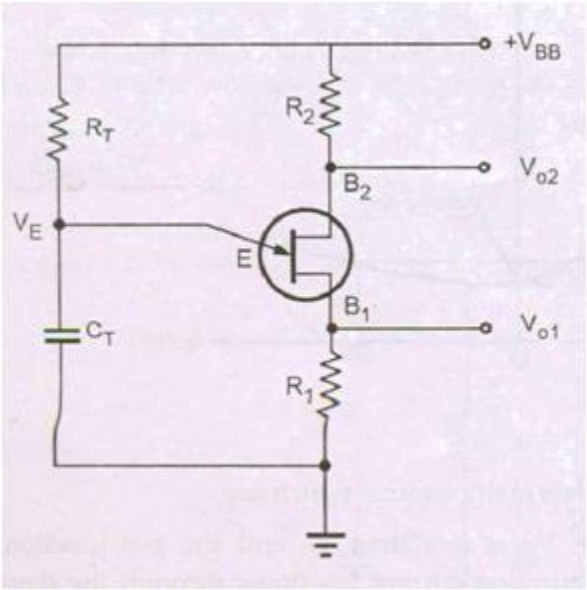
RELAXATION OSCILLATOR



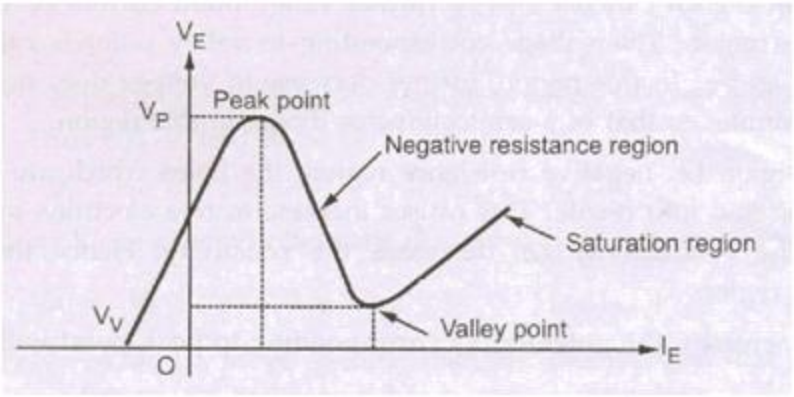
The pulse signal required to drive the digital circuits can be obtained from a single stage oscillator circuits using a particular device like unijunction transistor.

Such a oscillator which uses UJT is called UJT relaxation oscillator. The basic circuit of UJT relaxation oscillator is shown in the Fig.

The R1 and R2 are biasing resistances which are selected such that they are lower than interbase resistances RB1 and RB2.

The resistance RT and the capacitance CT decide the oscillating rate. The value of RT is so selected that the operating point of UJT remains in the negative resistance region.

The UJT characteristics and the negative resistance region of the characteristics are shown in the Fig. The characteristics of UJT show the variation between V and I where VE is emitter voltage and IE is emitter current.



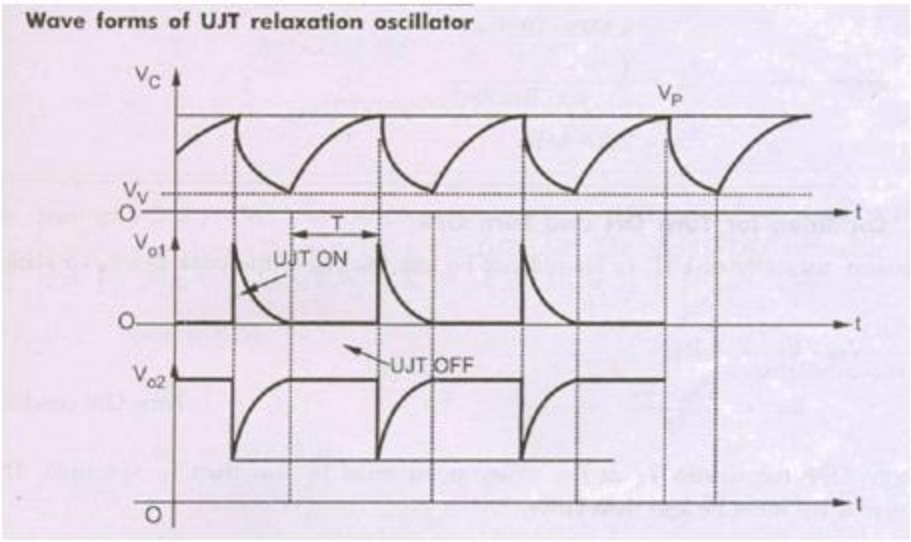
OPERATION

Capacitor CT gets charged through the resistance RT towards supply voltage VBB As long as the capacitor voltage is less than peak voltage Vp the emitter appears as an open circuit.

When the capacitor voltage Vc exceeds the voltage Vp the UJT fires. The capacitor starts discharging through R1 +RB1 where RB1 internal base resistance. As RB1 is assumed negligible and hence capacitor discharges through R1.

Due to the design of R1 this discharge is very fast, and it produces a pulse across R1 When the capacitor voltage falls below Vv i.e. VC = VE= VV the UJT gets turned OFF. The capacitor starts charging again.

The discharge time of the pulse is controlled by the time constant CTR1 while the charging time constant by RTCT.



There is voltage drop across R2 and voltage rise across R1, when UJT fires. The charging equation of the capacitor is given by,

$$V_{C(t)} = V_V + V_{BB}\left[1 - e^{-t/R_T C_T}\right]$$

$$V_{C(t)} = V_P, \quad \text{at } t = T$$

$$V_P = V_V + V_{BB}\left[1 - e^{-1/R_T C_T}\right]$$

Source : http://mediatoget.blogspot.in/2011/10/relaxation-oscillator.html