

Metal Oxide Varistor : Introduction

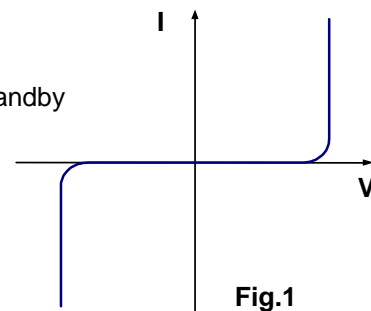


Introduction

Varistors, variable resistors, are voltage-dependent resistors with bidirectional and symmetrical V/I characteristics. Metal Oxide Varistors, MOV, are primarily made of Zinc Oxide and some suitable additives.

When varistors are exposed to over voltage transient or surge, the varistors switch from standby state (nearly open circuits) to clamping state (highly conductive state).

The major function is to protect equipments from being damaged by over voltage transient. The varistors electrical characteristics, V-I curve, are normally expressed in the Fig.2.



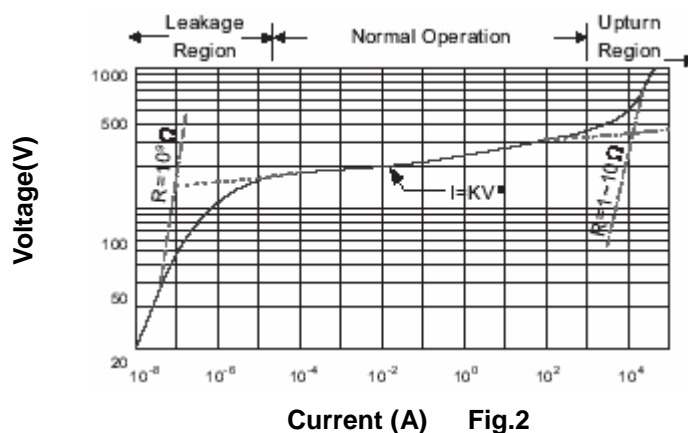
At leakage region, the V-I curve shows a linear relationship. The varistor is in high resistance mode and shows as an open circuit.

In normal operation, the V-I curve of a varistor can be described by power law:

$$I = KV^\alpha$$

Where K is a constant and α defines the degree of nonlinearity.

At high current, the varistor is in low resistance mode and shows as a short circuit.



Advantage Compared with Other Transient Suppressors:

1. Better Thermal Properties

Unlike a silicon suppressor which has only one P-N junction available to handle the current, varistor has millions of P-N junction as an integral part of the device which gives better energy dissipation capability and peak current handling capability.

2. Speed of Response

The action of varistor is similar to other semiconductor devices. The conduction happens very fast which has no significant time delay even in the nanosecond range. Varistors are fast enough to response to any practical requirements.

3. Stable Clamping Voltage over Temperature

Beyond the breakdown point, the clamping voltage of varistor is almost constant over wide range of operating temperature while the clamping voltage of zener diode is higher at upper operation temperature. The clamping voltage of varistor is temperature independent while leakage current increasing as temperature increase for both devices.

4. Capacitance

Compared to zener diodes, varistors have a higher capacitance. Depending on the application, transient suppressor capacitance can be a desirable or undesirable feature. In DC circuits, the capacitance of varistors provides both decoupling and transient voltage clamping functions.

5. Less Expensive

Varistors are both cost and size effective compared with diode.