# Application Note

# CG_EXINT
# (CG-M4K(2)-E)

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# 1. Preface

This application note describes sample software for the switches between NORMAL mode and low power consumption mode using clock control and operation mode functions.
This document helps the user check operation of a product under development and develop its program.

# 2. Technical Term

| Term/Abbreviation | Definition |
|---|---|
| BSP | Board Support Package |
| CG | Clock Control and Operation Mode |
| EXCEPT | Except |
| FLASH | Flash Memory |
| SIWDT | Clock Selective Watchdog Timer |
| Timer | T32A:32-bit Timer Event Counter |

# 3. Reference Document

| Document | Notes |
|---|---|
| Data sheet | Refer to the data sheet of MCU to be used. |
| Reference manual | Refer to the reference manual of each IP to be used. |
| Application note<br>MCU User Guide | Refer to the MCU user guide to be used. |

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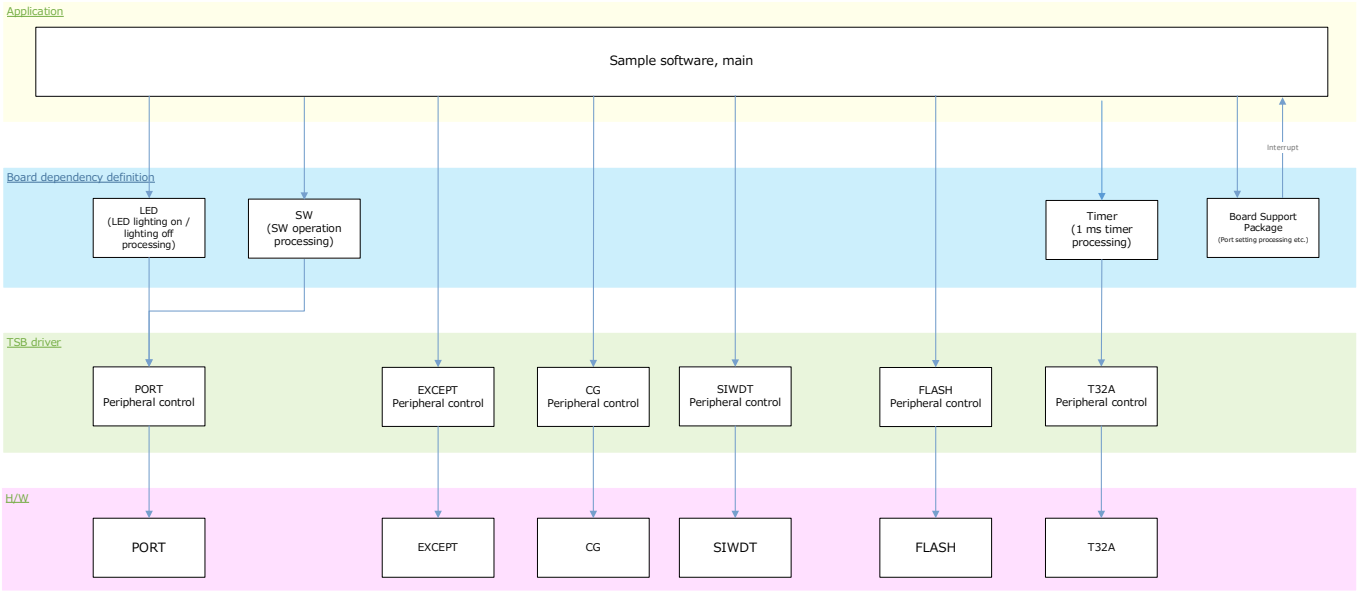
# 4. Target Sample Program

| Sample Program | Outline |
|---|---|
| CG_EXINT | Sample program of clock control and operation mode switching |

# 5. Configuration Diagram

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# 6. Sample Program:CG_EXINT

This is the sample software that uses CG operation mode transition function to shift to the low-power consumption mode and return to NORMAL mode according to the pressed switches.
Visualizes the operation mode by LED.

## 6.1. Outlines of Operation

Switches (NORMAL/IDLE/STOP1/STOP2) when pressed.

When BSP_PSW_1 is pressed, IDLE mode is entered.
However, it is invalid when pressed during low power consumption mode.

When BSP_PSW_2 is pressed, STOP1 mode is entered.
However, it is invalid when pressed during low power consumption mode.

When BSP_PSW_3 is pressed, STOP2 mode is entered.
However, it is invalid when pressed during low power consumption mode.

When BSP_PSW_5 is pressed, NORMAL mode is entered.
However, if it is pressed during NORMAL, it is disabled.

LED is turned on and off according to the selected mode.
NORMAL mode : BSP_LED_1 blink at a constant Duty for a fixed period. All other LED are turned off.
IDLE mode : BSP_LED_2 is turned on. All other LED are turned off.
STOP1 mode : BSP_LED_3 is turned on. All other LED are turned off.
STOP2 mode : BSP_LED_4 is turned on. All other LED are turned off.

## 6.2. Function to Use

The functions to use are as follows:
For the Port assignment of each BSP channel, refer to the MCU user guide.

| IP | Channel | Objective |
|---|---|---|
| PORT (Push Switch) | BSP_PSW_1 | Event trigger |
| | BSP_PSW_2 | Event trigger |
| | *BSP_PSW_3 | *Event trigger |
| | *BSP_PSW_5 | *Event trigger |
| PORT(LED) | BSP_LED_1 | For operation check |
| | BSP_LED_2 | For operation check |
| | BSP_LED_3 | For operation check |
| | BSP_LED_4 | For operation check |
| T32A | BSP_T32A_TIMER_1 | Interval timer |

* SBK-M4KN does not support STOP2 and does not have BSP_PSW_3.
* SBK-M4KN substitutes BSP_SSW_1.

## 6.3. Interrupt to Use

| Interrupt | Outlines |
|---|---|
| INT21 | External interrupt when pressing BSP_PSW_5.<br>For canceling low power consumption mode |
| INTT32A00A | T32A Timer A<br>Timer counter increments every 1ms for Switch / LED processing |

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## 6.4. Configuration

"main.c" configuration setting.

| Configuration | Current Value | Description |
|---|---|---|
| CFG_LED_BLINK_FRQ | 2 | LED blink Cycle (Unit:Hz) |
| CFG_LED_BLINK_DUTY | 0.5 | LED blink Duty (50%) |

## 6.5. Example of Terminal Emulator Output

Nothing.

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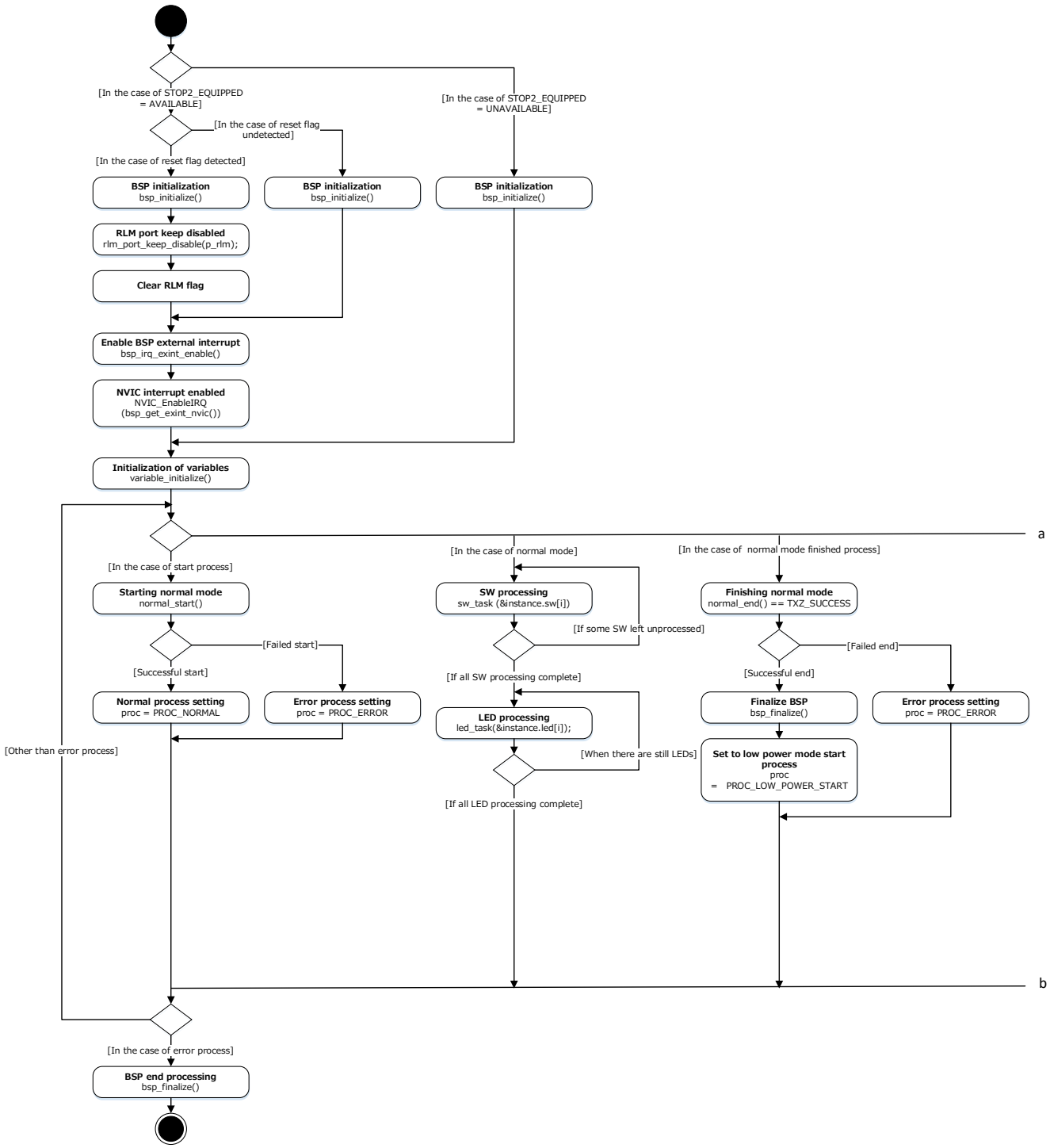
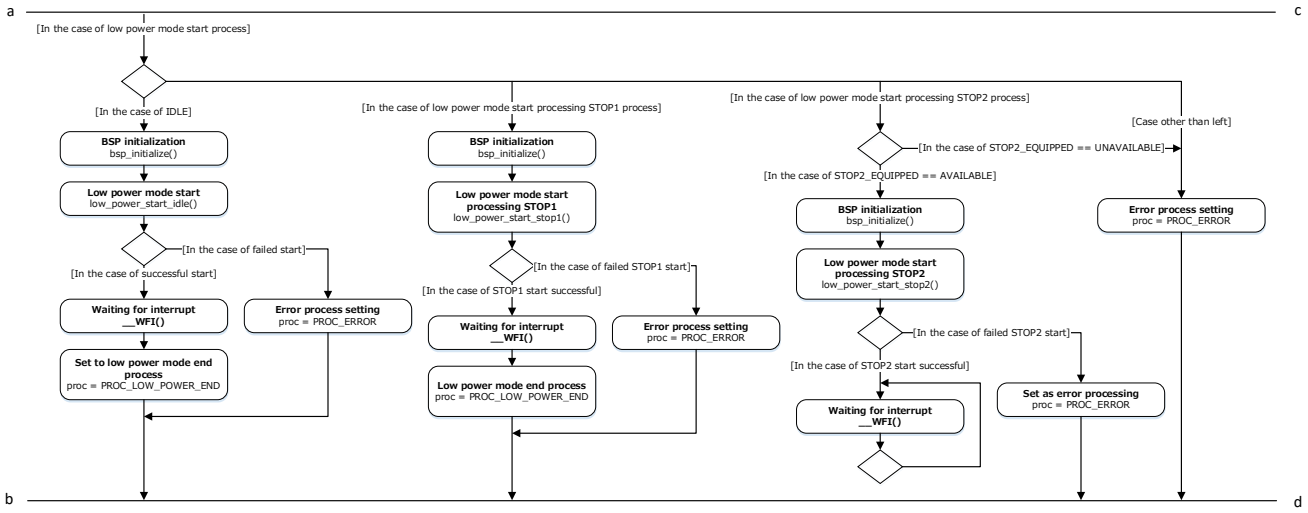
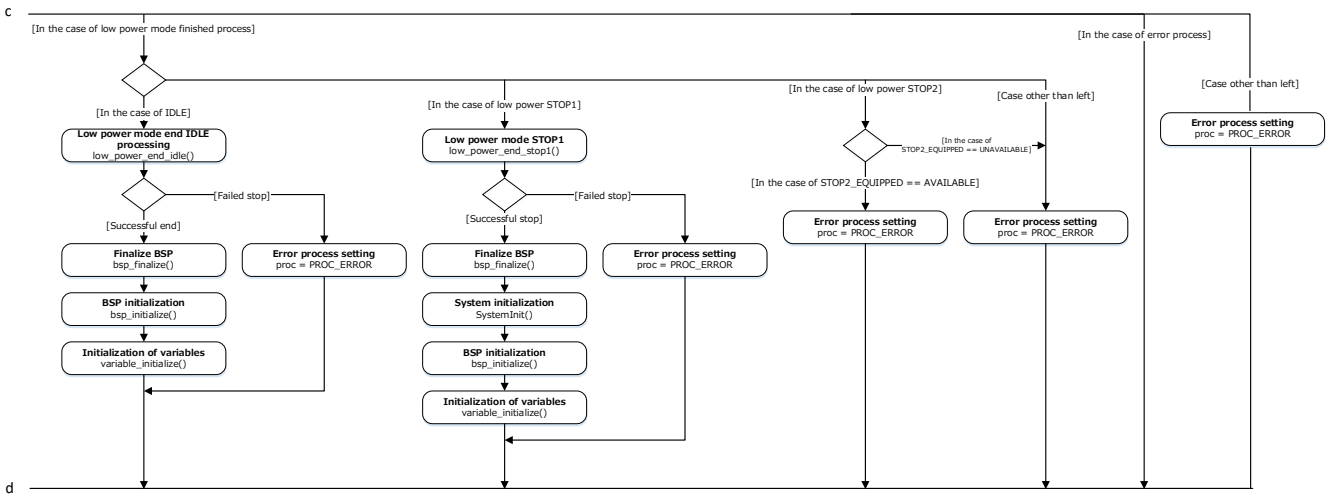
# 7. Activity diagram

## 7.1. main



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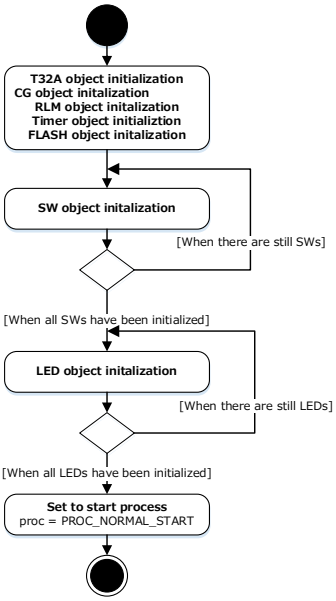
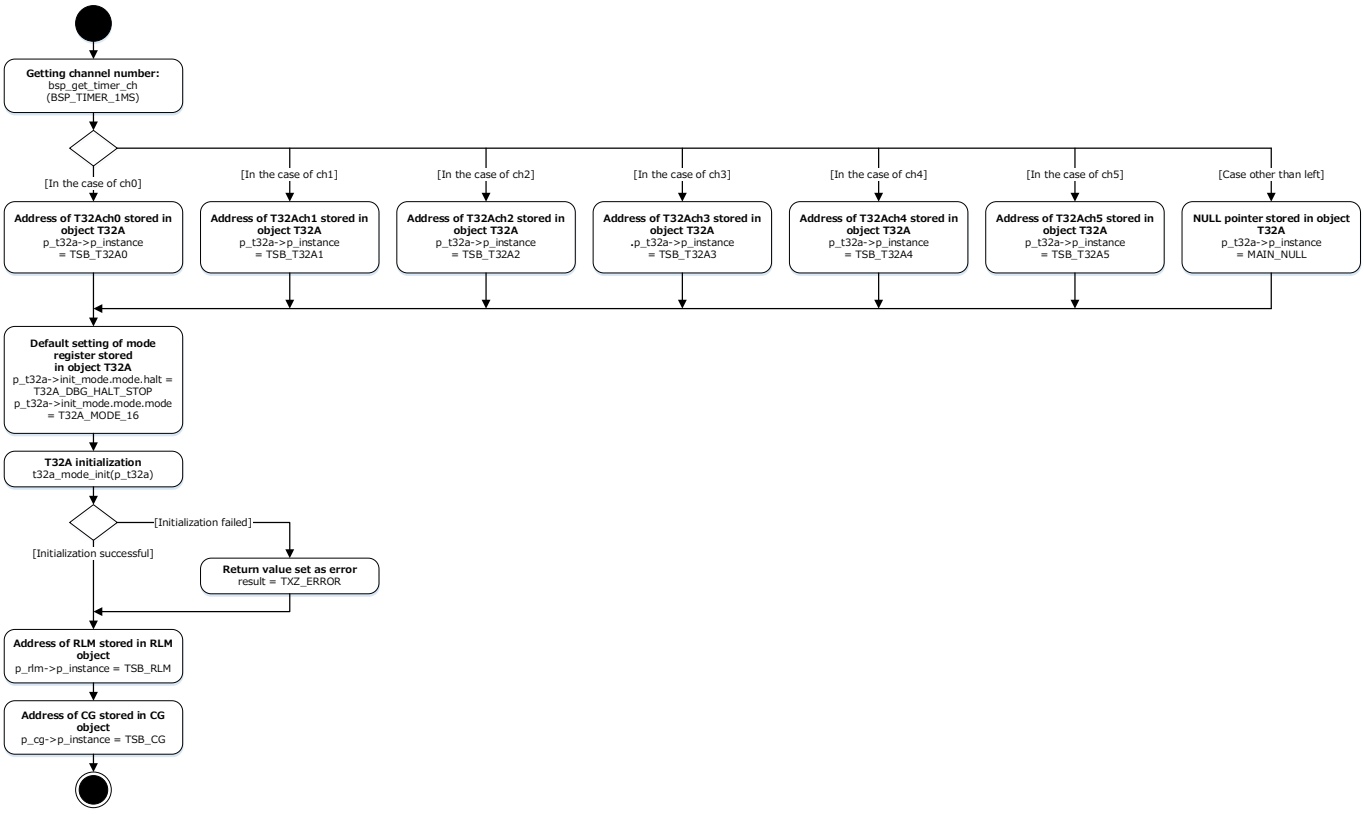
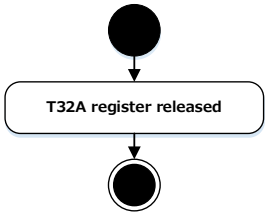
## 7.2. vaiable_initialize



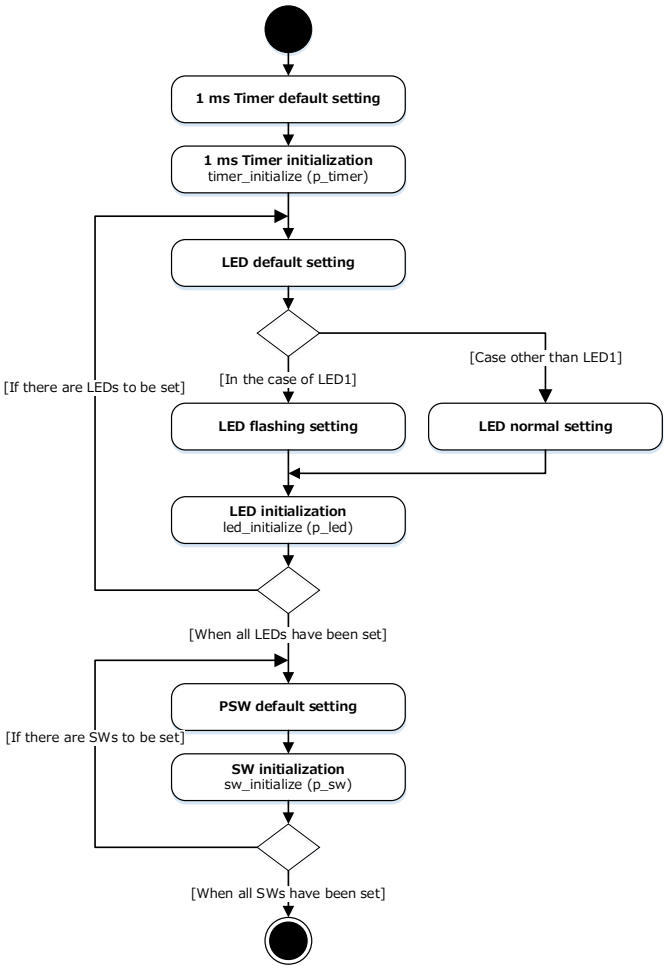

## 7.3. driver_initialize_normal



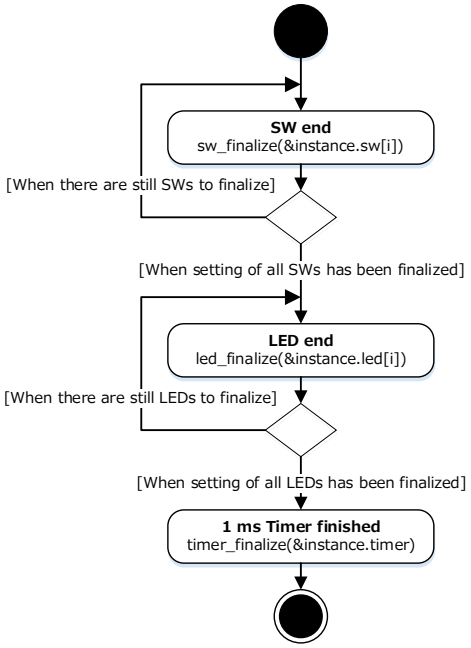
### 7.4. driver_finalize_normal



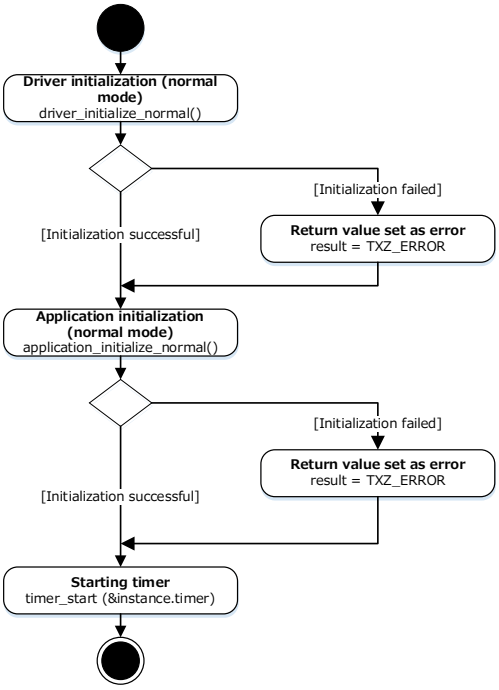

## 7.5. application_initialize_normal



## 7.6. application_finalize_normal




## 7.7. noraml_start

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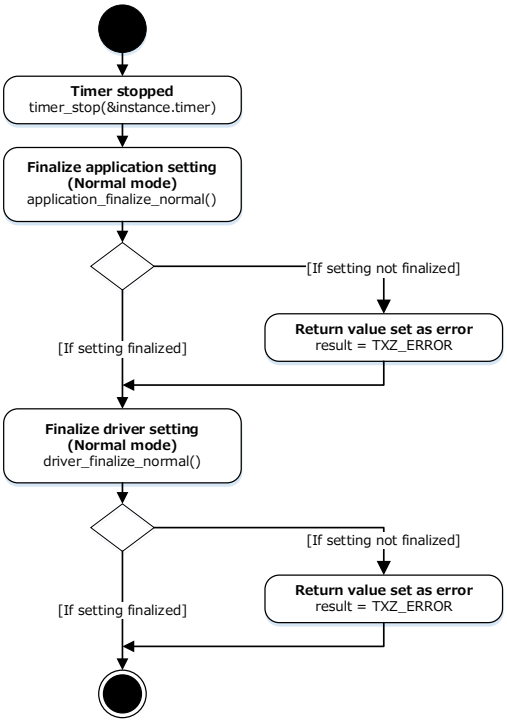
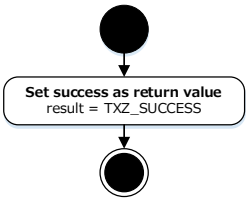
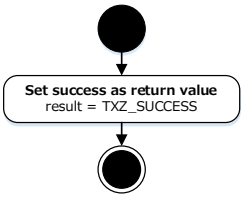
## 7.8. normal_end




## 7.9. driver_initialize_idle




## 7.10. driver_finalize_idle

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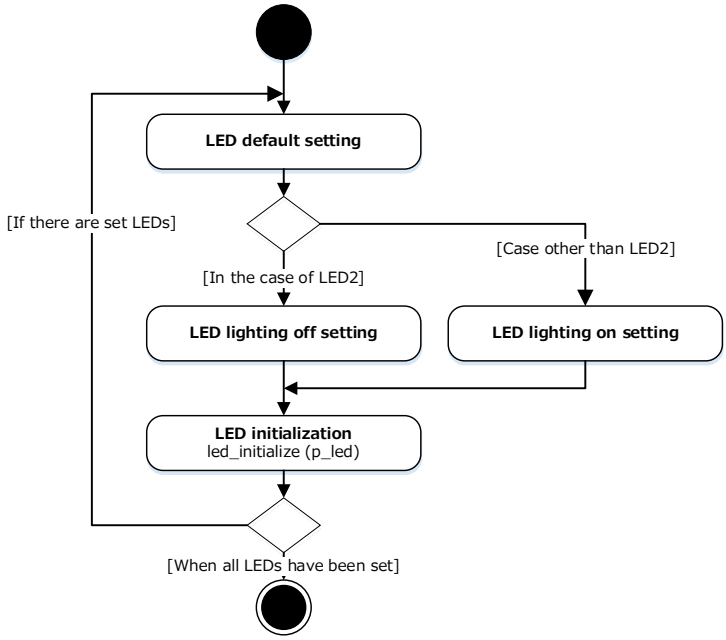
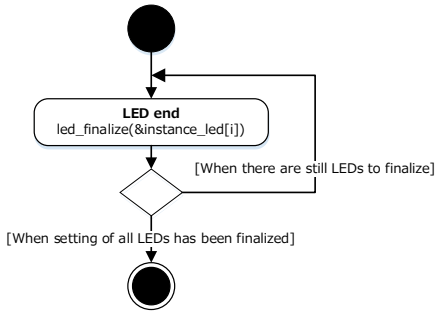
## 7.11. application_initialize_idle




## 7.12. application_finalize_idle

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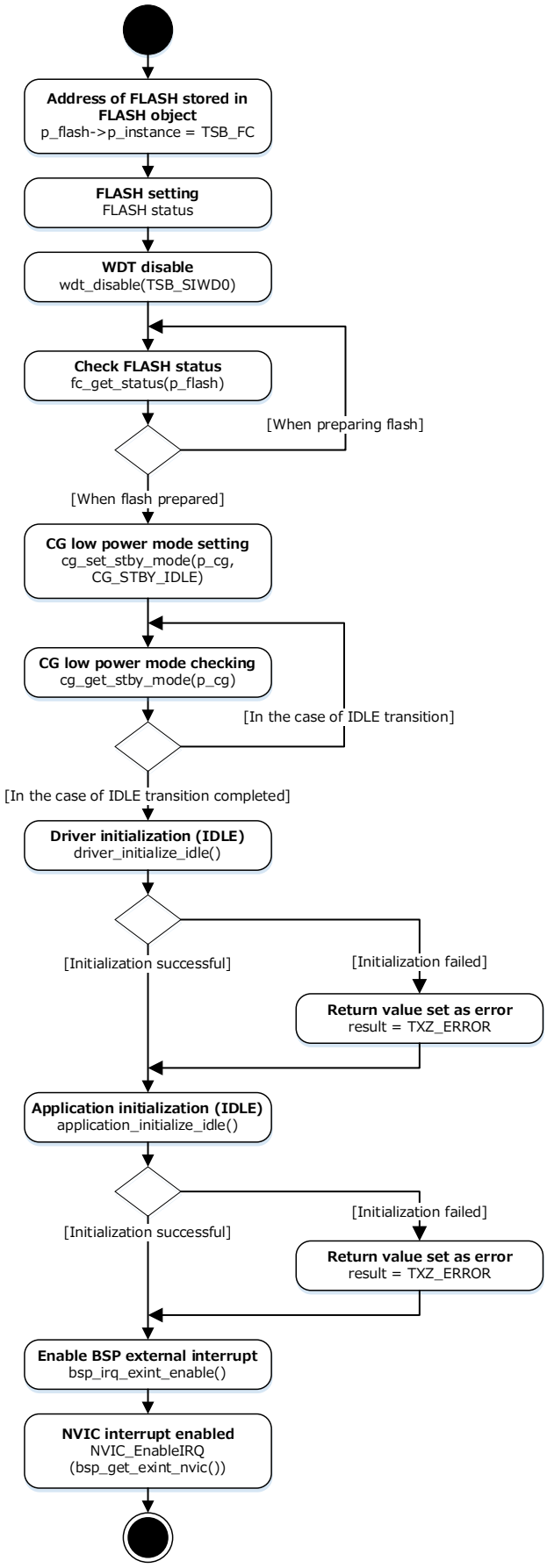
## 7.13. low_power_start_idle

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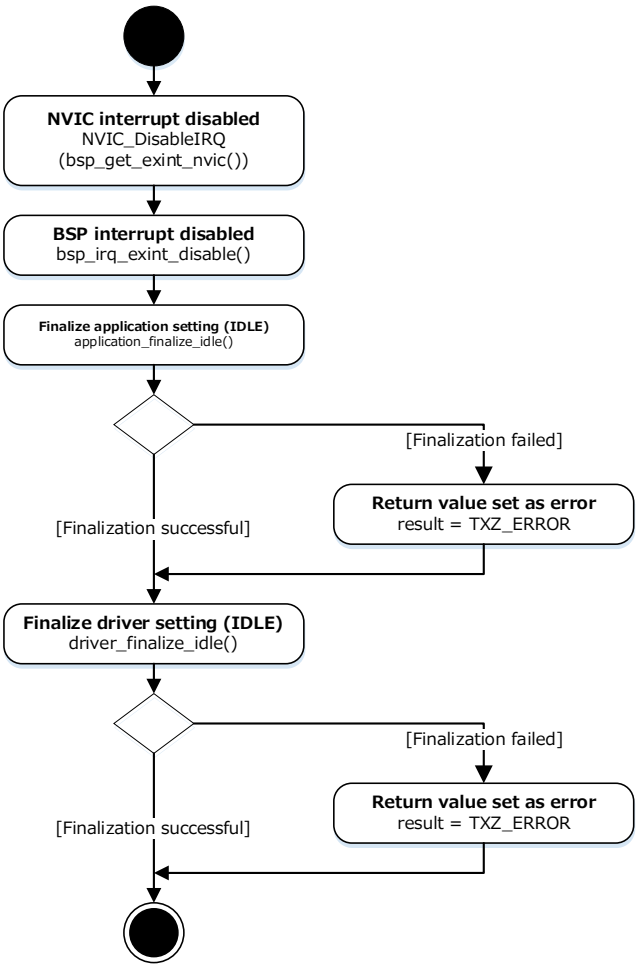
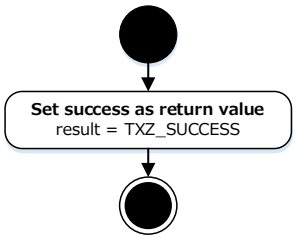
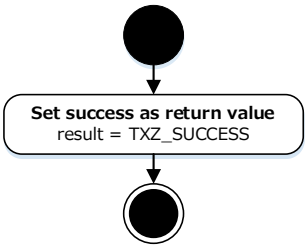
## 7.14. low_power_end_idle




## 7.15. driver_initialize_stop1




## 7.16. driver_finalize_stop1

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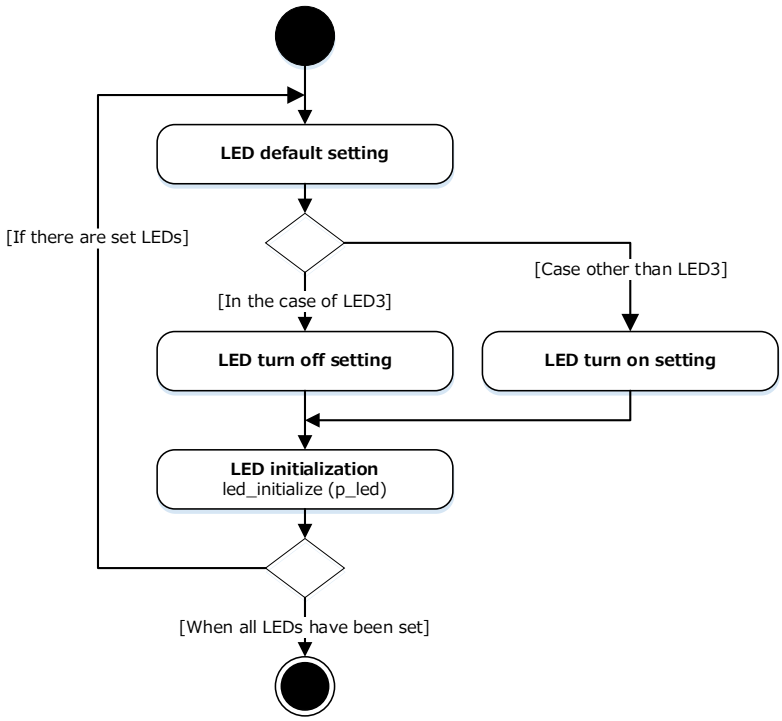
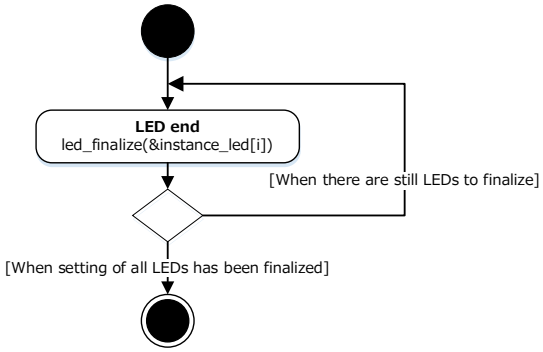
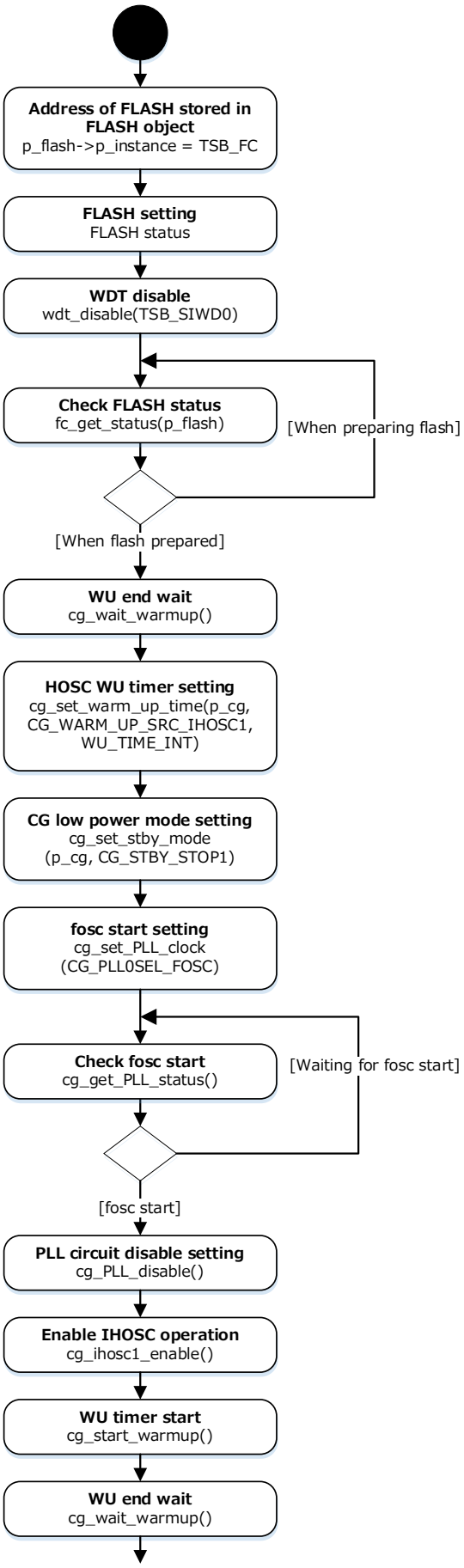
## 7.17. application_initialize_stop1




## 7.18. application_finalize_stop1



## 7.19. low_power_start_stop1

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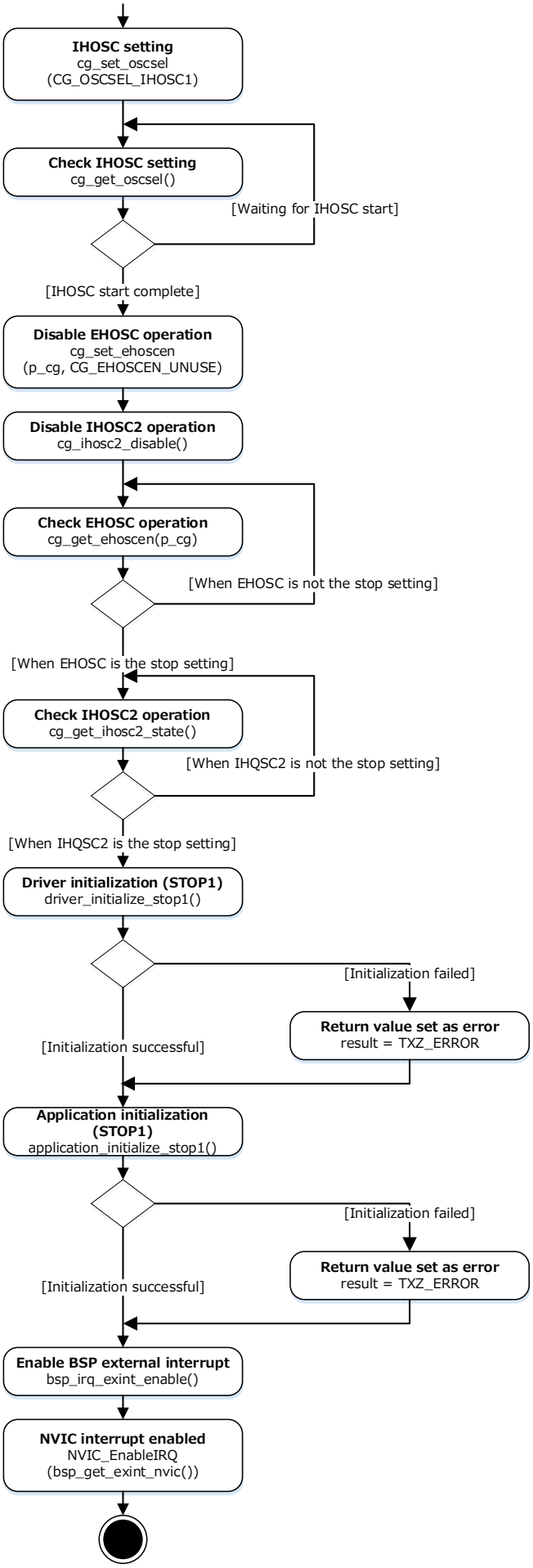


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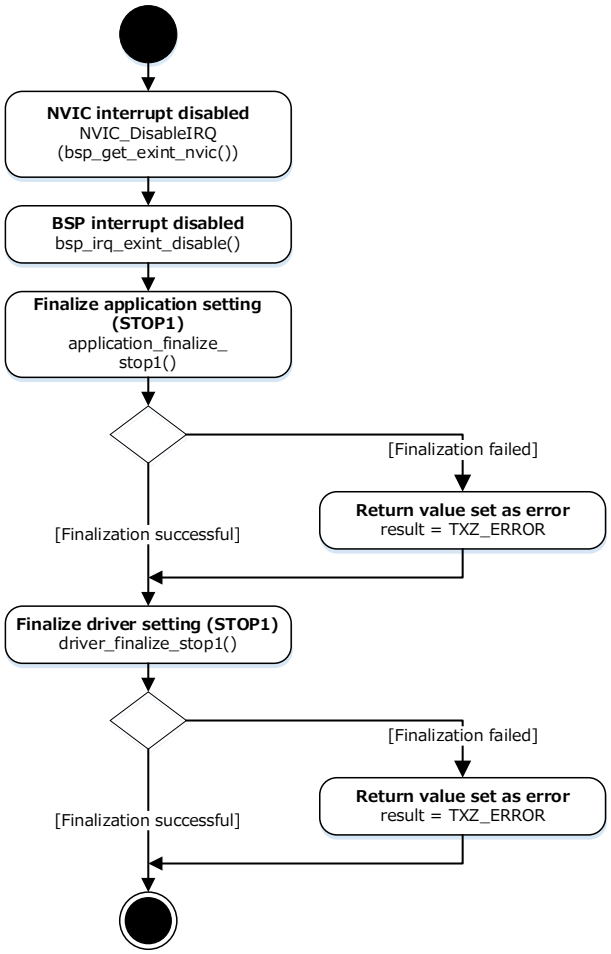
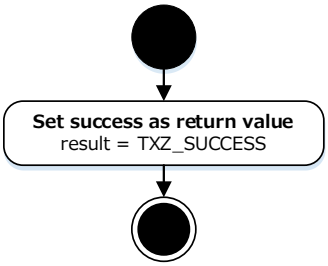
## 7.20. low_power_end_stop1

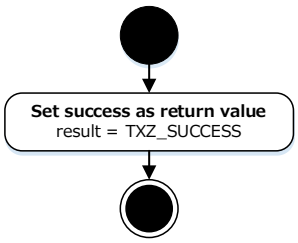



## 7.21. driver_initialize_stop2




When STOP2_EQUIPPED is defined

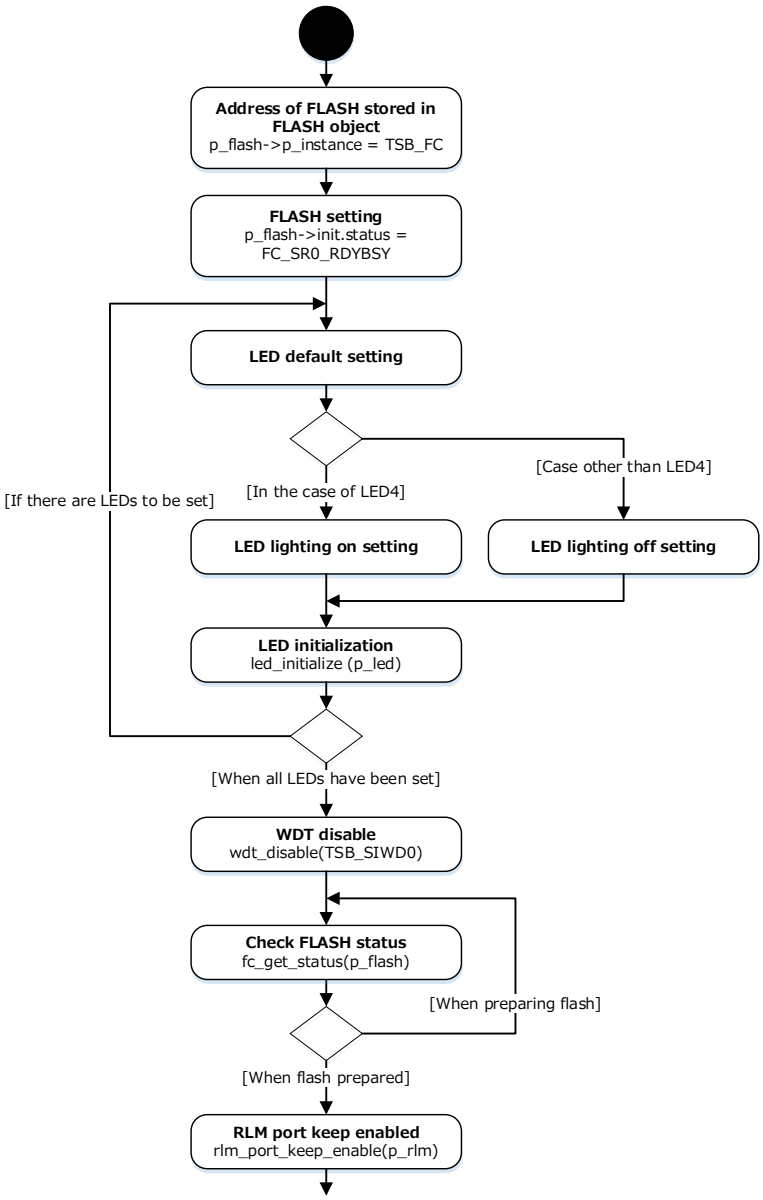
## 7.22. application_initialize_stop2




When STOP2_EQUIPPED is defined

## 7.23. low_power_start_stop2

When STOP2_EQUIPPED is defined

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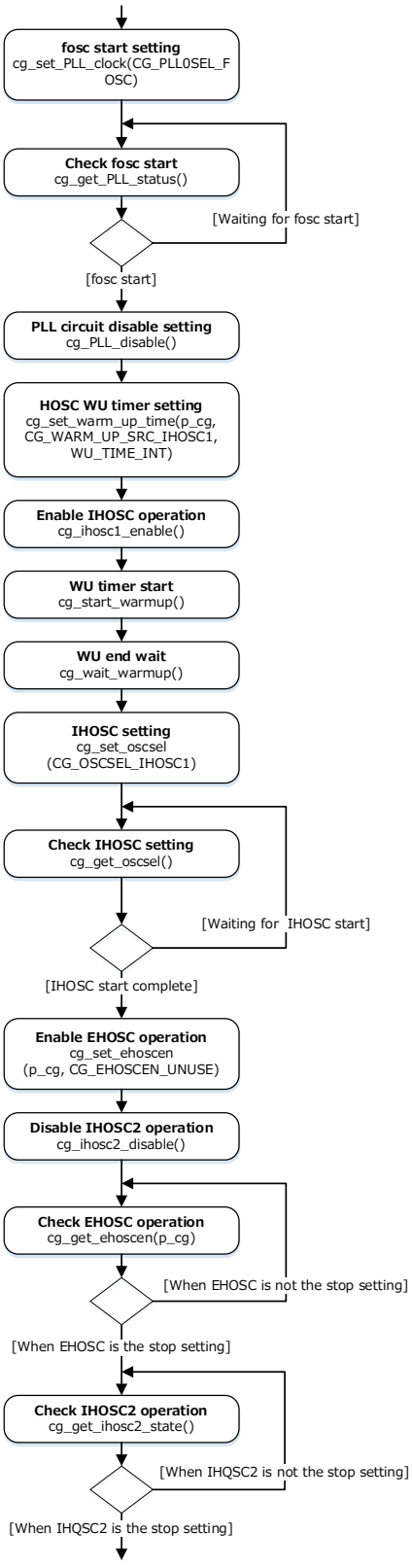
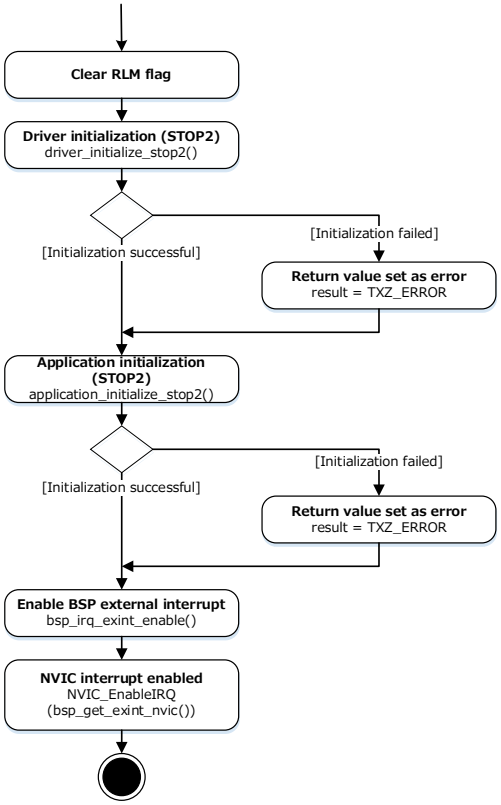
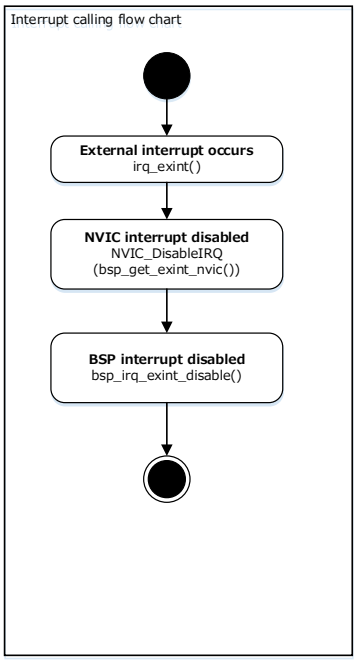
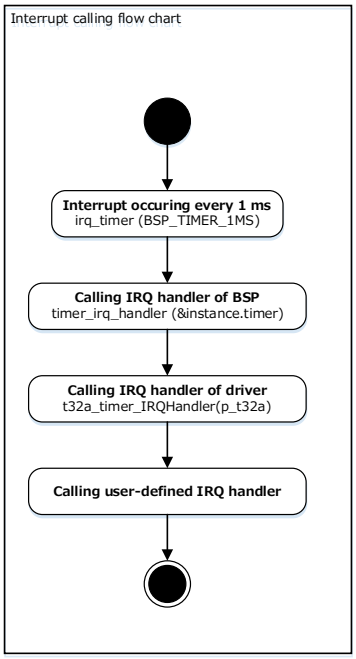

fosc start setting
cg_set_PLL_clock(CG_PLL0SEL_FOSC)
Check fosc start
cg_get_PLL_status()
[Waiting for fosc start]
[fosc start]
PLL circuit disable setting
cg_PLL_disable()
HOSC WU timer setting
cg_set_warm_up_time(p_cg, CG_WARM_UP_SRC_IHOSC1, WU_TIME_INT)
Enable IHOSC operation
cg_ihosc1_enable()
WU timer start
cg_start_warmup()
WU end wait
cg_wait_warmup()
IHOSC setting
cg_set_oscsel
(CG_OSCSEL_IHOSC1)
Check IHOSC setting
cg_get_oscsel()
[Waiting for IHOSC start]
[IHOSC start complete]
Enable EHOSC operation
cg_set_ehoscen
(p_cg, CG_EHOSCEN_UNUSE)
Disable IHOSC2 operation
cg_ihosc2_disable()
Check EHOSC operation
cg_get_ehoscen(p_cg)
[When EHOSC is not the stop setting]
[When EHOSC is the stop setting]
Check IHOSC2 operation
cg_get_ihosc2_state()
[When IHQSC2 is not the stop setting]
[When IHQSC2 is the stop setting]

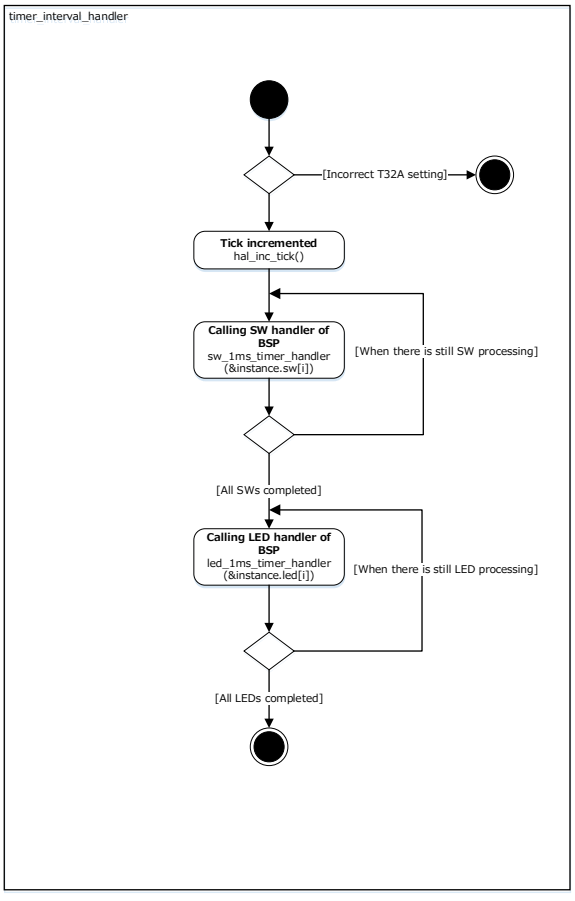



When STOP2_EQUIPPED is defined

## 7.24. Interrupt

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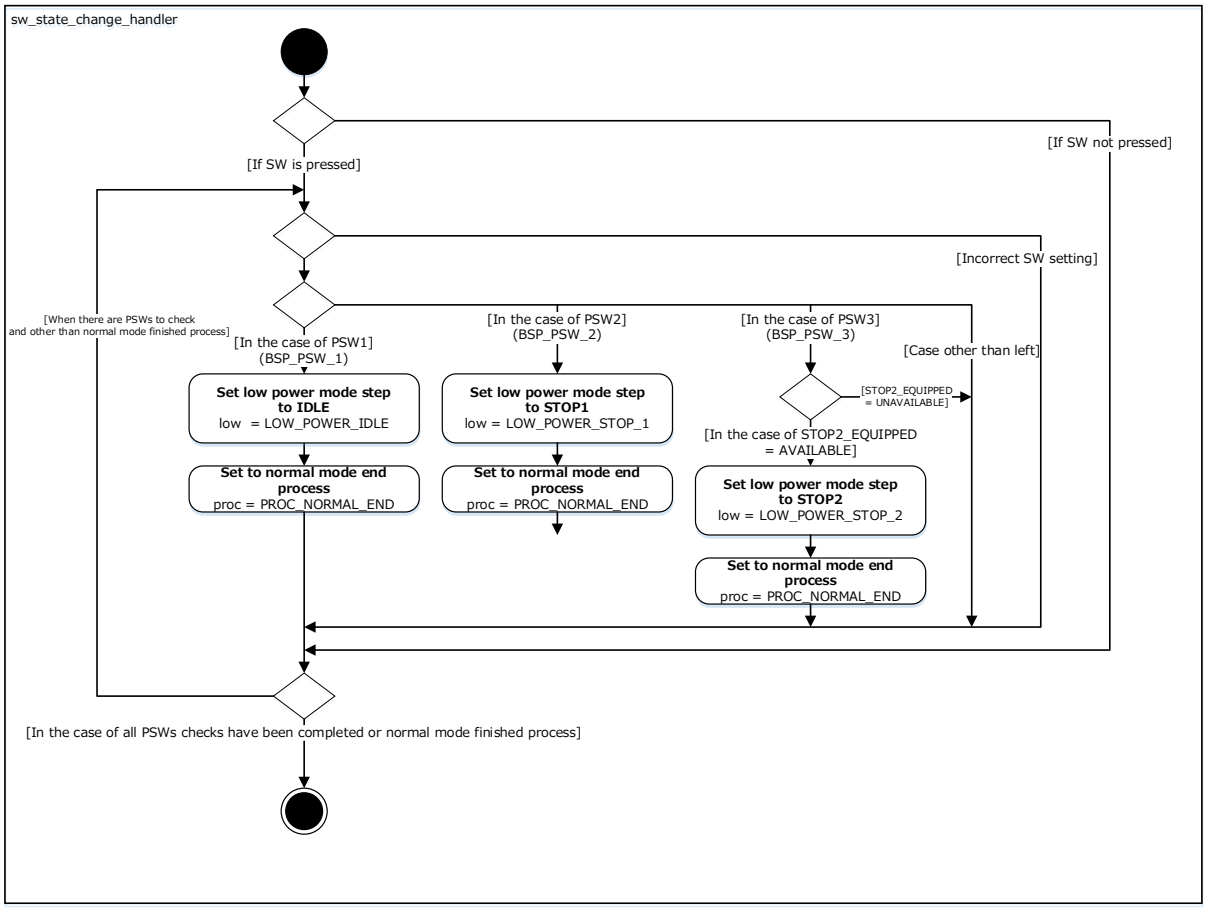


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## 8. Revision History

| Revision | Date | Description |
|---|---|---|
| 1.0 | 2023-10-16 | First release |

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