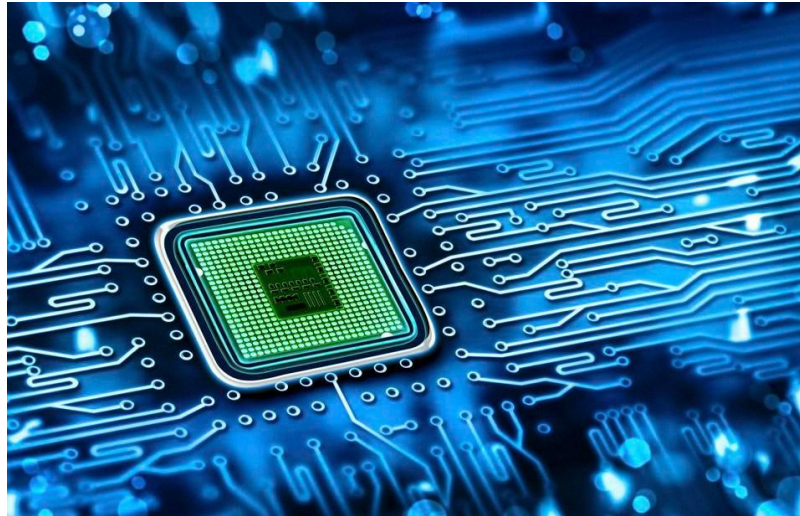




**SNS COLLEGE OF ENGINEERING**  
(Autonomous)  
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING



# PARAMETRIC AMPLIFIER



Unit-I/ PARAMETRIC AMPLIFIER / E.Divya , AP/ECE





# PARAMETRIC AMPLIFIER



**A highly sensitive low-noise amplifier for ultrahigh-frequency and microwave radio signals**, utilizing as the active element an inductor or capacitor whose reactance is varied periodically at another microwave or ultrahigh frequency. A varactor diode is most commonly used as the variable reactor.

The advantage of a parametric amplifier is that it has much lower noise than an amplifier based on a gain device like a transistor or vacuum tube. This is because in the parametric amplifier a reactance is varied instead of a (noise-producing) resistance.





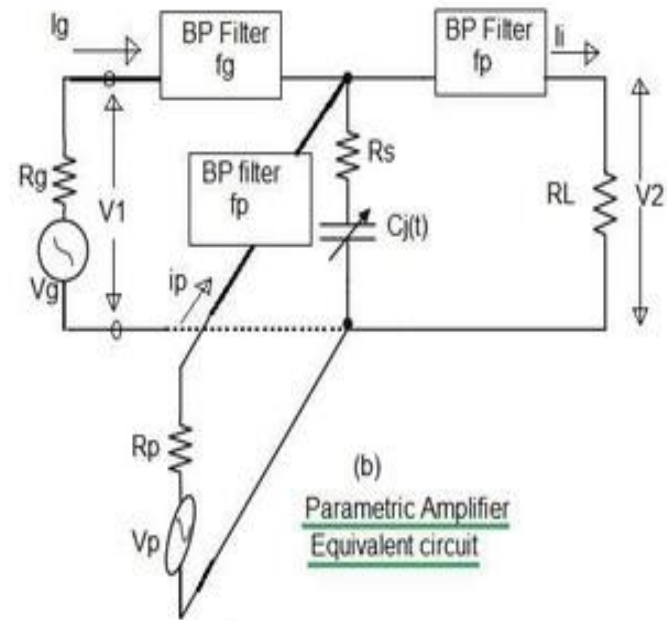
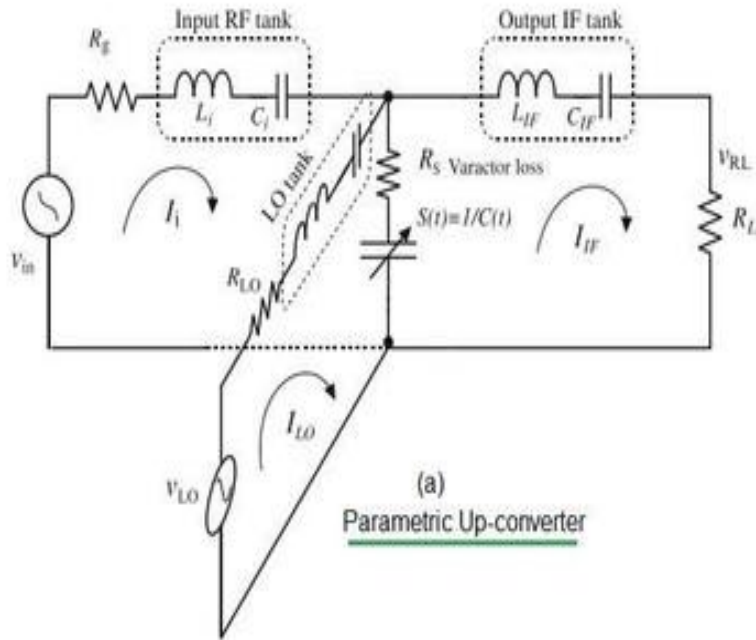
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If a small input signal with frequency  $f_g$  and AC power with frequency  $f_p$  are applied to varactor diode, linear amplification of small input signal occurs. This happens due to time varying capacitance of the varactor diode.

Here pump signal ( $f_p$ ) provides power needed for amplification. The power output is either at the input frequency ( $f_g$ ) or at the idler frequency ( $f_i = f_p - f_g$ ).







# PARAMETRIC AMPLIFIER



**Following are advantages of Parametric amplifier:**

- **Noise Figure:** Because of minimum resistive elements, thermal noise in parametric amplifier is very less in comparison to transistor amplifier. Hence noise figure is less and will be in the range 1-2 dB.
- **Frequency Range:** The upper frequency limit (about 40 to 200GHz) is set by the difficulty of obtaining a source power at pump frequency and also by the frequency at which the varactor capacitance can be pumped. The lower frequency limit is set by the cut-off frequency of the microwave components used in circuit
- Because of its low noise, parametric amplifiers are used in space communications systems, tropo-receivers and radio telescopes.





# PARAMETRIC AMPLIFIER



## DISADVANTAGES :

- **Bandwidth:** Parametric amplifier bandwidth is small due to the presence of tuned circuits. Bandwidth can be increased by stagger tuning.
- **Gain:** It is limited by the stabilities of pump source and the time varying capacitance. It is usually in the range of 20 to 80 dB.





Thank  
you

