

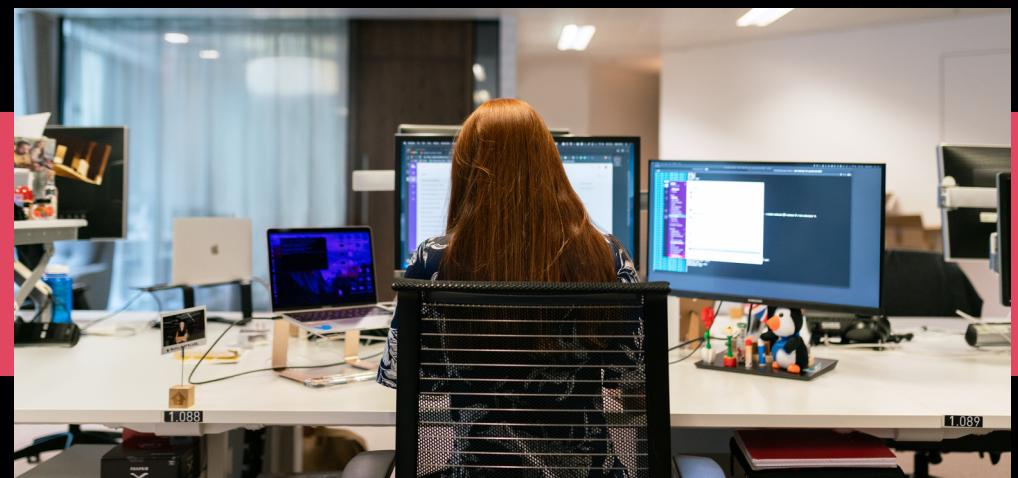
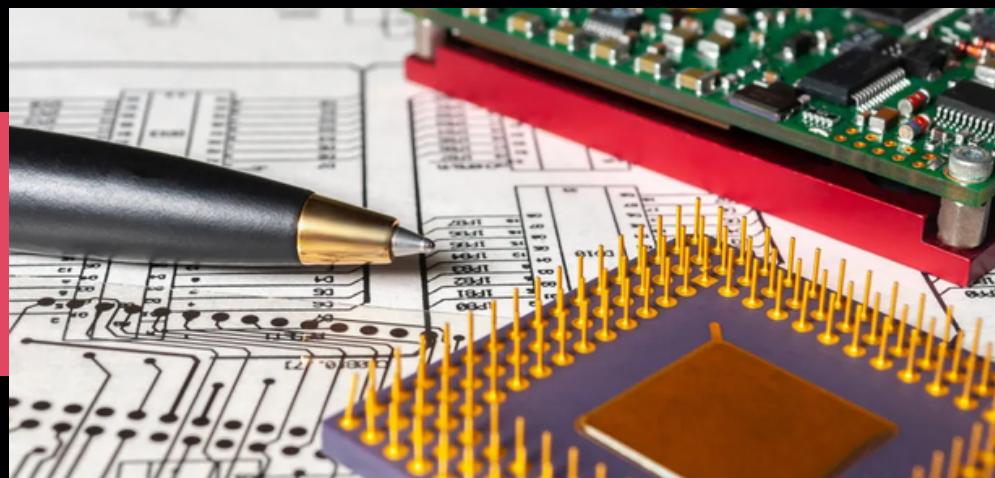
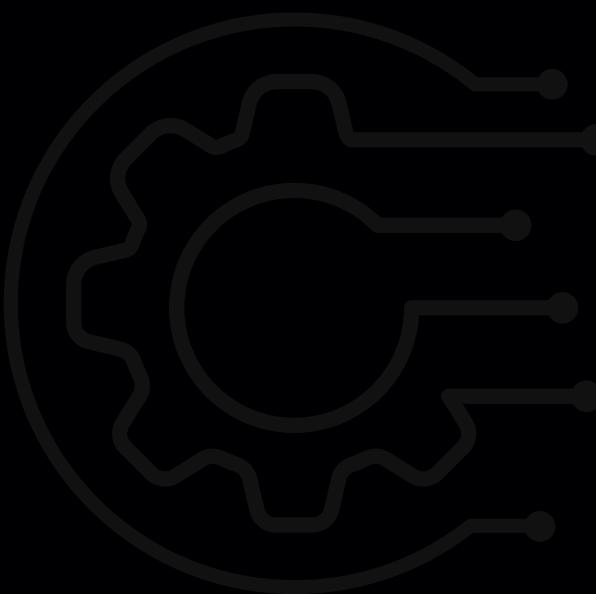
# INC 272

CAPSTONE PROJECT

# SYSTEM OVERVIEW



# INTRODUCTION



## Sensor simulation to embedded system

Using Proteus, reading a sensor and sending the value to an embedded system

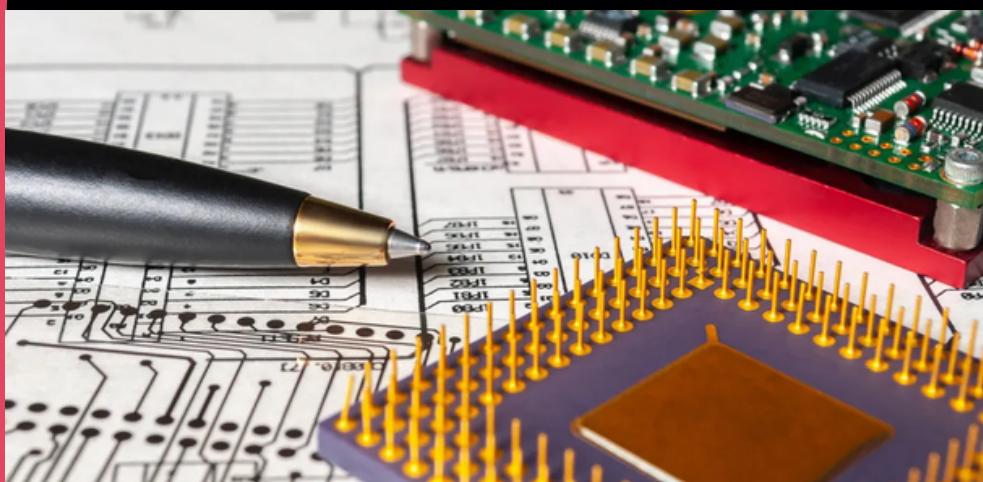
## Programming

Coding for Monitoring and Control in Embedded Systems

## IoT Dashboard Program

Utilizing an IoT dashboard to control and monitor a device

# INTRODUCTION



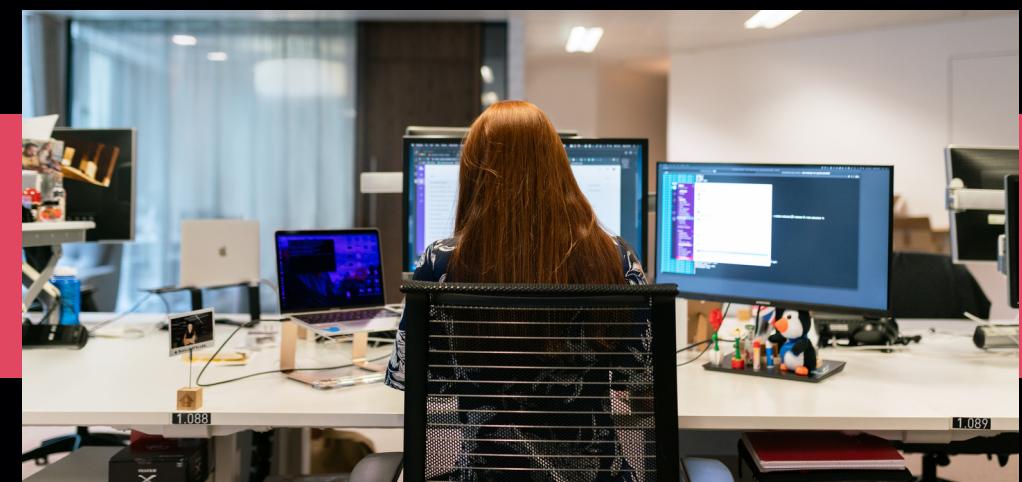
## Sensor simulation to embedded system

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## Programming

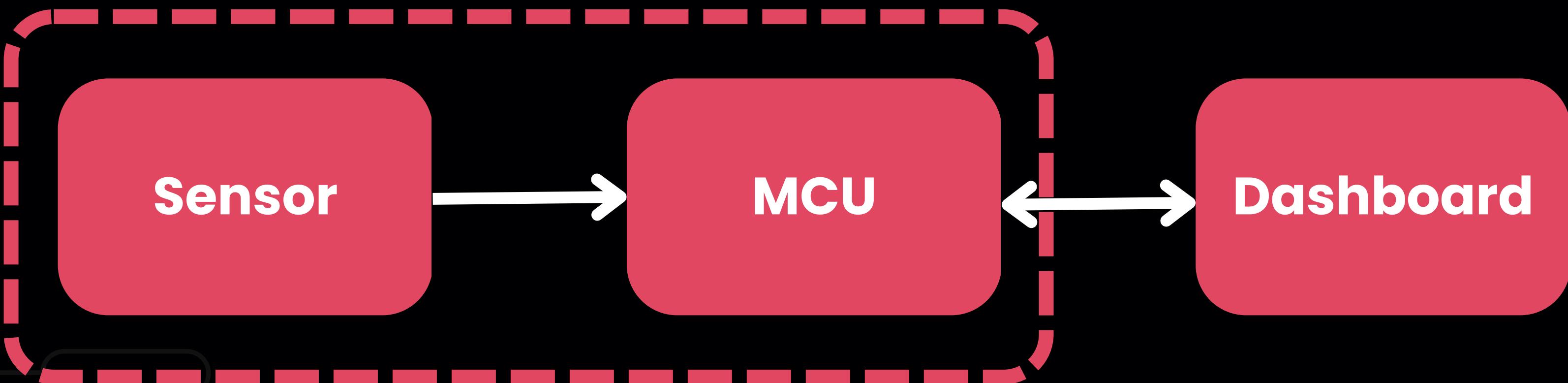
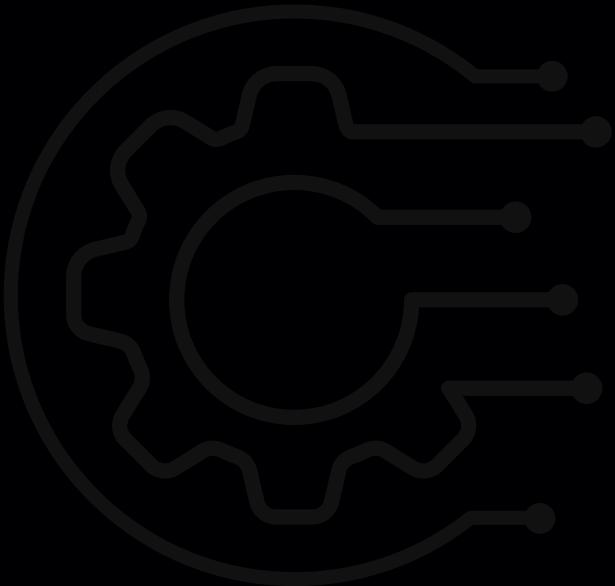
Coding for Monitoring and Control in Embedded Systems



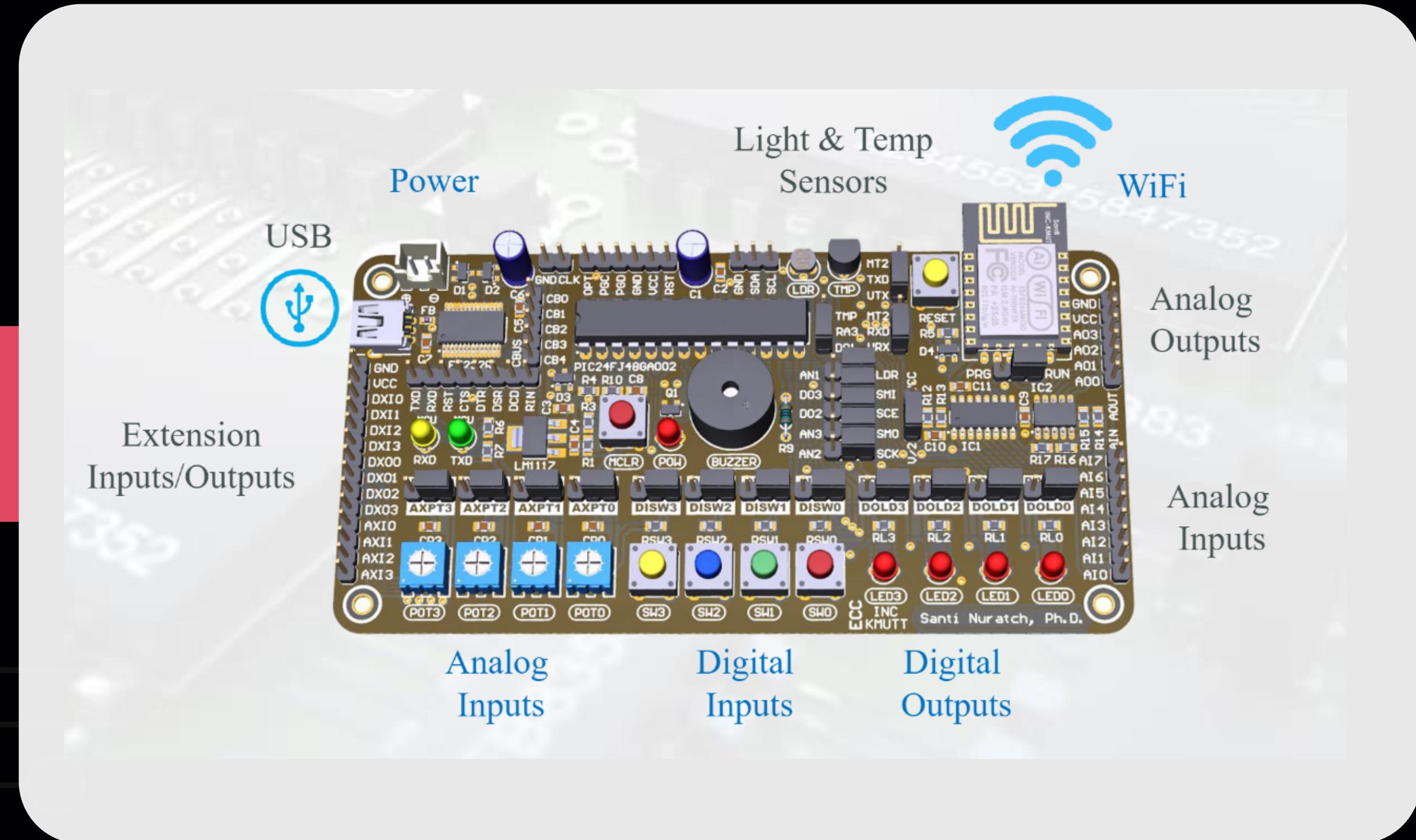
## IoT Dashboard Program

Utilizing an IoT dashboard to control and monitor a device

# SYSTEM OVERVIEW

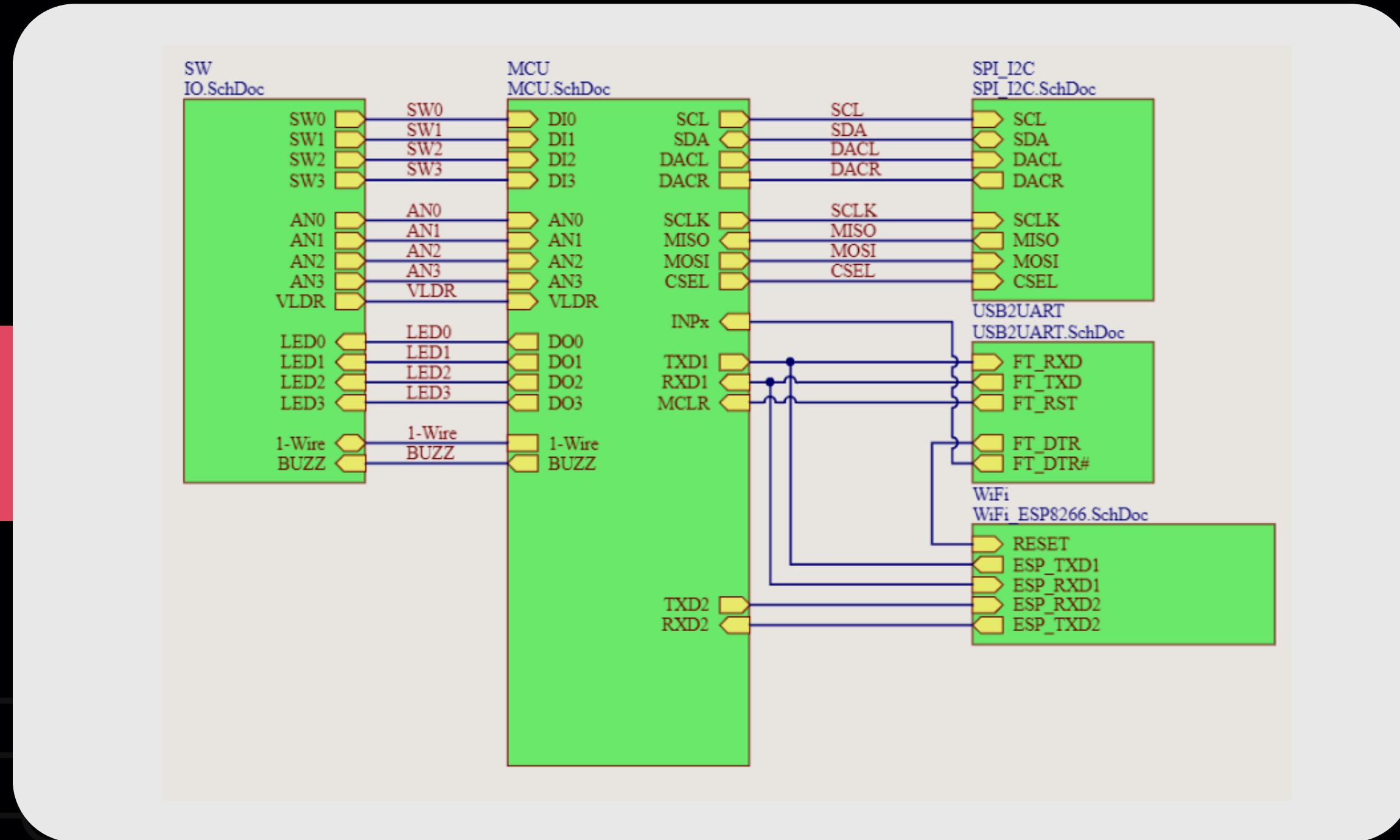


# EMBEDDED BOARD



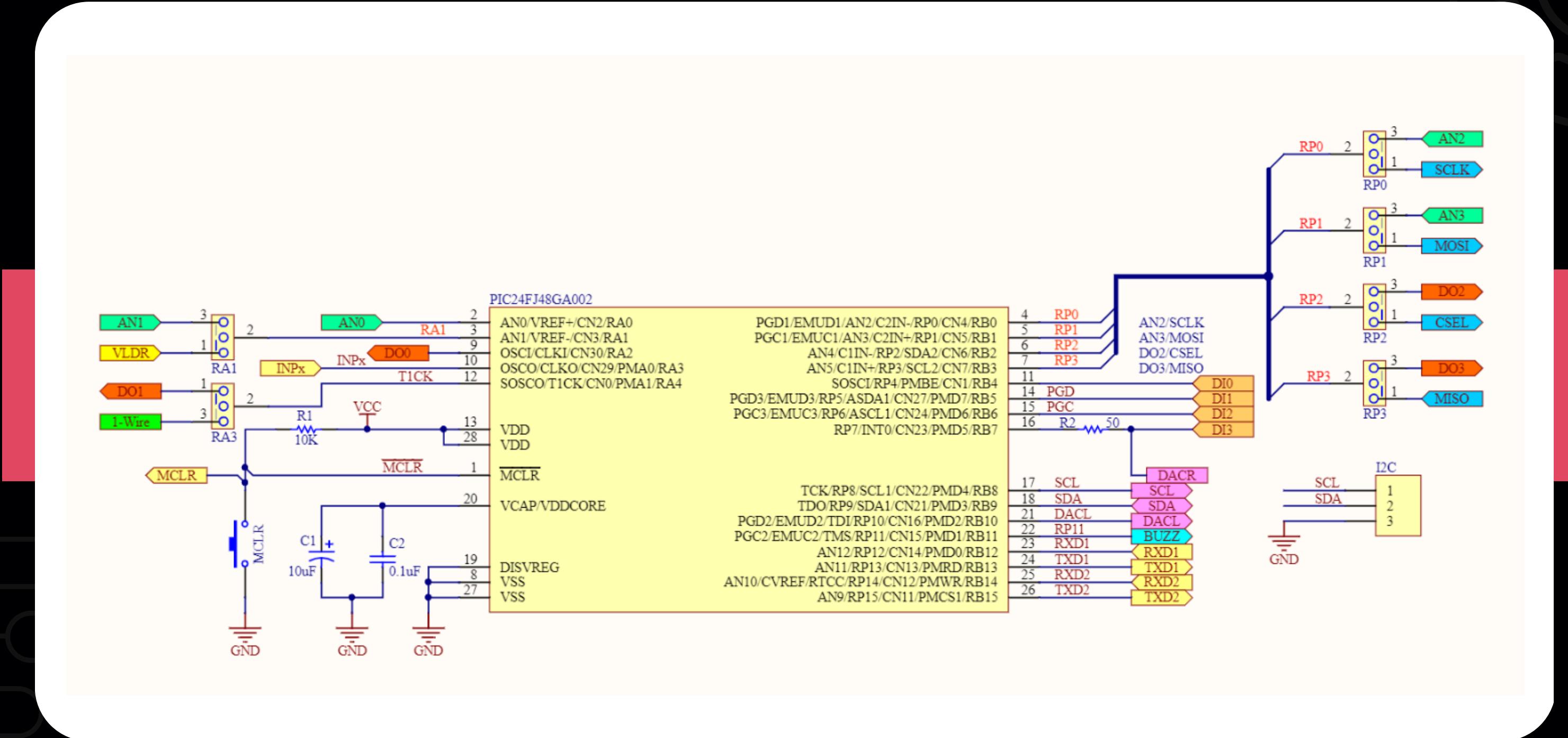
## PCB Board

# EMBEDDED BOARD



Pins layout

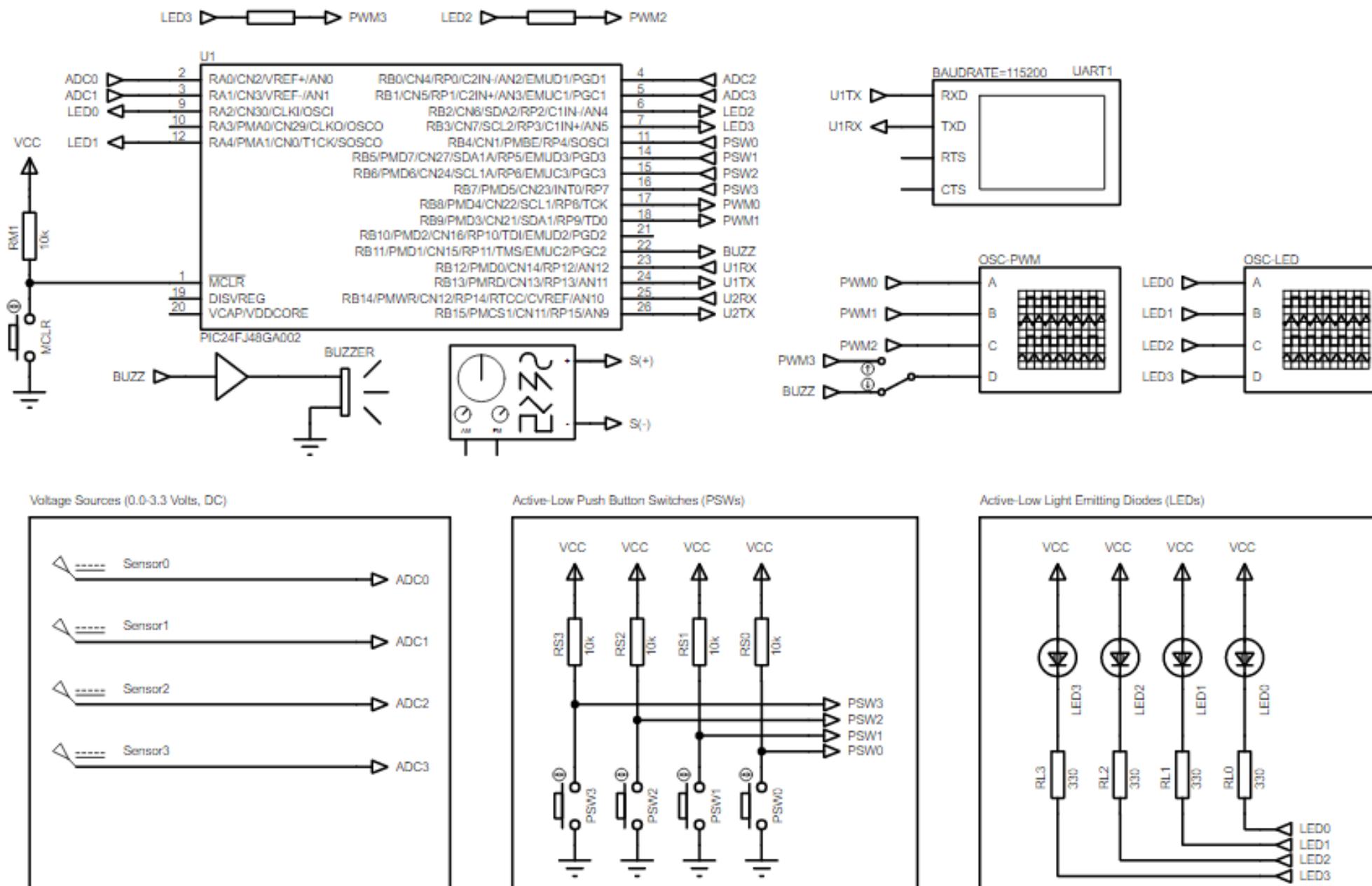
# EMBEDDED BOARD



Pins layout

# SIMULATION EMBEDDED BOARD

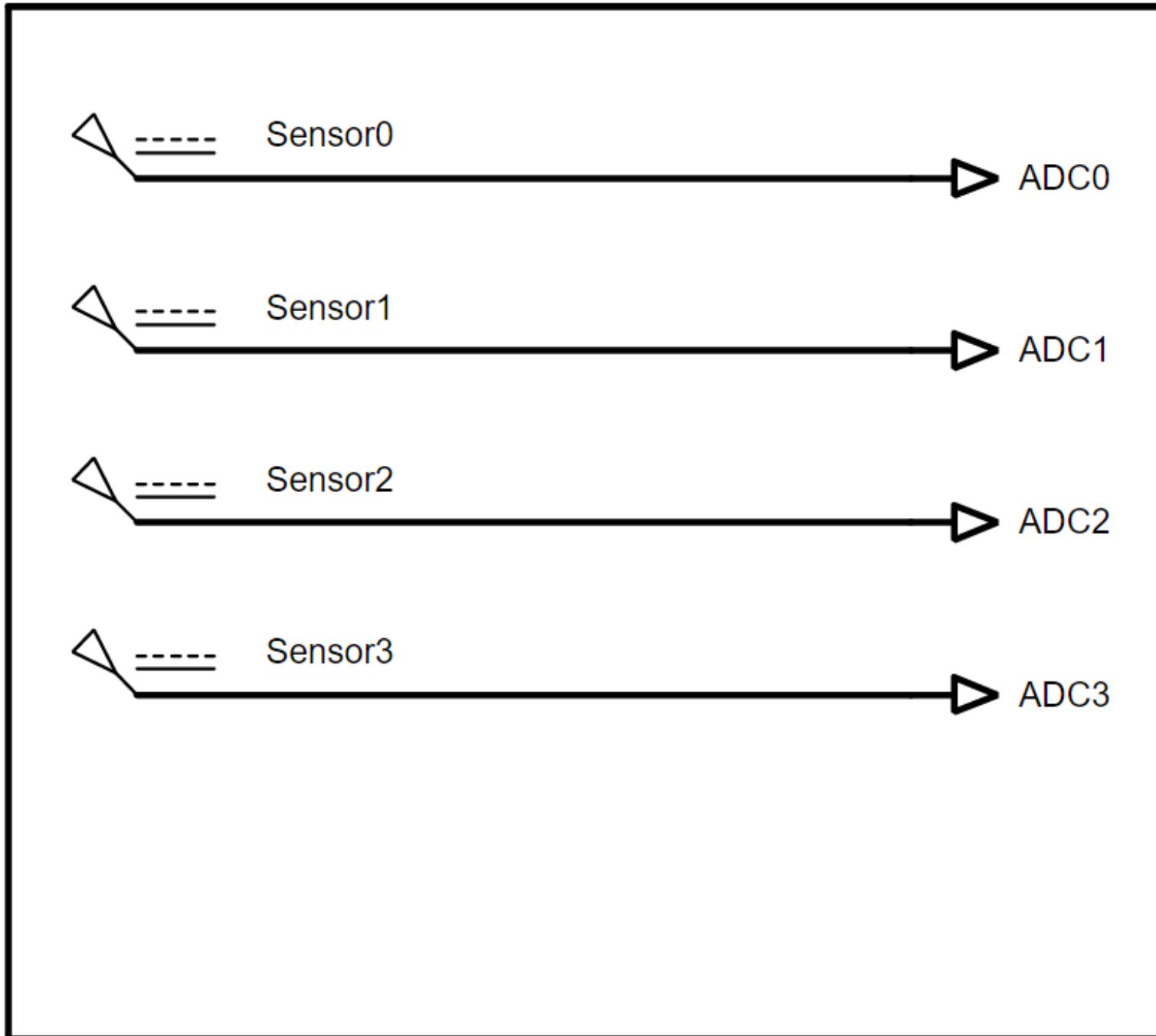
Microcontroller Circuit used for INC281



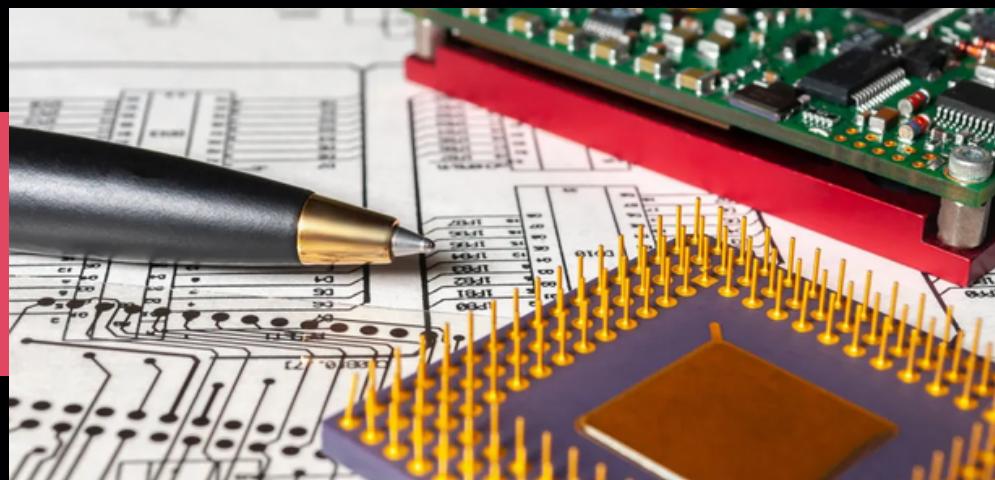
Asst.Prof.Dr.Santi Nuratch  
Embedded Computing and Control Lab.

# SIMULATION EMBEDDED BOARD

Voltage Sources (0.0-3.3 Volts, DC)



# INTRODUCTION



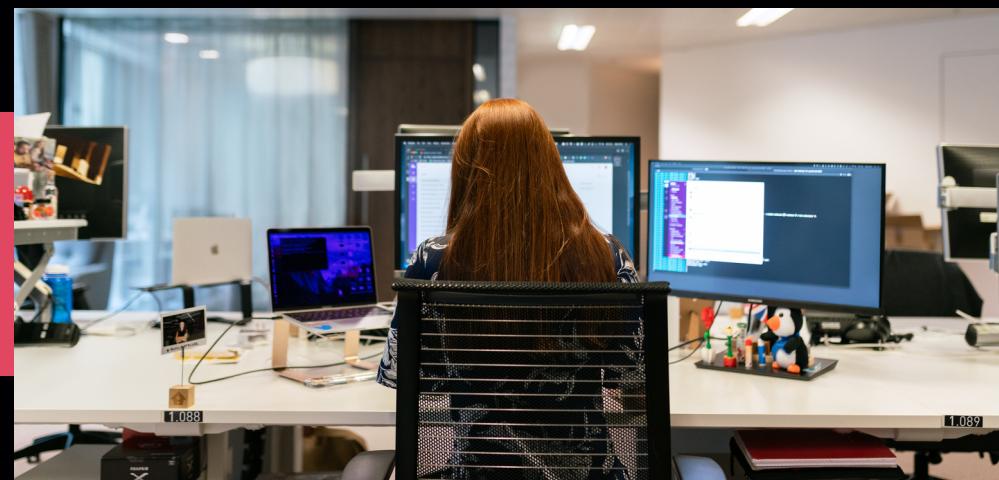
## Sensor simulation to embedded system

Using Proteus, reading a sensor and sending the value to an embedded system



## Programming

Coding for Monitoring and Control in Embedded Systems



## IoT Dashboard Program

Utilizing an IoT dashboard to control and monitor a device

# PROGRAMMING



 **Serial Output**

 **Led Control**

 **Timer**

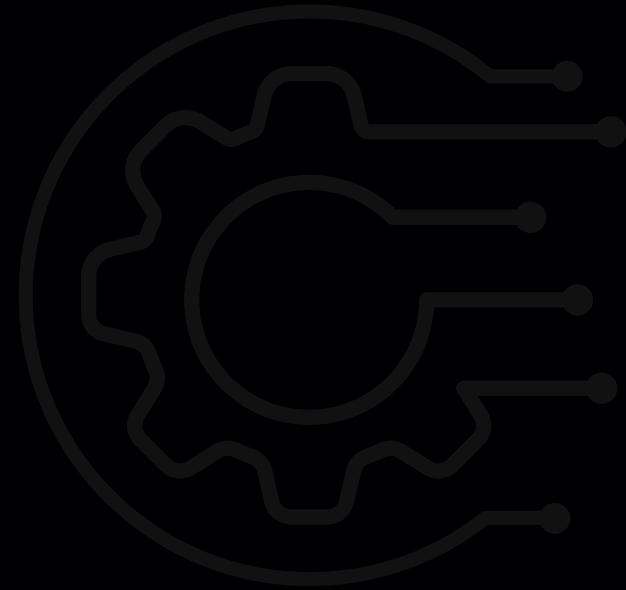
 **Push Button Switch (PSW)**

 **Analog Read**



# SERIAL OUTPUT

Synchronously prints a formatted string to Uart1 or Uart2.



```
Uart1_Printf(format, ...);
```

Parameter:

- format: The formatted string.
- ... : Additional parameters used to create the string.

Ex. Uart1\_Printf("Hello, World! \r\n");

Ex. Uart1\_Printf("Int Data: %d \r\n", 1254);



# LED CONTROL

Turn On LED Number

Ledx\_Set()

Ex. Led1\_Set();

Turn ON LED1

Turn OFF LED Number

Ledx\_Clr()

Ex. Led2\_Clr();

Turn OFF LED2

Toggle LED Number

Ledx\_Inv()

Ex. Led0\_Inv();

Toggle LED0

Parameter:

- x: Id of the target Led(0, 1, 2, 3).

# TIMER

Create method calls a function at specified intervals (in milliseconds).

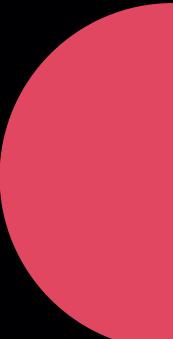


```
Timer_Create(uint16_t interval, callback_t callback);
```

Parameter:

- interval: Sleeping interval in milliseconds.
- callback: Callback function, performed when the timer ready.

```
Ex. Timer_Create(10000, timer_tick);
```



# PUSH BUTTON SWITCH (PSW)

Sets/Adds KeyDown callback to the switch specified by the id.



```
I Psw_SetKeyDownCallback(int16_t id, callback_t callback);
```

Parameter:

- id: Id of the target switch (PSW\_ID\_0, PSW\_ID\_1, PSW\_ID\_2, PSW\_ID\_3).
- callback: Callback function to execute when the KeyDown state is detected.

```
Psw_SetKeyDownCallback(PSW_ID_0, led0_on);
```



# ANALOG READ

Get Analog input show to Voltage

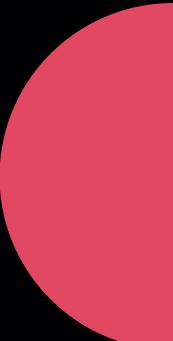


```
Adc_Get(uint16_t id);
```

Parameter:

- id: Id of ADC (ADC\_ID\_0, ..., ADC\_ID\_3).

```
float adc3 = Adc_GetVoltage(3);
```



# FULL EXAMPLE

⚡ main ▾ INC281-2022 / examples / basics /

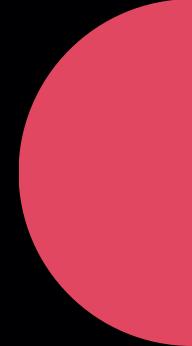
 [nitikorn20](#) first commit

...

	circuit	Create circuit01.SVG
	ex01_Serial_Out	Create mem.xml
	ex02_Led	Create mem.xml
	ex03_timer	first commit
	ex04_Psw	first commit
	ex05_ADC_Read	first commit

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# ASSIGNMENT

## Task 1

Write a program that emit **LED3** blink  
Frequency 2 Hz





# ASSIGNMENT

## Task 2

- Connect your signal conditioner to pin A0.
- Write a program so that the value is adjusted to the **real unit**.
- Print the value to serial monitor show in Proteus.



# THANK YOU

I N C 2 7 2

