君正®

SPI NAND 添加参数说明文档

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版本历史

日期	版本	描述
2023-02-01	2.0	发布第二版
2018-03-21	1.0	发布第一版

概述

支持新设备需要将 SFC NAND 参数添加到三处 SPL、UBOOT 和 KERNEL.

代码位置	参数目录
SPL	u-boot/tools/ingenic-tools/nand_device/
UBOOT	1) X1000 系列 NAND 参数代码路径: u-boot/drivers/mtd/devices/jz_sfc/nand_device/ 2) X2000 系列 NAND 参数代码路径: u-boot/drivers/mtd/devices/jz_sfc_v2/nand_device/
KERNEL	1) X1000 系列 NAND 参数代码路径: kernel/drivers/mtd/devices/ingenic_sfc_v1/nand_device/ 2) X2000 系列 NAND 参数代码路径: kernel/module_drivers/drivers/mtd/devices/ingenic_sfc_v2/nand_device/

1. SPL 添加新参数

步骤	描述
1	如果在参数目录下没有相应厂商文件时，拷贝已支持厂商.c 文件重命名为新厂商名称 例如: 1) cd cp tools/ingenic-tools/nand_device/ 2) cp foresee_nand.c new_nand.c 3) 替换 new_nand.c 文件中 FS/fs/foresee 厂商名称字段
2	参阅 FLASH 手册修改参数。

参数文件解释，以 u-boot/tools/ingenic-tools/nand_device/foresee_nand.c 为例:

```
#include <stdio.h>
    #include "nand_common.h"

    #define FS_MID                          0xCD
```

➤ 解释:

厂商 ID 为 0xCD，设备 ID 为 0xA1

```
#define FS_NAND_DEVICD_COUNT            1
```

➢ 解释:

支持设备 ID 数量

```
static unsigned char fs_xaw[] = {0x4, 0x7};
```

➢ 解释:

ECC 错误状态值定义

```
static struct device_struct device[] = {
        DEVICE_STRUCT(0xA1, 2048, 2, 4, 3, 2, fs_xaw),
```

➢ 解释:

```
#define DEVICE_STRUCT(id, pagesize, addrlen, bit, bitcounts,eccstatcount, err) {\
        .device_id = id,                    \    FLASH 设备 ID
        .page_size = pagesize,              \    FLASH 页大小
        .addr_len = addrlen,                \    单线或四线读地址长度
        .ecc_bit = bit,                     \    状态寄存器中 ECC 最低位数
        .bit_counts = bitcounts,            \    状态寄存器中 ECC 所占位数
        .eccstat_count = eccstatcount, \    ECC 错误状态值数量
        .eccerrstatus = err,                \    ECC 错误状态值内存地址
}
```

```
};

static struct nand_desc fs_nand = {
        .id_manufactory = FS_MID,
        .device_counts = FS_NAND_DEVICD_COUNT,
        .device = device,
};

int foresee_nand_register_func(void) {
        return nand_register(&fs_nand);
}
```

2. UBOOT 添加新参数

步骤	描述
1	如果在参数目录下没有相应厂商文件时，拷贝已支持厂商.c 文件重命名为新厂商名称，并修改参数目录下的 Makefile，添加新厂商名.o 文件。 例如: 1) cd u-boot/drivers/mtd/devices/jz_sfc_v2/nand_device/ 2) cp foresee_nand.c new_nand.c

	3) 替换 new_nand.c 文件中 FS/fs/foresee 厂商名称字段 4) vi ../Makefile 5) 添加 COBJS-$(CONFIG_MTD_SFCNAND) +=nand_device/new_nand.o
2	参阅 FLASH 手册修改参数。

参数文件解释，以 u-boot/drivers/mtd/devices/jz_sfc_v2/nand_device/foresee_nand.c 为例：

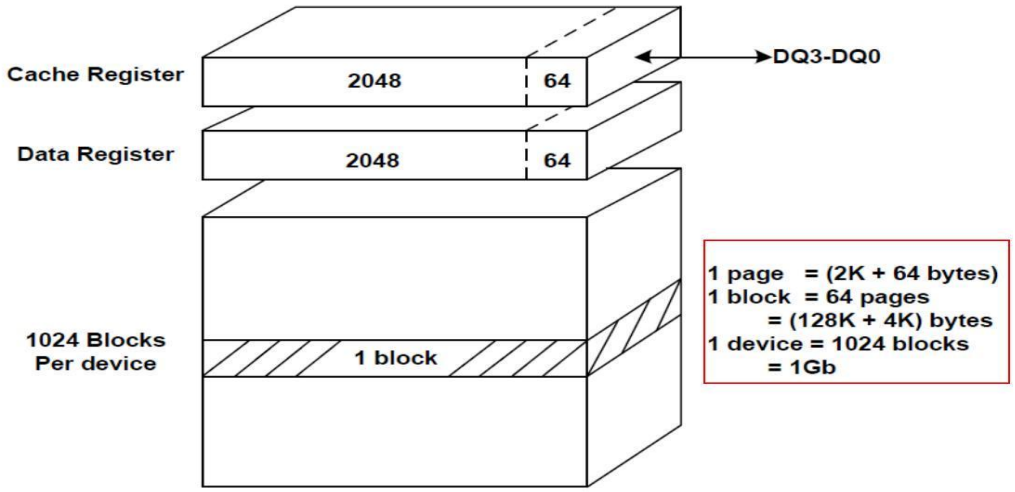
```
#include <errno.h>
    #include <malloc.h>
    #include <linux/mtd/partitions.h>
    #include "../jz_sfc_common.h"
    #include "nand_common.h"

    #define FS_DEVICES_NUM              1
```

➤ 解释：

支持设备 ID 数量

```
    #define TSETUP      5
    #define THOLD       5
    #define TSHSL_R         20
    #define TSHSL_W         20

    #define TRD         180
    #define TPP     400
    #define TBE     3

    static struct jz_sfcnand_device *fs_nand;

    static struct jz_sfcnand_base_param fs_param[FS_DEVICES_NUM] = {

        [0] = {
            /*FS35ND01G*/
            .pagesize = 2 * 1024,
            .blocksize = 2 * 1024 * 64,
            .oobsize = 64,
            .flashsize = 2 * 1024 * 64 * 1024,
```

➤ 解释：



pagesize	页大小
blocksize	块大小
oobsize	每个页 OOB 区域大小
flashsize	FLASH 总大小

.tSETUP = TSETUP,
.tHOLD = THOLD,
.tSHSL_R = TSHSL_R,
.tSHSL_W = TSHSL_W,

➤ 解释:

片选时序参数:

tSLCH	CS# Active Setup Time	5			ns
tCHSH	CS# Active Hold Time	5			ns
tSHCH	CS# Not Active Setup Time	5			ns
tCHSL	CS# Not Active Hold Time	5			ns
tSHSL/tCS	CS# High Time	20			ns

tSETUP(tSLCH): CS# Active Setup Time
tHOLD (tCHSH): CS# Active Hold Time
tSHSL_R: CS #Deselect Time (for Array Read -> Array Read)
tSHSL_W: CS #Deselect Time (for Erase, Program or Read Status Registers ->Read Status Registers)

.tRD = TRD,
.tPP = TPP,
.tBE = TBE,

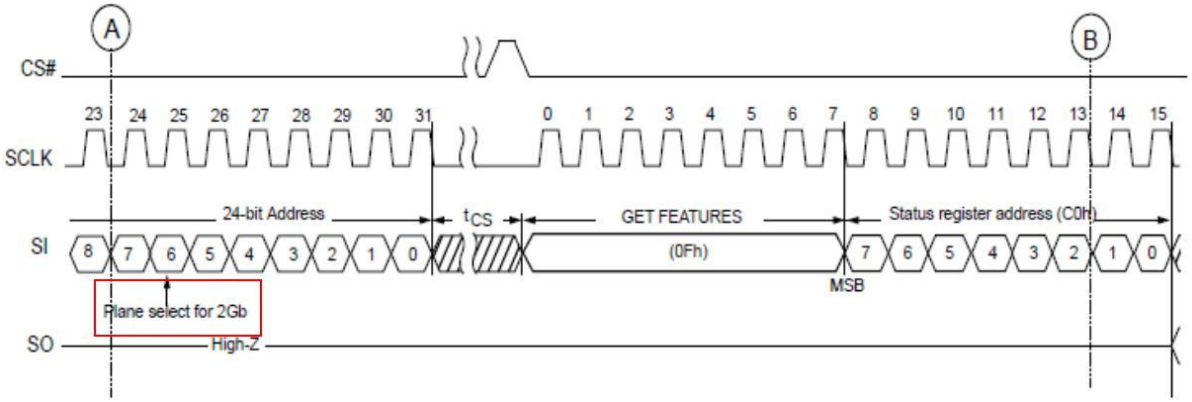
➤ 解释:

SYMBOL	PARAMETER	SPEC			UNIT
		MIN	TYP	MAX	
tRST	CS# High to Next Command After Reset(FFh)			500	μs
tRD	Page Read From Array		120	450	μs
tPROG	Page Program		430	800	μs
tERS	Block Erase		2	10	ms
NOP	Number of partial page program			1	time

tRD	读包含 OOB 的一页数据最大用时
tPP	写包含 OOB 的一页数据最大用时
tBE	擦除一个块数据最大用时

.plane_select = 0,

➤ 解释:



读写时序中包含片选信号时 plane_select=1，否则为 0

注意：X1000 平台没有该参数，不支持此操作

.ecc_max = 0x4,

➤ 解释:

ECCS2 ECCS1 ECCS0	ECC Status	ECCS provides ECC Status as follows: 000b = No bit errors were detected during the previous read algorithm. 001b = Bit errors(=1) were detected and corrected. 010b = Bit errors(=2) were detected and corrected. 011b = Bit errors(=3) were detected and corrected. 100b = Bit errors(=4) were detected and corrected. 111b = Internal error was detected and the data not promised correctly. Others = Reserved. Bit errors might not be detected and corrected if their number exceedsthe tolerance. Therefore, block data should be refreshed when ECCStatus is equal to 100b. ECCS is set to 000b either following a RESET, or at the beginning ofthe READ. It is then updated after the device completes a valid READoperation. ECCS is invalid if internal ECC is disabled (via a SET FEATUREScommand to reset ECC_EN).

ECC 状态中描述最多可纠 Bits 数量

注意：有些 FLASH 没有内部 ECC，需要外部控制器支持，我们不支持

.need_quad = 1,

➤ 解释:

激活四线功能时置 1，否则为 0

```
        },

    };

    static struct device_id_struct device_id[FS_DEVICES_NUM] = {
        DEVICE_ID_STRUCT(0xA1, "FS35ND01G", &fs_param[0]),
```

➤ 解释：

```
#define DEVICE_ID_STRUCT(id, name_string, parameter)        {\
    .id_device = id,                \     FLASH 设备 ID
    .name = name_string,            \      FLASH 设备名称
    .param = parameter,             \}    参数内存地址
```

```
    };


    static cdt_params_t *fs_get_cdt_params(struct sfc_flash *flash, uint8_t device_id)
    {
        CDT_PARAMS_INIT(fs_nand->cdt_params);

        switch(device_id) {
            case 0xA1:
                break;
```

➤ 解释：

单线和四线读命令时序地址长度为 2 时 break，为 3 时地址字节数重新赋值，如下：

```
xx_nand->cdt_params.standard_r.addr_nbyte = 3;
xx_nand->cdt_params.quad_r.addr_nbyte = 3;
```

```
            default:
                pr_err("device_id err, please check your    device id: device_id = 0x%02x\n",
device_id);
                return NULL;
        }

        return &fs_nand->cdt_params;
    }


    static inline int deal_ecc_status(struct sfc_flash *flash, uint8_t device_id, uint8_t
ecc_status)
    {
        int ret = 0;

        switch(device_id) {
```

```
                case 0xA1:
                    switch((ret = ((ecc_status >> 4) & 0x7))) {
                        case 0x0 ... 0x4:
                            return 0x4;
                        default:
                            ret = -EBADMSG;
                    }
```

➤ 解释:

case 0x0 ... 0x4: ECC 状态值在 0 到 4 之间时返回 ECC 最大可纠值，UBI 文件系统发现有位翻转错误时会迁移数据到其他位置。

default: 其他值时返回-EBADMSG，该扇区错误位数已超过最大可纠能力。

```
                default:
                    printf("device_id err, it maybe don`t support this device, check your device id: device_id = 0x%02x\n", device_id);
                    ret = -EIO;     //notice!!!

            }
            return ret;

        }


        static int fs_nand_init(void) {

            fs_nand = kzalloc(sizeof(*fs_nand), GFP_KERNEL);
            if(!fs_nand) {
                pr_err("alloc fs_nand struct fail\n");
                return -ENOMEM;
            }

            fs_nand->id_manufactory = 0xCD;
```

➤ 解释:

MID is Manufacture ID (CDh for FSNAND), DID is Device ID (A1h for current device)

厂商 ID 为 0xCD，设备 ID 为 0xA1

```
            fs_nand->id_device_list = device_id;
            fs_nand->id_device_count = FS_DEVICES_NUM;

            fs_nand->ops.get_cdt_params = fs_get_cdt_params;
```

➤ 解释:

单线和四线读时序地址长度不等于 2 时在此文件中 xx_get_cdt_params 函数中重新赋值

```
            fs_nand->ops.deal_ecc_status = deal_ecc_status;
```

➤ 解释:

ECC 状态处理函数地址

```
        /* use private get feature interface, please define it in this document */
        fs_nand->ops.get_feature = NULL;

        return jz_sfcnand_register(fs_nand);
    }

SPINAND_MOUDLE_INIT(fs_nand_init);
```

检查 Uboot 板级头文件中定义的页大小、OOB 大小和块数是否手册一致

```
#define CONFIG_SPI_NAND_BPP                    (2048 +64)
#define CONFIG_SPI_NAND_PPB                    (64)
```

3. KERNEL 添加新参数

步骤	描述
1	如果在参数目录下没有相应厂商文件时，拷贝刚在 UBOOT 中添加的 new_nand.c 到 KERNEL 参数目录下。 例如: 1) cd module_drivers/drivers/mtd/devices/ingenic_sfc_v2/nand_device/ 2) cp ~/SDK/u-boot/drivers/mtd/devices/jz_sfc_v2/nand_devcie/new_nand.c . 3) vi Makefile 4) 在 obj-y += dosilicon_nand.o foresee_nand.o... 后面添加 new_nand.o
2	对比其他参数文件修改 new_nand.c 例如：meld foresee_nand.c new_nand.c

4. ROOTFS 参数配置

页大小 2K 时，buildroot menuconfig 配置:

```
[*] ubifs root filesystem
      (0x1f000) logical eraseblock size
      (0x800) minimum I/O unit size
```

页大小 4K 时，buildroot menuconfig 配置:

```
[*] ubifs root filesystem
      (0x3e000) logical eraseblock size
      (0x1000) minimum I/O unit size
```