

What is Diode?

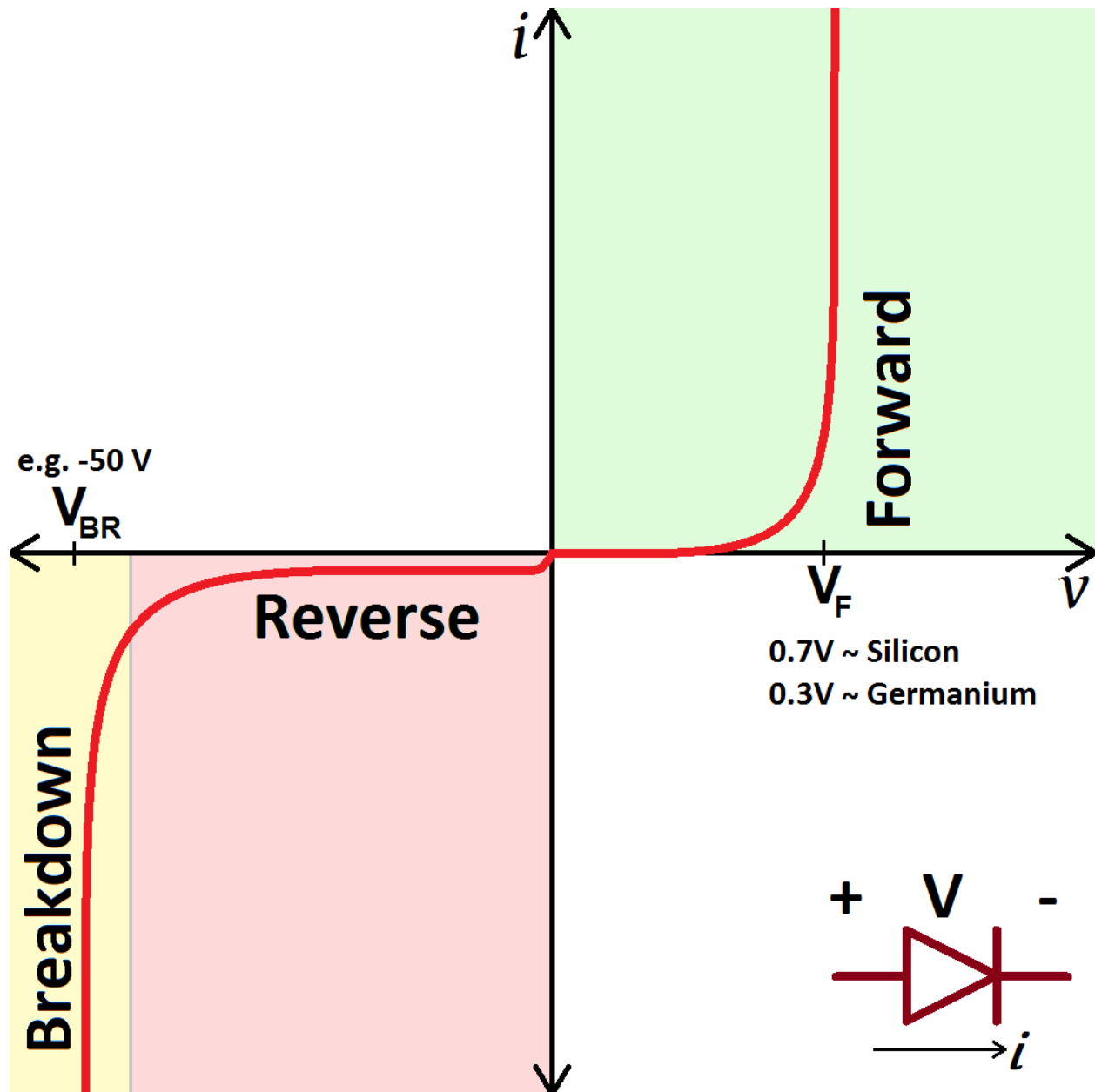
A diode is a two-terminal electronic device that allows the flow of electric current in one direction while restricting it in the opposite direction. It is commonly used in electronic circuits for various purposes, such as rectification, signal modulation, switching, and voltage regulation.

The most common type of diode is the semiconductor diode, which is made of a semiconductor material such as silicon or germanium. It consists of a p-n junction, where the p-region contains an excess of positive charge carriers (holes), and the n-region contains an excess of negative charge carriers (electrons). This junction creates a barrier potential that inhibits the flow of current in the reverse direction.

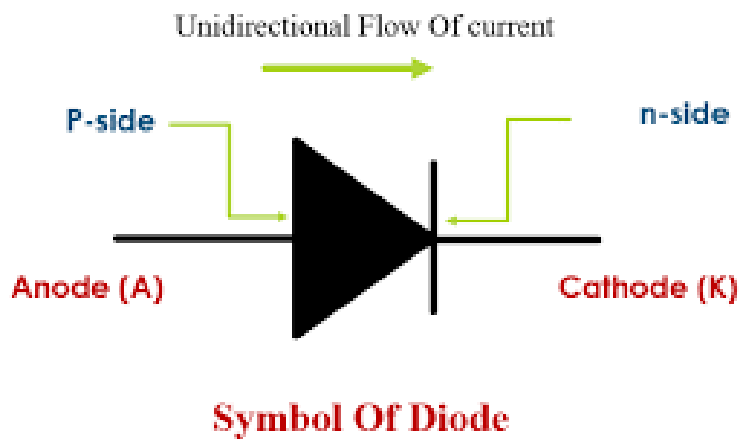
When a forward voltage is applied across the diode (positive voltage on the p-side and negative voltage on the n-side), it reduces the barrier potential, allowing current to flow easily. This forward-biased condition enables the diode to conduct electricity. On the other hand, if a reverse voltage is applied (positive voltage on the n-side and negative voltage on the p-side), it increases the barrier potential, preventing the flow of current. This reverse-biased condition makes the diode act as an insulator.

Diodes have various applications in electronics. For example, they are used in rectifier circuits to convert alternating current (AC) into direct current (DC), allowing the flow of current in one direction only. They are also used in voltage regulators to maintain a stable output voltage, as well as in signal diodes for switching and modulation of electronic signals.

Characteristic curve



Symbol of Diode



Types of Diode

- i. There are several types of diodes, each designed for specific applications. Here are some common types of diodes:
- ii. Rectifier Diode: The rectifier diode is used for converting alternating current (AC) into direct current (DC). It allows current flow in only one direction and blocks it in the opposite direction.
- iii. Zener Diode: The zener diode is primarily used for voltage regulation and as a voltage reference. It maintains a constant voltage across its terminals even when the applied voltage varies within a specific range.
- iv. Light-Emitting Diode (LED): LEDs are diodes that emit light when a current passes through them. They are widely used in lighting, displays, indicators, and other visual applications.

- v. Schottky Diode: Schottky diodes are known for their fast switching speed and low forward voltage drop. They are commonly used in high-frequency applications, rectifiers, and as clamping diodes.
- vi. Photodiode: Photodiodes are light-sensitive diodes that generate a current when exposed to light. They are used in applications such as light detection, optical communications, and light sensors.

Applications of diode

Diodes have a wide range of applications in electronic circuits due to their ability to control and manipulate the flow of electric current. Here are some common applications of diodes:

1. Rectification: Diodes are extensively used in rectifier circuits to convert alternating current (AC) to direct current (DC). They allow current flow in one direction, blocking the reverse current. This is crucial in power supplies, where DC power is required for electronic devices.
2. Voltage Regulation: Zener diodes are employed for voltage regulation. They maintain a constant voltage across their terminals even when the input voltage varies. Zener diodes are commonly used in voltage regulators and voltage reference circuits.
3. Signal Modulation: Diodes are used in signal modulation circuits to mix or encode signals. For example, amplitude modulation (AM) and frequency modulation (FM) circuits utilize diodes to encode and decode signals.

4. Switching: Diodes can act as electronic switches. When a diode is forward-biased, it conducts current, and when it is reverse-biased, it acts as an open circuit. This property is utilized in switching circuits, logic gates, and digital circuits.
5. Overvoltage Protection: Transient voltage suppression diodes (TVS diodes) and Zener diodes are used for overvoltage protection in electronic circuits. They provide a path for excessive voltage, protecting sensitive components from damage.