2015

MUSIC SYNCED LED

Riddha Manna
B. Tech
NIT Durgapur

What do we aim to do?

We aim to make Light Emitting Diodes or simply LEDs light up in synchronization with the music being played. Basically the LEDs light up on the thumps or beats of the music.

How do we aim to do it?

One way to do it is to amplify the audio signals from the music output port and feed into the LEDs. For this purpose we will be using a simple transistor circuit. We will be using an NPN transistor in Common Emitter Configuration(CEC) to amplify the audio signals using an external power source.

Basic Principle :

If we analyze the output from the audio port and plot Voltage against Time we will get a different waveform for different music being played. The signal gets amplified with increase in volume but the waveform remains same. On analyzing we see that low frequency sounds corresponds to higher voltage while higher frequency sounds corresponds to lower voltages. We will make use of this particular property. Basically we need to light up the leds on the “thumps”, which corresponds to the lower frequencies and hence higher voltages. So we need to chose our transistor carefully with just enough gain, so that the leds light up only during the higher voltages corresponding to the lower frequencies. On lower voltages the amplification should not be enough to light up the leds. For this purpose we use the TIP31 NPN transistor which had the right amount of gain for our purpose. It is also easily available at the market.

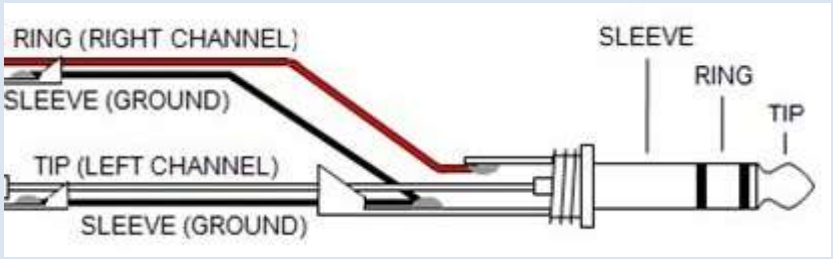
Materials required :

1. TIP31C (NPN Transistor).
2. 4 LEDs (I prefer blue. The choice is really personal).
3. 9V battery.
4. 3.5mm audio jack (male).
5. Connecting wires.
6. Breadboard(for beginners) or Soldering Iron and Solder(for those with soldering skills).
7. 3.5mm female port splitter (1 to 2).

Steps :

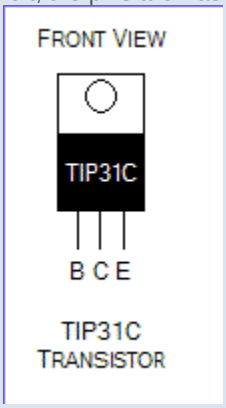
1. The 3.5mm jack :

The 3.5mm jack has 3 connections. The tip(left channel) connected with the shortest or central pin. The ring(right channel) connected with the medium pin. The sleeve(common or ground) connected with the largest pin. Solder 3 connecting wires to the three pins. Black for ground and any two colour of your choice each for the left and right channels.



2. TIP31 transistor :

Place the TIP31 transistor facing yourself. You should be able to read the writings on it(TIP31C). Starting from left, the pins are Base, Collector and Emitter.

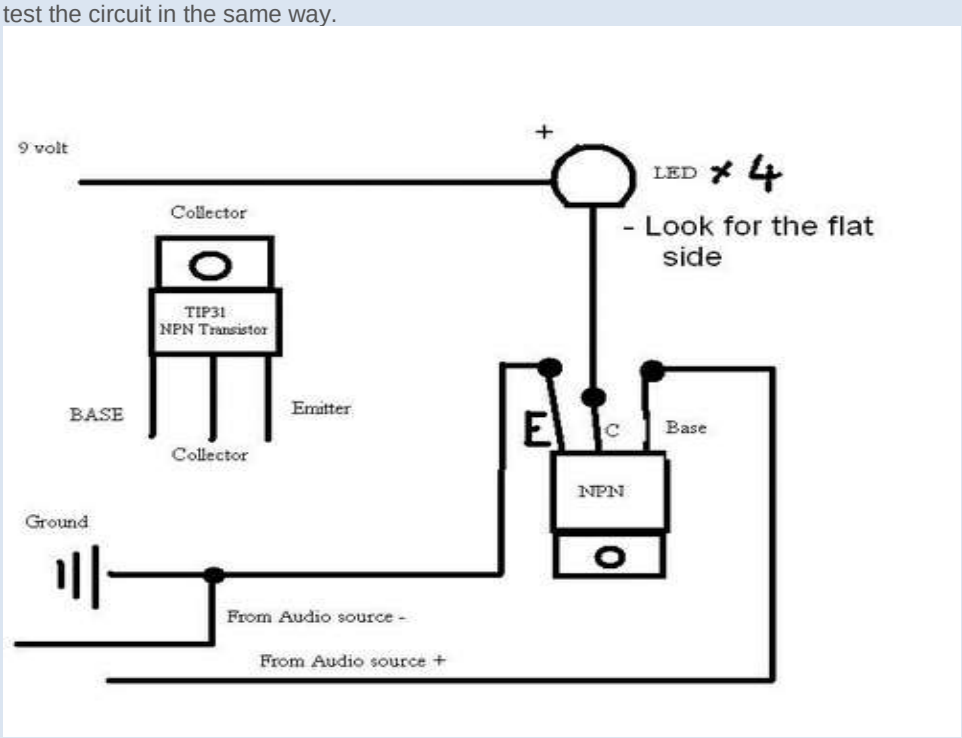


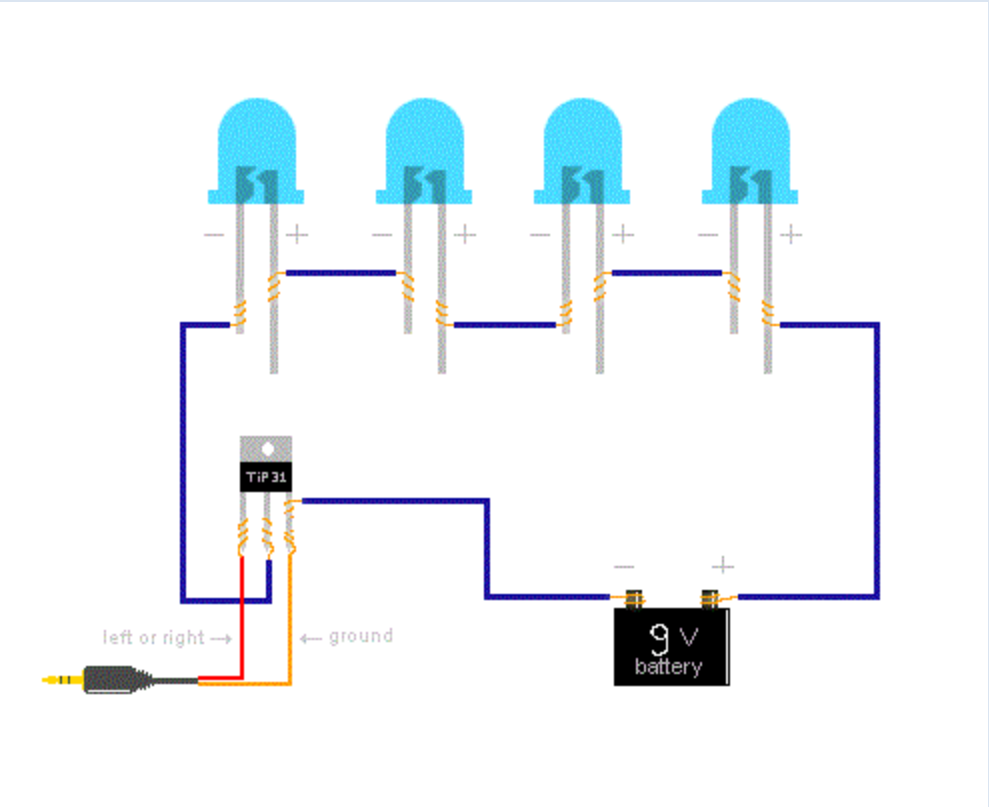
3. The LEDs :

The shorter pin of the LED is the cathode(-ve terminal) while the longer pin is the anode(+ve terminal). Connect the 4 LEDs in series ie. cathode to anode and solder.

4. Connecting everything together :

We are basically connecting a Common-Emitter Configuration of the TIP31 npn transistor. Connect the ground(-) of the 9V battery to the Emitter of the TIP31. Connect the Positive(+) terminal of the battery to the Anode of the first led connected in series. Connect the cathode of the last led connected in series to the Collector of TIP31. Connect the ground pin of the 3.5mm jack to the Emitter of TIP31. Connect the Right channel of the 3.5mm jack to the Base of the TIP31. Test the circuit by putting the 3.5mm audio jack into the female port of an audio player or laptop and playing a song in relatively high volume, then slowly decreasing the volume. It should work fine. Repeat the process for another set of 4 leds and TIP31 for the left channel. You can use the same battery. Now test the circuit in the same way.





5. And we are done :

Connect the 3.5mm female jack splitter to the source if audio. Connect the speakers to one of the two ports on the splitter. Connect your circuits 3.5mm jack into the other port of the splitter. Turn off the lights and enjoy your newly made disco lights.