



# Ameba Release Note

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SDK release note

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## **1 Release v3.0**

### **1.1 v3.0a**

- First release for 8195a

### **1.2 v3.0c**

- Fix WPS and long PassPrhase issue

## **2 Release v3.1**

### **2.1 v3.1a**

- Support EVB 2V0

### **2.2 v3.1b**

- add examples: crypto, i2s, flash, nfc, pw\_deepsleep
- update flash layout document: UM0034

## **3 Release v3.2**

### **3.1 v3.2a**

- add examples: pw\_deepstandby, pw\_sleep, watchdog, timer, adc(analog\_in), uart\_irq,
- wlan: support concurrent mode. support fast reconnect.
- evb: support 8195a 3v0 evaluation board (jlink).

### **3.2 v3.2b**

- Fix SPI clock rate issue
- Update example of disabling uart log before entering deep Sleep Mode
- Update I2C block read api

### **3.3 v3.2c**

- Modify heap size from 75KB to 70KB

## 3.4 v3.2d

- Update for tool chain

# 4 Release v3.3

## 4.1 v3.3a

- Add peripheral example :
  - gtimer\_rtc,
  - spi\_stream\_twoboard: SPI DMA mode
  - uart\_clock: use uart to generate clock
- Add peripehral device examples:
  - i2c\_epl2197\_heartrate: heart rate sensor
  - i2c\_epl2590\_light: light Sensor
  - i2c\_epl2590\_proximity: proximity Sensor
  - i2c-shtc1: humidity and temperature Sensor
  - pwm-buzzer: PWM buzzer
- Add application example
  - wlan\_fast\_connect example
  - multicast example
  - mdns example
- I2S: api is modified in order to enhance performance.
- Wlan:
  - enhance AP mode throughput
  - support unassociated idle, associated idle power save
- LwIP: upgrade to LwIP 1.4.1
  - Standard library: update standard library

## 4.2 v3.3b

- Fix issue of cannot load image

## 4.3 v3.3c

- Fix WPS library
- Add simple config wizard lost library

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## 5 Release v3.4

### 5.1 v3.4a

- Power Save
  - Provide power save mode to switch system between ON and Sleep dynamically and automatically.
  - example: pm\_tickless
  - Doc: AN0045 for detail discussion
- WLAN
  - Connection Indication
    - ◆ Support indication event of a STA association to Ameba AP
    - ◆ Please check wext\_wlan\_indicate, Running as AP mode.
  - Auto Connection after disconnect
    - ◆ Add an API for developer to decide retry time and timeout if wlan is disconnected.
    - ◆ API: wifi\_config\_autoreconnect
  - Fast Connect
    - ◆ Fix AES connect fail if key length is 13
    - ◆ Fix WEP connect fail for different key id
    - ◆ Change fast-connect flash area to prevent confliction with OTA address. (this address should finally be customized by developer according to their flash layout)
  - LwIP
    - ◆ Fix LwIP issue to solve hardfault issue.
- USB Video
  - Support USB camera software stack. It is able to use VLC on Windows/Android/iPhone to get video stream from Ameba.
  - Doc: AN0050
  - **It requires special guide** to turn on this function in SDK. Please contact FAE or agent for help.
  - Only several camera modules are included in supported vendor list, please contact FAE or agent for help. Before activation, please contact agent to apply for USB camera.

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- Wi-Fi RS232, UART Adapter application
    - Support putting system in sleep mode and can be wake up by UART RX.
    - It is required to use PA\_7/PA\_6, which is different from previous SDK.
    - Doc: AN0046 and AN0045
  - WiGadget Application
    - Provide an example to setup a sensor/control application quickly.
    - Sample code for both device code and Android app are provided.
    - Sample code for both local control and remote control are provided.
    - Doc: AN0049
  - mDNS lib
    - In previous version, mDNS lib is located in SDRAM by default. For this version, developers can locate it in SRAM is required by modifying linker. Please check document in detail
    - Doc: AN0043
  - Simple Config
    - Improve successful rate
    - Both library for Ameba device and Android/iOS app are updated
    - Fix Hardfault if running wifi\_connect and simple config at the same time. (although it is not correct control flow)
    - Fix the issue of simple config fail in open mode with under certain flow.
  - Efuse
    - Add example for using efuse. There are limited efuse storage, so
    - Please be caution when you decide to test efuse function. It is suggested to make a plan at first.
    - Example : example\_sources\efuse\_user\
  - Google Nest
    - Google Nest Server changes its behavior, so modify implementation accordingly.
  - GPIO
    - GPIO and Jtag
      - ◆ Add an example to disable jtag and config it as general gpio pin
      - ◆ Example: example\_sources\gpio\_jtag

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- Boot
    - Fix flash calibration fail under some special condition
    - Change start address of image 2
  
  - Application Example
    - SSL download large file (such as firmware)
      - ◆ It is usually used in OTA procedure
      - ◆ Example: component\common\example\ssl\_download
    - Socket Select
      - ◆ Example: component\common\example\socket\_select
    - XML parser/generator
      - ◆ Example: component\common\example\xml
  
  - Crypto Engine
    - AES
      - ◆ Support AES-CBC and DES-CBC larger than 16000
  
  - OTA
    - Add checksum feature
    - When using IAR to generate ota.bin, it appends checksum information at the end of image. Program downloads ota.bin from the internet and compares checksum value at the end.
  
  - UART
    - UART socket
      - ◆ Use select function for UART send and receive
      - ◆ Example: component\common\utilities\uart\_socket.[c/h]

## 5.2 v3.4b

- Wlan
  - Provide interface to control wi-fi power save mode and adjust DTIM time slot. Please check wifi\_set\_power\_mode, wifi\_set\_lps\_dtim.
  - Provide proper api for regulatory domain setting.
  - Fix long run disconnect issue in 3.4a
  - Fast Connect
    - ◆ Fix the issue of non-initialized content of channel field in flash causes scan fail.
    - ◆ Enable auto connect after fast connect.
  - Adaptivity



- 
- ◆ Add api to enabling adaptivity.
    - Isolate wlan and wps library to be os independent
  - System power save
    - Log uart tx should be pulled up before entering sleep mode to prevent from the receiving peer misunderstanding this kind of situation as TX start.
    - Support option for do not disable log uart during system sleep.
  - GPIO
    - Fix the issue of gpio port is disabled if the gpio share same pin with corresponding peripheral and the peripheral is disabled.
    - Add gpio level trigger example to represent how to detect both high and low triggered gpio
      - ◆ example\_sources/gpio\_level\_irq
  - I2C
    - Update peripheral example to allow reading data more than 16 bytes.
  - USB camera
    - Separate USB camera stack to several libraries.
    - Support more sets of USB camera
  - OTA
    - Fix the issue of unable to do ota under the configuration of older bootloader and new ota image.
    - Update image checksum execution code for both winx86 and winx64 platform.
  - File checksum tool
    - Provide a md5 file check sum tool
    - tools\file\_check\_sum.c
  - Flash
    - Support new type of flash.
  - Application
    - UART Adapter
      - ◆ Fix compiler error.
  - Other
    - Fix hardfault caused by reusing of GPIO control related memory as heap space.
    - Fix compiler warning under IAR 7.40.
    - Do not show sdram init warning message for 8711AF
  - Document
    - UM0014: Fix some typo.
    - UM0023: Add description for how to disable CMSIS-DAP.
    - UM0034: Add instruction for how to place data in sdram.

## 5.3 v3.4b2

- Wlan
  - Patch: `lib_wlan.a`, `lib_wlan_mp.a`
  - Patch: `wifi_conf.c`, `wifi_util.[c/h]`. (only if adaptivity feature is required)
  - Compatibility issue with one AP under AES mode
  - Add API for adaptivity mode and threshold.
  - Revise channel plan to improve tx power of channel 12, 13 in WW13.(Excluding FCC power limit for channel 12, 13)
  - Add Channel plan FCC2, MKK2 and Global.
  - Fix RX packet fail if RDU happened.
  - Fix TPLINK AP disconnect issue in power save mode.

## 5.4 v3.4b3

- Wlan
  - Patch: `lib_wlan.a`, `lib_wlan_mp.a`
  - Fix memory leak when continuously connect to encrypt AP.
  - Improve stability of wlan long run under power save. RF is off under some condition.
  - Improve stability of wlan long run under power save. One Netgear AP send deauth to STA under low traffic.
  - Update PHY parameter from v19 to v21.
  - CCK FA counter in MP mode. (wlan mp lib)
  - Fix ping loss in concurrent mode because PHY ODM excute twice in 2 seconds.
  - Add channel plan "Global"
- FreeRTOS
  - Patch: `osdep_service.h` [MUST]
  - Should open `USE_MUTEX_FOR_SPINLOCK` in `freertos_service.c` to enable spinlock protect for wlanlib.
- Toolchain
  - Patch: `platform_lib.a`
  - Support IAR 7.5
- OTA tool
  - Patch `checksum.exe`
  - Fix image checksum calculation incorrect that may lead to OTA fail



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## 6 Release v3.5

### 6.1 v3.5a

- Wlan
  - [Fix] Strengthen stability long run for association idle mode.
  - [Fix] Improve DHCP procedure.
  - [Fix] Fix memory leak in scan command.
  - [New] Add command to get driver capability.
  - [New] Add flash access protection for fast connect data storage.
  - [New] Get sta info in AP mode.
  - [New] API for hidden ssid in AP mode
  - [New] API for disassociate a sta
  - [New] API/example to get current connected beacon content
  - [New] API to set channel plan in normal driver mode. `wifi_set_channel_plan()`.
  - [Update] Normal driver checks K-free according to effuse.
  - [Update] Report matched ssid on during scan with ssid procedure.
- Lwip
  - [Fix] handle dhcp renew by default.
- Power Save
  - [Fix] 8711AF doesn't have SDRAM, so suspend/resume SDRAM cause device hang.
  - [Fix] The UART interrupt may cause sleep fail. Fix it by disable interrupt when enter sleepCG.
  - [New] Tickless: Extend wake lock module from one to 32 hardware device.
  - [New] Tickless: Support options that not to suspend sdram intickless. Please check flag `FREERTOS_PMU_TICKLESS_SUSPEND_SDRAM`.
  - [Update] Force to put stack of idle task in SRAM. To put idle task in SDRAM cause system hang because of incorrect power sequence.
- Simple config
  - [New] Simple config version 2. To reduce the condition that AP does not forward packets.
  - [fix] Improve 40MHz send/receive during simple config
- Multimedia
  - RTSP: Update RTSP library
  - Multimedia framework : New mmf middleware for streaming application.
  - UVC: Update UVC library
  - USB camera: Do not filter out unrecognized camera on 3.5 version.

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- Storage Application
    - SD interface storage/file system. Create/Open/Delete/Save data. For detail please check UM0073.
    - USB mass storage class. Ameba act as a USB device class, and data is input from usb interface and stored in SD card. For detail please check UM0073.
  - UART Adapter
    - [New] Add TCP socket auto-connect after reboot.
  - UART
    - [New] Provide new set of API to control log uart usage
    - [Update] Uart flow control
  - Efuse
    - [New] Add efuse api and provide example. Please check example\_sources\efuse\_mtp and example\_sources\efuse\_otp
    - [New] Add efuse api read/write lock to prevent from writing error under multiple thread access.
  - I2C
    - [Fix] example\_sources/i2c: Initialize I2C structure
  - SPI
    - [New] example\_sources/spi\_stream\_twoboard : support tx/rx concurrent mode
  - RTC
    - [Fix] example\_sources/rtc: fix ctime() and wait() function fail in RTC example code.
  - PWM & Gtimer
    - [Fix] Modify gtimer mapping to prevent from some PWM conflict with timer using by wlan
      - ◆ Support gtimer 0,1 IRQ handler.
      - ◆ Change PWM0~3 gtimer from 3~6 to 2~5. PWM[0,1,2,3] -> Timer[3,4,5,2]
      - ◆ Change RTC gtimer from 7 to 0.
  - Gpio
    - [new] Add gpio\_level\_irq example
  - Flash
    - [new] Add lock for flash r/w. device\_mutex\_lock(RT\_DEV\_LOCK\_FLASH);.
  - Ethernet
    - [new] Add Ethernet api
  - Network Stack
    - [Fix] ssl\_download example
    - [New] Add example for client/server authentication.
    - [New] Example for SNTP. Add example\_sntp\_showtime.c .

- Others
  - [Fix] Update NFC firmware.
  - [Update] Add more function and save up to 40KB sram
  - [Update] Move thread stack of log service and TCPIP to TCM to save SRAM usage.
  - [Update] Use heap\_5.c instead of heap\_4.c. Heap\_5.c allows the heap to span multiple non-contiguous regions.
  - [Update] Update flash loader in IAR.
    - ◆ When executing erash flash in IAR, do not clear system data and calibration data section.
  - [New] Provide a method to disable message output from printf
    - ◆ Set disablePrintf = TRUE low\_level\_io.c
  - [New] rtl\_vprintf and rtl\_vsnprintf
  - [New] Support AT command v2. Detail in AN0075
  - [New] Support firmware update through UART. Detail in AN0096
- Feature
  - Multimedia Frame Work
    - ◆ [New] Provide many audio/video examples.
- Document
  - [Update] UM0034. Provide methodology for how to use SDRAM

## 6.2 v3.5b

- Wlan
  - [Update] Improve P2P connection stability.
  - [Update] Improve association idle stability with some specific AP.
  - [Update] Optimization for adaptivity test.
  - [New] Add API for cancel WPS session
- Lwip
  - [fix] interoperability with one specific AP. Hardfault fixed.
- Simple config
  - [Fix] Improve ipteroperability
- Efuse
  - [Fix] Enlarge efuse programming successful rate during mass production.
- I2S
  - [Update] Move audio driver to common parts.
- Flash
  - [Update] Lower Flash operation frequency for stability for some flash type.
- Ethernet

- 
- [Update] Optimize Ethernet initialization flow.
  - Network Stack
    - MQTT
      - ◆ [New] Add MQTT example
    - SSL
      - ◆ [New] Add SSL server sample
  - Others
    - ◆ OTA
      - [Update] Move ota code from common to soc specific.
      - [New] Support flash read back check after OTA accomplished.
      - [New] Example for OTA over http
    - ◆ Firmware update through UART
      - [Update] Check flash content after upgrading firmware through UART
    - ◆ Http download example
      - [Update] Refine timeout behavior
  - Feature
    - SPI at command v2
      - ◆ [New] AT command over SPI interface. Ameba is SPI master.  
component\common\example\spi\_atcmd
    - Airkiss
      - ◆ [New] Support AirKiss2.0
    - UART at command v2
      - ◆ [Fix] Fix DHCP issue under AP mode
    - GoogleNest
      - ◆ [Update] Update client behavior according to google nest server
    - QQLink
      - ◆ [Update] Adjust connecting cloud server address, due to the old address is abolished.
    - HTTP client/daemon
      - ◆ [New] Support http client/demon. Please refer to api document in doc\api\_doc.htm, example is also supported.
  - Document
    - [Update] Peripheral api document in doc\api\_doc.htm

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## 7 Release v4.0

Both **Ameba-1** and **Ameba-Z** are supported from version greater than 4.0.

### 7.1 v4.0a

- Wlan
  - Ameba-1/Ameba-Z
    - ◆ [Critical Fix] Fix packet fails to send out if AP's IP address is 192.168.43.x. Android hotspot use 192.168.43.x. (existing in 3.5b only)
      - Patch is available for 3.5b: [3.5b\\_patch\\_fix\\_android\\_hotspot\\_issue\\_\(v01\)](#)
    - ◆ [Fix] Enhance WPS stability & interoperability.
    - ◆ [Fix] 4-way handshake fail under one special corner case with one AP. Hardfault fixed
    - ◆ [Update] Support channel plan WW2.
    - ◆ [Update] Support ping IP in external network
    - ◆ [New] WEP key error indication event
    - ◆ [New] Provide API "wext\_set\_sta\_num()" to support limited STAs number for AP mode.
    - ◆ [New] Support EAP supplicant
    - ◆ [New] API for AP's bssid wext\_get\_bssid()
    - ◆ [New] Support WPS multiple credential
    - ◆ [New] Support WPS2.0
    - ◆ [New] Support STA timeout mechanism in AP mode. Please check CONFIG\_ENABLE\_AP\_POLLING\_CLIENT\_ALIVE for detail.
- Simple config
  - Ameba-1/Ameba-Z
    - ◆ [Update] Improve simple config v3
- Power Save
  - Ameba-1/Ameba-Z
    - ◆ [Update] Adjust tickles API to support both Ameba-1/Ameba-Z
- Multimedia
  - Ameba1
    - ◆ [New] Playback MP3 file in sd card. Ameba-1 only
    - ◆ [New] Streaming MP3 from RTSP server. Ameba-1 only
- I2S
  - Add driver for audio codec sgtl5000
- Ethernet



- 
- ◆ Ameba-1
    - [Fix] Fix routing error under fixed IP configuration
  - Network Stack
    - Ameba-1/Ameba-Z
      - ◆ WebSocket
        - [Fix] fix memory leak on some condition
      - ◆ HTTP Server
        - [Update] Add some interface API
      - ◆ Ping
        - [Update] Support ping with domain name
      - ◆ DHCPc
        - [Fix] Fix DHCP release
      - ◆ DHCPs
        - [Fix] Fix interoperability with iPhone SE
      - ◆ QQLink
        - [Update] Lib update
      - ◆ Airkiss
        - [Update] Update to new version
    - Ameba-1
      - ◆ mbedTLS
        - [New] Support mbedTLS. It is suggested to stay PolarSSL in Ameba-Z for memory consideration.
      - ◆ PolarSSL
        - [Update] Speed up connection time
  - Others
    - Ameba-1/Ameba-Z
      - ◆ OS API Suggestion
        - [Update] For new users, please use osdep\_service.h in folder component\os\os\_dep
        - [Update] For old uses, suggest replace osdep\_api.h with osdep\_service.h
        - [Update] move osdep\_api.h code to component\soc\realtek\8195a\misc\os
      - ◆ OTA
        - [Update] add the solution for the scenario that the size of http header over the buffer size
      - ◆ Toolchain
        - [Update] Support IAR 7.8

- Feature
  - Ameba-1/Ameba-Z
    - ◆ [Update] Airkiss 2.0
    - ◆ [Update] Support SSID with UTF-8 format such as Chinese character.
    - ◆ [New] AWSIoT
    - ◆ [New] DCT, Device Configuration Table for variable data management
      - component/common/example/dct
- Document
  - Ameba-1/Ameba-Z
    - ◆ [Update] API document update.

## 7.2 v4.0b

- Network Stack
  - Ameba-1/Ameba-Z
    - ◆ WebSocket
      - [Update] Support buffer length assigned by user
- Feature
  - Ameba-Z
    - ◆ [Update] Alink
    - ◆ [Update] Joylink

## 7.3 v4.0c

- Wlan
  - [Update] Support KRACK test
- Power Save
  - Ameba-Z
    - ◆ [Fix] Improve tickles mode stability
- Network Stack
  - Ameba/Ameba-Z
    - ◆ MDNS
      - [Fix] Fix hardfault when receiving extra large packet

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## 8 Release v5.2

Version 5.2x support AmebaPro series IC only.

### 8.1 v5.1b

- First Release

### 8.2 v5.2a

Support EVB 2\_0

- Wlan
  - AmebaPro
    - ◆ [Update] Provide wake on wlan example
- ISP
  - AmebaPro
    - ◆ [Update] Move ISP type selection file from eval\_board.h to sensor.h

### 8.3 v5.2b

- Wlan
  - AmebaPro
    - ◆ [Update] Increase Wlan buffer for more stable streaming
    - ◆ [Update] Add API for Application Keep Alive mechanism
    - ◆ [Update] Add example for Wakeup pattern
- Network Stack
  - AmebaPro
    - ◆ [Update] Increase TCP/IP buffer for more stable streaming
    - ◆ [Update] Provide a lwip default setting suitable for video streaming application
- SD
  - AmebaPro
    - ◆ [Fix] Improve SD card stability and compatibility

- 
- ◆ [Fix] Resolve SD file system read/write error for alignment issue
  - H.264
    - AmebaPro
      - ◆ [Update] Add Chroma QP control
      - ◆ [Update] Add stop streaming API
  - Multi Media Framework
    - AmebaPro
      - ◆ [Update] Add example for I2S MIC scenario
  - ISP
    - AmebaPro
      - ◆ [Update] Add API for frame rate control for sensor
      - ◆ [Fix] Fix showing of OSD timing
  - Power Save
    - AmebaPro
      - ◆ [Update] Add example for Big/Little CPU standby and wakeup flow
  - Other
    - AmebaPro
      - ◆ [Update] OTA method description, please check application note.
      - ◆ [Update] Provide example code of OTA over SD card
      - ◆ [Update] Add system reset API sys\_reset

## 8.4 v5.2f

- Wlan
  - AmebaPro
    - ◆ [fix] Improve wifi connection stability
    - ◆ [fix] Improve wifi throughput for video stability
    - ◆ [Update] Support SKB buffer number setting
    - ◆ [Update] Save wifi calibration data in efuse by default
- Network Stack
  - AmebaPro
    - ◆ [fix] Improve tcp keep alive stability under standby mode
    - ◆ [fix] Improve stability or remote wake up
- SD
  - AmebaPro
    - ◆ [Fix] Improve SD card stability and compatibility
    - ◆ [Update] Add SD plug detect feature

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- ◆ [Update] Add mutex resource for FATFS
  - ◆ [Update] Add fatfs\_get\_free\_space\_byte to get accurate byte size
  - H.264
    - AmebaPro
      - ◆ [Update] Add VBR with dynamic QP range
  - ISP
    - AmebaPro
      - ◆ [Fix] Fix showing of OSD timing
  - Power Save
    - AmebaPro
      - ◆ [Fix] Big/Little CPU standby and wakeup flow
      - ◆ [Update] Add standby\_multiple\_wake\_source
  - Other
    - AmebaPro
      - ◆ [Fix] Fix ADC function on Big CPU

## 8.5 v5.2g\_rc1

- Wlan
  - AmebaPro
    - ◆ [Fix] tim issue in AP mode
    - ◆ [Fix] power trim issue due to no data in efuse
    - ◆ [Fix] wlan recv stack overflow
    - ◆ [Fix] CCK RX fail due to CCK PD threshold is too high
    - ◆ [Fix] wlan recvframe leak for concurrent mod
    - ◆ [Fix] solve the dhcp timeout problem when connectd to ap in WPA mode
    - ◆ [Update] add video streaming performance
    - ◆ [Update] add arp response keep alive method
    - ◆ [Update] open CONFIG GTK OL
    - ◆ [Update] Disable 8195b power limit in default normal driver
    - ◆ [Update] Disable/enable CCA before/after writing RF register
- Network Stack
  - AmebaPro
    - ◆ [Fix] rtsp response buffer overflow
    - ◆ [Fix] dhcp renew invalid
- SD

- 
- AmebaPro
    - ◆ [Fix] Fixed the wrong capacity value for SD V1
  - H.264
    - AmebaPro
      - ◆ [Update] UVC add the power on/off state when the streaming is off
      - ◆ [Update] Add the mp4 demuxer
      - ◆ [Update] H264 SUPPORT GOP BPS SETTING
      - ◆ [Update] Support H264 to change the frame rate dynamic
  - ISP
    - AmebaPro
      - ◆ [Fix] isp boot frame rate error
      - ◆ [Fix] Switching to Gray Mode bug
      - ◆ [Update] Add APIs for IR Mode and AE Target Delta
      - ◆ [Update] Update ISP Driver and Add ATCMD
      - ◆ [Update] ISP support multi-sensor and mp4 add extra function
      - ◆ [Update] Add ir mdoe and jpeg rotation function
      - ◆ [Update] Improve AE Speed for SC2232
  - Power Save
    - AmebaPro
      - ◆ [Fix] ls hang issue
      - ◆ [Fix] standby wake even not clear issue
  - Other
    - AmebaPro
      - ◆ [Fix] GPIO fail after ADC init
      - ◆ [Fix] doorbell firebase api invalid issue
      - ◆ [Fix] add wdt to fix ls reset hs platform hang issue
      - ◆ [Fix] hs adc read error
      - ◆ [Fix] i2c init cannot find matched pin
      - ◆ [Update] SNTP time zone unit from hours to seconds
      - ◆ [Update] Support EON Flash Type
      - ◆ [Update] SYNC NEW SWWDT
      - ◆ [Update] ADD DEEPSLEEP TO RAMSTART TO REBOOT AFTER LPWDT ACTIVE

## 8.6 v5.2g\_rc2

- Wlan
  - AmebaPro

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- ◆ [Fix] Fix pscan one byte heap overwrite
  - ◆ [Fix] Fix system hang if wlan power on fail
  - ◆ [Fix] Fix wowlan wakeup issues
  - ◆ [Update] Add dhcp renew in wowlan
  - ◆ [Fix] Fix security vulnerability
  - ◆ [Fix] Fix check tx fifo empty block issue when wowlan enable
  - ◆ [Update] Add dtim10 fine tune function in wowlan
  - ◆ [Fix] Fix array overflow in tcp keep alive offload
  - Network Stack
    - AmebaPro
      - ◆ [Fix] Fix dhcp ip conflict issue
  - SD
    - AmebaPro
      - ◆ [Fix] Avoid to repeat init the sd card driver
      - ◆ [Fix] Improve the format speed for SD card
  - H.264
    - AmebaPro
      - ◆ [Update] Support different profile for h264 encoder
      - ◆ [Update] Update the H264 for idrheader function
  - ISP
    - AmebaPro
      - ◆ [Update] Update sensor setting of SC2239
      - ◆ [Update] Update normal boot isp setting
      - ◆ [Fix] Fix the incorrect write in H264 lib
      - ◆ [Update] Support isp fw to select user space
  - Power Save
    - AmebaPro
      - ◆ [Update] Add gpio pull ctrl setting
  - Other
    - AmebaPro
      - ◆ [Fix] [ADC]Enable PWR\_CUT for HP adc audio issue
      - ◆ [Update] Add webrtc
      - ◆ [Update] Add BOD setting function
      - ◆ [Fix] Fix wlan wakeup lp reset issue
      - ◆ [Update] Unlock abnormal flash write protect
      - ◆ [Update] Support DFU update OTA function

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## 8.7 v5.2h

- Audio
  - Ameba Pro
    - ◆ [Fix] Fix AEC Memory leak.
    - ◆ [Add] Add rest function to acc loop example.
    - ◆ [Add] Support the audio to stop and start function.
- Wlan
  - Ameba Pro
    - ◆ [Fix] Fix softap 64 hex password not showing.
    - ◆ [Add] Support 5g wowlan beacon mode.
    - ◆ [Add] Add set mac address without writing efuse api.
    - ◆ [Fix] Fix antenna diversity.
    - ◆ [Fix] Fix wifi get station max data rate problem.
- ISP
  - Ameba Pro
    - ◆ [Add] Add multiple sensor to auto select.
- Network stack
  - Ameba Pro
    - ◆ [Fix] Fix sockets.h select static declaration build error.
    - ◆ [Fix] Fix tcp stream close socket error.
- USB
  - Ameba Pro
    - ◆ [Add] Add API to the download function of uvc extension port.
    - ◆ [Add] Add the callback function in extension node.
- Storage
  - Ameba Pro
    - ◆ [Add] Support multi record and user callback to write mp4.
    - ◆ [Update] Change the fatfs version to the latest.
- Other
  - [Add] Add posix and c++ porting modified.
  - [Add] C++ modification for IAR.
  - [Update] Update the elf2bin.



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