

Project 2

Smart Home

Layers Report

Group 1

Layers Structure

**MCAL Drivers**

ADC Driver

Type Definitions

|  |  |
| --- | --- |
| Name | ADC\_Channel |
| Type | Enum |
| Values | AN0 |
| AN1 |
| AN2 |
| AN3 |
| AN4 |
| AN5 |
| AN6 |
| AN7 |
| AN8 |
| AN9 |
| AN10 |
| AN11 |

Function Definitions

|  |  |  |
| --- | --- | --- |
| Name | ADC\_init | |
| Input | ADC\_Channel | Channel |
| Return | void | |
| Description | Initialization of the ADC selected by the ADC\_Channel | |

|  |  |  |
| --- | --- | --- |
| Name | ADC\_read | |
| Input | ADC\_Channel | Channel |
| Return | uint16 | |
| Description | Returns value read by the selected ADC Channel. | |

DIO Driver

Type Definitions

|  |  |
| --- | --- |
| Name | Dio\_LevelType |
| Type | Enum |
| Values | STD\_LOW |
| STD\_HIGH |

|  |  |
| --- | --- |
| Name | Dio\_PinDirectionType |
| Type | Enum |
| Values | DIO\_PIN\_IN |
| DIO\_PIN\_OUT |

|  |  |
| --- | --- |
| Name | Dio\_PortName |
| Type | Enum |
| Values | PORTA |
| PORTB |
| PORTC |
| PORTD |
| PORTE |
| PORTF |

|  |  |
| --- | --- |
| Name | Dio\_IntType |
| Type | Enum |
| Values | FALLING\_EDGE |
| RISING\_EDGE |
| BOTH\_EDGES |
| LOW\_LEVEL |
| HIGH\_LEVEL |

Function Definitions

|  |  |  |
| --- | --- | --- |
| Name | DIO\_Init | |
| Input | Dio\_PortName | port\_name |
| uint8 | pins\_mask |
| Return | void | |
| Description | Connect the clock to the required port and configure it as digital I/O | |

|  |  |  |
| --- | --- | --- |
| Name | DIO\_SetPinDirection | |
| Input | Dio\_PortName | port\_name |
| uint8 | pins\_mask |
| Dio\_PinDirectionType | pins\_direction |
| Return | void | |
| Description | Set required pins as inputs or outputs. | |

|  |  |  |
| --- | --- | --- |
| Name | DIO\_SetPinPullUp | |
| Input | Dio\_PortName | port\_name |
| uint8 | pins\_mask |
| Return | Void | |
| Description | Set internal pull up resistor of required pins | |

|  |  |  |
| --- | --- | --- |
| Name | DIO\_SetPinPullDown | |
| Input | Dio\_PortName | port\_name |
| uint8 | pins\_mask |
| Return | Void | |
| Description | Set internal pull down resistor of required pins | |

|  |  |  |
| --- | --- | --- |
| Name | DIO\_ReadPort | |
| Input | Dio\_PortName | port\_name |
| uint8 | pins\_mask |
| Return | uint8 | |
| Description | Return value of the pins selected by pins\_mask in the port selected by port\_name | |

|  |  |  |
| --- | --- | --- |
| Name | DIO\_WritePort | |
| Input | Dio\_PortName | port\_name |
| uint8 | pins\_mask |
| Dio\_LevelType | pins\_level |
| Return | void | |
| Description | Change pins selected by pins\_mask in the port selected by port\_name to the value pins\_level | |

|  |  |  |
| --- | --- | --- |
| Name | DIO\_FlipPort | |
| Input | Dio\_PortName | port\_name |
| uint8 | pins\_mask |
| Return | void | |
| Description | Toggle value of the pins selected by pins\_mask in the port selected by port\_name | |

|  |  |  |
| --- | --- | --- |
| Name | DIO\_EnableExtInt | |
| Input | Dio\_PortName | port\_name |
| uint8 | pins\_mask |
| Dio\_IntType | int\_source |
| Return | void | |
| Description | Enable external interrupt for required pins based on interrupt source | |

PWM Driver

Type Definitions

|  |  |
| --- | --- |
| Name | PWMChannel |
| Type | Enum |
| Values | PWM0 |
| PWM1 |
| PWM2 |
| PWM3 |
| PWM4 |
| PWM5 |
| PWM6 |
| PWM7 |

|  |  |
| --- | --- |
| Name | PWMModule |
| Type | Enum |
| Values | PWMModule0 |
| PWMModule1 |

Function Definitions

|  |  |  |
| --- | --- | --- |
| Name | PWM\_Init | |
| Input | PWMModule | module |
| PWMChannel | channel |
| uint16 | period |
| uint16 | duty |
| Return | void | |
| Description | Initialize PWM channel selected by the “channel” parameter  And determine the period and duty cycle. | |

|  |  |  |
| --- | --- | --- |
| Name | PWM\_SetDuty | |
| Input | PWMModule | module |
| PWMChannel | channel |
| uint16 | duty |
| Return | void | |
| Description | Sets the duty cycle of the selected PWM channel. | |

UART Driver

Type Definitions

|  |  |
| --- | --- |
| Name | UARTNUM |
| Type | enum |
| Values | uart0 |
| uart1 |
| uart2 |
| uart3 |
| uart4 |
| uart5 |
| uart6 |
| uart7 |

|  |  |
| --- | --- |
| Name | PARITY |
| Type | enum |
| Values | Parity\_OFF |
| Parity\_ON |

|  |  |
| --- | --- |
| Name | INTERRUPT |
| Type | enum |
| Values | Interrupt\_OFF |
| Interrupt\_ON |

Function Definitions

|  |  |  |
| --- | --- | --- |
| Name | UART\_Init | |
| Input | UARTNUM | UartNum |
| uint32 | BaudRate |
| PARITY | Parity |
| INTERRUPT | interrupt |
| Return | void | |
| Description | Initializes selected UART.  Enables priority and sets the clock. | |

|  |  |  |
| --- | --- | --- |
| Name | UART\_Available | |
| Input | UARTNUM | UartNum |
| Return | unit8 | |
| Description | Checks if receive FIFO is empty or not. | |

|  |  |  |
| --- | --- | --- |
| Name | UART\_Read | |
| Input | UARTNUM | UartNum |
| Return | unit8 | |
| Description | Reads the value received to the selected UART | |

|  |  |  |
| --- | --- | --- |
| Name | UART\_Write | |
| Input | UARTNUM | UartNum |
| uint8 | data |
| Return | void | |
| Description | Sends the value to selected UART. | |

|  |  |  |
| --- | --- | --- |
| Name | UART\_Print | |
| Input | UARTNUM | UartNum |
| Pointer to const char | Str |
| Return | void | |
| Description | Sends String to selected UART. | |

**ECUAL Drivers**

Button Driver

Type Definitions

|  |  |
| --- | --- |
| Name | InputMode |
| Type | Enum |
| Values | PULL\_DOWN |
| PULL\_UP |

Function Definitions

|  |  |  |
| --- | --- | --- |
| Name | Button\_Init | |
| Input | Dio\_PortName | port\_name |
| uint8 | pins\_mask |
| InputMode | mode |
| Return | void | |
| Description | Initialized the port selected by port\_name and set the direction of selected pins by pins\_mask to input then set internal pull up/down resistor of selected pins based on selected mode | |

|  |  |  |
| --- | --- | --- |
| Name | Button\_ActOnPressing | |
| Input | Dio\_PortName | port\_name |
| uint8 | pin\_Number |
| Pointer to void Function | pAction |
| Return | void | |
| Description | Read pin number of the button selected by pin\_Number from port selected by port\_name and take required action selected by pAction pointer to function when button is pressed. | |

|  |  |  |
| --- | --- | --- |
| Name | Button\_ActOnReleasing | |
| Input | Dio\_PortName | port\_name |
| uint8 | pin\_Number |
| Pointer to void Function | pAction |
| Return | void | |
| Description | Read pin number of the button selected by pin\_Number from port selected by port\_name and take required action selected by pAction pointer to function when button is released. | |

|  |  |  |
| --- | --- | --- |
| Name | Button\_ActOnHighLevel | |
| Input | Dio\_PortName | port\_name |
| uint8 | pin\_Number |
| Pointer to void Function | pAction |
| Return | void | |
| Description | Read pin number of the button selected by pin\_Number from port selected by port\_name and take required action selected by pAction pointer to function while button is on high level state | |

|  |  |  |
| --- | --- | --- |
| Name | Button\_ActOnLowLevel | |
| Input | Dio\_PortName | port\_name |
| uint8 | pin\_Number |
| Pointer to void Function | \*pAction |
| Return | void | |
| Description | Read pin number of the button selected by pin\_Number from port selected by port\_name and take required action selected by pAction pointer to function while button is on low level state | |

LCD Driver

Function Definitions

|  |  |  |
| --- | --- | --- |
| Name | LCD\_sendCommand | |
| Input | uint8 | command |
| Return | void | |
| Description | Send commands to LCD. | |

|  |  |  |
| --- | --- | --- |
| Name | LCD\_displayCharacter | |
| Input | uint8 | data |
| Return | void | |
| Description | Prints Characters sent to LCD | |

|  |  |  |
| --- | --- | --- |
| Name | LCD\_displayString | |
| Input | Pointer to const char | Str |
| Return | void | |
| Description | Calls LCD\_displayCharacter to print Strings sent to LCD. | |

|  |  |
| --- | --- |
| Name | LCD\_init |
| Input | void |
| Return | void |
| Description | Initialize the LCD to work on selected ports in LCD.h file. |

|  |  |
| --- | --- |
| Name | LCD\_clearScreen |
| Input | void |
| Return | void |
| Description | Clear the displayed data on the LCD. |

|  |  |  |
| --- | --- | --- |
| Name | LCD\_displayStringRowColumn | |
| Input | uint8 | row |
| uint8 | col |
| Pointer to const char | Str |
| Return | void | |
| Description | Prints string starting from the selected row and column. | |

|  |  |  |
| --- | --- | --- |
| Name | LCD\_goToRowColumn | |
| Input | uint8 | row |
| uint8 | col |
| Return | void | |
| Description | Makes the cursor points to the selected row and column. | |

|  |  |  |
| --- | --- | --- |
| Name | LCD\_intgerToString | |
| Input | int | data |
| Return | void | |
| Description | Converts integer data to string then displays it on the LCD using LCD\_displayString | |

|  |  |  |
| --- | --- | --- |
| Name | LCD\_displayCharacter4bit | |
| Input | uint8 | data |
| Return | void | |
| Description | An helping function that Prints a 4 bit Character to LCD to be used in display character function in 4 bit mode | |

|  |  |  |
| --- | --- | --- |
| Name | LCD\_sendCommand4bit | |
| Input | uint8 | command |
| Return | void | |
| Description | An helping function that Prints a 4 bit command to LCD to be used in send command function in 4 bit mode. | |

RGB LED Driver

Type Definitions

|  |  |  |
| --- | --- | --- |
| Name | LED\_RGB\_Color | |
| Type | Enum | |
| Values | dark | 0x00 |
| red | 0x02 |
| blue | 0x04 |
| pink | 0x06 |
| Green | 0x08 |
| Yellow | 0x0A |
| Sky | 0x0C |
| White | 0x0E |

Function Definitions

|  |  |
| --- | --- |
| Name | RGB\_LED\_Init |
| Input | Void |
| Return | Void |
| Description | Initializes the internal RGB LED of the board. |

|  |  |  |
| --- | --- | --- |
| Name | RGB\_LED\_Set\_Color | |
| Input | LED\_RGB\_Color | color |
| Return | Void | |
| Description | Sets the color of RGB LED. | |

|  |  |
| --- | --- |
| Name | RED\_LED\_PWM\_Init |
| Input | void |
| Return | void |
| Description | Initializes PWM of red LED |

|  |  |
| --- | --- |
| Name | GREEN\_LED\_PWM\_Init |
| Input | void |
| Return | void |
| Description | Initializes PWM of green LED |

|  |  |
| --- | --- |
| Name | BLUE\_LED\_PWM\_Init |
| Input | void |
| Return | void |
| Description | Initializes PWM of blue LED |

|  |  |  |
| --- | --- | --- |
| Name | RED\_LED\_Set\_Intensity | |
| Input | uint16 | Intensity |
| Return | void | |
| Description | Sets the intensity of the red LED. | |

|  |  |  |
| --- | --- | --- |
| Name | GREEN\_LED\_Set\_Intensity | |
| Input | uint16 | Intensity |
| Return | void | |
| Description | Sets the intensity of the green LED. | |

|  |  |  |
| --- | --- | --- |
| Name | BLUE\_LED\_Set\_Intensity | |
| Input | uint16 | Intensity |
| Return | void | |
| Description | Sets the intensity of the blue LED. | |

Stepper Motor Driver

Function Definitions

|  |  |  |
| --- | --- | --- |
| Name | StepperMotor\_Init | |
| Input | Void |  |
| Return | Void | |
| Description | Initializes Stepper Motor to work on the selected port. | |

|  |  |  |
| --- | --- | --- |
| Name | StepperMotor\_ClkWise | |
| Input | Float32 | cycle |
| Return | void | |
| Description | Change the values of the selected pins in the selected port to rotate the stepper motor in CW direction | |

|  |  |  |
| --- | --- | --- |
| Name | StepperMotor\_AntiClkWise | |
| Input | Float32 | cycle |
| Return | Void | |
| Description | Change the values of the selected pins in the selected port to rotate the stepper motor in CCW direction | |

|  |  |
| --- | --- |
| Name | StepperMotor\_Stop |
| Input | void |
| Return | void |
| Description | Stops the Stepper Motor |

Temperature Sensor Driver

Function Definitions

|  |  |  |
| --- | --- | --- |
| Name | LM35TS\_init | |
| Input | ADC\_Channel | Channel |
| Return | void | |
| Description | Initializes ADC Channel to be connected to External Temperature Sensor. | |

|  |  |  |
| --- | --- | --- |
| Name | LM35TS\_read | |
| Input | ADC\_Channel | Channel |
| Return | uint16 | |
| Description | Read the value measured by the external temperature sensor. | |

|  |  |  |
| --- | --- | --- |
| Name | InternalTempSensor\_read | |
| Input | Void |  |
| Return | Uint16 | |
| Description | Reads the measured temperature of the internal temperature sensor. | |

Servo Driver

Function Definitions

|  |  |  |
| --- | --- | --- |
| Name | Servo\_Init | |
| Input | PWMModule | module |
| PWMChannel | channel |
| uint16 | initial\_angle |
| Return | void | |
| Description | Initializes the PWM of Servo Motor. | |

|  |  |  |
| --- | --- | --- |
| Name | Servo\_SetDegree | |
| Input | PWMModule | module |
| PWMChannel | channel |
| uint16 | angle |
| Return | void | |
| Description | Sets the angle of Servo Motor | |