

What is GUNN diode?

Gunn diode is bulk semiconductor device. It is based on Transferred Electron Effect. The effect was found by Gunn to be exhibited by gallium arsenide, Indium phosphide. Latter on it was observed that the effect was also exhibited by cadmium telluride and indium arsenide. The transferred electron effect is also known as Gunn Effect.

Draw equivalent circuit for GUNN diode?

What are different modes in GUNN diode oscillator?

There are following possible modes for Gunn oscillations. Different modes are there depending of drift velocity of domain which in turn depends on applied electric field

1 Transit time domain mode: Sustaining velocity for GaAs is 10 cm/s. When drift velocity of domain equals to sustaining velocity the mode is transit time mode. Obviously for this type of mode oscillation time period is transit time.

2. Delayed domain mode: Main drawback of delayed mode is that its conversion efficiency is low. To overcome this drawback at positive end domain is collected when applied field is less than the threshold field (EE). Thus for the given length of GaAs slice, velocity at which domain is collected, increases thus decrease in transit time of domain.

3. Quenched Domain Mode: Drawback of transit time and delayed domain mode is that maximum frequency produced is equal to transit time of domain. But it has been observed that resonant circuit connected to Gunn diode is able to resonate at much greater frequency than this with good conversion efficiency. To overcome this, in case of quenched domain mode is suggested. In this mode, the applied field is reduced below sustaining field during negative half cycle.

4. Limited space charge accumulation (LSA) mode: LSA mode is the simplest mode of operation and it consists of a uniformly doped semiconductor without any internal space charges.

How many junctions are there in GUNN diode?

Gunn diodes typically have three junctions ("n-type" region, the "intrinsic" or "i-type" region, and the "p-type" region)

Explain the transferred electron effect in GUNN diode?

The transferred electron effect involves the motion of electrons in the presence of a strong electric field within certain semiconductor materials, such as gallium arsenide (GaAs).

The transferred electron effect in a Gunn diode is a phenomenon where electrons in a strong electric field reach a constant drift velocity, causing the diode to exhibit negative differential resistance. This effect leads to the formation of electron domains and the generation of microwave signals in the diode.

What are applications of GUNN diode?

1 GUNN Oscillator: Since Gunn diode consists of negative resistance and is very thin, it can be used to generate as oscillator at microwave frequency.

2 GUNN diode amplifier: Due to negative resistance, Gunn diode can be used as an amplifier. Above 30 GHz of frequency also Gunn diode amplifier provides high power output and low noise with good efficiency.

3 GUNN diode as pump source in parametric amplifier: The majority parametric amplifiers use Gunn diode as pump source. They have advantage over IMPATT diodes of having much lower noise.