lab4-UART_SPI

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Chapter 1

lab4-UART_SPI

lab4-UART_SPI is a university laboratory project for PIC32 WiFire kit written in C language for studying basic configuring and usage of UART and SPI protocols.

In project was implemented controlling an angle of the servo through UART and displaying setted angle of the servo on OLED SPI display. Using COM port terminal you can turn servo to one of three defined angles (0, 90, 180) by sending '1', '2' or '3' respectively. It uses 115200 baud rate.

Project was documented using doxygen, so if you have "latex" on your machine you can simply generate project's reference manual in pdf by using "make pdf" command in your console.

Chapter 2

File Index

2.1 File List

Here is a list of all files with brief descriptions:

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Chapter 3

File Documentation

3.1 README.md File Reference

3.2 src/configuration_bits.c File Reference

3.3 src/lab4_UART_SPI.h File Reference

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

Macros

- #define LD1_PORT_BIT LATGbits.LATG6
- #define LD2_PORT_BIT LATDbits.LATD4
- #define LD3_PORT_BIT LATBbits.LATB11
- #define LD4_PORT_BIT LATGbits.LATG15
- #define BTN1_PORT_BIT PORTAbits.RA5
- #define BTN2_PORT_BIT PORTAbits.RA4
- #define PWM_FREQ_HZ (50)
- #define PWM_PERIOD_COUNTS (100000000/(256 * PWM_FREQ_HZ))
- #define SERVO_0 (220)
- #define SERVO_90 (550)
- #define SERVO_180 (880)

Functions

- void initGPIO (void)

  GPIO initialization.
- void UART4_init (void)

  UART initialization.
- void delayMs (int t)

  primitive delay function
- void set_angle (char)

  function for turning servo

3.3.1 Macro Definition Documentation

3.3.1.1 BTN1_PORT_BIT

```
#define BTN1_PORT_BIT PORTAbits.RA5
```

Definition at line 17 of file lab4_UART_SPI.h.

3.3.1.2 BTN2_PORT_BIT

```
#define BTN2_PORT_BIT PORTAbits.RA4
```

Definition at line 18 of file lab4_UART_SPI.h.

3.3.1.3 LD1_PORT_BIT

```
#define LD1_PORT_BIT LATGbits.LATG6
```

Definition at line 12 of file lab4_UART_SPI.h.

3.3.1.4 LD2_PORT_BIT

```
#define LD2_PORT_BIT LATDbits.LATD4
```

Definition at line 13 of file lab4_UART_SPI.h.

3.3.1.5 LD3_PORT_BIT

```
#define LD3_PORT_BIT LATBbits.LATB11
```

Definition at line 14 of file lab4_UART_SPI.h.

3.3.1.6 LD4_PORT_BIT

```
#define LD4_PORT_BIT LATGbits.LATG15
```

Definition at line 15 of file lab4_UART_SPI.h.

3.3.1.7 PWM_FREQ_HZ

```
#define PWM_FREQ_HZ (50)
```

Definition at line 20 of file lab4_UART_SPI.h.

3.3.1.8 PWM_PERIOD_COUNTS

```
#define PWM_PERIOD_COUNTS (100000000/(256 * PWM_FREQ_HZ))
```

Definition at line 21 of file lab4_UART_SPI.h.

3.3.1.9 SERVO_0

```
#define SERVO_0 (220)
```

Definition at line 23 of file lab4_UART_SPI.h.

3.3.1.10 SERVO_180

```
#define SERVO_180 (880)
```

Definition at line 25 of file lab4_UART_SPI.h.

3.3.1.11 SERVO_90

```
#define SERVO_90 (550)
```

Definition at line 24 of file lab4_UART_SPI.h.

3.3.2 Function Documentation

3.3.2.1 delayMs()

```
void delayMs (
            int t )
```

primitive delay function

Used by OLED driver

Definition at line 85 of file user.c.

3.3.2.2 initGPIO()

```
void initGPIO (
            void  )
```

GPIO initialization.

Initialization for pins G6, B11, G15, D4, A4, A5. Disabling analog mode and setting pins directions

Definition at line 21 of file user.c.

3.3.2.3 set_angle()

```
void set_angle (
            char mode )
```

function for turning servo

Depending on the input parameter ('1', '2' or '3') setting servo angle

Parameters

in	*mode*	one of three servo angle states

Definition at line 98 of file user.c.

3.3.2.4 UART4_init()

```
void UART4_init (
            void  )
```

UART initialization.

Setting pins for UART usage and UART speed

Definition at line 40 of file UART.c.

3.4 src/main.c File Reference

Main project file.

```
#include <stdint.h>
#include "lab4_UART_SPI.h"
#include "OLED/OLED.h"
#include "UART.h"
```

Functions

- void main (void)
  main function

3.4.1 Detailed Description

Main project file.

Author

Alexandr Skopets

Date

28.11.2017

3.4.2 Function Documentation

3.4.2.1 main()

```
void main (
            void  )
```

main function

Contains GPIO and peripherals initialization and infinite loop.

Definition at line 24 of file main.c.

3.5 src/OLED/ChrFont0.c File Reference

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

Variables

- const BYTE rgbOledFont0 [ ]

3.5.1 Variable Documentation

3.5.1.1 rgbOledFont0

```
const BYTE rgbOledFont0[ ]
```

Definition at line 64 of file ChrFont0.c.

3.6 src/OLED/FillPat.c File Reference

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

Variables

- const BYTE rgbFillPat [ ]

3.6.1 Variable Documentation

3.6.1.1 rgbFillPat

```
const BYTE rgbFillPat[ ]
```

Initial value:

```
= {
    0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00,
    0xFF, 0xFF, 0xFF, 0xFF, 0xFF, 0xFF, 0xFF, 0xFF,
    0xAA, 0x55, 0xAA, 0x55, 0xAA, 0x55, 0xAA, 0x55,
    0x11, 0x44, 0x00, 0x11, 0x44, 0x00, 0x11, 0x44,
    0x92, 0x45, 0x24, 0x92, 0x45, 0x24, 0x92, 0x45,
    0x49, 0x92, 0x24, 0x49, 0x92, 0x24, 0x49, 0x92,
    0x22, 0x11, 0x22, 0x00, 0x22, 0x11, 0x22, 0x00,
    0x11, 0x22, 0x11, 0x00, 0x11, 0x22, 0x11, 0x00
}
```

Definition at line 62 of file FillPat.c.

3.7 src/OLED/OLED.c File Reference

```
#include "OLED.h"
#include "../lab4_UART_SPI.h"
```

Macros

- #define cmdOledDisplayOn 0xAF
- #define cmdOledDisplayOff 0xAE
- #define cmdOledSegRemap 0xA1
- #define cmdOledComDir 0xC8
- #define cmdOledComConfig 0xDA

Functions

- void OledHostInit ()
- void OledDspInit ()
- void OledDvrInit ()
- void OledUpdate ()
- void OledHostTerm ()
- void OledDevTerm ()

Variables

- BYTE rgbOledFont0 [ ]
- BYTE rgbOledFontUser [ ]
- BYTE rgbFillPat [ ]
- int xchOledMax
- int ychOledMax
- int xcoOledCur
- int ycoOledCur
- BYTE * pbOledCur
- int bnOledCur
- BYTE clrOledCur
- BYTE * pbOledPatCur
- int fOledCharUpdate
- int dxcoOledFontCur
- int dycoOledFontCur
- BYTE * pbOledFontCur
- BYTE * pbOledFontUser

3.7.1 Macro Definition Documentation

3.7.1.1 cmdOledComConfig

```
#define cmdOledComConfig 0xDA
```

Definition at line 60 of file OLED.c.

3.7.1.2 cmdOledComDir

```
#define cmdOledComDir 0xC8
```

Definition at line 59 of file OLED.c.

3.7.1.3 cmdOledDisplayOff

```
#define cmdOledDisplayOff 0xAE
```

Definition at line 57 of file OLED.c.

3.7.1.4 cmdOledDisplayOn

```
#define cmdOledDisplayOn 0xAF
```

Definition at line 56 of file OLED.c.

3.7.1.5 cmdOledSegRemap

```
#define cmdOledSegRemap 0xA1
```

Definition at line 58 of file OLED.c.

3.7.2 Function Documentation

3.7.2.1 OledDevTerm()

```
void OledDevTerm ( )
```

Definition at line 383 of file OLED.c.

3.7.2.2 OledDspInit()

```
void OledDspInit ( )
```

Definition at line 181 of file OLED.c.

3.7.2.3 OledDvrInit()

```
void OledDvrInit ( )
```

Definition at line 242 of file OLED.c.

3.7.2.4 OledHostInit()

```
void OledHostInit ( )
```

Function:

Summary:

Description:

Remarks:

Definition at line 129 of file OLED.c.

3.7.2.5 OledHostTerm()

```
void OledHostTerm ( )
```

Definition at line 336 of file OLED.c.

3.7.2.6 OledUpdate()

```
void OledUpdate ( )
```

Definition at line 293 of file OLED.c.

3.7.3 Variable Documentation

3.7.3.1 bnOledCur

```
int bnOledCur
```

Definition at line 81 of file OLED.c.

3.7.3.2 clrOledCur

```
BYTE clrOledCur
```

Definition at line 82 of file OLED.c.

3.7.3.3 dxcoOledFontCur

```
int dxcoOledFontCur
```

Definition at line 86 of file OLED.c.

3.7.3.4 dycoOledFontCur

```
int dycoOledFontCur
```

Definition at line 87 of file OLED.c.

3.7.3.5 fOledCharUpdate

```
int fOledCharUpdate
```

Definition at line 84 of file OLED.c.

3.7.3.6 pbOledCur

```
BYTE* pbOledCur
```

Definition at line 80 of file OLED.c.

3.7.3.7 pbOledFontCur

```
BYTE* pbOledFontCur
```

Definition at line 89 of file OLED.c.

3.7.3.8 pbOledFontUser

```
BYTE* pbOledFontUser
```

Definition at line 90 of file OLED.c.

3.7.3.9 pbOledPatCur

```
BYTE* pbOledPatCur
```

Definition at line 83 of file OLED.c.

3.7.3.10 rgbFillPat

```
BYTE rgbFillPat[]
```

Definition at line 62 of file FillPat.c.

3.7.3.11 rgbOledFont0

```
BYTE rgbOledFont0[]
```

Definition at line 64 of file ChrFont0.c.

3.7.3.12 rgbOledFontUser

```
BYTE rgbOledFontUser[]
```

Definition at line 90 of file OledChar.c.

3.7.3.13 xchOledMax

```
int xchOledMax
```

Definition at line 85 of file OledChar.c.

3.7.3.14 xcoOledCur

```
int xcoOledCur
```

Definition at line 77 of file OLED.c.

3.7.3.15 ychOledMax

```
int ychOledMax
```

Definition at line 86 of file OledChar.c.

3.7.3.16 ycoOledCur

```
int ycoOledCur
```

Definition at line 78 of file OLED.c.

3.8 src/OLED/OLED.h File Reference

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

Macros

- #define MASK(x) (1<<(x))
- #define prtVddCtrl PORTD
- #define bitVddCtrl MASK(12)
- #define prtVbatCtrl PORTD
- #define bitVbatCtrl MASK(15)
- #define prtDataCmd PORTD
- #define bitDataCmd MASK(14)
- #define prtReset PORTG
- #define bitReset MASK(9)
- #define cbOledDispMax 512
- #define ccolOledMax 128
- #define crowOledMax 32
- #define cpagOledMax 4
- #define cbOledChar 8
- #define chOledUserMax 0x20
- #define cbOledFontUser (chOledUserMax*cbOledChar)
- #define modOledSet 0
- #define modOledOr 1
- #define modOledAnd 2
- #define modOledXor 3

Typedefs

- typedef uint8_t BYTE

Functions

- void OledInit ()
- void OledDvrInit ()
- void OledTerm ()
- void OledDisplayOn ()
- void OledDisplayOff ()
- void OledClear ()
- void OledClearBuffer ()
- void OledUpdate ()

Variables

- BYTE rgbOledBmp [cbOledDispMax]

3.8.1 Macro Definition Documentation

3.8.1.1 bitDataCmd

```
#define bitDataCmd MASK(14)
```

Definition at line 75 of file OLED.h.

3.8.1.2 bitReset

```
#define bitReset MASK(9)
```

Definition at line 78 of file OLED.h.

3.8.1.3 bitVbatCtrl

```
#define bitVbatCtrl MASK(15)
```

Definition at line 72 of file OLED.h.

3.8.1.4 bitVddCtrl

```
#define bitVddCtrl MASK(12)
```

Definition at line 69 of file OLED.h.

3.8.1.5 cbOledChar

```
#define cbOledChar 8
```

Definition at line 87 of file OLED.h.

3.8.1.6 cbOledDispMax

```
#define cbOledDispMax 512
```

Definition at line 82 of file OLED.h.

3.8.1.7 cbOledFontUser

```
#define cbOledFontUser (chOledUserMax*cbOledChar)
```

Definition at line 89 of file OLED.h.

3.8.1.8 ccolOledMax

```
#define ccolOledMax 128
```

Definition at line 83 of file OLED.h.

3.8.1.9 chOledUserMax

```
#define chOledUserMax 0x20
```

Definition at line 88 of file OLED.h.

3.8.1.10 cpagOledMax

```
#define cpagOledMax 4
```

Definition at line 85 of file OLED.h.

3.8.1.11 crowOledMax

```
#define crowOledMax 32
```

Definition at line 84 of file OLED.h.

3.8.1.12 MASK

```
#define MASK(
             x ) (1<<(x))
```

Definition at line 46 of file OLED.h.

3.8.1.13 modOledAnd

```
#define modOledAnd 2
```

Definition at line 95 of file OLED.h.

3.8.1.14 modOledOr

```
#define modOledOr 1
```

Definition at line 94 of file OLED.h.

3.8.1.15 modOledSet

```
#define modOledSet 0
```

Definition at line 93 of file OLED.h.

3.8.1.16 modOledXor

```
#define modOledXor 3
```

Definition at line 96 of file OLED.h.

3.8.1.17 prtDataCmd

```
#define prtDataCmd PORTD
```

Definition at line 74 of file OLED.h.

3.8.1.18 prtReset

```
#define prtReset PORTG
```

Definition at line 77 of file OLED.h.

3.8.1.19 prtVbatCtrl

```
#define prtVbatCtrl PORTD
```

Definition at line 71 of file OLED.h.

3.8.1.20 prtVddCtrl

```
#define prtVddCtrl PORTD
```

Definition at line 68 of file OLED.h.

3.8.2 Typedef Documentation

3.8.2.1 BYTE

```
typedef uint8_t BYTE
```

Definition at line 38 of file OLED.h.

3.8.3 Function Documentation

3.8.3.1 OledClear()

```
void OledClear ( )
```

3.8.3.2 OledClearBuffer()

```
void OledClearBuffer ( )
```

3.8.3.3 OledDisplayOff()

```
void OledDisplayOff ( )
```

3.8.3.4 OledDisplayOn()

```
void OledDisplayOn ( )
```

3.8.3.5 OledDvrInit()

```
void OledDvrInit ( )
```

Definition at line 242 of file OLED.c.

3.8.3.6 OledInit()

```
void OledInit ( )
```

Function prototype:

Summary:

Description:

Precondition:

Parameters:

Returns:

Example:

Remarks:

3.8.3.7 OledTerm()

```
void OledTerm ( )
```

3.8.3.8 OledUpdate()

```
void OledUpdate ( )
```

Definition at line 293 of file OLED.c.

3.8.4 Variable Documentation

3.8.4.1 rgbOledBmp

```
BYTE rgbOledBmp[cbOledDispMax]
```

Definition at line 104 of file OLED.h.

3.9 src/OLED/OledChar.c File Reference

```
#include <inttypes.h>
#include "OLED.h"
#include "OledChar.h"
#include "OledGrph.h"
```

Functions

- void OledDrawGlyph (char ch)
- void OledAdvanceCursor ()
- void OledSetCursor (int xch, int ych)
- void OledGetCursor (int *pxch, int *pych)
- int OledDefUserChar (char ch, BYTE *pbDef)
- void OledSetCharUpdate (int f)
- int OledGetCharUpdate ()
- void OledPutChar (char ch)
- void OledPutString (char *sz)

Variables

- int xcoOledCur
- int ycoOledCur
- BYTE * pbOledCur
- BYTE mskOledCur
- int bnOledCur
- int fOledCharUpdate
- BYTE rgbOledBmp [ ]
- int dxcoOledFontCur
- int dycoOledFontCur
- BYTE * pbOledFontCur
- BYTE * pbOledFontUser
- int xchOledCur
- int ychOledCur
- int xchOledMax
- int ychOledMax
- BYTE * pbOledFontExt
- BYTE rgbOledFontUser [cbOledFontUser]

3.9.1 Function Documentation

3.9.1.1 OledAdvanceCursor()

```
void OledAdvanceCursor ( )
```

Definition at line 387 of file OledChar.c.

3.9.1.2 OledDefUserChar()

```
int OledDefUserChar (
            char ch,
            BYTE * pbDef )
```

Definition at line 192 of file OledChar.c.

3.9.1.3 OledDrawGlyph()

```
void OledDrawGlyph (
            char ch )
```

Definition at line 343 of file OledChar.c.

3.9.1.4 OledGetCharUpdate()

```
int OledGetCharUpdate ( )
```

Definition at line 254 of file OledChar.c.

3.9.1.5 OledGetCursor()

```
void OledGetCursor (
            int * pxch,
            int * pych )
```

Definition at line 163 of file OledChar.c.

3.9.1.6 OledPutChar()

```
void OledPutChar (
            char ch )
```

Definition at line 279 of file OledChar.c.

3.9.1.7 OledPutString()

```
void OledPutString (
            char * sz )
```

Definition at line 308 of file OledChar.c.

3.9.1.8 OledSetCharUpdate()

```
void OledSetCharUpdate (
            int f )
```

Definition at line 230 of file OledChar.c.

3.9.1.9 OledSetCursor()

```
void OledSetCursor (
            int xch,
            int ych )
```

Definition at line 121 of file OledChar.c.

3.9.2 Variable Documentation

3.9.2.1 bnOledCur

```
int bnOledCur
```

Definition at line 81 of file OLED.c.

3.9.2.2 dxcoOledFontCur

```
int dxcoOledFontCur
```

Definition at line 86 of file OLED.c.

3.9.2.3 dycoOledFontCur

```
int dycoOledFontCur
```

Definition at line 87 of file OLED.c.

3.9.2.4 fOledCharUpdate

```
int fOledCharUpdate
```

Definition at line 84 of file OLED.c.

3.9.2.5 mskOledCur

```
BYTE mskOledCur
```

3.9.2.6 pbOledCur

```
BYTE* pbOledCur
```

Definition at line 80 of file OLED.c.

3.9.2.7 pbOledFontCur

```
BYTE* pbOledFontCur
```

Definition at line 89 of file OLED.c.

3.9.2.8 pbOledFontExt

```
BYTE* pbOledFontExt
```

Definition at line 88 of file OledChar.c.

3.9.2.9 pbOledFontUser

```
BYTE* pbOledFontUser
```

Definition at line 90 of file OLED.c.

3.9.2.10 rgbOledBmp

```
BYTE rgbOledBmp[]
```

Definition at line 104 of file OLED.h.

3.9.2.11 rgbOledFontUser

```
BYTE rgbOledFontUser[cbOledFontUser]
```

Definition at line 90 of file OledChar.c.

3.9.2.12 xchOledCur

```
int xchOledCur
```

Definition at line 82 of file OledChar.c.

3.9.2.13 xchOledMax

```
int xchOledMax
```

Definition at line 85 of file OledChar.c.

3.9.2.14 xcoOledCur

```
int xcoOledCur
```

Definition at line 77 of file OLED.c.

3.9.2.15 ychOledCur

```
int ychOledCur
```

Definition at line 83 of file OledChar.c.

3.9.2.16 ychOledMax

```
int ychOledMax
```

Definition at line 86 of file OledChar.c.

3.9.2.17 ycoOledCur

```
int ycoOledCur
```

Definition at line 78 of file OLED.c.

3.10 src/OLED/OledChar.h File Reference

Functions

- void OledSetCursor (int xch, int ych)
- void OledGetCursor (int *pxcy, int *pych)
- int OledDefUserChar (char ch, uint8_t *pbDef)
- void OledSetCharUpdate (int f)
- int OledGetCharUpdate ()
- void OledPutChar (char ch)
- void OledPutString (char *sz)

3.10.1 Function Documentation

3.10.1.1 OledDefUserChar()

```
int OledDefUserChar (
            char ch,
            uint8_t * pbDef )
```

Definition at line 192 of file OledChar.c.

3.10.1.2 OledGetCharUpdate()

```
int OledGetCharUpdate ( )
```

Definition at line 254 of file OledChar.c.

3.10.1.3 OledGetCursor()

```
void OledGetCursor (
            int * pxcy,
            int * pych )
```

Definition at line 163 of file OledChar.c.

3.10.1.4 OledPutChar()

```
void OledPutChar (
            char ch )
```

Definition at line 279 of file OledChar.c.

3.10.1.5 OledPutString()

```
void OledPutString (
            char * sz )
```

Definition at line 308 of file OledChar.c.

3.10.1.6 OledSetCharUpdate()

```
void OledSetCharUpdate (
            int f )
```

Definition at line 230 of file OledChar.c.

3.10.1.7 OledSetCursor()

```
void OledSetCursor (
            int xch,
            int ych )
```

Definition at line 121 of file OledChar.c.

3.11 src/OLED/OledGrph.c File Reference

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

Functions

- void OledMoveDown ()
- void OledMoveUp ()
- void OledMoveRight ()
- void OledMoveLeft ()
- BYTE OledRopSet (BYTE bPix, BYTE bDsp, BYTE mskPix)
- BYTE OledRopOr (BYTE bPix, BYTE bDsp, BYTE mskPix)
- BYTE OledRopAnd (BYTE bPix, BYTE bDsp, BYTE mskPix)
- BYTE OledRopXor (BYTE bPix, BYTE bDsp, BYTE mskPix)
- int OledClampXco (int xco)
- int OledClampYco (int yco)
- void OledMoveTo (int xco, int yco)
- void OledGetPos (int *pxco, int *pyco)
- void OledSetDrawColor (BYTE clr)
- BYTE * OledGetStdPattern (int ipat)
- void OledSetFillPattern (BYTE *pbPat)
- void OledSetDrawMode (int mod)
- int OledGetDrawMode ()
- void OledDrawPixel ()
- BYTE OledGetPixel ()
- void OledLineTo (int xco, int yco)
- void OledDrawRect (int xco, int yco)
- void OledFillRect (int xco, int yco)
- void OledGetBmp (int dxco, int dyco, BYTE *pbBits)
- void OledPutBmp (int dxco, int dyco, BYTE *pbBits)
- void OledDrawChar (char ch)
- void OledDrawString (char *sz)

Variables

- int xcoOledCur
- int ycoOledCur
- BYTE * pbOledCur
- BYTE rgbOledBmp [ ]
- BYTE rgbFillPat [ ]
- int bnOledCur
- BYTE clrOledCur
- BYTE * pbOledPatCur
- BYTE * pbOledFontUser
- BYTE * pbOledFontCur
- int dxcoOledFontCur
- int dycoOledFontCur
- BYTE(* pfnDoRop)(BYTE bPix, BYTE bDsp, BYTE mskPix)
- int modOledCur

3.11.1 Function Documentation

3.11.1.1 OledClampXco()

```
int OledClampXco (
            int xco )
```

Definition at line 1136 of file OledGrph.c.

3.11.1.2 OledClampYco()

```
int OledClampYco (
            int yco )
```

Definition at line 1166 of file OledGrph.c.

3.11.1.3 OledDrawChar()

```
void OledDrawChar (
            char ch )
```

Definition at line 835 of file OledGrph.c.

3.11.1.4 OledDrawPixel()

```
void OledDrawPixel ( )
```

Definition at line 322 of file OledGrph.c.

3.11.1.5 OledDrawRect()

```
void OledDrawRect (
            int xco,
            int yco )
```

Definition at line 478 of file OledGrph.c.

3.11.1.6 OledDrawString()

```
void OledDrawString (
            char * sz )
```

Definition at line 878 of file OledGrph.c.

3.11.1.7 OledFillRect()

```
void OledFillRect (
            int xco,
            int yco )
```

Definition at line 515 of file OledGrph.c.

3.11.1.8 OledGetBmp()

```
void OledGetBmp (
            int dxco,
            int dyco,
            BYTE * pbBits )
```

Definition at line 621 of file OledGrph.c.

3.11.1.9 OledGetDrawMode()

```
int OledGetDrawMode ( )
```

Definition at line 297 of file OledGrph.c.

3.11.1.10 OledGetPixel()

```
BYTE OledGetPixel ( )
```

Definition at line 346 of file OledGrph.c.

3.11.1.11 OledGetPos()

```
void OledGetPos (
            int * pxco,
            int * pyco )
```

Definition at line 152 of file OledGrph.c.

3.11.1.12 OledGetStdPattern()

```
BYTE* OledGetStdPattern (
            int ipat )
```

Definition at line 202 of file OledGrph.c.

3.11.1.13 OledLineTo()

```
void OledLineTo (
            int xco,
            int yco )
```

Definition at line 372 of file OledGrph.c.

3.11.1.14 OledMoveDown()

```
void OledMoveDown ( )
```

Definition at line 1031 of file OledGrph.c.

3.11.1.15 OledMoveLeft()

```
void OledMoveLeft ( )
```

Definition at line 1071 of file OledGrph.c.

3.11.1.16 OledMoveRight()

```
void OledMoveRight ( )
```

Definition at line 1104 of file OledGrph.c.

3.11.1.17 OledMoveTo()

```
void OledMoveTo (
            int xco,
            int yco )
```

Definition at line 113 of file OledGrph.c.

3.11.1.18 OledMoveUp()

```
void OledMoveUp ( )
```

Definition at line 991 of file OledGrph.c.

3.11.1.19 OledPutBmp()

```
void OledPutBmp (
            int dxco,
            int dyco,
            BYTE * pbBits )
```

Definition at line 720 of file OledGrph.c.

3.11.1.20 OledRopAnd()

```
BYTE OledRopAnd (
            BYTE bPix,
            BYTE bDsp,
            BYTE mskPix )
```

Definition at line 945 of file OledGrph.c.

3.11.1.21 OledRopOr()

```
BYTE OledRopOr (
            BYTE bPix,
            BYTE bDsp,
            BYTE mskPix )
```

Definition at line 924 of file OledGrph.c.

3.11.1.22 OledRopSet()

```
BYTE OledRopSet (
            BYTE bPix,
            BYTE bDsp,
            BYTE mskPix )
```

Definition at line 903 of file OledGrph.c.

3.11.1.23 OledRopXor()

```
BYTE OledRopXor (
            BYTE bPix,
            BYTE bDsp,
            BYTE mskPix )
```

Definition at line 966 of file OledGrph.c.

3.11.1.24 OledSetDrawColor()

```
void OledSetDrawColor (
            BYTE clr )
```

Definition at line 177 of file OledGrph.c.

3.11.1.25 OledSetDrawMode()

```
void OledSetDrawMode (
            int mod )
```

Definition at line 251 of file OledGrph.c.

3.11.1.26 OledSetFillPattern()

```
void OledSetFillPattern (
            BYTE * pbPat )
```

Definition at line 227 of file OledGrph.c.

3.11.2 Variable Documentation

3.11.2.1 bnOledCur

```
int bnOledCur
```

Definition at line 81 of file OLED.c.

3.11.2.2 clrOledCur

```
BYTE clrOledCur
```

Definition at line 82 of file OLED.c.

3.11.2.3 dxcoOledFontCur

```
int dxcoOledFontCur
```

Definition at line 86 of file OLED.c.

3.11.2.4 dycoOledFontCur

```
int dycoOledFontCur
```

Definition at line 87 of file OLED.c.

3.11.2.5 modOledCur

```
int modOledCur
```

Definition at line 76 of file OledGrph.c.

3.11.2.6 pbOledCur

```
BYTE* pbOledCur
```

Definition at line 80 of file OLED.c.

3.11.2.7 pbOledFontCur

```
BYTE* pbOledFontCur
```

Definition at line 89 of file OLED.c.

3.11.2.8 pbOledFontUser

```
BYTE* pbOledFontUser
```

Definition at line 90 of file OLED.c.

3.11.2.9 pbOledPatCur

```
BYTE* pbOledPatCur
```

Definition at line 83 of file OLED.c.

3.11.2.10 pfnDoRop

```
BYTE(* pfnDoRop) (BYTE bPix, BYTE bDsp, BYTE mskPix)
```

Definition at line 75 of file OledGrph.c.

3.11.2.11 rgbFillPat

```
BYTE rgbFillPat[]
```

Definition at line 62 of file FillPat.c.

3.11.2.12 rgbOledBmp

```
BYTE rgbOledBmp[]
```

Definition at line 104 of file OLED.h.

3.11.2.13 xcoOledCur

```
int xcoOledCur
```

Definition at line 77 of file OLED.c.

3.11.2.14 ycoOledCur

```
int ycoOledCur
```

Definition at line 78 of file OLED.c.

3.12 src/OLED/OledGrph.h File Reference

Functions

- void OledSetDrawColor (uint8_t clr)
- void OledSetDrawMode (int mod)
- int OledGetDrawMode ()
- uint8_t * OledGetStdPattern (int ipat)
- void OledSetFillPattern (uint8_t *pbPat)
- void OledMoveTo (int xco, int yco)
- void OledGetPos (int *pxco, int *pyco)
- void OledDrawPixel ()
- uint8_t OledGetPixel ()
- void OledLineTo (int xco, int yco)
- void OledDrawRect (int xco, int yco)
- void OledFillRect (int xco, int yco)
- void OledGetBmp (int dxco, int dyco, uint8_t *pbBmp)
- void OledPutBmp (int dxco, int dyco, uint8_t *pbBmp)
- void OledDrawChar (char ch)
- void OledDrawString (char *sz)

3.12.1 Function Documentation

3.12.1.1 OledDrawChar()

```
void OledDrawChar (
            char ch )
```

Definition at line 835 of file OledGrph.c.

3.12.1.2 OledDrawPixel()

```
void OledDrawPixel ( )
```

Definition at line 322 of file OledGrph.c.

3.12.1.3 OledDrawRect()

```
void OledDrawRect (
            int xco,
            int yco )
```

Definition at line 478 of file OledGrph.c.

3.12.1.4 OledDrawString()

```
void OledDrawString (
            char * sz )
```

Definition at line 878 of file OledGrph.c.

3.12.1.5 OledFillRect()

```
void OledFillRect (
            int xco,
            int yco )
```

Definition at line 515 of file OledGrph.c.

3.12.1.6 OledGetBmp()

```
void OledGetBmp (
            int dxco,
            int dyco,
            uint8_t * pbBmp )
```

Definition at line 621 of file OledGrph.c.

3.12.1.7 OledGetDrawMode()

```
int OledGetDrawMode ( )
```

Definition at line 297 of file OledGrph.c.

3.12.1.8 OledGetPixel()

```
uint8_t OledGetPixel ( )
```

Definition at line 346 of file OledGrph.c.

3.12.1.9 OledGetPos()

```
void OledGetPos (
            int * pxco,
            int * pyco )
```

Definition at line 152 of file OledGrph.c.

3.12.1.10 OledGetStdPattern()

```
uint8_t* OledGetStdPattern (
            int ipat )
```

Definition at line 202 of file OledGrph.c.

3.12.1.11 OledLineTo()

```
void OledLineTo (
            int xco,
            int yco )
```

Definition at line 372 of file OledGrph.c.

3.12.1.12 OledMoveTo()

```
void OledMoveTo (
            int xco,
            int yco )
```

Definition at line 113 of file OledGrph.c.

3.12.1.13 OledPutBmp()

```
void OledPutBmp (
            int dxco,
            int dyco,
            uint8_t * pbBmp )
```

Definition at line 720 of file OledGrph.c.

3.12.1.14 OledSetDrawColor()

```
void OledSetDrawColor (
            uint8_t clr )
```

Definition at line 177 of file OledGrph.c.

3.12.1.15 OledSetDrawMode()

```
void OledSetDrawMode (
            int mod )
```

Definition at line 251 of file OledGrph.c.

3.12.1.16 OledSetFillPattern()

```
void OledSetFillPattern (
            uint8_t * pbPat )
```

Definition at line 227 of file OledGrph.c.

3.13 src/OLED/SPI.c File Reference

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

Functions

- void OledPutBuffer (int cb, BYTE *rgbTx)
- BYTE Spi2PutByte (BYTE bVal)

3.13.1 Function Documentation

3.13.1.1 OledPutBuffer()

```
void OledPutBuffer (
            int cb,
            BYTE * rgbTx )
```

Function:

Summary:

Description:

Remarks:

Definition at line 87 of file SPI.c.

3.13.1.2 Spi2PutByte()

```
BYTE Spi2PutByte (
            BYTE bVal )
```

Definition at line 122 of file SPI.c.

3.14 src/UART.c File Reference

```
#include "UART.h"
```

Functions

- void UART4_init (void)
  UART initialization.
- char UART4_getc (void)
  Reading char from UART.
- void UART4_putc (char c)
  Sending char by UART.
- void UART4_puts (char *s)
  Sending string by UART.

3.14.1 Function Documentation

3.14.1.1 UART4_getc()

```
char UART4_getc (
            void  )
```

Reading char from UART.

It waits until character received and returns it

Returns

U4RXREG readed character

Definition at line 58 of file UART.c.

3.14.1.2 UART4_init()

```
void UART4_init (
            void  )
```

UART initialization.

Setting pins for UART usage and UART speed

Definition at line 40 of file UART.c.

3.14.1.3 UART4_putc()

```
void UART4_putc (
            char c )
```

Sending char by UART.

It waits until transmit buffer not full and transmits char

Parameters

in	*c*	char to send

Definition at line 70 of file UART.c.

3.14.1.4 UART4_puts()

```
void UART4_puts (
            char * s )
```

Sending string by UART.

It sends chars from string while it's not end symbol

Parameters

in	*s*	pointer for string to send

Definition at line 83 of file UART.c.

3.15 src/UART.h File Reference

```
#include <xc.h>
```

Functions

- void UART4_init (void)
  UART initialization.
- char UART4_getc (void)
  Reading char from UART.
- void UART4_putc (char c)
  Sending char by UART.
- void UART4_puts (char *s)
  Sending string by UART.

3.15.1 Function Documentation

3.15.1.1 UART4_getc()

```
char UART4_getc (
            void  )
```

Reading char from UART.

It waits until character received and returns it

Returns

U4RXREG readed character

Definition at line 58 of file UART.c.

3.15.1.2 UART4_init()

```
void UART4_init (
            void  )
```

UART initialization.

Setting pins for UART usage and UART speed

Definition at line 40 of file UART.c.

3.15.1.3 UART4_putc()

```
void UART4_putc (
            char c )
```

Sending char by UART.

It waits until transmit buffer not full and transmits char

Parameters

in	*c*	char to send

Definition at line 70 of file UART.c.

3.15.1.4 UART4_puts()

```
void UART4_puts (
            char * s )
```

Sending string by UART.

It sends chars from string while it's not end symbol

Parameters

in	*s*	pointer for string to send

Definition at line 83 of file UART.c.

3.16 src/user.c File Reference

contains descroption for initialization and system functions

```
#include <stdint.h>
#include <stdbool.h>
#include "lab4_UART_SPI.h"
#include <sys/attribs.h>
```

Functions

- void initGPIO (void)
  GPIO initialization.
- void init_servo (void)
  Servo initialization.
- void delayMs (int t)
  primitive delay function
- void set_angle (char mode)
  function for turning servo

3.16.1 Detailed Description

contains descroption for initialization and system functions

3.16.2 Function Documentation

3.16.2.1 delayMs()

```
void delayMs (
            int t )
```

primitive delay function

Used by OLED driver

Definition at line 85 of file user.c.

3.16.2.2 init_servo()

```
void init_servo (
            void  )
```

Servo initialization.

Initialization of timer to drive servo. Timer 2 configured to generate PWM with 20ms period (50Hz frequency). OC8 output mapped to E3 pin (28th pin on chipKit WiFire board)

Definition at line 58 of file user.c.

3.16.2.3 initGPIO()

```
void initGPIO (
            void  )
```

GPIO initialization.

Initialization for pins G6, B11, G15, D4, A4, A5. Disabling analog mode and setting pins directions

Definition at line 21 of file user.c.

3.16.2.4 set_angle()

```
void set_angle (
            char mode )
```

function for turning servo

Depending on the input parameter ('1', '2' or '3') setting servo angle

Parameters

in	*mode*	one of three servo angle states

Definition at line 98 of file user.c.

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