

GigaDevice Semiconductor Inc.

GD32A503R-START

Arm[®] Cortex[®]-M33 32-bit MCU

User Guide

Revision 1.2

(Jan. 2025)

Table of Contents

| | |
|--|-----------|
| TABLE OF CONTENTS | 1 |
| LIST OF FIGURES | 3 |
| LIST OF TABLES | 4 |
| 1. SUMMARY | 5 |
| 2. FUNCTION PIN ASSIGN | 6 |
| 3. GETTING STARTED | 7 |
| 4. HARDWARE LAYOUT OVERVIEW | 8 |
| 4.1. Power supply | 8 |
| 4.2. Boot option | 8 |
| 4.3. LED | 8 |
| 4.4. KEY | 9 |
| 4.5. USART | 9 |
| 4.6. Extension | 9 |
| 4.7. GD-Link | 10 |
| 4.8. MCU | 10 |
| 4.9. Arduino..... | 11 |
| 5. ROUTINE USE GUIDE | 12 |
| 5.1. GPIO_Running_LED | 12 |
| 5.1.1. DEMO purpose | 12 |
| 5.1.2. DEMO running result | 12 |
| 5.2. GPIO_Key_Polling_mode..... | 12 |
| 5.2.1. DEMO purpose | 12 |
| 5.2.2. DEMO running result | 12 |
| 5.3. EXTI_Key_Interrupt_mode..... | 13 |
| 5.3.1. DEMO purpose | 13 |
| 5.3.2. DEMO running result | 13 |
| 5.4. USART_HyperTerminal_Interrupt..... | 13 |
| 5.4.1. DEMO purpose | 13 |
| 5.4.2. DEMO running result | 13 |
| 5.5. TIMER_Key_EXTI..... | 14 |
| 5.5.1. DEMO purpose | 14 |
| 5.5.2. DEMO running result | 14 |
| 5.6. TRIGSEL_TIMER_Trigger_EXTI..... | 14 |
| 5.6.1. DEMO purpose | 14 |
| 5.6.2. DEMO running result | 15 |
| 6. REVISION HISTORY | 16 |

List of Figures

| | |
|---|----|
| Figure 4-1. Schematic diagram of power supply..... | 8 |
| Figure 4-2. Schematic diagram of boot option | 8 |
| Figure 4-3. Schematic diagram of LED function | 8 |
| Figure 4-4. Schematic diagram of Key function | 9 |
| Figure 4-5. Schematic diagram of USART | 9 |
| Figure 4-6. Schematic diagram of Extension..... | 9 |
| Figure 4-7. Schematic diagram of GD-Link..... | 10 |
| Figure 4-8. Schematic diagram of MCU..... | 10 |
| Figure 4-9. Schematic diagram of Arduino | 11 |

List of Tables

| | |
|--|----|
| Table 2-1. Function pin assignment | 6 |
| Table 6-1. Revision history | 16 |

1. Summary

GD32A503R-START uses GD32A503RDT3 as the main controller. It uses GD-Link Mini USB interface to supply 5V power. Reset, Boot, User Key, LED, USART to USB, Arduino are also included. For more details, please refer to GD32A503R-START_Rev1.1 schematic.

2. Function Pin Assign

Table 2-1. Function pin assignment

| Function | Pin | Description |
|----------|------|-------------|
| LED | PA5 | LED1 |
| | PA6 | LED2 |
| | PA7 | LED3 |
| | PA8 | LED4 |
| RESET | | K1-Reset |
| KEY | PA0 | K2-User |
| USART | PB15 | RS232_TX |
| | PD8 | RS232_RX |

3. **Getting started**

The EVAL 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.

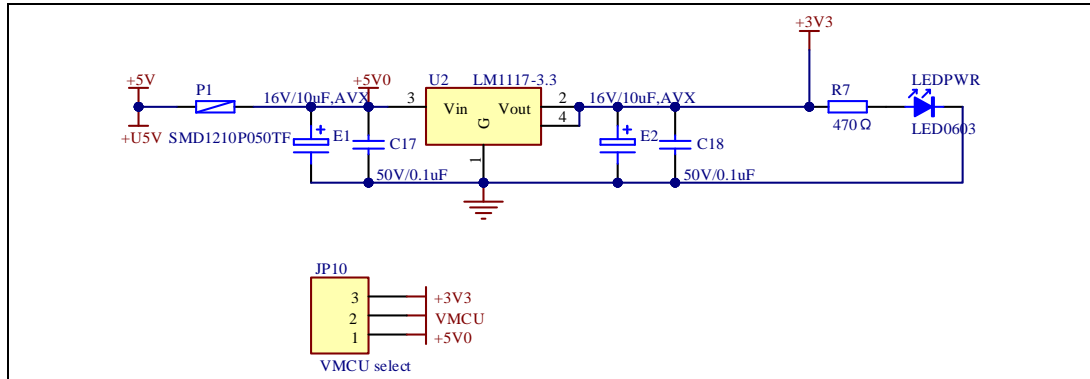
There are Keil version and IAR version of all projects. Keil version of the projects are created based on Keil MDK-ARM 5.35 uVision5. IAR version of the projects are created based on IAR Embedded Workbench for ARM 8.32.1. During use, the following points should be noted:

1. If you use Keil uVision5 to open the project, you need to install the latest version of GigaDevice. GD32A50x_DFP to load the related files.
2. If you use IAR to open the project, you need to install the latest version of IAR_GD32A50x_ADDON to load the related files.

4. Hardware layout overview

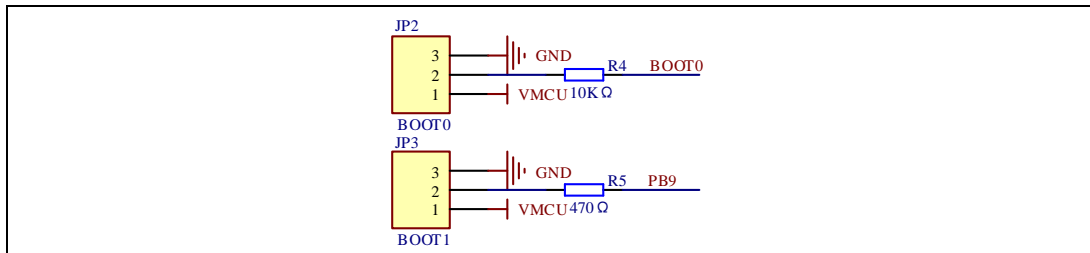
4.1. Power supply

Figure 4-1. Schematic diagram of power supply



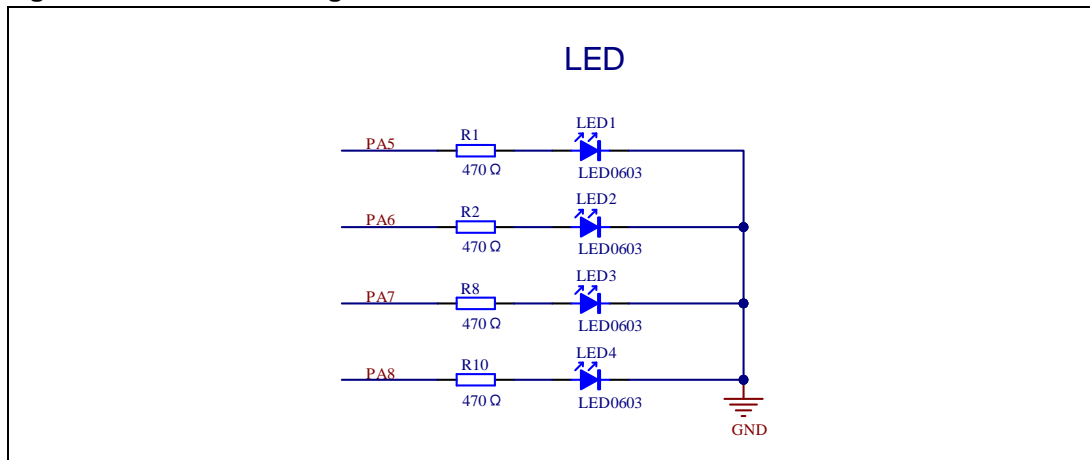
4.2. Boot option

Figure 4-2. Schematic diagram of boot option



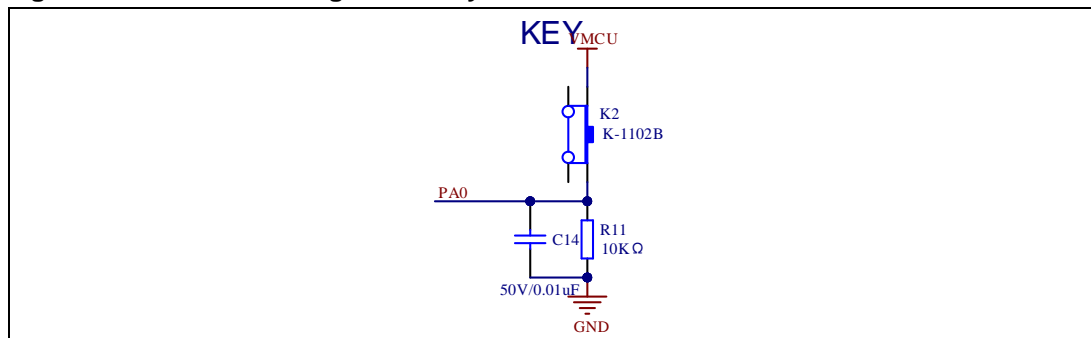
4.3. LED

Figure 4-3. Schematic diagram of LED function



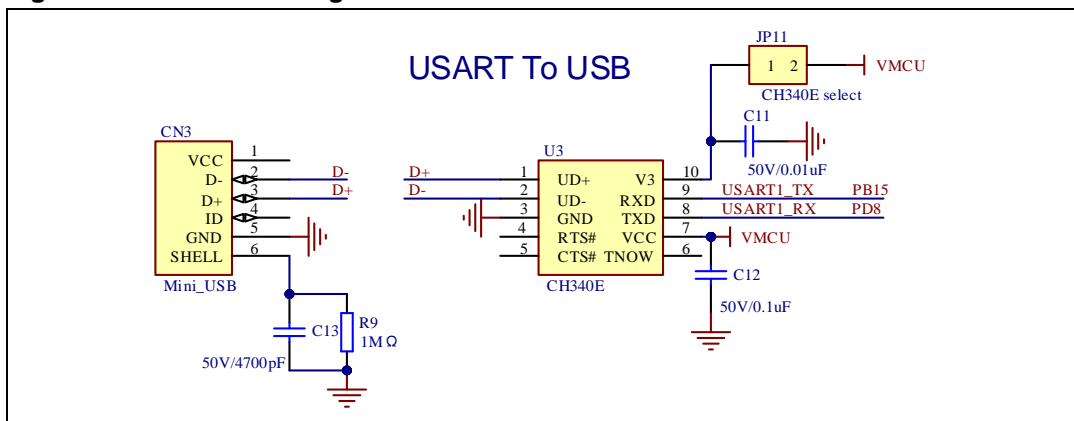
4.4. KEY

Figure 4-4. Schematic diagram of Key function



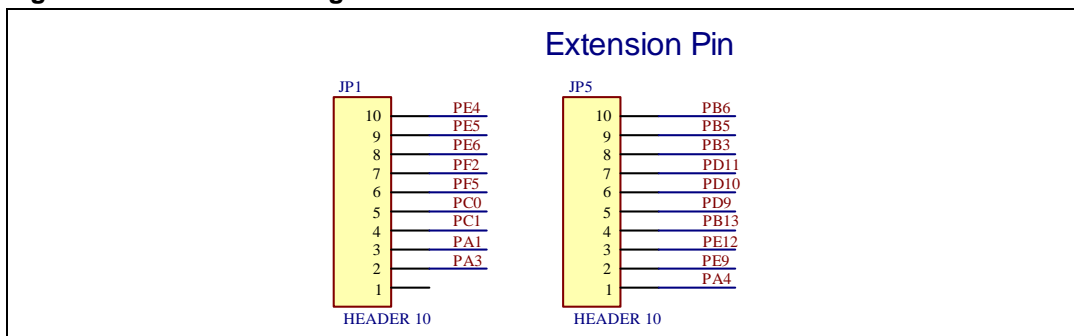
4.5. USART

Figure 4-5. Schematic diagram of USART



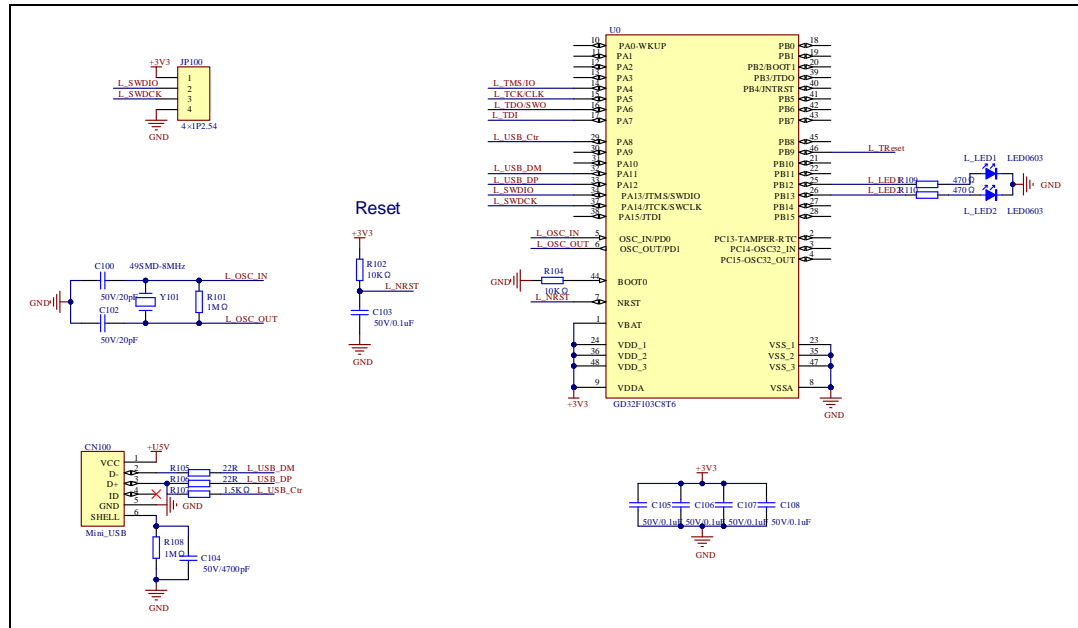
4.6. Extension

Figure 4-6. Schematic diagram of Extension



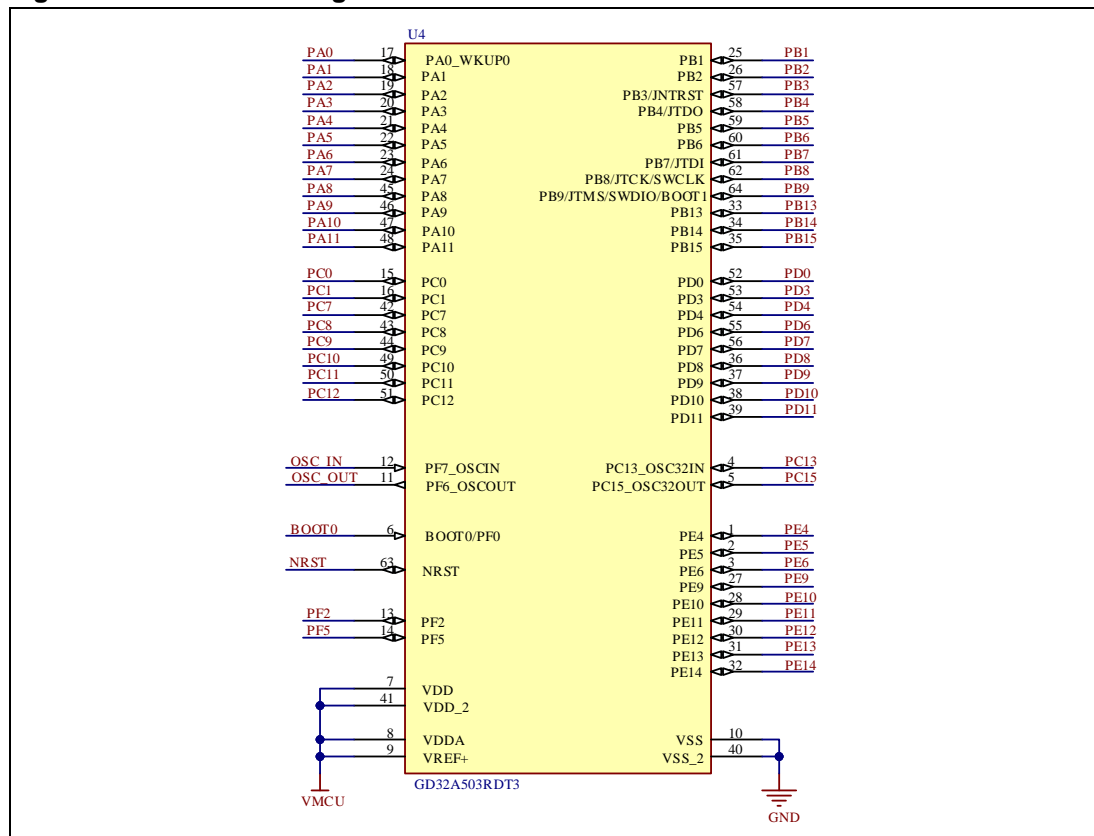
4.7. GD-Link

Figure 4-7. Schematic diagram of GD-Link



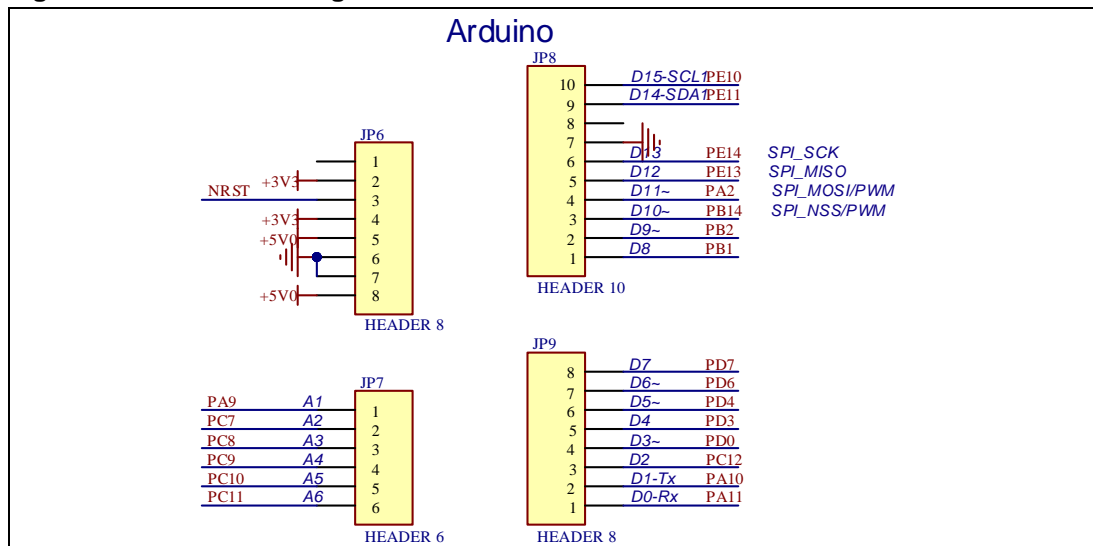
4.8. MCU

Figure 4-8. Schematic diagram of MCU



4.9. Arduino

Figure 4-9. Schematic diagram of Arduino



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

GD32A503R-START board has 2 keys and 4 LEDs. The 2 keys are Reset key and User key. The LEDs 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, The 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

GD32A503R-START board has 2 keys and 4 LEDs. The 2 keys are Reset key and User key. The LEDs are controlled by GPIO.

This demo will show how to use the User 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 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, LED2 will be turned on. Press down the User 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 control the LED and the KEY
- Learn to use EXTI to generate external interrupt

GD32A503R-START board has 2 keys and 4 LEDs. The 2 keys are Reset key and User 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 User 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, LED2 is turned on and off for test. When press down the User key, LED2 will be turned on. Press down the User 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 serial terminal tool

5.4.2. DEMO running result

Download the program < 04_USART_HyperTerminal_Interrupt > to the EVAL board, connect serial cable to UART. Firstly, all the LEDs are turned on and off for test. Then, the UART sends the tx_buffer array (from 0x00 to 0xFF) to the serial terminal tool supporting hex format communication and waits for receiving data of BUFFER_SIZE bytes from the serial terminal. The data MCU has received is stored in the rx_buffer array. After that, compare tx_buffer with rx_buffer. If tx_buffer is same with rx_buffer, LED1, LED2, LED3 and LED4 flash by turns. Otherwise, LED1, LED2, LED3 and LED4 toggle together.

The output information via the serial port 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

GD32A503R-START board has 2 keys and 4 LEDs. The 2 keys are Reset key and User key. The LEDs are controlled by GPIO.

This demo will show how to use the TIMER PWM to trigger EXTI interrupt to toggle the state of LED1 and EXTI interrupt line to control the LED1. When press down the User 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, the LED1 is flashed once for test, press down the User Key, LED1 will be turned on. Press down the User Key again, LED1 will be turned off. Connect PE6 (TIMER1_CH0) and PA4 with DuPont line. The LED1 will be toggled every 500ms.

5.6. TRIGSEL_TIMER_Trigger_EXTI

5.6.1. DEMO purpose

This demo includes the following functions of GD32 MCU:

- Learn to use TIMER output PWM wave
- Learn to use EXTI generate interrupt
- Learn to use TRIGSEL select trigger source and trigger peripheral

5.6.2. DEMO running result

Download the program < 06_TRIGSEL_TIMER_Trigger_EXTI > to the EVAL board, LED2 is turned on and off for test.

When the program is running, the EXTI10 interrupt is triggered by TRIGSEL output every 200ms, and LED2 state is toggled by the interrupt.

6. Revision history

Table 6-1. Revision history

| Revision No. | Description | Date |
|--------------|---|--------------|
| 1.0 | Initial Release | Oct.14, 2022 |
| 1.1 | Update compiler's Add on version in chapter 3 | Jun.30, 2023 |
| 1.2 | Update chapter 3 | Jan.25, 2025 |

Important Notice

This document is the property of GigaDevice Semiconductor Inc. and its subsidiaries (the "Company"). This document, including any product of the Company described in this document (the "Product"), is owned by the Company under the intellectual property laws and treaties of the People's Republic of China and other jurisdictions worldwide. The Company reserves all rights under such laws and treaties and does not grant any license under its patents, copyrights, trademarks, or other intellectual property rights. The names and brands of third party referred thereto (if any) are the property of their respective owner and referred to for identification purposes only.

The Company makes no warranty of any kind, express or implied, with regard to this document or any Product, including, but not limited to, the implied warranties of merchantability and fitness for a particular purpose. The Company does not assume any liability arising out of the application or use of any Product described in this document. Any information provided in this document is provided only for reference purposes. It is the responsibility of the user of this document to properly design, program, and test the functionality and safety of any application made of this information and any resulting product. Except for customized products which has been expressly identified in the applicable agreement, the Products are designed, developed, and/or manufactured for ordinary business, industrial, personal, and/or household applications only. The Products are not designed, intended, or authorized for use as components in systems designed or intended for the operation of weapons, weapons systems, nuclear installations, atomic energy control instruments, combustion control instruments, airplane or spaceship instruments, transportation instruments, traffic signal instruments, life-support devices or systems, other medical devices or systems (including resuscitation equipment and surgical implants), pollution control or hazardous substances management, or other uses where the failure of the device or Product could cause personal injury, death, property or environmental damage ("Unintended Uses"). Customers shall take any and all actions to ensure using and selling the Products in accordance with the applicable laws and regulations. The Company is not liable, in whole or in part, and customers shall and hereby do release the Company as well as its suppliers and/or distributors from any claim, damage, or other liability arising from or related to all Unintended Uses of the Products. Customers shall indemnify and hold the Company as well as its suppliers and/or distributors harmless from and against all claims, costs, damages, and other liabilities, including claims for personal injury or death, arising from or related to any Unintended Uses of the Products.

Information in this document is provided solely in connection with the Products. The Company reserves the right to make changes, corrections, modifications or improvements to this document and Products and services described herein at any time, without notice.