

M4K Group (1) Application Note Input / Output Ports (PORT-M4K(1))

Outlines

This application note is a reference material for developing products using the Input and output ports (PORT) of M4K Group (1).

This document helps the user check operation of the product and develop its program.

Target sample program: GPIO_LED



Table of Contents

Outlines	1
Table of Contents	2
1. Preface	4
2. Reference Document	4
3. Function to Use	4
4. Target Device	4
5. Operation Confirmation Condition	5
6. Evaluation Board Operation	5
7. Sample Program	6
7.1. Structure Diagram of Sample Program	6
7.2. Startup Routine	6
7.3. Main Operation	6
7.4. Operating Flow of Sample Program	7
8. Points to Remember on Handling of Sample Programs	11
9. Revision History	11
RESTRICTIONS ON PRODUCT USE	12



Arm and Keil are registered trademarks of Arm Limited (or its subsidiaries) in the US and/or elsewhere.

All other company names, product names, and service names mentioned herein may be trademarks of their respective companies.



1. Preface

This sample program is used to control the lighting of LED's using the Input and output ports. When a push switch is pushed down, the corresponding LED lights.

2. Reference Document

- 1. Datasheet
 - TMPM4K Group (1) datasheet Rev2.0 (Japanese edition)
- 2. Reference manual
 - Input/Output Ports (PORT-M4K(1)) Rev2.0 (Japanese edition)
- 3. Application note
 - M4K Group (1) Application Note Startup (CMSIS System & Clock Configuration) Rev1.0
- 4. Other reference document
 - TMPM4KxA Group Peripheral Driver User Manual (Doxygen) V1.0.4.0

3. Function to Use

IP	Channel	Port	Function/Operation mode
	_	PJ0 (Output Port)	- Output
	_	PJ2 (Output Port)	
	_	PJ4 (Output Port)	
January (Occidence) & Double	_	PL4 (Output Port)	
Input/Output Ports	_	PL0 (Input port)	
	_	PL1 (Input port)	logut
	_	PL2 (Input port)	Input
	_	PL3 (Input port)	

4. Target Device

The target devices of this application note are as follows;

TMPM4K4FYAUG	TMPM4K4FWAUG	TMPM4K4FUAUG	TMPM4K4FSAUG
TMPM4K4FYAFG	TMPM4K4FWAFG	TMPM4K4FUAFG	TMPM4K4FSAFG
TMPM4K2FYADUG	TMPM4K2FWADUG	TMPM4K2FUADUG	TMPM4K2FSADUG
TMPM4K1FYAUG	TMPM4K1FWAUG	TMPM4K1FUAUG	TMPM4K1FSAUG
			TMPM4K0FSADUG

^{*} This sample program operates on the evaluation board of TMPM4K4FYAUG.

If other function than the TMPM4K4 one is checked, it is necessary that CMSIS Core related files (the startup file and I/O header file) should be changed properly.

Additionally, the name of microcontroller which is set to the project should be changed.

The BSP related file is dedicated to the evaluation board (TMPM4K4FYAUG). If other function than the TMPM4K4 one is checked, the BSP related file should be changed properly.



5. Operation Confirmation Condition

Used microcontroller Used board Integrated development environment Integrated development environment Sample program TMPM4K4FYAUG
TMPM4K4 evaluation board (Product of ESP-kikaku Co. Ltd.)
IAR Embedded Workbench for ARM 8.22.2
Arm® Keil® MDK Version 5.24.2.0
v1.0.0

6. Evaluation Board Operation

The sample program should be started up.

While the SW input pin is set to low, the corresponding output port is low.

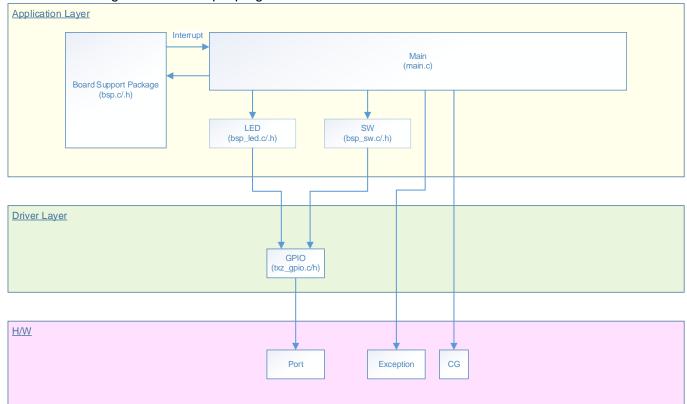
Switch: Input port	LED: Output port	Description
SW1: PL0	LED1: PJ0	_
SW2: PL1	LED2: PJ2	_
SW3: PL2	LED3: PJ4	_
SW4: PL3	— : PL4	Unconnected.



7. Sample Program

7.1. Structure Diagram of Sample Program

The structure diagram of the sample program is shown below.



7.2. Startup Routine

The following initialization is done after power is supplied.

The initialization of each clock setting and the initialization of the watchdog timer setting are done.

7.3. Main Operation

The initialization of the BSP is done.

The initialization of the LED's and the initialization of the switches are done as the initialization of the application software.

The initialization of the system clock is done. The SysTick interrupt which is generated every 10 ms is enabled.

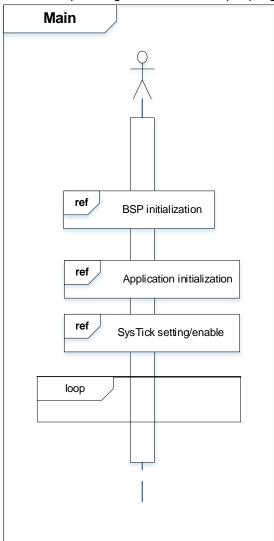
The status of the push switches is checked by the SysTick interrupt. If one of the switches is in the Low state, the corresponding port outputs the Low level.

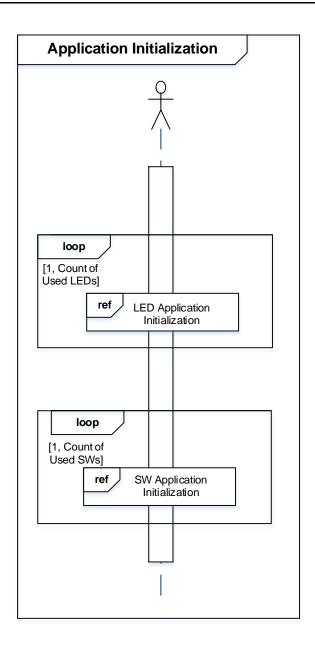
When the port is connected to an LED, the LED lights.



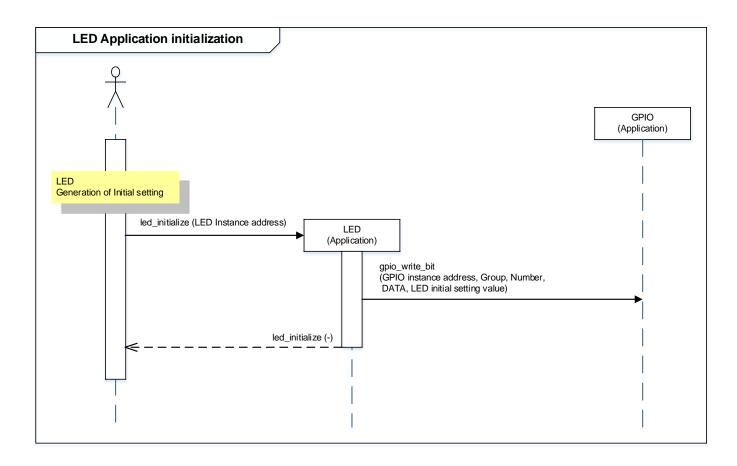
7.4. Operating Flow of Sample Program

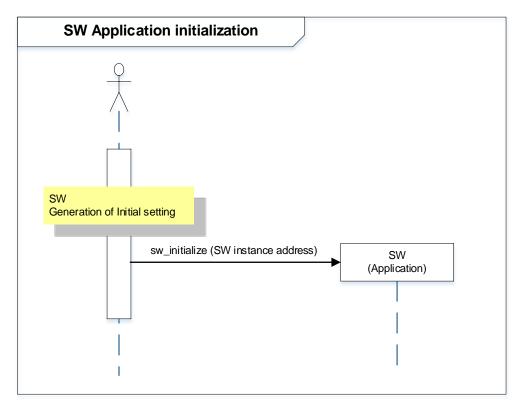
The basic operating flows of the sample program are shown in the following;

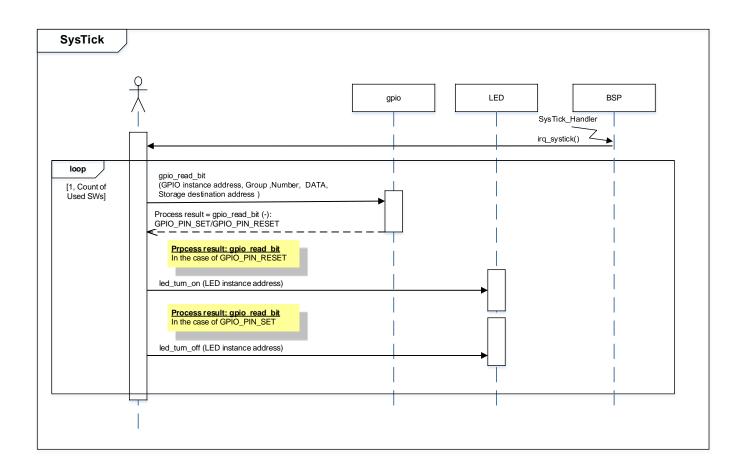














8. Points to Remember on Handling of Sample Programs

When using the sample program with other than "Operation Confirmation Condition" please check the operation sufficiently.

9. Revision History

Revision	Date	Description
1.0	2019-10-15	First release



RESTRICTIONS ON PRODUCT USE

Toshiba Corporation and its subsidiaries and affiliates are collectively referred to as "TOSHIBA". Hardware, software and systems described in this document are collectively referred to as "Product".

- TOSHIBA reserves the right to make changes to the information in this document and related Product without notice.
- This document and any information herein may not be reproduced without prior written permission from TOSHIBA. Even with TOSHIBA's written permission, reproduction is permissible only if reproduction is without alteration/omission.
- Though TOSHIBA works continually to improve Product's quality and reliability, Product can malfunction or fail. Customers are responsible for complying with safety standards and for providing adequate designs and safeguards for their hardware, software and systems which minimize risk and avoid situations in which a malfunction or failure of Product could cause loss of human life, bodily injury or damage to property, including data loss or corruption. Before customers use the Product, create designs including the Product, or incorporate the Product into their own applications, customers must also refer to and comply with (a) the latest versions of all relevant TOSHIBA information, including without limitation, this document, the specifications, the data sheets and application notes for Product and the precautions and conditions set forth in the "TOSHIBA Semiconductor Reliability Handbook" and (b) the instructions for the application with which the Product will be used with or for. Customers are solely responsible for all aspects of their own product design or applications, including but not limited to (a) determining the appropriateness of the use of this Product in such design or applications; (b) evaluating and determining the applicability of any information contained in this document, or in charts, diagrams, programs, algorithms, sample application circuits, or any other referenced documents; and (c) validating all operating parameters for such designs and applications. TOSHIBA ASSUMES NO LIABILITY FOR CUSTOMERS' PRODUCT DESIGN OR APPLICATIONS.
- PRODUCT IS NEITHER INTENDED NOR WARRANTED FOR USE IN EQUIPMENTS OR SYSTEMS THAT REQUIRE EXTRAORDINARILY
 HIGH LEVELS OF QUALITY AND/OR RELIABILITY, AND/OR A MALFUNCTION OR FAILURE OF WHICH MAY CAUSE LOSS OF
 HUMAN LIFE, BODILY INJURY, SERIOUS PROPERTY DAMAGE AND/OR SERIOUS PUBLIC IMPACT ("UNINTENDED USE"). Except for
 specific applications as expressly stated in this document, Unintended Use includes, without limitation, equipment used in nuclear facilities,
 equipment used in the aerospace industry, lifesaving and/or life supporting medical equipment, equipment used for automobiles, trains, ships
 and other transportation, traffic signaling equipment, equipment used to control combustions or explosions, safety devices, elevators and
 escalators, and devices related to power plant. IF YOU USE PRODUCT FOR UNINTENDED USE, TOSHIBA ASSUMES NO LIABILITY FOR
 PRODUCT. For details, please contact your TOSHIBA sales representative or contact us via our website.
- · Do not disassemble, analyze, reverse-engineer, alter, modify, translate or copy Product, whether in whole or in part.
- Product shall not be used for or incorporated into any products or systems whose manufacture, use, or sale is prohibited under any applicable laws or regulations.
- The information contained herein is presented only as guidance for Product use. No responsibility is assumed by TOSHIBA for any infringement of patents or any other intellectual property rights of third parties that may result from the use of Product. No license to any intellectual property right is granted by this document, whether express or implied, by estoppel or otherwise.
- ABSENT A WRITTEN SIGNED AGREEMENT, EXCEPT AS PROVIDED IN THE RELEVANT TERMS AND CONDITIONS OF SALE FOR
 PRODUCT, AND TO THE MAXIMUM EXTENT ALLOWABLE BY LAW, TOSHIBA (1) ASSUMES NO LIABILITY WHATSOEVER,
 INCLUDING WITHOUT LIMITATION, INDIRECT, CONSEQUENTIAL, SPECIAL, OR INCIDENTAL DAMAGES OR LOSS, INCLUDING
 WITHOUT LIMITATION, LOSS OF PROFITS, LOSS OF OPPORTUNITIES, BUSINESS INTERRUPTION AND LOSS OF DATA, AND (2)
 DISCLAIMS ANY AND ALL EXPRESS OR IMPLIED WARRANTIES AND CONDITIONS RELATED TO SALE, USE OF PRODUCT, OR
 INFORMATION, INCLUDING WARRANTIES OR CONDITIONS OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE,
 ACCURACY OF INFORMATION, OR NONINFRINGEMENT.
- Do not use or otherwise make available Product or related software or technology for any military purposes, including without limitation, for the
 design, development, use, stockpiling or manufacturing of nuclear, chemical, or biological weapons or missile technology products (mass
 destruction weapons). Product and related software and technology may be controlled under the applicable export laws and regulations
 including, without limitation, the Japanese Foreign Exchange and Foreign Trade Law and the U.S. Export Administration Regulations. Export
 and re-export of Product or related software or technology are strictly prohibited except in compliance with all applicable export laws and
 regulations.
- Please contact your TOSHIBA sales representative for details as to environmental matters such as the RoHS compatibility of Product. Please
 use Product in compliance with all applicable laws and regulations that regulate the inclusion or use of controlled substances, including without
 limitation, the EU RoHS Directive. TOSHIBA ASSUMES NO LIABILITY FOR DAMAGES OR LOSSES OCCURRING AS A RESULT OF
 NONCOMPLIANCE WITH APPLICABLE LAWS AND REGULATIONS.

TOSHIBA ELECTRONIC DEVICES & STORAGE CORPORATION

https://toshiba.semicon-storage.com/