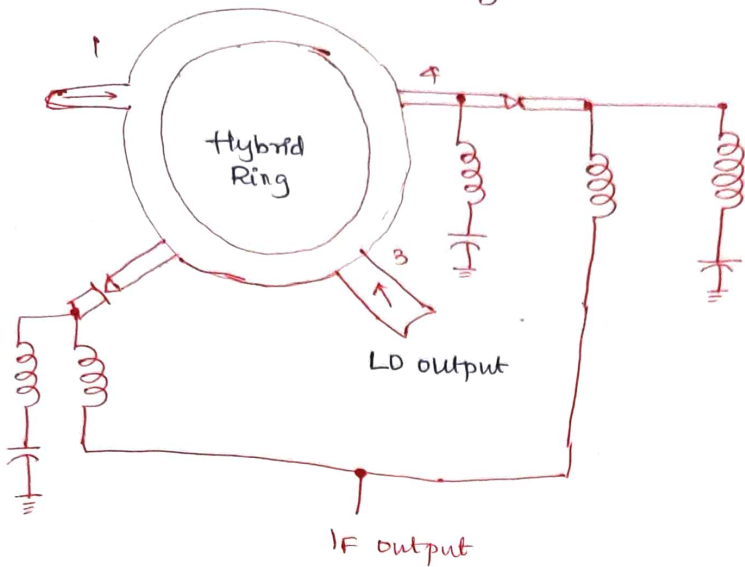
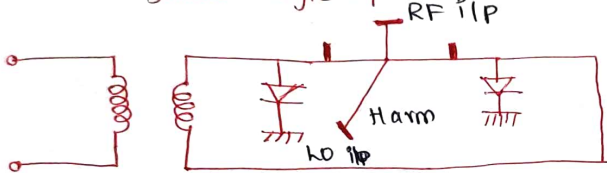


Balanced Mixers

(a) microstrip hybrid ring

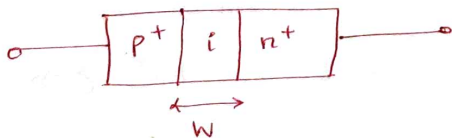


(b) waveguide magic-T



④ Pin Diode

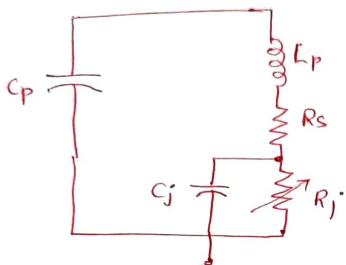
- * A PIN Diode consists of a high-resistivity (*i*) intrinsic semiconductor layer between two highly doped P^+ and n^+ Si layers
- * Acts as an electrically variable resistor which is related to the '*i*' layer thickness



i layer has very large resistance in Reverse Bias & decreases in forward bias.

Mobile carriers from p and n regions injected into i layer, act as a rectifier at microwave freq. & appears as a linear resistance suitable as a variable attenuator at microwave freq.

Equivalent ckt



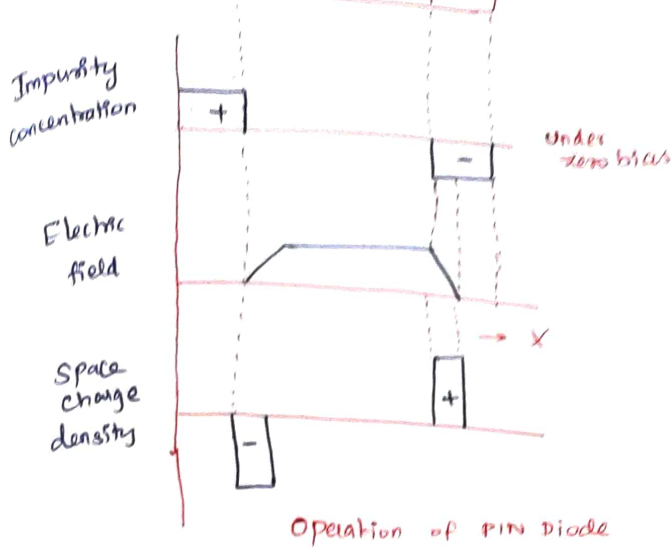
R_j, C_j - Junction resistance, capacitance of i layer

R_s - Bulk semiconductor (p^+ & n^+) layers and contact res

L_p, C_p - Package Inductance, capacitance

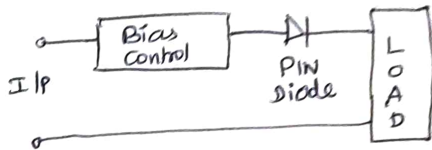
Operation of PIN Diode

- ① Zero bias :- The diffusion of the holes & e^- across the j_n causes space charge density region of thickness which is inversely prop to impurity concentration.
- ② Reverse bias :- space charge regions in the p and n layers will become thicker. The reverse res will be very high & almost constant.
- ③ Forward bias :- space charge regions become thinner. e^- & holes are injected carrier concent. in the i layer \uparrow above equilibrium levels and resistivity drops. low resistance offered in forward direction.



Applications of PIN Diodes

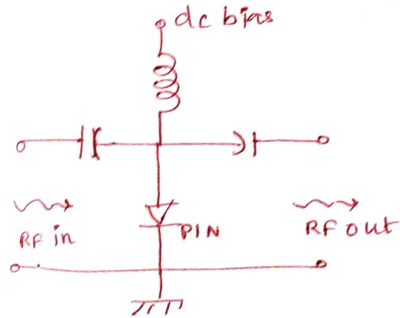
i) PIN Diode as a switch



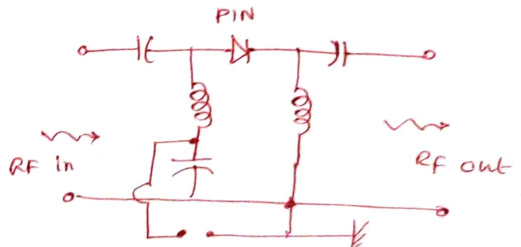
Series or shunt - When the diode is reverse biased, the switch is 'off' or 'open' and when it is forward biased, it is closed.

a) Single PIN switch

Shunt mount



Series mount



Single PIN switch

AC blocking inductor - high impedance strip line section

dc blocking cap - realised from a gap in the line

Series:

ON - FB
OFF - RB

shunt

RB - ON
FB - OFF

b) Double Switch.

- Single-Pole Double-Throw (SPDT)
- Diodes are biased thro' RF chokes - to isolate ac component.
- Imp. matchn obtained b/w RF feeder line and switch from Quarterwave lines

ii) PIN phase shifter:

- * Electronic phase shifters are mod to phased array.
- * D_1, D_2, D_3 and D_4 are identical PIN diodes.
- * phase shift obtained by perturbing parameters of Txn. line
- * Oprn. is based on Switching b/w FB & RB so that differential phase change occurs at the o/p.

