

M4G Group (1)
Application Note
Input/Output Ports
(PORT-M4G (1))

Outlines

This application note is a reference material for developing products using Input/Output Ports (PORT) function of M4G group (1).

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

Target sample program: GPIO_LED

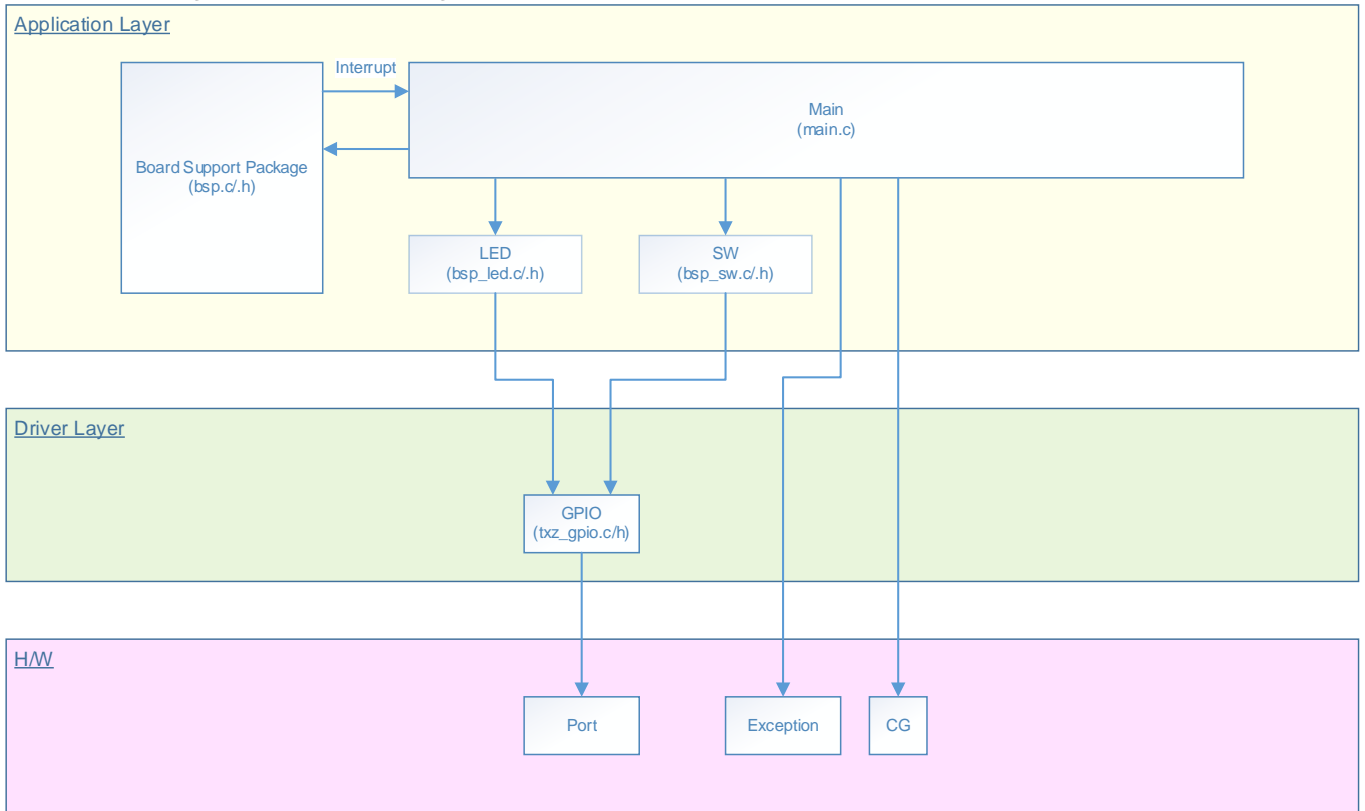
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1. Preface

This sample program 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.

Structure diagram of Sample program



2. Reference Document

- Datasheet
TMPM4G group (1) datasheet Rev1.0 (Japanese edition)
- Reference manual
Input/Output Ports (PORT-M4G (1)) Rev1.0 (Japanese edition)
- Application note
M4G Group (1) Application Note Startup (CMSIS System & Clock Configuration) Rev1.0
- Other reference document
TMPM4G (1) Group Peripheral Driver User Manual (Doxygen)

3. Function to Use

IP	Channel	Port	Function/Operation mode
Input/Output Ports	-	PE4 (Output port)	Output
	-	PE5 (Output port)	
	-	PE6 (Output port)	
	-	PE7 (Output port)	
	-	PL4 (Input port)	Input
	-	PL5 (Input port)	
	-	PV0 (Input port)	
	-	PV1 (Input port)	

4. Target Device

The target devices of this application note are as follows;

TMPM4G9F15FG	TMPM4G9F10FG	TMPM4G9FEFG	TMPM4G9FDFG
TMPM4G9F15XBG	TMPM4G9F10XBG	TMPM4G9FEXBG	TMPM4G9FDXBG
TMPM4G8F15FG	TMPM4G8F10FG	TMPM4G8FEFG	TMPM4G8FDFG
TMPM4G8F15XBG	TMPM4G8F10XBG	TMPM4G8FEXBG	TMPM4G8FDXBG
	TMPM4G7F10FG	TMPM4G7FEFG	TMPM4G7FDFG
	TMPM4G6F10FG	TMPM4G6FEFG	TMPM4G6FDFG

* This sample program operates on the evaluation board of TMPM4G9F15FG.

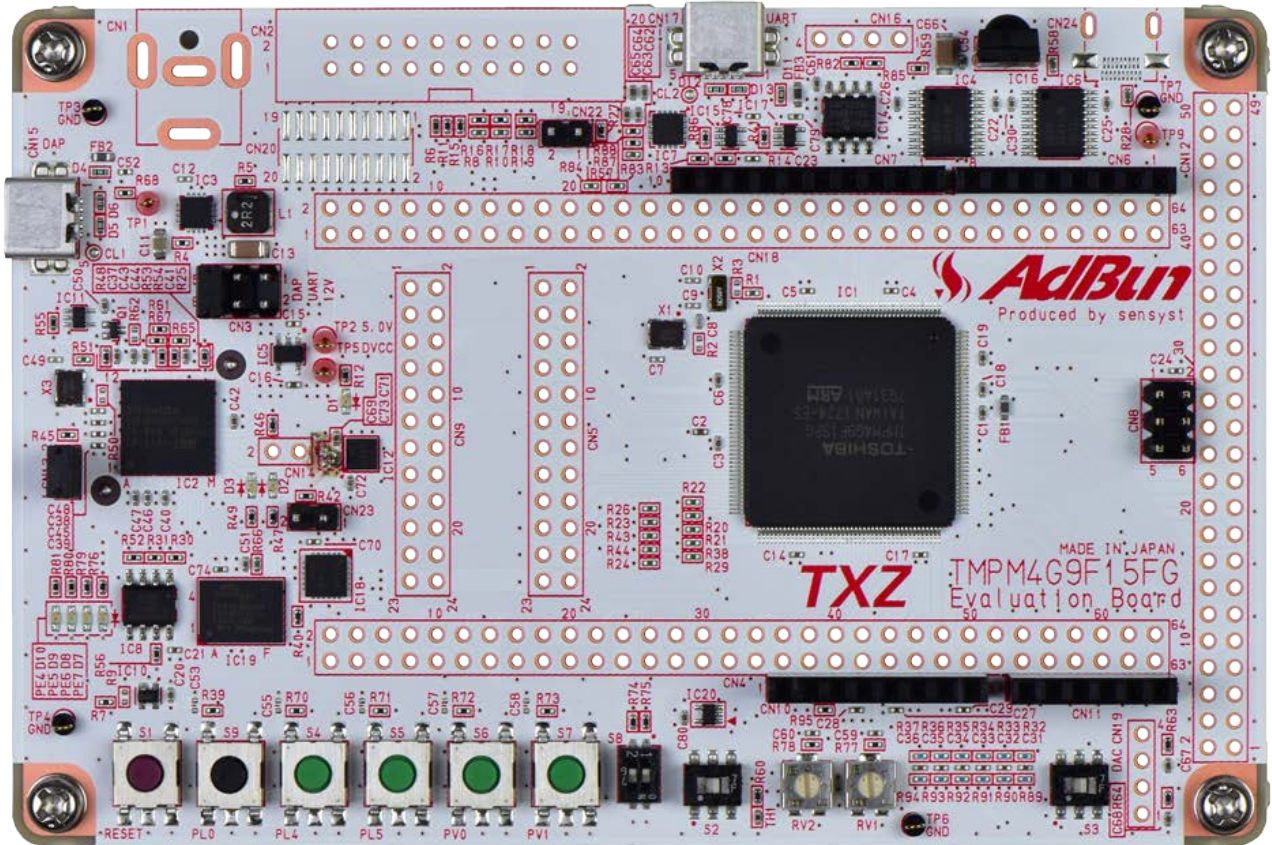
If other function than the TMPM4G9F15 one is checked, it is necessary that CMSIS Core related files (C startup file and I/O header file) should be changed properly.

The BSP related file is dedicated to the evaluation board (TMPM4G9F15). If other function than the TMPM4G9F15 one is checked, the BSP related file should be changed properly.

5. Operation Confirmation Condition

Used microcontroller	TMPM4G9F15FG
Used board	TMPM4G9F15FG Evaluation Board by 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	V1000

Evaluation board (TMPM4G9F15FG Evaluation Board) Top view

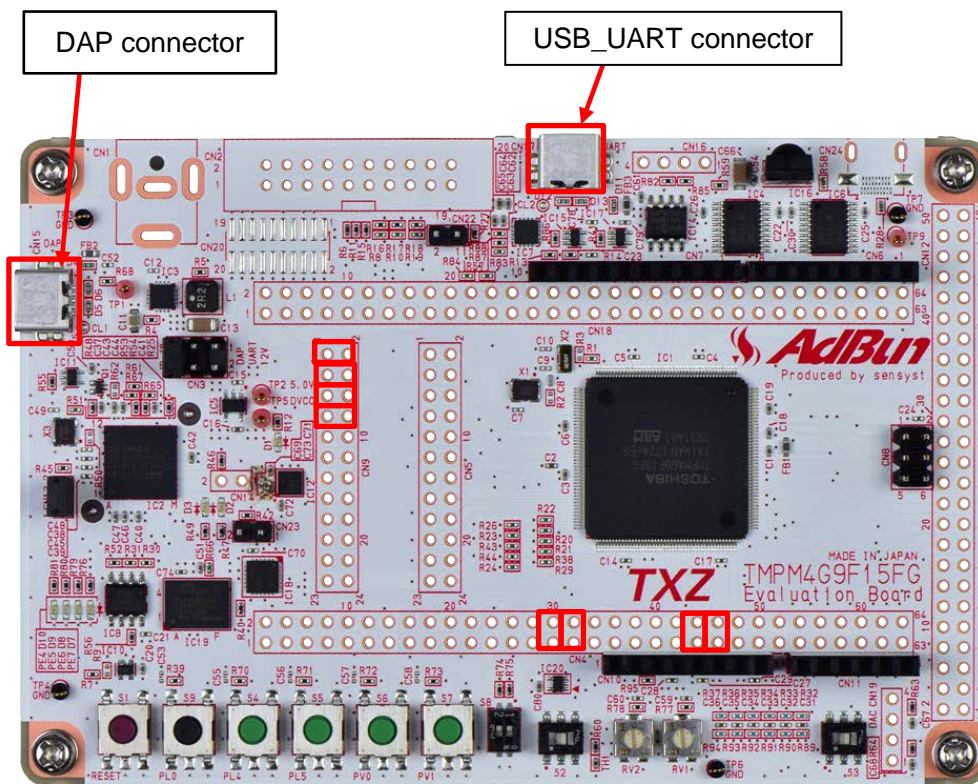


6. Evaluation Board Setting

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

CN9		
Board function	Through-hole No.	Through-hole No.
LED (D10)	1: LED0	2: PE4
LED (D9)	3: LED1	4: PE5
LED (D8)	5: LED2	6: PE6
LED (D7)	7: LED3	8: PE7

CN4		
Board function	Through-hole No.	Through-hole No.
Push switch (S4)	43: SW_INT1	44: PL5
Push switch (S5)	45: SW_INT0	46: PL4
Push switch (S6)	29: ISD_SW1	30: PV1
Push switch (S7)	31: ISD_SW0	32: PV0



7. Operation of Evaluation Board

The sample program should be started up.

While each push switch is pushed down, the corresponding LED lights.

Push switch	Lighting LED
SW4	LED (D10)
SW5	LED (D9)
SW6	LED (D8)
SW7	LED (D7)

8. Outline of Input/Output Ports Function

It is described about the register and setting of port. A list of the functions is indicated below.

Function Classification	Function	Description
Port	-	Programmable pull-up /Programmable pull-down /Open-drain output are possible.
Peripheral Function pins	Interrupt control	External Interrupt pin Interrupt pin has a noise filter(Filter width 30ns typ.).
	32-bit Timer Event Counter	Input capture input pin. Timer output pin.
	Serial Peripheral Interface	Chip select input 1 pin, Chip select output 2 pins, Data input pin, Data output pin, Clock input/output pin
	Asynchronous Serial Communication Circuit	Data input pin, Data output pin, Handshake function pins.
	Full Universal Asynchronous Receiver Transmitter	Data input pin, Data output pin, Handshake function pins, IrDA1.0 data input/output pin
	I ² C Interface	Data input/output pin, Clock input/output pin
	Serial Memory Interface	Chip select input/output pin, Data input/output pin, Clock input/output pin
	Multi-Function DMA Controller	MDMA Request input pin
	High Speed DMA Controller	HDMA Request input pin
	Interval Sensor Detection	Data input pin, Data output pin
	Consumer Electronics Control	Data input/output pin,
	External Bus Interface	Address bus output pin, Data bus input/output pin, Read strobe output pin, Write strobe output pin, Chip Select output pin, Byte Enable output pin, Address Latch Enable output pin, Wait input pin, Clock output pin
	Advanced Programmable Motor Control Circuit	X/Y/Z phase output pins, U/V/W phase output pins, EMG detection input pin, Overvoltage detection input pin.
	Remote Control Signal preprocessor	Data input pin
	12-bit Analog to Digital Convertor	Analog input pin, AD Trigger input pin
	8-bit Digital to Analog Convertor	DAC output pin
Real Time Clock	1Hz clock output pin, Alarm output pin	
Trigger Input(TRGSEL)	TRGINx pin	
Debug pin	JTAG	Test select input pin, Serial clock input pin, Serial data output pin, Serial data input pin, Test reset pin
	SW	Serial wire data input/output pin, Serial wire clock input pin, Serial wire viewer output pin
	Trace	Trace clock output pin, Trace data output 4pins.
	NBDIF	NBD synchronous input pin, NBD clock input pin, NBD data output 4pins.
Control pin	High speed resonator	High speed resonator connection pin, External High speed clock input
	Low speed resonator	Low speed resonator connection pin, External Low Speed clock input
	BOOT mode control	BOOT mode control pin

9. Sample Program

An LED lights while the corresponding push switch is pushed down.

9.1. Initialization

The following initialization is done after power is supplied.

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

9.2. Main Operation of Sample Program

BSP is initialized.

As the application initialization, the LED's and the push switches are initialized.

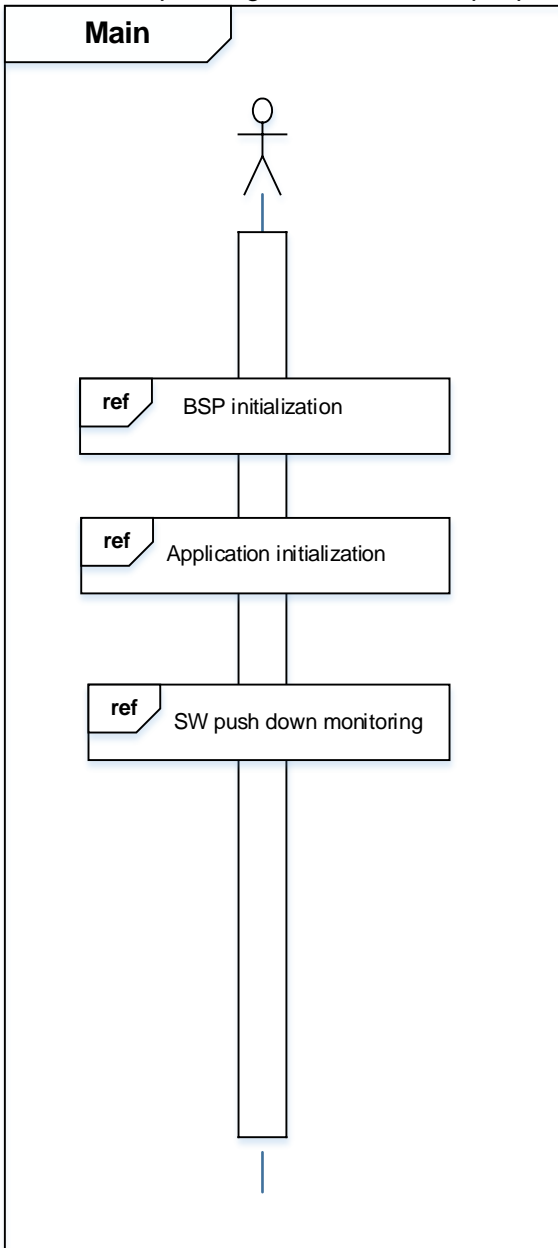
The system clock is initialized, and it is enabled that the SysTick interrupt is generated every 10 ms.

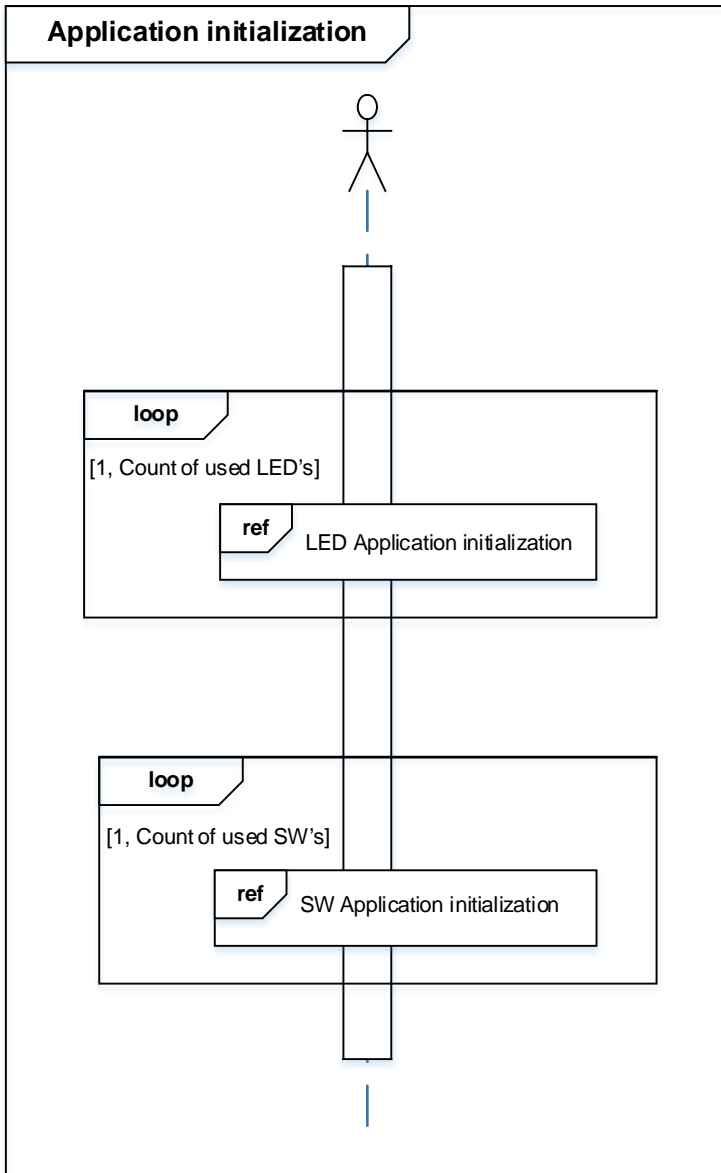
The status of the push switches are checked by the SysTick interrupt.

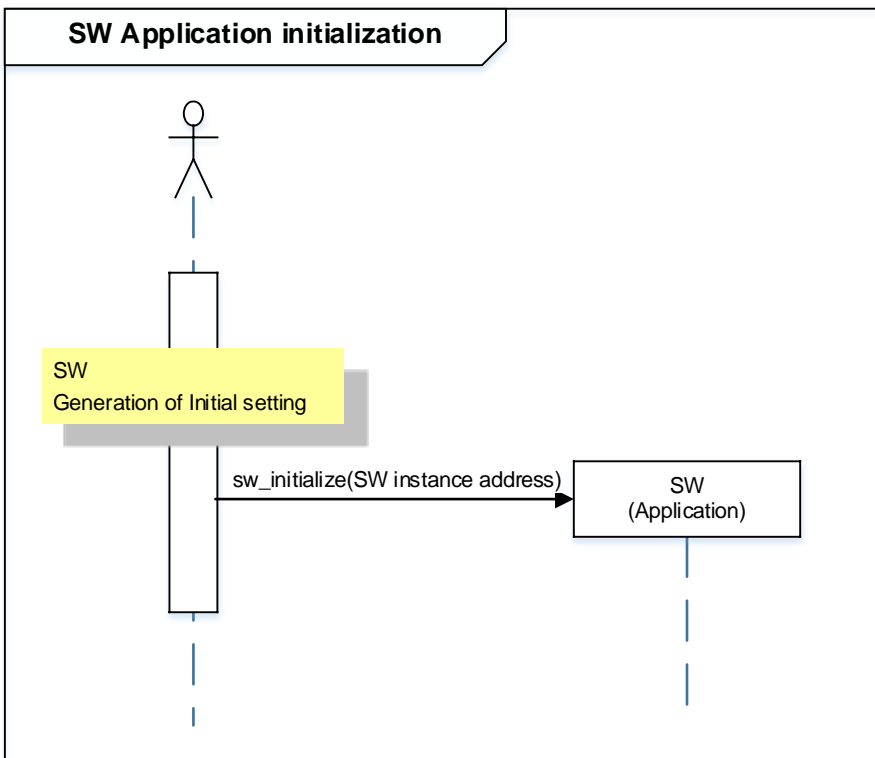
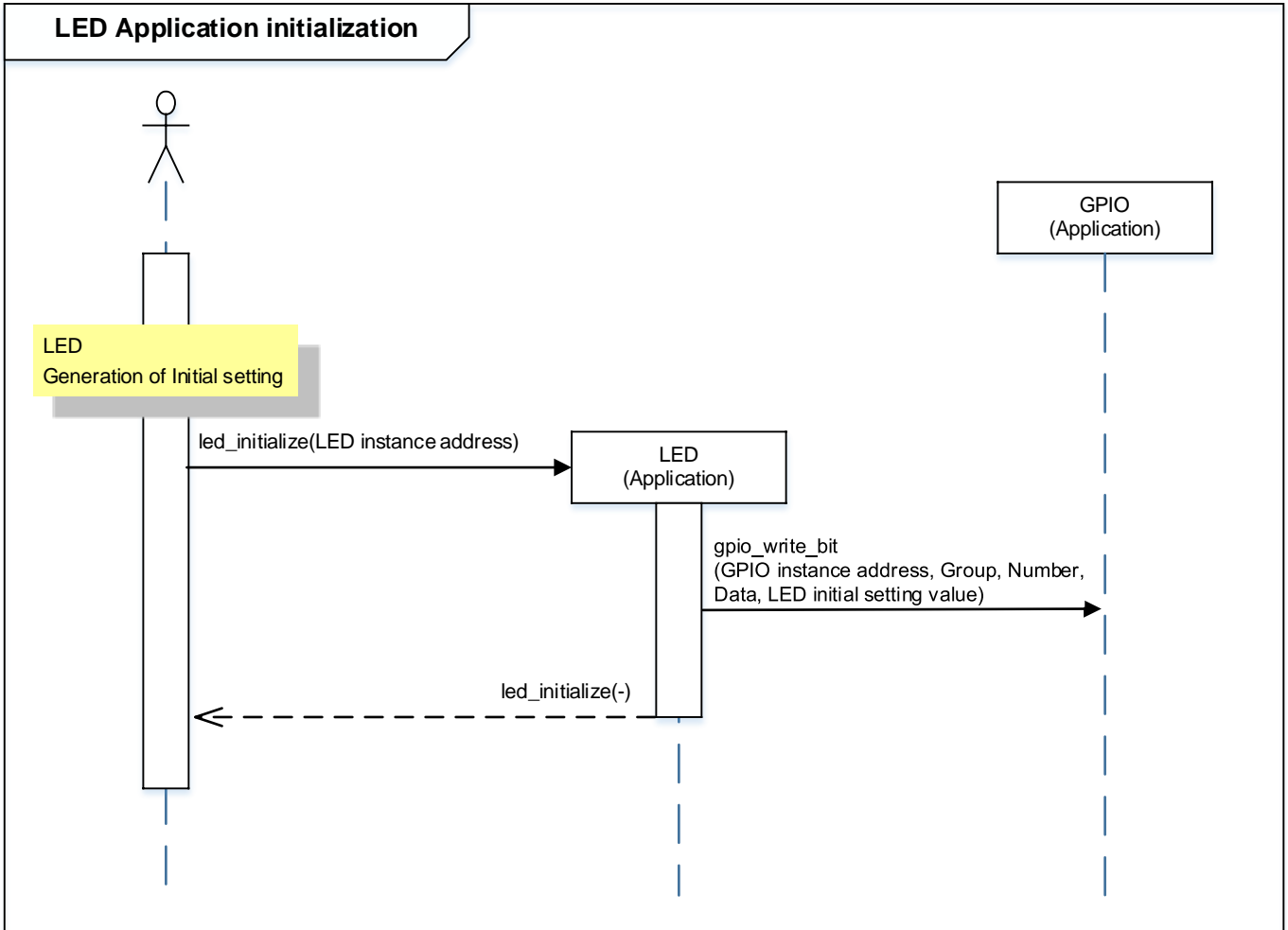
Check the press status of the push switch with the SysTick interrupt and light up the LED if it is pressed. If it is not pressed it will turn off the LED.

9.3. Operating Flow of Sample Program

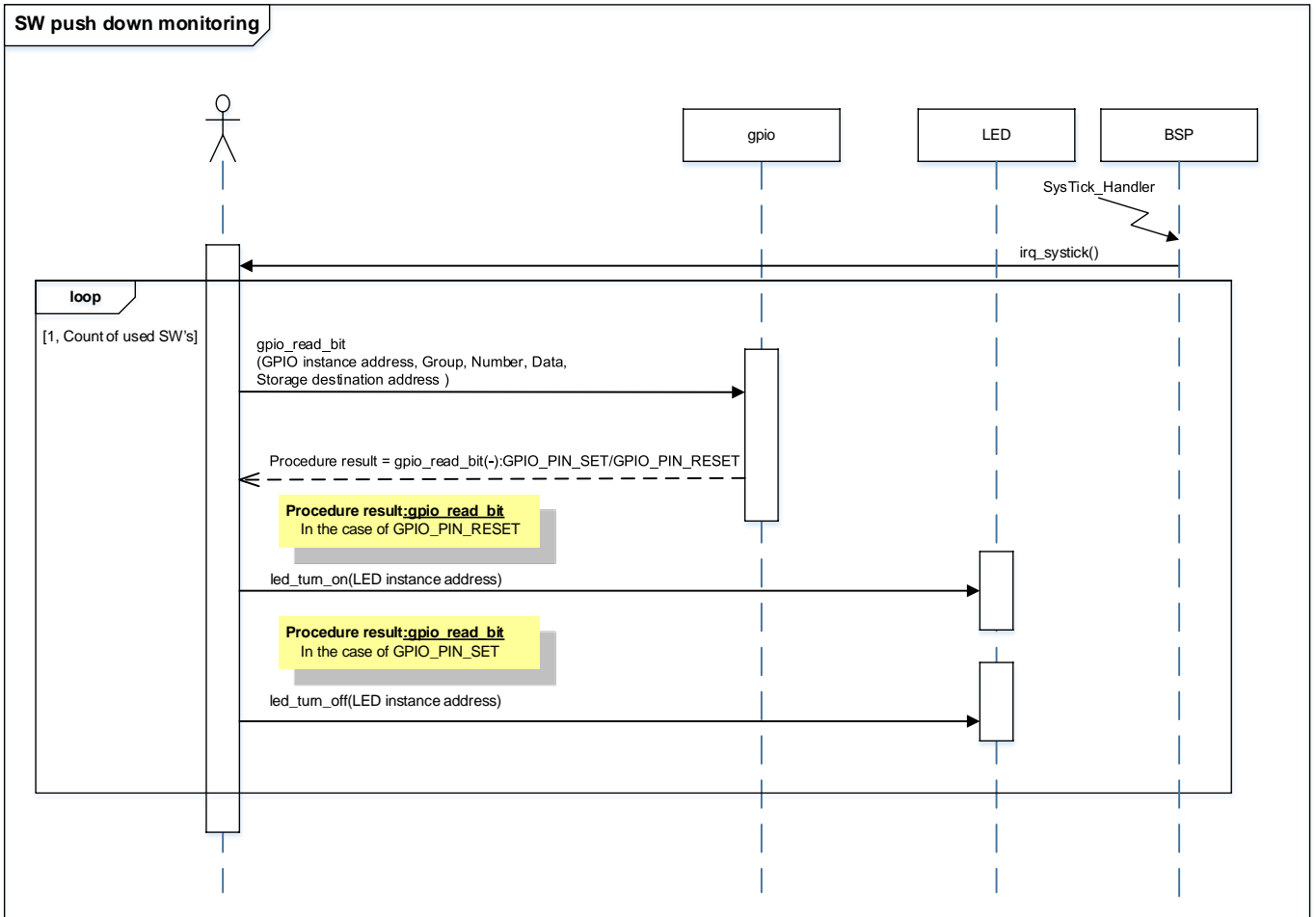
The basic operating flows of the sample program are shown in the following;







SW push down monitoring



10. Precaution

When using the sample program with CPU other than TPM4G9F15, please check operation sufficiently.

11. Revision History

Rev	Date	Description
1.0	2018-11-28	First release

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