

LedSemaphore

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1 File Index	1
1.1 File List	1
2 File Documentation	3
2.1 inc/Aplication.h File Reference	3
2.1.1 Detailed Description	4
2.1.2 Function Documentation	4
2.1.2.1 GPIO_Init()	4
2.1.2.2 LPC_Init()	5
2.1.2.3 Semaphore()	6
2.2 inc/GPIO_FW.h File Reference	7
2.2.1 Detailed Description	9
2.2.2 Function Documentation	9
2.2.2.1 GetOFFSET()	9
2.2.2.2 GPIO_ClearOUT()	10
2.2.2.3 GPIO_Debounce()	11
2.2.2.4 GPIO_DebounceUserKEY()	11
2.2.2.5 GPIO_Disable()	12
2.2.2.6 GPIO_Enable()	13
2.2.2.7 GPIO_GetPIN()	13
2.2.2.8 GPIO_SetDIR()	14
2.2.2.9 GPIO_SetModeCLKDIV()	15
2.2.2.10 GPIO_SetModeDAC()	15
2.2.2.11 GPIO_SetModeFILTER()	16
2.2.2.12 GPIO_SetModeHYS()	17
2.2.2.13 GPIO_SetModelI2C()	17
2.2.2.14 GPIO_SetModelINPUT()	18
2.2.2.15 GPIO_SetModelINV()	19
2.2.2.16 GPIO_SetModeOD()	20
2.2.2.17 GPIO_SetOUT()	20
2.2.2.18 GPIO_SetPIN()	21
2.2.2.19 GPIO_ToogleOUT()	22
2.2.2.20 IOCONDisable()	22
2.2.2.21 IOCONEnable()	23
2.3 inc/GPIO_SW.h File Reference	23
2.3.1 Detailed Description	24
2.3.2 Function Documentation	24
2.3.2.1 GetInput()	24
2.3.2.2 GetUserKEY()	25
2.4 inc/LPC845.h File Reference	26
2.4.1 Detailed Description	26
2.5 inc/SwitchMatrix_FW.h File Reference	26

2.5.1 Detailed Description	27
2.5.2 Enumeration Type Documentation	28
2.5.2.1 anonymous enum	28
2.5.2.2 anonymous enum	28
2.5.2.3 anonymous enum	29
2.5.2.4 anonymous enum	29
2.5.3 Function Documentation	29
2.5.3.1 SWM()	30
2.5.3.2 SWM_Disable()	30
2.5.3.3 SWM_Enable()	31
2.5.3.4 SWM_PinEnable()	31
2.6 inc/SYSCON_FW.h File Reference	32
2.6.1 Detailed Description	35
2.6.2 Function Documentation	35
2.6.2.1 BoardClockRUN()	35
2.7 inc/SysTick_FW.h File Reference	36
2.7.1 Detailed Description	36
2.7.2 Function Documentation	36
2.7.2.1 SysTick_Init()	36
2.7.2.2 SysTick_Off()	37
2.7.2.3 SysTick_Set()	37
2.8 source/03-Semaphore.c File Reference	38
2.8.1 Detailed Description	38
2.8.2 Function Documentation	39
2.8.2.1 main()	39
2.8.3 Variable Documentation	39
2.8.3.1 tick	39
2.9 source/Application.c File Reference	40
2.9.1 Detailed Description	40
2.9.2 Function Documentation	40
2.9.2.1 GPIO_Init()	40
2.9.2.2 LPC_Init()	41
2.9.2.3 Semaphore()	42
2.9.3 Variable Documentation	43
2.9.3.1 tick	43
2.10 source/GPIO_FW.c File Reference	43
2.10.1 Detailed Description	44
2.10.2 Function Documentation	45
2.10.2.1 GetOFFSET()	45
2.10.2.2 GPIO_ClearOUT()	45
2.10.2.3 GPIO_Debounce()	46
2.10.2.4 GPIO_DebounceUserKEY()	47

2.10.2.5 GPIO_Disable()	48
2.10.2.6 GPIO_Enable()	48
2.10.2.7 GPIO_GetPIN()	49
2.10.2.8 GPIO_SetDIR()	50
2.10.2.9 GPIO_SetModeCLKDIV()	50
2.10.2.10 GPIO_SetModeDAC()	51
2.10.2.11 GPIO_SetModeFILTER()	52
2.10.2.12 GPIO_SetModeHYS()	52
2.10.2.13 GPIO_SetModeI2C()	53
2.10.2.14 GPIO_SetModeINPUT()	54
2.10.2.15 GPIO_SetModeINV()	54
2.10.2.16 GPIO_SetModeOD()	55
2.10.2.17 GPIO_SetOUT()	56
2.10.2.18 GPIO_SetPIN()	56
2.10.2.19 GPIO_ToggleOUT()	57
2.10.2.20 IOCONDisable()	58
2.10.2.21 IOCONEnable()	58
2.10.3 Variable Documentation	59
2.10.3.1 offset	59
2.11 source/GPIO_SW.c File Reference	59
2.11.1 Detailed Description	60
2.11.2 Function Documentation	60
2.11.2.1 GetInput()	60
2.11.2.2 GetUserKEY()	61
2.12 source/mtb.c File Reference	61
2.12.1 Detailed Description	62
2.13 source/SwitchMatrix_FW.c File Reference	62
2.13.1 Detailed Description	62
2.13.2 Function Documentation	63
2.13.2.1 SWM()	63
2.13.2.2 SWM_Disable()	63
2.13.2.3 SWM_Enable()	64
2.13.2.4 SWM_PinEnable()	65
2.14 source/SYSCON_FW.c File Reference	65
2.14.1 Detailed Description	66
2.14.2 Function Documentation	66
2.14.2.1 BoardClockRUN()	66
2.15 source/SysTick_FW.c File Reference	67
2.15.1 Detailed Description	67
2.15.2 Function Documentation	68
2.15.2.1 SysTick_Handler()	68
2.15.2.2 SysTick_Init()	68

2.15.2.3 SysTick_Off()	69
2.15.2.4 SysTick_Set()	69
2.15.3 Variable Documentation	70
2.15.3.1 tick	70
Index	71

Chapter 1

File Index

1.1 File List

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

inc/ Aplication.h	
: Functions used in main	3
inc/ GPIO_FW.h	
: Firmware functions for GPIO	7
inc/ GPIO_SW.h	
: Software functions for GPIO	23
inc/ LPC845.h	
: Declarations for type of data	26
inc/ SwitchMatrix_FW.h	
: Firmware functions for SWM	26
inc/ SYSCON_FW.h	
: Firmware functions for SYSCON	32
inc/ SysTick_FW.h	
: Firmware functions for SysTick	36
source/ 03-Semaphore.c	
: Entry point for the program	38
source/ Aplication.c	
: Functions used in main	40
source/ GPIO_FW.c	
: Firmware functions for GPIO	43
source/ GPIO_SW.c	
: Software functions for GPIO	59
source/ mtb.c	
MTB initialization file	61
source/ semihost_hardfault.c	??
source/ SwitchMatrix_FW.c	
: Firmware functions for SWM	62
source/ SYSCON_FW.c	
: Firmware functions for SYSCON	65
source/ SysTick_FW.c	
: Firmware functions for SysTick	67

Chapter 2

File Documentation

2.1 inc/Application.h File Reference

: Functions used in main

```
#include "LPC845.h"
#include "GPIO_FW.h"
#include "GPIO_SW.h"
#include "SwitchMatrix_FW.h"
#include "SYSCON_FW.h"
#include "SysTick_FW.h"
```

Macros

- `#define RED_LIGTH` PORT0,13
- `#define YELLOW_LIGTH` PORT0,14
- `#define GREEN_LIGTH` PORT0,15
- `#define RESET` 0x00
- `#define R_STAGE` 0x01
Red on.
- `#define RY_STAGE` 0x02
Red, Yellow on.
- `#define G_STAGE` 0x03
Green on.
- `#define Y_STAGE` 0x04
Yellow on.
- `#define R_TICK` 25*TICK_OUT_1S
Red 25s.
- `#define RY_TICK` 2*TICK_OUT_1S
Red, Yellow 2s.
- `#define G_TICK` 50*TICK_OUT_1S
Green 50s.
- `#define Y_TICK` 5*TICK_OUT_1S
Yellow 5s.

Functions

- void `LPC_Init` (void)
: Initialize the board
- void `GPIO_Init` (void)
: Initialize the GPIO
- void `Semaphore` (void)
: Control of the lights

2.1.1 Detailed Description

: Functions used in main

:

Author

: Tobias Bavasso Piizzi

Date

: 04/01/2021

2.1.2 Function Documentation

2.1.2.1 `GPIO_Init()`

```
void GPIO_Init (  
    void )
```

: Initialize the GPIO

: It depends on each project

Author

: Tobias Bavasso Piizzi

Date

: 04/01/2021

Parameters

	[in] void
--	-----------

Returns

: void

Definition at line 35 of file Apiation.c.

```
35         {
36         /*
37         GPIO_SetDIR(LedRED, OUTPUT);
38         GPIO_SetDIR(LedGREEN, OUTPUT);
39         GPIO_SetDIR(LedBLUE, OUTPUT);
40         GPIO_SetDIR(UserKEY, INPUT);
41
42         GPIO_SetPIN(LedRED, LED_OFF);
43         GPIO_SetPIN(LedGREEN, LED_OFF);
44         GPIO_SetPIN(LedBLUE, LED_OFF);
45         */
46         GPIO_SetDIR(RED_LIGTH, OUTPUT);
47         GPIO_SetDIR(YELLOW_LIGTH, OUTPUT);
48         GPIO_SetDIR(GREEN_LIGTH, OUTPUT);
49
50         GPIO_SetPIN(RED_LIGTH, LOW);
51         GPIO_SetPIN(YELLOW_LIGTH, LOW);
52         GPIO_SetPIN(GREEN_LIGTH, LOW);
53     }
```

2.1.2.2 LPC_Init()

```
void LPC_Init (
    void )
```

: Initialize the board

: It depends on each proyect

Author

: Tobias Bavasso Piizzi

Date

: 04/01/2021

Parameters

	[in] void
--	-----------

Returns

: void

Definition at line 19 of file Apiation.c.

```
19         {
20         GPIO_Enable();
21         BoardClockRUN();
22         SysTick_Init();
23         GPIO_Init();
24     }
```

2.1.2.3 Semaphore()

```
void Semaphore (
    void )
```

: Control of the ligths

: Finite state machine

Author

: Tobias Bavasso Piizzi

Date

: 04/01/2021

Parameters

	[in] void
--	-----------

Returns

: void

< Reset condition

< Reset condition

< Reset condition

Definition at line 65 of file Aplicacion.c.

```
65     {
66     static uint8_t state = RESET;
67     switch (state) {
68     case RESET:
69         GPIO_SetPIN(RED_LIGTH, LOW);
70         GPIO_SetPIN(YELLOW_LIGTH, LOW);
71         GPIO_SetPIN(GREEN_LIGTH, LOW);
72         tick = R_TICK;
73         GPIO_SetPIN(RED_LIGTH, HIGH);
74         state = R_STAGE;
75         break;
76     case R_STAGE:
77         if (tick == 0) {
78             tick = RY_TICK;
79             GPIO_SetPIN(YELLOW_LIGTH, HIGH);
80             state = RY_STAGE;
81         }
82         break;
83     case RY_STAGE:
84         if (tick == 0) {
85             tick = G_TICK;
86             GPIO_SetPIN(RED_LIGTH, LOW);
87             GPIO_SetPIN(YELLOW_LIGTH, LOW);
88             GPIO_SetPIN(GREEN_LIGTH, HIGH);
89             state = G_STAGE;
90         }
91         break;
92     case G_STAGE:
93         if (tick == 0) {
94             tick = Y_TICK;
95             GPIO_SetPIN(GREEN_LIGTH, LOW);
96             GPIO_SetPIN(YELLOW_LIGTH, HIGH);
97             state = Y_STAGE;
```

```

98     }
99     break;
100    case Y_STAGE:
101        if (tick == 0) {
102            tick = R_TICK;
103            GPIO_SetPIN(YELLOW_LIGH, LOW);
104            GPIO_SetPIN(RED_LIGH, HIGH);
105            state = R_STAGE;
106        }
107        break;
108    }
109 }
110
111 }

```

2.2 inc/GPIO_FW.h File Reference

: Firmware functions for GPIO

Macros

- #define **PORT0** 0
- #define **PORT1** 1
- #define **LedGREEN** PORT1 , 0
Led green in board.
- #define **LedBLUE** PORT1 , 1
Led blue in board.
- #define **LedRED** PORT1 , 2
Led red in board.
- #define **UserKEY** PORT0 , 4
Key in board.
- #define **INPUT** 0
- #define **OUTPUT** 1
- #define **LOW** 0
- #define **HIGH** 1
- #define **ACT_HIGH** 1
- #define **ACT_LOW** 0
- #define **LED_ON** 0
The led are active low.
- #define **LED_OFF** 1
The led are active low.
- #define **BOUNCE** 10
Times to check the bounce.
- #define **SysAHBCLKCTRL** ((__RW uint32_t *) 0x40048080UL)
- #define **SysAHBCLKCTRL0** SysAHBCLKCTRL[0]
- #define **SysAHBCLKCTRL1** SysAHBCLKCTRL[1]
- #define **GPIO_PBYTE** ((__RW uint8_t *) 0xA0000000UL)
- #define **GPIO_PWORD** ((__RW uint32_t *) 0xA0001000UL)
- #define **GPIO_DIRP** ((__RW uint32_t *) 0xA0002000UL)
- #define **GPIO_PORT** ((__RW uint32_t *) 0xA0002100UL)
- #define **GPIO_SETP** ((__RW uint32_t *) 0xA0002200UL)
- #define **GPIO_CLRP** ((__RW uint32_t *) 0xA0002280UL)
- #define **GPIO_NOTP** ((__RW uint32_t *) 0xA0002300UL)
- #define **NO_PULL_UP_DOWN** 0x00
- #define **PULL_DOWN** 0x01

- #define **PULL_UP** 0x02
- #define **REPEATER** 0x03
- #define **HYS_EN** 0x01
- #define **HYS_DIS** 0x00
- #define **INV_INPUT** 0x01
- #define **NOT_INV_INPUT** 0x00
- #define **OD_EN** 0x01
- #define **OD_DIS** 0x00
- #define **BYPASS_FILTER** 0x00
- #define **CLK1_FILTER** 0x01
- #define **CLK2_FILTER** 0x02
- #define **CLK3_FILTER** 0x03
- #define **IOCONCLKDIV0** 0x00
- #define **IOCONCLKDIV1** 0x01
- #define **IOCONCLKDIV2** 0x02
- #define **IOCONCLKDIV3** 0x03
- #define **IOCONCLKDIV4** 0x04
- #define **IOCONCLKDIV5** 0x05
- #define **IOCONCLKDIV6** 0x06
- #define **DAC_EN** 0x01
- #define **DAC_DIS** 0x00
- #define **STD_MODE** 0x00
- #define **STD_GPIO** 0x01
- #define **FAST_MODE** 0x02
- #define **IOCON_** ((__RW uint32_t *) 0x40044000UL)

Functions

- void **GPIO_Enable** (void)
: Enable GPIO0 and GPIO1
- void **GPIO_Disable** (void)
: Disable GPIO0 and GPIO1
- void **GPIO_SetDIR** (uint8_t port, uint8_t pin, uint8_t dir)
: Choose GPIO as Input/Output
- void **GPIO_SetPIN** (uint8_t port, uint8_t pin, uint8_t state)
: Choose GPIO's output state
- uint8_t **GPIO_GetPIN** (uint8_t port, uint8_t pin, uint8_t state)
: Return GPIO's input state
- void **GPIO_SetOUT** (uint8_t port, uint8_t pin)
: Put GPIO's out to 1
- void **GPIO_ClearOUT** (uint8_t port, uint8_t pin)
: Put GPIO's out to 0
- void **GPIO_ToggleOUT** (uint8_t port, uint8_t pin)
: Invert GPIO's out
- void **GPIO_DebounceUserKEY** (void)
: Firmware debounce for user key in board
- void **GPIO_Debounce** (uint8_t port, uint8_t pin, uint8_t state)
: Firmware debounce for a GPIO
- void **IOCONEnable** (void)
: Enable IOCON
- void **IOCONDisable** (void)
: Disable IOCON

- uint8_t [GetOFFSET](#) (uint8_t port, uint8_t pin)
: Usefull for SetMode functions
- void [GPIO_SetModeINPUT](#) (uint8_t port, uint8_t pin, uint8_t mode)
: on-chip pull-up/pull-down resistor
- void [GPIO_SetModeHYS](#) (uint8_t port, uint8_t pin, uint8_t mode)
: Hysteresis
- void [GPIO_SetModeINV](#) (uint8_t port, uint8_t pin, uint8_t mode)
: Invert input
- void [GPIO_SetModeOD](#) (uint8_t port, uint8_t pin, uint8_t mode)
: Open drain
- void [GPIO_SetModeFILTER](#) (uint8_t port, uint8_t pin, uint8_t mode)
: Digital filter sample mode
- void [GPIO_SetModeCLKDIV](#) (uint8_t port, uint8_t pin, uint8_t mode)
: Select peripheral clock divider for input filter sampling clock
- void [GPIO_SetModeDAC](#) (uint8_t port, uint8_t pin, uint8_t mode)
: Selects DAC mode
- void [GPIO_SetModeI2C](#) (uint8_t port, uint8_t pin, uint8_t mode)
: Selects I2C mode

2.2.1 Detailed Description

: Firmware functions for GPIO

:

Author

: Tobias Bavasso Piizzi

Date

: 04/01/2021

2.2.2 Function Documentation

2.2.2.1 GetOFFSET()

```
uint8_t GetOFFSET (
    uint8_t port,
    uint8_t pin )
```

: Usefull for SetMode functions

:

Author

: Tobias Bavasso Piizzi

Date

: 04/01/2021

Parameters

	[in] uint8_t port : PORT0,PORT1
	[in] uint8_t pin : 0,31

Returns

: void

Definition at line 231 of file GPIO_FW.c.

```
231 {
232     uint8_t index;
233     index = port * 32 + pin;
234     return ((offset[index]) / 4);
235 }
```

2.2.2.2 GPIO_ClearOUT()

```
void GPIO_ClearOUT (
    uint8_t port,
    uint8_t pin )
```

: Put GPIO's out to 0

:

Author

: Tobias Bavasso Piizzi

Date

: 04/01/2021

Parameters

	[in] uint8_t port : PORT0,PORT1
	[in] uint8_t pin : 0,31

Returns

: void

Definition at line 113 of file GPIO_FW.c.

```
113 {
114     GPIO_CLRP[port] |= (1 « pin);
115 }
```


2.2.2.3 GPIO_Debounce()

```
void GPIO_Debounce (
    uint8_t port,
    uint8_t pin,
    uint8_t state )
```

: Firmware debounce for a GPIO

: Use in SysTick_Handler or in some timer interrupt

Author

: Tobias Bavasso Piizzi

Date

: 04/01/2021

Parameters

[in] uint8_t port	: PORT0,PORT1
[in] uint8_t pin	: 0,31
[in] uint8_t state	: ACT_LOW,ACT_HIGH

Returns

: void

Definition at line 169 of file GPIO_FW.c.

```
169
170     static uint8_t q = 0;    //Quantity of bounces
171     uint8_t j = 0;          //It captures changes
172
173     if (GPIO_GetPIN(port, pin, state))    // The key is pushed?
174         j = 0x01;                        //Something is happening, the key is been pushed
175
176     if (buff_In ^ j) {                  // If the key is pushed while q != BOUNCE
177         q++;                            // I change the buffer
178         if (q == BOUNCE) {
179             q = 0;
180             buff_In ^= 0x01;
181         }
182     } else
183         q = 0;
184 }
```

2.2.2.4 GPIO_DebounceUserKEY()

```
void GPIO_DebounceUserKEY (
    void )
```

: Firmware debounce for user key in board

: Use in SysTick_Handler or in some timer interrupt

Author

: Tobias Bavasso Piizzi

Date

: 04/01/2021

Parameters

	[in]
--	------

Returns

: void

Definition at line 141 of file GPIO_FW.c.

```

141     {
142         static uint8_t q = 0;    //Quantity of bounces
143         uint8_t j = 0;          //It captures changes
144
145         if (GPIO_GetPIN(UserKEY, ACT_LOW))    // The key is pushed?
146             j = 0x01;                        //Something is happening, the key is been pushed
147
148         if (buff_UserKEY ^ j) {                // If the key is pushed while q != BOUNCE
149             q++;                               // I change the buffer
150             if (q == BOUNCE) {
151                 q = 0;
152                 buff_UserKEY ^= 0x01;
153             }
154         } else
155             q = 0;
156     }

```

2.2.2.5 GPIO_Disable()

```

void GPIO_Disable (
    void )

```

: Disable GPIO0 and GPIO1

:

Author

: Tobias Bavasso Piizzi

Date

: 04/01/2021

Parameters

	[in] void
--	-----------

Returns

: void

Definition at line 32 of file GPIO_FW.c.

```
32     {  
33         SYSAHBCLKCTRL0 &= (~ (1<<6));  
34         SYSAHBCLKCTRL0 &= (~ (1<<20));  
35     }
```

2.2.2.6 GPIO_Enable()

```
void GPIO_Enable (  
    void )
```

: Enable GPIO0 and GPIO1

:

Author

: Tobias Bavasso Piizzi

Date

: 04/01/2021

Parameters

	[in] void
--	-----------

Returns

: void

Definition at line 19 of file GPIO_FW.c.

```
19     {  
20         SYSAHBCLKCTRL0 |= (1<<6);  
21         SYSAHBCLKCTRL0 |= (1<<20);  
22     }
```

2.2.2.7 GPIO_GetPIN()

```
uint8_t GPIO_GetPIN (  
    uint8_t port,  
    uint8_t pin,  
    uint8_t state )
```

: Return GPIO's input state

:

Author

: Tobias Bavasso Piizzi

Date

: 04/01/2021

Parameters

[in] uint8_t port	: PORT0,PORT1
[in] uint8_t pin	: 0,31
[in] uint8_t STATE	: ACT_LOW,ACT_HIGH

Returns

: uint8_t : 1 pin == [state] , 0 pin != [state]

Definition at line 81 of file GPIO_FW.c.

```

81                                     {
82     port = port * 32 + pin;
83     if ( GPIO_PBYTE[port] == state)
84         return 1;
85     else
86         return 0;
87 }
```

2.2.2.8 GPIO_SetDIR()

```

void GPIO_SetDIR (
    uint8_t port,
    uint8_t pin,
    uint8_t dir )
```

: Choose GPIO as Input/Output

:

Author

: Tobias Bavasso Piizzi

Date

: 04/01/2021

Parameters

[in] uint8_t port	: PORT0,PORT1
[in] uint8_t pin	: 0,31
[in] uint8_t dir	: INPUT,OUTPUT

Returns

: void

Definition at line 48 of file GPIO_FW.c.

```

48                                     {
49     GPIO_DIRP[port] &= (~(1 « pin));
50     GPIO_DIRP[port] |= (dir « pin);
51 }
```

2.2.2.9 GPIO_SetModeCLKDIV()

```

void GPIO_SetModeCLKDIV (
    uint8_t port,
    uint8_t pin,
    uint8_t mode )
```

: Select peripheral clock divider for input filter sampling clock

:

Author

: Tobias Bavasso Piizzi

Date

: 04/01/2021

Parameters

[in] uint8_t port: PORT0,PORT1 : [in] uint8_t pin: 0,31 : [in] uint8_t mode: IOCONCLKDIV0 to IOCONCLKDIV6

Returns

: void

Definition at line 338 of file GPIO_FW.c.

```

338                                     {
339     uint8_t offset;
340     offset = GetOFFSET(port, pin);
341     IOCON_[offset] &= (~(0x07 « 13));
342     IOCON_[offset] |= (mode « 13);
343 }
```

2.2.2.10 GPIO_SetModeDAC()

```

void GPIO_SetModeDAC (
    uint8_t port,
    uint8_t pin,
    uint8_t mode )
```

: Selects DAC mode

:

Author

: Tobias Bavasso Piizzi

Date

: 04/01/2021

Parameters

	[in] uint8_t port: PORT0,PORT1 : [in] uint8_t pin: 0,31 : [in] uint8_t mode: DAC_EN,DAC_DIS
--	---

Returns

: void

Definition at line 356 of file GPIO_FW.c.

```
356                                     {
357     uint8_t offset;
358     offset = GetOFFSET(port, pin);
359     IOCON_[offset] &= (~(0x01 « 16));
360     IOCON_[offset] |= (mode « 16);
361 }
```

2.2.2.11 GPIO_SetModeFILTER()

```
void GPIO_SetModeFILTER (
    uint8_t port,
    uint8_t pin,
    uint8_t mode )
```

: Digital filter sample mode

:

Author

: Tobias Bavasso Piizzi

Date

: 04/01/2021

Parameters

	[in] uint8_t port: PORT0,PORT1 : [in] uint8_t pin: 0,31 : [in] uint8_t mode: BYPASS_FILTER,CLK1_FILTER,CLK2_FILTER,CLK3_FILTER
--	---

Returns

: void

Definition at line 320 of file GPIO_FW.c.

```

320                                     {
321     uint8_t offset;
322     offset = GetOFFSET(port, pin);
323     IOCON_[offset] &= (~(0x03 « 11));
324     IOCON_[offset] |= (mode « 11);
325 }
```

2.2.2.12 GPIO_SetModeHYS()

```

void GPIO_SetModeHYS (
    uint8_t port,
    uint8_t pin,
    uint8_t mode )
```

: Hysteresis

:

Author

: Tobias Bavasso Piizzi

Date

: 04/01/2021

Parameters

	[in] uint8_t port: PORT0,PORT1 : [in] uint8_t pin: 0,31 : [in] uint8_t mode:HYS_EN,HYS_DIS
--	--

Returns

: void

Definition at line 266 of file GPIO_FW.c.

```

266                                     {
267     uint8_t offset;
268     offset = GetOFFSET(port, pin);
269     IOCON_[offset] &= (~(0x01 « 5));
270     IOCON_[offset] |= (mode « 5);
271 }
```

2.2.2.13 GPIO_SetModeI2C()

```

void GPIO_SetModeI2C (
    uint8_t port,
```

```
uint8_t pin,
uint8_t mode )
```

: Selects I2C mode

:

Author

: Tobias Bavasso Piizzi

Date

: 04/01/2021

Parameters

[in] uint8_t port: PORT0,PORT1 : [in] uint8_t pin: 0,31 : [in] uint8_t mode:STD_MODE,STD_GPIO,FAST_MODE

Returns

: void

Definition at line 374 of file GPIO_FW.c.

```
374                                     {
375     uint8_t offset;
376     offset = GetOFFSET(port, pin);
377     IOCON[offset] &= (~ (0x03 « 8));
378     IOCON[offset] |= (mode « 8);
379 }
```

2.2.2.14 GPIO_SetModeINPUT()

```
void GPIO_SetModeINPUT (
    uint8_t port,
    uint8_t pin,
    uint8_t mode )
```

: on-chip pull-up/pull-down resistor

:

Author

: Tobias Bavasso Piizzi

Date

: 04/01/2021

Parameters

[in] uint8_t port: PORT0,PORT1 : [in] uint8_t pin: 0,31 : [in] uint8_t mode:NO_PULL_UP_DOWN,PULL_DOWN,PULL_UP,REPEATER
--

Returns

: void

Definition at line 248 of file GPIO_FW.c.

```
248                                     {
249     uint8_t offset;
250     offset = GetOFFSET(port, pin);
251     IOCON[offset] &= (~(0x03 « 3));
252     IOCON[offset] |= (mode « 3);
253 }
```

2.2.2.15 GPIO_SetModeINV()

```
void GPIO_SetModeINV (
    uint8_t port,
    uint8_t pin,
    uint8_t mode )
```

: Invert input

:

Author

: Tobias Bavasso Piizzi

Date

: 04/01/2021

Parameters

[in] uint8_t port: PORT0,PORT1 : [in] uint8_t pin: 0,31 : [in] uint8_t mode: INV_INPUT,NOT_INV_INPUT
--

Returns

: void

Definition at line 284 of file GPIO_FW.c.

```
284                                     {
285     uint8_t offset;
286     offset = GetOFFSET(port, pin);
287     IOCON[offset] &= (~(0x01 « 6));
288     IOCON[offset] |= (mode « 6);
289 }
```

2.2.2.16 GPIO_SetModeOD()

```
void GPIO_SetModeOD (
    uint8_t port,
    uint8_t pin,
    uint8_t mode )
```

: Open drain

:

Author

: Tobias Bavasso Piizzi

Date

: 04/01/2021

Parameters

	[in] uint8_t port: PORT0,PORT1 : [in] uint8_t pin: 0,31 : [in] uint8_t mode: OD_EN,OD_DIS
--	---

Returns

: void

Definition at line 302 of file GPIO_FW.c.

```
302                                     {
303     uint8_t offset;
304     offset = GetOFFSET(port, pin);
305     IOCON_[offset] &= (~ (0x01 « 10));
306     IOCON_[offset] |= (mode « 10);
307 }
```

2.2.2.17 GPIO_SetOUT()

```
void GPIO_SetOUT (
    uint8_t port,
    uint8_t pin )
```

: Put GPIO's out to 1

:

Author

: Tobias Bavasso Piizzi

Date

: 04/01/2021

Parameters

[in] uint8_t port : PORT0,PORT1
[in] uint8_t pin : 0,31

Returns

: void

Definition at line 99 of file GPIO_FW.c.

```
99 {
100     GPIO_SETP[port] |= (1 << pin);
101 }
```

2.2.2.18 GPIO_SetPIN()

```
void GPIO_SetPIN (
    uint8_t port,
    uint8_t pin,
    uint8_t state )
```

: Choose GPIO's output state

:

Author

: Tobias Bavasso Piizzi

Date

: 04/01/2021

Parameters

[in] uint8_t port : PORT0,PORT1
[in] uint8_t pin : 0,31
[in] uint8_t state : LOW,HIGH

Returns

: void

Definition at line 64 of file GPIO_FW.c.

```
64 {
65     port = port * 32 + pin;
66     GPIO_PBYTE[port] &= (~1);
67     GPIO_PBYTE[port] |= state;
68 }
```

2.2.2.19 GPIO_ToogleOUT()

```
void GPIO_ToogleOUT (
    uint8_t port,
    uint8_t pin )
```

: Invert GPIO's out

:

Author

: Tobias Bavasso Piizzi

Date

: 04/01/2021

Parameters

	[in] uint8_t port : PORT0,PORT1
	[in] uint8_t pin : 0,31

Returns

: void

Definition at line 127 of file GPIO_FW.c.

```
127
128     GPIO_NOTP[port] |= (1 « pin);
129 }
```

2.2.2.20 IOCONDisable()

```
void IOCONDisable (
    void )
```

: Disable IOCON

:

Author

: Tobias Bavasso Piizzi

Date

: 04/01/2021

Parameters

	[in]
--	------

Returns

: void

Definition at line 208 of file GPIO_FW.c.

```

208     {
209         SYSAHBCLKCTRL0&= (~ (1<<18));
210     }

```

2.2.2.21 IOCONEnable()

```

void IOCONEnable (
    void )

```

: Enable IOCON

:

Author

: Tobias Bavasso Piizzi

Date

: 04/01/2021

Parameters

	[in]
--	------

Returns

: void

Definition at line 195 of file GPIO_FW.c.

```

195     {
196         SYSAHBCLKCTRL0|= (1<<18);
197     }

```

2.3 inc/GPIO_SW.h File Reference

: Software functions for GPIO

Functions

- uint8_t [GetUserKEY](#) (void)
: *State of the user key in board*
- uint8_t [GetInput](#) (void)
: *State of the input*

2.3.1 Detailed Description

: Software functions for GPIO

: These are functions in a higher layer of abstraction

Author

: Tobias Bavasso Piizzi

Date

: 04/01/2021

2.3.2 Function Documentation

2.3.2.1 GetInput()

```
uint8_t GetInput (  
    void )
```

: State of the input

: Is necessary using GPIO_Debounce

Author

: Tobias Bavasso Piizzi

Date

: 04/01/2021

Parameters

	[in] void
--	-----------

Returns

: uint8_t 1 if input pressed, 0 if input pressed

Definition at line 48 of file GPIO_SW.c.

```

48     {
49         static uint8_t buff_before = 0x00;
50
51         if ( buff_In == 0x01 && buff_before == 0x00 ){
52             buff_before = 0x01;
53             return (1);
54         }
55         else if ( buff_In == 0x01 && buff_before == 0x01 )
56             return (0);
57         else if ( buff_In == 0x00 && buff_before == 0x01 )
58             return (0);
59         else
60             return (0);
61     }

```

2.3.2.2 GetUserKEY()

```

uint8_t GetUserKEY (
    void )

```

: State of the user key in board

: Is necessary using GPIO_DebounceUserKEY

Author

: Tobias Bavasso Piizzi

Date

: 04/01/2021

Parameters

	[in] void
--	-----------

Returns

: uint8_t 1 if user key pressed, 0 if user key not

Definition at line 21 of file GPIO_SW.c.

```

21     {
22         static uint8_t buff_before = 0x00;
23
24         if ( buff_UserKEY == 0x01 && buff_before == 0x00 ){
25             buff_before = 0x01;
26             return (1);
27         }
28         else if ( buff_UserKEY == 0x01 && buff_before == 0x01 )
29             return (0);
30         else if ( buff_UserKEY == 0x00 && buff_before == 0x01 ){
31             buff_before = 0x00;
32             return (0);
33         }
34         else
35             return (0);
36     }

```

2.4 inc/LPC845.h File Reference

: Declarations for type of data

Macros

- `#define __R volatile const`
- `#define __W volatile`
- `#define __RW volatile`

Typedefs

- `typedef unsigned int uint32_t`
- `typedef unsigned short uint16_t`
- `typedef unsigned char uint8_t`

2.4.1 Detailed Description

: Declarations for type of data

: Only contains macros

Author

: Tobias Bavasso Piizzi

Date

: 04/01/2021

2.5 inc/SwitchMatrix_FW.h File Reference

: Firmware functions for SWM

Macros

- `#define PINASSIGN ((__RW uint32_t *) 0x4000C000UL)`
- `#define PINENABLE ((__RW uint32_t *) 0x4000C1C0UL)`

Enumerations

- enum { **BYTE0** , **BYTE1** , **BYTE2** , **BYTE3** }
- enum {
UO_TXD , **UO_SCLK** , **U1_CTS** , **U2_RTS** ,
SPI0_MOSI , **SPI0_SSEL2** , **SPI1_MISO** , **SCT_IN1** ,
SCT_OUT1 , **SCT_OUT5** , **I2C2_SDA** , **COMP0_OUT** ,
UART3_RXD , **UART4_SCLK** , **T0_MAT3** }
- enum {
U0_RXD , **U1_TXD** , **U0_SCLK** , **U2_CTS** ,
SPI0_MISO , **SPI0_SSEL3** , **SPI1_SSEL0** , **SCT_IN2** ,
SCT_OUT2 , **SCT_OUT6** , **I2C2_SCL** , **CLKOUT** ,
UART3_SCLK , **T0_MAT0** , **T0_CAP0** }
- enum {
UO_RTS , **U1_RXD** , **U2_TXD** , **U2_SCLK** ,
SPI0_SSEL0 , **SPI1_SCK** , **SPI1_SSEL1** , **SCT_IN3** ,
SCT_OUT3 , **I2C1_SDA** , **I2C3_SDA** , **GPIO_INT_BMAT** ,
UART4_TXD , **T0_MAT1** , **T0_CAP1** }
- enum {
UO_CTS , **U1_RTS** , **U0_RXD** , **SPIO_SCK** ,
SPI0_SSEL1 , **SPI1_MOSI** , **SCT0_IN0** , **SCT_OUT0** ,
SCT_OUT4 , **I2C1_SCL** , **I2C3_SCL** , **UART3_TXD** ,
UART4_RXD , **T0_MAT2** , **T0_CAP2** }
- enum {
ADC_0 , **ADC_1** , **ADC_2** , **ADC_3** ,
ADC_4 , **ADC_5** , **ADC_6** , **ADC_7** ,
ADC_8 , **ADC_9** , **ADC_10** , **ADC_11** ,
DACOUT0 , **DACOUT1** , **CAPT_X0** , **CAPT_X1** ,
CAPT_X2 , **CAPT_X3** }
- enum {
CAPT_X4 , **CAPT_X5** , **CAPT_X6** , **CAPT_X7** ,
CAPT_X8 , **CAPT_YL** , **CAPT_YH** }

Functions

- void **SWM** (uint8_t port, uint8_t pin, uint8_t assign, uint8_t byte)
: Assign movable functions for pin
- void **SWM_PinEnable** (uint8_t port, uint8_t pin, uint8_t ena)
: Enable pin works as value passed in ena
- void **SWM_Enable** (void)
: Enable SWM
- void **SWM_Disable** (void)
: Disable SWM

2.5.1 Detailed Description

: Firmware functions for SWM

:

Author

: Tobias Bavasso Piizzi

Date

: 04/01/2021

2.5.2 Enumeration Type Documentation

2.5.2.1 anonymous enum

anonymous enum

Enumerator

UO_TXD	Possible assign.
--------	------------------

Definition at line 38 of file SwitchMatrix_FW.h.

```

38     {
39         UO_TXD,
40         UO_SCLK,
41         U1_CTS,
42         U2_RTS,
43         SPI0_MOSI,
44         SPI0_SSEL2,
45         SPI1_MISO,
46         SCT_IN1,
47         SCT_OUT1,
48         SCT_OUT5,
49         I2C2_SDA,
50         COMP0_OUT,
51         UART3_RXD,
52         UART4_SCLK,
53         T0_MAT3
54     };

```

2.5.2.2 anonymous enum

anonymous enum

Enumerator

U0_RXD	Possible assign.
--------	------------------

Definition at line 56 of file SwitchMatrix_FW.h.

```

56     {
57         U0_RXD,
58         U1_TXD,
59         U0_SCLK,
60         U2_CTS,
61         SPI0_MISO,
62         SPI0_SSEL3,
63         SPI1_SSEL0,
64         SCT_IN2,
65         SCT_OUT2,
66         SCT_OUT6,
67         I2C2_SCL,
68         CLKOUT,
69         UART3_SCLK,
70         T0_MAT0,
71         T0_CAP0
72     };

```

2.5.2.3 anonymous enum

anonymous enum

Enumerator

UO_RTS	Possible assign.
--------	------------------

Definition at line 74 of file SwitchMatrix_FW.h.

```
74     {  
75         UO_RTS,  
76         U1_RXD,  
77         U2_TXD,  
78         U2_SCLK,  
79         SPI0_SSEL0,  
80         SPI1_SCK,  
81         SPI1_SSEL1,  
82         SCT_IN3,  
83         SCT_OUT3,  
84         I2C1_SDA,  
85         I2C3_SDA,  
86         GPIO_INT_BMAT,  
87         UART4_TXD,  
88         T0_MAT1,  
89         T0_CAP1  
90     };
```

2.5.2.4 anonymous enum

anonymous enum

Enumerator

UO_CTS	Possible assign.
--------	------------------

Definition at line 92 of file SwitchMatrix_FW.h.

```
92     {  
93         UO_CTS,  
94         U1_RTS,  
95         UO_RXD,  
96         SPI0_SCK,  
97         SPI0_SSEL1,  
98         SPI1_MOSI,  
99         SCT0_IN0,  
100        SCT_OUT0,  
101        SCT_OUT4,  
102        I2C1_SCL,  
103        I2C3_SCL,  
104        UART3_TXD,  
105        UART4_RXD,  
106        T0_MAT2,  
107        T0_CAP2  
108     };
```

2.5.3 Function Documentation

2.5.3.1 SWM()

```
void SWM (
    uint8_t port,
    uint8_t pin,
    uint8_t assign,
    uint8_t byte )
```

: Assign movable functions for pin

:

Author

: Tobias Bavasso Piizzi

Date

: 04/01/2021

Parameters

[in] uint8_t port :	PORT0,PORT1
[in] uint8_t pin :	0,31
[in] uint8_t assign :	
[in] uint8_t byte :	BYTE0,BYTE1,BYTE2,BYTE3

Returns

: void

Definition at line 22 of file SwitchMatrix_FW.c.

```
22
23     pin = pin + 0x20 * port; //PIO0[0:31] 0x00 to 0x1F PIO1[0:21] 0x1F to 0x35
24     PINASSIGN[assign] |= (pin « byte);
25 }
```

2.5.3.2 SWM_Disable()

```
void SWM_Disable (
    void )
```

: Disable SWM

:

Author

: Tobias Bavasso Piizzi

Date

: 04/01/2021

Parameters

	[in] void
--	-----------

Returns

: void

Definition at line 67 of file SwitchMatrix_FW.c.

```
67         {  
68     SYSAHBCLKCTRL0&= (~ (1<<7));  
69 }
```

2.5.3.3 SWM_Enable()

```
void SWM_Enable (  
    void )
```

: Enable SWM

:

Author

: Tobias Bavasso Piizzi

Date

: 04/01/2021

Parameters

	[in] void
--	-----------

Returns

: void

Definition at line 54 of file SwitchMatrix_FW.c.

```
54         {  
55     SYSAHBCLKCTRL0|= (1<<7);  
56 }
```

2.5.3.4 SWM_PinEnable()

```
void SWM_PinEnable (  
    uint8_t port,
```

```
uint8_t pin,
uint8_t ena )
```

: Enable pin works as value passed in ena

:

Author

: Tobias Bavasso Piizzi

Date

: 04/01/2021

Parameters

[in] uint8_t port	: PORT0,PORT1
[in] uint8_t pin	: 0,31
[in] uint8_t ena	: READ Page 143 UserManual. There are multiple choices

Returns

: void

Definition at line 38 of file SwitchMatrix_FW.c.

```
38
39     if (port == PORT1)          //PIENABLE[0] -> PIO0_0 .... PIO1_2
40         if (pin < 3)            //PIENABLE10] -> PIO1_3 .... PIO1_21
41             port = PORT0;
42     PINENABLE[port] |= (1 « ena);
43 }
```

2.6 inc/SYSCON_FW.h File Reference

: Firmware functions for SYSCON

Macros

- #define **SYSCON_ADD** ((__RW uint32_t *) 0x40048000UL)
- #define **SYSMEMREMAP** SYSCON_ADD [0]
- #define **SYSPLLCTRL** SYSCON_ADD [2]
- #define **SYSPLLSTAT** SYSCON_ADD [3]
- #define **SYSOSCCTRL** SYSCON_ADD [8]
- #define **WDTOSCCTRL** SYSCON_ADD [9]
- #define **FROOSCCTRL** SYSCON_ADD [10]
- #define **FRODIRECTCLKUEN** SYSCON_ADD [12]
- #define **SYSRSTSTAT** SYSCON_ADD [14]
- #define **SYSPLLCLKSEL** SYSCON_ADD [16]
- #define **SYSPLLCLKUEN** SYSCON_ADD [17]
- #define **MAINCLKPLLSEL** SYSCON_ADD [18]

- #define **MAINCLKPLL** SYSCON_ADD [19]
- #define **MAINCLKSEL** SYSCON_ADD [20]
- #define **MAINCLKUEN** SYSCON_ADD [21]
- #define **SYSAHBCLKDIV** SYSCON_ADD [22]
- #define **CAPTCLKSEL** SYSCON_ADD [24]
- #define **ADCCLKSEL** SYSCON_ADD [25]
- #define **ADCCLKDIV** SYSCON_ADD [26]
- #define **SCTCLKSEL** SYSCON_ADD [27]
- #define **SCTCLKDIV** SYSCON_ADD [28]
- #define **EXTCLKSEL** SYSCON_ADD [29]
- #define **_SYSAHBCLKCTRL0** SYSCON_ADD [32]
- #define **_SYSAHBCLKCTRL1** SYSCON_ADD [33]
- #define **PRESETCTRL0** SYSCON_ADD [34]
- #define **PRESETCTRL1** SYSCON_ADD [35]
- #define **UART0CLKSEL** SYSCON_ADD [36]
- #define **UART1CLKSEL** SYSCON_ADD [37]
- #define **UART2CLKSEL** SYSCON_ADD [38]
- #define **UART3CLKSEL** SYSCON_ADD [39]
- #define **UART4CLKSEL** SYSCON_ADD [40]
- #define **I2C0CLKSEL** SYSCON_ADD [41]
- #define **I2C1CLKSEL** SYSCON_ADD [42]
- #define **I2C2CLKSEL** SYSCON_ADD [43]
- #define **I2C3CLKSEL** SYSCON_ADD [44]
- #define **SPI0CLKSEL** SYSCON_ADD [45]
- #define **SPI1CLKSEL** SYSCON_ADD [46]
- #define **FRG0DIV** SYSCON_ADD [52]
- #define **FRG0MULT** SYSCON_ADD [53]
- #define **FRG0CLKSEL** SYSCON_ADD [54]
- #define **FRG1DIV** SYSCON_ADD [56]
- #define **FRG1MULT** SYSCON_ADD [57]
- #define **FRG1CLKSEL** SYSCON_ADD [58]
- #define **CLKOUTSEL** SYSCON_ADD [60]
- #define **CLKOUTDIV** SYSCON_ADD [61]
- #define **EXTTRACECMD** SYSCON_ADD [63]
- #define **PIOPORCAP0** SYSCON_ADD [64]
- #define **PIOPORCAP1** SYSCON_ADD [65]
- #define **_IOCONCLKDIV6** SYSCON_ADD [77]
- #define **_IOCONCLKDIV5** SYSCON_ADD [78]
- #define **_IOCONCLKDIV4** SYSCON_ADD [79]
- #define **_IOCONCLKDIV3** SYSCON_ADD [80]
- #define **_IOCONCLKDIV2** SYSCON_ADD [81]
- #define **_IOCONCLKDIV1** SYSCON_ADD [82]
- #define **_IOCONCLKDIV0** SYSCON_ADD [83]
- #define **BODCTRL** SYSCON_ADD [84]
- #define **SYSTCKCAL** SYSCON_ADD [85]
- #define **IRQLATENCY** SYSCON_ADD [92]
- #define **NMISRC** SYSCON_ADD [93]
- #define **PINTSEL0** SYSCON_ADD [94]
- #define **PINTSEL1** SYSCON_ADD [95]
- #define **PINTSEL2** SYSCON_ADD [96]
- #define **PINTSEL3** SYSCON_ADD [97]
- #define **PINTSEL4** SYSCON_ADD [98]
- #define **PINTSEL5** SYSCON_ADD [99]
- #define **PINTSEL6** SYSCON_ADD [100]
- #define **PINTSEL7** SYSCON_ADD [101]

- #define **STARTERP0** SYSCON_ADD [129]
- #define **STARTERP1** SYSCON_ADD [133]
- #define **PDSLEEP_CFG** SYSCON_ADD [140]
- #define **PDAWAKE_CFG** SYSCON_ADD [141]
- #define **PDRUN_CFG** SYSCON_ADD [142]
- #define **DEVICE_ID** SYSCON_ADD [254]
- #define **CLOCK_FRO_SETTING_API_ROM_ADDRESS** 0x0F0026F5U
- #define **F30MHz** 30000U
- #define **FRO_OUT_PowerDown** 1
- #define **FRO_PD** 2
- #define **SYSCON_FROOSCCTRL_FRO_DIRECT_MASK** (0x20000U)
- #define **SYSCON_FROOSCCTRL_FRO_DIRECT_SHIFT** (17U)
- #define **kCLOCK_FroSrcFroOsc** 1U << SYSCON_FROOSCCTRL_FRO_DIRECT_SHIFT
- #define **kPDRUN_CFG_PD_SYSOSC** 0x20
- #define **CLK_FROM_SYS_OSC** 0x00
- #define **FREQ30MHz** 30000000U
- #define **CLK_SYS_PLLSRCFRODIV** 0x03
- #define **CLOCK_FAIM_BASE** 0x50010000U
- #define **SYSPLL_MIN_FCCO_FREQ_HZ** 156000000U
- #define **SYSCON_SYSPLLCTRL_MSEL_MASK** 0x1FU
- #define **SYSCON_SYSPLLCTRL_MSEL_SHIFT** (0U)
- #define **SYSCON_SYSPLLCTRL_PSEL_MASK** 0x60U
- #define **SYSCON_SYSPLLCTRL_PSEL_SHIFT** (5U)
- #define **SYSCON_SYSPLLCTRL_MSEL(x)** (((uint32_t)((uint32_t)(x)) << SYSCON_SYSPLLCTRL_MSEL_SHIFT)) & SYSCON_SYSPLLCTRL_MSEL_MASK
- #define **SYSCON_SYSPLLCTRL_PSEL(x)** (((uint32_t)((uint32_t)(x)) << SYSCON_SYSPLLCTRL_PSEL_SHIFT)) & SYSCON_SYSPLLCTRL_PSEL_MASK
- #define **CLK_MAIN_CLK_MUX_GET_MUX(x)** ((uint32_t)(x) & 0xFFU)
- #define **CLK_MAIN_CLK_MUX_GET_PRE_MUX(x)** (((uint32_t)(x) >> 8U) & 0xFFU)
- #define **SYSCON_MAINCLKSEL_SEL_MASK** 0x03U
- #define **SYSCON_MAINCLKSEL_SEL_SHIFT** (0U)
- #define **SYSCON_MAINCLKSEL_SEL(x)** (((uint32_t)((uint32_t)(x)) << SYSCON_MAINCLKSEL_SEL_SHIFT)) & SYSCON_MAINCLKSEL_SEL_MASK
- #define **SYSCON_MAINCLKPLLSEL_SEL_MASK** (0x3U)
- #define **SYSCON_MAINCLKPLLSEL_SEL_SHIFT** (0U)
- #define **SYSCON_MAINCLKPLLSEL_SEL(x)** (((uint32_t)((uint32_t)(x)) << SYSCON_MAINCLKPLLSEL_SEL_SHIFT)) & SYSCON_MAINCLKPLLSEL_SEL_MASK
- #define **kCLOCK_MainClkSrcFro** 0
- #define **SYSCON_SYSAHBCLKDIV_DIV(x)** (((uint32_t)((uint32_t)(x)) << SYSCON_SYSAHBCLKDIV_DIV_SHIFT)) & SYSCON_SYSAHBCLKDIV_DIV_MASK
- #define **SYSCON_SYSAHBCLKDIV_DIV_MASK** 0xFFU
- #define **SYSCON_SYSAHBCLKDIV_DIV_SHIFT** (0U)

Functions

- void **BoardClockRUN** ()
: Runs clock at 30MHz
- void **ClockSetFroOscFREQ** (uint32_t freq)
- void **PowerDisablePD** (uint8_t en)
- void **CLOCK_SetFroOutClkSrc** (uint32_t src)
- void **CLOCK_Select** (uint8_t sel)
- void **CLOCK_InitSystemPII** (uint32_t freq, uint8_t src)
- uint32_t **CLOCK_GetSystemPLLInClockRate** (void)
- uint32_t **CLOCK_GetFroFreq** (void)
- uint32_t **FindSystemPIIPsel** (uint32_t outFreq)
- void **CLOCK_SetMainClkSrc** (uint32_t src)
- void **CLOCK_SetCoreSysClkDiv** (uint32_t value)

2.6.1 Detailed Description

: Firmware functions for SYSCON

:

Author

: Tobias Bavasso Piizzi

Date

: 04/01/2021

2.6.2 Function Documentation

2.6.2.1 BoardClockRUN()

```
void BoardClockRUN (
    void )
```

: Runs clock at 30MHz

: Select clock from fro

Author

: Tobias Bavasso Piizzi

Date

: 04/01/2021

Parameters

	[in] void
--	-----------

Returns

: void

Definition at line 19 of file SYSCON_FW.c.

```
19     {
20     PowerDisablePD (FRO_OUT_PowerDown);
21     PowerDisablePD (FRO_PD);
22     ClockSetFroOscFREQ (F30MHz);
23     CLOCK_SetFroOutClkSrc (kCLOCK_FroSrcFroOsc);
24     PowerDisablePD (kPDRUNCFG_PD_SYSOSC);
25     CLOCK_Select (CLK_FROM_SYS_OSC);
26     CLOCK_InitSystemPll (FREQ30MHz, CLK_SYS_PLLSRCFRODIV);
27     CLOCK_SetMainClkSrc (kCLOCK_MainClkSrcFro);
28     CLOCK_SetCoreSysClkDiv (1U);
29 }
```

2.7 inc/SysTick_FW.h File Reference

: Firmware functions for SysTick

Macros

- #define `TICK_OUT_1S` 100
Systick interrupt each 1 second.
- #define `SysTick_` ((__RW uint32_t *) 0xE000E000UL)
- #define `SYST_CSR` SysTick_[4]
- #define `SYST_RVR` SysTick_[5]
- #define `SYST_CVR` SysTick_[6]
- #define `SYST_CALIB` SysTick_[7]
- #define `SYSTICK_ENABLE_INTERRUPT_CLK` 0x07
- #define `SYSTICK_DISABLE` 0x00
- #define `FRE30MHz` 30000U

Functions

- void `SysTick_Init` (void)
: Initialize the systick
- void `SysTick_Off` (void)
: Stops the systick
- void `SysTick_Set` (uint32_t freq)
*: Set the counter as freq*10mS -1*

2.7.1 Detailed Description

: Firmware functions for SysTick

: Used for 30 MHz

Author

: Tobias Bavasso Piizzi

Date

: 04/01/2021

2.7.2 Function Documentation

2.7.2.1 SysTick_Init()

```
void SysTick_Init (
    void )
```

: Initialize the systick

: Enable SysTick, enable interrupt and set the counter

Author

: Tobias Bavasso Piizzi

Date

: 04/01/2021

Parameters

	[in] void
--	-----------

Returns

: void

Definition at line 19 of file SysTick_FW.c.

```
19      {  
20      SysTick_Set(FRE30MHz);  
21      SYST_CSR = SYSTICK_ENABLE_INTERRUPT_CLK;  
22      SYST_CVR = 0;  
23 }
```

2.7.2.2 SysTick_Off()

```
void SysTick_Off (  
    void )
```

: Stops the systick

: disable SysTick, disable interrupt

Author

: Tobias Bavasso Piizzi

Date

: 04/01/2021

Parameters

	[in] void
--	-----------

Returns

: void

Definition at line 34 of file SysTick_FW.c.

```
34      {  
35      SYST_CSR = SYSTICK_DISABLE;  
36 }
```

2.7.2.3 SysTick_Set()

```
void SysTick_Set (  
    uint32_t freq )
```

: Set the counter as $\text{freq} * 10\text{mS} - 1$

: Always use at 30MHz

Author

: Tobias Bavasso Piizzi

Date

: 04/01/2021

Parameters

[in]	uint32_t freq: FRE30MHz
------	-------------------------

Returns

: void

Definition at line 47 of file SysTick_FW.c.

```

47      {
48          SYST_RVR = freq*10 - 1; // 30MHz*10mS-1
49      }
```

2.8 source/03-Semaphore.c File Reference

: Entry point for the program

```
#include "Aplication.h"
```

Functions

- int [main](#) (void)
: *Main Function*

Variables

- uint32_t [tick](#) = 0
: *Var for SysTick_Handler.*

2.8.1 Detailed Description

: Entry point for the program

: Semaphore with 4 stages

Author

: Tobias Bavasso Piizzi

Date

: 05/01/2021

2.8.2 Function Documentation

2.8.2.1 main()

```
int main (
    void )
```

: Main Function

: initialize the system and stay in the while

Author

: Tobias Bavasso Piizzi

Date

: 05/01/2021

Parameters

[in] void

Returns

: int

< FSM in aplication.c

Definition at line 21 of file 03-Semaphore.c.

```
21 {
22     LPC_Init();
23     while(1) {
24         Semaphore();
25     }
26     return 0 ;
27 }
```

2.8.3 Variable Documentation

2.8.3.1 tick

```
uint32_t tick = 0
```

Var for SysTick_Handler.

Declared in main.

Definition at line 20 of file 03-Semaphore.c.

2.9 source/Aplication.c File Reference

: Functions used in main

```
#include "Aplication.h"
```

Functions

- void [LPC_Init](#) (void)
: Initialize the board
- void [GPIO_Init](#) (void)
: Initialize the GPIO
- void [Semaphore](#) (void)
: Control of the ligths

Variables

- uint32_t [tick](#)
Declared in main.

2.9.1 Detailed Description

: Functions used in main

:

Author

: Tobias Bavasso Piizzi

Date

: 04/01/2021

2.9.2 Function Documentation

2.9.2.1 GPIO_Init()

```
:void GPIO_Init (
        void )
```

: Initialize the GPIO

: It depends on each proyect

Author

: Tobias Bavasso Piizzi

Date

: 04/01/2021

Parameters

	[in] void
--	-----------

Returns

: void

Definition at line 35 of file Application.c.

```
35     {
36         /*
37         GPIO_SetDIR(LedRED, OUTPUT);
38         GPIO_SetDIR(LedGREEN, OUTPUT);
39         GPIO_SetDIR(LedBLUE, OUTPUT);
40         GPIO_SetDIR(UserKEY, INPUT);
41
42         GPIO_SetPIN(LedRED, LED_OFF);
43         GPIO_SetPIN(LedGREEN, LED_OFF);
44         GPIO_SetPIN(LedBLUE, LED_OFF);
45         */
46         GPIO_SetDIR(RED_LIGTH, OUTPUT);
47         GPIO_SetDIR(YELLOW_LIGTH, OUTPUT);
48         GPIO_SetDIR(GREEN_LIGTH, OUTPUT);
49
50         GPIO_SetPIN(RED_LIGTH, LOW);
51         GPIO_SetPIN(YELLOW_LIGTH, LOW);
52         GPIO_SetPIN(GREEN_LIGTH, LOW);
53     }
```

2.9.2.2 LPC_Init()

```
:void LPC_Init (
        void )
```

: Initialize the board

: It depends on each proyect

Author

: Tobias Bavasso Piizzi

Date

: 04/01/2021

Parameters

	[in] void
--	-----------

Returns

: void

Definition at line 19 of file Application.c.

```

19         {
20     GPIO_Enable();
21     BoardClockRUN();
22     SysTick_Init();
23     GPIO_Init();
24 }

```

2.9.2.3 Semaphore()

```

: void Semaphore (
    void )

```

: Control of the lights

: Finite state machine

Author

: Tobias Bavasso Piizzi

Date

: 04/01/2021

Parameters

	[in] void
--	-----------

Returns

: void

< Reset condition

< Reset condition

< Reset condition

Definition at line 65 of file Application.c.

```

65     {
66     static uint8_t state = RESET;
67     switch (state) {
68     case RESET:
69         GPIO_SetPIN(RED_LIGTH, LOW);
70         GPIO_SetPIN(YELLOW_LIGTH, LOW);
71         GPIO_SetPIN(GREEN_LIGTH, LOW);
72         tick = R_TICK;
73         GPIO_SetPIN(RED_LIGTH, HIGH);
74         state = R_STAGE;
75         break;
76     case R_STAGE:
77         if (tick == 0) {
78             tick = RY_TICK;
79             GPIO_SetPIN(YELLOW_LIGTH, HIGH);
80             state = RY_STAGE;
81         }
82         break;
83     case RY_STAGE:
84         if (tick == 0) {

```



```

85         tick = G_TICK;
86         GPIO_SetPIN(RED_LIGTH, LOW);
87         GPIO_SetPIN(YELLOW_LIGTH, LOW);
88         GPIO_SetPIN(GREEN_LIGTH, HIGH);
89         state = G_STAGE;
90     }
91     break;
92     case G_STAGE:
93         if (tick == 0) {
94             tick = Y_TICK;
95             GPIO_SetPIN(GREEN_LIGTH, LOW);
96             GPIO_SetPIN(YELLOW_LIGTH, HIGH);
97             state = Y_STAGE;
98         }
99         break;
100    case Y_STAGE:
101        if (tick == 0) {
102            tick = R_TICK;
103            GPIO_SetPIN(YELLOW_LIGTH, LOW);
104            GPIO_SetPIN(RED_LIGTH, HIGH);
105            state = R_STAGE;
106        }
107        break;
108    }
109 }
110
111 }

```

2.9.3 Variable Documentation

2.9.3.1 tick

uint32_t tick [extern]

Declared in main.

Declared in main.

Definition at line 20 of file 03-Semaphore.c.

2.10 source/GPIO_FW.c File Reference

: Firmware functions for GPIO

```
#include "Aplication.h"
```

Functions

- void [GPIO_Enable](#) (void)
: Enable GPIO0 and GPIO1
- void [GPIO_Disable](#) (void)
: Disable GPIO0 and GPIO1
- void [GPIO_SetDIR](#) (uint8_t port, uint8_t pin, uint8_t dir)
: Choose GPIO as Input/Output
- void [GPIO_SetPIN](#) (uint8_t port, uint8_t pin, uint8_t state)

- : Choose GPIO's output state*
- `uint8_t GPIO_GetPIN (uint8_t port, uint8_t pin, uint8_t state)`
- : Return GPIO's input state*
- `void GPIO_SetOUT (uint8_t port, uint8_t pin)`
- : Put GPIO's out to 1*
- `void GPIO_ClearOUT (uint8_t port, uint8_t pin)`
- : Put GPIO's out to 0*
- `void GPIO_ToogleOUT (uint8_t port, uint8_t pin)`
- : Invert GPIO's out*
- `void GPIO_DebounceUserKEY (void)`
- : Firmware debounce for user key in board*
- `void GPIO_Debounce (uint8_t port, uint8_t pin, uint8_t state)`
- : Firmware debounce for a GPIO*
- `void IOCONEnable (void)`
- : Enable IOCON*
- `void IOCONDisable (void)`
- : Disable IOCON*
- `uint8_t GetOFFSET (uint8_t port, uint8_t pin)`
- : Usefull for SetMode functions*
- `void GPIO_SetModeINPUT (uint8_t port, uint8_t pin, uint8_t mode)`
- : on-chip pull-up/pull-down resistor*
- `void GPIO_SetModeHYS (uint8_t port, uint8_t pin, uint8_t mode)`
- : Hysteresis*
- `void GPIO_SetModeINV (uint8_t port, uint8_t pin, uint8_t mode)`
- : Invert input*
- `void GPIO_SetModeOD (uint8_t port, uint8_t pin, uint8_t mode)`
- : Open drain*
- `void GPIO_SetModeFILTER (uint8_t port, uint8_t pin, uint8_t mode)`
- : Digital filter sample mode*
- `void GPIO_SetModeCLKDIV (uint8_t port, uint8_t pin, uint8_t mode)`
- : Select peripheral clock divider for input filter sampling clock*
- `void GPIO_SetModeDAC (uint8_t port, uint8_t pin, uint8_t mode)`
- : Selects DAC mode*
- `void GPIO_SetModeI2C (uint8_t port, uint8_t pin, uint8_t mode)`
- : Selects I2C mode*

Variables

- `__RW uint8_t buff_UserKEY = 0`
- `__RW uint8_t buff_In = 0`
- `uint8_t offset []`

2.10.1 Detailed Description

: Firmware functions for GPIO

:

Author

: Tobias Bavasso Piizzi

Date

: 04/01/2021

2.10.2 Function Documentation

2.10.2.1 GetOFFSET()

```
:uint8_t GetOFFSET (
    uint8_t port,
    uint8_t pin )
```

: Usefull for SetMode functions

:

Author

: Tobias Bavasso Piizzi

Date

: 04/01/2021

Parameters

[in] uint8_t port : PORT0,PORT1
[in] uint8_t pin : 0,31

Returns

: void

Definition at line 231 of file GPIO_FW.c.

```
231 {
232     uint8_t index;
233     index = port * 32 + pin;
234     return ((offset[index]) / 4);
235 }
```

2.10.2.2 GPIO_ClearOUT()

```
:void GPIO_ClearOUT (
    uint8_t port,
    uint8_t pin )
```

: Put GPIO's out to 0

:

Author

: Tobias Bavasso Piizzi

Date

: 04/01/2021

Parameters

	[in] uint8_t port : PORT0,PORT1
	[in] uint8_t pin : 0,31

Returns

: void

Definition at line 113 of file GPIO_FW.c.

```

113                                     {
114     GPIO_CLRP[port] |= (1 << pin);
115 }
```

2.10.2.3 GPIO_Debounce()

```

: void GPIO_Debounce (
    uint8_t port,
    uint8_t pin,
    uint8_t state )
```

: Firmware debounce for a GPIO

: Use in SysTick_Handler or in some timer interrupt

Author

: Tobias Bavasso Piizzi

Date

: 04/01/2021

Parameters

	[in] uint8_t port : PORT0,PORT1
	[in] uint8_t pin : 0,31
	[in] uint8_t state : ACT_LOW,ACT_HIGH

Returns

: void

Definition at line 169 of file GPIO_FW.c.

```

169                                     {
170     static uint8_t q = 0;    //Quantity of bounces
171     uint8_t j = 0;          //It captures changes
172
173     if (GPIO_GetPIN(port, pin, state))    // The key is pushed?
174         j = 0x01;                        //Something is happening, the key is been pushed
175 }
```

```

176     if (buff_In ^ j) {           // If the key is pushed while q != BOUNCE
177         q++;                     // I change the buffer
178         if (q == BOUNCE) {
179             q = 0;
180             buff_In ^= 0x01;
181         }
182     } else
183         q = 0;
184 }

```

2.10.2.4 GPIO_DebounceUserKEY()

```

: void GPIO_DebounceUserKEY (
    void )

```

: Firmware debounce for user key in board

: Use in SysTick_Handler or in some timer interrupt

Author

: Tobias Bavasso Piizzi

Date

: 04/01/2021

Parameters

	[in]
--	------

Returns

: void

Definition at line 141 of file GPIO_FW.c.

```

141     {
142         static uint8_t q = 0;    //Quantity of bounces
143         uint8_t j = 0;          //It captures changes
144
145         if (GPIO_GetPIN(UserKEY, ACT_LOW))    // The key is pushed?
146             j = 0x01;                        //Something is happening, the key is been pushed
147
148         if (buff_UserKEY ^ j) {               // If the key is pushed while q != BOUNCE
149             q++;                             // I change the buffer
150             if (q == BOUNCE) {
151                 q = 0;
152                 buff_UserKEY ^= 0x01;
153             }
154         } else
155             q = 0;
156     }

```

2.10.2.5 GPIO_Disable()

```
:void GPIO_Disable (
    void )
```

: Disable GPIO0 and GPIO1

:

Author

: Tobias Bavasso Piizzi

Date

: 04/01/2021

Parameters

	[in] void
--	-----------

Returns

: void

Definition at line 32 of file GPIO_FW.c.

```
32      {
33      SYSAHBCLKCTRL0&= (~ (1<<6));
34      SYSAHBCLKCTRL0 &= (~ (1<<20));
35 }
```

2.10.2.6 GPIO_Enable()

```
:void GPIO_Enable (
    void )
```

: Enable GPIO0 and GPIO1

:

Author

: Tobias Bavasso Piizzi

Date

: 04/01/2021

Parameters

	[in] void
--	-----------

Returns

: void

Definition at line 19 of file GPIO_FW.c.

```

19      {
20      SYSAHBCLKCTRL0|= (1<<6);
21      SYSAHBCLKCTRL0 |= (1<<20);
22  }
```

2.10.2.7 GPIO_GetPIN()

```

:uint8_t GPIO_GetPIN (
    uint8_t port,
    uint8_t pin,
    uint8_t dir )
```

: Return GPIO's input state

:

Author

: Tobias Bavasso Piizzi

Date

: 04/01/2021

Parameters

	[in] uint8_t port : PORT0,PORT1
	[in] uint8_t pin : 0,31
	[in] uint8_t STATE : ACT_LOW,ACT_HIGH

Returns

: uint8_t : 1 pin == [state] , 0 pin != [state]

Definition at line 81 of file GPIO_FW.c.

```

81      {
82      port = port * 32 + pin;
83      if ( GPIO_PBYTE[port] == state)
84          return 1;
85      else
86          return 0;
87  }
```

2.10.2.8 GPIO_SetDIR()

```
:void GPIO_SetDIR (
    uint8_t port,
    uint8_t pin,
    uint8_t dir )
```

: Choose GPIO as Input/Output

:

Author

: Tobias Bavasso Piizzi

Date

: 04/01/2021

Parameters

	[in] uint8_t port : PORT0,PORT1
	[in] uint8_t pin : 0,31
	[in] uint8_t dir : INPUT,OUTPUT

Returns

: void

Definition at line 48 of file GPIO_FW.c.

```
48
49     GPIO_DIRP[port] &= (~(1 « pin));
50     GPIO_DIRP[port] |= (dir « pin);
51 }
```

```
{
```

2.10.2.9 GPIO_SetModeCLKDIV()

```
:void GPIO_SetModeCLKDIV (
    uint8_t port,
    uint8_t pin,
    uint8_t mode )
```

: Select peripheral clock divider for input filter sampling clock

:

Author

: Tobias Bavasso Piizzi

Date

: 04/01/2021

Parameters

[in] uint8_t port: PORT0,PORT1 : [in] uint8_t pin: 0,31 : [in] uint8_t mode: IOCONCLKDIV0 to IOCONCLKDIV6

Returns

: void

Definition at line 338 of file GPIO_FW.c.

```

338                                     {
339     uint8_t offset;
340     offset = GetOFFSET(port, pin);
341     IOCON_[offset] &= (~ (0x07 « 13));
342     IOCON_[offset] |= (mode « 13);
343 }
```

2.10.2.10 GPIO_SetModeDAC()

```

: void GPIO_SetModeDAC (
    uint8_t port,
    uint8_t pin,
    uint8_t mode )
```

: Selects DAC mode

:

Author

: Tobias Bavasso Piizzi

Date

: 04/01/2021

Parameters

[in] uint8_t port: PORT0,PORT1 : [in] uint8_t pin: 0,31 : [in] uint8_t mode: DAC_EN,DAC_DIS

Returns

: void

Definition at line 356 of file GPIO_FW.c.

```

356                                     {
357     uint8_t offset;
358     offset = GetOFFSET(port, pin);
359     IOCON_[offset] &= (~ (0x01 « 16));
360     IOCON_[offset] |= (mode « 16);
361 }
```

2.10.2.11 GPIO_SetModeFILTER()

```
:void GPIO_SetModeFILTER (
    uint8_t port,
    uint8_t pin,
    uint8_t mode )
```

: Digital filter sample mode

:

Author

: Tobias Bavasso Piizzi

Date

: 04/01/2021

Parameters

[in] uint8_t port: PORT0,PORT1 : [in] uint8_t pin: 0,31 : [in] uint8_t mode: BYPASS_FILTER,CLK1_FILTER,CLK2_FILTER,CLK3_FILTER
--

Returns

: void

Definition at line 320 of file GPIO_FW.c.

```
320
321     uint8_t offset;
322     offset = GetOFFSET(port, pin);
323     IOCON[offset] &= (~ (0x03 « 11));
324     IOCON[offset] |= (mode « 11);
325 }
```

2.10.2.12 GPIO_SetModeHYS()

```
:void GPIO_SetModeHYS (
    uint8_t port,
    uint8_t pin,
    uint8_t mode )
```

: Hysteresis

:

Author

: Tobias Bavasso Piizzi

Date

: 04/01/2021

Parameters

[in] uint8_t port: PORT0,PORT1 : [in] uint8_t pin: 0,31 : [in] uint8_t mode:HYS_EN,HYS_DIS
--

Returns

: void

Definition at line 266 of file GPIO_FW.c.

```

266                                     {
267     uint8_t offset;
268     offset = GetOFFSET(port, pin);
269     IOCON_[offset] &= (~(0x01 « 5));
270     IOCON_[offset] |= (mode « 5);
271 }
```

2.10.2.13 GPIO_SetModeI2C()

```

: void GPIO_SetModeI2C (
    uint8_t port,
    uint8_t pin,
    uint8_t mode )
```

: Selects I2C mode

:

Author

: Tobias Bavasso Piizzi

Date

: 04/01/2021

Parameters

[in] uint8_t port: PORT0,PORT1 : [in] uint8_t pin: 0,31 : [in] uint8_t mode:STD_MODE,STD_GPIO,FAST_MODE

Returns

: void

Definition at line 374 of file GPIO_FW.c.

```

374                                     {
375     uint8_t offset;
376     offset = GetOFFSET(port, pin);
377     IOCON_[offset] &= (~(0x03 « 8));
378     IOCON_[offset] |= (mode « 8);
379 }
```

2.10.2.14 GPIO_SetModeINPUT()

```
:void GPIO_SetModeINPUT (
    uint8_t port,
    uint8_t pin,
    uint8_t mode )
```

: on-chip pull-up/pull-down resistor

:

Author

: Tobias Bavasso Piizzi

Date

: 04/01/2021

Parameters

	[in] uint8_t port: PORT0,PORT1 : [in] uint8_t pin: 0,31 : [in] uint8_t mode:NO_PULL_UP_DOWN,PULL_DOWN,PULL_UP,REPEATER
--	--

Returns

: void

Definition at line 248 of file GPIO_FW.c.

```
248
249     uint8_t offset;
250     offset = GetOFFSET(port, pin);
251     IOCON[offset] &= (~ (0x03 « 3));
252     IOCON[offset] |= (mode « 3);
253 }
```

2.10.2.15 GPIO_SetModeINV()

```
:void GPIO_SetModeINV (
    uint8_t port,
    uint8_t pin,
    uint8_t mode )
```

: Invert input

:

Author

: Tobias Bavasso Piizzi

Date

: 04/01/2021

Parameters

[in] uint8_t port: PORT0,PORT1 : [in] uint8_t pin: 0,31 : [in] uint8_t mode: INV_INPUT,NOT_INV_INPUT
--

Returns

: void

Definition at line 284 of file GPIO_FW.c.

```

284                                     {
285     uint8_t offset;
286     offset = GetOFFSET(port, pin);
287     IOCON_[offset] &= (~(0x01 « 6));
288     IOCON_[offset] |= (mode « 6);
289 }
```

2.10.2.16 GPIO_SetModeOD()

```

: void GPIO_SetModeOD (
    uint8_t port,
    uint8_t pin,
    uint8_t mode )
```

: Open drain

:

Author

: Tobias Bavasso Piizzi

Date

: 04/01/2021

Parameters

[in] uint8_t port: PORT0,PORT1 : [in] uint8_t pin: 0,31 : [in] uint8_t mode: OD_EN,OD_DIS

Returns

: void

Definition at line 302 of file GPIO_FW.c.

```

302                                     {
303     uint8_t offset;
304     offset = GetOFFSET(port, pin);
305     IOCON_[offset] &= (~(0x01 « 10));
306     IOCON_[offset] |= (mode « 10);
307 }
```

2.10.2.17 GPIO_SetOUT()

```
:void GPIO_SetOUT (
    uint8_t port,
    uint8_t pin )
```

: Put GPIO's out to 1

:

Author

: Tobias Bavasso Piizzi

Date

: 04/01/2021

Parameters

[in] uint8_t port : PORT0,PORT1
[in] uint8_t pin : 0,31

Returns

: void

Definition at line 99 of file GPIO_FW.c.

```
99
100     GPIO_SETP[port] |= (1 « pin);
101 }
```

2.10.2.18 GPIO_SetPIN()

```
:void GPIO_SetPIN (
    uint8_t port,
    uint8_t pin,
    uint8_t dir )
```

: Choose GPIO's output state

:

Author

: Tobias Bavasso Piizzi

Date

: 04/01/2021

Parameters

[in] uint8_t port : PORT0,PORT1
[in] uint8_t pin : 0,31
[in] uint8_t state : LOW,HIGH

Returns

: void

Definition at line 64 of file GPIO_FW.c.

```
64                                     {
65     port = port * 32 + pin;
66     GPIO_PBYTE[port] &= (~1);
67     GPIO_PBYTE[port] |= state;
68 }
```

2.10.2.19 GPIO_ToogleOUT()

```
:void GPIO_ToogleOUT (
    uint8_t port,
    uint8_t pin )
```

: Invert GPIO's out

:

Author

: Tobias Bavasso Piizzi

Date

: 04/01/2021

Parameters

[in] uint8_t port : PORT0,PORT1
[in] uint8_t pin : 0,31

Returns

: void

Definition at line 127 of file GPIO_FW.c.

```
127                                     {
128     GPIO_NOTP[port] |= (1 « pin);
129 }
```

2.10.2.20 IOCONDisable()

```
:void IOCONDisable (
    void )
```

: Disable IOCON

:

Author

: Tobias Bavasso Piizzi

Date

: 04/01/2021

Parameters

	[in]
--	------

Returns

: void

Definition at line 208 of file GPIO_FW.c.

```
208     {
209     SYSAHBCLKCTRL0&= (~ (1<<18));
210 }
```

2.10.2.21 IOCONEnable()

```
:void IOCONEnable (
    void )
```

: Enable IOCON

:

Author

: Tobias Bavasso Piizzi

Date

: 04/01/2021

Parameters

	[in]
--	------

Returns

: void

Definition at line 195 of file GPIO_FW.c.

```

195     {
196     SYSAHBCLKCTRL0|= (1<<18);
197 }

```

2.10.3 Variable Documentation

2.10.3.1 offset

uint8_t offset[]

Initial value:

```

= { 0x044, 0x02C, 0x018, 0x014, 0x010, 0x00C, 0x040, 0x03C,
    0x038, 0x034, 0x020, 0x01C, 0x008, 0x004, 0x048, 0x028, 0x024, 0x000,
    0x078, 0x074, 0x070, 0x06C, 0x068, 0x064, 0x060, 0x05C, 0x058, 0x054,
    0x050, 0x0C8, 0x0CC, 0x08C, 0x090, 0x094, 0x098, 0x0A4, 0x0A8, 0x0AC,
    0x0B8, 0x0C4, 0x07C, 0x080, 0x0DC, 0x0D8, 0x084, 0x088, 0x09C, 0x0A0,
    0x0B0, 0x0B4, 0x0BC, 0x0C0, 0x0D0, 0x0D4 }

```

Definition at line 214 of file GPIO_FW.c.

2.11 source/GPIO_SW.c File Reference

: Software functions for GPIO

```
#include "Aplication.h"
```

Functions

- uint8_t [GetUserKEY](#) (void)
: State of the user key in board
- uint8_t [GetInput](#) (void)
: State of the input

Variables

- uint8_t **buff_UserKEY**
- uint8_t **buff_In**

2.11.1 Detailed Description

: Software functions for GPIO

: These functions avoid bouncing. Both must be used w/ GPIO_DebounceUserKEY or GPIO_Debounce

Author

: Tobias Bavasso Piizzi

Date

: 04/01/2021

2.11.2 Function Documentation

2.11.2.1 GetInput()

```
:uint8_t GetInput (
    void )
```

: State of the input

: Is necessary using GPIO_Debounce

Author

: Tobias Bavasso Piizzi

Date

: 04/01/2021

Parameters

	[in] void
--	-----------

Returns

: uint8_t 1 if input pressed, 0 if input pressed

Definition at line 48 of file GPIO_SW.c.

```
48         {
49     static uint8_t buff_before = 0x00;
50
51     if ( buff_In == 0x01 && buff_before == 0x00 ){
52         buff_before = 0x01;
53         return (1);
54     }
```

```

55     else if ( buff_In == 0x01 && buff_before == 0x01 )
56         return (0);
57     else if ( buff_In == 0x00 && buff_before == 0x01 )
58         return (0);
59     else
60         return (0);
61 }

```

2.11.2.2 GetUserKEY()

```

:uint8_t GetUserKEY (
    void )

```

: State of the user key in board

: Is necessary using GPIO_DebounceUserKEY

Author

: Tobias Bavasso Piizzi

Date

: 04/01/2021

Parameters

	[in] void
--	-----------

Returns

: uint8_t 1 if user key pressed, 0 if user key not

Definition at line 21 of file GPIO_SW.c.

```

21     {
22         static uint8_t buff_before = 0x00;
23
24         if ( buff_UserKEY == 0x01 && buff_before == 0x00 ){
25             buff_before = 0x01;
26             return (1);
27         }
28         else if ( buff_UserKEY == 0x01 && buff_before == 0x01 )
29             return (0);
30         else if ( buff_UserKEY == 0x00 && buff_before == 0x01 ){
31             buff_before = 0x00;
32             return (0);
33         }
34         else
35             return (0);
36 }

```

2.12 source/mtb.c File Reference

MTB initialization file.

```
#include <cr_mtb_buffer.h>
```

Macros

- `#define __MTB_BUFFER_SIZE 128`

Functions

- `__CR_MTB_BUFFER (__MTB_BUFFER_SIZE)`

2.12.1 Detailed Description

MTB initialization file.

Symbols controlling behavior of this code... `__MTB_DISABLE` If this symbol is defined, then the buffer array for the MTB will not be created.

`__MTB_BUFFER_SIZE` Symbol specifying the size of the buffer array for the MTB. This must be a power of 2 in size, and fit into the available RAM. The MTB buffer will also be aligned to its 'size' boundary and be placed at the start of a RAM bank (which should ensure minimal or zero padding due to alignment).

`__MTB_RAM_BANK` Allows MTB Buffer to be placed into specific RAM bank. When this is not defined, the "default" (first if there are several) RAM bank is used.

2.13 source/SwitchMatrix_FW.c File Reference

: Firmware functions for SWM

```
#include "Aplication.h"
```

Functions

- void [SWM](#) (uint8_t port, uint8_t pin, uint8_t assign, uint8_t byte)
: *Assign movable functions for pin*
- void [SWM_PinEnable](#) (uint8_t port, uint8_t pin, uint8_t ena)
: *Enable pin works as value passed in ena*
- void [SWM_Enable](#) (void)
: *Enable SWM*
- void [SWM_Disable](#) (void)
: *Disable SWM*

2.13.1 Detailed Description

: Firmware functions for SWM

:

Author

: Tobias Bavasso Piizzi

Date

: 04/01/2021

2.13.2 Function Documentation

2.13.2.1 SWM()

```
:void SWM (  
    uint8_t port,  
    uint8_t pin,  
    uint8_t assign,  
    uint8_t byte )
```

: Assign movable functions for pin

:

Author

: Tobias Bavasso Piizzi

Date

: 04/01/2021

Parameters

	[in] uint8_t port : PORT0,PORT1
	[in] uint8_t pin : 0,31
	[in] uint8_t assign :
	[in] uint8_t byte : BYTE0,BYTE1,BYTE2,BYTE3

Returns

: void

Definition at line 22 of file SwitchMatrix_FW.c.

```
22  
23     pin = pin + 0x20 * port; //PIO0[0:31] 0x00 to 0x1F PIO1[0:21] 0x1F to 0x35  
24     PINASSIGN[assign] |= (pin << byte);  
25 }
```

2.13.2.2 SWM_Disable()

```
:void SWM_Disable (  
    void )
```

: Disable SWM

:

Author

: Tobias Bavasso Piizzi

Date

: 04/01/2021

Parameters

	[in] void
--	-----------

Returns

: void

Definition at line 67 of file SwitchMatrix_FW.c.

```
67      {  
68          SYSAHBCLKCTRL0&= (~ (1<<7));  
69      }
```

2.13.2.3 SWM_Enable()

```
:void SWM_Enable (  
    void )
```

: Enable SWM

:

Author

: Tobias Bavasso Piizzi

Date

: 04/01/2021

Parameters

	[in] void
--	-----------

Returns

: void

Definition at line 54 of file SwitchMatrix_FW.c.

```
54      {  
55          SYSAHBCLKCTRL0|= (1<<7);  
56      }
```

2.13.2.4 SWM_PinEnable()

```
:void SWM_PinEnable (
    uint8_t port,
    uint8_t pin,
    uint8_t ena )
```

: Enable pin works as value passed in ena

:

Author

: Tobias Bavasso Piizzi

Date

: 04/01/2021

Parameters

[in] uint8_t port	: PORT0,PORT1
[in] uint8_t pin	: 0,31
[in] uint8_t ena	: READ Page 143 UserManual. There are multiple choices

Returns

: void

Definition at line 38 of file SwitchMatrix_FW.c.

```
38                                     {
39     if (port == PORT1)               //PIENABLE[0] -> PIO0_0 .... PIO1_2
40         if (pin < 3)                 //PIENABLE10] -> PIO1_3 .... PIO1_21
41             port = PORT0;
42     PINENABLE[port] |= (1 << ena);
43 }
```

2.14 source/SYSCON_FW.c File Reference

: Firmware functions for SYSCON

```
#include "Aplication.h"
```

Functions

- void [BoardClockRUN](#) (void)
: Runs clock at 30MHz
- void [ClockSetFroOscFREQ](#) (uint32_t freq)
- void [PowerDisablePD](#) (uint8_t en)
- void [CLOCK_SetFroOutClkSrc](#) (uint32_t src)

- void **CLOCK_Select** (uint8_t sel)
- void **CLOCK_InitSystemPll** (uint32_t freq, uint8_t src)
- uint32_t **CLOCK_GetSystemPLLInClockRate** (void)
- uint32_t **CLOCK_GetFroFreq** (void)
- uint32_t **FindSyestemPIIPsel** (uint32_t outFreq)
- void **CLOCK_SetMainClkSrc** (uint32_t src)
- void **CLOCK_SetCoreSysClkDiv** (uint32_t value)

2.14.1 Detailed Description

: Firmware functions for SYSCON

: Only starts the board at 30MHz

Author

: Tobias Bavasso Piizzi

Date

: 04/01/2021

2.14.2 Function Documentation

2.14.2.1 BoardClockRUN()

```
:void BoardClockRUN (
    void )
```

: Runs clock at 30MHz

: Select clock from fro

Author

: Tobias Bavasso Piizzi

Date

: 04/01/2021

Parameters

	[in] void
--	-----------

Returns

: void

Definition at line 19 of file SYSCON_FW.c.

```

19      {
20      PowerDisablePD(FRO_OUT_PowerDown);
21      PowerDisablePD(FRO_PD);
22      ClockSetFroOscFREQ(F30MHz);
23      CLOCK_SetFroOutClkSrc(kCLOCK_FroSrcFroOsc);
24      PowerDisablePD(kPDRUNCFG_PD_SYOSC);
25      CLOCK_Select(CLK_FROM_SYS_OSC);
26      CLOCK_InitSystemPll(FREQ30MHz, CLK_SYS_PLLSRCFRODIV);
27      CLOCK_SetMainClkSrc(kCLOCK_MainClkSrcFro);
28      CLOCK_SetCoreSysClkDiv(1U);
29  }
```

2.15 source/SysTick_FW.c File Reference

: Firmware functions for SysTick

#include "Aplication.h"

Functions

- void [SysTick_Init](#) (void)
: Initialize the systick
- void [SysTick_Off](#) (void)
: Stops the systick
- void [SysTick_Set](#) (uint32_t freq)
: Set the counter as $freq * 10mS - 1$
- void [SysTick_Handler](#) (void)
: Interrupt each 10mS

Variables

- uint32_t [tick](#)
Declared in main.

2.15.1 Detailed Description

: Firmware functions for SysTick

: Only develop for 30MHz

Author

: Tobias Bavasso Piizzi

Date

: 04/01/2021

2.15.2 Function Documentation

2.15.2.1 SysTick_Handler()

```
:void SysTick_Handler (  
    void )
```

: Interrupt each 10mS

: when the tick is out i know that happend time = tick*10mS

Author

: Tobias Bavasso Piizzi

Date

: 04/01/2021

Parameters

	[in] void
--	-----------

Returns

: void

Definition at line 61 of file SysTick_FW.c.

```
62 {  
63  
64     if (tick != 0U)  
65         tick--;  
66  
67  
68 }
```

2.15.2.2 SysTick_Init()

```
:void SysTick_Init (  
    void )
```

: Initialize the systick

: Enable SysTick, enable interrupt and set the counter

Author

: Tobias Bavasso Piizzi

Date

: 04/01/2021

Parameters

	[in] void
--	-----------

Returns

: void

Definition at line 19 of file SysTick_FW.c.

```

19      {
20      SysTick_Set(FRE30MHz);
21      SYST_CSR = SYSTICK_ENABLE_INTERRUPT_CLK;
22      SYST_CVR = 0;
23  }
```

2.15.2.3 SysTick_Off()

```

: SysTick_Off (
        void )
```

: Stops the systick

: disable SysTick, disable interrupt

Author

: Tobias Bavasso Piizzi

Date

: 04/01/2021

Parameters

	[in] void
--	-----------

Returns

: void

Definition at line 34 of file SysTick_FW.c.

```

34      {
35      SYST_CSR = SYSTICK_DISABLE;
36  }
```

2.15.2.4 SysTick_Set()

```

: void SysTick_Set (
        uint32_t freq )
```

: Set the counter as $\text{freq} * 10\text{mS} - 1$

: Always use at 30MHz

Author

: Tobias Bavasso Piizzi

Date

: 04/01/2021

Parameters

	[in] uint32_t freq: FRE30MHz
--	------------------------------

Returns

: void

Definition at line 47 of file SysTick_FW.c.

```
47      {  
48          SYST_RVR = freq*10 - 1; // 30MHz*10mS-1  
49      }
```

2.15.3 Variable Documentation

2.15.3.1 tick

```
uint32_t tick [extern]
```

Declared in main.

Declared in main.

Definition at line 20 of file 03-Semaphore.c.

Index

03-Semaphore.c

main, [39](#)

tick, [39](#)

Aplication.c

GPIO_Init, [40](#)

LPC_Init, [41](#)

Semaphore, [42](#)

tick, [43](#)

Aplication.h

GPIO_Init, [4](#)

LPC_Init, [5](#)

Semaphore, [5](#)

BoardClockRUN

SYSCON_FW.c, [66](#)

SYSCON_FW.h, [35](#)

GetInput

GPIO_SW.c, [60](#)

GPIO_SW.h, [24](#)

GetOFFSET

GPIO_FW.c, [45](#)

GPIO_FW.h, [9](#)

GetUserKEY

GPIO_SW.c, [61](#)

GPIO_SW.h, [25](#)

GPIO_ClearOUT

GPIO_FW.c, [45](#)

GPIO_FW.h, [10](#)

GPIO_Debounce

GPIO_FW.c, [46](#)

GPIO_FW.h, [10](#)

GPIO_DebounceUserKEY

GPIO_FW.c, [47](#)

GPIO_FW.h, [11](#)

GPIO_Disable

GPIO_FW.c, [47](#)

GPIO_FW.h, [12](#)

GPIO_Enable

GPIO_FW.c, [48](#)

GPIO_FW.h, [13](#)

GPIO_FW.c

GetOFFSET, [45](#)

GPIO_ClearOUT, [45](#)

GPIO_Debounce, [46](#)

GPIO_DebounceUserKEY, [47](#)

GPIO_Disable, [47](#)

GPIO_Enable, [48](#)

GPIO_GetPIN, [49](#)

GPIO_SetDIR, [49](#)

GPIO_SetModeCLKDIV, [50](#)

GPIO_SetModeDAC, [51](#)

GPIO_SetModeFILTER, [51](#)

GPIO_SetModeHYS, [52](#)

GPIO_SetModel2C, [53](#)

GPIO_SetModeINPUT, [53](#)

GPIO_SetModeINV, [54](#)

GPIO_SetModeOD, [55](#)

GPIO_SetOUT, [55](#)

GPIO_SetPIN, [56](#)

GPIO_ToogleOUT, [57](#)

IOCONDisable, [57](#)

IOCONEnable, [58](#)

offset, [59](#)

GPIO_FW.h

GetOFFSET, [9](#)

GPIO_ClearOUT, [10](#)

GPIO_Debounce, [10](#)

GPIO_DebounceUserKEY, [11](#)

GPIO_Disable, [12](#)

GPIO_Enable, [13](#)

GPIO_GetPIN, [13](#)

GPIO_SetDIR, [14](#)

GPIO_SetModeCLKDIV, [15](#)

GPIO_SetModeDAC, [15](#)

GPIO_SetModeFILTER, [16](#)

GPIO_SetModeHYS, [17](#)

GPIO_SetModel2C, [17](#)

GPIO_SetModeINPUT, [18](#)

GPIO_SetModeINV, [19](#)

GPIO_SetModeOD, [19](#)

GPIO_SetOUT, [20](#)

GPIO_SetPIN, [21](#)

GPIO_ToogleOUT, [21](#)

IOCONDisable, [22](#)

IOCONEnable, [23](#)

GPIO_GetPIN

GPIO_FW.c, [49](#)

GPIO_FW.h, [13](#)

GPIO_Init

Aplication.c, [40](#)

Aplication.h, [4](#)

GPIO_SetDIR

GPIO_FW.c, [49](#)

GPIO_FW.h, [14](#)

GPIO_SetModeCLKDIV

GPIO_FW.c, [50](#)

GPIO_FW.h, [15](#)

- GPIO_SetModeDAC
 - GPIO_FW.c, [51](#)
 - GPIO_FW.h, [15](#)
- GPIO_SetModeFILTER
 - GPIO_FW.c, [51](#)
 - GPIO_FW.h, [16](#)
- GPIO_SetModeHYS
 - GPIO_FW.c, [52](#)
 - GPIO_FW.h, [17](#)
- GPIO_SetModeI2C
 - GPIO_FW.c, [53](#)
 - GPIO_FW.h, [17](#)
- GPIO_SetModeINPUT
 - GPIO_FW.c, [53](#)
 - GPIO_FW.h, [18](#)
- GPIO_SetModeINV
 - GPIO_FW.c, [54](#)
 - GPIO_FW.h, [19](#)
- GPIO_SetModeOD
 - GPIO_FW.c, [55](#)
 - GPIO_FW.h, [19](#)
- GPIO_SetOUT
 - GPIO_FW.c, [55](#)
 - GPIO_FW.h, [20](#)
- GPIO_SetPIN
 - GPIO_FW.c, [56](#)
 - GPIO_FW.h, [21](#)
- GPIO_SW.c
 - GetInput, [60](#)
 - GetUserKEY, [61](#)
- GPIO_SW.h
 - GetInput, [24](#)
 - GetUserKEY, [25](#)
- GPIO_ToogleOUT
 - GPIO_FW.c, [57](#)
 - GPIO_FW.h, [21](#)
- inc/Aplication.h, [3](#)
- inc/GPIO_FW.h, [7](#)
- inc/GPIO_SW.h, [23](#)
- inc/LPC845.h, [26](#)
- inc/SwitchMatrix_FW.h, [26](#)
- inc/SYSCON_FW.h, [32](#)
- inc/SysTick_FW.h, [36](#)
- IOCONDisable
 - GPIO_FW.c, [57](#)
 - GPIO_FW.h, [22](#)
- IOCONEnable
 - GPIO_FW.c, [58](#)
 - GPIO_FW.h, [23](#)
- LPC_Init
 - Aplication.c, [41](#)
 - Aplication.h, [5](#)
- main
 - 03-Semaphore.c, [39](#)
- offset
 - GPIO_FW.c, [59](#)
- Semaphore
 - Aplication.c, [42](#)
 - Aplication.h, [5](#)
 - source/03-Semaphore.c, [38](#)
 - source/Aplication.c, [40](#)
 - source/GPIO_FW.c, [43](#)
 - source/GPIO_SW.c, [59](#)
 - source/mtb.c, [61](#)
 - source/SwitchMatrix_FW.c, [62](#)
 - source/SYSCON_FW.c, [65](#)
 - source/SysTick_FW.c, [67](#)
 - SwitchMatrix_FW.c
 - SWM, [63](#)
 - SWM_Disable, [63](#)
 - SWM_Enable, [64](#)
 - SWM_PinEnable, [64](#)
 - SwitchMatrix_FW.h
 - SWM, [29](#)
 - SWM_Disable, [30](#)
 - SWM_Enable, [31](#)
 - SWM_PinEnable, [31](#)
 - U0_RXD, [28](#)
 - U0_CTS, [29](#)
 - U0_RTS, [29](#)
 - U0_TXD, [28](#)
- SWM
 - SwitchMatrix_FW.c, [63](#)
 - SwitchMatrix_FW.h, [29](#)
- SWM_Disable
 - SwitchMatrix_FW.c, [63](#)
 - SwitchMatrix_FW.h, [30](#)
- SWM_Enable
 - SwitchMatrix_FW.c, [64](#)
 - SwitchMatrix_FW.h, [31](#)
- SWM_PinEnable
 - SwitchMatrix_FW.c, [64](#)
 - SwitchMatrix_FW.h, [31](#)
- SYSCON_FW.c
 - BoardClockRUN, [66](#)
- SYSCON_FW.h
 - BoardClockRUN, [35](#)
- SysTick_FW.c
 - SysTick_Handler, [68](#)
 - SysTick_Init, [68](#)
 - SysTick_Off, [69](#)
 - SysTick_Set, [69](#)
 - tick, [70](#)
- SysTick_FW.h
 - SysTick_Init, [36](#)
 - SysTick_Off, [37](#)
 - SysTick_Set, [37](#)
- SysTick_Handler
 - SysTick_FW.c, [68](#)
- SysTick_Init
 - SysTick_FW.c, [68](#)
 - SysTick_FW.h, [36](#)
- SysTick_Off

- [SysTick_FW.c](#), [69](#)
 - [SysTick_FW.h](#), [37](#)
- [SysTick_Set](#)
 - [SysTick_FW.c](#), [69](#)
 - [SysTick_FW.h](#), [37](#)
- [tick](#)
 - [03-Semaphore.c](#), [39](#)
 - [Aplication.c](#), [43](#)
 - [SysTick_FW.c](#), [70](#)
- [U0_RXD](#)
 - [SwitchMatrix_FW.h](#), [28](#)
- [U0_CTS](#)
 - [SwitchMatrix_FW.h](#), [29](#)
- [U0_RTS](#)
 - [SwitchMatrix_FW.h](#), [29](#)
- [U0_TXD](#)
 - [SwitchMatrix_FW.h](#), [28](#)