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FUJITSU

FMX
MICROCONTROLLER
FMX Series

SD CARD LIBRARY
APPLICATION NOTE

For more information for the FM3 microcontroller, visit the web site at:
http://www.fujitsu.com/global/services/microelectronics/product/micom/roadmap/industrial/fm3/

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Revision History

Date	Author	Version
2013-03-13	Robin Qian	V1.0

Table of Contents

1 Introduction

1.1 About FMx MCU

FMx MCU means the CM0+, CM3 and CM4 MCU of Fujitsu (FM0+, FM3, FM4). It is a series of 32-bit ARMv7 architecture MCU. There is CSIO I/F in all FMx series MCU. And for CSIO I/F, it contains SIO and SPI mode communication method.

1.2 About SD Card Library (Secure Digital)

For SD, it is a non-volatile memory card format for use in portable devices, and SD has four families: SDSC/SDHC/SDXC/SDIO. SD has three different forms: original size/mini size/micro size. For communication methods, it supports: SPI & SD I/F.

In this SD Card Library, it will support:

- For families, it supports: SDSC/SDHC.
- For forms, it supports all.
- For communications, it supports SPI.
- For SD API, it provides:
  - SD Card Initialization
  - SD Card sector R/W
  - SD Card status get

1.3 About Document

This application note will mainly introduce:

1) SD Card Library API introduction
2) SD Card Library sample demonstration
3) SD Card Library adaption steps

2 SD Card Library API introduction

2.1 SD Card Library

It mainly includes:

- **Low level API:**
  - static void SdcardPowerOn(void)
  - static void SdcardChipSelect(stc_sdcardinfo_t *pstcSdcardInfo, uint8_t u8Select)
  - static uint8_t SdcardPresent(void)
  - static uint8_t SdcardWriteProtect(void)
  - static void SdcardPowerOff(void)
  - void Sdcard_TimeWait(uint32_t u32cnt)
  - uint8_t Sdcard_IsCardExist(void)
  - void Sdcard_CardSelect(stc_sdcardinfo_t *pstcSdcardInfo)
  - void Sdcard_CardDeSelect(stc_sdcardinfo_t *pstcSdcardInfo)
  - void Sdcard_Start(void)
  - void Sdcard_PowerOn(void)
  - void Sdcard_WaitPowerup(void)
  - void Sdcard_Stop(void)
  - void Sdcard_PowerOff(void)
  - uint8_t Sdcard_IsWrProtect(void)
  - void Sdcard_ConfigFifo(stc_sdcardinfo_t *pstcSdcardInfo)
  - void Sdcard_SpiModeConfig(stc_sdcardinfo_t *pstcSdcardInfo)
  - static void SdcardSpiStopTX(void)
  - static void SdcardSpiTXHandler(void)
  - uint32_t Sdcard_Write(stc_sdcardinfo_t *pstcSdcardInfo, uint8_t *pu8Buf, uint16_t u16Length)
  - static void SdcardSpiStopRX(void)
  - static void SdcardSpiRXHandler(void)
  - uint32_t Sdcard_Read(stc_sdcardinfo_t *pstcSdcardInfo, uint8_t *pu8Buf, uint16_t u16Length)
- **SD CMD basic API:**
  - static uint8_t SdcardGetCRC7(uint8_t *pu8buf, int32_t i32len)
  - static uint16_t SdcardGetCRC16(const uint8_t *pu8buf, int32_t i32len)
  - static void WriteCmd(stc_sdcardinfo_t *pstcSdcardInfo, uint8_t u8idx, uint32_t u32arg)
  - static int32_t WaitResponse(stc_sdcardinfo_t *pstcSdcardInfo, uint8_t *pu8c, uint32_t u32timeout)

- static int32_t ReadCmdResponse(stc_sdcardinfo_t *pstcSdcardInfo, uint8_t *pu8buf, uint32_t u32len)
- static int32_t ReadDataBlock(stc_sdcardinfo_t *pstcSdcardInfo, uint8_t *u8buf, int32_t i32len, int32_t i32timeout)
- static int32_t ReadDataResponse(stc_sdcardinfo_t *pstcSdcardInfo)
- static int32_t WaitBusyOff(stc_sdcardinfo_t *pstcSdcardInfo)
- static int32_t WaitBusyOff2(stc_sdcardinfo_t *pstcSdcardInfo)
- static void Shutdown(stc_sdcardinfo_t *pstcSdcardInfo)

SD CMD API

- int32_t SDDSendCMD0_GO_IDLE_STATE(stc_sdcardinfo_t *pstcSdcardInfo)
- int32_t SDDSendCMD8_CHECK_VERSION(stc_sdcardinfo_t *pstcSdcardInfo)
- int32_t SDDSendCMD9_SEND_CSD(stc_sdcardinfo_t *pstcSdcardInfo, uint8_t *pu8csd)
- int32_t SDDSendCMD13_SEND_STAUS(stc_sdcardinfo_t *pstcSdcardInfo)
- int32_t SDDSendCMD16_SET_BLOCK_LEN(stc_sdcardinfo_t *pstcSdcardInfo)
- int32_t SDDSendCMD17_READ_SINGLE_BLOCK(stc_sdcardinfo_t *pstcSdcardInfo, uint32_t u32addr, uint8_t *pu8buf)
- int32_t SDDSendCMD24_WRITE_BLOCK(stc_sdcardinfo_t *pstcSdcardInfo, uint32_t u32addr, const uint8_t *pu8buf)
- static int32_t SendCMD55_APP_CMD(stc_sdcardinfo_t *pstcSdcardInfo)
- int32_t SDDSendACMD41_SEND_OP_CODE(stc_sdcardinfo_t *pstcSdcardInfo)
- int32_t SDDSendCMD58_READ_OCR(stc_sdcardinfo_t *pstcSdcardInfo, uint8_t *pu8buf)
- int32_t SDDSendCMD59_CRC_ON_OFF(stc_sdcardinfo_t *pCSIOInfo, int32_t i32on_off)

SD API

- int32_t Sdcard_Init(stc_sdcardinfo_t *pstcSdcardInfo)
- int32_t Sdcard_ReadSector(stc_sdcardinfo_t *pstcSdcardInfo, uint32_t u32start, uint16_t u16count, uint8_t *pu8buf)
- int32_t Sdcard_WriteSector(stc_sdcardinfo_t *pstcSdcardInfo, uint32_t u32start, uint16_t u16count, const uint8_t *pu8buf)
- int32_t Sdcard_GetCardSize(uint32_t *pu32sectors)

2.2 Global API Functions

2.2.1 Sdcard_TimeWait

Wait for counted number cycles

Prototype:

void

Sdcard_TimeWait(uint32_t u32cnt)

Parameter:

u32cnt: Counted numbers

Return:

None

Description:

This function is used during the SD card command/initialization, for time wait usage.

The parameter *u32cnt* can be:

- **unsigned int number**

Remark:

None.

2.2.2 Sdcard_IsCardExist

Check whether the SD Card is in the socket

Prototype:

uint8_t

Sdcard_IsCardExist(void)

Parameter:

None

Return:

SD Card exists status

Description:

This function is used to check the CD pin to find out whether the SD Card is in the socket.

The return value can be one of following values:

0: Not exists

1: Exists

Remark:

None.

2.2.3 Sdcard_CardSelect

SD card selection on.

Prototype:

void

Sdcard_CardSelect(stc_sdcardinfo_t *pstcSdcardInfo)

Parameter:

***pstcSdcardInfo*:** Pointer of SD card information

Return:

None

Description:

This function is used to make CS of SD Card effective.

Remark:

None.

2.2.4 Sdcard_CardDeSelect

SD card selection off.

Prototype:

void

Sdcard_CardDeSelect(stc_sdcardinfo_t *pstcSdcardInfo)

Parameter:

***pstcSdcardInfo*:** Pointer of SD card information

Return:

None

Description:

This function is used to make CS of SD Card un-effective.

Remark:

None.

2.2.5 Sdcard_IsWrProtect

Check whether the SD Card is written protected

Prototype:

uint8_t

Sdcard_IsWrProtect(void)

Parameter:

None

Return:

SD Card written protected status

Description:

This function is used to check the WP pin to find out whether the SD Card is written protected.

The return value can be one of following values:

0: Not protected

1: Protected

Remark:

None.

2.2.6 Sdcard_ConfigFifo

Configure FIFO for SPI channel which used for SD Card.

Prototype:

void

Sdcard_ConfigFifo(stc_sdcardinfo_t *pstcSdcardInfo)

Parameter:

***pstcSdcardInfo*: Pointer of SD card information**

Return:

None

Description:

This function is used to configure FIFO for SPI channel which used for SD Card.

Remark:

None.

2.2.7 Sdcard_SpiModeConfig

Configure SPI channel which used for SD Card.

Prototype:

void

Sdcard_SpiModeConfig(stc_sdcardinfo_t *pstcSdcardInfo)

Parameter:

***pstcSdcardInfo*:** Pointer of SD card information

Return:

None

Description:

This function is used to configure working mode for SPI channel which used for SD Card.

Remark:

None.

2.2.8 Sdcard_Write

Transmit data to the SD Card.

Prototype:

uint32_t

Sdcard_Write(stc_sdcardinfo_t *pstcSdcardInfo, uint8_t *pu8Buf, uint16_t u16Length)

Parameter:

***pstcSdcardInfo*:** Pointer of SD card information

pu8Buf : Pointer of transmit data buffer

u16Length : Number of transmit data

Return:

None

Description:

This function is used to write the specified length data to the SD Card.

The return value can be one of following values:

SpiCommEND: Successful end

SpiCommERR: Error during communication

Remark:

None.

2.2.9 Sdcard_Read

Receive data from the SD Card.

Prototype:

uint32_t

Sdcard_Read(stc_sdcardinfo_t *pstcSdcardInfo, uint8_t *pu8Buf, uint16_t u16Length)

Parameter:

***pstcSdcardInfo*:** Pointer of SD card information

pu8Buf : Pointer of received data buffer

u16Length : Number of received data

Return:

None

Description:

This function is used to receive the specified length data to the SD Card.

The return value can be one of following values:

SpiCommEND: Successful end

SpiCommERR: Error during communication

Remark:

None.

2.2.10 Sdcard_Cmd0

Command 0 of the SD Card.

Prototype:

int32_t

Sdcard_Cmd0(stc_sdcardinfo_t *pstcSdcardInfo)

Parameter:

***pstcSdcardInfo*:** Pointer of SD card information

Return:

Command 0 result

Description:

This function is used to send command 0 to the SD Card, GO_IDLE_STATE, used to change from SD to SPI mode.

The return value can be one of following values:

E_SDD_CMD_OK: Success

E_SDD_CMD_ACCEPT: Command accepted

E_SDD_CMD_ERR: Command error

E_SDD_CMD_TIMEOUT: Timeout error

E_SDD_CMD_CRC_ERR: CRC error

E_SDD_CMD_WR_ERR: Write error

E_SDD_CMD_IDLE: Command idle

E_SDD_CMD_CARD_ERR: Card error

Remark:
None.

2.2.11 Sdcard_Cmd8

Command 8 of the SD Card.

Prototype:
int32_t

Sdcard_Cmd8(stc_sdcardinfo_t *pstcSdcardInfo)

Parameter:
***pstcSdcardInfo*:** Pointer of SD card information

Return:
Command 8 result

Description:
This function is used to send command 8 to the SD Card, required to support High Capacity Memory.

The return value can be one of following values:

E_SDD_CMD_OK: Success

E_SDD_CMD_ACCEPT: Command accepted

E_SDD_CMD_ERR: Command error

E_SDD_CMD_TIMEOUT: Timeout error

E_SDD_CMD_CRC_ERR: CRC error

E_SDD_CMD_WR_ERR: Write error

E_SDD_CMD_IDLE: Command idle

E_SDD_CMD_CARD_ERR: Card error

Remark:
None.

2.2.12 Sdcard_Cmd9

Command 9 of the SD Card.

Prototype:
int32_t

Sdcard_Cmd9(stc_sdcardinfo_t *pstcSdcardInfo)

Parameter:

***pstcSdcardInfo*:** Pointer of SD card information

Return:

Command 9 result

Description:

This function is used to send command 9 to the SD Card, SEND_CSD.

The return value can be one of following values:

E_SDD_CMD_OK: Success

E_SDD_CMD_ACCEPT: Command accepted

E_SDD_CMD_ERR: Command error

E_SDD_CMD_TIMEOUT: Timeout error

E_SDD_CMD_CRC_ERR: CRC error

E_SDD_CMD_WR_ERR: Write error

E_SDD_CMD_IDLE: Command idle

E_SDD_CMD_CARD_ERR: Card error

Remark:

None.

2.2.13 Sdcard_Cmd13

Command 13 of the SD Card.

Prototype:

int32_t

Sdcard_Cmd13(stc_sdcardinfo_t *pstcSdcardInfo)

Parameter:

***pstcSdcardInfo*:** Pointer of SD card information

Return:

Command 13 result

Description:

This function is used to send command 13 to the SD Card, SEND_STATUS.

The return value can be one of following values:

E_SDD_CMD_OK: Success

E_SDD_CMD_ACCEPT: Command accepted

E_SDD_CMD_ERR: Command error

E_SDD_CMD_TIMEOUT: Timeout error

E_SDD_CMD_CRC_ERR: CRC error

E_SDD_CMD_WR_ERR: Write error

E_SDD_CMD_IDLE: Command idle

E_SDD_CMD_CARD_ERR: Card error

Remark:
None.

2.2.14 Sdcard_Cmd16

Command 16 of the SD Card.

Prototype:
int32_t

Sdcard_Cmd16(stc_sdcardinfo_t *pstcSdcardInfo)

Parameter:
***pstcSdcardInfo*:** Pointer of SD card information

Return:
Command 16 result

Description:
This function is used to send command 16 to the SD Card, SET_BLOCKLEN.

The return value can be one of following values:

E_SDD_CMD_OK: Success

E_SDD_CMD_ACCEPT: Command accepted

E_SDD_CMD_ERR: Command error

E_SDD_CMD_TIMEOUT: Timeout error

E_SDD_CMD_CRC_ERR: CRC error

E_SDD_CMD_WR_ERR: Write error

E_SDD_CMD_IDLE: Command idle

E_SDD_CMD_CARD_ERR: Card error

Remark:
None.

2.2.15 Sdcard_Cmd17

Command 17 of the SD Card.

Prototype:

int32_t

Sdcard_Cmd17(stc_sdcardinfo_t *pstcSdcardInfo)

Parameter:

***pstcSdcardInfo*:** Pointer of SD card information

Return:

Command 17 result

Description:

This function is used to send command 17 to the SD Card, READ_SINGLE_BLOCK.

The return value can be one of following values:

E_SDD_CMD_OK: Success

E_SDD_CMD_ACCEPT: Command accepted

E_SDD_CMD_ERR: Command error

E_SDD_CMD_TIMEOUT: Timeout error

E_SDD_CMD_CRC_ERR: CRC error

E_SDD_CMD_WR_ERR: Write error

E_SDD_CMD_IDLE: Command idle

E_SDD_CMD_CARD_ERR: Card error

Remark:

None.

2.2.16 Sdcard_Cmd24

Command 24 of the SD Card.

Prototype:

int32_t

Sdcard_Cmd24(stc_sdcardinfo_t *pstcSdcardInfo)

Parameter:

***pstcSdcardInfo*:** Pointer of SD card information

Return:

Command 24 result

Description:

This function is used to send command 24 to the SD Card, WRITE_BLOCK.

The return value can be one of following values:

E_SDD_CMD_OK: Success

E_SDD_CMD_ACCEPT: Command accepted

E_SDD_CMD_ERR: Command error

E_SDD_CMD_TIMEOUT: Timeout error

E_SDD_CMD_CRC_ERR: CRC error

E_SDD_CMD_WR_ERR: Write error

E_SDD_CMD_IDLE: Command idle

E_SDD_CMD_CARD_ERR: Card error

Remark:

None.

2.2.17 Sdcard_AppCmd41

Application Command 41 of the SD Card.

Prototype:

int32_t

Sdcard_AppCmd41(stc_sdcardinfo_t *pstcSdcardInfo)

Parameter:

***pstcSdcardInfo*:** Pointer of SD card information

Return:

Application Command 41 result

Description:

This function is used to send application command 41 to the SD Card, SD_APP_OP_COND.

The return value can be one of following values:

E_SDD_CMD_OK: Success

E_SDD_CMD_ACCEPT: Command accepted

E_SDD_CMD_ERR: Command error

E_SDD_CMD_TIMEOUT: Timeout error

E_SDD_CMD_CRC_ERR: CRC error

E_SDD_CMD_WR_ERR: Write error

E_SDD_CMD_IDLE: Command idle

E_SDD_CMD_CARD_ERR: Card error

Remark:
None.

2.2.18 Sdcard_AppCmd55

Application Command 55 of the SD Card.

Prototype:
int32_t

Sdcard_AppCmd55(stc_sdcardinfo_t *pstcSdcardInfo)

Parameter:
***pstcSdcardInfo*:** Pointer of SD card information

Return:
Application Command 55 result

Description:
This function is used to send application command 55 to the SD Card, APP_CMD.

The return value can be one of following values:

E_SDD_CMD_OK: Success

E_SDD_CMD_ACCEPT: Command accepted

E_SDD_CMD_ERR: Command error

E_SDD_CMD_TIMEOUT: Timeout error

E_SDD_CMD_CRC_ERR: CRC error

E_SDD_CMD_WR_ERR: Write error

E_SDD_CMD_IDLE: Command idle

E_SDD_CMD_CARD_ERR: Card error

Remark:
None.

2.2.19 Sdcard_Cmd58

Command 58 of the SD Card.

Prototype:
int32_t

Sdcard_Cmd58(stc_sdcardinfo_t *pstcSdcardInfo)

Parameter:

***pstcSdcardInfo*:** Pointer of SD card information

Return:

Command 58 result

Description:

This function is used to send command 58 to the SD Card, READ_OCR.

The return value can be one of following values:

E_SDD_CMD_OK: Success

E_SDD_CMD_ACCEPT: Command accepted

E_SDD_CMD_ERR: Command error

E_SDD_CMD_TIMEOUT: Timeout error

E_SDD_CMD_CRC_ERR: CRC error

E_SDD_CMD_WR_ERR: Write error

E_SDD_CMD_IDLE: Command idle

E_SDD_CMD_CARD_ERR: Card error

Remark:

None.

2.2.20 Sdcard_Cmd59

Command 59 of the SD Card.

Prototype:

int32_t

Sdcard_Cmd59(stc_sdcardinfo_t *pstcSdcardInfo)

Parameter:

***pstcSdcardInfo*:** Pointer of SD card information

Return:

Command 59 result

Description:

This function is used to send command 59 to the SD Card, CRC_ON_OFF.

The return value can be one of following values:

E_SDD_CMD_OK: Success

E_SDD_CMD_ACCEPT: Command accepted

E_SDD_CMD_ERR: Command error

E_SDD_CMD_TIMEOUT: Timeout error

E_SDD_CMD_CRC_ERR: CRC error

E_SDD_CMD_WR_ERR: Write error

E_SDD_CMD_IDLE: Command idle

E_SDD_CMD_CARD_ERR: Card error

Remark:
None.

2.2.21 Sdcard_Init

SD card initialization.

Prototype:
int32_t

Sdcard_Init(stc_sdcardinfo_t *pstcSdcardInfo)

Parameter:
***pstcSdcardInfo*:** Pointer of SD card information

Return:
Initialization result

Description:
This function is used to initialize the SD Card.

The return value can be one of following values:

E_SDD_OK: Success

E_SDD_NO_CARD: No card error

E_SDD_INACTIVE: SD Card is not activated

E_SDD_PARAMETER: Parameter error

E_SDD_PROTECT: SD Card is written protected

E_SDD_DEVICE_TYPE: Not support

E_SDD_ACTIVE: SD Card is already activated

Remark:
None.

2.2.22 Sdcard_ReadSector

SD card read sector.

Prototype:

int32_t

Sdcard_ReadSector(stc_sdcardinfo_t *pstcSdcardInfo, uint32_t u32start, uint16_t u16count, uint8_t *pu8buf)

Parameter:

***pstcSdcardInfo*:** Pointer of SD card information

***u32start*:** Start sector number

***u16count*:** Sector count

***pu8buf*:** Received buffer

Return:

Read result

Description:

This function is used to read data from the SD Card.

The return value can be one of following values:

E_SDD_OK: Success

E_SDD_NO_CARD: No card error

E_SDD_INACTIVE: SD Card is not activated

E_SDD_PARAMETER: Parameter error

E_SDD_PROTECT: SD Card is written protected

E_SDD_DEVICE_TYPE: Not support

E_SDD_ACTIVE: SD Card is already activated

Remark:

None.

2.2.23 Sdcard_WriteSector

SD card write sector.

Prototype:

int32_t

Sdcard_WriteSector(stc_sdcardinfo_t *pstcSdcardInfo, uint32_t u32start, uint16_t u16count, uint8_t *pu8buf)

Parameter:

***pstcSdcardInfo*:** Pointer of SD card information

***u32start*:** Start sector number

***u16count*:** Sector count

***pu8buf*:** Transmitted buffer

Return:

Write result

Description:

This function is used to write data to the SD Card.

The return value can be one of following values:

E_SDD_OK: Success

E_SDD_NO_CARD: No card error

E_SDD_INACTIVE: SD Card is not activated

E_SDD_PARAMETER: Parameter error

E_SDD_PROTECT: SD Card is written protected

E_SDD_DEVICE_TYPE: Not support

E_SDD_ACTIVE: SD Card is already activated

Remark:

None.

3 SD Card Library sample demonstration

3.1 SD Card basic API demo

3.1.1 Code

IO initialization code

```
    Sdcard_Io_Init();
```

SD Card information setting code

```
        /* Config structure init */
        Sdcard_stcSdSpiInfo.u8Channel = SD_MFS_CH;
        Sdcard_stcSdSpiInfo.u8HwFifoFlag = NOHWFIFO;
        Sdcard_stcSdSpiInfo.u8TransState = SpiCommIDLE;
        Sdcard_stcSdSpiInfo.pstcModeConfig = &m_stcSdSpiModeConfig;
        Sdcard_stcSdSpiInfo.pstcFIFOConfig = NULL;

        Sdcard_SpiModeConfig(&Sdcard_stcSdSpiInfo);

        if(Sdcard_stcSdSpiInfo.u8HwFifoFlag == HWFIFO)
        {
            Sdcard_ConfigFifo(&Sdcard_stcSdSpiInfo);
        }
```

SD Card initialization code

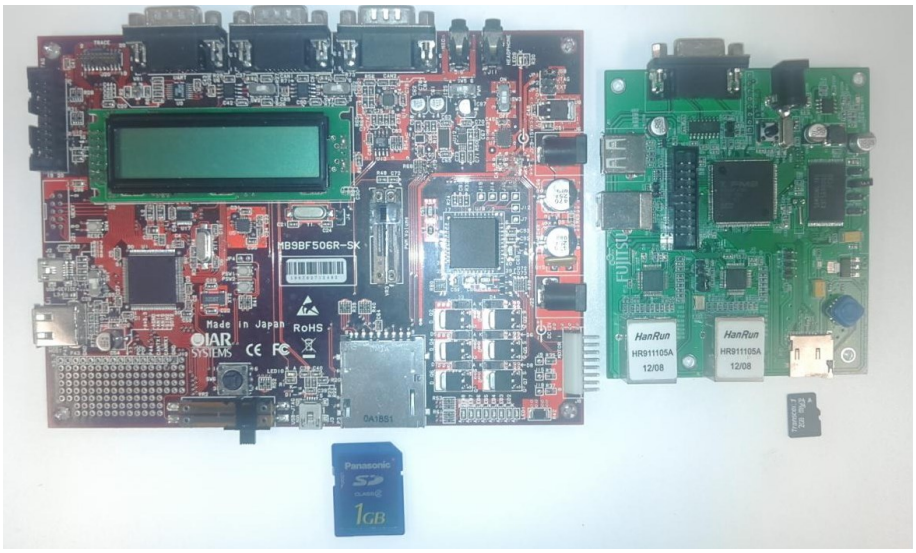
```
        i32RetValue = SdcardInit(&Sdcard_stcSdSpiInfo);

        if(0 == i32RetValue)
        {
         ...
```

SD Card get sector number/write/read sector test code

```
        if(0 == i32RetValue)
        {
            //Initialization success!
            i32RetValue = Sdcard_GetCardSize(&m_u32SdcardSectorNum);
            if(0 != i32RetValue)
            {
                //Fail
                while(1);
            }
            //Write sector test
            i32RetValue = SdcardWriteSector(&Sdcard_stcSdSpiInfo);
            if(0 != i32RetValue)
            {
                //Fail
                while(1);
            }
            //Read sector test
```

```
            i32RetValue = SdcardReadSector(&Sdcard_stcSdSpiInfo);
            if(0 != i32RetValue)
            {
                //Fail
                while(1);
            }
        }
```

3.1.2 Environment



MB9BF506R-SK (IAR)

FSSDC-9B618-EVB-V1.0

3.1.3 Demo procedure

1) Open IAR
2) Start the corresponding PRJ (506/618)
3) Insert the SD Card/micro SD Card into corresponding card socket
4) Run the test code and check the result (set the BPs and check)

```
    Sdcard_SpiModeConfig(&Sdcard_stcSdSpiInfo);

    if(Sdcard_stcSdSpiInfo.u8HwFifoFlag == HWFIFO)
    {
        Sdcard_ConfigFifo(&Sdcard_stcSdSpiInfo);
    }
#if 1
    /* SD Card RAW API test code */
    i32RetValue = SdcardInit(&Sdcard_stcSdSpiInfo);

    if(0 == i32RetValue)
    {
        //Initialization success!
        i32RetValue = Sdcard_GetCardSize(&m_u32SdcardSectorNum);
        if(0 != i32RetValue)
        {
            //Fail
            while(1);
        }
        //Write sector test
        i32RetValue = SdcardWriteSector(&Sdcard_stcSdSpiInfo);
        if(0 != i32RetValue)
        {
            //Fail
            while(1);
        }
        //Read sector test
        i32RetValue = SdcardReadSector(&Sdcard_stcSdSpiInfo);
        if(0 != i32RetValue)
        {
            //Fail
            while(1);
        }
    }
```

3.2 SD Card fatFS demo

3.2.1 Code

IO initialization code

```
    Sdcard_Io_Init();
```

SD Card information setting code

```
        /* Config structure init */
        Sdcard_stcSdSpiInfo.u8Channel = SD_MFS_CH;
        Sdcard_stcSdSpiInfo.u8HwFifoFlag = NOHWFIFO;
        Sdcard_stcSdSpiInfo.u8TransState = SpiCommIDLE;
        Sdcard_stcSdSpiInfo.pstcModeConfig = &m_stcSdSpiModeConfig;
        Sdcard_stcSdSpiInfo.pstcFIFOConfig = NULL;

        Sdcard_SpiModeConfig(&Sdcard_stcSdSpiInfo);
```

```
        if(Sdcard_stcSdSpiInfo.u8HwFifoFlag == HWFIFO)
        {
            Sdcard_ConfigFifo(&Sdcard_stcSdSpiInfo);
        }
```

SD Card initialization code

```
        i32RetValue = SdcardInit(&Sdcard_stcSdSpiInfo);

        if(0 == i32RetValue)
        {
         ...
```

fatFS test code

```
        #if 1
        /* fatFS API test */
        /* Call the Test API */

    //    FatFsfmount();
    //    FatFsfopenclose();
    //    FatFsfread();
    //    FatFsfwrite();
    //    FatFsflseek();
    //    FatFsfgetfree();
    //    FatFsunlink();
    //    FatFschmod();
    //    FatFsrename();
    //    FatFsgets();
    //    FatFsputc();
    //    FatFsputs();
        FatFssize();
```

3.2.2 Environment

Same as above.

3.2.3 Demo procedure

1) Open IAR
2) Start the corresponding PRJ (506/618)
3) Insert the SD Card/micro SD Card into corresponding card socket
4) Run the test code and check the result (set the BPs and check)

```
    }
#endif

#if 1
    /* fatFS API test */
    /* Call the Test API */

//    FatFsfmount();
//    FatFsfopenclose();
//    FatFsfread();
//    FatFsfwrite();
//    FatFsflseek();
//    FatFsfgetfree();
//    FatFsunlink();
//    FatFschmod();
//    FatFsrename();
//    FatFsgets();
//    FatFsputc();
//    FatFsputs();
    FatFssize();

    /* End */

#endif
```

4 SD Card Library adaption steps

This SD Card Library can be adapted to any FMx MCU with SPI I/F. Please use the following steps:

1) Define the clock and correlative pin in board.h
2) Check the SdcardChipSelect/SdcardPresent/SdcardWriteProtect in sdcard_hw.c

5 Annex

Pin assignment

board.h		
	506R	618S
CLKHC	(4MHZ)	(4MHZ)
CLKLC	(100KHZ)	(100KHZ)
CLKMO	(4MHZ)	(4MHZ)
CLKSO	(32768UL)	(32768UL)
SD_CS_IO_PORT	IO_PORT4	IO_PORT5
SD_CS_IO_PIN	IO_PINxA	IO_PINx3
SD_CD_IO_PORT	IO_PORT4	IO_PORTO
SD_CD_IO_PIN	IO_PINxB	IO_PINx9
SD_WP_IO_PORT	IO_PORT5	-
SD_WP_IO_PIN	IO_PINxB	-
USER_MFS_CH	MFS_Ch1	MFS_Ch3
SD_MFS_PORT	IO_PORT5	IO_PORT5
SD_MFS_SCK_PIN	IO_PINx8	IO_PINx2
SD_MFS_SOT_PIN	IO_PINx7	IO_PINx1
SD_MFS_SIN_PIN	IO_PINx6	IO_PINx0
SD_MFS_SCK_PIN_LOC	IO_MFS_SCKx_SCKx_0	IO_MFS_SCKx_SCKx_1
SD_MFS_SOT_PIN_LOC	IO_MFS_SOTx_SOTx_0	IO_MFS_SOTx_SOTx_1
SD_MFS_SIN_PIN_LOC	IO_MFS_SINx_SINx_0	IO_MFS_SINx_SINx_1