

VDR Metal Oxide Varistors Standard



FEATURES

- Zinc oxide disc, epoxy coated
- Straight leads
- Straight leads with flange (2381 592 and 593 series only)
- Kinked leads
- Compliant to RoHS directive 2002/95/EC and in accordance to WEEE 2002/96/EC
- Certified according to UL 1449 edition 3, VDE/IEC 61051-1/2 and CSA



RoHS
COMPLIANT

APPLICATION

- Overvoltage and transient voltage protection

DESCRIPTION

The varistors consist of a disc of low-β ceramic material with two tinned solid copper leads or tinned copper clad steel wire. They are coated with a layer of ochre coloured epoxy, which provides electrical, mechanical and climatic protection. The encapsulation is resistant to all cleaning solvents in accordance with IEC 60068-2-45.

MOUNTING

The varistors are suitable for processing on automatic insertion and cutting and bending equipment.

Varistors with flanged leads provide better positioning on printed-circuit boards (PCB) and more accurate control over component height. This is important for hand mounting and automatic insertion techniques; see outlines of flanged leads drawing.

Typical soldering

235 °C, duration: 5 s (Pb-bearing)

245 °C, duration: 5 s (lead (Pb)-free)

Resistance to soldering heat

260 °C, duration: 10 s max.

MARKING

The varistors are marked with the following information:

- Maximum continuous RMS voltage
- Series number (592, 593, 594, 595 or 596)
- Manufacturers logo
- Date of manufacture (YYWW)

INFLAMMABILITY

The varistors are non-flammable.

The encapsulation is made of flammable resistant epoxy in accordance with UL 94 V-0.

| QUICK REFERENCE DATA | | |
|--|---|------|
| PARAMETER | VALUE | UNIT |
| Maximum continuous voltage in operating temperature range: | | |
| RMS | 14 to 680 | V |
| DC | 18 to 895 | V |
| Maximum non-repetitive transient current I_{NRP} (8 x 20 μs) | 100 to 6500 | A |
| Detailed specification | Based on IEC 61051-1 IEC 61051-2 IEC 61051-2-2 | |
| Storage temperature | - 40 to + 125 | °C |
| Operating temperature | - 40 to + 85 | °C |

ORDERING INFORMATION

The varistors are available in a number of packaging options:

- Bulk
- On tape on reel
- On tape in ammpack

The basic ordering code for each option is given in tables titled Varistors on Tape on Reel, Varistors on Tape in Ammpack and Varistors in Bulk. To complete the catalog number and to determine the required operating parameters, see Electrical Data and Ordering Information table.

| ELECTRICAL DATA AND ORDERING INFORMATION | | | | | | | | | | | | |
|--|--------|--------------------------------|-----------------------------------|-------|--|---|-----------------------|----------|-----------|-------------------------------------|--------------------------------|---------------------------|
| MAXIMUM CONTINUOUS VOLTAGE | | VOLTAGE ⁽³⁾ at 1 mA | MAXIMUM VOLTAGE at STATED CURRENT | | MAXIMUM ENERGY ⁽⁴⁾ (10 x 1000 μs) | MAXIMUM NON-REP. TRANSIENT CURRENT ⁽⁵⁾ I_{NRP} (8 x 20 μs) | TYPICAL CAP. at 1 kHz | T (max.) | E | UL 1449 ED3 SPD TYPE ⁽⁸⁾ | CATALOG NUMBERS ⁽¹⁾ | |
| RMS ⁽²⁾ (V) | DC (V) | (V) | V (V) | I (A) | (J) | (A) | (pF) | (mm) | (mm) | | SAP ⁽⁷⁾ | 12NC ⁽⁶⁾ 2381- |
| 14 | 18 | 22 | 48 | 1.0 | 0.5 | 100 | 1300 | 4.1 | 0.7 ± 0.3 | 4 | VDRS05A014xyE | 592 x140y |
| | | | 43 | 2.5 | 1.7 | 250 | 2800 | 4.1 | 0.7 ± 0.3 | 4 | VDRS07B014xyE | 593 x140y |
| | | | 43 | 5.0 | 4.3 | 500 | 6000 | 4.4 | 0.9 ± 0.3 | 4 | VDRS10D014xyE | 594 x140y |
| | | | 43 | 10.0 | 5.4 | 1000 | 15 000 | 4.4 | 0.9 ± 0.3 | 4 | VDRS14G014xyE | 595 x140y |
| | | | 43 | 20.0 | 8.0 | 2000 | 30 000 | 4.6 | 1.1 ± 0.3 | 4 | VDRS20M014ByE | 596 x140y |



ELECTRICAL DATA AND ORDERING INFORMATION

| MAXIMUM CONTINUOUS VOLTAGE | | VOLTAGE ⁽³⁾ at 1 mA | MAXIMUM VOLTAGE at STATED CURRENT | | MAXIMUM ENERGY ⁽⁴⁾ (10 x 1000 µs) | MAXIMUM NON-REP. TRANSIENT CURRENT ⁽⁵⁾ I _{NRP} (8 x 20 µs) | TYPICAL CAP. at 1 kHz | T (max.) | E | UL 1449 ED3 SPD TYPE ⁽⁸⁾ | CATALOG NUMBERS ⁽¹⁾ | |
|----------------------------|--------|--------------------------------|-----------------------------------|-------|--|--|-----------------------|----------|-----------|-------------------------------------|--------------------------------|---------------------------|
| RMS ⁽²⁾ (V) | DC (V) | (V) | V (V) | I (A) | (J) | (A) | (pF) | (mm) | (mm) | | SAP ⁽⁷⁾ | 12NC ⁽⁶⁾ 2381- |
| 17 | 22 | 27 | 60 | 1.0 | 0.7 | 100 | 1050 | 4.1 | 0.8 ± 0.3 | 4 | VDRS05A017xyE | 592 x170y |
| | | | 53 | 2.5 | 2.0 | 250 | 2000 | 4.1 | 0.8 ± 0.3 | 4 | VDRS07B017xyE | 593 x170y |
| | | | 53 | 5.0 | 5.3 | 500 | 4000 | 4.4 | 1.0 ± 0.3 | 4 | VDRS10D017xyE | 594 x170y |
| | | | 53 | 10.0 | 6.9 | 1000 | 10 000 | 4.4 | 1.0 ± 0.3 | 4 | VDRS14G017xyE | 595 x170y |
| | | | 53 | 20.0 | 10.0 | 2000 | 20 000 | 4.6 | 1.2 ± 0.3 | 4 | VDRS20M017ByE | 596 x170y |
| 20 | 26 | 33 | 73 | 1.0 | 0.8 | 100 | 900 | 4.1 | 1.0 ± 0.3 | 4 | VDRS05A020xyE | 592 x200y |
| | | | 65 | 2.5 | 2.5 | 250 | 1500 | 4.1 | 1.0 ± 0.3 | 4 | VDRS07B020xyE | 593 x200y |
| | | | 65 | 5.0 | 6.5 | 500 | 3000 | 4.4 | 1.2 ± 0.3 | 4 | VDRS10D020xyE | 594 x200y |
| | | | 65 | 10.0 | 8.8 | 1000 | 7500 | 4.4 | 1.2 ± 0.3 | 4 | VDRS14G020xyE | 595 x200y |
| | | | 65 | 20.0 | 12.0 | 2000 | 15 000 | 4.8 | 1.4 ± 0.3 | 4 | VDRS20M020ByE | 596 x200y |
| 25 | 31 | 39 | 86 | 1.0 | 0.9 | 100 | 500 | 4.2 | 1.2 ± 0.3 | 4 | VDRS05A025xyE | 592 x250y |
| | | | 77 | 2.5 | 3.0 | 250 | 1350 | 4.2 | 1.2 ± 0.3 | 4 | VDRS07B025xyE | 593 x250y |
| | | | 77 | 5.0 | 7.7 | 500 | 2600 | 4.6 | 1.4 ± 0.3 | 4 | VDRS10D025xyE | 594 x250y |
| | | | 77 | 10.0 | 9.4 | 1000 | 6500 | 4.6 | 1.4 ± 0.3 | 4 | VDRS14G025xyE | 595 x250y |
| | | | 77 | 20.0 | 14.0 | 2000 | 13 000 | 5.0 | 1.6 ± 0.3 | 4 | VDRS20M025ByE | 596 x250y |
| 30 | 38 | 47 | 96 | 1.0 | 1.1 | 100 | 700 | 4.4 | 1.4 ± 0.5 | 4 | VDRS05A030xyE | 592 x300y |
| | | | 93 | 2.5 | 3.6 | 250 | 1600 | 4.4 | 1.4 ± 0.5 | 4 | VDRS07B030xyE | 593 x300y |
| | | | 93 | 5.0 | 9.2 | 500 | 2700 | 4.8 | 1.6 ± 0.5 | 4 | VDRS10D030xyE | 594 x300y |
| | | | 90 | 10.0 | 12.0 | 1000 | 6000 | 4.8 | 1.6 ± 0.5 | 4 | VDRS14G030xyE | 595 x300y |
| | | | 93 | 20.0 | 17.0 | 2000 | 12 000 | 5.2 | 1.8 ± 0.5 | 4 | VDRS20M030ByE | 596 x300y |
| 35 | 45 | 56 | 123 | 1.0 | 1.4 | 100 | 560 | 4.8 | 1.7 ± 0.5 | 4 | VDRS05A035xyE | 592 x350y |
| | | | 115 | 2.5 | 4.4 | 250 | 1300 | 4.8 | 1.7 ± 0.5 | 4 | VDRS07B035xyE | 593 x350y |
| | | | 110 | 5.0 | 11.0 | 500 | 2200 | 5.2 | 1.9 ± 0.5 | 4 | VDRS10D035xyE | 594 x350y |
| | | | 105 | 10.0 | 14.0 | 1000 | 4800 | 5.2 | 1.9 ± 0.5 | 4 | VDRS14G035xyE | 595 x350y |
| | | | 110 | 20.0 | 20.0 | 2000 | 9600 | 5.6 | 2.1 ± 0.5 | 4 | VDRS20M035ByE | 596 x350y |
| 40 | 56 | 68 | 145 | 1.0 | 1.6 | 100 | 460 | 5.1 | 2.1 ± 0.5 | 4 | VDRS05A040xyE | 592 x400y |
| | | | 135 | 2.5 | 5.2 | 250 | 1000 | 5.1 | 2.1 ± 0.5 | 4 | VDRS07B040xyE | 593 x400y |
| | | | 130 | 5.0 | 13.0 | 500 | 1800 | 5.5 | 2.3 ± 0.5 | 4 | VDRS10D040xyE | 594 x400y |
| | | | 130 | 10.0 | 17.0 | 1000 | 3800 | 5.5 | 2.3 ± 0.5 | 4 | VDRS14G040xyE | 595 x400y |
| | | | 135 | 20.0 | 24.0 | 2000 | 7600 | 5.9 | 2.5 ± 0.5 | 4 | VDRS20M040ByE | 596 x400y |
| 50 | 65 | 82 | 145 | 5.0 | 2.6 | 400 | 370 | 4.1 | 0.6 ± 0.3 | 4 | VDRS05C050xyE | 592 x500y |
| | | | 140 | 10.0 | 7.0 | 1200 | 900 | 4.1 | 0.6 ± 0.3 | 4 | VDRS07H050xyE | 593 x500y |
| | | | 140 | 25.0 | 12.0 | 2500 | 1500 | 4.4 | 0.8 ± 0.3 | 4 | VDRS10P050xyE | 594 x500y |
| | | | 140 | 50.0 | 21.0 | 4500 | 3100 | 4.4 | 0.8 ± 0.3 | 4 | VDRS14T050xyE | 595 x500y |
| 60 | 85 | 100 | 165 | 5.0 | 2.9 | 400 | 290 | 4.1 | 0.7 ± 0.3 | 4 | VDRS05C060xyE | 592 x600y |
| | | | 165 | 10.0 | 8.3 | 1200 | 700 | 4.1 | 0.7 ± 0.3 | 4 | VDRS07H060xyE | 593 x600y |
| | | | 165 | 25.0 | 15.0 | 2500 | 1200 | 4.4 | 0.9 ± 0.3 | 4 | VDRS10P060xyE | 594 x600y |
| | | | 165 | 50.0 | 24.0 | 4500 | 2300 | 4.4 | 0.9 ± 0.3 | 3 | VDRS14T060xyE | 595 x600y |
| | | | 165 | 100.0 | 56.0 | 6500 | 4700 | 4.5 | 1.1 ± 0.3 | 2 | VDRS20W060ByE | 596 x600y |
| 75 | 100 | 120 | 190 | 5.0 | 3.4 | 400 | 240 | 4.1 | 0.9 ± 0.3 | 4 | VDRS05C075xyE | 592 x750y |
| | | | 200 | 10.0 | 10.0 | 1200 | 530 | 4.1 | 0.9 ± 0.3 | 4 | VDRS07H075xyE | 593 x750y |
| | | | 200 | 25.0 | 18.0 | 2500 | 1000 | 4.4 | 1.1 ± 0.3 | 4 | VDRS10P075xyE | 594 x750y |
| | | | 200 | 50.0 | 29.0 | 4500 | 1900 | 4.4 | 1.1 ± 0.3 | 3 | VDRS14T075xyE | 595 x750y |
| | | | 200 | 100.0 | 64.0 | 6500 | 3900 | 4.8 | 1.3 ± 0.3 | 2 | VDRS20W075ByE | 596 x750y |
| 95 | 125 | 150 | 230 | 5.0 | 4.1 | 400 | 180 | 4.2 | 1.1 ± 0.3 | 4 | VDRS05C095xyE | 592 x950y |
| | | | 250 | 10.0 | 13.0 | 1200 | 450 | 4.2 | 1.1 ± 0.3 | 4 | VDRS07H095xyE | 593 x950y |
| | | | 250 | 25.0 | 22.0 | 2500 | 800 | 4.6 | 1.3 ± 0.3 | 4 | VDRS10P095xyE | 594 x950y |
| | | | 250 | 50.0 | 37.0 | 4500 | 1500 | 4.6 | 1.3 ± 0.3 | 3 | VDRS14T095xyE | 595 x950y |
| | | | 250 | 100.0 | 88.0 | 6500 | 3000 | 5.2 | 1.5 ± 0.3 | 2 | VDRS20W095ByE | 596 x950y |



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|--|--------|--------------------------------|-----------------------------------|-------|--|--|-----------------------|----------|-----------|-------------------------------------|--------------------------------|---------------------------|
| MAXIMUM CONTINUOUS VOLTAGE | | VOLTAGE ⁽³⁾ at 1 mA | MAXIMUM VOLTAGE at STATED CURRENT | | MAXIMUM ENERGY ⁽⁴⁾ (10 x 1000 µs) | MAXIMUM NON-REP. TRANSIENT CURRENT ⁽⁵⁾ I _{NRP} (8 x 20 µs) | TYPICAL CAP. at 1 kHz | T (max.) | E | UL 1449 ED3 SPD TYPE ⁽⁸⁾ | CATALOG NUMBERS ⁽¹⁾ | |
| RMS ⁽²⁾ (V) | DC (V) | (V) | V (V) | I (A) | (J) | (A) | (pF) | (mm) | (mm) | | SAP ⁽⁷⁾ | 12NC ⁽⁶⁾ 2381- |
| 130 | 170 | 205 | 310 | 5.0 | 5.5 | 400 | 130 | 4.2 | 1.0 ± 0.3 | 4 | VDRS05C130xyE | 592 x131y |
| | | | 340 | 10.0 | 17.0 | 1200 | 320 | 4.2 | 1.0 ± 0.3 | 4 | VDRS07H130xyE | 593 x131y |
| | | | 340 | 25.0 | 30.0 | 2500 | 580 | 4.6 | 1.2 ± 0.3 | 4 | VDRS10P130xyE | 594 x131y |
| | | | 340 | 50.0 | 56.0 | 4500 | 1050 | 4.6 | 1.2 ± 0.3 | 3 | VDRS14T130xyE | 595 x131y |
| | | | 340 | 100.0 | 114.0 | 6500 | 2100 | 5.3 | 1.4 ± 0.3 | 2 | VDRS20W130ByE | 596 x131y |
| 140 | 180 | 220 | 350 | 5.0 | 6.3 | 400 | 120 | 4.4 | 1.0 ± 0.3 | 4 | VDRS05C140xyE | 592 x141y |
| | | | 370 | 10.0 | 21.0 | 1200 | 290 | 4.4 | 1.0 ± 0.3 | 4 | VDRS07H140xyE | 593 x141y |
| | | | 370 | 25.0 | 33.0 | 2500 | 540 | 4.8 | 1.2 ± 0.3 | 4 | VDRS10P140xyE | 594 x141y |
| | | | 370 | 50.0 | 57.0 | 4500 | 950 | 4.8 | 1.2 ± 0.3 | 3 | VDRS14T140xyE | 595 x141y |
| | | | 360 | 100.0 | 124.0 | 6500 | 1900 | 5.4 | 1.5 ± 0.3 | 2 | VDRS20W140ByE | 596 x141y |
| 150 | 200 | 240 | 395 | 5.0 | 7.1 | 400 | 110 | 4.4 | 1.1 ± 0.3 | 4 | VDRS05C150xyE | 592 x151y |
| | | | 400 | 10.0 | 20.0 | 1200 | 270 | 4.4 | 1.1 ± 0.3 | 4 | VDRS07H150xyE | 593 x151y |
| | | | 400 | 25.0 | 36.0 | 2500 | 490 | 4.8 | 1.3 ± 0.3 | 4 | VDRS10P150xyE | 594 x151y |
| | | | 400 | 50.0 | 59.0 | 4500 | 850 | 4.8 | 1.3 ± 0.3 | 3 | VDRS14T150xyE | 595 x151y |
| | | | 395 | 100.0 | 134.0 | 6500 | 1700 | 5.5 | 1.6 ± 0.3 | 2 | VDRS20W150ByE | 596 x151y |
| 175 | 225 | 275 | 410 | 5.0 | 7.3 | 400 | 90 | 4.6 | 1.3 ± 0.3 | 4 | VDRS05C175xyE | 592 x171y |
| | | | 455 | 10.0 | 23.0 | 1200 | 230 | 4.6 | 1.3 ± 0.3 | 4 | VDRS07H175xyE | 593 x171y |
| | | | 455 | 25.0 | 41.0 | 2500 | 430 | 5.0 | 1.5 ± 0.3 | 4 | VDRS10P175xyE | 594 x171y |
| | | | 455 | 50.0 | 67.0 | 4500 | 750 | 5.0 | 1.5 ± 0.3 | 3 | VDRS14T175xyE | 595 x171y |
| | | | 455 | 100.0 | 158.0 | 6500 | 1500 | 5.7 | 1.7 ± 0.3 | 2 | VDRS20W175ByE | 596 x171y |
| 230 | 300 | 360 | 560 | 5.0 | 10.0 | 400 | 70 | 4.9 | 1.7 ± 0.8 | 4 | VDRS05C230xyE | 592 x231y |
| | | | 600 | 10.0 | 30.0 | 1200 | 170 | 4.9 | 1.7 ± 0.8 | 4 | VDRS07H230xyE | 593 x231y |
| | | | 600 | 25.0 | 54.0 | 2500 | 320 | 5.4 | 1.9 ± 0.8 | 4 | VDRS10P230xyE | 594 x231y |
| | | | 600 | 50.0 | 88.0 | 4500 | 540 | 5.4 | 1.9 ± 0.8 | 3 | VDRS14T230xyE | 595 x231y |
| | | | 595 | 100.0 | 208.0 | 6500 | 1100 | 6.2 | 2.2 ± 0.8 | 2 | VDRS20W230ByE | 596 x231y |
| 250 | 320 | 390 | 600 | 5.0 | 11.0 | 400 | 60 | 4.9 | 1.9 ± 0.8 | 4 | VDRS05C250xyE | 592 x251y |
| | | | 650 | 10.0 | 33.0 | 1200 | 160 | 4.9 | 1.9 ± 0.8 | 4 | VDRS07H250xyE | 593 x251y |
| | | | 650 | 25.0 | 58.0 | 2500 | 300 | 5.4 | 2.1 ± 0.8 | 4 | VDRS10P250xyE | 594 x251y |
| | | | 650 | 50.0 | 96.0 | 4500 | 480 | 5.4 | 2.1 ± 0.8 | 3 | VDRS14T250xyE | 595 x251y |
| | | | 650 | 100.0 | 240.0 | 6500 | 960 | 6.4 | 2.3 ± 0.8 | 2 | VDRS20W250ByE | 596 x251y |
| 275 | 350 | 430 | 695 | 5.0 | 12.0 | 400 | 55 | 4.9 | 2.0 ± 0.8 | 4 | VDRS05C275xyE | 592 x271y |
| | | | 710 | 10.0 | 36.0 | 1200 | 140 | 4.9 | 2.0 ± 0.8 | 4 | VDRS07H275xyE | 593 x271y |
| | | | 710 | 25.0 | 63.0 | 2500 | 270 | 5.4 | 2.2 ± 0.8 | 4 | VDRS10P275xyE | 594 x271y |
| | | | 710 | 50.0 | 104.0 | 4500 | 440 | 5.4 | 2.2 ± 0.8 | 3 | VDRS14T275xyE | 595 x271y |
| | | | 710 | 100.0 | 264.0 | 6500 | 900 | 6.6 | 2.5 ± 0.8 | 2 | VDRS20W275ByE | 596 x271y |
| 300 | 385 | 470 | 750 | 5.0 | 13.0 | 400 | 50 | 5.3 | 2.2 ± 0.8 | 4 | VDRS05C300xyE | 592 x301y |
| | | | 800 | 10.0 | 40.0 | 1200 | 130 | 5.3 | 2.2 ± 0.8 | 4 | VDRS07H300xyE | 593 x301y |
| | | | 800 | 25.0 | 71.0 | 2500 | 240 | 5.9 | 2.4 ± 0.8 | 4 | VDRS10P300xyE | 594 x301y |
| | | | 800 | 50.0 | 117.0 | 4500 | 400 | 5.9 | 2.4 ± 0.8 | 3 | VDRS14T300xyE | 595 x301y |
| | | | 775 | 100.0 | 280.0 | 6500 | 810 | 6.9 | 2.7 ± 0.8 | 2 | VDRS20W300ByE | 596 x301y |
| 320 | 420 | 510 | 800 | 5.0 | 15.0 | 400 | 45 | 5.5 | 2.4 ± 0.8 | 4 | VDRS05C320xyE | 592 x321y |
| | | | 850 | 10.0 | 44.0 | 1200 | 120 | 5.5 | 2.4 ± 0.8 | 4 | VDRS07H320xyE | 593 x321y |
| | | | 850 | 25.0 | 77.0 | 2500 | 220 | 6.2 | 2.6 ± 0.8 | 4 | VDRS10P320xyE | 594 x321y |
| | | | 850 | 50.0 | 120.0 | 4500 | 370 | 6.2 | 2.6 ± 0.8 | 3 | VDRS14T320xyE | 595 x321y |
| | | | 842 | 100.0 | 296.0 | 6500 | 750 | 7.1 | 2.9 ± 0.8 | 2 | VDRS20W320ByE | 596 x321y |
| 350 | 460 | 560 | 940 | 5.0 | 19.5 | 400 | 42 | 5.8 | 2.7 ± 0.8 | 4 | VDRS05C350xyE | 592 x351y |
| | | | 920 | 10.0 | 39.0 | 1200 | 110 | 5.8 | 2.7 ± 0.8 | 4 | VDRS07H350xyE | 593 x351y |
| | | | 920 | 25.0 | 78.0 | 2500 | 200 | 6.6 | 2.9 ± 0.8 | 4 | VDRS10P350xyE | 594 x351y |
| | | | 920 | 50.0 | 156.0 | 4500 | 325 | 6.6 | 2.9 ± 0.8 | 3 | VDRS14T350xyE | 595 x351y |
| | | | 920 | 100.0 | 312.0 | 6500 | 660 | 7.4 | 3.2 ± 0.8 | 2 | VDRS20W350ByE | 596 x351y |



| ELECTRICAL DATA AND ORDERING INFORMATION | | | | | | | | | | | | |
|---|---------------|---------------------------------------|--|--------------|---|--|------------------------------|-----------------|-------------|--|---------------------------------------|----------------------------------|
| MAXIMUM CONTINUOUS VOLTAGE | | VOLTAGE ⁽³⁾ at 1 mA | MAXIMUM VOLTAGE at STATED CURRENT | | MAXIMUM ENERGY ⁽⁴⁾ (10 x 1000 µs) | MAXIMUM NON-REP. TRANSIENT CURRENT ⁽⁵⁾ I_{NRP} (8 x 20 µs) | TYPICAL CAP. at 1 kHz | T (max.) | E | UL 1449 ED3 SPD TYPE ⁽⁸⁾ | CATALOG NUMBERS ⁽¹⁾ | |
| RMS ⁽²⁾ (V) | DC (V) | (V) | V (V) | I (A) | (J) | (A) | (pF) | (mm) | (mm) | | SAP ⁽⁷⁾ | 12NC ⁽⁶⁾ 2381- |
| 385 | 505 | 620 | 1000 | 5.0 | 18.0 | 400 | 40 | 6.0 | 3.0 ± 0.8 | 4 | VDRS05C385xyE | 592 x381y |
| | | | 1025 | 10.0 | 51.0 | 1200 | 95 | 6.0 | 3.0 ± 0.8 | 4 | VDRS07H385xyE | 593 x381y |
| | | | 1025 | 25.0 | 67.0 | 2500 | 180 | 6.6 | 3.2 ± 0.8 | 4 | VDRS10P385xyE | 594 x381y |
| | | | 1025 | 50.0 | 110.0 | 4500 | 280 | 6.6 | 3.2 ± 0.8 | 3 | VDRS14T385xyE | 595 x381y |
| | | | 1025 | 100.0 | 328.0 | 6500 | 570 | 7.7 | 3.5 ± 0.8 | 2 | VDRS20W385ByE | 596 x381y |
| 420 | 560 | 680 | 1100 | 5.0 | 20.0 | 400 | 35 | 6.1 | 3.2 ± 0.8 | 4 | VDRS05C420xyE | 592 x421y |
| | | | 1120 | 10.0 | 56.0 | 1200 | 85 | 6.1 | 3.2 ± 0.8 | 4 | VDRS07H420xyE | 593 x421y |
| | | | 1120 | 25.0 | 73.0 | 2500 | 165 | 6.6 | 3.4 ± 0.8 | 4 | VDRS10P420xyE | 594 x421y |
| | | | 1120 | 50.0 | 120.0 | 4500 | 250 | 6.6 | 3.4 ± 0.8 | 3 | VDRS14T420xyE | 595 x421y |
| | | | 1120 | 100.0 | 344.0 | 6500 | 510 | 8.1 | 3.7 ± 0.8 | 2 | VDRS20W420ByE | 596 x421y |
| 460 | 615 | 750 | 1200 | 5.0 | 21.0 | 400 | 30 | 6.4 | 3.6 ± 0.8 | 4 | VDRS05C460xyE | 592 x461y |
| | | | 1240 | 10.0 | 63.0 | 1200 | 75 | 6.4 | 3.6 ± 0.8 | 4 | VDRS07H460xyE | 593 x461y |
| | | | 1240 | 25.0 | 82.0 | 2500 | 150 | 6.8 | 3.8 ± 0.8 | 4 | VDRS10P460xyE | 594 x461y |
| | | | 1240 | 50.0 | 135.0 | 4500 | 225 | 6.8 | 3.8 ± 0.8 | 3 | VDRS14T460xyE | 595 x461y |
| | | | 1240 | 100.0 | 360.0 | 6500 | 460 | 8.5 | 4.1 ± 0.8 | 2 | VDRS20W460ByE | 596 x461y |
| 510 | 670 | 820 | 1355 | 25.0 | 89.0 | 2500 | 135 | 7.2 | 4.1 ± 0.8 | 4 | VDRS10P510xyE | 594 x511y |
| | | | 1355 | 50.0 | 145.0 | 4500 | 220 | 7.2 | 4.1 ± 0.8 | 3 | VDRS14T510xyE | 595 x511y |
| | | | 1355 | 100.0 | 376.0 | 6500 | 450 | 8.9 | 4.4 ± 0.8 | 2 | VDRS20W510ByE | 596 x511y |
| 550 | 745 | 910 | 1500 | 25.0 | 98.0 | 2500 | 120 | 7.9 | 4.5 ± 0.8 | 4 | VDRS10P550xyE | 594 x551y |
| | | | 1500 | 50.0 | 160.0 | 4500 | 180 | 7.9 | 4.5 ± 0.8 | 3 | VDRS14T550xyE | 595 x551y |
| | | | 1500 | 100.0 | 408.0 | 6500 | 370 | 9.5 | 4.9 ± 0.8 | 2 | VDRS20W550ByE | 596 x551y |
| 625 | 825 | 1000 | 1650 | 100.0 | 448.0 | 6500 | 320 | 10.1 | 5.3 ± 0.8 | 2 | VDRS20W625ByE | 596 x621y |
| 680 | 895 | 1100 | 1815 | 100.0 | 496.0 | 6500 | 270 | 10.6 | 5.8 ± 0.8 | 2 | VDRS20W680ByE | 596 x681y |

Notes

(1) The products are certified according to (c)UL (E332800), VDE (40002622) and CSA (219883)

(2) The sinusoidal voltage is assumed as the normal operating condition. If a non-sinusoidal voltage is present, type selection should be based on multiplying the peak voltage by a factor of 0.707.

(3) The voltage measured at 1 mA meets the requirements of IEC 61051.

The tolerance on the voltage at 1 mA is ± 10 %.

(4) High energy surges are generally of longer duration. The maximum energy for one pulse of 10 x 1000 µs is given as a reference for longer duration pulses. This pulse can be characterised by peak current (I_p) and pulse width t₂ (virtual time of half I_p value, following IEC 60060-2, section 6). If V_p is the clamping voltage corresponding to I_p, the energy absorbed in the varistor is determined by the formula:

$$E = K \times V_p \times I_p \times t_2$$

where:

a) K is dependent on the value of t₂ when the value of t₁ is between 8 µs and 10 µs; see Peak Current as a Function of Pulse Width drawing.

(5) A current wave of 8 x 20 µs is used as a standard for pulse current and clamping voltage ratings. The maximum non-repetitive transient current is given for one pulse applied during the life of the component.

(6) For composition of the 12NC part number replace “x” and “y” by figures from the sections “Varistors in Bulk”, “Varistors on Tape in Ammpack” and “Varistors on Tape on Reel”.

(7) For composition of the SAP part number:

Replace “x” by
 B for bulk type
 T for tape and reel
 A for tape and ammpack

Replace “y” by S for straight leads
 F for straight leads with flange (bulk only)
 G for straight leads with flange and H₀ = 16 mm (tape and reel/ammo)
 H for straight leads with flange and H₀ = 18.25 mm (tape and reel/ammo)
 K for kinked leads (bulk only)
 L for kinked leads with H₀ = 16 mm (tape and reel/ammo)
 M for kinked leads with H₀ = 18.25 mm (tape and reel/ammo)

(8) All varistors are recognized under VZAC2 surge protective devices, components type 4 as specified in UL 1449 edition 3. The parts with indication type 2 or 3 SPD's, are tested and certified to be used in type 2 or 3 SPD applications. The final acceptance of the component is dependent upon its installation and use in complete equipment submitted to underwriters laboratories Inc.

ELECTRICAL CHARACTERISTICS

| ELECTRICAL DATA | | |
|--|---------------|--------------|
| PARAMETER | VALUE | UNIT |
| Maximum continuous voltage: | | |
| RMS | 14 to 680 | V |
| DC | 18 to 895 | V |
| Maximum non-repetitive transient current (I_{NRP}) (8 x 20 μ s): | | |
| VDRS05.....E/2381 592 | 100 or 400 | A |
| VDRS07.....E/2381 593 | 250 or 1200 | A |
| VDRS10.....E/2381 594 | 500 or 2500 | A |
| VDRS14.....E/2381 595 | 1000 or 4500 | A |
| VDRS20.....E/2381 596 | 2000 or 6500 | A |
| Thermal resistance: | | |
| VDRS05.....E/2381 592 | \approx 80 | K/W |
| VDRS07.....E/2381 593 | \approx 70 | K/W |
| VDRS10.....E/2381 594 | \approx 60 | K/W |
| VDRS14.....E/2381 595 | \approx 50 | K/W |
| VDRS20.....E/2381 596 | \approx 40 | K/W |
| Maximum dissipation: | | |
| VDRS05.....E/2381 592 | 100 | mW |
| VDRS07.....E/2381 593 | 250 | mW |
| VDRS10.....E/2381 594 | 400 | mW |
| VDRS14.....E/2381 595 | 600 | mW |
| VDRS20.....E/2381 596 | 1000 | mW |
| Temperature coefficient of voltage at 1 mA maximum | \pm 0.05 | %/K |
| Voltage proof between interconnected leads and case | 2500 | V |
| Storage temperature | - 40 to + 125 | $^{\circ}$ C |
| Operating temperature | - 40 to + 85 | $^{\circ}$ C |

DERATING CURVE



PEAK CURRENT AS A FUNCTION OF PULSE WIDTH



COMPONENT DIMENSIONS (BULK TYPE) in millimeters AND CATALOG NUMBERS

| D MAX. | A MAX. | A ₀ MAX. | L MIN. | T ⁽¹⁾ MAX. | E ⁽¹⁾ | d | F | CATALOG NUMBER |
|--------|--------|---------------------|--------|-----------------------|------------------|----------------|---------------|----------------------------|
| 7.0 | 9.0 | 11.0 | 24.0 | 6.5 | 0.7 to 3.6 | 0.6 \pm 0.05 | 5 \pm 1.0 | VDRS05.....E/2381 592 |
| 9.0 | 11.0 | 13.0 | 24.0 | 6.5 | 0.7 to 3.6 | 0.6 \pm 0.05 | 5 \pm 1.0 | VDRS07.....E/2381 593 |
| 13.5 | 15.5 | 18.0 | 17.0 | 8 | 0.9 to 4.5 | 0.8 \pm 0.05 | 7.5 \pm 1.0 | VDRS10.....E/2381 594 |
| 17.0 | 19.0 | 23.0 | 16.0 | 8 | 0.9 to 4.5 | 0.8 \pm 0.05 | 7.5 \pm 1.0 | VDRS14.....E/2381 595 |
| 23.0 | 25.0 | 28.0 | 24.0 | 10 | 1.1 to 5.8 | 1.0 \pm 0.05 | 10 \pm 1.0 | VDRS20.....E/2381 596 |

Note

⁽¹⁾T_{max}. and E values per size and voltage level can be found back in the Electrical Data table

| VARISTORS IN BULK | | | | | |
|--|--|--|---|---|---|
| TYPE | VDRS05... 2381 592 ... Ø 5 mm 14 V to 460 V | VDRS07... 2381 593 Ø 7 mm 14 V to 460 V | VDRS10... 2381 594 Ø 10 mm 14 V to 550 V | VDRS14... 2381 595 Ø 14 mm 14 V to 550 V | VDRS20... 2381 596 Ø 20 mm 14 V to 680 V |
| Straight leads; see outline of components with straight leads drawing ⁽¹⁾ | BSE 5...6 | BSE 5...6 | BSE 5...6 | BSE 5...6 | BSE 5...6 |
| Straight leads with flange; see outline of components with flanged leads drawing | BFE 7...6 | BFE 7...6 | - | - | - |
| Kinked leads; see outline of components with kinked leads drawing | BKE 6...6 | BKE 6...6 | BKE 6...6 | BKE 6...6 | BKE 6...6 |
| Packaging quantities | | | | | |
| 14 V to 95 V | 250 | 250 | 250 | 100 | 50 |
| 130 V to 385 V | 250 | 250 | 250 | 100 | 50 |
| 420 V to 460 V | 250 | 250 | 200 | 100 | 50 |
| 485 V to max. V | - | 250 | 150 | 100 | 50 |

Note
⁽¹⁾ Outline of the Ø 20 mm differs from the other dimensions

DIMENSIONS in millimeters: See Component Dimensions and Electrical Data table

OUTLINE of Component with Straight Leads

OUTLINE of Component with Kinked Leads

OUTLINE of Component with Flanged Leads


| VARISTORS ON TAPE IN AMMOPACK | | | | |
|--|--|--|---|---|
| TYPE | VDRS05... 2381 592 ... Ø 5 mm 14 V to 460 V | VDRS07... 2381 593 ... Ø 7 mm 14 V to 460 V | VDRS10... 2381 594 ... Ø 10 mm 14 V to 550 V | VDRS14... 2381 595 ... Ø 14 mm 14 V to 550 V |
| Straight leads | | | | |
| H = 18 mm | - | - | ASE 0...7 | ASE 0...7 |
| H = 20 mm | ASE 0...7 | ASE 0...7 | - | - |
| See drawing: Taped version with straight leads | | | | |
| Straight leads with flange | | | | |
| H ₀ = 16 mm | AGE 1...7 | AGE 1...7 | - | - |
| H ₀ = 18.25 mm | AHE 2...7 | AHE 2...7 | - | - |
| See drawing: Taped version with flanged leads | | | | |
| Kinked leads | | | | |
| H ₀ = 18.25 mm | AME 3...7 | AME 3...7 | AME 3...7 | AME 3...7 |
| H ₀ = 16 mm | ALE 8...7 | ALE 8...7 | ALE 8...7 | ALE 8...7 |
| See drawing: Taped version with kinked leads | | | | |
| Packaging quantities | | | | |
| 14 V to 210 V | 1500 ⁽¹⁾ | 1500 ⁽¹⁾ | 500 | 500 |
| 230 V to max. V | 1000 | 1000 | 500 | 500 |

Note

⁽¹⁾ Except for 35 V and 40 V = 1000 pieces

DIMENSIONS OF AMMOPACK in millimeters



| VARISTORS ON TAPE AND REEL | | | | |
|--|--|--|---|---|
| TYPE | VDRS05... 2381 592 ... Ø 5 mm 14 V to 460 V | VDRS07... 2381 593 ... Ø 7 mm 14 V to 460 V | VDRS10... 2381 594 ... Ø 10 mm 14 V to 550 V | VDRS14... 2381 595 ... Ø 14 mm 14 V to 550 V |
| Straight leads | | | | |
| H = 18 mm | - | - | TSE 0...6 | TSE 0...6 |
| H = 20 mm | TSE 0...6 | TSE 0...6 | - | - |
| See drawing: Taped version with straight leads | | | | |
| Straight leads with flange | | | | |
| H ₀ = 16 mm | TGE 1...6 | TGE 1...6 | - | - |
| H ₀ = 18.25 mm | THE 2...6 | THE 2...6 | - | - |
| See drawing: Taped version with flanged leads | | | | |
| Kinked leads | | | | |
| H ₀ = 18.25 mm | TME 3...6 | TME 3...6 | TME 3...6 | TME 3...6 |
| H ₀ = 16 mm | TLE 8...6 | TLE 8...6 | TLE 8...6 | TLE 8...6 |
| See drawing: Taped version with kinked leads | | | | |
| Packaging quantities | | | | |
| 14 V to 250 V | 1500 | 1500 | 1000 | 750 |
| 275 V to 300 V | 1500 | 1500 | 750 | 750 |
| 320 V to 350 V | 1000 | 1000 | 500 | 500 |
| 385 V to max. V | 1000 | 1000 | 500 | 500 |

PACKAGING
TAPED VERSION WITH STRAIGHT LEADS (only for VDRS05.....E/2381 592 and VDRS07.....E/2381 593....)

TAPED VERSION WITH STRAIGHT LEADS (only for VDRS10.....E/2381 594 and VDRS14.....E/2381 595)


TAPED VERSION WITH KINKED LEADS

(only for VDRS05.....E/2381 592 and VDRS07.....E/2381 593)



TAPED VERSION WITH KINKED LEADS

(only for VDRS10.....E/2381 594 and VDRS14.....E/2381 595.....)



TAPED VERSION WITH FLANGED LEADS

(only for VDRS05.....E/2381 592 and VDRS07.....E/2381 593)



| TAPING DATA (based on IEC 60286-2) | | | | | |
|------------------------------------|--|---------------------------|---------------|------------------|---------------|
| SYMBOL | PARAMETER | DIMENSIONS/TOLERANCE | | | |
| | | VDRS05 592 | VDRS07 593 | VDRS10 594 | VDRS14 595 |
| A | Mounting height | 9.0 max. | 11.0 max. | 15.5 max. | 19.0 max. |
| A ₀ | Mounting height | 11.0 max. | 13.0 max. | 18.0 max. | 23.0 max. |
| D | Body diameter | 7.0 max. | 9.0 max. | 13.5 max. | 17.0 max. |
| d | Lead wire diameter | 0.6 ± 0.05 | | 0.8 ± 0.05 | |
| F | Lead to lead distance ⁽¹⁾ | 5.0 + 0.8/- 0.2 | | 7.5 ± 0.8 | |
| H | Distance component to tape center ⁽²⁾ | 20.0 + 2.0/- 0.0 | | 18.0 + 2.0/- 0.0 | |
| H ₀ | Lead wire clinch height | 16.0 or 18.25 ± 0.5 | | | |
| P | Pitch of components on tape | 12.7 ± 1.0 | | 25.4 ± 1.0 | |
| T | Total thickness | See Electrical Data table | | | |

Notes

⁽¹⁾ Guaranteed between component and tape

⁽²⁾ For 2381 595 0511y and 2381 595 0551y: H = 20 mm ± 1 mm



V/I CHARACTERISTICS

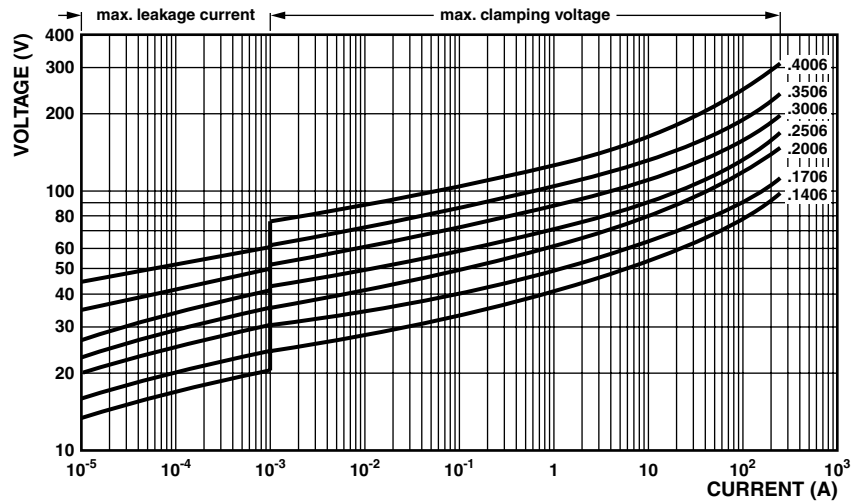
14 V_{RMS} to 40 V_{RMS}; VDRS05.....E/2381 592



50 V_{RMS} to 460 V_{RMS}; VDRS05.....E/2381 592



14 V_{RMS} to 40 V_{RMS}; VDRS07.....E/2381 593



VDRS.....E/2381 59.



Vishay BCcomponents VDR Metal Oxide Varistors Standard

50 V_{RMS} to 460 V_{RMS}; VDRS07.....E/2381 593



14 V_{RMS} to 40 V_{RMS}; VDRS10.....E/2381 594



50 V_{RMS} to 550 V_{RMS}; VDRS10.....E/2381 594





14 V_{RMS} to 40 V_{RMS}; VDRS14.....E/2381 595



50 V_{RMS} to 550 V_{RMS}; VDRS14.....E/2381 595



14 V_{RMS} to 40 V_{RMS}; VDRS20.....E/2381 596



50 V_{RMS} to 680 V_{RMS}; VDRS20.....E/2381 596



MAXIMUM APPLICABLE TRANSIENT CURRENT AS A FUNCTION OF PULSE DURATION

14 V_{RMS} to 40 V_{RMS}; VDRS05.....E/2381 592



50 V_{RMS} to 460 V_{RMS}; VDRS05.....E/2381 592





14 V_{RMS} to 40 V_{RMS}; VDRS07.....E/2381 593



50 V_{RMS} to 460 V_{RMS}; VDRS07.....E/2381 593



14 V_{RMS} to 40 V_{RMS}; VDRS10.....E/2381 594



50 V_{RMS} to 320 V_{RMS}; VDRS10.....E/2381 594



385 V_{RMS} to 550 V_{RMS}; VDRS10.....E/2381 594



14 V_{RMS} to 40 V_{RMS}; VDRS14.....E/2381 595





50 V_{RMS} to 320 V_{RMS}; VDRS14.....E/2381 595



385 V_{RMS} to 550 V_{RMS}; VDRS14.....E/2381 595



14 V_{RMS} to 40 V_{RMS}; VDRS20.....E/2381 596



60 V_{RMS} to 300 V_{RMS}; VDRS20.....E/2381 596



320 V_{RMS} to 680 V_{RMS}; VDRS20.....E/2381 596





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