

## Varistor Products

Low to Medium Voltage, Radial Lead

### ZA Varistor Series



The ZA Series of transient voltage surge suppressors are radial-lead varistors (MOVs) designed for use in the protection of low and medium-voltage circuits and systems. Typical applications include motor control, telecom, automotive systems, solenoid, and power supply circuits to protect circuit board components and maintain data integrity.

These devices are available in five model sizes: 5mm, 7mm, 10mm, 14mm and 20mm, and feature a wide  $V_{DC}$  voltage range of 5.5V to 615V.

See ZA Series Device Ratings and Specifications table for part number and brand information.

#### Features

- Wide Operating Voltage Range  $V_{M(AC)RMS}$  ..... 4V to 460V
- DC Voltage Ratings ..... 5.5V to 615V
- No Derating Up to 85°C Ambient
- 5 Model Sizes Available ..... 5, 7, 10, 14, and 20mm
- Radial-Lead Package for Hard-Wired or Printed Circuit Board Designs
- Available in Tape and Reel or Bulk Pack
- Standard Lead Form Options

**AGENCY APPROVALS:** Recognized under the components program of Underwriters Laboratories. VDE certified.

**AGENCY FILE NUMBERS:** UL E135010, VDE 116895E.



2

VARISTOR  
PRODUCTS

# Varistor Products

Low to Medium Voltage, Radial Lead

## ZA Varistor Series

**Absolute Maximum Ratings** For ratings of individual members of a series, see Device Ratings and Specifications chart.

Continuous:

Steady State Applied Voltage:

AC Voltage Range ( $V_{M(AC)RMS}$ ) ..... 4 to 460 V

DC Voltage Range ( $V_{M(DC)}$ ) ..... 5.5 to 615 V

Transient:

Peak Pulse Current ( $I_{TM}$ )

For 8/20 $\mu$ s Current Wave (See Figure 2) ..... 50 to 6500 A

Single Pulse Energy Range (Note 1)

For 10/1000 $\mu$ s Current Wave ( $W_{TM}$ ) ..... 0.1 to 52 J

Operating Ambient Temperature Range ( $T_A$ ) ..... -55 to 85 °C

Storage Temperature Range ( $T_{STG}$ ) ..... -55 to 125 °C

Temperature Coefficient ( $\alpha V$ ) of Clamping Voltage ( $V_C$ ) at Specified Test Current ..... <0.01 %/°C

Hi-Pot Encapsulation (Isolation Voltage Capability) ..... 2500 V

(Dielectric must withstand indicated DC voltage for one minute per MIL-STD 202, Method 301)

Insulation Resistance ..... 1000 M $\Omega$

**CAUTION:** Stresses above those listed in "Absolute Maximum Ratings" may cause permanent damage to the device. This is a stress only rating and operation of the device at these or any other conditions above those indicated in the operational sections of this specification is not implied.

### Device Ratings and Specifications (Note 1)

| PART<br>NUMBER | MODEL<br>SIZE<br>DISC<br>DIA. (mm) | BRAND | MAXIMUM RATING (85°C) |                |                             |                                   | SPECIFICATIONS (25°C)                           |                  |                                                  |          |                                         |
|----------------|------------------------------------|-------|-----------------------|----------------|-----------------------------|-----------------------------------|-------------------------------------------------|------------------|--------------------------------------------------|----------|-----------------------------------------|
|                |                                    |       | CONTINUOUS            |                | TRANSIENT                   |                                   | VARISTOR VOLT-<br>AGE AT 1mA DC<br>TEST CURRENT |                  | MAXIMUM<br>CLAMPING<br>VOLTAGE<br>8 x 20 $\mu$ s |          | TYPICAL<br>CAPACI-<br>TANCE<br>f = 1MHz |
|                |                                    |       | $V_{RMS}$             | $V_{DC}$       | ENERGY 10<br>x 1000 $\mu$ s | PEAK<br>CURRENT<br>8 x 20 $\mu$ s |                                                 |                  |                                                  |          |                                         |
|                |                                    |       | $V_{M(AC)}$           | $V_{M(DC)}$    | $W_{TM}$                    | $I_{TM}$                          | $V_{NOM}$<br>MIN                                | $V_{NOM}$<br>MAX | $V_C$                                            | $I_{PK}$ | C                                       |
|                |                                    |       | (V)                   | (V)            | (J)                         | (A)                               | (V)                                             |                  | (V)                                              | (A)      | (pF)                                    |
| V8ZA05         | 5                                  | Z08   | 4                     | 5.5            | 0.1                         | 50                                | 6                                               | 11               | 30                                               | 1        | 1400                                    |
| V8ZA1          | 7                                  | 08Z1  | 4                     | 5.5            | 0.4                         | 100                               | 6                                               | 11               | 22                                               | 2.5      | 3000                                    |
| V8ZA2          | 10                                 | 08Z2  | 4                     | 5.5            | 0.8                         | 250                               | 6                                               | 11               | 20                                               | 5        | 7500                                    |
| V12ZA05        | 5                                  | Z12   | 6                     | 8              | 0.14                        | 50                                | 9                                               | 16               | 37                                               | 1        | 1200                                    |
| V12ZA1         | 7                                  | 12Z1  | 6                     | 8              | 0.6                         | 100                               | 9                                               | 16               | 34                                               | 2.5      | 2500                                    |
| V12ZA2         | 10                                 | 12Z2  | 6                     | 8              | 1.2                         | 250                               | 9                                               | 16               | 30                                               | 5        | 6000                                    |
| V18ZA05        | 5                                  | Z18   | 10                    | 14             | 0.17                        | 100                               | 14.4                                            | 21.6             | 36                                               | 1        | 1000                                    |
| V18ZA1         | 7                                  | 18Z1  | 10                    | 14             | 0.8                         | 250                               | 14.4                                            | 21.6             | 36                                               | 2.5      | 2000                                    |
| V18ZA2         | 10                                 | 18Z2  | 10                    | 14             | 1.5                         | 500                               | 14.4                                            | 21.6             | 36                                               | 5        | 5000                                    |
| V18ZA3         | 14                                 | 18Z3  | 10                    | 14             | 3.5                         | 1000                              | 14.4                                            | 21.6             | 36                                               | 10       | 11000                                   |
| V18ZA40        | 20                                 | 18Z40 | 10                    | 14             | 80 (Note 2)                 | 2000                              | 14.4<br>(Note 3)                                | 21.6             | 37                                               | 20       | 22000                                   |
| V22ZA05        | 5                                  | Z22   | 14                    | 18             | 0.2                         | 100                               | 18.7                                            | 26               | 43                                               | 1        | 800                                     |
| V22ZA1         | 7                                  | 22Z1  | 14                    | 18             | 0.9                         | 250                               | 18.7                                            | 26               | 43                                               | 2.5      | 1600                                    |
| V22ZA2         | 10                                 | 22Z2  | 14                    | 18             | 2                           | 500                               | 18.7                                            | 26               | 43                                               | 5        | 4000                                    |
| V22ZA3         | 14                                 | 22Z3  | 14                    | 18             | 4                           | 1000                              | 18.7                                            | 26               | 43                                               | 10       | 9000                                    |
| V24ZA50        | 20                                 | 24Z50 | 14                    | 18<br>(Note 4) | 100 (Note 2)                | 2000                              | 19.2<br>(Note 3)                                | 26               | 43                                               | 20       | 18000                                   |
| V27ZA05        | 5                                  | Z27   | 17                    | 22             | 0.25                        | 100                               | 23                                              | 31.1             | 53                                               | 1        | 600                                     |
| V27ZA1         | 7                                  | 27Z1  | 17                    | 22             | 1                           | 250                               | 23                                              | 31.1             | 53                                               | 2.5      | 1300                                    |
| V27ZA2         | 10                                 | 27Z2  | 17                    | 22             | 2.5                         | 500                               | 23                                              | 31.1             | 53                                               | 5        | 3000                                    |
| V27ZA4         | 14                                 | 27Z4  | 17                    | 22             | 5                           | 1000                              | 23                                              | 31.1             | 53                                               | 10       | 7000                                    |
| V27ZA60        | 20                                 | 27Z60 | 17                    | 22             | 120 (Note 2)                | 2000                              | 23<br>(Note 3)                                  | 31.1             | 50                                               | 20       | 13000                                   |

# Varistor Products

Low to Medium Voltage, Radial Lead

## ZA Varistor Series

Device Ratings and Specifications (Note 1) (Continued)

| PART NUMBER | MODEL SIZE<br>DISC<br>DIA. (mm) | BRAND  | MAXIMUM RATING (85°C) |                    |                       |                             | SPECIFICATIONS (25°C)                           |                          |                                            |                 |                                         |
|-------------|---------------------------------|--------|-----------------------|--------------------|-----------------------|-----------------------------|-------------------------------------------------|--------------------------|--------------------------------------------|-----------------|-----------------------------------------|
|             |                                 |        | CONTINUOUS            |                    | TRANSIENT             |                             | VARISTOR VOLT-<br>AGE AT 1mA DC<br>TEST CURRENT |                          | MAXIMUM<br>CLAMPING<br>VOLTAGE<br>8 x 20µs |                 | TYPICAL<br>CAPACI-<br>TANCE<br>f = 1MHz |
|             |                                 |        | V <sub>RMS</sub>      | V <sub>DC</sub>    | ENERGY 10<br>x 1000µs | PEAK<br>CURRENT<br>8 x 20µs |                                                 |                          |                                            |                 |                                         |
|             |                                 |        | V <sub>M(AC)</sub>    | V <sub>M(DC)</sub> | W <sub>TM</sub>       | I <sub>TM</sub>             | V <sub>NOM<br/>MIN</sub>                        | V <sub>NOM<br/>MAX</sub> | V <sub>C</sub>                             | I <sub>PK</sub> | C                                       |
|             |                                 |        | (V)                   | (V)                | (J)                   | (A)                         | (V)                                             |                          | (V)                                        | (A)             | (pF)                                    |
| V33ZA05     | 5                               | Z33    | 20                    | 26                 | 0.3                   | 100                         | 29.5                                            | 38                       | 65                                         | 1               | 500                                     |
| V33ZA1      | 7                               | 33Z1   | 20                    | 26                 | 1.2                   | 250                         | 29.5                                            | 36.5                     | 65                                         | 2.5             | 1100                                    |
| V33ZA2      | 10                              | 33Z2   | 20                    | 26                 | 3                     | 500                         | 29.5                                            | 36.5                     | 65                                         | 5               | 2700                                    |
| V33ZA5      | 14                              | 33Z5   | 20                    | 26                 | 6                     | 1000                        | 29.5                                            | 36.5                     | 65                                         | 10              | 6000                                    |
| V33ZA70     | 20                              | 33Z70  | 21                    | 27                 | 150 (Note 2)          | 2000                        | 29.5<br>(Note 3)                                | 36.5                     | 58                                         | 20              | 13000                                   |
| V36ZA80     | 20                              | 36Z80  | 23                    | 31                 | 160 (Note 2)          | 2000                        | 32<br>(Note 3)                                  | 40                       | 63                                         | 20              | 12000                                   |
| V39ZA05     | 5                               | Z39    | 25                    | 31                 | 0.3                   | 100                         | 35                                              | 46                       | 79                                         | 1               | 500                                     |
| V39ZA1      | 7                               | 39Z1   | 25                    | 31                 | 1.2                   | 250                         | 35                                              | 43                       | 79                                         | 2.5             | 1100                                    |
| V39ZA3      | 10                              | 39Z3   | 25                    | 31                 | 3                     | 500                         | 35                                              | 43                       | 76                                         | 5               | 2700                                    |
| V39ZA6      | 14                              | 39Z6   | 25                    | 31                 | 6                     | 1000                        | 35                                              | 43                       | 76                                         | 10              | 6000                                    |
| V39ZA20     | 20                              | 39Z20  | 25                    | 31                 | 20                    | 2000                        | 35                                              | 43                       | 76                                         | 20              | 12000                                   |
| V47ZA05     | 5                               | Z47    | 30                    | 38                 | 0.4                   | 100                         | 42                                              | 55                       | 93                                         | 1               | 400                                     |
| V47ZA1      | 7                               | 47Z1   | 30                    | 38                 | 1.8                   | 250                         | 42                                              | 52                       | 93                                         | 2.5             | 800                                     |
| V47ZA3      | 10                              | 47Z3   | 30                    | 38                 | 4.5                   | 500                         | 42                                              | 52                       | 93                                         | 5               | 2000                                    |
| V47ZA7      | 14                              | 47Z7   | 30                    | 38                 | 8.8                   | 1000                        | 42                                              | 52                       | 93                                         | 10              | 4500                                    |
| V47ZA20     | 20                              | 47Z20  | 30                    | 38                 | 23                    | 2000                        | 42                                              | 52                       | 93                                         | 20              | 11000                                   |
| V56ZA05     | 5                               | Z56    | 35                    | 45                 | 0.5                   | 100                         | 50                                              | 66                       | 110                                        | 1               | 360                                     |
| V56ZA2      | 7                               | 56Z2   | 35                    | 45                 | 2.3                   | 250                         | 50                                              | 62                       | 110                                        | 2.5             | 700                                     |
| V56ZA3      | 10                              | 56Z3   | 35                    | 45                 | 5.5                   | 500                         | 50                                              | 62                       | 110                                        | 5               | 1800                                    |
| V56ZA8      | 14                              | 56Z8   | 35                    | 45                 | 10                    | 1000                        | 50                                              | 62                       | 110                                        | 10              | 3900                                    |
| V56ZA20     | 20                              | 56Z20  | 35                    | 45                 | 30                    | 2000                        | 50                                              | 62                       | 110                                        | 20              | 10000                                   |
| V68ZA05     | 5                               | Z68    | 40                    | 56                 | 0.6                   | 100                         | 61                                              | 80                       | 135                                        | 1               | 300                                     |
| V68ZA2      | 7                               | 68Z2   | 40                    | 56                 | 3                     | 250                         | 61                                              | 75                       | 135                                        | 2.5             | 600                                     |
| V68ZA3      | 10                              | 68Z3   | 40                    | 56                 | 6.5                   | 500                         | 61                                              | 75                       | 135                                        | 5               | 1500                                    |
| V68ZA10     | 14                              | 68Z10  | 40                    | 56                 | 13                    | 1000                        | 61                                              | 75                       | 135                                        | 10              | 3300                                    |
| V68ZA20     | 20                              | 68Z20  | 40                    | 56                 | 33                    | 2000                        | 61                                              | 75                       | 135                                        | 20              | 10000                                   |
| V82ZA05     | 5                               | Z82    | 50                    | 68                 | 2                     | 400                         | 73                                              | 97                       | 135                                        | 5               | 240                                     |
| V82ZA2      | 7                               | 82Z2   | 50                    | 68                 | 4                     | 1200                        | 73                                              | 91                       | 135                                        | 10              | 500                                     |
| V82ZA4      | 10                              | 82Z4   | 50                    | 68                 | 8                     | 2500                        | 73                                              | 91                       | 135                                        | 25              | 1100                                    |
| V82ZA12     | 14                              | 82Z12  | 50                    | 68                 | 15                    | 4500                        | 73                                              | 91                       | 145                                        | 50              | 2500                                    |
| V100ZA05    | 5                               | Z100   | 60                    | 81                 | 2.5                   | 400                         | 90                                              | 117                      | 165                                        | 5               | 180                                     |
| V100ZA3     | 7                               | 100Z   | 60                    | 81                 | 5                     | 1200                        | 90                                              | 110                      | 165                                        | 10              | 400                                     |
| V100ZA4     | 10                              | 100Z4  | 60                    | 81                 | 10                    | 2500                        | 90                                              | 110                      | 165                                        | 25              | 900                                     |
| V100ZA15    | 14                              | 100Z15 | 60                    | 81                 | 20                    | 4500                        | 90                                              | 110                      | 175                                        | 50              | 2000                                    |

# Varistor Products

Low to Medium Voltage, Radial Lead

## ZA Varistor Series

### Device Ratings and Specifications (Note1) (Continued)

| PART<br>NUMBER | MODEL<br>SIZE<br>DISC<br>DIA. (mm) | BRAND  | MAXIMUM RATING (85°C) |                    |                       |                             | SPECIFICATIONS (25°C)                           |                          |                                            |                 |                                         |
|----------------|------------------------------------|--------|-----------------------|--------------------|-----------------------|-----------------------------|-------------------------------------------------|--------------------------|--------------------------------------------|-----------------|-----------------------------------------|
|                |                                    |        | CONTINUOUS            |                    | TRANSIENT             |                             | VARISTOR VOLT-<br>AGE AT 1mA DC<br>TEST CURRENT |                          | MAXIMUM<br>CLAMPING<br>VOLTAGE<br>8 x 20µs |                 | TYPICAL<br>CAPACI-<br>TANCE<br>f = 1MHz |
|                |                                    |        | V <sub>RMS</sub>      | V <sub>DC</sub>    | ENERGY 10<br>x 1000µs | PEAK<br>CURRENT<br>8 x 20µs |                                                 |                          |                                            |                 |                                         |
|                |                                    |        | V <sub>M(AC)</sub>    | V <sub>M(DC)</sub> | W <sub>TM</sub>       | I <sub>TM</sub>             | V <sub>NOM<br/>MIN</sub>                        | V <sub>NOM<br/>MAX</sub> | V <sub>C</sub>                             | I <sub>PK</sub> |                                         |
|                |                                    |        | (V)                   | (V)                | (J)                   | (A)                         | (V)                                             |                          | (V)                                        | (A)             | (pF)                                    |
| V120ZA05       | 5                                  | Z120   | 75                    | 102                | 3                     | 400                         | 108                                             | 138                      | 205                                        | 5               | 140                                     |
| V120ZA1        | 7                                  | 120Z   | 75                    | 102                | 6                     | 1200                        | 108                                             | 132                      | 205                                        | 10              | 300                                     |
| V120ZA4        | 10                                 | 120Z4  | 75                    | 102                | 12                    | 2500                        | 108                                             | 132                      | 200                                        | 25              | 750                                     |
| V120ZA6        | 14                                 | 120Z6  | 75                    | 102                | 22                    | 4500                        | 108                                             | 132                      | 210                                        | 50              | 1700                                    |
| V120ZA20       | 20                                 | 120Z20 | 75                    | 102                | 33                    | 6500                        | 108                                             | 132                      | 210                                        | 100             | 1500                                    |
| V150ZA05       | 5                                  | Z150   | 92                    | 127                | 4                     | 400                         | 135                                             | 173                      | 250                                        | 5               | 120                                     |
| V150ZA1        | 7                                  | Z051   | 95                    | 127                | 8                     | 1200                        | 135                                             | 165                      | 250                                        | 10              | 250                                     |
| V150ZA4        | 10                                 | 150Z4  | 95                    | 127                | 15                    | 2500                        | 135                                             | 165                      | 250                                        | 25              | 600                                     |
| V150ZA8        | 14                                 | 150Z8  | 95                    | 127                | 20                    | 4500                        | 135                                             | 165                      | 250                                        | 50              | 1400                                    |
| V150ZA20       | 20                                 | 150Z20 | 95                    | 127                | 45                    | 6500                        | 135                                             | 165                      | 250                                        | 100             | 1000                                    |
| V180ZA05       | 5                                  | Z180   | 110                   | 153                | 5                     | 400                         | 162                                             | 207                      | 295                                        | 5               | 100                                     |
| V180ZA1        | 7                                  | 180Z   | 115                   | 153                | 10                    | 1200                        | 162                                             | 198                      | 300                                        | 10              | 200                                     |
| V180ZA5        | 10                                 | 180Z5  | 115                   | 153                | 18                    | 2500                        | 162                                             | 198                      | 300                                        | 25              | 500                                     |
| V180ZA10       | 14                                 | 180Z10 | 115                   | 153                | 35                    | 4500                        | 162                                             | 198                      | 300                                        | 50              | 1100                                    |
| V180ZA20       | 20                                 | 180Z20 | 115                   | 153                | 52                    | 6500                        | 162                                             | 198                      | 300                                        | 100             | 2400                                    |
| V205ZA05       | 5                                  | Z205   | 130                   | 170                | 5.5                   | 400                         | 184                                             | 226                      | 340                                        | 5               | 100                                     |
| V220ZA05       | 5                                  | Z220   | 140                   | 180                | 6                     | 400                         | 198                                             | 253                      | 360                                        | 5               | 90                                      |
| V240ZA05       | 5                                  | Z240   | 150                   | 200                | 7                     | 400                         | 216                                             | 264                      | 395                                        | 5               | 80                                      |
| V270ZA05       | 5                                  | Z270   | 175                   | 225                | 7.5                   | 400                         | 243                                             | 311                      | 455                                        | 5               | 70                                      |
| V330ZA05       | 5                                  | Z330   | 210                   | 275                | 9                     | 400                         | 297                                             | 380                      | 540                                        | 5               | 60                                      |
| V360ZA05       | 5                                  | Z360   | 230                   | 300                | 9.5                   | 400                         | 324                                             | 396                      | 595                                        | 5               | 55                                      |
| V390ZA05       | 5                                  | Z390   | 250                   | 330                | 10                    | 400                         | 351                                             | 449                      | 650                                        | 5               | 50                                      |
| V430ZA05       | 5                                  | Z430   | 275                   | 369                | 11                    | 400                         | 387                                             | 495                      | 710                                        | 5               | 45                                      |
| V470ZA05       | 5                                  | Z470   | 300                   | 385                | 12                    | 400                         | 420                                             | 517                      | 775                                        | 5               | 35                                      |
| V620ZA05       | 5                                  | Z620   | 385                   | 505                | 13                    | 400                         | 558                                             | 682                      | 1025                                       | 5               | 33                                      |
| V680ZA05       | 5                                  | Z680   | 420                   | 560                | 14                    | 400                         | 610                                             | 748                      | 1120                                       | 5               | 32                                      |
| V715ZA05       | 5                                  | Z715   | 440                   | 585                | 15.5                  | 400                         | 643                                             | 787                      | 1180                                       | 5               | 31                                      |
| V750ZA05       | 5                                  | Z750   | 460                   | 615                | 17                    | 400                         | 675                                             | 825                      | 1240                                       | 5               | 30                                      |

#### NOTES:

1. Average power dissipation of transients not to exceed 0.2W, 0.25W, 0.4W, 0.6W or 1W for model sizes 5mm, 7mm, 10mm, 14mm and 20mm, respectively.
2. Energy rating for impulse duration of 30ms minimum to one half of peak current (auto load dump).
3. 10mA DC test current.
4. Also rated to withstand 24V for 5 minutes.
5. Higher voltages available, contact Littelfuse.

† Also recognized to UL1449, "Transient Voltage Surge Suppressors" File #E75961.

# Varistor Products

Low to Medium Voltage, Radial Lead

## ZA Varistor Series

### Power Dissipation Ratings

Should transients occur in rapid succession, the average power dissipation required is simply the energy (watt-seconds) per pulse times the number of pulses per second. The power so developed must be within the specifications shown on the Device Ratings and Specifications table for the specific device. Furthermore, the operating values need to be derated at high temperatures as shown in Figure 1. Because varistors can only dissipate a relatively small amount of average power they are, therefore, not suitable for repetitive applications that involve substantial amounts of average power dissipation.

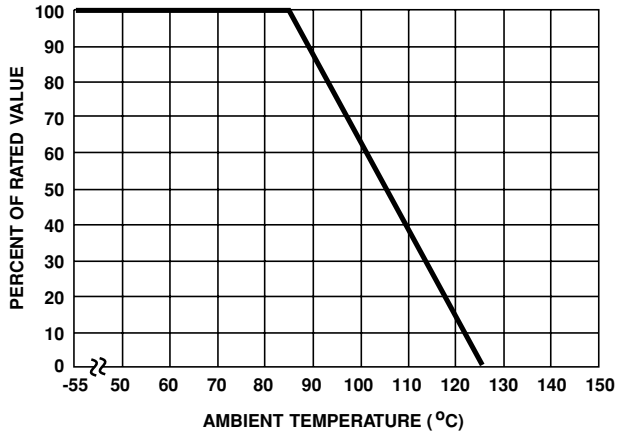


FIGURE 1. CURRENT, ENERGY AND POWER DERATING CURVE

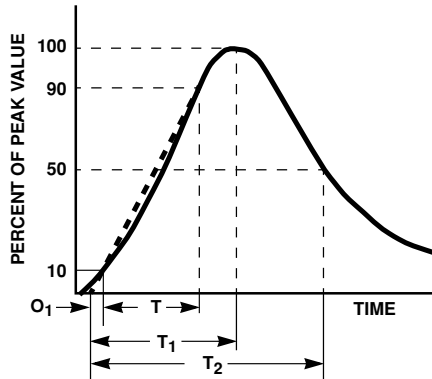


FIGURE 2. PEAK PULSE CURRENT TEST WAVEFORM

$O_1$  = Virtual Origin of Wave  
 $T$  = Time From 10% to 90% of Peak  
 $T_1$  = Virtual Front time =  $1.25 \cdot t$   
 $T_2$  = Virtual Time to Half Value (Impulse Duration)  
 Example: For an 8/20 $\mu$ s Current Waveform:  
 $8\mu$ s =  $T_1$  = Virtual Front Time  
 $20\mu$ s =  $T_2$  = Virtual Time to Half Value

### Transient V-I Characteristics Curves

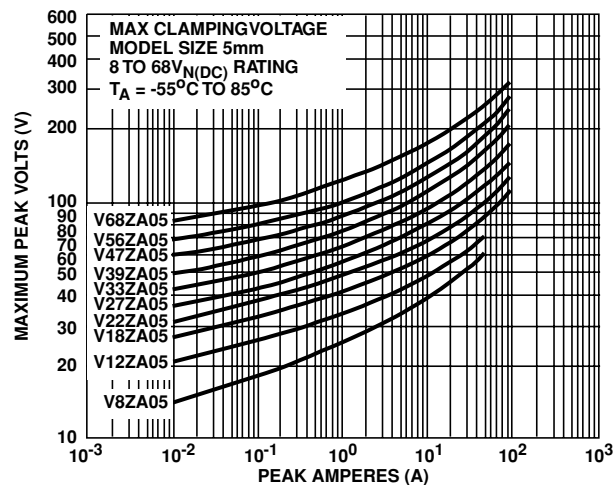


FIGURE 3. CLAMPING VOLTAGE FOR V8ZA05 - V68ZA05

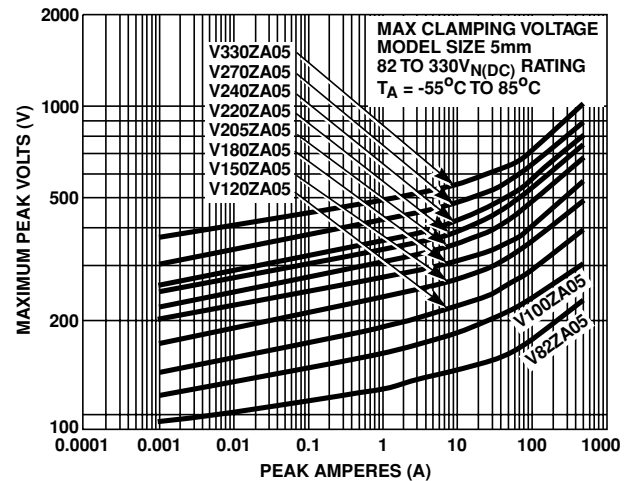


FIGURE 4. CLAMPING VOLTAGE FOR V82ZA05 - V330ZA05

# Varistor Products

Low to Medium Voltage, Radial Lead

## ZA Varistor Series

### Transient V-I Characteristics Curves (Continued)

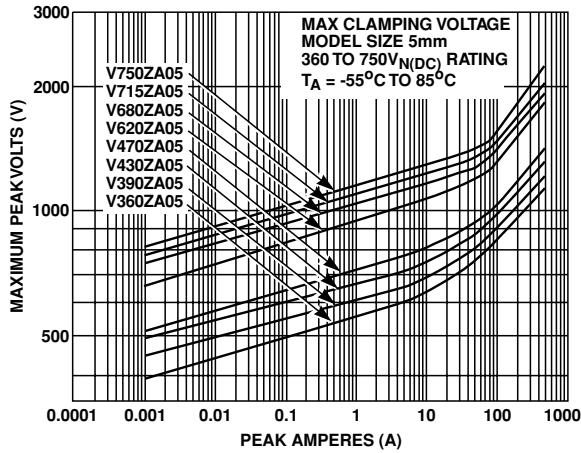


FIGURE 5. CLAMPING VOLTAGE FOR V360ZA05 - V750ZA05

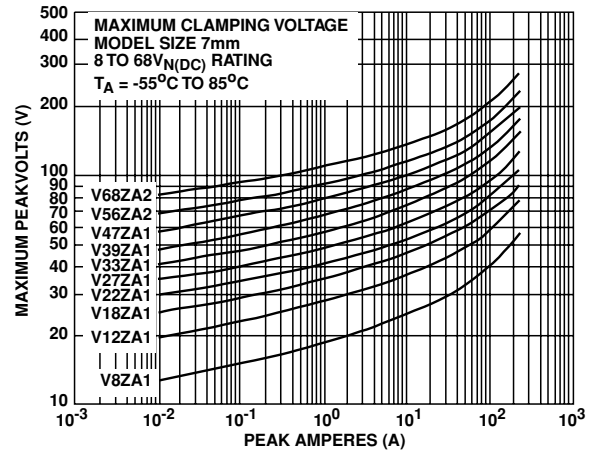


FIGURE 6. CLAMPING VOLTAGE FOR V8ZA1 - V68ZA2

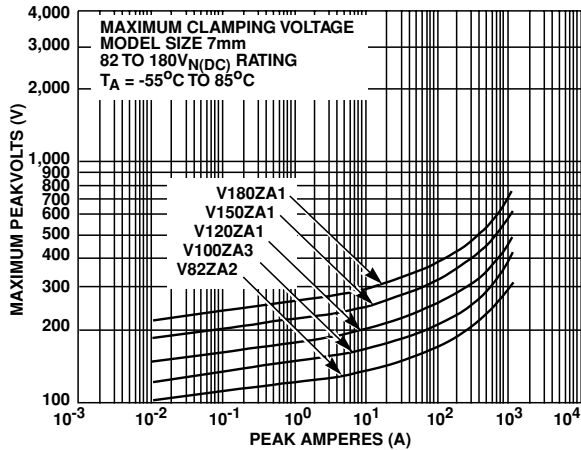


FIGURE 7. CLAMPING VOLTAGE FOR V82ZA2 - V180ZA1

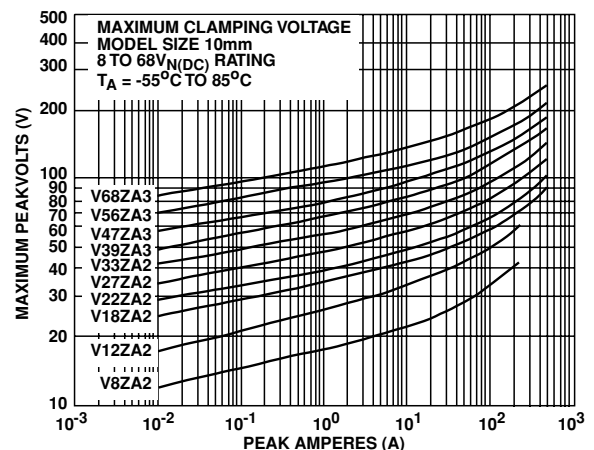


FIGURE 8. CLAMPING VOLTAGE FOR V8ZA2 - V68ZA3

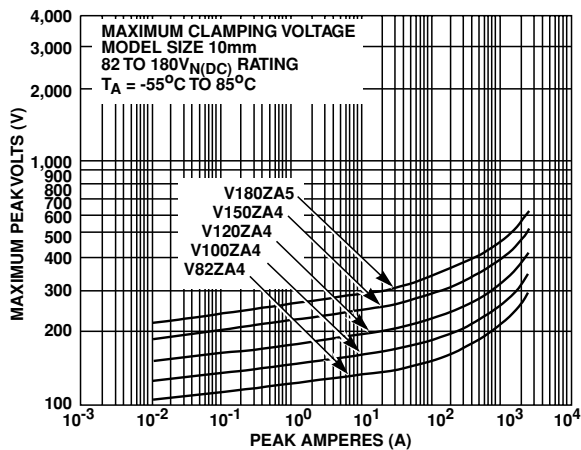


FIGURE 9. CLAMPING VOLTAGE FOR V82ZA4 - V180ZA5

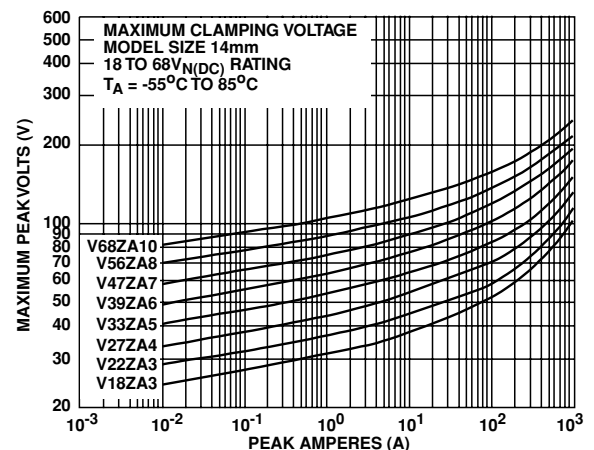


FIGURE 10. CLAMPING VOLTAGE FOR V18ZA3 - V68ZA10

# Varistor Products

Low to Medium Voltage, Radial Lead

## ZA Varistor Series

### Transient V-I Characteristics Curves (Continued)

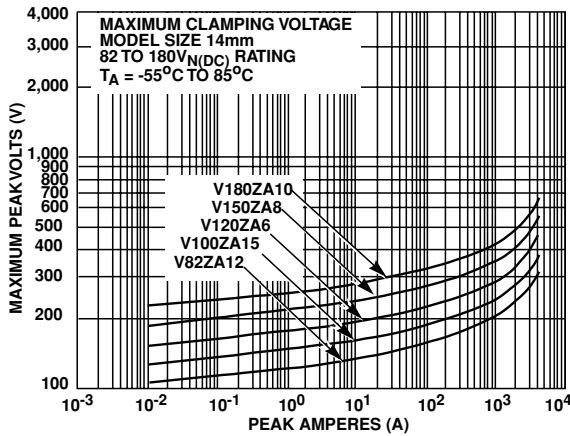


FIGURE 11. CLAMPING VOLTAGE FOR V82ZA12 - V180ZA10

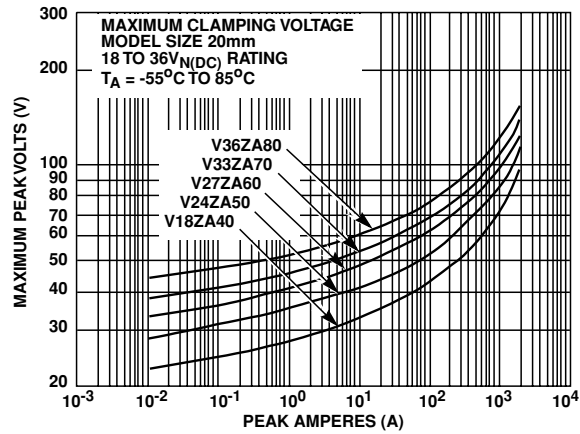


FIGURE 12. CLAMPING VOLTAGE FOR V18ZA40 - V36ZA80

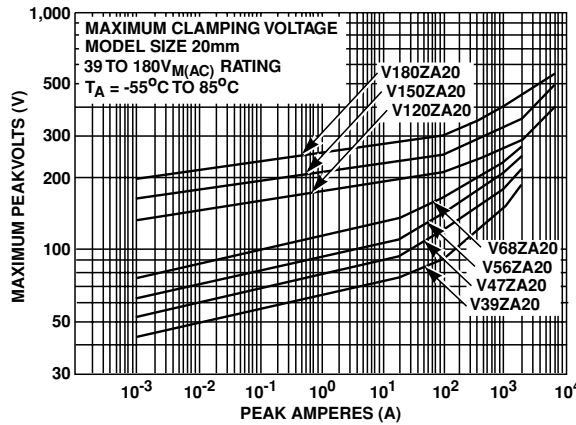


FIGURE 13. CLAMPING VOLTAGE FOR V39ZA20 - V180ZA20

### Pulse Rating Curves

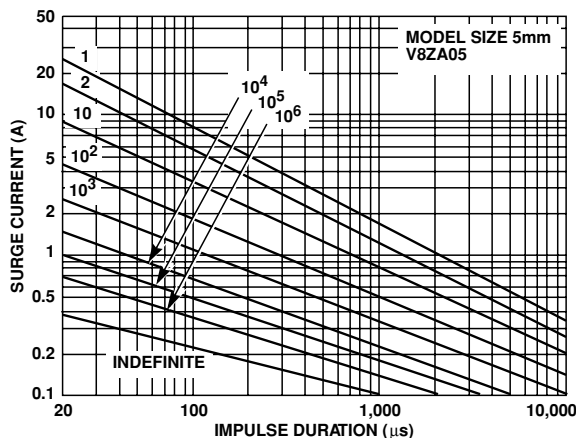


FIGURE 14. SURGE CURRENT RATING CURVES FOR V8ZA05

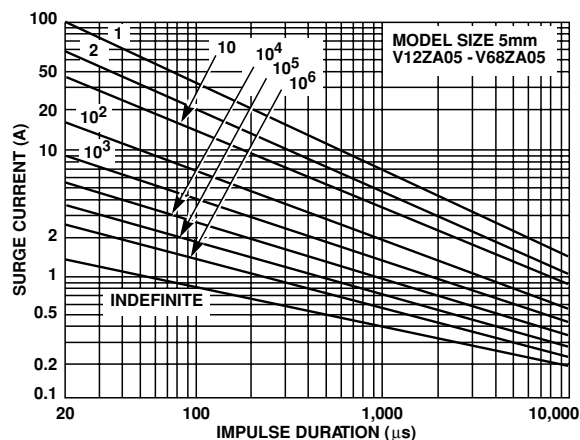


FIGURE 15. SURGE CURRENT RATING CURVES FOR V12ZA05 - V68ZA05



# Varistor Products

Low to Medium Voltage, Radial Lead

## ZA Varistor Series

### Pulse Rating Curves (Continued)

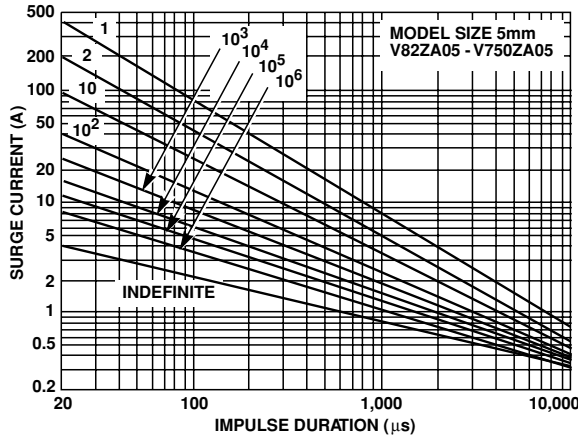


FIGURE 16. SURGE CURRENT RATING CURVES FOR V82ZA05 - V750ZA05

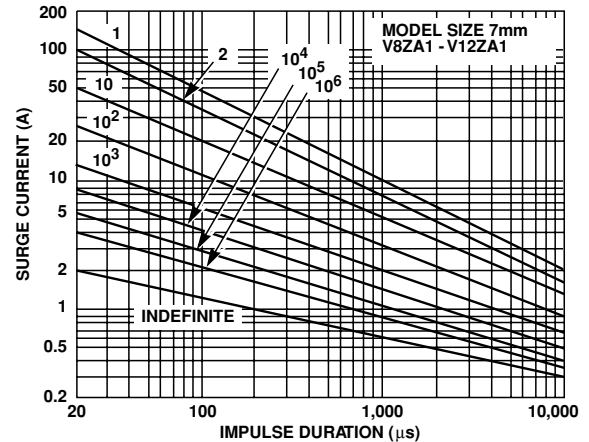


FIGURE 17. SURGE CURRENT RATING CURVES FOR V8ZA1 - V12ZA1

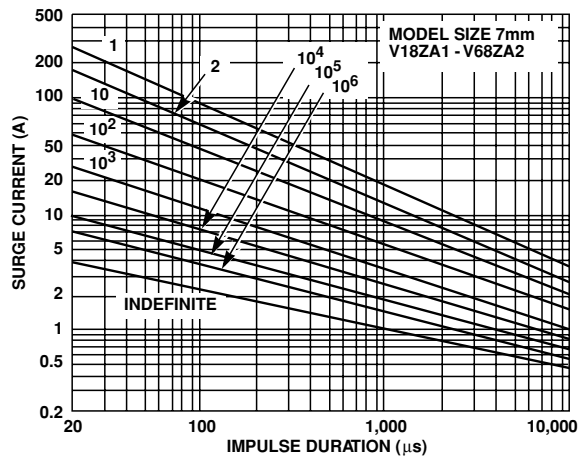


FIGURE 18. SURGE CURRENT RATING CURVES FOR V18ZA1 - V68ZA2

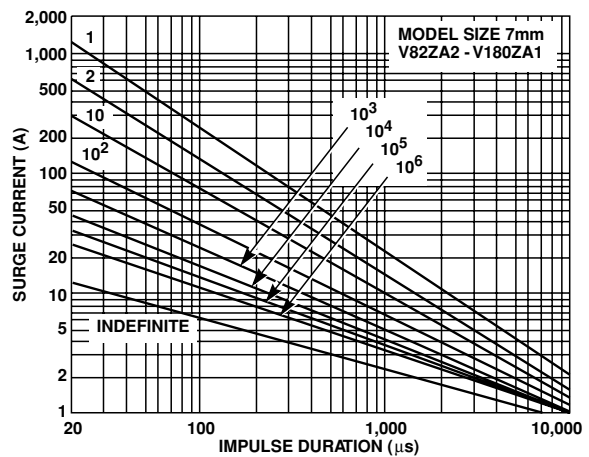


FIGURE 19. SURGE CURRENT RATING CURVES FOR V82ZA2 - V180ZA1

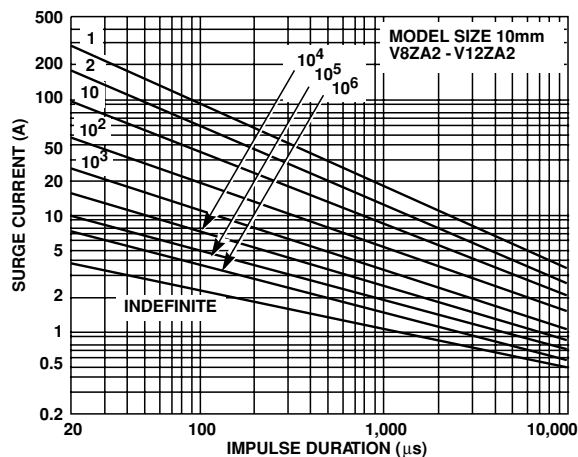


FIGURE 20. SURGE CURRENT RATING CURVES FOR V8ZA2 - V127ZA2

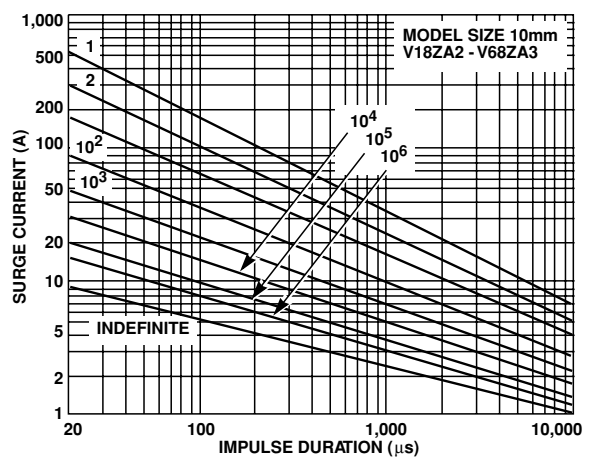


FIGURE 21. SURGE CURRENT RATING CURVES FOR V18ZA2 - V68ZA3



## Varistor Products

Low to Medium Voltage, Radial Lead

### ZA Varistor Series

#### Pulse Rating Curves (Continued)

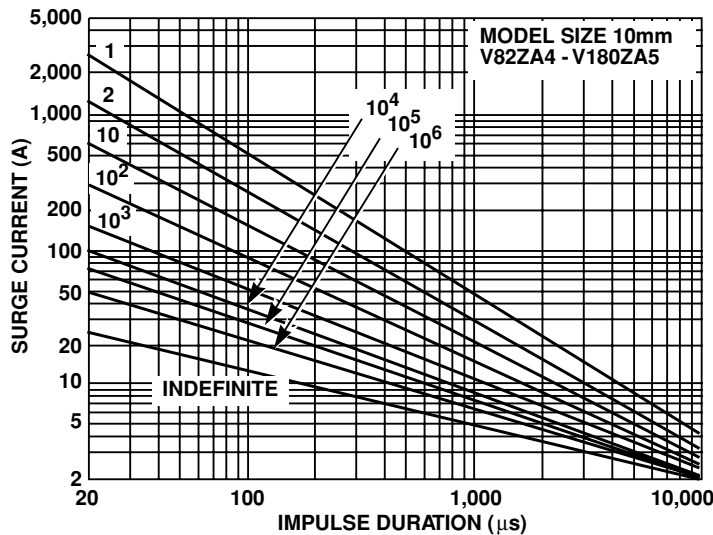


FIGURE 22. SURGE CURRENT RATING CURVES FOR  
V82ZA4 - V180ZA5

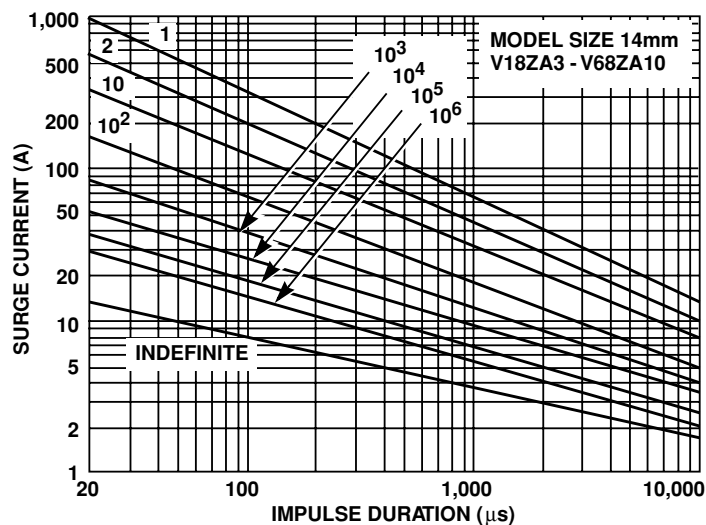


FIGURE 23. SURGE CURRENT RATING CURVES FOR  
V18ZA3 - V68ZA10

2

VARISTOR  
PRODUCTS

# Varistor Products

Low to Medium Voltage, Radial Lead

## ZA Varistor Series

### Pulse Rating Curves (Continued)

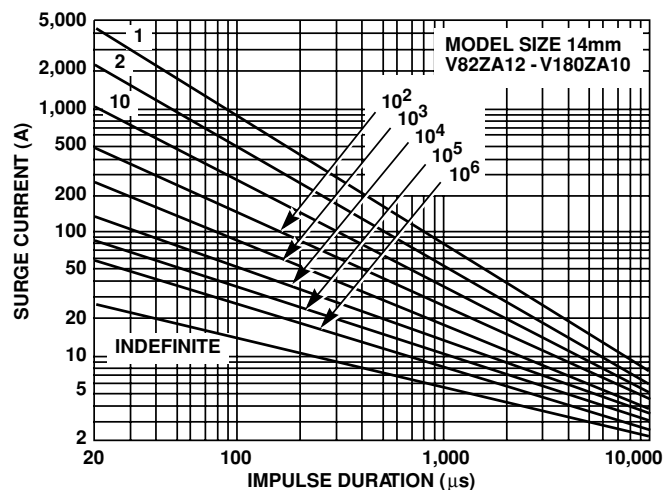


FIGURE 24. SURGE CURRENT RATING CURVES FOR V82ZA12 - V180ZA10

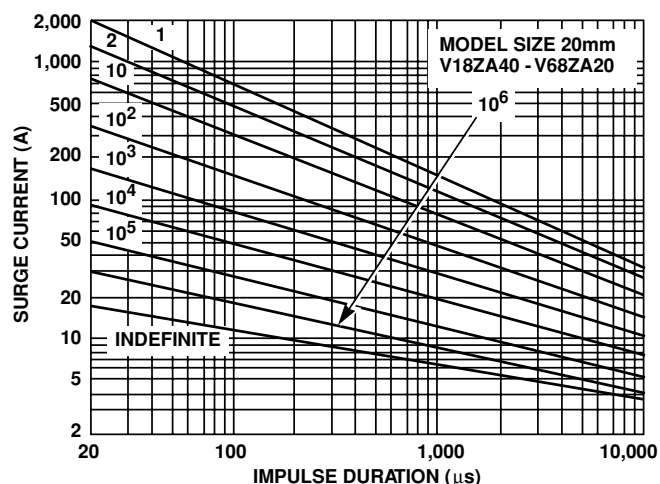


FIGURE 25. SURGE CURRENT RATING CURVES FOR V18ZA40 - V68ZA20

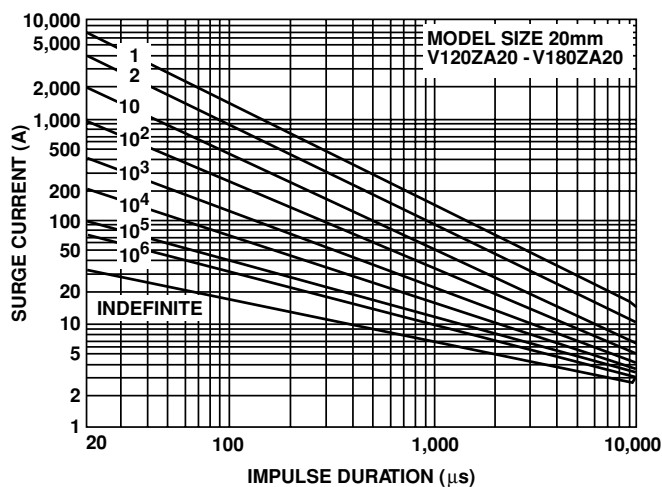


FIGURE 26. SURGE CURRENT RATING CURVES FOR V120ZA20 - V180ZA20

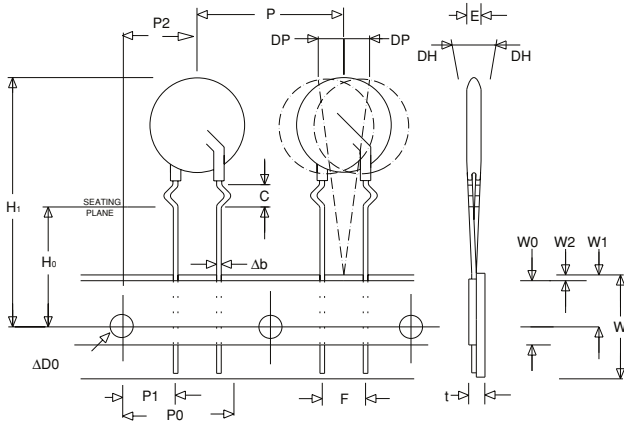
NOTE: If pulse ratings are exceeded, a shift of  $V_{N(DC)}$  (at specified current) of more than  $\pm 10\%$  could result. This type of shift, which normally results in a decrease of  $V_{N(DC)}$ , may result in the device not meeting the original published specifications, but does not prevent the device from continuing to function, and to provide ample protection.

# Varistor Products

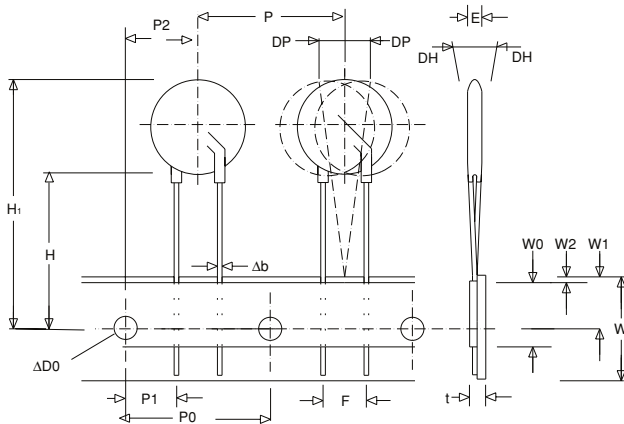
Low to Medium Voltage, Radial Lead

## ZA Varistor Series

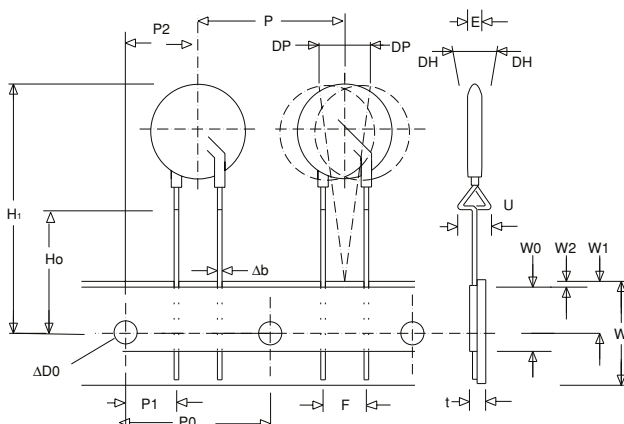
Tape and Reel Specifications  
5 and 7mm Devices



Crimped Leads "LT"

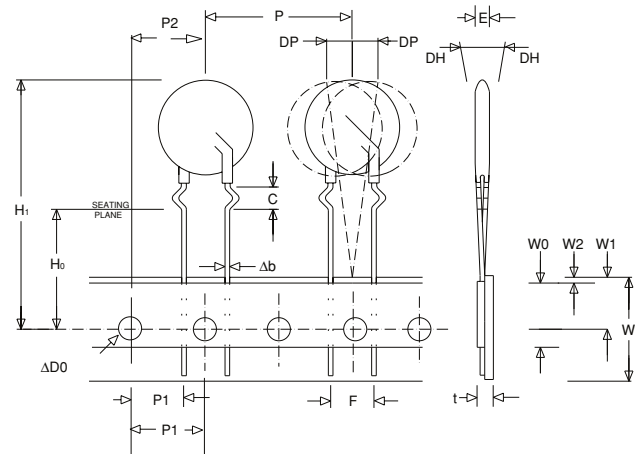


Straight Leads "LS"

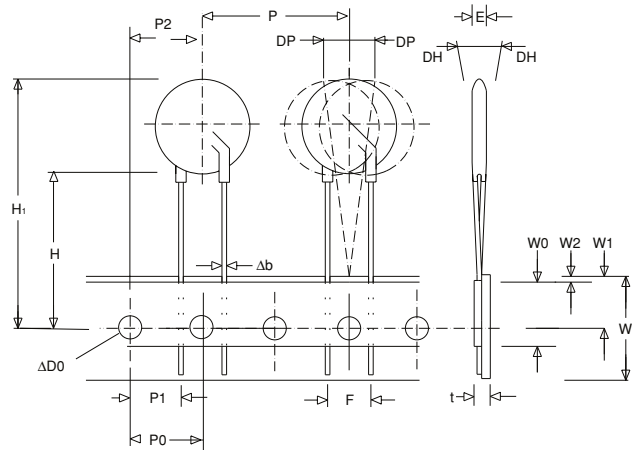


Under-crimped Leads "LU"

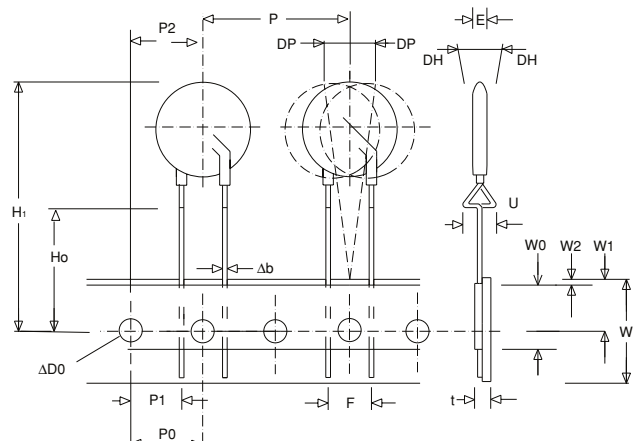
10, 14 and 20mm Devices



Crimped Leads "LT"



Straight Leads "LS"



Under-crimped Leads "LU"

2

VARISTOR  
PRODUCTS

## Varistor Products

Low to Medium Voltage, Radial Lead

### ZA Varistor Series

| SYMBOL         | PARAMETER                                 | MODEL SIZE               |                          |                          |                          |                          |
|----------------|-------------------------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
|                |                                           | 5mm                      | 7mm                      | 10mm                     | 14mm                     | 20mm                     |
| P              | Pitch of Component                        | 12.7 ± 1.0               | 12.7 ± 1.0               | 25.4 ± 1.0               | 25.4 ± 1.0               | 25.4 ± 1.0               |
| P <sub>0</sub> | Feed Hole Pitch                           | 12.7 ± 0.2               | 12.7 ± 0.2               | 12.7 ± 0.2               | 12.7 ± 0.2               | 12.7 ± 0.2               |
| P <sub>1</sub> | Feed Hole Center to Pitch                 | 3.85 ± 0.7               | 3.85 ± 0.7               | 8.85 ± 0.7               | 8.85 ± 0.7               | 8.85 ± 0.7               |
| P <sub>2</sub> | Hole Center to Component Center           | 6.35 ± 1.0               | 6.35 ± 1.0               | 12.7 ± 0.7               | 12.7 ± 0.7               | 12.7 ± 0.7               |
| F              | Lead to Lead Distance                     | 5.0 ± 1.0                | 5.0 ± 1.0                | 7.5 ± 1.0                | 7.5 ± 1.0                | 7.5 ± 1.0                |
| h              | Component Alignment                       | 2.0 Max                  | 2.0 Max                  | 2.0 Max                  | 2.0 Max                  | 2.0 Max                  |
| W              | Tape Width                                | 18.0 + 1.0<br>18.0 - 0.5 | 18.0 + 1.0<br>18.0 - 0.5 | 18.0 + 1.0<br>18.0 - 0.5 | 18.0 + 1.0<br>18.0 - 0.5 | 18.0 + 1.0<br>18.0 - 0.5 |
| W <sub>0</sub> | Hold Down Tape Width                      | 12.0 ± 0.3               | 12.0 ± 0.3               | 12.0 ± 0.3               | 12.0 ± 0.3               | 12.0 ± 0.3               |
| W <sub>1</sub> | Hole Position                             | 9.0 + 0.75<br>9.0 - 0.50 | 9.0 + 0.75<br>9.0 - 0.50 | 9.0 + 0.75<br>9.0 - 0.50 | 9.0 + 0.75<br>9.0 - 0.50 | 9.0 + 0.75<br>9.0 - 0.50 |
| W <sub>2</sub> | Hold Down Tape Position                   | 0.5 Max                  | 0.5 Max                  | 0.5 Max                  | 0.5 Max                  | 0.5 Max                  |
| H              | Height from Tape Center to Component Base | 18.0 + 2.0<br>18.0 - 0.0 | 18.0 + 2.0<br>18.0 - 0.0 | 18.0 + 2.0<br>18.0 - 0.0 | 18.0 + 2.0<br>18.0 - 0.0 | 18.0 + 2.0<br>18.0 - 0.0 |
| H <sub>0</sub> | Seating Plane Height                      | 16.0 ± 0.5               | 16.0 ± 0.5               | 16.0 ± 0.5               | 16.0 ± 0.5               | 16.0 ± 0.5               |
| H <sub>1</sub> | Component Height                          | 29.0 Max                 | 32.0 Max                 | 36.0 Max                 | 40.0 Max                 | 46.5 Max                 |
| D <sub>0</sub> | Feed Hole Diameter                        | 4.0 ± 0.2                | 4.0 ± 0.2                | 4.0 ± 0.2                | 4.0 ± 0.2                | 4.0 ± 0.2                |
| t              | Total Tape Thickness                      | 0.7 ± 0.2                | 0.7 ± 0.2                | 0.7 ± 0.2                | 0.7 ± 0.2                | 0.7 ± 0.2                |
| U              | Under-crimp Width                         | 8.0 Max                  | 8.0 Max                  | 8.0 Max                  | 8.0 Max                  | 8.0 Max                  |
| p              | Component Alignment                       | 3° Max                   | 3° Max                   | 3° Max                   | 3° Max                   | 3° Max                   |

NOTE: Dimensions are in mm.

#### Tape and Reel Data

- Conforms to ANSI and EIA specifications
- Can be supplied to IEC Publication 286-2
- Radial devices on tape are supplied with crimped leads, straight leads, or under-crimped leads

NOTE: Leads are offset by Dim e1

## Varistor Products

Low to Medium Voltage, Radial Lead

### ZA Varistor Series

#### Tape and Reel Ordering Information

Crimped leads are standard on ZA types supplied in tape and reel and are denoted by the model letter "T". Model letter "S" denotes straight leads and letter "U" denotes special under-crimped leads.

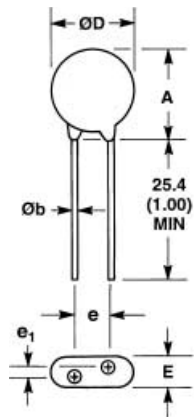
Example:

| STANDARD MODEL | CRIMPED LEADS | STRAIGHT LEADS | UNDER-CRIMPED LEADS |
|----------------|---------------|----------------|---------------------|
| V18ZA3         | V18ZT3        | V18ZS3         | V18ZU3              |

#### SHIPPING QUANTITY

| SIZE | RMS (MAX) VOLTAGE | QUANTITY PER REEL |          |          |
|------|-------------------|-------------------|----------|----------|
|      |                   | "T" REEL          | "S" REEL | "U" REEL |
| 5mm  | All               | 1000              | 1000     | 1000     |
| 7mm  | All               | 1000              | 1000     | 1000     |
| 10mm | All               | 500               | 500      | 500      |
| 14mm | < 300V            | 500               | 500      | 500      |
| 14mm | ≥ 300V            | 500               | 500      | 400      |
| 20mm | < 300V            | 500               | 500      | 500      |
| 20mm | ≥ 300V            | 500               | 500      | 400      |

#### Mechanical Dimensions



| SYM-BOL        | VOLTAGE MODEL | VARISTOR MODEL SIZE |                  |                  |                  |                 |                 |                 |                 |                            |                            |
|----------------|---------------|---------------------|------------------|------------------|------------------|-----------------|-----------------|-----------------|-----------------|----------------------------|----------------------------|
|                |               | 5mm                 |                  | 7mm              |                  | 10mm            |                 | 14mm            |                 | 20mm                       |                            |
|                |               | MIN                 | MAX              | MIN              | MAX              | MIN             | MAX             | MIN             | MAX             | MIN                        | MAX                        |
| A              | All           | -                   | 10<br>(0.394)    | -                | 12<br>(0.472)    | -               | 16<br>(0.630)   | -               | 20<br>(0.787)   | -                          | 26.5<br>(1.043)            |
| ØD             | All           | -                   | 7<br>(0.276)     | -                | 9<br>(0.354)     | -               | 12.5<br>(0.492) | -               | 17<br>(0.669)   | -                          | 23<br>(0.906)              |
| e              | All           | 4<br>(0.157)        | 6<br>(0.236)     | 4<br>(0.157)     | 6<br>(0.236)     | 6.5<br>(0.256)  | 8.5<br>(0.335)  | 6.5<br>(0.256)  | 8.5<br>(0.335)  | 6.5<br>(0.256)<br>(Note 6) | 8.5<br>(0.335)<br>(Note 6) |
| e <sub>1</sub> | V8ZA-V56ZA    | 1<br>(0.039)        | 3<br>(0.118)     | 1<br>(0.039)     | 3<br>(0.118)     | 1<br>(0.039)    | 3<br>(0.118)    | 1<br>(0.039)    | 3<br>(0.118)    | 1<br>(0.039)               | 3<br>(0.118)               |
|                | V68ZA-V100ZA  | 1.5<br>(0.059)      | 3.5<br>(0.138)   | 1.5<br>(0.059)   | 3.5<br>(0.138)   | 1.5<br>(0.059)  | 3.5<br>(0.138)  | 1.5<br>(0.059)  | 3.5<br>(0.138)  | 1.5<br>(0.059)             | 3.5<br>(0.138)             |
|                | V120ZA-V180ZA | 1<br>(0.039)        | 3<br>(0.118)     | 1<br>(0.039)     | 3<br>(0.118)     | 1<br>(0.039)    | 3<br>(0.118)    | 1<br>(0.038)    | 3<br>(0.118)    | 1<br>(0.038)               | 3<br>(0.118)               |
|                | V205ZA-V750ZA | 1.5<br>(0.059)      | 3.5<br>(0.138)   | -                | -                | -               | -               | -               | -               | -                          | -                          |
| E              | V8ZA-V56ZA    | -                   | 5<br>(0.197)     | -                | 5<br>(0.197)     | -               | 5<br>(0.197)    | -               | 5<br>(0.197)    | -                          | 5<br>(0.197)               |
|                | V68ZA-V100ZA  | -                   | 5.6<br>(0.220)   | -                | 5.6<br>(0.220)   | -               | 5.6<br>(0.220)  | -               | 5.6<br>(0.220)  | -                          | 5.6<br>(0.220)             |
|                | V120ZA-V180ZA | -                   | 5<br>(0.197)     | -                | 5<br>(0.197)     | -               | 5<br>(0.197)    | -               | 5<br>(0.197)    | -                          | 5<br>(0.197)               |
|                | V205ZA-V750ZA | -                   | 5.6<br>(0.220)   | -                | -                | -               | -               | -               | -               | -                          | -                          |
| Øb             | All           | 0.585<br>(0.023)    | 0.685<br>(0.027) | 0.585<br>(0.023) | 0.685<br>(0.027) | 0.76<br>(0.030) | 0.86<br>(0.034) | 0.76<br>(0.030) | 0.86<br>(0.034) | 0.76<br>(0.030)            | 0.86<br>(0.034)            |

NOTES: Dimensions in millimeters, inches in parentheses.

6. 10mm ALSO AVAILABLE; See Additional Lead Style Options.

7. V24ZA50 and V24ZC50 only supplied with lead spacing of 6.35mm ± 0.5mm (0.25 ± 0.0196)  
Dimension E = 5.85 min. Does not apply to T&R parts.

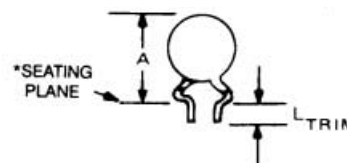
# Varistor Products

Low to Medium Voltage, Radial Lead

## ZA Varistor Series

### Additional Lead Style Options

Radial lead types can be supplied with combination preformed crimp and trimmed leads. This option is supplied to the dimensions shown.



**\*SEATING PLANE INTERPRETATION PER IEC-717  
CRIMPED AND TRIMMED LEAD**

| SYMBOL            | VARISTOR MODEL SIZE |                 |                 |                 |                 |                 |                 |                 |                 |                 |
|-------------------|---------------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|
|                   | 5mm                 |                 | 7mm             |                 | 10mm            |                 | 14mm            |                 | 20mm            |                 |
|                   | MIN                 | MAX             | MIN             | MAX             | MIN             | MAX             | MIN             | MAX             | MIN             | MAX             |
| A                 | -                   | 13.0<br>(0.512) | -               | 15<br>(0.591)   | -               | 19.5<br>(0.768) | -               | 22.5<br>(0.886) | -               | 29.0<br>(1.142) |
| L <sub>TRIM</sub> | 2.41<br>(0.095)     | 4.69<br>(0.185) | 2.41<br>(0.095) | 4.69<br>(0.185) | 2.41<br>(0.095) | 4.69<br>(0.185) | 2.41<br>(0.095) | 4.69<br>(0.185) | 2.41<br>(0.095) | 4.69<br>(0.185) |

NOTE: Dimensions in millimeters, inches in parentheses.

- To order this crimped and trimmed lead style, standard radial type model numbers are changed by replacing the model letter "ZA" with "ZC". This option is supplied in bulk only.

Example:

| STANDARD CATALOG MODEL | ORDER AS: |
|------------------------|-----------|
| V18ZA3                 | V18ZC3    |

For crimped leads without trimming and any variations to the above, contact Littelfuse.

- For 10±1mm lead spacing on 20mm diameter models only; append standard model numbers by adding "X10".

Example:

| STANDARD CATALOG MODEL | ORDER AS:  |
|------------------------|------------|
| V18ZA40                | V18ZA40X10 |

### ZA series varistors for Hi-Temperature operating conditions:

- Phenolic Coated ZA Series devices are available with improved maximum operating maximum temperature 125°C.
- These devices also have improved temperature cycling performance capability.
- Ratings and Specifications are as per standard ZA Series except Hi-Pot encapsulation Isolation Voltage Capability = 500V.
- To order: add X1347 to part number (e.g. V22ZA3X1347)
- Marked identifier will contain 'P' to denote Phenolic.
- These devices are not UL, CSA, VDE or CECC certified.
- Contact factory for further details.

### Ordering Information

ZA series Varistors are shipped standard in bulk pack with straight leads and lead spacing outlined in the package dimensions on page 4-13. Contact your Littelfuse sales representative to discuss the non-standard options outlined below.

