

Metal Oxide Varistors

Applications

Applications of MNR Varistors

As mentioned in the introduction, MNRs have many and varied applications, some of which are listed below for easy reference:

- Telephone and PABX equipment.
- Motor speed control systems.
- Power supplies.
- Automotive electronic systems.
- Elevator and conveyor controls.
- Control systems.
- AC operated smoke detectors.
- AC operated alarm systems.
- Transient suppression from AC power lines.
- Suppression of transients caused by interrupting inductive loads, such as: a) transformers, b) relay coils, c) solenoids, d) motors, e) filter reactors.
- Relay contact protection.
- ICs and microprocessor protection.
- Protection of transistor switching inductive and capacitance loads.
- Protection of motor winding insulation.
- Traffic and railway signal systems.
- Automatic control devices for power distribution.
- Centralized meter reading equipment.
- Cable TV systems.
- Broadcast relay equipment.
- Protection of equipment where loads are switched with vacuum relays and switches.
- Ground fault interrupters.
- RFI filters.
- Digital weighing systems.

In the foregoing list of applications, there are two forms of transients developed; those that are extraneous such as lightning and those that are manmade such as switching surges and ground faults. Both of these have very disastrous results on voltage sensitive equipment and micro circuitry. Lightning transients are all extraneous, so protection is needed on incoming power lines, whereas the switching and ground fault transients can be generated within the equipment itself. Direct lightning transients have a voltage peak value of about 5000KV, beyond the capability of MNRs, so lightning arresters are essential. Induced lightning transients are generally speaking 50KV and below, with peak current values of 1000 amps or less, well within the design parameter of varistors, where they fill their role as suppression devices.

There is a distinct difference between power line surges and voltage transients. Line surges are slower (greater than 8.3 milliseconds) and are produced from low impedance sources. In general they do not exceed 2 to 3 times the nominal operating voltage. Transients on the other hand are faster than 8.3 milliseconds and are related to high impedance sources and can range from a few millivolts to 20KV. A typical rise time for lightning is 600 volts to 1000 volts and power line surges can be from 100 volts to 300 volts per microsecond, electro-magnetic pulses (EMP) are typically in the nanoseconds area requiring the fast turn-on characteristics, the lower capacitance and the lower overshoot characteristics of the Stetron MNR. Some designers are of the opinion that voltage regulation/isolation transformers act as transient suppressors. However, these are effective only in the millisecond area, (typically 25 ms) due to capacitive effects etc. They pass faster rise time transients readily, so additional protection is required to protect delicate semiconductor devices. Certain classes of semiconductors, particularly LSI and VLSI circuits may have as many as 20,000 components in a 1/4" x 1/4" area, with damage thresholds below 100 micro joules, and are most susceptible to transients.

Another problem encountered is caused by the demand on power companies. Some localities are increasing their demands faster than the ability of the power companies to produce, so loads are constantly being switched from one line to the other in the power grid system. This causes surges, and those in turn cause high speed transients of short duration. All of these factors coupled with widespread use of semiconductor devices, require fast turn on time transient suppression devices provided by the Stetron MNR. Here we have a decided advantage over competitive products with 35 nanosecond turn-on time, lower capacitance and better transient characteristics.

Switching and internally generated surges refer to those generated by back EMF from motors and other inductive loads and ground faults either within or outside of the equipment. Voltage surges caused by load switching with vacuum switches or relays are particularly large and wherever this type of equipment is used, particular attention should be paid to transient suppression devices. Transient voltages can also be caused by load and no load switching, by thyristor commutation, and by the transmission of electrostatic and electromagnetic energy. It is beyond the scope of this catalog to go into details of all of these conditions, but they do exist and transient protection devices are of paramount importance for equipment protection.



Stetron International Inc.

Metal Oxide Varistors

General

ELECTRICAL CHARACTERISTICS

MNR 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 dependance of the voltage V upon the current I. It is called the voltage-dependant index

MNR Metal Oxide Varistors feature a patented barrier layer that gives the user fast response time—less than 35 nano seconds. The barrier layer used in MNR varistors, is composed of finely crystallized semi-conductive glass, that has been specially treated to make it resistant to high temperatures and shock. This treatment gives the device a high transient current handling capability, as a result of reduced resistance between the boundary layers, when high voltage is applied. Static resistance is, however, very high under low voltage conditions, permitting low standby drain currents. By utilizing a new special process to seal the edge of the varistor pellet, flashover problems are eliminated and leakage factors vastly reduced. MNR Varistors are available in three different series:

1. The NA Series—cylindrical type with axial leads.
2. The NR Series.
 - a) NR = disc type with radial leads.
 - b) NE = uncoated NR disc without the leads.
 - c) NS = NR disc type with spade lugs.
3. The ZR Series.
 - a) ZR = disc type with radial leads: low voltage.
 - b) ZE = uncoated ZR disc without the leads.
 - c) ZS = ZR disc type with spade lugs.

FEATURES

- High transient current capability—up to 6500A.
- Fast response time—less than 35 ns.
- Excellent voltage clamping characteristics.
- Very low temperature coefficient.
- Low standby current.
- Compact and lightweight.
- High energy capability.
- The value for "n" is greater.
- Very low leakage current.
- Low capacitance.
- Low overshoot characteristics.
- Low leakage factor.

ELECTRICAL RATINGS

1. Varistor Voltage: Voltage across the varistor at a DC current of 1.0mA, or 0.1mA for case size "0".
2. Energy: The maximum electrical energy which can be dissipated within the varistor by a single impulse of $10 \times 1000 \mu\text{s}$ 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.
3. Peak Current: The maximum current allowable for a single pulse of $8 \times 20 \mu\text{s}$ exponential waveform.

| | NR Series | NA Series | ZR Series |
|---------------------------------|---------------|---------------|---------------|
| Operating Ambient Temperature | -40 to +85°C | -40 to +85°C | -40 to +85°C |
| Storage Temperature | -40 to +125°C | -40 to +125°C | -40 to +125°C |
| Response Time | <35ns | <35ns | <35ns |
| Voltage Temperature Coefficient | <0.05%/°C | <0.05%/°C | <0.05%/°C |
| Non Linear Exponent | >40 | 19 ~ 60 | 15 ~ 50 |
| Maximum Leakage Current* | 10 μ A | 2 μ A | 10 μ A |

*Measured before life test.

MNR FAILURE MODE

MNR varistors are highly reliable and exhibit a very low failure rate. Careful designers should plan for the effect of potential failures on circuitry being protected and must take the following into consideration:

- MNR varistors short-circuit when subjected to surges beyond their peak current and energy ratings
- MNR 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 MNR varistor to limit high fault currents.
- Protecting the surrounding circuitry by physical shielding.
- Locating the MNR varistor away from other components.

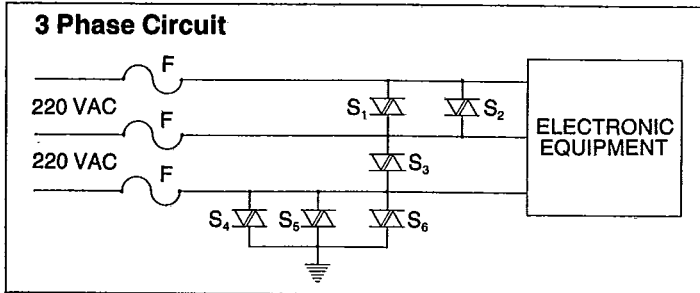


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Typical Circuits

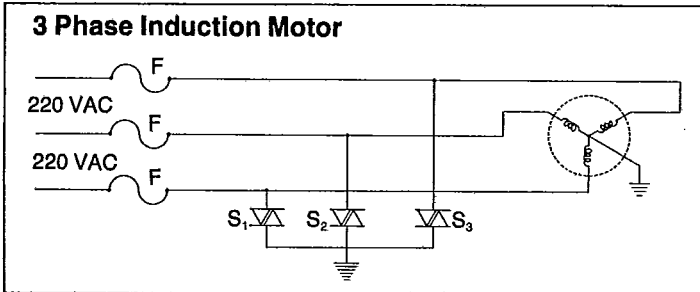
Absorption of Lightning and Power Line Transients



Between 220 VAC lines and between lines and ground S_1 , S_2 , and S_3 —383NR or higher rating.
 S_4 , S_5 and S_6 —765NR
 F—Fuse

In a 3 phase circuit the MNRs can be placed between the 240 VAC lines (S_1, S_2 and S_3 only) between lines to ground only (S_4, S_5 and S_6) or with 6 MNRs as shown.

Absorption of Switching Transients

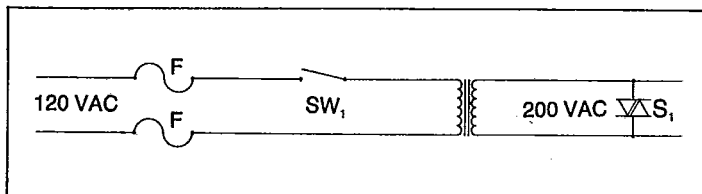


S_1, S_2 and S_3 —800NR and over
 S in a diagram indicates an MNR—the types of MNRs indicated are only examples. Circuit parameters would have to be taken into account in order to select the proper operating voltage and element diameter.

As the failure mode of an MNR is punch through (short circuit) it is recommended all circuits using MNRs be fused as indicated.

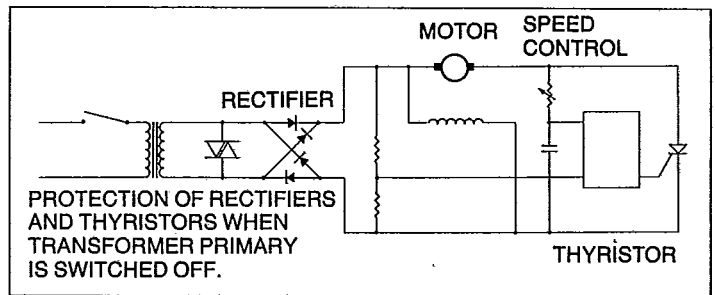
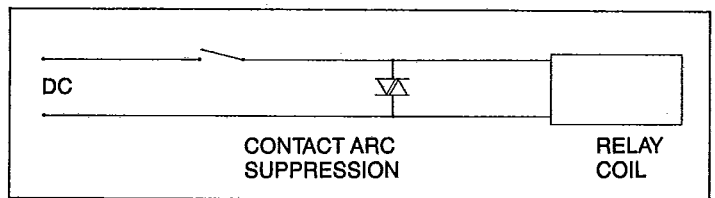
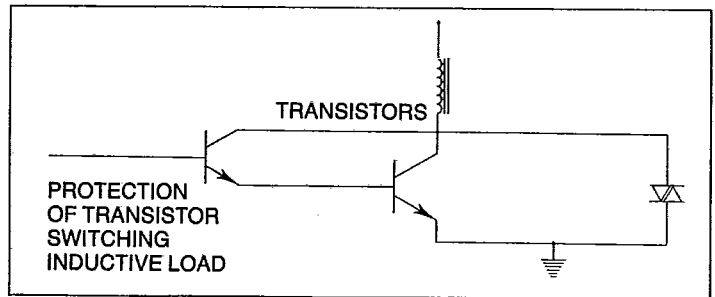
Other typical application circuits:

Switching Transients

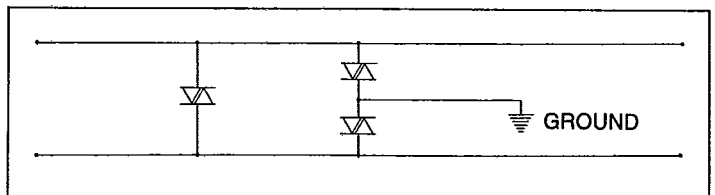


S_1 —383NR. In this circuit when switch SW_1 is opened back EMF from the transformer, damage can occur to a rectifier bridge without transient protection.

Protection of switching devices from inductive loads



Transient Protection in Telephone and Alarm Circuits



24 VDC Lines—47ZR Series and above
 48 VDC Lines—82ZR Series and above

Selection of MNR dependant on Circuit Parameters.

These can be 24 volt lines used in a fire alarm or 48 volt telephone circuits. In either case, the MNRs are used to protect the electronic equipment from externally generated transients.



Metal Oxide Varistors

NR Series

ELECTRICAL CHARACTERISTICS TABLE

| PART NUMBER | SIZE | STEADY STATE | | TRANSIENT (@ 85°C) | | | CHARACTERISTICS (@ 25°C) | | | | |
|-------------|------|-------------------|------------------|--------------------|---------------------------|------------------------|--------------------------|------|--|------|------------------|
| | | MAX. APPLIED Vrms | MAX. APPLIED Vdc | ENERGY (10X1000µs) | AVERAGE POWER DISSIPATION | PEAK CURRENT (8X20 µs) | VARISTOR VOLTAGE | | MAX. CLAMPING VOLTAGE @ TEST CURRENT (8X20 µs) | | TYP. CAP. (1KHz) |
| | | VOLTS | VOLTS | JOULES | WATTS | AMP. | VOLTS | TOL. | VOLTS | AMP. | pF. |
| 0117NR05-0 | 0 | 75 | 95 | 2.5 | 0.10 | 400 | 117 | ±10% | 220 | 5 | 95 |
| 0117NR07-1 | 1 | 75 | 95 | 5.0 | 0.25 | 1200 | 117 | ±10% | 205 | 10 | 160 |
| 0117NR12-2 | 2 | 75 | 95 | 13.0 | 0.40 | 2500 | 117 | ±10% | 205 | 35 | 630 |
| 0117NR14-3 | 3 | 75 | 95 | 21.0 | 0.60 | 4500 | 117 | ±10% | 205 | 50 | 940 |
| 0117NR20-4 | 4 | 75 | 95 | 40.0 | 1.00 | 6500 | 117 | ±10% | 205 | 100 | 1450 |
| 0150NR05-0 | 0 | 95 | 125 | 3.0 | 0.10 | 400 | 150 | ±10% | 265 | 5 | 75 |
| 0150NR07-1 | 1 | 95 | 125 | 7.0 | 0.25 | 1200 | 150 | ±10% | 250 | 10 | 120 |
| 0150NR12-2 | 2 | 95 | 125 | 18.0 | 0.40 | 2500 | 150 | ±10% | 250 | 35 | 490 |
| 0150NR14-3 | 3 | 95 | 125 | 29.0 | 0.60 | 4500 | 150 | ±10% | 250 | 50 | 740 |
| 0150NR20-4 | 4 | 95 | 125 | 50.0 | 1.00 | 6500 | 150 | ±10% | 250 | 100 | 1520 |
| 0183NR05-0 | 0 | 115 | 150 | 4.0 | 0.10 | 400 | 183 | ±10% | 315 | 5 | 60 |
| 0183NR07-1 | 1 | 115 | 150 | 10.0 | 0.25 | 1200 | 183 | ±10% | 305 | 10 | 100 |
| 0183NR12-2 | 2 | 115 | 150 | 22.0 | 0.40 | 2500 | 183 | ±10% | 305 | 35 | 400 |
| 0183NR14-3 | 3 | 115 | 150 | 35.0 | 0.60 | 4500 | 183 | ±10% | 305 | 50 | 600 |
| 0183NR20-4 | 4 | 115 | 150 | 69.0 | 1.00 | 6500 | 183 | ±10% | 305 | 100 | 1250 |
| 0216NR05-0 | 0 | 135 | 180 | 4.5 | 0.10 | 400 | 216 | ±10% | 370 | 5 | 50 |
| 0216NR07-1 | 1 | 135 | 180 | 10.0 | 0.25 | 1200 | 216 | ±10% | 355 | 10 | 85 |
| 0216NR12-2 | 2 | 135 | 180 | 25.0 | 0.40 | 2500 | 216 | ±10% | 355 | 35 | 340 |
| 0216NR14-3 | 3 | 135 | 180 | 39.0 | 0.60 | 4500 | 216 | ±10% | 355 | 50 | 510 |
| 0216NR20-4 | 4 | 135 | 180 | 72.0 | 1.00 | 6500 | 216 | ±10% | 355 | 100 | 1050 |
| 0250NR05-0 | 0 | 160 | 210 | 5.0 | 0.10 | 400 | 250 | ±10% | 430 | 5 | 45 |
| 0250NR07-1 | 1 | 160 | 210 | 10.0 | 0.25 | 1200 | 250 | ±10% | 410 | 10 | 75 |
| 0250NR12-2 | 2 | 160 | 210 | 30.0 | 0.40 | 2500 | 250 | ±10% | 410 | 35 | 300 |
| 0250NR14-3 | 3 | 160 | 210 | 40.0 | 0.60 | 4500 | 250 | ±10% | 410 | 50 | 450 |
| 0250NR20-4 | 4 | 160 | 210 | 80.0 | 1.00 | 6500 | 250 | ±10% | 410 | 100 | 930 |
| 0283NR05-0 | 0 | 180 | 220 | 6.0 | 0.10 | 400 | 283 | ±10% | 485 | 5 | 40 |
| 0283NR07-1 | 1 | 180 | 220 | 12.0 | 0.25 | 1200 | 283 | ±10% | 465 | 10 | 65 |
| 0283NR12-2 | 2 | 180 | 220 | 33.0 | 0.40 | 2500 | 283 | ±10% | 465 | 35 | 260 |
| 0283NR14-3 | 3 | 180 | 220 | 49.0 | 0.60 | 4500 | 283 | ±10% | 465 | 50 | 390 |
| 0283NR20-4 | 4 | 180 | 220 | 90.0 | 1.00 | 6500 | 283 | ±10% | 465 | 100 | 810 |
| 0330NR05-0 | 0 | 210 | 265 | 7.0 | 0.10 | 400 | 330 | ±10% | 565 | 5 | 35 |
| 0330NR07-1 | 1 | 210 | 265 | 13.0 | 0.25 | 1200 | 330 | ±10% | 545 | 10 | 55 |
| 0330NR12-2 | 2 | 210 | 265 | 40.0 | 0.40 | 2500 | 330 | ±10% | 545 | 35 | 225 |
| 0330NR14-3 | 3 | 210 | 265 | 52.0 | 0.60 | 4500 | 330 | ±10% | 545 | 50 | 340 |
| 0330NR20-4 | 4 | 210 | 265 | 95.0 | 1.00 | 6500 | 330 | ±10% | 545 | 100 | 700 |
| 0350NR05-0 | 0 | 220 | 285 | 7.0 | 0.10 | 400 | 350 | ±10% | 600 | 5 | 32 |
| 0350NR07-1 | 1 | 220 | 285 | 15.0 | 0.25 | 1200 | 350 | ±10% | 580 | 10 | 53 |
| 0350NR12-2 | 2 | 220 | 285 | 42.0 | 0.40 | 2500 | 350 | ±10% | 580 | 35 | 210 |
| 0350NR14-3 | 3 | 220 | 285 | 60.0 | 0.60 | 4500 | 350 | ±10% | 580 | 50 | 320 |
| 0350NR20-4 | 4 | 220 | 285 | 119.0 | 1.00 | 6500 | 350 | ±10% | 580 | 100 | 660 |
| 0383NR05-0 | 0 | 240 | 320 | 8.0 | 0.10 | 400 | 383 | ±10% | 655 | 5 | 30 |
| 0383NR07-1 | 1 | 240 | 320 | 20.0 | 0.25 | 1200 | 383 | ±10% | 630 | 10 | 48 |
| 0383NR12-2 | 2 | 240 | 320 | 45.0 | 0.40 | 2500 | 383 | ±10% | 630 | 35 | 190 |
| 0383NR14-3 | 3 | 240 | 320 | 70.0 | 0.60 | 4500 | 383 | ±10% | 630 | 50 | 290 |
| 0383NR20-4 | 4 | 240 | 320 | 129.0 | 1.00 | 6500 | 383 | ±10% | 630 | 100 | 590 |
| 0416NR05-0 | 0 | 260 | 330 | 8.5 | 0.10 | 400 | 416 | ±10% | 715 | 5 | 27 |
| 0416NR07-1 | 1 | 260 | 330 | 20.0 | 0.25 | 1200 | 416 | ±10% | 685 | 10 | 45 |
| 0416NR12-2 | 2 | 260 | 330 | 50.0 | 0.40 | 2500 | 416 | ±10% | 685 | 35 | 180 |
| 0416NR14-3 | 3 | 260 | 330 | 72.0 | 0.60 | 4500 | 416 | ±10% | 685 | 50 | 270 |
| 0416NR20-4 | 4 | 260 | 330 | 135.0 | 1.00 | 6500 | 416 | ±10% | 685 | 100 | 560 |
| 0450NR05-0 | 0 | 280 | 370 | 10.0 | 0.10 | 400 | 450 | ±10% | 770 | 5 | 25 |
| 0450NR07-1 | 1 | 280 | 370 | 22.0 | 0.25 | 1200 | 450 | ±10% | 740 | 10 | 40 |
| 0450NR12-2 | 2 | 280 | 370 | 55.0 | 0.40 | 2500 | 450 | ±10% | 740 | 35 | 165 |
| 0450NR14-3 | 3 | 280 | 370 | 79.0 | 0.60 | 4500 | 450 | ±10% | 740 | 50 | 250 |
| 0450NR20-4 | 4 | 280 | 370 | 145.0 | 1.00 | 6500 | 450 | ±10% | 740 | 100 | 510 |
| 0500NR05-0 | 0 | 315 | 400 | 10.0 | 0.10 | 400 | 500 | ±10% | 860 | 5 | 23 |
| 0500NR07-1 | 1 | 315 | 400 | 24.0 | 0.25 | 1200 | 500 | ±10% | 825 | 10 | 37 |
| 0500NR12-2 | 2 | 315 | 400 | 60.0 | 0.40 | 2500 | 500 | ±10% | 825 | 35 | 150 |
| 0500NR14-3 | 3 | 315 | 400 | 85.0 | 0.60 | 4500 | 500 | ±10% | 825 | 50 | 230 |
| 0500NR20-4 | 4 | 315 | 400 | 155.0 | 1.00 | 6500 | 500 | ±10% | 825 | 100 | 470 |
| 0550NR05-0 | 0 | 350 | 445 | 10.0 | 0.10 | 400 | 550 | ±10% | 945 | 5 | 20 |
| 0550NR07-1 | 1 | 350 | 445 | 24.0 | 0.25 | 1200 | 550 | ±10% | 910 | 10 | 34 |
| 0550NR12-2 | 2 | 350 | 445 | 60.0 | 0.40 | 2500 | 550 | ±10% | 910 | 35 | 135 |
| 0550NR14-3 | 3 | 350 | 445 | 85.0 | 0.60 | 4500 | 550 | ±10% | 910 | 50 | 200 |
| 0550NR20-4 | 4 | 350 | 445 | 155.0 | 1.00 | 6500 | 550 | ±10% | 910 | 100 | 420 |
| 0700NR14-3 | 3 | 440 | 550 | 90.0 | 0.60 | 4500 | 700 | ±10% | 1200 | 50 | 160 |
| 0700NR20-4 | 4 | 440 | 550 | 160.0 | 1.00 | 6500 | 700 | ±10% | 1200 | 100 | 330 |
| 0765NR14-3 | 3 | 480 | 630 | 105.0 | 0.60 | 4500 | 765 | ±10% | 1300 | 50 | 145 |
| 0765NR20-4 | 4 | 480 | 630 | 180.0 | 1.00 | 6500 | 765 | ±10% | 1300 | 100 | 300 |
| 0800NR14-3 | 3 | 500 | 660 | 110.0 | 0.60 | 4500 | 800 | ±10% | 1350 | 50 | 135 |
| 0800NR20-4 | 4 | 500 | 660 | 190.0 | 1.00 | 6500 | 800 | ±10% | 1350 | 100 | 290 |
| 0850NR14-3 | 3 | 540 | 690 | 110.0 | 0.60 | 4500 | 850 | ±10% | 1450 | 50 | 125 |
| 0850NR20-4 | 4 | 540 | 690 | 190.0 | 1.00 | 6500 | 850 | ±10% | 1450 | 100 | 265 |
| 1000NR20-4 | 4 | 630 | 825 | 230.0 | 1.00 | 6500 | 1000 | ±10% | 1700 | 100 | 230 |
| 1400NR20-4 | 4 | 890 | 1125 | 360.0 | 1.00 | 6500 | 1400 | ±10% | 2400 | 100 | 170 |



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NR Series

MECHANICAL DATA

| PART NUMBER | SIZE | D | | H | | T | | L | | S | | d | | | |
|-------------|------|-------|------|-------|------|-------|------|-------|------|-------|------|-------|------|-------|-----|
| | | MAX. | | MAX. | | MAX. | | MIN. | | MAX. | | NOM.* | | NOM. | |
| | | inch | mm | inch | mm | inch | mm | inch | mm | inch | mm | inch | mm | inch | mm |
| 0117NR05-0 | 0 | 0.275 | 7.0 | 0.433 | 11.0 | 0.177 | 4.5 | 0.043 | 1.10 | 0.067 | 1.70 | 0.20 | 5.0 | 0.023 | 0.6 |
| 0117NR07-1 | 1 | 0.334 | 8.5 | 0.472 | 12.0 | 0.177 | 4.5 | 0.043 | 1.10 | 0.067 | 1.70 | 0.20 | 5.0 | 0.023 | 0.6 |
| 0117NR12-2 | 2 | 0.551 | 14.0 | 0.709 | 18.0 | 0.197 | 5.0 | 0.051 | 1.30 | 0.075 | 1.90 | 0.30 | 7.5 | 0.031 | 0.8 |
| 0117NR14-3 | 3 | 0.630 | 16.0 | 0.787 | 20.0 | 0.197 | 5.0 | 0.051 | 1.30 | 0.075 | 1.90 | 0.30 | 7.5 | 0.031 | 0.8 |
| 0117NR20-4 | 4 | 0.866 | 22.0 | 1.023 | 26.0 | 0.216 | 5.5 | 0.055 | 1.40 | 0.082 | 2.10 | 0.40 | 10.0 | 0.039 | 1.0 |
| 0150NR05-0 | 0 | 0.275 | 7.0 | 0.433 | 11.0 | 0.197 | 5.0 | 0.055 | 1.40 | 0.079 | 2.00 | 0.20 | 5.0 | 0.023 | 0.6 |
| 0150NR07-1 | 1 | 0.334 | 8.5 | 0.472 | 12.0 | 0.197 | 5.0 | 0.055 | 1.40 | 0.079 | 2.00 | 0.20 | 5.0 | 0.023 | 0.6 |
| 0150NR12-2 | 2 | 0.551 | 14.0 | 0.709 | 18.0 | 0.216 | 5.5 | 0.063 | 1.60 | 0.086 | 2.20 | 0.30 | 7.5 | 0.031 | 0.8 |
| 0150NR14-3 | 3 | 0.630 | 16.0 | 0.787 | 20.0 | 0.216 | 5.5 | 0.063 | 1.60 | 0.086 | 2.20 | 0.30 | 7.5 | 0.031 | 0.8 |
| 0150NR20-4 | 4 | 0.866 | 22.0 | 1.023 | 26.0 | 0.236 | 6.0 | 0.071 | 1.80 | 0.094 | 2.40 | 0.40 | 10.0 | 0.039 | 1.0 |
| 0183NR05-0 | 0 | 0.275 | 7.0 | 0.433 | 11.0 | 0.197 | 5.0 | 0.055 | 1.40 | 0.082 | 2.10 | 0.20 | 5.0 | 0.023 | 0.6 |
| 0183NR07-1 | 1 | 0.334 | 8.5 | 0.472 | 12.0 | 0.197 | 5.0 | 0.055 | 1.40 | 0.082 | 2.10 | 0.20 | 5.0 | 0.023 | 0.6 |
| 0183NR12-2 | 2 | 0.551 | 14.0 | 0.709 | 18.0 | 0.216 | 5.5 | 0.063 | 1.60 | 0.090 | 2.30 | 0.30 | 7.5 | 0.031 | 0.8 |
| 0183NR14-3 | 3 | 0.630 | 16.0 | 0.787 | 20.0 | 0.216 | 5.5 | 0.063 | 1.60 | 0.090 | 2.30 | 0.30 | 7.5 | 0.031 | 0.8 |
| 0183NR20-4 | 4 | 0.866 | 22.0 | 1.023 | 26.0 | 0.236 | 6.0 | 0.071 | 1.80 | 0.098 | 2.50 | 0.40 | 10.0 | 0.039 | 1.0 |
| 0216NR05-0 | 0 | 0.275 | 7.0 | 0.433 | 11.0 | 0.197 | 5.0 | 0.063 | 1.60 | 0.090 | 2.30 | 0.20 | 5.0 | 0.023 | 0.6 |
| 0216NR07-1 | 1 | 0.334 | 8.5 | 0.472 | 12.0 | 0.197 | 5.0 | 0.063 | 1.60 | 0.090 | 2.30 | 0.20 | 5.0 | 0.023 | 0.6 |
| 0216NR12-2 | 2 | 0.551 | 14.0 | 0.709 | 18.0 | 0.216 | 5.5 | 0.071 | 1.80 | 0.098 | 2.50 | 0.30 | 7.5 | 0.031 | 0.8 |
| 0216NR14-3 | 3 | 0.630 | 16.0 | 0.787 | 20.0 | 0.216 | 5.5 | 0.071 | 1.80 | 0.098 | 2.50 | 0.30 | 7.5 | 0.031 | 0.8 |
| 0216NR20-4 | 4 | 0.866 | 22.0 | 1.023 | 26.0 | 0.256 | 6.5 | 0.079 | 2.00 | 0.106 | 2.70 | 0.40 | 10.0 | 0.039 | 1.0 |
| 0250NR05-0 | 0 | 0.275 | 7.0 | 0.433 | 11.0 | 0.197 | 5.0 | 0.067 | 1.70 | 0.094 | 2.40 | 0.20 | 5.0 | 0.023 | 0.6 |
| 0250NR07-1 | 1 | 0.334 | 8.5 | 0.472 | 12.0 | 0.197 | 5.0 | 0.067 | 1.70 | 0.094 | 2.40 | 0.20 | 5.0 | 0.023 | 0.6 |
| 0250NR12-2 | 2 | 0.551 | 14.0 | 0.709 | 18.0 | 0.216 | 5.5 | 0.075 | 1.90 | 0.102 | 2.60 | 0.30 | 7.5 | 0.031 | 0.8 |
| 0250NR14-3 | 3 | 0.630 | 16.0 | 0.787 | 20.0 | 0.216 | 5.5 | 0.075 | 1.90 | 0.102 | 2.60 | 0.30 | 7.5 | 0.031 | 0.8 |
| 0250NR20-4 | 4 | 0.866 | 22.0 | 1.023 | 26.0 | 0.256 | 6.5 | 0.082 | 2.10 | 0.110 | 2.80 | 0.40 | 10.0 | 0.039 | 1.0 |
| 0283NR05-0 | 0 | 0.275 | 7.0 | 0.433 | 11.0 | 0.216 | 5.5 | 0.071 | 1.80 | 0.098 | 2.50 | 0.20 | 5.0 | 0.023 | 0.6 |
| 0283NR07-1 | 1 | 0.334 | 8.5 | 0.472 | 12.0 | 0.216 | 5.5 | 0.071 | 1.80 | 0.098 | 2.50 | 0.20 | 5.0 | 0.023 | 0.6 |
| 0283NR12-2 | 2 | 0.551 | 14.0 | 0.709 | 18.0 | 0.236 | 6.0 | 0.079 | 2.00 | 0.106 | 2.70 | 0.30 | 7.5 | 0.031 | 0.8 |
| 0283NR14-3 | 3 | 0.630 | 16.0 | 0.787 | 20.0 | 0.236 | 6.0 | 0.079 | 2.00 | 0.106 | 2.70 | 0.30 | 7.5 | 0.031 | 0.8 |
| 0283NR20-4 | 4 | 0.866 | 22.0 | 1.023 | 26.0 | 0.256 | 6.5 | 0.086 | 2.20 | 0.114 | 2.90 | 0.40 | 10.0 | 0.039 | 1.0 |
| 0330NR05-0 | 0 | 0.295 | 7.5 | 0.453 | 11.5 | 0.216 | 5.5 | 0.082 | 2.10 | 0.114 | 2.90 | 0.20 | 5.0 | 0.023 | 0.6 |
| 0330NR07-1 | 1 | 0.354 | 9.0 | 0.492 | 12.5 | 0.216 | 5.5 | 0.082 | 2.10 | 0.114 | 2.90 | 0.20 | 5.0 | 0.023 | 0.6 |
| 0330NR12-2 | 2 | 0.571 | 14.5 | 0.709 | 18.0 | 0.236 | 6.0 | 0.090 | 2.30 | 0.122 | 3.10 | 0.30 | 7.5 | 0.031 | 0.8 |
| 0330NR14-3 | 3 | 0.670 | 17.0 | 0.827 | 21.0 | 0.236 | 6.0 | 0.090 | 2.30 | 0.122 | 3.10 | 0.30 | 7.5 | 0.031 | 0.8 |
| 0330NR20-4 | 4 | 0.905 | 23.0 | 1.063 | 27.0 | 0.275 | 7.0 | 0.098 | 2.50 | 0.130 | 3.30 | 0.40 | 10.0 | 0.039 | 1.0 |
| 0350NR05-0 | 0 | 0.295 | 7.5 | 0.453 | 11.5 | 0.236 | 6.0 | 0.086 | 2.20 | 0.118 | 3.00 | 0.20 | 5.0 | 0.023 | 0.6 |
| 0350NR07-1 | 1 | 0.354 | 9.0 | 0.492 | 12.5 | 0.236 | 6.0 | 0.086 | 2.20 | 0.118 | 3.00 | 0.20 | 5.0 | 0.023 | 0.6 |
| 0350NR12-2 | 2 | 0.571 | 14.5 | 0.709 | 18.0 | 0.256 | 6.5 | 0.094 | 2.40 | 0.126 | 3.20 | 0.30 | 7.5 | 0.031 | 0.8 |
| 0350NR14-3 | 3 | 0.670 | 17.0 | 0.827 | 21.0 | 0.256 | 6.5 | 0.094 | 2.40 | 0.126 | 3.20 | 0.30 | 7.5 | 0.031 | 0.8 |
| 0350NR20-4 | 4 | 0.905 | 23.0 | 1.063 | 27.0 | 0.275 | 7.0 | 0.102 | 2.60 | 0.134 | 3.40 | 0.40 | 10.0 | 0.039 | 1.0 |
| 0383NR05-0 | 0 | 0.295 | 7.5 | 0.453 | 11.5 | 0.236 | 6.0 | 0.094 | 2.40 | 0.126 | 3.20 | 0.20 | 5.0 | 0.023 | 0.6 |
| 0383NR07-1 | 1 | 0.354 | 9.0 | 0.492 | 12.5 | 0.236 | 6.0 | 0.094 | 2.40 | 0.126 | 3.20 | 0.20 | 5.0 | 0.023 | 0.6 |
| 0383NR12-2 | 2 | 0.571 | 14.5 | 0.709 | 18.0 | 0.256 | 6.5 | 0.102 | 2.60 | 0.134 | 3.40 | 0.30 | 7.5 | 0.031 | 0.8 |
| 0383NR14-3 | 3 | 0.670 | 17.0 | 0.827 | 21.0 | 0.256 | 6.5 | 0.102 | 2.60 | 0.134 | 3.40 | 0.30 | 7.5 | 0.031 | 0.8 |
| 0383NR20-4 | 4 | 0.905 | 23.0 | 1.063 | 27.0 | 0.275 | 7.0 | 0.110 | 2.80 | 0.142 | 3.60 | 0.40 | 10.0 | 0.039 | 1.0 |
| 0416NR05-0 | 0 | 0.295 | 7.5 | 0.453 | 11.5 | 0.236 | 6.0 | 0.102 | 2.60 | 0.134 | 3.40 | 0.20 | 5.0 | 0.023 | 0.6 |
| 0416NR07-1 | 1 | 0.354 | 9.0 | 0.492 | 12.5 | 0.236 | 6.0 | 0.102 | 2.60 | 0.134 | 3.40 | 0.20 | 5.0 | 0.023 | 0.6 |
| 0416NR12-2 | 2 | 0.571 | 14.5 | 0.709 | 18.0 | 0.256 | 6.5 | 0.110 | 2.80 | 0.142 | 3.60 | 0.30 | 7.5 | 0.031 | 0.8 |
| 0416NR14-3 | 3 | 0.670 | 17.0 | 0.827 | 21.0 | 0.256 | 6.5 | 0.110 | 2.80 | 0.142 | 3.60 | 0.30 | 7.5 | 0.031 | 0.8 |
| 0416NR20-4 | 4 | 0.905 | 23.0 | 1.063 | 27.0 | 0.295 | 7.5 | 0.118 | 3.00 | 0.149 | 3.80 | 0.40 | 10.0 | 0.039 | 1.0 |
| 0450NR05-0 | 0 | 0.295 | 7.5 | 0.453 | 11.5 | 0.256 | 6.5 | 0.106 | 2.70 | 0.142 | 3.60 | 0.20 | 5.0 | 0.023 | 0.6 |
| 0450NR07-1 | 1 | 0.354 | 9.0 | 0.492 | 12.5 | 0.256 | 6.5 | 0.106 | 2.70 | 0.142 | 3.60 | 0.20 | 5.0 | 0.023 | 0.6 |
| 0450NR12-2 | 2 | 0.571 | 14.5 | 0.709 | 18.0 | 0.275 | 7.0 | 0.114 | 2.90 | 0.149 | 3.80 | 0.30 | 7.5 | 0.031 | 0.8 |
| 0450NR14-3 | 3 | 0.670 | 17.0 | 0.827 | 21.0 | 0.275 | 7.0 | 0.114 | 2.90 | 0.149 | 3.80 | 0.30 | 7.5 | 0.031 | 0.8 |
| 0450NR20-4 | 4 | 0.905 | 23.0 | 1.063 | 27.0 | 0.295 | 7.5 | 0.122 | 3.10 | 0.157 | 4.00 | 0.40 | 10.0 | 0.039 | 1.0 |
| 0500NR05-0 | 0 | 0.295 | 7.5 | 0.453 | 11.5 | 0.256 | 6.5 | 0.118 | 3.00 | 0.153 | 3.90 | 0.20 | 5.0 | 0.023 | 0.6 |
| 0500NR07-1 | 1 | 0.354 | 9.0 | 0.492 | 12.5 | 0.256 | 6.5 | 0.118 | 3.00 | 0.153 | 3.90 | 0.20 | 5.0 | 0.023 | 0.6 |
| 0500NR12-2 | 2 | 0.571 | 14.5 | 0.709 | 18.0 | 0.275 | 7.0 | 0.126 | 3.20 | 0.161 | 4.10 | 0.30 | 7.5 | 0.031 | 0.8 |
| 0500NR14-3 | 3 | 0.670 | 17.0 | 0.827 | 21.0 | 0.275 | 7.0 | 0.126 | 3.20 | 0.161 | 4.10 | 0.30 | 7.5 | 0.031 | 0.8 |
| 0500NR20-4 | 4 | 0.905 | 23.0 | 1.063 | 27.0 | 0.295 | 7.5 | 0.134 | 3.40 | 0.169 | 4.30 | 0.40 | 10.0 | 0.039 | 1.0 |
| 0550NR05-0 | 0 | 0.295 | 7.5 | 0.453 | 11.5 | 0.275 | 7.0 | 0.130 | 3.30 | 0.169 | 4.30 | 0.20 | 5.0 | 0.023 | 0.6 |
| 0550NR07-1 | 1 | 0.354 | 9.0 | 0.492 | 12.5 | 0.275 | 7.0 | 0.130 | 3.30 | 0.169 | 4.30 | 0.20 | 5.0 | 0.023 | 0.6 |
| 0550NR12-2 | 2 | 0.571 | 14.5 | 0.709 | 18.0 | 0.295 | 7.5 | 0.138 | 3.50 | 0.177 | 4.50 | 0.30 | 7.5 | 0.031 | 0.8 |
| 0550NR14-3 | 3 | 0.670 | 17.0 | 0.827 | 21.0 | 0.295 | 7.5 | 0.138 | 3.50 | 0.177 | 4.50 | 0.30 | 7.5 | 0.031 | 0.8 |
| 0550NR20-4 | 4 | 0.905 | 23.0 | 1.063 | 27.0 | 0.315 | 8.0 | 0.145 | 3.70 | 0.185 | 4.70 | 0.40 | 10.0 | 0.039 | 1.0 |
| 0700NR14-3 | 3 | 0.689 | 17.5 | 0.866 | 22.0 | 0.354 | 9.0 | 0.149 | 3.80 | 0.216 | 5.50 | 0.30 | 7.5 | 0.031 | 0.8 |
| 0700NR20-4 | 4 | 0.945 | 24.0 | 1.102 | 28.0 | 0.374 | 9.5 | 0.157 | 4.00 | 0.236 | 6.00 | 0.40 | 10.0 | 0.039 | 1.0 |
| 0765NR14-3 | 3 | 0.689 | 17.5 | 0.866 | 22.0 | 0.374 | 9.5 | 0.149 | 3.80 | 0.236 | 6.00 | 0.30 | 7.5 | 0.031 | 0.8 |
| 0765NR20-4 | 4 | 0.945 | 24.0 | 1.102 | 28.0 | 0.374 | 9.5 | 0.157 | 4.00 | 0.236 | 6.00 | 0.40 | 10.0 | 0.039 | 1.0 |
| 0800NR14-3 | 3 | 0.689 | 17.5 | 0.866 | 22.0 | 0.374 | 9.5 | 0.165 | 4.20 | 0.236 | 6.00 | 0.30 | 7.5 | 0.031 | 0.8 |
| 0800NR20-4 | 4 | 0.945 | 24.0 | 1.102 | 28.0 | 0.394 | 10.0 | 0.173 | 4.40 | 0.256 | 6.50 | 0.40 | 10.0 | 0.039 | 1.0 |
| 0850NR14-3 | 3 | 0.689 | 17.5 | 0.866 | 22.0 | 0.394 | 10.0 | 0.173 | 4.40 | 0.256 | 6.50 | 0.30 | 7.5 | 0.031 | 0.8 |
| 0850NR20-4 | 4 | 0.945 | 24.0 | 1.102 | 28.0 | 0.394 | 10.0 | 0.181 | 4.60 | 0.256 | 6.50 | 0.40 | 10.0 | 0.039 | 1.0 |
| 1000NR20-4 | 4 | 0.984 | 25.0 | 1.142 | 29.0 | 0.433 | 11.0 | 0.208 | 5.30 | 0.295 | 7.50 | 0.40 | 10.0 | 0.039 | 1.0 |
| 1400NR20-4 | 4 | 0.984 | 25.0 | 1.142 | 29.0 | 0.512 | 13.0 | 0.275 | 7.00 | 0.354 | 9.60 | 0.40 | 10.0 | 0.039 | 1.0 |

* S Dimension tolerance ±(1.0 mm) 0.04 inch

Note: Size 1 is available with S dimension (7.0mm) 0.28 inch upon request.



Stetron International Inc.

Metal Oxide Varistors

ZR Series

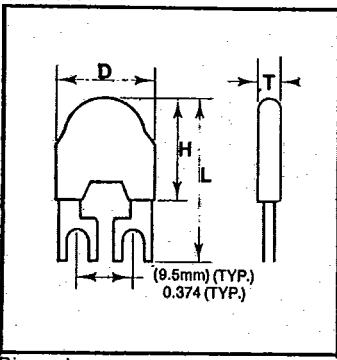
ELECTRICAL CHARACTERISTICS TABLE

| PART NUMBER | SIZE | STEADY STATE | | TRANSIENT (@ 85°C) | | | CHARACTERISTICS (@ 25°C) | | | | |
|-------------|------|-------------------|------------------|--------------------|---------------------------|-----------------------|-----------------------------|------|---|------|------------------|
| | | MAX. APPLIED Vrms | MAX. APPLIED Vdc | ENERGY (10X1000µs) | AVERAGE POWER DISSIPATION | PEAK CURRENT (8X20µs) | VARISTOR VOLTAGE DC VOLTAGE | | MAX. CLAMPING VOLTAGE @ TEST CURRENT (8X20µs) | | TYP. CAP. (1KHz) |
| | | VOLTS | VOLTS | JOULES | WATTS | AMP. | VOLTS | TOL. | VOLTS | AMP. | pF. |
| 0018ZR05-0 | 0 | 10 | 12 | 0.4 | 0.01 | 250 | 18 | ±20% | 50 | 1 | 1400 |
| 0018ZR07-1 | 1 | 10 | 12 | 0.8 | 0.02 | 500 | 18 | ±20% | 45 | 2.5 | 3000 |
| 0018ZR10-2 | 2 | 10 | 12 | 1.6 | 0.05 | 1000 | 18 | ±20% | 45 | 5 | 6100 |
| 0018ZR14-3 | 3 | 10 | 12 | 3.5 | 0.10 | 2000 | 18 | ±20% | 45 | 10 | 12200 |
| 0022ZR05-0 | 0 | 13 | 16 | 0.5 | 0.01 | 250 | 22 | ±15% | 55 | 1 | 1200 |
| 0022ZR07-1 | 1 | 13 | 16 | 1.0 | 0.02 | 500 | 22 | ±15% | 50 | 2.5 | 2500 |
| 0022ZR10-2 | 2 | 13 | 16 | 2.0 | 0.05 | 1000 | 22 | ±15% | 50 | 5 | 5000 |
| 0022ZR14-3 | 3 | 13 | 16 | 4.0 | 0.10 | 2000 | 22 | ±15% | 50 | 10 | 10000 |
| 0024ZR05-0 | 0 | 14 | 18 | 0.5 | 0.01 | 250 | 24 | ±15% | 60 | 1 | 1100 |
| 0024ZR07-1 | 1 | 14 | 18 | 1.2 | 0.02 | 500 | 24 | ±15% | 55 | 2.5 | 2300 |
| 0024ZR10-2 | 2 | 14 | 18 | 2.0 | 0.05 | 1000 | 24 | ±15% | 55 | 5 | 4500 |
| 0024ZR14-3 | 3 | 14 | 18 | 4.0 | 0.10 | 2000 | 24 | ±15% | 55 | 10 | 9100 |
| 0027ZR05-0 | 0 | 17 | 22 | 0.6 | 0.01 | 250 | 27 | ±10% | 65 | 1 | 1100 |
| 0027ZR07-1 | 1 | 17 | 22 | 1.3 | 0.02 | 500 | 27 | ±10% | 60 | 2.5 | 2200 |
| 0027ZR10-2 | 2 | 17 | 22 | 2.5 | 0.05 | 1000 | 27 | ±10% | 60 | 5 | 4500 |
| 0027ZR14-3 | 3 | 17 | 22 | 5.0 | 0.10 | 2000 | 27 | ±10% | 60 | 10 | 9000 |
| 0033ZR05-0 | 0 | 20 | 26 | 0.7 | 0.01 | 250 | 33 | ±10% | 75 | 1 | 1000 |
| 0033ZR07-1 | 1 | 20 | 26 | 1.5 | 0.02 | 500 | 33 | ±10% | 70 | 2.5 | 2000 |
| 0033ZR10-2 | 2 | 20 | 26 | 3.0 | 0.05 | 1000 | 33 | ±10% | 70 | 5 | 4000 |
| 0033ZR14-3 | 3 | 20 | 26 | 6.0 | 0.10 | 2000 | 33 | ±10% | 70 | 10 | 9000 |
| 0039ZR05-0 | 0 | 25 | 31 | 0.8 | 0.01 | 250 | 39 | ±10% | 85 | 1 | 800 |
| 0039ZR07-1 | 1 | 25 | 31 | 1.7 | 0.02 | 500 | 39 | ±10% | 80 | 2.5 | 1700 |
| 0039ZR10-2 | 2 | 25 | 31 | 3.5 | 0.05 | 1000 | 39 | ±10% | 80 | 5 | 3500 |
| 0039ZR14-3 | 3 | 25 | 31 | 7.0 | 0.10 | 2000 | 39 | ±10% | 80 | 10 | 7000 |
| 0047ZR05-0 | 0 | 30 | 38 | 1.1 | 0.01 | 250 | 47 | ±10% | 105 | 1 | 700 |
| 0047ZR07-1 | 1 | 30 | 38 | 2.3 | 0.02 | 500 | 47 | ±10% | 95 | 2.5 | 1500 |
| 0047ZR10-2 | 2 | 30 | 38 | 4.5 | 0.05 | 1000 | 47 | ±10% | 95 | 5 | 3000 |
| 0047ZR14-3 | 3 | 30 | 38 | 8.5 | 0.10 | 2000 | 47 | ±10% | 95 | 10 | 6000 |
| 0056ZR05-0 | 0 | 35 | 45 | 1.3 | 0.01 | 250 | 56 | ±10% | 125 | 1 | 600 |
| 0056ZR07-1 | 1 | 35 | 45 | 2.7 | 0.02 | 500 | 56 | ±10% | 110 | 2.5 | 1300 |
| 0056ZR10-2 | 2 | 35 | 45 | 5.5 | 0.05 | 1000 | 56 | ±10% | 110 | 5 | 2750 |
| 0056ZR14-3 | 3 | 35 | 45 | 10.0 | 0.10 | 2000 | 56 | ±10% | 110 | 10 | 5500 |
| 0068ZR05-0 | 0 | 43 | 55 | 1.6 | 0.01 | 250 | 68 | ±10% | 150 | 1 | 600 |
| 0068ZR07-1 | 1 | 43 | 55 | 3.2 | 0.02 | 500 | 68 | ±10% | 135 | 2.5 | 1200 |
| 0068ZR10-2 | 2 | 43 | 55 | 6.5 | 0.05 | 1000 | 68 | ±10% | 135 | 5 | 2500 |
| 0068ZR14-3 | 3 | 43 | 55 | 13.0 | 0.10 | 2000 | 68 | ±10% | 135 | 10 | 5000 |
| 0082ZR05-0 | 0 | 52 | 66 | 2.0 | 0.10 | 500 | 82 | ±10% | 160 | 5 | 630 |
| 0082ZR07-1 | 1 | 52 | 66 | 4.0 | 0.20 | 1000 | 82 | ±10% | 150 | 10 | 1400 |
| 0082ZR10-2 | 2 | 52 | 66 | 9.0 | 0.40 | 2500 | 82 | ±10% | 150 | 35 | 1900 |
| 0082ZR14-3 | 3 | 52 | 66 | 14.0 | 0.60 | 5000 | 82 | ±10% | 150 | 50 | 3800 |
| 0100ZR05-0 | 0 | 63 | 80 | 2.0 | 0.10 | 500 | 100 | ±10% | 190 | 5 | 530 |
| 0100ZR07-1 | 1 | 63 | 80 | 6.0 | 0.20 | 1000 | 100 | ±10% | 175 | 10 | 1200 |
| 0100ZR10-2 | 2 | 63 | 80 | 13.0 | 0.40 | 2500 | 100 | ±10% | 175 | 35 | 1500 |
| 0100ZR14-3 | 3 | 63 | 80 | 19.0 | 0.60 | 5000 | 100 | ±10% | 175 | 50 | 3200 |

Spade Lug Type

NS and ZS Series

TYPE A

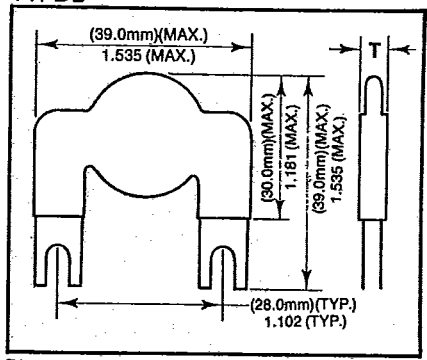


Stetron offers spade lug types for specific applications to facilitate ease of assembly at the lowest possible installed cost. Type A is designed to mount under NEMA barrier blocks in microprocessors and addressable Input/Output systems. Type B is designed to mount under AC input terminals on solid state relays.

| SIZE | H (MAX.) | | L (MAX.) | |
|------|----------|------|----------|------|
| | INCH | mm | INCH | mm |
| 1 | 0.630 | 16.0 | 1.024 | 26.0 |
| 2 | 0.787 | 20.0 | 1.181 | 30.0 |
| 3 | 0.866 | 22.0 | 1.457 | 37.0 |

Note: Refer to tables on pages 7 and 9 for other dimensions

TYPE B



Available in size 4 only



Stetron International Inc.

Metal Oxide Varistors

ZR Series

MECHANICAL DATA

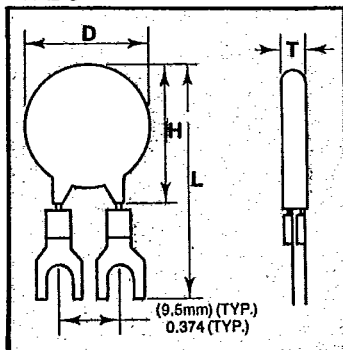
| PART NUMBER | SIZE | D | | H | | T | | L | | S | | d | | | |
|-------------|------|------|-----|------|----|------|-----|-------|-----|-------|-----|--------|-----|-------|-----|
| | | MAX. | | MAX. | | MAX. | | MIN. | | MAX. | | NOM.** | | NOM. | |
| | | Inch | mm | Inch | mm | Inch | mm | Inch | mm | Inch | mm | Inch | mm | Inch | mm |
| 0018ZR05-0 | 0 | 0.27 | 7 | 0.43 | 11 | 0.13 | 3.3 | 0.035 | 0.9 | 0.059 | 1.5 | 0.19 | 5 | 0.023 | 0.6 |
| 0018ZR07-1 | 1 | 0.33 | 8.5 | 0.51 | 13 | 0.13 | 3.3 | 0.035 | 0.9 | 0.059 | 1.5 | 0.19 | 5 | 0.023 | 0.6 |
| 0018ZR10-2 | 2 | 0.47 | 12 | 0.63 | 16 | 0.14 | 3.7 | 0.039 | 1.0 | 0.071 | 1.8 | 0.30 | 7.5 | 0.031 | 0.8 |
| 0018ZR14-3 | 3 | 0.63 | 16 | 0.79 | 20 | 0.14 | 3.7 | 0.039 | 1.0 | 0.071 | 1.8 | 0.30 | 7.5 | 0.031 | 0.8 |
| 0022ZR05-0 | 0 | 0.27 | 7 | 0.43 | 11 | 0.13 | 3.3 | 0.035 | 0.9 | 0.067 | 1.7 | 0.19 | 5 | 0.023 | 0.6 |
| 0022ZR07-1 | 1 | 0.33 | 8.5 | 0.51 | 13 | 0.13 | 3.3 | 0.035 | 0.9 | 0.067 | 1.7 | 0.19 | 5 | 0.023 | 0.6 |
| 0022ZR10-2 | 2 | 0.47 | 12 | 0.63 | 16 | 0.14 | 3.7 | 0.039 | 1.0 | 0.075 | 1.9 | 0.30 | 7.5 | 0.031 | 0.8 |
| 0022ZR14-3 | 3 | 0.63 | 16 | 0.79 | 20 | 0.14 | 3.7 | 0.039 | 1.0 | 0.075 | 1.9 | 0.30 | 7.5 | 0.031 | 0.8 |
| 0024ZR05-0 | 0 | 0.27 | 7 | 0.43 | 11 | 0.14 | 3.6 | 0.035 | 0.9 | 0.071 | 1.8 | 0.19 | 5 | 0.023 | 0.6 |
| 0024ZR07-1 | 1 | 0.33 | 8.5 | 0.51 | 13 | 0.14 | 3.6 | 0.035 | 0.9 | 0.071 | 1.8 | 0.19 | 5 | 0.023 | 0.6 |
| 0024ZR10-2 | 2 | 0.47 | 12 | 0.63 | 16 | 0.15 | 4.0 | 0.043 | 1.1 | 0.075 | 1.9 | 0.30 | 7.5 | 0.031 | 0.8 |
| 0024ZR14-3 | 3 | 0.63 | 16 | 0.79 | 20 | 0.15 | 4.0 | 0.043 | 1.1 | 0.075 | 1.9 | 0.30 | 7.5 | 0.031 | 0.8 |
| 0027ZR05-0 | 0 | 0.27 | 7 | 0.43 | 11 | 0.14 | 3.6 | 0.039 | 1.0 | 0.071 | 1.8 | 0.19 | 5 | 0.023 | 0.6 |
| 0027ZR07-1 | 1 | 0.33 | 8.5 | 0.51 | 13 | 0.14 | 3.6 | 0.039 | 1.0 | 0.071 | 1.8 | 0.19 | 5 | 0.023 | 0.6 |
| 0027ZR10-2 | 2 | 0.47 | 12 | 0.63 | 16 | 0.15 | 4.0 | 0.047 | 1.2 | 0.079 | 2.0 | 0.30 | 7.5 | 0.031 | 0.8 |
| 0027ZR14-3 | 3 | 0.63 | 16 | 0.79 | 20 | 0.15 | 4.0 | 0.047 | 1.2 | 0.079 | 2.0 | 0.30 | 7.5 | 0.031 | 0.8 |
| 0033ZR05-0 | 0 | 0.27 | 7 | 0.43 | 11 | 0.15 | 4.0 | 0.043 | 1.1 | 0.075 | 1.9 | 0.19 | 5 | 0.023 | 0.6 |
| 0033ZR07-1 | 1 | 0.33 | 8.5 | 0.51 | 13 | 0.15 | 4.0 | 0.043 | 1.1 | 0.075 | 1.9 | 0.19 | 5 | 0.023 | 0.6 |
| 0033ZR10-2 | 2 | 0.47 | 12 | 0.63 | 16 | 0.17 | 4.4 | 0.051 | 1.3 | 0.082 | 2.1 | 0.30 | 7.5 | 0.031 | 0.8 |
| 0033ZR14-3 | 3 | 0.63 | 16 | 0.79 | 20 | 0.17 | 4.4 | 0.051 | 1.3 | 0.082 | 2.1 | 0.30 | 7.5 | 0.031 | 0.8 |
| 0039ZR05-0 | 0 | 0.27 | 7 | 0.43 | 11 | 0.15 | 4.0 | 0.043 | 1.1 | 0.082 | 2.1 | 0.19 | 5 | 0.023 | 0.6 |
| 0039ZR07-1 | 1 | 0.33 | 8.5 | 0.51 | 13 | 0.15 | 4.0 | 0.043 | 1.1 | 0.082 | 2.1 | 0.19 | 5 | 0.023 | 0.6 |
| 0039ZR10-2 | 2 | 0.51 | 13 | 0.63 | 16 | 0.17 | 4.4 | 0.051 | 1.3 | 0.090 | 2.3 | 0.30 | 7.5 | 0.031 | 0.8 |
| 0039ZR14-3 | 3 | 0.67 | 17 | 0.79 | 20 | 0.17 | 4.4 | 0.051 | 1.3 | 0.090 | 2.3 | 0.30 | 7.5 | 0.031 | 0.8 |
| 0047ZR05-0 | 0 | 0.27 | 7 | 0.43 | 11 | 0.16 | 4.1 | 0.051 | 1.3 | 0.090 | 2.3 | 0.19 | 5 | 0.023 | 0.6 |
| 0047ZR07-1 | 1 | 0.35 | 9 | 0.51 | 13 | 0.16 | 4.1 | 0.051 | 1.3 | 0.090 | 2.3 | 0.19 | 5 | 0.023 | 0.6 |
| 0047ZR10-2 | 2 | 0.51 | 13 | 0.63 | 16 | 0.18 | 4.5 | 0.059 | 1.5 | 0.098 | 2.5 | 0.30 | 7.5 | 0.031 | 0.8 |
| 0047ZR14-3 | 3 | 0.67 | 17 | 0.79 | 20 | 0.18 | 4.5 | 0.059 | 1.5 | 0.098 | 2.5 | 0.30 | 7.5 | 0.031 | 0.8 |
| 0056ZR05-0 | 0 | 0.27 | 7 | 0.43 | 11 | 0.17 | 4.4 | 0.059 | 1.5 | 0.098 | 2.5 | 0.19 | 5 | 0.023 | 0.6 |
| 0056ZR07-1 | 1 | 0.35 | 9 | 0.51 | 13 | 0.17 | 4.4 | 0.059 | 1.5 | 0.098 | 2.5 | 0.19 | 5 | 0.023 | 0.6 |
| 0056ZR10-2 | 2 | 0.51 | 13 | 0.63 | 16 | 0.19 | 4.8 | 0.067 | 1.7 | 0.106 | 2.7 | 0.30 | 7.5 | 0.031 | 0.8 |
| 0056ZR14-3 | 3 | 0.67 | 17 | 0.79 | 20 | 0.19 | 4.8 | 0.067 | 1.7 | 0.106 | 2.7 | 0.30 | 7.5 | 0.031 | 0.8 |
| 0068ZR05-0 | 0 | 0.27 | 7 | 0.43 | 11 | 0.19 | 4.8 | 0.059 | 1.5 | 0.110 | 2.8 | 0.19 | 5 | 0.023 | 0.6 |
| 0068ZR07-1 | 1 | 0.35 | 9 | 0.51 | 13 | 0.19 | 4.8 | 0.059 | 1.5 | 0.110 | 2.8 | 0.19 | 5 | 0.023 | 0.6 |
| 0068ZR10-2 | 2 | 0.51 | 13 | 0.63 | 16 | 0.20 | 5.2 | 0.067 | 1.7 | 0.118 | 3.0 | 0.30 | 7.5 | 0.031 | 0.8 |
| 0068ZR14-3 | 3 | 0.67 | 17 | 0.79 | 20 | 0.20 | 5.2 | 0.067 | 1.7 | 0.118 | 3.0 | 0.30 | 7.5 | 0.031 | 0.8 |
| 0082ZR05-0 | 0 | 0.27 | 7 | 0.43 | 11 | 0.20 | 5.1 | 0.059 | 1.5 | 0.122 | 3.1 | 0.19 | 5 | 0.023 | 0.6 |
| 0082ZR07-1 | 1 | 0.35 | 9 | 0.51 | 13 | 0.20 | 5.1 | 0.059 | 1.5 | 0.122 | 3.1 | 0.19 | 5 | 0.023 | 0.6 |
| 0082ZR10-2 | 2 | 0.51 | 13 | 0.67 | 17 | 0.21 | 5.5 | 0.067 | 1.7 | 0.130 | 3.3 | 0.30 | 7.5 | 0.031 | 0.8 |
| 0082ZR14-3 | 3 | 0.67 | 17 | 0.83 | 21 | 0.21 | 5.5 | 0.067 | 1.7 | 0.130 | 3.3 | 0.30 | 7.5 | 0.031 | 0.8 |
| 0100ZR05-0 | 0 | 0.27 | 7 | 0.43 | 11 | 0.19 | 5.0 | 0.059 | 1.5 | 0.138 | 3.5 | 0.19 | 5 | 0.023 | 0.6 |
| 0100ZR07-1 | 1 | 0.35 | 9 | 0.51 | 13 | 0.19 | 5.0 | 0.059 | 1.5 | 0.138 | 3.5 | 0.19 | 5 | 0.023 | 0.6 |
| 0100ZR10-2 | 2 | 0.51 | 13 | 0.67 | 17 | 0.21 | 5.4 | 0.067 | 1.7 | 0.153 | 3.9 | 0.30 | 7.5 | 0.031 | 0.8 |
| 0100ZR14-3 | 3 | 0.67 | 17 | 0.83 | 21 | 0.21 | 5.4 | 0.067 | 1.7 | 0.153 | 3.9 | 0.30 | 7.5 | 0.031 | 0.8 |

** S Dimension tolerance \pm (1.0 mm) 0.04 inch

Spade Lug Type

NS and ZS Series

TYPE C



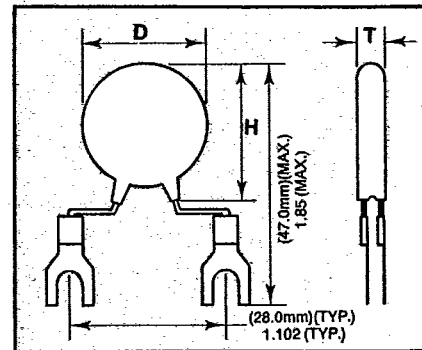
Dimensions (mm) in

Types C and D offer alternate mounting styles and are designed to meet applications which require quick disconnect termination to permit reliable and cost effective assembly.

| SIZE | L (MAX.) | |
|------|----------|------|
| | INCH | mm |
| 1 | 1.181 | 30.0 |
| 2 | 1.417 | 36.0 |
| 3 | 1.457 | 37.0 |

Note: Refer to tables on pages 7 and 9 for other dimensions

TYPE D



Dimensions (mm) in

Available in size 4 only



Stetron International Inc.

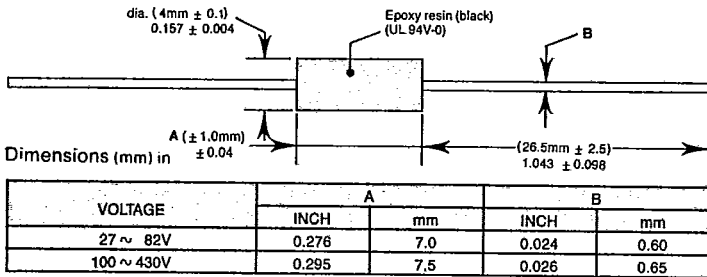
Metal Oxide Varistors

NA Series

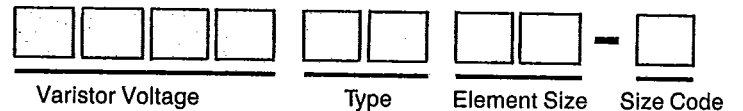
ELECTRICAL CHARACTERISTICS

| PART NUMBER | STEADY STATE | | TRANSIENT (@ 85°C) | | | CHARACTERISTICS (@ 25°C) | | TYP. CAPACITANCE (1KHz) | |
|-------------|-----------------------------------|--------------------|---------------------|---------------------------|--------------------------|------------------------------------|---|-------------------------|-----|
| | RMS APPLIED VOLTAGE (50-60 Hz) AC | DC APPLIED VOLTAGE | ENERGY (10X 1000µs) | AVERAGE POWER DISSIPATION | PEAK CURRENT (8 X 20 µs) | VARISTOR VOLTAGE @ 1 mA DC CURRENT | MAX. CLAMPING VOLTAGE @ 1.0 AMP (8 x 20 µs) | | |
| | VOLTS | VOLTS | JOULES | WATTS | AMPS | VOLTS TOL. | VOLTS | | |
| 0027NA | 17 | 21 | 0.13 | 0.1 | 40 | 27 | ±10% | 50 | 340 |
| 0033NA | 21 | 26 | 0.20 | 0.1 | 40 | 33 | ±10% | 60 | 270 |
| 0039NA | 25 | 31 | 0.20 | 0.1 | 40 | 39 | ±10% | 73 | 230 |
| 0047NA | 30 | 38 | 0.26 | 0.1 | 40 | 47 | ±10% | 85 | 190 |
| 0056NA | 35 | 45 | 0.26 | 0.1 | 40 | 56 | ±10% | 103 | 160 |
| 0068NA | 43 | 55 | 0.40 | 0.2 | 40 | 68 | ±10% | 120 | 130 |
| 0082NA | 52 | 66 | 0.50 | 0.2 | 40 | 82 | ±10% | 145 | 110 |
| 0100NA | 63 | 81 | 0.50 | 0.2 | 40 | 100 | ±10% | 170 | 50 |
| 0120NA | 76 | 97 | 0.50 | 0.2 | 100 | 120 | ±10% | 200 | 40 |
| 0150NA | 95 | 121 | 0.60 | 0.2 | 100 | 150 | ±10% | 230 | 30 |
| 0180NA | 114 | 145 | 0.70 | 0.2 | 100 | 180 | ±10% | 285 | 25 |
| 0220NA | 140 | 178 | 0.90 | 0.2 | 100 | 220 | ±10% | 355 | 20 |
| 0270NA | 171 | 218 | 1.00 | 0.2 | 100 | 270 | ±10% | 435 | 17 |
| 0330NA | 210 | 267 | 1.10 | 0.2 | 100 | 330 | ±10% | 535 | 15 |
| 0370NA | 235 | 299 | 1.10 | 0.2 | 100 | 370 | ±10% | 600 | 12 |
| 0390NA | 248 | 315 | 1.30 | 0.2 | 100 | 390 | ±10% | 635 | 10 |
| 0430NA | 273 | 348 | 1.70 | 0.2 | 100 | 430 | ±10% | 695 | 10 |

MECHANICAL DATA

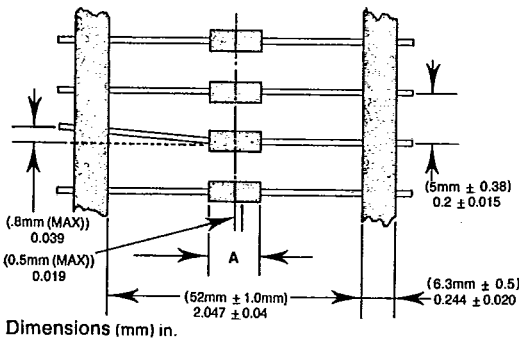


TYPE NUMBERING SYSTEM

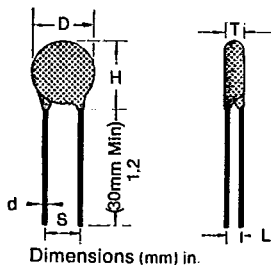


Examples:
0056 NA
0216NR07-1
0024ZR10-2

TAPE REEL SPECIFICATIONS



OUTLINE DIMENSIONS



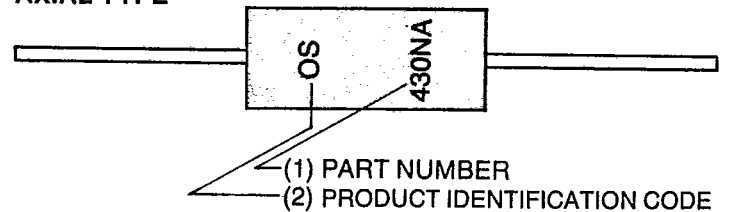
Coating material: non-flammable, non toxic.
Lead wire: solder coated copper wire.

CSA #LR 56165-1
UL# E79699(M)

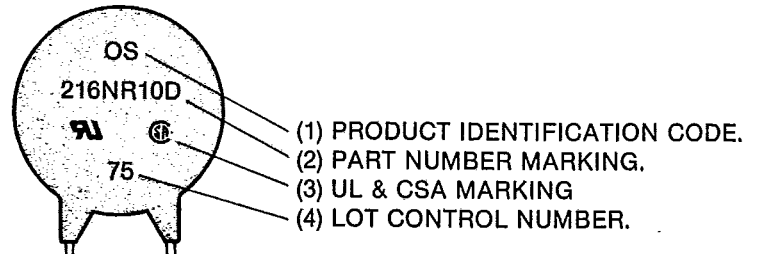
Note: Refer to tables on pages 7 and 9 for other dimensions

MNR MARKINGS

AXIAL TYPE



RADIAL TYPE



Stetron International Inc.

Metal Oxide Varistors

SUPPLEMENT

NR Series

ELECTRICAL CHARACTERISTICS TABLE

| PART NUMBER | SIZE | STEADY STATE | | TRANSIENT (@85°C) | | | CHARACTERISTICS(@ 25°C) | | | | |
|-------------|------|-------------------|------------------|--------------------|---------------------------|-----------------------|-------------------------|------|---|------|------------------|
| | | MAX. APPLIED VRMS | MAX. APPLIED VDC | ENERGY (10x1000µs) | AVERAGE POWER DISSIPATION | PEAK CURRENT (8x20µs) | VARISTOR VOLTAGE | | MAX. CLAMPING @ VOLTAGE TEST CURRENT (8x20µs) | | TYP. CAP. (1KHZ) |
| | | VOLTS | VOLTS | JOULES | WATTS | AMP | VOLTS | TOL. | VOLTS | AMP. | PF |
| 0117NR10-5 | 5 | 75 | 95 | 11 | 0.4 | 2500 | 117 | ±10% | 205 | 25 | 640 |
| 0150NR10-5 | 5 | 95 | 120 | 15 | 0.4 | 2500 | 150 | ±10% | 250 | 25 | 450 |
| 0183NR10-5 | 5 | 115 | 150 | 18 | 0.4 | 2500 | 183 | ±10% | 305 | 25 | 350 |
| 0216NR10-5 | 5 | 135 | 175 | 21 | 0.4 | 2500 | 216 | ±10% | 355 | 25 | 330 |
| 0250NR10-5 | 5 | 160 | 200 | 25 | 0.4 | 2500 | 250 | ±10% | 410 | 25 | 290 |
| 0283NR10-5 | 5 | 180 | 230 | 27 | 0.4 | 2500 | 283 | ±10% | 465 | 25 | 280 |
| 0330NR10-5 | 5 | 210 | 265 | 33 | 0.4 | 2500 | 330 | ±10% | 545 | 25 | 250 |
| 0350NR10-5 | 5 | 220 | 280 | 35 | 0.4 | 2500 | 350 | ±10% | 580 | 25 | 230 |
| 0383NR10-5 | 5 | 240 | 310 | 37 | 0.4 | 2500 | 383 | ±10% | 630 | 25 | 200 |
| 0416NR10-5 | 5 | 260 | 335 | 42 | 0.4 | 2500 | 416 | ±10% | 685 | 25 | 190 |
| 0450NR10-5 | 5 | 280 | 365 | 45 | 0.4 | 2500 | 450 | ±10% | 740 | 25 | 180 |
| 0500NR10-5 | 5 | 315 | 405 | 50 | 0.4 | 2500 | 500 | ±10% | 825 | 25 | 160 |
| 0550NR10-5 | 5 | 350 | 445 | 50 | 0.4 | 2500 | 550 | ±10% | 910 | 25 | 140 |
| 0700NR10-5 | 5 | 440 | 565 | 58 | 0.4 | 2500 | 700 | ±10% | 1200 | 25 | 110 |
| 0765NR10-5 | 5 | 480 | 620 | 65 | 0.4 | 2500 | 765 | ±10% | 1300 | 25 | 105 |
| 0800NR10-5 | 5 | 500 | 650 | 70 | 0.4 | 2500 | 800 | ±10% | 1350 | 25 | 100 |
| 0850NR10-5 | 5 | 540 | 690 | 75 | 0.4 | 2500 | 850 | ±10% | 1450 | 25 | 95 |
| 1000NR10-5 | 5 | 630 | 810 | 80 | 0.4 | 2500 | 1000 | ±10% | 1700 | 25 | 85 |

MECHANICAL DATA

| PART NUMBER | SIZE | D | | H | | T | | L | | S | | D | | | |
|-------------|------|-------|------|-------|------|-------|------|-------|------|-------|------|------|-----|------|-----|
| | | MAX | | MAX | | MAX | | MIN | | MAX | | NOM* | | | |
| | | INCH | MM | INCH | MM | INCH | MM | INCH | MM | INCH | MM | INCH | MM | | |
| 0117NR10-5 | 5 | 0.492 | 12.5 | 0.630 | 16.0 | 0.197 | 5.0 | 0.051 | 1.30 | 0.075 | 1.90 | 0.30 | 7.5 | 0.03 | 0.8 |
| 0150NR10-5 | 5 | 0.492 | 12.5 | 0.630 | 16.0 | 0.217 | 5.5 | 0.063 | 1.60 | 0.087 | 2.20 | 0.30 | 7.5 | 0.03 | 0.8 |
| 0183NR10-5 | 5 | 0.492 | 12.5 | 0.630 | 16.0 | 0.217 | 5.5 | 0.063 | 1.60 | 0.091 | 2.30 | 0.30 | 7.5 | 0.03 | 0.8 |
| 0216NR10-5 | 5 | 0.492 | 12.5 | 0.630 | 16.0 | 0.217 | 5.5 | 0.071 | 1.80 | 0.100 | 2.50 | 0.30 | 7.5 | 0.03 | 0.8 |
| 0250NR10-5 | 5 | 0.492 | 12.5 | 0.630 | 16.0 | 0.217 | 5.5 | 0.075 | 1.90 | 0.102 | 2.60 | 0.30 | 7.5 | 0.03 | 0.8 |
| 0283NR10-5 | 5 | 0.492 | 12.5 | 0.630 | 16.0 | 0.236 | 6.0 | 0.079 | 2.00 | 0.106 | 2.70 | 0.30 | 7.5 | 0.03 | 0.8 |
| 0330NR10-5 | 5 | 0.512 | 13.0 | 0.669 | 17.0 | 0.236 | 6.0 | 0.091 | 2.30 | 0.122 | 3.10 | 0.30 | 7.5 | 0.03 | 0.8 |
| 0350NR10-5 | 5 | 0.512 | 13.0 | 0.669 | 17.0 | 0.256 | 6.5 | 0.094 | 2.40 | 0.126 | 3.20 | 0.30 | 7.5 | 0.03 | 0.8 |
| 0383NR10-5 | 5 | 0.512 | 13.0 | 0.669 | 17.0 | 0.256 | 6.5 | 1.102 | 2.60 | 0.134 | 3.40 | 0.30 | 7.5 | 0.03 | 0.8 |
| 0416NR10-5 | 5 | 0.512 | 13.0 | 0.669 | 17.0 | 0.256 | 6.5 | 0.110 | 2.80 | 0.142 | 3.60 | 0.30 | 7.5 | 0.03 | 0.8 |
| 0450NR10-5 | 5 | 0.512 | 13.0 | 0.669 | 17.0 | 0.276 | 7.0 | 0.114 | 2.90 | 0.150 | 3.80 | 0.30 | 7.5 | 0.03 | 0.8 |
| 0500NR10-5 | 5 | 0.512 | 13.0 | 0.669 | 17.0 | 0.276 | 7.0 | 0.126 | 3.20 | 0.161 | 4.10 | 0.30 | 7.5 | 0.03 | 0.8 |
| 0550NR10-5 | 5 | 0.512 | 13.0 | 0.669 | 17.0 | 0.295 | 7.5 | 0.138 | 3.50 | 0.177 | 4.50 | 0.30 | 7.5 | 0.03 | 0.8 |
| 0700NR10-5 | 5 | 0.531 | 13.5 | 0.709 | 18.0 | 0.354 | 9.0 | 0.150 | 3.80 | 0.209 | 5.30 | 0.30 | 7.5 | 0.03 | 0.8 |
| 0765NR10-5 | 5 | 0.531 | 13.5 | 0.709 | 18.0 | 0.374 | 9.5 | 0.161 | 4.10 | 0.220 | 5.60 | 0.30 | 7.5 | 0.03 | 0.8 |
| 0800NR10-5 | 5 | 0.531 | 13.5 | 0.709 | 18.0 | 0.374 | 9.5 | 0.169 | 4.30 | 0.228 | 5.80 | 0.30 | 7.5 | 0.03 | 0.8 |
| 0850NR10-5 | 5 | 0.531 | 13.5 | 0.709 | 18.0 | 0.394 | 10.0 | 0.177 | 4.50 | 0.236 | 6.00 | 0.30 | 7.5 | 0.03 | 0.8 |
| 1000NR10-5 | 5 | 0.531 | 13.5 | 0.709 | 18.0 | 0.413 | 10.5 | 0.209 | 5.30 | 0.268 | 6.80 | 0.30 | 7.5 | 0.03 | 0.8 |

*S DIMENSION TOLERANCE ± (1.0MM) 0.04 INCH
(REFER TO PAGE 10 OF MNR VARISTOR BROCHURE FOR OTHER DATA)



Stetron International Inc.