

# Lab 4 ADC - PWM

How to setup ADC

# ADC – analog to digital converter

- ADC converts analog signal (typically voltage) to digital
- There are several type of ADC. STM32F411 has a 12 bit single-end ADC, which convert voltage linearly from 0 to 3.3v to 0 to 4095

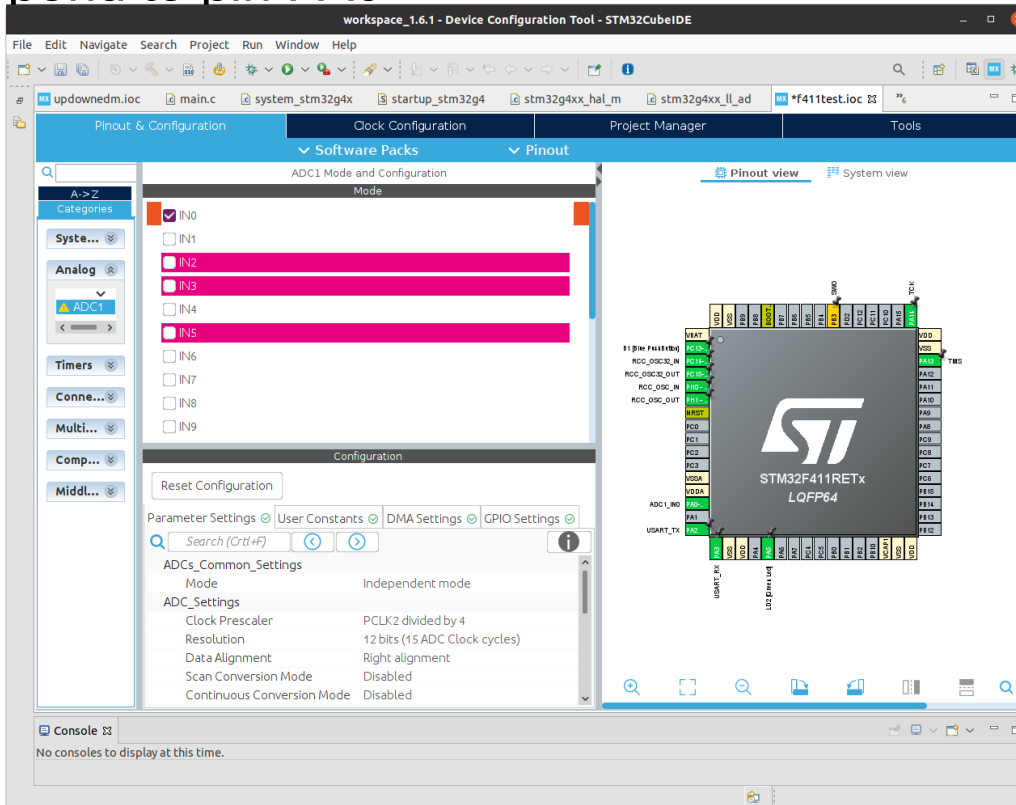
0v to 0

1.65v to 2047

3.3v (vref) to 4095

# Setting up ADC

- Choose an input you want to use, in this example, it is choosing IN0 which correspond to pin PA0



# Reading the ADC value

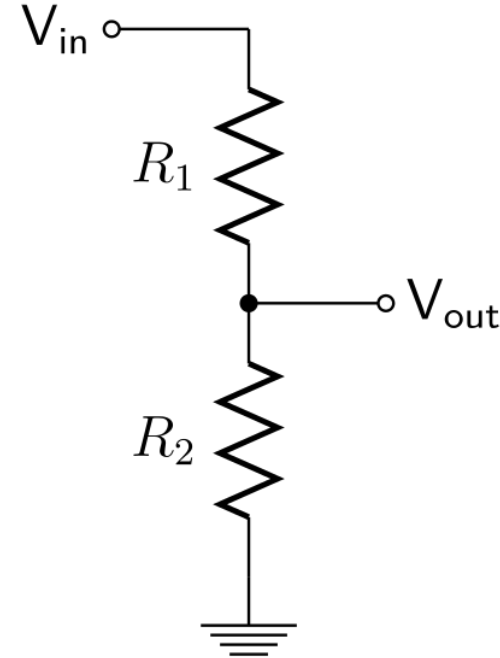
- Here is an example how to get the value

```
/* Infinite loop */
/* USER CODE BEGIN WHILE */
while (1)
{
    int adcval = 0;
    // Sampling/start getting conversion
    HAL_ADC_Start(&hadc1);
    // wait until the conversion is done
    if (HAL_ADC_PollForConversion(&hadc1, 1000) == HAL_OK)
        adcval = HAL_ADC_GetValue(&hadc1); // get the value
/* USER CODE END WHILE */

/* USER CODE BEGIN 3 */
}
/* USER CODE END 3 */
```

# Using LDR with ADC (1/2)

- LDR is a sensor that change resistance based on the light.
- The easiest method to use LDR with ADC is to use a voltage divider.



$$V_{out} = \frac{R_2}{R_1 + R_2} \cdot V_{in}$$

# Using LDR with ADC (2/2)

- You can connect LDR on the high side or on the low side depending on the application.
- In the example on the right, the LDR is on the high side

