SPI serial communication (Transmitter)

1.0.0

Generated by Doxygen 1.8.18

Chapter 1

Data Structure Index

1.1 Data Structures

Here are the data structures with brief descriptions:

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2.1 File List

Here is a list of all documented files with brief descriptions:

Chapter 3

Data Structure Documentation

3.1 SPI_ConfigType Struct Reference

Data Fields

- Clock_Select **cke**

  a user defined datatype to select the SPI clock select configuration
- Polarity **polarity**

  a user defined datatype to select the SPI polarity configuration
- CLK **clk**

  a user defined datatype to select the SPI clock configuration
- Mode **mode**

  a user defined datatype to select the SPI mode configuration

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

- **SPI.h**

Chapter 4

File Documentation

4.1 DIO.c File Reference

DIO Module Source File for this program.

```
#include "DIO.h"
#include <pic16f877a.h>
```

Functions

- void **write_pin** (**uint8** port, **uint8** pin, **uint8** value)

  Brief: *This is a function to select certain pin of pins (0->7) of port of ports (A,B,C,D,E) to set the value (LOW , HIGH)*
- void **toggle_pin** (**uint8** port, **uint8** pin)

  Brief: *This is a function to select certain pin of pins (0->7) of port of ports (A,B,C,D,E) to toggle it*
- **uint8 read_pin** (**uint8** port, **uint8** pin)

  Brief: *This is function to select certain pin of pins (0->7) of port of ports (A,B,C,D,E) to get the value*
- void **write_group_value** (**uint8** port, **uint8** group, **uint8** value)

  Brief: *This is a function to select certain group of groups (FIRST_GROUP , SECOND_GROUP) of port of ports (A,B,C,D,E) to set a certain value*
- void **write_port_value** (**uint8** port, **uint8** value)

  Brief: *This is a function to select certain port of ports (A,B,C,D,E) to set the value (any value)*
- void **write_port** (**uint8** port, **uint8** value)

  Brief: *This is a function to select certain port of ports (A,B,C,D,E) to set the value (LOW , HIGH)*
- void **toggle_port** (**uint8** port)

  Brief: *This is a function to select certain port of ports (A,B,C,D,E) to toggle it*
- void **write_group** (**uint8** port, **uint8** group, **uint8** value)

  Brief: *This is a function to select certain group of groups (FIRST_GROUP , SECOND_GROUP) of port of ports (A,B,C,D,E) to set the value (LOW , HIGH)*
- void **toggle_group** (**uint8** port, **uint8** group)

  Brief: *This is a function to select certain group of groups (FIRST_GROUP , SECOND_GROUP) of port of ports (A,B,C,D,E) to toggle it*

4.1.1 Detailed Description

DIO Module Source File for this program.

Author

Nour

Date

27/7/2020

Version

1.0

4.1.2 Function Documentation

4.1.2.1 write_pin()

```
void write_pin (
              uint8 port,
              uint8 pin,
              uint8 value )
```

Brief: This is a function to select certain pin of pins (0->7) of port of ports (A,B,C,D,E) to set the value (LOW , HIGH)

Parameters

port	uint8 port to select port
pin	uint8 pin to select pin
value	uint8 value to select value

Returns

void

References HIGH, LOW, PORTA_CONFIG, PORTB_CONFIG, PORTC_CONFIG, PORTD_CONFIG, and PORT↩ E_CONFIG.

4.1.2.2 toggle_pin()

```
void toggle_pin (
              uint8 port,
              uint8 pin )
```

Brief: This is a function to select certain pin of pins (0->7) of port of ports (A,B,C,D,E) to toggle it

Parameters

port	uint8 port to select port
pin	uint8 pin to select pin

Returns

void

References PORTA_CONFIG, PORTB_CONFIG, PORTC_CONFIG, PORTD_CONFIG, and PORTE_CONFIG.

4.1.2.3 read_pin()

```
uint8 read_pin (
              uint8 port,
              uint8 pin )
```

Brief: This is function to select certain pin of pins (0->7) of port of ports (A,B,C,D,E) to get the value

Parameters

port	uint8 port to select port
pin	uint8 pin to select pin

Returns

uint8 to get value of pin

References PORTA_CONFIG, PORTB_CONFIG, PORTC_CONFIG, PORTD_CONFIG, and PORTE_CONFIG.

4.1.2.4 write_group_value()

```
void write_group_value (
              uint8 port,
              uint8 group,
              uint8 value )
```

Brief: This is a function to select certain group of groups (FIRST_GROUP , SECOND_GROUP) of port of ports (A,B,C,D,E) to set a certain value

Parameters

port	uint8 port to select port
group	uint8 group to select group
value	uint8 value to select value

Returns

void

References PORTA_CONFIG, PORTB_CONFIG, PORTC_CONFIG, PORTD_CONFIG, and PORTE_CONFIG.

4.1.2.5 write_port_value()

```
void write_port_value (
              uint8 port,
              uint8 value )
```

Brief: This is a function to select certain port of ports (A,B,C,D,E) to set the value (any value)

Parameters

port	uint8 port to select port
value	uint8 value to select value

Returns

void

References PORTA_CONFIG, PORTB_CONFIG, PORTC_CONFIG, PORTD_CONFIG, and PORTE_CONFIG.

4.1.2.6 write_port()

```
void write_port (
              uint8 port,
              uint8 value )
```

Brief: This is a function to select certain port of ports (A,B,C,D,E) to set the value (LOW , HIGH)

Parameters

port	uint8 port to select port
value	uint8 value to select value

Returns

void

References HIGH, LOW, PORTA_CONFIG, PORTB_CONFIG, PORTC_CONFIG, PORTD_CONFIG, and PORT↩E_CONFIG.

4.1.2.7 toggle_port()

```
void toggle_port (
              uint8 port )
```

Brief: This is a function to select certain port of ports (A,B,C,D,E) to toggle it

Parameters

port	uint8 port to select port

Returns

void

References PORTA_CONFIG, PORTB_CONFIG, PORTC_CONFIG, PORTD_CONFIG, and PORTE_CONFIG.

4.1.2.8 write_group()

```
void write_group (
              uint8 port,
              uint8 group,
              uint8 value )
```

Brief: This is a function to select certain group of groups (FIRST_GROUP , SECOND_GROUP) of port of ports (A,B,C,D,E) to set the value (LOW , HIGH)

Parameters

port	uint8 port to select port
group	uint8 group to select group
value	uint8 value to select value

Returns

void

References HIGH, LOW, PORTB_CONFIG, PORTC_CONFIG, and PORTD_CONFIG.

4.1.2.9 toggle_group()

```
void toggle_group (
              uint8 port,
              uint8 group )
```

Brief: This is a function to select certain group of groups (FIRST_GROUP , SECOND_GROUP) of port of ports (A,B,C,D,E) to toggle it

Parameters

port	uint8 port to select port
group	uint8 group to select group

Returns

void

References PORTB_CONFIG, PORTC_CONFIG, and PORTD_CONFIG.

4.2 DIO.h File Reference

DIO Module Header File for this program.

```
#include "std_types.h"
#include "PORT_config.h"
#include "PIN_config.h"
```

Functions

- void **write_pin** (**uint8** port, **uint8** pin, **uint8** value)

  Brief: *This is a function to select certain pin of pins (0->7) of port of ports (A,B,C,D,E) to set the value (LOW , HIGH)*
- void **toggle_pin** (**uint8** port, **uint8** pin)

  Brief: *This is a function to select certain pin of pins (0->7) of port of ports (A,B,C,D,E) to toggle it*
- **uint8 read_pin** (**uint8** port, **uint8** pin)

  Brief: *This is function to select certain pin of pins (0->7) of port of ports (A,B,C,D,E) to get the value*
- void **write_group_value** (**uint8** port, **uint8** group, **uint8** value)

  Brief: *This is a function to select certain group of groups (FIRST_GROUP , SECOND_GROUP) of port of ports (A,B,C,D,E) to set a certain value*
- void **write_port** (**uint8** port, **uint8** value)

  Brief: *This is a function to select certain port of ports (A,B,C,D,E) to set the value (LOW , HIGH)*
- void **toggle_port** (**uint8** port)

  Brief: *This is a function to select certain port of ports (A,B,C,D,E) to toggle it*
- void **write_group** (**uint8** port, **uint8** group, **uint8** value)

  Brief: *This is a function to select certain group of groups (FIRST_GROUP , SECOND_GROUP) of port of ports (A,B,C,D,E) to set the value (LOW , HIGH)*
- void **toggle_group** (**uint8** port, **uint8** group)

  Brief: *This is a function to select certain group of groups (FIRST_GROUP , SECOND_GROUP) of port of ports (A,B,C,D,E) to toggle it*
- void **write_port_value** (**uint8** port, **uint8** value)

  Brief: *This is a function to select certain port of ports (A,B,C,D,E) to set the value (any value)*

4.2.1 Detailed Description

DIO Module Header File for this program.

Author

Nour

Date

27/7/2020

Version

1.0

4.2.2 Function Documentation

4.2.2.1 write_pin()

```
void write_pin (
              uint8 port,
              uint8 pin,
              uint8 value )
```

Brief: This is a function to select certain pin of pins (0->7) of port of ports (A,B,C,D,E) to set the value (LOW , HIGH)

Parameters

port	uint8 port to select port
pin	uint8 pin to select pin
value	uint8 value to select value

Returns

void

References HIGH, LOW, PORTA_CONFIG, PORTB_CONFIG, PORTC_CONFIG, PORTD_CONFIG, and PORT↩ E_CONFIG.

4.2.2.2 toggle_pin()

```
void toggle_pin (
              uint8 port,
              uint8 pin )
```

Brief: This is a function to select certain pin of pins (0->7) of port of ports (A,B,C,D,E) to toggle it

Parameters

port	uint8 port to select port
pin	uint8 pin to select pin

Returns

void

References PORTA_CONFIG, PORTB_CONFIG, PORTC_CONFIG, PORTD_CONFIG, and PORTE_CONFIG.

4.2.2.3 read_pin()

```
uint8 read_pin (
              uint8 port,
              uint8 pin )
```

Brief: This is function to select certain pin of pins (0->7) of port of ports (A,B,C,D,E) to get the value

Parameters

port	uint8 port to select port
pin	uint8 pin to select pin

Returns

uint8 to get value of pin

References PORTA_CONFIG, PORTB_CONFIG, PORTC_CONFIG, PORTD_CONFIG, and PORTE_CONFIG.

4.2.2.4 write_group_value()

```
void write_group_value (
              uint8 port,
              uint8 group,
              uint8 value )
```

Brief: This is a function to select certain group of groups (FIRST_GROUP , SECOND_GROUP) of port of ports (A,B,C,D,E) to set a certain value

Parameters

port	uint8 port to select port
group	uint8 group to select group
value	uint8 value to select value

Returns

void

References PORTA_CONFIG, PORTB_CONFIG, PORTC_CONFIG, PORTD_CONFIG, and PORTE_CONFIG.

4.2.2.5 write_port()

```
void write_port (
              uint8 port,
              uint8 value )
```

Brief: This is a function to select certain port of ports (A,B,C,D,E) to set the value (LOW , HIGH)

Parameters

port	uint8 port to select port
value	uint8 value to select value

Returns

void

References HIGH, LOW, PORTA_CONFIG, PORTB_CONFIG, PORTC_CONFIG, PORTD_CONFIG, and PORT↩E_CONFIG.

4.2.2.6 toggle_port()

```
void toggle_port (
              uint8 port )
```

Brief: This is a function to select certain port of ports (A,B,C,D,E) to toggle it

Parameters

port	uint8 port to select port

Returns

void

References PORTA_CONFIG, PORTB_CONFIG, PORTC_CONFIG, PORTD_CONFIG, and PORTE_CONFIG.

4.2.2.7 write_group()

```
void write_group (
              uint8 port,
              uint8 group,
              uint8 value )
```

Brief: This is a function to select certain group of groups (FIRST_GROUP , SECOND_GROUP) of port of ports (A,B,C,D,E) to set the value (LOW , HIGH)

Parameters

port	uint8 port to select port
group	uint8 group to select group
value	uint8 value to select value

Returns

void

References HIGH, LOW, PORTB_CONFIG, PORTC_CONFIG, and PORTD_CONFIG.

4.2.2.8 toggle_group()

```
void toggle_group (
              uint8 port,
              uint8 group )
```

Brief: This is a function to select certain group of groups (FIRST_GROUP , SECOND_GROUP) of port of ports (A,B,C,D,E) to toggle it

Parameters

port	uint8 port to select port
group	uint8 group to select group

Returns

void

References PORTB_CONFIG, PORTC_CONFIG, and PORTD_CONFIG.

4.2.2.9 write_port_value()

```
void write_port_value (
              uint8 port,
              uint8 value )
```

Brief: This is a function to select certain port of ports (A,B,C,D,E) to set the value (any value)

Parameters

port	uint8 port to select port
value	uint8 value to select value

Returns

void

References PORTA_CONFIG, PORTB_CONFIG, PORTC_CONFIG, PORTD_CONFIG, and PORTE_CONFIG.

4.3 interrupts.c File Reference

interrupts Module Source File for this program

```
#include <pic16f877a.h>
#include "std_types.h"
```

Functions

- void interrupt **ISR** (void)

Variables

- **uint8 receive_data**

4.3.1 Detailed Description

interrupts Module Source File for this program

Author

Nour

Date

17/9/2020

Version

1.0

4.4 interrupts.h File Reference

interrupts Module Header File for this program

Variables

- **uint8 receive_data**

4.4.1 Detailed Description

interrupts Module Header File for this program

Author

Nour

Date

17/9/2020

Version

1.0

4.5 PIN_config.h File Reference

PIN_config Module Header File for this program.

Macros

- #define **PIN0** 0x01
  a preprocessor to define pin0
- #define **PIN1** 0x02
  a preprocessor to define pin1
- #define **PIN2** 0x04
  a preprocessor to define pin2
- #define **PIN3** 0x08
  a preprocessor to define pin3
- #define **PIN4** 0x10
  a preprocessor to define pin4
- #define **PIN5** 0x20
  a preprocessor to define pin5
- #define **PIN6** 0x40
  a preprocessor to define pin6
- #define **PIN7** 0x80
  a preprocessor to define pin7
- #define **FIRST_GROUP** 0x0F
  a preprocessor to define first group
- #define **SECOND_GROUP** 0xF0
  a preprocessor to define second group

4.5.1 Detailed Description

PIN_config Module Header File for this program.

Author

Nour

Date

27/7/2020

Version

1.0

4.6 PORT.c File Reference

PORT Module Source File for this program.

```
#include "PORT.h"
#include <pic16f877a.h>
```

Functions

- void **set_pin_direction** (**uint8** port, **uint8** pin, **uint8** direction)

  Brief: *This is a function to select certain pin of pins (0->7) of port of ports (A,B,C,D,E) to set the direction (INPUT , OUTPUT)*
- void **set_port_direction** (**uint8** port, **uint8** direction)

  Brief: *This is a function to select certain port of ports (A,B,C,D,E) to set the direction (INPUT , OUTPUT)*
- void **set_group_direction** (**uint8** port, **uint8** group, **uint8** direction)

  Brief: *This is a function to select certain group of groups (FIRST_GROUP , SECOND_GROUP) of port of ports (A,B,C,D,E) to set the direction (INPUT , OUTPUT)*

4.6.1 Detailed Description

PORT Module Source File for this program.

Author

Nour

Date

27/7/2020

Version

1.0

4.6.2 Function Documentation

4.6.2.1 set_pin_direction()

```
void set_pin_direction (
              uint8 port,
              uint8 pin,
              uint8 direction )
```

Brief: This is a function to select certain pin of pins (0->7) of port of ports (A,B,C,D,E) to set the direction (INPUT , OUTPUT)

Parameters

port	uint8 port to select port
pin	uint8 pin to select pin
direction	uint8 direction to select direction

Returns

void

References INPUT, OUTPUT, PORTA_CONFIG, PORTB_CONFIG, PORTC_CONFIG, PORTD_CONFIG, and P↩ ORTE_CONFIG.

4.6.2.2 set_port_direction()

```
void set_port_direction (
              uint8 port,
              uint8 direction )
```

Brief: This is a function to select certain port of ports (A,B,C,D,E) to set the direction (INPUT , OUTPUT)

Parameters

port	uint8 port to select port
direction	uint8 direction to select direction

Returns

void

References INPUT, OUTPUT, PORTA_CONFIG, PORTB_CONFIG, PORTC_CONFIG, PORTD_CONFIG, and P↩ ORTE_CONFIG.

4.6.2.3 set_group_direction()

```
void set_group_direction (
              uint8 port,
              uint8 group,
              uint8 direction )
```

Brief: This is a function to select certain group of groups (FIRST_GROUP , SECOND_GROUP) of port of ports (A,B,C,D,E) to set the direction (INPUT , OUTPUT)

Parameters

port	uint8 port to select port
group	uint8 group to select group
direction	uint8 direction to select direction

Returns

void

References INPUT, OUTPUT, PORTB_CONFIG, PORTC_CONFIG, and PORTD_CONFIG.

4.7 PORT.h File Reference

PORT Module Header File for this program.

```
#include "std_types.h"
#include "PORT_config.h"
#include "PIN_config.h"
```

Functions

- void **set_pin_direction** (**uint8** port, **uint8** pin, **uint8** direction)

  Brief: *This is a function to select certain pin of pins (0->7) of port of ports (A,B,C,D,E) to set the direction (INPUT , OUTPUT)*
- void **set_port_direction** (**uint8** port, **uint8** direction)

  Brief: *This is a function to select certain port of ports (A,B,C,D,E) to set the direction (INPUT , OUTPUT)*
- void **set_group_direction** (**uint8** port, **uint8** group, **uint8** direction)

  Brief: *This is a function to select certain group of groups (FIRST_GROUP , SECOND_GROUP) of port of ports (A,B,C,D,E) to set the direction (INPUT , OUTPUT)*

4.7.1 Detailed Description

PORT Module Header File for this program.

Author

Nour

Date

27/7/2020

Version

1.0

4.7.2 Function Documentation

4.7.2.1 set_pin_direction()

```
void set_pin_direction (
              uint8 port,
              uint8 pin,
              uint8 direction )
```

Brief: This is a function to select certain pin of pins (0->7) of port of ports (A,B,C,D,E) to set the direction (INPUT , OUTPUT)

Parameters

port	uint8 port to select port
pin	uint8 pin to select pin
direction	uint8 direction to select direction

Returns

void

References INPUT, OUTPUT, PORTA_CONFIG, PORTB_CONFIG, PORTC_CONFIG, PORTD_CONFIG, and P↩ ORTE_CONFIG.

4.7.2.2 set_port_direction()

```
void set_port_direction (
              uint8 port,
              uint8 direction )
```

Brief: This is a function to select certain port of ports (A,B,C,D,E) to set the direction (INPUT , OUTPUT)

Parameters

port	uint8 port to select port
direction	uint8 direction to select direction

Returns

void

References INPUT, OUTPUT, PORTA_CONFIG, PORTB_CONFIG, PORTC_CONFIG, PORTD_CONFIG, and P↩ ORTE_CONFIG.

4.7.2.3 set_group_direction()

```
void set_group_direction (
              uint8 port,
              uint8 group,
              uint8 direction )
```

Brief: This is a function to select certain group of groups (FIRST_GROUP , SECOND_GROUP) of port of ports (A,B,C,D,E) to set the direction (INPUT , OUTPUT)

Parameters

port	uint8 port to select port
group	uint8 group to select group
direction	uint8 direction to select direction

Returns

void

References INPUT, OUTPUT, PORTB_CONFIG, PORTC_CONFIG, and PORTD_CONFIG.

4.8 PORT_config.h File Reference

PORT_config Module Header File for this program.

Macros

- #define **PORTA_CONFIG** 1
  a preprocessor to define portA
- #define **PORTB_CONFIG** 2
  a preprocessor to define portB
- #define **PORTC_CONFIG** 3
  a preprocessor to define portC
- #define **PORTD_CONFIG** 4
  a preprocessor to define portD
- #define **PORTE_CONFIG** 5
  a preprocessor to define portE

4.8.1 Detailed Description

PORT_config Module Header File for this program.

Author

Nour

Date

27/7/2020

Version

1.0

4.9 SPI.c File Reference

SPI Module Source File for this program.

```
#include <pic16f877a.h>
#include "SPI.h"
#include "PORT.h"
```

Functions

- void **SPI_init** (**SPI_ConfigType** *Config_Ptr)
  Brief: *This is SPI Module Initialization Function*
- void **SPI_Transmit** (**uint8** data)
  Brief: *This is function to transmit data using SPI*

4.9.1 Detailed Description

SPI Module Source File for this program.

Author

Nour

Date

29/9/2020

Version

1.0

4.9.2 Function Documentation

4.9.2.1 SPI_init()

```
void SPI_init (
              SPI_ConfigType * Config_Ptr )
```

Brief: This is SPI Module Initialization Function

Parameters

Config_Ptr	**SPI_ConfigType** (p. 5) * Config_Ptr to select Config_Ptr

Returns

void

4.9.2.2 SPI_Transmit()

```
void SPI_Transmit (
              uint8 data )
```

Brief: This is function to transmit data using SPI

Parameters

data	uint8 data to select transmitted data

Returns

void

4.10 SPI.h File Reference

SPI Module Header File for this program.

```
#include "std_types.h"
```

Data Structures

- struct **SPI_ConfigType**

Enumerations

- enum **Clock_Select** { **_0**, **_1** }
- enum **Polarity** { **__0**, **__1** }
- enum **CLK** {
  ___0, **___1**, **___2**, **___3**,
  ___4, **___5** }
- enum **Mode** { **TX**, **RX** }

Functions

SPI_ConfigType

SPI_ConfigTypee responsible for dynamic configuration of SPI module

- void **SPI_init** (**SPI_ConfigType** ∗Config_Ptr)
  Brief: *This is SPI Module Initialization Function*
- void **SPI_Transmit** (**uint8** data)
  Brief: *This is function to transmit data using SPI*

4.10.1 Detailed Description

SPI Module Header File for this program.

Author

Nour

Date

29/9/2020

Version

1.0

4.10.2 Function Documentation

4.10.2.1 SPI_init()

```
void SPI_init (
              SPI_ConfigType * Config_Ptr )
```

Brief: This is SPI Module Initialization Function

Parameters

Config_Ptr	**SPI_ConfigType** (p. 5) * Config_Ptr to select Config_Ptr

Returns

void

4.10.2.2 SPI_Transmit()

```
void SPI_Transmit (
              uint8 data )
```

Brief: This is function to transmit data using SPI

Parameters

data	uint8 data to select transmitted data

Returns

void

4.11 std_types.h File Reference

Standard Types Header File for this program.

Macros

- #define **LOW** 0u
  a preprocessor to define low
- #define **HIGH** 1u
  a preprocessor to define high
- #define **FALSE** 0u
  a preprocessor to define false
- #define **TRUE** 1u
  a preprocessor to define true
- #define **INPUT** 1u
  a preprocessor to define input
- #define **OUTPUT** 0u
  a preprocessor to define output
- #define **NULL_PTR** (void ∗)0
  a preprocessor to define null pointer

Typedefs

- typedef unsigned char **uint8**
  a user defined datatype to define uint8
- typedef unsigned short **uint16**
  a user defined datatype to define uint16
- typedef unsigned long **uint32**
  a user defined datatype to define uint32

4.11.1 Detailed Description

Standard Types Header File for this program.

Author

Nour

Date

16/9/2019

Version

1.0

4.12 TX.c File Reference

TX Source File for this program.

```
#include <xc.h>
#include "SPI.h"
#include "DIO.h"
#include "PORT.h"
```

Functions

- void **main** (void)

4.12.1 Detailed Description

TX Source File for this program.

Author

Nour

Date

17/9/2020

Version

1.0