I2C Driver

Version 1.0.0

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Data Structure Documentation

3.1 i2c_config_t Struct Reference

```
#include <i2c_stm32f411_config.h>
```

Data Fields

- i2c_enabled_t en
- i2c_ack_en_t ack_en
- uint32_t periph_clk_freq_MHz
- uint32_t i2c_op_freq_kHz
- i2c_fast_slow_t fast_or_std
- i2c_fm_duty_cycle_t duty_cycle

3.1.1 Detailed Description

Struct contains the settings required to configure an i2c device.

3.1.2 Field Documentation

3.1.2.1 ack_en

```
i2c_ack_en_t ack_en
```

Whether the device sends ACK upon byte reception

3.1.2.2 duty_cycle

```
i2c_fm_duty_cycle_t duty_cycle
```

The ratio of the period of low vs high cycles of bit pulses

3.1.2.3 en

```
i2c_enabled_t en
```

Whether the device is enabled or not

3.1.2.4 fast_or_std

```
i2c_fast_slow_t fast_or_std
```

Whether the I2C device will be in fast or standard mode

3.1.2.5 i2c_op_freq_kHz

```
uint32_t i2c_op_freq_kHz
```

The operational frequency of the I2C bus

3.1.2.6 periph_clk_freq_MHz

```
uint32_t periph_clk_freq_MHz
```

The frequency of the device in MHz

The documentation for this struct was generated from the following file:

- /home/marko/Documents/embedded_workspace/i2c_driver/i2c_stm32f411_config.h

3.2 i2c_transfer_t Struct Reference

```
#include <i2c_interface.h>
```

Data Fields

- i2c_channel_t channel
- uint8_t ∗ buffer
- uint32_t data_length
- uint8_t slave_address

3.2.1 Detailed Description

Generic transfer structure, independent of implementation. Passed into transmission functions.

3.2.2 Field Documentation

3.2.2.1 buffer

```
uint8_t* buffer
```

The data buffer

3.2.2.2 channel

```
i2c_channel_t channel
```

The target I2C peripheral

3.2.2.3 data_length

```
uint32_t data_length
```

The number of bytes to be receive/sent

3.2.2.4 slave_address

```
uint8_t slave_address
```

The 7-bit slave address

The documentation for this struct was generated from the following file:

- /home/marko/Documents/embedded_workspace/i2c_driver/i2c_interface.h

Chapter 4

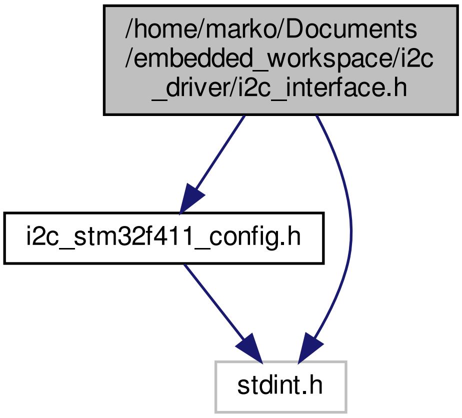
File Documentation

4.1 /home/marko/Documents/embedded_workspace/i2c_driver/i2c_interface.h File Reference

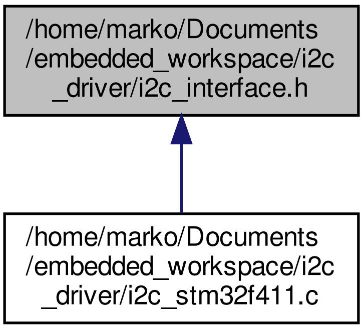
General interface covering user accesses to the i2c communication bus.

```
#include "i2c_stm32f411_config.h"
#include <stdint.h>
```

Include dependency graph for i2c_interface.h:



This graph shows which files directly or indirectly include this file:



Data Structures

- struct i2c_transfer_t

Enumerations

- enum **i2c_interrupt_control_t** { **INTERRUPT_DISABLED**, **INTERRUPT_ENABLED** }

Functions

- void i2c_init (const i2c_config_t ∗config_table)
- void **i2c_irq_handler** (i2c_channel_t channel)
- void i2c_interrupt_control (i2c_channel_t channel, i2c_interrupt_dma_t interrupt, i2c_interrupt_control_t signal)
- void i2c_master_transmit (i2c_transfer_t ∗transfer)
- void i2c_master_receive (i2c_transfer_t ∗transfer)
- void i2c_slave_transmit (i2c_transfer_t ∗transfer)
- void i2c_slave_receive (i2c_transfer_t ∗transfer)
- void **i2c_master_transmit_it** (i2c_transfer_t ∗transfer)
- void **i2c_master_receive_it** (i2c_transfer_t ∗transfer)
- void **i2c_slave_transmit_it** (i2c_transfer_t ∗transfer)
- void **i2c_slave_receive_it** (i2c_transfer_t ∗transfer)
- void **i2c_register_write** (uint32_t i2c_register)
- uint32_t **i2c_register_read** (uint32_t i2c_regsister)

4.1.1 Detailed Description

General interface covering user accesses to the i2c communication bus.

4.1.2 Function Documentation

4.1.2.1 i2c_init()

```
void i2c_init (
            const i2c_config_t * config_table )
```

Description:

```
Carries out the initialisation of the I2C channels as per the information
in the config table
```

PRE-CONDITION: The config table has been obtained and is non-null PRE-CONDITION: The required GPIO pins for i2c combination have been configured correctly with gpio_init PRE-CONDITION: The appropriate peripheral clocks have been activated

POST-CONDITION: The selected i2c channels have been activated anda ready to be used

Returns

void

Example:

```
const i2c_config_t *config_table = i2c_config_get();
i2c_init(config_table);
```

POST-CONDITION: The appropraite trise value has been calculated and placed in the register

See also

i2c_config_get

- CHANGE HISTORY -

Date	Software Version	Initials	Description

4.1.2.2 i2c_interrupt_control()

```
void i2c_interrupt_control (
            i2c_channel_t channel,
            i2c_interrupt_dma_t interrupt,
            i2c_interrupt_control_t signal )
```

Description:

```
Enabled or disables the selected interrupt on the selected channel. Caled both by users
and within the driver itself
```

PRE-CONDITION: The i2c_init function has been carried out successfully

POST-CONDITION: The desired interrupt on the selected device has been activated/disabled

Returns

void

Example:

```
i2c_interrupt_control(I2C_2, IT_BUF, INTERRUPT_ENABLED);
```

See also

i2c_init
i2c_master_transmit_it
i2c_master_receive_it
i2c_slave_transmit_it
i2c_slave_receive_it
- CHANGE HISTORY -

Date	Software Version	Initials	Description

4.1.2.3 i2c_master_receive()

```
void i2c_master_receive (
            i2c_transfer_t * i2c_transfer )
```

Description:

```
Initiates a blocking reception in master mode using the parameters specified in transfer
```

PRE-CONDITION: i2c_init has been carried out properly PRE-CONDITION: The data buffer points to non-null location and the transfer length is non-zero.

POST-CONDITION: The data has been received from the slave

Parameters

i2c_transfer	is a pointer to a struct which contains all the information required to carry out a transfer.

Returns

void

Example:

```
i2c_init(config_table);
i2c_transfer_t accelerometer_comm;
accelerometer_comm.channel = I2C_2;
accelerometer_comm.buffer = &data_from_accel;
accelerometer_comm.length = 2;
accelerometer_comm.address = ACCELEROMETER_ADDRESS;
i2c_master_transmit(&accelerometer_comm);
```

See also

i2c_init
i2c_master_transmit
i2c_slave_transmit
i2c_slave_receive
- CHANGE HISTORY -

Date	Software Version	Initials	Description

4.1.2.4 i2c_master_transmit()

```
void i2c_master_transmit (
            i2c_transfer_t * i2c_transfer )
```

Description:

```
Initiates a blocking transmission in master mode using the parameters specified in transfer
```

PRE-CONDITION: i2c_init has been carried out properly PRE-CONDITION: The data buffer points to non-null location and the transfer length is non-zero.

POST-CONDITION: The data has been sent to the slave

Parameters

i2c_transfer	is a pointer to a struct which contains all the information required to carry out a transfer.

Returns

void

Example:

```
i2c_init(config_table);
i2c_transfer_t motor_controller_comm;
motor_controller_comm.channel = I2C_2;
motor_controller_comm.buffer = &data_to_motor;
motor_controller_comm.length = 4;
motor_controller_comm.address = MOTOR_CONTROLLER_ADDRESS;
i2c_master_transmit(&motor_controller_comm);
```

See also

i2c_init
i2c_master_receive
i2c_slave_transmit
i2c_slave_receive
- CHANGE HISTORY -

Date	Software Version	Initials	Description

4.1.2.5 i2c_slave_receive()

```
void i2c_slave_receive (
            i2c_transfer_t * i2c_transfer )
```

Description:

```
Initiates a blocking reception in master mode using the parameters specified in transfer
```

PRE-CONDITION: i2c_init has been carried out properly PRE-CONDITION: The data buffer points to non-null location and the transfer length is non-zero.

POST-CONDITION: The data has been received from the slave

Parameters

i2c_transfer	is a pointer to a struct which contains all the information required to carry out a transfer.

Returns

void

Example:

```
i2c_init(config_table);
i2c_transfer_t accelerometer_comm;
accelerometer_comm.channel = I2C_2;
accelerometer_comm.buffer = &data_from_accel;
accelerometer_comm.length = 2;
accelerometer_comm.address = ACCELEROMETER_ADDRESS;
i2c_master_transmit(&accelerometer_comm);
```

See also

i2c_init
i2c_master_transmit
i2c_slave_transmit
i2c_slave_receive
- CHANGE HISTORY -

Date	Software Version	Initials	Description

4.1.2.6 i2c_slave_transmit()

```
void i2c_slave_transmit (
            i2c_transfer_t * i2c_transfer )
```

Description:

```
Initiates a blocking transmission in slave mode using the parameters specified in transfer
```

PRE-CONDITION: i2c_init has been carried out properly PRE-CONDITION: The data buffer points to non-null location and the transfer length is non-zero.

POST-CONDITION: The data has been sent to the master

Parameters

i2c_transfer	is a pointer to a struct which contains all the information required to carry out a transfer.

Returns

void

Example:

```
i2c_init(config_table);
i2c_transfer_t motor_controller_comm;
motor_controller_comm.channel = I2C_2;
motor_controller_comm.buffer = &data_to_motor;
motor_controller_comm.length = 4;
motor_controller_comm.address = MOTOR_CONTROLLER_ADDRESS;
i2c_master_transmit(&motor_controller_comm);
```

See also

i2c_init
i2c_master_transmit
i2c_slave_transmit
i2c_slave_receive
- CHANGE HISTORY -

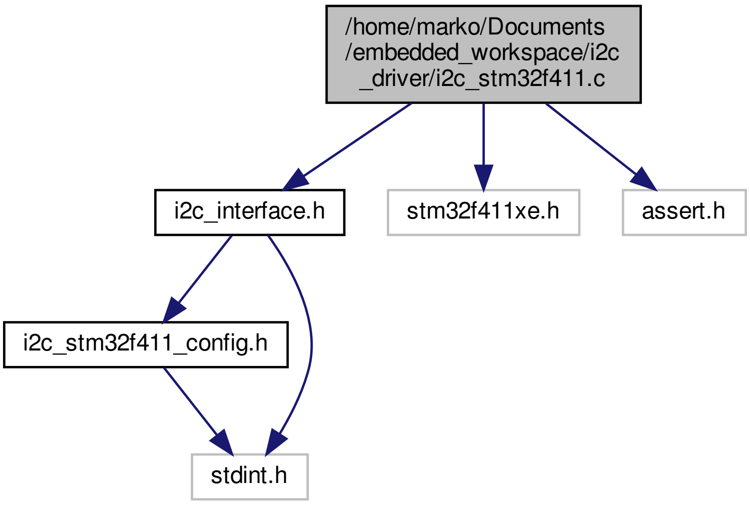
Date	Software Version	Initials	Description

4.2 /home/marko/Documents/embedded_workspace/i2c_driver/i2c_stm32f411.c File Reference

Chip specific implementation for i2c communication.

```
#include "i2c_interface.h"
#include "stm32f411xe.h"
#include <assert.h>
```

Include dependency graph for i2c_stm32f411.c:



Macros

- #define SM_RISE_TIME_MAX 1000
- #define FM_RISE_TIME_MAX 300

Typedefs

- typedef void(∗ i2c_interrupt_callback_t) (i2c_transfer_t ∗)

Functions

- static uint32_t i2c_calculate_ccr (i2c_config_t ∗config_entry)
- static uint32_t i2c_calculate_trise (i2c_config_t ∗config_entry)
- static void **i2c_clear_addr_bit** (i2c_channel_t channel)
- static void **i2c_clear_stopf_bit** (i2c_channel_t channel)
- static void **i2c_one_byte_reception** (i2c_transfer_t ∗i2c_transfer)
- static void **i2c_two_byte_reception** (i2c_transfer_t ∗i2c_transfer)
- static void **i2c_n_byte_reception** (i2c_transfer_t ∗i2c_transfer)
- void i2c_init (const i2c_config_t ∗config_table)
- void i2c_interrupt_control (i2c_channel_t channel, i2c_interrupt_dma_t interrupt, i2c_interrupt_control_t signal)
- void i2c_master_transmit (i2c_transfer_t ∗i2c_transfer)
- void i2c_master_receive (i2c_transfer_t ∗i2c_transfer)
- void i2c_slave_transmit (i2c_transfer_t ∗i2c_transfer)
- void i2c_slave_receive (i2c_transfer_t ∗i2c_transfer)
- static void **i2c_master_transmit_it_callback** (i2c_transfer_t ∗i2c_transfer)
- static void **i2c_master_receive_it_callback** (i2c_transfer_t ∗i2c_transfer)
- static void **i2c_slave_transmit_it_callback** (i2c_transfer_t ∗i2c_transfer)
- static void **i2c_slave_receive_it_callback** (i2c_transfer_t ∗i2c_transfer)
- void **i2c_master_transmit_it** (i2c_transfer_t ∗i2c_transfer)
- void **i2c_master_receive_it** (i2c_transfer_t ∗i2c_transfer)
- void **i2c_slave_transmit_it** (i2c_transfer_t ∗i2c_transfer)
- void **i2c_slave_receive_it** (i2c_transfer_t ∗i2c_transfer)
- void **i2c_irq_handler** (i2c_channel_t channel)

Variables

- static volatile uint16_t ∗const I2C_CR1 [NUM_I2C]
- static volatile uint16_t ∗const I2C_CR2 [NUM_I2C]
- static volatile uint16_t ∗const I2C_OAR1 [NUM_I2C]
- static volatile uint16_t ∗const I2C_OAR2 [NUM_I2C]
- static volatile uint16_t ∗const I2C_DR [NUM_I2C]
- static volatile uint16_t ∗const I2C_SR1 [NUM_I2C]
- static volatile uint16_t ∗const I2C_SR2 [NUM_I2C]
- static volatile uint16_t ∗const I2C_CCR [NUM_I2C]
- static volatile uint16_t ∗const I2C_TRISE [NUM_I2C]
- static volatile uint16_t ∗const I2C_FLTR [NUM_I2C]
- static i2c_transfer_t i2c_interrupt_transfers [NUM_I2C]
- static i2c_interrupt_callback_t i2c_interrupt_callbacks [NUM_I2C]

4.2.1 Detailed Description

Chip specific implementation for i2c communication.

4.2.2 Macro Definition Documentation

4.2.2.1 FM_RISE_TIME_MAX

```
#define FM_RISE_TIME_MAX 300
```

Maximum rise time for a fast mode pulse in ns.

4.2.2.2 SM_RISE_TIME_MAX

```
#define SM_RISE_TIME_MAX 1000
```

Rise times obtained from the phillips i2c spec sheetMaximum rise time for a stanard mode pulse in ns.

4.2.3 Typedef Documentation

4.2.3.1 i2c_interrupt_callback_t

```
typedef void(* i2c_interrupt_callback_t) (i2c_transfer_t *)
```

Callback typedef for interrupt callbacks

4.2.4 Function Documentation

4.2.4.1 i2c_calculate_ccr()

```
static uint32_t i2c_calculate_ccr (
             i2c_config_t * config_entry )  [inline], [static]
```

Description:

```
Static inline function called from within the driver to carry out the calculation of
the required pulse length for a given frequency.
```

PRE-CONDITION: The config table has been obtained and is non-null

POST-CONDITION: The appropriate cc value has been calculated and placed in the register

Returns

uint32_t

Example: Automatically called within i2c_init

See also

i2c_init
i2c_calculate_trise
- CHANGE HISTORY -

Date	Software Version	Initials	Description

Equation obtained from RM0383 18.6.8: $CCR = \frac{T_{high}}{T_{pclk}}$, where $T_{high} = \frac{1}{2 \times T_{opfreq}}$ (kHz) and $T_{opfreq} = \frac{1}{f_{opfreq}}$ and $T_{pclk} = \frac{1}{f_{pclk}}$ leading to $CCR = \frac{f_{pclk}(MHz)}{2 \times f_{opfreq}(khZ)} = \frac{f_{pclk}}{2000 \times f_{opfreq}}$

Equation obtained from RM0383 18.6.8: $CCR = \frac{T_{high}}{T_{pclk}}$, where $T_{high} = \frac{1}{3 \times T_{opfreq}}$ (kHz) and $T_{opfreq} = \frac{1}{f_{opfreq}}$ and $T_{pclk} = \frac{1}{f_{pclk}}$ leading to $CCR = \frac{f_{pclk}(MHz)}{3 \times f_{opfreq}(khZ)} = \frac{f_{pclk}}{3000 \times f_{opfreq}}$

Equation obtained from RM0383 18.6.8: $CCR = \frac{T_{high}}{T_{pclk}}$, where $T_{high} = \frac{25}{9 \times T_{opfreq}}$ (kHz) and $T_{opfreq} = \frac{1}{f_{opfreq}}$ and $T_{pclk} = \frac{1}{f_{pclk}}$ leading to $CCR = \frac{9 \times f_{pclk}(MHz)}{25 \times f_{opfreq}(khZ)} = \frac{9 \times f_{pclk}}{25000 \times f_{opfreq}}$

4.2.4.2 i2c_calculate_trise()

```
static uint32_t i2c_calculate_trise (
            i2c_config_t * config_entry )  [inline], [static]
```

Description:

```
Static inline function called from within the driver to carry out the calculation of
the required rise time
```

PRE-CONDITION: The config table has been obtained and is non-null

POST-CONDITION: The appropriate trise value has been calculated and placed in the register

Returns

uint32_t

Example: Automatically called within i2c_init

See also

i2c_init
i2c_calculate_ccr
- CHANGE HISTORY -

Date	Software Version	Initials	Description

4.2.4.3 i2c_init()

```
void i2c_init (
            const i2c_config_t * config_table )
```

Description:

```
Carries out the initialisation of the I2C channels as per the information
in the config table
```

PRE-CONDITION: The config table has been obtained and is non-null PRE-CONDITION: The required GPIO pins for i2c combination have been configured correctly with gpio_init PRE-CONDITION: The appropriate peripheral clocks have been activated

POST-CONDITION: The selected i2c channels have been activated anda ready to be used

Returns

void

Example:

```
const i2c_config_t *config_table = i2c_config_get();
i2c_init(config_table);
```

POST-CONDITION: The appropraite trise value has been calculated and placed in the register

See also

i2c_config_get

- CHANGE HISTORY -

Date	Software Version	Initials	Description

4.2.4.4 i2c_interrupt_control()

```
void i2c_interrupt_control (
            i2c_channel_t channel,
            i2c_interrupt_dma_t interrupt,
            i2c_interrupt_control_t signal )
```

Description:

```
Enabled or disables the selected interrupt on the selected channel. Caled both by users
and within the driver itself
```

PRE-CONDITION: The i2c_init function has been carried out successfully

POST-CONDITION: The desired interrupt on the selected device has been activated/disabled

Returns

void

Example:

```
i2c_interrupt_control(I2C_2, IT_BUF, INTERRUPT_ENABLED);
```

See also

i2c_init
i2c_master_transmit_it
i2c_master_receive_it
i2c_slave_transmit_it
i2c_slave_receive_it
- CHANGE HISTORY -

Date	Software Version	Initials	Description

4.2.4.5 i2c_master_receive()

```
void i2c_master_receive (
            i2c_transfer_t * i2c_transfer )
```

Description:

```
Initiates a blocking reception in master mode using the parameters specified in transfer
```

PRE-CONDITION: i2c_init has been carried out properly PRE-CONDITION: The data buffer points to non-null location and the transfer length is non-zero.

POST-CONDITION: The data has been received from the slave

Parameters

i2c_transfer	is a pointer to a struct which contains all the information required to carry out a transfer.

Returns

void

Example:

```
i2c_init(config_table);
i2c_transfer_t accelerometer_comm;
accelerometer_comm.channel = I2C_2;
accelerometer_comm.buffer = &data_from_accel;
accelerometer_comm.length = 2;
accelerometer_comm.address = ACCELEROMETER_ADDRESS;
i2c_master_transmit(&accelerometer_comm);
```

See also

i2c_init
i2c_master_transmit
i2c_slave_transmit
i2c_slave_receive
- CHANGE HISTORY -

Date	Software Version	Initials	Description

4.2.4.6 i2c_master_transmit()

```
void i2c_master_transmit (
            i2c_transfer_t * i2c_transfer )
```

Description:

```
Initiates a blocking transmission in master mode using the parameters specified in transfer
```

PRE-CONDITION: i2c_init has been carried out properly PRE-CONDITION: The data buffer points to non-null location and the transfer length is non-zero.

POST-CONDITION: The data has been sent to the slave

Parameters

i2c_transfer	is a pointer to a struct which contains all the information required to carry out a transfer.

Returns

void

Example:

```
i2c_init(config_table);
i2c_transfer_t motor_controller_comm;
motor_controller_comm.channel = I2C_2;
motor_controller_comm.buffer = &data_to_motor;
motor_controller_comm.length = 4;
motor_controller_comm.address = MOTOR_CONTROLLER_ADDRESS;
i2c_master_transmit(&motor_controller_comm);
```

See also

i2c_init
i2c_master_receive
i2c_slave_transmit
i2c_slave_receive
- CHANGE HISTORY -

Date	Software Version	Initials	Description

4.2.4.7 i2c_slave_receive()

```
void i2c_slave_receive (
            i2c_transfer_t * i2c_transfer )
```

Description:

```
Initiates a blocking reception in master mode using the parameters specified in transfer
```

PRE-CONDITION: i2c_init has been carried out properly PRE-CONDITION: The data buffer points to non-null location and the transfer length is non-zero.

POST-CONDITION: The data has been received from the slave

Parameters

i2c_transfer	is a pointer to a struct which contains all the information required to carry out a transfer.

Returns

void

Example:

```
i2c_init(config_table);
i2c_transfer_t accelerometer_comm;
accelerometer_comm.channel = I2C_2;
accelerometer_comm.buffer = &data_from_accel;
accelerometer_comm.length = 2;
accelerometer_comm.address = ACCELEROMETER_ADDRESS;
i2c_master_transmit(&accelerometer_comm);
```

See also

i2c_init
i2c_master_transmit
i2c_slave_transmit
i2c_slave_receive
- CHANGE HISTORY -

Date	Software Version	Initials	Description

4.2.4.8 i2c_slave_transmit()

```
void i2c_slave_transmit (
            i2c_transfer_t * i2c_transfer )
```

Description:

```
Initiates a blocking transmission in slave mode using the parameters specified in transfer
```

PRE-CONDITION: i2c_init has been carried out properly PRE-CONDITION: The data buffer points to non-null location and the transfer length is non-zero.

POST-CONDITION: The data has been sent to the master

Parameters

i2c_transfer	is a pointer to a struct which contains all the information required to carry out a transfer.

Returns

void

Example:

```
i2c_init(config_table);
i2c_transfer_t motor_controller_comm;
motor_controller_comm.channel = I2C_2;
motor_controller_comm.buffer = &data_to_motor;
motor_controller_comm.length = 4;
motor_controller_comm.address = MOTOR_CONTROLLER_ADDRESS;
i2c_master_transmit(&motor_controller_comm);
```

See also

i2c_init
i2c_master_transmit
i2c_slave_transmit
i2c_slave_receive
- CHANGE HISTORY -

Date	Software Version	Initials	Description

4.2.5 Variable Documentation

4.2.5.1 I2C_CCR

```
volatile uint16_t* const I2C_CCR[NUM_I2C]  [static]
```

Initial value:

```
=
{
    (uint16_t *)I2C1_BASE + 0x1CUL, (uint16_t *)I2C2_BASE + 0x1CUL,
    (uint16_t *)I2C3_BASE + 0x1CUL
}
```

Array of pointers to the clock control registers

4.2.5.2 I2C_CR1

```
volatile uint16_t* const I2C_CR1[NUM_I2C]  [static]
```

Initial value:

```
=
{
    (uint16_t *)I2C1_BASE, (uint16_t *)I2C2_BASE, (uint16_t *)I2C3_BASE
}
```

Array of pointers to the Control Register 1 registers

4.2.5.3 I2C_CR2

```
volatile uint16_t* const I2C_CR2[NUM_I2C]  [static]
```

Initial value:

```
=
{
    (uint16_t *)I2C1_BASE + 0x04UL, (uint16_t *)I2C2_BASE + 0x04UL,
    (uint16_t *)I2C3_BASE + 0x04UL

}
```

Array of pointers to the Control Register 2 registers

4.2.5.4 I2C_DR

```
volatile uint16_t* const I2C_DR[NUM_I2C]  [static]
```

Initial value:

```
=
{
    (uint16_t *)I2C1_BASE + 0x10UL, (uint16_t *)I2C2_BASE + 0x10UL,
    (uint16_t *)I2C3_BASE + 0x10UL
}
```

Array of pointers to the Data registers

4.2.5.5 I2C_FLTR

```
volatile uint16_t* const I2C_FLTR[NUM_I2C]  [static]
```

Initial value:

```
=
{
    (uint16_t *)I2C1_BASE + 0x24UL, (uint16_t *)I2C2_BASE + 0x24UL,
    (uint16_t *)I2C3_BASE + 0x24UL
}
```

Array of pointers to the filter registers

4.2.5.6 i2c_interrupt_callbacks

```
i2c_interrupt_callback_t i2c_interrupt_callbacks[NUM_I2C]  [static]
```

Static array containing interrupt callbacks currently mapped to each i2c channel

4.2.5.7 i2c_interrupt_transfers

```
i2c_transfer_t i2c_interrupt_transfers[NUM_I2C]  [static]
```

Static array which holds copies of requested interrupt based transfers

4.2.5.8 I2C_OAR1

```
volatile uint16_t* const I2C_OAR1[NUM_I2C]  [static]
```

Initial value:

```
=
{
    (uint16_t *)I2C1_BASE + 0x08UL, (uint16_t *)I2C2_BASE + 0x08UL,
    (uint16_t *)I2C3_BASE + 0x08UL
}
```

Array of pointers to the Own Address 1 registers

4.2.5.9 I2C_OAR2

```
volatile uint16_t* const I2C_OAR2[NUM_I2C]  [static]
```

Initial value:

```
=
{
    (uint16_t *)I2C1_BASE + 0x0CUL, (uint16_t *)I2C2_BASE + 0x0CUL,
    (uint16_t *)I2C3_BASE + 0x0CUL
}
```

Array of pointers to the Own Address 2 registers

4.2.5.10 I2C_SR1

```
volatile uint16_t* const I2C_SR1[NUM_I2C]  [static]
```

Initial value:

```
=
{
    (uint16_t *)I2C1_BASE + 0x14UL, (uint16_t *)I2C2_BASE + 0x14UL,
    (uint16_t *)I2C3_BASE + 0x14UL
}
```

Array of pointers to the Status Register 1 registers

4.2.5.11 I2C_SR2

```
volatile uint16_t* const I2C_SR2[NUM_I2C]  [static]
```

Initial value:

```
=
{
    (uint16_t *)I2C1_BASE + 0x18UL, (uint16_t *)I2C2_BASE + 0x18UL,
    (uint16_t *)I2C3_BASE + 0x18UL
}
```

Array of pointers to the Status Register 2 registers

4.2.5.12 I2C_TRISE

```
volatile uint16_t* const I2C_TRISE[NUM_I2C]  [static]
```

Initial value:

```
=
{
    (uint16_t *)I2C1_BASE + 0x20UL, (uint16_t *)I2C2_BASE + 0x20UL,
    (uint16_t *)I2C3_BASE + 0x20UL
}
```

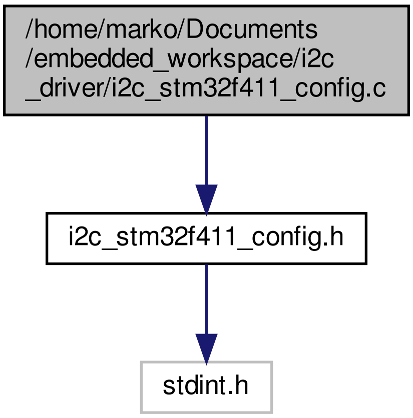
Array of pointers to the rise time registers

4.3 /home/marko/Documents/embedded_workspace/i2c_driver/i2c_stm32f411_config.c File Reference

Contains the configuration information for each I2C channel.

`#include "i2c_stm32f411_config.h"`

Include dependency graph for i2c_stm32f411_config.c:



Functions

- const i2c_config_t ∗ i2c_config_get (void)

Variables

- static const i2c_config_t i2c_config_table [NUM_I2C]

4.3.1 Detailed Description

Contains the configuration information for each I2C channel.

4.3.2 Function Documentation

4.3.2.1 i2c_config_get()

```
const i2c_config_t* i2c_config_get (
            void )
```

Description:

```
Returns a pointer to the base of the configuration table for i2c peripherals
```

PRE-CONDITION: The config table has been filled out and is non-null

Returns

∗i2c_config_t

Example:

```
const i2c_config_t *config_table = i2c_config_get();
i2c_init(config_table);
```

See also

i2c_init

- CHANGE HISTORY -

Date	Software Version	Initials	Description

4.3.3 Variable Documentation

4.3.3.1 i2c_config_table

```
const i2c_config_t i2c_config_table[NUM_I2C]  [static]
```

Initial value:

```
=
{

        {},
        {},
        {}
}
```

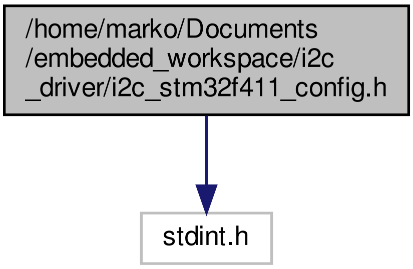
The configuration table that must be filled out by the user and is used by i2c_init to initialise the separate i2c channels

4.4 /home/marko/Documents/embedded_workspace/i2c_driver/i2c_stm32f411_config.h File Reference

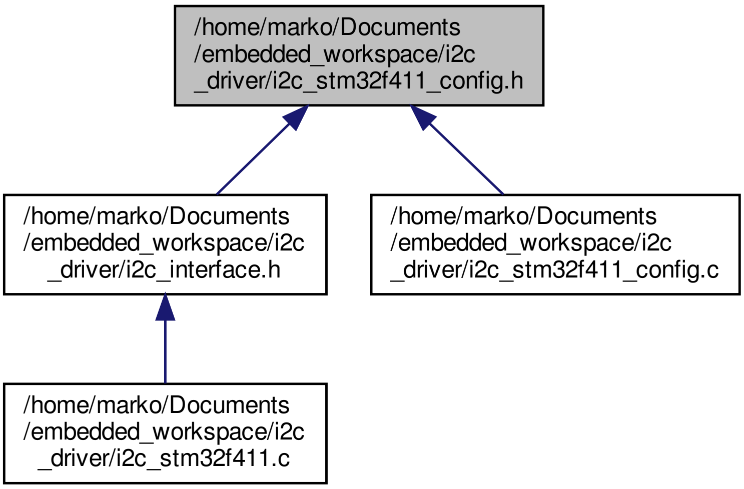
Contains the definitions and structures required to configure the i2c peripherals on an stm32f411.

```
#include <stdint.h>
```

Include dependency graph for i2c_stm32f411_config.h:



This graph shows which files directly or indirectly include this file:



Data Structures

- struct i2c_config_t

Macros

- #define **DISABLED** 0
- #define **ENABLED** 1

Enumerations

- enum i2c_enabled_t { **I2C_DISABLED**, **I2C_ENABLED** }
- enum i2c_ack_en_t { **I2C_ACK_DISABLED**, **I2C_ACK_ENABLED** }
- enum i2c_interrupt_dma_t { IT_ERR, IT_EVT, IT_BUF, DMA_REQ }
- enum i2c_channel_t { **I2C_1** = 0x00UL, **I2C_2** = 0x01UL, **I2C_3** = 0x02UL, **NUM_I2C** }
- enum i2c_fast_slow_t { I2C_SM = 0x00UL, I2C_FM = 0x01UL }
- enum i2c_fm_duty_cycle_t { FM_MODE_2 = 0x00UL, FM_MODE_16_9 = 0x01UL }

Functions

- const i2c_config_t ∗ i2c_config_get (void)

4.4.1 Detailed Description

Contains the definitions and structures required to configure the i2c peripherals on an stm32f411.

4.4.2 Enumeration Type Documentation

4.4.2.1 i2c_ack_en_t

```
enum i2c_ack_en_t
```

Options which decided whether the I2C returns an ACK pulse upon data reception or address match

4.4.2.2 i2c_channel_t

```
enum i2c_channel_t
```

Contains all of the I2C devices on chip

4.4.2.3 i2c_enabled_t

```
enum i2c_enabled_t
```

Options for enabling or disabling an I2C channel

4.4.2.4 i2c_fast_slow_t

```
enum i2c_fast_slow_t
```

Decides the maximum frequency with which the i2c may work

Enumerator

I2C_SM	Up to 100kHz
I2C_FM	Up to 400kHz

4.4.2.5 i2c_fm_duty_cycle_t

```
enum i2c_fm_duty_cycle_t
```

Determines the ratio of low to high periods per I2C pulse

Enumerator

FM_MODE_2	T_low/T_high = 2
FM_MODE_16_9	T_low/T_high = 16/9

4.4.2.6 i2c_interrupt_dma_t

```
enum i2c_interrupt_dma_t
```

Lists all the possible interrupts (and the dma request mode) available to the I2C channel

Enumerator

IT_ERR	The I2C raises an interrupt upon an error flag being raised
IT_EVT	The I2C raises an interrupt upon events: Start Bit, Address Matching, STOPF, BTF
IT_BUF	The I2C raises an interrupt when TxE or RxNE = 1 (if IT_EVT is also enabled)
DMA_REQ	Th2 I2C issues a DMA request upon TxE or TxNE = 1

4.4.3 Function Documentation

4.4.3.1 i2c_config_get()

```
const i2c_config_t* i2c_config_get (
             void  )
```

Description:

```
Returns a pointer to the base of the configuration table for i2c peripherals
```

PRE-CONDITION: The config table has been filled out and is non-null

Returns

∗i2c_config_t

Example:

```
const i2c_config_t *config_table = i2c_config_get();
i2c_init(config_table);
```

See also

i2c_init

- CHANGE HISTORY -

Date	Software Version	Initials	Description