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**How to work with Winbond Serial NAND Flash build-in ECC**

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**Introduction**

Winbond Serial NAND Flash family has built-in ECC engine that can be used to preserve the data integrity. Internal ECC calculation is done during page programming and put the ECC parity code in the dedicated address of the extra 64 bytes area (spare area) of each page. ECC engine verifies data values by the ECC parity code and to make necessary correction during the page read operation.

As above, the built-in ECC engine generate the ECC parity code of the whole 2Kbyte page data at one time. If there is partial page program, the built-in ECC engine also generate the ECC parity code for the unused address and update to the dedicated address in spare area.

Basically, Flash memory cell can't be changed from "0" logic state to "1" logic state by program operation. It means the ECC parity code of the second partial page program cannot overwrite the dedicated address in spare area. It is called "over program issue".

This document shows how to program the data to Serial NAND correctly while the built-in ECC engine is active.

**Blank page copy**

To conduct BBM (bad block management), bad block skip and maintain spare block are common method. Software designer would build up a partition table for NAND Flash memory and send the table with binary code to programmer or ISP tool for downloading.

Over program issue would come up if the programmer or ISP tool program "blank page", which means all of the 2112Byte data are "FFh". During this operation, built-in ECC engine generate the ECC parity code of the first 2048byte and update it on dedicated addresses in spare area, show in fig 1. In this situation, the whole programmed page is not blank. It makes the mismatch between the binary code and actual device. File system use the blank area as an erased status and program data without erase. However, the actual reserve area has been programmed with "blank" data and the ECC parity code. It would makes the file system may over program the code to this page and make the data and ECC parity code mismatch. Please check Fig.2 for this issue.

To prevent this over program issue, we suggest to check the page data before programming. If the data in whole page is blank, one easy way is to skip programming this page. The other way is to turn off the build-in ECC engine before program by setting the ECC-E bit to 0 in status register-2 show in fig 3

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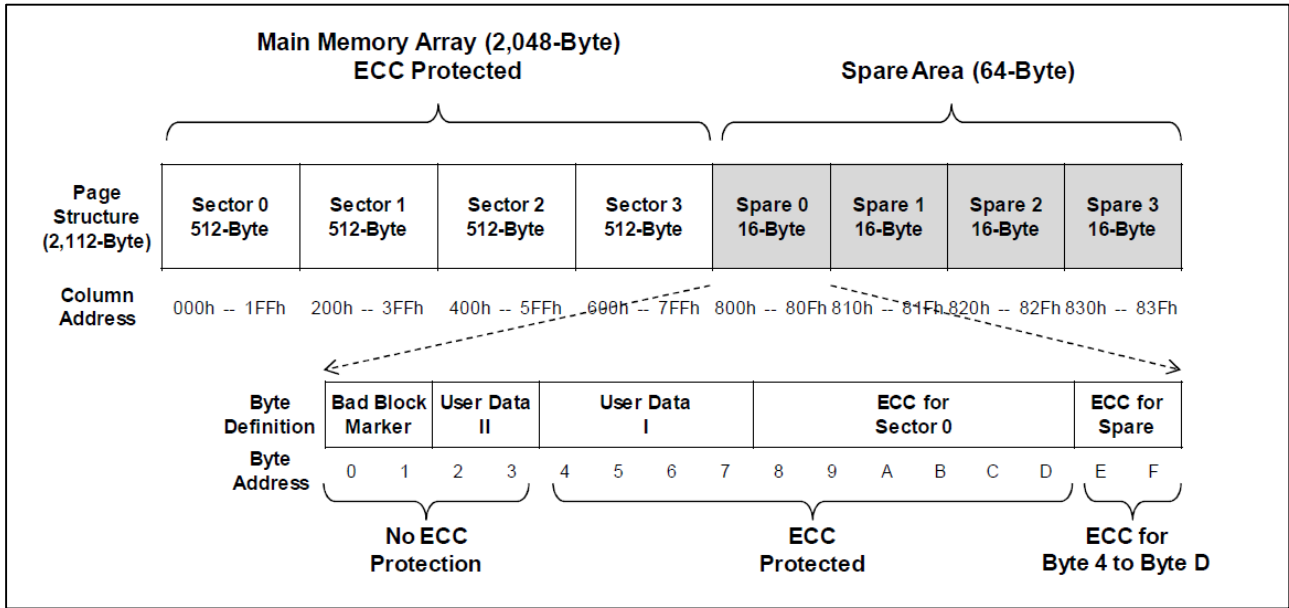


Fig.1 W25N01GV Flash Memory architecture and addressing

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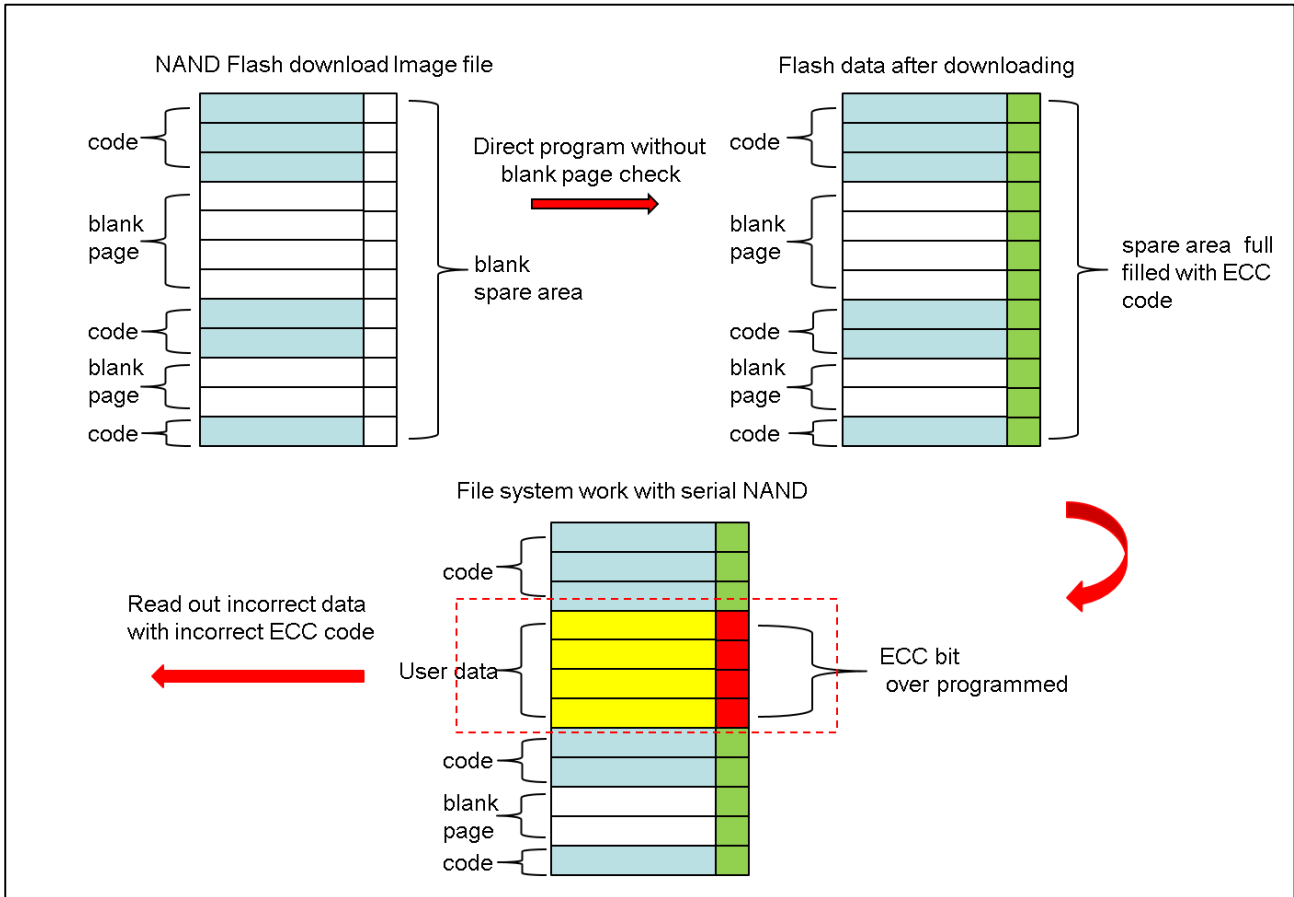


Fig.2 Blank page copy issue

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**7.2 Configuration Register / Status Register-2 (Volatile Writable)**

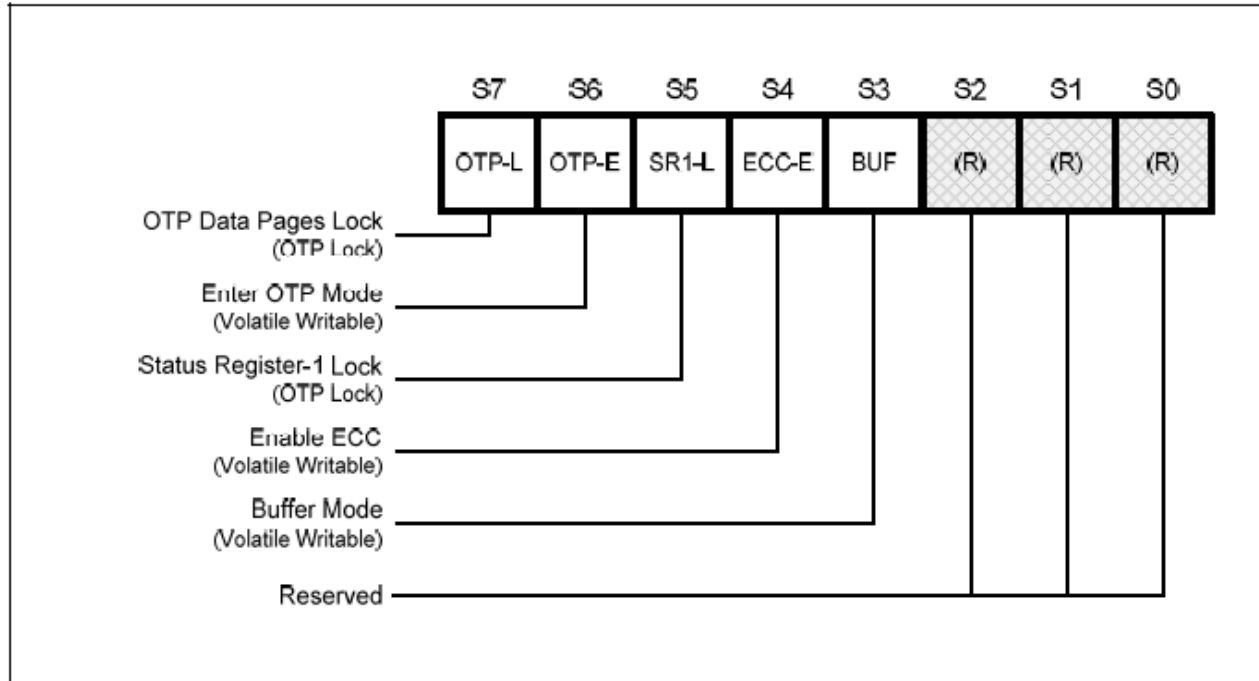


Figure 4b. Configuration Register / Status Register-2 (Address Bxh)

**Fig.3 Status register-2 bit information**

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**Revision History**

Version	Date	Page	Description
1.0	09/01/2020	NA	New create application note

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