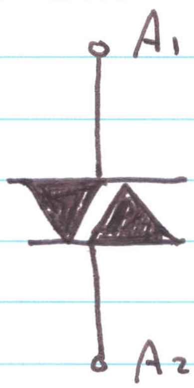
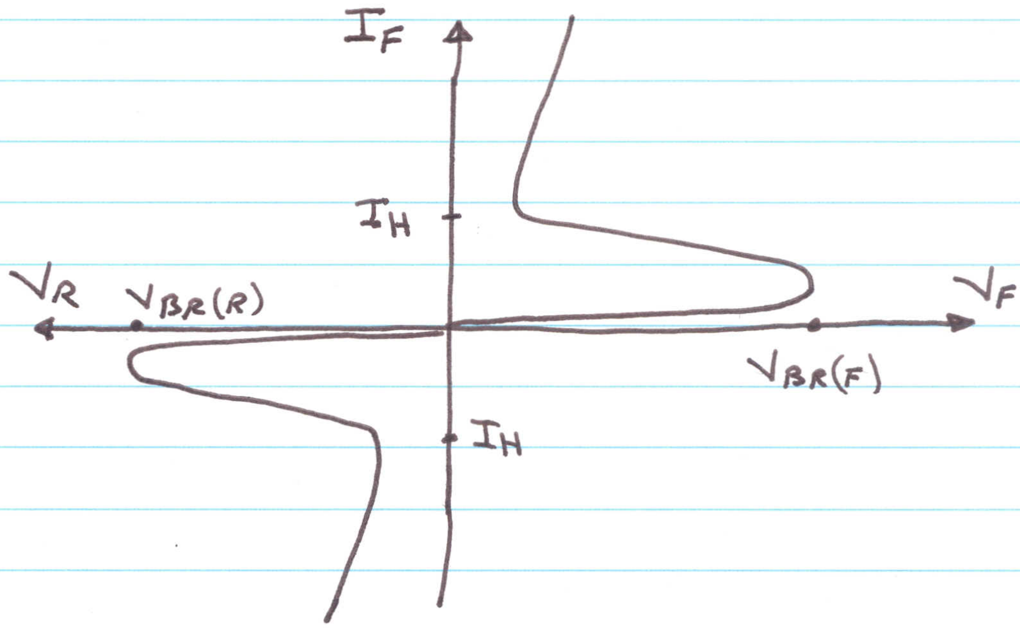
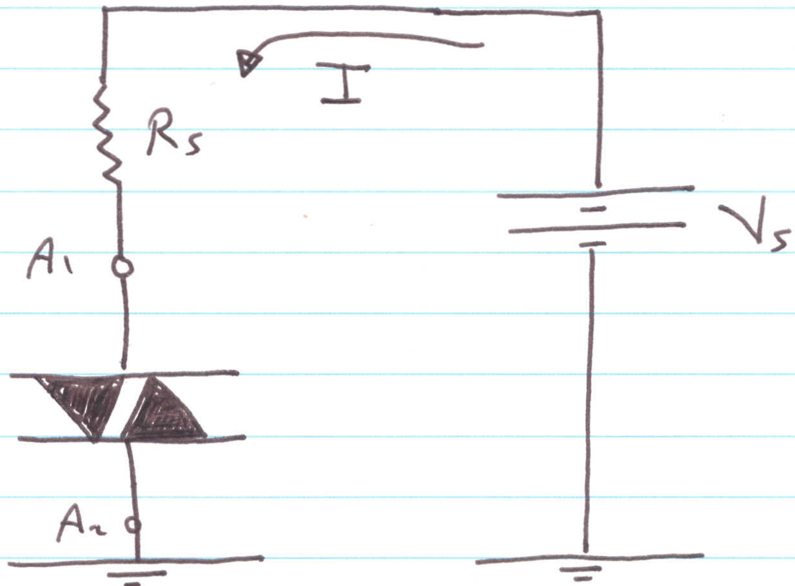
The Diac

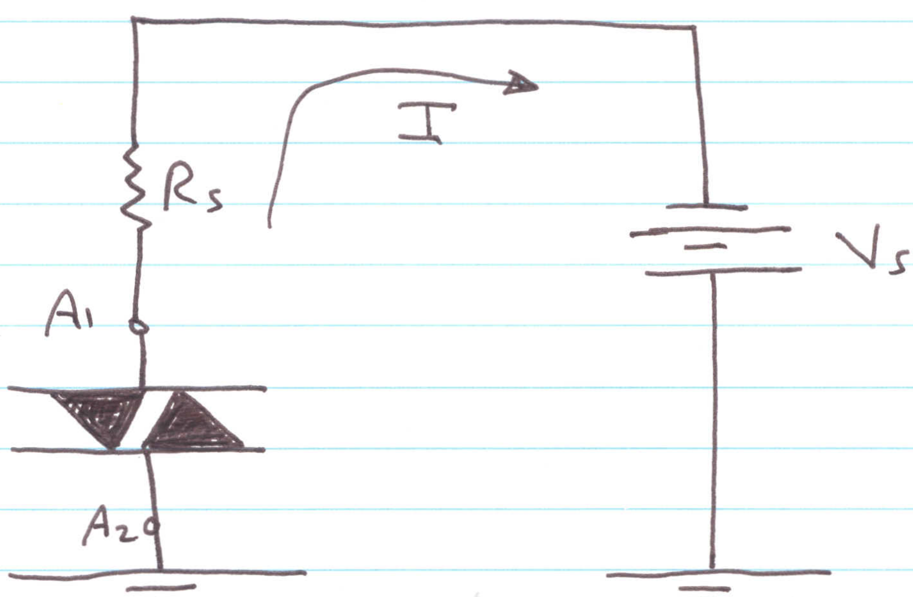




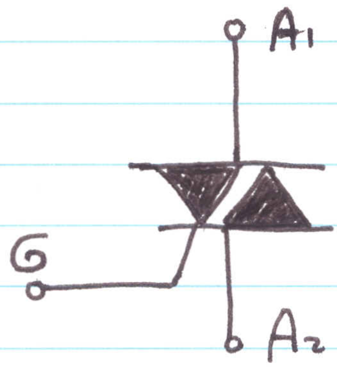
Circuit symbol — Characteristic curve

- It is a two terminal device
- It can conduct current in either direction when properly activated
- Conduction occurs when the breakover voltage is reached with either polarity
- The device turns off when the current drops below the holding value (I_H)
- The device functions like two parallel shockley diodes turned in opposite direction

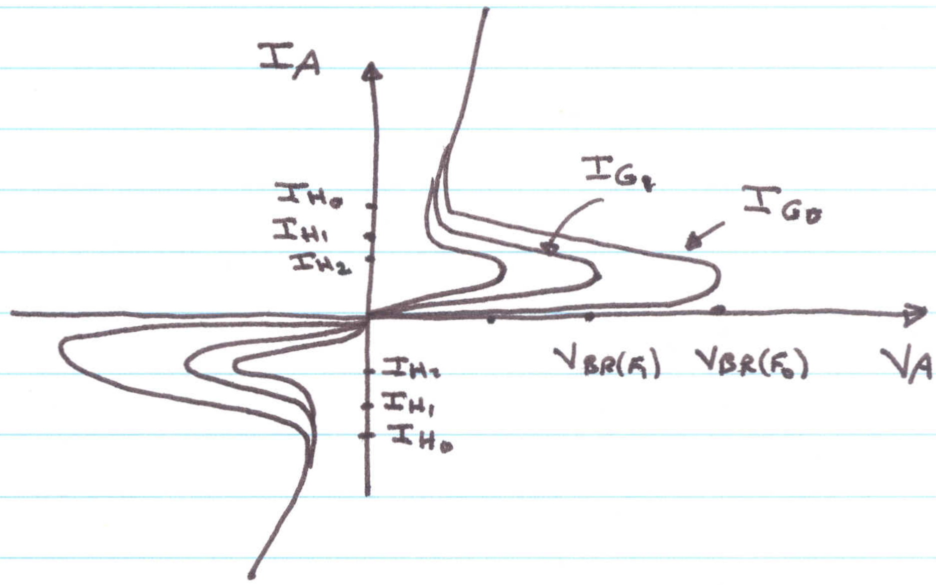

I
R_s
V_s
A_1
A_2


I
R_s
V_s
A_1
A_2

The Triac



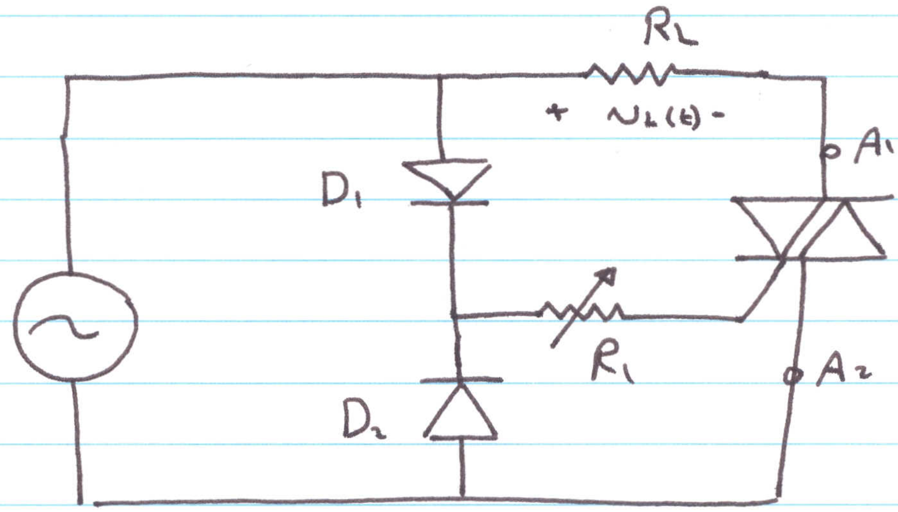
Circuit symbol



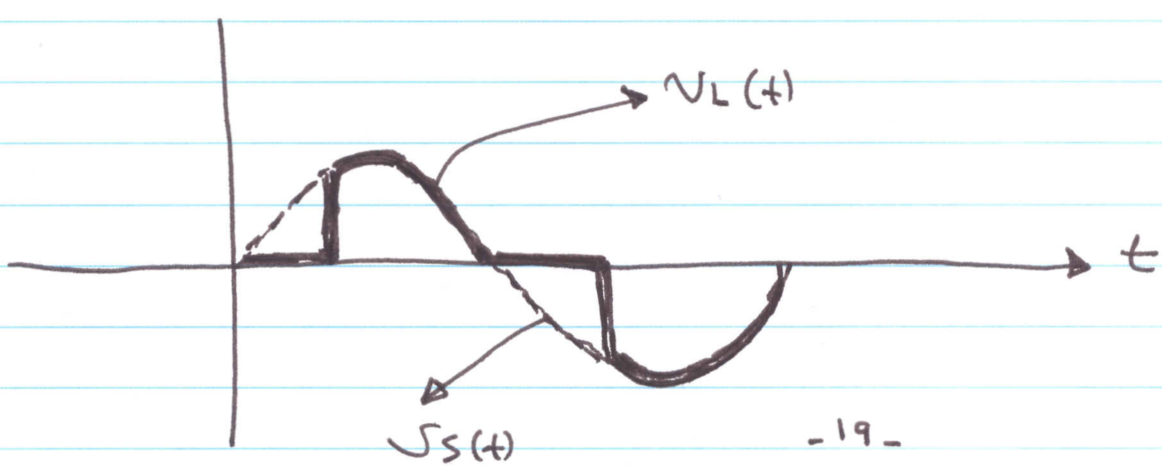
characteristic Curves

- A triac is Like a diac with a gate
- The triac functions like two SCR connected in Parallel and in opposite direction with a Common gate terminal.
- The triac Can Conduct Current in either direction when it is triggered on, depending on the polarity of the Voltage across its A_1 and A_2 terminals.
- The triac turns off when the Current drops below the holding Value (I_H).

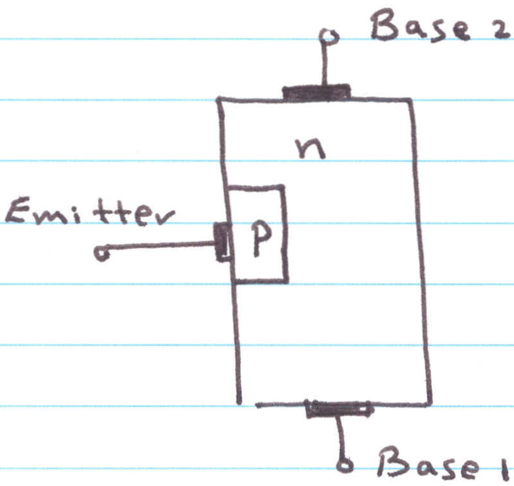
Triac Application

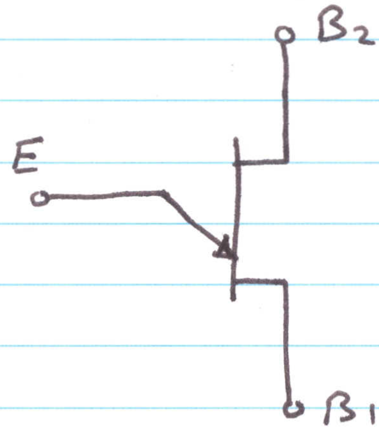


- Diode D_1 Conducts during the positive half-cycle
- The value of R_1 sets the point on the positive half cycle at which the triac triggers
- Diode D_2 Conducts during the negative half cycle
- The value of R_1 sets the trigger point



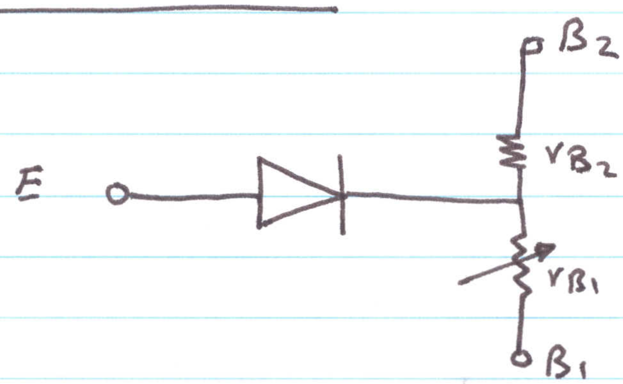
The Unijunction Transistor : UJT





- UJT is a three terminal device ; E, B_1, and B_2
- UJT has one pn junction

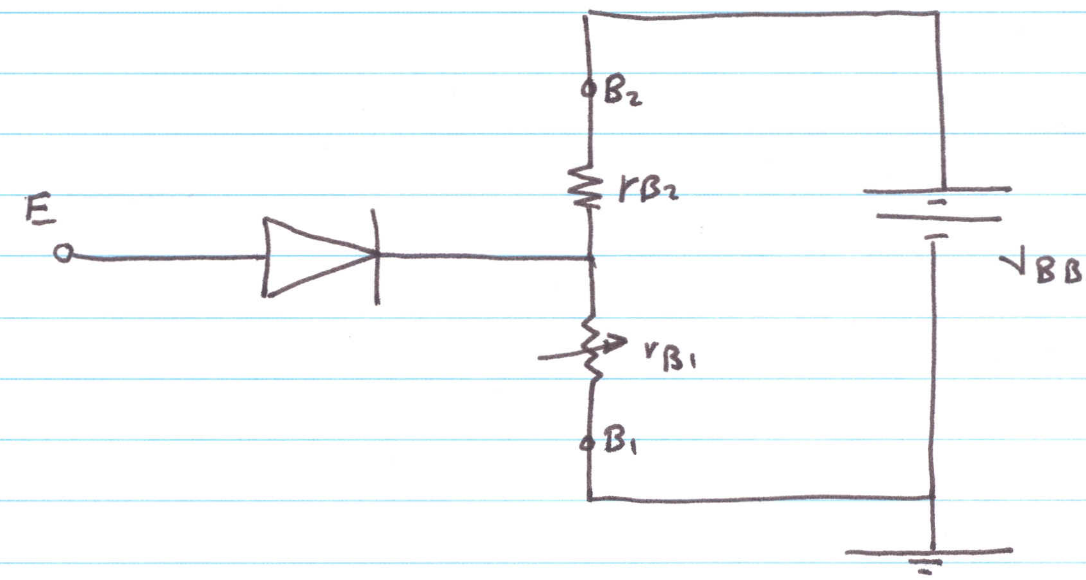
Equivalent Circuit



rB_1 , rB_2 are the dynamic resistance

$rBB = rB_1 + rB_2$ interbase resistance

rB_1 varies inversely with emitter current



To fire the UJT

$$V_{EB_1} \geq V_D + \frac{r_{B_1}}{r_{B_1}+r_{B_2}} V_{BB} = V_p$$

$$V_{EB_1} \geq V_D + \frac{r_{B_1}}{r_{BB}} V_{BB} = V_p$$

$$V_{EB_1} \geq V_D + \eta V_{BB} = V_p$$

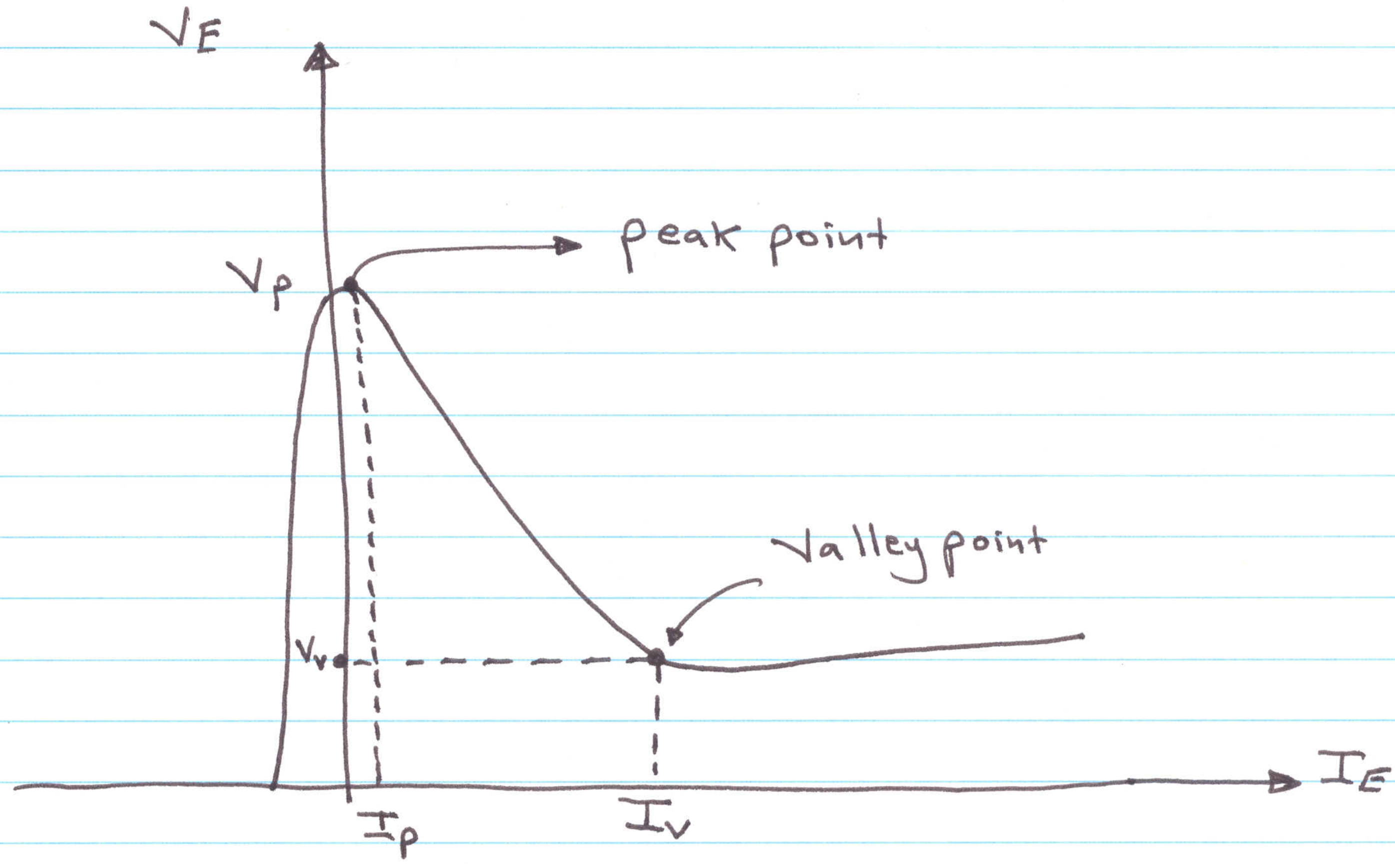
$$\eta = \frac{r_{B_1}}{r_{BB}} \equiv \text{standoff ratio}$$

$V_p \equiv$ peak point voltage

As long as the applied emitter voltage V_{EB_1} is less than V_p; there is no emitter current because the pn junction is not forward biased

- When V_{EB_1} reaches V_p, the pn junction becomes forward biased and I_E begins.
- Holes are injected into the n-type bar from the p-type emitter
- r_{B_1} decreases
- After turn on, the UJT operates in a negative resistance region up to a certain value of I_E.
- After the peak point ($V_E = V_p$ and $I_E = I_p$) V_E decreases as I_E continues to increase, thus producing the negative resistance characteristic.
- Beyond the valley point ($V_E = V_v$ and $I_E = I_v$), the device is in saturation

UJT Characteristic Curve

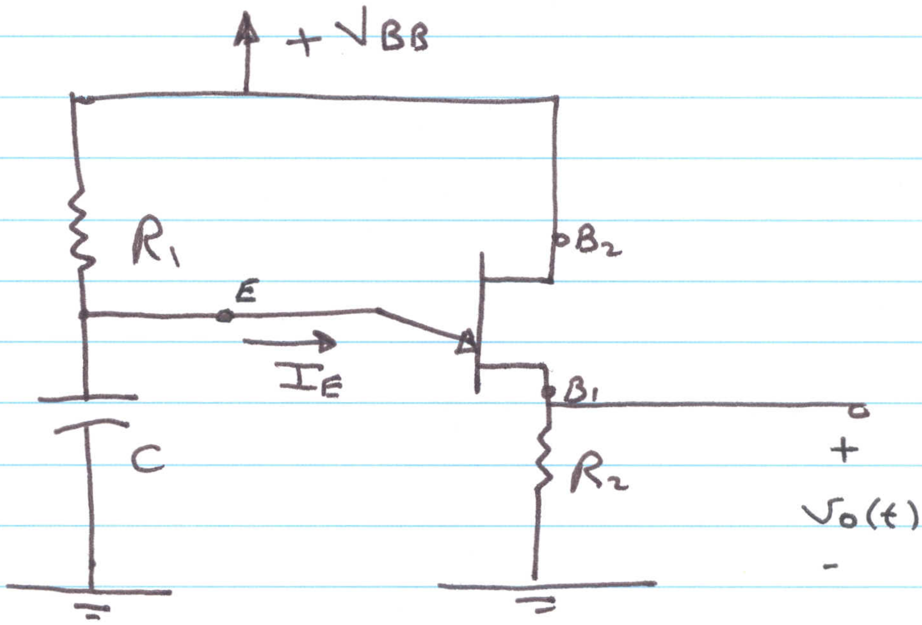


$V_v \equiv$ Valley Voltage

$I_v \equiv$ Valley Current

A UJT Application

Relaxation Oscillator



- When the dc power supply is applied, the Capacitor C charges through R_1 until it reaches V_p
- At this point, the pn junction becomes forward biased and I_E Conducts. and V_{B_1} decreases
- The Capacitor then quickly discharge through R_2 and V_{B_1}
- When the Capacitor Voltage decreases to the Valley Voltage, the UJT turns OFF

- The Capacitor begins to charge again and the cycle is repeated.