ARDUINO CAPACITANCE METER

A PROJECT BY

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COMPONENTS REQUIRED

- ARDUINO UNO
- 16*2 LCD DISPLAY
- 10K OHM POTENTIOMETER
- 10K OHM RESISTOR
- 220 OHM RESISTOR
- JUMPER WIRES
- CAPACITOR UNDER TEST

DESCRIPTION

- A capacitance meter is a device that is used to measure capacitance of a capacitor.

- In this project, we will develop two circuits-

  a) CIRCUIT1 - to measure capacitance in the range of 1μF to 4700μF

  b) CIRCUIT2 - to measure capacitance in the range of 20pF to 1000nF

- BASIC PRINCIPLE - The Time Constant (τ)

An unknown capacitor is charged through a known resistor using Arduino pins. The time taken for the voltage across capacitor to reach 63.2% of the supply voltage gives us the value of τ.

$$C = \frac{\tau}{R}$$

NEED FOR TWO CIRCUITS

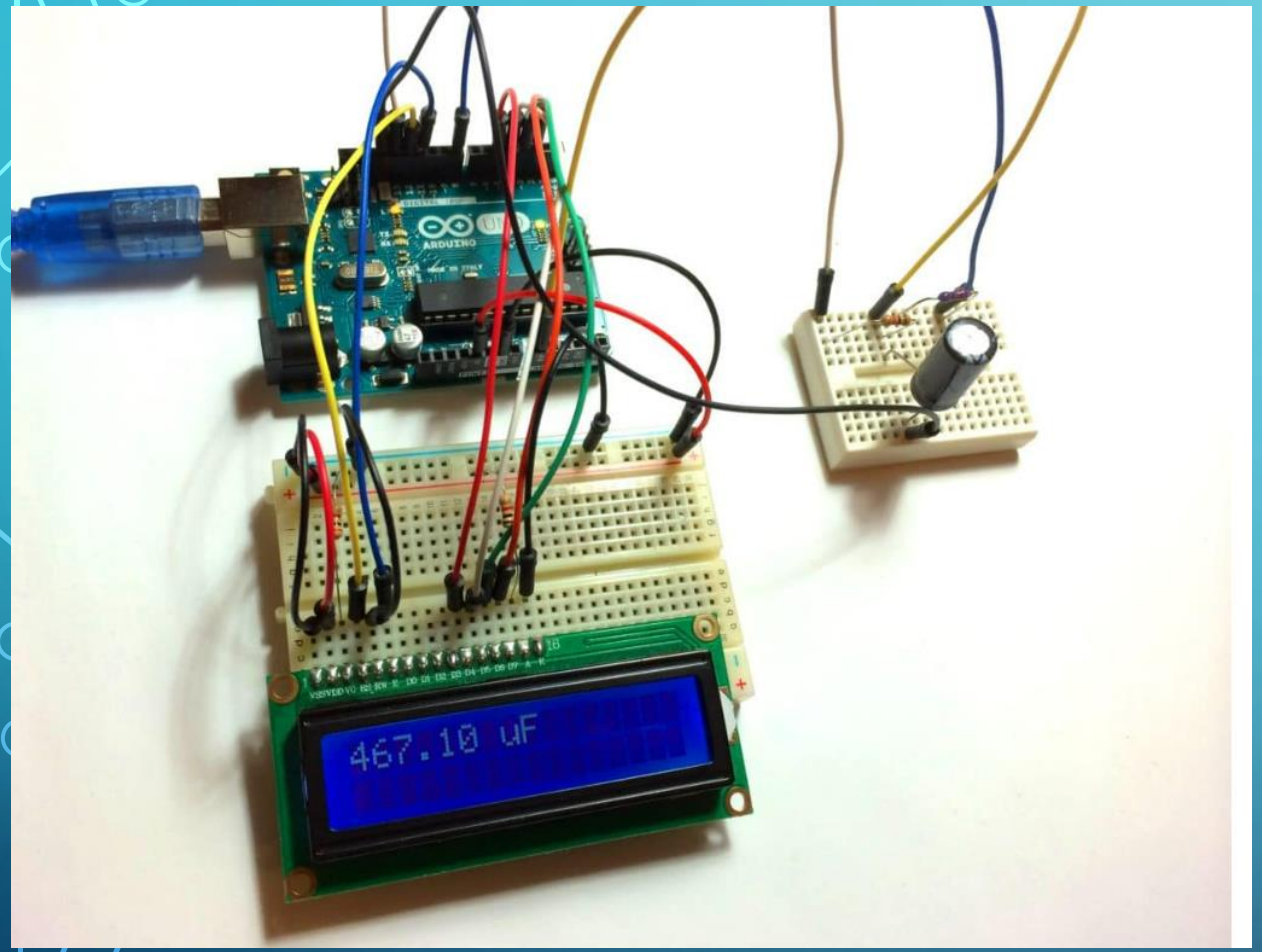
- All the I/O ports in ATmega328P Microcontroller have an internal pull – up resistor and an internal capacitor connected between the pin and ground.

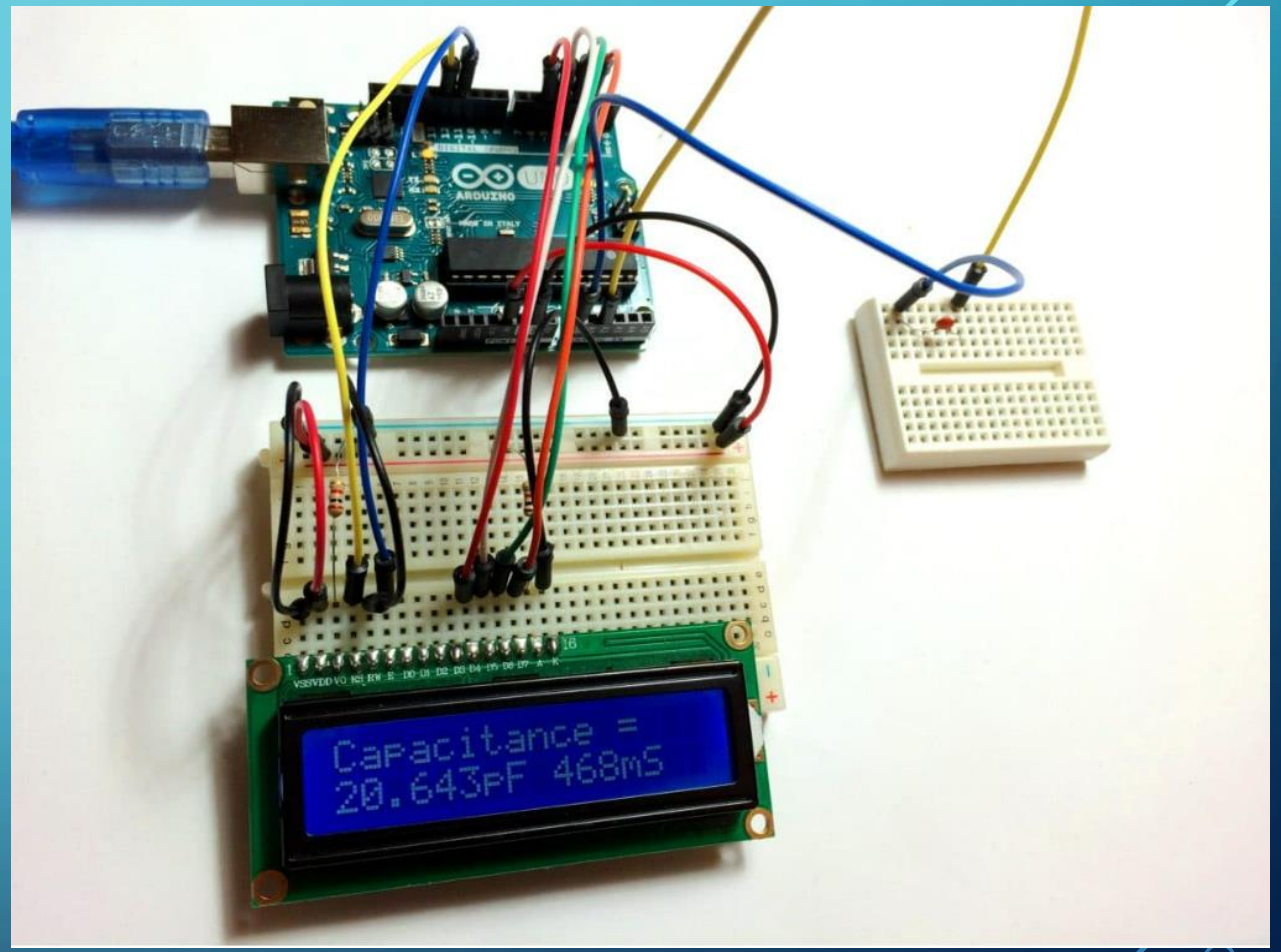
- The value of internal capacitance ranges from 20-30pF.

- For large values of capacitance of the test capacitor, voltage drop across the internal capacitor is negligible and almost the entire supply voltage is obtained across the unknown capacitor.

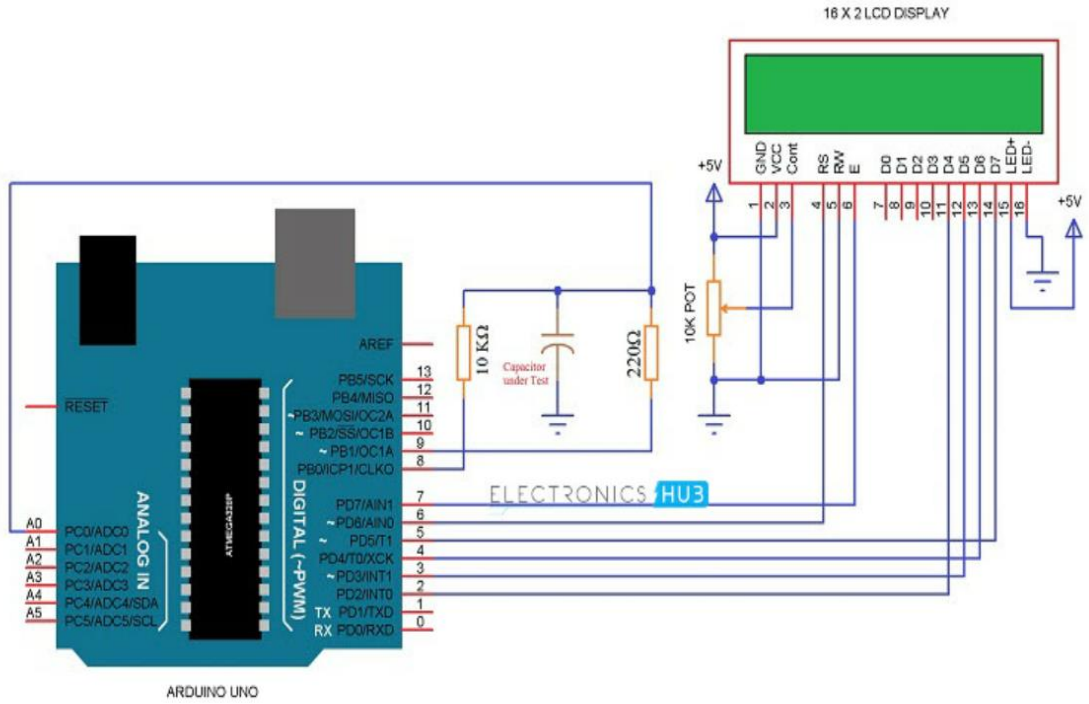
- But for small values of capacitance of the test capacitor, the supply voltage gets divided among the test and the internal capacitor in direct ratios of their capacitances.

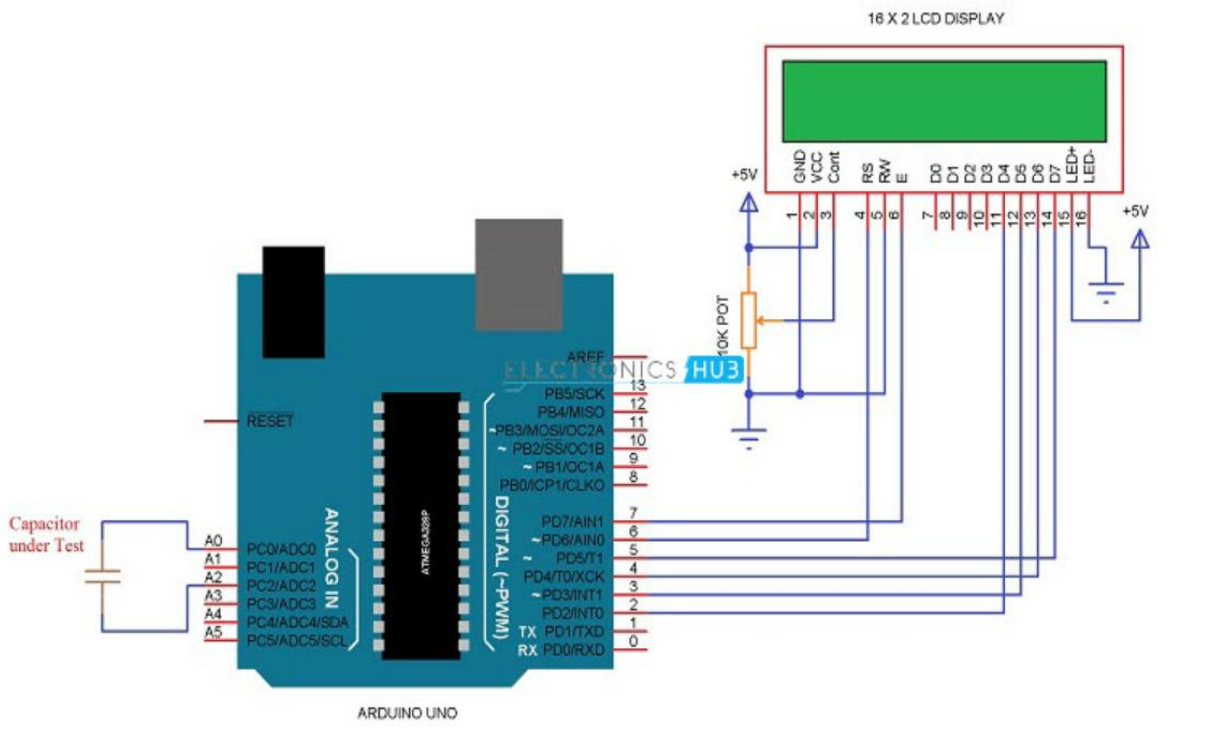
$$v_{C_t} = v_s * \left(\frac{C_t}{C_t + C_i}\right)$$


467.10 uF


Capacitance =
20.643pF 468mS

CIRCUIT DIAGRAMS





TIMELINE

- COMPLETION OF CIRCUIT 1 - 30/01/2023
- COMPLETION OF CIRCUIT 2 - 03/02/2023
- COMPLETION OF PROJECT - 05/02/2023
- FINAL TEST OF THE PROJECT – 06/02/2023