- ## Aim

The aim of this project is to design, implement and build a circuit to convert 1.5 V DC to 6 V DC. Attach simulation output and hardware implementation to the report.

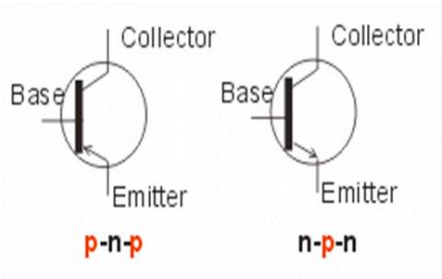
- ## Components Used

1. 1.5 V DC Battery
2. LED
3. Diode **1N4148** x1
4. **BJT BC557A** (PNP) x1
5. **BJT BC547A** (NPN) x2
6. **BJT BC337** (NPN) X1
7. Resistors (100 ohms,33K ohms,15K ohms, 100K ohms, 1K)
8. Inductor (20 uH)
9. Capacitor (100uF, 330pF)

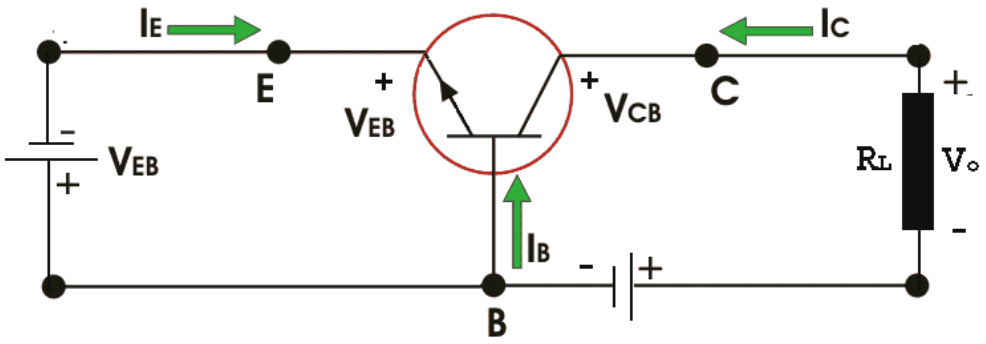
- ## Working Principle

BJT working:

The Bipolar junction transistor is a solid-state device and in the BJTs the current flow in two terminals, they are emitter and collector and the amount of current controlled by the third base terminal.



The BE junction is a forward bias and the CB is a reverse bias junction. The width of the depletion region of the CB junction is higher than the BE junction. The forward bias at the BE junction decreases the barrier potential and produces electrons to flow from the emitter to the base and the base is a thin and lightly doped it has very few holes and less amount of electrons from the emitter about 2% it recombine in the base region with holes and from the base terminal it will flow out



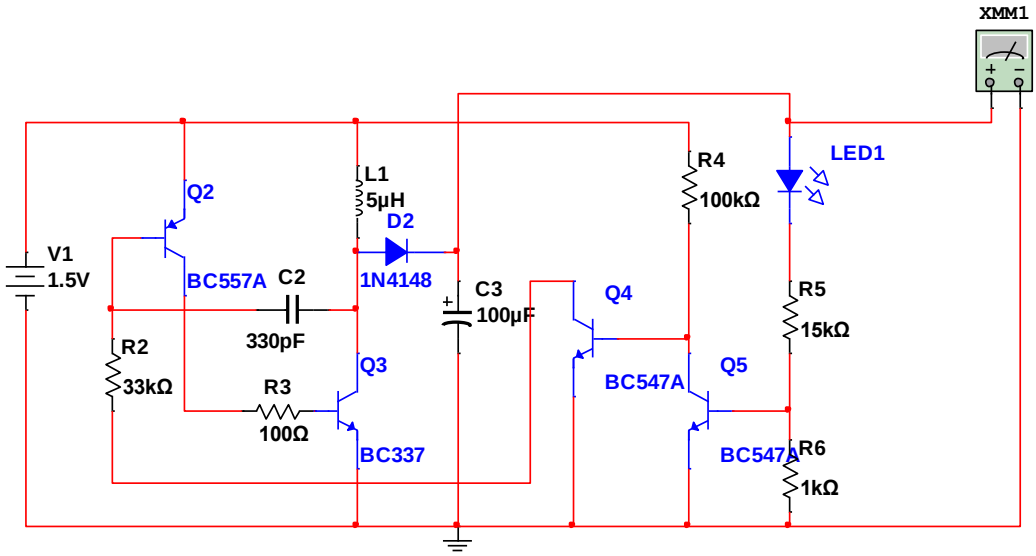
Working of circuit:

The circuit works by using an oscillator (**Q2** and **Q3**) in conjunction with the inductor (**L1**) to store and release energy with the right timing and regulates the output with help of **LED**, **Q4** and **Q5**.

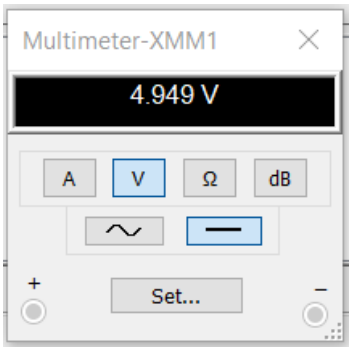
The transistor **Q4** and **Q5** in conjunction with the voltage divider **R5** and **R6** and **LED** regulate the output. **Q5** should switch with about **0.55-0.59V** on the base and around **4V** to **6V** on the output side is obtained by making the assumption that the LED drops **2V** at around **600uA**.

The oscillation is supposed to be by **Q2**,**Q3** and **C2**, with off time controlled by R2·C2≈ 10us. On time in the original design is limited by inductor saturation having the highest effect. The current increases linearly until the inductor saturates, the current spikes up and **Q3** comes out of saturation, causing the pair to power off, or by the current supplied by **C2** tailing off, causing **Q2** collector current and **Q3** base current to drop and again **Q3** comes out of saturation, or some combination of the two.

- ## Circuit Diagram

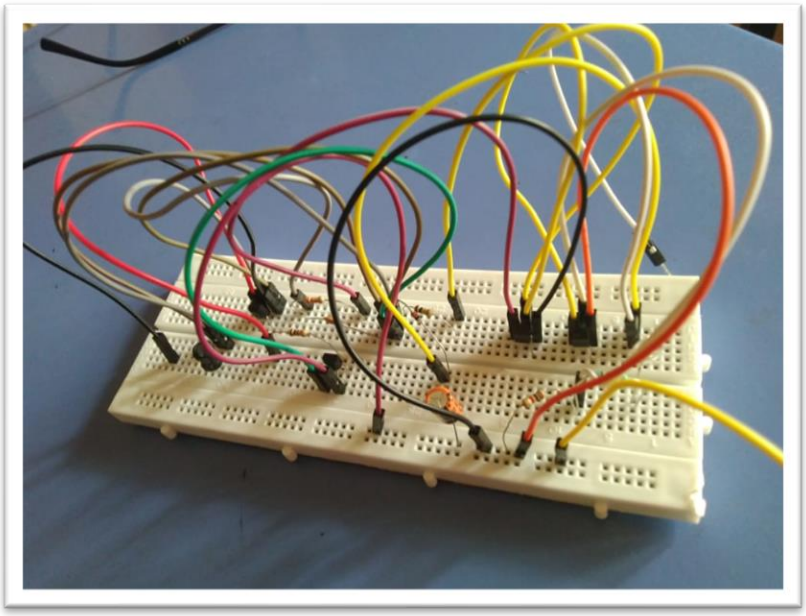


Circuit Diagram of DC-DC Self oscillating transistor converter created in Multisim.



Simulation OUTPUT

- **Hardware Implementation**



1.5V DC to DC converter Circuit on breadboard

- **Application**

- Industrial, transport and test & measurement equipment
- Factory automation
- RF remotes
- Robotics
- Suitable for harsh environments with non-linear loads
- High reliability applications
- Personal electronics eg. toys
- Automotive
- Communications

- **Result**

By performing the above stated hardware analysis, we learn how transistor is used in circuit formation for making DC step up miniature circuits in handy and compact electronic equipment with ability to energize completely with only single **1.5V** battery. Also, the interconnection between terminals of paired BJTs with switching under active and saturation mode has been studied. The simulation result yields an output of greater than 8V but under practical situations, the output varies between **3V** to **5V**.

- **Reference**

1. https://www.pinterest.com/pin/510173464036800032/
2. https://www.google.com

3.https://electronics.stackexchange.com/questions/192387/how-does-this-4-transistor-dc-dc-1-5v-to-9v-boost-converter-work