8bit & 32bit

ABOV I2C API

User Guide

Application Note

Version 1.00

Contents

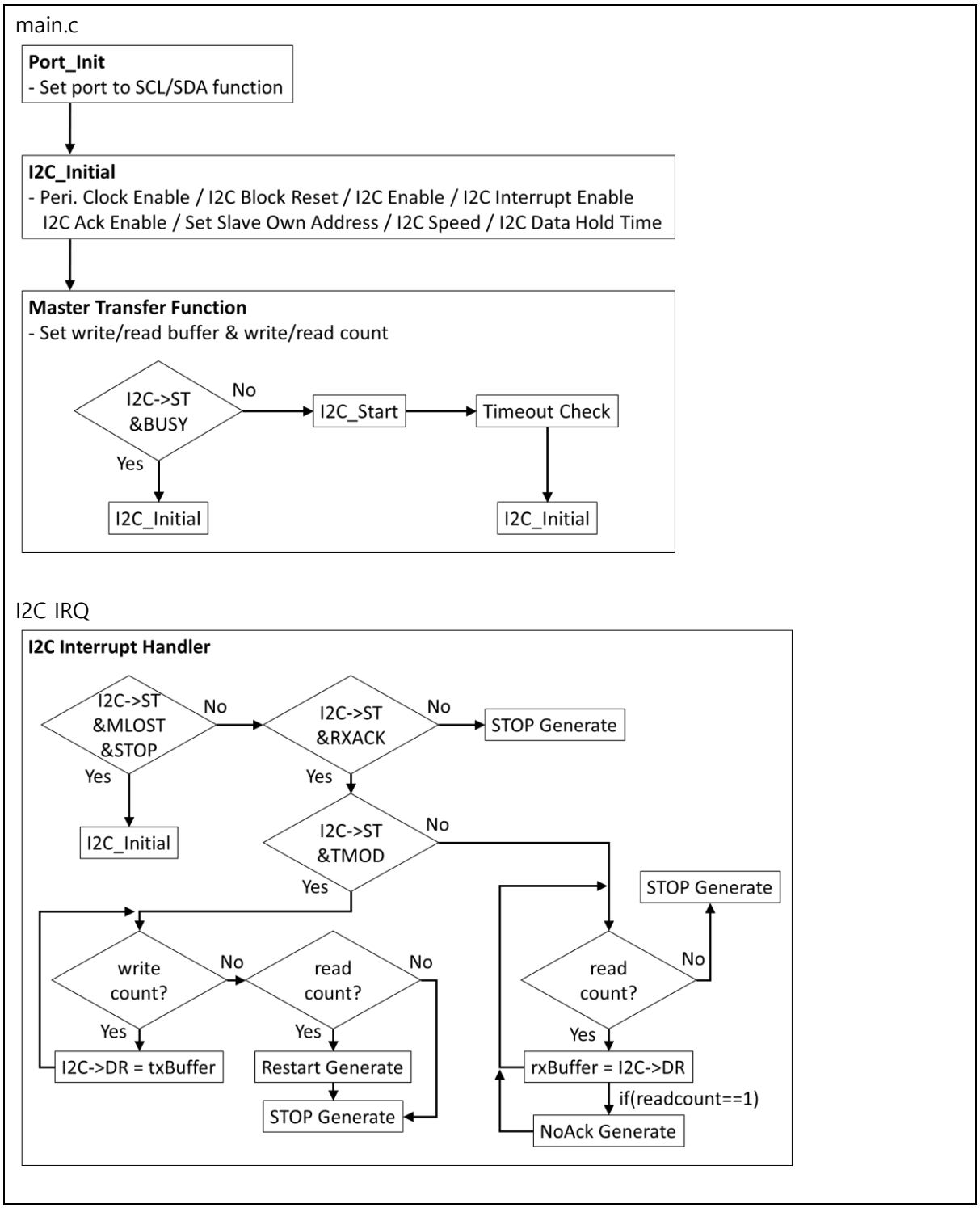
1 Overview

This document describes the firmware for the ABOV_I2C_Driver.

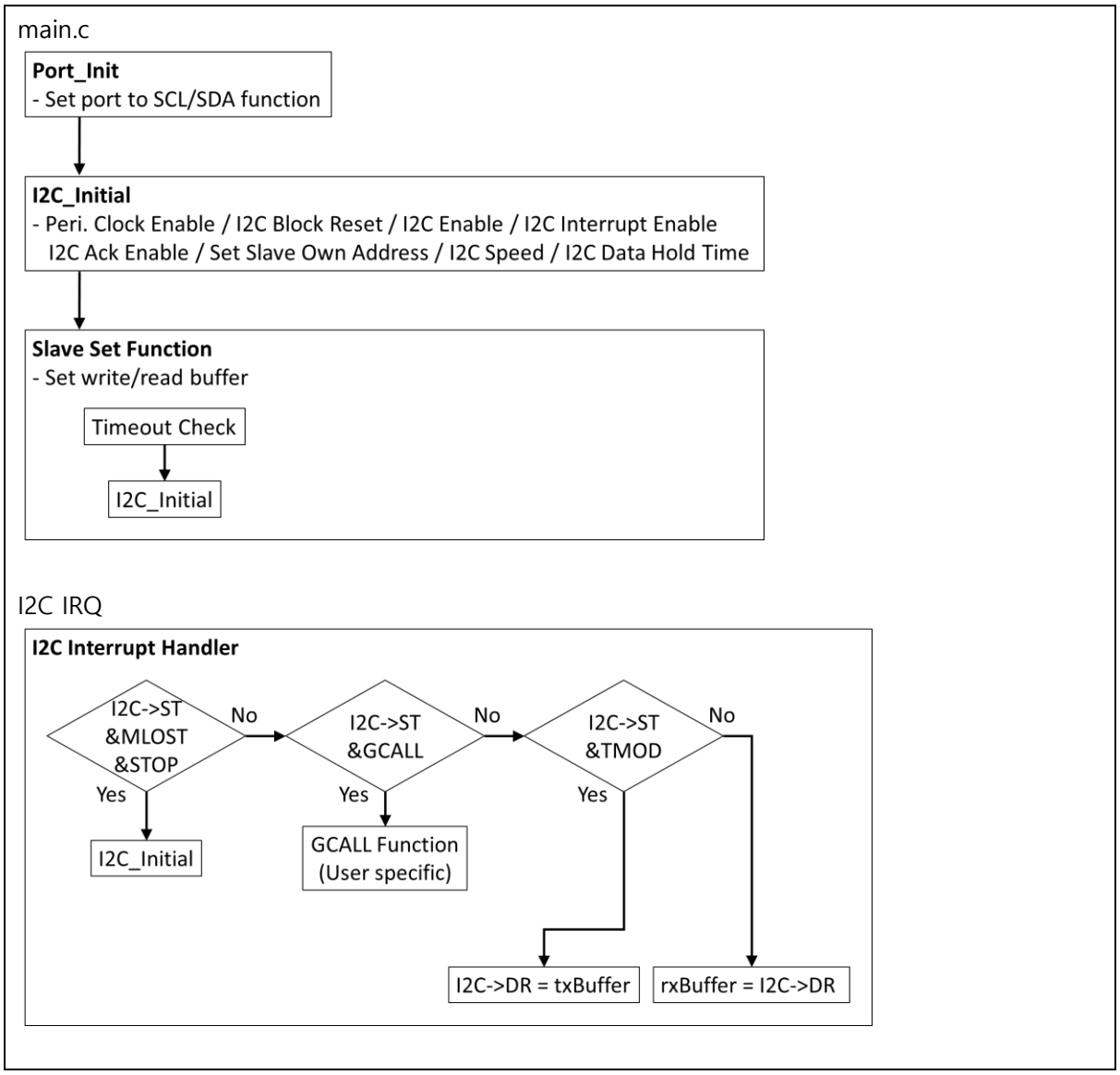
It has the goal of helping the developer to understand how this firmware works, and how to tailor the application.

2 Function block diagram

2.1 I2C Master Mode



2.2 I2C Slave Mode



3 How to use in main application

3.1 Public Macro

The macros on the left side are user specific.

Modification is required for the user application.

#define I2C_DEVICE_ADDRESS	0xA0	#define I2C_ACK_DISABLE	0
#define I2C_SLAVE_OWN_ADDR	0xA0	#define I2C_ACK_ENABLE	1
#define I2C_SPEED	10000	#define I2C_WRITE_MODE	0
#define I2C_MAX_BUFFER_SIZE	20	#define I2C_READ_MODE	1
#define I2C_MAX_CHANNEL	2	#define I2C_IDLE	0
#define I2C_CH0	0	#define I2C_BUSY	1
#define I2C_CH1	1	#define I2C_FALSE	0
		#define I2C_TRUE	1

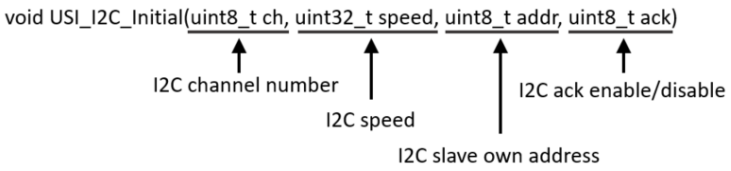
3.2 I2C Initialization

‘USI_I2C_Initial()’ function is required to use I2C functionality.

This function includes the following.

- Peri. Clock Enable / I2C Block Reset / I2C Interrupt Enable

- I2C Enable / I2C Ack Enable / Set Slave Own Address / Set I2C Speed / Set I2C Data Hold Time



[example of use]

USI_I2C_Initial(I2C_CH0, I2C_SPEED, I2C_SLAVE_OWN_ADDR, I2C_ACK_ENABLE);

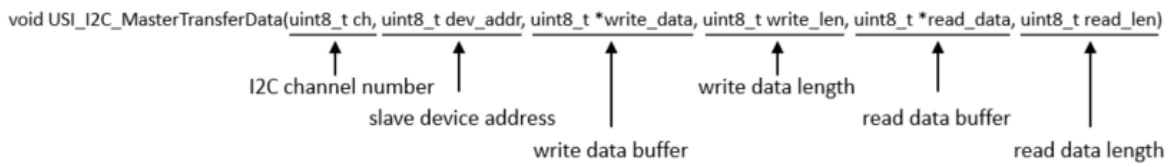
3.3 I2C Master – Write / Read

Using ‘USI_I2C_MasterTransferData()’ function, you can use both I2C Write and I2C Read functions.

This function includes the following parameter.

- I2C channel number / slave device address

- write data buffer / write data length / read data buffer / read data length



[example of use]

(case1) I2C Write 4-byte

→ USI_I2C_MasterTransferData(I2C_CH0, I2C_DEVICE_ADDRESS, *u8TxDat, 4, *u8RxDat, 0);

(case2) I2C Read 4-byte

→ USI_I2C_MasterTransferData(I2C_CH0, I2C_DEVICE_ADDRESS, *u8TxDat, 0, *u8RxDat, 4);

(case3) I2C Write 1-byte , Read 3-byte

→ USI_I2C_MasterTransferData(I2C_CH0, I2C_DEVICE_ADDRESS, *u8TxDat, 1, *u8RxDat, 3);

(case4) I2C Write 3-byte , Read 1-byte

→ USI_I2C_MasterTransferData(I2C_CH0, I2C_DEVICE_ADDRESS, *u8TxDat, 3, *u8RxDat, 1);

3.4 I2C Slave – Set Transmit Buffer

Using ‘USI_I2C_SetSlaveData()’ function, you can set transmit buffer data.

The buffer data can be modified by the user.

```
void USI_I2C_SetSlaveData(uint8_t ch)
{
 ......
 receiveNum[ch] = 0;
 transmitNum[ch] = 0;

 ......
 for(i=0; i<I2C_MAX_BUFFER_SIZE; i++)
 {
  transmitBuffer0[i] = (0x00 + i);
  receiveBuffer0[i] = 0x00;
 }
 ......
}
```

I2C channel number

Set Transmit Buffer
0x00 , 0x01, 0x02, ...
(User specific)

[example of use]

USI_I2C_SetSlaveData(I2C_CH0);

3.5 Example of use in main application

This is example of use in main application.

```
int main( void )
{
 unsigned char i;
 unsigned char u8TxDat[8];
 unsigned char u8RxDat[8];

 Init_Port();
 Init_Clock();

#if 1       /* Master mode */
 USI_I2C_Initial(I2C_CH0, I2C_SPEED, I2C_SLAVE_OWN_ADDR, I2C_ACK_ENABLE);

 for(i=0;i<8;i++)
 {
  u8TxDat[i] = (i + 0x00);
  u8RxDat[i] = 0x00;
 }

 while(1)
 {
  USI_I2C_MasterTransferData(I2C_CH0, I2C_DEVICE_ADDRESS, u8TxDat, 8, u8RxDat, 0);
 }

#else       /* Slave mode */
 USI_I2C_Initial(I2C_CH1, I2C_SPEED, I2C_SLAVE_OWN_ADDR, I2C_ACK_ENABLE);

 while(1)
 {
  USI_I2C_SetSlaveData(I2C_CH1);
 }
#endif
  return 0;
}
```

4 How to port to other device

4.1 Main (main.c)

1) Include header file → #include "ABOV_USI_I2C.h"

2) Call 'USI_I2C_InterruptHandler()' function at the I2C IRQ.

→ Example) void I2C0_Handler(void){ USI_I2C_InterruptHandler(I2C_CH0); }
void I2C1_Handler(void){ USI_I2C_InterruptHandler(I2C_CH1); }

3) Use functions as below in user application.

→ Example) USI_I2C_Initial(I2C_CH0, I2C_SPEED, I2C_SLAVE_OWN_ADDR, I2C_ACK_ENABLE);
USI_I2C_MasterTransferData(I2C_CH0, I2C_DEVICE_ADDRESS, *u8TxDat, 4, *u8RxDat, 0);
USI_I2C_SetSlaveData(I2C_CH1);

4.2 Header file (ABOV_USI_I2C.h)

It needs to change public typedef as below.

I2C Control Register and I2C Status Register may differ from product to product,

So the corresponding bits must be checked.

```
enum  i2c_control_flags{      // I2C Control Register Flags
        fI2CnEN               = (1<<7),
        fTXDLYENBn            = (1<<6),
        fI2CnIEN              = (1<<5),
        fI2CnIFLAG            = (1<<4),
        fACKnEN               = (1<<3),
        fIMASTERn             = (1<<2),
        fSTOPCn               = (1<<1),
        fSTARTCn              = (1<<0),
};
enum  i2c_status_flags{       // I2C Status Register Flags
        fGCALL                = (1<<7),
        fTEND                 = (1<<6),
        fSTOPD                = (1<<5),
        fSSEL                 = (1<<4),
        fMLOST                = (1<<3),
        fBUSY                 = (1<<2),
        fTMODE                = (1<<1),
        fRXACK                = (1<<0),
};
```

4.3 Source file (ABOV_USI_I2C.c)

1) Exchange device header file → #include "user_device_name.h"

2) Exchange name of register as below

- SCUCG relevant registers and their sub bits
- I2C relevant registers and their sub bits
- Interrupt relevant registers and their sub bits