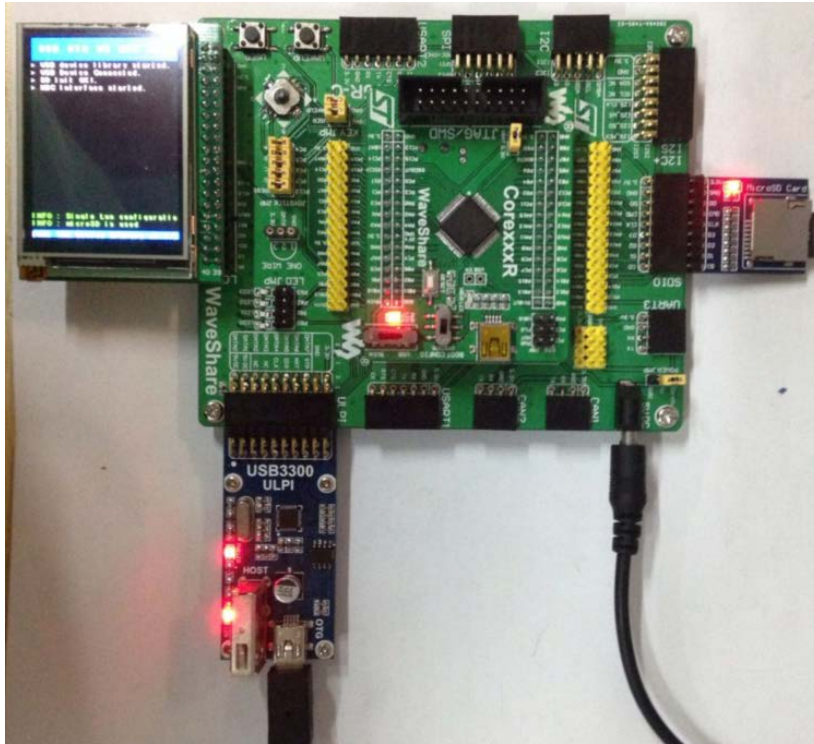> Connect the 2.2inch320x240Touch LCD (A) to the board

◆ Operation and result
  ➢ MSC

The LCD will display the file list in the USB flash drive
- ◆ Part 2：HS Device
- ◆ Hardware connection

- ➢ Open the LED、OTG jumper;
- ➢ Connect the USB3300 board to the onboard ULPI interface.
- ➢ Connect the Micro SD Storage Board (with SD card) to the board via SDIO interface
- ➢ Connect the USB3300 Mini USB interface and PC USB port through a USB cable
- ➢ Connect the 2.2inch320x240Touch LCD (A) to the board

- ◆ Operation and result
  - ➢ MSC

You should find the SD card as a removable storage device on the computer.

3. Revision history

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