NTE Electronics 1N4004

NTE Electronics 1N4004 Standard Recovery Rectifier Diode User Manual

Model: 1N4004 | Brand: NTE Electronics

1. Introduction

The NTE Electronics 1N4004 is a general-purpose standard recovery rectifier diode designed for converting alternating current (AC) to direct current (DC). This diode features a diffused junction, low forward voltage drop, high current capability, and high surge current capability, making it suitable for a wide range of power supply and rectification applications. It is also RoHS compliant.

Image 1: The NTE Electronics 1N4004 Standard Recovery Rectifier Diode. This image shows the cylindrical body of the diode with a silver band indicating the cathode, and two axial leads extending from each end.

2. Setup and Installation

Proper installation is crucial for the reliable operation of the 1N4004 diode. Observe the following guidelines:

2.1 Polarity Identification

Diodes are polarized components. The 1N4004 has two terminals: the anode and the cathode. The cathode is typically indicated by a silver or colored band on the diode's cylindrical body. Current flows from the anode to the cathode when forward biased.

- **Anode:** The positive terminal, where current enters.
- **Cathode:** The negative terminal, marked by a band, where current exits.

2.2 Handling Precautions

- Avoid excessive mechanical stress on the leads, especially near the diode body.
- Bend leads carefully, ensuring the bend radius is not too sharp and is at least 3mm from the diode body.
- While not highly sensitive to ESD, general electrostatic discharge precautions are recommended for all electronic components.

2.3 Soldering Instructions

- **Hand Soldering:** Solder iron tip temperature should not exceed 350°C (662°F). Limit soldering time to 3 seconds per lead.
- **Wave Soldering:** Maintain solder bath temperature below 260°C (500°F) for a maximum of 10 seconds.
- Ensure proper ventilation during soldering.

2.4 Circuit Integration

Integrate the diode into your circuit ensuring correct polarity. For rectification, the diode should be placed to allow current flow in the desired direction (e.g., from AC source to DC load). Consider appropriate heat sinking if the diode is expected to operate at its maximum current ratings for extended periods, although for 1A applications, this is often not required.

3. Operating Principles

The 1N4004 is a silicon rectifier diode that allows current to flow predominantly in one direction. Its primary function is rectification, converting AC voltage into pulsating DC voltage.

- **Forward Bias:** When a positive voltage is applied to the anode and a negative voltage to the cathode, the diode conducts current with a low forward voltage drop (typically around 0.7V for silicon diodes).
- **Reverse Bias:** When a negative voltage is applied to the anode and a positive voltage to the cathode, the diode blocks current flow. The 1N4004 is rated for a maximum reverse voltage of 400V. Exceeding this voltage can lead to breakdown and permanent damage.
- **Standard Recovery:** This diode is characterized by its standard recovery time, meaning it takes a certain amount of time to switch from a conducting state to a non-conducting state when the voltage reverses. This is suitable for lower frequency applications (e.g., 50/60 Hz power rectification).

4. Maintenance

Rectifier diodes like the 1N4004 are solid-state devices and generally require no active maintenance once

properly installed. However, proper storage and periodic inspection can ensure longevity.

- **Storage:** Store diodes in a dry, cool environment, away from direct sunlight and corrosive substances. Keep them in their original packaging or anti-static bags to prevent physical damage and contamination.
- **Inspection:** Periodically inspect installed diodes for any signs of physical damage, discoloration (indicating overheating), or compromised solder joints.

5. Troubleshooting

If your circuit is not functioning as expected, and you suspect the diode, consider the following common issues:

- **No Output/Incorrect Voltage:**
  - **Incorrect Polarity:** Verify the diode is installed with the correct anode/cathode orientation. A reversed diode will block current.
  - **Open Circuit:** The diode may have failed internally, acting as an open circuit. Test with a multimeter in diode mode.
  - **Short Circuit:** The diode may have failed and become a short circuit, allowing current to flow in both directions or causing excessive current draw. Test with a multimeter.
- **Overheating:**
  - **Exceeded Current Rating:** The diode may be handling more current than its 1.0 A rating.
  - **Insufficient Heat Dissipation:** In high-current applications, ensure adequate ventilation or consider external heat sinking.
- **Damaged Leads/Body:** Physical damage during handling or installation can lead to intermittent or complete failure.

Always disconnect power before performing any inspection or troubleshooting on electronic circuits.

6. Technical Specifications

Parameter	Value
Model Number	1N4004
Manufacturer	NTE Electronics, Inc.
Type	Standard Recovery Rectifier Diode
Maximum Average Forward Current ($I_{F(AV)}$)	1.0 A
Maximum Peak Reverse Voltage (V_{RRM})	400 V
Junction Type	Diffused Junction
Forward Voltage Drop	Low
Surge Current Capability	High
Compliance	RoHS Compliant
Package Dimensions	5.12 x 1.46 x 0.35 inches (approximate for packaging)
Item Weight	0.32 ounces (approximate for packaging)

7. Warranty and Support

For specific warranty information or technical support regarding the NTE Electronics 1N4004 diode, please refer to the documentation provided by your supplier or contact NTE Electronics directly through their official website. Ensure you have your purchase details and product model number (1N4004) available when seeking support.