Readme

APM32F4xx SDK

Rev：v1.4

1 Introduction

The Geehy Semiconductor APM32F4xx MINI board software development kit includes a series driver library, a group of example applications that demonstrate key peripheral functionality, and other development files.

Software development kit have a hierarchy as follows:

- SDK directory
  - Boards
  - Documents
  - Examples
  - Libraries
  - Middlewares
  - Package

Table of Contents

1 Introduction 1

2 About boards 7

3 About documents 9

4 About examples 10

4.1 ADC_AnalogWindowWatchdog 16

4.2 ADC_ContinuousConversion 16

4.3 ADC_DMA 16

4.4 ADC_DualInterleavedMode 16

4.5 ADC_DualRegulSimulMode 17

4.6 ADC_MultiChannelScan 17

4.7 ADC_TripleInterleavedMode 17

4.8 ADC_TSensor 18

4.9 ADC_VBAT 18

4.10 CAN_LoopBack 18

4.11 CAN_Normal 18

4.12 COMP_PWMSignalControl 19

4.13 CRC_Calculation 19

4.14 CRYP_AES 20

4.15 CRYP_DES-TDES 20

4.16 DAC_ADC 20

4.17 DCI_OV2640 21

4.18 DMA_ADC 21

4.19 DMA_FMCToRAM 21

4.20 DSP_bayes 21

4.21 DSP_class_marks 22

4.22 DSP_convolution 22

4.23 DSP_dotproduct 22
4.24 DSP_fft_bin 23
4.25 DSP_fir 23
4.26 DSP_graphic_equalizer 23
4.27 DSP_linear_interp 23
4.28 DSP_matrix 24
4.29 DSP_signal_converge 24
4.30 DSP_sin_cos 24
4.31 DSP_svm 25
4.32 DSP_Template 25
4.33 DSP_variance 25
4.34 EINT_Config 25
4.35 ETH_Ping 26
4.36 ETH_TCP_client 26
4.37 Flash_Emulation_Eeprom 27
4.38 FMC_Write 27
4.39 GPIO_Toggle 27
4.40 HASH_SHA1 27
4.41 I2C_TwoBoards_Master 28
4.42 I2C_TwoBoards_Slave 28
4.43 I2S_Interrupt 28
4.44 Application1 29
4.45 Application2 29
4.46 BootLoader 29
4.47 IWDT_Reset 30
4.48 NVIC_Priority 30
4.49 NVIC_WFI 30
4.50 PMU_STANDBY 31

4.51 PMU_STOP 31
4.52 PMU_BOR 31
4.53 PMU_Consumption 31
4.54 PMU_PVD 33
4.55 QSPI_QualSPI 33
4.56 RCM_ClockConfig 33
4.57 RNG_MultiRNG 33
4.58 RTC_Alarm 34
4.59 FreeRTOS 34
4.60 RT-thread 34
4.61 SDIO_SDCard 35
4.62 SPI_FullDuplex 35
4.63 SysTick_TimeBase 36
4.64 Template 36
4.65 TMR_32BitCount 36
4.66 TMR_6Steps 36
4.67 TMR_CascadeSynchro 37
4.68 TMR_EncoderInterface 37
4.69 TMR_ExtTriggerSynchro 37
4.70 TMR_InputCapture 37
4.71 TMR_OCActive 38
4.72 TMR_OCInactive 38
4.73 TMR_OCToggle 38
4.74 TMR_ParallelSynchro 38
4.75 TMR_PWMInput 39
4.76 TMR_PWMOutput 39
4.77 TMR_SinglePulse 39
4.78 TMR_TimeBase 40

4.79 TMR_TMR11PWMOutput 40
4.80 TMR_TMR1DMABurst 40
4.81 TMR_TMR1PWMOutput 40
4.82 TMR_TMR1Synchro 41
4.83 TMR_TMR2PWMOutput 41
4.84 TMR_TMR8DMA 41
4.85 TMR_TMR9OCToggle 41
4.86 USART_Interrupt 42
4.87 USART_Polling 42
4.88 USART_IrDA 42
4.89 USART_SmartCard 43
4.90 USART_TwoBoardsDMA 43
4.91 USART_TwoBoardsInterrupt 43
4.92 OTGD_CDC 44
4.93 OTGD_CDC_HS2 44
4.94 OTGD_Custom_HID 44
4.95 OTGD_Custom_HID_HS2 45
4.96 OTGD_Custom_HID_Keyboard 45
4.97 OTGD_Custom_HID_Keyboard_HS2 45
4.98 OTGD_HID 46
4.99 OTGD_HID_HS2 46
4.100 OTGD_HID_Keyboard 46
4.101 OTGD_MSC 47
4.102 OTGD_MSC_HS2 47
4.103 OTGD_WINUSB 47
4.104 OTGH_CDC 47
4.105 OTGH_CDC_HS2 48
4.106 OTGH_HID 48

4.107 OTGH_HID_HS2 48
4.108 OTGH_MSC 49
4.109 OTGH_MSC_HS2 49
4.110 WWDT_OverTime 49
5 About libraries 51
6 About middlewares 52
7 About Package 53
8 Revision History 54

2 About boards

The boards folder includes a board support package for APM32F4xx MINI board. It can help drive the peripheral circuit or components on the board quickly. The BSP can be found in the ~/Boards directory.

The BSP provided are built for APM32F4xx MINI board and APM32F4xx TINY board compatibility. For other user development board use, some minor modifications may be required.

Boards have a hierarchy as follows:

* Board.c
* Board.h

- Board_APM32F407_MINI folder
  * Board_APM32F407_MINI.c\h
  * bsp_delay.c\h
  * bsp_i2c.c\h
  * bsp_key.c\h
  * bsp_usart.c\h
- Board_APM32F407_ELE_HUETB folder
  * Board_APM32F407_ELE_HUETB.c\h
- Board_APM32F407_TINY folder
  * Board_APM32F407_TINY.c\h
  * bsp_delay.c\h
  * bsp_i2c.c\h
  * bsp_key.c\h
  * bsp_usart.c\h
- Board_APM32F411_TINY folder
  * Board_APM32F411_TINY.c\h
  * bsp_delay.c\h
  * bsp_i2c.c\h

* bsp_key.c\h
* bsp_usart.c\h

3 About documents

The documents folder includes a link file that can be redirected to the technical support center of Geehy semiconductor. The document can be found in the ~/Documents directory.

4 About examples

The example applications can be found in the ~/Examples directory.

The examples provided are built for APM32F4xx MINI board and APM32F4xx TINY board compatibility. For other user development board use, some minor modifications may be required.

Example projects have a hierarchy as follows:

- Example folder
  - Include
  - Project
    - Eclipse
    - IAR
    - MDK
  - Source

All example applications tested with: **APM32F4xx StdPeriphDriver v1.0.3**, include the following examples:

- Examples
  - ADC
    - ADC_AnalogWindowWatchdog
    - ADC_ContinuousConversion
    - ADC_DMA
    - ADC_DualInterleavedMode
    - ADC_DualRegulSimulMode
    - ADC_MultiChannelScan
    - ADC_TripleInterleavedMode
    - ADC_TSensor
    - ADC_VBAT
  - CAN
    - CAN_LoopBack
    - CAN_Normal

* COMP
  - COMP_PWMSignalControl
* CRC
  - CRC_Calculation
* CRYP
  - CRYP_AES
  - CRYP_DES-TDES
* DAC
  - DAC_ADC
* DCI
  - DCI_OV2640
* DMA
  - DMA_ADC
  - DMA_FMCToRAM
* DSP
  - DSP_bayes
  - DSP_class_marks
  - DSP_convolution
  - DSP_dotproduct
  - DSP_fft_bin
  - DSP_fir
  - DSP_graphic_equalizer
  - DSP_linear_interp
  - DSP_matrix
  - DSP_signal_converge
  - DSP_sin_cos
  - DSP_svm
  - DSP_Template

- DSP_variance

* EINT
  - EINT_Config
* ETH
  - ETH_Ping
  - ETH_TCP_client
* FMC
  - FMC_Write
* GPIO
  - GPIO_Toggle
* HASH
  - HASH_SHA1
* I2C
  - I2C_TwoBoards_Master
  - I2C_TwoBoards_Slave
* I2S
  - I2S_Interrupt
* IAP
  - Application1
  - Application2
  - BootLoader
* IWDT
  - IWDT_Reset
* NVIC
  - NVIC_Priority
  - NVIC_WFI
* PMU
  - PMU_STANDBY

- PMU_STOP
- PMU_BOR
- PMU_Consumption
- PMU_PVD

* QSPI
  - QSPI_QualSPI
* RCM
  - RCM_ClockConfig
* RNG
  - RNG_MultiRNG
* RTC
  - RTC_Alarm
* RTOS
  - FreeRTOS
  - RT-thread
* SDIO
  - SDIO_SDCard
* SPI
  - SPI_FullDuplex
* SysTick
  - SysTick_TimeBase
* Template
  - Template
* TMR
  - TMR_32BitCount
  - TMR_6Steps
  - TMR_CascadeSynchro
  - TMR_EncoderInterface

- TMR_ExtTriggerSynchro
- TMR_InputCapture
- TMR_OCActive
- TMR_OCInactive
- TMR_OCToggle
- TMR_ParallelSynchro
- TMR_PWMInput
- TMR_PWMOutput
- TMR_SinglePulse
- TMR_TimeBase
- TMR_TMR11PWMOutput
- TMR_TMR1DMABurst
- TMR_TMR1PWMOutput
- TMR_TMR1Synchro
- TMR_TMR2PWMOutput
- TMR_TMR8DMA
- TMR_TMR9OCToggle

* USART
  - USART_Interrupt
  - USART_Polling
  - USART_IrDA
  - USART_SmartCard
  - USART_TwoBoardsDMA
  - USART_TwoBoardsInterrupt

* USB_OTG
  - OTGD_CDC
  - OTGD_CDC_HS2
  - OTGD_CUSTOM_HID

- OTGD_CUSTOM_HID_HS2
- OTGD_CUSTOM_HID_Keyboard
- OTGD_CUSTOM_HID_Keyboard_HS
- OTGD_HID
- OTGD_HID_HS2
- OTGD_HID_Keyboard
- OTGD_MSC
- OTGD_MSC_HS2
- OTGD_WINUSB
- OTGH_CDC
- OTGH_CDC_HS2
- OTGH_HID
- OTGH_HID_HS2
- OTGH_MSC
- OTGH_MSC_HS2

* WWDT
  - WWDT_OverTime

4.1 ADC_AnalogWindowWatchdog

4.1.1 Example Description

This example describes how to use ADC1 to monitor the voltage of ADC1_Channel0 continuously. When input Voltage of ADC1_Channel0(PA0) voltage is lower than 0.62v or higher than 2.27V， LED2 is on, otherwise, LED2 is off. That is If the voltage on ADC1_Channel0(PA0) is not in the thresholds which is setted before, analog watchdog interrupt will generate and light LED2. The converted voltage is displayed on serial assistant through USART1.

4.1.2 Directory contents

This example can be found in the ~ /Examples/ADC/ADC_AnalogWindowWatchdog directory.

4.2 ADC_ContinuousConversion

4.2.1 Example Description

This example describes how to use the ADC1 to convert continuously the voltage applied to the APM32F407 MINI ADC1_Channel0 input. The voltage converted is displayed on serial assistant through USART1.

4.2.2 Directory contents

This example can be found in the ~ /Examples/ADC/ADC_ContinuousConversion directory.

4.3 ADC_DMA

4.3.1 Example Description

This example provides example of how to use a DMA channel to transfer continuously a data from a peripheral (ADC1) to DMA transfer. The ADC channel0 for APMF407 MINI Board is configured to be converted when device startup. The value of ADC is shown in USART1.

4.3.2 Directory contents

This example can be found in the ~ /Examples/ADC/ADC_DMA directory.

4.4 ADC_DualInterleavedMode

4.4.1 Example Description

This example describes how to use the ADC to convert Channel0 in Dual interleaved mode using DMA in mode 3.

4.4.2 Directory contents

This example can be found in the ~ /Examples/ADC/ADC_DualInterleavedMode directory.

4.5 ADC_DualRegulSimulMode

4.5.1 Example Description

This example describes how to use the ADC to convert Channel0, Channel1 and Channel2 simultaneously in dual mode using DMA in mode 1.

4.5.2 Directory contents

This example can be found in the ~ /Examples/ADC/ADC_DualRegulSimulMode directory.

4.6 ADC_MultiChannelScan

4.6.1 Example Description

This example describes how to use the ADC1 to scan continuously the voltage applied to the APM32F407 MINI ADC1_Channel0 and ADC1_Channel1 and ADC1_Channel2 input. The converted voltage is displayed on serial assistant through USART1.

4.6.2 Directory contents

This example can be found in the ~ /Examples/ADC/ADC_MultiChannelScan directory.

4.7 ADC_TripleInterleavedMode

4.7.1 Example Description

This example describes how to use the ADC to convert Channel0 in Triple interleaved mode using DMA in mode 2.

4.7.2 Directory contents

This example can be found in the ~ /Examples/ADC/ADC_TripleInterleavedMode directory.

4.8 ADC_TSensor

4.8.1 Example Description

This example describes how to use the ADC1 to convert the internal temperature sensor's voltage applied to the APM32F407 MINI ADC1_Channel16.

4.8.2 Directory contents

This example can be found in the ~ /Examples/ADC/ADC_TSensor directory.

4.9 ADC_VBAT

4.9.1 Example Description

This example describes how to use the ADC1 to convert VBAT voltage applied to the APM32F407 MINI ADC1_Channel18. The converted voltage is displayed on serial assistant through USART1.

4.9.2 Directory contents

This example can be found in the ~ /Examples/ADC/ADC_VBAT directory.

4.10 CAN_LoopBack

4.10.1 Example Description

This example describes how to configure a communication the CAN in loopback mode. CAN transmit a message to self. Then compare the received message with transmitted message. The data of Polling transmit and Interrupt transmit will displayed on serial assistant through USART1.

4.10.2 Directory contents

This example can be found in the ~ /Examples/CAN/LoopBack directory.

4.11 CAN_Normal

4.11.1 Example Description

This example describes how to configure a communication the CAN in normal mode. CAN1 transmit a message to CAN2. Then compare the received message with transmitted message. The result of Polling transmit and Interrupt transmit will displayed on serial assistant through USART1.

- Polling transmit success: The LED2 turns on, printf "CAN polling test passed!". Otherwise LED2 toggles, printf "CAN polling test failed!".

- Interrupt transmit success: The LED3 turns on, printf "CAN interrupt test passed!". Otherwise LED3 toggles, printf "CAN interrupt test failed".

4.11.2 Directory contents

This example can be found in the ~ /Examples/CAN/CAN_Normal directory.

4.12 COMP_PWMSignalControl

4.12.1 Example Description

This example shows how to use the comparator. COMP2 non-inverting input connect to PC2. And COMP2 inverting input is internally connected to VREFINT(1.22V) which is used to compare with PC2 input.

-While PC2 is lower than VREFINT (1.22V), PA8 is in low level.

-While PC2 is higher than VREFINT, PWM signal is displayed on PA8.

4.12.2 Directory contents

This example can be found in the ~ /Examples/COMP/ COMP_PWMSignalControl directory.

4.13 CRC_Calculation

4.13.1 Example Description

This example shows how to use CRC (Cyclic Redundancy Check) calculation unit to get a CRC code of a given buffer of data word(32-bit), based on a fixed generator polynomial(0x4C11DB7). an interactive human interface is developed to allow user to display CRC 32bit numbers using the eval board USART1 with PC HyperTerminal.

4.13.2 Directory contents

This example can be found in the ~ /Examples/CRC/CRC_Calculation directory.

4.14 CRYP_AES

4.14.1 Example Description

This example describes the CRYP processor performs data encryption and decryption using AES lgorithms in Electronic codebook (ECB) or Cipher block chaining (CBC) or counter(CTR) mode. The data that needs to be decrypted and encrypted will be displayed on the serial assistant through USART1.

4.14.2 Directory contents

This example can be found in the ~ /Examples/CRYP/CRYP_AES directory.

4.15 CRYP_DES-TDES

4.15.1 Example Description

This example describes the CRYP processor performs data encryption and decryption using DES and TDES lgorithms in Electronic codebook (ECB) or Cipher block chaining (CBC) mode. The data that needs to be decrypted and encrypted will be displayed on the serial assistant through USART1. if define PLAIN_TEXT_SHORT then the length of plaintext is 64, else the length of plaintext is 128.

4.15.2 Directory contents

This example can be found in the ~ /Examples/CRYP/CRYP_DES-TDES directory.

4.16 DAC_ADC

4.16.1 Example Description

This example provides example of how to use DAC channel 1(PA4) to output voltage to ADC channel 0(PA0). The converted voltage of PA4 is detected by ADC channel 0 and displayed on serial assistant through USART1.

4.16.2 Directory contents

This example can be found in the ~ /Examples/DAC/DAC_ADC directory.

4.17 DCI_OV2640

4.17.1 Example Description

The program aims to show how to use interrupt or DMA to get camera image data by using DCI, in this case, DCI continuously get the data of the OV2640 camera through DMA and sends it to the host by USART2(jpeg mode). In another regb 565 mode, DCI continuously get the data of the OV2640 camera through DMA and transfer it to LCD data register to display. And OV2640 can be set to jpeg and rgb565 data output format.

4.17.2 Directory contents

This example can be found in the ~ /Examples/DCI/DCI_OV2640 directory.

4.18 DMA_ADC

4.18.1 Example Description

This example provides a example of how to use a DMA channel to transfer continuously a data from a peripheral (ADC1) to DMA transfer. The ADC channel0 for APMF407 MINI Board is configured to be converted when device startup. The value of ADC is shown in USART1.

4.18.2 Directory contents

This example can be found in the ~ /Examples/DMA/DMA_ADC directory.

4.19 DMA_FMCToRAM

4.19.1 Example Description

This example shows how to use a DMA channel to transfer a word data buffer from FLASH memory to embedded SRAM memory.

4.19.2 Directory contents

This example can be found in the ~ /Examples/DMA/DMA_FMCToRAM directory.

4.20 DSP_bayes

4.20.1 Example Description

Example code demonstrating how to use Bayes functions. The demo can be displayed using serial assistant. After power on, can press KEY1 to start demo test.

4.20.2 Directory contents

This example can be found in the ~ /Examples/DSP/DSP_bayes directory.

4.21 DSP_class_marks

4.21.1 Example Description

Example code to calculate Minimum, Maximum Mean, std and variance of marks obtained in a class. The demo can be displayed using serial assistant. After power on, can press KEY1 to start demo test.

4.21.2 Directory contents

This example can be found in the ~ /Examples/DSP/DSP_class_marks directory.

4.22 DSP_convolution

4.22.1 Example Description

Example code demonstrating Convolution of two input signals using fft. The demo can be displayed using serial assistant. After power on, can press KEY1 to start demo test.

4.22.2 Directory contents

This example can be found in the ~ /Examples/DSP/DSP_convolution directory.

4.23 DSP_dotproduct

4.23.1 Example Description

Example code computing dot product of two vectors. The demo can be displayed using serial assistant. After power on, can press KEY1 to start demo test.

4.23.2 Directory contents

This example can be found in the ~ /Examples/DSP/DSP_dotproduct directory.

4.24 DSP_fft_bin

4.24.1 Example Description

Example code demonstrating calculation of Max energy bin of frequency domain of input signal. The demo can be displayed using serial assistant. After power on, can press KEY1 to start demo test.

4.24.2 Directory contents

This example can be found in the ~ /Examples/DSP/DSP_fft_bin directory.

4.25 DSP_fir

4.25.1 Example Description

Example code demonstrating how an FIR filter can be used as a low pass filter. The demo can be displayed using serial assistant. After power on, can press KEY1 to start demo test.

4.25.2 Directory contents

This example can be found in the ~ /Examples/DSP/DSP_fir directory.

4.26 DSP_graphic_equalizer

4.26.1 Example Description

Example showing an audio graphic equalizer constructed out of Biquad filters. The demo can be displayed using serial assistant. After power on, can press KEY1 to start demo test.

4.26.2 Directory contents

This example can be found in the ~ /Examples/DSP/DSP_graphic_equalizer directory.

4.27 DSP_linear_interp

4.27.1 Example Description

Example code demonstrating usage of sin function and uses linear interpolation to get higher precision. The demo can be displayed using serial assistant. After power on, can press KEY1 to start demo test.

4.27.2 Directory contents

This example can be found in the ~ /Examples/DSP/DSP_linear_interp directory.

4.28 DSP_matrix

4.28.1 Example Description

Example code demonstrating least square fit to data using matrix functions. The demo can be displayed using serial assistant. After power on, can press KEY1 to start demo test.

4.28.2 Directory contents

This example can be found in the ~ /Examples/DSP/DSP_matrix directory.

4.29 DSP_signal_converge

4.29.1 Example Description

Example code demonstrating convergence of an adaptive filter. The demo can be displayed using serial assistant. After power on, can press KEY1 to start demo test.

4.29.2 Directory contents

This example can be found in the ~ /Examples/DSP/DSP_signal_converge directory.

4.30 DSP_sin_cos

4.30.1 Example Description

Example code demonstrating sin and cos calculation of input signal. The demo can be displayed using serial assistant. After power on, can press KEY1 to start demo test.

4.30.2 Directory contents

This example can be found in the ~ /Examples/DSP/DSP_sin_cos directory.

4.31 DSP_svm

4.31.1 Example Description

Example code demonstrating how to use SVM functions. The demo can be displayed using serial assistant. After power on, can press KEY1 to start demo test.

4.31.2 Directory contents

This example can be found in the ~ /Examples/DSP/DSP_svm directory.

4.32 DSP_Template

4.32.1 Example Description

This demo is based on the APM32F407 MIN board. it provides a DSP template project.

4.32.2 Directory contents

This example can be found in the ~ /Examples/DSP/DSP_Template directory.

4.33 DSP_variance

4.33.1 Example Description

Example code demonstrating variance calculation of input sequence. The demo can be displayed using serial assistant. After power on, can press KEY1 to start demo test.

4.33.2 Directory contents

This example can be found in the ~ /Examples/DSP/DSP_variance directory.

4.34 EINT_Config

4.34.1 Example Description

This example shows how to configure external interrupt lines. In this example, 2 EINT lines (KEY1、KEY2) when using the APM32F407 MINI BOARD are configured to generate an interrupt on each falling edge. In the interrupt routine a led connected to a specific GPIO pin is toggled.

4.34.2 Directory contents

This example can be found in the ~ /Examples/EINT/EINT_Config directory.

4.35 ETH_Ping

4.35.1 Example Description

This example describes how to use ethernet PHY by using APM32F4xx_ETH_Driver library. After configured ethernet mainboard will be use USART1 to printf static IP address. if computer ping static IP address（192.168.73.22）， computer will be visit mainboard normality.

The phenomenon of data interaction process can be displayed using cmd.exe.

4.35.2 Directory contents

This example can be found in the ~ /Examples/ETH/ETH_Ping directory.

4.36 ETH_TCP_client

4.36.1 Example Description

This example shows how to configure TCP Client to connect server.

phenomenon :

- After initialization, You can see the system information on serial assisatant through USART1 or LCD screen.

- connect server(IP 169.254.207.43:6000) by KEY1. And disconnect server by KEY2.

- you can send data to the TINY board by TCP server using tcp assisatant.

4.36.2 Directory contents

This example can be found in the ~ /Examples/ETH/ETH_TCP_client directory.

4.37 Flash_Emulation_Eeprom

4.37.1 Example Description

This example provides a description of how to program the flash address of APM32F407. After Reset, the Flash will be unlock. Then erase the specifies address and write a data in the address. In the end, lock the flash. The data of the address after erasing and programing will displayed on serial assistant through USART1.

4.37.2 Directory contents

This example can be found in the ~ /Examples/FMC/FMC_Write directory.

4.38 FMC_Write

4.38.1 Example Description

This example provides a description of how to program the flash address of APM32F407. After Reset, the Flash will be unlock. Then erase the specifies address and write a data in the address. In the end, lock the flash. The data of the address after erasing and programing will displayed on serial assistant through USART1.

4.38.2 Directory contents

This example can be found in the ~ /Examples/FMC/FMC_Write directory.

4.39 GPIO_Toggle

4.39.1 Example Description

This example describes how to use DOUT for toggling IO. The IO of LED2 and LED3 is configed to toggle constantly. The phenomenon of LED2 and LED3 constantly flickered alternately.

4.39.2 Directory contents

This example can be found in the ~ /Examples/GPIO/GPIO_Toggle directory.

4.40 HASH_SHA1

4.40.1 Example Description

This example describes how to use DOUT for HASH Calculation. The HASH of SHA1 calculate the data that need to be digested. The phenomenon of HASH Calculation are the data outputed by DOUT. display HASH-SHA1 20 numbers using the eval board USART1 with PC HyperTerminal.

4.40.2 Directory contents

This example can be found in the ~ /Examples/HASH/HASH_SHA1 directory.

4.41 I2C_TwoBoards_Master

4.41.1 Example Description

This example shows how to control I2C devices and communicate between two different boards. To use this example, you need to load the software into two APM32F407_MINI boards (let's call them Board master and Board Slave) then connect these two boards through I2C lines and GND.

4.41.2 Directory contents

This example can be found in the ~ /Examples/I2C/I2C_TwoBoards_Master directory.

4.42 I2C_TwoBoards_Slave

4.42.1 Example Description

This example shows how to control I2C devices and communicate between two different boards. To use this example, you need to load the software into two APM32F407_MINI boards (let's call them Board master and Board Slave) then connect these two boards through I2C lines and GND.

4.42.2 Directory contents

This example can be found in the ~ /Examples/I2C/I2C_TwoBoards_Slave directory.

4.43 I2S_Interrupt

4.43.1 Example Description

This example describes how to use I2S peripheral. by making a communication between the I2S2 and the I2S3. If communication success, LED2 will turn on. "Transfer OK!" will be shown on serial assistant trough usart1. if fail， LED2 will turn off, "Transfer Fail!" will be shown on serial assistant trough usart1. LED3 blinking shows system is running.

4.43.2 Directory contents

This example can be found in the ~ /Examples/I2S/I2S_Interrupt directory.

4.44 Application1

4.44.1 Example Description

This example shows how to generate a APP firmware to IAP. LED2 are toggled with a timing defined by the Delay function.

4.44.2 Directory contents

This example can be found in the ~ /Examples/IAP/Application1 directory.

4.45 Application2

4.45.1 Example Description

This example shows how to generate a APP firmware to IAP. LED3 are toggled with a timing defined by the Delay function.

4.45.2 Directory contents

This example can be found in the ~ /Examples/IAP/Application2 directory.

4.46 BootLoader

4.46.1 Example Description

The example aim to show how to configure a bootloader firmware to IAP.

4.46.2 Directory contents

This example can be found in the ~ /Examples/IAP/BootLoader directory.

4.47 IWDT_Reset

4.47.1 Example Description

The example shows how to configure IWDT and feed dog to prevent a system reset. After IWDT initialization, if press KEY1 to start feed watchdog, System enters into a infinite loop, feed dog before the counter. reach a given timeout value to prevent system reset and keep LED2 blinking regulary. Otherwise System will reset about 4 seconds! Pressing KEY1 again to stop feed dog will trigger system reset in 4 4 seconds, when the counter reach a given timeout value. LED3 will be lighted when a system reset is triggered by IWDT. if system reset is triggered by IWDT, "IWDT Reset" will be print with USART1.

4.47.2 Directory contents

This example can be found in the ~ /Examples/IWDT/IWDT_Reset directory.

4.48 NVIC_Priority

4.48.1 Example Description

This example describes how to use NVIC priority. At startup, press KEY1(PA0) to occur enter EINT1 Interrupt, and device will enter Infinite loop mode. The device will enter higher priority EINT0 Interrupt if press KEY2. Now press KEY1 again will not enter EINT1 Interrupt. The status of device is displayed on serial assistant through USART1.

4.48.2 Directory contents

This example can be found in the ~ /Examples/NVIC/NVIC_Priority directory.

4.49 NVIC_WFI

4.49.1 Example Description

This example describes how to use WFI event to enter sleep mode and wake up using external interrupt. At startup, press KEY1(PA0) to occur Wait for Interrupt(WFI) event, and device will enter sleep mode. The device will wake up if press KEY1 again. The status of device is displayed on serial assistant through USART1.

4.49.2 Directory contents

This example can be found in the ~ /Examples/NVIC/NVIC_WFI directory.

4.50 PMU_STANDBY

4.50.1 Example Description

This example shows how to enter the system by external interrupt to STANDBY mode and wake-up from this mode either with the RESET or give PA0 a rising edge to recover.

4.50.2 Directory contents

This example can be found in the ~ /Examples/PMU/PMU_STANDBY directory.

4.51 PMU_STOP

4.51.1 Example Description

This example shows how to enter the system by external interrupt to STOP mode and wake-up from this mode either with the RESET or press KEY2 to recover.

4.51.2 Directory contents

This example can be found in the ~ /Examples/PMU/PMU_STOP directory.

4.52 PMU_BOR

4.52.1 Example Description

This example shows how to configure BOR threshold. When VDD drops below the BOR threshold, a reset occurs in the system. To modify the BOR threshold, select the voltage range using the "BOR_LEVEL_Table".When KEY1 is pressed, the BOR value will be modified.

4.52.2 Directory contents

This example can be found in the ~ /Examples/PMU/PMU_BOR directory.

4.53 PMU_Consumption

4.53.1 Example Description

This example shows how to configure system to measure different low power modes consumption. Includes the following modes:

- Sleep Mode
- Stop mode with RTC wakeup
- Standby mode with WKUP pin
- Standby mode with RTC wakeup
- Standby mode with RTC wakeup and BKPSRAM

4.53.2 Directory contents

This example can be found in the ~ /Examples/PMU/PMU_Consumption directory.

4.54 PMU_PVD

4.54.1 Example Description

This example shows how to configure PVD to detect changes in VDD power supply and generate interrupt signals.

phenomenon :

- When the VDD voltage rise exceeds 2.6V, the PVD interrupt signals will be generated. And USART1 will print "PVD detected that VDD rose above the threshold" string.

4.54.2 Directory contents

This example can be found in the ~ /Examples/PMU/PMU_PVD directory.

4.55 QSPI_QualSPI

4.55.1 Example Description

This example shows how to use QSPI to control W25Qxx into qual mode.

Read W25Qxx ID and communicate with W25Qxx. If is ok, LED3 will blink.

Otherwish, LED2 will blink.

4.55.2 Directory contents

This example can be found in the ~ /Examples/QSPI/ QSPI_QualSPI directory.

4.56 RCM_ClockConfig

4.56.1 Example Description

This example shows how to: Configure the PLL1 (clocked by HSE) as System clock source Output the System clock(33.6MHz) on MCO pin(PA8).

4.56.2 Directory contents

This example can be found in the ~ /Examples/RCM/RCM_ClockConfig directory.

4.57 RNG_MultiRNG

4.57.1 Example Description

This example shows how to use the RNG peripheral to generate Random 32bit numbers. For this example, random 32bit numbers will display on serial assistant through USART1.

4.57.2 Directory contents

This example can be found in the ~ /Examples/RNG/RNG_MultiRNG directory.

4.58 RTC_Alarm

4.58.1 Example Description

This example shows how to configure RTC and ALARM.

phenomenon:

- After initialization, Alarm begin to count down with LED2 is on. Five second later, Alarm is waking up and LED2 is off.

- You can monitor the system state on serial assistant through USART1.

4.58.2 Directory contents

This example can be found in the ~ /Examples/RTC/RTC_Alarm directory.

4.59 FreeRTOS

4.59.1 Example Description

This example describes show how to how to use FreeRTOS create multiple tasks.

4.59.2 Directory contents

This example can be found in the ~ /Examples/RTOS/FreeRTOS directory.

4.60 RT-thread

4.60.1 Example Description

This example describes how to use RT-Thread for APM32F4xx. The IO of LED2 and LED3 is configured to toggle constantly. The phenomenon of LED2 and LED3 constantly flickered alternately..

4.60.2 Directory contents

This example can be found in the ~ /Examples/RTOS/RT-thread directory.

4.61 SDIO_SDCard

4.61.1 Example Description

The program aims to show how to DMA or polling mode to write and read SD card data by SDIO, in this case, The data can write to SD card or read data from SD card by SDIO. Verification will occur after transmission,

The SD card sector data can be displayed using serial assistant. After power on, can switch between single block test or multi block test by KEY1 and KEY2.

KEY1 ----> single block test

KEY2 ----> multi block test

4.61.2 Directory contents

This example can be found in the ~ /Examples/SDIO/SDIO_SDCard directory.

4.62 SPI_FullDuplex

4.62.1 Example Description

This example shows how to use SPI Peripheral to transfer data. Press KEY1 to send data from SPI1 to SPI2, if communication success, LED2 will turn on. The data will be shown on serial assistant trough usart1. Press KEY2 to use SPI1 to SPI2 to Realize full-duplex transmission. If communication success, LED3 will turn on. The data will be shown on serial assistant trough usart1.

4.62.2 Directory contents

This example can be found in the ~ /Examples/SPI/SPI_FullDuplex directory.

4.63 SysTick_TimeBase

4.63.1 Example Description

This example describes how to use Systick_Delay for toggling IO. The IO of LED2 and LED3 is configed to toggle constantly every 1000 milliseconds. The phenomenon of LED2 and LED3 constantly flickered alternately. Delay time is printed with USART1.

4.63.2 Directory contents

This example can be found in the ~ /Examples/SysTick/SysTick_TimeBase directory.

4.64 Template

4.64.1 Example Description

This demo is based on the APM32F407 MIN board. it provides a template project.

4.64.2 Directory contents

This example can be found in the ~ /Examples/Template/Template directory.

4.65 TMR_32BitCount

4.65.1 Example Description

This example describes how to configure the TMR3 and TMR4 realize the 32-bit timer. TMR3 as High 16 bit count value,TMR4 as Low 16 bit count value. User can view the counter value through serial termainal.

4.65.2 Directory contents

This example can be found in the ~ /Examples/TMR/TMR_32BitCount directory.

4.66 TMR_6Steps

4.66.1 Example Description

The program to show how to configure the TMR1 peripheral to generate 6 Steps. In this example, a software COM event is generated each 100ms.

4.66.2 Directory contents

This example can be found in the ~ /Examples/TMR/TMR_6Steps directory.

4.67 TMR_CascadeSynchro

4.67.1 Example Description

This example shows how to synchronize TMR peripherals in cascade mode.

4.67.2 Directory contents

This example can be found in the ~ /Examples/TMR/TMR_CascadeSynchro directory.

4.68 TMR_EncoderInterface

4.68.1 Example Description

This example describes how to configure the TMR1 peripheral to Encoder mode.

4.68.2 Directory contents

This example can be found in the ~ /Examples/TMR/TMR_EncoderInterface directory.

4.69 TMR_ExtTriggerSynchro

4.69.1 Example Description

This example shows how to synchronize TMR1 and TMR peripherals in cascade mode with an external trigger.

4.69.2 Directory contents

This example can be found in the ~ /Examples/TMR/TMR_ExtTriggerSynchro directory.

4.70 TMR_InputCapture

4.70.1 Example Description

This example describes how to use TMR5 Channel_2 (PA1) measure frequency of external signal. User can view the "Frequency "value through serial termainal.

4.70.2 Directory contents

This example can be found in the ~ /Examples/TMR/TMR_InputCapture directory.

4.71 TMR_OCActive

4.71.1 Example Description

The program to show how to configure the TMR2 peripheral to generate 4 different signals with four different delays.

4.71.2 Directory contents

This example can be found in the ~ /Examples/TMR/TMR_OCActive directory.

4.72 TMR_OCInactive

4.72.1 Example Description

The program to show how to configure the TMR3 peripheral in Output Compare Inactive mode.

4.72.2 Directory contents

This example can be found in the ~ /Examples/TMR/TMR_OCInactive directory.

4.73 TMR_OCToggle

4.73.1 Example Description

The program to show how to configure the TMR4 peripheral to generate 4 waveform with 4 different frequencies (2.5KHz, 5KHz, 25KHz and 50KHz).

4.73.2 Directory contents

This example can be found in the ~ /Examples/TMR/TMR_OCToggle directory.

4.74 TMR_ParallelSynchro

4.74.1 Example Description

This example shows how to synchronize TMR peripherals in parallel mode.

4.74.2 Directory contents

This example can be found in the ~ /Examples/TMR/TMR_ParallelSynchro directory.

4.75 TMR_PWMInput

4.75.1 Example Description

This example describes how to use TMR5 Channel_2 (PA1) measure frequency and duty cycle of external signal. User can view the "DutyCycle" "Frequency "value through serial termainal.

4.75.2 Directory contents

This example can be found in the ~ /Examples/TMR/TMR_PWMInput directory.

4.76 TMR_PWMOutput

4.76.1 Example Description

This example shows how to configure the TMR1 peripheral to generate PWM signals with different duty cycles. The TMR1 waveform can be displayed using an oscilloscope. using TMR1 CHANNEL1(PA8 and PA7) to output PWM.

4.76.2 Directory contents

This example can be found in the ~ /Examples/TMR/TMR_PWMOutput directory.

4.77 TMR_SinglePulse

4.77.1 Example Description

This example shows how to configure TMR peripherals to generate a Single Pulse

with an external trigger.

4.77.2 Directory contents

This example can be found in the ~ /Examples/TMR/TMR_SinglePulse directory.

4.78 TMR_TimeBase

4.78.1 Example Description

This example describes how to use TMR1 for toggling IO. The IO of LED2 is configed to toggle constantly every one second. The phenomenon of LED2 constantly flickered alternately.

4.78.2 Directory contents

This example can be found in the ~ /Examples/TMR/TMR_TimeBase directory.

4.79 TMR_TMR11PWMOutput

4.79.1 Example Description

The program to show how to configure the TMR11 peripheral in PWM mode.

4.79.2 Directory contents

This example can be found in the ~ /Examples/TMR/TMR_TMR11PWMOutput directory.

4.80 TMR_TMR1DMABurst

4.80.1 Example Description

The program to show how to configure the TMR1 channel period and the duty cycle by DMA burst to generate 7 PWM with 7 different duty cycles (80%, 70%, 60%, 50%, 40%, 30% and 20%).

4.80.2 Directory contents

This example can be found in the ~ /Examples/TMR/TMR_TMR1DMABurst directory.

4.81 TMR_TMR1PWMOutput

4.81.1 Example Description

The program to show how to configure the TMR1 peripheral to generate 7 PWM with 7 different duty cycles (80%, 70%, 60%, 50%, 40%, 30% and 20%).

4.81.2 Directory contents

This example can be found in the ~ /Examples/TMR/TMR_TMR1PWMOutput directory.

4.82 TMR_TMR1Synchro

4.82.1 Example Description

This example shows how to synchronize TMR1 and TMR peripherals in parallel mode.

4.82.2 Directory contents

This example can be found in the ~ /Examples/TMR/TMR_TMR1Synchro directory.

4.83 TMR_TMR2PWMOutput

4.83.1 Example Description

The program to show how to configure the TMR2 peripheral to generate 4 PWM with 4 different duty cycles (80%, 70%, 60%, and 50%).

4.83.2 Directory contents

This example can be found in the ~ /Examples/TMR/TMR_TMR2PWMOutput directory.

4.84 TMR_TMR8DMA

4.84.1 Example Description

The program to show how to use DMA to transfer Data from memory to TMR8 Capture Compare Register1 to change the Duty Cycle.

4.84.2 Directory contents

This example can be found in the ~ /Examples/TMR/TMR_TMR8DMA directory.

4.85 TMR_TMR9OCToggle

4.85.1 Example Description

The program to show how to configure the TMR9 peripheral to generate 2 waveform with 2 different frequencies (5KHz and 50KHz).

4.85.2 Directory contents

This example can be found in the ~ /Examples/TMR/TMR_TMR9OCToggle directory.

4.86 USART_Interrupt

4.86.1 Example Description

The program aims to show how to use interrupt to send or received data by using USART, in this case, USART1 and USART2 send or received data to each other. Verification will occur after transmission, if Data transmission pass from USART1 to USART2, LED2 will be on. If data transmission pass from USART2 to USART1, LED3 will be on.

The phenomenon of data interaction process can be displayed using serial assistant.

4.86.2 Directory contents

This example can be found in the ~ /Examples/USART/USART_Interrupt directory.

4.87 USART_Polling

4.87.1 Example Description

The program aims to show how to how to use polling to send or received data by using USART, in this case, USART1 and USART2 send or received data to each other. Verification will occur after transmission, if Data transmission pass from USART1 to USART2, LED2 will be on. If data transmission pass from USART2 to USART1, LED3 will be on.

The phenomenon of data interaction process can be displayed using serial assistant.

4.87.2 Directory contents

This example can be found in the ~ /Examples/USART/USART_Polling directory.

4.88 USART_IrDA

4.88.1 Example Description

The program shows how to using USART IrDA mode, in this case, USART1 sends data to upper computer. You can check the data in a Serial Port Utility.

4.88.2 Directory contents

This example can be found in the ~ /Examples/USART/USART_IrDA directory.

4.89 USART_SmartCard

4.89.1 Example Description

The program shows how to using USART Smartcard mode, in this case, USART1 sends data to upper computer. You can check the data in a Serial Port Utility.

4.89.2 Directory contents

This example can be found in the ~ /Examples/USART/USART_SmartCard directory.

4.90 USART_TwoBoardsDMA

4.90.1 Example Description

The program aims to show how to use KEY1 button to trigger USART communication using DMA, in this case, you need to load program on two APM32F407_MINI boards. Then connect these two boards through USART lines and GND. If USART RX Board receives the correct data from USART TX Board, USART RX Board LED2 will turn on.

4.90.2 Directory contents

This example can be found in the ~ /Examples/USART/USART_TwoBoardsDMA directory.

4.91 USART_TwoBoardsInterrupt

4.91.1 Example Description

The program aims to show how to use KEY1 button to trigger USART communication using interrupts, in this case, you need to load program on two APM32F407_MINI boards. Then connect these two boards through USART lines and GND. If USART RX Board receives the correct data from USART TX Board, USART RX Board LED2 will turn on.

4.91.2 Directory contents

This example can be found in the ~ /Examples/USART/USART_TwoBoardsInterrupt directory.

4.92 OTGD_CDC

4.92.1 Example Description

This example describes how to use OTG to simulate a CDC device. When CDC device receive data will send back the same data to USB host.

4.92.2 Directory contents

This example can be found in the ~ /Examples\USB_OTG\Device_Examples\OTGD_CDC directory.

4.93 OTGD_CDC_HS2

4.93.1 Example Description

This example describes how to use OTG HS2 to simulate a CDC device. When CDC device receive data will send back the same data to USB host.

4.93.2 Directory contents

This example can be found in the ~ /Examples\USB_OTG\Device_Examples\OTGD_CDC_HS2 directory.

4.94 OTGD_Custom_HID

4.94.1 Example Description

This example describes how to use OTG to simulate a custom hid.

This is a template example.

User can customize HID reports to implement the desired functionality.

4.94.2 Directory contents

This example can be found in the ~ /Examples\USB_OTG\Device_Examples\ OTGD_Custom_HID directory.

4.95 OTGD_Custom_HID_HS2

4.95.1 Example Description

This example describes how to use OTG HS2 to simulate a custom hid.

This is a template example.

User can customize HID reports to implement the desired functionality.

4.95.2 Directory contents

This example can be found in the ~ /Examples\USB_OTG\Device_Examples\ OTGD_Custom_HID_HS2 directory.

4.96 OTGD_Custom_HID_Keyboard

4.96.1 Example Description

This example describes how to use OTG to simulate a custom HID keyboard.

Press KEY1 will send the report descriptor of a - z or Enter to the USB host.

The state of Capslock and numlock determine whether LED2 and LED3 are on or off.

4.96.2 Directory contents

This example can be found in the ~ /Examples\USB_OTG\Device_Examples\OTGD_Custom_HID_Keyboard directory.

4.97 OTGD_Custom_HID_Keyboard_HS2

4.97.1 Example Description

This example describes how to use OTG HS2 to simulate a custom HID keyboard.

Press KEY1 will send the report descriptor of a - z or Enter to the USB host.

The state of Capslock and numlock determine whether LED2 and LED3 are on or off.

4.97.2 Directory contents

This example can be found in the ~ /Examples\USB_OTG\Device_Examples\OTGD_Custom_HID_Keyboard_HS2 directory.

4.98 OTGD_HID

4.98.1 Example Description

This example describes how to use OTG to simulate a HID mouse.

Press KEY1 will move the cursor to the left.

Press KEY2 will move the cursor to the right.

4.98.2 Directory contents

This example can be found in the ~ /Examples\USB_OTG\Device_Examples\OTGD_HID directory.

4.99 OTGD_HID_HS2

4.99.1 Example Description

This example describes how to use OTG HS2 to simulate a HID mouse.

Press KEY1 will move the cursor to the left.

Press KEY2 will move the cursor to the right.

4.99.2 Directory contents

This example can be found in the ~ /Examples\USB_OTG\Device_Examples\OTGD_HID_HS2 directory.

4.100 OTGD_HID_Keyboard

4.100.1 Example Description

This example describes how to use OTG to simulate a HID keyboard.

Press KEY1 will send the report descriptor of a - z or Enter to the USB host.

4.100.2 Directory contents

This example can be found in the ~ /Examples\USB_OTG\Device_Examples\OTGD_HID_Keyboard directory.

4.101 OTGD_MSC

4.101.1 Example Description

This example describes how to use sram array to simulate a fake U disk.

4.101.2 Directory contents

This example can be found in the ~ /Examples\USB_OTG\Device_Examples\OTGD_MSC directory.

4.102 OTGD_MSC_HS2

4.102.1 Example Description

This example describes how to use sram array and OTG HS2 to simulate a fake U disk.

4.102.2 Directory contents

This example can be found in the ~ /Examples\USB_OTG\Device_Examples\OTGD_MSC_HS2 directory.

4.103 OTGD_WINUSB

4.103.1 Example Description

This example describes how to use OTG to simulate a WINUSB device.

Program will send hello + num string to USB host. And when WINUSB device receive data will send back the same data to USB host.

4.103.2 Directory contents

This example can be found in the ~ /Examples\USB_OTG\Device_Examples\OTGD_WINUSB directory.

4.104 OTGH_CDC

4.104.1 Example Description

This example describes how to use the usb host to enum a CDC device.

And use UART to print CDC device operation information.

4.104.2 Directory contents

This example can be found in the ~ /Examples\USB_OTG\Device_Examples\OTGH_CDC_ directory.

4.105 OTGH_CDC_HS2

4.105.1 Example Description

This example describes how to use the OTG HS2 host to enum a CDC device.

And use UART to print CDC device operation information.

4.105.2 Directory contents

This example can be found in the ~ /Examples\USB_OTG\Device_Examples\OTGH_CDC_HS2_ directory.

4.106 OTGH_HID

4.106.1 Example Description

This example describes how to use the usb host to enum a HID device(mouse or keyboard).

And use UART to print mouse or keyboard operation information.

4.106.2 Directory contents

This example can be found in the ~ /Examples\USB_OTG\Device_Examples\OTGH_HID_ directory.

4.107 OTGH_HID_HS2

4.107.1 Example Description

This example describes how to use the OTG HS2 host to enum a HID device(mouse or keyboard).

And use UART to print mouse or keyboard operation information.

4.107.2 Directory contents

This example can be found in the ~ /Examples\USB_OTG\Device_Examples\OTGH_HID_HS2_ directory.

4.108 OTGH_MSC

4.108.1 Example Description

T This example describes how to use the usb host to enum a U disk.

And use FATFS to write and read file to U disk.Press KEY1 to write file to U disk and press KEY2 to read file from U disk.

4.108.2 Directory contents

This example can be found in the ~ /Examples\USB_OTG\Device_Examples\OTGH_MSC_ directory.

4.109 OTGH_MSC_HS2

4.109.1 Example Description

This example describes how to use the usb host HS2 to enum a U disk.

And use FATFS to write and read file to U disk.Press KEY1 to write file to U disk and

press KEY2 to read file from U disk.

4.109.2 Directory contents

This example can be found in the ~ /Examples\USB_OTG\Device_Examples\OTGH_MSC_HS2_ directory.

4.110 WWDT_OverTime

4.110.1 Example Description

This example aims to show how to use WWDT. At start, is OverTime = 0, System would not reset for feeding dog timely. LED2 Toggle. if press KEY1, then is OverTime = 1, System will reset. LED3 ON.

4.110.2 Directory contents

This example can be found in the ~ /Examples/WWDT/WWDT_OverTime directory.

5 About libraries

The libraries folder includes a series library. It can provide supports for APM32F4xx MCU such as device support and standard peripheral and USB OTG etc. The libraries can be found in the ~/Libraries directory.

APM32F4xx MCU include following library:

- Libraries folder
  - APM32F4xx_ETH_Driver
  - APM32F4xx_StdPeriphDriver
  - CMSIS
  - Device

6 About middlewares

The middlewares folder includes a series third-party middleware. The middlewares can be found in the ~/middlewares directory.

The middlewares used by APM32F4xx MINI or APM32F4xx TINY include following:

- Middlewares folder
  - APM32_USB_Library
  - fat_fs
  - FreeRTOS
  - lwip-1.4.1
  - RealThread

7 About Package

The Package folder includes Geehy APM32F4xx DFP Package. The Package can be found in the ~/Package directory.

The middlewares used by APM32F4xx MINI or APM32F4xx TINY include following:

- Package folder
  - SVD
  - Geehy.APM32F4xx_DFP.1.0.4.pack

8 Revision History

Table 1 File Revision History

Date	Rev	Description
2021.09.25	1.0	First Release version of APM32F4xx SDK
2022.02.20	1.1	Add descriptions of SDIO and DCI examples
2022.06.23	1.2	Add descriptions of DSP, IAP, TMR and ADC examples
2023.03.01	1.3	Add descriptions of PMU, USART and USB_OTG examples
2023.07.31	1.4	Add descriptions of COMP,QSPI and Custom HID examples

Statement

This document is formulated and published by Geehy Semiconductor Co., Ltd. (hereinafter referred to as “Geehy”). The contents in this document are protected by laws and regulations of trademark, copyright and software copyright. Geehy reserves the right to make corrections and modifications to this document at any time. Please read this document carefully before using Geehy products. Once you use the Geehy product, it means that you (hereinafter referred to as the “users”) have known and accepted all the contents of this document. Users shall use the Geehy product in accordance with relevant laws and regulations and the requirements of this document.

1. Ownership

This document can only be used in connection with the corresponding chip products or software products provided by Geehy. Without the prior permission of Geehy, no unit or individual may copy, transcribe, modify, edit or disseminate all or part of the contents of this document for any reason or in any form.

The “极海” or “Geehy” words or graphics with “®” or “TM” in this document are trademarks of Geehy. Other product or service names displayed on Geehy products are the property of their respective owners.

2. No Intellectual Property License

Geehy owns all rights, ownership and intellectual property rights involved in this document.

Geehy shall not be deemed to grant the license or right of any intellectual property to users explicitly or implicitly due to the sale or distribution of Geehy products or this document.

If any third party’s products, services or intellectual property are involved in this document, it shall not be deemed that Geehy authorizes users to use the aforesaid third party’s products, services or intellectual property, unless otherwise agreed in sales order or sales contract.

3. Version Update

Users can obtain the latest document of the corresponding models when ordering Geehy products.

If the contents in this document are inconsistent with Geehy products, the agreement in thesales order or the sales contract shall prevail.

4. Information Reliability

The relevant data in this document are obtained from batch test by Geehy Laboratory or cooperative third-party testing organization. However, clerical errors in correction or errors caused by differences in testing environment may occur inevitably. Therefore, users should understand that Geehy does not bear any responsibility for such errors that may occur in this document. The relevant data in this document are only used to guide users as performance parameter reference and do not constitute Geehy's guarantee for any product performance.

Users shall select appropriate Geehy products according to their own needs, and effectively verify and test the applicability of Geehy products to confirm that Geehy products meet their own needs, corresponding standards, safety or other reliability requirements. If loses are caused to users due to the user's failure to fully verify and test Geehy products, Geehy will not bear any responsibility.

5. Legality

USERS SHALL ABIDE BY ALL APPLICABLE LOCAL LAWS AND REGULATIONS WHEN USING THIS DOCUMENT AND THE MATCHING GEEHY PRODUCTS. USERS SHALL UNDERSTAND THAT THE PRODUCTS MAY BE RESTRICTED BY THE EXPORT, RE-EXPORT OR OTHER LAWS OF THE COUNTIRIES OF THE PRODUCTS SUPPLIERS, GEEHY, GEEHY DISTRIBUTORS AND USERS. USERS (ON BEHALF OR ITSELF, SUBSIDIARIES AND AFFILIATED ENTERPRISES) SHALL AGREE AND PROMISE TO ABIDE BY ALL APPLICABLE LAWS AND REGULATIONS ON THE EXPORT AND RE-EXPORT OF GEEHY PRODUCTS AND/OR TECHNOLOGIES AND DIRECT PRODUCTS.

6. Disclaimer of Warranty

THIS DOCUMENT IS PROVIDED BY GEEHY "AS IS" AND THERE IS NO WARRANTY OF ANY KIND, EITHER EXPRESSED OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, THE WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE, TO THE EXTENT PERMITTED BY APPLICABLE LAW.

GEEHY WILL BEAR NO RESPONSIBILITY FOR ANY DISPUTES ARISING FROM THE SUBSEQUENT DESIGN OR USE BY USERS.

7. Limitation of Liability

IN NO EVENT UNLESS REQUIRED BY APPLICABLE LAW OR AGREED TO IN WRITING WILL GEEHY OR ANY OTHER PARTY WHO PROVIDE THE DOCUMENT "AS IS", BE LIABLE FOR DAMAGES, INCLUDING ANY GENERAL, SPECIAL, DIRECT, INCIDENTAL OR CONSEQUENTIAL DAMAGES ARISING OUT OF THE USE OR INABILITY TO USE THE DOCUMENT (INCLUDING BUT NOT LIMITED TO LOSS OF DATA OR DATA BEING RENDERED INACCURATE OR LOSSES SUSTAINED BY USERS OR THIRD PARTIES).

8. Scope of Application

The information in this document replaces the information provided in all previous versions of the document.

Geehy Semiconductor Co.,Ltd.
Bldg.1, No.83 Guangwan Street, Zhuhai, Guangdong, China +86 0756 6299999 www.geehy.com