Release Notes for

AT32F435_437 Firmware Library

V2.2.5-2026/06/02

1. CMSIS
   - system_at32f435_437.c
     - Updated the process of the System_init() to avoid potential clock failure during switching
2. Middlewares
   - USB
     - Updated the msc class by adding a step to handle the test_unit() and start_stop() to enhance compatibility
3. Drivers
   - PWC
     - __force_stores() is replaced with the __ISB() and __DSB() to adapt to different compilers
   - CRM
     - Updated the processes of the crm_reset(), crm_hick_sclk_frequency_select() and crm_hick_divider_select() to avoid potential clock failure during switching
   - EXINT
     - Added a new EXINT_TRIGGER_NONE_EDGE to adapt to software trigger without edge configuration requirement
4. Updated some notes

V2.2.4-2026/04/08

5. CMSIS
   - at32f435_437.h
     - Added AT32F435VCH7, AT32F435VDH7, AT32F435VGH7 and AT32F435VMH7 new part numbers
     - Added AT32F437VCH7, AT32F437VDH7, AT32F437VGH7 and AT32F437VMH7 new part numbers
   - system_at32m412_416.h
     - Added “SystemCoreClock” macro definition to prevent error occurring when called by third-party library
6. Middlewares
   - USB
     - Updated “usbh_enum_handler()” in host mode to enhance compatibility: during host enumeration period, a delay of 10ms is inserted following the “SET_ADDRESS” operation to ensure that the device address is taken into account before starting subsequent operation and configuration.
     - Updated “msc class” to avoid compiling warning error that occurred when the “msc class” mode is not enabled in the uhost_process_handler() functipon.
   - I2C
     - Corrected macro definition typing error: I2C_MEM_ADDR_WIDIH_8 is changed to I2C_MEM_ADDR_WIDTH_8, and I2C_MEM_ADDR_WIDIH_16 to I2C_MEM_ADDR_WIDTH_16

7. Demos
   - SUFER_BOARD
     - Fixed the potential memory leakage problem as a result of APE format decoding
   - Utilities
     - Updated “usb_iap_demo”: change the APP_ADDRESS in the app_led4_toggle from 0x08005000 to 0x08006000
   - EMAC
     - Updated “http_server demo”: change the html_temp size from 4096 to 8192
   - I2C
     - Updated macro definition typing errors in I2C demo: I2C_MEM_ADDR_WIDIH_8 is changed to I2C_MEM_ADDR_WIDTH_8, and I2C_MEM_ADDR_WIDIH_16 to I2C_MEM_ADDR_WIDIH_16

V2.2.3-2025/11/24

8. CMSIS
   - at32f435_437.h
     - Added new product numbers: AT32F435RGT7-7 and AT32F435RMT7-7
9. Drivers
   - ADC
     - Added the new function “adc_combine_mode_set()” to configure combined master/slave mode
   - CRM
     - Changed the bit name adc14rst to tmr14rst, added new bit name “adc2en”
   - GPIO
     - Added the new function “gpio_bits_toggle()”
   - QSPI
     - Changed the width of the xip_cmd_w2_bit.xipr_dcnt to 6 bits
   - TMR
     - Updated these functions: tmr_pwm_input_config(), tmr_encoder_mode_config() and tmr_output_channel_config()
       Note that the channel must be disabled before configuring channel mode, otherwise the channel mode fails to switch
10. Middlewares
    - USB
      - Updated “keyboard class” by adding a new member “send_state” in the keyboard_type structure to record transmit status. At the same time, updated the function “usb_keyboard_class_send_report” to deal with flow control issue during transmission operation so as to avoid data error
      - Updated “audio class” by changing the “audio sampling frequency” request configuration to handle compatibility issue the host may encounter
    - EMAC
      - Updated DNS server default IP address to 114.114.114.114
11. Demos
    - ADC
      - Updated ADC initialization process in all demos to prevent errors occurring under extreme circumstances
      - Updated DMA-related demos to enable circular DMA mode in the configuration pro cedure so as to achieve circular trigger
      - Remove the software_trigger_repeat demo
    - CRM
      - Updated the clock configuration process in the sysclk_switch demo to set correspo nding LDO based on the main frequency
    - DVP
      - Updated the clock configuration process in DVP demo to remove unused codes
    - USB
      - Updated the clock configuration process in all usb_device demos to prevent USB clock division error as a result of AHB frequency division

- Adjusted the latency method to achieve stabilization after wakeup via a keyboard
- Adjusted the latency method to achieve stabilization after wakeup via a mouse
- Updated the USB_FLASH_ADDR_OFFSET parameter in msc macro from 0x08005000 to 0x08008000 so as to solve problems arising from compiling range overflow in different environments
- Updated Jump APP function in the virtual_msc_iap demo by adding compilation non-optimization settings to avoid jump failure due to optimization issue

- SRAM
  - Removed SRAM demo. Use ICP tool to adjust SRAM size
- Utilities
  - Updated the qspi_algorithm_demo by removing unnecessary configuration steps and solving null pointer operation error in the code
- templates
  - Updated the “include” path in the eclipse_gcc to avoid error in the parameters of the workspace_project_location during multiple project import
- Board
  - Updated the description of some parameter variables in the board.c to solve the compiling warning sent from a new version of compiler
- Cortex-m4
  - Updated the latency judgement description in the systick_interrupt from “greater than” to “greater than or equal to” to avoid that it takes 1ms more to toggle IO than it should do
- AT32IDE and Eclipse project
  - Removed the “release” items from the project configuration, only reserved “debug” items
- IAP
  - Updated all IAP_Programmer.exe
- Keil
  - Updated IROM size parameters in some Keil projects

12. Updated some notes

V2.2.2-2025/01/20

13. Middlewares
    - USB
      - Updated “usbh_hch_in_handler()” function in host mode, and channels are disabled during interrupt transfer and synchronous transfer when NAK occurs.
14. Demos
    - IAP
      - Updated IAP_Programmer.exe.
    - USB_DEVICE
      - Updated USB low-power wakeup configuration and process to enhance system stability when entering/existing low-power mode.
    - SPI
      - Updated the structure and framework of all SPI demo codes, removed “usb_jtagpin_hardwarecs_dma” demo and added “fullduplex_dma” demo.
    - SURF_BOARD
      - Added video demo in at_surf_f437 to demonstrate video decoding.

15. Updated some notes.

V2.2.1-2024/12/13

1. CMSIS
   - DSP
     - Updated DSP source code library.
     - Updated “system_core_clock_update()” function in *system_at32f435_437.c*, and fixed the error caused by calculation value overflow.
2. Drivers
   - PWC
     - Updated LDO output level settings, and removed LDO configuration option “PWC_LDO_OUTPUT_1V0”.
   - CAN
     - Updated “can_transmit_cancel()” function writing to avoid cross-mailbox interference due to misoperation.
   - USB
     - Updated “usb_hch_halt()” function in host mode and improved channel halt processing flow.
     - Updated “usb_hc_enable()” function in host mode to ensure that its original state is cleared when enabling the corresponding channel.
     - Updated “usb_host_disable()” function in host mode, and updated process of disabling channels to avoid inadvertently opening the remaining channels.
     - Updated “usb_ept_open()” function in device mode, and added synchronous transfer handling (frame number ignored).
     - Updated “usb_ept_close()” function in device mode, and improved endpoint closing process.
3. Middlewares
   - USB
     - Updated “usbd_reset_handler()” function, and changed endpoint status to NAK on USB RESET.
     - Added “usbd_ept_in_check_fifo()” function to check the current endpoint status and FIFO when transmitting data through USB.
     - Updated *mouse_class.c* and *custom_hid_class.c*, and added the process of checking whether the previous packet has been transferred completely when sending hid/mouse data.
     - Updated “usbd_set_configuration()” function in device mode, and modified the USB set configuration judgement logic.
4. Demos
   - I2C
     - Added memory_write demo.
     - Updated eeprom, and added multi-page write logic.
   - PWC
     - Updated the delay mechanism after waking up from Deepsleep mode in all PWC related demos to ensure stability
   - FLASH

- Removed “fap_enable” demo to avoid system malfunctions caused by unexpected events in harsh electronic environments.

- TMR
  - Fixed the problem of no output in “oc_toggle_tmr9” and “pwm_output_tmr10” (the original demo ignored enabling “tmr_output_enable()” function).
- EMAC
  - Updated code structure and wakeup initialization process in “wake_on_lan” demo.
- SDIO
  - Updated at32_sdio.c protocol driver layer, and added “sd_emmc_card” demo.
- QSPI
  - Updated QSPI interface configuration process (disabled cache) in “xip_port_read_write_sram” demo.
- BOARD
  - Updated QSPI interface configuration process (disabled cache) in “at_surf_f437_board_qspi_sram.c”.
- USB
  - Revised SOF pin definitions in “virtual_comport” demo.
- SURF_BOARD
  - Added demo picture in at_surf_f437 to demonstrate picture decoding.
- Utilities
  - Added support for AT32IDE project in SLIB demo.
  - Updated bootloader jump address variables in “usb_iap” demo, and changed local variables to global variables to ensure that the jump address is not affected as much as possible.

5. Updated some notes.

V2.2.0-2024/08/08

1. Drivers
   - QSPI
     - Updated “qspi_flag_clear()” function writing, and fixed AC6 compilation problems.
2. Demos
   - I2C
     - Modified “GPIO_PULL_UP” to “GPIO_PULL_NONE” in I^2C GPIO initialization to enhance the adaptability of external circuits.
     - Modified DMA channel configuration sequence in “communication_dma” to prevent illegal pointer access.
   - USB
     - Modified write handling of *flash_fat16.c* in “virtual_msc_iap” to enhance compatibility.
   - QSPI
     - Updated QSPI interface initialization and writing in all QSPI demos.
3. Updated some notes.

V2.1.9-2024/04/30

1. CMSIS
   - device_support
     - Added link files in GCC and IAR environment for AT32F435xD and AT32F437xD.

2. Drivers
   - QSPI
     - Revised FIFO depth definition from “QSPI_DMA_FIFO_THOD_WORD32” to “QSPI_DMA_FIFO_THOD_WORD24”.
3. Middlewares
   - USB
     - Replaced keyword “__weak” with “__WEAK” to improve cross-platform compatibility.
4. Demos
   - Cortex-m4
     - Modified code initialization sequence and fixed AC5 compilation problems.
   - SDIO
     - Adjusted SDIO bus clock frequency in demo project: increased to 12 MHz for SD_CARD V1.1 and V2.0 and to 25 MHz for others.
   - XMC
     - Added LCD id read operation in XMC initialization process in lcd_8bit.
   - Utilities
     - Adjusted non-optimization option “__attribute__” in “usart_iap_demo” and “usb_iap_demo” to comply with AC6 compiler.

V2.1.8-2024/04/08

1. Drivers
   - QSPI
     - Added “qspi_auto_ispc_enable()” function for bus input clock phase matching.
2. Middlewares
   - USB
     - Revised STALL state assignment method in “usbh_hch_out_handler()” function.
3. Demos
   - QSPI
     - Updated all demos, and added “qspi_auto_ispc_enable()” function to call in initialization process.
4. Updated some notes.

V2.1.7-2024/03/01

1. Demos
   - QSPI
     - Added run_in_qspi_flash demo.
     - Updated all *qspi_cmd_esmt32m.c* files, and removed unused “user_func_check_timeout()” function.
   - EMAC
     - Updated the method to call “sys_check_timeouts()” function in all EMAC demos.
   - Utilities
     - Updated LDO output configuration in qspi_algorithm demo, and presented the QSPI peripheral used in the algorithm in the form of macro definition for convenient interface switching.

V2.1.6-2024/01/26

1. Middlewares

- USB
  - Updated the type of “usbd_core_type” structure members to ensure 4-byte-alignment of “default_config” and “dev_config” addresses.
  - Updated “custom hid report” and “audio hid report” descriptors.

2. Demos
   - Board
     - Updated *at_surf_f437_board_usart.c* file, and improved the printf redirecting output function “__write” in GCC environment.
3. Updated some notes.

V2.1.5-2024/01/05

1. Updated timer input_capture demo counting method.
2. Fixed HID low-speed identification problems in USB demo HID.
3. Updated systick initialization function in systick interrupt demo.
4. Added winusb demo.
5. Added ADC loop_transfer demo.
6. Updated the method to call “xx_interrupt_flag_get()” function in all demos.

V2.1.4-2023/10/26

1. Updated QSPI demo.
2. Updated QSPI download algorithm demo.
3. Updated some notes and readme.

V2.1.3-2023/08/04

1. Added AT32IDE project to demos under utilities.
2. Added CRC polynomial support.
3. Added AT32F435/437 Flash size 448 KB.
4. Updated USB driver and demo, improved data alignment and code process.
5. Improved redirecting compatibility while using printf in IAR9.
6. Added macro definitions regarding Flash size and Flash demo.
7. Updated some notes.

V2.1.2-2023/02/16

1. Improved AC6 compiling in freertos demo under utilities.
2. Improved EMAC demo, updated cc.h file to solve AC6 compiling issue (alignment error), and lwip assert information can be output from a serial interface.
3. Updated lwip lower-level package interface in EMAC demo to support multiple-packet transfer.
4. Added LEXT_VALUE definition in *at32f435_437_conf.h*.
5. Added section SPIM descriptions in the *.ld file to better support SPIM address linking in GCC.
6. Adjusted the location in which the “crm_reset()” function is called in the “system_clock_config()” function, with the aim to avoid error to occur during system clock switching.
7. Adjusted the time when USB address needs to be set, and modified the process of handling USB host enumeration timeout.
8. Added XMC pc_card demo.
9. Updated the “qspi_data_write()” function process in the QSPI flash demo to resolve write data error when the incoming Flash start address is not page aligned.
10. Updated some notes.

V2.1.1-2022/11/18

1. Removed the versions and records located in file headers.
2. Added release notes drivers which are used to record drivers update, in libraries\drivers directory.
3. Fixed the problem of USB cdc_msc failed in linux.
4. Updated USB virtual msc iap demo supporting linux.
5. Updated USB audio content to provide better compatibility.
6. Updated IAR_Programmer.exe.
7. Added interrupt enable judgement to flag bits in the USART interrupt demo.
8. Added repeat_conversion_loop_transfer demo to ADC, using DMA circular mode to get ADC data.
9. Increased the upper limit of VCO clock to 1200 MHz.

V2.1.0-2022/08/16

1. Updated I^2C eeprom demo with 16-bit address support.
2. Added USB host CDC demo.
3. Added QSPI XIP mode Flash read demo.
4. Added IAR v9.3 demo (in template).
5. Fixed the problem of being unable to output printf in gcc environment.
6. Startup file supports configuration wizard graphic configuration.

V2.0.9-2022/06/28

1. Added USART RS485 demo.
2. Added IO toggle demo.
3. Added USB composite_vcp_msc demo.
4. Added EMAC mqtt client demo.
5. Added FLASH access protection enable demo.
6. Updated some demos and their drive process, and revised notes.

V2.0.8-2022/04/25

1. Changed descriptors in the USB virtual msc iap demo.
2. Added EMAC-related demo about network connection status detection, and updated local_time variable.
3. Disabled cache feature of xip mode in QSPI-related demo.
4. Updated some demos and revised notes.

V2.0.7-2022/04/02

1. Added lvgl_music_player demo to the at_surf_f437 evaluation board.
2. Introduced DSP-related source codes and added cmsis_dsp demo.
3. Updated some demos and their drive process, and revised notes.

V2.0.6-2022/03/11

1. Added wdt_standby demo.
2. Added demos related to at_surf_f437 evaluation board.

V2.0.5-2022/02/11

1. Added virtual_comport demo in USB.

2. Added dual OTG-related demo (1Host&1Device, 2Host, 2Device).
3. Improved the compatibility of USB msc iap demo across different systems.
4. Updated some demos and their drive process, and revised notes.

V2.0.4-2021/12/31

1. Revised wrong parameter definitions in the interrupt priority group.
2. Integrated the serial port initialization and redirection functions of printf into xx_board.c, and removed related contents in demo.
3. Updated some demos to support AC6 and –O3 compilation.
4. Added composite_audio_hid demo in the USB, and optimized reporting and synchronization mechanism.
5. Revised wrong definitions about speed status and duplex modes while using phy dp83848 of AT32F437 EMAC.

V2.0.3-2021/12/17

1. Revised flag clear functions of peripherals in order to avoid inappropriate bit operations.
2. Revised the 4-byte alignment problem of USB device array.
3. Updated the member name under SDRAM structure.
4. Updated the virtual space of virtual_msc_iap demo to 100 MB.
5. Revised bulk transfer complete problem of the serial port in the composite_vcp_keyboard demo.
6. Updated some contents and notes of XMC demo.
7. Updated pin initialization of DVP demo and revised instability problem.
8. Update transmit functions related to keyboard in USB demo.
9. Updated timer frequency configuration process for triggering ADC conversions in ADC demo.
10. Adjusted XMC peripheral driver structure, and updated the corresponding demo.

V2.0.2-2021/11/26

1. Updated some notes and readme.
2. Modified the sampling frequency judgement process for configuring the microphone frequency using audio codec.
3. Revised the I^2C communication interface configuration error of audio codec.
4. Revised USB audio feedback function error.
5. Revised byte alignment problem while USB writing to fifo.
6. Added a demo of mem_map of SCFG.
7. Changed the macro definition “I2Cx_SPEED” in I^2C demo to “I2Cx_CLKCTRL”.
8. Updated pwc_wakeup_pinx_enable and pin-related functions, and enable all pins to call the same interface pwc_wakeup_pin_enable.

V2.0.1-2021/11/15

1. Updated some flag_clear functions of some peripheral drivers, and revised improper operational problem when bit is w1c.
2. Added a process to judge unlock flags after unlocking USD or SLIB.
3. Modified the process of driver functions in QSPI peripheral xip/cmd.
4. Updated some ADC demos, and revised original configuration error.

5. Updated USB audio demo, and revised recording problem.
6. Updated SDRAM peripheral configuration parameters in sdram_dma demo.
7. Updated the notes and descriptions in some documents.

V2.0.0-2021/09/06

1. Initial release of AT32F435 and AT32F437 firmware library.