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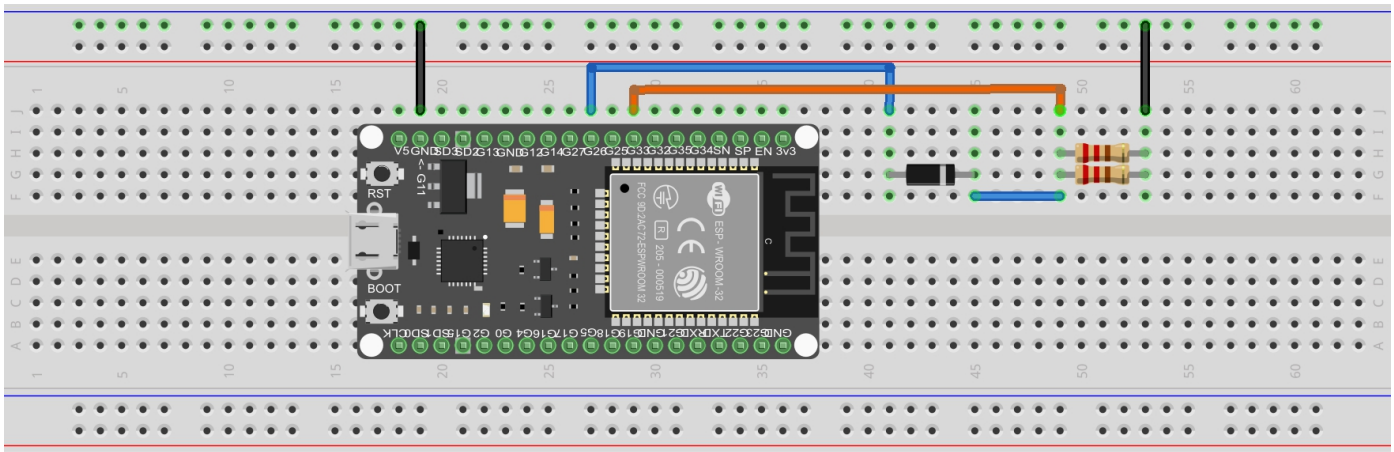
ESP32 Lab Assignment II guide

Problem

Using the AD (analog to digital) and DA (digital to analog) functions of esp32 to measure the I-V characteristics of a diode (apply different voltage across the diode and measure the current through the diode with a sampling resistor). Mark down the data and draw the I-V curve of the diode.

Bonus: Using the AD and DA functions of esp32, measure the response of an NPN BJT (bipolar junction transistor) under different applied voltages. Draw the output characteristic curve of the BJT with the aquired data. The other requirements are the same as those in question 4.

Circuit



Reminder:

1. Be careful about the direction of your diode. The side with black line should at the cathode.
2. Please use two 470ohm resistors in parallel in this case.

Function

ADC

Note: ADC can only applied on specialized pins, they are: A2/IO34、A3/IO35、A0/IO36、A1/IO39

Reading an analog value with the ESP32 means you can measure varying voltage levels between 0 V and 3.3 V.

The voltage measured is then assigned to a value between 0 and 4095(not always 4095, it depends on your attenuation ratio which will be talked later), in which 0 V corresponds to 0, and 3.3 V corresponds to 4095. Any voltage between 0 V and 3.3 V will be given the corresponding value in between.

Define the object

Example:

```
from machine import ADC, pin
adc = ADC(Pin(34))
```

ADC.read()

Illustration: read the ADC and return the result.

Example:

```
x = adc.read()
print(x)
```

ADC.atten(db)

Illustration: set the attenuation ratio (that is full-scale voltage), for example 11db stands for 3.3V.

Example:

```
adc.atten(ADC.ATTN_11DB)
```

ADC.width(bit)

Illustration: set the data width.

Example:

```
adc.width(ADC.WIDTH_9BIT)
```

ADC.WIDTH_9BIT: full-scale is 511;

ADC.WIDTH_10BIT: full-scale is 1023;

ADC.WIDTH_11BIT: full-scale is 2047;

ADC.WIDTH_12BIT: full-scale is 4095;

Comprehensive example

```
from machine import ADC, Pin
import time

adc = ADC(Pin(36))             #设置IO36为模拟IO口
adc.atten(ADC.ATTN_11DB)       #设置衰减比
adc.width(ADC.WIDTH_12BIT)     #设置12位数据宽度
for i in range(0, 10):
  print("adc0 =", adc.read()) #读取IO口模拟电压值
  time.sleep(0.5)
```

DAC

Note: DAC can only applied on specialized pins, they are: IO25/D2、IO26/D3.

Define the object

Example:

```
from machine import DAC, Pin
dac = DAC(Pin(26))
```

DAC.write(value)

```
value:
    0 ≤ value ≤ 255 (对应0~3.3V)
```

Example:

```
dac.write(255)
```

Comprehensive example

```
from machine import DAC,Pin
dac = DAC(Pin(25))  #创建一个DAC对象
dac.write(245)      #输出电压
```

Reference

You can go to this page to have more examples.