M3H Group(1)
Application Note
Input and Output Port
(PORT-M3H(1))

Outlines

This application note is a reference material for developing products using the I/O port (PORT) function of M3H Group(1).
This document helps the user check operation of the product and develop its program

Target sample program: GPIO_LED
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1. Preface

This sample program uses the Port to light the LED. LED on and off can be switched by Push switch.

Structure diagram of Sample program

![Structure diagram of Sample program](image-url)
2. Reference Document

- Datasheet
  TMPM3H group (1) datasheet Rev2.0 (Japanese edition)
- Reference manual
  Input/output ports (PORT-M3H(1)) Rev1.2 (Japanese edition)
- Other reference document
  TMPM3H(1) 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></td>
<td></td>
<td>PN1 (Input Port)</td>
<td>Input</td>
</tr>
<tr>
<td></td>
<td></td>
<td>PN2 (Input Port)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>PN3 (Input Port)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>PN4 (Input Port)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>PB4 (Output Port)</td>
<td>Output</td>
</tr>
<tr>
<td></td>
<td></td>
<td>PB5 (Output Port)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>PB6 (Output Port)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>PB7 (Output Port)</td>
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</tr>
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4. Target Device

The target devices of application note are as follows.

<table>
<thead>
<tr>
<th>TMPM3H6FWFG</th>
<th>TMPM3H6FUFG</th>
<th>TMPM3H6FSFG</th>
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<tbody>
<tr>
<td>TMPM3H6FWDFG</td>
<td>TMPM3H6FUDFG</td>
<td>TMPM3H6FSDFG</td>
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<tr>
<td>TMPM3H5FWFG</td>
<td>TMPM3H5FUFG</td>
<td>TMPM3H5FSFG</td>
</tr>
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<td>TMPM3H5FUDFG</td>
<td>TMPM3H5FSDFG</td>
</tr>
<tr>
<td>TMPM3H4FWUG</td>
<td>TMPM3H4FUUG</td>
<td>TMPM3H4FSUG</td>
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<td>TMPM3H3FSUG</td>
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<td>TMPM3H1FWQG</td>
<td>TMPM3H1FUQG</td>
<td>TMPM3H1FSQG</td>
</tr>
<tr>
<td>TMPM3H1FUG</td>
<td>TMPM3H0FSDUG</td>
<td>TMPM3H0FMDUG</td>
</tr>
</tbody>
</table>

* 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
Sample program        V1100

Evaluation board (TMPM3H6FWFG Evaluation Board) (Top view)

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

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

<table>
<thead>
<tr>
<th>CN5</th>
<th>Use</th>
<th>Through-hole No.</th>
<th>Setting</th>
</tr>
</thead>
<tbody>
<tr>
<td>LED (D10)</td>
<td>27-28</td>
<td></td>
<td>Connection</td>
</tr>
<tr>
<td>LED (D9)</td>
<td>29-30</td>
<td></td>
<td>Connection</td>
</tr>
<tr>
<td>LED (D8)</td>
<td>31-32</td>
<td></td>
<td>Connection</td>
</tr>
<tr>
<td>LED (D7)</td>
<td>33-34</td>
<td></td>
<td>Connection</td>
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</table>

<table>
<thead>
<tr>
<th>CN9</th>
<th>Use</th>
<th>Through-hole No.</th>
<th>Setting</th>
</tr>
</thead>
<tbody>
<tr>
<td>Push SW (S4)</td>
<td>19-20</td>
<td></td>
<td>Connection</td>
</tr>
<tr>
<td>Push SW (S5)</td>
<td>21-22</td>
<td></td>
<td>Connection</td>
</tr>
<tr>
<td>Push SW (S6)</td>
<td>23-24</td>
<td></td>
<td>Connection</td>
</tr>
<tr>
<td>Push SW (S7)</td>
<td>25-26</td>
<td></td>
<td>Connection</td>
</tr>
</tbody>
</table>

7. Operation of Evaluation Board

Push switch changes the LED lighting operation.
While Push switch is pushed down, the corresponding LED on.

While Push switch for PortN4 (S4) is pushed down, PortB7 LED on.
When Push switch is not pushed down, the corresponding LED off.

While Push switch for PortN3 (S5) is pushed down, PortB6 LED on.
When Push switch is not pushed down, the corresponding LED off.

While Push switch for PortN2 (S6) is pushed down, PortB5 LED on.
When Push switch is not pushed down, the corresponding LED off.

While Push switch for PortN1 (S7) is pushed down, PortB4 LED on.
When Push switch is not pushed down, the corresponding LED off.
8. Outline of Input and Output Port function

TMPM3H group has ports, PORTA to PORTR. Each port is used as an input and output pin for a built-in peripheral function as well as it has its own port function.

Since the number of PORT correspondence differs depending on the product, please refer to the product datasheet for details.
9. Sample Program

Push switch are used to light the corresponding LED’s.
When a Push switch is pushed down, the corresponding LED on.
When a Push switch is not pushed down, the corresponding LED off.

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 main operation of the sample program is executed after every initialization completes.

9.2. Sample program main operation

This sample program executes the LED setting after the initialization completes.
The LED setting is four PORT settings from PB 4 to PB 7.
Push switch setting is done after the LED setting.
The Push SW settings are four PORT settings from PN 1 to PN 4.

After every setting completes, the main program operates.
The LED control is done by “SysTick” interrupt which checks the status of the Push SW’s every 10-ms.
9.3. Operating Flow of Sample Program

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

- led_initialize(LED instance address)
- led_initialize(-)

GPIO (Application)

gpio_write_bit(GPIO instance address, Group, number, DATA, LED Initial setting value)

SW Application initialization

- sw_initialize(SW instance address)

SW (Application)
gpio_read_bit(GPIO_Instance address, Group, number, DATA, Storage address)

result = gpio_read_bit():GPIO_PIN_SET/GPIO_PIN_RESET

Surveillance of SW push-down

loop

[1. used SW count]

1. led_turn_on(LED instance address)
2. led_turn_off(LED instance address)
10. Precaution

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

11. Revision History

<table>
<thead>
<tr>
<th>Rev</th>
<th>Date</th>
<th>Page</th>
<th>Description</th>
</tr>
</thead>
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<tr>
<td>1.0</td>
<td>2018-03-05</td>
<td>-</td>
<td>First release</td>
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