

## Radial Lead Varistor (MOV)

### Description

The 05D series radial leaded varistors provides an ideal circuit protection solution for lower DC voltage applications by offering higher surge ratings than ever before available in such small discs. The maximum peak surge current rating can reach up to 0.8KA (8/20  $\mu$ s pulse) to protect against high peak surges, including indirect lightning strike interference, system switching transients and abnormal fast transients from the power source.

### Features

- ◆ Wide operating voltages ranging from 11Vrms to 460Vrms(AC)
- ◆ Fast response time of less than 25ns, instantly clamping the transient over voltage.
- ◆ High surge current handling capability.
- ◆ High energy absorption capability.
- ◆ Low clamping voltages, providing better surge protection
- ◆ Low capacitance values, providing digital switching circuitry protection.
- ◆ High insulation resistance, preventing electric arching to the adjacent devices or circuits.

### Applicable

- ◆ 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.

### Part Numbering

**05 - D - XXX - K - X - X - X - X**  
( 1 ) ( 2 ) ( 3 ) ( 4 ) ( 5 ) ( 6 ) ( 7 ) ( 8 )

(1) Size(mm) : 05mm to 32mm

(2) Type : D: Disk, S: Square

(3) Varistor Voltage :470( $47 \times 10^0=47V$ ) , 471(  $47 \times 10^1=470V$ )

(4) Tolerance : K $\pm$ 10%, L $\pm$ 15%, M $\pm$ 20%

(5) Surge Current Standard: J:High Surge & High Energy

(6) Taping Mode : TR : Reel

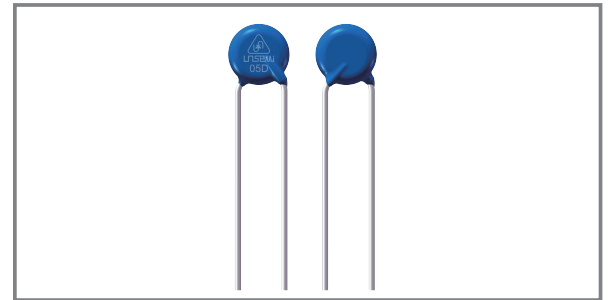
(7) Lead Form : C:Crimped, Short leg : NO : X.X

(8) Coating : H:Epoxy Coating 125°C

Note: (5)、(6)、(7)、(8) options is non-standard



www.unsemi.com.tw



### Material

- ◆ Coating: Epoxy Resin
- ◆ Lead Wire: The Copper Wire
- ◆ Electrode: Silver Solder
- ◆ Disk: Zinc Oxide



### General Characteristics Definition

- ◆ Operating Temperature: -40°C~ +85°C
- ◆ Storage Temperature: -40°C~ +125°C
- ◆ Working Surface Temperature: +115°C
- ◆ Insulation Resistance: > 100M $\Omega$
- ◆ Coating (Epoxy Resin): Flame-Retardant to UL 94V-0
- ◆ Approval Standard and File Number:  
VDE: 40046112  
CSA&CUL: E489912

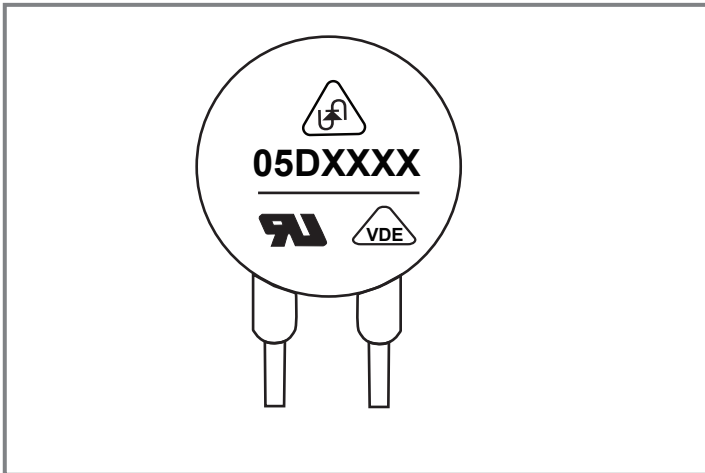
Electrical Characteristics (@ 25°C Unless Otherwise Specified )

| Part Number |            | Maximum Allowable Voltage |         | Varistor Voltage | Withstanding Surge Current 8/20 $\mu$ S |         |                 |         | Max Clamping Voltage |        | Maximum Energy (10/1000 $\mu$ s) |                | Rated Power |
|-------------|------------|---------------------------|---------|------------------|---|---------|-----------------|---------|----------------------|--------|----------------------------------|----------------|-------------|
| Standard    | High Surge | Vac (V)                   | Vdc (V) | V1mA (V)         | I(A) Standard                           |         | I(A) High Surge |         | Vc (V)               | Ip (A) | (J) Standard                     | (J) High Surge | (W)         |
|             |            |                           |         |                  | 1 time                                  | 2 times | 1 time          | 2 times |                      |        |                                  |                |             |
| 05D180L     | 05D180LJ   | 11                        | 14      | 18(15.3-20.7)    | 100                                     | 50      | 250             | 125     | 40                   | 1      | 0.4                              | 0.6            | 0.01        |
| 05D220K     | 05D220KJ   | 14                        | 18      | 22(19.8-24.2)    | 100                                     | 50      | 250             | 125     | 48                   | 1      | 0.5                              | 0.7            | 0.01        |
| 05D270K     | 05D270KJ   | 17                        | 22      | 27(24.3-29.7)    | 100                                     | 50      | 250             | 125     | 50                   | 1      | 0.6                              | 0.9            | 0.01        |
| 05D330K     | 05D330KJ   | 20                        | 26      | 33(29.7-36.3)    | 100                                     | 50      | 250             | 125     | 73                   | 1      | 0.8                              | 1.1            | 0.01        |
| 05D390K     | 05D390KJ   | 25                        | 31      | 39(35.1-42.9)    | 100                                     | 50      | 250             | 125     | 30                   | 1      | 0.9                              | 1.2            | 0.01        |
| 05D470K     | 05D470KJ   | 30                        | 38      | 47(42.3-51.7)    | 100                                     | 50      | 250             | 125     | 104                  | 1      | 1.1                              | 1.5            | 0.01        |
| 05D560K     | 05D560KJ   | 35                        | 45      | 56(50.4-61.6)    | 100                                     | 50      | 250             | 125     | 123                  | 1      | 1.3                              | 1.8            | 0.01        |
| 05D680K     | 05D680KJ   | 40                        | 56      | 68(61.2-74.8)    | 100                                     | 50      | 250             | 125     | 145                  | 1      | 1.6                              | 2.2            | 0.01        |
| 05D820K     | 05D820KJ   | 50                        | 65      | 82(73.8-90.2)    | 400                                     | 200     | 800             | 600     | 150                  | 5      | 2.5                              | 4.0            | 0.1         |
| 05D101K     | 05D101KJ   | 60                        | 85      | 100(90-110)      | 400                                     | 200     | 800             | 600     | 177                  | 5      | 3.0                              | 4.1            | 0.1         |
| 05D121K     | 05D121KJ   | 75                        | 100     | 120(108-132)     | 400                                     | 200     | 800             | 600     | 210                  | 5      | 4.0                              | 4.9            | 0.1         |
| 05D151K     | 05D151KJ   | 95                        | 125     | 150(135-165)     | 400                                     | 200     | 800             | 600     | 260                  | 5      | 4.1                              | 6.5            | 0.1         |
| 05D181K     | 05D181KJ   | 115                       | 150     | 180(162-198)     | 400                                     | 200     | 800             | 600     | 320                  | 5      | 4.9                              | 7.5            | 0.1         |
| 05D201K     | 05D201KJ   | 130                       | 170     | 200(185-225)     | 400                                     | 200     | 800             | 600     | 340                  | 5      | 6.5                              | 8.5            | 0.1         |
| 05D221K     | 05D221KJ   | 140                       | 180     | 220(198-242)     | 400                                     | 200     | 800             | 600     | 380                  | 5      | 7.5                              | 9.0            | 0.1         |
| 05D241K     | 05D241KJ   | 150                       | 200     | 240(216-264)     | 400                                     | 200     | 800             | 600     | 415                  | 5      | 8.0                              | 10.5           | 0.1         |
| 05D271K     | 05D271KJ   | 175                       | 225     | 270(243-297)     | 400                                     | 200     | 800             | 600     | 475                  | 5      | 8.5                              | 11.0           | 0.1         |
| 05D301K     | 05D301KJ   | 190                       | 250     | 300(270-330)     | 400                                     | 200     | 800             | 600     | 520                  | 5      | 9.0                              | 12.0           | 0.1         |
| 05D331K     | 05D331KJ   | 210                       | 275     | 330(297-363)     | 400                                     | 200     | 800             | 600     | 570                  | 5      | 9.5                              | 13.0           | 0.1         |
| 05D361K     | 05D361KJ   | 230                       | 300     | 360(324-396)     | 400                                     | 200     | 800             | 600     | 620                  | 5      | 10.0                             | 16.0           | 0.1         |
| 05D391K     | 05D391KJ   | 250                       | 320     | 390(351-429)     | 400                                     | 200     | 800             | 600     | 675                  | 5      | 12.0                             | 17.0           | 0.1         |
| 05D431K     | 05D431KJ   | 275                       | 350     | 430(387-473)     | 400                                     | 200     | 800             | 600     | 745                  | 5      | 13.0                             | 20.0           | 0.1         |
| 05D471K     | 05D471KJ   | 300                       | 385     | 470(423-517)     | 400                                     | 200     | 800             | 600     | 810                  | 5      | 15.0                             | 21.0           | 0.1         |
| 05D511K     | 05D511KJ   | 320                       | 415     | 510(459-561)     | 400                                     | 200     | 800             | 600     | 845                  | 5      | 16.0                             | 22.5           | 0.1         |
| 05D561K     | 05D561KJ   | 350                       | 460     | 560(504-616)     | 400                                     | 200     | 800             | 600     | 920                  | 5      | 16.5                             | 24.0           | 0.1         |
| 05D621K     | 05D621KJ   | 385                       | 505     | 620(558-682)     | 400                                     | 200     | 800             | 600     | 1025                 | 5      | 21.0                             | 25.0           | 0.1         |
| 05D681K     | 05D681KJ   | 420                       | 560     | 680(612-748)     | 400                                     | 200     | 800             | 600     | 1120                 | 5      | 22.0                             | 29.0           | 0.1         |
| 05D751K     | 05D751KJ   | 460                       | 615     | 750(675-825)     | 400                                     | 200     | 800             | 600     | 1240                 | 5      | 22.4                             | 32.0           | 0.1         |

Approval Standard And File Number

| Certified Model No. |          |  E489912 |  VDE 40046112 |
|---------------------|----------|--|--|
| 05D180L             | 05D180LJ | YES  | YES  |
| 05D220K             | 05D220KJ | YES  | YES  |
| 05D270K             | 05D270KJ | YES  | YES  |
| 05D330K             | 05D330KJ | YES  | YES  |
| 05D390K             | 05D390KJ | YES  | YES  |
| 05D470K             | 05D470KJ | YES  | YES  |
| 05D560K             | 05D560KJ | YES  | YES  |
| 05D680K             | 05D680KJ | YES  | YES  |
| 05D820K             | 05D820KJ | YES  | YES  |
| 05D101K             | 05D101KJ | YES  | YES  |
| 05D121K             | 05D121KJ | YES  | YES  |
| 05D151K             | 05D151KJ | YES  | YES  |
| 05D181K             | 05D181KJ | YES  | YES  |
| 05D201K             | 05D201KJ | YES  | YES  |
| 05D221K             | 05D221KJ | YES  | YES  |
| 05D241K             | 05D241KJ | YES  | YES  |
| 05D271K             | 05D271KJ | YES  | YES  |
| 05D301K             | 05D301KJ | YES  | YES  |
| 05D331K             | 05D331KJ | YES  | YES  |
| 05D361K             | 05D361KJ | YES  | YES  |
| 05D391K             | 05D391KJ | YES  | YES  |
| 05D431K             | 05D431KJ | YES  | YES  |
| 05D471K             | 05D471KJ | YES  | YES  |
| 05D511K             | 05D511KJ | YES  |  |
| 05D561K             | 05D561KJ | YES  |  |
| 05D621K             | 05D621KJ | YES  |  |
| 05D681K             | 05D681KJ | YES  |  |
| 05D751K             | 05D751KJ |  |  |

Part Marking



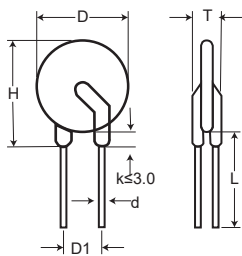
| Marking                   |                |
|---------------------------|----------------|
| Trademark                 | UN logo        |
| Part No.                  | 05DXXXX/KJ     |
| Standard for Safety       | UL / VDE / CQC |
| _____                     | High Surge     |
| ** 05D511K-05D751K No VDE |                |
| ** 05D180L-05751K No Csa  |                |

Packaging Information

Unit:Pcs

| Dimension       | Part No.     | Bag  | Small Carton | Carton |
|-----------------|--------------|------|--------------|--------|
| 05D             | 180L to 751K | 1000 | 10000        | 20000  |
| 05D (Short leg) | 180L to 751K | 1000 | 10000        | 20000  |

Package Dimensions Unit: mm



| TABLE1   |           |
|----------|-----------|
| Symbol   | Dimension |
| H(max.)  | 10.5      |
| L(min.)  | 20.0      |
| D(max.)  | 7.50      |
| D1(±0.8) | 5.00      |
| T(max.)  | TABLE2    |
| d(±0.05) | 0.60      |

| TABLE2 |         |       |         |
|--------|---------|-------|---------|
| Model  | T(max.) | Model | T(max.) |
| 180L   | 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  | 6.5     |
| 181K   | 4.3     | 681K  | 6.8     |
| 201K   | 4.4     | 751K  | 6.9     |

Reliability Test (Mechanical Ratings)

| Test Parameter                      | Test Condition / Description  |          | Performance Requirements                           |                   |
|-------------------------------------|---|----------|--|-------------------|
| Terminal Pull Strength              | After gradually applying the load specified below and keeping the unit fixed for ten seconds, the terminal shall be visually examined for any damage  | Diameter | Loading  | No visible damage |
|                                     |   | 0.6mm    | 1.0 Kg   |                   |
|                                     |   | 0.8mm    | 1.0 Kg   |                   |
|                                     |   | 1.0mm    | 2.0 Kg   |                   |
| Terminal Bending Strength           | The unit shall be secured with its terminal kept vertical and the weight specified below be applied in the axial direction. The terminal shall gradually be bent by 90° in one direction, then 90° in the opposite direction, and again back to the original position. The damage of the terminal shall be visually examined. | Diameter | Loading  | No visible damage |
|                                     |   | 0.6mm    | 0.5 Kg   |                   |
|                                     |   | 0.8mm    | 0.5 Kg   |                   |
|                                     |   | 1.0mm    | 1.0 Kg   |                   |
|                                     |   |          |  |                   |
| Vibration                           | The Specimen shall be vibrated by its lead wires with a total amplitude of 1.5mm and a varying frequency of 10~55~10HZ(each minutes) for a period of 2 hours respectively in each X,Y and Z directions.   |          | No visible damage<br>$\Delta VB/VB\% \leq \pm 5\%$ |                   |
| Soldering-solder ability            | After dipping the terminal to depth of approximately 3mm from the specimen in a soldering bath of 260°C for 10±1(D5: 5±1) seconds. Thereafter the terminal shall be visually examined.  |          | Terminations shall be uniformly tinned             |                   |
| Soldering-Resistance to Solder Heat | After preheating the specimen, the specimen shall be completely immersed into a soldering bath having a temperature of 260±5°C for 10±1 (D5: 5±1) seconds or iron of 400±5°C for 3±0.5 seconds. There after the change of Vb and mechanical damage shall be examined.   |          | No visible damage<br>$\Delta VB/VB\% \leq \pm 5\%$ |                   |

Reliability Test (ENVIRONMENTAL RATINGS)

| Test Parameter           | Test Condition / Description   |      |           | Performance Requirements                            |   |
|--------------------------|--|------|-----------|---|---|
| Dry Heat Loading         | The specimen shall be applied continuously the maximum allowable voltage at the specified conditions for specified period and then stored at room temperature and normal humidity over 2 hours. Thereafter, the change of Vb and mechanical damage shall be examined. Ambient temp: 125±2°C ; Period: 1000±24hours |      |           | $\Delta VB/VB\% \leq \pm 10\%$                      |   |
| High Temperature Storage | In a drying oven without load. Ambient temp: 125±2°C ; period: 1000±24hours  |      |           | $\Delta VB/VB\% \leq \pm 5\%$                       |   |
| Damp Heat Loading        | The Specimen shall be vibrated by its lead wires with a total amplitude of 1.5mm and a varying frequency of 10~55~10HZ(each minutes) for a period of 2 hours respectively in each X,Y and Z directions.  |      |           | $\Delta VB/VB\% \leq \pm 10\%$                      |   |
| Temperature Cycle        | Condition the specimen to each temperature form step 1 to step 4 in this order for the period shown in the table of specifications. The change of Vb and mechanical damage shall be examined after 2 hours.  | Step | Temp°C    | Period  | No visible damage<br>$\Delta VB/VB\% \leq \pm 10\%$ |
|                          |  | 1    | 40+3°C    | 30 min.   |   |
|                          |  | 2    | Room Temp | 15 min.   |   |
|                          |  | 3    | 85+2°C    | 30 min.   |   |
|                          |  | 4    | Room Temp | 15 min.   |   |
| Surge Lifetime Rating    | 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. Vb and mechanical damage shall be examined.   |      |           | No visible damage<br>$\Delta VB/VB\% \leq \pm 10\%$ |   |
| Voltage Proof            | Voltage: 2500VAC Leakage Current $\leq 0.5\text{mA}$<br>Time: 60 Seconds   |      |           | No Breakdown  |   |

## Disclaimer

UNSEMI RESERVES THE RIGHT TO MAKE CHANGE ON OUR PRODUCTS , PRODUCTS SPECIFICATION AND DATA WITHOUT NOTICE TO IMPROVE RELIABILITY, FUNCTION OR DESIGN OR OTHERWISE.

UN SEMICONDUCTOR LIMITED its affiliates, agents, and employees, and all persons acting on its or their behalf (collectively, "UNSEMI") does not give any representations or warranties for any errors, inaccuracies or incompleteness contained in any datasheet or in any other disclosure relating to any product.

In no event shall UNSEMI be liable for any indirect, incidental, punitive, special or consequential damages (including any and all implied warranties, warranties of fitness for particular purpose, non-infringement and merchantability.) whether or not such damages are based on tort (including negligence), warranty, breach of contract or any other legal theory.

Statements regarding the suitability of products for certain types of applications are based on UNSEMI knowledge of typical requirements that are often placed on UNSEMI products in generic applications. Such statements are not binding, statements about the suitability of products for a particular application. It is the customer's responsibility to validate that a particular product with the properties described in the product specification is suitable for use in a particular application. Parameters provided in datasheets or specifications may vary in different applications and performance may vary over time. All operating parameters, including typical parameters, must be validated for each customer application by the customer's technical experts. Product specifications do not expand or otherwise modify UNSEMI's terms and conditions of purchase, including but not limited to the warranty expressed therein.

Unless otherwise agreed in writing, UNSEMI product is not designed, authorized or warranted to be suitable for use in medical life-saving, or life-sustaining application , nor in applications where failure or malfunction of a UNSEMI product can reasonably be expected to result in personal injury, death or severe property or environmental damage. UNSEMI and its suppliers accept no liability for inclusion or use of UNSEMI products in such equipment or applications and therefore such inclusion and/or use is at the customer's own risk.

All referenced brands, product names, service names and trademarks are the property of their respective owners.