

## Video 1: The multimeter

Ohms law:  $R = V/I$

To measure Resistance:

switch to resistance sign, touch two probes on two sides of resistor.

Continuity  $\rightarrow$  Beep

- we measure voltage in parallel.  
II II Current II Series,

Video 2: Dimming all kinds of LEDs!

PWM  $\rightarrow$  Pulse width modulation

Using potentiometer  $\rightarrow$  waste energy  
Expensive

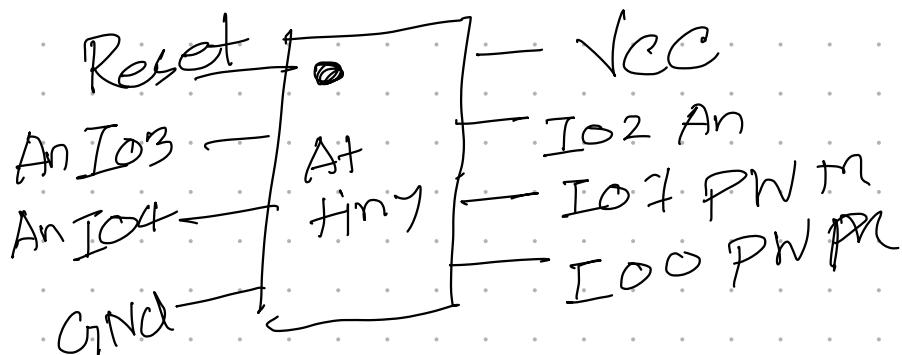
But PWM  $\rightarrow$  lowering and increasing voltage  
very fast, 50% duty cycle - 2.5V

analog write (0-255)  $\downarrow$   
on 5V

# 555 timer chip

Video 3% Programming an attiny +  
homemade arduino shield.

Total waste to use arduino on  
small circuits, instead use attiny  
~~8A~~



Bit Bank → Emulating Protocol

Video 4% Arduino + Bluetooth  
+ Android = Awesome

Bluetooth module → HC05

fragile

Arduino uses 5V logic levels

BT Module in 3.3V u 4

need to decrease voltage  
with resistor

## Video 58 How to Multiplex

Multiplex → Running more things  
with less IO's

## Video 6 : Standalone arduino circuit

Atmega + clock crystal +  
22 pF capacitors + 10k resistor

Some features aren't available  
here

3 ways to program,

FTDI → USB to serial conn

ICSP → in circuit serial prog

## Video 7: Segment Display

To show numbers, need a  
BCD To seven segment Display  
Driver (SN 74247)

SN 74 LS290N → Counter  
(when pressed push button,  
a number goes up)

## Video 8: Everything about LEDs

and current limiting resistors.

Every LED has 2 important data

- forward voltage
- ideal current

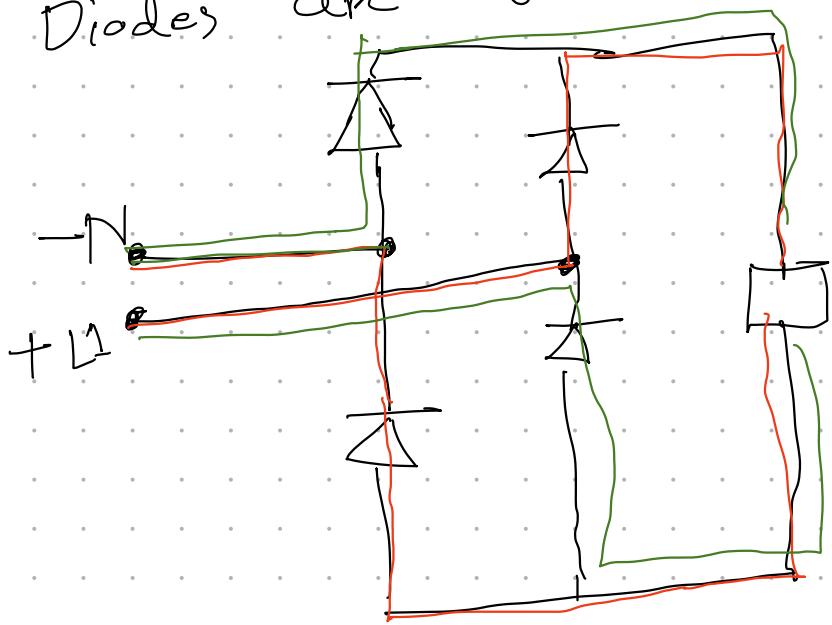
must lower voltage as it  
every led forward voltage  
is different

Constant current  $\rightarrow$  Constant voltage

## Video 2: Diodes and Bridge rectifiers.

Diode is only conductive when positive terminal with anode and neg with cathode

Diodes are used to convert Ac to dc



Video 10 : Digital to Analog Converts  
( DAC )

R to R method : 8 bit  $\rightarrow$  256  
volt value

Video 11 : Sending SMS with  
arduino  $\rightarrow$  TC 35 GSM module

~~3V~~ (No voltage regulator)

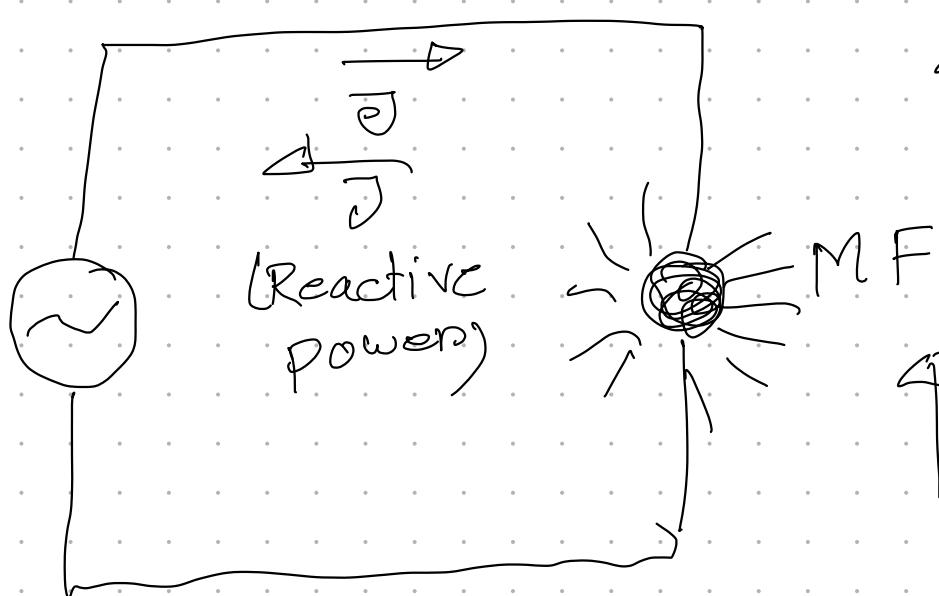
Video 12 : Coils / Inductors (P-1)



lens law  $\rightarrow$

Video - 13 : Coils / inductors  
(pt - 2)

inductance creates a form  
of resistance ( $X_L$   $\rightarrow$  inductive  
Resistance)



$$I = \frac{U}{X_L}$$

$$F \rightarrow X_L F$$

$$f \rightarrow X_L f$$

$$X_L = 2\pi f L$$

Substitute of RLC meter,  
→ Transistor tester  
(precision isn't good in  
little values)

## Video 14<sup>o</sup> Capacitors

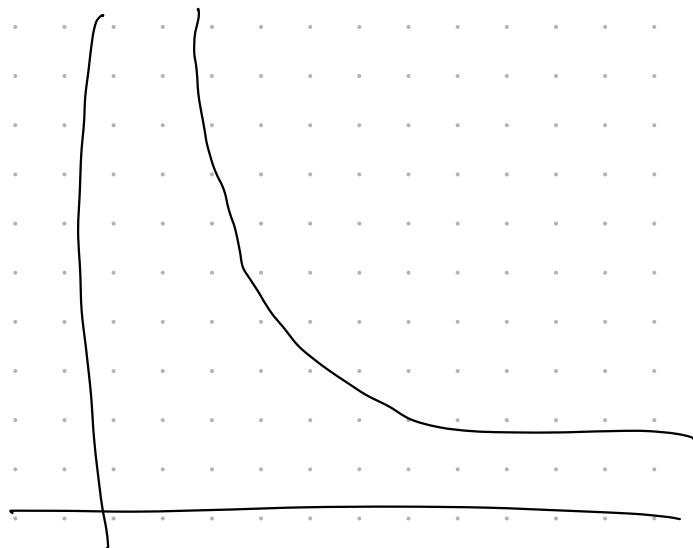


$$X_C = \frac{1}{f_C}$$

## Video 15<sup>o</sup> Temperature measurement (part 1) || NTC, PT100, Wheatstone Bridge

NTC → Negative Temperature  
Coefficient

Heat  $\uparrow \rightarrow$  Resistance  $\downarrow$



RTD  $\rightarrow$  Resistance  
Temperature  
Detector

Thermal inertia  $\rightarrow$  Slow  
rise of  
temp

Video 16 : Resistors

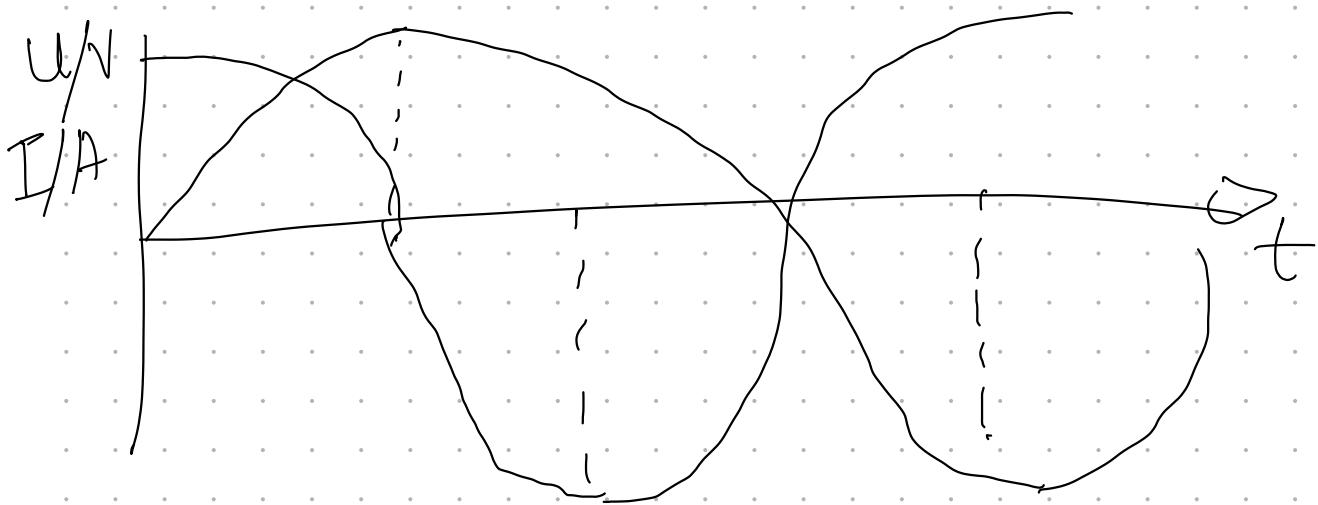
resists extra current

Potentiometer  $\rightarrow$  Variable  
resistor

Various uses of resistor

# Video 17 Oscillators / RC, LC crystal

RC → Relaxation circuits,



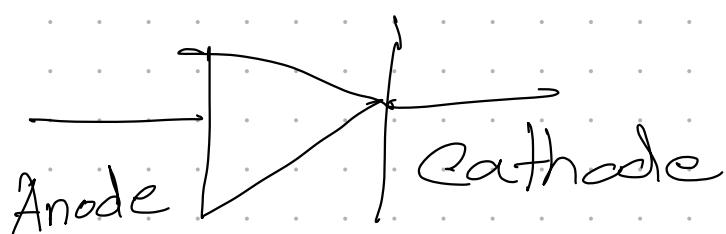
## Video 18 DC & Brushless DC motor + ESC

$f \propto V \uparrow \rightarrow RPM \uparrow$

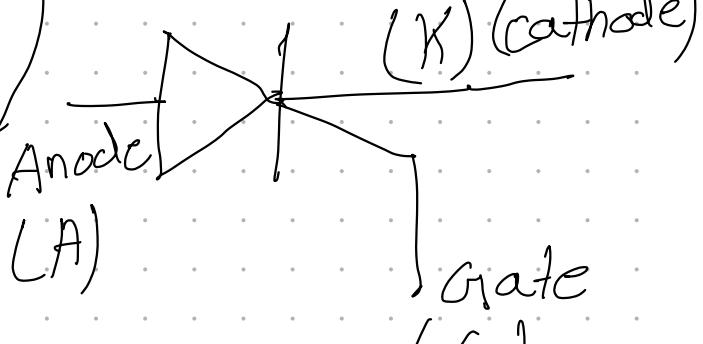
Video 19° T<sub>RC</sub> and how to  
use it.

Video 20° Thyristor, Triac  
phase angle  
control

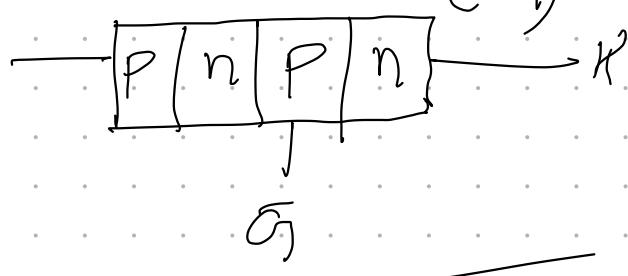
Diode



Thyristor



Triac → Two Thyristors  
Connected



Video 21: OP AMP (operational amplifier)

it amplifies signal

Video 22: Transistor (BJT) as a switch

BJT  $\rightarrow$  High energy loss

Video 23: Transistors (MosFET)  
as a switch

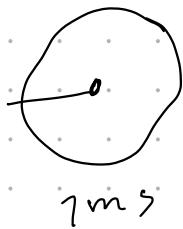
MosFet  $\rightarrow$  energy loss low

2 types of mosfets  $\rightarrow$  N channel  
P channel

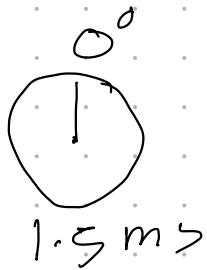
Video 24% Stepper motors and how to use them

4988 Microstepping IC

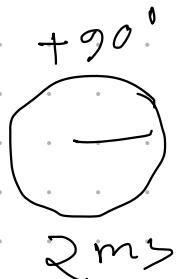
Video 25% Servos and how to use them



1ms



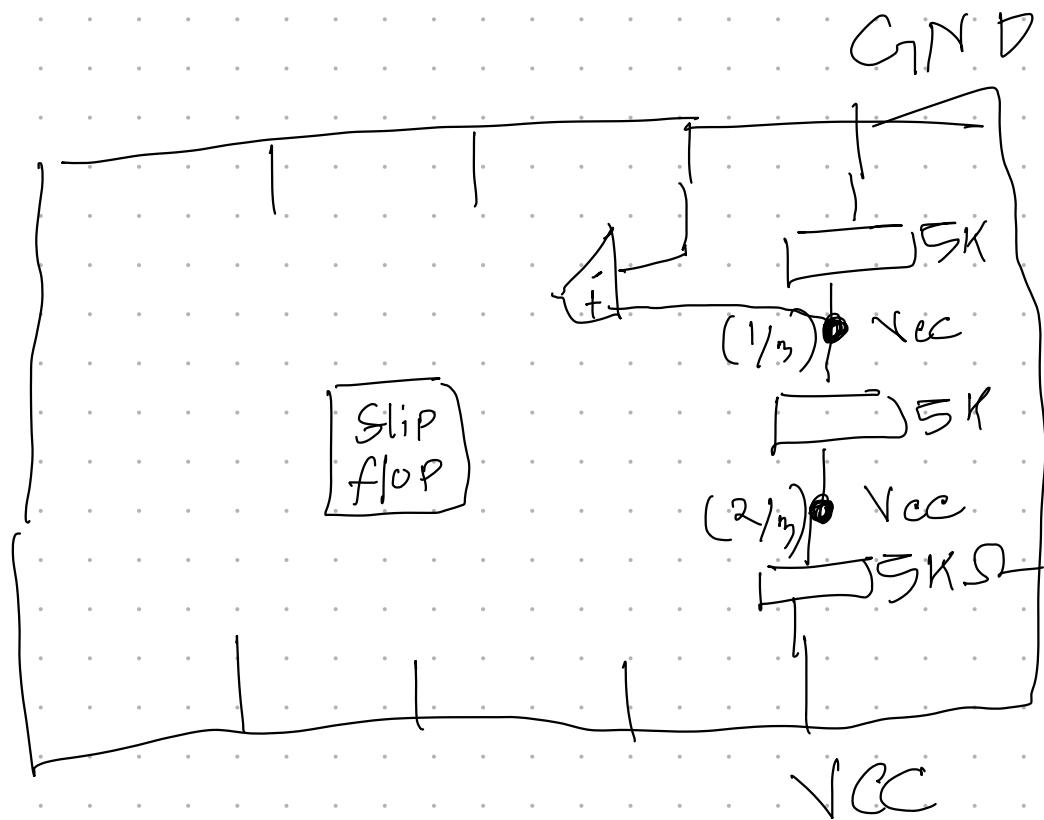
1.5ms



2ms

Modifications can be done  
to rotate servos  $360^\circ$

Video 26% 555 timer IC



Video 27 : ADC (Analog to  
Digital Converter)

Video 28% IGBT & where to use them

Insulated gate Bipolar transistor  
(N and P channel)

Video 29% Solar Panel:

Very fragile

Video 30% Microcontroller (Arduino)  
timers

