



# SafeFLASH NAND Driver for Hynix HY27UF08 User Guide

Version 2.00

For use with SafeFLASH NAND Driver for Hynix  
HY27UF08 versions 1.01 and above

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# 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 Hynix HY27UF08 devices supported, and also the similar Hynix HY27UF16.
- [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.

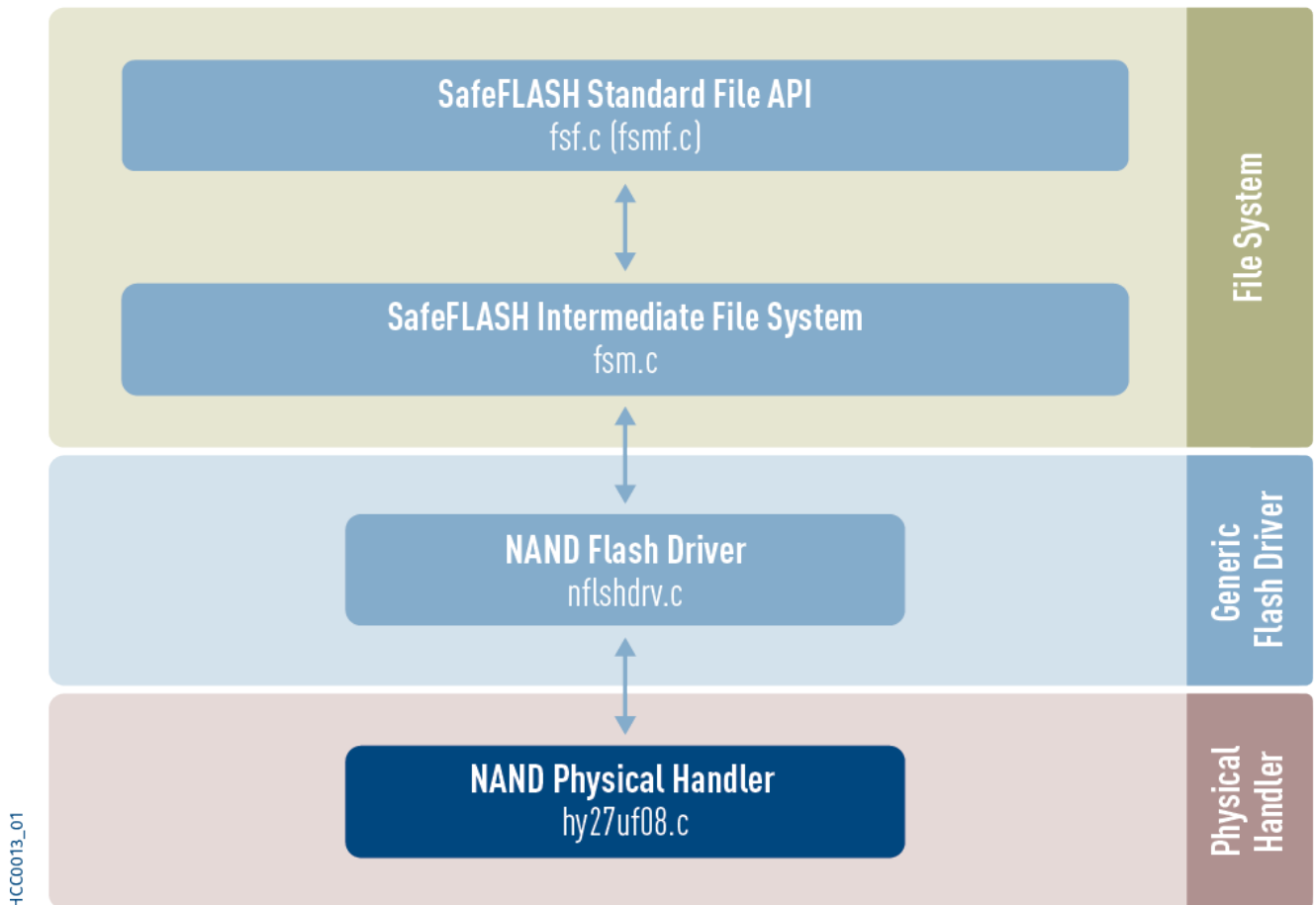
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## 1.1. Introduction

This guide is for those who want to implement an HCC Embedded SafeFLASH NAND driver for Hynix HY27UF08 flash and similar devices from Hynix. This is for use with HCC's SafeFLASH file system.

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



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 Hynix HY27UF08 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

This table summarizes the properties of the relevant Hynix device types:

	<b>HY27UF08</b>	<b>HY27UF16</b>
<b>Size (Gb)</b>	1	2
<b>Page size</b>	(2K + 64 spare) bytes	(1K + 32 spare) words
<b>Pages per block</b>	64	64
<b>Block size</b>	(128K + 4K spare) bytes	(64K + 2K spare) words
<b>Planes</b>	2	2
<b>Bus width</b>	x8	x16

### Error-Correcting Code (ECC) Requirement

1 bit per 528 bytes. The sample driver includes a software ECC algorithm. This can be modified to use hardware ECC if this is provided by the host microcontroller.

## 1.4. Fail-safety

This driver for Hynix HY27UF08 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
<code>hcc_base_doc</code>	This contains the two guides that will help you get started.
<code>fs_safe_nand</code>	The SafeFLASH NAND flash driver.
<code>fs_safe_nand_drv_hy27uf08</code>	The SafeFLASH NAND driver for Hynix HY27UF08 package described in this document.

### 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 Hynix HY27UF08 driver.

#### HCC SafeFLASH NAND Driver for Hynix HY27UF08 User Guide

This is this document.



## 1.6. Change History

To view or download manuals, see [File System PDFs](#).

For the history of changes made to the package code itself, see [History: fs\\_safe\\_nand\\_drv\\_hy27uf08](#).

The current version of this manual is 2.00.

Manual version	Date	Software version	Reason for change
2.00	2020-02-03	1.01 R3	New template. No changes to text.
1.00	2019-01-22	1.01	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.

### Configuration File

The file `src/config/config_safe_nand_hy27uf08_ecc.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](#).

### System Files

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

File	Description
<code>hy27uf08.c</code>	Driver source code.
<code>hy27uf08.h</code>	Driver header file.

### Version File

The file `src/version/ver_safe_nand_hy27uf08.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.

### Platform Support Package (PSP) Files

There is one set of files in the directory `psp_stm32f4xx`. These files, located in the directory `src/psp/target/nand_hy27uf08`, provide the functions that configure the hardware and wait until ready.

**Note:**

- These are PSP implementations for the specific microcontroller and board; you may need to modify these to work with a different microcontroller and/or development board. For details, see [PSP Porting](#).
- In the package these files are offset to avoid overwriting an existing implementation. Copy them to the root `hcc` directory for use.

The files are as follows:

File	Description
<b>psp_nand_hy27uf08.c</b>	Low level initialization and wait until ready function source code.
<b>psp_nand_hy27uf08.h</b>	Header file.

The PSP also has a version file, **ver\_psp\_nand\_hy27uf08.h**.

## 3. Configuration Options

Set the system configuration options in the file **src/config/config\_safe\_nand\_hy27uf08\_ecc.h** This section lists the available options and their default values.

### **S\_HY27UF08\_ECC\_ID**

The NAND ID for HY27UF082G2B.

The default is ( 0xAD | ( 0xDA << 8 ) | ( 0x10 << 16 ) | ( 0x95 << 24 ) )

### **S\_HY27UF08\_SECTOR\_SIZE**

The logical sector size. The default is 0x2000 (8K); this is calculated for HY27UF082G2B by the **FSmem.exe** utility.

### **S\_HY27UF08\_BLOCK\_START**

Keep the default of 1 to reserve the first block for any purpose. Otherwise, set this to 0.

### **S\_HY27UF08\_BLOCK\_NUM**

The number of blocks in the flash. The default is 2048.

### **S\_HY27UF08\_SEPARATE\_DIR**

Keep the default of 1 to keep directories in a separate block from FAT.

### **S\_HY27UF08\_ALWAYS\_USE\_INTERNAL\_BUFFER**

This has two possible values:

- 1 (the default) - always use an internal buffer.
- 0 - use the caller function's buffer if it is aligned, otherwise use an aligned internal buffer.

### **S\_HY27UF08\_USE\_BYTE\_ACCESS**

This controls the type of byte access. It has two possible values:

- 0 - use 1 byte access. This is the default.
- 1 - use 4 byte access.

## 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. For full details of its functions, see the *HCC Base Platform Support Package User Guide*.

The module makes use of the following standard PSP function:

Function	Package	Element	Description
<b>psp_memcpy()</b>	psp_base	psp_string	Copies a block of memory. The result is a binary copy of the data.

The files **psp\_nand\_hy27uf08.c** and **psp\_nand\_hy27uf08.h** define the following functions for the hardware. Modify these files as required for your hardware.

Macro	Description
<b>psp_nand_hy27uf08_init()</b>	Initializes the hardware.
<b>psp_wait_ready()</b>	Waits until the flash becomes ready or the timeout expires.

These functions are described in the following sections.

## 4.1. psp\_nand\_hy27uf08\_init

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

### Format

```
uint32_t psp_nand_hy27uf08_init ( void )
```

### Arguments

None.

### Return Values

Return value	Description
0	Successful execution.
Else	Operation failed.

## 4.2. psp\_wait\_ready

This function is provided by the PSP to wait until the flash becomes ready or the timeout expires.

### Format

```
uint32_t psp_wait_ready ( uint32_t tick )
```

### Arguments

Argument	Description	Type
ms	The timeout value in milliseconds.	uint32_t

### Return Values

Return value	Description
0	The flash is ready. R/B# was asserted before the timeout.
1	The timeout expired.

## 5. Version

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