

# ELECTRONICS *Supply Co., Inc.*

4100 MAIN STREET • KANSAS CITY, MISSOURI 64111  
PHONE (816) 931-0250 • FAX (816) 753-2595  
[www.eskc.com](http://www.eskc.com)

## TECH TIP – What is Varistor?

A varistor is a voltage dependent resistor (VDR). The resistance of a varistor is variable and depends on the voltage applied. The word is composed of parts of the words “variable resistor”. Their resistance decreases when the voltage increases. In case of excessive voltage increases, their resistance drops dramatically. This behavior makes them suitable to protect circuits during voltage surges. Causes of a surge can include lightning strikes and electrostatic discharges. The most common type of VDR is the metal oxide varistor or MOV.

A varistor typically comes in a disc package:



### Characteristics

A voltage dependent resistor has a nonlinear varying resistance, dependent on the voltage applied. The impedance is high under nominal load conditions, but will sharply decrease to a low value when a voltage threshold, the breakdown voltage, is exceeded. They are often used to protect circuits against excessive transient voltages. When the circuit is exposed to a high voltage transient, the varistor starts to conduct and clamps the transient voltage to a safe level. The energy of the incoming surge is partially conducted and partially absorbed, protecting the circuit. The most important selection parameter is the clamping voltage. It is recommended to use as high clamping-voltage as the protected circuit allows, to limit the amount of exposure to surges. For example, to protect 120VAC circuits, you would use an MOV rated at 150V as long as the circuit would allow voltages up to 150V. Varistors are useful for short duration protection in case of high transient voltage surges in the order of 1-1000 microseconds. They are however not suited to handle sustained surges. If a transient pulse energy in joules (J) is too high and significantly exceeds the absolute maximum ratings, they can melt.

### Applications

The nonlinear characteristic of the varistor make them ideal for use as surge protector devices. Sources of high voltage transients can for example be lightning strikes, electrostatic discharges or inductive discharge from motors or transformers. They are for example often used in surge protector power strips. Special types with a low capacitance protect communication lines. These VDRs are useful for a wide variety of applications that can include:

- Telephone and other communication line protection
- Radio communication equipment transient suppression
- Surge protector power strips
- Cable TV system surge protectors
- Power supply protection
- Microprocessor protection
- Electronics equipment protection
- Low voltage board level protection
- Transient voltage surge suppressor (TVSS)
- Car electronics protection
- Industrial high energy AC protection

Varistors are connected between the positive and negative inputs on the circuit, or could be connected from the positive input to earth ground on the circuit. Electronics Supply stocks MOV's from NTE. The part number is 2Vxxx, where 'xxx' is the MOV surge voltage. For a 150 volt MOV surge protector, the part number would be 2V150.