M3H Group(1)
Application Note
Flash Memory
(FLASH128_32-A)

Outlines

This application note is a reference material for developing products using Flash Memory (FLASH128_32-A) functions of M3H Group(1).
This document helps the user check operation of the product and develop its program.

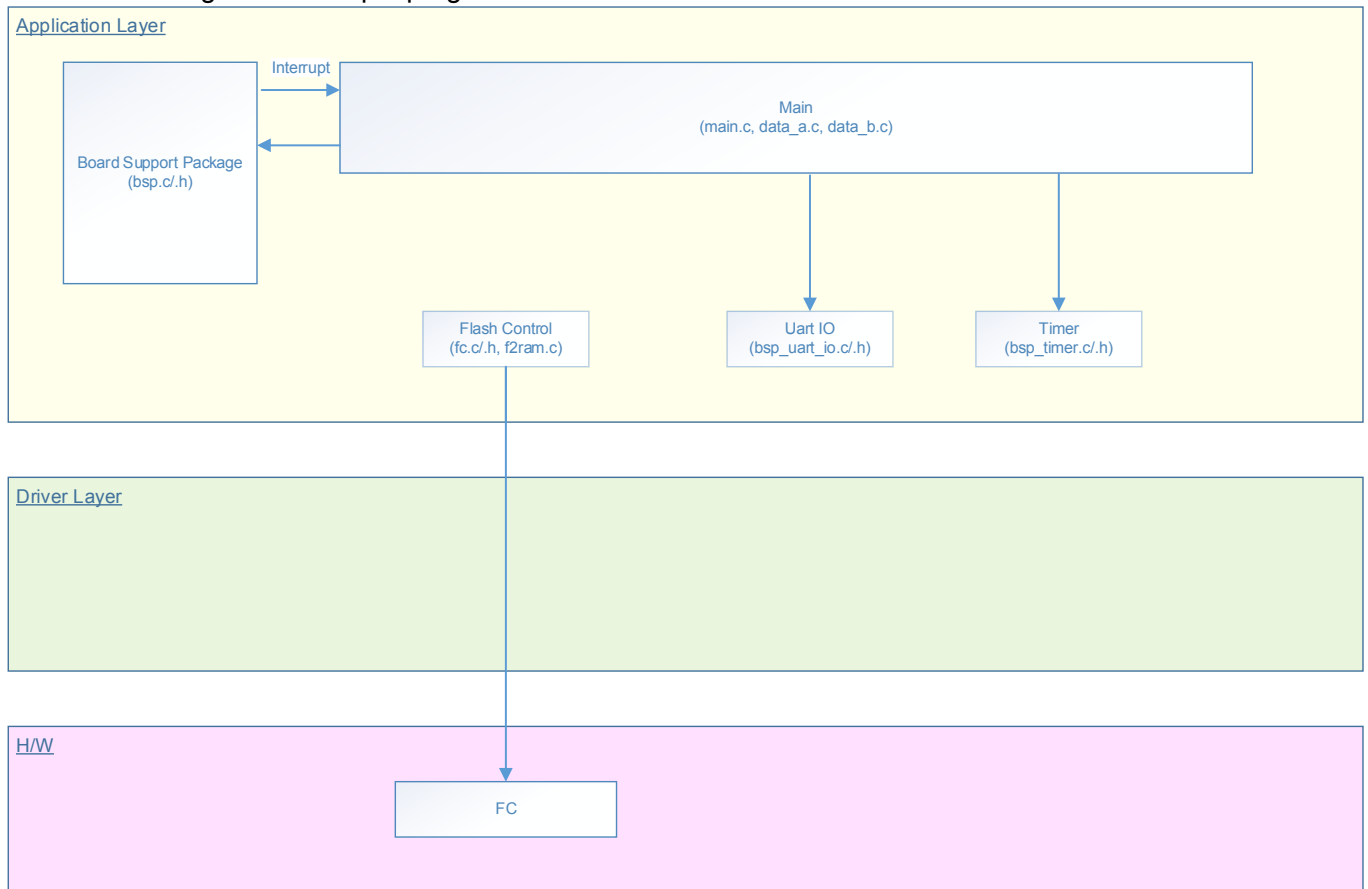Target sample program: Flash_Userboot

Table of Contents

1. Preface

This sample program is used to check the operation of Flash memory function.
It writes the Flash memory and executes the program in the Flash memory.

Structure diagram of Sample program

2. Reference Document

- Datasheet
  TMPM3H group (1) datasheet Rev2.0 (Japanese edition)
- Reference manual
  Flash memory (FLASH128_32_A) Rev1.1 (Japanese edition)
- Other reference document
  TMPM3H(1) Group Peripheral Driver User Manual (Doxygen)

3. Function to Use

IP	channel	port	Function / operation mode
Flash memory	-	-	-
Asynchronous communication	ch1	PA1 (UT0TXDA) PA2 (UT0RXD)	UART mode
Input and output port	-	PN4 (Input Port)	Input
	-	PB4 (Output Port) PB5 (Output Port) PB6 (Output Port) PB7 (Output Port)	Output

4. Target Device

The target devices of application note are as follows.

TMPM3H6FWFG	TMPM3H6FUFG	TMPM3H6FSFG
TMPM3H6FWDFG	TMPM3H6FUDFG	TMPM3H6FSDFG
TMPM3H5FWFG	TMPM3H5FUFG	TMPM3H5FSFG
TMPM3H5FWDFG	TMPM3H5FUDFG	TMPM3H5FSDFG
TMPM3H4FWUG	TMPM3H4FUUG	TMPM3H4FSUG
TMPM3H4FWFG	TMPM3H4FUFG	TMPM3H4FSFG
TMPM3H3FWUG	TMPM3H3FUUG	TMPM3H3FSUG
TMPM3H2FWDUG	TMPM3H2FUDUG	TMPM3H2FSDUG
TMPM3H2FWQG	TMPM3H2FUQG	TMPM3H2FSQG
TMPM3H1FWUG	TMPM3H1FUUG	TMPM3H1FSUG
TMPM3H1FPUG	TMPM3H0FSDUG	TMPM3H0FMDUG

 * This sample program operates on the evaluation board of TMPM3H6FWFG.
If other function than the TMPM3H6 one is checked, it is necessary that CMSIS Core related files (C startup file and IO header file) should be changed properly.
The BSP related file is dedicated to the evaluation board (TMPM3H6). If other function than the TMPM3H6 one is checked, the BSP related file should be changed properly.

5. Operation confirmation condition

Used microcontroller	TMPM3H6FWFG
Used board	TMPM3H6FWFG Evaluation Board (Product of Sensyst)
Unified development environment	IAR Embedded Workbench for ARM 8.11.2.13606
Unified development environment	µVision MDK Version 5.24.2.0
Terminal software	Tera Term V4.96
Sample program	V1100

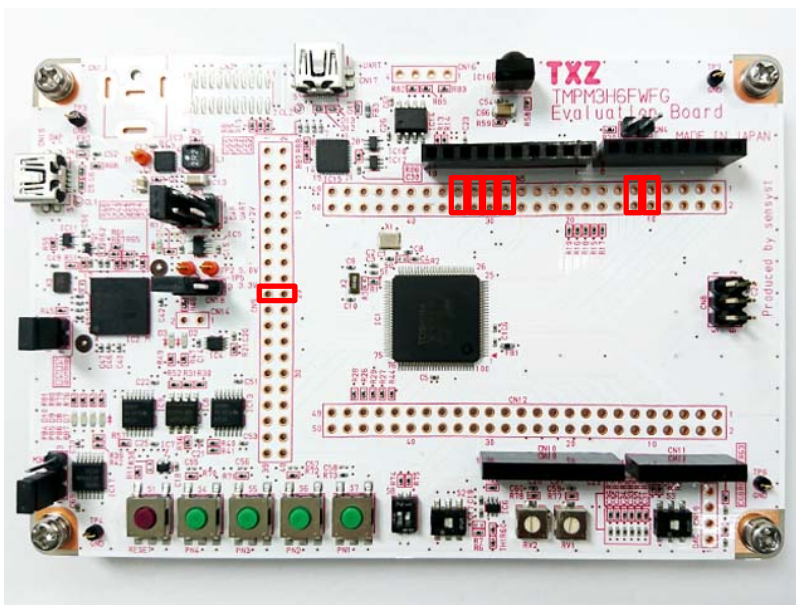Evaluation board (TMPM3H6FWFG Evaluation Board) (Top view)
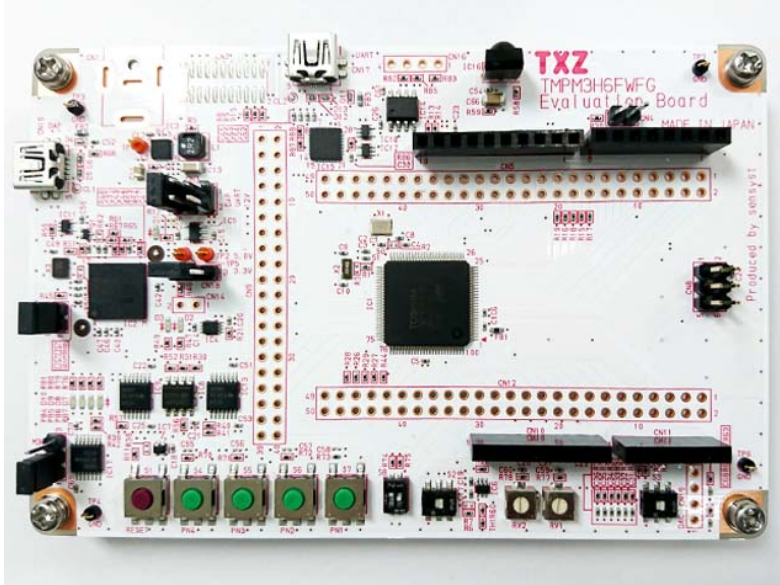
For purchasing the board, refer to the following homepage. (http://www.chip1stop.com/)

6. E4valuation Board Setting

The following pin connections should be done on the evaluation board.

CN5		
Use	Through-hole No.	Setting
UART (RXD)	9-10	Connection
UART (TXD)	11-12	Connection
LED (D10)	27-28	Connection
LED (D9)	29-30	Connection
LED (D8)	31-32	Connection
LED (D7)	33-34	Connection

CN9		
Use	Through-hole No.	Setting
Push SW (S4)	19-20	Connection

7. Operation of Evaluation Board

Connect the PC and USB_UART terminal of the evaluation board with a USB cable.
After PC starts terminal software (Tera Term), communication setting is executed.
Push the reset button on the evaluation board.

8. Outline of Flash Memory function

The code flash which stores a program code, and the data flash which saves data are explained.
A code flash stores an instruction code, and CPU reads and executes it.
There is user information area which can be accessed in a code flash by bank change. Since user information area is not erased by a chip erasing command, for example, it can be written a unique management number etc. for every chip.
A data flash stores data, and even if power supply is intercepted, it keeps data.

9. Sample Program

The write of the Flash memory is done in the user boot mode.
Programs A and B with different LED display patterns are prepared in this sample program.

9.1. Initialization

The following initialization is done after power is supplied.
The port setting is executed after the initialization of each clock setting, the watchdog timer setting and the clock setting.

9.2. Sample program main operation

After the initialization operation, shift to the main function and do the following initialization.
  1: Initialization of BSP (Board Support Package)
  2: Initialization of variables
  3: Initialize the driver
  4: Initialize the application
  5: Enable internal oscillation circuit

The following operations should be done on the terminal software (Tera Term) on PC.

The main procedure starts up, then, the user program (Program A) should be executed.
The write procedure, Program A, and Program B should be stored to RAM by pushing the SW.
The Flash areas for Program A and B should be erased.
Program B in RAM should be written to the Program A area in the Flash memory, and Program A in RAM should be written to the Program B area in the Flash memory.
The user program (Program B) should be executed by the main procedure.
The similar procedure repeats with writing Program A and B alternately.
The operation status is displayed via the UART interface.

9.3. Output Example of Sample Program

When the sample program operates, the command results are shown as follows;

```
COM9 - Tera Term VT

File  Edit  Setup  Control  Window  Help
********************
Excecute Data A
********************
Please press the S4
RAM transferring.
Erasing.
Rewriting.
Finished.
********************
Excecute Data B
********************
Please press the S4
RAM transferring.
Erasing.
Rewriting.
Finished.
********************
Excecute Data A
********************
Please press the S4
```

9.3.1. Setting Example of Terminal Software

The operation of the terminal software (Tera Term) has been checked with the following settings.

Tera Term: Serial port setup

Port:	COM9	OK
Baud rate:	115200	
Data:	8 bit	Cancel
Parity:	none	
Stop:	1 bit	Help
Flow control:	none	

Transmit delay

0 msec/char   0 msec/line

Tera Term: Terminal setup

Terminal size
80 X 24
☑ Term size = win size
☐ Auto window resize

New-line
Receive: AUTO
Transmit: CR+LF

OK
Cancel
Help

Terminal ID: VT100
Answerback:
☑ Local echo
☐ Auto switch (VT<->TEK)
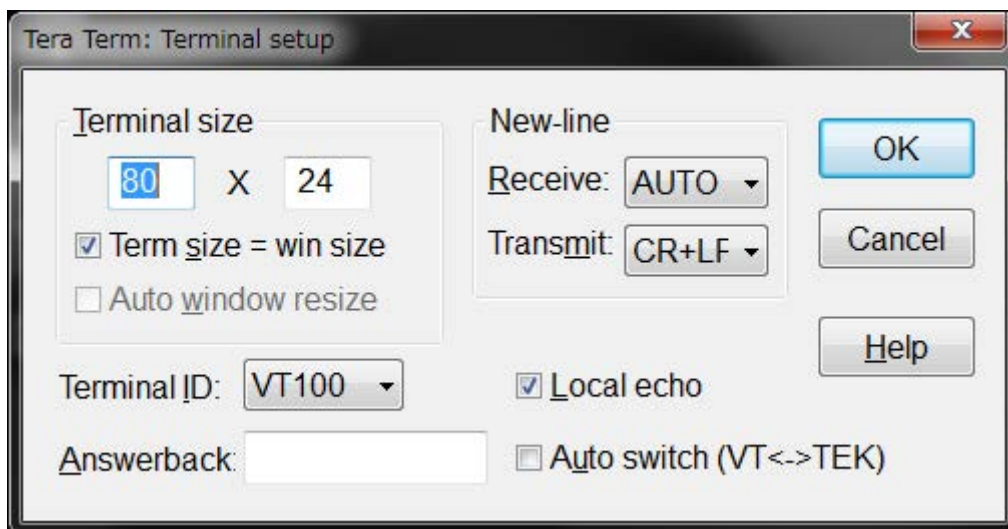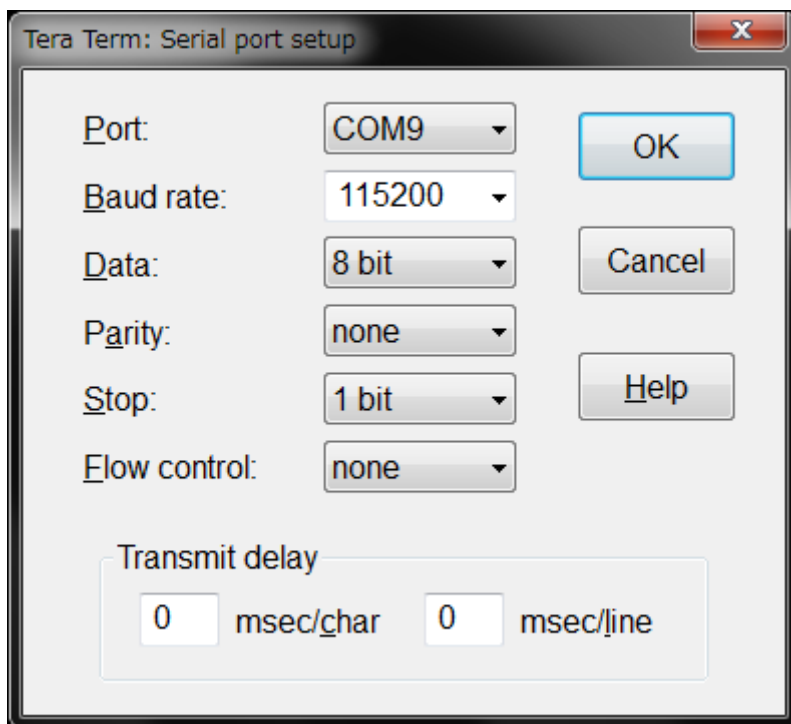
9.4. Operating Flow of Sample program

The operating flows of the sample program are shown as follows.

Memory map example

	main program execution	→	SW push-down	→	Erasing	→	Re-write and Completion	→	main program execution	→	Repeat from "SW push-down"

Display

main program execution	SW push-down	Erasing	Re-write and Completion	main program execution
Excecute Program A	RAM transferring	Erasing.	Rewriting.	Excecute Program B
Please press the S7			Finished.	Please press the S7

LED

	D7	D8	D9	D10
main program execution	Off	Blink	Off	Blinl
SW push-down	Off	On	Off	On
Erasing	Off	On	Off	On
Re-write and Completion	Off	On	Off	On
main program execution	Blinl	Off	Blinl	Off

10. Precaution

When using the sample program with CPU other than TMPM3H6, please check operation sufficiently.

11. Revision History

Rev	Date	Page	Description
1.0	2018-03-05	-	First release

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