

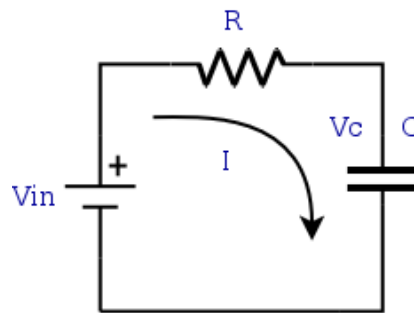
# CAPACITANCE METER

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In order to test an electronic circuit, we need some testing equipment. Capacitance meter is electronic equipment used to measure capacitance. This project will show how to construct a simple capacitance meter using 8051 controller.

## Theory & Design

Capacitance can be measured using the RC circuit. In this project, we have designed the capacitance meter using RC circuit, comparator and microcontroller.



RC circuit

Voltage across the capacitor( $V_c$ ) at any instant of time during the charging period is given as,

$$V_c = V_i(1 - e^{-t/RC})$$

where,  $V_c$  - Voltage across the capacitor

$V_i$  - Supply voltage

t - is the elapsed time since the application of supply voltage

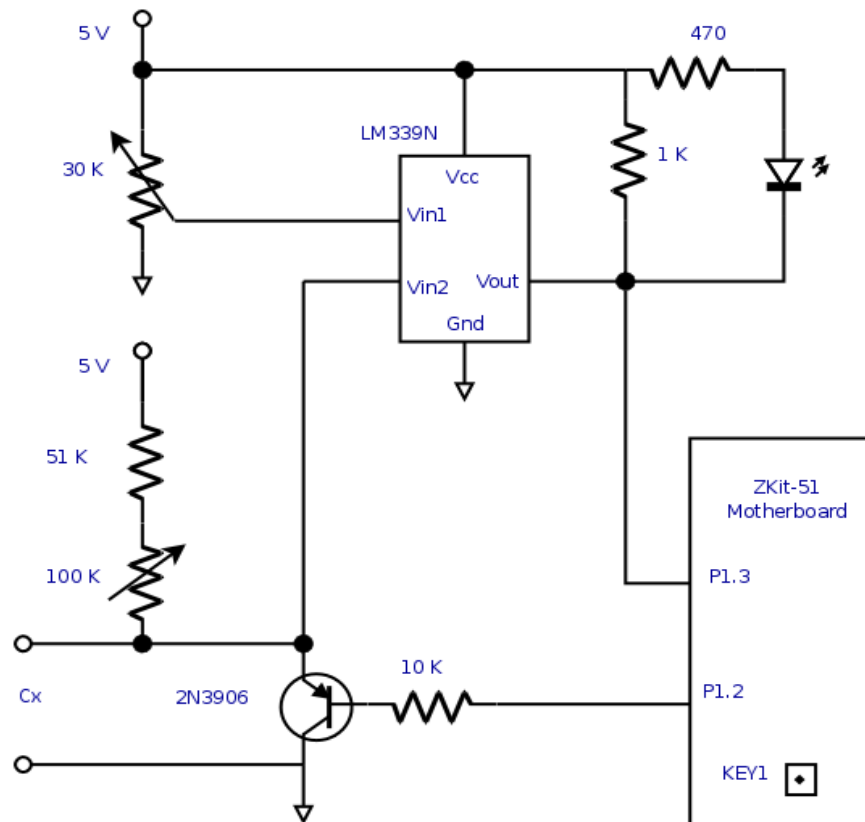
RC - is the time constant of RC charging circuit

The time required to charge the capacitor to 63.5 percent of input voltage is known as time constant ( $\tau$ ), as given by

$$\tau = RC$$

The capacitance is given by the following formula:

$$C = \tau R$$



Circuit Diagram

## Working Principle

Transistor is used to discharge the capacitor before starting the measurement.

Variable resistor near the comparator is used to set the voltage to 63.2 percent of input voltage.

- Initially the base of the transistor should be made low to discharge the capacitor.
- After the pressing the key1, base of the transistor will be made high.
- So that the capacitor starts charging.
- Charging time of the capacitor is calculated using stop watch APIs.
- When the voltage across the capacitor reaches 63.2 percent of input voltage, comparator triggers a signal.
- After receiving the signal from the comparator, stop watch will be stopped.
- Using the above formula, capacitance is calculated.

Source: <http://www.zilogic.com/blog/zkit-51-cap-meter.html>