

# Metal Oxide Varistor : TVR Series

## Disc Type Varistor for Surge Protection



### ■ Features

1. RoHS compliant
2. Halogen-free series are available
3. Body size:  $\Phi 5 \sim \Phi 20\text{mm}$
4. Wide operating voltage range:  $11\text{Vac} \sim 1000\text{ Vac}$
5. Operating temperature range:  $-40^{\circ}\text{C} \sim +105^{\circ}\text{C}$   
Storage temperature range:  $-40^{\circ}\text{C} \sim +125^{\circ}\text{C}$
6. Agency recognition: UL 1449 4<sup>th</sup> / cUL / TUV/ VDE/ CQC



### ■ Recommended Applications

1. Power supply
2. Home appliance
3. Industrial equipment
4. Telecommunication or telephone system
5. Smart meter
6. PLC (Power line communication)
7. Lighting products
8. Photovoltaic industry

### ■ Part Number Code

| T            | V                            | R         | 0                  | 5                             | 1                                       | 8 | 0                      | K          | S  |           |                                                          |    |    |                 |                     | Y                     |
|--------------|------------------------------|-----------|--------------------|-------------------------------|-----------------------------------------|---|------------------------|------------|----|-----------|----------------------------------------------------------|----|----|-----------------|---------------------|-----------------------|
| 1            | 2                            | 3         | 4                  | 5                             | 6                                       | 7 | 8                      | 9          | 10 | 11        | 12                                                       | 13 | 14 | 15              | 16                  |                       |
| Product Type |                              | Body Size |                    | Varistor Voltage( $V_{1mA}$ ) |                                         |   | Tolerance of $V_{1mA}$ |            |    | Packaging |                                                          |    |    | Optional Suffix |                     |                       |
|              |                              |           |                    |                               |                                         |   |                        |            |    |           |                                                          |    |    |                 |                     |                       |
| TVR          | THINKING Varistor TVR Series | 05        | $\Phi 5\text{mm}$  | 180                           | $18 \times 10^0\text{V} = 18\text{V}$   |   | K                      | $\pm 10\%$ |    | AR        | Tape & reel packing (hole pitch:12.7mm)                  |    |    | Y               | RoHS & HF Compliant |                       |
|              |                              | 07        | $\Phi 7\text{mm}$  | 241                           | $24 \times 10^1\text{V} = 240\text{V}$  |   |                        |            |    | ER        | Tape & reel packing (hole pitch:15.0mm)                  |    |    |                 |                     |                       |
|              |                              | 10        | $\Phi 10\text{mm}$ | 102                           | $10 \times 10^2\text{V} = 1000\text{V}$ |   |                        |            |    | AB        | Tape & ammo box packing (hole pitch:12.7mm)              |    |    |                 |                     |                       |
|              |                              | 14        | $\Phi 14\text{mm}$ |                               |                                         |   |                        |            |    | EB        | Tape & ammo box packing (hole pitch:15.0mm)              |    |    |                 |                     |                       |
|              |                              | 20        | $\Phi 20\text{mm}$ |                               |                                         |   |                        |            |    | C         | Bulk & cut lead (followed by the codes of 2 lead length) |    |    |                 |                     |                       |
|              |                              |           |                    |                               |                                         |   |                        |            |    | Blank     | Bulk                                                     |    |    |                 |                     | Internal Control Code |
|              |                              |           |                    |                               |                                         |   |                        |            |    |           |                                                          |    |    |                 |                     | 01~ZZ                 |

Note: Optional suffix will be the 11<sup>th</sup> digit if packaging and internal control codes are not coded.

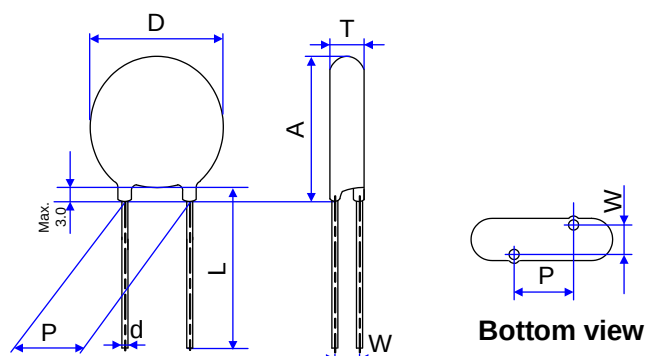
# Metal Oxide Varistor : TVR Series



## Disc Type Varistor for Surge Protection

### Structures and Dimensions

#### S Type (Straight lead)



(Unit: mm)

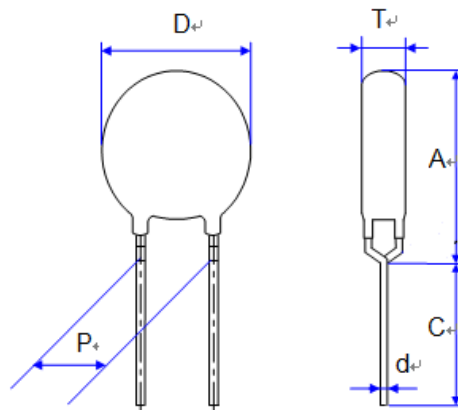
| Series | D                                      | Lmin. | d        | P                                                        | Amax.                                                                         | Tmax.                                                | W |
|--------|----------------------------------------|-------|----------|----------------------------------------------------------|-------------------------------------------------------------------------------|------------------------------------------------------|---|
| TVR05  | 5.0~7.0                                | 26.5  | 0.6±0.02 | 5.0±0.5 (for TVR180-561)<br>5.0±1.0 (for TVR621-751)     | 9.0                                                                           | Please refer to the Electrical Characteristics Table |   |
| TVR07  | 6.5~9.0                                | 26.5  | 0.6±0.02 | 5.0±0.5 (for TVR180-561)<br>5.0±1.0 (for TVR621-821)     | 11.0 (for TVR07180~621)<br>11.5 (for TVR07681~821)                            |                                                      |   |
| TVR10  | 9.5~12.5<br>9.5~13.5<br>(for TVR10182) | 26.5  | 0.8±0.02 | 7.5±0.5 (for TVR10180-561)<br>7.5±1.0 (for TVR10621-182) | 15.0 (for TVR10180-112)<br>15.5 (for TVR10122-182)                            |                                                      |   |
| TVR14  | 13.5~16.0                              | 26.5  | 0.8±0.02 | 7.5±0.5 (for TVR14180-561)<br>7.5±1.0 (for TVR14621-182) | 18.5 (for TVR14180-511)<br>19.0 (for TVR14561-182)                            |                                                      |   |
| TVR20  | 19.5~22.0                              | 22.5  | 1.0±0.02 | 10±1                                                     | 25.5 (for TVR20180-511)<br>26.0 (for TVR20561-112)<br>26.5 (for TVR20122-182) |                                                      |   |

# Metal Oxide Varistor : TVR Series

## Disc Type Varistor for Surge Protection



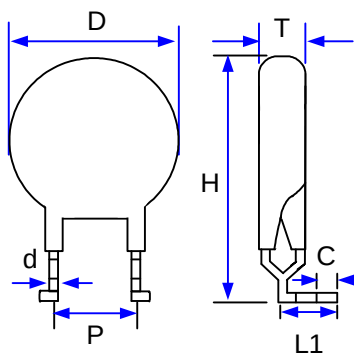
### ■ F Type (Y kink lead)



(Unit: mm)

| Series | D                                      | Cmin. | d        | P                                                        | Amax. | Tmax.                                                |
|--------|----------------------------------------|-------|----------|----------------------------------------------------------|-------|------------------------------------------------------|
| TVR05  | 5.0~7.0                                | 20    | 0.6±0.02 | 5.0±0.5 (for TVR05180-561)<br>5.0±1.0 (for TVR05621-751) | 9.5   | Please refer to the Electrical Characteristics Table |
| TVR07  | 6.5~9.0                                | 20    | 0.6±0.02 | 5.0±0.5 (for TVR07180-561)<br>5.0±1.0 (for TVR07621-821) | 11.5  |                                                      |
| TVR10  | 9.5~12.5<br>9.5~13.5<br>(for TVR10182) | 20    | 0.8±0.02 | 7.5±0.5 (for TVR10180-561)<br>7.5±1.0 (for TVR10621-182) | 16.0  |                                                      |
| TVR14  | 13.5 ~16.0                             | 20    | 0.8±0.02 | 7.5±0.5 (for TVR14180-561)<br>7.5±1.0 (for TVR14621-182) | 19.0  |                                                      |
| TVR20  | 19.5~22                                | 20    | 1.0±0.02 | 10±1                                                     | 26.5  |                                                      |

### ■ T Type (L kink lead)



(Unit: mm)

| Series | D                                      | C       | d        | P     | Hmax. | L1     | Tmax.                                                |
|--------|----------------------------------------|---------|----------|-------|-------|--------|------------------------------------------------------|
| TVR10  | 9.5~12.5<br>9.5~13.5<br>(for TVR10182) | 3.8±0.8 | 0.8±0.02 | 7.5±1 | 20.0  | 7.0±1  | Please refer to the Electrical Characteristics Table |
| TVR14  | 13.5 ~16.0                             |         | 0.8±0.02 | 7.5±1 | 23.5  | 10.0±1 |                                                      |
| TVR20  | 19.5~22                                |         | 1.0±0.02 | 10±1  | 30.5  | 9.0±1  |                                                      |

# Metal Oxide Varistor : TVR Series



## Disc Type Varistor for Surge Protection

### ■ Electrical Characteristics 05mm Series

| Part No. | Varistor Voltage<br>(@ 1mA DC) | Max. Continuous Voltage |                 | Max. Clamping Voltage<br>(8/20μs) |                | Max. Surge Current<br>(8/20μs) | Rated Power | Max. Energy<br>(10/1000μs) | Dimension        |                  |           |
|----------|--------------------------------|-------------------------|-----------------|-----------------------------------|----------------|--------------------------------|-------------|----------------------------|------------------|------------------|-----------|
|          | V <sub>1mA</sub>               | V <sub>AC(rms)</sub>    | V <sub>DC</sub> | V <sub>P</sub>                    | I <sub>P</sub> | I <sub>max</sub>               | P           | W <sub>max</sub>           | T <sub>min</sub> | T <sub>max</sub> | W<br>±1.0 |
|          | (V)                            | (V)                     | (V)             | (V)                               | (A)            | (A)                            | (W)         | (J)                        | (mm)             |                  |           |
| TVR05180 | 18 (16~20)                     | 11                      | 14              | 40                                | 1.0            | 100                            | 0.01        | 0.4                        | 2.2              | 3.9              | 1.5       |
| TVR05220 | 22 (20~24)                     | 14                      | 18              | 48                                | 1.0            | 100                            | 0.01        | 0.5                        | 2.2              | 4.1              | 1.5       |
| TVR05270 | 27 (24~30)                     | 17                      | 22              | 60                                | 1.0            | 100                            | 0.01        | 0.6                        | 2.4              | 4.3              | 1.5       |
| TVR05330 | 33 (30~36)                     | 20                      | 26              | 73                                | 1.0            | 100                            | 0.01        | 0.8                        | 2.6              | 4.5              | 1.5       |
| TVR05390 | 39 (35~43)                     | 25                      | 31              | 86                                | 1.0            | 100                            | 0.01        | 0.9                        | 2.6              | 4.6              | 1.5       |
| TVR05470 | 47 (42~52)                     | 30                      | 38              | 104                               | 1.0            | 100                            | 0.01        | 1.1                        | 2.3              | 4.2              | 1.5       |
| TVR05560 | 56 (50~62)                     | 35                      | 45              | 123                               | 1.0            | 100                            | 0.01        | 1.3                        | 2.6              | 4.3              | 1.5       |
| TVR05680 | 68 (61~75)                     | 40                      | 56              | 150                               | 1.0            | 100                            | 0.01        | 1.6                        | 2.8              | 4.6              | 1.5       |
| TVR05820 | 82 (74~90)                     | 50                      | 65              | 145                               | 5.0            | 400                            | 0.1         | 2.5                        | 2.0              | 3.9              | 1.5       |
| TVR05101 | 100 (90~110)                   | 60                      | 85              | 175                               | 5.0            | 400                            | 0.1         | 3.0                        | 2.1              | 4.1              | 1.6       |
| TVR05121 | 120 (108~132)                  | 75                      | 100             | 210                               | 5.0            | 400                            | 0.1         | 4.0                        | 2.5              | 4.3              | 1.8       |
| TVR05151 | 150 (135~165)                  | 95                      | 125             | 260                               | 5.0            | 400                            | 0.1         | 4.8                        | 2.0              | 4.6              | 1.6       |
| TVR05181 | 180 (162~198)                  | 115                     | 150             | 315                               | 5.0            | 400                            | 0.1         | 5.9                        | 2.0              | 3.9              | 1.4       |
| TVR05201 | 200 (180~220)                  | 130                     | 170             | 355                               | 5.0            | 400                            | 0.1         | 6.5                        | 2.1              | 4.0              | 1.5       |
| TVR05221 | 220 (198~242)                  | 140                     | 180             | 380                               | 5.0            | 400                            | 0.1         | 7.0                        | 2.1              | 4.0              | 1.5       |
| TVR05241 | 240 (216~264)                  | 150                     | 200             | 415                               | 5.0            | 400                            | 0.1         | 8.0                        | 2.3              | 4.2              | 1.6       |
| TVR05271 | 270 (243~297)                  | 175                     | 225             | 475                               | 5.0            | 400                            | 0.1         | 8.5                        | 2.4              | 4.4              | 1.7       |
| TVR05301 | 300 (270~330)                  | 195                     | 250             | 525                               | 5.0            | 400                            | 0.1         | 8.5                        | 2.7              | 4.4              | 1.9       |
| TVR05331 | 330 (297~363)                  | 215                     | 275             | 585                               | 5.0            | 400                            | 0.1         | 9.2                        | 2.8              | 4.5              | 2.0       |
| TVR05361 | 360 (324~396)                  | 230                     | 300             | 620                               | 5.0            | 400                            | 0.1         | 10                         | 2.9              | 4.6              | 2.1       |
| TVR05391 | 390 (351~429)                  | 250                     | 320             | 675                               | 5.0            | 400                            | 0.1         | 12                         | 3.1              | 4.8              | 2.3       |
| TVR05431 | 430 (387~473)                  | 275                     | 350             | 745                               | 5.0            | 400                            | 0.1         | 13                         | 3.0              | 5.1              | 2.3       |
| TVR05471 | 470 (423~517)                  | 300                     | 385             | 810                               | 5.0            | 400                            | 0.1         | 15                         | 3.2              | 5.2              | 2.4       |
| TVR05511 | 510 (459~561)                  | 320                     | 410             | 878                               | 5.0            | 400                            | 0.1         | 16                         | 3.4              | 5.4              | 2.6       |
| TVR05561 | 560 (504~616)                  | 350                     | 450             | 962                               | 5.0            | 400                            | 0.1         | 18                         | 3.6              | 5.5              | 2.8       |
| TVR05621 | 620 (558~682)                  | 395                     | 510             | 1050                              | 5.0            | 400                            | 0.1         | 18                         | 3.9              | 5.9              | 3.0       |
| TVR05681 | 680 (612~748)                  | 420                     | 560             | 1120                              | 5.0            | 400                            | 0.1         | 18                         | 4.1              | 6.2              | 3.2       |
| TVR05751 | 750 (675~825)                  | 465                     | 615             | 1240                              | 5.0            | 400                            | 0.1         | 18                         | 4.4              | 6.4              | 3.5       |

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## Disc Type Varistor for Surge Protection

### 07mm Series

| Part No. | Varistor Voltage<br>(@ 1mA DC) | Max. Continuous Voltage |                 | Max. Clamping Voltage<br>(8/20μs) |                | Max. Surge Current<br>(8/20μs) | Rated Power | Max. Energy<br>(10/1000μs) | Dimension        |                  |           |
|----------|--------------------------------|-------------------------|-----------------|-----------------------------------|----------------|--------------------------------|-------------|----------------------------|------------------|------------------|-----------|
|          | V <sub>1mA</sub>               | V <sub>AC(rms)</sub>    | V <sub>DC</sub> | V <sub>P</sub>                    | I <sub>P</sub> | I <sub>max</sub>               | P           | W <sub>max</sub>           | T <sub>min</sub> | T <sub>max</sub> | W<br>±1.0 |
|          | (V)                            | (V)                     | (V)             | (V)                               | (A)            | (A)                            | (W)         | (J)                        | (mm)             |                  |           |
| TVR07180 | 18 (16~20)                     | 11                      | 14              | 36                                | 2.5            | 250                            | 0.02        | 0.9                        | 2.2              | 3.9              | 1.3       |
| TVR07220 | 22 (20~24)                     | 14                      | 18              | 43                                | 2.5            | 250                            | 0.02        | 1.1                        | 2.2              | 4.1              | 1.4       |
| TVR07270 | 27 (24~30)                     | 17                      | 22              | 53                                | 2.5            | 250                            | 0.02        | 1.4                        | 2.4              | 4.3              | 1.5       |
| TVR07330 | 33 (30~36)                     | 20                      | 26              | 65                                | 2.5            | 250                            | 0.02        | 1.7                        | 2.6              | 4.5              | 1.7       |
| TVR07390 | 39 (35~43)                     | 25                      | 31              | 77                                | 2.5            | 250                            | 0.02        | 2.1                        | 2.6              | 4.6              | 1.8       |
| TVR07470 | 47 (42~52)                     | 30                      | 38              | 93                                | 2.5            | 250                            | 0.02        | 2.5                        | 2.3              | 4.2              | 1.9       |
| TVR07560 | 56 (50~62)                     | 35                      | 45              | 110                               | 2.5            | 250                            | 0.02        | 3.1                        | 2.6              | 4.3              | 2.0       |
| TVR07680 | 68 (61~75)                     | 40                      | 56              | 135                               | 2.5            | 250                            | 0.02        | 3.6                        | 2.3              | 4.6              | 2.1       |
| TVR07820 | 82 (74~90)                     | 50                      | 65              | 135                               | 10             | 1200                           | 0.25        | 5.5                        | 2.0              | 3.9              | 1.5       |
| TVR07101 | 100 (90~110)                   | 60                      | 85              | 165                               | 10             | 1200                           | 0.25        | 6.5                        | 2.1              | 4.1              | 1.6       |
| TVR07121 | 120 (108~132)                  | 75                      | 100             | 200                               | 10             | 1200                           | 0.25        | 7.8                        | 2.5              | 4.3              | 1.8       |
| TVR07151 | 150 (135~165)                  | 95                      | 125             | 250                               | 10             | 1200                           | 0.25        | 9.7                        | 2.0              | 4.6              | 1.6       |
| TVR07181 | 180 (162~198)                  | 115                     | 150             | 300                               | 10             | 1200                           | 0.25        | 11.7                       | 2.0              | 3.9              | 1.4       |
| TVR07201 | 200 (180~220)                  | 130                     | 170             | 340                               | 10             | 1200                           | 0.25        | 13                         | 2.1              | 4.0              | 1.5       |
| TVR07221 | 220 (198~242)                  | 140                     | 180             | 360                               | 10             | 1200                           | 0.25        | 14                         | 2.1              | 4.0              | 1.5       |
| TVR07241 | 240 (216~264)                  | 150                     | 200             | 395                               | 10             | 1200                           | 0.25        | 15                         | 2.3              | 4.2              | 1.6       |
| TVR07271 | 270 (243~297)                  | 175                     | 225             | 455                               | 10             | 1200                           | 0.25        | 18                         | 2.4              | 4.4              | 1.7       |
| TVR07301 | 300 (270~330)                  | 195                     | 250             | 500                               | 10             | 1200                           | 0.25        | 21                         | 2.7              | 4.4              | 1.9       |
| TVR07331 | 330 (297~363)                  | 215                     | 275             | 550                               | 10             | 1200                           | 0.25        | 23                         | 2.8              | 4.5              | 2.0       |
| TVR07361 | 360 (324~396)                  | 230                     | 300             | 595                               | 10             | 1200                           | 0.25        | 25                         | 2.9              | 4.6              | 2.1       |
| TVR07391 | 390 (351~429)                  | 250                     | 320             | 650                               | 10             | 1200                           | 0.25        | 25                         | 3.1              | 4.8              | 2.3       |
| TVR07431 | 430 (387~473)                  | 275                     | 350             | 710                               | 10             | 1200                           | 0.25        | 28                         | 3.0              | 5.1              | 2.3       |
| TVR07471 | 470 (423~517)                  | 300                     | 385             | 775                               | 10             | 1200                           | 0.25        | 30                         | 3.2              | 5.2              | 2.4       |
| TVR07511 | 510 (459~561)                  | 320                     | 410             | 845                               | 10             | 1200                           | 0.25        | 33                         | 3.4              | 5.4              | 2.6       |
| TVR07561 | 560 (504~616)                  | 350                     | 450             | 930                               | 10             | 1200                           | 0.25        | 33                         | 3.6              | 5.5              | 2.8       |
| TVR07621 | 620 (558~682)                  | 395                     | 510             | 1020                              | 10             | 1200                           | 0.25        | 35                         | 3.9              | 5.9              | 3.0       |
| TVR07681 | 680 (612~748)                  | 420                     | 560             | 1120                              | 10             | 1200                           | 0.25        | 35                         | 4.1              | 6.2              | 3.2       |
| TVR07751 | 750 (675~825)                  | 465                     | 615             | 1235                              | 10             | 1200                           | 0.25        | 38                         | 4.4              | 6.4              | 3.5       |
| TVR07821 | 820 (738~902)                  | 510                     | 670             | 1355                              | 10             | 1200                           | 0.25        | 42                         | 4.5              | 6.4              | 3.2       |

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## Disc Type Varistor for Surge Protection

### 10mm Series

| Part No. | Varistor Voltage<br>(@ 1mA DC) | Max. Continuous Voltage |                 | Max. Clamping Voltage<br>(8/20μs) |                | Max. Surge Current<br>(8/20μs) | Rated Power | Max. Energy<br>(10/1000μs) | Dimension        |                  |           |
|----------|--------------------------------|-------------------------|-----------------|-----------------------------------|----------------|--------------------------------|-------------|----------------------------|------------------|------------------|-----------|
|          | V <sub>1mA</sub>               | V <sub>AC(rms)</sub>    | V <sub>DC</sub> | V <sub>P</sub>                    | I <sub>P</sub> | I <sub>max</sub>               | P           | W <sub>max</sub>           | T <sub>min</sub> | T <sub>max</sub> | W<br>±1.0 |
|          | (V)                            | (V)                     | (V)             | (V)                               | (A)            | (A)                            | (W)         | (J)                        | (mm)             |                  |           |
| TVR10180 | 18 (16~20)                     | 11                      | 14              | 36                                | 5.0            | 500                            | 0.05        | 2.1                        | 2.6              | 4.3              | 1.3       |
| TVR10220 | 22 (20~24)                     | 14                      | 18              | 43                                | 5.0            | 500                            | 0.05        | 2.5                        | 2.6              | 4.5              | 1.4       |
| TVR10270 | 27 (24~30)                     | 17                      | 22              | 53                                | 5.0            | 500                            | 0.05        | 3.0                        | 2.8              | 4.7              | 1.5       |
| TVR10330 | 33 (30~36)                     | 20                      | 26              | 65                                | 5.0            | 500                            | 0.05        | 4.0                        | 2.9              | 4.9              | 1.7       |
| TVR10390 | 39 (35~43)                     | 25                      | 31              | 77                                | 5.0            | 500                            | 0.05        | 4.6                        | 2.7              | 5.1              | 1.8       |
| TVR10470 | 47 (42~52)                     | 30                      | 38              | 93                                | 5.0            | 500                            | 0.05        | 5.5                        | 2.7              | 4.5              | 1.8       |
| TVR10560 | 56 (50~62)                     | 35                      | 45              | 110                               | 5.0            | 500                            | 0.05        | 7.0                        | 3.0              | 4.7              | 1.9       |
| TVR10680 | 68 (61~75)                     | 40                      | 56              | 135                               | 5.0            | 500                            | 0.05        | 8.2                        | 2.6              | 5.0              | 2.2       |
| TVR10820 | 82 (74~90)                     | 50                      | 65              | 135                               | 25             | 2500                           | 0.4         | 12                         | 2.4              | 4.3              | 1.6       |
| TVR10101 | 100 (90~110)                   | 60                      | 85              | 165                               | 25             | 2500                           | 0.4         | 15                         | 2.6              | 4.5              | 1.8       |
| TVR10121 | 120 (108~132)                  | 75                      | 100             | 200                               | 25             | 2500                           | 0.4         | 18                         | 2.9              | 4.7              | 2.0       |
| TVR10151 | 150 (135~165)                  | 95                      | 125             | 250                               | 25             | 2500                           | 0.4         | 22                         | 2.4              | 5.0              | 1.8       |
| TVR10181 | 180 (162~198)                  | 115                     | 150             | 300                               | 25             | 2500                           | 0.4         | 27                         | 2.4              | 4.3              | 1.6       |
| TVR10201 | 200 (180~220)                  | 130                     | 170             | 340                               | 25             | 2500                           | 0.4         | 30                         | 2.5              | 4.4              | 1.7       |
| TVR10221 | 220 (198~242)                  | 140                     | 180             | 360                               | 25             | 2500                           | 0.4         | 32                         | 2.5              | 4.4              | 1.7       |
| TVR10241 | 240 (216~264)                  | 150                     | 200             | 395                               | 25             | 2500                           | 0.4         | 35                         | 2.7              | 4.6              | 1.8       |
| TVR10271 | 270 (243~297)                  | 175                     | 225             | 455                               | 25             | 2500                           | 0.4         | 40                         | 2.8              | 4.8              | 1.9       |
| TVR10301 | 300 (270~330)                  | 195                     | 250             | 500                               | 25             | 2500                           | 0.4         | 40                         | 3.1              | 4.8              | 2.1       |
| TVR10331 | 330 (297~363)                  | 215                     | 275             | 550                               | 25             | 2500                           | 0.4         | 43                         | 3.2              | 4.9              | 2.2       |
| TVR10361 | 360 (324~396)                  | 230                     | 300             | 595                               | 25             | 2500                           | 0.4         | 47                         | 3.3              | 5.0              | 2.3       |
| TVR10391 | 390 (351~429)                  | 250                     | 320             | 650                               | 25             | 2500                           | 0.4         | 60                         | 3.5              | 5.2              | 2.5       |
| TVR10431 | 430 (387~473)                  | 275                     | 350             | 710                               | 25             | 2500                           | 0.4         | 65                         | 3.4              | 5.5              | 2.5       |
| TVR10471 | 470 (423~517)                  | 300                     | 385             | 775                               | 25             | 2500                           | 0.4         | 70                         | 3.6              | 5.6              | 2.6       |
| TVR10511 | 510 (459~561)                  | 320                     | 410             | 845                               | 25             | 2500                           | 0.4         | 70                         | 3.8              | 5.8              | 2.8       |
| TVR10561 | 560 (504~616)                  | 350                     | 450             | 930                               | 25             | 2500                           | 0.4         | 70                         | 4.0              | 5.9              | 3.0       |
| TVR10621 | 620 (558~682)                  | 395                     | 510             | 1020                              | 25             | 2500                           | 0.4         | 70                         | 4.3              | 6.3              | 3.2       |
| TVR10681 | 680 (612~748)                  | 420                     | 560             | 1120                              | 25             | 2500                           | 0.4         | 70                         | 4.5              | 6.6              | 3.4       |
| TVR10751 | 750 (675~825)                  | 465                     | 615             | 1235                              | 25             | 2500                           | 0.4         | 75                         | 4.8              | 6.8              | 3.7       |
| TVR10821 | 820 (738~902)                  | 510                     | 670             | 1355                              | 25             | 2500                           | 0.4         | 85                         | 4.9              | 6.8              | 3.4       |
| TVR10911 | 910 (819~1001)                 | 550                     | 745             | 1500                              | 25             | 2500                           | 0.4         | 93                         | 5.3              | 7.2              | 3.7       |
| TVR10102 | 1000 (900~1100)                | 625                     | 825             | 1650                              | 25             | 2500                           | 0.4         | 102                        | 5.5              | 7.5              | 4.0       |
| TVR10112 | 1100 (990~1210)                | 680                     | 895             | 1815                              | 25             | 2500                           | 0.4         | 115                        | 5.7              | 8.0              | 4.3       |
| TVR10122 | 1200 (1080~1320)               | 725                     | 975             | 1980                              | 25             | 2500                           | 0.4         | 125                        | 6.0              | 8.1              | 5.2       |
| TVR10142 | 1400 (1260~1540)               | 820                     | 1140            | 2300                              | 25             | 2500                           | 0.4         | 145                        | 6.6              | 8.7              | 6.0       |
| TVR10162 | 1600 (1440~1760)               | 910                     | 1300            | 2630                              | 25             | 2500                           | 0.4         | 165                        | 7.1              | 9.8              | 6.7       |
| TVR10182 | 1800 (1620~1980)               | 1000                    | 1465            | 2950                              | 25             | 2500                           | 0.4         | 185                        | 7.8              | 10.3             | 7.4       |

# Metal Oxide Varistor : TVR Series



## Disc Type Varistor for Surge Protection

### 14mm Series

| Part No. | Varistor Voltage<br>(@ 1mA DC) | Max. Continuous Voltage |                 | Max. Clamping Voltage<br>(8/20μs) |                | Max. Surge Current<br>(8/20μs) | Rated Power | Max. Energy<br>(10/1000μs) | Dimension        |                  |           |
|----------|--------------------------------|-------------------------|-----------------|-----------------------------------|----------------|--------------------------------|-------------|----------------------------|------------------|------------------|-----------|
|          | V <sub>1mA</sub>               | V <sub>AC(rms)</sub>    | V <sub>DC</sub> | V <sub>P</sub>                    | I <sub>P</sub> | I <sub>max</sub>               | P           | W <sub>max</sub>           | T <sub>min</sub> | T <sub>max</sub> | W<br>±1.0 |
|          | (V)                            | (V)                     | (V)             | (V)                               | (A)            | (A)                            | (W)         | (J)                        | (mm)             |                  |           |
| TVR14180 | 18 (16~20)                     | 11                      | 14              | 36                                | 10             | 1000                           | 0.1         | 4.0                        | 2.6              | 4.3              | 1.3       |
| TVR14220 | 22 (20~24)                     | 14                      | 18              | 43                                | 10             | 1000                           | 0.1         | 5.0                        | 2.6              | 4.5              | 1.4       |
| TVR14270 | 27 (24~30)                     | 17                      | 22              | 53                                | 10             | 1000                           | 0.1         | 6.0                        | 2.8              | 4.7              | 1.5       |
| TVR14330 | 33 (30~36)                     | 20                      | 26              | 65                                | 10             | 1000                           | 0.1         | 7.5                        | 2.9              | 4.9              | 1.7       |
| TVR14390 | 39 (35~43)                     | 25                      | 31              | 77                                | 10             | 1000                           | 0.1         | 8.6                        | 2.7              | 5.1              | 1.8       |
| TVR14470 | 47 (42~52)                     | 30                      | 38              | 93                                | 10             | 1000                           | 0.1         | 10                         | 2.7              | 4.5              | 1.8       |
| TVR14560 | 56 (50~62)                     | 35                      | 45              | 110                               | 10             | 1000                           | 0.1         | 11                         | 3.0              | 4.7              | 1.9       |
| TVR14680 | 68 (61~75)                     | 40                      | 56              | 135                               | 10             | 1000                           | 0.1         | 14                         | 3.1              | 5.0              | 2.2       |
| TVR14820 | 82 (74~90)                     | 50                      | 65              | 135                               | 50             | 4500                           | 0.6         | 22                         | 2.4              | 4.3              | 1.6       |
| TVR14101 | 100 (90~110)                   | 60                      | 85              | 165                               | 50             | 4500                           | 0.6         | 28                         | 2.6              | 4.5              | 1.8       |
| TVR14121 | 120 (108~132)                  | 75                      | 100             | 200                               | 50             | 4500                           | 0.6         | 32                         | 2.9              | 4.7              | 2.0       |
| TVR14151 | 150 (135~165)                  | 95                      | 125             | 250                               | 50             | 4500                           | 0.6         | 40                         | 2.4              | 5.0              | 1.8       |
| TVR14181 | 180 (162~198)                  | 115                     | 150             | 300                               | 50             | 4500                           | 0.6         | 52                         | 2.4              | 4.3              | 1.6       |
| TVR14201 | 200 (180~220)                  | 130                     | 170             | 340                               | 50             | 4500                           | 0.6         | 57                         | 2.5              | 4.4              | 1.7       |
| TVR14221 | 220 (198~242)                  | 140                     | 180             | 360                               | 50             | 4500                           | 0.6         | 60                         | 2.5              | 4.4              | 1.7       |
| TVR14241 | 240 (216~264)                  | 150                     | 200             | 395                               | 50             | 4500                           | 0.6         | 63                         | 2.7              | 4.6              | 1.8       |
| TVR14271 | 270 (243~297)                  | 175                     | 225             | 455                               | 50             | 4500                           | 0.6         | 70                         | 2.8              | 4.8              | 1.9       |
| TVR14301 | 300 (270~330)                  | 195                     | 250             | 500                               | 50             | 4500                           | 0.6         | 78                         | 3.1              | 4.8              | 2.1       |
| TVR14331 | 330 (297~363)                  | 215                     | 275             | 550                               | 50             | 4500                           | 0.6         | 85                         | 3.2              | 4.9              | 2.2       |
| TVR14361 | 360 (324~396)                  | 230                     | 300             | 595                               | 50             | 4500                           | 0.6         | 93                         | 3.3              | 5.0              | 2.3       |
| TVR14391 | 390 (351~429)                  | 250                     | 320             | 650                               | 50             | 4500                           | 0.6         | 100                        | 3.5              | 5.2              | 2.5       |
| TVR14431 | 430 (387~473)                  | 275                     | 350             | 710                               | 50             | 4500                           | 0.6         | 115                        | 3.4              | 5.5              | 2.5       |
| TVR14471 | 470 (423~517)                  | 300                     | 385             | 775                               | 50             | 4500                           | 0.6         | 125                        | 3.6              | 5.6              | 2.6       |
| TVR14511 | 510 (459~561)                  | 320                     | 410             | 845                               | 50             | 4500                           | 0.6         | 125                        | 3.8              | 5.8              | 2.8       |
| TVR14561 | 560 (504~616)                  | 350                     | 450             | 930                               | 50             | 4500                           | 0.6         | 125                        | 4.0              | 5.9              | 3.0       |
| TVR14621 | 620 (558~682)                  | 395                     | 510             | 1020                              | 50             | 4500                           | 0.6         | 125                        | 4.3              | 6.3              | 3.2       |
| TVR14681 | 680 (612~748)                  | 420                     | 560             | 1120                              | 50             | 4500                           | 0.6         | 130                        | 4.5              | 6.6              | 3.4       |
| TVR14751 | 750 (675~825)                  | 465                     | 615             | 1235                              | 50             | 4500                           | 0.6         | 143                        | 4.8              | 6.8              | 3.7       |
| TVR14821 | 820 (738~902)                  | 510                     | 670             | 1355                              | 50             | 4500                           | 0.6         | 157                        | 4.9              | 6.8              | 3.4       |
| TVR14911 | 910 (819~1001)                 | 550                     | 745             | 1500                              | 50             | 4500                           | 0.6         | 175                        | 5.3              | 7.2              | 3.7       |
| TVR14102 | 1000 (900~1100)                | 625                     | 825             | 1650                              | 50             | 4500                           | 0.6         | 190                        | 5.5              | 7.5              | 4.0       |
| TVR14112 | 1100 (990~1210)                | 680                     | 895             | 1815                              | 50             | 4500                           | 0.6         | 213                        | 5.6              | 8.0              | 4.3       |
| TVR14122 | 1200 (1080~1320)               | 725                     | 975             | 1980                              | 50             | 4500                           | 0.6         | 230                        | 6.0              | 8.1              | 5.2       |
| TVR14142 | 1400 (1260~1540)               | 820                     | 1140            | 2300                              | 50             | 4500                           | 0.6         | 250                        | 6.6              | 8.7              | 6.0       |
| TVR14162 | 1600 (1440~1760)               | 910                     | 1300            | 2630                              | 50             | 4500                           | 0.6         | 315                        | 7.1              | 9.8              | 6.7       |
| TVR14182 | 1800 (1620~1980)               | 1000                    | 1465            | 2950                              | 50             | 4500                           | 0.6         | 354                        | 7.8              | 10.3             | 7.4       |

# Metal Oxide Varistor : TVR Series

## Disc Type Varistor for Surge Protection



### 20mm Series

| Part No. | Varistor Voltage<br>(@ 1mA DC) | Max. Continuous Voltage |                 | Max. Clamping Voltage<br>(8/20μs) |                | Max. Surge Current<br>(8/20μs) | Rated Power | Max. Energy<br>(10/1000μs) | Dimension        |                  |           |
|----------|--------------------------------|-------------------------|-----------------|-----------------------------------|----------------|--------------------------------|-------------|----------------------------|------------------|------------------|-----------|
|          | V <sub>1mA</sub>               | V <sub>AC(rms)</sub>    | V <sub>DC</sub> | V <sub>P</sub>                    | I <sub>P</sub> | I <sub>max</sub>               | P           | W <sub>max</sub>           | T <sub>min</sub> | T <sub>max</sub> | W<br>±1.0 |
|          | (V)                            | (V)                     | (V)             | (V)                               | (A)            | (A)                            | (W)         | (J)                        | (mm)             |                  |           |
| TVR20180 | 18 (16~20)                     | 11                      | 14              | 36                                | 20             | 2000                           | 0.2         | 11                         | 3.0              | 4.7              | 1.3       |
| TVR20220 | 22 (20~24)                     | 14                      | 18              | 43                                | 20             | 2000                           | 0.2         | 14                         | 3.0              | 4.9              | 1.4       |
| TVR20270 | 27 (24~30)                     | 17                      | 22              | 53                                | 20             | 2000                           | 0.2         | 18                         | 3.2              | 5.1              | 1.5       |
| TVR20330 | 33 (30~36)                     | 20                      | 26              | 65                                | 20             | 2000                           | 0.2         | 23                         | 3.4              | 5.3              | 1.7       |
| TVR20390 | 39 (35~43)                     | 25                      | 31              | 77                                | 20             | 2000                           | 0.2         | 26                         | 3.1              | 5.5              | 1.7       |
| TVR20470 | 47 (42~52)                     | 30                      | 38              | 93                                | 20             | 2000                           | 0.2         | 33                         | 3.1              | 4.9              | 1.8       |
| TVR20560 | 56 (50~62)                     | 35                      | 45              | 110                               | 20             | 2000                           | 0.2         | 41                         | 3.4              | 5.1              | 2.0       |
| TVR20680 | 68 (61~75)                     | 40                      | 56              | 135                               | 20             | 2000                           | 0.2         | 46                         | 3.5              | 5.4              | 2.2       |
| TVR20820 | 82 (74~90)                     | 50                      | 65              | 135                               | 100            | 6500                           | 1.0         | 48                         | 2.8              | 4.7              | 1.8       |
| TVR20101 | 100 (90~110)                   | 60                      | 85              | 165                               | 100            | 6500                           | 1.0         | 51                         | 3.1              | 4.9              | 2.0       |
| TVR20121 | 120 (108~132)                  | 75                      | 100             | 200                               | 100            | 6500                           | 1.0         | 55                         | 3.3              | 5.1              | 2.2       |
| TVR20151 | 150 (135~165)                  | 95                      | 125             | 250                               | 100            | 6500                           | 1.0         | 70                         | 2.8              | 5.4              | 2.0       |
| TVR20181 | 180 (162~198)                  | 115                     | 150             | 300                               | 100            | 6500                           | 1.0         | 84                         | 2.8              | 4.7              | 1.8       |
| TVR20201 | 200 (180~220)                  | 130                     | 170             | 340                               | 100            | 6500                           | 1.0         | 95                         | 2.9              | 4.8              | 1.9       |
| TVR20221 | 220 (198~242)                  | 140                     | 180             | 360                               | 100            | 6500                           | 1.0         | 100                        | 2.9              | 4.8              | 1.9       |
| TVR20241 | 240 (216~264)                  | 150                     | 200             | 395                               | 100            | 6500                           | 1.0         | 108                        | 3.1              | 5.0              | 2.0       |
| TVR20271 | 270 (243~297)                  | 175                     | 225             | 455                               | 100            | 6500                           | 1.0         | 127                        | 3.2              | 5.2              | 2.1       |
| TVR20301 | 300 (270~330)                  | 195                     | 250             | 500                               | 100            | 6500                           | 1.0         | 136                        | 3.5              | 5.2              | 2.3       |
| TVR20331 | 330 (297~363)                  | 215                     | 275             | 550                               | 100            | 6500                           | 1.0         | 150                        | 3.6              | 5.3              | 2.4       |
| TVR20361 | 360 (324~396)                  | 230                     | 300             | 595                               | 100            | 6500                           | 1.0         | 163                        | 3.7              | 5.4              | 2.5       |
| TVR20391 | 390 (351~429)                  | 250                     | 320             | 650                               | 100            | 6500                           | 1.0         | 180                        | 3.9              | 5.6              | 2.7       |
| TVR20431 | 430 (387~473)                  | 275                     | 350             | 710                               | 100            | 6500                           | 1.0         | 190                        | 3.8              | 5.9              | 2.7       |
| TVR20471 | 470 (423~517)                  | 300                     | 385             | 775                               | 100            | 6500                           | 1.0         | 220                        | 4.0              | 6.0              | 2.8       |
| TVR20511 | 510 (459~561)                  | 320                     | 410             | 845                               | 100            | 6500                           | 1.0         | 220                        | 4.2              | 6.2              | 3.0       |
| TVR20561 | 560 (504~616)                  | 350                     | 450             | 930                               | 100            | 6500                           | 1.0         | 220                        | 4.4              | 6.3              | 3.2       |
| TVR20621 | 620 (558~682)                  | 395                     | 510             | 1020                              | 100            | 6500                           | 1.0         | 220                        | 4.7              | 6.7              | 3.4       |
| TVR20681 | 680 (612~748)                  | 420                     | 560             | 1120                              | 100            | 6500                           | 1.0         | 230                        | 4.9              | 7.0              | 3.6       |
| TVR20751 | 750 (675~825)                  | 465                     | 615             | 1235                              | 100            | 6500                           | 1.0         | 255                        | 5.2              | 7.2              | 3.9       |
| TVR20821 | 820 (738~902)                  | 510                     | 670             | 1355                              | 100            | 6500                           | 1.0         | 282                        | 5.3              | 7.2              | 3.6       |
| TVR20911 | 910 (819~1001)                 | 550                     | 745             | 1500                              | 100            | 6500                           | 1.0         | 310                        | 5.7              | 7.6              | 3.9       |
| TVR20102 | 1000 (900~1100)                | 625                     | 825             | 1650                              | 100            | 6500                           | 1.0         | 342                        | 6.1              | 7.9              | 4.2       |
| TVR20112 | 1100 (990~1210)                | 680                     | 895             | 1815                              | 100            | 6500                           | 1.0         | 383                        | 6.2              | 8.4              | 4.5       |
| TVR20122 | 1200 (1080~1320)               | 725                     | 975             | 1980                              | 100            | 6500                           | 1.0         | 415                        | 6.4              | 8.5              | 5.4       |
| TVR20142 | 1400 (1260~1540)               | 820                     | 1140            | 2300                              | 100            | 6500                           | 1.0         | 480                        | 7.0              | 9.1              | 6.2       |
| TVR20162 | 1600 (1440~1760)               | 910                     | 1300            | 2630                              | 100            | 6500                           | 1.0         | 550                        | 7.5              | 10.2             | 6.9       |
| TVR20182 | 1800 (1620~1980)               | 1000                    | 1465            | 2950                              | 100            | 6500                           | 1.0         | 620                        | 8.5              | 10.7             | 7.6       |



# Metal Oxide Varistor : TVR Series

## Disc Type Varistor for Surge Protection



### ■ Safety Approvals

| Certified<br>Model No. | Agency                                                                            |                                                                                   |                                                                                     |                                                                                     |
|------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
|                        |  |  |  |  |
|                        | UL1449 4 <sup>th</sup><br>& cUL                                                   | EN/IEC 61051-1,<br>IEC 61051-2,<br>IEC 61051-2-2                                  | IEC 61051-1<br>IEC 61051-2<br>IEC 61051-2-2                                         | GB/T10193<br>GB/T10194                                                              |
|                        | E314979                                                                           | J50411784                                                                         | 5944                                                                                | CQC03001005165<br>CQC03001007654                                                    |
| TVR05180               | √                                                                                 | √                                                                                 | √                                                                                   | √                                                                                   |
| TVR05220               | √                                                                                 | √                                                                                 | √                                                                                   | √                                                                                   |
| TVR05270               | √                                                                                 | √                                                                                 | √                                                                                   | √                                                                                   |
| TVR05330               | √                                                                                 | √                                                                                 | √                                                                                   | √                                                                                   |
| TVR05390               | √                                                                                 | √                                                                                 | √                                                                                   | √                                                                                   |
| TVR05470               | √                                                                                 | √                                                                                 | √                                                                                   | √                                                                                   |
| TVR05560               | √                                                                                 | √                                                                                 | √                                                                                   | √                                                                                   |
| TVR05680               | √                                                                                 | √                                                                                 | √                                                                                   | √                                                                                   |
| TVR05820               | √                                                                                 | √                                                                                 | √                                                                                   | √                                                                                   |
| TVR05101               | √                                                                                 | √                                                                                 | √                                                                                   | √                                                                                   |
| TVR05121               | √                                                                                 | √                                                                                 | √                                                                                   | √                                                                                   |
| TVR05151               | √                                                                                 | √                                                                                 | √                                                                                   | √                                                                                   |
| TVR05181               | √                                                                                 | √                                                                                 | √                                                                                   | √                                                                                   |
| TVR05201               | √                                                                                 | √                                                                                 | √                                                                                   | √                                                                                   |
| TVR05221               | √                                                                                 | √                                                                                 | √                                                                                   | √                                                                                   |
| TVR05241               | √                                                                                 | √                                                                                 | √                                                                                   | √                                                                                   |
| TVR05271               | √                                                                                 | √                                                                                 | √                                                                                   | √                                                                                   |
| TVR05301               | √                                                                                 | √                                                                                 | √                                                                                   | √                                                                                   |
| TVR05331               | √                                                                                 | √                                                                                 | √                                                                                   | √                                                                                   |
| TVR05361               | √                                                                                 | √                                                                                 | √                                                                                   | √                                                                                   |
| TVR05391               | √                                                                                 | √                                                                                 | √                                                                                   | √                                                                                   |
| TVR05431               | √                                                                                 | √                                                                                 | √                                                                                   | √                                                                                   |
| TVR05471               | √                                                                                 | √                                                                                 | √                                                                                   | √                                                                                   |
| TVR05511               | √                                                                                 | √                                                                                 | √                                                                                   | √                                                                                   |
| TVR05561               | √                                                                                 | √                                                                                 | √                                                                                   | √                                                                                   |
| TVR05621               | √                                                                                 | √                                                                                 | √                                                                                   | √                                                                                   |
| TVR05681               | √                                                                                 | √                                                                                 | √                                                                                   | √                                                                                   |
| TVR05751               | √                                                                                 | √                                                                                 |                                                                                     | √                                                                                   |

Note: UL/cUL/TUV/VDE/CQC certification: Operating Temperature is 105°C

# Metal Oxide Varistor : TVR Series

## Disc Type Varistor for Surge Protection



| Certified<br>Model No. | Agency                                                                            |                                                                                   |                                                                                     |                                                                                                                  |
|------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------|
|                        |  |  |  |                               |
|                        | UL1449 4 <sup>th</sup><br>& cUL                                                   | EN/IEC 61051-1,<br>IEC 61051-2,<br>IEC 61051-2-2                                  | IEC 61051-1<br>IEC 61051-2<br>IEC 61051-2-2                                         | GB/T10193<br>GB/T10194                                                                                           |
|                        | E314979                                                                           | J50411784                                                                         | 5944                                                                                | Current No.:<br>CQC03001005165<br>CQC03001007654<br>New No.: (Refer to Note)<br>CQC18001199806<br>CQC18001199789 |
| TVR07180               | √                                                                                 | √                                                                                 | √                                                                                   | √                                                                                                                |
| TVR07220               | √                                                                                 | √                                                                                 | √                                                                                   | √                                                                                                                |
| TVR07270               | √                                                                                 | √                                                                                 | √                                                                                   | √                                                                                                                |
| TVR07330               | √                                                                                 | √                                                                                 | √                                                                                   | √                                                                                                                |
| TVR07390               | √                                                                                 | √                                                                                 | √                                                                                   | √                                                                                                                |
| TVR07470               | √                                                                                 | √                                                                                 | √                                                                                   | √                                                                                                                |
| TVR07560               | √                                                                                 | √                                                                                 | √                                                                                   | √                                                                                                                |
| TVR07680               | √                                                                                 | √                                                                                 | √                                                                                   | √                                                                                                                |
| TVR07820               | √                                                                                 | √                                                                                 | √                                                                                   | √                                                                                                                |
| TVR07101               | √                                                                                 | √                                                                                 | √                                                                                   | √                                                                                                                |
| TVR07121               | √                                                                                 | √                                                                                 | √                                                                                   | √                                                                                                                |
| TVR07151               | √                                                                                 | √                                                                                 | √                                                                                   | √                                                                                                                |
| TVR07181               | √                                                                                 | √                                                                                 | √                                                                                   | √                                                                                                                |
| TVR07201               | √                                                                                 | √                                                                                 | √                                                                                   | √                                                                                                                |
| TVR07221               | √                                                                                 | √                                                                                 | √                                                                                   | √                                                                                                                |
| TVR07241               | √                                                                                 | √                                                                                 | √                                                                                   | √                                                                                                                |
| TVR07271               | √                                                                                 | √                                                                                 | √                                                                                   | √                                                                                                                |
| TVR07301               | √                                                                                 | √                                                                                 | √                                                                                   | √                                                                                                                |
| TVR07331               | √                                                                                 | √                                                                                 | √                                                                                   | √                                                                                                                |
| TVR07361               | √                                                                                 | √                                                                                 | √                                                                                   | √                                                                                                                |
| TVR07391               | √                                                                                 | √                                                                                 | √                                                                                   | √                                                                                                                |
| TVR07431               | √                                                                                 | √                                                                                 | √                                                                                   | √                                                                                                                |
| TVR07471               | √                                                                                 | √                                                                                 | √                                                                                   | √                                                                                                                |
| TVR07511               | √                                                                                 | √                                                                                 | √                                                                                   | √                                                                                                                |
| TVR07561               | √                                                                                 | √                                                                                 | √                                                                                   | √                                                                                                                |
| TVR07621               | √                                                                                 | √                                                                                 | √                                                                                   | √                                                                                                                |
| TVR07681               | √                                                                                 | √                                                                                 | √                                                                                   | √                                                                                                                |
| TVR07751               | √                                                                                 | √                                                                                 | √                                                                                   | √                                                                                                                |
| TVR07821               | √                                                                                 | √                                                                                 | √                                                                                   | √                                                                                                                |

Note:

1. For CQC certification, its current and New numbers are both effective. However, its current number will be cancelled on 2019/12/31, and only its NEW number will be available from 2020/01/01. Please use NEW number as your first priority.
2. UL/cUL/TUV/VDE/CQC certification: Operating Temperature is 105°C

# Metal Oxide Varistor : TVR Series

## Disc Type Varistor for Surge Protection



| Certified<br>Model No. | Agency                                                                            |                                                                                   |                                                                                     |                                                                                                                |
|------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------|
|                        |  |  |  |                             |
|                        | UL1449 4 <sup>th</sup><br>& cUL                                                   | EN/IEC 61051-1,<br>IEC 61051-2,<br>IEC 61051-2-2                                  | IEC 61051-1<br>IEC 61051-2<br>IEC 61051-2-2                                         | GB/T10193<br>GB/T10194                                                                                         |
|                        | E314979                                                                           | J50411784                                                                         | 5944                                                                                | Current No.<br>CQC03001005165<br>CQC03001007654<br>New No: (Refer to Note)<br>CQC18001200336<br>CQC18001199790 |
| TVR10180               | √                                                                                 | √                                                                                 | √                                                                                   | √                                                                                                              |
| TVR10220               | √                                                                                 | √                                                                                 | √                                                                                   | √                                                                                                              |
| TVR10270               | √                                                                                 | √                                                                                 | √                                                                                   | √                                                                                                              |
| TVR10330               | √                                                                                 | √                                                                                 | √                                                                                   | √                                                                                                              |
| TVR10390               | √                                                                                 | √                                                                                 | √                                                                                   | √                                                                                                              |
| TVR10470               | √                                                                                 | √                                                                                 | √                                                                                   | √                                                                                                              |
| TVR10560               | √                                                                                 | √                                                                                 | √                                                                                   | √                                                                                                              |
| TVR10680               | √                                                                                 | √                                                                                 | √                                                                                   | √                                                                                                              |
| TVR10820               | √                                                                                 | √                                                                                 | √                                                                                   | √                                                                                                              |
| TVR10101               | √                                                                                 | √                                                                                 | √                                                                                   | √                                                                                                              |
| TVR10121               | √                                                                                 | √                                                                                 | √                                                                                   | √                                                                                                              |
| TVR10151               | √                                                                                 | √                                                                                 | √                                                                                   | √                                                                                                              |
| TVR10181               | √                                                                                 | √                                                                                 | √                                                                                   | √                                                                                                              |
| TVR10201               | √                                                                                 | √                                                                                 | √                                                                                   | √                                                                                                              |
| TVR10221               | √                                                                                 | √                                                                                 | √                                                                                   | √                                                                                                              |
| TVR10241               | √                                                                                 | √                                                                                 | √                                                                                   | √                                                                                                              |
| TVR10271               | √                                                                                 | √                                                                                 | √                                                                                   | √                                                                                                              |
| TVR10301               | √                                                                                 | √                                                                                 | √                                                                                   | √                                                                                                              |
| TVR10331               | √                                                                                 | √                                                                                 | √                                                                                   | √                                                                                                              |
| TVR10361               | √                                                                                 | √                                                                                 | √                                                                                   | √                                                                                                              |
| TVR10391               | √                                                                                 | √                                                                                 | √                                                                                   | √                                                                                                              |
| TVR10431               | √                                                                                 | √                                                                                 | √                                                                                   | √                                                                                                              |
| TVR10471               | √                                                                                 | √                                                                                 | √                                                                                   | √                                                                                                              |
| TVR10511               | √                                                                                 | √                                                                                 | √                                                                                   | √                                                                                                              |
| TVR10561               | √                                                                                 | √                                                                                 | √                                                                                   | √                                                                                                              |
| TVR10621               | √                                                                                 | √                                                                                 | √                                                                                   | √                                                                                                              |
| TVR10681               | √                                                                                 | √                                                                                 | √                                                                                   | √                                                                                                              |
| TVR10751               | √                                                                                 | √                                                                                 | √                                                                                   | √                                                                                                              |
| TVR10821               | √                                                                                 | √                                                                                 | √                                                                                   | √                                                                                                              |
| TVR10911               | √                                                                                 | √                                                                                 | √                                                                                   | √                                                                                                              |
| TVR10102               | √                                                                                 | √                                                                                 | √                                                                                   | √                                                                                                              |
| TVR10112               | √                                                                                 | √                                                                                 | √                                                                                   | √                                                                                                              |
| TVR10122               | √                                                                                 | √                                                                                 | √                                                                                   | √                                                                                                              |
| TVR10142               | √                                                                                 | √                                                                                 | √                                                                                   | √                                                                                                              |
| TVR10162               | √                                                                                 | √                                                                                 | √                                                                                   | √                                                                                                              |
| TVR10182               | √                                                                                 | √                                                                                 | √                                                                                   | √                                                                                                              |

Note:

1. For CQC certification, its current and New numbers are both effective. However, its current number will be cancelled on 2019/12/31, and only its NEW number will be available from 2020/01/01. Please use NEW number as your first priority.
2. UL/cUL/TUV/VDE/CQC certification: Operating Temperature is 105°C

# Metal Oxide Varistor : TVR Series

## Disc Type Varistor for Surge Protection



| Certified Model No. | Agency                       |                                            |                                                   |                                            |                         |                                                                                                                |                           |
|---------------------|------------------------------|--------------------------------------------|---------------------------------------------------|--------------------------------------------|-------------------------|----------------------------------------------------------------------------------------------------------------|---------------------------|
|                     |                              |                                            |                                                   |                                            |                         |                                                                                                                |                           |
|                     | UL1449 4 <sup>th</sup> & cUL | EN/IEC 61051-1, IEC 61051-2, IEC 61051-2-2 | IEC/EN 60950-1 Annex Q IEC/EN 62368-1 Annex G.8.2 | EN/IEC 61051-1, IEC 61051-2, IEC 61051-2-2 | IEC 62368-1 Annex G.8.2 | GB/T10193-1997 GB/T10194-1997                                                                                  | GB8898-2011 GB4943.1-2011 |
|                     | E314979                      | J50411784                                  |                                                   | 5944                                       |                         | Current No.<br>CQC03001005165<br>CQC03001007654<br>New No: (Refer to Note)<br>CQC18001199842<br>CQC18001198951 |                           |
| TVR14180            | √                            | √                                          |                                                   | √                                          |                         | √                                                                                                              |                           |
| TVR14220            | √                            | √                                          |                                                   | √                                          |                         | √                                                                                                              |                           |
| TVR14270            | √                            | √                                          |                                                   | √                                          |                         | √                                                                                                              |                           |
| TVR14330            | √                            | √                                          |                                                   | √                                          |                         | √                                                                                                              |                           |
| TVR14390            | √                            | √                                          |                                                   | √                                          |                         | √                                                                                                              |                           |
| TVR14470            | √                            | √                                          |                                                   | √                                          |                         | √                                                                                                              |                           |
| TVR14560            | √                            | √                                          |                                                   | √                                          |                         | √                                                                                                              |                           |
| TVR14680            | √                            | √                                          |                                                   | √                                          |                         | √                                                                                                              |                           |
| TVR14820            | √                            | √                                          |                                                   | √                                          |                         | √                                                                                                              |                           |
| TVR14101            | √                            | √                                          |                                                   | √                                          |                         | √                                                                                                              |                           |
| TVR14121            | √                            | √                                          |                                                   | √                                          |                         | √                                                                                                              |                           |
| TVR14151            | √                            | √                                          |                                                   | √                                          |                         | √                                                                                                              |                           |
| TVR14181            | √                            | √                                          | √                                                 | √                                          | √                       | √                                                                                                              |                           |
| TVR14201            | √                            | √                                          | √                                                 | √                                          | √                       | √                                                                                                              | √                         |
| TVR14221            | √                            | √                                          | √                                                 | √                                          | √                       | √                                                                                                              | √                         |
| TVR14241            | √                            | √                                          | √                                                 | √                                          | √                       | √                                                                                                              | √                         |
| TVR14271            | √                            | √                                          | √                                                 | √                                          | √                       | √                                                                                                              | √                         |
| TVR14301            | √                            | √                                          | √                                                 | √                                          | √                       | √                                                                                                              | √                         |
| TVR14331            | √                            | √                                          | √                                                 | √                                          | √                       | √                                                                                                              | √                         |
| TVR14361            | √                            | √                                          | √                                                 | √                                          | √                       | √                                                                                                              | √                         |
| TVR14391            | √                            | √                                          | √                                                 | √                                          | √                       | √                                                                                                              | √                         |
| TVR14431            | √                            | √                                          | √                                                 | √                                          | √                       | √                                                                                                              | √                         |
| TVR14471            | √                            | √                                          | √                                                 | √                                          | √                       | √                                                                                                              | √                         |
| TVR14511            | √                            | √                                          | √                                                 | √                                          | √                       | √                                                                                                              | √                         |
| TVR14561            | √                            | √                                          | √                                                 | √                                          | √                       | √                                                                                                              | √                         |
| TVR14621            | √                            | √                                          | √                                                 | √                                          | √                       | √                                                                                                              | √                         |
| TVR14681            | √                            | √                                          | √                                                 | √                                          | √                       | √                                                                                                              | √                         |
| TVR14751            | √                            | √                                          | √                                                 | √                                          | √                       | √                                                                                                              | √                         |
| TVR14821            | √                            | √                                          | √                                                 | √                                          | √                       | √                                                                                                              | √                         |
| TVR14911            | √                            | √                                          | √                                                 | √                                          | √                       | √                                                                                                              | √                         |
| TVR14102            | √                            | √                                          | √                                                 | √                                          | √                       | √                                                                                                              | √                         |
| TVR14112            | √                            | √                                          | √                                                 | √                                          | √                       | √                                                                                                              | √                         |
| TVR14122            | √                            | √                                          | √                                                 | √                                          | √                       | √                                                                                                              | √                         |
| TVR14142            | √                            | √                                          | √                                                 | √                                          | √                       | √                                                                                                              | √                         |
| TVR14162            | √                            | √                                          | √                                                 | √                                          | √                       | √                                                                                                              | √                         |
| TVR14182            | √                            | √                                          | √                                                 | √                                          | √                       | √                                                                                                              | √                         |

Note:

1. For CQC certification, its current and New numbers are both effective. However, its current number will be cancelled on 2019/12/31, and only its NEW number will be available from 2020/01/01. Please use NEW number as your first priority.
2. UL/cUL/TUV/VDE/CQC certification: Operating Temperature is 105°C

# Metal Oxide Varistor : TVR Series

## Disc Type Varistor for Surge Protection



| Certified Model No. | Agency                       |                                            |                                                   |                                            |                         |                                                                                                                |                           |
|---------------------|------------------------------|--------------------------------------------|---------------------------------------------------|--------------------------------------------|-------------------------|----------------------------------------------------------------------------------------------------------------|---------------------------|
|                     |                              |                                            |                                                   |                                            |                         |                                                                                                                |                           |
|                     | UL1449 4 <sup>th</sup> & cUL | EN/IEC 61051-1, IEC 61051-2, IEC 61051-2-2 | IEC/EN 60950-1 Annex Q IEC/EN 62368-1 Annex G.8.2 | EN/IEC 61051-1, IEC 61051-2, IEC 61051-2-2 | IEC 62368-1 Annex G.8.2 | GB/T10193-1997 GB/T10194-1997                                                                                  | GB8898-2011 GB4943.1-2011 |
|                     | E314979                      | J50411784                                  |                                                   | 5944                                       |                         | Current No.<br>CQC03001005165<br>CQC03001007654<br>New No: (Refer to Note)<br>CQC18001199807<br>CQC18001198952 |                           |
| TVR20180            | √                            | √                                          |                                                   | √                                          |                         | √                                                                                                              |                           |
| TVR20220            | √                            | √                                          |                                                   | √                                          |                         | √                                                                                                              |                           |
| TVR20270            | √                            | √                                          |                                                   | √                                          |                         | √                                                                                                              |                           |
| TVR20330            | √                            | √                                          |                                                   | √                                          |                         | √                                                                                                              |                           |
| TVR20390            | √                            | √                                          |                                                   | √                                          |                         | √                                                                                                              |                           |
| TVR20470            | √                            | √                                          |                                                   | √                                          |                         | √                                                                                                              |                           |
| TVR20560            | √                            | √                                          |                                                   | √                                          |                         | √                                                                                                              |                           |
| TVR20680            | √                            | √                                          |                                                   | √                                          |                         | √                                                                                                              |                           |
| TVR20820            | √                            | √                                          |                                                   | √                                          |                         | √                                                                                                              |                           |
| TVR20101            | √                            | √                                          |                                                   | √                                          |                         | √                                                                                                              |                           |
| TVR20121            | √                            | √                                          |                                                   | √                                          |                         | √                                                                                                              |                           |
| TVR20151            | √                            | √                                          |                                                   | √                                          |                         | √                                                                                                              |                           |
| TVR20181            | √                            | √                                          | √                                                 | √                                          | √                       | √                                                                                                              |                           |
| TVR20201            | √                            | √                                          | √                                                 | √                                          | √                       | √                                                                                                              | √                         |
| TVR20221            | √                            | √                                          | √                                                 | √                                          | √                       | √                                                                                                              | √                         |
| TVR20241            | √                            | √                                          | √                                                 | √                                          | √                       | √                                                                                                              | √                         |
| TVR20271            | √                            | √                                          | √                                                 | √                                          | √                       | √                                                                                                              | √                         |
| TVR20301            | √                            | √                                          | √                                                 | √                                          | √                       | √                                                                                                              | √                         |
| TVR20331            | √                            | √                                          | √                                                 | √                                          | √                       | √                                                                                                              | √                         |
| TVR20361            | √                            | √                                          | √                                                 | √                                          | √                       | √                                                                                                              | √                         |
| TVR20391            | √                            | √                                          | √                                                 | √                                          | √                       | √                                                                                                              | √                         |
| TVR20431            | √                            | √                                          | √                                                 | √                                          | √                       | √                                                                                                              | √                         |
| TVR20471            | √                            | √                                          | √                                                 | √                                          | √                       | √                                                                                                              | √                         |
| TVR20511            | √                            | √                                          | √                                                 | √                                          | √                       | √                                                                                                              | √                         |
| TVR20561            | √                            | √                                          | √                                                 | √                                          | √                       | √                                                                                                              | √                         |
| TVR20621            | √                            | √                                          | √                                                 | √                                          | √                       | √                                                                                                              | √                         |
| TVR20681            | √                            | √                                          | √                                                 | √                                          | √                       | √                                                                                                              | √                         |
| TVR20751            | √                            | √                                          | √                                                 | √                                          | √                       | √                                                                                                              | √                         |
| TVR20821            | √                            | √                                          | √                                                 | √                                          | √                       | √                                                                                                              | √                         |
| TVR20911            | √                            | √                                          | √                                                 | √                                          | √                       | √                                                                                                              | √                         |
| TVR20102            | √                            | √                                          | √                                                 | √                                          | √                       | √                                                                                                              | √                         |
| TVR20112            | √                            | √                                          | √                                                 | √                                          | √                       | √                                                                                                              | √                         |
| TVR20122            | √                            | √                                          | √                                                 | √                                          | √                       | √                                                                                                              | √                         |
| TVR20142            | √                            | √                                          | √                                                 | √                                          | √                       | √                                                                                                              | √                         |
| TVR20162            | √                            | √                                          | √                                                 | √                                          | √                       | √                                                                                                              | √                         |
| TVR20182            | √                            | √                                          | √                                                 | √                                          | √                       | √                                                                                                              | √                         |

Note:

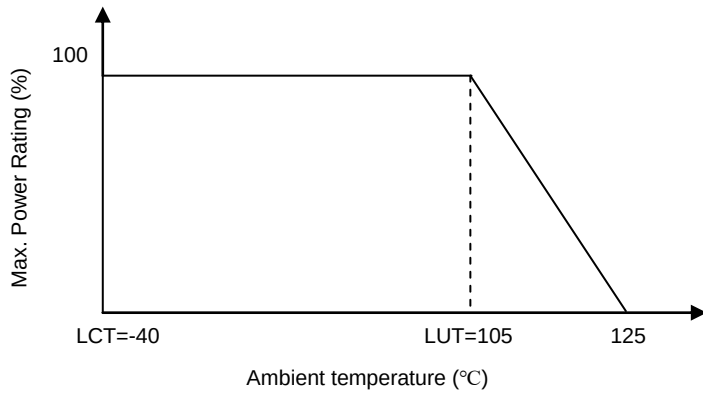
1. For CQC certification, its current and New numbers are both effective. However, its current number will be cancelled on 2019/12/31, and only its NEW number will be available from 2020/01/01. Please use NEW number as your first priority.
2. UL/cUL/TUV/VDE/CQC certification: Operating Temperature is 105°C

# Metal Oxide Varistor : TVR Series

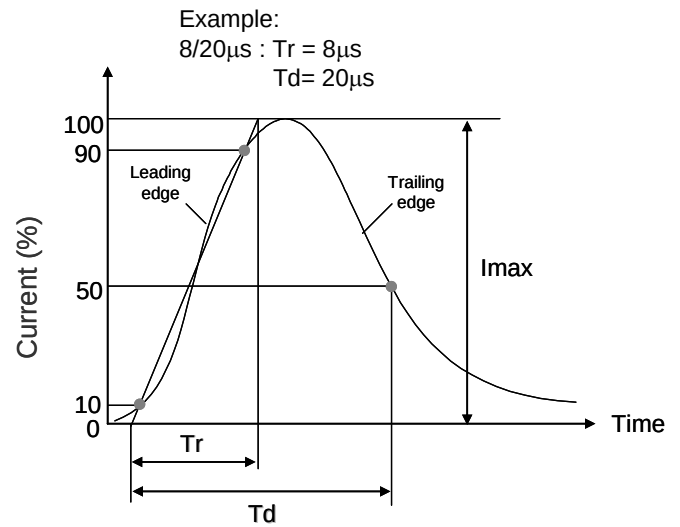


## Disc Type Varistor for Surge Protection

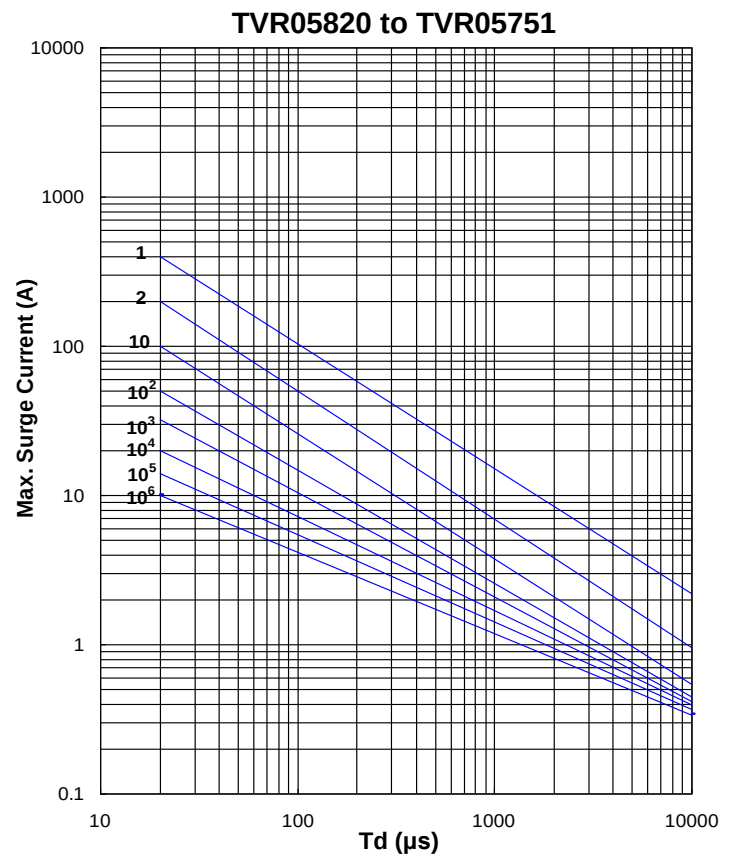
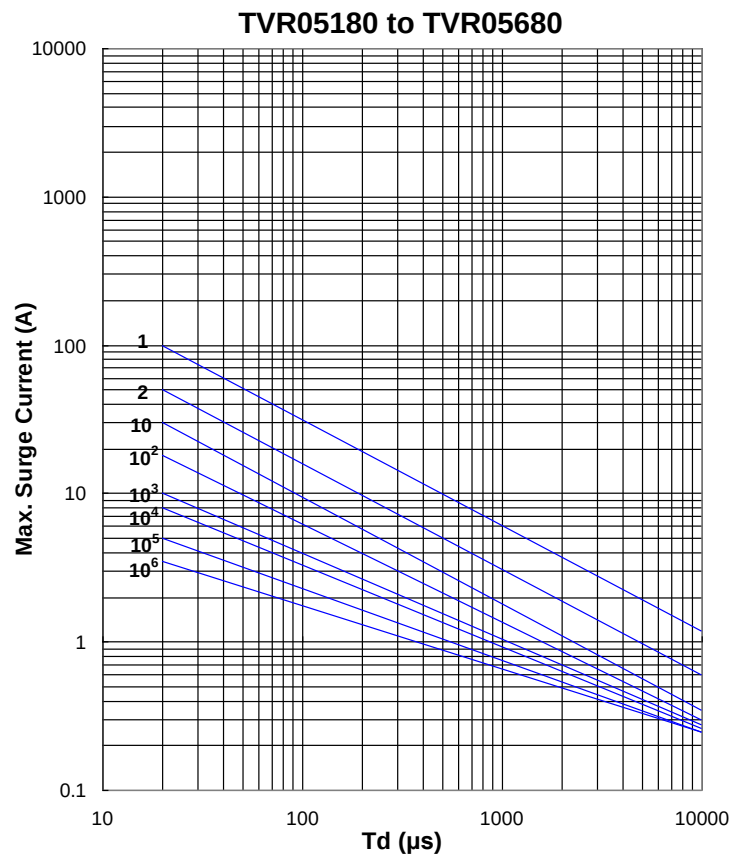
### Power Derating Curve



### Surge Current Standard Waveform



### Max. Surge Current Derating Curves



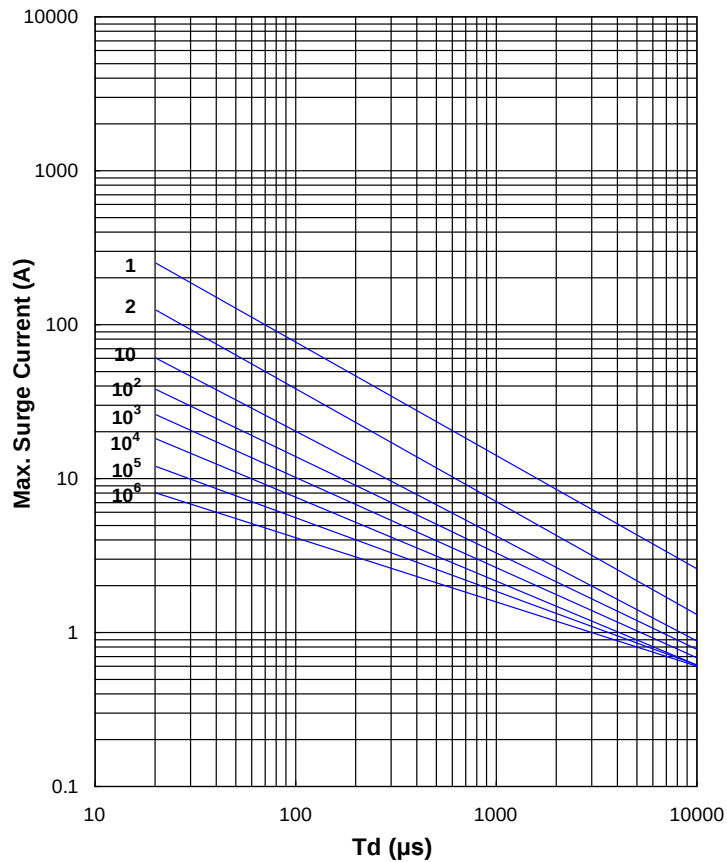
# Metal Oxide Varistor : TVR Series

## Disc Type Varistor for Surge Protection

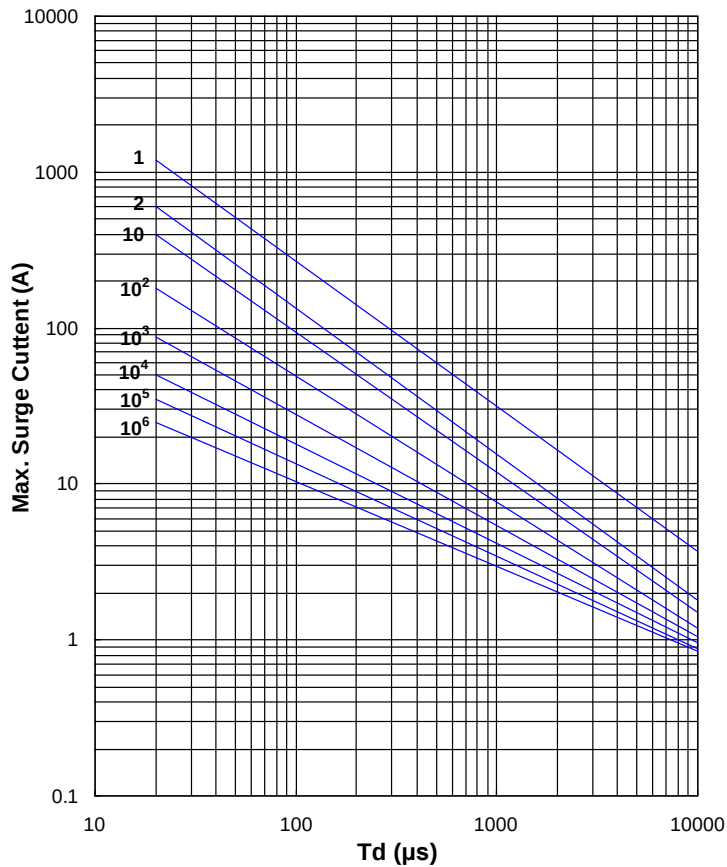


### ■ Max. Surge Current Derating Curves

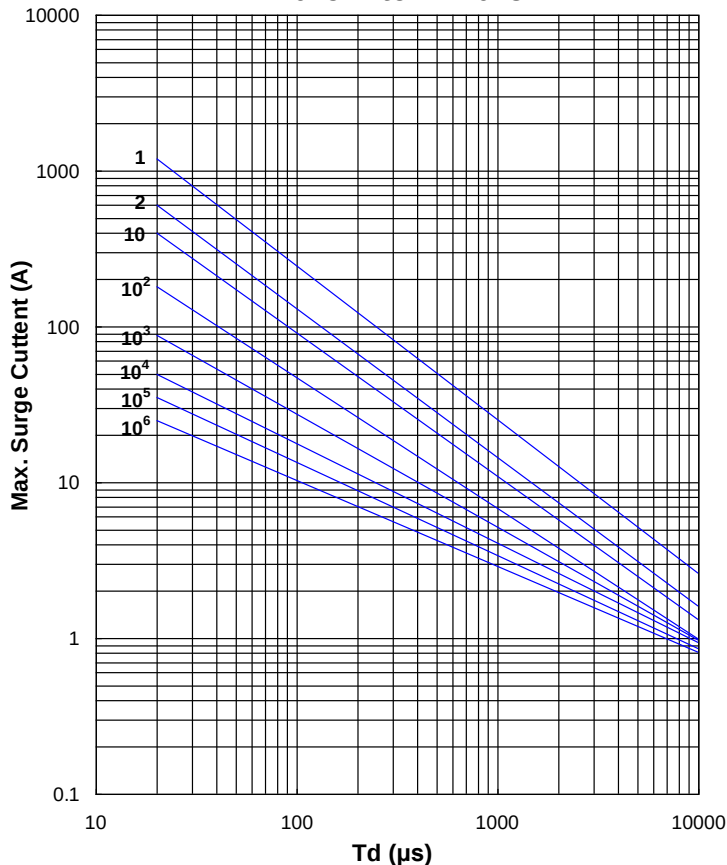
TVR07180 to TVR07680



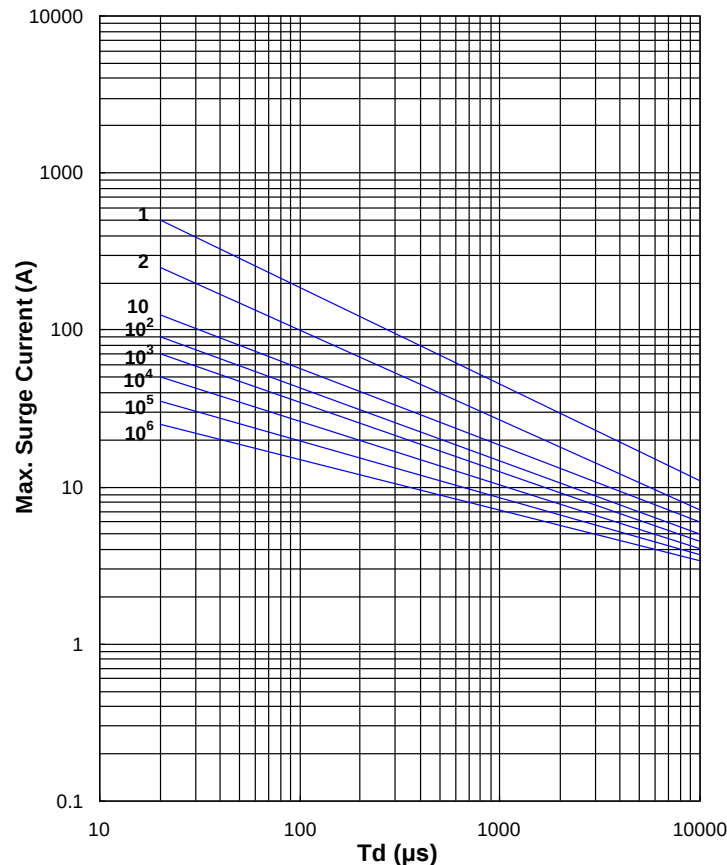
TVR07820 to TVR07471



TVR07511 to TVR07821



TVR10180 to TVR10680



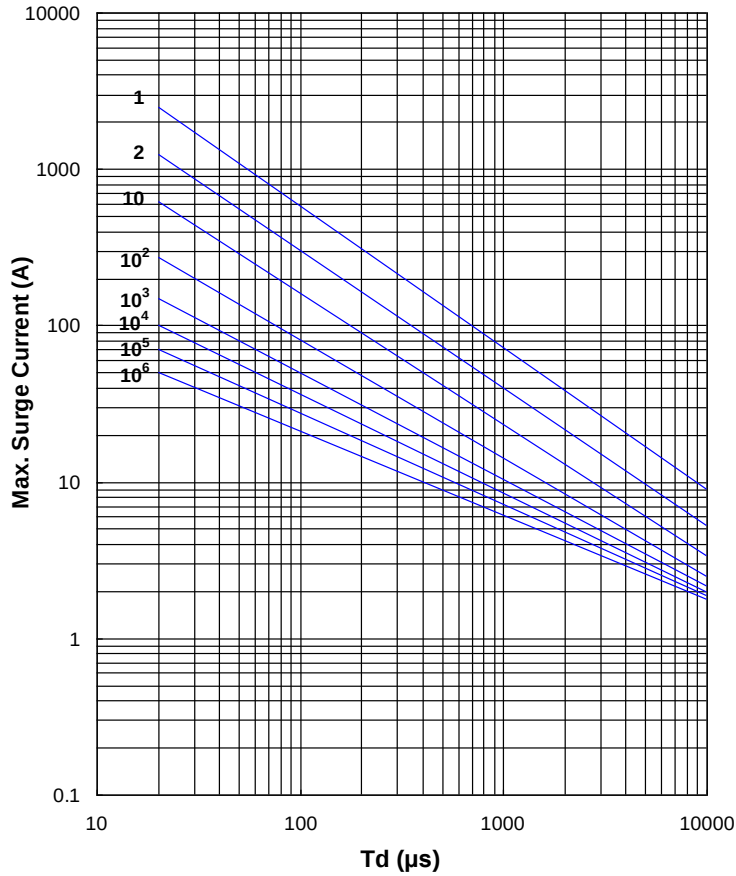
# Metal Oxide Varistor : TVR Series

## Disc Type Varistor for Surge Protection

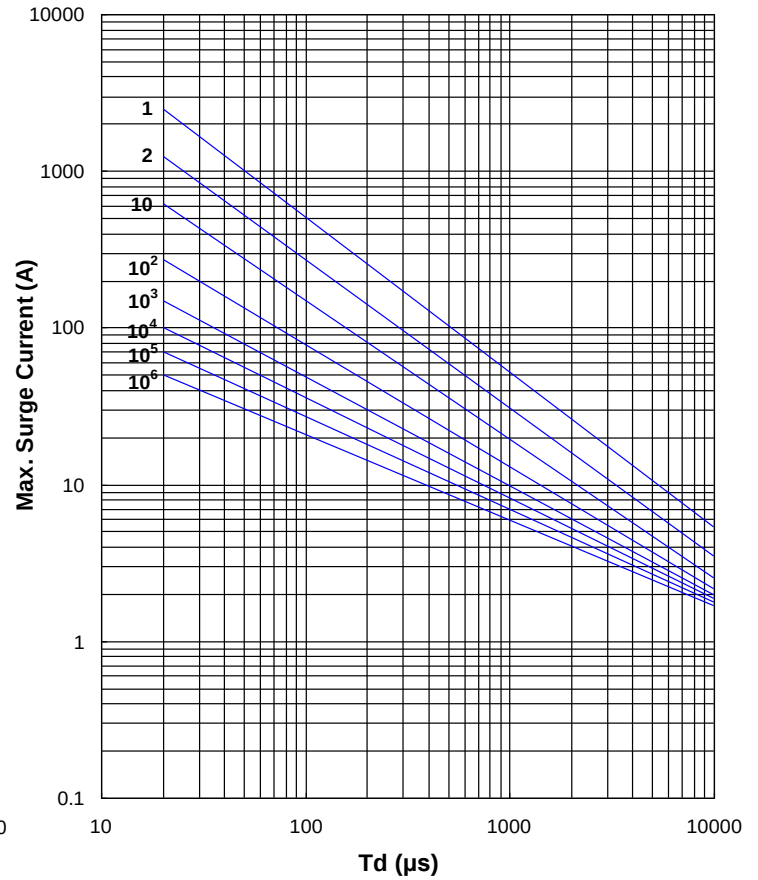


### ■ Max. Surge Current Derating Curves

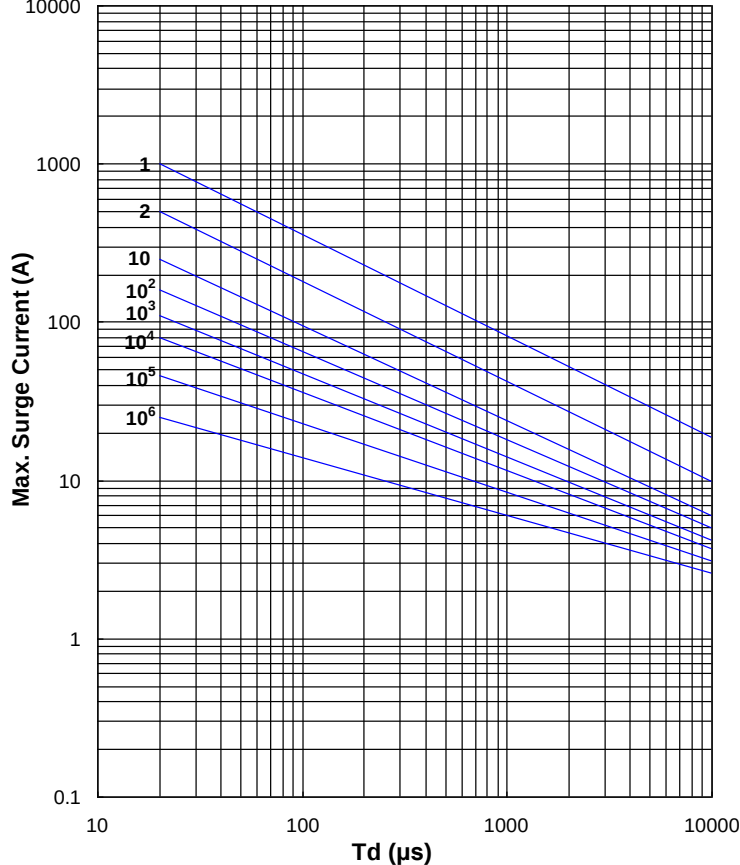
TVR10820 to TVR10751



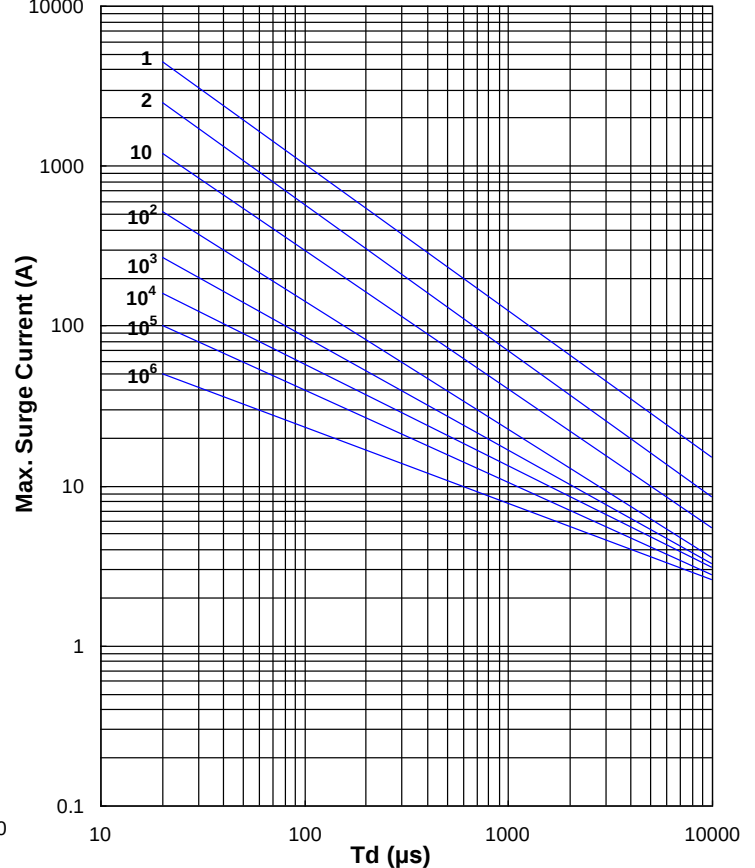
TVR10821 to TVR10182



TVR14180 to TVR14680



TVR14820 to TVR14751



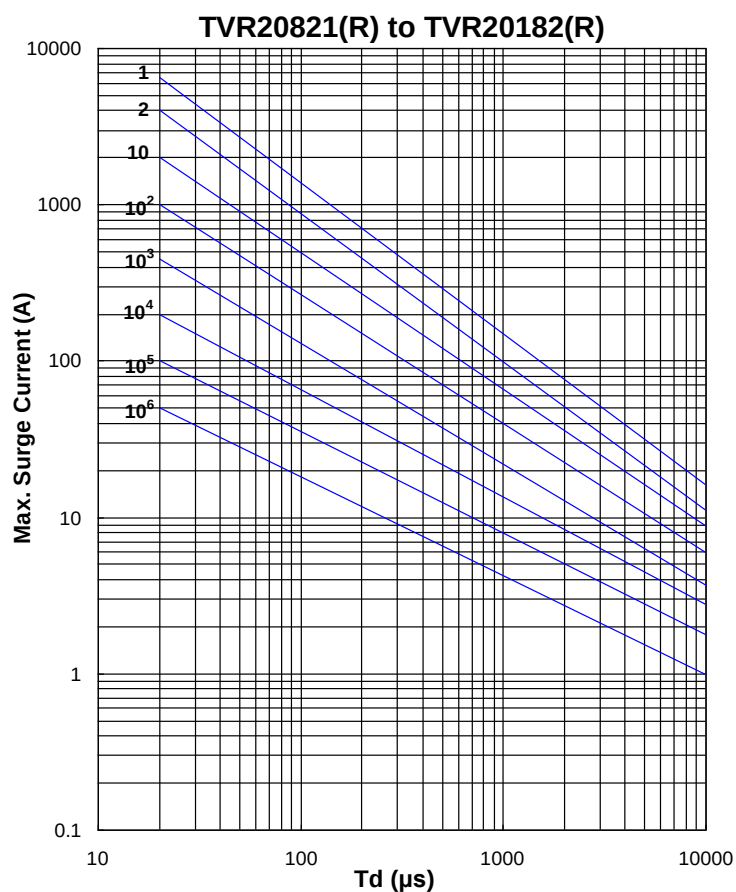
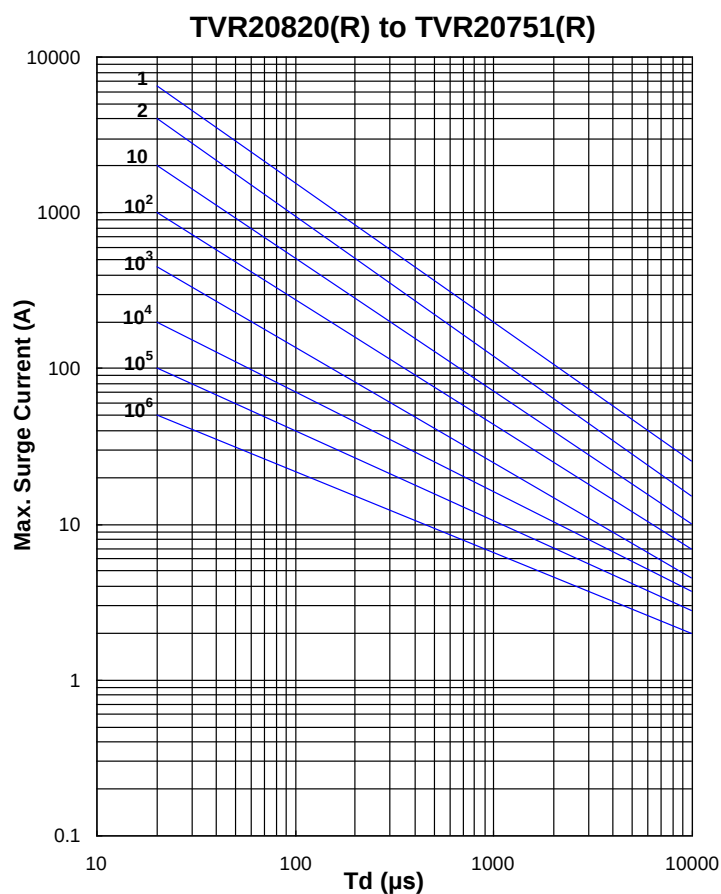
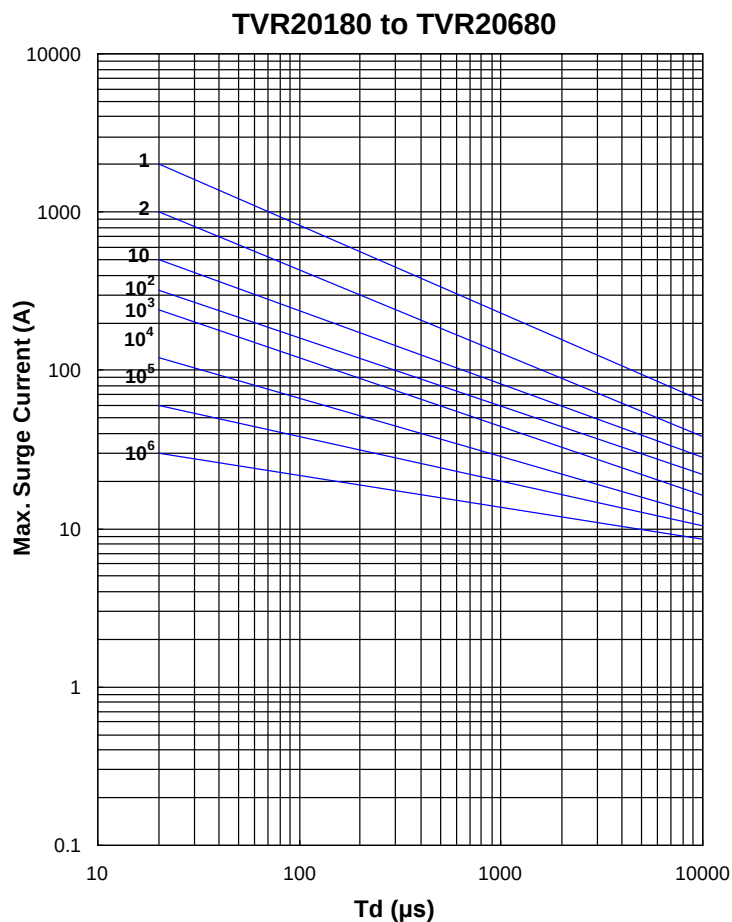
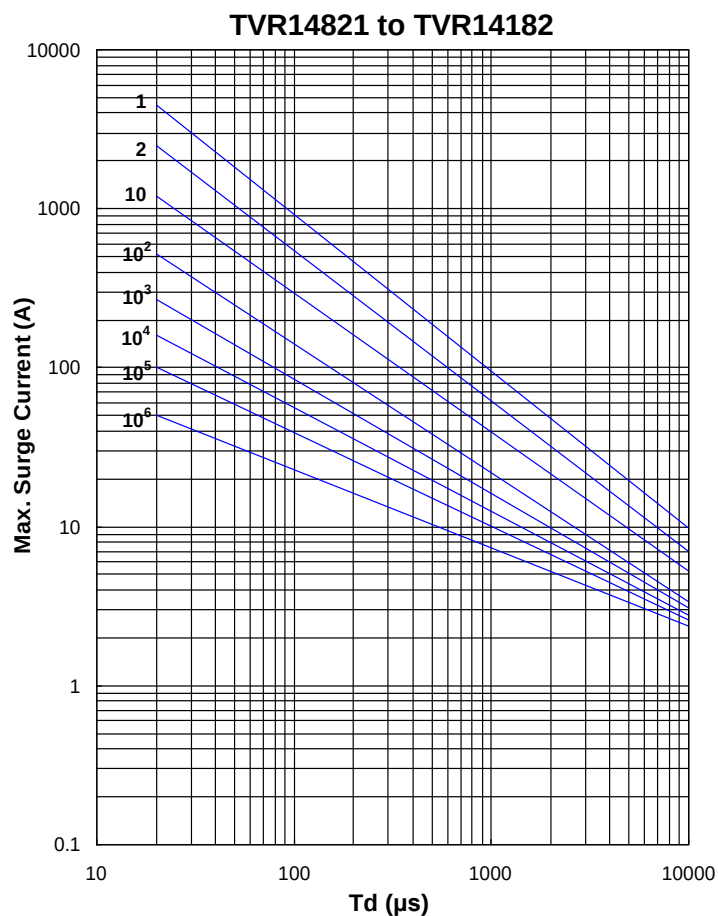


# Metal Oxide Varistor : TVR Series

## Disc Type Varistor for Surge Protection



### ■ Max. Surge Current Derating Curves



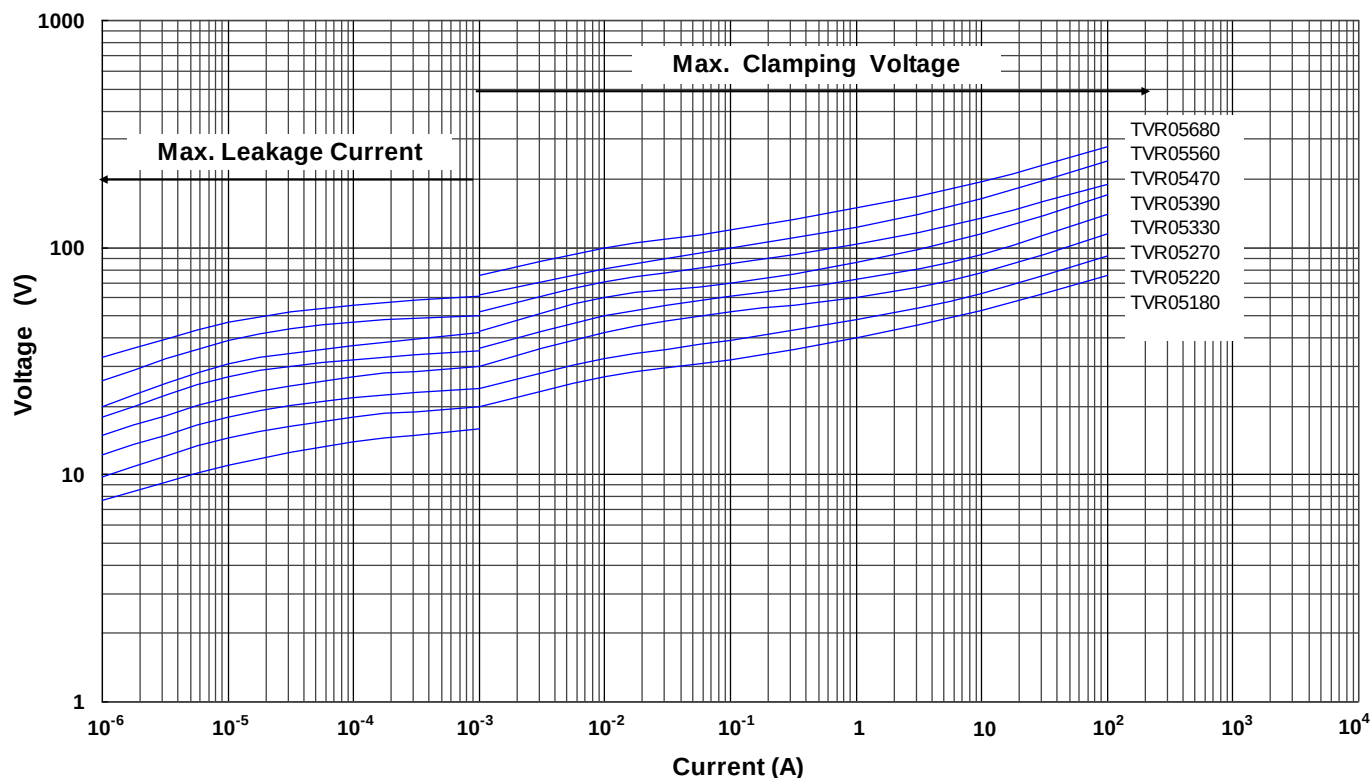
# Metal Oxide Varistor : TVR Series

## Disc Type Varistor for Surge Protection

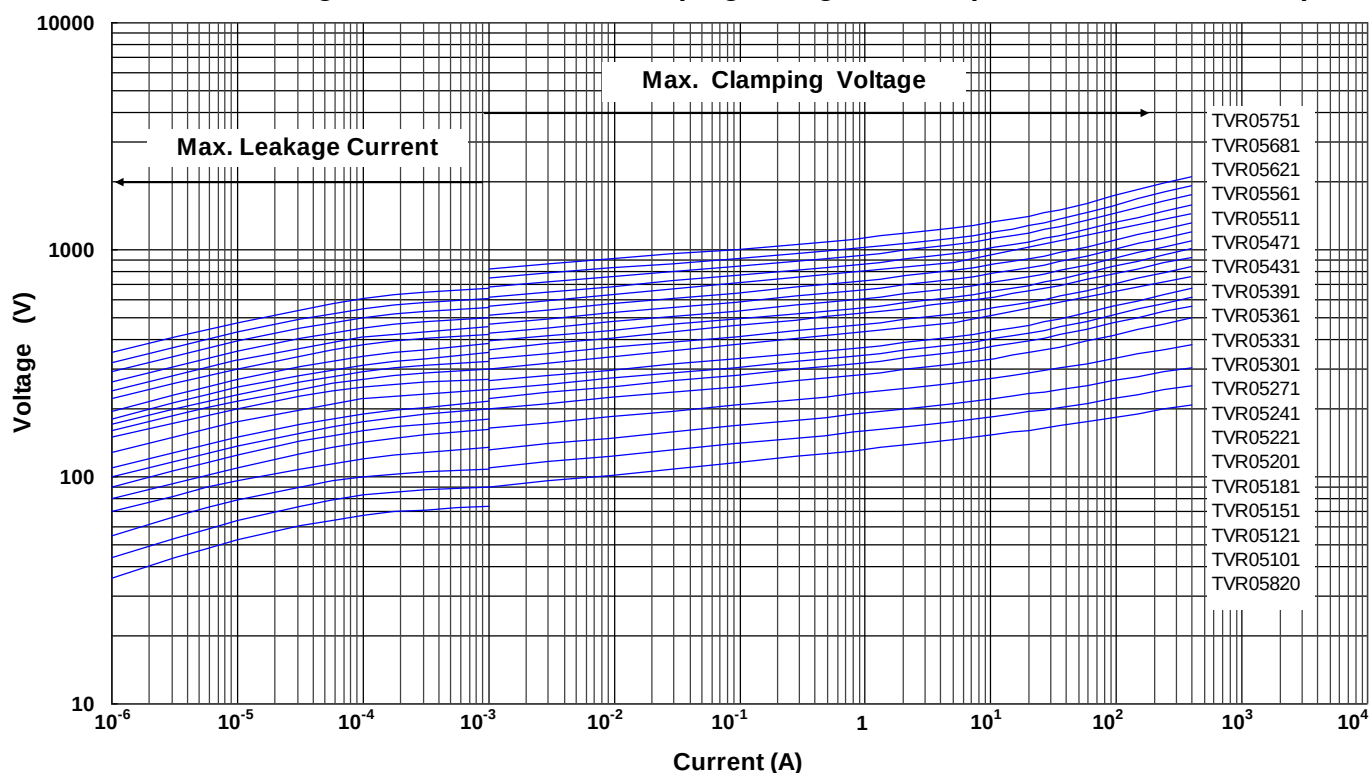


### ■ Max. Leakage Current and Max. Clamping Voltage Curves

Max. Leakage Current and Max. Clamping Voltage Curves (TVR05180 to TVR05680)



Max. Leakage Current and Max. Clamping Voltage Curves (TVR05820 to TVR05751)



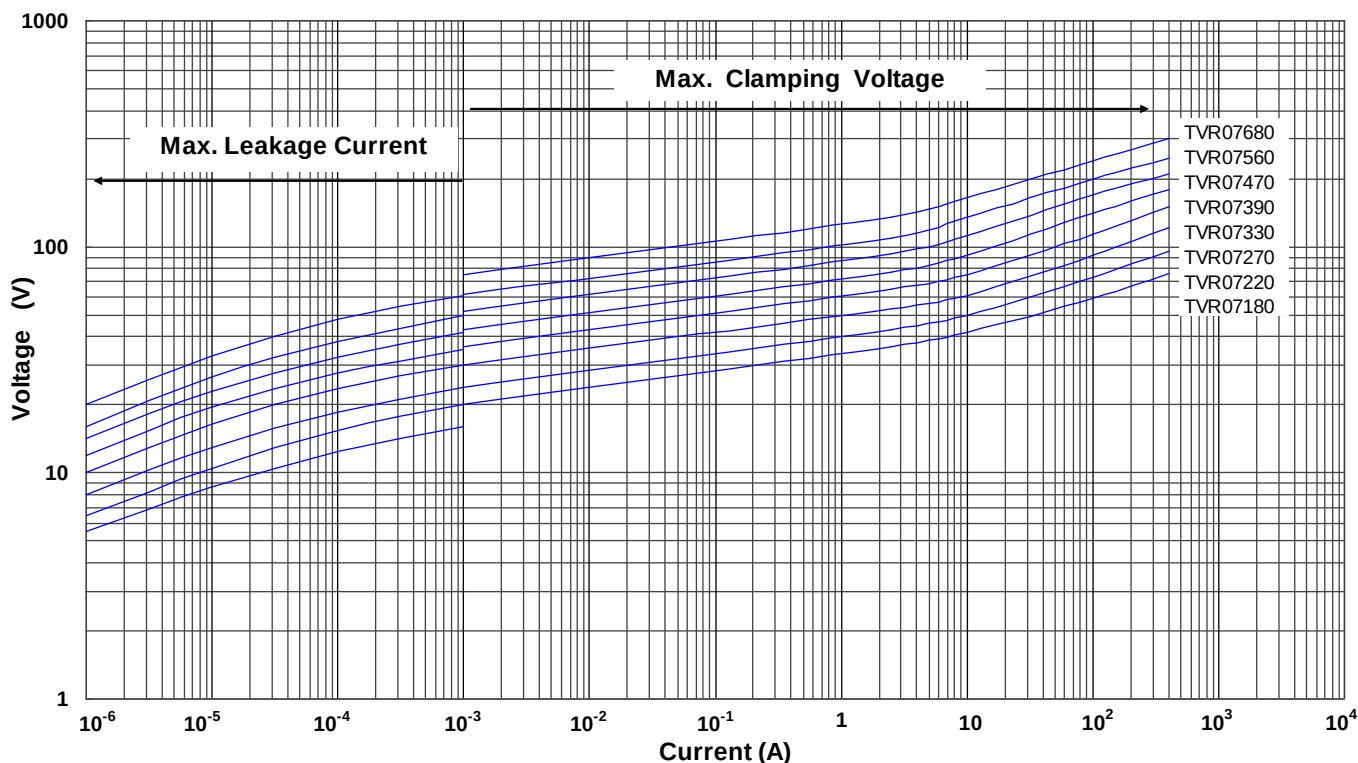
# Metal Oxide Varistor : TVR Series

## Disc Type Varistor for Surge Protection

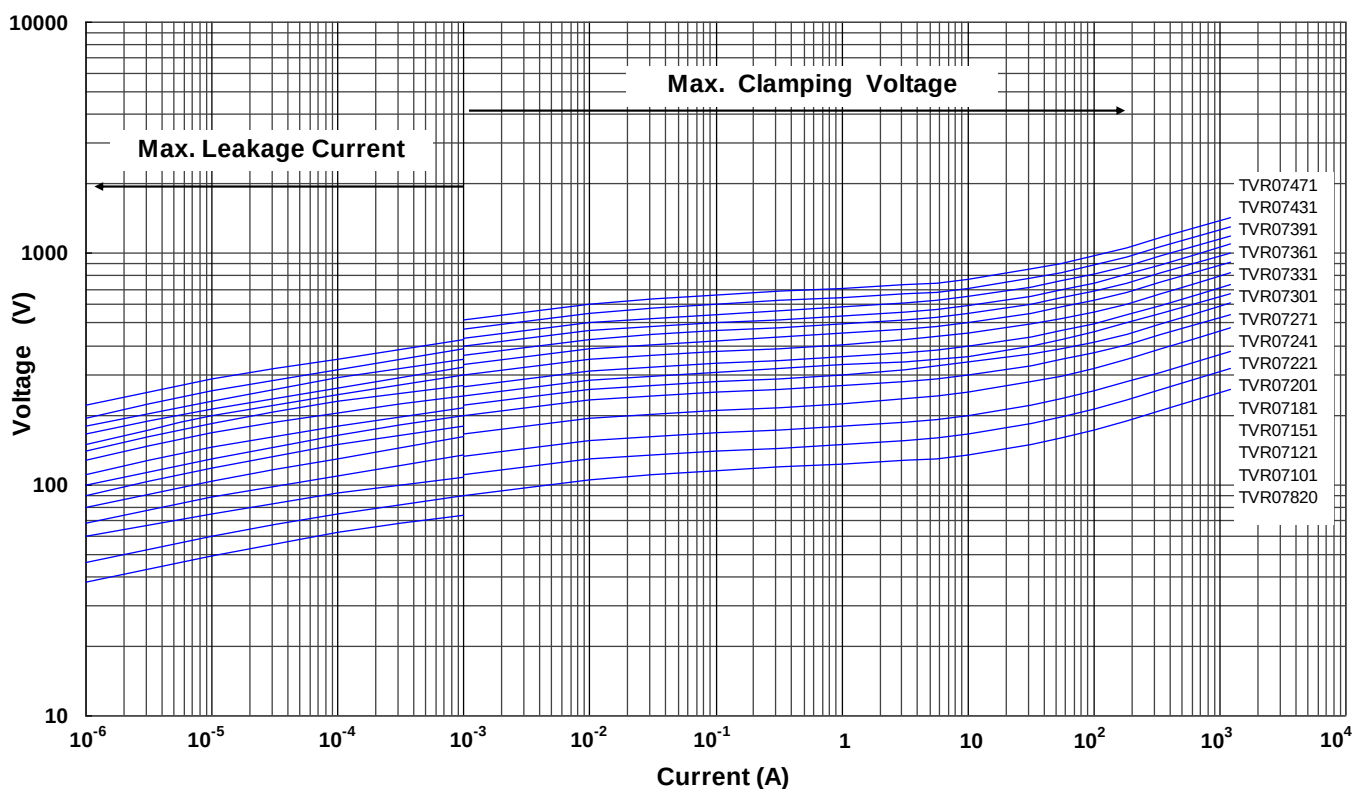


### ■ Max. Leakage Current and Max. Clamping Voltage Curves

Max. Leakage Current and Max. Clamping Voltage Curves (TVR07180 to TVR07680)



Max. Leakage Current and Max. Clamping Voltage Curves (TVR07820 to TVR07471)



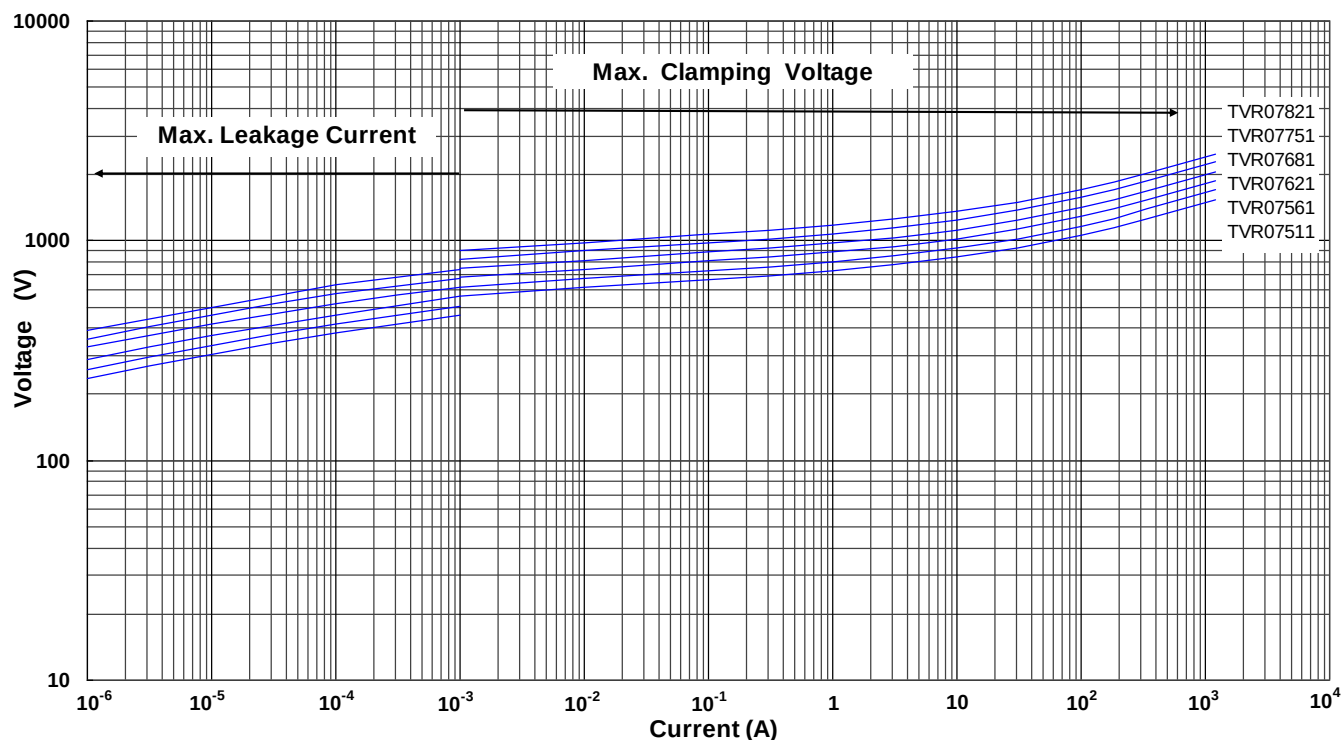
# Metal Oxide Varistor : TVR Series

## Disc Type Varistor for Surge Protection

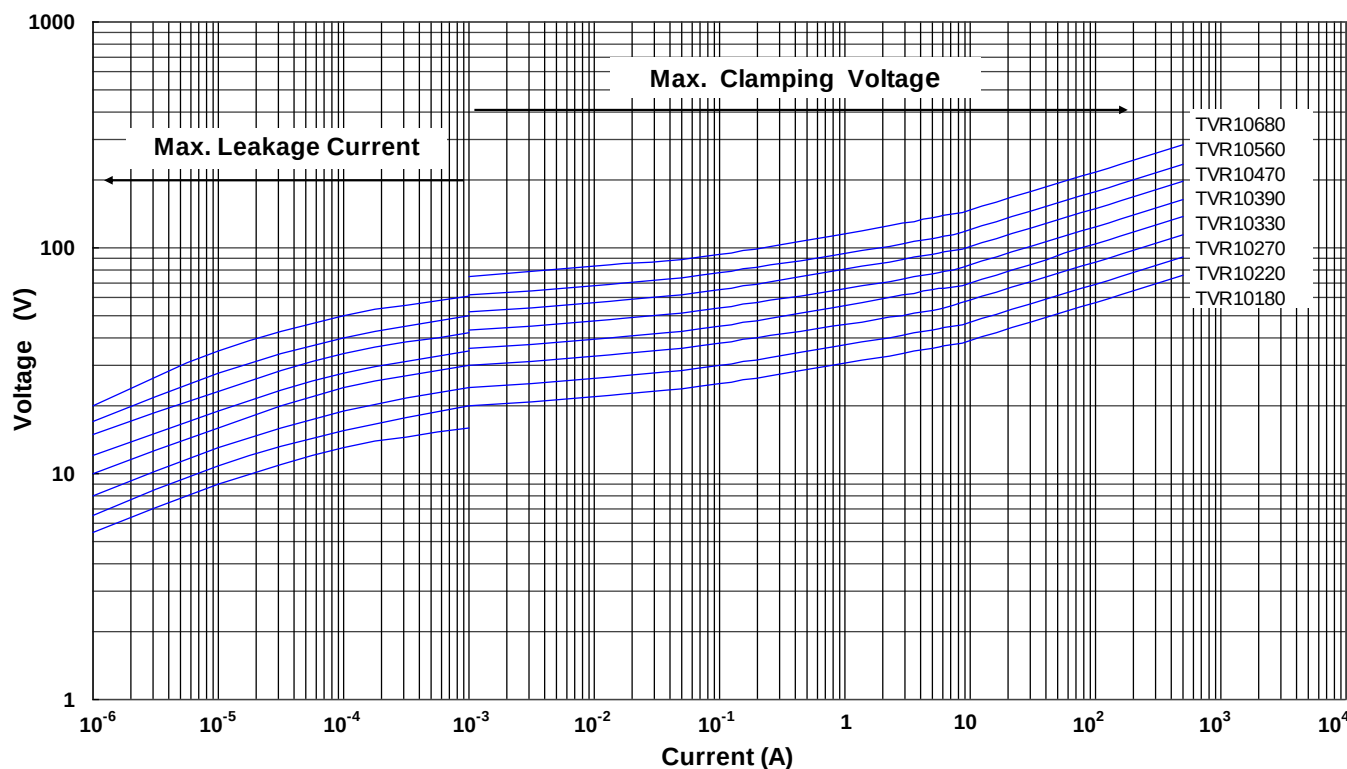


### ■ Max. Leakage Current and Max. Clamping Voltage Curves

Max. Leakage Current and Max. Clamping Voltage Curves (TVR07511 to TVR07821)



Max. Leakage Current and Max. Clamping Voltage Curves (TVR10180 to TVR10680)



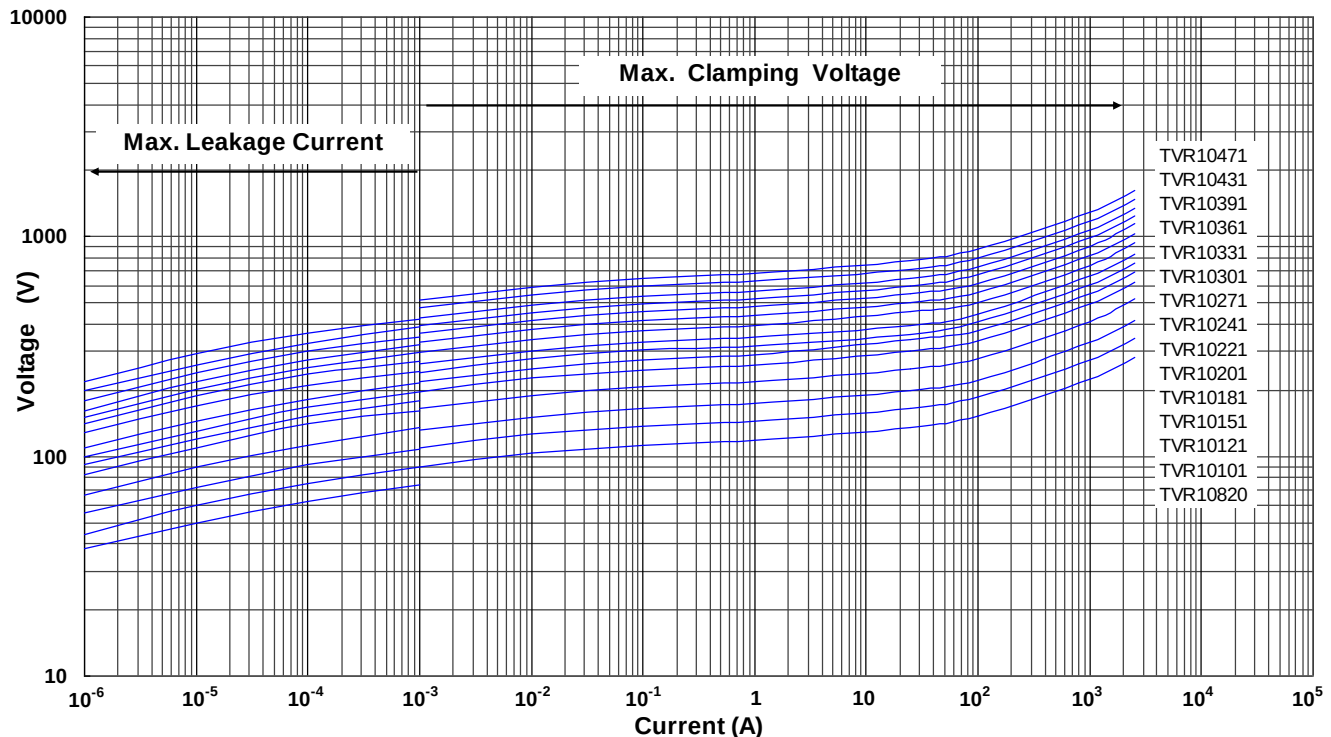
# Metal Oxide Varistor : TVR Series

## Disc Type Varistor for Surge Protection

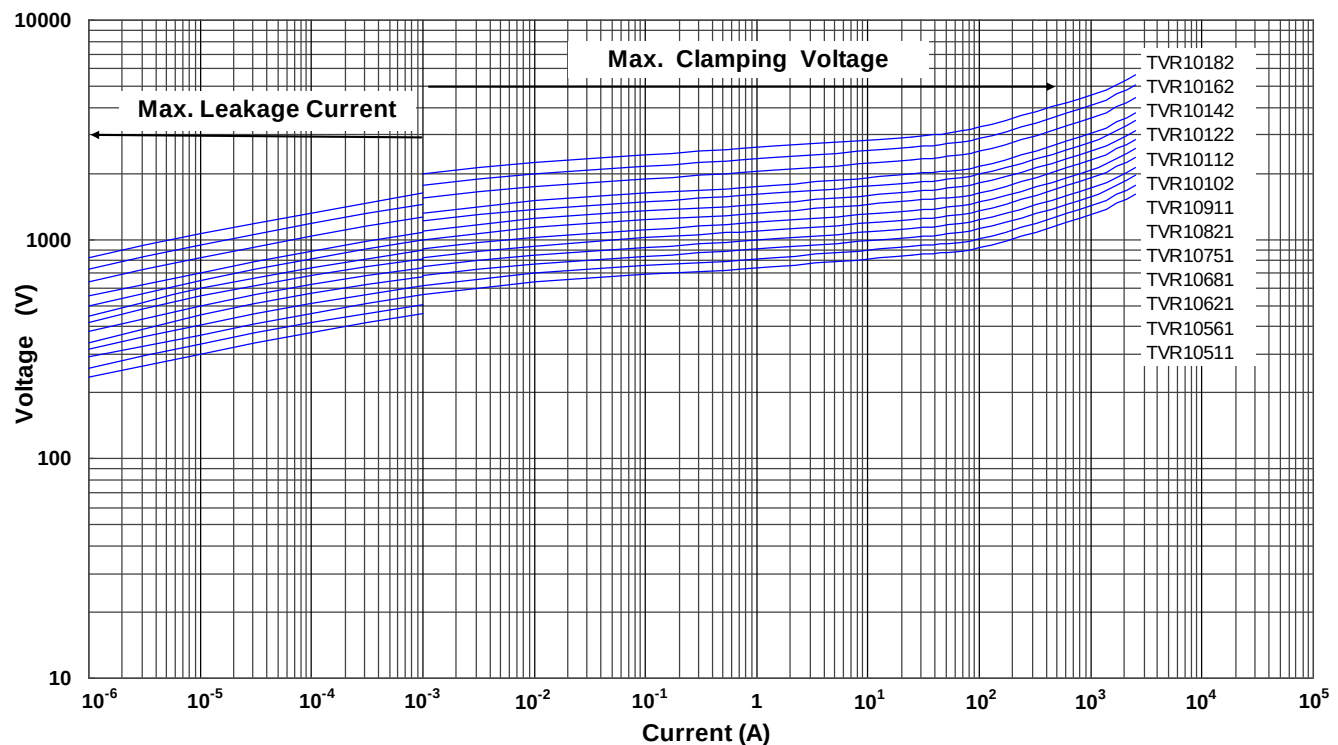


### ■ Max. Leakage Current and Max. Clamping Voltage Curves

Max. Leakage Current and Max. Clamping Voltage Curves (TVR10820 to TVR10471)



Max. Leakage Current and Max. Clamping Voltage Curves (TVR10511 to TVR10182)



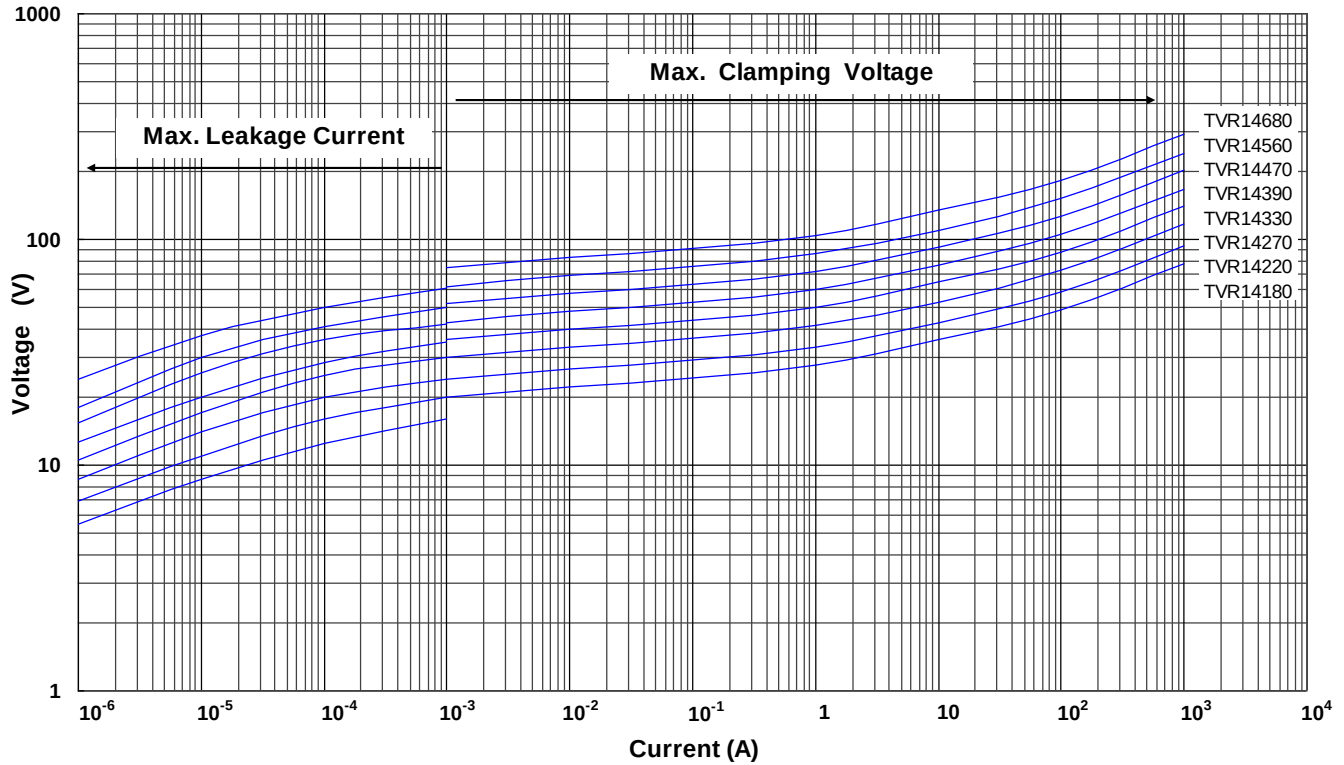
# Metal Oxide Varistor : TVR Series

## Disc Type Varistor for Surge Protection

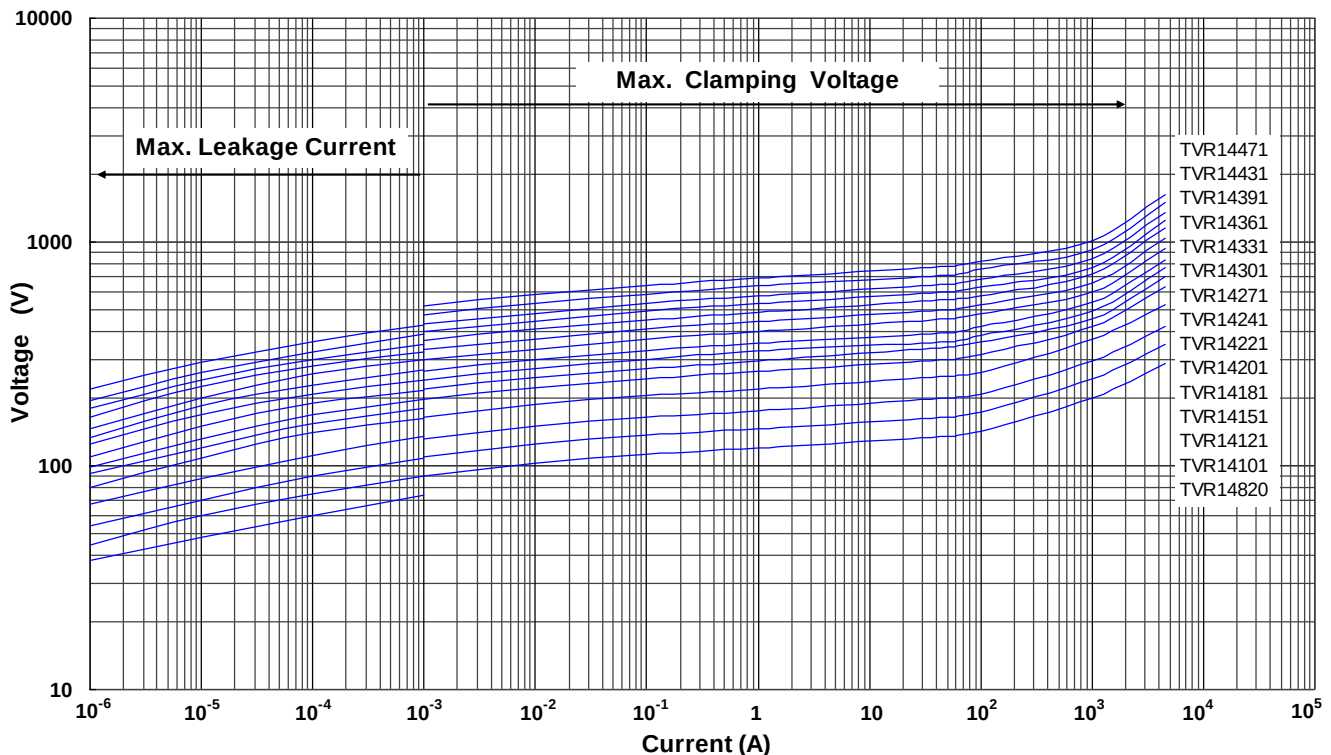


### ■ Max. Leakage Current and Max. Clamping Voltage Curves

Max. Leakage Current and Max. Clamping Voltage Curves (TVR14180 to TVR14680)



Max. Leakage Current and Max. Clamping Voltage Curves (TVR14820 to TVR14471)



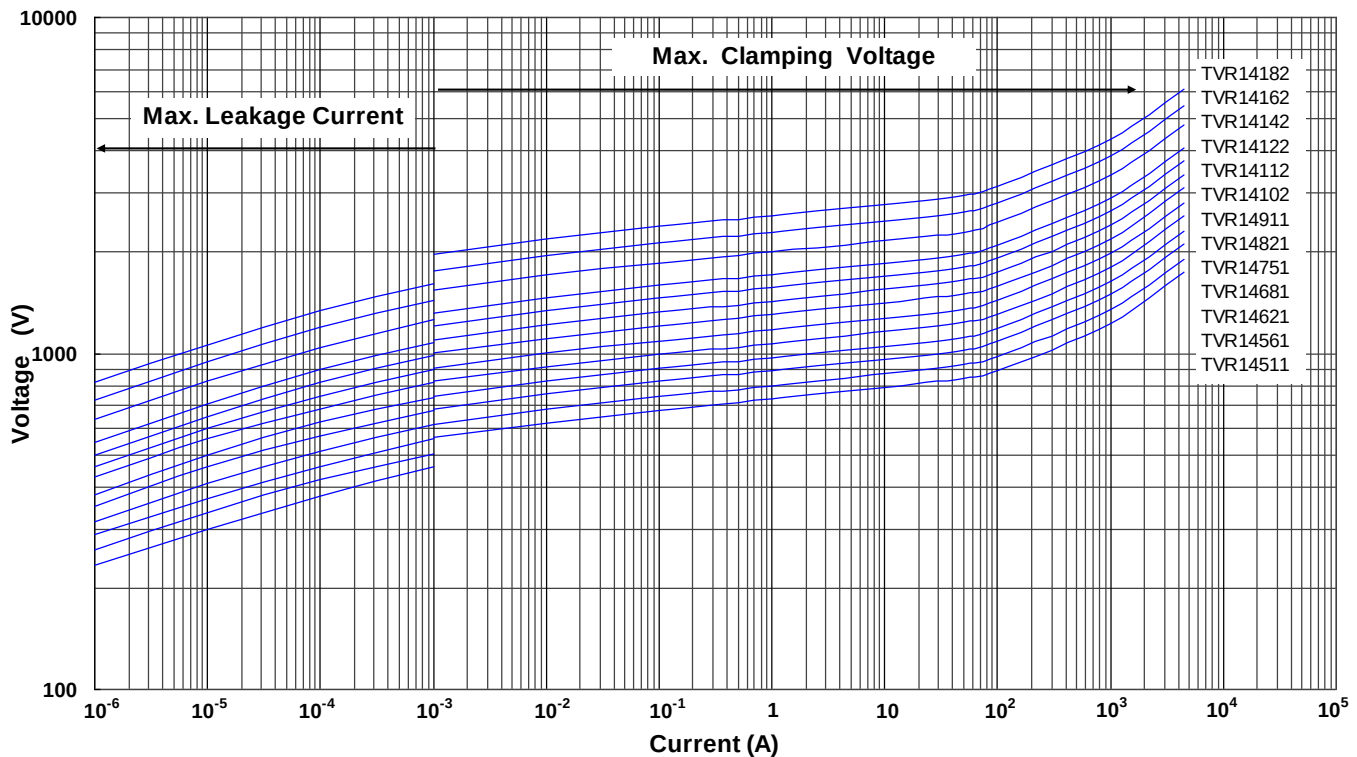
# Metal Oxide Varistor : TVR Series

## Disc Type Varistor for Surge Protection

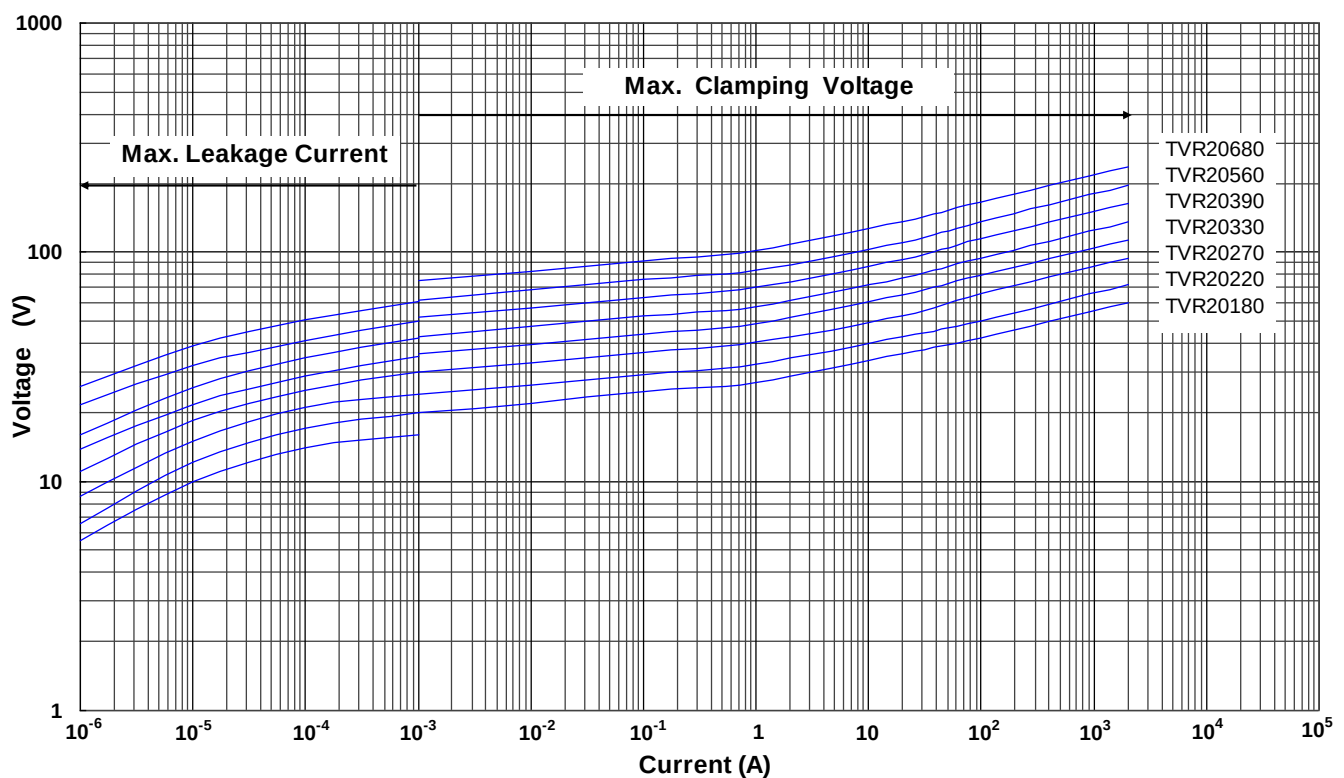


### ■ Max. Leakage Current and Max. Clamping Voltage Curves

Max. Leakage Current and Max. Clamping Voltage Curves (TVR14511 to TVR14182)



Max. Leakage Current and Max. Clamping Voltage Curves (TVR20180 to TVR20680)



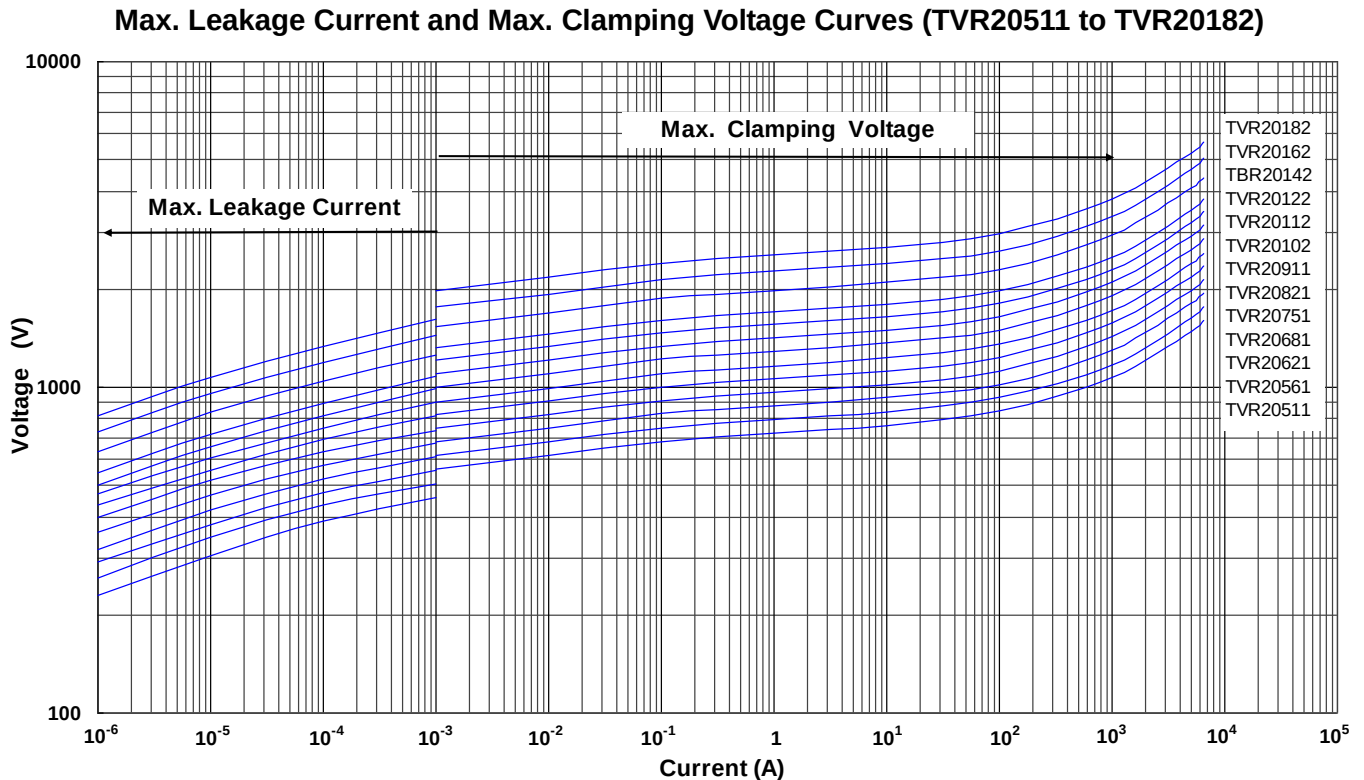
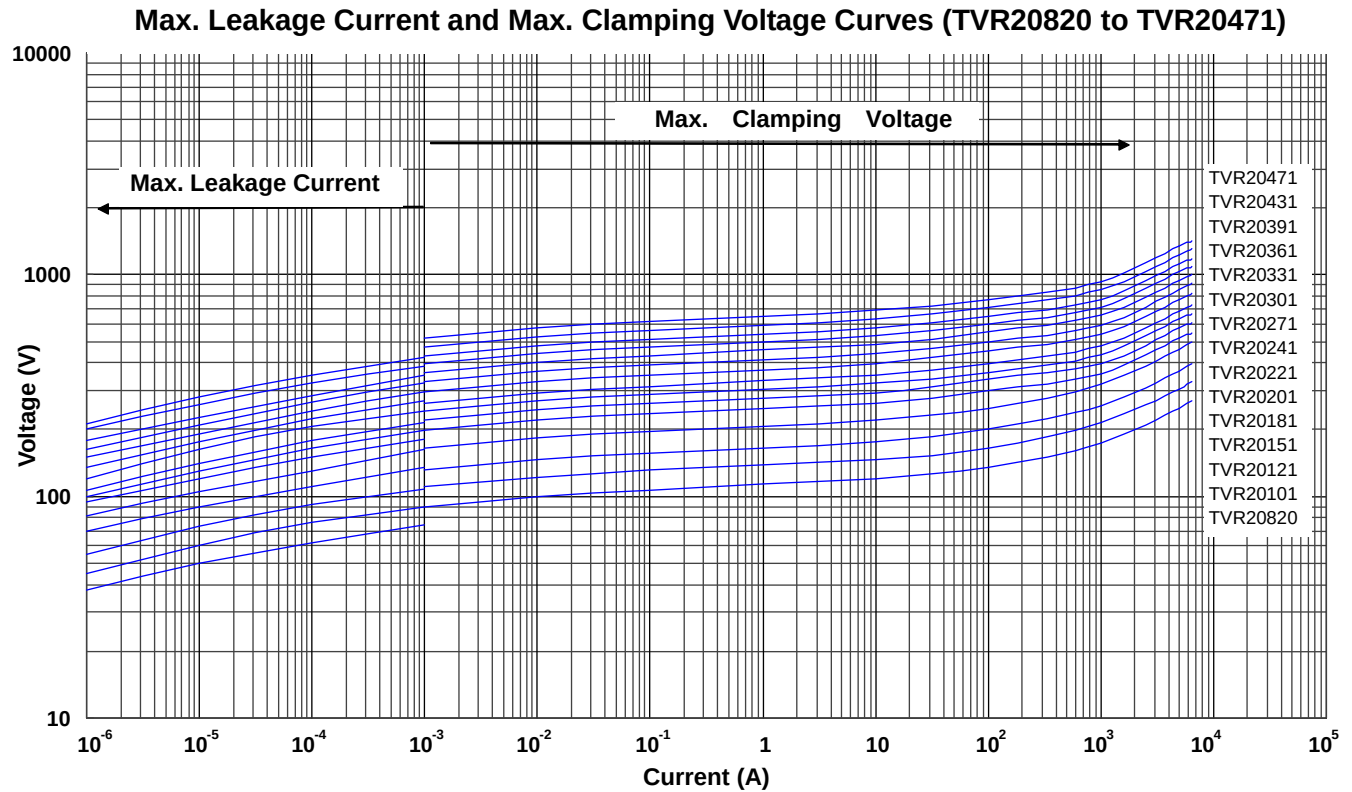


# Metal Oxide Varistor : TVR Series

## Disc Type Varistor for Surge Protection



### ■ Max. Leakage Current and Max. Clamping Voltage Curves





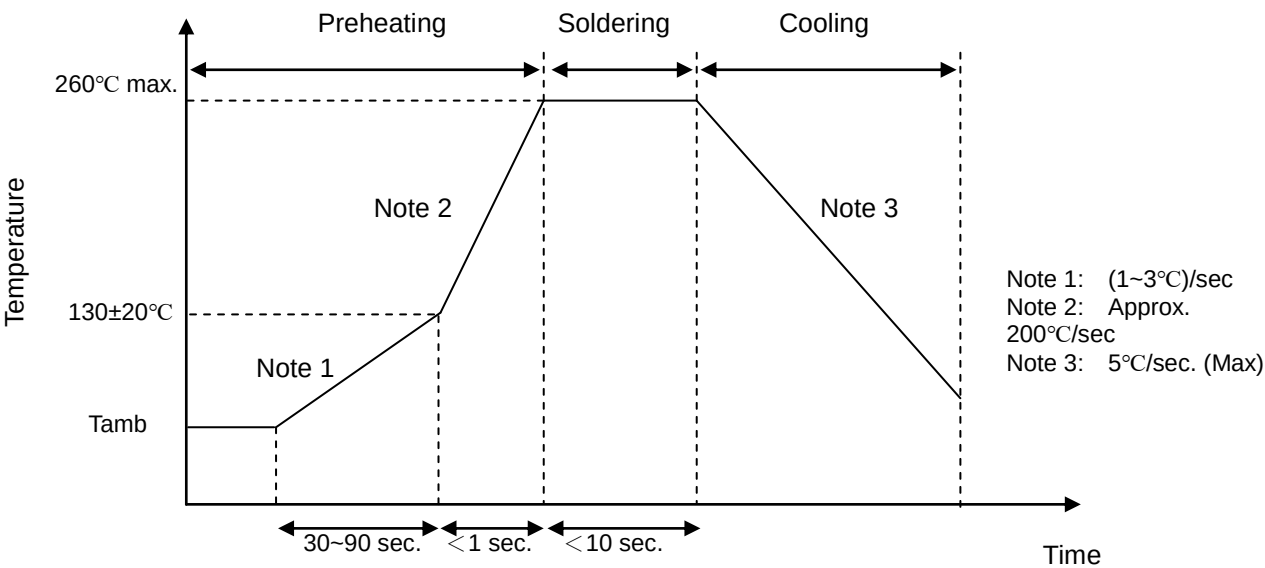
# Metal Oxide Varistor : TVR Series

## Disc Type Varistor for Surge Protection



### ■ Soldering Recommendation

#### ● Wave Soldering Profile



#### ● Recommended Reworking Conditions with Soldering Iron

| Item                              | Conditions                   |
|-----------------------------------|------------------------------|
| Temperature of Soldering Iron-tip | $360^{\circ}\text{C (max.)}$ |
| Soldering Time                    | 3 sec (max.)                 |
| Distance from Varistor            | 2 mm (min.)                  |

# Metal Oxide Varistor : TVR Series

## Disc Type Varistor for Surge Protection



### ■ Reliability

| Item                               | Standard               | Test conditions / Methods                                                                                                                                                                                                                                                                                                                                                            | Specifications                                                                              |                 |                  |     |            |      |                                                          |                  |     |   |       |      |   |                  |     |                                                          |
|------------------------------------|------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------|-----------------|------------------|-----|------------|------|----------------------------------------------------------|------------------|-----|---|-------|------|---|------------------|-----|----------------------------------------------------------|
| Tensile Strength of Terminals      | IEC60068-2-21          | Gradually apply the specified force and keep the unit fixed for 10±1 sec.<br><br><table><tr><td>Terminal diameter<br/>(mm)</td><td>Force<br/>(Kg)</td></tr><tr><td>0.5&lt;d≤0.8</td><td>1.0</td></tr><tr><td>0.8&lt;d≤1.25</td><td>2.0</td></tr></table>                                                                                                                             | Terminal diameter<br>(mm)                                                                   | Force<br>(Kg)   | 0.5<d≤0.8        | 1.0 | 0.8<d≤1.25 | 2.0  | $ \Delta V_{1mA}/V_{1mA}  \leq 5\%$<br>No visible damage |                  |     |   |       |      |   |                  |     |                                                          |
| Terminal diameter<br>(mm)          | Force<br>(Kg)          |                                                                                                                                                                                                                                                                                                                                                                                      |                                                                                             |                 |                  |     |            |      |                                                          |                  |     |   |       |      |   |                  |     |                                                          |
| 0.5<d≤0.8                          | 1.0                    |                                                                                                                                                                                                                                                                                                                                                                                      |                                                                                             |                 |                  |     |            |      |                                                          |                  |     |   |       |      |   |                  |     |                                                          |
| 0.8<d≤1.25                         | 2.0                    |                                                                                                                                                                                                                                                                                                                                                                                      |                                                                                             |                 |                  |     |            |      |                                                          |                  |     |   |       |      |   |                  |     |                                                          |
| Bending Strength of Terminals      | IEC 60068-2-21         | Hold specimen and apply the force specified below to each lead. Bend the specimen to 90°, then return to the original position. Repeat the procedure in the opposite direction.<br><br><table><tr><td>Terminal diameter<br/>(mm)</td><td>Force<br/>(Kg)</td></tr><tr><td>0.5&lt;d≤0.8</td><td>0.5</td></tr><tr><td>0.8&lt;d≤1.25</td><td>1.0</td></tr></table>                       | Terminal diameter<br>(mm)                                                                   | Force<br>(Kg)   | 0.5<d≤0.8        | 0.5 | 0.8<d≤1.25 | 1.0  | $ \Delta V_{1mA}/V_{1mA}  \leq 5\%$<br>No visible damage |                  |     |   |       |      |   |                  |     |                                                          |
| Terminal diameter<br>(mm)          | Force<br>(Kg)          |                                                                                                                                                                                                                                                                                                                                                                                      |                                                                                             |                 |                  |     |            |      |                                                          |                  |     |   |       |      |   |                  |     |                                                          |
| 0.5<d≤0.8                          | 0.5                    |                                                                                                                                                                                                                                                                                                                                                                                      |                                                                                             |                 |                  |     |            |      |                                                          |                  |     |   |       |      |   |                  |     |                                                          |
| 0.8<d≤1.25                         | 1.0                    |                                                                                                                                                                                                                                                                                                                                                                                      |                                                                                             |                 |                  |     |            |      |                                                          |                  |     |   |       |      |   |                  |     |                                                          |
| Vibration                          | IEC 60068-2-6          | Frequency range: 10-55 Hz<br>Amplitude: 0.75mm or 98 m/s <sup>2</sup><br>Direction: 3 mutually perpendicular directions, 2 hrs each                                                                                                                                                                                                                                                  | $ \Delta V_{1mA}/V_{1mA}  \leq 5\%$<br>No visible damage                                    |                 |                  |     |            |      |                                                          |                  |     |   |       |      |   |                  |     |                                                          |
| Solderability                      | IEC 60068-2-20         | 245±3℃, 3±0.3 sec                                                                                                                                                                                                                                                                                                                                                                    | At least 95% of terminal electrode is covered by new solder                                 |                 |                  |     |            |      |                                                          |                  |     |   |       |      |   |                  |     |                                                          |
| Resistance to Soldering Heat       | IEC 60068-2-20         | 260±3℃, 10±1 sec,<br>(5±0.5 sec for TVR05 )                                                                                                                                                                                                                                                                                                                                          | $ \Delta V_{1mA}/V_{1mA}  \leq 5\%$<br>No visible damage                                    |                 |                  |     |            |      |                                                          |                  |     |   |       |      |   |                  |     |                                                          |
| High Temperature Storage           | IEC 60068-2-2          | 125±5℃ x 1000± 24 hrs                                                                                                                                                                                                                                                                                                                                                                | $ \Delta V_{1mA}/V_{1mA}  \leq 5\%$<br>No visible damage                                    |                 |                  |     |            |      |                                                          |                  |     |   |       |      |   |                  |     |                                                          |
| Damp Heat, Steady State            | IEC60068-2-78          | a. 40±2℃, 90 ~ 95 % RH, 1344 hrs<br>b. 40±2℃, 90 ~ 95 % RH, at 10%Vdc, 1344 hrs                                                                                                                                                                                                                                                                                                      | $ \Delta V_{1mA}/V_{1mA}  \leq 5\%$<br>No visible damage<br>Insulation Resistance<br>≥100MΩ |                 |                  |     |            |      |                                                          |                  |     |   |       |      |   |                  |     |                                                          |
| Rapid Change of Temperature        | IEC 60068-2-14         | The conditions shown below shall be repeated 5 cycles<br><table><tr><th>Step</th><th>Temperature (℃)</th><th>Period (minutes)</th></tr><tr><td>1</td><td>-40±3</td><td>30±3</td></tr><tr><td>2</td><td>Room temperature</td><td>5±3</td></tr><tr><td>3</td><td>105±2</td><td>30±3</td></tr><tr><td>4</td><td>Room temperature</td><td>5±3</td></tr></table>                          | Step                                                                                        | Temperature (℃) | Period (minutes) | 1   | -40±3      | 30±3 | 2                                                        | Room temperature | 5±3 | 3 | 105±2 | 30±3 | 4 | Room temperature | 5±3 | $ \Delta V_{1mA}/V_{1mA}  \leq 5\%$<br>No visible damage |
| Step                               | Temperature (℃)        | Period (minutes)                                                                                                                                                                                                                                                                                                                                                                     |                                                                                             |                 |                  |     |            |      |                                                          |                  |     |   |       |      |   |                  |     |                                                          |
| 1                                  | -40±3                  | 30±3                                                                                                                                                                                                                                                                                                                                                                                 |                                                                                             |                 |                  |     |            |      |                                                          |                  |     |   |       |      |   |                  |     |                                                          |
| 2                                  | Room temperature       | 5±3                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                             |                 |                  |     |            |      |                                                          |                  |     |   |       |      |   |                  |     |                                                          |
| 3                                  | 105±2                  | 30±3                                                                                                                                                                                                                                                                                                                                                                                 |                                                                                             |                 |                  |     |            |      |                                                          |                  |     |   |       |      |   |                  |     |                                                          |
| 4                                  | Room temperature       | 5±3                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                             |                 |                  |     |            |      |                                                          |                  |     |   |       |      |   |                  |     |                                                          |
| High Temp. Load                    | MIL-STD-202 Method 108 | 105±2℃, 1000±24 hrs at V <sub>DC</sub> or V <sub>rms</sub> (Max. Continuous Voltage)                                                                                                                                                                                                                                                                                                 | $ \Delta V_{1mA}/V_{1mA}  \leq 10\%$<br>No visible damage                                   |                 |                  |     |            |      |                                                          |                  |     |   |       |      |   |                  |     |                                                          |
| 8/20μs Surge Life                  | IEC 61051-1            | 8/20μs waveform, 10 surge currents, unipolar, interval 30 secs, amplitude corresponding to max. surge current derating curves for 20μs.                                                                                                                                                                                                                                              | $ \Delta V_{1mA}/V_{1mA}  \leq 10\%$<br>No visible damage                                   |                 |                  |     |            |      |                                                          |                  |     |   |       |      |   |                  |     |                                                          |
| 10/1000μs Surge Life               | IEC 61051-1            | 10/1000μs waveform, 10 surge currents, unipolar, interval 2mins, amplitude corresponding to max. surge current derating curves for 1000μs.                                                                                                                                                                                                                                           | $ \Delta V_{1mA}/V_{1mA}  \leq 10\%$<br>No visible damage                                   |                 |                  |     |            |      |                                                          |                  |     |   |       |      |   |                  |     |                                                          |
| Voltage Proof                      | IEC 61051-1            | Metal balls method, 2500 Vac 1 min                                                                                                                                                                                                                                                                                                                                                   | No visible damage                                                                           |                 |                  |     |            |      |                                                          |                  |     |   |       |      |   |                  |     |                                                          |
| Varistor Voltage Temp. Coefficient | Specification Standard | $\frac{V_{1mA} \text{ at } 105^{\circ}\text{C} - V_{1mA} \text{ at } 25^{\circ}\text{C}}{V_{1mA} \text{ at } 25^{\circ}\text{C}} \times \frac{1}{80} \times 100 (\% / ^{\circ}\text{C})$<br>$\frac{V_{1mA} \text{ at } -40^{\circ}\text{C} - V_{1mA} \text{ at } 25^{\circ}\text{C}}{V_{1mA} \text{ at } 25^{\circ}\text{C}} \times \frac{1}{65} \times 100 (\% / ^{\circ}\text{C})$ | -0.05≤TC≤0.05 (%/℃)                                                                         |                 |                  |     |            |      |                                                          |                  |     |   |       |      |   |                  |     |                                                          |

# Metal Oxide Varistor : TVR Series



## Disc Type Varistor for Surge Protection

- Packaging
  - Taping Specification

### S Type (Straight Lead)

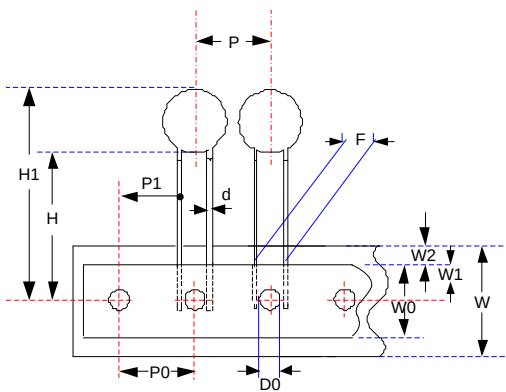


Figure A

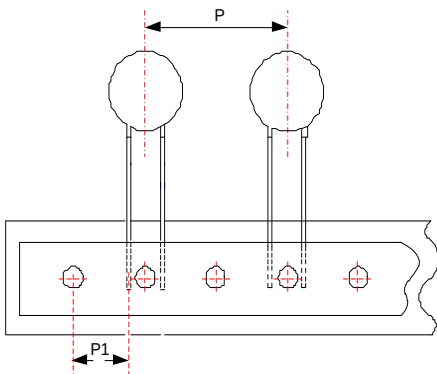


Figure B

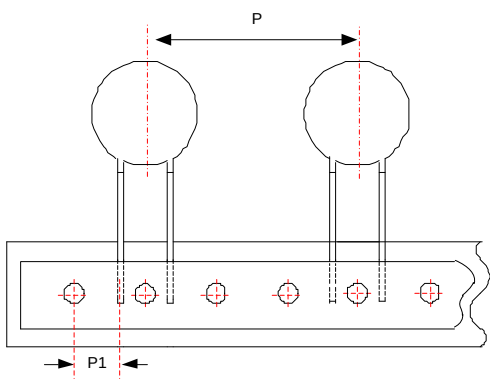


Figure C

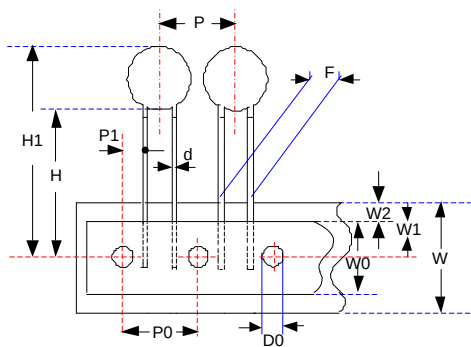


Figure D

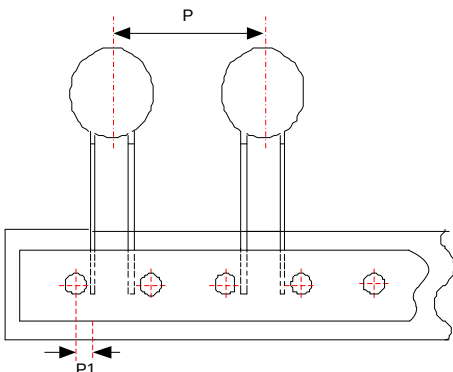
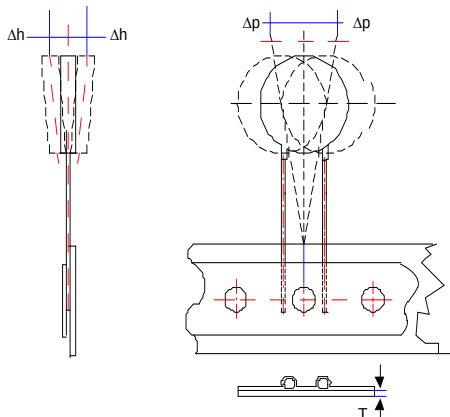


Figure E



(Unit: mm)

| Taping Code                 | Body Size | P <sub>0</sub> | F    | P    | P <sub>1</sub> | H     | H <sub>1</sub> | d     | W <sub>0</sub> | W <sub>1</sub> | W <sub>2</sub> | W       | ΔP   | Δh   | D <sub>0</sub> | T    | Figure |
|-----------------------------|-----------|----------------|------|------|----------------|-------|----------------|-------|----------------|----------------|----------------|---------|------|------|----------------|------|--------|
|                             |           | ±0.3           | ±1   | ±1   | ±1             | +2/-0 | Max.           | ±0.02 | ±1             | +0.75/-0.5     | Max            | +1/-0.5 | Max. | Max. | ±0.2           | ±0.2 |        |
| A<br>(P <sub>0</sub> :12.7) | 05        | 12.7           | 5.0  | 12.7 | 3.55           | 18    | 28.0           | 0.6   | 12             | 9              | 3              | 18      | 1    | 2    | 4              | 0.6  | D      |
|                             | 07        | 12.7           | 5.0  | 12.7 | 3.55           | 18    | 30.0           | 0.6   | 12             | 9              | 3              | 18      | 1    | 2    | 4              | 0.6  | D      |
|                             | 10        | 12.7           | 7.5  | 12.7 | 8.55           | 18    | 33.5           | 0.8   | 12             | 9              | 3              | 18      | 1    | 2    | 4              | 0.6  | A      |
|                             | 14        | 12.7           | 7.5  | 25.4 | 8.55           | 18    | 38.0           | 0.8   | 12             | 9              | 3              | 18      | 1    | 2    | 4              | 0.6  | B      |
|                             | 20        | 12.7           | 10.0 | 38.1 | 7.20           | 18    | 40.5           | 1.0   | 12             | 9              | 3              | 18      | 1    | 2    | 4              | 0.6  | C      |
| E<br>(P <sub>0</sub> :15.0) | 05        | 15             | 5.0  | 15.0 | 4.70           | 18    | 28.0           | 0.6   | 12             | 9              | 3              | 18      | 1    | 2    | 4              | 0.6  | D      |
|                             | 07        | 15             | 5.0  | 15.0 | 4.70           | 18    | 30.0           | 0.6   | 12             | 9              | 3              | 18      | 1    | 2    | 4              | 0.6  | D      |
|                             | 10        | 15             | 7.5  | 15.0 | 3.35           | 18    | 33.5           | 0.8   | 12             | 9              | 3              | 18      | 1    | 2    | 4              | 0.6  | D      |
|                             | 14        | 15             | 7.5  | 30.0 | 3.35           | 18    | 38.0           | 0.8   | 12             | 9              | 3              | 18      | 1    | 2    | 4              | 0.6  | E      |
|                             | 20        | 15             | 10.0 | 30.0 | 9.50           | 18    | 40.5           | 1.0   | 12             | 9              | 3              | 18      | 1    | 2    | 4              | 0.6  | B      |

# Metal Oxide Varistor : TVR Series

## Disc Type Varistor for Surge Protection



### F Type (Y Kink Lead)

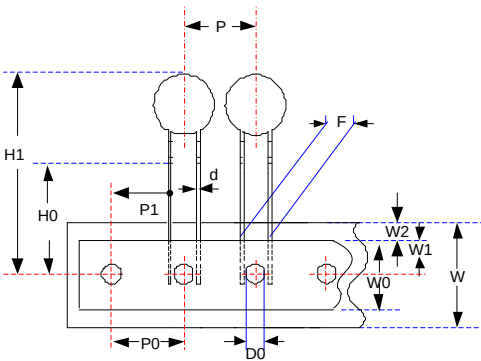


Figure A

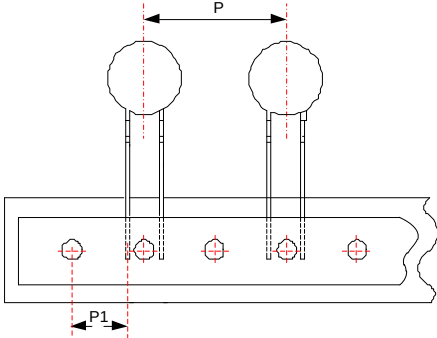


Figure B

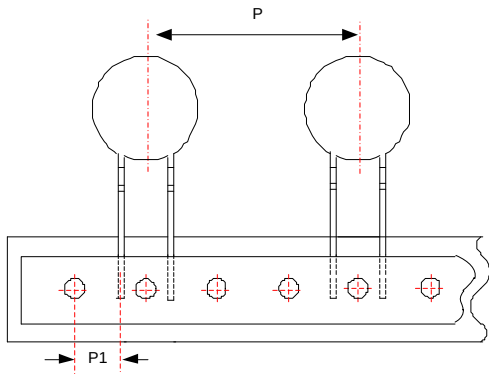


Figure C

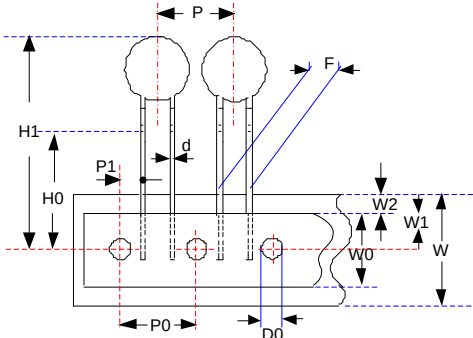


Figure D

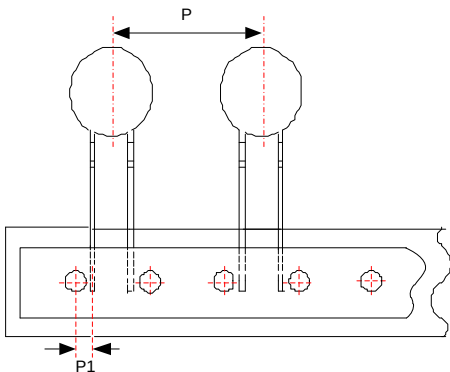
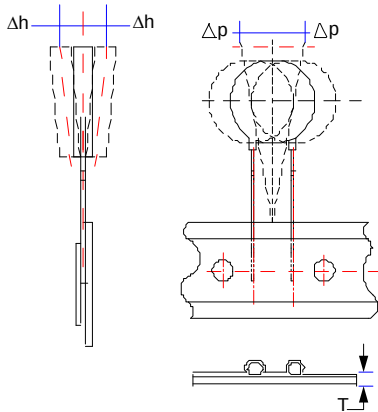


Figure E



(Unit: mm)

| Taping Code                 | Body Size | P <sub>0</sub> | F    | P    | P <sub>1</sub> | H <sub>0</sub> | H <sub>1</sub> | d     | W <sub>0</sub> | W <sub>1</sub> | W <sub>2</sub> | W       | ΔP   | Δh   | D <sub>0</sub> | T    | Figure |
|-----------------------------|-----------|----------------|------|------|----------------|----------------|----------------|-------|----------------|----------------|----------------|---------|------|------|----------------|------|--------|
|                             |           | ±0.3           | ±1   | ±1   | ±1             | ±0.5           | Max.           | ±0.02 | ±1             | +0.75/-0.5     | Max            | +1/-0.5 | Max. | Max. | ±0.2           | ±0.2 |        |
| A<br>(P <sub>0</sub> :12.7) | 05        | 12.7           | 5.0  | 12.7 | 3.55           | 16             | 28.0           | 0.6   | 12             | 9              | 3              | 18      | 1    | 2    | 4              | 0.6  | D      |
|                             | 07        | 12.7           | 5.0  | 12.7 | 3.55           | 16             | 30.0           | 0.6   | 12             | 9              | 3              | 18      | 1    | 2    | 4              | 0.6  | D      |
|                             | 10        | 12.7           | 7.5  | 12.7 | 8.55           | 16             | 33.5           | 0.8   | 12             | 9              | 3              | 18      | 1    | 2    | 4              | 0.6  | A      |
|                             | 14        | 12.7           | 7.5  | 25.4 | 8.55           | 16             | 38.0           | 0.8   | 12             | 9              | 3              | 18      | 1    | 2    | 4              | 0.6  | B      |
|                             | 20        | 12.7           | 10.0 | 38.1 | 7.20           | 16             | 44.5           | 1.0   | 12             | 9              | 3              | 18      | 1    | 2    | 4              | 0.6  | C      |
| E<br>(P <sub>0</sub> :15.0) | 05        | 15             | 5.0  | 15.0 | 4.70           | 16             | 28.0           | 0.6   | 12             | 9              | 3              | 18      | 1    | 2    | 4              | 0.6  | D      |
|                             | 07        | 15             | 5.0  | 15.0 | 4.70           | 16             | 30.0           | 0.6   | 12             | 9              | 3              | 18      | 1    | 2    | 4              | 0.6  | D      |
|                             | 10        | 15             | 7.5  | 15.0 | 3.35           | 16             | 33.5           | 0.8   | 12             | 9              | 3              | 18      | 1    | 2    | 4              | 0.6  | D      |
|                             | 14        | 15             | 7.5  | 30.0 | 3.35           | 16             | 38.0           | 0.8   | 12             | 9              | 3              | 18      | 1    | 2    | 4              | 0.6  | E      |
|                             | 20        | 15             | 10.0 | 30.0 | 9.50           | 16             | 44.5           | 1.0   | 12             | 9              | 3              | 18      | 1    | 2    | 4              | 0.6  | B      |

# Metal Oxide Varistor : TVR Series

## Disc Type Varistor for Surge Protection



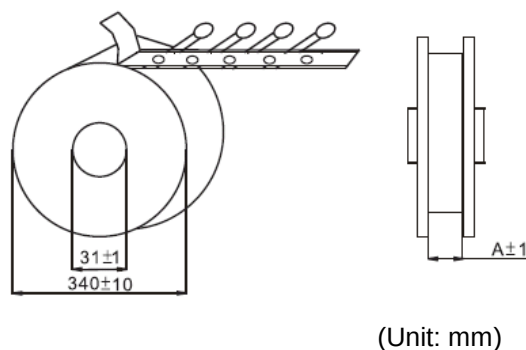
### ■ Quantity

#### ● Bulk Packing

| Series          | Straight Lead Type<br>Quantity (pcs/bag) | Cut Lead Type<br>Quantity (pcs/bag) | Kink Type<br>Quantity (pcs/bag) |
|-----------------|------------------------------------------|-------------------------------------|---------------------------------|
| TVR05           | 250                                      | 250                                 | ---                             |
| TVR07           | 250                                      | 250                                 | 200                             |
| TVR10 (180~751) | 200                                      | 200                                 | 200                             |
| TVR10 (821~182) | 100                                      | 100                                 | 100                             |
| TVR14           | 100                                      | 100                                 | 100                             |
| TVR20           | 50                                       | 50                                  | 50                              |

#### ● Reel Packing

| Series         | A (mm) | Quantity (pcs/reel) |
|----------------|--------|---------------------|
| TVR05(180~391) | 46     | 1,500               |
| TVR05(431~751) |        | 1,000               |
| TVR07(180~391) |        | 1,500               |
| TVR07(431~821) |        | 1,000               |
| TVR10(180~911) |        | 1,000               |
| TVR10(102~112) |        | 750                 |
| TVR10(122~182) |        | 500                 |
| TVR14(180~470) |        | 800                 |
| TVR14(560~391) |        | 750                 |
| TVR14(431~182) |        | 500                 |
| TVR20(180~431) | 52     | 500                 |
| TVR20(471~681) |        | 400                 |
| TVR20(751~182) |        | 250                 |



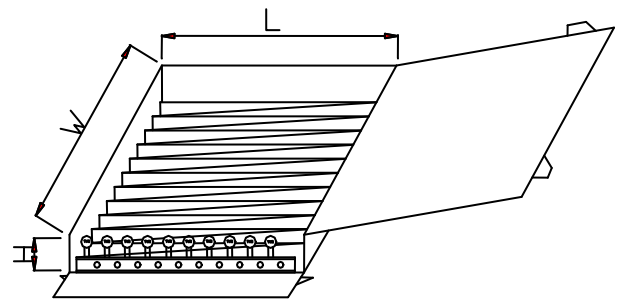
# Metal Oxide Varistor : TVR Series

## Disc Type Varistor for Surge Protection



### ● Ammo Packing

| Series         | Quantity<br>(pcs/box)<br>P0=12.7mm | Quantity<br>(pcs/box)<br>P0=15.0mm |
|----------------|------------------------------------|------------------------------------|
| TVR05(180~391) | 1,500                              | 1,500                              |
| TVR05(431~751) | 1,200                              | 1,000                              |
| TVR07(180~391) | 1,500                              | 1,500                              |
| TVR07(431~511) | 1,200                              | 1,200                              |
| TVR07(561~821) | 1,000                              | 1,200                              |
| TVR10(180~361) | 1,200                              | 950                                |
| TVR10(391~621) | 1,200                              | 750                                |
| TVR10(681~112) | 800                                | 600                                |
| TVR10(122~182) | 700                                | 400                                |
| TVR14(180~271) | 650                                | 500                                |
| TVR14(301~561) | 500                                | 450                                |
| TVR14(621~751) | 400                                | 350                                |
| TVR14(821~112) | 300                                | 300                                |
| TVR14(122~182) | 300                                | 250                                |
| TVR20(180~751) | 300                                | 300                                |
| TVR20(821~182) | 250                                | 250                                |



(Unit: mm)

| Series           | W±5 | L±5 | H±5 |
|------------------|-----|-----|-----|
| TVR05<br>~ TVR20 | 345 | 275 | 55  |

### ■ Warehouse Storage Conditions of Products

- Storage Conditions:
  1. Storage Temperature: -10°C ~ +40°C
  2. Relative Humidity: ≤ 75%RH
  3. Keep away from corrosive atmosphere and sunlight.
- Period of Storage: 1 year