SNS COLLEGE OF ENGINEERING

Kurumbapalayam (Po), Coimbatore – 641 107

An Autonomous Institution

Accredited by NBA – AICTE and Accredited by NAAC – UGC with 'A' Grade
Approved by AICTE, New Delhi & Affiliated to Anna University, Chennai

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

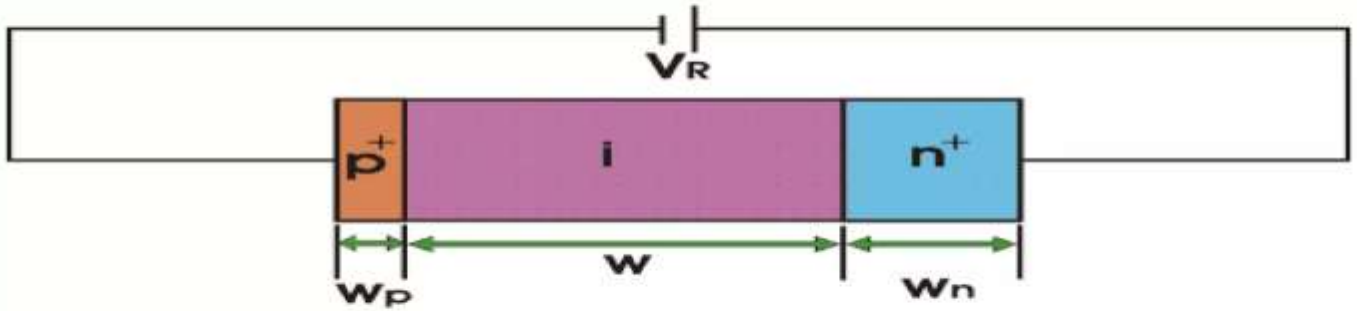
COURSE NAME : 19EC602 – Microwave and Optical Engineering

III YEAR / VI SEMESTER

Unit I- MICROWAVE ACTIVE DEVICES

Topic : PIN modulator

❖PIN diode consists of heavily doped P and N regions separated by a wide intrinsic region.



❖Intrinsic region offers the high resistance to the current through it .

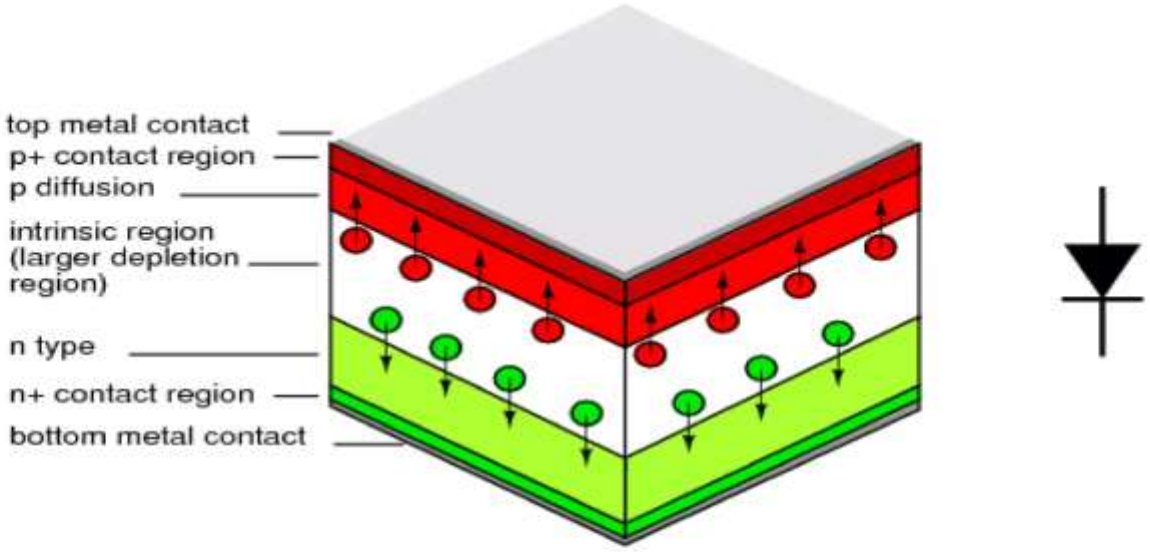
❖The wide intrinsic region makes the PIN diode an inferior rectifier (one typical function of a diode), but it makes the PIN diode suitable for attenuators, fast switches, photo detectors, and high voltage power electronics applications.

❖PIN diode works as an ordinary PN junction diode frequencies up to a 100 MHZ.

❖Above 100 MHZ it seizes its operation of rectifier and behaves as a switch or resistance.

❖In reverse bias it acts as a capacitor.

CONSTRUCTION



BIASING OF PIN DIODE

1. UNBIASED : when the PIN is unbiased there is a diffusion of electron across the junction. Depletion region is formed between PI and IN regions with more penetration in intrinsic region.

2. FORWARD BIAS : When the diode is forward biased, the injected carrier concentration is typically several orders of magnitude higher than the intrinsic level carrier concentration.

- Due to this high level injection, which in turn is due to the depletion region , the electric field extends deeply (almost the entire length) into the region.

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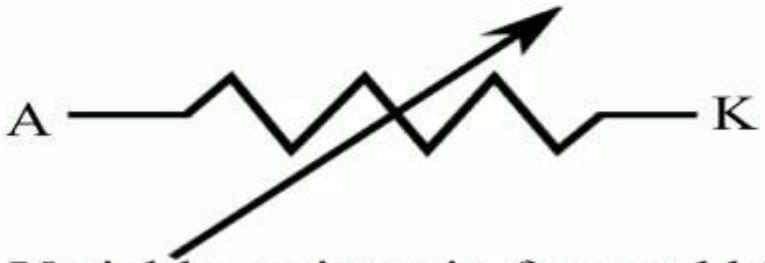
❖This electric field helps in speeding up of the transport of charge carriers from P to N region, which results in faster operation of the diode, making it a suitable device for high frequency operations.

❖IN forward bias the diode behaves as a variable resistance and resistance decreases with increase in forward bias voltage.



Variable resistor in forward bias

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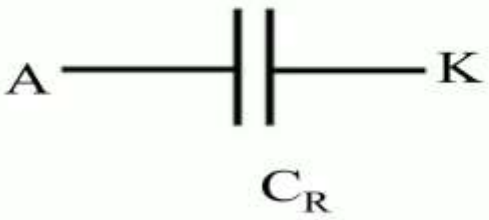
Reverse Bias : As the reverse bias voltage is increased the depletion layer thickness increases . The device behaves as a variable capacitor until the intrinsic region becomes free of mobile carriers.

- This voltage is called swept out voltage .
- At this voltage the device works as a constant capacitor.



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APPLICATIONS

- RF and dc controlled microwave switches
- RF and variable attenuator
- In limiter circuit
- Photo detector and photo voltaic cell
- RF modulator circuit.

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Any Query????

Thank you……