

GigaDevice Semiconductor Inc.

GD32E518C-START

Arm[®] Cortex[®]-M33 32-bit MCU

User Guide

Revision 1.0

(Jun. 2024)

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1. Summary

GD32E518C-START uses GD32E518CET6 as the main controller. It uses GD-Link Mini USB interface to supply 5V power. Reset, Boot, K2-Wakeup Key, LED, USB and USART to USB interface are also included. For more details please refer to GD32E518C-START-Rev1.0 schematic.

2. Function Pin Assign

Table 2-1. Function pin assignment

Function	Pin	Description
LED	PB4	LED1
	PB8	LED2
	PB9	LED3
	PC13	LED4
RESET		K1-Reset
KEY	PA0	K2-Wakeup Key
USART	PA9	USART0_TX
	PA10	USART0_RX
USB	PA8	USB_VBUS
	PA11	USB_DM
	PA12	USB_DP

3. Getting started

The START board uses GD-Link Mini USB connector to get power DC +5V, which is the hardware system normal work voltage. A GD-Link on board is necessary in order to download and debug programs. Select the correct boot mode and then power on, the LEDPWR will turn on, which indicates the power supply is OK.

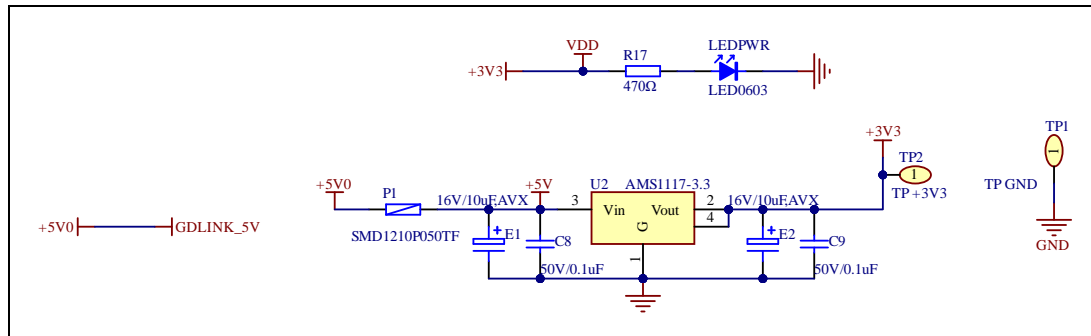
There are Keil version and IAR version of all projects. Keil version of the projects are created based on Keil MDK-ARM 5.28 uVision5. IAR version of the projects are created based on IAR Embedded Workbench for ARM 8.32.1. During use, the following points should be noted:

1. If you use Keil uVision5 to open the project. In order to solve the "Device Missing (s)" problem, you can install GigaDevice.GD32E51x_DFP.x.x.x.pack.
2. If you use IAR to open the project, install IAR_GD32E51x_ADDON_x.x.x.exe to load the associated files.

4. Hardware layout overview

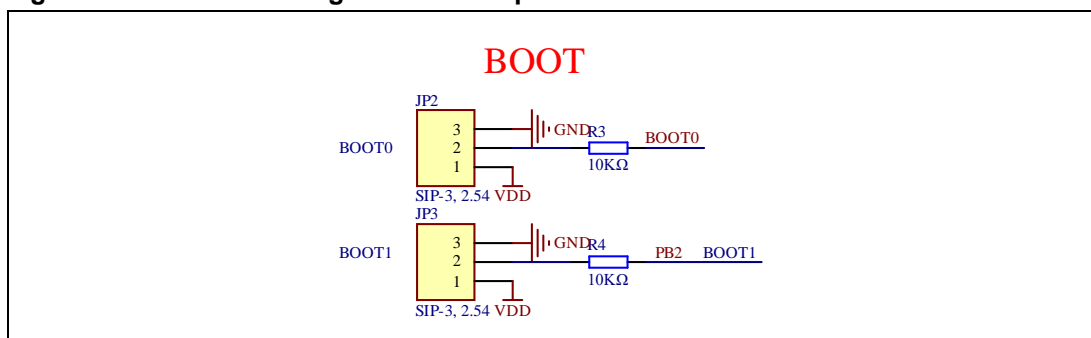
4.1. Power supply

Figure 4-1. Schematic diagram of power supply



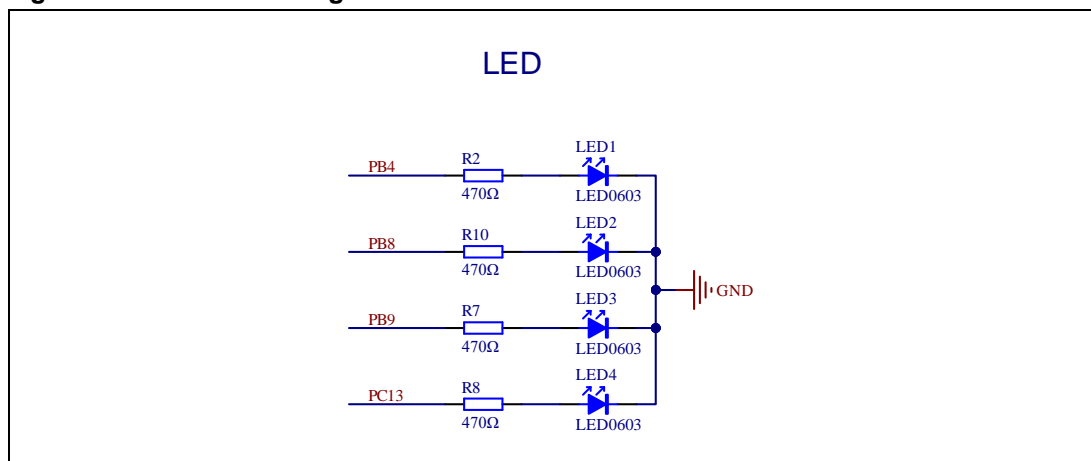
4.2. Boot option

Figure 4-2. Schematic diagram of boot option



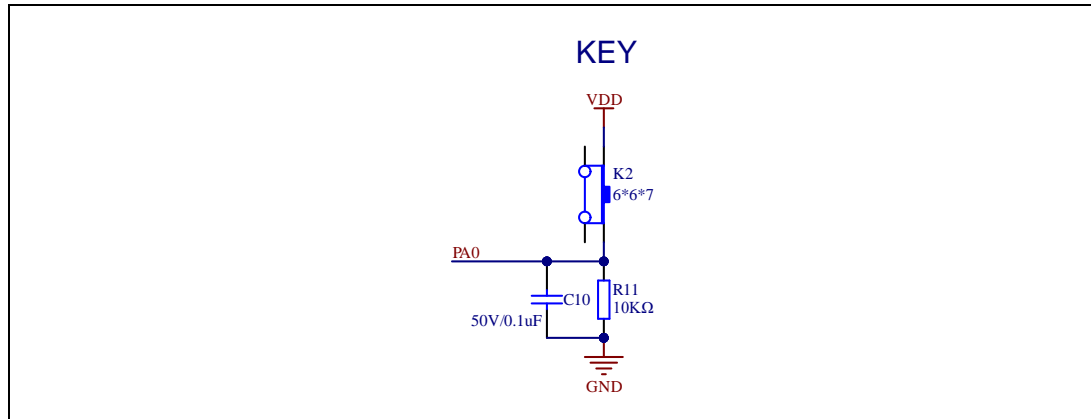
4.3. LED

Figure 4-3. Schematic diagram of LED function



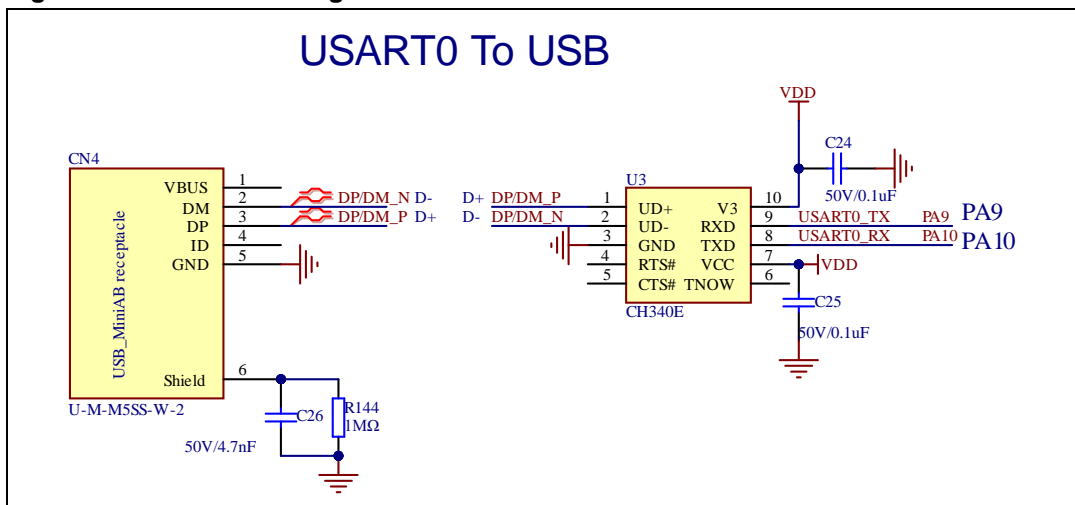
4.4. KEY

Figure 4-4. Schematic diagram of Key function



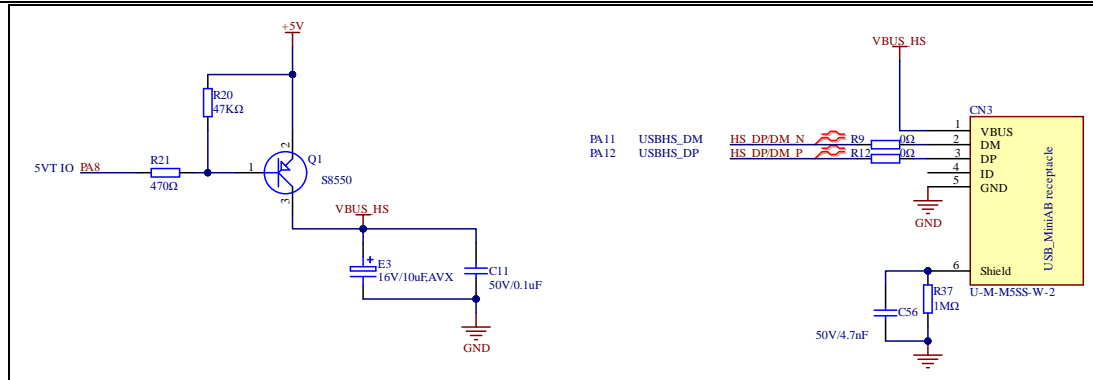
4.5. USART

Figure 4-5. Schematic diagram of USART



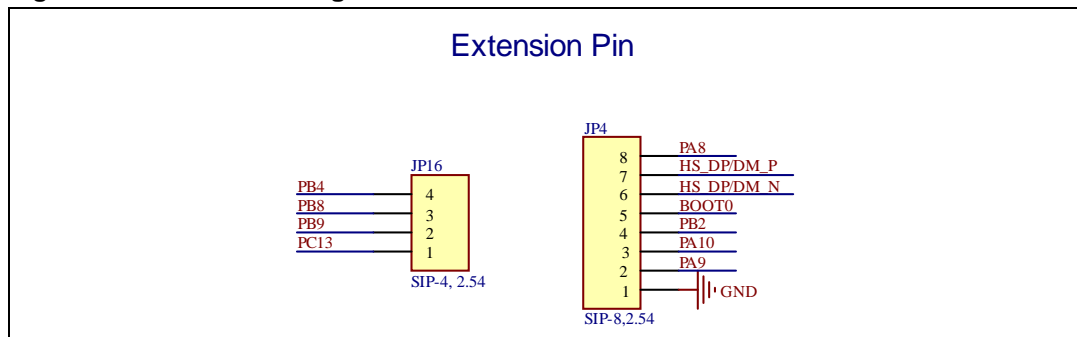
4.6. USB

Figure 4-6. Schematic diagram of USB



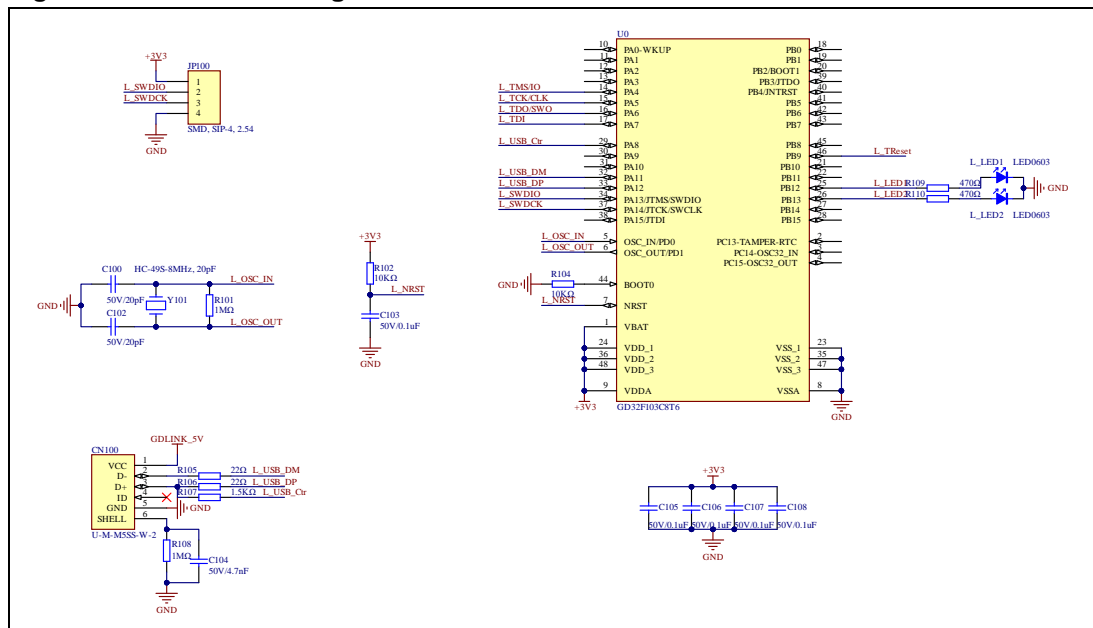
4.7. Extension

Figure 4-7. Schematic diagram of Extension



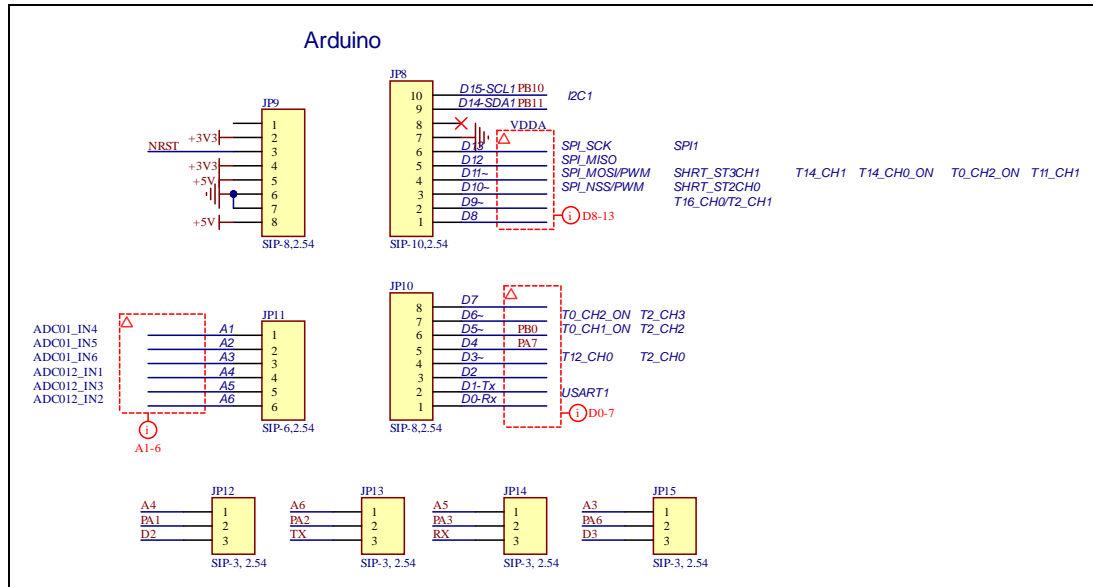
4.8. GD-Link

Figure 4-8. Schematic diagram of GD-Link



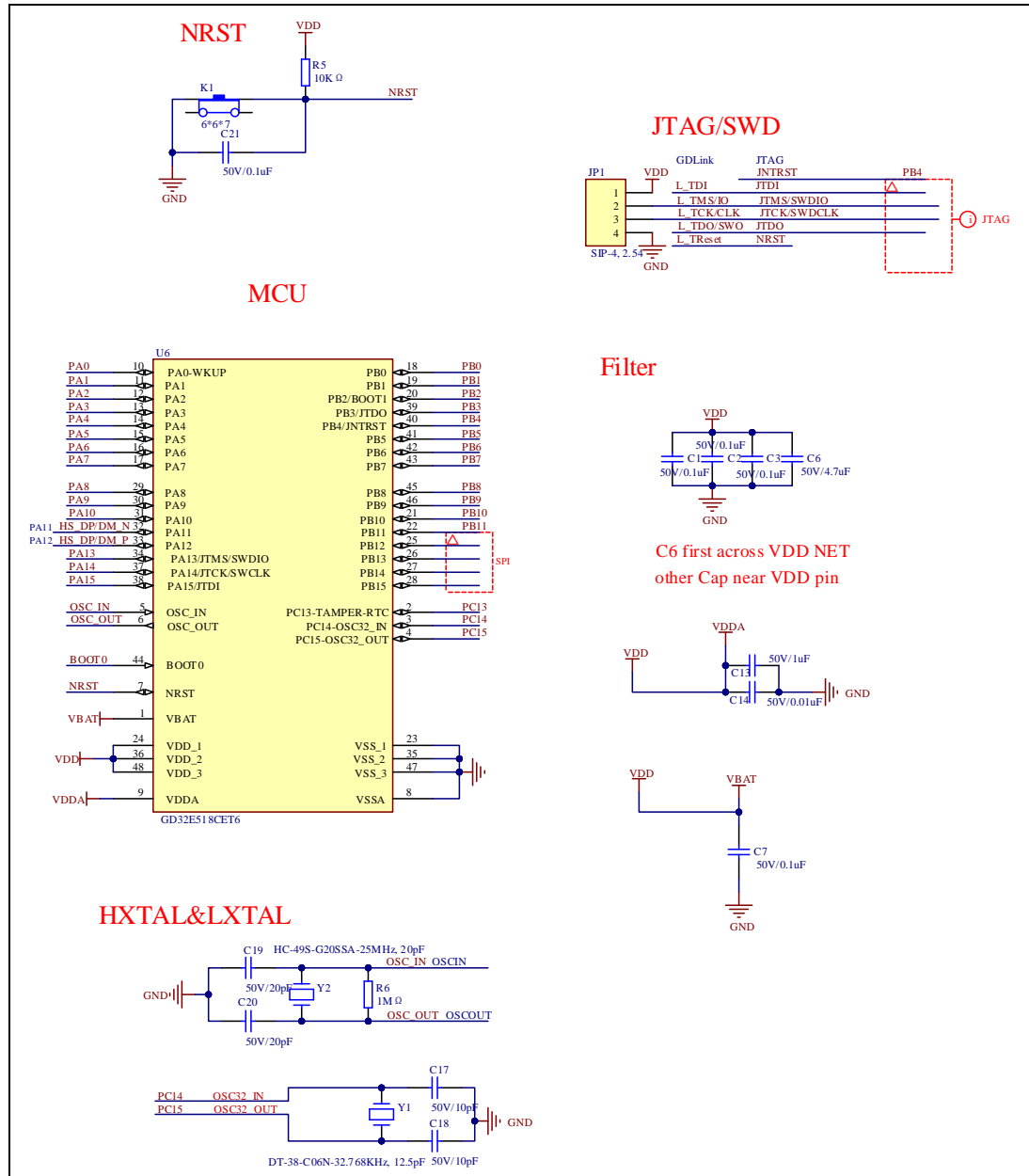
4.9. Arduino

Figure 4-9. Schematic diagram of Arduino



4.10. MCU

Figure 4-10. Schematic diagram of MCU



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

GD32E518C-START-V1.0 board has 2 keys and 4 LEDs. The keys are Wakeup Key and Reset Key. The LEDs are controlled by GPIO.

This demo will show how to light the LED.

5.1.2. DEMO running result

Download the program < 01_GPIO_Running_LED > to the START board, four LEDs can light cycles.

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

GD32E518C-START-V1.0 board has 2 keys and 4 LEDs. The keys are Wakeup Key and Reset Key. The LEDs are controlled by GPIO.

This demo will show how to use the Wakeup Key to control the LED2. When press down the Wakeup Key, it will check the input value of the IO port. If the value is 1 and will wait for 100ms. Check the input value of the IO port again. If the value still is 1, it indicates that the button is pressed successfully and toggle LED2.

5.2.2. DEMO running result

Download the program < 02_GPIO_Key_Polling_mode > to the START board, press down the User Key, LED1 will be turned on. Press down the User Key again, LED1 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 control the LED and the KEY.
- Learn to use EXTI to generate external interrupt.

GD32E518C-START-V1.0 board has 2 keys and 4 LEDs. The keys are Wakeup Key and Reset Key. The LEDs are controlled by GPIO.

This demo will show how to use the EXTI interrupt line to control the LED2. When press down the Wakeup 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 START board, LED2 is turned on and off for test. When press down the Wakeup Key, LED2 will be turned on. Press down the Wakeup Key again, LED2 will be turned off.

5.4. USART_HyperTerminal_Interrupt

5.4.1. DEMO purpose

This demo includes the following functions of GD32 MCU:

- Learn to use the USART transmit and receive interrupts to communicate with the HyperTerminal.

5.4.2. DEMO running result

Download the program <04_USART_HyperTerminal_Interrupt> to the START board, connect serial cable to USART. Firstly, the LED1,LED2,LED3,LED4 flash 1 times for test. Then, the USART 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, LED2, LED3, LED4 light by turns. Otherwise, LED1, LED2, LED3, LED4 toggle together.

The output information via the HyperTerminal is 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

```

5.5. TIMER_Key_EXTI

5.5.1. DEMO purpose

This demo includes the following functions of GD32 MCU:

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

GD32E518C-START-V1.0 board has two keys and four LEDs. The two keys are Reset key and Wakeup key. The LED1, LED2, LED3 and LED4 are controlled by GPIO.

This demo will show how to use the TIMER PWM to trigger EXTI interrupt to toggle the state of LED2 and EXTI interrupt line to control the LED1. When press down the Wakeup Key, it will produce an interrupt. In the interrupt service function, the demo will toggle LED1.

5.5.2. DEMO running result

Download the program < 05_TIMER_Key_EXTI > to the START board, all the LED1 and LED2 are flashed once for test, press down the Wakeup Key, LED1 will be turned on. Press down the Wakeup Key again, LED1 will be turned off. Connect PA6 (TIMER2_CH0) and PA4 with DuPont line. The LED2 will be toggled every 500ms.

5.6. USB MSC Device

5.6.1. DEMO purpose

This demo includes the following functions of GD32 MCU:

- Learn how to use the USBHS
- Learn how to implement USB MSC(mass storage) device

This demo mainly implements a U disk. U disk is currently very widely used removable MSC devices. MSC, the Mass Storage device Class, is a transport protocol between a computer

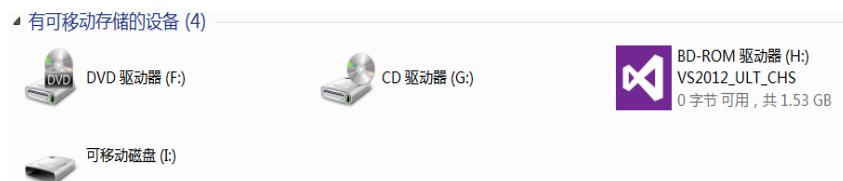
and mobile devices, which allow a universal serial bus (USB) equipment to access a host computing device, file transfer between them, mainly including mobile hard disk, mobile U disk drive, etc. The MSC device must have a storage medium, and this demo uses the MCU's internal SRAM as the storage medium. For more details of the MSC protocol please refer to the MSC protocol standard.

MSC device will use a variety of transport protocols and command formats for communication, so it need to choose the appropriate protocol and command format in the realization of the application. This demo selects the BOT (bulk only transport) protocol and the required SCSI (small computer interface) command, and is compatible with a wide variety of Window operating systems. Specific BOT protocol and SCSI command specification please refer to the standard of their agreement.

5.6.2. DEMO Running Result

Download the program < 06_USB_MSC_Device > to the EVAL board and run. When the start board is connected to the PC, you will find a USB large capacity storage device is in the universal serial bus controller, and there is 1 more disk drives in the equipment manager of PC.

Then, after opening the resource manager, you will see more of the 1 disk, as shown in the following diagram:



At this point, the write/read/formatting operation can be performed as the other mobile devices.

5.7. USB HID Host

5.7.1. DEMO Purpose

This demo includes the following functions of GD32 MCU:

- Learn to use the USBHS 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

GD32E518C-START board integrates the USBHS module, and the module can be used as a USB device, a USB host or an OTG device. This demo mainly shows how to use the USBHS as a USB HID host to communicate with external USB HID device.

5.7.2. DEMO Running Result

Download the program < 07_USB_HID_Host > to the start board and run.

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

If a keyboard has been attached, the user will see the information of keyboard enumeration. First pressing the Wakeup key will see the inserted device is keyboard, and then pressing the keyboard will show the state of the button in the HyperTerminal.

6. Revision history

Table 6-1. Revision history

Revision No.	Description	Date
1.0	Initial Release	Jun.04, 2024

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