

M480 NAND 資料收集器

NuMicro® 32 位系列微控制器範例代碼介紹

文件資訊

應用簡述	在 EBI 介面上的快閃記憶體的檔案讀寫範例
BSP 版本	M480 Series BSP CMSIS V3.03.000
開發平台	M483 Nand Flash v1.0

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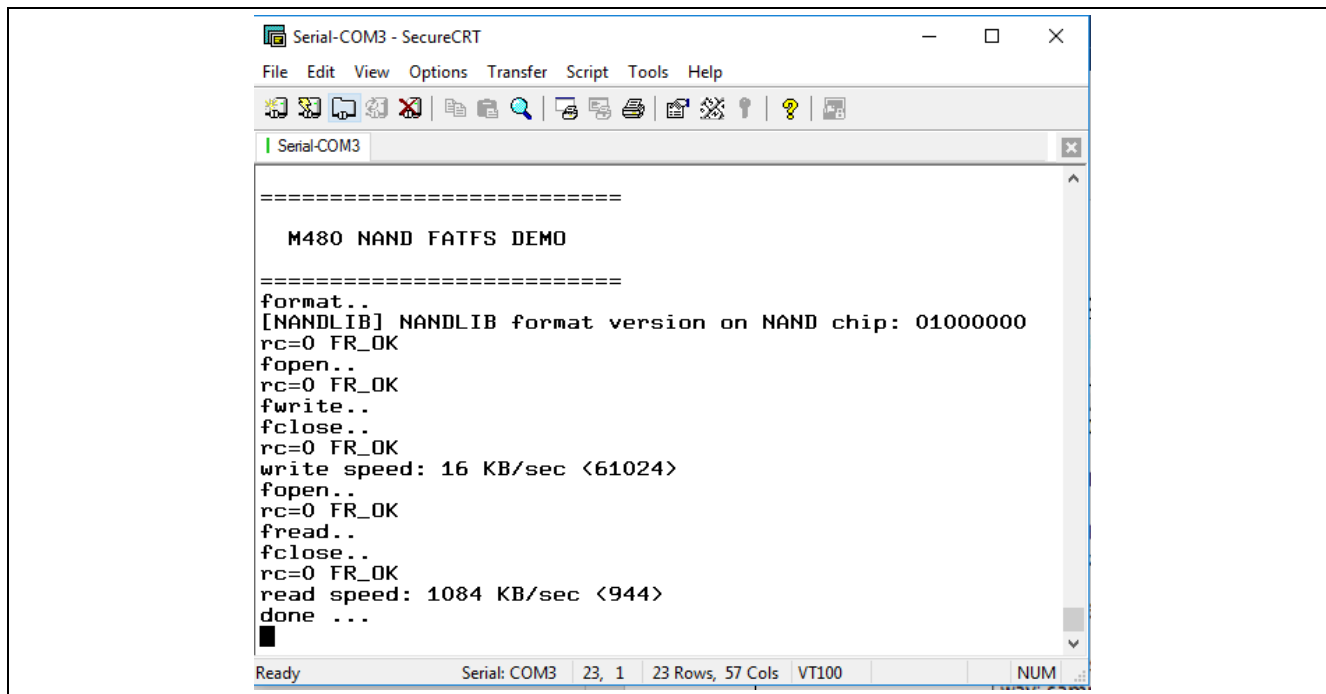
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1 概述

此範例代碼是讀寫外部 EBI NAND 快閃記憶體中的文件。使用者可以將數據資料儲存在 NAND 快閃記憶體中作為資料收集器。

1.1 執行結果

執行結果如下。



```
Serial-COM3 - SecureCRT
File Edit View Options Transfer Script Tools Help
Serial-COM3
=====
M480 NAND FATFS DEMO
=====
format..
[NANDLIB] NANDLIB format version on NAND chip: 01000000
rc=0 FR_OK
fopen..
rc=0 FR_OK
fwrite..
fclose..
rc=0 FR_OK
write speed: 16 KB/sec <61024>
fopen..
rc=0 FR_OK
fread..
fclose..
rc=0 FR_OK
read speed: 1084 KB/sec <944>
done ...
█
Ready Serial: COM3 23, 1 23 Rows, 57 Cols VT100 NUM
```

圖 1-1 執行結果

2 代碼介紹

EBI 8-bit 配置：

```
void Configure_EBI_8BIT_Pins(void)
{
    /* EBI AD0~5 pins on PC.0~5 */
    SYS->GPC_MFPL |= SYS_GPC_MFPL_PC0MFP_EBI_AD0 | SYS_GPC_MFPL_PC1MFP_EBI_AD1 |
                    SYS_GPC_MFPL_PC2MFP_EBI_AD2 | SYS_GPC_MFPL_PC3MFP_EBI_AD3 |
                    SYS_GPC_MFPL_PC4MFP_EBI_AD4 | SYS_GPC_MFPL_PC5MFP_EBI_AD5;

    /* EBI AD6, AD7 pins on PA.6, PA.7 */
    SYS->GPA_MFPL |= SYS_GPA_MFPL_PA6MFP_EBI_AD6 | SYS_GPA_MFPL_PA7MFP_EBI_AD7;

    /* EBI ADR2~3 pins on PB.2~3 */
    SYS->GPB_MFPL |= SYS_GPB_MFPL_PB2MFP_EBI_ADR3 | SYS_GPB_MFPL_PB3MFP_EBI_ADR2;

    /* EBI nWR and nRD pins on PA.10 and PA.11 */
    SYS->GPA_MFPH |= SYS_GPA_MFPH_PA10MFP_EBI_nWR | SYS_GPA_MFPH_PA11MFP_EBI_nRD;

    /* EBI CS0 pin on PF.6 */
    SYS->GPF_MFPL |= SYS_GPF_MFPL_PF6MFP_EBI_nCS0;

    /* Set WP (PB0) output high to enable write/erase */
    GPIO_SetMode(PB, BIT0, GPIO_MODE_OUTPUT);
    PB0 = 1;
}
```

NAND 快閃記憶體的配置，掛載快閃記憶體的訊息和驅動程式：

```
NDRV_T NandDiskDriver = {
    .vid = 0x98,      /* vendor id: Toshiba */
    .did = 0xD3,      /* device id */
    .mcycle = 1,      /* 5 address cycles */
    .pblock = 4096,   /* total physical block counts */
    .lblock = 4000,   /* total logical block counts */
    .ppb = 64,        /* pages pre block */
    .pagesize = 4096, /* page size */
    .oobsize = 256,   /* spare area size */
    .ecc = 8,          /* correctable error bit */
    .eccbyte = 13,    /* ECC byte per 512 byte data */
    .init = Init,
    .pread = ReadPage,
    .pwrite = WritePage,
    .isDirtyPage = IsDirtyPage,
    .isValidBlock = IsValidBlock,
    .erase = EraseBlock,
    .markBad=MarkBadBlock
};
```

在主程式中，初始化系統，配置 EBI 介面，掛載 NAND 磁盤，然後進行文件操作：

```
int32_t main(void)
{
    long          p1;
    TCHAR         nand_path[] = { '0', ':', 0 }; /* NAND drive started from 0 */
    uint32_t s1, s2, cnt;
    static FIL file1; /* File objects */
}
```

```

Buff = (BYTE *)Buff_Pool;

/* Initialize System, peripheral clock and multi-function I/O */
SYS_Init();
UART_Open(UART0, 115200);
timer_init();

/* Configure multi-function pins for EBI 8-bit application */
Configure_EBI_8BIT_Pins();

/* Initialize EBI bank0 to access NAND flash */
EBI_Open(EBI_BANK0, EBI_BUSWIDTH_8BIT, EBI_TIMING_NORMAL, EBI_OPMODE_ADSEPARATE,
EBI_CS_ACTIVE_LOW);

printf("\n===== \n");
printf("\n  M480 NAND FATFS DEMO \n");
printf("\n===== \n");

/* Mount NAND disk */
f_mount(&gFatfsVol, nand_path, 0);
printf("format.. \n");
put_rc(f_mkfs("", FM_FAT32, 0, Buff, FF_MAX_SS));
f_mount(&gFatfsVol, nand_path, 1);

/* Write file test: fopen -> fwrite -> fclose */
printf("fopen.. \n");
put_rc(f_open(&file1, "hello.txt", FA_OPEN_APPEND | FA_WRITE));
p1 = 10 * 1024 * 1024;
printf("fwrite.. \n");
s1 = gSec;
while(p1 > 0)
{
    f_write(&file1, Buff, 8192, &cnt);
    p1 -= cnt;
}
s2 = gSec;

printf("fclose.. \n");
put_rc(f_close(&file1));
printf("write speed: %d KB/sec <%d> \n", 10*1024*100/(s2-s1), s2-s1);

/* Read file test: fopen -> fread -> fclose */
printf("fopen.. \n");
put_rc(f_open(&file1, "hello.txt", FA_READ));
p1 = 10 * 1024 * 1024;
printf("fread.. \n");
s1 = gSec;
while(p1 > 0)
{
    f_read(&file1, Buff, 8192, &cnt);
    p1 -= cnt;
}
s2 = gSec;

printf("fclose.. \n");
put_rc(f_close(&file1));
printf("read speed: %d KB/sec <%d> \n", 10*1024*100/(s2-s1), s2-s1);

printf("done ... \n");
}

```

3 軟體與硬體需求

3.1 軟體需求

- BSP 版本
 - ◆ M480 Series BSP CMSIS V3.03.000
- IDE 版本
 - ◆ Keil uVersion 5.26

3.2 硬體需求

- 電路元件
 - ◆ M483 Nand Flash v1.0
 - ◆ NAND FLASH – TH58NVG3S0HTAI0

■ 示意圖

	V _{DD}	↔	V _{DD}
	GND	↔	GND
	PC.0 (AD0)	↔	D0
	PC.1 (AD1)	↔	D1
	PC.2 (AD2)	↔	D2
	PC.3 (AD3)	↔	D3
	PC.4 (AD4)	↔	D4
	PC.5 (AD5)	↔	D5
	PA.6 (AD6)	↔	D6
	PA.7 (AD7)	↔	D7
	PB.2 (ADR3)	↔	ALE
	PB.3 (ADR2)	↔	CLE
	PA.10 (nWR)	↔	WE#
	PA.11 (nRD)	↔	RE#
	PF.6 (nCS0)	↔	CE0#
EBI			
	PB.1	↔	RB#
	PB.0	↔	WP#
		↔	
M480			NAND Flash

圖 3-1 線路連接

4 目錄資訊












	EC_M480_NAND_Data_Logger_V1.00	
	Library	Sample code header and source files
	CMSIS	Cortex® Microcontroller Software Interface Standard (CMSIS) by Arm® Corp.
	Device	CMSIS compliant device header file
	NandLib	NAND Flash logic to physical mapping
	StdDriver	All peripheral driver header and source files
	SampleCode	
	ExampleCode	Source file of example code
	ThirdParty	
	FatFs	A generic FAT file system module for small embedded systems. Its official website is: http://elm-chan.org/fsw/ff/00index_e.html .
	bch	Bose-Chaudhuri-Hocquenghem (BCH) codes used by NAND Error Correction Code

圖 4-1 目錄資訊

5 範例程式執行

1. 根據目錄資訊章節進入 ExampleCode 路徑中的 KEIL 資料夾，雙擊 NAND_Data_Logger.uvproj。
2. 進入編譯模式介面
 - a. 編譯
 - b. 下載代碼至記憶體
 - c. 進入 / 離開除錯模式
3. 進入除錯模式介面
 - a. 執行代碼

6 修訂紀錄

Date	Revision	Description
2021.08.10	1.00	1. 初始發布.

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