

MPU Gang Writer G1 User Manual

Support Platforms N32926, N9H26, N3290x, N9H20 series

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1 OVERVIEW

MPU GANG Writer G1 programmer is a NAND Flash writer that can do offline programming up to 8 NAND Flash at a time. There are eight micro SD cards included in this programmer, which store user's target images waiting to be programed into NAND Flash. MPU GANG Writer G1 programmer supports the following platforms, include N32926, N9H26, N3290x, N9H20 series.

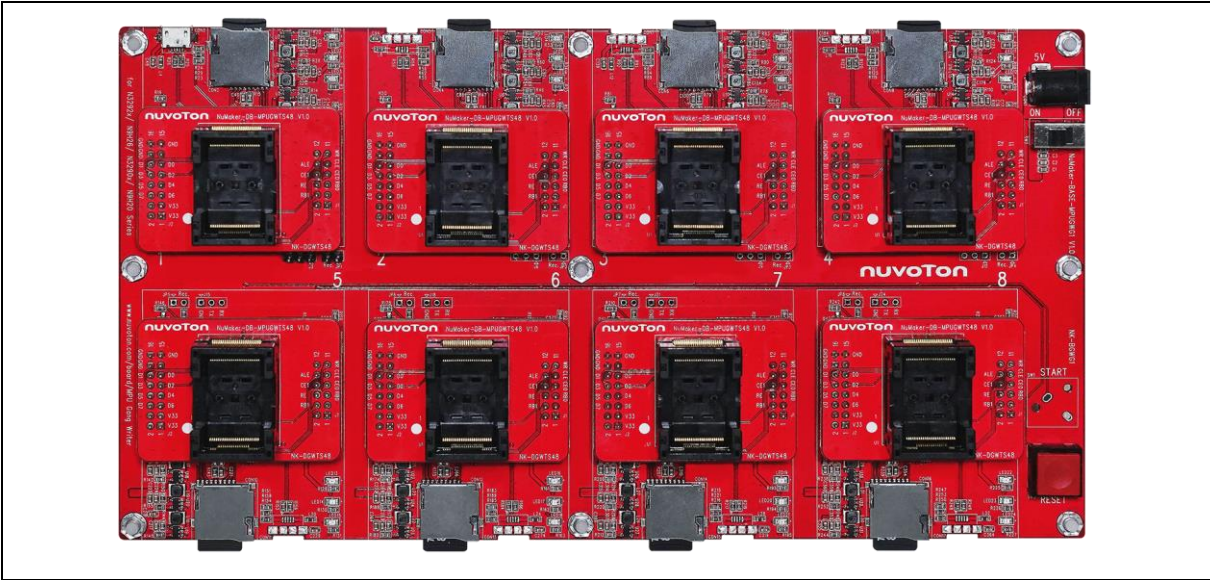


Figure 1-1 MPU Gang Writer G1 Board

1.1 Board Part Number and Information

The following table lists the part number of this board, and ordering number.

Part Number	Ordering Number	Support Devices	NAND Flash Package Type
NuMaker-MPUGWG1-TS48	NK-GWG1TS48	N32926, N9H26, N3290x, N9H20 Series	TSOP-48

Table 1-1 Board Part Number and Information

2 FEATURES

- 8 pcs of N32926U6DN: LQFP128 pin MCP package with DDR2 (64 MB), which can run up to 240 MHz operating speed
- 8 pcs of SD: User SD card for system booting, data storage
- UART: Connected to TX/RX for system development, debug message output
- 8 pcs of USB port-0 that can be used as Device
- 3.3V I/O power, 1.8V Memory power and 1.2V core power
- NAND Flash Writer for N32926, N9H26, N3290x, N9H20 series boot up image

3 HARDWARE CONFIGURATION

3.1 Front View

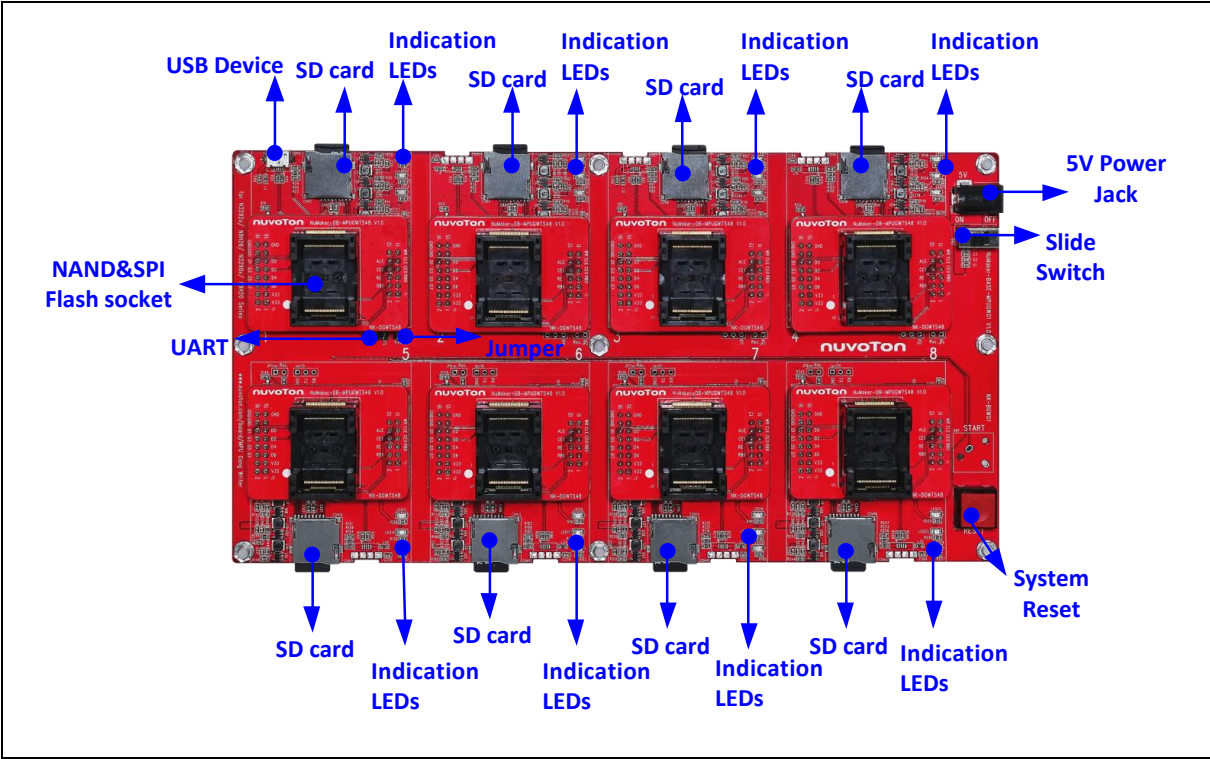


Figure 3-1 Front View of MPU Gang Writer G1

Figure 3-1 shows the main components and connectors from the front side of MPU Gang Writer G1.

- 5V Power Jack (CON1): This power jack needs to connect an extra adapter to supply DC 5V/2A power input for this MPU Gang Writer G1.
- Slide Switch (SW1): To switch the input 5V voltage to supply power to this MPU Gang Writer G1
- System Reset (SW3): System will be reset if the SW3 button is pressed.
- User indication LEDs:

Color	GPIO pin of N32926
Yellow	PB0
Green	PB1
Red	PB2

- Jumper (JP1): Configuration N32926 group 1~8 boot mode.

Jumper	Boot mode
Short	Recovery mode
Open	Normal mode

- UART (J3): N32926 debug message output.

J3	Pin name
1	UR_RX
2	UR_TX
3	GND

- SD card (CON2, CON4, CON6, CON8, CON10, CON12, CON14, CON16): Use MicroSD/eMMC memory card for system booting, data storage.
- NAND & SPI Flash socket (J1, J2, J4, J5, J7, J8, J10, J11, J13, K14, J16, J17, J19, J20, J22, J23): A physical connector that allows NAND Flash or SPI Flash to be easily inserted, removed, and replaced on the MPU Gang Writer G1.
- USB Device (CON3, JP1): Micro USB Device connector to connect to PC.
- SOC CPU: N32926U6DN (U1, U5, U9, U13, U17, U21, U25, U29)

4 MPU GANG WRITER G1 FIRMWARE

The MPU Gang Writer G1 is a firmware executed on the MPU Gang Writer G1 board to program the NAND Flash according to the image on MicroSD card. This document will guide you how to prepare the MicroSD card, modify the configuration file, and execute it to program NAND Flash.

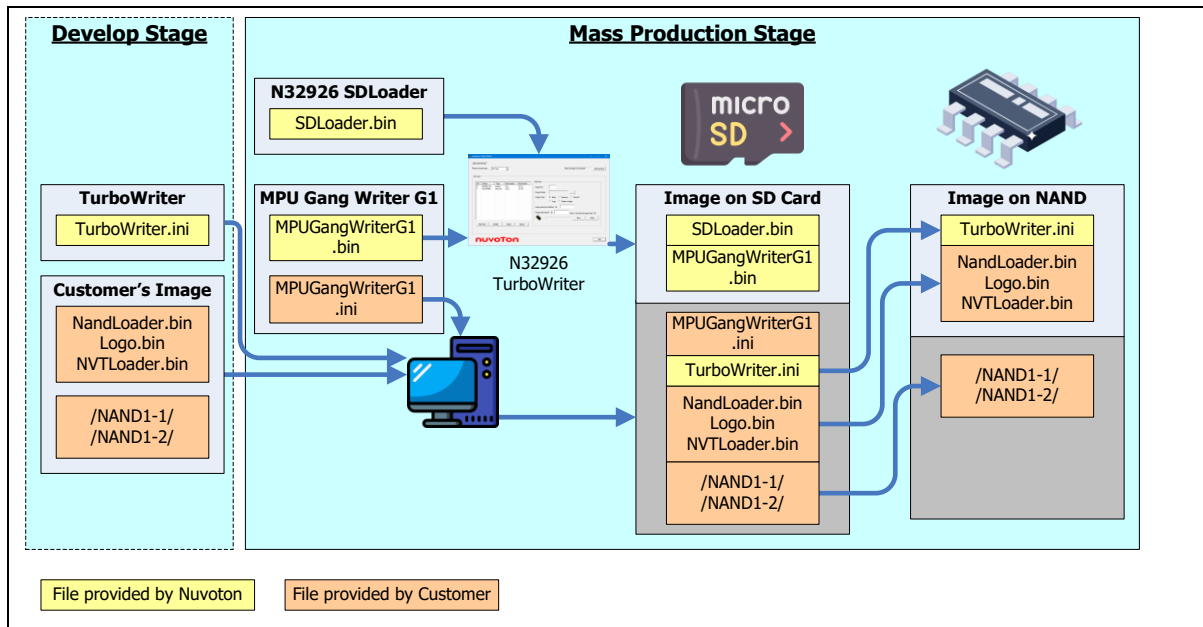


Figure 4-1 MPU Gang WRITER G1 Firmware

The N329 series has two boot flows – one is Normal mode; the other is Recovery mode. For N32926, the boot flows are below:

- The Normal mode boot flow is SD card 0 boot → NAND 0 boot → NAND 1 boot → SPI boot → SD card 1 boot → SD card 2 boot → USB boot
- The Recovery mode boot flow is USB boot only.

The MPU Gang Writer G1 utilizes the character of Normal mode to load code of **MPUGangWriterG1.bin** from SD card 0. When **MPUGangWriterG1.bin** program executes, it will read the configuration file, **MPUGangWriterG1.ini**, from SD card 0 and then program the NAND Flash according to the setting in **MPUGangWriterG1.ini**.

The MPU Gang Writer G1 can program the NAND Flash for all N329 series such as N3290x, and N3292x. Different series will use different **TurboWriter.ini** setting. The **TurboWriter.ini** setting can be defined by the keyword "[TurboWriter INI]" in the configuration file **MPUGangWriterG1.ini**.

Download location:

https://github.com/OpenNuvoton/N32926_NonOS_BSP/tree/master/MPU_Gang_Writer_G1/

4.1 Checklist before Operation

4.1.1 Development Stage

When product development is completed, the customer should already have the following files. Please prepare them before using the MPU Gang Writer G1.

Items	Source	Description
TurboWrite.ini	Nuvoton	The configuration file of TurboWriter for target CPU .

NandLoader.bin	Nuvoton / Customer	The NAND Loader firmware for target CPU . The original firmware is provided by Nuvoton. However, it could be modified by the customer.
Logo.bin	Customer	(Optional) The Logo image displayed on the panel when booting.
NVTLoader.bin	Nuvoton / Customer	The NVT Loader firmware for target CPU . The original firmware is provided by Nuvoton. However, it could be modified by the customer.
/NAND1-1/	Customer	The firmware or any data files for product.
/NAND1-2/	Customer	Any data files for product.

4.1.2 Mass Production Stage

Please prepare following files or tools before using the MPU Gang Writer G1 for mass production.

Items	Source	Description
SDLoader.bin	Nuvoton	The N32926 SD Loader firmware.
MPUGangWriterG1.bin	Nuvoton	The MPU Gang Writer G1 firmware.
MPUGangWriterG1.ini	Nuvoton / Customer	The configuration file of MPU Gang Writer G1. The original firmware is provided by Nuvoton. However, it could be modified by the customer.
N32926 TurboWriter	Nuvoton	The N32926 TurboWriter tool. Download location: N32905_NonOS_Tool/TurboWriter/TurboWriter_V2.30.003_N329x6_at_master · OpenNuvoton/N32905_NonOS_Tool · GitHub Please note that this TurboWriter may be different from the TurboWriter used during development stage. For development stage, it is TurboWriter for target CPU. For mass production stage, it is TurboWriter for N32926.
MPU Gang Writer G1 board	Customer	The hardware for MPU Gang Writer G1 board.
MicroSD card	Customer	The MicroSD card as a mass production tool.
MicroSD card reader	Customer	The MicroSD card reader is used to copy files from PC to MicroSD card.
NAND Flash IC	Customer	The NAND Flash chip as a part of product.

4.2 Firmware Operation

4.2.1 Modify MPU Gang Writer G1 Configuration File

The MPU Gang Writer G1 configuration file, *MPUGangWriterG1.ini*, should be modified by the customer to match the requirements of product. When the *MPUGangWriterG1.ini* modification is completed,

please copy it to the root folder of the MicroSD card. The MPU Gang Writer G1 will read it from the MicroSD card root folder.

The *MPUGangWriterG1.ini* file provides some sections as follows:

```
[TurboWriter INI]
// Please copy the tag from TurboWriter.ini for target CPU
N3292 USER_DEFINE

[NAND1-1 FAT FILE]
// -1 to skip NAND1-1 copy, 0 to use DiskImage without MBR,
// 1 to Use FAT file, 2 to use DiskImage with MBR
1

[NandLoader File Name]
// All file name length MUST <= 511 bytes
// Unavailable if [NAND1-1 FAT FILE] is -1
NANDLoader.bin

[Logo File Name]
// Unavailable if [NAND1-1 FAT FILE] is -1
Logo.bin

[NVTLoader File Name]
// Unavailable if [NAND1-1 FAT FILE] is -1
NVTLoader_NAND.bin

[System Reserved MegaB]
// Unit : Mega Byte
2

[NAND1-1 DISK SIZE]
// Unit : Mega Byte (default : 16MB)
// This specify Nand1-1 partition size, total capacity - Nand1-1 = Nand1-2 partition size
// Unavailable if [NAND1-1 FAT FILE] is 2
32

[NAND1-2 FAT FILE]
// Unavailable if [NAND1-1 FAT FILE] is 2
// -1 to skip NAND1-2 copy, 0 to use DiskImage without MBR, 1 to Use FAT file
1
```

[NANDCARD FAT FILE]

// -1 to skip NANDCARD copy, 0 to use DiskImage without MBR,
 // 1 to Use FAT file, 2 to use DiskImage with MBR
 -1

[TIMEOUT SECOND]

// -1 to disable TIMEOUT feature. Other positive integer for TIMEOUT seconds.
 -1

Due to its limited parsing ability of **MPUGangWriterG1.bin**, there are some constraints in **MPUGangWriterG1.ini** as listed below:

- No space is allowed to precede the option for each line.
- Only “//” comment is allowed at the beginning of each line
- String in “[]” is not allowed to be changed.
- Only “[Logo File Name]”, “[NVTLoader File Name]” and “[System Reserved MegaB]” section is optional for its setting. The others are must.

[TurboWriter INI]

Please copy the tag from **TurboWriter.ini** for target CPU to here. For example, if the target CPU is **N32905**, the tag should be “**N3290 USER DEFINE**”.

```
[ ADDRESS]
ADDRESS = 00900000
[CLOCK_SKEW]
DQS0DS = 00001010
CKDQSDS = 00888800
[N3290 USER DEFINE]
B0003010 = 00000005
```

Figure 4-2 The Tag of TurboWriter INI

[NandLoader File Name] / [NVTLoader File Name]

It allows changing the firmware file name for burning. Below sample changes the file name from **NandLoader.bin** to **Nuvoton.bin** for “[NandLoader File Name]” section. Please note that the file name length MUST be less than or equal to 31 bytes.

[NandLoader File Name]

Nuvoton.bin

[Logo File Name]

If the logo file is not necessary for the NandWriter, below two methods are all to skip burning **Logo.dat** into the NAND Flash.

[Logo File Name]

//Logo.dat

or

[Logo File Name]

[System Reserved MegaB]

If the “[System Reserved MegaB]” section is not provided, the default reserved size is **8** Mega Bytes for it.

[NAND1-1 FAT FILE] / [NAND1-2 FAT FILE] / [NANDCARD FAT FILE]

Regarding the copy for Nand1-1, Nand1-2, Nand2, and Nandcard, it provides 4 options:

- Option “-1”: Skip to check the Nand1-x folder.
- Option “0”: NandWriter copy file **content.bin** on Nand1-x folder in SD card through GNAND to Nand1-x partition. It gets the best performance but it need to prepare the disk image by **NRomMaker** tool or Linux
- Option “1”: NandWriter copy those files on Nand1-x folder in SD card through FAT to Nand1-x partition.
- Option “2”: Like option “0” but the disk image must include partition table (MBR, Master Boot Record).

Please note that the value [NAND1-1 FAT FILE] could influence the action of other options.

- If NAND1-1 is -1 (skip), NandWriter do nothing at first NAND on CS0 interface. It includes all files in System Reserved Area and NAND1-2.
- If NAND1-1 is 2 (disk image with MBR), the options [NAND1-1 DISK SIZE] and [NAND1-2 FAT FILE] are unavailable since they are decided by MBR within disk image, not by NandWriter.

[TIMEOUT SECOND]

The MPU Gang Writer G1 can also turn on the FAIL LED if the NAND programming cannot be completed within the timeout interval. The timeout interval can be defined by the keyword “[TIMEOUT SECOND]” in the configuration file **MPUGangWriterG1.ini**.

Set the timeout time for MPU Gang Writer G1 in seconds. The MPU Gang Writer G1 will turn on the FAIL LED if the NAND programming cannot be completed within this timeout time. -1 to disable timeout feature.

4.2.2 Prepare MicroSD Card

The first step to execute MPU Gang Writer G1 is to prepare a MicroSD card with MPU Gang Writer G1 firmware, configuration file, and the content of NAND Flash. The MicroSD card must reserve some space to store the **SDLoader.bin** and **MPUGangWriterG1.bin** before usage. The procedure is described below:

1. Short jumper “Rec.” on the MPU Gang Writer G1 board group 1 to become Recovery mode.
2. Connect USB cable between the MPU Gang Writer G1 board group 1 and PC.

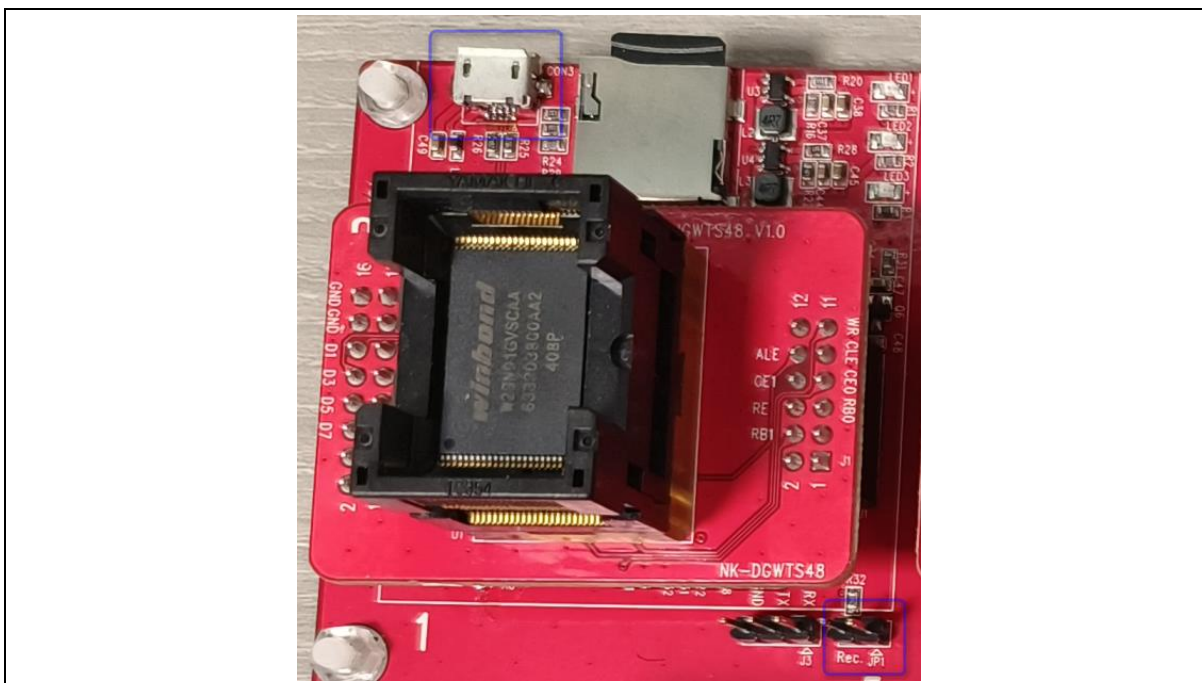


Figure 4-3 MPU Gang Writer G1 Group 1

3. Launch N32926 TurboWriter on PC.
4. Power on MPU Gang Writer G1 board and then click “Re-Connect” button on TurboWriter.

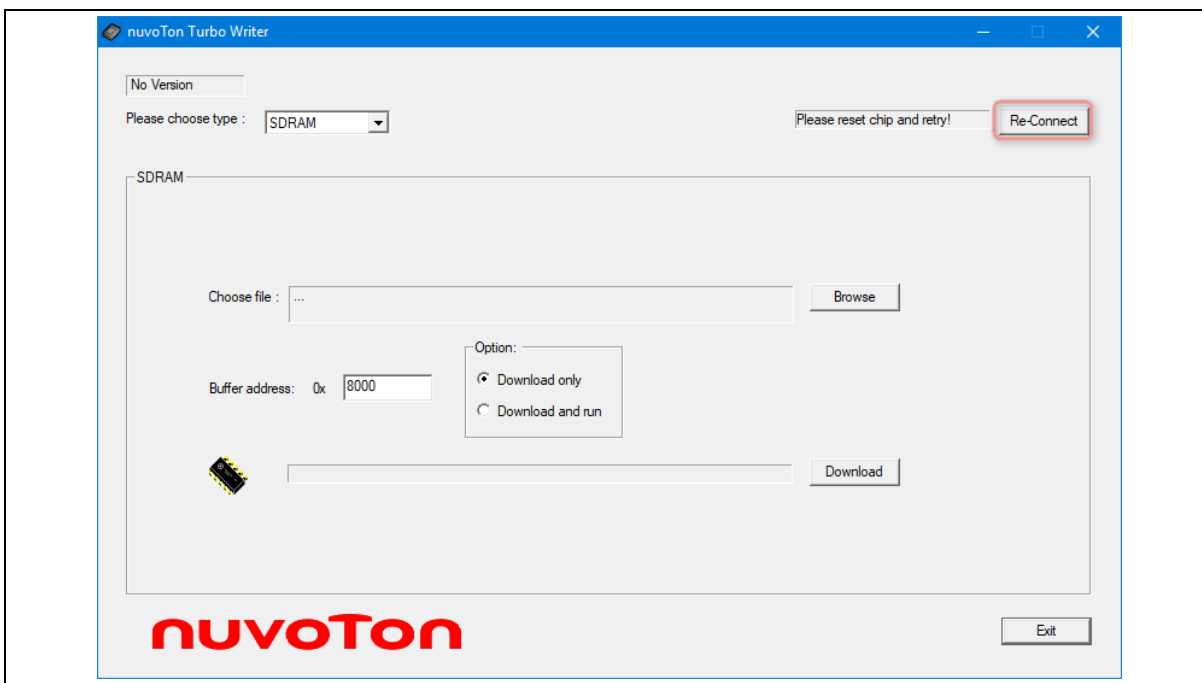


Figure 4-4 TurboWriter tool operation (1)

- After connected, insert MicroSD card to NandWriter board and select “SD Card” on TurboWriter.

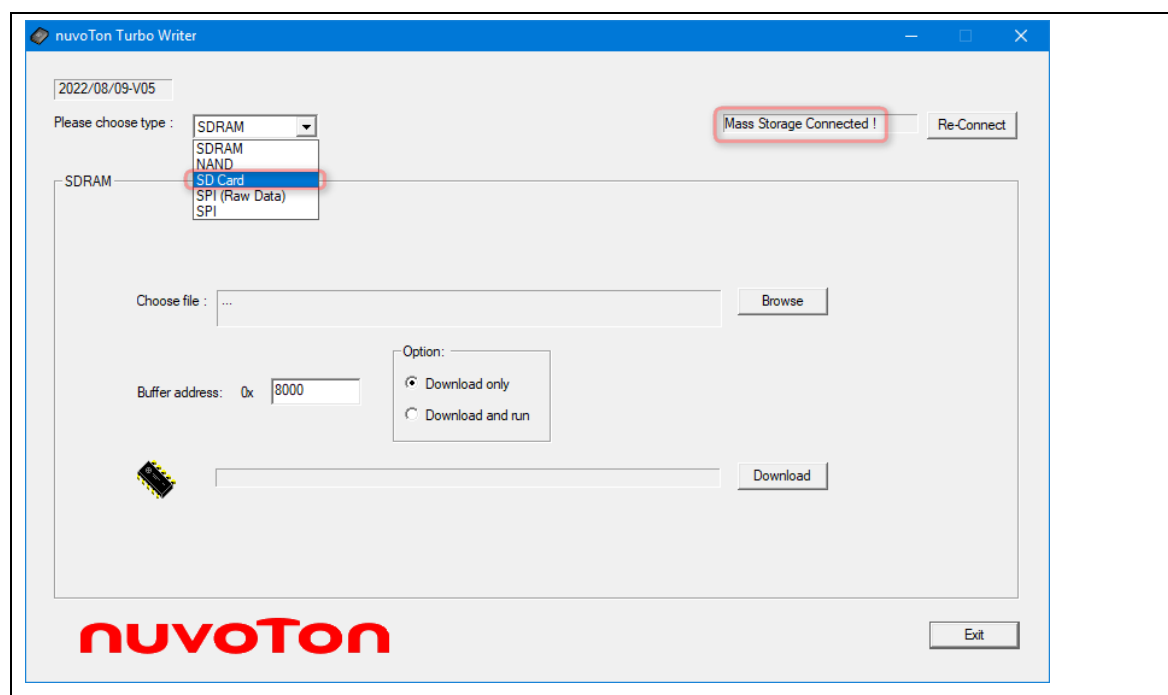


Figure 4-5 TurboWriter Tool Operation (2)

- Set the “System Reserved Area Size” and “Enable SD Format” on “Option” page.
- Please note to check the “Enable SD Format” option to format MicroSD card. If you format MicroSD card under Windows system, it does not reserve System Reserved Area Size on MicroSD card and cannot boot MicroSD card in N32926 system.

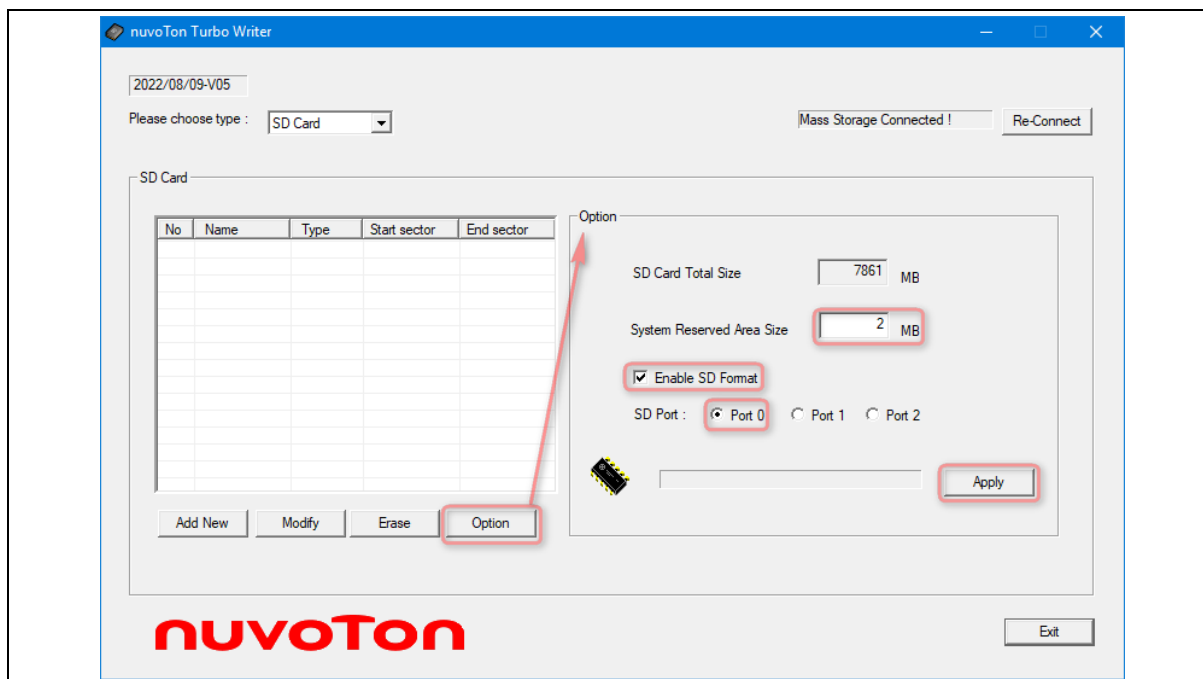


Figure 4-6 TurboWriter Tool Operation (3)

8. Program the **SDLoader.bin** as system image on “Add New” page

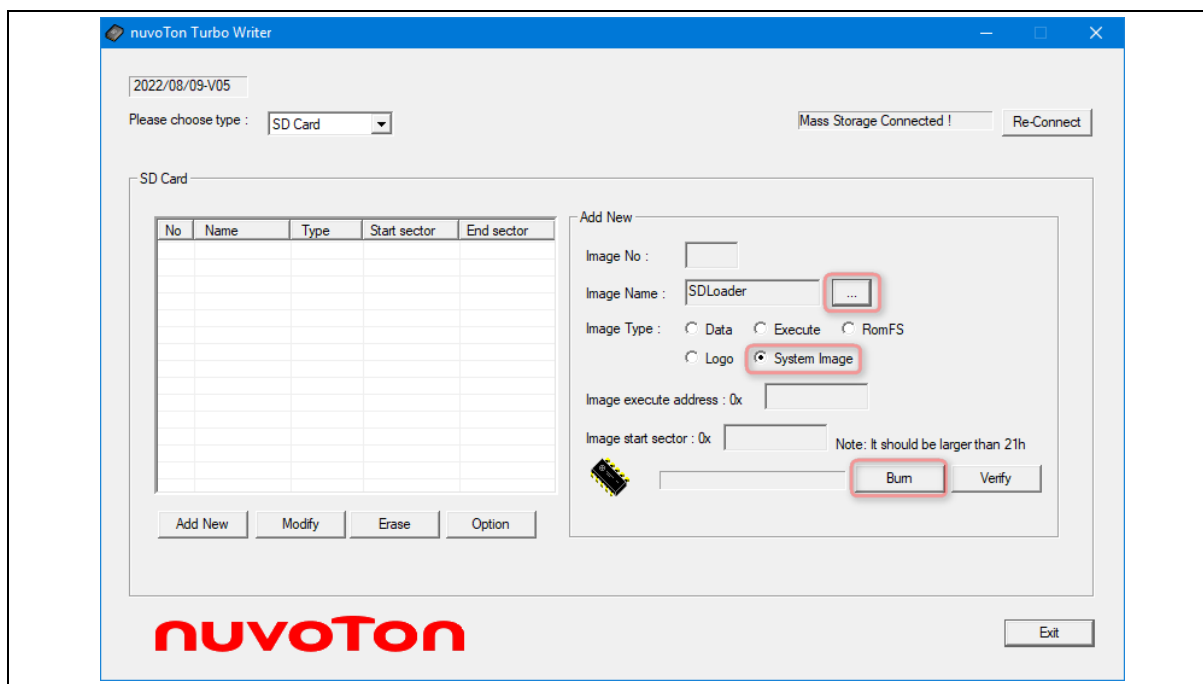


Figure 4-7 TurboWriter Tool Operation (4)

9. Program the **MPUGangWriterG1.bin** as execute image with “Image execute address” 0

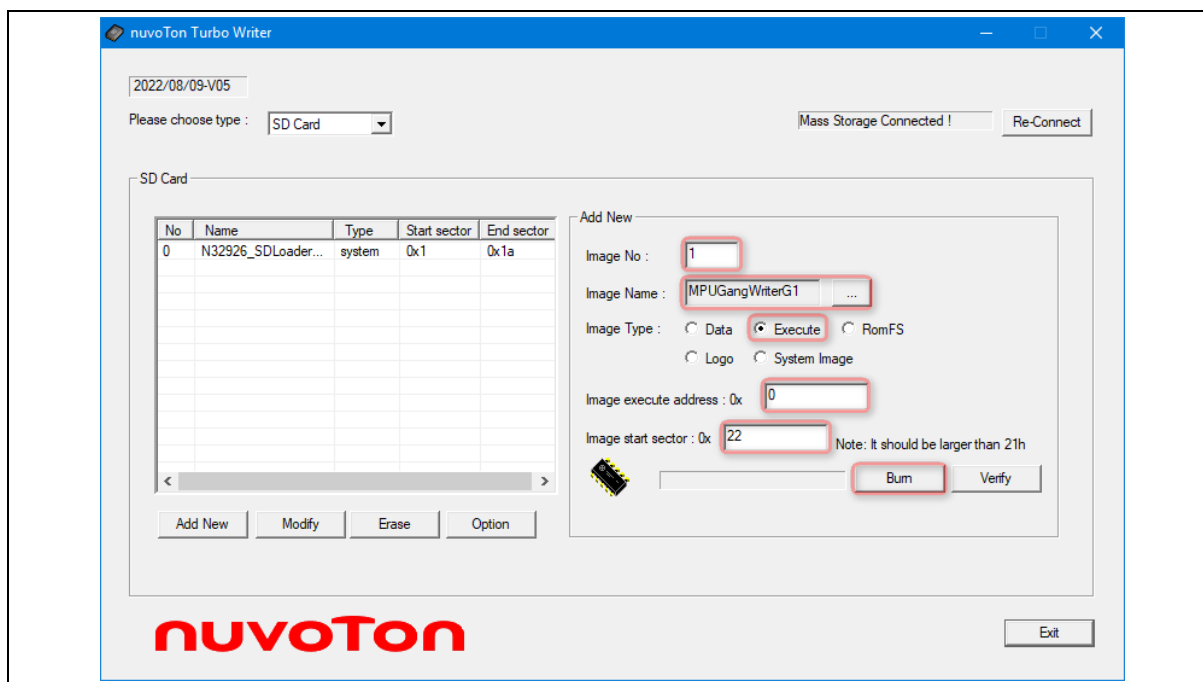


Figure 4-8 TurboWriter Tool Operation (5)

10. MicroSD card system reserved area is ready.

Please note that the two bin files are programmed in system reserved area of MicroSD card

and unreadable from normal MicroSD card reader.

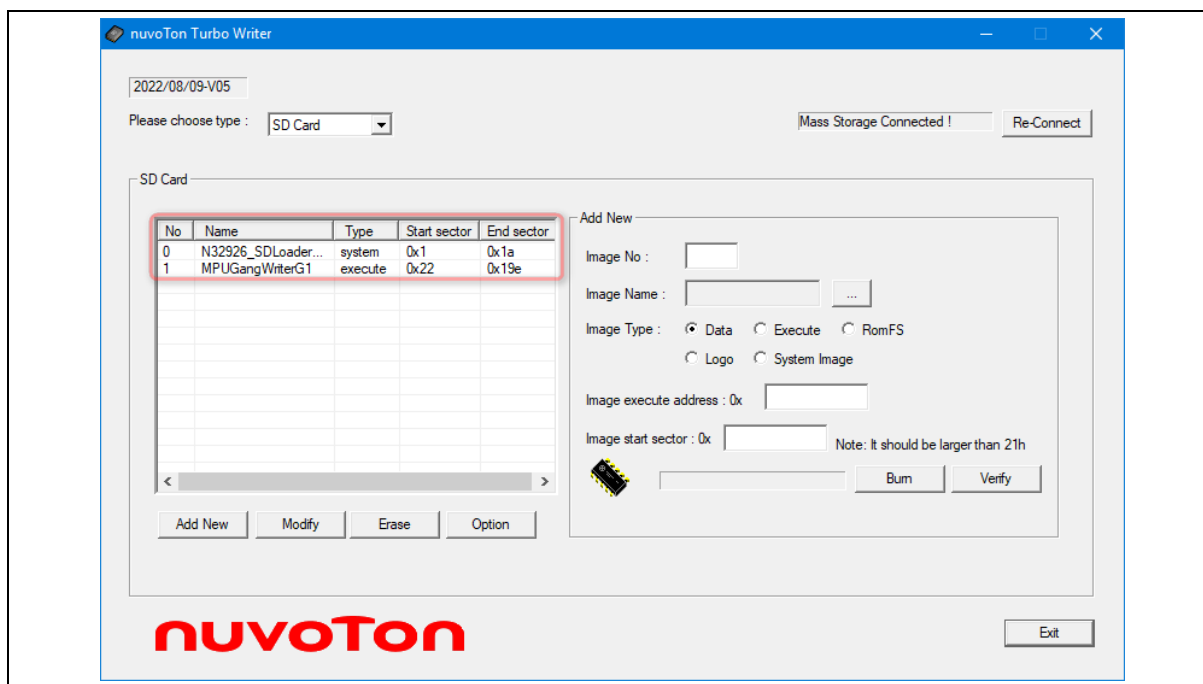


Figure 4-9 TurboWriter Tool Operation (6)

11. After program system reserved area of MicroSD card by TurboWriter, please put this MicroSD card to MicroSD card reader on PC and copy **MPUGangWriterG1.ini** and content files that are programmed to NAND Flash from PC to this MicroSD card. Typically, the content file on the MicroSD card should be as follows.

- /NAND1-1/ folder that includes customer's application bin file
- /NAND1-2/ folder that includes customer's data file
- MPUGangWriterG1.ini
- TurboWriter.ini
- NandLoader.bin
- Logo.bin (optional)
- NVTLoader.bin

Please note that the disk volume label of MicroSD card cannot be the same as any folder name in MicroSD card. For example, "NAND1-1" or "NAND1-2".

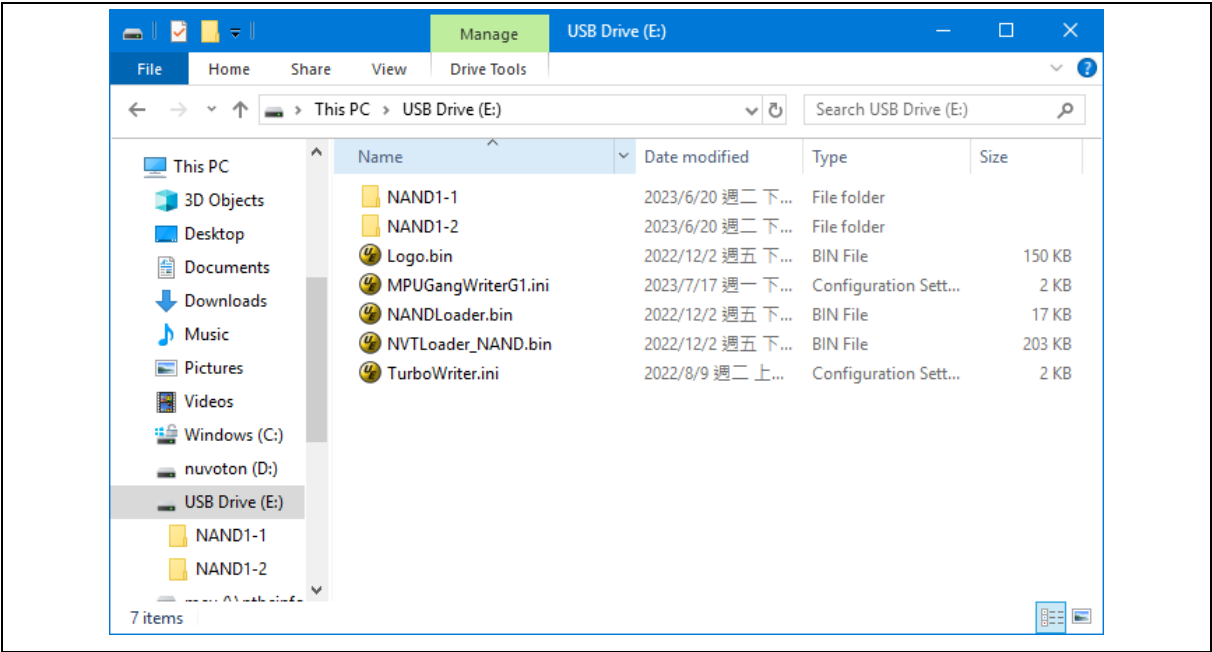


Figure 4-10 The File Copied to SD Card

5 QUICK START

The firmware runs on the MPU Gang Writer G1 board (referring to Chapter 4) and is used for programming NAND Flash memory based on the image stored on an SD card.

5.1 Operation Process

1. Insert SD card and NAND Flash chips to the Sockets.
2. Connect the 5V/2A power supply to the CON1 and slide SW1 to the ON position.
3. The LED behavior is defined in the table below. After the system is powered on, the yellow LED will blink. The green LED will illuminate when programming NAND Flash memory is Passed. The red LED will illuminate when programming NAND Flash memory is Failed.

Interface GPIO	Pins	Description
LED Yellow	PB0	Flash: Programming NAND Flash memory OFF: Program completed
LED Green	PB1	OFF: Programming NAND Flash memory ON: Program PASS
LED Red	PB2	OFF: Programming NAND Flash memory ON: Program FAIL

Table 5-1 LED Behavior

4. Once the programming is complete, replace the new NAND Flash chips. Press the System Reset button (SW3). Repeat Step 4 for all NAND Flash chips.

6 MPU GANG WRITER G1 SCHEMATICS

6.1 Block Diagram Schematic

Figure 6-1 shows the Block Diagram of the MPU Gang Writer G1 board.

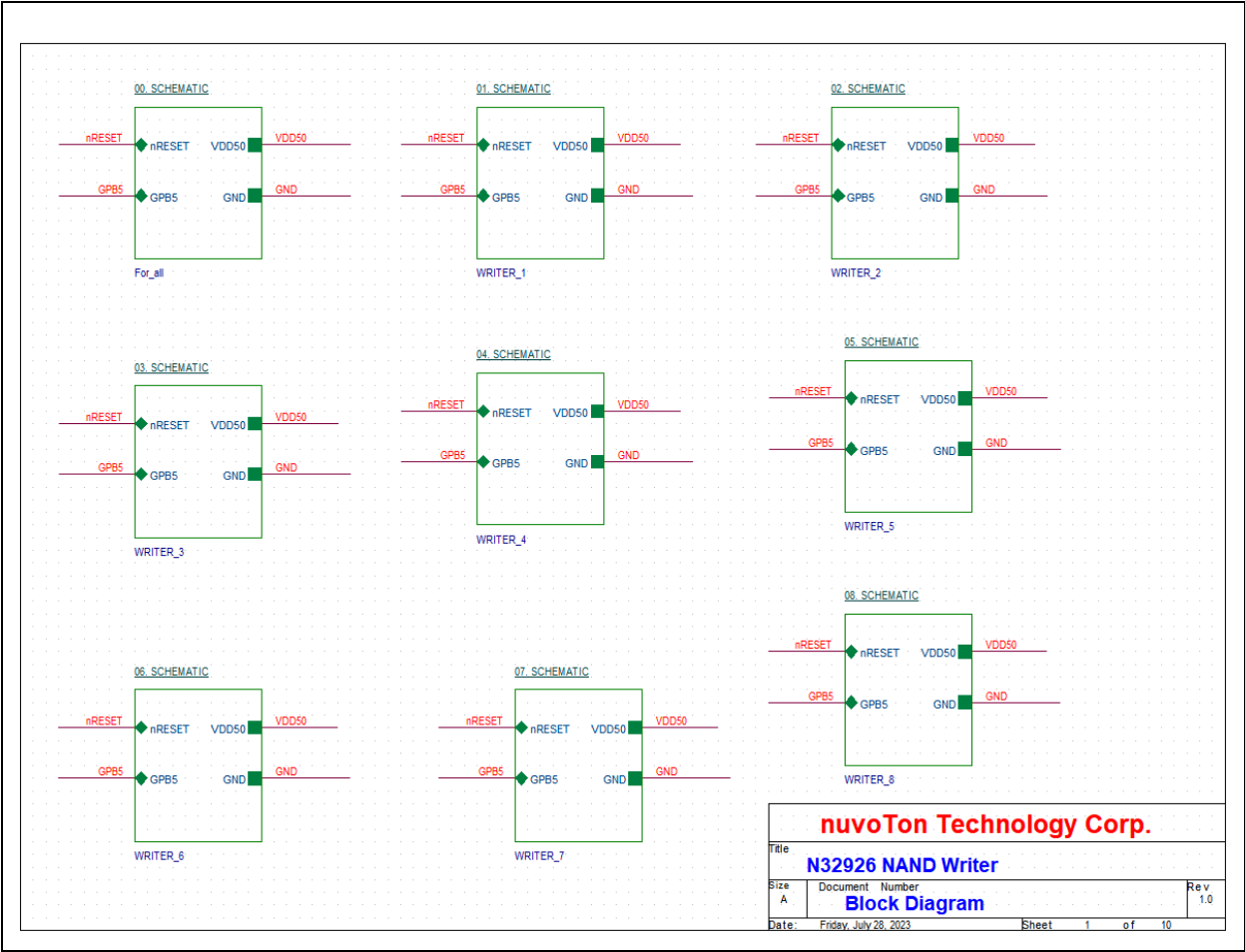


Figure 6-1 MPU Gang Writer G1 Block Diagram

6.2 Power

Figure 6-2 shows the power circuit of the MPU Gang Writer G1 board.

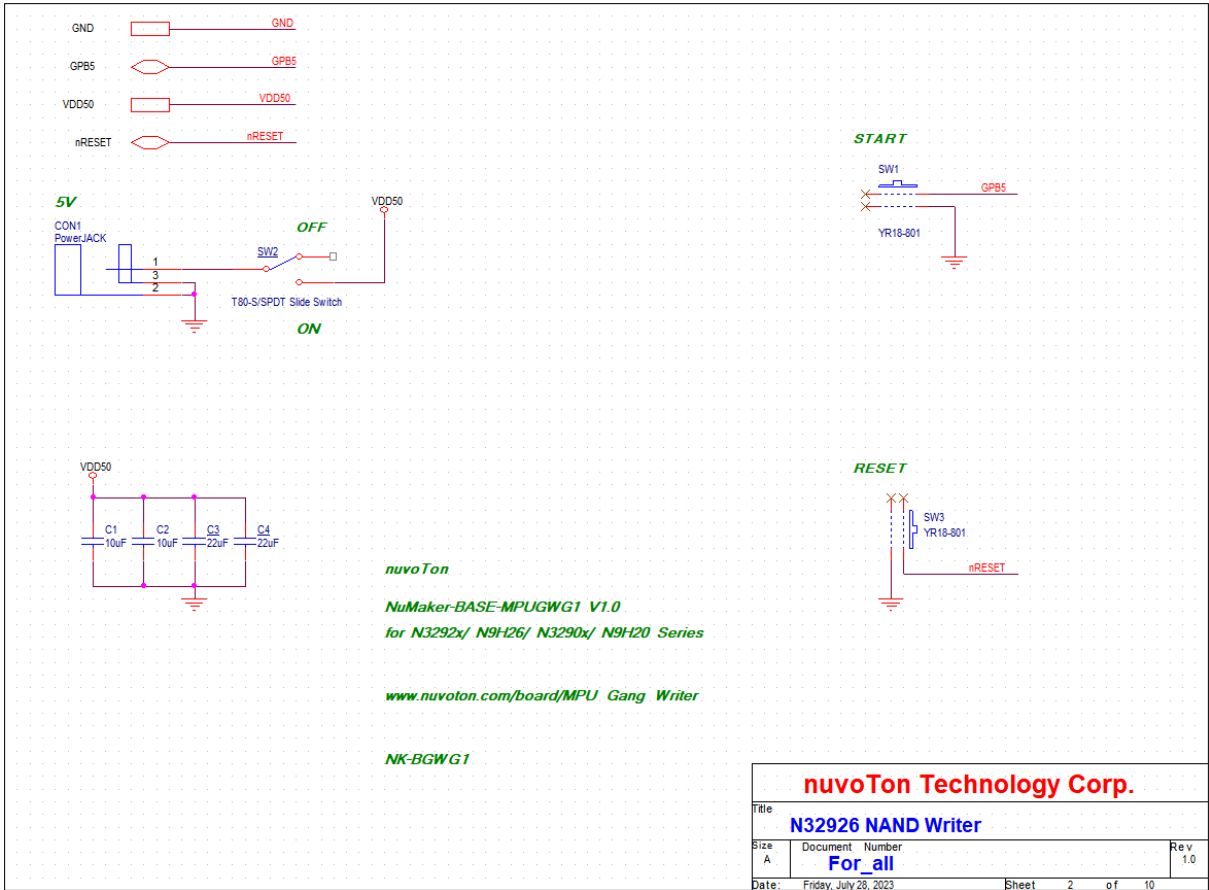


Figure 6-2 Power

6.3 Writer Group 1

Figure 6-3 shows the Writer Group 1 circuit of the MPU Gang Writer G1 board.

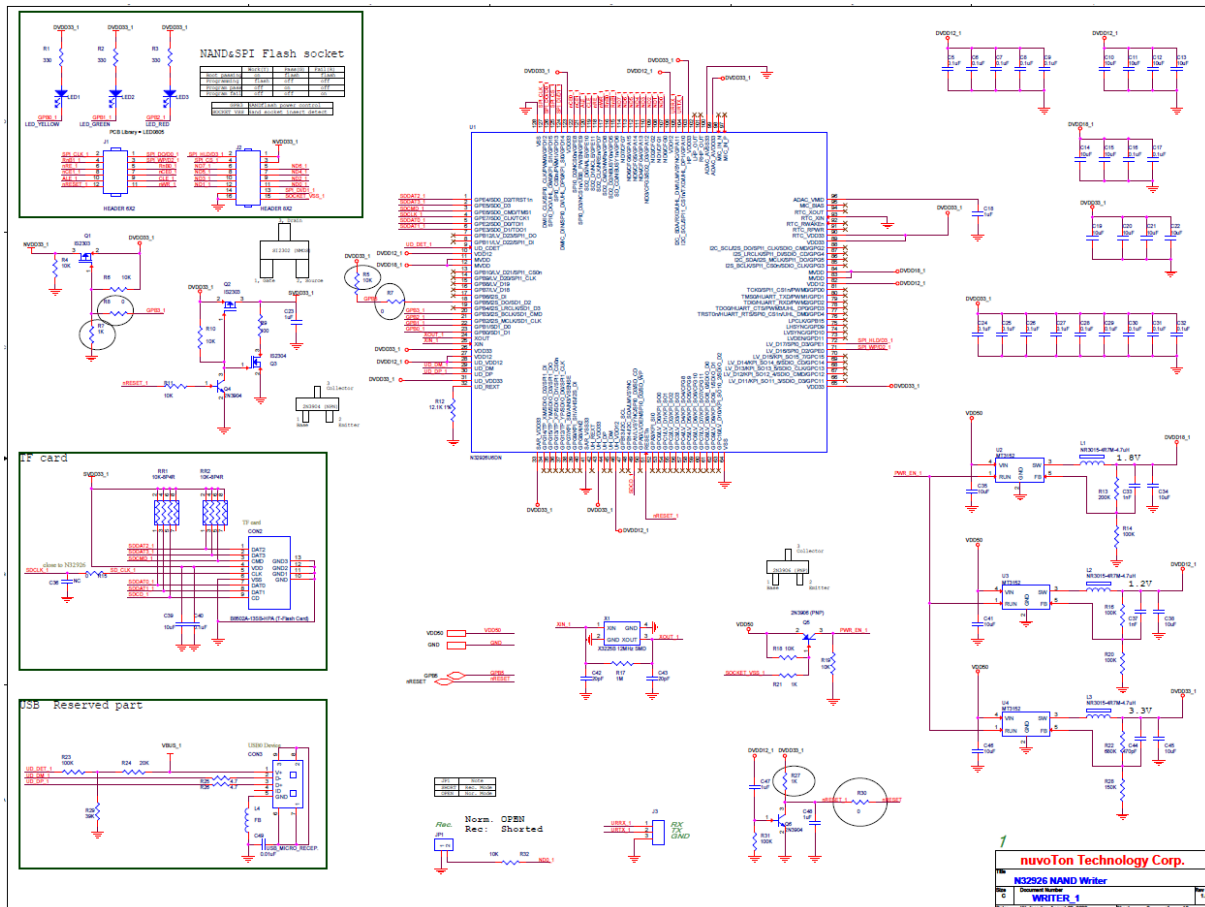


Figure 6-3 Writer Group 1

Figure 6-4 shows the Writer Group 2 circuit of the MPU Gang Writer G1 board.

Figure 6-4 Writer Group 2

Figure 6-5 shows the Writer Group 3 circuit of the MPU Gang Writer G1 board.



Figure 6-5 Writer Group 3

6.6 Writer Group 4

Figure 6-6 shows the Writer Group 4 circuit of the MPU Gang Writer G1 board.

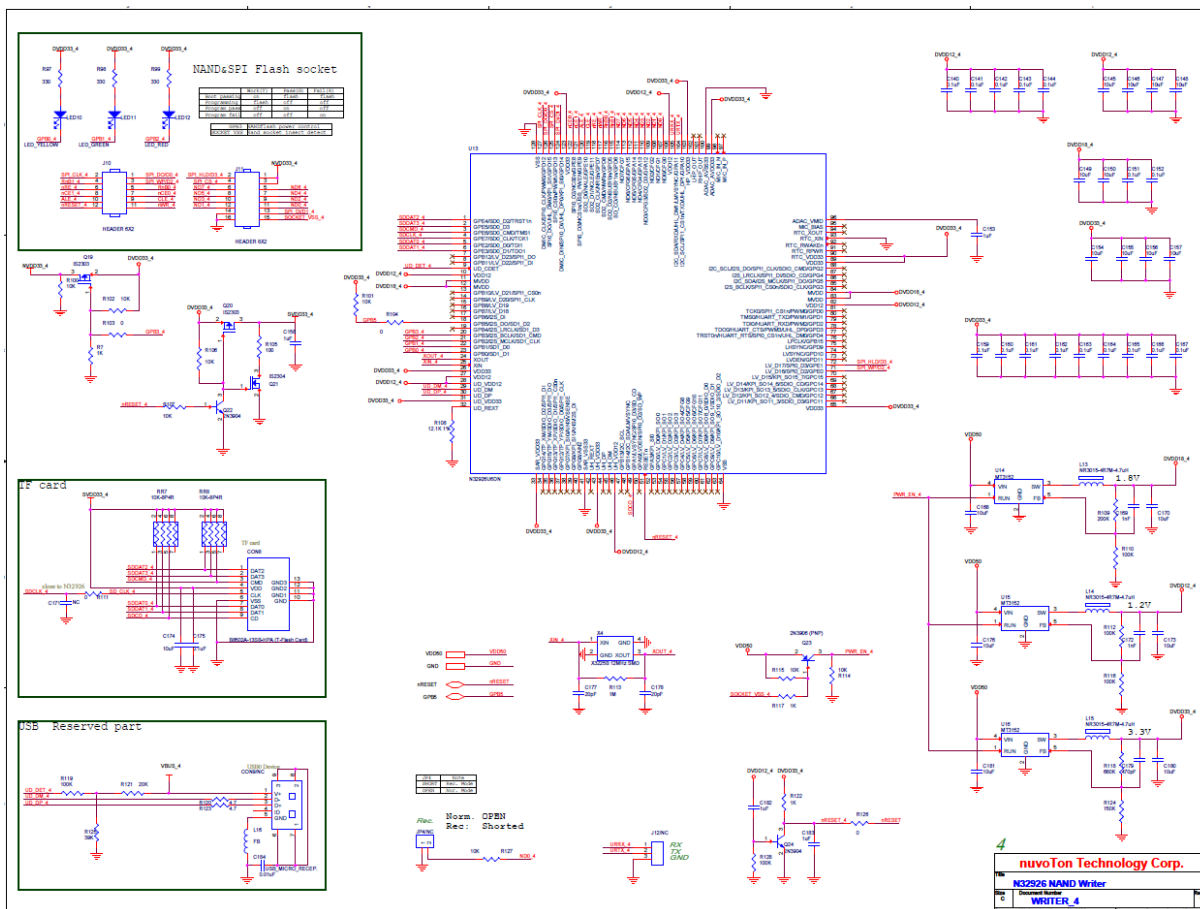


Figure 6-6 Writer Group 4

6.7 Writer Group 5

Figure 6-7 shows the Writer Group 5 circuit of the MPU Gang Writer G1 board.

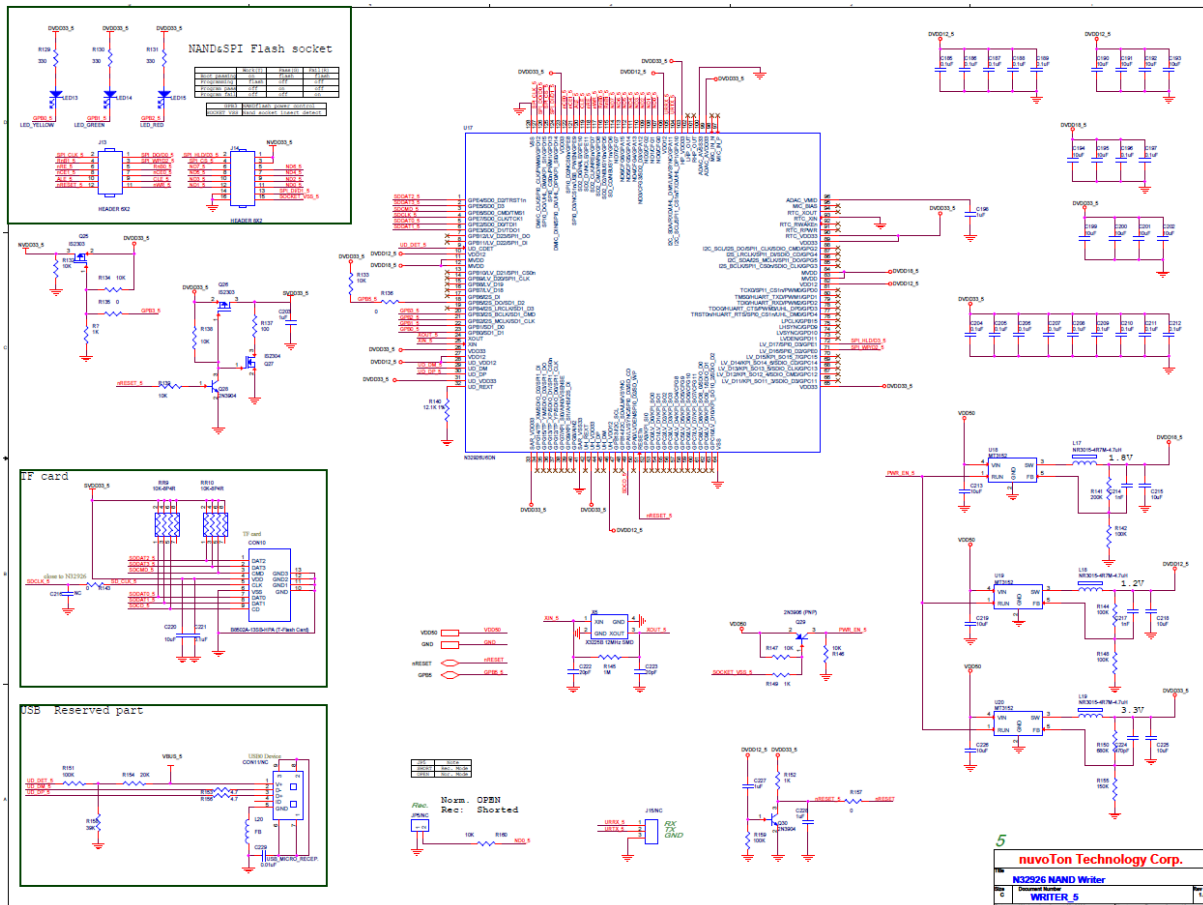


Figure 6-7 Writer Group 5

6.8 Writer Group 6

Figure 6-8 shows the Writer Group 6 circuit of the MPU Gang Writer G1 board.

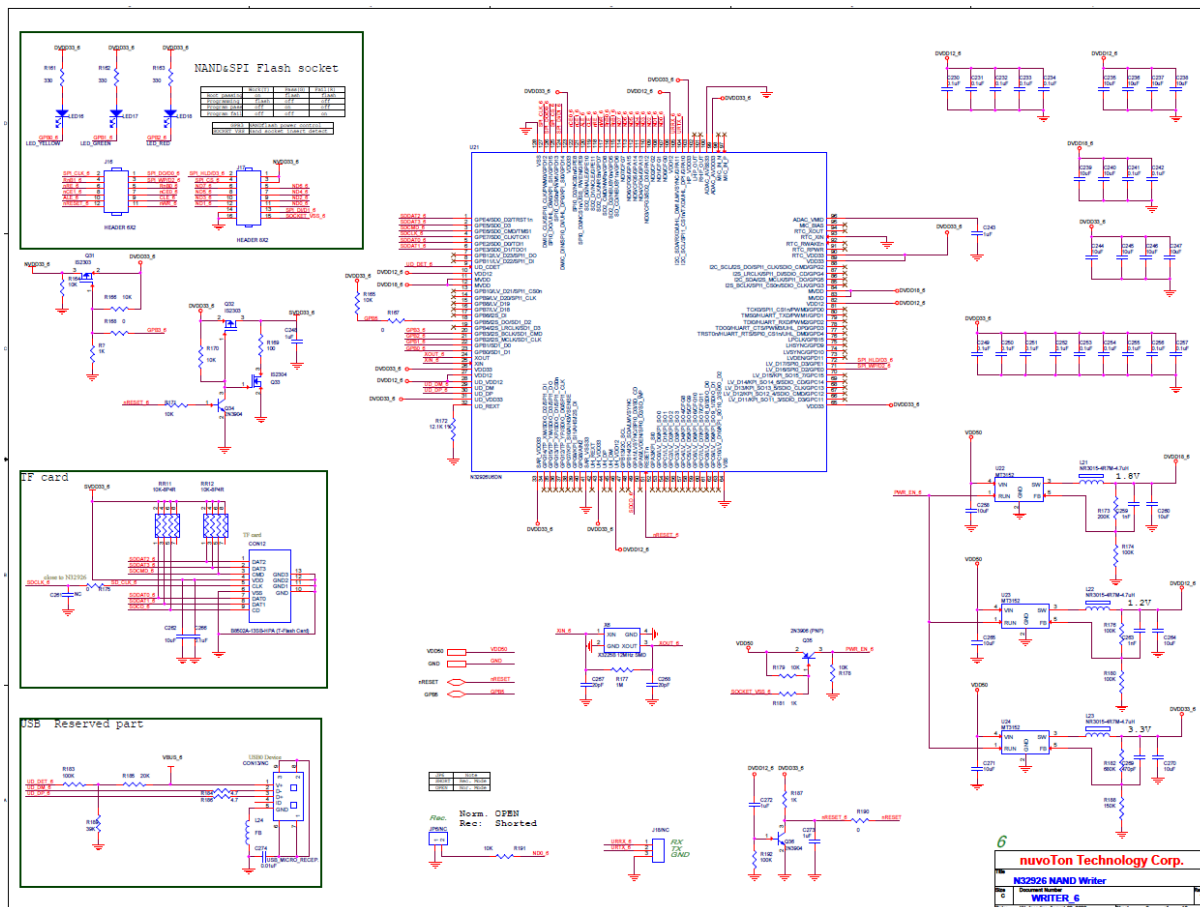


Figure 6-9 shows the Writer Group 7 circuit of the MPU Gang Writer G1 board.



Figure 6-9 Writer Group 7

6.10 Writer Group 8

Figure 6-10 shows the Writer Group 8 circuit of the MPU Gang Writer G1 board.

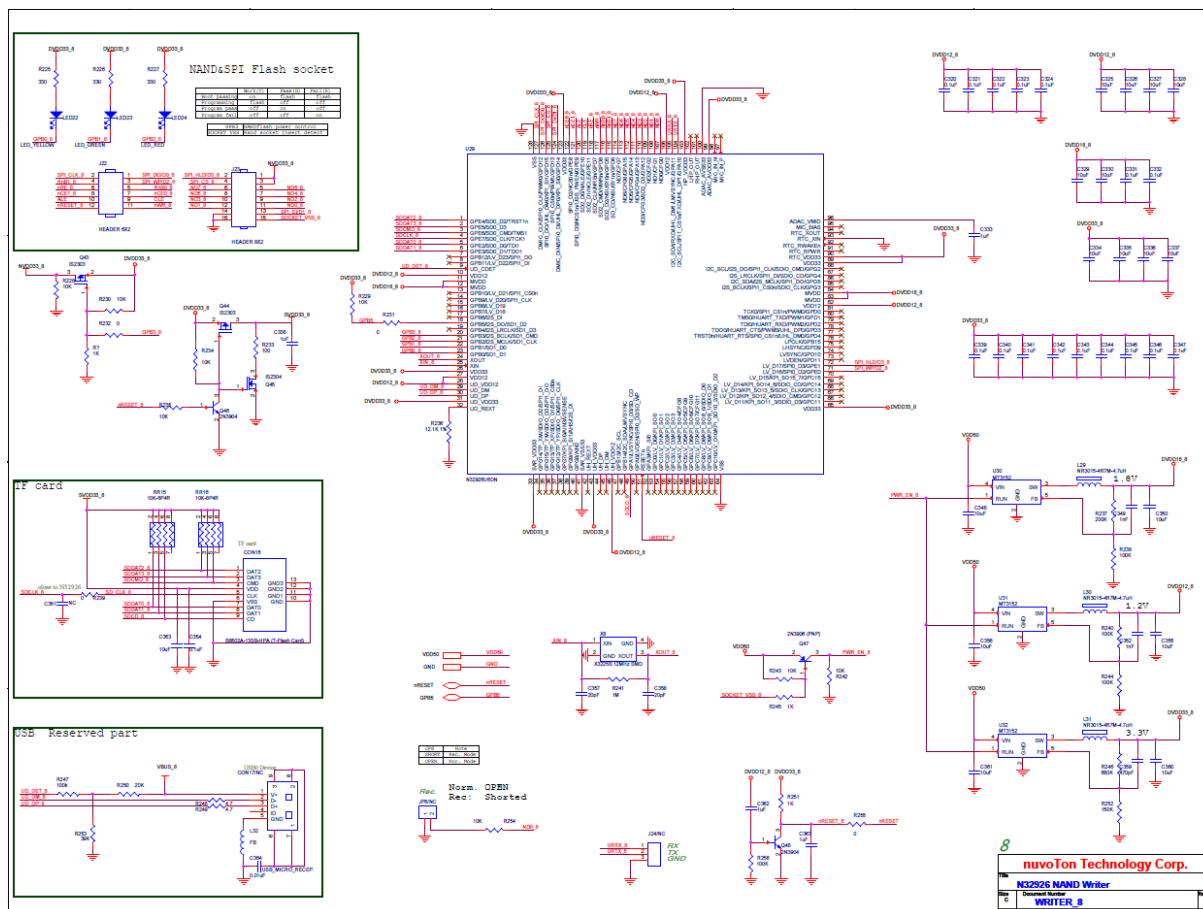


Figure 6-10 Writer Group 8

7 REVISION HISTORY

Date	Revision	Description
2023.09.06	1.00	● Initial version.
2024.01.15	1.01	● Add section 1.1.

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