

M3H Group(1)
Application Note
Voltage Detection Circuit
(LVD-A)

Outlines

This application note is a reference material for developing products using the voltage detection circuit (LVD) function of M3H Group(1).

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

Target sample program: LVD-DEMO

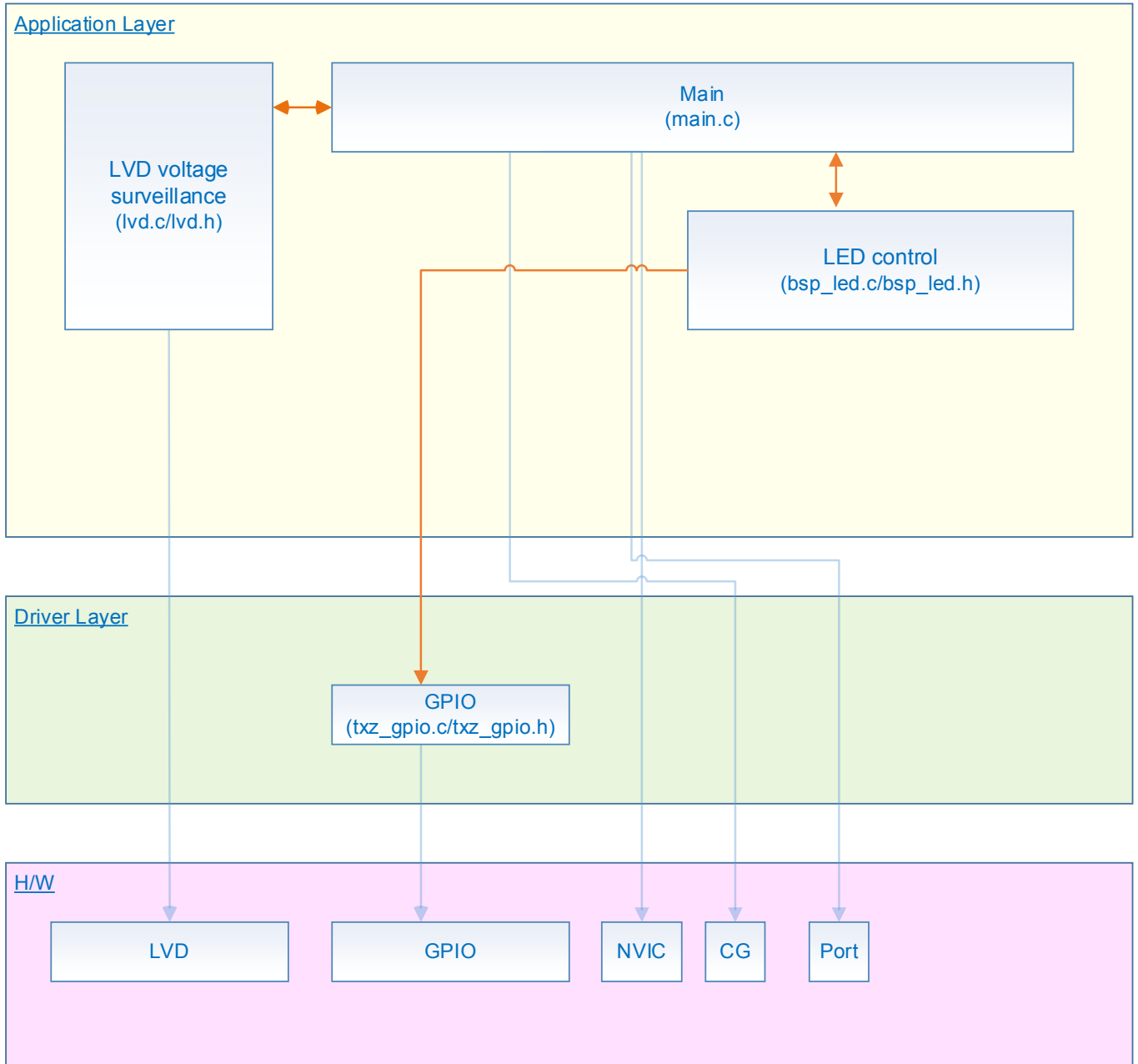
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1. Preface

This sample program is used to check the operation of the LVD function. The result of the voltage detection is shown by the lighting or the blink of the LED's when the power is supplied.

Structure diagram of Sample program



2. Reference Document

- Datasheet
 TMPM3H group (1) datasheet Rev2.0 (Japanese edition)
- Reference manual
 Voltage detection circuit (LVD-A) Rev1.2 (Japanese edition)
- Other reference document
 TMPM3H(1) Group Peripheral Driver User Manual (Doxygen)

3. Function to Use

IP	channel	port	Function / operation mode
Voltage detection	-	-	Detection of Power supply voltage
32-bit timer event counter	Timer A ch0	-	Interval timer

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.

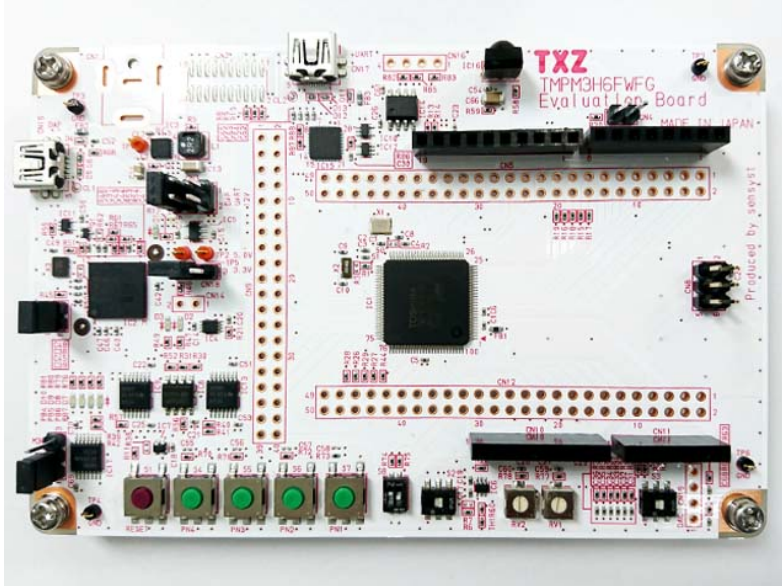
If other function than the TMPM3H6 one is checked, it is necessary that CMSIS Core related files (C startup file and IO header file) should be changed properly.

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
Sample program	V1100

Evaluation board (TMPM3H6FWFG Evaluation Board) (Top view)

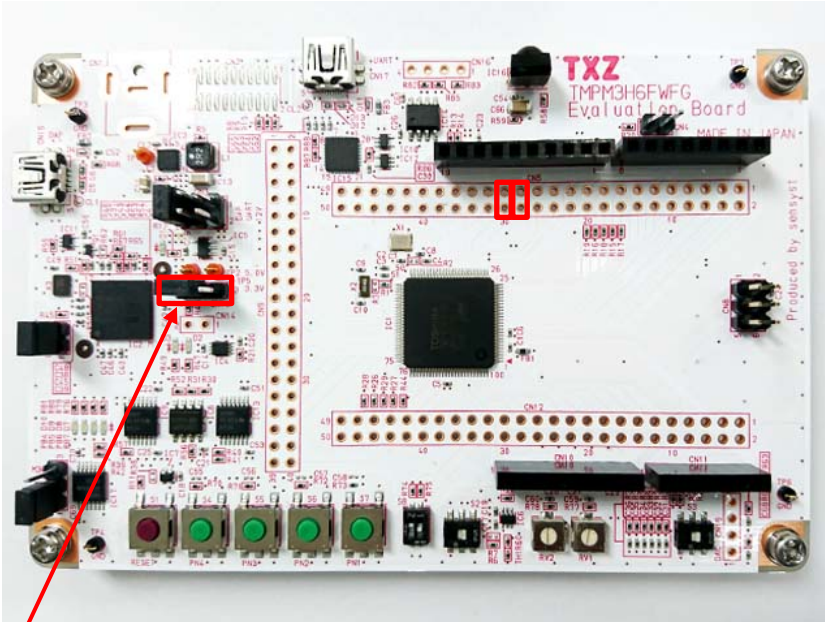


For purchasing the board, refer to the following homepage. (<http://www.chip1stop.com/>)

6. Evaluation Board Setting

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

CN5		
Use	Through-hole No.	Setting
LED (D10)	27-28	Connection
LED (D9)	29-30	Connection



CN18: External power should be supplied to No2 pin.

7. Operation of Evaluation Board

The LVD detection result is shown by the LED lighting or blink.

CN18 JP should be removed. The external power should be supplied to Pin 2 (the central pin).

The power voltage is lower than the set LVD value: LED (D10) blinks.

The power voltage is higher than the set LVD value: LED (D9) lights.

DVDD5 voltage status can be checked by the LED lighting or blink.

8. Outline of LVD Function

The voltage detection circuit (LVD) generates an interrupt request or an internal reset signal when it detects a lower voltage than the preset value or a higher voltage than the other preset one.

A voltage detection circuit supervises the voltage of DVDD5.

The reference voltage which occurred in the reference voltage generating circuit is compared with the output of the detection voltage made from DVDD5. Detection voltage can be chosen.

According to a comparison result, interrupt/reset selection output control circuit outputs reset or interrupt.

9. Sample Program

An external power should be supplied to the DVCC pin on the board.

The LED lighting or blink shows the result of the comparison of the output of the voltage detection circuit with the preset voltage.

9.1. Initialization

The following initialization is done after power is supplied.

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

9.2. Sample program main operation

The setting of 1-ms interrupt timer is done.

The setting of the LED control is done.

The LVD setting is done.

In this sample program, the detection voltage and the release voltage have been set to 4.0V and 4.05V, respectively.

The voltage detection status of the LVD should be checked. The power voltage should be compared with the detection and the release voltages.

When the detected power voltage is higher than the set LVD value, LED (D9) lights.

Check the voltage detection status of the LVD at 1-ms intervals and continue lighting if the result is the same.

When the detected power voltage is lower than the set LVD value, LED (D10) blinks.

The voltage detection status of the LVD should be checked, and the blink continues when the result is the same.

9.3. LVD Setting Change

When the value of the comparison voltage in the LVD is changed in the sample program, the following should be done.

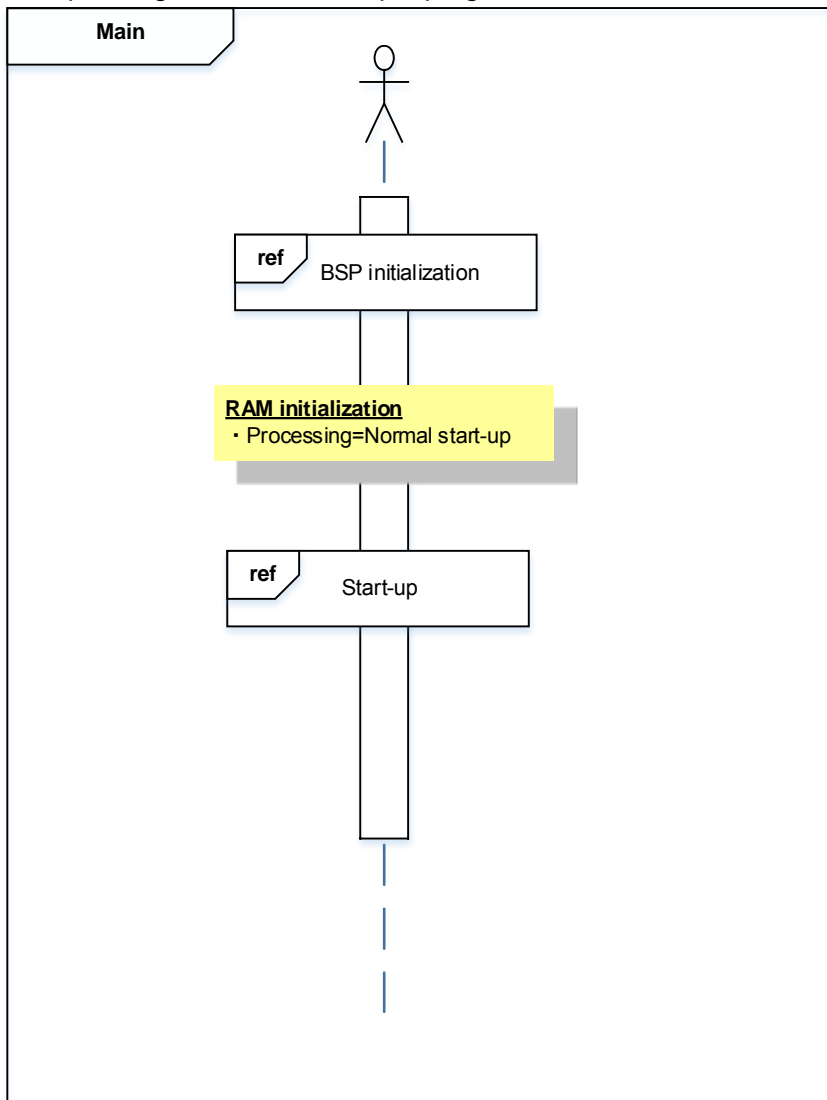
The setting of `init_LVD` in `lvd.c` should be changed properly.

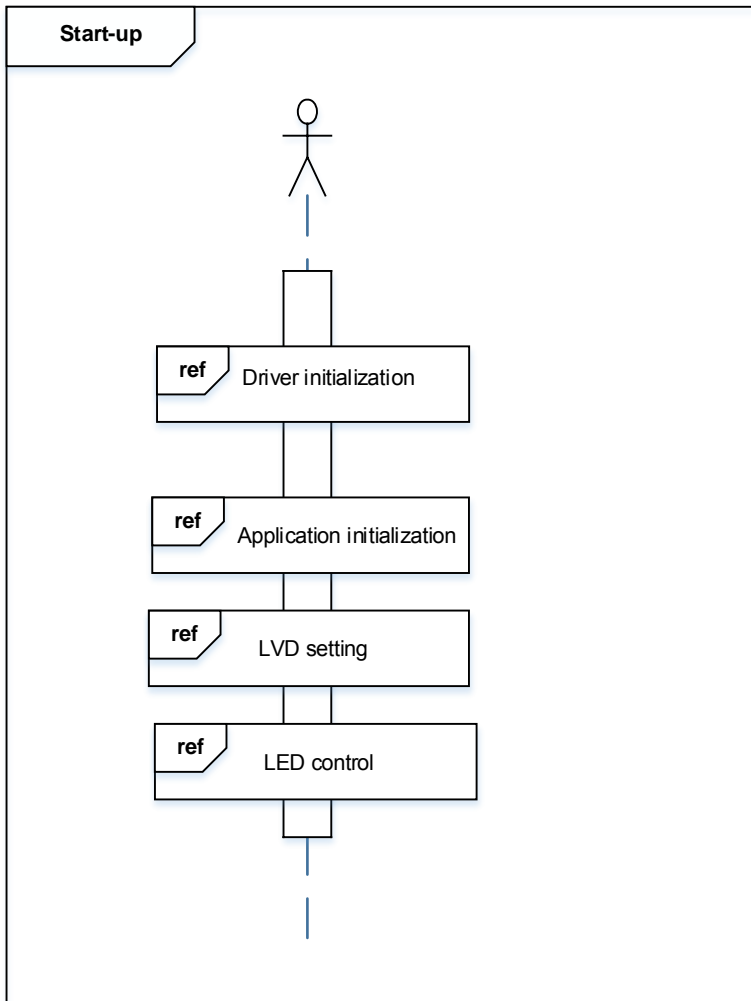
Example: `TSB_LVD->CR |= (uint8_t)LVD_VOLTAGE_44;`

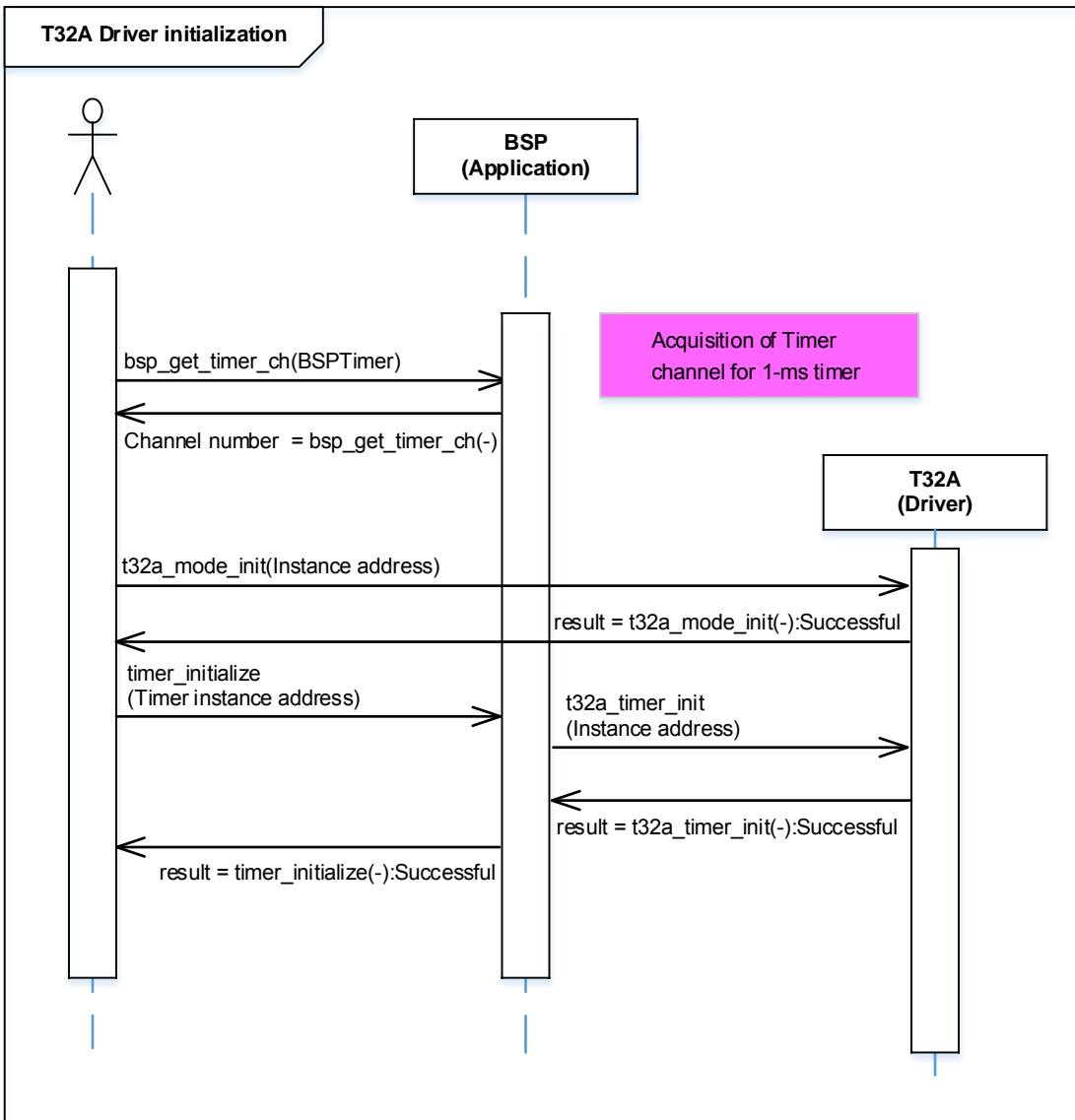
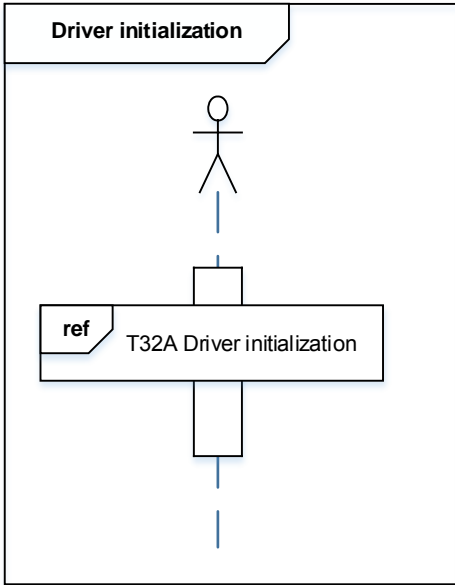
The detection result of the threshold voltage of 4.4V can be changed.

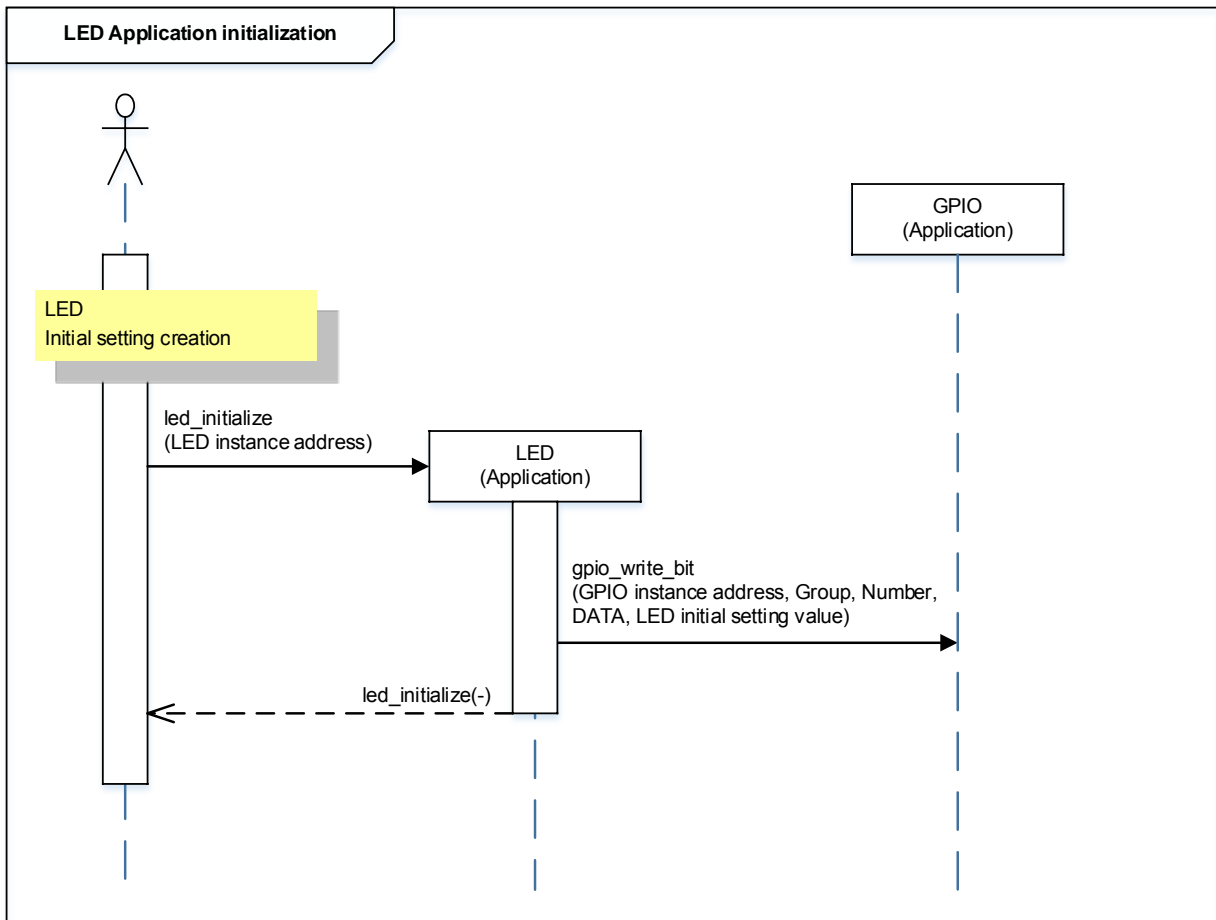
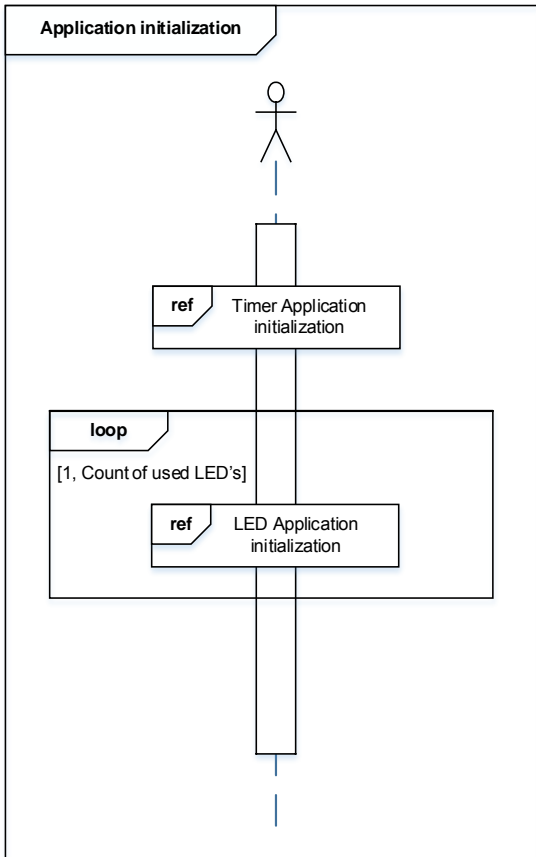
9.4. Operating Flow of Sample Program

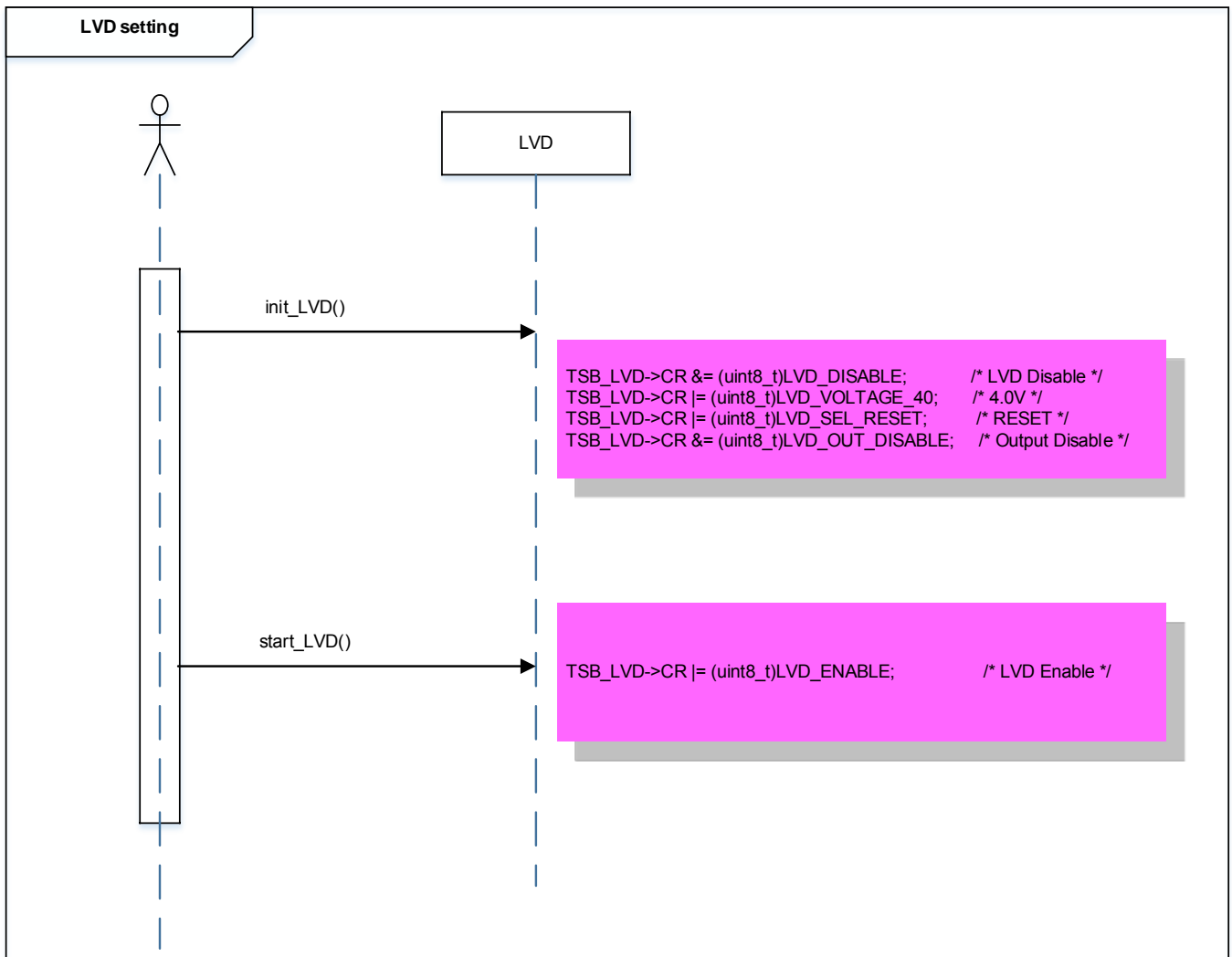
The operating flows of the sample program are shown as follows.

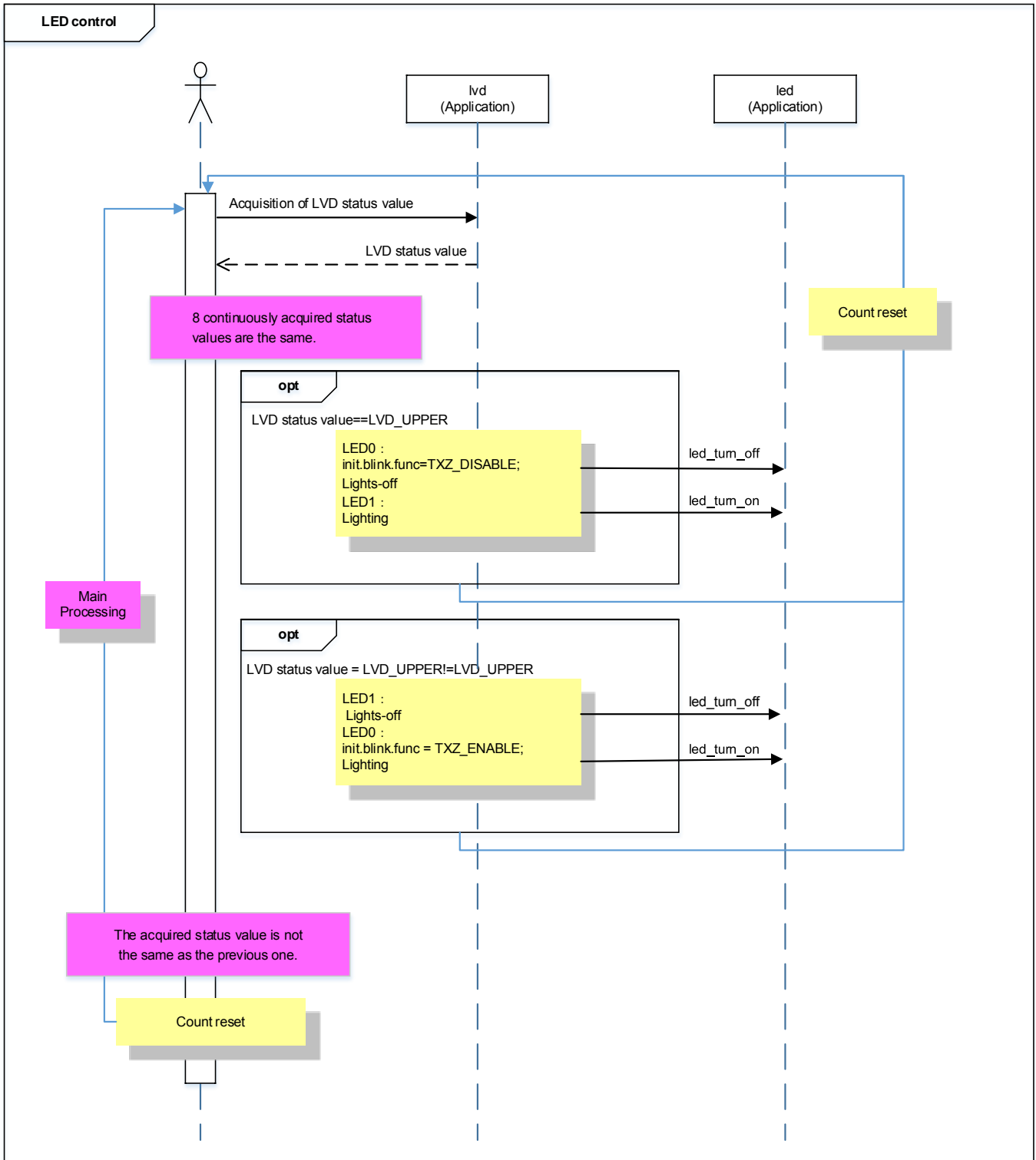












10. Precaution

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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