

GigaDevice Semiconductor Inc.

GD32F503R-START

Arm[®] Cortex[®]-M33 32-bit MCU

User Guide

Revision 1.1

(Feb. 2026)

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1. Summary

GD32F503R-START uses GD32F503RGT6 as the main controller. It uses GD-Link Type-C interface to supply 5V power. Reset, Boot, Button key, LED, Type-C interface are also included. For more details, please refer to GD32F503R-START_Rev1.2 schematic.

2. Function Pin Assign

Table 2-1. Function pin assignment

Function	Pin	Description
LED	PC7	LED1
LED	PC8	LED2
LED	PC9	LED3
RESET	NRST	Reset
KEY	PA0	K2(Wakeup key)
USART	PA9	USART0_TX
	PA10	USART0_RX

3. Getting started

The START board uses GD-Link Type-C interface 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.

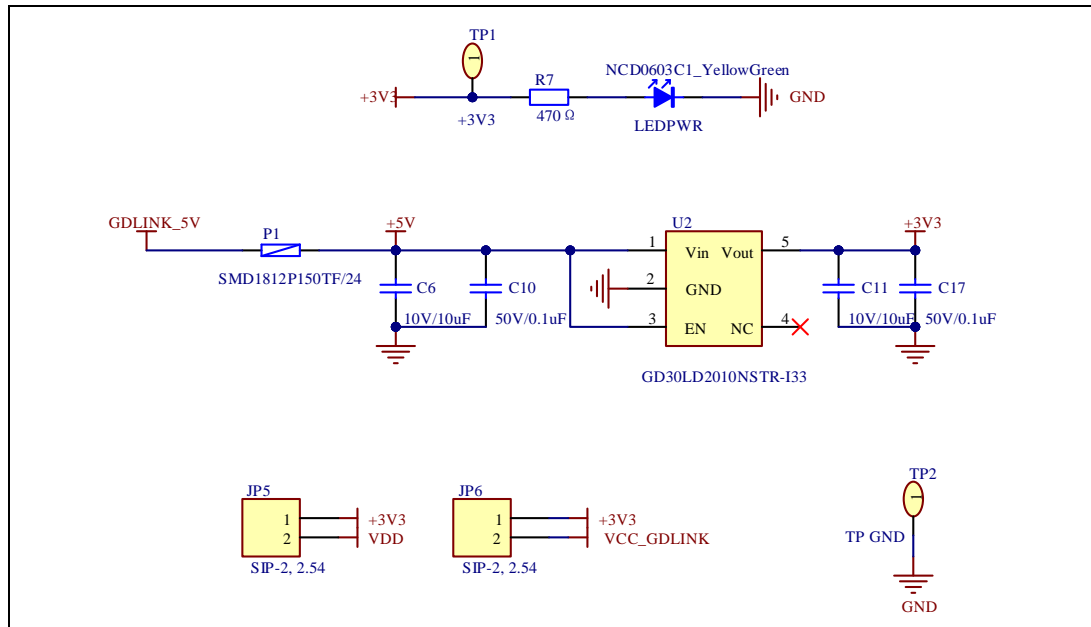
There are Keil version, IAR version and GD32EBuilder version of all projects. Keil version of the projects are created based on Keil MDK-ARM 5.29 uVision5. IAR version of the projects are created based on IAR Embedded Workbench for ARM 8.32.1 and GD32EBuilder version of the projects are created based on GD32 Embedded Builder_v1.5.5_Rel. 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, the latest version of GigaDevice.GD32F50x_DFP (URL: <https://www.gd32mcu.com>) should be installed to load related files.
2. If you use IAR to open the project, the latest version of IAR_GD32F50x_ADDON (URL: <https://www.gd32mcu.com>) should be installed to load related files.

4. Hardware layout overview

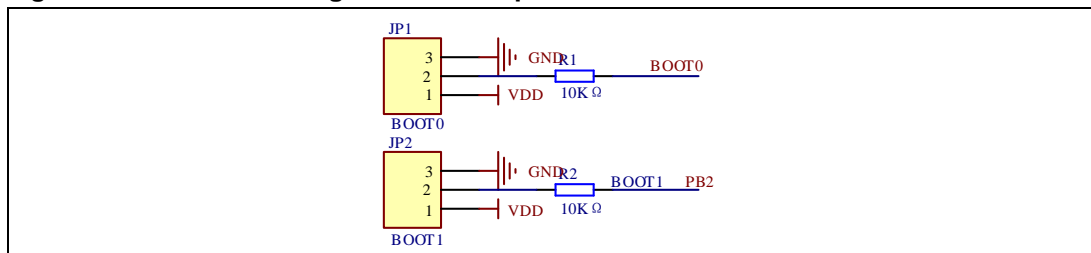
4.1. Power supply

Figure 4-1. Schematic diagram of power supply



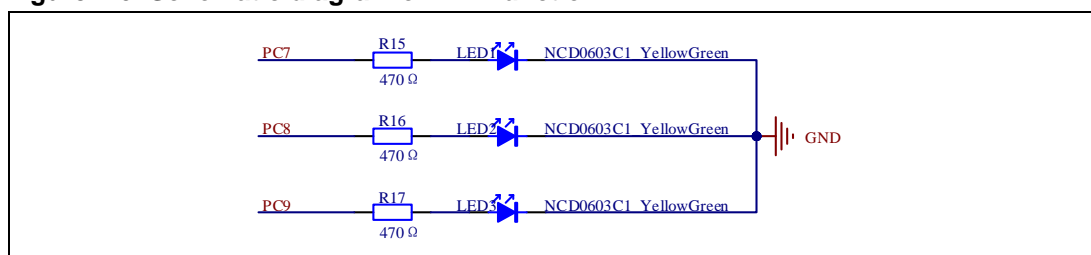
4.2. Boot option

Figure 4-2. Schematic diagram of boot option



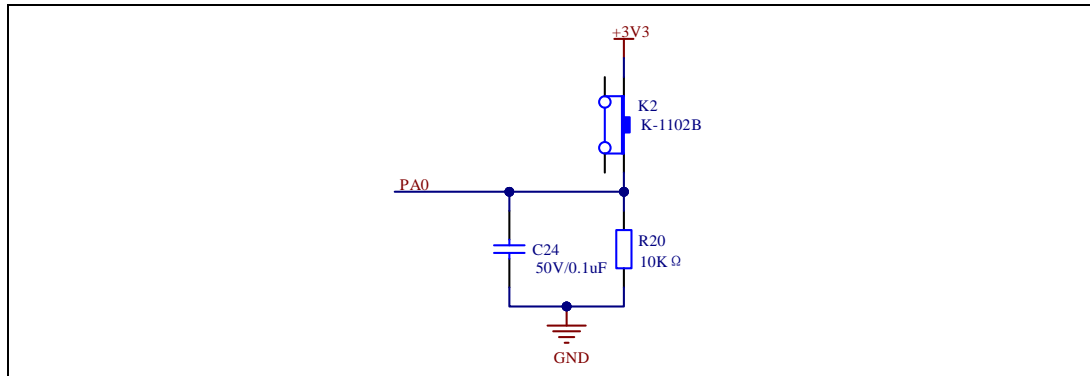
4.3. LED

Figure 4-3. Schematic diagram of LED function



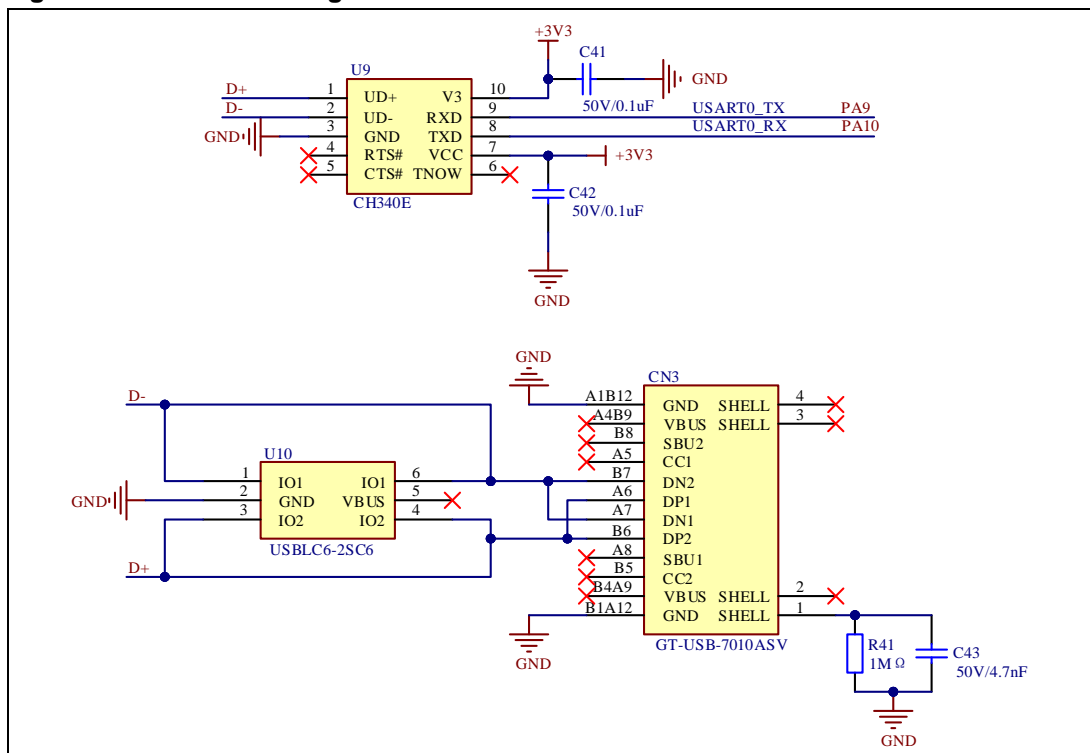
4.4. KEY

Figure 4-4. Schematic diagram of Key function



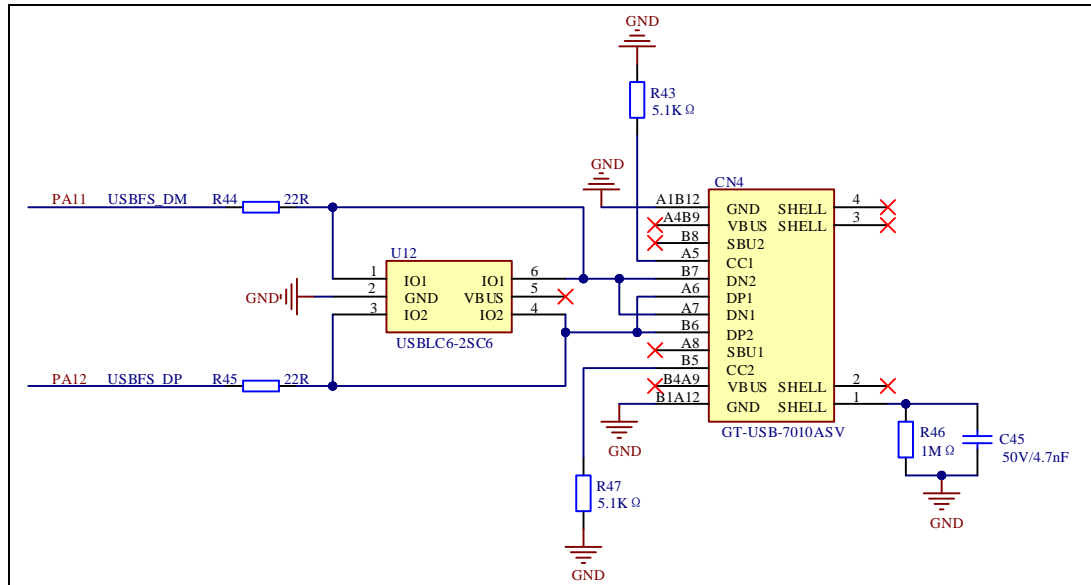
4.5. USART

Figure 4-5. Schematic diagram of USART



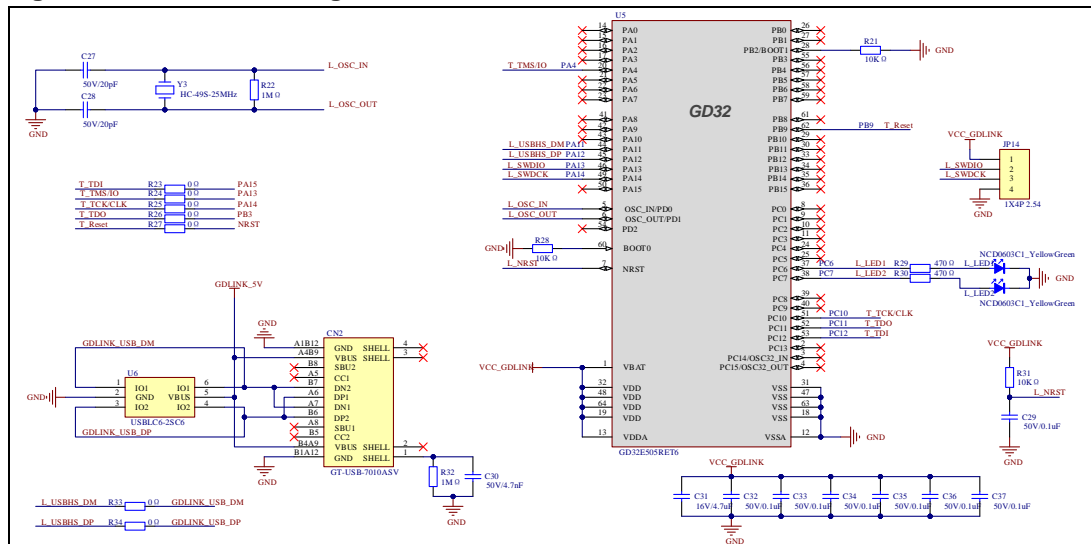
4.6. USB

Figure 4-6. Schematic diagram of USB



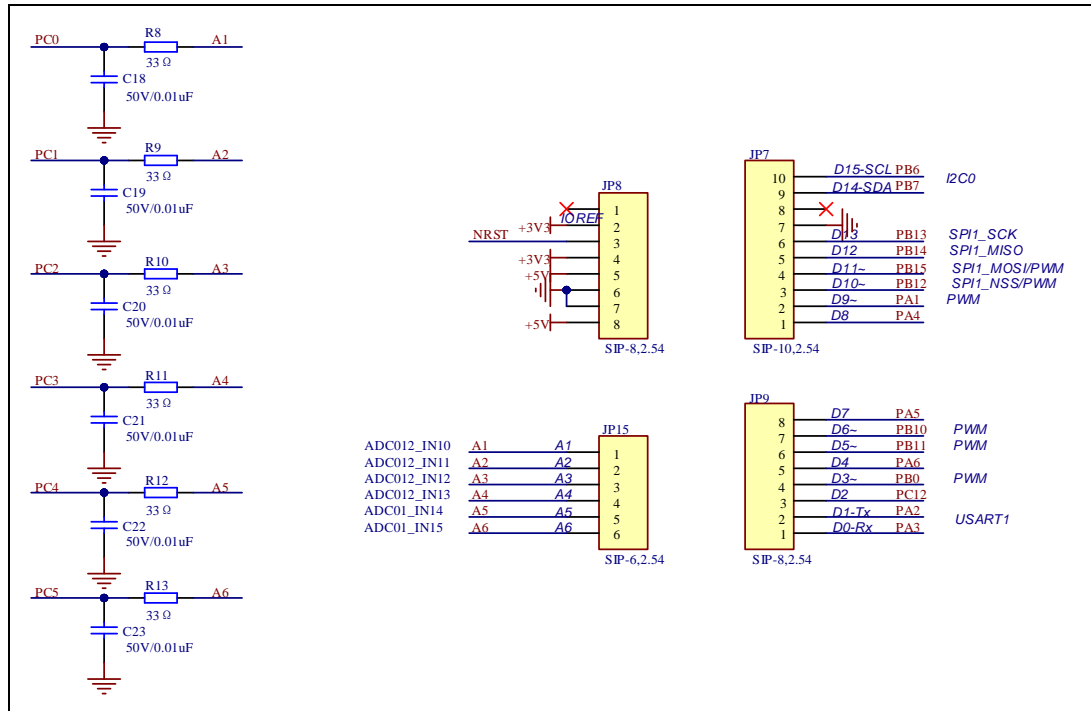
4.7. GD-Link

Figure 4-7. Schematic diagram of GD-Link



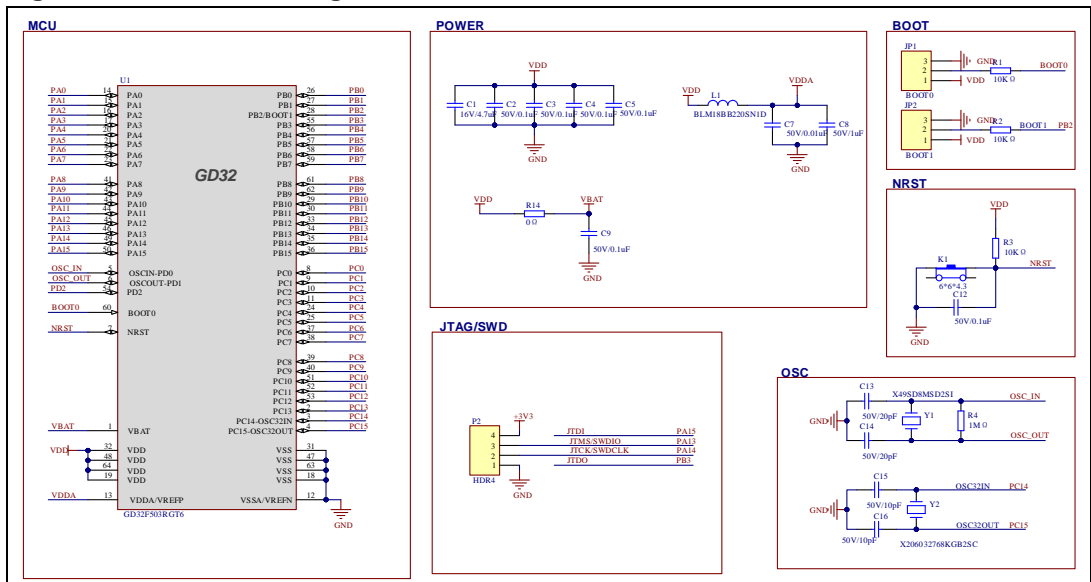
4.8. Arduino

Figure 4-8. Schematic diagram of Arduino



4.9. MCU

Figure 4-9. Schematic diagram of MCU



5. Routine use guide

5.1. GPIO_Runing_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

GD32F503R-START board has three LEDs. The LED1, LED2, LED3 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 START board, LED1, LED2, LED3 will turn on in sequence with interval of 500ms, and turn off together, 500ms later, repeat the process.

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

GD32F503R-START board has two keys and three LEDs. The two keys are Reset key, Wakeup key. The LED1, LED2, LED3 are controlled by GPIO.

This demo will show how to use the Wakeup key to control the LED1. When press down the Wakeup Key, it will check the input value of the IO port. If the value is 0 and will wait for 50ms. Check the input value of the IO port again. If the value still is 0, it indicates that the button is pressed successfully and toggle LED1.

5.2.2. DEMO Running Result

Download the program <02_GPIO_Key_Polling_mode> to the START board, press down the Wakeup Key, LED1 will be turned on. Press down the Wakeup 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

GD32F503R-START board has two keys and three LEDs. The two keys are Reset key, Wakeup key. The LED1, LED2, LED3 are controlled by GPIO.

This demo will show how to use the 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.

5.3.2. DEMO Running Result

Download the program <03_EXTI_Key_Interrupt_mode> to the START board, LED1 is turned on and off for test. When press down the Wakeup Key, LED1 will be turned on. Press down the Wakeup Key again, LED1 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 EVAL board and connect serial cable to USART. Firstly, the LED1、LED2、LED3 is turned on and off 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 the tx_buffer is the same with the rx_buffer, LED1, LED2, LED3 light by turns. Otherwise, LED1, LED2, LED3 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_Breath_LED

5.5.1. DEMO Purpose

This demo includes the following functions of GD32 MCU:

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

5.5.2. DEMO Running Result

Download the program <05_TIMER_Breath_LED > to the GD32F503R-START board and run. PC7 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.

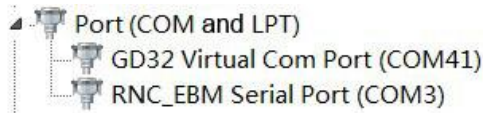
5.6. CDC_ACM

5.6.1. DEMO_Purpose

This demo includes the following functions of GD32 MCU:


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

GD32F503R-START board has one USBFS interface. In this demo, the GD32F503R-START 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.



5.6.2. DEMO Running Result

Download the program < 06_USB_FS\USB_Device_CDC > to the EVAL board and run. When you input message through computer keyboard, the HyperTerminal will receive and shown the message. For example, when input “GigaDevice MCU”, the HyperTerminal will get and show it as below.



```
GigaDevice MCU
```

5.7. MSC_Host

5.7.1. 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

GD32F503R-START-V1.2 board integrates the USBFS module, and the module can be used as a USB device or a USB host. This demo mainly shows how to use the USBFS as a USB MSC host to communicate with external Udisk.

5.7.2. DEMO Running Result

Insert the OTG cable to the USB port, download the program <06_USB_FS\USB_Host_MSC > to the board and run.

If an Udisk has been attached, the user will see the information of Udisk enumeration, the Udisk information, and the root content of the Udisk, then the host 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	Dec.08, 2025
1.1	The USB section adds power supply for the host	Feb.25, 2026

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