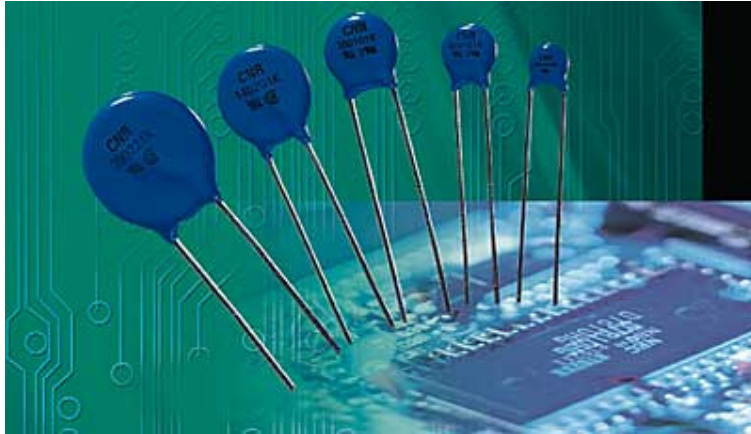


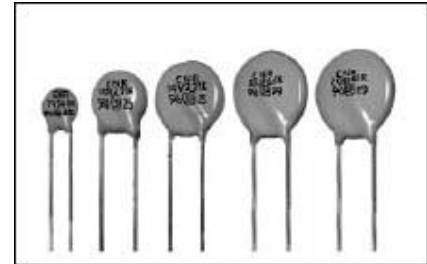


**Metal Oxide Varistors**  
**Transient/Surge Absorbers**



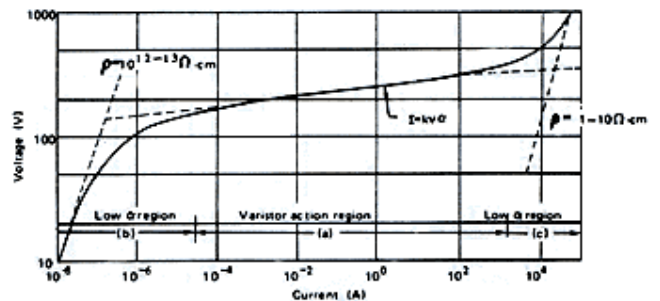
### CeNtRa Varistor

Varistor are voltage dependent, nonlinear device which have an electrical behavior similar to back-to-back zender diodes. CNR series zinc oxide varistor are nonlinear resistors, consisting main of zinc oxide and several kinds of metal oxide additive. They are bilateral and symmetrical V-I characteristics curve and unparalleled large peak current capability are used for absorption of transient voltage, suppression of pulse noise and circuit voltage stabilization.



### Features

- Fast response
- Excellent voltage ratio
- High stabilization for circuit voltage
- Unparalleled absorption for transient voltage characteristics
- Bilateral and symmetrical V-I characteristics curve



Typical Varistor V - I Curve

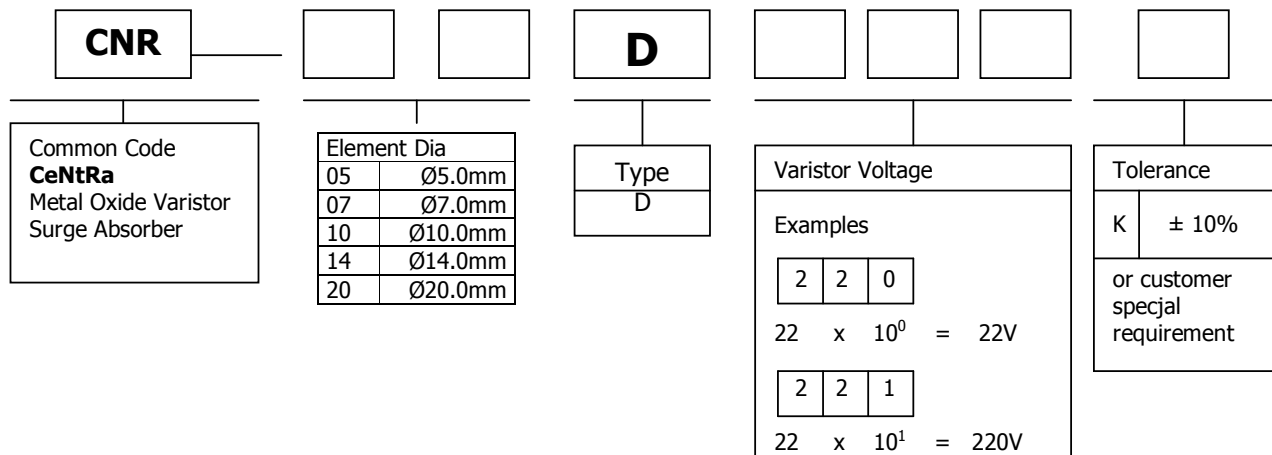
### Applications

- Surge Protection in consumer electronics
  - industrial electronics
  - telephone and telecommunication systems
  - automobile equipments
  - measuring and controller systems
  - electronic home appliances
- Absorption of switching surge form various kinds of relays and electro-magnetic valves.
- Electrostatic discharge an spike noise suppression.
- Protection of various kinds of transistors, diodes, ICs, thyristors, triac semiconductors, and etc.

### Related Standards

- UL1414, UL1449, (2<sup>nd</sup> Edition), CSA, VDE

### Explanation of Part Numbers

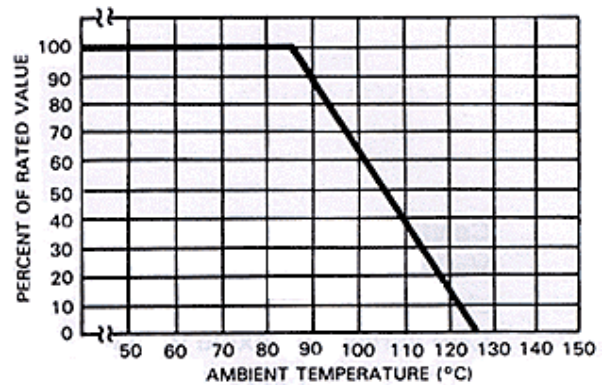




## Transient/Surge Absorbers Transient Voltage Surge Suppressors

### Specifications

- Varistor Voltage Range .....18 TO 1800Vdc
- Peak Current For 8/20  $\mu$ s Current Wave.....100 TO 6500A
- Energy Range For 10/1000  $\mu$ s Current Wave..... 0.4 TO 625 Joule
- Storage Temperature Range .....-40 TO +125°C
- Operation Ambient Temperature Range .....- 40 TO 85°C
- Typical Response Time .....< 25ns
- Insulation Resistance .....>1000M $\Omega$



Current, Energy and Power Derating Curve

### Device Ratings and Characteristics

| Part No.       | Maximum Allowable Voltage |    | Varistor Voltage (@1mA) |    |      | Clamping Voltage @ Test Current (8/20μs) |     | Maximum Energy 10/1000μs | Maximum Peak Current (8/20μs) | Rated Power | Typical Capacitance (@1KHz) | Standards |
|----------------|---------------------------|----|-------------------------|----|------|------------------------------------------|-----|--------------------------|-------------------------------|-------------|-----------------------------|-----------|
| Device Marking |                           |    |                         |    |      |                                          |     |                          |                               |             |                             |           |
| CNR-05D180K    | 11                        | 14 | 14.4                    | 18 | 21.6 | 44                                       | 1   | 0.4                      | 100                           | 0.01        | 1600                        | ☆         |
| CNR-07D180K    |                           |    |                         |    |      | 42                                       | 2.5 | 0.9                      | 250                           | 0.02        | 3800                        | ☆         |
| CNR-10D180K    |                           |    |                         |    |      | 39                                       | 5   | 2.1                      | 500                           | 0.05        | 16000                       | ☆         |
| CNR-14D180K    |                           |    |                         |    |      | 39                                       | 10  | 4.0                      | 1000                          | 0.10        | 25000                       | ☆         |
| CNR-20D180K    |                           |    |                         |    |      | 39                                       | 20  | 11.0                     | 2000                          | 0.20        | 40000                       | ☆         |
|                |                           |    |                         |    |      |                                          |     |                          |                               |             |                             |           |
| CNR-05D220K    | 14                        | 18 | 18.7                    | 22 | 26.0 | 51                                       | 1   | 0.5                      | 100                           | 0.01        | 1500                        | ☆         |
| CNR-07D220K    |                           |    |                         |    |      | 47                                       | 2.5 | 1.1                      | 250                           | 0.02        | 3600                        | ☆         |
| CNR-10D220K    |                           |    |                         |    |      | 43                                       | 5   | 2.5                      | 500                           | 0.05        | 11000                       | ☆         |
| CNR-14D220K    |                           |    |                         |    |      | 43                                       | 10  | 5.0                      | 1000                          | 0.10        | 20000                       | ☆         |
| CNR-20D220K    |                           |    |                         |    |      | 43                                       | 20  | 14.0                     | 2000                          | 0.20        | 30000                       | ☆         |
|                |                           |    |                         |    |      |                                          |     |                          |                               |             |                             |           |
| CNR-05D270K    | 17                        | 22 | 23.0                    | 27 | 31.1 | 60                                       | 1   | 0.6                      | 100                           | 0.01        | 1450                        | ☆         |
| CNR-07D270K    |                           |    |                         |    |      | 53                                       | 2.5 | 1.4                      | 250                           | 0.02        | 3400                        | ☆         |
| CNR-10D270K    |                           |    |                         |    |      | 53                                       | 5   | 3.0                      | 500                           | 0.05        | 8000                        | ☆         |
| CNR-14D270K    |                           |    |                         |    |      | 53                                       | 10  | 6.0                      | 1000                          | 0.10        | 16000                       | ☆         |
| CNR-20D270K    |                           |    |                         |    |      | 53                                       | 20  | 18.0                     | 2000                          | 0.20        | 24500                       | ☆         |
|                |                           |    |                         |    |      |                                          |     |                          |                               |             |                             |           |
| CNR-05D330K    | 20                        | 26 | 29.5                    | 33 | 36.5 | 73                                       | 1   | 0.8                      | 100                           | 0.01        | 1400                        | ☆         |
| CNR-07D330K    |                           |    |                         |    |      | 65                                       | 2.5 | 1.7                      | 250                           | 0.02        | 2900                        | ☆         |
| CNR-10D330K    |                           |    |                         |    |      | 65                                       | 5   | 4.0                      | 500                           | 0.05        | 6300                        | ☆         |
| CNR-14D330K    |                           |    |                         |    |      | 65                                       | 10  | 7.5                      | 1000                          | 0.10        | 12200                       | ☆         |
| CNR-20D330K    |                           |    |                         |    |      | 65                                       | 20  | 23.0                     | 2000                          | 0.20        | 20000                       | ☆         |
|                |                           |    |                         |    |      |                                          |     |                          |                               |             |                             |           |
| CNR-05D390K    | 25                        | 31 | 35                      | 39 | 46   | 86                                       | 1   | 0.9                      | 100                           | 0.01        | 700                         | ☆         |
| CNR-07D390K    |                           |    |                         |    | 43   | 77                                       | 2.5 | 2.1                      | 250                           | 0.02        | 1600                        | ☆         |
| CNR-10D390K    |                           |    |                         |    | 43   | 77                                       | 5   | 4.6                      | 500                           | 0.05        | 5200                        | ☆         |
| CNR-14D390K    |                           |    |                         |    | 43   | 77                                       | 10  | 8.6                      | 1000                          | 0.10        | 7000                        | ☆         |
| CNR-20D390K    |                           |    |                         |    | 43   | 77                                       | 20  | 26.0                     | 2000                          | 0.20        | 13800                       | ☆         |
|                |                           |    |                         |    |      |                                          |     |                          |                               |             |                             |           |
| CNR-05D470K    | 30                        | 38 | 42                      | 47 | 55   | 104                                      | 1   | 1.1                      | 100                           | 0.01        | 650                         | ☆         |
| CNR-07D470K    |                           |    |                         |    | 52   | 93                                       | 2.5 | 2.5                      | 250                           | 0.02        | 1550                        | ☆         |
| CNR-10D470K    |                           |    |                         |    | 52   | 93                                       | 5   | 5.5                      | 500                           | 0.05        | 4600                        | ☆         |
| CNR-14D470K    |                           |    |                         |    | 52   | 93                                       | 10  | 10.0                     | 1000                          | 0.10        | 6750                        | ☆         |
| CNR-20D470K    |                           |    |                         |    | 52   | 93                                       | 20  | 33.0                     | 2000                          | 0.20        | 13500                       | ☆         |

Note: 1. O5D series Varistor voltage test current by Dc 0.1 mA



# **Transient/Surge Absorbers** **Transient Voltage Surge Suppressors**

## **Device Ratings and Characteristics**

| Part No.       | Maximum Allowable Voltage |       | Varistor Voltage (@1mA) |         |      | Clamping Voltage @ Test Current (8/20μs) |       | Maximum Energy 10/1000μs | Maximum Peak Current (8/20μs) | Rated Power | Typical Capacitance (@1KHz) | Standards |
|----------------|---------------------------|-------|-------------------------|---------|------|------------------------------------------|-------|--------------------------|-------------------------------|-------------|-----------------------------|-----------|
| Device Marking | ACrms(V)                  | DC(V) | Min.                    | Vb(Vdc) | Max. | Vc(V)                                    | Ip(A) | (J)                      | (A)                           | (W)         | (pF)                        |           |
| CNR-05D560K    | 35                        | 45    | 50                      | 56      | 66   | 123                                      | 1     | 1.3                      | 100                           | 0.01        | 600                         | ☆         |
| CNR-07D560K    |                           |       |                         |         | 62   | 110                                      | 2.5   | 3.1                      | 250                           | 0.02        | 1500                        | ☆         |
| CNR-10D560K    |                           |       |                         |         | 62   | 110                                      | 5     | 7.0                      | 500                           | 0.05        | 3750                        | ☆         |
| CNR-14D560K    |                           |       |                         |         | 62   | 110                                      | 10    | 11.0                     | 1000                          | 0.10        | 6500                        | ☆         |
| CNR-20D560K    |                           |       |                         |         | 62   | 110                                      | 20    | 41.0                     | 2000                          | 0.20        | 12200                       | ☆         |
| CNR-05D680K    | 40                        | 56    | 61                      | 68      | 80   | 150                                      | 1     | 1.6                      | 100                           | 0.01        | 580                         | ☆         |
| CNR-07D680K    |                           |       |                         |         | 75   | 135                                      | 2.5   | 3.6                      | 250                           | 0.02        | 1200                        | ☆         |
| CNR-10D680K    |                           |       |                         |         | 75   | 135                                      | 5     | 8.2                      | 500                           | 0.05        | 2800                        | ☆         |
| CNR-14D680K    |                           |       |                         |         | 75   | 135                                      | 10    | 14.0                     | 1000                          | 0.10        | 5500                        | ☆         |
| CNR-20D680K    |                           |       |                         |         | 75   | 135                                      | 20    | 46.0                     | 2000                          | 0.20        | 11500                       | ☆         |
| CNR-05D820K    | 50                        | 65    | 74                      | 82      | 90   | 145                                      | 5     | 2.5                      | 400                           | 0.10        | 310                         | ☆ ◎       |
| CNR-07D820K    |                           |       |                         |         |      | 135                                      | 10    | 5.5                      | 1200                          | 0.25        | 860                         | ☆ ◎       |
| CNR-10D820K    |                           |       |                         |         |      | 135                                      | 25    | 12.0                     | 2500                          | 0.40        | 1920                        | ☆ ◎       |
| CNR-14D820K    |                           |       |                         |         |      | 135                                      | 50    | 22.0                     | 4500                          | 0.60        | 4300                        | ☆ ◎       |
| CNR-20D820K    |                           |       |                         |         |      | 135                                      | 100   | 38.0                     | 6500                          | 1.0         | 8200                        | ☆ ◎       |
| CNR-05D101K    | 60                        | 85    | 90                      | 100     | 110  | 175                                      | 5     | 3.0                      | 400                           | 0.10        | 290                         | ☆ ◎       |
| CNR-07D101K    |                           |       |                         |         |      | 165                                      | 10    | 6.5                      | 1200                          | 0.25        | 750                         | ☆ ◎       |
| CNR-10D101K    |                           |       |                         |         |      | 165                                      | 25    | 15.0                     | 2500                          | 0.40        | 1800                        | ☆ ◎       |
| CNR-14D101K    |                           |       |                         |         |      | 165                                      | 50    | 28.0                     | 4500                          | 0.60        | 3500                        | ☆ ◎       |
| CNR-20D101K    |                           |       |                         |         |      | 165                                      | 100   | 45.0                     | 6500                          | 1.0         | 8000                        | ☆ ◎       |
| CNR-05D121K    | 75                        | 100   | 108                     | 120     | 132  | 210                                      | 5     | 4.0                      | 400                           | 0.10        | 270                         | ☆ ◎       |
| CNR-07D121K    |                           |       |                         |         |      | 200                                      | 10    | 7.8                      | 1200                          | 0.25        | 530                         | ☆ ◎       |
| CNR-10D121K    |                           |       |                         |         |      | 200                                      | 25    | 18.0                     | 2500                          | 0.40        | 1500                        | ☆ ◎       |
| CNR-14D121K    |                           |       |                         |         |      | 200                                      | 50    | 32.0                     | 4500                          | 0.60        | 2500                        | ☆ ◎       |
| CNR-20D121K    |                           |       |                         |         |      | 200                                      | 100   | 55.0                     | 6500                          | 1.0         | 5500                        | ☆ ◎       |
| CNR-05D151K    | 95                        | 125   | 135                     | 150     | 165  | 260                                      | 5     | 4.8                      | 400                           | 0.10        | 240                         | ☆ ◎       |
| CNR-07D151K    |                           |       |                         |         |      | 250                                      | 10    | 9.7                      | 1200                          | 0.25        | 410                         | ☆ ◎       |
| CNR-10D151K    |                           |       |                         |         |      | 250                                      | 25    | 22.0                     | 2500                          | 0.40        | 1200                        | ☆ ◎       |
| CNR-14D151K    |                           |       |                         |         |      | 250                                      | 50    | 40.0                     | 4500                          | 0.60        | 2100                        | ☆ ◎       |
| CNR-20D151K    |                           |       |                         |         |      | 250                                      | 100   | 70.0                     | 6500                          | 1.0         | 4200                        | ☆ ◎       |
| CNR-05D181K    | 115                       | 150   | 162                     | 180     | 198  | 325                                      | 5     | 5.9                      | 400                           | 0.10        | 140                         | ☆ ◎       |
| CNR-07D181K    |                           |       |                         |         |      | 300                                      | 10    | 11.7                     | 1200                          | 0.25        | 300                         | ☆ ◎       |
| CNR-10D181K    |                           |       |                         |         |      | 300                                      | 25    | 27.0                     | 2500                          | 0.40        | 620                         | ☆ ◎       |
| CNR-14D181K    |                           |       |                         |         |      | 300                                      | 50    | 50.0                     | 4500                          | 0.60        | 1250                        | ☆ ◎       |
| CNR-20D181K    |                           |       |                         |         |      | 300                                      | 100   | 85.0                     | 6500                          | 1.0         | 2500                        | ☆ ◎       |
| CNR-05D201K    | 130                       | 170   | 185                     | 200     | 225  | 355                                      | 5     | 6.5                      | 400                           | 0.10        | 120                         | Δ ☆ ※ ◎   |
| CNR-07D201K    |                           |       |                         |         |      | 340                                      | 10    | 13.0                     | 1200                          | 0.25        | 250                         | Δ ☆ ※ ◎   |
| CNR-10D201K    |                           |       |                         |         |      | 340                                      | 25    | 30.0                     | 2500                          | 0.40        | 570                         | Δ ☆ ※ ◎   |
| CNR-14D201K    |                           |       |                         |         |      | 340                                      | 50    | 57.0                     | 4500                          | 0.60        | 1150                        | Δ ☆ ※ ◎   |
| CNR-20D201K    |                           |       |                         |         |      | 340                                      | 100   | 95.0                     | 6500                          | 1.0         | 2300                        | Δ ☆ ※ ◎   |

Note: 1. OSD series Varistor voltage test current by Dc 0.1 mA



**Device Ratings and Characteristics**

| Part No.       | Maximum Allowable Voltage |       | Varistor Voltage (@1mA) |         |      | Clamping Voltage @ Test Current (8/20 $\mu$ s) |       | Maximum Energy 10/1000 $\mu$ s | Maximum Peak Current (8/20 $\mu$ s) | Rated Power | Typical Capacitance (@1KHz) | Standards      |
|----------------|---------------------------|-------|-------------------------|---------|------|------------------------------------------------|-------|--------------------------------|-------------------------------------|-------------|-----------------------------|----------------|
| Device Marking |                           |       |                         |         |      |                                                |       |                                |                                     |             |                             |                |
|                | ACrms(V)                  | DC(V) | Min.                    | Vb(Vdc) | Max. | Vc(V)                                          | Ip(A) | (J)                            | (A)                                 | (W)         | (pF)                        |                |
| CNR-05D221K    | 140                       | 180   | 198                     | 220     | 242  | 380                                            | 5     | 7.0                            | 400                                 | 0.10        | 110                         | $\Delta$ ☆ ※ ◎ |
| CNR-07D221K    |                           |       |                         |         |      | 360                                            | 10    | 14.0                           | 1200                                | 0.25        | 250                         | $\Delta$ ☆ ※ ◎ |
| CNR-10D221K    |                           |       |                         |         |      | 360                                            | 25    | 32.0                           | 2500                                | 0.40        | 560                         | $\Delta$ ☆ ※ ◎ |
| CNR-14D221K    |                           |       |                         |         |      | 360                                            | 50    | 60.0                           | 4500                                | 0.60        | 1100                        | $\Delta$ ☆ ※ ◎ |
| CNR-20D221K    |                           |       |                         |         |      | 360                                            | 100   | 100.0                          | 6500                                | 1.0         | 2200                        | $\Delta$ ☆ ※ ◎ |
| CNR-05D241K    | 150                       | 200   | 216                     | 240     | 264  | 415                                            | 5     | 8.0                            | 400                                 | 0.10        | 110                         | $\Delta$ ☆ ※ ◎ |
| CNR-07D241K    |                           |       |                         |         |      | 395                                            | 10    | 15.0                           | 1200                                | 0.25        | 240                         | $\Delta$ ☆ ※ ◎ |
| CNR-10D241K    |                           |       |                         |         |      | 395                                            | 25    | 35.0                           | 2500                                | 0.40        | 550                         | $\Delta$ ☆ ※ ◎ |
| CNR-14D241K    |                           |       |                         |         |      | 395                                            | 50    | 63.0                           | 4500                                | 0.60        | 1050                        | $\Delta$ ☆ ※ ◎ |
| CNR-20D241K    |                           |       |                         |         |      | 395                                            | 100   | 108.0                          | 6500                                | 1.0         | 2200                        | $\Delta$ ☆ ※ ◎ |
| CNR-05D271K    | 175                       | 225   | 247                     | 270     | 303  | 475                                            | 5     | 8.5                            | 400                                 | 0.10        | 100                         | $\Delta$ ☆ ※ ◎ |
| CNR-07D271K    |                           |       |                         |         |      | 455                                            | 10    | 18.0                           | 1200                                | 0.25        | 220                         | $\Delta$ ☆ ※ ◎ |
| CNR-10D271K    |                           |       |                         |         |      | 455                                            | 25    | 40.0                           | 2500                                | 0.40        | 530                         | $\Delta$ ☆ ※ ◎ |
| CNR-14D271K    |                           |       |                         |         |      | 455                                            | 50    | 70.0                           | 4500                                | 0.60        | 1000                        | $\Delta$ ☆ ※ ◎ |
| CNR-20D271K    |                           |       |                         |         |      | 455                                            | 100   | 127.0                          | 6500                                | 1.0         | 2100                        | $\Delta$ ☆ ※ ◎ |
| CNR-05D301K    | 195                       | 250   | 270                     | 300     | 330  | 505                                            | 5     | 9.0                            | 400                                 | 0.10        | 100                         | $\Delta$ ☆ ※ ◎ |
| CNR-07D301K    |                           |       |                         |         |      | 500                                            | 10    | 20.0                           | 1200                                | 0.25        | 190                         | $\Delta$ ☆ ※ ◎ |
| CNR-10D301K    |                           |       |                         |         |      | 500                                            | 25    | 42.0                           | 2500                                | 0.40        | 500                         | $\Delta$ ☆ ※ ◎ |
| CNR-14D301K    |                           |       |                         |         |      | 500                                            | 50    | 73.0                           | 4500                                | 0.60        | 900                         | $\Delta$ ☆ ※ ◎ |
| CNR-20D301K    |                           |       |                         |         |      | 500                                            | 100   | 150.0                          | 6500                                | 1.0         | 1800                        | $\Delta$ ☆ ※ ◎ |
| CNR-05D331K    | 210                       | 275   | 297                     | 330     | 363  | 600                                            | 5     | 10.0                           | 400                                 | 0.10        | 90                          | $\Delta$ ☆ ※ ◎ |
| CNR-07D331K    |                           |       |                         |         |      | 550                                            | 10    | 25.0                           | 1200                                | 0.25        | 180                         | $\Delta$ ☆ ※ ◎ |
| CNR-10D331K    |                           |       |                         |         |      | 550                                            | 25    | 47.0                           | 2500                                | 0.40        | 450                         | $\Delta$ ☆ ※ ◎ |
| CNR-14D331K    |                           |       |                         |         |      | 550                                            | 50    | 93.0                           | 4500                                | 0.60        | 850                         | $\Delta$ ☆ ※ ◎ |
| CNR-20D331K    |                           |       |                         |         |      | 550                                            | 100   | 163.0                          | 6500                                | 1.0         | 1750                        | $\Delta$ ☆ ※ ◎ |
| CNR-05D361K    | 230                       | 230   | 324                     | 360     | 396  | 320                                            | 5     | 10.0                           | 400                                 | 0.10        | 80                          | $\Delta$ ☆ ※ ◎ |
| CNR-07D361K    |                           |       |                         |         |      | 595                                            | 10    | 25.0                           | 1200                                | 0.25        | 170                         | $\Delta$ ☆ ※ ◎ |
| CNR-10D361K    |                           |       |                         |         |      | 595                                            | 25    | 47.0                           | 2500                                | 0.40        | 450                         | $\Delta$ ☆ ※ ◎ |
| CNR-14D361K    |                           |       |                         |         |      | 595                                            | 50    | 93.0                           | 4500                                | 0.60        | 800                         | $\Delta$ ☆ ※ ◎ |
| CNR-20D361K    |                           |       |                         |         |      | 595                                            | 100   | 163.0                          | 6500                                | 1.0         | 1700                        | $\Delta$ ☆ ※ ◎ |
| CNR-05D391K    | 250                       | 320   | 351                     | 390     | 429  | 675                                            | 5     | 12.0                           | 400                                 | 0.10        | 80                          | $\Delta$ ☆ ※ ◎ |
| CNR-07D391K    |                           |       |                         |         |      | 650                                            | 10    | 25.0                           | 1200                                | 0.25        | 160                         | $\Delta$ ☆ ※ ◎ |
| CNR-10D391K    |                           |       |                         |         |      | 650                                            | 25    | 60.0                           | 2500                                | 0.40        | 430                         | $\Delta$ ☆ ※ ◎ |
| CNR-14D391K    |                           |       |                         |         |      | 650                                            | 50    | 100.0                          | 4500                                | 0.60        | 800                         | $\Delta$ ☆ ※ ◎ |
| CNR-20D391K    |                           |       |                         |         |      | 650                                            | 100   | 180.0                          | 6500                                | 1.0         | 1400                        | $\Delta$ ☆ ※ ◎ |
| CNR-05D431K    | 275                       | 350   | 387                     | 430     | 473  | 745                                            | 5     | 13.0                           | 400                                 | 0.10        | 70                          | $\Delta$ ☆ ※ ◎ |
| CNR-07D431K    |                           |       |                         |         |      | 710                                            | 10    | 28.0                           | 1200                                | 0.25        | 150                         | $\Delta$ ☆ ※ ◎ |
| CNR-10D431K    |                           |       |                         |         |      | 710                                            | 25    | 65.0                           | 2500                                | 0.40        | 400                         | $\Delta$ ☆ ※ ◎ |
| CNR-14D431K    |                           |       |                         |         |      | 710                                            | 50    | 115.0                          | 4500                                | 0.60        | 650                         | $\Delta$ ☆ ※ ◎ |
| CNR-20D431K    |                           |       |                         |         |      | 710                                            | 100   | 190.0                          | 6500                                | 1.0         | 1350                        | $\Delta$ ☆ ※ ◎ |

Note: 1. O5D series Varistor voltage test current by Dc 0.1 mA



**Transient/Surge Absorbers**  
**Transient Voltage Surge Suppressors**

**Device Ratings and Characteristics**

| Part No.       | Maximum Allowable Voltage |       | Varistor Voltage (@1mA) |         |      | Clamping Voltage @ Test Current (8/20 $\mu$ s) |       | Maximum Energy 10/1000 $\mu$ s | Maximum Peak Current (8/20 $\mu$ s) | Rated Power | Typical Capacitance (@1KHz) | Standards      |
|----------------|---------------------------|-------|-------------------------|---------|------|------------------------------------------------|-------|--------------------------------|-------------------------------------|-------------|-----------------------------|----------------|
| Device Marking |                           |       |                         |         |      |                                                |       |                                |                                     |             |                             |                |
|                | ACrms(V)                  | DC(V) | Min.                    | Vb(Vdc) | Max. | Vc(V)                                          | Ip(A) | (J)                            | (A)                                 | (W)         | (pF)                        |                |
| CNR-05D471K    | 300                       | 385   | 423                     | 470     | 517  | 810                                            | 5     | 15.0                           | 400                                 | 0.10        | 70                          | $\Delta$ ☆ ※ ◎ |
| CNR-07D471K    |                           |       |                         |         |      | 775                                            | 10    | 30.0                           | 1200                                | 0.25        | 130                         | $\Delta$ ☆ ※ ◎ |
| CNR-10D471K    |                           |       |                         |         |      | 775                                            | 25    | 70.0                           | 2500                                | 0.40        | 300                         | $\Delta$ ☆ ※ ◎ |
| CNR-14D471K    |                           |       |                         |         |      | 775                                            | 50    | 125.0                          | 4500                                | 0.60        | 550                         | $\Delta$ ☆ ※ ◎ |
| CNR-20D471K    |                           |       |                         |         |      | 775                                            | 100   | 220.0                          | 6500                                | 1.0         | 1200                        | $\Delta$ ☆ ※ ◎ |
| CNR-05D511K    | 320                       | 410   | 459                     | 510     | 561  | 880                                            | 5     | 15.0                           | 400                                 | 0.10        | 65                          | $\Delta$ ☆ ※ ◎ |
| CNR-07D511K    |                           |       |                         |         |      | 845                                            | 10    | 30.0                           | 1200                                | 0.25        | 120                         | $\Delta$ ☆ ※ ◎ |
| CNR-10D511K    |                           |       |                         |         |      | 845                                            | 25    | 70.0                           | 2500                                | 0.40        | 260                         | $\Delta$ ☆ ※ ◎ |
| CNR-14D511K    |                           |       |                         |         |      | 845                                            | 50    | 125.0                          | 4500                                | 0.60        | 450                         | $\Delta$ ☆ ※ ◎ |
| CNR-20D511K    |                           |       |                         |         |      | 845                                            | 100   | 220.0                          | 6500                                | 1.0         | 1050                        | $\Delta$ ☆ ※ ◎ |
| CNR-05D561K    | 350                       | 460   | 504                     | 560     | 616  | 940                                            | 5     | 15.0                           | 400                                 | 0.10        | 65                          | $\Delta$ ☆ ※ ◎ |
| CNR-07D561K    |                           |       |                         |         |      | 915                                            | 10    | 30.0                           | 1200                                | 0.25        | 120                         | $\Delta$ ☆ ※ ◎ |
| CNR-10D561K    |                           |       |                         |         |      | 915                                            | 25    | 70.0                           | 2500                                | 0.40        | 200                         | $\Delta$ ☆ ※ ◎ |
| CNR-14D561K    |                           |       |                         |         |      | 915                                            | 50    | 125.0                          | 4500                                | 0.60        | 400                         | $\Delta$ ☆ ※ ◎ |
| CNR-20D561K    |                           |       |                         |         |      | 915                                            | 100   | 220.0                          | 6500                                | 1.0         | 850                         | $\Delta$ ☆ ※ ◎ |
| CNR-05D621K    | 385                       | 505   | 558                     | 620     | 682  | 1050                                           | 5     | 15.0                           | 400                                 | 0.10        | 65                          | $\Delta$ ☆ ※ ◎ |
| CNR-07D621K    |                           |       |                         |         |      | 1025                                           | 10    | 30.0                           | 1200                                | 0.25        | 120                         | $\Delta$ ☆ ※ ◎ |
| CNR-10D621K    |                           |       |                         |         |      | 1025                                           | 25    | 70.0                           | 2500                                | 0.40        | 170                         | $\Delta$ ☆ ※ ◎ |
| CNR-14D621K    |                           |       |                         |         |      | 1025                                           | 50    | 125.0                          | 4500                                | 0.60        | 350                         | $\Delta$ ☆ ※ ◎ |
| CNR-20D621K    |                           |       |                         |         |      | 1025                                           | 100   | 220.0                          | 6500                                | 1.0         | 570                         | $\Delta$ ☆ ※ ◎ |
| CNR-05D681K    | 420                       | 560   | 612                     | 680     | 748  | 1150                                           | 5     | 15.0                           | 400                                 | 0.10        | 60                          | ※ ◎            |
| CNR-07D681K    |                           |       |                         |         |      | 1120                                           | 10    | 30.0                           | 1200                                | 0.25        | 110                         | $\Delta$ ☆ ※ ◎ |
| CNR-10D681K    |                           |       |                         |         |      | 1120                                           | 25    | 70.0                           | 2500                                | 0.40        | 160                         | $\Delta$ ☆ ※ ◎ |
| CNR-14D681K    |                           |       |                         |         |      | 1120                                           | 50    | 130.0                          | 4500                                | 0.60        | 350                         | $\Delta$ ☆ ※ ◎ |
| CNR-20D681K    |                           |       |                         |         |      | 1120                                           | 100   | 230.0                          | 6500                                | 1.0         | 550                         | $\Delta$ ☆ ※ ◎ |
| CNR-05D751K    | 460                       | 615   | 675                     | 750     | 825  | 1290                                           | 5     | 15.0                           | 400                                 | 0.10        | 60                          | ※ ◎            |
| CNR-07D751K    |                           |       |                         |         |      | 1240                                           | 10    | 33.0                           | 1200                                | 0.25        | 100                         | $\Delta$ ☆ ※ ◎ |
| CNR-10D751K    |                           |       |                         |         |      | 1240                                           | 25    | 75.0                           | 2500                                | 0.40        | 150                         | $\Delta$ ☆ ※ ◎ |
| CNR-14D751K    |                           |       |                         |         |      | 1240                                           | 50    | 143.0                          | 4500                                | 0.60        | 330                         | $\Delta$ ☆ ※ ◎ |
| CNR-20D751K    |                           |       |                         |         |      | 1240                                           | 100   | 255.0                          | 6500                                | 1.0         | 530                         | $\Delta$ ☆ ※ ◎ |
| CNR-07D781K    | 485                       | 640   | 702                     | 780     | 858  | 1290                                           | 10    | 37.0                           | 1200                                | 0.25        | 90                          | $\Delta$ ☆ ※ ◎ |
| CNR-10D781K    |                           |       |                         |         |      | 1290                                           | 25    | 80.0                           | 2500                                | 0.40        | 150                         | $\Delta$ ☆ ※ ◎ |
| CNR-14D781K    |                           |       |                         |         |      | 1290                                           | 50    | 148.0                          | 4500                                | 0.60        | 330                         | $\Delta$ ☆ ※ ◎ |
| CNR-20D781K    |                           |       |                         |         |      | 1290                                           | 100   | 265.0                          | 6500                                | 1.0         | 500                         | $\Delta$ ☆ ※ ◎ |
| CNR-07D821K    | 510                       | 670   | 738                     | 820     | 902  | 1355                                           | 10    | 40.0                           | 1200                                | 0.25        | 90                          | $\Delta$ ☆ ※ ◎ |
| CNR-10D821K    |                           |       |                         |         |      | 1355                                           | 25    | 85.0                           | 2500                                | 0.40        | 150                         | $\Delta$ ☆ ※ ◎ |
| CNR-14D821K    |                           |       |                         |         |      | 1355                                           | 50    | 157.0                          | 4500                                | 0.60        | 330                         | $\Delta$ ☆ ※ ◎ |
| CNR-20D821K    |                           |       |                         |         |      | 1355                                           | 100   | 282.0                          | 6500                                | 1.0         | 500                         | $\Delta$ ☆ ※ ◎ |
| CNR-10D911K    | 550                       | 745   | 819                     | 910     | 1001 | 1500                                           | 25    | 93.0                           | 2500                                | 0.40        | 140                         | $\Delta$ ☆ ※ ◎ |
| CNR-14D911K    |                           |       |                         |         |      | 1500                                           | 50    | 175.0                          | 4500                                | 0.60        | 300                         | $\Delta$ ☆ ※ ◎ |
| CNR-20D911K    |                           |       |                         |         |      | 1500                                           | 100   | 310.0                          | 6500                                | 1.0         | 480                         | $\Delta$ ☆ ※ ◎ |

Note: 1. O5D series Varistor voltage test current by Dc 0.1 mA



### Device Ratings and Characteristics

| Part No.       | Maximum Allowable Voltage |       | Varistor Voltage (@1mA) |         |      | Clamping Voltage @ Test Current (8/20μs) |       | Maximum Energy 10/1000μs | Maximum Peak Current (8/20μs) | Rated Power | Typical Capacitance (@1KHz) | Standards |
|----------------|---------------------------|-------|-------------------------|---------|------|------------------------------------------|-------|--------------------------|-------------------------------|-------------|-----------------------------|-----------|
| Device Marking |                           |       |                         |         |      |                                          |       |                          |                               |             |                             |           |
|                | ACrms(V)                  | DC(V) | Min.                    | Vb(Vdc) | Max. | Vc(V)                                    | Ip(A) | (J)                      | (A)                           | (W)         | (pF)                        |           |
| CNR-10D102K    | 625                       | 825   | 900                     | 1000    | 1100 | 1650                                     | 25    | 102.0                    | 2500                          | 0.40        | 140                         | Δ ☆ ※ ◎   |
| CNR-14D102K    |                           |       |                         |         |      | 1650                                     | 50    | 190.0                    | 4500                          | 0.60        | 300                         | Δ ☆ ※ ◎   |
| CNR-20D102K    |                           |       |                         |         |      | 1650                                     | 100   | 342.0                    | 6500                          | 1.0         | 460                         | Δ ☆ ※ ◎   |
| CNR-10D112K    | 680                       | 895   | 990                     | 1100    | 1210 | 1815                                     | 25    | 115.0                    | 2500                          | 0.40        | 130                         | ※ ◎       |
| CNR-14D112K    |                           |       |                         |         |      | 1815                                     | 50    | 213.0                    | 4500                          | 0.60        | 200                         | ※ ◎       |
| CNR-20D112K    |                           |       |                         |         |      | 1815                                     | 100   | 383.0                    | 6500                          | 1.0         | 400                         | ※ ◎       |
| CNR-14D182K    | 1000                      | 1465  | 1620                    | 1800    | 1980 | 2970                                     | 50    | 337.0                    | 4500                          | 0.60        | 150                         |           |
| CNR-20D182K    |                           |       |                         |         |      | 2970                                     | 100   | 625.0                    | 6500                          | 1.0         | 250                         |           |

Note: 1. O5D series Varistor voltage test current by Dc 0.1 mA

### Application Notes for UL Recognized Components

#### Related Standards

| Standard No. | UL 1414                    | UL 1449(2nd Edition)                | CSA                                           | VDE                                       |
|--------------|----------------------------|-------------------------------------|-----------------------------------------------|-------------------------------------------|
| Title        | Across-The-Line Components | Transient Voltage Surge Suppressors | Accessories and Parts for Electronic Products | Varistors for use in Electronic equipment |
| File No.     | E165143                    | E150709                             | LR109736-1                                    | 21557-4790-001                            |
| Symbols      | △                          | ☆                                   | ※                                             | ◎                                         |

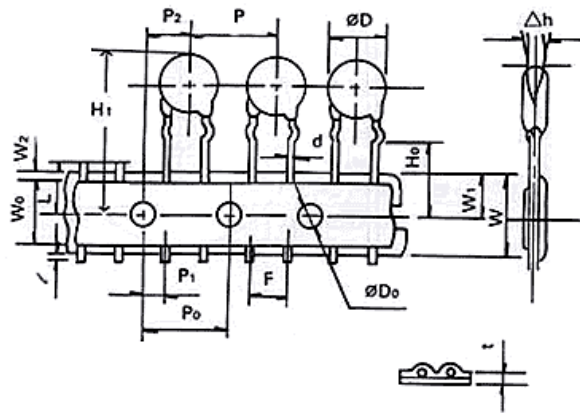
### Selection guide

1. Determine the necessary steady-state voltage (working voltage).
2. Establish the transient energy absorbed by the varistor.
3. Calculate the peak transient current through the varistor.
4. Determine power dissipation requirement.
5. Select a model to provide the required voltage-clamping characteristics.

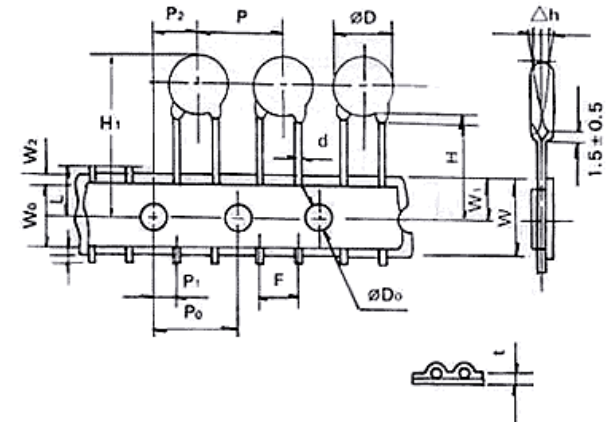


## Tape and Reel Specifications

### 1. Crimped Leads



### 2. Straight Leads



| Symbol         | PARAMETER                                 | Series               |                      |                      |                      |
|----------------|-------------------------------------------|----------------------|----------------------|----------------------|----------------------|
|                |                                           | 05D                  | 07D                  | 10D                  | 14D                  |
| P              | Pitch of Component                        | 12.7±1.0             | 12.7±1.0             | 12.7±1.0             | 25.4±1.0             |
| P <sub>0</sub> | Feed Hole Pitch                           | 12.7±0.2             | 12.7±0.2             | 12.7±0.2             | 12.7±0.2             |
| P <sub>1</sub> | Feed Hole Center to Lead                  | 3.85±0.7             | 3.85±0.7             | 2.6±0.7              | 2.6±0.7              |
| P <sub>2</sub> | Hole Center to Component Center           | 6.35±0.7             | 6.35±0.7             | 6.35±0.7             | 6.35±0.7             |
| F              | Lead to Lead Distance                     | 5.0±0.8              | 5.0±0.8              | 7.50±0.8             | 7.50±0.8             |
| Δh             | Component Alignment                       | 2.0 Max              | 2.0 Max              | 2.0 Max              | 2.0 Max              |
| W              | Tape Width                                | 18.0+1.0<br>18.0-0.5 | 18.0+1.0<br>18.0-0.5 | 18.0+1.0<br>18.0-0.5 | 18.0+1.0<br>18.0-0.5 |
| W <sub>0</sub> | Hold Down Tape Width                      | 16.0±0.3             | 16.0±0.3             | 16.0±0.3             | 16.0±0.3             |
| W <sub>1</sub> | Hole Position                             | 9.0+0.75<br>9.0-0.50 | 9.0+0.75<br>9.0-0.50 | 9.0+0.75<br>9.0-0.50 | 9.0+0.75<br>9.0-0.50 |
| W <sub>2</sub> | Hold Down Tape Position                   | 0.5 Max              | 0.5 Max              | 0.5 Max              | 0.5 Max              |
| H              | Height from Tape Center to Component Base | 18.0+2.0<br>18.0-0.0 | 18.0+2.0<br>18.0-0.0 | 18.0+2.0<br>18.0-0.0 | 18.0+2.0<br>18.0-0.0 |
| H <sub>0</sub> | Seating Plane Height                      | 16.0±0.5             | 16.0±0.5             | 16.0±0.5             | 16.0±0.5             |
| H <sub>1</sub> | Component Height                          | 29.0 Max             | 32.0 Max             | 36.0 Max             | 40.0 Max             |
| D <sub>0</sub> | Feed Hole Diameter                        | 4.0±0.2              | 4.0±0.2              | 4.0±0.2              | 4.0±0.2              |
| t              | Total Tape Thickness                      | 0.7±0.2              | 0.7±0.2              | 0.7±0.2              | 0.7±0.2              |
| L              | Length of Clipped Lead                    | 11.0 Max             | 11.0 Max             | 11.0 Max             | 11.0 Max             |

### Order Information of Taped Reel

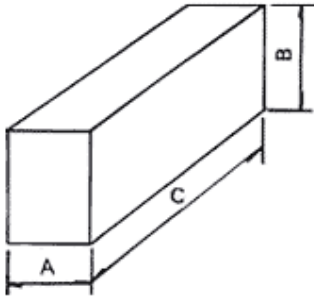
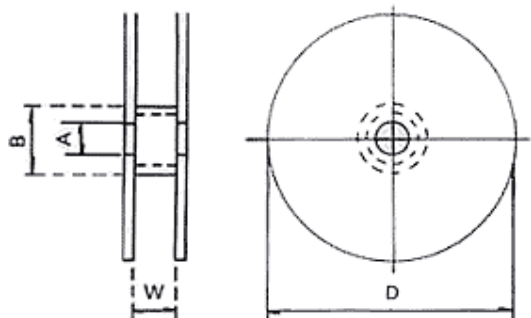
| Standard Products | Tape Reel Straight Lead | Tape Reel Crimped Lead | Min. Q'ty | Q'ty / Inner Box | Q'ty / Carton |
|-------------------|-------------------------|------------------------|-----------|------------------|---------------|
| CNR-05DXXXK       | CNR-05DXXXK-TRS         | CNR-05DXXXK-TRK        | 2000/1500 | 4000/3000        | 20000/15000   |
| CNR-07DXXXK       | CNR-07DXXXK-TRS         | CNR-07DXXXK-TRK        | 2000/1500 | 4000/3000        | 20000/15000   |
| CNR-10DXXXK       | CNR-10DXXXK-TRS         | CNR-10DXXXK-TRK        | 1500/1000 | 3000/2000        | 15000/10000   |
| CNR-14DXXXK       | CNR-14DXXXK-TRS         | CNR-14DXXXK-TRK        | 1000/800  | 2000/1600        | 8000/6400     |

#### Note:

- "2000/1500" Packing in CNR-XXD180K to CNR-XXD271K are 2000 pcs, CNR-XXD301K to CNR-XXD471K with 1500 pcs.
- Packing unit in pcs.



### Packaging Specifications

| Dimensions<br>are in mm | Flat box                                                                          |          |    |     | Reel                                                                               |              |    |     |     |
|-------------------------|-----------------------------------------------------------------------------------|----------|----|-----|------------------------------------------------------------------------------------|--------------|----|-----|-----|
|                         |  |          |    |     |  |              |    |     |     |
|                         | Symbol                                                                            | 5D       | 7D | 10D | Symbol                                                                             | 5D           | 7D | 10D | 14D |
|                         | A                                                                                 | 55 max.  |    |     | W                                                                                  | Approx. 35   |    |     | 55  |
|                         | B                                                                                 | 330 max. |    |     | D                                                                                  | 360 max      |    |     |     |
|                         | C                                                                                 | 340 max. |    |     | A                                                                                  | Approx. Ø 30 |    |     |     |
|                         |                                                                                   |          |    |     | B                                                                                  | Approx. Ø 90 |    |     |     |

### Order Information of Flat Box

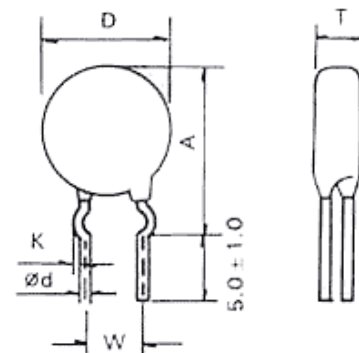
| Standard Products | Tape Box Straight Lead | Tape Box Crimped Lead | Max. Q`ty | Q`ty / Inner Box | Q`ty / Carton |
|-------------------|------------------------|-----------------------|-----------|------------------|---------------|
| CNR-05DXXXK       | CNR-05DXXXK-BTS        | CNR-05DXXXK-BTK       | 2000/1500 | 4000/3000        | 20000/15000   |
| CNR-07DXXXK       | CNR-07DXXXK-BTS        | CNR-07DXXXK-BTK       | 2000/1500 | 4000/3000        | 20000/15000   |
| CNR-10DXXXK       | CNR-10DXXXK-BTS        | CNR-10DXXXK-BTK       | 1500/1000 | 3000/2000        | 15000/10000   |

Note:

1. "2000/1500" Packing in CNR-XXD180K to CNR-XXD271K are 2000 pcs, CNR-XXD301K to CNR-XXD471K with 1500 pcs.
2. Packing unit in pcs.

| Symbol \ Series |                             |            | 05D       | 07D       | 10D       | 14D       |
|-----------------|-----------------------------|------------|-----------|-----------|-----------|-----------|
| A max.          | Varistor Voltage<br>V1mA(V) | 18 to 270  | 13.0      | 15.0      | 19.5      | 22.5      |
|                 |                             | 360 to 470 | 13.0      | 15.0      | 20.5      | 23.5      |
| D max.          |                             |            | 7.5       | 9.0       | 14.0      | 17.5      |
| K               |                             |            | 1.2 ± 0.4 | 1.2 ± 0.4 | 1.4 ± 0.4 | 1.4 ± 0.4 |
| W               |                             |            | 5.0 ± 1.0 | 5.0 ± 1.0 | 7.5 ± 1.0 | 7.5 ± 1.0 |
| Ø d             |                             |            | 0.6       | 0.6       | 0.8       | 0.8       |

### Crimped Leads Type



T max. see standard specification table.

### Order Information of Crimp Leads

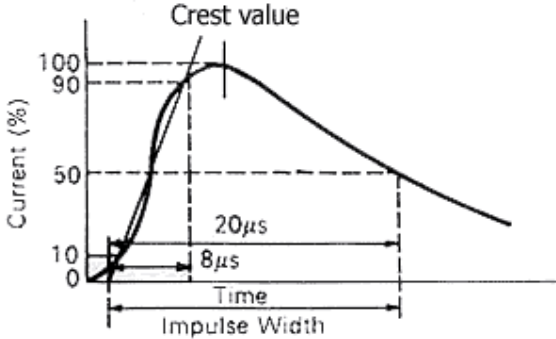
| Standard Products | Cut Off Straight Lead | Cut Off Crimped Lead | Max. Q`ty | Q`ty / Box | Q`ty / Carton |
|-------------------|-----------------------|----------------------|-----------|------------|---------------|
| CNR-05DXXXK       | CNR-05DXXXK-TTS       | CNR-05DXXXK-TTK      | 1000      | 25000      | 50000         |
| CNR-07DXXXK       | CNR-07DXXXK-TTS       | CNR-07DXXXK-TTK      | 1000      | 20000      | 40000         |
| CNR-10DXXXK       | CNR-10DXXXK-TTS       | CNR-10DXXXK-TTK      | 1000      | 20000      | 40000         |
| CNR-14DXXXK       | CNR-14DXXXK-TTS       | CNR-14DXXXK-TTK      | 1000      | 10000      | 20000         |

Note:

1. Packing unit in pcs.



**Performance Characteristics (Electrical)**

| Characteristics                                 |                            | Test Methods/Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | Specifications                               |                            |                      |                            |                      |          |                            |               |                            |               |           |                            |               |                            |                |           |                            |               |                            |                |           |                            |                |                            |                |                       |
|-------------------------------------------------|----------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------|----------------------------|----------------------|----------------------------|----------------------|----------|----------------------------|---------------|----------------------------|---------------|-----------|----------------------------|---------------|----------------------------|----------------|-----------|----------------------------|---------------|----------------------------|----------------|-----------|----------------------------|----------------|----------------------------|----------------|-----------------------|
| Standard Test Condition                         |                            | Environmental conditions under which every measuring is done without doubt on the measuring results. Unless specially specified, temperature, relative humidity are 5 to 35 °C, 45 to 85 % RH.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | —                                            |                            |                      |                            |                      |          |                            |               |                            |               |           |                            |               |                            |                |           |                            |               |                            |                |           |                            |                |                            |                |                       |
| varistor Voltage                                |                            | The voltage between two terminals with the speciefied measuring current Cm A DC applied is called Vc or Vcm A The measurement shall be made as fast as pssible to avoid head affection.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | To meet the specified value                  |                            |                      |                            |                      |          |                            |               |                            |               |           |                            |               |                            |                |           |                            |               |                            |                |           |                            |                |                            |                |                       |
| Maximum Allowable Voltage                       |                            | The maximum sinusoidal RMS voltage or maximum DC voltage that can be applied continuously in the specified environmental temperature range                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                              |                            |                      |                            |                      |          |                            |               |                            |               |           |                            |               |                            |                |           |                            |               |                            |                |           |                            |                |                            |                |                       |
| Clamping Voltage                                |                            | <div>The maximum voltage between two terminals with the specified standard impulse current (8/20μs) illustrated below applied.</div> <div></div>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                              |                            |                      |                            |                      |          |                            |               |                            |               |           |                            |               |                            |                |           |                            |               |                            |                |           |                            |                |                            |                |                       |
| Rated Power                                     |                            | The power that can be applied in the specified ambient temperature.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                              |                            |                      |                            |                      |          |                            |               |                            |               |           |                            |               |                            |                |           |                            |               |                            |                |           |                            |                |                            |                |                       |
| Maximum Energy                                  |                            | The maximum energy within the varistor voltage change of ± 10 % when one impulse of 2 ms or 10/1000μs is applied.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                              |                            |                      |                            |                      |          |                            |               |                            |               |           |                            |               |                            |                |           |                            |               |                            |                |           |                            |                |                            |                |                       |
| Maximum peak Current Withstanding Surge Current | 2 times                    | The maximum current within the varistor voltage change of ± 10 % with the standard impulse current (8/20μs) applied two times with an interval of 5 minutes.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                              |                            |                      |                            |                      |          |                            |               |                            |               |           |                            |               |                            |                |           |                            |               |                            |                |           |                            |                |                            |                |                       |
|                                                 | 1 time                     | The maximum current within the varistor voltage change of ± 10 % with the standard impulse current (8/20 μ s) applied one time.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                              |                            |                      |                            |                      |          |                            |               |                            |               |           |                            |               |                            |                |           |                            |               |                            |                |           |                            |                |                            |                |                       |
| Temperature Coefficient of Varistor Voltage     |                            | $\frac{V_c \text{ at } 85^\circ\text{C} - V_c \text{ at } 25^\circ\text{C}}{V_c \text{ at } 25^\circ\text{C}} \times \frac{1}{60} \times 100 (\%/^\circ\text{C})$                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | -0.05%/°C max                                |                            |                      |                            |                      |          |                            |               |                            |               |           |                            |               |                            |                |           |                            |               |                            |                |           |                            |                |                            |                |                       |
| Capacitance                                     |                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                              |                            |                      |                            |                      |          |                            |               |                            |               |           |                            |               |                            |                |           |                            |               |                            |                |           |                            |                |                            |                |                       |
| Dissipation Factor                              |                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                              |                            |                      |                            |                      |          |                            |               |                            |               |           |                            |               |                            |                |           |                            |               |                            |                |           |                            |                |                            |                |                       |
| Withstanding Voltage ( Body Insulation )        |                            | <div>The specified voltage shall be applied both terminals of the specimen connected together and metal foil closely wrapped round its body for 1 minute. Electrical breakdown shall be examined.</div> <table><thead><tr><th>Classification<br/>(Nominal varistor voltage)</th><th>Test Voltage<br/>(AC)</th></tr></thead><tbody><tr><td>V0.1mA, V1mA, ≤ 330V</td><td>1000Vrms</td></tr><tr><td>V0.1mA, V1mA, &gt; 330V</td><td>1500Vrms</td></tr></tbody></table>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Classification<br>(Nominal varistor voltage) | Test Voltage<br>(AC)       | V0.1mA, V1mA, ≤ 330V | 1000Vrms                   | V0.1mA, V1mA, > 330V | 1500Vrms | No breakdown               |               |                            |               |           |                            |               |                            |                |           |                            |               |                            |                |           |                            |                |                            |                |                       |
| Classification<br>(Nominal varistor voltage)    | Test Voltage<br>(AC)       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                              |                            |                      |                            |                      |          |                            |               |                            |               |           |                            |               |                            |                |           |                            |               |                            |                |           |                            |                |                            |                |                       |
| V0.1mA, V1mA, ≤ 330V                            | 1000Vrms                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                              |                            |                      |                            |                      |          |                            |               |                            |               |           |                            |               |                            |                |           |                            |               |                            |                |           |                            |                |                            |                |                       |
| V0.1mA, V1mA, > 330V                            | 1500Vrms                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                              |                            |                      |                            |                      |          |                            |               |                            |               |           |                            |               |                            |                |           |                            |               |                            |                |           |                            |                |                            |                |                       |
| Impulse Life                                    |                            | <div>The change of Vc shall be measured after the impulse listed below is applied 10000 times continuously with the interval of 10 seconds at room temperature .</div> <table><tbody><tr><td rowspan="2">5 Series</td><td>CNR-05D180K to CNR-05D680K</td><td>0.5A (2ms)</td></tr><tr><td>CNR-05D820K to CNR-05D471K</td><td>20A (8/20 μs)</td></tr><tr><td rowspan="2">7 Series</td><td>CNR-07D180K to CNR-07D680K</td><td>18A (8/20 μs)</td></tr><tr><td>CNR-07D820K to CNR-07D471K</td><td>50A (8/20 μs)</td></tr><tr><td rowspan="2">10 Series</td><td>CNR-10D180K to CNR-10D680K</td><td>50A (8/20 μs)</td></tr><tr><td>CNR-10D820K to CNR-10D112K</td><td>100A (8/20 μs)</td></tr><tr><td rowspan="2">14 Series</td><td>CNR-14D180K to CNR-14D680K</td><td>75A (8/20 μs)</td></tr><tr><td>CNR-14D820K to CNR-14D182K</td><td>150A (8/20 μs)</td></tr><tr><td rowspan="2">20 Series</td><td>CNR-20D180K to CNR-20D680K</td><td>120A (8/20 μs)</td></tr><tr><td>CNR-20D820K to CNR-20D471K</td><td>200A (8/20 μs)</td></tr></tbody></table> | 5 Series                                     | CNR-05D180K to CNR-05D680K | 0.5A (2ms)           | CNR-05D820K to CNR-05D471K | 20A (8/20 μs)        | 7 Series | CNR-07D180K to CNR-07D680K | 18A (8/20 μs) | CNR-07D820K to CNR-07D471K | 50A (8/20 μs) | 10 Series | CNR-10D180K to CNR-10D680K | 50A (8/20 μs) | CNR-10D820K to CNR-10D112K | 100A (8/20 μs) | 14 Series | CNR-14D180K to CNR-14D680K | 75A (8/20 μs) | CNR-14D820K to CNR-14D182K | 150A (8/20 μs) | 20 Series | CNR-20D180K to CNR-20D680K | 120A (8/20 μs) | CNR-20D820K to CNR-20D471K | 200A (8/20 μs) | ΔVcm A / Vcm A ≤ ±10% |
| 5 Series                                        | CNR-05D180K to CNR-05D680K | 0.5A (2ms)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                              |                            |                      |                            |                      |          |                            |               |                            |               |           |                            |               |                            |                |           |                            |               |                            |                |           |                            |                |                            |                |                       |
|                                                 | CNR-05D820K to CNR-05D471K | 20A (8/20 μs)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                              |                            |                      |                            |                      |          |                            |               |                            |               |           |                            |               |                            |                |           |                            |               |                            |                |           |                            |                |                            |                |                       |
| 7 Series                                        | CNR-07D180K to CNR-07D680K | 18A (8/20 μs)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                              |                            |                      |                            |                      |          |                            |               |                            |               |           |                            |               |                            |                |           |                            |               |                            |                |           |                            |                |                            |                |                       |
|                                                 | CNR-07D820K to CNR-07D471K | 50A (8/20 μs)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                              |                            |                      |                            |                      |          |                            |               |                            |               |           |                            |               |                            |                |           |                            |               |                            |                |           |                            |                |                            |                |                       |
| 10 Series                                       | CNR-10D180K to CNR-10D680K | 50A (8/20 μs)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                              |                            |                      |                            |                      |          |                            |               |                            |               |           |                            |               |                            |                |           |                            |               |                            |                |           |                            |                |                            |                |                       |
|                                                 | CNR-10D820K to CNR-10D112K | 100A (8/20 μs)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                              |                            |                      |                            |                      |          |                            |               |                            |               |           |                            |               |                            |                |           |                            |               |                            |                |           |                            |                |                            |                |                       |
| 14 Series                                       | CNR-14D180K to CNR-14D680K | 75A (8/20 μs)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                              |                            |                      |                            |                      |          |                            |               |                            |               |           |                            |               |                            |                |           |                            |               |                            |                |           |                            |                |                            |                |                       |
|                                                 | CNR-14D820K to CNR-14D182K | 150A (8/20 μs)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                              |                            |                      |                            |                      |          |                            |               |                            |               |           |                            |               |                            |                |           |                            |               |                            |                |           |                            |                |                            |                |                       |
| 20 Series                                       | CNR-20D180K to CNR-20D680K | 120A (8/20 μs)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                              |                            |                      |                            |                      |          |                            |               |                            |               |           |                            |               |                            |                |           |                            |               |                            |                |           |                            |                |                            |                |                       |
|                                                 | CNR-20D820K to CNR-20D471K | 200A (8/20 μs)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                              |                            |                      |                            |                      |          |                            |               |                            |               |           |                            |               |                            |                |           |                            |               |                            |                |           |                            |                |                            |                |                       |



### Electrical

| Characteristics   | Test Methods/Description                                                                                                                                        |                                   | Specifications                           |
|-------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------|------------------------------------------|
| Impulse Life (II) | The change of $V_c$ shall be measured after the impulse listed below is applied 100000 times continuously with the interval of 10 seconds at room temperature . |                                   | $\Delta V_{cmA} / V_{cmA} \leq \pm 10\%$ |
|                   | 5 Series                                                                                                                                                        | <b>CNR-05D180K to CNR-05D680K</b> | 0.45A (2ms)                              |
|                   |                                                                                                                                                                 | <b>CNR-05D820K to CNR-05D471K</b> | 14A (8/20 $\mu$ s)                       |
|                   | 7 Series                                                                                                                                                        | <b>CNR-07D180K to CNR-07D680K</b> | 12A (8/20 $\mu$ s)                       |
|                   |                                                                                                                                                                 | <b>CNR-07D820K to CNR-07D471K</b> | 35A (8/20 $\mu$ s)                       |
|                   | 10 Series                                                                                                                                                       | <b>CNR-10D180K to CNR-10D680K</b> | 35A (8/20 $\mu$ s)                       |
|                   |                                                                                                                                                                 | <b>CNR-10D820K to CNR-10D112K</b> | 70A (8/20 $\mu$ s)                       |
|                   | 14 Series                                                                                                                                                       | <b>CNR-14D180K to CNR-14D680K</b> | 45A (8/20 $\mu$ s)                       |
|                   |                                                                                                                                                                 | <b>CNR-14D820K to CNR-14D182K</b> | 90A (8/20 $\mu$ s)                       |
|                   | 20 Series                                                                                                                                                       | <b>CNR-20D180K to CNR-20D680K</b> | 55A (8/20 $\mu$ s)                       |
|                   |                                                                                                                                                                 | <b>CNR-20D820K to CNR-20D471K</b> | 100A (8/20 $\mu$ s)                      |

Note: Varistor voltage change of forward direction shall be measured in the test of uni-pole surge life and DC load life

### (Mechanical)

| Characteristics                      | Test Methods                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Specifications                                                                 |
|--------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------|
| Robustness of Terminations (Tensile) | After gradually applying the force specified below and keeping the unit fixed for the seconds, the terminal shall be visually examined for any damage.<br><u>Terminal diameter</u><br>$\varnothing$ 0.6mm<br>$\varnothing$ 0.8mm<br>$\varnothing$ 1.0mm<br><u>Force</u><br>9.8 N (1.0Kg)<br>9.8 N (1.0Kg)<br>19.6 N (2.0Kg)                                                                                                                                                                                    | No outstanding damage                                                          |
| Robustness of Terminations (Bending) | The unit shall be secured with its terminal kept vertical and the force specified below be applied in the axial direction. The terminal shall gradually be bent by $90^\circ$ in one direction, then $90^\circ$ in the opposite direction, and again back to the original position, The damage of the terminal shall be visually examined.<br><u>Terminal diameter</u><br>$\varnothing$ 0.6mm<br>$\varnothing$ 0.8mm<br>$\varnothing$ 1.0mm<br><u>Force</u><br>4.9 N (0.5Kg)<br>4.9 N (0.5Kg)<br>9.8 N (1.0Kg) |                                                                                |
| Vibration                            | After repeatedly applying a single harmonic vibration (amplitude: 0.75mm) double amplitude: 1.5mm with 1 minute vibration frequency cycles (10 Hz to 55 Hz to 10 Hz) to each of three perpendicular directions for 2 hours. thereafter There a f t e r, the term i n a shall be visually examined.                                                                                                                                                                                                             |                                                                                |
| Solderadility                        | After dipping the terminals to a depth of approximately 3mm from the body in a soldering bath of $235 \pm 5^\circ\text{C}$ for $2 \pm 0.5$ seconds, the terminal shall be visually examined.                                                                                                                                                                                                                                                                                                                   | Approximately 95% of the term i n a l s shall be covered with solder uniformly |
| Resistance to Soldering Heat         | After each lead shall be dipped into a solder bath having a temperature $260 \pm 5^\circ\text{C}$ (3 series: $2.5 \pm 0.5^\circ\text{C}$ ) to a point 2.0 to 2.5 mm from the body of the unit, using shieldig b o a r d ( $t=1.5\text{mm}$ ), be held there for specified time (3series: $3 \pm 1$ s, 5 series: $5 \pm 1$ s and others: $10 \pm 1$ s) hen stored at room temperature and humidity for 1 to 2 hours. The change of $V_c$ and mechanical damages are examined.                                   | $\Delta V_{cmA} / V_{cmA} \leq \pm 5\%$<br>No outstanding damage               |



**Transient/Surge Absorbers  
Transient Voltage Surge Suppressors**

**(Environmental)**

| Characteristics                          | Test Methods                                                                                                                                                                                                                                                                                                    | Specifications   |                              |                              |                  |   |       |      |   |                  |      |   |       |      |   |                  |      |
|------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------|------------------------------|------------------------------|------------------|---|-------|------|---|------------------|------|---|-------|------|---|------------------|------|
| High Temperatuer Storage/<br>Dry Heat    | The specimen shall be subjected to 125±2 <sup>0</sup> C for 1000 hours in a thermostatic bath without load and then stored at room temperatureand humidity for 1 to 2 hours. Thereafter, the change of Vc shall be measured.                                                                                    | △VcmA/VcmA≤±5%   |                              |                              |                  |   |       |      |   |                  |      |   |       |      |   |                  |      |
| Damp Heat/<br>Humidity<br>(Steady State) | The specimen shall be subjected to 40 ± 2 °C, 90 to 95 %RH for 1000 hours load and then stored at room temperature and humidity for one to two hours. Thereafter, the change of Vc shall be measured.                                                                                                           |                  |                              |                              |                  |   |       |      |   |                  |      |   |       |      |   |                  |      |
| Temperature Cycle                        | The temperature cycle shown below shall be repeated five times and then stored at room temperature and humidi ty for one to two hours. The change of Vc and mechanical damage shall be examined.                                                                                                                |                  |                              |                              |                  |   |       |      |   |                  |      |   |       |      |   |                  |      |
|                                          | <table><tr><td>Step</td><td>Temperature(<sup>0</sup>C)</td><td>Period (minutes)</td></tr><tr><td>1</td><td>-40±3</td><td>30±3</td></tr><tr><td>2</td><td>Room temperature</td><td>15±3</td></tr><tr><td>3</td><td>125±2</td><td>30±3</td></tr><tr><td>4</td><td>Room temperatuer</td><td>15±3</td></tr></table> |                  | Step                         | Temperature( <sup>0</sup> C) | Period (minutes) | 1 | -40±3 | 30±3 | 2 | Room temperature | 15±3 | 3 | 125±2 | 30±3 | 4 | Room temperatuer | 15±3 |
|                                          | Step                                                                                                                                                                                                                                                                                                            |                  | Temperature( <sup>0</sup> C) | Period (minutes)             |                  |   |       |      |   |                  |      |   |       |      |   |                  |      |
|                                          | 1                                                                                                                                                                                                                                                                                                               | -40±3            | 30±3                         |                              |                  |   |       |      |   |                  |      |   |       |      |   |                  |      |
|                                          | 2                                                                                                                                                                                                                                                                                                               | Room temperature | 15±3                         |                              |                  |   |       |      |   |                  |      |   |       |      |   |                  |      |
| 3                                        | 125±2                                                                                                                                                                                                                                                                                                           | 30±3             |                              |                              |                  |   |       |      |   |                  |      |   |       |      |   |                  |      |
| 4                                        | Room temperatuer                                                                                                                                                                                                                                                                                                | 15±3             |                              |                              |                  |   |       |      |   |                  |      |   |       |      |   |                  |      |
|                                          |                                                                                                                                                                                                                                                                                                                 |                  |                              |                              |                  |   |       |      |   |                  |      |   |       |      |   |                  |      |
|                                          |                                                                                                                                                                                                                                                                                                                 |                  |                              |                              |                  |   |       |      |   |                  |      |   |       |      |   |                  |      |
| High Temperatuer Load/<br>Dry Heat Load  | After being continuously applied the Maximum Allowable Voltage at 85 ± 2 <sup>0</sup> C for 1000 hours. The specimen shall be stored at room temperature and humidity for one to two hours Thereafter, the change of Vc shall be measured.                                                                      | △VcmA/VcmA≤±10%  |                              |                              |                  |   |       |      |   |                  |      |   |       |      |   |                  |      |
| Damp Heat Load/<br>Humidity Load         | The specimen shall be subjected to 40±2 °C, 90 to 95 %RH and the Maximum Allowable Voltage for 1000 hours and then stored at room temperature and humidity for one to two hours. Thereafter, the change of Vc shall be measured.                                                                                | △VcmA/VcmA≤±10%  |                              |                              |                  |   |       |      |   |                  |      |   |       |      |   |                  |      |
| Low Temperatuer Storage/Cold             | The specimen shall be subjected to -40±2 <sup>0</sup> C without load for 1000 hours and then stored at room temperature for one to two hours. Thereafter, the change of Vc shall be measured.                                                                                                                   | △VcmA/VcmA≤±5%   |                              |                              |                  |   |       |      |   |                  |      |   |       |      |   |                  |      |



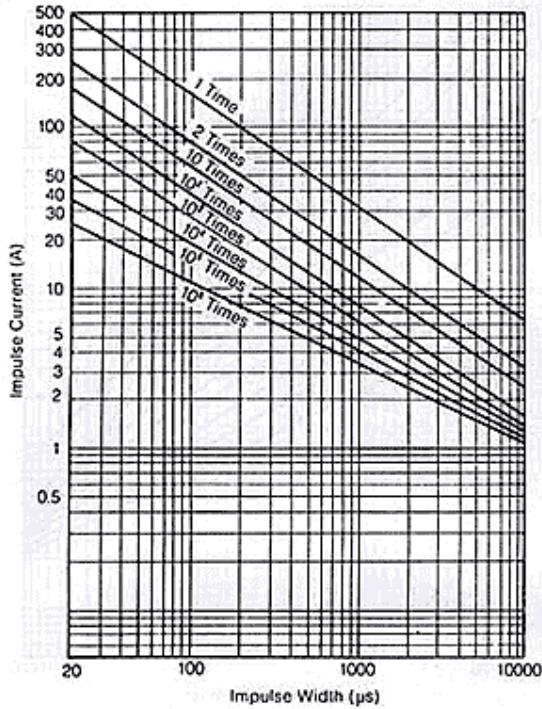


## Impulse Life Time Rating Curves

2 times: 5 minutes interval  
up to 10 times: 2 minutes interval  
up to 106 times: 10 seconds interval

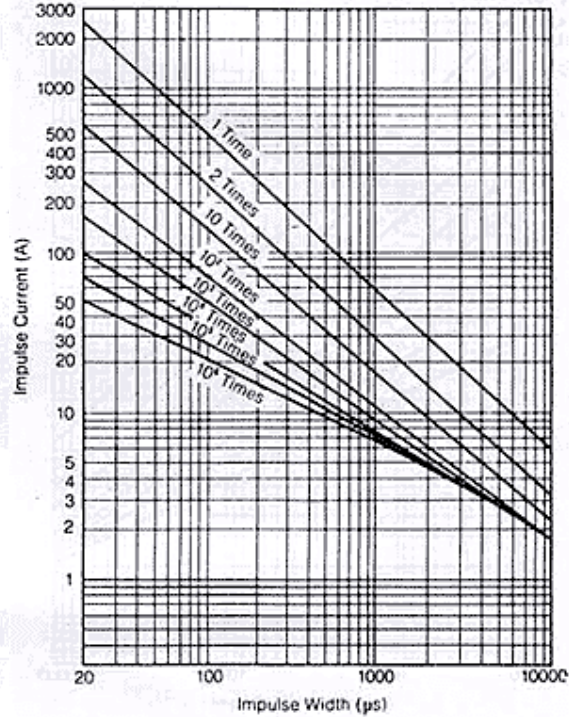
### 10 Series

(CNR10D180K to CNR10D680K)



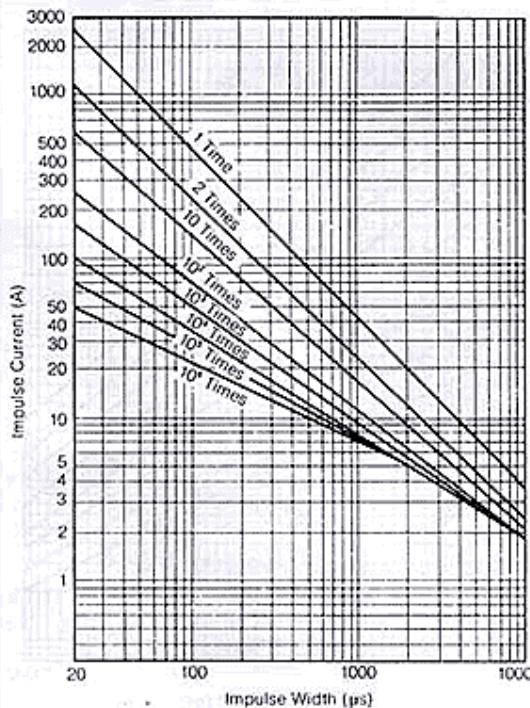
### 10 Series

(CNR10D820K to CNR10D471K)



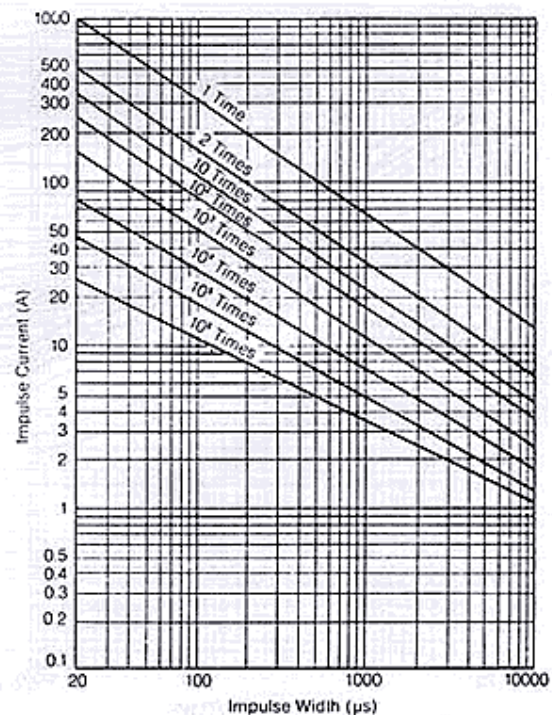
### 10 Series

(CNR10D511K to CNR10D112K)



### 14 Series

(CNR14D180K to CNR14D680K)





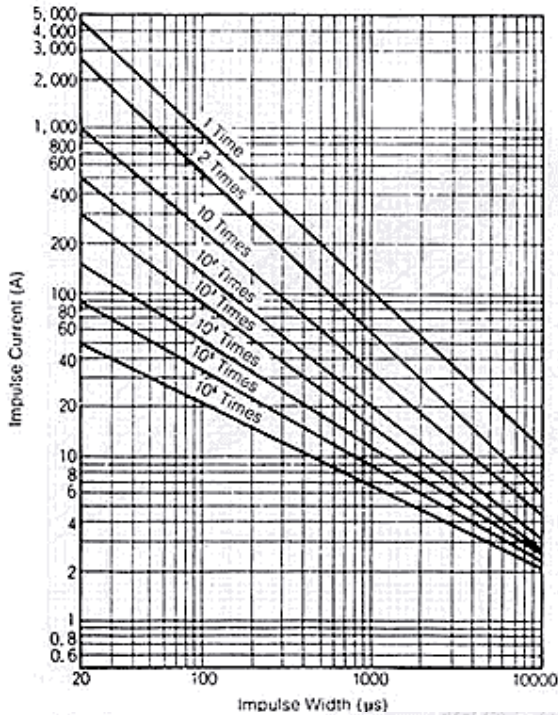


## Impulse Life Time Rating Curves

2 times: 5 minutes interval  
up to 10 times: 2 minutes interval  
up to 106 times: 10 seconds interval

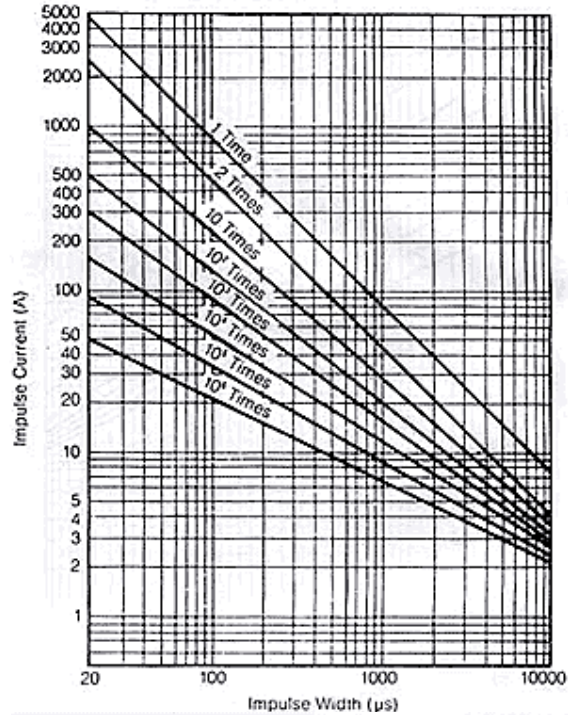
### 14 Series

(CNR14D820K to CNR14D471K)



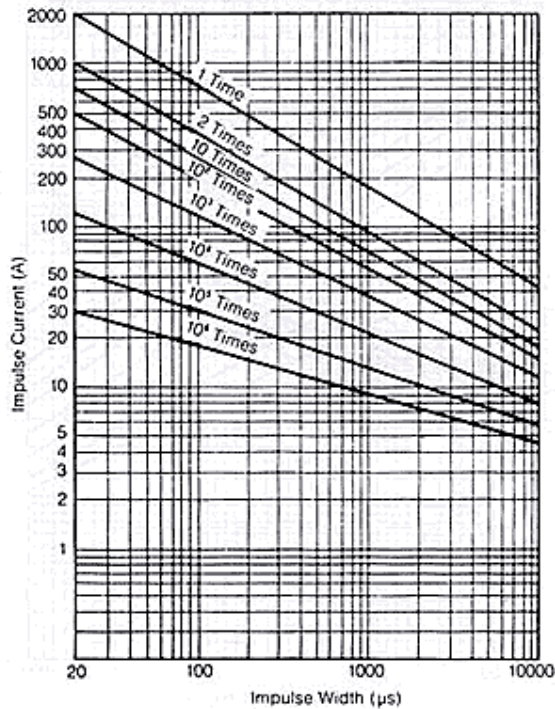
### 14 Series

(CNR14D511K to CNR14D182K)



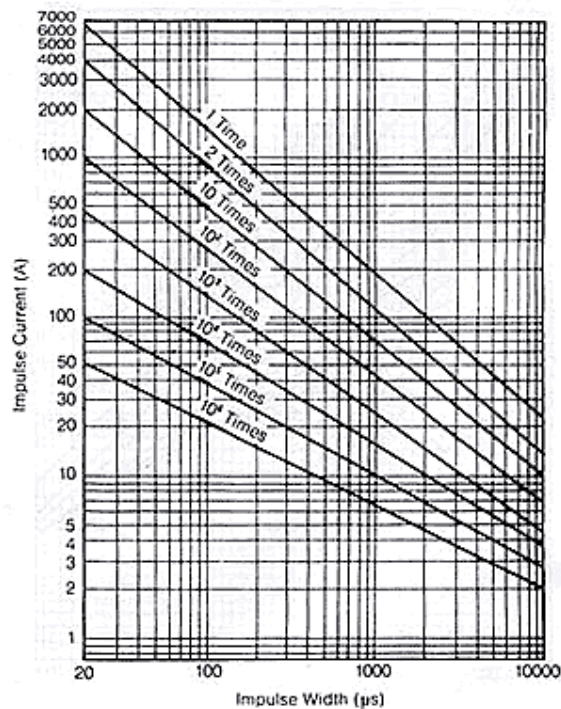
### 20 Series

(CNR20D180K to CNR20D680K)



### 20 Series

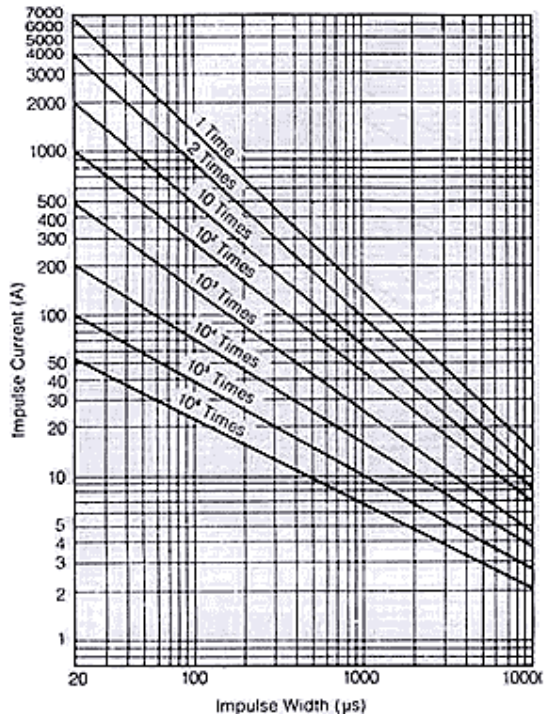
(CNR20D820K to CNR20D471K)



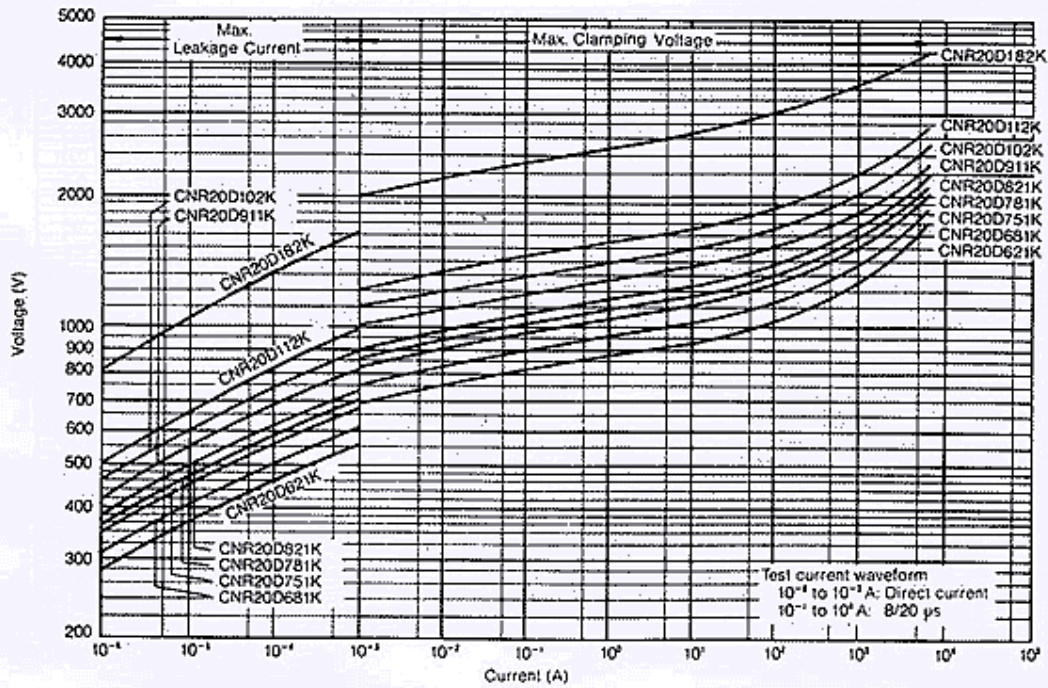


## 20 Series

(CNR20D511K to CNR20D182K)

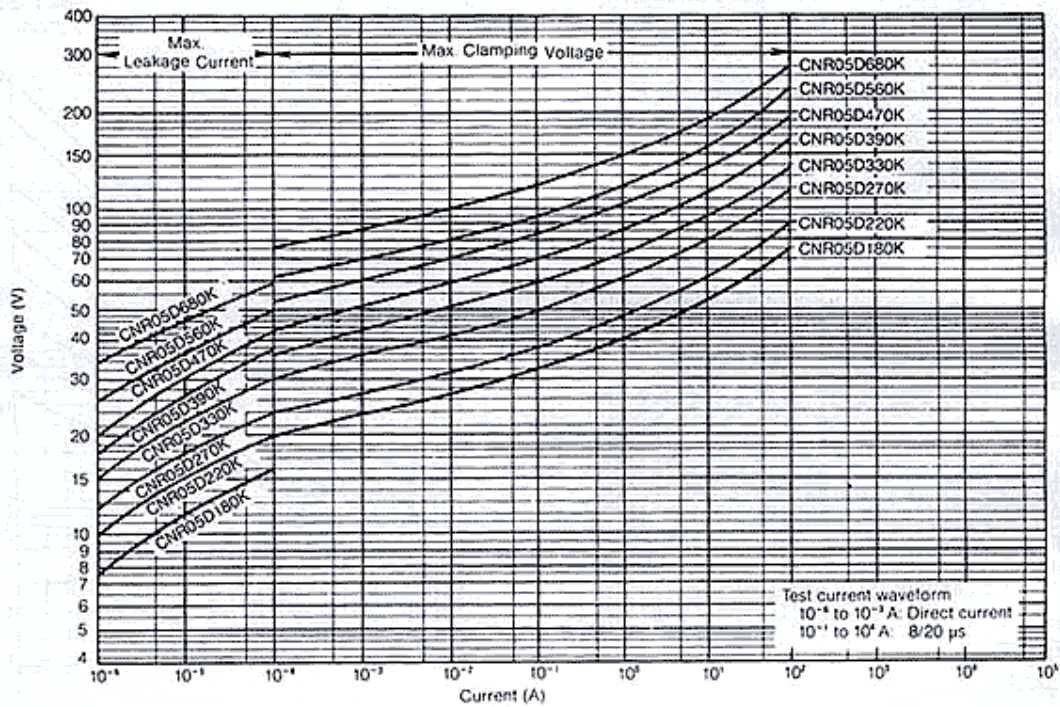


V-I Curve (CNR20D621K to CNR20D182K)

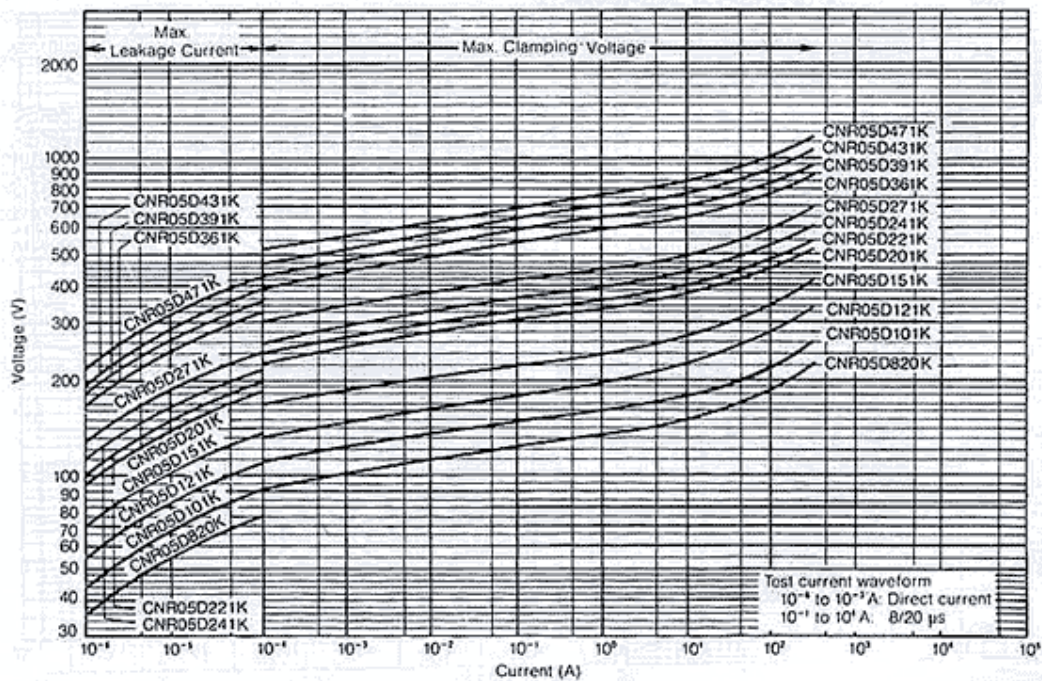




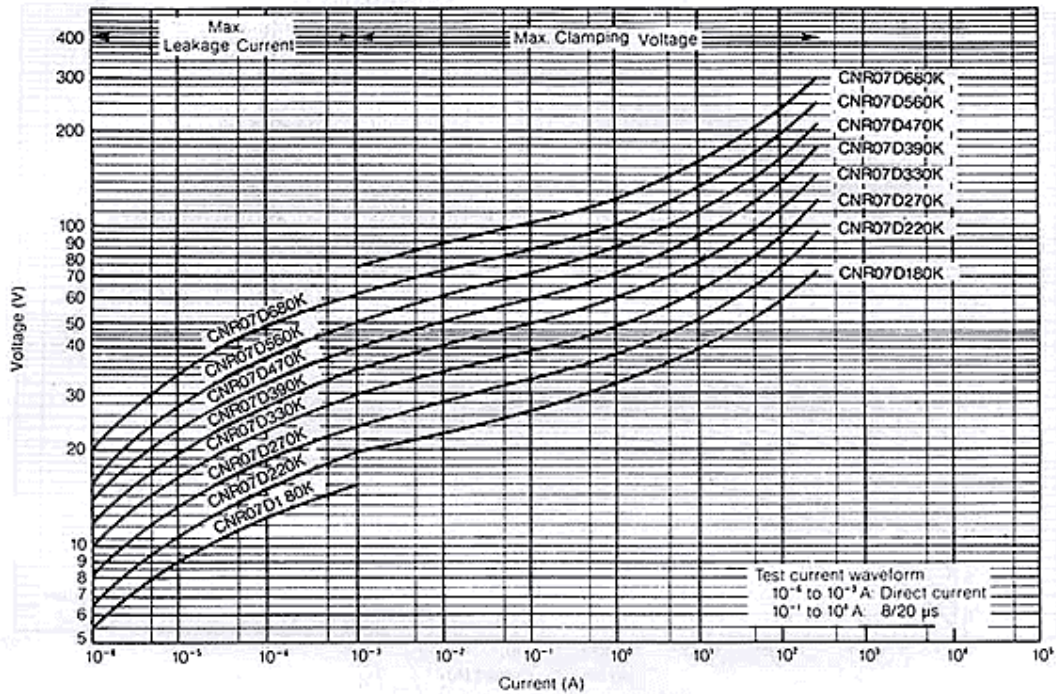
**V-I Curve (CNR05D180K to CNR05D680K)**



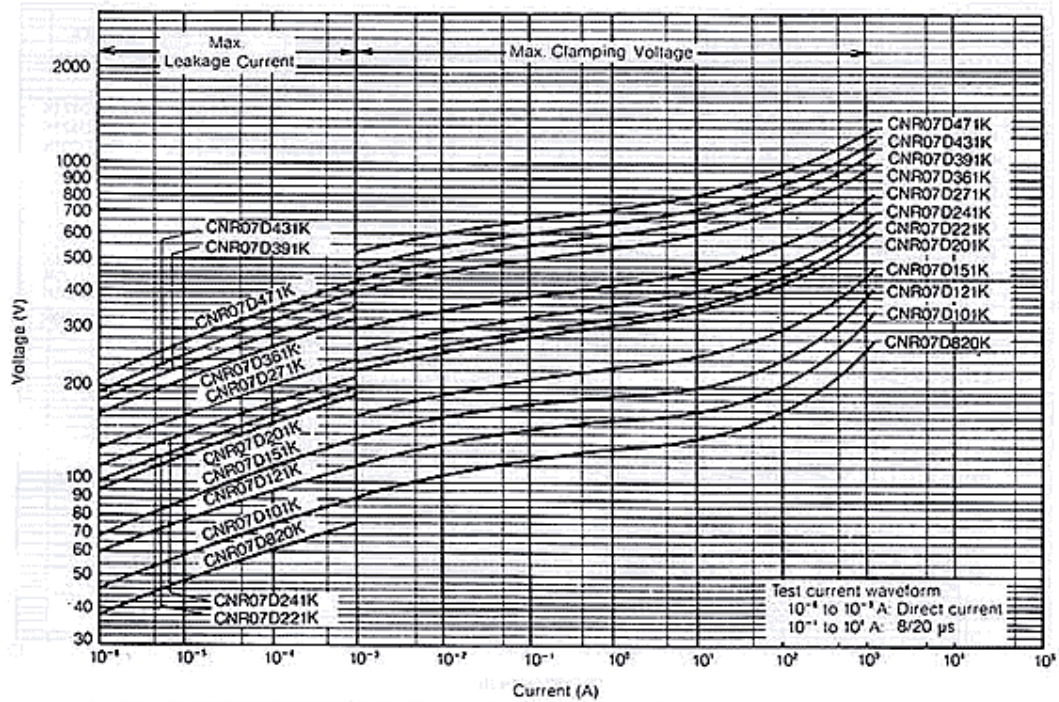
**V-I Curve (CNR05D820K to CNR05D471K)**



**V-I Curve (CNR07D180K to CNR07D680K)**

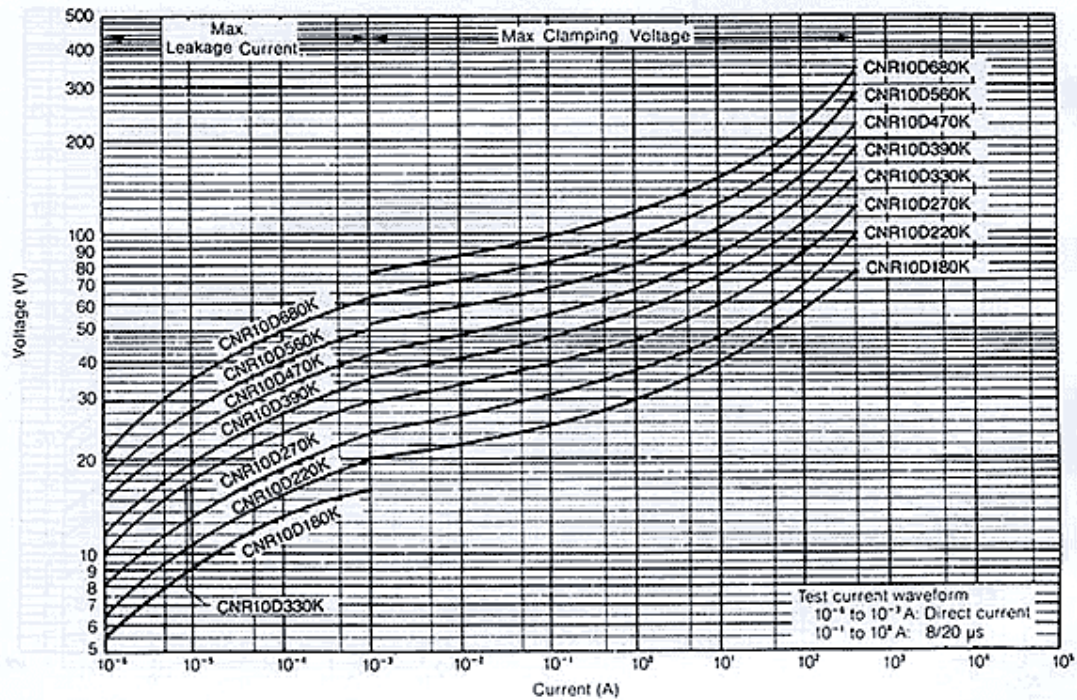


**V-I Curve (CNR07D820K to CNR07D471K)**

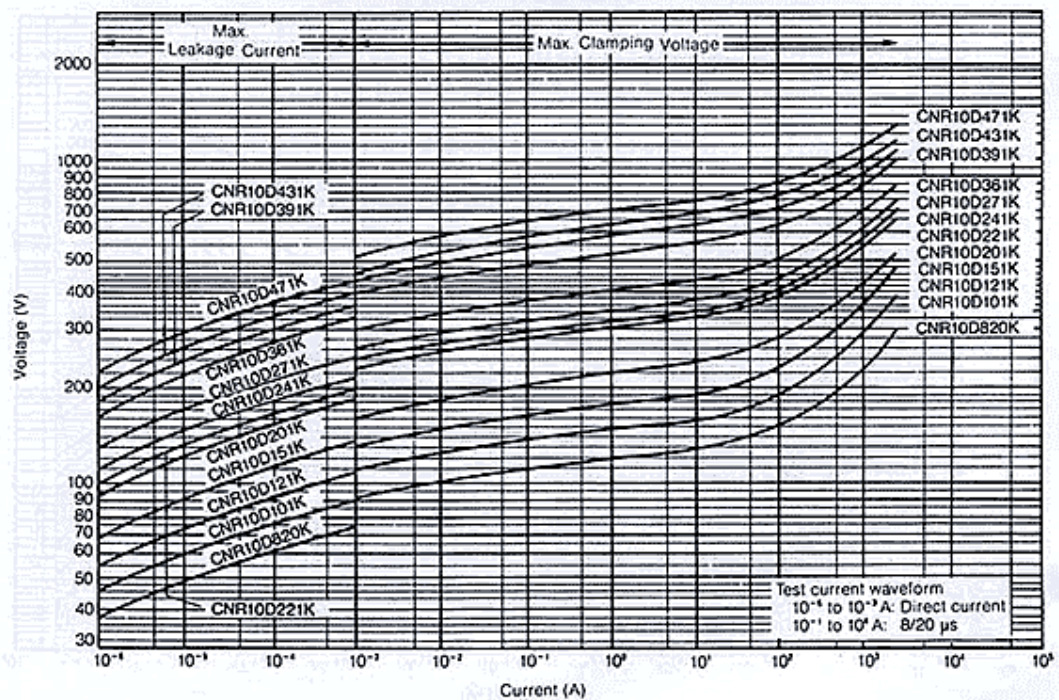




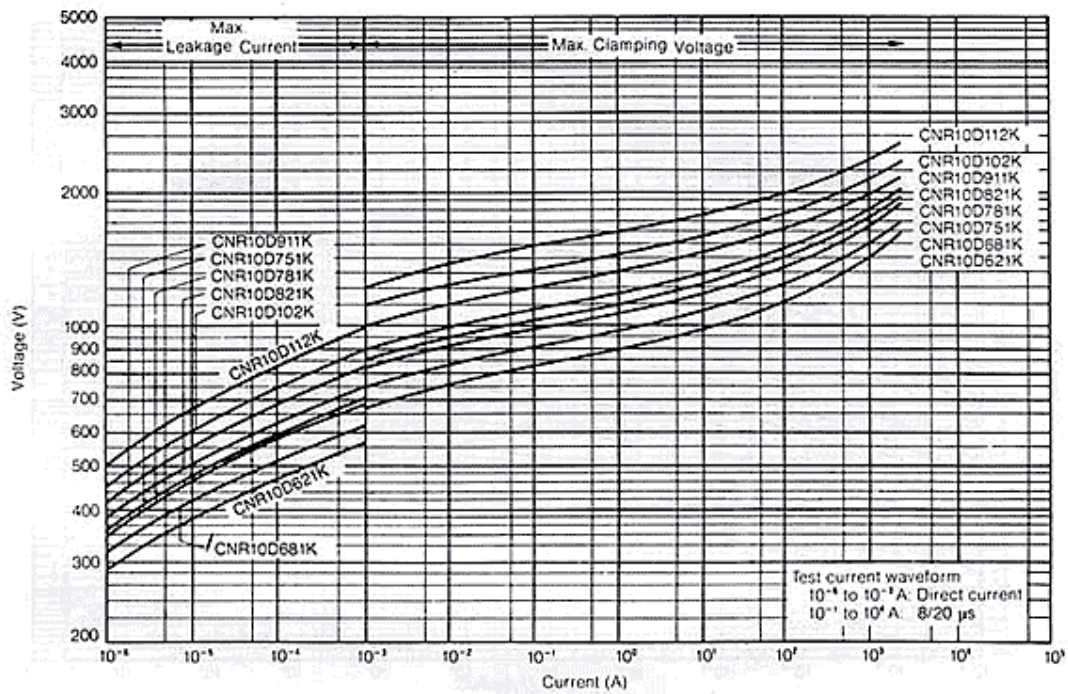
**V-I Curve (CNR10D180K to CNR10D680K)**



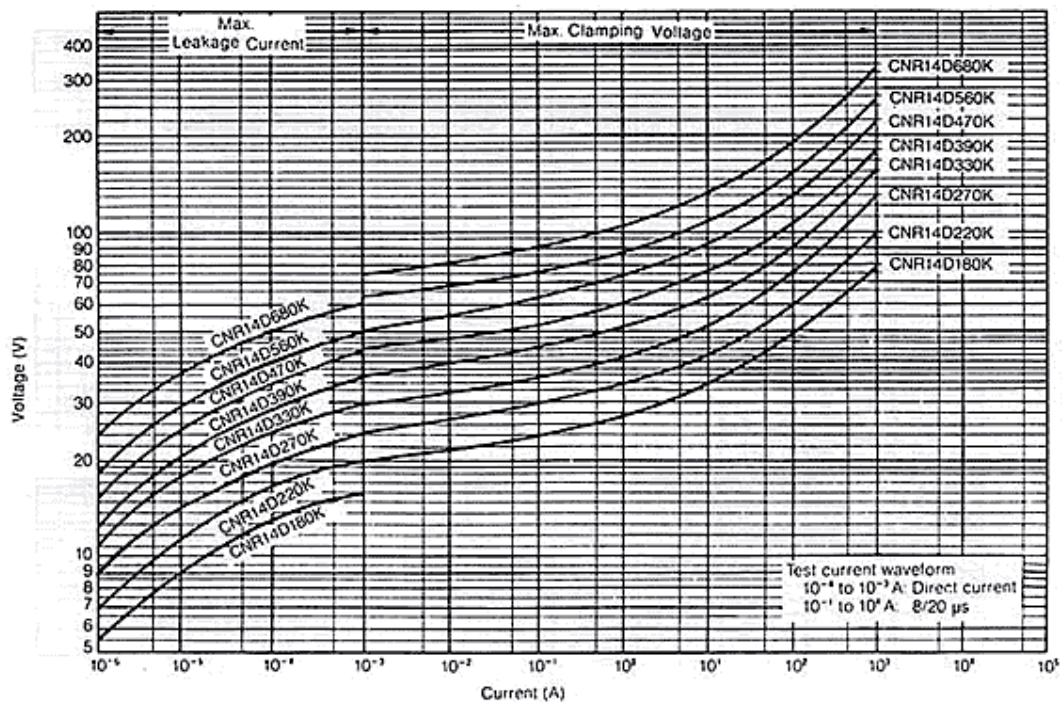
**V-I Curve (CNR10D820K to CNR10D471K)**



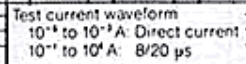
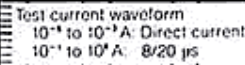
**V-I Curve (CNR10D621K to CNR10D112K)**



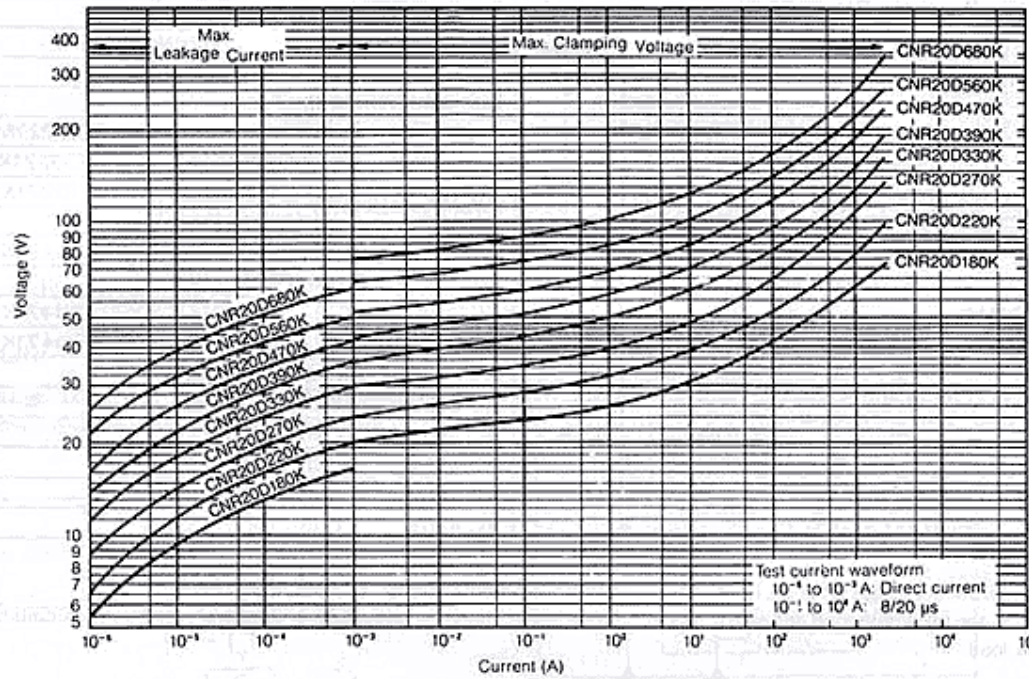
**V-I Curve (CNR14D180K to CNR14D680K)**



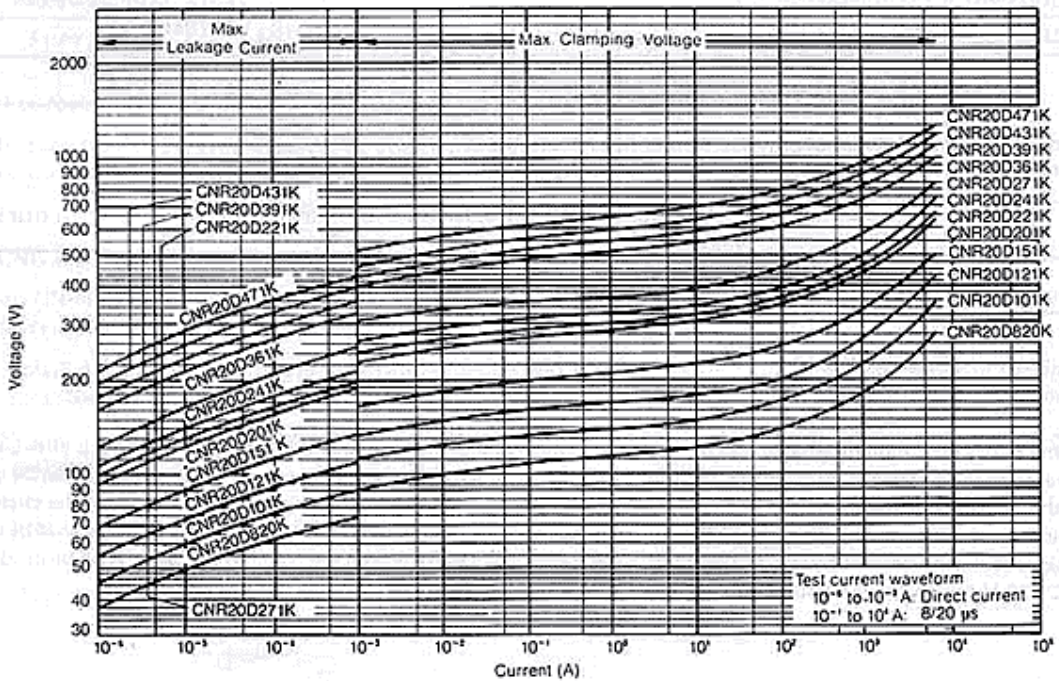




**V-I Curve (CNR20D180K to CNR20D680K)**



**V-I Curve (CNR20D820K to CNR20D471K)**





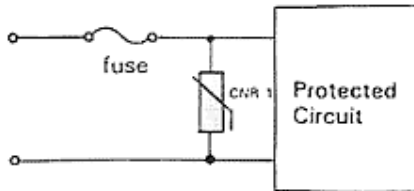
## Application Notes

### 1. Line protection

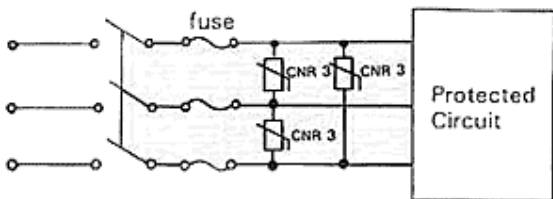
#### Line to line Protection Connections

DC

AC single phase



AC three phases



### Selection of Ratings and Varistor Voltage

#### Line to Line

| Symbol | Line Voltage | Part Number              |
|--------|--------------|--------------------------|
| CNR 1  | DC 12V       | CNR- D220K               |
|        | DC 24V       | CNR- D390K               |
|        | AC 100V      | CNR- D201K, CNR- D221K   |
|        |              | CNR- D241K*, CNR- D271K* |
|        | AC 120V      | CNR- D241K, CNR- D271K*  |
|        | AC 127V      | CNR- D271K               |
|        | AC 200V      | CNR- D391K, CNR- D431K   |
| CNR 3  |              | CNR- D471K               |
|        | AC 240V      | CNR- D431K, CNR- D471K*  |
|        |              | CNR- D511K               |
|        | AC 265V      | CNR- D511K               |
|        | AC 380V      | CNR- D821K               |
|        | AC 415V      | CNR- D911K               |
|        | AC 460V      | CNR- D112K               |
|        | AC 480V      | CNR- D112K               |

Notes:

1. Maximum operating voltage shall be lower than Maximum allowable voltage of CNR at any time.
2. CNRs with \* are recommended for single phase, 3 wire applications to withstand a temporary overvoltage caused by unbalance load.

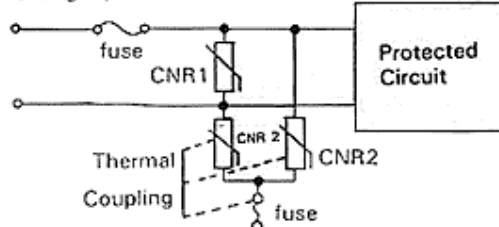
#### Line to Line and Line to Ground Protection Connections

### Selection of Ratings and Varistor Voltage

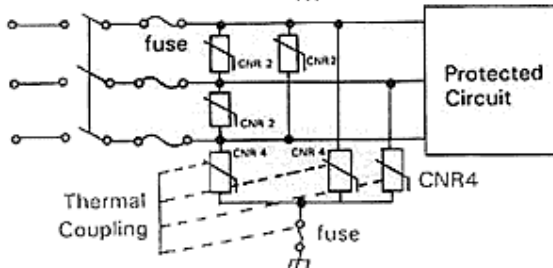
#### Line to Ground

DC

AC single phase



AC three phases



Notes:

1. When the 500V insulation resistance test of the circuits employing CNRs is conducted, CNR shall be remove after getting approval from the customer, or CNR \*\* with the Maximum Allowable Voltage exceeding to test voltage shall be used.
2. When the 1000V withstanding voltage test is conducted, CNR shall be remove after getting approval from the customer according to the revelant regulations, or CNR \*\* with the Maximum Allowable Voltage exceeding to the test voltage shall be used.
3. To avoid CNR failure caused by the ground fault, CNR with higher Varistor Voltage listed in the table shall be used for the AC 120V line to ground application.

| Symbol | Line Voltage       | Part Number                                                                                |
|--------|--------------------|--------------------------------------------------------------------------------------------|
|        | AC 100V to AC 220V | CNR- D431K, CNR- D471K                                                                     |
|        | AC 240V            | CNR- D431K, CNR- D471K or CNR- D751K** or higher Varistor Voltage CNR- D182K***            |
| CNR 4  | AC 240V            | CNR- D431K<br>CNR- D471K<br>or CNR- D751K**<br>or higher Varistor Voltage<br>CNR- D182K*** |





## Transient/Surge Absorbers Transient Voltage Surge Suppressors

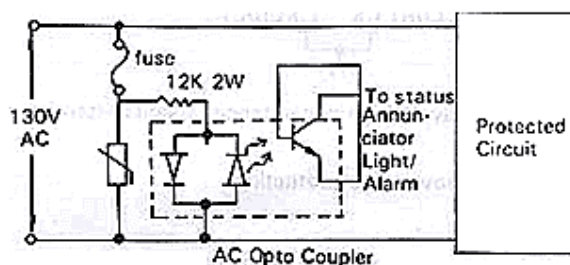
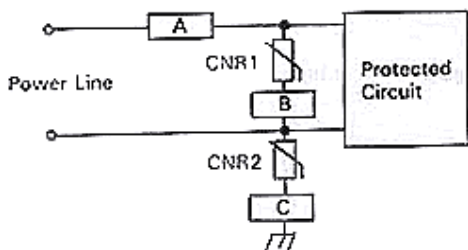
### Application examples

| Protected circuit   | Location        | Part Number |
|---------------------|-----------------|-------------|
| Home Appliances     | Indoor          | CNR-05D K   |
|                     |                 | CNR-07D K   |
|                     |                 | CNR-10D K   |
|                     | Outdoor         | CNR-10D K   |
|                     |                 | CNR-14D K   |
|                     |                 | CNR-20D K   |
| Consumer Industrial | Indoor, Outdoor | CNR-14D K   |
|                     |                 | CNR-20D K   |

| Protected circuit                   | Location | Part Number |
|-------------------------------------|----------|-------------|
| Communication Measurements Controls | Indoor   | CNR-07D K   |
|                                     |          | CNR-10D K   |
|                                     |          | CNR-14D K   |
|                                     | Outdoor  | CNR-05D K   |
|                                     |          | CNR-07D K   |
|                                     |          | CNR-10D K   |

#### CAUTION:

1. A surge excess of the specific Maximum Peak Current may cause short circuit or mechanical damage. The following measures are recommended.



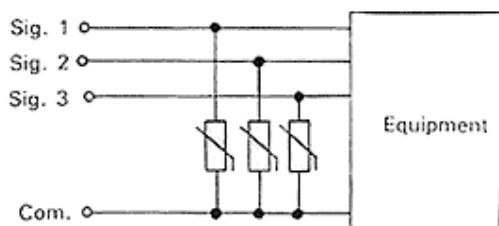
- 1) Location of the over current protector (circuit breaker or current fuse) shall be in the power line to the circuit (Location A) or in series with CNR (Location B).

| Part Number | CNR-05D K | CNR-07D K | CNR-10D K | CNR-14D K | CNR-20D K |
|-------------|-----------|-----------|-----------|-----------|-----------|
| Fuse Rating | 1 to 2 A  | 2 to 3 A  | 3 to 5 A  | 3 to 10 A | 5 to 15 A |

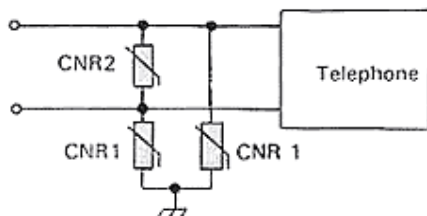
- 2) It is recommended that a fuse listed in the table shall be put in location A or B.
  - 3) In case that CNR is used in line to ground, the ground fault circuit interrupter shall be applied in location A or thermally coupled fuse shall be applied in location C.
  - 4) Fuse mounted Type K or Type P are available for CNR 1 and CNR 2 applications.
  - 5) CNR shall not be used near the flammable materials.
2. When CNR is molded at end-user, molding resin materials shall be carefully selected, otherwise CNR's long term stability could degrade.
  3. CNR shall not be used near heat generating device and free from direct sunlight. CNR shall be used with in the specified Operating Temperature Range.
  4. CNR shall be free from dust, metal powder, dew and sea wind. A protective box is recommended to prevent the unit from those.

## **2. Signal Line and telephone line surge protection**

### Signal line



### Telephone Line



### **Selection Example**

#### Surge Protection of Signal Line

| Signal Line Voltage | Part Number |
|---------------------|-------------|
| DC 48 V             | CNR- D820K  |
| DC 100 V            | CNR- D201K  |

#### Surge Protection of Telephone Line

| CNR   | Part Number              |
|-------|--------------------------|
| CNR 1 | CNR- D331K<br>CNR- D361K |
| CNR 2 | CNR- D151K               |

#### **Note:**

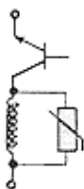
CNR has relatively high capacitance, special attention shall be paid for it in high frequency circuits.

#### **Caution:**

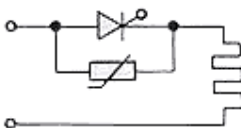
Refer to the power line protection.

## **3. Switching surge protection, semiconductor protection and contact spark suppression**

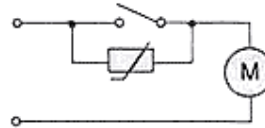
### Switching surge protection



### Semiconductor protection



### Contact spark suppression



#### **Selection examples**

| Voltage | Part Number                            |
|---------|----------------------------------------|
| DC 12V  | CNR- D220K                             |
| DC 24V  | CNR- D390K                             |
| DC 100V | CNR- D151K                             |
| DC 120V | CNR- D221K<br>CNR- D241K<br>CNR- D271K |

#### **Note:**

1. The Maximum Allowable Voltage to be higher than maximum operation voltage at all time.
2. Energy handling capability of CNR shall be selected by studying switching surge energy from the inductive load.

#### **Caution:**

1. Refer to the mentioned caution described in power line protection.
2. The relation between surge current repetition and CNR ratings is drawn in the CNR's impulse life characteristics.
3. Capacitor connection in parallel CNR is recommended for a contact spark suppression.