WM_W60X_ROM Function Guide
V1.1

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Document History

Version	Completing Date	Revision Record	Author	Auditor
V1.0	2018-09-21	Initial Release	Cuiych	
V1.1	2018-10-11	Add figures number	Cuiych	

Content

1 Introduction

1.1 Overview

This document describes the functions and usage of W600 ROM for developers.

1.2 Abbreviations and acronyms

Abbreviations and acronyms	Definition
CRC	Cyclic Redundancy Check
IMAGE	Binary File
MAC	Medium Access Control
QFLASH	Quad-SPI Flash
RAM	Read-Write Memory
ROM	Read-Only Memory
SECBOOT	Second Boot
UART	Universal asynchronous receiver-transmitter

1.3 References

1. <WM_W60X_Firmware Generation Guide>
2. <WM_W60X_QFLASH Management Guide>

2 ROM Basic Functions

2.1 ROM Flowchart

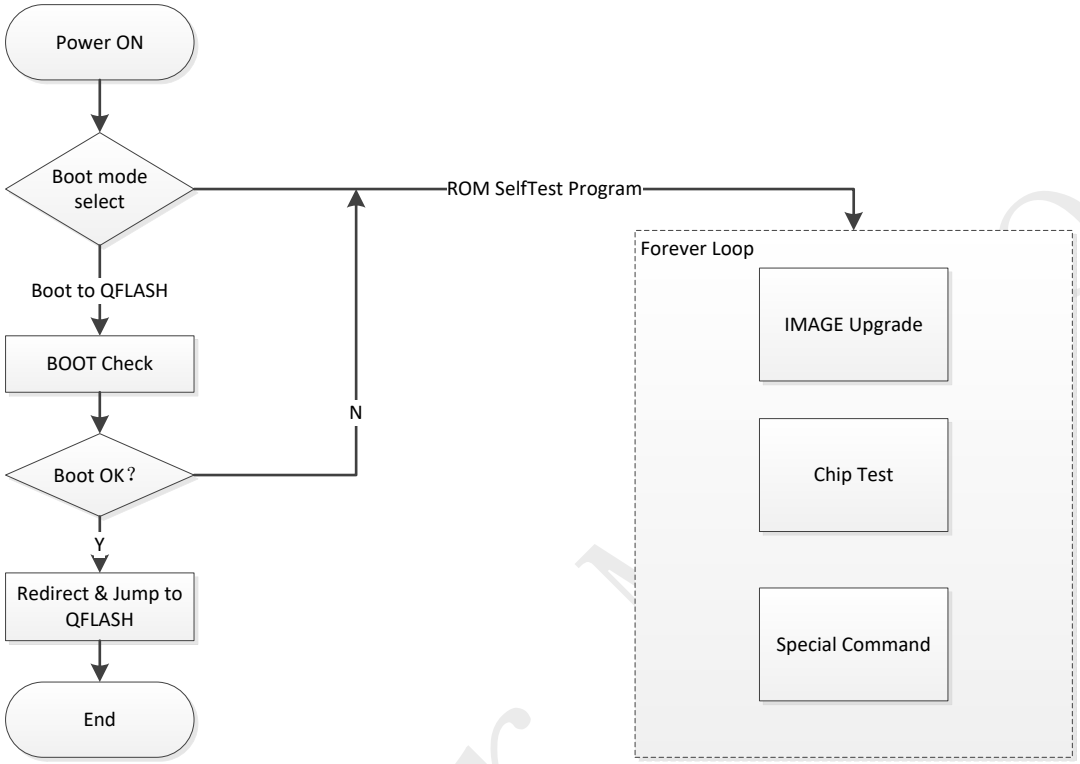

Figure 2-1

2.2 Bootloader

2.2.1 QFLASH Self Check

Checking QFLASH working status.

2.2.2 Switch QFLASH working mode

After starting up from ROM, the default working mode of QFLASH is line 1. The QFLASH mode should be switched to line 4 in order the code can run from QFLASH.

2.2.3 IMAGE Checksum

To complete checking the header and content's checksum of IMAGE.

2.2.4 Redirect Vector Table

The vector table should be redirected for program running from QFLASH (the base address of code: 0x8000000).

Rules for redirection: (exception vector + interrupt) the address number should be up to the nearest 2^N x 4 (vector table should be calculated by word). The result value is the base address of vector table and the integer multiple of this value is the usable redirection address.

For example: excpetion vector + interrupt is 56, up to nearest 2^N is 2^6=64, 64x4=256 (0x100), so the usable redirection address can be 0, 0x100, 0x200, 0x300…….

2.3 Updating Program

Update IMAGE to QFLASH through XModem protocol.

Two types of IMAGE file can be used: SECBOOT, FLASH image

(1) Second level Boot format:

Figure 2-2

(2) FLASH image format:

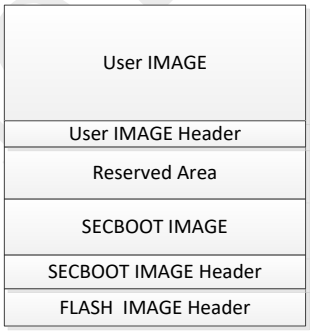

Figure 2-3

The detailed decribtion of IMAGE HEADER and IMAGE generation is in <WM_W60X_Firmware Generation Guide>.

2.4 Test Program

W60X ROM code supports some testing functions to chipset's testing phase.

2.5 Operation Command

W60X ROM code supports some operations for Wi-Fi module's production process: baudrate changing, IMAGE area erasing, MAC address reading/writing, transmit gain reading/writing, QFLASH ID reading.

Command type: hexadecimal

2.5.1 Command Table

Function	SubCmd	Data Segment	Describtion
Switching Baudrate	0x31	≤2000000	Max baudrate of UART to 2Mbps
Erasing IMAGE Area	0x32	None	Erase all area after 8KByte
Setting Security Level	0x33	≤2	0: open JTAG, ROM can response command 1: close JTAG, ROM can response command conditionaly 2: close JTAG, ROM do not response command (use with caution).
Get Security Level	0x34	None	
Set GAIN Parameters	0x35	≤84bytes	The reference gain values during Wi-Fi transmitting (use with caution).
Get GAIN Parameters	0x36	None	
Set MAC Address	0x37	6bytes	
Get MAC Address	0x38	None	
Get QFLASH ID	0x3C	None	

2.5.2 Command Sets

Changing Uart Baudrate:

2M setting command: 21 0a 00 ef 2a 31 00 00 00 80 84 1e 00

1M setting command: 21 0a 00 5e 3d 31 00 00 00 40 42 0f 00

921600 setting command: 21 0a 00 5d 50 31 00 00 00 00 10 0e 00

460800 setting command: 21 0a 00 07 00 31 00 00 00 00 08 07 00

115200 setting command: 21 0a 00 97 4b 31 00 00 00 00 c2 01 00

Erasing IMAGE Area: 21 06 00 41 45 32 00 00 00

Getting Security Level: 21 06 00 d8 62 34 00 00 00

Setting Security Level:

Level 0: 21 0a 00 97 bf 33 00 00 00 00 00 00 00

Level 1: 21 0a 00 23 c9 33 00 00 00 01 00 00 00

Level 2: 21 0a 00 ff 52 33 00 00 00 02 00 00 00

Getting MAC Address: 21 06 00 ea 2d 38 00 00 00

Getting QFLASH ID: 21 06 00 1b e7 3c 00 00 00

2.6 STANDBY Function

ROM code supports W60X's STANDBY API (includes QFLASH DPD operation).

Function pointer should be assigned value in order to visit such function in QFLASH:0x499

(1) Define function pointer

```
typedef void (*standby_func)(void);
standby_func pfunstandby = (standby_func)0x499;
```

(2) Call this function pointer to Standby mode

```
pfunstandby();
```

Note:

If QFLASH DPD is not required by STANDBY function, do not need to call the function API.

2.7 ROM Security Protection

ROM supports 3 security levels to protect ROM for opening/closing JTAG and responsing UART commands.

Security Level **0**: open JTAG, ROM can response command.

Security Level 1: close JTAG, ROM can response command conditionaly

(1) IMAGE area should be erased when switching to level 0 to open JTAG.

(2) IMAGE area should be erased when updating IMAGE.

Security Level 2: close JTAG, ROM do not response command.

ROM can not be used. If want to reduce the security level, it should be restored through user's program.

2.8 ROM Error Code

During ROM startup process, ROM code will jump to endless loop if some abnormal conditions happen. At the same time the error code will be printed to describe current error information for developer.

Following is the error code table:

Error Code	Describtion

C	Normal
During updating (XModem protocol)	
D	Host cancel
E	NACK
F	Time out without getting data
G	Packet number error
H	Packet number complement error
I	IMAGE is too large
J	IMAGE updating address is disagreement
K	IMAGE updating address page is not aligned
L	IMAGE header checksum error
M	IMAGE content checksum error
During starting up process	
N	FLASH ID self checking failed
O	FLASH QIO setting mode failed
P	SECBOOT header checksum error
Q	SECBOOT checksum error
Function module	
R	Command check error
S	Command parameter error
T	Setting security level failed
U	Setting gain failed
V	Setting MAC failed

3 Usage of QFLASH and RAM

3.1 QFLASH Arragement

QFLASH Arrangement by ROM:

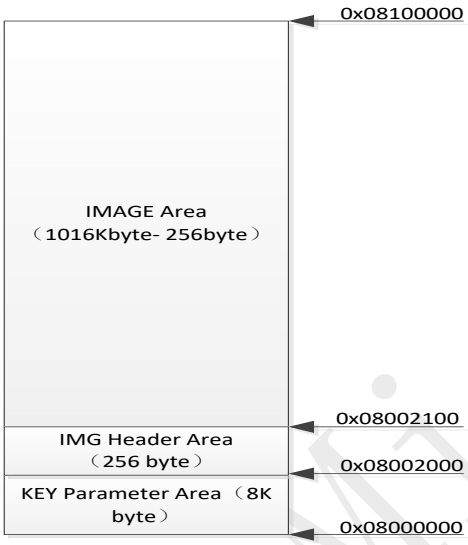

Figure 3-1

3.2 RAM Arrangement

W60X's RAM is devided to 2 parts: 160KByte and 128KByte. Following is the RAM arrangement by ROM:

Part of RAM	Function	Start Address	End Address	Size	Describtion
160Kbyte	NC	0x20000000	0x20027FFF	160Kbyte	NC
128Kbyte	Stack&Heap	0x20028000	0x2002FFFF	64Kbyte	For ROM code
	NC	0x20030000	0x20047FFF	64Kbyte	NC