Four Layer P-N-P-N Switching Devices (Shockley Diode) Lecture – 11

TDC PART – II

Paper - III (Group - A)

Chapter - 4

by:

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Four Layer P-N-P-N Switching Devices (Shockley Diode)

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- **P-N-P-N Diode or Shockley Diode**
- **Lecture Content :-**

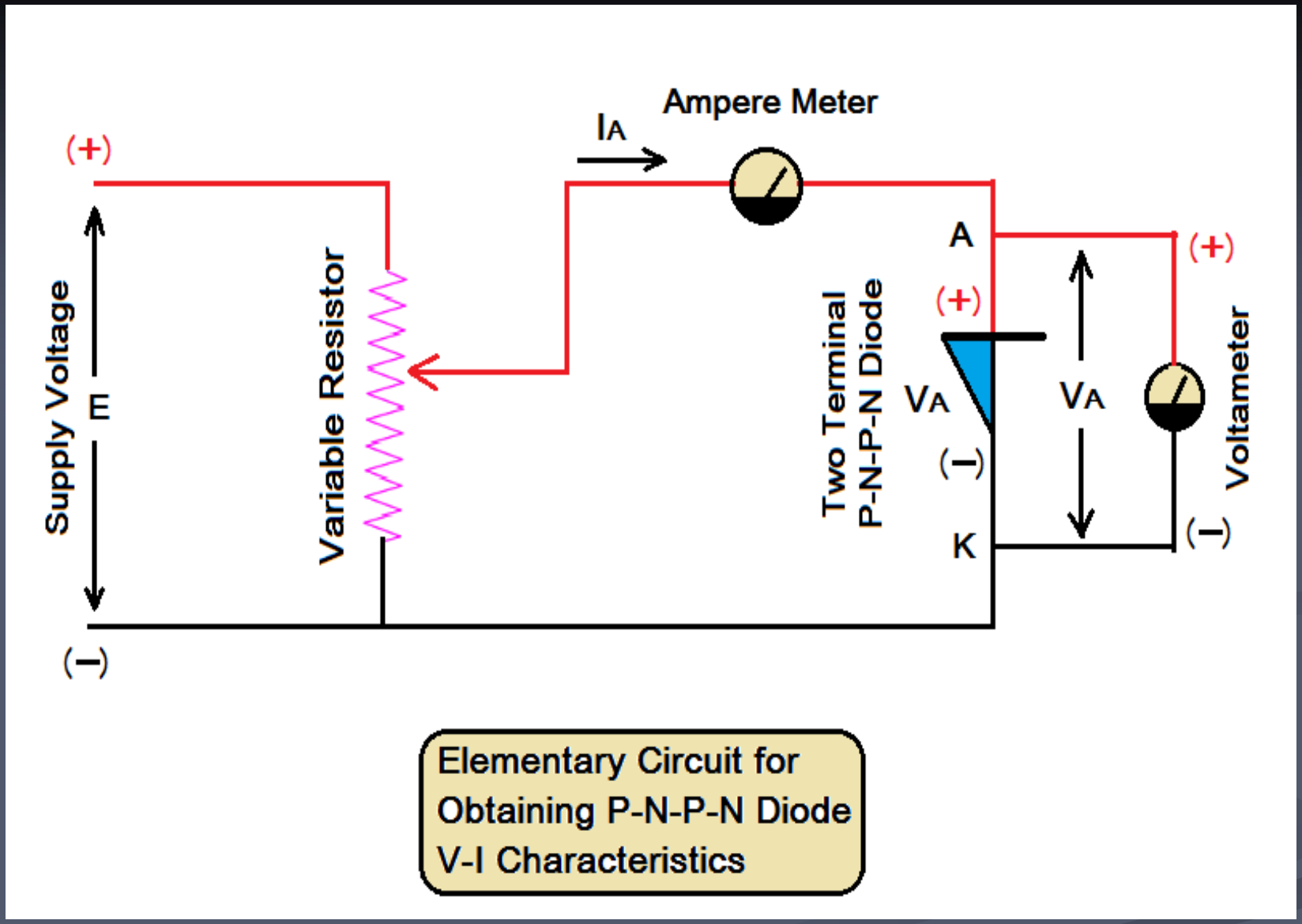
➢ **(7) V-I Characteristics of P-N-P-N Diode or Shockley Diode**

➢ **(III) Forward Conducting Mode (ON-State)**

P-N-P-N Diode or Shockley Diode

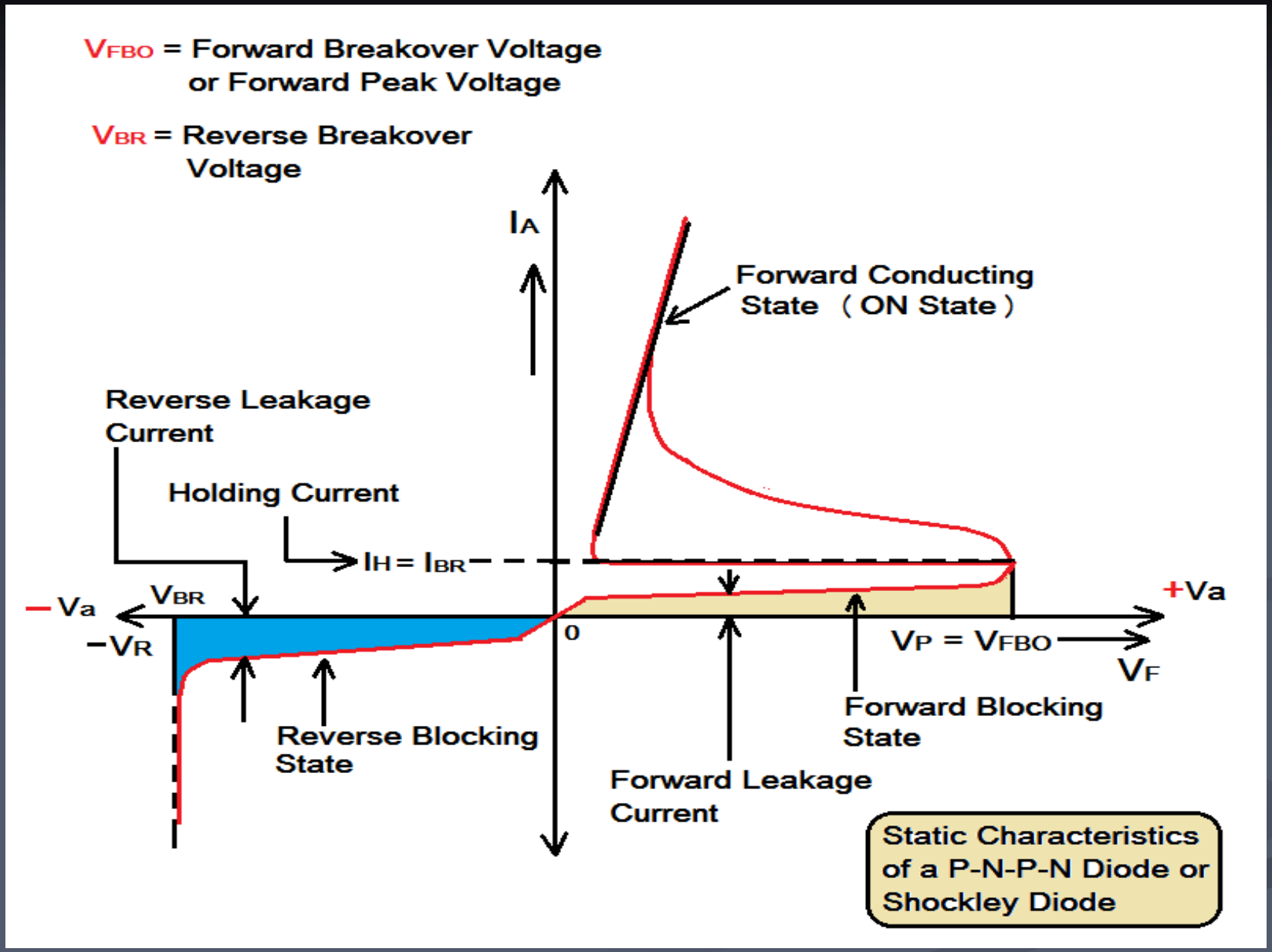
- **(7) V-I Characteristics of P-N-P-N Diode or Shockley Diode**

- **An Elementary Circuit Diagram** for obtaining **V-I Characteristics** of a **P-N-P-N Diode or Shockley Diode** is shown in **Figure (18)** below. The **Anode (A) and Cathode (K)** are connected to **Main Source (Supply Voltage E)** through an **"Ampere Meter" and a Voltage finding meter "Voltmeter"** connected in **Parallel in device.**



- **Fig. (18)** Shown an elementary circuit diagram for obtaining V-I Characteristics of a P-N-P-N Diode or Shockley Diode.

- **Figure (19)** shown below a **Static V-I Characteristics of a P-N-P-N Diode.** Here **V_A** is the **Anode (A) Voltage** across **P-N-P-N Diode** terminals **Anode (A), Cathode (K)** and **I_A** is the **Anode (A) Current.**



- **Fig. (19)** Shown Static V-I Characteristics of a P-N-P-N Diode or Shockley Diode.

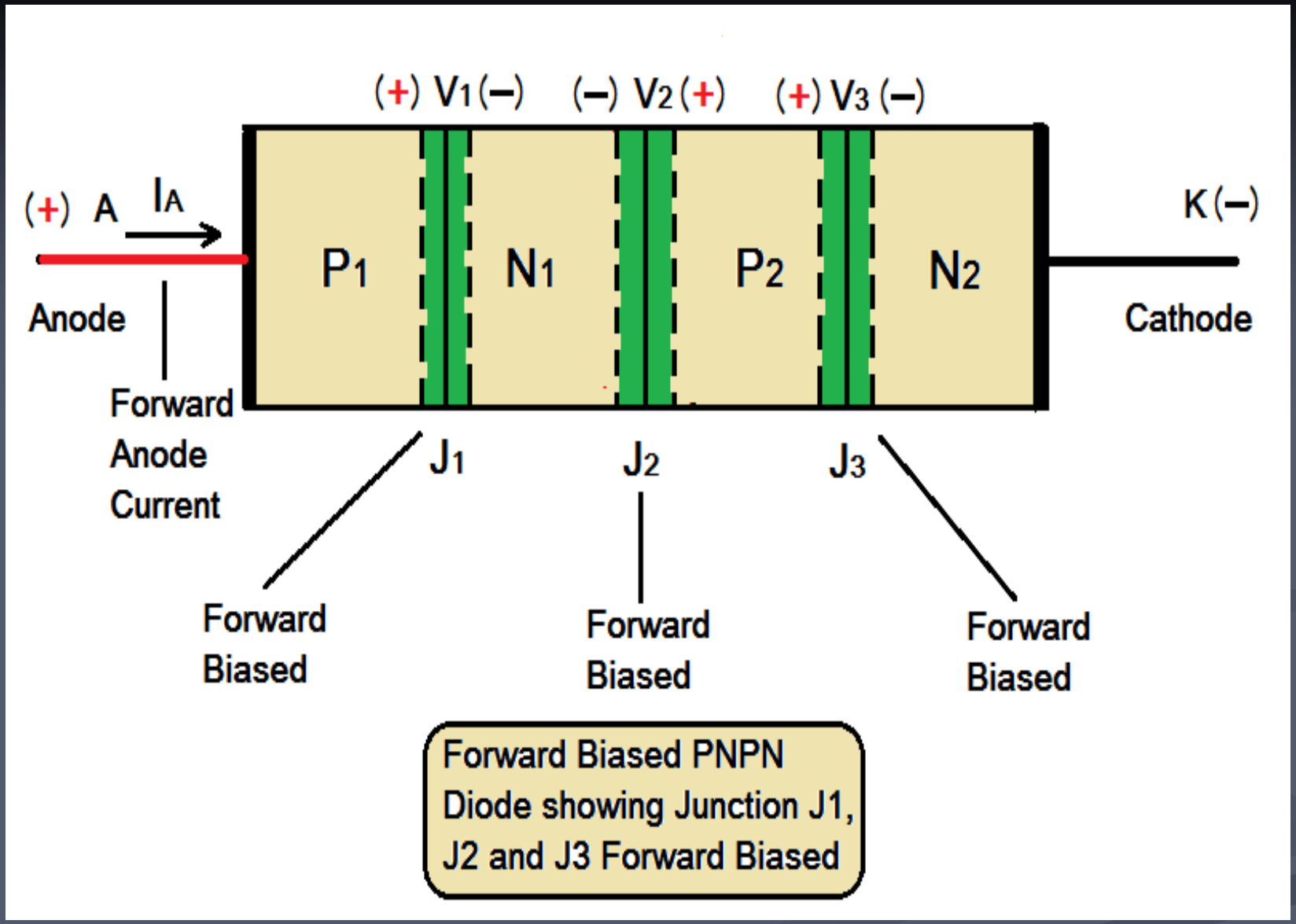
- Typical **P-N-P-N Diode V-I Characteristics** shown above in **Figure (19)** reveals that a **P-N-P-N Diode** has **Three Basic Mode of Operation**; namely,

- **(I) Reverse Blocking Mode (OFF-State)**
- **(II) Forward Blocking Mode (OFF-State)**
- **(III) Forward Conducting Mode (ON-State)**

- These **three modes of operation** are now discussed below one by one;

(III) Forward Conducting Mode (ON-State)

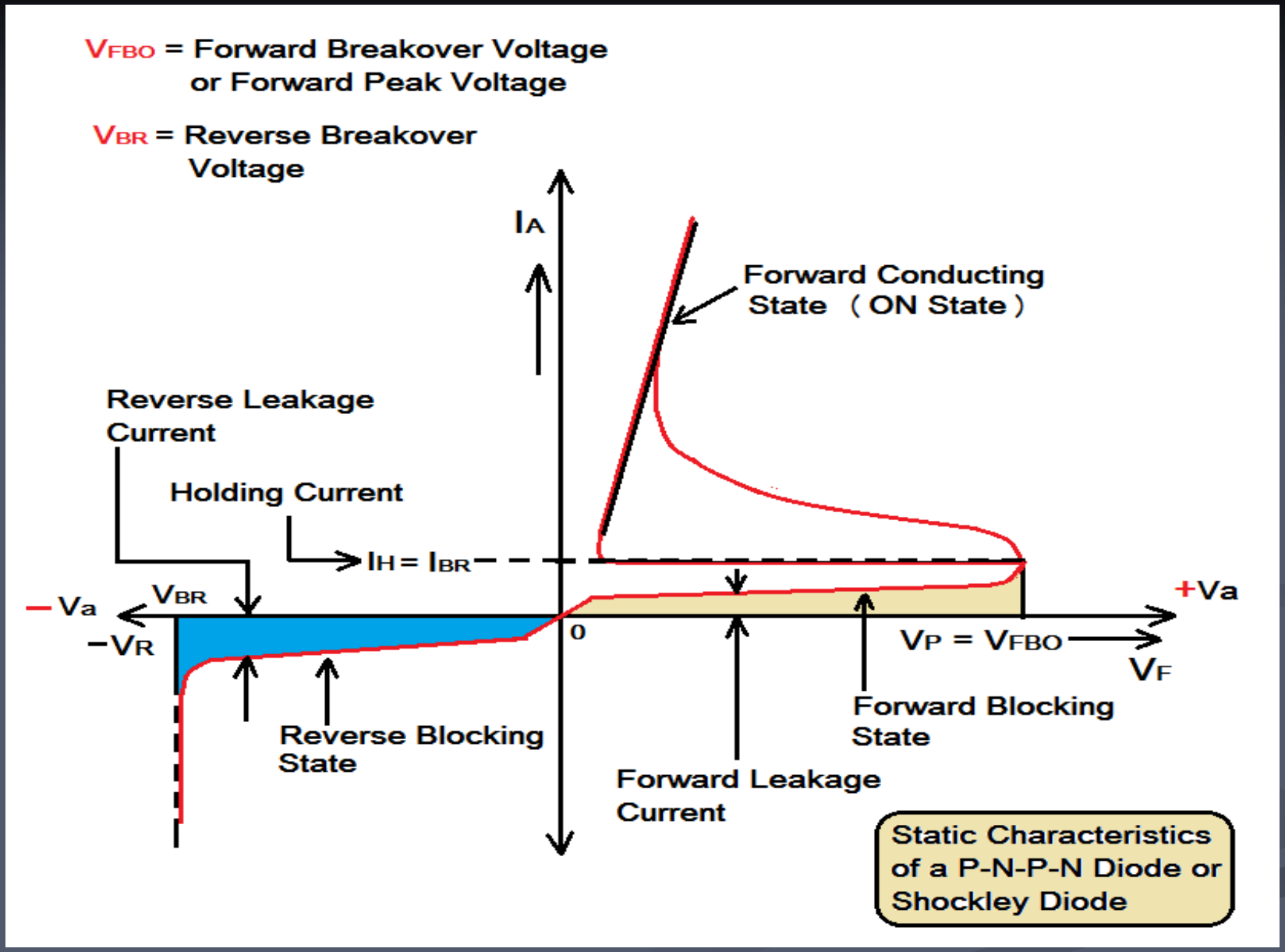
- When **Anode (A) terminal is Positive** with respect to the **Cathode (K) terminal**, **P-N-P-N Diode** is said to be **Forward Biased** as shown in **Figure (24)** below. It is seen from this **Figure (24)** that **Junctions J1, J2 and J3 are Forward Biased.**



- **Fig. (24)** Shown Forward Biased P-N-P-N Diode with Junctions J1, J2 and J3 are Forward Biased.

- In this **Forward Conducting Mode, P-N-P-N Diode Conducts** from **Anode-to-Cathode** with a **very small Voltage Drop** across it. A **P-N-P-N Diode** is brought from **Forward Blocking Mode to Forward Conduction Mode** by **Turning it ON** by **Exceeding the Forward Break Over Voltage V_{FBO}** or by applying a **More Forward Voltage at Anode (A) terminal.**

- **Voltage Drop** across diode in the **ON-State** is of the order of **1 V to 2 V** depending on the rating of **P-N-P-N Diode.** It may be seen from **Static V-I Characteristics** of a **P-N-P-N Diode or Shockley Diode** shown in **Figure (25) below,** that this **Voltage Drop Increases Slightly** with an **Increase in Anode Current (IA).**



- **Fig. (25)** Shown Static V-I Characteristics of a P-N-P-N Diode or Shockley Diode.

- In this **Forward Conducting Mode**, **P-N-P-N Diode** is in **ON-State** and behaves like a **Closed-Switch.** When **Forward Voltage is Greater than Forward Breakdown or breakover Voltage VFBO, P-N-P-N Diode** offers **Low Impedance.** Therefore, a **P-N-P-N Diode** can be treated as a **Closed-Switch** in the **Forward Conducting Mode**.

to be continued .....