UJT RELAXATION OSCILLATOR

Aim To design and set up a UJT relaxation oscillator to generate pulses of 1 kHz frequency.

Equipments and components required UJT, potentiometer, capacitor, bread board and dc supply.

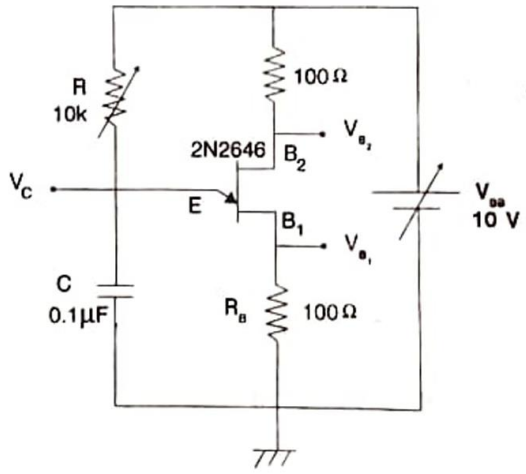
Theory Unijunction transistor (UJT) is a unipolar device. The UJT is made up of an N-type silicon bar on which a p-type material is doped. It has three terminals base$_1$(B_1), base$_2$(B_2) and emitter (E). An RC circuit in association with UJT will function as a relaxation oscillator. The sharp pulses available from the circuit can be used to trigger an SCR.

Once power supply is switched ON, capacitor is charging through resistor R towards V_{BB}. When potential across the capacitor reaches V_p, UJT turns ON. Capacitor rapidly discharges through UJT since UJT then offers very low resistance. This sudden discharge develops a sharp pulse at B_1. While discharging, at the moment capacitor voltage reaches valley voltage of UJT, it turns OFF. This enables the capacitor to charge again and repeat the cycle.

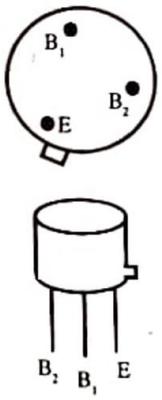
Procedure

1. Verify the components and assure the terminals of the UJT.
2. Switch ON power supply and observe the capacitor and base waveforms on CRO.
3. Vary the potentiometer for fine adjustments of frequency.

Circuit diagram



Pin out of 2N 2646



Design Output requirements Amplitude and frequency of sweep waveform = 10 V, 1 kHz.

DC bias conditions V_{CC} = 10 V since the required amplitude of the output = 10 V

Select UJT 2N2646

Details of 2N2646 η = 0.56 to 0.75. Typical η = 0.63, I_p = 5 μA and I_v = 4 mA

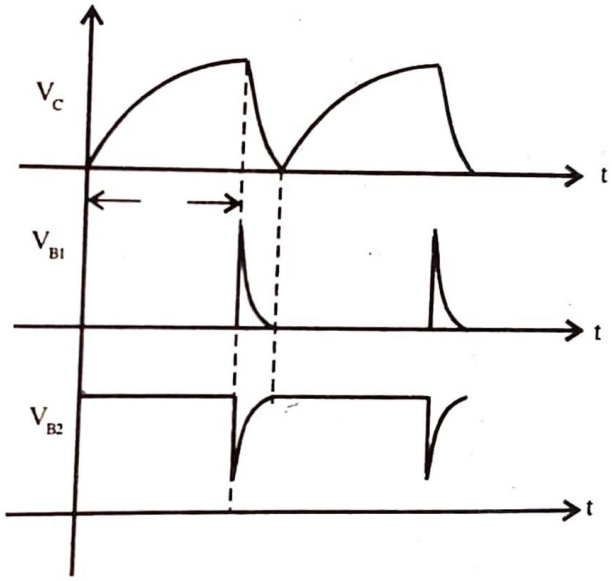
Design of R and C We have, $T = RC\ln[1/(1-\eta)]$

Take C = 0.1 μF. Then R = 10.1 k. Use a 10 k pot.

Selection of R_B R_B provides a low resistance path for the capacitor to discharge.

So, take R_B = 100 Ω.

Waveforms



Reference

Electronics Lab Manual Volume I, K.A. Navas, **Rajath Publishers**