

Below are detailed information and a more in-depth explanation of the technical specifications of the 1N4148 diode based on the manufacturer's data sheet:

1. Forward voltage at specified current

- Specification: The electrical characteristics table adds that the maximum forward voltage at a forward current of 10 mA is 1 V and that the maximum value of the forward voltage is 1 V at a forward current of 100 mA.
- Explanation: The term forward voltage defines the voltage drop across a diode when it is forward-biased (i.e. current flows). It is the energy needed for the free carriers to overcome the potential barrier at the P-N junction. It is an important parameter for calculating energy efficiency and voltage drop in a circuit.

2. Maximum reverse voltage

- Specifications: the maximum continuous reverse voltage and peak reverse voltage of the diode are 75 V.
- Explanation: The maximum inverse voltage (MIV) is the limit of how much the diode can handle in reverse bias with no reverse current. If a diode experiences more than 75 V in reverse bias, breakdown occurs and the diode becomes a failed component. When designing circuits, diodes are usually selected to have a VR which is at least 20-50% larger than the actual voltage.

3. Maximum Forward Current

- Specification: The device's maximum continuous forward current rating is 200 mA (0.20 amps) while its maximum repetitive peak forward current rating is 450 mA (0.45 amps).
- Description: 200 mA is the maximum current that the diode can continuously carry without overheating (when mounted on the usual printed circuit board). If this value is exceeded for long periods, the heat produced by the Joule effect destroys the internal structure of the semiconductor.

4. Operating Temperature Range

- Specifications: The maximum junction temperature is 200 °C (392 °F), the storage temperature is from -65 °C to +200 °C.

- Explanation: The 1N4148 diode has excellent heat resistance. The hermetic glass envelope allows it to operate at ambient temperatures of 200 °C. Thus, the 1N4148 can operate in hot industrial environments or in high-heat-generating devices, without the heat deterioration normally observed with other commonly used silicon devices.

5. Practical application: High-speed switching

- Technical reason: The most important application of the 1N4148 is in high-speed switching, which is due to the very short reverse recovery time of the 1N4148, with a maximum of only 4 ns (nanoseconds) for a switching period from forward current of 10 mA to reverse current of 60 mA.
- Explanation: The time required for a diode to turn off completely once it ceases to conduct is termed the reverse recovery time. The 1N4148, having just 4 ns, is suitable for use in digital logic circuits and signal processing systems in computers and telecom equipment, where high sensitivity and instant response are required.