

The Mediatek logo consists of the word "MEDIATEK" in a bold, orange, sans-serif font. It is positioned inside a white, parallelogram-shaped box that is tilted slightly to the right.

MT7986 Single Image SOP

2022/1/30

Document Revision History

Revision	Date	Author (Optional)	Description
1.0	2021-12-3	Micheal Su	Official release
1.1	2022-1-13	Micheal Su	Modify eMMC partition layout
1.2	2022-1-18	Jones Huang	Add ALL-300G Flash Programmer example
1.3	2022-1-26	Micheal Su	Add generate GPT_EMMC command
1.4	2022-1-30	Micheal Su	Add for SPIM-NAND flash

Outline

- ❑ Generate SPIM-NAND Single Image
- ❑ Generate eMMC Single Image

Generate SPIM-NAND Single Image

Prepare File for SPIM-NAND Single Image

- **bl2.img**
 - Please refer to MT7986_Build_SOP_xxx.pdf application note.
- **fip.bin**
 - Please refer to MT7986_Build_SOP_xxx.pdf application note.
- **kernal_image**
 - Please refer to MT7986_Build_SOP_xxx.pdf application note.
- **mk_image.sh**
 - In ATF folder, i.e. `atf/tools/dev/single_img_wrapper/mk_image.sh`

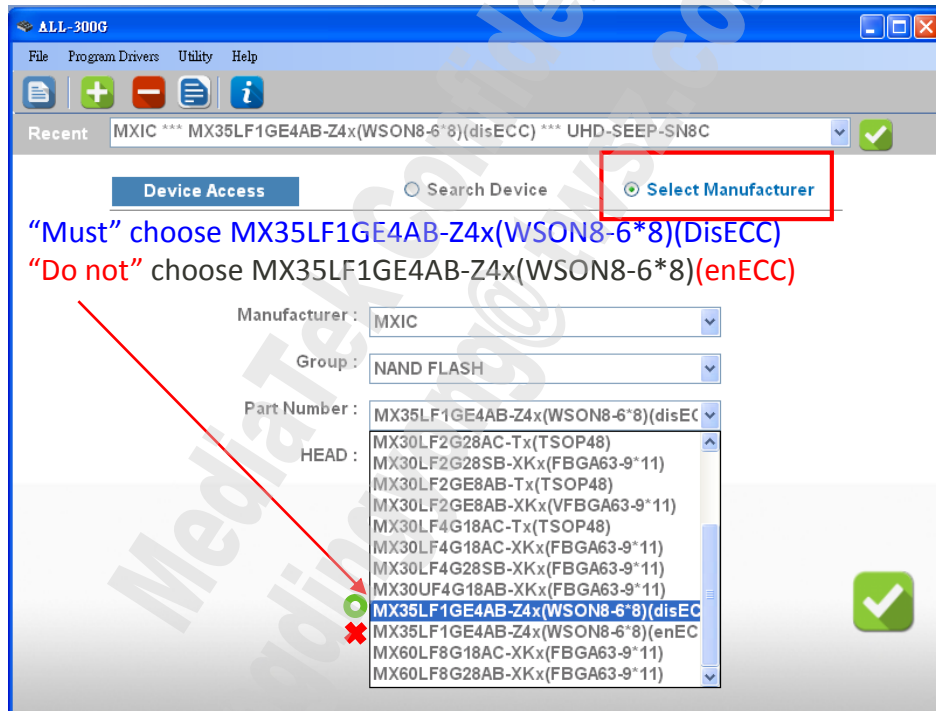
How to Generate SPIM-NAND Single Image

- Put all those files under the same folder,
 - bl2.img
 - fip.bin
 - kernal_image, e.g. openwrt-mediatek-mt7986-mt7986a-ax6000-2500wan-spim-nand-rfb-squashfs-**factory**.bin
 - mk_image.sh
- Run mk_image.sh
 - CMD:~/#> ./mk_image.sh -p <CHIP Name> -d <Flash Type> -b <bl2.img> -f <fip.bin> -k <Kernel image>
 - For example:
CMD:~/#> ./mk_image.sh -p mt7986a -d spim-nand -b bl2.img -f fip.bin -k openwrt-mediatek-mt7986-mt7986a-ax6000-2500wan-spim-nand-rfb-squashfs-**factory**.bin
- The single image “mt7986a-spim-nand-20220126-single-image” generated in the same folder.

How to Program SPIM-NAND Single Image by Programmer

The example of ALL-300G programmer

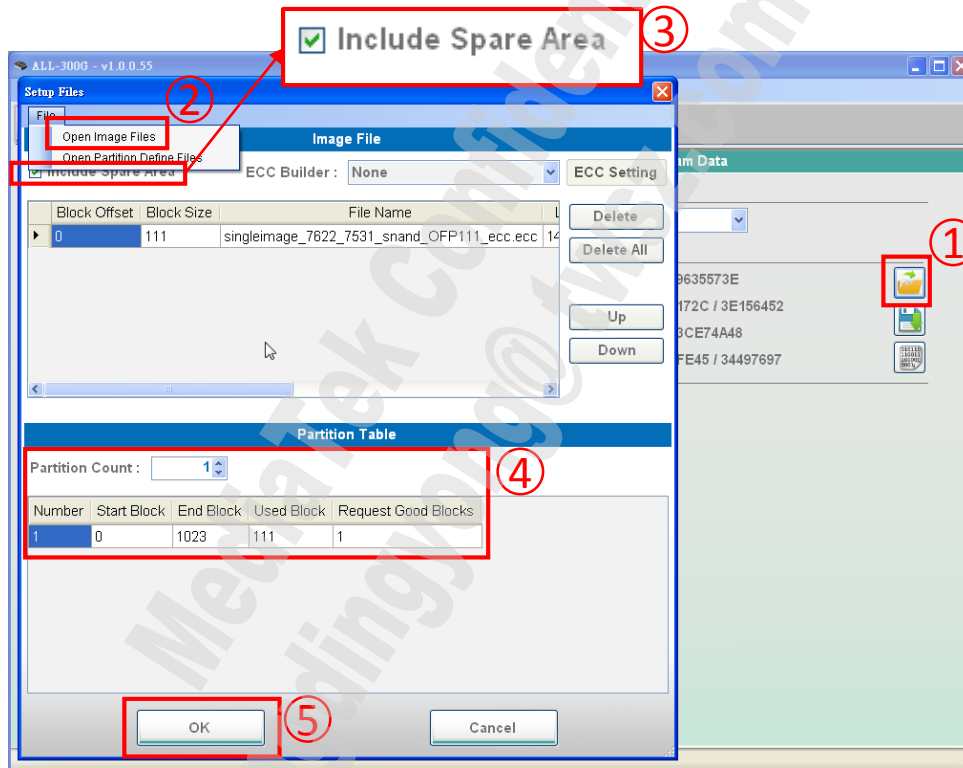
- Select SPI-NAND P/N (MXIC's part as example)



How to Program SPIM-NAND Single Image by Programmer

The example of ALL-300G programmer

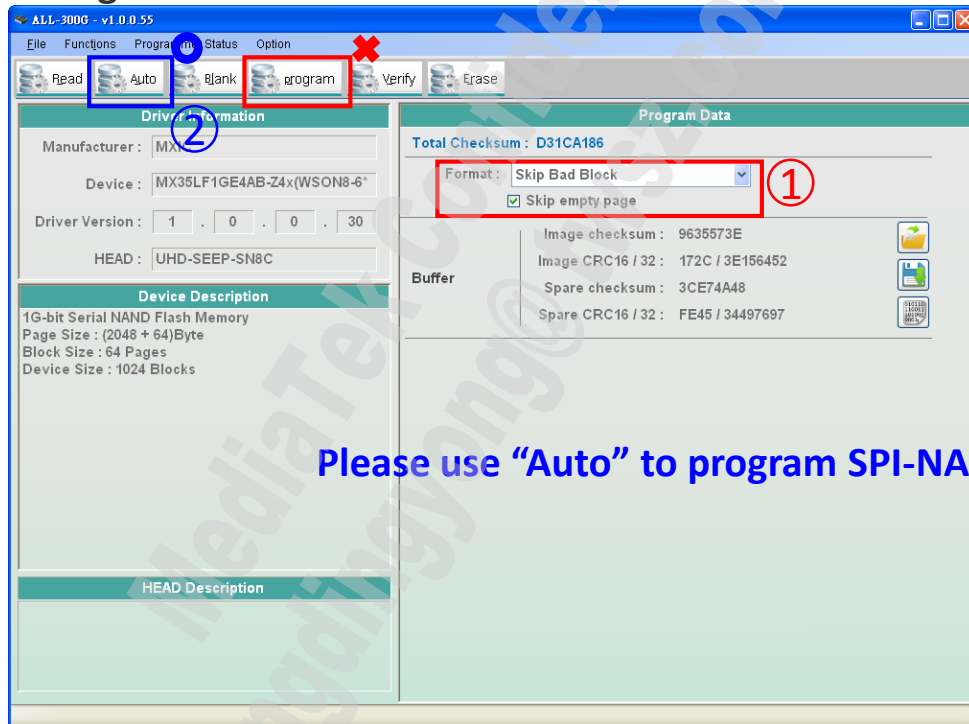
- Load image



How to Program SPIM-NAND Single Image by Programmer

The example of ALL-300G programmer

- Setup for programming



Please use “Auto” to program SPI-NAND Flash

How to Program SPIM-NAND Single Image by Programmer

The example of ALL-300G programmer

- Programming (check contact first)

Auto

Manufacturer : MXIC
Device : MX35LF1GE4AB-Z4x(WSON8-6*8)(disECC)

Total Checksum : D31CA186

Items		Programmer																		Counter	
		Site#	Status	Socket #																Pass	Fail
<input checked="" type="checkbox"/> Short Test	①	0	Finish	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	8	0
<input checked="" type="checkbox"/> Contact		1																		0	0
<input checked="" type="checkbox"/> ID Check		2																		0	0
<input type="checkbox"/> Detect Blocks		3																		0	0
<input type="checkbox"/> Erase		4																		0	0
<input type="checkbox"/> Blank Check		5																		0	0
<input type="checkbox"/> Program/Verify		6																		0	0
		7																		0	0

Flash chip may not be contacted very well in the socket
So, please do the package contact check first.

Total : 8 0

Reset Counter

Run Close

How to Program SPIM-NAND Single Image by Programmer

The example of ALL-300G programmer

- Programming (formal programming)

Auto

Manufacturer : MXIC
Device : MX35LF1GE4AB-Z4x(WSON8-6*8)(disECC)

Total Checksum : D31CA186

Items		Programmer																		Counter	
<input checked="" type="checkbox"/> Short Test		Site#	Status	Socket #																Pass	Fail
				1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16		
<input checked="" type="checkbox"/> Contact		0	Finish	0	0	0	0	0	0	0	0									8	0
<input checked="" type="checkbox"/> ID Check		1																		0	0
<input checked="" type="checkbox"/> Detect Blocks		2																		0	0
<input checked="" type="checkbox"/> Erase		3																		0	0
<input checked="" type="checkbox"/> Blank Check		4																		0	0
<input checked="" type="checkbox"/> Program/Verify		5																		0	0
		6																		0	0
		7																		0	0

Total : 8 0

Reset Counter

Run Close

Generate eMMC Single Image

eMMC Physical Partitions

- According to eMMC standard 5.1 section 6.2.1, eMMC devices have the following physical partitions
- In MTK's platforms, we use boot area partition 1 & user data area (UDA) only.
- BL2 is placed at boot partition 1, and the rest is at UDA.

6.2.1 General

The default area of the memory device consists of a User Data Area to store data, two possible boot area partitions for booting (see 6.3.2) and the Replay Protected Memory Block Area Partition (see 6.6.22) to manage data in an authenticated and replay protected manner. The memory configuration initially consists (before any partitioning operation) of the User Data Area and RPMB Area Partitions and Boot Area Partitions (whose dimensions and technology features are defined by the memory manufacturer).

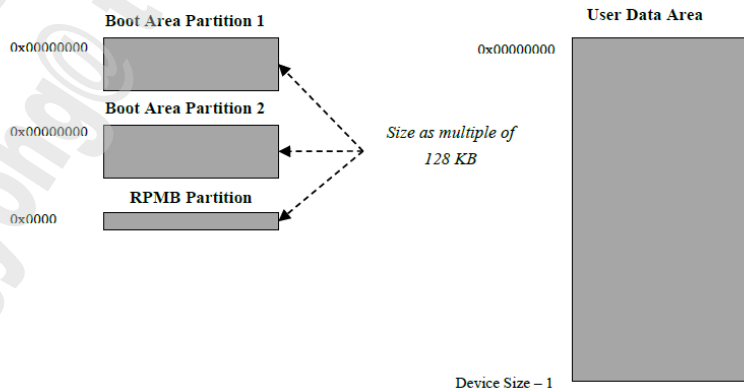
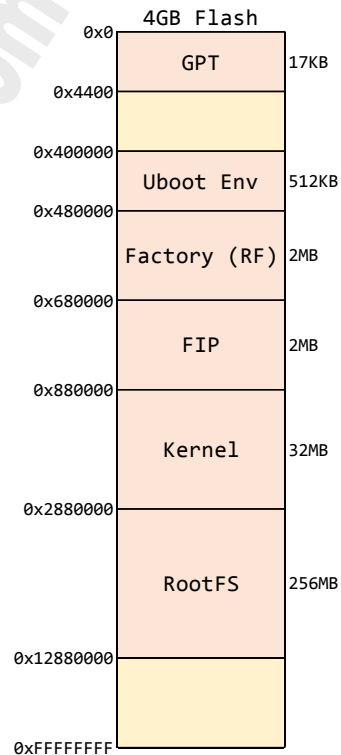


Figure 14 — eMMC memory organization at time zero

MT7986 eMMC Partition Layout

- **Boot partition 1: BL2**
- **UDA:**
The flash partition layout define at
`atf/tools/dev/gpt_editor/example/mt7986-emmc.json`



MT7986 eMMC Partition Layout

- For Programmer need to prepare bl2.img for boot partition 1 and mt7986-eMMC-single-image.bin for UDA.
- mt7986-eMMC-single-image.bin is includes,
 - GPT (GPT_EMMC)
 - FIP (fip.bin)
 - firmware (kernel image, openwrt-mediatek-mt7986-xxxxxx.bin)

Prepare File for eMMC Single Image

- **bl2.img**
 - Please refer to MT7986_Build_SOP_xxx.pdf application note.
- **fip.bin**
 - Please refer to MT7986_Build_SOP_xxx.pdf application note.
- **kernal_image**
 - Please refer to MT7986_Build_SOP_xxx.pdf application note.
- **GPT_EMMC**
 - `cd atf/tools/dev/gpt_editor`
 - `python mtk_gpt.py --i example/mt7986-emmc.json --o GPT_EMMC`
- **mk_image.sh**
 - In ATF folder, i.e. `atf/tools/dev/single_img_wrapper/mk_image.sh`

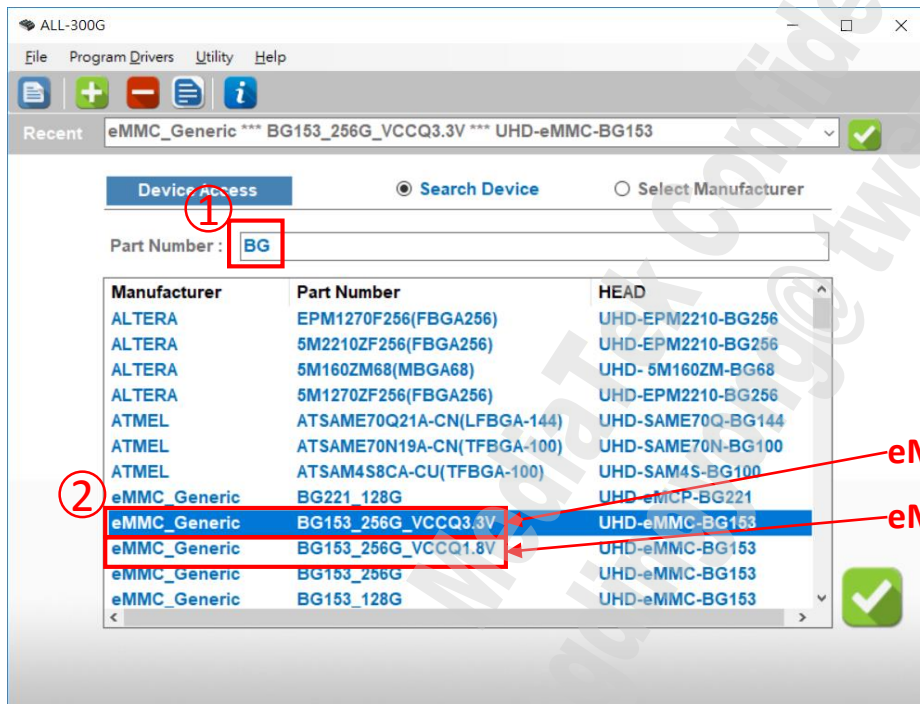
How to Generate eMMC Single Image

- Put all those files under the same folder,
 - GPT_EMMC
 - fip.bin
 - kernal_image, e.g. openwrt-mediatek-mt7986-mt7986a-ax8400-2500wan-emmc-rfb-squashfs-sysupgrade.bin
 - mk_image.sh
- Run mk_image.sh
 - CMD:~/#> ./mk_image.sh -p <CHIP Name> -d <Flash Type> -g <GPT table> -f <fip.bin> -k <Kernel image>
 - For example:
CMD:~/#> ./mk_image.sh -p mt7986a -d emmc -g GPT_EMMC -f fip.bin -k openwrt-mediatek-mt7986-mt7986a-ax8400-2500wan-emmc-rfb-squashfs-sysupgrade.bin
- The single image “mt7986-eMMC-single-image.bin” generated in the same folder.

How to Program Single Image by Programmer

The example of ALL-300G programmer

- Select eMMC flash type,



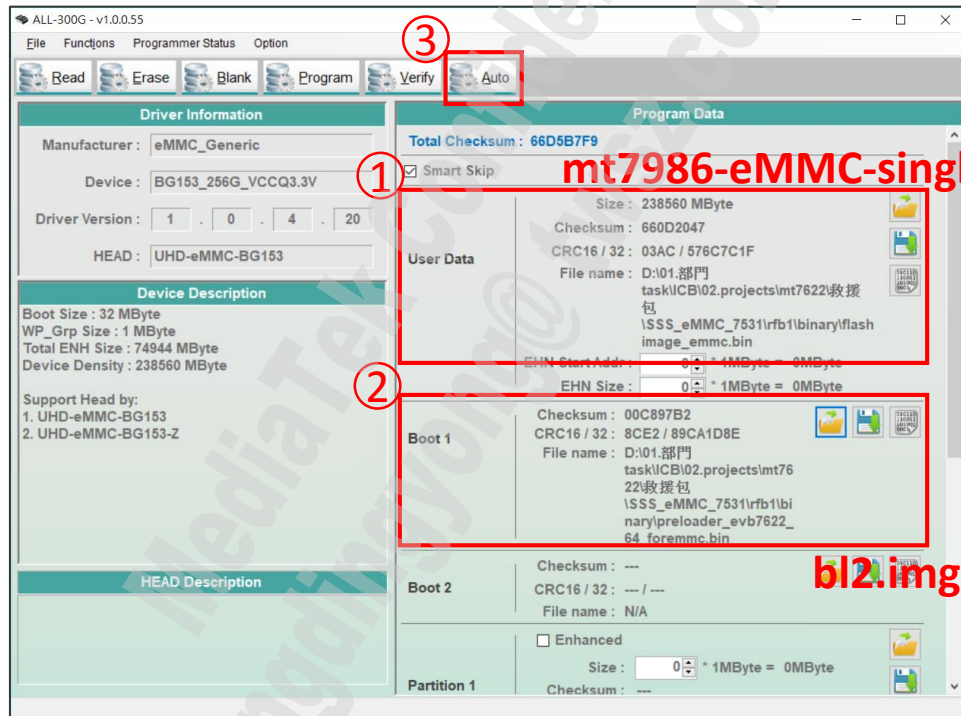
eMMC 4.5 → use BG153_256G_VCCQ3.3V

eMMC 5.1 → use BG153_256G_VCCQ1.8V

How to Program Single Image by Programmer

The example of ALL-300G programmer

- Load image,



How to Program Single Image by Programmer

The example of ALL-300G programmer

- Configure EXT_CSD register

Extended CSD register setting

☒ WR_REL_SET [167]

☒ Bit [0]: User Data ☒ Bit [1]: Partition 1 ☒ Bit [2]: Partition 2 ☒ Bit [3]: Partition 3 ☒ Bit [4]: Partition 4

☒ PARTITION_CONFIG [179] 0x 48

☐ BOOT_CONFIG_PROT [178] 0x 0

☒ BOOT_BUS_CONDITIONS [177] 0x 0

☐ BOOT_WP [173] 0x 0

☐ USER_WP [171] 0x 0

☐ FW_CONFIG [169] 0x 0

☐ BKOPS_EN [163] 0x 0

☒ RST_n_FUNCTION [162] 0x 1

☐ SEC_BAD_BLK_MGMNT [134] 0x 0

☐ EXT_PARTITIONS_ATTRIBUTE [53:52] 0x 0

PARTITION_SETTING_COMPLETED [155]

☒ Auto set PARTITION_SETTING_COMPLETED

☐ Manual set PARTITION_SETTING_COMPLETED = 0x 0

Production State Awareness (PSA)

PRE_LOADING_DATA_SIZE [25:22] 0x 0

PRODUCTION_STATE_AWARENESS [133] Disable

ext_csd[162] = 0x01
 ext_csd[167] = 0x1F
 ext_csd[177] = 0x00
 ext_csd[179] = 0x48

How to Program Single Image by Programmer

The example of ALL-300G programmer

- Start program,

Check

①

②

③

④

⑤

⑥

Auto

Manufacturer : eMMC_Generic

Device : BG153_256G_VCCQ3.3V

Total Checksum : 66D5B7F9

Items		Programmer																Counter	
		Socket #																	
Site#	Status	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	Pass	Fail
0																		0	0
1																		0	0
2																		0	0
3																		0	0
4																		0	0
5																		0	0
6																		0	0
7																		0	0

Total : 0 0

Reset Counter

Run Close

MediaTek Proprietary and Confidential

© 2021 MediaTek Inc. All rights reserved. The term “MediaTek” refers to MediaTek Inc. and/or its affiliates.

This document has been prepared solely for informational purposes. The content herein is made available to a restricted number of clients or partners, for internal use, pursuant to a license agreement or any other applicable agreement and subject to this notice. THIS DOCUMENT AND ANY ORAL INFORMATION PROVIDED BY MEDIATEK IN CONNECTION WITH THIS DOCUMENT (COLLECTIVELY THIS “DOCUMENT”), IF ANY, ARE PROVIDED “AS IS” WITHOUT WARRANTY OF ANY KIND, WHETHER EXPRESS, IMPLIED, STATUTORY, OR OTHERWISE. MEDIATEK DOES NOT WARRANT OR MAKE ANY REPRESENTATIONS OR GUARANTEE REGARDING THE USE OR THE RESULT OF THE USE OF THIS DOCUMENT IN TERMS OF CORRECTNESS, ACCURACY, TIMELINESS, RELIABILITY, OR OTHERWISE. MEDIATEK SPECIFICALLY DISCLAIMS ALL WARRANTIES OF MERCHANTABILITY, NON-INFRINGEMENT AND FITNESS FOR A PARTICULAR PURPOSE AND ANY WARRANTIES ARISING OUT OF COURSE OF PERFORMANCE, COURSE OF DEALING OR USAGE OF TRADE. This Document must be held in strict confidence and may not be communicated, reproduced, distributed or disclosed to any third party or to any other person, or being referred to publicly, in whole or in part at any time except with MediaTek’s prior written consent, which MediaTek reserves the right to deny for any reason. You agree to indemnify MediaTek for any loss or damages suffered by MediaTek for your unauthorized use or disclosure of this Document, in whole or in part. If you are not the intended recipient of this document, please delete and destroy all copies immediately.



MEDIATEK

everyday genius