



## Varistor>05D180~751KJ Series

### Applications

- Transistor, diode, IC, thyristor or triac semiconductor protection.
- Surge protection in consumer electronics.
- Surge protection in industrial electronics.
- Surge protection in electronic home appliances, gas and petroleum appliances.
- Relay and electromagnetic valve surge absorption.

### Features

- Wide operating voltage (V1mA) range from 8V to 1800V.
- Fast responding to transient over-voltage.
- Large absorbing transient energy capability.
- Low clamping ratio and no following-on current.

### General Information

The MOV-05DxxxK Series of 5 mm radial leaded varistor devices protects against overvoltage transients such as lightning, power contact and power induction. The metal oxide varistors offer a choice of varistor voltages from 18 V to 750 V and Vrms voltages from 11 V to 460 V.

The devices have a high current handling, high energy absorption capability and fast response times to protect against transient faults up to rated limits.

### General Characteristics

No Radioactive Material

Storage Temperature: -55°C to +125°C

Operating Temperature: -55°C to +85°C

Body: Nickel Plated

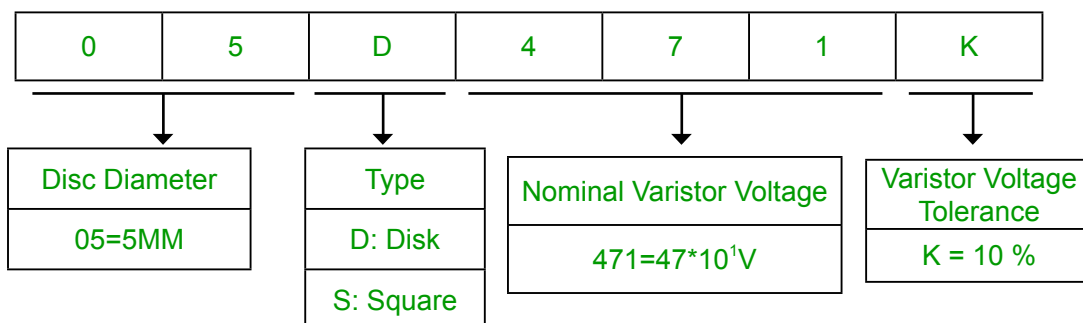
Leads: Surface-mount, Axial Devices: Tin Plated

Devices with No Leads: Nickel Plated

### Packaging Information

| Part Number | Component package | Quantity | Packaging Option | Packaging Specification |
|-------------|-------------------|----------|------------------|-------------------------|
| 5D          | 5.0               | 1000     | BOX              | 2000                    |

### Product Name



Varistor>05D180~751KJ Series

Electrical Characteristics (@ TA = 25 °C Unless Otherwise Noted)

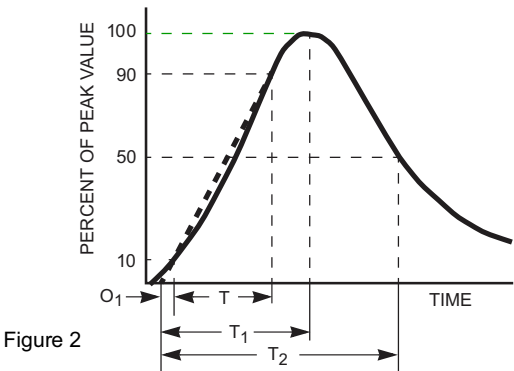
| Type Number |            | Maximum Allowable Voltage |        | Varistor Voltage | Maximum Clamping Voltage |       | Withstanding Surge Current |                 | Maximum Energy (10/1000µs) |                | Rated Power | Typical Capacitance (Reference) |
|-------------|------------|---------------------------|--------|------------------|--------------------------|-------|----------------------------|-----------------|----------------------------|----------------|-------------|---------------------------------|
| Standard    | High Surge | VAC(V)                    | VDC(V) | V1mA(V)          | Ip(A)                    | Vc(V) | I(A) Standard              | I(A) High Surge | (J) Standard               | (J) High Surge | (W)         | @1KHz(pf)                       |
| 05D180K     | 05D180KJ   | 11                        | 14     | 18(15~21.6)      | 1                        | 40    | 100                        | 250             | 0.4                        | 0.6            | 0.01        | 1400                            |
| 05D220K     | 05D220KJ   | 14                        | 18     | 22(19.5~26)      | 1                        | 48    | 100                        | 250             | 0.5                        | 0.7            | 0.01        | 1150                            |
| 05D270K     | 05D270KJ   | 17                        | 22     | 27(24~31)        | 1                        | 60    | 100                        | 250             | 0.6                        | 0.9            | 0.01        | 930                             |
| 05D330K     | 05D330KJ   | 20                        | 26     | 33(29.5~36.5)    | 1                        | 73    | 100                        | 250             | 0.8                        | 1.1            | 0.01        | 760                             |
| 05D390K     | 05D390KJ   | 25                        | 31     | 39(35~43)        | 1                        | 80    | 100                        | 250             | 0.9                        | 1.2            | 0.01        | 640                             |
| 05D470K     | 05D470KJ   | 30                        | 38     | 47(42~54)        | 1                        | 104   | 100                        | 250             | 1.1                        | 1.5            | 0.01        | 530                             |
| 05D560K     | 05D560KJ   | 35                        | 45     | 56(50~62)        | 1                        | 123   | 100                        | 250             | 1.3                        | 1.8            | 0.01        | 450                             |
| 05D680K     | 05D680KJ   | 40                        | 56     | 68(61~75)        | 1                        | 150   | 100                        | 250             | 1.6                        | 2.2            | 0.01        | 370                             |
| 05D820K     | 05D820KJ   | 50                        | 65     | 82(74~90)        | 5                        | 145   | 400                        | 800             | 2.5                        | 4.0            | 0.1         | 300                             |
| 05D101K     | 05D101KJ   | 60                        | 85     | 100(90~110)      | 5                        | 177   | 400                        | 800             | 3.0                        | 4.1            | 0.1         | 250                             |
| 05D121K     | 05D121KJ   | 75                        | 100    | 120(108~132)     | 5                        | 210   | 400                        | 800             | 4.0                        | 4.9            | 0.1         | 210                             |
| 05D151K     | 05D151KJ   | 95                        | 125    | 150(135~165)     | 5                        | 260   | 400                        | 800             | 4.1                        | 6.5            | 0.1         | 165                             |
| 05D181K     | 05D181KJ   | 115                       | 150    | 180(162~198)     | 5                        | 320   | 400                        | 800             | 4.9                        | 7.5            | 0.1         | 140                             |
| 05D201K     | 05D201KJ   | 130                       | 170    | 200(180~220)     | 5                        | 355   | 400                        | 800             | 6.5                        | 8.5            | 0.1         | 125                             |
| 05D221K     | 05D221KJ   | 140                       | 180    | 220(198~242)     | 5                        | 380   | 400                        | 800             | 7.5                        | 9.0            | 0.1         | 110                             |
| 05D241K     | 05D241KJ   | 150                       | 200    | 240(216~264)     | 5                        | 415   | 400                        | 800             | 8.0                        | 10.5           | 0.1         | 100                             |
| 05D271K     | 05D271KJ   | 175                       | 225    | 270(243~297)     | 5                        | 475   | 400                        | 800             | 8.5                        | 11.0           | 0.1         | 95                              |
| 05D301K     | 05D301KJ   | 190                       | 250    | 300(270~330)     | 5                        | 520   | 400                        | 800             | 9.0                        | 12.0           | 0.1         | 85                              |
| 05D331K     | 05D331KJ   | 210                       | 275    | 330(297~363)     | 5                        | 570   | 400                        | 800             | 9.5                        | 13.0           | 0.1         | 75                              |
| 05D361K     | 05D361KJ   | 230                       | 300    | 360(324~396)     | 5                        | 620   | 400                        | 800             | 10.0                       | 16.0           | 0.1         | 70                              |
| 05D391K     | 05D391KJ   | 250                       | 320    | 390(351~429)     | 5                        | 675   | 400                        | 800             | 12.0                       | 17.0           | 0.1         | 65                              |
| 05D431K     | 05D431KJ   | 275                       | 350    | 430(387~473)     | 5                        | 745   | 400                        | 800             | 13.0                       | 20.0           | 0.1         | 60                              |
| 05D471K     | 05D471KJ   | 300                       | 385    | 470(423~517)     | 5                        | 810   | 400                        | 800             | 15.0                       | 21.0           | 0.1         | 55                              |
| 05D511K     | 05D511KJ   | 320                       | 415    | 510(459~561)     | 5                        | 845   | 400                        | 800             | 16.0                       | 22.5           | 0.1         | 50                              |
| 05D561K     | 05D561KJ   | 350                       | 460    | 560(504~616)     | 5                        | 920   | 400                        | 800             | 16.0                       | 24.0           | 0.1         | 45                              |
| 05D621K     | 05D621KJ   | 385                       | 505    | 620(558~682)     | 5                        | 1025  | 400                        | 800             | 21.0                       | 25.0           | 0.1         | 40                              |
| 05D681K     | 05D681KJ   | 420                       | 560    | 680(612~748)     | 5                        | 1120  | 400                        | 800             | 21.0                       | 29.0           | 0.1         | 35                              |
| 05D751K     | 05D751KJ   | 460                       | 615    | 750(675~825)     | 5                        | 1240  | 400                        | 800             | 22.4                       | 32.0           | 0.1         | 30                              |

The tolerance of varistor voltage between 18V and 27V is more than 10%.

Varistor>05D180~751KJ Series

| Electrical Rating          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                        |           |              |                 |              |                 |          |              |                 |              |                 |            |              |                 |              |                  |            |              |                 |              |                  |            |              |                  |              |
|----------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------|-----------|--------------|-----------------|--------------|-----------------|----------|--------------|-----------------|--------------|-----------------|------------|--------------|-----------------|--------------|------------------|------------|--------------|-----------------|--------------|------------------|------------|--------------|------------------|--------------|
| Item                       | Test Condition / Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Requirement                            |           |              |                 |              |                 |          |              |                 |              |                 |            |              |                 |              |                  |            |              |                 |              |                  |            |              |                  |              |
| Varistor Voltage           | The voltage between two terminals with the specified measuring current 1mA.DC applied is call Vb.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | To meet the specified value            |           |              |                 |              |                 |          |              |                 |              |                 |            |              |                 |              |                  |            |              |                 |              |                  |            |              |                  |              |
| Maximum Allowable Voltage  | The recommended maximum sine wave voltage (RMS) or the maximum DC voltage can be applied continuously.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                        |           |              |                 |              |                 |          |              |                 |              |                 |            |              |                 |              |                  |            |              |                 |              |                  |            |              |                  |              |
| Rated Wattaget             | The maximum average power that can be applied within the specified ambient temperature.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                        |           |              |                 |              |                 |          |              |                 |              |                 |            |              |                 |              |                  |            |              |                 |              |                  |            |              |                  |              |
| IEnergy                    | The maximum energy within the varistor voltage change of ±10% when one impulse of10/1000µsec. or 2 msec. is applied.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                        |           |              |                 |              |                 |          |              |                 |              |                 |            |              |                 |              |                  |            |              |                 |              |                  |            |              |                  |              |
| Withstanding Surge Current | The maximum current within the varistor voltage change of ±10% with the standard impulse current (8/20µsec.) applied one time.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | $\frac{\Delta V_b}{V_b} \leq \pm 10\%$ |           |              |                 |              |                 |          |              |                 |              |                 |            |              |                 |              |                  |            |              |                 |              |                  |            |              |                  |              |
| Surge Life                 | <p>The change of Vb shall be measured after the impulse listed below is applied 10,000 times continuously with the interval of ten seconds at room temperature.</p> <table> <tr> <td rowspan="2">5D series</td><td>180K to 680K</td><td>10A (8/20µsec.)</td></tr> <tr> <td>820K to 751K</td><td>20A (8/20µsec.)</td></tr> <tr> <td rowspan="2">7Dseries</td><td>180K to 680K</td><td>25A (8/20µsec.)</td></tr> <tr> <td>820K to 821K</td><td>50A (8/20µsec.)</td></tr> <tr> <td rowspan="2">10D series</td><td>180K to 680K</td><td>50A (8/20µsec.)</td></tr> <tr> <td>820K to 182K</td><td>100A (8/20µsec.)</td></tr> <tr> <td rowspan="2">14D series</td><td>180K to 680K</td><td>75A (8/20µsec.)</td></tr> <tr> <td>820K to 182K</td><td>150A (8/20µsec.)</td></tr> <tr> <td rowspan="2">20D series</td><td>180K to 680K</td><td>100A (8/20µsec.)</td></tr> <tr> <td>820K to 182K</td><td>200A (8/20µsec.)</td></tr> </table> |                                        | 5D series | 180K to 680K | 10A (8/20µsec.) | 820K to 751K | 20A (8/20µsec.) | 7Dseries | 180K to 680K | 25A (8/20µsec.) | 820K to 821K | 50A (8/20µsec.) | 10D series | 180K to 680K | 50A (8/20µsec.) | 820K to 182K | 100A (8/20µsec.) | 14D series | 180K to 680K | 75A (8/20µsec.) | 820K to 182K | 150A (8/20µsec.) | 20D series | 180K to 680K | 100A (8/20µsec.) | 820K to 182K |
| 5D series                  | 180K to 680K                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | 10A (8/20µsec.)                        |           |              |                 |              |                 |          |              |                 |              |                 |            |              |                 |              |                  |            |              |                 |              |                  |            |              |                  |              |
|                            | 820K to 751K                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | 20A (8/20µsec.)                        |           |              |                 |              |                 |          |              |                 |              |                 |            |              |                 |              |                  |            |              |                 |              |                  |            |              |                  |              |
| 7Dseries                   | 180K to 680K                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | 25A (8/20µsec.)                        |           |              |                 |              |                 |          |              |                 |              |                 |            |              |                 |              |                  |            |              |                 |              |                  |            |              |                  |              |
|                            | 820K to 821K                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | 50A (8/20µsec.)                        |           |              |                 |              |                 |          |              |                 |              |                 |            |              |                 |              |                  |            |              |                 |              |                  |            |              |                  |              |
| 10D series                 | 180K to 680K                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | 50A (8/20µsec.)                        |           |              |                 |              |                 |          |              |                 |              |                 |            |              |                 |              |                  |            |              |                 |              |                  |            |              |                  |              |
|                            | 820K to 182K                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | 100A (8/20µsec.)                       |           |              |                 |              |                 |          |              |                 |              |                 |            |              |                 |              |                  |            |              |                 |              |                  |            |              |                  |              |
| 14D series                 | 180K to 680K                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | 75A (8/20µsec.)                        |           |              |                 |              |                 |          |              |                 |              |                 |            |              |                 |              |                  |            |              |                 |              |                  |            |              |                  |              |
|                            | 820K to 182K                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | 150A (8/20µsec.)                       |           |              |                 |              |                 |          |              |                 |              |                 |            |              |                 |              |                  |            |              |                 |              |                  |            |              |                  |              |
| 20D series                 | 180K to 680K                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | 100A (8/20µsec.)                       |           |              |                 |              |                 |          |              |                 |              |                 |            |              |                 |              |                  |            |              |                 |              |                  |            |              |                  |              |
|                            | 820K to 182K                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | 200A (8/20µsec.)                       |           |              |                 |              |                 |          |              |                 |              |                 |            |              |                 |              |                  |            |              |                 |              |                  |            |              |                  |              |

Peak Pulse Current Test Waveform



O<sub>1</sub> = Virtual Origin of Wave  
 T = Time from 10% to 90% of Peak  
 T<sub>1</sub> = Rise Time = 1.25 x T  
 T<sub>2</sub> = Decay Time  
 Example - For an 8/20 µs Current Waveform:  
 8µs = T<sub>1</sub> = Rise Time  
 20µs = T<sub>2</sub> = Decay Time



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Current Energy and Power Dissipation Ratings

Should transients occur in rapid succession, the average power dissipation is the energy (watt-seconds) per pulse times the number of pulses per second. The power so developed must be within the specifications shown on the Device Ratings and Specifications Table for the specific

device. The operating values of a MOV need to be derated at high temperatures as shown above. Because varistors only dissipate a relatively small amount of average power they are not suitable for repetitive applications that involve substantial amounts of average power dissipation.

Figure 1A - Power Derating for Epoxy Coated

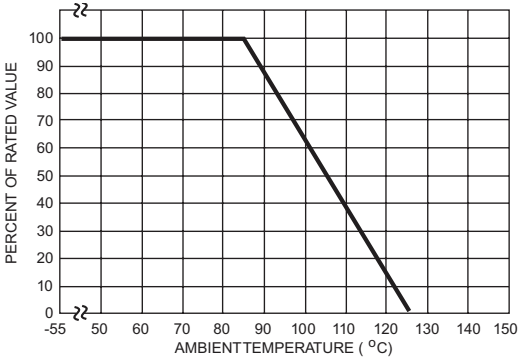
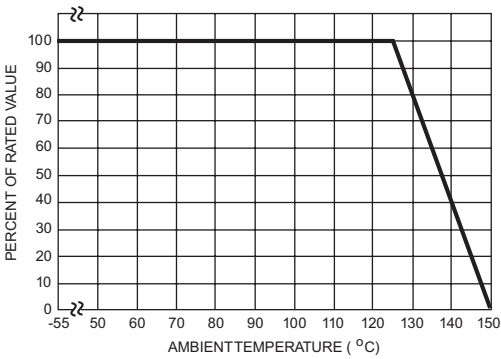


Figure 1B - Power Derating for Pholenic Coated



Package Dimensions

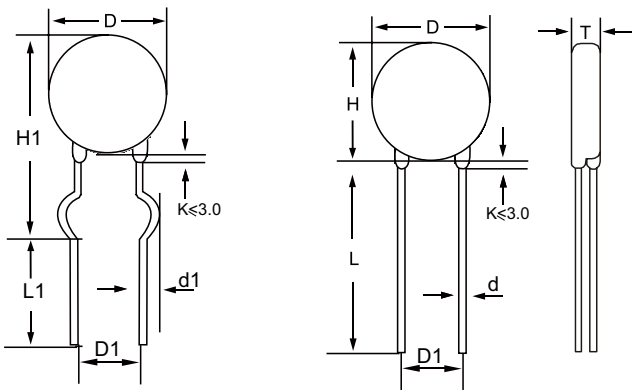


TABLE 1

| Symbol   | Dimensions |
|----------|------------|
| H(max.)  | 10.5       |
| H1(max.) | 13.0       |
| L(min.)  | 20.0       |
| L1(min.) | 15.0       |
| D(max.)  | 7.5        |
| D1(±0.8) | 5.0        |
| T(max.)  | TABLE 2    |
| d(±0.05) | 0.6        |
| d1(±0.4) | 1.2        |

TABLE 2

| Model | T(max.) | Model | T(max.) |
|-------|---------|-------|---------|
| 180K  | 4.5     | 221K  | 4.5     |
| 220K  | 4.6     | 241K  | 4.6     |
| 270K  | 4.7     | 271K  | 4.9     |
| 330K  | 4.9     | 301K  | 5.0     |
| 390K  | 4.8     | 331K  | 5.1     |
| 470K  | 4.9     | 361K  | 5.2     |
| 560K  | 5.0     | 391K  | 5.4     |
| 680K  | 5.2     | 431K  | 5.7     |
| 820K  | 4.1     | 471K  | 6.0     |
| 101K  | 4.3     | 511K  | 6.2     |
| 121K  | 4.5     | 561K  | 6.5     |
| 151K  | 4.8     | 621K  | 6.4     |
| 181K  | 4.3     | 681K  | 6.5     |
| 201K  | 4.4     | 751K  | 6.5     |