

## Application Note

T32A PPG

(T32A-C)

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### 1. Preface

This application note describes sample software for the programmable square wave (PPG) output function using the t32a driver.

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
Timer	T32A:32-bit Timer Event Counter

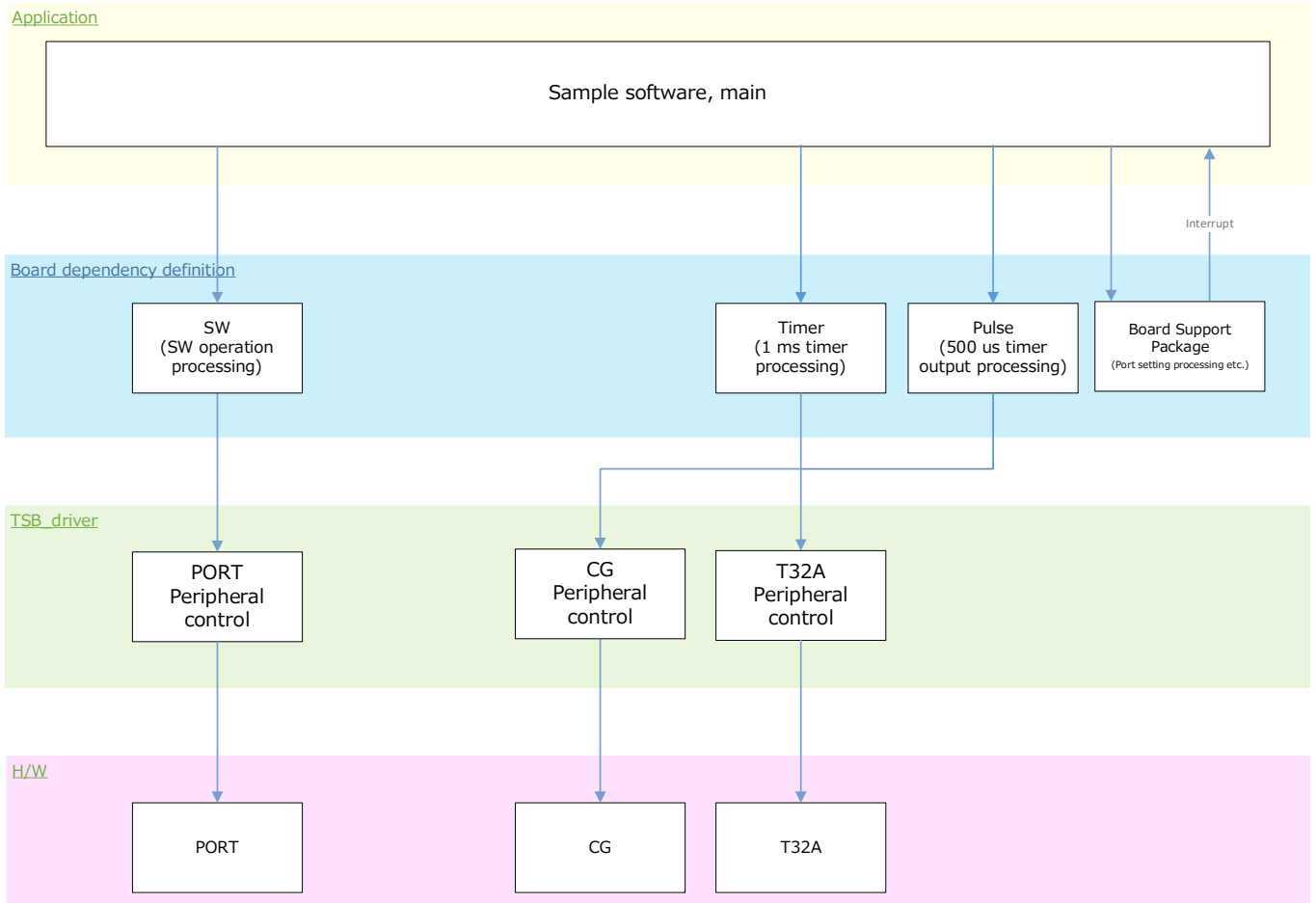
### 3. Reference Document

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 MCU User Guide	Refer to the MCU user guide to be used.

## 4. Target Sample Program

Sample Program	Outline
T32A_PPG	Sample program of T32A_PPG function

## 5. Configuration Diagram



## 6. Sample Program:T32A\_PPG

This is sample software that adjusts the duty ratio by pressing the switch and outputs a PPG square wave.

### 6.1. Outlines of Operation

At startup, PPG output is stopped.

Press BSP\_PSW\_1 to start PPG output. Press BSP\_PSW\_1 again to stop PPG output.

Pressing BSP\_PSW\_2 during PPG output changes Duty. Each time you press the button, the duty value changes in the order of 10, 25, 50, 75, 90, and then returns to 10.

### 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
T32A	BSP_T32A_PPG_1	For pulse output
	BSP_T32A_TIMER_1	Interval timer
PORT(Push-Switch)	BSP_PSW_1	Event trigger
	BSP_PSW_2	Event trigger
UART	BSP_UART_1	For terminal emulator communication (Outputs log)

### 6.3. Interrupt to Use

Interrupt	Outlines
INTT32A03A	T32A ch3 Timer_A (For PPG output)
INTT32A00A	T32A ch0 Timer_A Timer counter increment every 1ms for SW processing
*1	UART ch0 Receive interrupt for terminal emulator
*2	UART ch0 Transmission interrupt for terminal emulator
*3	UART ch0 Error interrupt for terminal emulator

\*1 For SBK-M4KN/SBK-M4KN10, "INTSC0RX", for AdBun-M3HQF10/AdBun-M3HQA, "INTUART0RX"

\*2 For SBK-M4KN/SBK-M4KN10, "INTSC0TX", for AdBun-M3HQF10/AdBun-M3HQA, "INTUART0TX"

\*3 For SBK-M4KN/SBK-M4KN10, "INTSC0ERR", for AdBun-M3HQF10/AdBun-M3HQA, "INTUART0ERR"

### 6.4. Configuration

"main.c" configuration setting.

Configuration	Current Value	Description
Timer A	500 $\mu$ s	-

## 6.5. Example of Terminal Emulator Output

### 6.5.1. Normal Operation

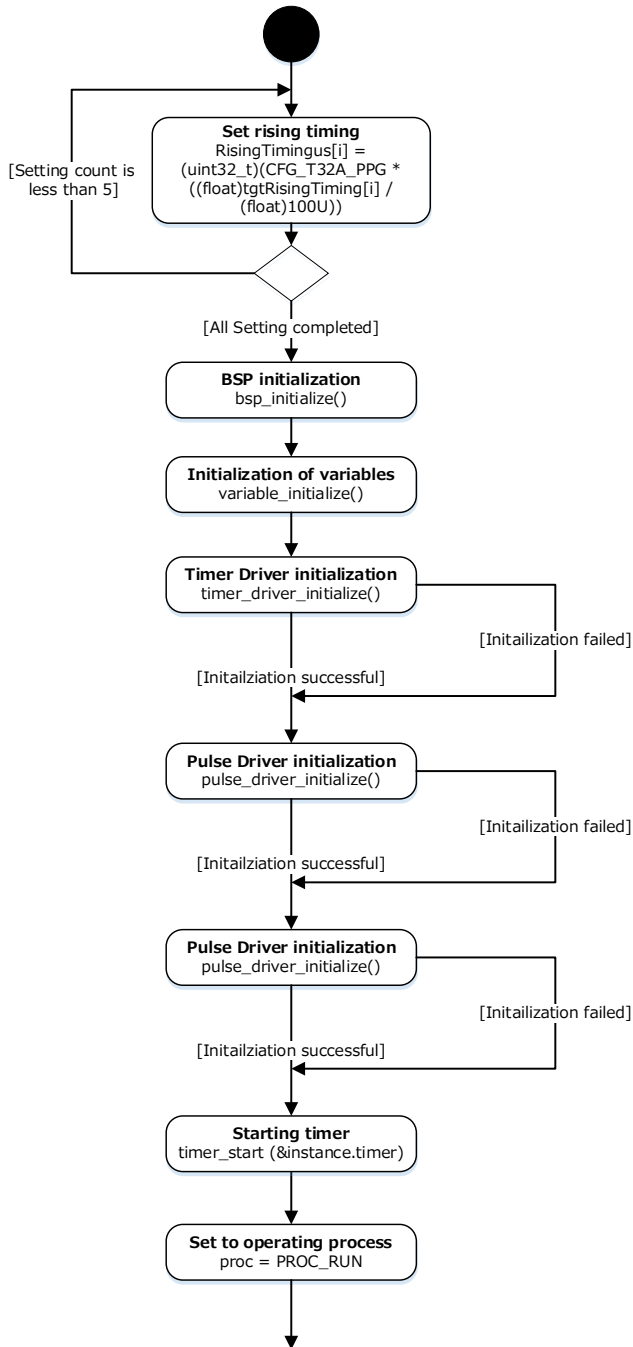
```
PPG Output  
Duty: 10%  
PPG Stop  
Change to Duty: 25%  
Change to Duty: 50%  
Change to Duty: 75%  
Change to Duty: 90%  
PPG Output  
Duty: 90%  
PPG Stop  
Change to Duty: 10%  
PPG Output
```

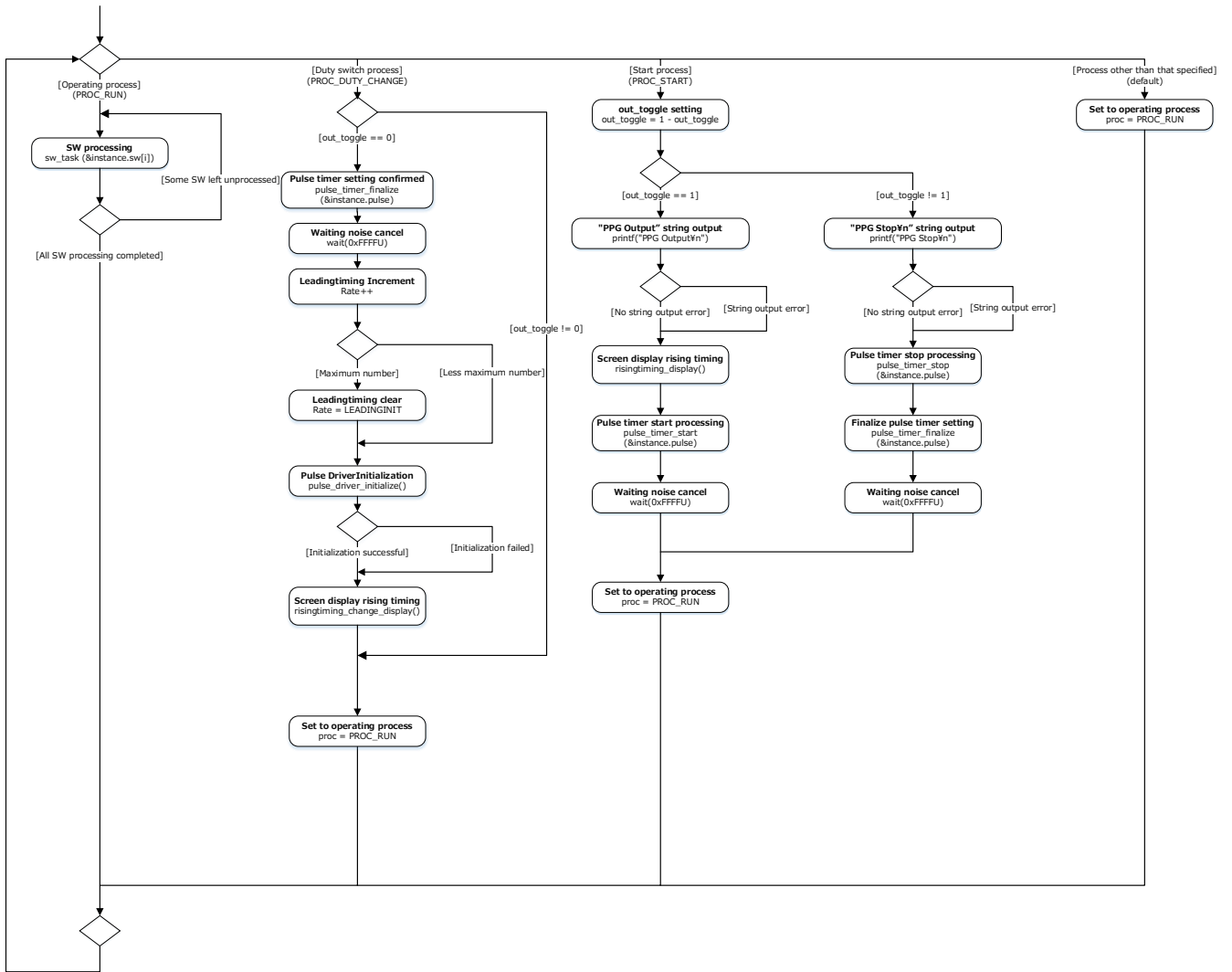
### 6.5.2. Case of Error Occurrence

Nothing.

## 7. Activity diagram

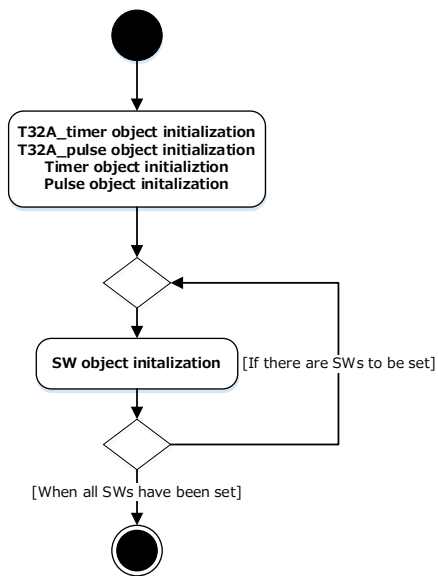
### 7.1. main



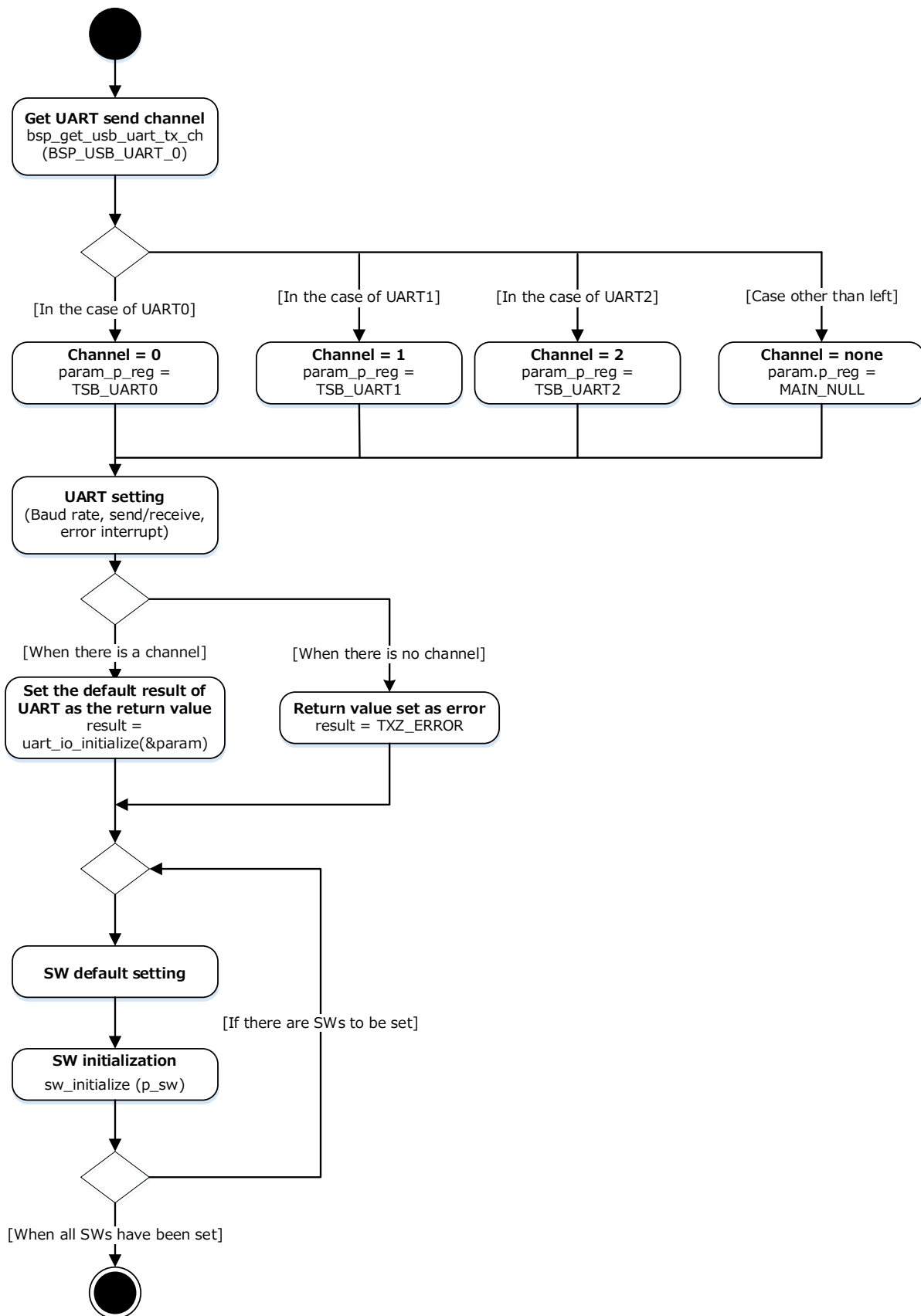




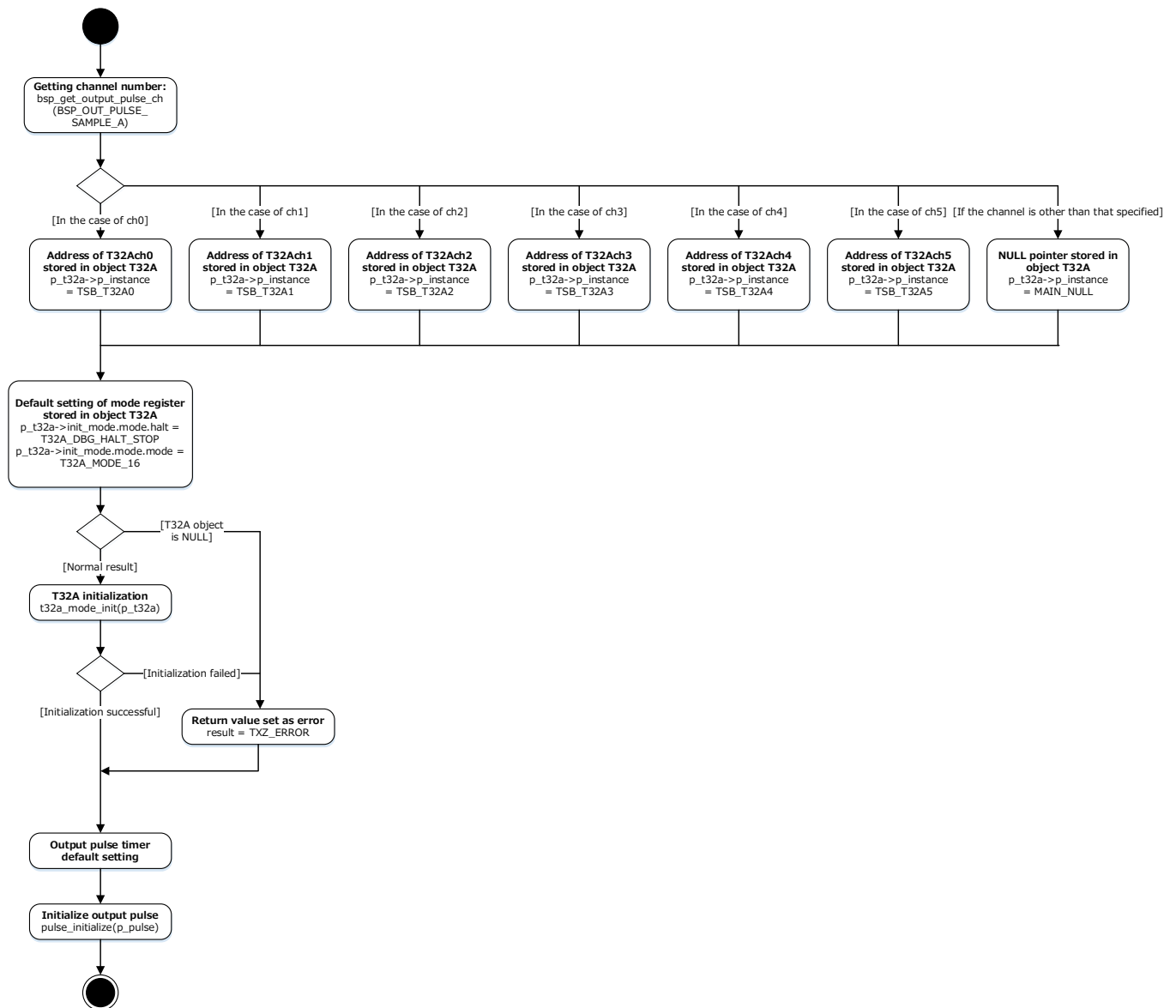
## 7.2. variable\_initialize



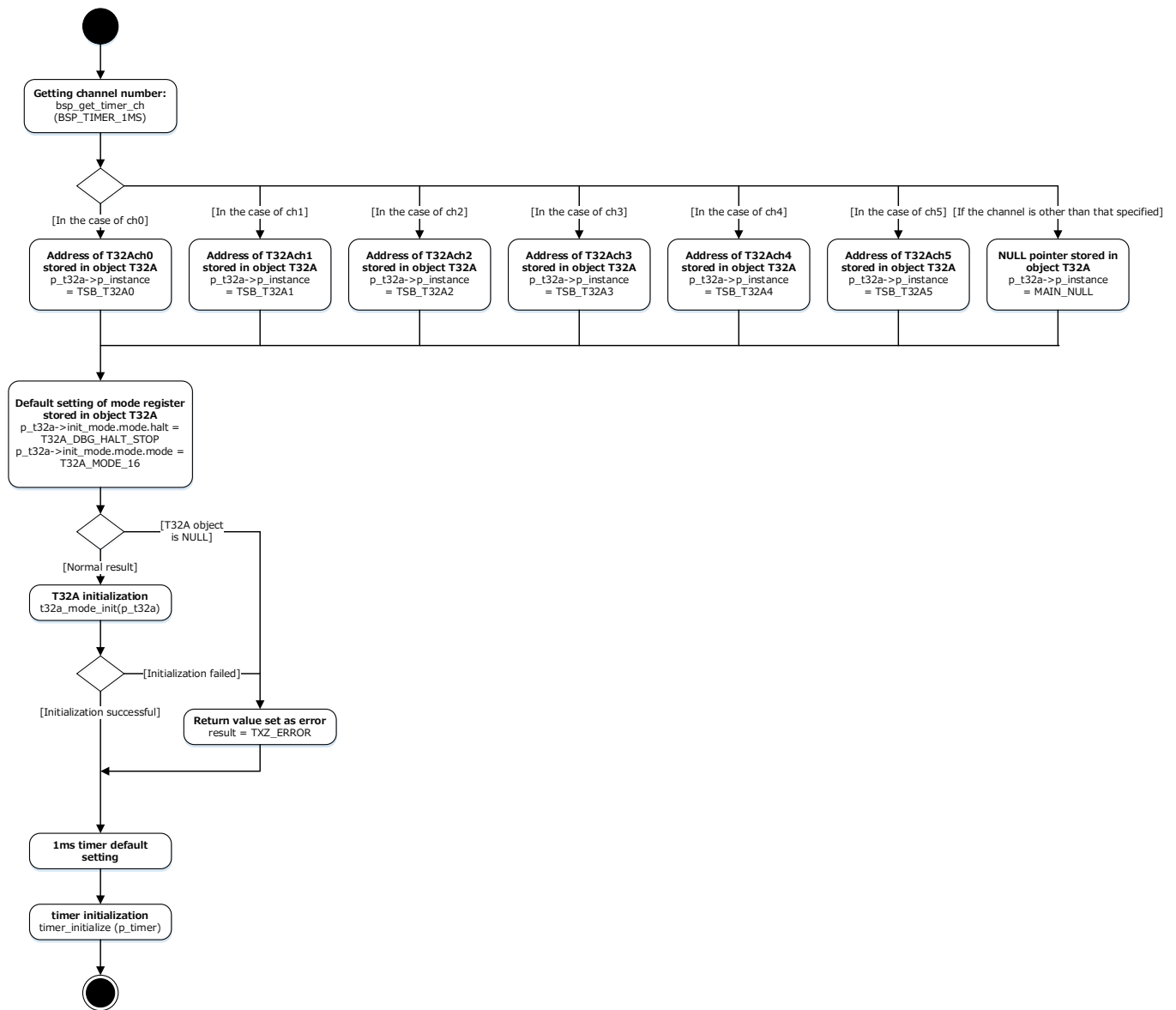
## 7.3. application\_initialize



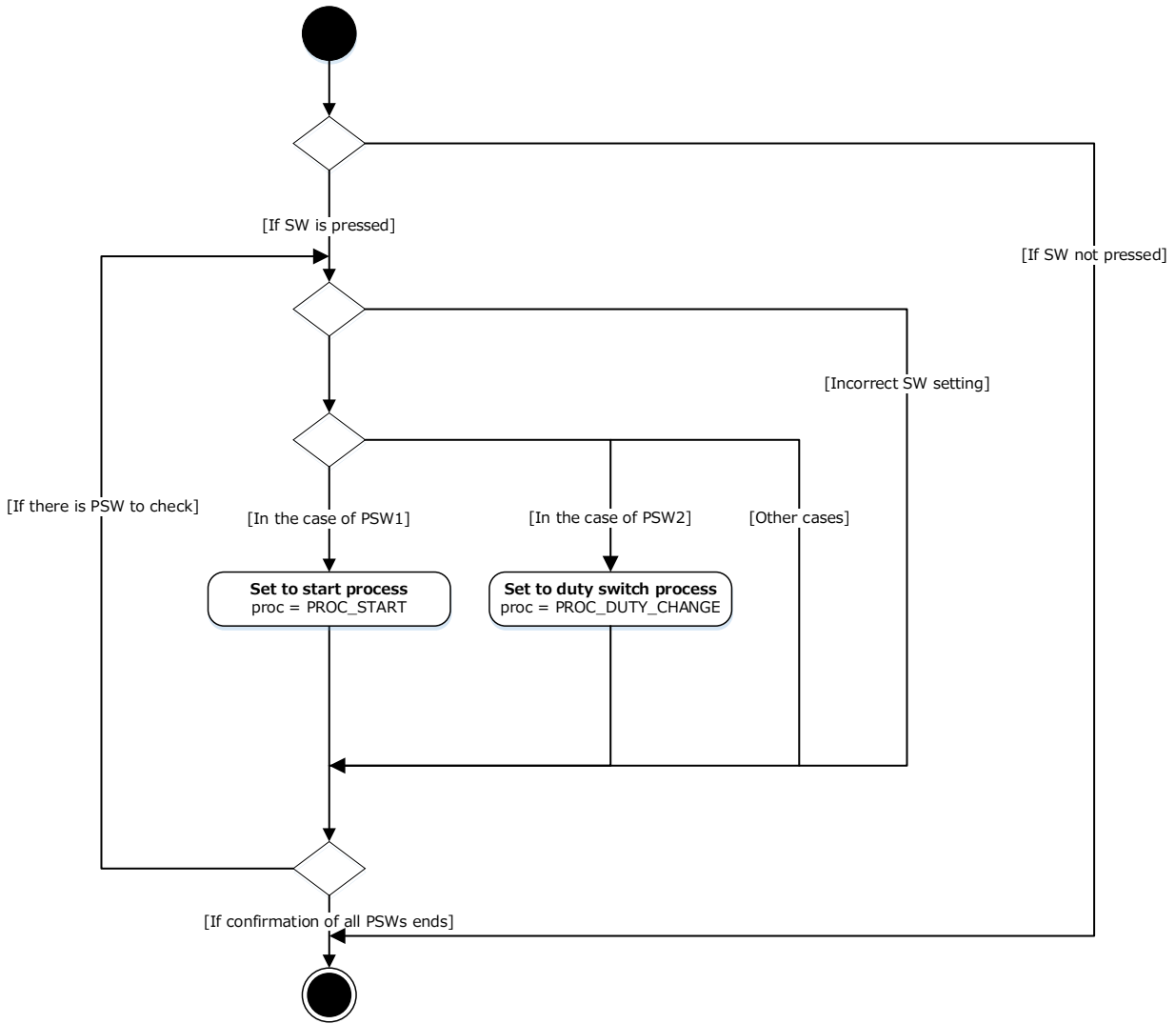
### 7.4. pulse\_driver\_initialize



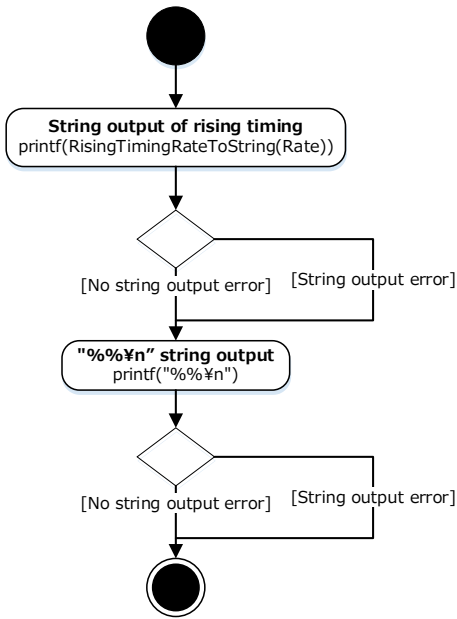
### 7.5. timer\_driver\_initialize



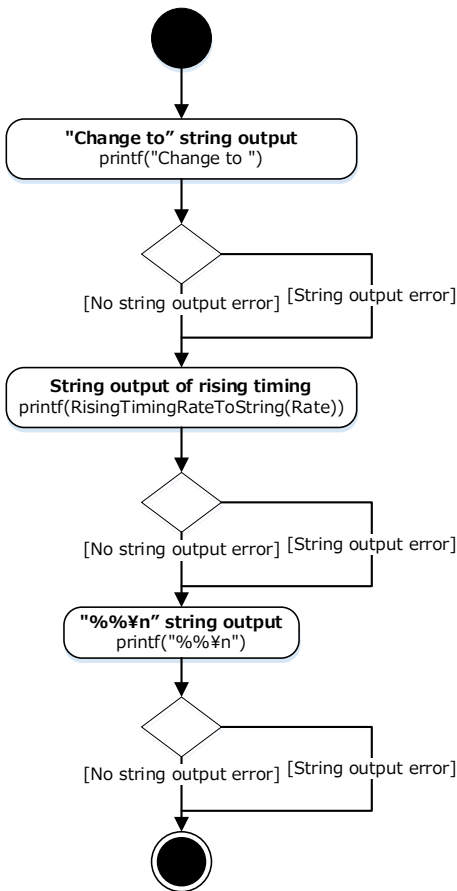
### 7.6. sw\_state\_change\_handler



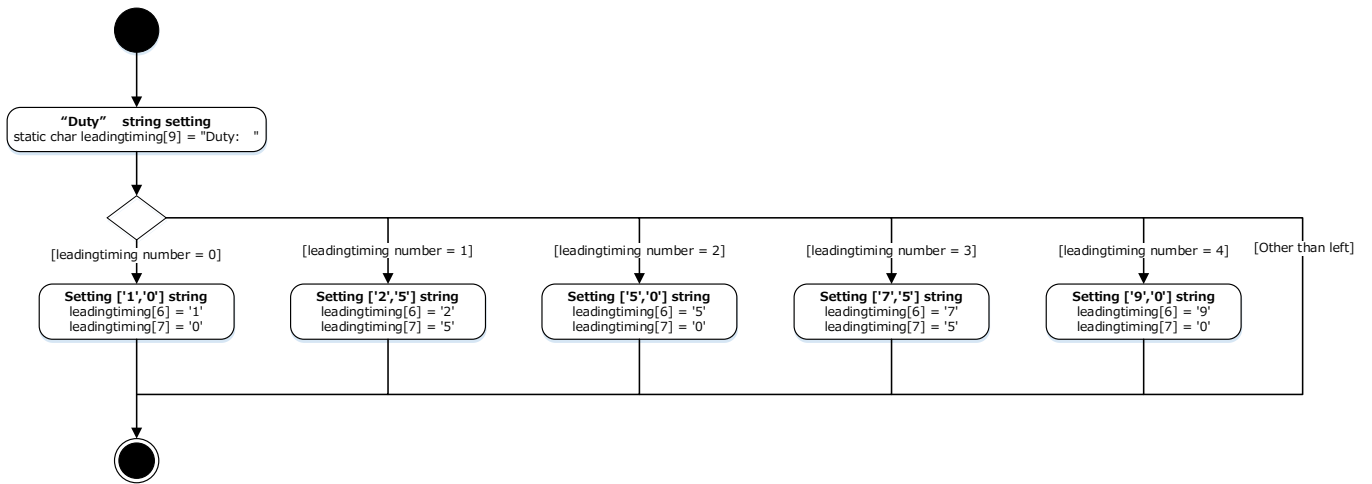
## 7.7. risingtiming\_display



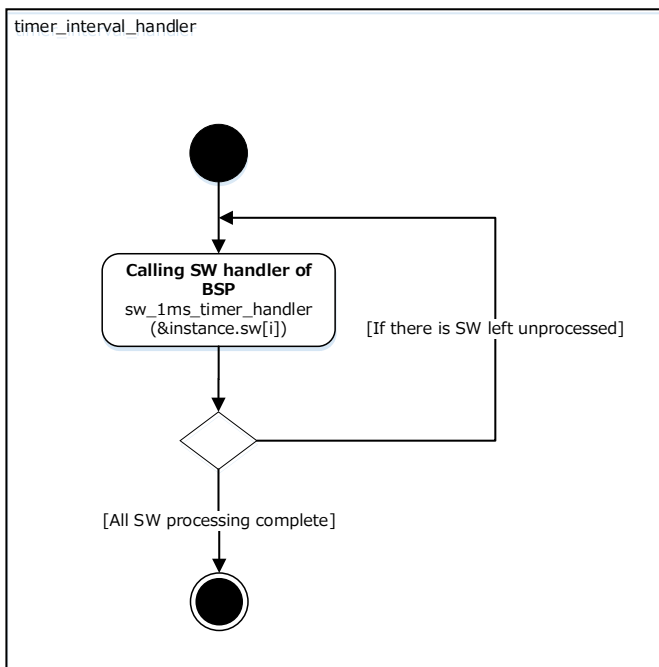
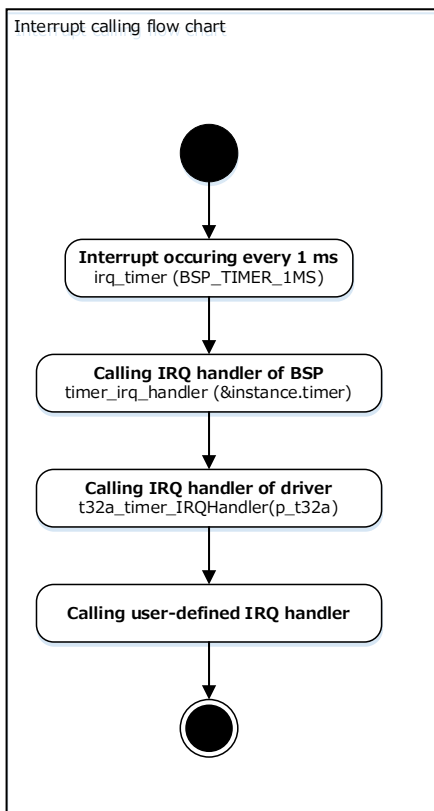
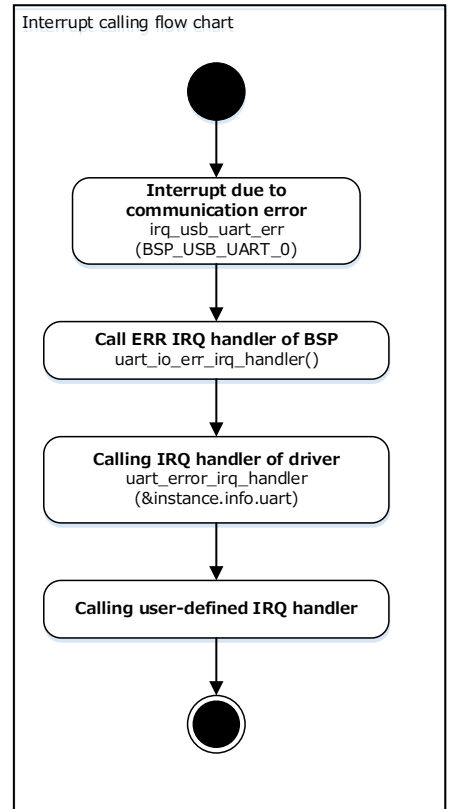
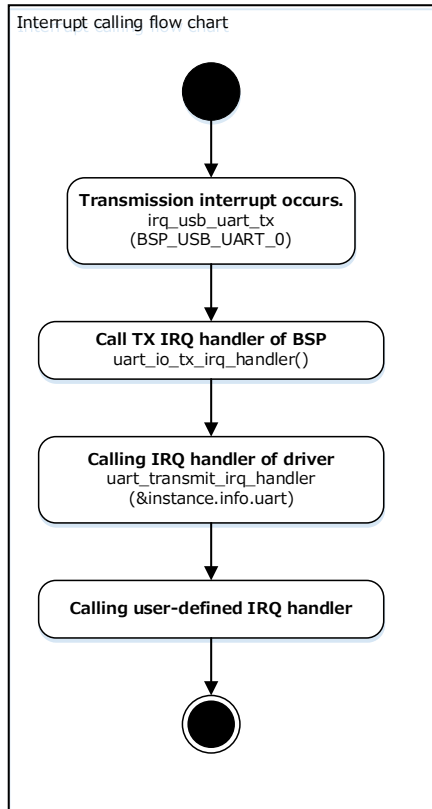
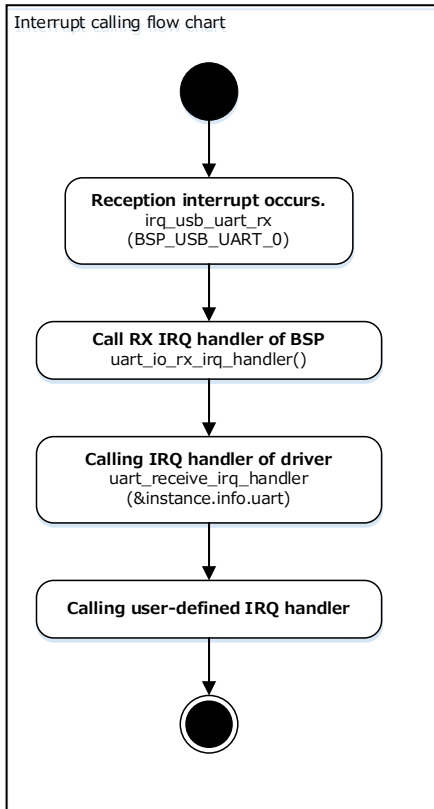
## 7.8. risingtiming\_change\_display



### 7.9. RisingTimingRateToString



### 7.10. Interrupt





## 8. Revision History

Revision	Date	Description
1.0	2023-10-16	First release
1.1	2024-07-16	Correction to "6.3 Interrupts to Use" and "7. Activity Diagram main"

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