GigaDevice Semiconductor Inc.

GD32350R-EVAL

User Guide

V2.0

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1. Summary

GD32350R-EVAL evaluation board uses GD32F350RBT6 as the main controller. As a complete development platform of GD32F3x0 powered by ARM® Cortex™-M4 core, the board supports full range of peripherals. It uses mini-USB interface or AC/DC adapter to supply 5V power. SWD, Reset, Boot, User button key, LED, I2C, I2S, USART, RS485, TFT-LCD, HDMI-CEC, LDR, TSI, IFRP LED, IR Receiver, RTC, SPI, USB, ADC, DAC and Extension Pin are also included. This document details its hardware schematic and the relevant applications.

2. Function Pin Assign

Table 2-1 Pin assignment

Function	Pin	Description
LED	PC10	LED1
	PC11	LED2
	PC12	LED3
	PD2	LED4
RESET		K1-Reset
KEY	PA0	K2-Wakeup
	PC13	K4-Temper
	PF7	K3-User Key
USB	PA11	USBDM
	PA12	USBDP
	PA9	USB VBUS
IR	PC6	IR_RX
	PB9	IR_TX
I2C	PB6	I2C0_SCL
	PB7	I2C0_SDA
I2S	PA4	I2S_WS
	PA5	I2S_CK
	PA7	I2S_DIN
	PA15	MSEL
	PB3	MCLK
	PB5	MDIN
	PA6	I2S_MCK
USART0	PA9	USART0_TX
	PA10	USART0_RX
RS485	PA2	RS485_TX
	PA3	RS485_RX
	PA1	RS485_DIR
TSI	PB11	TSI_G5_IO0

Function	Pin	Description
	PB14	TSI_G5_IO3
	PB13	TSI_G2_IO2
	PB12	TSI_G5_IO1
	PC5	TSI_G2_IO0
	PB0	TSI_G2_IO1
SPI	PB3	SPI0_SCK
	PB4	SPI0_MISO
	PB5	SPI0_MOSI
	PF5	TFT_CS
	PF4	TF_CARD_CS
	PC4	TFT_RESET
ADC	PC1	ADC_IN11
HDMI-CEC	PB8	CEC
COMPARATOR	PA1	COMP0_INP
DAC	PA4	DAC_OUT

3. Getting started

The EVAL Board uses mini-USB connecter or AC/DC adapter to get power, the hardware system power is +3.3V. A mini-USB cable and a J-Link tool are necessary to down programs. Select the correct boot mode and then power on, the LED6 will turn on, which indicates the power supply is ready.

There are Keil version and IAR version of all projects. Keil version of the projects are created based on Keil MDK-ARM 4.74 uVision4. IAR version of the projects are created based on IAR Embedded Workbench for ARM 7.40.2. During use, the following points should be noted:

1. If you use Keil uVision4 to open the project, install the GD32F3x0_AddOn.2.0.0.exe to load the associated files.

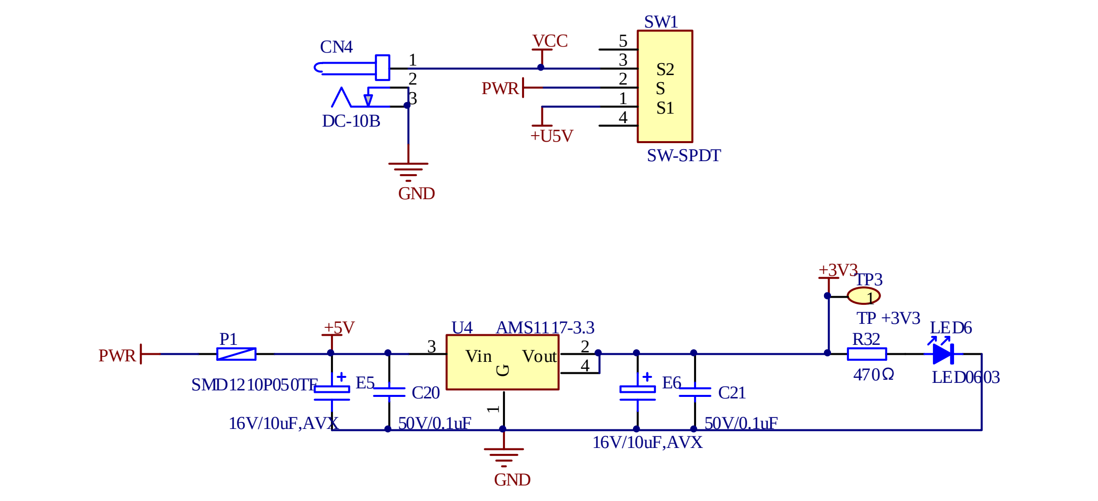
2. If you use Keil uVision5 to open the project, there are two ways to solve the "Device Missing (s)" problem. One is to install GigaDevice.GD32F3x0_DFP.2.0.0.pack. In Project menu, select the Manage sub menu, click on the “Version Migrate 5 Format...” menu, the Keil uVision4 project will be converted to Keil uVision5 project. Then add “C:\Keil_v5\ARM \Pack\ARM\CMSIS\4.2.0\CMSIS\Include” to C/C++ in Option for Target. The other is to install Addon directly. Select the installation directory of Keil uVision5 software, such as C:\Keil_v5, in Destination Folder of Folder Selection. Select the corresponding device in Device of Option for Target and add “C:\Keil_v5\ARM\Pack\ARM\CMSIS\4.2.0\CMSIS \Include” to C/C++ in Option for Target.

3. If you use IAR to open the project, install IAR_GD32F3x0_ADDON.2.0.0.exe to load the associated files.

4. Hardware layout overview

4.1. Power supply

Figure 4-1 Schematic diagram of power supply



4.2. Boot option

Figure 4-2 Schematic diagram of boot option

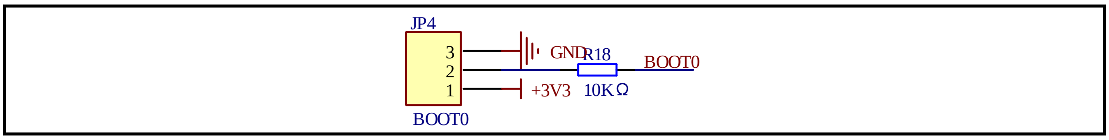
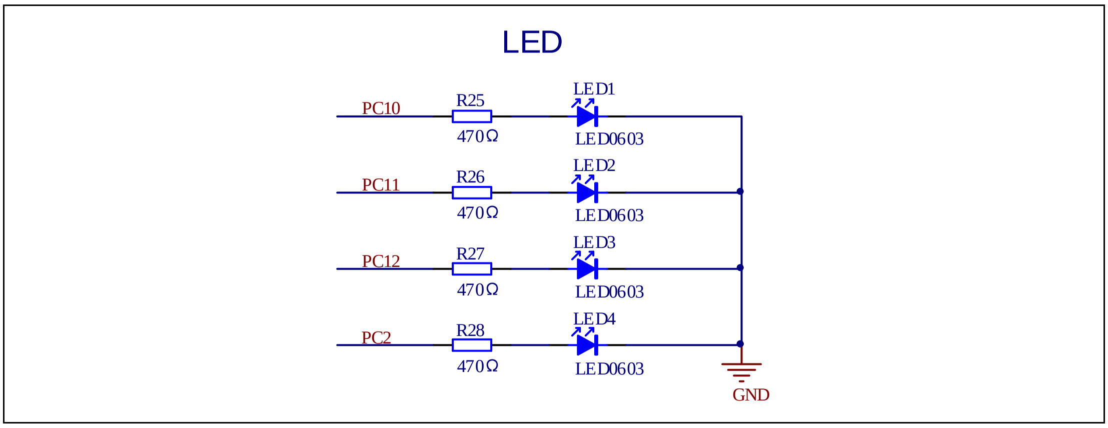


Table 4-1 Boot configuration

BOOT1	BOOT0	Boot Mode
Default	2-3	User memory
	1-2	System memory
Changed by ISP	1-2	SRAM memory

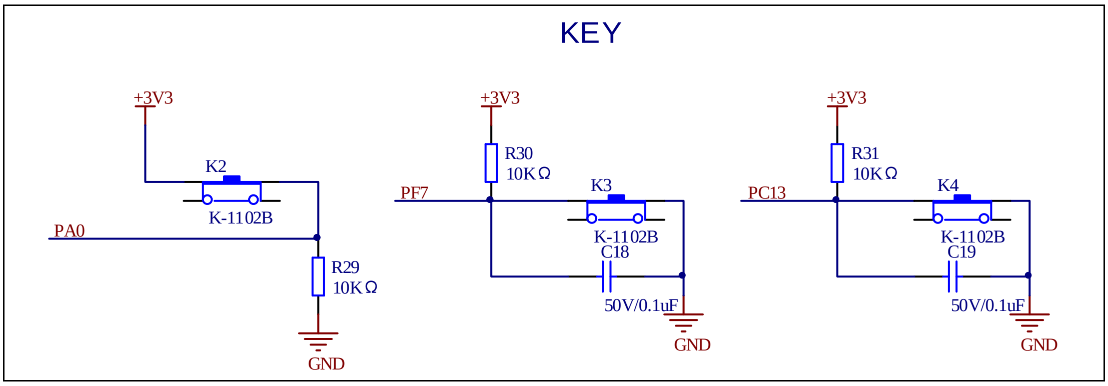
4.3. LED

Figure 4-3 Schematic diagram of LED function



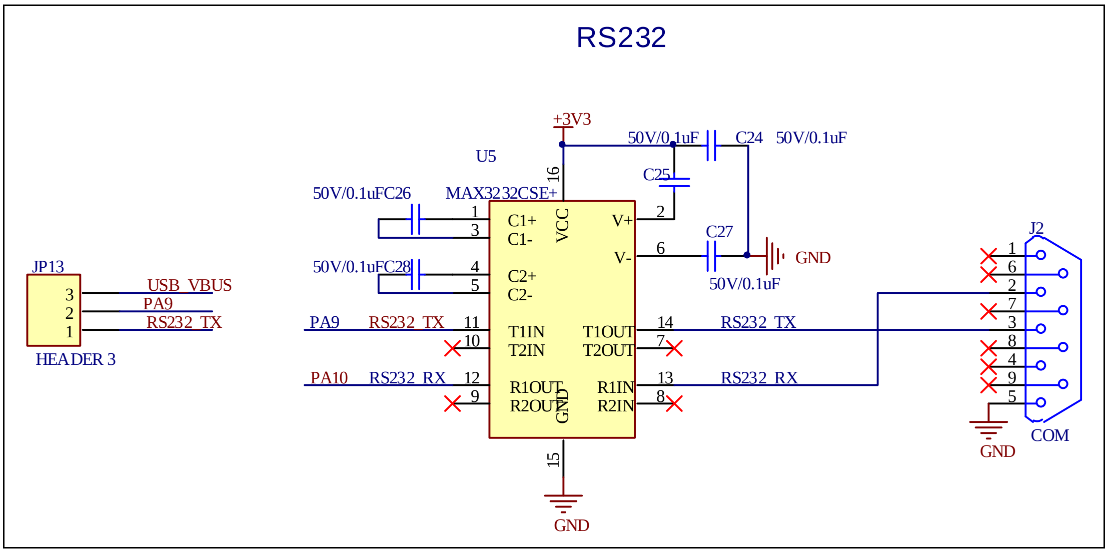
4.4. KEY

Figure 4-4 Schematic diagram of Key function



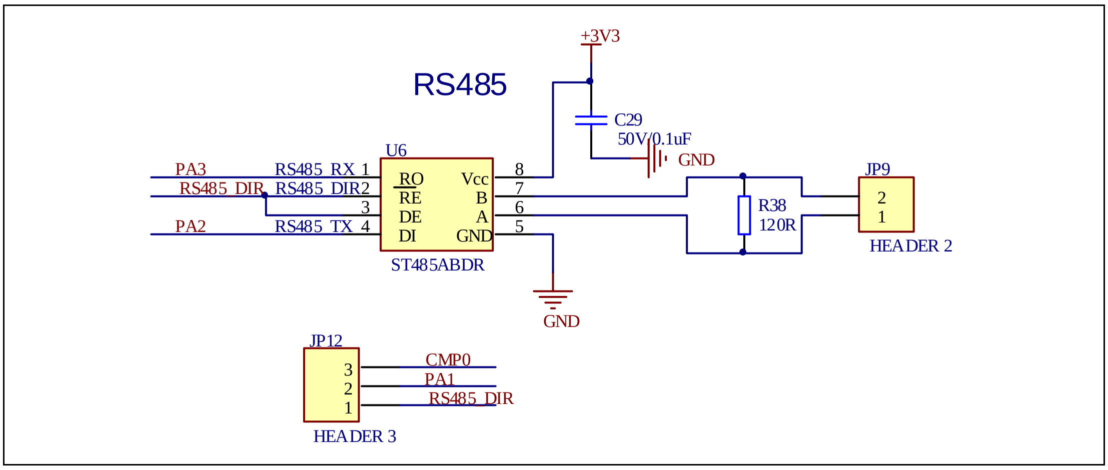
4.5. USART0

Figure 4-5 Schematic diagram of USART0 function



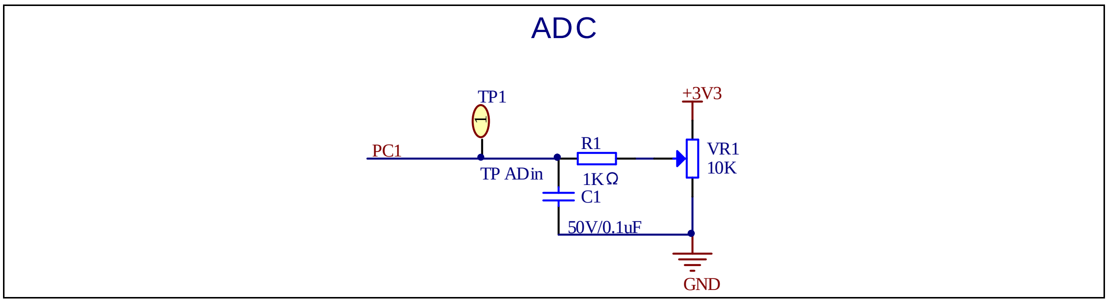
4.6. RS485

Figure 4-6 Schematic diagram of RS485 function



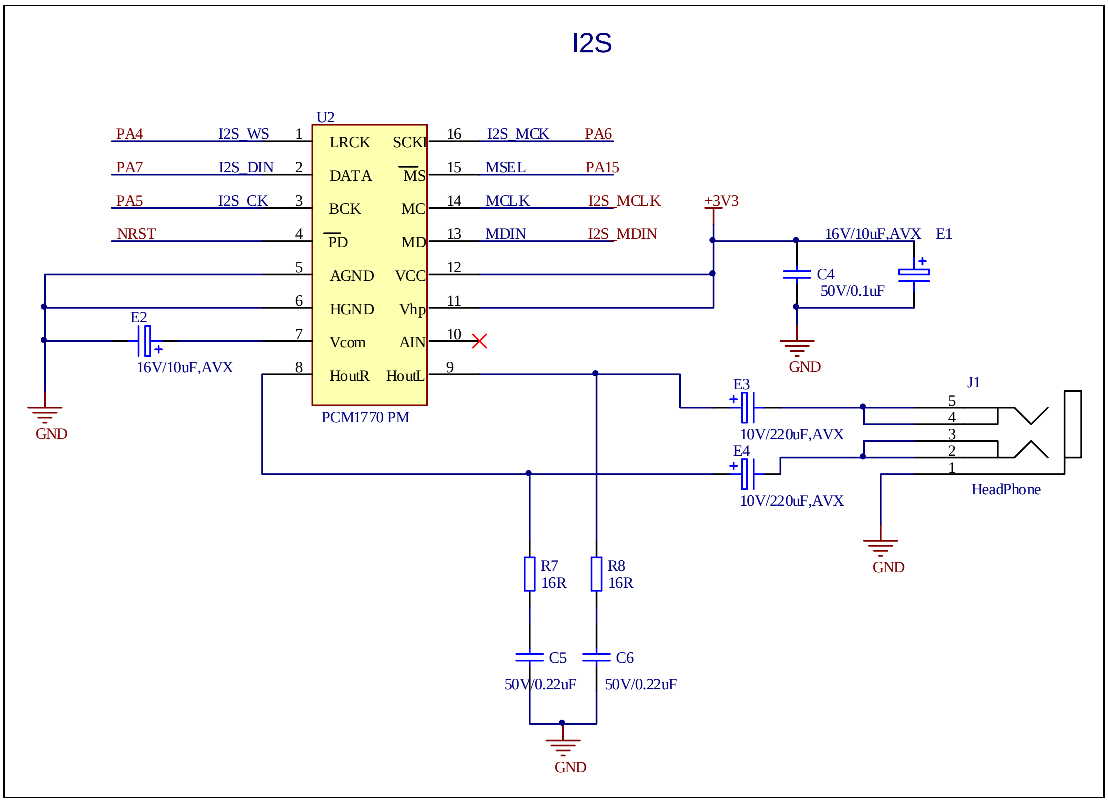
4.7. ADC/DAC

Figure 4-7 Schematic diagram of ADC/DAC function



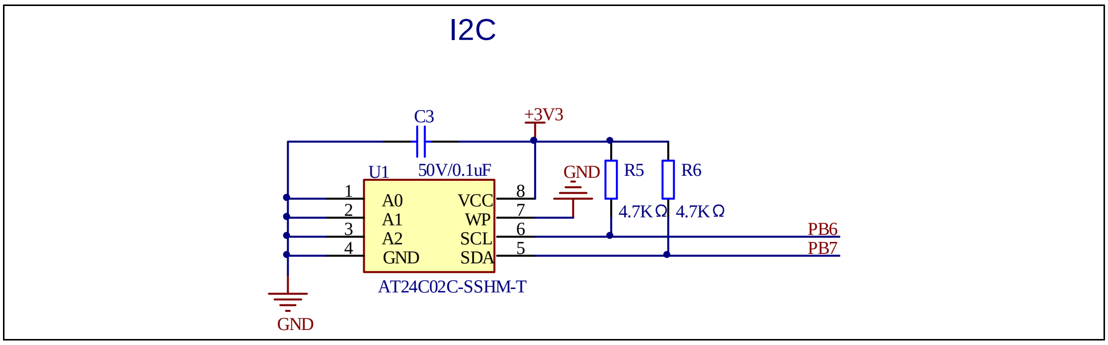
4.8. I2S

Figure 4-8 Schematic diagram of I2S function



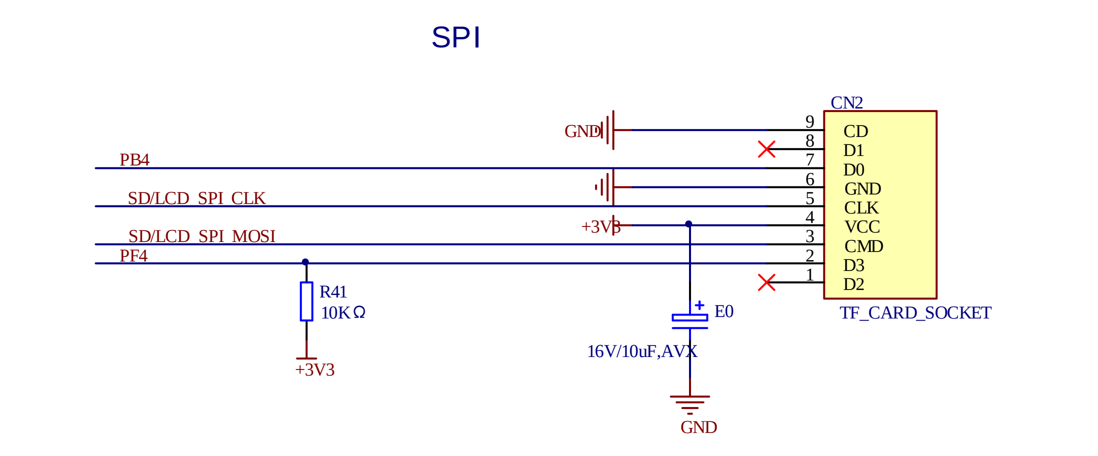
4.9. I2C

Figure 4-9 Schematic diagram of I2C function



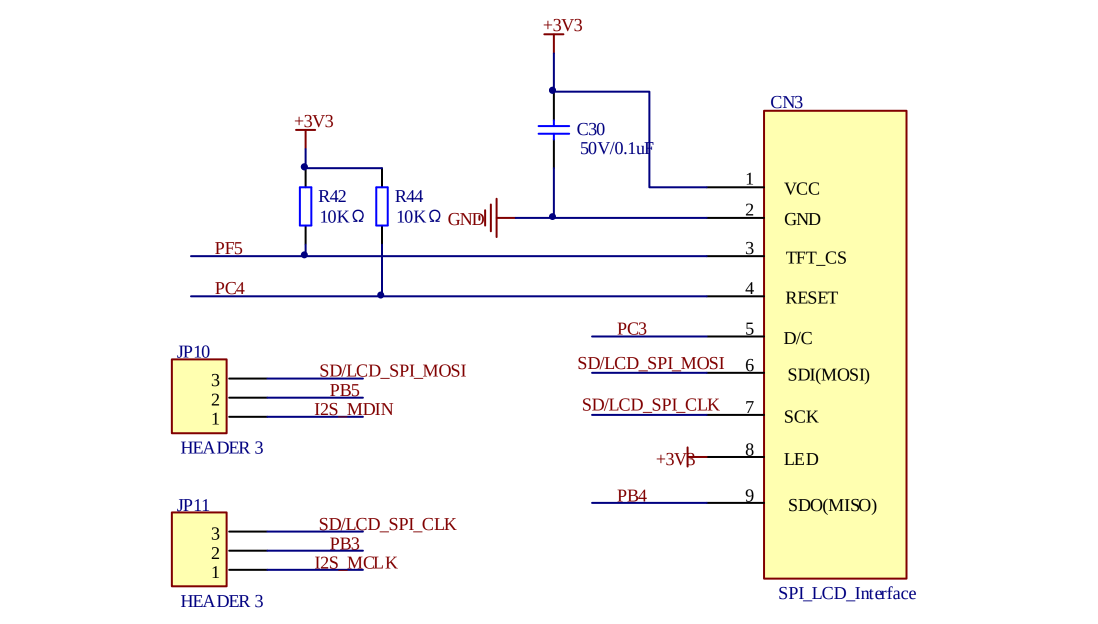
4.10. SPI-TF CARD

Figure 4-10 Schematic diagram of SPI-TF CARD function



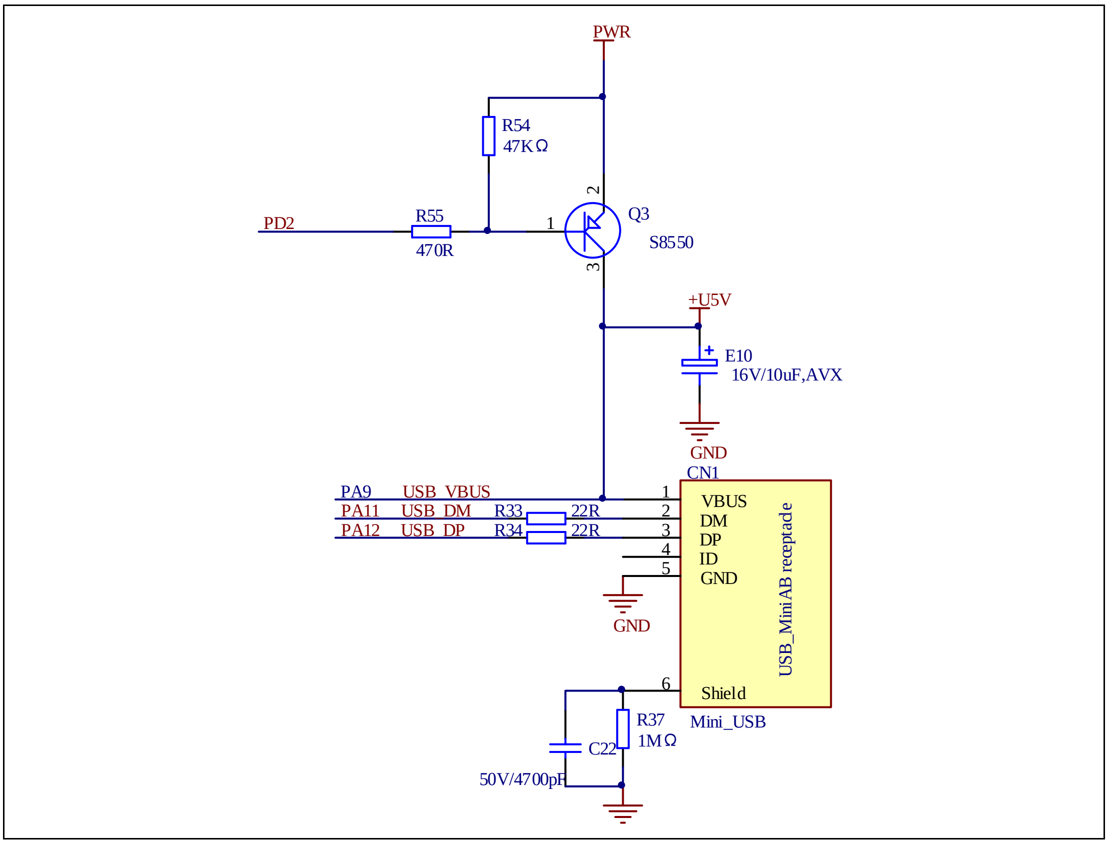
4.11. SPI-TFT LCD

Figure 4-11 Schematic diagram of SPI-TFT LCD function



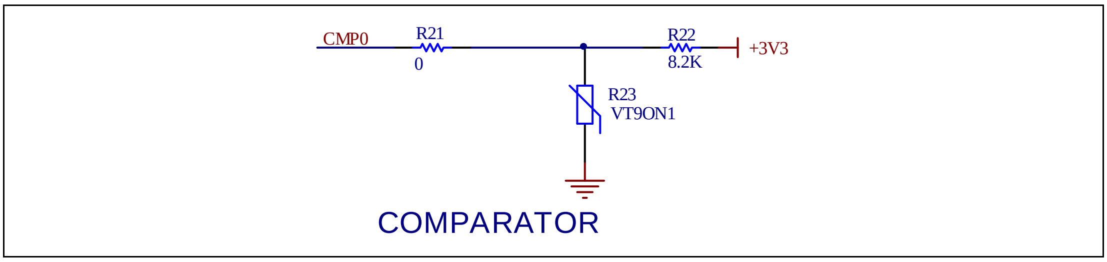
4.12. USBFS

Figure 4-12 Schematic diagram of USBFS function



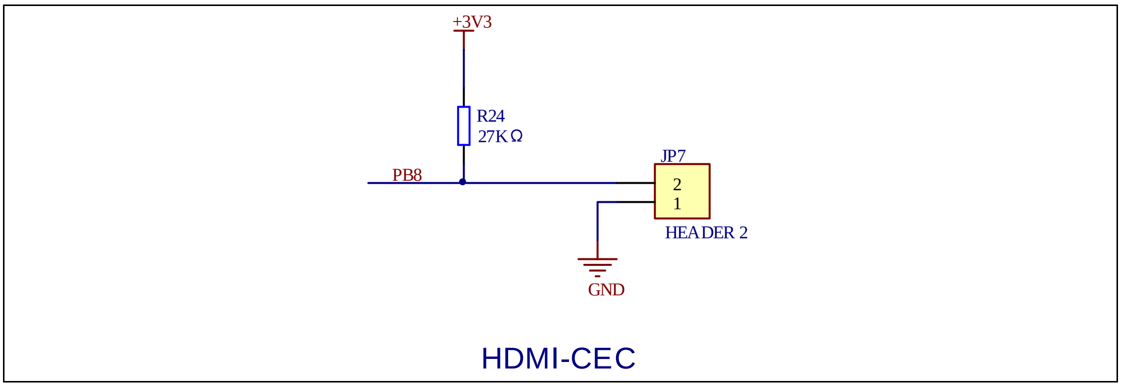
4.13. CMP

Figure 4-13 Schematic diagram of CMP function



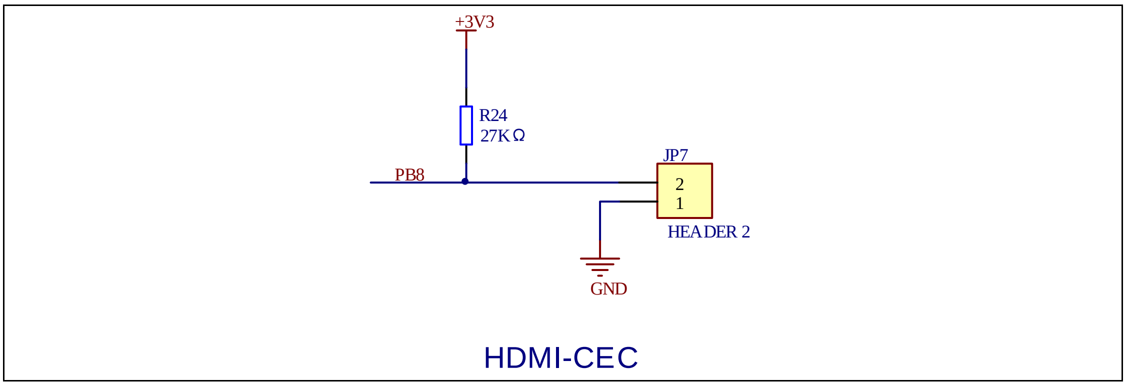
4.14. HDMI-CEC

Figure 4-14 Schematic diagram of HDMI-CEC function



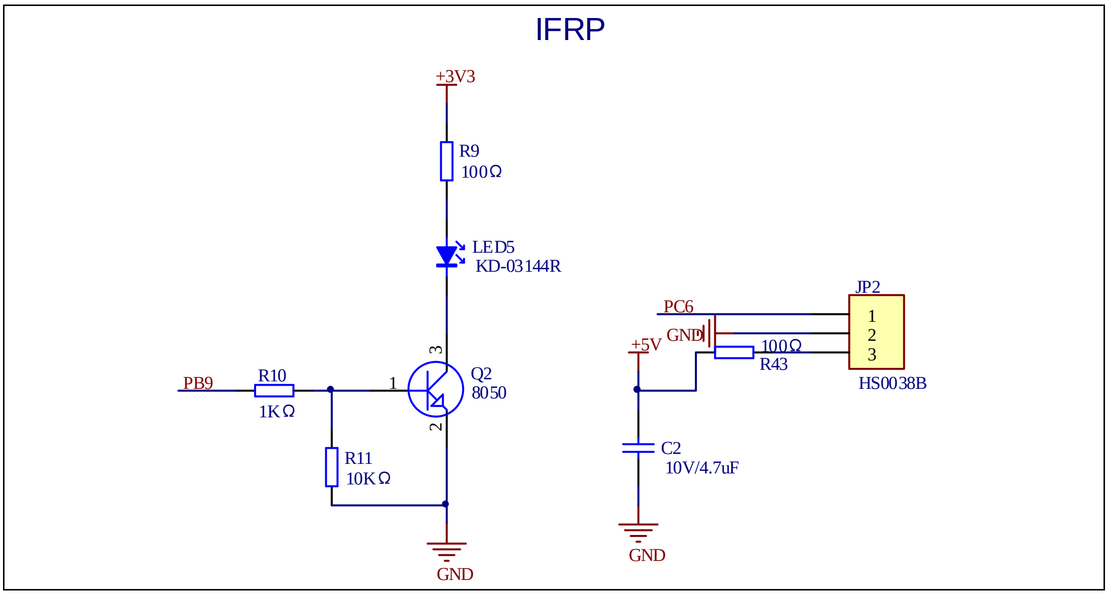
4.15. TSI

Figure 4-15 Schematic diagram of TSI function



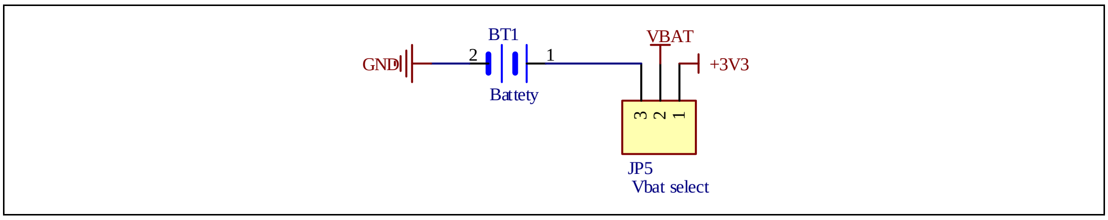
4.16. IFRP

Figure 4-16 Schematic diagram of IFRP function



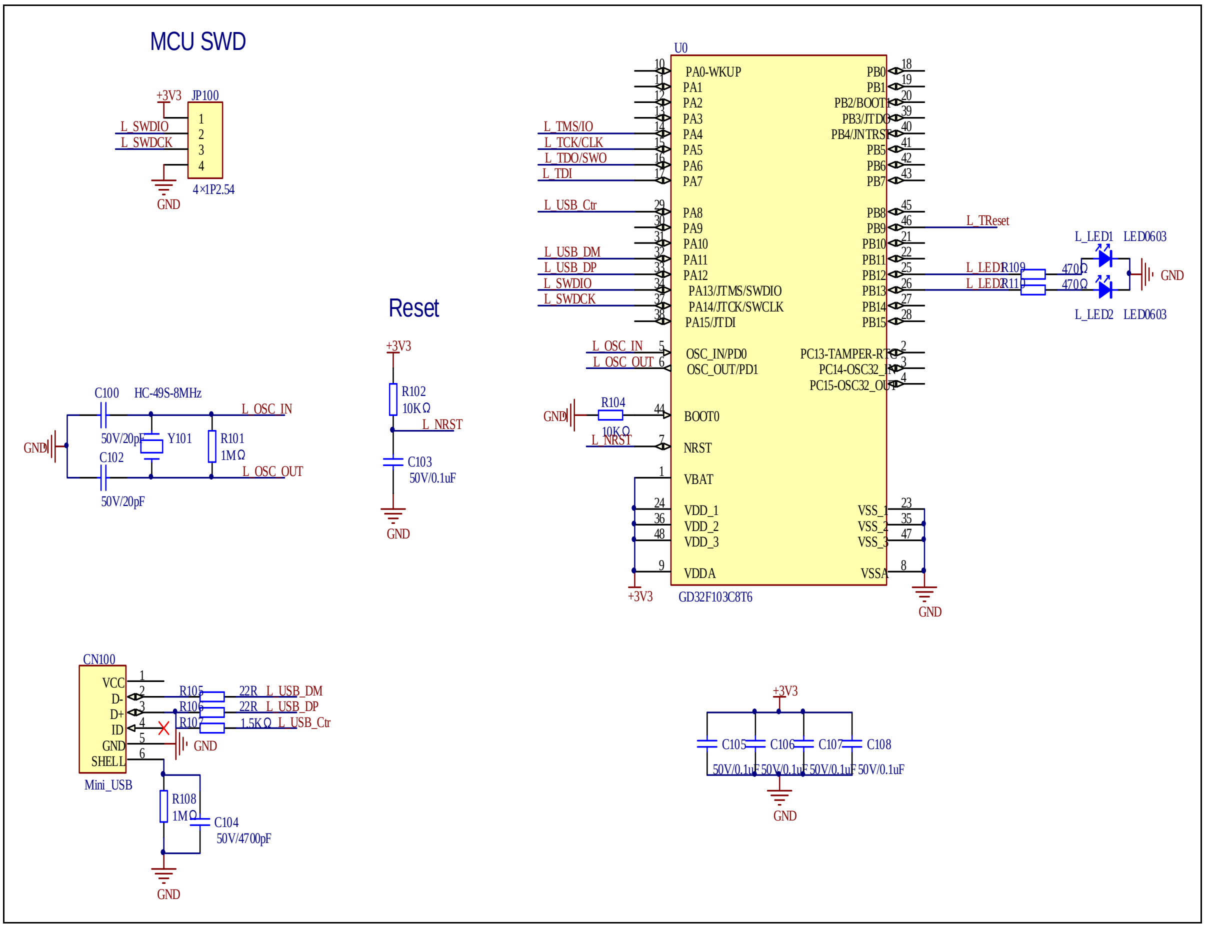
4.17. RTC

Figure 4-17 Schematic diagram of RTC function



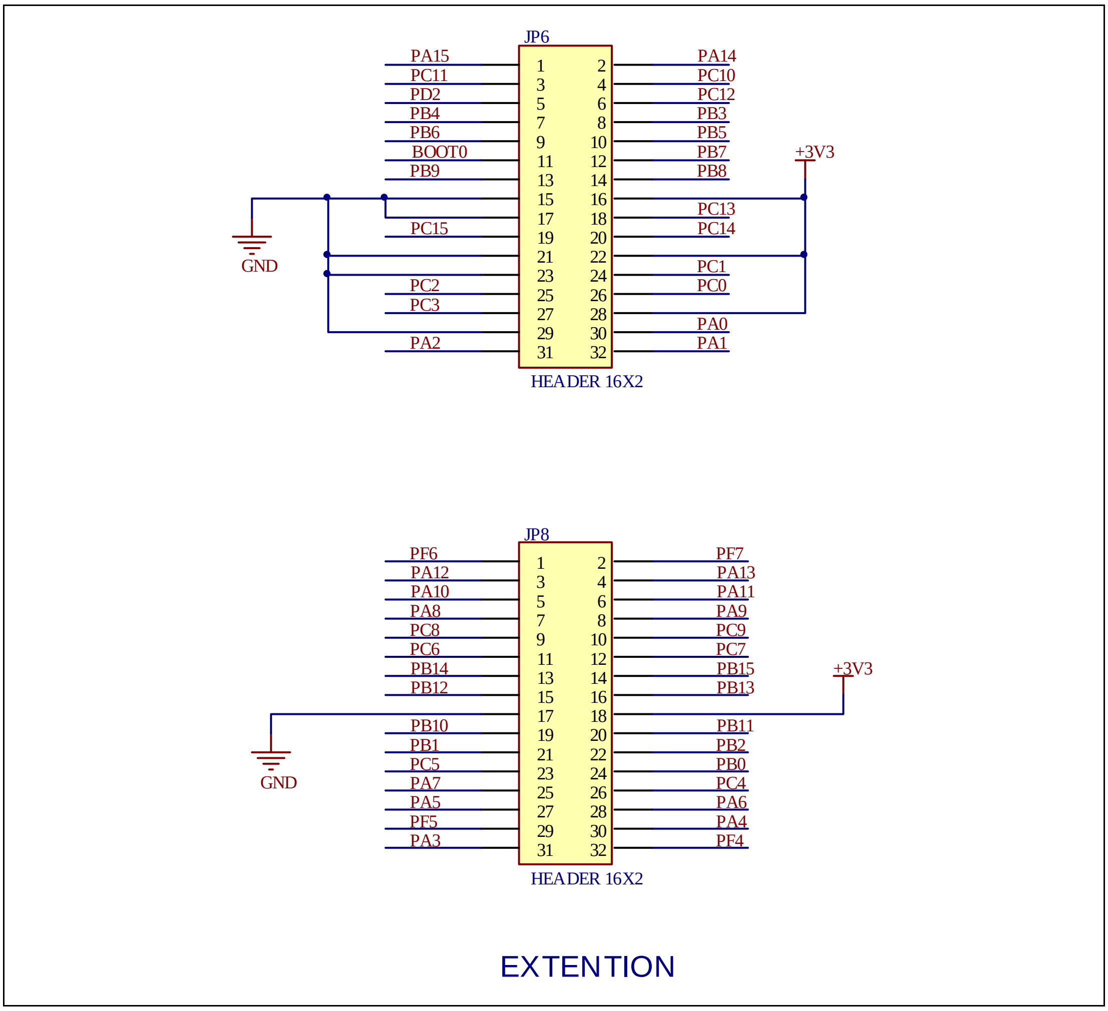
4.18. GD-Link

Figure 4-18 Schematic diagram of GD-Link function



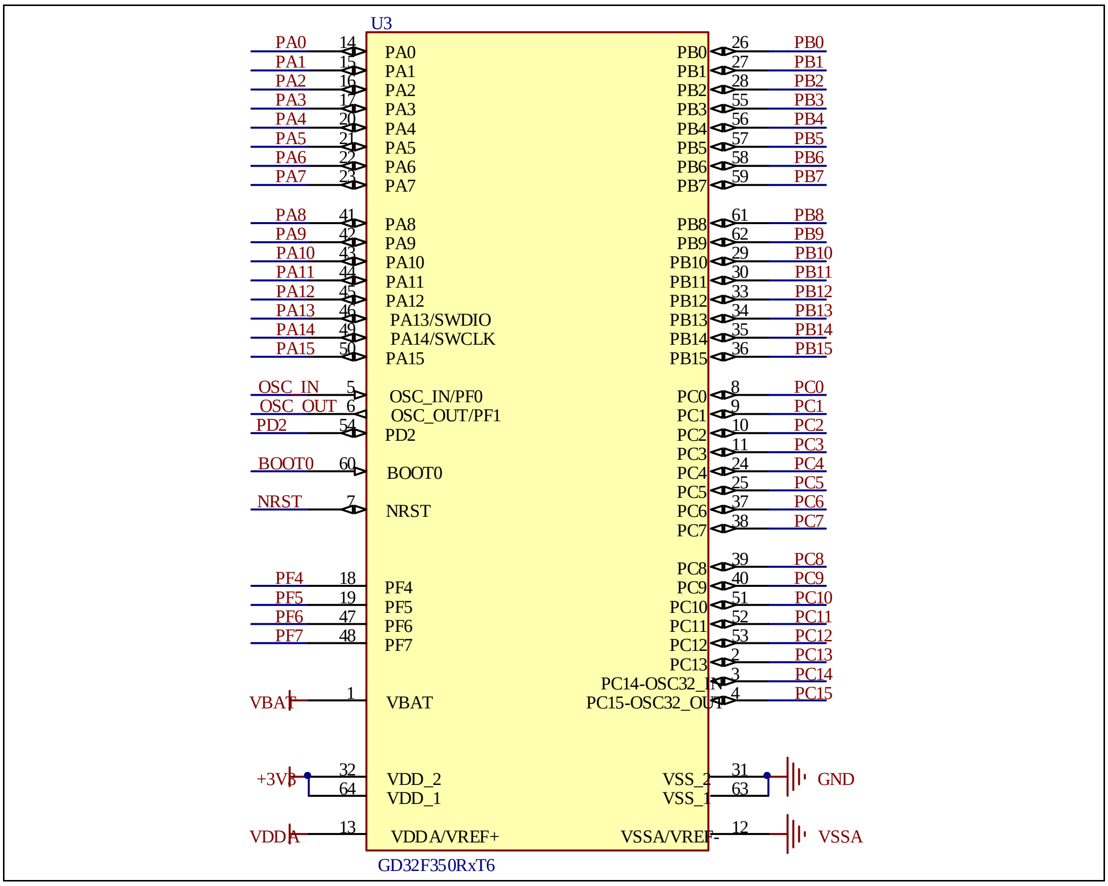
4.19. Extension

Figure 4-19 Schematic diagram of Extension Pin



4.20. MCU

Figure 4-20 Schematic diagram of MCU Pin



5. Routine use guide

5.1. GPIO_Running_LED

5.1.1. DEMO purpose

This Demo includes the following functions of GD32 MCU:

- Learn to use GPIO for controlling the LED
- Learn to use SysTick to generate 1ms delay

GD32350R-EVAL board has four LEDs. The LED1, LED2, LED3 and LED4 are controlled by GPIO. This demo will show how to light the LEDs.

5.1.2. DEMO running result

Download the program <01_GPIO_Running_LED> to the EVAL board, four LEDs will turn on one by one from LED1 to LED4 every 200ms, and then turn off together. 200ms later, the four LEDs work like previous again.

5.2. GPIO_Key_Polling_mode

5.2.1. DEMO purpose

This Demo includes the following functions of GD32 MCU:

- Learn to use GPIO control the LED and the KEY
- Learn to use SysTick to generate 1ms delay

GD32350R-EVAL board has four keys and four LEDs. The four keys are Reset key, Tamper key, User key and Wakeup key. The LED1, LED2, LED3 and LED4 are controlled by GPIO.

This demo will show how to use the Tamper key to control the LED2. When press down the User Key, it will check the input value of the IO port. If the value is 0, wait for 50ms. Then check the input value of the IO port again. If the value is still 0, indicates that the button is pressed down successfully, and light the LED2.

5.2.2. DEMO running result

Download the program <02_GPIO_Key_Polling_mode> to the EVAL board, first of all, all the LEDs will be flashed once for test. Then press down the Tamper Key, LED2 will be turned on. Press down the Tamper Key again, LED2 will be turned off.

5.3. EXTI_Key_Interrupt_mode

5.3.1. DEMO purpose

This Demo includes the following functions of GD32 MCU:

- Learn to use GPIO to control the LED and the KEY
- Learn to use EXTI to generate external interrupt

GD32350R-EVAL board has four keys and four LEDs. The four keys are Reset key, Wakeup key, User key and Tamper key. The LED1, LED2, LED3 and LED4 are controlled by GPIO.

This demo will show how to use EXTI interrupt line to control the LED2. When press down the Tamper Key, it will produce an interrupt. In the interrupt service function, the demo will toggle LED2.

5.3.2. DEMO running result

Download the program <03_EXTI_Key_Interrupt_mode> to the EVAL board, first of all, all the LEDs will be flashed once for test. Then press down the Tamper Key, LED2 will be turned on. Press down the Tamper Key again, LED2 will be turned off.

5.4. USART_Printf

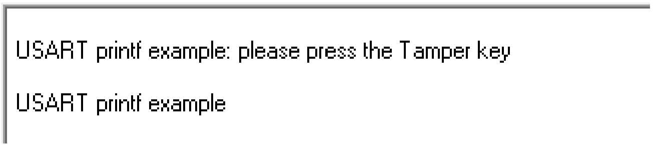
5.4.1. DEMO purpose

This Demo includes the following functions of GD32 MCU:

- Learn to use GPIO: the Tamper key control the LED

5.4.2. DEMO running result

Jump JP13 to USART, then download the program <04_USART_Printf> to the EVAL board and run. This implementation outputs “USART printf example: please press the Tamper Key” on the hyperterminal using COM. Press the Tamper key, serial port will output “USART Printf Example”. The information via a serial port output as following.



```
USART printf example: please press the Tamper key

USART printf example
```

5.5. USART_HyperTerminal_Interrupt

5.5.1. DEMO purpose

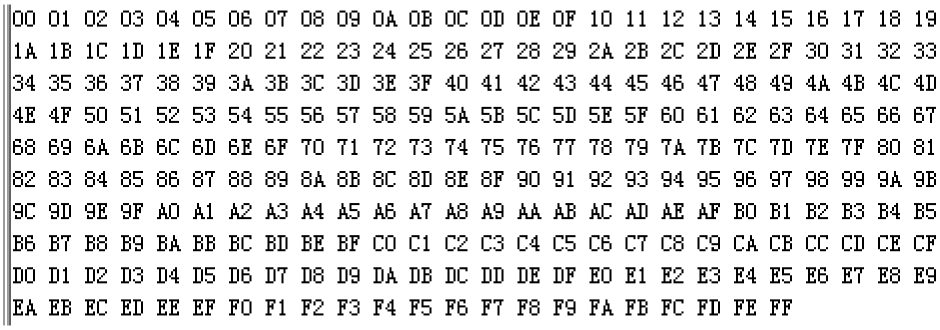
This Demo includes the following functions of GD32 MCU:

- Learn to use the EVAL_COM transmit and receive interrupts to communicate with the hyperterminal

5.5.2. DEMO running result

Jump JP13 to USART, then download the program <05_USART_HyperTerminal_ Interrupt> to the EVAL board and run. Firstly, all the LEDs are turned on and off for test. Then, the COM sends the tx_buffer array (from 0x00 to 0xFF) to the hyperterminal and waits for receiving data from the hyperterminal that you must send. The string that you have sent is stored in the rx_buffer array. The receive buffer have a BUFFER_SIZE bytes as maximum. After that, compare tx_buffer with rx_buffer. If tx_buffer is same with rx_buffer, LED1 and LED2 are turned on, LED3 and LED4 are turned off. Otherwise, LED1 and LED2 are turned off, LED3 and LED4 are turned on.

The information via a serial port output as following:



```
00 01 02 03 04 05 06 07 08 09 0A 0B 0C 0D 0E 0F 10 11 12 13 14 15 16 17 18 19
1A 1B 1C 1D 1E 1F 20 21 22 23 24 25 26 27 28 29 2A 2B 2C 2D 2E 2F 30 31 32 33
34 35 36 37 38 39 3A 3B 3C 3D 3E 3F 40 41 42 43 44 45 46 47 48 49 4A 4B 4C 4D
4E 4F 50 51 52 53 54 55 56 57 58 59 5A 5B 5C 5D 5E 5F 60 61 62 63 64 65 66 67
68 69 6A 6B 6C 6D 6E 6F 70 71 72 73 74 75 76 77 78 79 7A 7B 7C 7D 7E 7F 80 81
82 83 84 85 86 87 88 89 8A 8B 8C 8D 8E 8F 90 91 92 93 94 95 96 97 98 99 9A 9B
9C 9D 9E 9F A0 A1 A2 A3 A4 A5 A6 A7 A8 A9 AA AB AC AD AE AF B0 B1 B2 B3 B4 B5
B6 B7 B8 B9 BA BB BC BD BE BF C0 C1 C2 C3 C4 C5 C6 C7 C8 C9 CA CB CC CD CE CF
D0 D1 D2 D3 D4 D5 D6 D7 D8 D9 DA DB DC DD DE DF E0 E1 E2 E3 E4 E5 E6 E7 E8 E9
EA EB EC ED EE EF F0 F1 F2 F3 F4 F5 F6 F7 F8 F9 FA FB FC FD FE FF
```

5.6. USART_DMA

5.6.1. DEMO purpose

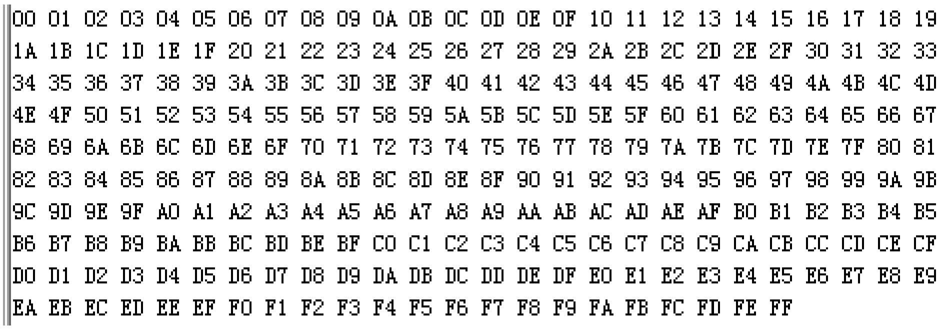
This Demo includes the following functions of GD32 MCU:

- Learn to use the COM transmit and receive using DMA

5.6.2. DEMO running result

Jump JP13 to USART, then download the program < 06_USART_DMA > to the EVAL board and run. Firstly, all the LEDs are turned on and off for test. Then, the COM sends the tx_buffer array to the hyperterminal and waits for receiving data from the hyperterminal that you must send. The string that you have sent is stored in the rx_buffer array. The receive buffer have a BUFFER_SIZE bytes as maximum. After that, compare tx_buffer with rx_buffer. If tx_buffer is same with rx_buffer, LED1 and LED2 are turned on, LED3 and LED4 are turned off. Otherwise, LED1 and LED2 are turned off, LED3 and LED4 are turned on.

The information via a serial port output as following:



```
00 01 02 03 04 05 06 07 08 09 0A 0B 0C 0D 0E 0F 10 11 12 13 14 15 16 17 18 19
1A 1B 1C 1D 1E 1F 20 21 22 23 24 25 26 27 28 29 2A 2B 2C 2D 2E 2F 30 31 32 33
34 35 36 37 38 39 3A 3B 3C 3D 3E 3F 40 41 42 43 44 45 46 47 48 49 4A 4B 4C 4D
4E 4F 50 51 52 53 54 55 56 57 58 59 5A 5B 5C 5D 5E 5F 60 61 62 63 64 65 66 67
68 69 6A 6B 6C 6D 6E 6F 70 71 72 73 74 75 76 77 78 79 7A 7B 7C 7D 7E 7F 80 81
82 83 84 85 86 87 88 89 8A 8B 8C 8D 8E 8F 90 91 92 93 94 95 96 97 98 99 9A 9B
9C 9D 9E 9F A0 A1 A2 A3 A4 A5 A6 A7 A8 A9 AA AB AC AD AE AF B0 B1 B2 B3 B4 B5
B6 B7 B8 B9 BA BB BC BD BE BF C0 C1 C2 C3 C4 C5 C6 C7 C8 C9 CA CB CC CD CE CF
D0 D1 D2 D3 D4 D5 D6 D7 D8 D9 DA DB DC DD DE DF E0 E1 E2 E3 E4 E5 E6 E7 E8 E9
EA EB EC ED EE EF F0 F1 F2 F3 F4 F5 F6 F7 F8 F9 FA FB FC FD FE FF
```

5.7. RS485_Test

5.7.1. DEMO purpose

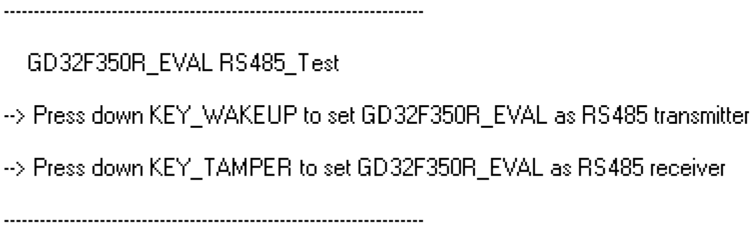
This Demo includes the following functions of GD32 MCU:

- Learn to use the USART RS485

5.7.2. DEMO running result

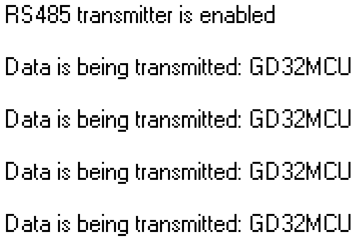
Jump the JP12 to RS485 and JP13 to USART with the jumper cap. This routines need to prepare two GD32F350R_EVAL boards, one board as a sender, the other as a receiver. First connect two GD32350R-EVAL boards through RS485 line A and B, and then download the program < 07_RS485_Test > to the board for running. When press the Wakeup key on one board, the board is set as RS485 transmitter and LED2 is on and when press the Tamper key on one board, the board is set as RS485 receiver and LED3 is on.

Download the program < 07_RS485_Test > to the EVAL board and run, the information via a serial port output as following:



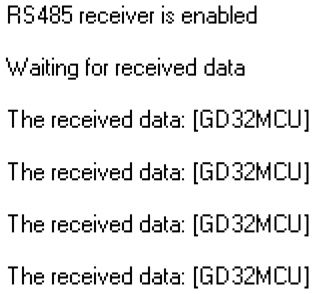
```
----------------------------------------------------------------------
   GD32F350R_EVAL RS485_Test
--> Press down KEY_WAKEUP to set GD32F350R_EVAL as RS485 transmitter
--> Press down KEY_TAMPER to set GD32F350R_EVAL as RS485 receiver
----------------------------------------------------------------------
```

According to the tips, press down Wakeup key to set one board as a transmitter and press down Tamper key to the other as a receiver. The transmitter output as following.



```
RS485 transmitter is enabled
Data is being transmitted: GD32MCU
Data is being transmitted: GD32MCU
Data is being transmitted: GD32MCU
Data is being transmitted: GD32MCU
```

The receiver output as following.



```
RS485 receiver is enabled
Waiting for received data
The received data: [GD32MCU]
The received data: [GD32MCU]
The received data: [GD32MCU]
The received data: [GD32MCU]
```

5.8. ADC_Conversion_Triggered_By_Timer

5.8.1. DEMO purpose

This Demo includes the following functions of GD32 MCU:

- Learn to use ADC to convert analog to digital
- Learn to use TIMER to generate a CC event
- Learn to use LCD to show the ADC converted result

TIMER1 CH1 event triggers ADC conversion, the value displayed on the LCD corresponds to the ADC analog input, and changes with it. The converted data are moved to SRAM through DMA continuously.

5.8.2. DEMO running result

Download the program <08_ADC_conversion_triggered_by_timer> to the GD32350R-EVAL board, adjust the adjustable potentiometer knob to change the analog input. The ADC, which is triggered by TIMER1 CH1 event, will convert the analog input, and you will see the result, a voltage curve, on the LCD. The curve adjusts with the analog input.

5.9. DAC_Output_Voltage_Value

5.9.1. DEMO purpose

This Demo includes the following functions of GD32 MCU:

- Learn to use DAC channel to generate different voltages on DAC output

5.9.2. DEMO running result

Download the program <09_DAC_Output_Voltage_Value> to the EVAL board, the digital value is 0x7ff0, its converted analog voltage should be VREF/2, using the voltmeter to measure PA4, its value is 1.648V.

5.10. Comparator_Obtain_Brightness

5.10.1. DEMO purpose

This Demo includes the following functions of GD32 MCU:

- Learn to use comparator output compare result

There are two comparators on EVAL board and each comparator has two inputs. In this demo, one input is 3.3V, and the other one is the 1/4 reference voltage. Compare the two input voltages, the output is a high or low level, and the LED2 will performs the corresponding action.

5.10.2. DEMO running result

Download the program <10_Comparator_obtain_brightness> to the EVAL board, comparing two input voltage, if output level is high, LED2 is on, otherwise LED2 is off.

5.11. I2C_EEPROM

5.11.1. DEMO purpose

This Demo includes the following functions of GD32 MCU:

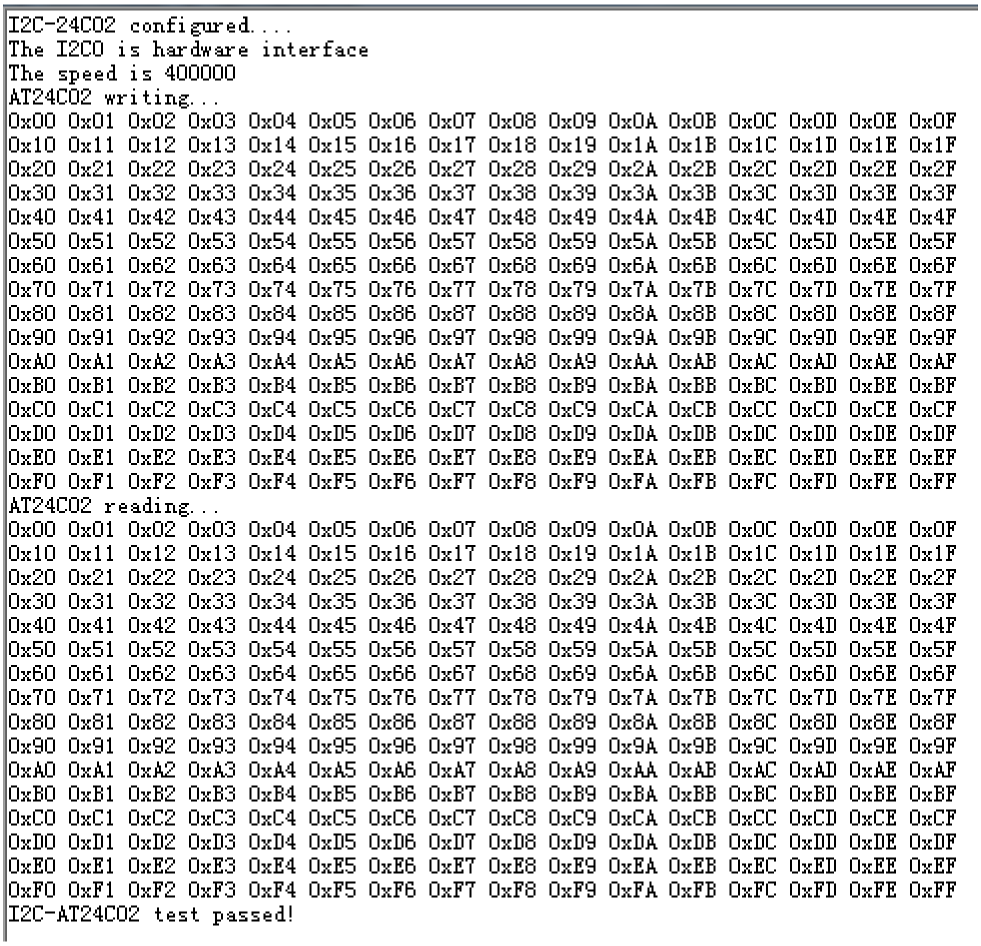
- Learn how to use the master transmitting mode of the I2C module
- Learn how to use the master receiving mode of the I2C module
- Learn to read and write the EEPROM with the I2C interface

5.11.2. DEMO running result

Jump JP13 to USART, then download the program <11_I2C_EEPROM> to the EVAL board and run. Connect serial cable to COM, and open the HyperTerminal to show the print message.

Firstly, the data of 256 bytes will be written to the EEPROM from the address 0x00 and printed by the serial port. Then, reading the EEPROM from address 0x00 for 256 bytes and the result will be printed. Finally, compare the data that were written to the EEPROM and the data that were read from the EEPROM. If they are the same, the serial port will output "I2C-AT24C02 test passed!" and the four LEDs lights flashing, otherwise the serial port will output "Err: data read and write aren't matching." and all the four LEDs light.

The output information via the serial port is as following.



```
I2C-24C02 configured....
The I2C0 is hardware interface
The speed is 400000
AT24C02 writing...
0x00 0x01 0x02 0x03 0x04 0x05 0x06 0x07 0x08 0x09 0x0A 0x0B 0x0C 0x0D 0x0E 0x0F
0x10 0x11 0x12 0x13 0x14 0x15 0x16 0x17 0x18 0x19 0x1A 0x1B 0x1C 0x1D 0x1E 0x1F
0x20 0x21 0x22 0x23 0x24 0x25 0x26 0x27 0x28 0x29 0x2A 0x2B 0x2C 0x2D 0x2E 0x2F
0x30 0x31 0x32 0x33 0x34 0x35 0x36 0x37 0x38 0x39 0x3A 0x3B 0x3C 0x3D 0x3E 0x3F
0x40 0x41 0x42 0x43 0x44 0x45 0x46 0x47 0x48 0x49 0x4A 0x4B 0x4C 0x4D 0x4E 0x4F
0x50 0x51 0x52 0x53 0x54 0x55 0x56 0x57 0x58 0x59 0x5A 0x5B 0x5C 0x5D 0x5E 0x5F
0x60 0x61 0x62 0x63 0x64 0x65 0x66 0x67 0x68 0x69 0x6A 0x6B 0x6C 0x6D 0x6E 0x6F
0x70 0x71 0x72 0x73 0x74 0x75 0x76 0x77 0x78 0x79 0x7A 0x7B 0x7C 0x7D 0x7E 0x7F
0x80 0x81 0x82 0x83 0x84 0x85 0x86 0x87 0x88 0x89 0x8A 0x8B 0x8C 0x8D 0x8E 0x8F
0x90 0x91 0x92 0x93 0x94 0x95 0x96 0x97 0x98 0x99 0x9A 0x9B 0x9C 0x9D 0x9E 0x9F
0xA0 0xA1 0xA2 0xA3 0xA4 0xA5 0xA6 0xA7 0xA8 0xA9 0xAA 0xAB 0xAC 0xAD 0xAE 0xAF
0xB0 0xB1 0xB2 0xB3 0xB4 0xB5 0xB6 0xB7 0xB8 0xB9 0xBA 0xBB 0xBC 0xBD 0xBE 0xBF
0xC0 0xC1 0xC2 0xC3 0xC4 0xC5 0xC6 0xC7 0xC8 0xC9 0xCA 0xCB 0xCC 0xCD 0xCE 0xCF
0xD0 0xD1 0xD2 0xD3 0xD4 0xD5 0xD6 0xD7 0xD8 0xD9 0xDA 0xDB 0xDC 0xDD 0xDE 0xDF
0xE0 0xE1 0xE2 0xE3 0xE4 0xE5 0xE6 0xE7 0xE8 0xE9 0xEA 0xEB 0xEC 0xED 0xEE 0xEF
0xF0 0xF1 0xF2 0xF3 0xF4 0xF5 0xF6 0xF7 0xF8 0xF9 0xFA 0xFB 0xFC 0xFD 0xFE 0xFF
AT24C02 reading...
0x00 0x01 0x02 0x03 0x04 0x05 0x06 0x07 0x08 0x09 0x0A 0x0B 0x0C 0x0D 0x0E 0x0F
0x10 0x11 0x12 0x13 0x14 0x15 0x16 0x17 0x18 0x19 0x1A 0x1B 0x1C 0x1D 0x1E 0x1F
0x20 0x21 0x22 0x23 0x24 0x25 0x26 0x27 0x28 0x29 0x2A 0x2B 0x2C 0x2D 0x2E 0x2F
0x30 0x31 0x32 0x33 0x34 0x35 0x36 0x37 0x38 0x39 0x3A 0x3B 0x3C 0x3D 0x3E 0x3F
0x40 0x41 0x42 0x43 0x44 0x45 0x46 0x47 0x48 0x49 0x4A 0x4B 0x4C 0x4D 0x4E 0x4F
0x50 0x51 0x52 0x53 0x54 0x55 0x56 0x57 0x58 0x59 0x5A 0x5B 0x5C 0x5D 0x5E 0x5F
0x60 0x61 0x62 0x63 0x64 0x65 0x66 0x67 0x68 0x69 0x6A 0x6B 0x6C 0x6D 0x6E 0x6F
0x70 0x71 0x72 0x73 0x74 0x75 0x76 0x77 0x78 0x79 0x7A 0x7B 0x7C 0x7D 0x7E 0x7F
0x80 0x81 0x82 0x83 0x84 0x85 0x86 0x87 0x88 0x89 0x8A 0x8B 0x8C 0x8D 0x8E 0x8F
0x90 0x91 0x92 0x93 0x94 0x95 0x96 0x97 0x98 0x99 0x9A 0x9B 0x9C 0x9D 0x9E 0x9F
0xA0 0xA1 0xA2 0xA3 0xA4 0xA5 0xA6 0xA7 0xA8 0xA9 0xAA 0xAB 0xAC 0xAD 0xAE 0xAF
0xB0 0xB1 0xB2 0xB3 0xB4 0xB5 0xB6 0xB7 0xB8 0xB9 0xBA 0xBB 0xBC 0xBD 0xBE 0xBF
0xC0 0xC1 0xC2 0xC3 0xC4 0xC5 0xC6 0xC7 0xC8 0xC9 0xCA 0xCB 0xCC 0xCD 0xCE 0xCF
0xD0 0xD1 0xD2 0xD3 0xD4 0xD5 0xD6 0xD7 0xD8 0xD9 0xDA 0xDB 0xDC 0xDD 0xDE 0xDF
0xE0 0xE1 0xE2 0xE3 0xE4 0xE5 0xE6 0xE7 0xE8 0xE9 0xEA 0xEB 0xEC 0xED 0xEE 0xEF
0xF0 0xF1 0xF2 0xF3 0xF4 0xF5 0xF6 0xF7 0xF8 0xF9 0xFA 0xFB 0xFC 0xFD 0xFE 0xFF
I2C-AT24C02 test passed!
```

5.12. SPI_TF_Card_Block_Operation

5.12.1. DEMO purpose

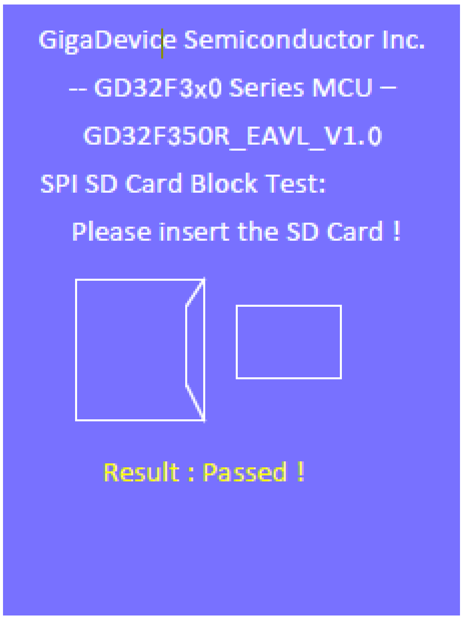
This Demo includes the following function of GD32 MCU:

- Learn how to use SPI to block read and write from TF card

In this demo, the SPI interface is used for reading from and writing to TF card. Write to TF card with 0 to 255, a total of 2048 bytes directly. Then read data from the original address, check the correctness of the written and read data. Note that, the FATFS is not used in this demo and in the absence of FATFS, read and write to the TF card will destroy the file system, please make a backup before testing.

5.12.2. DEMO running result

Firstly, JP10 and JP11 must be fitted to SPI and then download the program <12_SPI_TF_Card_Block_Operation> to the EVAL board. All the LEDs are turned on and then turned off for test. Insert the TF card to the board, the test results will be displayed on the LCD screen.



GigaDevice Semiconductor Inc.

-- GD32F3x0 Series MCU --

GD32F350R_EAVL_V1.0

SPI SD Card Block Test:

Please insert the SD Card !

Result : Passed !

5.13. SPI_TF_Card_FATFS_Operation

5.13.1. DEMO purpose

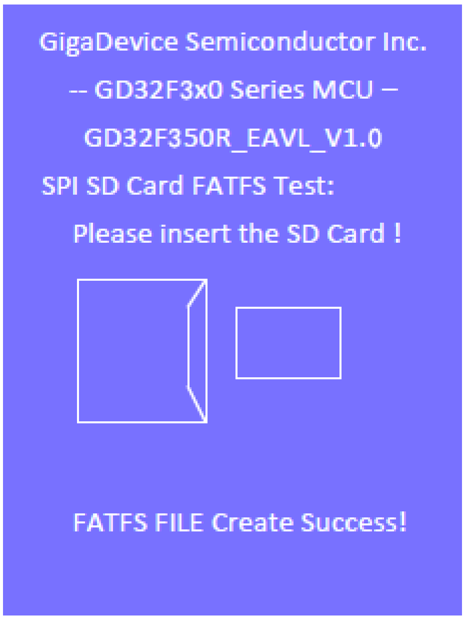
This Demo includes the following function of GD32 MCU:

- Learn how to use SPI to read and write from TF card with FATFS

In this demo, the SPI interface is used for reading from and writing to TF card. Make sure the TF card has FAT file system. If not, some information will be displayed on the LCD screen.

5.13.2. DEMO running result

Firstly, JP10 and JP11 must be fitted to SPI and then download the program <13_SPI_TF_Card_FATFS_Operation> to the EVAL board. All the LEDs are turned on and then turned off for test. Insert a formatted TF card, a text file will be created in this TF card. When the screen appears "FATFS FILE Create Success", you can remove the TF card and check whether the file is successfully created in the TF card with a card reader. When the exception occurs, operate follow the screen prompts.



GigaDevice Semiconductor Inc.

-- GD32F3x0 Series MCU --

GD32F350R_EAVL_V1.0

SPI SD Card FATFS Test:

Please insert the SD Card !

FATFS FILE Create Success!

5.14. SPI_TFT_LCD_Driver

5.14.1. DEMO purpose

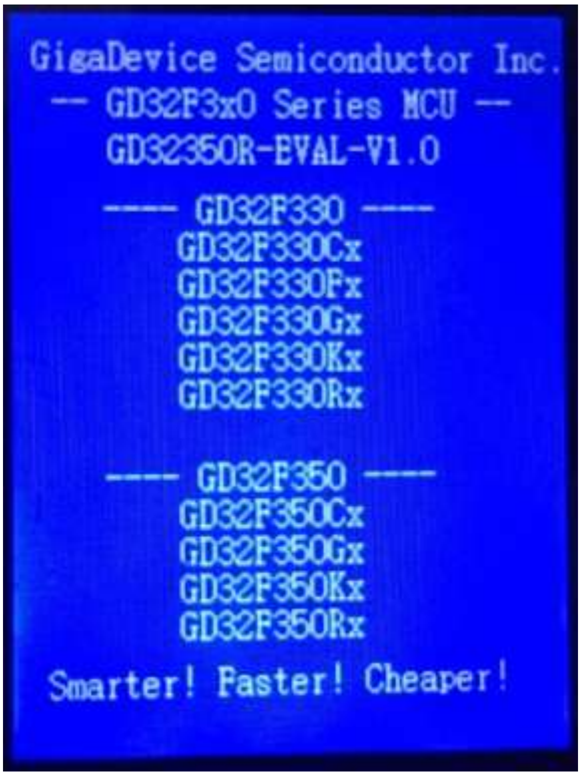
This Demo includes the following function of GD32 MCU:

- Learn how to use SPI to drive TFT LCD screen and display

GD32350R-EVAL board has a TFT LCD screen which supports SPI interface. In this demo, tests of font, number, draw and color are displayed on the LCD screen respectively.

5.14.2. DEMO running result

Firstly, JP10 and JP11 must be fitted to SPI port and then download the program <14_SPI_TFT_LCD_Driver> to the EVAL board. All the LEDs are turned on and then turned off for test. After that, the LCD screen on the board will display the GUI tests in infinite loop.



GigaDevice Semiconductor Inc.
-- GD32F3x0 Series MCU --
GD32350R-EVAL-V1.0

---- GD32F330 ----
GD32F330Cx
GD32F330Fx
GD32F330Gx
GD32F330Kx
GD32F330Rx

---- GD32F350 ----
GD32F350Cx
GD32F350Gx
GD32F350Kx
GD32F350Rx

Smarter! Faster! Cheaper!

5.15. HDMI-CEC_HostSlaveCommunication

5.15.1. DEMO purpose

This Demo includes the following functions of GD32 MCU:

- Learn the communication function of HDMI-CEC

In the process of communication, the sender sends data to receiver through the key interrupt, the receiver for receiving data in the CEC interrupt. The entire communication process does not make the error processing.

5.15.2. DEMO running result

This routines need to prepare two GD32F350_EVAL board, one board as a sender, the other as a receiver. First use the DuPont to connect CEC bus (PB8) and ground wire (GND) pins in the two board, and then download the program <15_HDMI_CEC_HostSlaveCommunication> to the board for running. When the program runs, the first development board of the LCD display is data 0, press one of the development board TAMPER key, the other piece of the development board LCD number will increase, which shows the end of a data transmission. Each it increases to 9, it will clear to 0 to re-increase; press the WAKEUP key, the number will decline, which also shows the end of a data transmission. Every time it decreases to 0, it will return to the number 9 to re-decrease.

5.16. I2S_Audio_Player

5.16.1. DEMO purpose

This Demo includes the following functions of GD32 MCU:

- Learn to use I2S module to output audio file

GD32350R-EVAL board integrates the I2S (Inter-IC Sound) module, and the module can communicate with external devices using the I2S audio protocol. This Demo mainly shows how to use the I2S interface of the board for audio output.

5.16.2. DEMO running result

Firstly, JP10 and JP11 must be fitted to I2S port and then download the program <16_I2S_Audio_Player> to the EVAL board. After downloading the program, insert the earphone into the audio port J1, then listen to the audio file.

5.17. RCU_Clock_Out

5.17.1. DEMO purpose

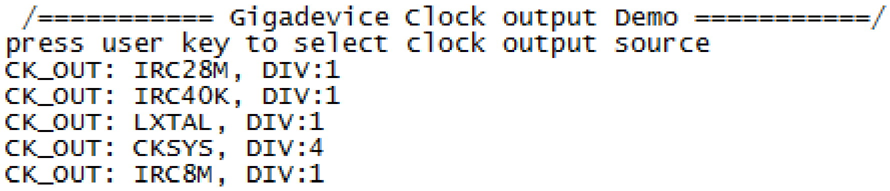
This Demo includes the following functions of GD32 MCU:

- Learn to use GPIO control the LED
- Learn to use the clock output function of RCU
- Learn to communicate with PC by USART

5.17.2. DEMO running result

Download the program <17_RCU_Clock_Out> to the EVAL board and run. Connect serial cable to EVAL_COM, open the HyperTerminal. When the program is running, HyperTerminal will display the initial information. Then user can choose the type of the output clock by pressing the USER button. After pressing, the corresponding LED will be turned on and HyperTerminal will display which mode be selected. The frequency of the output clock can be observed through the oscilloscope by PA8 pin.

Information via a serial port output as following:



```
 /=========== Gigadevice Clock output Demo ===========/
press user key to select clock output source
CK_OUT: IRC28M, DIV:1
CK_OUT: IRC40K, DIV:1
CK_OUT: LXTAL, DIV:1
CK_OUT: CKSYS, DIV:4
CK_OUT: IRC8M, DIV:1
```

5.18. CTC_Calibration

5.18.1. DEMO purpose

This demo includes the following functions of GD32 MCU:

- Learn to use external low speed crystal oscillator (LXTAL) to implement the CTC calibration function
- Learn to use clock trim controller (CTC) to trim internal 48MHz RC oscillator (IRC48M) clock

The CTC unit trim the frequency of the IRC48M based on an external accurate reference signal source. It can automaticly adjust the trim value to provide a precise IRC48M clock.

5.18.2. DEMO running result

Download the program <18_CTC_Calibration > to the EVAL board and run. The LED1 will turn on if the internal 48MHz RC oscillator (IRC48M) clock trim is OK.

5.19. PMU_sleep_wakeup

5.19.1. DEMO purpose

This Demo includes the following functions of GD32 MCU:

- Learn to use the USART receive interrupt to wake up the PMU from sleep mode

5.19.2. DEMO running result

Download the program < 19_PMU_sleep_wakeup > to the EVAL board, connect serial cable to EVAL_COM. After power-on, all the LEDs are off. The MCU will enter sleep mode and the software stop running. When the USART0 receives a byte of data from the HyperTerminal, the MCU will wake up from a receive interrupt. And all the LEDs will flash together.

5.20. RTC_Calendar

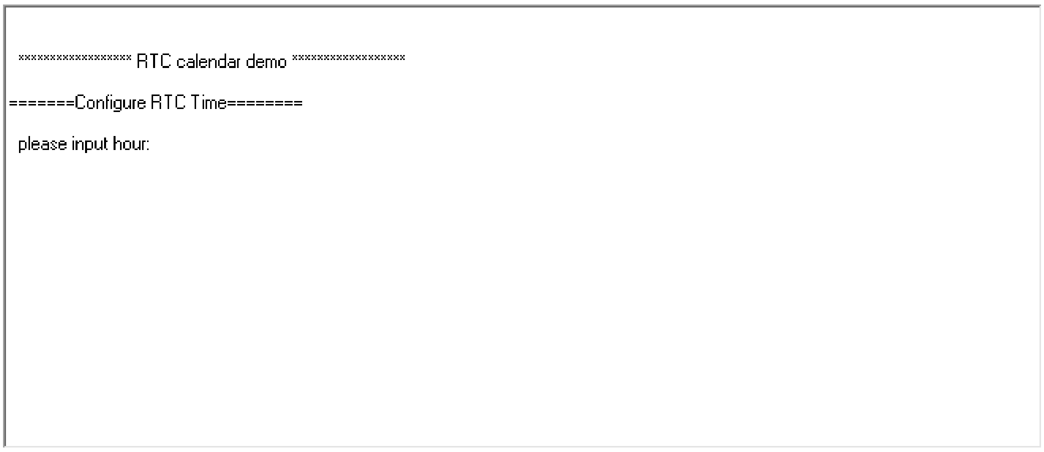
5.20.1. DEMO purpose

This Demo includes the following functions of GD32 MCU:

- Learn to use RTC module to implement calendar function
- Learn to use USART module to implement time display

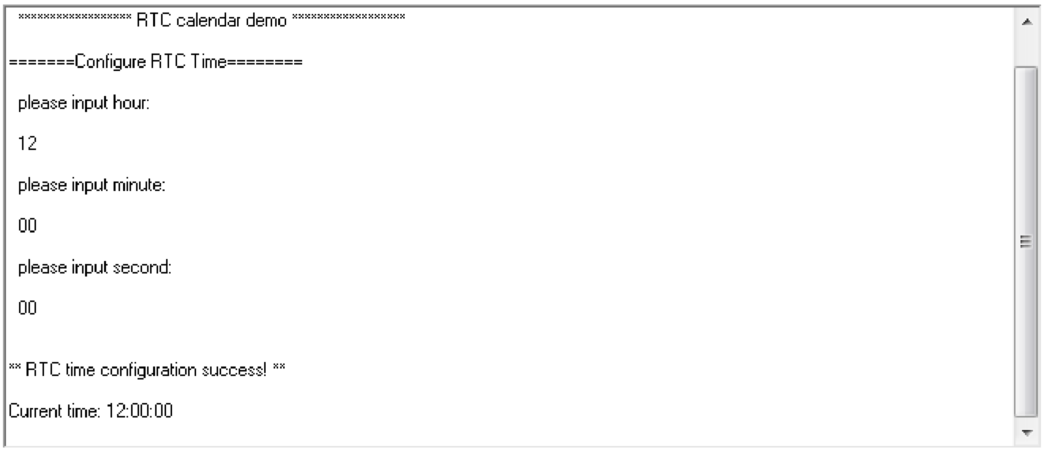
5.20.2. DEMO running result

Jump the JP13 to USART with the jumper cap, Download the program <20_RTC_Calendar> to the EVAL board and Connect serial cable to COM. If the development board run the program for the first time, serial port output following information "RTC not yet configured…." It requires the user to set up hours、minutes and seconds.



```
 ****************** RTC calendar demo ******************
=======Configure RTC Time========
 please input hour:
```

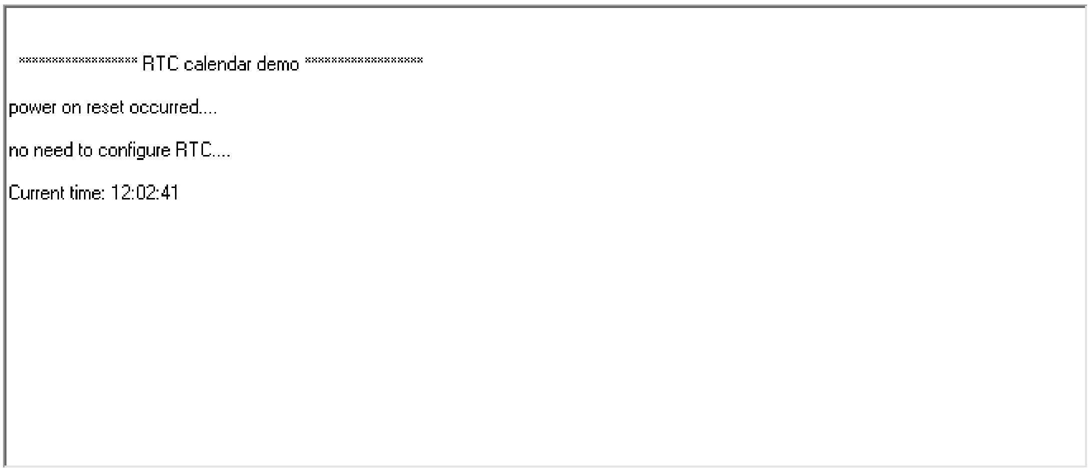
According to the serial port output information prompt, setting time, as shown below, serial port output following information.



```
 ****************** RTC calendar demo ******************
=======Configure RTC Time========
 please input hour:
 12
 please input minute:
 00
 please input second:
 00

** RTC time configuration success! **
Current time: 12:00:00
```

If the development board is not the first run of the program, time has been set up in the last run, after the system reset, as shown below, serial port output following information " No need to configured RTC....", serial port continue printing time information



```
 ****************** RTC calendar demo ******************
power on reset occurred....
no need to configure RTC....
Current time: 12:02:41
```

5.21. IRInfrared_Transceiver

5.21.1. DEMO purpose

This Demo includes the following functions of GD32 MCU:

- Learn to use general timer output PWM wave
- Learn to use general timer generated update interrupt
- Learn to use general timer capture interrupt
- Learn to use general timer TIMER15 and TIMER16 implement Infrared function

5.21.2. DEMO running result

Download the program <21_IRInfrared_Transceiver> to the EVAL board and run. When the program is running, if the infrared receiver received data is correct, LED1, LED2, LED3, LED4 light in turn, otherwise LED1, LED2, LED3, LED4 toggle together.

5.22. TIMER_Breath_LED

5.22.1. DEMO purpose

This Demo includes the following functions of GD32 MCU:

- Learn to use Timer output PWM wave
- Learn to update channel value

5.22.2. DEMO running result

Use the DuPont line to connect the TIMER0_CH0 (PA8) and LED1 (PC10), and then download the program <22_TIMER_Breath_LED> to the GD32350R-EVAL board and run. PA8 should not be reused by other peripherals.

When the program is running, you can see LED1 lighting from dark to bright gradually and then gradually darken, ad infinitum, just like breathing as rhythm.

5.23. TSI_TouchKey_leds

5.23.1. DEMO purpose

This Demo includes the following functions of GD32 MCU:

- Learn to use TSI module implement Touch Key function

5.23.2. DEMO running result

Download the program <23_TSI_TouchKey_leds> to the EVAL board and run. When the program is running, you can use a finger slide the Touch Sensor (A-1, B, C or A-2) on the EVAL board, and then the associated LED is light.

5.24. USB_Device

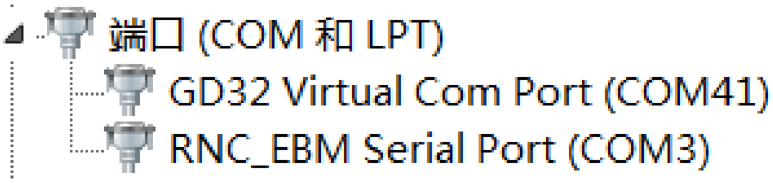
5.24.1. USBD_CDC_ACM

DEMO purpose

This demo includes the following functions of GD32 MCU:

- Learn how to use the USBFS peripheral
- Learn how to implement USB CDC device

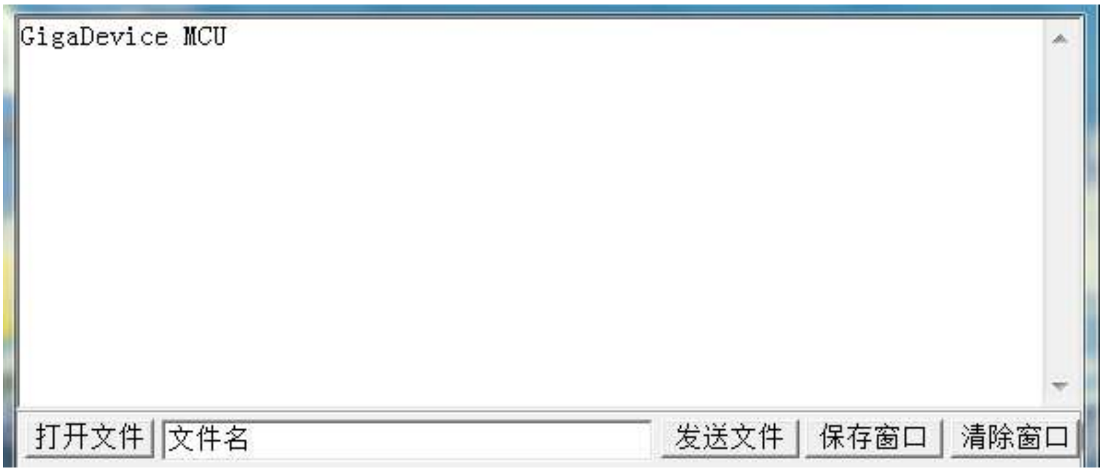
EVAL board has one USBFS interface. In this demo, the EVAL board is enumerated as an USB virtual COM port, which was shown in device manager of PC as below. This demo makes the USB device look like a serial port, and loops back the contents of a text file over USB port. To run the demo, input a message using the PC's keyboard. Any data that shows in HyperTerminal is received from the device.



端口 (COM 和 LPT)
GD32 Virtual Com Port (COM41)
RNC_EBM Serial Port (COM3)

DEMO running result

Download the program <24_USB_Device\CDC_ACM> to the EVAL board and run. When you input message through computer keyboard, the HyperTerminal will receive and shown the message. For example, when you input “GigaDevice MCU”, the HyperTerminal will get and show it as below.



GigaDevice MCU

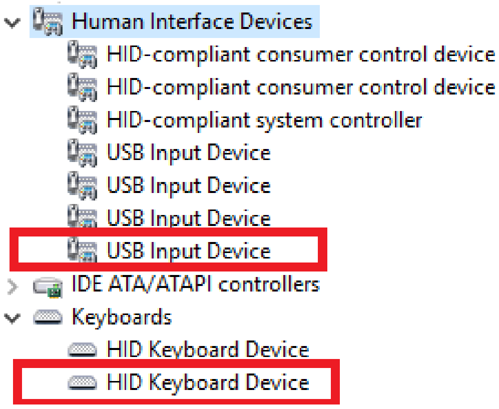
5.24.2. USBD_Keyboard

DEMO purpose

This demo includes the following functions of GD32 MCU:

- Learn how to use the USBFS peripheral mode
- Learn how to implement USB HID(human interface) device

EVAL board has four keys and one USB_FS interface. The five keys are Reset key, Wakeup key, Tamper key and User key. In this demo, the EVAL board is enumerated as an USB Keyboard, which uses the native PC Host HID driver, as shown below. The USB Keyboard uses three keys(wakeup key, tamper key and user key) to output three characters (‘b’, ‘a’ and ‘c’). In addition, the demo also supports remote wakeup which is the ability of a USB device to bring a suspended bus back to the active condition, and the wakeup key is used as the remote wakeup source.



DEMO running result

Before running the demo, please ensure that jumper JP13 jump to USB. After doing this, download the program <24_USB_Device\HID_Keyboard)> to the EVAL board and run. If you press the Wakeup key, will output ‘b’. If you press the User key, will output ‘c’. If you press the Tamper key, will output ‘a’.

If you want to test USB remote wakeup function, you can do as follows:

- Manually switch PC to standby mode
- Wait for PC to fully enter the standby mode
- Push the Wakeup key
- If PC is ON, remote wakeup is OK, else failed.

5.25. USB_Host

5.25.1. USBH_HID_Host

DEMO purpose

This demo includes the following functions of GD32 MCU:

- Learn to use the USBFS as a HID host
- Learn the operation between the HID host and the mouse device
- Learn the operation between the HID host and the keyboard device

EVAL evaluation board integrates the USBFS module, and the module can be used as a USBFS device, a USBFS host or OTG device. This demo mainly shows how to use the USBFS as a USB HID host to communicate with external USB HID device.

DEMO running result

Jump the JP13 to USB. Then download the program <25_USB_Host\USBH_HID> to the EVAL board and run.

If a mouse has been attached, the user will see the information of mouse enumeration. First pressing the user key will see the inserted device is mouse, and then moving the mouse will show the position of mouse and the state of button in the screen.

If a keyboard has been attached, the user will see the information of keyboard enumeration. First pressing the user key will see the inserted device is keyboard, and then pressing the keyboard will show the data which keyboard inserted in the screen.

5.25.2. USBH_MSC_Host

DEMO purpose

This demo includes the following functions of GD32 MCU:

- Learn to use the USBFS as a MSC host
- Learn the operation between the MSC host and the Udisk

EVAL evaluation board integrates the USBFS module, and the module can be used as

USBFS device, a USBFS host or OTG device. This demo mainly shows how to use the USBFS as a USB MSC host to communicate with external Udisk.

DEMO running result

Jump the JP13 to USB. Then insert the OTG cable to the USB port, download the program <25_USB_Host\USBH_MSC > to the EVAL board and run.

If an Udisk has been attached, the user will see the information of Udisk enumeration. First pressing the user key will see the Udisk information, next pressing the tamper key will see the root content of the Udisk, then press the wakeup key will write file to the Udisk, finally the user will see information that the MSC host demo is end.

6. Revision history

Table 6-1 Revision history

Revision No.	Description	Date
1.0	Initial Release	Jun.28, 2017
2.0	Updated format across the whole document	Jun.1, 2019

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