

OPTIONAL PROJECT

“IF YOU KNOW ENOUGH ABOUT CIRCUITS SKIP THIS PART”

ELECTRICAL COMPONENTS:

TRANSISTORS

-What it is?

-Do you know how they work?

-Would you know how to put it into a circuit and build something around it?

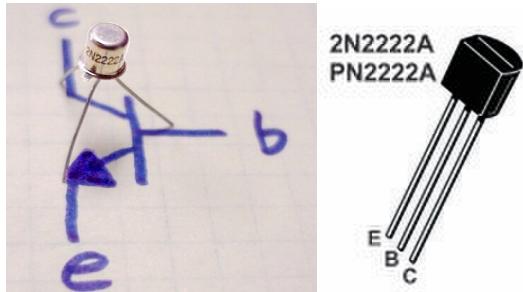
Transistors:

are back bone of all technology, they act as amplifier or a switch

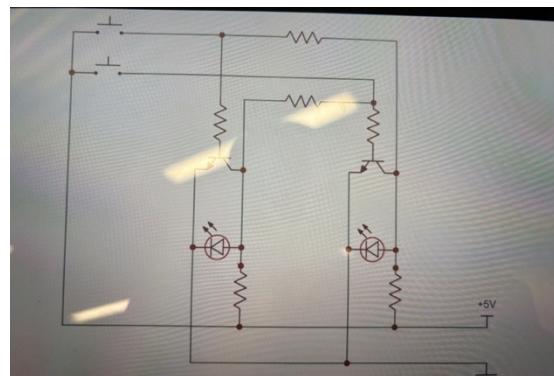
First → simple circuit
second → oscillating circuit

We are going to have fairly complex system all built from scratch.

The most common transistors are 2N2222 that we are going to use them in this project.

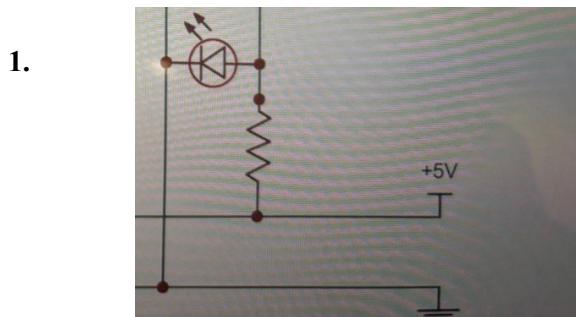


EMITTER and COLLECTOR act as a switch, when you activate the BASE, you connect the emitter to collector.



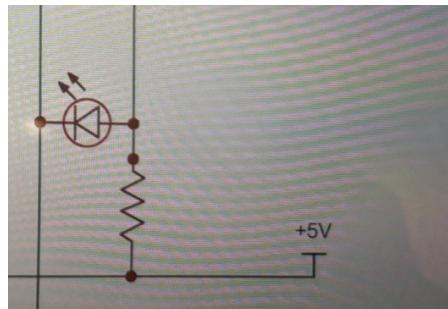
1. Transistors → 4 /2n2222
2. Resistors → 10/10k
3. LED → 4
4. Capacitor → 1/22mfarad
5. Capacitor → 1/ 1 microfarad
6. Tactile Buttons → 2
7. Piezo buzzer → 1
8. Diode → 1
9. Thermistor (optional) → 1(a resistor with high temperature)
10. Photocell (optional) → 1
11. Wires
12. Breadboard

1.SIMPLE CIRCUIT:

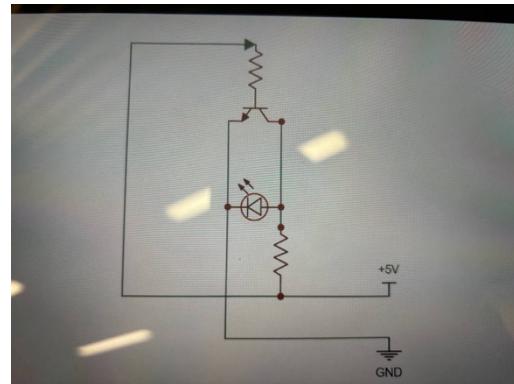
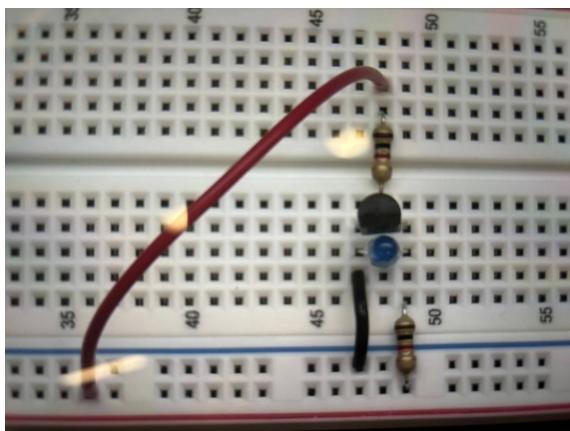


2. remember you should always run a LED with a resistor, it protects the led.

RESISTROS regulate and limit the flow of current. (because lots of current will harm things).



3. Add a resistor to circuit, and not to harm the transistor



2. OSCILATING CIRCUIT

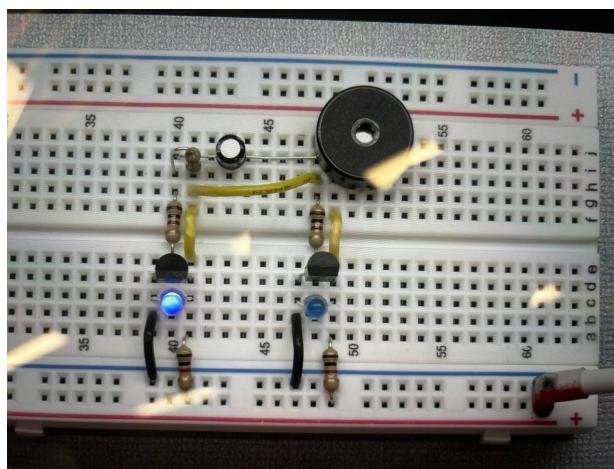
Here we just duplicate the circuit in 1:

We have two inversion circuit.

time constant: $T = R * C$

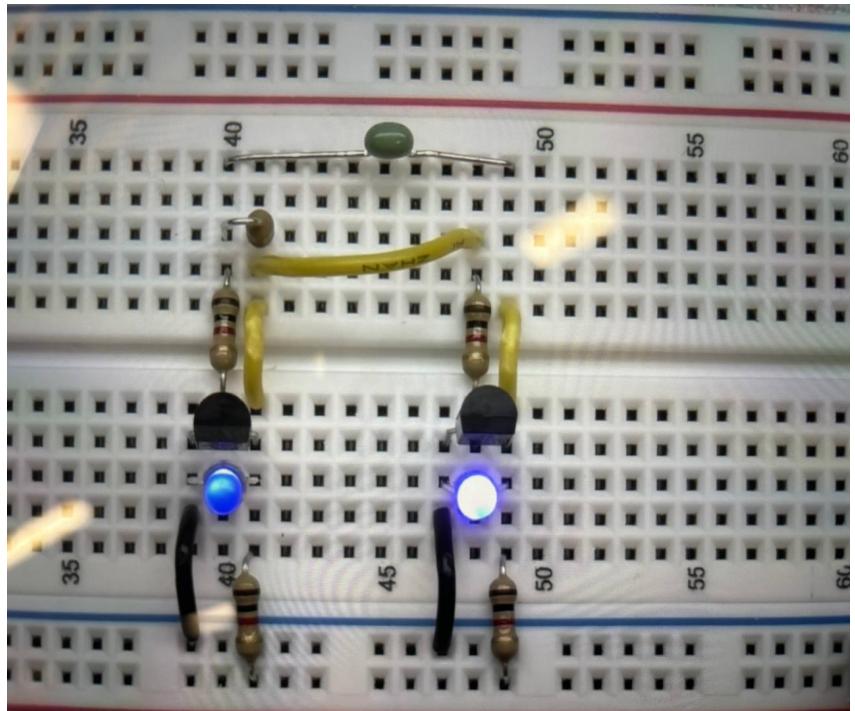
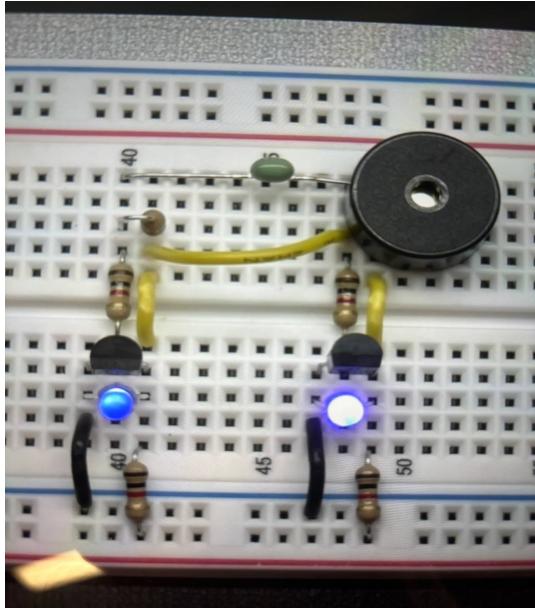
you can see they are flickering fast.

want to hear their flickering, just add a buzzer and hear what going on?!



It is just a little bit click,

Now if I add a little bit capacitor (**Capacitor → 1/ 1 microfarad**)
And then add a capacitor + buzzer → the sound will change.
frequency increase



oscillating circuit + delay circuit + speaker

what is happening is that one inversion circuit charge the capacitors, once the capacitor charge it activates the other one and vice versa.

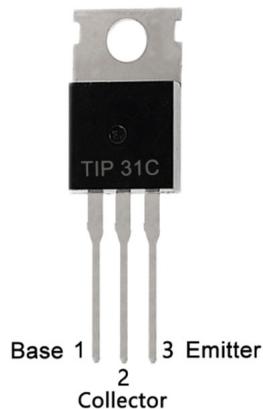
End of optional project

2. Making a H-Bridge circuit with TRANSISTORS to control a DC motor direction.

-rotating a motor in clockwise direction, and counterclockwise direction.
(Forward/reverse)

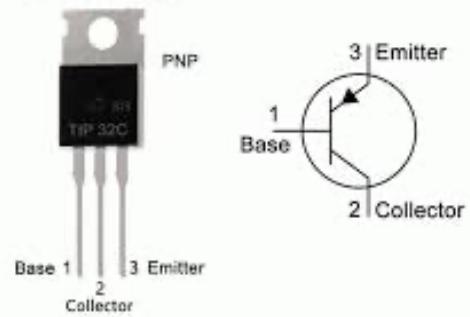
- **2 PNP Transistors → TIP32C**
- **2 NPN Transistors → TIP31C**
- **4 Resistors → 1 kΩ**
- **DC Motor**

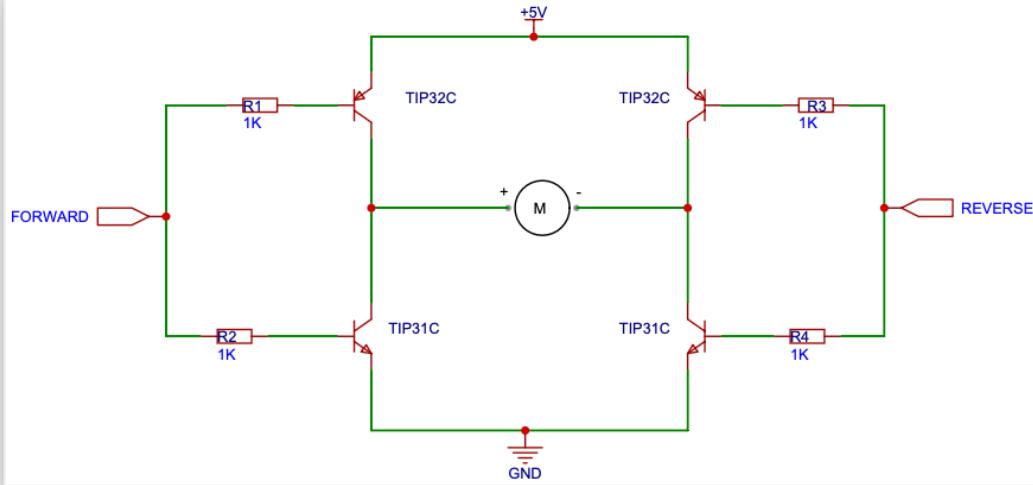
TO - 220 Package



TIP32C Transistor Pinout

TO - 220 Package





**Connect board to ARDIUNO → PIN D7 CONNECT TO FORWARD
→ PIN D5 → CONNECT TO REVERSE
→ GND → CONNECT TO GROUND**

3. Making a **H-Bridge circuit** with **MOSFETs** to control a DC motor direction -rotating a motor in clockwise direction, and counterclockwise direction. (Forward/reverse)

Components:

1. 2 MOSFET PNP → GTO65P06
2. 2 MOSFET NPN → IRLZ44N
3. 2 RESISTROS → 10K
4. 1 MOTOR DC
5. ARDUINO
6. WIRES

GOFORD

GT065P06D5

P-Channel Enhancement Mode Power MOSFET

Description

The GT065P06D5 uses advanced trench technology to provide excellent $R_{DS(on)}$, low gate charge. It can be used in a wide variety of applications.

General Features

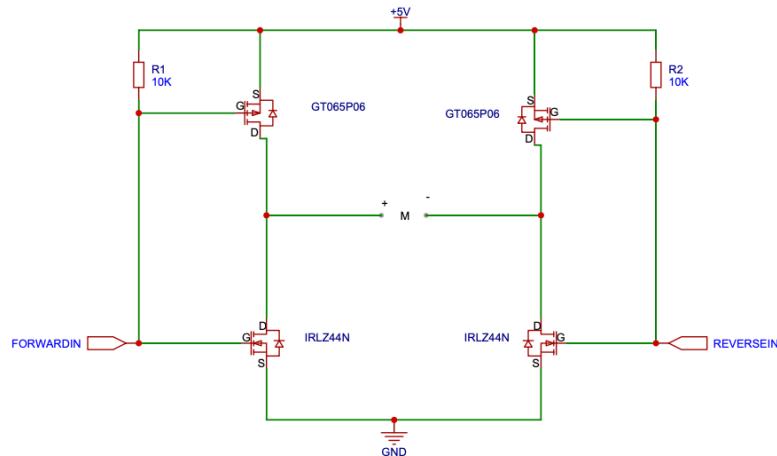
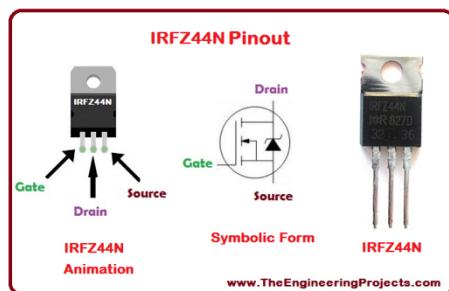
- V_{GS} : -60V
- I_D (at $V_{GS} = -10V$) : -103A
- $R_{DS(on)}$ ($4V V_{GS} = -10V$) : < 7mΩ
- $R_{DS(on)}$ ($4V V_{GS} = -4.5V$) : < 9mΩ
- 100% Avalanche Tested
- RoHS Compliant

Application

- Power switch
- DC/DC converters

Schematic diagram

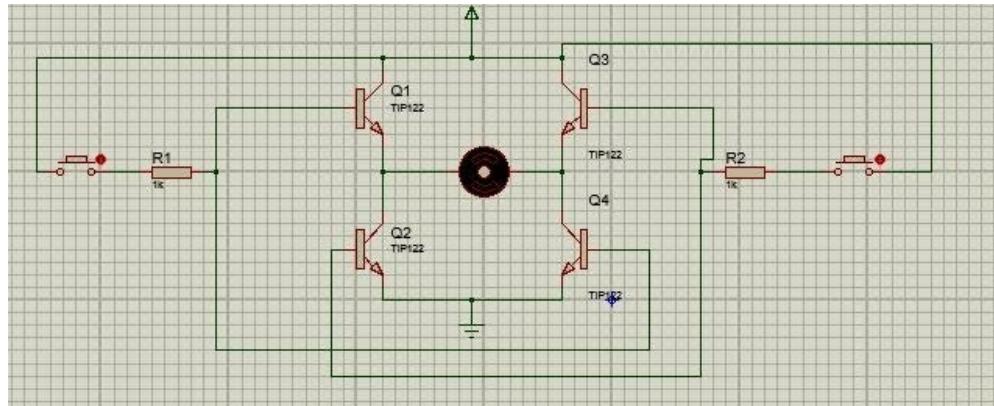
pin assignment



Connect board to ARDIUNO → PIN D7 CONNECT TO FORWARD
 → PIN D5 → CONNECT TO REVERSE
 → GND → CONNECT TO GROUND

“OPTIONAL PROJECT”

4 • Circuit Diagram for Control Motor Without Microcontroller



components:

1. 4 NPN TIP122 → Transistor
2. ESSP32 C3 (SMALLEST MICROCONTROLLER → Microcontroller
3. MOTOR DC
4. 1KOHM →RESISTOR

