SPI flash as a storage for USB MSC

NuMicro® 32 位系列微控制器范例代码介绍

文件信息

代码简述	本范例代码使用SPI flash作为U盘的储存空间
BSP 版本	M480 Series BSP CMSIS V3.04.000
开发平台	NuMaker-PFM-M487 Ver 3.0

1 功能介绍

1.1 简介

范例程序中，M480作为高速U盘，其透过SPIM接口外接SPI Flash当作储存空间，且带有文件系统(File system)，此功能可以实现替代SD卡当作储存空间的替代方案，测试写入速度约为每秒128字节。

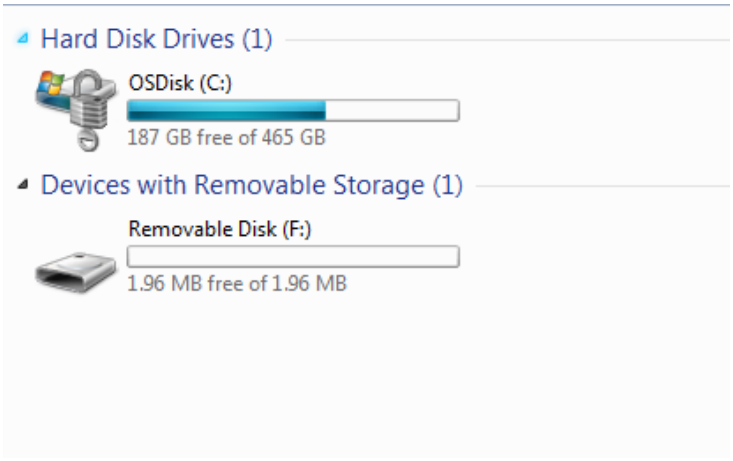
使用者须透过MSC_Init(SectorOffset, TotalSector)设定储存内存起始位置，以及总共内存空间大小。一个Sector预设为512 KB。由于SPI Flash限制一次最少需要清除4KB，因此会先读取4KB内容，并且删除再重新写入。USB处理程序在MSC_ProcessCmd()内，M480会根据所收到的指令进行相对应的处理动作。

1.2 执行结果

执行后会打印出以下信息

```
+------------------------------------------------------------+
|              HSUSB Mass Storage Sample Code                |
|  use SPI flash as back end storage through SPIM interface  |
+------------------------------------------------------------+
disk size is : 2048 KB
SPIM get JEDEC ID=0xEF, 0x40, 0x16
```

连接NuMaker-PFM-M487上的USB2.0插槽至计算机后，出现以下随身碟图示



2 代码介绍

在main.c中首先进行初始化并读取外接SPI flash ID，接着设定U盘储存起始位置与储存空间大小，最后等待连接计算机后在MSC_ProcessCmd()内执行USB处理程序：

```
int32_t main(void)
{
    /* Init System, IP clock and multi-function I/O
       In the end of SYS_Init() will issue SYS_LockReg()
       to lock protected register. If user want to write
       protected register, please issue SYS_UnlockReg()
       to unlock protected register if necessary */
    SYS_Init();

    /* Init UART to 115200-8n1 for print message */
    UART_Open(UART0, 115200);

    printf("+------------------------------------------------------------+\n");
    printf("|             HSUSB Mass Storage Sample Code                 |\n");
    printf("|  use SPI flash as back end storage through SPIM interface |\n");
    printf("+------------------------------------------------------------+\n");
    printf("disk size is : %d KB\n", (disk_size*512)/1024);

    SYS_UnlockReg();

    /* SPIM init */
    SPIM_Init();

    HSUSBD_Open(&gsHSInfo, MSC_ClassRequest, NULL);

    /* Massstorage init */
    MSC_Init(memory_offset, disk_size);

    /* Enable USBD interrupt */
    NVIC_EnableIRQ(USBD20_IRQn);

    /* Start transaction */
    while (1) {
        if (HSUSBD_IS_ATTACHED()) {
            HSUSBD_Start();
            break;
```

```
        }
    }
    /* Massstorage process */
    while (1) {
        if (g_hsusbd_Configured)
            MSC_ProcessCmd();
    }
}
```

读写SPI flash程序代码如下:

```
/* Read data through SPIM */
void MSC_ReadMedia(uint32_t addr, uint32_t size, uint8_t *buffer)
{
    SPIM_Read(addr + g_SectorsOffset, size, buffer);
}
/* Write data through SPIM */
void MSC_WriteMedia(uint32_t addr, uint32_t size, uint8_t *buffer)
{
    SPIM_Write(addr + g_SectorsOffset, size, buffer);
}
```

3 软件与硬件环境

- 软件环境
  - BSP 版本
    - M480 Series BSP CMSIS V3.04.000
  - IDE 版本
    - Keil uVersion 5.26
- 硬件环境
  - 电路组件
    - NuMaker-PFM-M487 or other M480 Development Board
  - 示意图

透过SPIM接口外接SPI flash，使用硬件的方式处理传输协议，来提升对于SPI flash的读写速度。使用USB2.0 OTG插槽连接计算机，即可在计算机端看到随身碟。

SPIM_MOSI (PC.0)	↔	IO0
SPIM_MISO (PC.1)	↔	IO1
SPIM_CLK (PC.2)		CLK
SPIM_SS (PC.3)		/CS
SPIM_D2 (PC.5)		IO2
SPIM_D3 (PC.4)		IO3
M480		W25Q32

4 目录信息

- EC_M480_ HSUSBD_MassStorage_SPIMFlash_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
    - StdDriver — All peripheral driver header and source files
  - SampleCode
    - ExampleCode — Source file of example code

5 如何执行范例程序

1. 根据目录信息章节进入 ExampleCode 路径中的 KEIL 文件夹，双击 HSUSBD_MassStorage_SPIMFlash.uvproj
2. 进入编译模式接口
   a. 编译
   b. 下载代码至内存
   c. 进入 / 离开除错模式
3. 进入除错模式接口
   a. 执行代码

6 修订纪录

Date	Revision	Description
Oct. 01, 2019	1.00	1. 初始发布.

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