Outlines

This application note is a reference material for developing products using the RAM Parity (RAMP-A) function of M3H Group (2).
This document helps the user check operation of the product and develop its program.

Target sample program: RAMParity
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1. Preface

This sample program is used to check the operation of the RAM parity function. The character string input from the terminal software is stored with the parity added to the RAM with the write command. The read command checks the parity which is stored in the RAM.

Structure diagram of Sample program
2. Reference Document

- Datasheet
  TMPM3H group (2) datasheet Rev2.0 (Japanese edition)
- Reference manual
  RAM PARITY (RAMP-A) Rev1.0 (Japanese edition)
- Other reference document
  TMPM3H(2) Group Peripheral Driver User Manual (Doxygen)

3. Function to Use

<table>
<thead>
<tr>
<th>IP</th>
<th>channel</th>
<th>port</th>
<th>Function / operation mode</th>
</tr>
</thead>
<tbody>
<tr>
<td>Asynchronous serial</td>
<td>ch0</td>
<td>PA1 (UT0TXDA)</td>
<td>Asynchronous communication with PC</td>
</tr>
<tr>
<td>communication circuit</td>
<td></td>
<td>PA2 (UT0RXD)</td>
<td></td>
</tr>
</tbody>
</table>

4. Target Device

The target devices of application note are as follows.

<table>
<thead>
<tr>
<th>TMPM3HQFDFG</th>
<th>TMPM3HQFZFG</th>
<th>TMPM3HQFYFG</th>
</tr>
</thead>
<tbody>
<tr>
<td>TMPM3HPFDFG</td>
<td>TMPM3HPFZFG</td>
<td>TMPM3HPFYFG</td>
</tr>
<tr>
<td>TMPM3HNFDFG</td>
<td>TMPM3HNFZFG</td>
<td>TMPM3HNFYFG</td>
</tr>
<tr>
<td>TMPM3HNFDDFG</td>
<td>TMPM3HNFZDFG</td>
<td>TMPM3HNFYDFG</td>
</tr>
<tr>
<td>TMPM3HMFDGF</td>
<td>TMPM3HMFZFG</td>
<td>TMPM3HMFYFG</td>
</tr>
</tbody>
</table>

* This sample program operates on the evaluation board of TMPM3HQFDFG. If other function than the TMPM3HQ one is checked, it is necessary that CMSIS Core related files (C startup file and I/O header file) should be changed properly. The BSP related file is dedicated to the evaluation board (TMPM3HQ). If other function than the TMPM3HQ one is checked, the BSP related file should be changed properly.
5. Operation confirmation condition

- **Used microcontroller**: TMPM3HQFDFG
- **Used board**: TMPM3HQFDFG 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

For purchasing the board, refer to the following homepage. ([http://www.chip1stop.com/](http://www.chip1stop.com/))
6. Evaluation Board Setting

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

<table>
<thead>
<tr>
<th>CN12</th>
<th>Through hole No.</th>
<th>Through hole No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>USB UART conversion</td>
<td>53 : PA1</td>
<td>54 : USB_TXD</td>
</tr>
<tr>
<td>USB UART conversion</td>
<td>55 : PA2</td>
<td>56 : USB_RXD</td>
</tr>
</tbody>
</table>

7. Operation of Evaluation Board

The USB_UART connector on the evaluation board should be connected to a PC with a USB cable. The terminal software (Tera Term) is started up on the PC, and the communication setting should be done. The reset button should be pushed down on the evaluation board. The communication starts according to the command input. For the details of the command operation, refer to “Sample program main operation”.
8. Outline of RAM Parity Function

RAM parity function generates parity data when write to RAM. And read RAM data with parity and do parity check (judgment) the parity. At that time, detected parity error, then generates RAM parity interrupt request (INTPARI).
9. Sample Program

The RAM parity data is added to the character string which is input by a write command on the Tera Term. The data and its parity data are stored to the RAM. A read command reads data in the RAM and its parity is checked. The result is displayed on the Tera Term. The maximum length of the character string is 10 characters.

9.1. Initialization

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

9.2. Sample program main operation

After the initialization, the "main" function is executed, and the following initialization is done.
1. BSP (Board Support Package) initialization
2. Application initialization
3. RAM clear and RAM parity setting
4. “main” control of the sample program

After the above procedure, the following operation should be done on the terminal software (Tera Term) on the PC.
"command >” is displayed on the Tera Term. Commands should be input according to the following command format.
When the write command is input, the written data after “write data >” is displayed on the Tera Term. And the data and its parity value are stored to the RAM.
When the read command is input, the data in the RAM is displayed after the parity check on the Tera Term. The data is displayed after "read data >". Then “command >” is displayed again.
The read command should be done after the write command is executed.

Command format:
write command
write X                X: Arbitrary characters
read command
read
9.3. Output Example of Sample Program

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

```
command > write abc
write data > abc
command > read
read data > abc
command >
```

9.3.1. Setting Example of Terminal Software

The operation of the terminal software (Tera Term) has been checked with the following settings.
9.4. Operating Flow of Sample Program

The operating flows of the sample program are shown in the following:
Creation and Initialization

BSP initialization

Application initialization

RAM initialization

RAM Parity setting

Status initialization
Application initialization

- UART Application initialization
- TSPI transmission channel initialization
- TSPI reception channel initialization

RAM Parity setting

- REG_RPAREN_enablet(Register base address, Transmission data)
"getchar" is retargeted to "getc", and the characters are input one by one.

Reception data is picked up.

[Reception information = Reception data is present.]

loop

[Reception result != Failure]

break
Command procedure

Input data == "write" ?

YES

Data is written to RAM area.

NO

Input data == "read" ?

Command error message display

ref RAM Parity check
RAM Parity setting

REG_RPARFGx_get(Register base address, RAM area)

Status value == 0?

Write data display

NO

Error procedure

Status value: REG_RPARFGx_get(-)
10. Precaution

When using the sample program with CPU other than TMPM3HQ, please check operation sufficiently.

11. Revision History

<table>
<thead>
<tr>
<th>Rev</th>
<th>Date</th>
<th>Page</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.0</td>
<td>2018-05-18</td>
<td>-</td>
<td>First release</td>
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