

1: UJT CHARACTERISTICS Electronic devices and circuits lab manual - Computer Programming

PE43 Scientech Technologies Pvt. Ltd. 4 Introduction UJT Relaxation Oscillator PE43 is a compact, ready to use experiment board. This is helpful for students to have a study, how to generate the pulse using UJT with.

UJT is an excellent switch with switching times in the order of nano seconds. It has a negative resistance region in the characteristics and can be easily employed in relaxation oscillators. The UJT relaxation oscillator is called so because the timing interval is set up by the charging of a capacitor and the timing interval is ceased by the the rapid discharge of the same capacitor. UJT uni junction transistor From the name itself, the UJT or uni junction transistor is a semiconductor device that has only one junction. These end terminals are called B1 and B2. A heavily doped P-type region is constructed on one side of the bar close to the B2 region. This heavily doped P region is called emitter and it is designated as E. The internal block diagram, simplified internal circuit model and circuit symbol of a UJT is given in the figure below. The diode symbol shown in the internal circuit model represents the P-N junction formed between the heavily doped P-region E and the lightly doped N-Type bar. It is the resistance between the terminals B1 and B2. In simple words, it is the resistance of the N-Type bar when measured lengthwise. The typical range of intrinsic standoff ratio is from 0. Current starts flowing into the emitter only when the bias voltage V_e has exceeded the forward drop of the internal diode V_d plus the voltage drop across R_{B1} V_{rb1} . This condition can be expressed using the following equation. But the V_e can be only increased up to a particular point called V_p peak voltage. These holes are repelled by B2 and attracted by B1. As a result, the region between emitter E and B1 terminal starts saturating by holes and the conductivity of this region starts to increase. This phenomenon of increasing conductivity by the insertion of holes is called conductivity modulation. This results in a condition where emitter current I_e increases and the emitter voltage V_e decreases. This situation is similar to a negative resistance scenario. In the graph Fig: This negative resistance region in the UJT characteristics is employed in relaxation oscillators. At last the emitter current I_e will be increased to a point that no more increase in conductivity is possible. The emitter current corresponding to valley point is denoted as I_v and the corresponding emitter voltage is denoted as V_v . Beyond the valley point, the UJT is fully saturated and the junction behaves like a fully saturated P-N junction. Voltage or current limiting circuit. R_1 and R_2 are current limiting resistors. Resistor R and capacitor C determines the frequency of the oscillator. When power supply is switched ON the capacitor C starts charging through resistor R. The capacitor keeps on charging until the voltage across it becomes equal to 0. After this point the emitter to R_{B1} resistance drops drastically and the capacitors starts discharging through this path. This cycle is repeated and results in a sort of sawtooth waveform across the capacitor. Practical circuit diagram and testing of the UJT relaxation oscillator will be added soon.

2: Analog Lab Training Modules - UJT as Relaxation Oscillator OEM Manufacturer from Ambala

UJT relaxation oscillator is a type of RC (resistor-capacitor) oscillator where the active element is a UJT (uni-junction transistor). UJT is an excellent switch with switching times in the order of nano seconds.

Types[edit] Graph of UJT characteristic curve, emitter-base1 voltage as a function of emitter current, showing current-controlled negative resistance downward-sloping region There are three types of unijunction transistor: The 2N model is the most commonly used version of the UJT. The programmable unijunction transistor, or PUT, is a multi-junction device that, with two external resistors, displays similar characteristics to the UJT. It is a close cousin to the thyristor and like the thyristor consists of four p-n layers. It has an anode and a cathode connected to the first and the last layer, and a gate connected to one of the inner layers. Applications[edit] Unijunction transistor circuits were popular in hobbyist electronics circuits in the s and s because they allowed simple oscillators to be built using just one active device. For example, they were used for relaxation oscillators in variable-rate strobe lights. This application is important for large AC current control. UJTs can also be used to measure magnetic flux. The hall effect modulates the voltage at the PN junction. This affects the frequency of UJT relaxation oscillators. PUTs do not exhibit this phenomenon. The base is formed by a lightly doped n-type bar of silicon. Two ohmic contacts B1 and B2 are attached at its ends. The emitter is of p-type is heavily doped; this single PN junction gives the device its name. The resistance between B1 and B2 when the emitter is open-circuit is called interbase resistance. The emitter junction is usually located closer to base-2 B2 than base-1 B1 so that the device is not symmetrical, because a symmetrical unit does not provide optimum electrical characteristics for most of the applications. If no potential difference exists between its emitter and either of its base leads, there is an extremely small current from B1 to B2. On the other hand, if an adequately large voltage relative to its base leads, known as the trigger voltage, is applied to its emitter, then a very large current from its emitter joins the current from B1 to B2, which creates a larger B2 output current. The schematic diagram symbol for a unijunction transistor represents the emitter lead with an arrow, showing the direction of conventional current when the emitter-base junction is conducting a current. A complementary UJT uses a p-type base and an n-type emitter, and operates the same as the n-type base device but with all voltage polarities reversed. It is a current-controlled negative resistance device. Device operation[edit] The device has a unique characteristic that when it is triggered, its emitter current increases regeneratively until it is restricted by emitter power supply. It exhibits a negative resistance characteristic and so it can be employed as an oscillator. The UJT is biased with a positive voltage between the two bases. This causes a potential drop along the length of the device. When the emitter voltage is driven approximately one diode voltage above the voltage at the point where the P diffusion emitter is, current will begin to flow from the emitter into the base region. Because the base region is very lightly doped, the additional current actually charges in the base region causes conductivity modulation which reduces the resistance of the portion of the base between the emitter junction and the B2 terminal. This reduction in resistance means that the emitter junction is more forward biased, and so even more current is injected. Overall, the effect is a negative resistance at the emitter terminal. This is what makes the UJT useful, especially in simple oscillator circuits. Invention[edit] The unijunction transistor was invented as a byproduct of research on germanium tetrode transistors at General Electric. Commercially, silicon devices were manufactured. International Journal of Electronics. Retrieved 24 September Retrieved April 10, Wikimedia Commons has media related to Unijunction transistors.

3: Electronics Analog Lab - UJT as Relaxation Oscillator Manufacturer from Ambala

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Pin assignment of UJT: Viewing from the side of pins The uni-junction transistor UJT has two doped regions with three external leads. It has one emitter and two bases. The emitter is heavily doped having many holes. The n-region is lightly doped. For this reason, the resistance between the bases is relatively high, typically 5K to 10 K when the emitter is open. This voltage V_1 reverse biases the PN-junction and emitter current is cut-off. But a small leakage current flows from B2 to emitter due to minority carriers. The equivalent circuit of UJT is shown in figure below. If a negative voltage is applied to the emitter, PN-junction remains reverse biased and the emitter current is cut-off. If V_E exceeds V_i by the cut-in voltage v_y , the diode becomes forward biased. Under this condition, holes are injected into n-type bar. These holes are repelled by the terminal B2 and are attracted by the terminal B1. Figure below shows the input characteristics of UJT. Hence, resistance decreases thereby decreasing V_E for the increase in I_E . So there is a negative resistance region from peak point P to valley point V. After the valley point, the device is driven into saturation and behaves like a conventional forward biased PN-junction diode. The region to the right of the valley point is called saturation region. In the valley point, the resistance changes from negative to positive. The resistance remains positive in the saturation region. Due to the negative resistance property, a UJT can be employed in a variety of applications, viz. The time period and hence the frequency of the saw-tooth wave can be calculated as follows: The discharge of the capacitor occurs when V_C is equal to the peak-point voltage V_P , i. Connect the circuit as shown in figure. Apply 12V DC power supply to the circuit. The operation of UJT as relaxation oscillator is studied. What is a relaxation oscillator? A relaxation oscillator is a nonlinear electronic oscillator circuit that produces a nonsinusoidal repetitive output signal, such as a triangle wave or square wave. Relaxation oscillators are generally used to produce low frequency signals for such applications as blinking lights, and electronic beepers and clock signals in some digital circuits. What is meant by intrinsic stand off ratio of an UJT? Why UJT is called as negative resistance device? When the negative resistance exists in UJT characteristics. Draw the equivalent circuit of an UJT Ans: The deviation from linearity of a relaxation oscillator is expressed in three ways. The transmission error, et. What are Peak point and valley point for an UJT? Write formula for Peak voltage. The voltage reaches its peak value V_P . The emitter current at this point is minimum. The valley point where the resistance change changes from negative to positive. The emitter current I_e is minimum at this valley point and it is called valley current I_V , where the resistance is positive. After finishing this experiment students are able to understand the operation of UJT as a relaxation oscillator.

Mention any application of UJT relaxation oscillator In triggering circuits of SCR 2. sheets for testing in lab. images of electronics lab manual.i need it.

Students are able to obtain the Emitter characteristics of UJT. Write the features of UJT. The device has only one junction, so it is called the uni-junction device. The device, because of one P-N junction, is quite similar to a diode but it differs from an ordinary diode as it has three terminals. In a uni-junction transistor the emitter is heavily doped while the N-region is lightly doped, so the resistance between the base terminals is relatively high, typically 4 to 10 kilo Ohm when the emitter is open. The N-type silicon bar has a high resistance and the resistance between emitter and base-1 is larger than that between emitter and base It is because emitter is closer to base-2 than base UJT is operated with emitter junction forward- biased while the JFET is normally operated with the gate junction reverse-biased. UJT does not have ability to amplify but it has the ability to control a large ac power with a small signal. It exhibits a negative resistance characteristic and so it can be employed as an oscillator. What is a UJT? It is Uni-junction transistor, it has only one junction between emitter and n-slab. What is relaxation oscillator? That is, a dynamical system within the oscillator continuously dissipates its internal energy. Normally the system would return to its natural equilibrium; however, each time the system reaches some threshold sufficiently close to its equilibrium, a mechanism disturbs it with additional energy. The period of the oscillations is set by the time it takes for the system to relax from each disturbed state to the threshold that triggers the next disturbance. What are the applications of UJT? Relaxation oscillator, Saw tooth wave form generator 6. What is the importance of intrinsic stand-off ratio? Why does negative resistance region appears in UJT? What is the doping profile of UJT? Is there any break down region in UJT?

5: UJT RELAXATION OSCILATOR - Electronic Circuits and Diagrams-Electronic Projects and Design

Design UJT relaxation oscillator with sweep amplitude of 10V, with sweep interval of 2ms neglect flyback time and $e s =$
Outcomes: After finishing this experiment students are able to understand the operation of UJT as a relaxation oscillator.

It is a three terminal device. The equivalent circuit is shown with the circuit diagram. So there are two resistors. One is a variable resistor and other is a fixed resistor. It is defined as the ratio of the variable resistance to the total resistance. Due to the existing pn junction, there will be a voltage drop. If we apply a voltage to the emitter, the device will not turn on until the input voltage is less than the drop across the diode plus the drop at the variable resistance R_1 . When the device is turned on holes moves from emitter to base resulting in a current flow. Due to this sudden increase in charge concentration in base1 region conductivity increases. This causes a drop at base1. This region in the graph is known as negative resistance region. If we further increase the emitter voltage the device undergoes saturation. So a UJT has 3 operating regions: Cut off region 2. Negative resistance region 3. Saturation region In a relaxation circuit there is an RC timing circuit. When the supply is turned on, the capacitor starts charging. When the voltage across the capacitor reaches the pinch off voltage, the UJT turns on. After discharging of capacitor ,again it starts charging, and this process continues till power supply is turned off. Test the components and identify the leads of UJT 2. Switch on the power supply. Observe the wave forms at bases and emitter of UJT.

6: UJT relaxation oscillator, circuit diagram, UJT theory and working

[cdc] - Ujt Relaxation Oscillator Lab Manual caution 1 do not play with electricity 2 carelessness not only destroys the valuable equipment in the lab but also costs your life 3 mere.

7: Unijunction transistor - Wikipedia

A Unijunction Transistor (UJT) is an electronic semiconductor device that has only one junction. The UJT Unijunction Transistor (UJT) has three terminals an emitter (E) and two bases (B1 and B2).

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