Ameba-Z Memory Layout

This document introduces usage of SRAM, Flash, and OTA.

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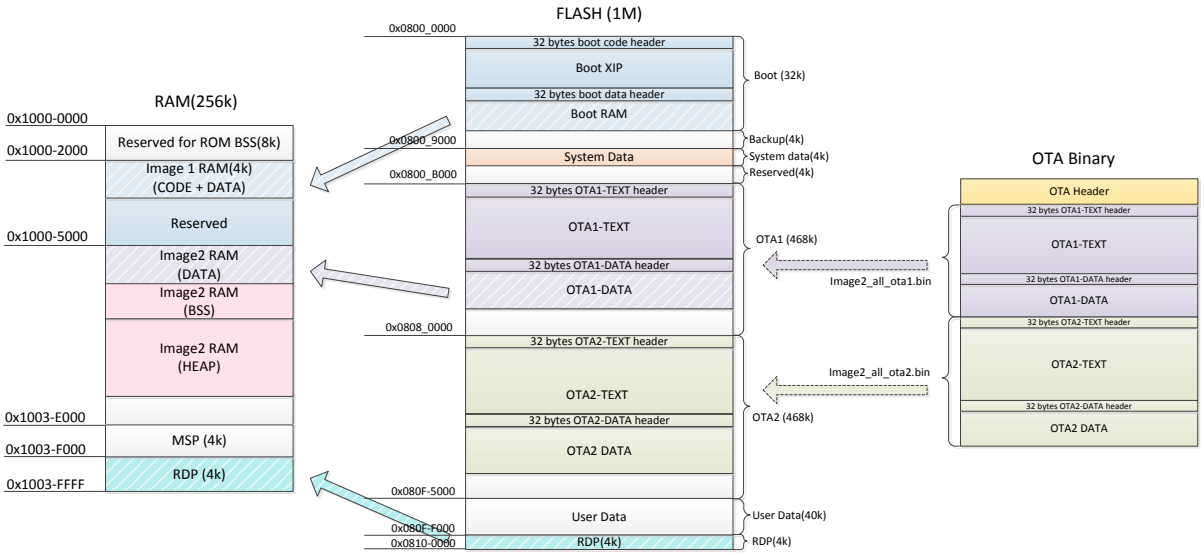
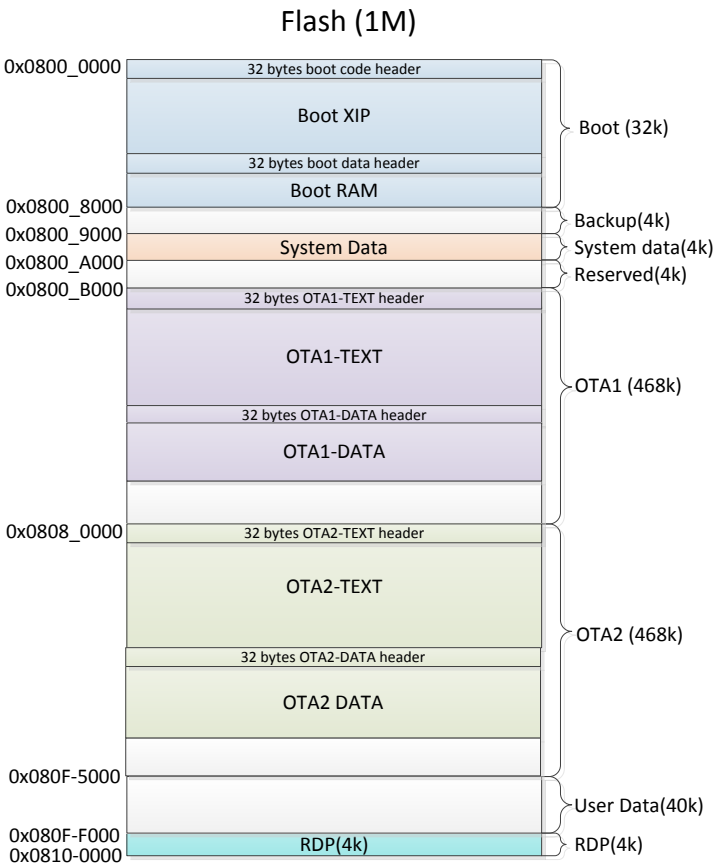
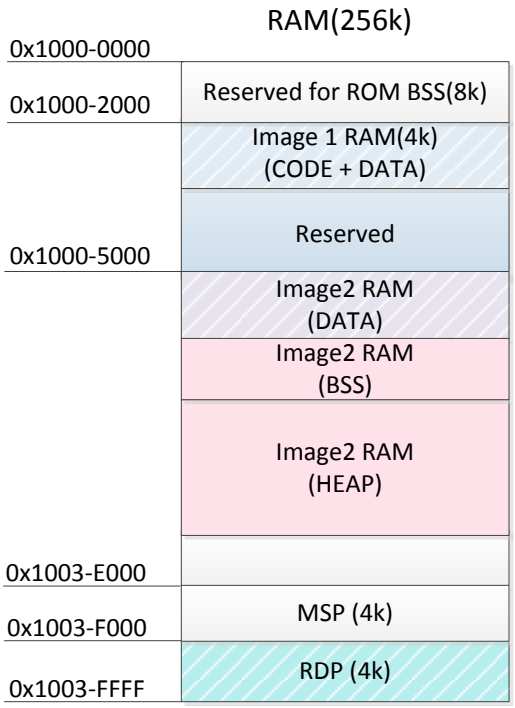
1. Memory layout



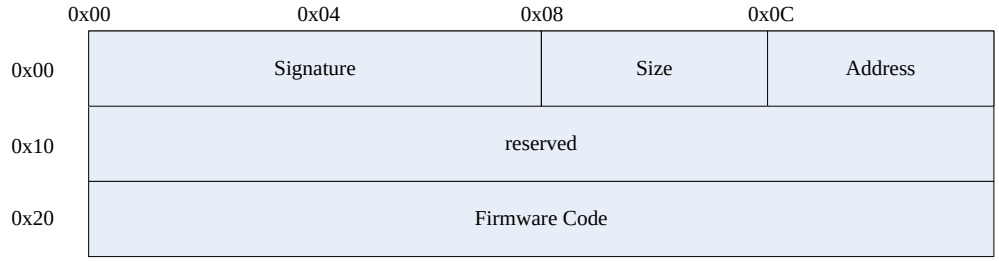
1.1. Flash Layout



1.2. SRAM layout

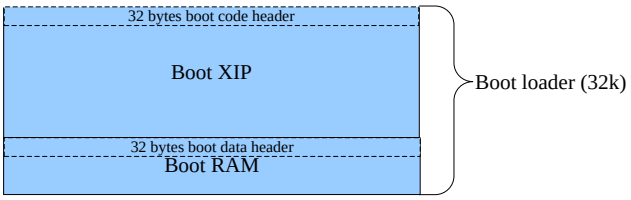


2. Image Header



- Signature:
  - Image1 Signature for Flash calibration: 8 bytes
  - Image2 Signature is string: “81958711”
- Size:
  - The size of image: 4 bytes
- Address:
  - Code executes address after boot.
  - ‘BOOT RAM’, ‘OTA1 DATA’ ‘OTA2 DATA’ is target RAM address
  - ‘BOOT XIP’. ‘OTA1 TEXT’, ‘OTA2 TEXT’ is Flash XIP address

3. Boot Loader (Image 1)



- Boot_all.bin
- Hardware initialization
- Call Image 2 Firmware based on system data
- Bootloader RAM means this part will be load to RAM.
- Bootloader XIP means this part will be run in flash.
- Should run independently, should not depend on image2.

4. System Data (4k)

- system.bin is generated by image tool.

	0x00	0x04	0x08	0x0C
0x00	OTA2 Flash Address	Valid IMG2	Forth OTA1 GPIO	OTA Rsvd
0x10	RDP Flash Address	RDP Len (no checksum 4B)	RDP Rsvd	RDP Rsvd
0x20	WORD1: SPI Speed WORD0: SPI Mode	WORD1: Flash Size WORD0: Flash ID	Flash Rsvd	Flash Rsvd
0x30	ULOG BaudRate	ULOG Rsvd	ULOG Rsvd	ULOG Rsvd
	reserved			
0x100 ~ 0x147	USB Parameter			
	reserved			
0x200	ADC Prameter			

4.1. OTA system data (0x00)

4.1.1. OTA2 Flash Address

- Flash address for OTA2.

- If 0xFFFFFFFF, select OTA1

4.1.2. Valid IMG2

- Used for OTA1 and OTA2 switch
  - LSB 0 bits number is odd: like 0xFFFFFFFE/0xFFFFFFF8... means select OTA2
  - LSB 0 bits number is even: like 0xFFFFFFFF/0xFFFFFFFC... means select OTA1

4.1.3. Force OTA1 GPIO

- GPIO force OTA1 as image2.
  - BIT[4:0]: pin num 0~31
  - BIT[5]: port: 0/1
  - BIT[7]: active_state 0/1

4.2. RDP system data (0x10)

- RDP Flash address:
  - Flash address for RDP
- RDP Len: RDP image length
  - 16 bytes alignment
  - Not include checksum 4bytes

4.3. Flash system data (0x20)

4.3.1. SPI Speed

- 0xFFFF: 100MHz
- 0x7FFF: 83MHz
- 0x3FFF: 71MHz
- 0x1FFF: 62MHz
- 0x0FFF: 55MHz
- 0x07FF: 50MHz
- 0x03FF: 45MHz

4.3.2. SPI Mode

- 0xFFFF: Read quad IO, Address & Data 4 bits mode
- 0x7FFF: Read quad O, Just data 4 bits mode
- 0x3FFF: Read dual IO, Address & Data 2 bits mode
- 0x1FFF: Read dual O, Just data 2 bits mode
- 0x0FFF: 1 bit mode

4.3.3. Flash size

- 0xFFFF: 2MB
- 0x7FFF: 32M
- 0x3FFF: 16M
- 0x1FFF: 8MB
- 0x0FFF: 4MB
- 0x07FF: 2MB
- 0x03FF: 1MB

4.3.4. Flash ID

- Reserved, use it when flash ID cannot get from flash ID cmd.

4.4. LOG UART system data (0x30)

4.4.1. ULOG BaudRate

- 0xFFFFFFFF: 115200
- 115200~3000000

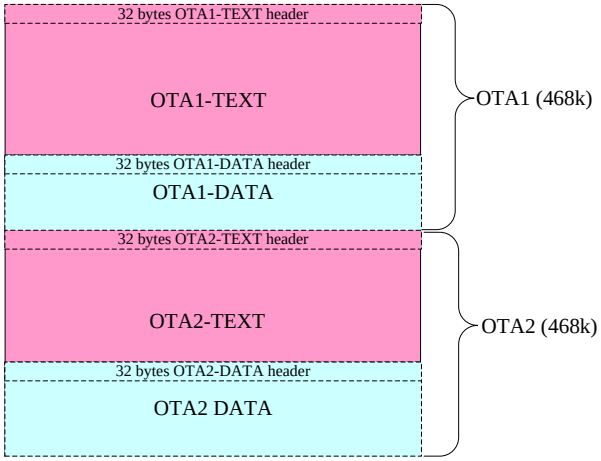
4.5. USB Parameter (0x100~0x147)

- Just used for USB dongle mode (AN0117)

4.6. ADC Parameter

- ADC calibration data

5. OTA-X (Image 2)



- Image2_all_ota1.bin / image2_all_ota2.bin
- OTA-X-TEXT: OTA-X code and RO data, this will not be loaded to RAM
- OTA-X-DATA: OTA-X DATA, this will be loaded to RAM.

6. Application Data (40k)

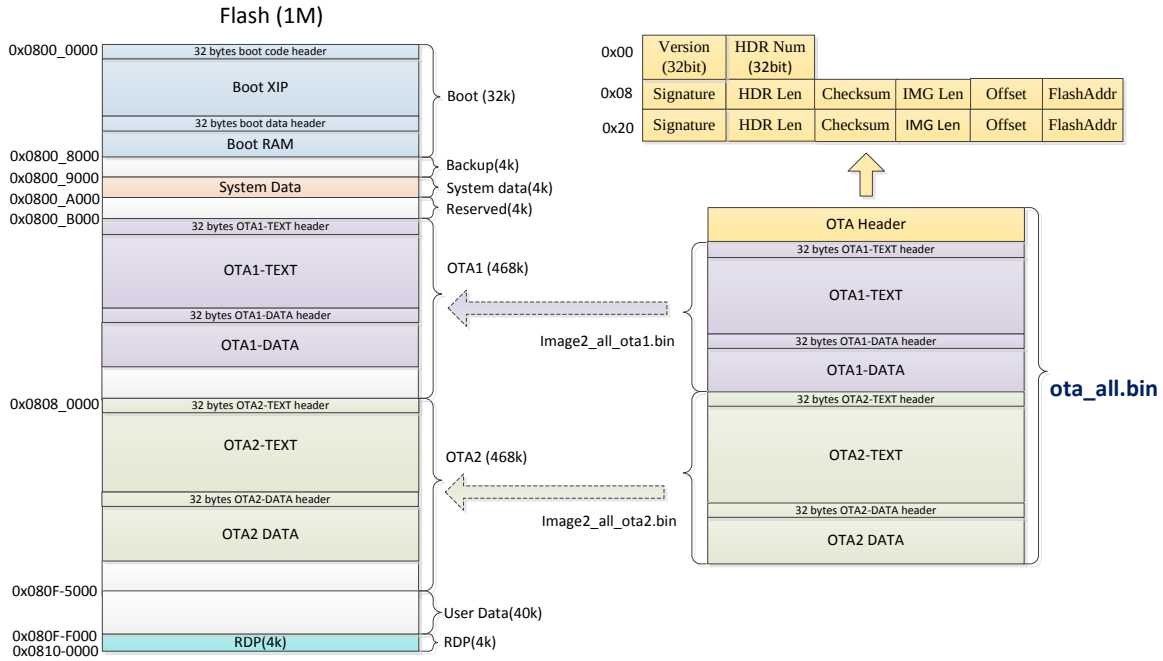
- This section of flash memory is used by application like WIFI profile.

7. RDP Encrypt Area (4k)

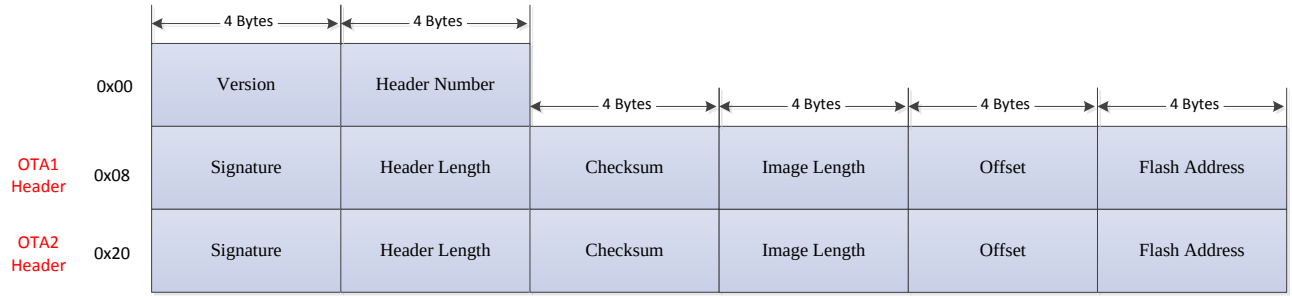
- This section of flash memory is used for FW protection.
- Flash memory address:
  - Always bottom 4k of flash
- RAM address
  - Always bottom 4k of CM4 RAM

8. OTA update

Please reference AN0110_Realtek_Ameba-Z_over_the_air_firmware_update for more detail.



8.1. OTA Header



- Version:
  - The version of OTA image: 4 bytes
- Header Number:
  - The number of OTAx Header : 4 bytes
- Signature:
  - OTAx Signature is string: “OTAx”, 4 bytes.
  - For example, “OTA1” for OTA1, and “OTA2 ” for OTA2.
- Header Length
  - The length of OTAx header, 4bytes
- Checksum
  - The checksum of OTAx image, 4 bytes
- Image Length:
  - The size of OTAx image: 4 bytes
- Offset:
  - The start position of OTAx in current image: 4 bytes
- Flash Address:

- Address in flash where OTAx will be programmed, 4 bytes