RX Family

R20AN0293EJ0101
Rev.1.01
Oct 01, 2016

Sample program that uses Open Source FAT File System
 [M3S-TFAT-Tiny] Module
Firmware Integration Technology

Introduction

This document explains the usage of the Open Source FAT File System M3S-TFAT-Tiny for the RX Family (hereafter referred to as "TFAT library") along with a sample program.

Target Device

RX610, RX62N, RX210, RX64M, RX71M, RX65N

Contents

1.   Structure of application note

This application note includes files below.

Table 1.1 Structure of application note

name	Description
r20an0293ej0101_rx_tfat.pdf	This document
readme_r22e.txt	Sample program information
Workspace (workspace)	
Sample program (sample)	
TFAT_sample_RX210_with_MMC	Sample program for rx210 by e^2 studio(*2)
TFAT_sample_RX610_with_MMC	Sample program for rx610 by e^2 studio(*2)
TFAT_sample_RX62N_with_MMC	Sample program for rx62N by e^2 studio(*2)
TFAT_sample_RX62N_with_USB_ mmc	Sample program for rx62N(*1) by e^2 studio(*2)
TFAT_sample_RX64M_with_USB	Sample program for rx64M by e^2 studio(*2)
TFAT_sample_RX71M_with_USB	Sample program for rx71M by e^2 studio(*2)
TFAT_sample_RX65N_with_USB	Sample program for rx65N by e^2 studio(*2)

(*1)This can use Multidrive feature.

(*2)It is possible to convert e2 studio project to CS+ project.

1.1   Development environment

TFAT library can run with this development environment below.

[Software tools]

- Integrated Development Environment
- e2 studio V5.2
- Coding Tool
- Renesas RXC Toolchain V2.04.01(e^2 studio)

[Debug tools]

- Emulator debugger
- RX E1/E20 Emulator Debugger
- Emulator software
- RX E1/E20 Emulator software V.1.02.00

[Board]

- Renesas Starter Kit for RX610   (type: R0K556100S000BE)
- Renesas Starter Kit+ for RX62N   (type: R0K5562N0S100BE)
- Renesas Starter Kit for RX210   (type: R0K505210S000BE)
- Renesas Starter Kit+ for RX64M   (type:R0K50564MS100BE)
- Renesas Starter Kit+ for RX71M   (type:R0K50571MS100BE)
- Renesas Starter Kit+ for RX65N   (type:RTK5005651C01000BR)

2. Sample program

2.1 Outline

The sample program is High-performance Embedded Workshop project that works at the board (hereafter referred to as "CPU board") shown in 1.1 Development environment. The sample program prepares for two kinds of following projects

- Sample program only using an MMC driver
- Sample program using an MMC driver and the USB driver

Please refer to the following for more information about MMC driver.

http://www.renesas.com/products/mpumcu/rx/Application_Notes.jsp

— Document No. : R20AN0046
— Document Title. : RX Family SPI mode MultiMediaCard Driver: Introduction Guide

— Document No. : R01AN2025
— Document Title. : USB Basic Host and Peripheral Driver Firmware Integration Technology: Application note

— Document No. : R01AN2026
— Document Title. : USB Host Mass Storage Class Driver (HMSC) Firmware Integration Technology: Application note

2.2 Sample software execution

2.2.1 The sample program that only an MMC driver used

When the program is run, a FAT filesystem work area is registered. A file is created on the memory media and text data of 2 KB is written to the file. The file is then closed. For confirmation of the data that is written, the file is opened again in the read mode. The entire contents of the file are read and they are compared with the write buffer data in the program. Whether the contents of the data are matching or not is indicated on the LEDs on CPU board.

Table 2.1 Explanation of LED display

LED2	LED3	Explanation
OFF	ON	Program running
ON	OFF	Error occurred
ON	ON	Execution successful

The sample data for file read / write is stored in the r_data_file.c. The data is stored in an array of 2048 elements giving a total size of 2 KB (2048 Bytes). The data array consists of the text string "Renesas," written repeatedly. If required, the user can modify this array and the corresponding macro FILESIZE.

RENESAS

2.2.2   Flow
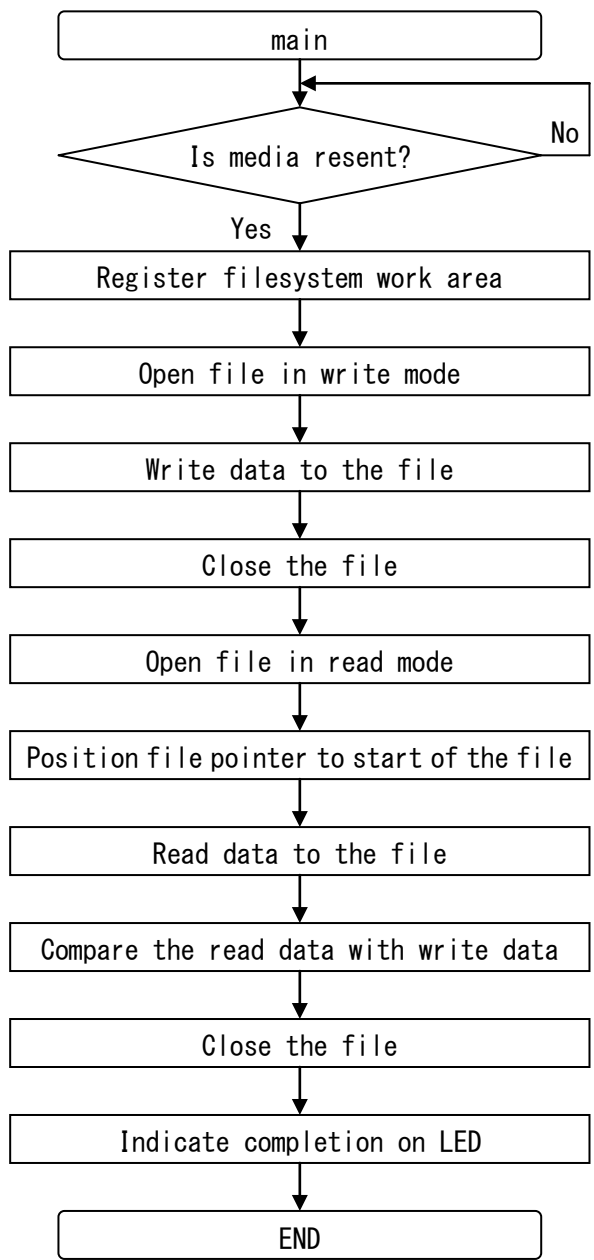
Flow of a sample program is shown below.

```
                            ┌──────────────────────────────┐
                            │            main              │
                            └──────────────────────────────┘
                                           │
                                           ▼
                            ◄─────────────────────────────── No
                             ╲   Is media resent?   ╱
                              ╲───────────────────╱
                                           │
                                         Yes
                                           ▼
                            ┌──────────────────────────────┐
                            │   Register filesystem work area │
                            └──────────────────────────────┘
                                           │
                                           ▼
                            ┌──────────────────────────────┐
                            │     Open file in write mode    │
                            └──────────────────────────────┘
                                           │
                                           ▼
                            ┌──────────────────────────────┐
                            │      Write data to the file    │
                            └──────────────────────────────┘
                                           │
                                           ▼
                            ┌──────────────────────────────┐
                            │         Close the file         │
                            └──────────────────────────────┘
                                           │
                                           ▼
                            ┌──────────────────────────────┐
                            │     Open file in read mode     │
                            └──────────────────────────────┘
                                           │
                                           ▼
                            ┌──────────────────────────────┐
                            │ Position file pointer to start of the file │
                            └──────────────────────────────┘
                                           │
                                           ▼
                            ┌──────────────────────────────┐
                            │      Read data to the file     │
                            └──────────────────────────────┘
                                           │
                                           ▼
                            ┌──────────────────────────────┐
                            │ Compare the read data with write data │
                            └──────────────────────────────┘
                                           │
                                           ▼
                            ┌──────────────────────────────┐
                            │         Close the file         │
                            └──────────────────────────────┘
                                           │
                                           ▼
                            ┌──────────────────────────────┐
                            │   Indicate completion on LED   │
                            └──────────────────────────────┘
                                           │
                                           ▼
                            ┌──────────────────────────────┐
                            │             END              │
                            └──────────────────────────────┘
```
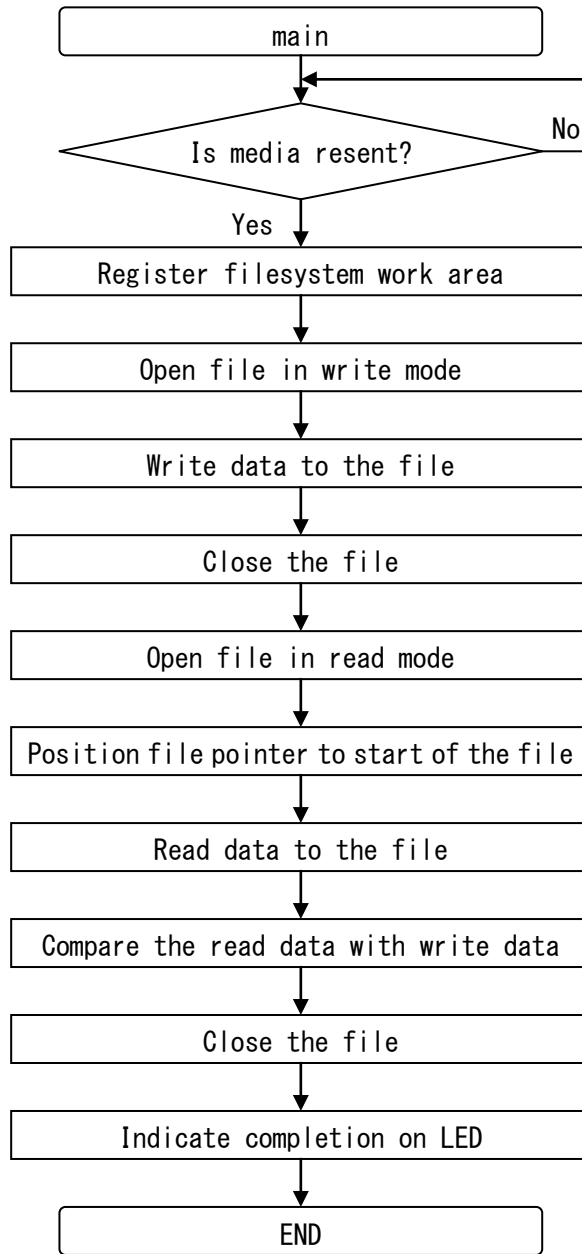
Figure 2-1 Flow of sample program

2.2.3   Sample program using an MMC driver and the USB driver

When a program is executed, I register FAT File System working area for USB and MMC.

I repeat the following movement when I push down SW2 on the CPU board.

- I make a file in both MMC and USB memory.
- I write in text data of 2KB at both files and close a file.
- I cut MMC and a file of the USB memory open with a reading mode again.
- I read the whole contents of the file and close a file.

I repeat a stop and the reopening of the movement every one of pressing of SW2.

In operation, LED0 - LED3 performs lighting / lights out sequentially.

The data of the file note are as follows.

- It is written in 512 characters at USB storage device 'a'.
- It is written in 512 characters at MMC 'b'.

2.2.4　　Flow

Flow of a sample program is shown below.

v
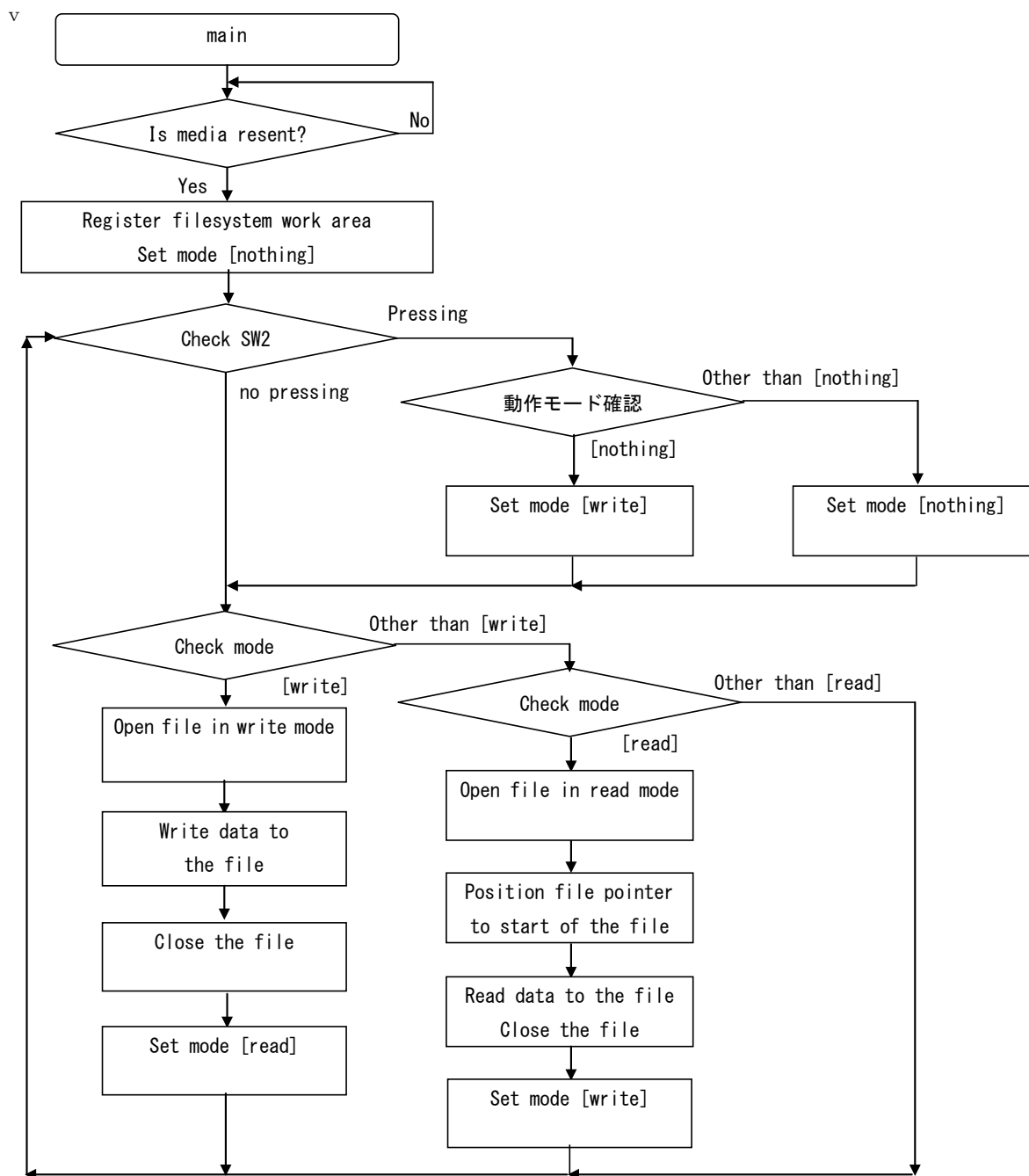
Figure 2-2 Flow of sample program

2.2.5   The sample program that only an USB driver used

When the program is run, a FAT filesystem work area is registered. A file is created on the memory media and text data of 2 KB is written to the file. The file is then closed. For confirmation of the data that is written, the file is opened again in the read mode. The entire contents of the file are read and they are compared with the write buffer data in the program. Whether the contents of the data are matching or not is indicated on the LEDs on CPU board.

Table 2.3 Explanation of LED display

LED2	LED3	Explanation
OFF	ON	Program running
ON	OFF	Error occurred
ON	ON	Execution successful

The sample data for file read / write is stored in the r_data_file.c. The data is stored in an array of 2048 elements giving a total size of 2 KB (2048 Bytes). The data array consists of the text string "Renesas," written repeatedly. If required, the user can modify this array and the corresponding macro FILESIZE.

2.2.6   Flow

Flow of a sample program is shown below.

```
                        ┌──────────────────────────────┐
                        │             main             │
                        └──────────────┬───────────────┘
                                       │◄──────────────────┐
                                       ▼                    │
                              ╱───────────────╲        No   │
                             ╱  Is media resent? ╲──────────┘
                              ╲───────────────╱
                                  Yes  │
                                       ▼
                        ┌──────────────────────────────┐
                        │  Register filesystem work area │
                        └──────────────┬───────────────┘
                                       ▼
                        ┌──────────────────────────────┐
                        │     Open file in write mode    │
                        └──────────────┬───────────────┘
                                       ▼
                        ┌──────────────────────────────┐
                        │      Write data to the file    │
                        └──────────────┬───────────────┘
                                       ▼
                        ┌──────────────────────────────┐
                        │         Close the file         │
                        └──────────────┬───────────────┘
                                       ▼
                        ┌──────────────────────────────┐
                        │     Open file in read mode     │
                        └──────────────┬───────────────┘
                                       ▼
                        ┌──────────────────────────────┐
                        │ Position file pointer to start of the file │
                        └──────────────┬───────────────┘
                                       ▼
                        ┌──────────────────────────────┐
                        │      Read data to the file     │
                        └──────────────┬───────────────┘
                                       ▼
                        ┌──────────────────────────────┐
                        │ Compare the read data with write data │
                        └──────────────┬───────────────┘
                                       ▼
                        ┌──────────────────────────────┐
                        │         Close the file         │
                        └──────────────┬───────────────┘
                                       ▼
                        ┌──────────────────────────────┐
                        │   Indicate completion on LED   │
                        └──────────────┬───────────────┘
                                       ▼
                        ┌──────────────────────────────┐
                        │              END               │
                        └──────────────────────────────┘
```

Figure 2-3 Flow of sample program

RX Family   Sample program that uses Open Source FAT File System [M3S-TFAT-Tiny] Module
Firmware Integration Technology

3. Software update information

This document version	TFAT library version	Change
1.01	3.03	- Updated TFAT library - Added sample program's for RX64M, RX71M and RX65N
1.00	3.00	- Applied FIT spec.
---	3.00	- Added Multidrive sample program for RX62N - Fixed, do not call R_tfat_disk_initialize() in each sample program.

R20AN0293EJ0101 Rev.1.01
Oct 01, 2016

Page 9 of 10

Website and Support

Renesas Electronics Website
   http://www.renesas.com/

Inquiries
   http://www.renesas.com/contact/

All trademarks and registered trademarks are the property of their respective owners.

Revision History

		Description	
Rev.	Date	Page	Summary
1.01	Oct 01, 2016	—	Updated sample program's
1.00	Jul 01, 2014	—	First Edition issued

General Precautions in the Handling of Microprocessing Unit and Microcontroller Unit Products

The following usage notes are applicable to all Microprocessing unit and Microcontroller unit products from Renesas. For detailed usage notes on the products covered by this document, refer to the relevant sections of the document as well as any technical updates that have been issued for the products.

1. Handling of Unused Pins

   Handle unused pins in accordance with the directions given under Handling of Unused Pins in the manual.

   — The input pins of CMOS products are generally in the high-impedance state. In operation with an unused pin in the open-circuit state, extra electromagnetic noise is induced in the vicinity of LSI, an associated shoot-through current flows internally, and malfunctions occur due to the false recognition of the pin state as an input signal become possible. Unused pins should be handled as described under Handling of Unused Pins in the manual.

2. Processing at Power-on

   The state of the product is undefined at the moment when power is supplied.

   — The states of internal circuits in the LSI are indeterminate and the states of register settings and pins are undefined at the moment when power is supplied.
   In a finished product where the reset signal is applied to the external reset pin, the states of pins are not guaranteed from the moment when power is supplied until the reset process is completed.
   In a similar way, the states of pins in a product that is reset by an on-chip power-on reset function are not guaranteed from the moment when power is supplied until the power reaches the level at which resetting has been specified.

3. Prohibition of Access to Reserved Addresses

   Access to reserved addresses is prohibited.

   — The reserved addresses are provided for the possible future expansion of functions. Do not access these addresses; the correct operation of LSI is not guaranteed if they are accessed.

4. Clock Signals

   After applying a reset, only release the reset line after the operating clock signal has become stable. When switching the clock signal during program execution, wait until the target clock signal has stabilized.

   — When the clock signal is generated with an external resonator (or from an external oscillator) during a reset, ensure that the reset line is only released after full stabilization of the clock signal. Moreover, when switching to a clock signal produced with an external resonator (or by an external oscillator) while program execution is in progress, wait until the target clock signal is stable.

5. Differences between Products

   Before changing from one product to another, i.e. to a product with a different part number, confirm that the change will not lead to problems.

   — The characteristics of Microprocessing unit or Microcontroller unit products in the same group but having a different part number may differ in terms of the internal memory capacity, layout pattern, and other factors, which can affect the ranges of electrical characteristics, such as characteristic values, operating margins, immunity to noise, and amount of radiated noise. When changing to a product with a different part number, implement a system-evaluation test for the given product.

RENESAS

Renesas Electronics Corporation

http://www.renesas.com