User Manual

APM32E103ZE EVAL Board

Version: V1.0

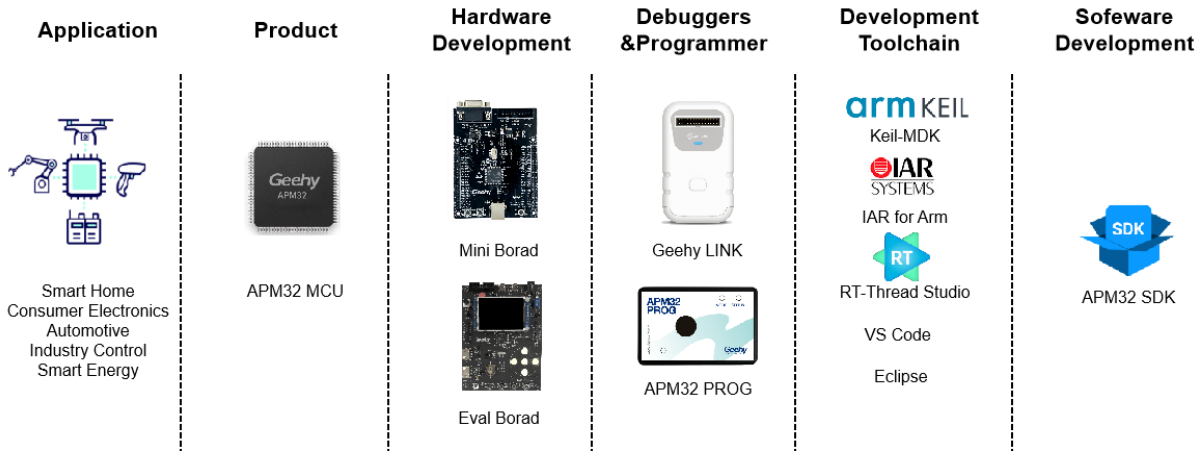
1 Introduction

This User Manual describes the functions, on-board resources and supporting SDK of APM32E103ZE EVAL Board. The SDK and related data mentioned in the document can be obtained from the official website of Geehy (www.geehy. com).

1.1 APM32 Ecosystem

The APM32 ecosystem includes product application solution, hardware development board, download simulation tool, development tool chain and SDK. Moreover, the development tool chain is suitable for many development tools at home and abroad, such as Keil-MDK, IAR for Arm, Eclipse, etc., and all of them are equipped with relevant engineering in the SDK to meet the needs of different users in different platforms.

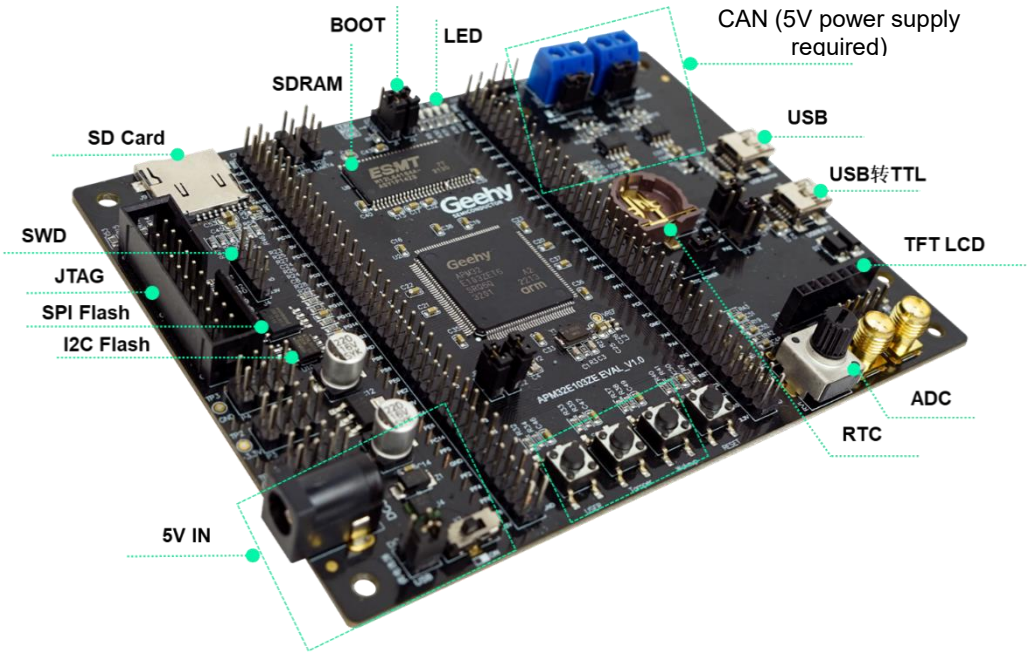
Figure 1 APM32 Ecosystem



1.2 Evaluation board

The APM32E103ZE EVAL Board is a complete demonstration and development platform for the enhanced APM32E103 series MCU. It carries an APM32E103ZET6 MCU chip, which is based on the Arm Cortex-M3 core, operating frequency 120MHz, and Flash 512KB. This evaluation board has rich peripheral functions (as shown in Figure 2), and is equipped with EVAL SDK, which can help developers effectively evaluate the performance of APM32E103ZET6 chip or related development applications.

Figure 2 APM32E103ZE EVAL Board



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2 Function overview

The APM32E103ZE EVAL Board includes the following peripheral functions, and is equipped with the EVAL SDK, which can help developers evaluate chip performance or related development applications

1.TFT LCD

2.EEPROM

3.SPI FLASH

4.USB to UART

5.USB Device Connector

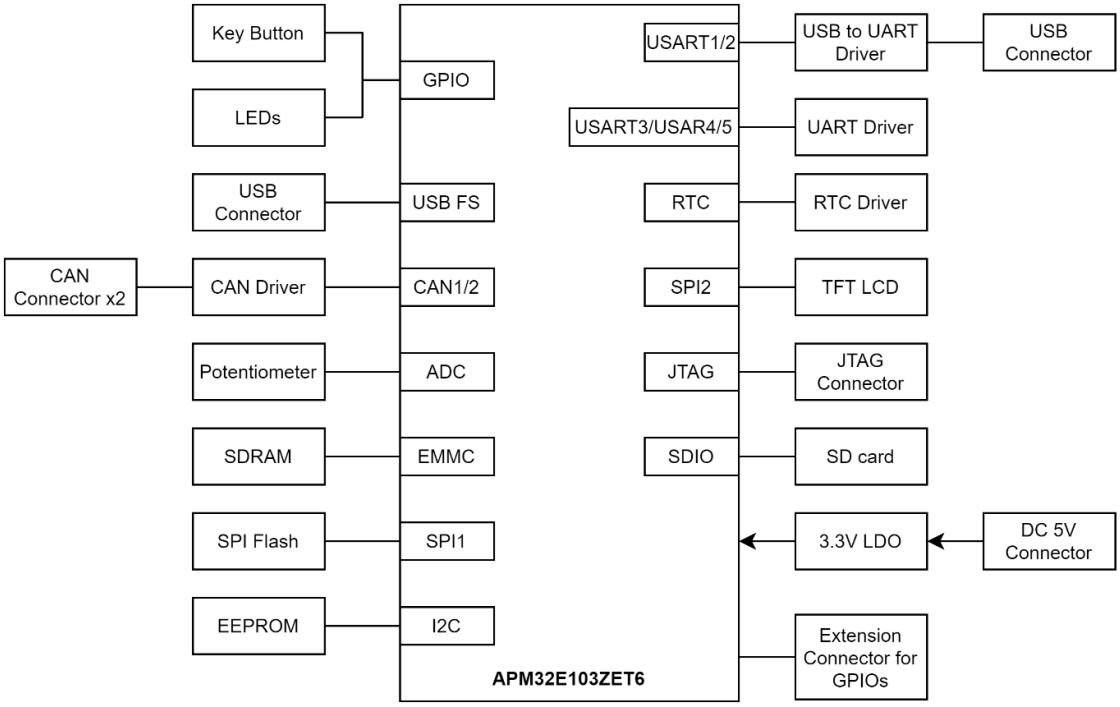
6.SDRAM

6.CAN Connector x 2

7.Button x 3

8.LED x 3

Figure 3 APM32E103ZE EVAL Board Overview

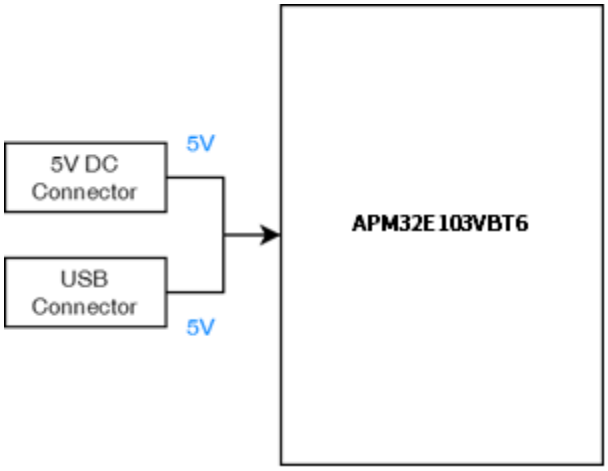


2.1 Power supply control

APM32E103ZE EVAL Board can be powered by external 5V DC power supply or USB. JTAG/SWD interface can supply power to MCU (3.3V), and other required voltages are provided by on-board voltage regulator.

Rich 5V/3.3V/GND pin headers are reserved on the board for users to use external interfaces.

Figure 4 Power Supply of APM32E103ZE EVAL Board



2.2 Battery interface

A CR1220 standard battery interface on board, providing normal operation of APM32E103ZE RTC.

2.3 Clock

Two external clocks on board:

- X1, 32.768KHz clock for RTC
- X2, 8MHz clock is used for APM32E103ZET6. If the internal RC clock of the chip is used, the clock can be removed or the HSE can be disabled

2.4 Reset

Two reset controls are provided:

- RESET key; press it to send a reset signal
- JTAG reset signal

2.5 Simulation interface

Two simulation interfaces are provided:

- Standard 20-pin IDC JTAG connecting interface.
- Four-wire SWD connecting interface

2.6 LCD screen

An LCD screen interface (SPI interface) is provided. The SDK provides a demo based on a 2.4-inch TFT LCD screen with 240 x 320 pixels and ILI9341 control chip.

2.7 LED

3 general red LED lights on board, which can be used for display.

2.8 Keys

3 keys on board, which can be used for LCD menu switching or other input purposes.

2.9 EEPROM

An AT24C32 EEPROM chip on board, which can be used to maintain data and is driven by I2C peripheral.

2.10 Flash

A Flash chip on board, which provides 2MB external storage space and is driven by SPI.

2.11 CAN

Provide CAN1 and CAN2 two controller local area network interfaces. (5V power supply is required during use)

2.12 MicroSD card

A MicroSD card interface on board, which can be connected to the MicroSD card and is driven by SPI.

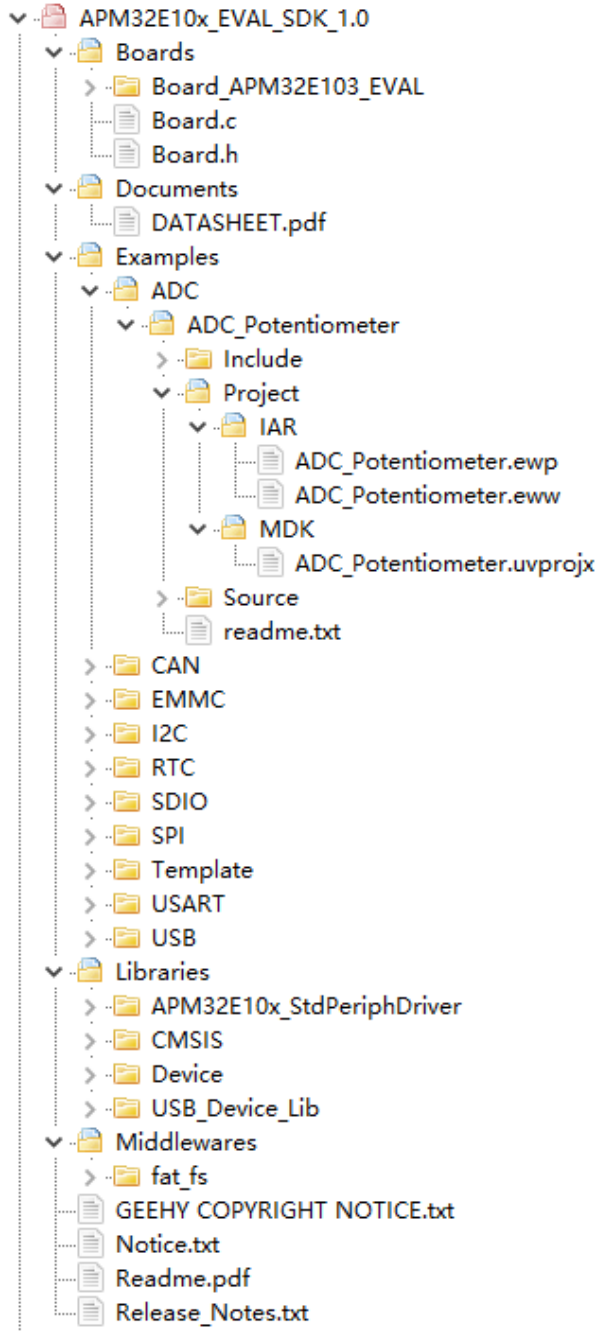
2.13 SDRAM

A MicroSD card interface on board, which can be connected to the MicroSD card and is driven by SPI.

3 SDK Overview

The SDK[1] is provided in the form of compressed packages, including on-board driver packages, such as basic LED, Button and COM driver, I2C for EEPROM driver package, LCD screen driver package and W25Q16 Flash driver package, as well as multiple necessary libraries, such as APM32E10x standard library and USB Device peripheral driver library. It also includes many routines that are easy to reuse, such as EEPROM reading and writing, LCD multi-level menu, CAN double-computer communication, and USB communication.

Figure 5 SDK Directory Architecture

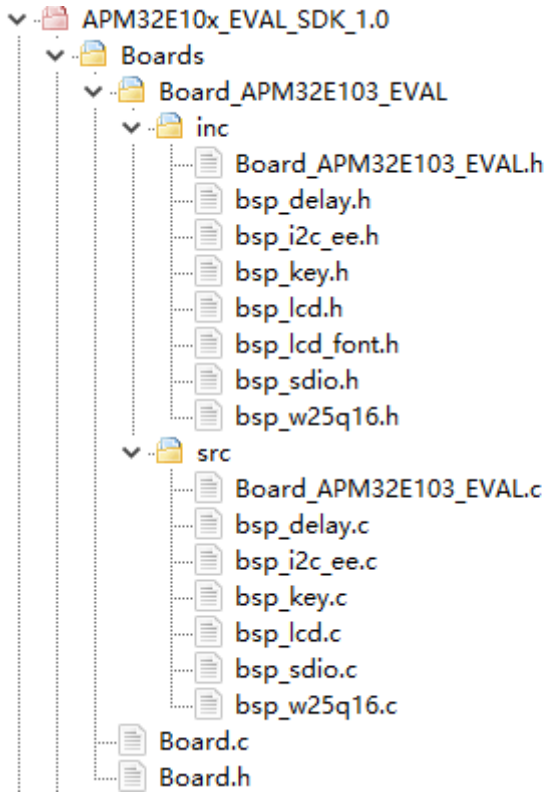


[1]. There is no package supported by IDE in the SDK of APM32xx_EVAL Board. You need to obtain it on the official website of Geehy www.geehy.com.

3.1 On-board driver

The on-board drive file is in the "Boards" folder and provides the KEY, LED, USART, SDIO, I2C EEPROM, SPI LCD, SPI Flash and other drives of the APM32E103ZE EVAL Board.

Figure 6 On-board Drive



3.2 Library file

The library file is in the "Libraries" folder, providing the core drive file, peripheral drive file, and USB peripheral protocol file using the APM32E103ZE EVAL Board.

3.3 Middleware

The middleware files are in the "Middlewares" folder and are some third-party tools or source code used in the demo provided by the APM32E103ZE EVAL Board.

3.4 IDE support

The demo provided by the APM32E103ZE EVAL Board supports IAR for Arm and Keil MDK.

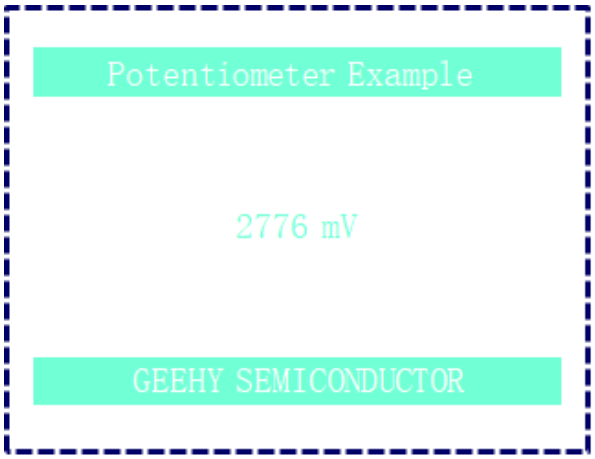
3.5 Routine

The SDK package contains many applications that are easy to reuse, such as EEPROM reading and writing, LCD multi-level menu, USART communication, and CAN communication. This chapter will briefly introduce the demo provided by the APM32E103ZE EVAL Board.

3.5.1 ADC

This routine uses a 10K potentiometer as the sampling source, which can be adjusted by the knob. The AD sampling channel is PC0 (channel 10). The ADC sampling value will be displayed on the screen after the program is compiled and downloaded into the evaluation board.

Figure 7ADC Menu



3.5.2 CAN

This routine uses on-board CAN transceiver chip to show how to use CAN module. Before running the routine, the user needs to short-circuit the H/L wiring of CAN1 and CAN2, and use the external 5V power supply to supply power. After completing the above operations, the following information will be displayed on the screen after the program is compiled and downloaded into the evaluation board. At this time, press KEY1 and KEY2 respectively to test the data transmission and receiving.

Figure 8 CAN Dual Menu

3.5.3 DMC SDRAM

This routine implements the simple use of EMMC function of APM32E103ZET6. This routine shows users how to use EMMC to mount SDRAM chips and finally map to internal storage areas. After the program is compiled and downloaded into the evaluation board, the following information will be displayed on the screen. At this time, press KEY1 to test the reading and writing of SDRAM chip data.

Figure 9 DMC SDRAMl Menu

S

3.5.4 I2C

This routine implements reading and writing EEPROM by APM32E103ZET6 through I2C interface. EEPROM adopts AT24C02, the device address is 0xA0, and the addressing address is 16bit. After the program is compiled and downloaded into the evaluation board, the following information will be displayed on the screen. At this time, press KEY1 to test the EEPROM reading and writing.

Figure 10I2C EEPROM Menu

3.5.5 RTC

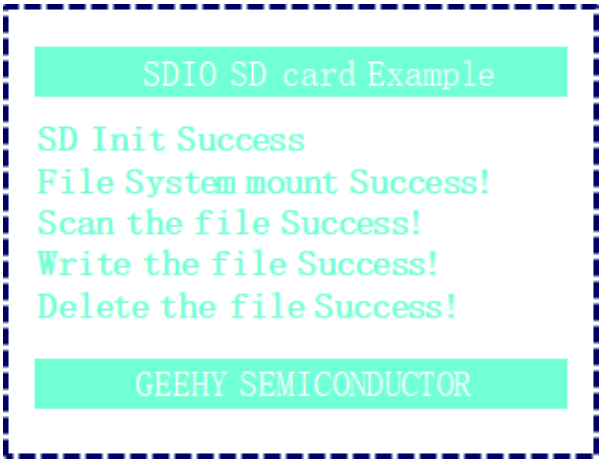
This routine uses the RTC peripheral of APM32E103ZET6 to simulate a 24-hour clock. After the program is compiled and downloaded into the evaluation board, a clock will be displayed on the screen and keep timing.

Figure 11RTC Clock Menu

3.5.6 SDIO

This routine uses the SDIO peripheral of APM32E103ZET6 to store the data of external MicroSD card and create, write, and delete the target files. After the MicroSD card is inserted, and the program is compiled and downloaded into the evaluation board, the following content will be displayed on the screen, indicating that the file creation, writing and deletion operations are successful.

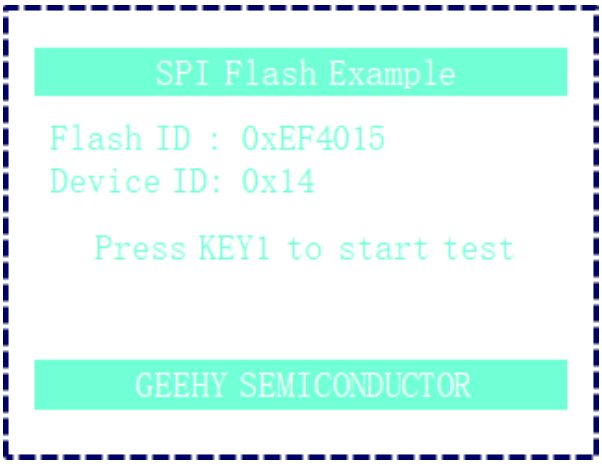
Figure 12SDIO SD Card Menu



3.5.7 SPI Flash

This routine implements data writing and reading of W25Q16. After the program is compiled and downloaded into the evaluation board, the following content will be displayed on the screen; then press KEY1 to conduct data writing and reading of W25Q16.

Figure 13SPI Flash Menu



3.5.8 SPI LCD

This routine realizes the drive of 2.4-inch LCD screen. After the program is compiled and downloaded into the evaluation board, a multi-level menu will be displayed on the screen; then press KEY1 (PREV), KEY2 (ENTER) and KEY3 (RETURN) to conduct corresponding operation.

Figure 14SPI LCD Menu

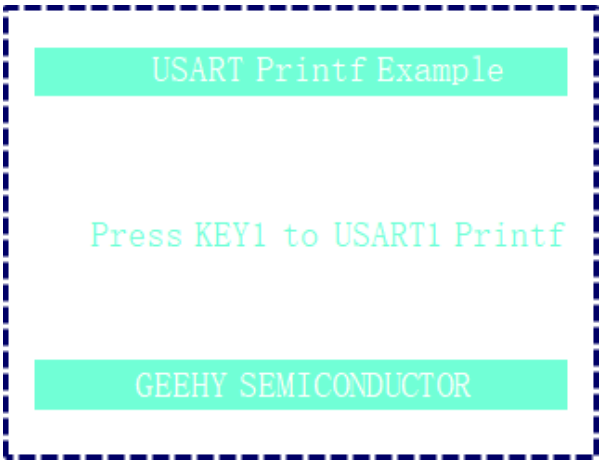
3.5.9 Template

This routine is a template engineering, which allows users to add various functions.

3.5.10 USART

This routine uses USART1 PA9/PA10 of APM32E103ZET6 to print information to PC. When using this routine, users need to select PA10 for P6 jumper cap and PA9 for P7 jumper cap. Connect the MINI USB cable to PC. Open the corresponding serial port monitoring software on the PC (baud rate: 115200, 8 data bits, 1 stop bit, no check bit), press KEY1 and you can see the message "Hello USART1".

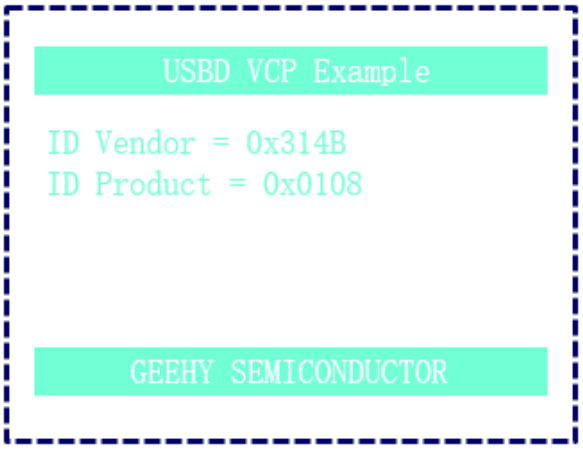
Figure 15USART Printf Menu



3.5.11 USB_CDC_VirtualCOMPort

This routine implements virtual serial port device through the USB Device peripheral of APM32E103ZET6, and the evaluation board is configured as the Device. When the USB port of the evaluation board is connected to the PC terminal, you can see an additional COM port in the device manager. You can open this COM port through the serial port debugging tool, and then send data to the evaluation board through this COM port. After receiving the data, the evaluation board will return the same data to the serial port debugging tool.

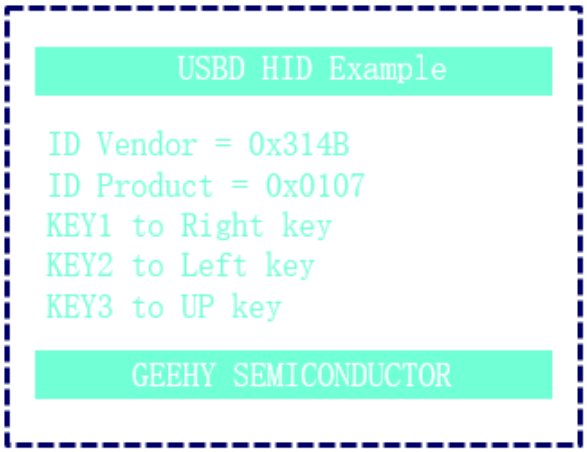
Figure 16USB CDC VirtualCOMPort Menu



3.5.12 USB_HID_Mouse

This routine simulates the implementation of a USB mouse through the USB Device peripheral of APM32E103ZET6, and the evaluation board is configured as the Device. When the USB interface of the evaluation board is connected to the PC terminal, you can see an additional mouse device in the device manager. Users can operate the KEY1 - KEY3 keys on the board to simulate movement function of the mouse.

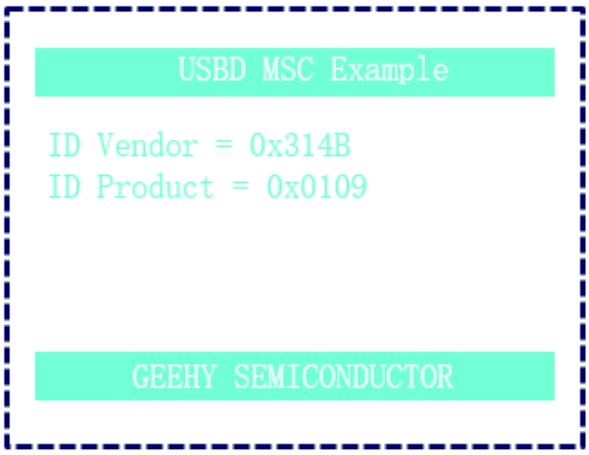
Figure 17USB HID Mouse Menu



3.5.13 USB MSC Disk

This routine simulates the implementation of a U disk device through the USB Device peripheral of APM32E10ZET6, and the evaluation board is configured as the Device. When the USB interface of the evaluation board is connected to the PC terminal, you can see an additional disk device in the device manager. This routine uses internal RAM of APM32E103ZET6 to simulate a U disk device.

Figure 18USB MSC Disk Menu



4 References

For chip specifications and peripheral details, see *APM32E103xCxE User Manual*, *APM32E103xCxE Data Manual*, and *APM32E103ZE EVAL Schematic Diagram*. For more technical support, please visit the official website of Geehy: www.geehy.com.

5 Revision History

Table 1Document Revision History

Date	Revision	Changes
2023.1.18	1.0	New

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