



ELECTRONICS, INC.

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NTE1V010 thru NTE1V300 NTE2V010 thru NTEV480 NTE524V13 thru NTE524V48 Metal Oxide Varistors (MOV)

Description:

The NTE Metal Oxide Varistors feature a barrier layer that gives the user fast response time. These devices have a high transient current handling capability when high voltage is applied. Static resistance is, however, very high under low voltage conditions, permitting low standby drain currents.

The NTE 1V Series Varistors have a non-linear voltage/current characteristic as expressed by the relationship:

$$I = KV^n$$

Where I = The current in amperes

V = The voltage

K = A constant

n = A constant which shows the dependence of the voltage V upon the current I. It is called the voltage-dependant index

Features:

- High Transient Current Capability – up to 6500A
- Fast Response Time – less than 35ns
- Excellent Voltage Clamping Characteristics
- Very Low Temperature Coefficient
- Low Standby Current
- High Energy Capability
- The Value for “n” is Greater
- Very Low Leakage Current
- Low Capacitance
- Low Overshoot Characteristics

Electrical Ratings:

Varistor Voltage

The voltage across the varistor at a DC current of 1.0mA.

Energy

The maximum electrical energy which can be dissipated within the varistor by a single impulse of 10 x 1000µs current waveform with continuous voltage applied. Energy ratings are based on a shift of varistor voltage of less than 10% of the initial value. The unit is expressed in joules.

Peak Current

The maximum current allowable for a single pulse of 8 x 20µs exponential waveform.

| | |
|--|--------------------|
| Operating Ambient Temperature | -40° to +85°C |
| Storage Temperature | -40° to +125°C |
| Response Time | less than 35ns |
| Voltage Temperature Coefficient | less than 0.05%/°C |
| Non-Linear Exponent | |
| NTE1V010 to NTE1V075, NTE2V010 to NTE2V075 | 15 to 50 |
| NTE1V095 to NTE1V300, NTE2V095 to NTE2V480, NTE524V13 to NTE524V48 | greater than 40 |
| Maximum Leakage Current | 10µA |

Electrical Characteristics:

| NTE Type Number | Case Diameter | Maximum Ratings (T _A = 25°C) | | | | Characteristics | | |
|-----------------|---------------|---|---------------------|-----------------------------|------------------------------|--|--|-------------------------------------|
| | | Continuous | | Transient | | Nominal Varistor Voltage @ 1mA DC Test Current (Volts) | Maximum Clamping Voltage, V _C @ Test Current (8/20μs) (Volts) | Transient Power Dissipation (Watts) |
| | | RMS Voltage (Volts) | DC Voltage (Volts) | Energy (10/1000μs) (Joules) | Peak Current (8/20μs) (Amps) | | | |
| | | V _m (AC) | V _m (DC) | W _{TM} | I _{TM} | V _{NOM} | V _{CL} | P _D |
| 1V010 | 8.5mm | 10 | 12 | 0.8 | 250 | 18 | 45 | 0.25 |
| 2V010 | 16mm | 10 | 12 | 3.5 | 1000 | 18 | 45 | 0.60 |
| 1V014 | 8.5mm | 14 | 18 | 1.2 | 250 | 22 | 55 | 0.25 |
| 2V014 | 16mm | 10 | 12 | 4.0 | 1000 | 22 | 55 | 0.60 |
| 1V015 | 8.5mm | 15 | 20 | 1.0 | 250 | 24 | 52 | 0.25 |
| 2V015 | 16mm | 15 | 20 | 4.5 | 1000 | 24 | 48 | 0.60 |
| 1V017 | 8.5mm | 17 | 22 | 1.3 | 250 | 27 | 60 | 0.25 |
| 2V017 | 16mm | 17 | 22 | 5.0 | 1000 | 27 | 60 | 0.60 |
| 1V020 | 8.5mm | 20 | 26 | 1.5 | 250 | 33 | 70 | 0.25 |
| 2V020 | 16mm | 20 | 26 | 6.0 | 1000 | 33 | 70 | 0.60 |
| 1V025 | 8.5mm | 25 | 31 | 1.7 | 250 | 39 | 80 | 0.25 |
| 2V025 | 16mm | 25 | 31 | 7.0 | 1000 | 39 | 80 | 0.60 |
| 1V030 | 8.5mm | 30 | 38 | 2.3 | 250 | 47 | 95 | 0.25 |
| 2V030 | 16mm | 30 | 38 | 8.5 | 1000 | 47 | 95 | 0.60 |
| 1V035 | 8.5mm | 35 | 45 | 2.7 | 250 | 56 | 110 | 0.25 |
| 2V035 | 16mm | 35 | 45 | 10.0 | 1000 | 56 | 110 | 0.60 |
| 1V040 | 8.5mm | 43 | 55 | 3.2 | 250 | 68 | 135 | 0.25 |
| 2V040 | 16mm | 43 | 55 | 13.0 | 1000 | 68 | 135 | 0.60 |
| 1V050 | 8.5mm | 52 | 66 | 4.0 | 250 | 82 | 150 | 0.25 |
| 2V050 | 16mm | 52 | 66 | 14.0 | 1000 | 82 | 150 | 0.60 |
| 1V060 | 8.5mm | 63 | 80 | 6.0 | 1200 | 100 | 175 | 0.25 |
| 2V060 | 16mm | 63 | 80 | 18.0 | 4500 | 100 | 175 | 0.60 |
| 1V075 | 8.5mm | 75 | 95 | 5.0 | 1200 | 120 | 205 | 0.25 |
| 2V075 | 16mm | 75 | 95 | 21.0 | 4500 | 120 | 205 | 0.60 |
| 1V095 | 8.5mm | 95 | 125 | 7.0 | 1200 | 150 | 250 | 0.25 |
| 2V095 | 16mm | 95 | 125 | 29.0 | 4500 | 150 | 250 | 0.60 |
| 1V115 | 8.5mm | 115 | 150 | 10.0 | 1200 | 171 | 295 | 0.25 |
| 2V115 | 16mm | 115 | 150 | 35.0 | 4500 | 171 | 300 | 0.60 |
| 1V130 | 8.5mm | 135 | 180 | 10.0 | 1200 | 216 | 355 | 0.25 |
| 2V130 | 16mm | 135 | 180 | 39.0 | 4500 | 216 | 355 | 0.60 |
| 524V13 | 23mm | 135 | 180 | 72.0 | 6500 | 216 | 355 | 1.00 |
| 1V150 | 8.5mm | 160 | 210 | 10.0 | 1200 | 240 | 410 | 0.25 |
| 2V150 | 16mm | 160 | 210 | 40.0 | 4500 | 240 | 410 | 0.60 |
| 524V15 | 23mm | 160 | 210 | 80.0 | 6500 | 240 | 410 | 1.00 |
| 1V175 | 8.5mm | 170 | 225 | 12.0 | 1200 | 270 | 450 | .025 |
| 524V17 | 23mm | 170 | 225 | 90.0 | 6500 | 270 | 450 | 1.00 |
| 1V250 | 8.5mm | 240 | 320 | 20.0 | 1200 | 390 | 630 | 0.25 |
| 2V250 | 16mm | 240 | 320 | 70.0 | 4500 | 390 | 630 | 0.60 |
| 524V25 | 23mm | 240 | 320 | 129.0 | 6500 | 390 | 630 | 1.00 |
| 1V275 | 8.5mm | 260 | 330 | 20.0 | 1200 | 430 | 685 | 0.25 |
| 2V275 | 16mm | 260 | 330 | 72.0 | 4500 | 430 | 685 | 0.60 |
| 524V27 | 23mm | 260 | 330 | 135.0 | 6500 | 430 | 685 | 1.00 |

Electrical Characteristics (Cont'd):

| NTE Type Number | Case Diameter | Maximum Ratings (T _A = 25°C) | | | | Characteristics | | |
|-----------------|---------------|---|---------------------|-----------------------------|------------------------------|--|--|-------------------------------------|
| | | Continuous | | Transient | | Nominal Varistor Voltage @ 1mA DC Test Current (Volts) | Maximum Clamping Voltage, V _C @ Test Current (8/20μs) (Volts) | Transient Power Dissipation (Watts) |
| | | RMS Voltage (Volts) | DC Voltage (Volts) | Energy (10/1000μs) (Joules) | Peak Current (8/20μs) (Amps) | | | |
| | | V _m (AC) | V _m (DC) | W _{TM} | I _{TM} | V _{NOM} | V _{CL} | P _D |
| 1V300 | 8.5mm | 280 | 370 | 22.0 | 1200 | 470 | 740 | 0.25 |
| 2V300 | 16mm | 280 | 370 | 79.0 | 4500 | 470 | 740 | 0.60 |
| 524V30 | 23mm | 280 | 370 | 149.0 | 6500 | 470 | 740 | 1.00 |
| 2V420 | 16mm | 420 | 560 | 90.0 | 4500 | 680 | 1110 | 0.60 |
| 524V42 | 23mm | 420 | 560 | 160.0 | 6500 | 680 | 1110 | 1.00 |
| 2V480 | 16mm | 480 | 640 | 105.0 | 4500 | 750 | 1240 | 0.60 |
| 524V48 | 23mm | 480 | 640 | 180.0 | 6500 | 750 | 1240 | 1.00 |

Cautions:

NTE varistors short-circuit when subjected to surges beyond their peak current and energy ratings.

NTE varistors short-circuit when operated at steady-state voltages well beyond their voltage ratings, which may eventually result in open-circuiting leaving the circuit without protection.

The following precautions should be taken to minimize this potential hazard:

- Fusing the varistor to limit high fault currents.
- Protecting the surrounding circuitry by physical shielding.
- Locating the varistor away from other components.

Typical Power Supply Circuit

| | D | H | L | LL | LS | LD |
|-------------|----------------|---------------|-----------------|-----------------|----------------|---------------|
| 1V Series | .345 (9.0) | .235 (6.0) | .475 (12.0) | 1.000 (25.4) | .200 (5.08) | .024 (0.6) |
| 2V Series | .699 (17.8) | .275 (7.0) | .787 (20.0) | 1.000 (25.4) | .315 (8.0) | .031 (0.8) |
| 524V Series | .945 (24.0) | .291 (7.4) | 1.230 (31.0) | 1.063 (27.0) | .394 (10.0) | .039 (1.0) |