Application Note

TSPI_CONTROLLER_TRANS

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1. Preface

This application note describes the sample software TSPI_CONTROLLER_TRANS using Serial Peripheral Interface (TSPI).
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
CRC	Cyclic Redundancy Check
DMA	Direct Memory Access Controller
Timer	T32A:32-bit Timer Event Counter
TSPI	Serial Peripheral Interface

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.

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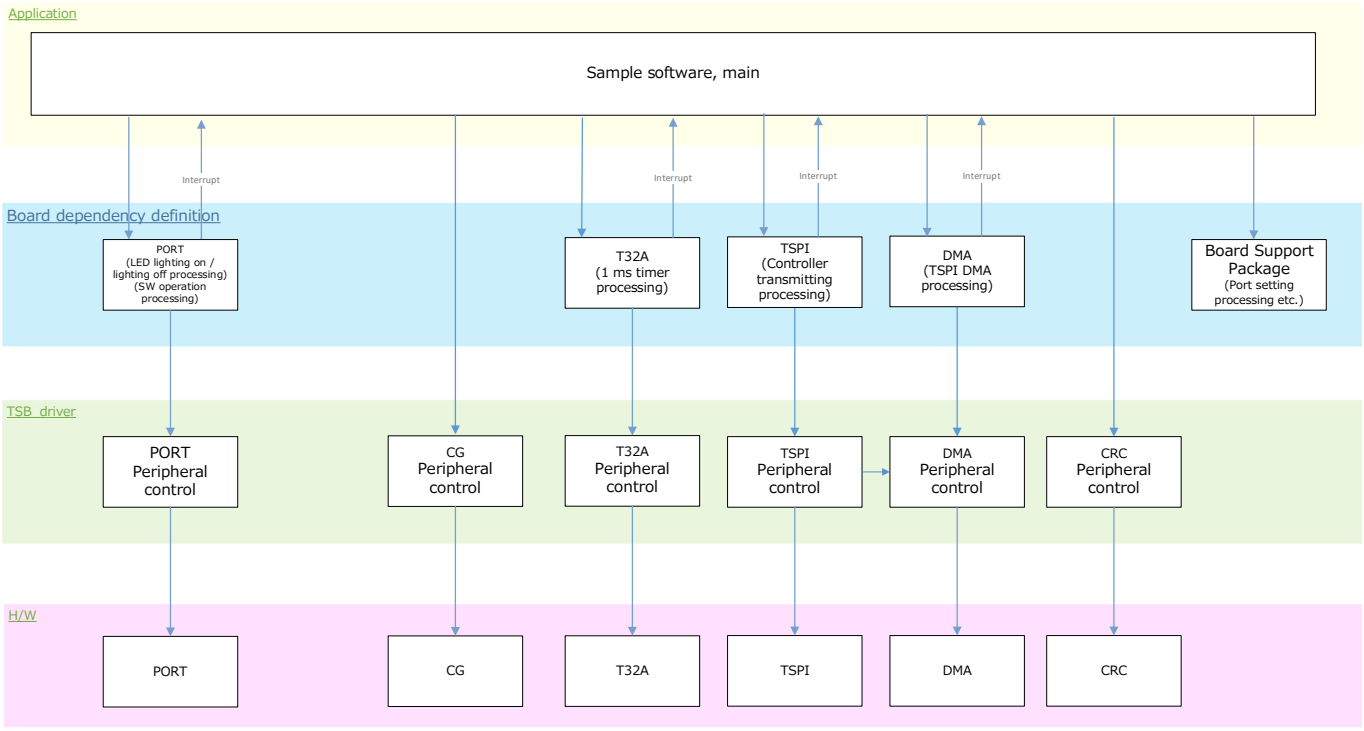
4. Target Sample Program

Sample Program	Outline
TSPI_CONTROLLER_TRANS	Sample program of SPI function (Controller Trans)

5. Configuration Diagram



6. Sample Program: TSPI_CONTROLLER_TRANS

This is the sample software TSPI_CONTROLLER_TRANS using the Controller transmission processing function of the SPI communication function to send a character string when the switch is pressed, and switches the LED turn on / turn off each time data transmission is completed.

6.1. Outlines of Operation

Turns off BSP_LED_1 and BSP_LED_3.
When BSP_PSW_1 is pressed, BSP_LED_3 is turned off and character string 1 is sent.
Switches the lighting status (lighting on / lighting off) of BSP_LED_1.
When an SPI write error occurs, BSP_LED_3 is turn on.

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
TSPI	BSP_TSPI_1	SPI Communication
T32A	BSP_T32A_TIMER_1	Interval timer
PORT (Push-Switch)	BSP_PSW_1	Event Trigger
PORT (LED)	BSP_LED_1	For operation check
	BSP_LED_3	For operation check

6.3. Interrupt to Use

For details, please refer to the “Interrupt List by Sample” in the MCU User’s Manual.

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6.4. Configuration

Configuration setting.

Configuration	Soft Definition Name	Current Value (Defaults)	Description
String 1	BSP_MCU_NAME	(Note1)	Send String
Data size	BSP_DATA_LENGTH	12	Data size (Unit: byte) Compilation switch (Note2): Be switched by the BSP_CHK_CODE setting.
Check CODE	BSP_CHK_CODE	BSP_CHK_CODE _CRC16	BSP_CHK_CODE_CRC16 and BSP_CHK_CODE_CRC32 can be switched
Communication Control	BSP_REQUEST_MODE	BSP_FIFO_MODE	BSP_FIFO_MODE and BSP_DMA_MODE can be switched.
Send Fill Level Setting	BSP_TX_FILL_LEVEL	3	Set to TIL in TSPIxCR2

Note1: Please refer to the "Log Control and Others" section in the MCU User's Manual.
Note2: When BSP_CHK_CODE_CRC16, 12byte.
When BSP_CHK_CODE_CRC32, 14byte.

6.5. Example of Terminal Emulator Output

Nothing.

6.6. DMAC Communication Setting

Startup Factors and Transfer Mode

Configuration	Description
Startup Factors	DMA Request from TSPI Driver (Request Based on FIFO level)
Transfer Mode	Burst Transfer/Unit Normal Transfer

Channel Control Data: Transfer Mode Setting [DMAChnlCfg]

Configuration	Description
Destination Address Increment	11: [No increment]
Destination Data Size	00: [1byte]
Source Address Increment	00: [1byte]
Source Data Size	00: [1byte]
Arbitration	0000: [After 1 Rotation Transfer]
Transfer Count	0x00B: [12times (BSP_DATA_LENGTH)]
Singel Transfer Setting	0: [Not used because it is not a chain transfer]
Transfer Mode	001: [Unit Normal Transfer]

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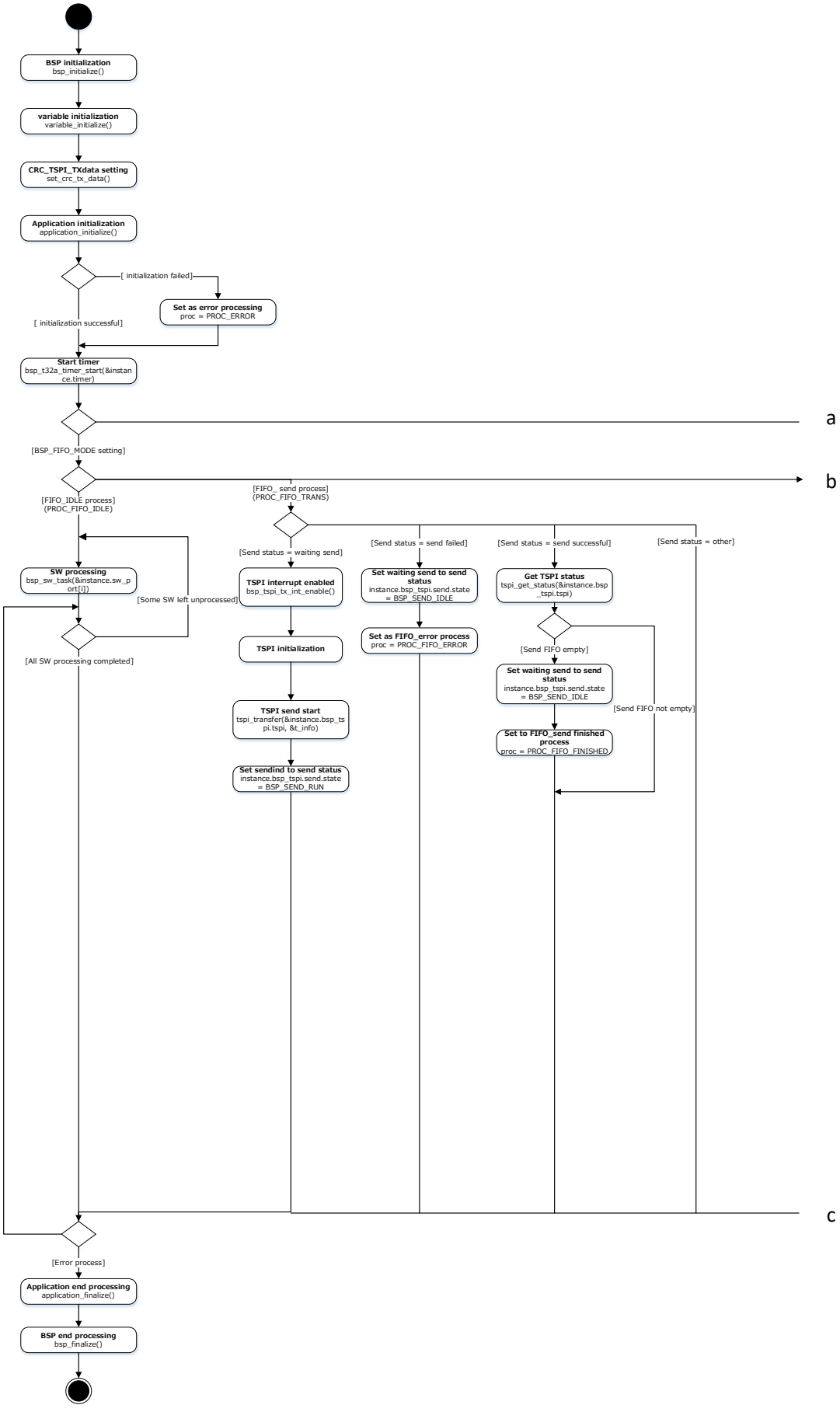
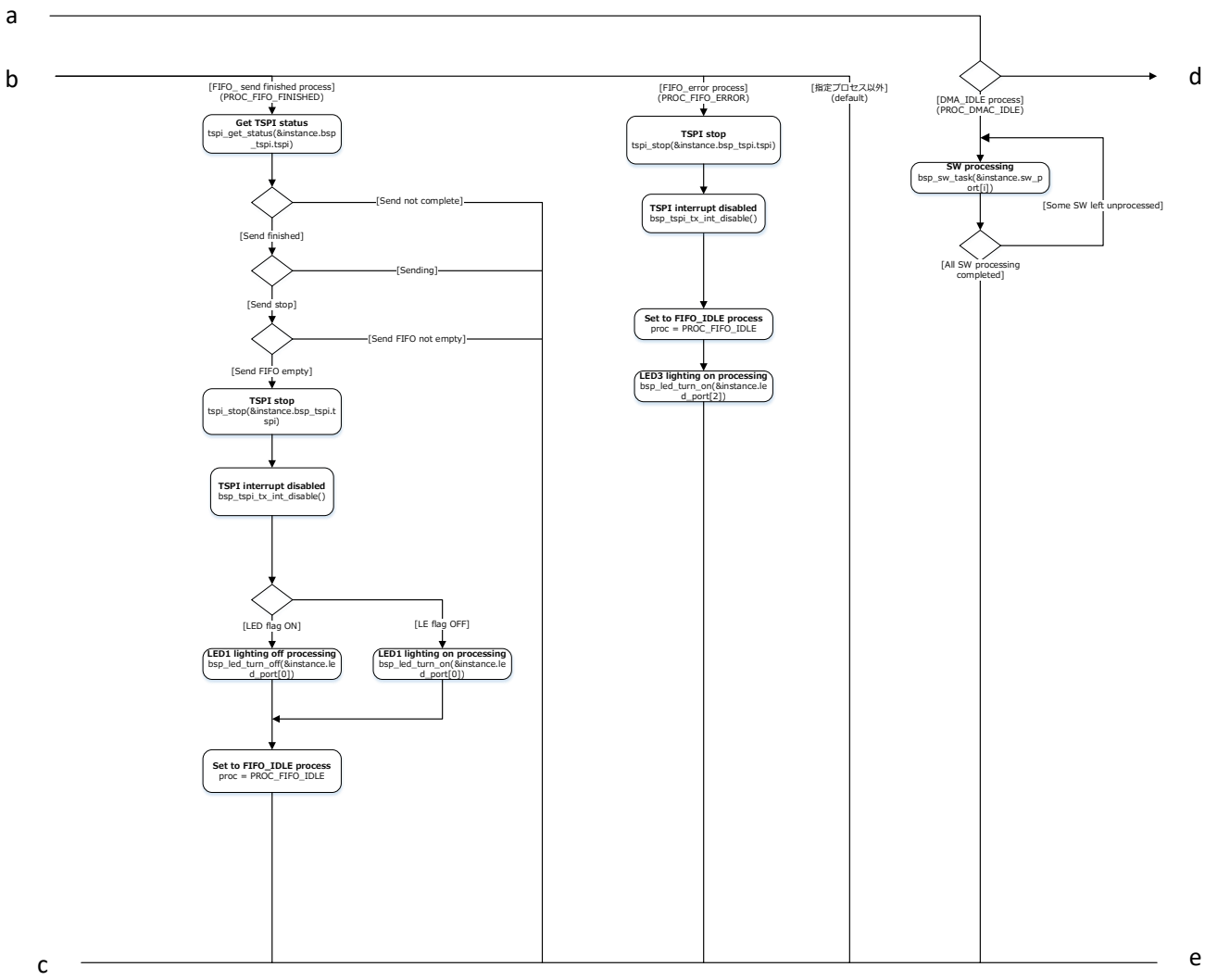
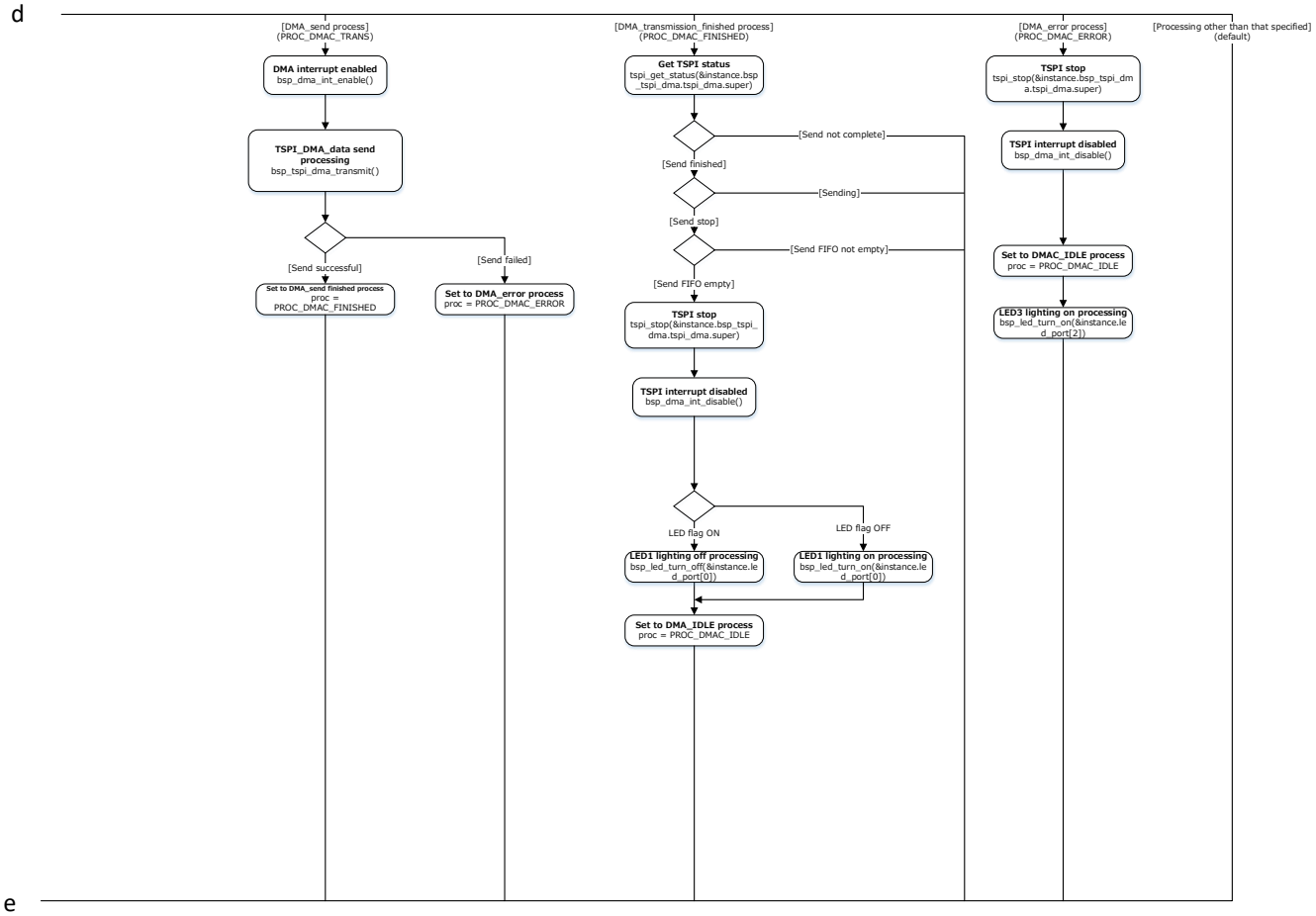
7. Activity diagram

7.1. main



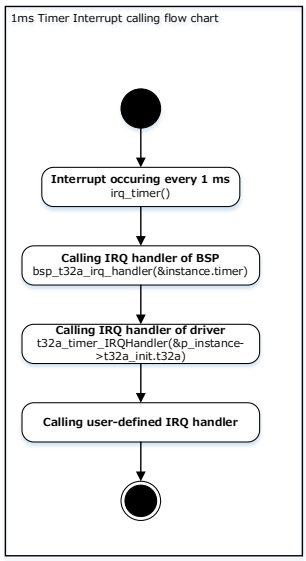

a
b
c
d
e
[FIFO_ send finished process]
(PROC_FIFO_FINISHED)
Get TSPI status
tspi_get_status(&instance.bsp_tspi.tspi)
[Send not complete]
[Send finished]
[Sending]
[Send stop]
[Send FIFO not empty]
[Send FIFO empty]
TSPI stop
tspi_stop(&instance.bsp_tspi.tspi)
TSPI interrupt disabled
bsp_tspi_tx_int_disable()
[LED flag ON]
[LE flag OFF]
LED1 lighting off processing
bsp_led_turn_off(&instance.led_port[0])
LED1 lighting on processing
bsp_led_turn_on(&instance.led_port[0])
Set to FIFO_IDLE process
proc = PROC_FIFO_IDLE
[FIFO_error process]
(PROC_FIFO_ERROR)
TSPI stop
tspi_stop(&instance.bsp_tspi.tspi)
TSPI interrupt disabled
bsp_tspi_tx_int_disable()
Set to FIFO_IDLE process
proc = PROC_FIFO_IDLE
LED3 lighting on processing
bsp_led_turn_on(&instance.led_port[2])
[指定プロセス以外]
(default)
[DMA_IDLE process]
(PROC_DMAC_IDLE)
SW processing
bsp_sw_task(&instance.sw_port[i])
[Some SW left unprocessed]
[All SW processing completed]

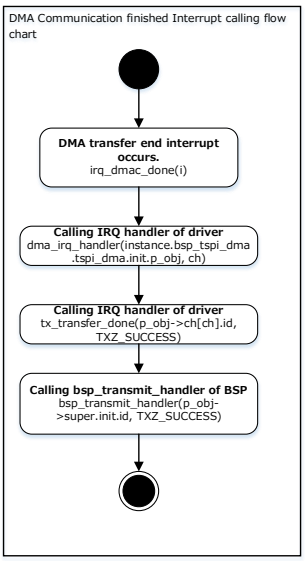
d

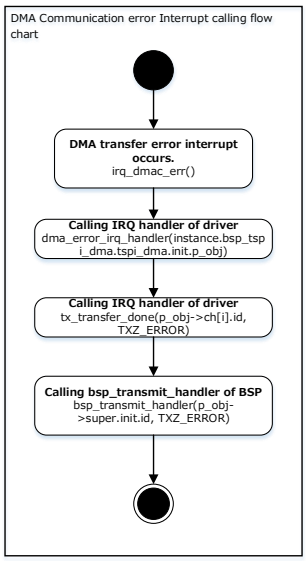

[DMA_send process]
(PROC_DMAC_TRANS)
DMA interrupt enabled
bsp_dma_int_enable()
TSPI_DMA_data send processing
bsp_tspi_dma_transmit()
[Send successful]
[Send failed]
Set to DMA_send finished process
proc = PROC_DMAC_FINISHED
Set to DMA_error process
proc = PROC_DMAC_ERROR
[DMA_transmission_finished process]
(PROC_DMAC_FINISHED)
Get TSPI status
tspi_get_status(&instance.bsp_tspi_dma.tspi_dma.super)
[Send not complete]
[Send finished]
[Sending]
[Send stop]
[Send FIFO not empty]
[Send FIFO empty]
TSPI stop
tspi_stop(&instance.bsp_tspi_dma.tspi_dma.super)
TSPI interrupt disabled
bsp_dma_int_disable()
LED flag ON
LED flag OFF
LED1 lighting off processing
bsp_led_turn_off(&instance.led_port[0])
LED1 lighting on processing
bsp_led_turn_on(&instance.led_port[0])
Set to DMA_IDLE process
proc = PROC_DMAC_IDLE
[DMA_error process]
(PROC_DMAC_ERROR)
TSPI stop
tspi_stop(&instance.bsp_tspi_dma.tspi_dma.super)
TSPI interrupt disabled
bsp_dma_int_disable()
Set to DMAC_IDLE process
proc = PROC_DMAC_IDLE
LED3 lighting on processing
bsp_led_turn_on(&instance.led_port[2])
[Processing other than that specified]
(default)

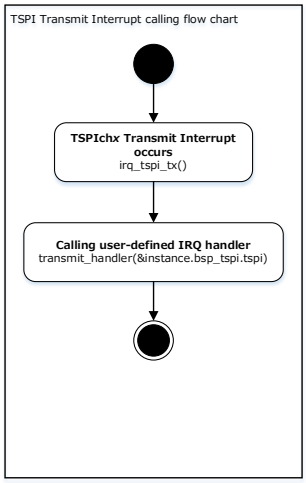
e

7.2. Interrupt

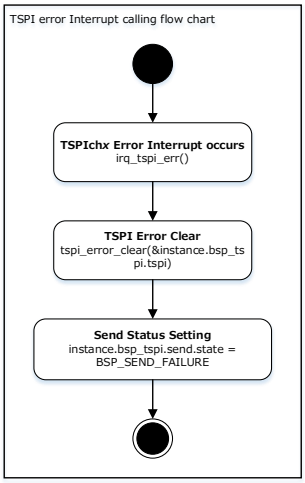








M471 : *x* = 2
M4L4 : *x* = 0
M3H : *x* = 1



M471 : *x* = 2
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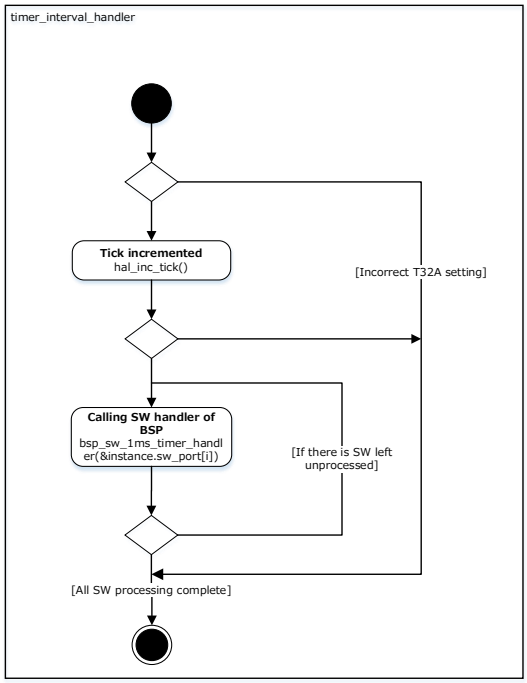

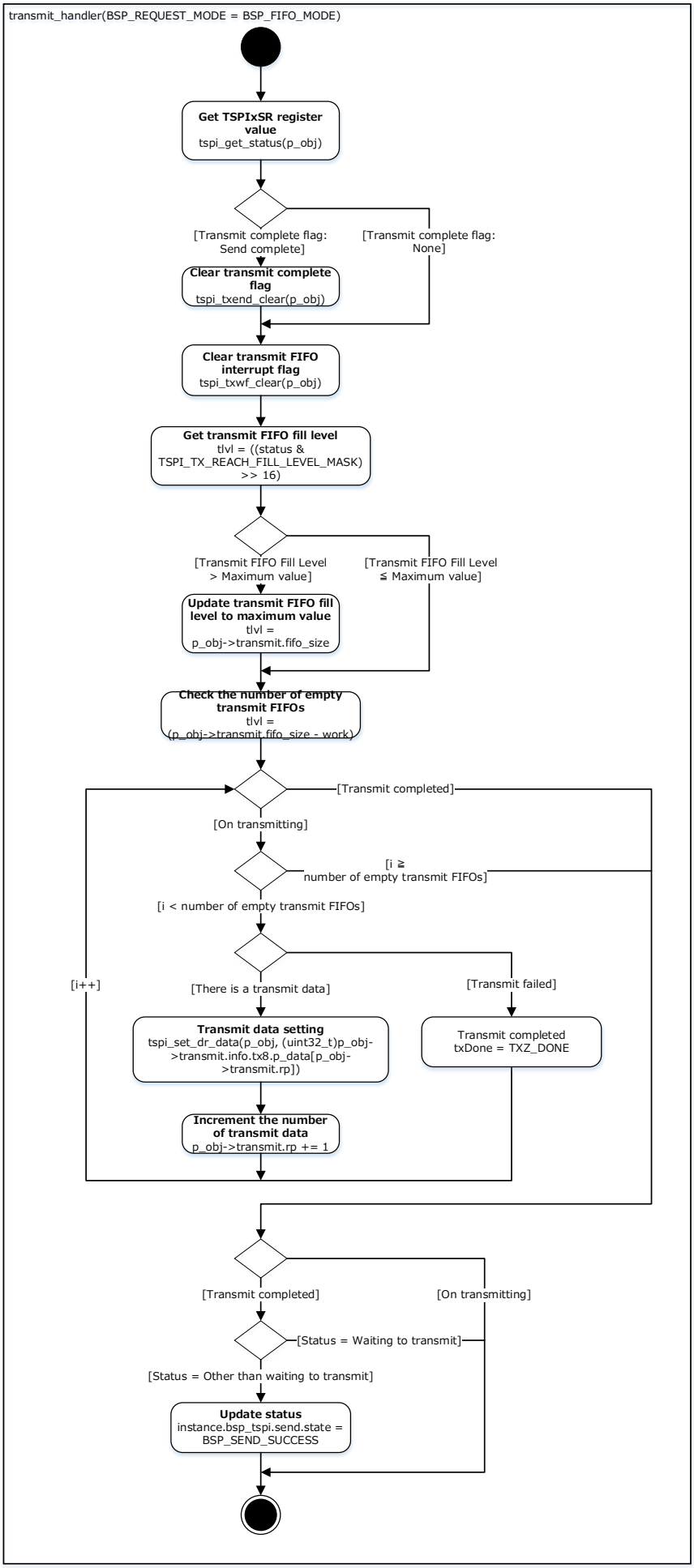
transmit_handler(BSP_REQUEST_MODE = BSP_FIFO_MODE)
Get TSPIxSR register value
tspi_get_status(p_obj)
[Transmit complete flag: Send complete]
[Transmit complete flag: None]
Clear transmit complete flag
tspi_txend_clear(p_obj)
Clear transmit FIFO interrupt flag
tspi_txwf_clear(p_obj)
Get transmit FIFO fill level
tlvl = ((status & TSPI_TX_REACH_FILL_LEVEL_MASK) >> 16)
[Transmit FIFO Fill Level > Maximum value]
[Transmit FIFO Fill Level ≦ Maximum value]
Update transmit FIFO fill level to maximum value
tlvl = p_obj->transmit.fifo_size
Check the number of empty transmit FIFOs
tlvl = (p_obj->transmit.fifo_size - work)
[Transmit completed]
[On transmitting]
[i ≧ number of empty transmit FIFOs]
[i < number of empty transmit FIFOs]
[i++]
[There is a transmit data]
[Transmit failed]
Transmit data setting
tspi_set_dr_data(p_obj, (uint32_t)p_obj->transmit.info.tx8.p_data[p_obj->transmit.rp])
Transmit completed
txDone = TXZ_DONE
Increment the number of transmit data
p_obj->transmit.rp += 1
[Transmit completed]
[On transmitting]
[Status = Waiting to transmit]
[Status = Other than waiting to transmit]
Update status
instance.bsp_tspi.send.state = BSP_SEND_SUCCESS

8. Revision History

Revision	Date	Description
1.0	2025-01-20	First release
1.1	2025-10-30	6.3 Interrupt to Use Added M3H Interrupt Name.
1.2	2026-07-30	6.3 Interrupt to Use Detailed information is transcribed into the User's Manual

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