SafeFLASH NAND Driver for MT29FxG01 SPI User Guide

Version 1.30

For use with SafeFLASH NAND Driver for Micron® MT29FxG01 SPI versions 1.03 and above

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Table of Contents

1 System Overview

This chapter contains the fundamental information for this module.

The component sections are as follows:

- Introduction – describes the main elements of the module.
- Feature Check – summarizes the main features of the module as bullet points.
- Device Description – summarizes the Micron devices supported.
- Fail-safety – defines fail-safety and describes the quality of service that SafeFLASH provides.
- Packages and Documents – the *Packages* section lists the packages that you need in order to use this module. The *Documents* section lists the relevant user guides.
- Change History – lists the earlier versions of this manual, giving the software version that each manual describes.

1.1 Introduction

This guide is for those who want to implement an HCC Embedded SafeFLASH NAND driver for MT29FxG01 Serial Peripheral Interface (SPI) flash and similar devices from Micron® Technology Inc. This is for use with HCC's SafeFLASH file system.

The following diagram illustrates the structure of the file system software:

```
┌─────────────────────────────────────────────────────────────┐
│  ┌───────────────────────────────────────────────┐          │
│  │        SafeFLASH Standard File API             │          │
│  │           fsf.c  (fsmf.c)                       │       F  │
│  └───────────────────────────────────────────────┘       I  │
│                         ↕                                 L  │
│  ┌───────────────────────────────────────────────┐       E  │
│  │        SafeFLASH Intermediate File System      │          │
│  │           fsm.c                                 │       S  │
│  └───────────────────────────────────────────────┘       Y  │
└─────────────────────────────────────────────────────────────┘
```
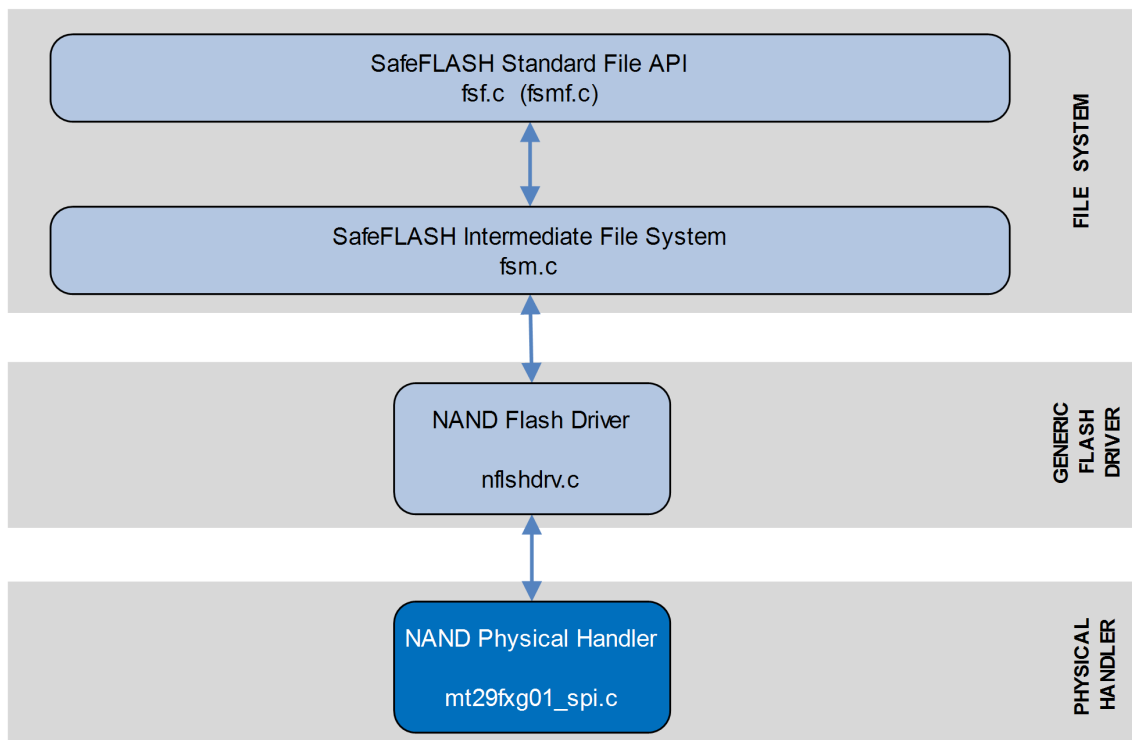
The main SafeFLASH package provides the file API and intermediate file system. This is described in the HCC SafeFLASH File System User Guide. This design is highly portable and gives excellent performance. The basic device architecture includes a high level driver for each general media type that shares some common properties. This driver handles issues of FAT maintenance, wear leveling, and so on.

Also shown in this diagram are the following:

- The NAND Flash driver – the device driver for the NAND flash, provided by the base NAND package. This is described in the HCC SafeFLASH File System NAND Drive User Guide.
- The NAND physical handler – provided by this module, this performs the translation between the driver and the physical flash hardware.

> **Note:** HCC Embedded offers hardware and firmware development consultancy to assist developers with the implementation of flash file systems.

1.2 Feature Check

The main features of the module are the following:

- Conforms to the HCC Advanced Embedded Framework.
- Designed for integration with both RTOS and non-RTOS based systems.
- Supports Micron® MT29FxG01 SPI NAND flash and is easily configurable for similar NAND flash parts.
- Supports static and dynamic wear leveling.
- Provides bad block management.

1.3 Device Description

For Micron devices, the digit after the "F" gives the size in Gb, that is 2 Gb.

The address lines are multiplexed with the data input/output signals on a multiplexed x16 input/output bus.

1.4 Fail-safety

This driver for MT29FxG01 Serial NAND flash is designed as part of HCC's SafeFLASH file system. SafeFLASH guarantees a defined level of fail-safety (see the SafeFLASH File System User Guide). For the system to be able to guarantee fail-safety, each component must provide a defined quality of service.

For this driver the following must be guaranteed to ensure the system is fail-safe:

- All write operations must be committed to flash in the sequence in which they are provided to the driver.
- Any write operation that fails must return an error.
- Any erase operation that fails must return an error.
- The system must ensure that there is at most one partially complete write or erase operation. At this point the file system should be restarted so that it can be recovered.

To achieve this in practice, the target hardware should ensure that in the event of a falling voltage the system resets or signals when the level approaches the specified programming level of the flash chip and inhibits further flash access.

There are other ways to manage this, for instance by adding a capacitance to ensure power is still available to complete an operation after a hardware error or reset condition is detected.

By using these techniques, the system can guarantee correct operation even after an unexpected system reset.

1.5 Packages and Documents

Packages

The table below lists the packages that you need in order to use this module:

Package	Description
hcc_base_doc	This contains the two guides that will help you get started.
fs_safe_nand	The SafeFLASH NAND flash driver.
fs_safe_nand_drv_mt29fxg01_spi	The SafeFLASH NAND driver for Micron MT29FxG01 SPI package described in this document.
psp_template_spi	The SPI Platform Support Package (PSP).

Documents

For an overview of HCC file systems and guidance on choosing a file system, see Product Information on the main HCC website.

Readers should note the points in the HCC Documentation Guidelines on the HCC documentation website.

HCC Firmware Quick Start Guide

This document describes how to install packages provided by HCC in the target development environment. Also follow the *Quick Start Guide* when HCC provides package updates.

HCC Source Tree Guide

This document describes the HCC source tree. It gives an overview of the system to make clear the logic behind its organization.

HCC SafeFLASH File System User Guide

This document describes the base SafeFLASH System.

HCC SafeFLASH File System NAND Drive User Guide

This document describes the SafeFLASH NAND driver that is used with the MT29FxG01 SPI driver.

HCC SafeFLASH NAND Driver for Micron MT29FxG01 SPI User Guide

This is this document.

1.6 Change History

This section describes past changes to this manual.

- To view or download earlier manuals, see File System PDFs.
- For the history of changes made to the package code itself, see History: fs_safe_nand_drv_mt29fxg01_spi.

The current version of this manual is 1.30. The full list of versions is as follows:

Manual version	Date	Software version	Reason for change
1.30	2018-07-06	1.03	Added second note to *PSP Files* section in *Source Files*.
1.20	2017-08-31	1.03	Corrected *Packages* list.
1.10	2017-06-26	1.03	New *Change History* format.
1.00	2017-04-24	1.03	First online version.

2 Source File List

The following sections describe all the source code files included in the system. These files follow the HCC Embedded standard source tree system, described in the HCC Source Tree Guide. All references to file pathnames refer to locations within this standard source tree, not within the package you initially receive.

> **Note:** Do not modify any files except the configuration file and PSP files.

2.1 Configuration File

The file **src/config/config_safe_nand_mt29fxg01_spi.h** contains the configurable parameters of the system. Configure these as required. This is the only file in the module that you should modify. For details of the options, see Configuration Options.

2.2 System Files

These files are in the directory **src/safe-flash/nand/phy/micron**. **These files should only be modified by HCC**.

File	Description
mt29fxg01_spi.c	Driver source code.
mt29fxg01_spi.h	Driver header file.

2.3 Version File

The file **src/version/ver_safe_nand_mt29fxg01_spi.h** contains the version number of this module. This version number is checked by all modules that use this module to ensure system consistency over upgrades.

2.4 Platform Support Package (PSP) Files

These files in the directory **src/psp/target/safe_nand_mt29fxg01_spi** provide the
psp_safe_nand_mt29fxg01_spi_init() function that configures the hardware. Modify these files as required
for your hardware.

> **Note:**
>
> - These are PSP implementations for the specific micro-controller and board; you may need to
>   modify these to work with a different micro-controller and/or development board.
> - In the package these files are offset to avoid overwriting an existing implementation. Copy them to
>   the root **hcc** directory for use.

File	Description
psp_safe_nand_mt29fxg01_spi.c	Low level initialization function source.
psp_safe_nand_mt29fxg01_spi.h	Header file.

3 Configuration Options

Set the following system configuration options in the file **src/config/config_safe_nand_mt29fxg01_spi.h**.

MT29FXG01_SPI_BAUDRATE

The SPI baud rate in Hz. The default is 50000000.

MT29FXG01_SPI_UNIT_ID

The unit ID of the SPI to be used to communicate with the flash chip. The default is 0.

4 PSP Porting

The Platform Support Package (PSP) is designed to hold all platform-specific functionality, either because it relies on specific features of a target system, or because this provides the most efficient or flexible solution for the developer.

The files **psp_safe_nand_mt29fxg01_spi.c** and **psp_safe_nand_mt29fxg01_spi.h** define the psp_safe_nand_mt29fxg01_spi_init() function that configures the hardware. Modify these files as required for your hardware.

4.1 psp_safe_nand_mt29fxg01_spi_init

Use this function to initialize the hardware. This configures pins and clocks.

Format

```
void psp_safe_nand_mt29fxg01_spi_init ( void )
```

Arguments

None.

Return Values

None.